REPAIR SECTION

FOREWORD

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

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

FUJI HEAVY INDUSTRIES LTD.

ENGINE SCTION

TRANSMISSION AND DIFFERENTIAL SECTION

MECHANICAL COMPONENTS SECTION

BODY SECTION

ELECTRICAL SECTION

Important safety notice

- Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.
- In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.
- It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if the used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

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How to use this manual

- This Service Manual is divided into four volumes by section so that it can be used with ease at work. Refer to the Table of Contents, select and use the necessary section.

  - GENERAL INFORMATION SECTION
  - REPAIR SECTION
  - DIAGNOSTICS SECTION
  - WIRING DIAGRAM SECTION

- Each chapter in the manual is basically made of the following four types of areas.

  S SPECIFICATIONS AND SERVICE DATA
  C COMPONENT PARTS
  W SERVICE PROCEDURE
  (X SERVICE PROCEDURE)
  (Y SERVICE PROCEDURE)
  T DIAGNOSTICS

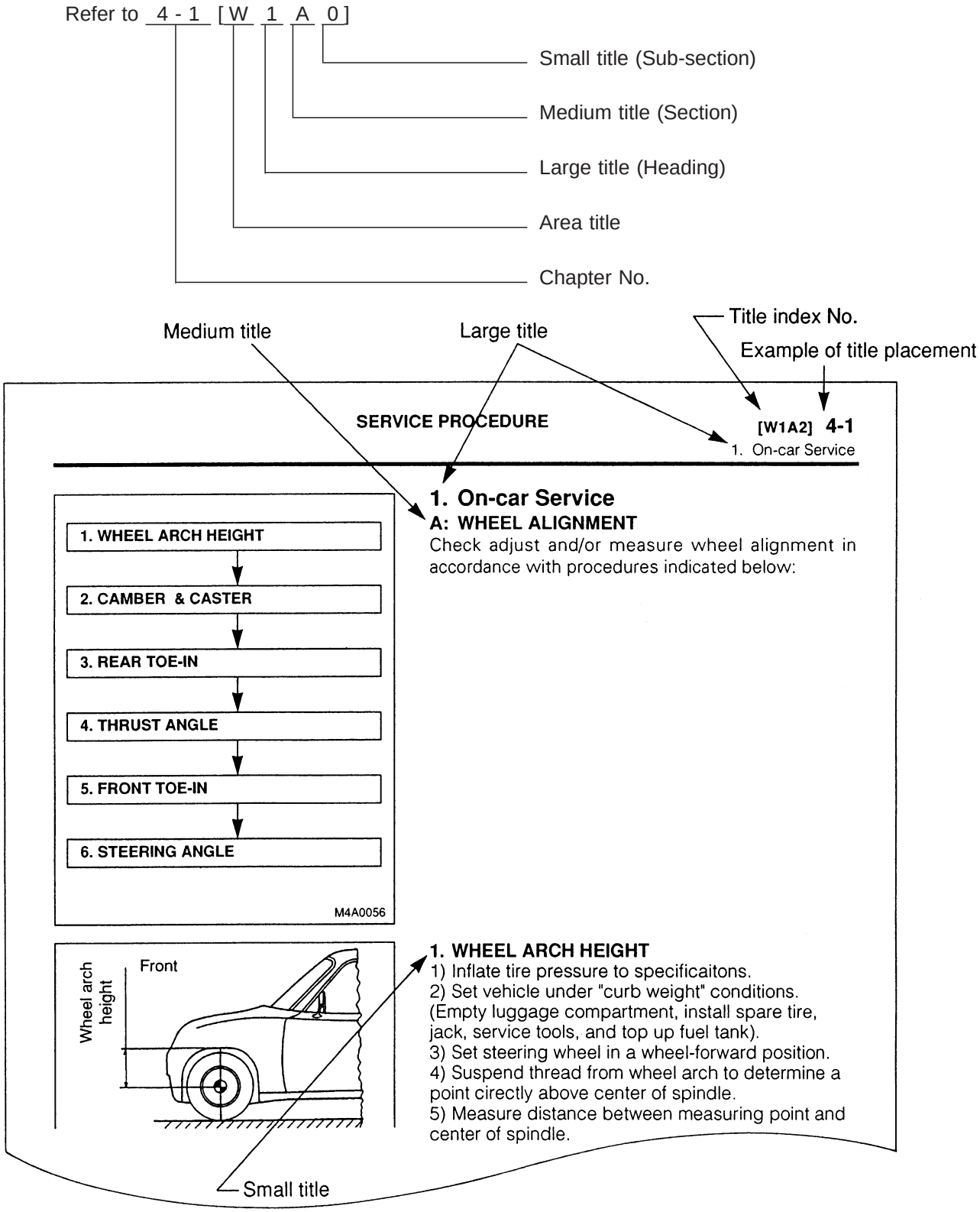
- The description of each area is provided with four types of titles different in size as shown below. The Title No. or Symbol prefixes each title in order that the construction of the article and the flow of explanation can be easily understood.

  [Example of each title]

  - Area title: W SERVICE PROCEDURE (one of the four types of areas)
  - Large title (Heading): 1. Oil Pump (to denote the main item of explanation)
  - Medium title (Section): A: REMOVAL (to denote the type of work in principle)
  - Small title (Sub-section): 1. INNER ROTATOR (to denote a derivative item of explanation)

- The Title Index No. is indicated on the top left (or right) side of the page as the book is opened. This is useful for retrieving the necessary portion.

(Example of usage)



- In this manual, the following symbols are used.

  ✻ : Selective part

  ★ : Replacement part

  : Should be lubricated with oil.

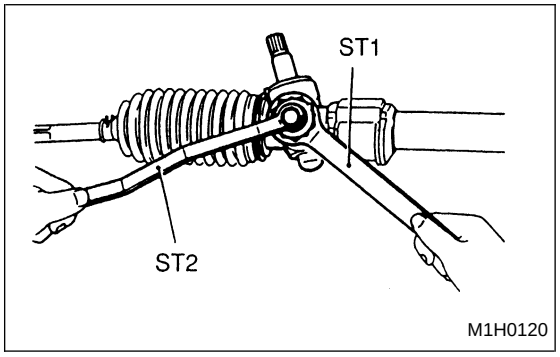
  : Should be lubricated with grease.

  : Sealing point

  T : Tightening torque

- WARNING, CAUTION, NOTE
  - WARNING: Indicates the item which must be observed precisely during performance of maintenance services in order to avoid injury to the mechanics and other persons.
  - CAUTION: Indicates the item which must be followed precisely during performance of maintenance services so as to avoid damage and breakage to the vehicle and its parts and components.
  - NOTE: Indicates the hints, knacks, etc. which make the maintenance job easier.

- SPECIAL TOOLS
  When any special tool is required to perform the job, it is identified by “ST” in the applicable illustration and its part number is shown in the manual.



1. Procedures for adjusting backlash

1) Set steering wheel to the straight-ahead position.
2) Remove the exhaust pipe
3) Loosen the lock nut with ST.

ST1	921650000	STEERING GEARBOX WRENCH
ST2	921550000	STEERING GEARBOX WRENCH

Description (of job method)

Shows the part name

Shows the part number

Tells that two kinds of special tools are required.
When two or more kinds of special tools are required to do a job, they are identified by ST1, ST2,.....respectively.

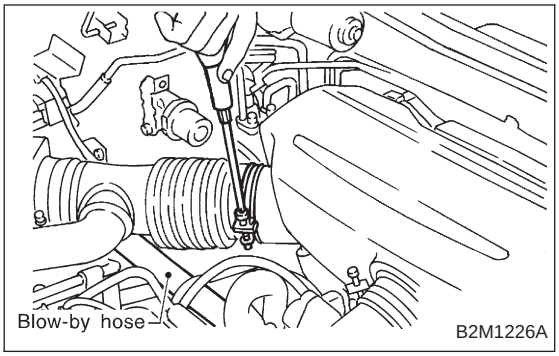
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	6-2	Body Electrical System

EMISSION CONTROL SYSTEM AND VACUUM FITTING 2-1

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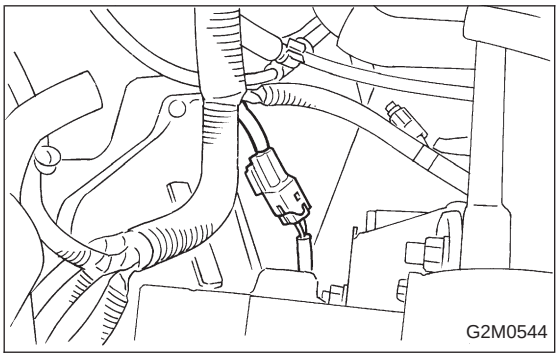
W SERVICE PROCEDURE 2
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13. Air Filter 22



1. Front Catalytic Converter

A: REMOVAL

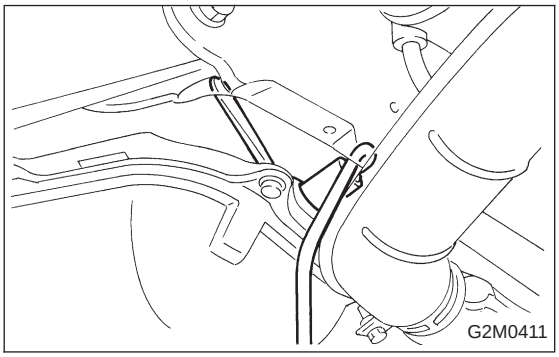
1) Remove air intake duct. <Ref. to 2-7 [W1A0].>



2) Disconnect front oxygen sensor connector.

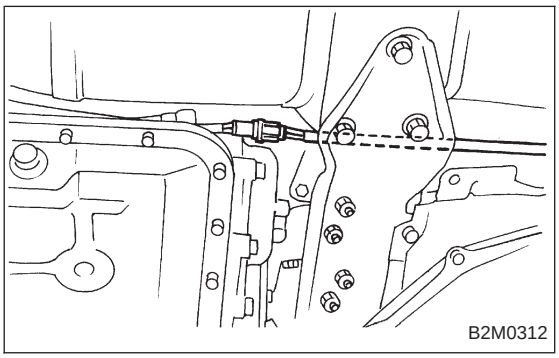
3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

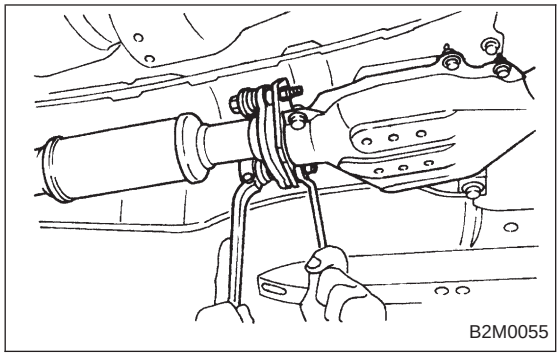


5) Remove front oxygen sensor.

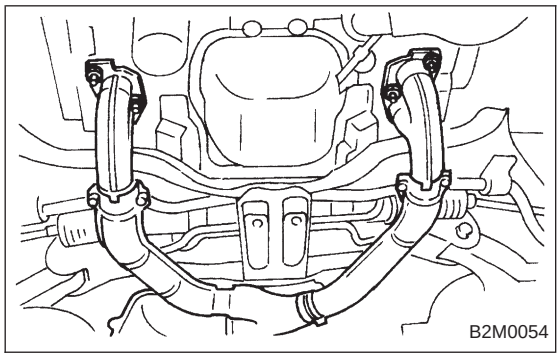
CAUTION:
When removing oxygen sensor, do not force oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.



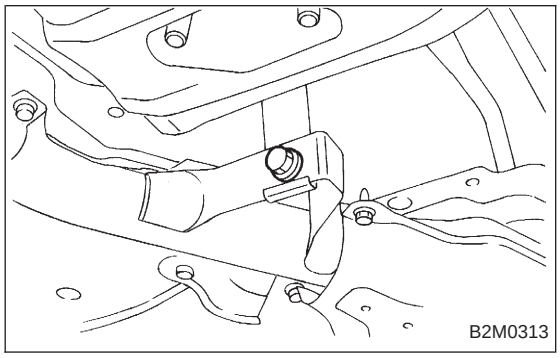
6) Disconnect rear oxygen sensor connector.


B2M0055

7) Separate center exhaust pipe from rear exhaust pipe.

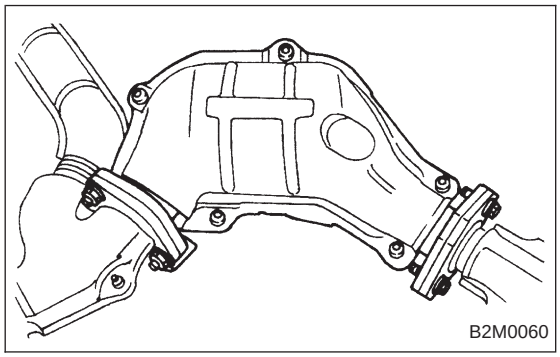

B2M0054

8) Remove bolts which hold front exhaust pipe onto cylinder heads.


B2M0313

9) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

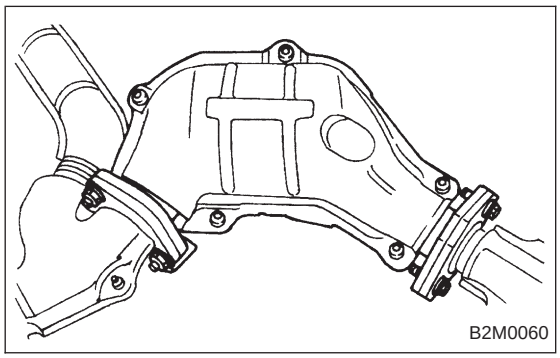
CAUTION:
Be careful not to pull down front exhaust pipe and center exhaust pipe.


B2M0060

10) Separate front catalytic converter from front exhaust pipe and center exhaust pipe.

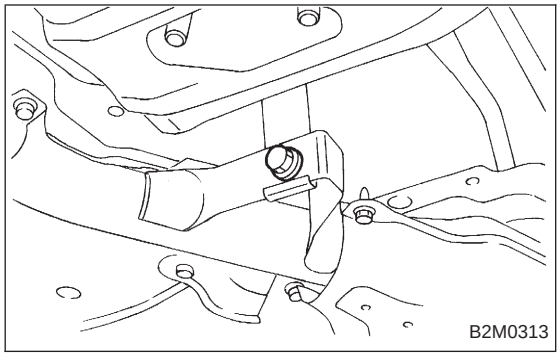
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

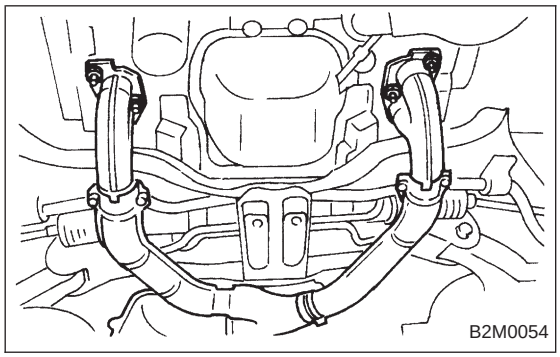

B2M0060

1) Install front catalytic converter to front exhaust pipe and center exhaust pipe.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)

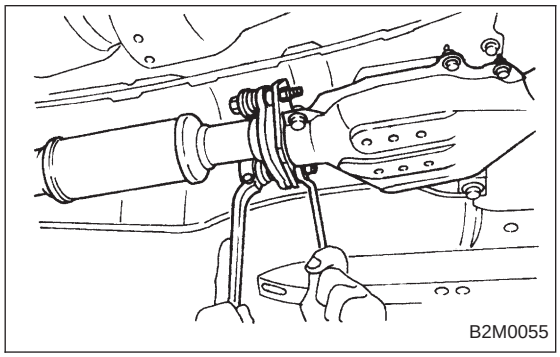


2) Install front exhaust pipe and center exhaust pipe. And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



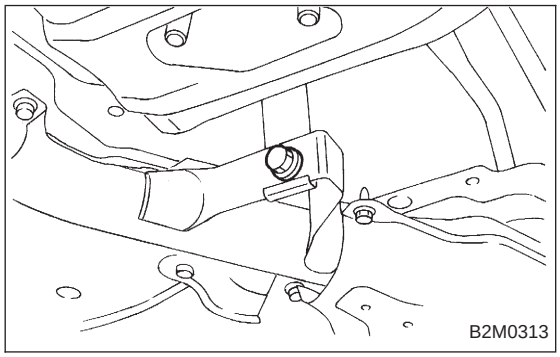
3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)



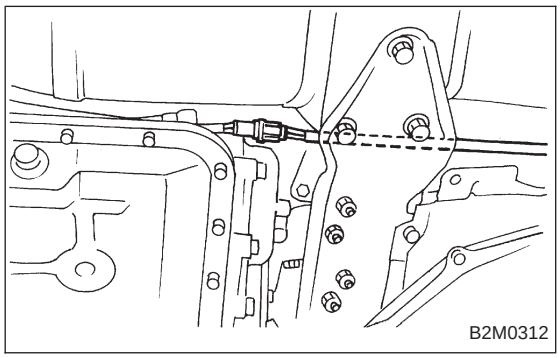
4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

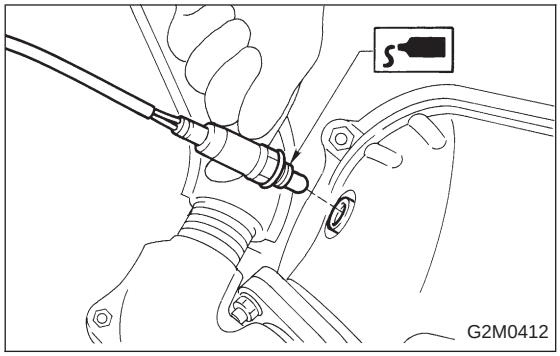


5) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



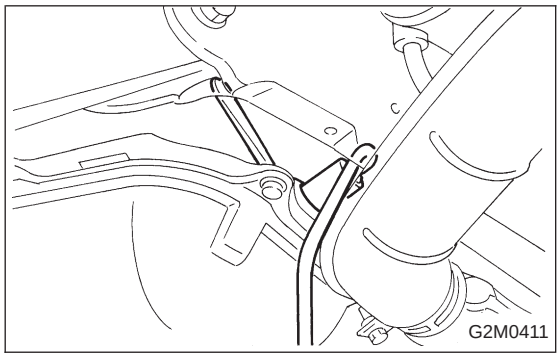
6) Connect rear oxygen sensor connector.



7) Before installing front oxygen sensor, apply anti-seize compound only to threaded portion of front oxygen sensor to make the next removal easier.

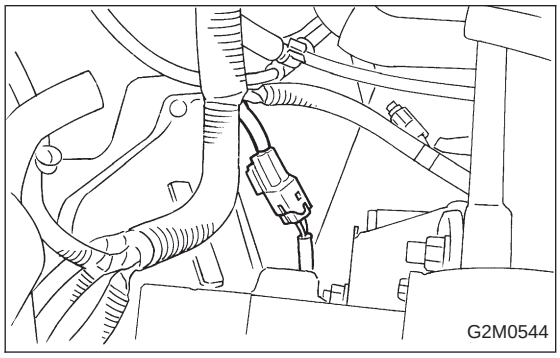
Anti-seize compound:
SS-30 by JET LUBE

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



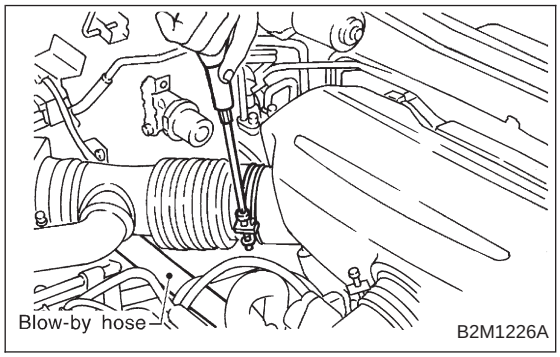
8) Install front oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

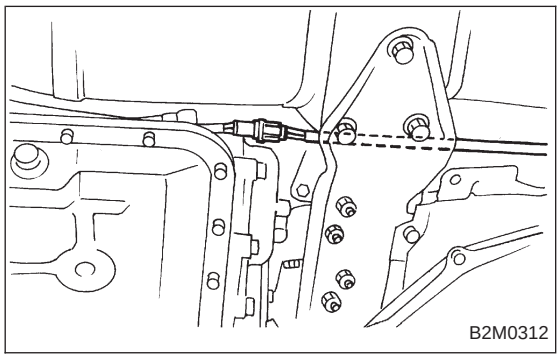


9) Lower the vehicle.

10) Connect front oxygen sensor connector.



11) Install air intake duct.



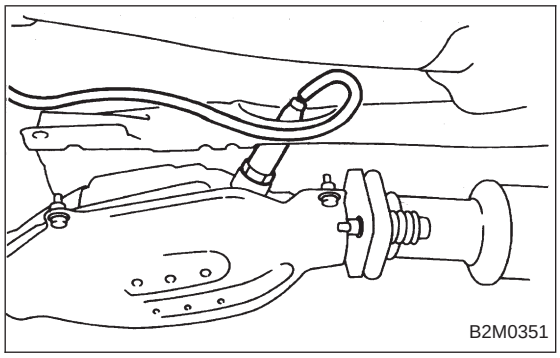
2. Rear Catalytic Converter

A: REMOVAL

1) Lift-up the vehicle.
2) Disconnect rear oxygen sensor connector.

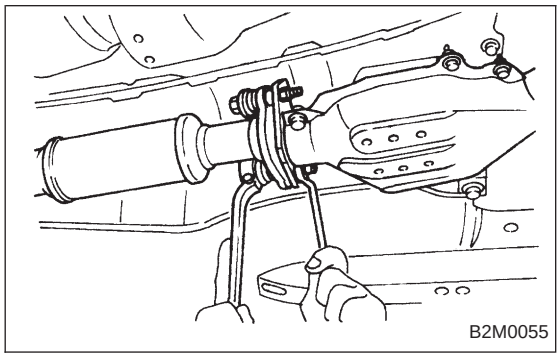
3) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

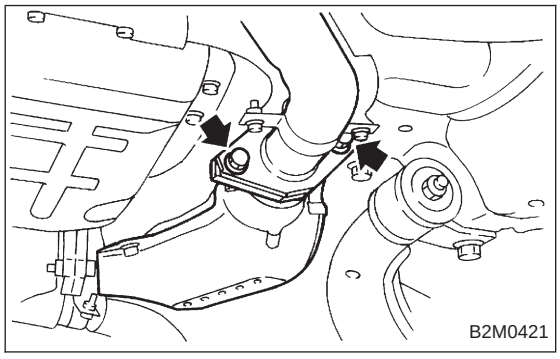

B2M0351

4) Remove rear oxygen sensor.

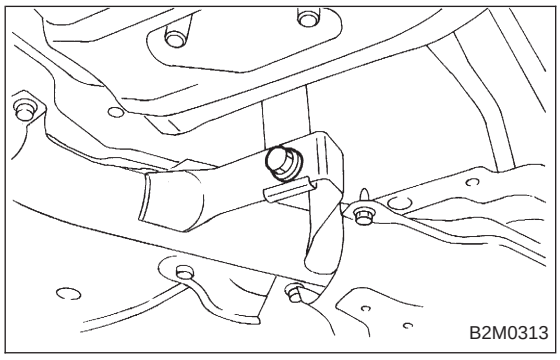
CAUTION:
When removing rear oxygen sensor, do not force rear oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.


B2M0055

5) Separate center exhaust pipe and rear catalytic converter assembly from rear exhaust pipe.

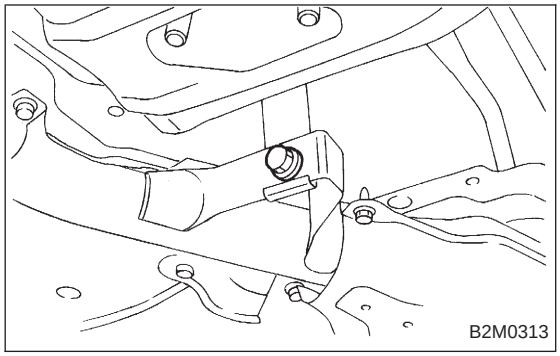

B2M0421

6) Separate center exhaust pipe and rear catalytic converter assembly from front catalytic converter.


B2M0313

7) Remove center exhaust pipe and rear catalytic converter assembly from hanger bracket.

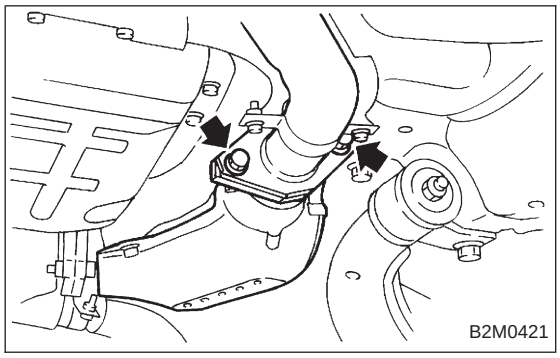
CAUTION:
- **Be careful not to pull down center exhaust pipe.**
- **After removing center exhaust pipe, do not apply excessive pulling force on front catalytic converter and front exhaust pipe.**



B: INSTALLATION

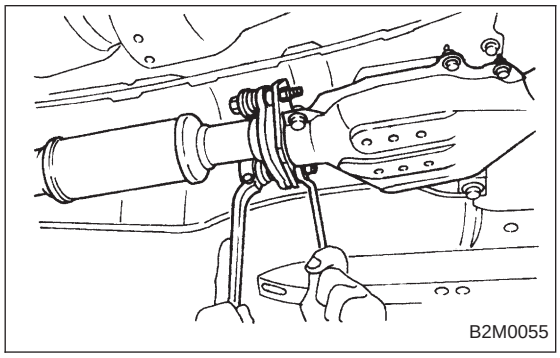
CAUTION:
Replace gaskets with new ones.

1) Install center exhaust pipe and rear catalytic converter assembly.
Temporarily tighten bolt which installs center exhaust pipe to hanger bracket.



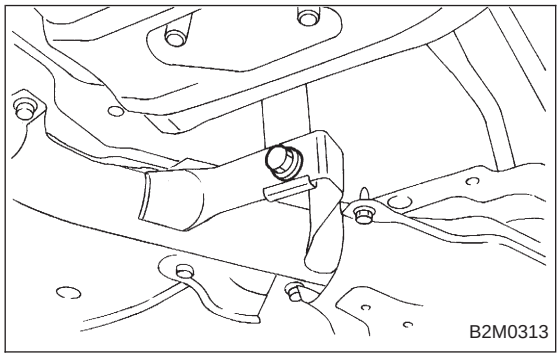
2) Install center exhaust pipe to front catalytic converter.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



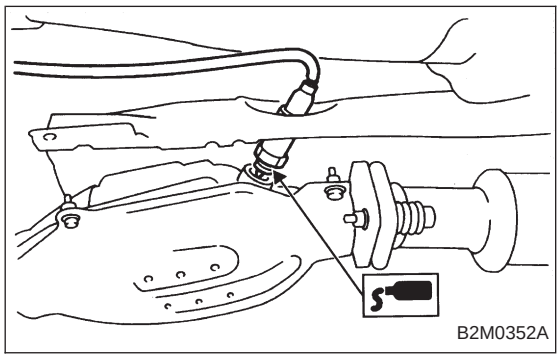
3) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



4) Tighten bolt which holds center exhaust pipe to hanger bracket.

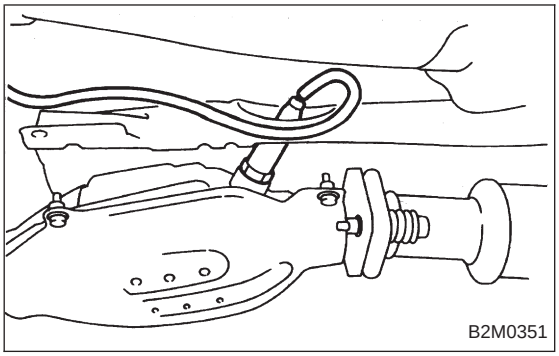
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)



5) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

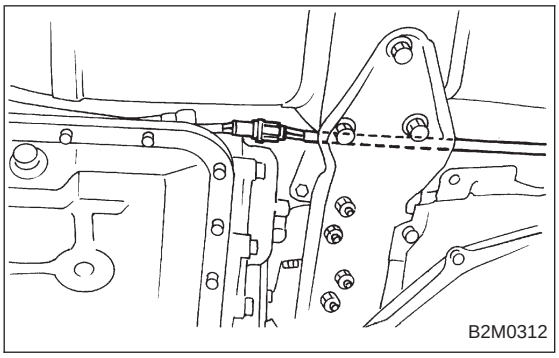
Anti-seize compound:
SS-30 by JET LUBE

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

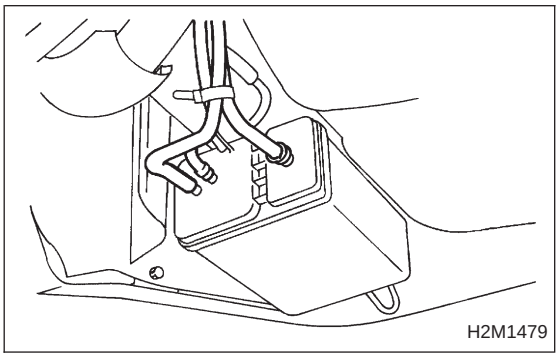

B2M0351

6) Install rear oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)


B2M0312

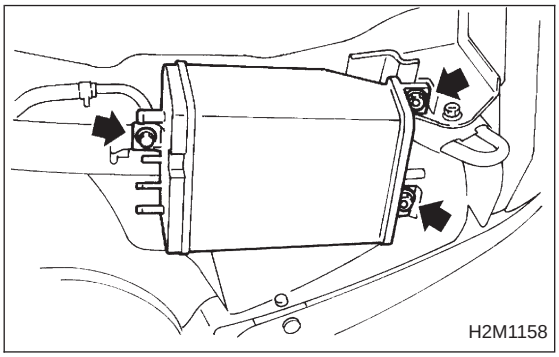
7) Connect rear oxygen sensor connector.
8) Lower the vehicle.


H2M1479

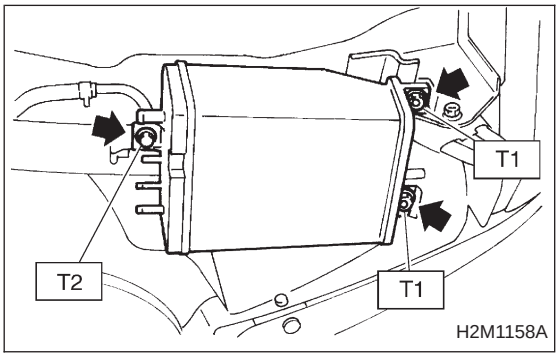
3. Canister

A: REMOVAL AND INSTALLATION

1) Lift-up the vehicle.
2) Disconnect evaporation hoses from canister.


H2M1158

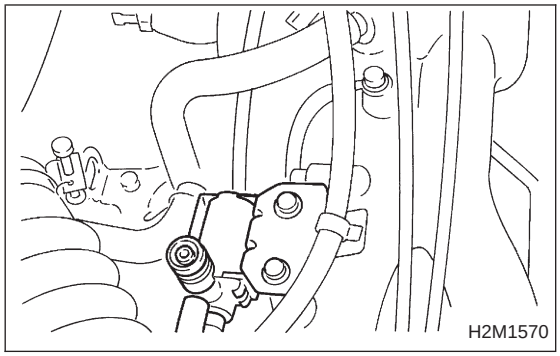
3) Remove canister from body.



H2M1158A

4) Installation is in the reverse order of removal.

Tightening torque:
T1: 22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)
T2: 24.5±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)

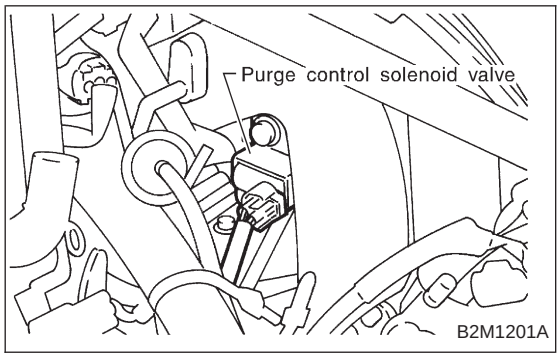


4. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

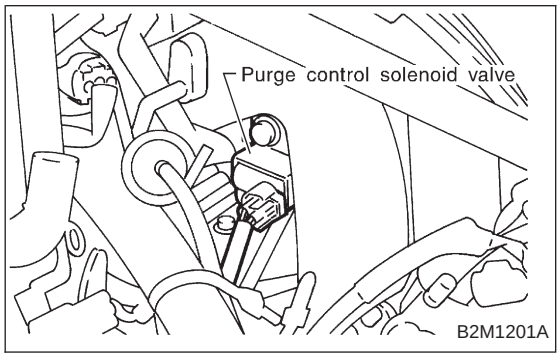
1. 1800 cc MODEL

1) Disconnect connector from FICD solenoid valve.
2) Remove bolts which installs FICD solenoid valve to intake manifold.



3) Disconnect connector from purge control solenoid valve.
4) Disconnect vacuum hoses from purge control solenoid valve.
5) Remove bolt which installs purge control solenoid valve to intake manifold.
6) Take out purge control solenoid valve.
7) Installation is in the reverse order of removal.

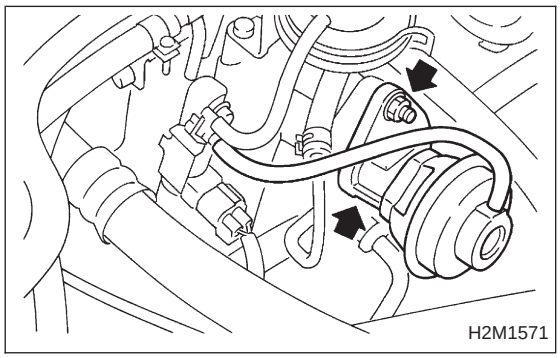
Tightening torque:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



2. 2200 cc MODEL

1) Disconnect connector from purge control solenoid valve.
2) Disconnect vacuum hoses from purge control solenoid valve.
3) Remove bolt which installs purge control solenoid valve to intake manifold.
4) Take out purge control solenoid valve.
5) Installation is in the reverse order of removal.

Tightening torque:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



5. EGR Valve [AT Vehicles]

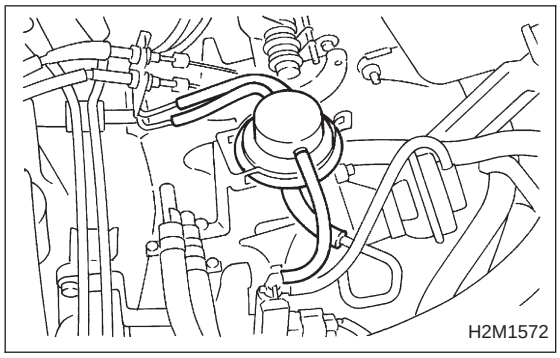
A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hose from EGR valve.
2) Remove bolts which install EGR valve onto intake manifold.

3) Installation is in the reverse order of removal.

CAUTION:
Replace gasket with a new one.

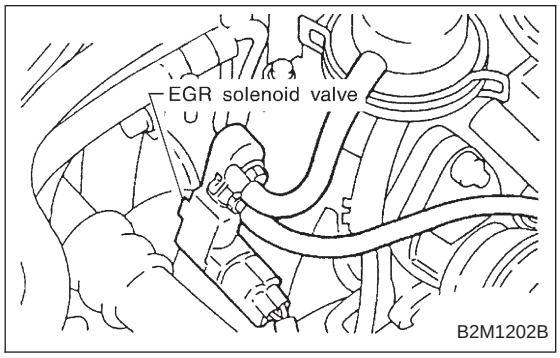
Tightening torque:
19±1 N·m (1.9±0.1 kg-m, 13.7±0.7 ft-lb)


H2M1572

6. Back-Pressure Transducer (BPT) [AT Vehicles]

A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hoses from BPT.
2) Remove BPT from bracket.
3) Installation is in the reverse order of removal.



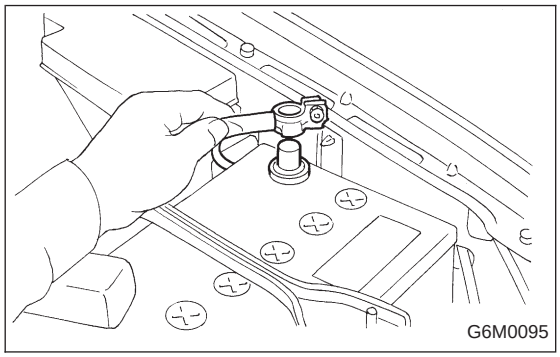
B2M1202B

7. EGR Solenoid Valve [AT Vehicles]

A: REMOVAL AND INSTALLATION

1) Disconnect connector from EGR solenoid valve.
2) Disconnect vacuum hoses from EGR solenoid valve.
3) Remove bolt which installs EGR solenoid valve.
4) Take out EGR solenoid valve.
5) Installation is in the reverse order of removal.

Tightening torque:
16±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)

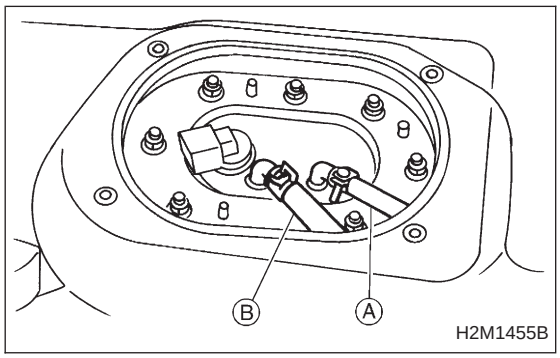

G6M0095

8. Fuel Temperature Sensor

A: REMOVAL

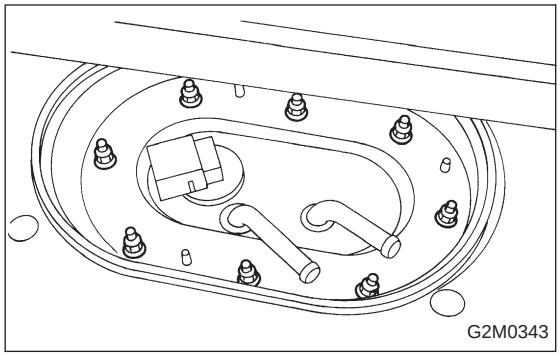
1. 1800 cc MODEL

1) Disconnect battery ground cable.

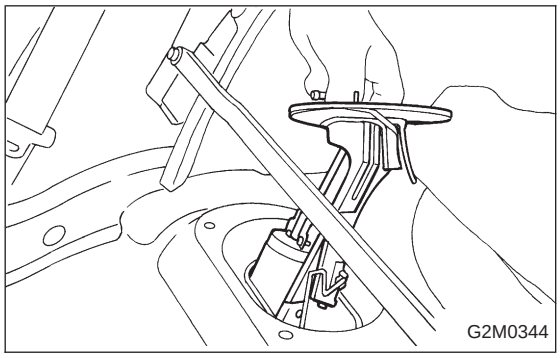


H2M1455B

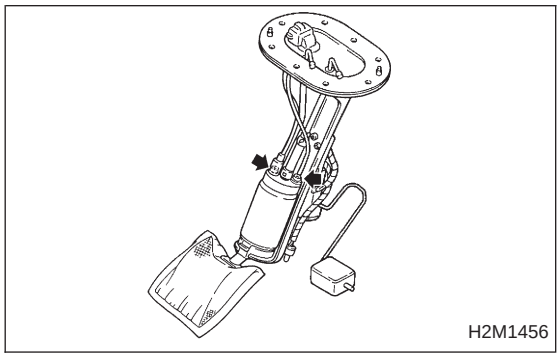
2) Release fuel pressure. <Ref. to 2-8 [W1B0].>
3) Disconnect fuel delivery hose Ⓐ and return hose Ⓑ.


G2M0343

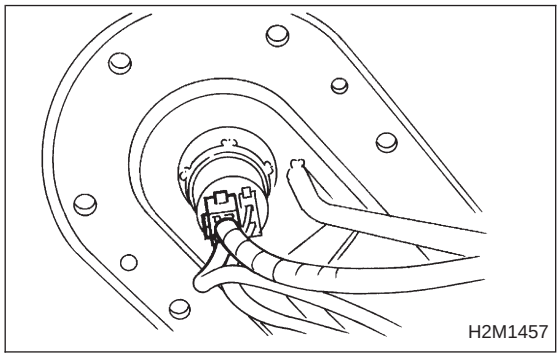
4) Remove nuts which install fuel pump assembly onto fuel tank.


G2M0344

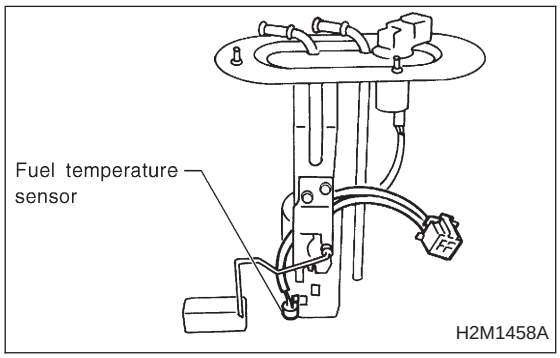
5) Take off fuel pump from fuel tank.


H2M1456

6) Remove two screws fixing terminals on fuel pump assembly.

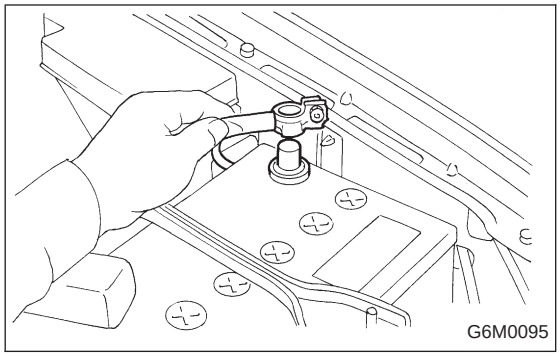

H2M1457

7) Disconnect connector from fuel pump.



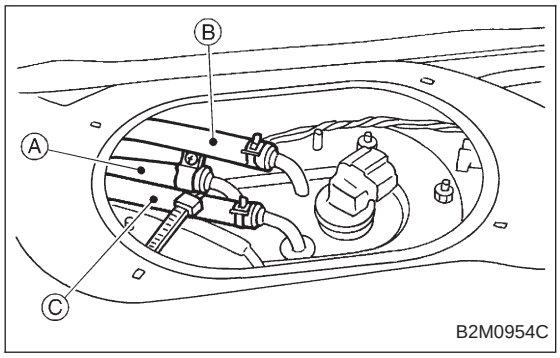
H2M1458A

8) Remove fuel temperature sensor from fuel pump assembly.


G6M0095

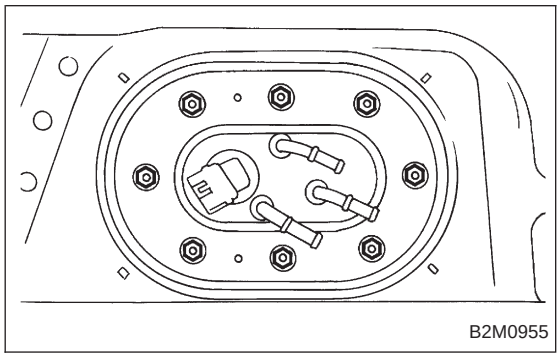
2. 2200 cc MODEL

1) Disconnect battery ground cable.

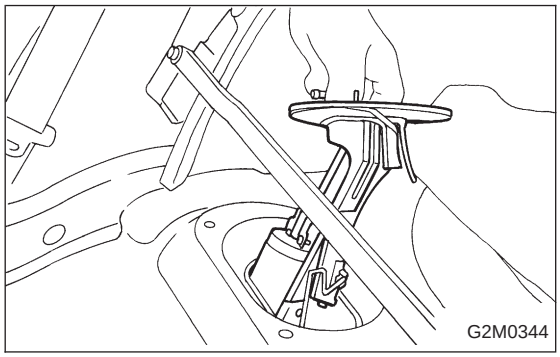


B2M0954C

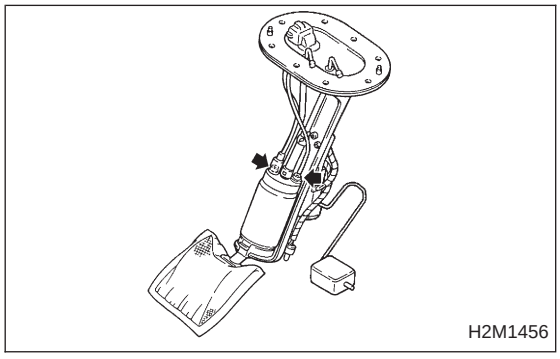
2) Release fuel pressure. <Ref. to 2-8 [W1B0].>
3) Disconnect fuel delivery hose Ⓐ, return hose Ⓑ and jet pump hose Ⓒ.


B2M0955

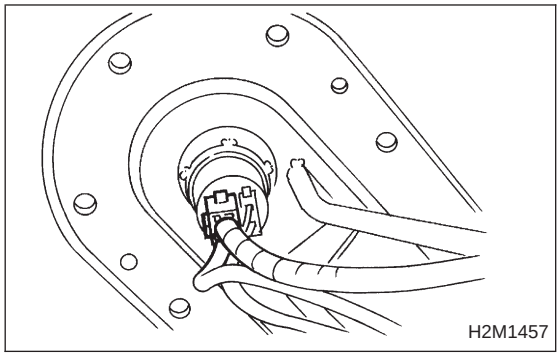
4) Remove nuts which install fuel pump assembly onto fuel tank.


G2M0344

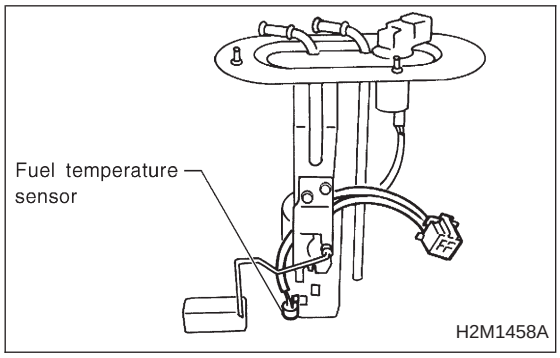
5) Take off fuel pump from fuel tank.


H2M1456

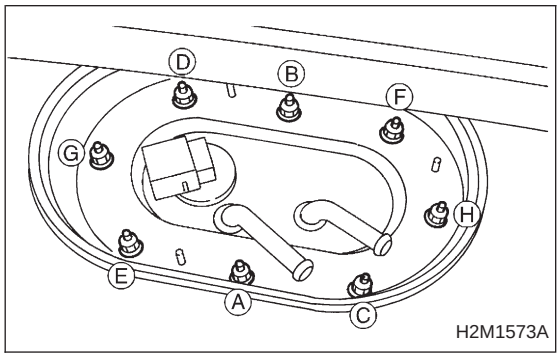
6) Remove two screws fixing terminals on fuel pump assembly.



7) Disconnect connector from fuel pump.



8) Remove fuel temperature sensor from fuel pump assembly.



B: INSTALLATION

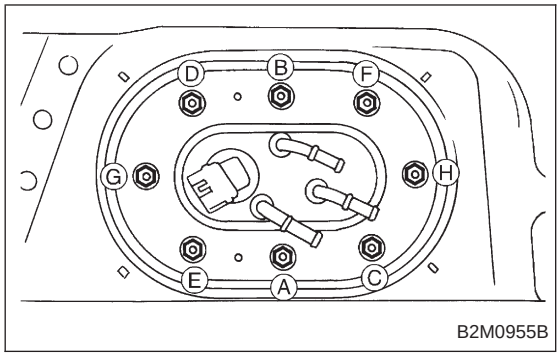
1. 1800 cc MODEL

CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

Installation is in the reverse order of removal. Do the following:

- Always use new gaskets.
- Ensure sealing portion is free from fuel or foreign particles before installation.
- Tighten nuts in alphabetical sequence shown in Figure to specified torque.

Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



B2M0955B

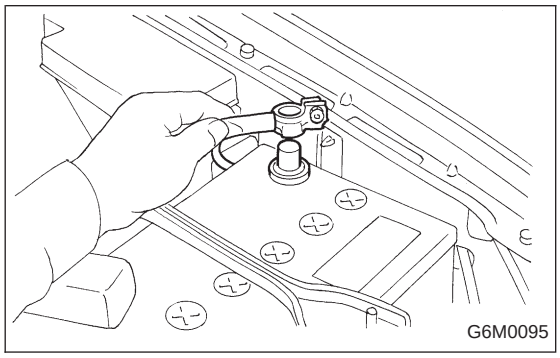
2. 2200 cc MODEL

CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

Installation is in the reverse order of removal. Do the following:

- Always use new gaskets.
- Ensure sealing portion is free from fuel or foreign particles before installation.
- Tighten nuts in alphabetical sequence shown in Figure to specified torque.

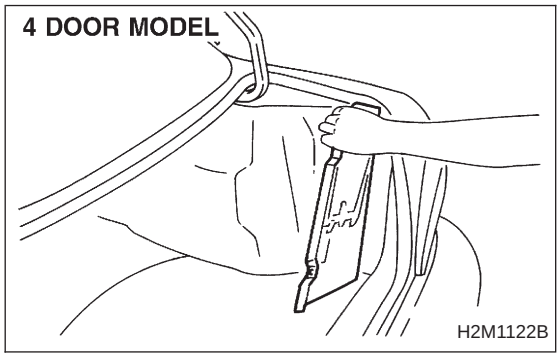
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)


G6M0095

9. Fuel Tank Pressure Sensor

A: REMOVAL AND INSTALLATION

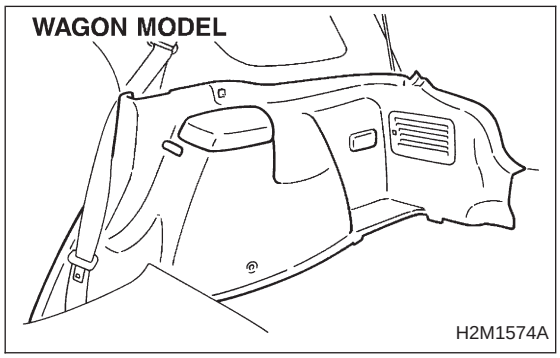
1) Disconnect battery ground cable.



H2M1122B

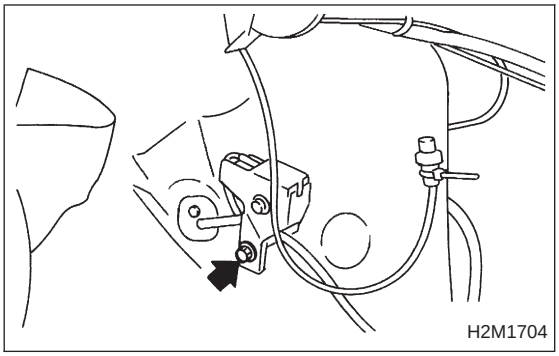
2) Remove trims.

- 4 door model:
  Remove right trunk side trim.

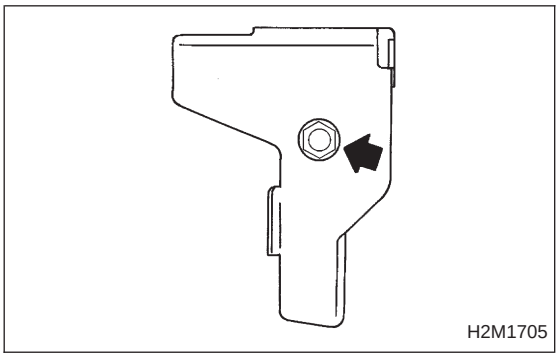


H2M1574A

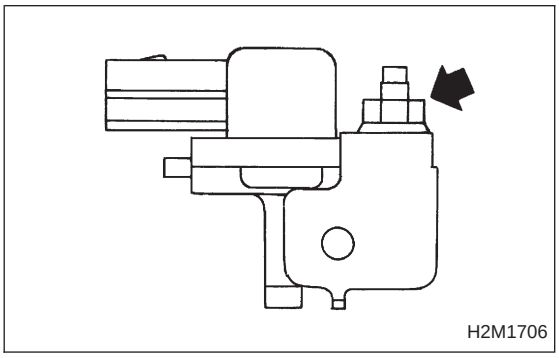
- Wagon model:
  Remove right rear quarter lower trim. <Ref. to 5-3 [W5A4].>


H2M1704

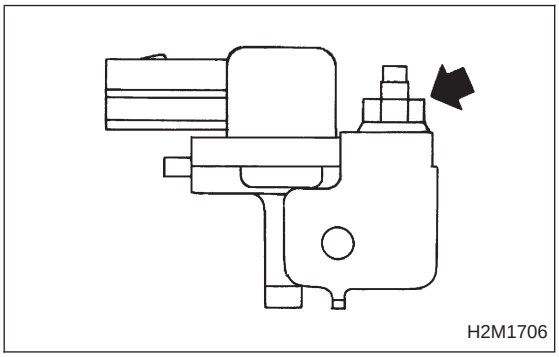
3) Remove bolts which install fuel tank pressure sensor bracket on body.
4) Disconnect hose from connection pipe.


H2M1705

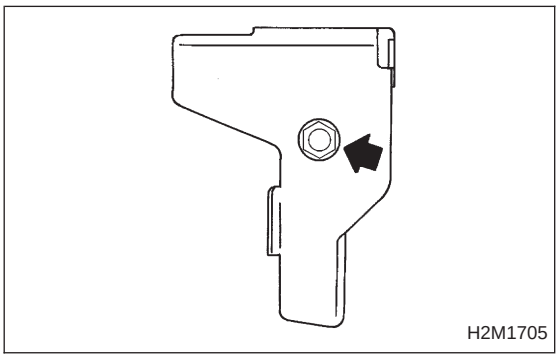
5) Disconnect connector from fuel tank pressure sensor.
6) Remove fuel tank pressure sensor assembly from bracket.


H2M1706

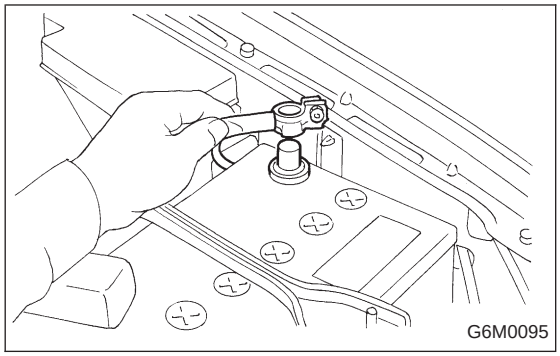
7) Remove fuel tank pressure sensor from bracket.


H2M1706

8) Installation is in the reverse order of removal.
Tightening torque:
7.35±1.96 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)


H2M1705

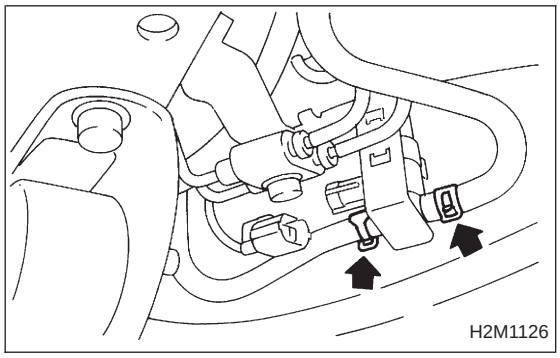
Tightening torque:
7.35±1.96 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)



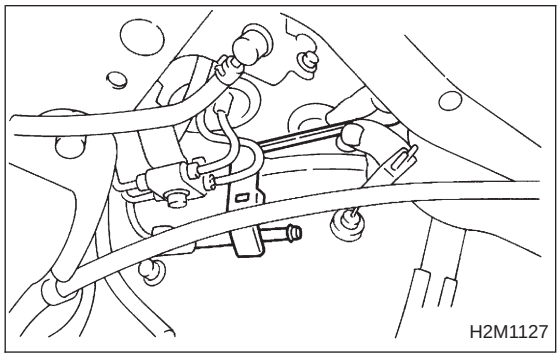
10. Pressure Control Solenoid Valve

A: REMOVAL AND INSTALLATION

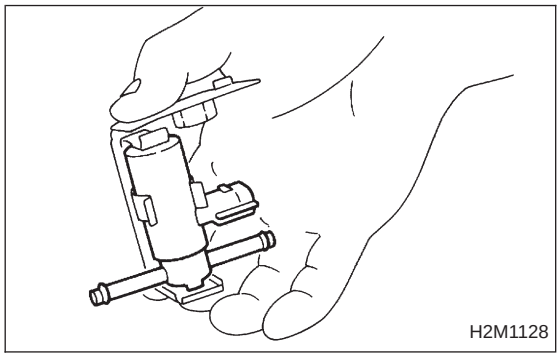
1) Disconnect battery ground cable.
2) Lift-up the vehicle.



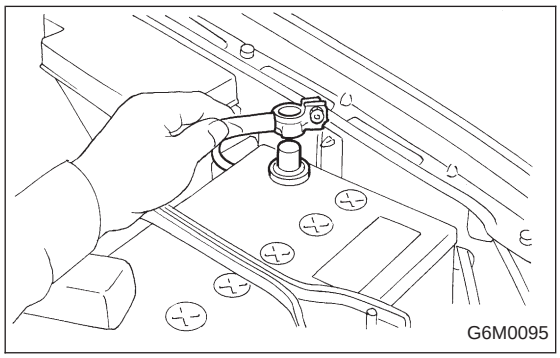
3) Disconnect evaporation hoses from pressure control valve.
4) Disconnect connector from pressure control valve.



5) Remove pressure control valve with bracket.



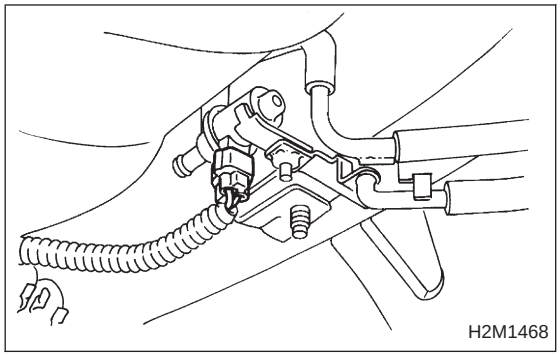
6) Remove pressure control valve from bracket.
7) Installation is in the reverse order of removal.



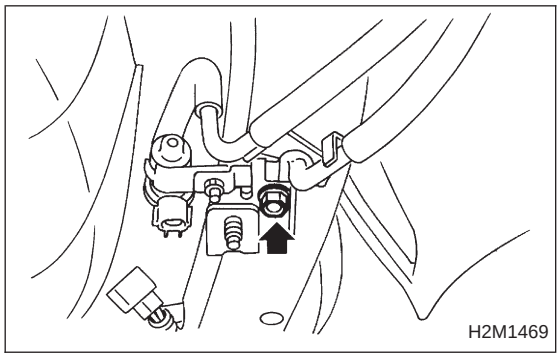
11. Vent Control Solenoid Valve

A: REMOVAL

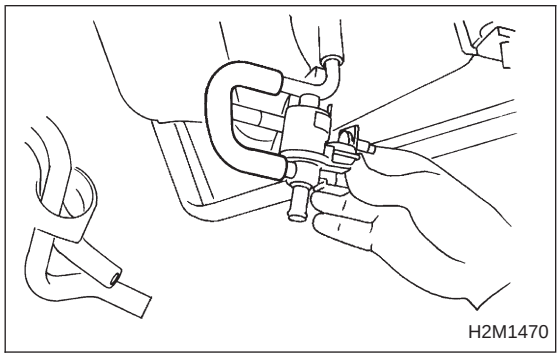
1) Disconnect battery ground cable.



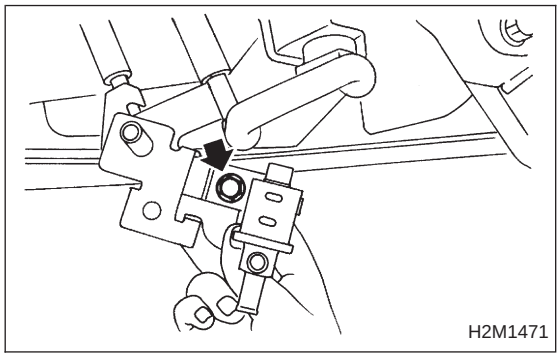
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>
4) Disconnect connector from vent control solenoid valve.



5) Remove one bolt fixing bracket on the body.

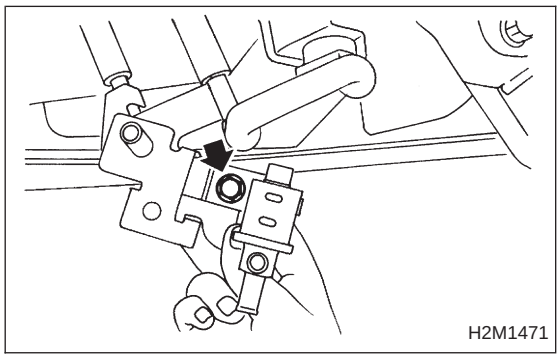


6) Remove one vacuum hose from vent control solenoid valve.

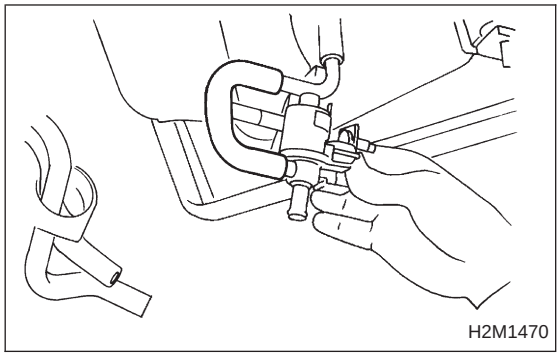


7) Remove one bolt fixing vent control solenoid valve on bracket.
8) Remove vent control solenoid valve.

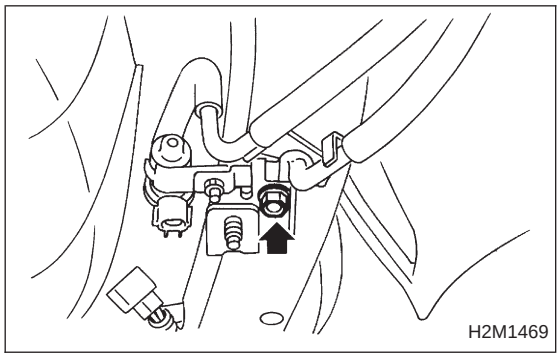
B: INSTALLATION



1) Install the bolt fixing vent control solenoid valve on bracket.

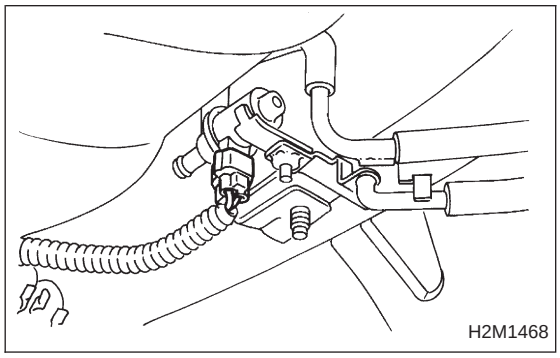

H2M1470

2) Install the vacuum hose to vent control solenoid valve.

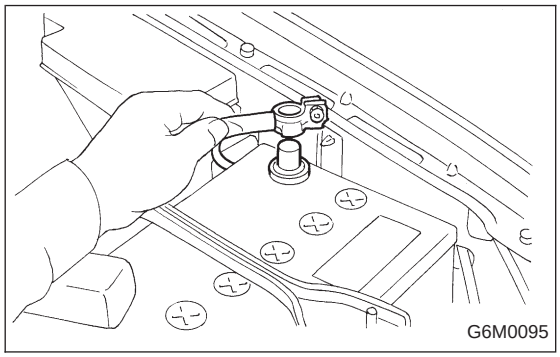

H2M1469

3) Install the bolt fixing bracket on the body.

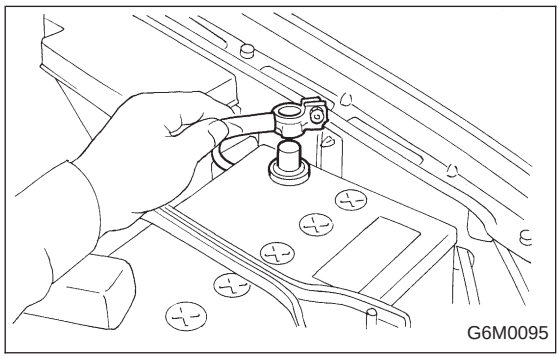
Tightening torque:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)


H2M1468

4) Connect connector to vent control solenoid valve.
5) Install canister. <Ref. to 2-1 [W3A0].>
6) Lower the vehicle.


G6M0095

7) Connect battery ground cable.

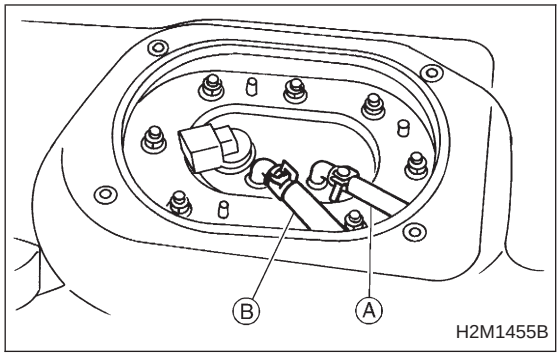

G6M0095

12. Fuel Level Sensor

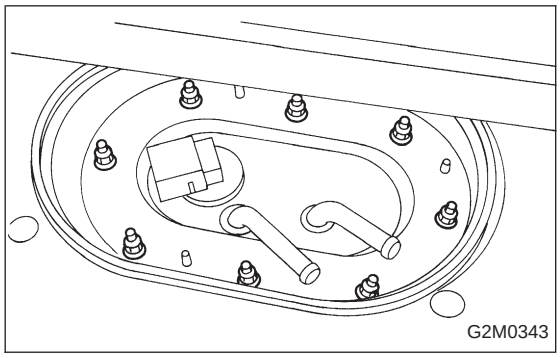
A: REMOVAL

1. 1800 cc MODEL

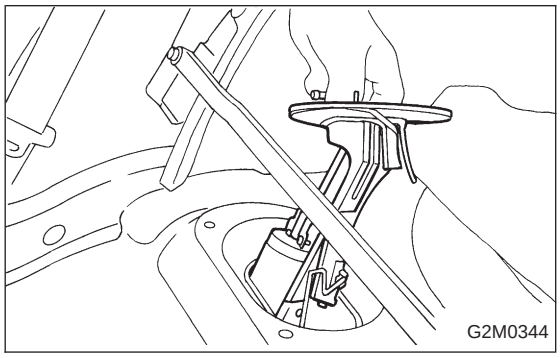
1) Disconnect battery ground cable.



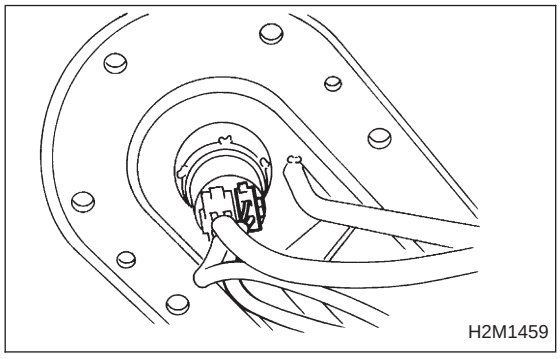
2) Release fuel pressure. <Ref. to 2-8 [W1B0].>
3) Disconnect fuel delivery hose Ⓐ and return hose Ⓑ.



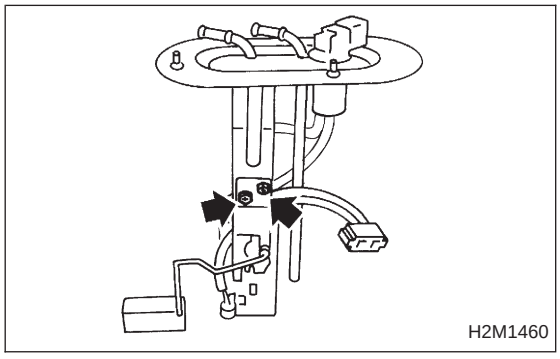
4) Remove nuts which install fuel pump assembly onto fuel tank.



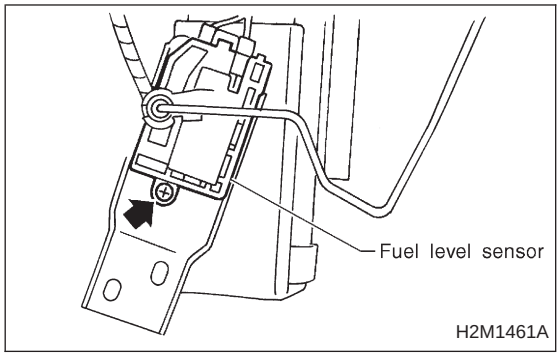
5) Take off fuel pump from fuel tank.



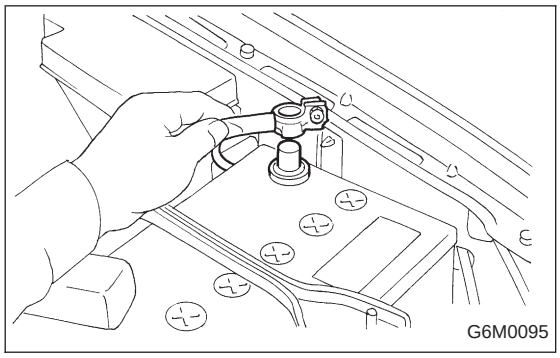
6) Disconnect connector from fuel pump.



7) Remove two screws fixing bracket on fuel pump assembly.

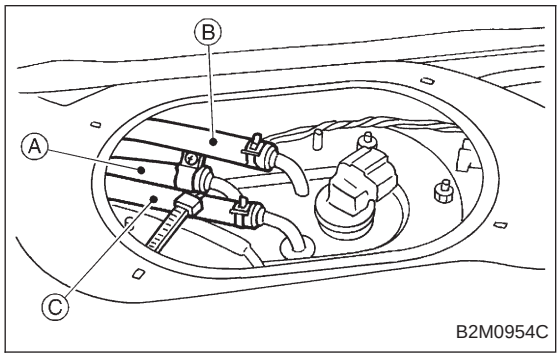


8) Remove one screw fixing fuel level sensor on bracket.
9) Remove fuel level sensor from fuel pump assembly.

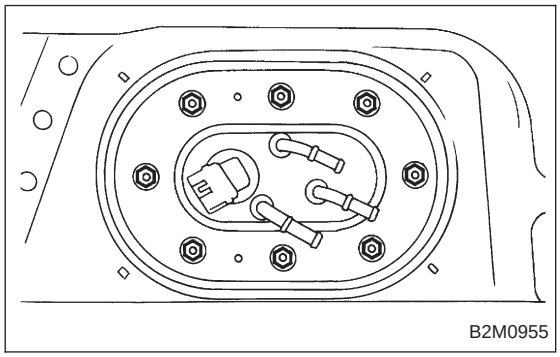


2. 2200 cc MODEL

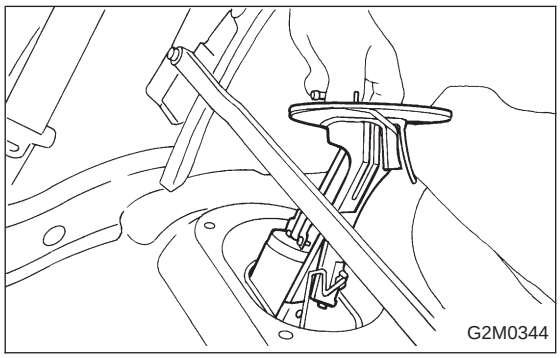
1) Disconnect battery ground cable.



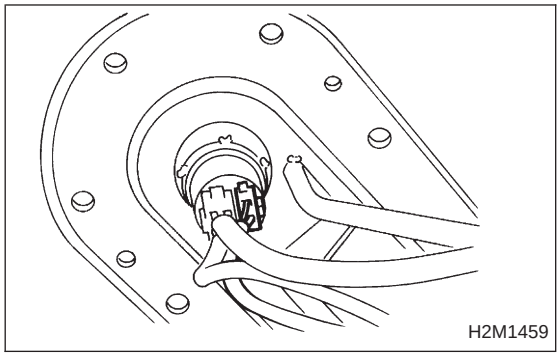
2) Release fuel pressure. <Ref. to 2-8 [W1B0].>
3) Disconnect fuel delivery hose Ⓐ and return hose Ⓑ.



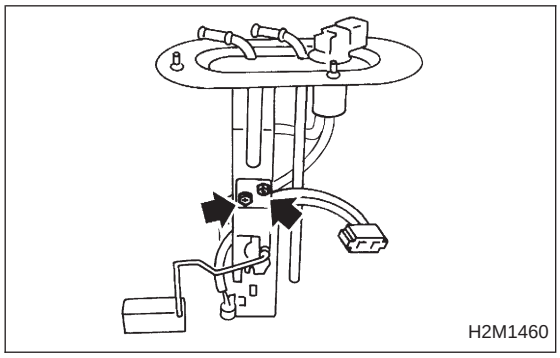
4) Remove nuts which install fuel pump assembly onto fuel tank.



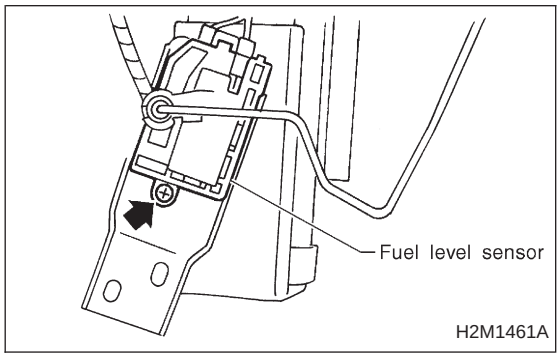
5) Take off fuel pump from fuel tank.



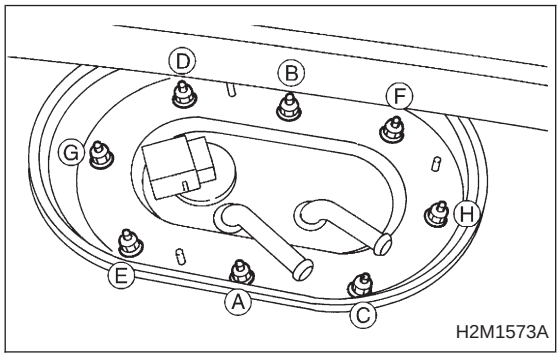
6) Disconnect connector from fuel pump.



7) Remove two screws fixing bracket on fuel pump assembly.



8) Remove one screw fixing fuel level sensor on bracket.
9) Remove fuel level sensor from fuel pump assembly.



B: INSTALLATION

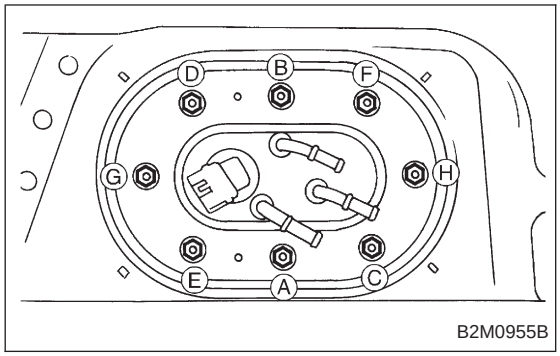
1. 1800 cc MODEL

CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

Installation is in the reverse order of removal. Do the following:

- Always use new gaskets.
- Ensure sealing portion is free from fuel or foreign particles before installation.
- Tighten nuts in alphabetical sequence shown in Figure to specified torque.

Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



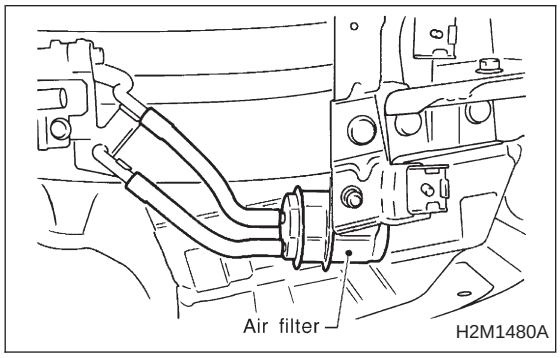
2. 2200 cc MODEL

CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

Installation is in the reverse order of removal. Do the following:

- Always use new gaskets.
- Ensure sealing portion is free from fuel or foreign particles before installation.
- Tighten nuts in alphabetical sequence shown in Figure to specified torque.

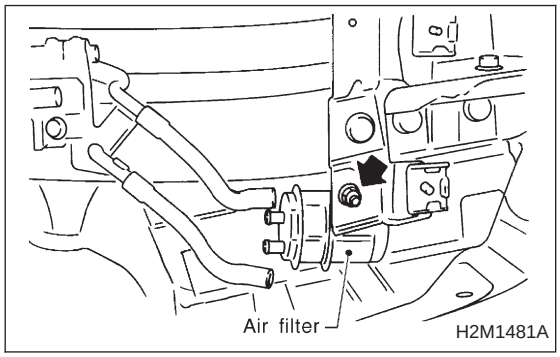
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



13. Air Filter

A: REMOVAL AND INSTALLATION

1) Remove canister. <Ref. to 2-1 [W3A0].>
2) Remove two hoses from air filter.



3) Remove flange nut from bracket.
4) Installation is in the reverse order of removal.

ON-CAR SERVICES 2-2

Page

1. Foreword 2
2. Ignition Timing 2
3. Engine Idle Speed 3
4. Engine Compression 4
5. Intake Manifold Vacuum 5
6. Engine Oil Pressure 6
7. Valve Clearance 8

1. Foreword

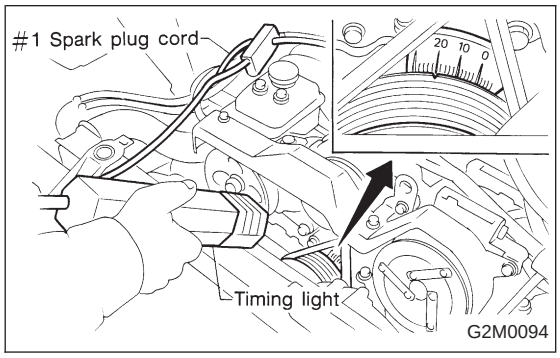
This chapter describes major inspection and service procedures for the engine mounted on the body. For procedures not found in this chapter, refer to the service procedure section in the applicable chapter.

2. Ignition Timing

A: MEASUREMENT

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Warm-up the engine.



2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with the timing light.
3) Start the engine at idle speed and check the ignition timing.
If the timing is not correct, check the ignition control system. <Ref. to 2-7 [T8D0].>

Ignition timing [BTDC/rpm]:
16°±8°/700 (1800 cc MT vehicles)
14°±8°/700 (2200 cc MT vehicles)
20°±8°/700 (2200 cc AT vehicles)

NOTE:
To improve stability, ignition timing while engine is idling is also controlled. For this reason specified ignition timing range is increased somewhat, to ±8°.

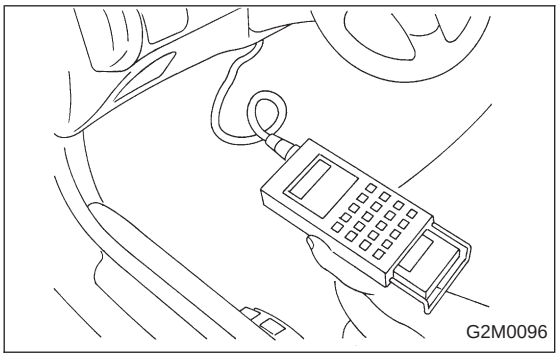
3. Engine Idle Speed

A: MEASUREMENT

1) Before checking idle speed, check the following:

(1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
(2) Ensure that malfunction indicator lamp (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.

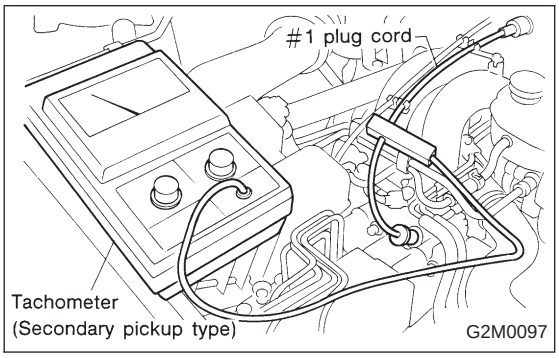

G2M0096

3) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.

CAUTION:
When connecting Subaru Select Monitor, turn ignition switch to OFF.

4) Start the engine and measure engine speed.

NOTE:
Engine speed is indicated on Subaru Select Monitor by selecting “MODE F04”.



G2M0097

NOTE:
- When using the OBD-II general scan tool, carefully read its operation manual.
- When Subaru Select Monitor is not used, attach the pickup sensor on tachometer (Secondary pickup type) to #1 spark plug cord.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

5) Check idle speed when unloaded (with headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF).

Idle speed [No load and gears in neutral (MT) or N or P (AT) position]:
700±100 rpm

6) Check idle speed when loaded. (Turn air conditioning switch to “ON” and operate compressor for at least one minute before measurement.)

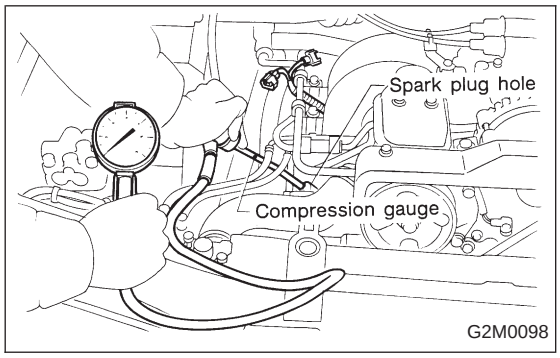
Idle speed [A/C switch “ON”, no load and gears in neutral (MT) or N or P (AT) position]:
850±100 rpm

CAUTION:
Never rotate idle adjusting screw, if idle speed is outside specifications, refer to General On-board Diagnosis Table under “2-7 On-Board Diagnostics II System”.

4. Engine Compression

A: MEASUREMENT

1) After warming-up the engine, turn ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Remove all the spark plugs.
4) Disconnect connectors from fuel injectors.
5) Fully open throttle valve.
6) Check the starter motor for satisfactory performance and operation.



7) Hold the compression gauge tight against the spark plug hole.

CAUTION:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.

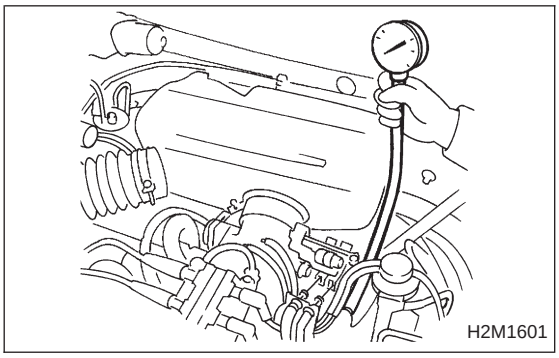
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (200 — 300 rpm and fully open throttle):
Standard: 1,079 — 1,275 kPa
(11.0 — 13.0 kg/cm^2, 156 — 185 psi)
Limit: 883 kPa (9.0 kg/cm^2, 128 psi)
Difference between cylinders: 196 kPa (2.0 kg/cm^2, 28 psi)

5. Intake Manifold Vacuum

A: MEASUREMENT

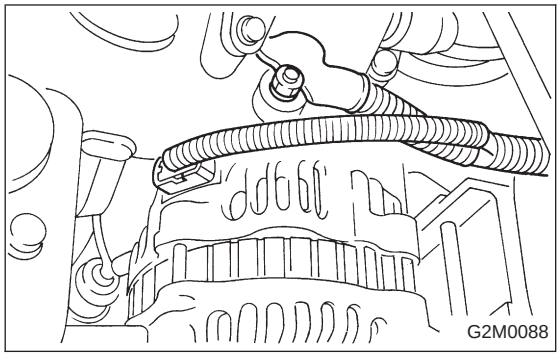
1) Warm-up the engine.
2) Disconnect the vacuum hose and install the vacuum gauge to the hose fitting on the manifold.


H2M1601

3) Keep the engine at the idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.

Vacuum pressure (at idling, A/C "OFF"):
1800 cc:
Less than −66.7 kPa
(−500 mmHg, −19.69 inHg)
2200 cc:
Less than −60.0 kPa
(−450 mmHg, −17.72 inHg)

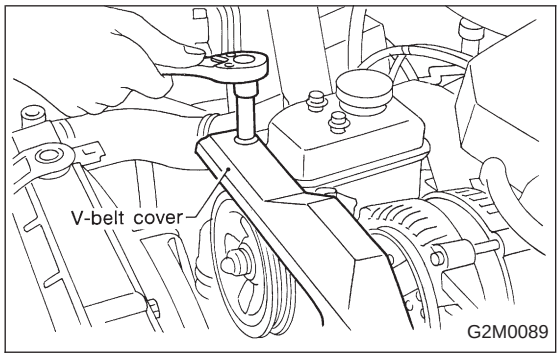
Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket/throttle chamber gasket or disconnection/damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment



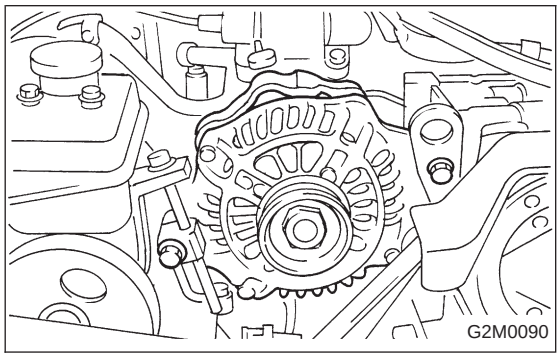
6. Engine Oil Pressure

A: MEASUREMENT

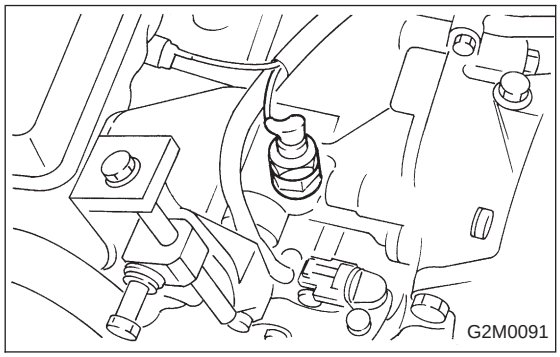
1) Remove generator from bracket.
   (1) Disconnect connector and terminal from generator.



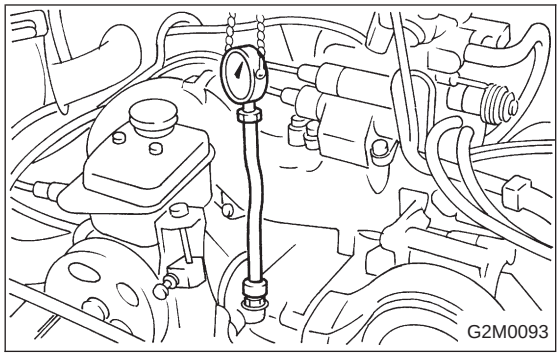
   (2) Remove V-belt cover.
   (3) Loosen lock bolt and slider bolt, and remove front side V-belt.



   (4) Remove lock bolt.
   (5) Remove bolts which install generator on bracket.



2) Disconnect connector from oil pressure switch.
3) Remove oil pressure switch from engine block.



4) Connect oil pressure gauge hose.
5) Start the engine, and measure oil pressure.

Oil pressure:
98 kPa (1.0 kg/cm^2,14 psi) or more at 600 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
● If oil pressure is out of specification, check oil pump, oil filter and lubrication line.
<Ref. to 2-4 [W1A0].>
● If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch.
<Ref. to 2-4 [W3A0].>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

6) After measuring oil pressure, install oil pressure switch.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

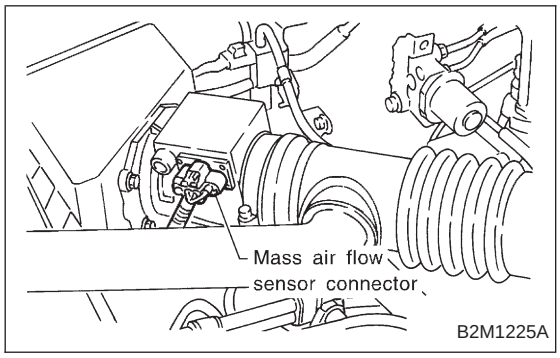
7) Install generator and V-belt in the reverse order of removal, and adjust the V-belt deflection.

7. Valve Clearance

A: INSPECTION

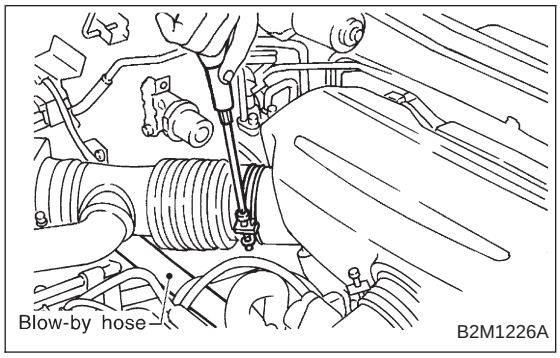
CAUTION:
Inspection and adjustment of valve clearance should be performed while engine is cold.

1) Set the vehicle onto the lift.
2) Disconnect battery ground cable.
3) Remove timing belt cover (RH).



4) Remove rocker cover.

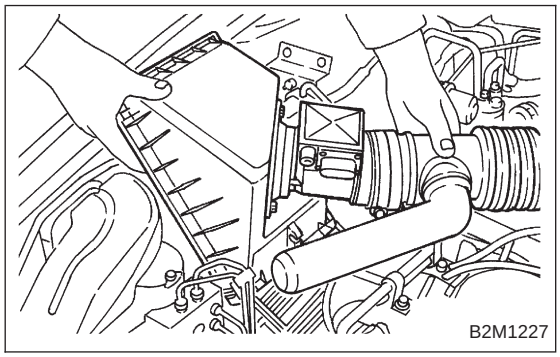
- When inspecting #1 and #3 cylinders;
  (1) Disconnect connector from mass air flow sensor.



(2) Loosen clamp which connects air intake duct to air intake chamber.
(3) Remove the two clips from air cleaner upper cover.

CAUTION:
Before installing air cleaner upper cover, align hole(s) with protruding portions of air cleaner lower case, then secure upper cover.

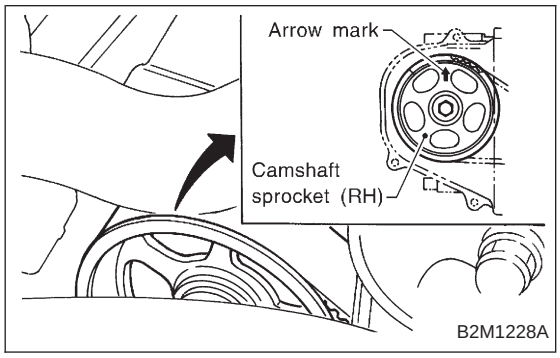
(4) Disconnect blow-by hose from air intake duct.



(5) Remove air intake duct and air cleaner upper cover as a unit.
(6) Remove air cleaner element.
(7) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).
(8) Remove under cover (RH).
(9) Place suitable container under the vehicle.
(10) Disconnect PCV hose from rocker cover (RH).
(11) Remove bolts, then remove rocker cover (RH).

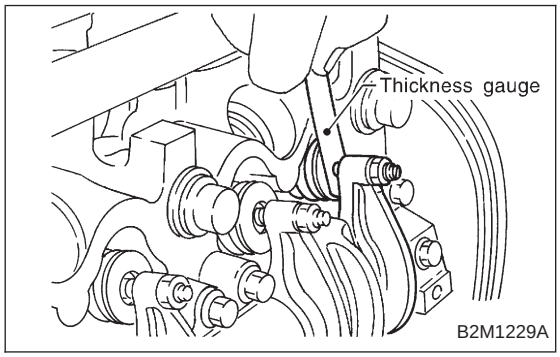
● When inspecting #2 and #4 cylinders;

(1) Disconnect battery cables, and then remove battery and battery carrier.
(2) Disconnect washer motor connectors.
(3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
(4) Remove the two bolts which holds washer tank, then secure the tank away from working area.
(5) Disconnect spark plug cords from spark plugs (#2 and #4 cylinders).
(6) Remove under cover (LH).
(7) Place suitable container under the vehicle.
(8) Disconnect PCV hose from rocker cover (LH).
(9) Remove bolts, then remove rocker cover (LH).



5) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise.

NOTE:
When arrow mark on camshaft sprocket (RH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

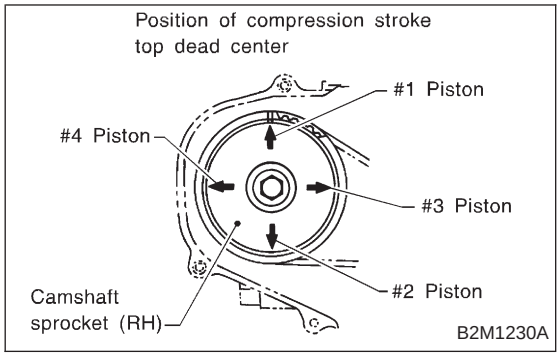


6) Measure #1 cylinder valve clearance by using thickness gauge.

CAUTION:
● Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
● Measure exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.25±0.02 mm (0.0098±0.0008 in)

7) If necessary, adjust the valve clearance. <Ref. to 2-2 [07B0].>

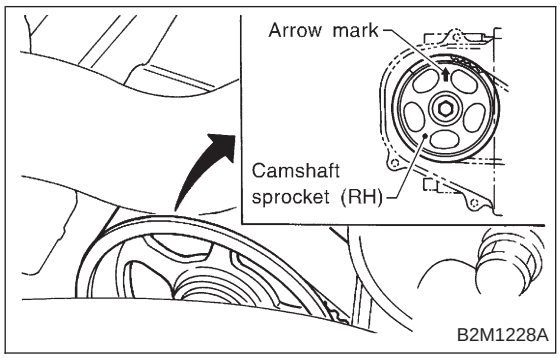


8) Similar to measurement procedures used for #1 cylinder, measure #2, #3 and #4 cylinder valve clearances.

NOTE:

- Be sure to set cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
- To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on right-hand camshaft sprocket facing up.

9) After inspection, install the related parts in the reverse order of removal.

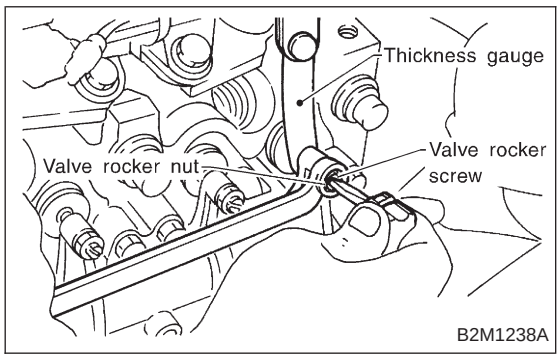


B: ADJUSTMENT

CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise.

NOTE:
When arrow mark on camshaft sprocket (RH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



2) Adjust the #1 cylinder valve clearance.
   (1) Loosen the valve rocker nut and screw.
   (2) Place suitable thickness gauge.
   (3) While noting valve clearance, tighten valve rocker adjust screw.
   (4) When specified valve clearance is obtained, tighten valve rocker nut.

Tightening torque:
10±1 N·m (1.0±0.1 kg-m, 7.2±0.7 ft-lb)

CAUTION:
- **Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.**
- **Adjust exhaust valve clearances while lifting-up the vehicle.**

Valve clearance:
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.25±0.02 mm (0.0098±0.0008 in)

3) Ensure that valve clearances are within specifications.

4) Turn crankshaft two complete rotations until #1 cylinder piston is again set to top dead center on compression stroke.

5) Ensure that valve clearances are within specifications. If necessary, re-adjust valve clearances.

ENGINE 2-3

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1. Specifications

Model			1800 cc	2200 cc
ENGINE	Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement		Belt driven, single over-head camshaft, 4-valve/cylinder	
	Bore x Stroke	mm (in)	87.9 x 75.0 (3.461 x 2.953)	96.9 x 75.0 (3.815 x 2.953)
	Piston displacement	cm^3 (cu in)	1,820 (111.06)	2,212 (135.0)
	Compression ratio		9.7	
	Compression pressure (at 200 — 300 rpm)	kPa (kg/cm^2, psi)	1,079 — 1,275 (11.0 — 13.0, 156 — 185)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	2° BTDC	4° BTDC
		Closing	54° ABDC	52° ABDC
	Exhaust valve timing	Opening	48° BBDC	48° BBDC
		Closing	8° ATDC	12° ATDC
	Valve clearance	Intake mm (in)	0.20±0.02 (0.0079±0.0008)	
		Exhaust mm (in)	0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position on MT, or "P" or "N" position on AT]	rpm	700±100 (No load) 800±50 (A/C switch ON)	700±100 (No load) 850±50 (A/C switch ON)
	Firing order		1 → 3 → 2 → 4	
	Ignition timing	BTDC/rpm	MT: 20°±2°/700	AT: 20°±8°/700 MT: 14°±8°/700

2. Service Data

Belt tensioner adjuster	Protrusion of adjuster rod					15.4 — 16.4 mm	(0.606 — 0.646 in)
Belt tensioner	Spacer O.D.					16 mm	(0.63 in)
	Tensioner bush I.D.					16.16 mm	(0.6362 in)
	Clearance between spacer and bush				STD	0.117 — 0.180 mm	(0.0046 — 0.0071 in)
					Limit	0.230 mm	(0.0091 in)
	Side clearance of spacer				STD	0.37 — 0.54 mm	(0.0146 — 0.0213 in)
					Limit	0.8 mm	(0.031 in)
Valve rocker arm	Clearance between shaft and arm				STD	0.020 — 0.054 mm	(0.0008 — 0.0021 in)
					Limit	0.10 mm	(0.0039 in)
Camshaft	Bend limit					0.025 mm	(0.0010 in)
	Thrust clearance				STD	0.030 — 0.260 mm	(0.0012 — 0.0102 in)
					Limit	0.35 mm	(0.0138 in)
	Cam lobe height			Intake	STD	32.244 — 32.344 mm	(1.2694 — 1.2734 in)
					Limit	32.094 mm	(1.2635 in)
				Exhaust	STD	31.964 — 32.064 mm	(1.2584 — 1.2624 in)
					Limit	31.814 mm	(1.2525 in)
	Camshaft journal O.D.	RH	Front	LH	Rear	31.935 — 31.950 mm	(1.2573 — 1.2579 in)
			Center		Center	37.435 — 37.450 mm	(1.4738 — 1.4744 in)
			Rear		Front	37.935 — 37.950 mm	(1.4935 — 1.4941 in)
	Camshaft journal hole I.D.	RH	Front	LH	Rear	32.005 — 32.025 mm	(1.2600 — 1.2608 in)
			Center		Center	37.505 — 37.525 mm	(1.4766 — 1.4774 in)
			Rear		Front	38.005 — 38.025 mm	(1.4963 — 1.4970 in)
	Oil clearance				STD	0.055 — 0.090 mm	(0.0022 — 0.0035 in)
					Limit	0.10 mm	(0.0039 in)
Cylinder head	Surface warpage limit					0.05 mm	(0.0020 in)
	Surface grinding limit					0.1 mm	(0.004 in)
	Standard height					98.3 mm	(3.870 in)
Valve set	Refacing angle					90°	
	Contacting width			Intake	STD	0.7 mm	(0.028 in)
					Limit	1.4 mm	(0.055 in)
				Exhaust	STD	1.4 mm	(0.055 in)
					Limit	1.8 mm	(0.071 in)
Valve guide	Inner diameter					6.000 — 6.012 mm	(0.2362 — 0.2367 in)
	Protrusion above head					17.5 — 18.0 mm	(0.689 — 0.709 in)
Valve	Head edge thickness			Intake	STD	1.0 mm	(0.039 in)
					Limit	0.8 mm	(0.031 in)
				Exhaust	STD	1.2 mm	(0.047 in)
					Limit	0.8 mm	(0.031 in)
	Stem diameter				Intake	5.950 — 5.965 mm	(0.2343 — 0.2348 in)
					Exhaust	5.945 — 5.960 mm	(0.2341 — 0.2346 in)
	Stem oil clearance			STD	Intake	0.035 — 0.062 mm	(0.0014 — 0.0024 in)
					Exhaust	0.040 — 0.067 mm	(0.0016 — 0.0026 in)
				Limit	—	0.15 mm	(0.0059 in)
	Overall length				Intake	101.0 mm	(3.976 in)
					Exhaust	101.2 mm	(3.984 in)

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter

Valve spring	Free length				44.05 mm	(1.7342 in)
	Squareness				2.5°, 1.9 mm	(0.075 in)
	Tension/spring height				174.6 — 200.1 N (17.8 — 20.4 kg, 39.2 — 45.0 lb)/36.0 mm (1.417 in) 405.0 — 458.0 N (41.3 — 46.7 kg, 91.1 — 103.0 lb)/28.2 mm (1.110 in)	
Cylinder block	Surface warpage limit (mating with cylinder head)				0.05 mm	(0.0020 in)
	Surface grinding limit				0.1 mm	(0.004 in)
	Cylinder bore	1800 cc	STD	A	87.905 — 87.915 mm	(3.4608 — 3.4612 in)
				B	87.895 — 87.905 mm	(3.4604 — 3.4608 in)
		2200 cc	STD	A	96.905 — 96.915 mm	(3.8151 — 3.8155 in)
				B	96.895 — 96.905 mm	(3.8148 — 3.8151 in)
	Taper			STD	0.015 mm	(0.0006 in)
				Limit	0.050 mm	(0.0020 in)
	Out-of-roundness			STD	0.010 mm	(0.0004 in)
				Limit	0.050 mm	(0.0020 in)
	Piston clearance			STD	0.010 — 0.030 mm	(0.0004 — 0.0012 in)
				Limit	0.050 mm	(0.0020 in)
	Enlarging (boring) limit				0.5 mm	(0.020 in)
Piston	Outer diameter	1800 cc	STD	A	87.885 — 87.895 mm	(3.4600 — 3.4604 in)
				B	87.875 — 87.885 mm	(3.4596 — 3.4600 in)
			0.25 mm (0.0098 in) OS		88.125 — 88.135 mm	(3.4695 — 3.4699 in)
			0.50 mm (0.0197 in) OS		88.375 — 88.385 mm	(3.4793 — 3.4797 in)
		2200 cc	STD	A	96.885 — 96.895 mm	(3.8144 — 3.8148 in)
				B	96.875 — 96.885 mm	(3.8140 — 3.8144 in)
			0.25 mm (0.0098 in) OS		97.115 — 97.145 mm	(3.8234 — 3.8246 in)
			0.50 mm (0.0197 in) OS		97.365 — 97.395 mm	(3.8333 — 3.8344 in)
Piston pin	Standard clearance between piston pin and hole in piston			STD	0.004 — 0.010 mm	(0.0002 — 0.0004 in)
				Limit	0.020 mm	(0.0008 in)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).	
Piston ring	Piston ring gap	Top ring		STD	0.20 — 0.35 mm	(0.0079 — 0.0138 in)
				Limit	1.0 mm	(0.039 in)
		Second ring		STD	0.20 — 0.50 mm	(0.0079 — 0.0197 in)
				Limit	1.0 mm	(0.039 in)
		Oil ring		STD	0.20 — 0.70 mm	(0.0079 — 0.0276 in)
				Limit	1.5 mm	(0.059 in)
	Clearance between piston ring and piston ring groove	Top ring		STD	0.040 — 0.080 mm	(0.0016 — 0.0031 in)
				Limit	0.15 mm	(0.0059 in)
		Second ring		STD	0.030 — 0.070 mm	(0.0012 — 0.0028 in)
				Limit	0.15 mm	(0.0059 in)

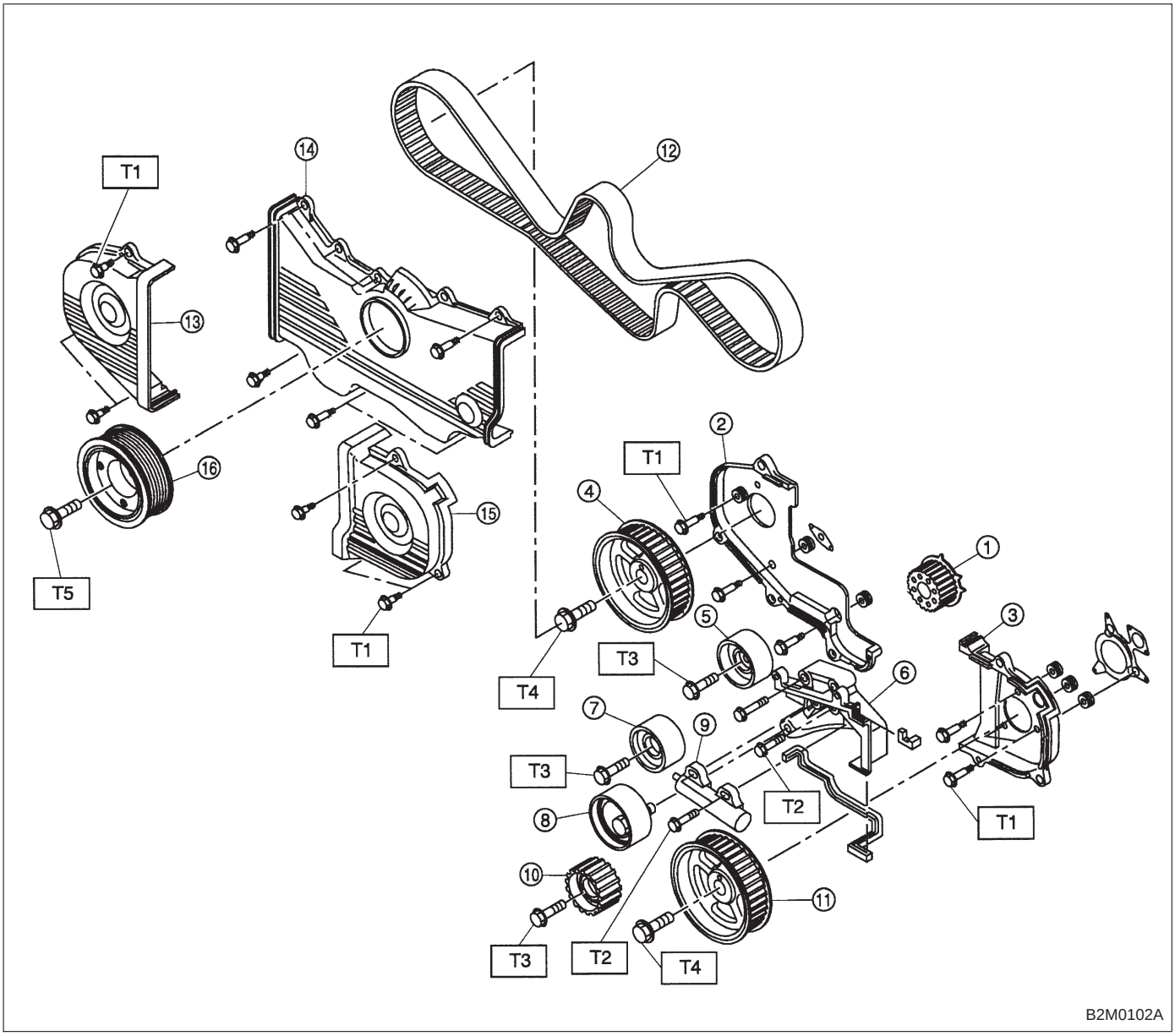
Connecting rod	Bend twist per 100 mm (3.94 in) in length	Limit	0.10 mm	(0.0039 in)
	Side clearance	STD	0.070 — 0.330 mm	(0.0028 — 0.0130 in)
		Limit	0.4 mm	(0.016 in)
Connecting rod bearing	Oil clearance	STD	0.015 — 0.045 mm	(0.0006 — 0.0018 in)
		Limit	0.05 mm	(0.0020 in)
	Thickness at center portion	STD	1.492 — 1.501 mm	(0.0587 — 0.0591 in)
		0.03 mm (0.0012 in) US	1.510 — 1.513 mm	(0.0594 — 0.0596 in)
		0.05 mm (0.0020 in) US	1.520 — 1.523 mm	(0.0598 — 0.0600 in)
		0.25 mm (0.0098 in) US	1.620 — 1.623 mm	(0.0638 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing	STD	0 — 0.022 mm	(0 — 0.0009 in)
		Limit	0.030 mm	(0.0012 in)

STD: Standard OS: Oversize US: Undersize

Crankshaft	Bend limit			0.035 mm	(0.0014 in)
	Crankpin and crank journal	Out-of-roundness		0.030 mm (0.0012 in) or less	
		Grinding limit		0.250 mm	(0.0098 in)
	Crankpin outer diameter		STD	51.984 — 52.000 mm	(2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm	(2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm	(2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm	(2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #5	STD	59.992 — 60.008 mm	(2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm	(2.3607— 2.3613 in)
			0.05 mm (0.0020 in) US	59.934 — 59.950 mm	(2.3596 — 2.3602 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm	(2.3520 — 2.3527 in)
		#2, #3, #4	STD	59.992 — 60.008 mm	(2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.954 — 59.970 mm	(2.3604 — 2.3610 in)
			0.05 mm (0.0020 in) US	59.934 — 59.950 mm	(2.3596 — 2.3602 in)
			0.25 mm (0.0098 in) US	59.734 — 59.750 mm	(2.3517 — 2.3524 in)
	Thrust clearance		STD	0.030 — 0.115 mm	(0.0012 — 0.0045 in)
			Limit	0.25 mm	(0.0098 in)
	Oil clearance	#1, #5	STD	0.003 — 0.030 mm	(0.0001 — 0.0012 in)
		#2, #3, #4	STD	0.010 — 0.033 mm	(0.0004 — 0.0013 in)
		#1, #3, #5	Limit	0.040 mm	(0.0016 in)
		#2, #4	Limit	0.035 mm	(0.0014 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #5	STD	1.998 — 2.011 mm	(0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm	(0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm	(0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm	(0.0837 — 0.0839 in)
		#2, #3, #4	STD	2.000 — 2.013 mm	(0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm	(0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm	(0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm	(0.0838 — 0.0839 in)

STD: Standard US: Undersize

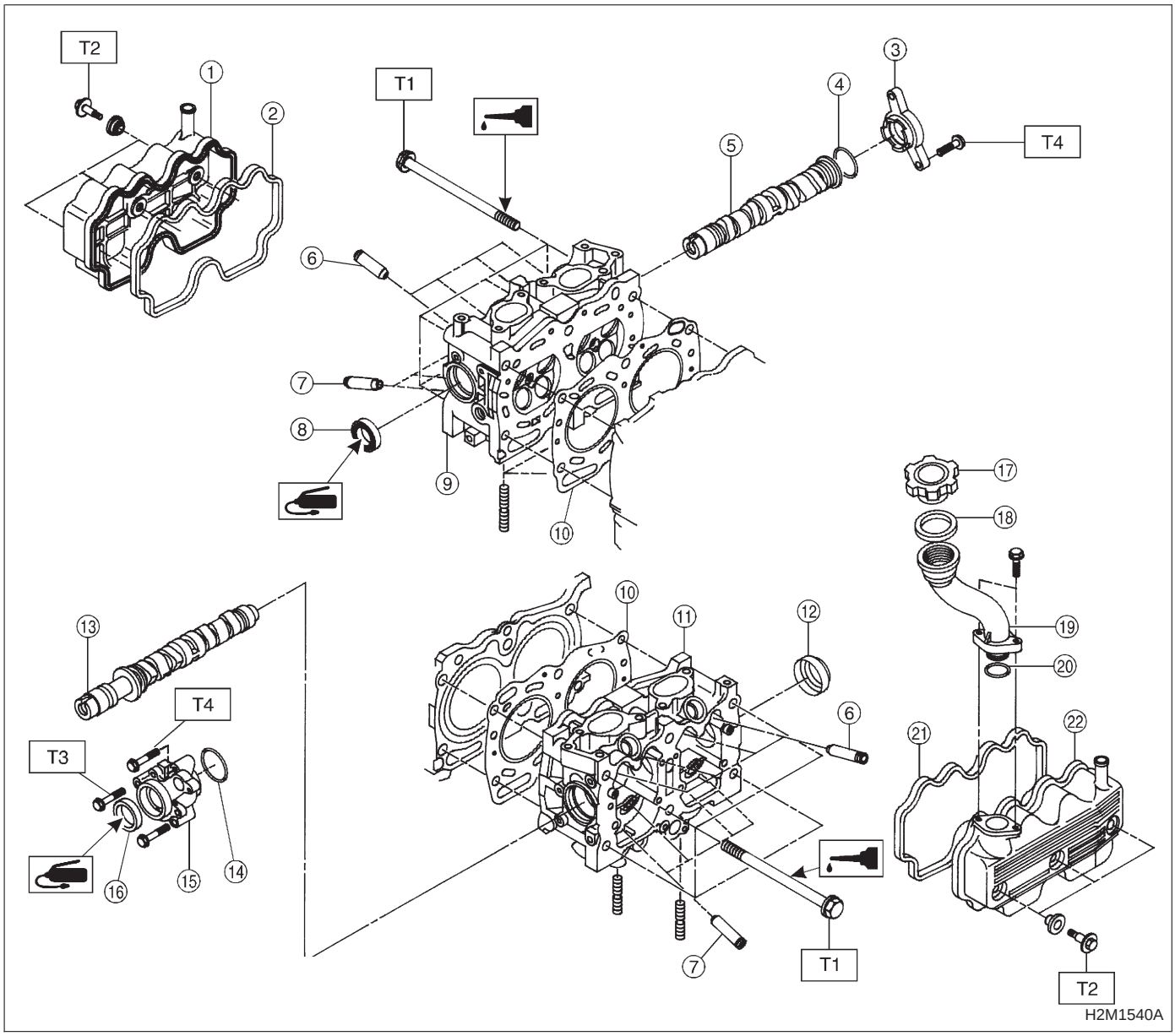
1. Timing Belt



① Crankshaft sprocket
② Belt cover No. 2 (RH)
③ Belt cover No. 2 (LH)
④ Camshaft sprocket No. 1
⑤ Belt idler (No. 1)
⑥ Tensioner bracket
⑦ Belt idler (No. 2)
⑧ Belt tensioner
⑨ Belt tensioner adjuster
⑩ Belt idler No. 2
⑪ Camshaft sprocket No. 2
⑫ Timing belt
⑬ Belt cover (RH)
⑭ Front belt cover
⑮ Belt cover (LH)
⑯ Crankshaft pulley

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 25±2 (2.5±0.2, 18.1±1.4)
T3: 39±4 (4.0±0.4, 28.9±2.9)
T4: 78±5 (8.0±0.5, 57.9±3.6)
T5: 127±10 (13.0±1.0, 94±7)

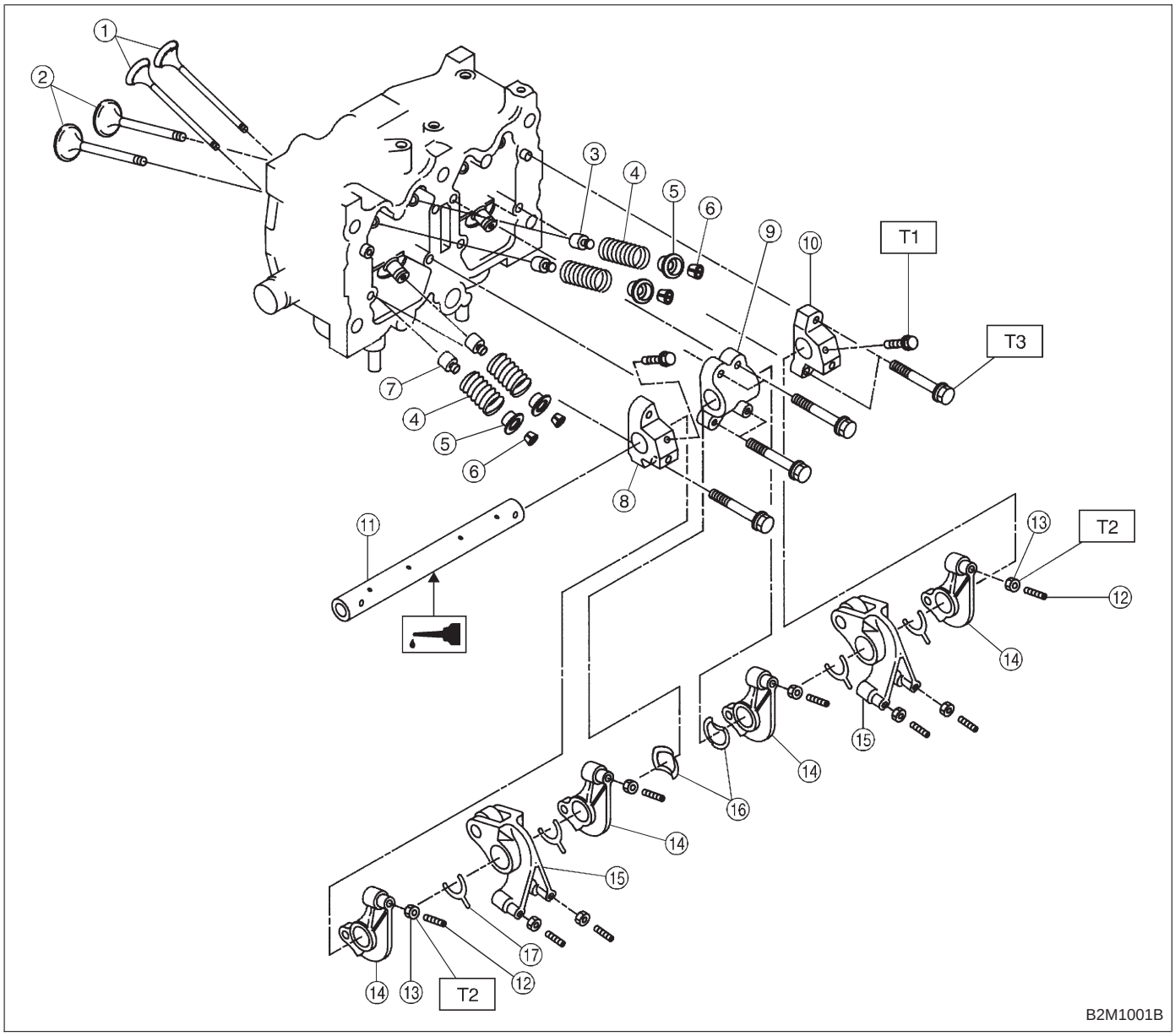
2. Cylinder Head and Camshaft



① Rocker cover (RH)
② Rocker cover gasket
③ Camshaft support (RH)
④ O-ring
⑤ Camshaft (RH)
⑥ Intake valve guide
⑦ Exhaust valve guide
⑧ Oil seal
⑨ Cylinder head (RH)
⑩ Cylinder head gasket
⑪ Cylinder head (LH)
⑫ Plug
⑬ Camshaft (LH)
⑭ O-ring
⑮ Camshaft support (LH)
⑯ Oil seal
⑰ Oil filler cap
⑱ Gasket
⑲ Oil filler pipe
⑳ O-ring
㉑ Rocker gasket
㉒ Rocker cover (LH)

Tightening torque: N·m (kg-m, ft-lb)
T1: <Ref. to 2-3 [W5E1].>
T2: 5±1 (0.5±0.1, 3.7±0.7)
T3: 10 (1.0, 7)
T4: 16 (1.6, 12)

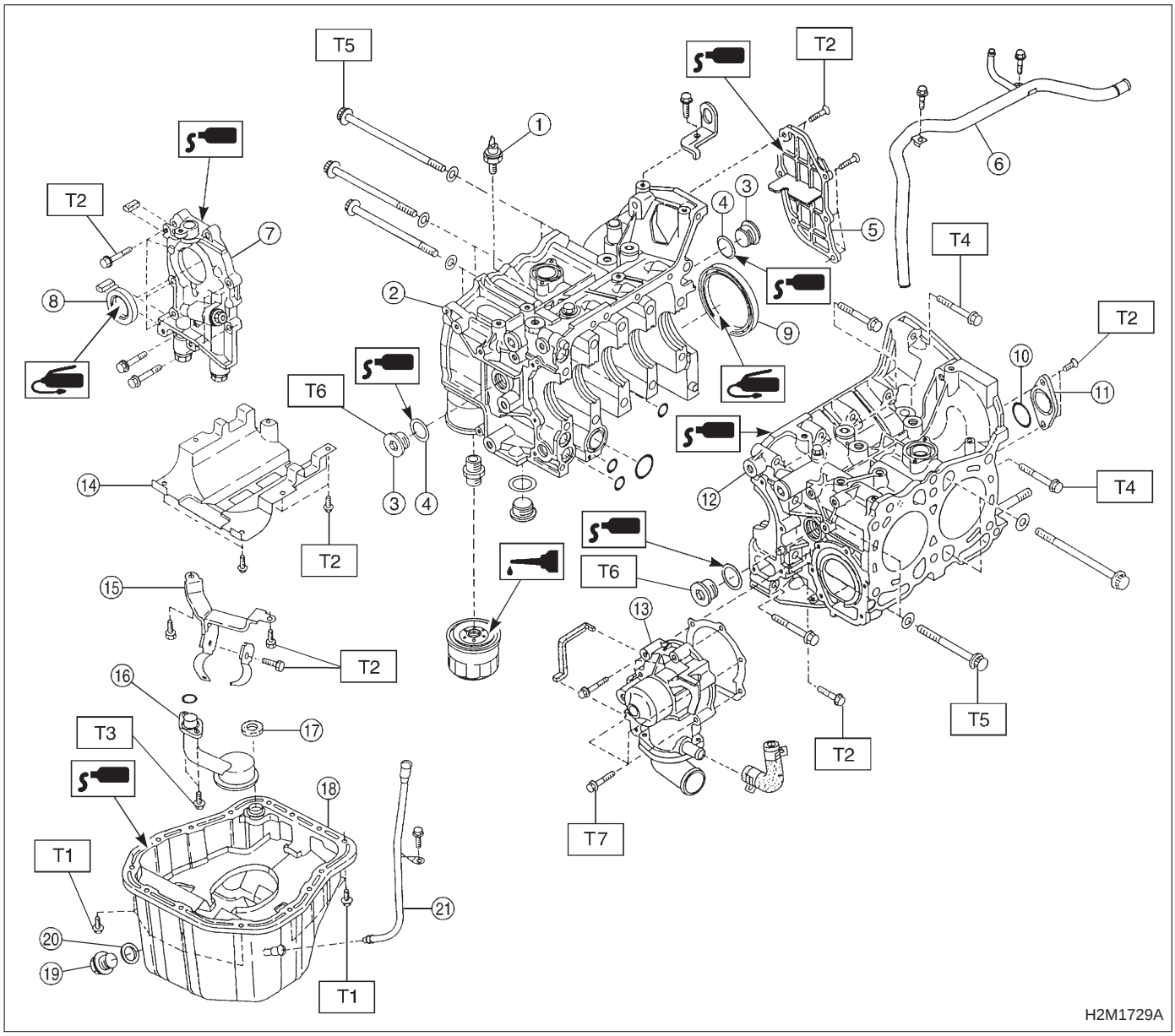
3. Cylinder Head and Valve Assembly



① Exhaust valve
② Intake valve
③ Intake valve oil seal
④ Valve spring
⑤ Retainer
⑥ Retainer key
⑦ Exhaust valve oil seal
⑧ Rocker shaft support
⑨ Rocker shaft support
⑩ Rocker shaft support
⑪ Rocker shaft
⑫ Valve rocker adjust screw
⑬ Valve rocker nut
⑭ Intake valve rocker arm
⑮ Exhaust valve rocker arm
⑯ Spring
⑰ Plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 10±1 (1.0±0.1, 7.2±0.7)
T3: 12±1 (1.2±0.1, 8.7±0.7)

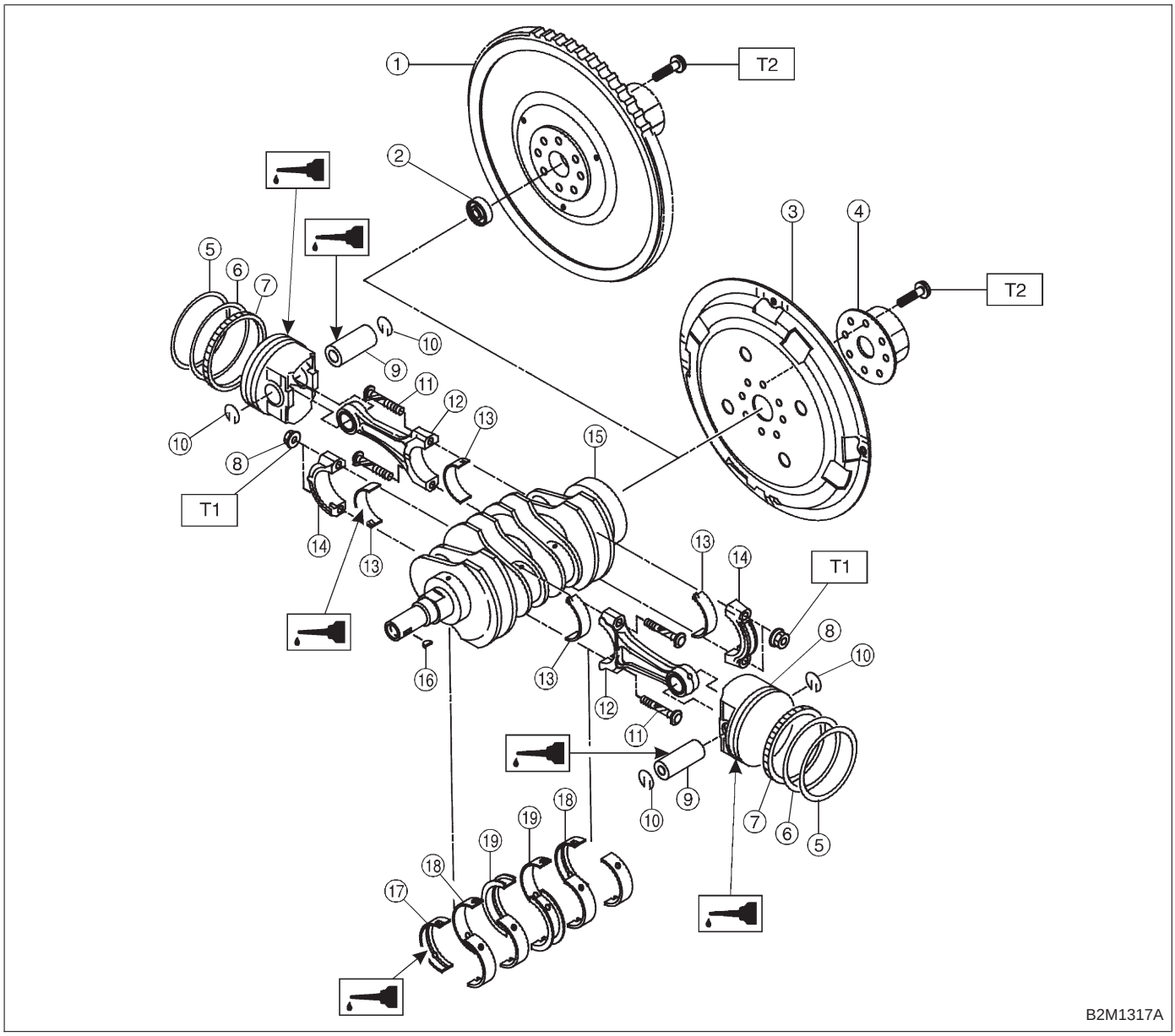
4. Cylinder Block



① Oil pressure switch
② Cylinder block (RH)
③ Service hole plug
④ Gasket
⑤ Oil separator cover
⑥ Water by-pass pipe
⑦ Oil pump
⑧ Front oil seal
⑨ Rear oil seal
⑩ O-ring
⑪ Service hole cover
⑫ Cylinder block (LH)
⑬ Water pump
⑭ Baffle plate
⑮ Oil strainer stay
⑯ Oil strainer
⑰ Gasket
⑱ Oil pan
⑲ Oil drain plug
⑳ Gasket
㉑ Oil filler pipe

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 25±2 (2.5±0.2, 18.1±1.4)
T5: 47±3 (4.8±0.3, 34.7±2.2)
T6: 69±7 (7.0±0.7, 50.6±5.1)
T7: First 12±2 (1.2±0.2, 8.7±1.4)
Second 12±2 (1.2±0.2, 8.7±1.4)

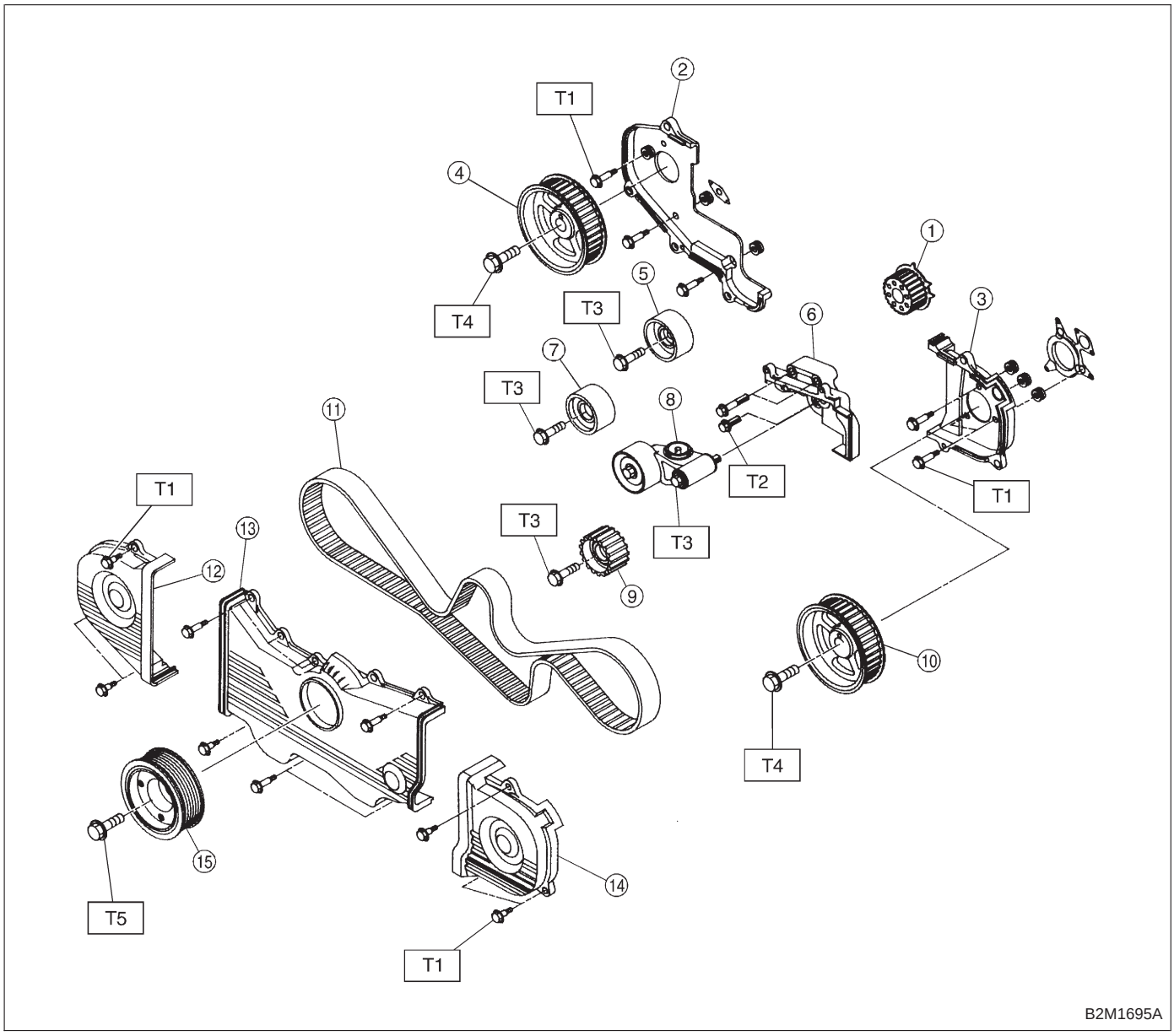
5. Crankshaft and Piston



① Flywheel (MT vehicles)
② Bell bearing (MT vehicles)
③ Drive plate (AT vehicles)
④ Reinforcement (AT vehicles)
⑤ Top ring
⑥ Second ring
⑦ Oil ring
⑧ Piston
⑨ Piston pin
⑩ Circlip
⑪ Connecting rod bolt
⑫ Connecting rod
⑬ Connecting rod bearing
⑭ Connecting rod cap
⑮ Crankshaft
⑯ Woodruff key
⑰ Crankshaft bearing #1, #5
⑱ Crankshaft bearing #2, #4
⑲ Crankshaft bearing #3

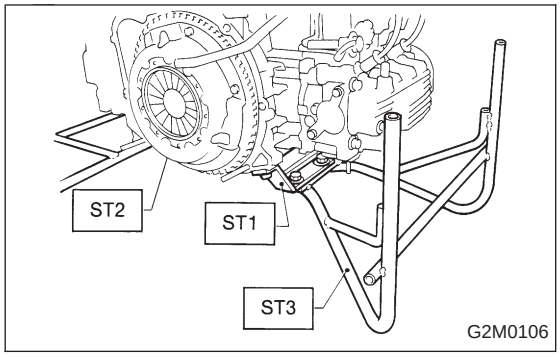
Tightening torque: N·m (kg-m, ft-lb)
T1: 44±2 (4.5±0.2, 32.5±1.4)
T2: 72±3 (7.3±0.3, 52.8±2.2)

6. Timing Belt (Equipped New Automatic Belt Tension Adjuster)



① Crankshaft sprocket
② Belt cover No. 2 (RH)
③ Belt cover No. 2 (LH)
④ Camshaft sprocket No. 1
⑤ Belt idler (No. 1)
⑥ Tensioner bracket
⑦ Belt idler (No. 2)
⑧ Automatic belt tension adjuster ASSY
⑨ Belt idler No. 2
⑩ Camshaft sprocket No. 2
⑪ Timing belt
⑫ Belt cover (RH)
⑬ Front belt cover
⑭ Belt cover (LH)
⑮ Crankshaft pulley

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 25±3 (2.5±0.3, 18.1±2.2)
T3: 39±4 (4.0±0.4, 28.9±2.9)
T4: 78±5 (8.0±0.5, 57.9±3.6)
T5: 127±10 (13.0±1.0, 94±7)



1. General Precautions

1) Before disassembling engine, place it on ST3.

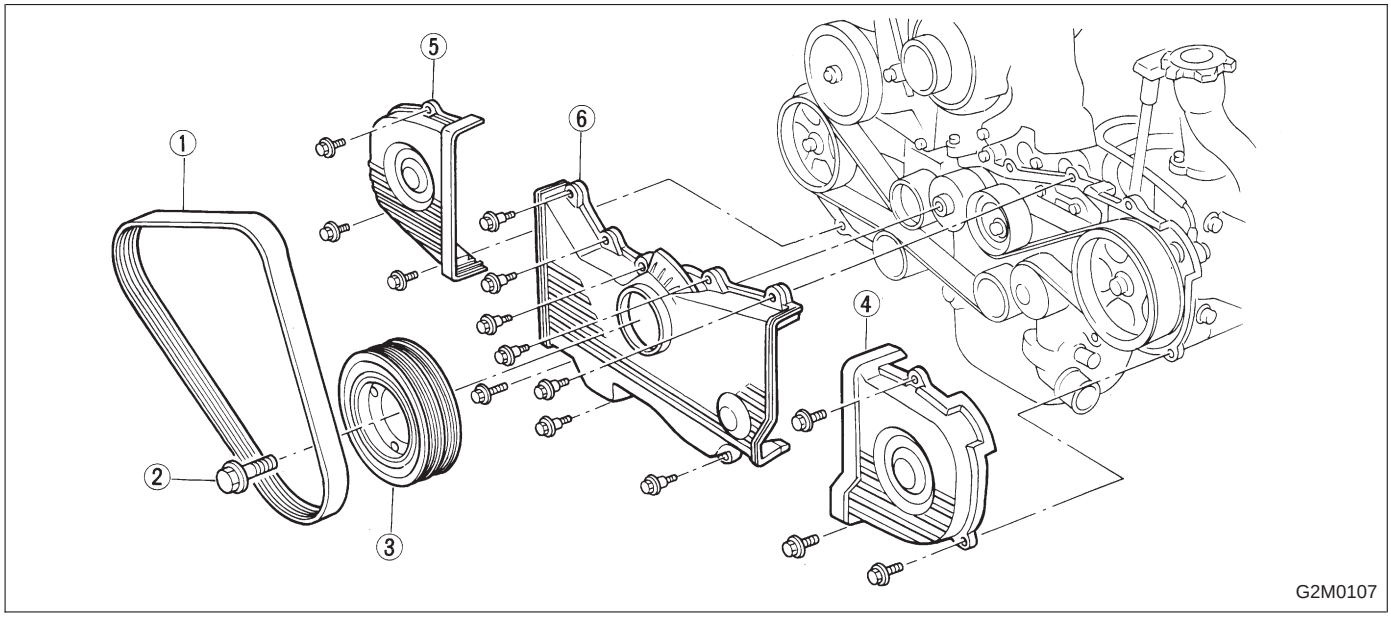
ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND

2) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
3) Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
4) Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
5) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets and lock washers must be replaced with new ones. Liquid gasket should be used where specified to prevent leakage.
7) Bolts, nuts and washers should be replaced with new ones as required.
8) Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.

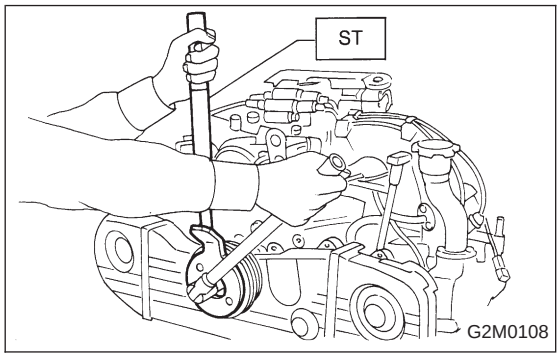
2. Timing Belt

A: REMOVAL

1. CRANKSHAFT PULLEY AND BELT COVER



① V-belt
② Crankshaft pulley bolt
③ Crankshaft pulley
④ Belt cover (LH)
⑤ Belt cover (RH)
⑥ Front belt cover

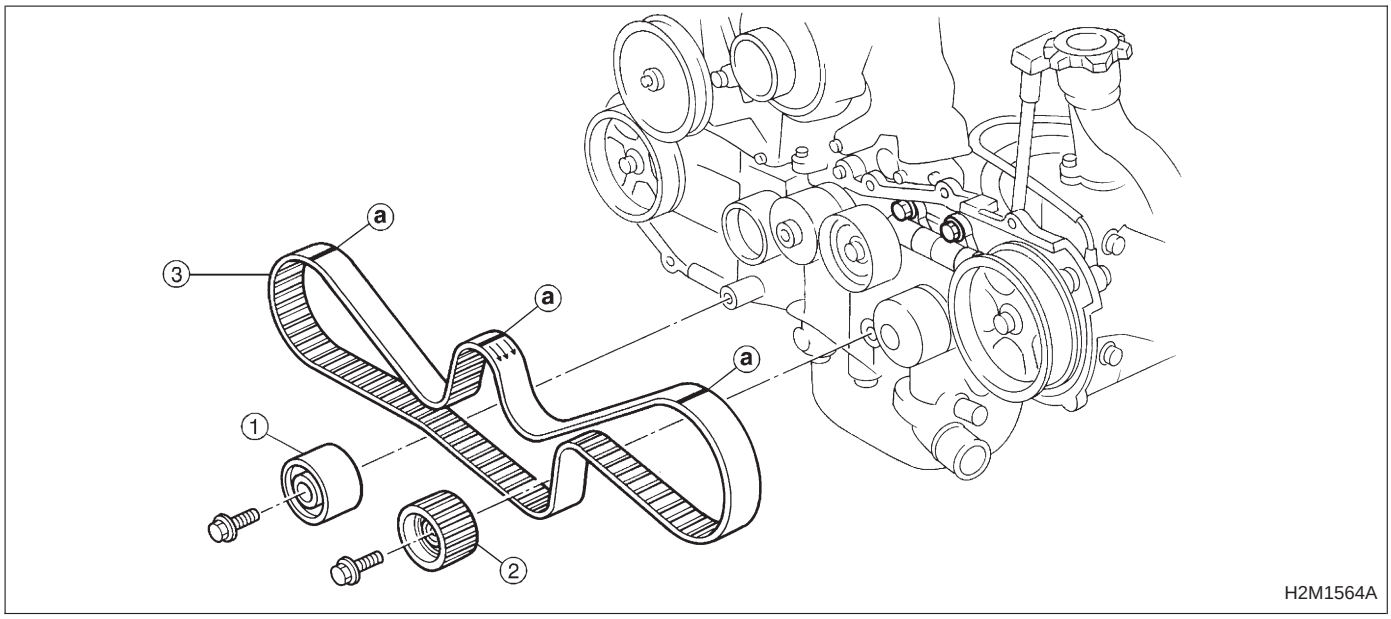


1) Remove V-belt and A/C belt tensioner.
2) Remove crankshaft pulley bolt. To lock crankshaft use ST.

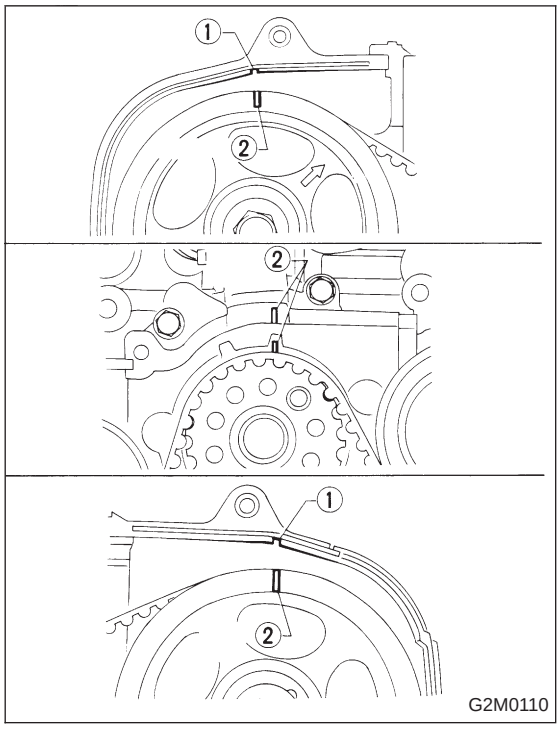
ST 499977000 CRANKSHAFT PULLEY WRENCH

3) Remove crankshaft pulley.
4) Remove belt cover (LH).
5) Remove belt cover (RH).
6) Remove front belt cover.

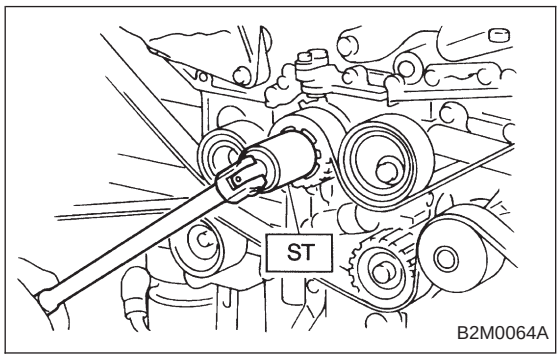
2. TIMING BELT



ⓐ Alignment mark
① Belt idler (No. 2)
② Belt idler No. 2
③ Timing belt

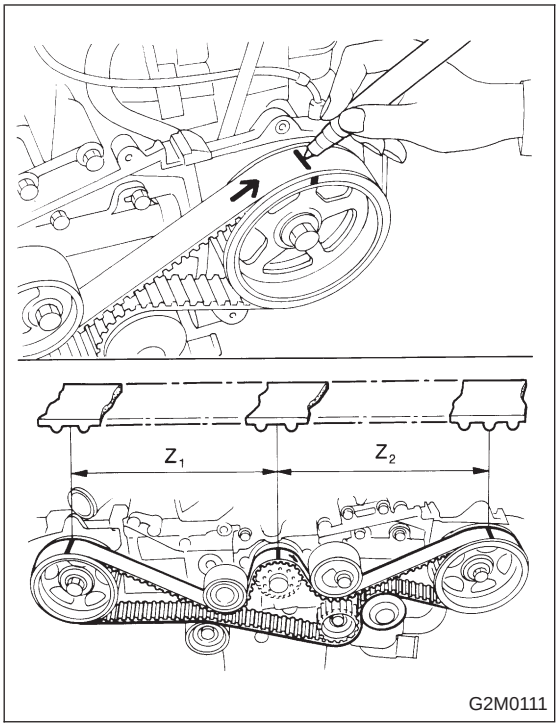


1) If alignment mark ② and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:



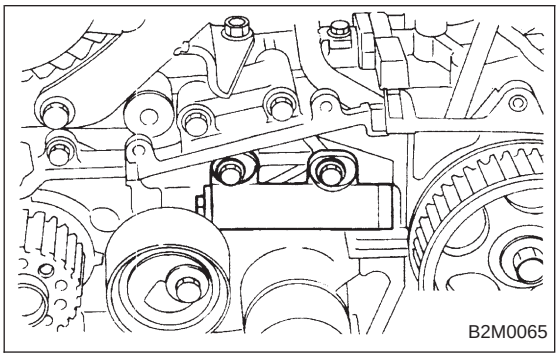
(1) Turn crankshaft, and align alignment marks ② on crankshaft sprocket, and left and right camshaft sprockets with notches ① of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.

Z_1: 44 tooth length
Z_2: 40.5 tooth length

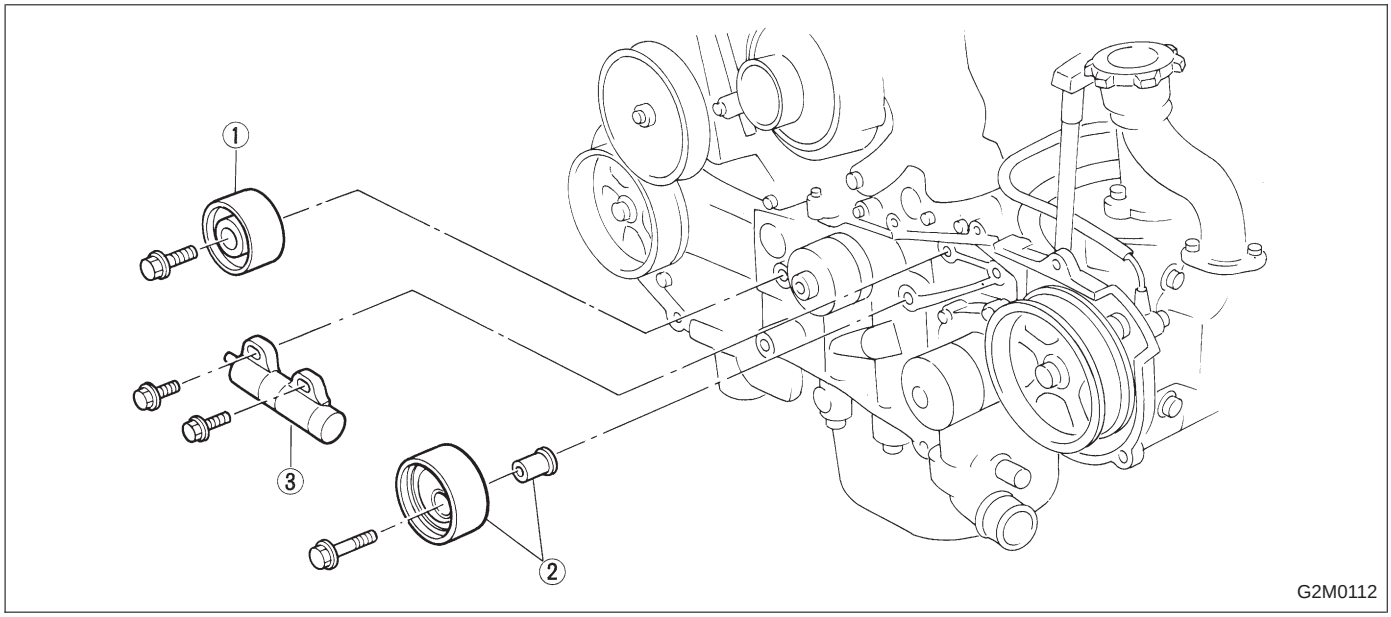


2) Loosen belt tensioner adjuster mounting bolts.

3) Remove belt idler (No. 2).

4) Remove belt idler No. 2.
5) Remove timing belt.

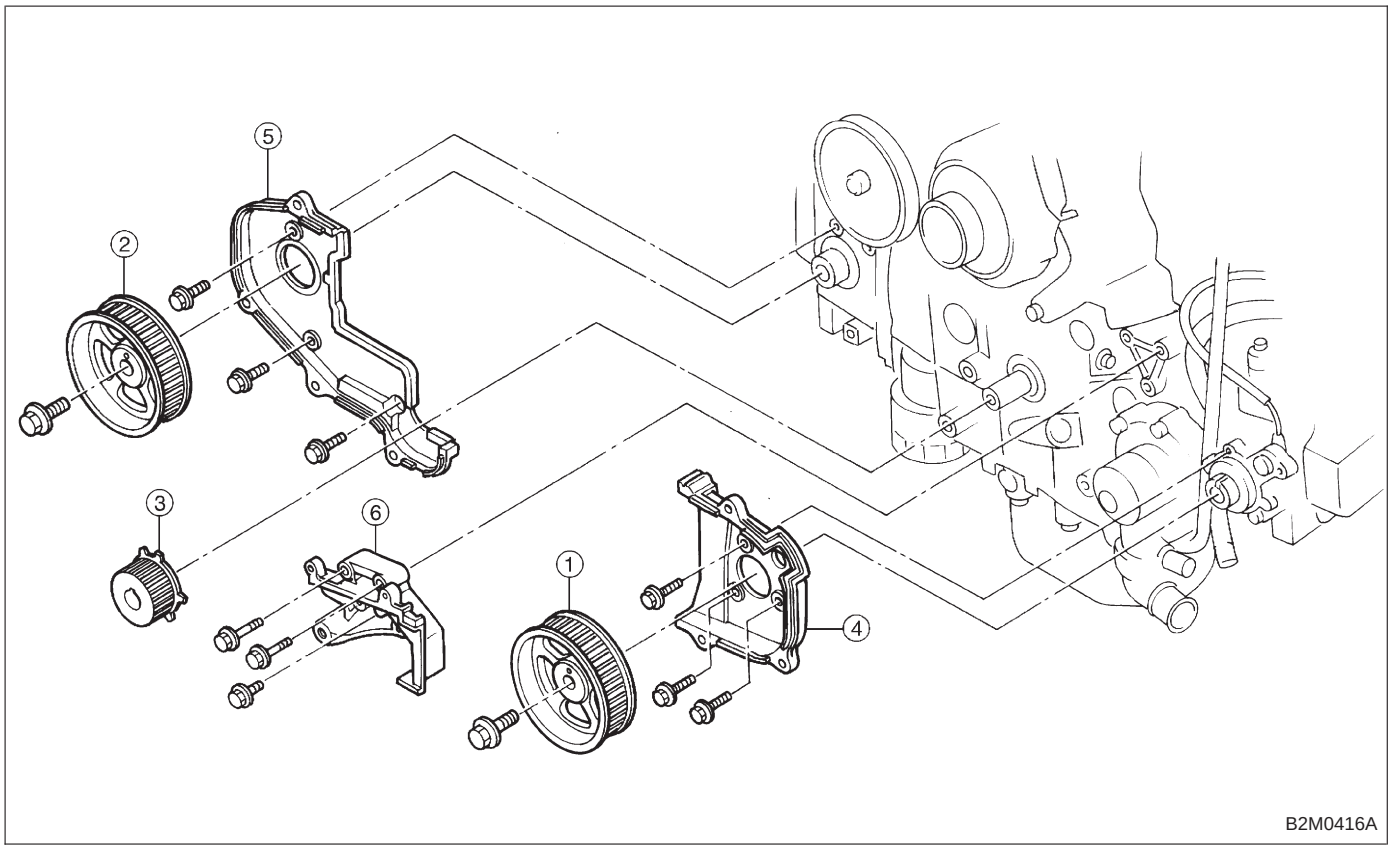
3. BELT TENSIONER AND IDLER



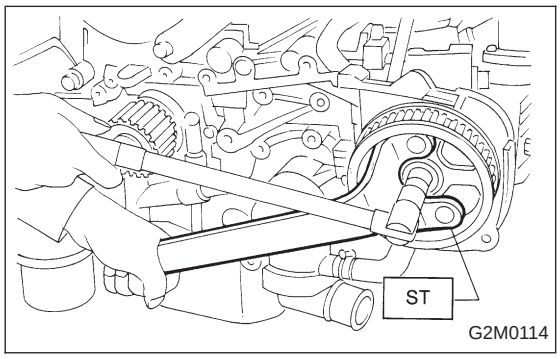
① Belt idler (No. 1)
② Belt tensioner ASSY
③ Belt tensioner adjuster

1) Remove belt idler (No. 1).
2) Remove belt tensioner assembly.
3) Remove belt tensioner adjuster.

4. SPROCKET



① Camshaft sprocket No. 2
② Camshaft sprocket No. 1
③ Crankshaft sprocket
④ Belt cover No. 2 (LH)
⑤ Belt cover No. 2 (RH)
⑥ Tensioner bracket



1) Remove camshaft sprocket No. 2.
2) Remove camshaft sprocket No. 1. To lock camshaft use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

3) Remove crankshaft sprocket.
4) Remove belt cover No. 2 (LH).
5) Remove belt cover No. 2 (RH).

CAUTION:
Do not damage or lose the seal rubber when removing belt covers.

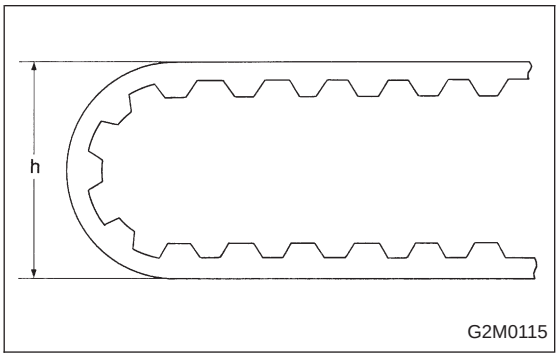
6) Remove tensioner bracket.

B: INSPECTION

1. TIMING BELT

1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
2) Check the condition of back side of belt; if any crack is found, replace belt.

CAUTION:
● Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.



● Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more

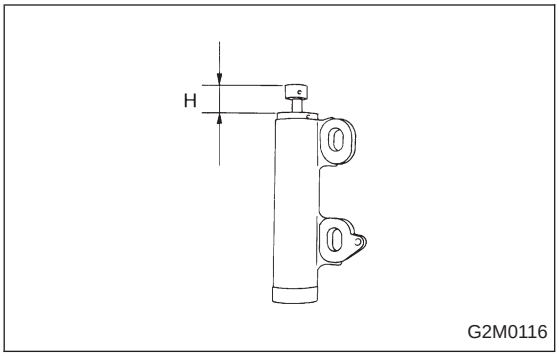
2. BELT TENSIONER ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace belt tensioner adjuster.

CAUTION:
Slight traces of oil at rod' oil seal does not indicate a problem.

2) While holding belt tensioner adjuster with both hands, push the rod section against floor or wall ensuring the rod section will react as follows:

(1) When applying a force of 147 N (15 kg, 33 lb), the rod section should not sink.
(2) When applying a force of 147 to 490 N (15 to 50 kg, 33 to 110 lb), the rod section should maintain a projectionally acting force and should not sink within 8.5 seconds.



3) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
15.4 — 16.4 mm (0.606 — 0.646 in)

3. BELT TENSIONER

1) Check mating surfaces of timing belt and contact point of belt tensioner adjuster rod for abnormal wear or scratches. Replace belt tensioner if faulty.
2) Check spacer and tensioner bushing for wear.
3) Check belt tensioner for smooth rotation. Replace if noise or excessive play is noted.
4) Check belt tensioner for grease leakage.

4. BELT IDLER

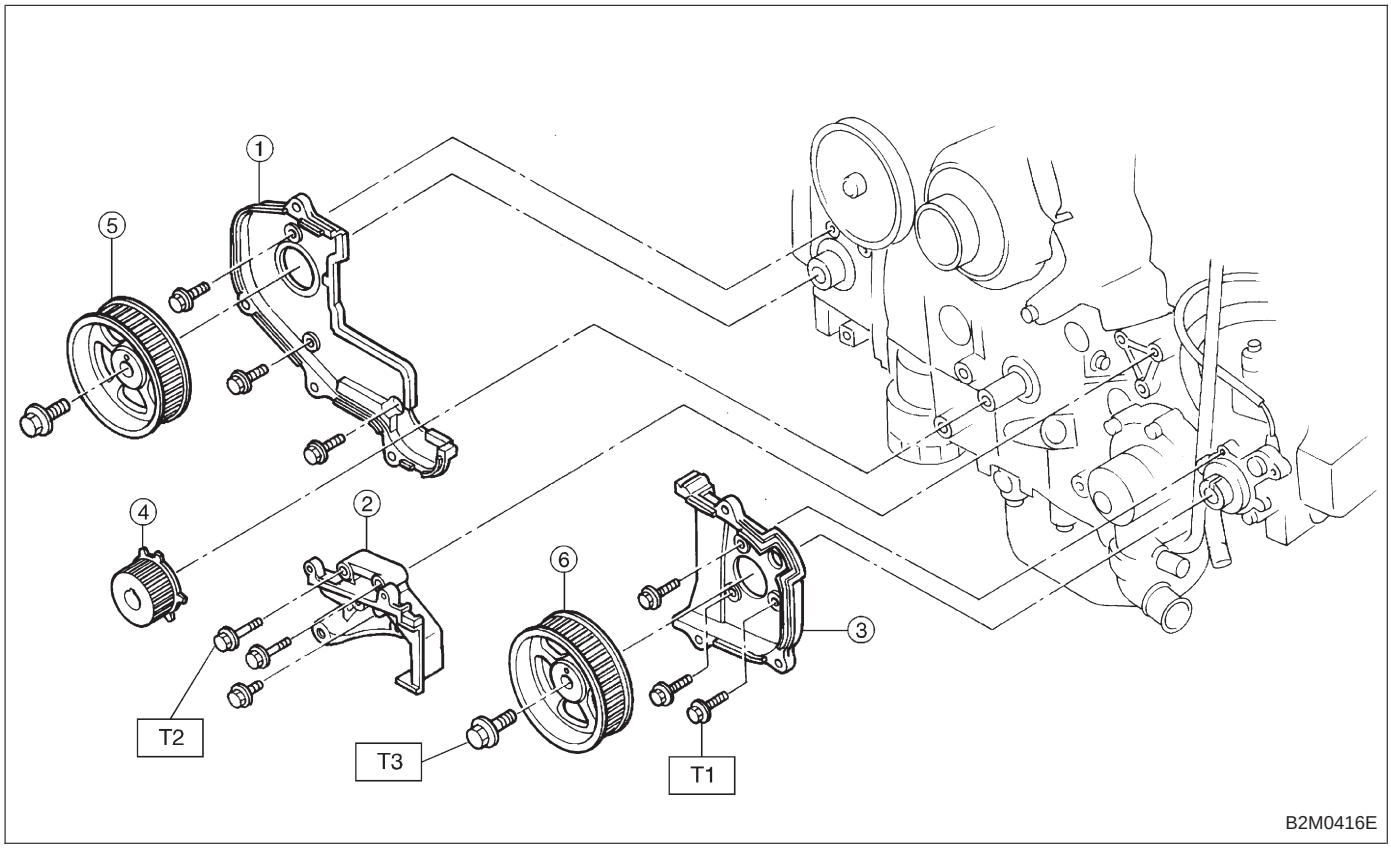
1) Check belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check outer contacting surfaces of belt idler for abnormal wear and scratches.
3) Check belt idler for grease leakage.

5. CAMSHAFT AND CRANKSHAFT SPROCKET

1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

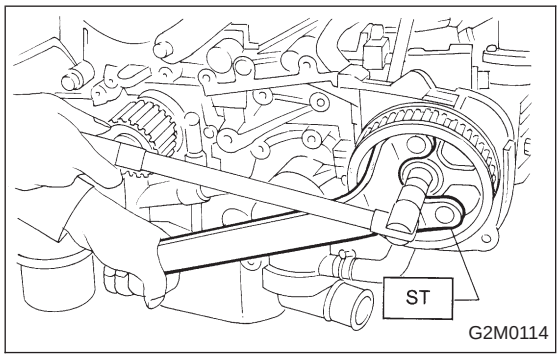
C: INSTALLATION

1. CAMSHAFT AND CRANKSHAFT SPROCKET



① Belt cover No. 2 (RH)
② Tensioner bracket
③ Belt cover No. 2 (LH)
④ Crankshaft pulley
⑤ Camshaft sprocket No. 1
⑥ Camshaft sprocket No. 2

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 25±2 (2.5±0.2, 18.1±1.4)
T3: 78±5 (8.0±0.5, 57.9±3.6)

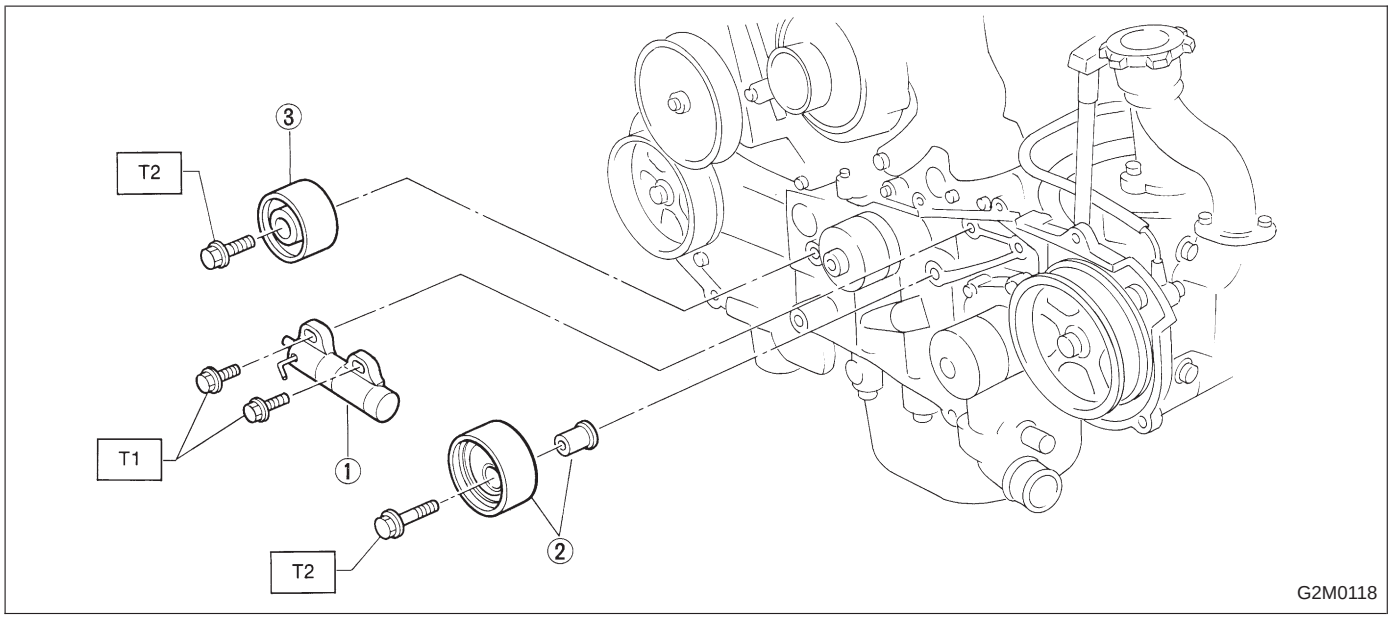


1) Install belt cover No. 2 (RH).
2) Install tensioner bracket.
3) Install belt cover No. 2 (LH).
4) Install crankshaft sprocket.
5) Install camshaft sprocket No. 1 and camshaft sprocket No. 2. To lock camshaft use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

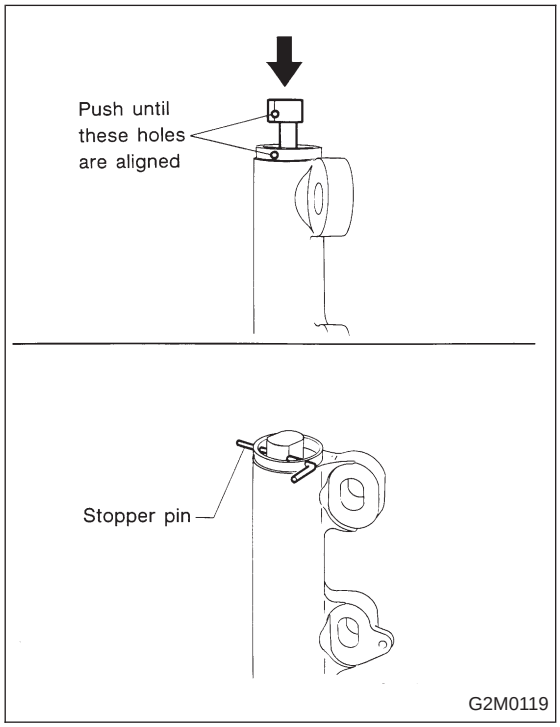
CAUTION:
Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.

2. BELT TENSIONER AND IDLER



① Belt tensioner adjuster
② Belt tesnioner ASSY
③ Belt idler (No. 1)

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±2 (2.5±0.2, 18.1±1.4)
T2: 39±4 (4.0±0.4, 28.9±2.9)



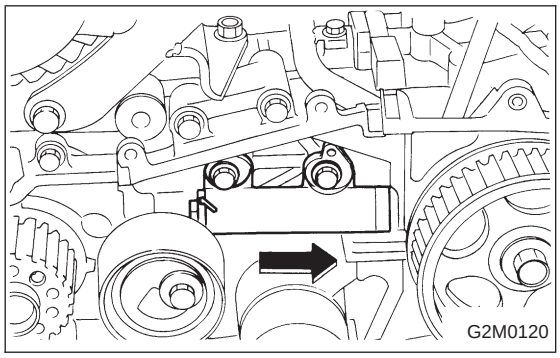
1) Installation of belt tensioner adjuster

(1) Insert stopper pin 1.5 mm (0.059 in) diameter into place while pushing adjuster rod into body using a press.

CAUTION:
● Do not allow press pressure to exceed 9,807 N (1,000 kg, 2,205 lb).
● Do not release press pressure until stopper pin is completely inserted.
● Push belt tensioner adjuster rod vertically.
● Press-in the push adjuster rod gradually taking three minutes or more.

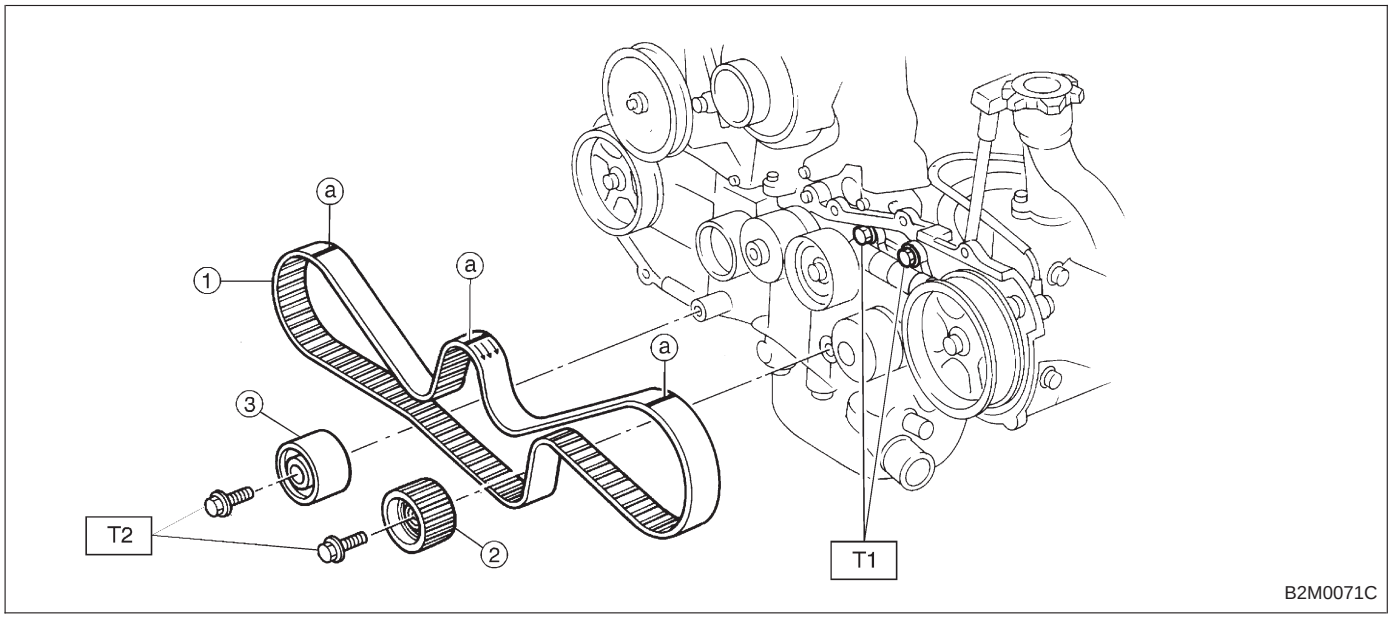
(2) Install belt tensioner adjuster to tensioner bracket.

2) Install belt tensioner assembly.
3) Install belt idler (No. 1).



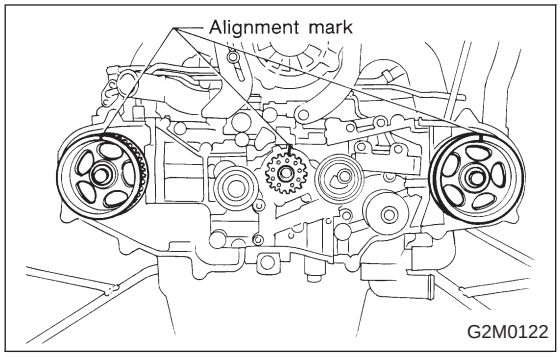
4) Temporarily tighten bolts while belt tensioner adjuster is pushed all the way to the right.

3. TIMING BELT



ⓐ Alignment mark
① Timing belt
② Belt idler No. 2
③ Belt idler (No. 2)

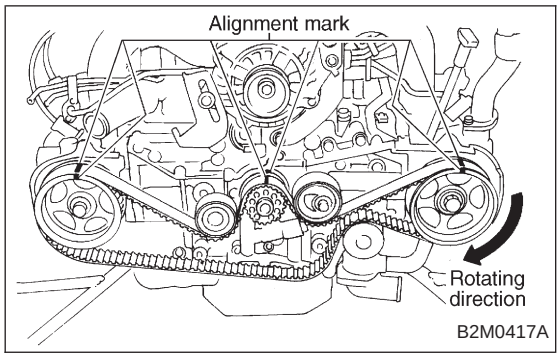
Tightening torque: N·m (kg-m, ft-lb)
T1: 25±2 (2.5±0.2, 18.1±1.4)
T2: 39±4 (4.0±0.4, 28.9±2.9)



1) Installation of timing belt.

(1) Using ST, turn left and right camshaft sprockets so that their alignment marks come to top positions.

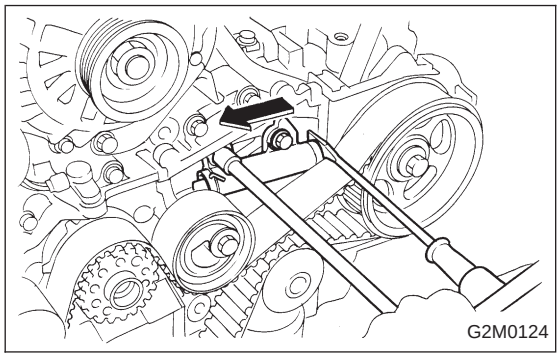
ST 499207100 CAMSHAFT SPROCKET WRENCH



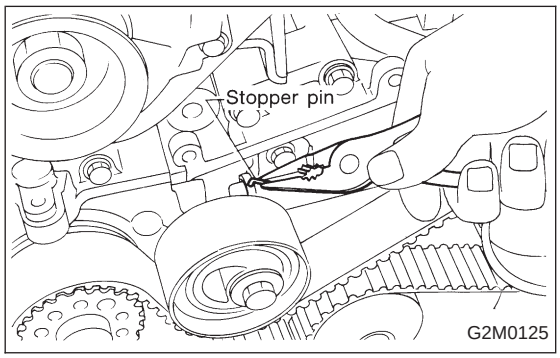
(2) While aligning alignment mark on timing belt with marks on sprockets, position timing belt properly.

CAUTION:
Ensure belt's rotating direction is correct.

2) Install belt idler No. 2.
3) Install belt idler (No. 2).

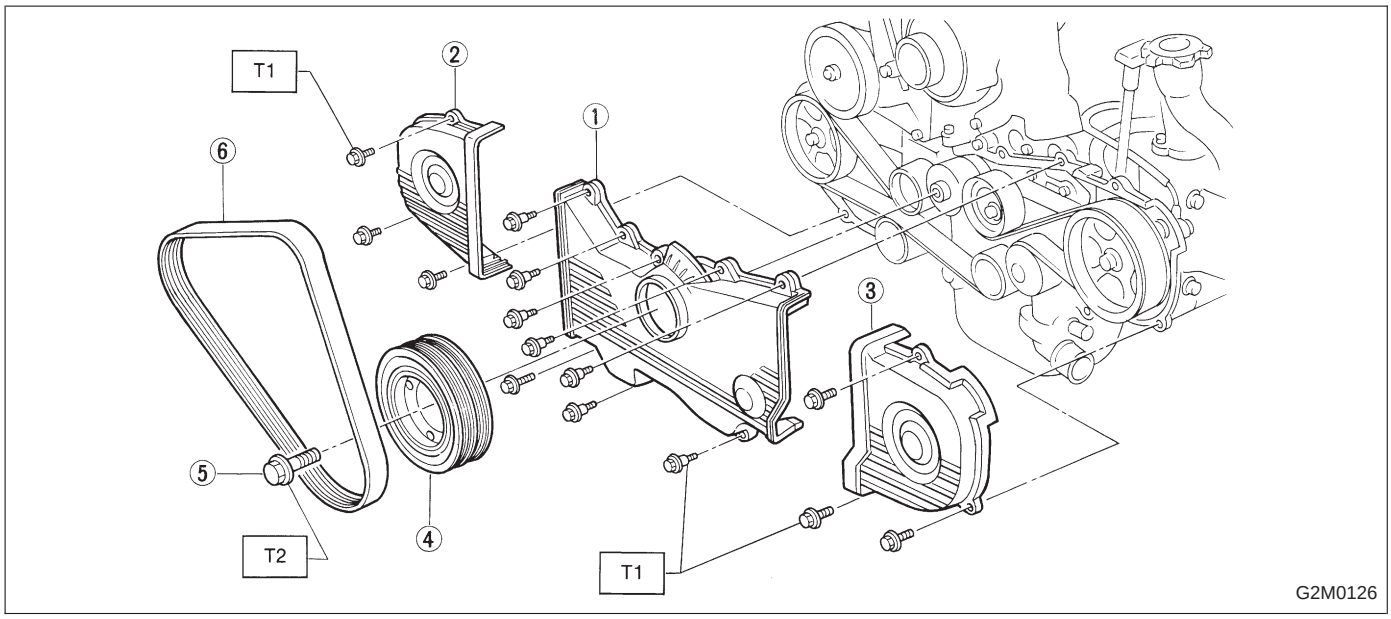


4) Loosen belt tensioner adjuster attaching bolts and move adjuster all the way to the left. Tighten the bolts.



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from belt tensioner adjuster.

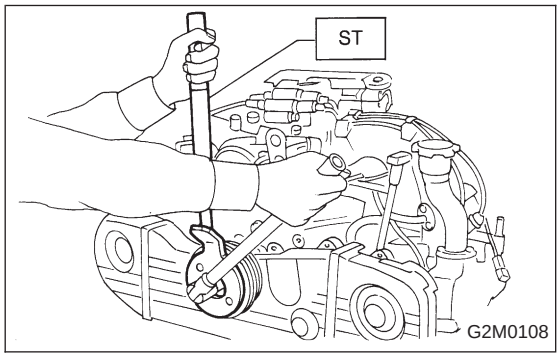
4. CRANKSHAFT PULLEY AND BELT COVER



① Front belt cover
② Belt cover (RH)
③ Belt cover (LH)
④ Crankshaft pulley
⑤ Crankshaft pulley bolt
⑥ V-belt

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 127±10 (13.0±1.0, 94±7)

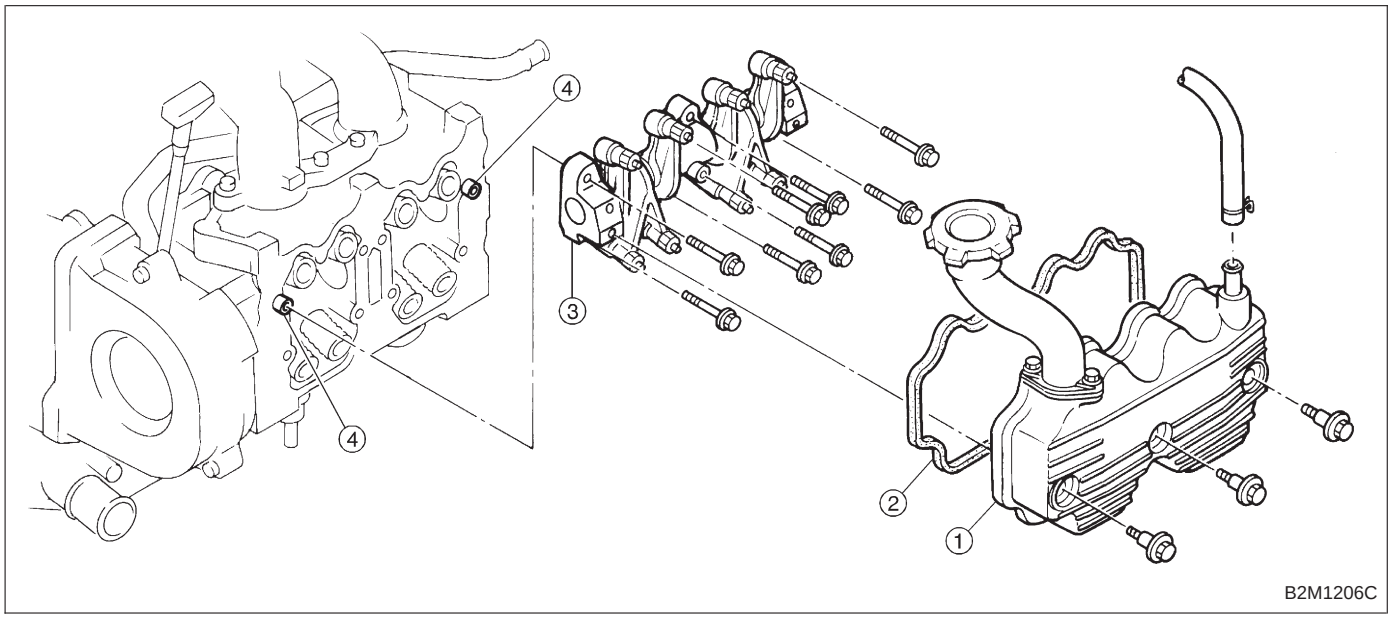
1) Install front belt cover.
2) Install belt cover (RH).
3) Install belt cover (LH).
4) Install crankshaft pulley.



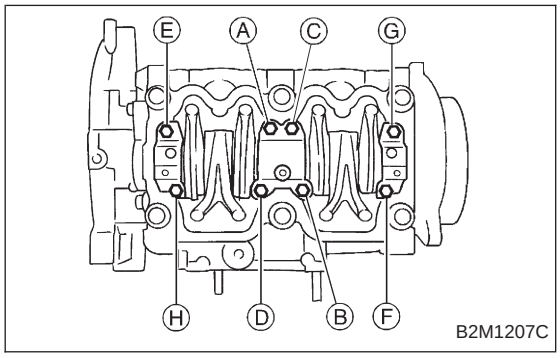
5) Install pulley bolt.
To lock crankshaft, use ST.
ST 499977000 CRANKSHAFT PULLEY WRENCH
6) Install V-belt.

3. Valve Rocker Assembly

A: REMOVAL



① Rocker cover
② Rocker cover gasket
③ Valve rocker ASSY
④ Knock pin



1) Disconnect PCV hose and remove rocker cover.
2) Removal of valve rocker assembly

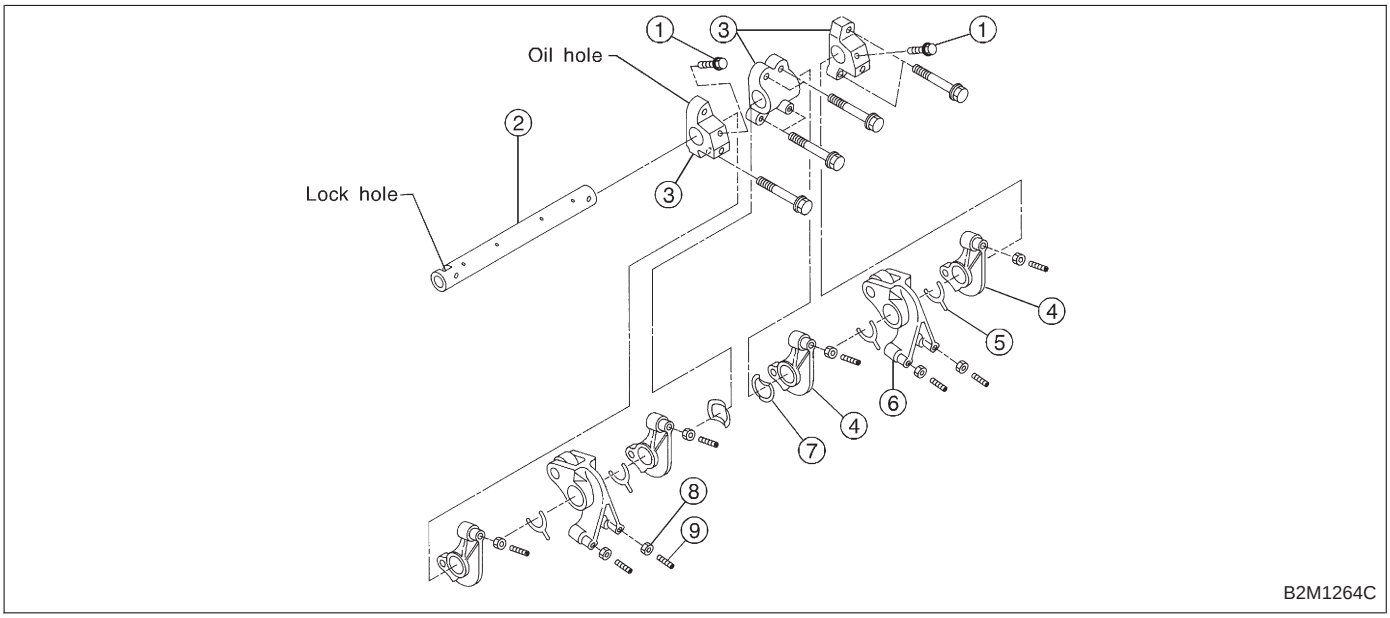
(1) Remove bolts Ⓐ through Ⓓ in alphabetical sequence.

CAUTION:
Leave two or three threads of bolt Ⓐ engaged to retain valve rocker assembly.

(2) Equally loosen bolts Ⓔ through Ⓗ all the way, being careful that knock pin is not gouged.

(3) Remove valve rocker assembly.

B: DISASSEMBLY



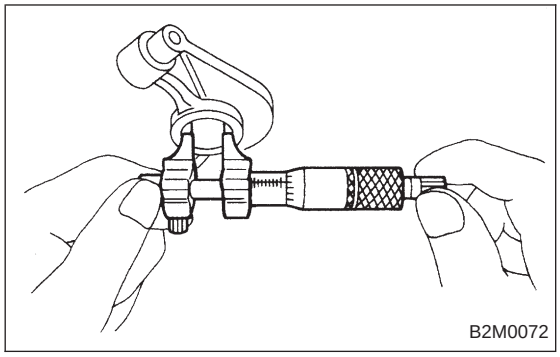
① Bolt
② Rocker shaft
③ Rocker shaft support
④ Intake valve rocker arm
⑤ Plate
⑥ Exhaust valve rocker arm
⑦ Spring
⑧ Valve rocker nut
⑨ Valve rocker adjust screw

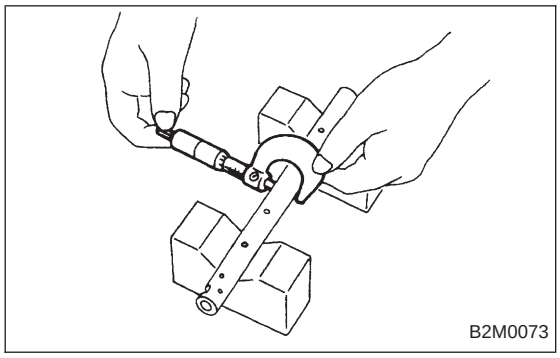
1) Remove bolts which secure rocker shaft.
2) Extract rocker shaft. Remove valve rocker arms, plates, springs and shaft supports from rocker shaft.

CAUTION:
Arrange all removed parts in order so that they can be installed in their original positions.

3) Loosen valve rocker nut, and then remove valve rocker adjust screw and nut from valve rocker arm.

CAUTION:
Do not remove valve rocker adjust screw and valve rocker nut unless necessary.


B2M0072


B2M0073

C: INSPECTION

1. VALVE ROCKER ARM

1) Measure inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)

If oil clearance exceeds specifications, replace valve rocker arm or shaft.

NOTE:
Replace valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

2) Measure inside diameter of rocker shaft support and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between support and shaft:
Standard
0.005 — 0.039 mm (0.0002 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

If oil clearance exceeds specifications, replace rocker shaft support or shaft.

NOTE:
Replace rocker shaft support or shaft, whichever shows greater amount of wear.

Rocker shaft support inside diameter:
22.005 — 22.026 mm (0.8663 — 0.8672 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

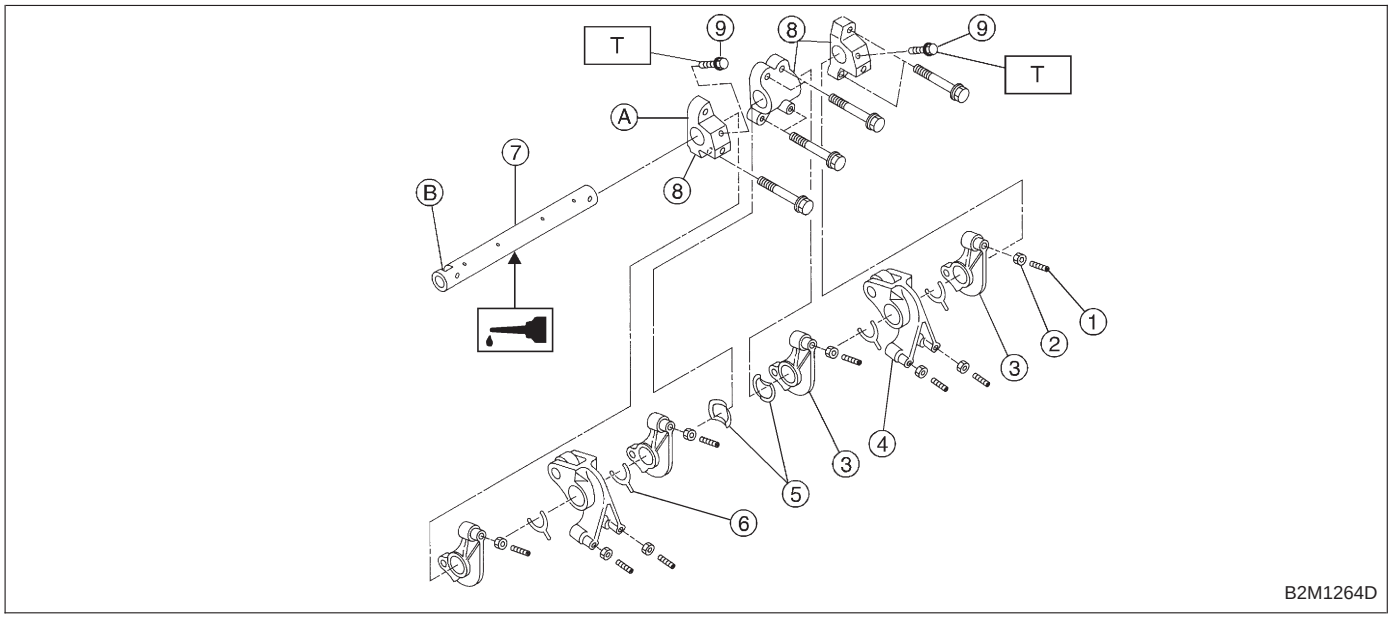
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.
4) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

2. VALVE ROCKER SHAFT

Visually check oil relief valve of shaft end for any of the following abnormalities.
- Breaks in check ball body
- Foreign particles caught in valve spring
- Oil leaks at check ball

CAUTION:
Repair or replace valve rocker shaft as necessary.

D: ASSEMBLY



① Valve rocker adjust screw
② Valve rocker nut
③ Intake valve rocker arm
④ Exhaust valve rocker arm
⑤ Spring
⑥ Plate
⑦ Rocker shaft
⑧ Rocker shaft support
⑨ Bolt
Ⓐ Oil hole
Ⓑ Lock hole

Tightening torque: N·m (kg-m, ft-lb)
T: 5±1 (0.5±0.1, 3.6±0.7)

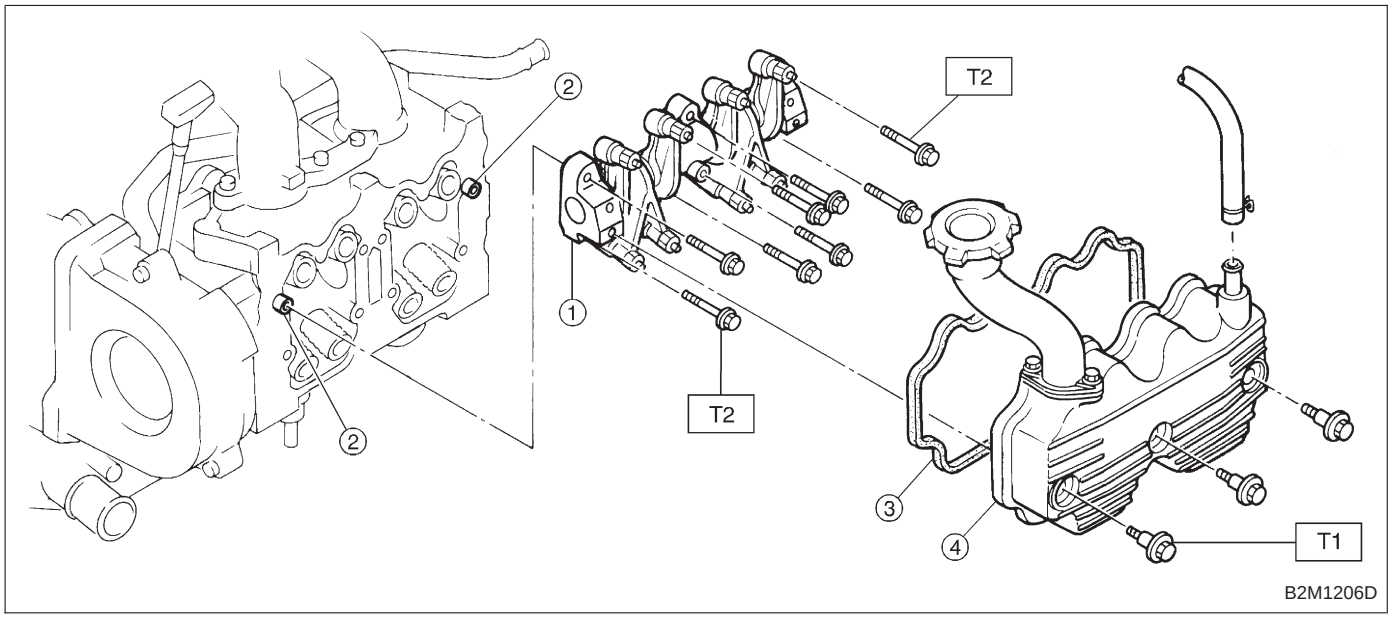
1) Install valve rocker adjust screw and valve rocker nut to valve rocker arm, and loosely tighten nut.

2) Arrange valve rocker arms, plates, springs and rocker shaft supports in assembly order and insert valve rocker shaft. Ensure that cutout portion of rocker shaft faces oil holes Ⓐ in rocker shaft supports.

CAUTION:
Valve rocker arms, rocker shaft and rocker shaft supports have identification marks. Ensure parts with same markings are properly assembled.

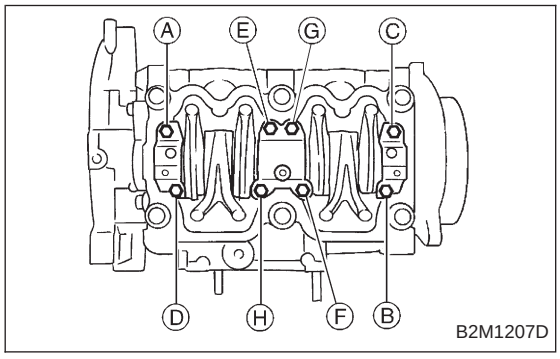
3) Install valve rocker shaft securing bolts while aligning shaft “lock” holes Ⓑ with bolts.

E: INSTALLATION



① Valve rocker ASSY
② Knock pin
③ Rocker cover gasket
④ Rocker cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 12±1 (1.2±0.1, 8.7±0.7)



1) Installation of valve rocker assembly
   (1) Temporarily tighten bolts Ⓐ through Ⓓ equally as shown in Figure.

CAUTION:
Do not allow valve rocker assembly to gouge knock pins.

   (2) Tighten bolts Ⓔ through Ⓗ to specified torque.
   (3) Tighten bolts Ⓐ through Ⓓ to specified torque.

Tightening torque:
12±1 N·m (1.2±0.1 kg-m, 8.7±0.7 ft-lb)

2) Adjust the valve clearances. <Ref. to 2-2 [07B0].>
3) Install rocker cover and connect PCV hose.

4. Camshaft

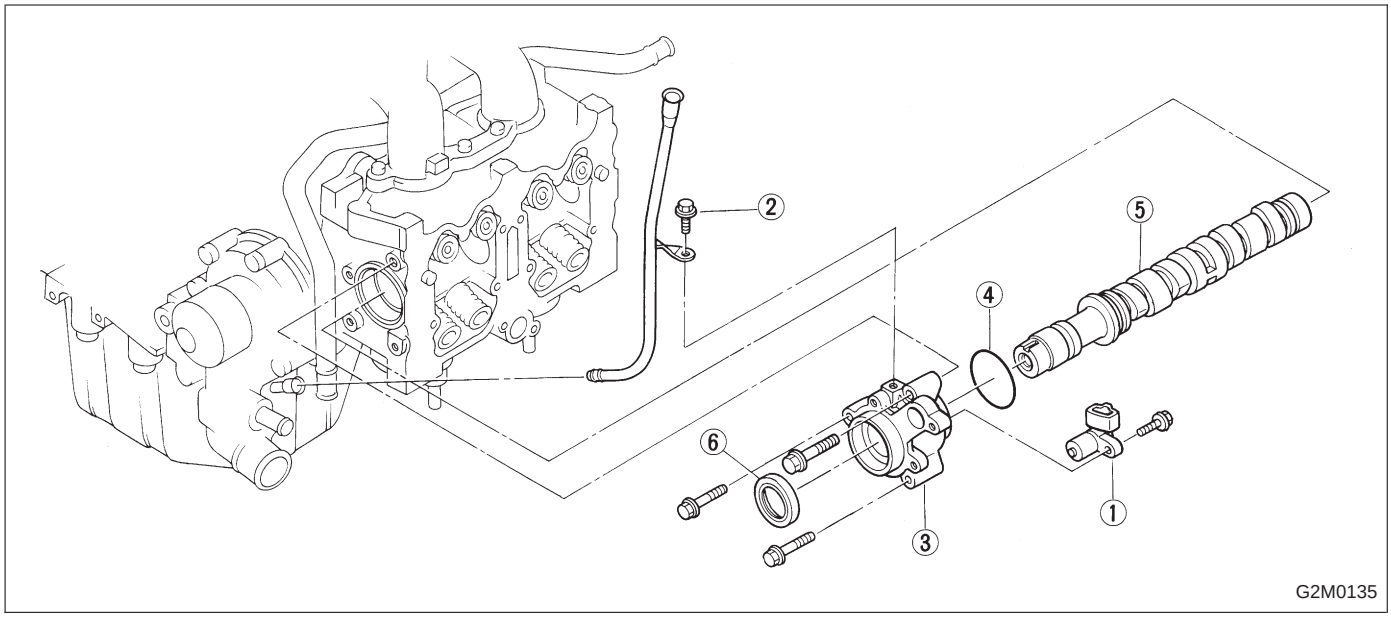
A: REMOVAL

1. RELATED PARTS

1) Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3 [W2A0].>

2) Remove valve rocker assembly.
<Ref. to 2-3 [W3A0].>

2. CAMSHAFT (LH)



① Camshaft position sensor
② Bolt
③ Camshaft support (LH)
④ O-ring
⑤ Camshaft (LH)
⑥ Oil seal

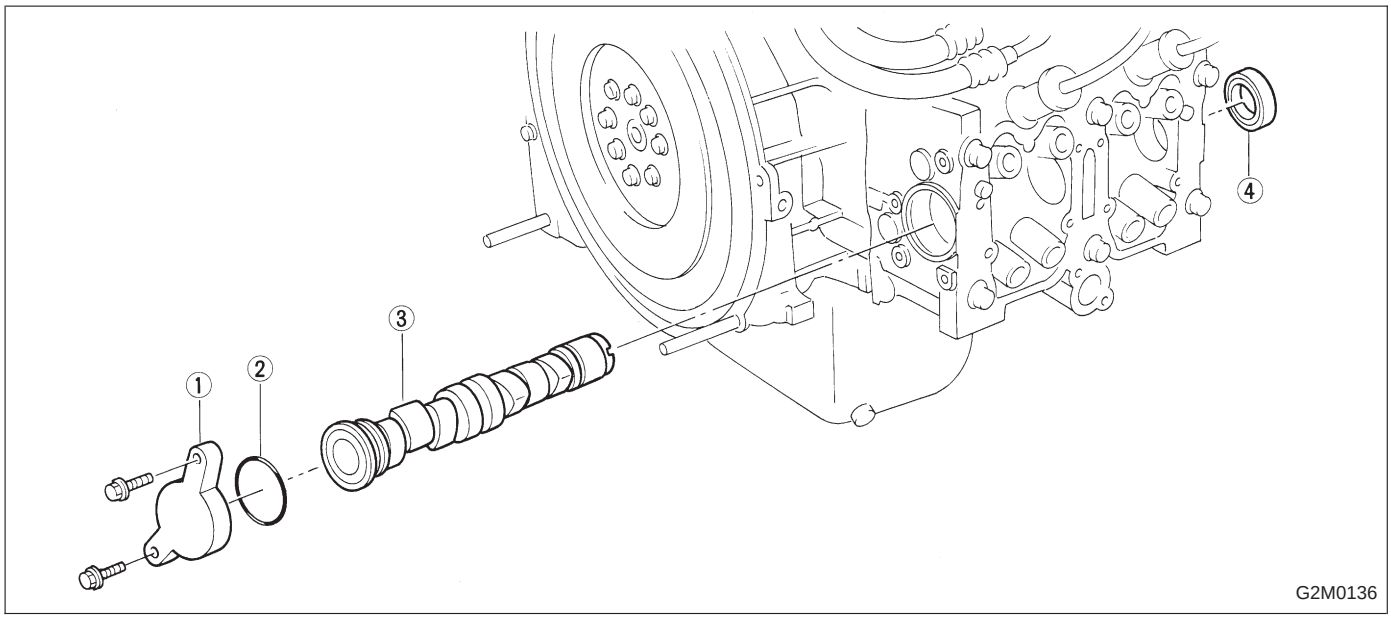
1) Remove camshaft position sensor.

CAUTION:
Do not damage the camshaft position sensor.

2) Remove oil level gauge guide attaching bolt.
3) Remove camshaft support (LH).
4) Remove O-ring.
5) Remove camshaft (LH).
6) Remove oil seal.

CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**

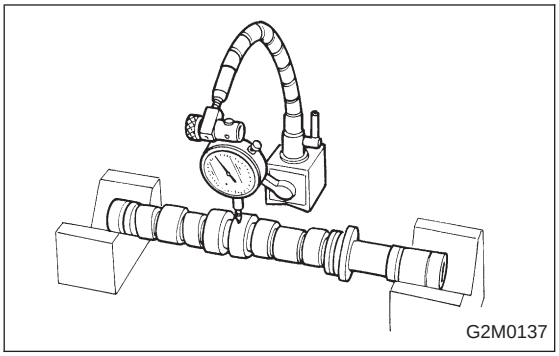
3. CAMSHAFT (RH)



① Camshaft support (RH)
② O-ring
③ Camshaft (RH)
④ Oil seal

1) Remove camshaft support (RH).
2) Remove O-ring.
3) Remove camshaft (RH).
4) Remove oil seal.

CAUTION:
● Do not remove oil seal unless necessary.
● Do not scratch journal surface when removing oil seal.


G2M0137

B: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

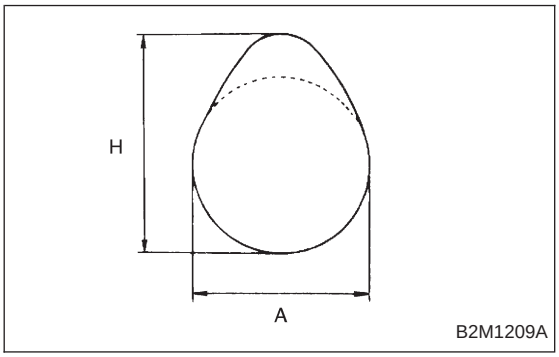
Limit:
0.025 mm (0.0010 in)

2) Check journal for damage and wear. Replace if faulty.

3) Measure outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between the two (= oil clearance). If oil clearance exceeds specifications, replace camshaft or cylinder head as necessary.

Unit: mm (in)

Item				
	Right-hand camshaft	Front	Center	Rear
	Left-hand camshaft	Rear	Center	Front
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)		
	Limit	0.10 (0.0039)		
Camshaft journal O.D.		31.935 — 31.950 (1.2573 — 1.2579)	37.435 — 37.450 (1.4738 — 1.4744)	37.935 — 37.950 (1.4935 — 1.4941)
Journal hole I.D.		32.005 — 32.025 (1.2600 — 1.2608)	37.505 — 37.525 (1.4766 — 1.4774)	38.005 — 38.025 (1.4963 — 1.4970)

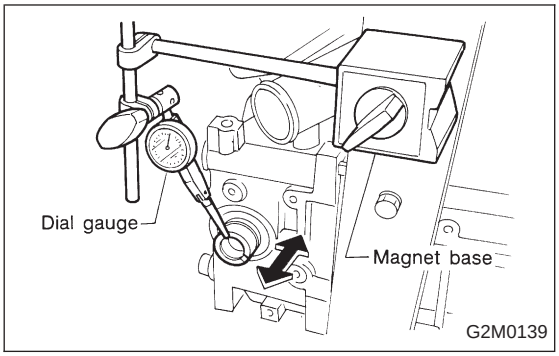


B2M1209A

4) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H
Standard
IN: 32.244 — 32.344 mm (1.2694 — 1.2734 in)
EX: 31.964 — 32.064 mm (1.2584 — 1.2624 in)
Limit
IN: 32.094 mm (1.2635 in)
EX: 31.814 mm (1.2525 in)

Cam base circle diameter A:
IN: 27.5 mm (1.083 in)
EX: 27.0 mm (1.063 in)



2. CAMSHAFT SUPPORT

Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace camshaft support.

Standard:

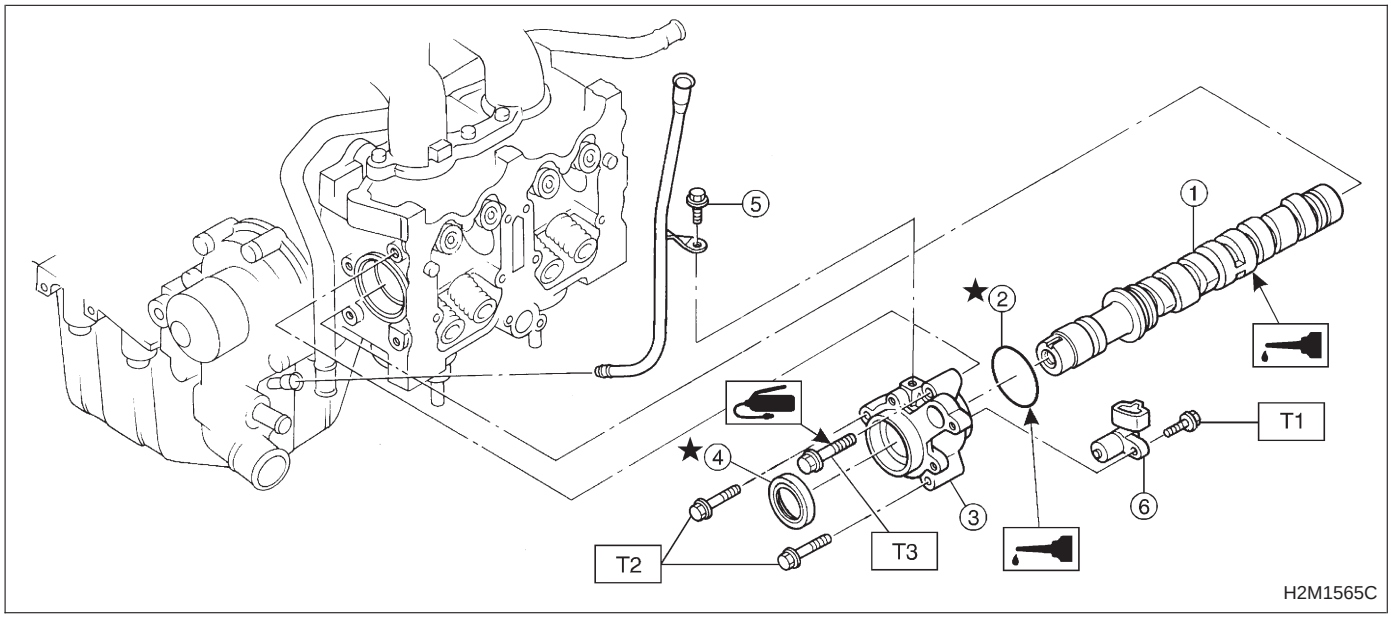
0.030 — 0.260 mm (0.0012 — 0.0102 in)

Limit:

0.35 mm (0.0138 in)

C: INSTALLATION

1. CAMSHAFT (LH)



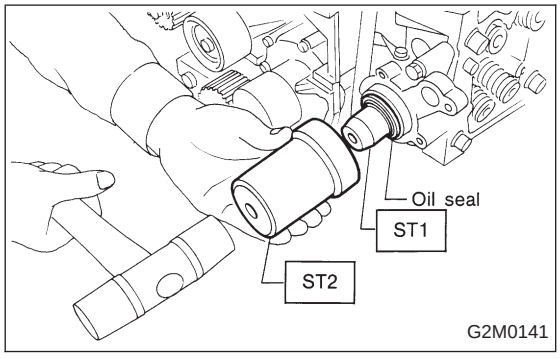
① Camshaft (LH)
② O-ring
③ Camshaft support (LH)
④ Oil seal
⑤ Bolt
⑥ Camshaft position sensor
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7)
T3: 16 (1.6, 12)

1) Apply a coat of engine oil to camshaft journals and install camshaft (LH).
2) Apply a coat of engine oil or grease to O-ring.
3) Install O-ring to camshaft support (LH).

CAUTION:
Use a new O-ring.

4) Install camshaft support (LH).



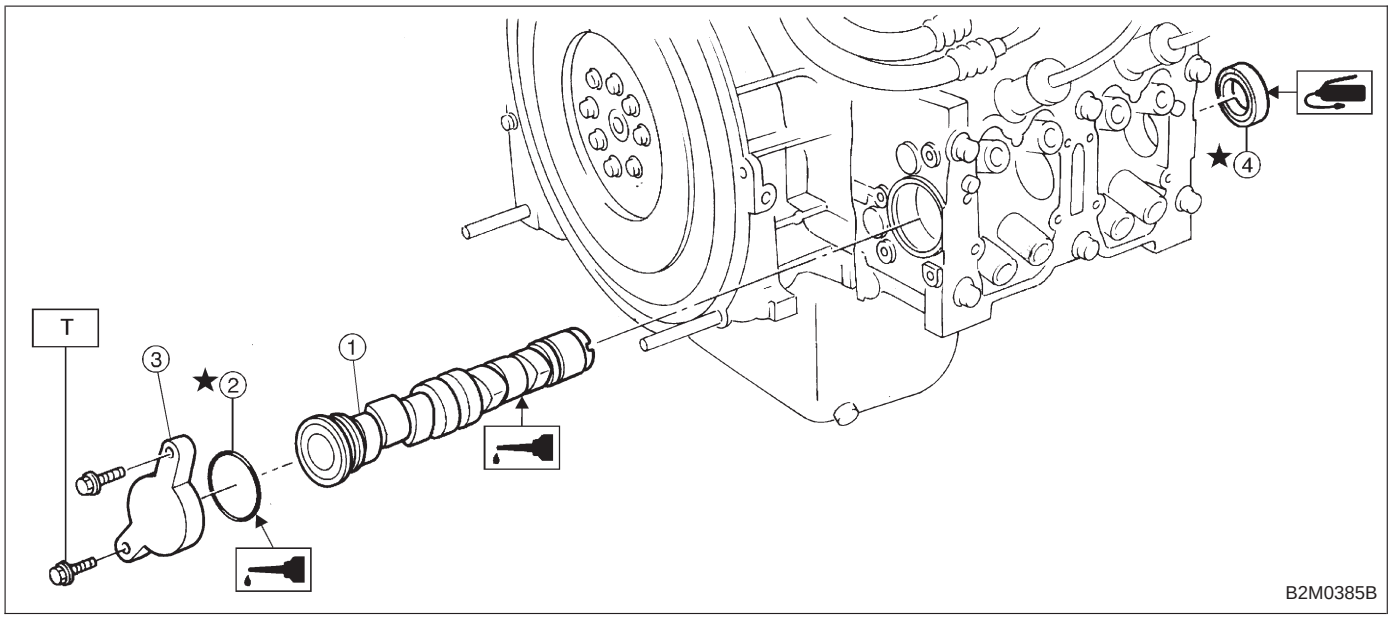
5) Apply a coat of grease to oil seal lips and install oil seal on camshaft support (LH) by using ST1 and ST2.

CAUTION:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587100 OIL SEAL INSTALLER

6) Install oil level gauge guide bolt.
7) Install camshaft position sensor.

2. CAMSHAFT (RH)



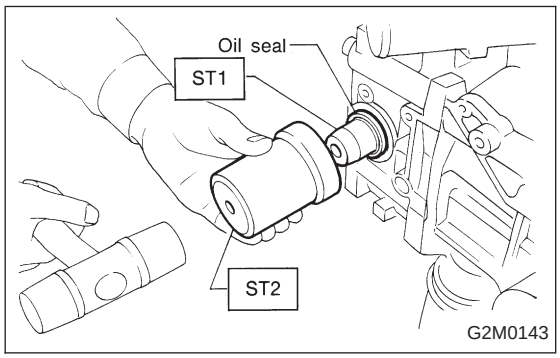
① Camshaft (RH)
② O-ring
③ Camshaft support (RH)
④ Oil seal
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T: 16 (1.6, 1.2)

1) Apply a coat of engine oil to camshaft journals and install camshaft (RH).
2) Apply a coat of engine oil or grease to O-ring.
3) Install O-ring to camshaft support (RH).

CAUTION:
Use a new O-ring.

4) Install camshaft support (RH).



5) Install oil seal by using ST1 and ST2.

CAUTION:

Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587100 OIL SEAL INSTALLER

3. RELATED PARTS

1) Install valve rocker assembly.
<Ref. to 2-3 [W3E0].>

2) Install timing belt, camshaft sprockets and related parts.
<Ref. to 2-3 [W2C0].>

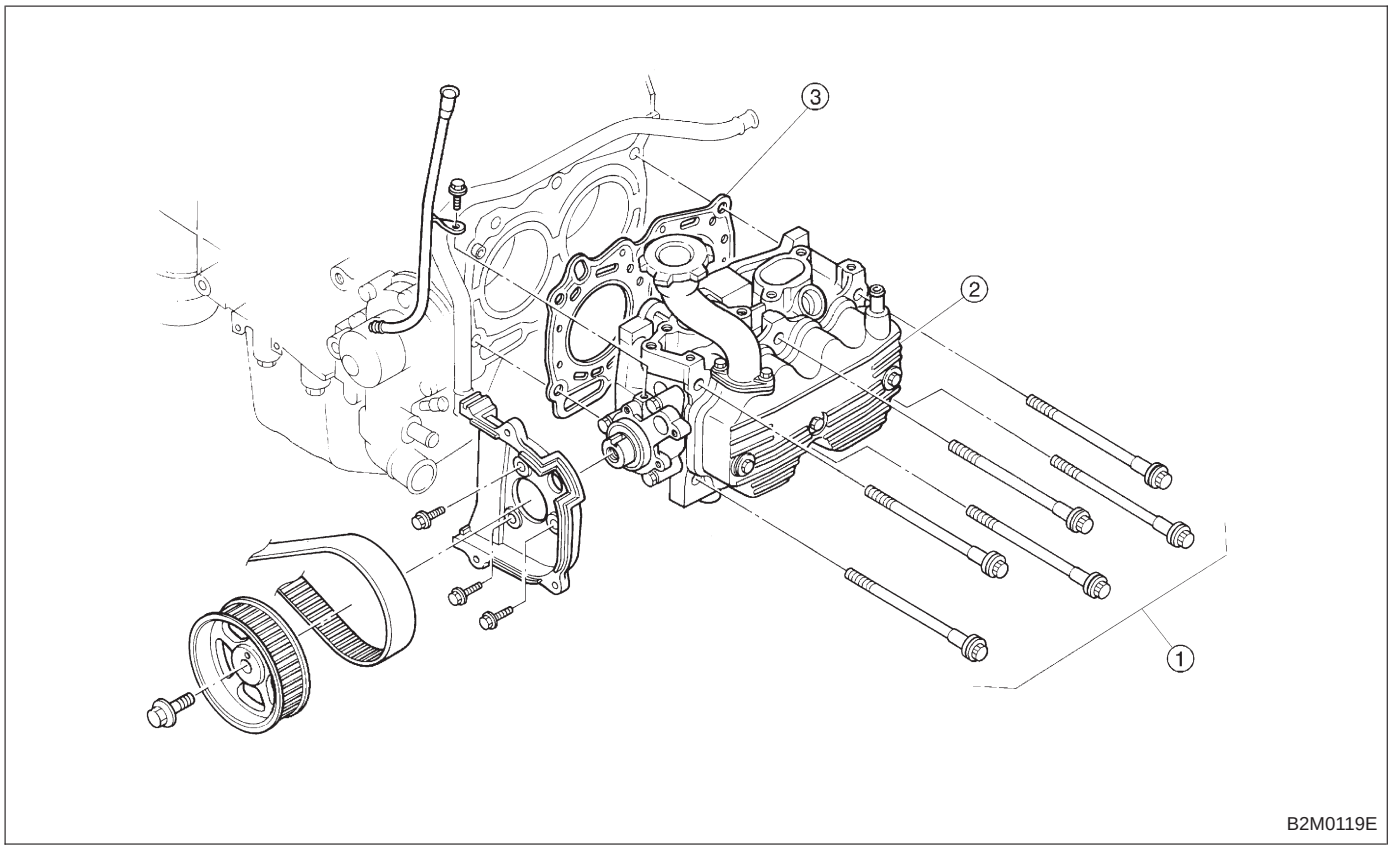
5. Cylinder Head

A: REMOVAL

1. RELATED PARTS

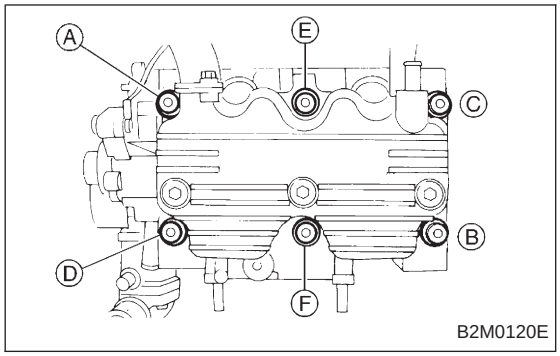
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Drain engine coolant. <Ref. to 2-5 [W1A0].>
3) Remove V-belt.
4) Remove alternator and bracket.
5) Disconnect spark plug cords.
6) Remove connector bracket attaching bolt.
7) Remove crankshaft position sensor and camshaft position sensor.
8) Disconnect oil pressure switch connector.
9) Disconnect blow-by hose.
10) Remove EGR pipe. (AT vehicles only)
11) Remove intake manifold and gasket. <Ref. to 2-7 [W4A0].>
12) Remove water pipe.

2. CYLINDER HEAD



① Cylinder head bolt
② Cylinder head
③ Cylinder head gasket

1) Remove timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W2A0].>
2) Remove oil level gauge guide attaching bolt (left hand only) and oil level gauge guide.



3) Remove cylinder head bolts in alphabetical sequence shown in Figure.

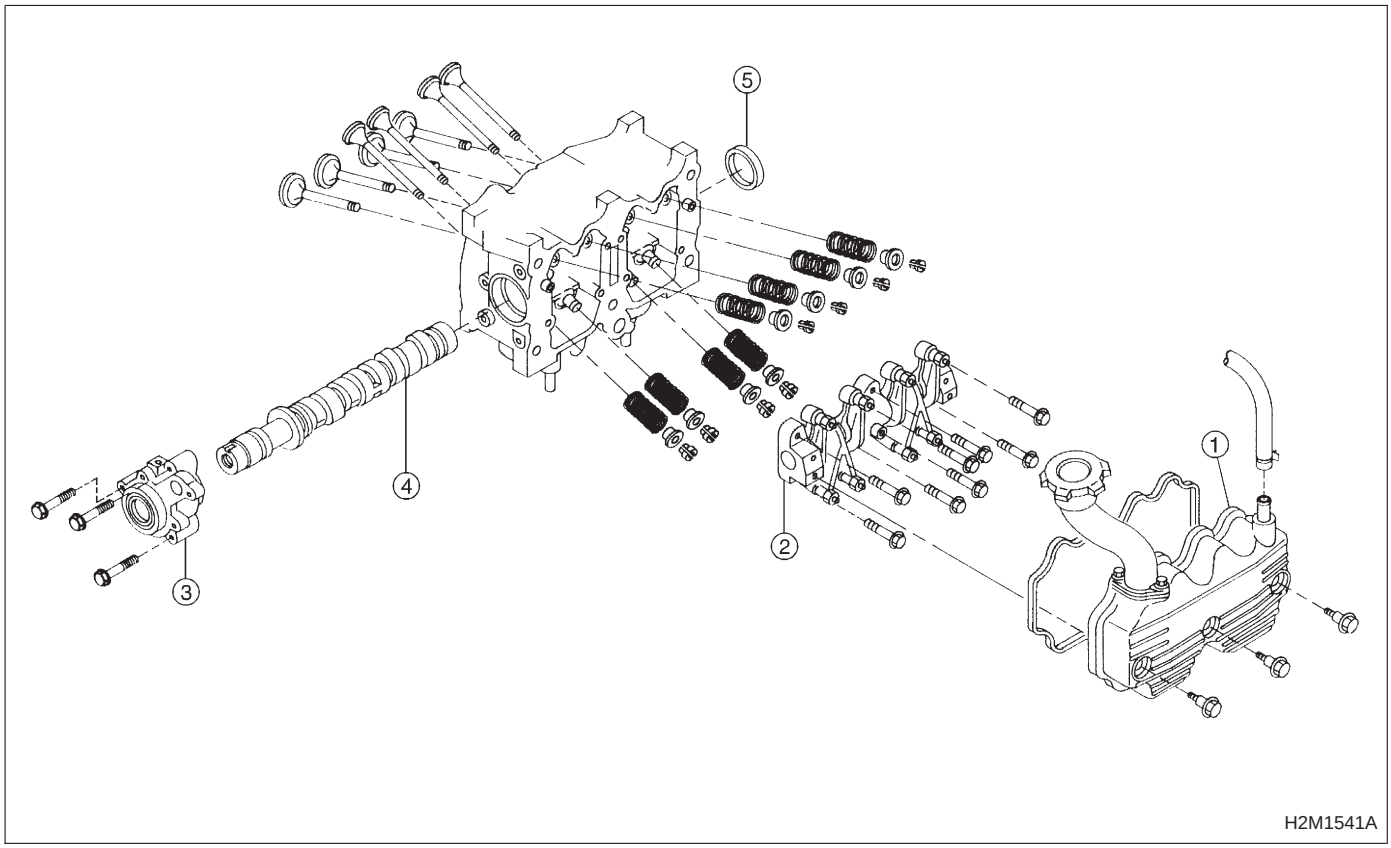
CAUTION:
Leave bolts Ⓐ and Ⓒ engaged by three or four threads to prevent cylinder head from falling.

4) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
5) Remove bolts Ⓐ and Ⓒ to remove cylinder head.
6) Remove cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

7) Similarly, remove right side cylinder head.

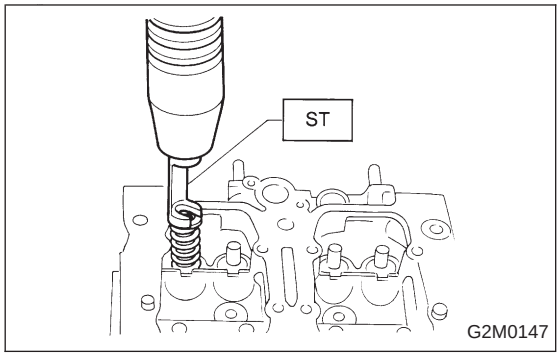
B: DISASSEMBLY



① Rocker cover
② Valve rocker ASSY
③ Camshaft support
④ Camshaft
⑤ Oil seal

1) Remove rocker cover.
2) Remove valve rocker assembly.
<Ref. to 2-3 [W3A0].>
3) Remove camshaft and support.
<Ref. to 2-3 [W4A0].>
4) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE



5) Set ST on valve spring. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST 499718000 VALVE SPRING REMOVER

CAUTION:
- **Mark each valve to prevent confusion.**
- **Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.**

6) Removal of plug (cylinder head LH).

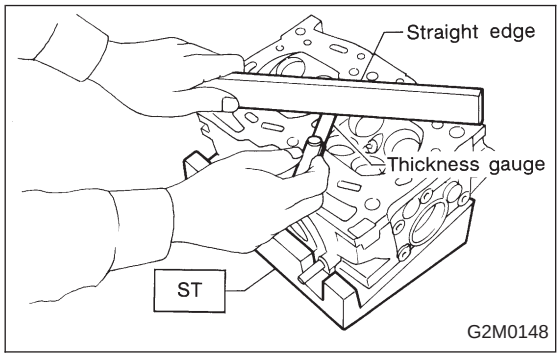
CAUTION:
Do not remove plug unless necessary.

C: INSPECTION

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE



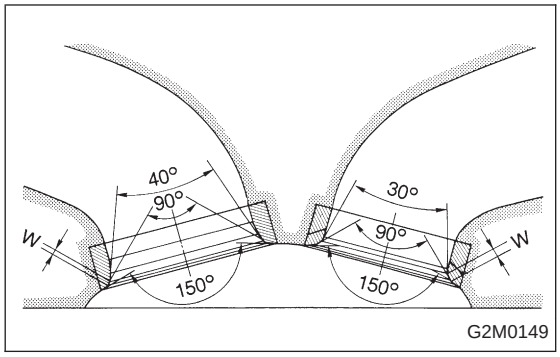
3) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

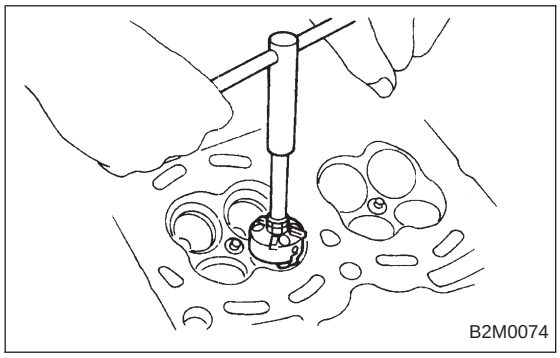
Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
98.3 mm (3.870 in)

CAUTION:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

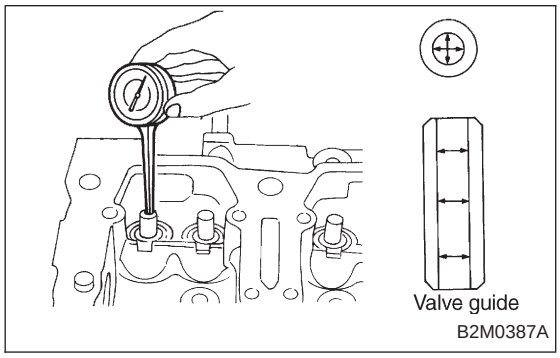




2. VALVE SEAT

Inspect intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard
0.7 mm (0.028 in)
Limit
1.4 mm (0.055 in)
Exhaust
Standard
1.4 mm (0.055 in)
Limit
1.8 mm (0.071 in)



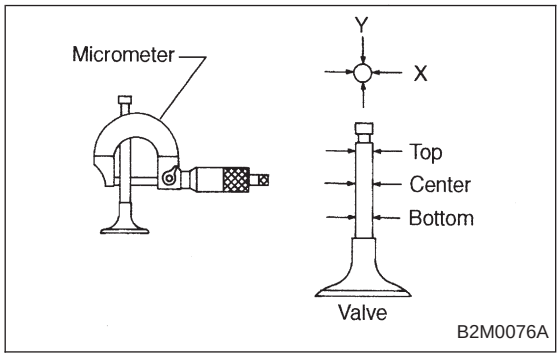
3. VALVE GUIDE

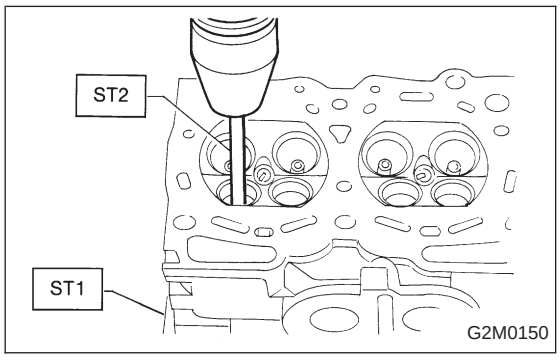
1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:
Standard
Intake
0.035 — 0.062 mm (0.0014 — 0.0024 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)
Limit
0.15 mm (0.0059 in)

Valve guide inner diameters:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameter:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

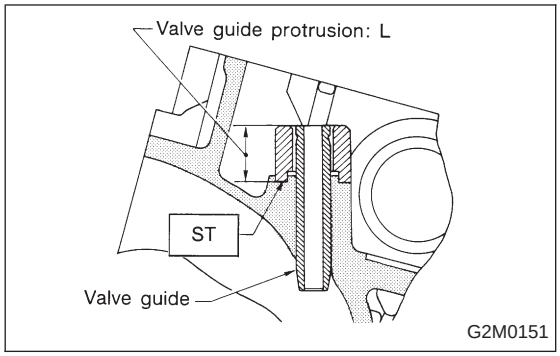




2) If the clearance between valve guide and stem exceeds the specification, replace guide as follows:

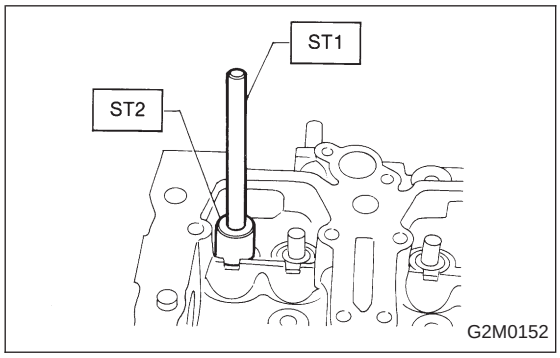
(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1	498267200	CYLINDER HEAD TABLE
ST2	499767200	VALVE GUIDE REMOVER



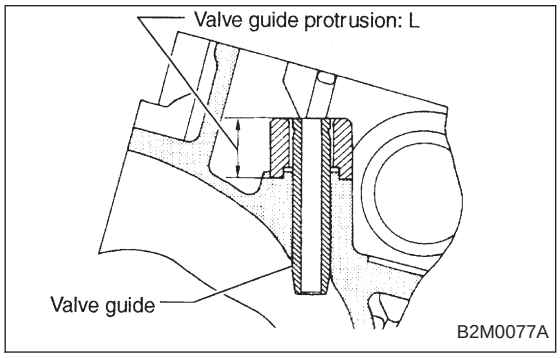
(3) Turn cylinder head upside down and place ST as shown in the Figure.

ST 499767000 VALVE GUIDE ADJUSTER



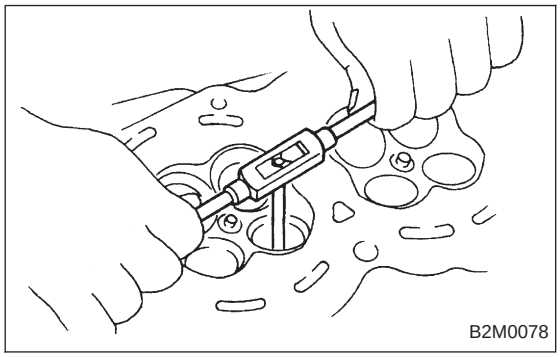
(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 499767000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
17.5 — 18.0 mm (0.689 — 0.709 in)

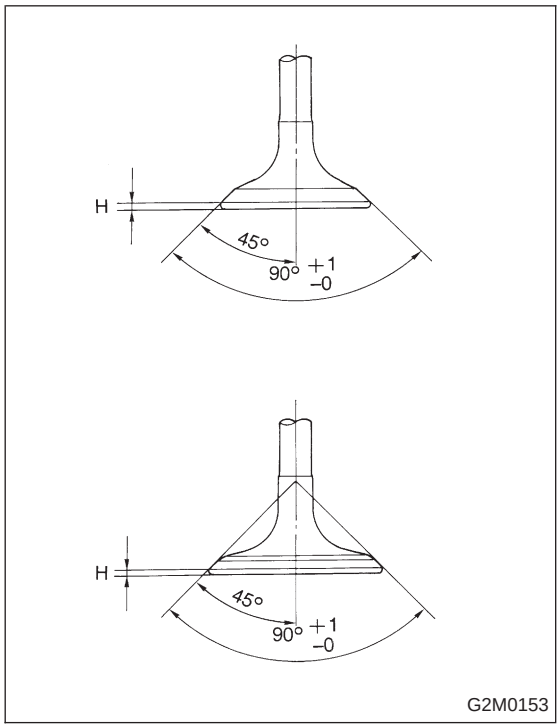


(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

CAUTION:
- **Apply engine oil to the reamer when reaming.**
- **If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.**
- **If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.**

(8) Recheck the contact condition between valve and valve seat after replacing valve guide.



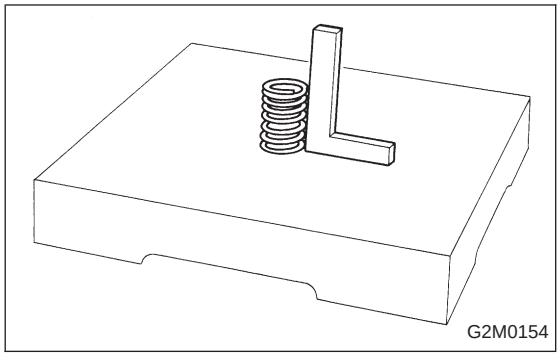
4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake
Standard
1.0 mm (0.039 in)
Limit
0.8 mm (0.031 in)
Exhaust
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)

Valve overall length:
Intake
101.0 mm (3.976 in)
Exhaust
101.2 mm (3.984 in)

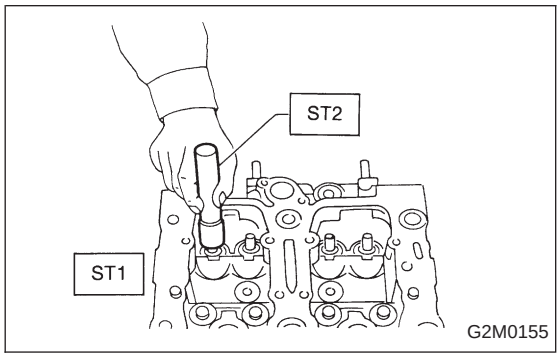
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Also refer to “2. VALVE SEAT” at this time <Ref. to 2-3 [W5C2].>. Install a new intake valve oil seal after lapping.



5. VALVE SPRINGS

1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	44.05 mm (1.7342 in)
Squareness	2.5°, 1.9 mm (0.075 in)
Tension/spring height	174.6 — 200.1 N (17.8 — 20.4 kg, 39.2 — 45.0 lb)/ 36.0 mm (1.417 in)
	405.0 — 458.0 N (41.3 — 46.7 kg, 91.1 — 103.0 lb)/ 28.2 mm (1.110 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

1) Place cylinder head on ST1.
2) Press in oil seal to the specified dimension indicated in the Figure by using ST2.

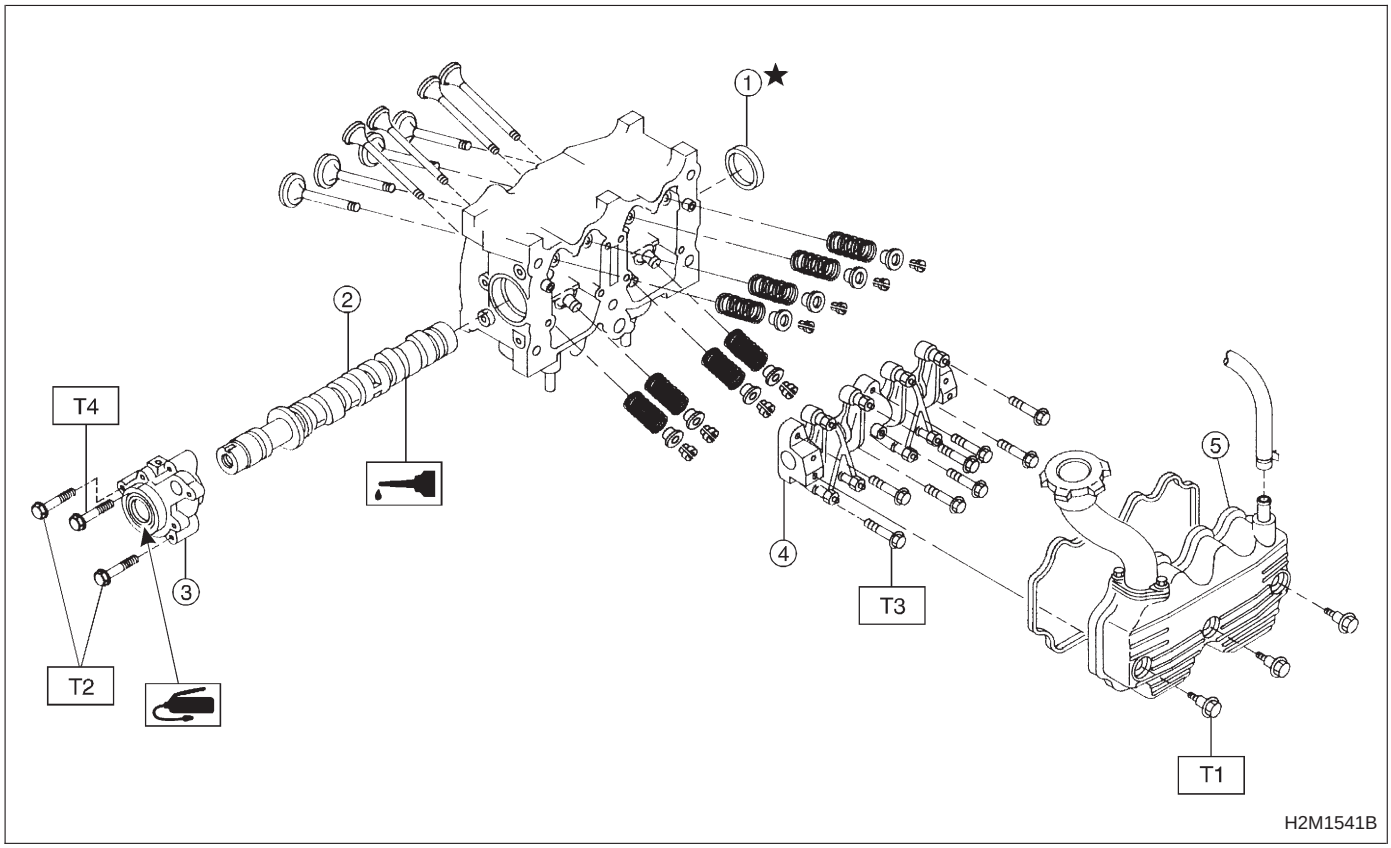
ST1 498267200 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

CAUTION:
- **Apply engine oil to oil seal before force-fitting.**
- **When press-fitting oil seal, do not use a hammer or strike into position.**
- **Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.**

Color of rubber part:
Intake [Black]
Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]

D: ASSEMBLY



① Oil seal
② Camshaft
③ Camshaft support
④ Valve rocker ASSY
⑤ Rocker cover
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 10 (1.0, 7)
T3: 12±1 (1.2±0.1, 8.7±0.7)
T4: 16 (1.6, 12)

1) Install plug (cylinder head LH) by using ST.

ST 499587100 OIL SEAL INSTALLER

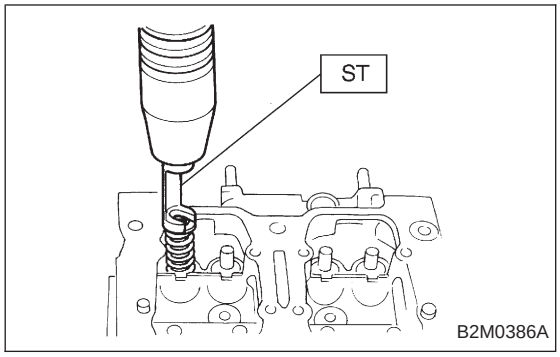
2) Installation of valve spring and valve

(1) Place cylinder head on ST.

ST 498267200 CYLINDER HEAD TABLE

(2) Coat stem of each valve with engine oil and insert valve into valve guide.

CAUTION:
When inserting valve into valve guide, use special care not to damage the oil seal lip.



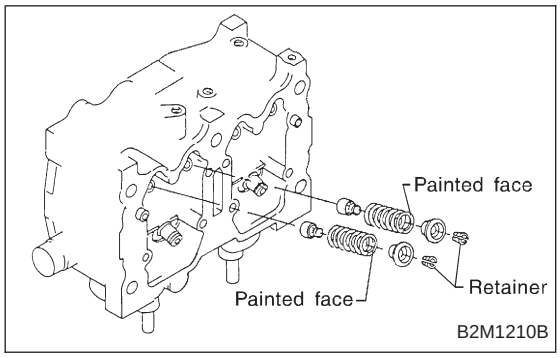
(3) Install valve spring and retainer.

CAUTION:
Be sure to install the valve springs with their painted facing towards the valve spring retainer.

(4) Set ST on valve spring.

ST 499718000 VALVE SPRING REMOVER

(5) Compress valve spring and fit valve spring retainer key.

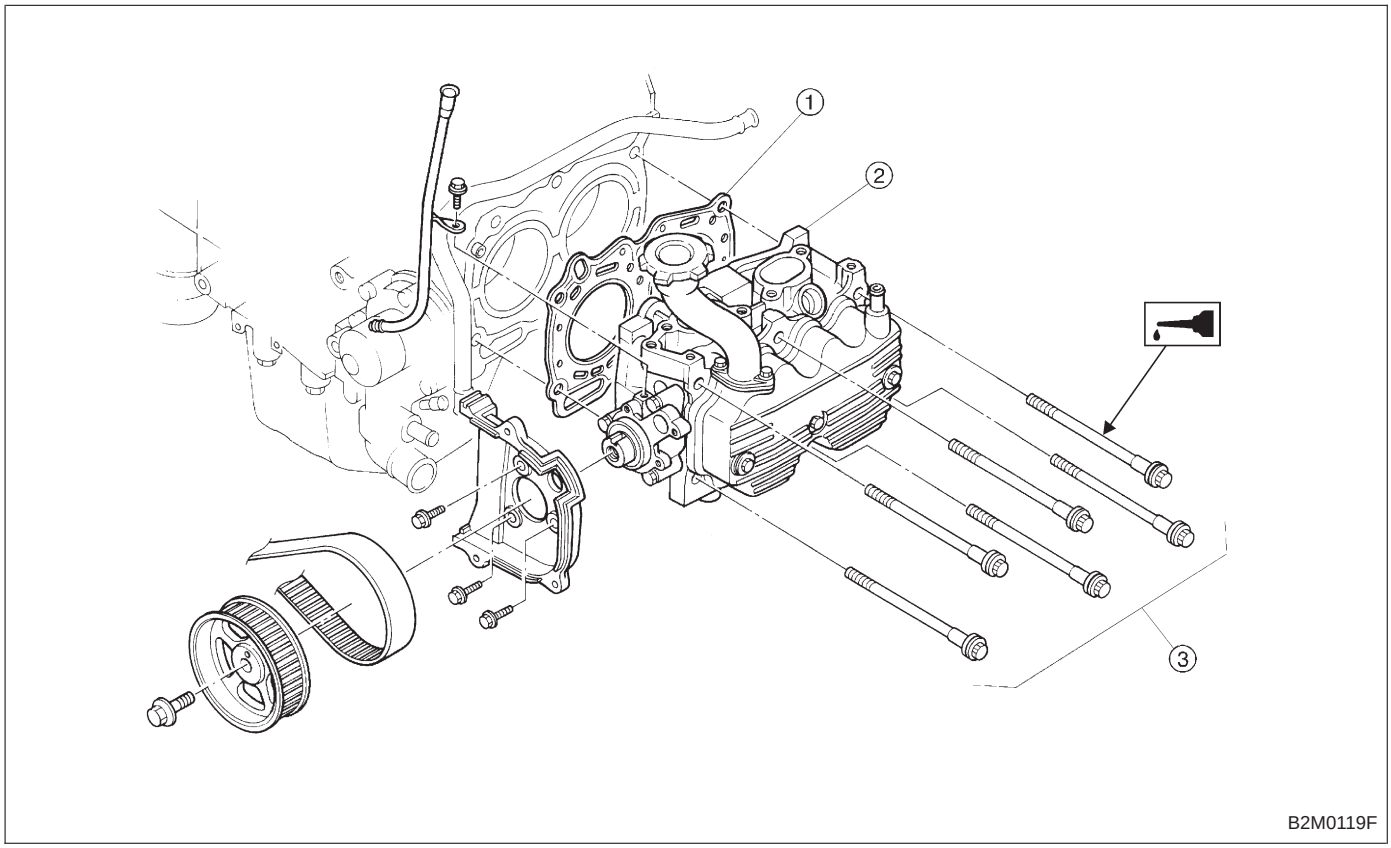


(6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.

3) Install camshaft and support.
<Ref. to 2-3 [W4C0].>
4) Install valve rocker assembly.
<Ref. to 2-3 [W3E0].>
5) Install rocker cover.

E: INSTALLATION

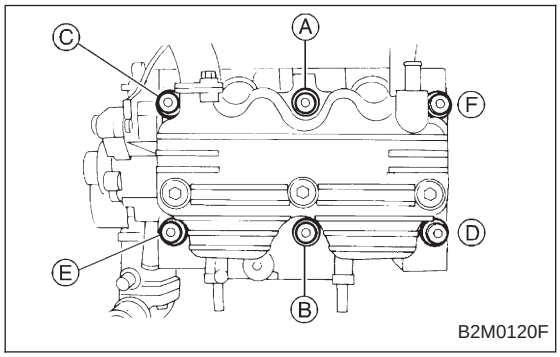
1. CYLINDER HEAD



① Cylinder head gasket
② Cylinder head
③ Cylinder head bolt

1) Install cylinder head and gaskets on cylinder block.

CAUTION:
Use new cylinder head gaskets.



2) Tighten cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kg-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten bolts Ⓐ and Ⓑ to 34 N·m (3.5 kg-m, 25 ft-lb).
(5) Tighten bolts Ⓒ, Ⓓ, Ⓔ and Ⓕ to 15 N·m (1.5 kg-m, 11 ft-lb).

(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps] does not exceed 180°.

3) Install oil level gauge guide attaching bolt (left hand only).
4) Install timing belt, camshaft sprocket and related parts. <Ref. to 2-3 [W2C0].>

2. RELATED PARTS

CAUTION:
Use dry compressed air to remove foreign particles before installing each solenoid valve and sensor.

1) Install water pipe.
2) Install intake manifold. <Ref. to 2-7 [W4D0].>
3) Connect blow-by hose.
4) Install EGR pipe. (AT vehicles only)
5) Connect oil pressure switch connector.
6) Install crankshaft position sensor and camshaft position sensor.
7) Install connector bracket attaching bolt.
8) Connect spark plug cords.
9) Install alternator and bracket.
10) Install V-belt.
11) Remove engine stand.

6. Cylinder Block

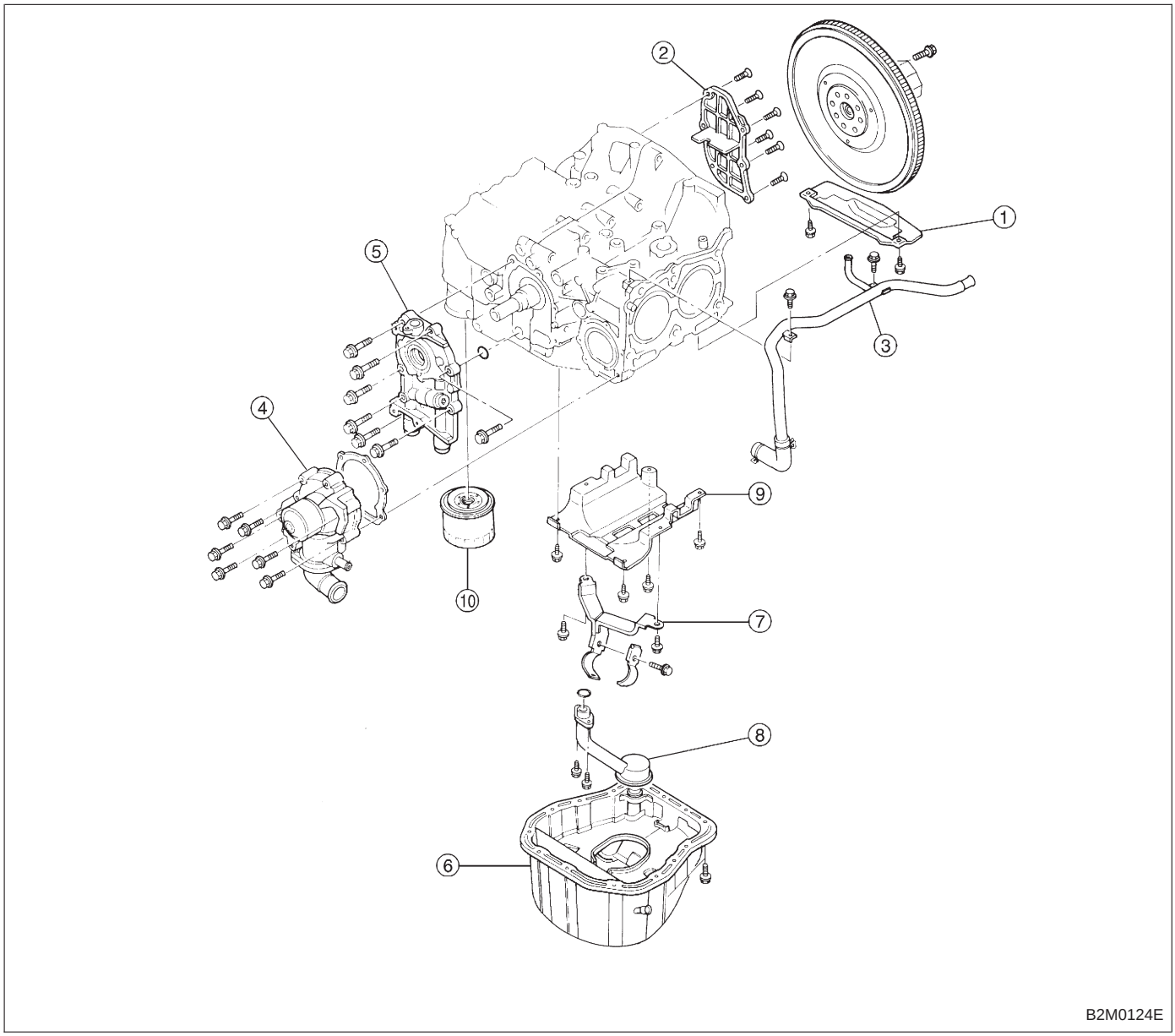
A: REMOVAL

1. RELATED PARTS

1) Remove timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W2A0].>

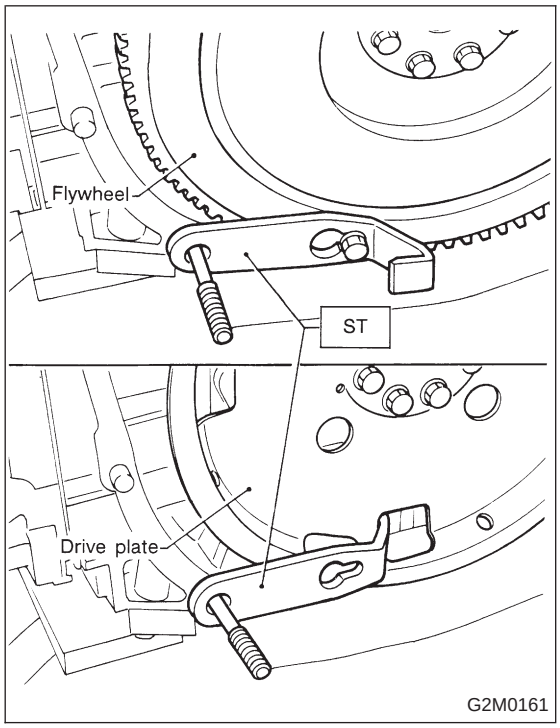
2) Remove intake manifold and cylinder head.
<Ref. to 2-3 [W5A0].>

2. OIL PUMP AND WATER PUMP



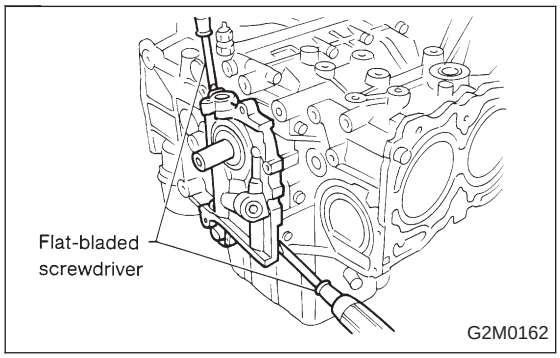
① Clutch housing cover (MT vehicles)
② Oil separator cover
③ Water by-pass pipe
④ Water pump
⑤ Oil pump
⑥ Oil pan
⑦ Oil strainer stay
⑧ Oil strainer
⑨ Baffle plate
⑩ Oil filter

1) Remove clutch housing cover. (MT vehicles only)



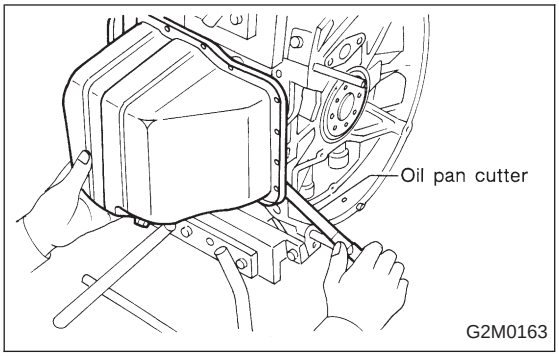
2) Remove flywheel or drive plate.
To lock crankshaft use ST.
ST 498497100 CRANKSHAFT STOPPER

3) Remove oil separator cover.
4) Remove water pipe and water by-pass pipe.
5) Remove water pump.



6) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in Figure when removing oil pump.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.



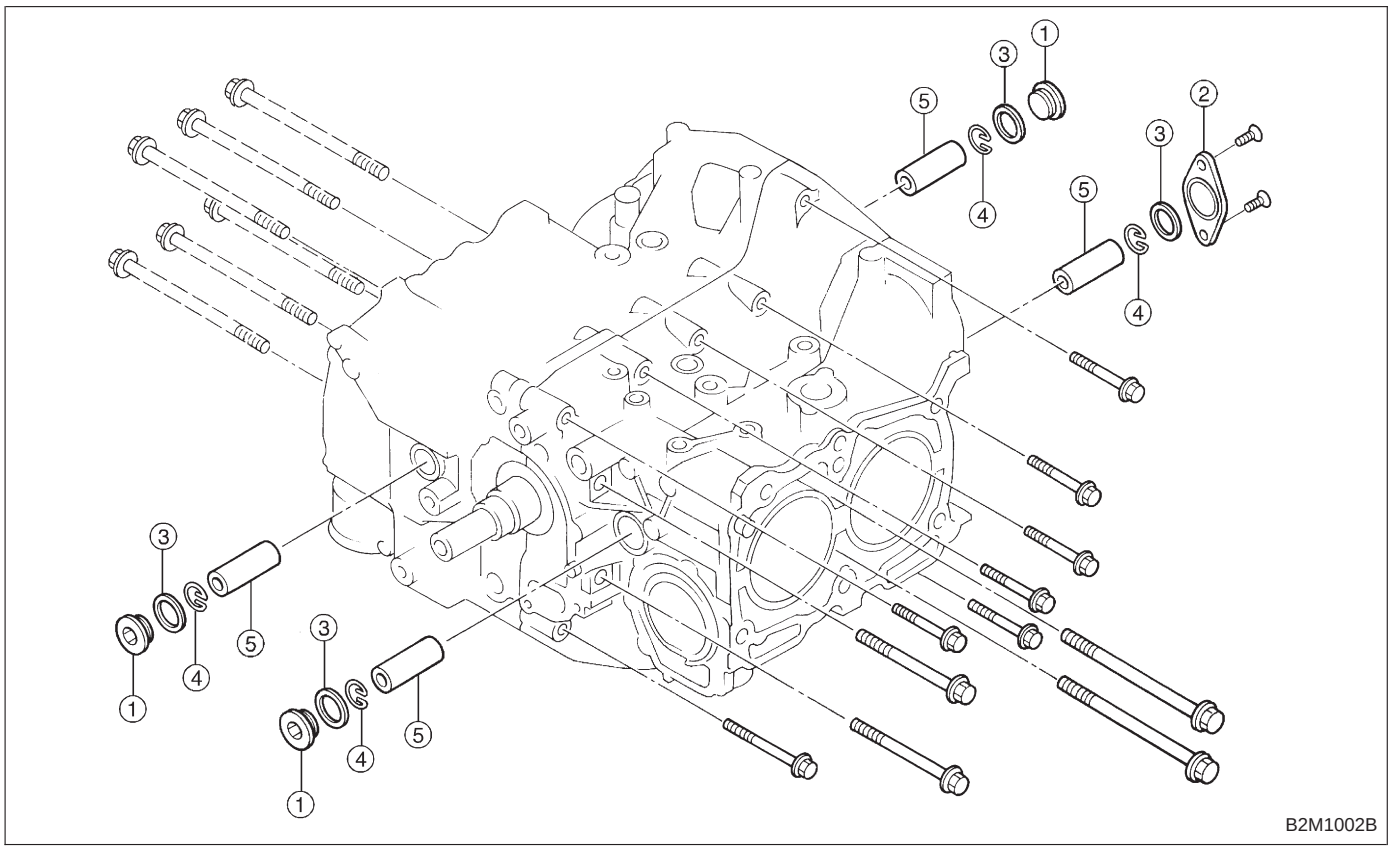
7) Removal of oil pan.
(1) Turn cylinder block with #2 and #4 piston sides facing upward.
(2) Remove bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil-pan cutter blade.

8) Remove oil strainer stay.
9) Remove oil strainer.
10) Remove baffle plate.
11) Remove oil filter.

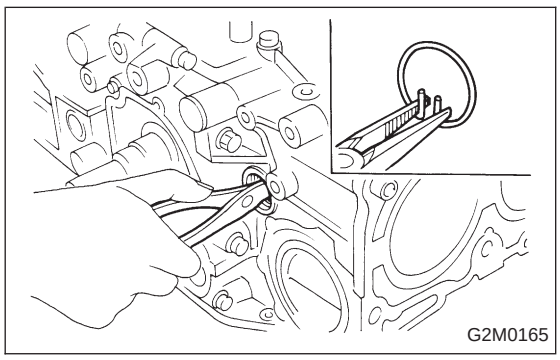
B: DISASSEMBLY

1. PISTON PIN AND CYLINDER BLOCK CONNECTING BOLT

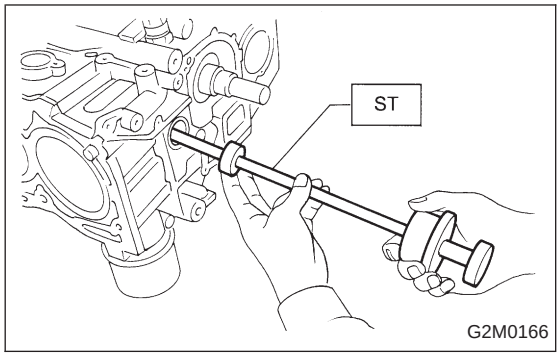


① Service hole plug
② Service hole cover
③ Gasket
④ Circlip
⑤ Piston pin

1) Remove service hole cover and service hole plugs using hexagon wrench (14 mm).



2) Rotate crankshaft to bring #1 and #2 pistons to BDC position, then remove piston circlip through service hole of #1 and #2 cylinders.



3) Draw out piston pin from #1 and #2 pistons by using ST.

ST 499097500 PISTON PIN REMOVER

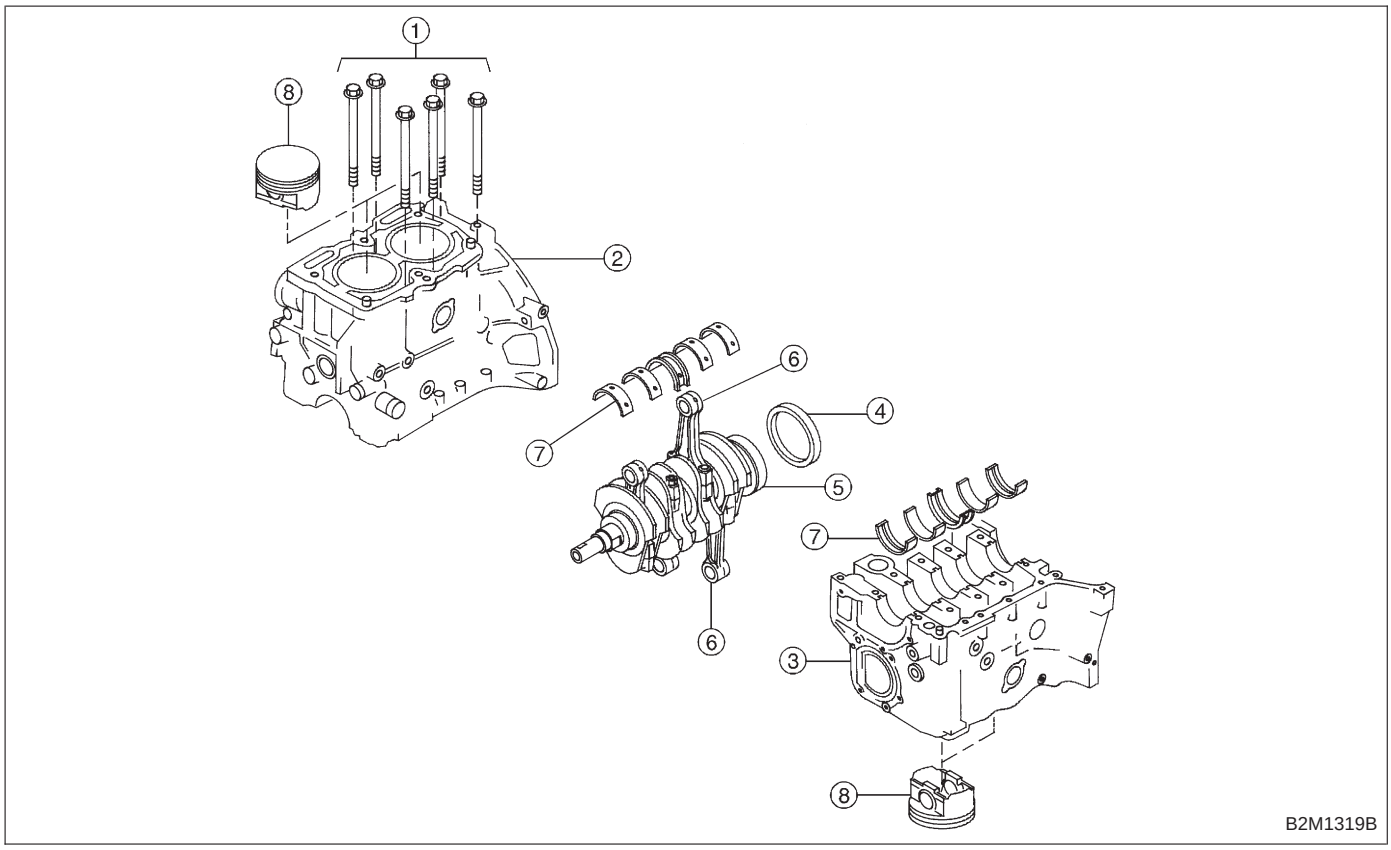
CAUTION:
Be careful not to confuse original combination of piston, piston pin and cylinder.

4) Similarly remove piston pins from #3 and #4 pistons by using ST.

ST 499097500 PISTON PIN REMOVER

5) Remove bolts which connect cylinder block on the side of #2 and #4 cylinders.
6) Back off bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

2. CYLINDER BLOCK



① Bolt
② Cylinder block (RH)
③ Cylinder block (LH)
④ Rear oil seal
⑤ Crankshaft
⑥ Connecting rod
⑦ Crankshaft bearing
⑧ Piston

1) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.
2) Separate left-hand and right-hand cylinder blocks.

CAUTION:
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

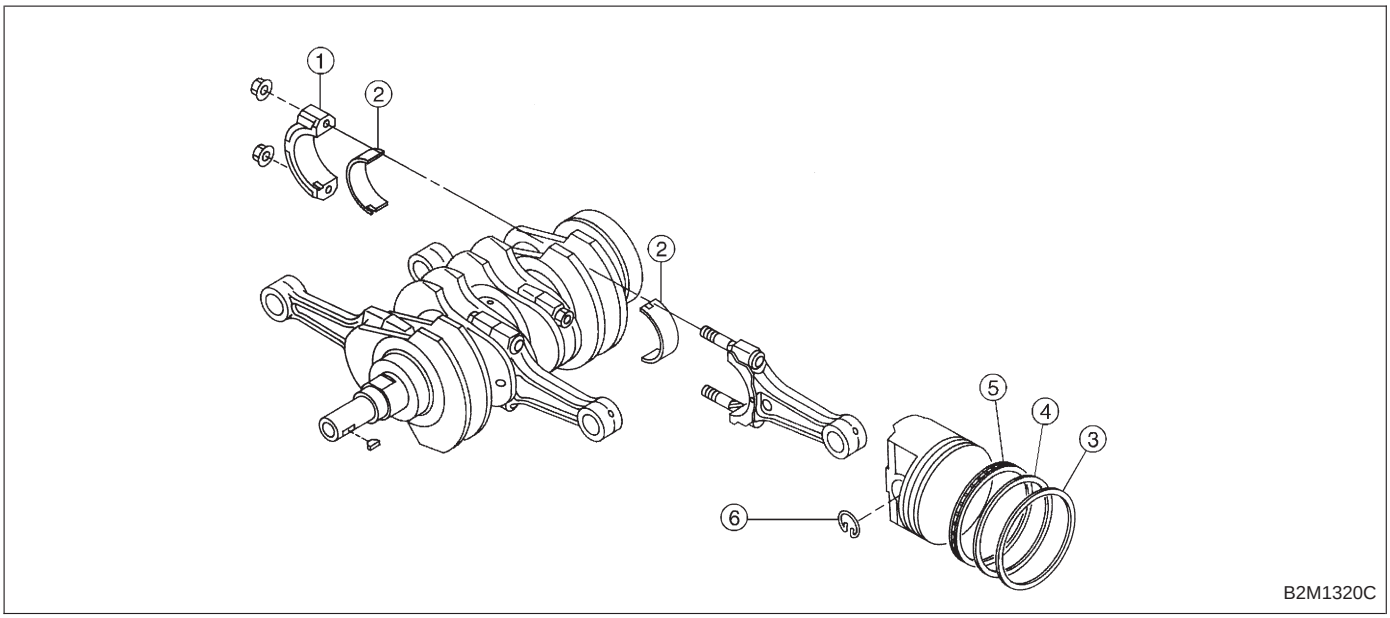
3) Remove rear oil seal.
4) Remove crankshaft together with connecting rod.
5) Remove crankshaft bearings from cylinder block using hammer handle.

CAUTION:
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

6) Draw out each piston from cylinder block using wooden bar or hammer handle.

CAUTION:
Do not confuse combination of piston and cylinder.

3. CRANKSHAFT AND PISTON



① Connecting rod cap
② Connecting rod bearing
③ Top ring
④ Second ring
⑤ Oil ring
⑥ Circlip

1) Remove connecting rod cap.
2) Remove connecting rod bearing.

CAUTION:
Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove piston top and second rings using the piston ring expander.
4) Remove the oil ring by hand.

CAUTION:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

C: INSPECTION

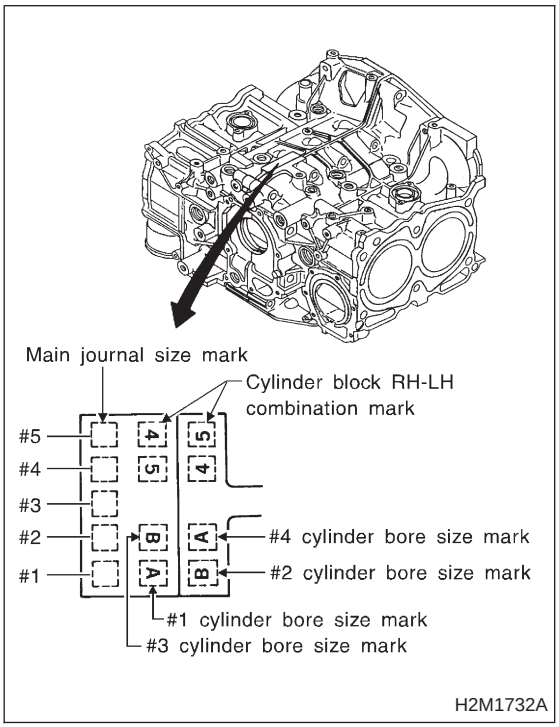
1. CYLINDER BLOCK

1) Check for cracks and damage visually. Especially, inspect important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

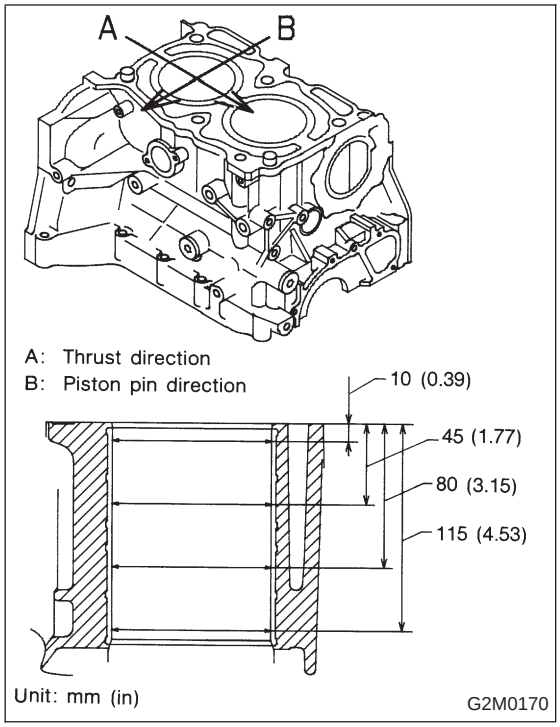


2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

NOTE:
Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guideline in selecting a standard piston.

Standard diameter:
1800 cc:
A: 87.905 — 87.915 mm (3.4608 — 3.4612 in)
B: 87.895 — 87.905 mm (3.4604 — 3.4608 in)
2200 cc:
A: 96.905 — 96.915 mm (3.8151 — 3.8155 in)
B: 96.895 — 96.905 mm (3.8148 — 3.8151 in)

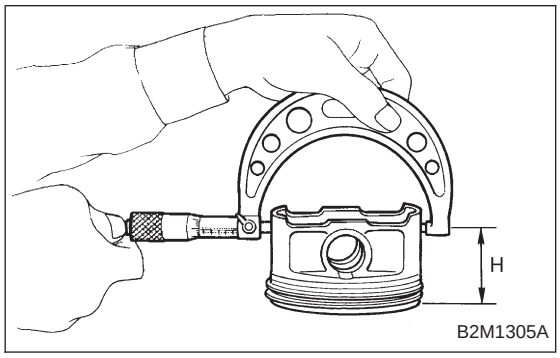


2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the Figure, using a cylinder bore gauge.

CAUTION:
Measurement should be performed at a temperature 20°C (68°F).

- ***Taper:***
  Standard
  0.015 mm (0.0006 in)
  Limit
  0.050 mm (0.0020 in)
- ***Out-of-roundness:***
  Standard
  0.010 mm (0.0004 in)
  Limit
  0.050 mm (0.0020 in)

3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.



4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the Figure. (Thrust direction)

CAUTION:
Measurement should be performed at a temperature of 20°C (68°F).

- ***Piston grade point H:***
  40.0 mm (1.575 in)
- ***Piston outer diameter:***
  - ***1800 cc:***
    Standard
    A: 87.885 — 87.895 mm (3.4600 — 3.4604 in)
    B: 87.875 — 87.885 mm (3.4596 — 3.4600 in)
    0.25 mm (0.0098 in) oversize
    88.125 — 88.135 mm (3.4695 — 3.4699 in)
    0.50 mm (0.0197 in) oversize
    88.375 — 88.385 mm (3.4793 — 3.4797 in)
  - ***2200 cc:***
    Standard
    A: 96.885 — 96.895 mm (3.8144 — 3.8148 in)
    B: 96.875 — 96.885 mm (3.8140 — 3.8144 in)
    0.25 mm (0.0098 in) oversize
    97.115 — 97.145 mm (3.8234 — 3.8246 in)
    0.50 mm (0.0197 in) oversize
    97.365 — 97.395 mm (3.8333 — 3.8344 in)

5) Calculate the clearance between cylinder and piston.

CAUTION:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

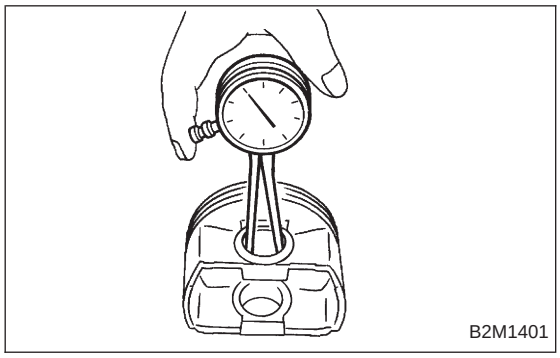
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder as instructed in “2. CYLINDER AND PISTON”. <Ref. to 2-3 [W6C2].> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.


B2M1401

3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

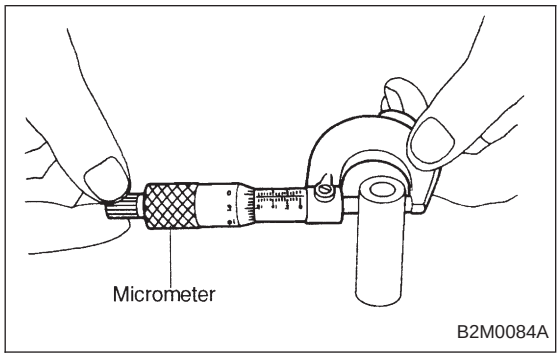
Standard clearance between piston pin and hole in piston:

Standard

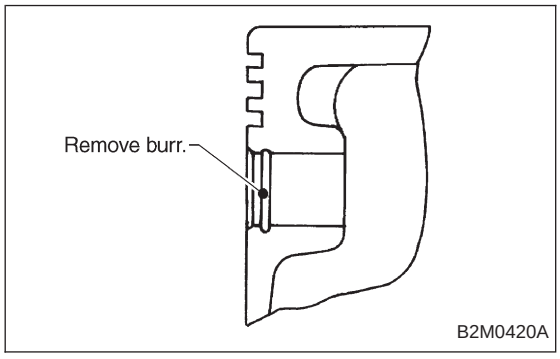
0.004 — 0.010 mm (0.0002 — 0.0004 in)

Limit

0.020 mm (0.0008 in)



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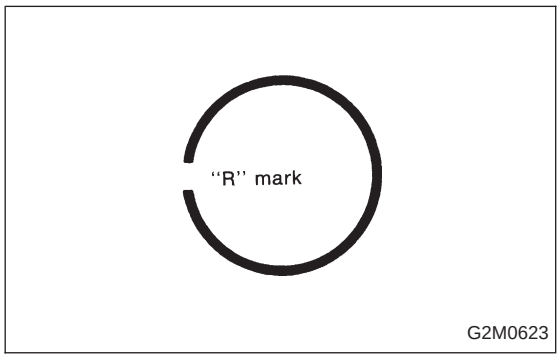


B2M0420A

4) Check circlip installation groove on the piston for burr. If necessary, remove burr from the groove so that piston pin can lightly move.

5) Check piston pin circlip for distortion, cracks and wear.

4. PISTON RING

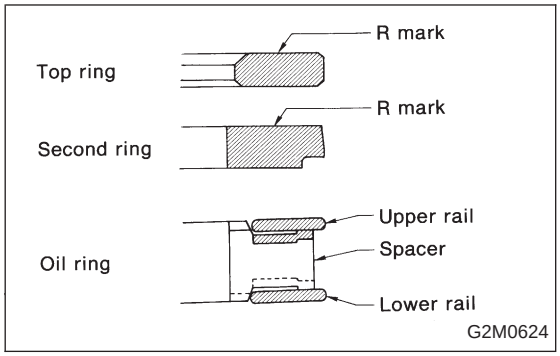


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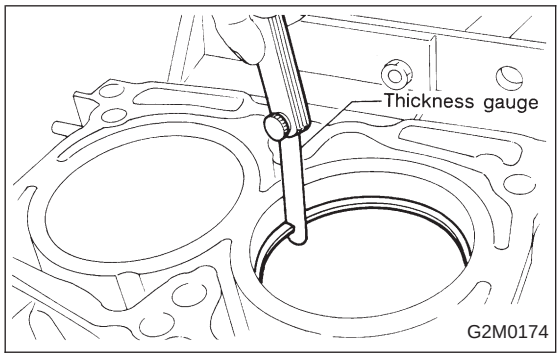
1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

CAUTION:

● “R” is marked on the end of the top and second rings. When installing the rings to the piston, face this mark upward.

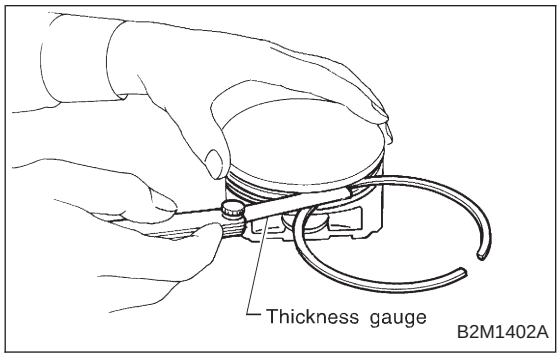


● **The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.**



2) Squarely place piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

Item		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.20 — 0.50 (0.0079 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.70 (0.0079 — 0.0276)	1.5 (0.059)



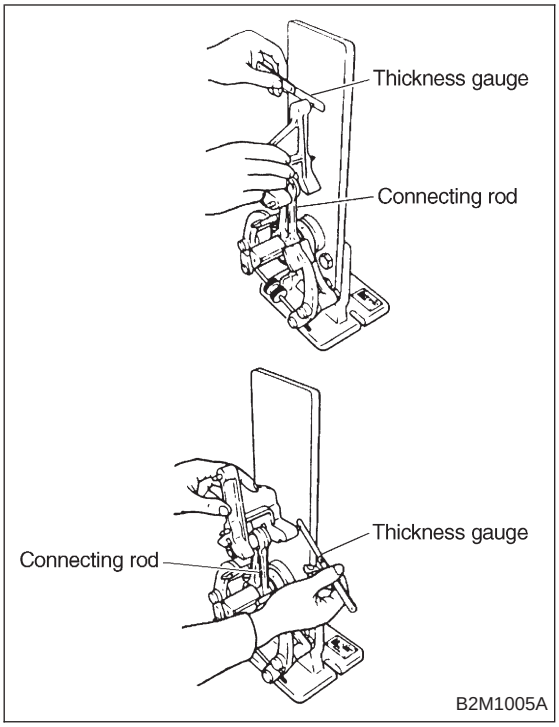
3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

CAUTION:
Before measuring the clearance, clean the piston ring groove and piston ring.

Item		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)

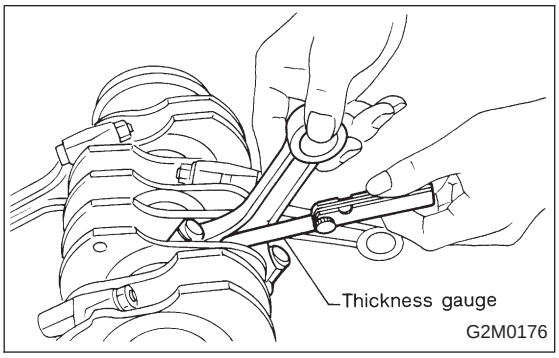
5. CONNECTING ROD

1) Replace connecting rod, if the large or small end thrust surface is damaged.



2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.4 mm (0.016 in)

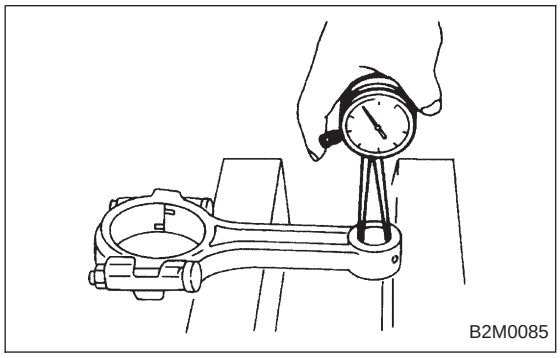
4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary.

Connecting rod oil clearance:
Standard
0.015 — 0.045 mm (0.0006 — 0.0018 in)
Limit
0.05 mm (0.0020 in)

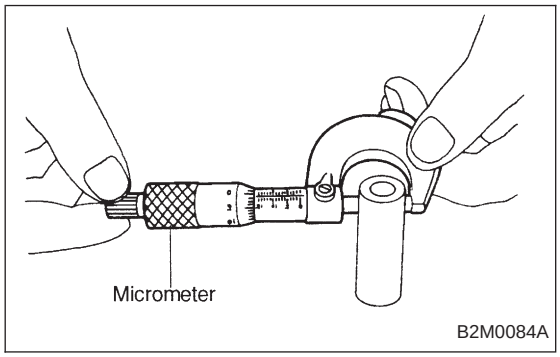
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

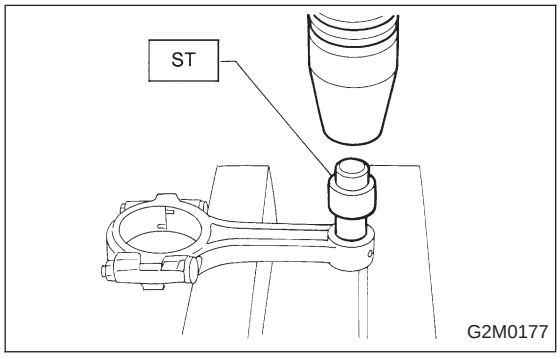

B2M0085

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)



B2M0084A



G2M0177

7) Replacement procedure is as follows.
(1) Remove bushing from connecting rod with ST and press.
(2) Press bushing with ST after applying oil on the periphery of bushing.

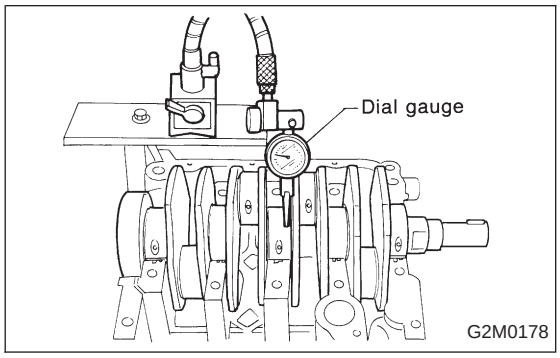
ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER

(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

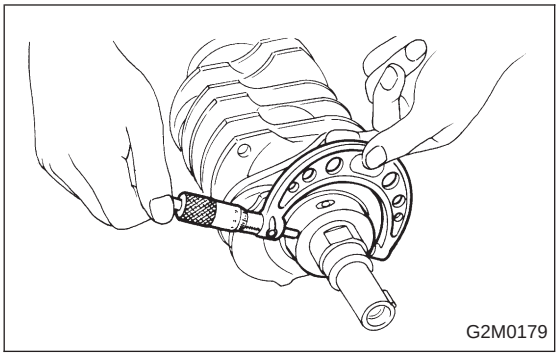
1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.



2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


G2M0179

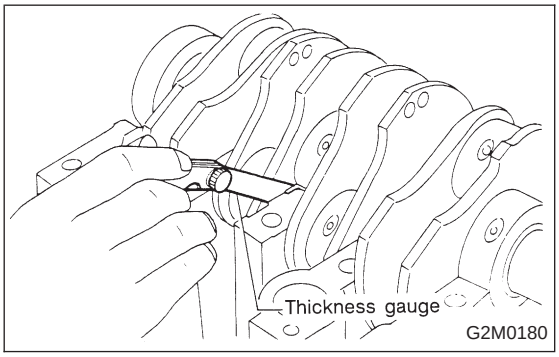
3) Inspect the crank journal and crank pin for wear. If not to specifications, replace bearing with an undersize one, and replace or recondition crankshaft as necessary. When grinding crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.030 mm (0.0012 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.25 mm (0.0098 in)

Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #5	#2, #3, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.954 — 59.970 (2.3604 — 2.3610)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	59.934 — 59.950 (2.3596 — 2.3602)	59.934 — 59.950 (2.3596 — 2.3602)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.734 — 59.750 (2.3517 — 2.3524)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D. ... Outer Diameter



G2M0180

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)

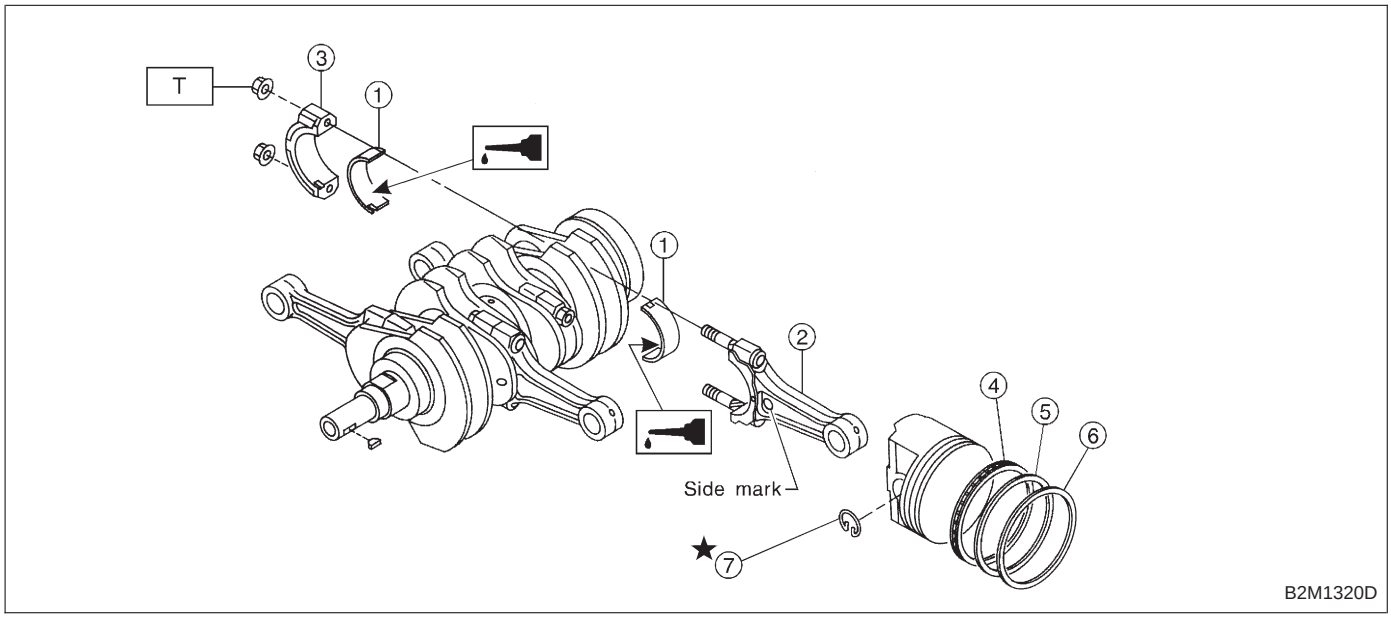
5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
Standard	#1, #5	0.003 — 0.030 (0.0001 — 0.0012)
	#2, #3, #4	0.010 — 0.033 (0.0004 — 0.0013)
Limit	#1, #3, #5	0.040 (0.0016)
	#2, #4	0.035 (0.0014)

D: ASSEMBLY

1. CRANKSHAFT AND PISTON



① Connecting rod bearing
② Connecting rod
③ Connecting rod cap
④ Oil ring
⑤ Second ring
⑥ Top ring
⑦ Circlip
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T: 44±2 (4.5±0.2, 32.5±1.4)

1) Install connecting rod bearings on connecting rods and connecting rod caps.

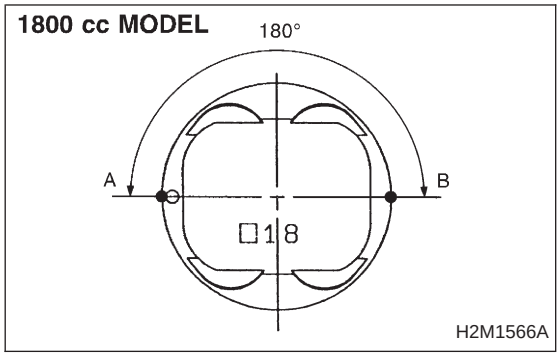
CAUTION:
Apply oil to the surfaces of the connecting rod bearings.

2) Install connecting rod on crankshaft.

CAUTION:
Position each connecting rod with the side marked facing forward.

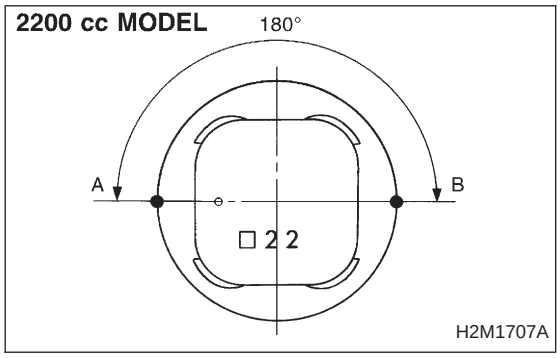
3) Install connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

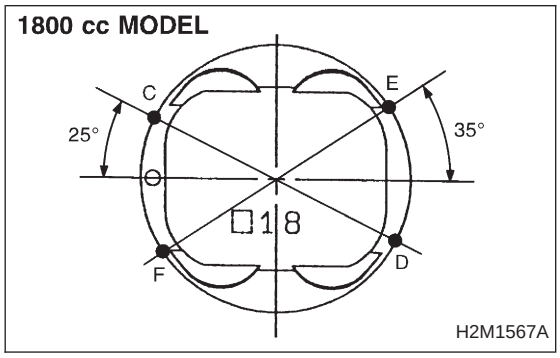
CAUTION:
- **Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.**
- **When tightening the connecting rod nuts, apply oil on the threads.**



4) Installation of piston rings and oil ring

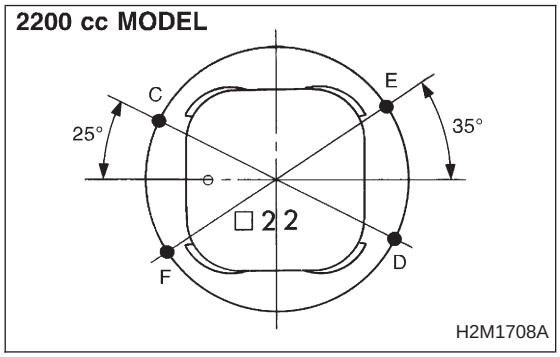
(1) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.
(2) Position the top ring gap at A or B in the Figure.
(3) Position the second ring gap at 180° on the reverse side for the top ring gap.

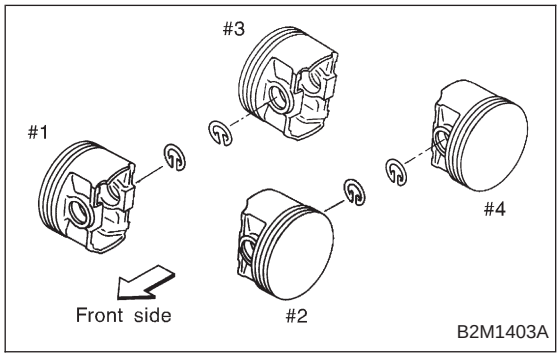




(4) Position the upper rail gap at C or D in the Figure.
(5) Position the expander gap at 180° of the reverse side for the upper rail gap.
(6) Position the lower rail gap at E or F in the Figure.

CAUTION:
- **Ensure ring gaps do not face the same direction.**
- **Ensure ring gaps are not within the piston skirt area.**





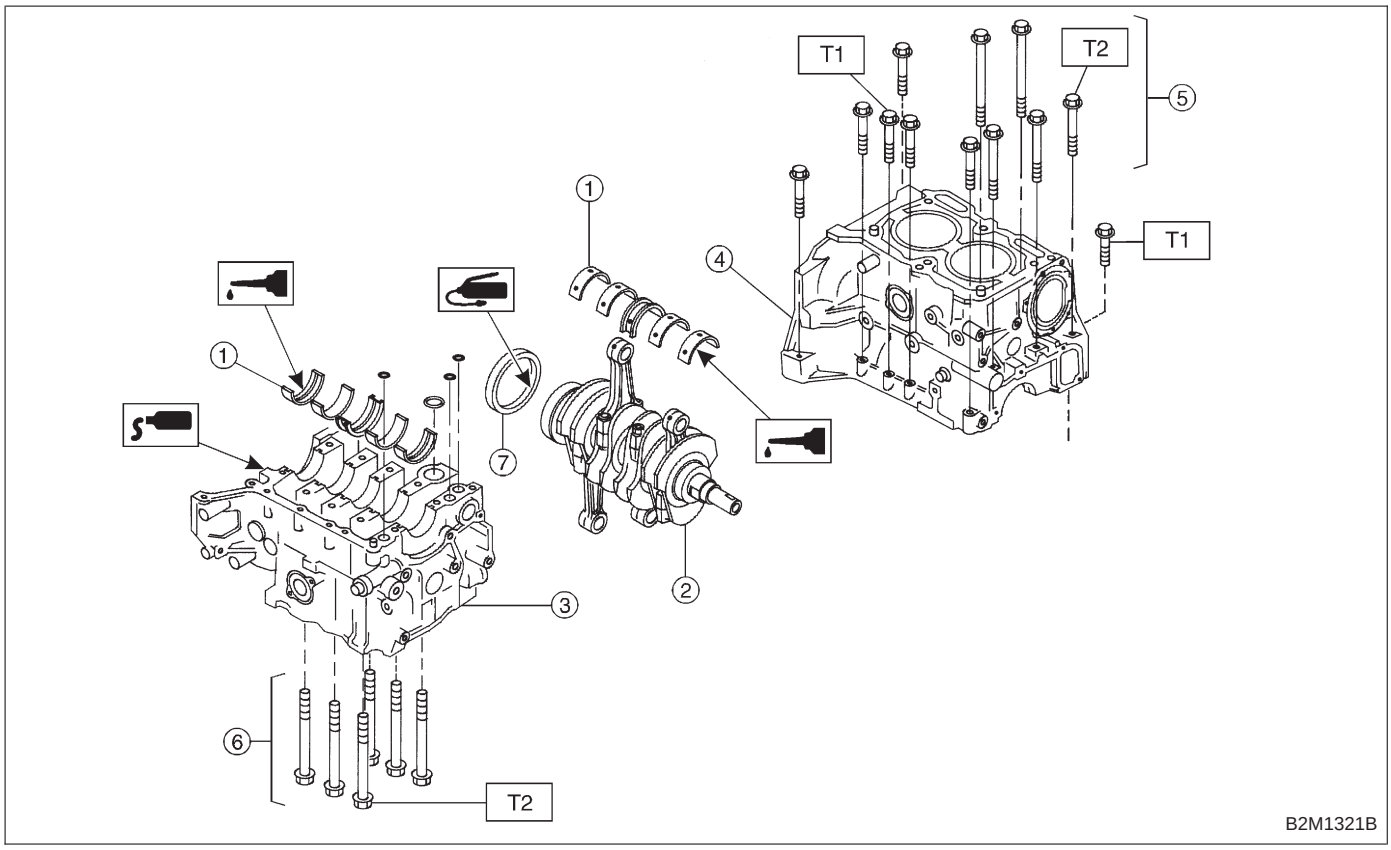
5) Install circlip.

Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

CAUTION:
Use new circlips.

NOTE:
Piston front mark "◯" facer toward front of engine.

2. CYLINDER BLOCK



① Crankshaft bearing
② Crankshaft ASSY
③ Cylinder block (LH)
④ Cylinder block (RH)
⑤ Bolt
⑥ Bolt
⑦ Rear oil seal

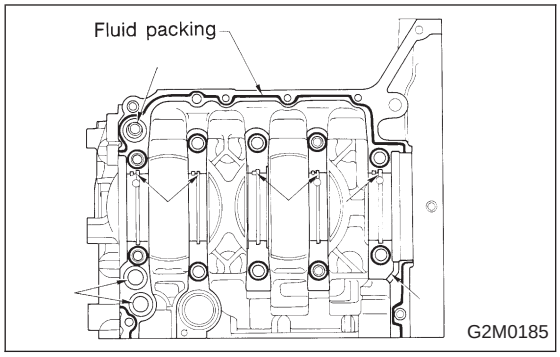
Tightening torque: N·m (kg-m, ft-lb)
T1: 25±2 (2.5±0.2, 18.1±1.4)
T2: 47±3 (4.8±0.3, 34.7±2.2)

1) Install ST to cylinder block, then install crankshaft bearings.

ST 499817000 ENGINE STAND

CAUTION:
Remove oil the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

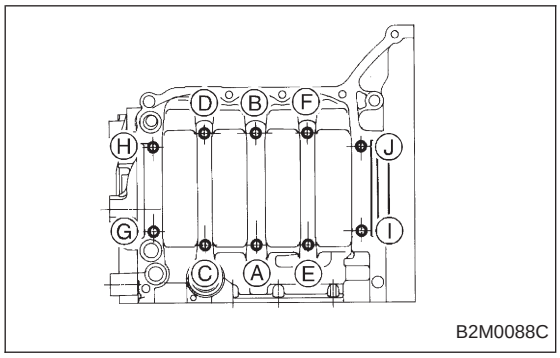
2) Position crankshaft on the cylinder block (LH).



3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

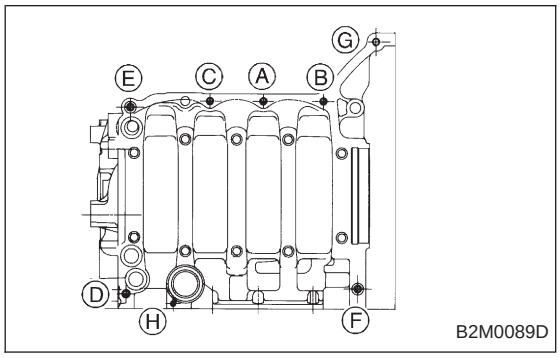
Fluid packing:
THREE BOND 1215 or equivalent

CAUTION:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



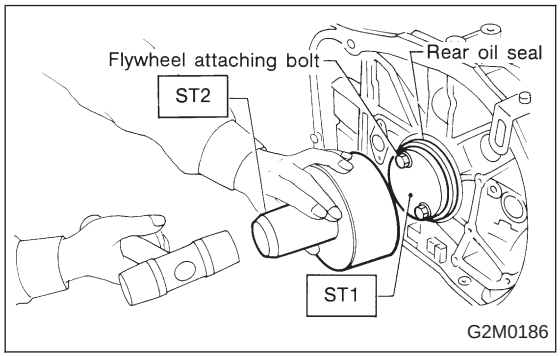
4) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical order shown in Figure.
5) Tighten 10 mm cylinder block connecting bolts in alphabetical order.

Tightening torque:
47±3 N·m (4.8±0.3 kg-m, 34.7±2.2 ft-lb)



6) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical order shown in Figure.

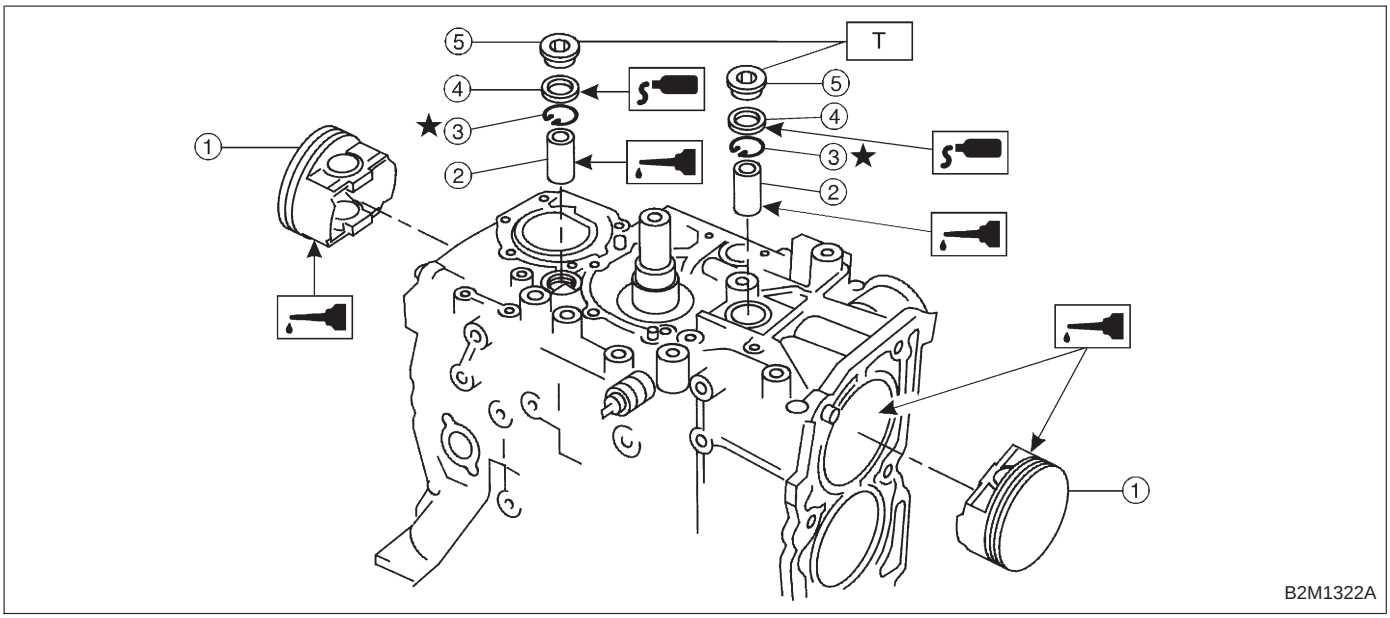
Tightening torque:
Ⓐ — Ⓖ: 25±2 N·m
(2.5±0.2 kg-m, 18.1±1.4 ft-lb)
Ⓗ: 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



7) Install rear oil seal by using ST1 and ST2.

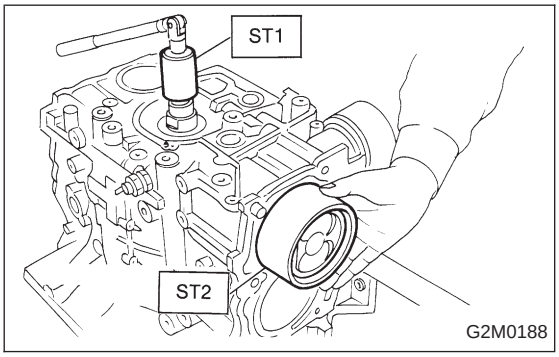
ST1	499597100	OIL SEAL GUIDE
ST2	499587200	OIL SEAL INSTALLER

3. PISTON AND PISTON PIN (#1 AND #2)



① Piston
② Piston pin
③ Circlip
④ Gasket
⑤ Service hole plug
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T: 69±7 (7.0±0.7, 50.6±5.1)

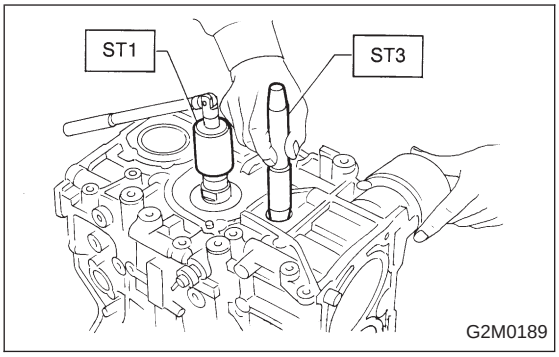


1) Installing piston
(1) Turn cylinder block so that #1 and #2 cylinders face upward.
(2) Using ST1, turn crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to pistons and cylinders and insert pistons in their cylinders by using ST2.

ST2 498747000 PISTON GUIDE (1800 cc)
498747100 PISTON GUIDE (2200 cc)

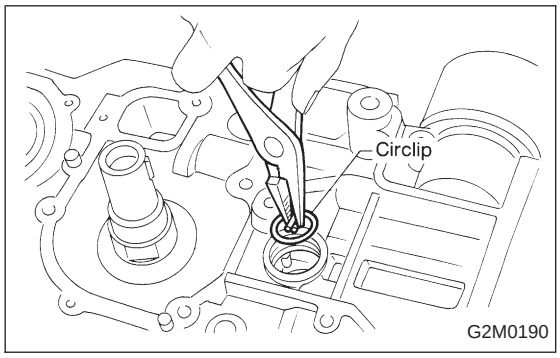


2) Installing piston pin
(1) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

CAUTION:
Apply a coat of engine oil to ST3 before insertion.

ST3 499017100 PISTON PIN GUIDE

(2) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod through service hole.



(3) Install circlip.

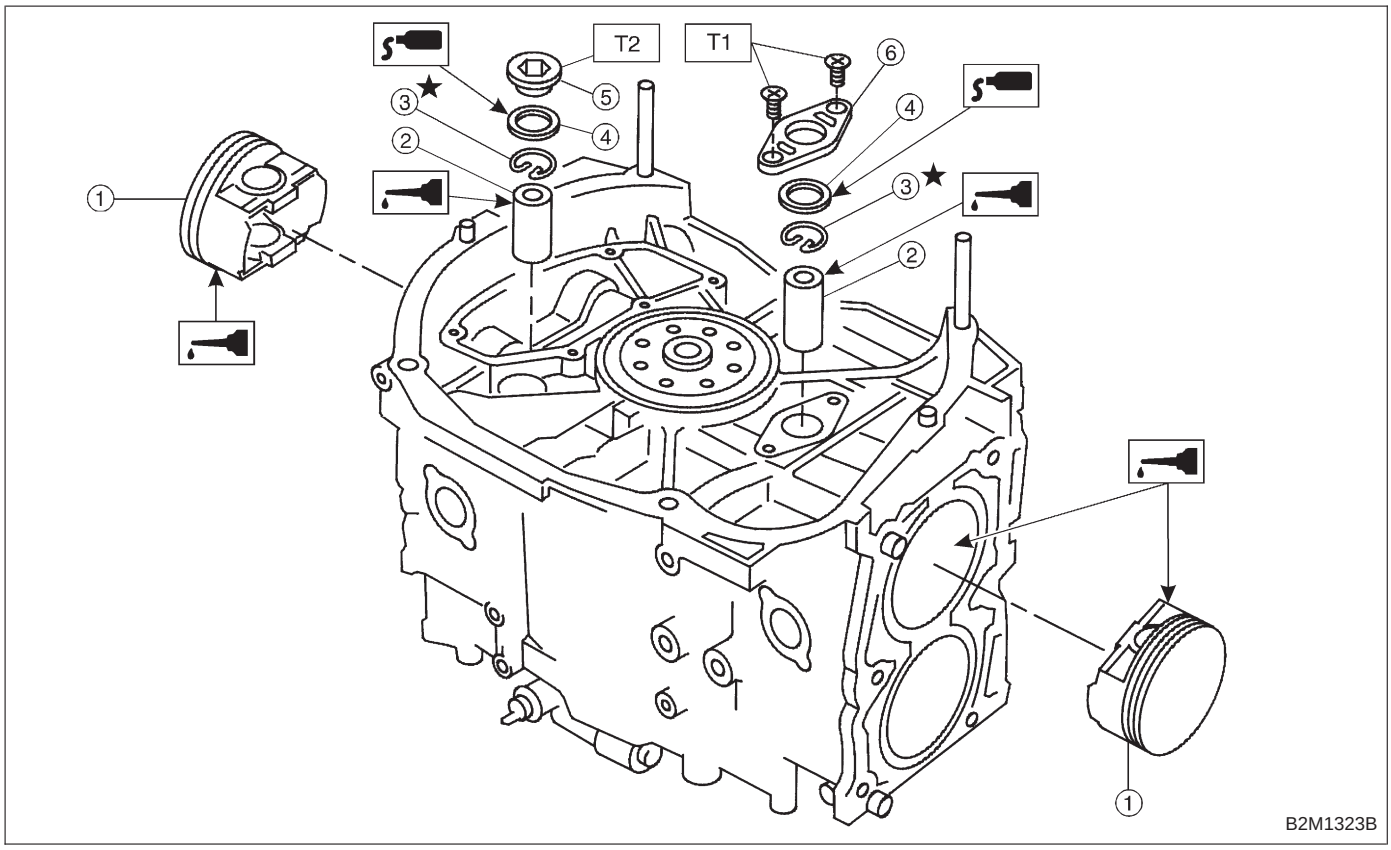
CAUTION:
Use new circlips.

(4) Install service hole plug and gasket.

CAUTION:
Use a new gasket and apply a coat of fluid packing to it before installation.

Fluid packing:
THREE BOND 1215 or equivalent

4. PISTON AND PISTON PIN (#3 AND #4)



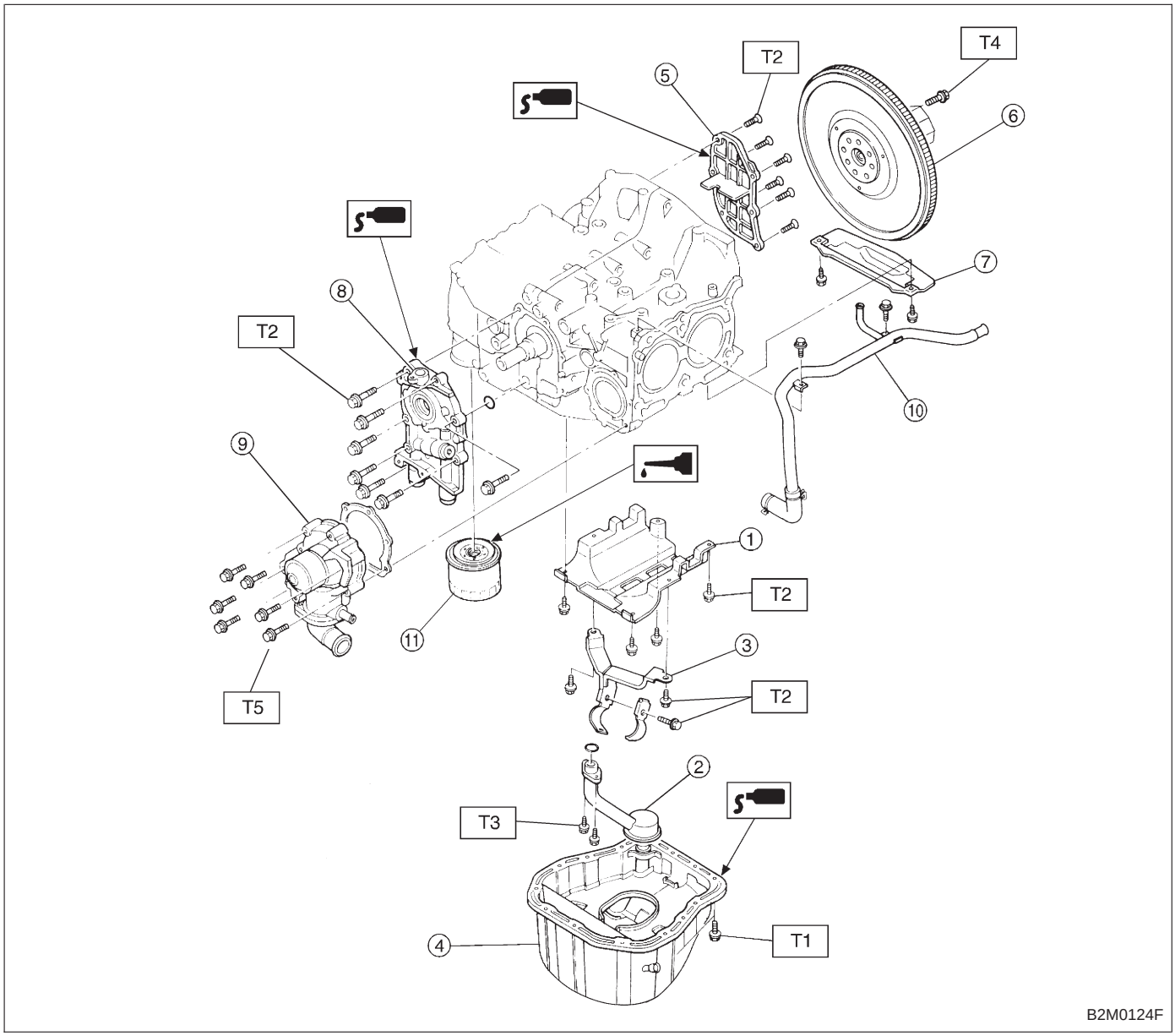
① Piston
② Piston pin
③ Circlip
④ Gasket
⑤ Service hole plug
⑥ Service hole cover
★: Replacement part

Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 69±7 (7.0±0.7, 50.6±5.1)

Turn cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install pistons and piston pins.

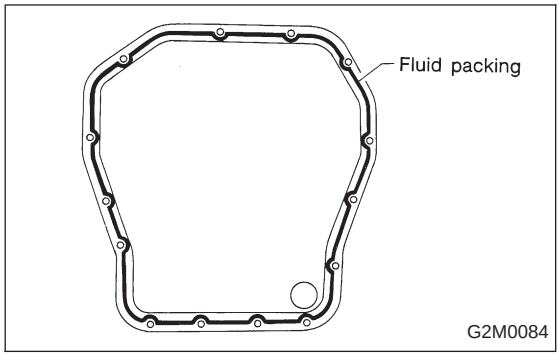
E: INSTALLATION

1. OIL PUMP AND WATER PUMP



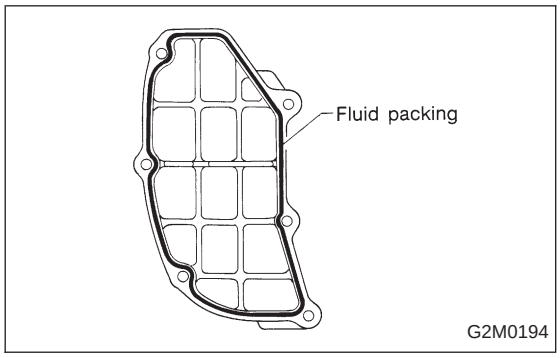
① Baffle plate
② Oil strainer
③ Oil strainer stay
④ Oil pan
⑤ Oil separator cover
⑥ Flywheel (MT vehicles)/ Drive plate (AT vehicles)
⑦ Clutch housing (MT vehicles)
⑧ Oil pump
⑨ Water pump
⑩ Water by-pass pipe
⑪ Oil filter

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 72±3 (7.3±0.3, 52.8±2.2)
T5: First 12±2 (1.2±0.2, 8.7±1.4)
Second 12±2 (1.2±0.2, 8.7±1.4)



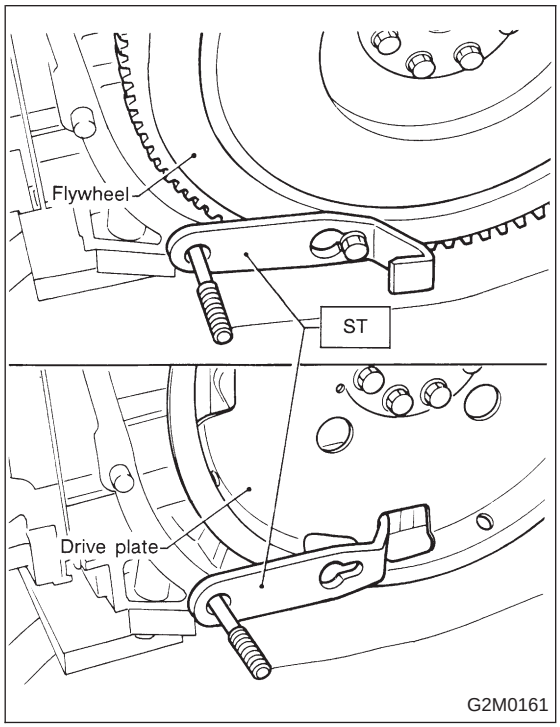
1) Install baffle plate.
2) Install oil strainer and O-ring
3) Install oil strainer stay.
4) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent

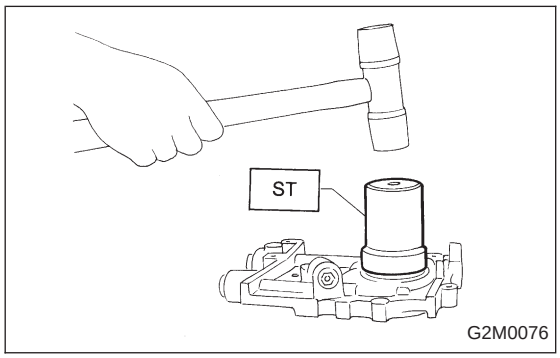


5) Apply fluid packing to matching surfaces and install oil separator cover.

Fluid packing:
THREE BOND 1215 or equivalent

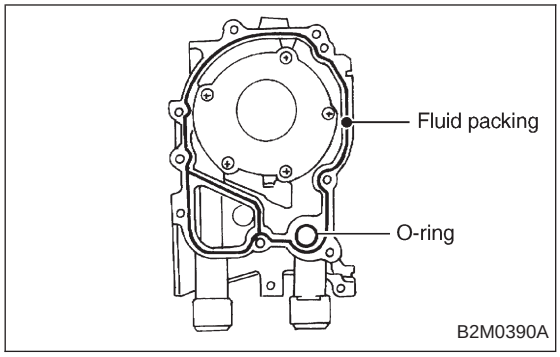


6) Install flywheel or drive plate.
To lock crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER
7) Install housing cover.



8) Installation of oil pump.
(1) Discard front oil seal after removal. Replace with a new one by using ST.

ST 499587100 OIL SEAL INSTALLER



(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:

THREE BOND 1215 or equivalent

(3) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

CAUTION:

● Do not forget to install O-ring and seal when installing oil pump.

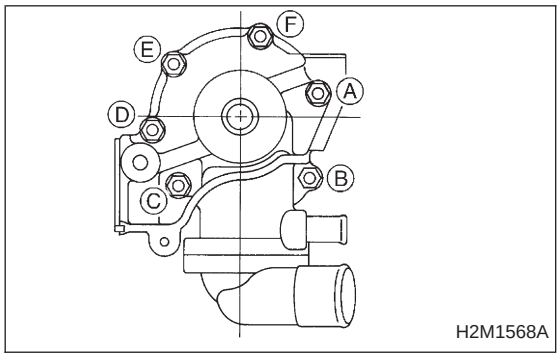
● Align flat surface of oil pump's inner rotor with crankshaft before installation.

9) Install water pump and gasket.

CAUTION:

● Be sure to use a new gasket.

● When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in Figure.



10) Install water pipe.
11) Install oil filter.

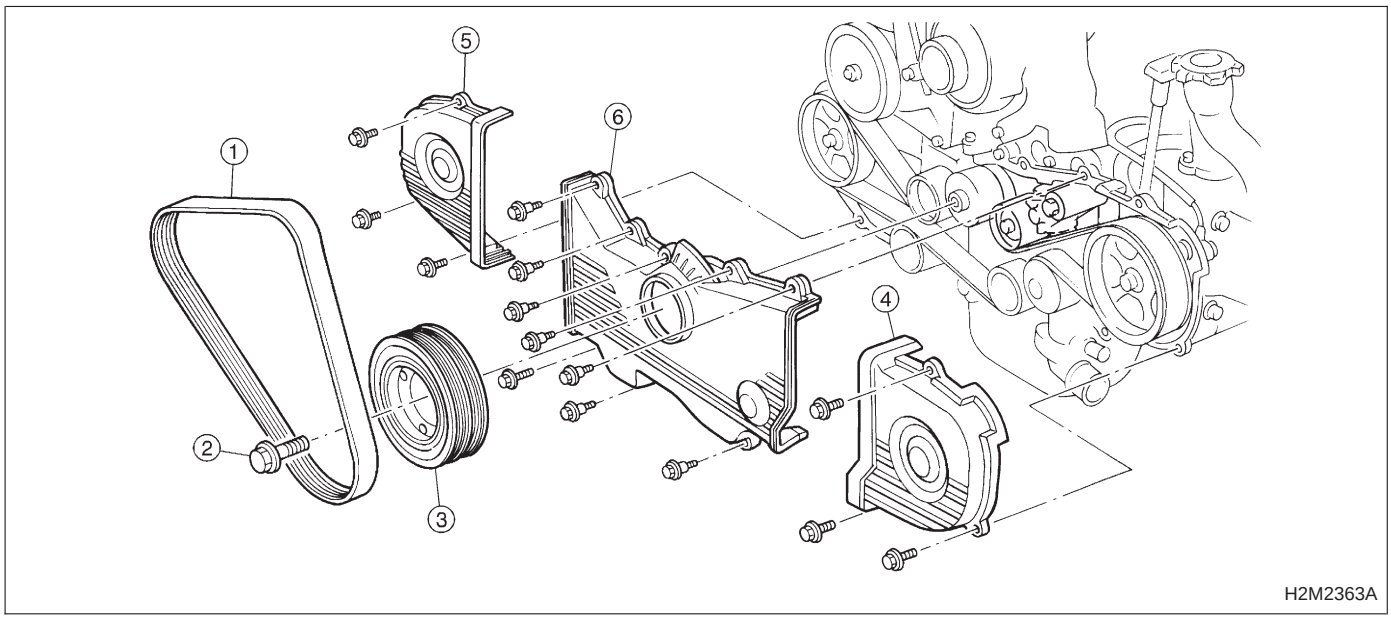
2. RELATED PARTS

1) Install cylinder head and intake manifold.
<Ref. to 2-3 [W5E0].>
2) Install timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W2C0].>

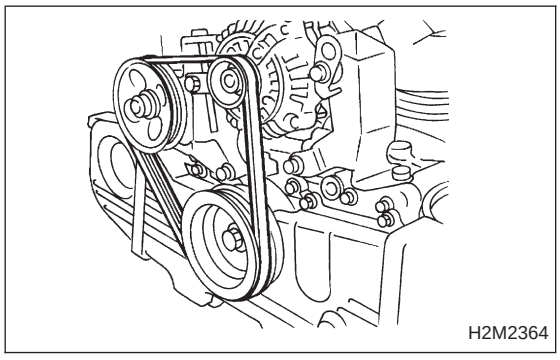
7. Timing Belt (Equipped New Automatic Belt Tension Adjuster)

A: REMOVAL

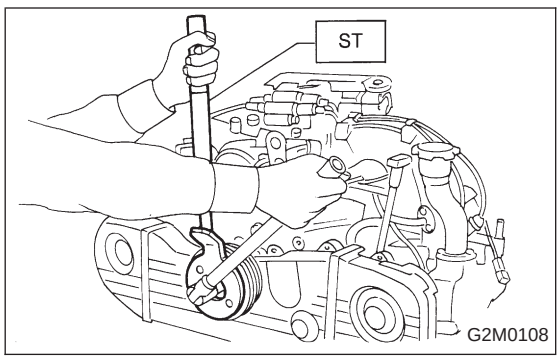
1. CRANKSHAFT PULLEY AND BELT COVER



① V-belt
② Crankshaft pulley bolt
③ Crankshaft pulley
④ Belt cover (LH)
⑤ Belt cover (RH)
⑥ Front belt cover



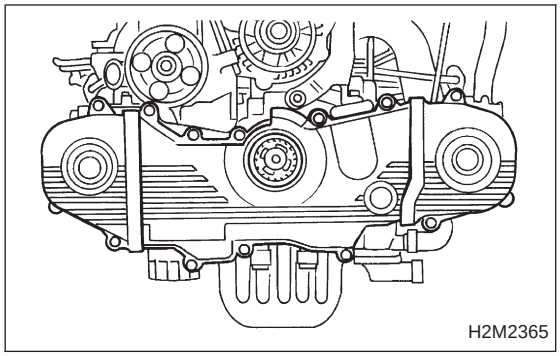
1) Remove V-belt.



2) Remove crankshaft pulley bolt. To lock crankshaft use ST.

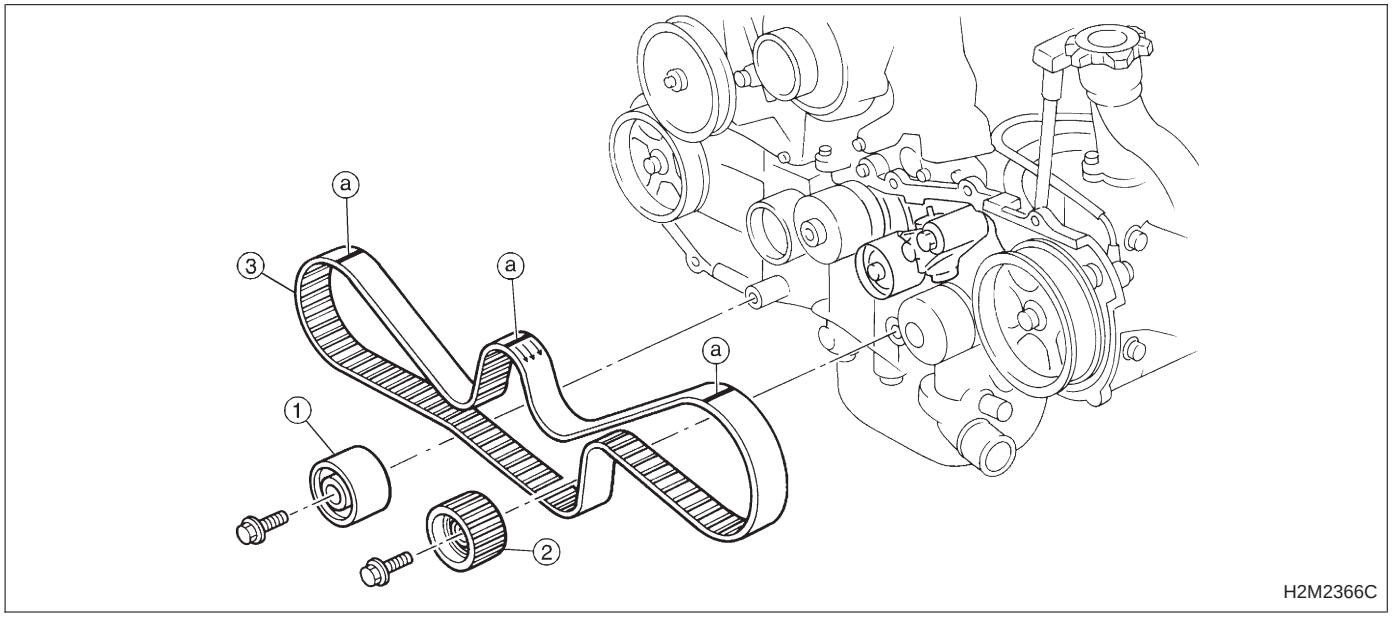
ST 499977000 CRANKSHAFT PULLEY WRENCH

3) Remove crankshaft pulley.


H2M2365

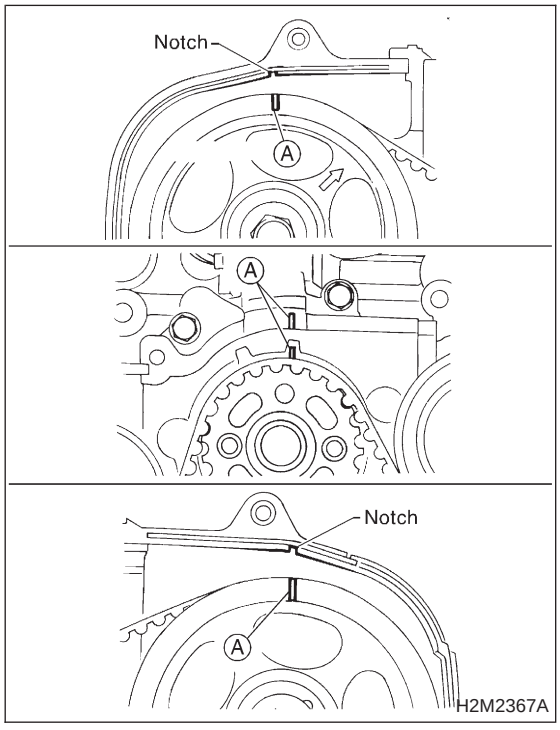
4) Remove belt cover (LH).
5) Remove belt cover (RH).
6) Remove front belt cover.

2. TIMING BELT



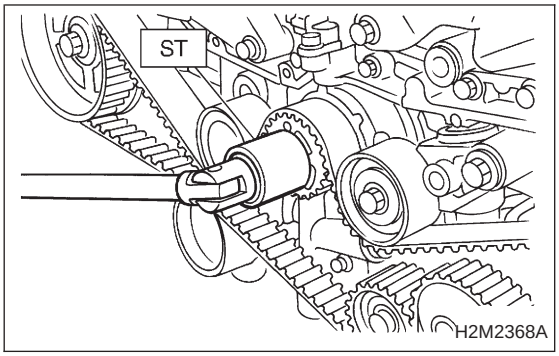
H2M2366C

ⓐ Alignment mark
① Belt idler (No. 2)
② Belt idler No. 2
③ Timing belt



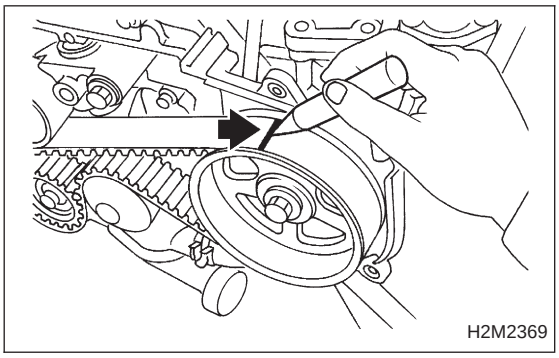
H2M2367A

1) If alignment mark Ⓐ and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as follows:



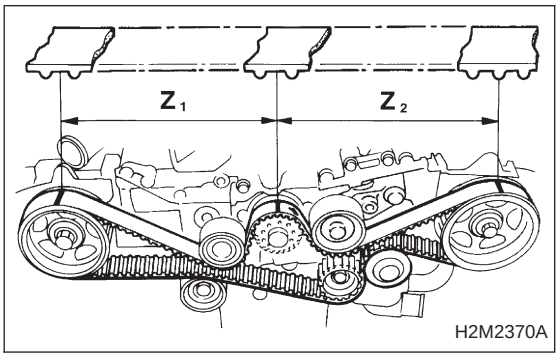
(1) Turn crankshaft, and align alignment marks Ⓐ on crankshaft sprocket, and left and right camshaft sprockets with notches of belt cover and cylinder block.

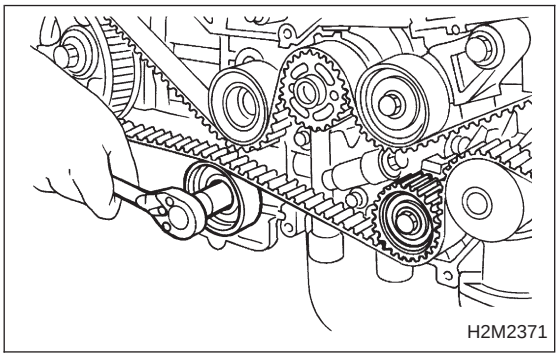
ST 499987500 CRANKSHAFT SOCKET



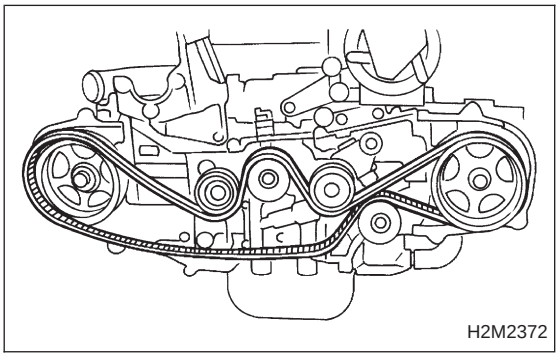
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.

Z_1: 44 tooth length
Z_2: 40.5 tooth length



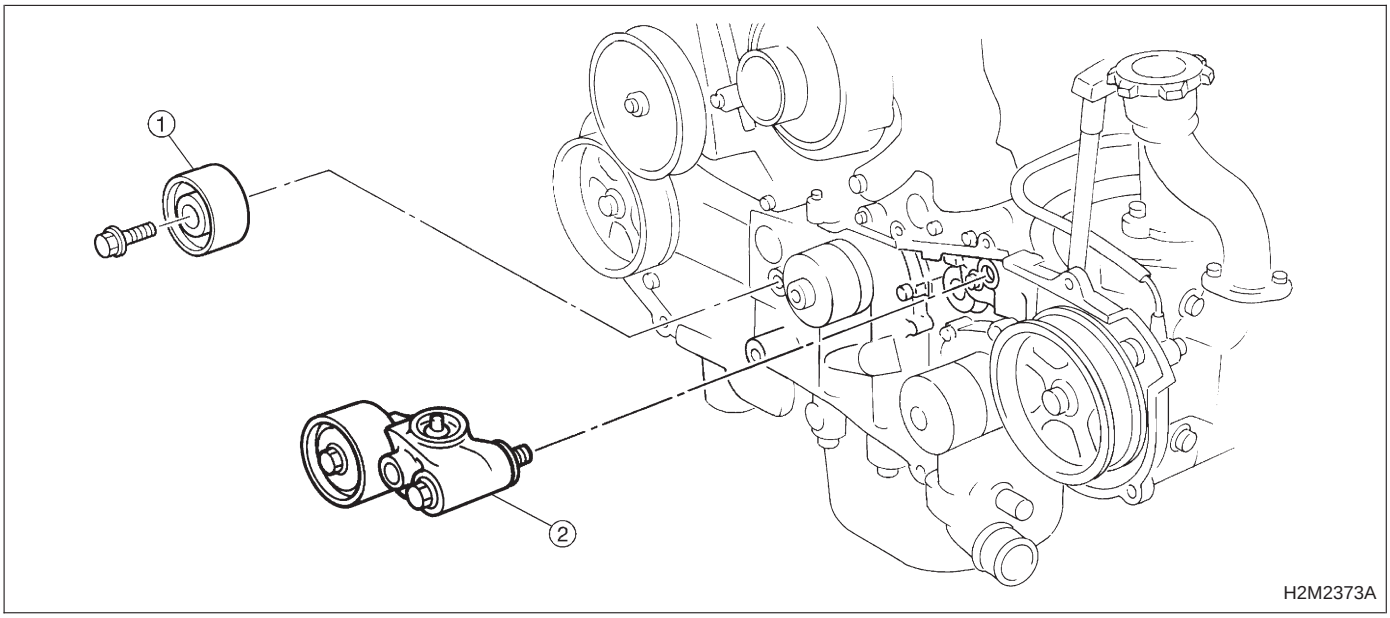


2) Remove belt idler (No. 2).
3) Remove belt idler No. 2.



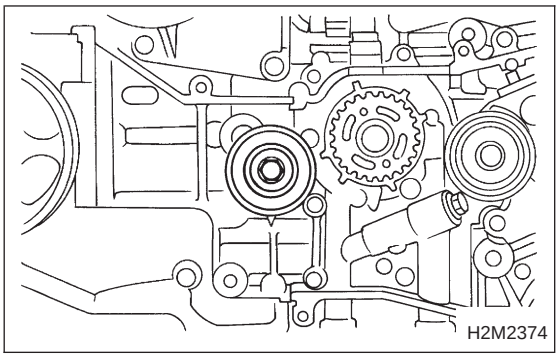
4) Remove timing belt.

3. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

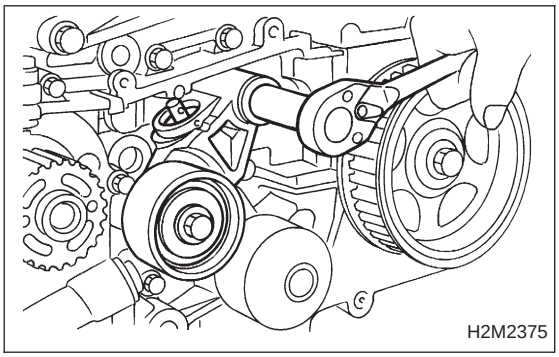


① Belt idler (No. 1)

② Automatic belt tension adjuster ASSY

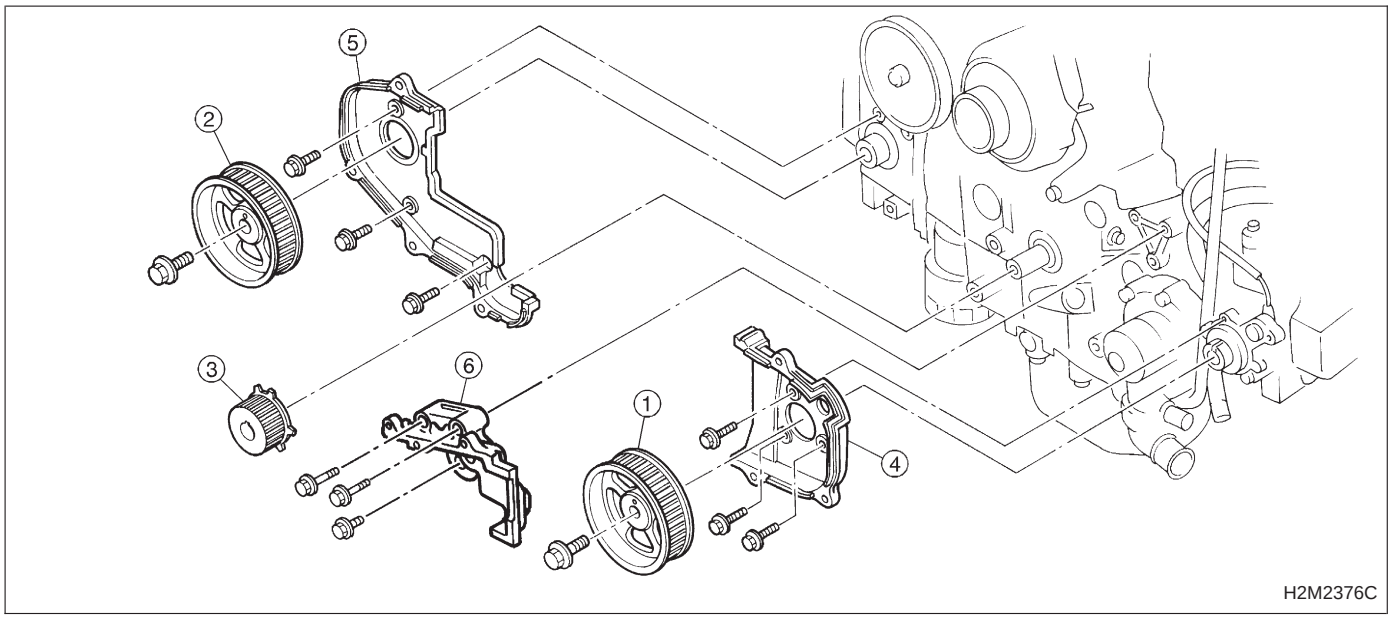


1) Remove belt idler (No. 1).

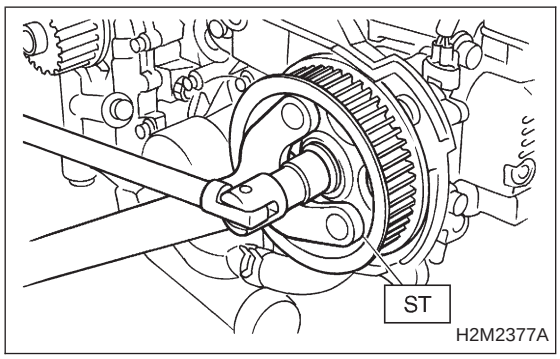


2) Remove automatic belt tension adjuster assembly.

4. SPROCKET

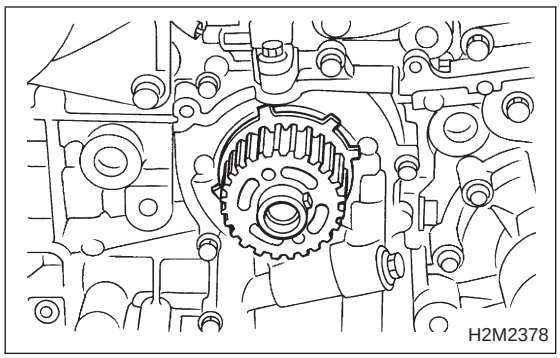


① Camshaft sprocket No. 2
② Camshaft sprocket No. 1
③ Crankshaft sprocket
④ Belt cover No. 2 (LH)
⑤ Belt cover No. 2 (RH)
⑥ Tensioner bracket

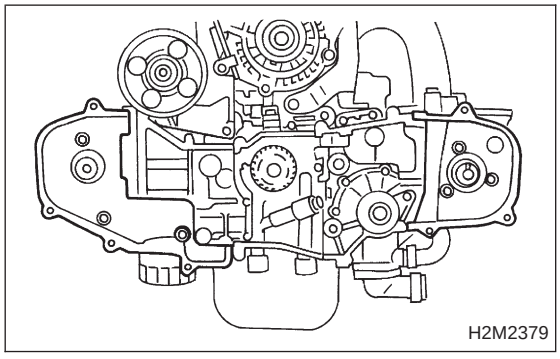


1) Remove camshaft sprocket No. 1 and No. 2.
To lock camshaft use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

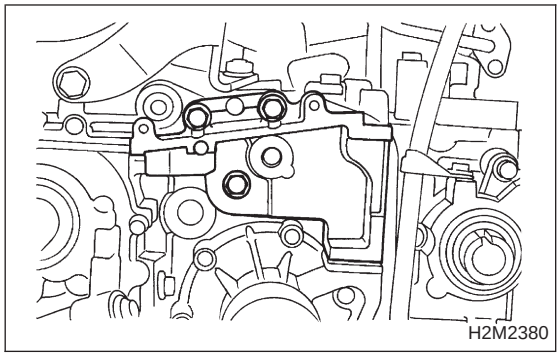


2) Remove crankshaft sprocket.



3) Remove belt cover No. 2 (LH).
4) Remove belt cover No. 2 (RH).

CAUTION:
Do not damage or lose the seal rubber when removing belt covers.


H2M2380

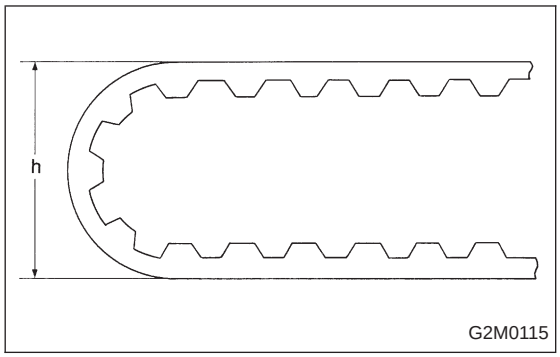
5) Remove tensioner bracket.

B: INSPECTION

1. TIMING BELT

1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
2) Check the condition of back side of belt; if any crack is found, replace belt.

CAUTION:
● Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
● Do not bend the belt sharply.



G2M0115

Bending radius: h
60 mm (2.36 in) or more

2. AUTOMATIC BELT TENSION ADJUSTER

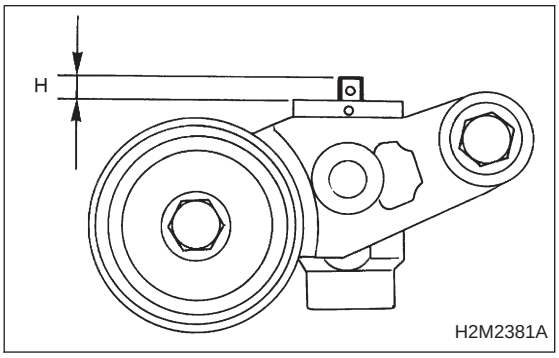
1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.

CAUTION:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kg, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kg, 66 lb), check it using the following procedures:

(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kg, 66 lb) to it. Check adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
- **Always use a vertical type pressing tool to move the adjuster rod down.**
- **Do not use a lateral type vise.**
- **Push adjuster rod vertically.**
- **Press-in the push adjuster rod gradually taking more than three minutes.**
- **Do not allow press pressure to exceed 9,807 N (1,000 kg, 2,205 lb).**
- **Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.**



4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
6.0±0.5 mm (0.236±0.020 in)

3. BELT TENSION PULLEY

1) Check mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace belt tension pulley if faulty.
2) Check belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check belt tension pulley for grease leakage.

4. BELT IDLER

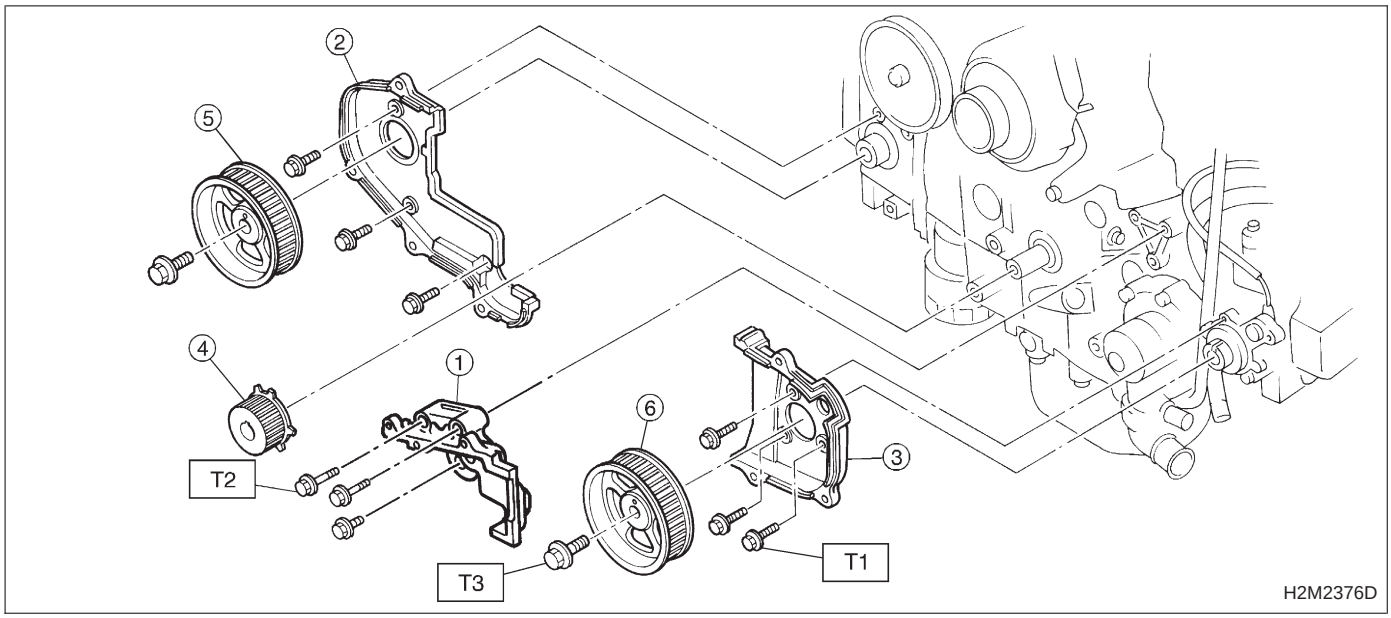
1) Check belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check belt idler for grease leakage.

5. CAMSHAFT AND CRANKSHAFT SPROCKET

1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

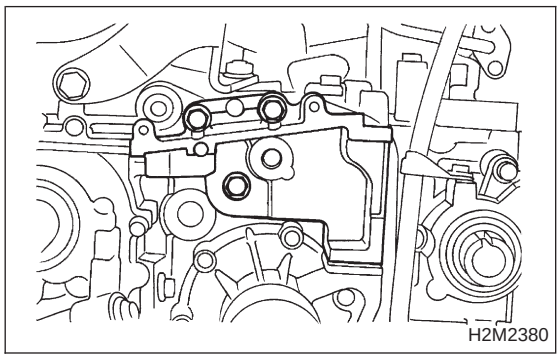
C: INSTALLATION

1. CAMSHAFT AND CRANKSHAFT SPROCKET

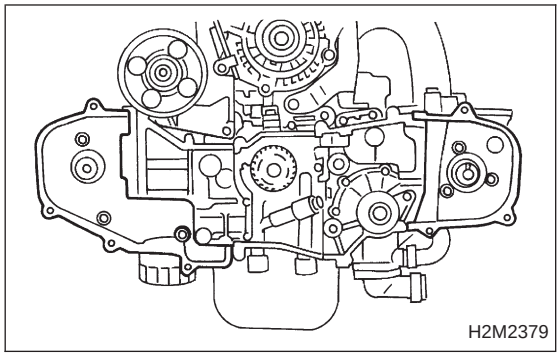


① Tensioner bracket
② Belt cover No. 2 (RH)
③ Belt cover No. 2 (LH)
④ Crankshaft sprocket
⑤ Camshaft sprocket No. 1
⑥ Camshaft sprocket No. 2

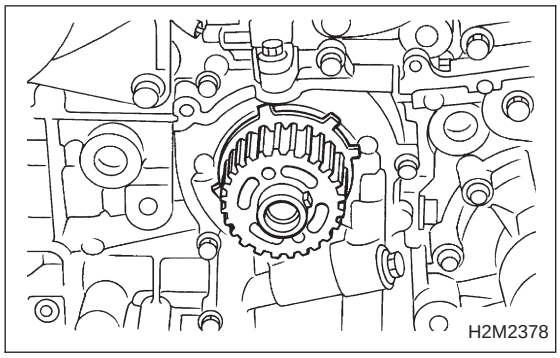
Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 25±3 (2.5±0.3, 18.1±2.2)
T3: 78±5 (8.0±0.5, 57.9±3.6)



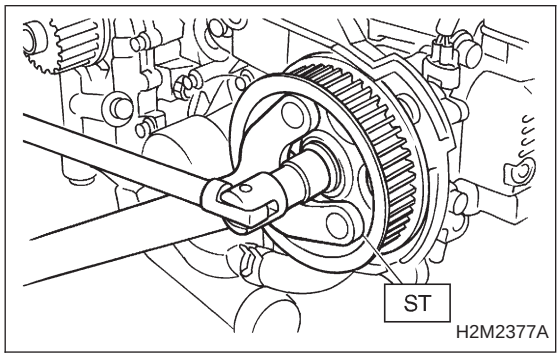
1) Install tensioner bracket.



2) Install belt cover No. 2 (RH).
3) Install belt cover No. 2 (LH).



4) Install crankshaft sprocket.

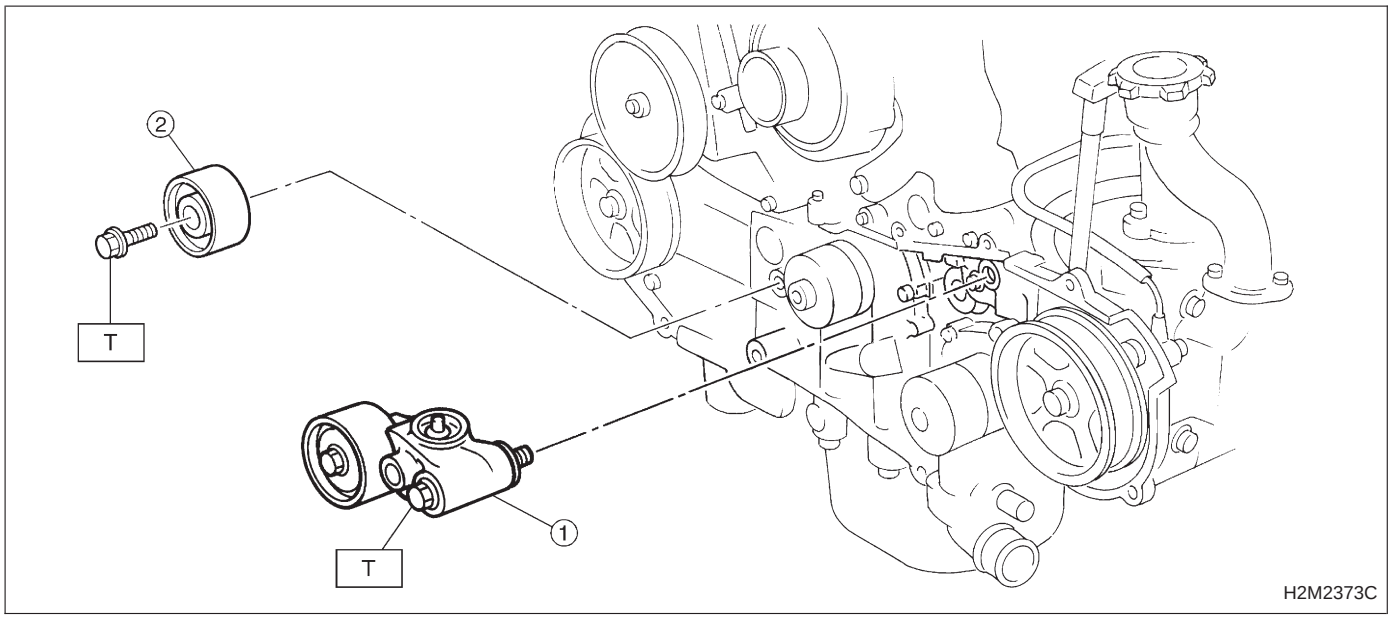


5) Install camshaft sprocket No. 1 and camshaft sprocket No. 2. To lock camshaft use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

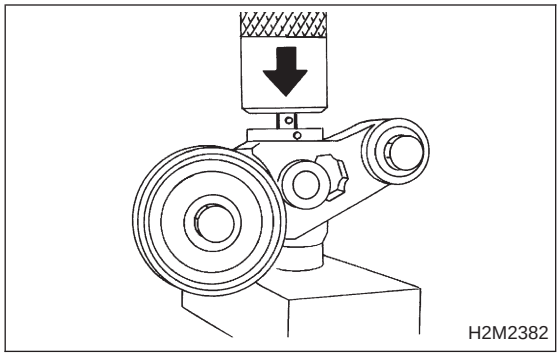
CAUTION:
Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.

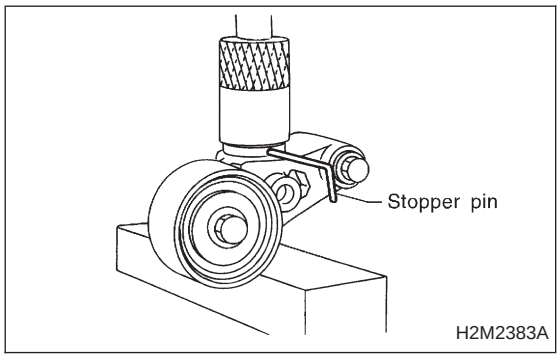
2. BELT TENSIONER AND IDLER



① Automatic belt tension adjuster ASSY
② Belt idler (No. 1)

Tightening torque: N·m (kg-m, ft-lb)
T: 39±4 (4.0±0.4, 28.9±2.9)



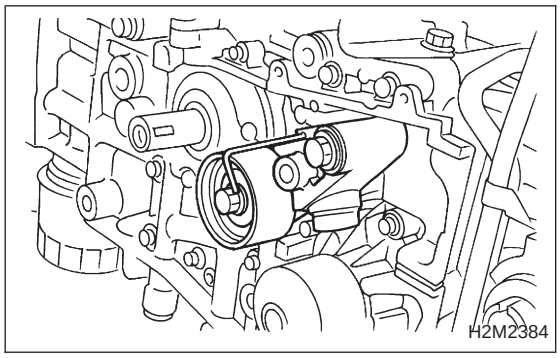


1) Preparation for installation of automatic belt tension adjuster assembly;

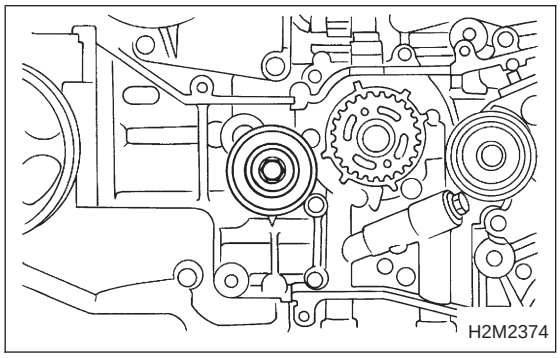
CAUTION:
● Always use a vertical type pressing tool to move the adjuster rod down.
● Do not use a lateral type vise.
● Push adjuster rod vertically.
● Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kg, 66 lb).
● Press-in the push adjuster rod gradually taking more than three minutes.
● Do not allow press pressure to exceed 9,807 N (1,000 kg, 2,205 lb).
● Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
● Do not release press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kg, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.

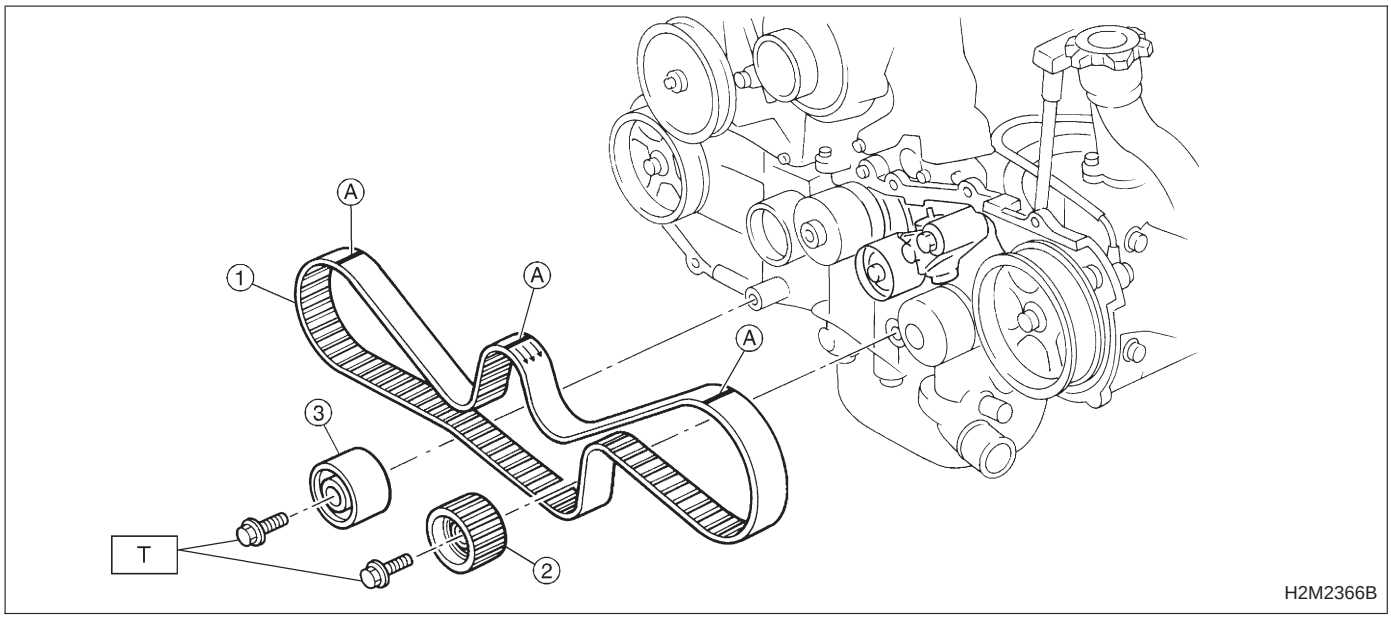


2) Install automatic belt tension adjuster assembly.



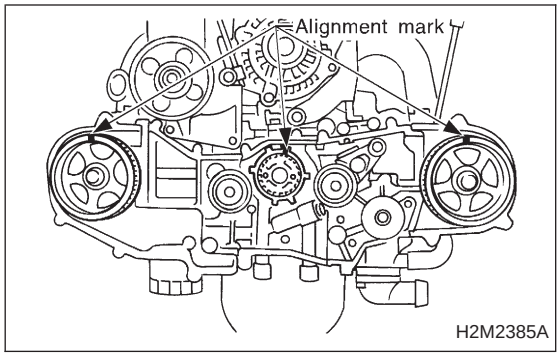
3) Install belt idler (No. 1).

3. TIMING BELT



Ⓐ Alignment mark
① Timing belt
② Belt idler No. 2
③ Belt idler (No. 2)

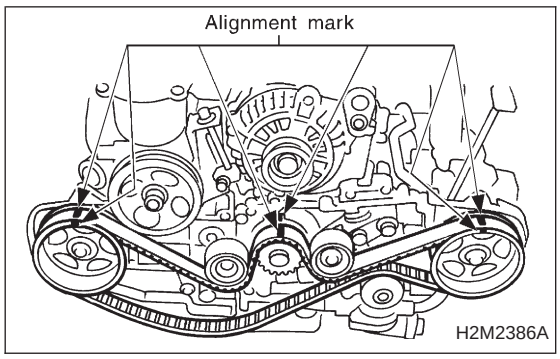
Tightening torque: N·m (kg-m, ft-lb)
T: 39±4 (4.0±0.4, 28.9±2.9)



1) Installation of timing belt.

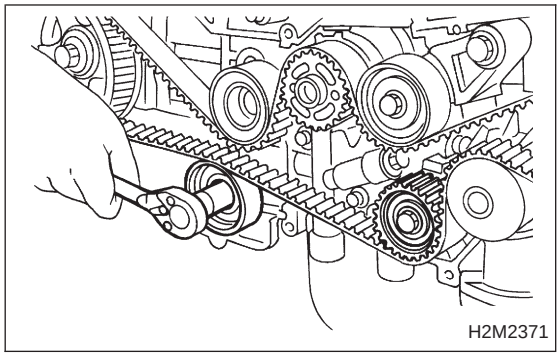
(1) Using ST, turn left and right camshaft sprockets so that their alignment marks come to top positions.

ST 499207100 CAMSHAFT SPROCKET WRENCH

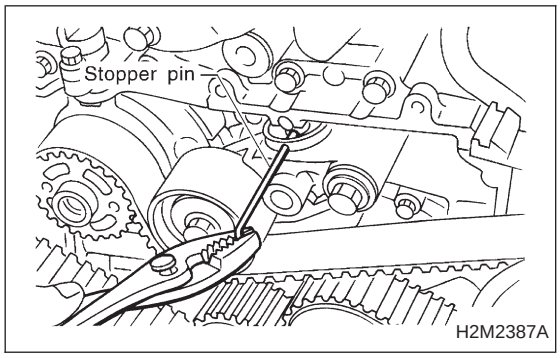


(2) While aligning alignment mark Ⓐ on timing belt with marks on sprockets, position timing belt properly.

CAUTION:
Ensure belt's rotating direction is correct.

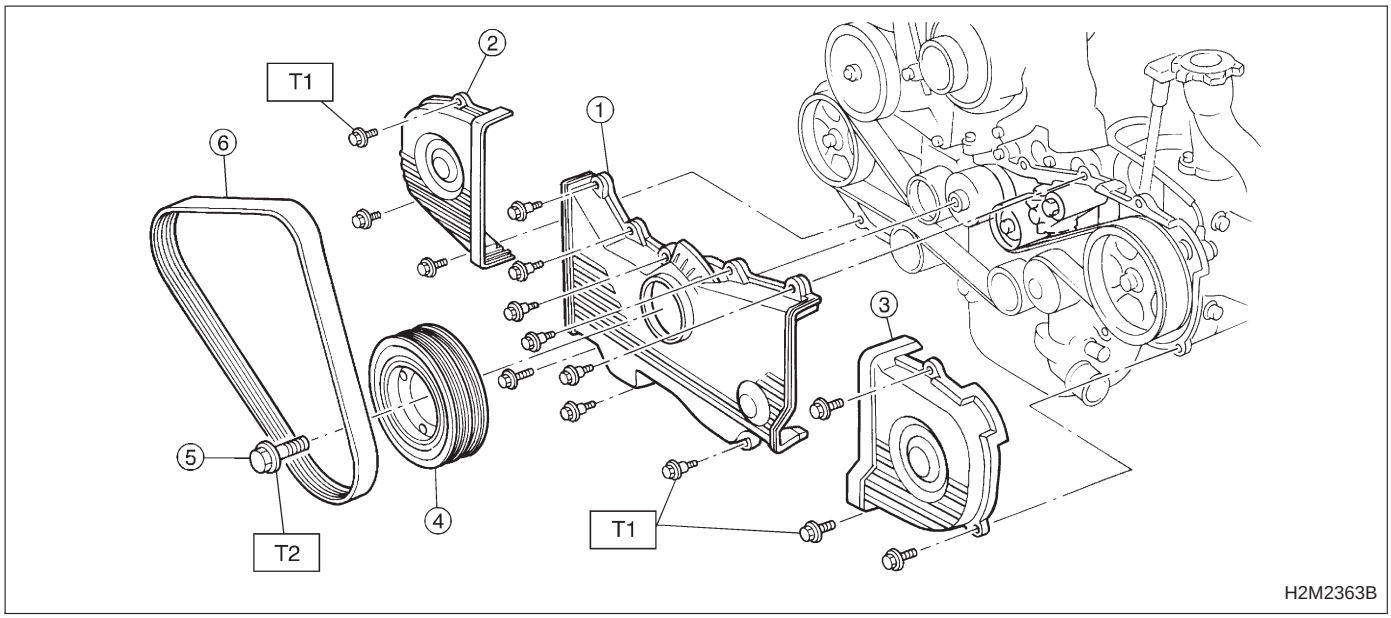


2) Install belt idler No. 2.
3) Install belt idler (No. 2).



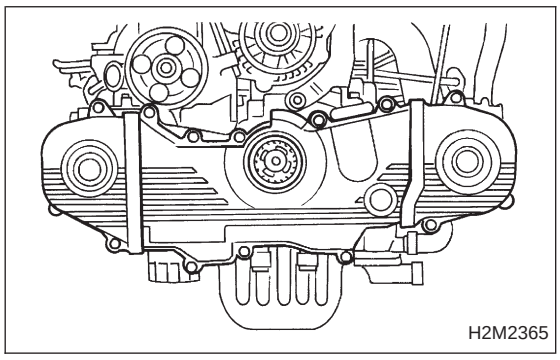
4) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from automatic belt tension adjuster.

4. CRANKSHAFT PULLEY AND BELT COVER

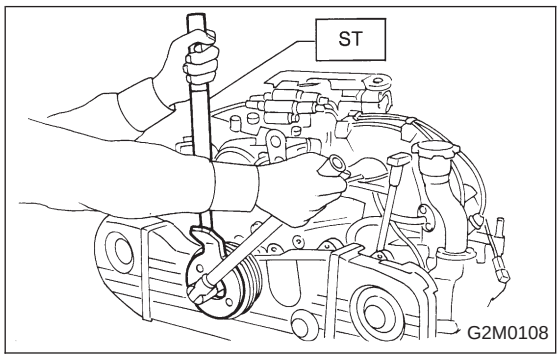


① Front belt cover
② Belt cover (RH)
③ Belt cover (LH)
④ Crankshaft pulley
⑤ Crankshaft pulley bolt
⑥ V-belt

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 127±10 (13.0±1.0, 94±7)

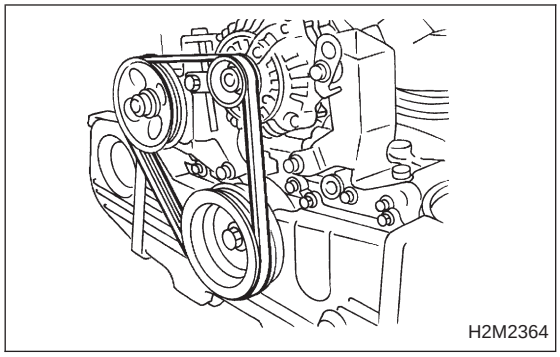


1) Install front belt cover.
2) Install belt cover (RH).
3) Install belt cover (LH).



4) Install crankshaft pulley.
5) Install pulley bolt.

To lock crankshaft, use ST.
ST 499977000 CRANKSHAFT PULLEY WRENCH


H2M2364

6) Install V-belt.

1. Engine Trouble in General

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	● Starter	● Defective battery-to-starter harness	B
		● Defective starter switch	C
		● Defective inhibitor switch or neutral switch	C
		● Defective starter	B
	● Battery	● Poor terminal connection	A
		● Run-down battery	A
		● Defective charging system	B
	● Friction	● Seizure of crankshaft and connecting rod bearing	C
		● Seized camshaft	C
		● Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	● Starter	● Defective starter	C
	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Fuel line	● Defective fuel pump and relay	A
		● Lack of or insufficient fuel	B
	● Belt	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	C
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	C
		● Incorrect valve timing	B
		● Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Defective intake manifold gasket	B
		● Defective throttle body gasket	B
	● Fuel line	● Defective fuel pump and relay	C
		● Clogged fuel line	C
		● Lack of/or insufficient fuel	B
	● Belt	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	C
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	C
		● Incorrect valve timing	B
		● Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Loosened or cracked intake duct	B
		● Loosened or cracked PCV hose	C
		● Loosened or cracked vacuum hose	C
		● Defective intake manifold gasket	B
		● Defective throttle body gasket	B
		● Dirty air cleaner element	C
	● Fuel line	● Clogged fuel line	C
		● Lack of or insufficient fuel	B
	● Belt	● Defective	B
		● Defective timing	B
	● Compression	● Incorrect valve clearance	C
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	C
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	C
		● Incorrect valve timing	B
		● Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Loosened or cracked intake duct	A
		● Loosened or cracked PCV hose	A
		● Loosened or cracked vacuum hose	A
		● Defective intake manifold gasket	B
		● Defective throttle body gasket	B
		● Defective PCV valve	C
		● Loosened oil filler cap	B
		● Dirty air cleaner element	C
	● Fuel line	● Defective fuel pump and relay	C
		● Clogged fuel line	C
		● Lack of/or insufficient fuel	B
	● Belt	● Defective timing	C
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	B
		● Loosened cylinder head bolts or defective gasket	B
		● Improper valve seating	B
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	B
		● Incorrect valve timing	A
		● Improper engine oil (low viscosity)	B
	● Lubrication system	● Incorrect oil pressure	B
		● Defective rocker cover gasket	C
	● Cooling system	● Overheating	C
	● Others	● Malfunction of evaporative emission control system	A
		● Stuck or damaged throttle valve	B
		● Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Loosened or cracked intake duct	A
		● Loosened or cracked PCV hose	A
		● Loosened or cracked vacuum hose	B
		● Defective intake manifold gasket	B
		● Defective throttle body gasket	B
		● Defective PCV valve	B
		● Loosened oil filler cap	B
		● Dirty air cleaner element	A
	● Fuel line	● Defective fuel pump and relay	B
		● Clogged fuel line	B
		● Lack of/or insufficient fuel	C
	● Belt	● Defective timing	B
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	B
		● Loosened cylinder head bolts or defective gasket	B
		● Improper valve seating	B
		● Defective valve stem	C
		● Worn or broken valve spring	B
		● Worn or stuck piston rings, cylinder and piston	C
		● Incorrect valve timing	A
		● Improper engine oil (low viscosity)	B
	● Lubrication system	● Incorrect oil pressure	B
	● Cooling system	● Overheating	C
		● Over cooling	C
	● Others	● Malfunction of evaporative emission control system	A

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4. Surging	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Loosened or cracked intake duct	A
		● Loosened or cracked PCV hose	A
		● Loosened or cracked vacuum hose	A
		● Defective intake manifold gasket	B
		● Defective throttle body gasket	B
		● Defective PCV valve	B
		● Loosened oil filler cap	B
		● Dirty air cleaner element	B
	● Fuel line	● Defective fuel pump and relay	B
		● Clogged fuel line	B
		● Lack of/or insufficient fuel	C
	● Belt	● Defective timing	B
	● Compression	● Incorrect valve clearance	B
		● Loosened spark plugs or defective gasket	C
		● Loosened cylinder head bolts or defective gasket	C
		● Improper valve seating	C
		● Defective valve stem	C
		● Worn or broken valve spring	C
		● Worn or stuck piston rings, cylinder and piston	C
		● Incorrect valve timing	A
		● Improper engine oil (low viscosity)	B
	● Cooling system	● Overheating	B
	● Others	● Malfunction of evaporative emission control system	C
5. Engine does not return to idle.	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Intake system	● Loosened or cracked vacuum hose	A
	● Others	● Stuck or damaged throttle valve	A
		● Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	● Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	● Cooling system	● Overheating	B
	● Others	● Accelerator cable out of adjustment	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
7. After burning in exhaust system	• Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B
10. Excessive fuel consumption	• Fuel injection system (Ref. to 2-7 On-Board Diagnostics II System)		A
	• Intake system	• Dirty air cleaner element	A
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Accelerator cable out of adjustment	B

2. Engine Noise

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	● Valve mechanism is defective. ● Incorrect valve clearance ● Worn valve rocker ● Worn camshaft ● Broken valve spring
Heavy and dull clank	Oil pressure is low.	● Worn crankshaft main bearing ● Worn connecting rod bearing (big end)
	Oil pressure is normal.	● Loose flywheel mounting bolts ● Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	● Ignition timing advanced ● Accumulation of carbon inside combustion chamber ● Wrong spark plug ● Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	● Worn crankshaft main bearing ● Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm.	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	● Worn cylinder liner and piston ring ● Broken or stuck piston ring ● Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	● Worn camshaft journal bore in crankcase
Squeaky sound	—	● Insufficient generator lubrication
Rubbing sound	—	● Defective generator brush and rotor contact
Gear scream when starting engine	—	● Defective ignition starter switch ● Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	● Loose drive belt ● Defective water pump shaft
Hissing sound	—	● Loss of compression ● Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	● Loose timing belt ● Belt contacting case/adjacent part
Valve tappet noise	—	● Incorrect valve clearance

NOTE*:
● When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
● Therefore, carry out the CLEAR MEMORY MODE <Ref. to 2-7 [T3D0].> and INSPECTION MODE <Ref. to 2-7 [T3E0].> after connecting fuel injector connector.

ENGINE LUBRICATION SYSTEM 2-4

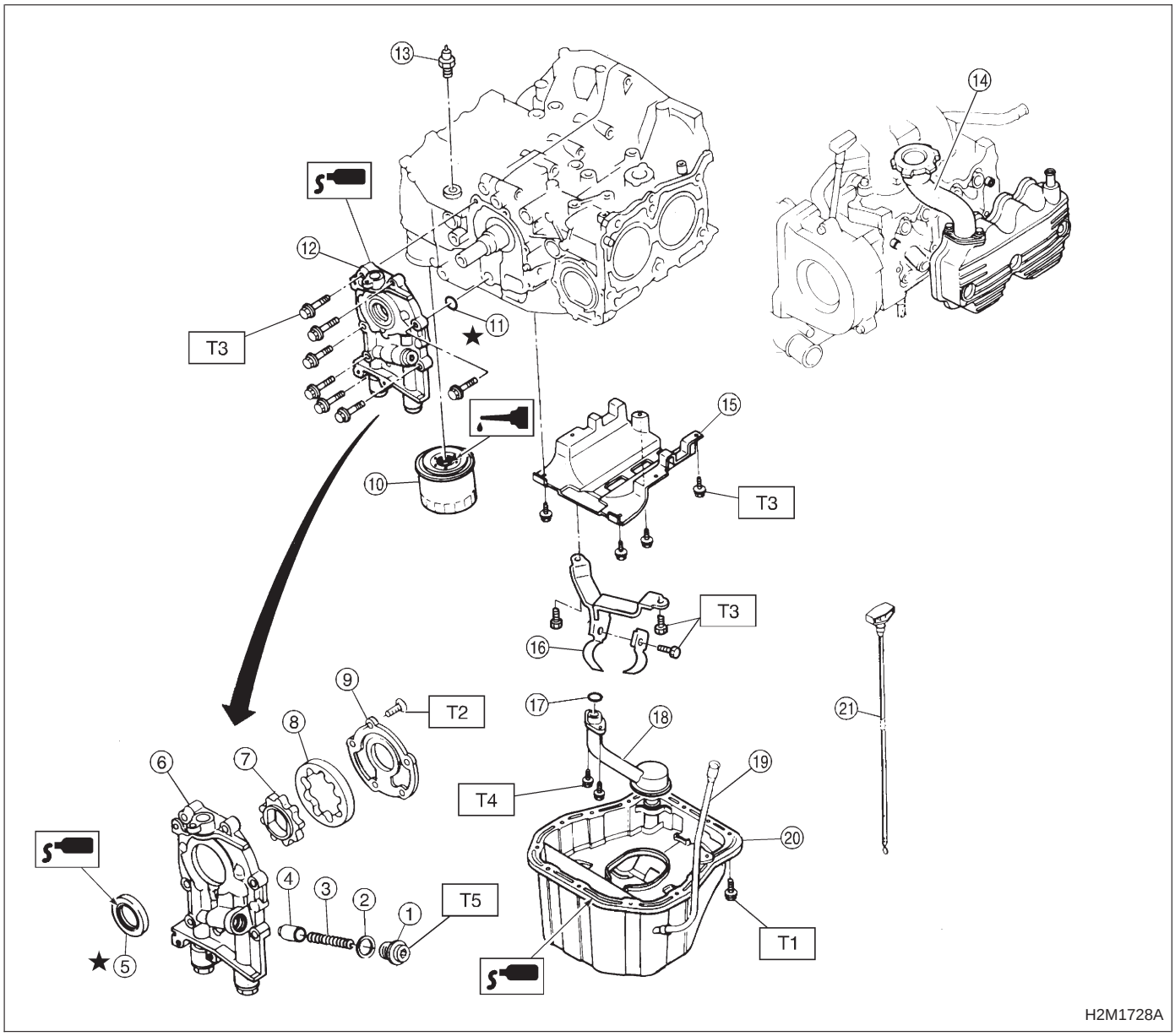
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1. Specifications

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter x thickness				78 x 9 mm (3.07 x 0.35 in)
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case			STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
				LIMIT	0.15 mm (0.0059 in)
	Case clearance between outer rotor and pump case			STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
				LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm^2, 14 psi) or more
				- quantity	4.2 ℓ (4.4 US qt, 3.7 Imp qt)/min.
		5,000 rpm	Discharge	- pressure	294 kPa (3.0 kg/cm^2, 43 psi) or more
				- quantity	42.0 ℓ (11.10 US gal, 9.24 Imp gal)/min.
	Relief valve operation pressure				490 kPa (5.0 kg/cm^2, 71 psi)
Oil filter	Type				Full-flow filter type
	Filtration area				1,000 cm^2 (155 sq in)
	By-pass valve opening pressure				156 kPa (1.6 kg/cm^2, 23 psi)
	Outer diameter x width				80 x 70 mm (3.15 x 2.76 in)
	Oil filter to engine thread size				M 20 x 1.5
Relief valve (on rocker shaft) operation pressure					69 kPa (0.7 kg/cm^2, 10 psi)
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure				14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure				More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)					4.0 ℓ (4.2 US qt, 3.5 Imp qt)

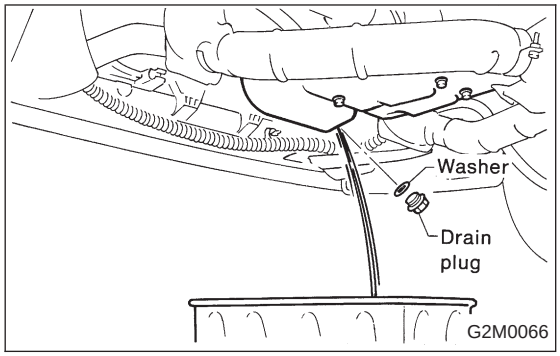
1. Lubrication System



H2M1728A

① Plug
② Washer
③ Relief valve spring
④ Relief valve
⑤ Oil seal
⑥ Oil pump case
⑦ Inner rotor
⑧ Outer rotor
⑨ Oil pump cover
⑩ Oil filter
⑪ O-ring
⑫ Oil pump ASSY
⑬ Oil pressure switch
⑭ Oil filler duct
⑮ Baffle plate
⑯ Oil strainer stay
⑰ O-ring
⑱ Oil strainer
⑲ Oil level gauge guide
⑳ Oil pan
㉑ Oil level gauge

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5 — 6 (0.5 — 0.6, 3.6 — 4.3)
T3: 6.4 (0.65, 4.7)
T4: 9.8 (1.0, 7.0)
T5: 40.7 — 47.6 (4.15 — 4.85, 30.0 — 35.1)

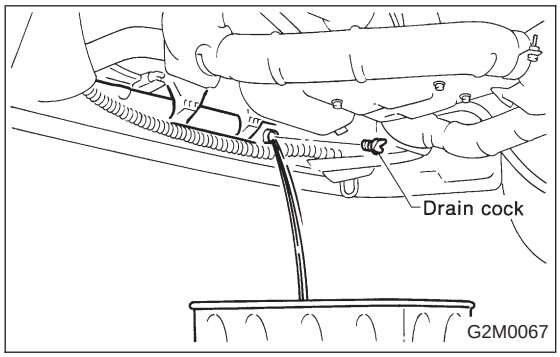


1. Oil Pump

A: REMOVAL

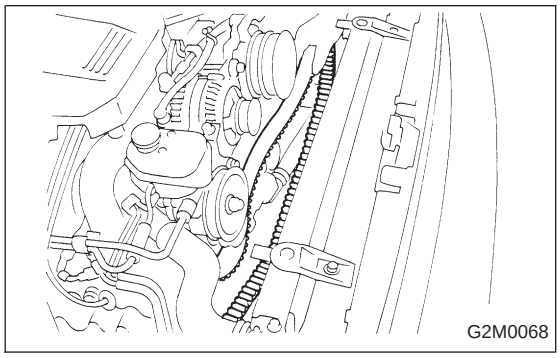
1) Drain engine oil.

Set container under the vehicle, and remove drain plug from oil pan.

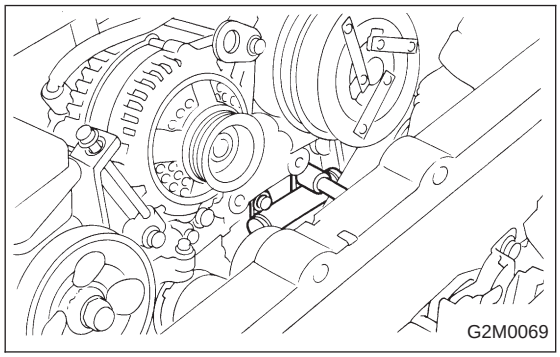


2) Drain coolant.

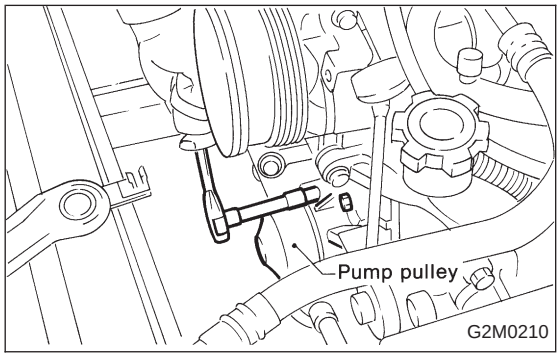
Set container under the vehicle, and remove drain cock from radiator.



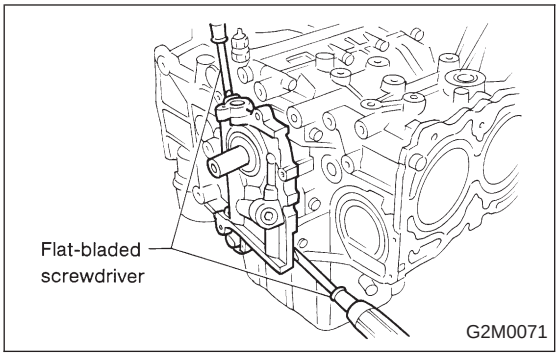
3) Remove belt covers, timing belt and related parts. <Ref. to 1-5 [W2A0].>



4) Remove belt tensioner bracket.

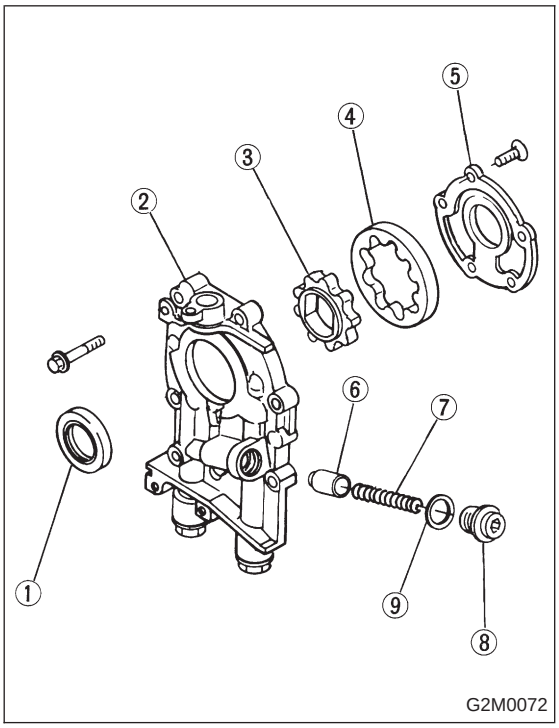


5) Remove left-hand camshaft sprocket and left-hand belt cover No. 2.
6) Remove water pump.



7) Remove oil pump by using flat-bladed screwdriver.

CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.

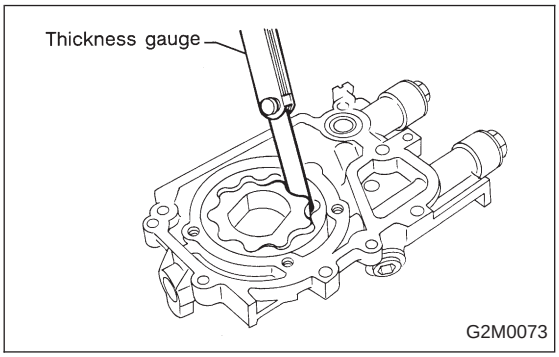


B: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump.
Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before removing relief valve, loosen plug when removing oil pump from cylinder block.

① Oil seal
② Pump case
③ Inner rotor
④ Outer rotor
⑤ Pump cover
⑥ Relief valve
⑦ Relief spring
⑧ Plug
⑨ Washer

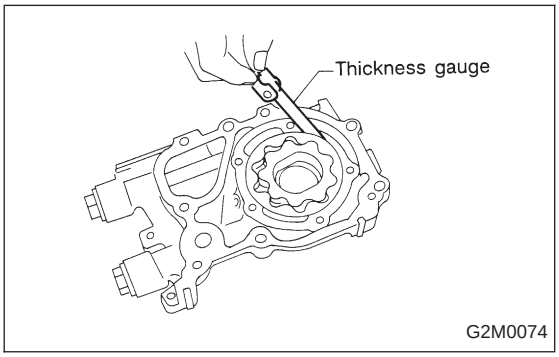


C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

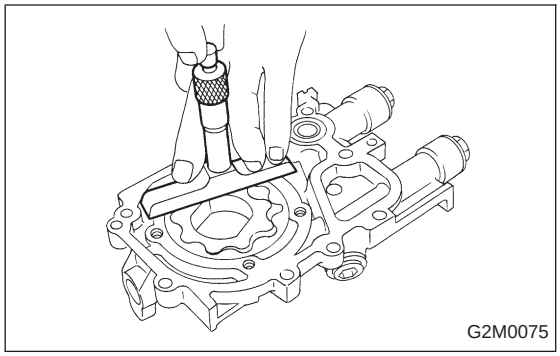
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the cylinder block rotor housing. If the clearance exceeds the limit, replace the rotor.

Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)


G2M0075

3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.15 mm (0.0059 in)

4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

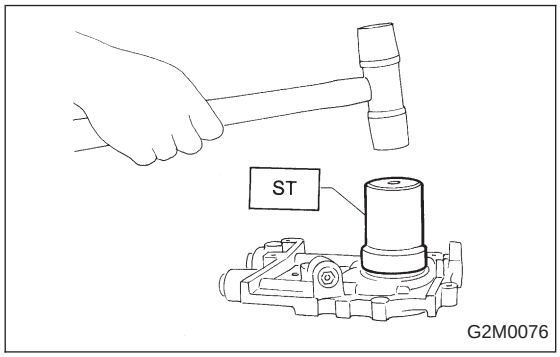
Relief valve spring:
Free length; 71.8 mm (2.827 in)
Installed length; 54.7 mm (2.154 in)
Load when installed; 77.08 N (7.86 kg, 17.33 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.



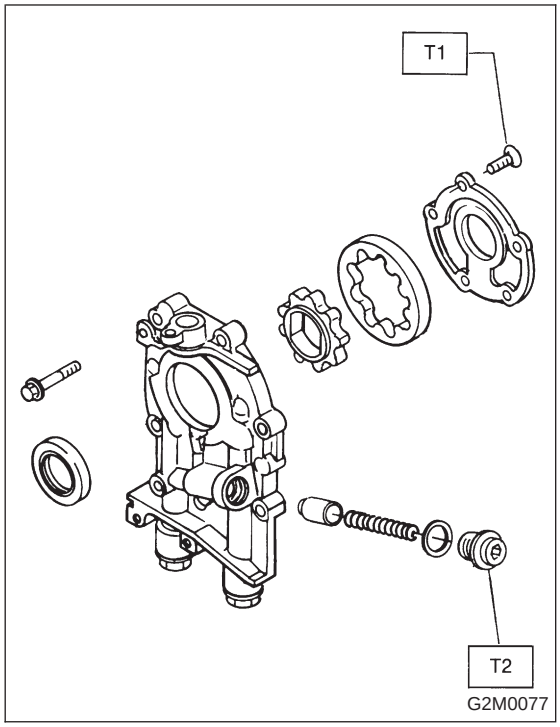
G2M0076

D: ASSEMBLY

1) Install front oil seal by using ST.

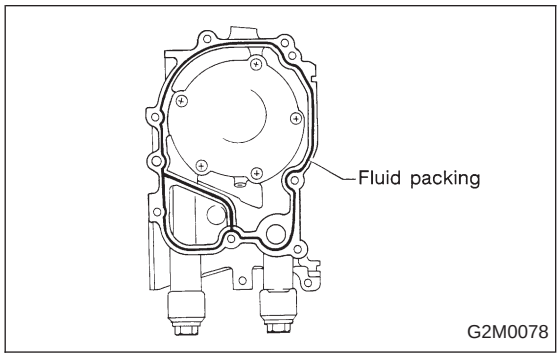
ST 499587100 OIL SEAL INSTALLER

CAUTION:
Use a new oil seal.



2) Install inner and outer rotors in their original positions.
3) Install oil relief valve and relief spring.
4) Install oil pump cover.

Tightening torque:
T1: 5 — 6 N·m (0.5 — 0.6 kg-m, 3.6 — 4.3 ft-lb)
T2: 40.7 — 47.6 N·m
(4.15 — 4.85 kg-m, 30.0 — 35.1 ft-lb)



E: INSTALLATION

Installation is in the reverse order of removal.

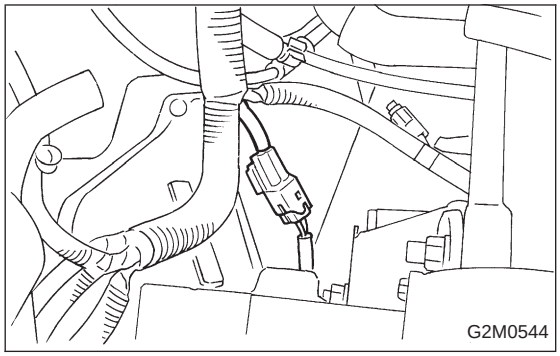
Observe the following:
1) Apply fluid packing to matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent

2) Replace O-ring with a new one.
3) Be careful not to scratch oil seal when installing oil pump on cylinder block.

CAUTION:
Apply fluid packing to oil pressure switch threads before installation.

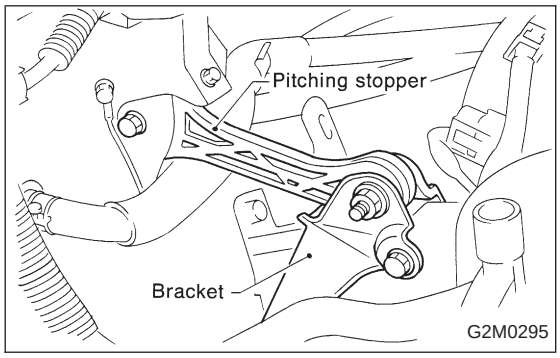
Fluid packing:
THREE BOND 1215 or equivalent



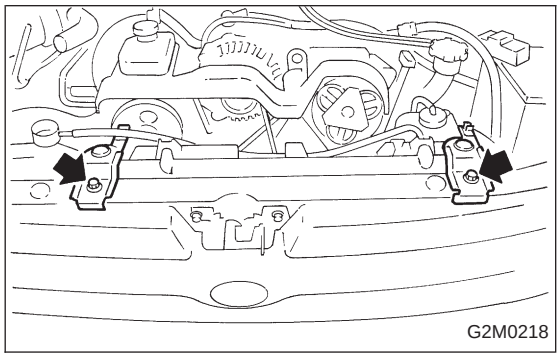
2. Oil Pan and Oil Strainer

A: REMOVAL

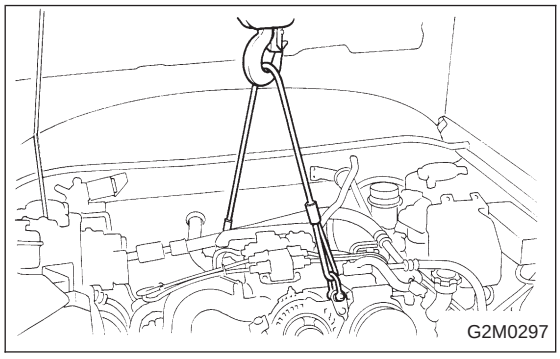
1) Remove front wheels.
2) Remove air intake duct and air intake chamber.
3) Disconnect connector from front oxygen sensor.



4) Remove pitching stopper.

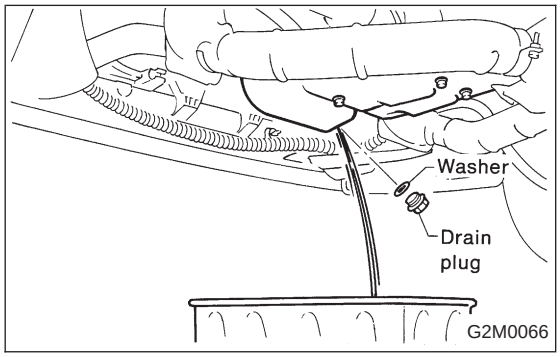


5) Remove radiator upper brackets.



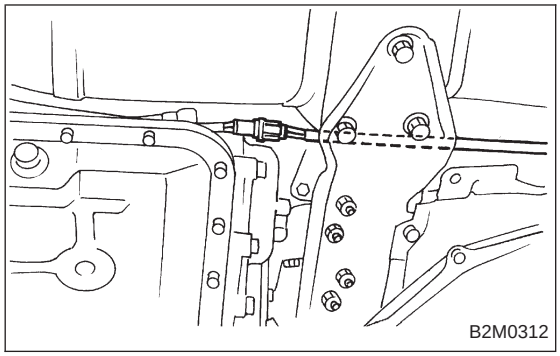
6) Support engine with a lifting device and wire ropes.
7) Lift-up the vehicle.

CAUTION:
At this time, raise up wire ropes.

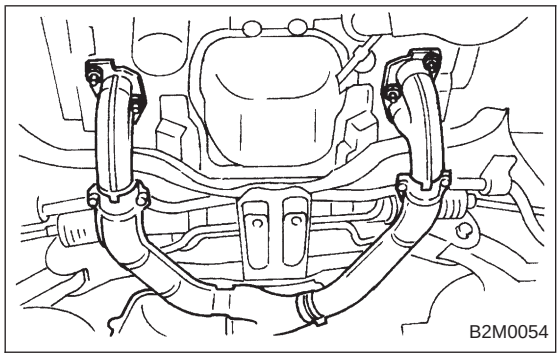


8) Drain engine oil.

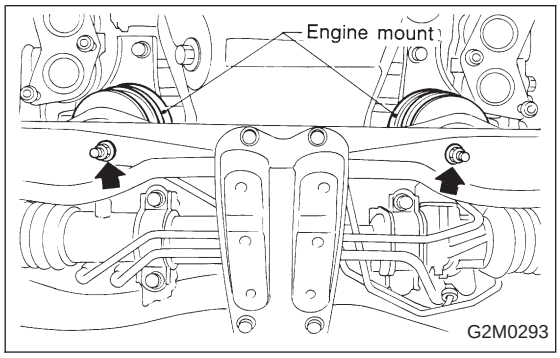
Set container under the vehicle, and remove drain plug from oil pan.


B2M0312

9) Disconnect connector from rear oxygen sensor.

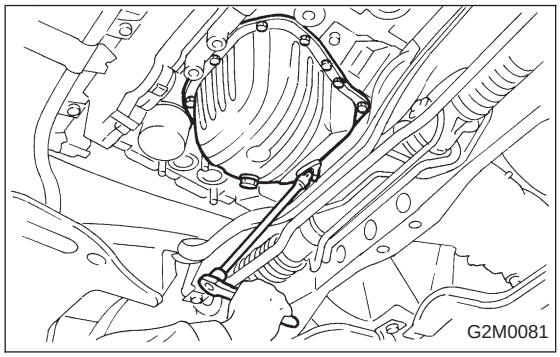

B2M0054

10) Remove front exhaust pipe.
(1) Separate front catalytic converter from center exhaust pipe.
(2) Remove front exhaust pipe from engine.
(3) Remove bolt which installs front exhaust pipe on bracket.



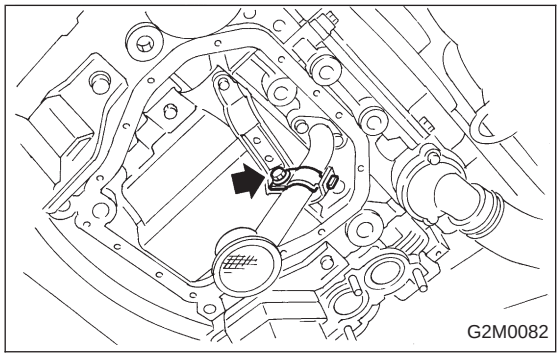
G2M0293

11) Remove nuts which install front cushion rubber onto front crossmember.

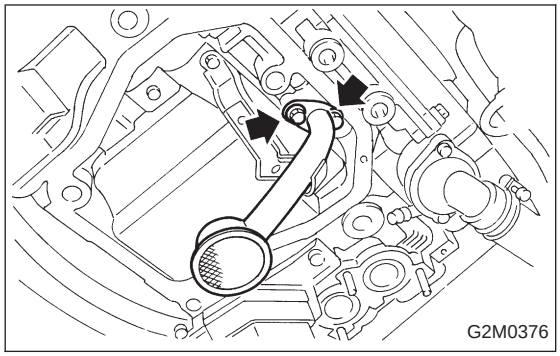

G2M0081

12) Remove bolts which install oil pan on cylinder block while raising up engine.
13) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

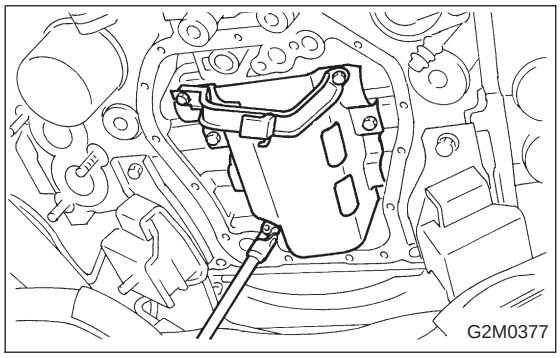
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.


G2M0082

14) Separate oil strainer from oil strainer stay.



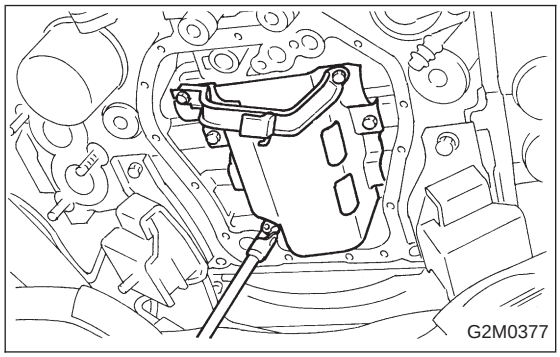
15) Remove oil strainer.



16) Remove baffle plate and oil strainer stay.

B: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

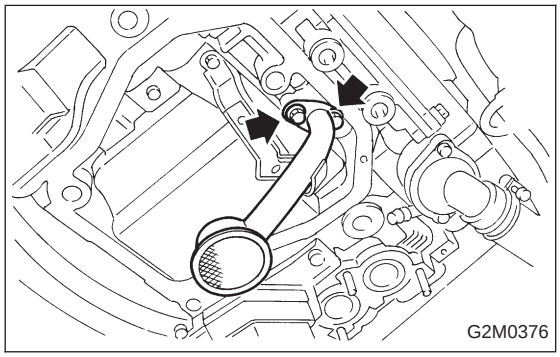


C: INSTALLATION

CAUTION:
Before installing oil pan, clean sealant from oil and engine block.

1) Install baffle plate and oil strainer stay.

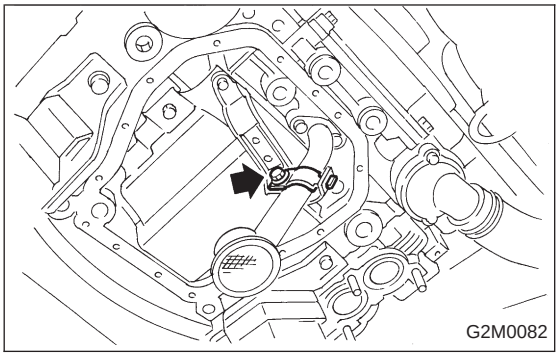
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



2) Install oil strainer onto baffle plate.

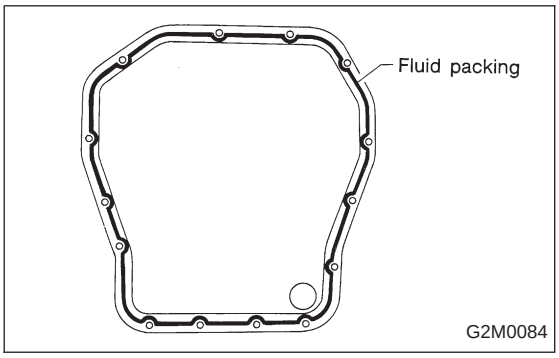
CAUTION:
Replace O-ring with a new one.

Tightening torque:
9.8 N·m (1.0 kg-m, 7 ft-lb)



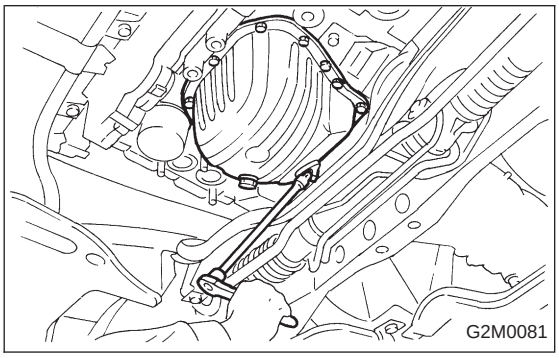
3) Hold oil strainer to oil strainer stay.

Tightening torque:
9.8 N·m (1.0 kg-m, 7 ft-lb)



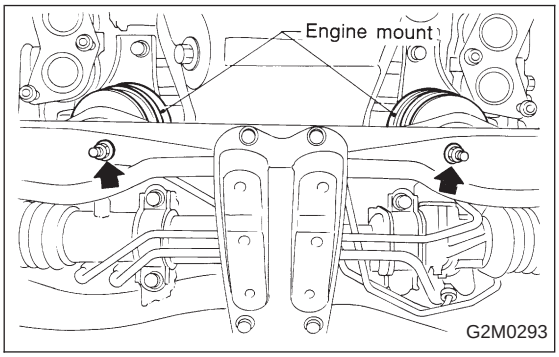
4) Apply fluid packing to mating surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



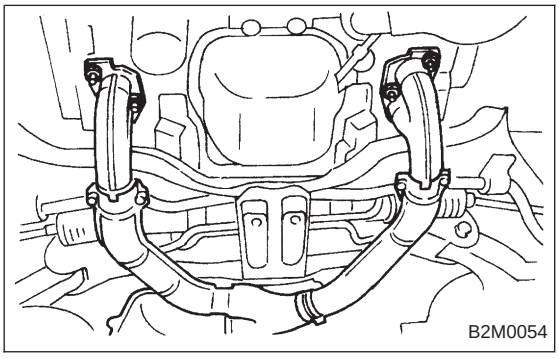
5) Tighten bolts which install oil pan onto engine block.

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



6) Lower engine onto front crossmember.
7) Tighten nuts which install front cushion rubber onto front crossmember.

Tightening torque:
69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)

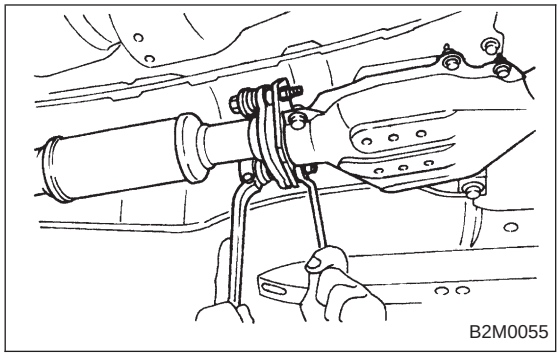


8) Install front exhaust pipe.

CAUTION:
Always use the new gaskets.

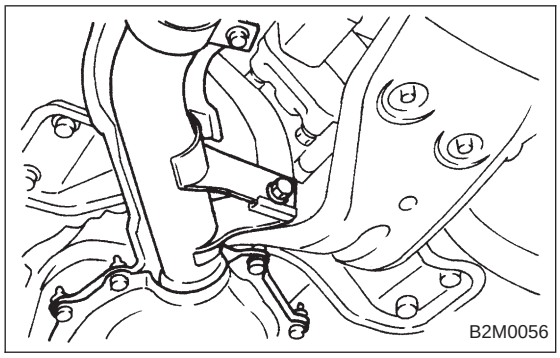
(1) Place front exhaust pipe on bracket.
(2) Tighten nuts which install front exhaust pipe on engine.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)



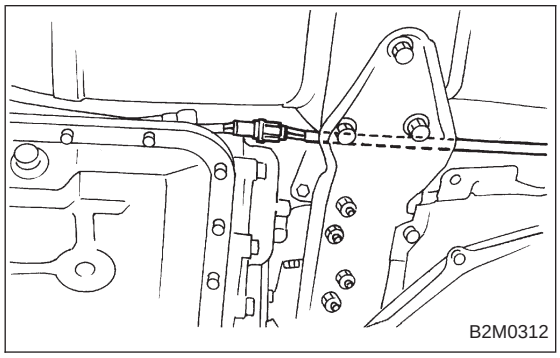
(3) Tighten nuts which install front catalytic converter to center exhaust pipe.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)

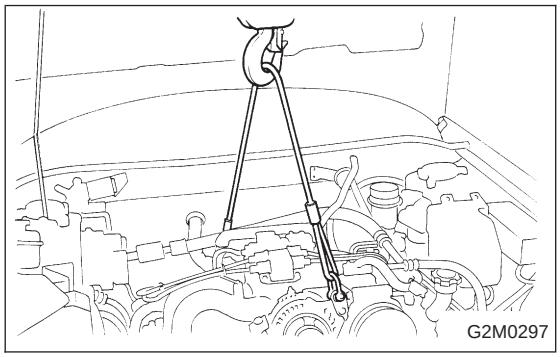


(4) Tighten bolt which installs front exhaust pipe on bracket.

Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)



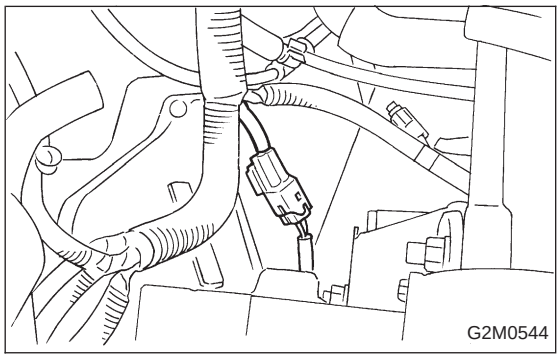
9) Connect connector to rear oxygen sensor.



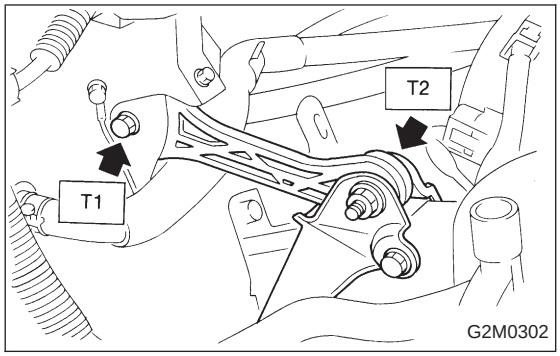
10) Lower the vehicle.

CAUTION:
At this time, lower lifting device and release steel cables.

11) Remove lifting device and steel cables.

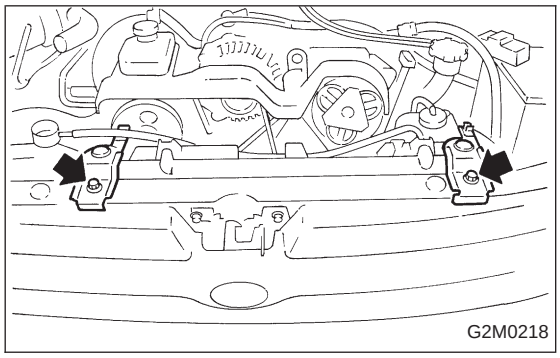


12) Connect connector to front oxygen sensor.



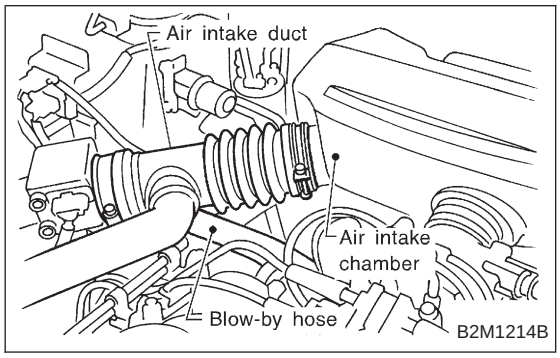
13) Install pitching stopper.

Tightening torque:
T1: 49±5 N·m (5.0±0.5 kg-m, 36.2±3.6 ft-lb)
T2: 57±10 N·m (5.8±1.0 kg-m, 42±7 ft-lb)

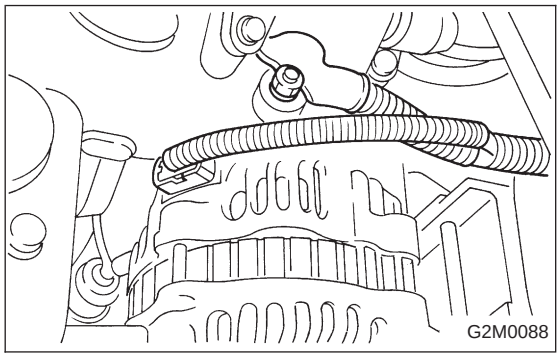


14) Install radiator upper brackets.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13±4 ft-lb)



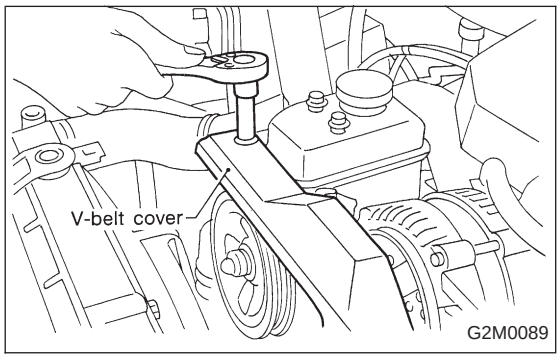
15) Install air intake duct and air intake chamber.



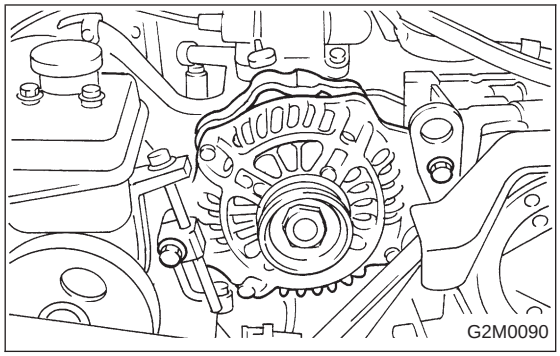
3. Oil Pressure Switch

A: REMOVAL

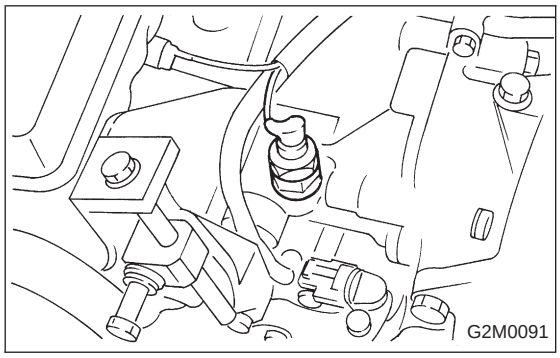
1) Remove alternator from bracket.
(1) Disconnect connector and terminal from generator.



(2) Remove V-belt cover.
(3) Loosen lock bolt and slider bolt, and remove front side V-belt.

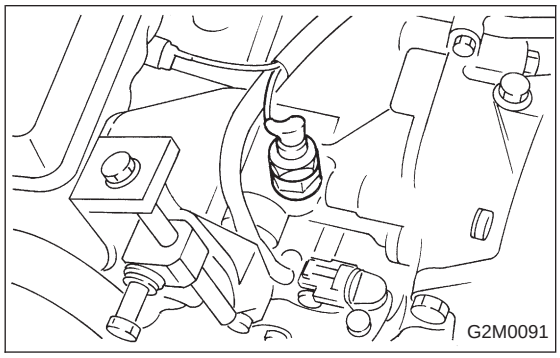


(4) Remove bolts which install generator on bracket.



2) Disconnect terminal from oil pressure switch.
3) Remove oil pressure switch.

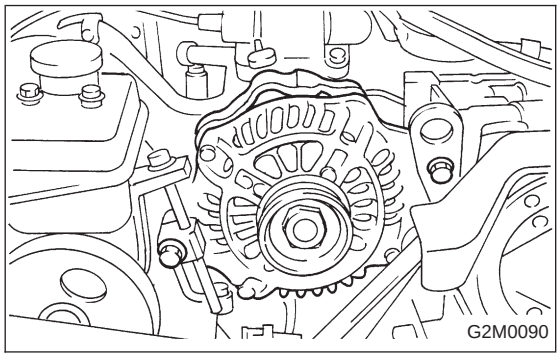
B: INSTALLATION



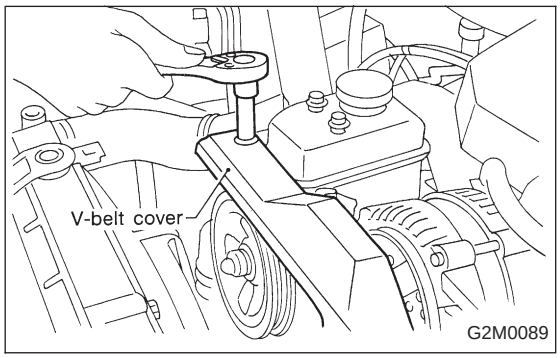
1) Install oil pressure switch onto engine block.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

2) Connect terminal of oil pressure switch.

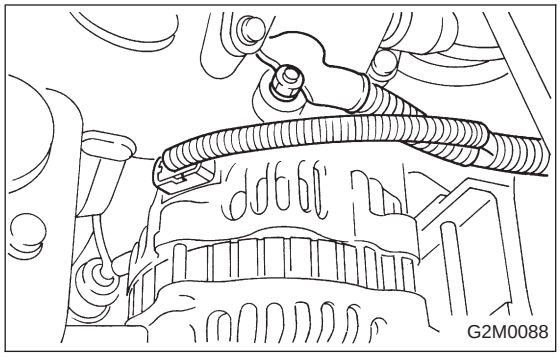


3) Install generator on bracket and temporary tighten installing bolts.



4) Install front side V-belt and adjust it.
<Ref. to 1-5 [01B0].>

5) Install V-belt cover.



6) Connect connector and terminal to generator.

1. Engine Lubrication System Trouble in General

Before troubleshooting, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2)

ENGINE COOLING SYSTEM 2-5

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1. Engine Cooling System Trouble in General 18

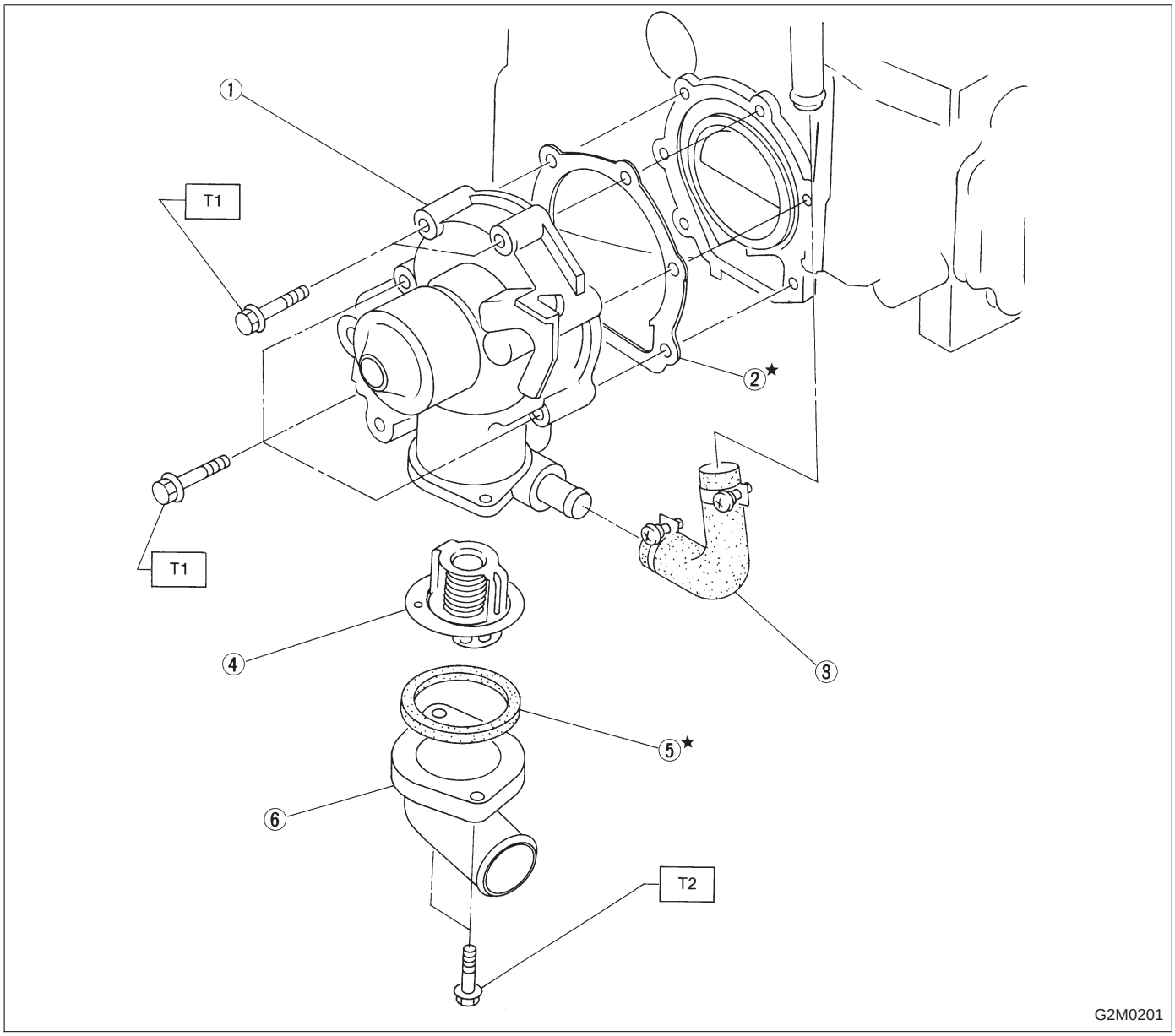
1. Specifications

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)		1800 cc	6.2 (6.6, 5.5)
		2200 cc	5.8 (6.1, 5.1)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—total engine coolant head	760 rpm — 0.3 mAq (1.0 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—total engine coolant head	3,000 rpm — 5.0 mAq (16.4 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—total engine coolant head	6,000 rpm — 23.0 mAq (75.5 ftAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		90 W
	Fan diameter x Blade		320 mm (12.60 in) x 5
Radiator	Type		Down flow, pressure type
	Core dimensions		691 x 340 x 16 mm (27.20 x 13.39 x 0.63 in)
	Pressure range in which cap valve is open		Above: 88±10 kPa (0.9±0.1 kg/cm^2, 12.8±1.4 psi) Below: −4.9 to −9.8 kPa (−0.05 to −0.1 kg/cm^2, −0.7 to −1.4 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

2. Service Data

Water pump	Clearance between impeller and case	Standard Limit	0.5 — 0.7 mm (0.020 — 0.028 in) 1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)

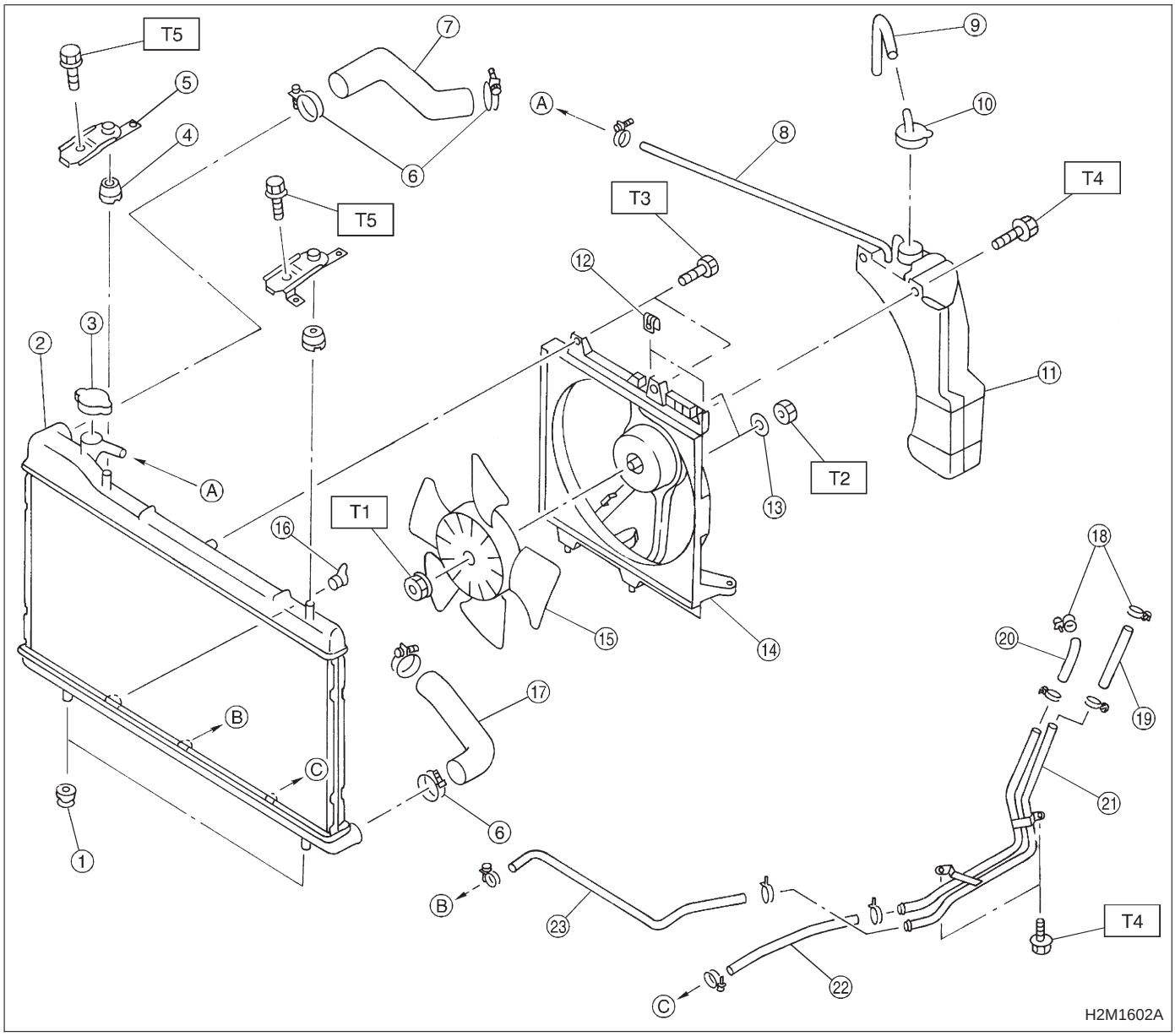
1. Water Pump



① Water pump ASSY
② Gasket
③ Heater hose
④ Thermostat
⑤ Gasket
⑥ Thermostat case

Tightening torque: N·m (kg-m, ft-lb)
T1: First 10^{+4}_{-0} ($1.0^{+0.4}_{-0}$, $7.2^{+2.9}_{-0}$)
Second 10^{+4}_{-0} ($1.0^{+0.4}_{-0}$, $7.2^{+2.9}_{-0}$)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)

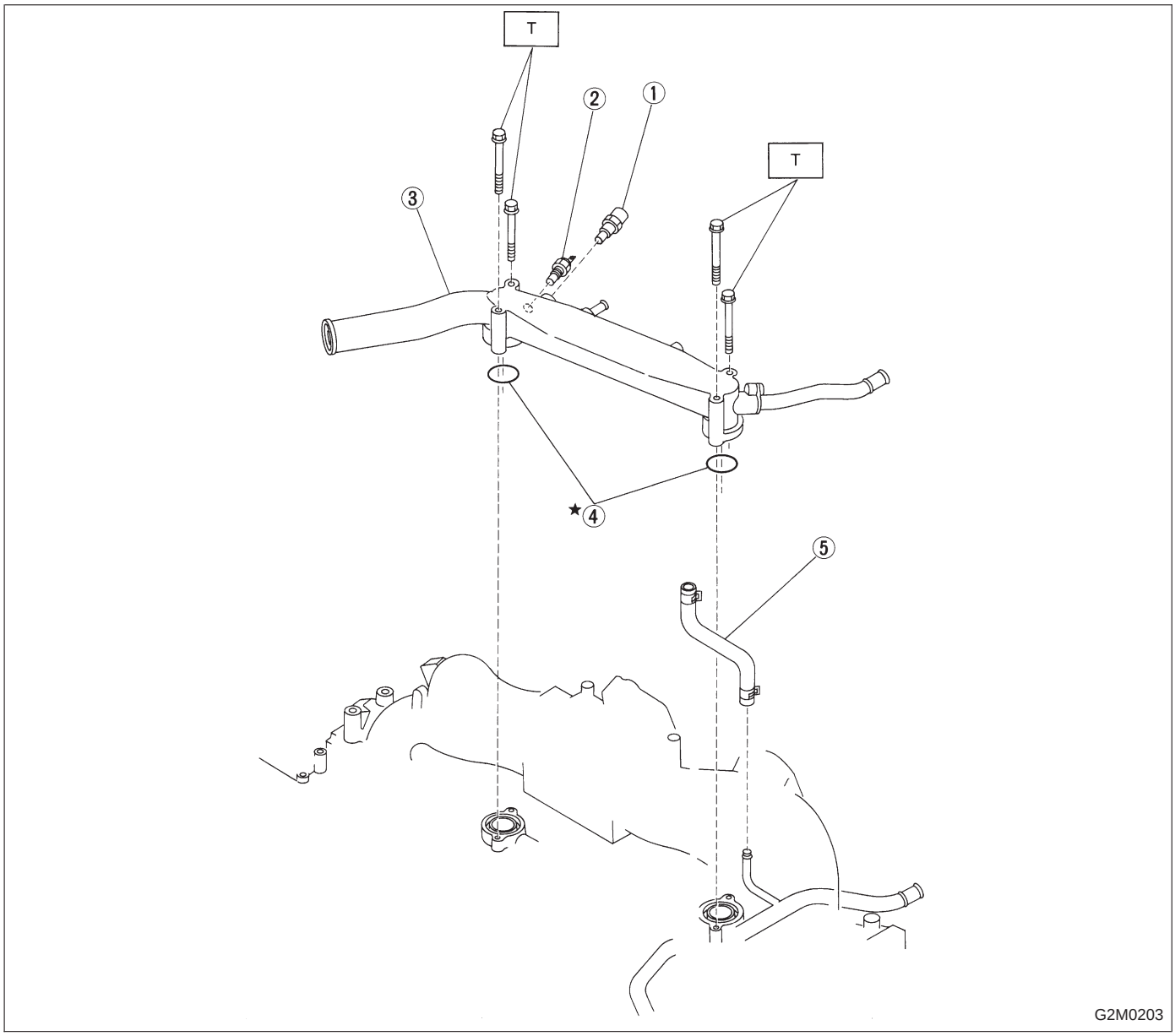
2. Radiator and Radiator Fan



① Radiator lower cushion
② Radiator
③ Radiator cap
④ Radiator upper cushion
⑤ Radiator upper bracket
⑥ Clamp
⑦ Radiator inlet hose
⑧ Over flow hose
⑨ Air vent hose
⑩ Engine coolant reservoir tank cap
⑪ Engine coolant reservoir tank
⑫ Clip
⑬ Washer
⑭ Radiator main fan motor ASSY
⑮ Radiator main fan
⑯ Radiator drain plug
⑰ Radiator outlet hose
⑱ ATF hose clamp
⑲ ATF inlet hose A
⑳ ATF outlet hose A
㉑ ATF pipe
㉒ ATF outlet hose B
㉓ ATF inlet hose B

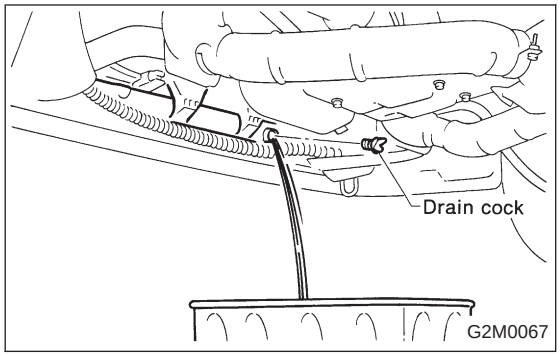
Tightening torque: N·m (kg-m, ft-lb)
T1: 2.0±0.5 (0.2±0.05, 1.4±0.4)
T2: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T3: 3.9±1.0 (0.4±0.1, 2.9±0.7)
T4: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T5: 18±5 (1.8±0.5, 13.0±3.6)

3. Water Pipe



① Engine coolant temperature sensor
② Engine coolant temperature gauge
③ Water pipe
④ O-ring
⑤ By-pass hose

Tightening torque: N·m (kg-m, ft-lb)
T: 6.4±0.5 (0.65±0.05, 4.7±0.4)



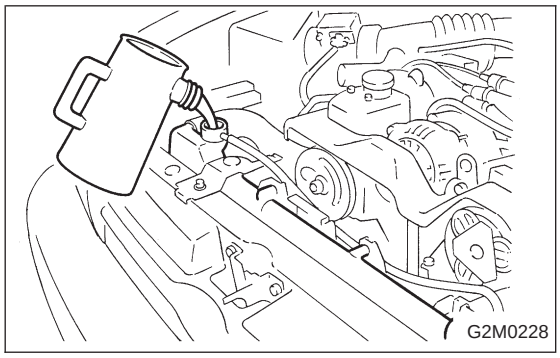
1. On-Car Service

A: DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.

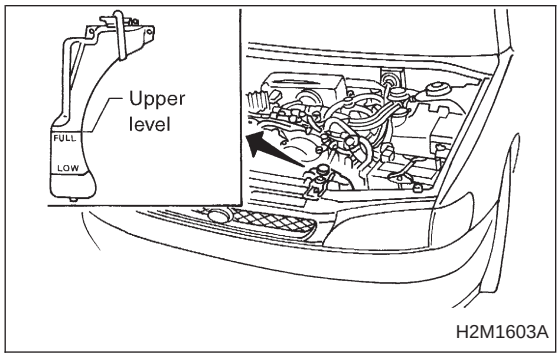
2) Loosen drain cock to drain engine coolant into container.

NOTE:
Remove radiator cap so that engine coolant will drain faster.



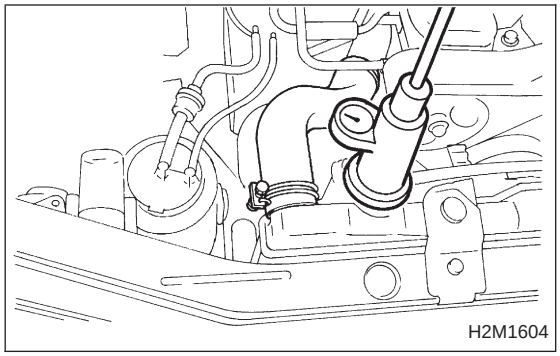
B: FILLING OF ENGINE COOLANT

1) Fill engine coolant into radiator up to filler neck position.



2) Fill engine coolant into reservoir tank up to upper level.

3) Attach radiator cap and reservoir tank cap properly.
4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
5) Stop engine and wait until temperature drops to a safe level.
6) If engine coolant level drops in radiator, add engine coolant to filler neck position.
7) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
8) Attach radiator cap and reservoir tank cap properly.


H2M1604

C: CHECKING OF COOLING SYSTEM

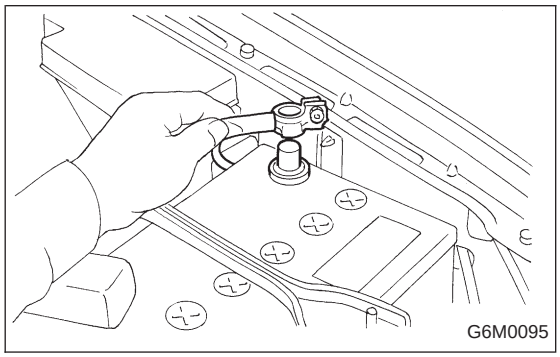
1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

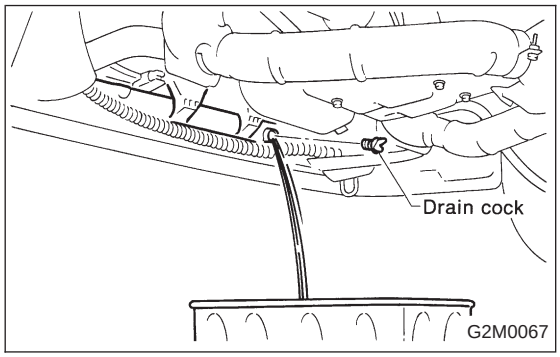
CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

2. Water Pump

A: REMOVAL AND INSTALLATION

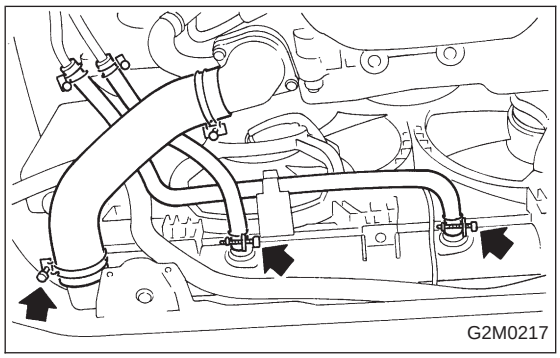
1) Open front hood.
2) Disconnect ground cable from the battery.


G6M0095

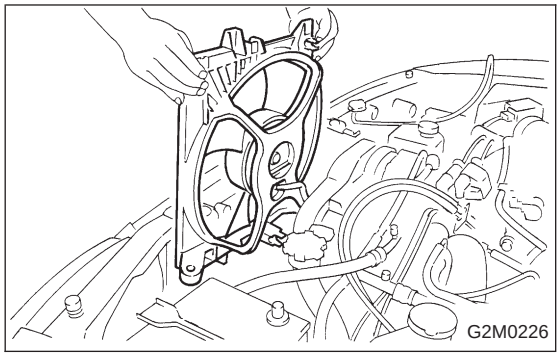


G2M0067

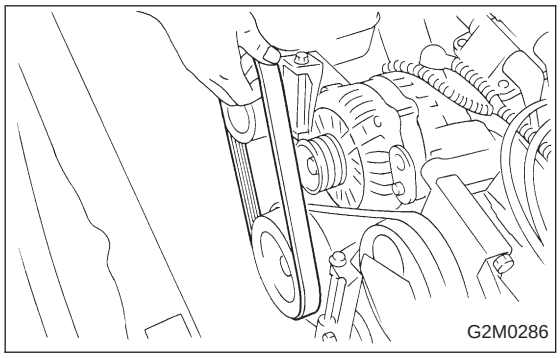
3) Drain engine coolant completely.
NOTE:
Set container under the vehicle, and remove drain cock from radiator.


G2M0217

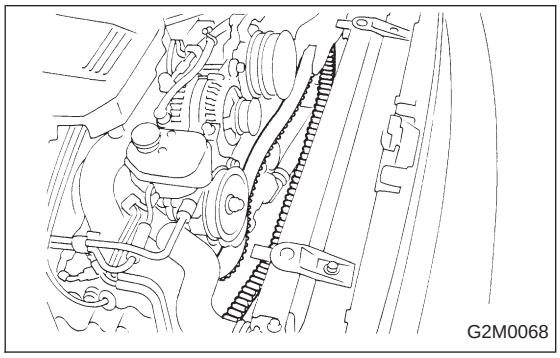
4) Disconnect radiator outlet hose from water pump.



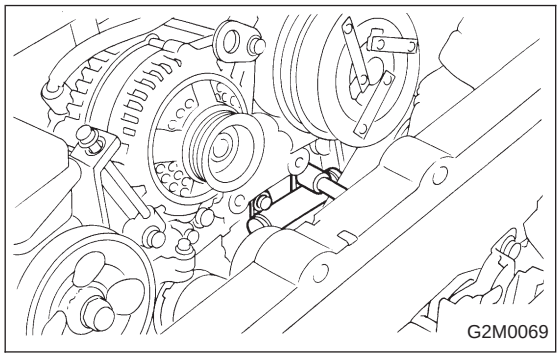
5) Remove radiator fan motor assembly.
<Ref. to 2-5 [W6A0].>



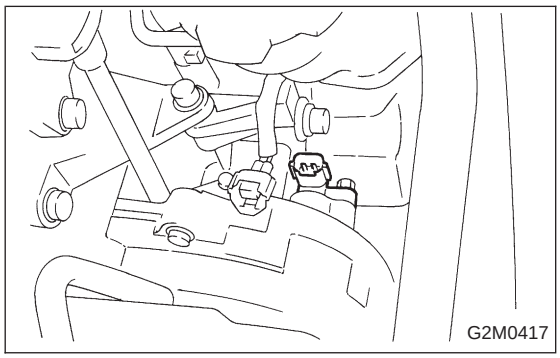
6) Remove V-belt(s).
<Ref. to 1-5 [02B0].>



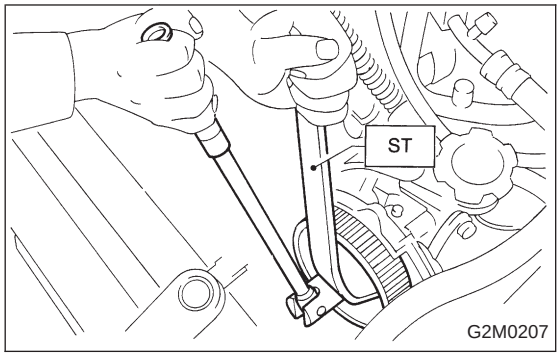
7) Remove timing belt.
<Ref. to 1-5 [03A0].>



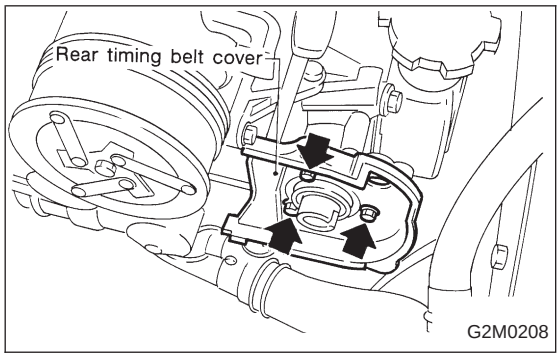
8) Remove belt tension adjuster.



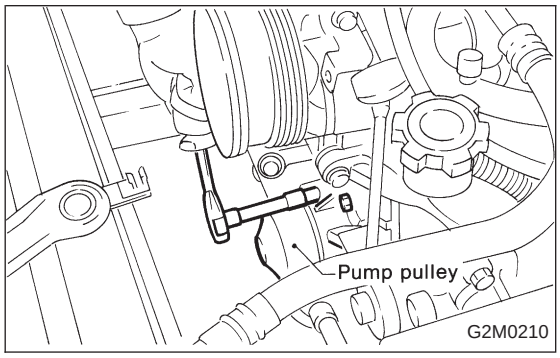
9) Remove camshaft position sensor.



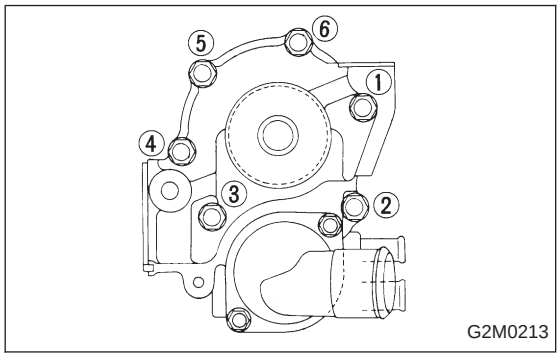
10) Remove left-hand camshaft sprocket by using ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH



11) Remove left-hand belt cover No. 2.



12) Remove tensioner bracket.
13) Disconnect heater hose from water pump.
14) Remove water pump.



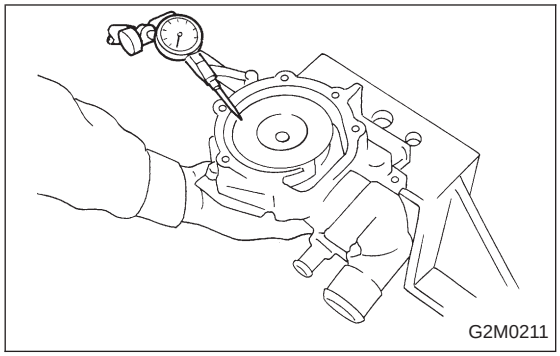
15) Installation is in the reverse order of removal.

CAUTION:
- **Replace gasket with a new one.**
- **When installing water pump, tighten bolts in two stages in numerical sequence as shown in figure.**

Tightening torque:
10^{+4}_{0} N·m ($1.0^{+0.4}_{0}$ kg-m, $7.2^{+2.9}_{0}$ ft-lb)

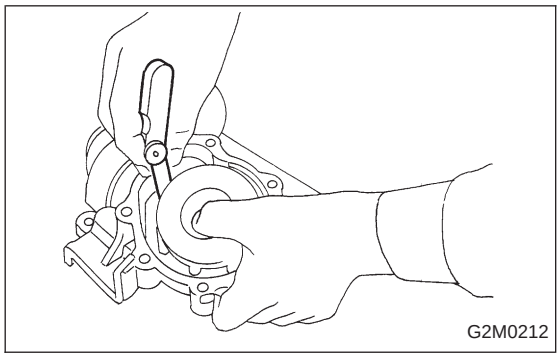
B: INSPECTION

1) Check water pump bearing for smooth rotation.
2) Check water pump pulley for abnormalities.


G2M0211

3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

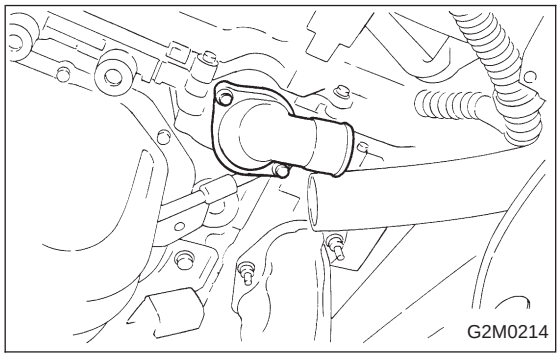
"Thrust" runout limit:
0.5 mm (0.020 in)


G2M0212

4) Check clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

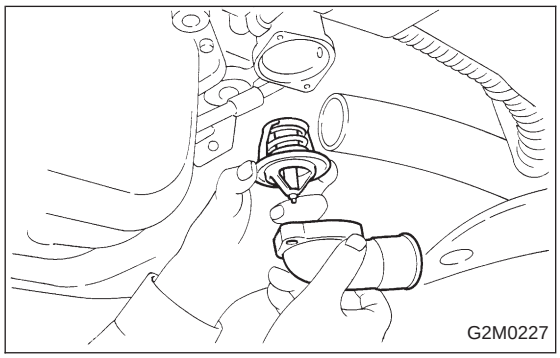
5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.


G2M0214

3. Thermostat

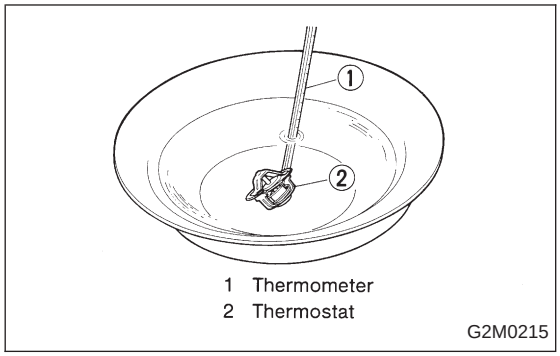
A: REMOVAL AND INSTALLATION

1) Drain engine coolant:
Set container under the vehicle, and remove drain cock from radiator.
2) Disconnect radiator outlet hose from thermostat cover.
3) Remove thermostat cover and gasket, and pull out the thermostat.


G2M0227

4) Install the thermostat in the intake manifold, and install the thermostat cover together with a gasket.

CAUTION:
- **When reinstalling the thermostat, use a new gasket.**
- **The thermostat must be installed with the jiggle pin upward.**
- **In this time, set the jiggle pin of thermostat for front side.**



1 Thermometer
2 Thermostat
G2M0215

B: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

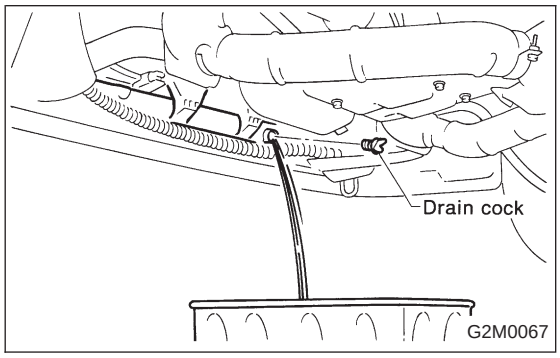
Starts to open:
76.0 — 80.0°C (169 — 176°F)

Fully opens:
91°C (196°F)

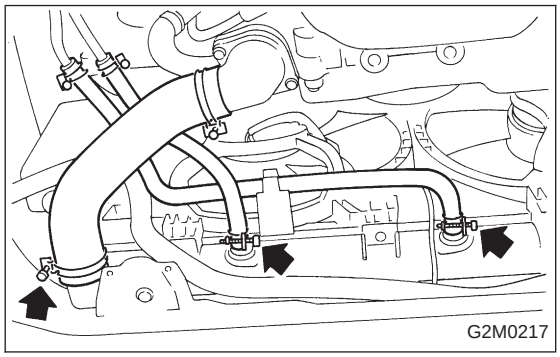
4. Radiator

A: REMOVAL

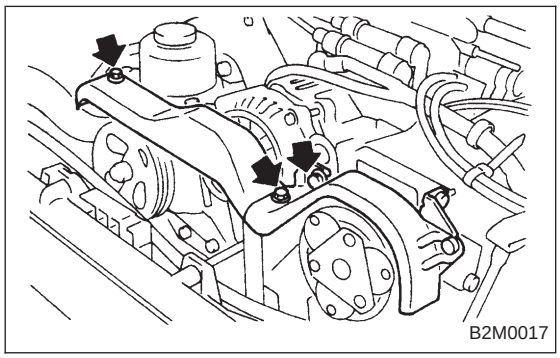
1) Disconnect battery cables and remove battery from body.
2) Drain engine coolant:
Set container under the vehicle, and remove drain cock from radiator.



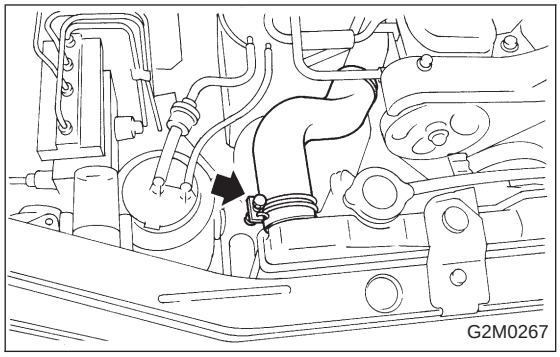
G2M0067


G2M0217

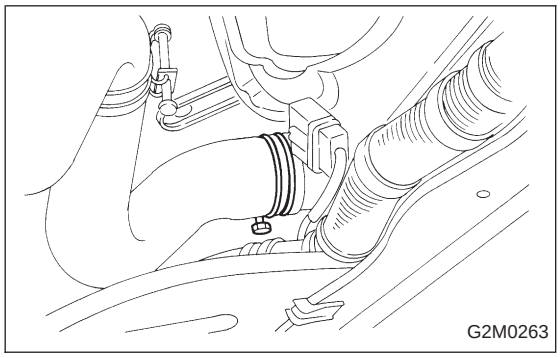
3) Disconnect radiator outlet hose from thermostat cover.
4) Disconnect ATF cooler hoses from radiator. (AT model)


B2M0017

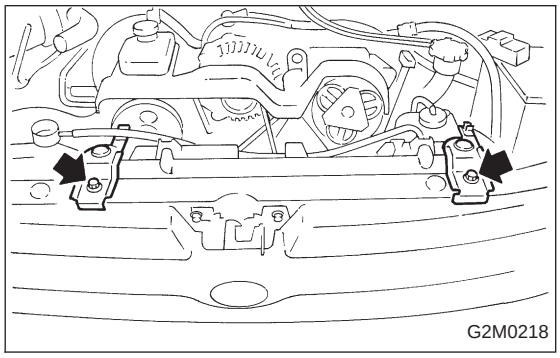
5) Remove V-belt cover.



6) Disconnect inlet hose from radiator.



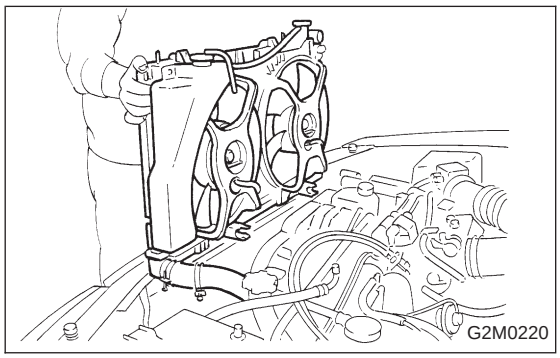
7) Disconnect connectors of radiator main fan and sub fan motor.



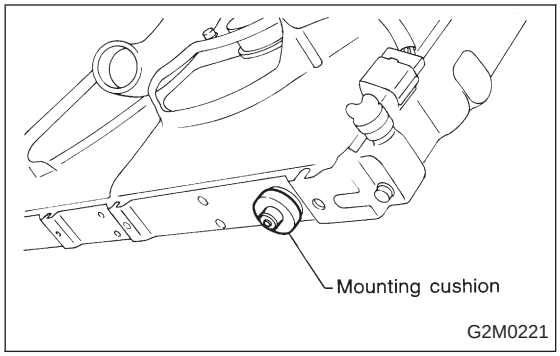
8) Remove radiator upper brackets.

NOTE:
Place left upper radiator bracket between grille and body.

9) While slightly lifting radiator, slide it to left.

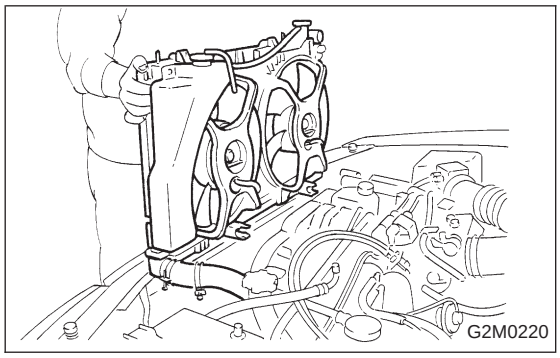


10) Lift radiator up and away from vehicle.

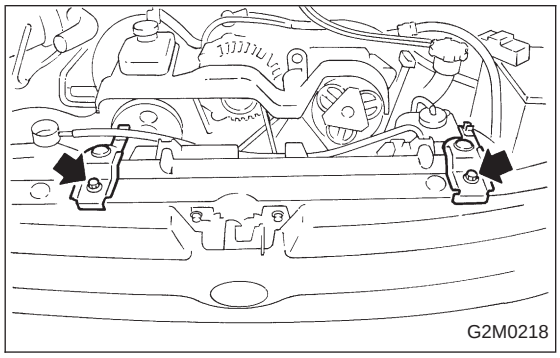


B: INSTALLATION

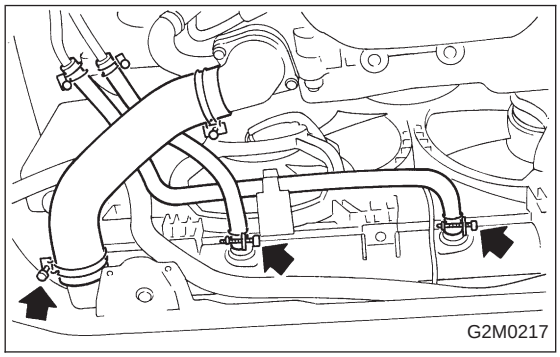
1) Attach radiator mounting cushions to pins on the lower side of radiator.



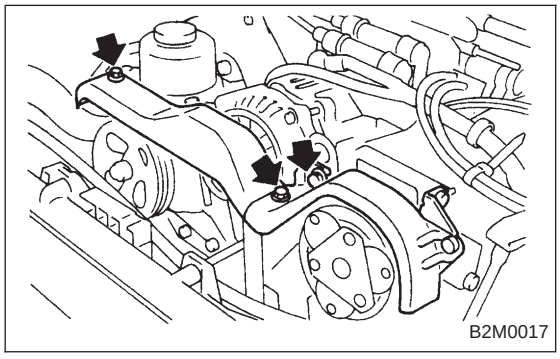
2) Fit cushions on lower side of radiator, into holes on body side and install radiator.



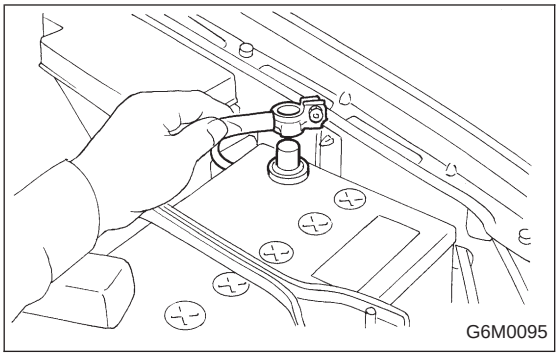
3) Install radiator brackets and tighten bolts.
4) Connect radiator main fan motor and sub fan motor connectors.



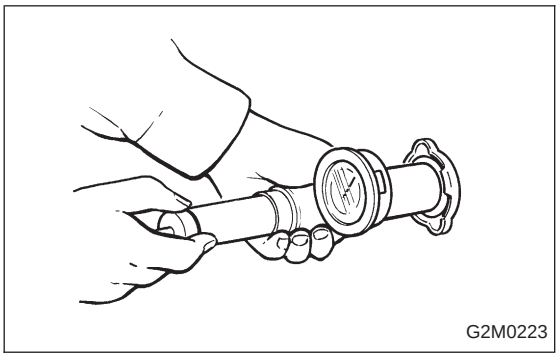
5) Connect radiator inlet and outlet hoses.
6) Connect ATF cooler hoses. (AT model)



7) Install V-belt cover.


G6M0095

8) Connect ground cable to battery terminal.


G2M0223

5. Radiator Cap

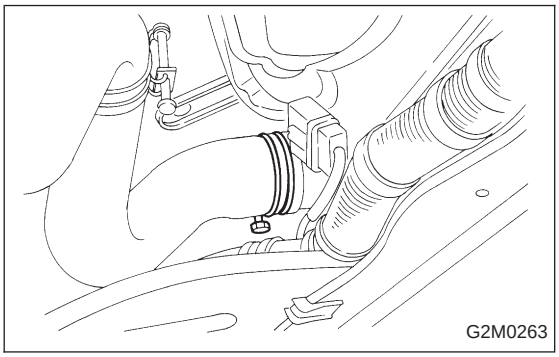
A: INSPECTION

1) Attach radiator cap to tester.
2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
78 — 98 kPa (0.8 — 1.0 kg/cm^2, 11 — 14 psi)

Service limit pressure:
69 kPa (0.7 kg/cm^2, 10 psi)

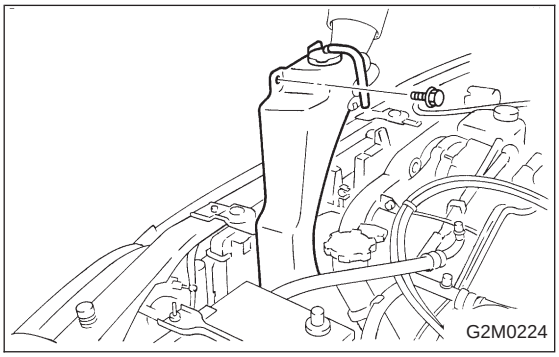
CAUTION:
Be sure to remove foreign matter and rust from the cap in advance; otherwise, results of pressure test will be incorrect.


G2M0263

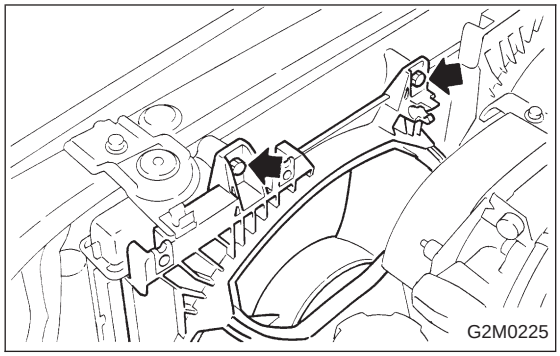
6. Radiator Fan and Fan Motor

A: REMOVAL AND INSTALLATION

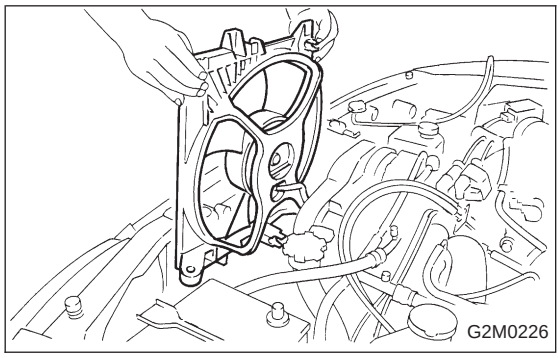
1) Disconnect ground cable from battery terminal.
2) Disconnect connector of fan motor.


G2M0224

3) Remove reservoir tank.


G2M0225

4) Remove two bolts holding shroud to radiator upper side.


G2M0226

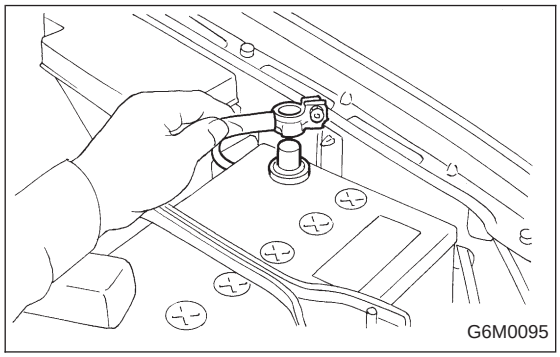
5) Remove radiator fan motor assembly.
6) Remove fan motor from shroud.

7) Installation is in the reverse order of removal procedures.

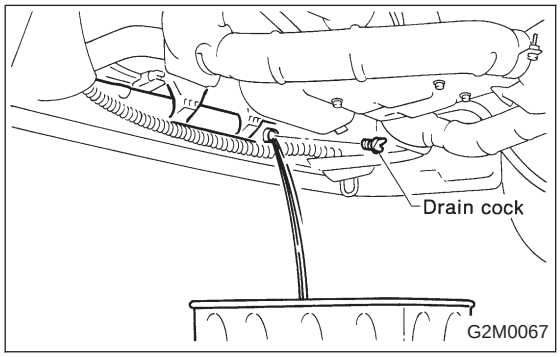
NOTE:
● Before installing radiator fan motor, apply a coat of sealant to threads and tighten nuts.
● Make sure radiator fan does not come into contact with shroud when installed.
● After installation, make sure there is no unusual noise or vibration when fan is rotated.

7. Water Pipe

A: REMOVAL

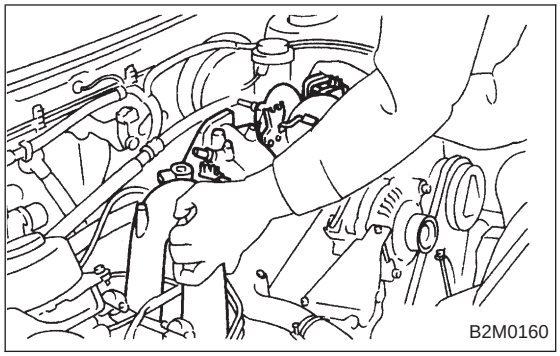

G6M0095

1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Disconnect ground cable from the battery.

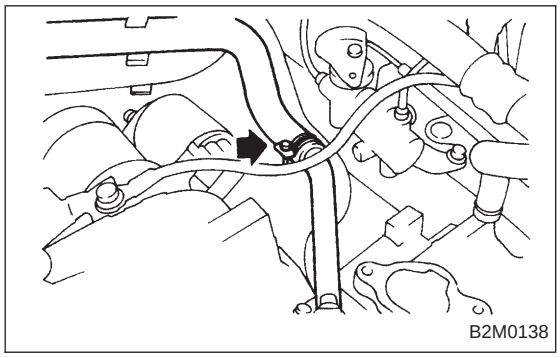


G2M0067

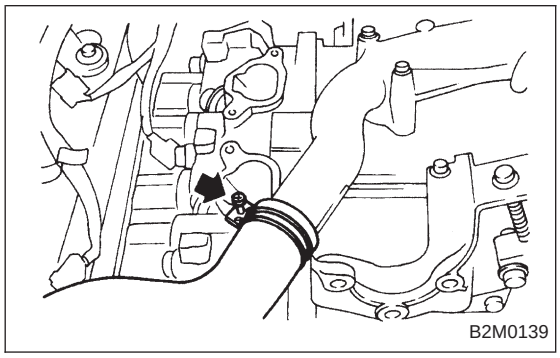
3) Drain engine coolant completely.
<Ref. to 2-5 [W1A0].>


B2M0160

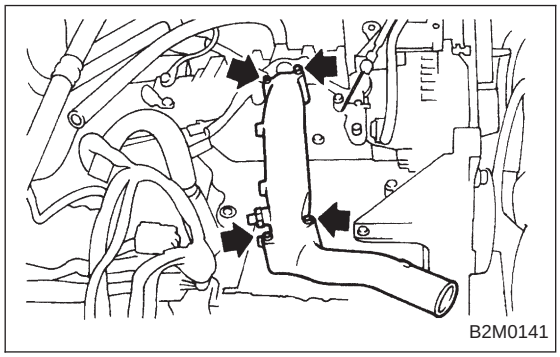
4) Remove intake manifold.
<Ref. to 2-7 [W4A0].>


B2M0138

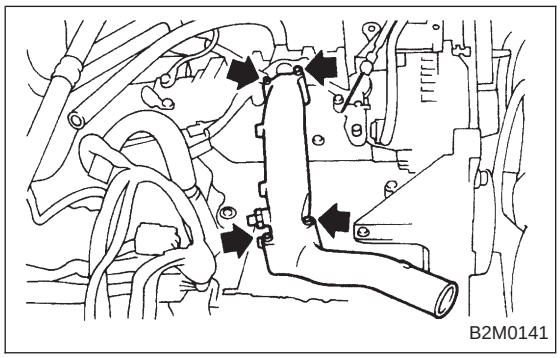
5) Disconnect heater inlet hose.


B2M0139

6) Disconnect radiator inlet hose from water pipe.


B2M0141

7) Remove bolts which install water pipe on cylinder block.

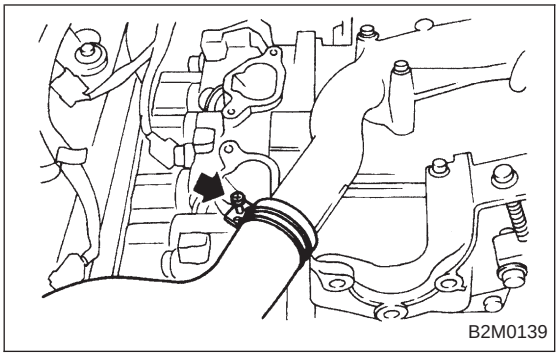

B2M0141

B: INSTALLATION

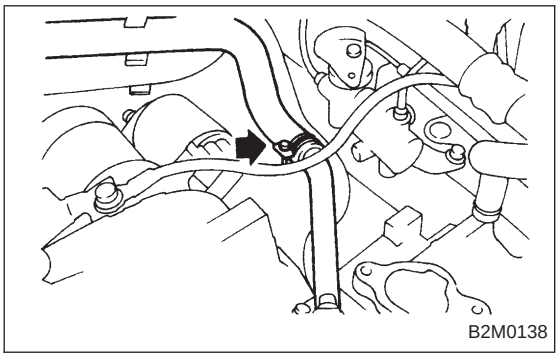
1) Install water pipe on cylinder block.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

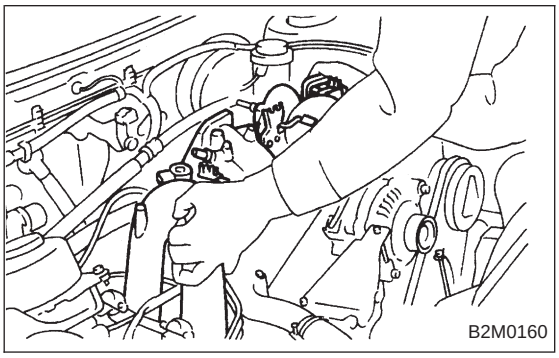
CAUTION:
Use a new O-ring.



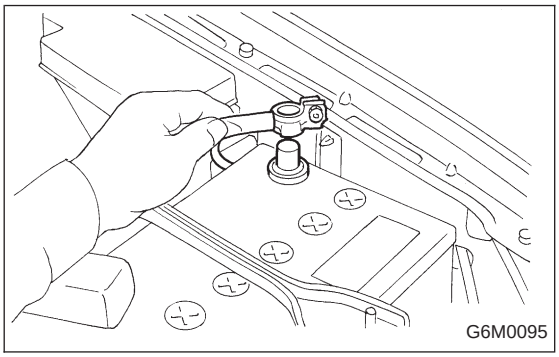
2) Connect radiator inlet hose.



3) Connect heater inlet hose.



4) Install intake manifold.
<Ref. to 2-7 [W4D0].>



5) Connect ground cable to battery terminal.

1. Engine Cooling System Trouble in General

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to 2-7 [T8D0].>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to 2-7 [T1000].>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Improper transmission oil	Replace.
	p. Defective thermostat	Replace.
	q. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

FUEL INJECTION SYSTEM 2-7

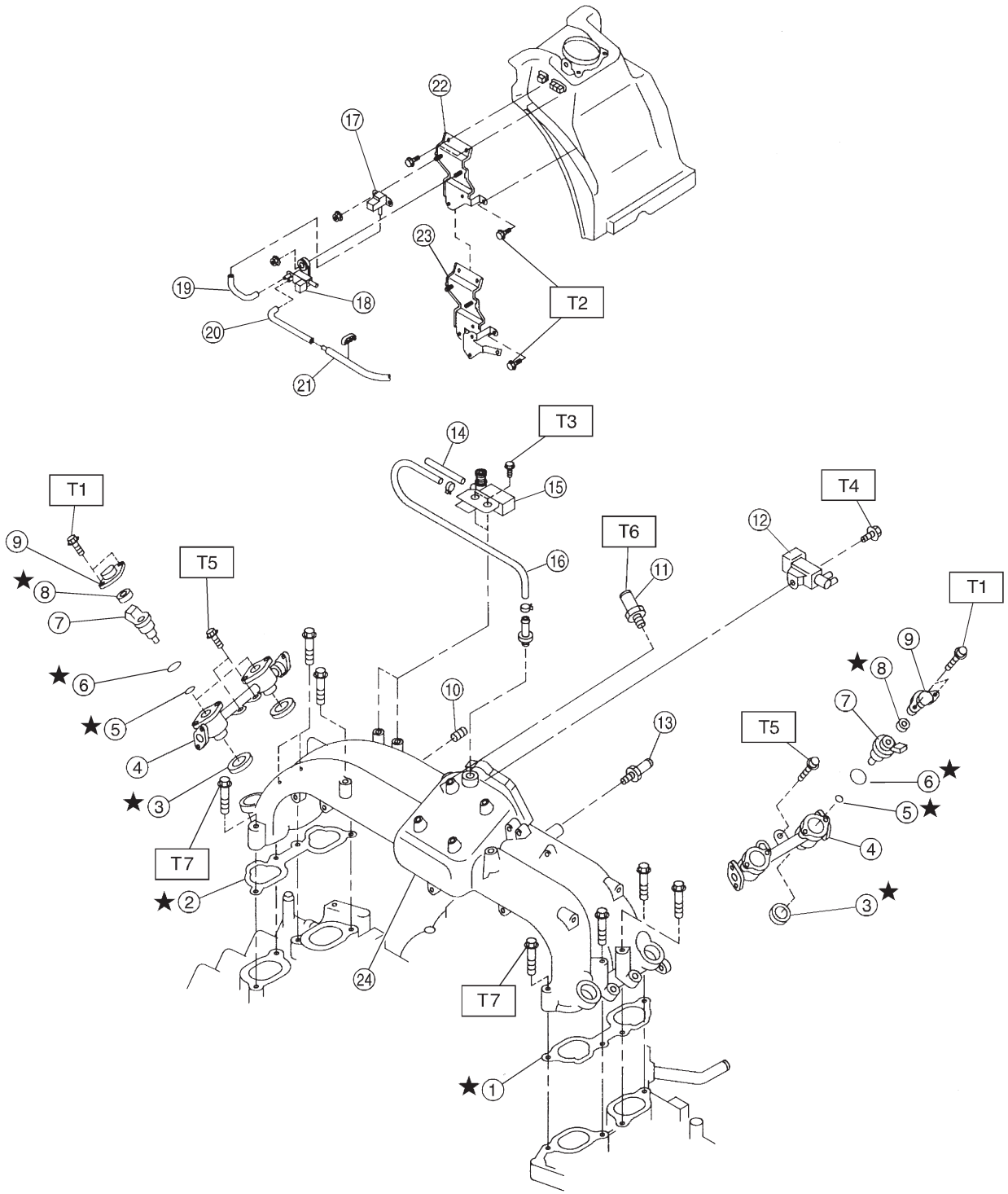
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3. Air Cleaner....8

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3. Throttle Body....11
4. Intake Manifold....13
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6. Crankshaft Position Sensor....38
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1. Intake Manifold

A: 1800 cc MODEL

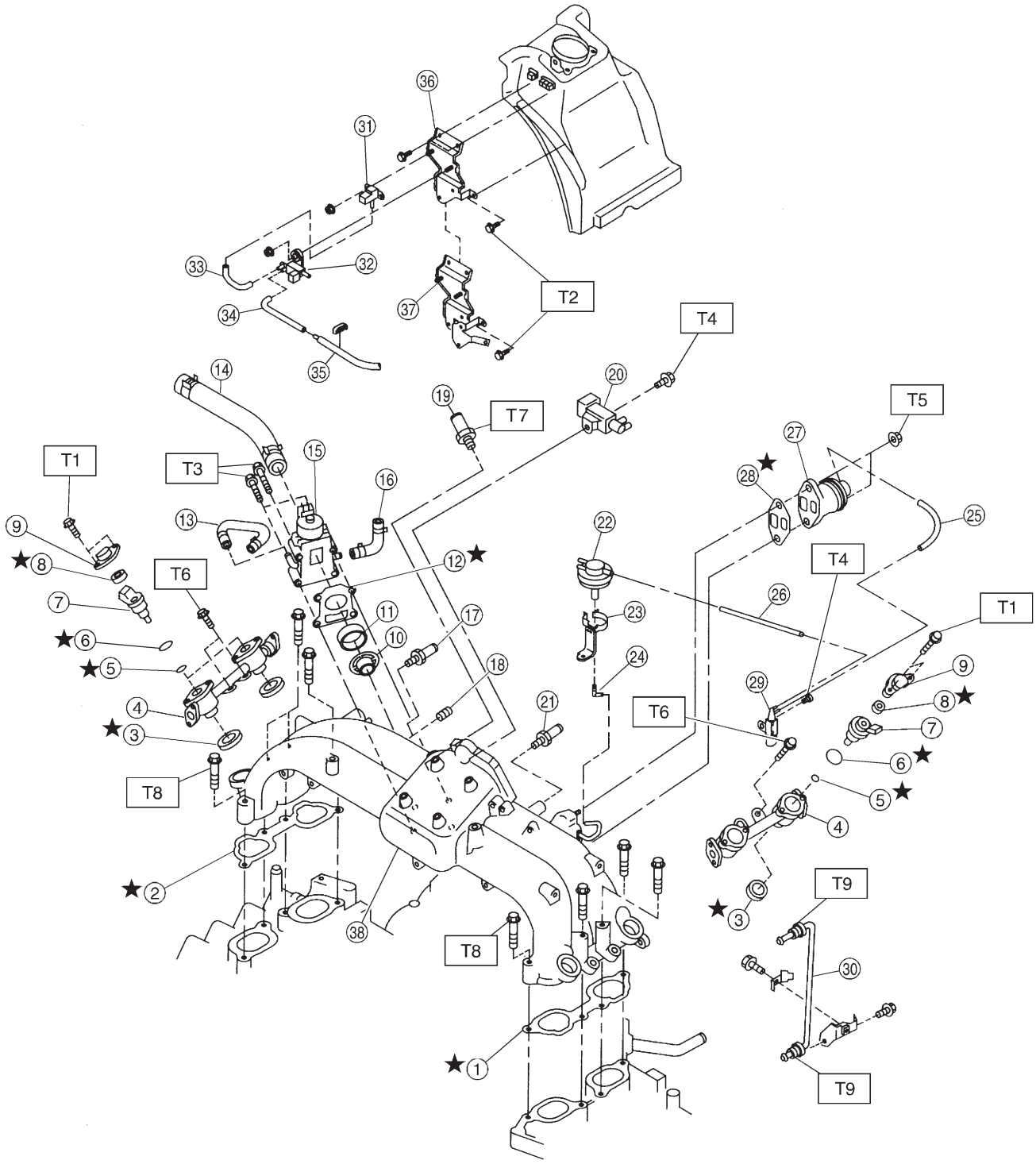


H2M1576A

① Intake manifold gasket LH
② Intake manifold gasket RH
③ Fuel injector pipe insulator
④ Fuel injector pipe
⑤ O-ring A
⑥ O-ring B
⑦ Fuel injector
⑧ Insulator
⑨ Fuel injector cap
⑩ Plug
⑪ PCV valve
⑫ Purge control solenoid valve
⑬ Nipple
⑭ FICD solenoid valve hose A (With A/C model)
⑮ FICD solenoid valve (With A/C model)
⑯ FICD solenoid valve hose B (With A/C model)
⑰ Pressure sensor
⑱ Pressure sources switching solenoid valve
⑲ Vacuum hose A
⑳ Vacuum hose B
㉑ Vacuum hose C
㉒ Bracket (Except Canada spec. vehicles)
㉓ Bracket (For Canada spec. vehicles)
㉔ Intake manifold

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T3: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T4: 16±1.5 (1.6±0.15, 11.6±1.1)
T5: 19±2 (1.9±0.2, 13.7±1.4)
T6: 23±3 (2.3±0.3, 16.6±2.2)
T7: 25±2 (2.5±0.2, 18.1±1.4)

B: 2200 cc MODEL

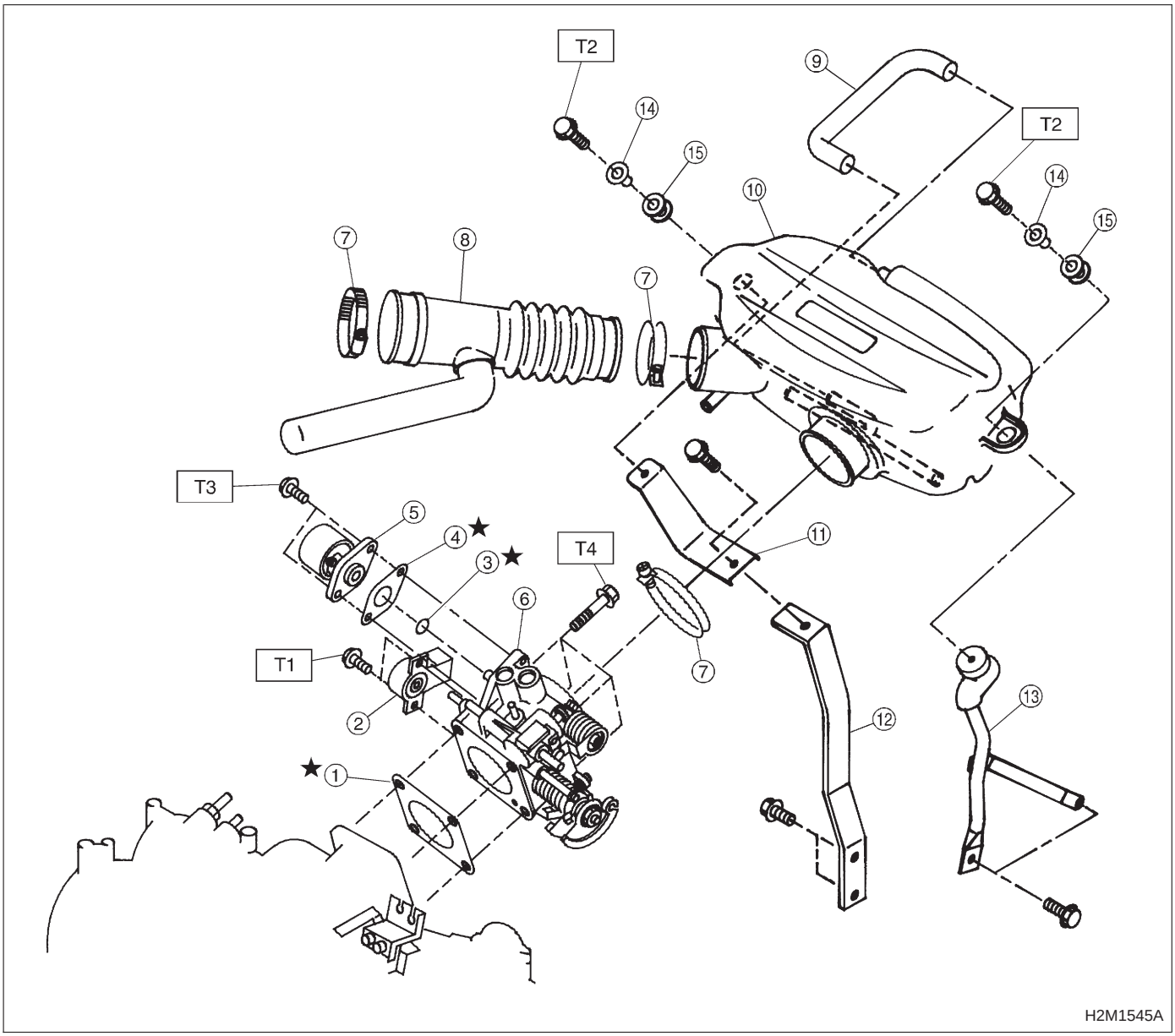


① Intake manifold gasket LH
② Intake manifold gasket RH
③ Fuel injector pipe insulator
④ Fuel injector pipe
⑤ O-ring A
⑥ O-ring B
⑦ Fuel injector
⑧ Insulator
⑨ Fuel injector cap
⑩ Plate
⑪ Sealing
⑫ Gasket
⑬ Engine coolant hose B
⑭ Air by-pass hose
⑮ Idle air control solenoid valve
⑯ Engine coolant hose A
⑰ Nipple (AT vehicles)
⑱ Plug
⑲ PCV valve
⑳ Purge control solenoid valve
㉑ Nipple
㉒ BPT (AT vehicles)
㉓ BPT holder bracket (AT vehicles)
㉔ Back pressure hose (AT vehicles)
㉕ EGR vacuum hose A (AT vehicles)
㉖ EGR vacuum hose B (AT vehicles)
㉗ EGR valve (AT vehicles)
㉘ Gasket (AT vehicles)
㉙ EGR solenoid valve (AT vehicles)
㉚ EGR pipe (AT vehicles)
㉛ Pressure sensor
㉜ Pressure sources switching solenoid valve
㉝ Vacuum hose A
㉞ Vacuum hose B
㉟ Vacuum hose C
㊱ Bracket (Except Canada spec. vehicles)
㊲ Bracket (For Canada spec. vehicles)
㊳ Intake manifold

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T3: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T4: 16±1.5 (1.6±0.15, 11.6±1.1)
T5: 19±1.5 (1.9±0.15, 13.7±1.1)
T6: 19±2 (1.9±0.2, 13.7±1.4)
T7: 23±3 (2.3±0.3, 16.6±2.2)
T8: 25±2 (2.5±0.2, 18.1±1.4)
T9: 34±2 (3.5±0.2, 25.3±1.4)

2. Air Intake System

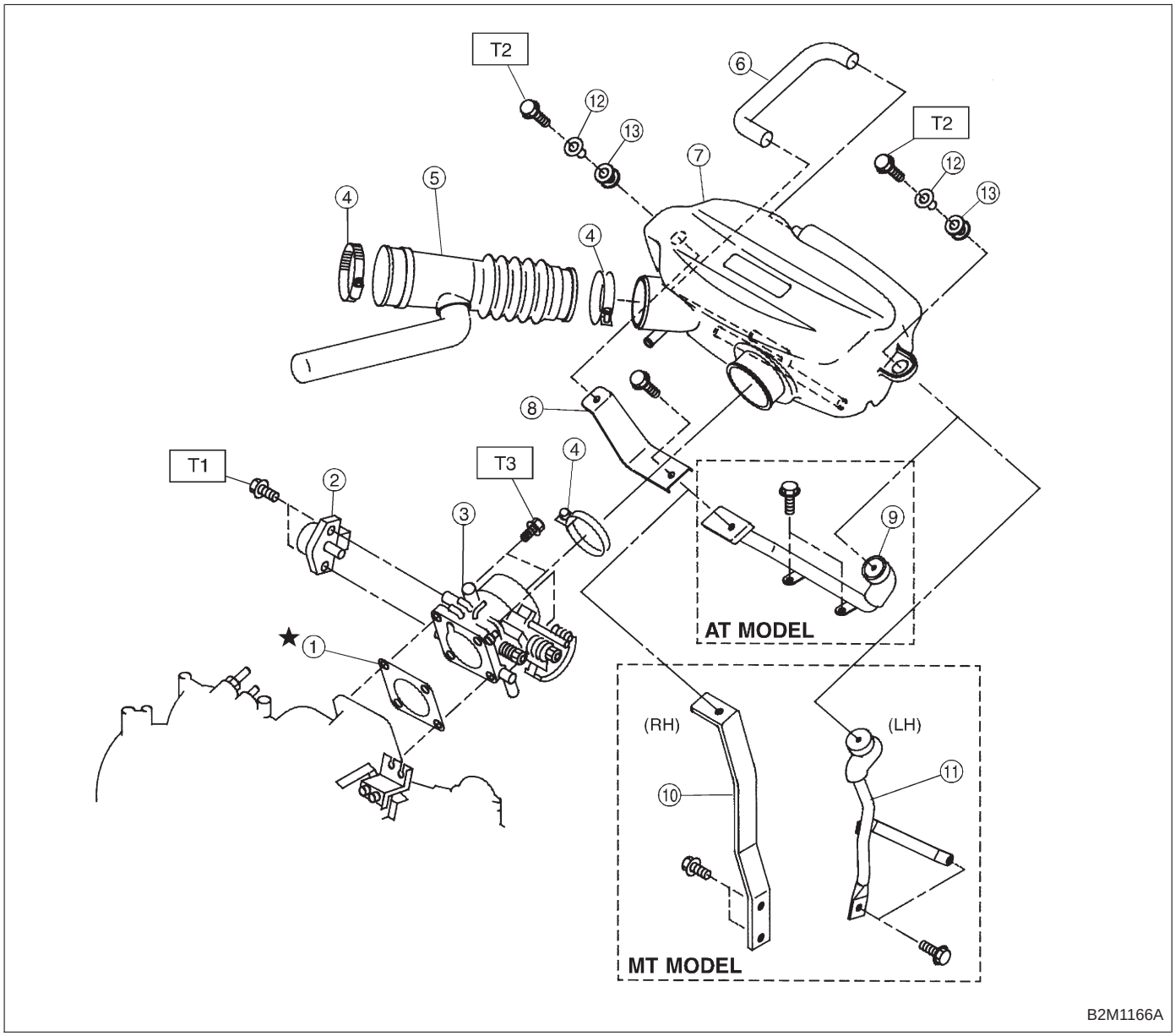
A: 1800 cc MODEL



① Gasket
② Throttle position sensor
③ O-ring
④ Gasket
⑤ Idle air control solenoid valve
⑥ Throttle body
⑦ Clamp
⑧ Air intake duct
⑨ By-pass hose
⑩ Air intake chamber
⑪ Stay A
⑫ Stay C (MT vehicles)
⑬ Stay D (MT vehicles)
⑭ Spacer
⑮ Bush

Tightening torque: N·m (kg-m, ft-lb)
T1: 2.2±0.2 (0.22±0.02, 1.6±0.1)
T2: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T3: 6.0±0.8 (0.61±0.08, 4.4±0.6)
T4: 22±2 (2.2±0.2, 15.9±1.4)

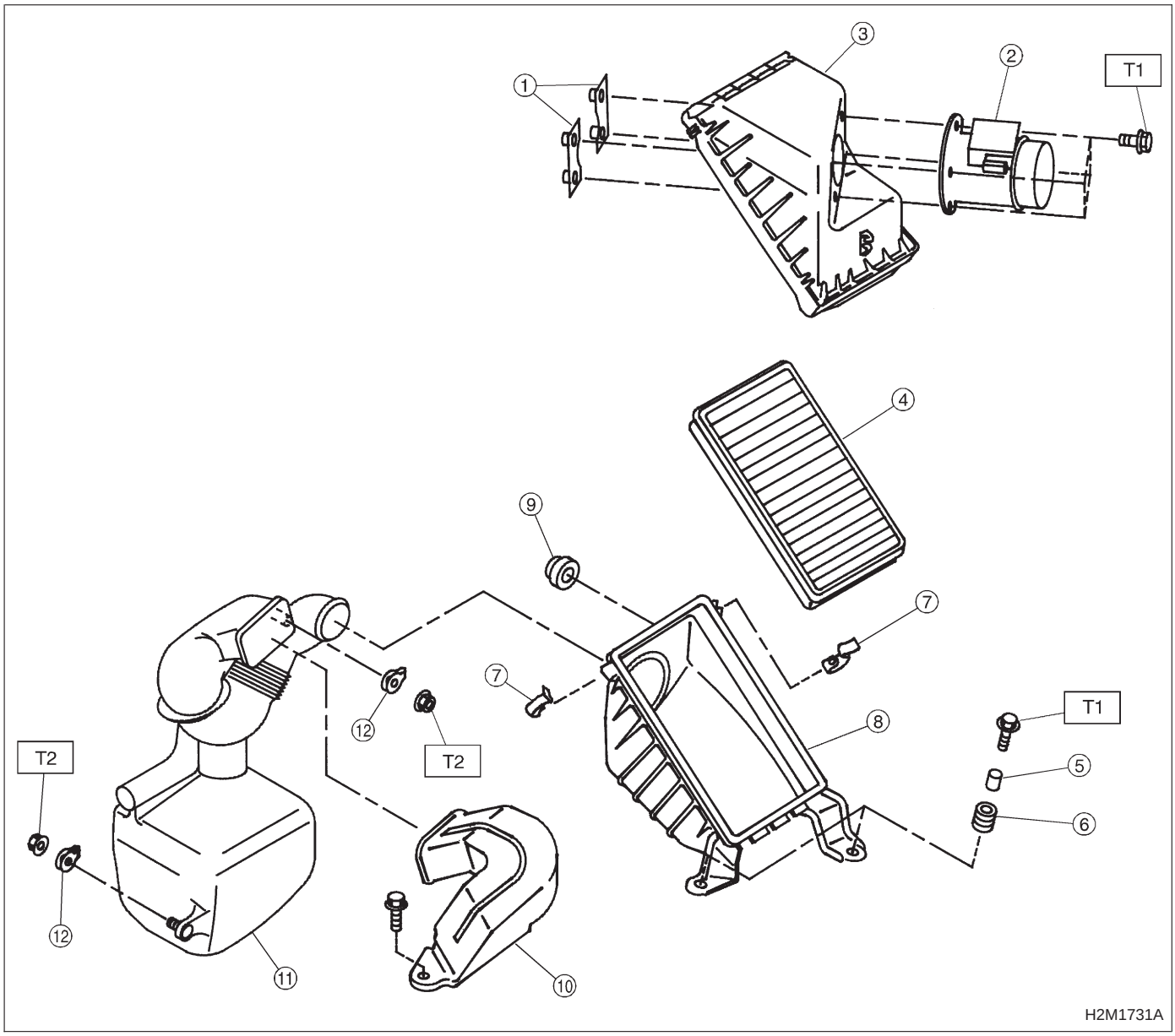
B: 2200 cc MODEL



① Gasket
② Throttle position sensor
③ Throttle body
④ Clamp
⑤ Air intake duct
⑥ By-pass hose
⑦ Air intake chamber
⑧ Stay A
⑨ Stay B (AT model)
⑩ Stay C (MT model)
⑪ Stay D (MT model)
⑫ Spacer
⑬ Bush

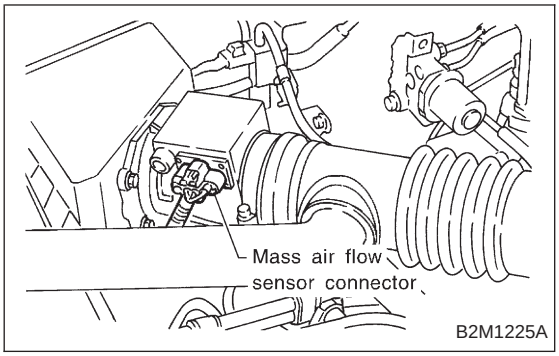
Tightening torque: N·m (kg-m, ft-lb)
T1: 2.2±0.2 (0.22±0.02, 1.6±0.1)
T2: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T3: 22±2 (2.2±0.2, 15.9±1.4)

3. Air Cleaner



① Mass air flow sensor bracket
② Mass air flow sensor ASSY
③ Air cleaner upper cover
④ Air cleaner element
⑤ Spacer
⑥ Bush
⑦ Clip
⑧ Air cleaner case
⑨ Cushion rubber
⑩ Air intake duct
⑪ Resonator chamber ASSY
⑫ Clip

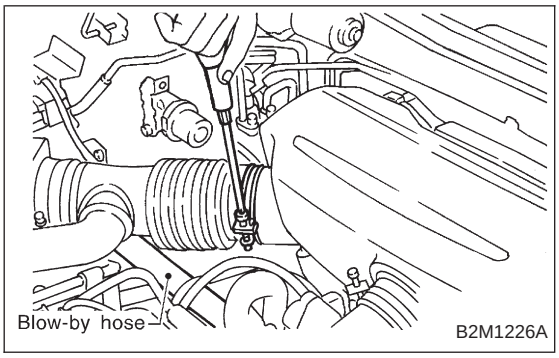
Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±10 (3.4±1.0, 25±7)



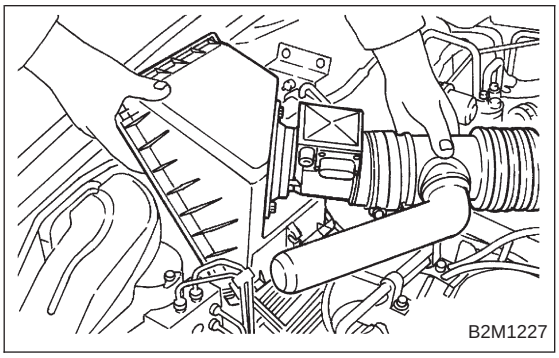
1. Air Cleaner and Air Intake Duct

A: REMOVAL AND INSTALLATION

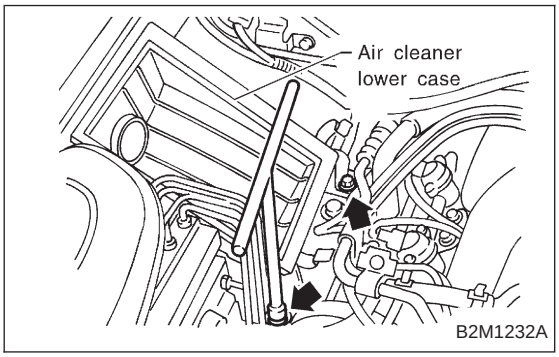
1) Disconnect connector from mass air flow sensor.



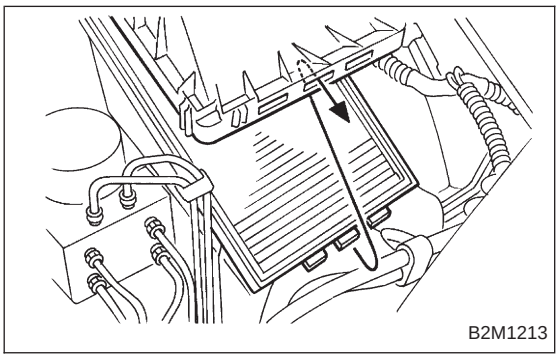
2) Loosen clamp which connects air intake duct to air intake chamber.
3) Remove two clips of air cleaner upper cover.
4) Disconnect blow-by hose from air intake duct.



5) Remove air intake duct and air cleaner upper cover as a unit.
6) Remove air cleaner element.

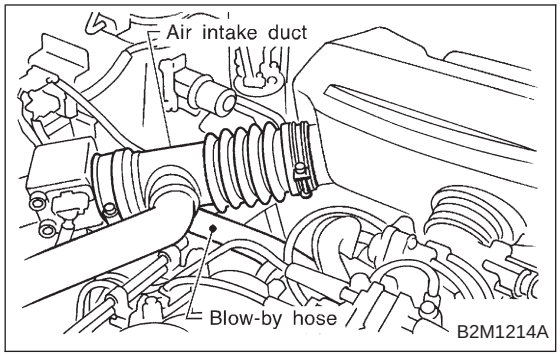


7) Remove air cleaner lower case.



8) Installation is in the reverse order of removal.

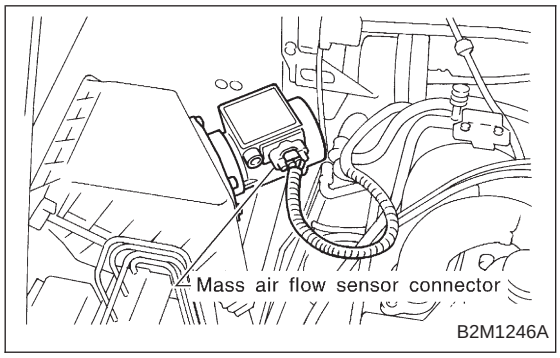
CAUTION:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



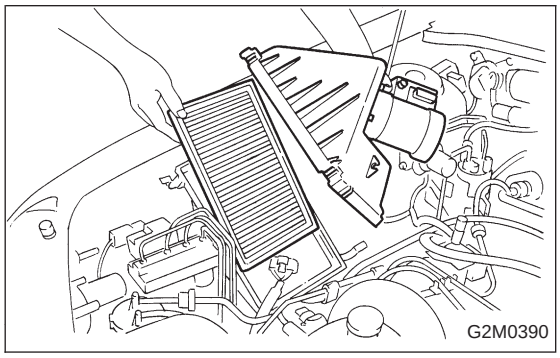
2. Mass Air Flow Sensor

A: REMOVAL AND INSTALLATION

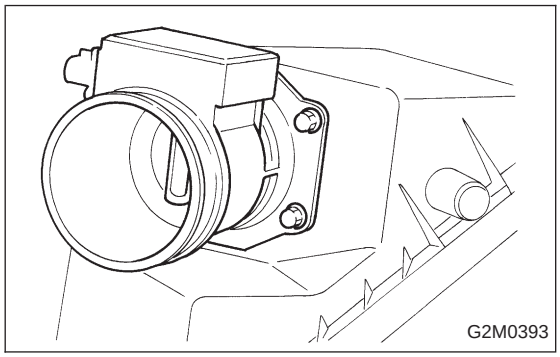
1) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.



4) Disconnect connector from mass air flow sensor.



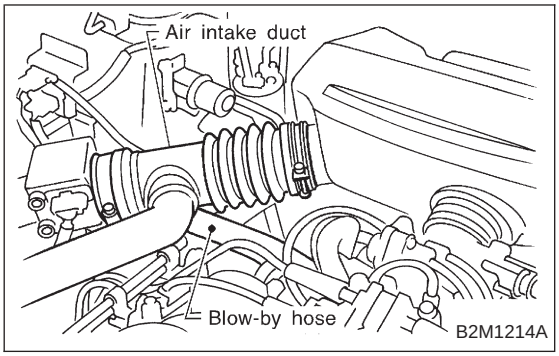
5) Remove two clips, then remove air cleaner upper cover.



6) Remove mass air flow sensor from air cleaner upper cover.
7) Installation is in the reverse order of removal.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

CAUTION:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.

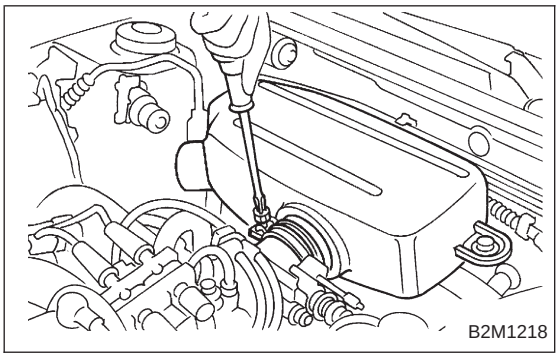


3. Throttle Body

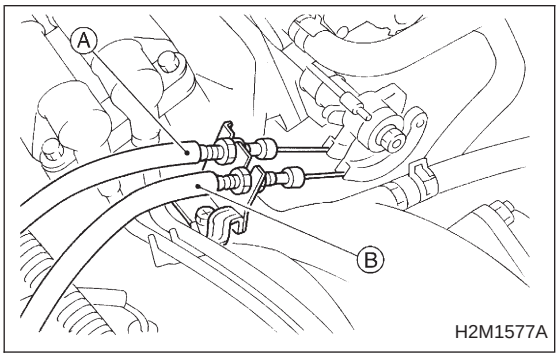
A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

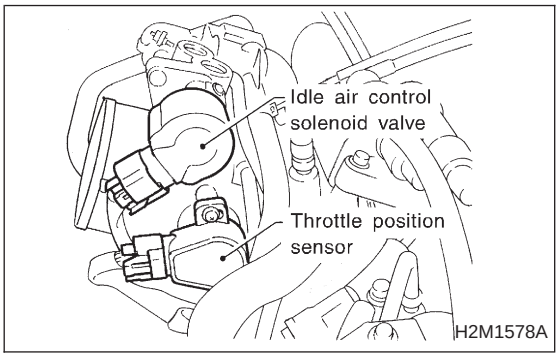
1) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.



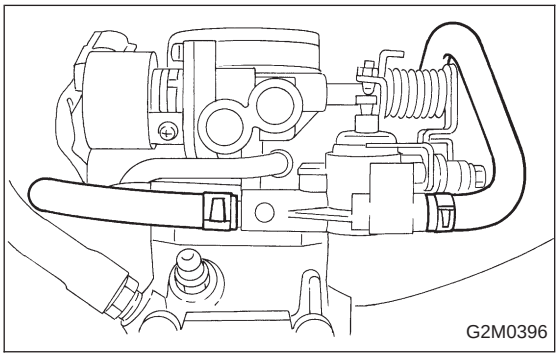
4) Loosen clamp which connects air intake chamber to throttle body.
5) Disconnect air hoses, and remove air intake chamber.



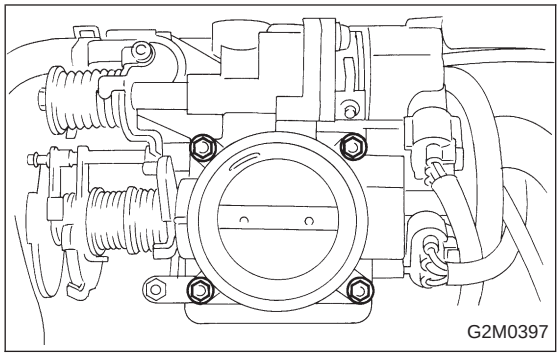
6) Disconnect accelerator cable Ⓐ.
7) Disconnect cruise control cable Ⓑ. (With cruise control model)



8) Disconnect connectors from idle air control solenoid valve and throttle position sensor.



9) Disconnect water hoses from throttle body.

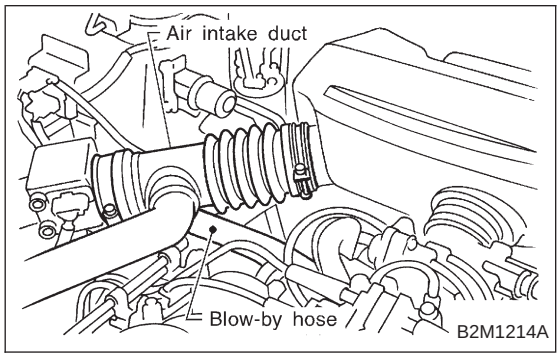

G2M0397

10) Remove bolts which install throttle body to intake manifold.

11) Installation is in the reverse order of removal.

CAUTION:
- **Always use a new gasket.**
- **Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.**

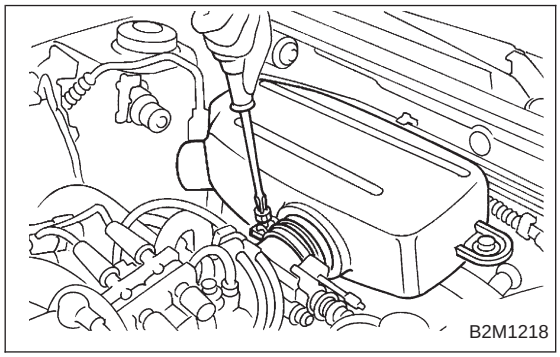
Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air intake chamber:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)



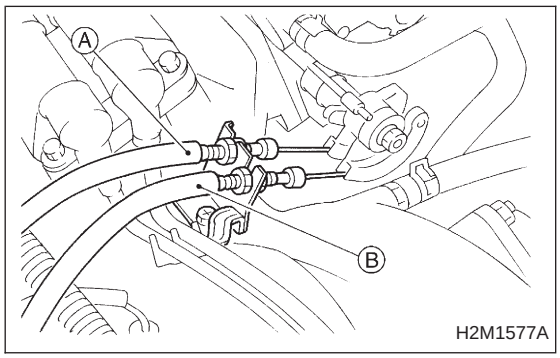
B2M1214A

2. 2200 cc MODEL

1) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.

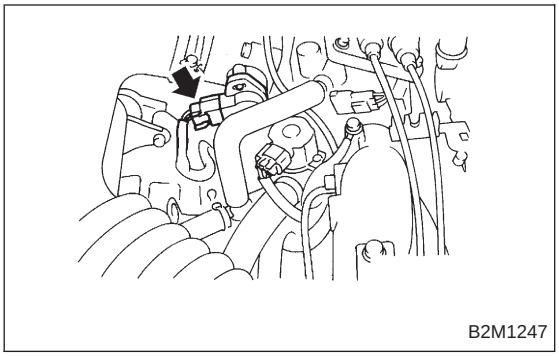

B2M1218

4) Loosen clamp which connects air intake chamber to throttle body.
5) Disconnect air hoses, and remove air intake chamber.

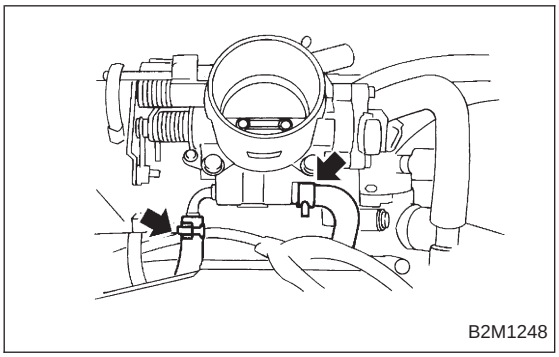


H2M1577A

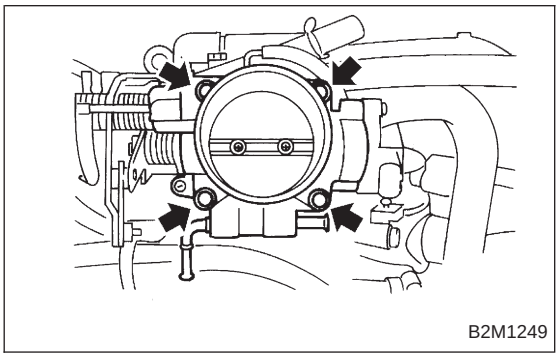
6) Disconnect accelerator cable Ⓐ.
7) Disconnect cruise control cable Ⓑ. (With cruise control model)


B2M1247

8) Disconnect connector from throttle position sensor.


B2M1248

9) Disconnect engine coolant hoses from throttle body.

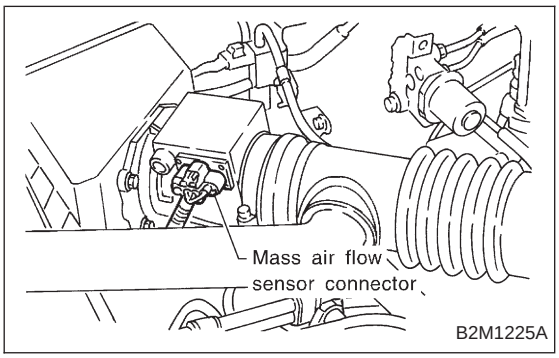

B2M1249

10) Remove bolts which install throttle body to intake manifold.

11) Installation is in the reverse order of removal.

CAUTION:
- **Always use a new gasket.**
- **Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.**

Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air intake chamber:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)



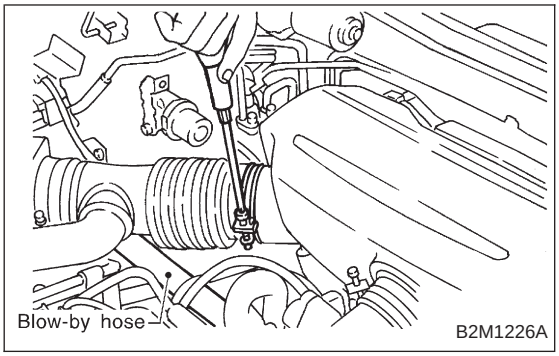
B2M1225A

4. Intake Manifold

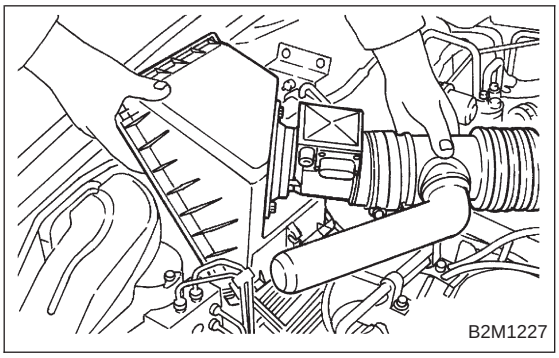
A: REMOVAL

1. 1800 cc MODEL

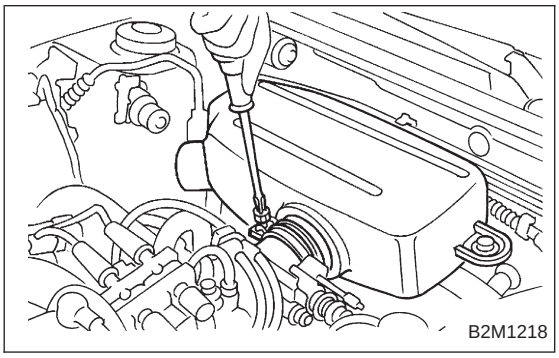
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect connector from mass air flow sensor.



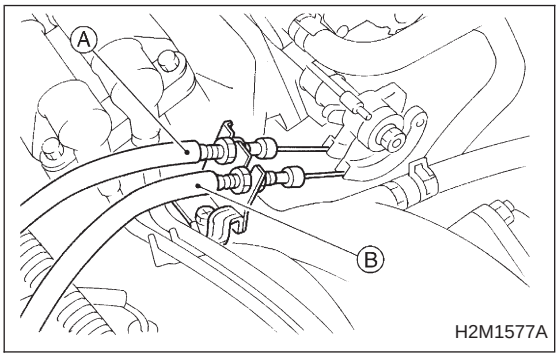
3) Loosen clamp which connects air intake duct to air intake chamber.
4) Remove two clips of air cleaner upper cover.
5) Disconnect blow-by hose from air intake duct.



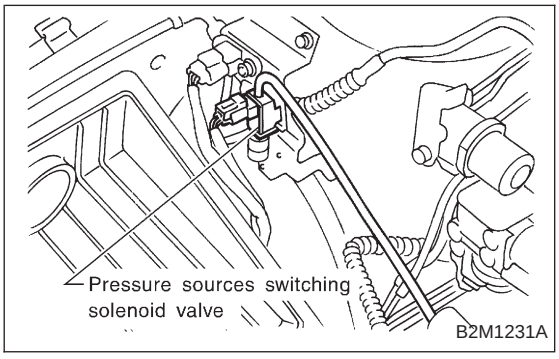
6) Remove air intake duct and air cleaner upper cover as a unit.
7) Remove air cleaner element.



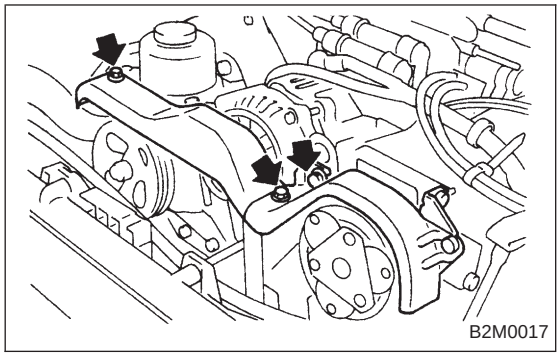
8) Loosen clamp which connects air intake chamber to throttle body.
9) Disconnect air hoses, and remove air intake chamber.



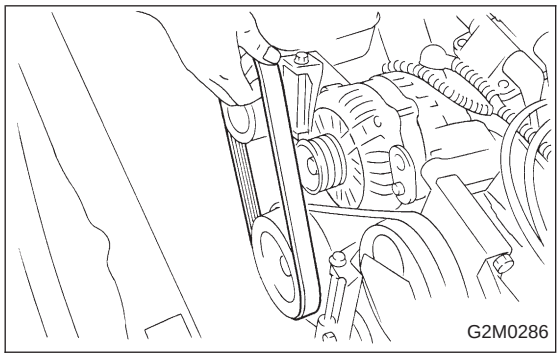
10) Disconnect accelerator cable Ⓐ.
11) Disconnect cruise control cable Ⓑ. (With cruise control model)



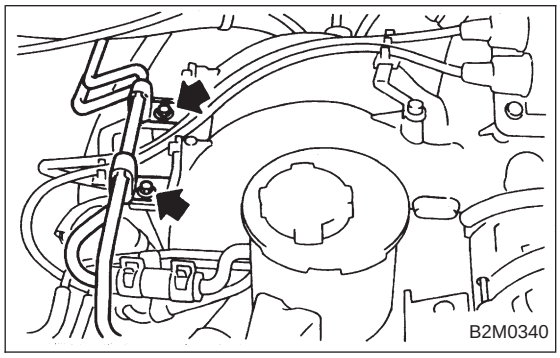
12) Disconnect vacuum hoses from pressure sources switching solenoid valve.



13) Remove power steering pump from bracket.
(1) Remove V-belt cover.

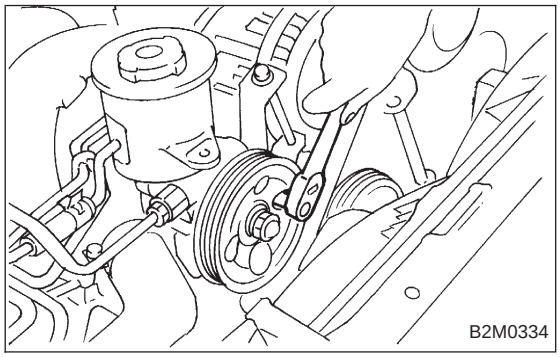


(2) Loosen lock bolt and slider bolt, and remove power steering pump drive V-belt.

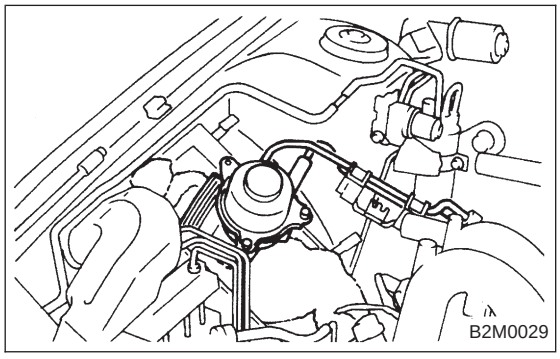


(3) Remove bolts which secure power steering pipe brackets to intake manifold.

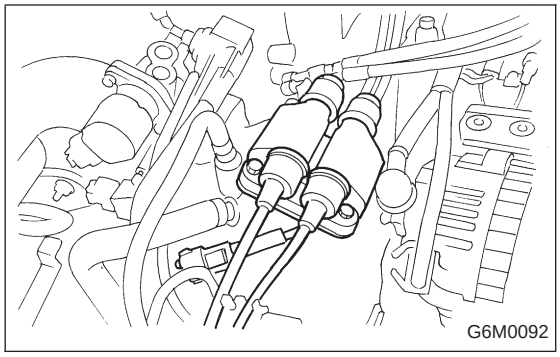
NOTE:
Do not disconnect power steering hose.



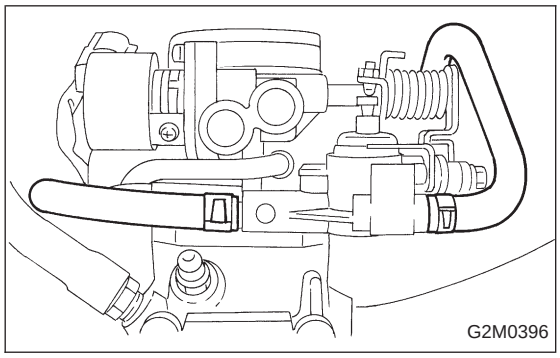
(4) Remove bolts which install power steering pump to bracket.



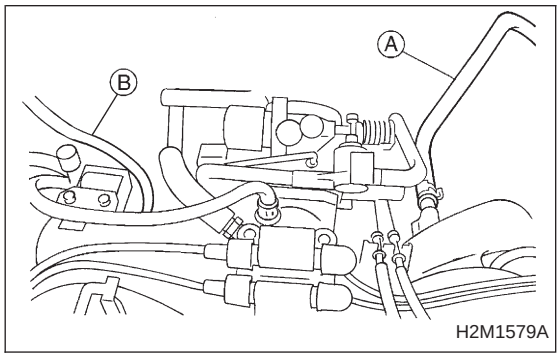
(5) Place power steering pump on the right side wheel apron.


G6M0092

14) Disconnect spark plug cords from ignition coil.
15) Disconnect connector from ignition coil.

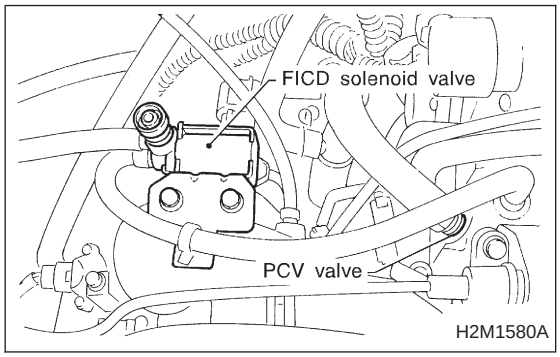

G2M0396

16) Disconnect water hose from throttle body.



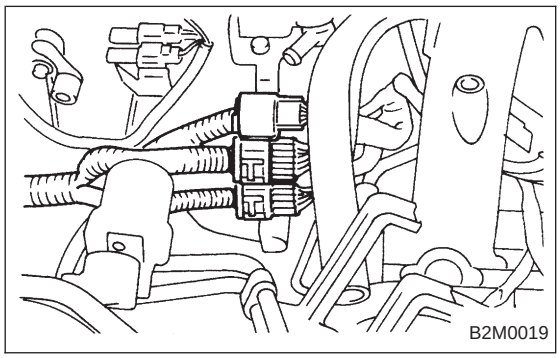
H2M1579A

17) Disconnect brake booster hose Ⓐ.
18) Disconnect cruise control vacuum hose Ⓑ. (With cruise control)

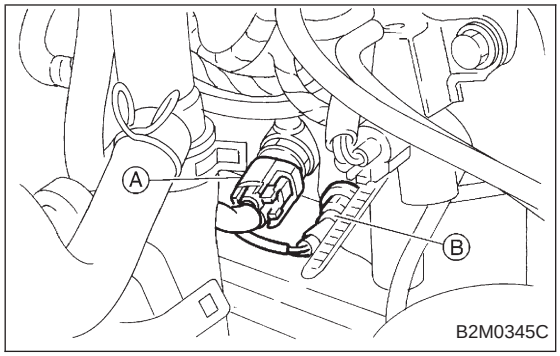


H2M1580A

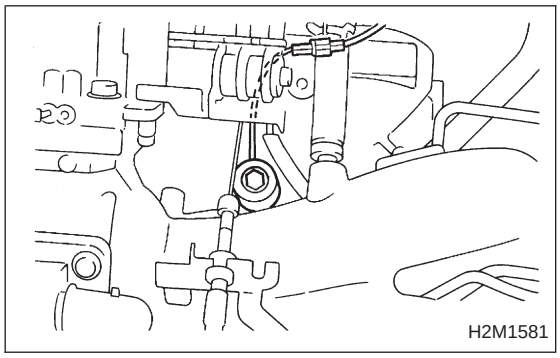
19) Disconnect air by-pass hose from FICD solenoid valve. (With A/C)
20) Disconnect emission hose from PCV valve.


B2M0019

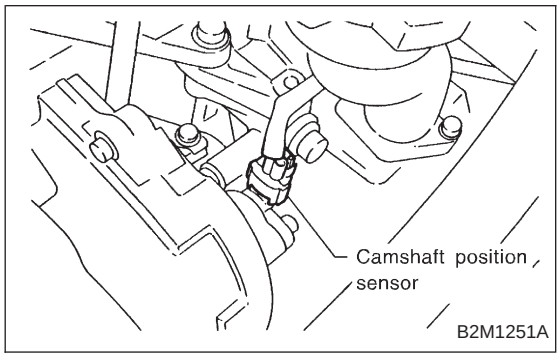
21) Disconnect engine harness connectors from bulkhead harness connectors, and remove engine harness connectors from bracket.



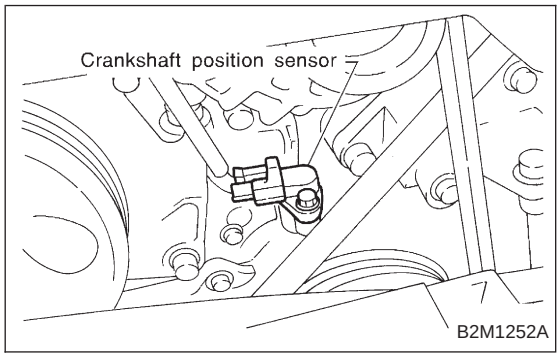
22) Disconnect connectors from engine coolant temperature sensor Ⓐ and thermometer Ⓑ.



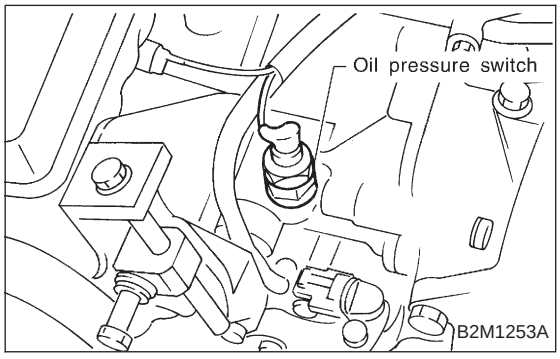
23) Disconnect knock sensor connector.



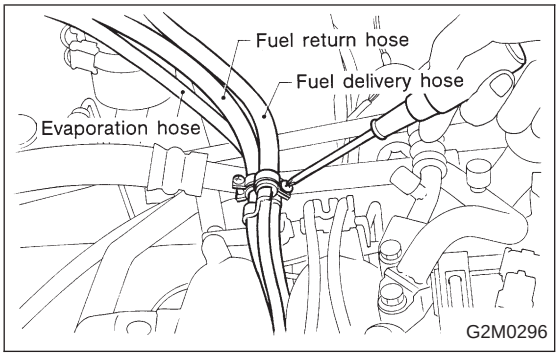
24) Disconnect connector from camshaft position sensor.



25) Disconnect connector from crankshaft position sensor.

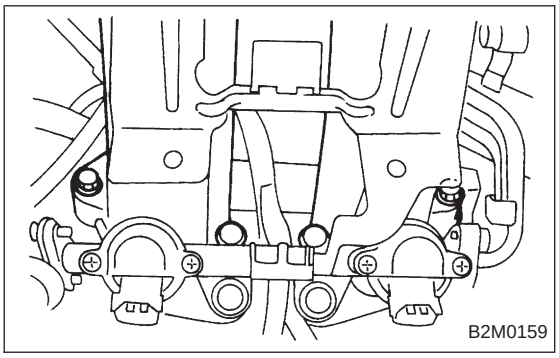


26) Disconnect connector from oil pressure switch.

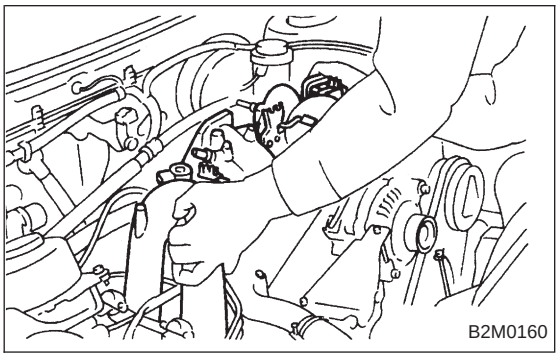


27) Disconnect fuel hoses from fuel pipes.

WARNING:
Catch fuel from hoses in a container.



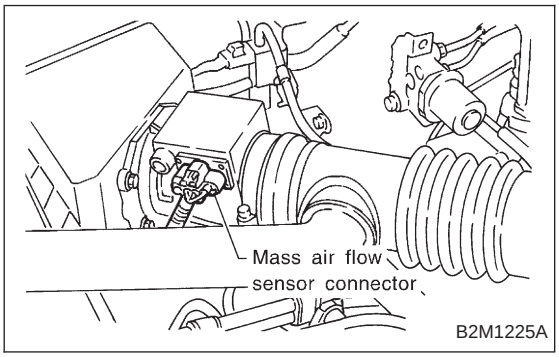
28) Remove bolts which hold intake manifold onto cylinder heads.



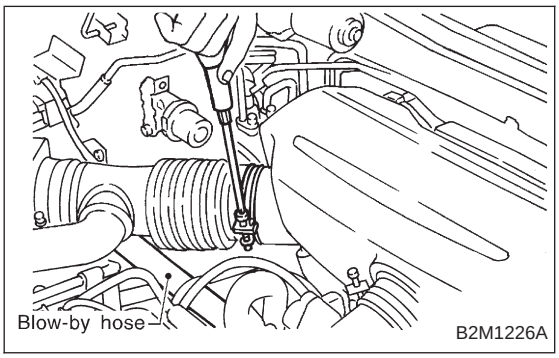
29) Remove intake manifold.

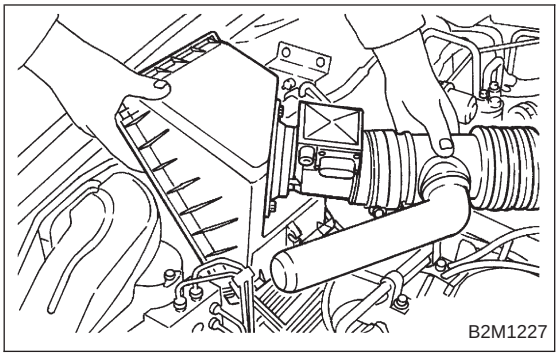
2. 2200 cc MODEL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect connector from mass air flow sensor.

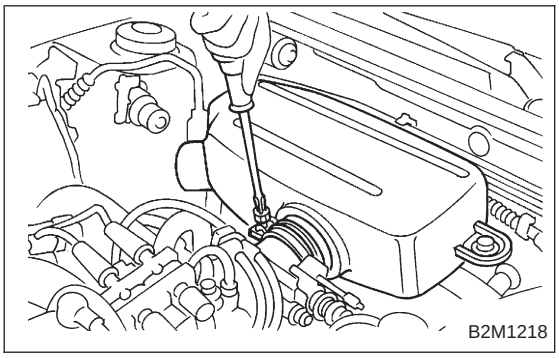


3) Loosen clamp which connects air intake duct to air intake chamber.
4) Remove two clips of air cleaner upper cover.
5) Disconnect blow-by hose from air intake duct.

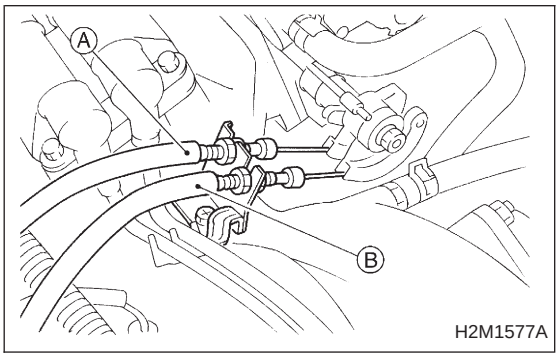



B2M1227

6) Remove air intake duct and air cleaner upper cover as a unit.
7) Remove air cleaner element.

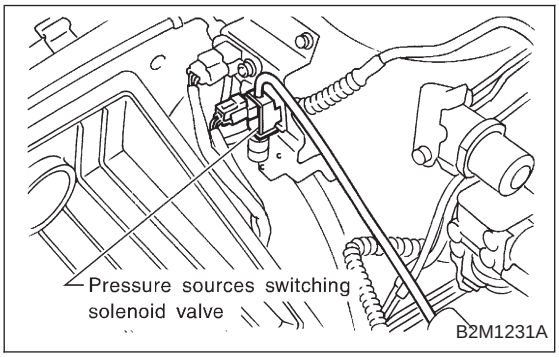

B2M1218

8) Loosen clamp which connects air intake chamber to throttle body.
9) Disconnect air hoses, and remove air intake chamber.



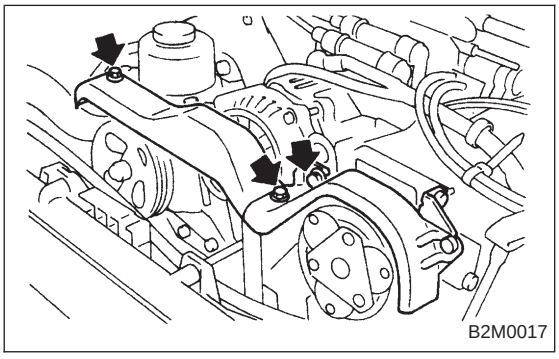
H2M1577A

10) Disconnect accelerator cable Ⓐ.
11) Disconnect cruise control cable Ⓑ. (With cruise control model)

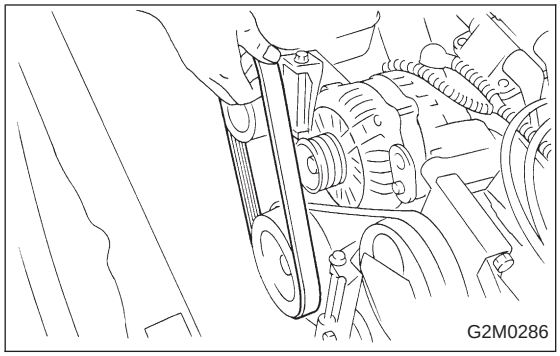


B2M1231A

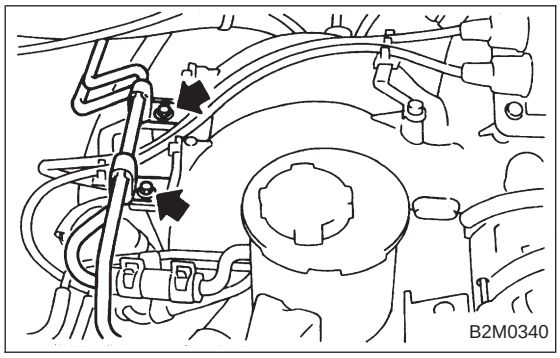
12) Disconnect vacuum hoses from pressure sources switching solenoid valve.


B2M0017

13) Remove power steering pump from bracket.
(1) Remove V-belt cover.

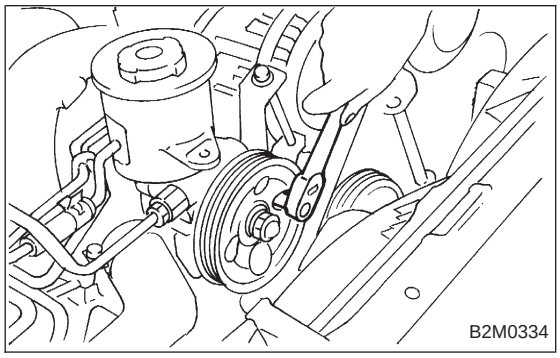


(2) Loosen lock bolt and slider bolt, and remove power steering pump drive V-belt.

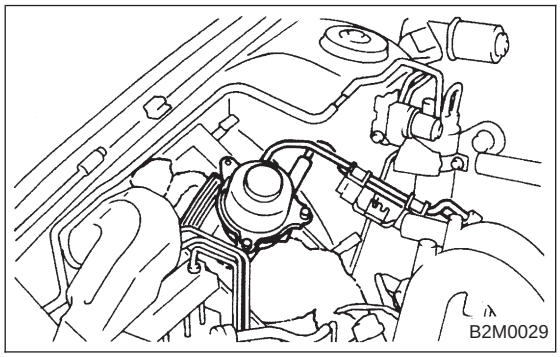


(3) Remove bolts which secure power steering pipe brackets to intake manifold.

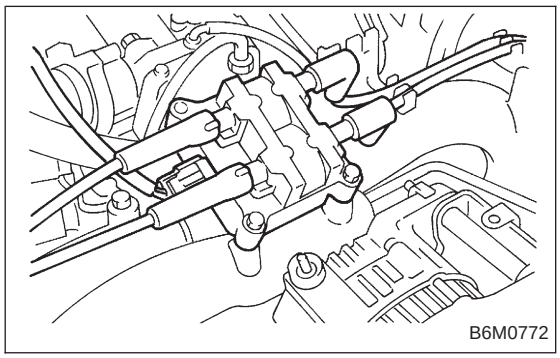
NOTE:
Do not disconnect power steering hose.



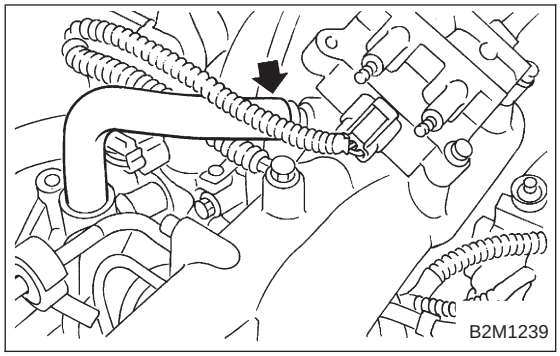
(4) Remove bolts which install power steering pump to bracket.



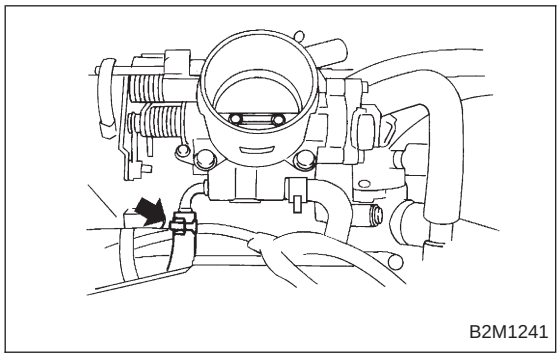
(5) Place power steering pump on the right side wheel apron.



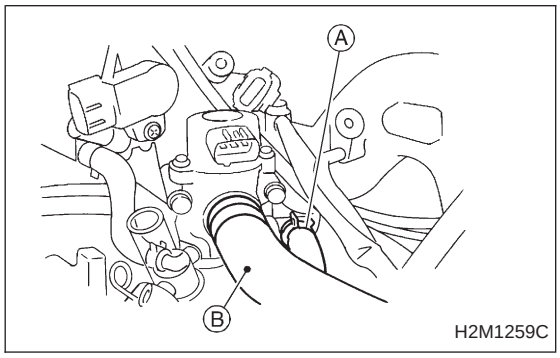
14) Disconnect spark plug cords from ignition coil.



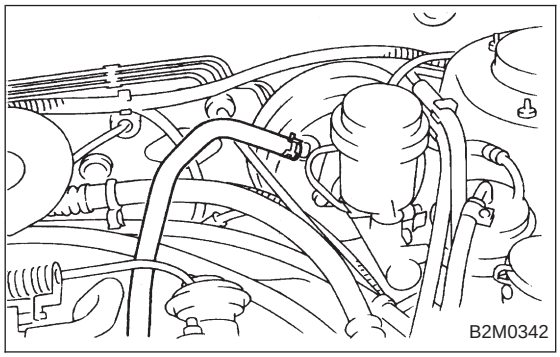
15) Disconnect PCV hose from intake manifold.



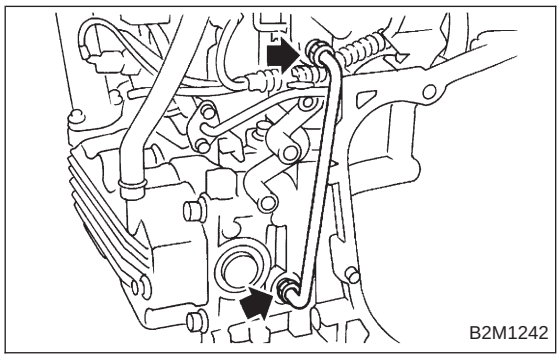
16) Disconnect engine coolant hose from throttle body.



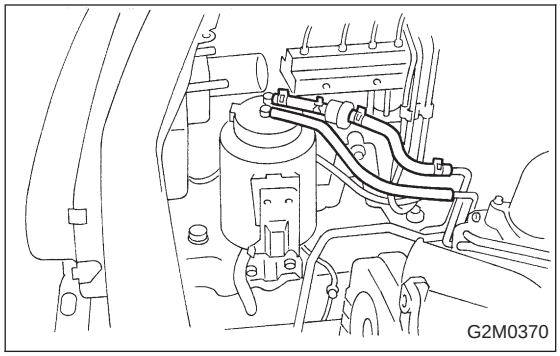
17) Disconnect engine coolant hose Ⓐ from idle air control solenoid valve.
18) Disconnect air by-pass hose Ⓑ from idle air control solenoid valve.



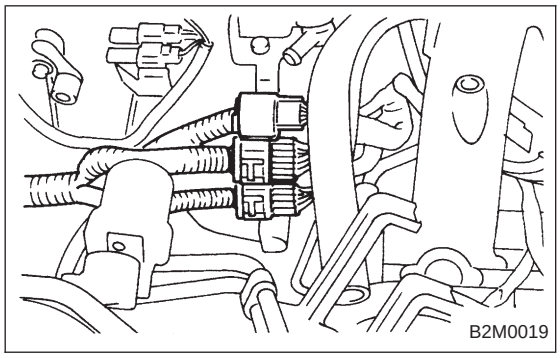
19) Disconnect brake booster hose.



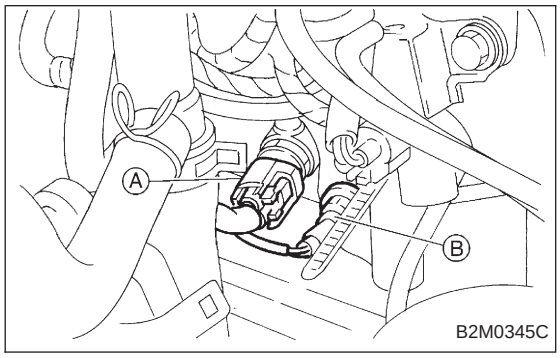
20) Remove EGR pipe. (AT vehicles)



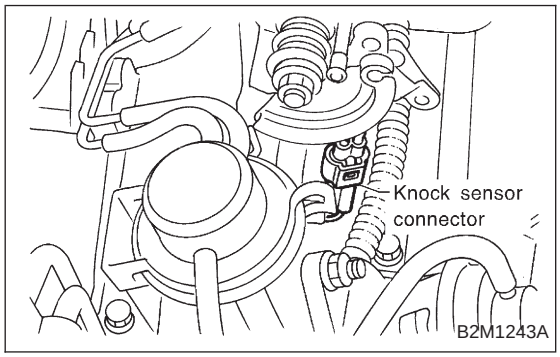
21) Disconnect canister hoses from pipes.



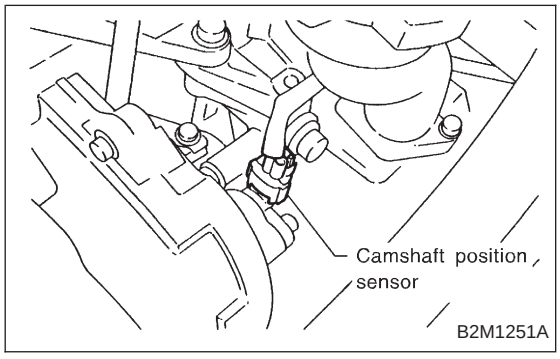
22) Disconnect engine harness connectors from bulkhead harness connectors, and remove engine harness connectors from bracket.



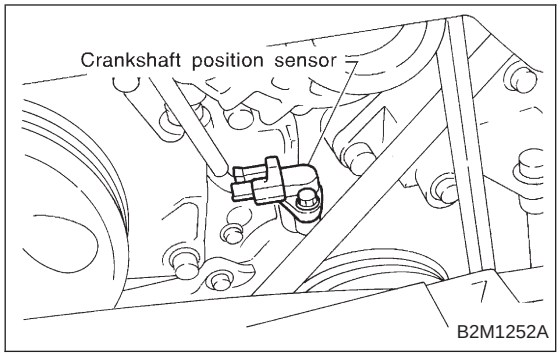
23) Disconnect connectors from engine coolant temperature sensor Ⓐ and thermometer Ⓑ.



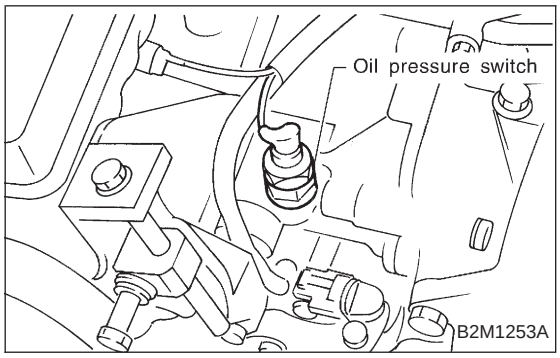
24) Disconnect knock sensor connector.



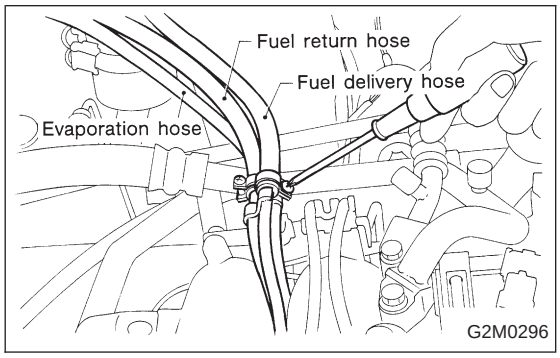
25) Disconnect connector from camshaft position sensor.



26) Disconnect connector from crankshaft position sensor.

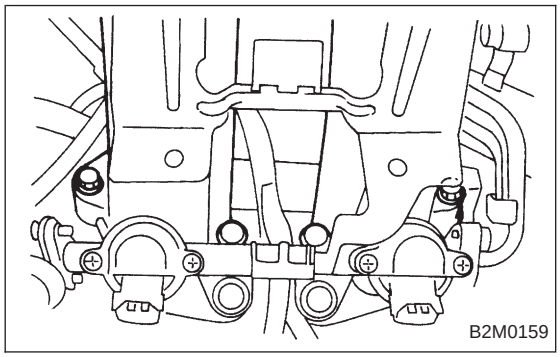


27) Disconnect connector from oil pressure switch.

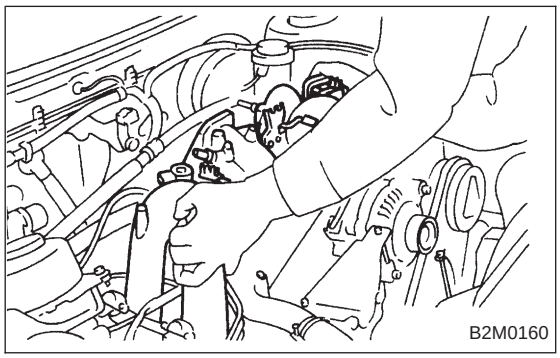


28) Disconnect fuel hoses from fuel pipes.

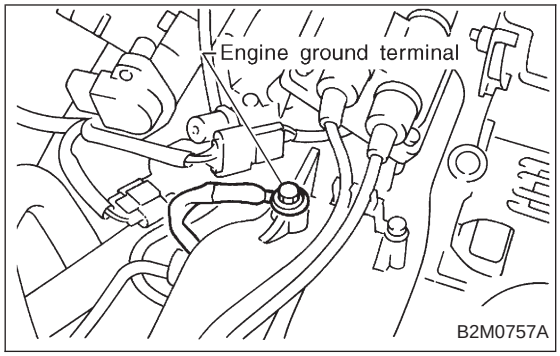
WARNING:
Catch fuel from hoses in a container.



29) Remove bolts which hold intake manifold onto cylinder heads.



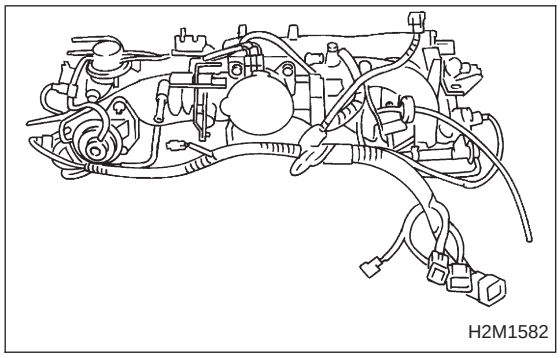
30) Remove intake manifold.



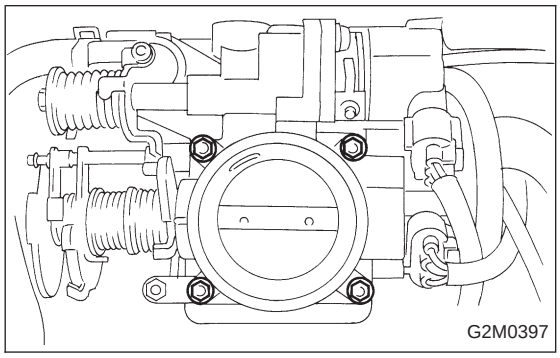
B: DISASSEMBLY

1. 1800 cc MODEL

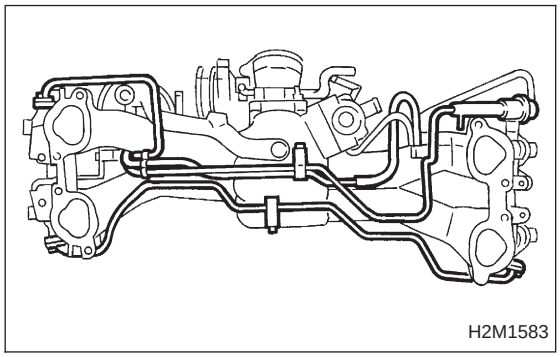
1) Disconnect engine ground terminal from intake manifold.



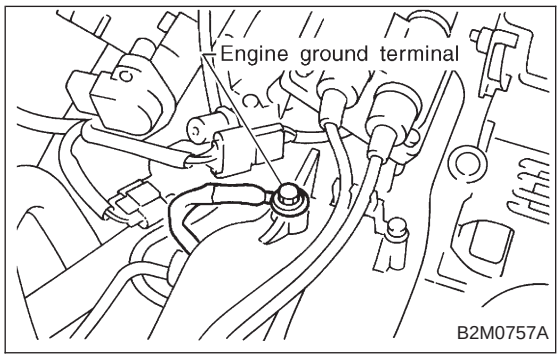
2) Disconnect connectors from throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and FICD solenoid valve.
3) Remove engine harness from intake manifold.



4) Remove throttle body from intake manifold.

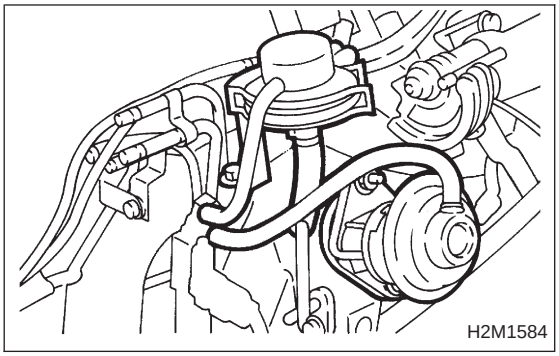


5) Remove fuel pipes, etc. from intake manifold.

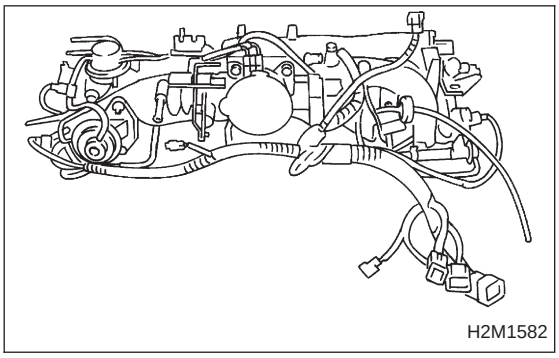


2. 2200 cc MODEL

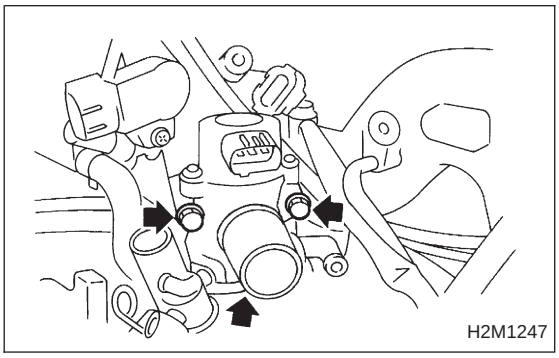
1) Disconnect engine ground terminal from intake manifold.


H2M1584

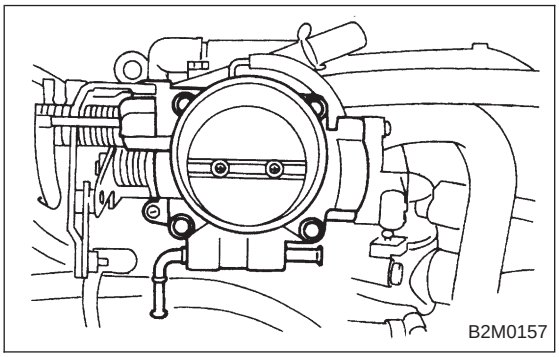
2) Disconnect EGR vacuum hose from EGR valve. (AT vehicles)
3) Disconnect back pressure hose from pipe. (AT vehicles)
4) Disconnect BPT hoses from EGR solenoid valve and intake manifold. (AT vehicles)
5) Remove BPT with BTP holder bracket. (AT vehicles)
6) Remove EGR valve. (AT vehicles)


H2M1582

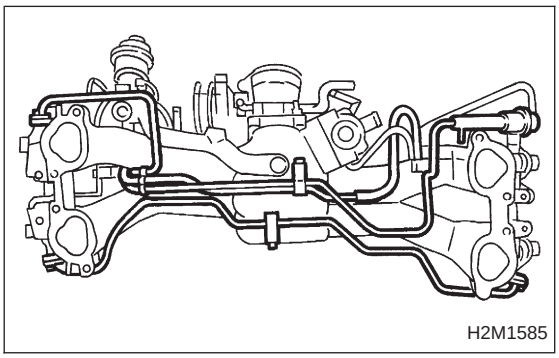
7) Disconnect connectors from throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve. (AT vehicles)
8) Remove engine harness from intake manifold.


H2M1247

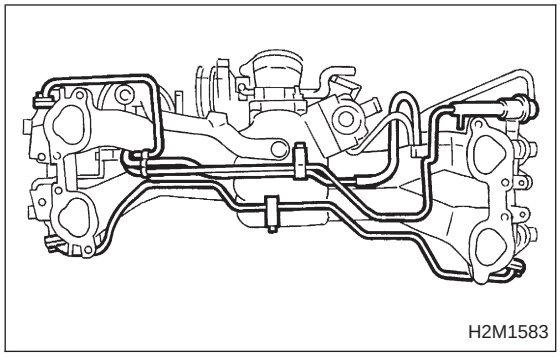
9) Remove idle air control solenoid valve from intake manifold.


B2M0157

10) Remove throttle body from intake manifold.


H2M1585

11) Remove fuel pipes, etc. from intake manifold.
12) Remove EGR solenoid valve (AT vehicles) and purge control solenoid valve.

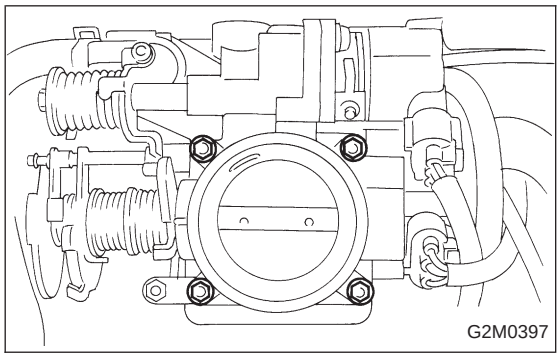

H2M1583

C: ASSEMBLY

1. 1800 cc MODEL

1) Install EGR solenoid valve (AT vehicles) and purge control solenoid valve.

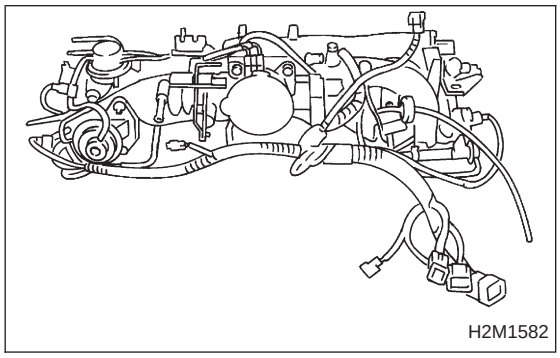
2) Assemble fuel pipes, etc. to intake manifold.


G2M0397

3) Assemble throttle body to intake manifold.

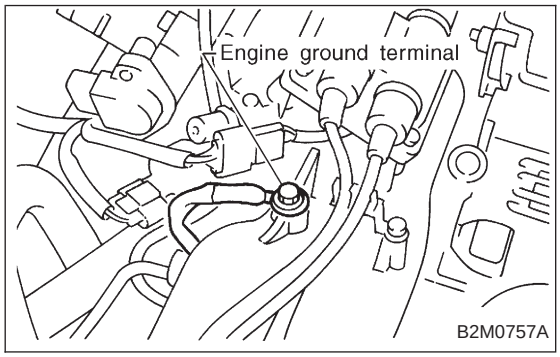
CAUTION:
Replace gasket with a new one.

Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)


H2M1582

4) Install engine harness onto intake manifold.

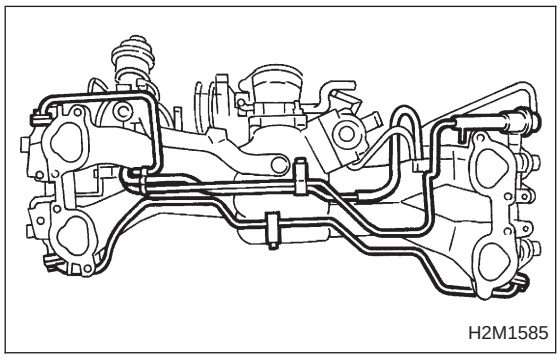
5) Connect connectors to throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and solenoid valve.



B2M0757A

6) Connect engine ground terminal to intake manifold.

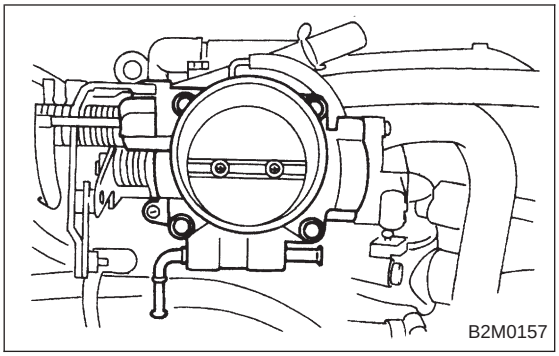
Tightening torque:
19±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)


H2M1585

2. 2200 cc MODEL

1) Install EGR solenoid valve (AT vehicles) and purge control solenoid valve.

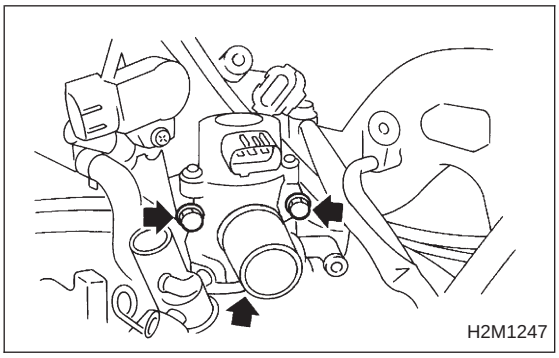
2) Assemble fuel pipes, etc. to intake manifold.


B2M0157

3) Assemble throttle body to intake manifold.

CAUTION:
Replace gasket with a new one.

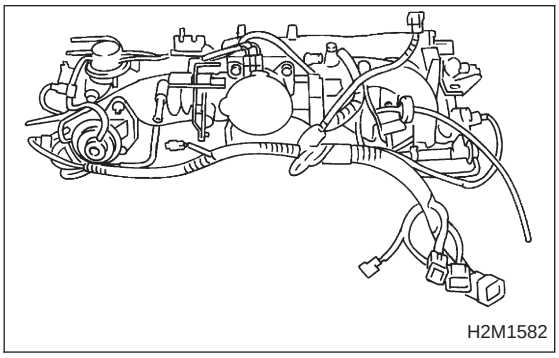
Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)


H2M1247

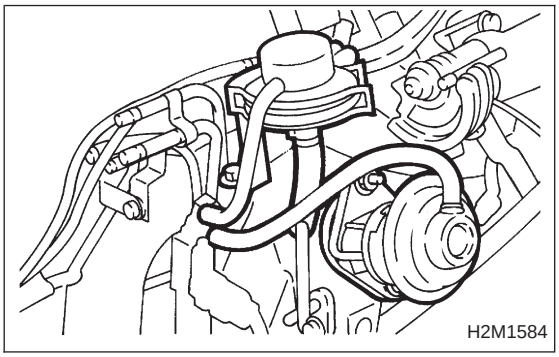
4) Install idle air control solenoid valve to intake manifold.

CAUTION:
Replace gasket with a new one.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)


H2M1582

5) Install engine harness onto intake manifold.
6) Connect connectors to throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve. (AT vehicles)

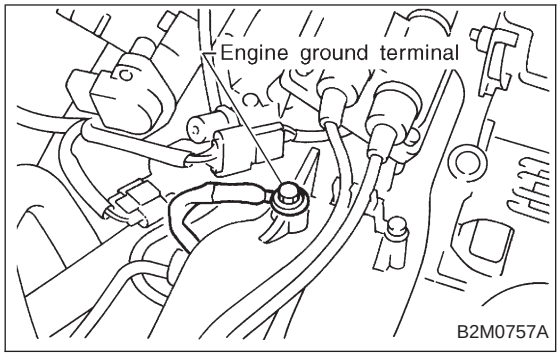

H2M1584

7) Install EGR valve. (AT vehicles)

CAUTION:
Replace gasket with a new one.

Tightening torque:
19±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)

8) Install BPT with BPT holder bracket. (AT vehicles)
9) Connect BPT hoses from EGR solenoid valve and intake manifold. (AT vehicles)
10) Connect back pressure hose from pipe. (AT vehicles)
11) Connect EGR vacuum hose from EGR valve. (AT vehicles)



12) Connect engine ground terminal to intake manifold.

Tightening torque:
19±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)

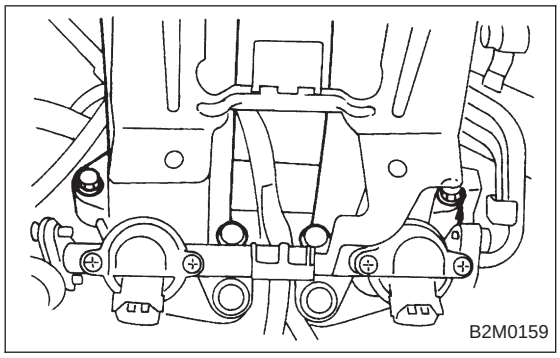
D: INSTALLATION

1. 1800 cc MODEL

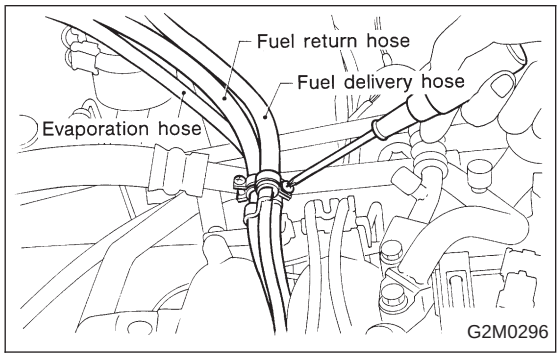
1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

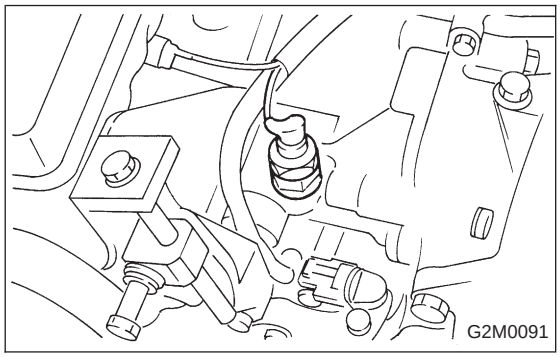
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



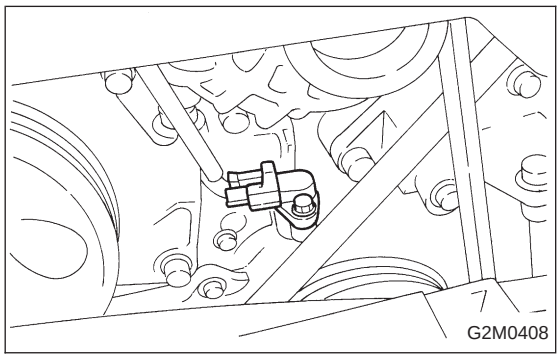
2) Connect fuel hoses.

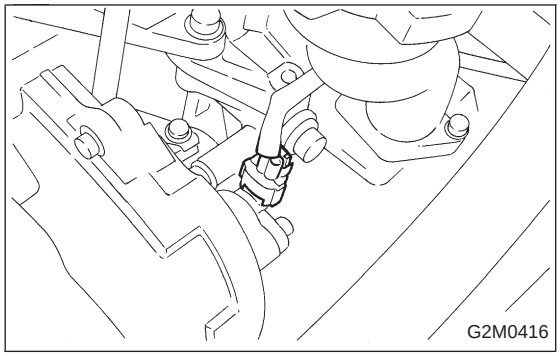


3) Connect connector to oil pressure switch.

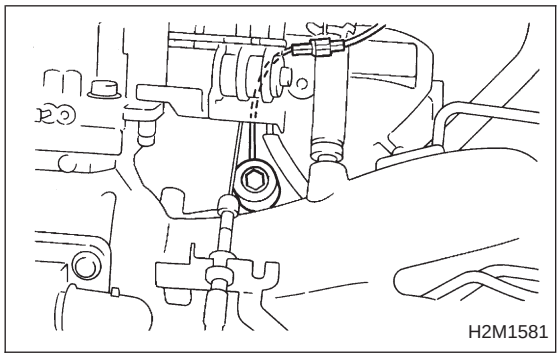


4) Connect connector to crankshaft position sensor.

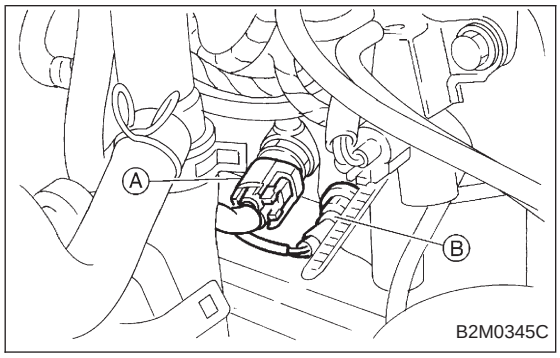




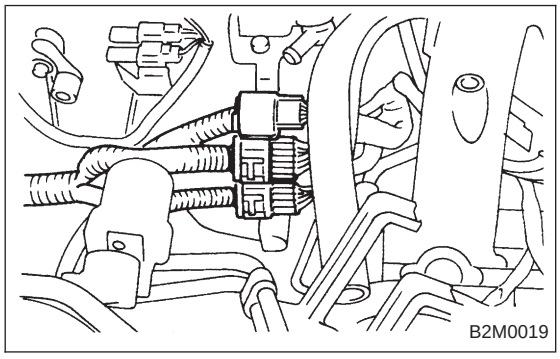
5) Connect connector to camshaft position sensor.



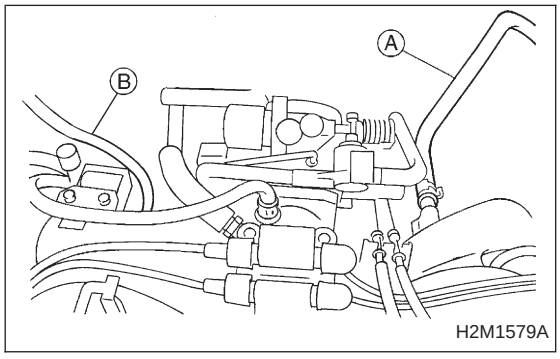
6) Connect connector to knock sensor.



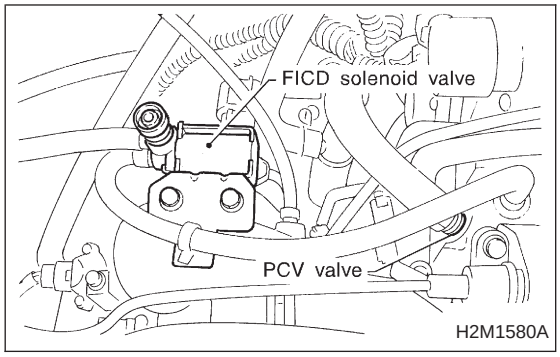
7) Connect connectors to engine coolant temperature sensor Ⓐ and thermometer Ⓑ.



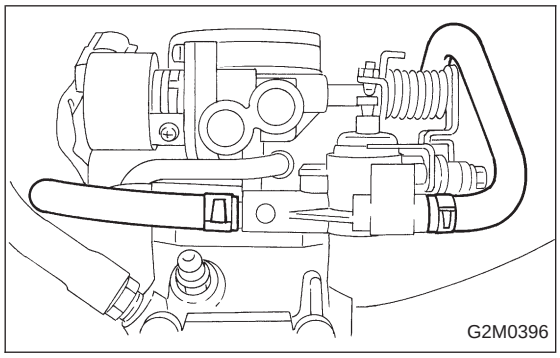
8) Connect engine harness connector to bulkhead harness connectors.



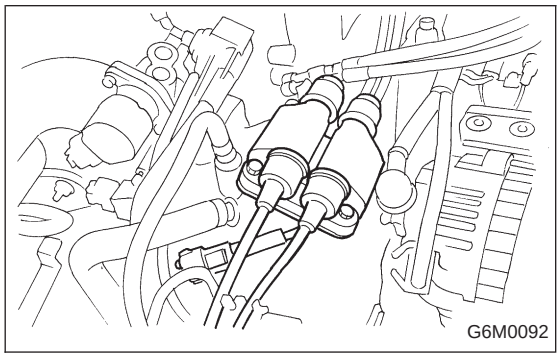
9) Connect cruise control vacuum hose Ⓑ. (With cruise control)
10) Connect brake booster vacuum hose Ⓐ.



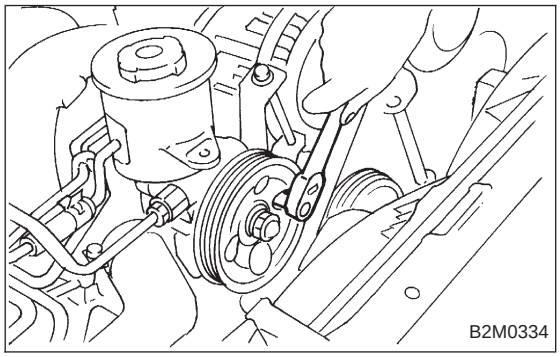
11) Connect air by-pass hose to FICD solenoid valve. (With A/C)
12) Connect emission hose to PCV valve.



13) Connect engine coolant hoses to throttle body.

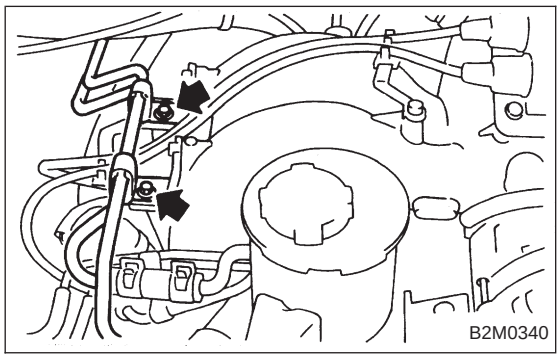


14) Connect spark plug cords to ignition coil.
15) Connect connector to ignition coil.

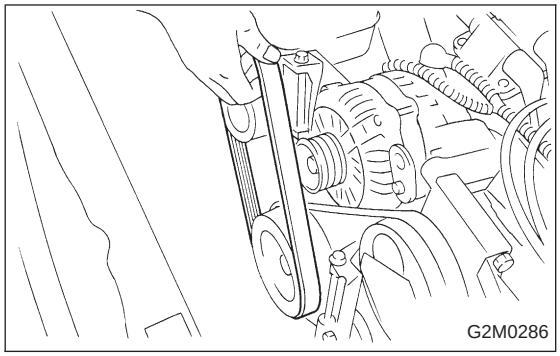


16) Install power steering pump on bracket.
(1) Install power steering pump on bracket, and tighten bolts.

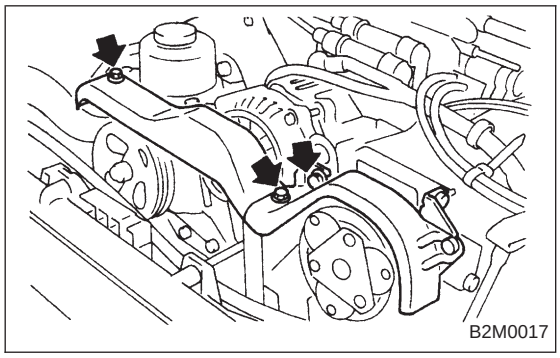
Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)



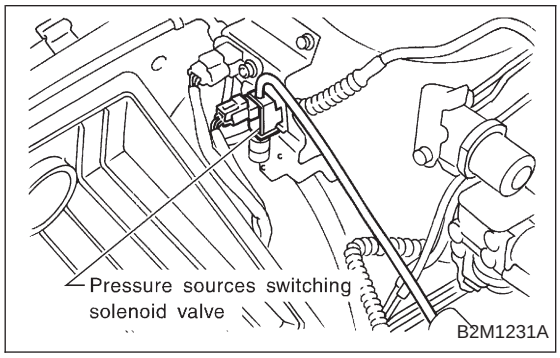
(2) Install power steering pipe brackets on right side intake manifold.



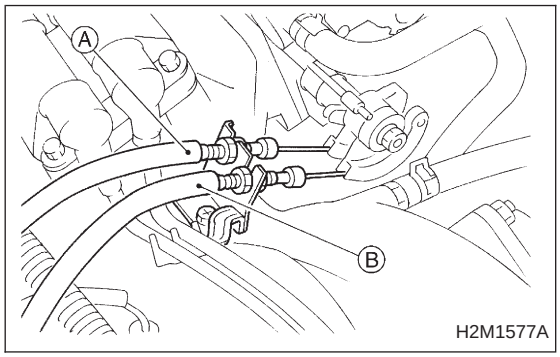
(3) Install power steering pump drive V-belt.
(4) Adjust V-belt. <Ref. to 1-5 [01A0].>



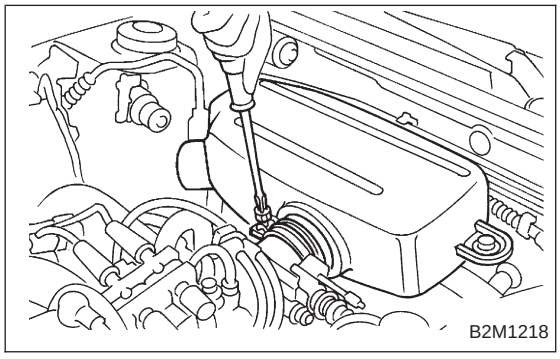
(5) Install V-belt cover.



17) Connect vacuum hoses to pressure sources switching solenoid valve.

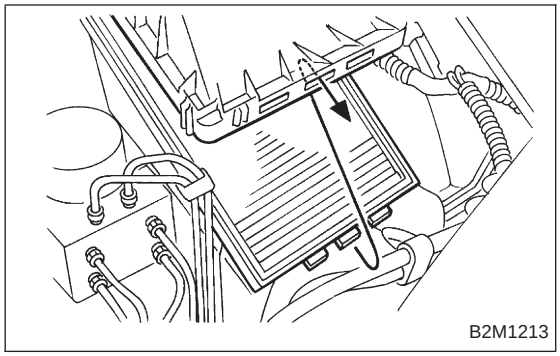


18) Connect accelerator cable Ⓐ.
19) Connect cruise control cable Ⓑ. (With cruise control model)



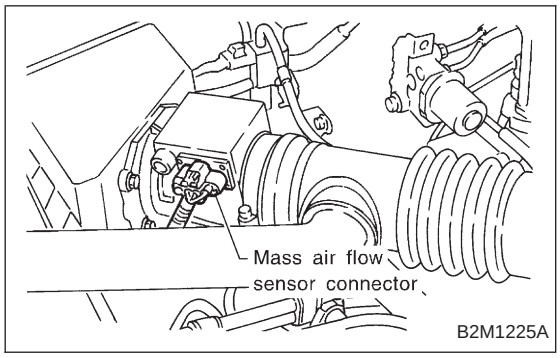
20) Install air intake chamber and connect air hoses.

Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)


B2M1213

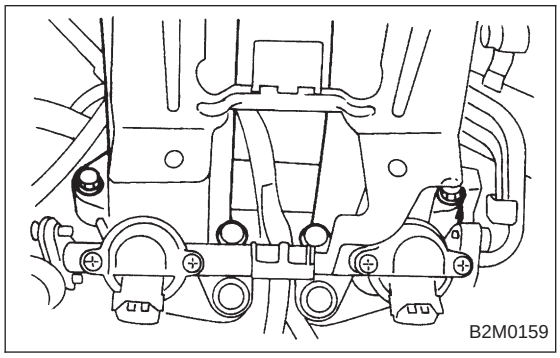
21) Install air cleaner element.
22) Install air cleaner upper cover and air intake duct as a unit.

CAUTION:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



B2M1225A

23) Connect connector to mass air flow sensor.

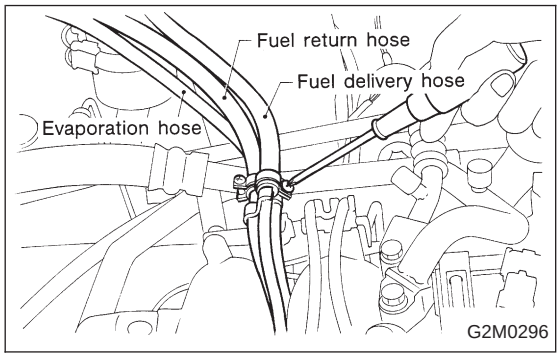

B2M0159

2. 2200 cc MODEL

1) Install intake manifold onto cylinder heads.

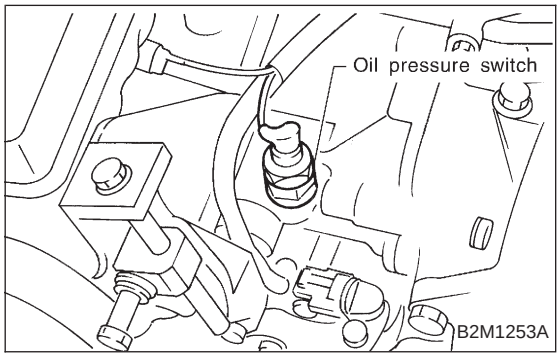
CAUTION:
Always use new gaskets.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



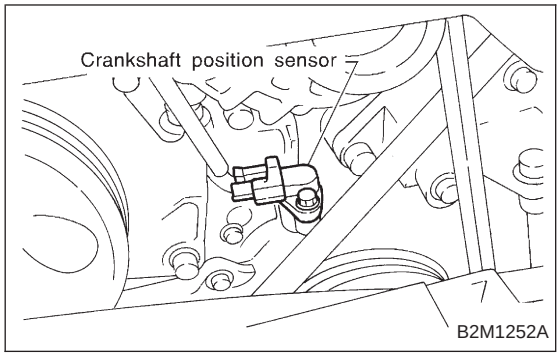
G2M0296

2) Connect fuel hoses.

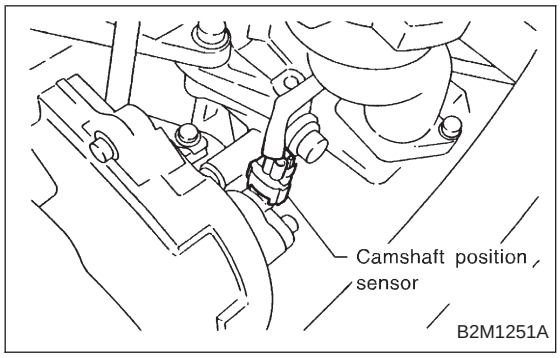


B2M1253A

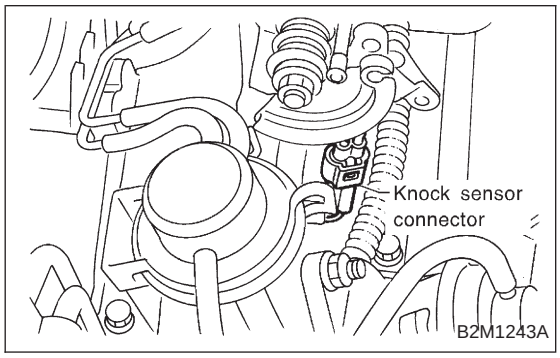
3) Connect connector to oil pressure switch.



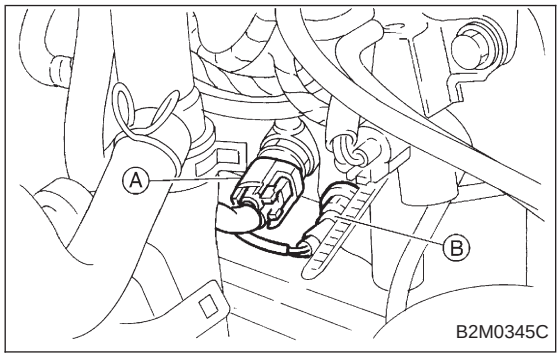
4) Connect connector to crankshaft position sensor.



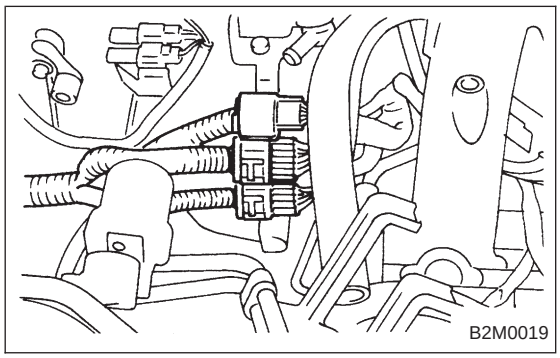
5) Connect connector to camshaft position sensor.



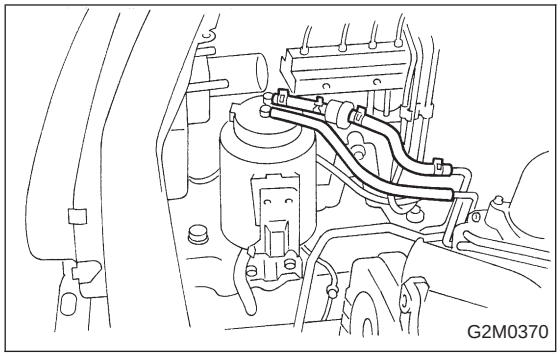
6) Connect knock sensor connector.



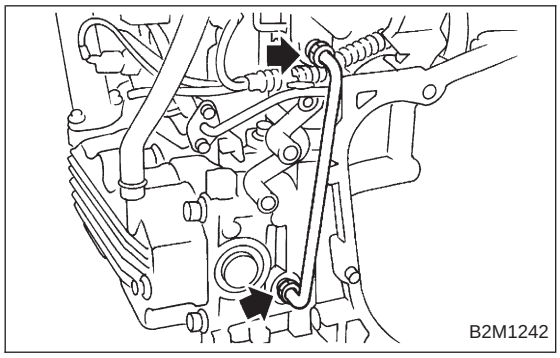
7) Connect connectors to engine coolant temperature sensor Ⓐ and thermometer Ⓑ.



8) Install engine harness connectors to bracket, and connect engine harness connectors to bulkhead connectors.

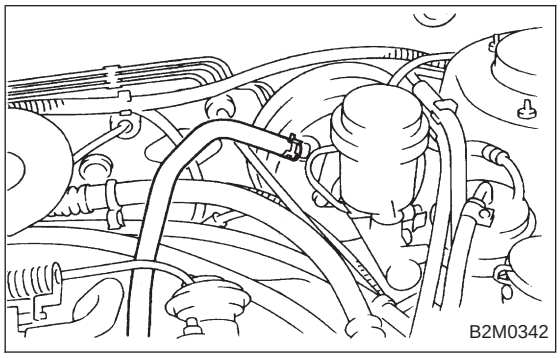

G2M0370

9) Connect canister hoses.

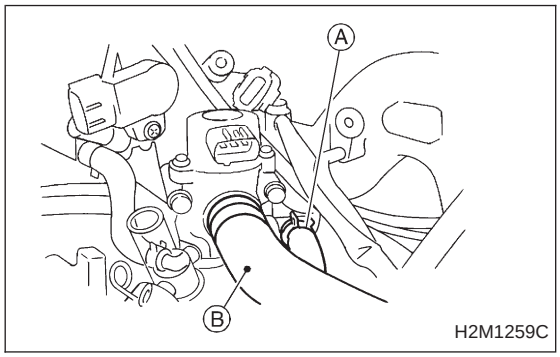

B2M1242

10) Install EGR pipe. (AT vehicles)

Tightening torque:
34±2 N·m (3.5±0.2 kg-m, 25.3±1.4 ft-lb)

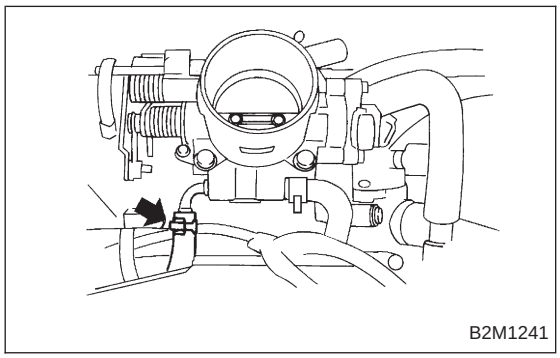

B2M0342

11) Connect brake booster hose.

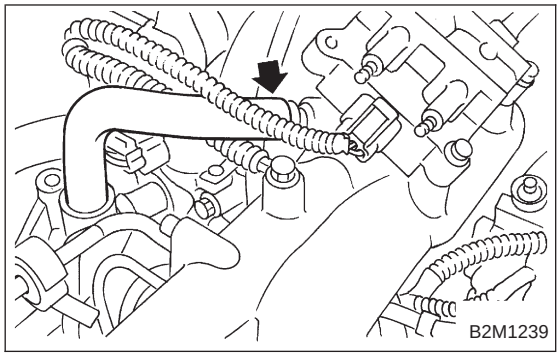


H2M1259C

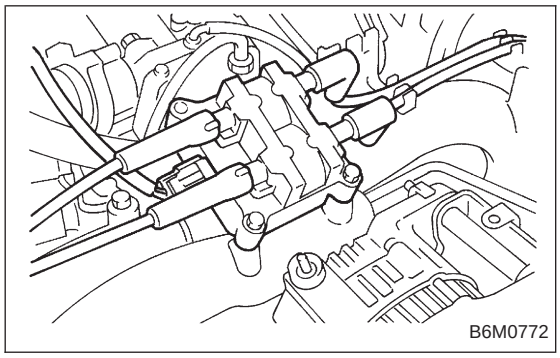
12) Connect engine coolant hose Ⓐ to idle air control solenoid valve.
13) Connect air by-pass hose Ⓑ to idle air control solenoid valve.


B2M1241

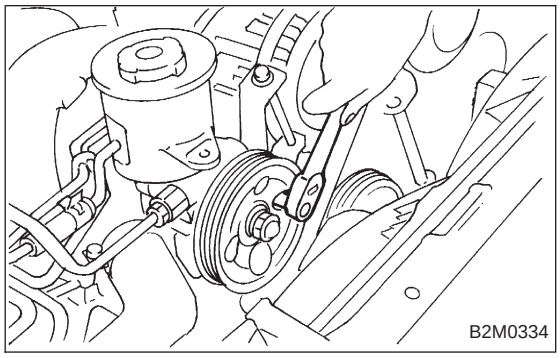
14) Connect engine coolant hose to throttle body.



15) Connect PCV hose to intake manifold.

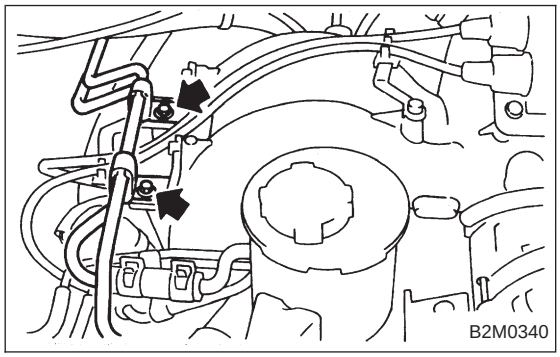


16) Connect spark plug cords to ignition coil.

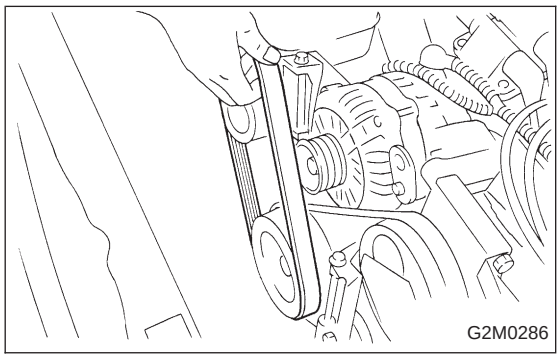


17) Install power steering pump on bracket.
(1) Install power steering pump on bracket, and tighten bolts.

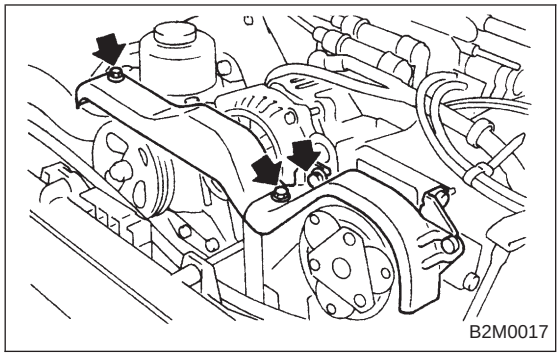
Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)



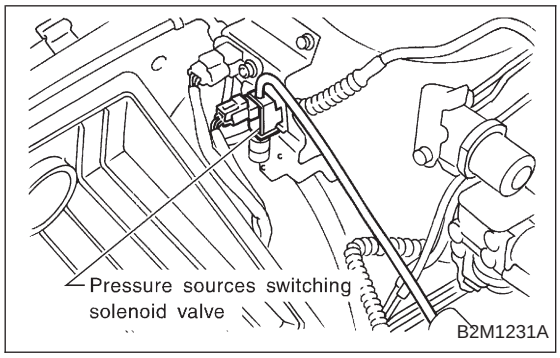
(2) Install power steering pipe brackets on right side intake manifold.



(3) Install power steering pump drive V-belt.
(4) Adjust V-belt. <Ref. to 1-5 [01A0].>

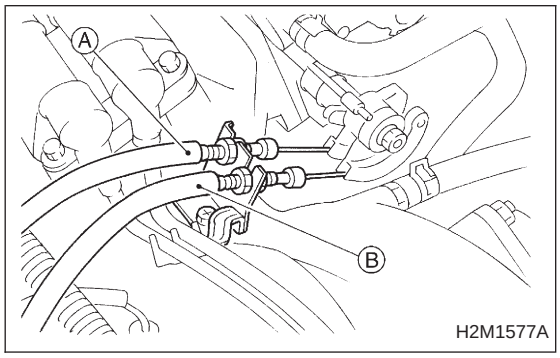

B2M0017

(5) Install V-belt cover.



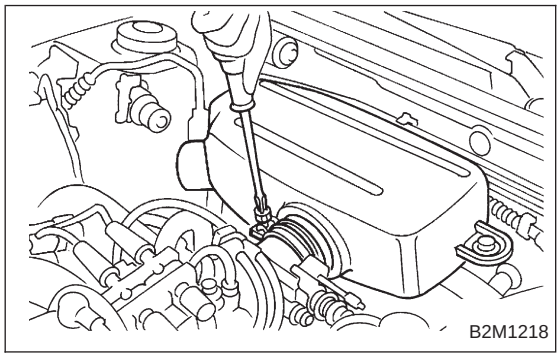
B2M1231A

18) Connect vacuum hoses to pressure sources switching solenoid valve.



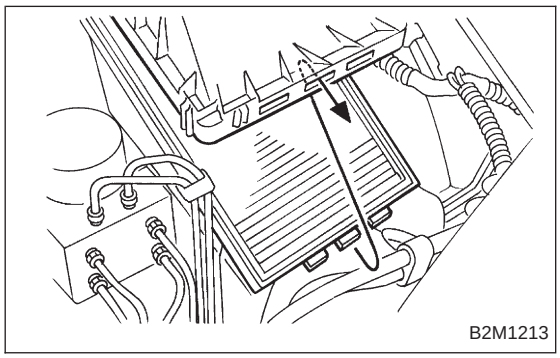
H2M1577A

19) Connect accelerator cable Ⓐ.
20) Connect cruise control cable Ⓑ. (With cruise control model)


B2M1218

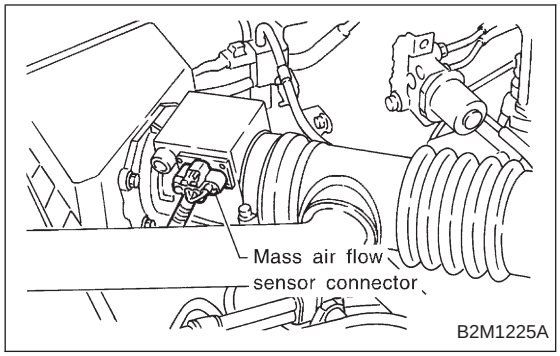
21) Install air intake chamber and connect air hoses.

Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

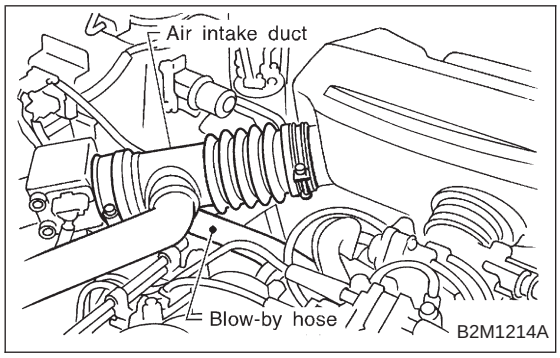

B2M1213

22) Install air cleaner element.
23) Install air cleaner upper cover and air intake duct as a unit.

CAUTION:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



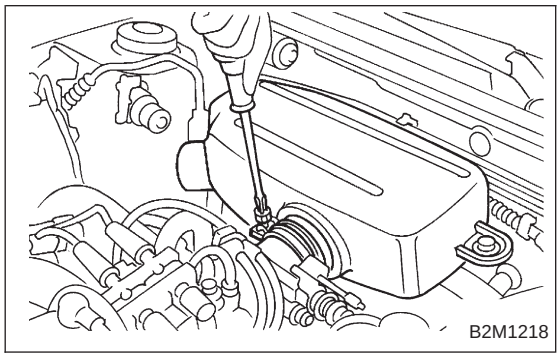
24) Connect connector to mass air flow sensor.



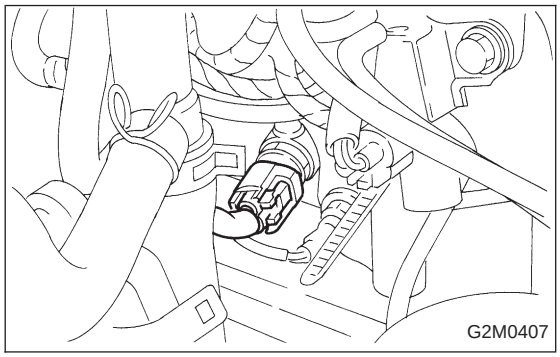
5. Engine Coolant Temperature Sensor

A: REMOVAL AND INSTALLATION

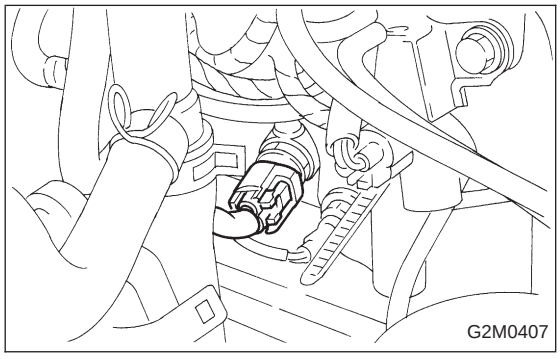
1) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.



4) Loosen clamp which connects air intake chamber to throttle body.
5) Disconnect air hoses, and remove air intake chamber.

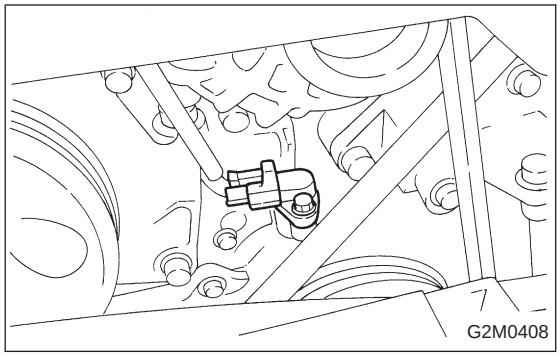


6) Disconnect connector from engine coolant temperature sensor.
7) Remove engine coolant temperature sensor.



8) Installation is in the reverse order of removal.

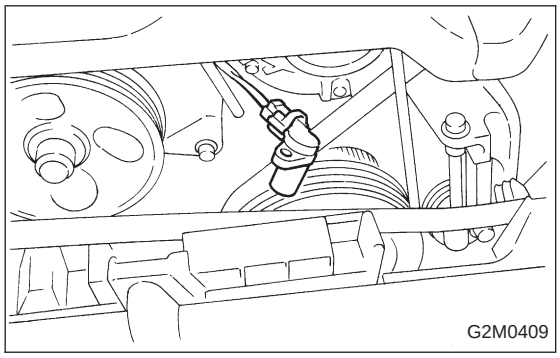
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



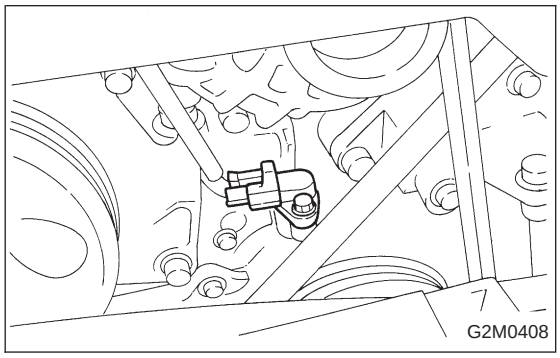
6. Crankshaft Position Sensor

A: REMOVAL AND INSTALLATION

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

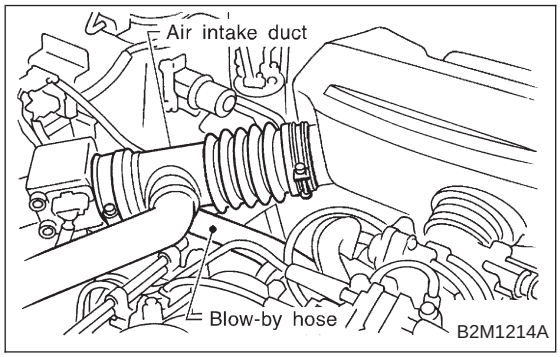


2) Remove crankshaft position sensor, and disconnect connector from it.



3) Installation is in the reverse order of removal.

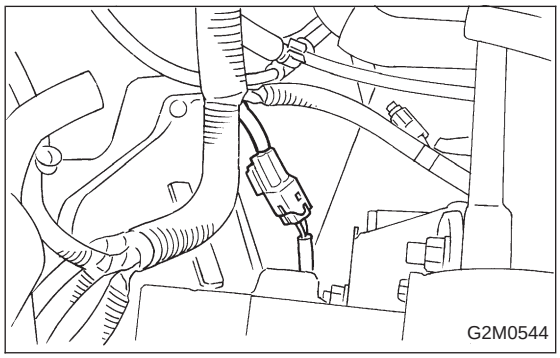
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



7. Front Oxygen Sensor

A: REMOVAL

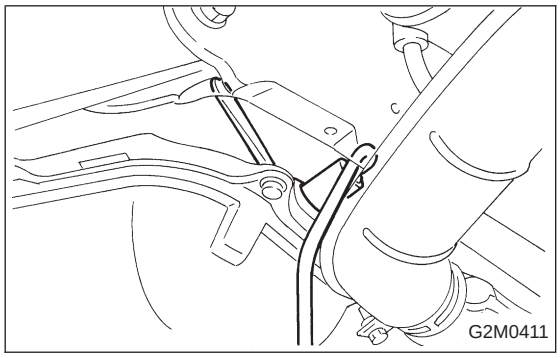
1) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.
2) Disconnect blow-by hose from air intake duct.
3) Remove air intake duct.



4) Disconnect connector from front oxygen sensor.

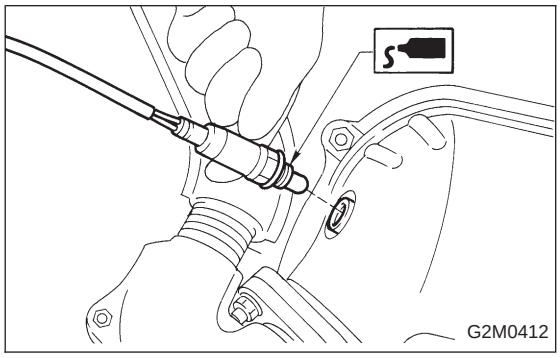
5) Lift-up the vehicle.
6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)



7) Remove front oxygen sensor.

CAUTION:
When removing oxygen sensor, do not force oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

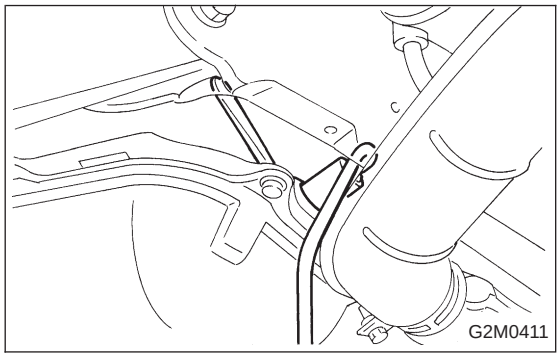


B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

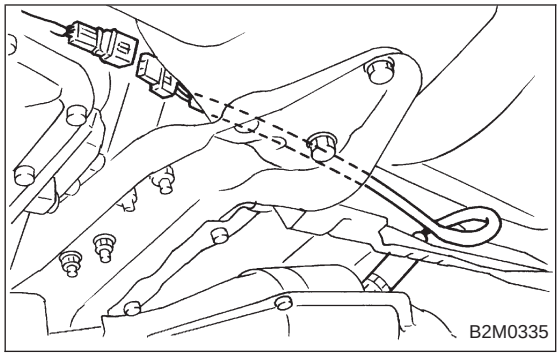
CAUTION:
Never apply anti-seize compound to protector of front oxygen sensor.



2) Install front oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

3) Lower the vehicle.
4) Connect connector of front oxygen sensor.
5) Install air intake duct.


B2M0335

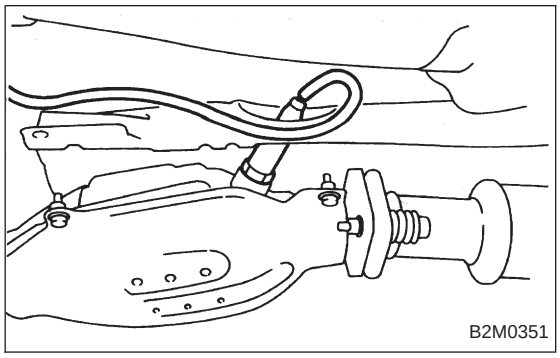
8. Rear Oxygen Sensor

A: REMOVAL

1) Lift-up the vehicle.
2) Disconnect connector from rear oxygen sensor.

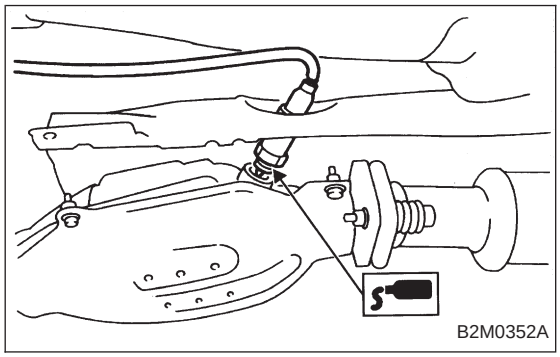
3) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)


B2M0351

4) Remove rear oxygen sensor.

CAUTION:
When removing rear oxygen sensor, do not force rear oxygen sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

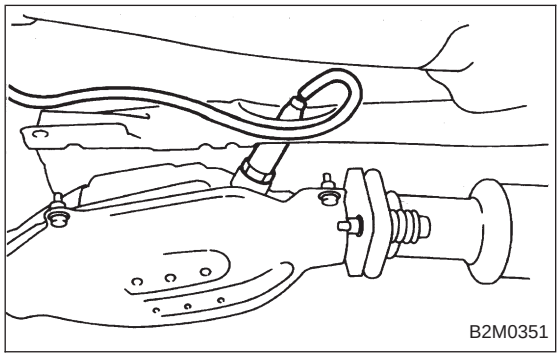

B2M0352A

B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

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

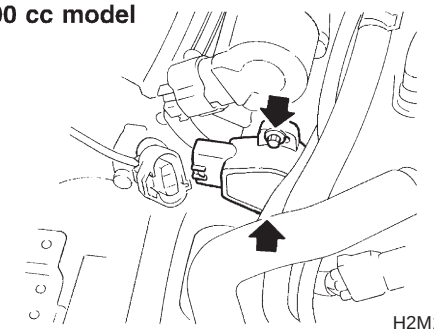

B2M0351

2) Install rear oxygen sensor.

Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

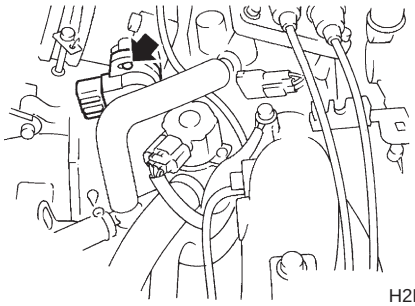
3) Connect connector of rear oxygen sensor.
4) Lower the vehicle.

1800 cc model



H2M1586A

2200 cc model



H2M1587A

9. Throttle Position Sensor

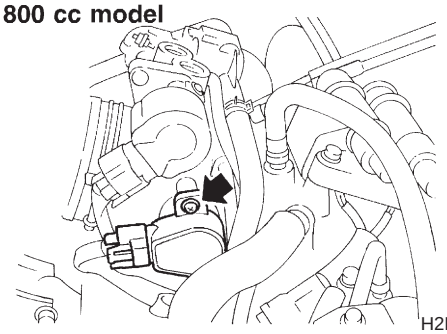
A: REMOVAL AND INSTALLATION

1) Disconnect connector from throttle position sensor.
2) Remove throttle position sensor holding screws, and remove it.
3) Installation is in the reverse order of removal.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

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

1800 cc model

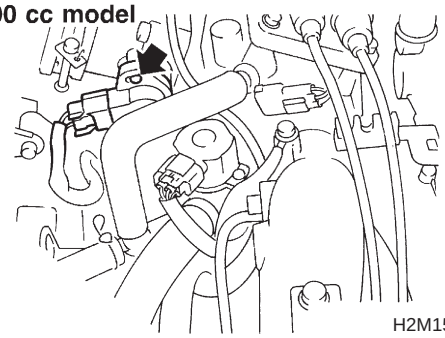


H2M1588A

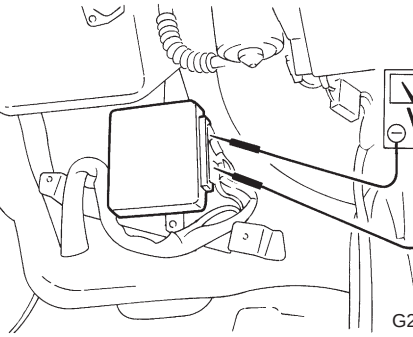
B: ADJUSTMENT

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

2200 cc model



H2M1589A

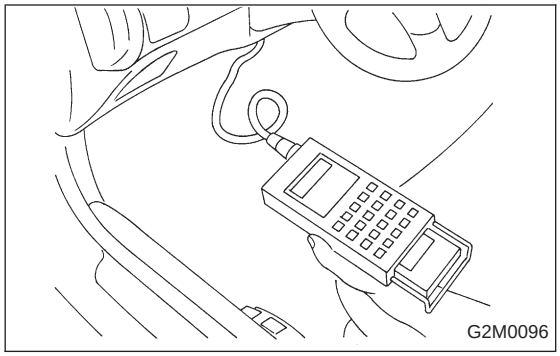


G2M0415

3) When using voltage meter;
(1) Take out ECM.
(2) Turn ignition switch to ON.
(3) Adjust throttle position sensor to specified voltage between ECM connector terminal.

Connector & terminal / Specified voltage
(B84) No. 6 — No. 20 / 0.45 — 0.55 V
[Fully closed.]

(4) Tighten throttle position sensor holding screws.


G2M0096

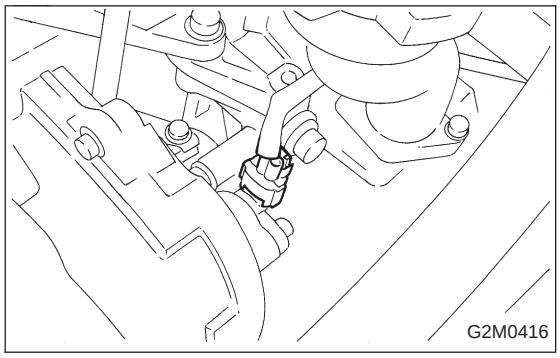
4) When using the Select Monitor;
(1) Attach Select Monitor.
(2) Turn ignition switch to ON.
(3) Select mode “F07”.
(4) Adjust throttle position sensor to specified data.

Condition / Specified data
Throttle fully closed. / 0.50 V

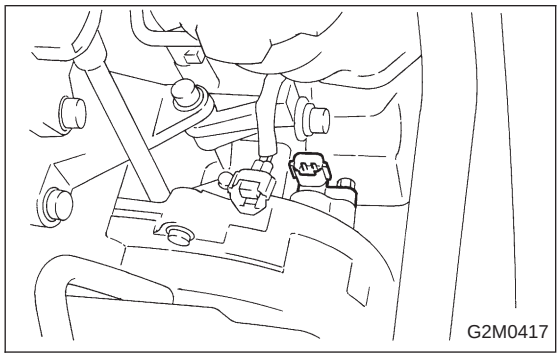
(5) Tighten throttle position sensor holding screws.

10. Camshaft Position Sensor

A: REMOVAL AND INSTALLATION


G2M0416

1) Disconnect connector from camshaft position sensor.

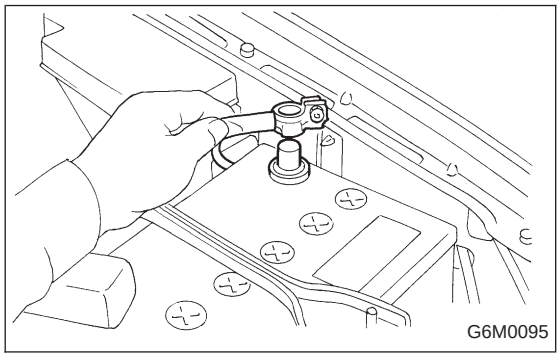

G2M0417

2) Remove camshaft position sensor from camshaft support LH.
3) Installation is in the reverse order of removal.

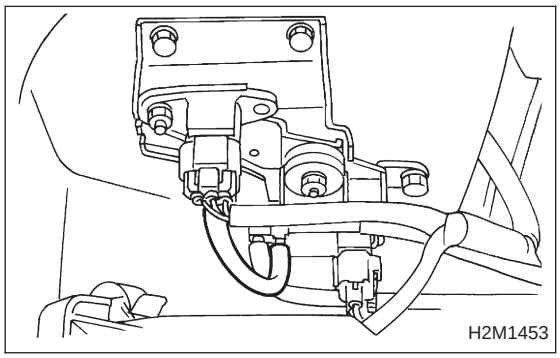
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

11. Pressure Sensor

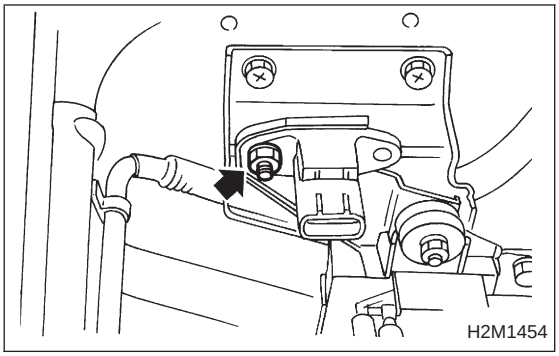
A: REMOVAL AND INSTALLATION


G6M0095

1) Disconnect battery ground cable.


H2M1453

2) Disconnect connector from pressure sensor.
3) Disconnect hose from pressure sensor.



4) Remove pressure sensor from bracket.
5) Installation is in the reverse order of removal.

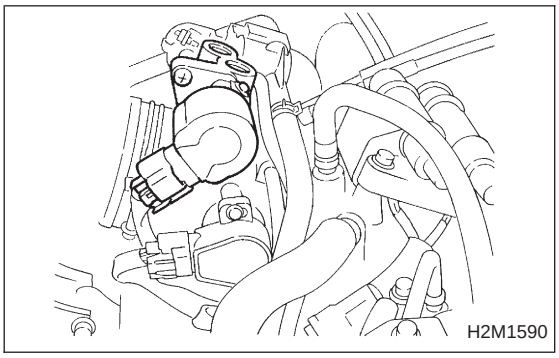
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

12. Idle Air Control Solenoid Valve

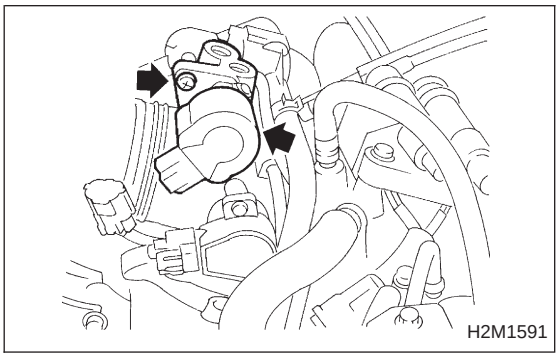
A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

1) Disconnect connector from idle air control solenoid valve.



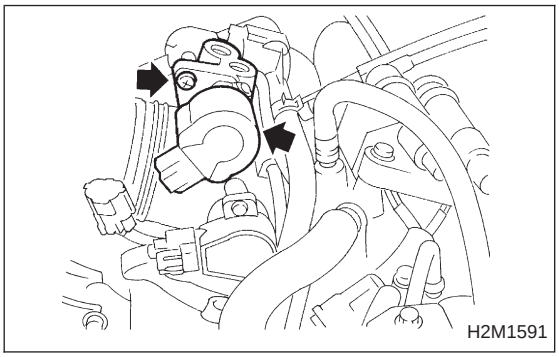
2) Remove idle air control solenoid valve from throttle body.



3) Installation is in the reverse order of removal.

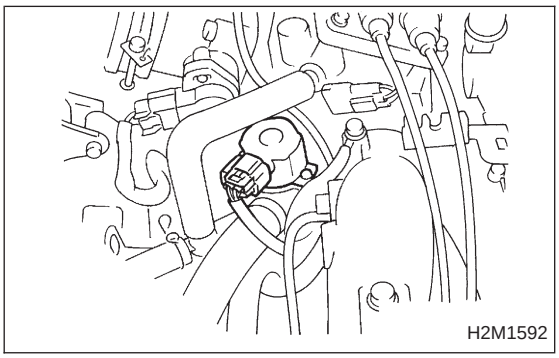
CAUTION:
Replace gasket with a new one.

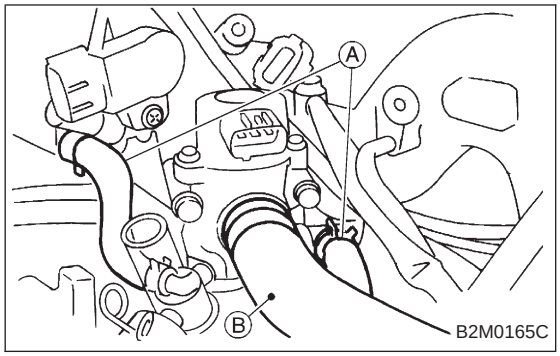
Tightening torque:
6.0±0.8 N·m (0.61±0.08 kg-m, 4.4±0.6 ft-lb)



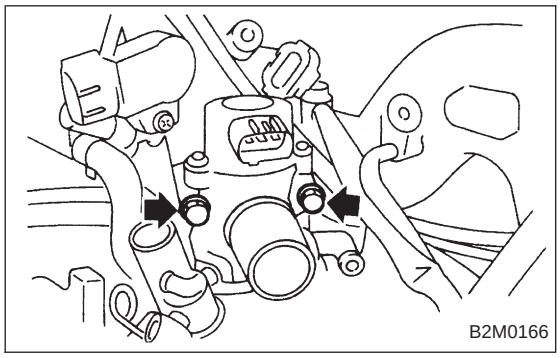
2. 2200 cc MODEL

1) Disconnect connector from idle air control solenoid valve.





2) Disconnect engine coolant hoses Ⓐ from idle air control solenoid valve.
3) Disconnect air by-pass hose Ⓑ from idle air control solenoid valve.

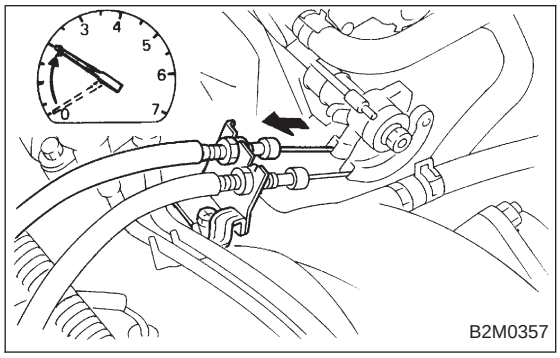


4) Remove idle air control solenoid valve from throttle body.
5) Installation is in the reverse order of removal.

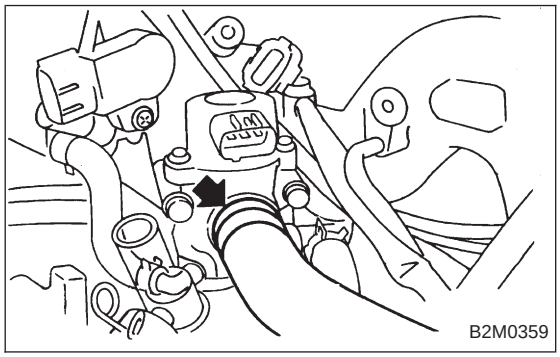
CAUTION:
Replace gasket with a new one.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

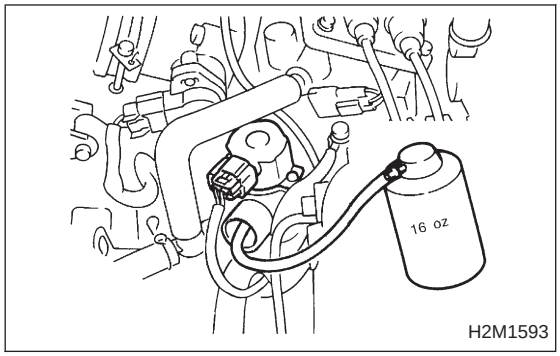
B: CLEANING (2200 cc MODEL)



1) Start and warm-up the engine until radiator fan operates.
2) Hold throttle valve so that engine speed is at 2,000 rpm.



3) Disconnect by-pass hose from idle air control solenoid valve.



4) Slowly pour one can (16 oz) of cleaner into by-pass air hole.

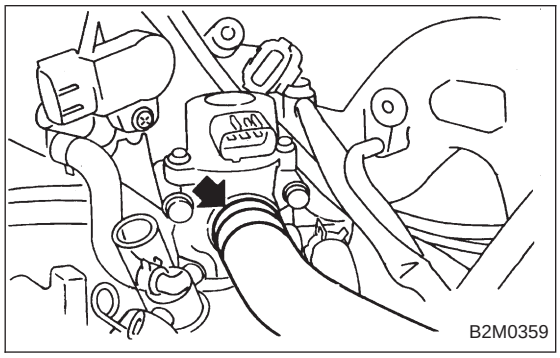
Cleaner:

- ***Part No. 1050002 GM Top Engine Cleaner***
- ***Part No. X66-A AC Delco Carburetor Tune-up Conditioner***

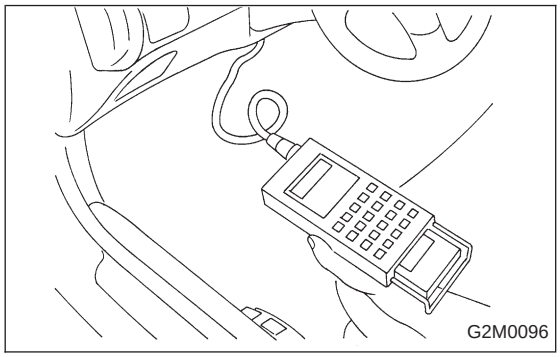
5) Leave the engine running for five minutes.

NOTE:
White smoke comes out of the muffler until the cleaner is used up.

6) Stop the engine.



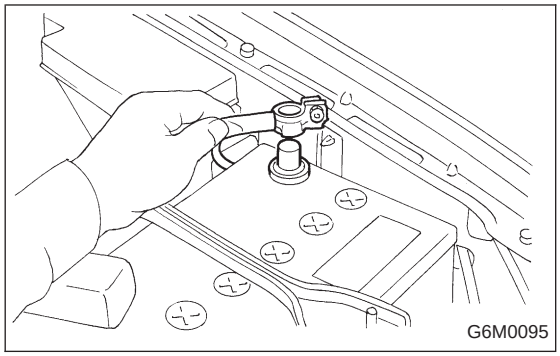
7) Release the throttle valve.
8) Connect by-pass hose to idle air control solenoid valve.



9) Check duty ratio of idle air control solenoid valve with Subaru Select Monitor.

(1) Connect Subaru Select Monitor to the data link connector.
(2) Start the engine and turn Subaru Select Monitor switch to ON.
(3) Select mode “F12”.
(4) Make sure duty ratio on radiator fan and electric load is OFF.

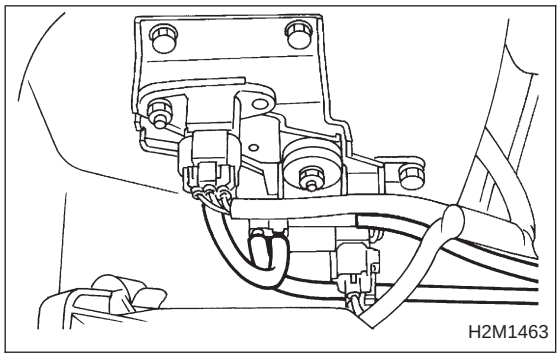
Specified data: 25 — 40%


G6M0095

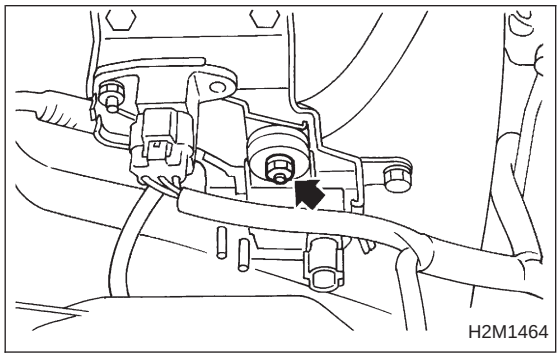
13. Pressure Sources Switching Solenoid Valve

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.

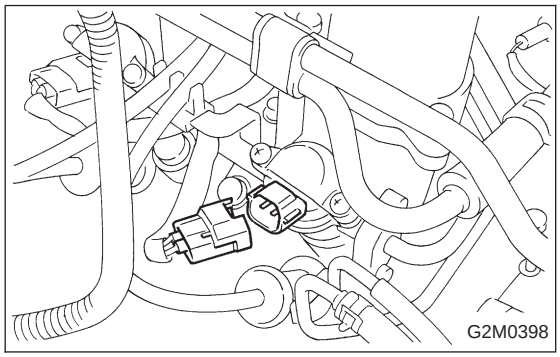

H2M1463

2) Disconnect connector from pressure sources switching solenoid valve.
3) Disconnect hoses from pressure sources switching solenoid valve.


H2M1464

4) Remove pressure sources switching solenoid valve from bracket.
5) Installation is in the reverse order of removal.

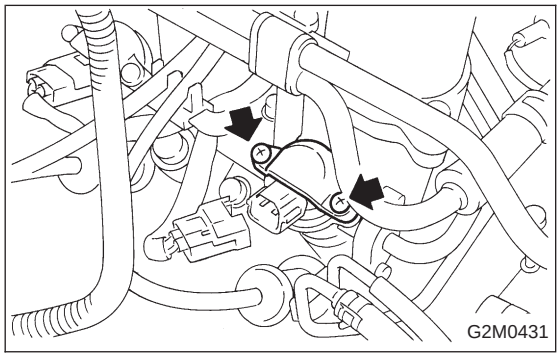
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)


G2M0398

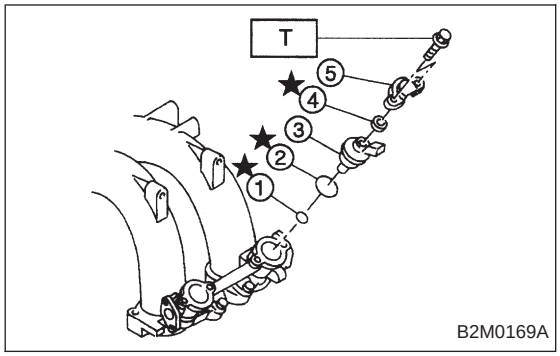
14. Fuel Injector

A: REMOVAL AND INSTALLATION

1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Disconnect connector from fuel injector.


G2M0431

3) Remove fuel injector from fuel pipe assembly.

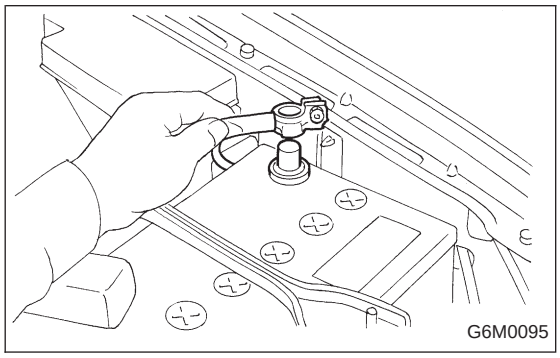


4) Installation is in the reverse order of removal.

CAUTION:
Replace O-rings and insulator.

Tightening torque:
T: 3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

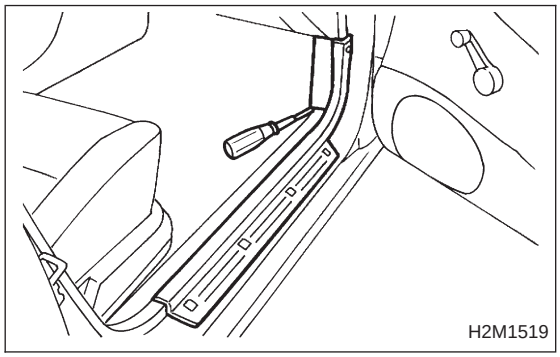
① O-ring B
② O-ring A
③ Fuel injector
④ Insulator
⑤ Fuel injector cup
★: Replacement part



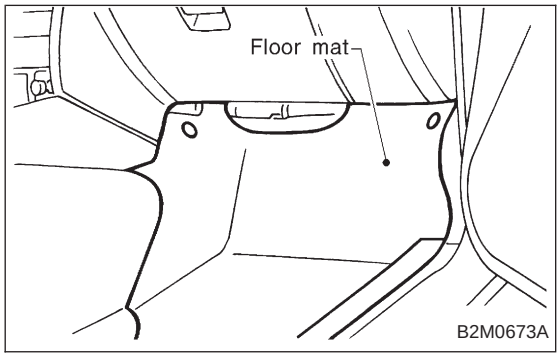
15. Engine Control Module

A: REMOVAL AND INSTALLATION

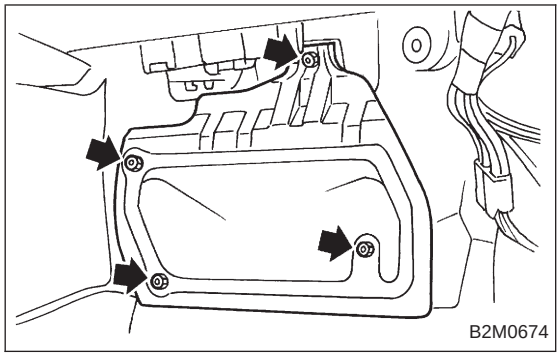
1) Disconnect battery ground cable.



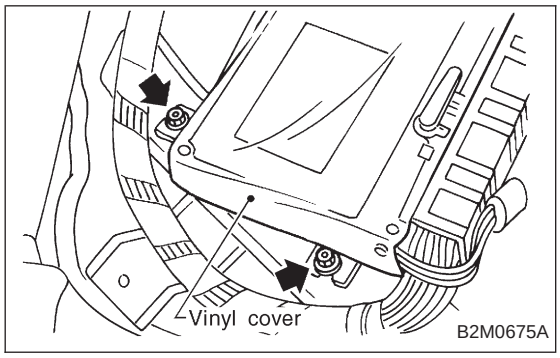
2) Remove front pillar lower trim.



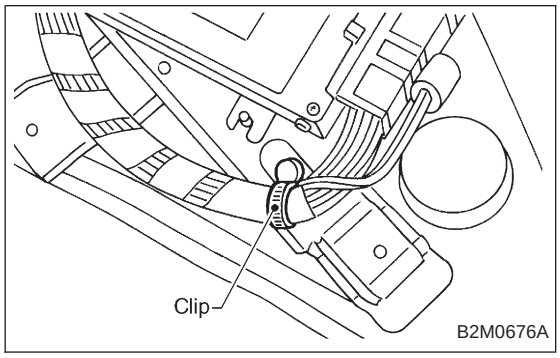
3) Detach floor mat of front passenger seat.



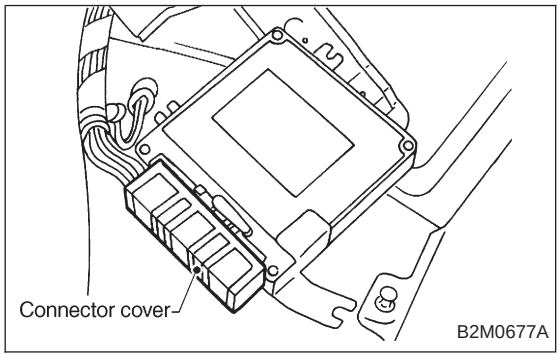
4) Remove protect cover.



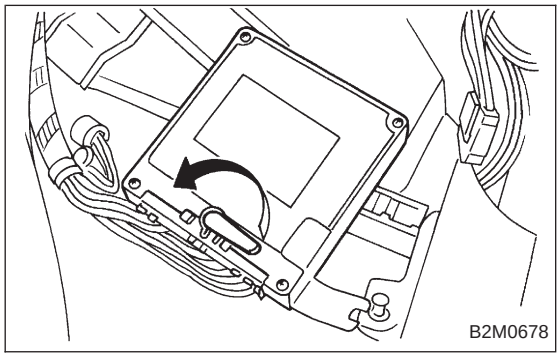
5) Remove vinyl cover and nuts which attach ECM to bracket.



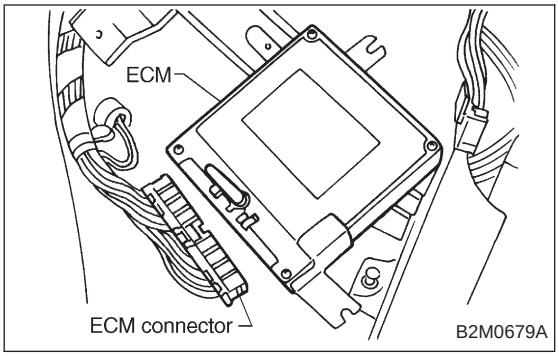
6) Detach clip from bracket.



7) Remove connector cover.



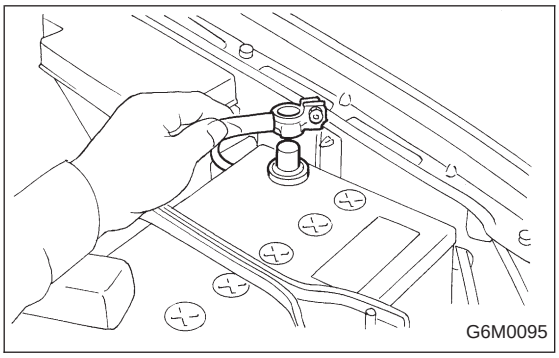
8) Disconnect ECM connector.



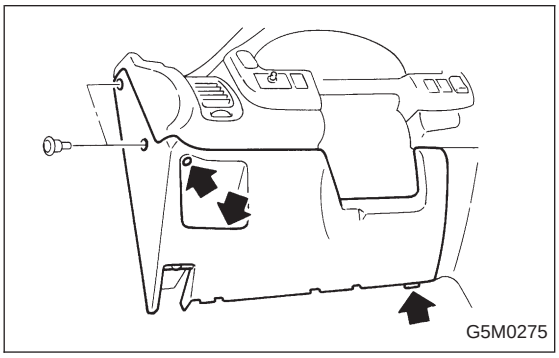
9) Take out ECM.
10) Installation is in the reverse order of removal.

16. Main Relay

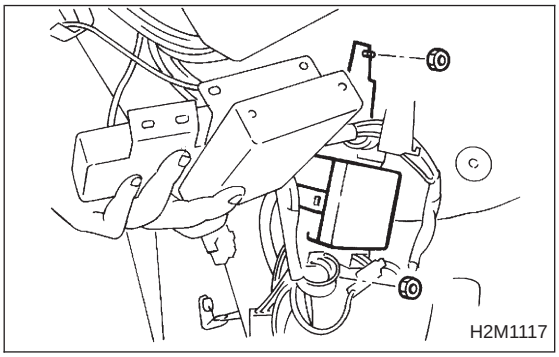
A: REMOVAL AND INSTALLATION



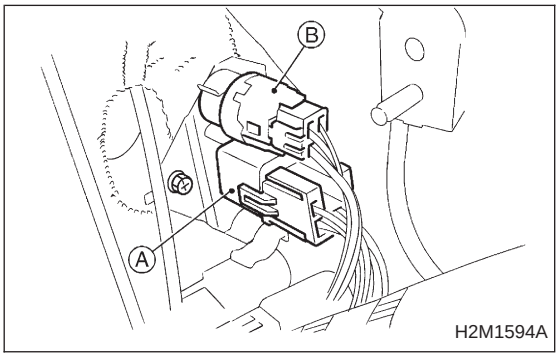
1) Disconnect battery ground cable.



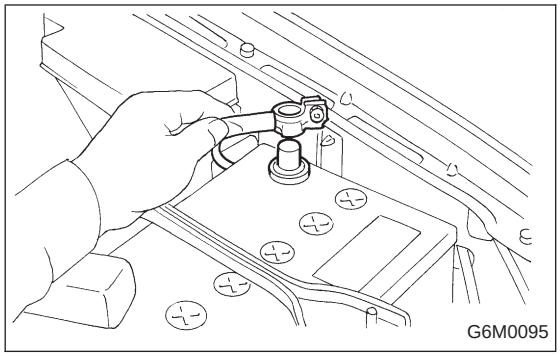
2) Remove lower cover and then disconnect connectors.
3) Remove the front pillar lower trim.



4) Remove fuse and relay box from bracket.
5) Disconnect connector from horn relay.
6) Remove all relays with bracket from body.
7) Remove fuse box mounting nuts.
8) Lower fuse box.
9) Remove fuse box mounting bracket.



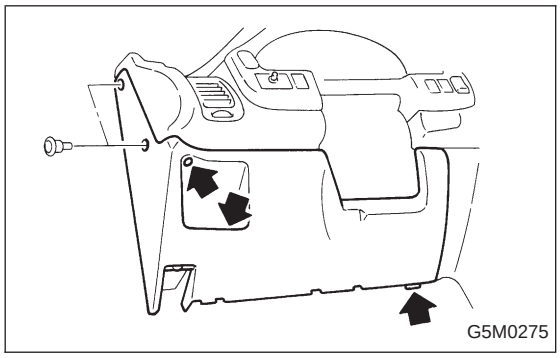
10) Remove bolt which retains bracket of main relay Ⓐ and fuel pump relay Ⓑ.
11) Disconnect connector from main relay.
12) Installation is in the reverse order of removal.


G6M0095

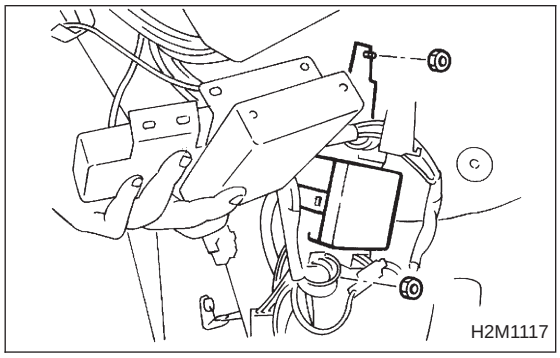
17. Fuel Pump Relay

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.

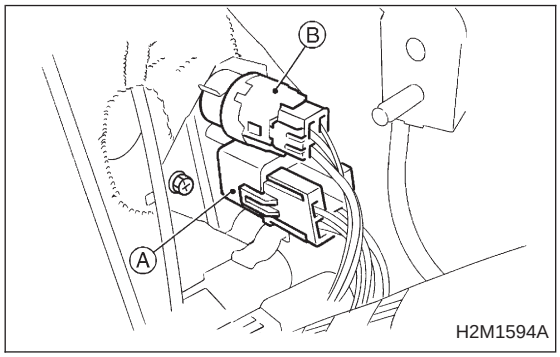

G5M0275

2) Remove lower cover and then disconnect connectors.
3) Remove the front pillar lower trim.



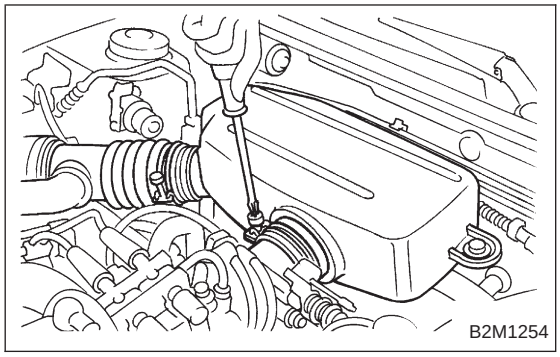
H2M1117

4) Remove fuse and relay box from bracket.
5) Disconnect connector from horn relay.
6) Remove all relays with bracket from body.
7) Remove fuse box mounting nuts.
8) Lower fuse box.
9) Remove fuse box mounting bracket.



H2M1594A

10) Remove fuel pump relay from main relay and fuel pump relay mounting bracket.
11) Disconnect connector from fuel pump relay.
12) Installation is in the reverse order of removal.



18. Air Intake Chamber

A: REMOVAL AND INSTALLATION

1) Loosen clamps which connect air intake chamber to throttle body and air intake duct.
2) Disconnect air hoses from air intake chamber.
3) Remove bolts which secure air intake chamber to stays.
4) Remove air intake chamber.
5) Installation is in the reverse order of removal.

Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

FUEL SYSTEM 2-8

Page

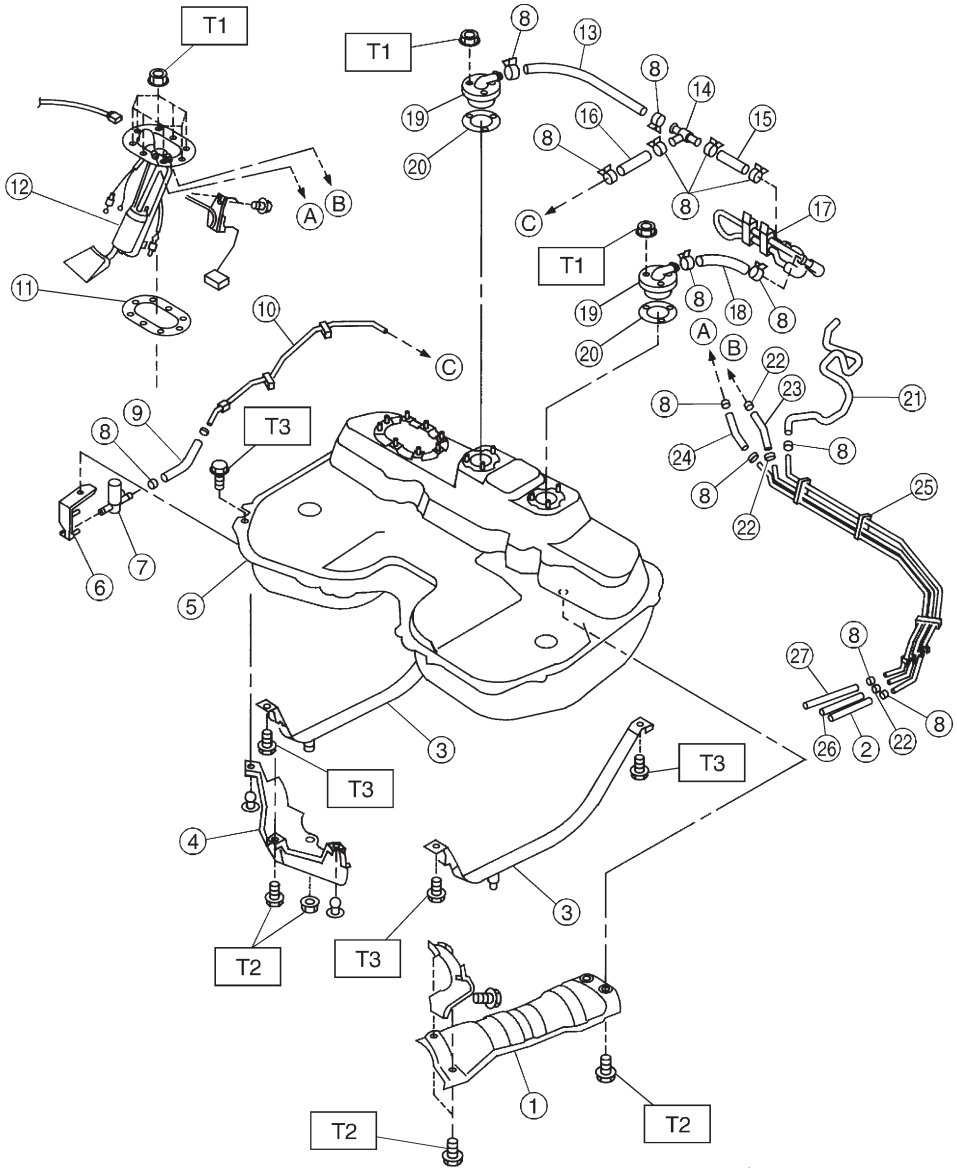
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1. Specifications

Model		1800 cc	2200 cc
Fuel tank	Capacity	50 ℓ (13.2 US gal, 11.0 Imp gal)	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat	
Fuel pump	Type	Impeller	
	Discharge pressure	250.1 kPa (2.55 kg/cm^2, 36.3 psi)	
	Discharge flow	More than 80 ℓ (21.1 US gal, 17.6 Imp gal)/h [12 V at 250.1 kPa (2.55 kg/cm^2, 36.3 psi)]	
Fuel filter		Cartridge type	

1. Fuel Tank

A: 1800 cc MODEL

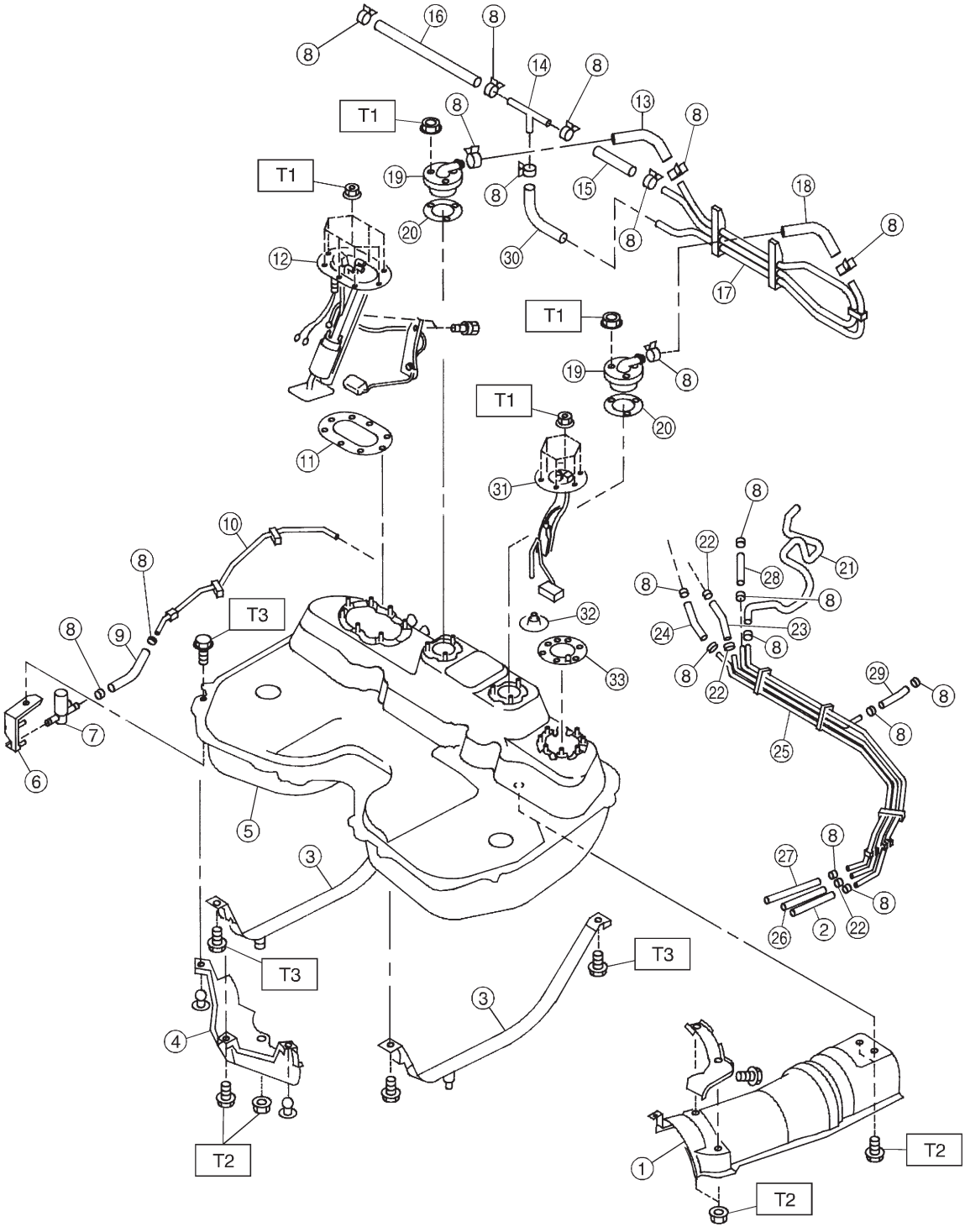


H2M1542A

① Heat sealed cover
② Evaporation hose E
③ Fuel tank band
④ Protector
⑤ Fuel tank
⑥ Pressure control solenoid valve bracket
⑦ Pressure control solenoid valve
⑧ Clip
⑨ Evaporation hose G
⑩ Evaporation pipe A
⑪ Fuel pump gasket
⑫ Fuel pump ASSY
⑬ Evaporation hose F
⑭ Joint pipe
⑮ Evaporation hose B
⑯ Evaporation hose A
⑰ Evaporation pipe ASSY
⑱ Evaporation hose D
⑲ Fuel cut valve
⑳ Fuel cut valve gasket
㉑ Evaporation hose C
㉒ Clamp
㉓ Fuel delivery hose A
㉔ Fuel return hose A
㉕ Fuel pipe ASSY
㉖ Fuel delivery hose B
㉗ Fuel return hose B

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 33±10 (3.4±1.0, 25±7)

B: 2200 cc MODEL



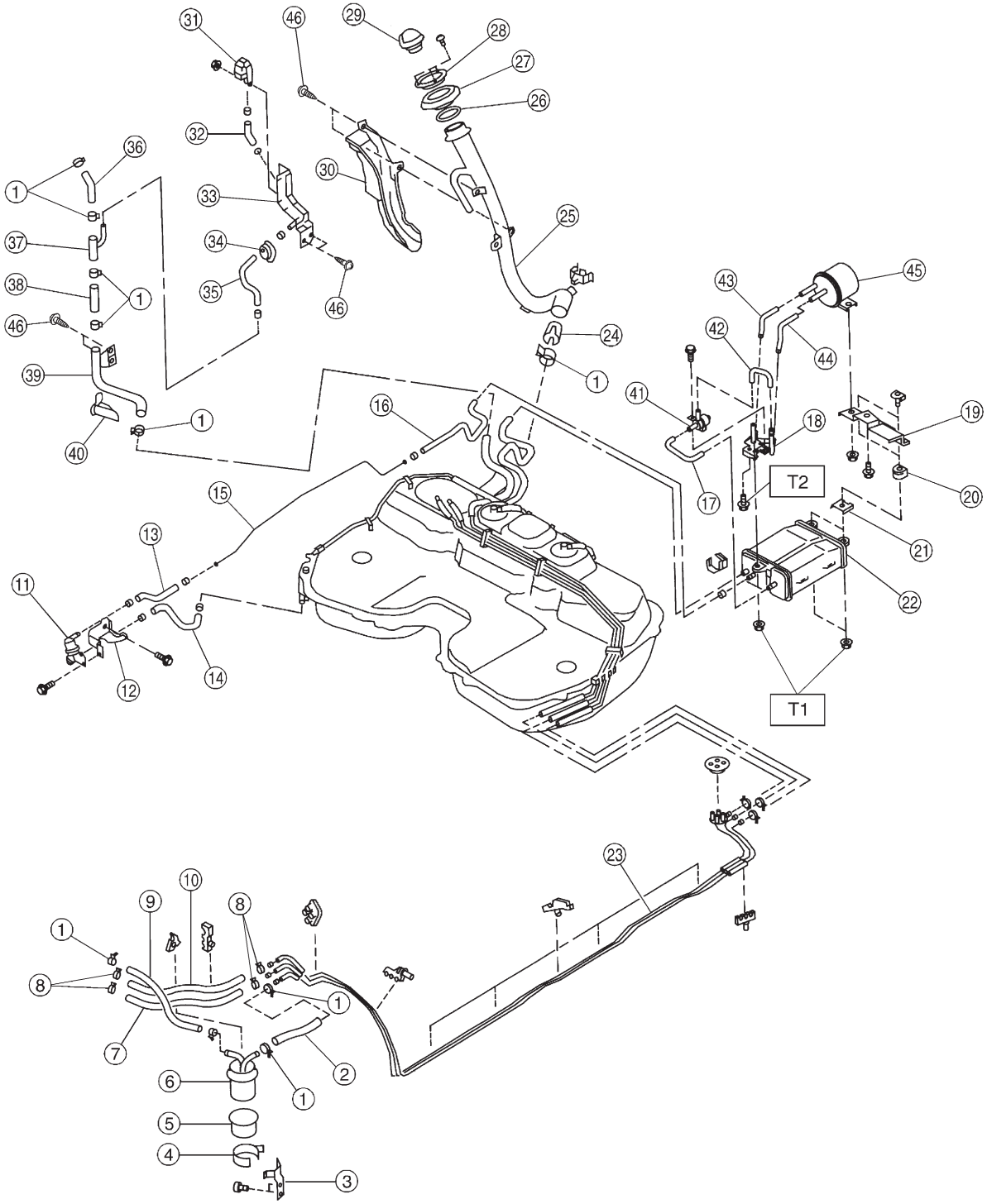
H2M2313A

① Heat sealed cover
② Evaporation hose E
③ Fuel tank band
④ Protector
⑤ Fuel tank
⑥ Pressure control solenoid valve bracket
⑦ Pressure control solenoid valve
⑧ Clip
⑨ Evaporation hose G
⑩ Evaporation pipe A
⑪ Fuel pump gasket
⑫ Fuel pump ASSY
⑬ Evaporation hose F
⑭ Joint pipe
⑮ Evaporation hose B
⑯ Evaporation hose A
⑰ Evaporation pipe ASSY
⑱ Evaporation hose D
⑲ Fuel cut valve
⑳ Fuel cut valve gasket
㉑ Evaporation hose C
㉒ Clamp
㉓ Fuel delivery hose A
㉔ Fuel return hose A
㉕ Fuel pipe ASSY
㉖ Fuel delivery hose B
㉗ Fuel return hose B
㉘ Jet pump hose A
㉙ Jet pump hose B
㉚ Evaporation hose E
㉛ Fuel sub meter unit
㉜ Jet pump filter
㉝ Gasket

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 33±10 (3.4±1.0, 25±7)

2. Fuel Line

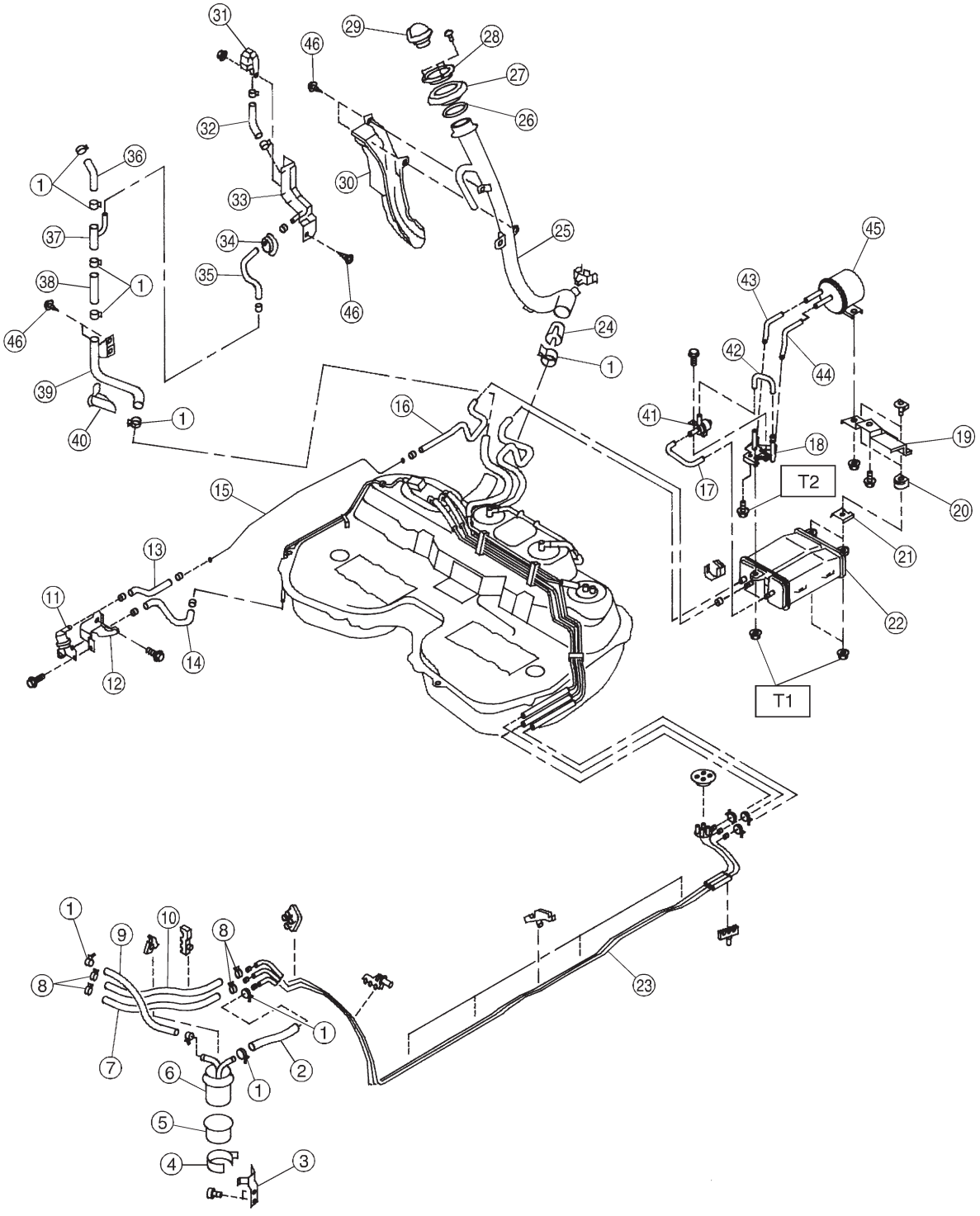
A: 1800 cc MODEL



① Clamp
② Fuel delivery hose A
③ Fuel filter bracket
④ Fuel filter holder
⑤ Fuel filter cup
⑥ Fuel filter
⑦ Evaporation hose
⑧ Clip
⑨ Fuel delivery hose B
⑩ Fuel return hose
⑪ Roll over valve
⑫ Roll over valve bracket
⑬ Evaporation hose H
⑭ Evaporation hose I
⑮ Evaporation pipe B
⑯ Canister hose A
⑰ Canister hose B
⑱ Canister holder
⑲ Canister upper bracket
⑳ Cushion rubber
㉑ Canister lower bracket
㉒ Canister
㉓ Fuel pipe ASSY
㉔ Fuel filler valve
㉕ Fuel filler pipe
㉖ Packing
㉗ Ring A
㉘ Ring B
㉙ Fuel filler cap
㉚ Fuel filler pipe protector
㉛ Fuel tank pressure sensor
㉜ Fuel tank pressure sensor hose A
㉝ Fuel tank pressure sensor bracket
㉞ Grommet
㉟ Fuel tank pressure sensor hose B
㊱ Air ventilator hose A
㊲ Air ventilator pipe A
㊳ Air ventilator hose B
㊴ Air ventilator pipe B
㊵ Air ventilator pipe protector
㊶ Vent control solenoid valve
㊷ Vent control solenoid valve hose
㊸ Air filter hose A
㊹ Air filter hose B
㊺ Air filter
㊻ Tapping screw

Tightening torque: N·m (kg-m, ft-lb)
T1: 23±7 (2.3±0.7, 17±5.1)
T2: 25±7 (2.5±0.7, 18±5.1)

B: 2200 cc MODEL



H2M2314A

① Clamp
② Fuel delivery hose A
③ Fuel filter bracket
④ Fuel filter holder
⑤ Fuel filter cup
⑥ Fuel filter
⑦ Evaporation hose
⑧ Clip
⑨ Fuel delivery hose B
⑩ Fuel return hose
⑪ Roll over valve
⑫ Roll over valve bracket
⑬ Evaporation hose H
⑭ Evaporation hose I
⑮ Evaporation pipe B
⑯ Canister hose A
⑰ Canister hose B
⑱ Canister holder
⑲ Canister upper bracket
⑳ Cushion rubber
㉑ Canister lower bracket
㉒ Canister
㉓ Fuel pipe ASSY
㉔ Fuel filler valve
㉕ Fuel filler pipe
㉖ Packing
㉗ Ring A
㉘ Ring B
㉙ Fuel filler cap
㉚ Fuel filler pipe protector
㉛ Fuel tank pressure sensor
㉜ Fuel tank pressure sensor hose A
㉝ Fuel tank pressure sensor bracket
㉞ Grommet
㉟ Fuel tank pressure sensor hose B
㊱ Air ventilator hose A
㊲ Air ventilator pipe A
㊳ Air ventilator hose B
㊴ Air ventilator pipe B
㊵ Air ventilator pipe protector
㊶ Vent control solenoid valve
㊷ Vent control solenoid valve hose
㊸ Air filter hose A
㊹ Air filter hose B
㊺ Air filter
㊻ Tapping screw

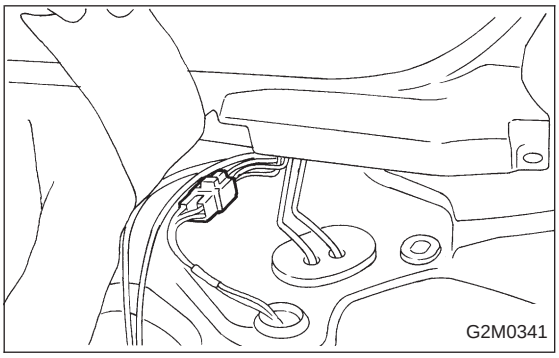
Tightening torque: N·m (kg-m, ft-lb)
T1: 23±7 (2.3±0.7, 17±5.1)
T2: 25±7 (2.5±0.7, 18±5.1)

1. On-Car Services

A: PRECAUTIONS

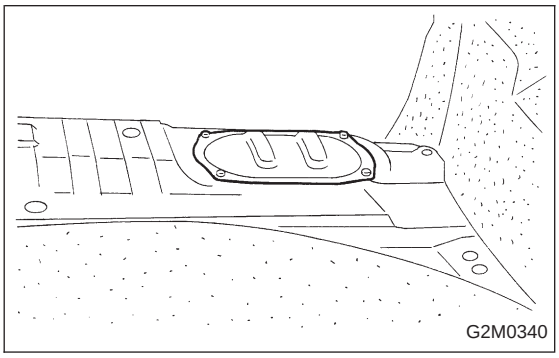
WARNING:

- **Place “No fire” signs near the working area.**
- **Disconnect ground terminal from battery.**
- **Be careful not to spill fuel on the floor.**


G2M0341

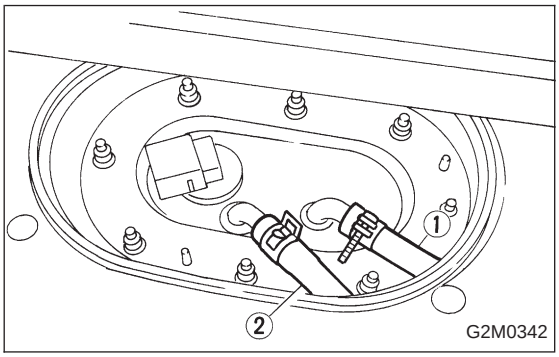
B: RELEASING OF FUEL PRESSURE

1) Remove rear seat, and turn up floor mat.
2) Disconnect connector from fuel tank.
3) Start the engine, and run it until it stalls.
4) After the engine stalls, crank it for five more seconds.
5) Turn ignition switch OFF.


G2M0340

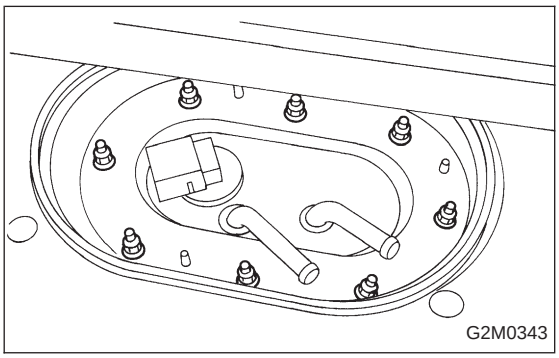
C: DRAINING OF FUEL

1) Remove rear seat and seat back.
2) Remove access hole lid.
3) Disconnect connector from fuel pump.
4) Release fuel pressure. <Ref. to 2-8 [W1B0].>

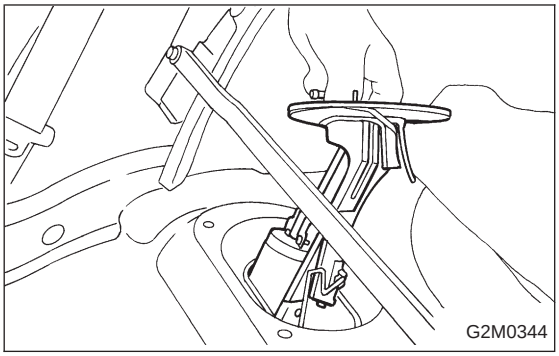


G2M0342

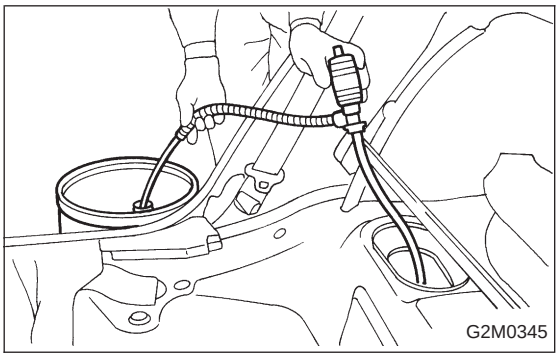
5) Disconnect fuel delivery hose ① and return hose ②.


G2M0343

6) Remove nuts which install fuel pump assembly onto fuel tank.

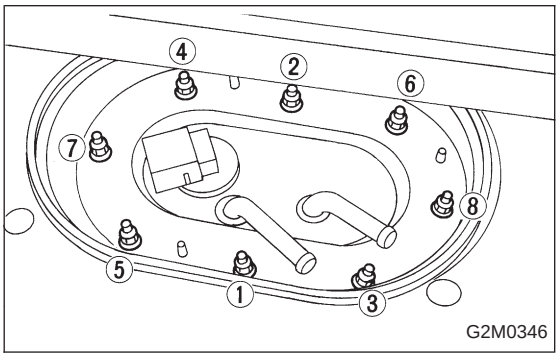


7) Take off fuel pump from fuel tank.



8) Drain fuel from fuel tank by using a hand pump.

WARNING:
Do not use a motor pump when draining fuel.

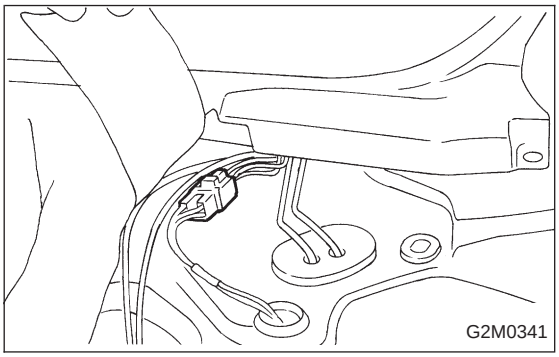


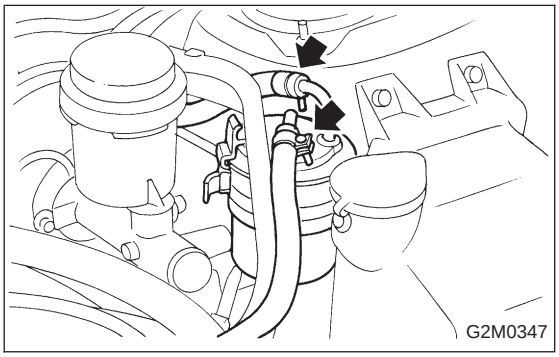
9) After draining fuel, reinstall fuel pump.
Tighten nuts in numerical sequence shown in Figure to specified torque.

Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

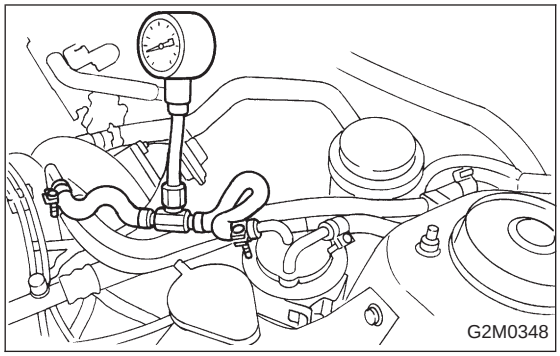
D: MEASUREMENT OF FUEL PRESSURE

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Connect connector to fuel tank.





3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.


G2M0348

4) Start the engine.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from collector chamber.

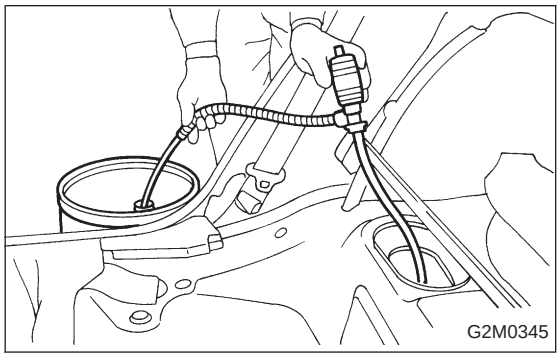
Fuel pressure:
235 — 265 kPa (2.4 — 2.7 kg/cm^2, 34 — 38 psi)

6) After connecting pressure regulator vacuum hose, measure fuel pressure.

Fuel pressure:
177 — 206 kPa (1.8 — 2.1 kg/cm^2, 26 — 30 psi)

WARNING:
Before removing fuel pressure gauge, release fuel pressure.

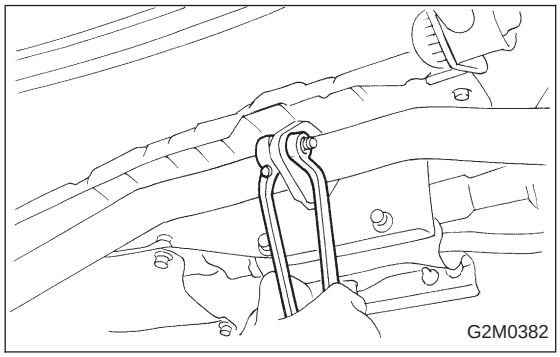
NOTE:
If out of specification as measured at step 6), check or replace pressure regulator and pressure regulator vacuum hose.


G2M0345

2. Fuel Tank

A: REMOVAL

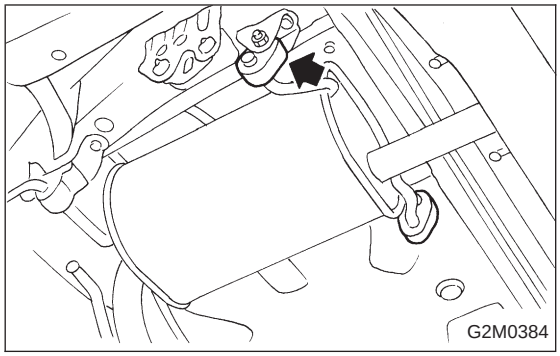
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>


G2M0382

3) Remove rear exhaust pipe.
   (1) Lift-up the vehicle.
   (2) Separate rear exhaust pipe from front catalyst converter.
   (3) Separate rear exhaust pipe from muffler.
   (4) Remove hook from rubber cushion, and remove exhaust pipe.

NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (004301003)

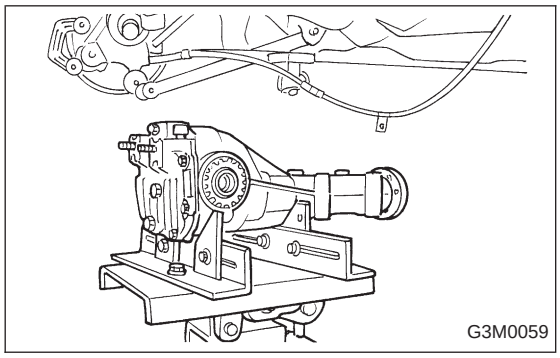
<Ref. to 2-9 [W2A0].>


G2M0384

4) Remove muffler assembly.

NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (004301003)

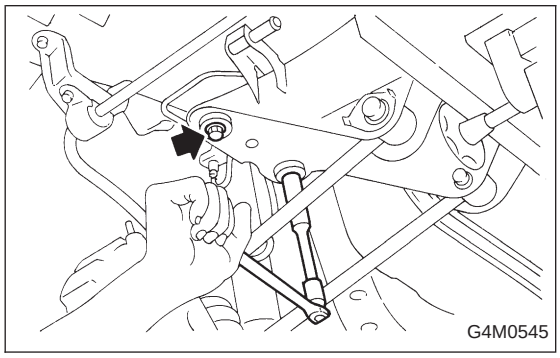
<Ref. to 2-9 [W3A0].>


G3M0059

5) Remove rear differential assembly.

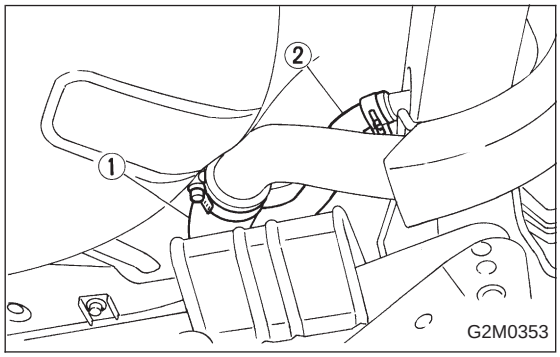
(1) Remove rear axle shafts from rear differential assembly.
(2) Remove rear differential front cover.
(3) Remove propeller shaft.
(4) Remove lower differential bracket.
(5) Set transmission jack under rear differential.
(6) Remove bolts which install rear differential onto transmission jack.

<Ref. to 3-4 [W2B0], [W3B0].>


G4M0545

6) Remove rear crossmember.

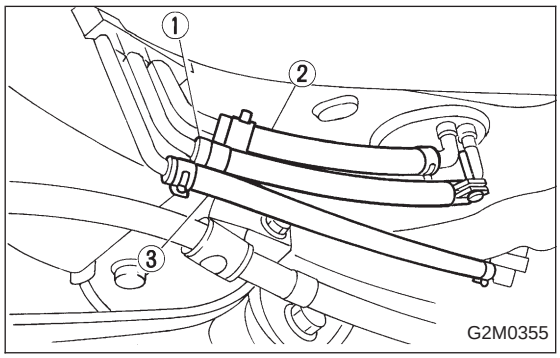
<Ref. to 4-1 [W10A0].>



G2M0353

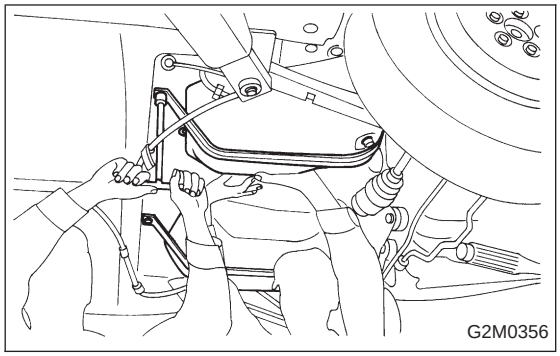
7) Loosen clamp, and disconnect fuel filler hose from pipe.
8) Loosen clamp, and disconnect air vent hose from air vent pipe.

① Fuel filler hose
② Air vent hose



G2M0355

9) Loosen clip and clamps, and disconnect fuel delivery hose ①, return hose ② and evaporation hose ③.

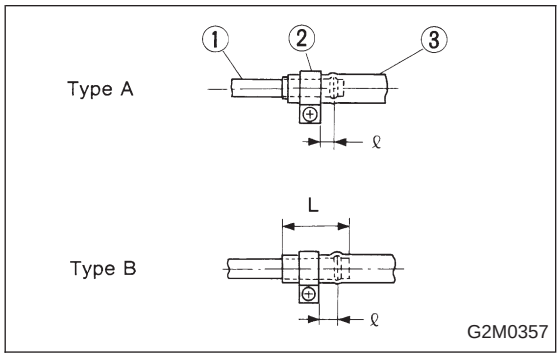


10) While holding fuel tank, remove bolts from bands and dismount fuel tank.

WARNING:
A helper is required to perform step 10).

B: INSTALLATION

Installation is in the reverse order of removal. Observe the following:
1) When installing fuel tank, have a helper hold fuel tank while installing bands.
2) Before tightening band mounting bolts, connect fuel system hoses.



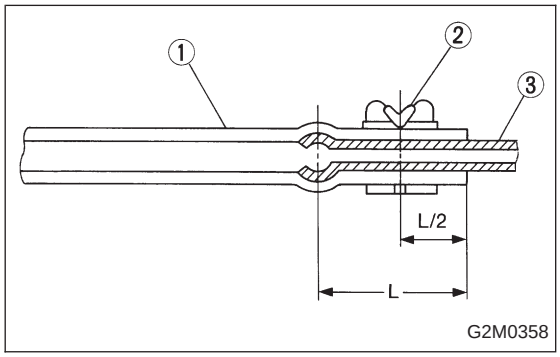
3) Install hose and hold down clips at positions indicated in Figure.

Tightening torque:
12.5±2.5 N·m (1.27±0.25 kg-m, 9.2±1.8 ft-lb)

Type A: When fitting length is specified.
Type B: When fitting length is not specified.

① Fitting
② Clamp
③ Hose

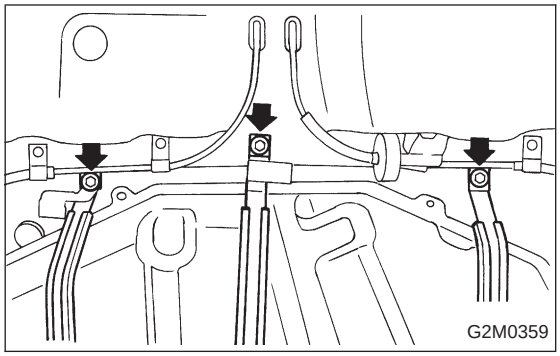
ℓ : 2.5±1.5 mm (0.098±0.059 in)
L: 22.5±2.5 mm (0.886±0.059 in)



① Hose
② Clip
③ Pipe

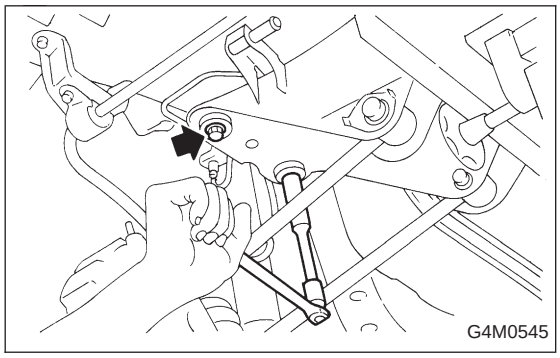
Fuel return hose:
L = 22.5±2.5 mm (0.098±0.059 in)

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

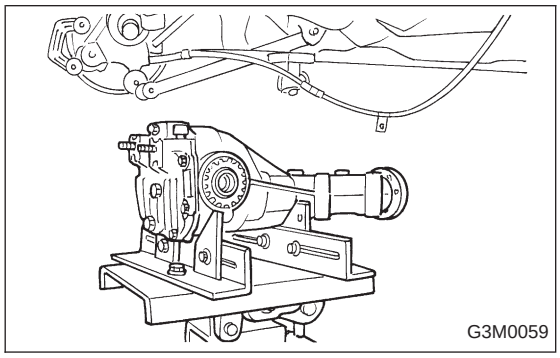

G2M0359

4) Tighten band mounting bolts.

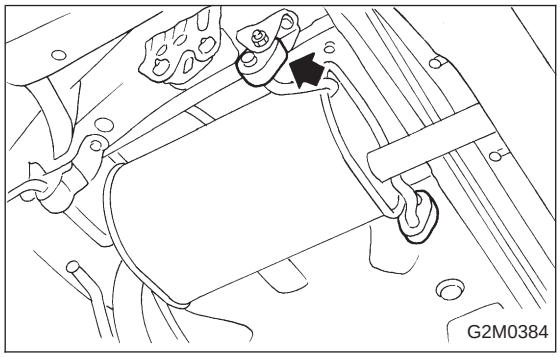
Tightening torque:
23.5±0.5 N·m (2.40±0.05 kg-m, 17.4±0.4 ft-lb)


G4M0545

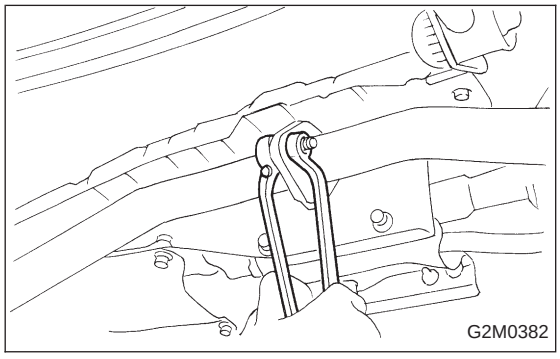
5) Install rear crossmember. <Ref. to 4-1 [W10C0].>


G3M0059

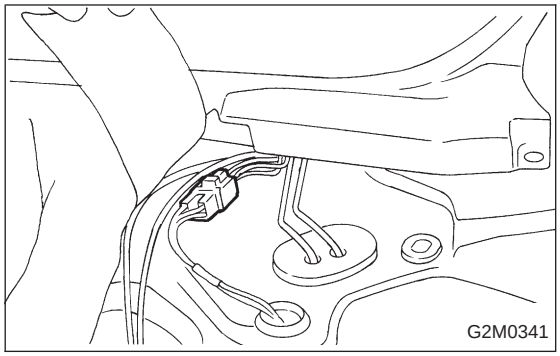
6) Install rear differential assembly. <Ref. to 3-4 [W2F0], [W3F0].>


G2M0384

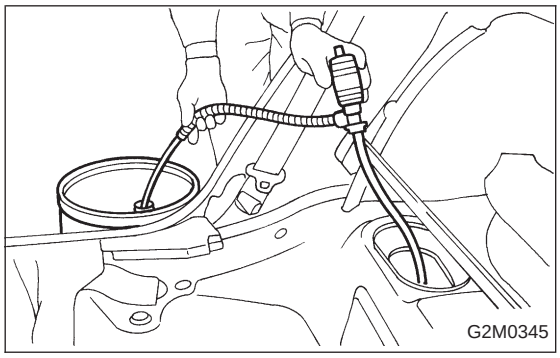
7) Install muffler assembly.


G2M0382

8) Install heat sealed cover.
9) Install rear exhaust pipe.


G2M0341

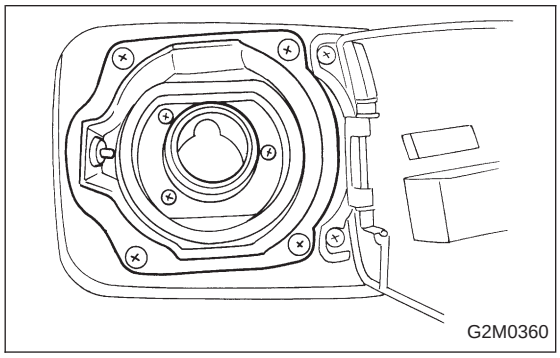
10) Lower the vehicle, and connect connector to fuel pump.
11) Install access hole lid.
12) Install rear seat back and rear seat.


G2M0345

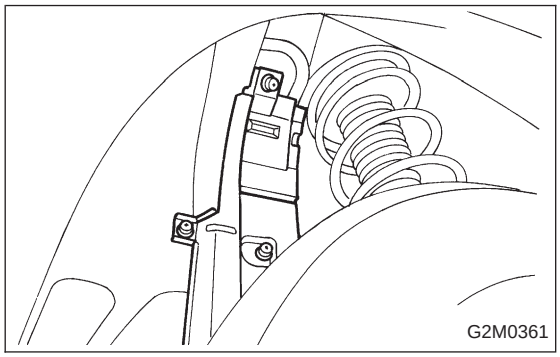
3. Fuel Filler Pipe

A: REMOVAL

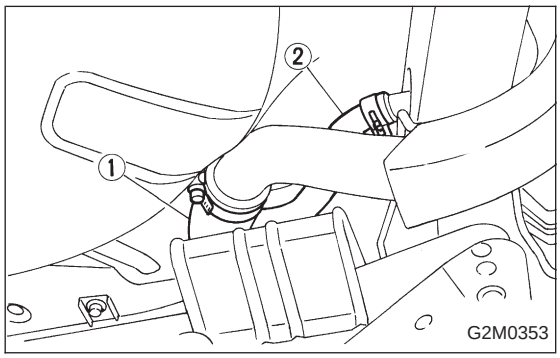
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>


G2M0360

3) Remove right rear wheel.
4) Open fuel filler flap and remove filler cap.
5) Remove screws holding packing in place.

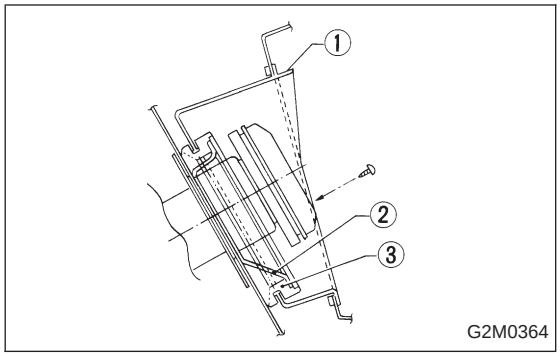

G2M0361

6) Lift-up the vehicle.
7) Remove fuel filler pipe protector.



G2M0353

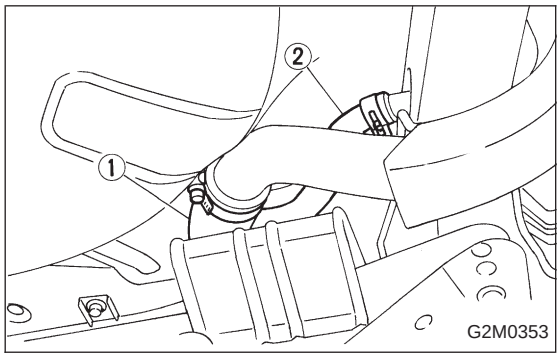
8) Remove clip, and separate air vent hose from pipe.
9) Loosen clamp, and separate fuel filler hose from pipe.
① Fuel filler hose
② Air vent hose
10) Remove fuel filler pipe to under side of the vehicle.



B: INSTALLATION

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

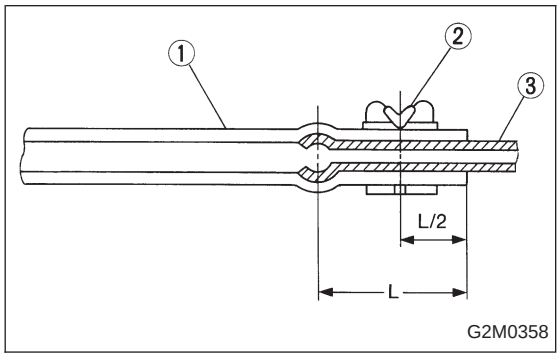
NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Insert fuel filler hose approximately 25 to 30 mm (0.98 to 1.18 in) over the lower end of fuel filler pipe and tighten clamp.

① Fuel filler hose
② Air vent hose

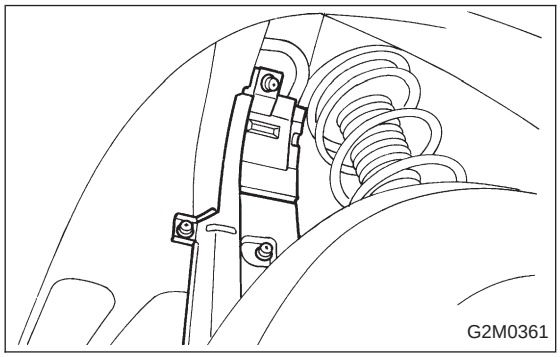
CAUTION:
Do not allow clips to touch air vent hose and rear suspension crossmember.



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

① Hose
② Clip
③ Pipe

L = 27.5±2.5 mm (1.083±0.098 in)

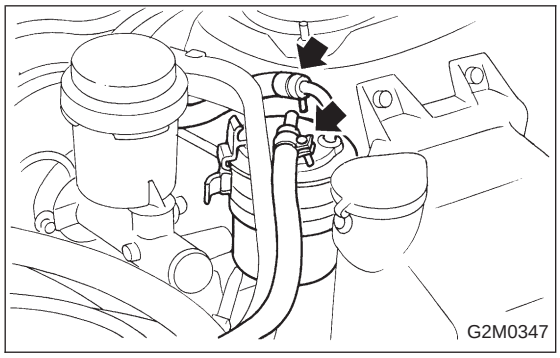


6) Install fuel filler pipe protector.
7) Install right rear wheel.

4. Fuel Filter

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>



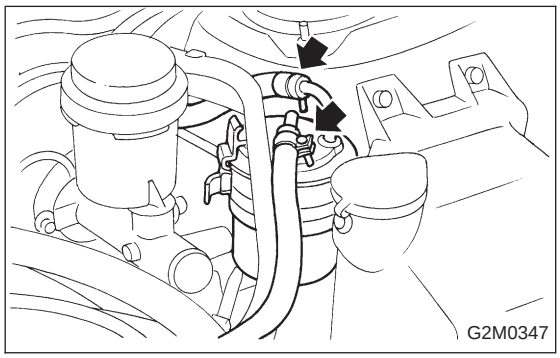
2) Disconnect fuel hoses from fuel filter.
3) Remove filter from holder.

B: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

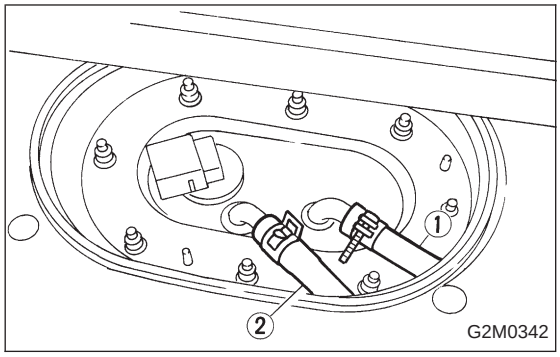
C: INSTALLATION

CAUTION:
● If fuel hoses are damaged at the connecting portion, replace it with a new one.
● If clamps are badly damaged, replace with new ones.



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

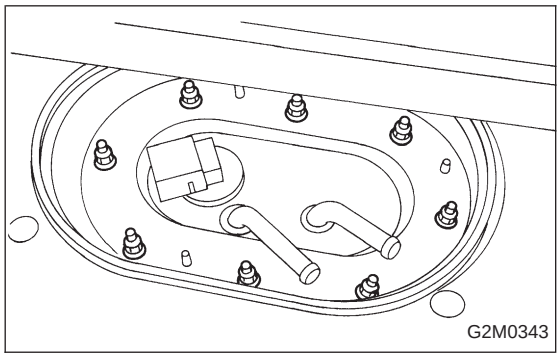
Tightening torque:
12.5±2.5 N·m (1.27±0.25 kg-m, 9.2±1.8 ft-lb)



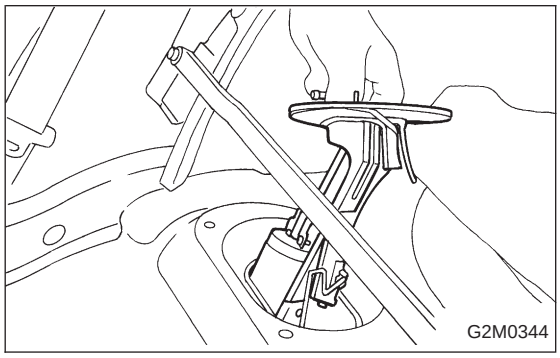
5. Fuel Pump

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hose ① and return hose ②.

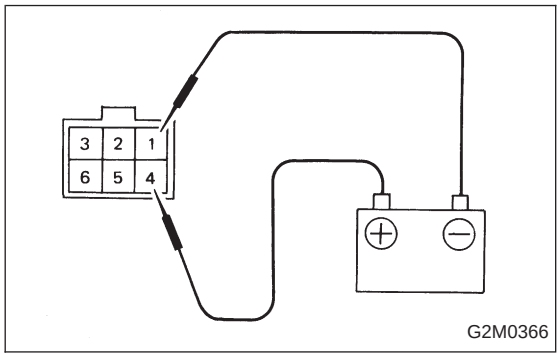


3) Remove nuts which install fuel pump onto fuel tank.



4) Take off fuel pump from fuel tank.

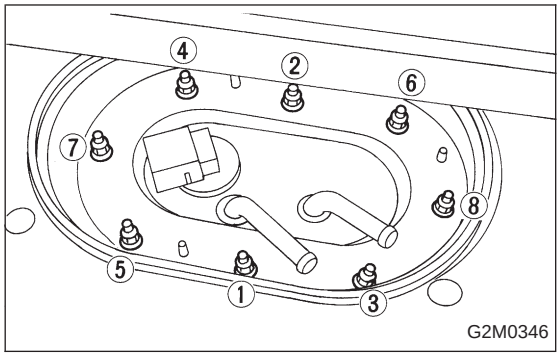
B: INSPECTION



Connect lead harness to connector terminal of fuel pump, and apply a 12 V power supply to check whether the pump operate.

WARNING:

- **Wipe off the fuel completely.**
- **Keep battery as far apart from fuel pump as possible.**
- **Be sure to turn the 12 V supply ON and OFF on the battery side.**
- **Do not run fuel pump for a long time under non-load condition.**



C: INSTALLATION

Installation is in the reverse order of removal. Observe the following:

(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in numerical sequence shown in Figure to specified torque.

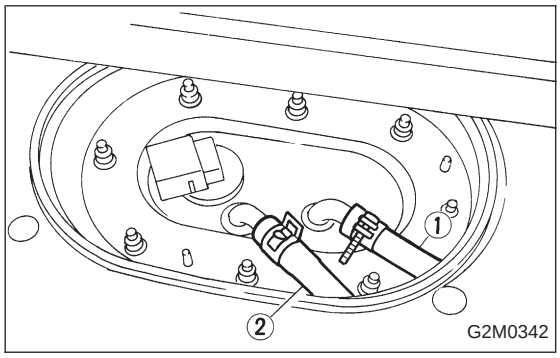
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

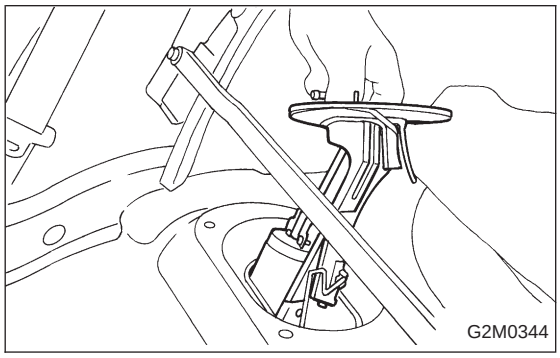
6. Fuel Meter Unit

A: REMOVAL

NOTE:
Fuel meter unit is built in fuel pump assembly.

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hose ① and return hose ②.



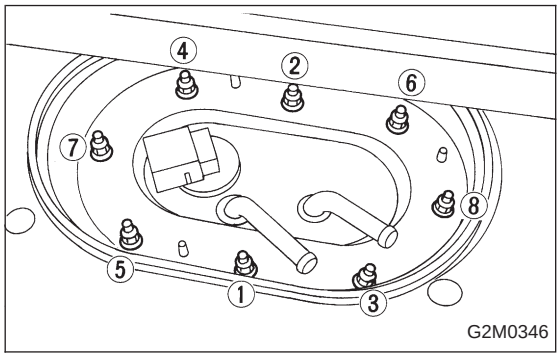


3) Remove nuts which install fuel pump onto fuel tank.
4) Take off fuel pump assembly.

B: INSTALLATION

Installation is in the reverse order of removal. <Ref. to 2-8 [W5C0].>
Tighten nuts in numerical sequence shown in Figure to specified torque.

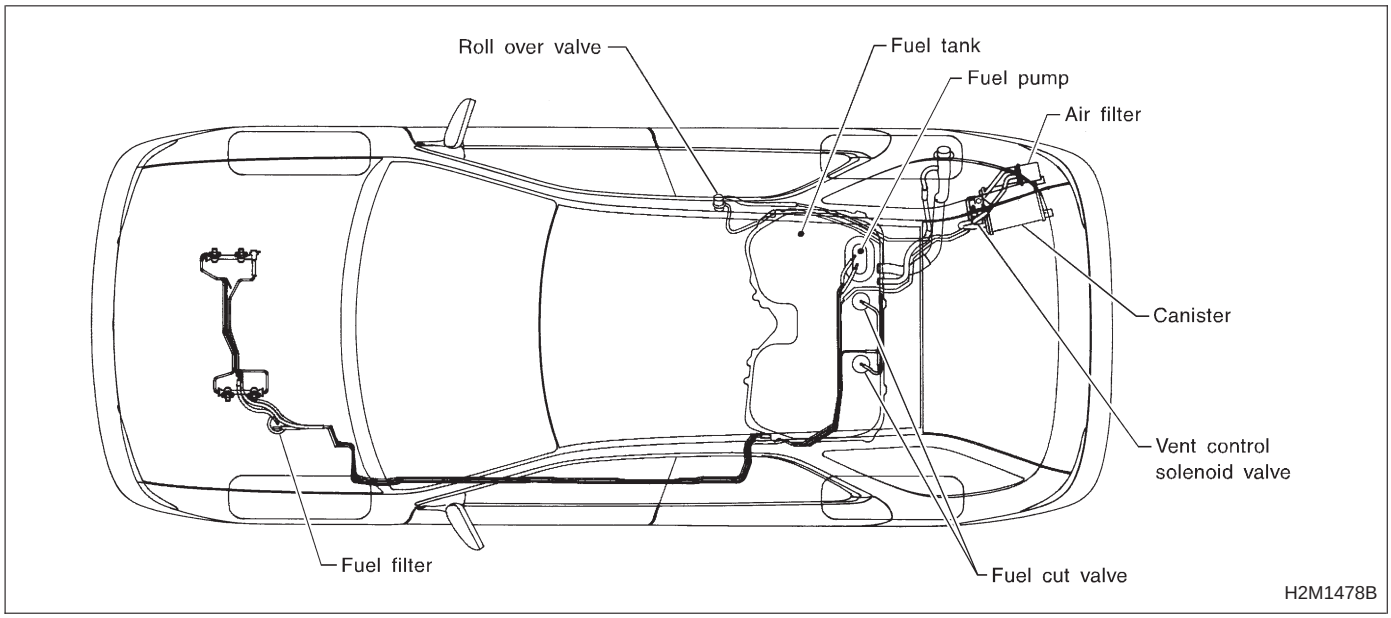
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

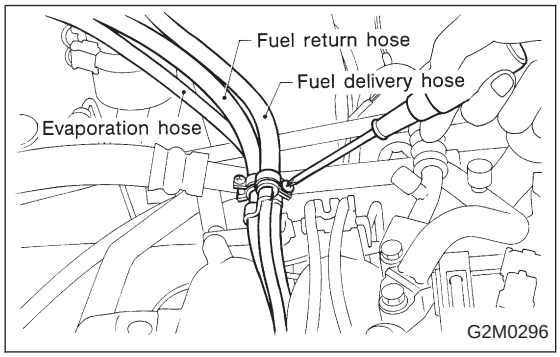


7. Fuel Delivery, Return and Evaporation Lines

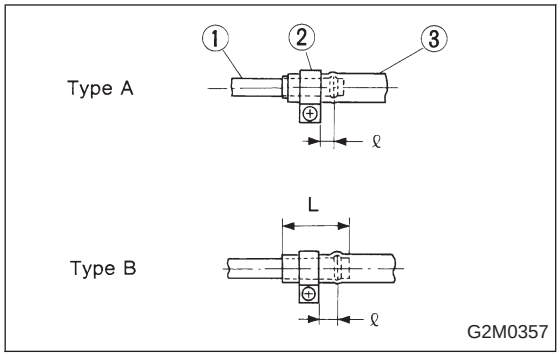
A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Remove inner trim, insulator and rear seat. <Ref. to 5-3 [W2A0].>
3) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, and evaporation pipes and hoses.





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



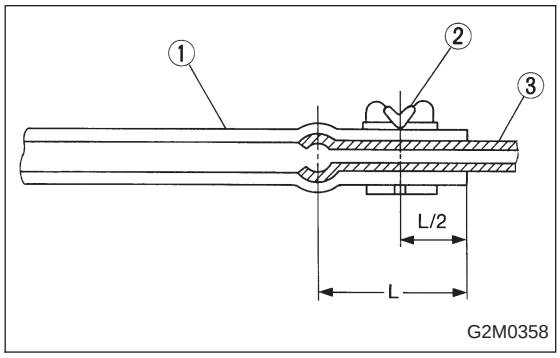
B: INSTALLATION

Installation is in the reverse order of removal.
1) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When fitting length is specified.
Type B: When fitting length is not specified.

① Fitting
② Clamp
③ Hose

ℓ : 2.5±1.5 mm (0.098±0.059 in)
L: 22.5±2.5 mm (0.886±0.098 in)

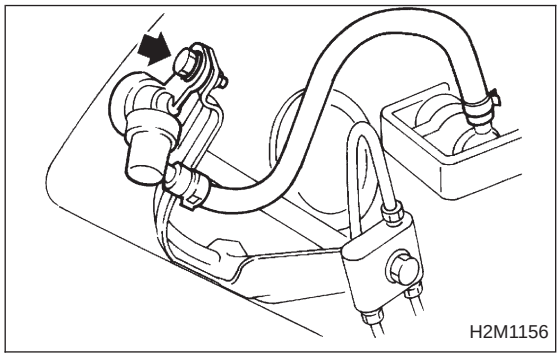


2) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

① Hose
② Clip
③ Pipe

L = 17.5±2.5 mm (0.689±0.098 in)

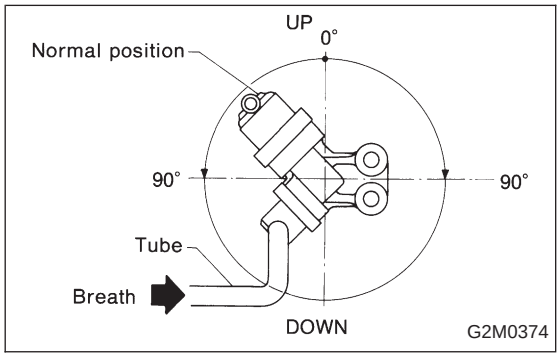
CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



8. Roll Over Valve

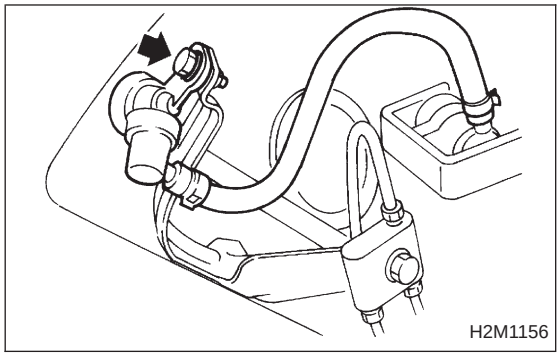
A: REMOVAL

1) Lift-up the vehicle.
2) Remove roll over valve from bracket.
3) Disconnect hoses from roll over valve.



B: INSPECTION

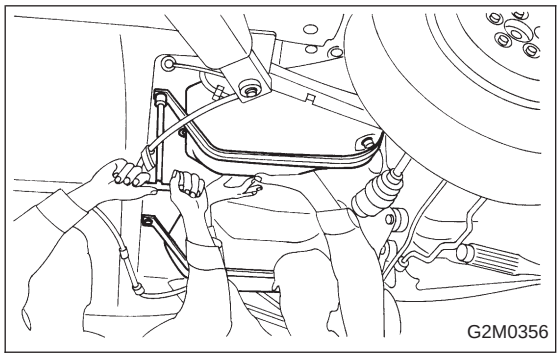
1) Connect hoses to roll over valve as shown in Figure.
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.
3) Ensure that there is no air flow when hose is tilted greater than 90°.



C: INSTALLATION

Installation is in the reverse order of removal.

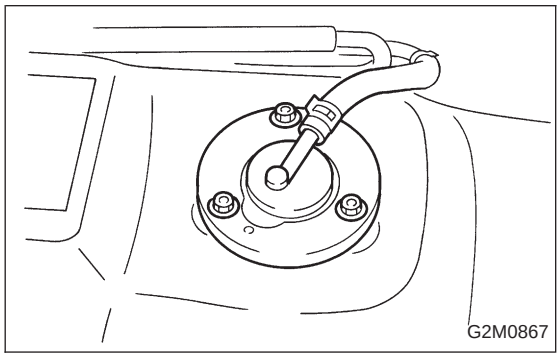
CAUTION:
- **Do not install top side of valve down.**
- **Before installing bracket on body, securely fit concave part of bracket to hole in body.**



9. Fuel Cut Valve

A: REMOVAL AND INSTALLATION

1) Remove fuel tank. <Ref. to 2-8 [W2A0].>



2) Disconnect evaporation hose from fuel cut valve.
3) Remove fuel cut valve.
4) Installation is in the reverse order of removal procedure.

Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)

1. Fuel System Trouble in General

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

NOTE:

● When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation:

1) Top off the fuel tank or drain the fuel completely.
2) Drain water condensation from the fuel filter.

● Refilling the fuel tank.

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

● Protecting the fuel system against freezing and water condensation.

1) Cold areas

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

2) Affected areas

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

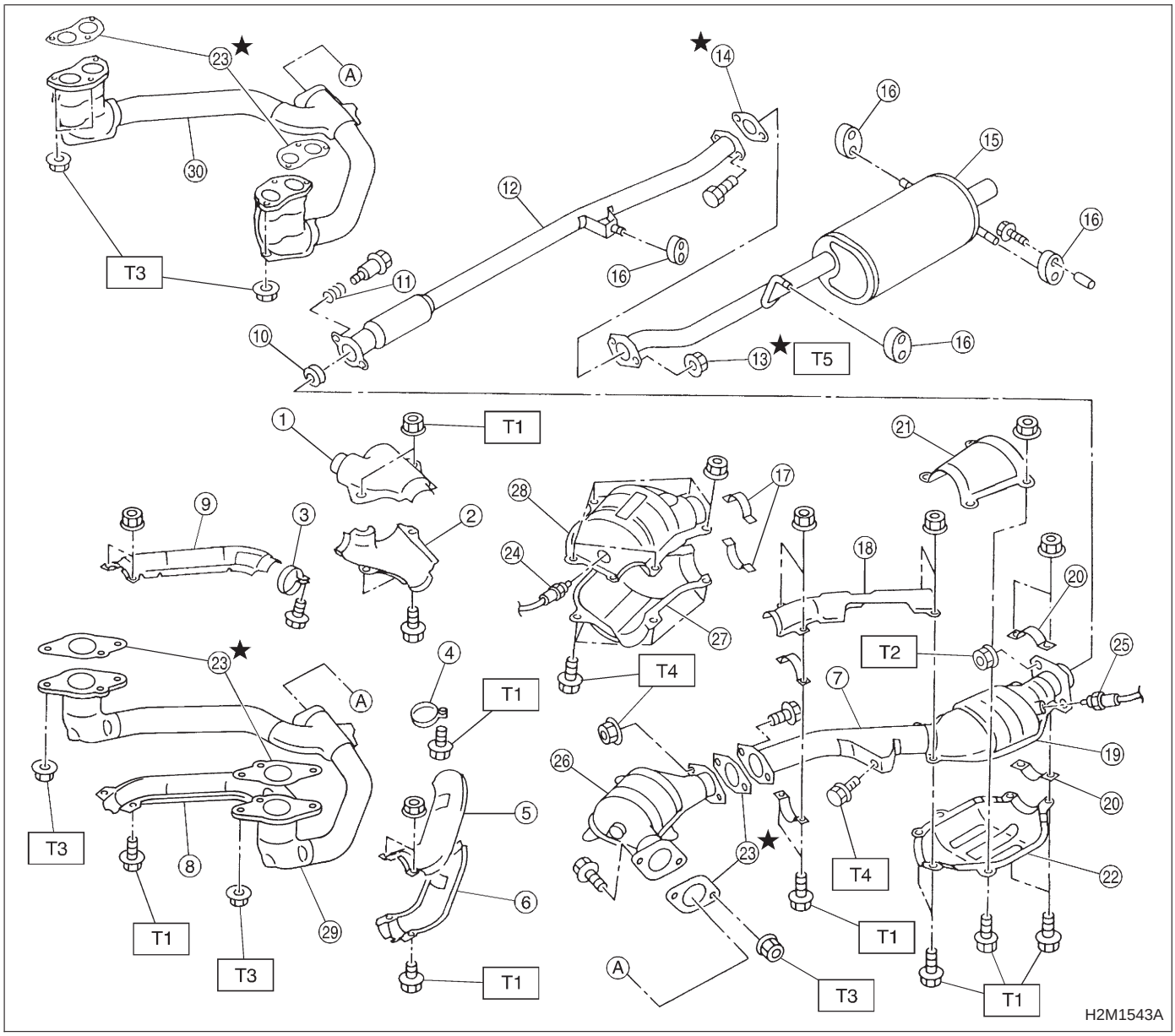
● Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EXHAUST SYSTEM 2-9

Page

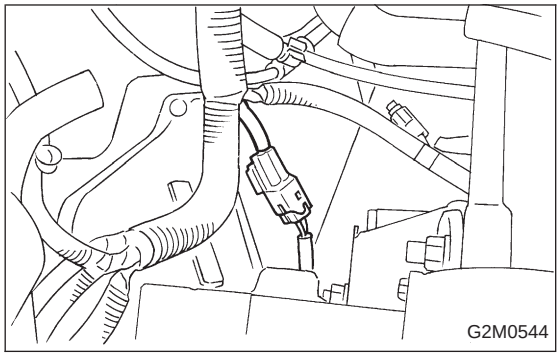
C **COMPONENT PARTS**.....2
1. Exhaust System.....2
W **SERVICE PROCEDURE**.....3
1. Front Exhaust Pipe and Center Exhaust Pipe.....3
2. Rear Exhaust Pipe.....5
3. Muffler.....6

1. Exhaust System



① Upper front exhaust pipe cover CTR
② Lower front exhaust pipe cover CTR
③ Band RH
④ Band LH
⑤ Upper front exhaust pipe cover LH
⑥ Lower front exhaust pipe cover LH
⑦ Center exhaust pipe
⑧ Lower front exhaust pipe cover RH
⑨ Upper front exhaust pipe cover RH
⑩ Gasket
⑪ Spring
⑫ Rear exhaust pipe
⑬ Self-locking nut
⑭ Gasket
⑮ Muffler
⑯ Cushion rubber
⑰ Clamp
⑱ Upper center exhaust pipe cover
⑲ Rear catalytic converter
⑳ Clamp B
㉑ Upper rear catalytic converter cover
㉒ Lower rear catalytic converter cover
㉓ Gasket
㉔ Front oxygen sensor
㉕ Rear oxygen sensor
㉖ Front catalytic converter
㉗ Lower front catalytic converter cover
㉘ Upper front catalytic converter cover
㉙ Front exhaust pipe (2200 cc)
㉚ Front exhaust pipe (1800 cc)

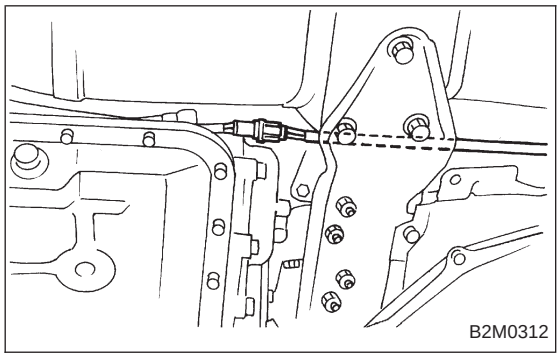
Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 30±5 (3.1±0.5, 22.4±3.6)
T4: 35±5 (3.6±0.5, 26.0±3.6)
T5: 48±5 (4.9±0.5, 35.4±3.6)


G2M0544

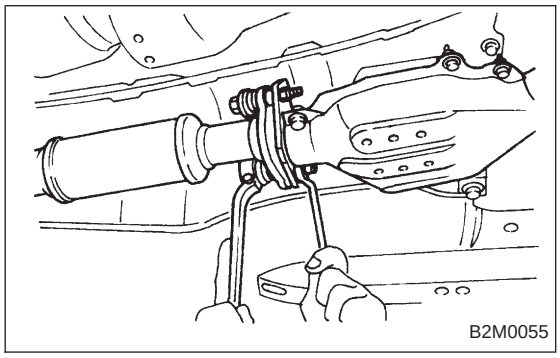
1. Front Exhaust Pipe and Center Exhaust Pipe

A: REMOVAL

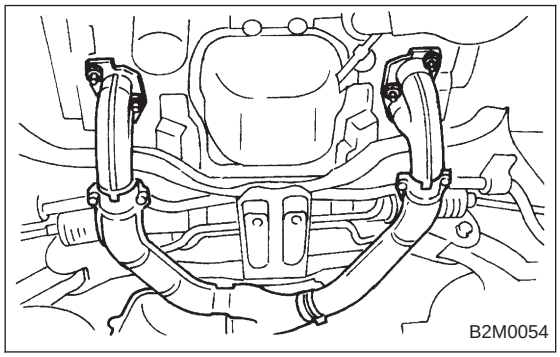
1) Disconnect front oxygen sensor connector.


B2M0312

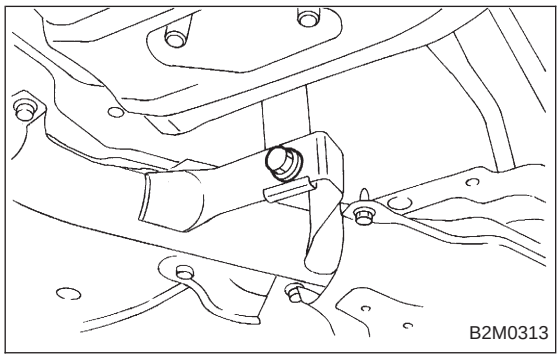
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector.


B2M0055

4) Separate center exhaust pipe from rear exhaust pipe.

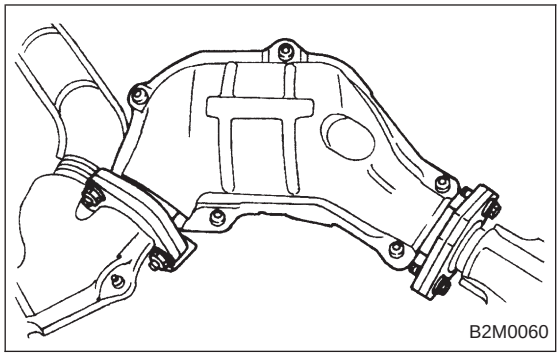

B2M0054

5) Remove bolts which hold front exhaust pipe onto cylinder heads.


B2M0313

6) Remove front exhaust pipe and center exhaust pipe from hanger bracket.

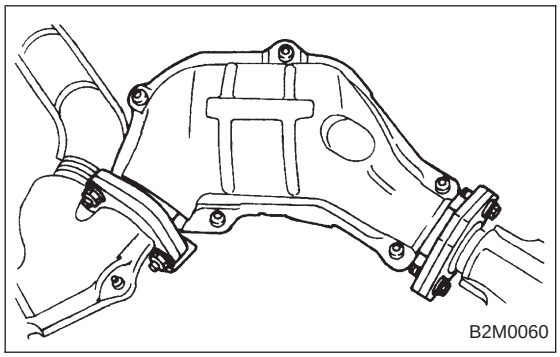
CAUTION:
Be careful not to pull down front exhaust pipe and center exhaust pipe.


B2M0060

7) Separate front exhaust pipe from front catalytic converter.

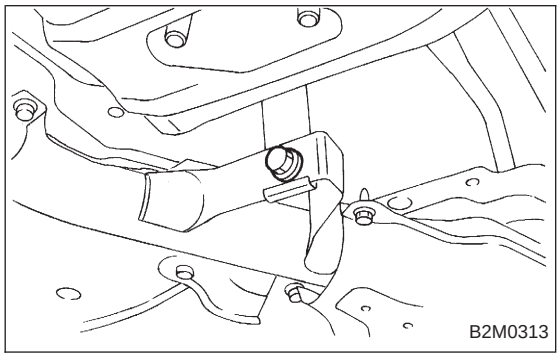
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

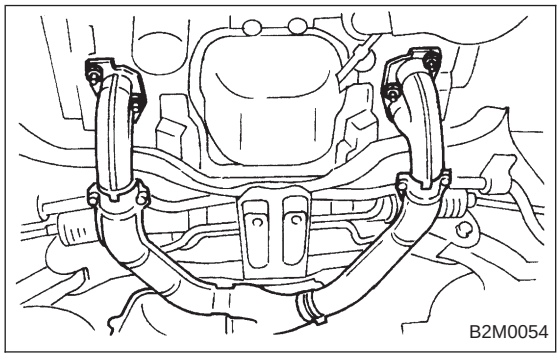

B2M0060

1) Install front catalytic converter to front exhaust pipe.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)

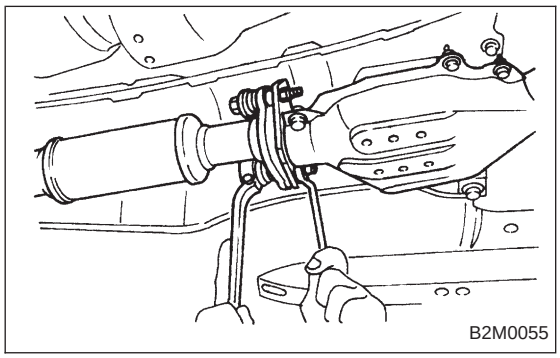

B2M0313

2) Install front exhaust pipe and center exhaust pipe.
And temporarily tighten bolt which installs center exhaust pipe to hanger bracket.


B2M0054

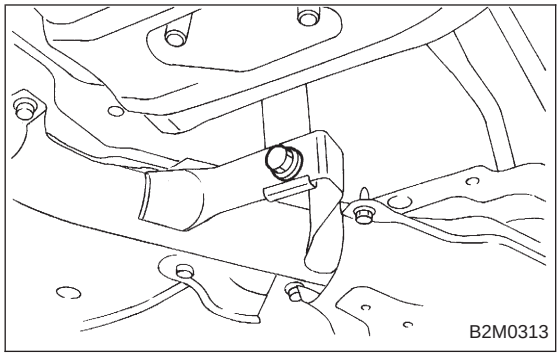
3) Tighten bolts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)


B2M0055

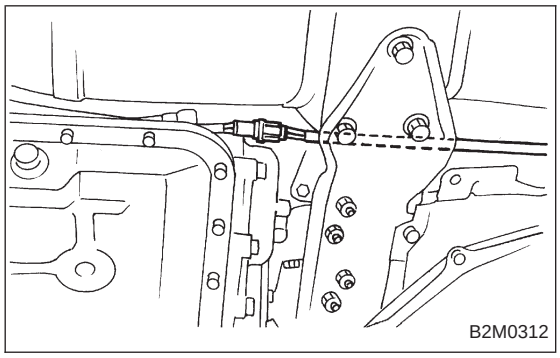
4) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

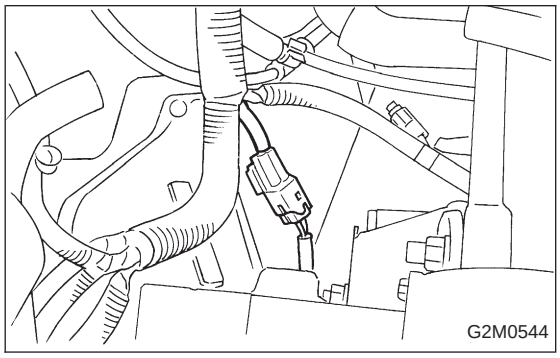

B2M0313

5) Tighten bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


B2M0312

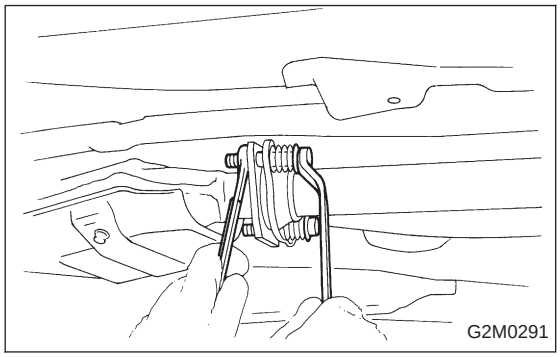
6) Connect rear oxygen sensor connector.


G2M0544

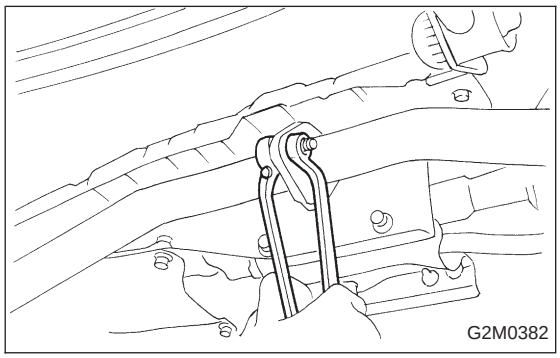
7) Lower the vehicle.
8) Connect front oxygen sensor connector.

2. Rear Exhaust Pipe

A: REMOVAL

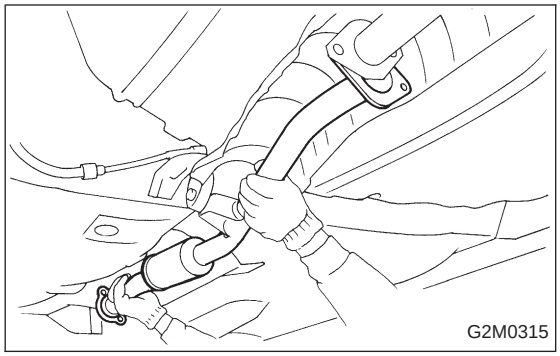

G2M0291

1) Separate rear exhaust pipe from front catalytic converter.


G2M0382

2) Separate rear exhaust pipe from muffler.

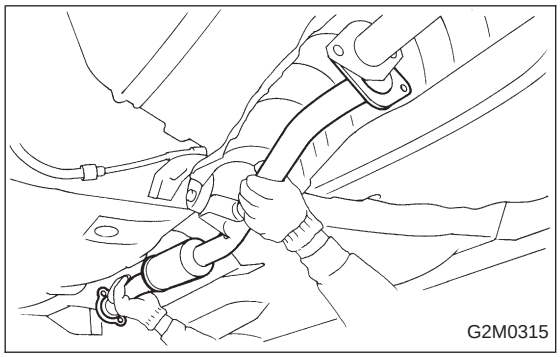
CAUTION:
Be careful not to pull down front exhaust pipe and front catalytic converter.



3) Remove rear exhaust pipe bracket from rubber cushion.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to pipe bracket in advance.

SUBARU CRC (Part No. 004301003)



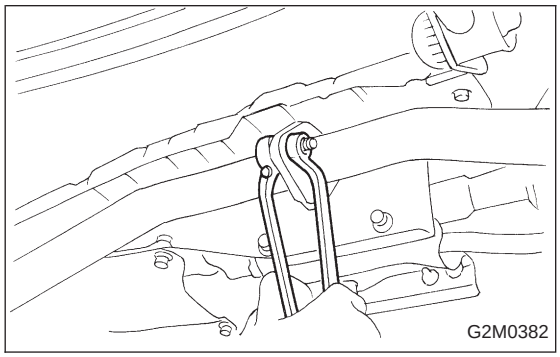
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

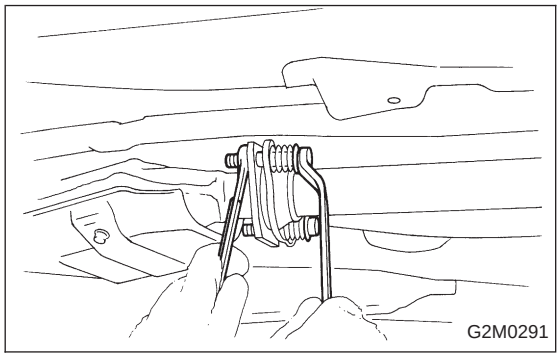
NOTE:
To facilitate installation, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



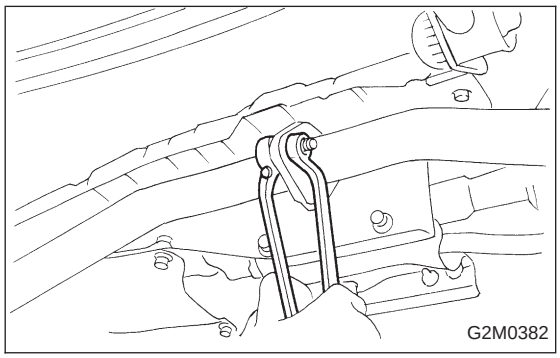
2) Install rear exhaust pipe to muffler.

Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)



3) Install rear exhaust pipe to front catalytic converter.

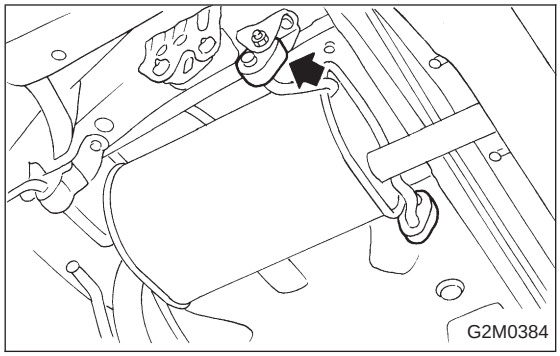
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



3. Muffler

A: REMOVAL AND INSTALLATION

1) Separate muffler from rear exhaust pipe.

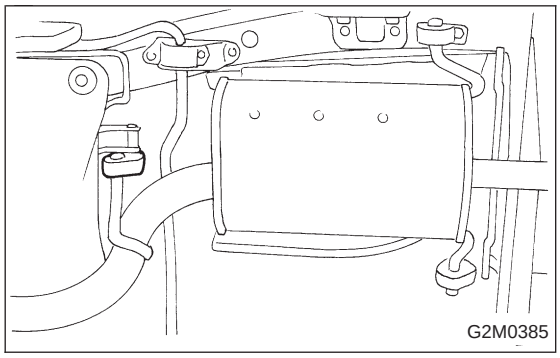


2) Remove left and right rubber cushions.

CAUTION:
Be careful not to pull down front exhaust pipe and front catalytic converter.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

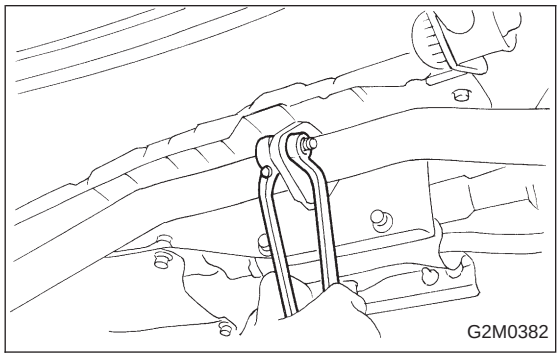
SUBARU CRC (Part No. 004301003)



3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



4) Installation is in the reverse order of removal.

CAUTION:
Replace gasket with a new one.

Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)

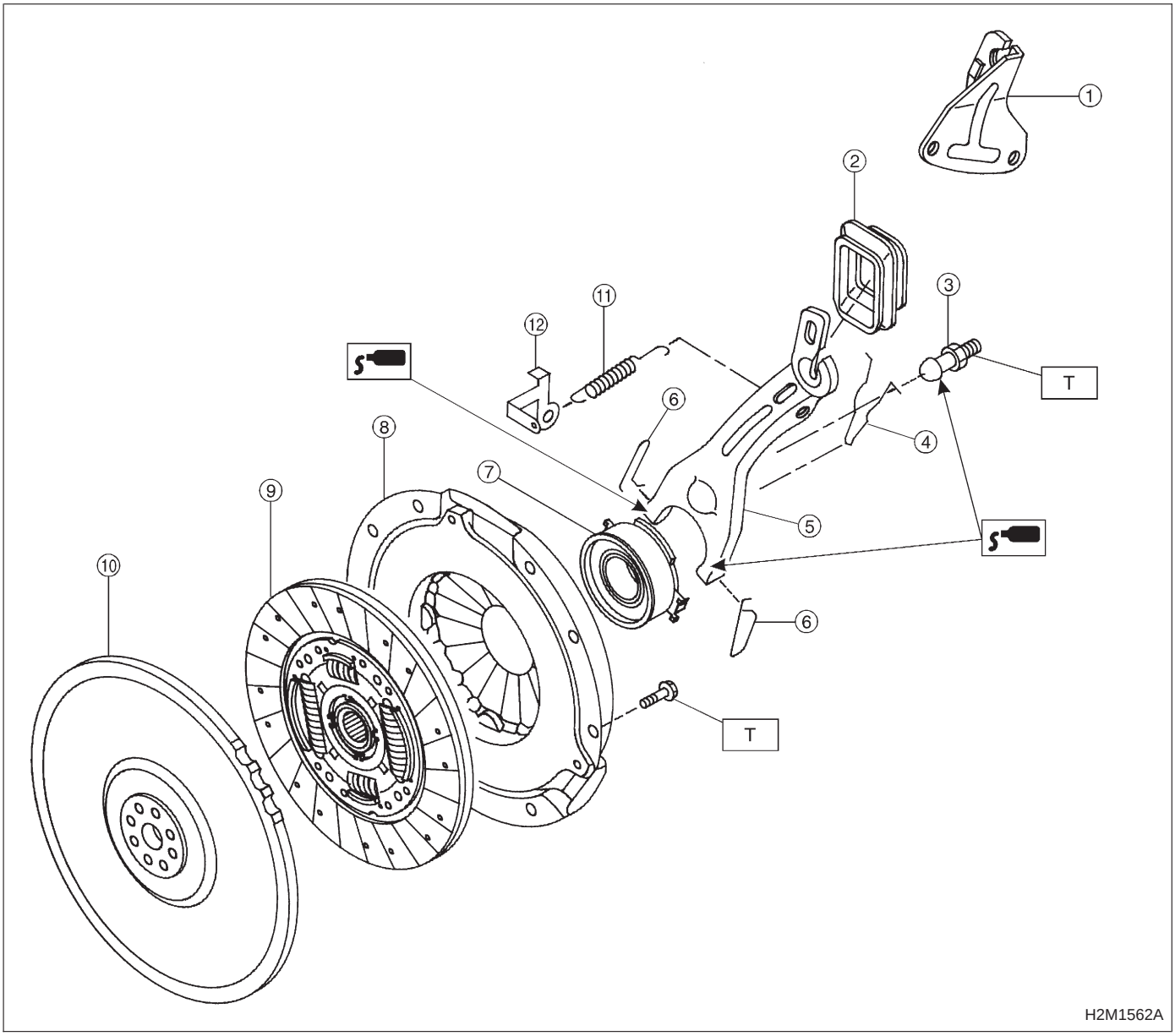
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W SERVICE PROCEDURE 4
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K DIAGNOSTICS 11
1. Clutch Trouble in General 11

1. Specifications

			1800 cc	2200 cc
Clutch cover	Diaphragm set load kg (lb)		450 (992)	
Clutch disc	Facing material		Woven	
	O.D. x I.D. x thickness mm (in)		225 x 150 x 3.5 (8.86 x 5.91 x 0.138)	
	Spline O.D. (No. of teeth) mm (in)		25.2 (0.992) (24)	
	Depth of rivet head mm (in)	Standard	1.3 — 1.9 (0.051 — 0.075)	
		Limit of sinking	0.3 (0.012)	
	Limit for runout mm (in)		1.0 (0.039) at R = 107 (4.21)	
Clutch release lever ratio			3.0	
Release lever	Stroke mm (in)		24 — 26 (0.94 — 1.02)	
	Play at release lever center mm (in)		3 — 4 (0.12 — 0.16)	
Release bearing			Grease-packed self-aligning	
Clutch pedal	Full stroke mm (in)		140 — 145 (5.51 — 5.71)	

O.D.; Outer Diameter I.D.; Inner Diameter

1. Clutch System



① Clutch cable bracket
② Clutch release lever sealing
③ Pivot
④ Retainer spring
⑤ Clutch release lever
⑥ Clip
⑦ Clutch release bearing
⑧ Clutch cover
⑨ Clutch disc
⑩ Flywheel
⑪ Return spring
⑫ Clutch return spring bracket

Tightening torque: N·m (kg-m, ft-lb)
T: 15.7±1.5 (1.6±0.15, 11.6±1.1)

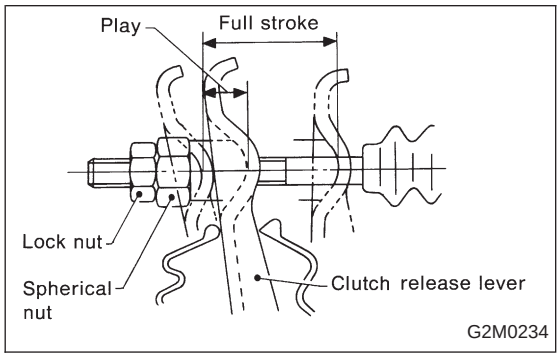
1. General

A: PRECAUTION

1. MECHANICAL APPLICATION TYPE

When servicing clutch system, pay attention to the following items.

1) Check the routing of clutch cable for smoothness.
2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
3) Apply grease sufficiently to the connecting portion of clutch pedal.
4) Apply grease sufficiently to the release lever portion.
5) Position clutch cable through the center of toe board hole and route it smoothly. Adjustment is done by moving the outer cable.
6) Make sure not to let the clutch chatter when starting forward or rearward. If clutch chattering occurs, readjust so that the bend of clutch outer cable becomes flatter.



2. On-Car Service

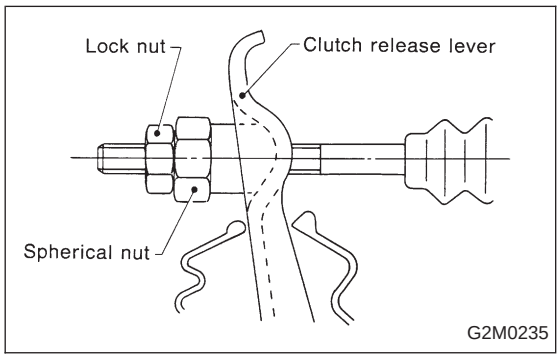
A: ADJUSTMENT

1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring from lever.
2) Adjust spherical nut so that the play is within the specified value at the lever end (center of spherical nut).

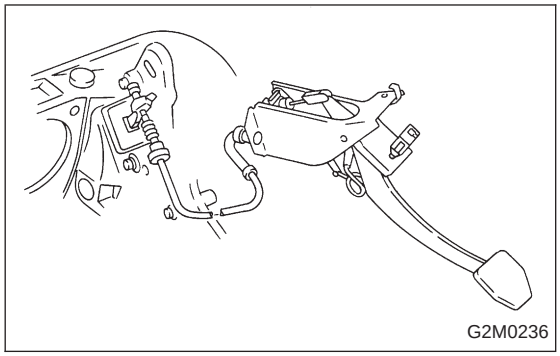
CAUTION:
Take care not to twist the cable during adjustment

Play: 3 — 4 mm (0.12 — 0.16 in)
Full stroke: 24 — 26 mm (0.94 — 1.02 in)

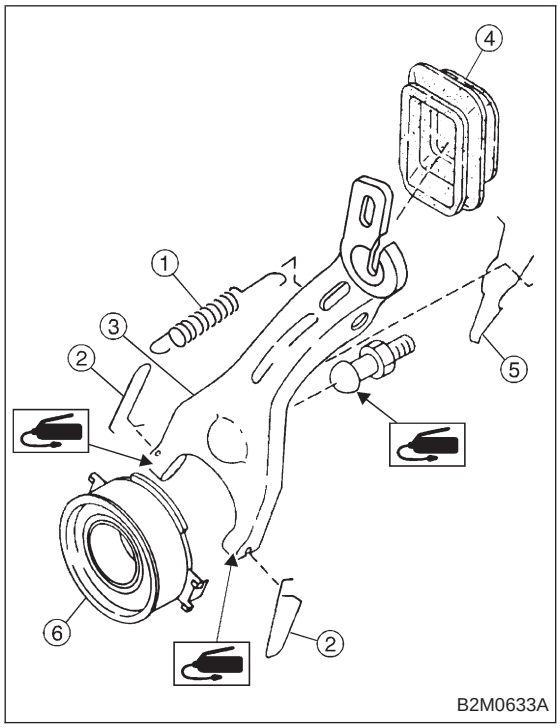


3) Upon completion of adjustment, securely lock spherical nut with lock nut.
Install return spring on lever.

NOTE:
Hook the long hook side of the return spring with the lever.


G2M0236

4) Depress clutch pedal to assure there is no abnormality in the clutch system.



B2M0633A

3. Release Bearing and Lever

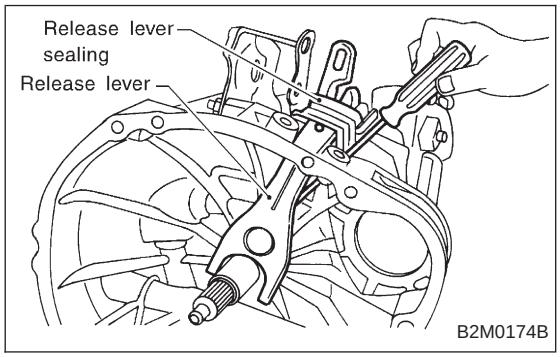
A: REMOVAL

1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring ①.
2) Remove the two clips ② from clutch release lever ③ and remove release bearing ⑥.

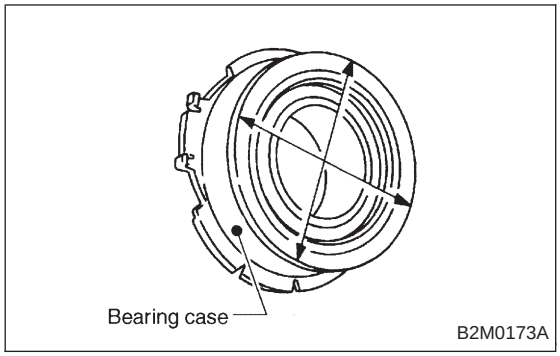
CAUTION:
Be careful not to deform clips.

3) Remove release lever seal ④.



B2M0174B

4) Remove release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove release lever.



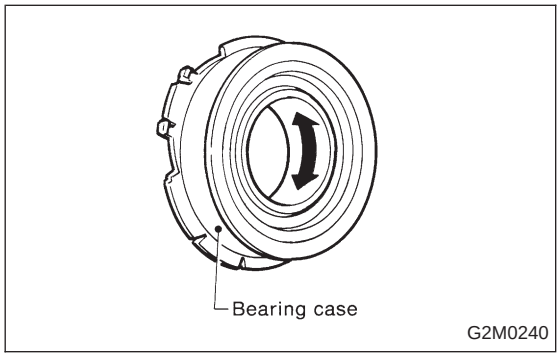
B: INSPECTION

1. RELEASE BEARING

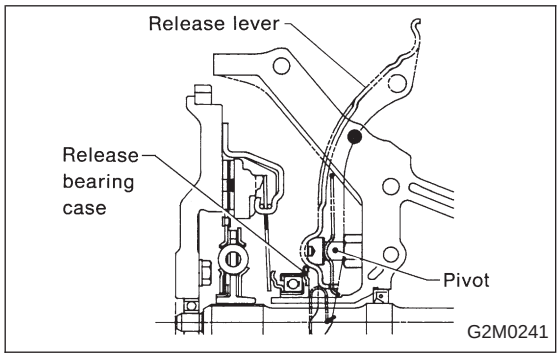
CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
Approx.
1.4 mm (0.055 in)



2) Check the bearing for smooth rotation by applying pressure in the thrust direction.
3) Check wear and damage of bearing case surface contacting with lever.



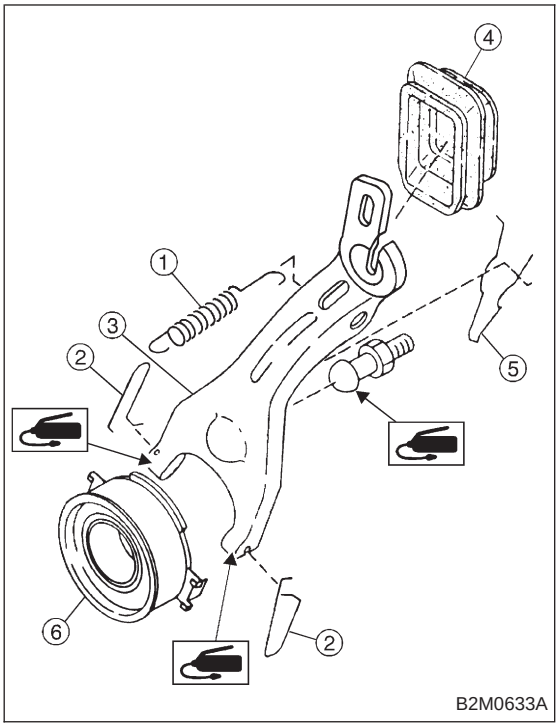
2. RELEASE LEVER

Check lever pivot portion and the point of contact with release bearing case for wear.

C: INSTALLATION

1. MECHANICAL APPLICATION TYPE

CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Inner groove of release bearing**
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

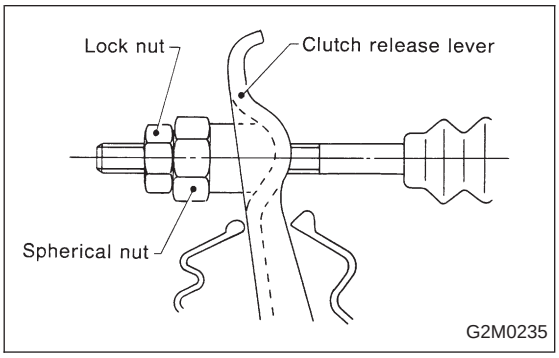


1) While pushing release lever ③ to pivot and twisting it to both sides, fit retainer spring ⑤ onto the constricted portion of pivot.

NOTE:
Confirm that retainer spring is securely fitted by observing it through the main case hole.

2) Install release bearing ⑥ and fasten it with two clips ②.

3) Install release lever seal ④.

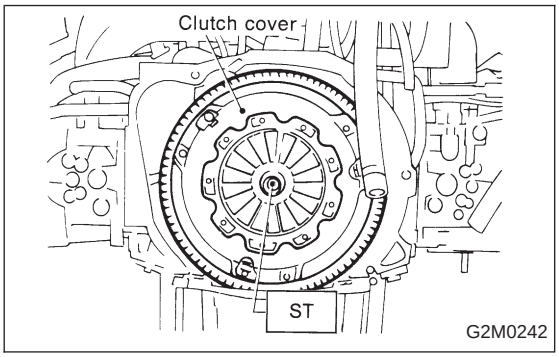


4) After remounting engine and transmission on body, make adjustment of the clutch release lever end play.

CAUTION:
Take care not to twist the cable during adjustment.

5) Install release lever return spring.

NOTE:
Hook up the return spring to right side hole of the release lever.



4. Clutch Disc and Cover

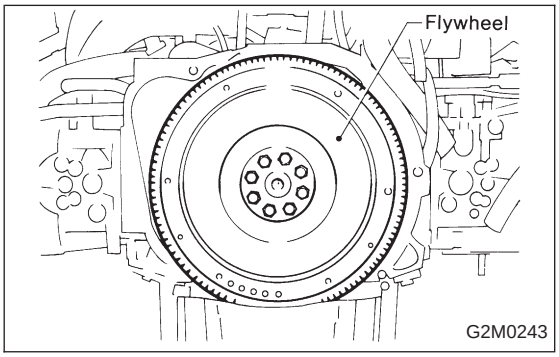
A: REMOVAL

1) Install ST on flywheel.

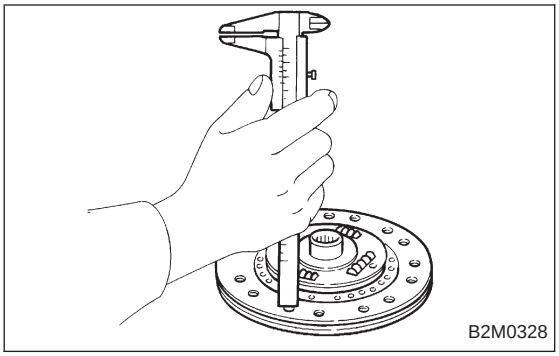
ST 498497100 CRANKSHAFT STOPPER

2) Remove clutch cover and clutch disc.

CAUTION:
- **Take care not to allow oil on the clutch disc facing.**
- **Do not disassemble either clutch cover or clutch disc.**



3) Remove flywheel.


B2M0328

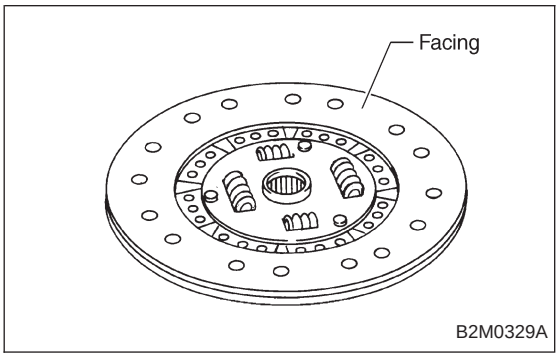
B: INSPECTION

1. CLUTCH DISC

1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

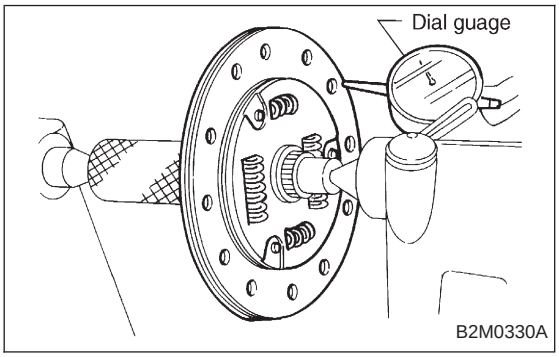
Depth of rivet head:
Standard value
1.3 — 1.9 mm (0.051 — 0.075 in)
Limit of sinking
0.3 mm (0.012 in)

CAUTION:
Do not wash clutch disc with any cleaning fluid.



B2M0329A

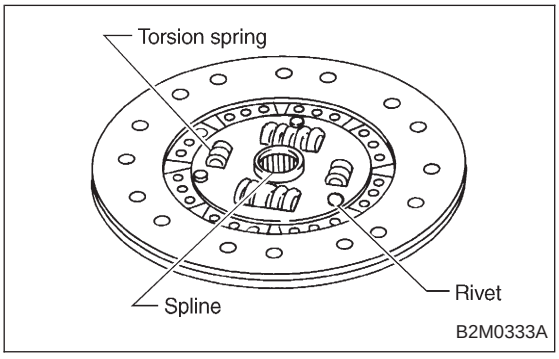
2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



B2M0330A

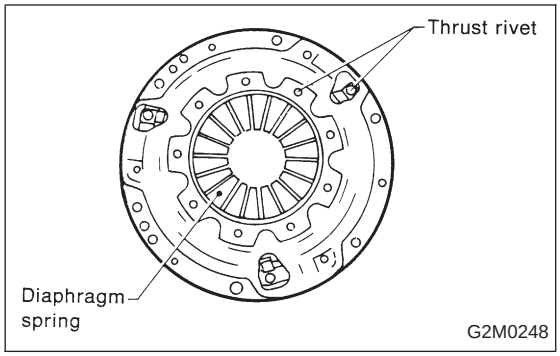
4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

Limit for deflection:
1.0 mm (0.039 in) at R = 107 mm (4.21 in)



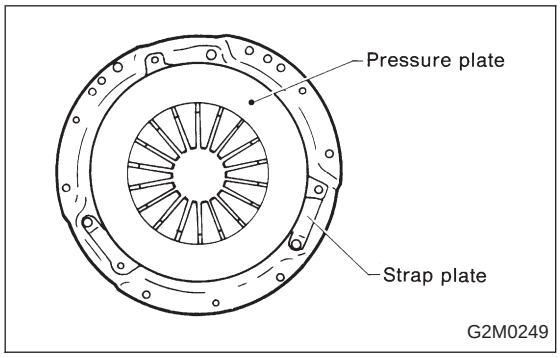
B2M0333A

5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.

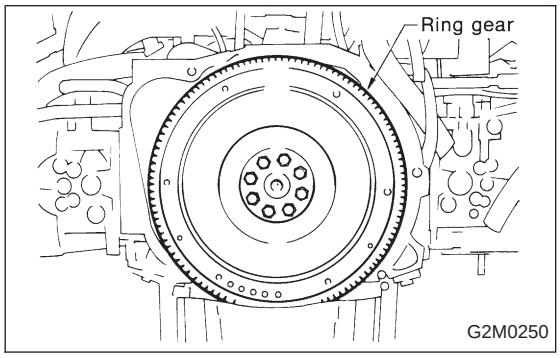


2. CLUTCH COVER

Visually check for the following items without disassembling, and replace or repair if defective.
1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.



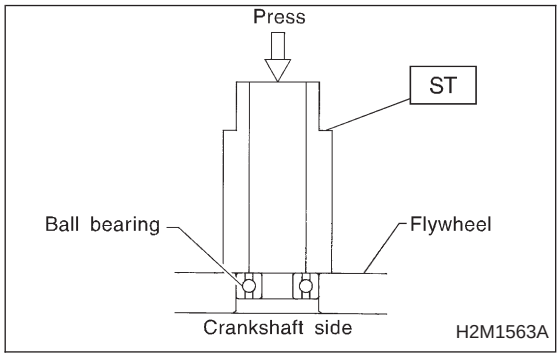
3) Damaged or worn disc contact surface of pressure plate.
4) Loose strap plate setting bolt.
5) Worn diaphragm sliding surface.



3. FLYWHEEL

CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace flywheel.

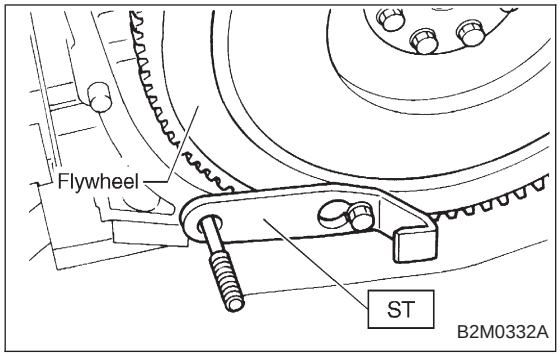


2) Smoothness of rotation
Rotate ball bearing applying pressure in thrust direction.

If noise or excessive play is noted, replace ball bearing as follows:

(1) Drive out ball bearing from flywheel.
(2) Press bearing into flywheel until bearing end surface is flush with clutch disc contact surface of flywheel. Do not press inner race.

ST 899754112 SNAP RING PRESS



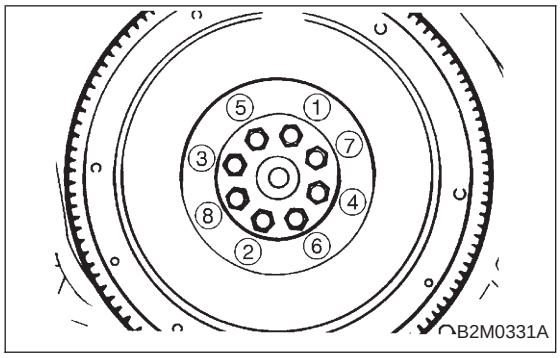
C: INSTALLATION

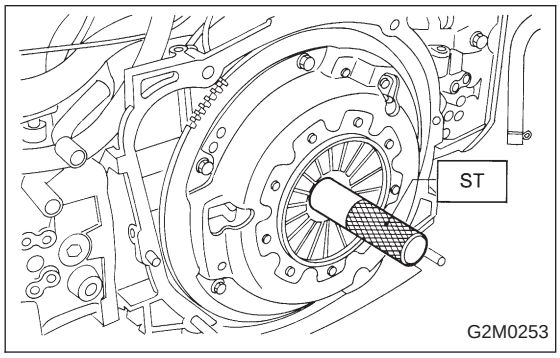
1) Install flywheel.
2) Install ST, and tighten the flywheel attaching bolts to the specified torque.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72±3 N·m (7.3±0.3 kg-m, 52.8±2.2 ft-lb)

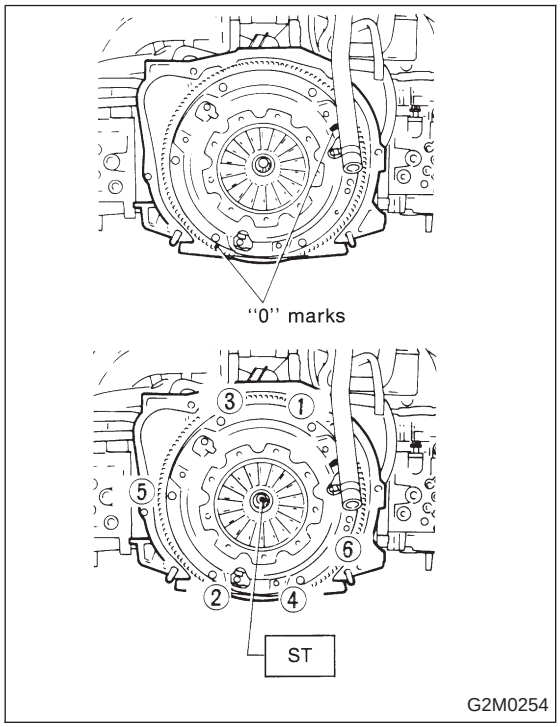
NOTE:
Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.





3) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.

ST 499747100 CLUTCH DISC GUIDE



4) Install clutch cover on flywheel and tighten bolts to the specified torque.

NOTE:
- When installing the clutch cover on the flywheel, position the clutch cover so that there is a gap of 120° or more between “0” marks on the flywheel and clutch cover. (“0” marks indicate the directions of residual unbalance.)
- Note the front and rear of the clutch disc when installing.
- Tighten clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
15.7±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)

5) Remove ST.

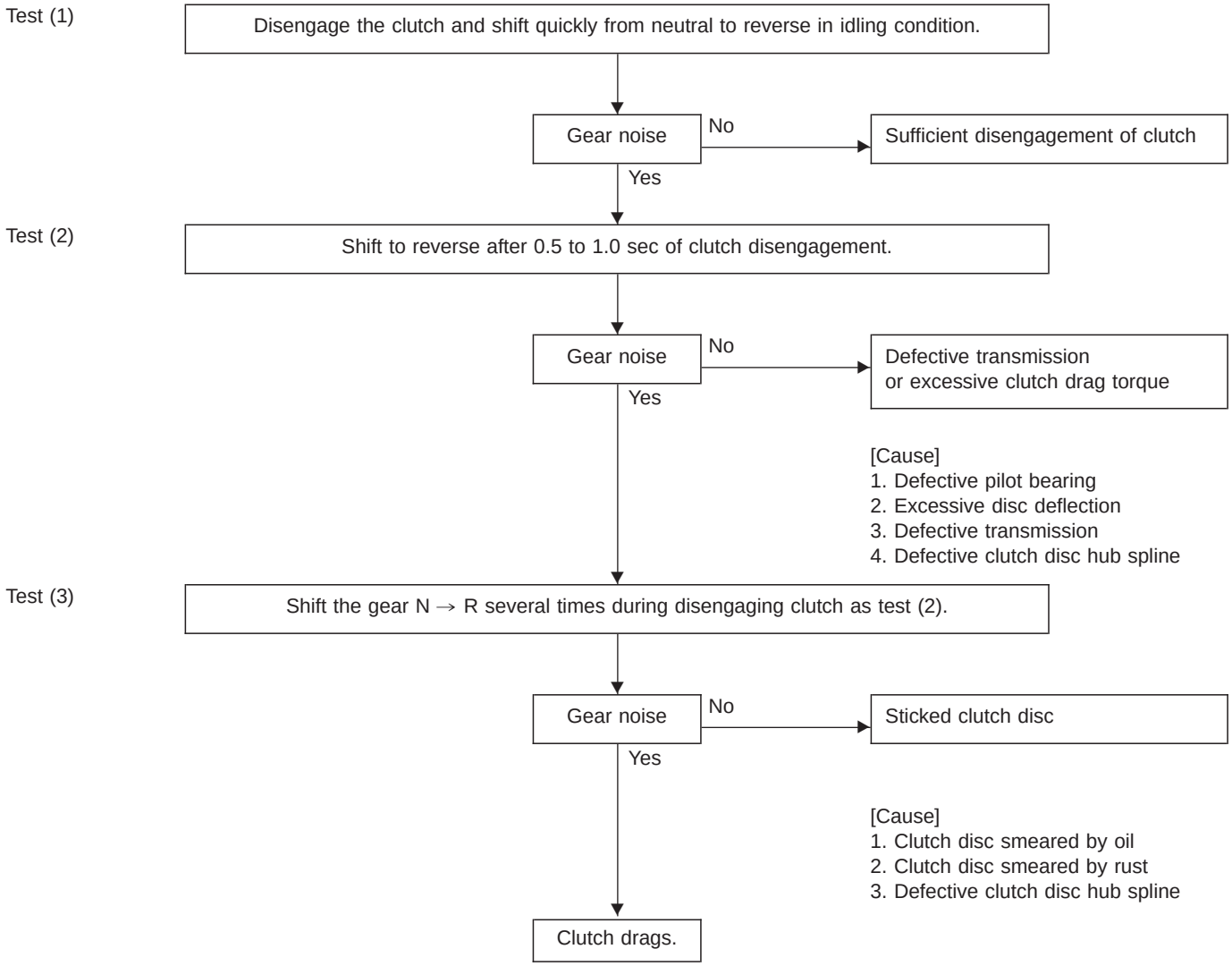
ST 499747100 CLUTCH DISC GUIDE

1. Clutch Trouble in General

Condition	Possible cause and testing	Corrective action
1. Clutch slippage	It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms.	
	(a) Engine revs up when shifting. (b) High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. (c) Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. ● Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	
	(a) No clutch pedal play	Readjust.
	(b) No release lever end play	Readjust.
	(c) Clutch facing smeared by oil	Replace.
	(d) Worn clutch facing	Replace.
	(e) Deteriorated diaphragm spring	Replace.
	(f) Distorted pressure plate or flywheel	Correct or replace.
	(g) Defective release bearing holder	Correct or replace.
	(h) Defective pedal and cable system	Correct or replace.
2. Clutch drags.	As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. ● Method of testing: Refer to DIAGNOSTIC DIAGRAM on page after.	
	It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	
	(a) Excessive clutch pedal play	Readjust.
	(b) Excessive clutch release lever play	Readjust.
	(c) Worn or rusty clutch disc hub spline	Replace clutch disc.
	(d) Excessive deflection of clutch disc facing	Correct or replace.
	(e) Seized crankshaft pilot needle bearing	Replace.
	(f) Malfunction of pedal and cable system	Correct or replace.
	(g) Cracked clutch disc facing	Replace.
	(h) Sticked clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters.	Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	
	(a) Improper clutch cable routing	Correct.
	(b) Adhesion of oil on the facing	Replace clutch disc.
	(c) Weak or broken torsion spring	Replace clutch disc.
	(d) Defective facing contact or excessive disc	Replace clutch disc defection.
	(e) Warped pressure plate or flywheel	Correct or replace.
	(f) Loose disc rivets	Replace clutch disc.
	(g) Loose engine mounting	Retighten or replace mounting.
	(h) Improper adjustment of pitching stopper	Adjustment.

Condition	Possible cause and testing	Corrective action
4. Noisy clutch	Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	
	(a) Broken, worn or unlubricated release bearing	Replace release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace clutch disc.
	(d) Loose torsion spring retainer	Replace clutch disc.
	(e) Deteriorated or broken torsion spring	Replace clutch disc.
5. Clutch grabs.	When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	
	(a) Grease or oil on facing	Replace clutch disc.
	(b) Deteriorated cushioning spring	Replace clutch disc.
	(c) Worn or rusted spline of clutch disc or main	Take off rust, apply grease or replace clutch shaft disc or mainshaft.
	(d) Deteriorated or broken torsion spring	Replace clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

A: DIAGNOSTIC DIAGRAM OF CLUTCH DRAG



[Cause]
1. Cracked clutch disc facing
2. Damaged or worn clutch cover
3. Malfunction of clutch release system
4. Insufficient clutch release amount
5. Excessive clutch pedal play

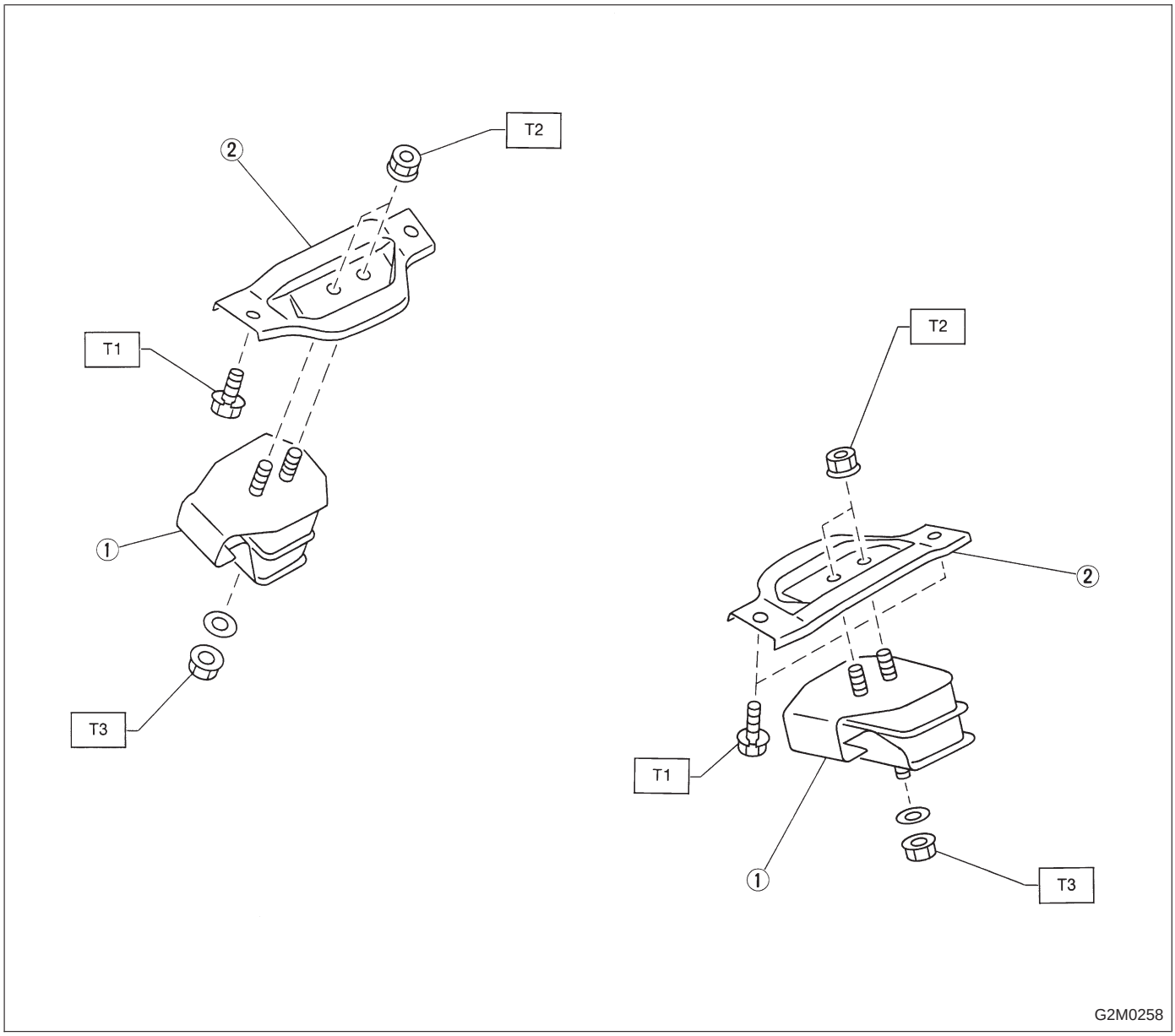
ENGINE AND TRANSMISSION MOUNTING SYSTEM 2-11

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C COMPONENT PARTS 2
1. Engine Mounting 2
2. Transmission Mounting 3

W SERVICE PROCEDURE 5
1. Engine 5
2. Transmission 25

1. Engine Mounting

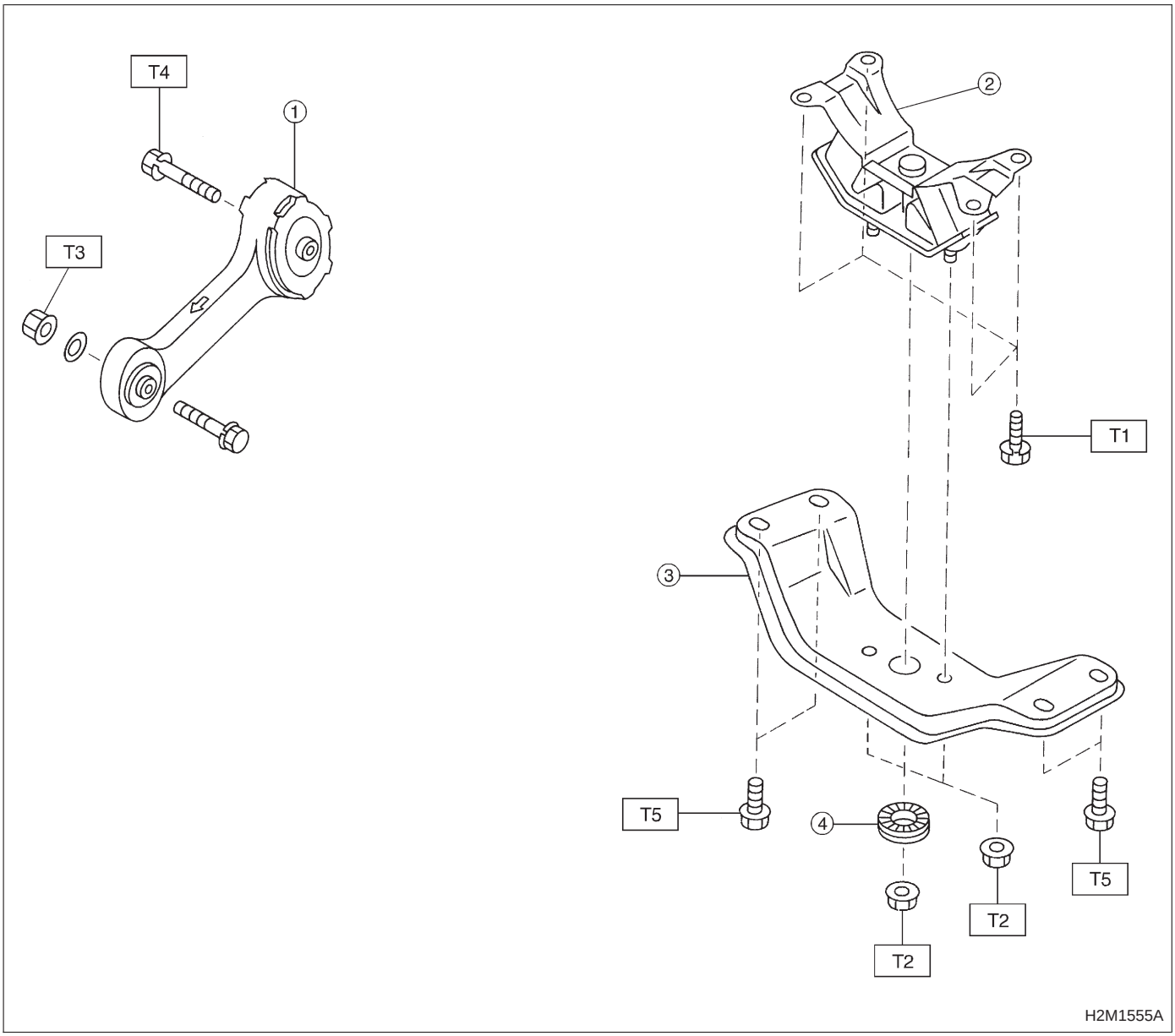


① Front cushion rubber
② Front engine mounting bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 26±7 (2.7±0.7, 19.5±5.1)
T2: 41±10 (4.2±1.0, 30±7)
T3: 69±15 (7.0±1.5, 51±11)

2. Transmission Mounting

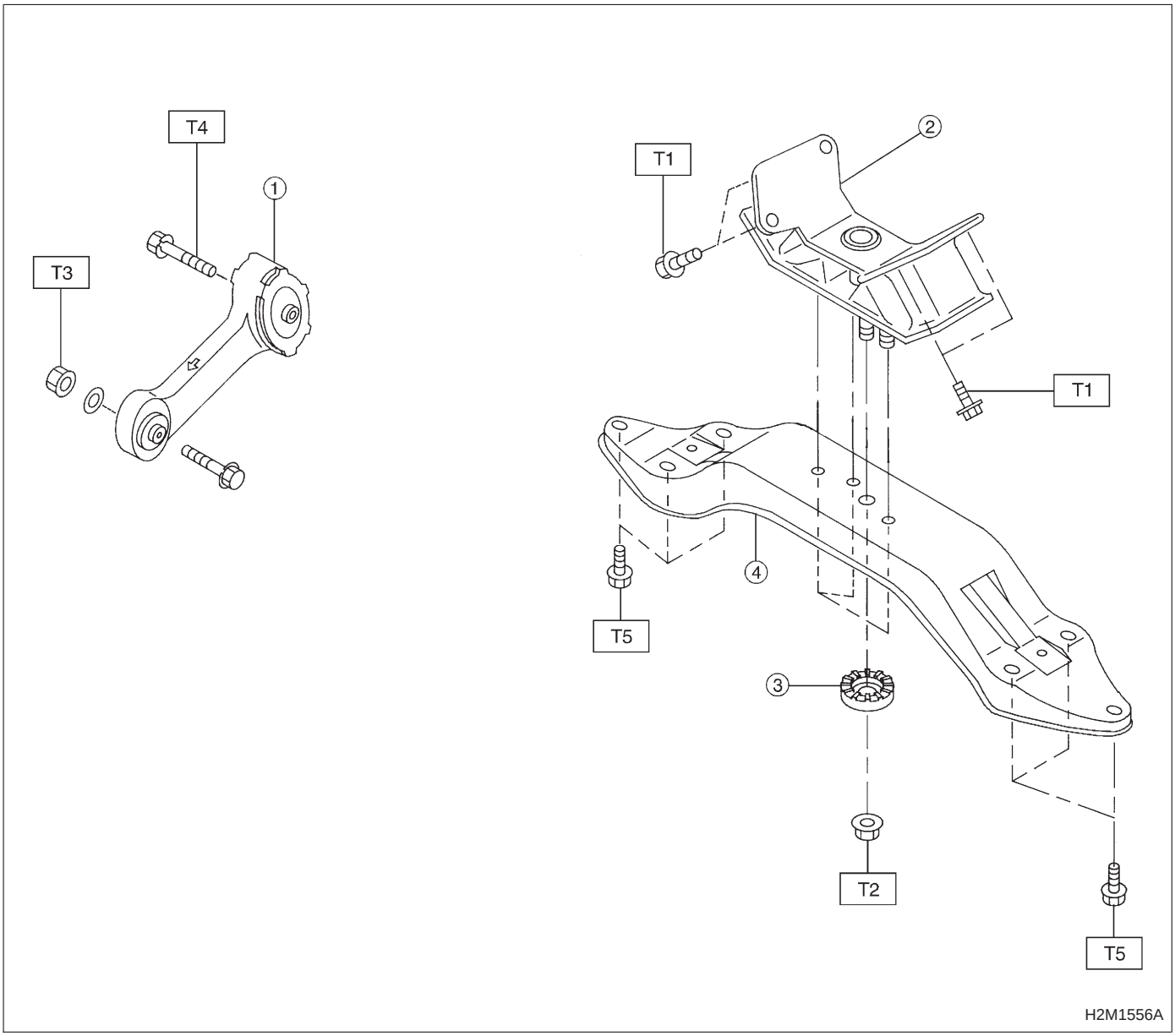
A: MT MODEL



① Pitching stopper
② Rear cushion rubber
③ Rear crossmember
④ Stopper

Tightening torque: N·m (kg-m, ft-lb)
T1: 33±5 (3.4±0.5, 24.6±3.6)
T2: 37±10 (3.8±1.0, 27±7)
T3: 49±5 (5.0±0.5, 36.2±3.6)
T4: 57±10 (5.8±1.0, 42±7)
T5: 69±15 (7.0±1.5, 51±11)

B: AT MODEL



① Pitching stopper
② Rear cushion rubber
③ Stopper
④ Crossmember

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±7 (2.5±0.7, 18.1±5.1)
T2: 37±10 (3.8±1.0, 27±7)
T3: 49±5 (5.0±0.5, 36.2±3.6)
T4: 57±10 (5.8±1.0, 42±7)
T5: 69±15 (7.0±1.5, 51±11)

1. Engine

A: GENERAL PRECAUTION

1) Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
2) Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
3) Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
4) Lift-up or lower the vehicle when necessary. Make sure to support the correct positions. <Ref. to 1-3 [0700].>

B: REMOVAL

1. Set the vehicle on lift arms.
2. Open front hood and support with a stay.

3. Release fuel pressure.
4. Disconnect battery cable and remove battery from vehicle.
5. Drain coolant.

6. Remove cooling system.

A/C equipped model

7. Collect refrigerant, and remove pressure hose.

8. Remove air intake system.

9. Remove canister and bracket. (2200 cc)

10. Disconnect connectors, cables and hoses.

11. Remove power steering pump from bracket.

12. Remove front exhaust pipe and center exhaust pipe.

13. Remove nuts which hold lower side of transmission to engine.
14. Remove nuts which install front cushion rubber onto front crossmember.

AT model

15. Separate torque converter from drive plate.

16. Remove pitching stopper and bracket.

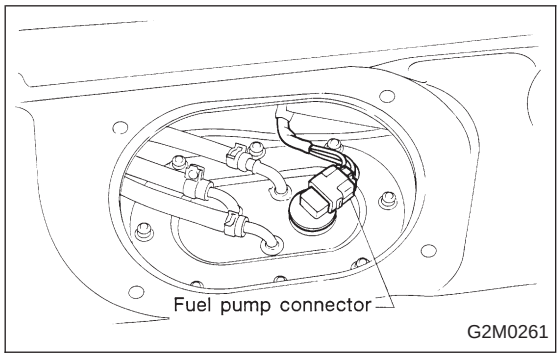
17. Disconnect fuel delivery hose, return hose and evaporation hose.

18. Support engine with a lifting device and wire ropes.
19. Support transmission with a garage jack.

20. Remove bolts which hold upper side of transmission to engine.

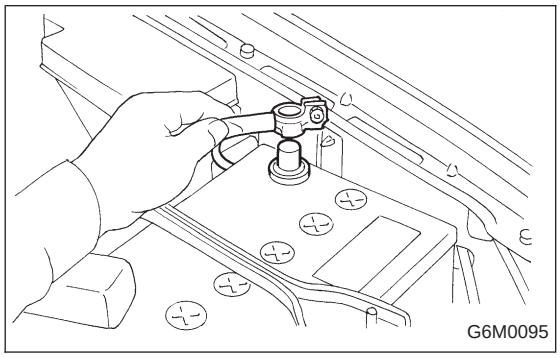
21. Remove engine from vehicle.

1) Set the vehicle on lift arms.
2) Open front hood fully and support with stay.

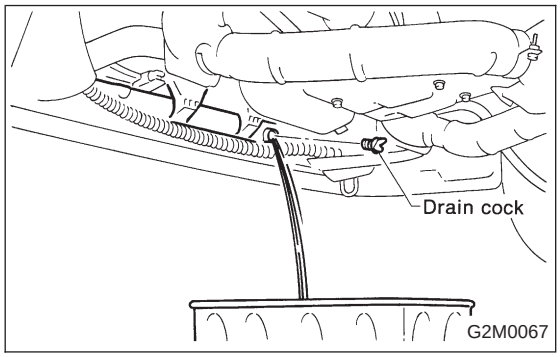


3) Release fuel pressure.
   (1) Disconnect fuel pump connector.
   (2) Start the engine, and run until it stalls.
   (3) After the engine stalls, crank it for five seconds more.
   (4) Turn ignition switch to “OFF”.

<Ref. to 2-8 [W1B0].>

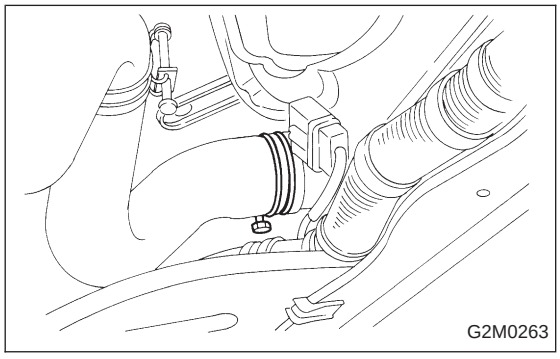


4) Disconnect battery cables and remove battery from vehicle.

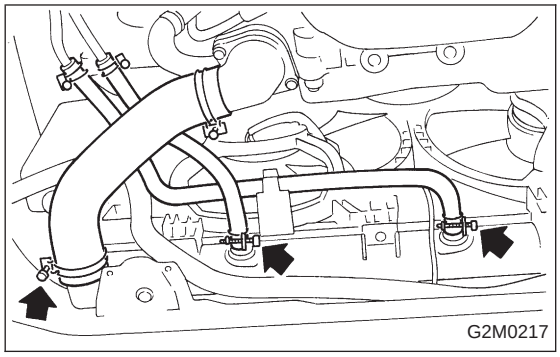


5) Drain coolant.

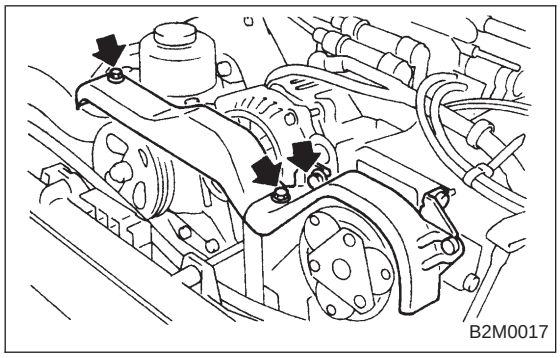
Set container under the vehicle, and remove drain cock from radiator.



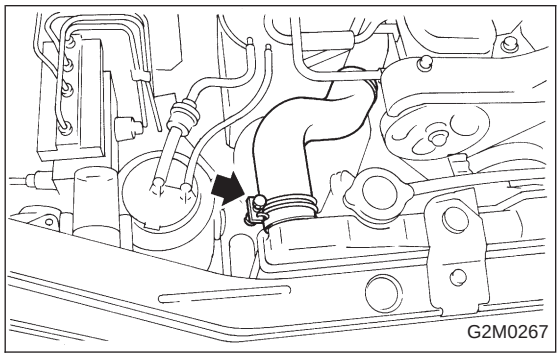
6) Remove cooling system.
   (1) Disconnect radiator fan motor connector.


G2M0217

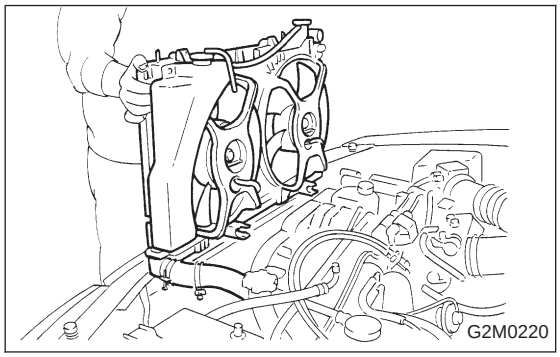
(2) Disconnect radiator outlet hose from thermostat cover.
(3) Disconnect ATF cooler hoses from pipes. (AT model)


B2M0017

(4) Remove V-belt cover.

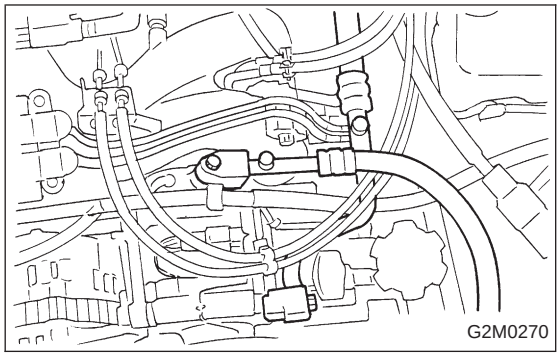

G2M0267

(5) Disconnect radiator inlet hose from radiator.

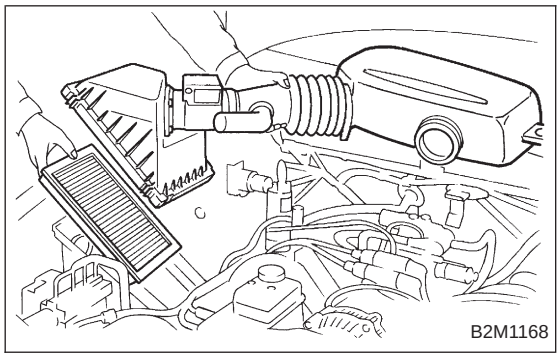

G2M0220

(6) Remove radiator upper bracket, and remove radiator assembly from vehicle.

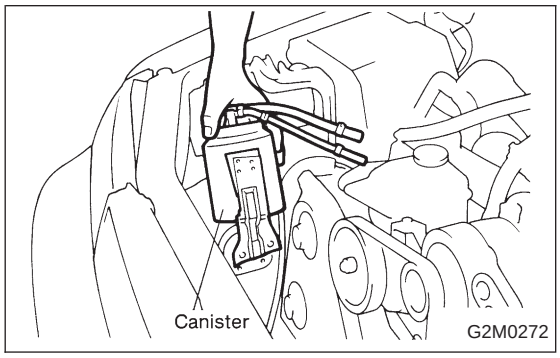
7) Collect refrigerant, and remove pressure hoses. (With A/C)
(1) Place and connect the attachment hose to the refrigerant recycle system.
(2) Collect refrigerant from A/C system.


G2M0270

(3) Disconnect A/C pressure hoses from A/C compressor.


B2M1168

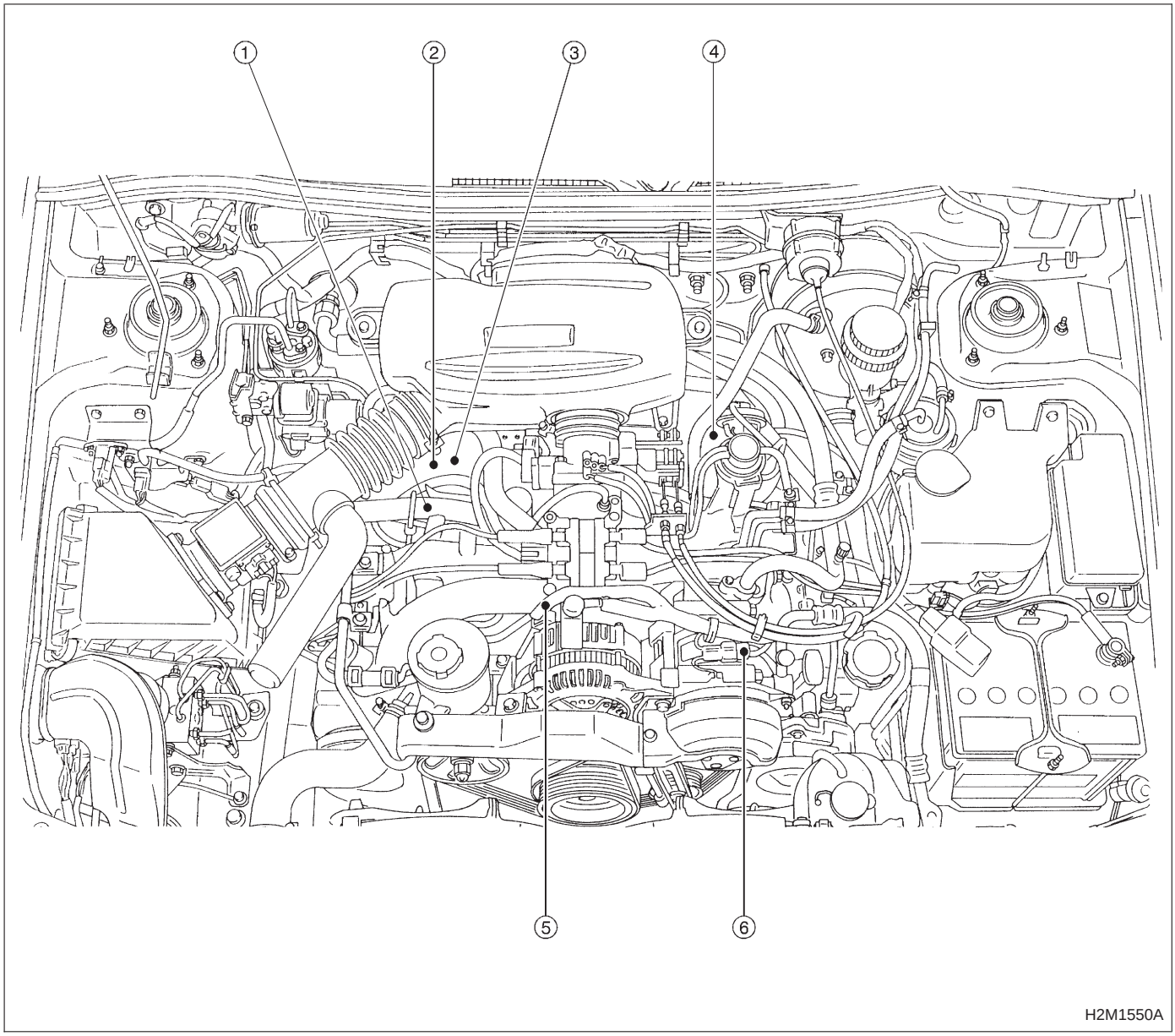
8) Remove air intake system.
(1) Disconnect connector from mass air flow sensor.
(2) Remove air intake duct with air cleaner upper cover, and remove air cleaner element.



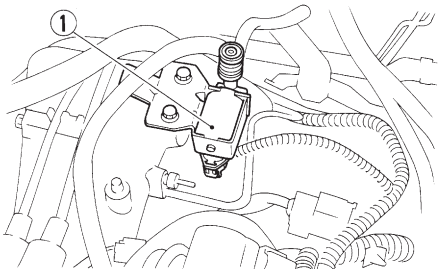
G2M0272

9) Remove canister and bracket. (2200 cc model)

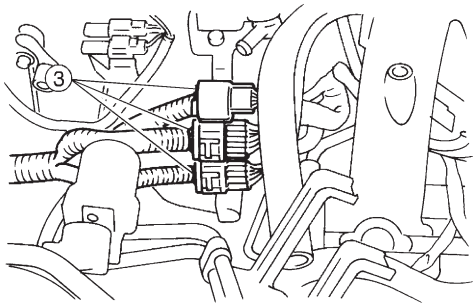
10) Disconnect connectors, cables and hoses.
(1) Disconnect the following connectors.
① FICD solenoid valve (With A/C 1800 cc)
② Front oxygen sensor connector
③ Engine harness connectors
④ Engine ground terminal stay
⑤ Alternator connector and terminal
⑥ A/C compressor connectors (With A/C)



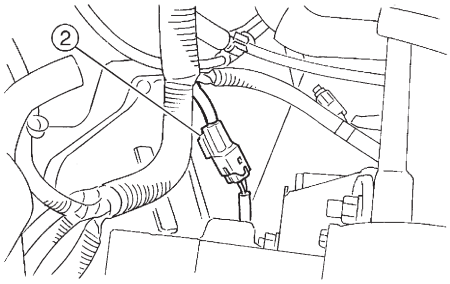
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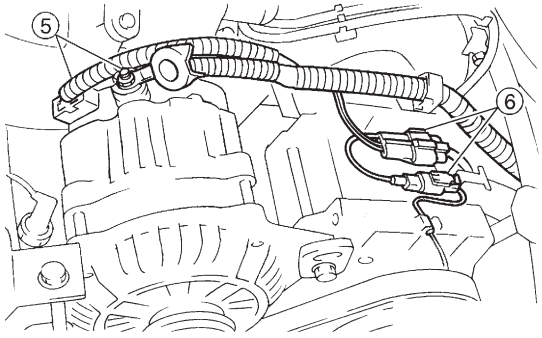
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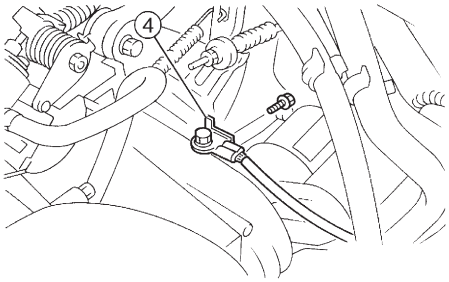
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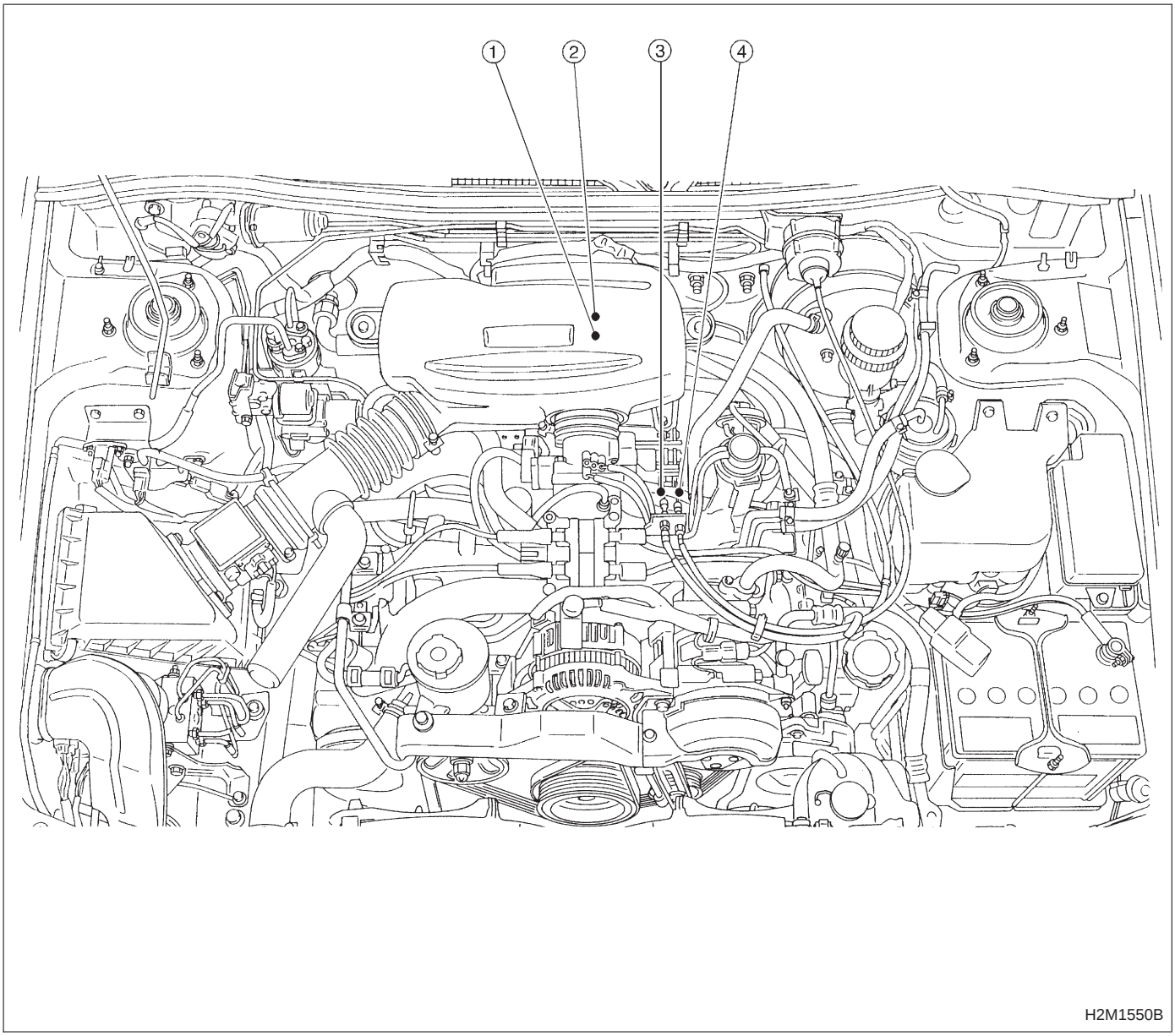


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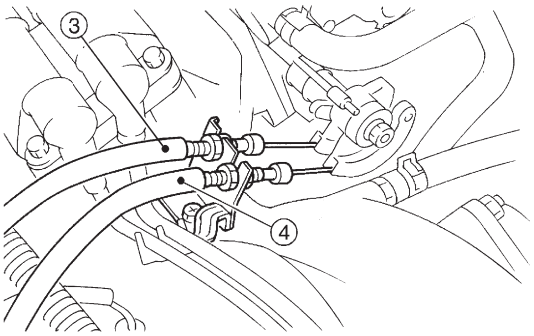


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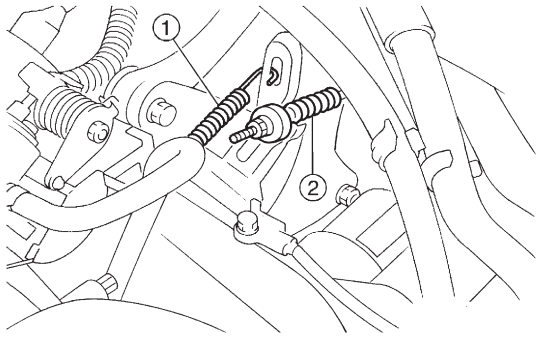
(2) Disconnect the following cables.
① Clutch release spring (MT model)
② Clutch cable (MT model)
③ Accelerator cable
④ Cruise control cable (With cruise control)



H2M1550B

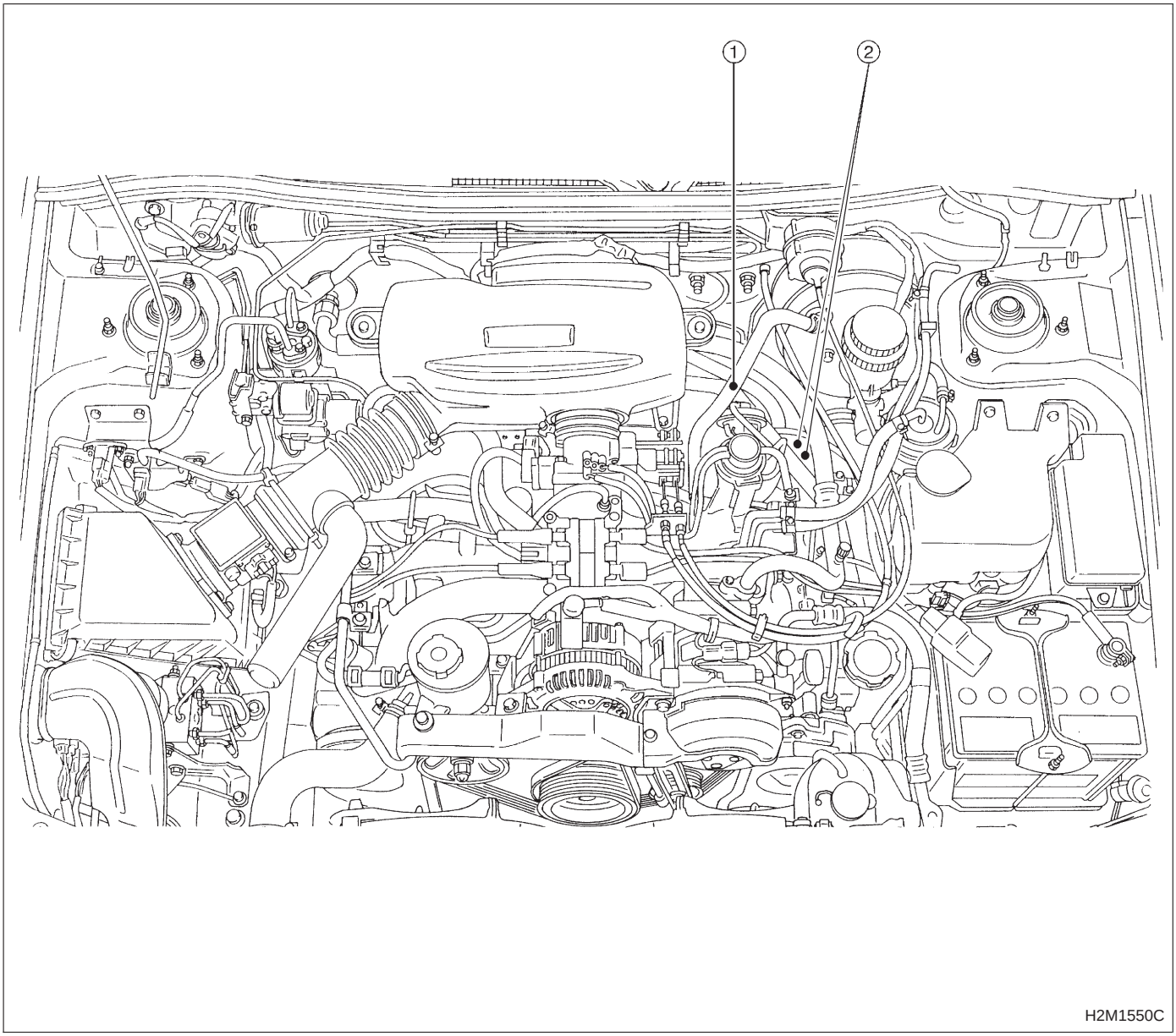


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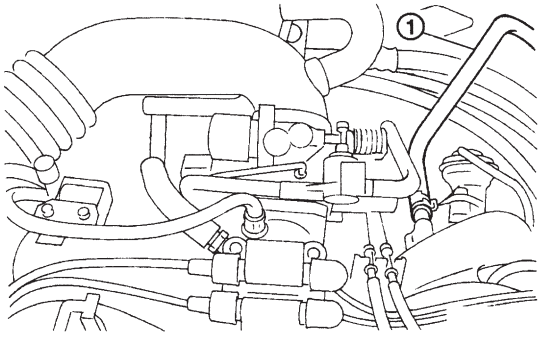


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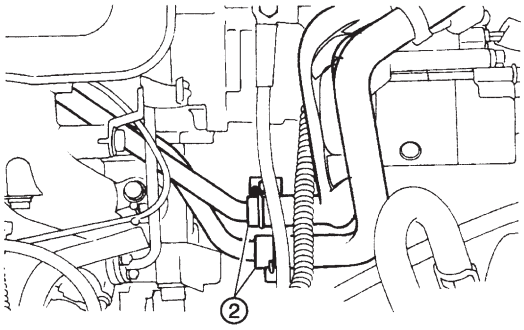
(3) Disconnect the following hoses.
① Brake booster vacuum hose
② Heater inlet and outlet hoses



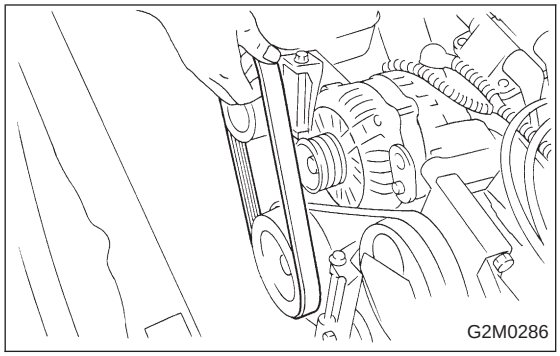
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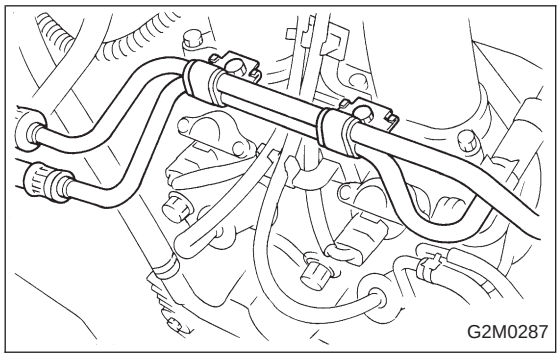
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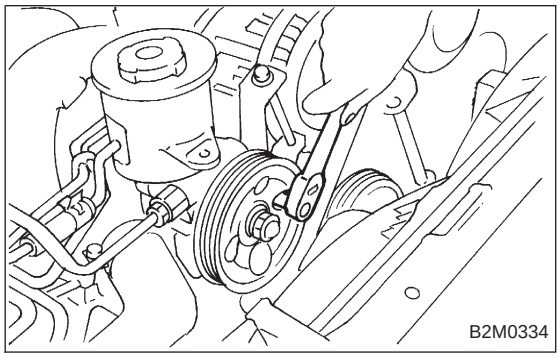
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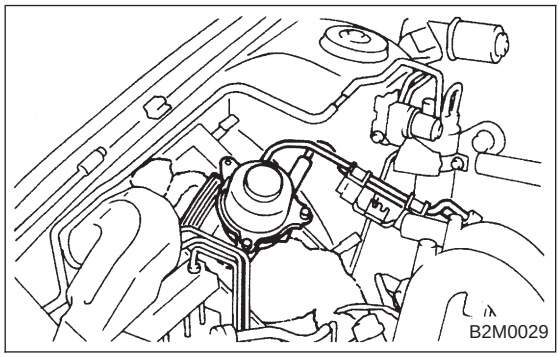
11) Remove power steering pump from bracket.
(1) Loosen lock bolt and slider bolt, and remove front side V-belt.



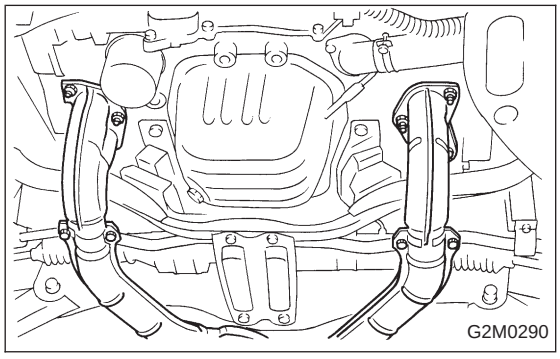
(2) Remove pipe with bracket from intake manifold.



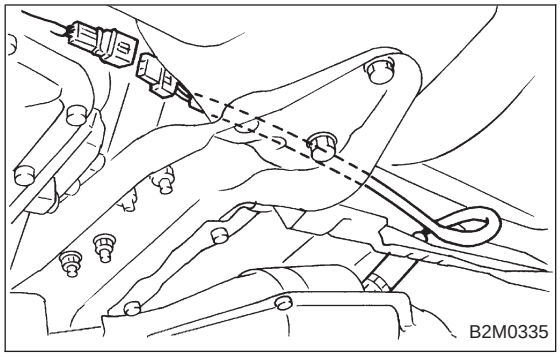
(3) Remove bolts which install power steering pump from bracket.



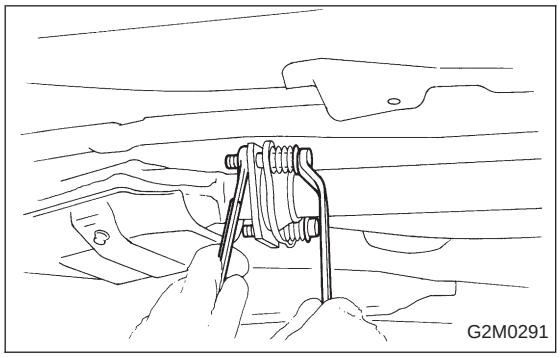
(4) Place power steering pump on the right side wheel apron.



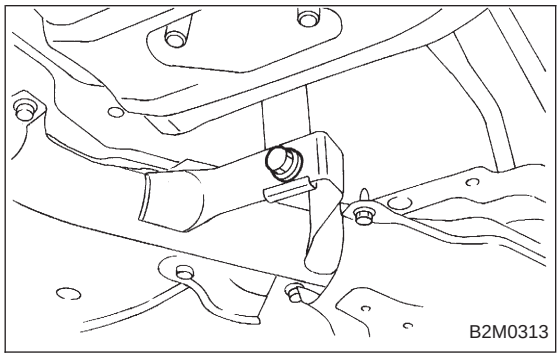
12) Remove front exhaust pipe and center exhaust pipe.
(1) Lift-up the vehicle.
(2) Remove nuts which install front exhaust pipe onto engine.



(3) Disconnect connector from rear oxygen sensor.

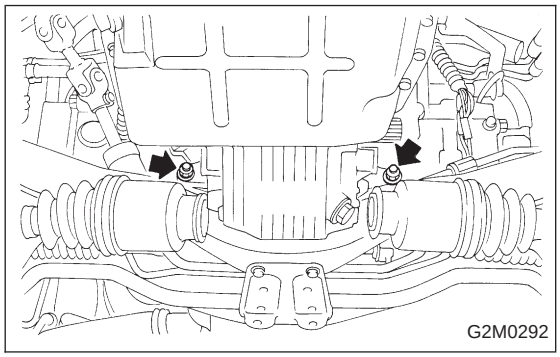


(4) Separate center exhaust pipe from rear exhaust pipe.

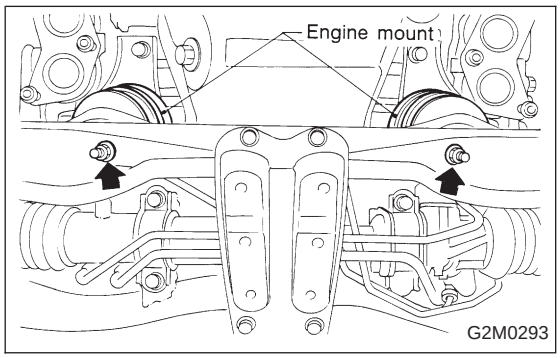


(5) Remove bolt which installs center exhaust pipe on hunger bracket.
(6) Take off front and center exhaust pipes.

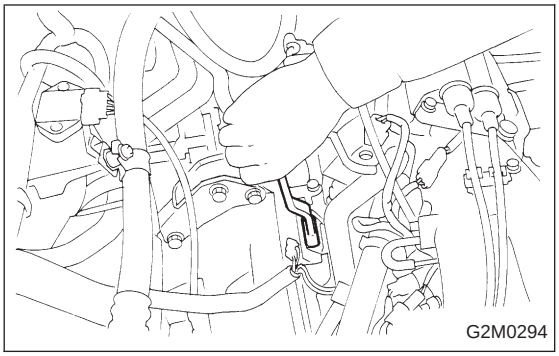
CAUTION:
Exhaust pipe will drop when all bolts are removed. So, hold it when removing the last bolt.



13) Remove nuts which hold lower side of transmission to engine.

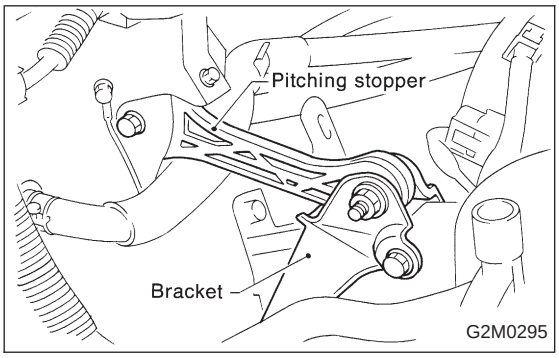


14) Remove nuts which install front cushion rubber onto front crossmember.


G2M0294

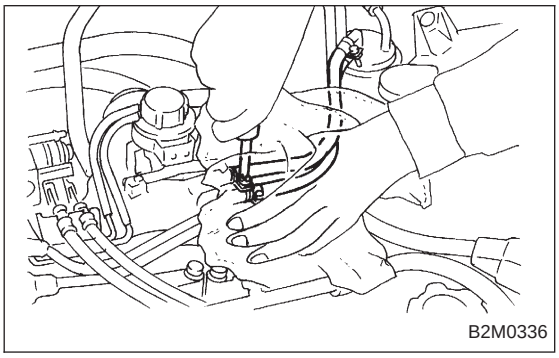
15) Separate torque converter from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove service hole plug.
(3) Remove bolts which hold torque converter to drive plate.
(4) Remove other bolts while rotating the engine using ST.

ST 499977000 CRANK PULLEY WRENCH



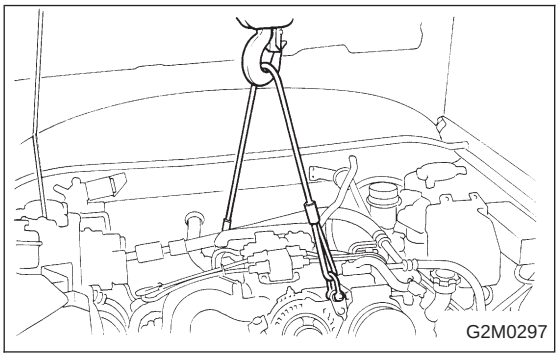
G2M0295

16) Remove pitching stopper.

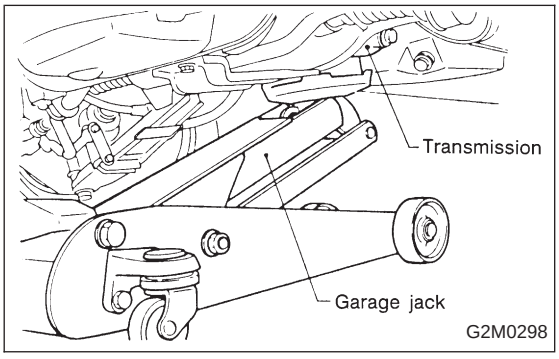

B2M0336

17) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.**
- **Catch fuel from hose into container.**


G2M0297

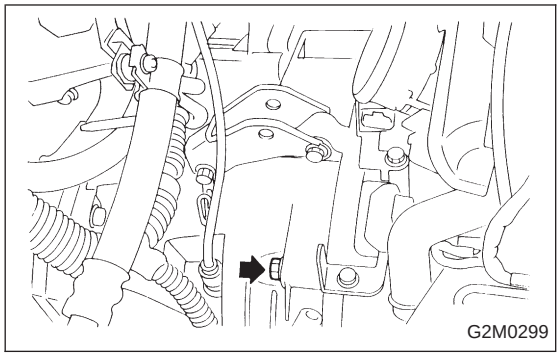
18) Support engine with a lifting device and wire ropes.



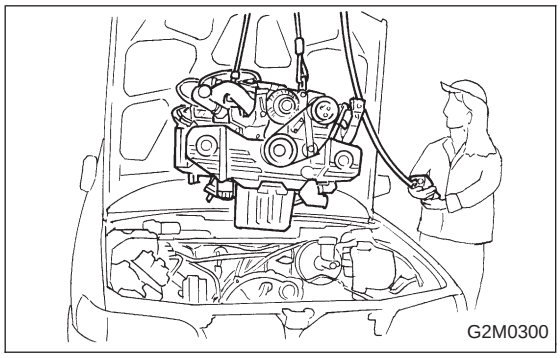
G2M0298

19) Support transmission with a garage jack.

CAUTION:
Before moving engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.


G2M0299

20) Remove bolts which holds upper side of transmission to engine.


G2M0300

21) Remove engine from vehicle.
(1) Slightly raise engine.
(2) Raise transmission with garage jack.
(3) Move engine horizontally until mainshaft is withdrawn from clutch cover.
(4) Slowly move engine away from engine compartment.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

C: INSTALLATION

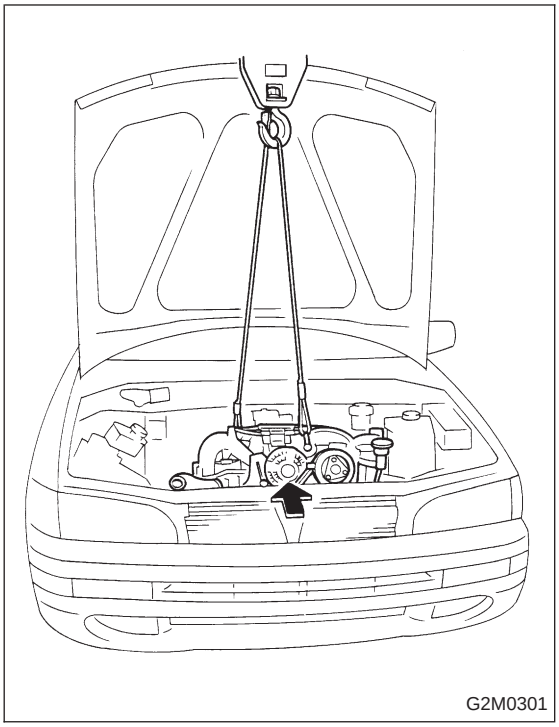
1. Install engine to transmission.
2. Tighten bolts which hold upper side of transmission to engine.
3. Remove lifting device and wire rope.
4. Remove garage jack.
5. Install pitching stopper.

AT model

6. Install torque converter onto drive plate.
7. Install canister and bracket. (2200 cc)
8. Install power steering pump on bracket.
9. Tighten nuts which hold lower side of transmission to engine.
10. Tighten nuts which install front cushion rubber onto cross-member.
11. Install front exhaust pipe and center exhaust pipe.
12. Connect hoses, connectors and cables.
13. Install air intake system.
    - Air intake duct
    - Air cleaner element and upper cover.

With A/C

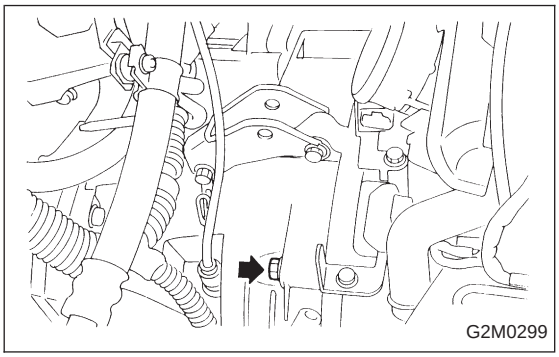
14. Install A/C pressure hoses.
15. Install cooling system.
16. Install battery onto the vehicle, and connect cables.
17. Fill coolant.
18. Check ATF level, and connect if necessary. [AT]
19. Correct power steering oil, and bleed air.
20. Remove front hood stay, and close front hood.
21. Remove the vehicle from lift arms.


G2M0301

1) Install engine onto transmission.
   (1) Position engine in engine compartment and align it with transmission.

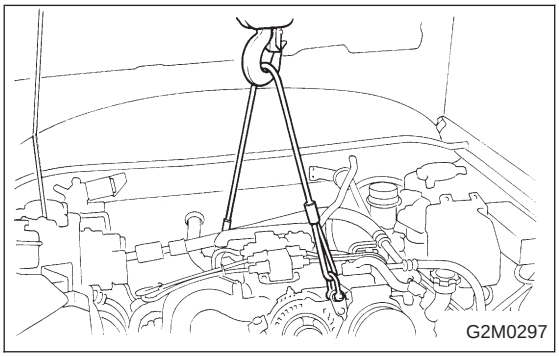
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

   (2) Apply a small amount of grease to splines of mainshaft.

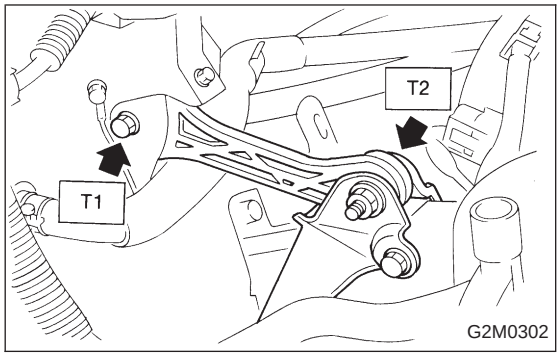

G2M0299

2) Tighten bolts which hold upper side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)

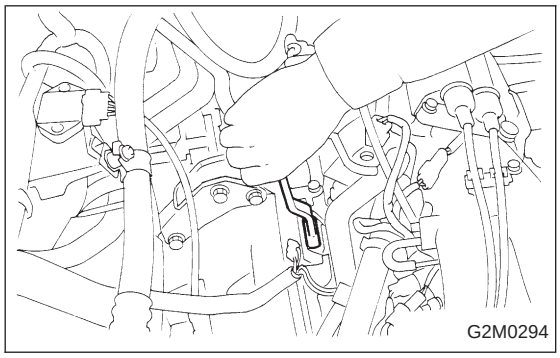

G2M0297

3) Remove lifting device and wire ropes.
4) Remove garage jack.



5) Install pitching stopper.

Tightening torque:
T1: 49±5 N·m (5.0±0.5 kg-m, 36.2±3.6 ft-lb)
T2: 57±10 N·m (5.8±1.0 kg-m, 42±7 ft-lb)



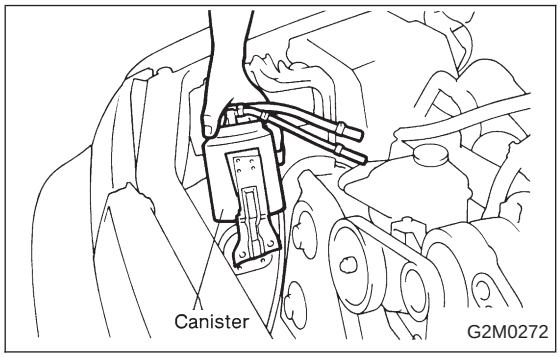
6) Install torque converter onto drive plate. (AT model)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977000 CRANK PULLEY WRENCH

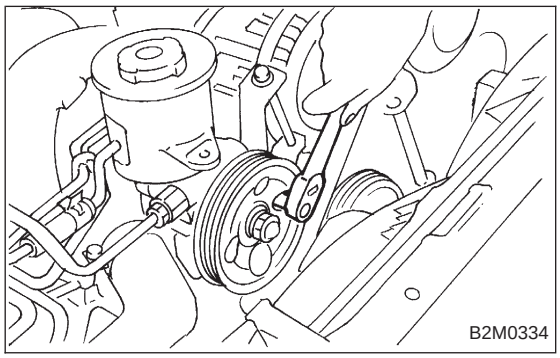
CAUTION:
Be careful not to drop bolts into torque converter housing.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

(3) Clog plug onto service hole.

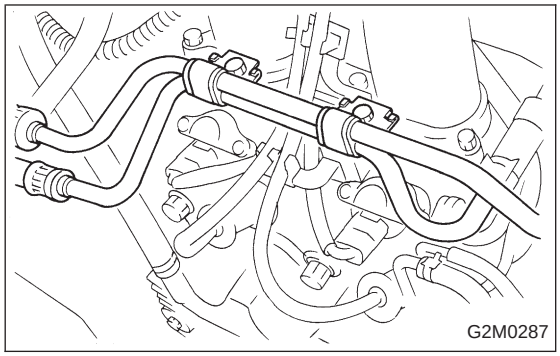


7) Install canister and bracket. (2200 cc model)

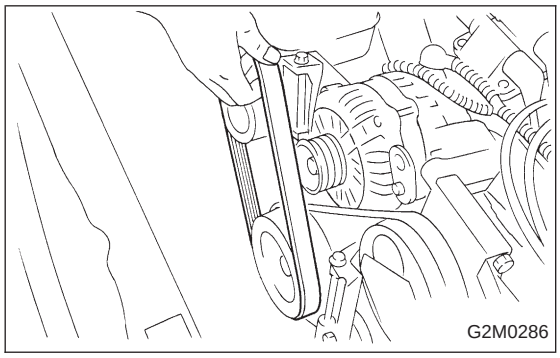


8) Install power steering pump on bracket.
(1) Install power steering pump on bracket, and tighten bolts.

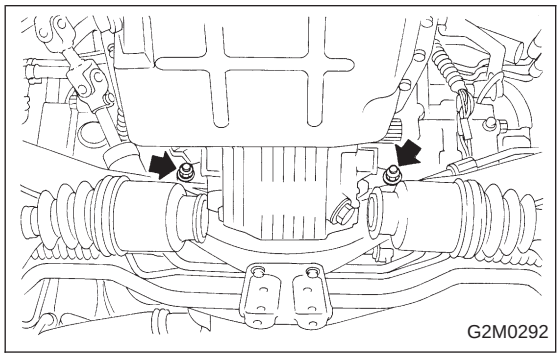
Tightening torque:
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)



(2) Install power steering pipe bracket on right side intake manifold, and install spark plug codes.

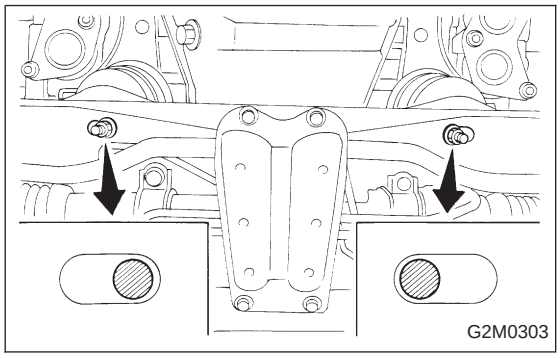


(3) Install front side V-belt, and adjust it.
<Ref. to 1-5 [0200].>



9) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)



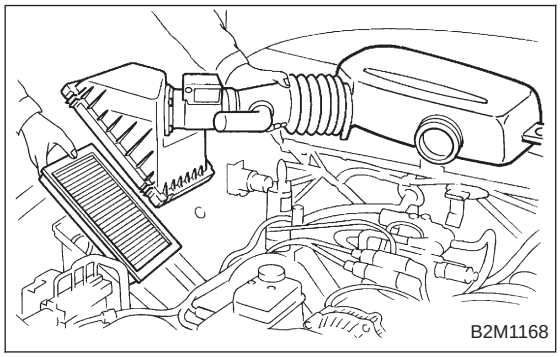
10) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:
69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)

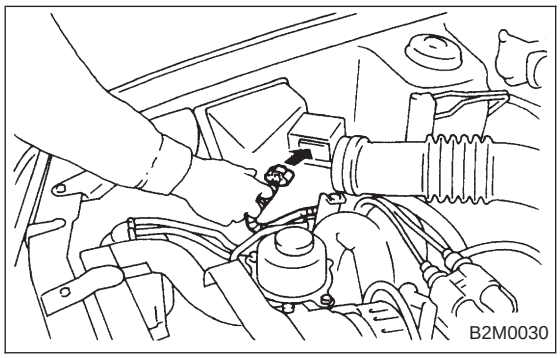
CAUTION:
Be sure to tighten front cushion rubber mounting bolts in the innermost elliptical hole in the front crossmember.

11) Install front exhaust pipe and center exhaust pipe.
12) Connect hoses, connectors and cables.
    (1) Connect the following hoses.
        - Fuel delivery hose, return hose and evaporation hose
        - Heater inlet and outlet hoses
        - Brake booster vacuum hose
        - Canister hoses (2200 cc)
    (2) Connect the following connectors.
        - Engine ground terminal
        - Engine harness connectors
        - Front and rear oxygen sensor connector
        - Cam angle sensor connector
        - Crank angle sensor connector
        - Alternator connector and terminal
        - A/C compressor connectors (With A/C)
    (3) Connect the following cables.
        - Accelerator cable
        - Cruise control cables (With cruise control)
        - Clutch cable
        - Clutch release spring

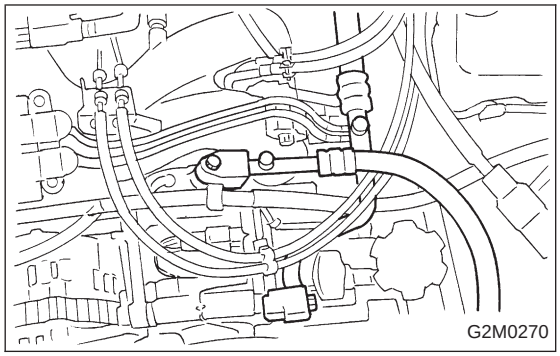
CAUTION:
After connecting each cable, adjust them.


B2M1168

13) Install air intake system.
    (1) Install air cleaner element.
    (2) Install air intake duct with air cleaner upper cover.


B2M0030

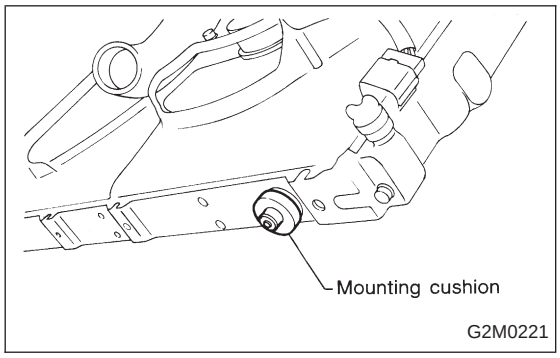
    (3) Connect connector to mass air flow sensor.


G2M0270

14) Install A/C flexible hoses. (With A/C)
<Ref. to 4-7 [W16A0].>

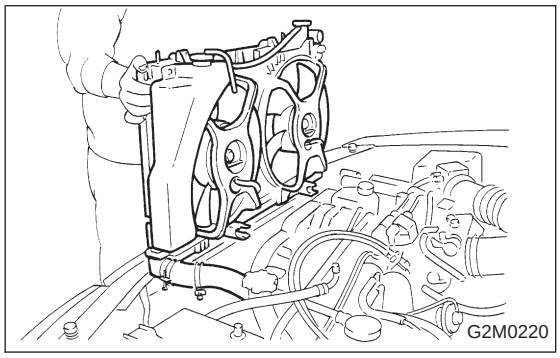
CAUTION:
Use new O-rings.

Tightening torque:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)

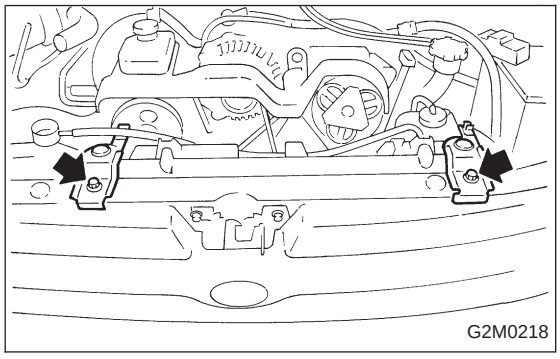


G2M0221

15) Install cooling system.
(1) Attach radiator mounting cushions to pins on lower side of radiator.

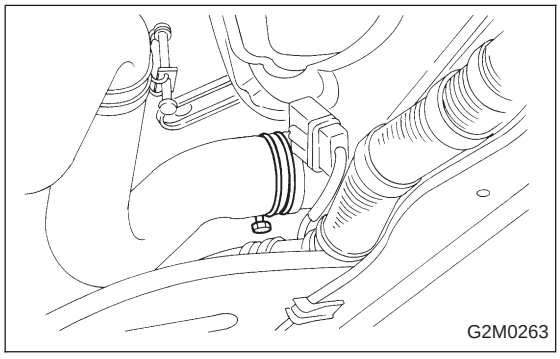

G2M0220

(2) Fit cushions on lower side of radiator, into holes on body side and install radiator.

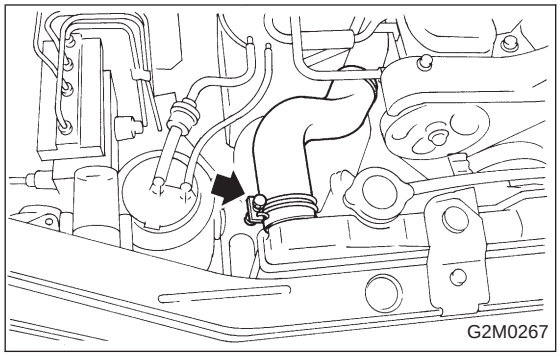

G2M0218

(3) Install radiator brackets and tighten bolts.

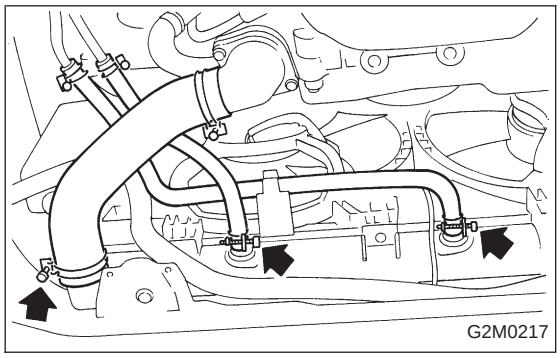
Tightening torque:
13.7±1.5 N·m (1.4±0.15 kg-m, 10.1±1.1 ft-lb)


G2M0263

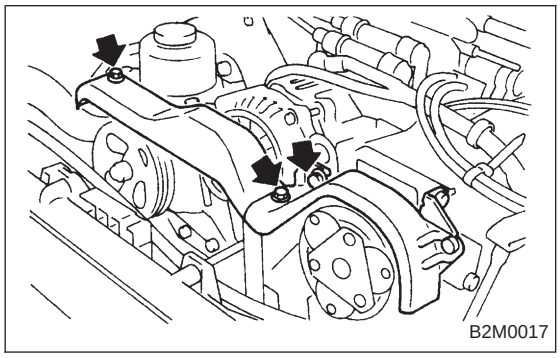
(4) Connect radiator fan motor connector.


G2M0267

(5) Connect radiator inlet hose.


G2M0217

(6) Connect radiator outlet hose.
(7) Connect ATF cooler hoses. (AT model)


B2M0017

(8) Install V-belt cover.

16) Install battery in the vehicle, and connect cables.
17) Fill coolant.
<Ref. to 1-5 [0600].>
18) Check ATF level and correct if necessary. (AT model)
<Ref. to 3-2 [W1B1].>
19) Charge A/C system with refrigerant.
<Ref. to 4-7 [W700].>
20) Remove front hood stay, and close front hood.
21) Remove the vehicle from lift arms.

2. Transmission

A: GENERAL PRECAUTION

1) Remove or install transmission in an area where chain hoists, lifting devices, etc. are available for ready use.
2) Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
3) Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
4) Lift-up or lower the vehicle when necessary. Make sure to support the correct positions. <Ref. to 1-3 [0700].>

B: REMOVAL

1. Open front hood fully, and support it with stay.
2. Disconnect battery ground terminal.

↓

3. Remove air intake duct and chamber.

↓

4. Disconnect connectors and cables.

↓

5. Remove starter.

↓

6. Remove pitching stopper and bracket.

↓

AT model

7. Separate torque converter from drive plate.
8. Remove ATF level gauge.

↓

9. Remove transmission connector bracket.

↓

10. Set special tools.

↓

11. Remove bolt which holds right upper side of transmission to engine.

↓

12. Remove exhaust system.
- Front exhaust pipe
- Center exhaust pipe
- Rear exhaust pipe
- Heat shield cover

↓

AT model

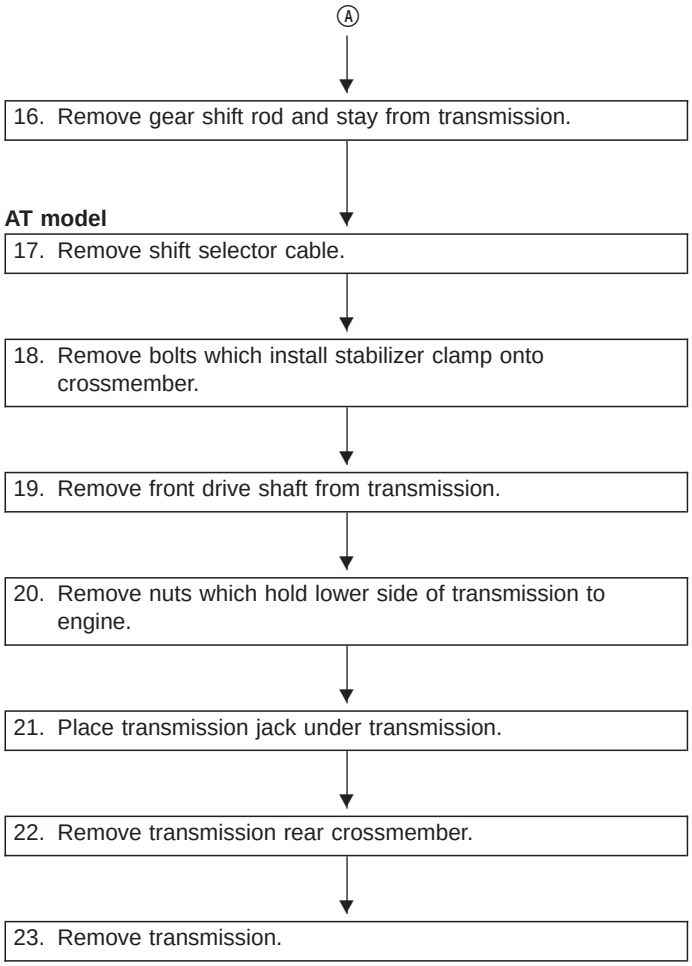
13. Drain ATF to remove drain plug.
14. Disconnect ATF cooler hose from pipe on transmission side, and remove ATF supply pipe.

↓

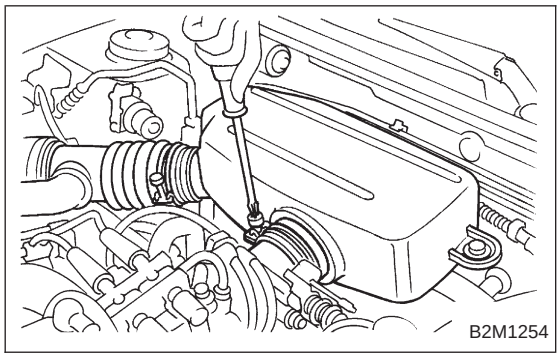
15. Remove propeller shaft.

↓

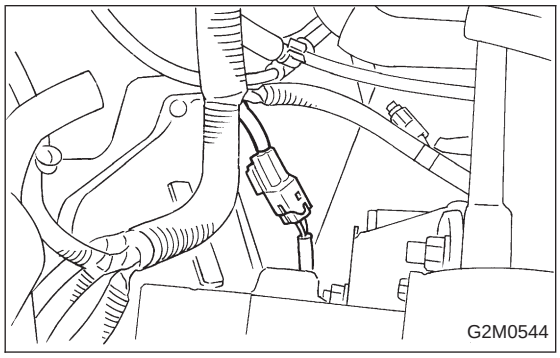
Ⓐ


Ⓐ
16. Remove gear shift rod and stay from transmission.
AT model
17. Remove shift selector cable.
18. Remove bolts which install stabilizer clamp onto crossmember.
19. Remove front drive shaft from transmission.
20. Remove nuts which hold lower side of transmission to engine.
21. Place transmission jack under transmission.
22. Remove transmission rear crossmember.
23. Remove transmission.

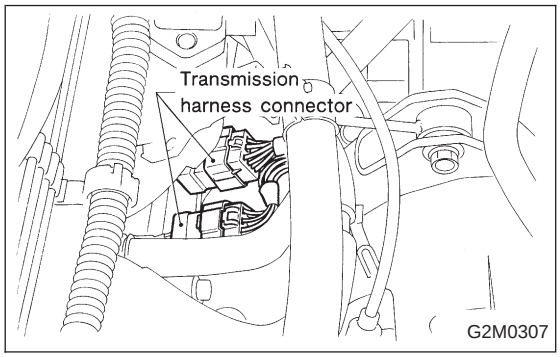
1) Open front hood fully, and support with stay.
2) Disconnect battery ground terminal.


B2M1254

3) Remove air intake duct and chamber.

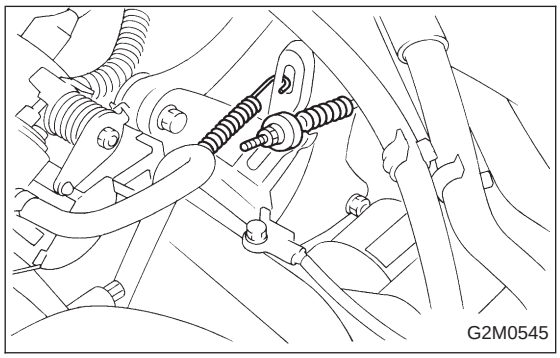

G2M0544

4) Disconnect connectors and cables.
   (1) Disconnect the following connectors.
   - Front oxygen sensor connector

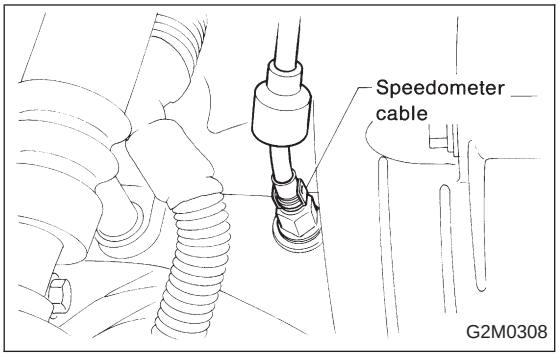


G2M0307

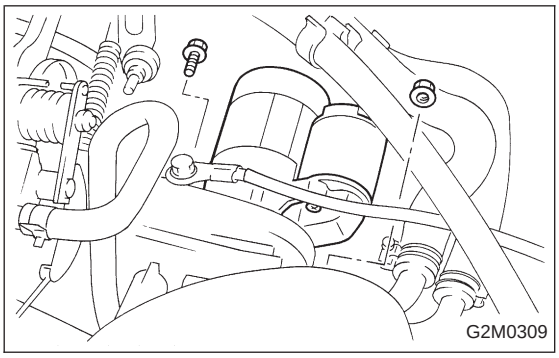
   - Transmission harness connector
   - Transmission ground terminal


G2M0545

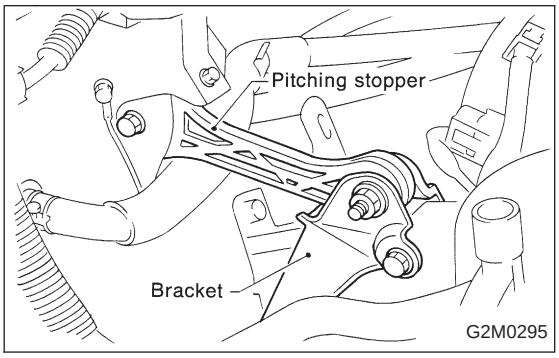
   (2) Disconnect the following cables.
   - Clutch release spring
   - Clutch cable
   - Hill holder cable



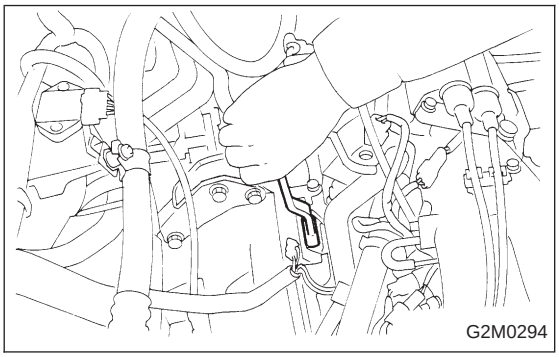
- Speedometer cable



5) Remove starter.
   (1) Disconnect connectors and terminal from starter.
   (2) Remove bolt which installs upper side of starter.
   (3) Remove nut which installs lower side of starter, and remove starter from transmission.



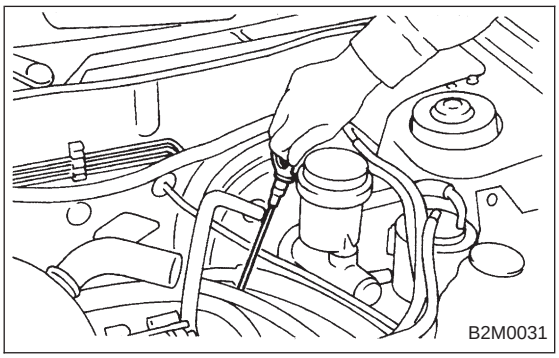
6) Remove pitching stopper.



7) Separate torque converter from drive plate. (AT model)
   (1) Remove service hole plug.
   (2) Remove bolts which hold torque converter to drive plate.
   (3) While rotating the engine, remove other bolts using ST.

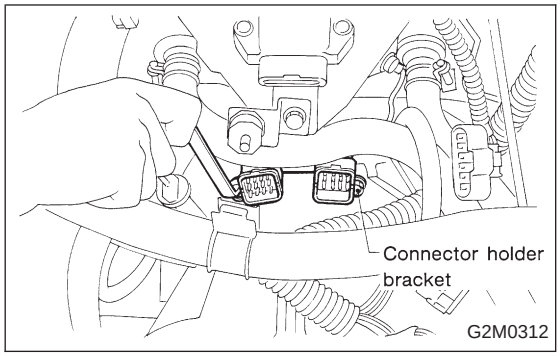
ST 499977000 CRANK PULLEY WRENCH

CAUTION:
Be careful not to drop bolts into torque converter housing.

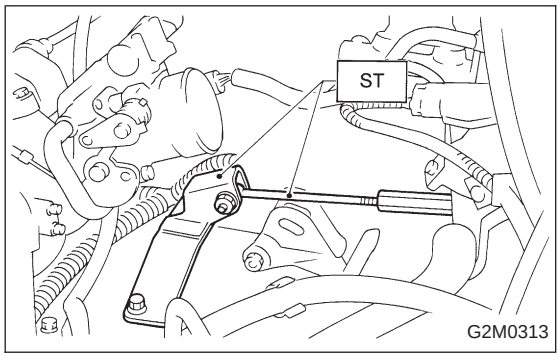


8) Remove ATF level gauge. (AT model)

CAUTION:
Plug opening to prevent entry of foreign particles into transmission fluid.



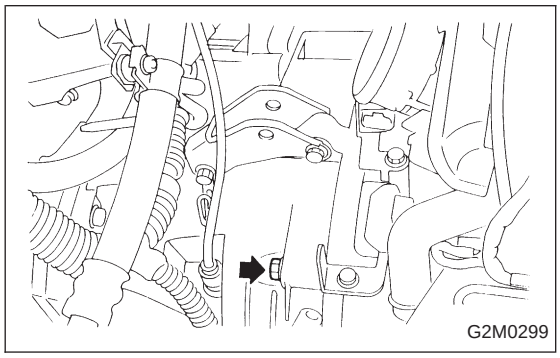
9) Remove transmission connector holder bracket.



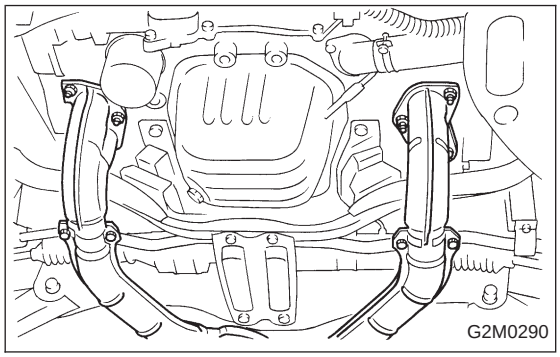
10) Set special tool.

ST 41099AA000 ENGINE SUPPORT ASSY

NOTE:
Also available is Part No. 927670000.



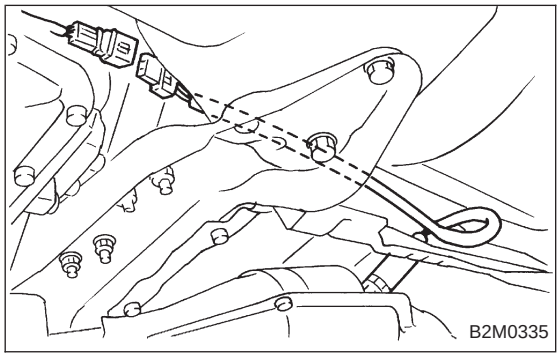
11) Remove bolt which holds right upper side of transmission to engine.



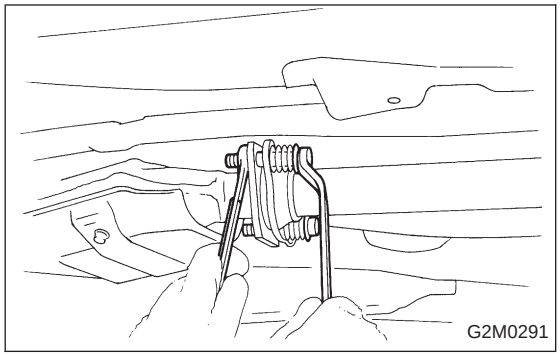
12) Remove exhaust system.

(1) Lift-up the vehicle.

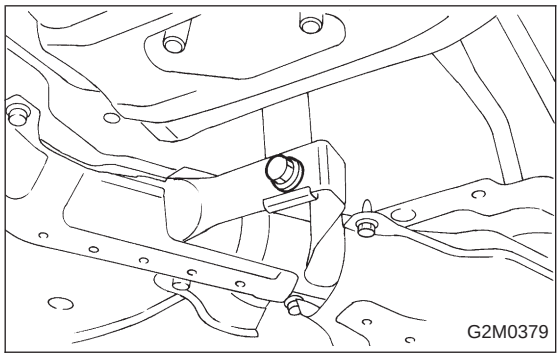
(2) Remove nuts which install front exhaust pipe onto engine.



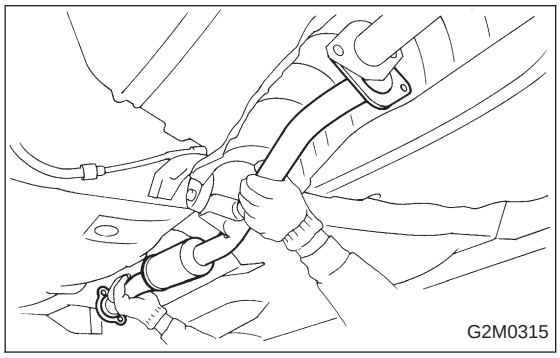
(3) Disconnect connector from rear oxygen sensor.


G2M0291

(4) Separate center exhaust pipe from rear exhaust pipe.

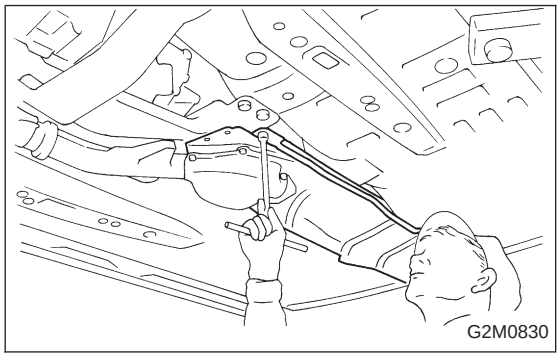

G2M0379

(5) Remove bolt which installs center exhaust pipe to hunger bracket then take off front and center exhaust pipes.

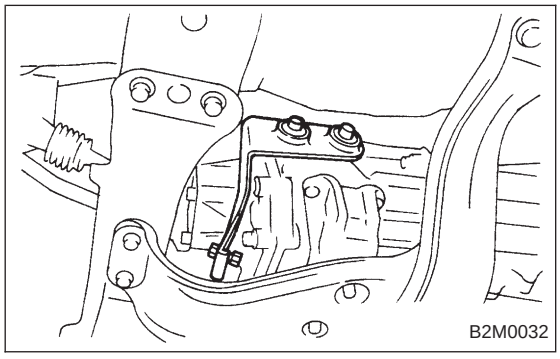

G2M0315

(6) Remove rear exhaust pipe.

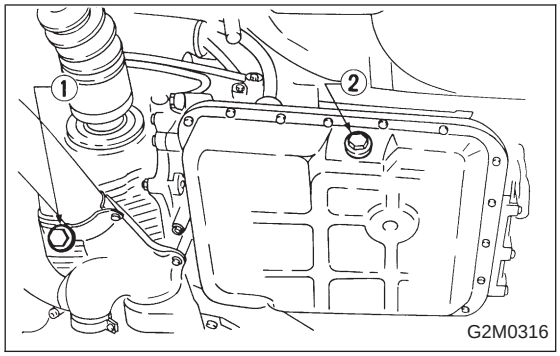
CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.


G2M0830

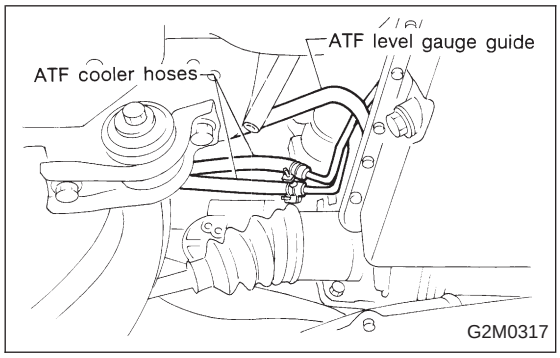
(7) Remove heat shield cover of rear exhaust pipe.


B2M0032

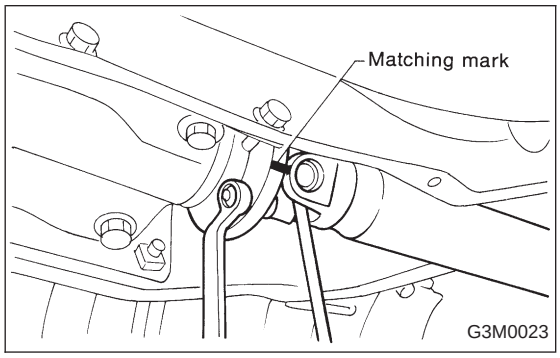
(8) Remove hanger bracket from right side of transmission.



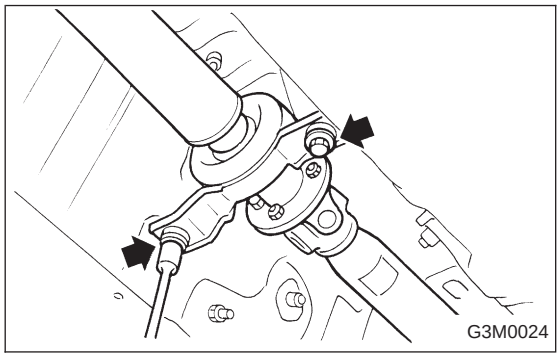
13) Drain ATF to remove drain plug. (AT model)
① Front differential oil drain plug
② ATF drain plug



14) Disconnect ATF cooler hoses from pipes of transmission side and remove ATF level gauge guide. (AT model)

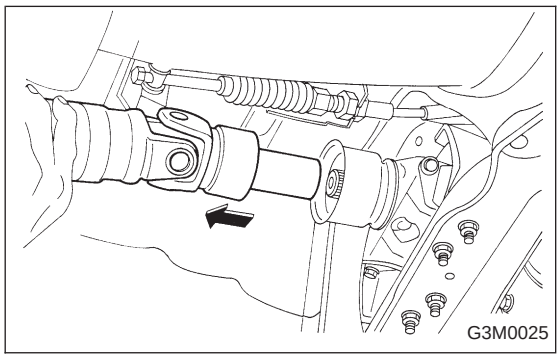


15) Remove propeller shaft.
(1) Remove front cover of rear differential mount.
(2) Separate propeller shaft from rear differential.



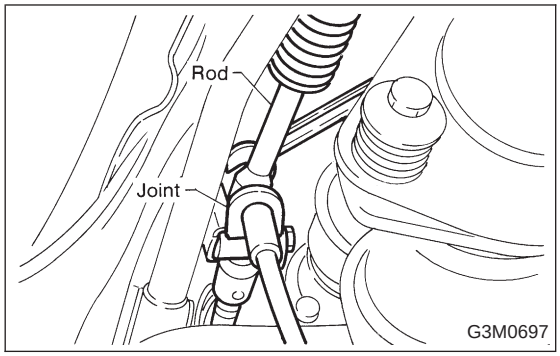
(3) Remove bolts which hold center bearing onto body.

CAUTION:
Be careful not to drop propeller shaft.

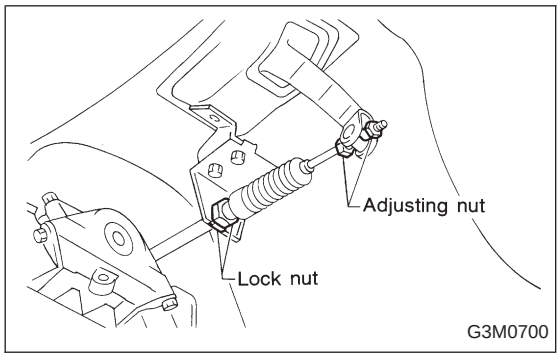


(4) Remove propeller shaft from transmission.

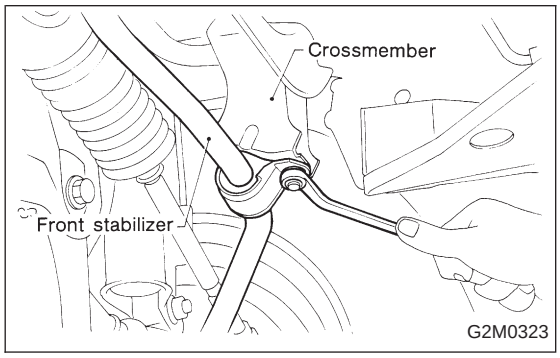
CAUTION:
- **Be sure to use an empty container to catch oil flowing out when removing propeller shaft.**
- **Be sure not to damage oil seals and the frictional surface of sleeve yoke.**
- **Be sure to plug the opening in transmission after removal of propeller shaft.**



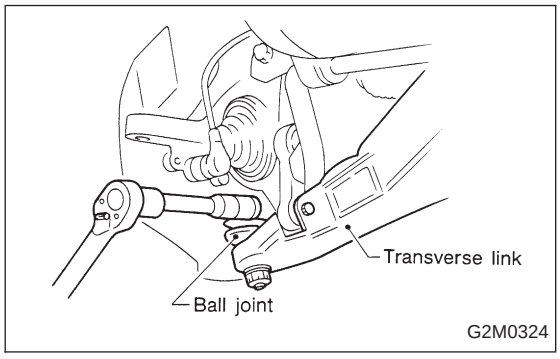
16) Remove gear shift rod and stay from transmission. (MT model)
(1) Remove spring.
(2) Disconnect stay from transmission.
(3) Disconnect rod from transmission.



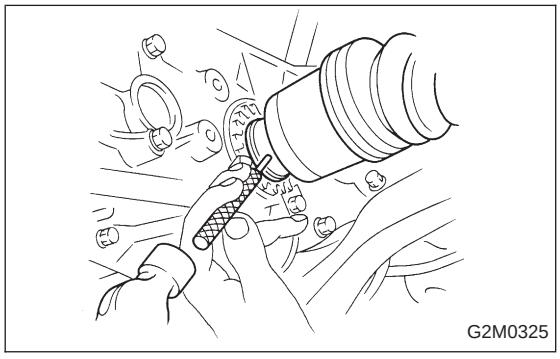
17) Remove shift selector cable. (AT model)
(1) Disconnect shift selector cable from selector lever.
(2) Remove cable bracket from selector lever assembly.



18) Remove bolts which install stabilizer clamp onto crossmember.

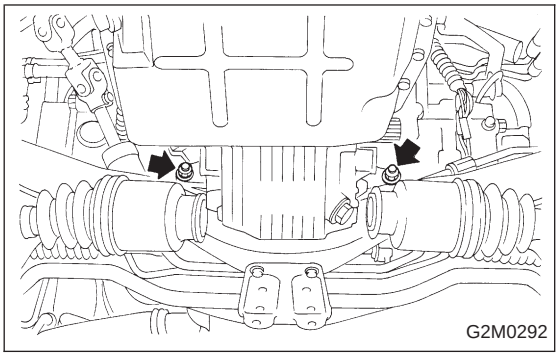


19) Remove front drive shaft from transmission.
(1) Remove transverse link from housing.
(2) Lower transverse link.

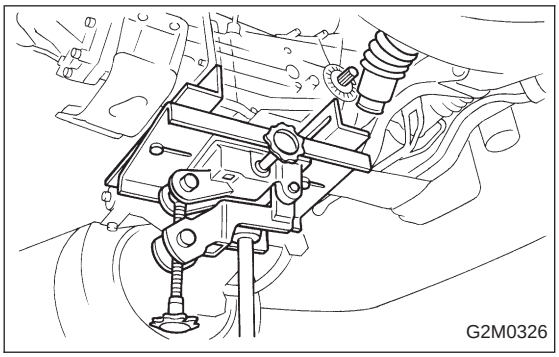


(3) Remove spring pin and separate front drive shaft from each side of the transmission.

CAUTION:
Discard removing spring pin. Replace with a new one.

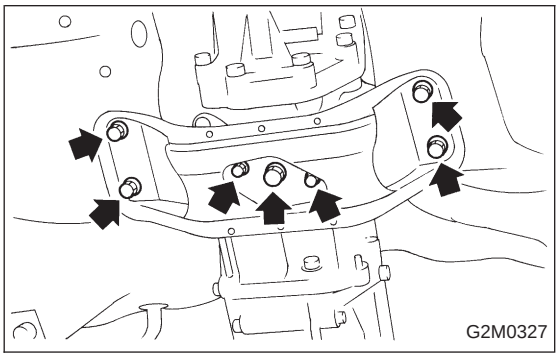

G2M0292

20) Remove nuts which hold lower side of transmission to engine.

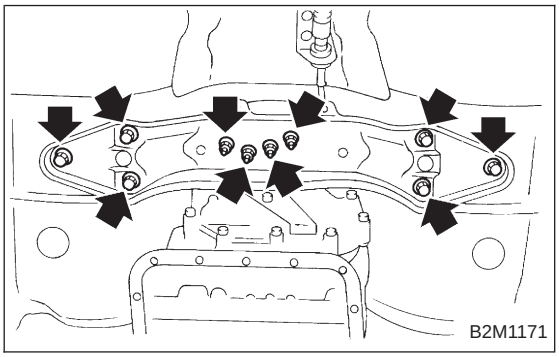

G2M0326

21) Place transmission jack under transmission.

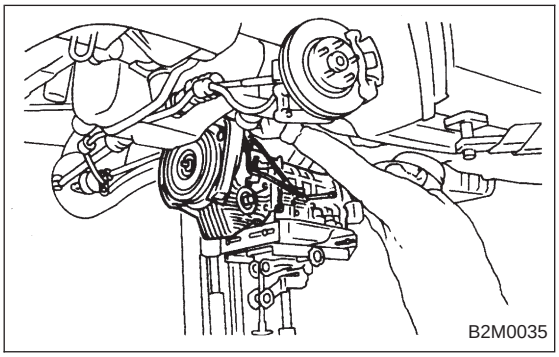
CAUTION:
- **Always support transmission case with a transmission jack.**
- **On AT model, make sure that the support plates of transmission jack do not touch the oil pan.**


G2M0327

22) Remove transmission rear crossmember.
- **MT model**


B2M1171

- **AT model**


B2M0035

23) Remove transmission.

CAUTION:
- **Move transmission jack toward rear until mainshaft is withdrawn from clutch cover. (MT model)**
- **Move transmission and torque converter as a unit away from engine. (AT model)**

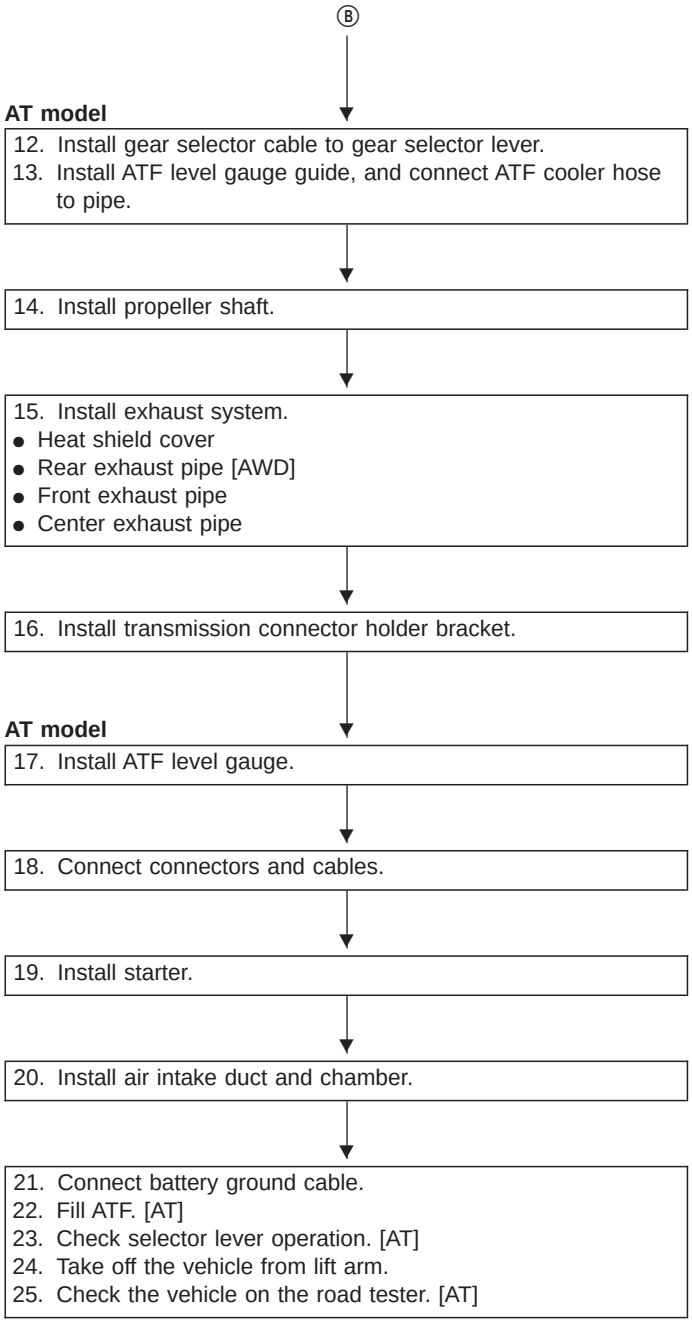
C: INSTALLATION

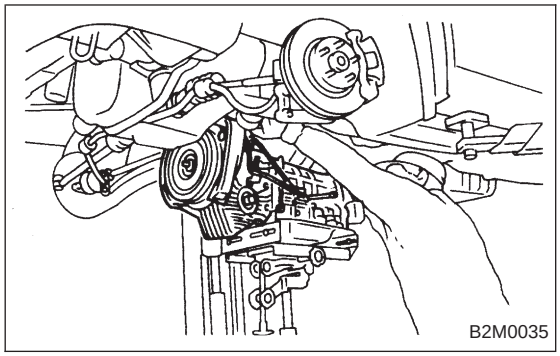
1. Install transmission to engine.
2. Install transmission rear crossmember.
3. Take off transmission jack.
4. Tighten nuts which hold lower side of transmission to engine.
5. Tighten bolt which holds right upper side of transmission to engine.

AT model

6. Install torque converter to drive plate.
7. Remove special tools.
8. Install pitching stopper and bracket.
9. Install front drive shafts into transmission.
10. Install stabilizer clamps onto front crossmember.
11. Install gear shift rod and stay.

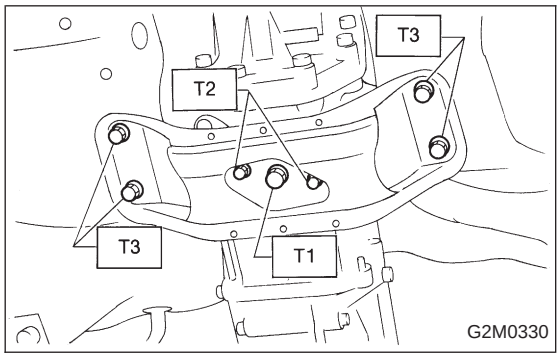
Ⓑ


Ⓑ
AT model
12. Install gear selector cable to gear selector lever.
13. Install ATF level gauge guide, and connect ATF cooler hose to pipe.
14. Install propeller shaft.
15. Install exhaust system.
● Heat shield cover
● Rear exhaust pipe [AWD]
● Front exhaust pipe
● Center exhaust pipe
16. Install transmission connector holder bracket.
AT model
17. Install ATF level gauge.
18. Connect connectors and cables.
19. Install starter.
20. Install air intake duct and chamber.
21. Connect battery ground cable.
22. Fill ATF. [AT]
23. Check selector lever operation. [AT]
24. Take off the vehicle from lift arm.
25. Check the vehicle on the road tester. [AT]


B2M0035

1) Install transmission onto engine.
(1) Gradually raise transmission with transmission jack.
(2) Engage them at splines.

CAUTION:
Be careful not to strike mainshaft against clutch cover. (MT model)

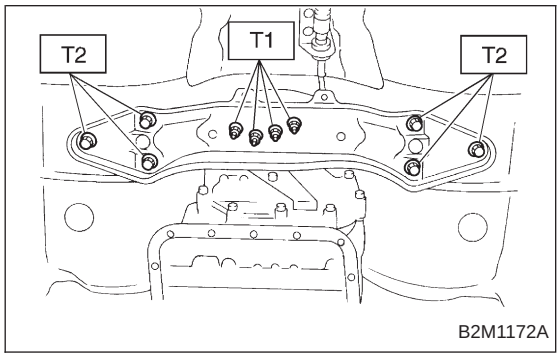


G2M0330

2) Install transmission rear crossmember.

● **MT model**

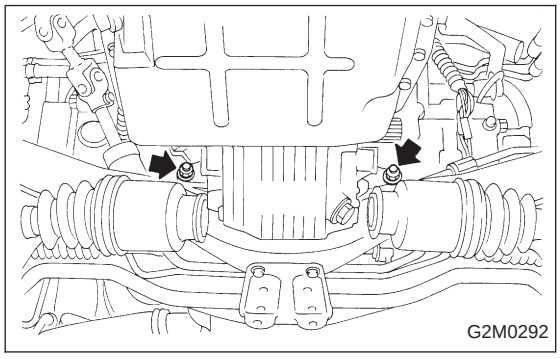
Tightening torque:
T1: 24.5±1.5 N·m (2.50±0.153 kg-m, 18.07±1.11 ft-lb)
T2: 37±10 N·m (3.8±1.0 kg-m, 27±7 ft-lb)
T3: 69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)



B2M1172A

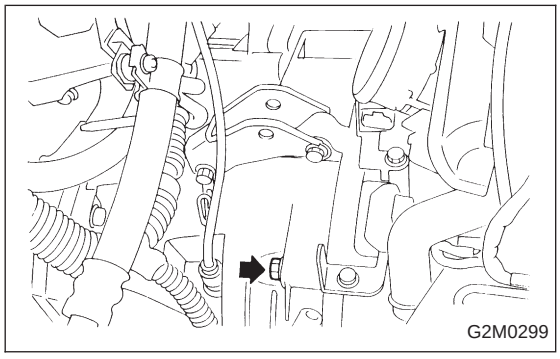
● **AT model**

Tightening torque:
T1: 37±10 N·m (3.8±1.0 kg-m, 27±7 ft-lb)
T2: 69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)


G2M0292

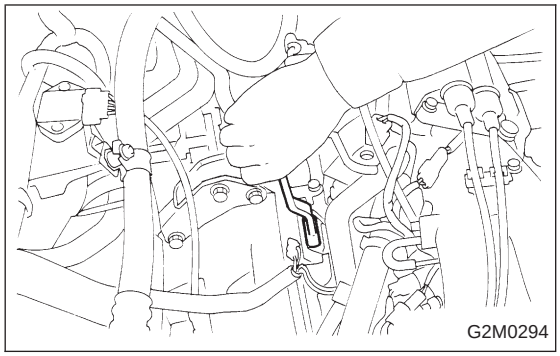
3) Take off transmission jack.
4) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)


G2M0299

5) Tighten bolt which holds right upper side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)



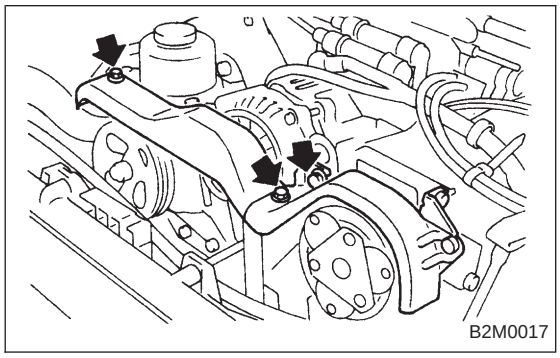
6) Install torque converter to drive plate. (AT model)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977000 CRANK PULLEY WRENCH

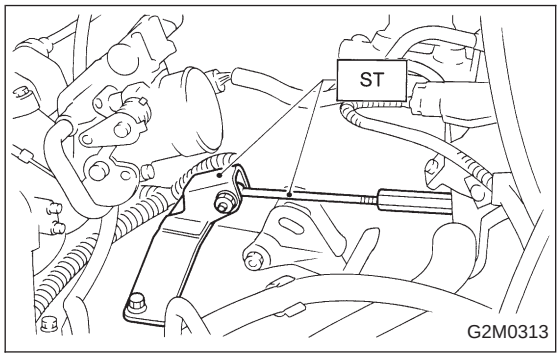
CAUTION:
Be careful not to drop bolts into torque converter housing.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

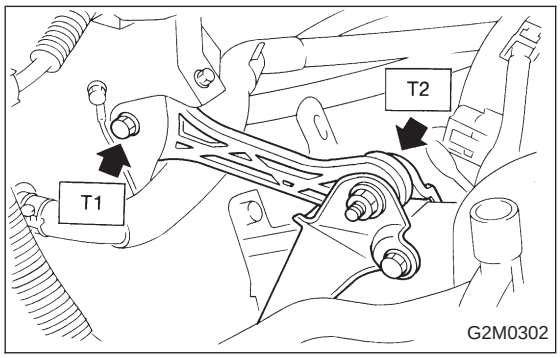
(3) Clog plug onto service hole.



(4) Install V-belt cover.

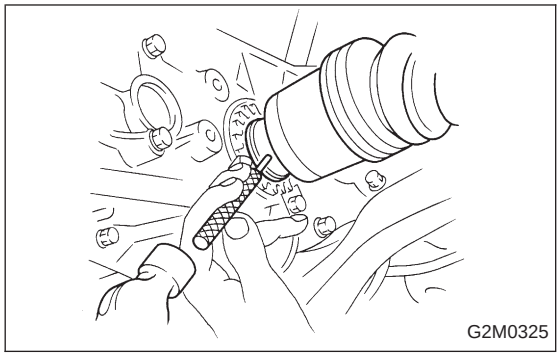


7) Remove special tool.



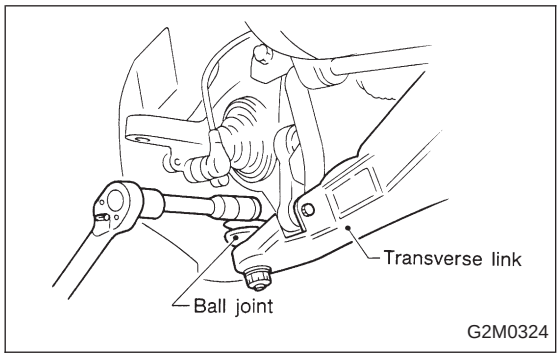
8) Install pitching stopper.

Tightening torque:
T1: 49±5 N·m (5.0±0.5 kg-m, 36.2±3.6 ft-lb)
T2: 57±10 N·m (5.8±1.0 kg-m, 42±7 ft-lb)


G2M0325

9) Install front drive shafts into transmission.
(1) Lift-up the vehicle.
(2) Install front drive shaft into transmission.
(3) Drive spring pin into chamfered hole of drive shaft.

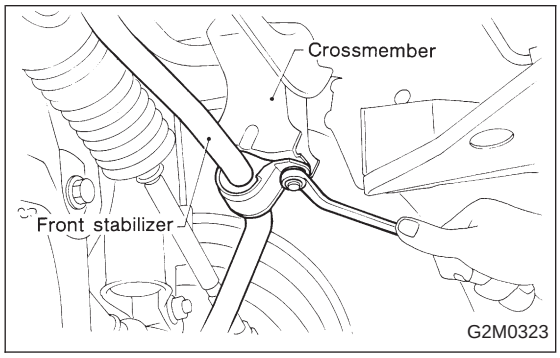
CAUTION:
Always use a new spring pin.



G2M0324

(4) Install ball joints of lower arm into knuckle arm of housing, and tighten installing bolt.

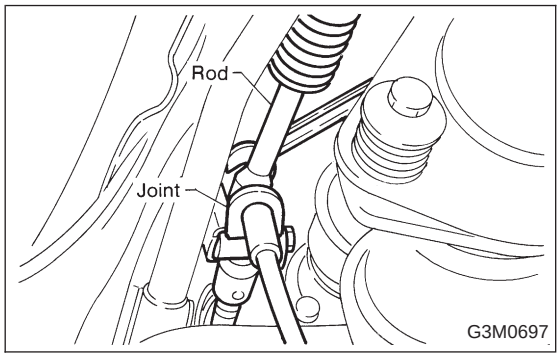
Tightening torque:
49±10 N·m (5.0±1.0 kg-m, 36±7 ft-lb)



G2M0323

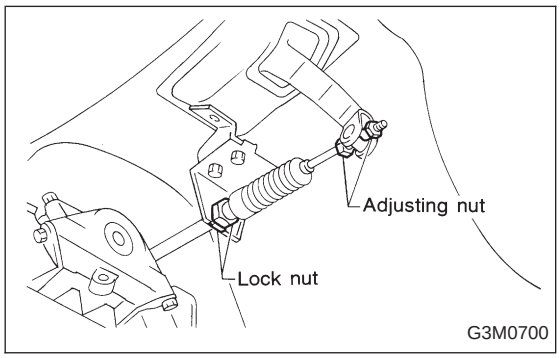
10) Install stabilizer clamp onto front crossmember.

Tightening torque:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)



G3M0697

11) Install gear shift rod and stay. (MT model)
(1) Install gear shift rod onto transmission.
(2) Install stay onto transmission.
(3) Install spring.

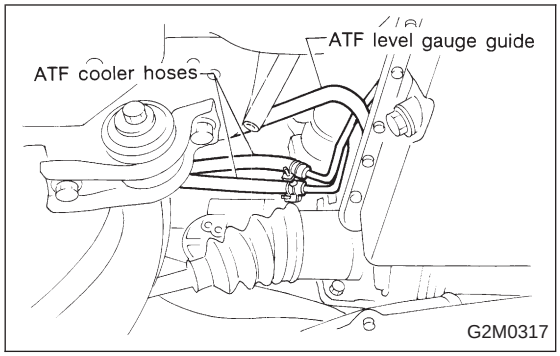


G3M0700

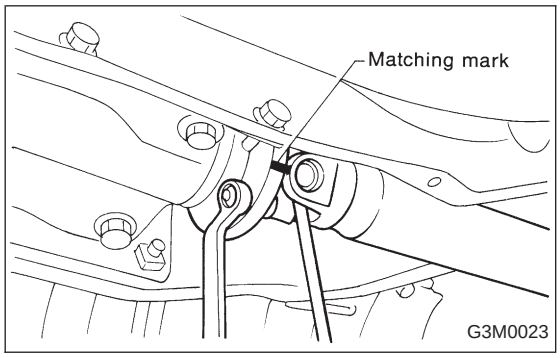
12) Install shift selector cable onto selector cable. (AT model)
(1) Install selector cable into selector lever.
(2) Install cable bracket onto body.

Tightening torque:
18±5 N·m (1.84±0.51 kg-m, 13.3±3.7 ft-lb)

NOTE:
Tighten selector cable adjusting and lock nut after checking selector lever operation. <Ref. to 3-3 [W2E0].>

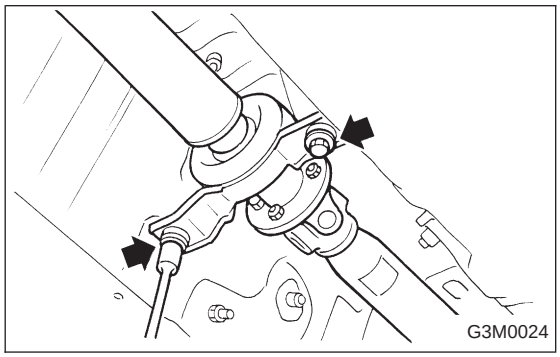


13) Install ATF level gauge guide, and ATF cooler hoses onto pipe. (AT model)



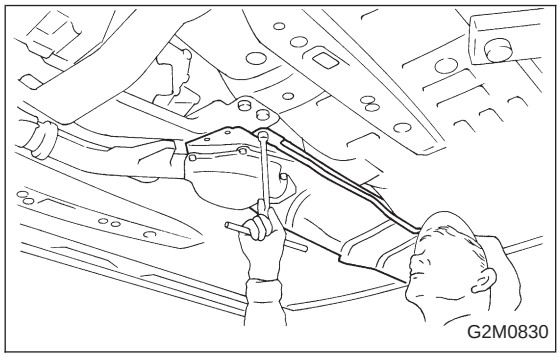
14) Install propeller shaft.
(1) Install propeller shaft into transmission.
(2) Tighten bolts which install propeller shaft onto companion flange of rear differential.

Tightening torque:
31±8 N·m (3.2±0.8 kg-m, 23.1±5.8 ft-lb)

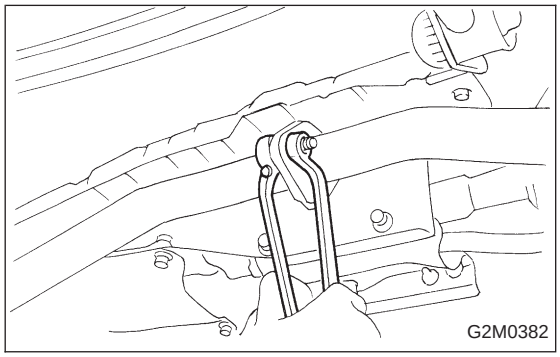


(3) Install center bearing bracket on body.

Tightening torque:
52±5 N·m (5.3±0.5 kg-m, 38.3±3.6 ft-lb)

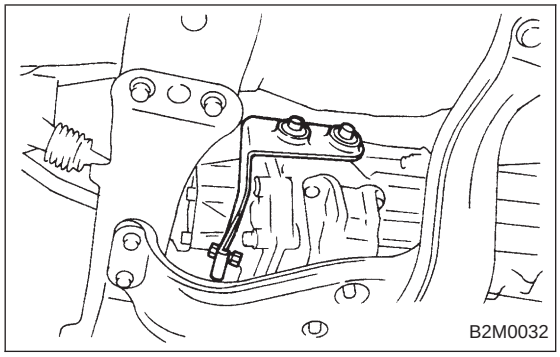


15) Install exhaust system.
(1) Install heat shield cover.

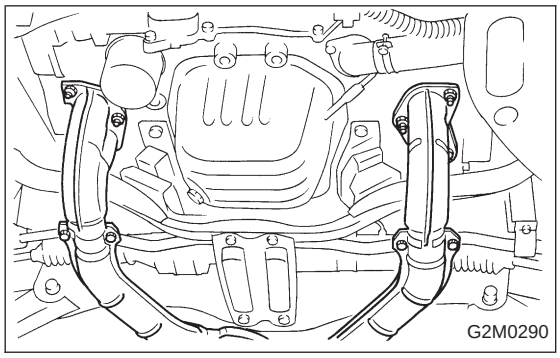


(2) Install rear exhaust pipe to muffler.

Tightening torque:
48±9 N·m (4.9±0.9 kg-m, 35.4±6.5 ft-lb)

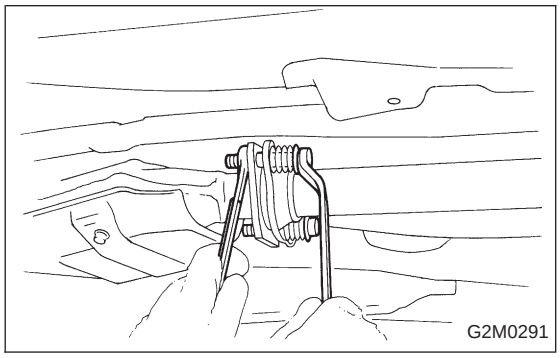


(3) Install hanger bracket on right side of transmission.



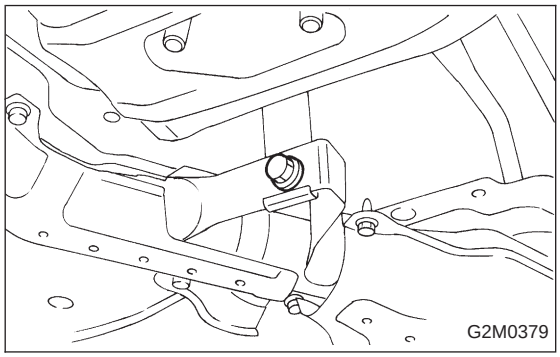
(4) Install front exhaust pipe onto engine.

Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)



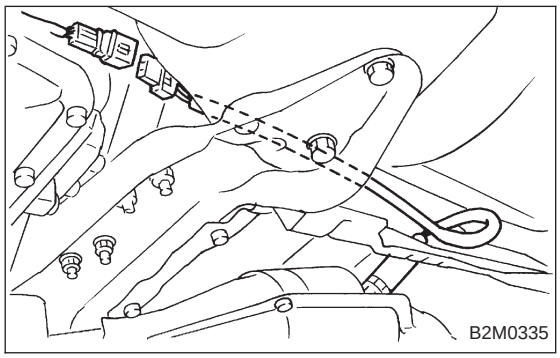
(5) Install center exhaust pipe to rear exhaust pipe.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

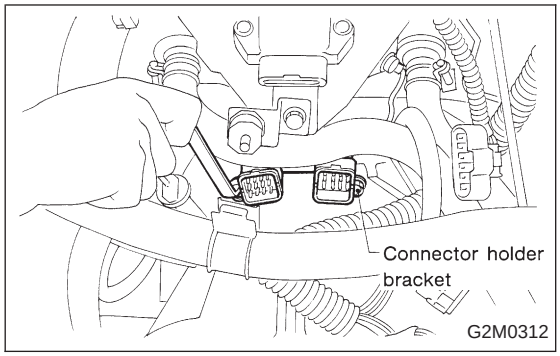


(6) Tighten bolt which installs center exhaust pipe to hunger bracket.

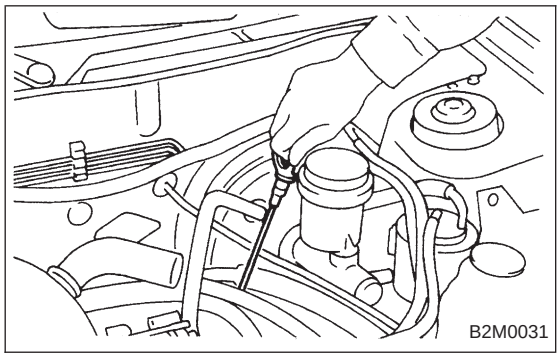
Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)



(7) Connect connector to rear oxygen sensor.



16) Install transmission connector holder bracket.

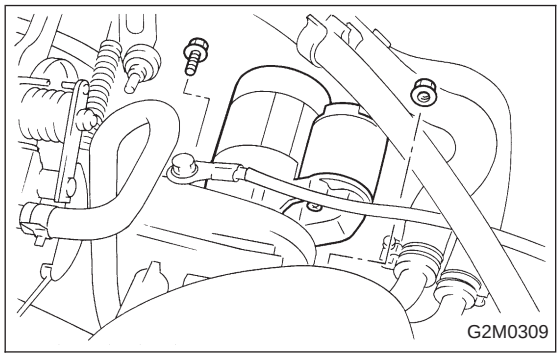


17) Install ATF level gauge. (AT model)

18) Connect connectors and cables.
(1) Connect the following connectors.
- Transmission harness connectors
- Transmission ground terminal
- Front oxygen sensor connector

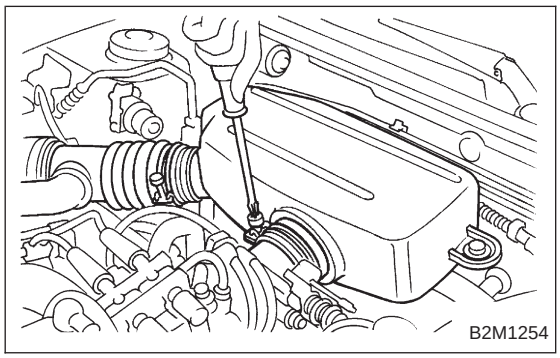
(2) Connect the following cables.
- Cruise control cable

(With cruise control model)
- Clutch cable
- Speedometer cable



19) Install starter.
(1) Install starter onto transmission case, and connect connectors and terminals.
(2) Tighten bolt and nut which install starter onto transmission.

Tightening torque:
40±4 N·m (4.1±0.4 kg-m, 29.7±2.9 ft-lb)



20) Install air intake duct and chamber then connect connector to mass air flow sensor.

21) Connect battery ground cable.
22) Fill ATF. (AT model)
<Ref. to 3-2 [W1B1].>
23) Check selector lever operation. (AT model)
<Ref. to 3-3 [W2E0].>
24) Take off vehicle from lift arms.
25) Check the vehicle on road tester. (AT model)
<Ref. to 3-2 [W7A0].>

MANUAL TRANSMISSION AND DIFFERENTIAL 3-1

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1. Specifications

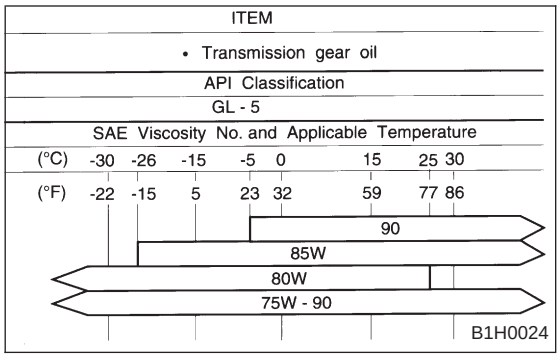
A: MANUAL TRANSMISSION AND DIFFERENTIAL

Item			Model	
			AWD	
			1800 cc	2200 cc
Type			5-forward speeds with synchromesh and 1-reverse	
Transmission gear ratio		1st	3.545	
		2nd	2.111	
		3rd	1.448	
		4th	1.088	
		5th	0.825	0.780
		Reverse	3.416	
Front reduction gear	Final	Type of gear	Hypoid	
		Gear ratio	3.900	
Rear reduction gear	Transfer	Type of gear	Helical	
		Gear ratio	1.000	
	Final	Type of gear	Hypoid	
		Gear ratio	3.900	
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)	
Center differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)	
Transmission gear oil			GL-5	
Transmission oil capacity			3.5 ℓ (3.7 US qt, 3.1 Imp qt)	

2. Service Data

A: TRANSMISSION GEAR OIL

Recommended oil



B: TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Hypoid gear backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)
Selection of main shaft rear plate

Main shaft rear plate		
Dimension “A” mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

C: DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing
Starting torque
0.3 — 0.8 N·m (3 — 8 kg-cm, 2.6 — 6.9 in-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

Assemble a driven shaft and 1st driven gear that are selected for the proper radial clearance adjustment.

Driven shaft		1st driven gear
Part No.	Diameter A mm (in)	Part No.
32229AA150	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270
32229AA140	49.967 — 49.975 (1.9672 — 1.9675)	32231AA260

D: REVERSE IDLER GEAR

Adjustment of reverse idler gear position
Reverse idler gear to transmission case (LH) wall clearance
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	Closer to the case wall

After installing a suitable reverse shifter lever, adjust reverse idler gear to transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 x 26 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

E: SHIFTER FORK AND ROD

Select suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchro-mesh mechanisms.

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork		
Part No.	Mark	Remarks
32812AA200	4	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA210	No mark	Standard
32812AA220	6	Become distant from 5th gear by 0.2 mm (0.008 in)

Rod end clearance
1st-2nd — 3rd-4th:
0.4 — 1.4 mm (0.016 — 0.055 in)
3rd-4th — 5th:
0.5 — 1.3 mm (0.020 — 0.051 in)

F: TRANSFER CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA040	1	Neutral position is closer to 1st.
32188AA011	No mark or 2	Standard
32188AA050	3	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

G: EXTENSION

Snap ring (Inner-72) to ball bearing side clearance
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-72)	
Part No.	Thickness mm (in)
805172071	1.78 (0.0701)
805172072	1.90 (0.0748)
805172073	2.02 (0.0795)

Snap ring (Outer-30) to ball bearing side clearance
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

H: EXTENSION ASSEMBLY

Thrust washer (52 x 61 x t) to ball bearing side clearance
0.05 — 0.30 mm (0.0020 — 0.0118 in)

Thrust washer (52 x 61 x t)	
Part No.	Thickness mm (in)
803052021	0.50 (0.0197)
803052022	0.75 (0.0295)
803052023	1.00 (0.0394)

I: FRONT DIFFERENTIAL

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 x 50 x t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

Pinion shaft to axle drive shaft clearance
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

J: CENTER DIFFERENTIAL

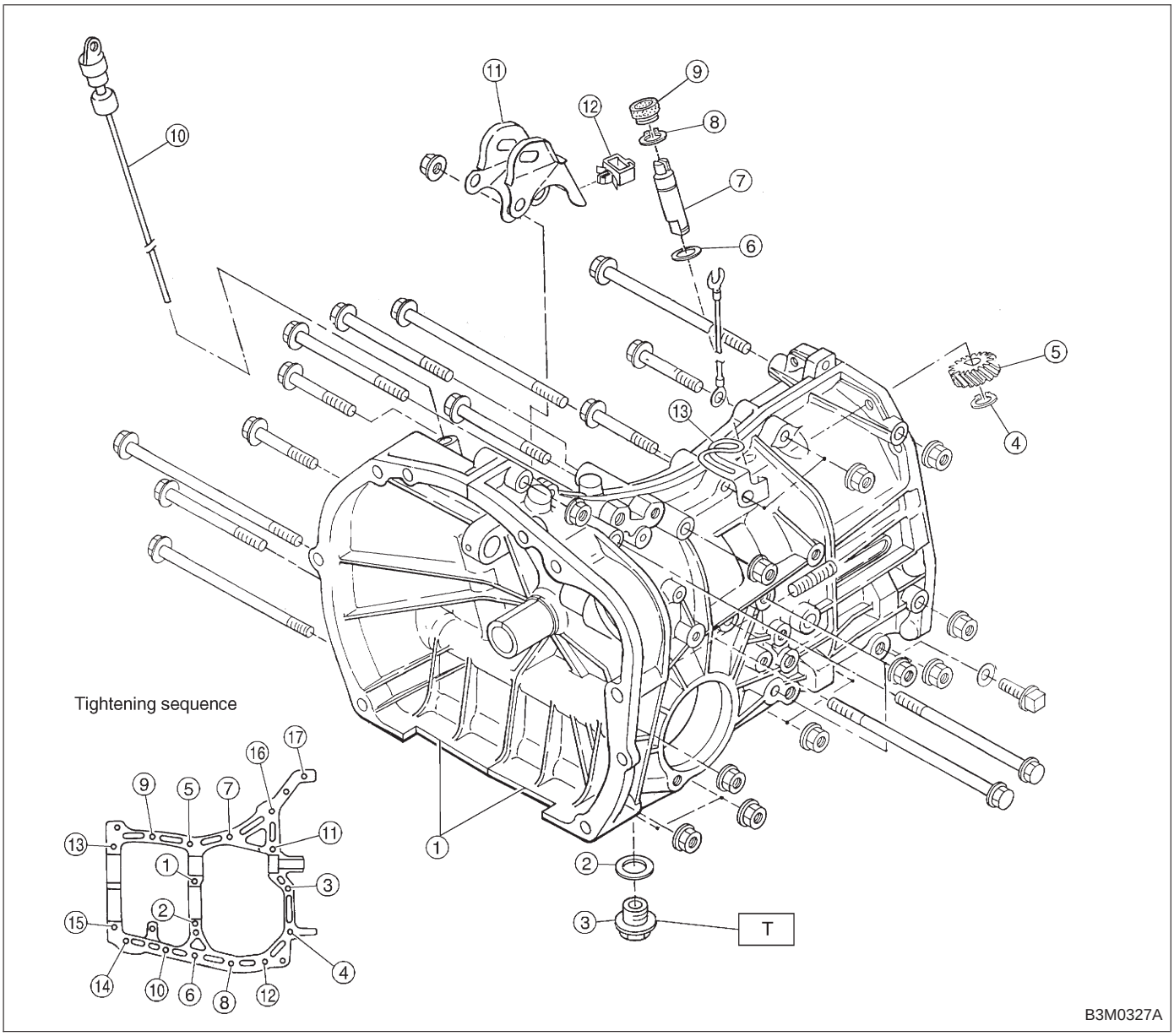
Snap ring (Inner-110) to center differential case clearance
0 — 0.15 mm (0 — 0.0059 in)

Snap ring (Inner-110)	
Part No.	Thickness mm (in)
805100061	2.10 (0.0827)
805100062	2.21 (0.0870)
805100063	2.32 (0.0913)

Backlash adjustment axial movement
0.62 — 0.86 mm (0.0244 — 0.0339 in)

Adjusting washer (45 x 62 x t)	
Part No.	Thickness mm (in)
803045041	1.60 (0.0630)
803045042	1.80 (0.0709)
803045043	2.00 (0.0787)
803045044	2.20 (0.0866)
803045045	2.40 (0.0945)

1. Transmission Case

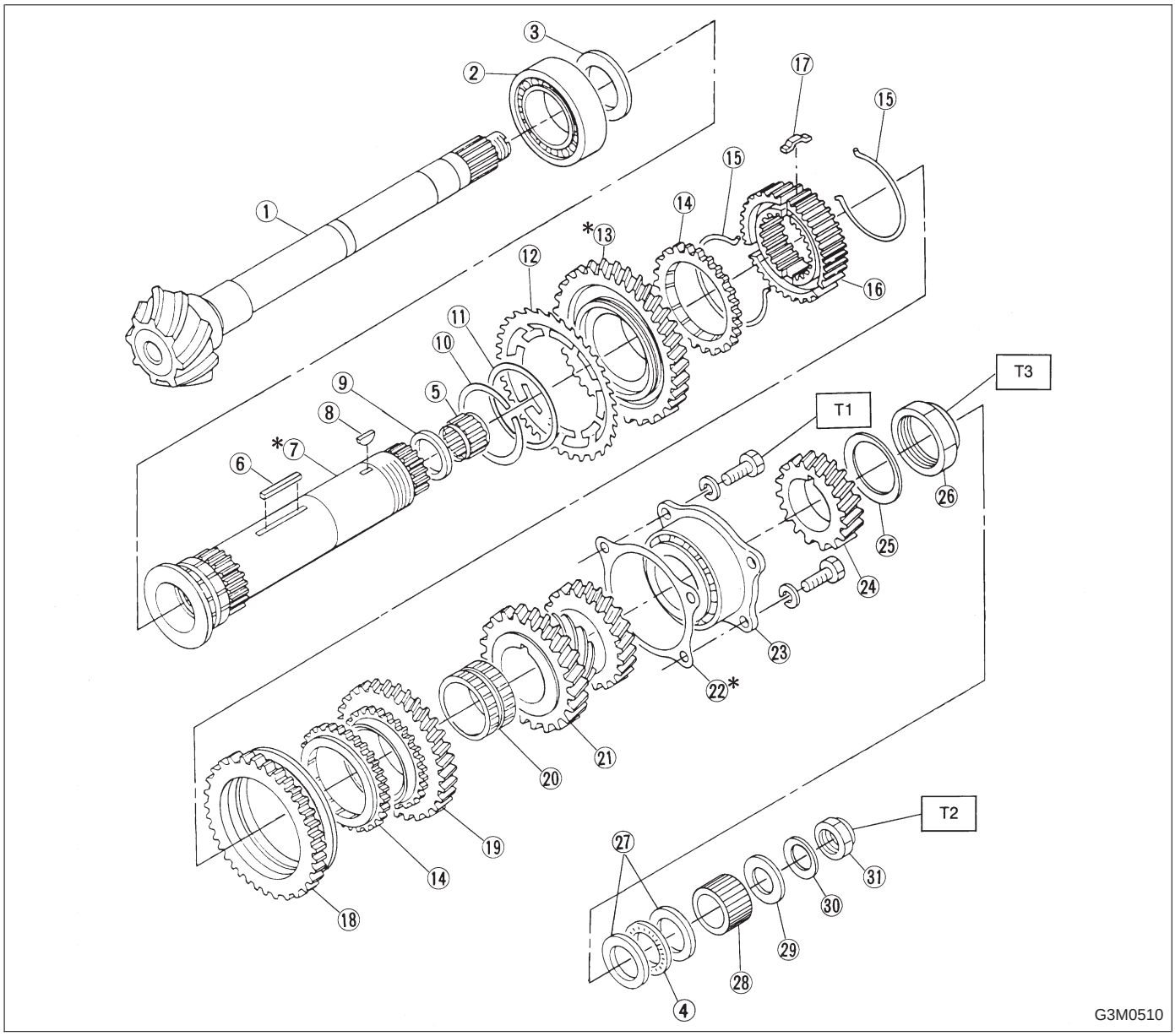


① Transmission case ASSY
② Gasket
③ Drain plug
④ Snap ring (Outer)
⑤ Speedometer driven gear
⑥ Washer
⑦ Speedometer shaft
⑧ Snap ring (Outer)
⑨ Oil seal
⑩ Oil level gauge
⑪ Pitching stopper bracket
⑫ Clamp
⑬ Clip

Tightening torque: N·m (kg-m, ft-lb)
T: 44±3 (4.5±0.3, 32.5±2.2)

Size	All models	Torque
8 mm bolt	⑤ — ⑮	25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)
10 mm bolt	① — ④ ⑯ — ⑰	39±2 N·m (4.0±0.2 kg-m, 28.9±1.4 ft-lb)

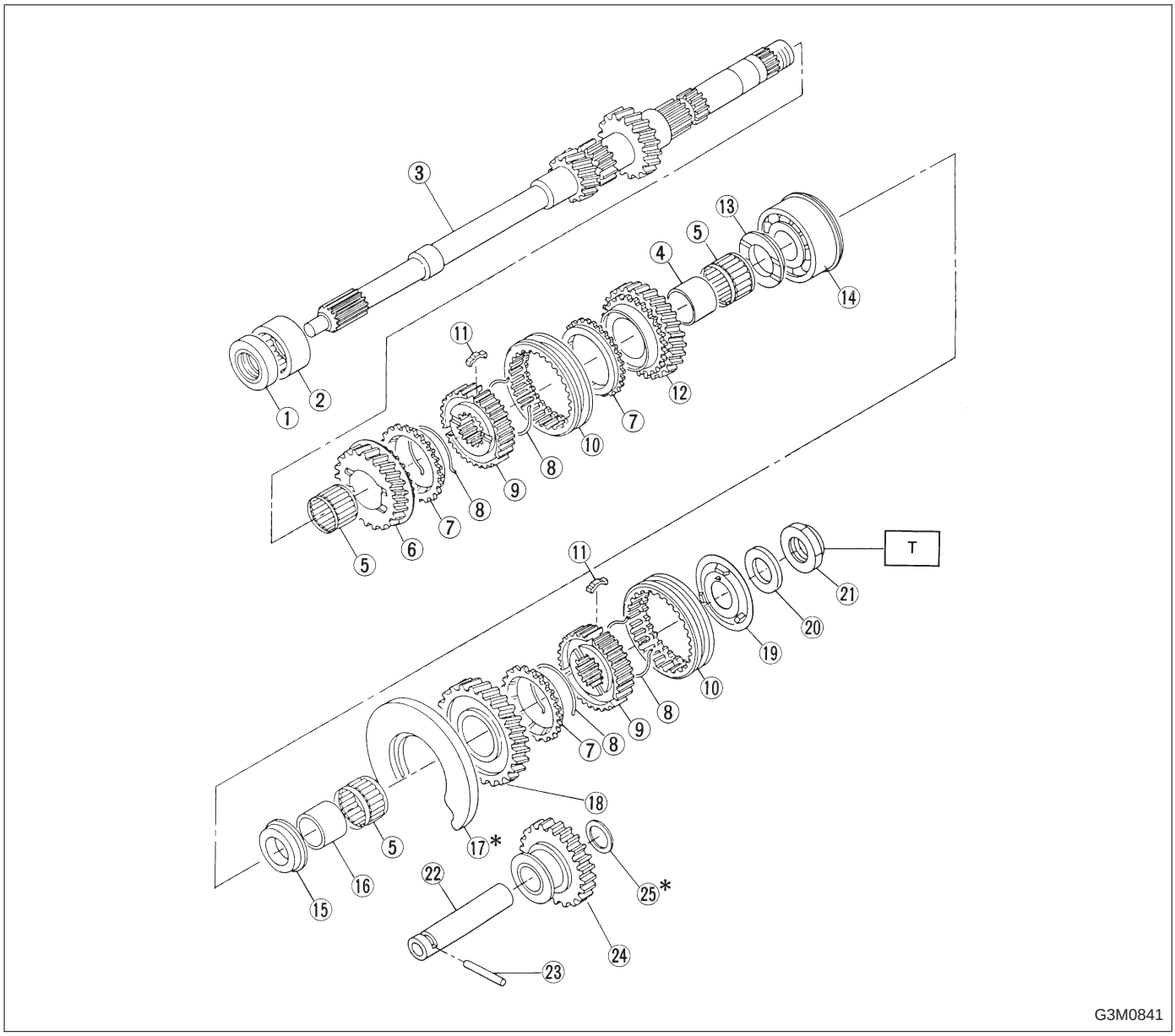
2. Drive Pinion Assembly



① Drive pinion shaft
② Roller bearing
③ Washer
④ Thrust bearing
⑤ Needle bearing
⑥ Key
⑦ Driven shaft
⑧ Woodruff key
⑨ Drive pinion collar
⑩ Snap ring (Outer)
⑪ Washer
⑫ Sub gear
⑬ 1st driven gear
⑭ Baulk ring
⑮ Spring
⑯ 1st-2nd synchronizer hub
⑰ Insert
⑱ Reverse driven gear
⑲ 2nd driven gear
⑳ 2nd driven gear bush
㉑ 3rd-4th driven gear
㉒ Driven pinion shim
㉓ Roller bearing
㉔ 5th driven gear
㉕ Lock washer
㉖ Lock nut
㉗ Washer
㉘ Differential bevel gear sleeve
㉙ Washer
㉚ Lock washer
㉛ Lock nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 29±3 (3.0±0.3, 21.7±2.2)
T2: 118±8 (12.0±0.8, 86.8±5.8)
T3: 265±10 (27±1, 195±7)

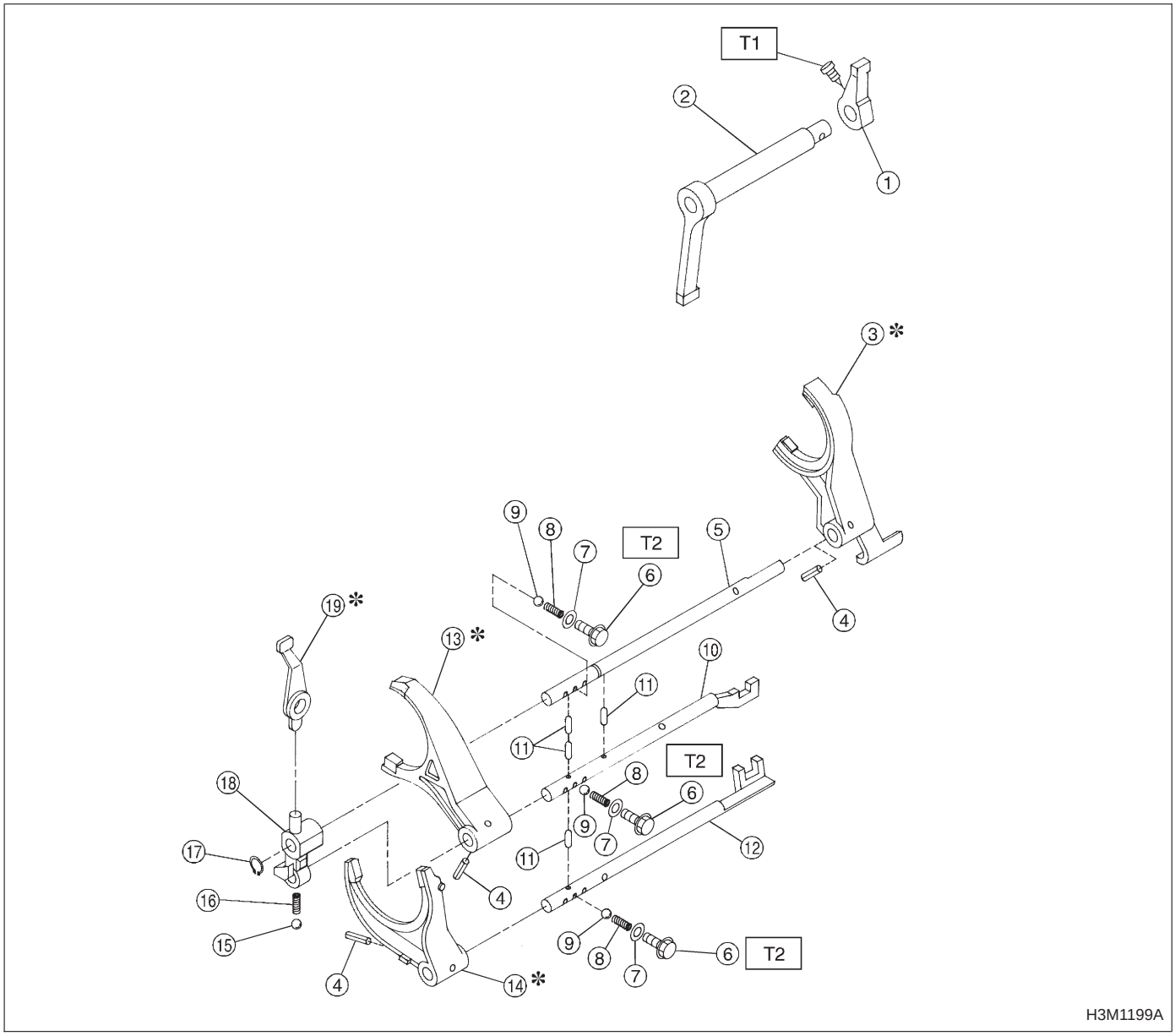
3. Main Shaft Assembly



① Oil seal
② Needle bearing
③ Transmission main shaft
④ 4th needle bearing race
⑤ Needle bearing
⑥ 3rd drive gear
⑦ Baulk ring
⑧ Synchronizer spring
⑨ Synchronizer hub
⑩ Coupling sleeve
⑪ Shifting insert
⑫ 4th drive gear
⑬ 4th gear thrust washer
⑭ Ball bearing
⑮ 5th gear thrust washer
⑯ 5th needle bearing race
⑰ Main shaft rear plate
⑱ 5th drive gear
⑲ Insert stopper plate
⑳ Lock washer
㉑ Lock nut
㉒ Reverse idler gear shaft
㉓ Straight pin
㉔ Reverse idler gear
㉕ Washer

Tightening torque: N·m (kg-m, ft-lb)
T: 118±6 (12.0±0.6, 86.8±4.3)

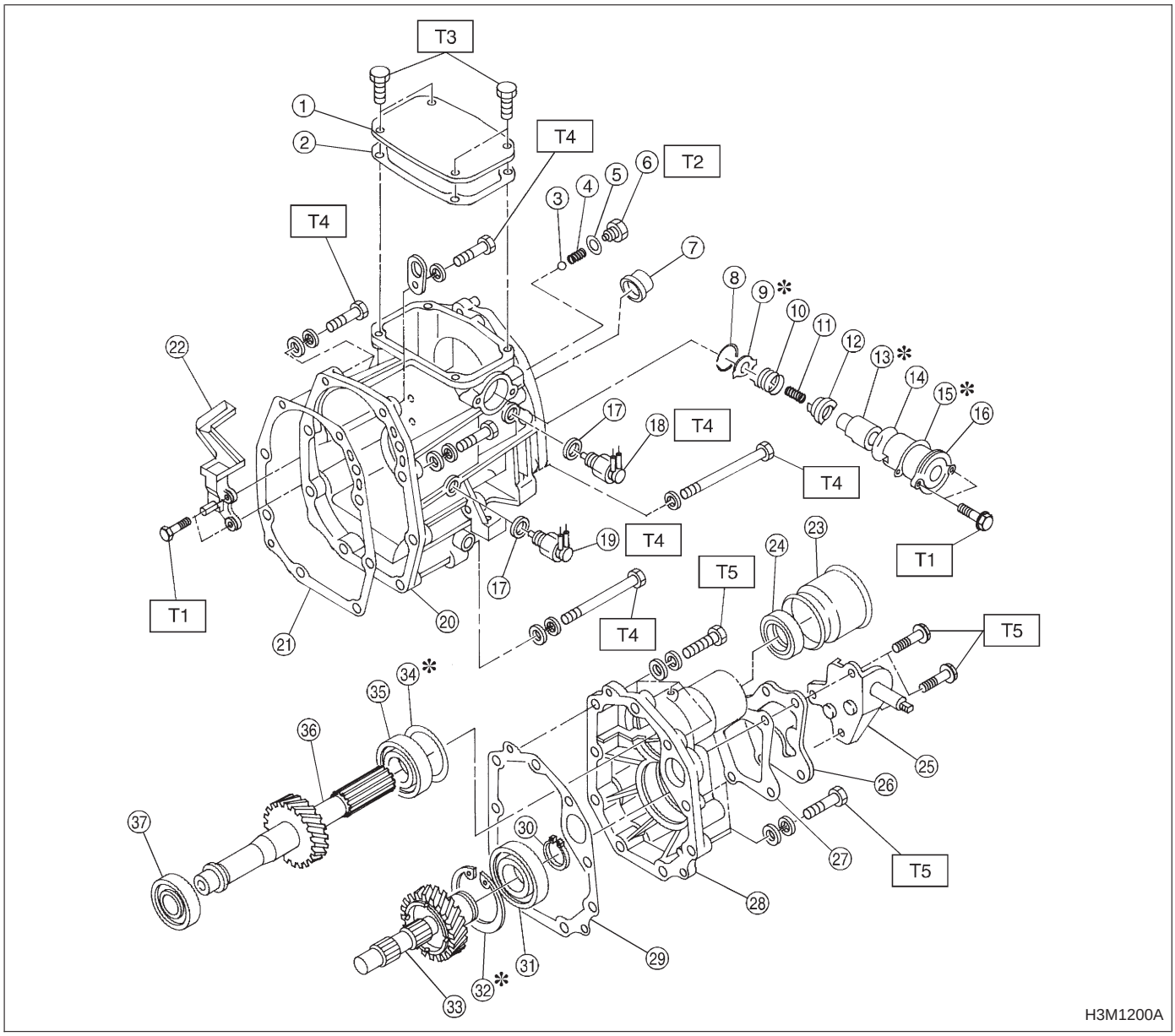
4. Shifter Fork and Shifter Rod



① Selector arm
② Shifter arm
③ 5th shifter fork
④ Straight pin
⑤ Reverse fork rod
⑥ Checking ball plug
⑦ Gasket
⑧ Checking ball spring
⑨ Ball
⑩ 3rd-4th fork rod
⑪ Interlock plunger
⑫ 1st-2nd fork rod
⑬ 3rd-4th shifter fork
⑭ 1st-2nd shifter fork
⑮ Ball
⑯ Spring
⑰ Snap ring (Outer)
⑱ Reverse fork rod arm
⑲ Reverse shifter lever

Tightening torque: N·m (kg-m, ft-lb)
T1: 10±1 (1.0±0.1, 7.2±0.7)
T2: 19.6±1.5
(2.00±0.15, 14.5±1.1)

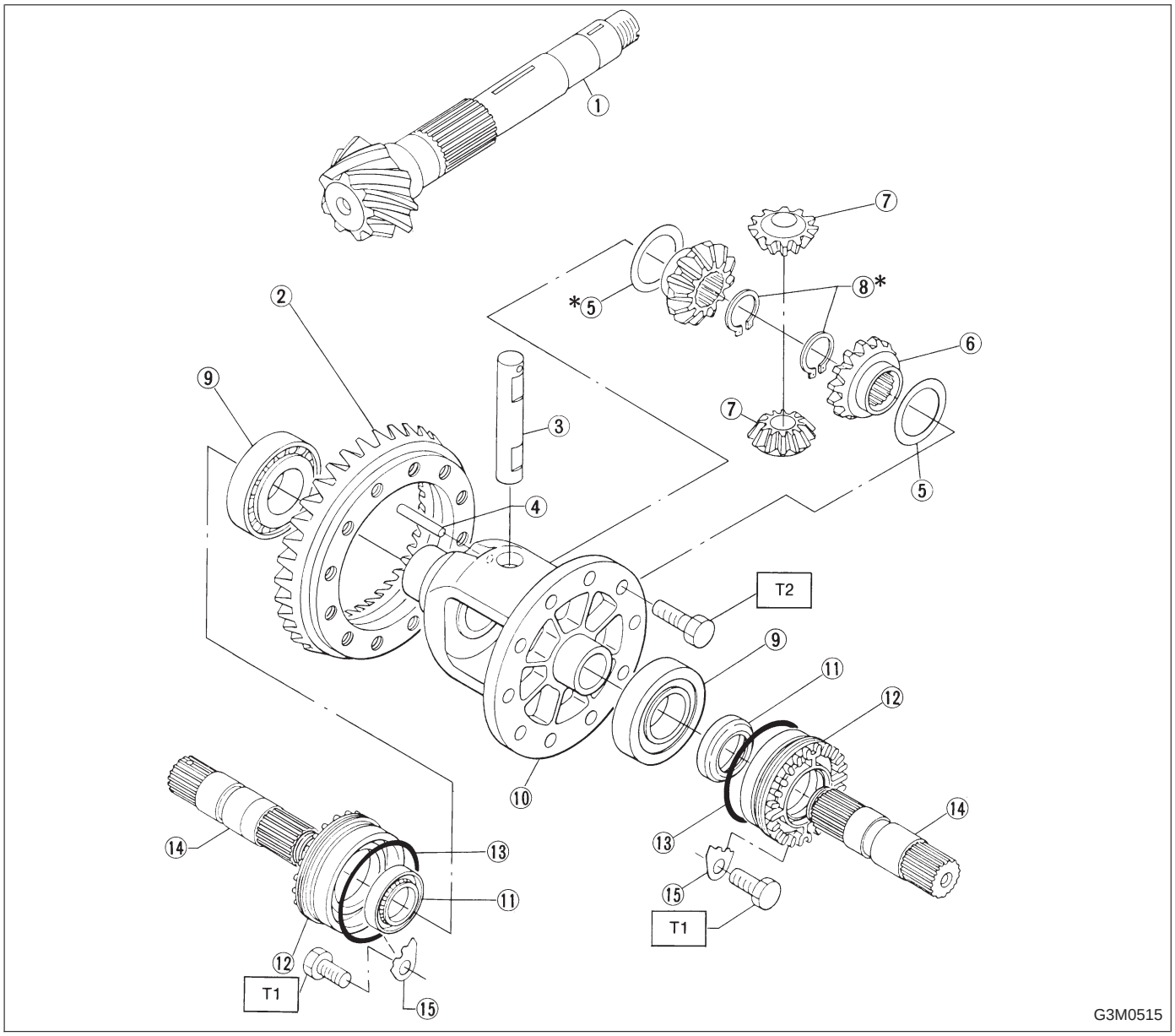
5. Transfer Case and Extension



① Transfer cover
② Cover gasket
③ Ball
④ Reverse accent spring
⑤ Gasket
⑥ Plug
⑦ Oil seal
⑧ Snap ring (Inner)
⑨ Reverse check plate
⑩ Reverse check spring
⑪ Reverse return spring
⑫ Reverse check cam
⑬ Reverse accent shaft
⑭ O-ring
⑮ Adjusting select shim
⑯ Reverse check sleeve
⑰ Gasket
⑱ Neutral switch
⑲ Back-up light switch
⑳ Transfer case
㉑ Gasket
㉒ Oil guide
㉓ Dust cover
㉔ Oil seal
㉕ Shift bracket
㉖ Extension cover
㉗ Gasket
㉘ Extension
㉙ Gasket
㉚ Snap ring (Outer-30)
㉛ Ball bearing
㉜ Snap ring (Inner-72)
㉝ Transfer drive gear
㉞ Adjusting washer
㉟ Ball bearing
㊱ Transfer driven gear
㊲ Ball bearing

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 10±1 (1.0±0.1, 7.2±0.7)
T3: 15.7±1.5 (1.6±0.15, 11.6±1.1)
T4: 25±2 (2.5±0.2, 18.1±1.4)
T5: 37±3 (3.8±0.3, 27.5±2.2)

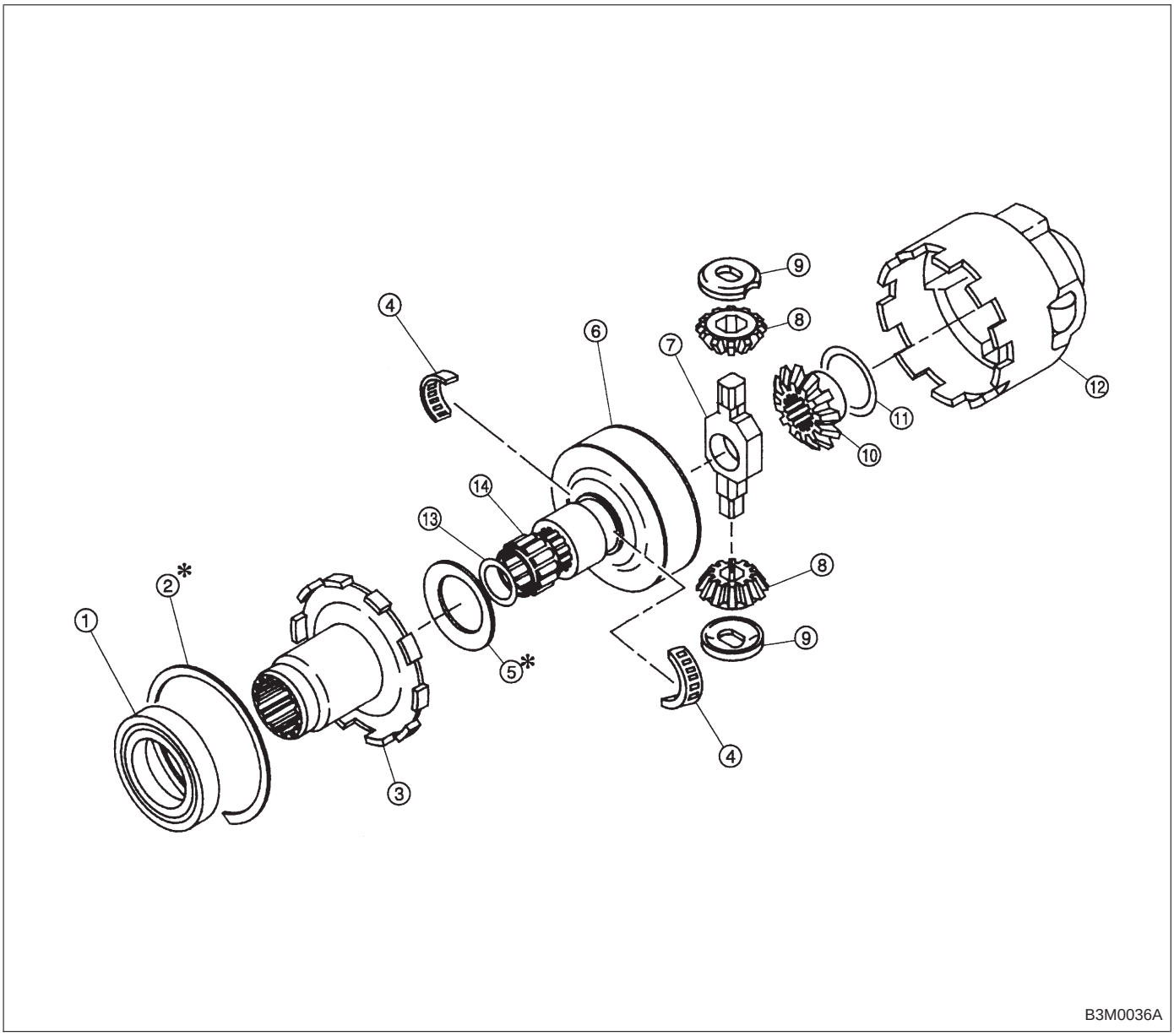
6. Front Differential



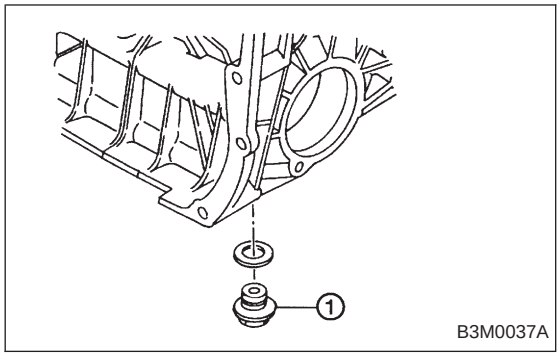
① Drive pinion shaft
② Hypoid driven gear
③ Pinion shaft
④ Straight pin
⑤ Washer
⑥ Differential bevel gear
⑦ Differential bevel pinion
⑧ Snap ring (Outer)
⑨ Roller bearing
⑩ Differential case
⑪ Oil seal
⑫ Differential side retainer
⑬ O-ring
⑭ Axle drive shaft
⑮ Retainer lock plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±5 (2.5±0.5, 18.1±3.6)
T2: 62±5 (6.3±0.5, 45.6±3.6)

7. Center Differential



① Ball bearing
② Snap ring (Inner-110)
③ Center differential cover
④ Needle bearing
⑤ Adjusting washer
⑥ Viscous coupling
⑦ Pinion shaft
⑧ Differential bevel pinion
⑨ Retainer
⑩ Differential bevel gear
⑪ Washer
⑫ Center differential case
⑬ Snap ring
⑭ Roller bearing



1. General

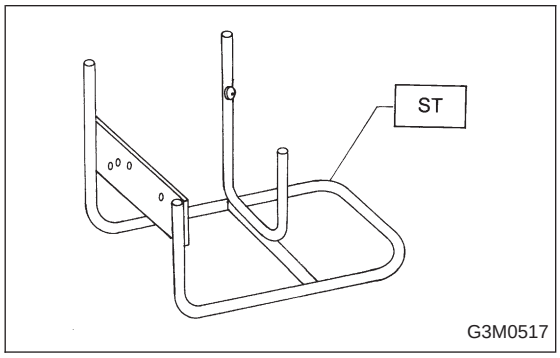
A: PRECAUTIONS

1) The following job should be followed before disassembly:

(1) Clean oil, grease, dirt and dust from transmission.
(2) Remove drain plug ① to drain oil. After draining, retighten it as before.

CAUTION:
Replace gasket with a new one.

Tightening torque:
44±3 N·m (4.5±0.3 kg-m, 32.5±2.2 ft-lb)



(3) Attach transmission to ST.

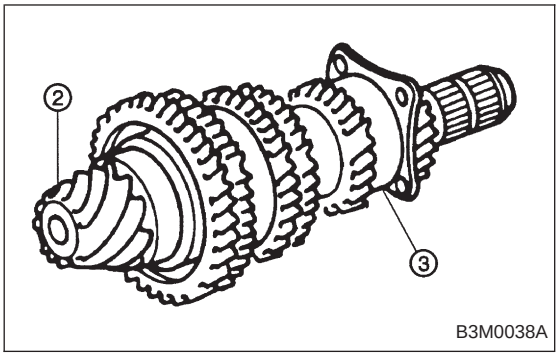
ST 499937100 TRANSMISSION STAND SET

2) Rotating parts should be coated with oil prior to assembly.
3) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
4) Gaskets and lock washers must be replaced with new ones.
5) Liquid gasket should be used where specified to prevent leakage.
6) Fill transmission gear oil through the oil level gauge hole up to upper point level gauge. <Ref. to 1-5 [09A1].>

B: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings
Replace bearings in the following cases:
● Bearings whose balls, outer races and inner races are broken or rusty.
● Worn bearings
● Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.



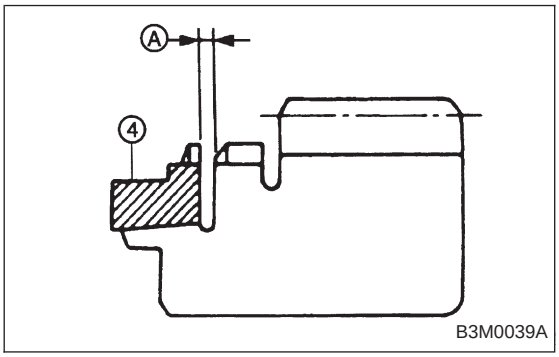
The ball bearing ③ on the rear side of the drive pinion shaft ② should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.
● Bearings having other defects

2) Bushing (each gear)
Replace the bushing in the following cases:

(1) When the sliding surface is damaged or abnormally worn.
(2) When the inner wall is abnormally worn.

3) Gears

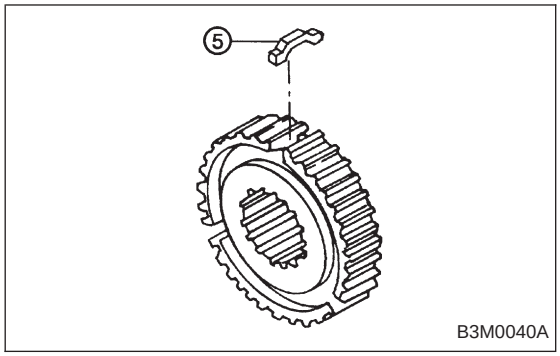
(1) Replace gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
(2) Correct or replace if the cone that contacts the baulk ring is rough or damaged.
(3) Correct or replace if the inner surface or end face is damaged.



4) Baulk ring
Replace the ring in the following cases:
● When the inner surface and end face are damaged.
● When the ring inner surface is abnormally or partially worn down.
● If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

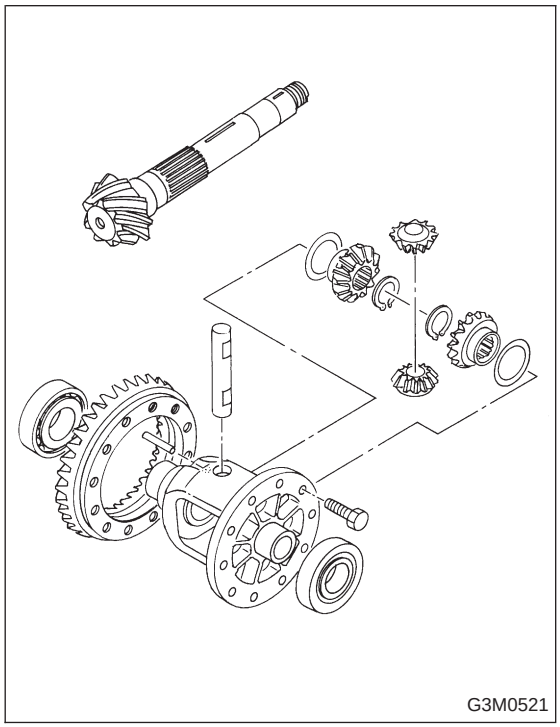
Clearance Ⓐ:
0.5 — 1.0 mm (0.020 — 0.040 in)

● When the contact surface of the synchronizer ring ④ insert is scored or abnormally worn down.



5) Insert ⑤ (shifting)
Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.



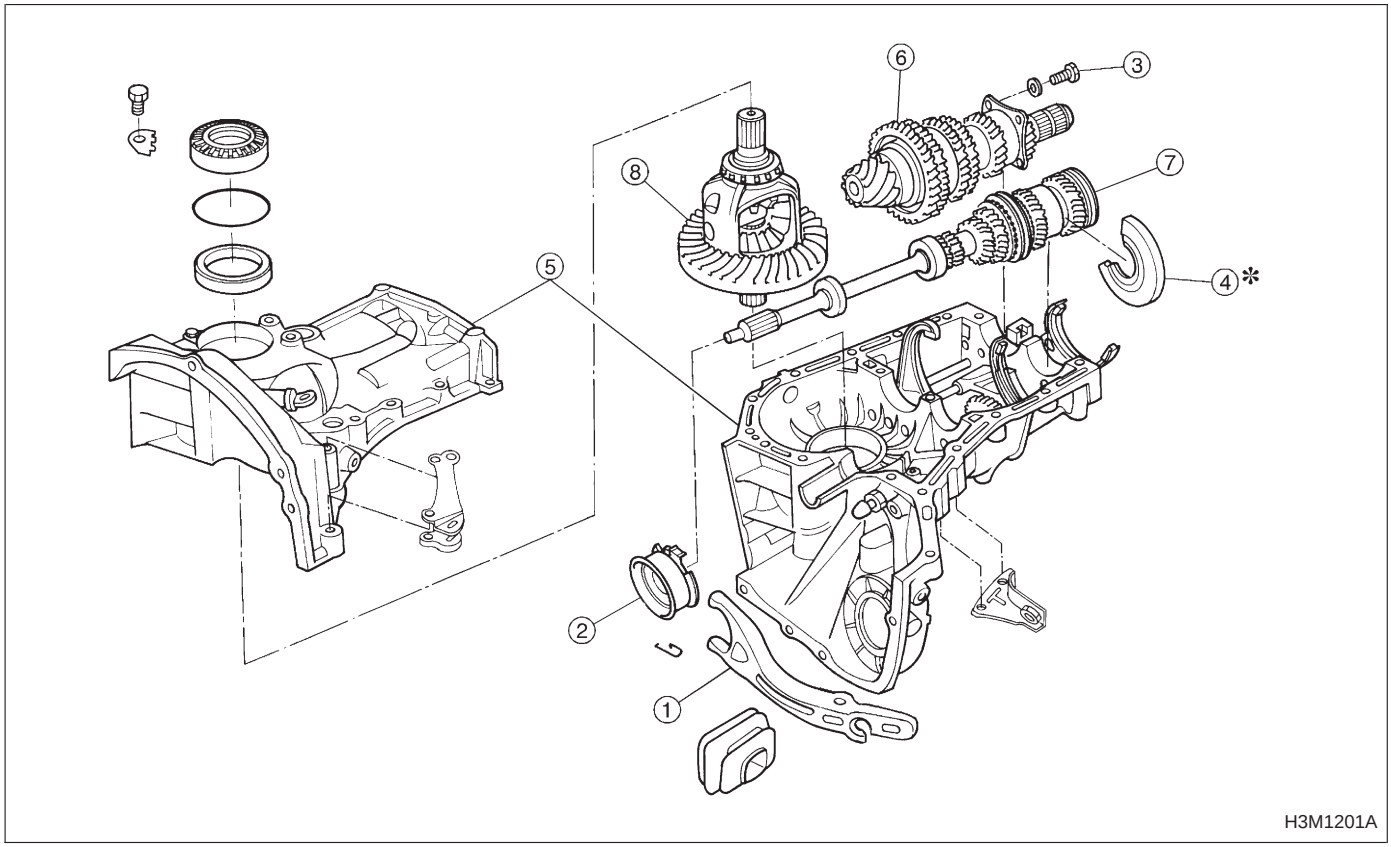
9) Differential gear
Repair or replace the differential gear in the following cases:

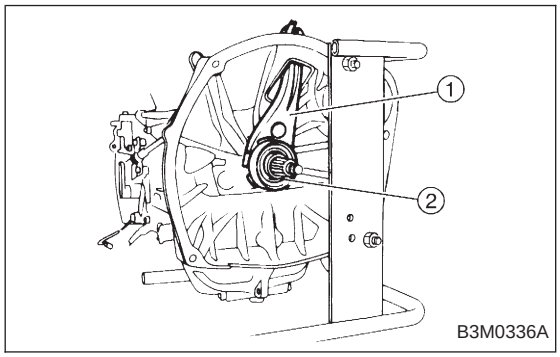
(1) The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
(2) The roller bearing on the drive pinion shaft has a worn or damaged roller path.
(3) There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
(4) The differential case has worn or damaged sliding surfaces.

2. Transmission Case

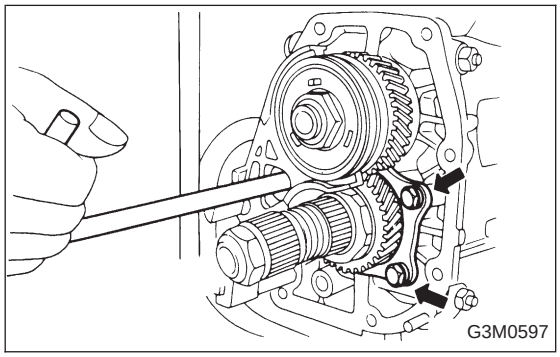
A: DISASSEMBLY

1. SEPARATION OF TRANSMISSION

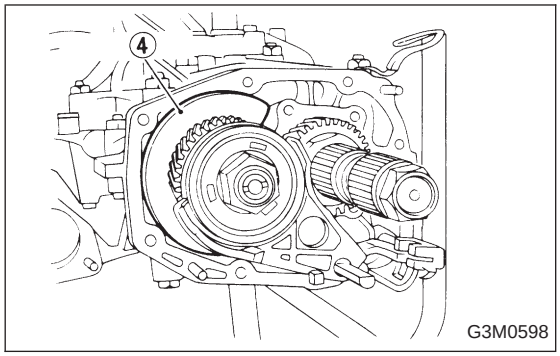




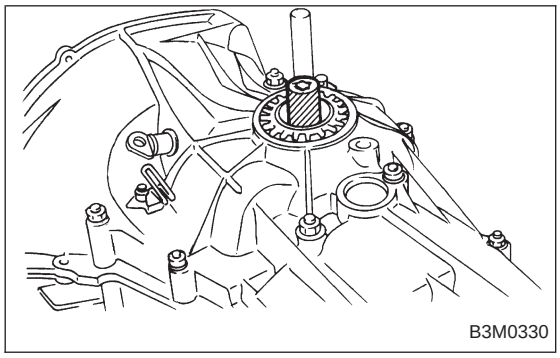
1) Remove transfer cover.
2) Remove shifter fork screw which secures selector arm to shifter arm.
3) Remove transfer case with extension assembly.
4) Remove clutch release lever ① and bearing ②. <Ref. to 2-10 [W3A1].>



5) Remove bearing mounting bolts.

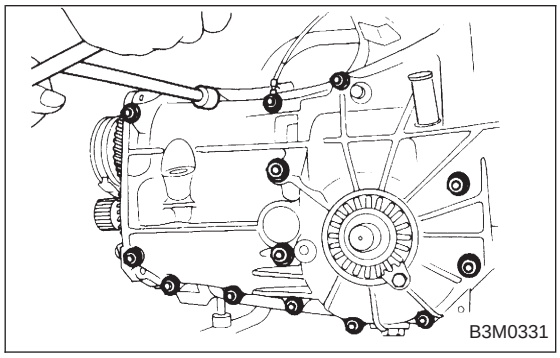


6) Remove main shaft rear plate ④.

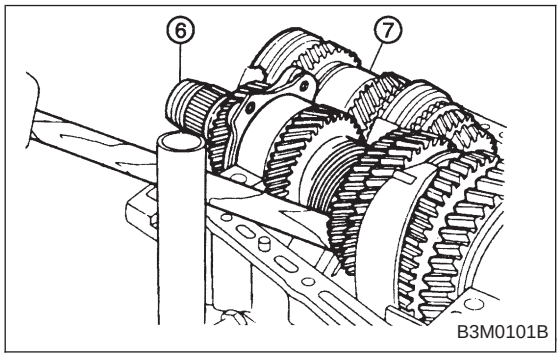


7) Separating transmission case

(1) Put vinyl tape around splines of right and left axle drive shafts to prevent damage to oil seals.



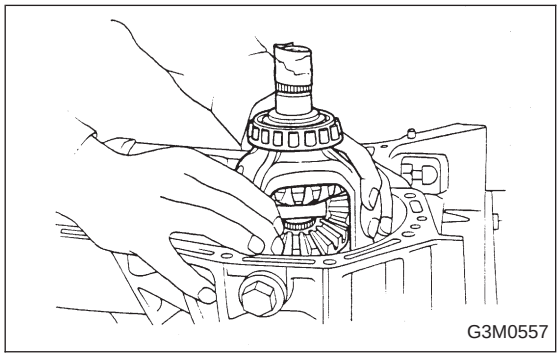
(2) Separate transmission case into right and left cases by loosening seventeen coupling bolts and nuts.



8) Remove drive pinion shaft assembly ⑥ from left side transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

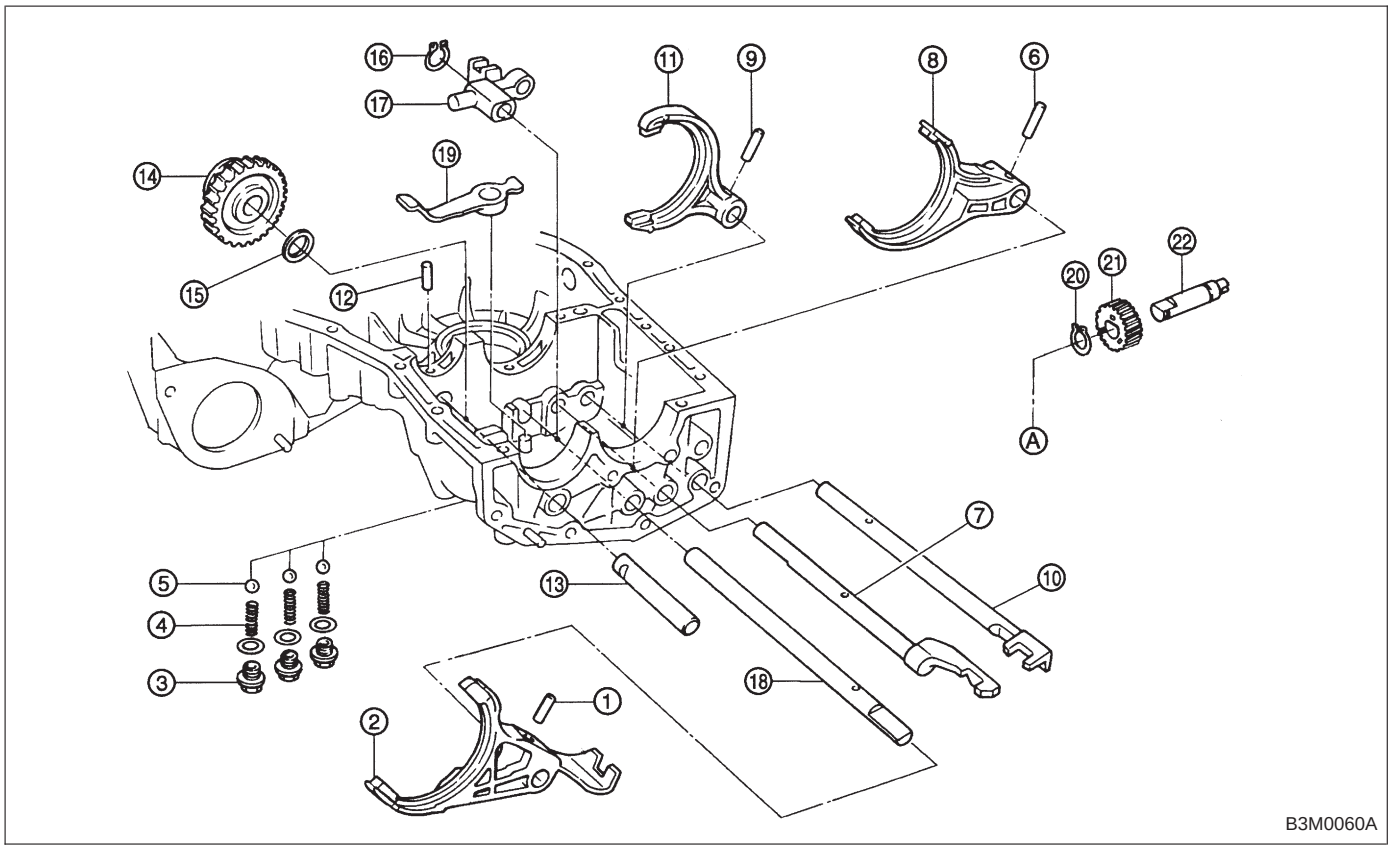
9) Remove main shaft assembly ⑦.



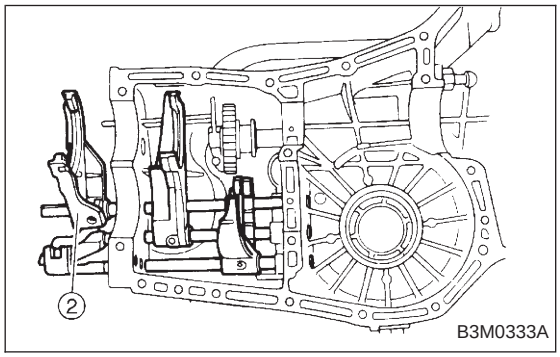
10) Remove differential assembly.

CAUTION:
- **Be careful not to confuse right and left roller bearing outer races.**
- **Be careful not to damage retainer oil seal.**

2. TRANSMISSION CASE



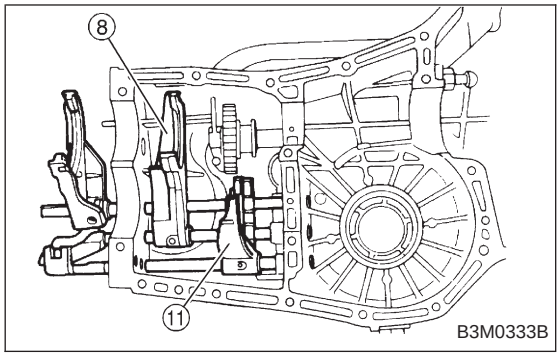
Ⓐ: Front right hand transmission case



1) Drive out spring pin ① with ST, and remove 5th shifter fork ②.

ST 398791700 STRAIGHT PIN REMOVER

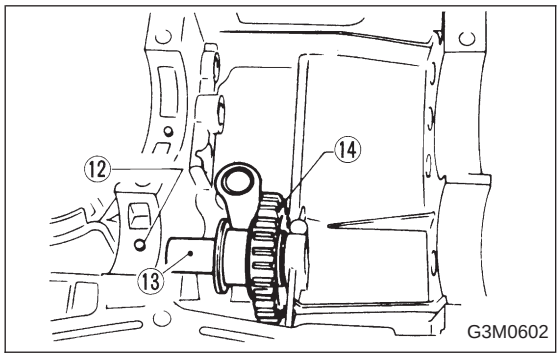
2) Remove plugs ③, springs ④ and checking balls ⑤.



3) Drive out spring pin ⑥, and pull out 3-4 fork rod ⑦ and shifter fork ⑧.

NOTE:
When removing rod, keep other rods in neutral. Also, when pulling out straight pin, remove it toward inside of case so that it may not hit against case.

4) Drive out straight pin ⑨, and pull out 1-2 fork rod ⑩ and shifter fork ⑪.

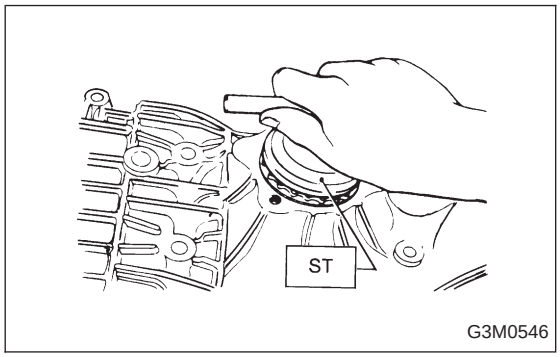


5) Pull out straight pin ⑫, and remove idler gear shaft ⑬, reverse idler gear ⑭ and washer ⑮.

6) Remove outer snap ring ⑯, and pull out reverse shifter rod arm ⑰ from reverse fork rod ⑱. Then take out ball, spring and interlock plunger from rod.
And then remove rod.

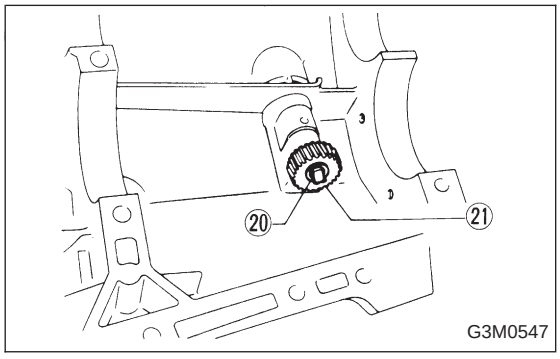
NOTE:
When pulling out reverse shifter rod arm, be careful not to let ball pop out of arm.

7) Remove reverse shifter lever ⑲.



8) Remove differential side retainers using ST.

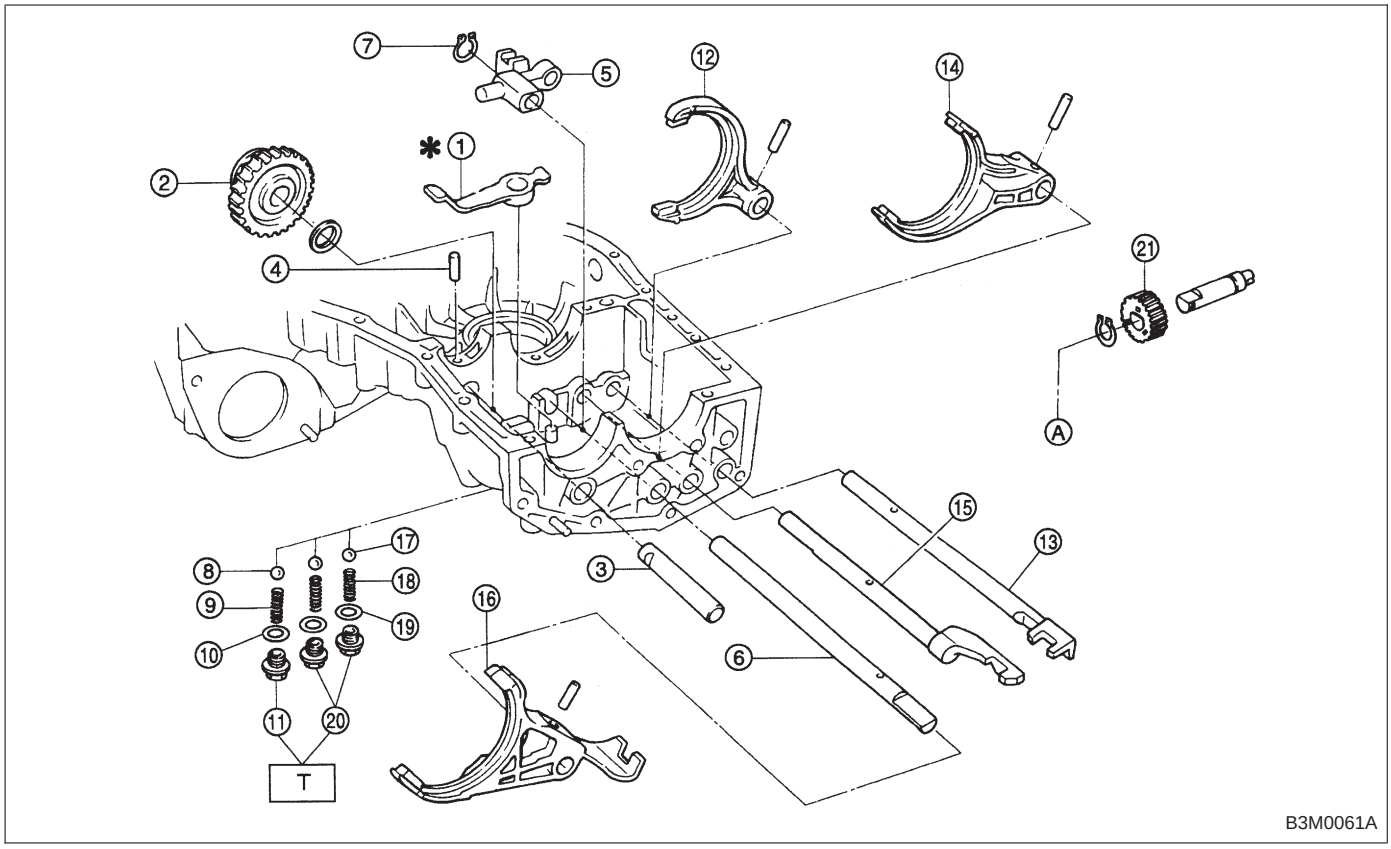
ST 499787000 WRENCH ASSY



9) Remove outer snap ring ⑳ and pull out speedometer driven gear ㉑. Next, remove vehicle speed sensor 2, oil seal, speedometer shaft ㉒ and washer.

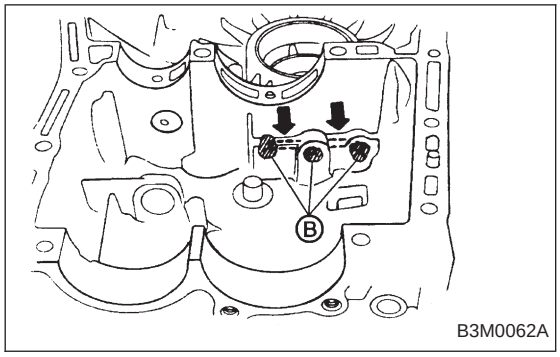
B: ASSEMBLY

1. TRANSMISSION CASE

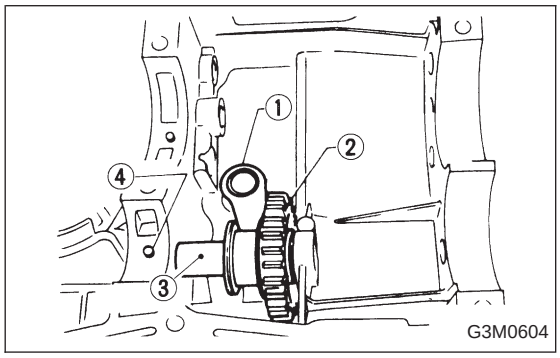


Ⓐ: To right hand transmission case

Tightening torque: N·m (kg-m, ft-lb)
T: 19.6±0.1 (2.00±0.015, 14.5±0.1)



1) Position interlock plungers (5.56 x 19.6), one plunger in hole between 1-2 and 3-4 fork rod holes, and one plunger in hole between 3-4 and reverse fork rod holes.
Ⓑ: Rod holes



2) Install reverse shifter lever ①, reverse idler gear ② and reverse idler gear shaft ③, and secure with straight pin ④.
NOTE:
Be sure to install reverse idler shaft from the rear side.

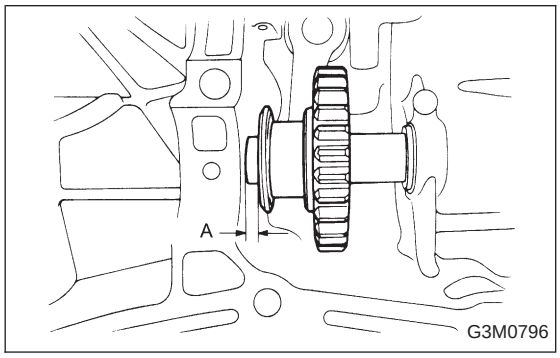
3) Install reverse arm fork spring, ball and interlock plunger (5.56 x 19.6) to reverse fork rod arm ⑤. Insert reverse fork rod ⑥ into hole in reverse fork rod arm ⑤, and hold it with outer snap ring ⑦ using ST.

ST 399411700 ACCENT BALL INSTALLER

CAUTION:
Apply grease to plunger to prevent it from falling.

4) Position ball ⑧ (7.1438), spring ⑨ and gasket ⑩ in reverse shifter rod hole, on left side transmission case, and tighten checking ball plug ⑪.

CAUTION:
Replace gasket with a new one.

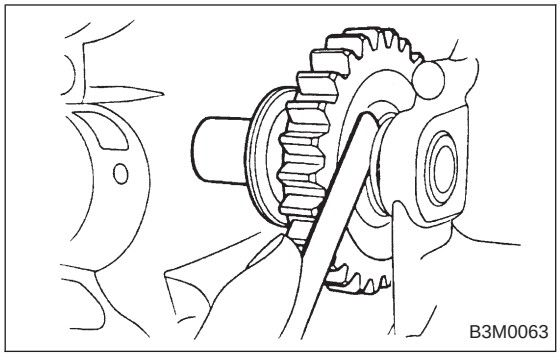


5) Adjustment of reverse idler gear position

(1) Move reverse shifter rod toward REV side. Adjust clearance between reverse idler gear and transmission case wall, using reverse shifter lever ①.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)

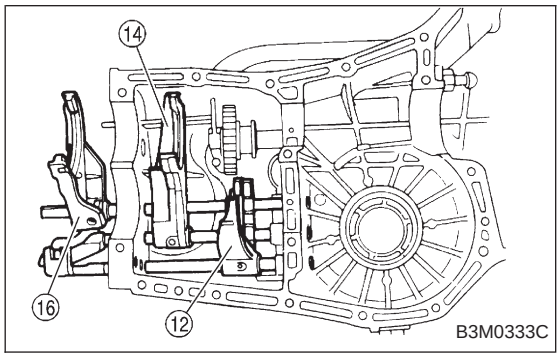
Reverse shifter lever		
Part No.	No.	Remarks
32820AA000	0	Further from case wall
32820AA010	No mark	Standard
32820AA020	2	Closer to case wall



(2) After installing a suitable reverse shifter lever, shift into neutral. Using a thickness gauge, measure clearance between reverse idler gear and transmission case wall and adjust with washer(s).

Clearance:
0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 x 26 x t)	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)



6) Installation of 1-2 shifter fork ⑫ and rod ⑬

(1) Install 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
(2) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes using ST.

ST 398791700 STRAIGHT PIN REMOVER

NOTE:
- Set other rods to neutral.
- Make sure interlock plunger (5.56 x 19.6) is on the 3-4 fork rod side.

7) Installation of 3-4 shifter fork ⑭ and rod ⑮

(1) Install interlock plunger (3 x 11.9) onto 3-4 fork rod.

CAUTION:
Apply a coat of grease to plunger to prevent it from falling.

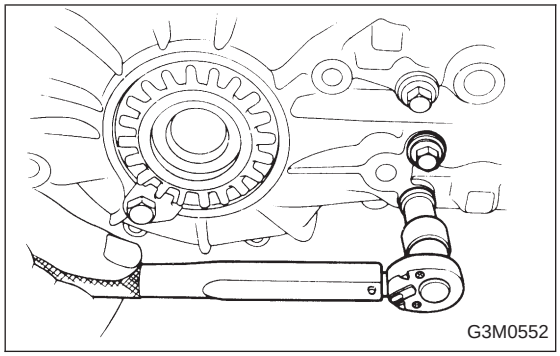
(2) Install 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.
(3) Align the holes in rod and fork, and drive straight pin (6 x 22) into these holes.

ST 398791700 STRAIGHT PIN REMOVER

NOTE:
- Set reverse fork rod to neutral.
- Make sure interlock plunger (installed before) is on the reverse fork rod side.

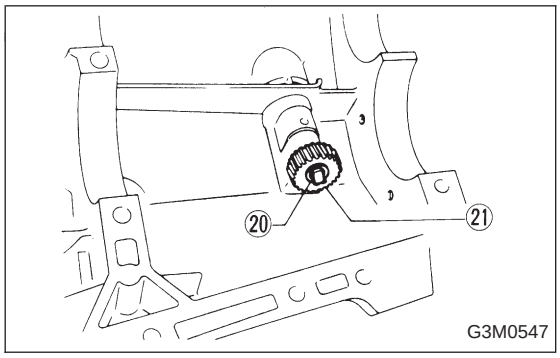
8) Install 5th shifter fork ⑯ onto the rear of reverse fork rod ⑥. Align holes in the two parts and drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER


G3M0552

9) Position balls ⑰, checking ball springs ⑱ and gaskets ⑲ into 3-4 and 1-2 rod holes, and install plugs ⑳.

CAUTION:
Replace gasket with a new one.



G3M0547

10) Installation of speedometer driven gear ㉑

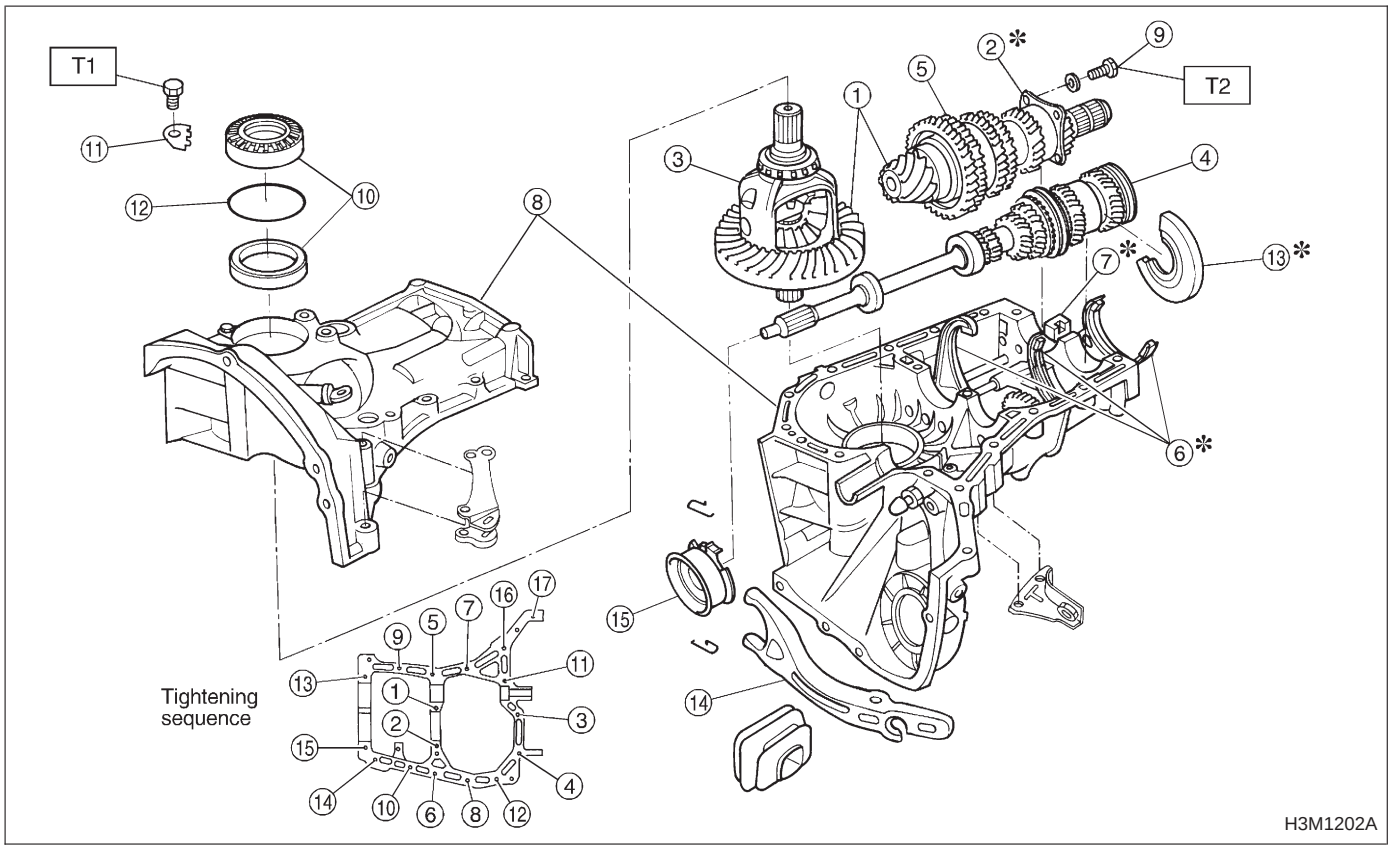
(1) Install washer and speedometer shaft, and press fit oil seal with ST.

ST 899824100 or 499827000 PRESS

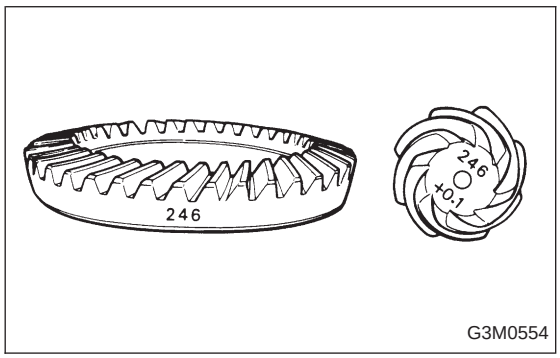
CAUTION:
Use new oil seal, if it has been removed.

(2) Install speedometer driven gear and snap ring.

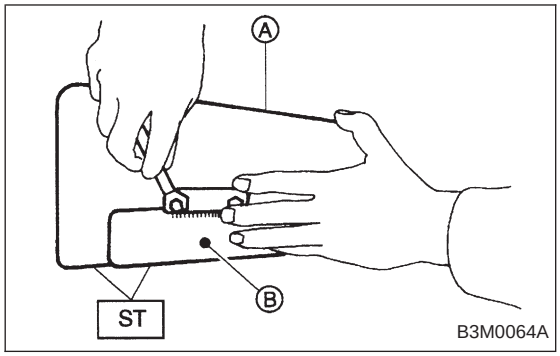
2. COMBINATION OF TRANSMISSION CASE



Tightening torque: N·m (kg-m, ft-lb)
T1: 25 (2.5, 18)
T2: 29±3 (3.0±0.3, 21.7±2.2)



1) Alignment marks/numbers on hypoid gear set ①
The upper number on driven pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.



2) Adjustment of drive pinion shim ②

(1) Place drive pinion shaft assembly on right hand transmission main case without shim and tighten bearing mounting bolts.

(2) Inspection and adjustment of ST

NOTE:

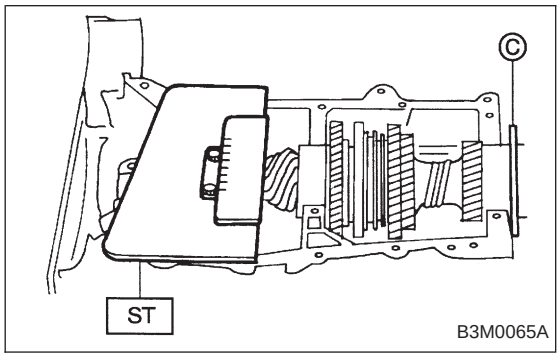
● Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.

● Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY

Ⓐ: Plate

Ⓑ: Scale



(3) Position the ST by inserting the knock pin of ST into the knock hole in the transmission case.

(4) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

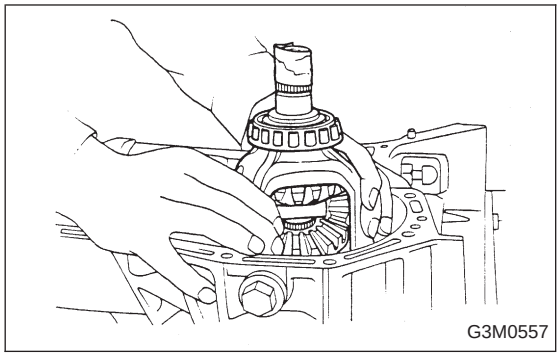
Ⓒ: Adjust clearance to zero without shim.

(5) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by −.)

ST 499917500 DRIVE PINION GAUGE ASSY

Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the said value.

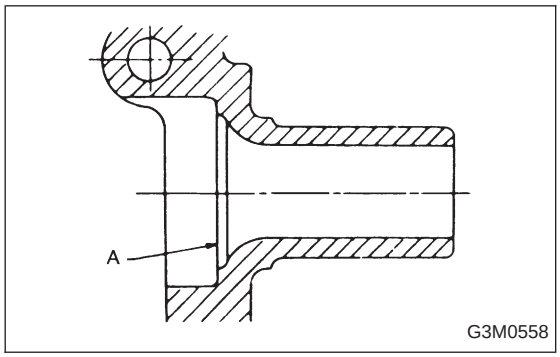
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)


G3M0557

3) Install differential assembly ③ on left hand transmission case.

CAUTION:
Be careful not to fold the sealing lip of oil seal.

NOTE:
Wrap the left and right splined sections of axle shaft with vinyl tape to prevent scratches.

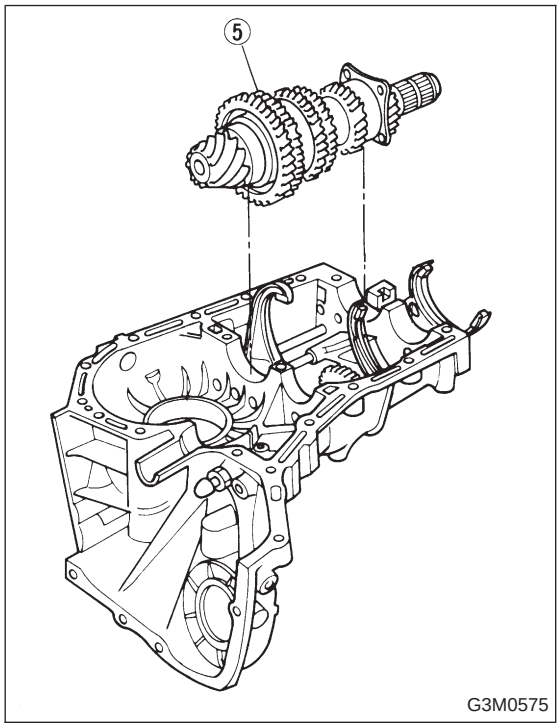


G3M0558

4) Install needle bearing and oil seal onto the front of transmission main shaft assembly ④, and position in left side transmission case.

CAUTION:
- **Wrap clutch splined section with vinyl tape to prevent damage to oil seal.**
- **Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.**

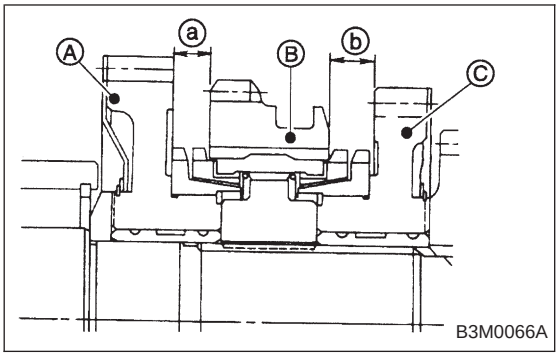
NOTE:
- Align the end face of seal with surface A of left side transmission main case when installing oil seal.
- Be careful not to drop oil seal when installing right side transmission main case.
- Make sure straight pin is positioned in hole in needle bearing's outer race.



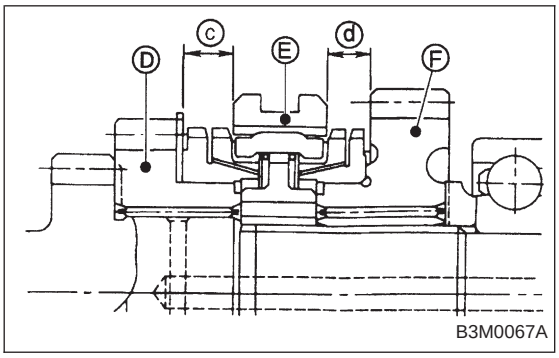
G3M0575

5) Install drive pinion shaft assembly ⑤ with shims selected before into transmission case.

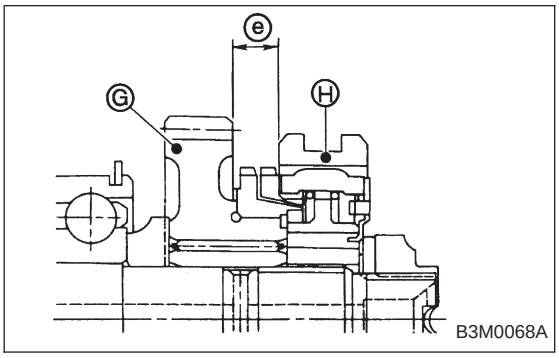
NOTE:
Ensure that the knock pin of the case is fitted into the hole in the bearing outer race.



B3M0066A



B3M0067A



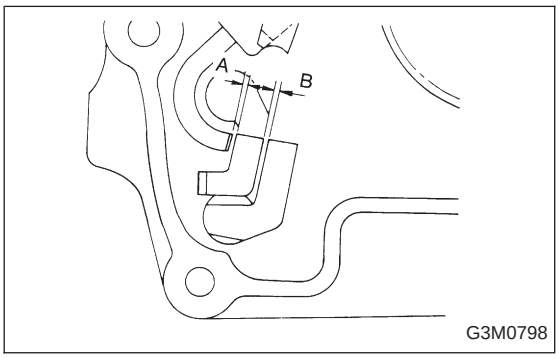
B3M0068A

6) Selection of suitable 1st-2nd, 3rd-4th and 5th shifter fork

Set transmission main shaft assembly and drive pinion shaft assembly in position (so there is no clearance between the two when moved all the way to the front). Select suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms.

	Clearance mm (in)
1st driven gear Ⓐ to reverse driven gear Ⓑ	ⓐ: 9.5 (0.374)
2nd driven gear Ⓒ to reverse driven gear Ⓑ	ⓑ: 9.5 (0.374)
3rd drive gear Ⓓ to coupling sleeve Ⓔ	ⓒ: 9.3 (0.366)
4th drive gear Ⓕ to coupling sleeve Ⓔ	ⓓ: 9.3 (0.366)
5th drive gear Ⓖ to coupling sleeve Ⓗ	ⓔ: 9.3 (0.366)

1st-2nd shifter fork		
Part No.	No.	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)
3rd-4th shifter fork		
Part No.	No.	Remarks
32810AA060	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA070	No mark	Standard
32810AA100	3	Approach to 3rd gear by 0.2 mm (0.008 in)
5th shifter fork		
Part No.	No.	Remarks
32812AA200	4	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA210	No mark	Standard
32812AA220	6	Become distant from 5th gear by 0.2 mm (0.008 in)

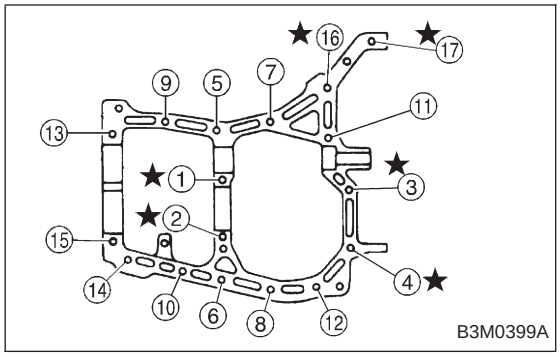


G3M0798

7) Inspection of rod end clearance

Measure rod end clearances A and B. If any clearance is not within specifications, replace rod or fork as required.

A: 1st-2nd to 3rd-4th	0.4 — 1.4 mm (0.016 — 0.055 in)
B: 3rd-4th to 5th	0.5 — 1.3 mm (0.020 — 0.051 in)



B3M0399A

8) Combination of transmission case

(1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline, and apply liquid gasket, and then put case right side and left side together.

Liquid gasket:

THREE BOND 1215 or equivalent

(2) Tighten 17 bolts with bracket, clip, etc. as shown in the figure.

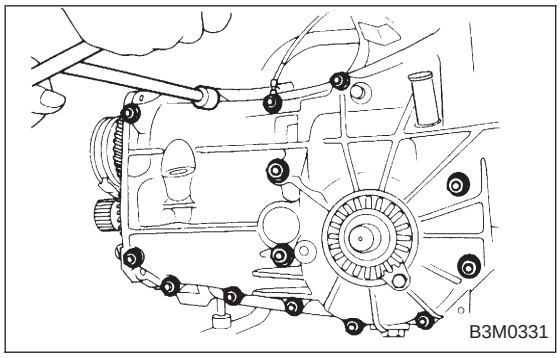
Tightening torque:

8 mm bolt

25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

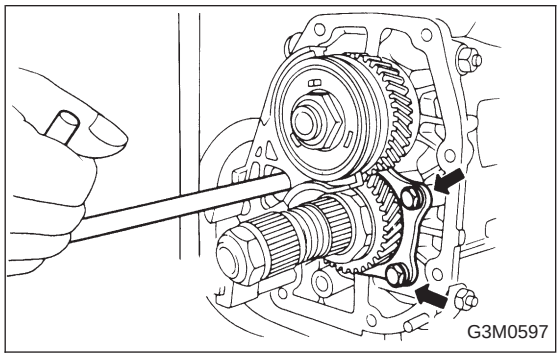
★ 10 mm bolt

39±3 N·m (4.0±0.3 kg-m, 28.9±2.2 ft-lb)


B3M0331

NOTE:

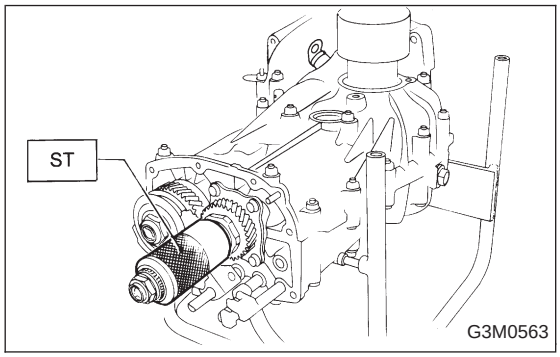
- Insert bolts from the bottom and tighten nuts at the top.
- Put cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that counter gear and speedometer gear are meshed.


G3M0597

9) Tighten ball bearing attachment bolts.

Tightening torque:

29±3 N·m (3.0±0.3 kg-m, 21.7±2.2 ft-lb)



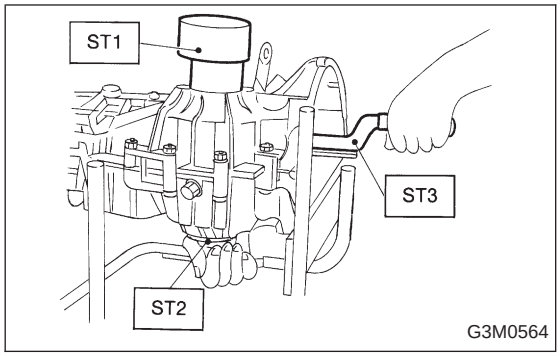
G3M0563

10) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

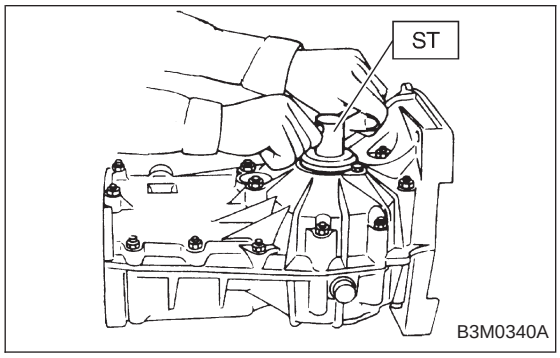
Support drive pinion assembly with ST.

ST 498427100 STOPPER



(1) Place the transmission with case left side facing downward and put ST1 on bearing cup.
(2) Screw retainer assembly into left case from the bottom with ST2. Fit ST3 on the transmission main shaft. Shift gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2.
This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

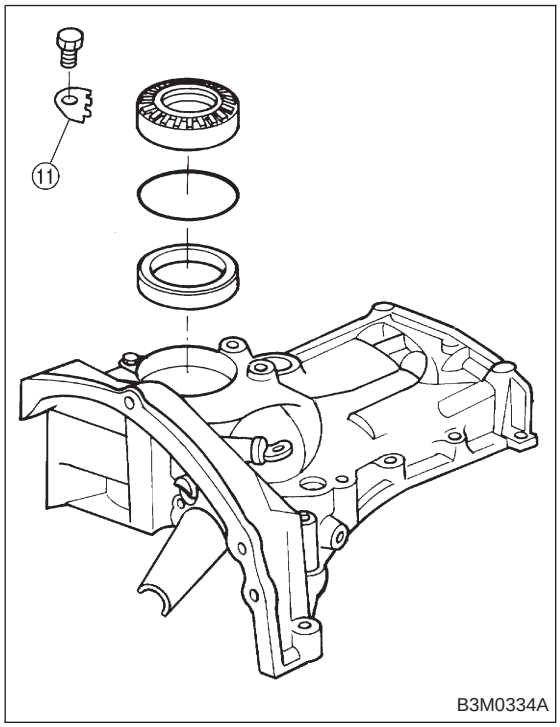
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



(3) Remove weight and screw in retainer without O-ring on the upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

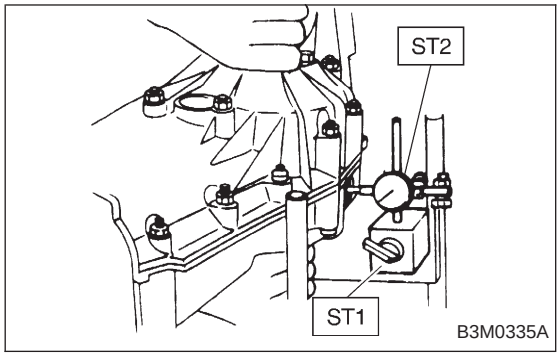
ST 499787000 WRENCH ASSY



(4) Fit lock plate ⑪. Loosen the retainer on the lower side by 1-1/2 teeth of lock plate and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

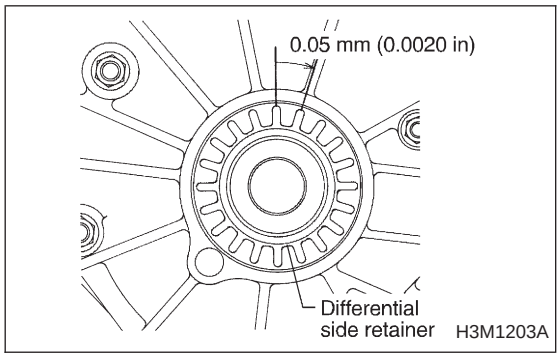
NOTE:
The notch on the lock plate moves by 1/2 tooth if the plate is turned upside down.

(5) Turn in the retainer on the upper side additionally by 1 tooth in order to apply preload on taper roller bearing.
(6) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
(7) Turn transmission main shaft several times while tapping around retainer lightly with plastic hammer.
(8) Set ST1 and ST2. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.



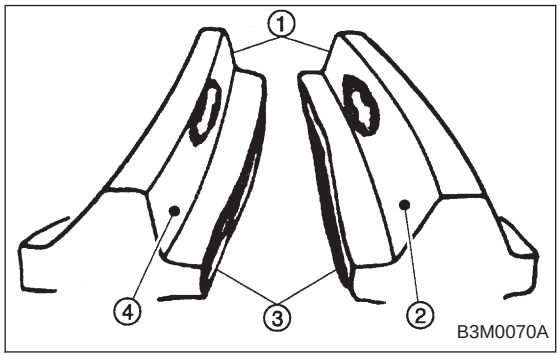
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



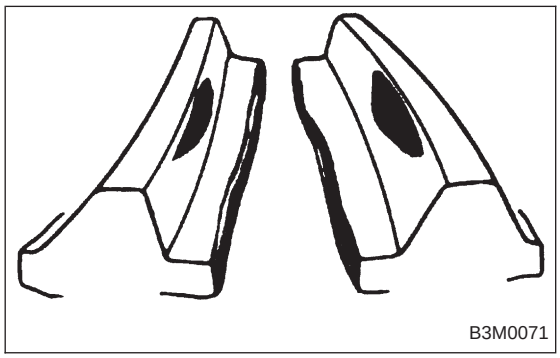
NOTE:
● If backlash is outside specified range, adjust it by turning holder in right side case.
● Each time holder rotates one tooth, backlash changes by 0.05 mm (0.0020 in).

(9) Check tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is incorrect, make the following correction.

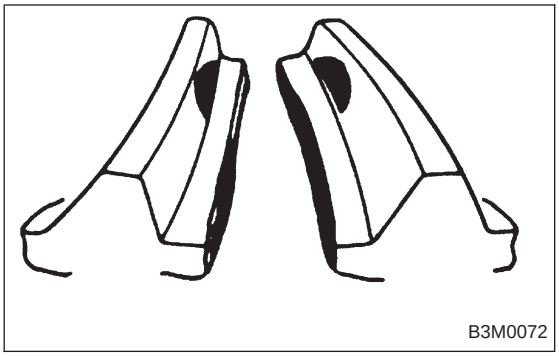


● Tooth contact is correct.

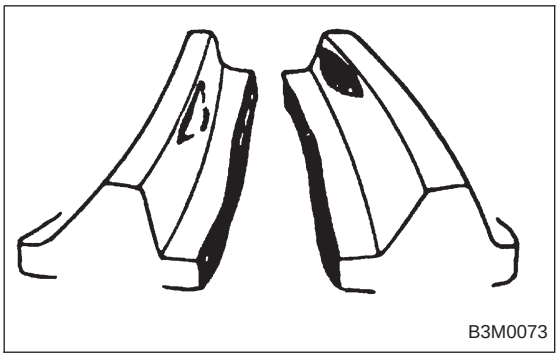
① Toe
② Coast side
③ Heel
④ Drive side



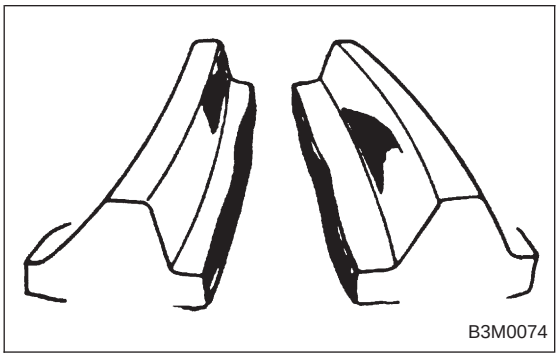
● Backlash is excessive.
To reduce backlash, loosen holder on the upper side (case right side) and turn in the holder on the lower side (case left side) by the same amount.


B3M0072

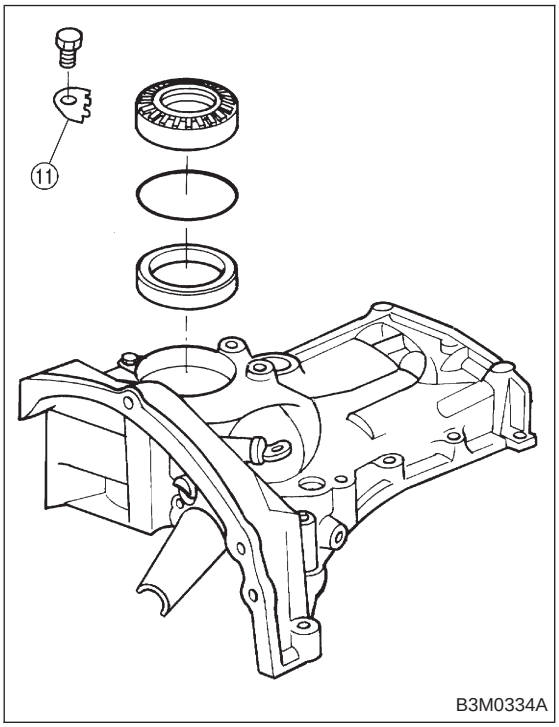
● Backlash is insufficient.
To increase backlash, loosen holder on the lower side (case left side) and turn in the holder on the upper side (case right side) by the same amount.


B3M0073

● The drive pinion shim selected before is too thick.
Reduce its thickness.


B3M0074

● The drive pinion shim selected before is too thin.
Increase its thickness.

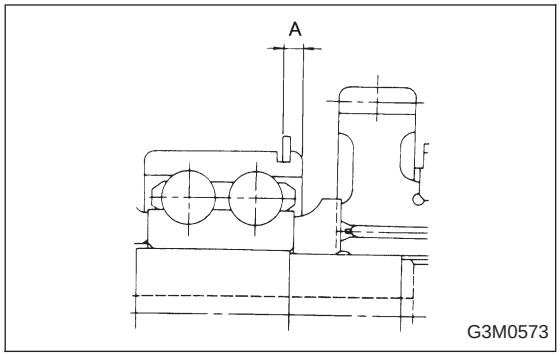


B3M0334A

11) After checking the tooth contact of hypoid gears, remove the lock plate ⑪. Then loosen retainer until the O-ring groove appears. Fit O-ring into the groove and tighten retainer into the position where retainer has been tightened in.
Tighten lock plate ⑪.

Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

NOTE:
Carry out this job on both upper and lower retainers.

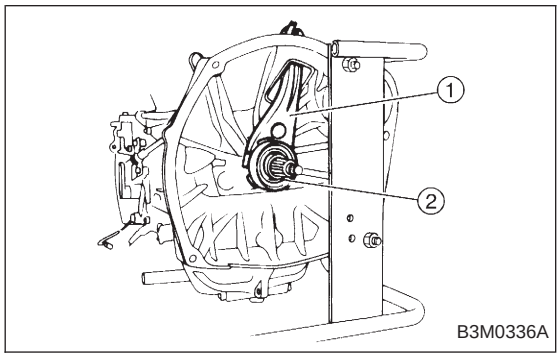


12) Selecting of main shaft rear plate
Using ST, measure the amount A of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

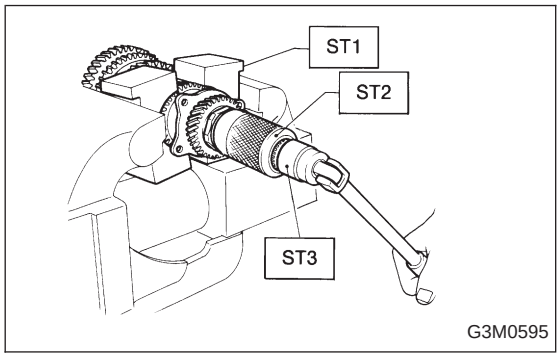
ST 498147000 DEPTH GAUGE

Dimension "A" mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

NOTE:
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.



13) Install clutch release lever ① and bearing ②. <Ref. to 2-10 [W3C1].>



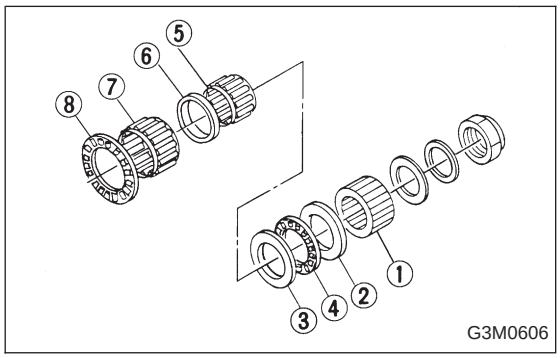
3. Drive Pinion Assembly

A: DISASSEMBLY

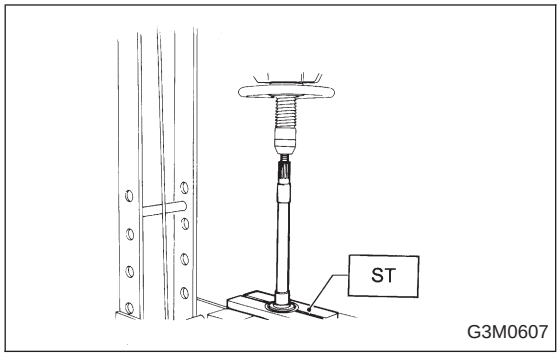
1. DRIVE PINION SHAFT

1) Straighten lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH



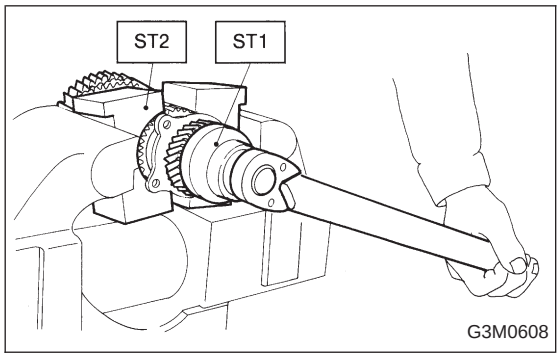
2) Withdraw drive pinion from driven shaft.
Remove differential bevel gear sleeve ①, adjusting washer No. 1 ② (25 x 37.5 x t), adjusting washer No. 2 ③ (25 x 37.5 x 4), thrust bearing ④ (25 x 37.5 x 3), needle bearing ⑤ (25 x 30 x 20), drive pinion collar ⑥, needle bearing ⑦ (30 x 37 x 23) and thrust bearing ⑧ (33 x 50 x 3).



3) Remove roller bearing and washer (33 x 50 x 5) using ST and press.

ST 498077000 REMOVER

CAUTION:
Do not reuse roller bearing.

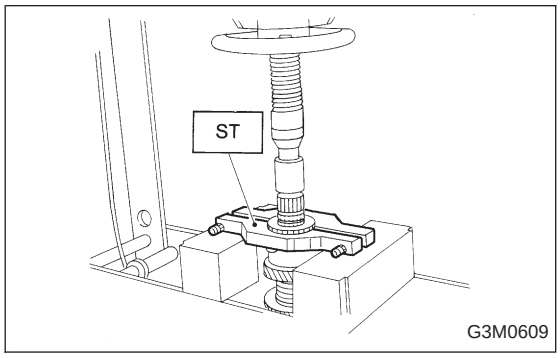


2. DRIVEN GEAR ASSEMBLY

CAUTION:
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

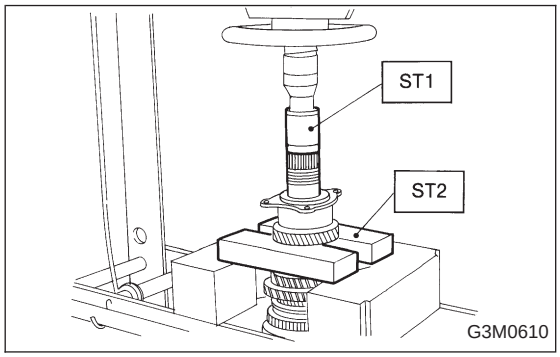
1) Straighten lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



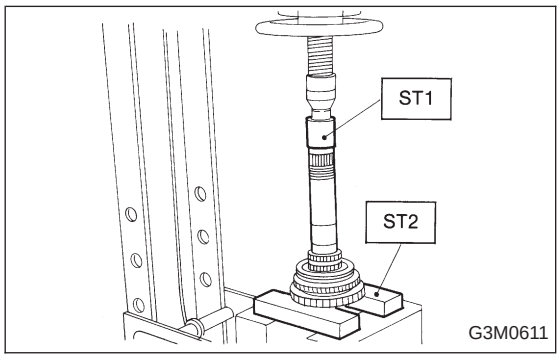
2) Remove 5th driven gear using ST.

ST 499857000 5TH DRIVEN GEAR REMOVER



3) Remove woodruff key.
4) Remove roller bearing (42 x 74 x 40), 3rd and 4th driven gear using ST1 and ST2.

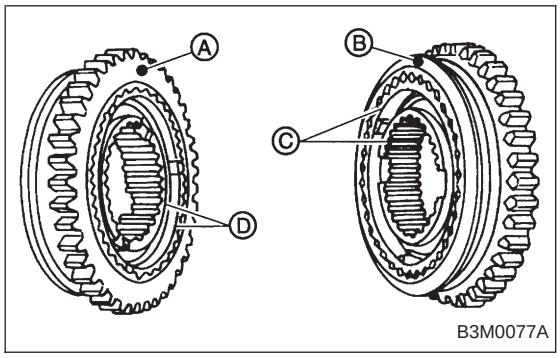
ST1 499757002 SNAP RING PRESS
ST2 899714110 REMOVER



5) Remove the key.
6) Remove 2nd driven gear assembly.
7) Remove 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.
Replace gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they have to be disassembled, mark the engaging point beforehand.

ST1 499757002 SNAP RING PRESS
ST2 899714110 REMOVER

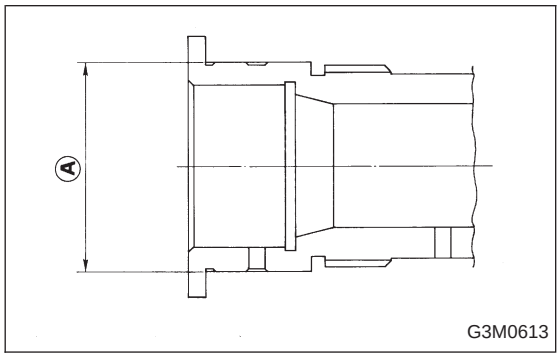
8) Remove sub gears for 1st and 2nd driven gear.



B: ASSEMBLY

1. GEAR AND HUB ASSEMBLY

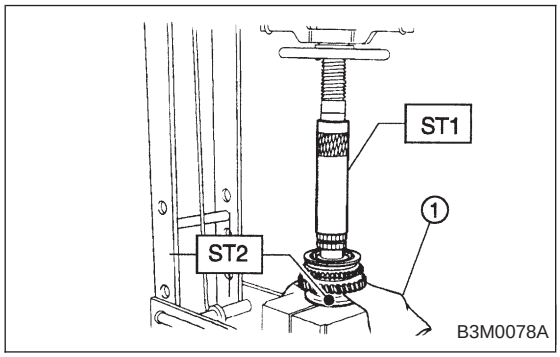
NOTE:
Position open ends of springs 120° apart.
Ⓐ: 1st gear side
Ⓑ: 2nd gear side
Ⓒ: Flush surface
Ⓓ: Stepped surface



2. DRIVEN GEAR ASSEMBLY

Assemble a driven shaft and 1st driven gear that select for adjustment the proper radial clearance.

Driven shaft		1st driven gear
Part No.	Diameter A mm (in)	Part No.
32229AA150	49.959 — 49.966 (1.9669 — 1.9672)	32231AA270
32229AA140	49.967 — 49.975 (1.9672 — 1.9675)	32231AA260



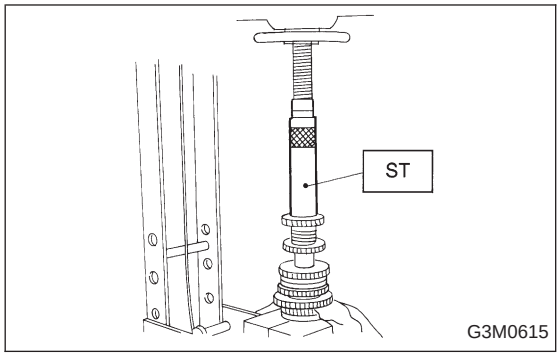
1) Install 1st driven gear, 1st-2nd baulk ring and gear and hub assembly onto driven shaft.

NOTE:
Take care to install gear hub in proper direction.

2) Install 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER

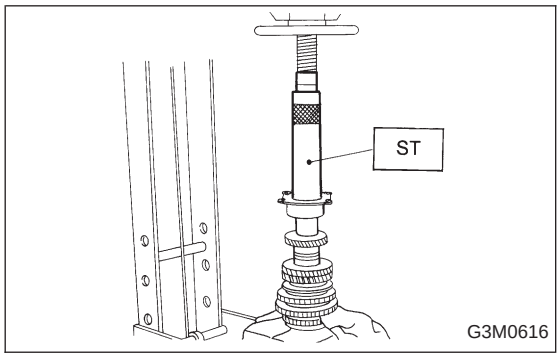
CAUTION:
Attach a cloth ① to the end of driven shaft to prevent damage.



3) Install 2nd driven gear, 1st-2nd baulk ring and insert onto driven shaft. After installing key on driven shaft, install 3rd-4th driven gear using ST and press.

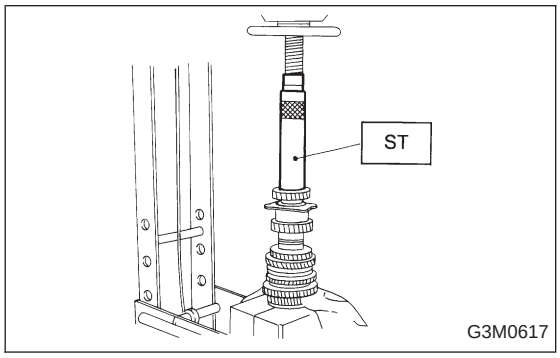
ST 499277200 INSTALLER

Align groove in baulk ring with insert.



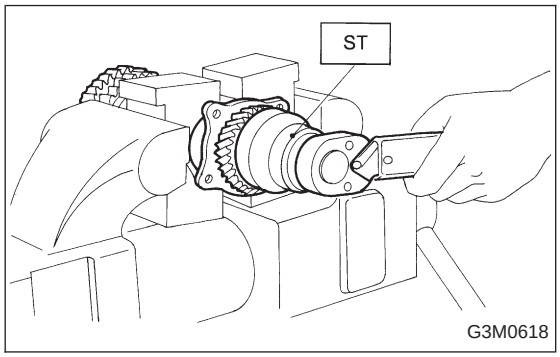
4) Install a set of roller bearings (42 x 74 x 40) onto the driven shaft using ST and press.

ST 499277200 INSTALLER



5) Position woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto drive shaft using ST and press.

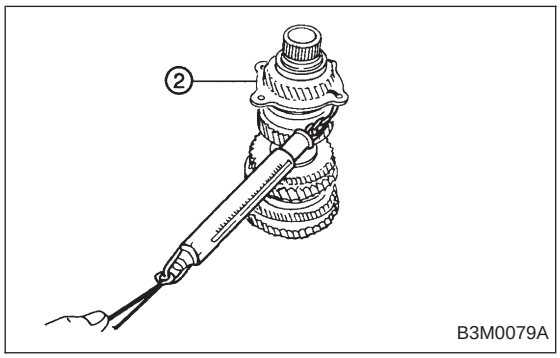
ST 499277200 INSTALLER



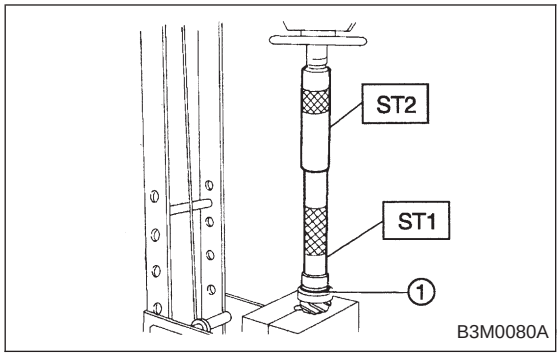
6) Install lock washer (42 x 53 x 2). Install lock nut (42 x 13) and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

Tightening torque:
265±10 N·m (27±1 kg-m, 195±7 ft-lb)



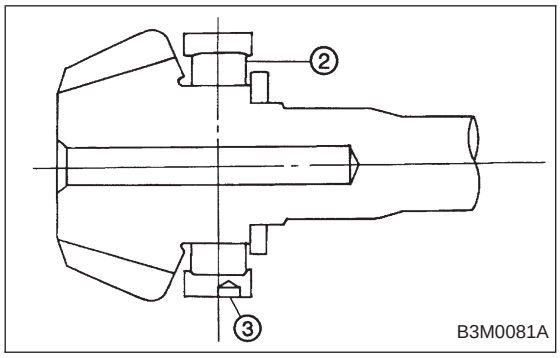
NOTE:
- Stake lock nut at two points.
- Using spring balancer, check that starting torque of roller bearing ② is 0.1 to 1.5 N·m (1 to 15 kg-cm, 0.9 to 13.0 in-lb).



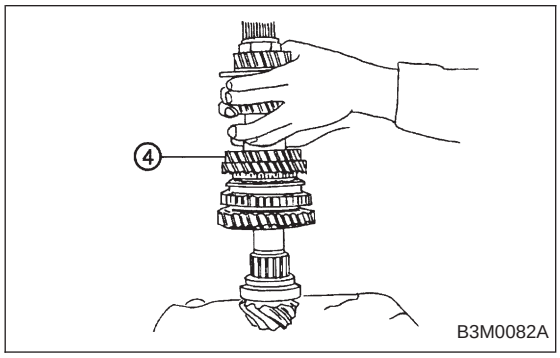
3. DRIVE PINION SHAFT

1) Install roller bearing onto drive pinion. Install washer ① (33 x 50 x 5) using ST1, ST2 and press.

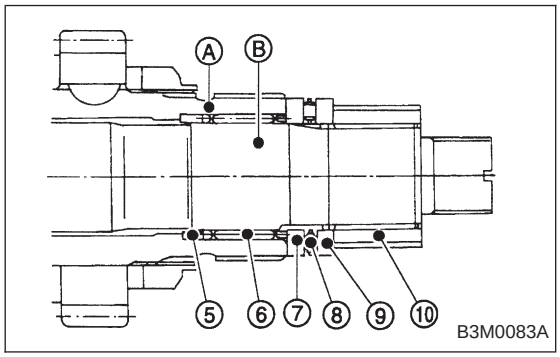
ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



NOTE:
When installing roller bearing ②, note its directions (front and rear) because knock pin hole ③ in outer race is offset.

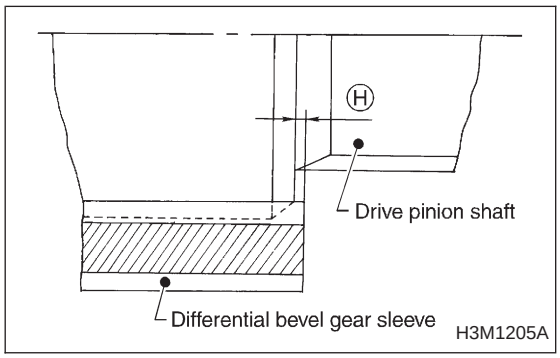


2) Install thrust bearing (33 x 50 x 3) and needle bearing (30 x 37 x 23). Install driven shaft assembly ④.



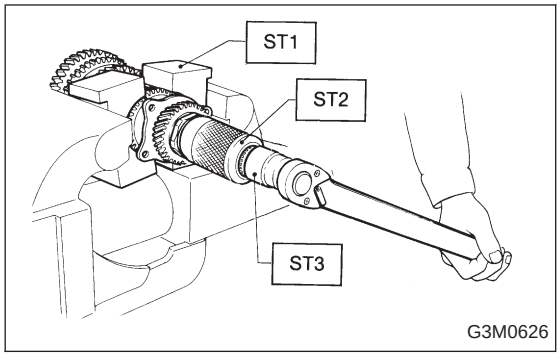
3) Install drive pinion collar ⑤, needle bearing ⑥ (25 x 30 x 20), adjusting washer No. 2 ⑦ (25 x 36 x 4), thrust bearing ⑧ (25 x 37.5 x 3), adjusting washer No. 1 ⑨ (25 x 36 x t) and differential bevel gear sleeve ⑩ in that order.

NOTE:
Be careful because spacer must be installed in proper direction.
Ⓐ: Driven shaft
Ⓑ: Driven pinion shaft



4. ADJUSTMENT OF THRUST BEARING PRELOAD

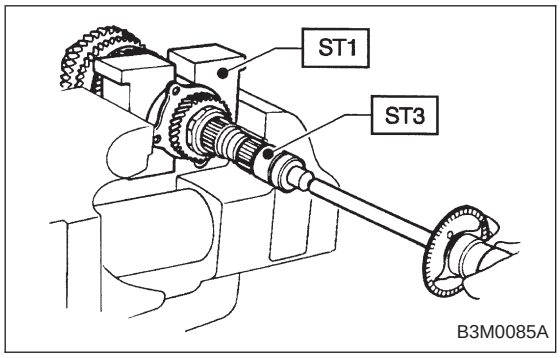
1) After completing the preceding steps 1) through 3), select adjusting washer No. 2 so that dimension Ⓗ is zero through visual check. Position washer (18.3 x 30 x 4) and lock washer (18 x 30 x 2) and install lock nut (18 x 13.5).



2) Using ST1, ST2 and ST3, tighten lock nut to the specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

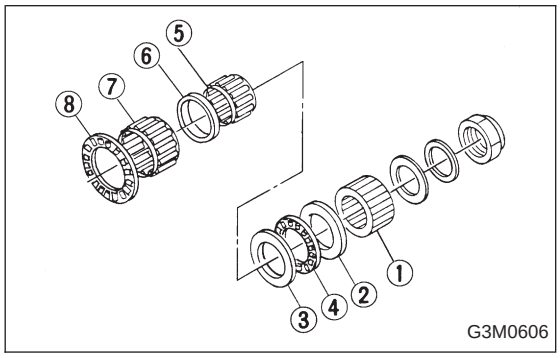
Tightening torque:
118±8 N·m (12±0.8 kg-m, 86.8±5.8 ft-lb)



3) After removing ST2, measure starting torque using torque driver.

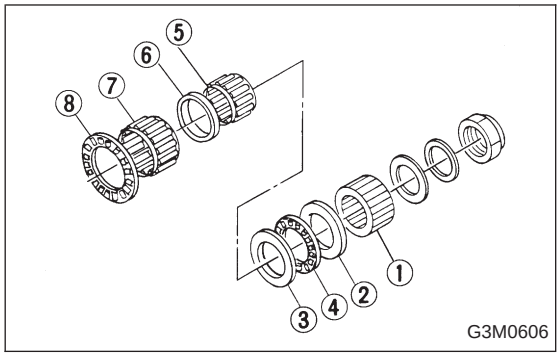
ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.5±0.2 N·m (0.055±0.025 kg-m, 0.4±0.2 ft-lb)



4) If starting torque is not within specified limit, select new adjusting washer No. 1 ② and recheck starting torque.

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

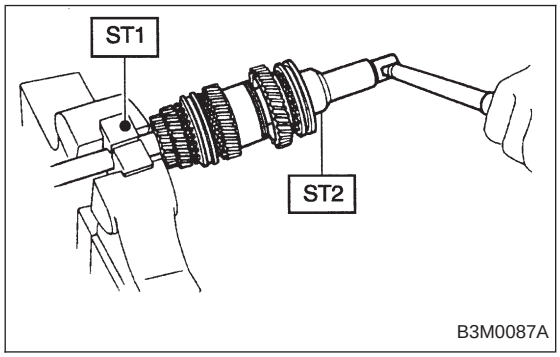


5) If specified starting torque range cannot be obtained when a No. 1 ② adjusting washer is used, then select a suitable No. 2 ③ adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

6) Recheck that starting torque is within specified range, then clinch lock nut at four positions.



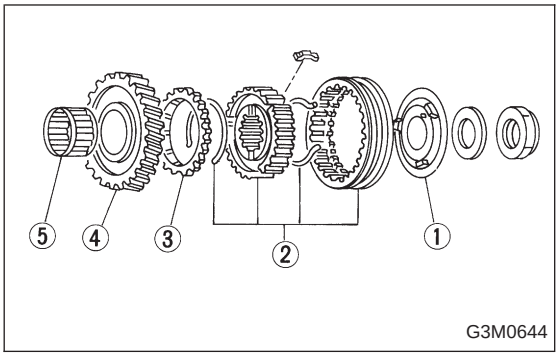
4. Main Shaft Assembly

A: DISASSEMBLY

1) Put vinyl tape around main shaft splines to protect oil seal from damage. Then pull out oil seal and needle bearing by hand.
2) Remove lock nut from transmission main shaft assembly.

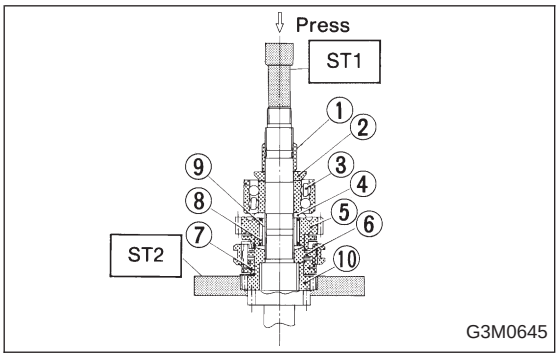
NOTE:
Remove caulking before taking off lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)



G3M0644

3) Remove insert stopper plate ①, sleeve and hub assembly No. 2, baulk ring ③, 5th drive gear ④, and needle bearing ⑤ (32 x 36 x 25.7).



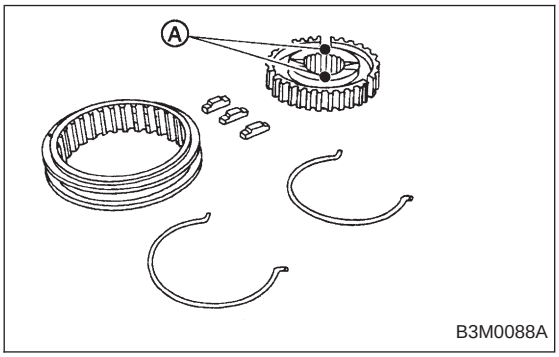
G3M0645

4) Using ST1, ST2 and a press, remove:
- 5th needle bearing inner race ①
- 5th gear thrust washer ②
- Ball bearing ③ (25.5 x 65 x 31)
- 4th gear thrust washer ④
- 4th drive gear ⑤
- Sleeve and hub assembly ⑥
- Baulk ring ⑦
- 4th needle bearing ⑧
- 4th needle bearing inner race ⑨
- 3rd drive gear ⑩

ST1 899864100 REMOVER
ST2 899714110 REMOVER

NOTE:
Replace sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

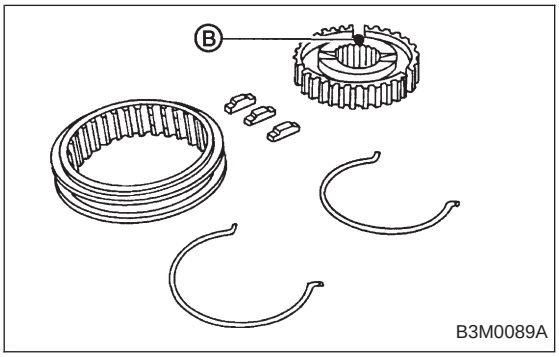
B: ASSEMBLY



B3M0088A

1) Assemble sleeve and hub assembly for 3rd-4th and, 5th and high-low synchronizing.

NOTE:
Position open ends of spring 120° apart.
Ⓐ: Two holes for discrimination (3rd-4th hub)

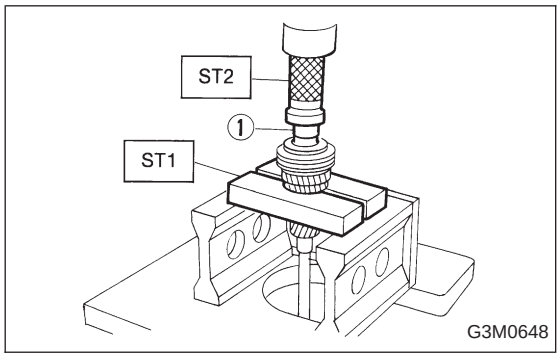


B3M0089A

Ⓑ: One hole for discrimination (5th hub)

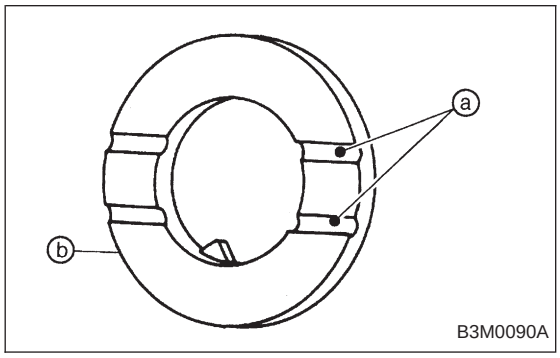
2) Install 3rd drive gear, baulk ring, and sleeve and hub assembly for 3rd-4th needle bearing (32 x 36 x 25.7) on transmission main shaft.

NOTE:
Align groove in baulk ring with shifting insert.



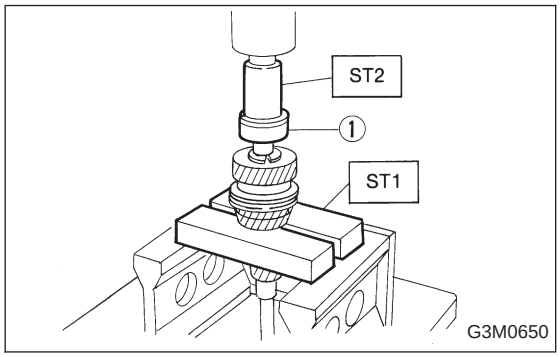
3) Install 4th needle bearing race ① onto transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



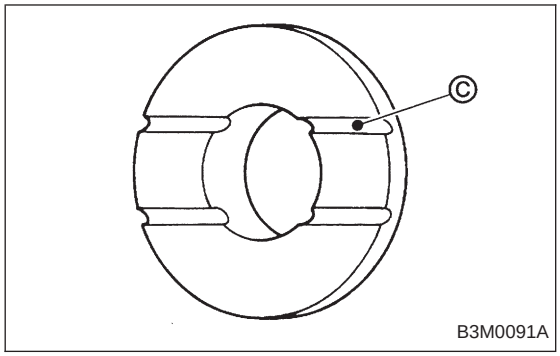
4) Install baulk ring, needle bearing (32 x 30 x 25.7), 4th drive gear and 4th gear thrust washer to transmission main shaft.

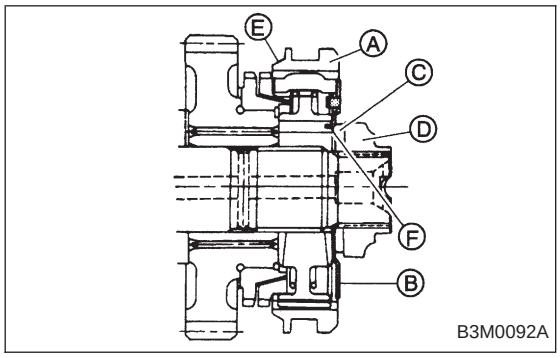
NOTE:
Face thrust washer in the correct direction.
ⓐ: Groove
ⓑ: 4th gear side



5) Drive ball bearing ① onto the rear section of transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER





6) Using the same tools as in step 5) above, install the following parts onto the rear section of transmission main shaft.
- 5th gear thrust washer

NOTE:
Face thrust washer in the correct direction.
ⓒ: Face this surface to 5th gear side.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

- 5th needle bearing race

7) Install the following parts to the rear section of transmission main shaft.
- Needle bearing (32 x 36 x 25.7)
- 5th drive gear
- Baulk ring
- Sleeve Ⓐ and hub assembly
- Insert stopper plate Ⓑ
- Lock washer Ⓒ (22 x 38 x 2)
- Tighten lock nuts Ⓓ (22 x 13) to the specified torque using ST1 and ST2.

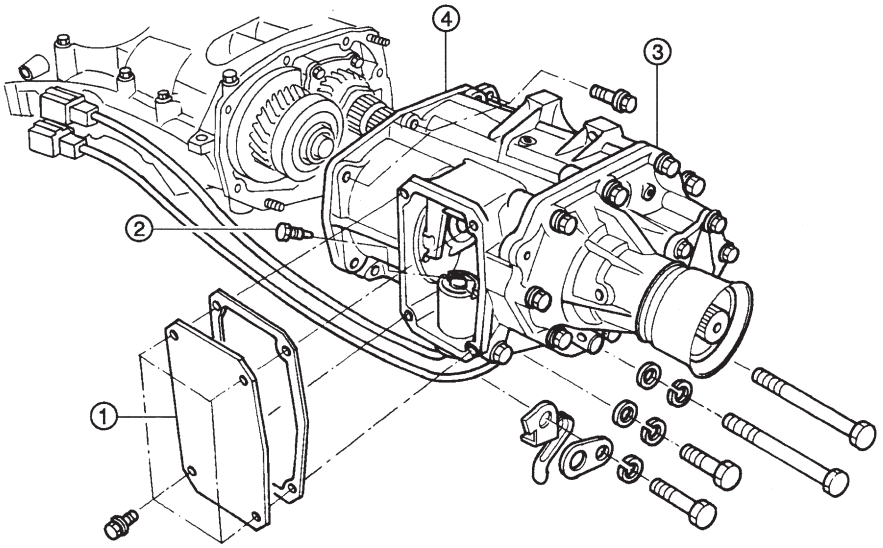
ST1 499987003 SOCKET WRENCH (35)
ST2 498937000 TRANSMISSION HOLDER

NOTE:
- Align groove Ⓔ in baulk ring with shifting insert.
- Be sure to fit pawl Ⓕ of insert stopper plate into 4 mm (0.16 in) dia. hole in the boss section of synchronizer hub.
- Secure lock nuts in two places after tightening.

Tightening torque:
118±6 N·m (12.0±0.6 kg-m, 86.8±4.3 ft-lb)

5. Transfer Case and Extension

A: REMOVAL

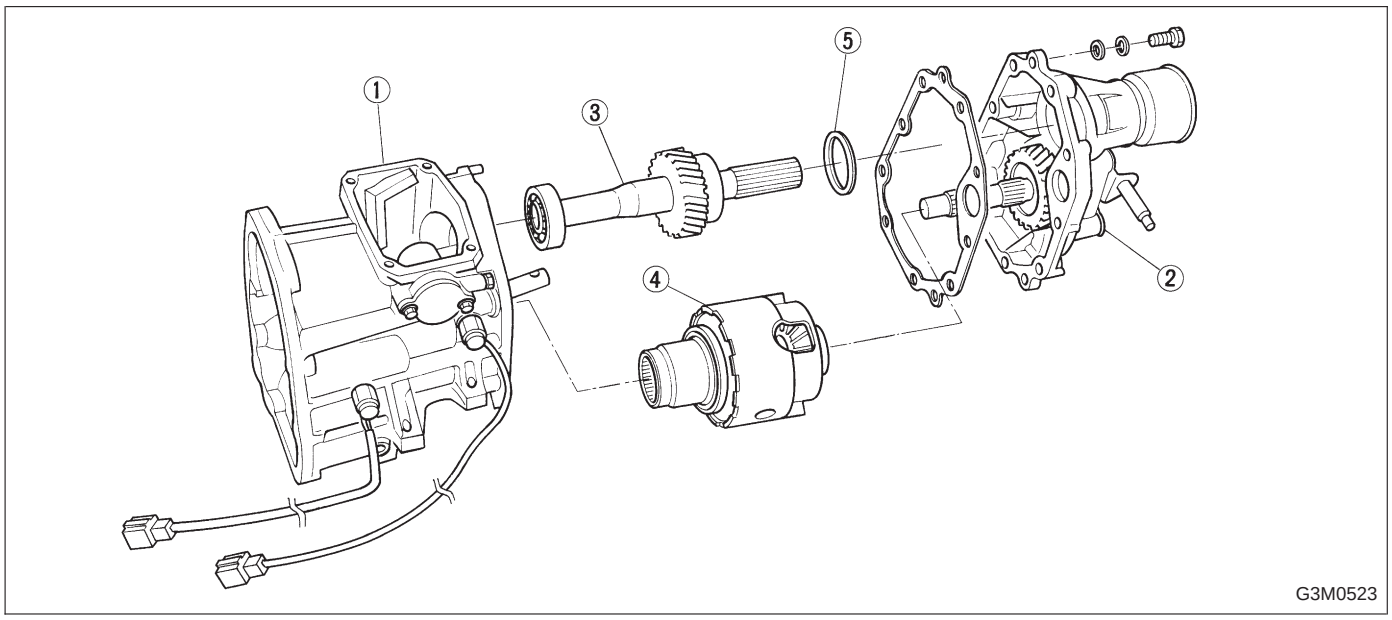


B3M0041A

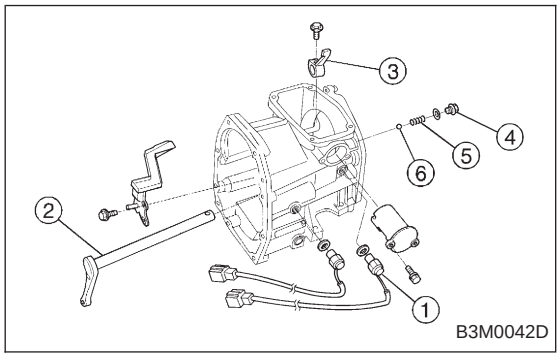
1) Remove transfer cover ①.
2) Remove shifter fork screw ② which secures selector arm to shifter arm.
3) Remove transfer case ④ with extension assembly ③.

B: DISASSEMBLY

1. SEPARATION OF TRANSFER CASE AND EXTENSION ASSEMBLY



1) Separate transfer case ① and extension assembly ②.
2) Remove transfer driven gear ③ and center differential ④ as a set.
3) Remove thrust washer ⑤ (52 x 61 x t).

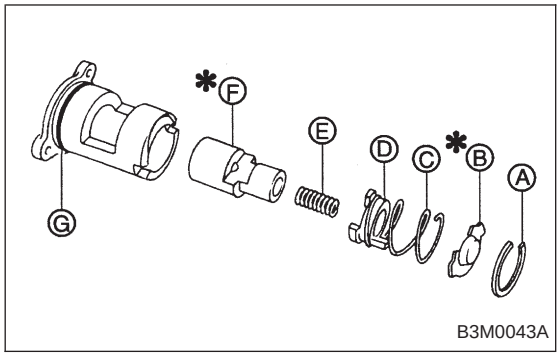


2. TRANSFER CASE

1) Remove neutral switch ①.

NOTE:
Before removing shifter arm, disconnect neutral switch.

2) Draw out shifter arm ② and remove selector arm ③.
3) Remove plug ④, spring ⑤ and reverse check ball ⑥.



B3M0043A

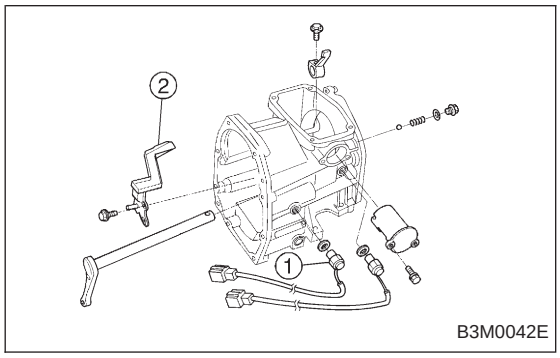
4) Remove reverse check sleeve.
Disassembly procedure is as follows:

(1) Using a standard screwdriver, remove snap ring Ⓐ (Inner-28).

NOTE:
Replace snap ring with a new one if deformed or weakened.

(2) Remove reverse check plate Ⓑ.
(3) Remove reverse check spring Ⓒ with cam Ⓓ.
(4) Remove reverse return spring Ⓔ.
(5) Remove reverse accent shaft Ⓕ.
(6) Remove O-ring Ⓖ.

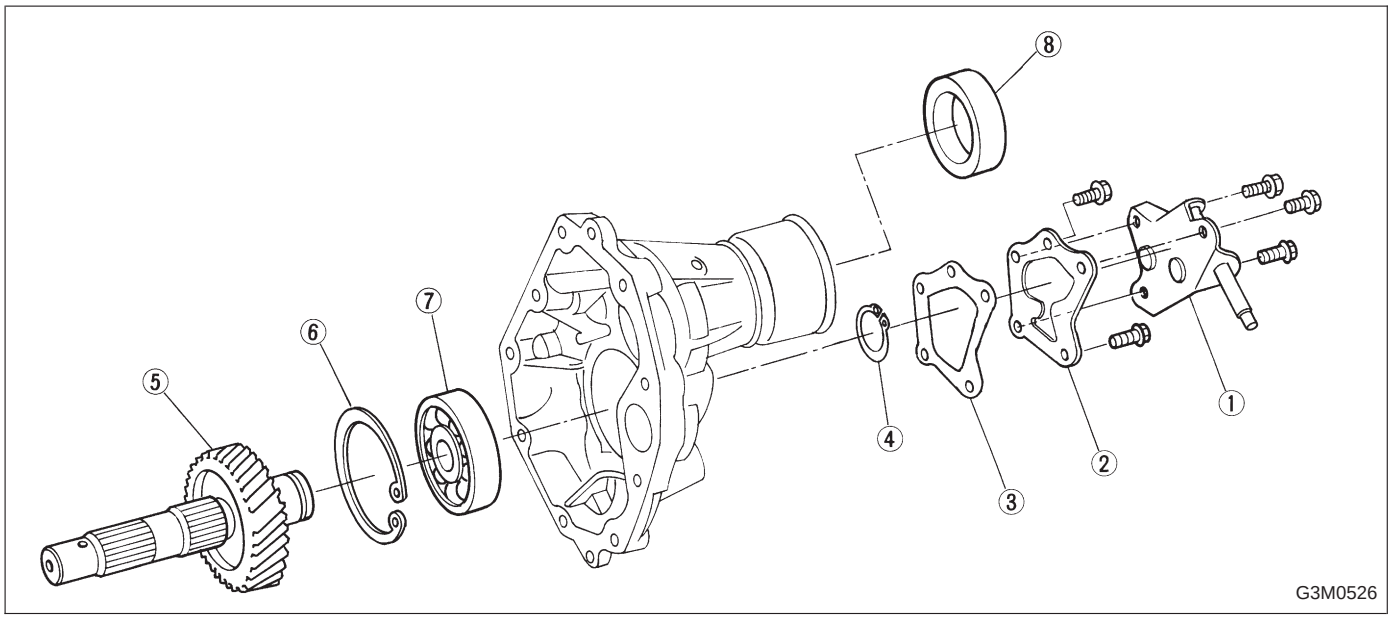
NOTE:
● Reverse check sleeve assembly uses an O-ring which should not be scratched.
● Be careful not to break adjustment shim placed between reverse check sleeve assembly and case.



B3M0042E

5) Remove back-up light switch ①.
6) Remove oil guide ②.

3. EXTENSION



1) Remove extension cover ② and shift bracket ①.
2) Remove snap ring ④ (Outer-30).
3) Remove transfer drive gear ⑤.

CAUTION:
Do not remove ball bearing unless replacing.

4) Remove snap ring ⑥ (Inner-72).
5) Remove ball bearing ⑦.

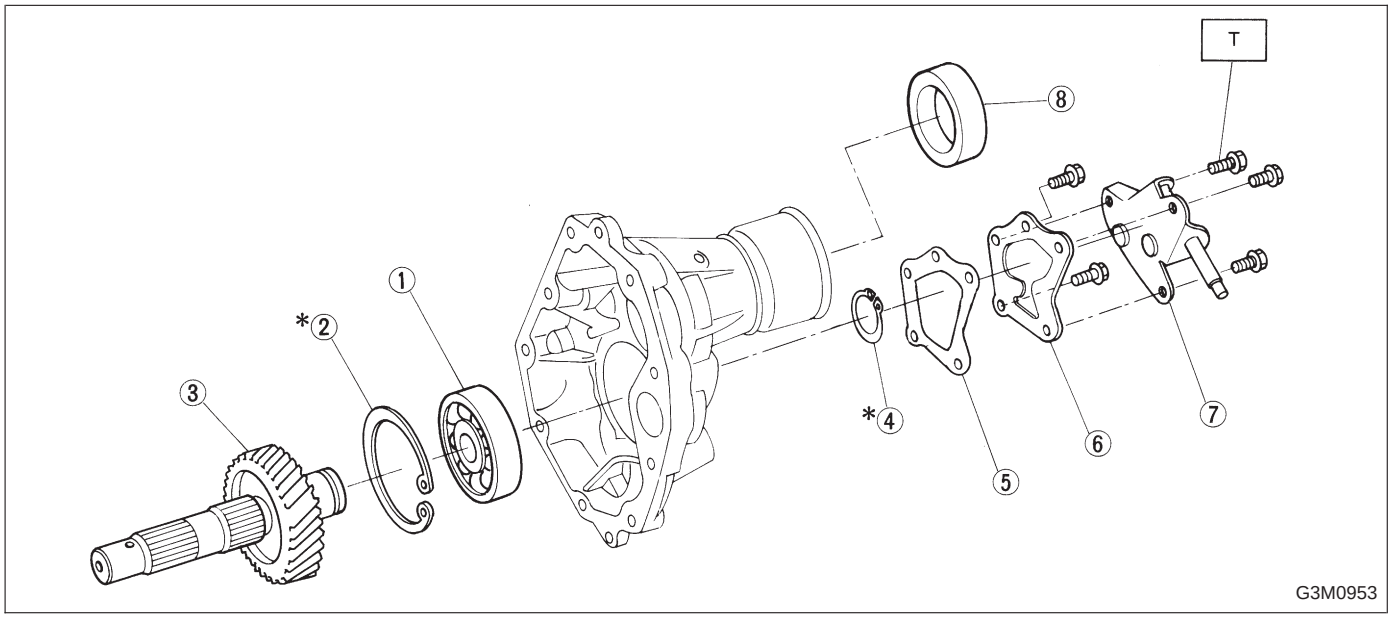
CAUTION:
Do not reuse ball bearing.

6) Remove oil seal ⑧.

CAUTION:
Do not reuse oil seal.

C: ASSEMBLY

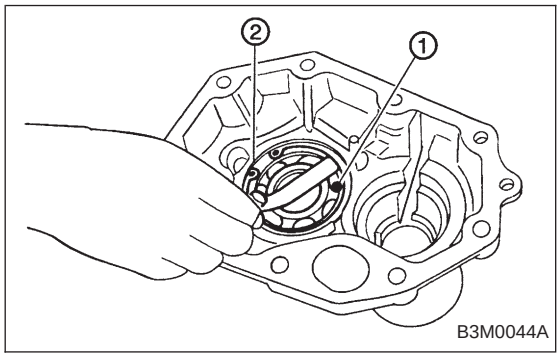
1. EXTENSION



Tightening torque: N·m (kg-m, ft-lb)
T: 25±2 (2.5±0.2, 18.1±1.4)

1) Installation of ball bearing ① and selection of snap ring ② (Inner-72)

(1) Attach ball bearing ① (30 x 72 x 17) to extension and install snap ring ②.



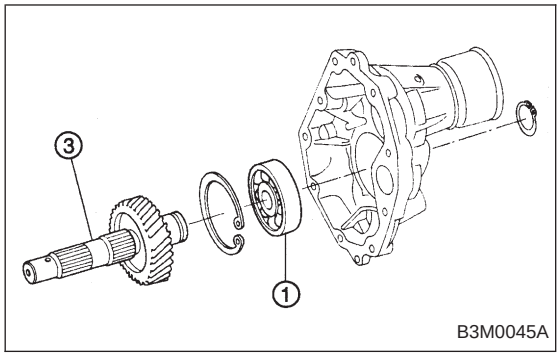
(2) Measure clearance between snap ring ② and outer race of ball bearing ① with a thickness gauge.

CAUTION:
Replace ball bearing with a new one.

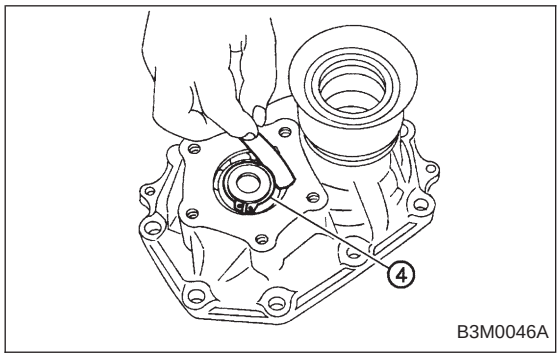
Clearance:
0 — 0.15 mm (0 — 0.0059 in)

(3) If the measurement is not within the specification, select suitable snap ring ②.

Snap ring (Inner-72)	
Part No.	Thickness mm (in)
805172071	1.78 (0.0701)
805172072	1.90 (0.0748)
805172073	2.02 (0.0795)



2) Installation of transfer drive gear ③
Press transfer drive gear into inner race of ball bearing.

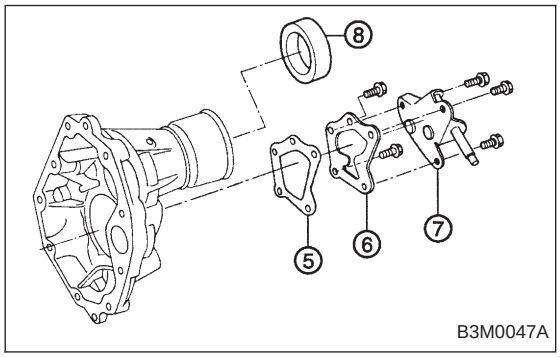


3) Selection of snap ring ④ (Outer-30)
(1) Install snap ring ④ on transfer drive shaft.
(2) Measure clearance between snap ring and inner race of ball bearing with a thickness gauge.

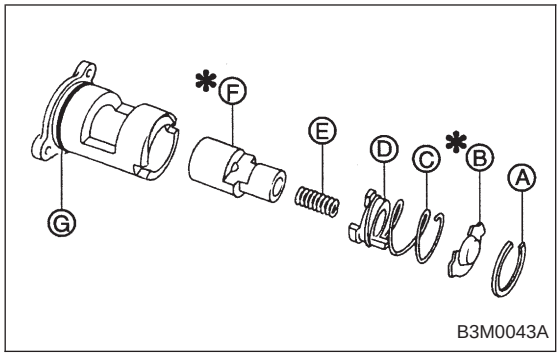
Clearance:
0 — 0.15 mm (0 — 0.0059 in)

(3) If the measurement is not within the specification, select suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)



4) Install extension cover ⑥, gasket ⑤ and shift bracket ⑦.
CAUTION:
Use new gasket.
5) Install oil seal ⑧ with ST.
ST 498057300 INSTALLER
CAUTION:
Use new oil seal.



B3M0043A

2. TRANSFER CASE

Assembly of transfer case is in the reverse order of disassembly. Do the following:

1) Assembly of reverse check sleeve

(1) Install reverse accent shaft Ⓕ, check cam Ⓓ, return spring Ⓔ and check spring Ⓒ onto reverse check sleeve.

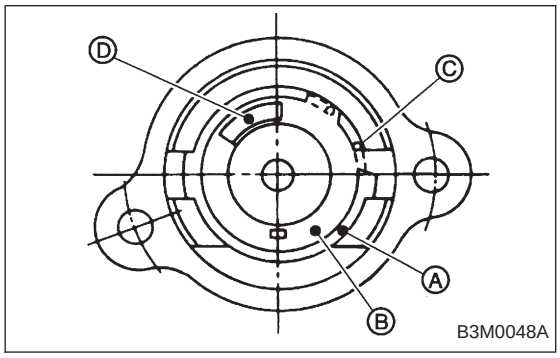
NOTE:
Be sure the bent section of reverse check spring is positioned in the groove in check cam.

(2) Hook the bent section of reverse check spring over reverse check plate Ⓑ.

(3) Rotate cam so that the protrusion of reverse check cam is at the opening in plate.

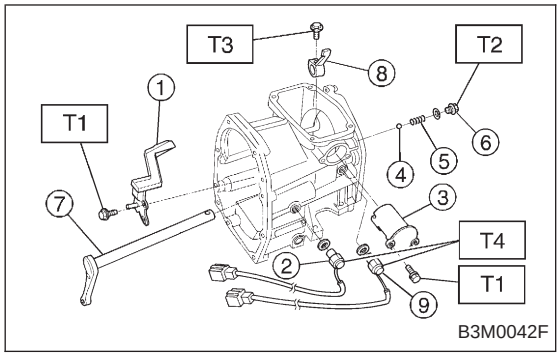
(4) With cam held in that position, install plate onto reverse check sleeve and hold with snap ring Ⓐ (Inner-28).

(5) Position O-ring Ⓖ (35.4 x 1.5) in groove in sleeve.



B3M0048A

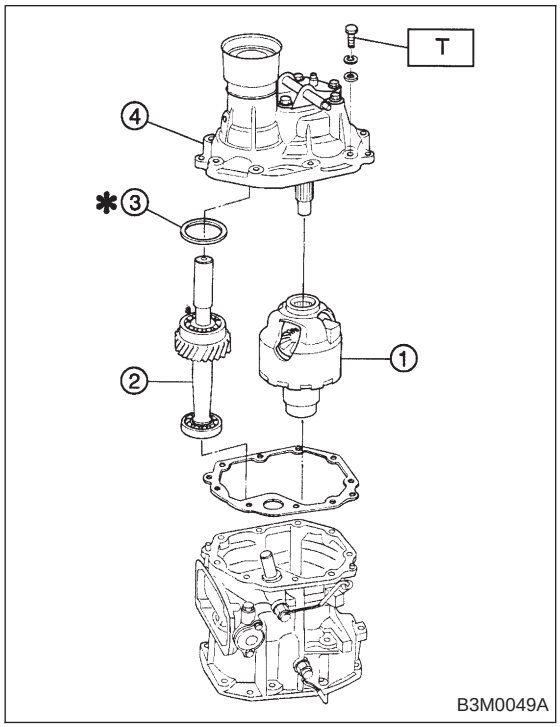
CAUTION:
● Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
● Spin cam by hand for smooth rotation.
If it does not return properly, replace reverse check spring.
● Move cam and shaft all the way toward plate and release.
If cam does not return properly, replace reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace spring.
● Select a suitable reverse accent shaft and reverse check plate by referring to "Neutral Position Adjustment."



2) Installation of shifter arm ⑦ and selector arm ⑧
Install shifter arm into the partition from the front while inserting selector arm into the opening in reverse check sleeve. Pass shaft through hole in selector arm until its end comes out of the rear of transfer case.

NOTE:
Apply a coat of gear oil to shifter arm. Also make sure oil seal is positioned properly.

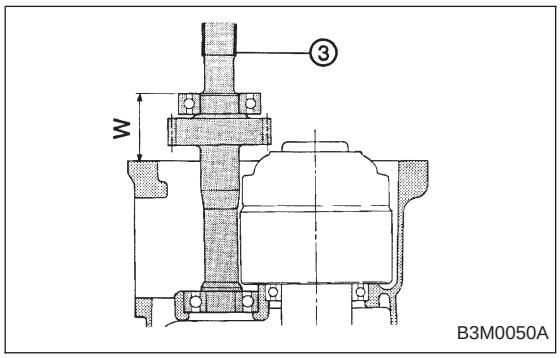
Tightening torque:
T1: 6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)
T2: 10±1 N·m (1.0±0.1 kg-m, 7.2±0.7 ft-lb)
T3: 19.6±1.5 N·m (2.00±0.15 kg-m, 14.5±1.1 ft-lb)
T4: 25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



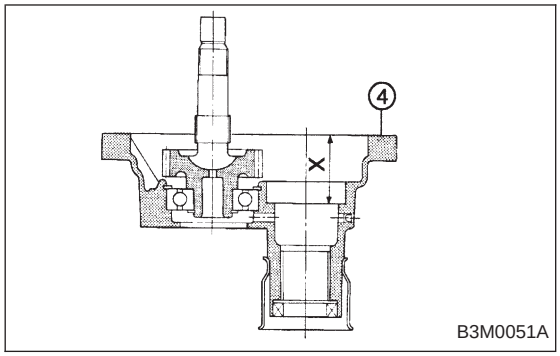
3. COMBINATION OF TRANSFER CASE AND EXTENSION ASSEMBLY

1) Install center differential ① and transfer driven gear ② into transfer case.

Tightening torque:
T: 37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)



2) Selection of thrust washer (52 x 61 x t)
(1) Measure height “W” between transfer case and ball bearing on the transfer driven gear ③.



(2) Measure depth “X” as shown in figure.

④ Extension

(3) Calculate space “Y” using the following equation: Y = X − W + 0.24 mm (0.0094 in) [Thickness of gasket]

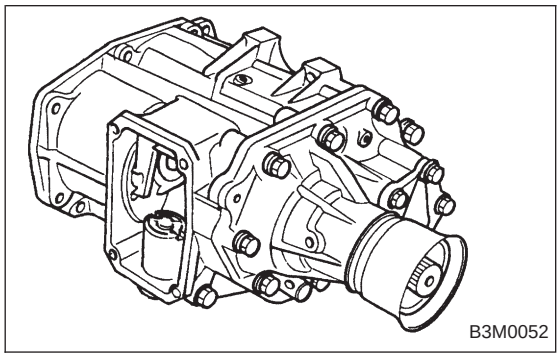
(4) Select suitable washer in the following table:

Space “Y” mm (in)	Thrust washer (52 x 61 x t)	
	Part No.	Thickness mm (in)
0.55 — 0.79 (0.0217 — 0.0311)	803052021	0.50 (0.0197)
0.80 — 1.04 (0.0315 — 0.0409)	803052022	0.75 (0.0295)
1.05 — 1.30 (0.0413 — 0.0512)	803052023	1.00 (0.0394)

Standard clearance between thrust washer and ball bearing:

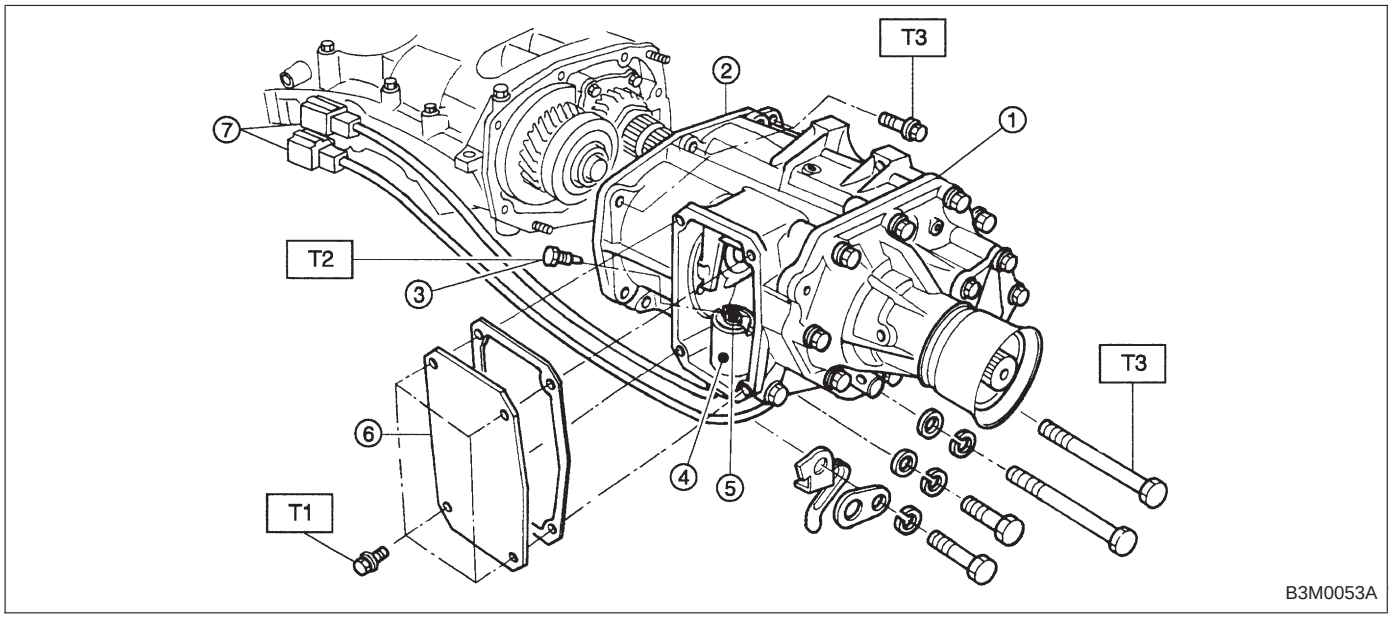
0.05 — 0.30 mm (0.0020 — 0.0118 in)

(5) Fit thrust washers on transfer drive shaft.



3) Install extension assembly into transfer case.

D: INSTALLATION



Tightening torque: N·m (kg-m, ft-lb)
T1: 15.7±1.5 (1.6±0.15, 11.6±1.1)
T2: 19.6±1.5 (2.00±0.15, 14.5±1.1)
T3: 24.5±2.0 (2.50±0.20, 18.1±1.4)

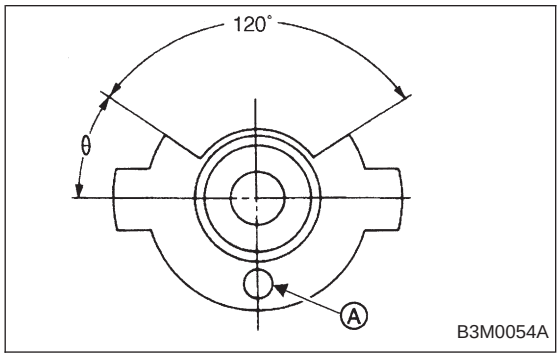
1) Install transfer case ② with extension assembly ①.
2) Secure selector arm to shifter arm with shifter fork screw ③. Shifter arm should be caught by pawl of rod. Selector arm must be engaged with reverse check sleeve assembly.
3) Adjustment of neutral position
   (1) Shift gear into 3rd gear position.
   (2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of the return spring, until arm contacts the stopper.
   (3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
   (4) To adjust, remove bolts holding reverse check sleeve assembly ④ to the case, move sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.

CAUTION:
Be careful not to break O-ring when placing shim(s).

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

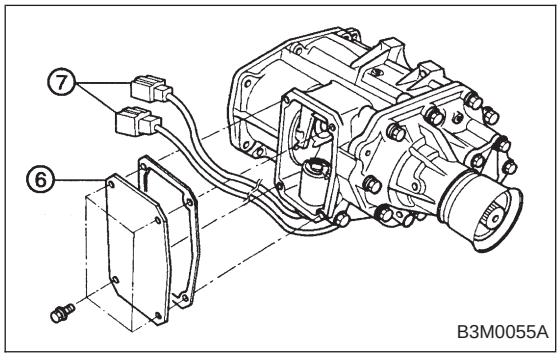
● When shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
● If shims alone cannot adjust the clearance, replace reverse accent shaft and re-adjust.

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA040	1	Neutral position is closer to 1st gear.
32188AA011	No mark or 2	Standard
32188AA050	3	Neutral position is closer to reverse gear.

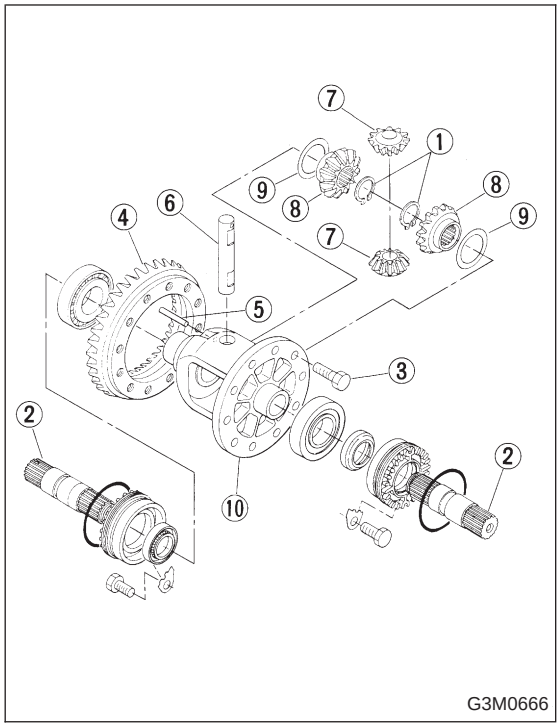


4) Reverse check plate ⑤ adjustment
Shift shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly. Also check to see if arm returns to neutral when released from the reverse position. If arm does not return properly, replace reverse check plate.

Reverse check plate			
Part No.	Ⓐ: No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



5) Install transfer ⑥ cover and gasket.
6) Connect each connector ⑦.



G3M0666

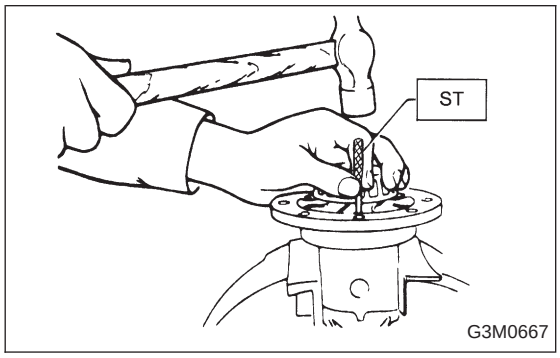
6. Front Differential

A: DISASSEMBLY

1) Remove right and left snap rings ① from differential, and then remove two axle drive shafts ②.

NOTE:
During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

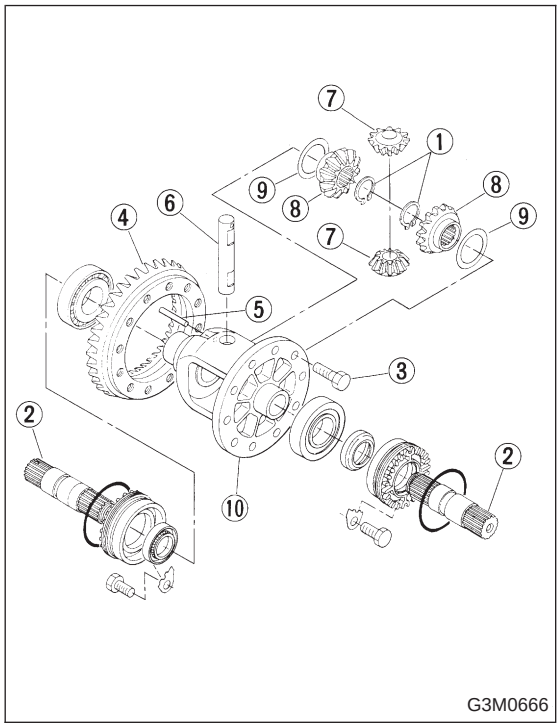
2) Loosen twelve bolts ③ and remove hypoid drive gear ④.



G3M0667

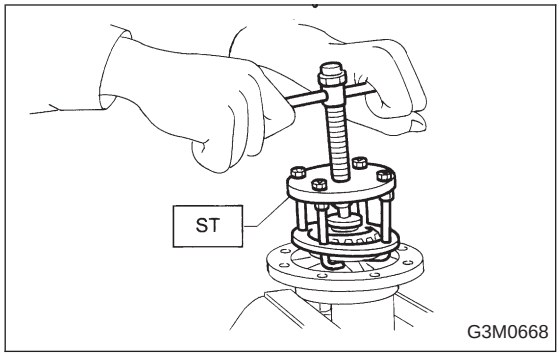
3) Drive out straight pin ⑤ from differential assembly toward hypoid driven gear.

ST 899904100 REMOVER

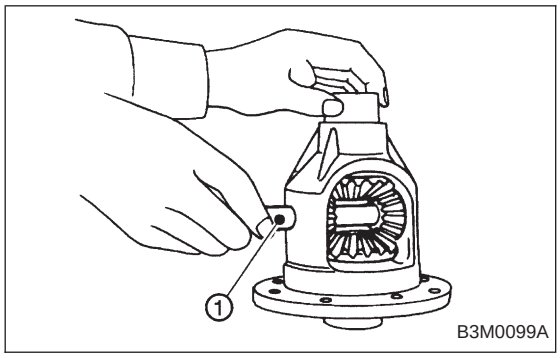


G3M0666

4) Pull out pinion shaft ⑥, and remove differential bevel pinion ⑦ and gear ⑧ and washer ⑨.



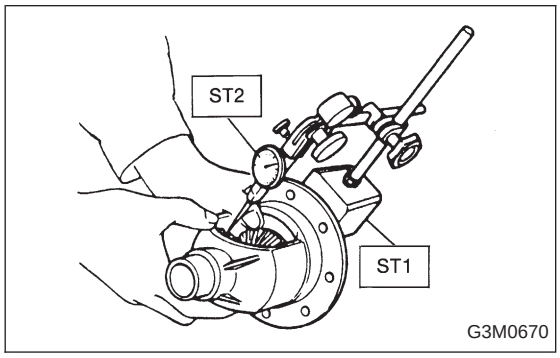
5) Remove roller bearing using ST.
ST 399527700 PULLER SET



B: ASSEMBLY

1) Install bevel gear and bevel pinion together with washers, and insert pinion shaft ①.

NOTE:
Face the chamfered side of washer toward gear.



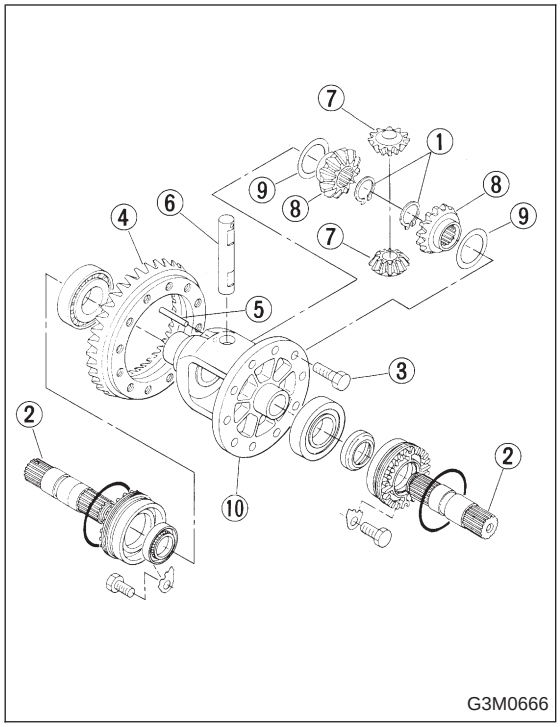
2) Measure backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

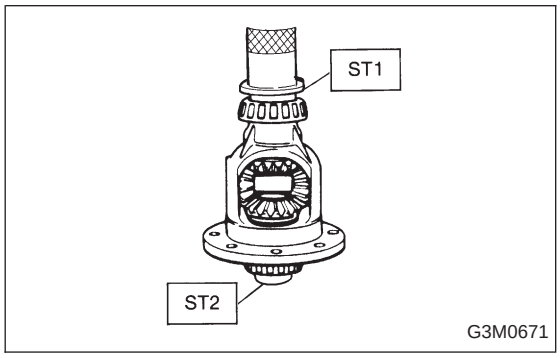
Washer (38.1 x 50 x t)	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)



3) Align pinion shaft and differential case at their holes, and drive straight pin ⑤ into holes from the hypoid driven gear side, using ST.

ST 899904100 REMOVER

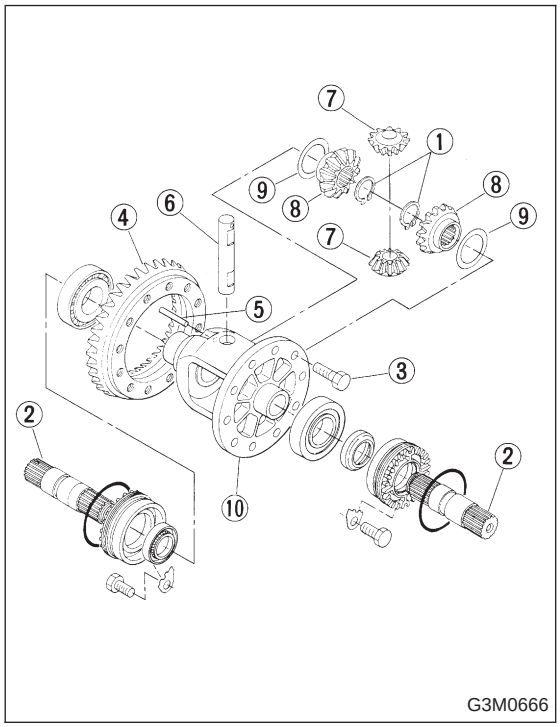
NOTE:
Lock straight pin after installing.



4) Install roller bearing (40 x 80 x 19.75) to differential case.

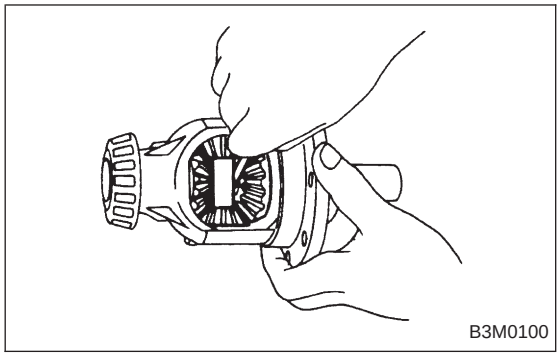
NOTE:
Be careful because roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install hypoid driven gear ④ to differential case ⑩ using twelve bolts ③.

Tightening torque:
62±5 N·m (6.3±0.5 kg-m, 45.6±3.6 ft-lb)


B3M0100

6) Position drive axle shaft in differential case and hold it with outer snap ring (28). Using a thickness gauge, measure clearance between the shaft and case is within specifications.

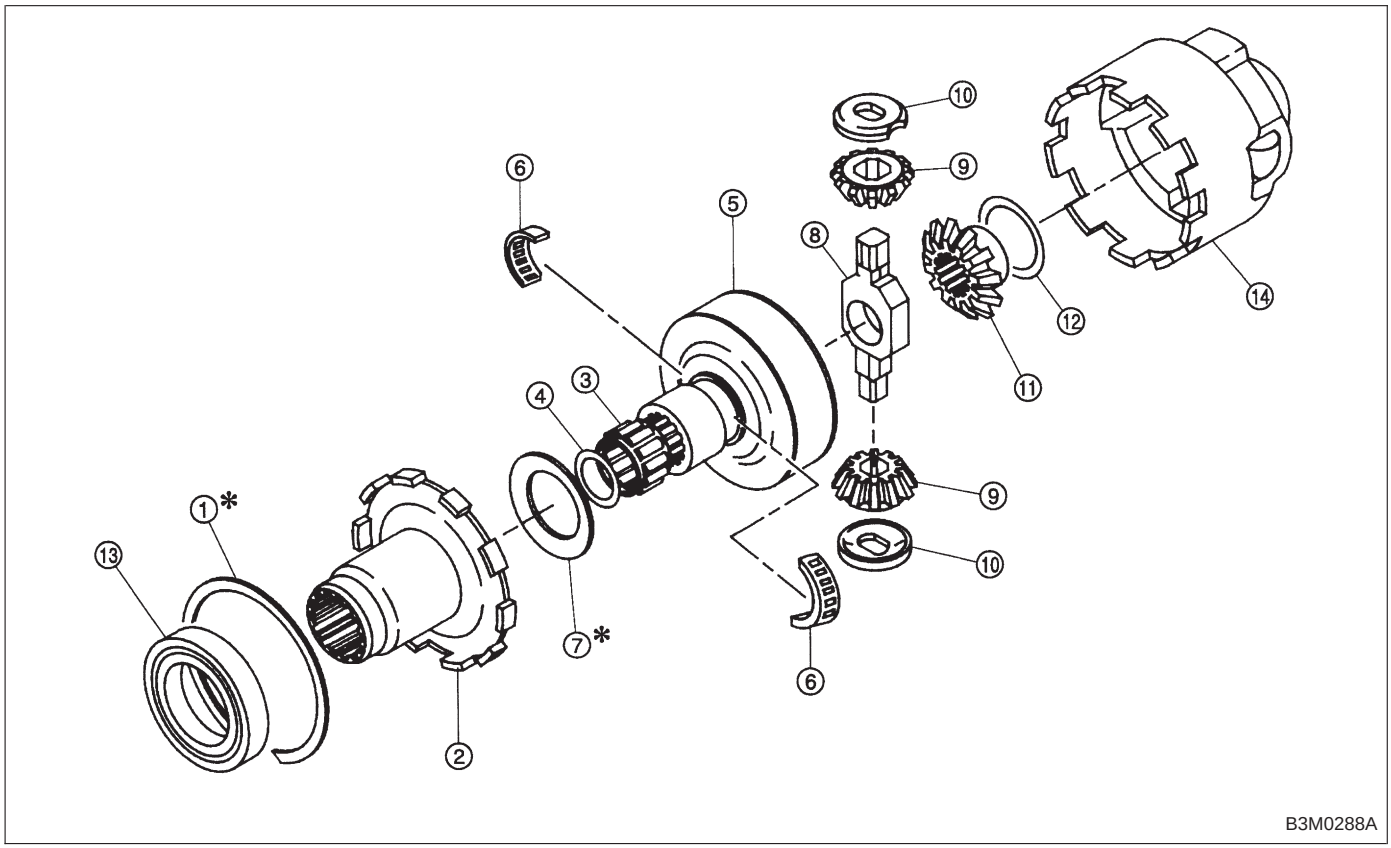
Clearance:
0 — 0.2 mm (0 — 0.008 in)

If it is not within specifications, replace snap ring with a suitable one.

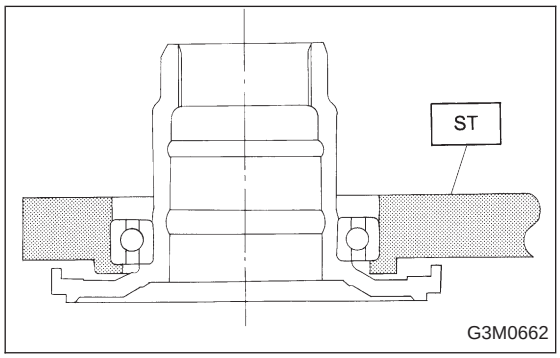
Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)

7. Center Differential

A: DISASSEMBLY



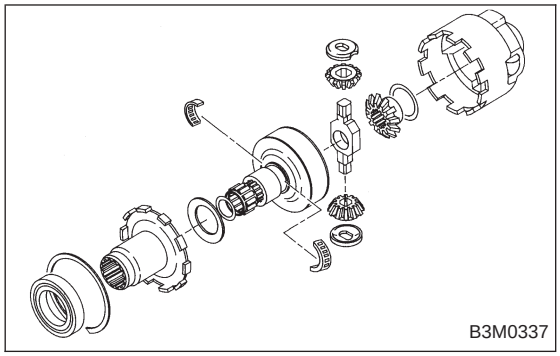
1) Remove snap ring ① (Inner-110) using flat bladed screwdriver.
2) Remove center differential cover ②.
3) Remove snap ring ④ and roller bearing ③.
4) Remove viscous coupling ⑤.
5) Remove needle bearings ⑥.
6) Remove adjusting washer ⑦ (45 x 62 x t).
7) Remove pinion shaft ⑧, bevel pinions ⑨ and retainers ⑩.
8) Remove side gear ⑪.
9) Remove thrust washer ⑫.



10) Remove ball bearing ⑬ using ST.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

CAUTION:
Do not reuse ball bearing.

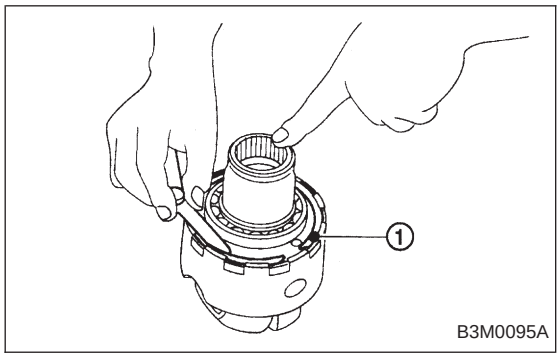

B3M0337

B: ASSEMBLY

Assembly is in the reverse order of disassembly.
Do the following:

- Install thrust washer with chamfered side of inner perimeter facing the side gear.
- Install adjusting washer with chamfered side of inner perimeter facing the viscous coupling using ST.

ST 499547300 INSTALLER SET



B3M0095A

1) Selection of snap ring (Inner-110)

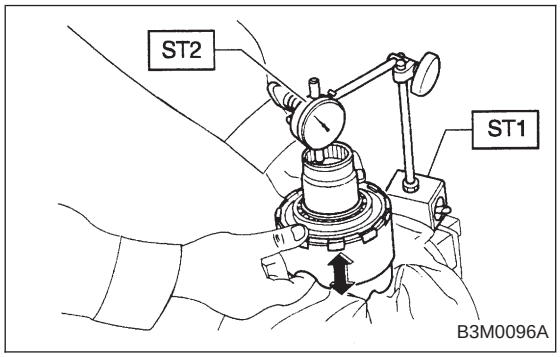
(1) After assembling, using a thickness gauge measure clearance between snap ring ① and center differential case.

Clearance:

0 — 0.15 mm (0 — 0.0059 in)

(2) If the measurement is not within the specification, select suitable snap ring.

Snap ring (Inner-110)	
Part No.	Thickness mm (in)
805100061	2.10 (0.0827)
805100062	2.21 (0.0870)
805100063	2.32 (0.0913)



B3M0096A

2) Selection of adjusting washer (Backlash adjustment)

(1) After assembling, set up a ST1 and ST2 to end of viscous coupling shaft. Move viscous coupling up and down, and measure backlash in the axial direction.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Backlash:

0.62 — 0.86 mm (0.0244 — 0.0339 in)

(2) If the measurement is not within the specification, select suitable washer.

Adjusting washer (45 x 62 x t)	
Part No.	Thickness mm (in)
803045041	1.60 (0.0630)
803045042	1.80 (0.0709)
803045043	2.00 (0.0787)
803045044	2.20 (0.0866)
803045045	2.40 (0.0945)

1. Manual Transmission and Differential

Symptom and possible cause	Remedy
1. Gears are difficult to intermesh. The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	
(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
(b) Worn, damaged or burred chamfer of spline of gears	Replace.
(c) Worn or scratched bushings	Replace.
(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. (1) Gear slips out when coasting on rough road. (2) Gear slips out during acceleration.	
(a) Defective pitching stopper adjustment	Adjust.
(b) Loose engine mounting bolts	Tighten or replace.
(c) Worn fork shifter, broken shifter fork rail spring	Replace.
(d) Worn or damaged ball bearing	Replace.
(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
(g) Worn 1st driven gear, needle bearing and race	Replace.
(h) Worn 2nd driven gear, needle bearing and race	Replace.
(i) Worn 3rd drive gear and bushing	Replace.
(j) Worn 4th drive gear and bushing	Replace.
(k) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	
(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
(b) Worn or damaged gears and bearings	Replace.
NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	

Symptom and possible cause	Remedy
4. Broken differential (case, gear, bearing, etc.) Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	
(a) Insufficient or improper oil	Disassemble differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust bearing preload and backlash and face contact of gears.
(c) Improper adjustment of taper roller bearing	Adjust.
(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
(e) Excessive backlash due to worn differential side gear, washer or differential pinion	Add recommended oil to specified level. Do not use vehicle under severe operating conditions.
(f) Loose hypoid driven gear clamping bolts	Tighten.
5. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. (1) Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. (2) Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment (3) Bearing noise when driving or when coasting: Cracked, broken or damaged bearings (4) Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.	
(a) Insufficient oil	Lubricate.
(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust bearing preload.
(d) Loose roller bearing	Readjust hypoid driven gear to drive pinion backlash and check tooth contact.
(e) Distorted hypoid driven gear or differential case	Replace.
(f) Worn washer and differential pinion shaft	Replace.

AUTOMATIC TRANSMISSION AND DIFFERENTIAL 3-2

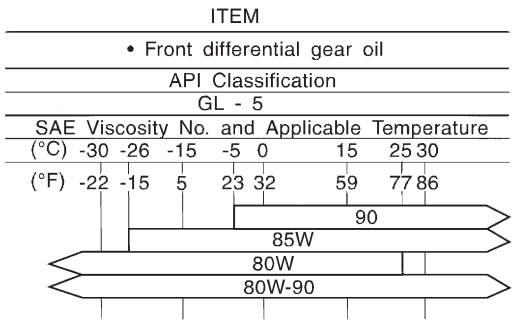
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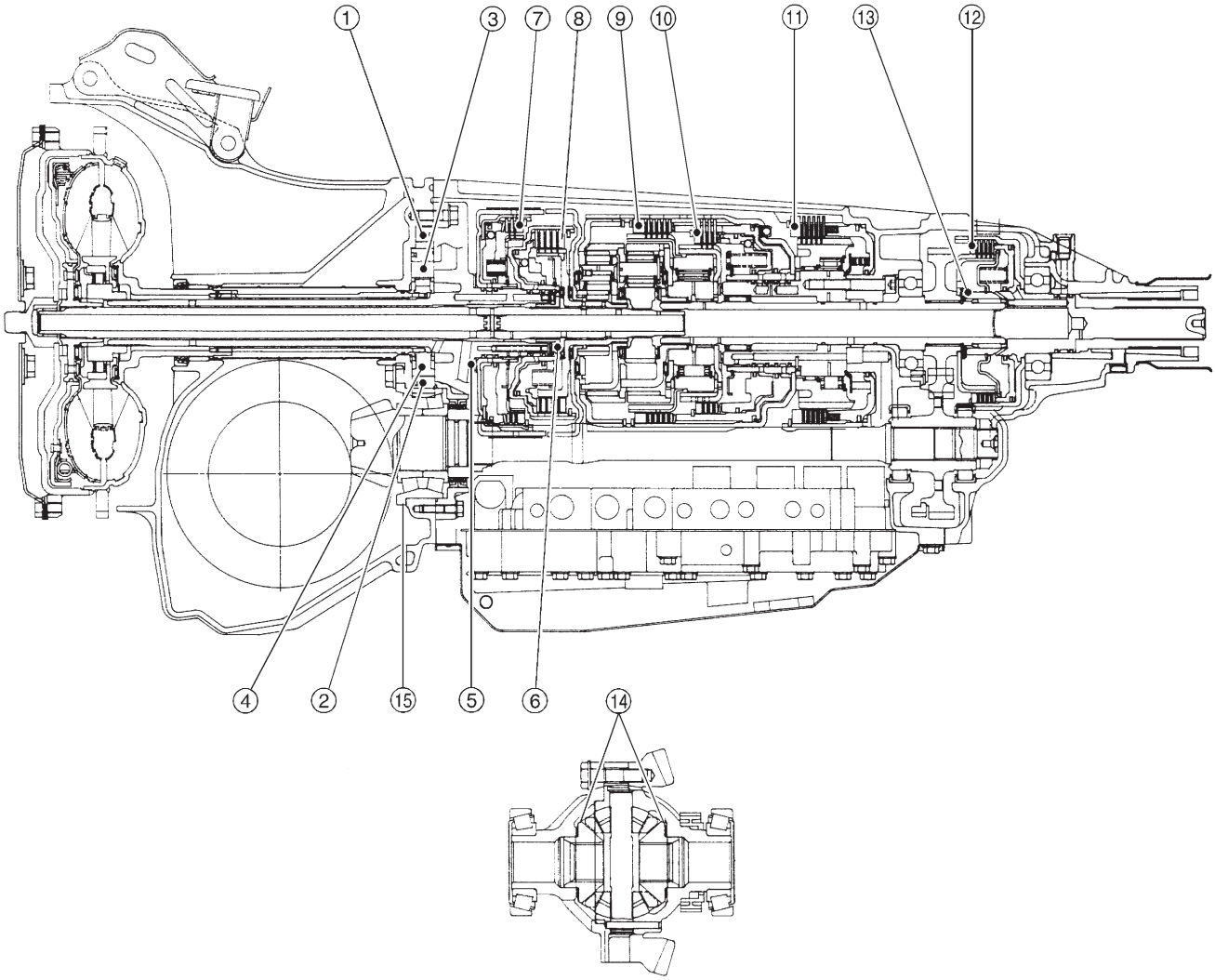
1. Automatic Transmission and Differential

A: SPECIFICATIONS

Torque converter clutch	Type		Symmetric, 3 element, single stage, 2 phase torque converter clutch coupling	
	Stall torque ratio		2.1 — 2.3	
	Nominal diameter		236 mm (9.29 in)	
	Stall speed (at sea level)		2,300 — 2,700 rpm	
	One-way clutch		Sprague type one-way clutch	
Automatic transmission	Transmission	Type	4-forward, 1-reverse, double-row planetary gears	
		Control element	Multi-plate clutch	4 sets
			Multi-plate brake	1 set
			Band brake	1 set
			One-way clutch (sprague type)	2 sets
		Gear ratio	1st	2.785
			2nd	1.545
			3rd	1.000
			4th	0.694
			Reverse	2.272
		Tooth number of planetary gear	Front sun gear	33
			Front pinion	21
			Front internal gear	75
			Rear sun gear	42
			Rear pinion	17
			Rear internal gear	75
		Clutch number of reverse clutch	Drive plate & driven plate	2
		Clutch number of high clutch	Drive plate & driven plate	4
		Clutch number of forward clutch	Drive plate & driven plate	5
		Clutch number of overrunning clutch	Drive plate & driven plate	3
		Clutch number of low & reverse brake	Drive plate & driven plate	5
		Selector position	P (Park)	Transmission in neutral, output member immovable, and engine start possible
			R (Reverse)	Transmission in reverse for backing
			N (Neutral)	Transmission in neutral, and engine start possible
			D (Drive)	Automatic gear change 1st ⇆ 2nd ⇆ 3rd ⇆ 4th
			3 (3rd)	Automatic gear change 1st ⇆ 2nd ⇆ 3rd ← 4th
			2 (2nd)	2nd gear locked (Deceleration possible 4th → 3rd → 2nd)
			1 (1st)	1st gear locked (Deceleration possible 4th → 3rd → 2nd → 1st)
		Control method	Hydraulic remote control	

Automatic transmission	Oil pump	Type	Variable-capacity type vane pump	
		Driving method	Driven by engine	
		Number of vanes	9 pieces	
	Hydraulic control	Type	Electronic/hydraulic control [Four forward speed changes by electrical signals of car speed and accelerator (throttle) opening]	
		Fluid	Dexron II or Dexron III type Automatic transmission fluid	
		Fluid capacity	7.9 ℓ (8.4 US qt, 7.0 Imp qt)	
	Lubrication	Lubrication system	Forced feed lubrication with oil pump	
		Oil	Automatic transmission fluid (above mentioned.)	
	Cooling	Cooling system	Liquid-cooled cooler incorporated in radiator	
	Harness	Inhibitor switch	12 poles	
		Transmission harness	13 poles	
	Transfer	Transfer clutch	Hydraulic multi-plate clutch	
		Clutch number of transfer clutch	Drive plate & driven plate	5
		Control method	Electronic, hydraulic type	
		Lubricant	The same Automatic Transmission Fluid used in automatic transmission.	
		1st reduction gear ratio	1.000 (53/53)	
Final reduction	Final gear ratio	Front drive	4.111 (37/9)	
	Speedometer gear ratio		0.83 (19/23)	
	Recommended oil		 H3M1235A	
	Oil capacity	Front drive	1.2 ℓ (1.3 US qt, 1.1 Imp qt)	
	ATF cooling system	Radiation capacity	1.97 kW (1,700 kcal/h, 6,746 BTU/h)	

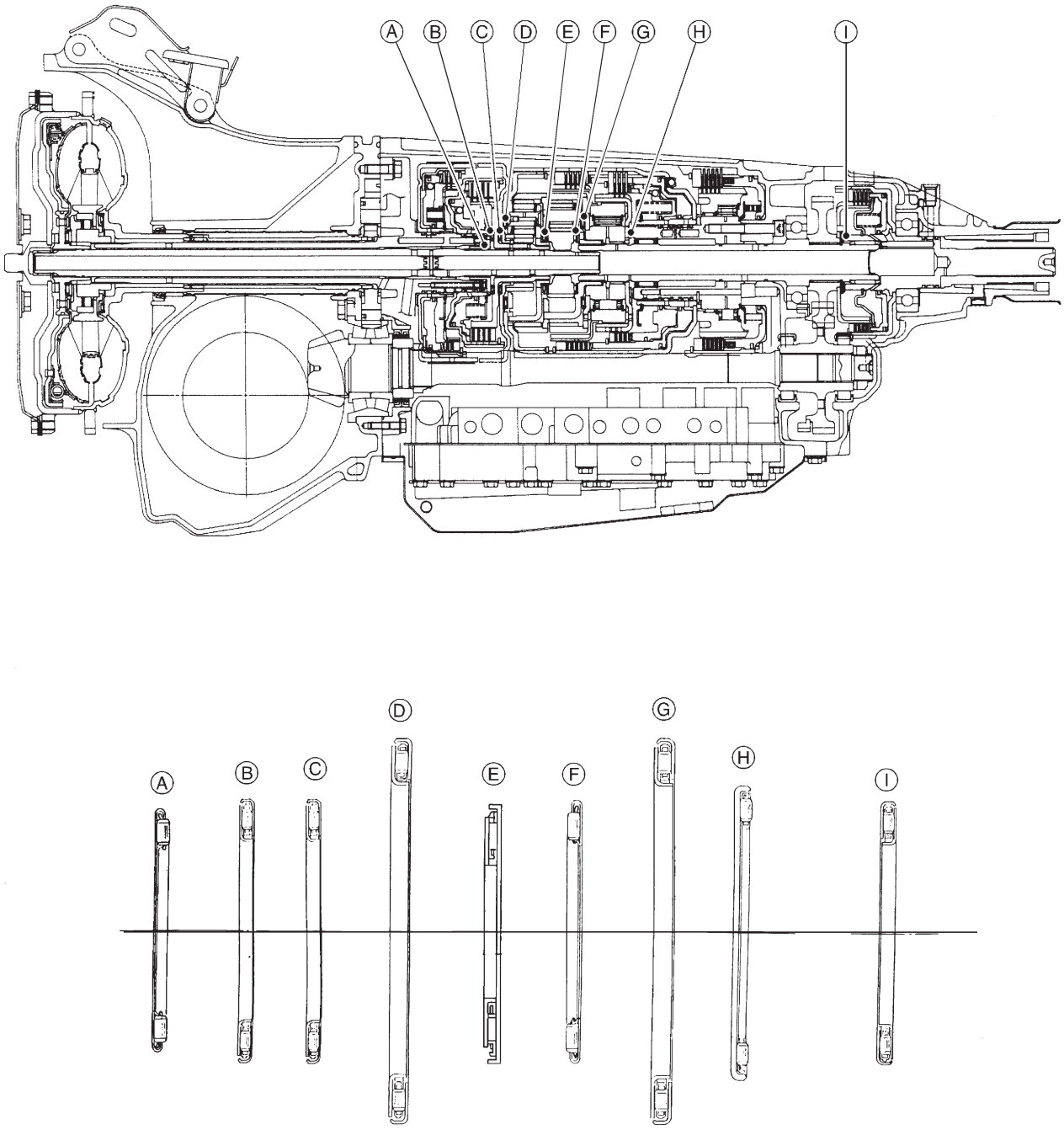
B: ADJUSTING PARTS



H3M1236A

No.	Part Name	Part Number	Dimension mm (in)	Application
1	Control piston	31235AA000 — 030	$13.5\ ^{-0.030}_{-0.037}$ (0.5315 $^{-0.0012}_{-0.0015}$), $13.5\ ^{-0.023}_{-0.030}$ (0.5315 $^{-0.0009}_{-0.0012}$), $13.5\ ^{-0.016}_{-0.023}$ (0.5315 $^{-0.0006}_{-0.0009}$), $13.5\ ^{-0.009}_{-0.016}$ (0.5315 $^{-0.0004}_{-0.0006}$)	Adjusting side clearance of oil pump
2	Cam ring	31241AA001 — 031	$17\ ^{-0.010}_{-0.017}$ (0.6693 $^{-0.0004}_{-0.0007}$), $17\ ^{-0.003}_{-0.010}$ (0.6693 $^{-0.0001}_{-0.0004}$), $17^{+0.004}_{-0.003}$ (0.6693$^{+0.0002}_{-0.0001}$), $17^{+0.011}_{+0.004}$ (0.6693$^{+0.0004}_{+0.0002}$)	Adjusting side clearance of oil pump
3	Vane (Oil pump)	31243AA000 — 030	$17\ ^{-0.030}_{-0.037}$ (0.6693 $^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ (0.6693 $^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ (0.6693 $^{-0.0006}_{-0.0009}$), $17^{+0.009}_{+0.016}$ (0.6693$^{+0.0004}_{+0.0006}$)	Adjusting side clearance of oil pump
4	Rotor (Oil pump)	31240AA000 — 030	$17\ ^{-0.030}_{-0.037}$ (0.6693 $^{-0.0012}_{-0.0015}$), $17\ ^{-0.023}_{-0.030}$ (0.6693 $^{-0.0009}_{-0.0012}$), $17\ ^{-0.016}_{-0.023}$ (0.6693 $^{-0.0006}_{-0.0009}$), $17^{+0.009}_{+0.016}$ (0.6693$^{+0.0004}_{+0.0006}$)	Adjusting side clearance of oil pump
5	Thrust washer (Reverse clutch)	31299AA000 — 060	0.7, 0.9, 1.1, 1.3, 1.5, 1.7, 1.9 (0.028, 0.035, 0.043, 0.051, 0.059, 0.067, 0.075)	Adjusting end play of reverse clutch drum
6	Bearing race	803031021 — 027	0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 (0.031, 0.039, 0.047, 0.055, 0.063, 0.071, 0.079)	Adjusting total end play
7	Retaining plate	31567AA350 — 400	4.6, 4.8, 5.0, 5.2, 5.4, 5.6 (0.181, 0.189, 0.197, 0.205, 0.213, 0.220)	Adjusting clearance of reverse clutch
8	Retaining plate	31567AA190 — 260	3.6, 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.142, 0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting clearance of high clutch
9	Retaining plate	31567AA010, 31567AA060 — 110	4.0, 4.2, 4.4, 4.6, 4.8, 5.0, 5.2 (0.157, 0.165, 0.173, 0.181, 0.189, 0.197, 0.205)	Adjusting clearance of forward clutch
10	Retaining plate	31567AA410 — 470	8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2 (0.315, 0.323, 0.331, 0.339, 0.346, 0.354, 0.362)	Adjusting clearance of overrunning clutch
11	Retaining plate No. 2	31667AA180 — 250 31667AA310	6.5, 6.8, 7.1, 7.4, 7.7, 8.0, 8.2, 8.4, 8.6 (0.256, 0.268, 0.280, 0.291, 0.303, 0.315, 0.323, 0.331, 0.339)	Adjusting clearance of low and reverse brake
12	Pressure plate (Front)	31593AA151 — 181	3.3, 3.7, 4.1, 4.5 (0.130, 0.146, 0.161, 0.177)	Adjusting clearance of transfer clutch
13	Thrust bearing (35 x 53 x T)	806536020, 806535030 — 070, 090	3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting end play of transfer clutch
14	Washer (38.1 x 50 x T)	803038021 — 023	0.95, 1.00, 1.05 (0.0374, 0.0394, 0.0413)	Adjusting backlash of differential bevel gear
15	Drive pinion shim	31451AA050 — 100	0.150, 0.175, 0.200, 0.225, 0.250, 0.275 (0.0059, 0.0069, 0.0079, 0.0089, 0.0098, 0.0108)	Adjusting drive pinion height

C: LOCATION AND INSTALLING DIRECTION OF THRUST NEEDLE BEARING

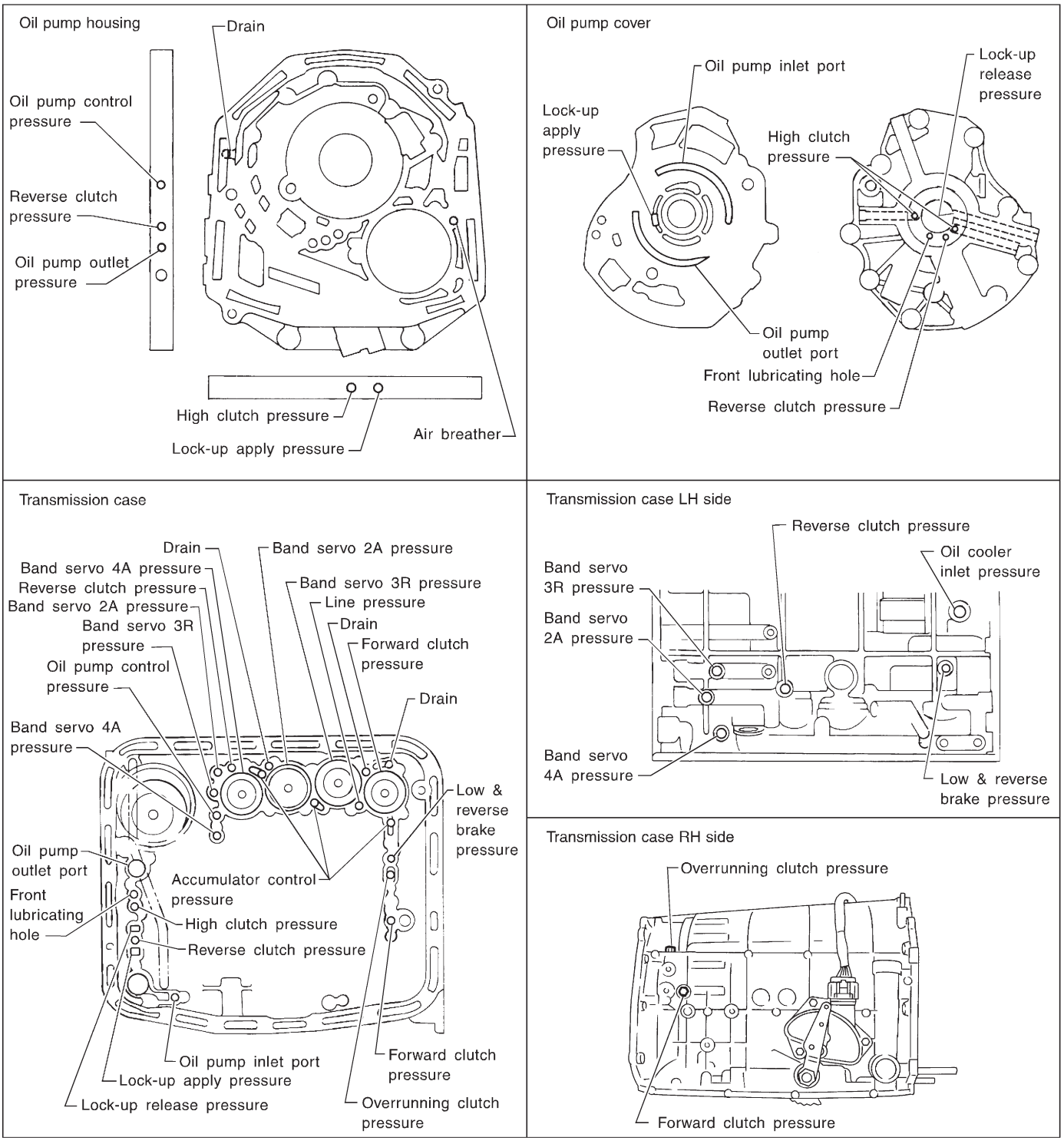


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Unit: mm (in)

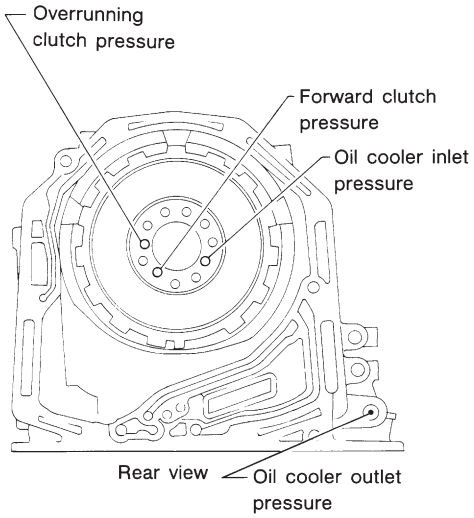
No.	Part Name	Part Number	Inside diameter	Outside diameter	Dimension	Application
A	Thrust needle bearing	806530020	30 (1.18)	47 (1.85)	3.3 (0.130)	A place of high clutch
B	Thrust needle bearing	806537010	38 (1.50)	53 (2.09)	3.2 (0.126)	A place of high clutch hub
C	Thrust needle bearing	806537010	38 (1.50)	53 (2.09)	3.2 (0.126)	A place of front sun gear
D	Thrust needle bearing	806558020	58 (2.28)	78 (3.07)	4.0 (0.157)	A place of front planetary carrier
E	Thrust needle bearing	806535120	35 (1.38)	53 (2.09)	4.8 (0.189)	A place of rear sun gear
F	Thrust needle bearing	806534010	34 (1.34)	53 (2.09)	3.37 (0.1327)	A place of rear internal gear
G	Thrust needle bearing	806558020	58 (2.28)	78 (3.07)	4.0 (0.157)	A place of overrunning clutch hub
H	Thrust needle bearing	806542010	42 (1.65)	59 (2.32)	3.6 (0.142)	A place of low & reverse brake
I	Thrust needle bearing	806536020 806535030 ≀ 806535070 806535090	36 (1.42)	53 (2.09)	3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5.0 (0.150, 0.157, 0.165, 0.173, 0.181, 0.189, 0.197)	Adjusting end play of transfer clutch

D: FLUID PASSAGES

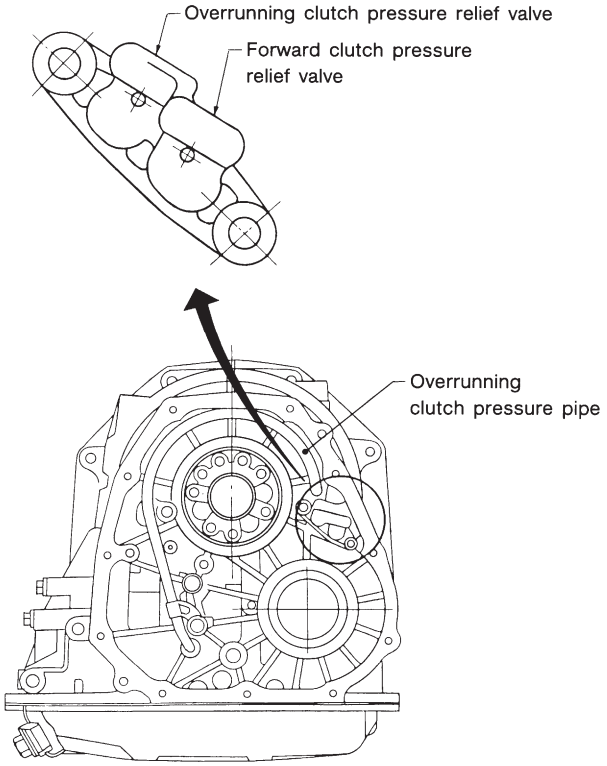


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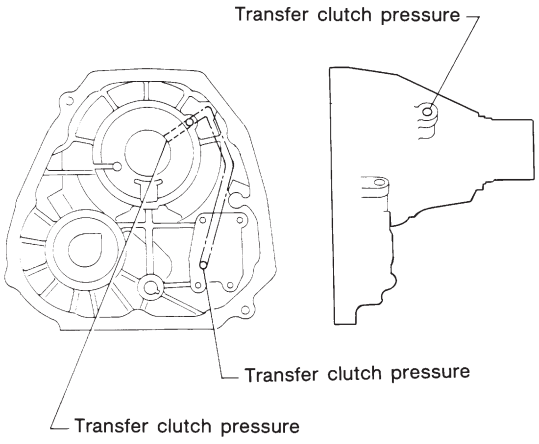
Transmission case



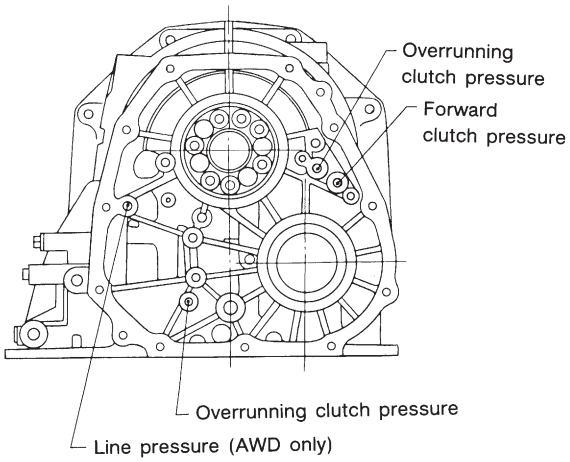
Transmission case



Extension case

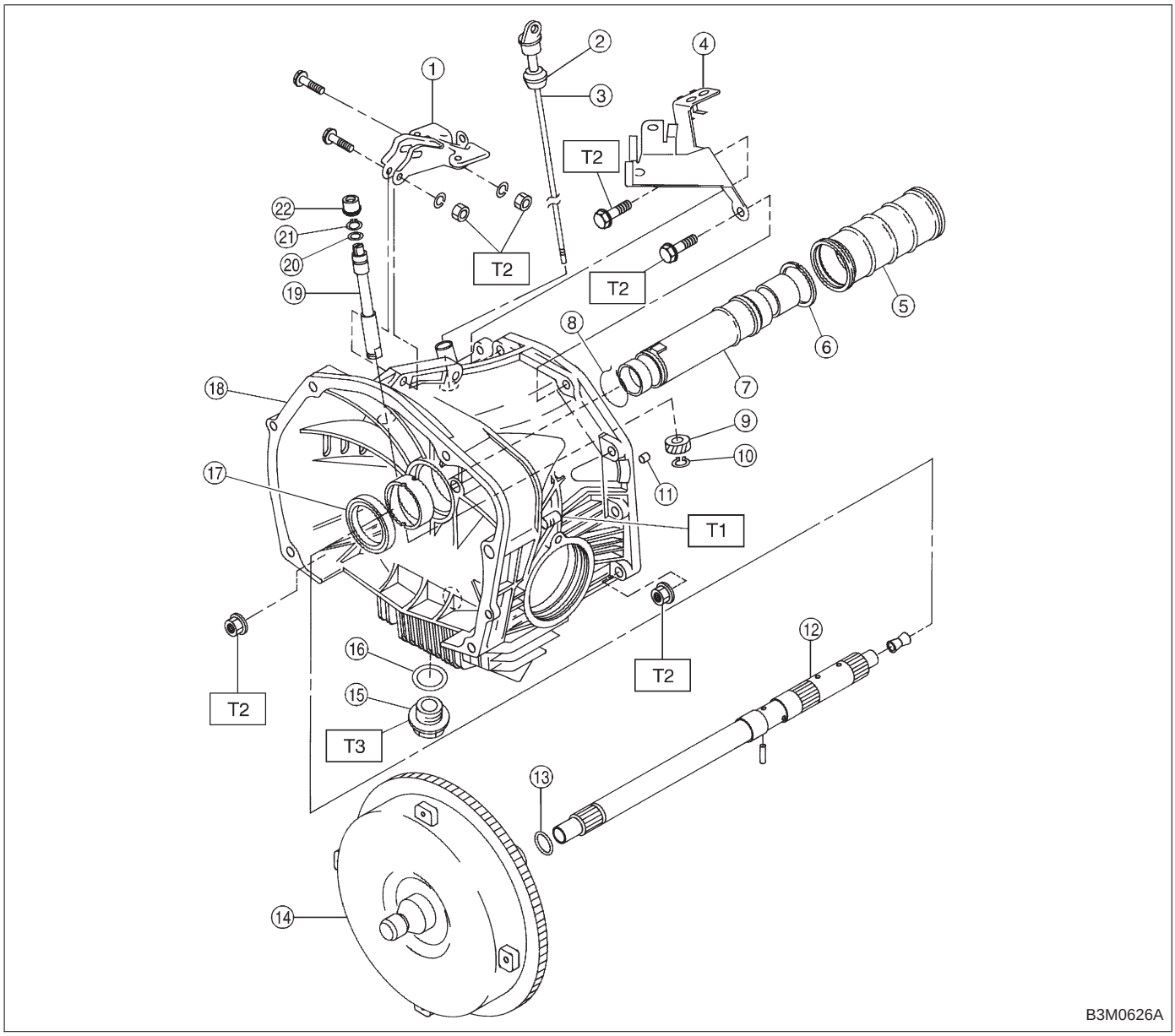


Transmission case



G3M0777

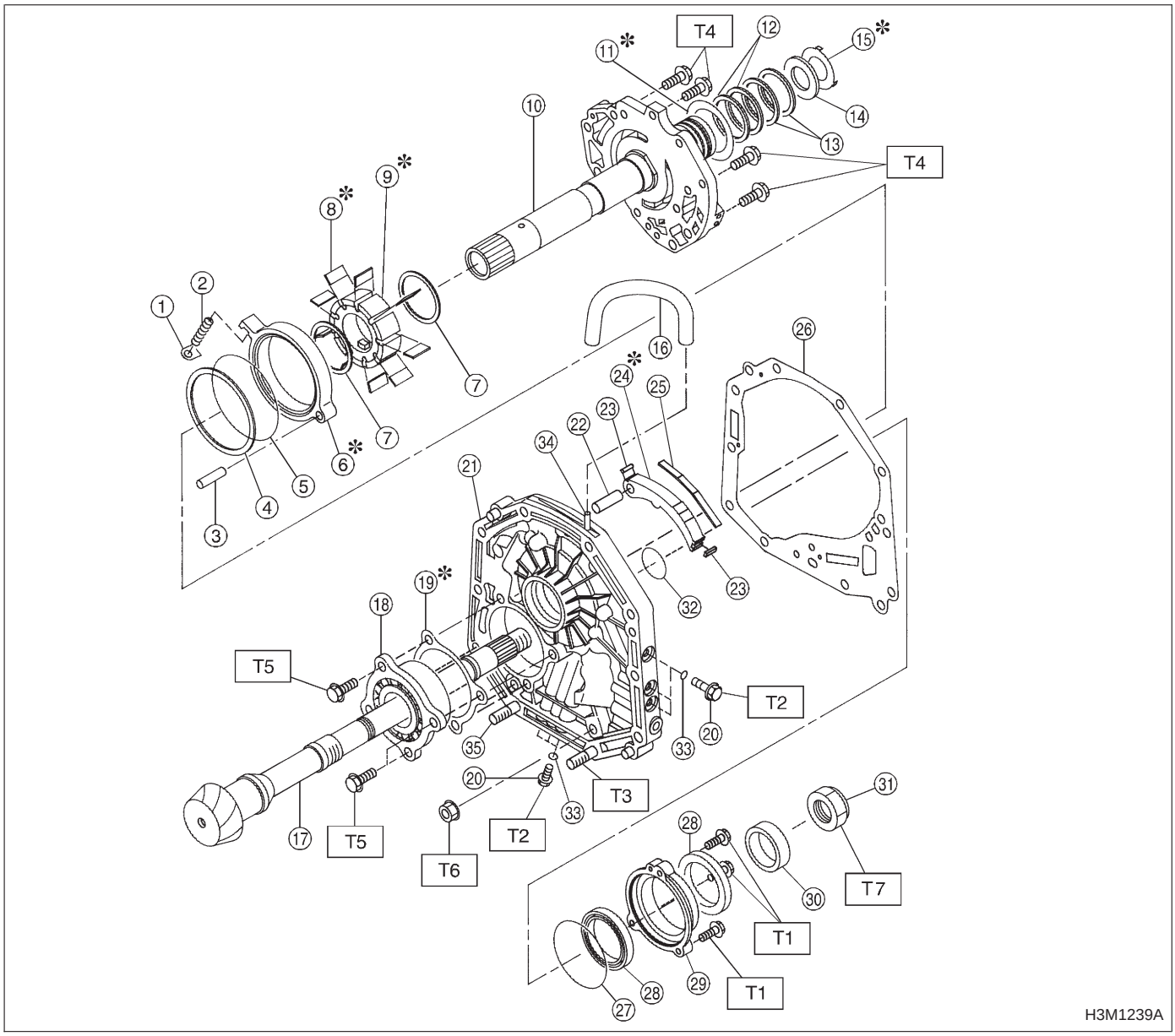
1. Torque Converter Clutch and Case



① Pitching stopper bracket
② O-ring
③ Oil level gauge
④ Stay
⑤ Seal pipe
⑥ Seal ring
⑦ Oil pump shaft
⑧ Clip
⑨ Speedometer driven gear
⑩ Snap ring
⑪ Oil drain pipe
⑫ Input shaft
⑬ O-ring
⑭ Torque converter clutch
⑮ Drain plug
⑯ Gasket
⑰ Oil seal
⑱ Torque converter clutch case
⑲ Speedometer shaft
⑳ Washer
㉑ Snap ring
㉒ Oil seal

Tightening torque: N·m (kg-m, ft-lb)
T1: 18±5 (1.8±0.5, 13.0±3.6)
T2: 41±3 (4.2±0.3, 30.4±2.2)
T3: 44±3 (4.5±0.3, 32.5±2.2)

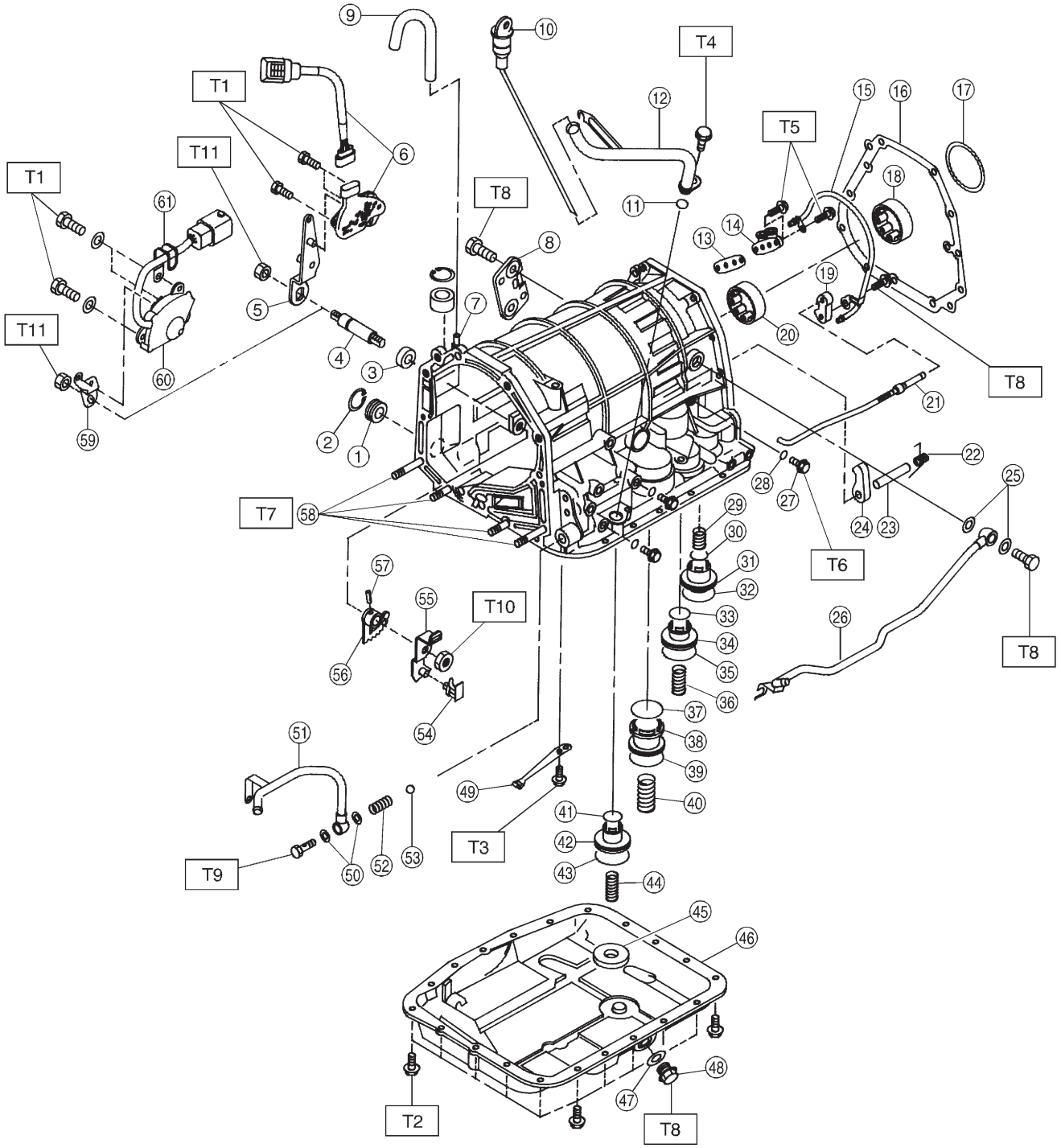
2. Oil Pump



① Retainer
② Return spring
③ Pin
④ Friction ring
⑤ O-ring
⑥ Cam ring
⑦ Vane ring
⑧ Vane
⑨ Rotor
⑩ Oil pump cover
⑪ Thrust washer
⑫ Seal ring (R)
⑬ Seal ring (H)
⑭ Thrust needle bearing
⑮ Thrust washer
⑯ Air breather hose
⑰ Drive pinion shaft
⑱ Roller bearing
⑲ Shim
⑳ Test plug
㉑ Oil pump housing
㉒ Pin
㉓ Side seal
㉔ Control piston
㉕ Plane seal
㉖ Gasket
㉗ O-ring
㉘ Oil seal
㉙ Oil seal retainer
㉚ Drive pinion collar
㉛ Lock nut
㉜ O-ring
㉝ O-ring
㉞ Nipple
㉟ Stud bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 13±1 (1.3±0.1, 9.4±0.7)
T3: 18±5 (1.8±0.5, 13.0±3.6)
T4: 25±2 (2.5±0.2, 18.1±1.4)
T5: 39±3 (4.0±0.3, 28.9±2.2)
T6: 41±3 (4.2±0.3, 30.4±2.2)
T7: 113±5 (11.5±0.5, 83.2±3.6)

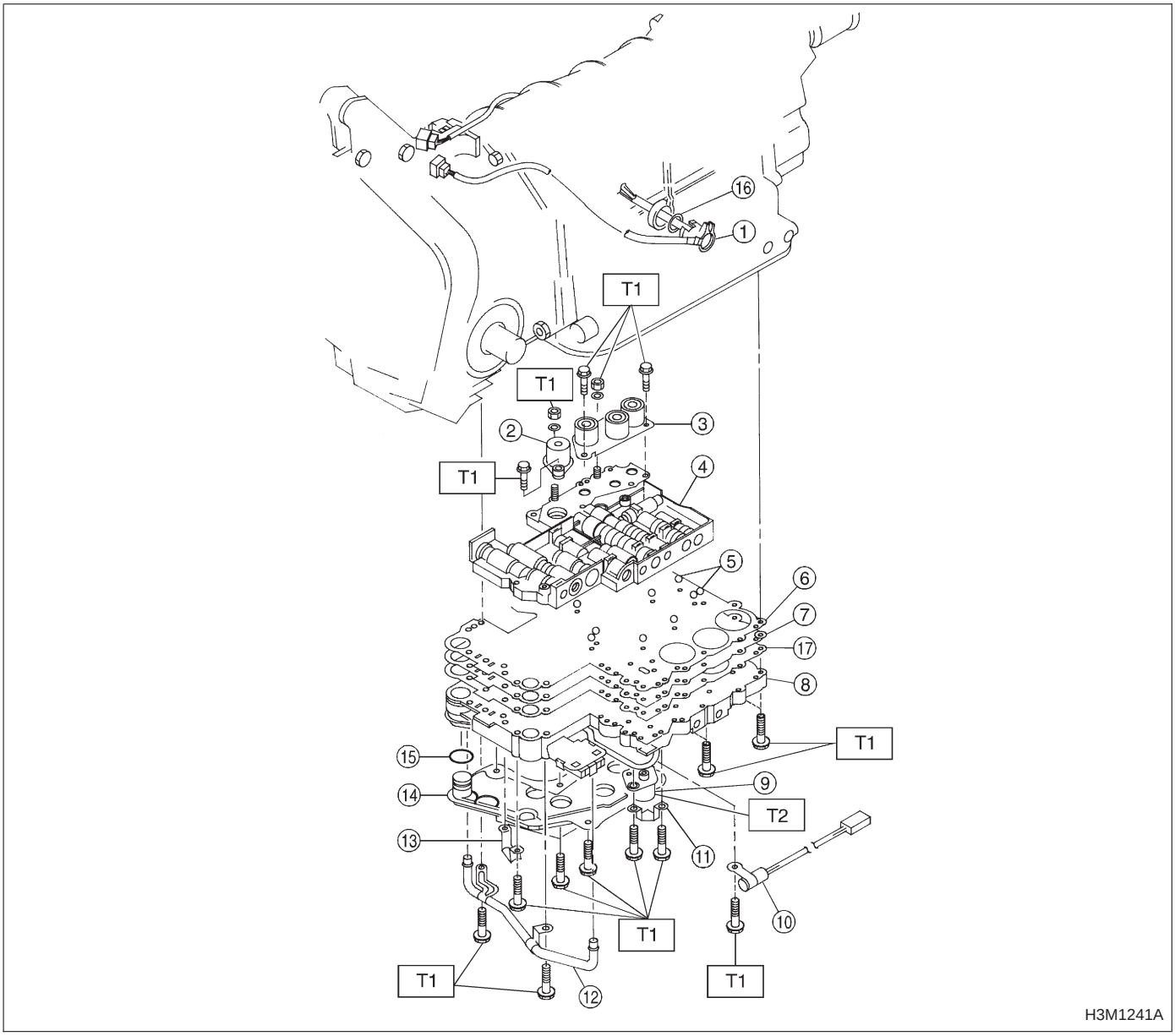
3. Transmission Case, Transmission Cover and Control Device



① Plug
② Snap ring
③ Oil seal
④ Manual shaft
⑤ Range select lever (Plastic body type)
⑥ Inhibitor switch ASSY (Plastic body type)
⑦ Nipple
⑧ Plate ASSY
⑨ Air breather hose
⑩ Oil level gauge
⑪ O-ring
⑫ Oil charger pipe
⑬ Gasket
⑭ Relief valve
⑮ Pipe
⑯ Gasket
⑰ Shim
⑱ Roller bearing
⑲ Parking support
⑳ Ball bearing
㉑ Parking rod
㉒ Return spring
㉓ Shaft
㉔ Parking pawl
㉕ Gasket
㉖ Inlet pipe
㉗ Test plug
㉘ O-ring
㉙ Spring
㉚ O-ring
㉛ Accumulator piston (N-D)
㉜ O-ring
㉝ O-ring
㉞ Accumulator piston (2-3)
㉟ O-ring
㊱ Spring
㊲ O-ring
㊳ Accumulator piston (1-2)
㊴ O-ring
㊵ Spring
㊶ O-ring
㊷ Accumulator piston (3-4)
㊸ O-ring
㊹ Spring
㊺ Magnet
㊻ Oil pan
㊼ Gasket
㊽ Drain plug
㊾ Detention spring
㊿ Gasket
(51) Outlet pipe
(52) Spring
(53) Ball
(54) Stopper
(55) Manual lever
(56) Manual plate
(57) Spring pin
(58) Stud bolt
(59) Range select lever (Aluminum body type)
(60) Inhibitor switch (Aluminum body type)
(61) Clip (Aluminum body type)

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T2: 4.9±0.5 (0.50±0.05, 3.6±0.4)
T3: 5.9±1.0 (0.60±0.10, 4.3±0.7)
T4: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T5: 7.8±1.0 (0.80±0.10, 5.8±0.7)
T6: 12.7±1.0 (1.30±0.10, 9.4±0.7)
T7: 17.7±2.9 (1.80±0.30, 13.0±2.2)
T8: 24.5±2.0 (2.50±0.20, 18.1±1.4)
T9: 34.3±2.9 (3.50±0.30, 25.3±2.2)
T10: 47.1±2.0 (4.80±0.20, 34.7±1.4)
T11: 47.1±4.9 (4.80±0.50, 34.7±3.6)

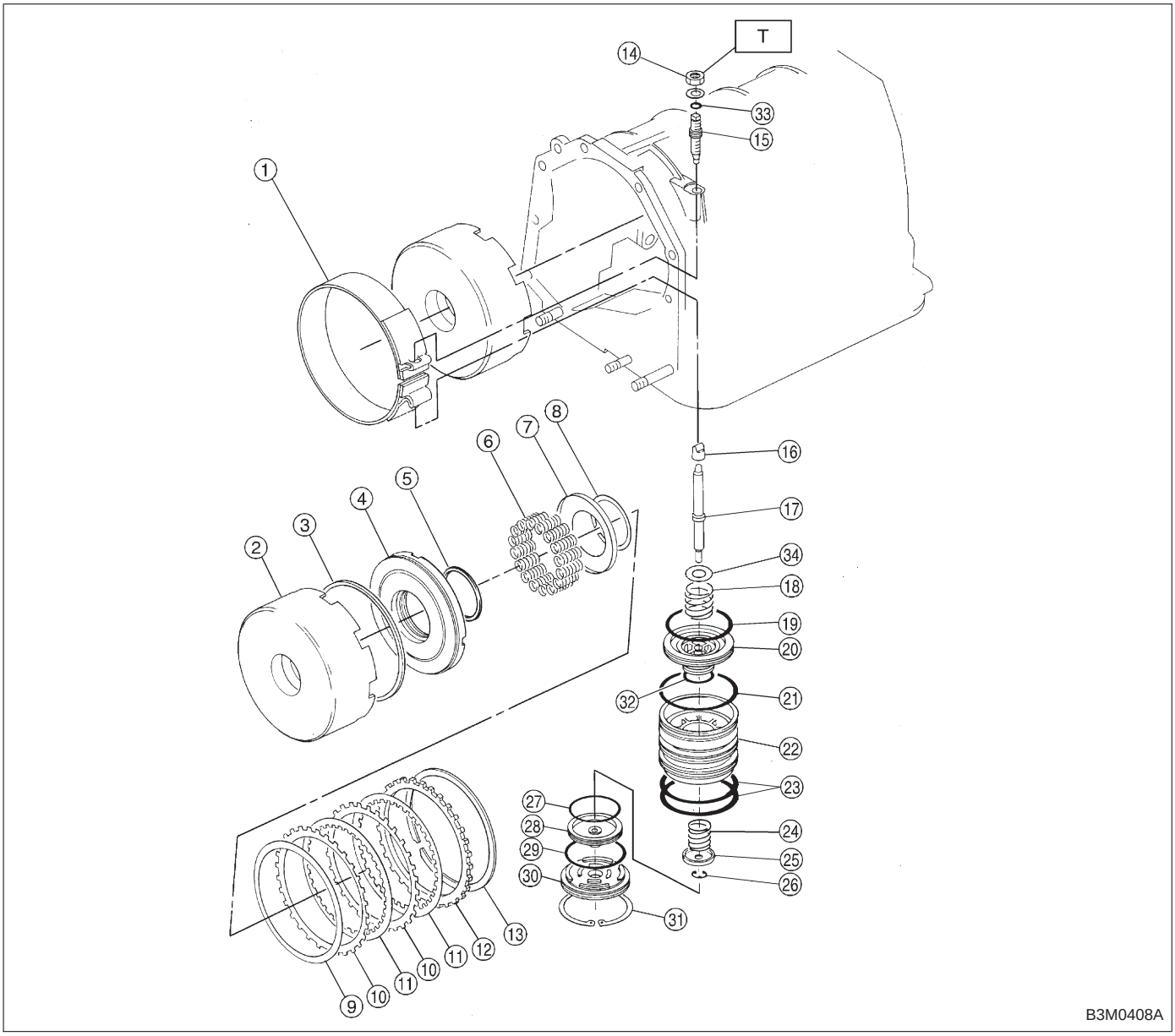
4. Control Valve and Harness Routing



① Transmission harness
② Duty solenoid A (Line pressure)
③ Shift solenoid ASSY
④ Upper valve body
⑤ Ball
⑥ Upper separator gasket
⑦ Lower separator gasket
⑧ Lower valve body
⑨ Duty solenoid B (Lock-up)
⑩ ATF temperature sensor
⑪ Bracket
⑫ Pipe
⑬ Bracket
⑭ Oil strainer
⑮ O-ring
⑯ O-ring
⑰ Separator plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 11.3±1.5 (1.15±0.15, 8.3±1.1)

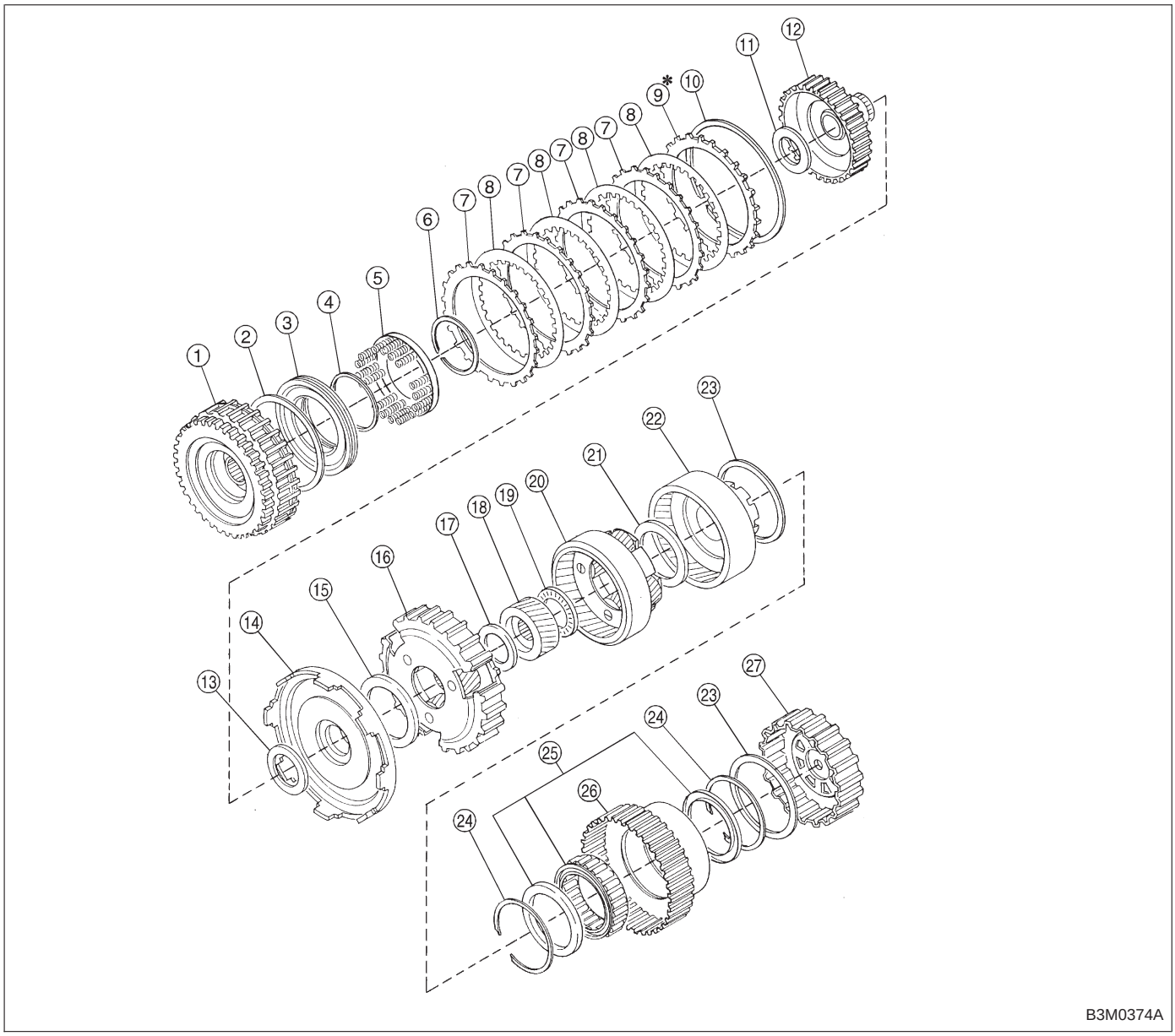
5. Reverse Clutch and Brake Band



① Brake band
② Reverse clutch drum
③ Lip seal
④ Piston
⑤ Lathe cut seal ring
⑥ Spring
⑦ Spring retainer
⑧ Snap ring
⑨ Dish plate
⑩ Driven plate
⑪ Drive plate
⑫ Retaining plate
⑬ Snap ring
⑭ Lock nut
⑮ Brake band adjusting screw
⑯ Strut
⑰ Band servo piston stem
⑱ Spring
⑲ Lathe cut seal ring
⑳ Band servo piston (1-2)
㉑ O-ring
㉒ Retainer
㉓ O-ring
㉔ Spring
㉕ Retainer
㉖ Circlip
㉗ Lathe cut seal ring
㉘ Band servo piston (3-4)
㉙ O-ring
㉚ O.D. servo retainer
㉛ Snap ring
㉜ Lathe cut seal ring
㉝ O-ring
㉞ Washer

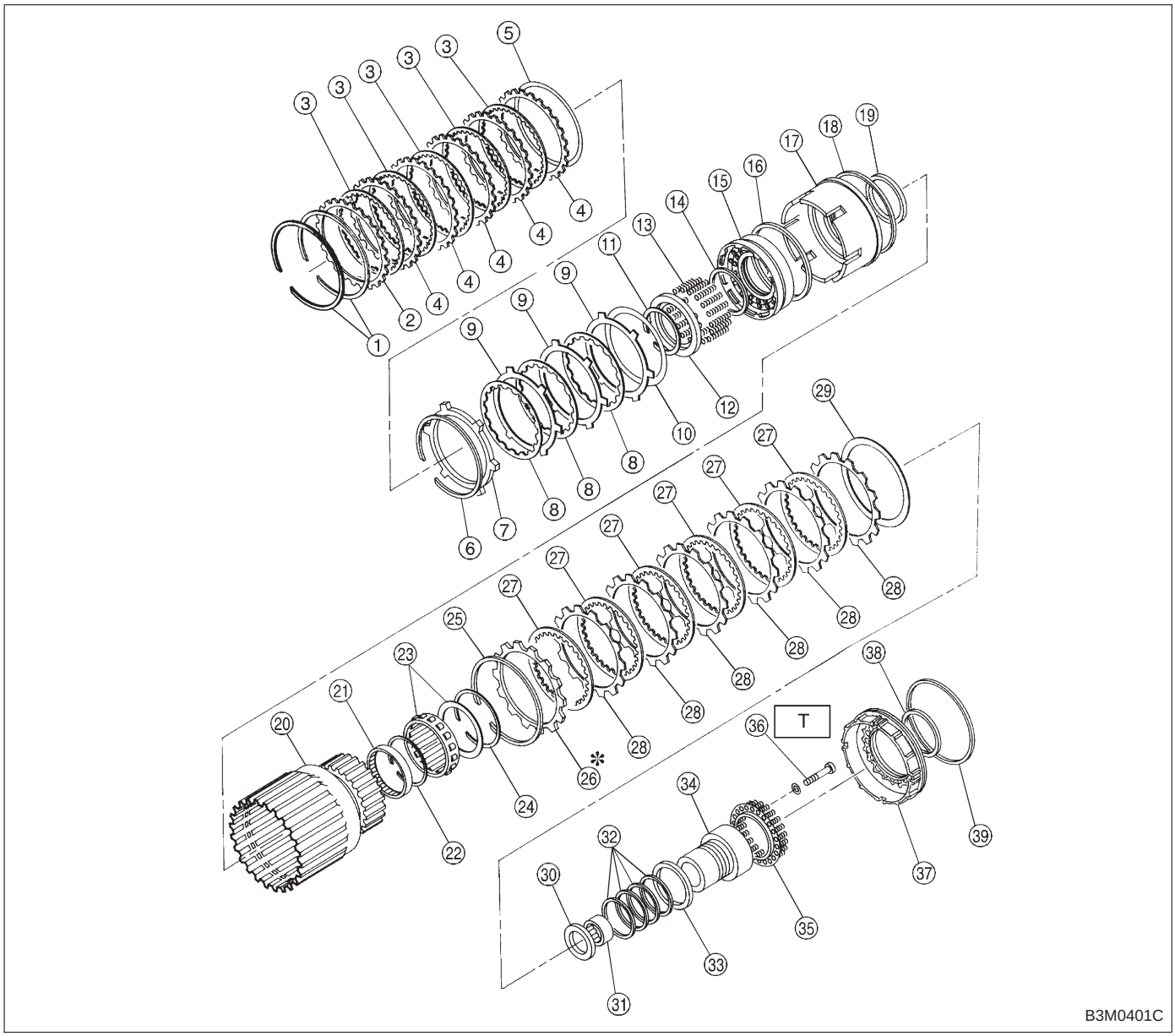
Tightening torque: N·m (kg-m, ft-lb)
T: 26±2 (2.7±0.2, 19.5±1.4)

6. High Clutch and Planetary Gear



① High clutch drum
② Lathe cut seal ring
③ Piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate
⑧ Drive plate
⑨ Retaining plate
⑩ Snap ring
⑪ Thrust needle bearing
⑫ High clutch hub
⑬ Thrust needle bearing
⑭ Front sun gear
⑮ Thrust needle bearing
⑯ Front planetary carrier
⑰ Thrust needle bearing
⑱ Rear sun gear
⑲ Thrust needle bearing
⑳ Rear planetary carrier
㉑ Thrust needle bearing
㉒ Rear internal gear
㉓ Thrust washer
㉔ Snap ring
㉕ One-way clutch (3-4)
㉖ One-way clutch outer race (3-4)
㉗ Overrunning clutch hub

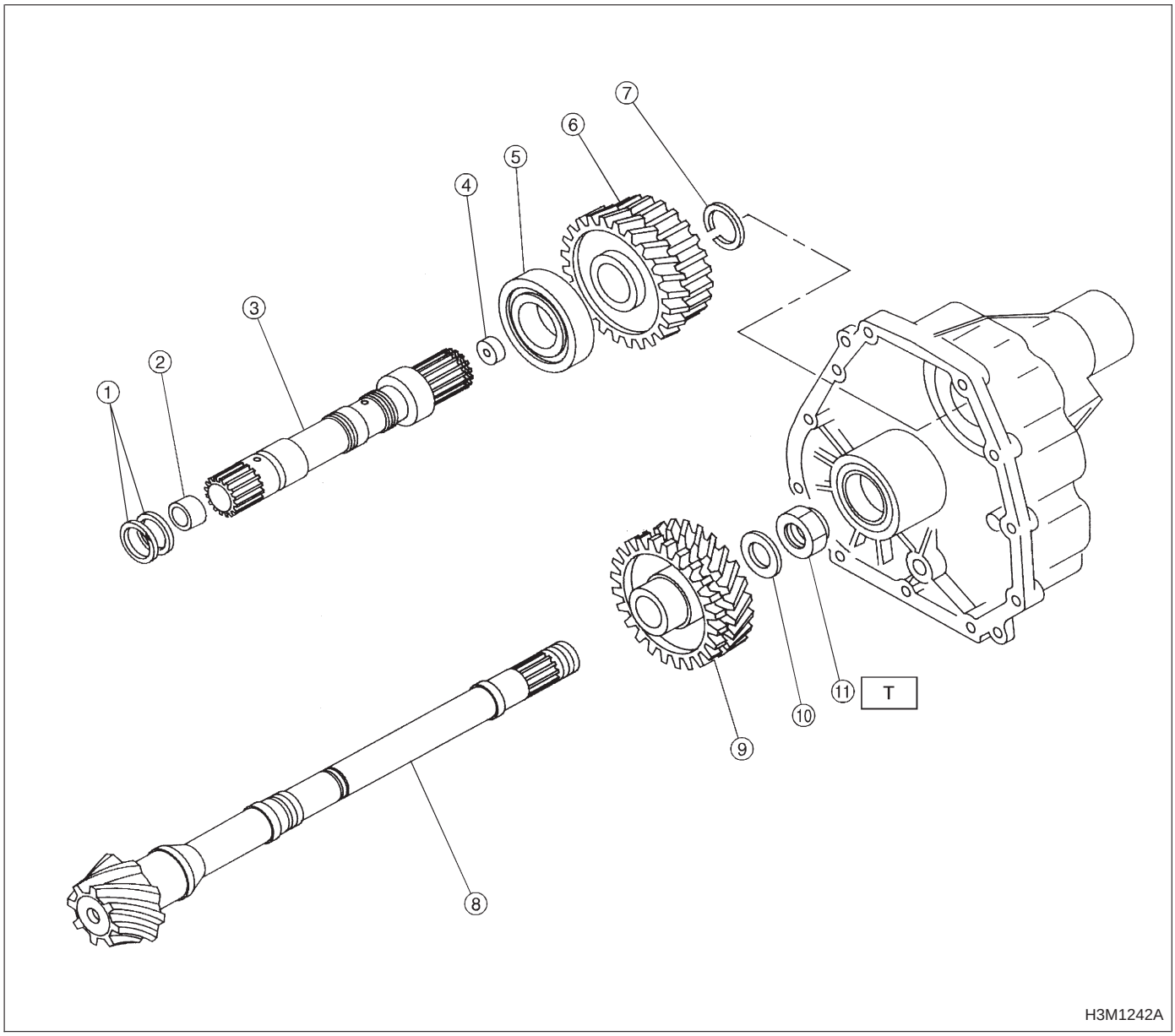
7. Forward Clutch and Low & Reverse Brake



① Snap ring
② Retaining plate
③ Drive plate (5)
④ Driven plate (5)
⑤ Dish plate
⑥ Snap ring
⑦ Retaining plate
⑧ Drive plate
⑨ Driven plate
⑩ Dish plate
⑪ Snap ring
⑫ Spring retainer
⑬ Spring
⑭ Lathe cut seal ring
⑮ Overrunning piston
⑯ Lathe cut seal ring
⑰ Forward piston
⑱ Lip seal
⑲ Lathe cut seal ring
⑳ Forward clutch drum
㉑ Needle bearing
㉒ Snap ring
㉓ One-way clutch (1-2)
㉔ Snap ring
㉕ Snap ring
㉖ Retaining plate
㉗ Drive plate (6)
㉘ Driven plate (6)
㉙ Dish plate
㉚ Thrust needle bearing
㉛ Needle bearing
㉜ Seal ring
㉝ Thrust washer
㉞ One-way clutch inner race (1-2)
㉟ Spring retainer
㊱ Socket bolt
㊲ Low & reverse piston
㊳ Lathe cut seal ring
㊴ Lathe cut seal ring

Tightening torque: N·m (kg-m, ft-lb)
T: 25±2 (2.5±0.2, 18.1±1.4)

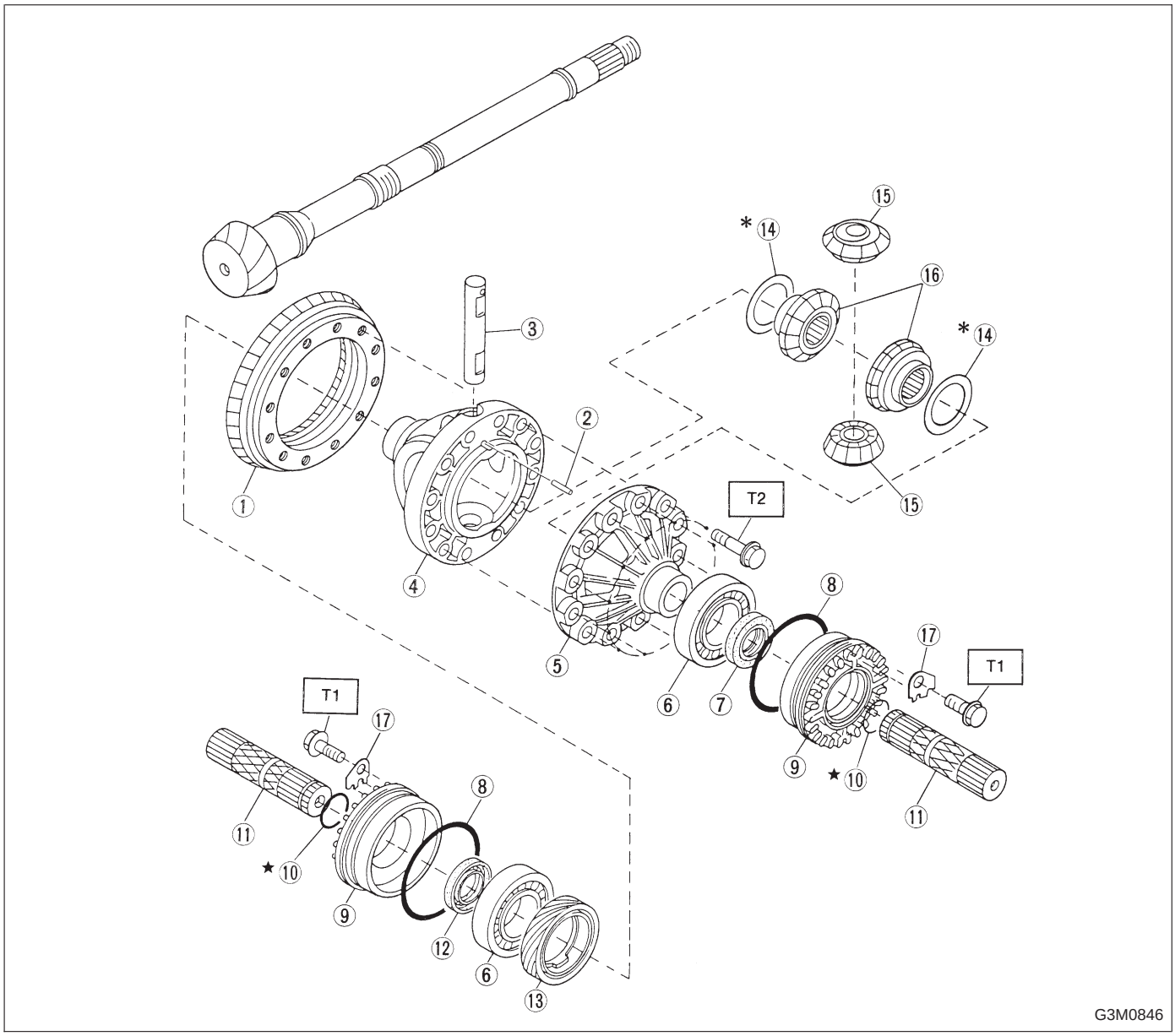
8. Reduction Gear



① Seal ring
② Bushing
③ Reduction drive shaft
④ Plug
⑤ Ball bearing
⑥ Reduction drive gear
⑦ Snap ring
⑧ Drive pinion shaft
⑨ Reduction driven gear
⑩ Washer
⑪ Lock nut

Tightening torque: N·m (kg-m, ft-lb)
T: 98±5 (10.0±0.5, 72.3±3.6)

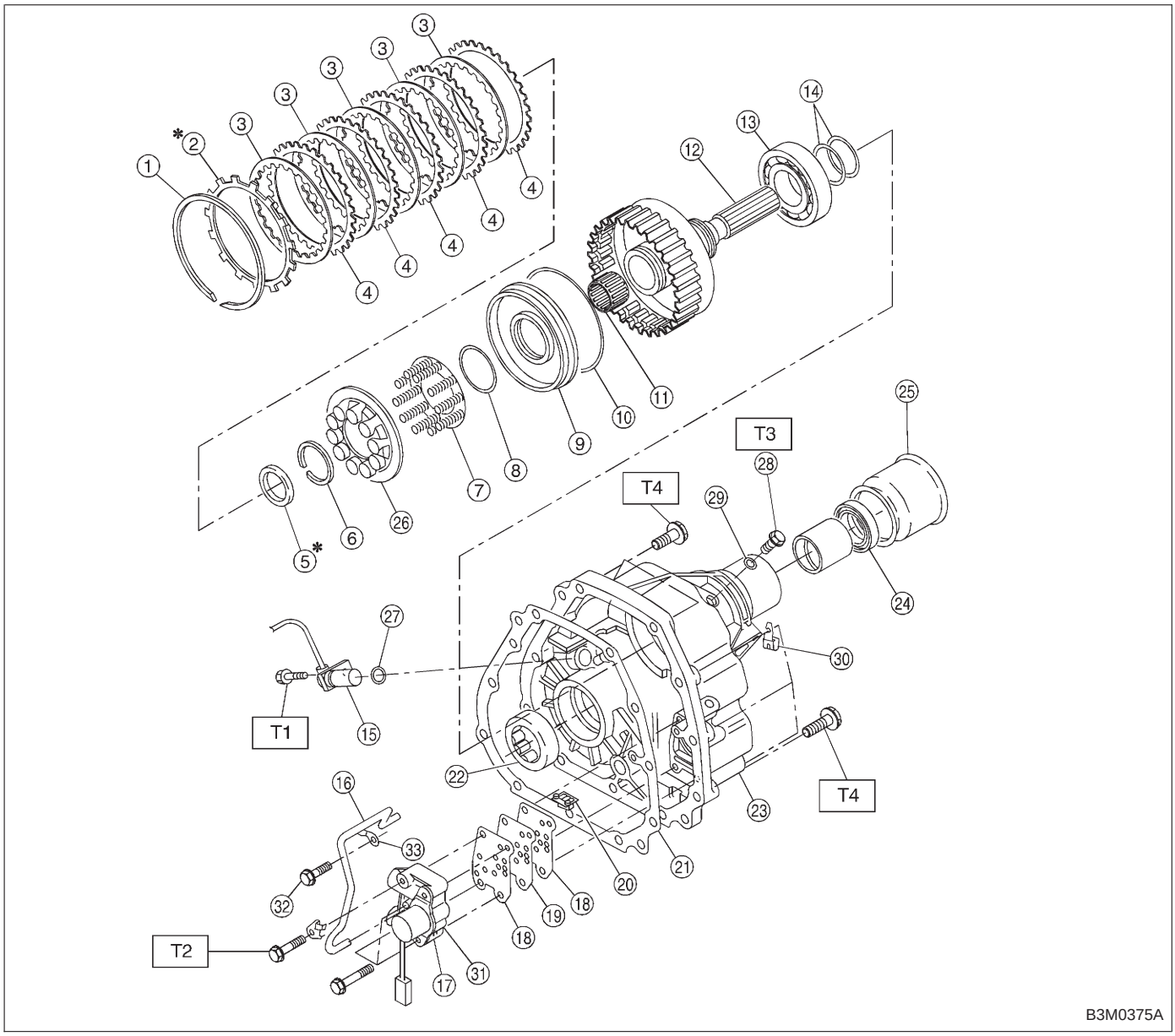
9. Differential Case



① Crown gear
② Straight pin
③ Pinion shaft
④ Differential case (RH)
⑤ Differential case (LH)
⑥ Taper roller bearing
⑦ Oil seal (LH)
⑧ O-ring
⑨ Differential side retainer
⑩ Circlip
⑪ Axle shaft
⑫ Oil seal (RH)
⑬ Speedometer drive gear
⑭ Washer
⑮ Differential bevel pinion
⑯ Differential bevel gear
⑰ Lock plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±2 (2.5±0.2, 18.1±1.4)
T2: 62±5 (6.3±0.5, 45.6±3.6)

10. Transfer and Extension



① Snap ring
② Pressure plate
③ Drive plate
④ Driven plate
⑤ Thrust needle bearing
⑥ Snap ring
⑦ Spring retainer
⑧ Lathe cut seal ring
⑨ Transfer clutch piston
⑩ Lathe cut seal ring
⑪ Needle bearing
⑫ Rear drive shaft
⑬ Ball bearing
⑭ Seal ring
⑮ Vehicle speed sensor 1
⑯ Transfer clutch pipe
⑰ Duty solenoid C (Transfer clutch)
⑱ Gasket
⑲ Plate
⑳ Filter
㉑ Gasket
㉒ Roller bearing
㉓ Extension case
㉔ Oil seal
㉕ Dust seal
㉖ Seal transfer piston
㉗ O-ring
㉘ Test plug
㉙ O-ring
㉚ Clip
㉛ Transfer valve body
㉜ Clip
㉝ Stay

Tightening torque: N·m (kg-m, ft-lb)
T1: 7±1 (0.7±0.1, 5.1±0.7)
T2: 8±1 (0.8±0.1, 5.8±0.7)
T3: 13±1 (1.3±0.1, 9.4±0.7)
T4: 25±2 (2.5±0.2, 18.1±1.4)

1. General

A: PRECAUTION

When disassembling or assembling the automatic transmission, observe the following instructions.

1) Workshop

Provide a place that is clean and free from dust. Principally the conventional workshop is suitable except for a dusty place. In a workshop where grinding work, etc. which produces fine particles is done, make independent place divided by the vinyl curtain or the equivalent.

2) Work table

The size of 1 x 1.5 m (40 x 60 in) is large enough to work, and it is more desirable that its surface be covered with flat plate like iron plate which is not rusted too much.

3) Cleaning of exterior

(1) Clean the exterior surface of transmission with steam and/or kerosene prior to disassembly, however it should be noted that vinyl tape be placed on the air breather or oil level gauge to prevent infiltration of the steam into the transmission and also the cleaning job be done away from the place of disassembly and assembly.

(2) Partial cleaning will do, depending on the extent of disassembly (such as when disassembly is limited to some certain parts).

4) Disassembly, assembly and cleaning

(1) Disassemble and assemble the transmission while inspecting the parts in accordance with the Diagnostics.

(2) During job, don't use gloves. Don't clean the parts with rags: Use chamois or nylon cloth.

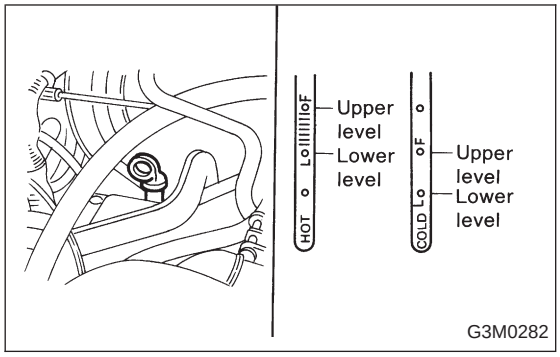
(3) Pay special attention to the air to be used for cleaning. Get the moisture and the dust rid of the air as much as possible. Be careful not to scratch or dent any part while checking for proper operation with an air gun.

(4) Complete the job from cleaning to completion of assembly as continuously and speedily as possible in order to avoid occurrence of secondary troubles caused by dust. When stopping the job unavoidably cover the parts with clean chamois or nylon cloth to keep them away from any dust.

(5) Use kerosene, white gasoline or the equivalent as washing fluid. Use always new fluid for cleaning the automatic transmission parts and never reuse. The used fluid is usable in disassemble and assemble work of engine and manual transmission.

(6) Although the cleaning should be done by dipping into the washing fluid or blowing of the pressurized washing fluid, the dipping is more desirable. (Do not rub with a brush.) Assemble the parts immediately after the cleaning without exposure to the air for a while. Besides in case of washing rubber parts, perform the job quickly not to dip them into the washing fluid for long time.

(7) Apply the automatic transmission fluid (ATF) onto the parts immediately prior to assembly, and the specified tightening torque should be observed carefully.
(8) Use vaseline if it is necessary to hold parts in the position when assembling.
(9) Drain ATF and differential gear oil into a saucer so that the conditions of fluid and oil can be inspected.
(10) Do not support axle drive shaft, stator shaft, input shaft or various pipes when moving transmission from one place to another.
(11) Always discard old oil seals and O-ring, and install new ones.
(12) Do not reuse old aluminum (overrunning clutch pipes, etc.) pipes, gaskets, spring pins. Install new ones.
(13) Be sure to replace parts which are damaged, worn, scratched, discolored, etc.



B: INSPECTION

1. ATF LEVEL

1) Raise ATF temperature to 60 to 80°C (140 to 176°F) from 40 to 60°C (104 to 140°F) (when cold) by driving a distance of 5 to 10 km (3 to 6 miles).

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

2) Make sure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the selector leveler in "P" range. Measure fluid level with the engine idling.

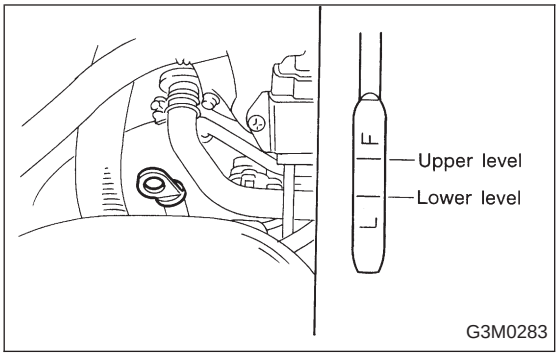
NOTE:
After running, idle the engine for one or two minutes before measurement.

3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower marks). When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

CAUTION:
- **Use care not to exceed the upper limit level.**
- **ATF level varies with temperature. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in the overfilling of fluid.**

4) Fluid temperature rising speed
- By idling the engine
  Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes
<Reference>
  Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes
- By running the vehicle
  Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

5) Method for checking fluid level upon delivery or at periodic inspection
Check fluid level after a warm-up run of approx. 10 minutes. During the warm-up period, the automatic transmission functions can also be checked.

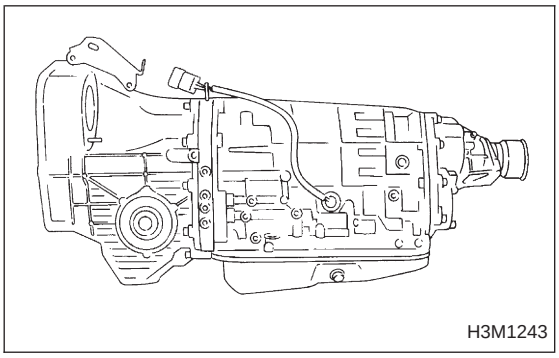


2. DIFFERENTIAL GEAR OIL LEVEL

1) Ensure the vehicle is in safe condition.

NOTE:
Do not check the oil level nor add oil to the case with the front end of the vehicle jacked-up; this will result in an incorrect reading of the oil level.

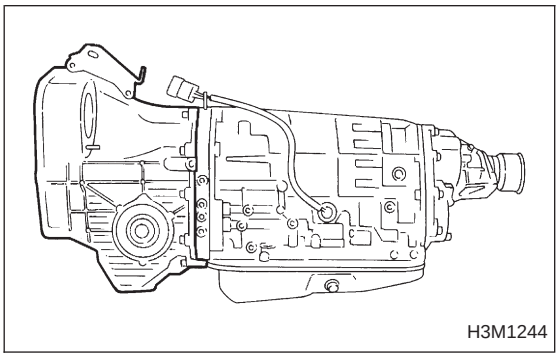
2) Check whether the oil level is between the upper (F) and lower (L) marks. If it is below the lower limit mark, add oil until the level reaches the upper mark.



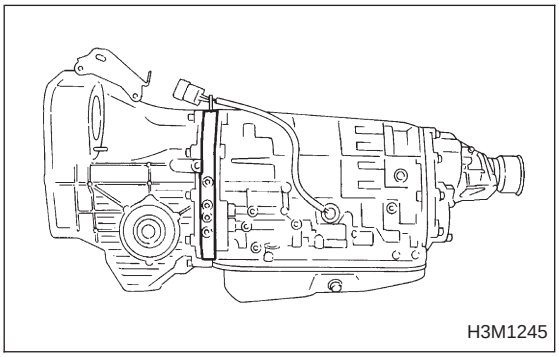
3. OIL LEAKAGE

It is difficult to accurately determine the precise position of a oil leak, since the surrounding area also becomes wet with oil. The places where oil seals and gaskets are used are as follows:

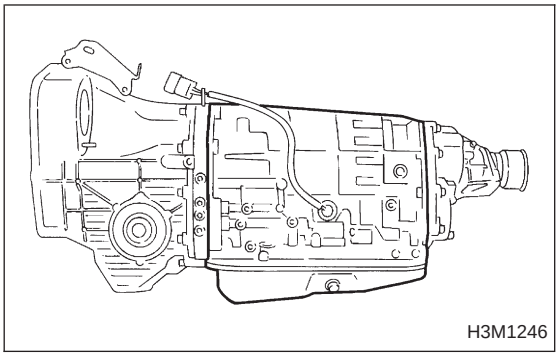
1) Jointing portion of the case
- Transmission case and oil pump housing jointing portion
- Torque converter clutch case and oil pump housing jointing portion
- Transmission case and extension case jointing portion



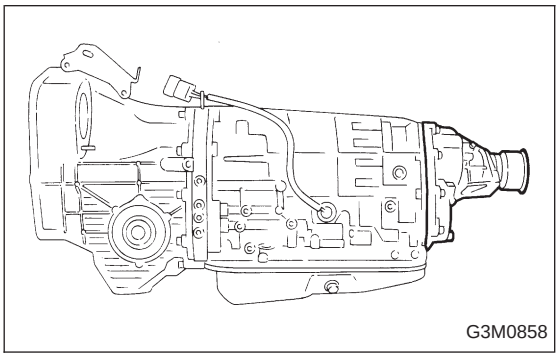
2) Torque converter clutch case
- Engine crankshaft oil seal
- Torque converter clutch impeller sleeve oil seal
- ATF cooler pipe connector
- Torque converter clutch
- Torque converter clutch case
- Axle shaft oil seal
- O-ring on the outside diameter of axle shaft oil seal holder
- O-ring on the differential oil gauge
- Differential oil drain plug
- Speedometer cable mounting portion
- Location of steel balls



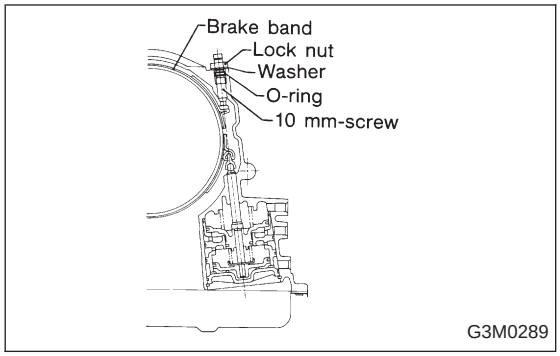
3) Oil pump housing
- Oil pump housing (Defective casting)
- O-ring on the test plugs
- Checking blind plugs
- Differential gear breather


H3M1246

4) Automatic transmission case
- Transmission case (Defective casting)
- Mating surface of oil pan
- O-ring on the test plugs
- Checking blind plugs (Steel balls)
- Oil supply pipe connector
- ATF cooler pipe connector and gasket
- Oil pan drain plug
- O-ring on the transmission harness holder
- Oil pump plugs
- ATF breather
- Shift lever oil seal


G3M0858

5) Extension case
- Extension case (Defective casting)
- O-ring on the vehicle speed sensor
- Rear drive shaft oil seal
- Checking blind plugs (Steel ball)
- O-ring on the test plugs

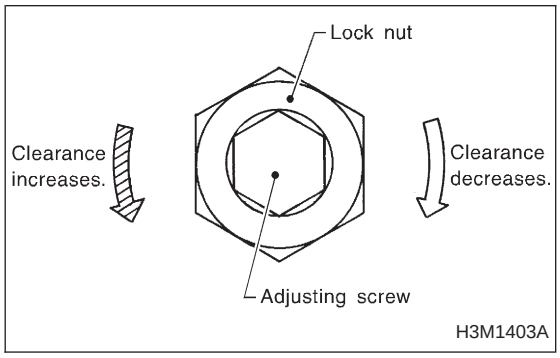


2. Brake Band

A: INSPECTION

If the following abnormal shifting conditions are noted in a road test, the brake band must be adjusted.

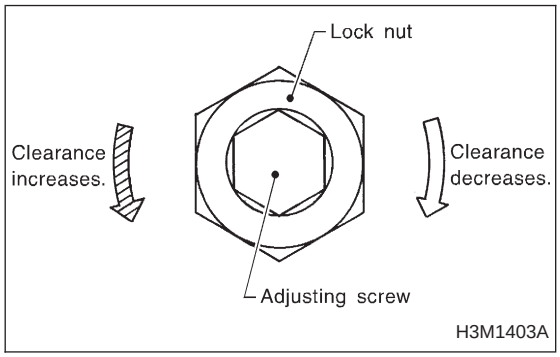
Improper brake band clearances and their symptoms	
Clearance	Problem
1. Too wide	Upshift from 1st directly to 3rd gear occurs.
2. Wide	● Engine rpm increases abruptly while upshifting from 1st to 2nd gear or 3rd to 4th gear. ● Time lag of at least one second occurs during kickdown operation from 3rd to 2nd gear.
3. Small	"Braking" symptom occurs while upshifting from 2nd to 3rd gear.
4. Too small	Upshifts from 2nd to 4th gear and downshifts from 4th to 2nd gear occur repeatedly.



B: ADJUSTMENT

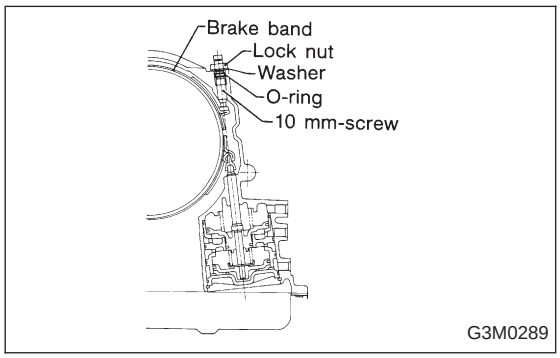
1) Immobilize the end of the 10 mm-screw projecting on the left side of the transmission case, and loosen the nut with a double-end wrench.
In the case of occurrence of problems 2. and 3. mentioned previously, perform the adjustment by loosening or tightening the nut within a range of 3/4 turn from this state.

CAUTION:
Do not loosen excessively; otherwise, the band strut on the servo piston will drop off.



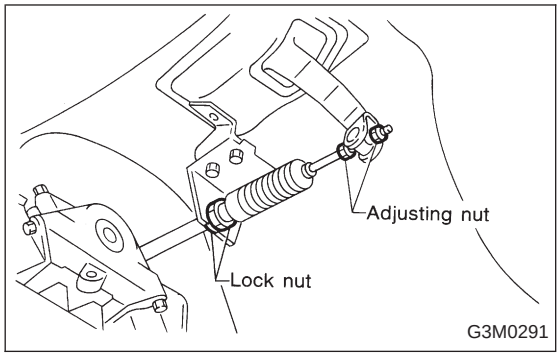
2) In case of the occurrence of problems 1. and 4. mentioned previously, perform the adjustment as follows:
Adjusting procedure: Tighten adjust screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, then back off three turns.

CAUTION:
Do not tighten the adjusting screw with an excessively large torque.



3) With the adjusting screw immobilized, tighten the lock nut.

Tightening torque:
26±2 N·m (2.7±0.2 kg-m, 19.5±1.4 ft-lb)



3. Inhibitor Switch

A: INSPECTION

When driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

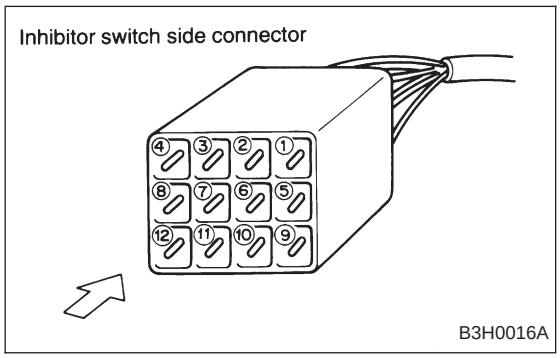
1) Disconnect cable end from select lever.
2) Disconnect inhibitor switch side connector.
3) Check continuity in inhibitor switch circuits with select lever moved to each position.

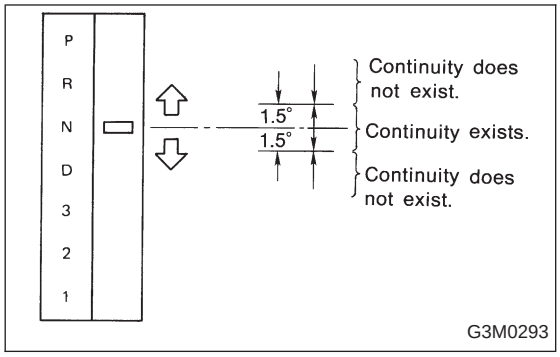
CAUTION:
Also check that continuity in ignition circuit does not exist when selector lever is in R, D, 3, 2 and 1 ranges.

NOTE:
If inhibitor switch is inoperative, check for poor contact of connector on transmission side. (Plastic body type inhibitor switch)

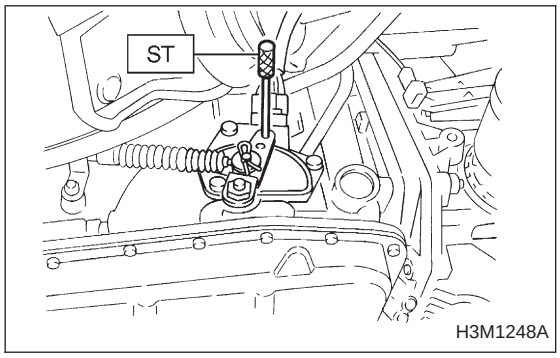
Pin No.	4	3	2	1	8	7	6	5	12	11	10	9
Lead color / Position	B	Y	Br	YG	W	BY	R	GW	BY	BW	BW	RW
P	○	○							○	○		
R	○		○								○	○
N	○			○					○	○		
D	○				○							
3	○					○						
2	○						○					
1	○							○				
	Signal sent to AT control unit								Ignition circuit		Back-up light circuit	

H3M1247A





4) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from the N range.
If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch.



B: ADJUSTMENT

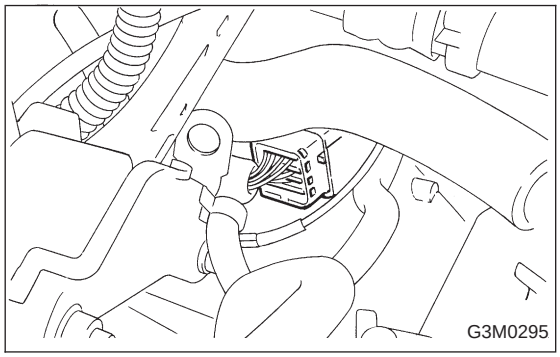
1) Loosen the three inhibitor switch securing bolts.
2) Shift the select lever to the N range.
3) Insert ST as vertical as possible into the holes in the inhibitor switch lever and switch body.

ST 499267300 STOPPER PIN

4) Tighten the three inhibitor switch bolts.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

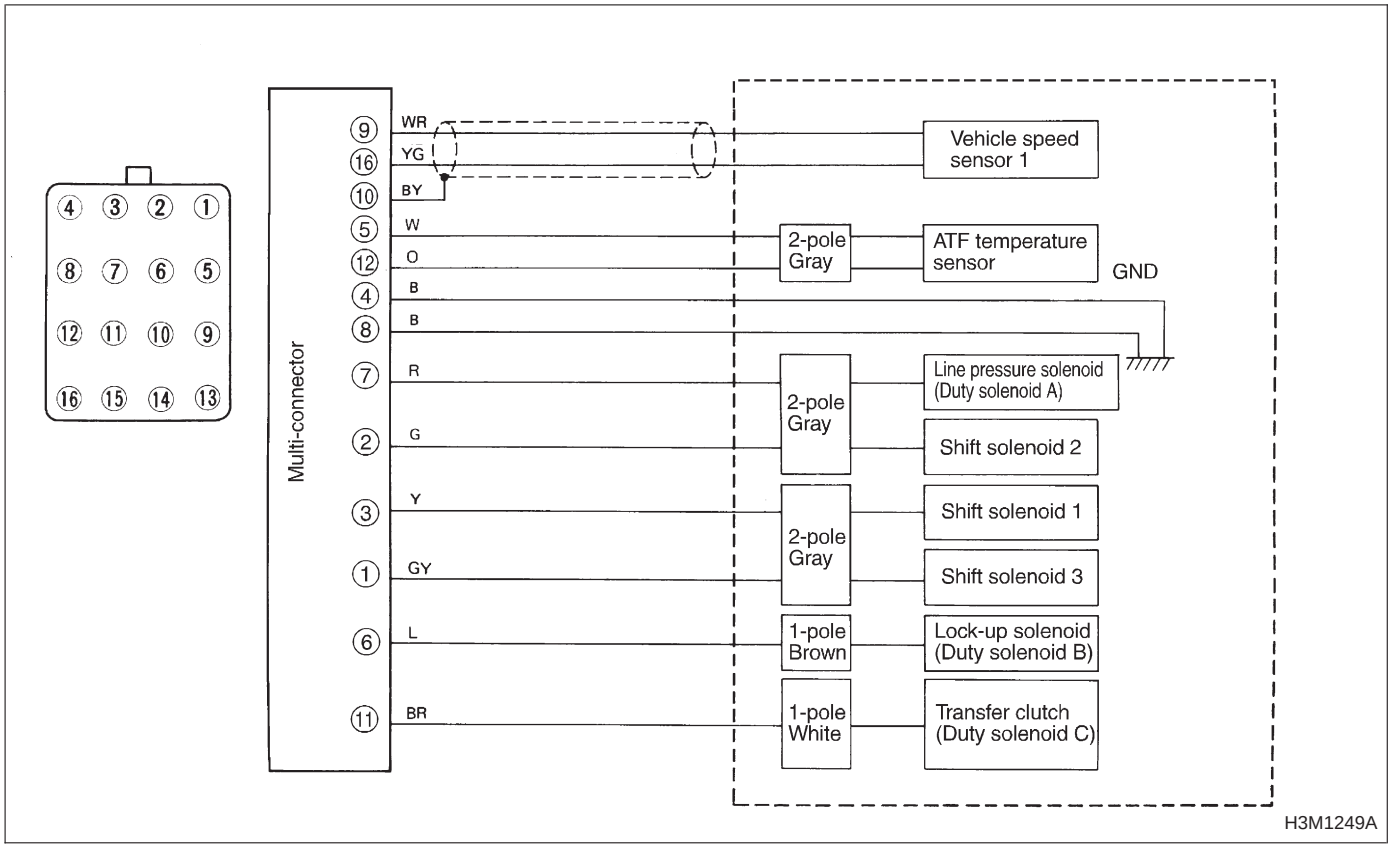
5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.



4. Sensor (in transmission)

A: INSPECTION

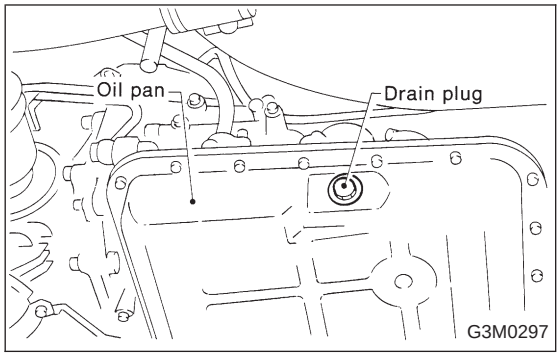
Check each sensor, solenoid and ground system for short circuits.



1. EVALUATION

NOTE:
If part is faulty, its resistance value will be different from the standard value indicated below.

Part name	Terminal	Resistance (Ω)
Vehicle speed sensor 1	9 — 16	450 — 720
ATF temperature sensor	5 — 12	[2,100 — 2,900/20°C (68°F) 275 — 375/80°C (176°F)]
Duty solenoid A (Line pressure solenoid)	7 — 4, 8	1.5 — 4.5
Duty solenoid B (Lock-up solenoid)	6 — 4, 8	9 — 17
Shift solenoid 1	3 — 4, 8	20 — 32
Shift solenoid 2	2 — 4, 8	20 — 32
Shift solenoid 3	1 — 4, 8	20 — 32
Duty solenoid C (Transfer clutch solenoid)	11 — 4, 8	9 — 17



5. Shift Solenoid, Duty Solenoid and Valve Body

A: REMOVAL

1) Clean transmission exterior.
2) Drain ATF completely.

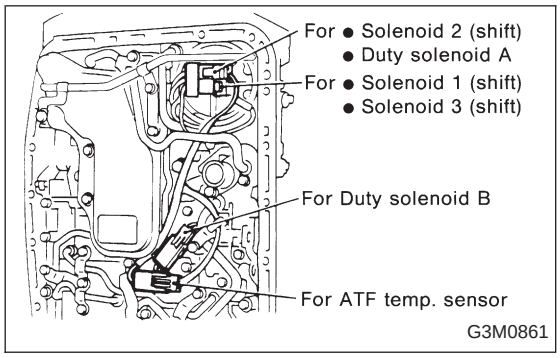
NOTE:
Tighten ATF drain plug after draining ATF.

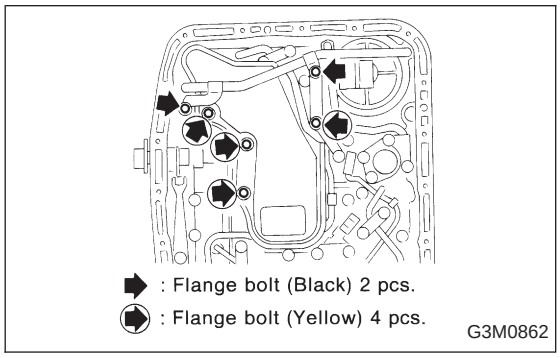
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

3) Remove oil pan and gasket.

NOTE:
Drain oil into a container.

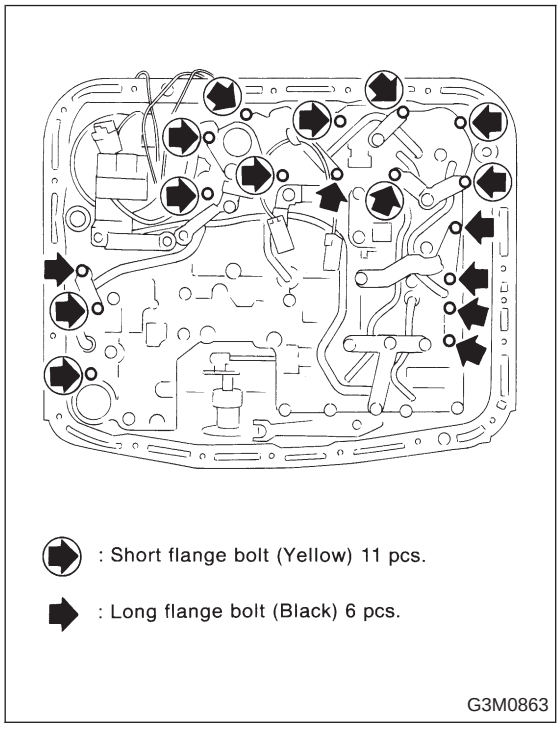
4) Disconnect solenoid valve connectors.
Remove connectors from clips and disconnect connectors at 4 places.





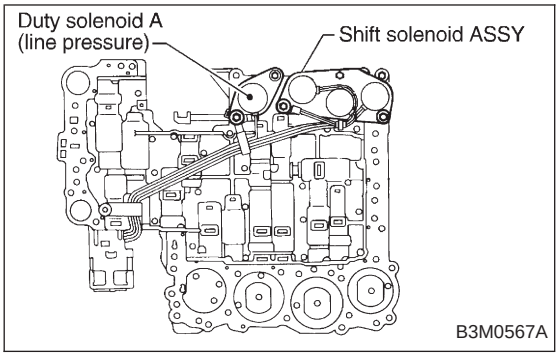
5) Remove oil strainer.
Disconnect oil pipe by removing the two bolts, and remove four bolts and oil strainer.

NOTE:
Be careful because oil flows from oil strainer.



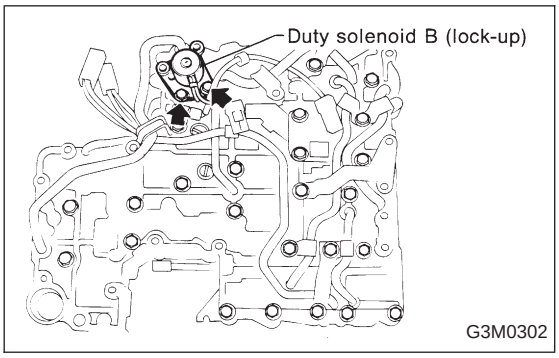
6) Remove control valve body and two brackets.
Remove 6 long bolts (Black) and 11 short bolts (Yellow).

NOTE:
- Be careful because oil flows from valve body.
- Be careful not to damage accumulator spring at rear of control valve.



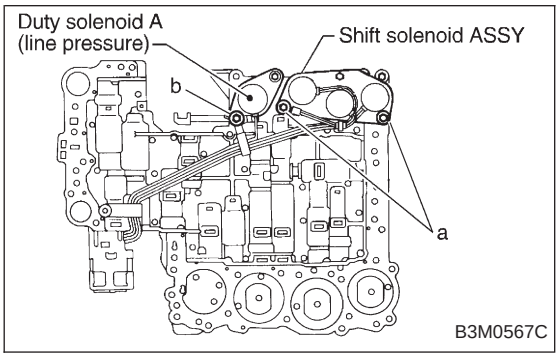
7) Remove shift solenoid assembly, and duty solenoid A.
8) Remove duty solenoid B.

B: INSTALLATION



1) Install duty solenoid B (lock-up).

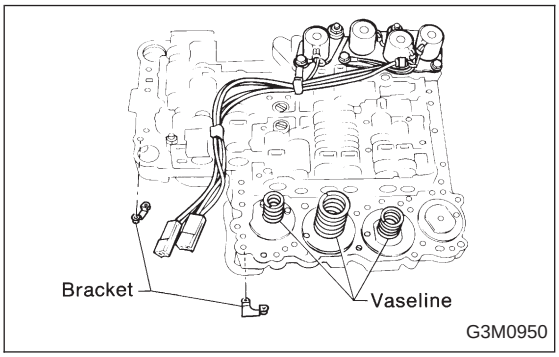
Tightening torque:
11.3±1.5 N·m (1.15±0.15 kg-m, 8.3±1.1 ft-lb)



2) Install solenoid valves.
Shift solenoid assembly, and duty solenoid A (line pressure).

a length : 16 mm (0.63 in)
b length : 27 mm (1.06 in)

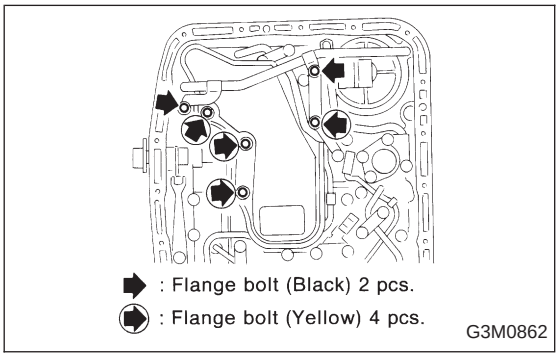
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)



3) Install valve body and two brackets.

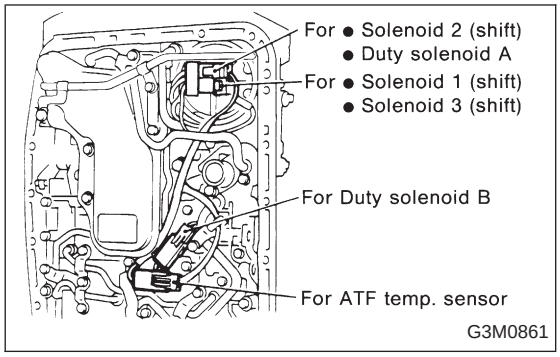
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

NOTE:
- Secure accumulator springs using vaseline.
- Align manual valve connections.

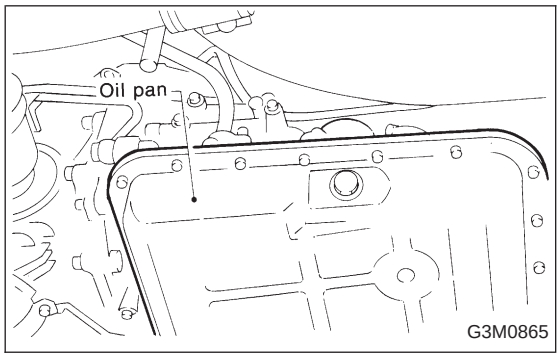


4) Install oil strainer.
Also install oil pipe and harness connector bracket.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

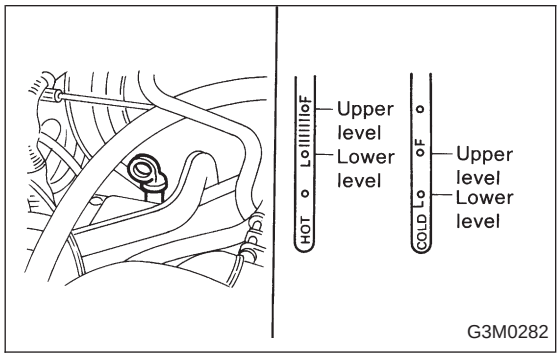


5) Connect harness connectors at 4 places.
Connect connectors of same color, and secure connectors to valve body using clips.

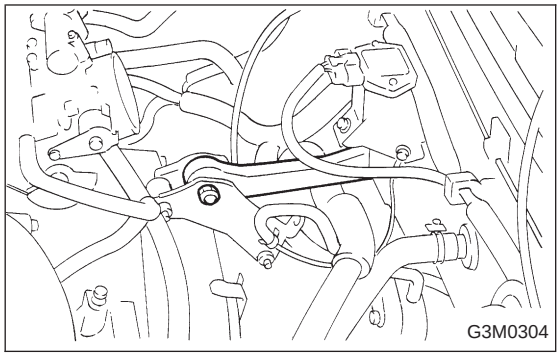


6) Install oil pan and gasket.

Tightening torque:
4.9±0.5 N·m (0.50±0.05 kg-m, 3.6±0.4 ft-lb)



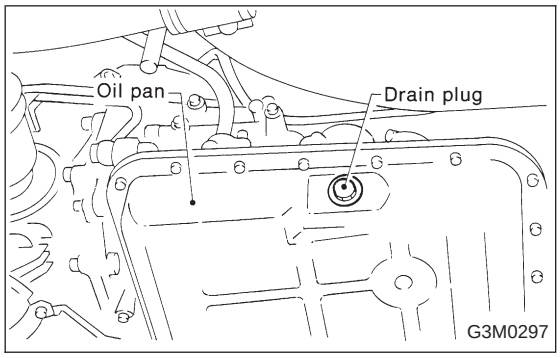
7) Add ATF and check level.



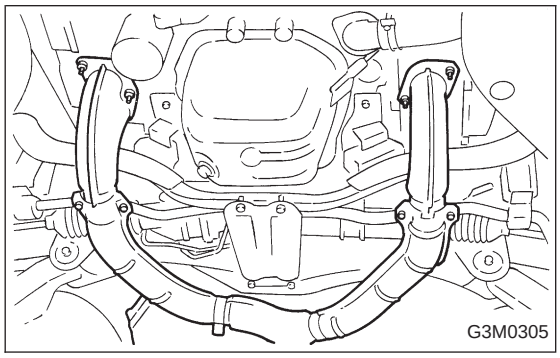
6. Duty Solenoid C and Transfer Valve Body

A: REMOVAL

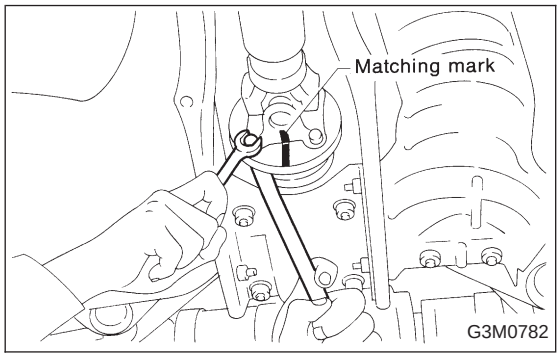
1) Remove pitching stopper.



2) Raise vehicle and drain ATF.

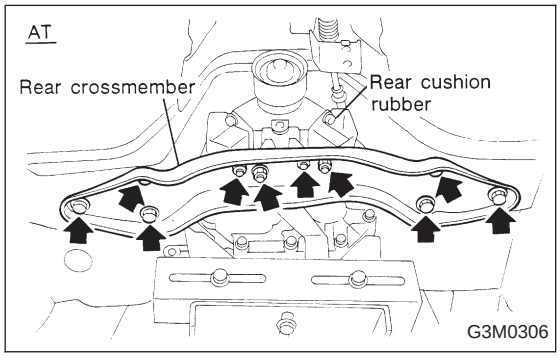


3) Remove front exhaust pipe.
Disconnect oxygen sensor connector, and remove exhaust pipe.

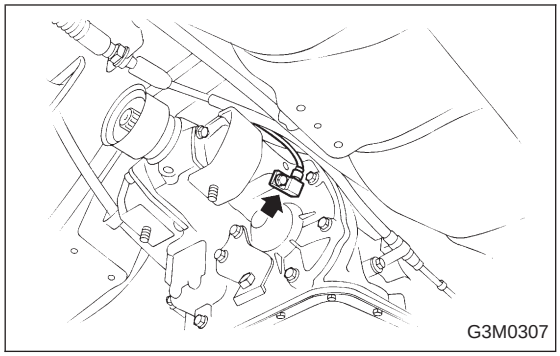


4) Remove propeller shaft.

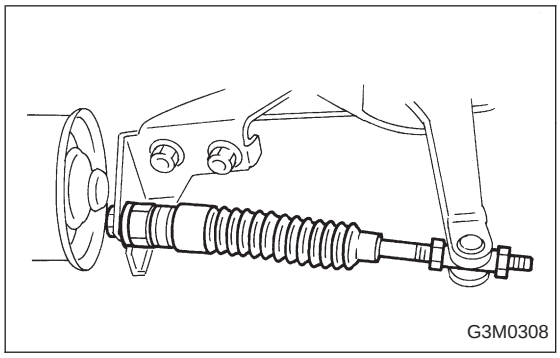
NOTE:
Before removing propeller shaft, scribe matching marks on propeller shaft and rear differential coupling.



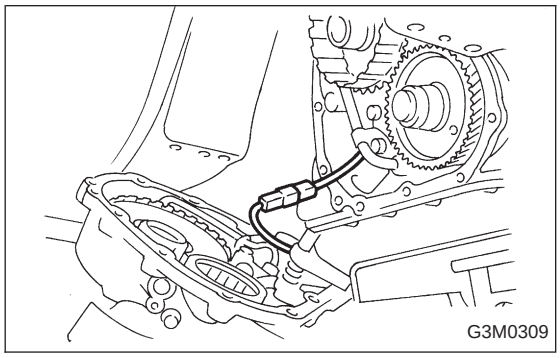
5) Remove rear crossmember.
   (1) Support transmission using a transmission jack and raise slightly.
   (2) Remove bolts and nuts as shown in Figure.


G3M0307

6) Remove vehicle speed sensor 1.


G3M0308

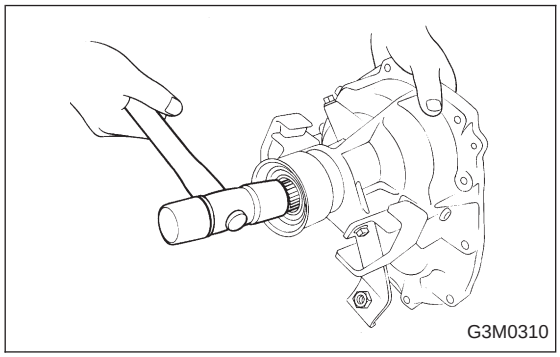
7) Remove extension and gasket.
(1) Remove gear select cable nut.
(2) Move gear select cable so that extension bolts can be removed.


G3M0309

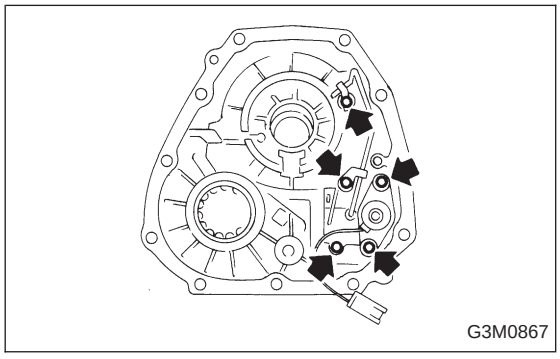
(3) Remove bolts.
(4) Remove extension and disconnect duty solenoid C connector.

CAUTION:
Do not force extension back before disconnecting solenoid connector. Otherwise, harness may be damaged.

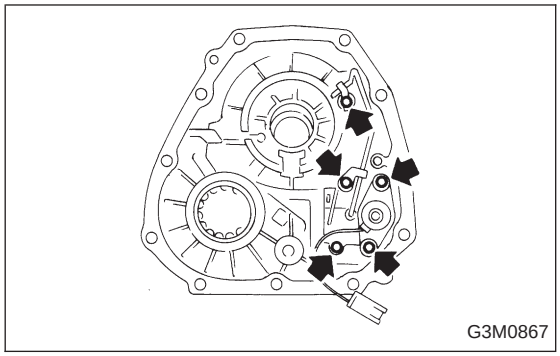
NOTE:
Use a container to catch oil flowing from extension.


G3M0310

8) Remove duty solenoid C and transfer valve body from extension.
(1) Remove transfer clutch drum.


G3M0867

(2) Remove clamp which secures pipe.
(3) Remove bolts.


G3M0867

B: INSTALLATION

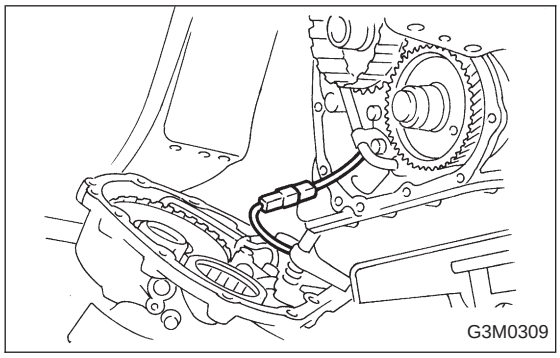
1) Install duty solenoid C and transfer valve body.
   (1) Install duty solenoid C and transfer valve body.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

   (2) Install pipe and clamp.

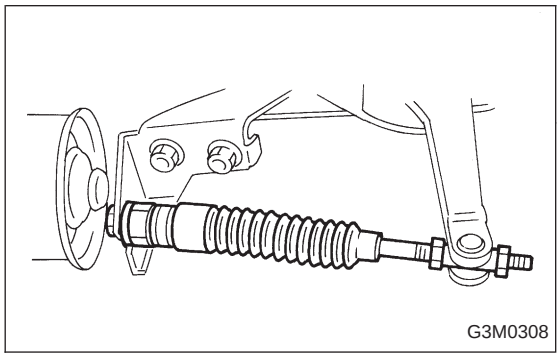
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

   (3) Install clutch drum.


G3M0309

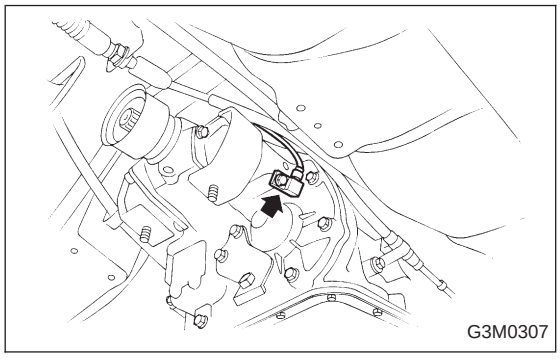
2) Install extension.
   (1) Connect connector.
   (2) Tighten 11 bolts.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)


G3M0308

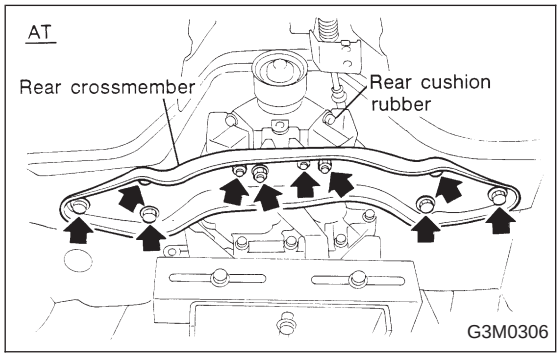
   (3) Install gear select cable.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)


G3M0307

3) Install vehicle speed sensor 1.

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)

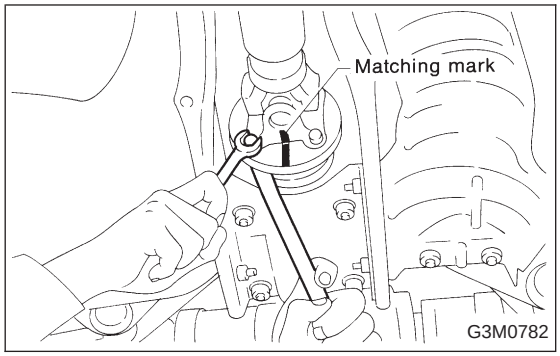


G3M0306

4) Install rear crossmember.
   (1) Tighten bolts.

Tightening torque:
Crossmember to body
69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)
Crossmember to cushion
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

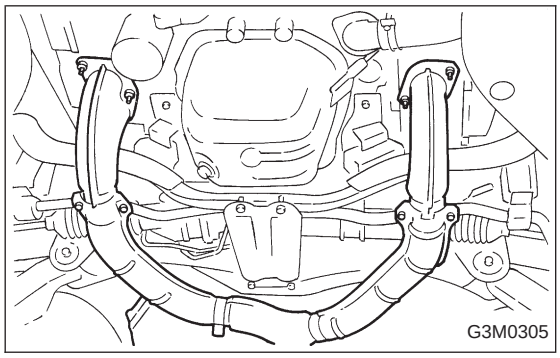
   (2) Lower and remove transmission jack.



5) Install propeller shaft.

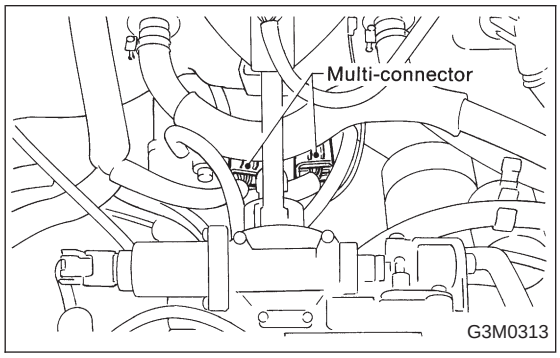
Tightening torque:
At rear differential
23±5 N·m (2.3±0.5 kg-m, 16.6±3.6 ft-lb)
At center bearing
39±5 N·m (4.0±0.5 kg-m, 28.9±3.6 ft-lb)

NOTE:
Align matching marks on propeller shaft and rear differential coupling.

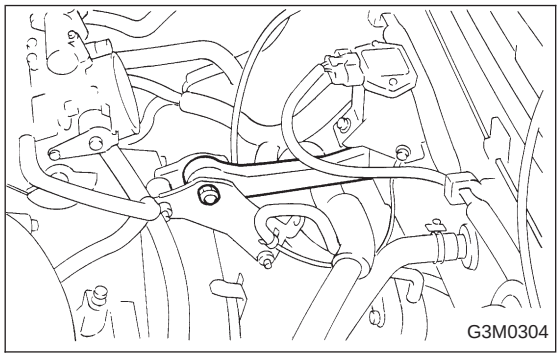


6) Install front exhaust pipe.

Tightening torque:
At engine
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
At hanger
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
At front and rear connections
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

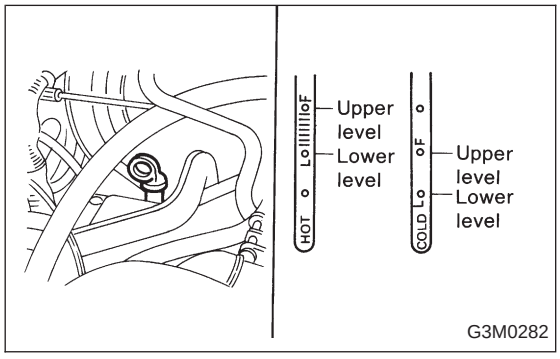


7) Lower and remove jack.
8) Connect the following parts:
(1) Oxygen sensor connector
(2) Multi-connector



9) Install pitching stopper.

Tightening torque:
Body side
57±10 N·m (5.8±1.0 kg-m, 42±7 ft-lb)
Engine side
49±5 N·m (5.0±0.5 kg-m, 36.2±3.6 ft-lb)



10) Replenish ATF and check oil level. Check for leaks.

7. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

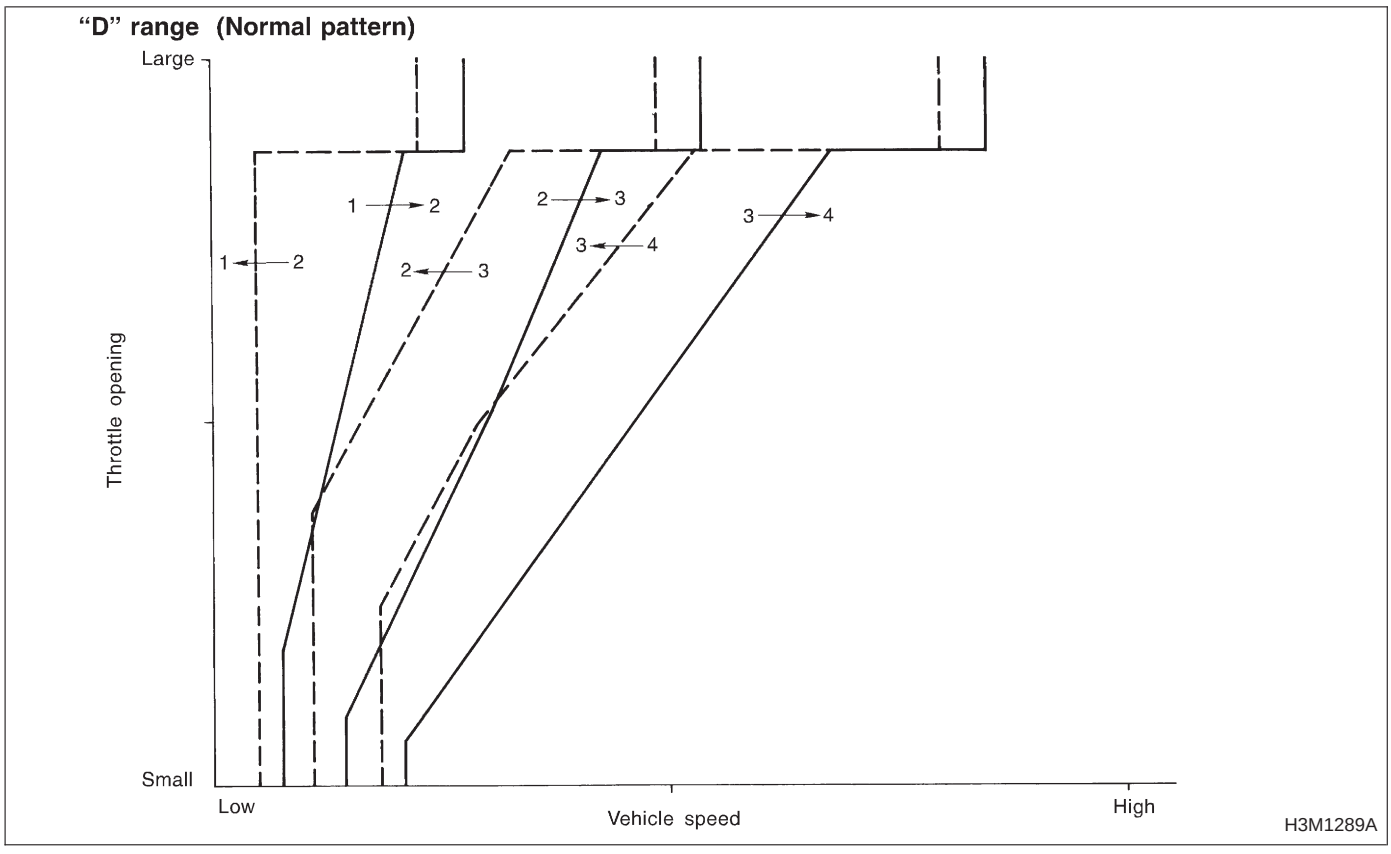
Road tests should be conducted to properly diagnose the condition of the automatic transmission.

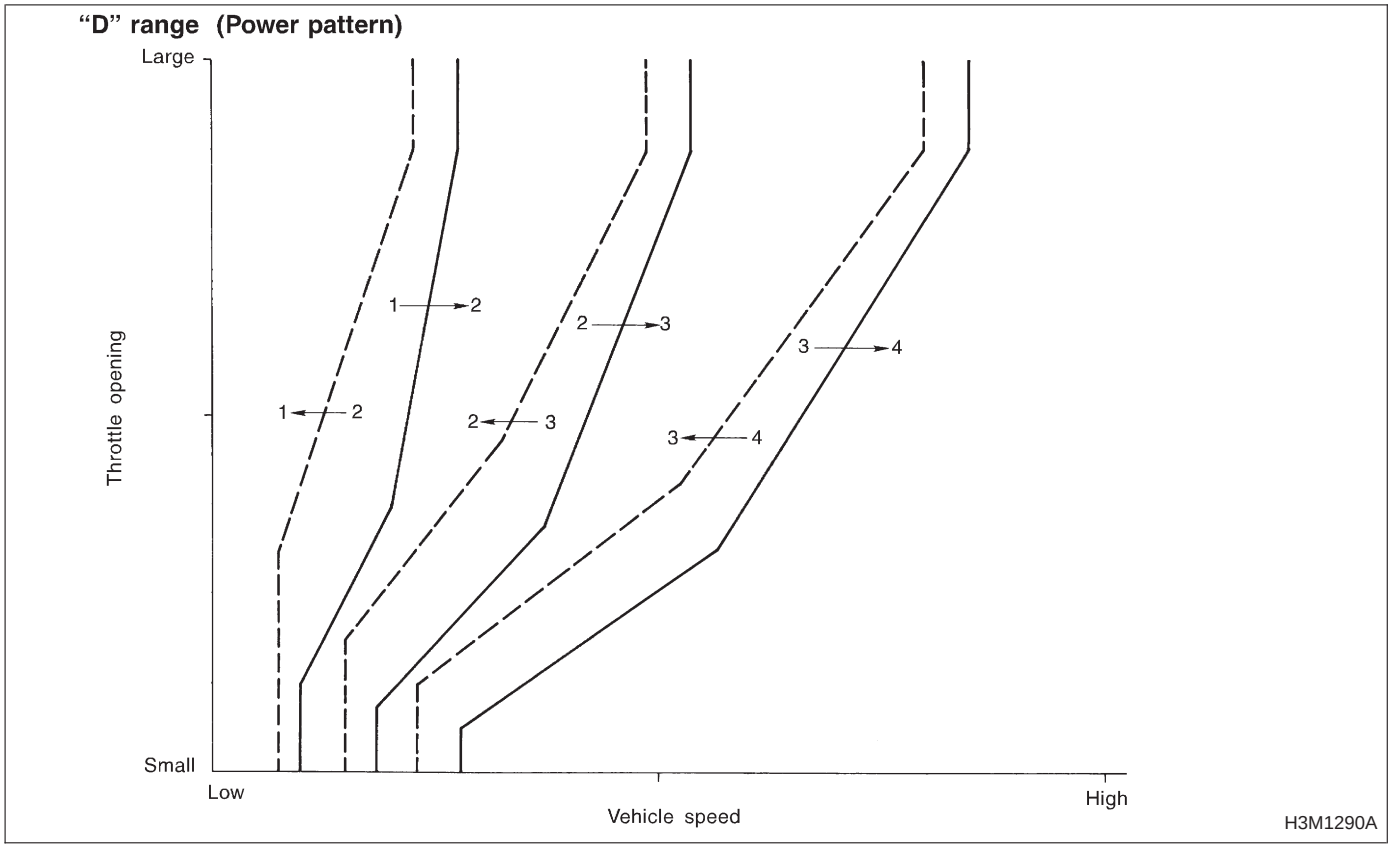
CAUTION:
When performing test, do not exceed posted speed limit.

2. SHIFT PATTERNS

Check “kick-down”.

D range: 1st ⇐ 2nd ⇐ 3rd ⇐ 4th
3 range: 1st ⇐ 2nd ⇐ 3rd ← 4th
2 range: 2nd ← 3rd ← 4th
1 range: 1st ← 2nd ← 3rd ← 4th





3. ENGINE BRAKE OPERATION

Engine brake operation:

D range → 4th gear
3 range → 3rd gear
2 range → 2nd gear
1 range → 1st gear

4. AWD FUNCTION

If "tight-corner braking" occurs when the steering wheel is fully turned at low speed:
1) Determine the applicable trouble code and check the corresponding duty solenoid C (transfer) for improper operation.
2) If the solenoid is operating properly, check transfer clutch pressure.
3) If oil pressure is normal but "tight-corner braking" occurs:
Check the transfer control valve for sticking, and the transfer clutch facing for wear.
<Ref. to 3-2 [W23A0].>

8. Stall Speed Test

A: MEASUREMENT

1. GENERAL INFORMATION

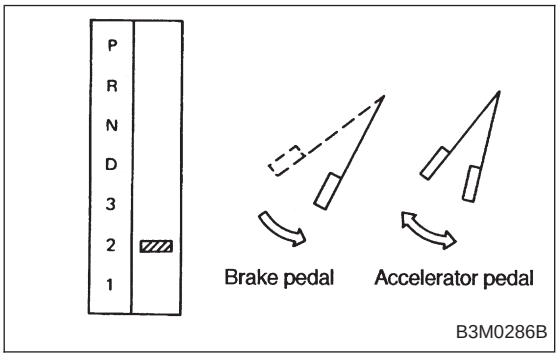
The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in all shift ranges except the P and N ranges.

Purposes of the stall test:
1) To check the operation of the automatic transmission clutch.
2) To check the operation of the torque converter clutch.
3) To check engine performance.

2. TEST METHODS

1) Preparations before test:
   (1) Check that throttle valve opens fully.
   (2) Check that engine oil level is correct.
   (3) Check that coolant level is correct.
   (4) Check that ATF level is correct.
   (5) Check that differential gear oil level is correct.
   (6) Increase ATF temperature to 60 to 80°C (140 to 176°F) by idling the engine for approximately 30 minutes (with select lever set to “N” or “P”).

2) Install an engine tachometer at a location visible from the driver’s compartment and mark the stall speed range on the tachometer scale.
3) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
4) Move the manual linkage to ensure it operates properly, and shift the select lever to the 2 range.



5) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.

6) When the engine speed is stabilized, read that speed quickly and release the accelerator pedal.
7) Shift the select lever to Neutral, and cool down the engine by idling it for more than one minute.
8) Record the stall speed.
9) If stall speed in 2 range is higher than specifications, forward clutch slipping on brake band slipping may occur. To identify it, conduct the same test as above in D range.
10) Perform the stall tests with the select lever in the R range.

CAUTION:
● Do not continue the stall test for MORE THAN FIVE SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake band to be adversely affected.
Be sure to cool down the engine for at least one minute after each stall test with the select lever set in the P or N range and with the idle speed lower than 1,200 rpm.
● If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Specifications

Stall speed (at sea level):
2,300 — 2,700 rpm

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2 R	● Throttle valve not fully open ● Erroneous engine operation ● Torque converter clutch's one-way clutch slipping
Greater than specifications	D	● Forward clutch slipping ● One-way clutch (1-2) malfunctioning
	R	● Line pressure too low ● Reverse clutch slipping ● Low & reverse brake slipping
	2	● Line pressure too low ● Forward clutch slipping ● Brake band slipping ● One-way clutch (3-4) malfunctioning

9. Time Lag Test

A: INSPECTION

1. GENERAL INFORMATION

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the forward clutch, reverse clutch, low & reverse brake, forward one-way clutch and low one-way clutch.

CAUTION:
● Perform the test at normal operation fluid temperature 60 to 80°C (140 to 176°F).
● Be sure to allow a one minute interval between tests.
● Make three measurements and take the average value.

2. TEST METHODS

1) Fully apply the parking brake.
2) Start the engine.

Check idling speed (A/C OFF).
"N" range: 800±100 rpm

3) Shift the shift lever from "N" to "D" range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds

4) In same manner, measure the time lag for "N" → "R".
Time lag: Less than 1.5 seconds

3. EVALUATION

1) If "N" → "D" time lag is longer than specified:
- Line pressure too low
- Forward clutch worn
- Low one-way clutch not operating properly

2) If "N" → "R" time lag is longer than specified:
- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- Forward one-way clutch not operating properly

10. Line Pressure Test

A: MEASUREMENT

1. GENERAL INFORMATION

If the clutch or the brake band shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

- Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.
- Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake band or control valve.

1) Line pressure measurement (under no load)

CAUTION:

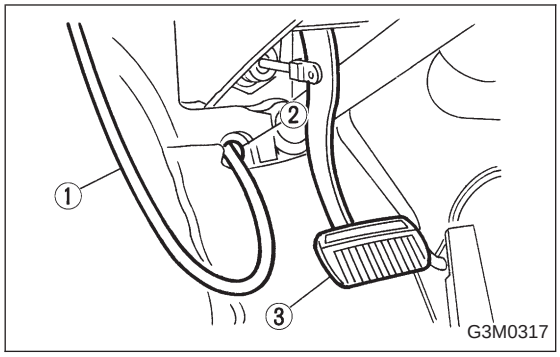
- **Before measuring line pressure, jack-up all wheels.**
- **Maintain temperature of ATF at approximately 50°C (122°F) during measurement.**

(ATF will reach the above temperature after idling the engine for approximately 30 minutes with select lever in "N" or "P".)

2) Line pressure measurement (under heavy load)

CAUTION:

- **Before measuring line pressure, apply both foot and parking brakes with all wheels chocked (Same as for "stall" test conditions).**
- **Measure line pressure when select lever is in "R", "2" with engine under stall conditions.**
- **Measure line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle and then stop. Wait for at least one minute before measurement.)**
- **Maintain the temperature of ATF at approximately 50°C (122°F) during measurement. (ATF will reach the above temperature after idling the engine for approximately 30 minutes with the select lever in "N" or "P".)**

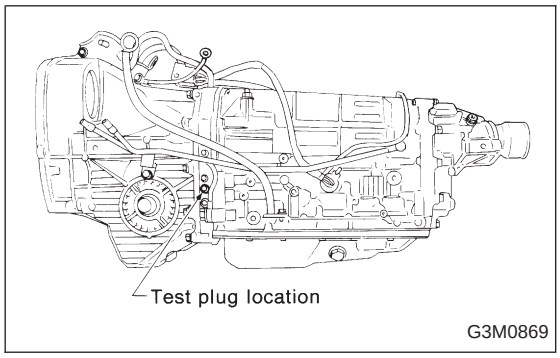


2. TEST METHODS

1) Temporarily attach the ST to a suitable place in the driver's compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to the engine compartment.

ST 498575400 OIL PRESSURE GAUGE ASSY

① Pressure gauge hose
② Hole in toe board (blank cap hole)
③ Brake pedal



2) Remove the test plug and install ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER

3) Connect ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY

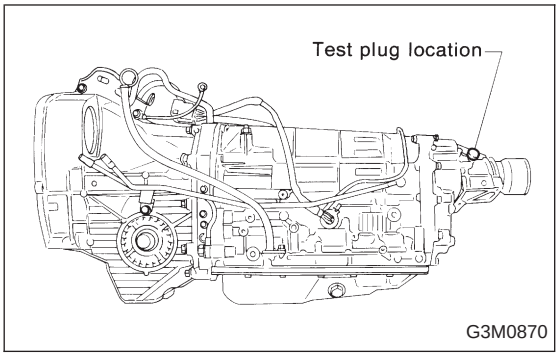
4) Check for duty ratio changes by opening and closing throttle valve using select monitor. <Ref. to 3-2 [T9K0].>
5) Check line pressure in accordance with the following chart.

3. EVALUATION

NOTE:
- Under no load: "D"
- Under full load: "R", "2"

(With engine running at stall speed)

Standard line pressure			
Duty ratio (%)	"2" range kPa (kg/cm^2, psi)	"R" range kPa (kg/cm^2, psi)	"D" range kPa (kg/cm^2, psi)
5	1,167 — 1,363 (11.9 — 13.9, 169 — 198)	1,432 — 1,569 (14.6 — 16.0, 208 — 228)	—
22	—	—	765 — 902 (7.8 — 9.2, 111 — 131)
100	—	—	235 — 481 (2.4 — 4.9, 34 — 70)



11. Transfer Clutch Pressure Test

A: MEASUREMENT

1. TEST METHODS

Check transfer clutch pressure in accordance with the following chart in the same manner as with line pressure.

ST 499897700 OIL PRESSURE ADAPTER SET
ST 498575400 OIL PRESSURE GAUGE ASSY
AWD mode: “D” range
FWD mode: “P” range, engine speed 2000 rpm

CAUTION:
Before setting in FWD mode, install spare fuse on FWD mode switch.

2. EVALUATION

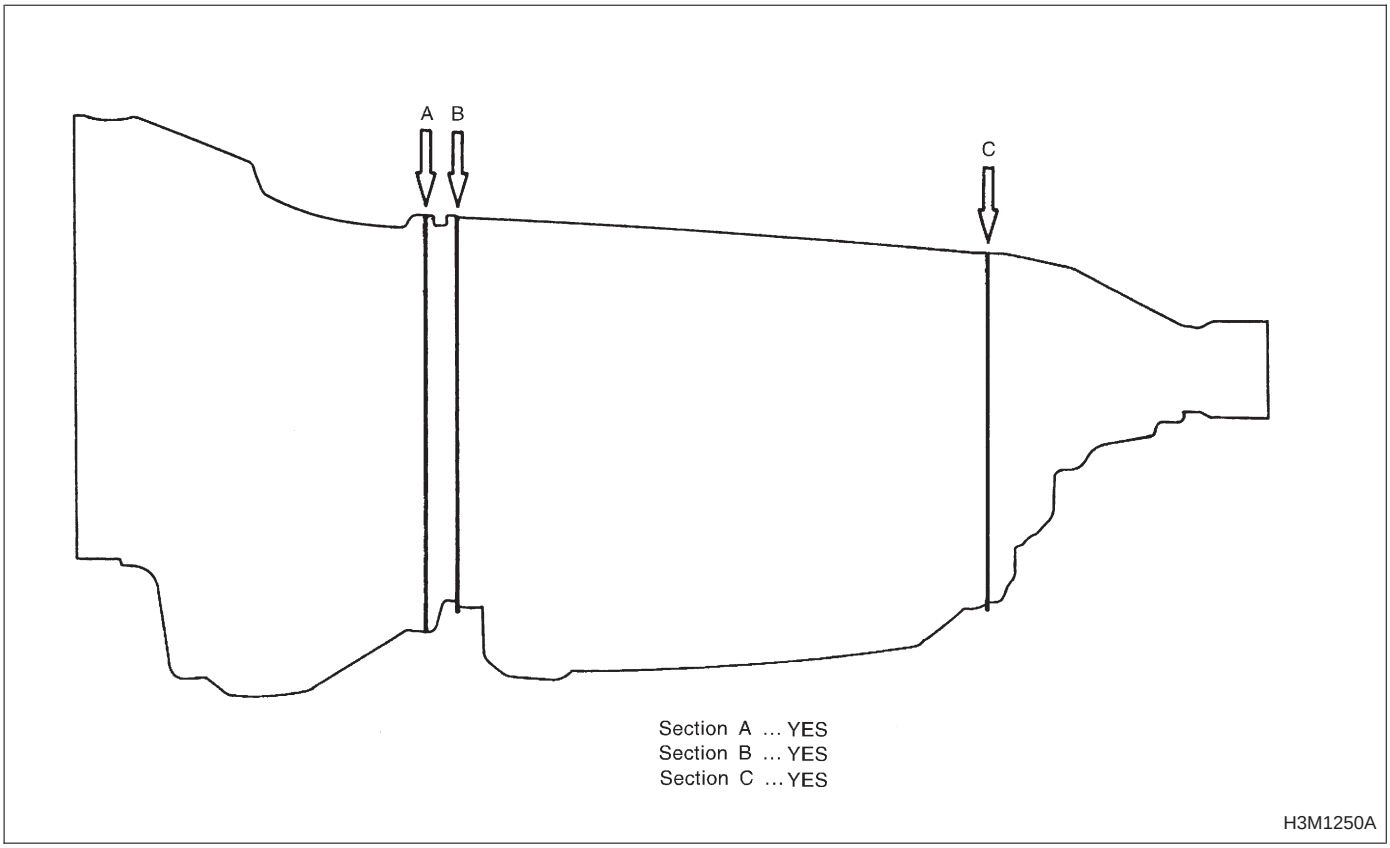
NOTE:

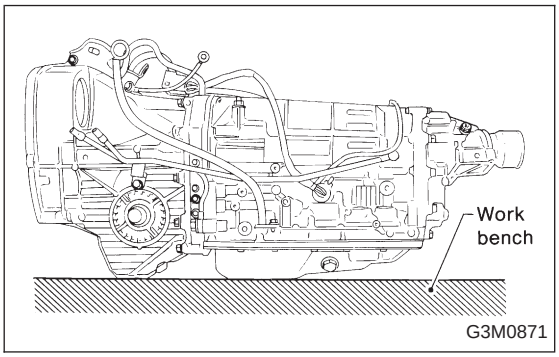
If oil pressure is not produced or if it does not change in the AWD mode, the duty solenoid C or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

Standard transfer clutch pressure		
Duty ratio (%)	AWD mode kPa (kg/cm^2, psi)	FWD mode kPa (kg/cm^2, psi)
5	667 — 804 (6.8 — 8.2, 97 — 117)	667 — 804 (6.8 — 8.2, 97 — 117)
40	137 — 226 (1.4 — 2.3, 20 — 33)	—
95	0 (0, 0)	—

12. Overall Transmission

A: SECTIONS THAT CAN BE DETACHED/ASSEMBLED



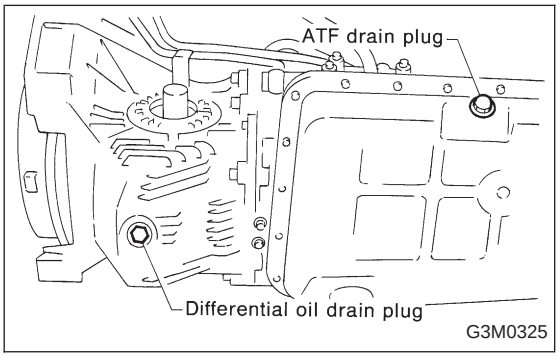


B: DISASSEMBLY

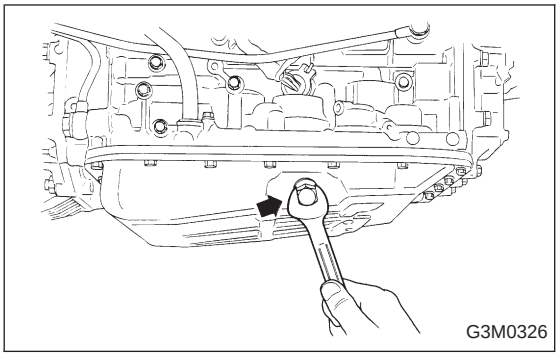
1. EXTERNAL PARTS

1) Place the transmission unit on a work bench, with the oil pan facing down.

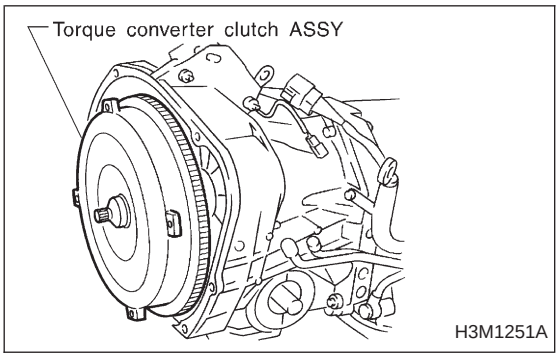
CAUTION:
Be careful not to bend or damage external parts.



2) Remove the drain plug, and drain differential oil. Tighten the plug temporarily after draining.


G3M0326

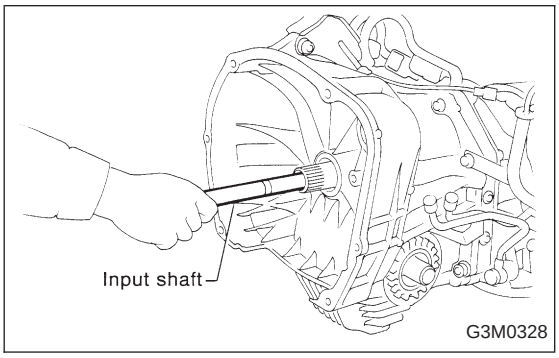
3) Remove the drain plug, and drain automatic transmission fluid (ATF). Tighten the plug temporarily after draining.



H3M1251A

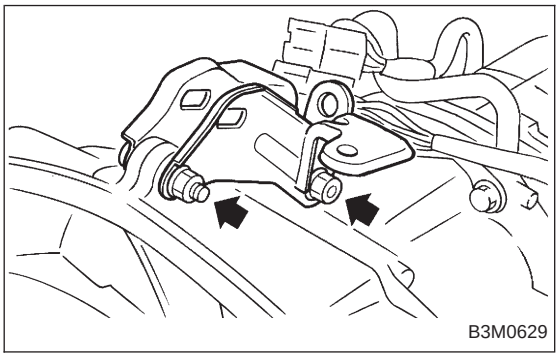
4) Extract the torque converter clutch assembly.

NOTE:
- Extract the torque converter clutch horizontally. Be careful not to scratch the bushing inside the oil pump shaft.
- Note that oil pump shaft also comes out.

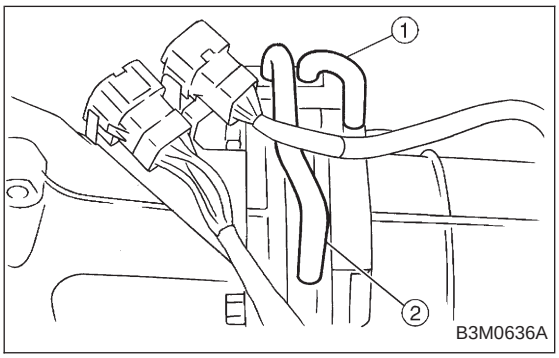


G3M0328

5) Remove the input shaft.


B3M0629

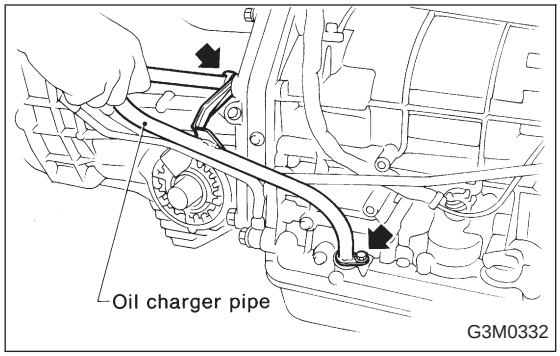
6) Remove the pitching stopper bracket.



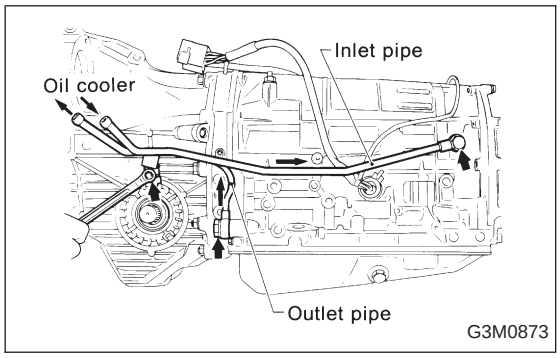
B3M0636A

7) Disconnect the air breather hose.

① Air breather hose (Transmission case)
② Air breather hose (Oil pump housing)

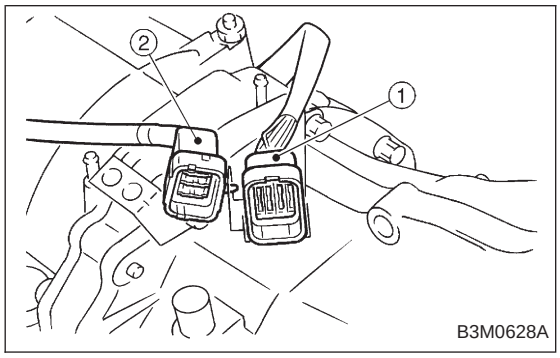


8) Remove the oil charger pipe, and remove the O-ring from the flange face. Attach the O-ring to the pipe.

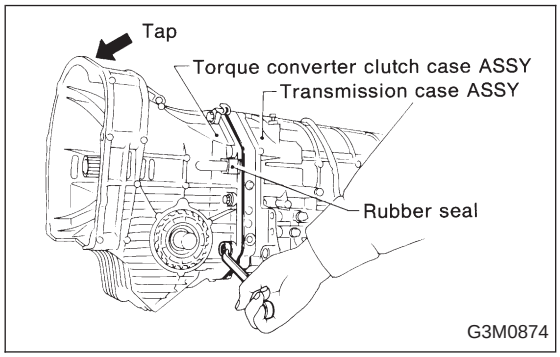


9) Remove the oil cooler inlet and outlet pipes.

CAUTION:
When removing outlet pipes, be careful not to lose balls and springs used with retaining screws.



10) Remove harnesses from bracket.
① Transmission harness
② Inhibitor switch cord

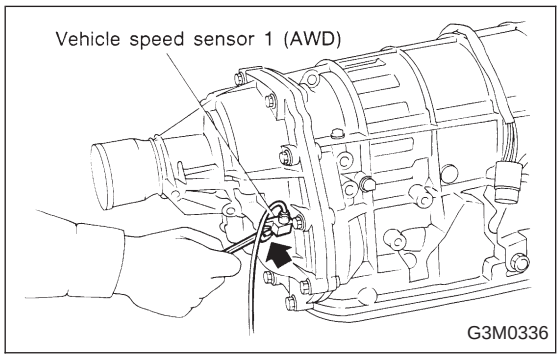


2. SEPARATION OF EACH SECTION

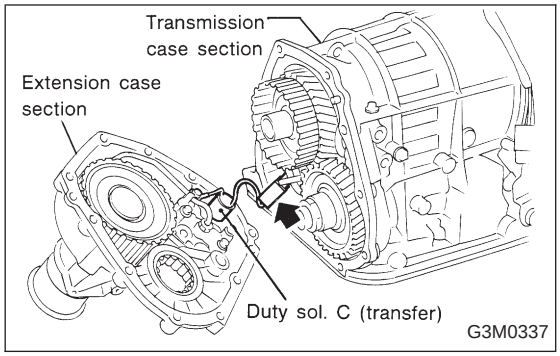
1) Separation of torque converter clutch case and transmission case sections

CAUTION:
- **Be careful not to damage the oil seal and bushing inside the torque converter clutch case by the oil pump cover.**
- **Be careful not to lose the rubber seal.**

NOTE:
Separate these cases while tapping lightly on the housing.



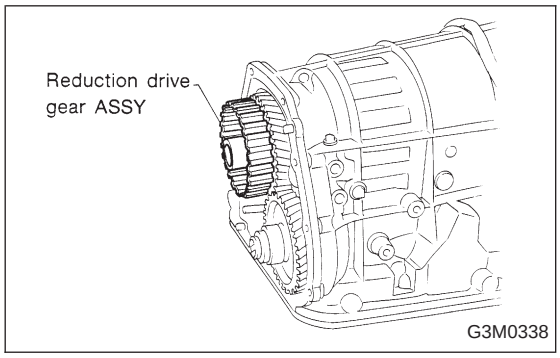
2) Separation of transmission case and extension sections
(1) Remove vehicle speed sensor 1.



(2) While pulling the extension slightly, disconnect the connector for the duty solenoid C (transfer).

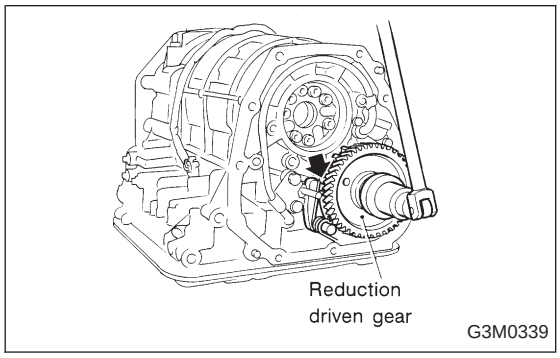
CAUTION:
Be careful not to cut the harness.

3) Separate both sections.



3. TRANSMISSION CASE SECTION

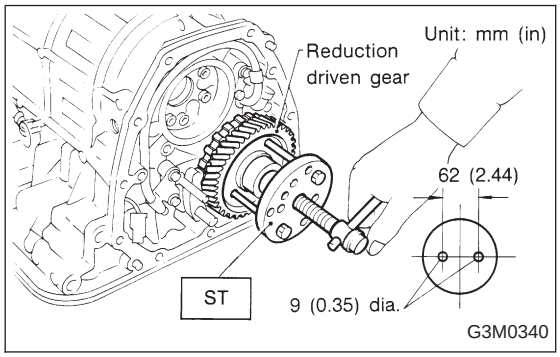
1) Remove the reduction drive gear assembly.



2) Remove the reduction driven gear.

(1) Straighten the staked portion, and remove the lock nut.

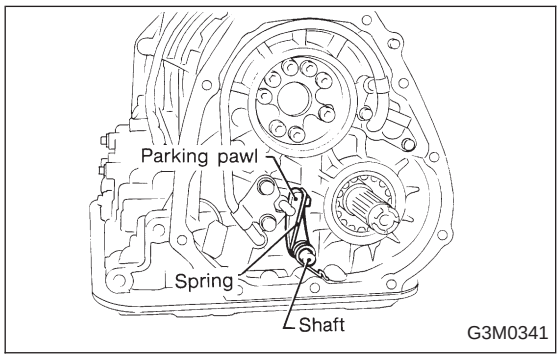
NOTE:
Set the range selector lever to “P”.



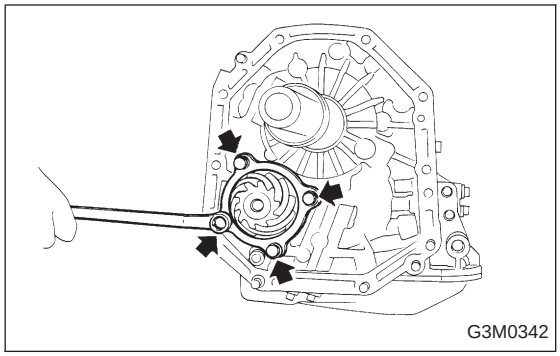
(2) Using the ST, extract the reduction driven gear.

ST 899524100 PULLER SET

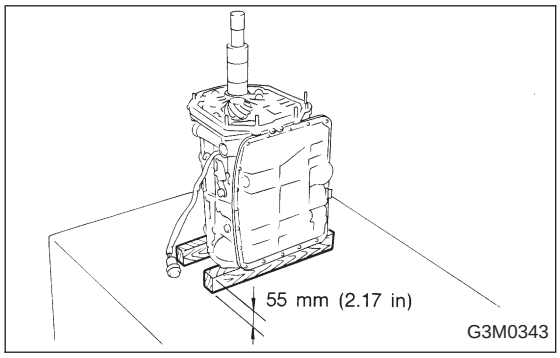
NOTE:
Drill two holes in the puller.



3) Remove the parking pawl, return spring and shaft.


G3M0342

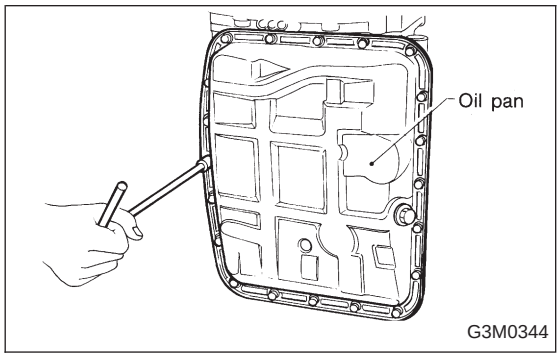
4) Loosen the taper roller bearing mounting bolts.



G3M0343

5) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

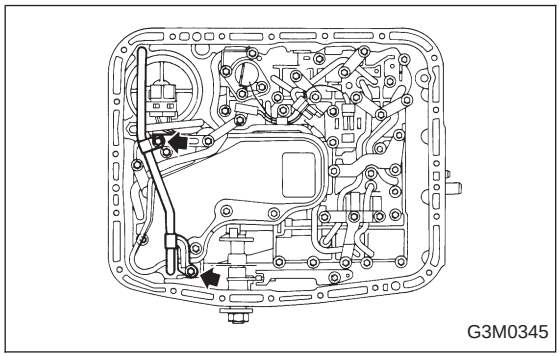
CAUTION:
● Be careful not to scratch the rear mating surface of the transmission case.
● Note that the parking rod and drive pinion protrude from the mating surface.



G3M0344

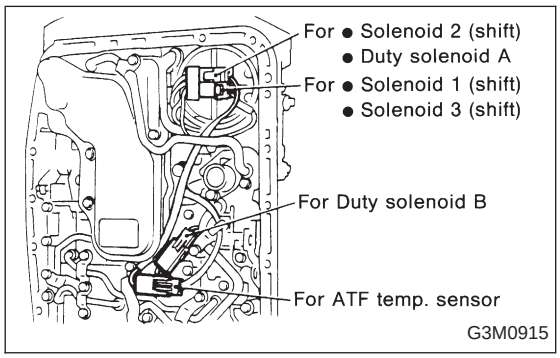
6) Remove the oil pan.

NOTE:
Tap the corners of the oil pan when removing.


G3M0345

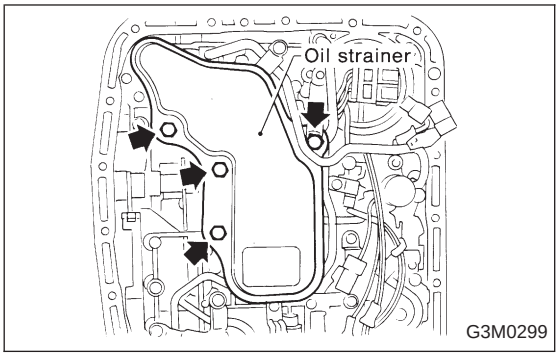
7) Remove the oil cooler outlet pipe.

CAUTION:
Be careful not to twist the pipe.



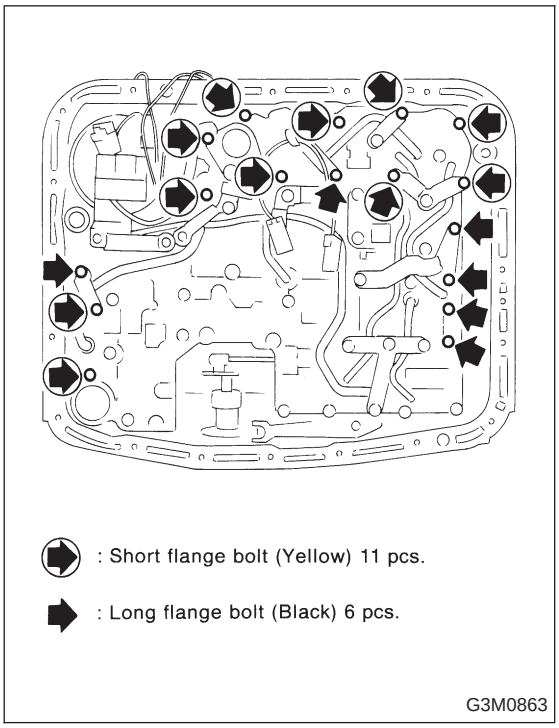
G3M0915

8) Disconnect the harness connectors for the solenoids and duty solenoids and the ground cord.

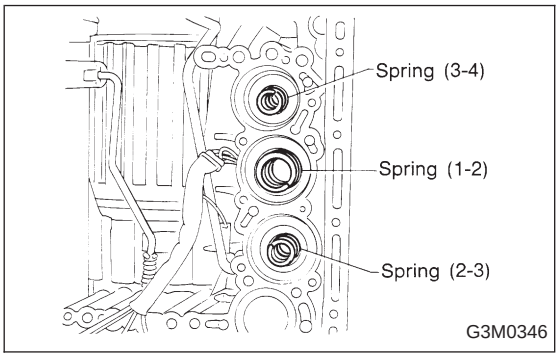


9) Remove the oil strainer.

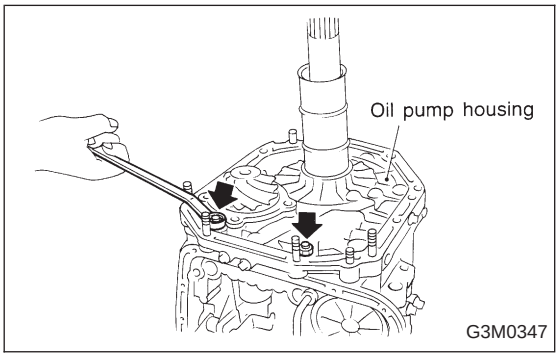
CAUTION:
Be careful not to damage O-ring on oil strainer.



10) Remove the control valve body and the two brackets.

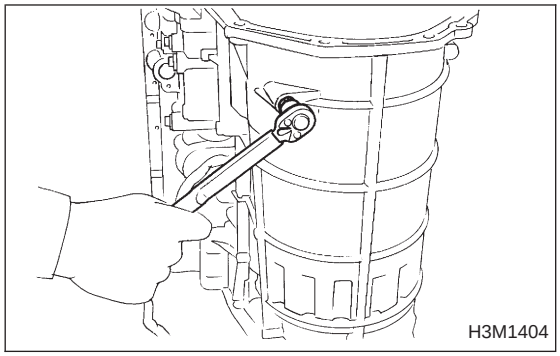


11) Remove the three accumulator springs.

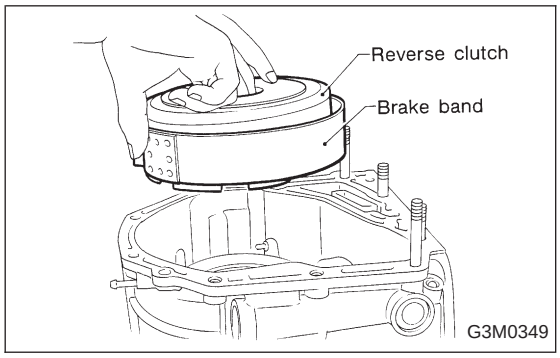


12) Loosen the reverse clutch drum lightly by turning the adjusting screw. Then remove the oil pump housing.

CAUTION:
Be careful not to lose the total end play adjusting thrust washer.

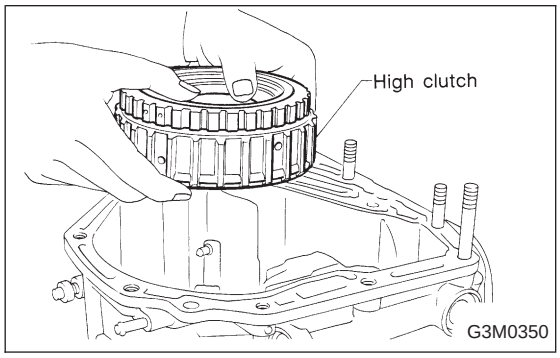


13) Loosen the brake band adjusting screw and take out the strut.



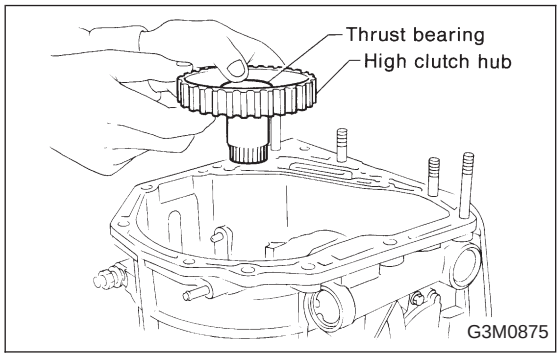
14) Remove the brake band and reverse clutch.

NOTE:
Contract the brake band with a clip.

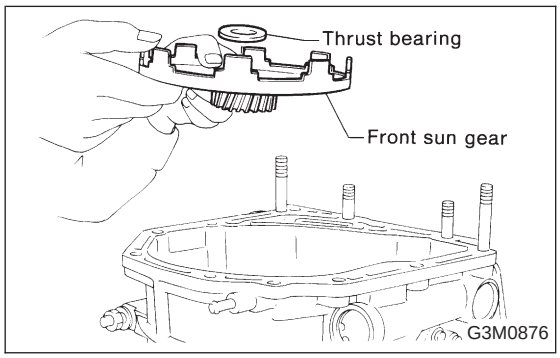


15) Take out the high clutch.

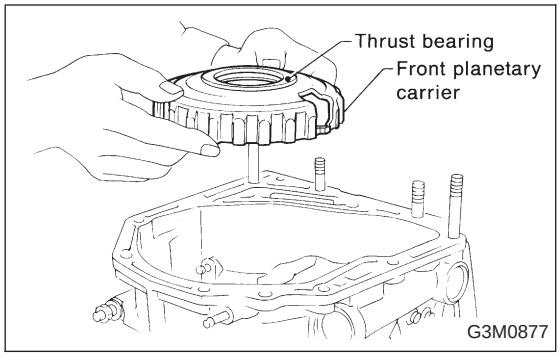
CAUTION:
Thrust needle bearing and bearing race are removed together with high clutch. Be careful not to lose them.



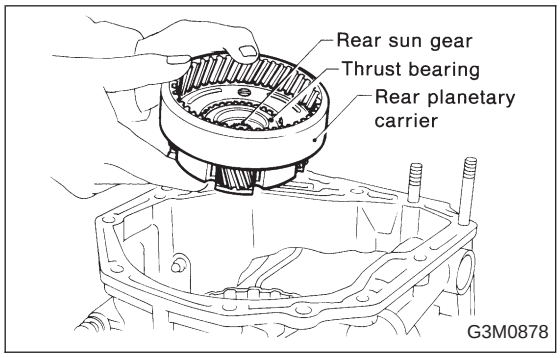
16) Take out the high clutch hub and the thrust bearing.



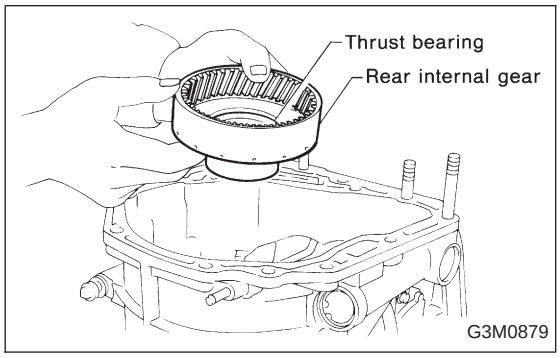
17) Take out the front sun gear and the thrust bearing.



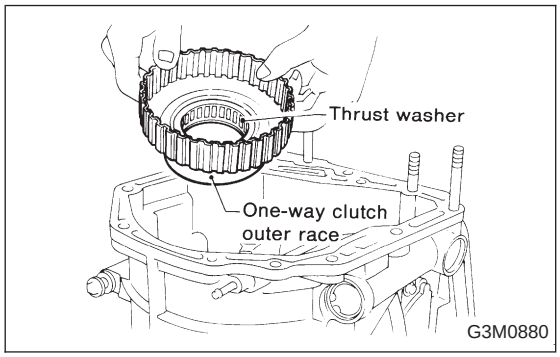
18) Take out the front planetary carrier and the thrust bearing.



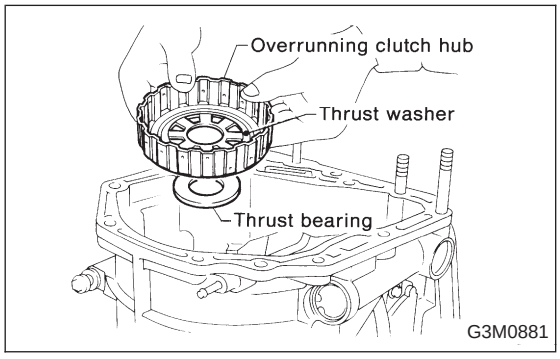
19) Take out the rear planetary carrier, rear sun gear and the thrust bearing.



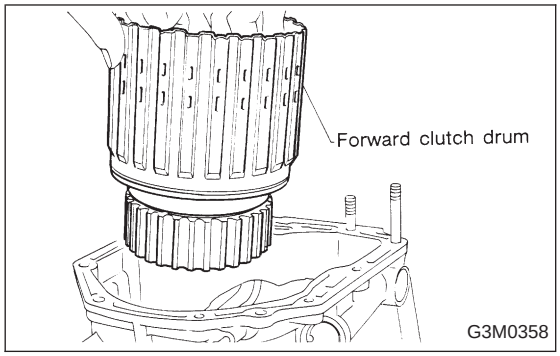
20) Take out the rear internal gear and the thrust bearing.



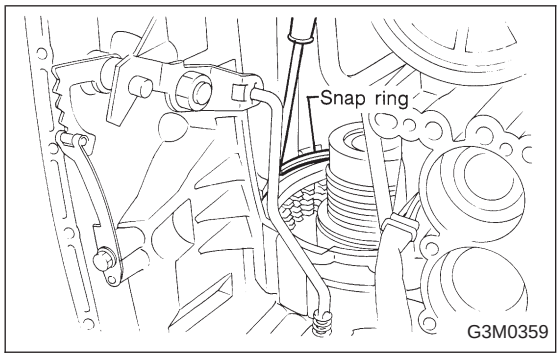
21) Take out the one-way clutch outer race and the thrust washer.



22) Take out the overrunning clutch hub, the thrust washer and the thrust bearing.

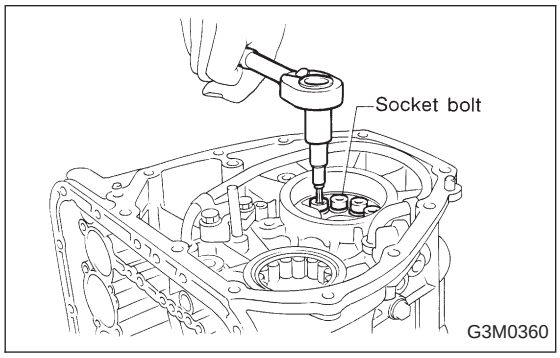


23) Take out the forward clutch drum.

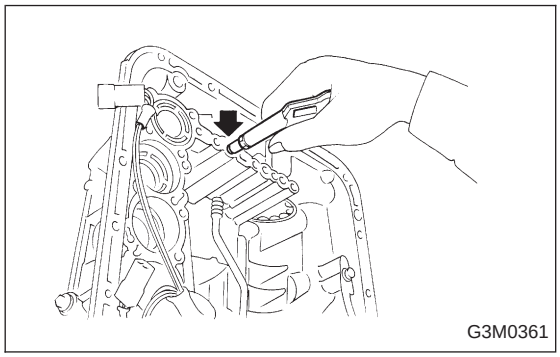


24) Take out the low & reverse brake section.

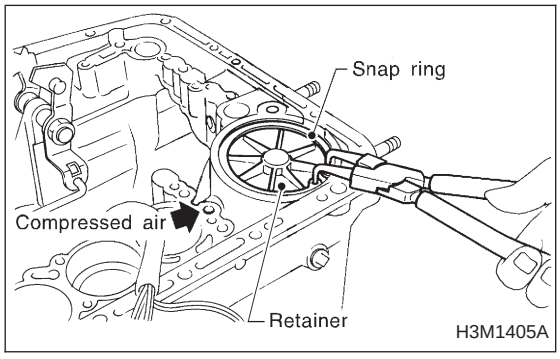
(1) Remove the snap ring. Then remove the retaining plate, drive plates, driven plates, and dish plates as a unit.



(2) Turning the case upside down, take out the one-way clutch inner race and spring retainer.

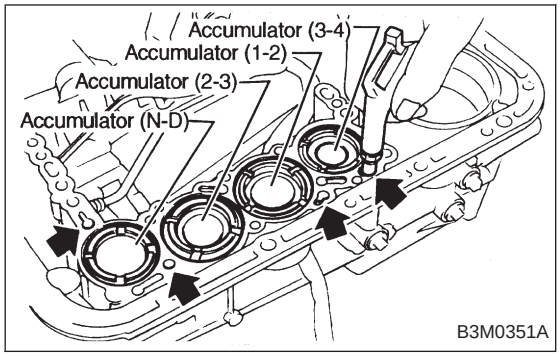


(3) Take out the low & reverse piston by applying compressed air.

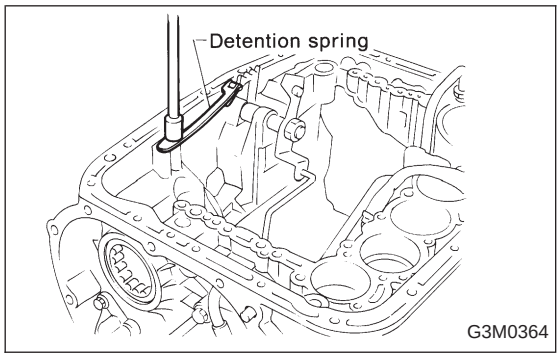


25) After removing the snap ring (inner), take out the servo piston by applying compressed air from the release pressure side.

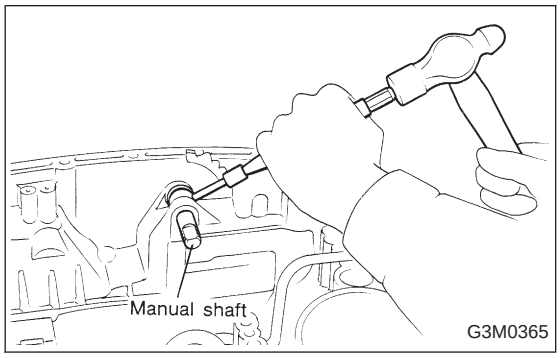
CAUTION:
Hold the servo piston with a rag so that it will not be ejected with the air pressure. In this case, do not allow your finger to be pinched between the pipe and retainer.



26) Apply compressed air from the operating pressure side, and take out accumulator (3-4), accumulator (1-2), accumulator (2-3), accumulator and spring (N-D).

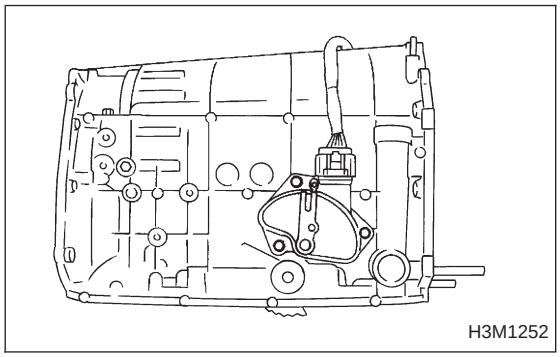


27) Remove the range select lever.
28) Remove the detention spring.

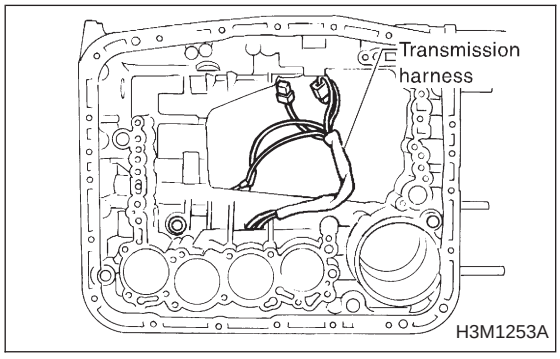


29) Remove the parking rod together with the manual lever. Then remove the manual shaft by pulling off the straight pin.

CAUTION:
Be careful not to damage the lips of the press-fitted oil seal in the case.

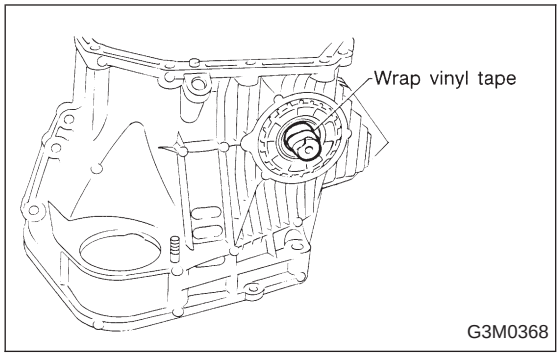


30) Remove the inhibitor switch.



31) Remove the transmission harness.

CAUTION:
Be careful not to damage the cord insulation.

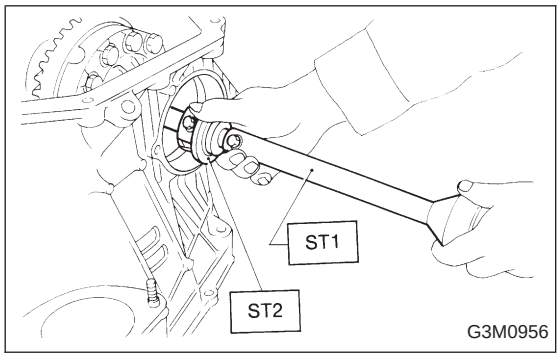


4. TORQUE CONVERTER CLUTCH CASE SECTION

1) Wrap the axle shaft serration with vinyl tape.
2) Remove the differential side retainer with ST.

ST 499787000 WRENCH ASSY

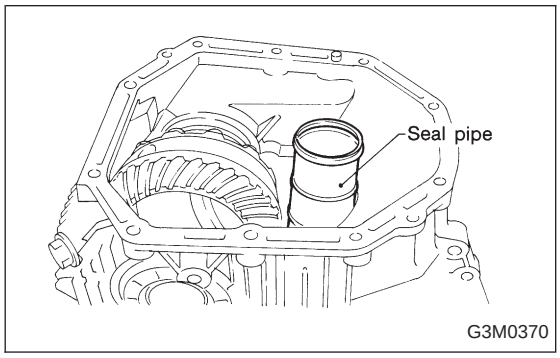
CAUTION:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the torque converter clutch case and speedometer gears.



3) Extract the axle shaft with ST1 and ST2.

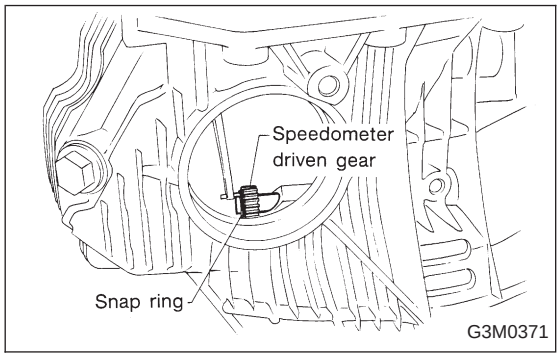
ST1 499095500 REMOVER
ST2 499247300 INSTALLER

CAUTION:
Do not reuse the circlip.

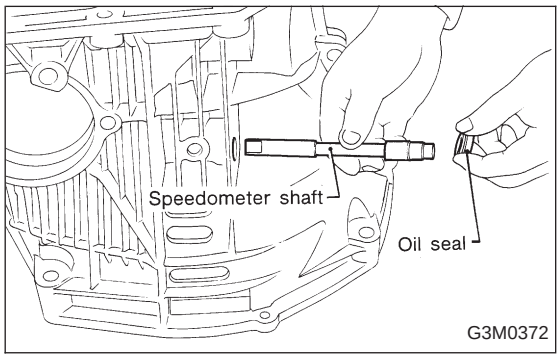


4) Remove the differential case assembly.

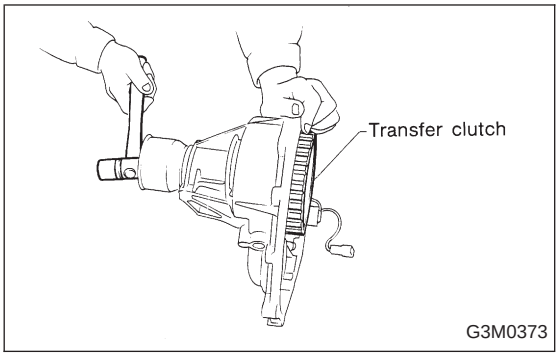
CAUTION:
● Remove the seal pipe if it is attached. (Reusing is not allowed.)
● Be careful not to damage the retainer mounting hole of the torque converter clutch case and the speedometer gears.



5) Remove the snap ring. Then remove the speedometer driven gear.



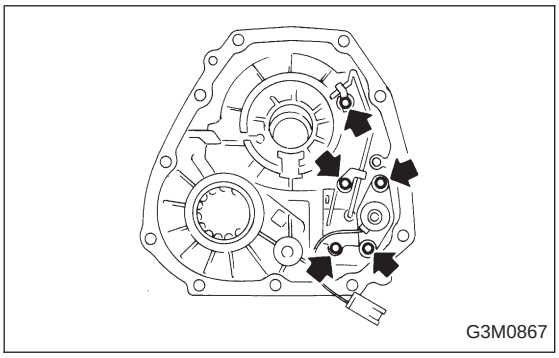
6) Tap out the speedometer shaft to the outside of the case, and remove the oil seal.



5. EXTENSION SECTION

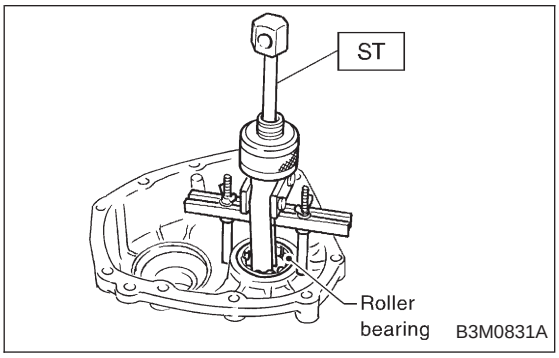
1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

CAUTION:
Be careful not to damage the oil seal in the extension.



2) Remove duty solenoid C, transfer valve body and the transfer pipe.

CAUTION:
- **Take out the inlet filter.**
- **Do not damage the O-ring.**
- **Be careful not to bend the pipe.**



3) Take out the roller bearing inner race with ST.

ST 398527700 PULLER

4) Take out roller bearing outer race with ST.

NOTE:
Hook ST in the inner side of the roller bearing outer race.

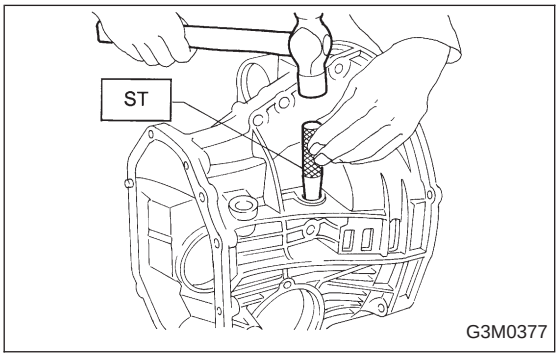
ST 398527700 PULLER

C: ASSEMBLY OF OVERALL TRANSMISSION

1. TORQUE CONVERTER CLUTCH CASE SECTION

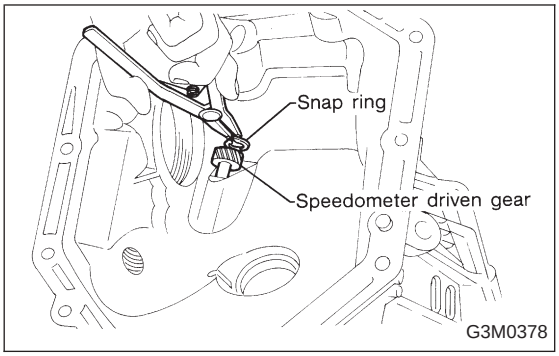
1) Check the appearance of each component and clean.

CAUTION:
Make sure each part is free of harmful cuts, damage and other faults.

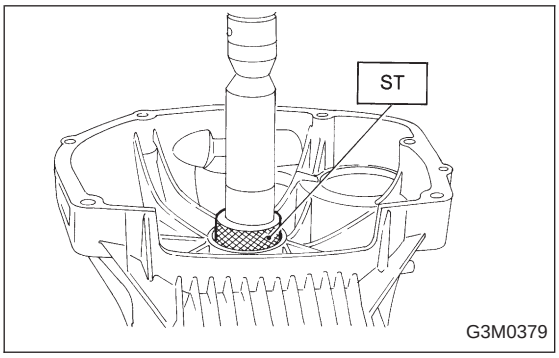


2) Install the washer and snap ring to the speedometer shaft with ST, and set the oil seal. Then force-fit the shaft to the torque converter clutch case.

ST 499827000 PRESS

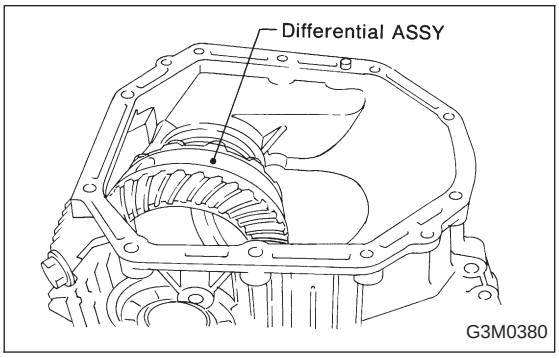


3) Install the speedometer driven gear to the speedometer shaft, and secure with a snap ring.



4) Force-fit the oil seal to the torque converter clutch case with ST.

ST 398437700 DRIFT



5) Install the differential assembly to the case, paying special attention not to damage the speedometer gears (drive and driven) and the inside of the case (particularly, the differential side retainer contact surface).

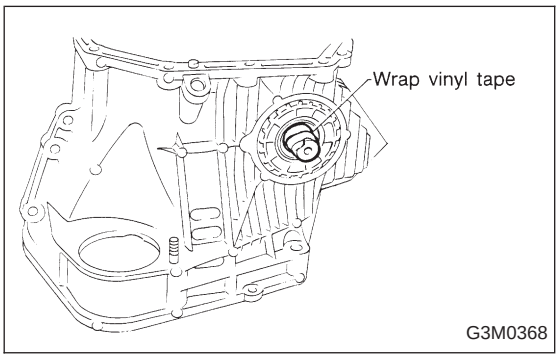
6) Install the circlip to the axle shaft, insert the shaft into the differential assembly, and tap it into position with a plastic hammer.

Thrust play:

Approx. 0.3 — 0.5 mm (0.012 — 0.020 in)

CAUTION:

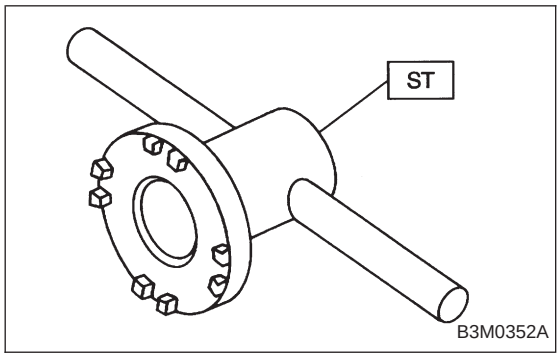
- **If no play is felt, check whether the shaft is fully inserted. If shaft insertion is correct, replace the axle shaft.**
- **Be sure to use a new circlip.**



7) Wrap vinyl tape around the splined portion of the axle shaft.

8) Install the oil seal and outer race (taper roller bearing) to the differential side retainer. Then screw in the retainer and the O-ring after coating the threads with oil.

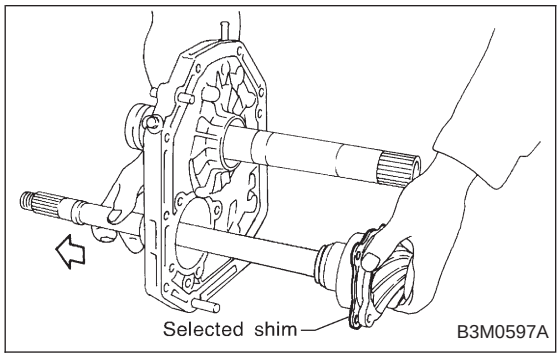
CAUTION:
- **Pay attention not to damage the oil seal lips.**
- **Do not confuse the RH and LH oil seals.**
- **Keep the O-ring removed from the retainer.**



9) Using the ST, screw in the retainer until light contact is felt.

ST 499787000 WRENCH ASSY

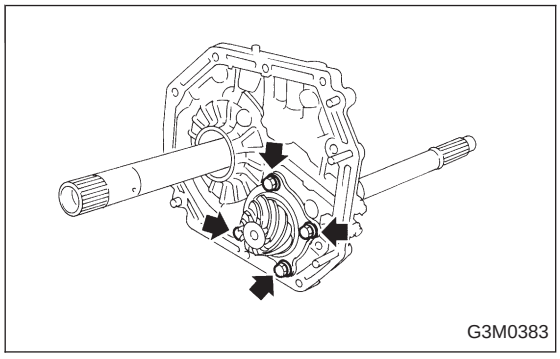
NOTE:
Screw in the RH side slightly deeper than the LH side.



10) Hypoid gear backlash adjustment and tooth contact check

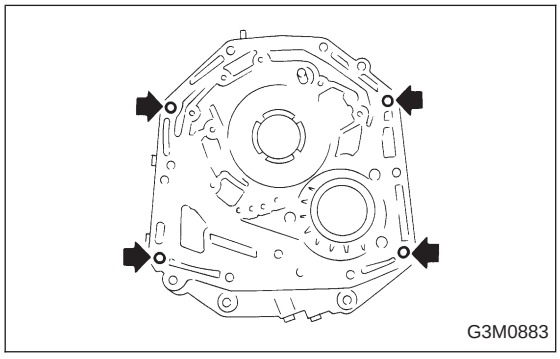
(1) Assemble the drive pinion assembly to the oil pump housing.

CAUTION:
- **Be careful not to bend the shims. <Ref. to 3-2 [W16C0].>**
- **Be careful not to force the pinion against the housing bore.**



(2) Tighten four bolts to secure the roller bearing.

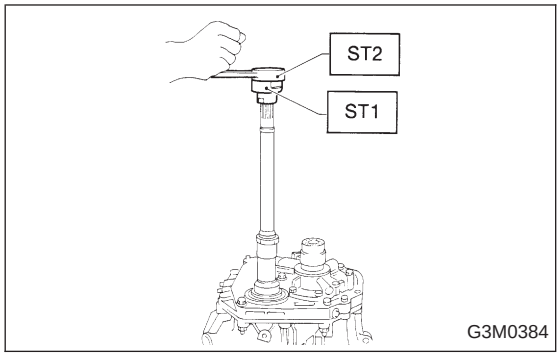
Tightening torque:
39±3 N·m (4.0±0.3 kg-m, 28.9±2.2 ft-lb)



(3) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

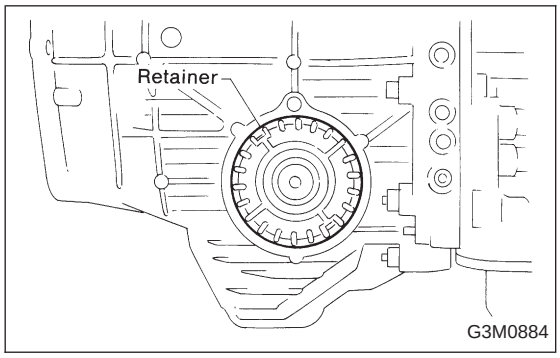
Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)

CAUTION:
- **Thoroughly remove the liquid gasket from the case mating surface beforehand.**
- **Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.**

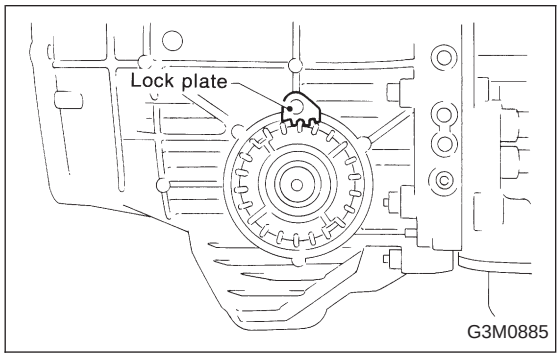


(4) Rotate the drive pinion several times with ST1 and ST2.

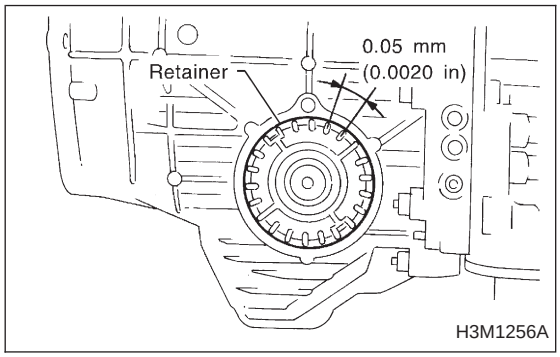
ST1 498937100 HOLDER
ST2 499787100 WRENCH



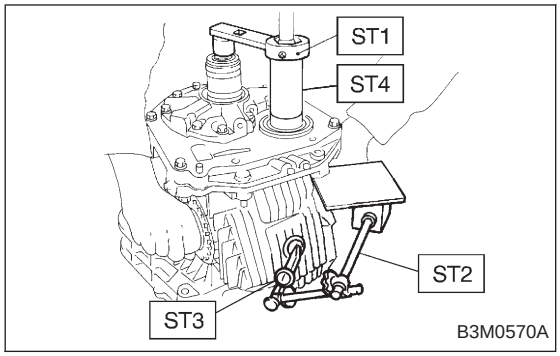
(5) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the “zero” state.



(6) After the “zero” state is established, back off the LH retainer 3 teeth and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Repeat this procedure several times. Tighten the RH retainer 1-3/4 teeth further. This sets the preload. Finally, secure the retainer with its lock plate.



NOTE:
Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



(7) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3 and ST4.

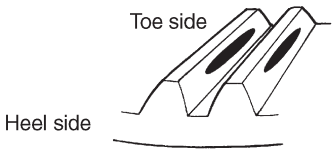
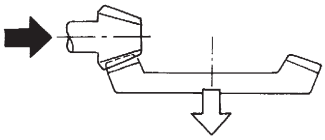
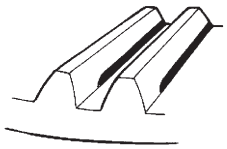
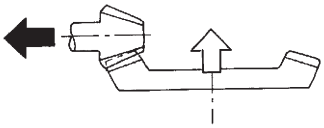
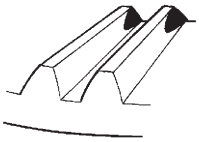
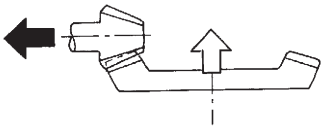
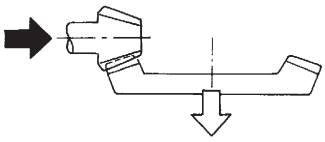
ST1	499787100	WRENCH
ST2	498247001	MAGNET BASE
ST3	498247100	DIAL GAUGE
ST4	499757800	ADAPTER WRENCH

Backlash:

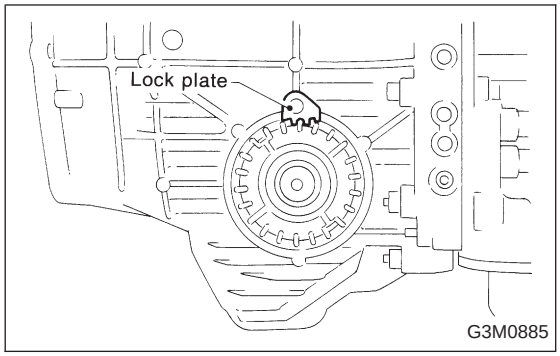
0.13 — 0.18 mm (0.0051 — 0.0071 in)

NOTE:
After confirming that the backlash is correct, check the tooth contact.

(8) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.

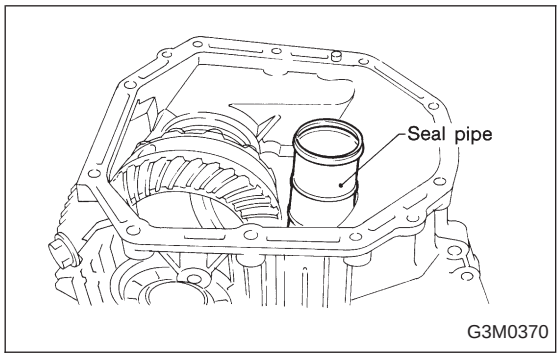
Checking item	Contact pattern	Corrective action
Tooth contact Tooth contact pattern is slightly shifted toward to under no-load rotation. [When loaded, contact pattern moves toward heel.]	 B3M0317A	———
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  B3M0319	Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.  B3M0323
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  B3M0320	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.  B3M0324
Toe contact (Inside end contact) Contact areas is small.	This may cause chipping at toe ends.  B3M0321	Adjust as for flank contact.  B3M0324
Heel contact (Outside end contact) Contact area is small.	This may cause chipping at heel ends.  B3M0322	Adjust as for face contact.  B3M0323

➡ : Adjusting direction of drive pinion
⇨ : Adjusting direction of crown gear



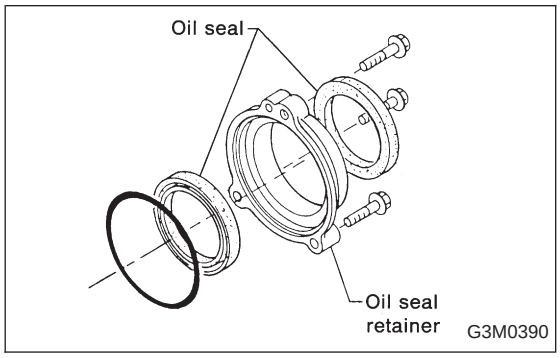
(9) If tooth contact is correct, mark the retainer position and loosen it. After fitting the O-ring, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



11) Install the seal pipe to the torque converter clutch case.

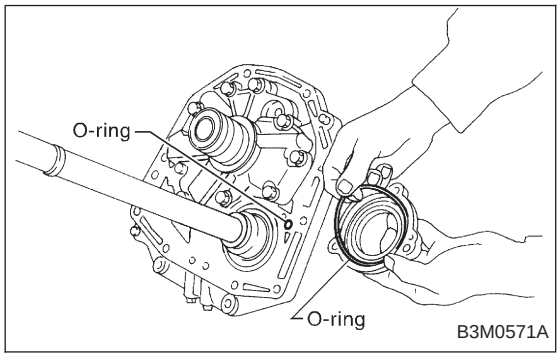
CAUTION:
Be sure to use a new seal pipe.



12) Install two oil seals to the oil seal retainer with ST.

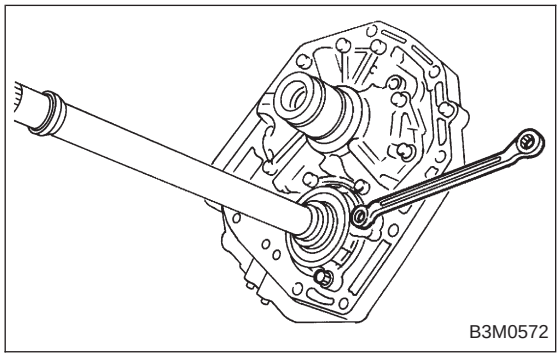
ST 499247300 INSTALLER

CAUTION:
- **Always discard old oil seals, and install new ones.**
- **Pay attention to the orientation of the oil seals.**



13) Attach the O-ring to the oil seal retainer with vaseline. Install the seal to the oil pump housing bore.

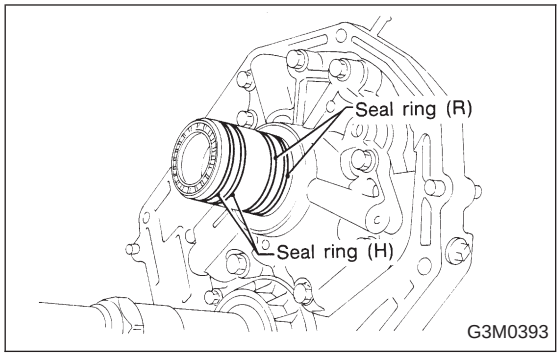
CAUTION:
Always discard old O-rings and install new ones.



14) Install the oil seal retainer taking care not to damage the oil seal lips. Then secure with three bolts.

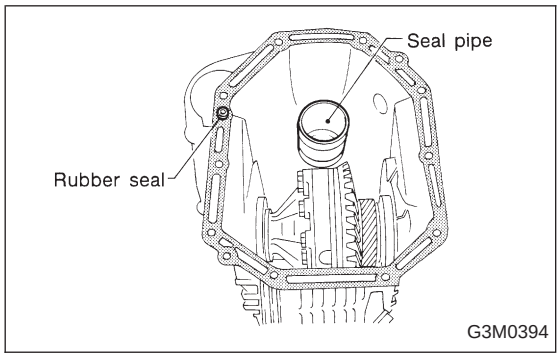
NOTE:
Make sure the O-ring is fitted correctly in position.

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)



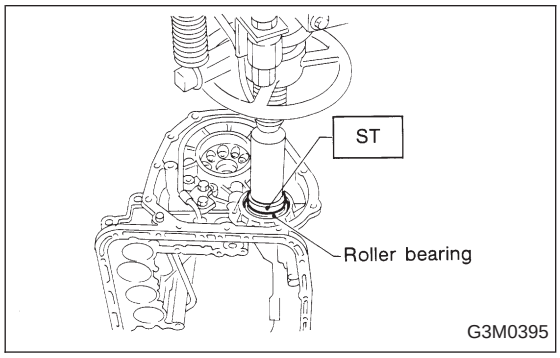
15) Apply vaseline to the groove on the oil pump cover, and install two (R) seal rings and two (H) seal rings.

NOTE:
● Fit the seal ring after compressing, and rub vaseline into the seal ring to avoid expansion.
● The “R” seal ring has a large diameter, while “H” has small diameter.



16) Install the rubber seal to the torque converter clutch case.

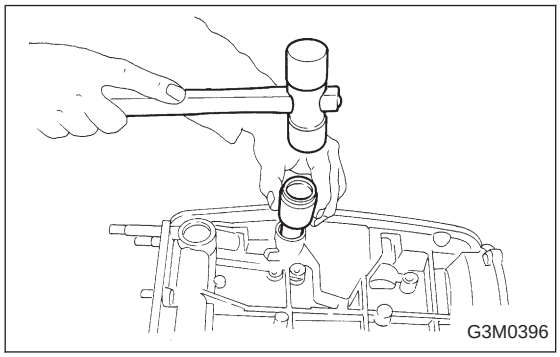
CAUTION:
Be careful not to lose the rubber seal.



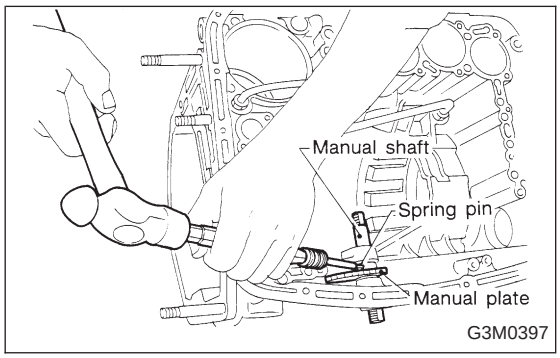
2. TRANSMISSION CASE SECTION

1) Press-fit the roller bearing to the transmission case with ST.

ST 398487700 DRIFT



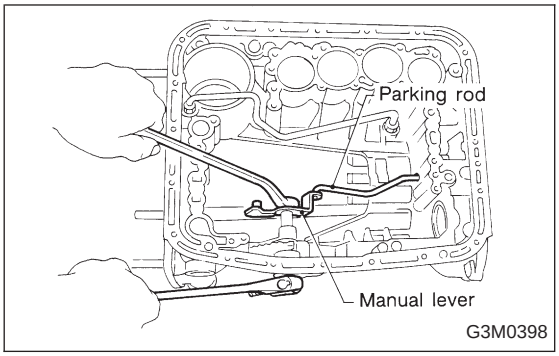
2) Using a plastic hammer, force-fit the oil seal.



3) Install the manual plate and shaft, and secure with a spring pin.

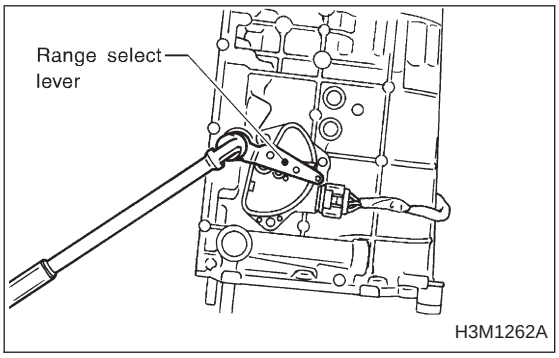
CAUTION:
Be careful not to damage the oil seal lip.

NOTE:
After installation, make sure of smooth movement.



4) Assemble the manual lever and parking rod to the inside shaft, and secure with a nut.

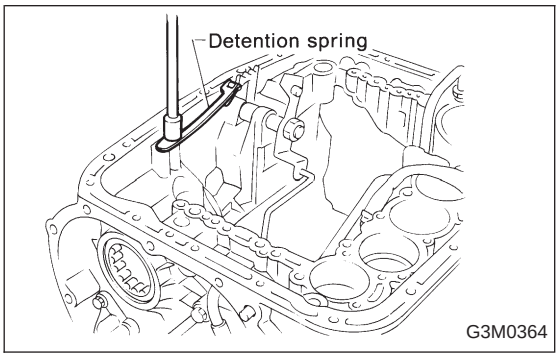
Tightening torque:
47±2 N·m (4.8±0.2 kg-m, 34.7±1.4 ft-lb)



5) Install inhibitor switch.

(1) Install the inhibitor switch to the transmission case. Fit the projecting portion of the switch in the recessed portion of the case, and tighten three bolts temporarily.
(2) Insert the range select lever into the shaft, and tighten the nut.

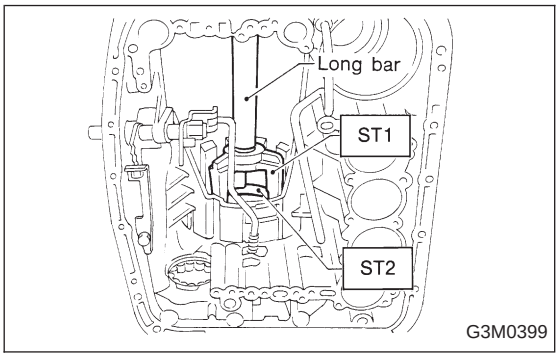
Tightening torque:
47±5 N·m (4.8±0.5 kg-m, 34.7±3.6 ft-lb)



6) Install the detention spring.

NOTE:
Position the spring so that its center is aligned with the center of the manual plate.

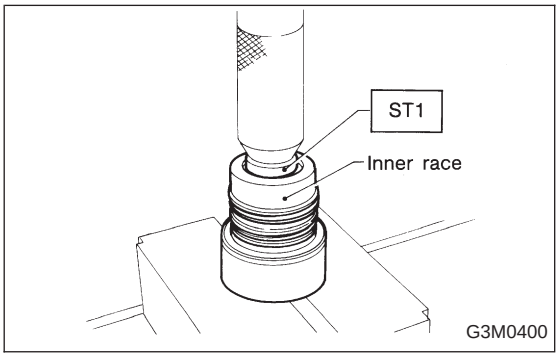
Tightening torque:
6±1 N·m (0.6±0.1 kg-m, 4.3±0.7 ft-lb)



7) Install the lathe cut seal rings to the I.D./O.D. of the low and reverse piston. Then install the piston into the case with a press, ST1 and ST2.

ST1 398673600 COMPRESSOR
ST2 498627000 SEAT

CAUTION:
- **Be careful not to tilt the piston when installing.**
- **Be careful not to damage the lip seal.**



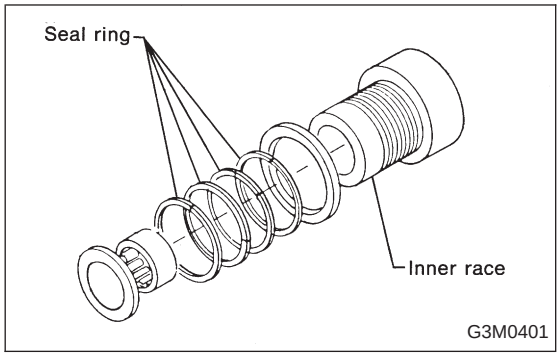
8) Install the one-way clutch inner race.

(1) Using a press and ST1, install the needle bearing to the inner race.

ST1 398497701 INSTALLER

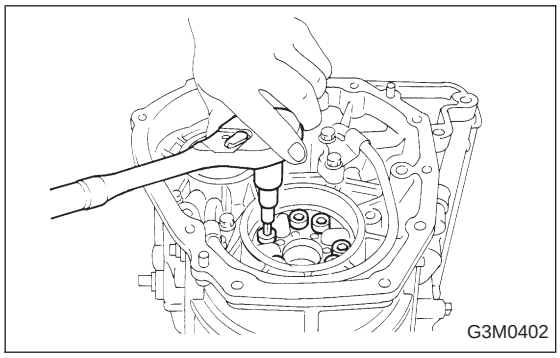
NOTE:
Use the following ST when removing.

ST 398527700 PULLER ASSY



(2) Install four seal rings and thrust washer.

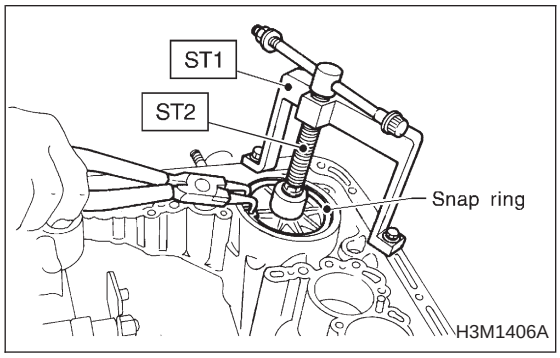
NOTE:
Apply vaseline to the groove of the inner race and to the seal ring after installation, so that the seal ring will not expand.



(3) Place the spring retainer on the inner race. Install the spring to the recessed portion of the piston. Then tighten eight socket head bolts from the rear side of the transmission case.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

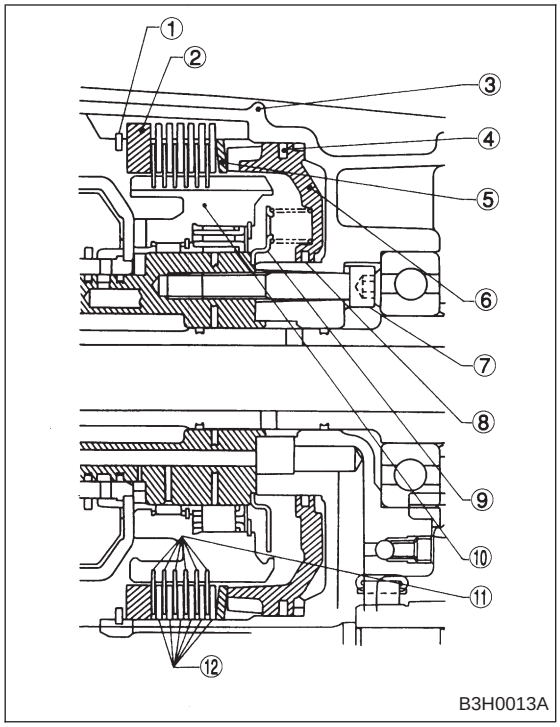
CAUTION:
Be sure to tighten evenly.



9) Install the band servo sub assembly.
10) Press the O.D. servo retainer into position with ST1 and ST2, and secure with a snap ring.

ST1	498677010	COMPRESSOR
ST2	399703600	PULLER ASSY

CAUTION:
Perform the following operations with the transmission case set vertically on wooden blocks.



B3H0013A

11) Measure the drive plates thickness of the low & reverse brake.

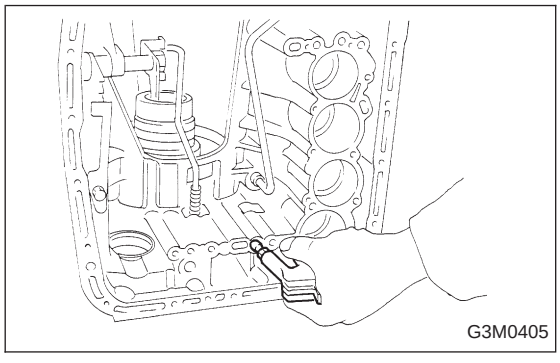
Standard value: 1.8 mm (0.071 in)
Allowable limit: 1.6 mm (0.063 in)

12) Installation of the low & reverse brake:

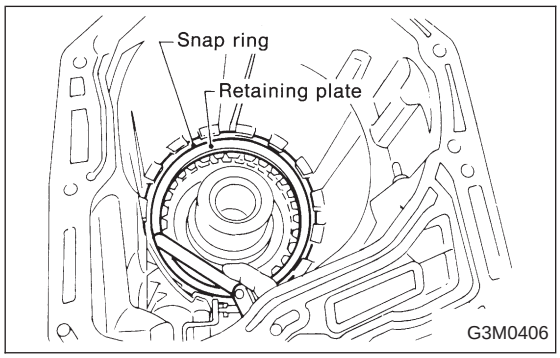
(1) Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:
Pay attention to the orientation of the dish plate.

① Snap ring
② Retaining plate
③ Transmission case
④ Lathe cut seal ring
⑤ Dish plate
⑥ Piston
⑦ Bolt
⑧ Lathe cut seal ring
⑨ Clutch spring retainer
⑩ Forward clutch drum
⑪ Drive plate
⑫ Driven plate


G3M0405

(2) Apply compressed air intermittently to check for operation.



G3M0406

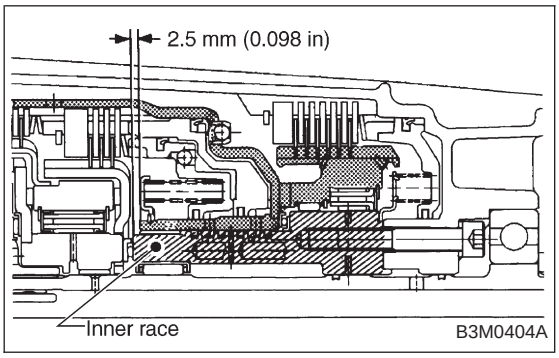
(3) Check the clearance. (Selection of retaining plate)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

Standard value:
0.7 — 1.0 mm (0.028 — 0.039 in)

Allowable limit:
2.0 mm (0.079 in)

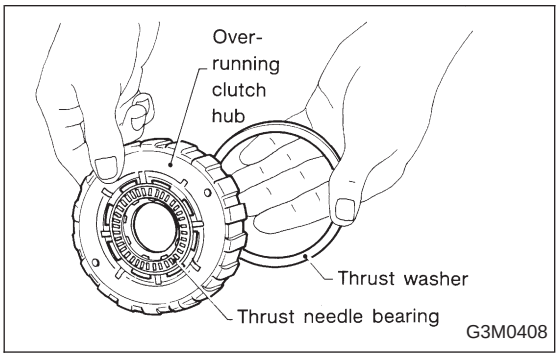
	Part No.	Thickness mm (in)
● Available retaining plates	31667AA180	6.5 (0.256)
	31667AA190	6.8 (0.268)
	31667AA200	7.1 (0.280)
	31667AA210	7.4 (0.291)
	31667AA220	7.7 (0.303)
	31667AA230	8.0 (0.315)
	31667AA240	8.2 (0.323)
	31667AA250	8.4 (0.331)
	31667AA310	8.6 (0.339)



13) Install the forward clutch drum.

(1) Install carefully while rotating the forward drum slowly paying special attention not to damage the seal ring.

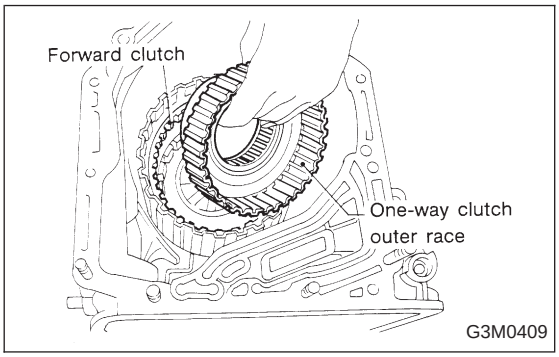
(2) Installation is complete when the forward drum recedes 2.5 mm (0.098 in) from the inner race surface.



14) Assemble the overrunning clutch hub.

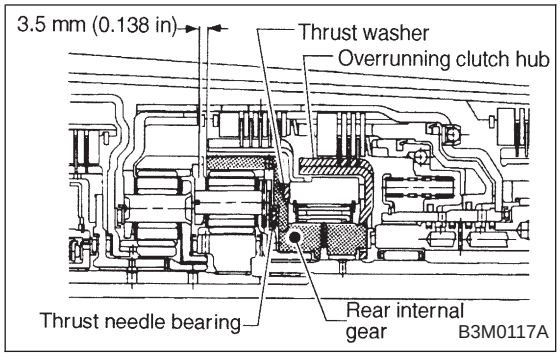
CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>

NOTE:
● Join the thrust needle bearing and thrust washer with vaseline, and then install them together.
● Make sure that the splines are engaged correctly.



15) Install the one-way clutch outer race.

NOTE:
Make sure the forward clutch splines are engaged correctly.



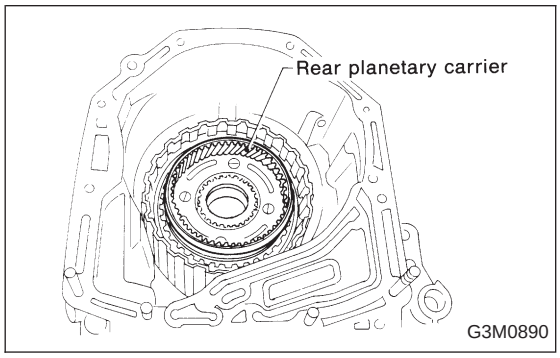
16) Assemble the rear internal gear.

(1) Join the thrust needle bearing and thrust washer to the internal gear with vaseline, and install the internal gear while rotating it.

(2) Securely engage the bearing with the dog of the overrunning clutch hub.

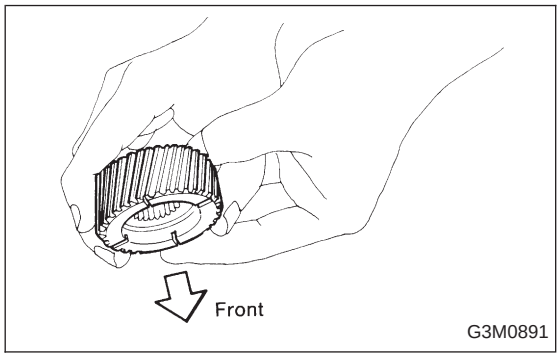
CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>

NOTE:
Installation is complete when the snap ring top surface of the forward clutch drum recedes approximately 3.5 mm (0.138 in).



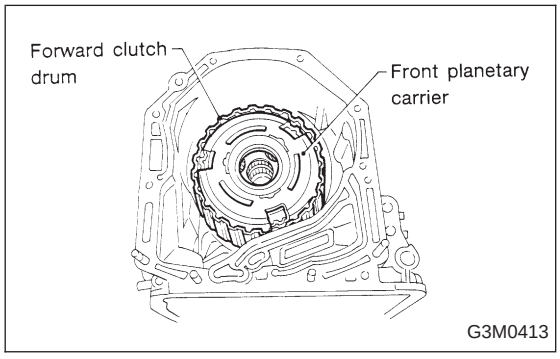
17) Install the rear planetary carrier.
Attach the thrust needle bearing to the inside of the carrier with vaseline. Then install the carrier while rotating slowly.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



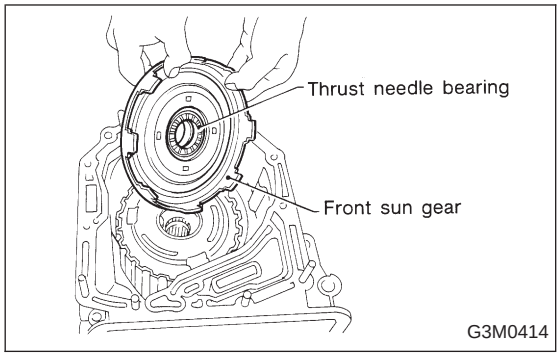
18) Install the rear sun gear.

NOTE:
Install the gear with the oil groove facing up.



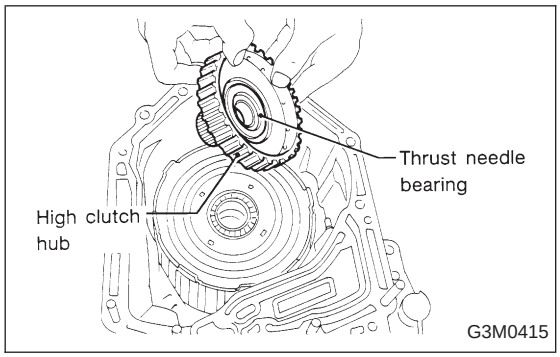
19) Install the front planetary carrier.
Attach the thrust needle bearings to both sides of the carrier with vaseline. Install the carrier carefully, while aligning with the splines of the forward clutch drum, and while rotating the pinion.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



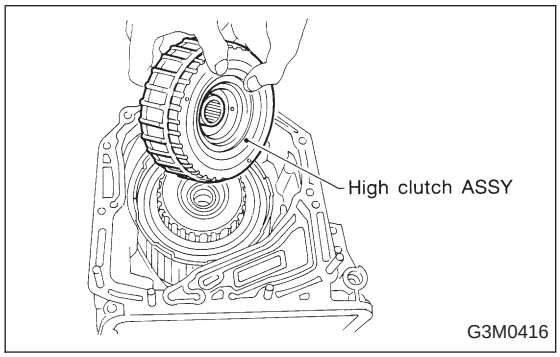
20) Install the front sun gear.
Attach the thrust needle bearing to the gear, and install the gear while turning slowly.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



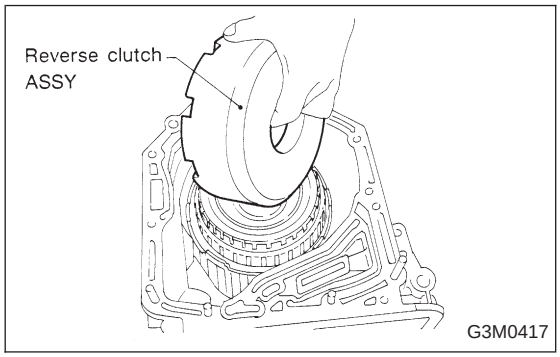
21) Install the high clutch hub.
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.

CAUTION:
Install thrust needle bearing in the correct direction. <Ref. to 3-2 [S1C0].>



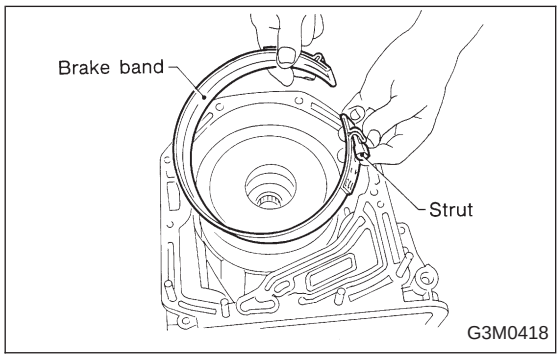
22) Install the high clutch assembly.

NOTE:
Correctly engage the high clutch hub and clutch splines.



23) Install the reverse clutch assembly.

NOTE:
Engage the high clutch outer spline with the reverse clutch spline and the front sun gear with the cut-out portion of the reverse clutch drum correctly when installing.



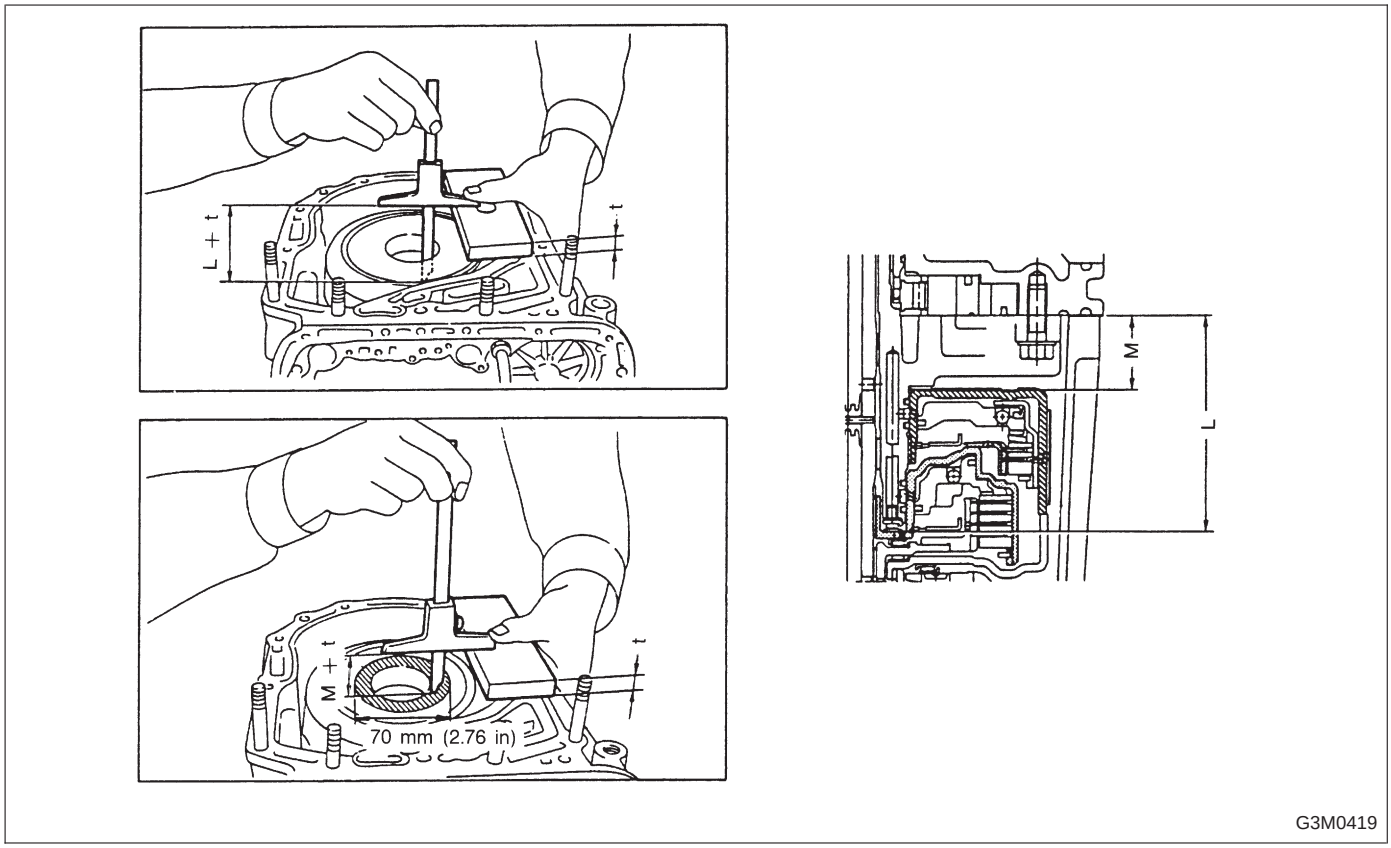
24) Install the brake band.

CAUTION:
Be careful not to damage the brake band when installing.

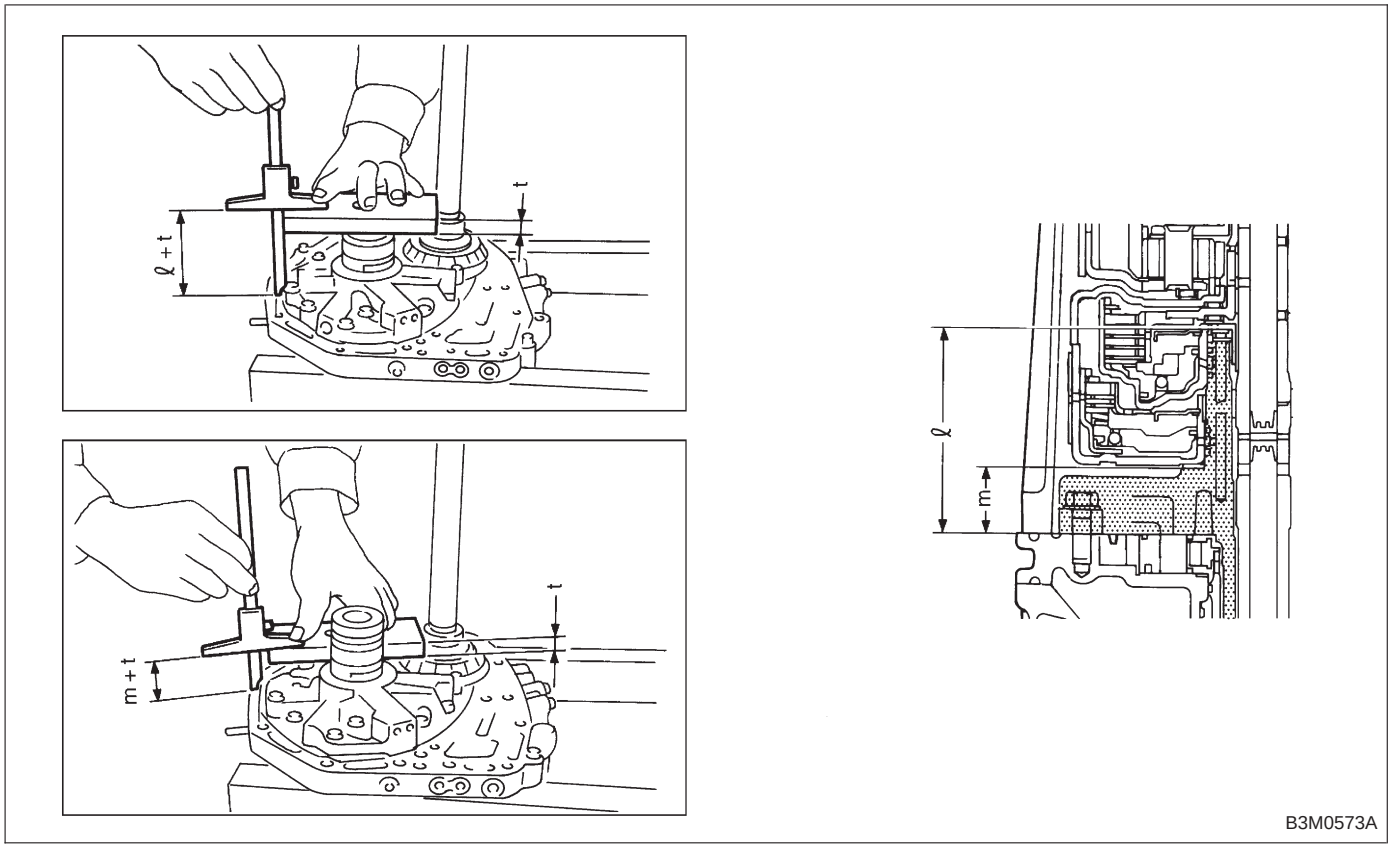
NOTE:
Install the strut to the band servo piston stem. Then tighten it temporarily to avoid tilting the band.

25) Adjustment of total end play and reverse clutch end play

(1) Measure the distance from the transmission case mating surface to the recessed portion of the high clutch drum “L”, and the distance to the top surface of the reverse clutch drum “M”.



(2) Measure the distance from the oil pump housing mating surface to the top surface of the oil pump cover with needle bearing, and to the thrust surface of the reverse clutch.



(3) Equation for calculation

- Total end play
  C = (L + 0.4 mm) − ℓ

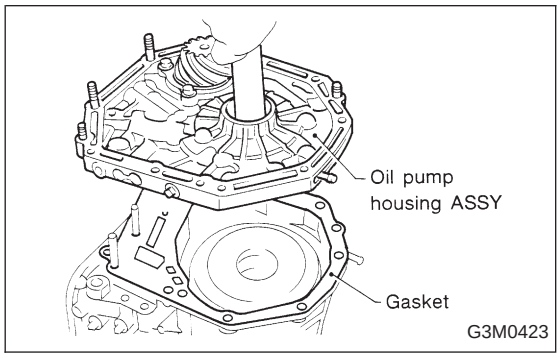
C : Clearance between concave portion of high clutch and end of clutch drum support
L : Length from case mating surface to concave portion of high clutch
0.4 : Gasket thickness
ℓ : Height from housing mating surface to upper surface of clutch drum support

	Part No.	Thickness mm (in)
Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 — 0.55 mm (0.0098 — 0.0217 in) range.	803031021 803031022 803031023 803031024 803031025 803031026 803031027	0.8 (0.031) 1.0 (0.039) 1.2 (0.047) 1.4 (0.055) 1.6 (0.063) 1.8 (0.071) 2.0 (0.079)

- Reverse clutch end play
  C = (M + 0.4 mm) − m

C : Clearance between oil pump housing hose and end of reverse clutch
M : Distance from case mating surface to upper surface of reverse clutch
0.4 : Gasket thickness
m : Height from housing mating surface to thrust-receiving area of reverse clutch

	Part No.	Thickness mm (in)
Select suitable thrust washer from among those listed in this table so that clearance C is in the 0.55 — 0.90 mm (0.0217 — 0.0354 in) range.	31299AA000	0.7 (0.028)
	31299AA010	0.9 (0.035)
	31299AA020	1.1 (0.043)
	31299AA030	1.3 (0.051)
	31299AA040	1.5 (0.059)
	31299AA050	1.7 (0.067)
	31299AA060	1.9 (0.075)

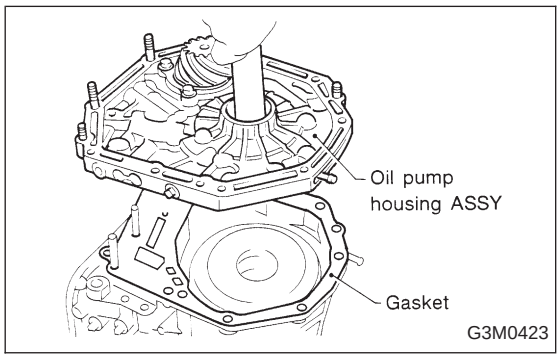


26) Install the oil pump housing assembly.

(1) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust washer and thrust needle bearing to the oil pump cover with vaseline.

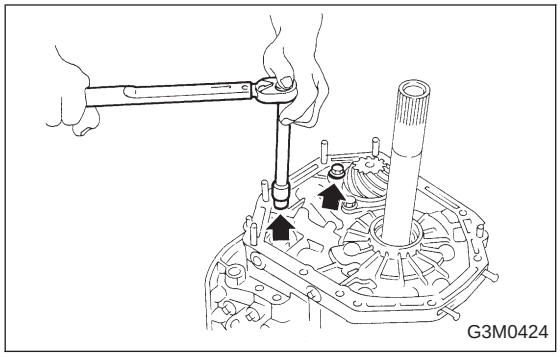
(2) After correctly installing the gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.

CAUTION:
- **Be careful not to damage the seal ring.**
- **Be sure to use a new gasket.**



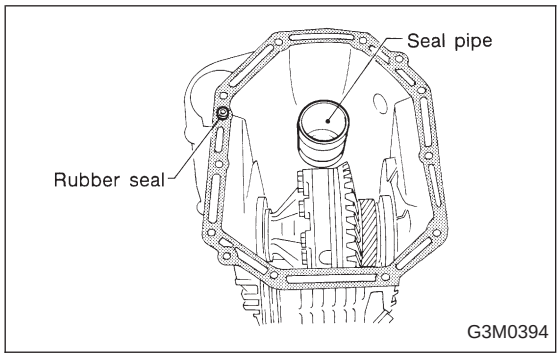
(3) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

NOTE:
Any clearance suggests a damaged seal ring.


G3M0424

(4) Secure the housing with two nuts.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)

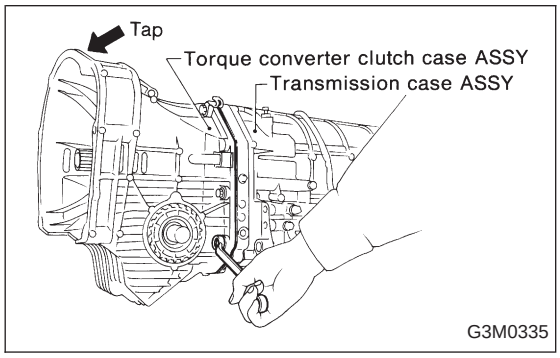


G3M0394

3. TORQUE CONVERTER CLUTCH CASE AND TRANSMISSION CASE

1) Apply proper amount of liquid gasket (THREE BOND Part No. 1215) to the entire torque converter clutch case mating surface.

NOTE:
Make sure that the rubber seal and seal pipe are fitted in position.

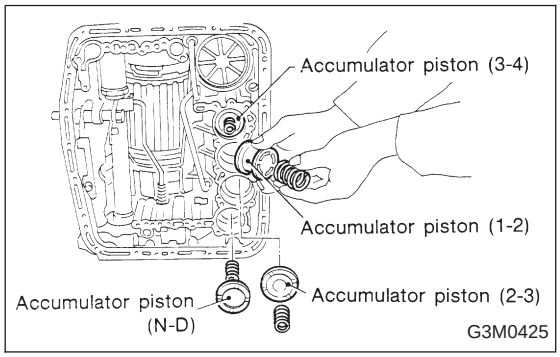


G3M0335

2) Install the torque converter clutch case assembly to the transmission case assembly, and secure with six bolts and four nuts.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)

CAUTION:
When installing, be careful not to damage the torque converter clutch case bushing and oil seal.



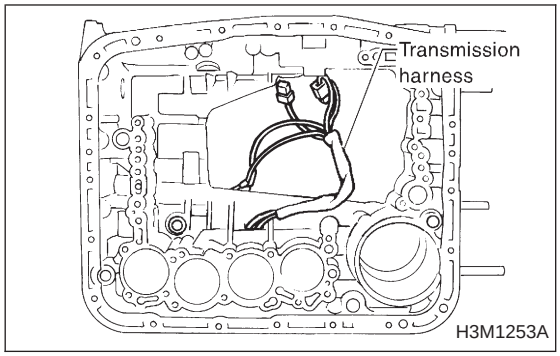
G3M0425

4. CONTROL VALVE AND OIL PAN

1) Install four accumulators with oil pans facing upward.

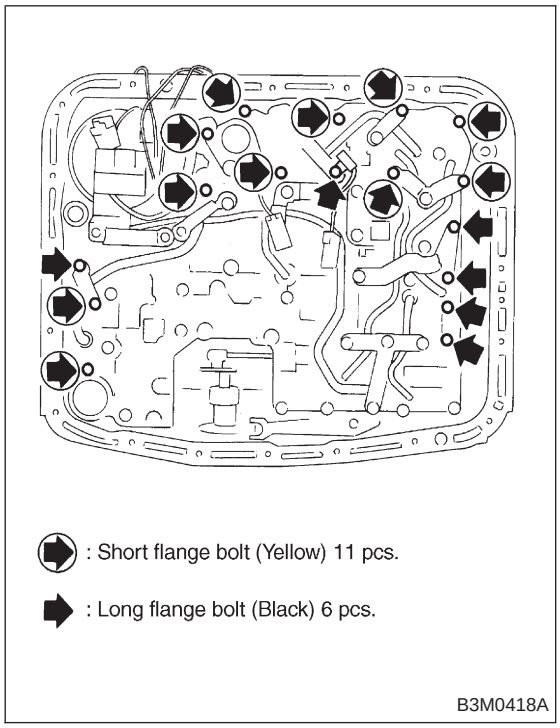
CAUTION:
Be careful not to confuse the springs and installation positions.

Spring specification		
Accumulator spring	Outer diameter mm (in)	Free length mm (in)
1 — 2	28.5 (1.122)	44.5 (1.752)
2 — 3	20.5 (0.807)	31.0 (1.220)
3 — 4	17.3 (0.681)	43.7 (1.720)
N — D	17.8 (0.701)	36.5 (1.437)



2) Install and route the transmission harness.

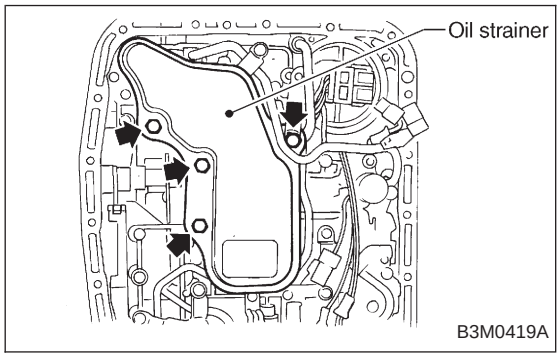
CAUTION:
Be careful not to damage the harness.



3) Install the control valve assembly.
(1) Set the select lever in range “2”.
(2) Install the two brackets, ATF temperature sensor and the control valve by engaging the manual valve and manual lever, then tighten the 17 bolts.

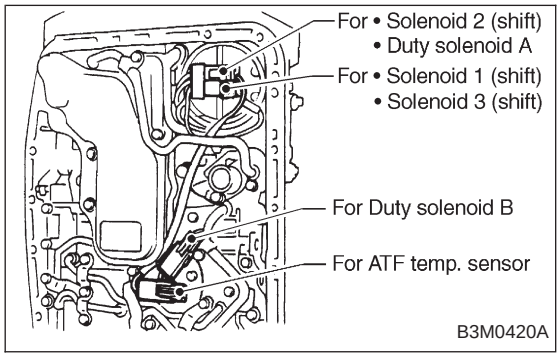
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

CAUTION:
- **Be careful not to pinch the harness roll the gasket.**
- **Tighten the control valve mounting bolts evenly.**

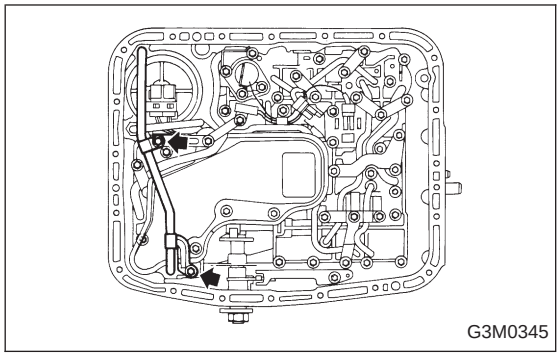


4) Install the oil strainer to the control valve. Be careful not to cut or break the O-ring. Then tighten four bolts.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)



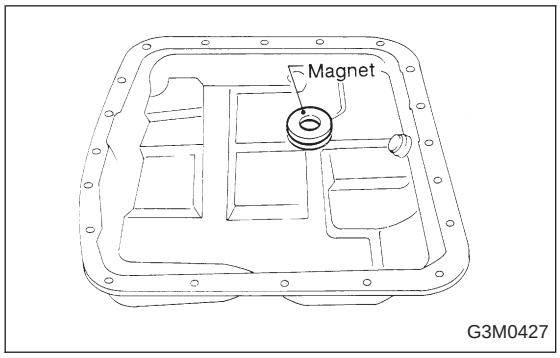
5) Secure four connectors.


G3M0345

6) Install the oil cooler outlet pipe, and secure with two bolts.

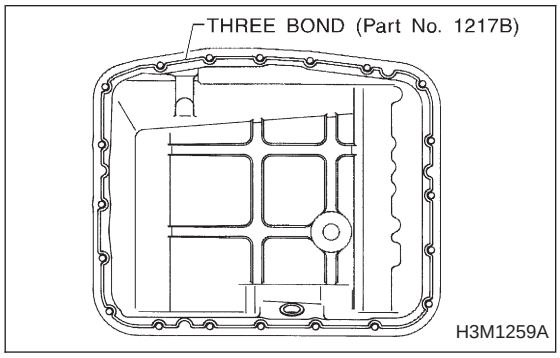
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

CAUTION:
Fit the pipe into position. Be careful to avoid twisting.



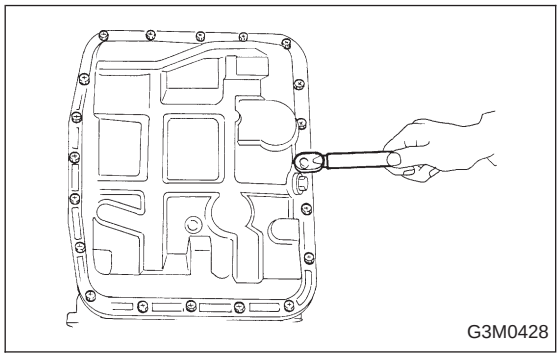
G3M0427

7) Install the oil pan.
(1) Attach the magnet at the specified position.



H3M1259A

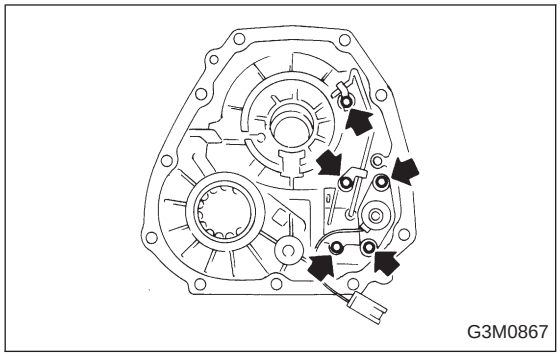
(2) Apply proper amount of liquid gasket (THREE BOND Part No. 1217B) to the entire oil pan mating surface.


G3M0428

(3) Install the oil pan to transmission case.

Tightening torque:
4.9±0.5 N·m (0.50±0.05 kg-m, 3.6±0.4 ft-lb)

NOTE:
Tighten the bolts evenly.


G3M0867

5. EXTENSION SECTION

NOTE:
When installing new oil seal into extension case, press it with ST.

ST 498057300 INSTALLER

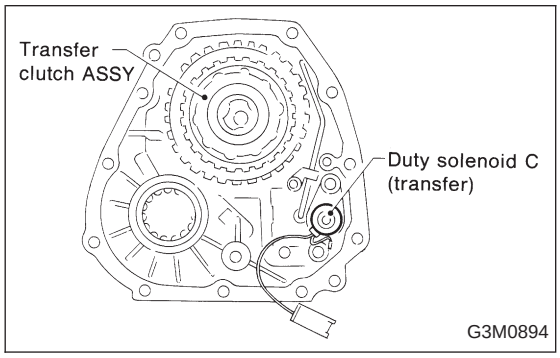
1) Install the filter in the extension case.

NOTE:
Pay attention to the orientation of the filter.

2) Install the transfer clutch valve assembly, transfer pipe, and the stay then secure with five bolts.

Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

CAUTION:
● Be sure to tighten the going lead with one of these bolts.
● Be sure to use a new gasket.

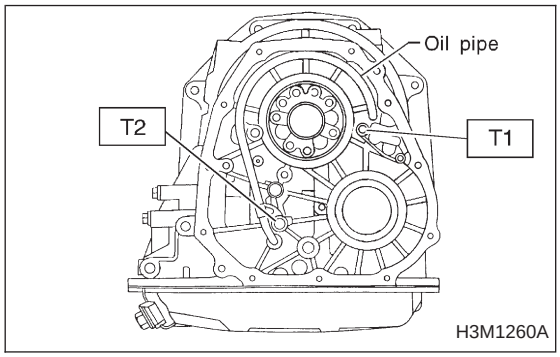


G3M0894

3) Install the transfer clutch assembly to the case.

CAUTION:
Be careful not to damage the seal rings.

NOTE:
Insert the clutch assembly fully into position until the bearing shoulder bottoms.

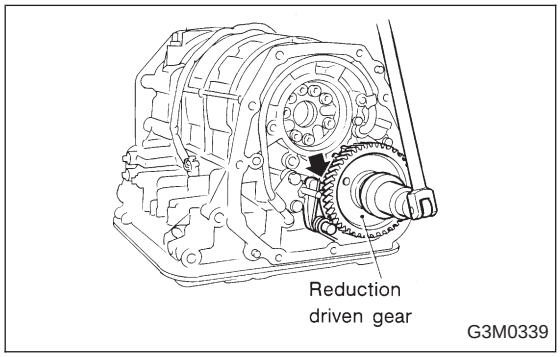


H3M1260A

6. CONNECTION OF EACH SECTION

1) Install oil pipe.

Tightening torque:
T1: 7.8±1.0 N·m (0.80±0.10 kg-m, 5.8±0.7 ft-lb)
T2: 24.5±2.0 N·m (2.50±0.20 kg-m, 18.1±1.4 ft-lb)

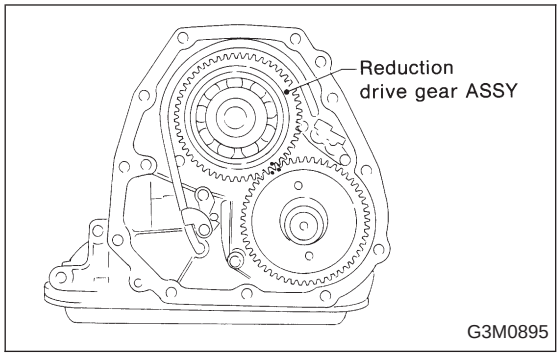


G3M0339

2) Install the reduction driven gear.
3) Install the parking pawl and shaft, set the select lever in the “P” range and tighten the drive pinion lock nut.

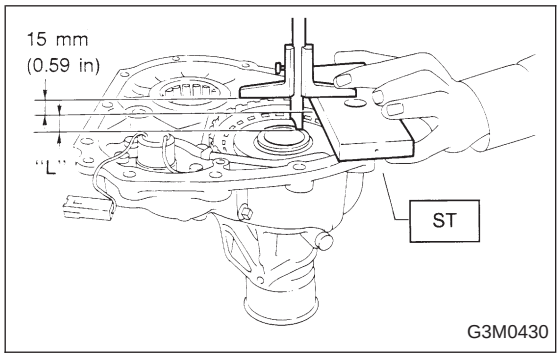
Tightening torque:
98±5 N·m (10.0±0.5 kg-m, 72.3±3.6 ft-lb)

NOTE:
After tightening, stake the lock nut securely.



4) Install the reduction drive gear.

NOTE:
Insert it fully into position until the bearing shoulder bottoms.

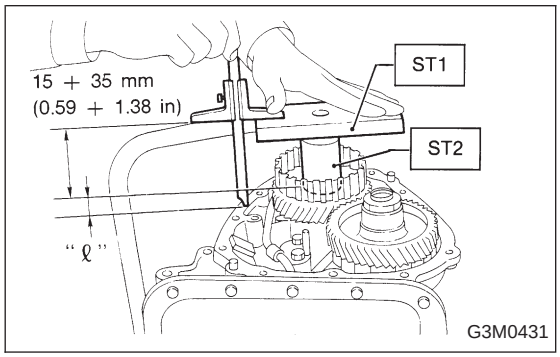


5) Measurement and adjustment of extension end play

(1) Measure distance L from end of extension case and rear drive shaft with ST.

ST 398643600 GAUGE

L = Measured value − 15 mm



(2) Measure the distance "ℓ" from the transmission case mating surface to the reduction drive gear end surface with ST1 and ST2.

ℓ = Measured value − 50 mm

ST1 398643600 GAUGE
ST2 499577000 GAUGE

(3) Calculation equation:

$T = (L + 0.4\ mm) - \ell$

T : Clearance between end of reduction drive gear and end of rear drive shaft.

L : Distance from end of extension case to end of rear drive shaft.

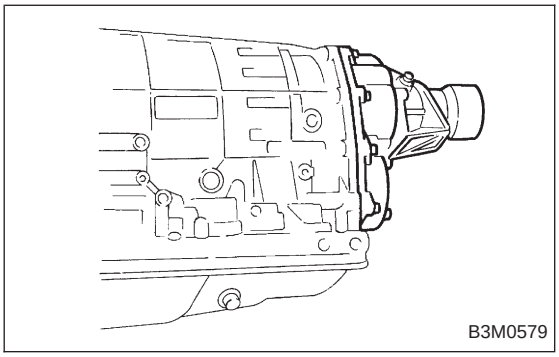
0.4: Gasket thickness

ℓ : Height from end of transmission case to end of reduction drive gear.

Select suitable thrust needle bearing from among those listed in the following table to adjust clearance in the 0.05 — 0.20 mm (0.0020 — 0.0079 in) range.

	Part No.	Thickness mm (in)
● Thrust needle bearing	806536020	3.8 (0.150)
	806535030	4.0 (0.157)
	806535040	4.2 (0.165)
	806535050	4.4 (0.173)
	806535060	4.6 (0.181)
	806535070	4.8 (0.189)
	806535090	5.0 (0.197)

Select from one to five shims so that clearance is within specifications.


B3M0579

6) Installation of extension case and transmission case.

(1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

(2) Set the parking return spring.

(3) Remove the transfer clutch from the extension case.

Set the needle bearing on the reduction drive shaft and then install transfer clutch to the transfer clutch hub.

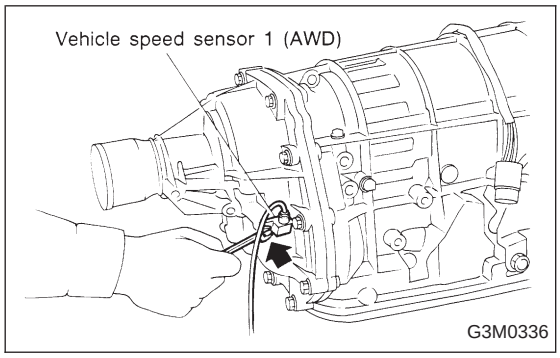
NOTE:
Be sure to engage the spline teeth correctly.

(4) With gasket inserted between them, install the extension case to the transmission case.

CAUTION:
● Be sure to use a new gasket.
● After inserting the extension case halfway, connect the connector for duty solenoid C. Be careful not to jam the cord in the case.
● Be careful not to damage the rear drive shaft seal ring.

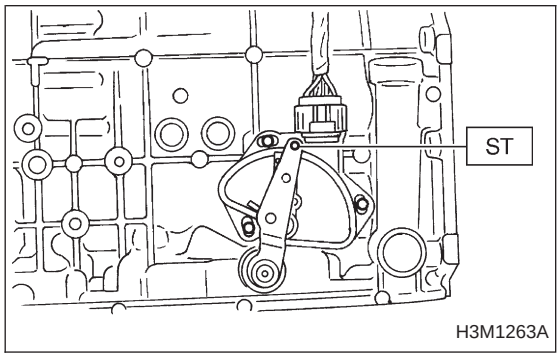
(5) Tighten bolts to secure the case.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



7) Install the vehicle speed sensor 1.

Tightening torque:
7±1 N·m (0.7±0.1 kg-m, 5.1±0.7 ft-lb)



7. EXTERNAL PARTS

1) Adjustment of inhibitor switch.

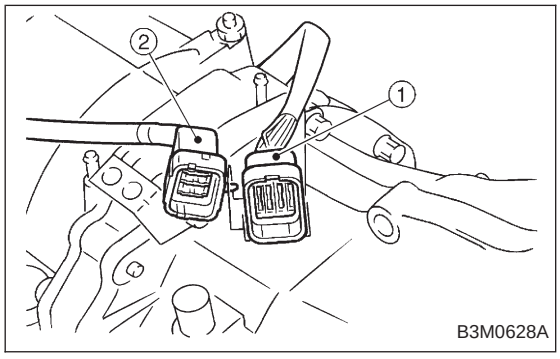
(1) With the selector lever set to “N” adjust the inhibitor switch so that the hole of range select lever is aligned with the inhibitor switch hole with ST.

ST 499267300 STOPPER PIN

NOTE:
Ensure that gauge moves properly.

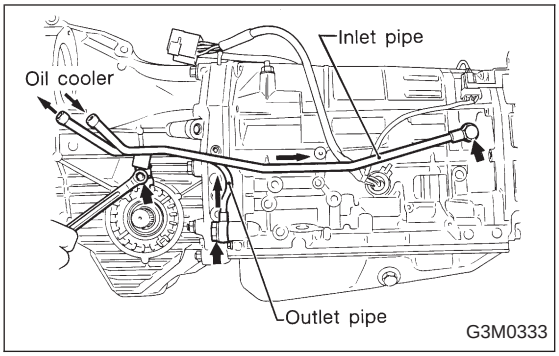
(2) With hole aligned, tighten three bolts to secure the inhibitor switch.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)



2) Clip the following cords and harness.

① Transmission harness
② Inhibitor switch cord



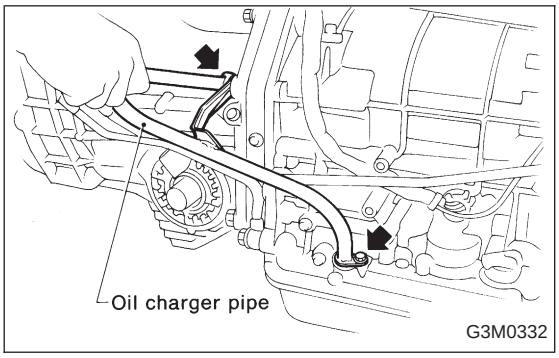
3) Install the oil cooler outlet pipe.

Tightening torque:
34±3 N·m (3.5±0.3 kg-m, 25.3±2.2 ft-lb)

4) Install the oil cooler inlet pipe.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

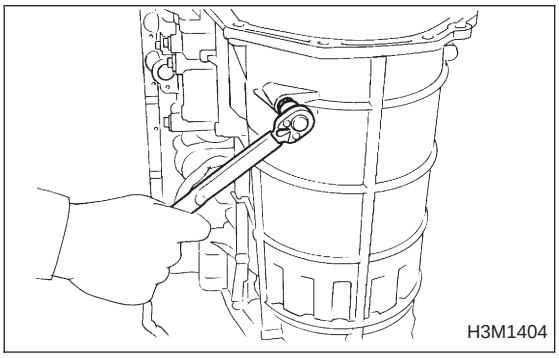
CAUTION:
Be sure to use a new aluminum washer.



5) Install the oil charge pipe.

Tightening torque:
Upper
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)
Lower
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

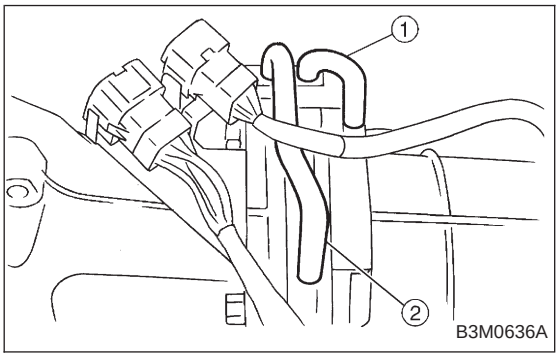
CAUTION:
Be careful not to damage the O-ring.



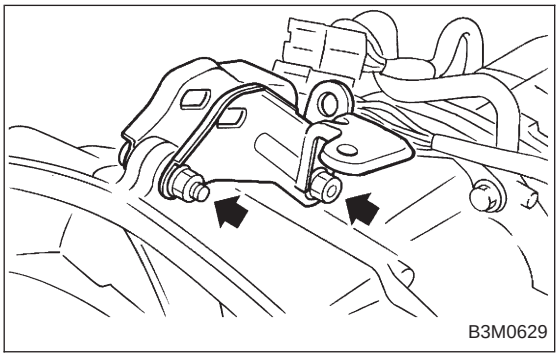
6) Adjustment of brake band
After tightening the brake band adjusting screw to 9 N·m (0.9 kg-m, 6.5 ft-lb) torque, back it off three turns. Then secure with a lock nut.

Tightening torque:
26±2 N·m (2.7±0.2 kg-m, 19.5±1.4 ft-lb)

NOTE:
When tightening the lock nut, be careful not to turn the adjusting screw.

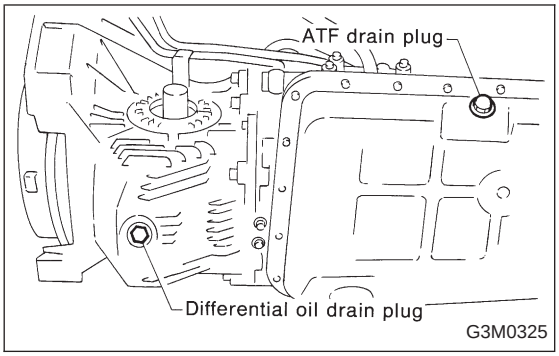


7) Install the air breather hose.
① Air breather hose (Transmission case)
② Air breather hose (Oil pump housing)



8) Install the pitching stopper bracket.

Tightening torque:
41±3 N·m (4.2±0.3 kg-m, 30.4±2.2 ft-lb)



9) Tighten the drain plugs.

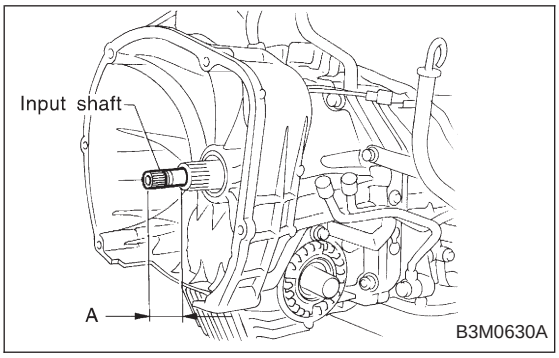
Tightening torque:

Diff.

44±3 N·m (4.5±0.3 kg-m, 32.5±2.2 ft-lb)

ATF

25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

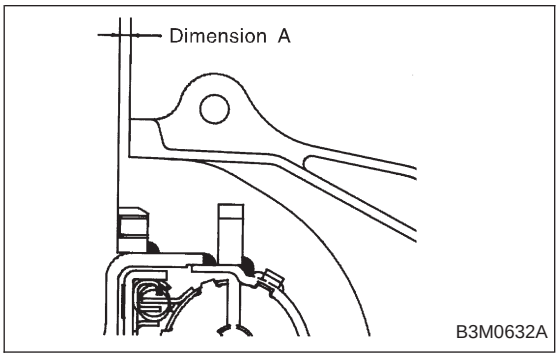


10) Insert the input shaft while turning lightly by hand.

CAUTION:
Be careful not to damage the bushing.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



11) Install the torque converter clutch assembly.

(1) Install the oil pump shaft to the torque converter clutch.

NOTE:
Make sure the clip fits securely in its groove.

(2) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.

(3) Rotate the shaft lightly by hand to engage the splines securely.

Dimension A:

3.9 — 4.1 mm (0.154 — 0.161 in)

12) Fill ATF and differential gear oil.
<Ref. to 3-2 [W1B1], [W1B2].>

Differential gear oil capacity:

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

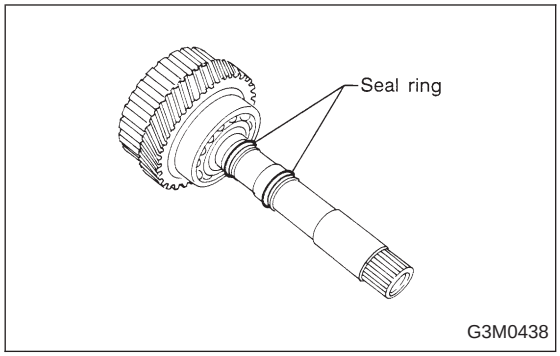
Automatic transmission fluid capacity:

7.9 — 8.2 ℓ (8.4 — 8.7 US qt, 7.0 — 7.2 Imp qt)

Recommended fluid:

Dexron II or Dexron III type automatic transmission

NOTE:
After filling oil, insert the oil level gauge into the oil inlet.

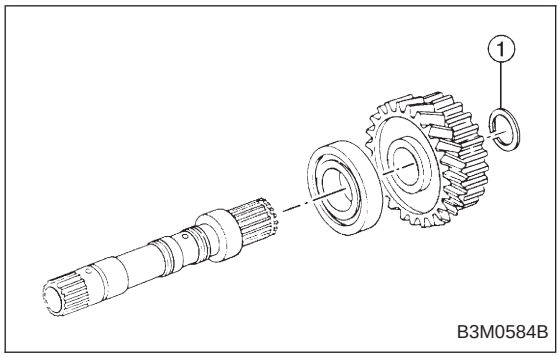


13. Reduction Drive Gear Assembly

A: DISASSEMBLY

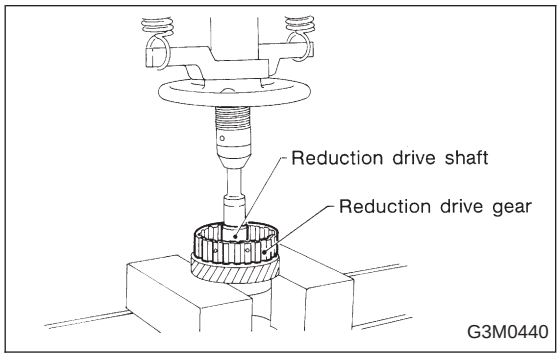
1) Take out the seal rings.

CAUTION:
Be careful not to damage the seal rings.

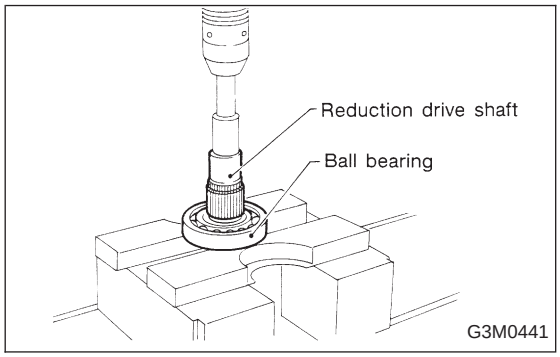


2) Take out the snap ring (outer ①).

CAUTION:
Be careful not to damage the splines.



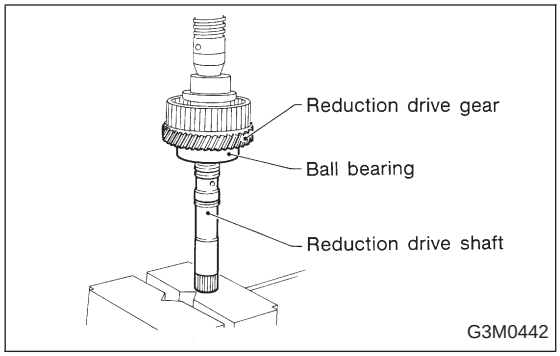
3) Using a press, remove the reduction drive gear.



4) Using a press, remove the ball bearing.

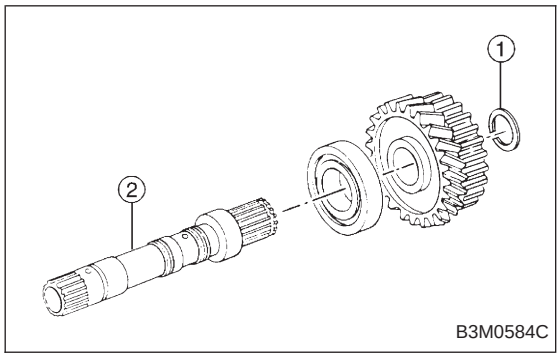
B: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

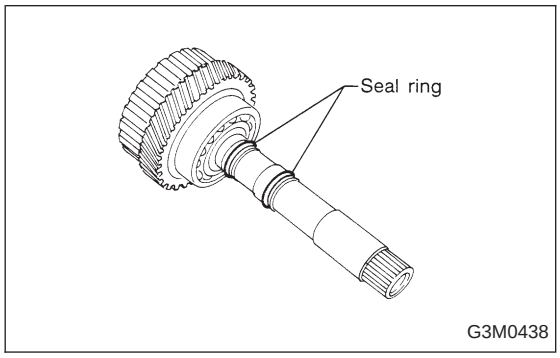


C: ASSEMBLY

1) Press-fit the ball bearing and reduction drive gear to the shaft.



2) Fit the snap ring ① securely in the snap ring groove on the shaft ②.

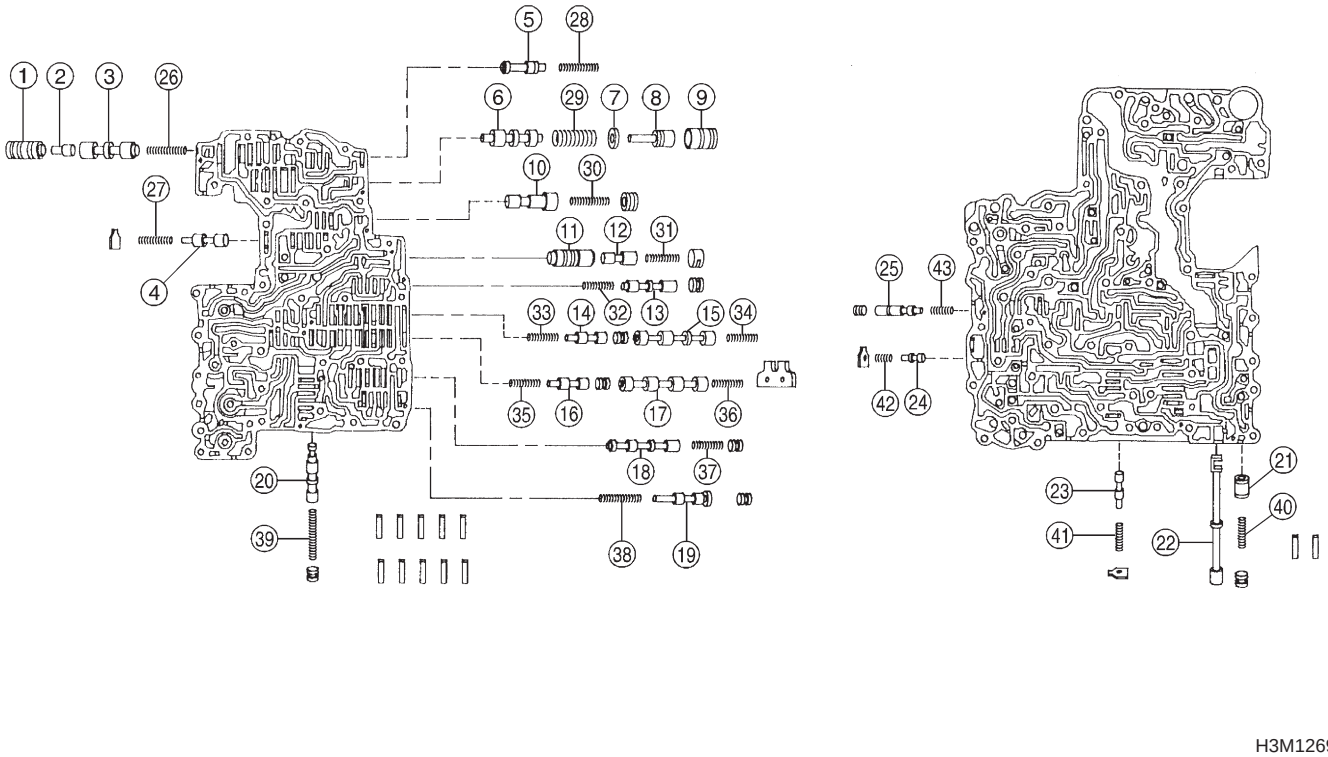


3) Attach two seal rings.

NOTE:
To make subsequent assembly easier, apply vaseline to the grooves of the shaft and to the exterior of the seal ring.

14. Control Valve Body

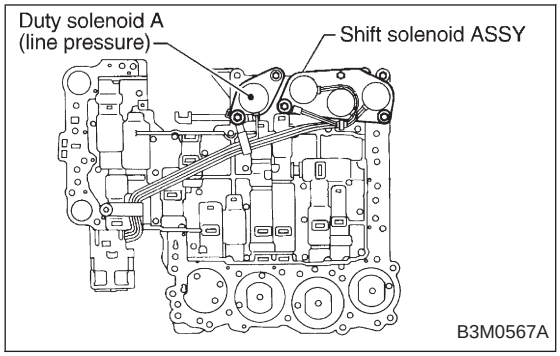
The control valve is composed of parts which are accurately machined to a high degree and should be handled carefully during disassembly and assembly. As these parts are similar in shape, they should be arranged in neat order on a table after disassembly so that they can be easily installed to their original positions. Spring loaded parts should be also handled carefully, as springs may jump out of place when the parts are disassembled or removed. Extreme care should be taken so as not to drop valves on the floor. Before assembling, the parts and valves should be dipped in a container filled with the ATF. Make sure that the valves are clean and free from any foreign material before assembly. Torque specifications should also be observed.



① Lock-up control sleeve
② Lock-up control plug
③ Lock-up control valve
④ Pilot valve
⑤ Torque converter regulation valve
⑥ Pressure regulator valve
⑦ Washer
⑧ Pressure regulator plug
⑨ Pressure regulator sleeve
⑩ Pressure modifier valve
⑪ Accumulator control sleeve valve
⑫ Accumulator control plug valve
⑬ Shuttle duty shift valve
⑭ 4-2 sequence valve
⑮ Shift valve B
⑯ 4-2 relay valve
⑰ Shift valve A
⑱ Overrunning clutch control valve
⑲ Overrunning clutch reducing valve
⑳ Shuttle shift valve
㉑ Accumulator modifier piston
㉒ Manual valve
㉓ 1st reducing valve
㉔ 3-2 timing valve
㉕ Servo charger valve
㉖ Lock-up control spring
㉗ Pilot spring
㉘ Torque converter regulator spring
㉙ Pressure regulator spring
㉚ Pressure modifier spring
㉛ Accumulator control spring
㉜ Shuttle shift spring
㉝ 4-2 sequence spring
㉞ Shift B spring
㉟ 4-2 relay spring
㊱ Shift A spring
㊲ Overrunning clutch control spring
㊳ Overrunning clutch reducing spring
㊴ Shuttle duty shift spring
㊵ Modifier accumulator spring
㊶ 1st reducing spring
㊷ 3-2 timing spring
㊸ Servo charger spring

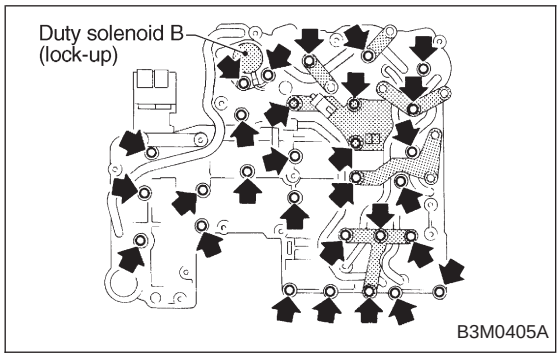
Unit: mm (in)

No.	Part name	Wire dia.	Outer dia.	Effective turn	Free length
26	Lock-up control spring	0.75 (0.0295)	13.0 (0.512)	3.5	18.5 (0.728)
27	Pilot spring	1.1 (0.043)	9.1 (0.358)	8.3	25.7 (1.012)
28	Torque converter regulator spring	1.3 (0.051)	9.0 (0.354)	11.7	38.0 (1.496)
29	Pressure regulator spring	1.6 (0.063)	14.0 (0.551)	5.6	31.5 (1.240)
30	Pressure modifier spring	0.8 (0.031)	6.8 (0.268)	10.0	31.95 (1.2579)
31	Accumulator control spring	0.4 (0.016)	6.6 (0.260)	11.0	27.5 (1.083)
32	Shuttle shift spring	0.65 (0.0256)	5.65 (0.2224)	27.6	51.0 (2.008)
33	4-2 sequence spring	0.55 (0.0217)	6.95 (0.2736)	11.0	29.1 (1.146)
34	Shift B spring	0.65 (0.0256)	7.0 (0.276)	9.5	25.0 (0.984)
35	4-2 relay spring	0.55 (0.0217)	6.95 (0.2736)	11.0	29.1 (1.146)
36	Shift A spring	0.5 (0.020)	7.0 (0.276)	9.5	25.0 (0.984)
37	Overrunning clutch control spring	0.7 (0.028)	6.0 (0.236)	12.0	26.5 (1.043)
38	Overrunning clutch reducing spring	1.05 (0.0413)	7.05 (0.2776)	15.21	34.7 (1.366)
39	Shuttle duty shift spring	0.75 (0.0295)	5.65 (0.2224)	27.6	51.0 (2.008)
40	Modifier accumulator spring	1.3 (0.051)	9.8 (0.386)	8.8	30.5 (1.201)
41	1st reducing spring	0.75 (0.0295)	6.75 (0.2657)	12.5	25.4 (1.000)
42	3-2 timing spring	0.75 (0.0295)	6.75 (0.2657)	7.5	20.55 (0.8091)
43	Servo charger spring	0.7 (0.028)	6.7 (0.264)	9.0	23.0 (0.906)

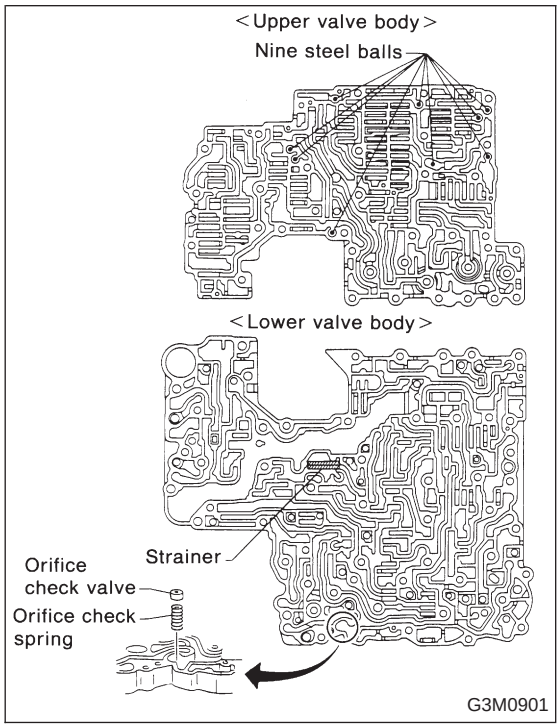


A: DISASSEMBLY

1) Remove the following parts from the upper valve body.
   (1) Shift solenoid assembly (shift 1-2-3)
   (2) Duty solenoid A (line pressure)



2) Remove the following parts from the lower valve body.
   (1) Duty solenoid B (lock-up)
   (2) Bracket
3) Separate the upper valve body and lower valve body.

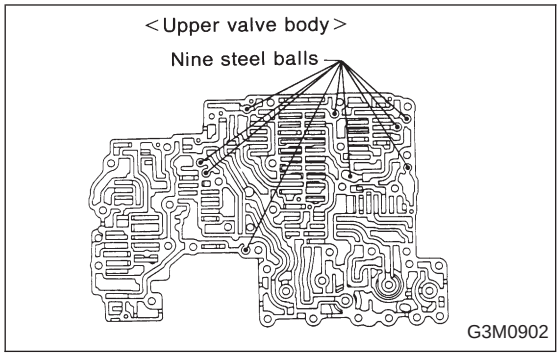


CAUTION:
● Do not lose the nine (9) steel balls contained in the upper valve body.
● Do not lose an orifice and a strainer contained in the lower valve body.

NOTE:
Remove the upper-lower valve body tightening bolts. Then remove two locating bolts. (⬅)
During ordinary servicing, clean the control valve bodies in this condition, without further disassembly.
In the event of a seized clutch or other problem, disassemble the control valve bodies further, and clean the component parts.

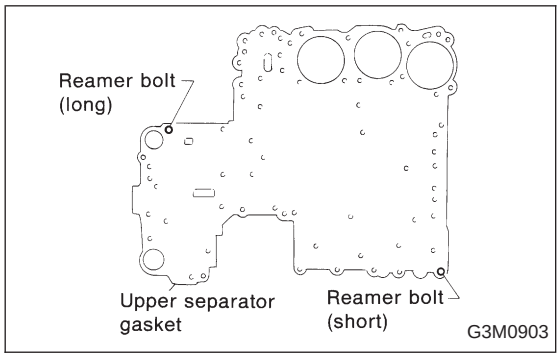
B: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

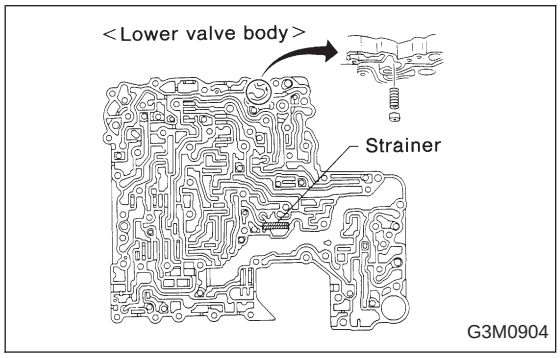


C: ASSEMBLY

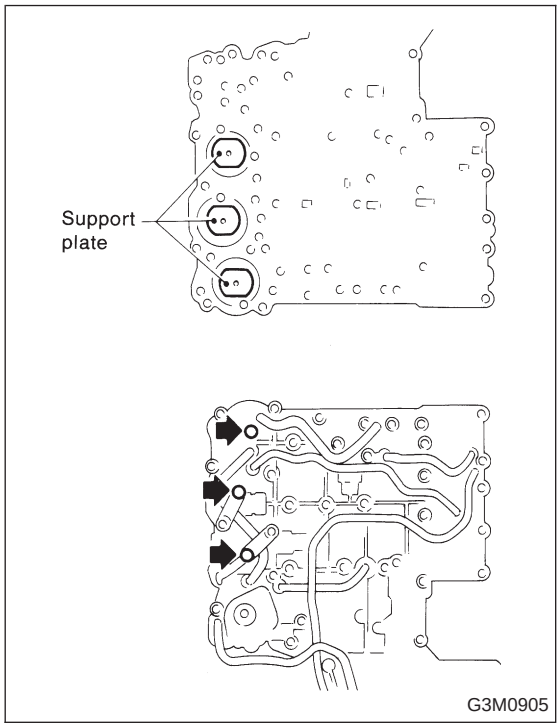
1) Install the nine steel balls to the upper valve body.



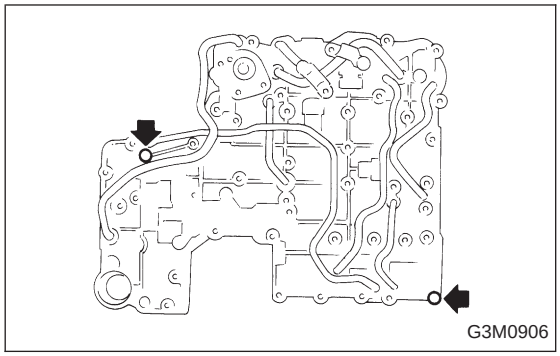
2) From under upper valve body, install two bolts using washers and position upper separator gasket.



3) Install the orifice check valve, orifice check spring and filter to the lower valve body.

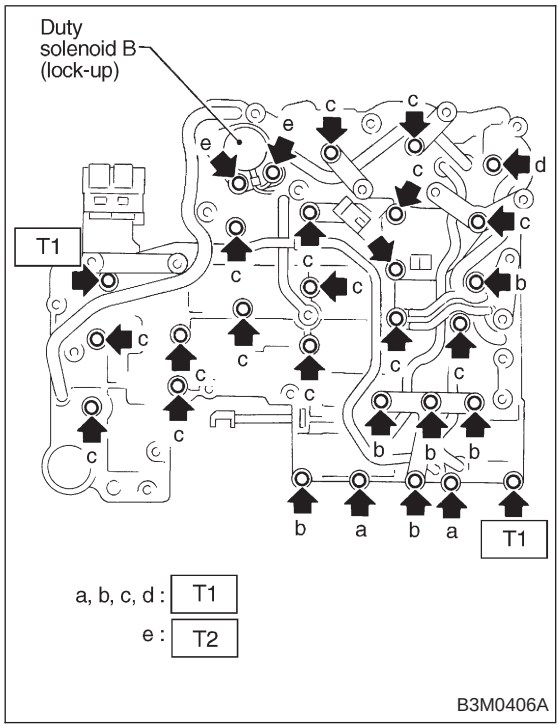


4) Install lower separate gasket and separate plate on lower body in that order, then temporarily tighten three support plates and two brackets.



5) Temporarily assemble lower valve body to upper valve body.

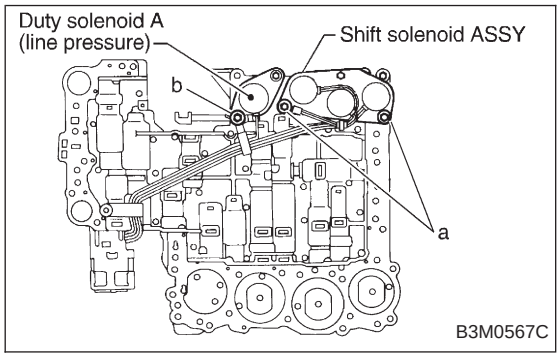
CAUTION:
Be careful not to drop the upper body interior steel ball, or the lower body interior filter, orifice check spring, or orifice check valve.



6) Install the duty solenoid B and the four brackets.
7) Tighten twenty seven bolts & washers and two reamer bolts.

Tightening torque:
T1: 8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)
T2: 11.3±1.5 N·m (1.15±0.15 kg-m, 8.3±1.1 ft-lb)

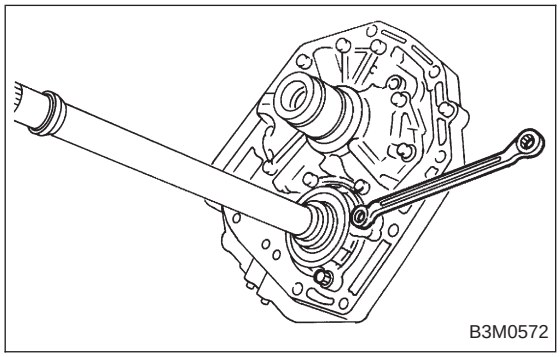
	a	b	c	d	e
Length mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)	28 (1.10)
Numbers	2	6	16	1	2



8) Install the shift solenoid assembly and duty solenoid A.

a length : 16 mm (0.63 in)
b length : 27 mm (1.06 in)

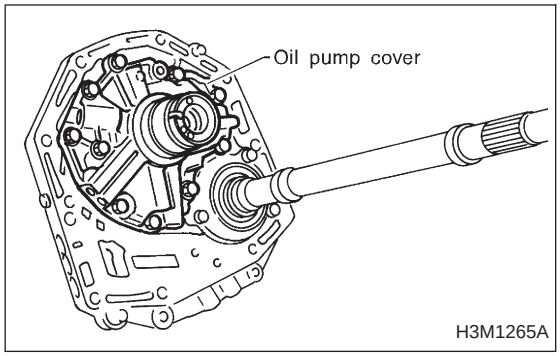
Tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)



15. Oil Pump Assembly

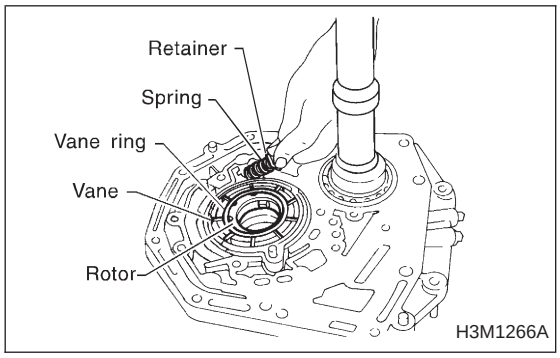
A: DISASSEMBLY

1) Remove the oil seal retainer.
Also remove the O-ring and oil seal (air breather).

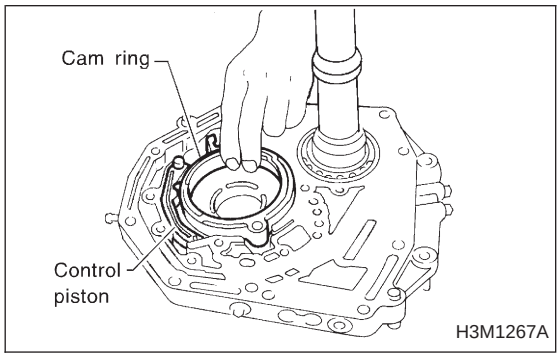


2) Remove the oil pump cover.

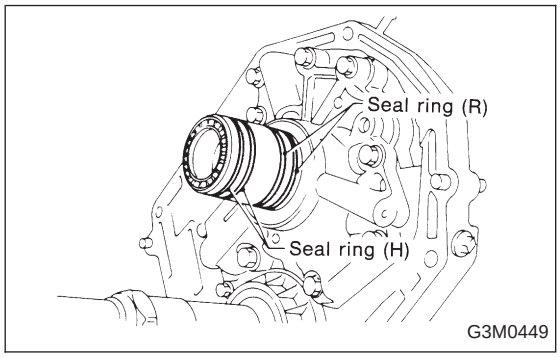
NOTE:
Lightly tap the end of the stator shaft to remove the cover.



3) Remove the retainer and return spring. Then remove the rotor, two vane rings and nine vanes.



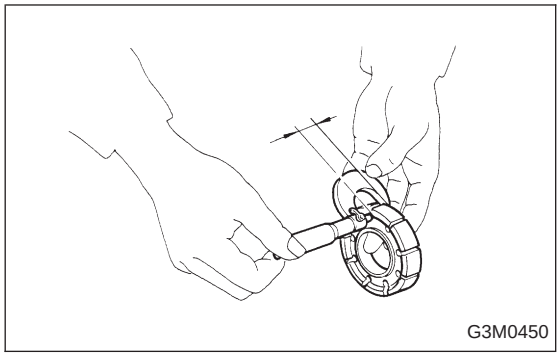
4) Remove the cam ring and control piston.
Also remove the O-ring, friction ring, two side seals, and plain seal.



5) Remove two seal rings (R) and two seal rings (H).

B: INSPECTION

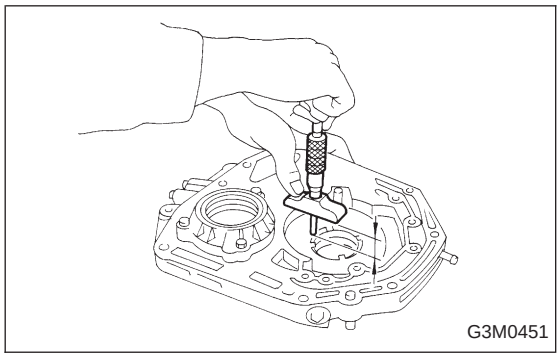
1) Make sure that each component is free of harmful gouges, cuts, and dust.


G3M0450

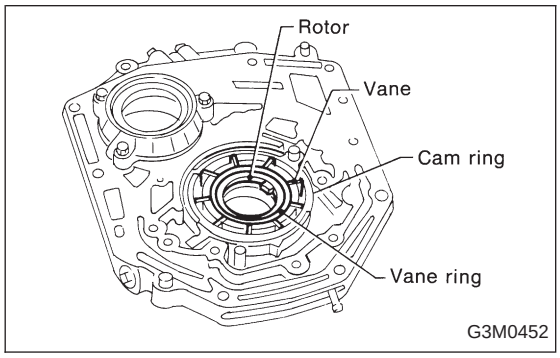
2) Selection of oil pump components (rotor, vanes, control piston and cam ring)

(1) Using a micrometer, measure the height of the rotor, vanes, control piston and cam ring in at least four positions. (Measure the height at one place for each of the nine vanes.)

NOTE:
- Remove the control piston seals when measuring.
- Remove the friction ring from the cam ring when measuring.


G3M0451

(2) Using a depth gauge, measure the depth of the oil pump housing from the contact/sliding surface of the above mentioned component parts in the same manner as above.



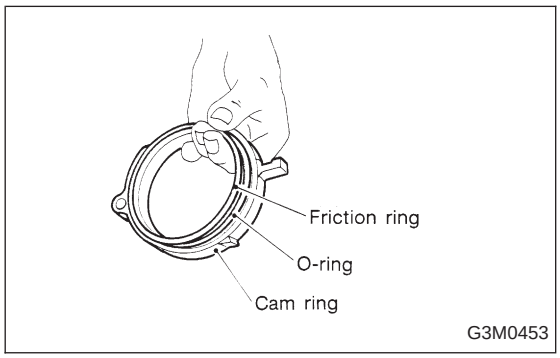
G3M0452

(3) Make sure that the clearances are within the specified wear limits. If the wear limit is exceeded, select pump components so that the standard clearance can be obtained.

NOTE:
Select vanes which are the same height as the rotor.

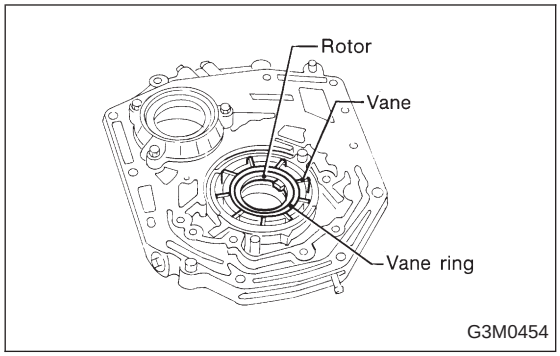
Part name	Wear limit mm (in)	Standard value mm (in)
Rotor, control piston, vanes	0.054 (0.0021)	0.030 — 0.044 (0.0012 — 0.0017)
Cam ring	0.034 (0.0013)	0.010 — 0.024 (0.0004 — 0.0009)

C: ASSEMBLY

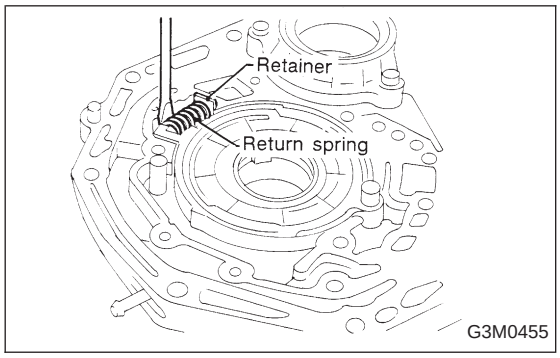


G3M0453

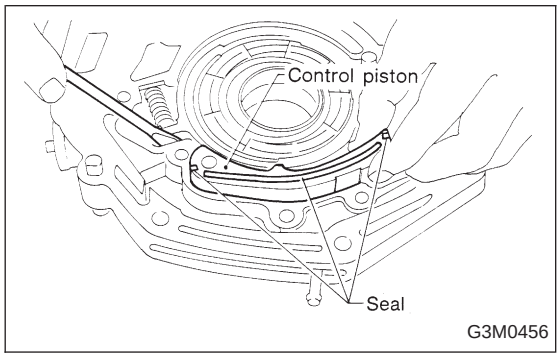
1) Coat both the O-ring and friction ring with vaseline and attach to the cam ring. Then fit them into the oil pump housing.



2) Install the vane ring, rotor and vanes into the housing in this sequence.



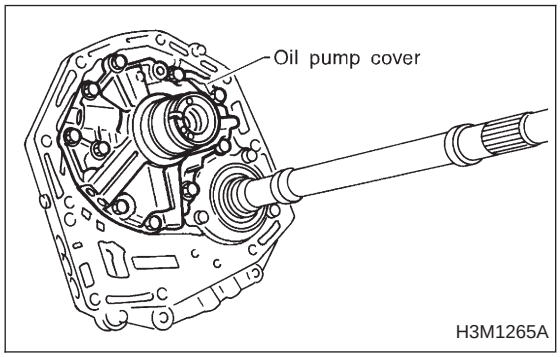
3) Install the return spring and retainer between the housing and cam ring.



4) Install the control piston to the oil pump housing.

NOTE:
Fit the seal in the piston groove, with the red seals facing the top side. (Two side seals and one plain seal are attached.)

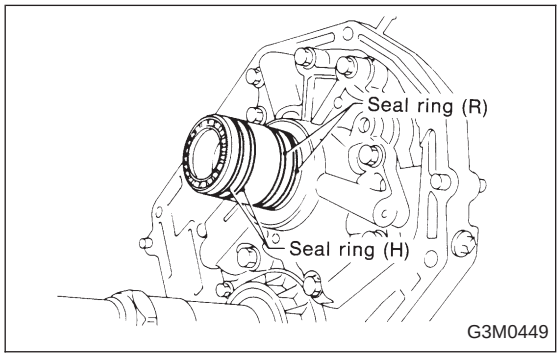
5) Set the rotor at the center of the housing bore. Apply ATF abundantly to each rotary portion.



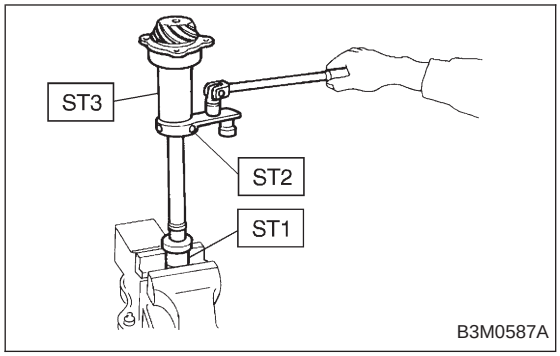
6) Install the oil pump cover.

Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

NOTE:
- Align both pivots with the pivot holes of the cover, and install the cover being careful not to apply undue force to the pivots.
- After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.



NOTE:
- Install the oil seal retainer and seal rings (R) and (H) after adjusting the drive pinion backlash and tooth contact.



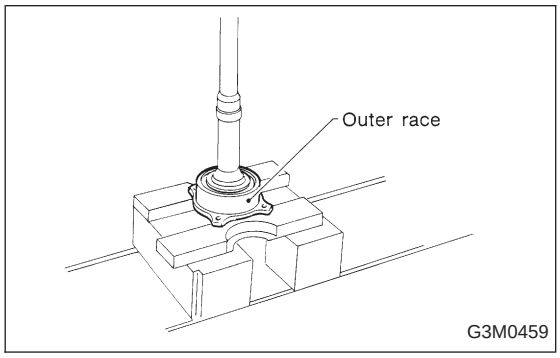
16. Drive Pinion Shaft

A: DISASSEMBLY

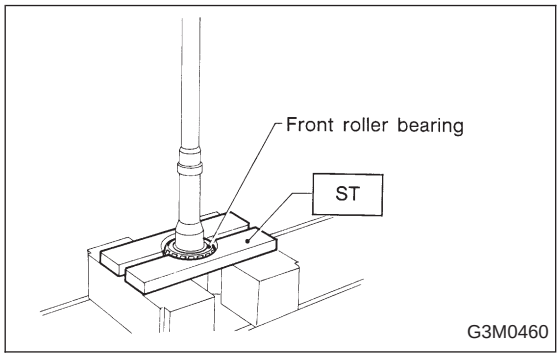
1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.

ST1 498937100 HOLDER
ST2 499787100 WRENCH
ST3 499757800 ADAPTER WRENCH

NOTE:
Remove the O-ring.



2) Using a press, separate the rear roller bearing and outer race from the shaft.

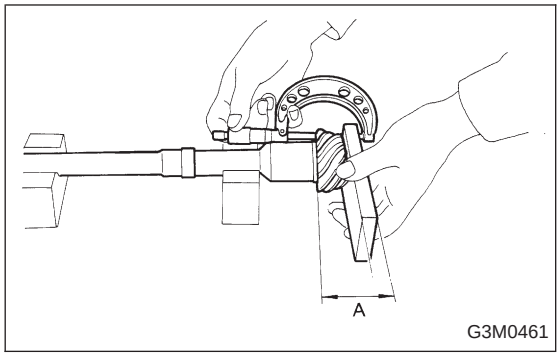


3) Using a press and ST, separate the front roller bearing from the shaft.

ST 498517000 REPLACER

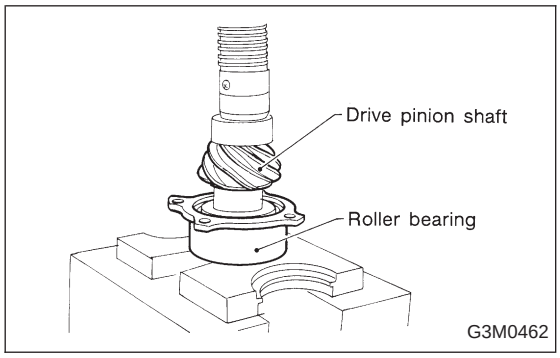
B: INSPECTION

Make sure that all component parts are free of harmful cuts, gouges, and other faults.



C: ASSEMBLY

1) Measure dimension “A” of the drive pinion shaft.

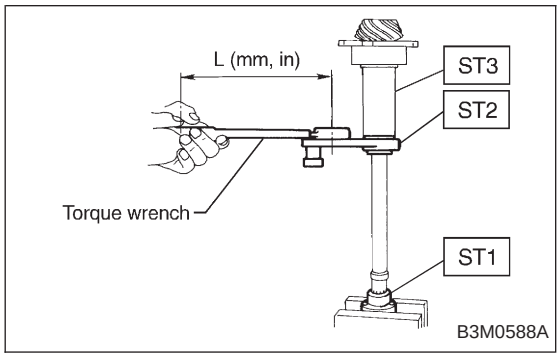


2) Using a press, force-fit the roller bearing in position.

CAUTION:
Do not change the relative positions of the outer race and bearing cone.

3) After fitting the O-ring to the shaft, attach the drive pinion collar to the shaft.

CAUTION:
Be careful not to damage the O-ring.



4) Tighten the lock washer and lock nut with ST1, ST2 and ST3.

ST1	498937100	HOLDER
ST2	499787100	WRENCH
ST3	499787500	ADAPTER WRENCH

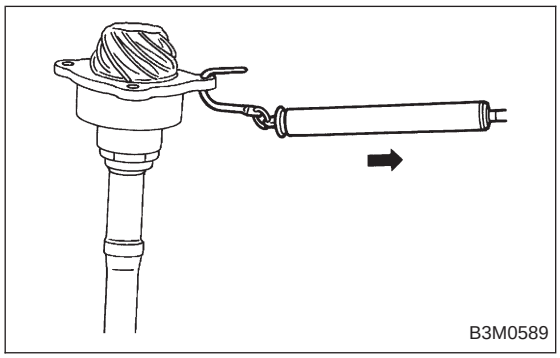
Actual tightening torque:
113±5 N·m (11.5±0.5 kg-m, 83.2±3.6 ft-lb)

NOTE:
- Pay attention to the orientation of lock washer.
- Tightening torque using torque wrench is determined by the following equation:

$$T_1 = \frac{72.2}{L + 72.2} \times T$$

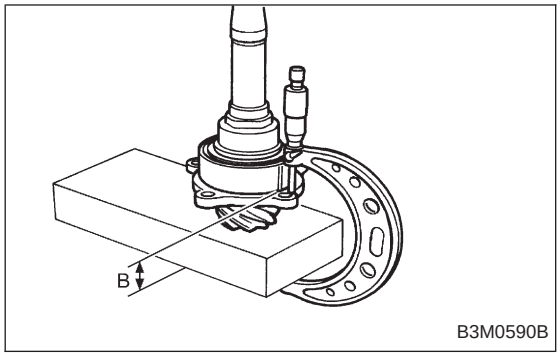
T: Actual tightening torque

- Install ST2 to torque wrench as straight as possible.



5) Measure the starting torque of the bearing.
Make sure the starting torque is within the specified range.
If out of the allowable range, replace the roller bearing.

Starting torque:
0.3 — 2.0 N·m (3 — 20 kg-cm, 2.6 — 17.4 ft-lb)



6) Stake the lock nut securely at two places.
7) Measure dimension “B” of the drive pinion shaft.

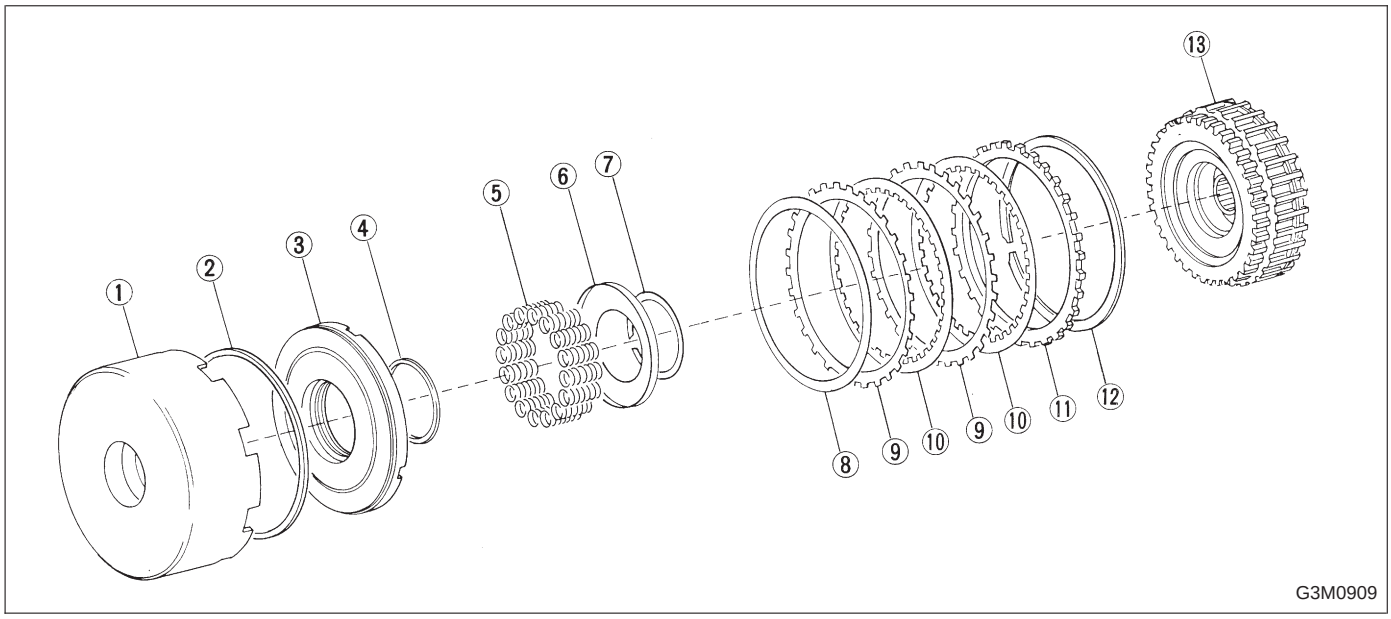
8) Determine the thickness t (mm) of the drive pinion shim.

t = 6.5±0.0625 − (B − A)

NOTE:
The number of shims must be three or less.

	Part No.	Thickness mm (in)
● Available drive pinion shims	31451AA050	0.150 (0.0059)
	31451AA060	0.175 (0.0069)
	31451AA070	0.200 (0.0079)
	31451AA080	0.225 (0.0089)
	31451AA090	0.250 (0.0098)
	31451AA100	0.275 (0.0108)

17. Reverse Clutch



① Reverse clutch drum
② Lip seal
③ Reverse clutch piston
④ Lathe cut seal ring
⑤ Spring
⑥ Spring retainer
⑦ Snap ring
⑧ Dish plate
⑨ Driven plate
⑩ Drive plate
⑪ Retaining plate
⑫ Snap ring
⑬ High clutch drum

A: DISASSEMBLY

1) Remove the snap ring ⑫, and take out the retaining plate ⑪, drive plates ⑩, driven plates ⑨, and dish plate ⑧.
2) Using the ST1, ST2 and ST3, remove the snap ring ⑦ and take out the spring retainer ⑥ and springs ⑤.

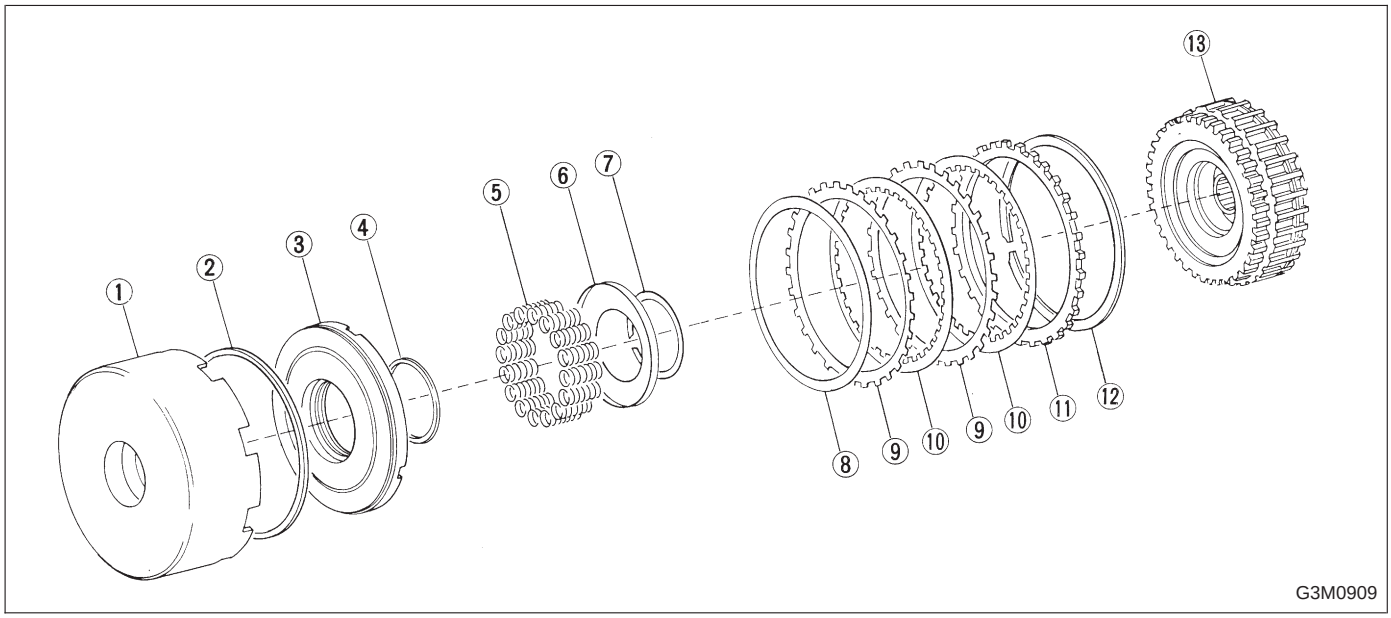
ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

3) Take out the piston ③ by applying compressed air.

B: INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
3) Lip seal and lathe cut seal ring for damage
4) Piston check ball for operation

C: ASSEMBLY



① Reverse clutch drum
② Lip seal
③ Reverse clutch piston
④ Lathe cut seal ring
⑤ Spring
⑥ Spring retainer
⑦ Snap ring
⑧ Dish plate
⑨ Driven plate
⑩ Drive plate
⑪ Retaining plate
⑫ Snap ring
⑬ High clutch drum

1) Using the ST1, ST2 and ST3 as those used in disassembling, assemble piston ③ the springs ⑤, spring retainer ⑥ and snap ring ⑦.

ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

2) Assemble the dish plate ⑧, driven plates ⑨, drive plates ⑩ and retaining plate ⑪ in that order and attach the snap ring ⑫.

NOTE:
Pay attention to the orientation of the dish plate.

3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the reverse clutch for smooth operation.

4) Measuring clearance (Retaining plate selection):

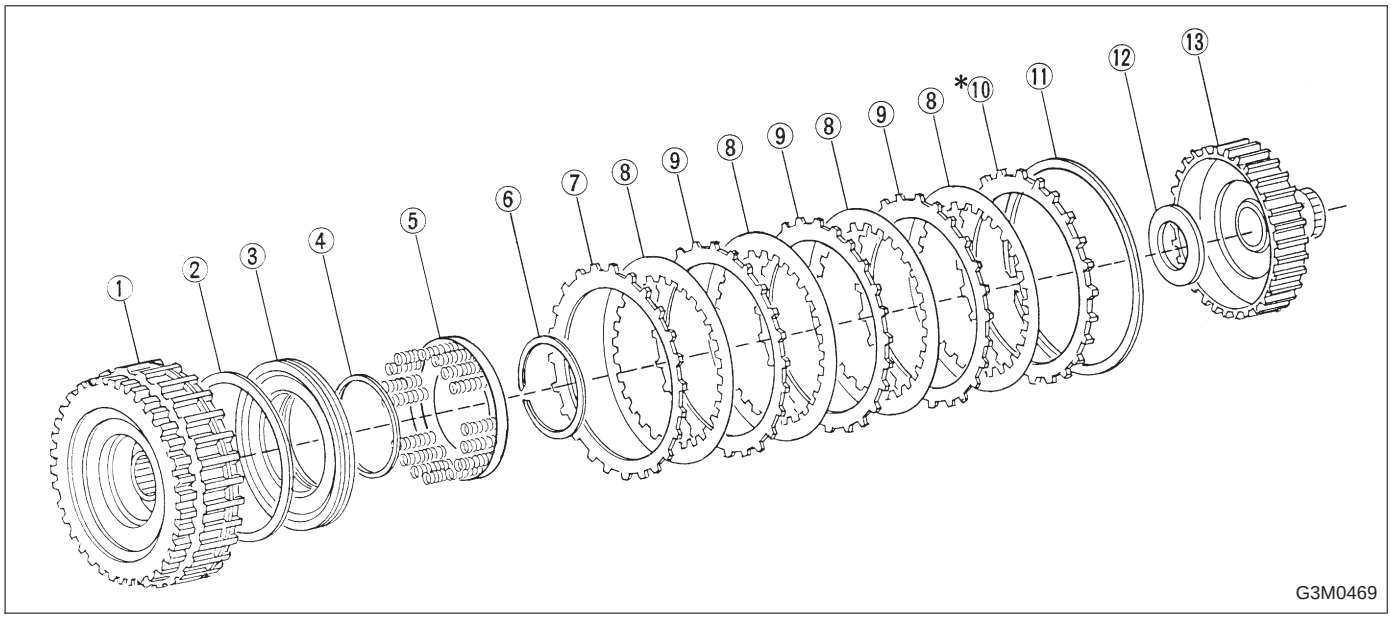
Standard value:
0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:
1.2 mm (0.047 in)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

	Part No.	Thickness mm (in)
• Available retaining plates	31567AA350 31567AA360 31567AA370 31567AA380 31567AA390 31567AA400	4.6 (0.181) 4.8 (0.189) 5.0 (0.197) 5.2 (0.205) 5.4 (0.213) 5.6 (0.220)

18. High Clutch



① High clutch drum
② Lathe cut seal ring
③ High clutch piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate (Thinner)
⑧ Drive plate
⑨ Driven plate (Thicker)
⑩ Retaining plate
⑪ Snap ring
⑫ Thrust needle bearing
⑬ High clutch hub

A: DISASSEMBLY

1) Remove the snap ring ⑪, and take out the retaining plate ⑩, drive plates ⑧, and driven plates ⑦, ⑨.
2) Using the ST1, ST2 and ST3, remove the snap ring ⑥ and take out the spring retainer ⑤.

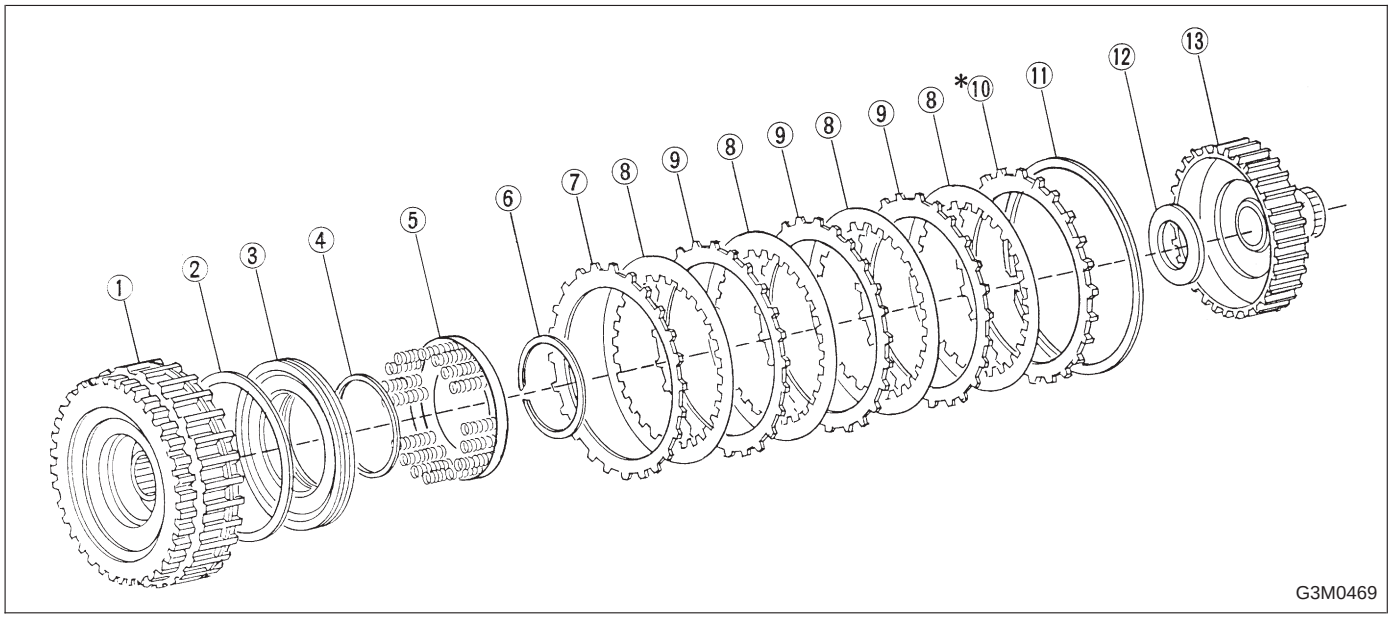
ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

3) Apply compressed air to the clutch drum ① to remove the piston ③.

B: INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and spring retainer for deformation
3) Lathe cut seal rings (large) (small) for damage
4) Piston check ball for smooth operation

C: ASSEMBLY



① High clutch drum
② Lathe cut seal ring
③ High clutch piston
④ Lathe cut seal ring
⑤ Spring retainer
⑥ Snap ring
⑦ Driven plate (Thinner)
⑧ Drive plate
⑨ Driven plate (Thicker)
⑩ Retaining plate
⑪ Snap ring
⑫ Thrust needle bearing
⑬ High clutch hub

1) Using the ST1, ST2 and ST3 as those used in disassembling, assemble the piston ③, spring retainer ⑤, and snap ring ⑥.

ST1 398673600 COMPRESSOR
ST2 398177700 INSTALLER
ST3 399893600 PLIERS

2) Install the driven plate (thinner) ⑦, drive plates ⑧, driven plates (thicker)⑨, and retaining plate ⑩ in that order. Then attach the snap ring ⑪.

3) Checking operation:
Apply compressed air intermittently to the oil hole, and check the high clutch for smooth operation.

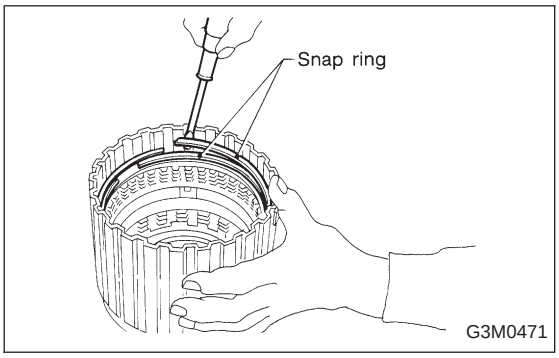
4) Measuring clearance (Retaining plate selection):

Standard value:
1.8 — 2.2 mm (0.071 — 0.087 in)

Allowable limit:
2.6 mm (0.102 in)

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

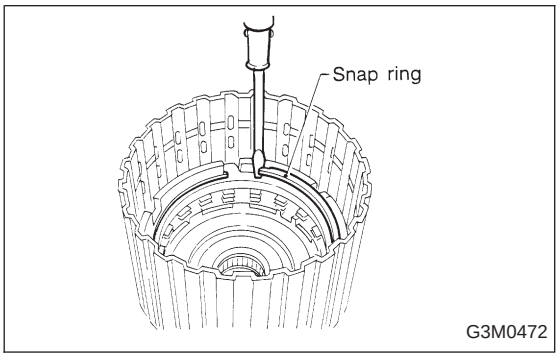
	Part No.	Thickness mm (in)
• Available retaining plates	31567AA190	3.6 (0.142)
	31567AA200	3.8 (0.150)
	31567AA210	4.0 (0.157)
	31567AA220	4.2 (0.165)
	31567AA230	4.4 (0.173)
	31567AA240	4.6 (0.181)
	31567AA250	4.8 (0.189)
	31567AA260	5.0 (0.197)



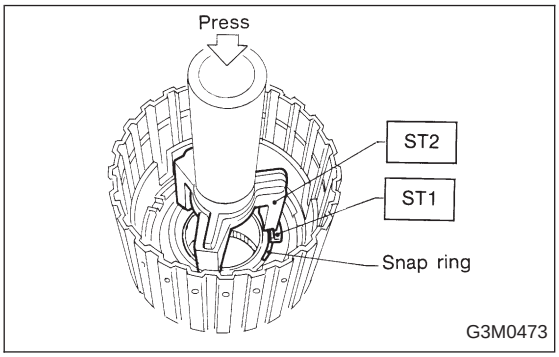
19. Forward Clutch Drum

A: DISASSEMBLY

1) Remove two snap rings from the forward clutch drum.
2) Remove the retaining plate, drive plates, driven plates and dish plate. (Forward clutch)

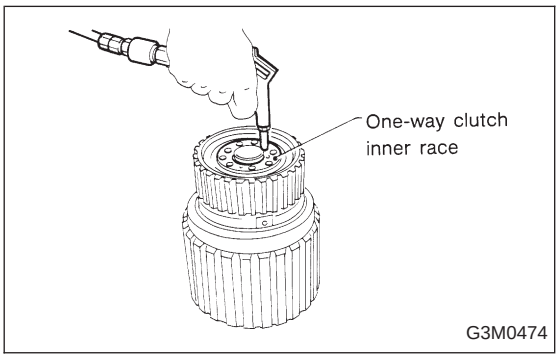


3) Remove the snap ring from the forward clutch drum.
4) Remove the retaining plate, drive plates, driven plates and dish plate. (Overrunning clutch)

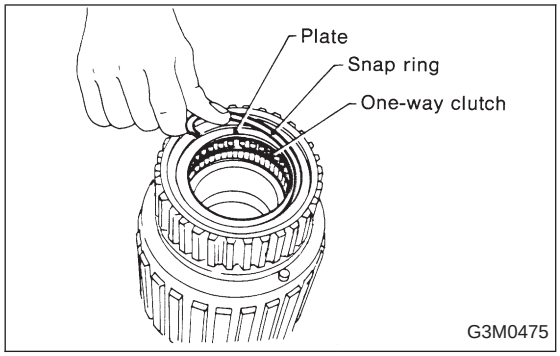


5) Compress the spring retainer, and remove the snap ring from the forward clutch, by using ST1 and ST2.

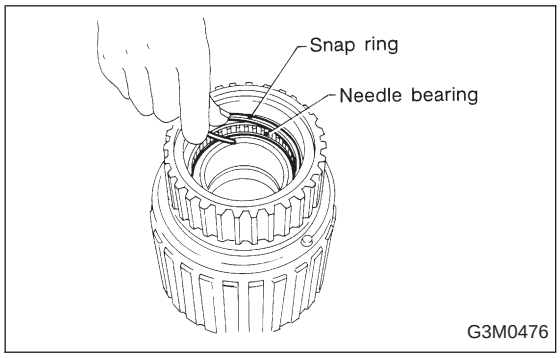
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



6) Install the one-way clutch inner race to the forward clutch drum, and apply compressed air to remove the over-running piston and forward piston.



7) Remove the one-way clutch after taking out the snap ring.

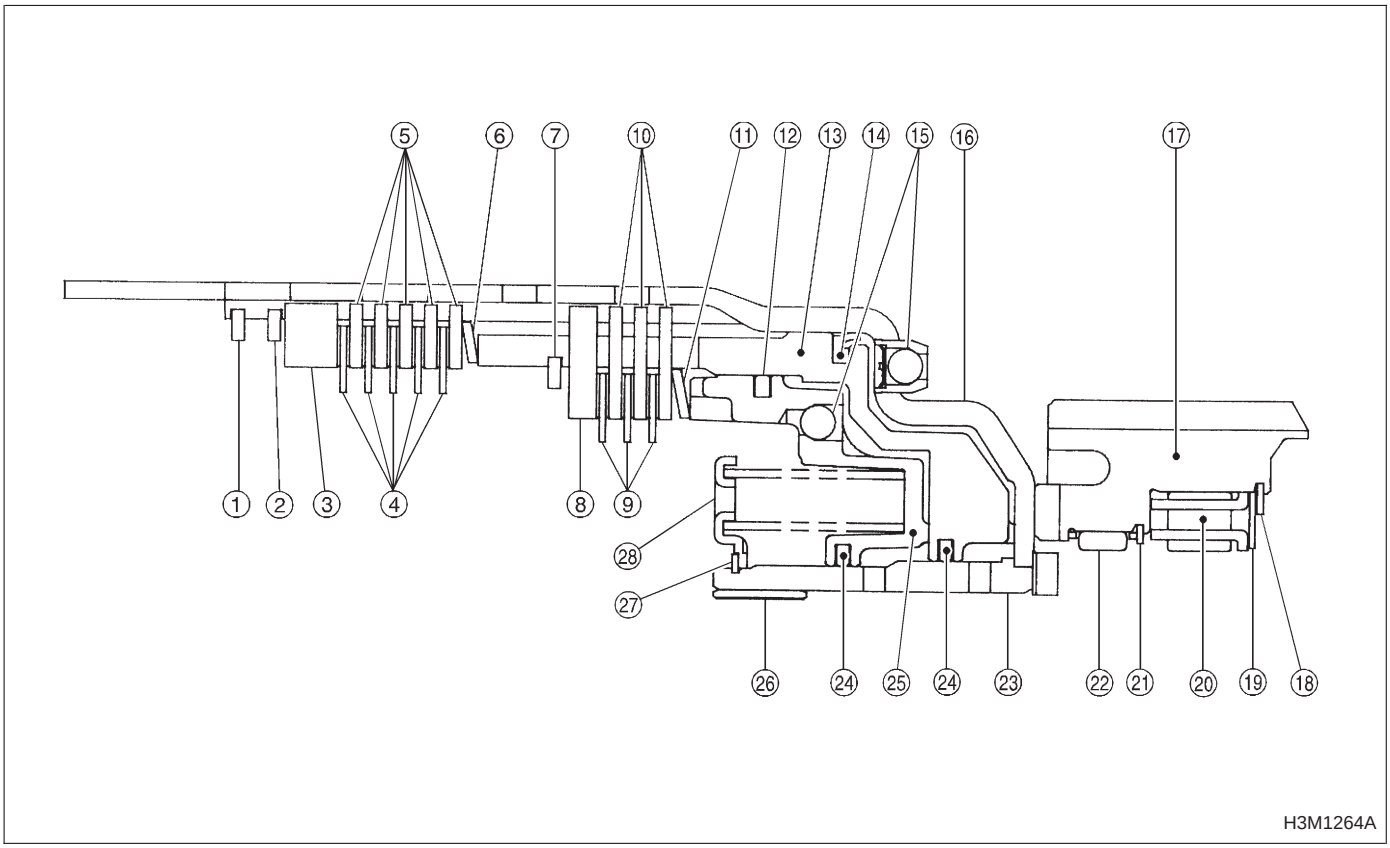


8) Remove the needle bearing after taking out the snap ring.

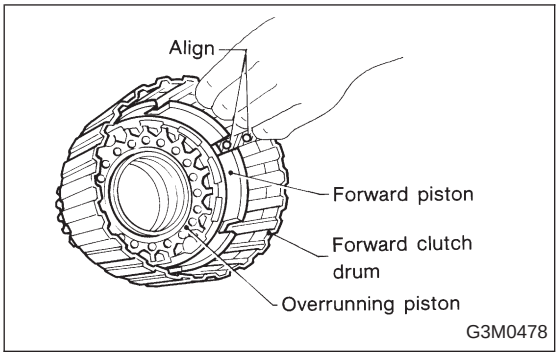
B: INSPECTION

1) Drive plate facing for wear and damage
2) Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
3) Lip seal and lathe cut ring for damage
4) Piston and drum check ball for operation

C: ASSEMBLY

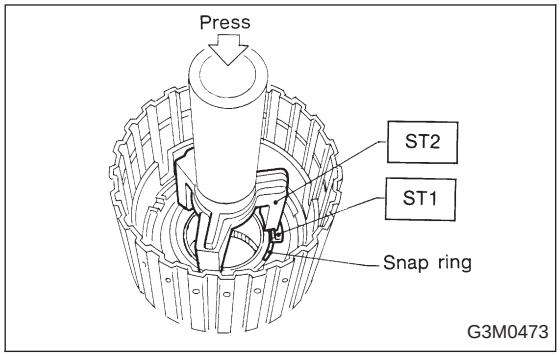


① Snap ring
② Snap ring
③ Retaining plate
④ Driven plate (Thinner)
⑤ Driven plate (Thicker)
⑥ Dish plate
⑦ Snap ring
⑧ Retaining plate
⑨ Drive plate
⑩ Driven plate
⑪ Dish plate
⑫ Lathe cut seal ring
⑬ Forward clutch piston
⑭ Lathe cut seal ring
⑮ Drift ball
⑯ Forward clutch drum
⑰ Outer race
⑱ Snap ring
⑲ Plate
⑳ O.W.C. (1-2)
㉑ Snap ring
㉒ Needle bearing
㉓ Sleeve
㉔ Lathe cut seal ring
㉕ Overrunning clutch piston
㉖ Bushing
㉗ Snap ring
㉘ Retainer



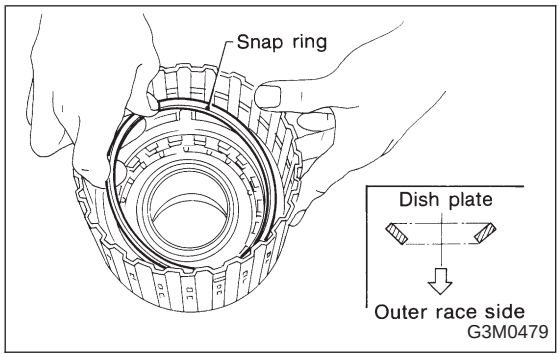
1) Fit the forward piston and overrunning piston to the forward clutch drum.

NOTE:
Align the forward piston cut-out portion with the spline of the drum.



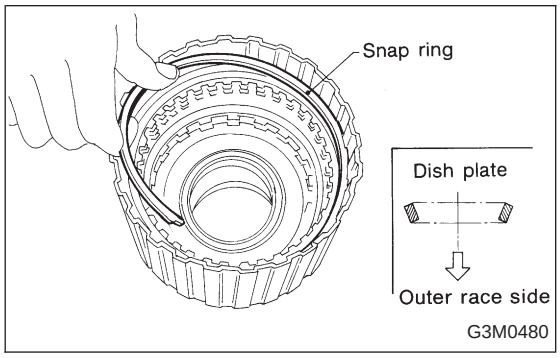
2) Set the retainer on the piston with a press using ST1 and ST2, and attach the snap ring.

ST1 498627000 SEAT
ST2 398673600 COMPRESSOR



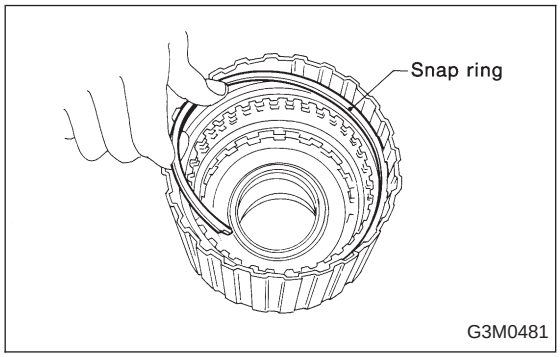
3) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring. (Overrunning clutch)

NOTE:
Pay attention to the orientation of the dish plate.

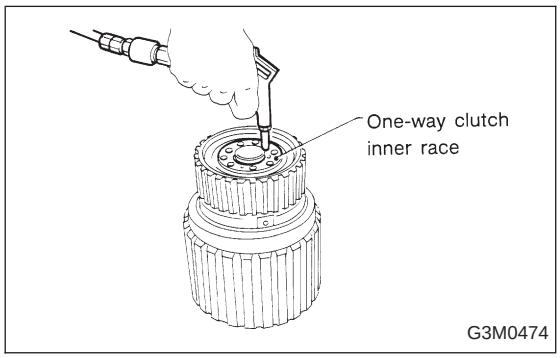


4) Install the dish plates, driven plates, drive plates, and retaining plate, and secure with the snap ring. (Forward clutch)

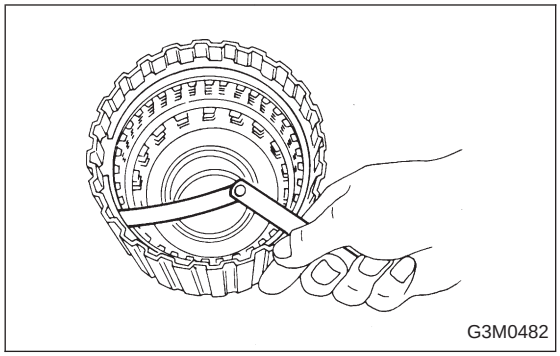
NOTE:
Pay attention to the orientation of the dish plate.



5) Install the snap ring (for front planetary carrier).



6) Check the forward clutch and overrunning clutch for operation.
Set the one-way clutch inner race, and apply compressed air for checking.


G3M0482

7) Checking forward clutch clearance:

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

Standard value:
0.45 — 0.85 mm (0.0177 — 0.0335 in)

Allowable limit:
1.6 mm (0.063 in)

	Part No.	Thickness mm (in)
• Forward clutch	31567AA270	4.0 (0.157)
	31567AA280	4.2 (0.165)
	31567AA290	4.4 (0.173)
	31567AA300	4.6 (0.181)
	31567AA310	4.8 (0.189)
	31567AA320	5.0 (0.197)
	31567AA330	5.2 (0.205)

8) Checking overrunning clutch clearance:

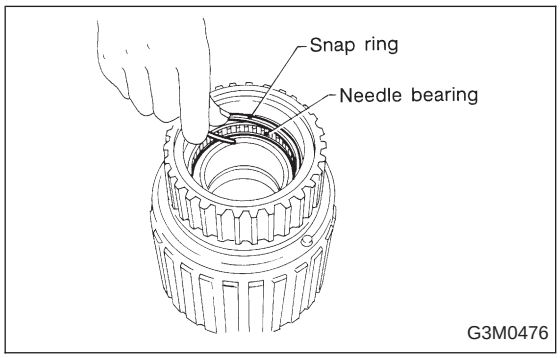
NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent retaining plate from tilting.

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

Standard value:
1.0 — 1.4 mm (0.039 — 0.055 in)

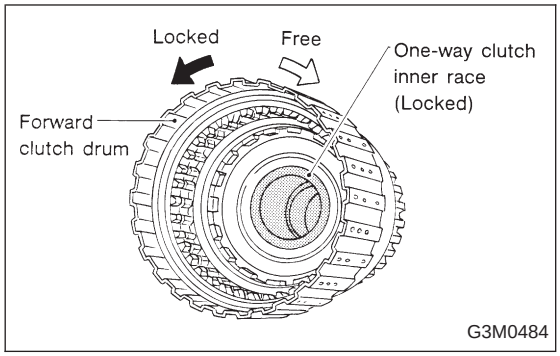
Allowable limit:
2.0 mm (0.079 in)

	Part No.	Thickness mm (in)
• Overrunning clutch	31567AA120	8.0 (0.315)
	31567AA130	8.2 (0.323)
	31567AA140	8.4 (0.331)
	31567AA150	8.6 (0.339)
	31567AA160	8.8 (0.346)
	31567AA170	9.0 (0.354)
	31567AA180	9.2 (0.362)



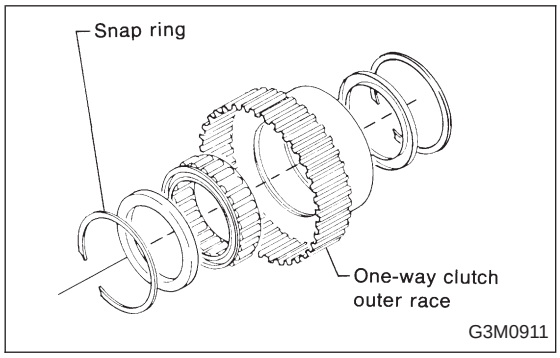
G3M0476

9) Install the needle bearing, and secure with the snap ring.



10) Install the one-way clutch (1-2) and plate, and secure with the snap ring.

NOTE:
Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



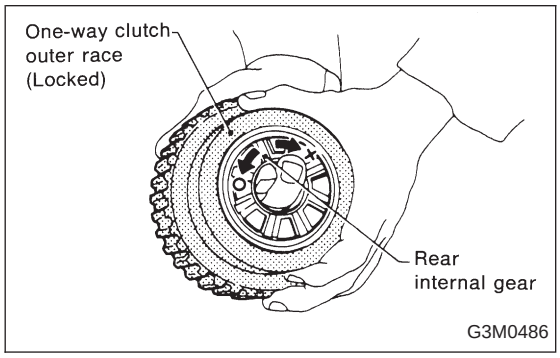
20. One-way Clutch Outer Race

A: DISASSEMBLY

Remove the snap ring. Then remove the one-way clutch (3-4).

B: INSPECTION

Check the sliding surface and one-way clutch (3-4) for any harmful cuts, damage, or other faults.

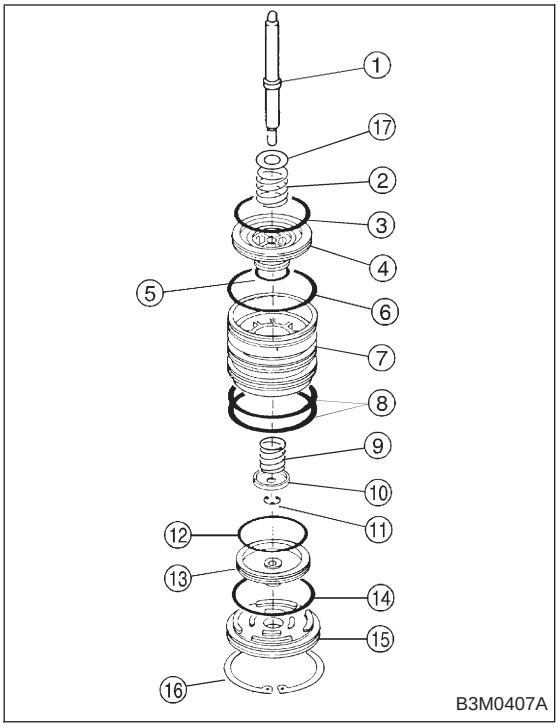


C: ASSEMBLY

1) Assemble the one-way clutch (3-4), and secure with the snap ring.

NOTE:
Pay attention to the orientation of the one-way clutch (3-4).

2) Assemble the rear internal gear, and secure the outer race. Make sure that the internal gear is locked in the clockwise direction, and free to rotate in the counterclockwise direction.



21. Servo Piston

① Band servo piston stem
② Spring
③ Lathe cut seal ring
④ Band servo piston (1-2)
⑤ Lathe cut seal ring
⑥ O-ring
⑦ Band servo retainer
⑧ O-ring
⑨ Spring
⑩ Retainer
⑪ Snap ring
⑫ Lathe cut seal ring
⑬ Band servo piston (3-4)
⑭ O-ring
⑮ O.D. servo retainer
⑯ Snap ring
⑰ Washer

A: DISASSEMBLY

1) Remove the spring.
2) Remove the band servo piston (3-4).
3) While compressing the retainer from above, remove the snap ring. Then remove the retainer, spring and stem.
4) Take out the band servo piston (1-2).

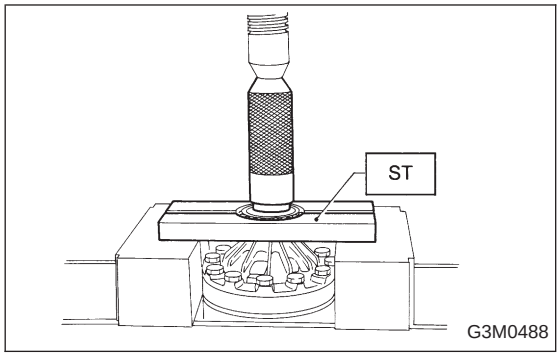
B: INSPECTION

1) Check each component for harmful cuts, damage, or other faults.
2) Check the O-ring and lathe cut ring for damage.

C: ASSEMBLY

1) Install the band servo piston (1-2) to the retainer, and insert the stem.
2) Put the spring and retainer on the piston. Fit the snap ring securely while compressing the spring.
3) Install the band servo piston (3-4).
4) Install the spring securely to the band servo piston (1-2).

CAUTION:
● Many different O-rings and lathe cut rings are used. Be careful not to confuse them when installing.
● Be careful not to damage O-rings and lathe cut rings.



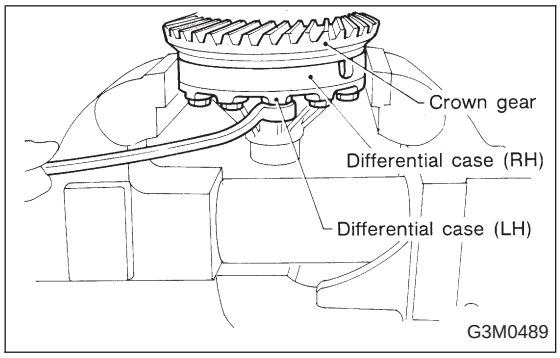
22. Differential Case Assembly

A: DISASSEMBLY

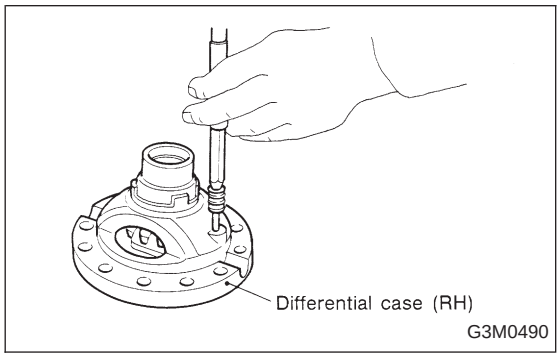
1) Using a press and ST, remove the taper roller bearing.

ST 498077000 REMOVER

CAUTION:
Be careful not to damage the speedometer drive gear.



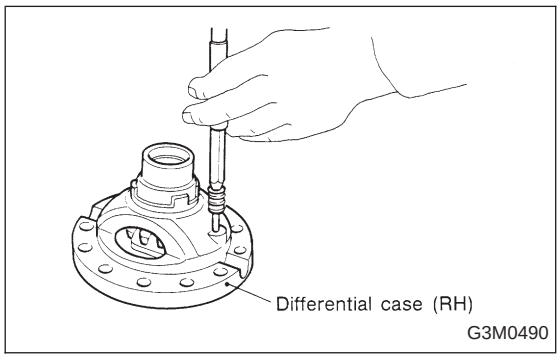
2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

B: INSPECTION

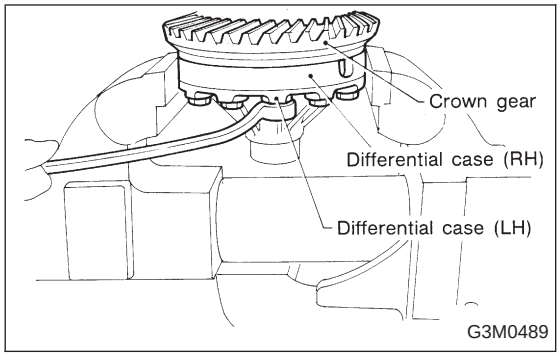
Check each component for harmful cuts, damage and other faults.



C: ASSEMBLY

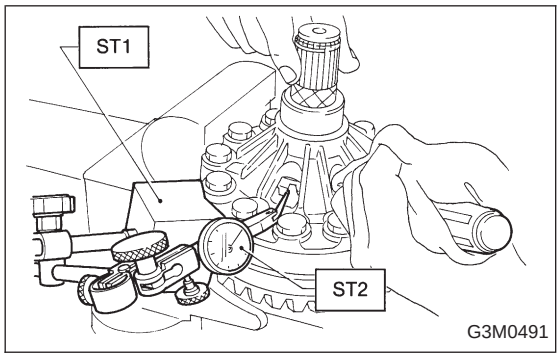
1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft, and fit the straight pin.

NOTE:
Install straight pin from reverse direction.



2) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.
3) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
62±5 N·m (6.3±0.5 kg-m, 45.6±3.6 ft-lb)

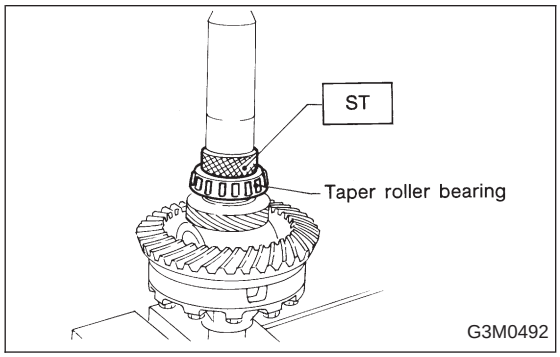


4) Measurement of backlash (Selection of washer)
Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

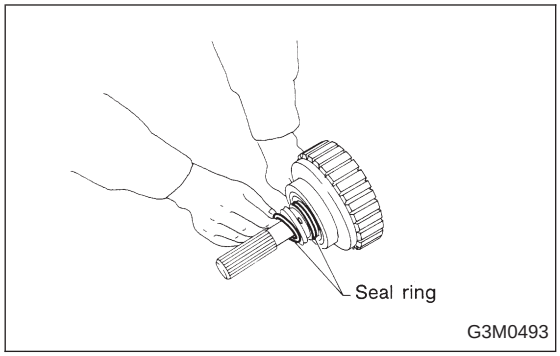
NOTE:
Measure the backlash by applying a pinion tooth between two bevel gear teeth.



5) Install the speedometer drive gear. Then force-fit the taper roller bearing with a press and ST.

ST 398487700 DRIFT

CAUTION:
Be sure to position correctly the locking end of the speedometer drive gear.

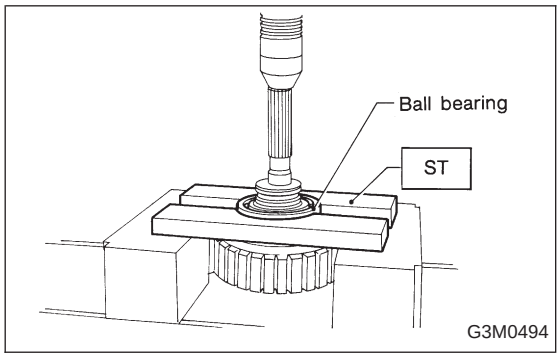


23. Transfer Clutch

A: DISASSEMBLY

1) Remove the seal ring.

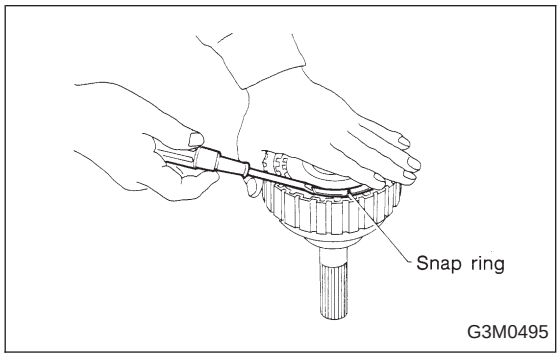
CAUTION:
Be careful not to damage the seal ring.



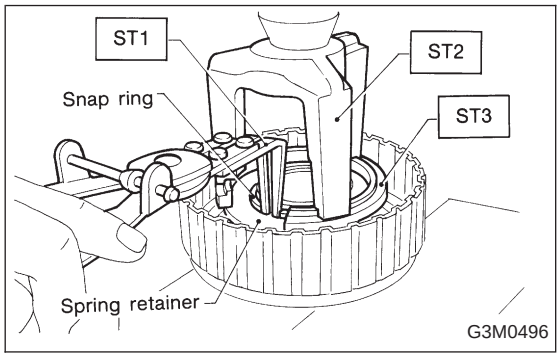
2) Using a press and ST, remove the ball bearing.

ST 498077000 REMOVER

CAUTION:
Do not reuse the bearing.

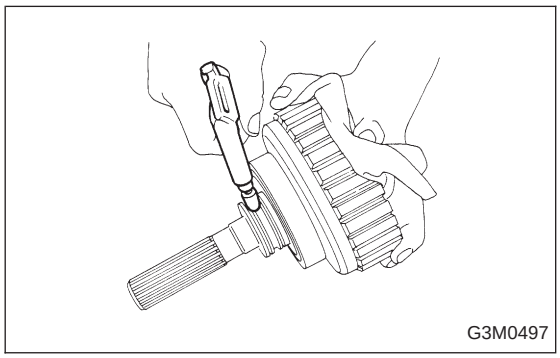


3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.



4) Remove the snap ring with ST1, ST2 and ST3, and take out the spring retainer.

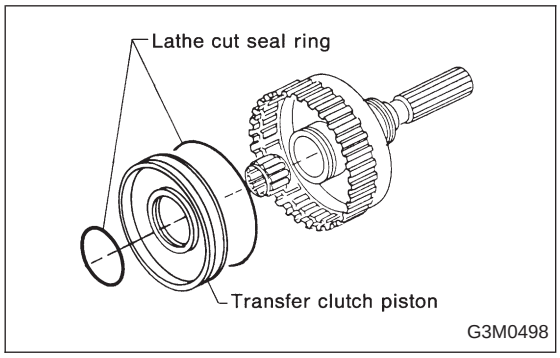
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 498627000 SEAT



5) Apply compressed air to the rear drive shaft to remove the piston.

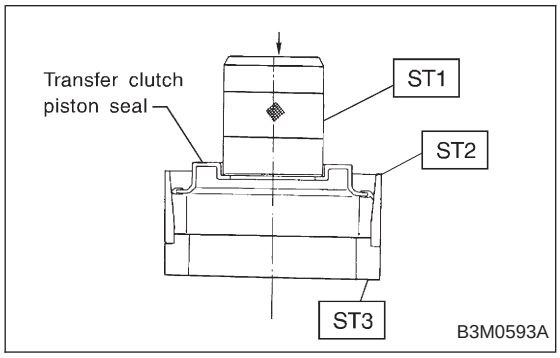
B: INSPECTION

1) Check the drive plate facing for wear and damage.
2) Check the snap ring for wear, return spring for permanent set and breakage, and spring retainer for deformation.
3) Check the lathe cut ring for damage.



C: ASSEMBLY

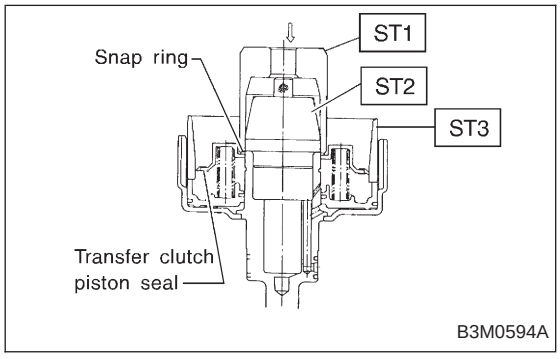
1) Install the lathe cut seal ring to the I.D./O.D. of the transfer clutch piston.



2) Install piston.
   (1) Connect transfer clutch piston to rear drive shaft (until it reaches hole in valve body).
   (2) Install spring retainer to transfer clutch piston.
   (3) Using ST1, ST2 and ST3, attach transfer piston seal to ST2.

ST1 499247400 INSTALLER
ST2 499257400 PISTON GUIDE
ST3 498267400 TABLE

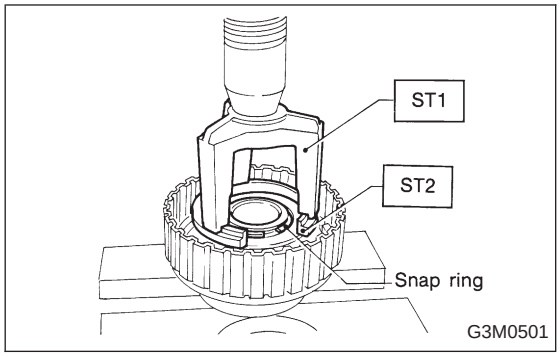
CAUTION:
Be careful not to tilt transfer piston seal.



   (4) Place ST3 onto rear drive shaft so that spring can be inserted into hole in transfer piston seal.
   (5) Attach ST2 to rear drive shaft. Using ST1, press into place.

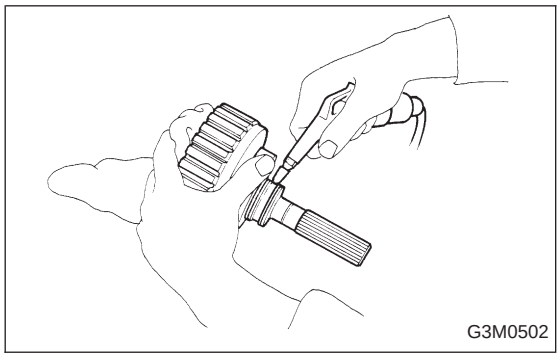
ST1 499247400 INSTALLER
ST2 499257300 SNAP RING OUTER GUIDE
ST3 499257400 PISTON GUIDE

CAUTION:
Do not allow lip of transfer piston seal to fold back.

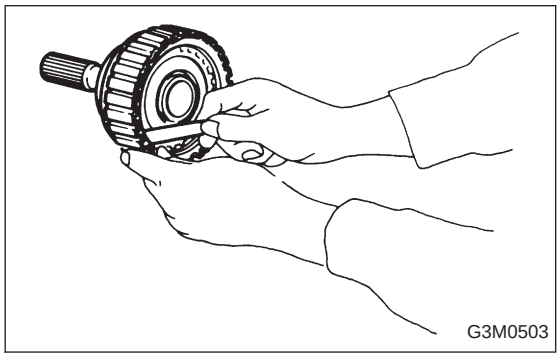


3) Install the driven plates, drive plates, and pressure plate, and secure with a snap ring with ST1, ST2 and a press.

ST1 398673600 COMPRESSOR
ST2 498627000 SEAT



4) Apply compressed air to see if the assembled parts move smoothly.



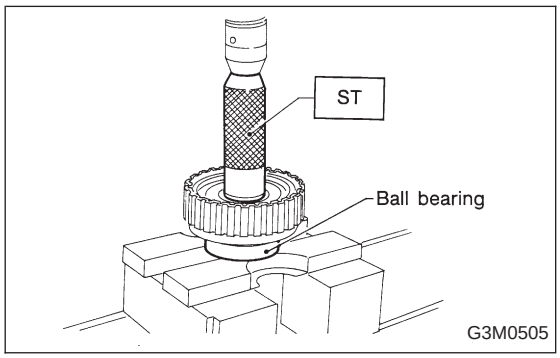
5) Check the clearance.

NOTE:
Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
If the clearance is not within the specified range, select a proper pressure plate.

Standard value:
0.2 — 0.6 mm (0.008 — 0.024 in)

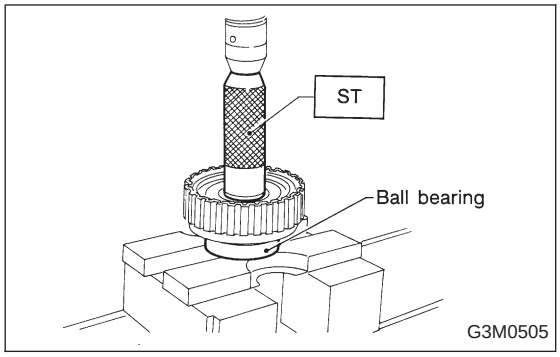
Allowable limit:
1.6 mm (0.063 in)

	Part No.	Thickness mm (in)
• Available pressure plates	31593AA151	3.3 (0.130)
	31593AA161	3.7 (0.146)
	31593AA171	4.1 (0.161)
	31593AA181	4.5 (0.177)



6) Press-fit the ball bearing with ST.

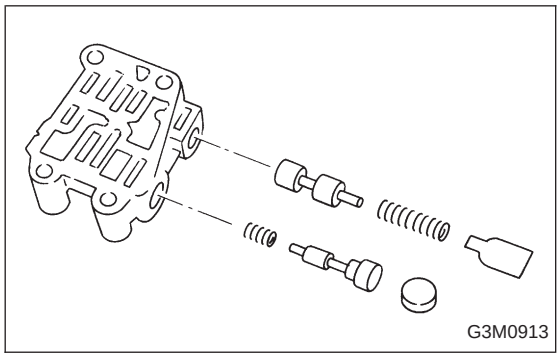
ST 899580100 INSTALLER



7) Coat the seal ring with vaseline, and install it in the seal ring groove of the shaft.

CAUTION:
Do not expand the seal ring excessively when installing.

ST 899580100 INSTALLER



24. Transfer Valve Body

A: DISASSEMBLY

1) Remove the plate. Then remove the spring and pilot valve together.
2) Remove the straight pin and pry out the plug with a screwdriver. Then extract the spring and transfer clutch valve together.

CAUTION:
Be careful not to damage the valve and valve body.

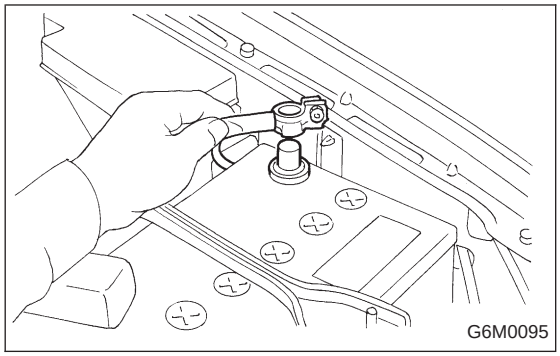
B: INSPECTION

Check each component for harmful cuts, damage, or other faults.

C: ASSEMBLY

To assemble, reverse the removal sequence.

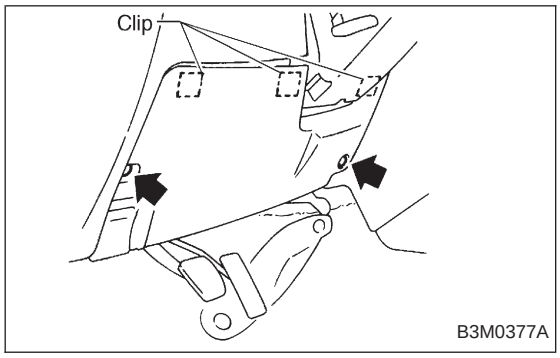
NOTE:
Make sure the valve slides smoothly after assembling.


G6M0095

25. Transmission Control Module

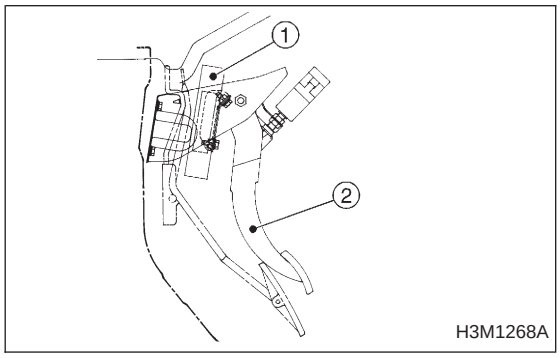
A: REMOVAL

1) Disconnect battery ground cable.



B3M0377A

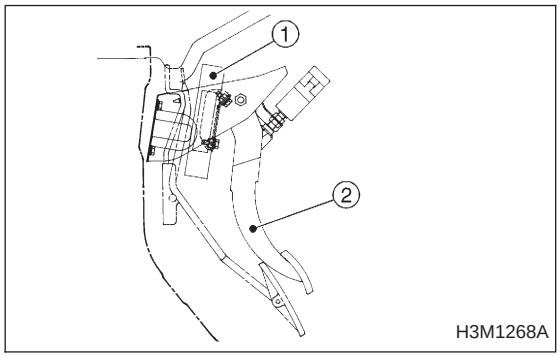
2) Remove lower cover and then disconnect connector.



H3M1268A

3) Remove transmission control module.
① Transmission control module
② Brake pedal
4) Disconnect connectors from transmission control module.

B: INSTALLATION



H3M1268A

1) Connect connectors to transmission control module.
① Transmission control module
② Brake pedal
2) Install transmission control module.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

3) Installing procedure hereafter is in the reverse order of removal.

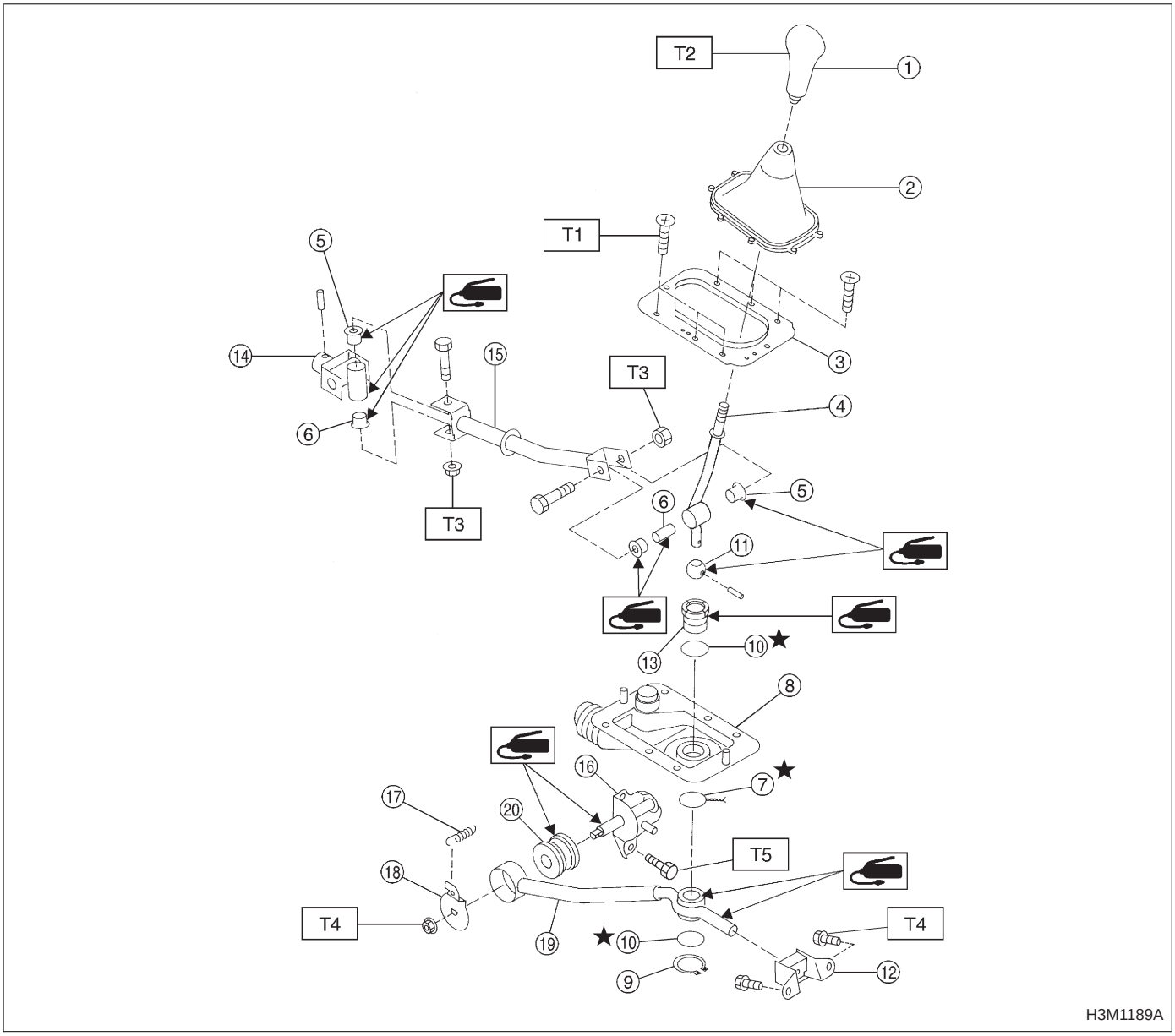
TRANSMISSION CONTROL SYSTEM 3-3

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C COMPONENT PARTS 2
1. Manual Transmission 2
2. Automatic Transmission 3

W SERVICE PROCEDURE 4
1. Manual Transmission 4
2. Automatic Transmission 10

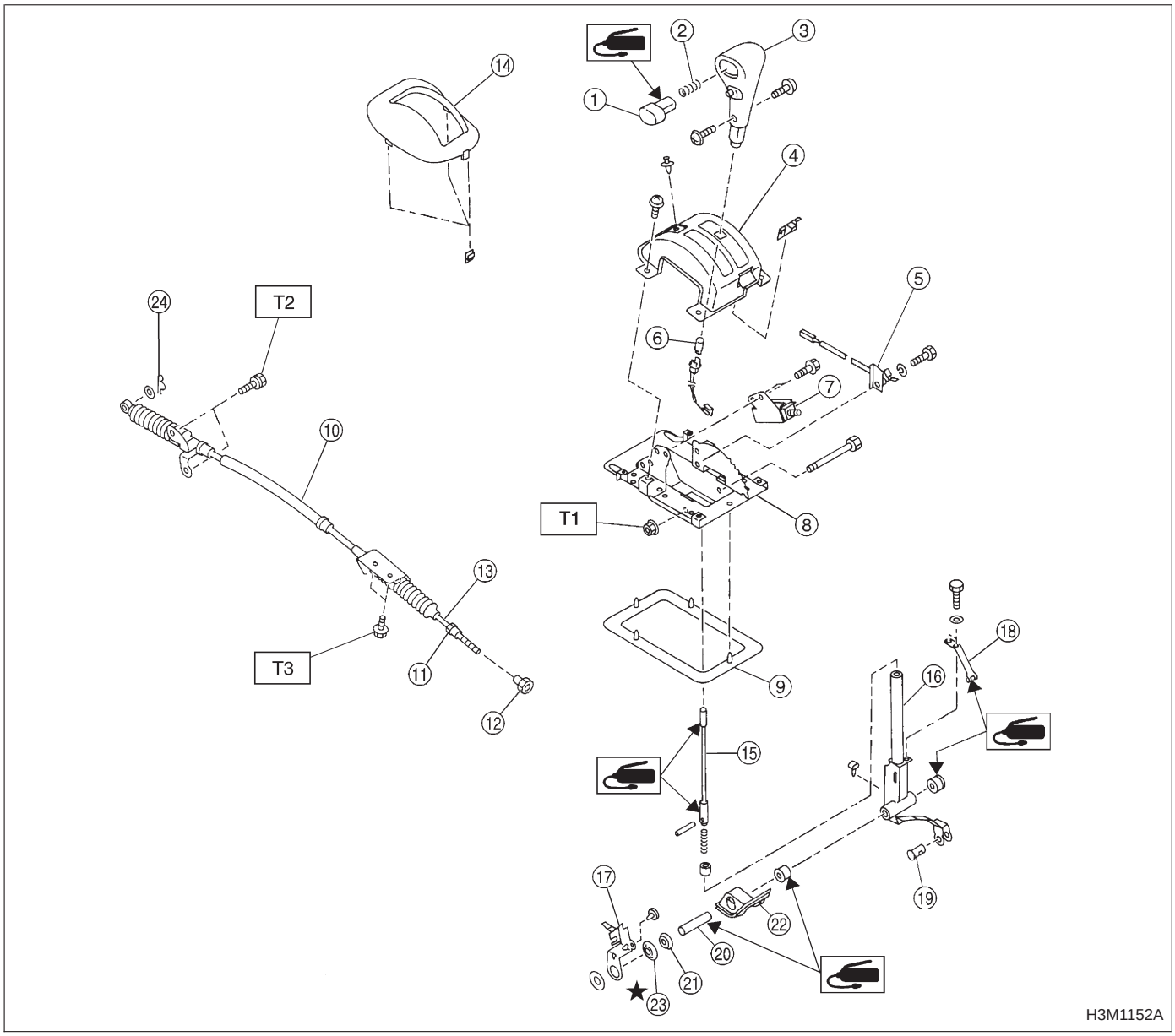
1. Manual Transmission



① Gear shift knob
② Console boot
③ Boot plate
④ Gear shift lever
⑤ Bush
⑥ Spacer
⑦ Locking wire
⑧ Boot
⑨ Snap ring
⑩ O-ring
⑪ Bush (Shift lever)
⑫ Cushion rubber
⑬ Bush (Stay rear)
⑭ Joint
⑮ Rod
⑯ Bracket
⑰ Spring
⑱ Washer
⑲ Stay
⑳ Bush (Stay front)

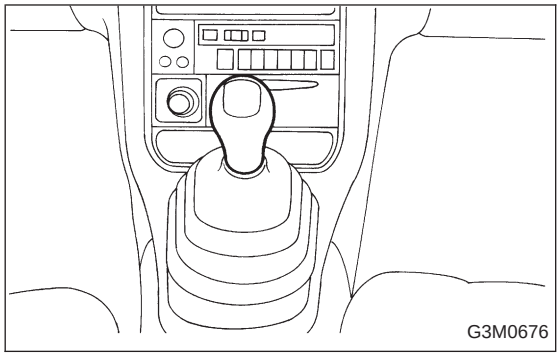
Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 5 (0.51, 3.7)
T3: 12±3 (1.2±0.3, 8.7±2.2)
T4: 18±5 (1.8±0.5, 13.0±3.6)
T5: 24.5±2 (2.50±0.20, 18.07±1.48)

2. Automatic Transmission



① Button
② Spring
③ Grip
④ Indicator cover
⑤ "P" position switch
⑥ Indicator light bulb
⑦ Shift-lock solenoid
⑧ Plate
⑨ Packing
⑩ Outer cable
⑪ Nut
⑫ Nut
⑬ Inner cable
⑭ Panel
⑮ Rod
⑯ Selector lever
⑰ Lock plate
⑱ Detention spring
⑲ Pin
⑳ Spacer
㉑ Washer
㉒ Boot
㉓ Spacer
㉔ Snap pin

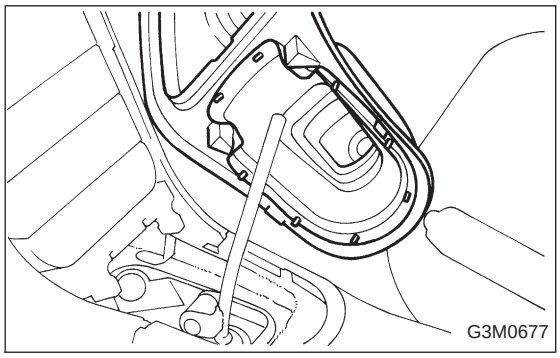
Tightening torque: N·m (kg-m, ft-lb)
T1: 14±3 (1.43±0.31, 10.3±2.2)
T2: 14±4 (1.43±0.41, 10.3±3.0)
T3: 18±5 (1.84±0.51, 13.3±3.7)


G3M0676

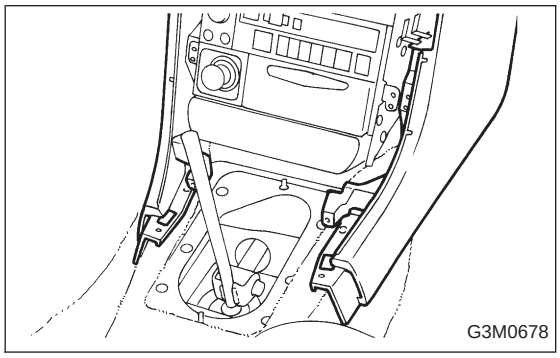
1. Manual Transmission

A: REMOVAL

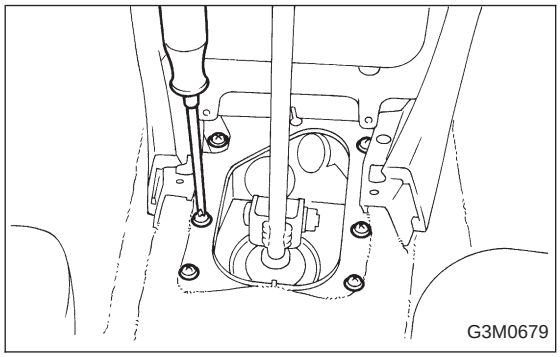
1) Remove knob from gearshift lever.


G3M0677

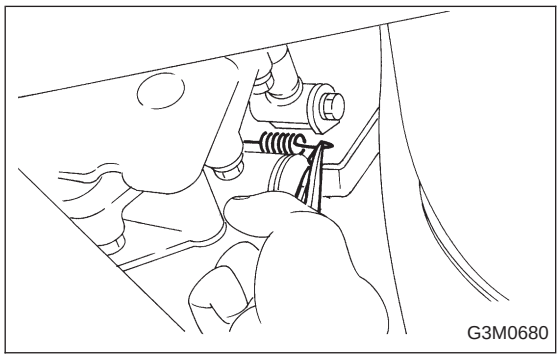
2) Remove console cover and console boot.


G3M0678

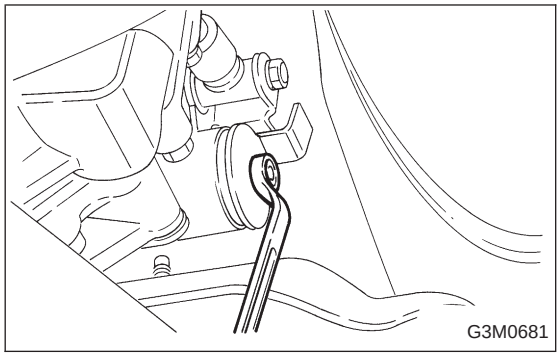
3) Remove rear console box, center console and instrument console.


G3M0679

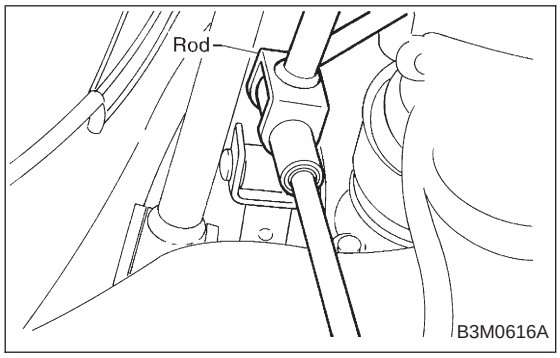
4) Remove boot plate from the body.


G3M0680

5) Remove the spring between the joint and bracket.

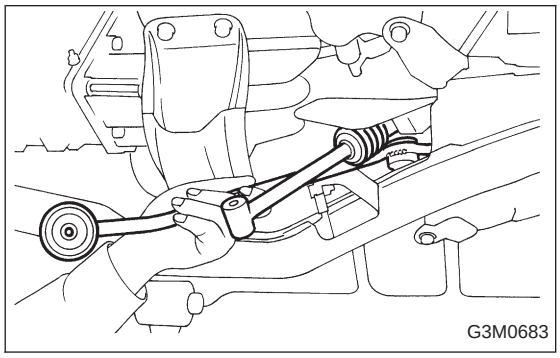

G3M0681

6) Remove stay from bracket.

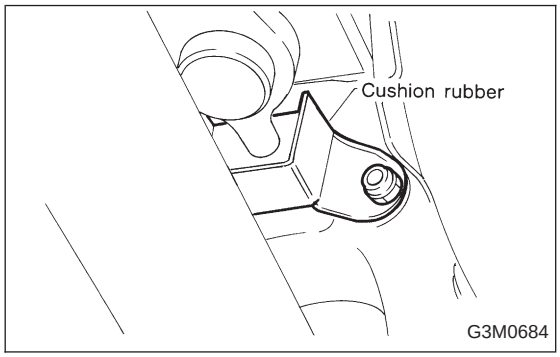


B3M0616A

7) Remove rod from joint.


G3M0683

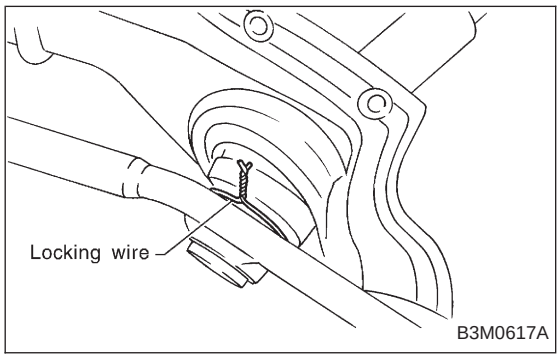
8) Remove gearshift lever.



G3M0684

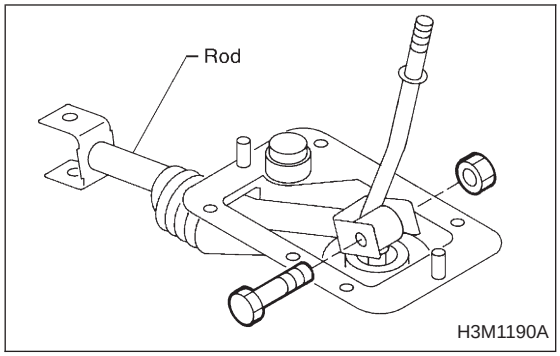
9) Remove the exhaust cover and remove cushion rubber from the body.

B: DISASSEMBLY

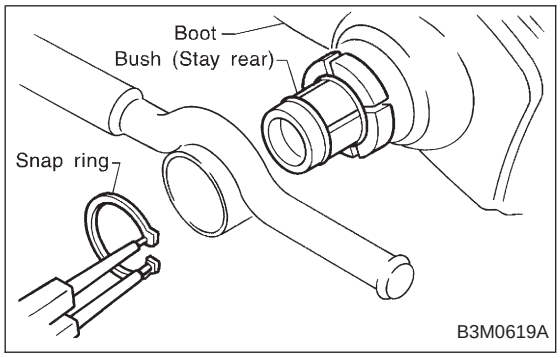


B3M0617A

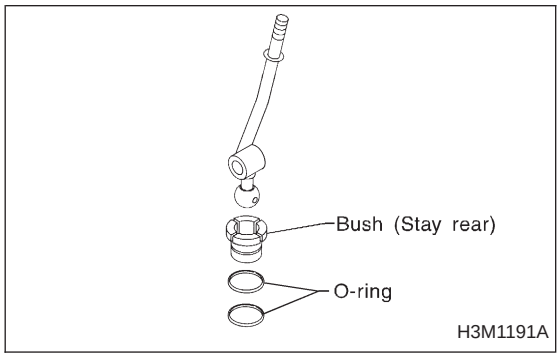
1) Disconnect locking wire.



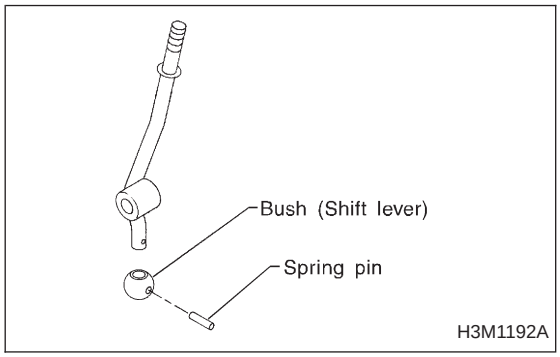
2) Remove rod from gearshift lever.



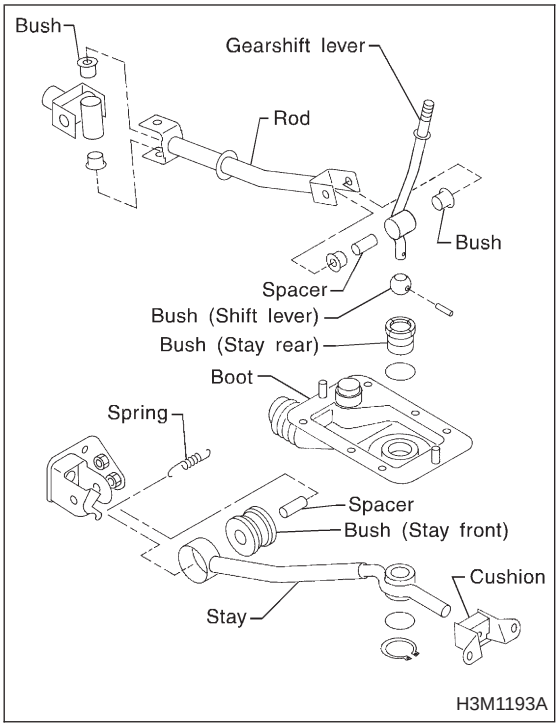
3) Remove snap ring, then disconnect gearshift lever from stay.
4) Remove boot from gearshift lever.



5) Remove O-ring, then disconnect bush (Stay rear).

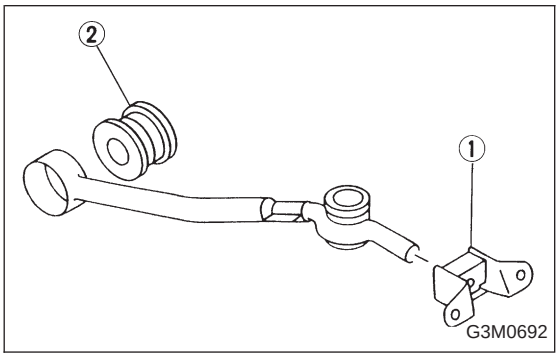


6) Draw out spring pin, then remove bush (Shift lever) from gearshift lever.



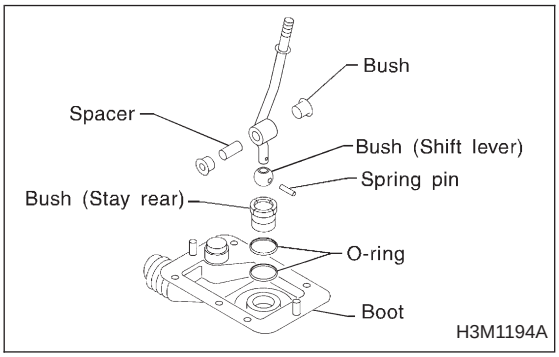
C: INSPECTION

Check each parts (Bush, cushion, spacer, boot, spring, stay and rod etc.) for deformation, damage and wear. Repair or replace any defective parts. Determine defective parts by comparing with new parts.



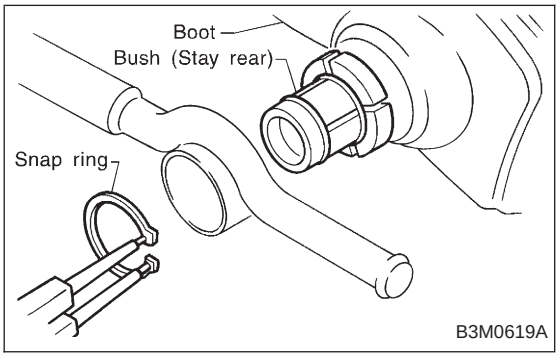
D: ASSEMBLY

1) Clean all parts before assembly.
2) Mount the following parts on the stay.
① Cushion rubber
② Bush (Stay front)

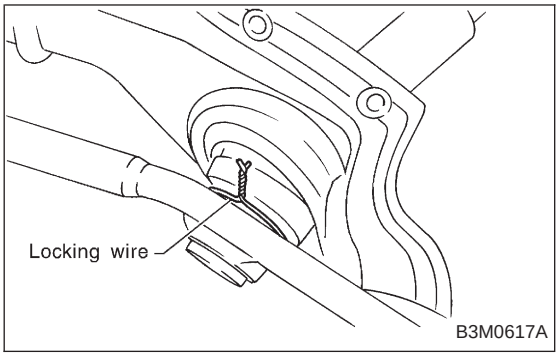


3) Mount each parts (Boot, O-ring, bush and spacer) on the gearshift lever.

CAUTION:
- **Always use new O-rings.**
- **Apply grease [NIGTIGHT LYW No.2 or equivalent] to the inner and side surfaces of the bush when installing spacer.**

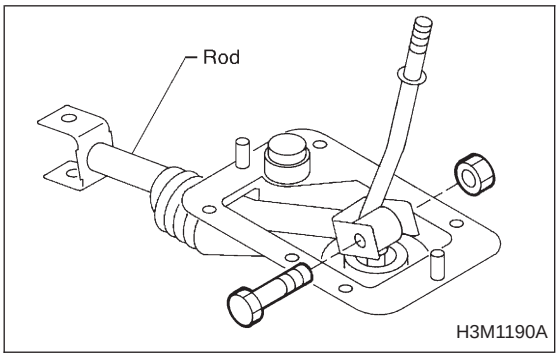


4) Insert the gearshift lever into the boot hole.
5) Mount gearshift lever on the stay.
6) Install snap ring to the bottom of the bush (Stay rear).



7) Tighten with locking wire to the extent that the boot will not come off.

CAUTION:
Always use new locking wire.



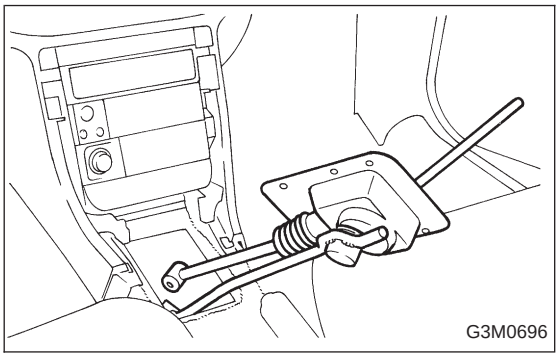
8) Insert the rod into the boot hole.
9) Connect rod to gearshift lever.

Tightening torque:
12±3 N·m (1.2±0.3 kg-m, 8.7±2.2 ft-lb)

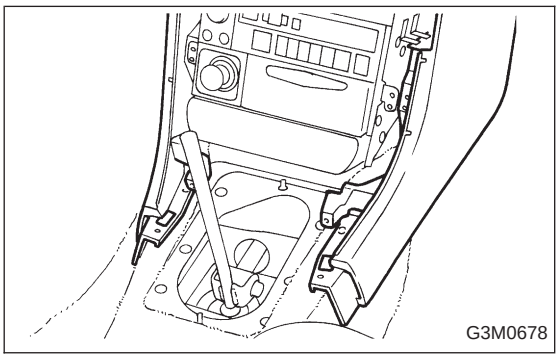
Rocking torque:
0.74±0.25 N·m (0.075±0.025 kg-m, 0.54±0.18 ft-lb) or less

10) Check that there is no excessive play and that parts move smoothly.

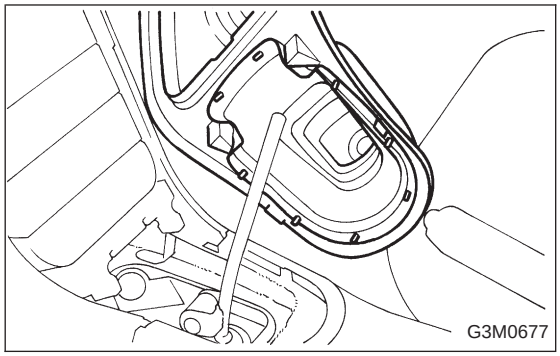
E: INSTALLATION



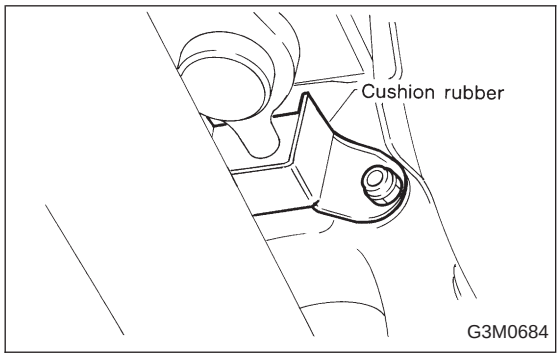
1) Put into gearshift lever from passenger compartment.
2) Mount boot plate on the body.



3) Install rear console box, center console and instrument console.

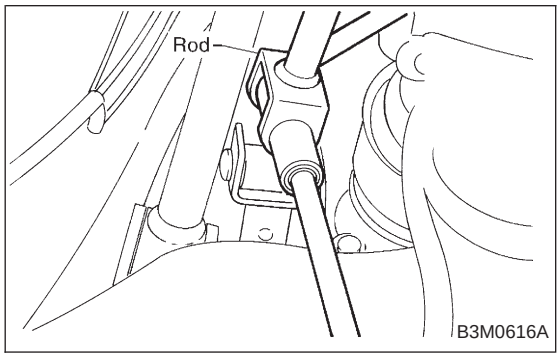


4) Install console cover and boot.
5) Install gearshift knob.



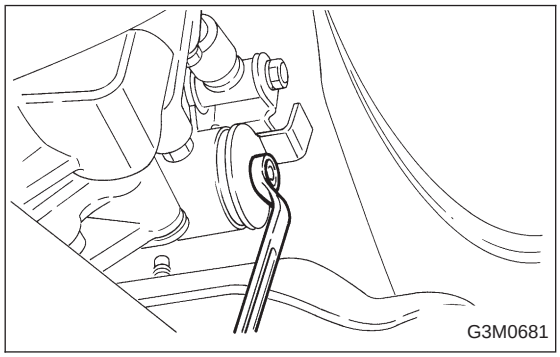
6) Mount cushion rubber on the body.

Tightening torque:
18±5 N·m (1.84±0.51 kg-m, 13.3±3.7 ft-lb)



7) Connect rod to the joint.

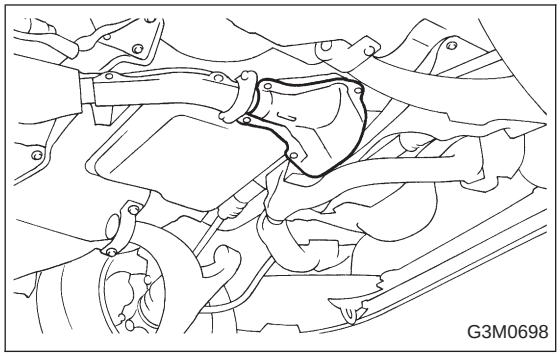
Tightening torque:
12±3 N·m (1.2±0.3 kg-m, 8.7±2.2 ft-lb)



8) Connect stay to the bracket.

Tightening torque:
18±5 N·m (1.84±0.51 kg-m, 13.3±3.7 ft-lb)

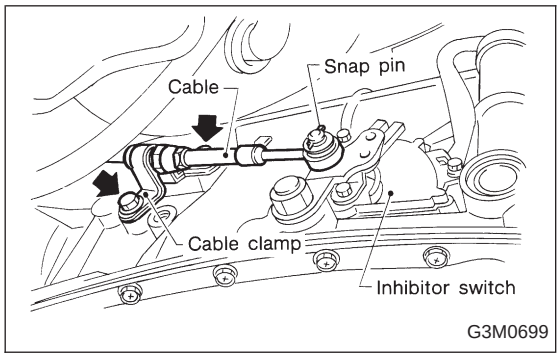
9) Install the exhaust cover.


G3M0698

2. Automatic Transmission

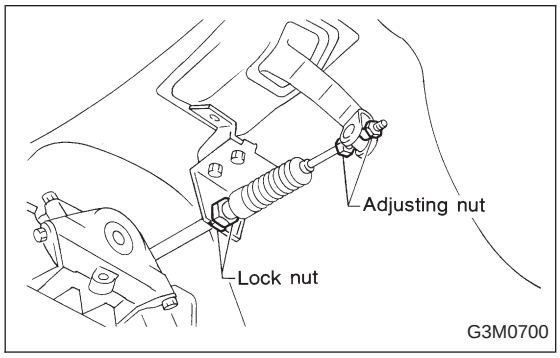
A: REMOVAL

1) Remove the cable.
   (1) Prior to removal, set lever to “N” position.
   (2) Remove front exhaust pipe.



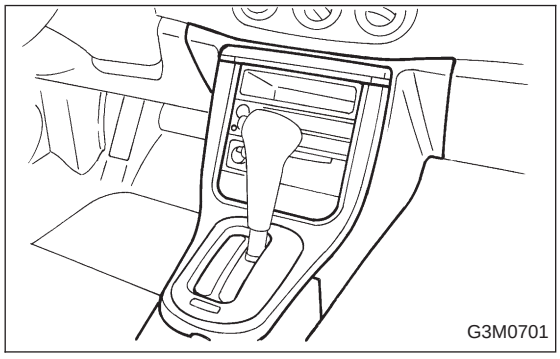
G3M0699

   (3) Separate cable from transmission lever.
   (4) Remove clamp from transmission case.

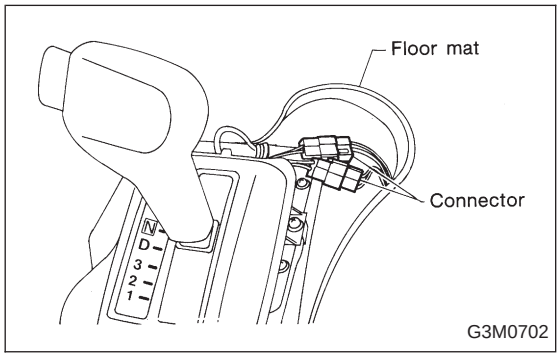


G3M0700

   (5) Disconnect cable from selector lever.

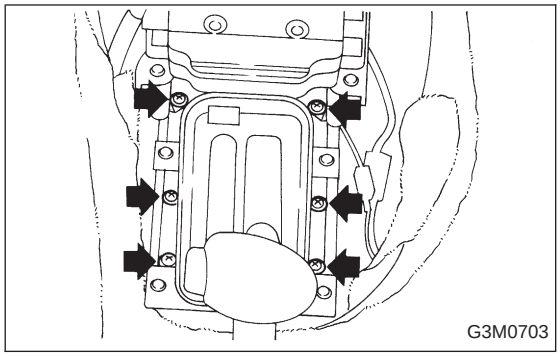

G3M0701

2) Remove all of the screws to take off the following console parts.
- Instrument console
- Center console
- Rear console box



G3M0702

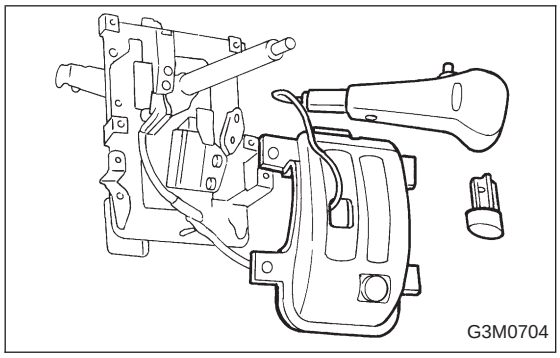
3) Disconnect the connectors.

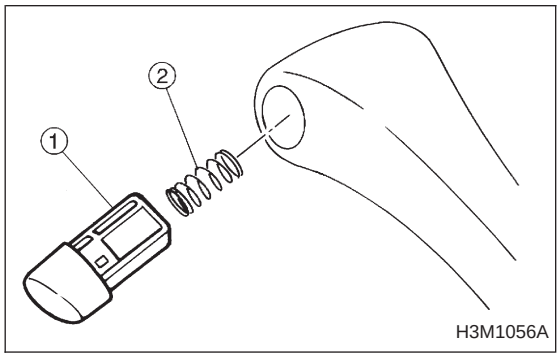

G3M0703

4) Remove the screws to take off the plate from the body.

B: DISASSEMBLY

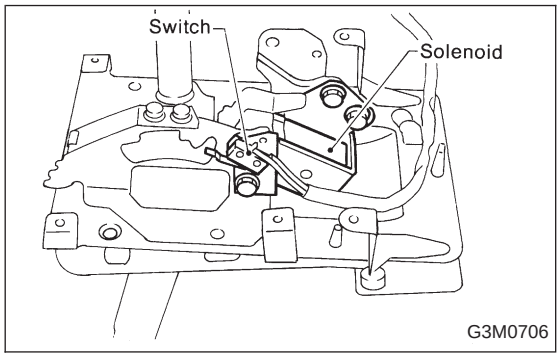
1) Remove grip from selector lever.
2) Remove indicator from plate.


G3M0704



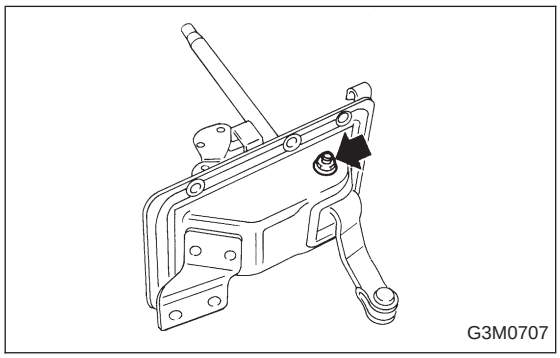
H3M1056A

3) Remove the following parts from the grip.
① Button
② Spring

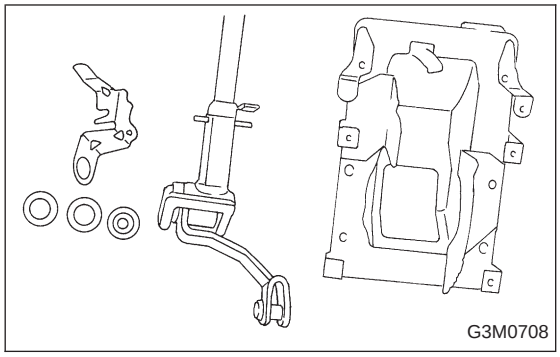


G3M0706

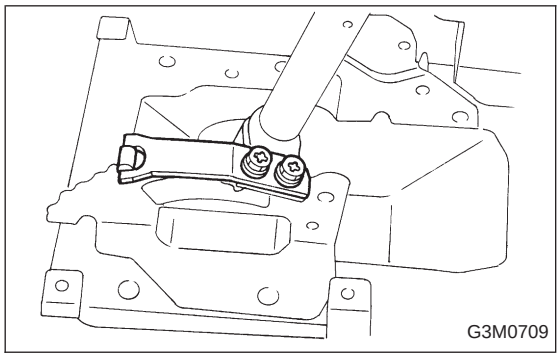
4) Remove shift-lock solenoid and “P” position switch.


G3M0707

5) Remove the bolt to take off the selector lever from the plate.


G3M0708

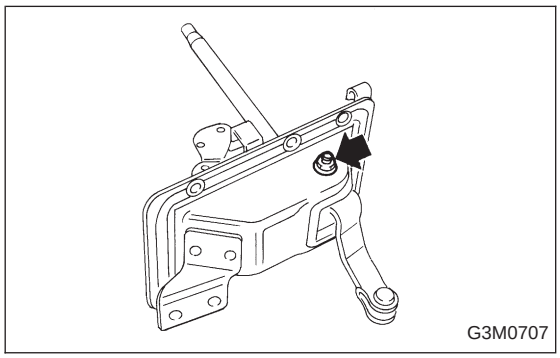
6) Remove lock plate.
7) Remove selector lever from the plate.


G3M0709

8) Remove detention spring.

C: INSPECTION

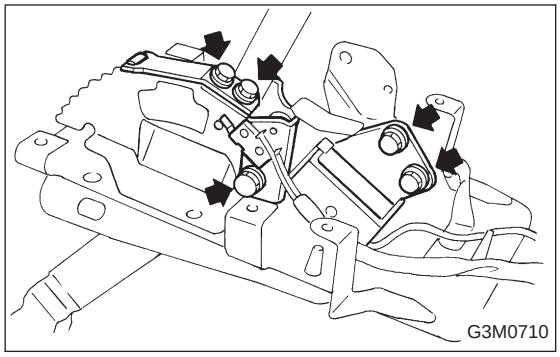
1) Inspect removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm the following parts for operating condition before assembly.
(1) Sliding condition of the button in the grip ... it should move smoothly.
(2) Insertion of the grip on the selector lever ... when pushing the grip on the selector lever by hand, screw holes should be aligned.
(3) Operation of selector lever and rod ... they should move smoothly.
(4) Insertion of the spacer into the selector lever ... it should be inserted lightly by finger pressure.


G3M0707

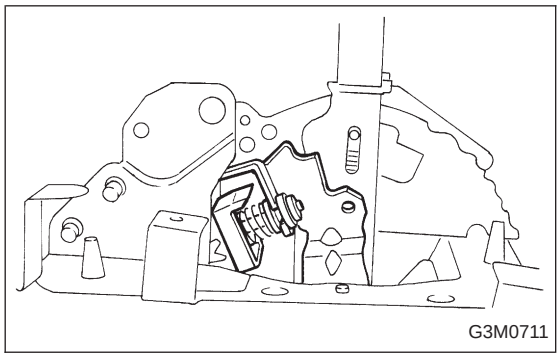
D: ASSEMBLY

1) Clean all parts before assembly.
2) Assemble selector lever and lock plate to the plate.
3) Insert the bolt and tighten the flange nut to the specified torque.

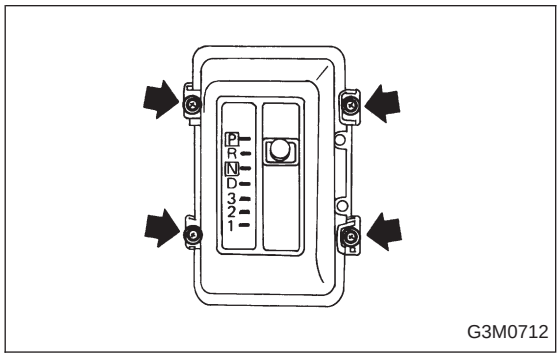
Tightening torque (Flange nut):
14±3 N·m (1.43±0.31 kg-m, 10.3±2.2 ft-lb)


G3M0710

4) Assemble detention spring, shift-lock solenoid and “P” position switch.


G3M0711

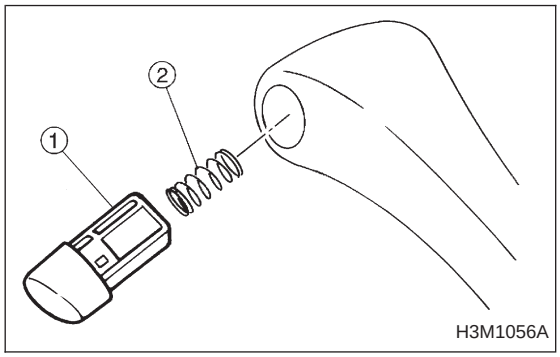
5) Adjust the position of shift-lock plate and solenoid. Then, tighten the bolts.



G3M0712

6) Assemble indicator to the plate.

Tightening torque:
1.95±0.65 N·m (1.999±0.066 kg-m, 1.438±0.479 ft-lb)

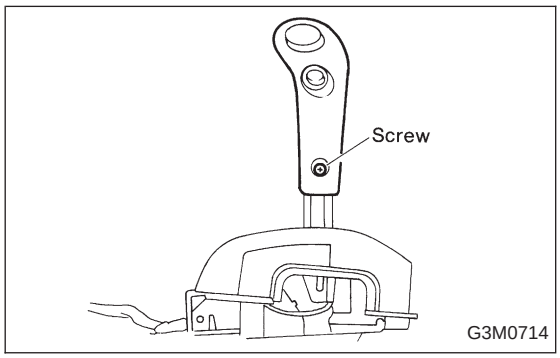


H3M1056A

7) Assemble the following parts to the grip.

CAUTION:
Apply grease on sliding surfaces of the following parts.

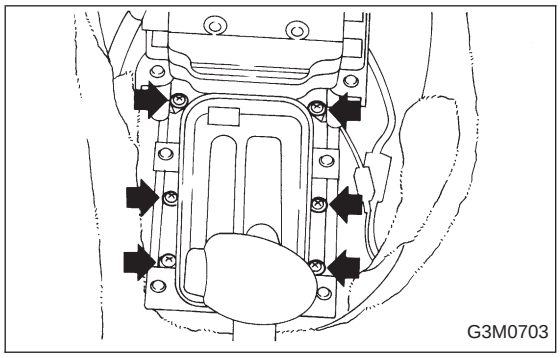
① Button
② Spring



G3M0714

8) Assemble the grip to the selector lever.

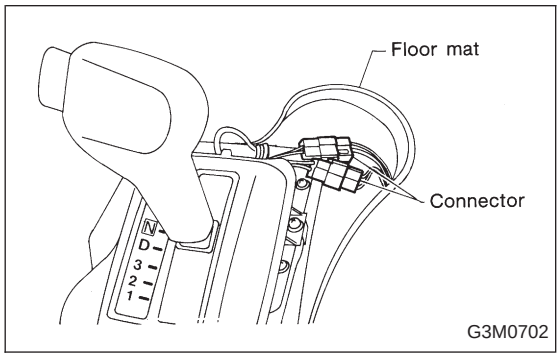
9) After completion of fitting, transfer selector lever to range “P” ~ “1”, pressing the button of the grip; then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.


G3M0703

E: INSTALLATION

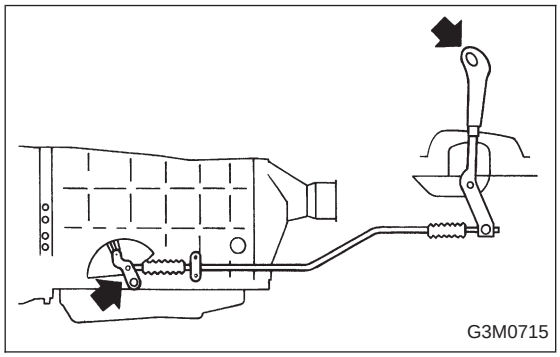
1) Mount the selector lever onto the car body.
2) Tighten the six bolts to install the selector lever to the car body.

Tightening torque:
4.5±1.5 N·m (0.46±0.153 kg-m, 3.32±1.11 ft-lb)

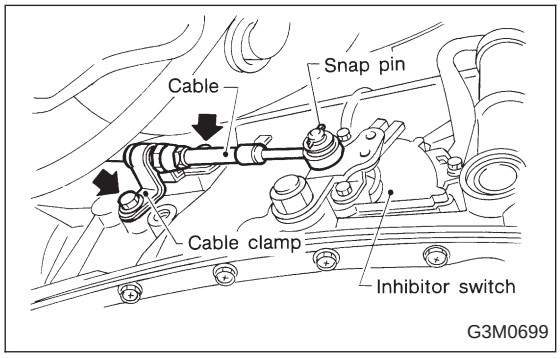


G3M0702

3) Connect connectors and install rear console, center console and instrument console.


G3M0715

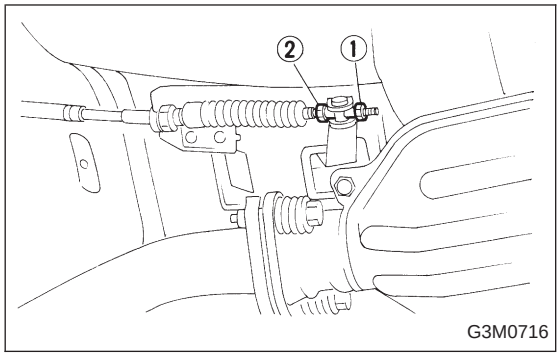
4) Set location of selector lever at “N” position.
5) Set location of selector arm installed on the transmission body at “N” position.



G3M0699

6) Pass inner cable through selector arm pin and then connect it using a washer and snap pin.
7) Attach outer cable to transmission case with the bolts.

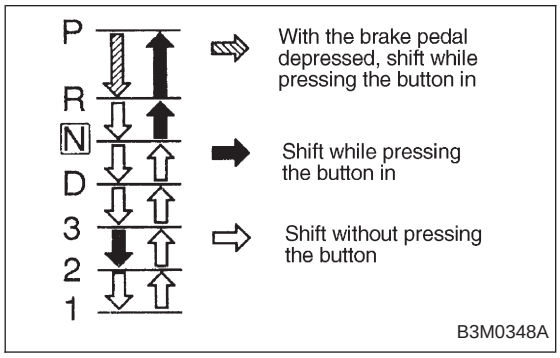
Tightening torque:
14±4 N·m (1.43±0.41 kg-m, 10.3±3.0 ft-lb)



8) Insert the thread portion of the other inner cable and into the connector hole of the selector lever, and fix the other outer cable end to the bracket.
9) Adjust the inner cable length.
(1) Put connector into contact with nut ②.
(2) Tighten nut ①.

Tightening torque:
7.35±1.95 N·m (0.750±0.199 kg-m, 5.421±1.438 ft-lb)

10) After completion of fitting, make sure that the selector lever operates smoothly all across the operating range.
11) Connect the harnesses and check the following items.
(1) The engine starts operating when selector lever is in position “P”, but not in other positions.
(2) The back-up light is lit when the selector lever is in position “R”, but not in other positions.



12) Check selector lever operation.

WARNING:
Stop the engine while checking operation of selector lever.

(1) Check that selector lever does not move from “N” to “R” without pushing the button.
(2) Check that selector lever does not move from “R” to “P” without pushing the button.
(3) Check that selector lever does not move from “P” to “R” without pushing the button.
(4) Check that selector lever does not move from “3” to “2” without pushing the button.

13) Check shift lock system.
(1) Ensure ignition switch rotates from “ACC” to “LOCK” when the selector lever is set at “P”. Also check that ignition key can be removed from the “LOCK” position only.
(2) Ensure selector lever moves from “P” to any other position when the brake pedal is depressed with ignition key set at “ON” or “START”.

AWD SYSTEM 3-4

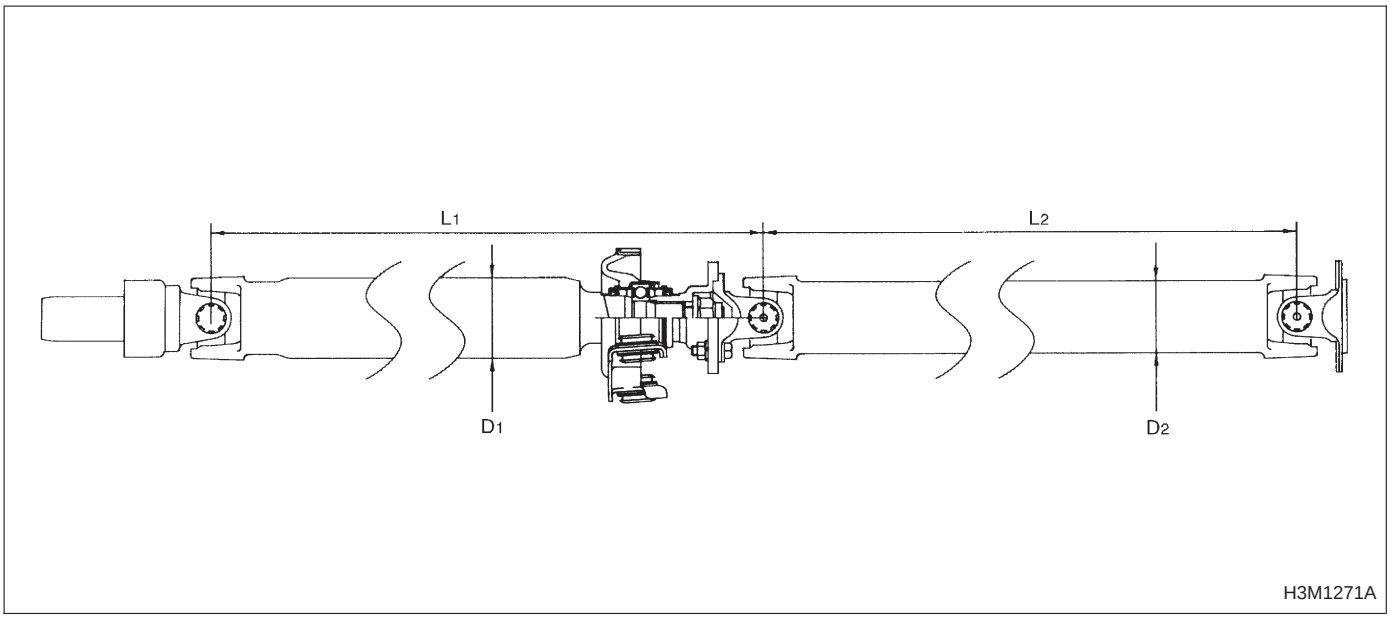
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1. Propeller Shaft 71
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1. Specifications

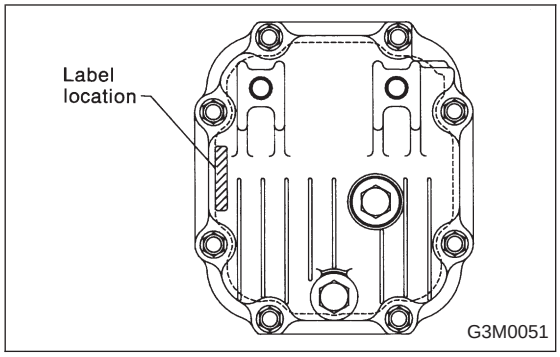
A: PROPELLER SHAFT

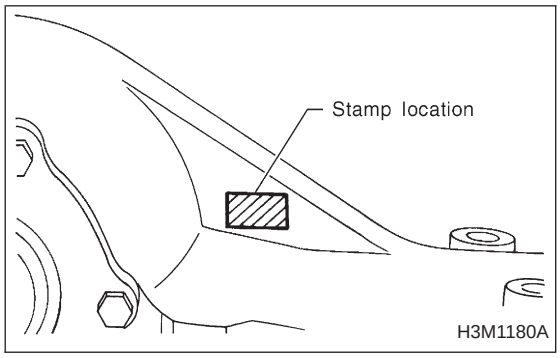
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	586 (23.07)
	MT	645 (25.39)
Rear propeller shaft Joint-to joint length: L_2 mm (in)		706 (27.80)
Outside dia. of tube mm (in)	D_1	63.5 (2.500)
	D_2	57.0 (2.244)



B: REAR DIFFERENTIAL

Type of gear	Hypoid	
	MT	AT
	1800 cc and 2200 cc	2200 cc
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)	
Rear differential gear oil	GL-5	





2. Identification

When replacing a rear differential assembly, select the correct one according to the following table.

CAUTION:
Using the different rear differential assembly causes the drive line and tires to "drag" or emit abnormal noise when AWD is selected.

Gear ratio		Label or stamp on rear differential
1800 cc MT	3.900	 H3M1057
2200 cc AT	4.111	 H3M1159
2200 cc MT	3.900	 B3M0124

3. Service Data

A: REAR DIFFERENTIAL (VA-TYPE)

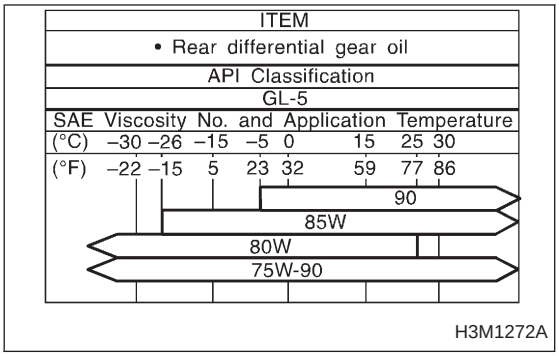
Front and rear bearing preload at companion flange bolt hole	New bearing	12.7 — 32.4 N (1.3 — 3.3 kg, 2.9 — 7.3 lb)
Preload adjusting washer length	Part No.	Length mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
Preload adjusting spacer length	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)
Pinion height adjusting shim thickness	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)

Side gear backlash	0.05 — 0.15 mm (0.0020 — 0.0059 in)	
Side gear thrust washer thickness	Part No.	Thickness mm (in)
	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)
Crown gear to drive pinion backlash	Limit	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface		0.05 (0.0020)
Oil capacity		0.8 ℓ (0.8 US qt, 0.7 Imp qt)

B: REAR DIFFERENTIAL (T-TYPE)

Front and rear bearing preload at companion flange bolt hole	New bearing	19.6 — 28.4 N (2.0 — 2.9 kg, 4.4 — 6.4 lb)
	Used bearing	8.34 — 16.67 N (0.85 — 1.70 kg, 1.87 — 3.75 lb)
Preload adjusting washer length	Part No.	Length
	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Preload adjusting spacer length	Part No.	Length
	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
	383695206	57.2 mm (2.252 in)

Pinion height adjusting shim thickness	Part No.	Thickness
	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
	383665200	3.60 mm (0.1417 in)
	383675200	3.63 mm (0.1429 in)
	383685200	3.66 mm (0.1441 in)
Side gear backlash	0.10 — 0.20 mm (0.0039 — 0.0079 in)	
Side gear thrust washer thickness	Part No.	Thickness
	383445201	0.75 — 0.8 mm (0.0295 — 0.0315 in)
	383445202	0.8 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.9 mm (0.0335 — 0.0354 in)
Side bearing standard width	20.00 mm (0.7874 in)	
Side bearing retainer shim thickness	Part No.	Thickness
	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
	383475205	0.50 mm (0.0197 in)
Crown gear to drive pinion backlash	Limit	0.10 — 0.20 mm (0.0039 — 0.0079 in)
Crown gear runout on its back surface		0.05 mm (0.0020 in)
Oil capacity		0.8 ℓ (0.8 US qt, 0.7 Imp qt)

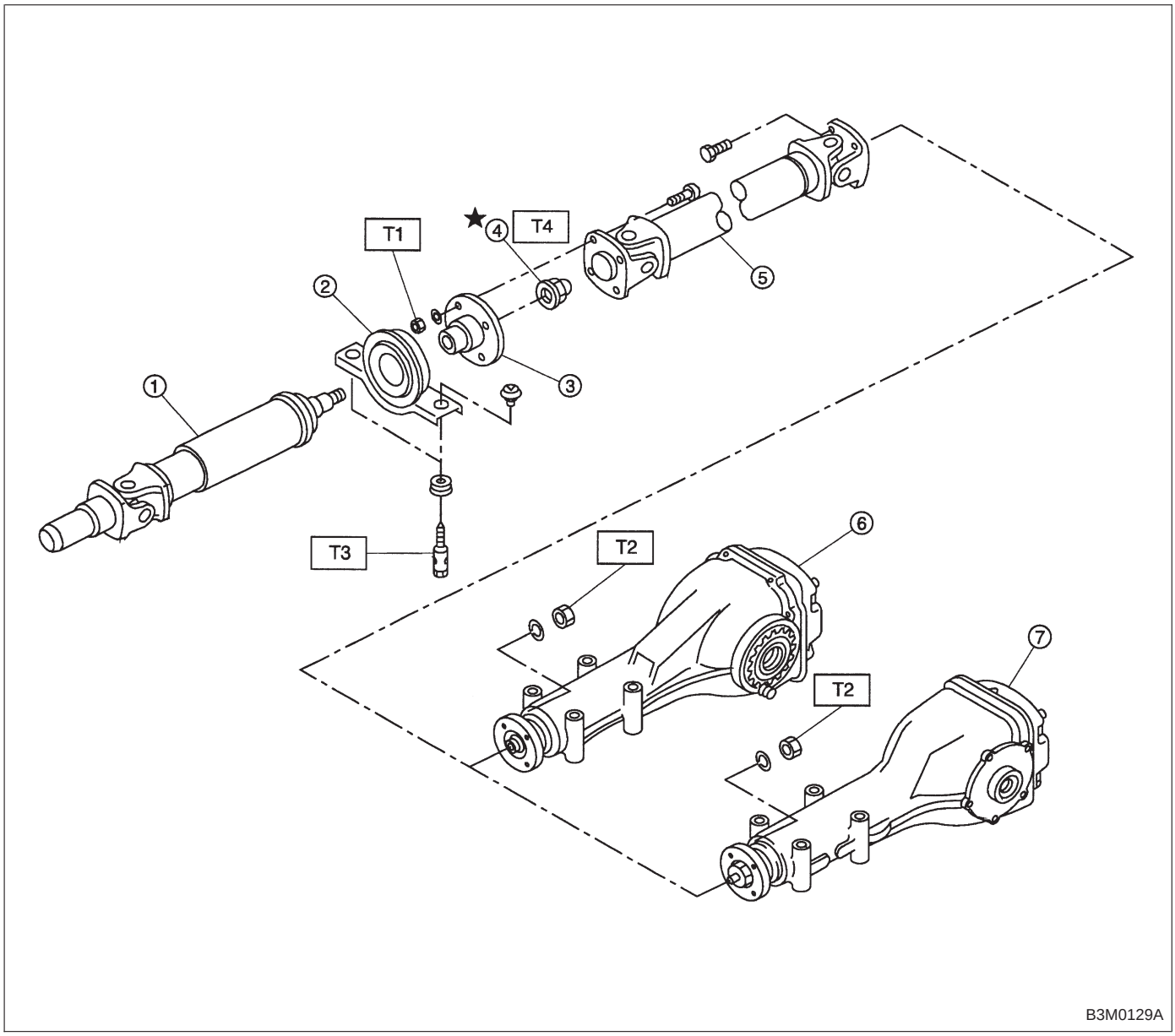


C: REAR DIFFERENTIAL GEAR OIL

- **Recommended oil**

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

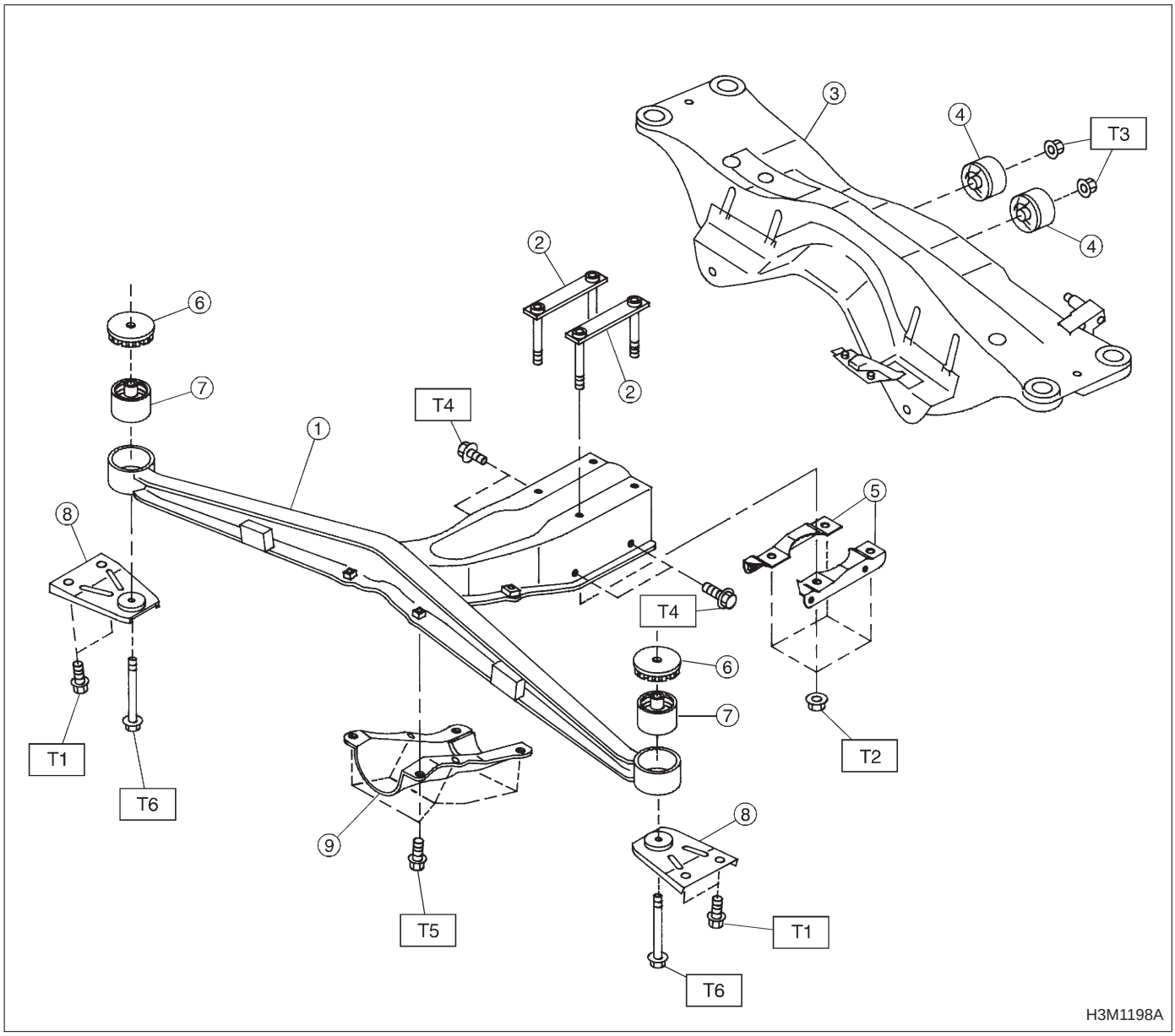
1. Propeller Shaft



① Front propeller shaft
② Center bearing
③ Companion flange
④ Stake nut
⑤ Rear propeller shaft
⑥ Rear differential (VA-type)
⑦ Rear differential (T-type)

Tightening torque: N·m (kg-m, ft-lb)
T1: 27.9±4.4 (2.85±0.45, 20.6±3.3)
T2: 31±8 (3.2±0.8, 23.1±5.8)
T3: 52±5 (5.3±0.5, 38.3±3.6)
T4: 270±25 (27.5±2.5, 199±18)

2. Rear Differential Mounting System

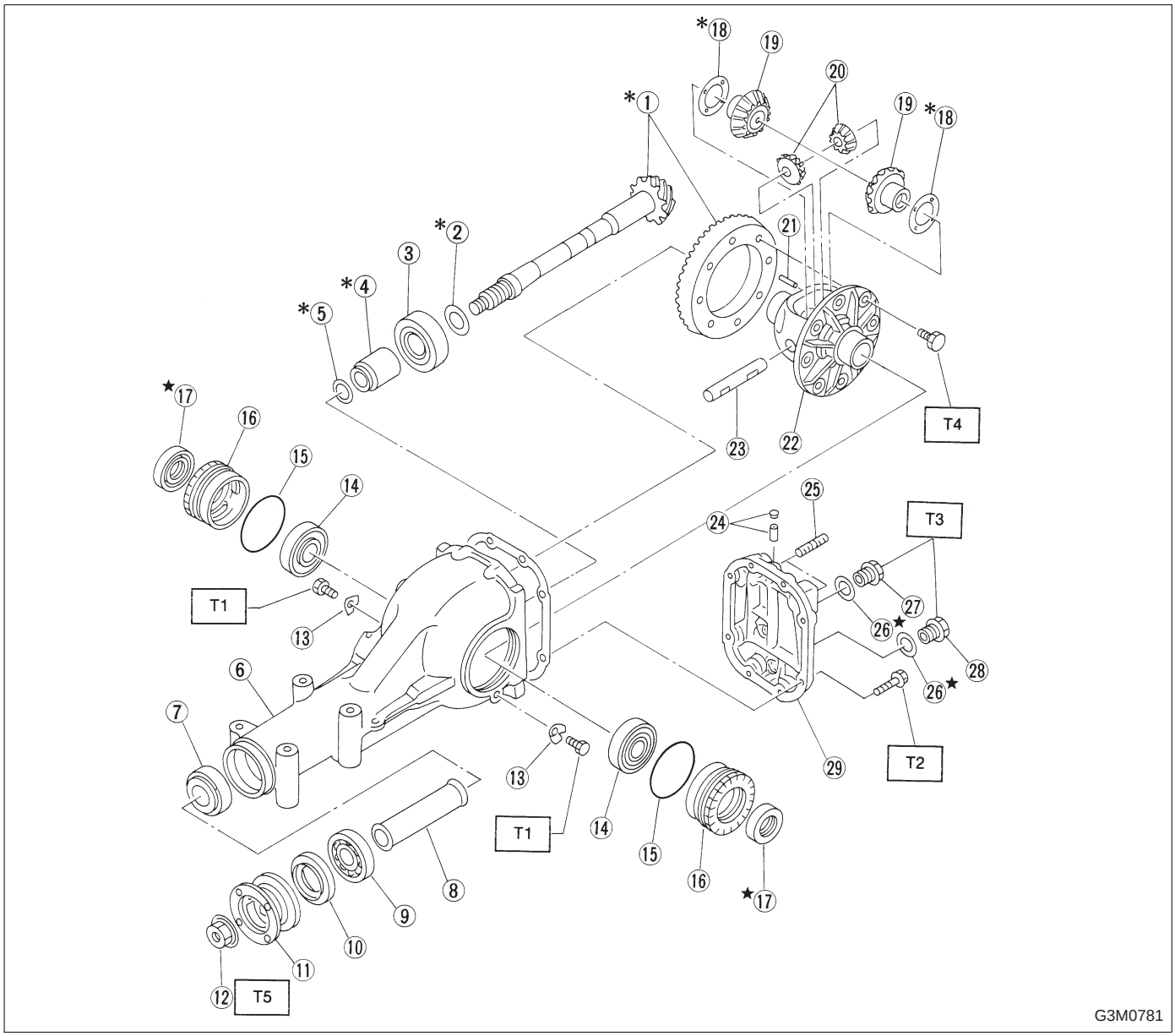


① Differential front member
② Plate
③ Crossmember
④ Rear bushing
⑤ Differential mount lower bracket
⑥ Stopper
⑦ Front bushing
⑧ Differential mount bracket
⑨ Differential mount front cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 32±8 (3.3±0.8, 23.9±5.8)
T2: 64±8 (6.5±0.8, 47.0±5.8)
T3: 69±8 (7.0±0.8, 50.6±5.8)
T4: 69±10 (7.0±1.0, 51.0±7.2)
T5: 88±10 (9.0±1.0, 65.0±7.2)
T6: 98±10 (10.0±1.0, 72.0±7.2)

3. Rear Differential Assembly

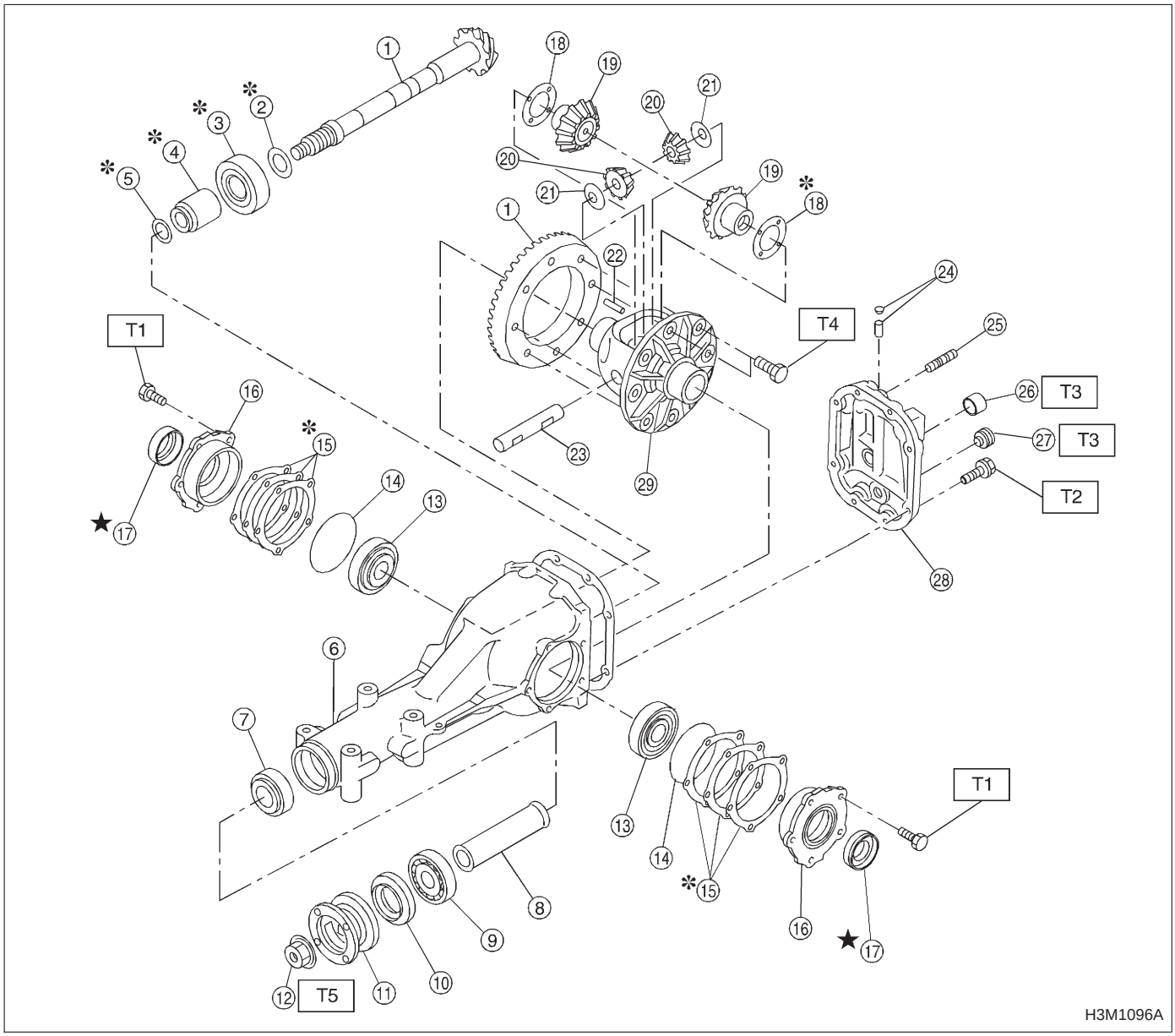
A: VA-TYPE



① Pinion crown gear set
② Pinion height adjusting shim
③ Rear bearing
④ Bearing preload adjusting spacer
⑤ Bearing preload adjusting washer
⑥ Differential carrier
⑦ Front bearing
⑧ Collar
⑨ Pilot bearing
⑩ Front oil seal
⑪ Companion flange
⑫ Self-locking nut
⑬ Lock plate
⑭ Side bearing
⑮ O-ring
⑯ Axle shaft holder
⑰ Side oil seal
⑱ Side gear thrust washer
⑲ Side gear
⑳ Pinion mate gear
㉑ Pinion shaft lock pin
㉒ Differential case
㉓ Pinion mate shaft
㉔ Air breather cap
㉕ Stud bolt
㉖ Gasket
㉗ Oil filler plug
㉘ Oil drain plug
㉙ Rear cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±3 (2.5±0.3, 18.1±2.2)
T2: 25±2 (2.5±0.2, 18.1±1.4)
T3: 34±4 (3.5±0.4, 25.3±2.9)
T4: 62±5 (6.3±0.5, 45.6±3.6)
T5: 188±26 (19.2±2.7, 139±20)

B: T-TYPE



① Pinion crown gear set
② Pinion height adjusting washer
③ Rear bearing
④ Bearing preload adjusting spacer
⑤ Bearing preload adjusting washer
⑥ Differential carrier
⑦ Front bearing
⑧ Spacer
⑨ Pilot bearing
⑩ Front oil seal
⑪ Companion flange
⑫ Self-locking nut
⑬ Side bearing
⑭ O-ring
⑮ Side bearing retainer shim
⑯ Side bearing retainer
⑰ Side oil seal
⑱ Side gear thrust washer
⑲ Side gear
⑳ Pinion mate gear
㉑ Pinion mate gear washer
㉒ Pinion shaft lock pin
㉓ Pinion mate shaft
㉔ Air breather cap
㉕ Stud bolt
㉖ Oil filler plug
㉗ Oil drain plug
㉘ Rear cover
㉙ Differential case

Tightening torque: N·m (kg-m, ft-lb)
T1: 10.3±1.5
(1.05±0.15, 7.6±1.1)
T2: 29.4±4.9
(3.00±0.50, 21.7±3.6)
T3: 44.1±3.9
(4.50±0.40, 32.5±2.9)
T4: 103.0±9.8
(10.50±1.00, 75.9±7.2)
T5: 181.4±14.7
(18.50±1.50, 133.8±10.8)

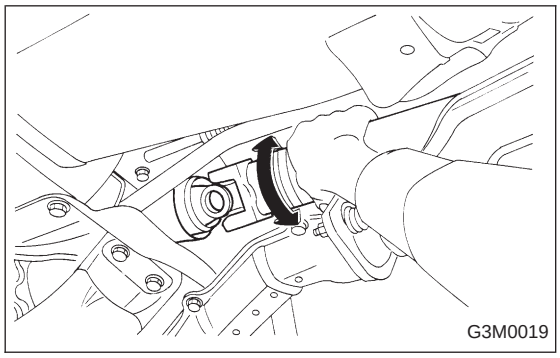
1. Propeller Shaft

A: ON-CAR SERVICE

Check the following points with propeller shaft installed in vehicle.

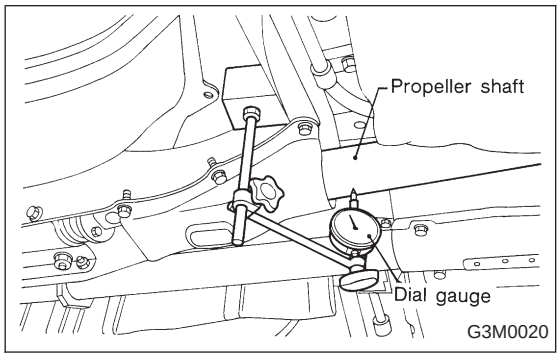
1) Joints and connections

Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.


G3M0019

2) Splines and bearing locations

Turn propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



G3M0020

3) Runout of propeller shaft

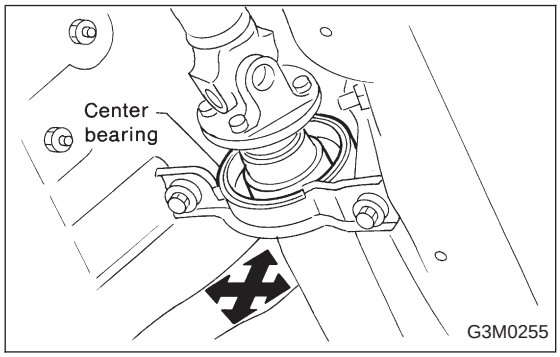
Turn rear wheels by hand to check for “runout” of propeller shaft.

Runout:

Limit 0.6 mm (0.024 in)

NOTE:

Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.



G3M0255

4) Center bearing free play

While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.

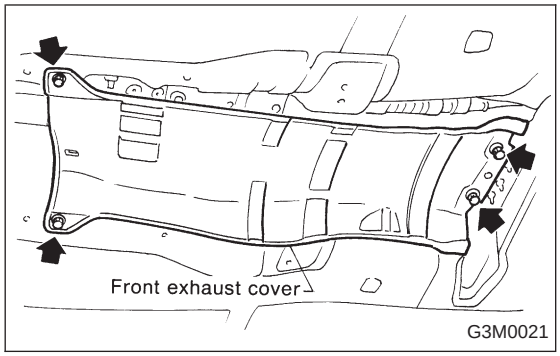
B: REMOVAL

NOTE:

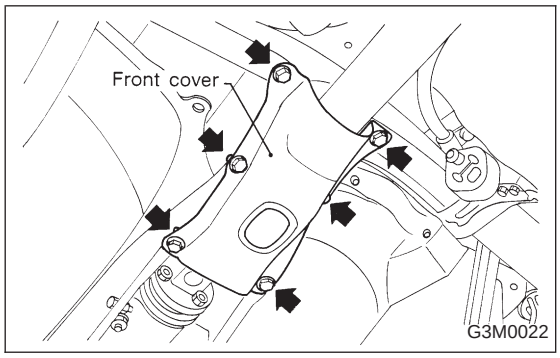
Before removing propeller shaft, wrap metal parts with a cloth or rubber material.

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up vehicle and support it with sturdy racks.
5) Remove rear exhaust pipe and muffler.

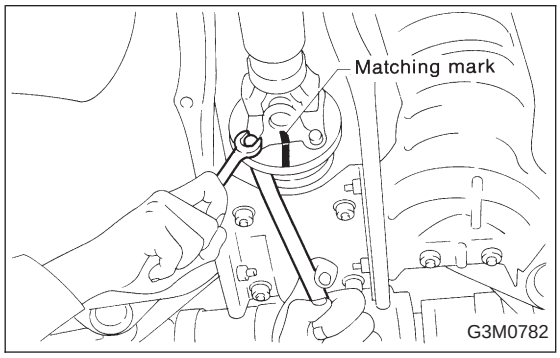
<Ref. to 2-9 [W2A0], [W3A0].>



6) Remove front exhaust cover.

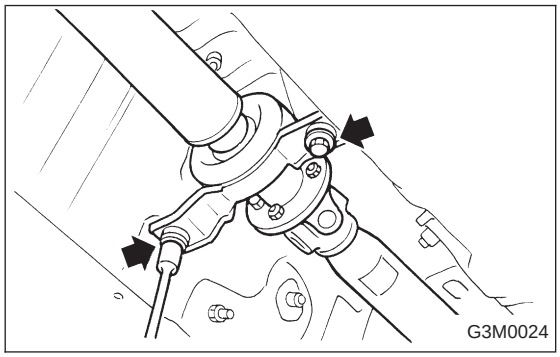


7) Remove differential mount front cover.

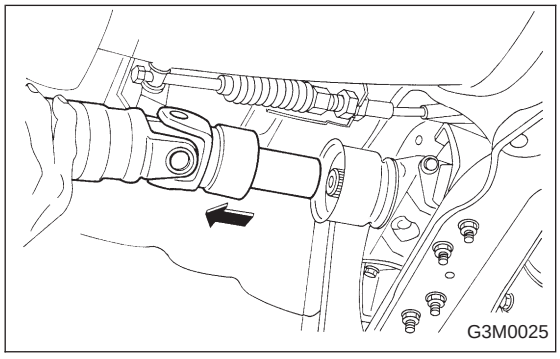


8) Remove the four bolts which hold propeller shaft to rear differential.

NOTE:
- Put matching mark on affected parts before removal.
- Remove all but one bolt.



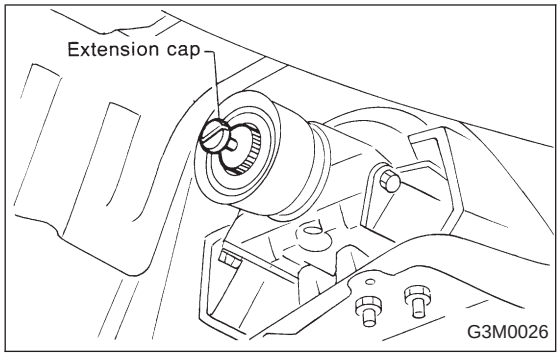
9) Remove the two bolts which hold center bearing to vehicle body.



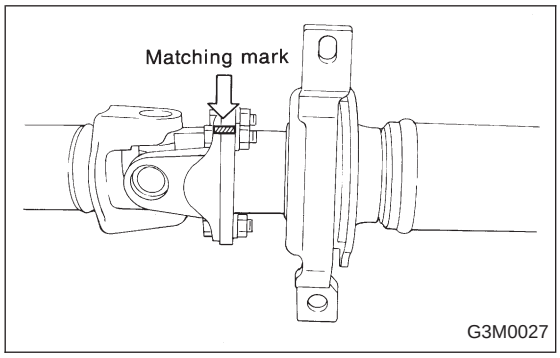
10) Remove propeller shaft from transmission.

CAUTION:
Be sure not to damage oil seals and the frictional surface of sleeve yoke.

NOTE:
- Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
- Be sure to plug the opening in transmission after removal of propeller shaft.



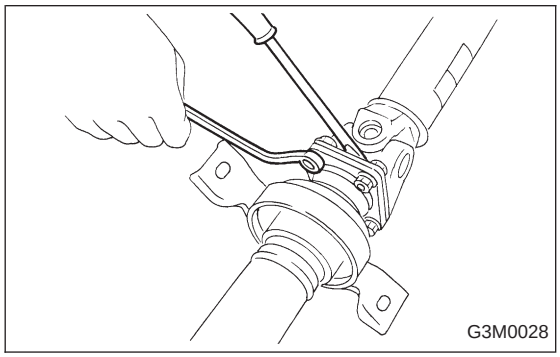
11) Install the extension cap to transmission.



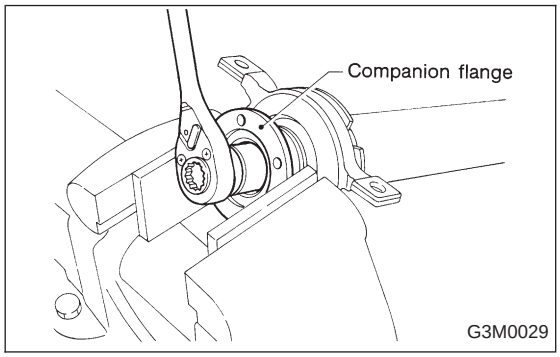
C: DISASSEMBLY

Before removing center bearing, check its condition. If it does not operate smoothly or if there is any free play or leakage, remove as follows:

1) Put matching marks on affected parts.

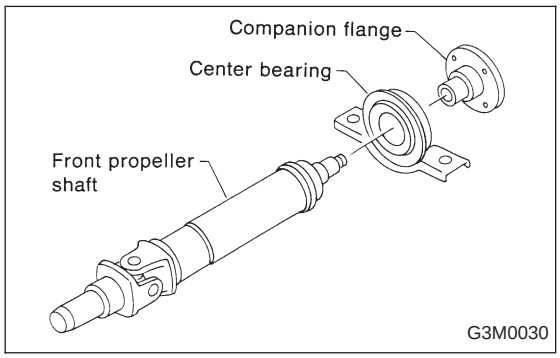


2) Remove bolts which hold front propeller shaft to rear propeller shaft.



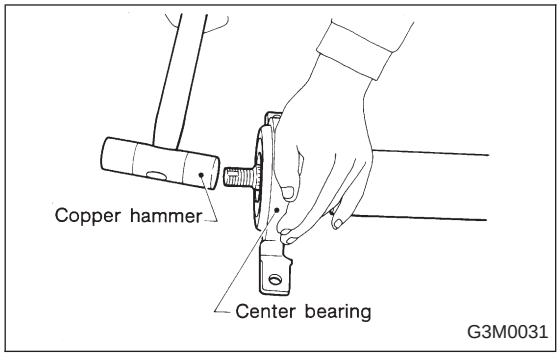
3) Place companion flange in a vise and remove stake nut.

CAUTION:
Be sure not to hold propeller shaft pipe portion in the vise.



4) Drive out companion flange with a puller or press.

NOTE:
Before disassembling, put matching mark on affected parts.



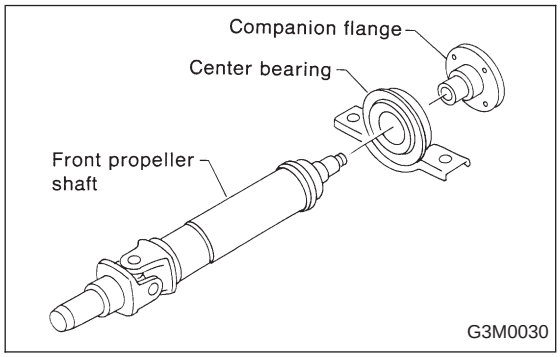
5) Lightly tap the head of front propeller shaft with a copper hammer until center bearing is removed.

CAUTION:
Be careful not to damage the thread portion.

D: INSPECTION

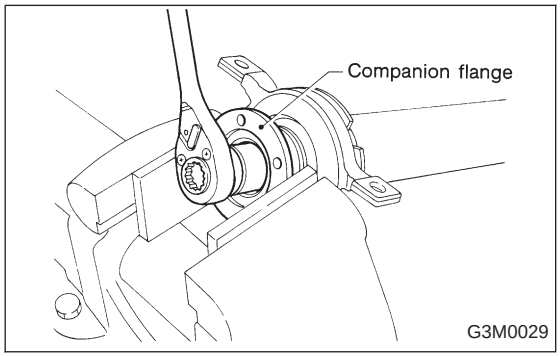
NOTE:
Do not disassemble propeller shaft. Check the following and replace if necessary.

1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage



E: ASSEMBLY

1) Install center bearing onto front propeller shaft.
2) Align marks and install companion flange.

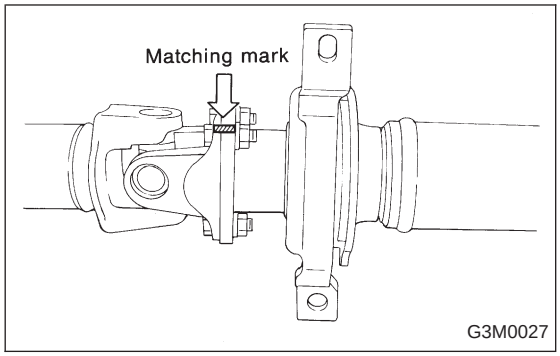


3) Tighten stake nut until center bearing is set in position.

CAUTION:
Be sure to install new stake nut.

Tightening torque:
270±25 N·m (27.5±2.5 kg-m, 199±18 ft-lb)

NOTE:
Stake the nut after tightening.



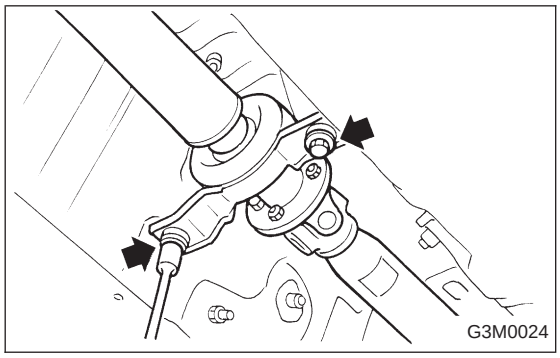
4) Align matching marks and connect front and rear propeller shafts.

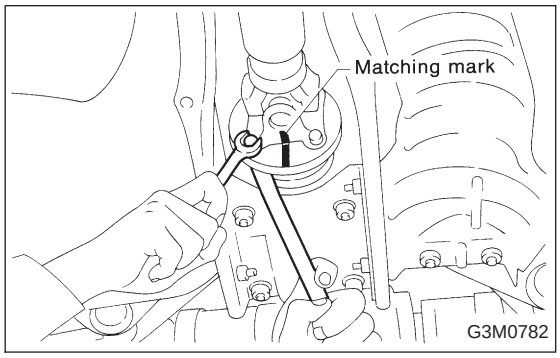
Tightening torque:
27.9±4.4 N·m (2.85±0.45 kg-m, 20.6±3.3 ft-lb)

F: INSTALLATION

1) Insert sleeve yoke into transmission and attach center bearing to vehicle body.

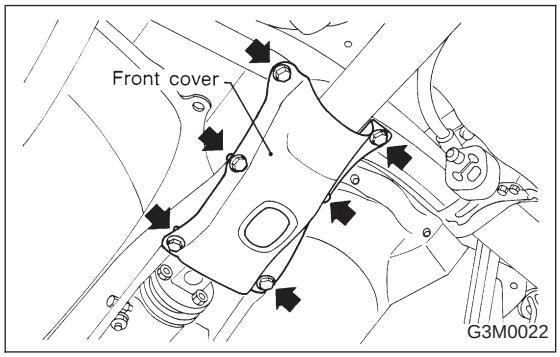
Tightening torque:
52±5 N·m (5.3±0.5 kg-m, 38.3±3.6 ft-lb)





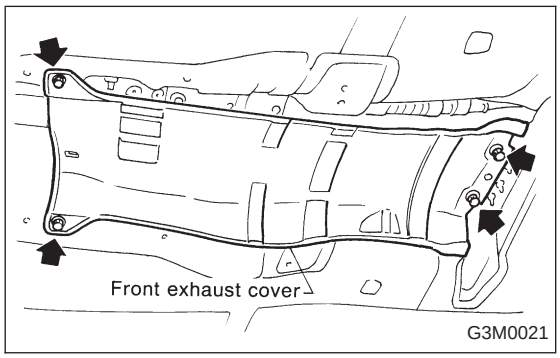
2) Align matching marks and connect flange yoke and rear differential.

Tightening torque:
31±8 N·m (3.2±0.8 kg-m, 23.1±5.8 ft-lb)



3) Install differential mount front cover.

Tightening torque:
88±10 N·m (9.0±1.0 kg-m, 65±7 ft-lb)



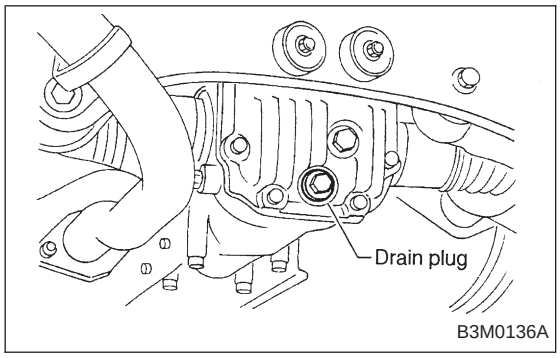
4) Install front exhaust cover.
5) Install rear exhaust pipe and muffler.

2. Rear Differential (VA-Type)

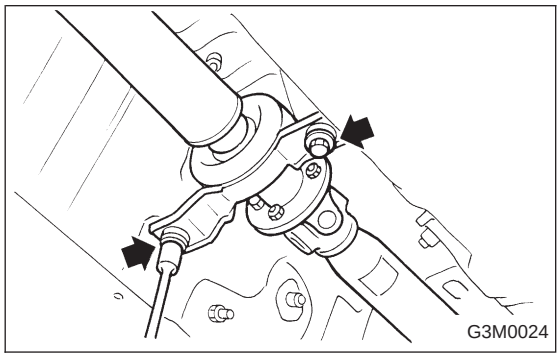
A: ON-CAR SERVICE

1. FRONT OIL SEAL

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.

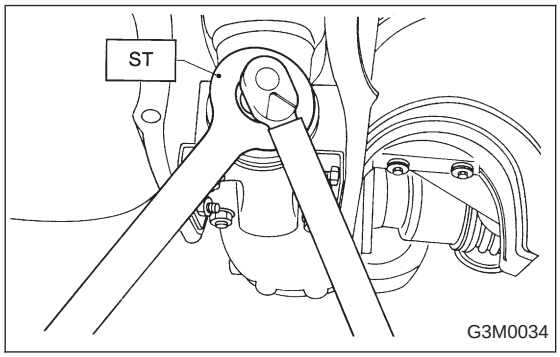


4) Remove oil drain plug, and drain gear oil.

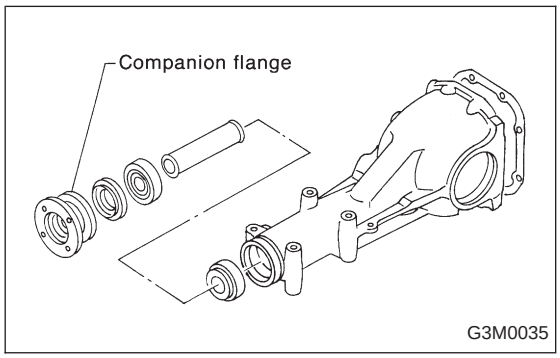


5) Jack-up rear wheels and support the vehicle body with sturdy racks.
6) Remove propeller shaft from body. <Ref. to 3-4 [W1B0].>

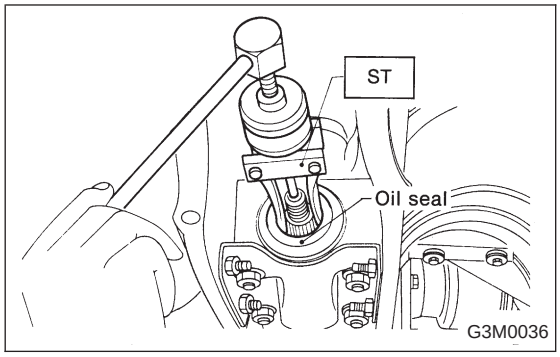
CAUTION:
Wrap metal parts with a cloth or rubber material to prevent damage from adjacent metal parts.



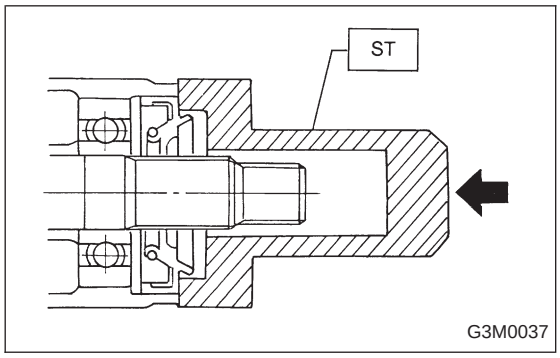
7) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



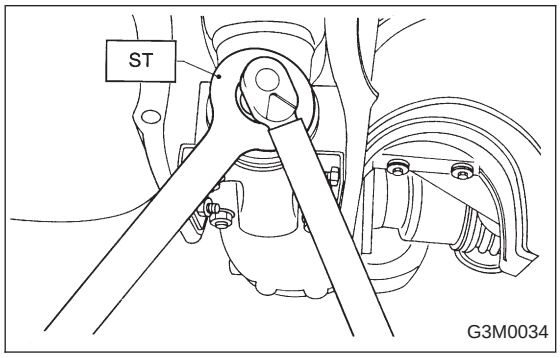
8) Extract companion flange with a puller.



9) Remove oil seal using ST.
ST 398527700 PULLER ASSY



10) Fit a new oil seal using ST.
ST 498447120 OIL SEAL INSTALLER



11) Install companion flange.
12) Tighten self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.
ST 498427200 FLANGE WRENCH

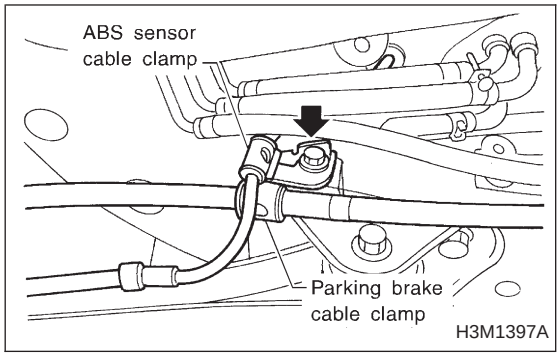
CAUTION:
Use a new self-locking nut.

Tightening torque:
188±26 N·m (19.2±2.7 kg-m, 139±20 ft-lb)

13) Reassembling procedure hereafter is the reverse of the disassembling.

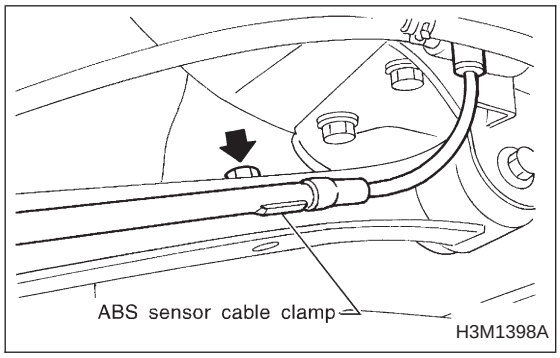
2. SIDE OIL SEAL

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>

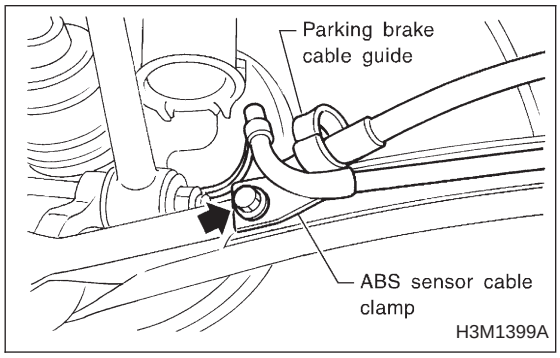


8) Remove the DOJ of rear drive shaft from rear differential.

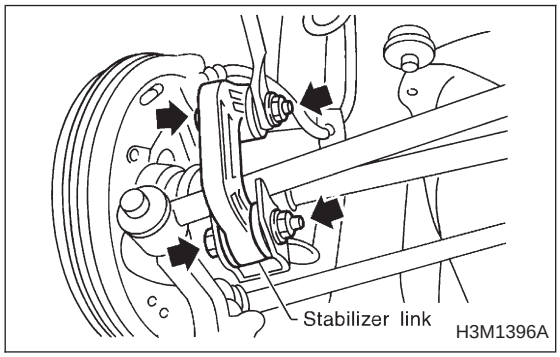
(1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.



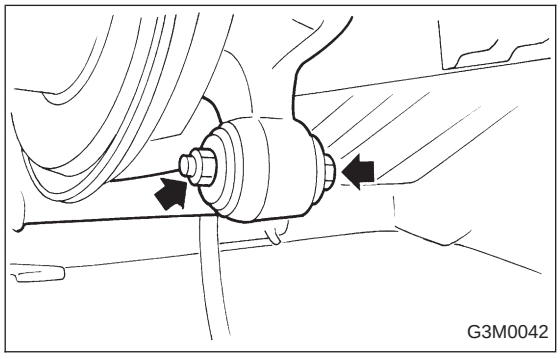
(2) Remove the ABS sensor cable clamp from the trailing link.



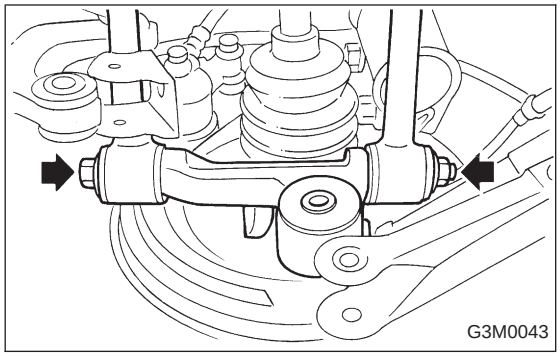
(3) Remove the ABS sensor cable clamp and parking brake cable guide from the trailing link.



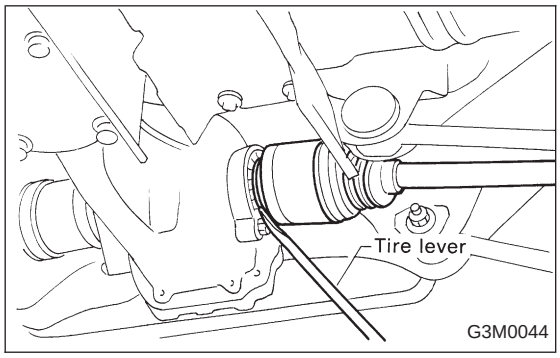
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to the rear housing.

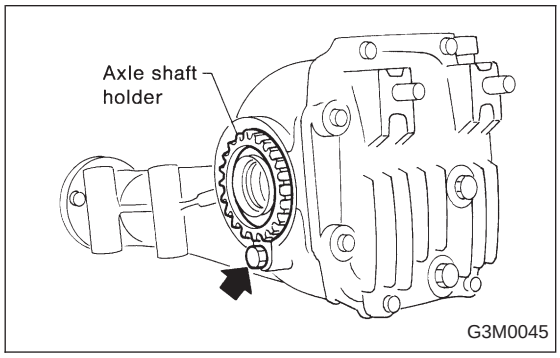


(6) Remove the bolts which secure the front and rear lateral link to the rear housing.

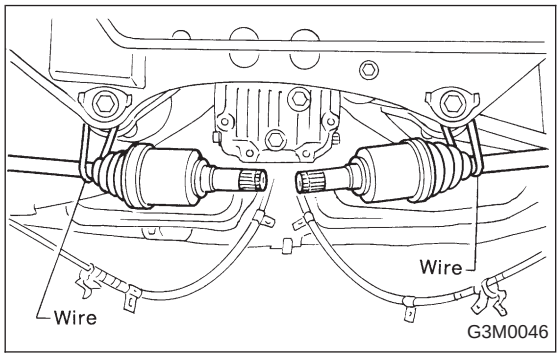


(7) Remove the DOJ from the rear differential with tire lever.

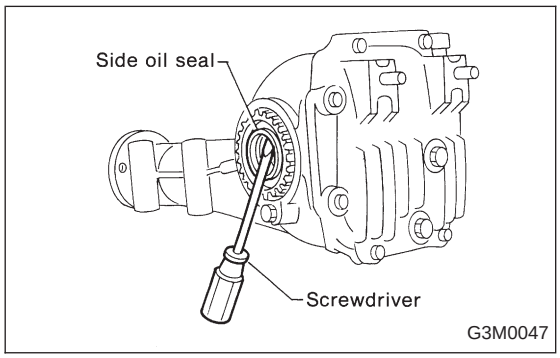
NOTE:
The side spline shaft circlip comes out together with the shaft.



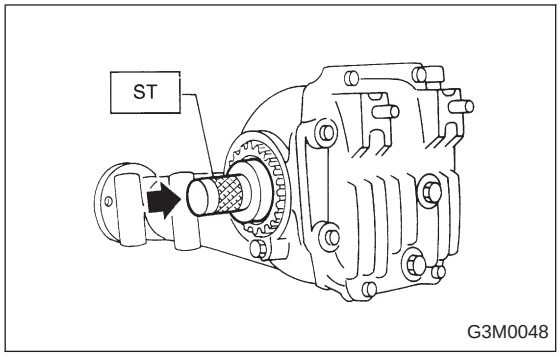
CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.



9) Secure rear drive shaft to rear crossmember using wire.



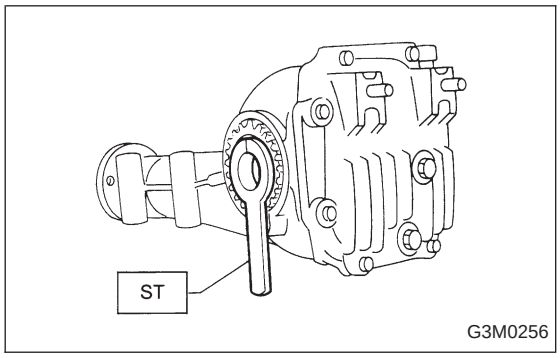
10) Remove oil seal with screwdriver.



11) Drive in a new side oil seal with ST.

CAUTION:
Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER

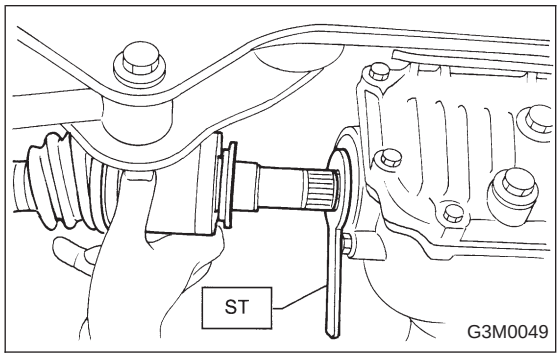


12) Insert the DOJ into rear differential.

CAUTION:
Before inserting, replace the circlip at the end of the spline shaft with a new one.

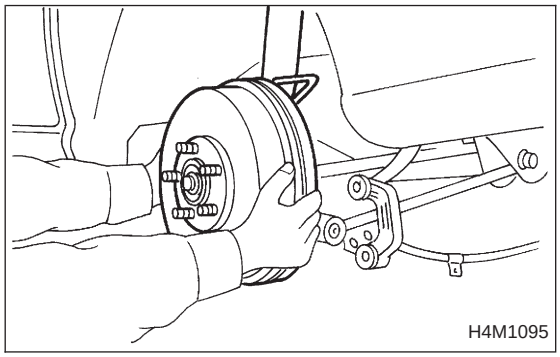
(1) Install ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Insert the spline shaft until the spline portion is inside the side oil seal.
(3) Remove ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



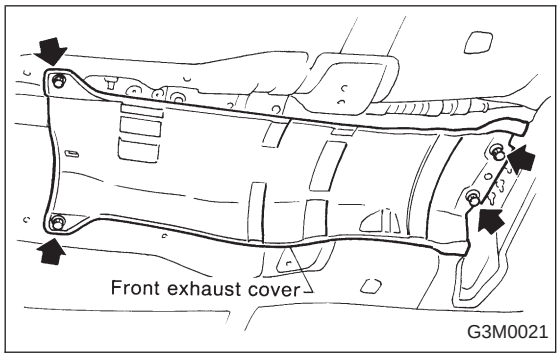
(4) Completely insert DOJ into rear differential by pressing rear housing.

NOTE:
Make sure that oil seal lip is not folded over inward.

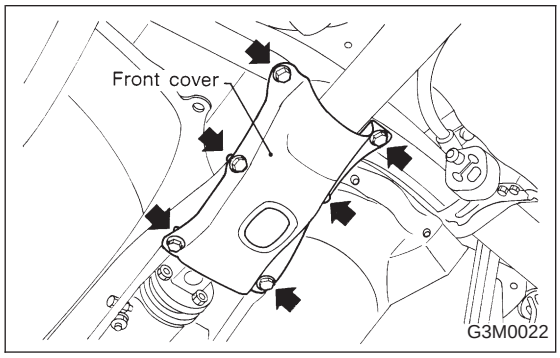
13) Hereafter, re-assemble in reverse order of disassembly.

B: REMOVAL

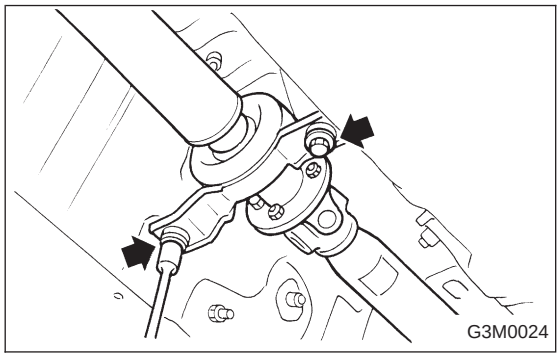
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>



8) Remove front exhaust cover.



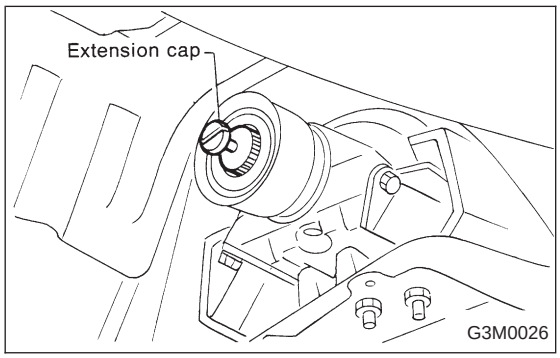
9) Remove front cover of rear differential mount.



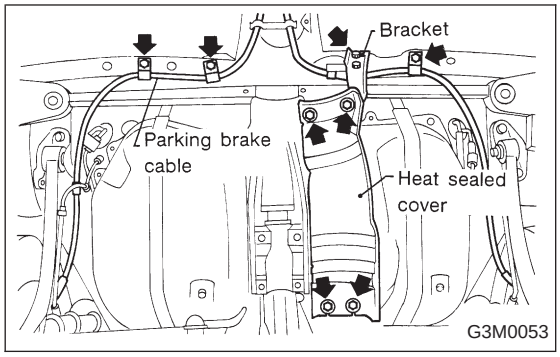
10) Remove propeller shaft.

CAUTION:
When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

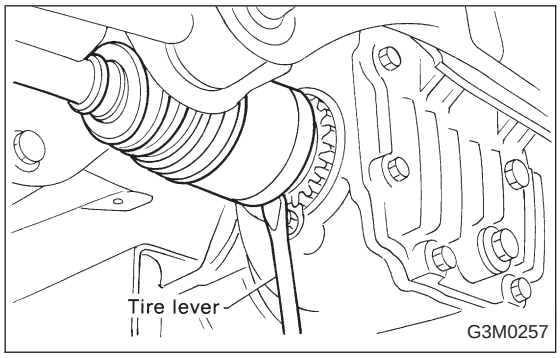
NOTE:
Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.



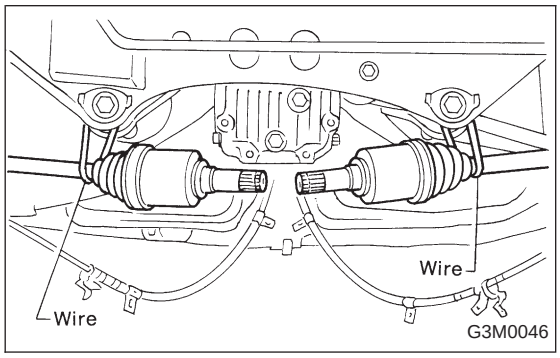
NOTE:
Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.



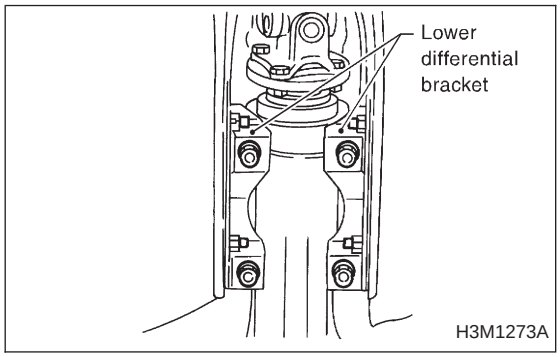
11) Remove heat sealed cover.
12) Remove clamps and bracket of parking brake cable.



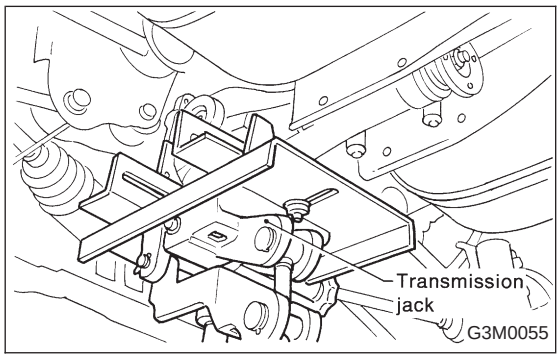
13) Remove DOJ of rear drive shaft from rear differential. <Ref. to 3-4 [W2A2].>



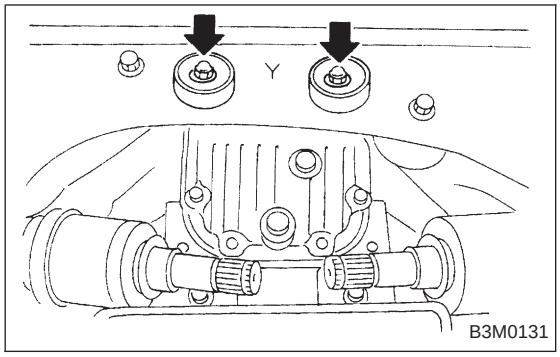
14) Secure rear drive shaft to rear crossmember using wire.



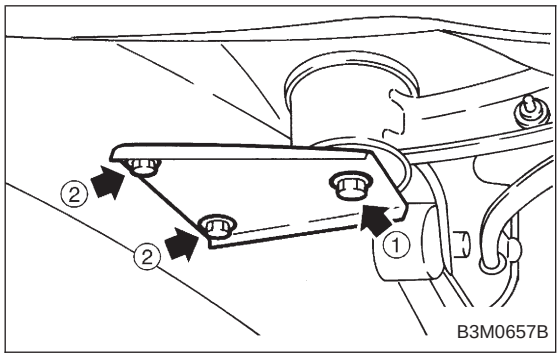
15) Remove lower differential bracket.



16) Support rear differential with transmission jack.

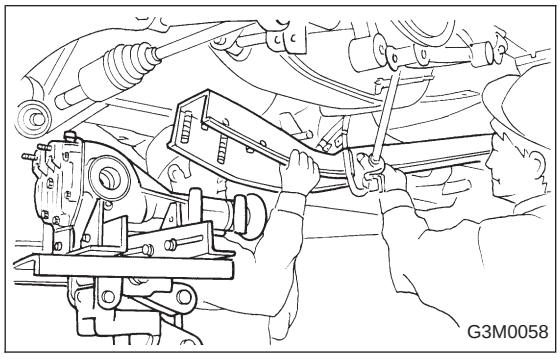


17) Remove self-locking nuts connecting rear differential to rear crossmember.

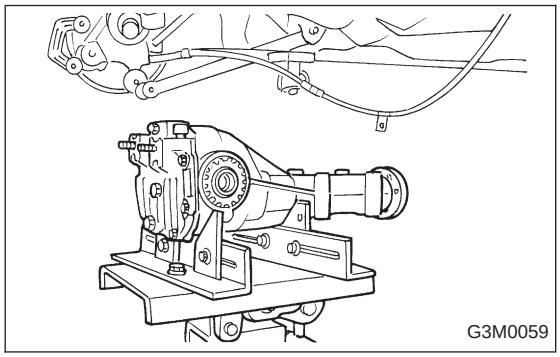


18) Remove bolts which secure rear differential front member to body.
Loosen bolt ① first, then removal bolts ② .

NOTE:
Support front member with the use of a helper to prevent it from dropping.



19) While slowly lowering transmission jack, move rear differential forward and remove bolts from rear crossmember.
20) Remove front member from body.

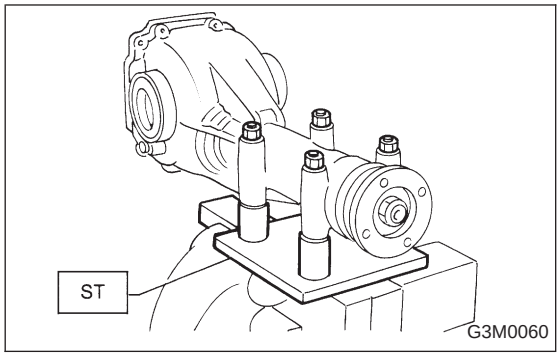


21) Remove rear differential from body.

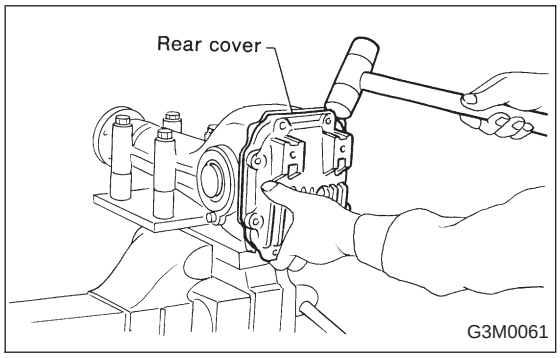
C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling. <Ref. to 3-4 [W2E0].>

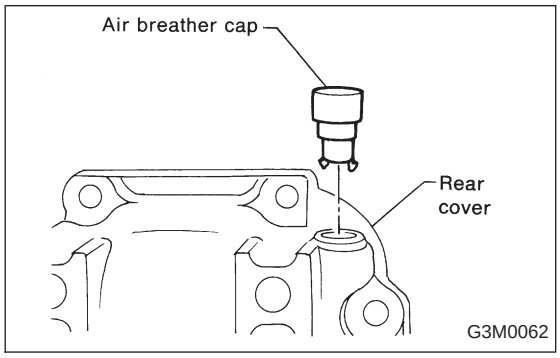
- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion



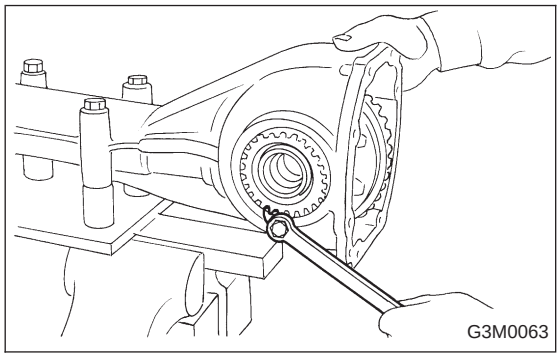
1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT
2) Drain gear oil by removing plug.



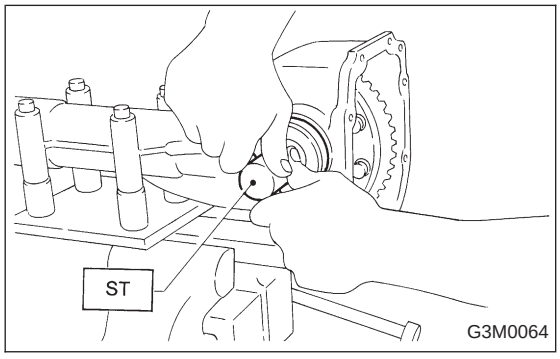
3) Remove rear cover by loosening retaining bolts.



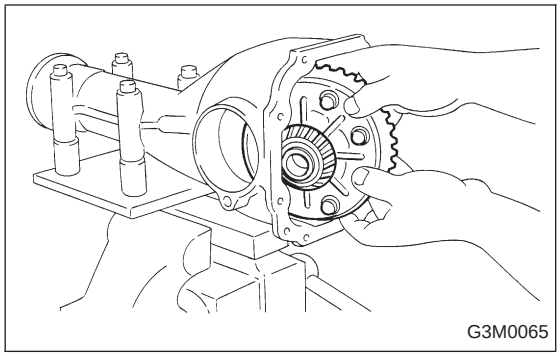
4) Replace air breather cap.
NOTE:
Do not attempt to replace the air breather cap unless necessary.



5) Remove right and left lock plates.

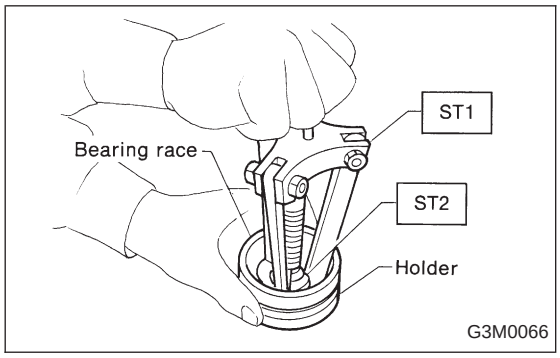


6) Remove right and left holders with ST.
ST 399780111 WRENCH


G3M0065

7) Pull out differential assembly from differential carrier.

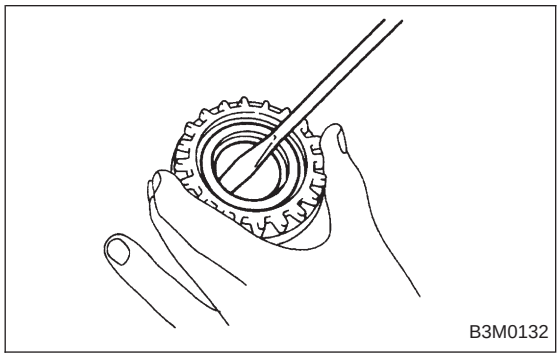
CAUTION:
Be careful not to hit the teeth against the case.



G3M0066

8) Remove bearing race from right and left holders with ST1 and ST2.

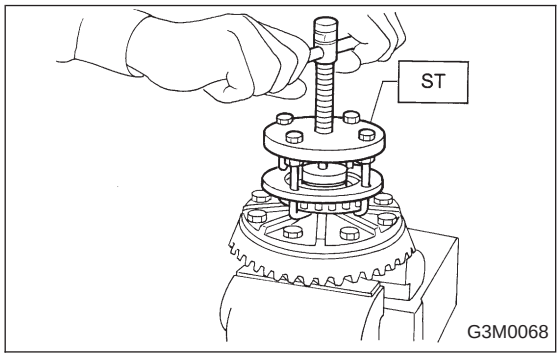
ST1 499705401 BEARING OUTER RACE PULLER ASSY
ST2 499705404 OUTER RACE PULLER SEAT


B3M0132

9) Remove oil seal from right and left holders with screwdriver.

CAUTION:
Perform this operation only when changing oil seal.

ST 899580100 INSTALLER



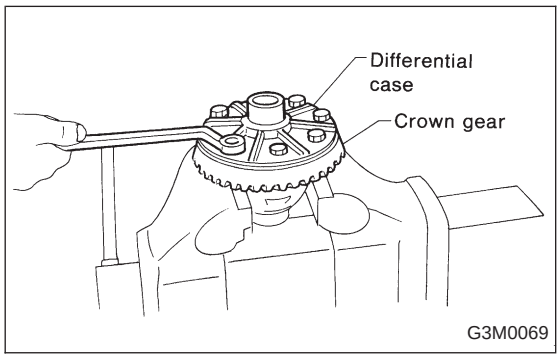
G3M0068

10) Extract bearing cone with ST.

CAUTION:
Do not attempt to disassemble the parts unless necessary.

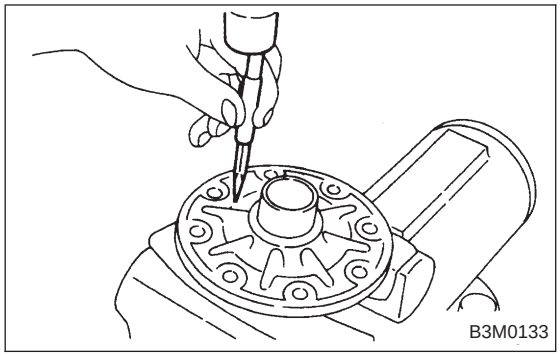
NOTE:
● Set Puller so that its claws catch the edge of the bearing cone.
● Never mix up the right and left hand bearing cups and cones.

ST 899524100 PULLER SET



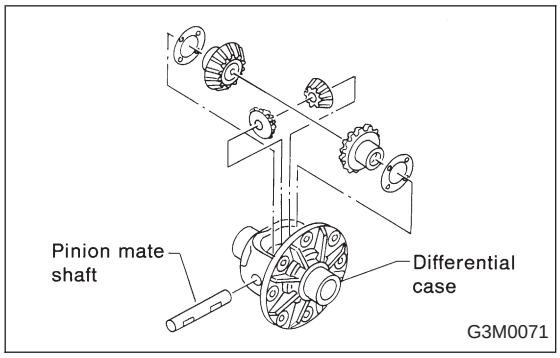
G3M0069

11) Remove crown gear by loosening crown gear bolts.


B3M0133

12) Drive out pinion shaft lock pin from crown gear side.

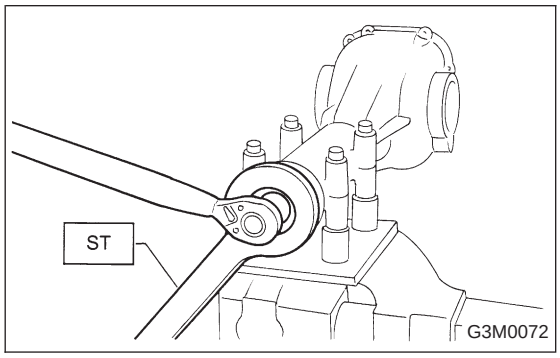
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.
ST 899904100 STRAIGHT PIN REMOVER



G3M0071

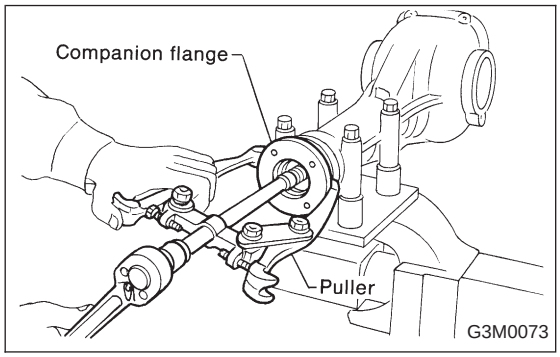
13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



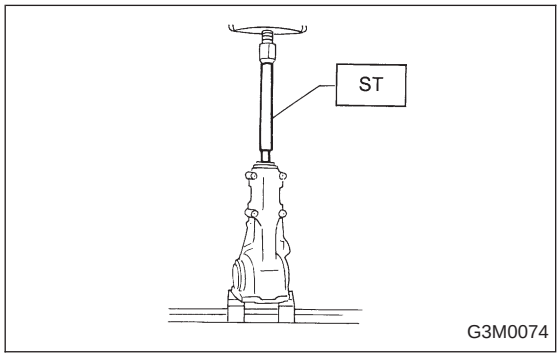
G3M0072

14) Hold companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH



G3M0073

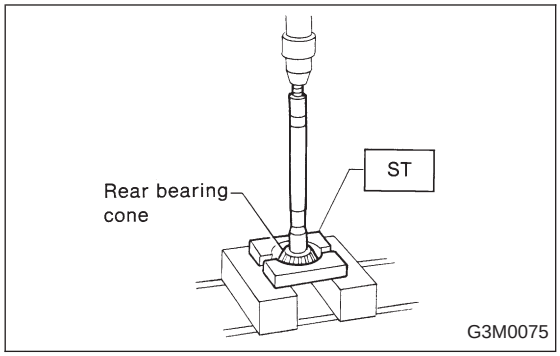
15) Extract the companion flange with a puller.



G3M0074

16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

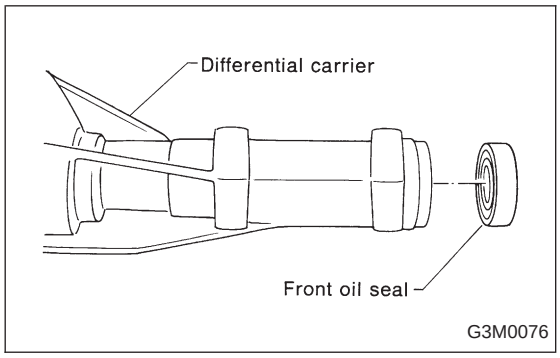
NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT



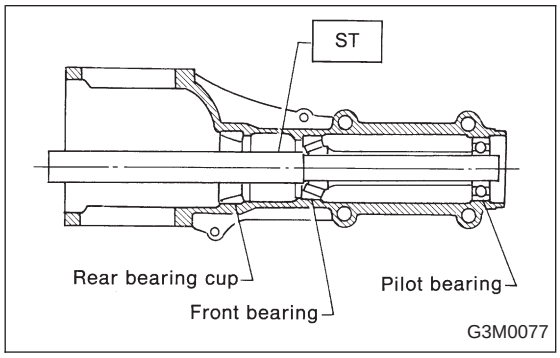
17) Remove rear bearing cone from drive pinion by supporting cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER

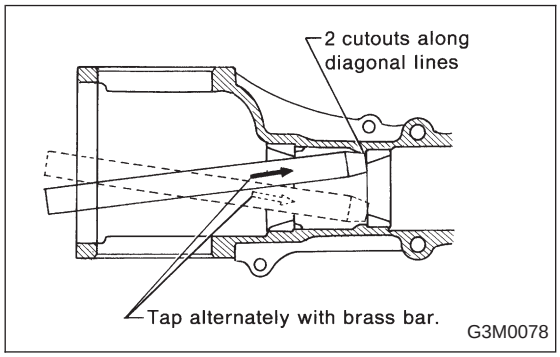


18) Remove front oil seal from differential carrier.



19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

D: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

(1) If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

(2) If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

(1) Replace if crack, score, or other defects are evident on tooth surface.

(2) Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

E: ASSEMBLY

1) Precautions for assembling

(1) Assemble in the reverse order of disassembling.

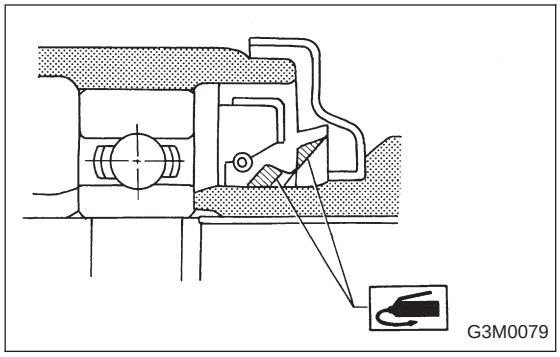
(2) Check and adjust each part during assembly.

(3) Keep the shims and washers in order, so that they are not misinstalled.

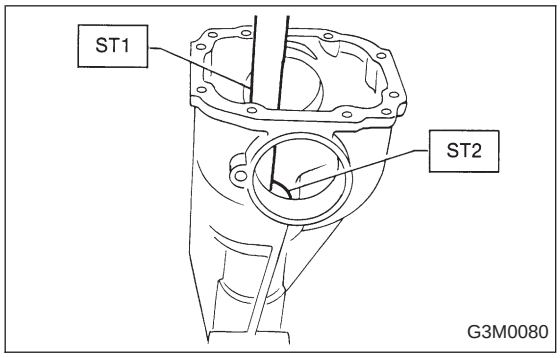
(4) Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.

(5) Apply gear oil when installing the bearings and thrust washers.

(6) Be careful not to mix up the right and left hand cups of the bearings.



(7) Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



2) Adjust preload for front and rear bearings.
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race into differential carrier with ST1 and ST2.

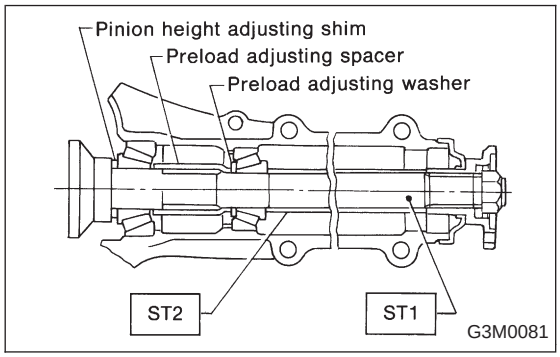
ST1 398477701 HANDLE
ST2 398477702 DRIFT

(2) Press front bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Insert front bearing cone.

CAUTION:
Use a new front bearing cone.

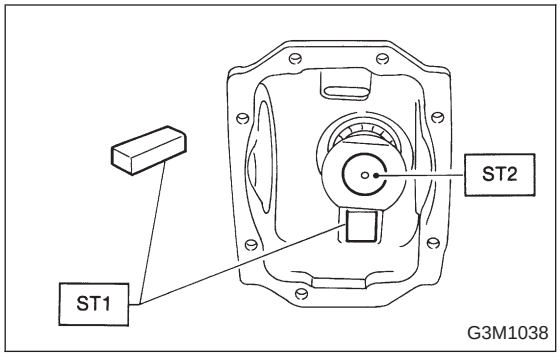


(4) Insert ST1 into case with pinion height adjusting shim and rear bearing cone fitted onto it.

CAUTION:
- **Re-use the used washer if not deformed.**
- **Use a new rear bearing cone.**

(5) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR

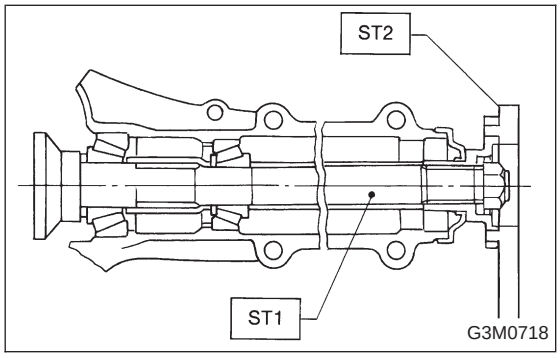


(6) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque with ST2.

ST1 398507704 BLOCK
ST2 498447150 DUMMY SHAFT

CAUTION:
Use a new lock nut.

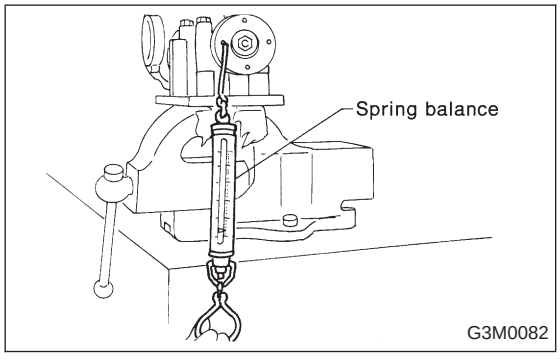
NOTE:
● Be careful not to give excessive preload.



● When tightening the drive pinion nut, lock ST1 with ST2 as illustrated here.

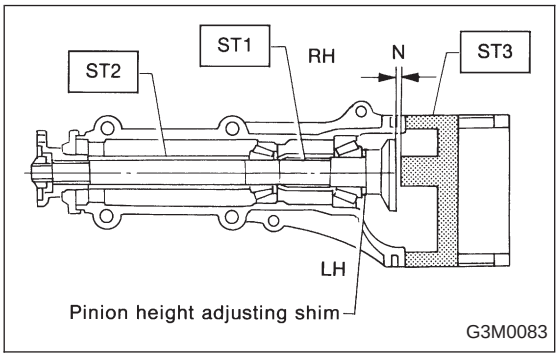
ST1 498447150 DUMMY SHAFT
ST2 398427700 FLANGE WRENCH

Tightening torque:
188±26 N·m (19.2±2.7 kg-m, 139±20 ft-lb)



Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kg, 2.9 — 7.3 lb) at companion flange bolt hole

	Part No.	Length mm (in)
● Preload adjusting washer length	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
● Preload adjusting spacer length	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)



3) Adjusting drive pinion height
Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

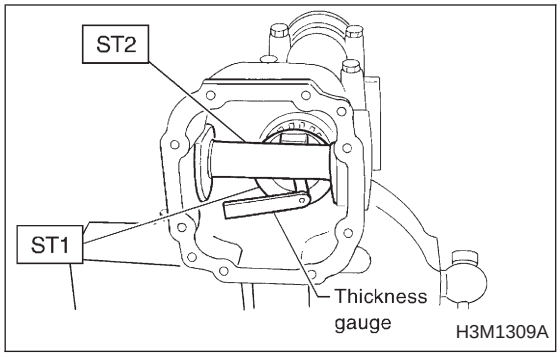
(1) Install ST1, ST2 and ST3, as shown in the figure, and apply the specified preload on the bearings.

Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kg, 2.9 — 7.3 lb) at companion flange bolt hole

Adjust preload for front and rear bearings.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR
ST3 498505501 DIFFERENTIAL CARRIER GAUGE

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before.



(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

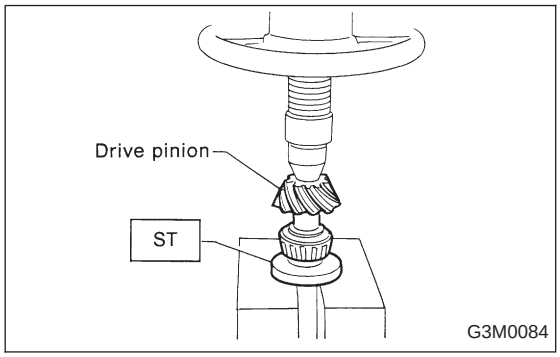
NOTE:
Make sure there is no clearance between the case and ST3.
ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE

(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

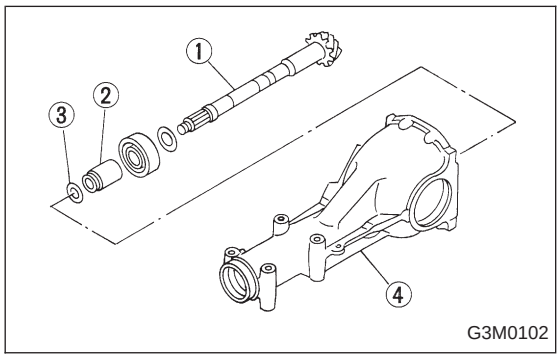
NOTE:
Use 1 to 3 shims as required for adjustment.

T = To + N − 0.35 (mm)
where
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
(Example of calculation)
To = 0.15 mm
N = 0.4 mm
T = 0.15 + 0.4 − 0.35 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the 32295AA220.

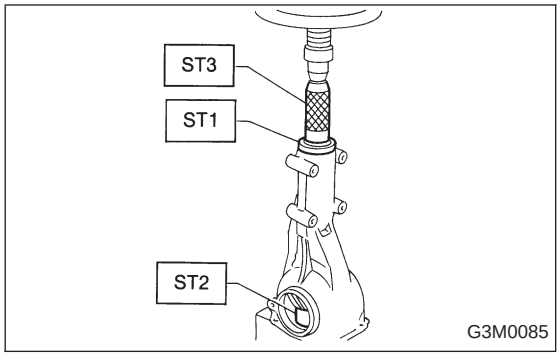
	Part No.	Length mm (in)
● Pinion height adjusting shim thickness	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)



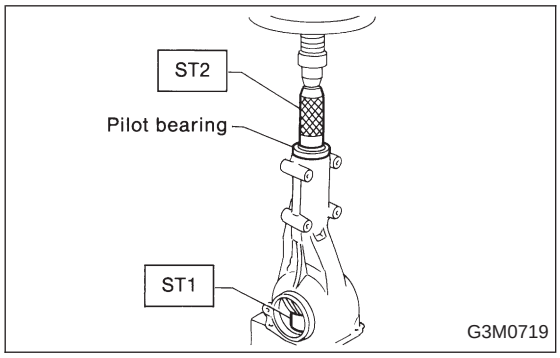
4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 498175500 INSTALLER



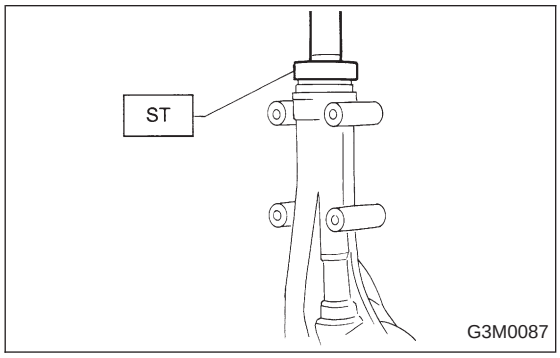
5) Insert drive pinion ① into differential carrier ④, install the previously selected bearing preload adjusting spacer ② and washer ③.



6) Press-fit front bearing cone into case with ST1, ST2 and ST3.
ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



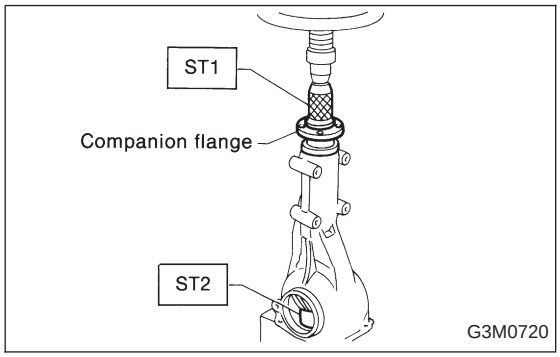
7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



8) Fit a new oil seal with ST.

NOTE:
- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

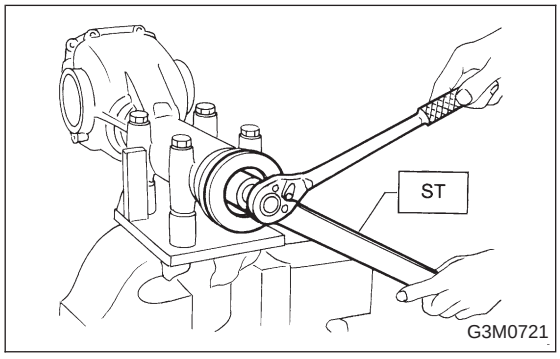
ST 498447120 OIL SEAL INSTALLER



9) Press-fit companion flange with ST1 and ST2.

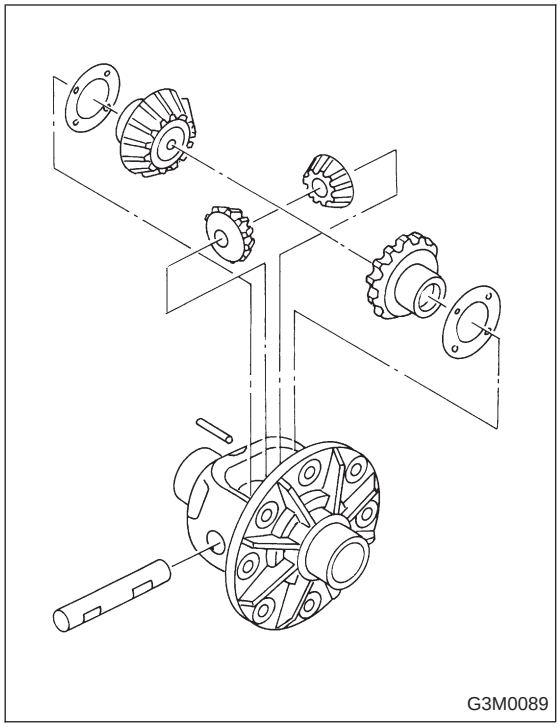
CAUTION:
Be careful not to damage bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



10) Install self-locking nut. Then tighten self-locking nut with ST.
ST 398427700 FLANGE WRENCH

Tightening torque:
188±26 N·m (19.2±2.7 kg-m, 139±20 ft-lb)


G3M0089

11) Assembling differential case
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

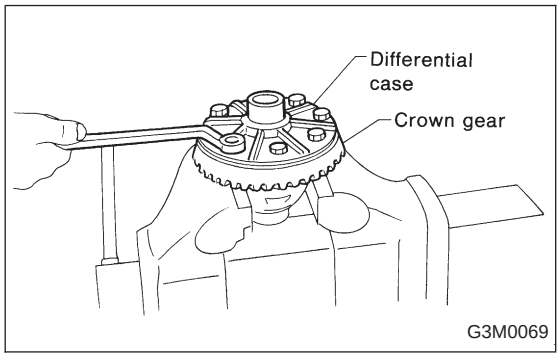
NOTE:
● Apply gear oil on both sides of the washer and on the side gear shaft before installing.
● Insert the pinion mate shaft into the differential case by aligning the lock pin holes.

(1) Measure the clearance between differential case and the back of side gear.
(2) Adjust the clearance as specified by selecting side gear thrust washer.

Side gear backlash:
0.05 — 0.15 mm (0.0020 — 0.0059 in)

	Part No.	Thickness mm (in)
● Side gear thrust washer thickness	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.

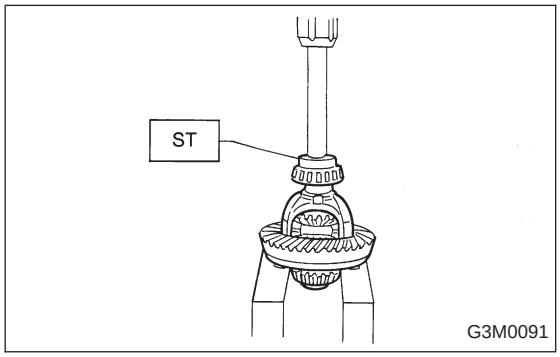


G3M0069

(5) Install crown gear on differential case.

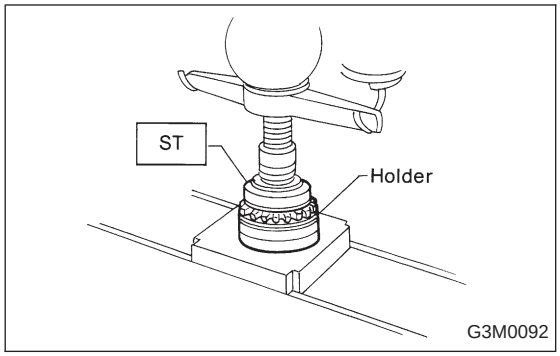
Tightening torque:
62±5 N·m (6.3±0.5 kg-m, 45.6±3.6 ft-lb)

NOTE:
Tighten diagonally while tapping the bolt heads.

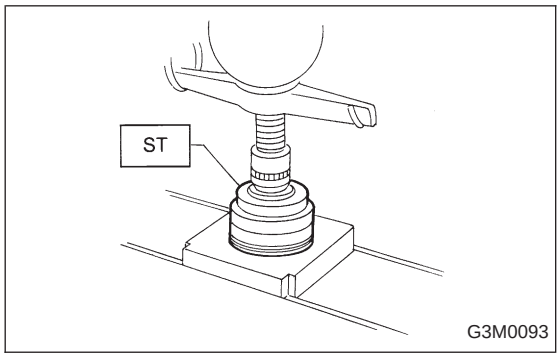


G3M0091

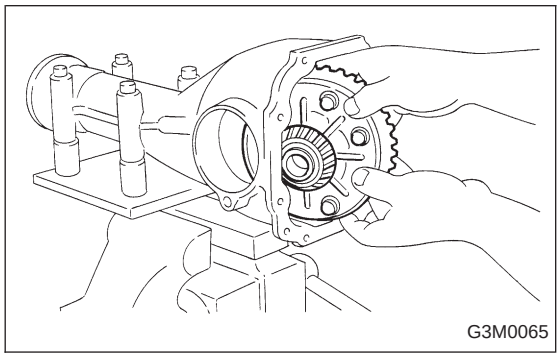
12) Press side bearing cone onto differential case with ST.
ST 498485400 DRIFT



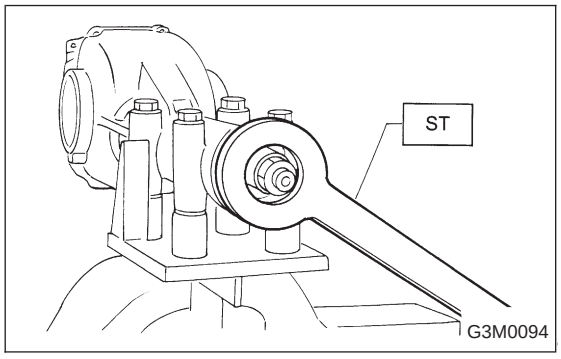
13) Assemble holders.
(1) Install oil seal into right and left holders.
ST 498447100 AXLE SHAFT OIL SEAL INSTALLER



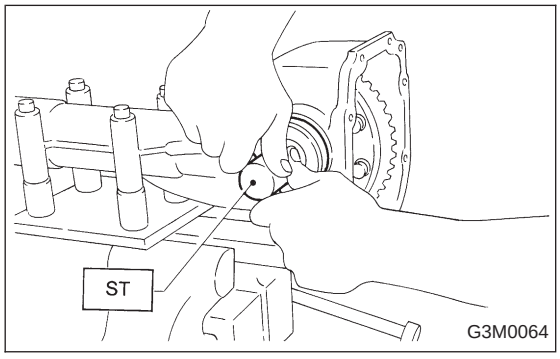
(2) Install bearing race into right and left holders.
ST 398477702 BEARING OUTER RACE DRIFT



(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.

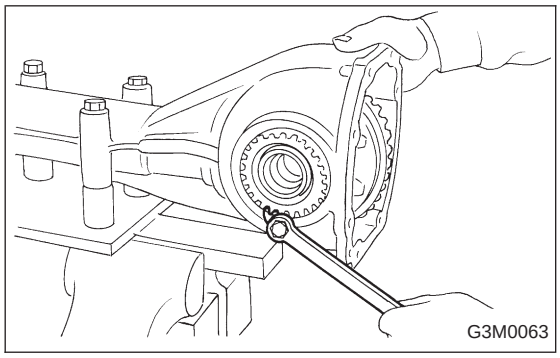


14) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.
(1) Turn drive pinion with ST for better fitting of differential side bearing.
ST 498427200 FLANGE WRENCH



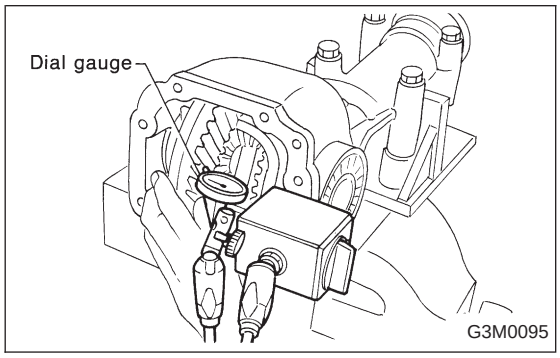
(2) Screw in side (left-side) holder until light contact is made with ST.
(3) Screw in left-side holder until light contact is made with ST.
ST 399780111 WRENCH

(4) Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).
[Back off amount of side (left-side) holder + 1/2 tooth].
This + 1/2 tooth gives preload.


G3M0063

(5) Temporarily tighten lock plate.

NOTE:
Turn over lock plate to displace holder 1/2 tooth.



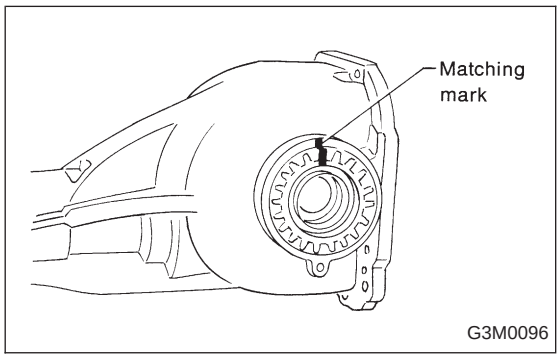
G3M0095

(6) Measure the crown gear-to-drive pinion backlash.

Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

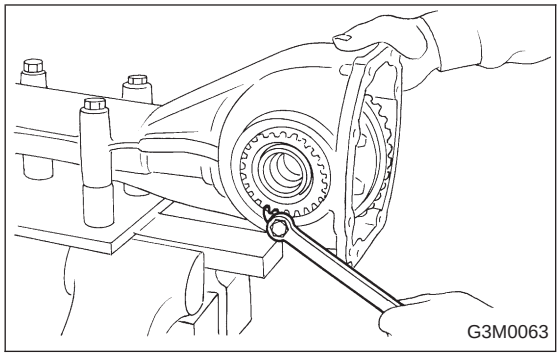
Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

NOTE:
If measured backlash is not within specified range, repeat procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.



G3M0096

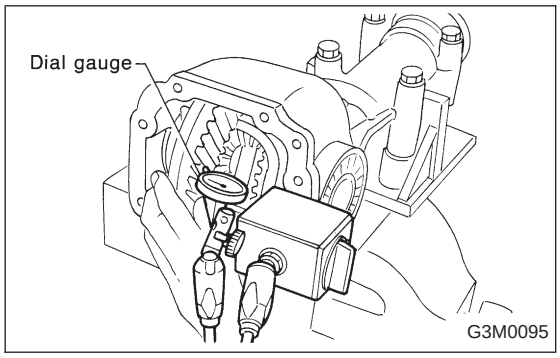
15) Draw a matching mark on both differential carrier and holder. Remove holder one side at a time.
Replace in the original position after inserting an O-ring and applying grease to threaded portion.


G3M0063

16) Tighten bolt of lock plate to specified torque.

Tightening torque:

25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

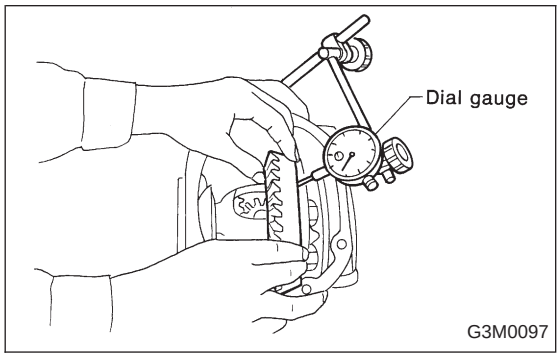


G3M0095

17) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



G3M0097

18) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)

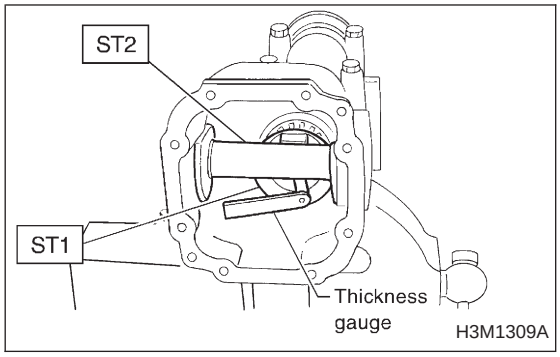
19) Checking and adjusting tooth contact of crown gear.

(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in “Tooth contact pattern”.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

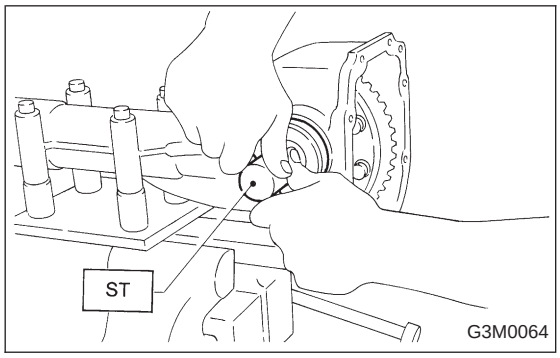
20) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (mentioned above) and the hypoid gear backlash.



(1) Drive pinion height

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE

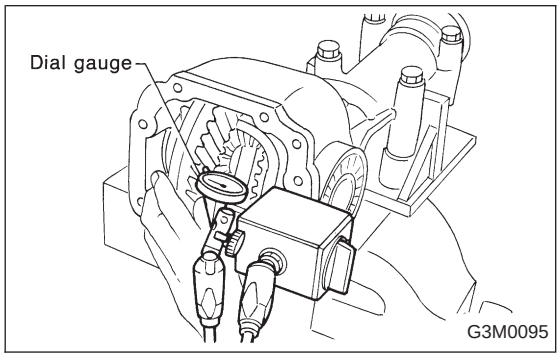
T = To + N − 0.35 (mm)
where
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)



(2) Differential side bearing preload

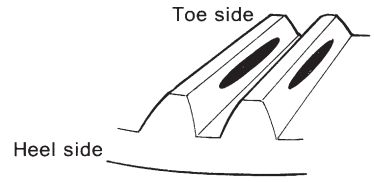
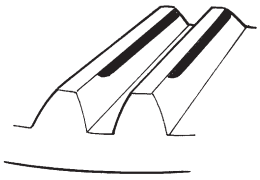
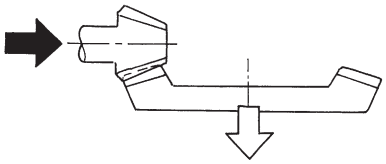
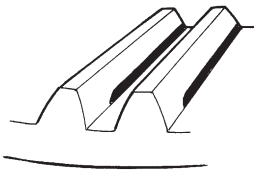
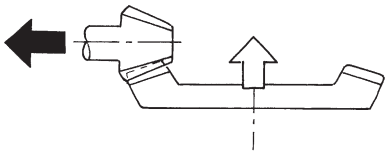
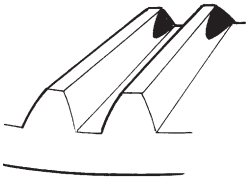
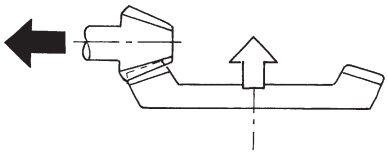
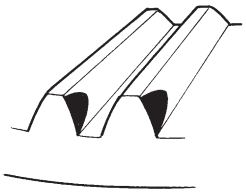
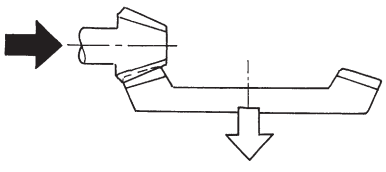
Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).
[Back off amount of side (left-side) holder + 1/2 tooth].
This + 1/2 tooth gives preload.

ST 399780111 WRENCH

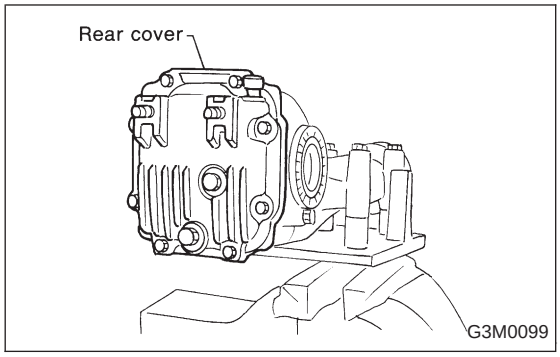


(3) Hypoid gear backlash

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)	 G3M0098A	—
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  G3M0098B	Increase thickness of drive pinion height adjusting washer in order to bring drive pinion closer to crown gear center.  G3M0098F
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  G3M0098C	Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from crown gear.  G3M0098G
Toe contact	Contact area is small. This may cause chipping at toe ends.  G3M0098D	Adjust as for flank contact.  G3M0098G
Heel contact	Contact area is small. This may cause chipping at heel ends.  G3M0098E	Adjust as for face contact  G3M0098F

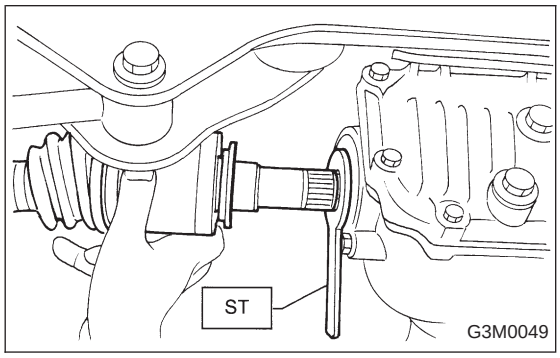
➡ : Adjusting direction of drive pinion
⇨ : Adjusting direction of crown gear



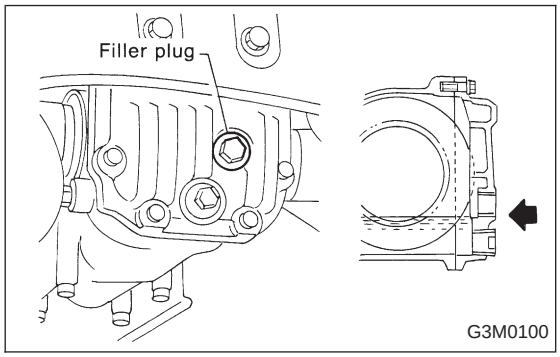
21) Install rear cover and tighten bolts to specified torque.
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

F: INSTALLATION

To install, reverse the removal sequence.
1) Position front member on body by passing it under parking brake cable and securing to rear differential.
NOTE:
When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.



2) Install DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W2A2].>
ST 28099PA090 SIDE OIL SEAL PROTECTOR



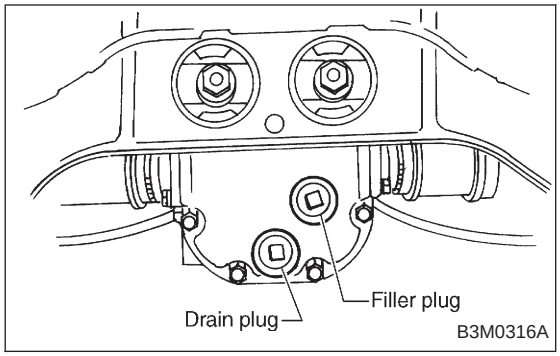
3) Installing procedure hereafter is in the reverse order of removal.
4) After installation, fill differential carrier with gear oil to the upper plug level.
CAUTION:
Use a new aluminum gasket when installing the plug.
Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

3. Rear Differential (T-Type)

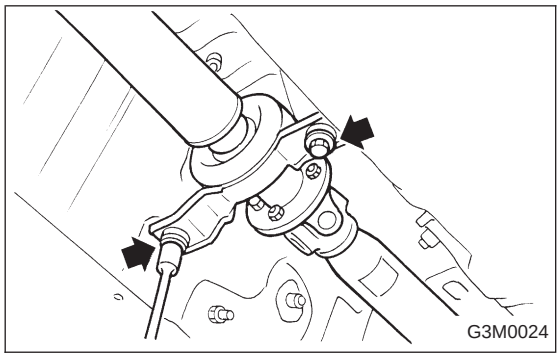
A: ON-CAR SERVICE

1. FRONT OIL SEAL

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.

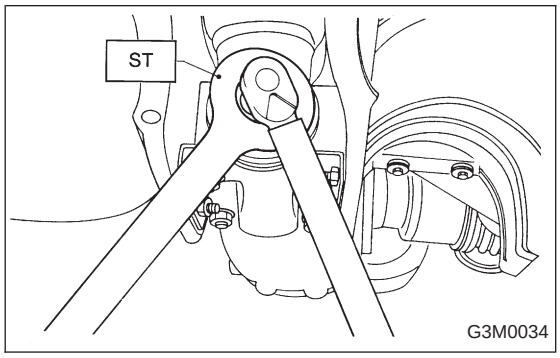


4) Remove oil drain plug, and drain gear oil.

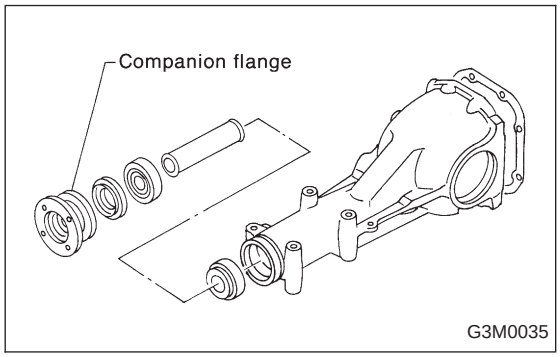


5) Jack-up rear wheels and support the vehicle body with sturdy racks.
6) Remove propeller shaft from body. <Ref. to 3-4 [W1B0].>

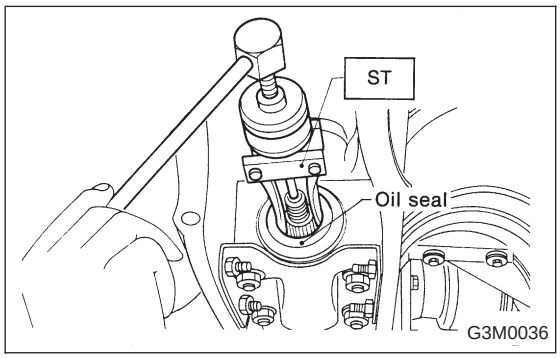
CAUTION:
Wrap metal parts with a cloth or rubber material to prevent damage from adjacent metal parts.



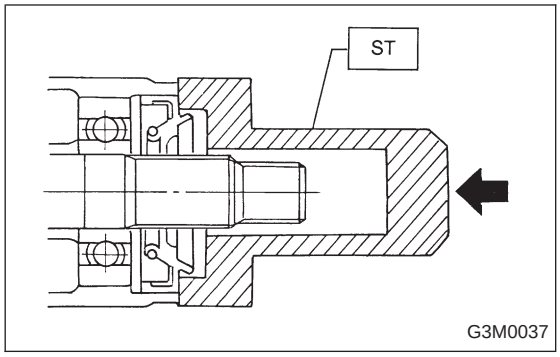
7) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



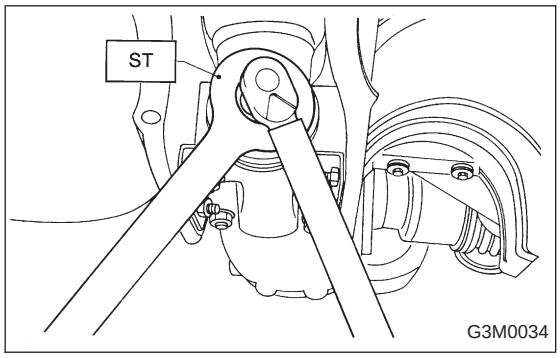
8) Extract companion flange with a puller.



9) Remove oil seal using ST.
ST 499705401 PULLER ASSY



10) Fit a new oil seal using ST.
ST 498447120 OIL SEAL INSTALLER



11) Install companion flange.
12) Tighten self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.
ST 498427200 FLANGE WRENCH

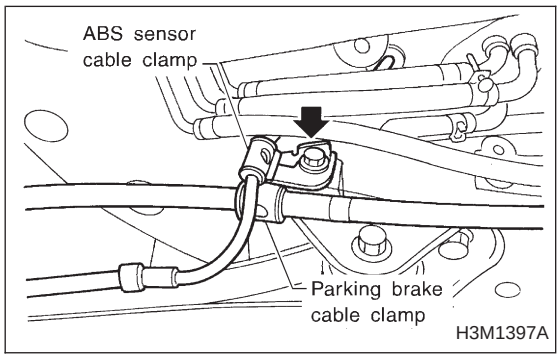
CAUTION:
Use a new self-locking nut.

Tightening torque:
181.4±14.7 N·m (18.50±1.50 kg-m, 133.8±10.8 ft-lb)

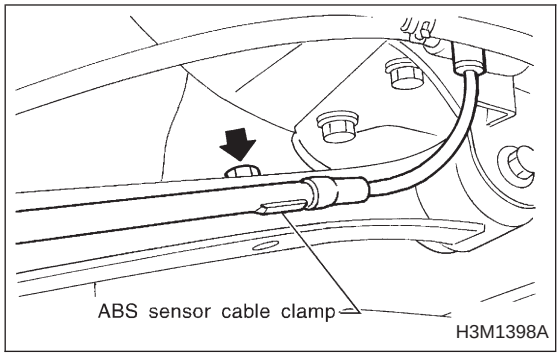
13) Reassembling procedure hereafter is the reverse of the disassembling.

2. SIDE OIL SEAL

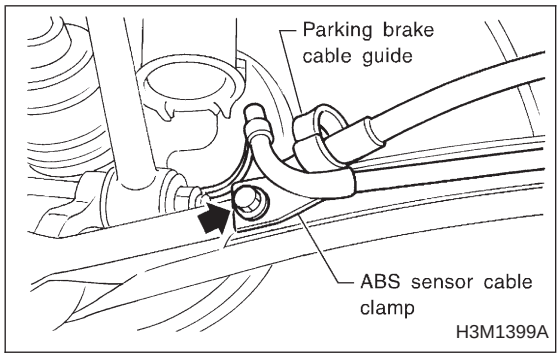
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>



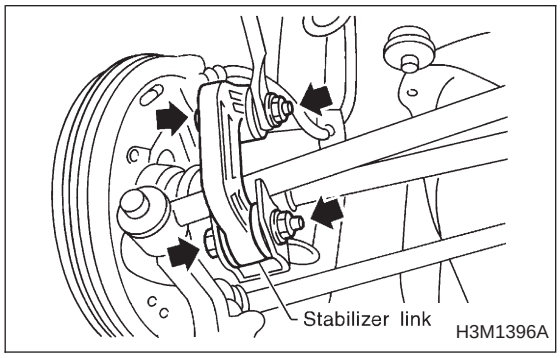
8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.



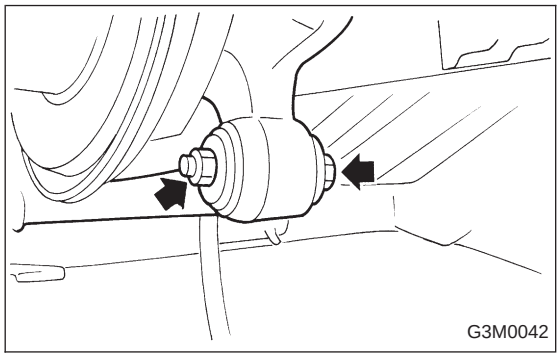
(2) Remove the ABS sensor cable clamp from the trailing link.



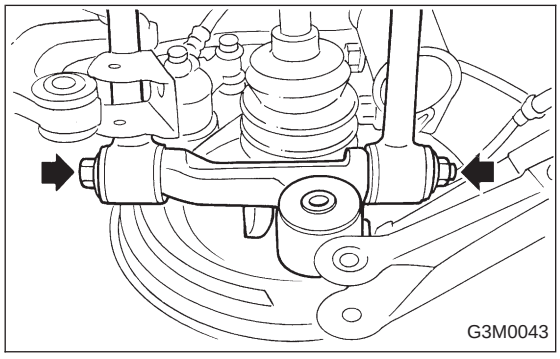
(3) Remove the ABS sensor cable clamp and parking brake cable guide from the trailing link.



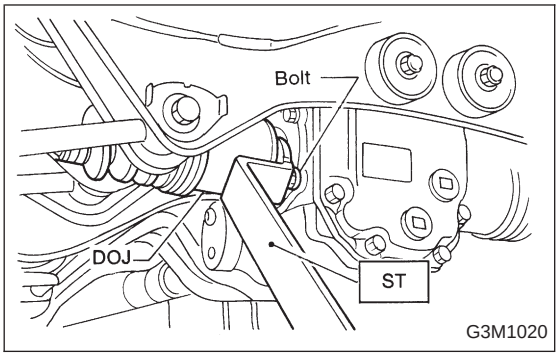
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure the trailing link to the rear housing.

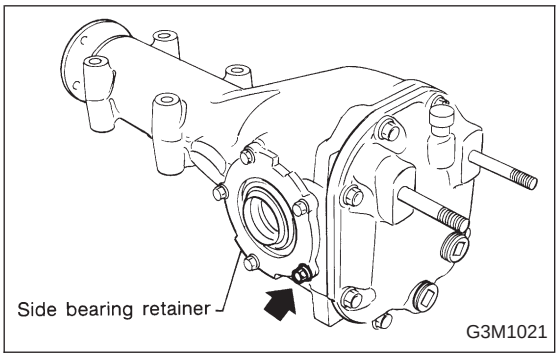


(6) Remove the bolts which secure the front and rear lateral link to the rear housing.

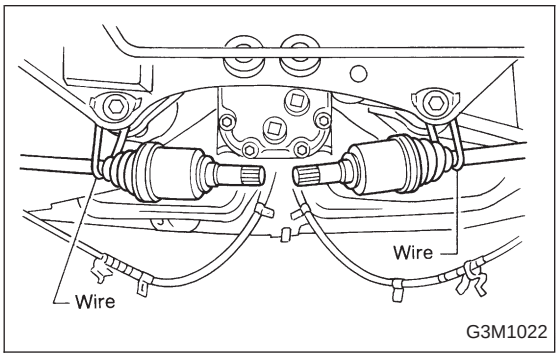


(7) Remove the DOJ from the rear differential by using ST.

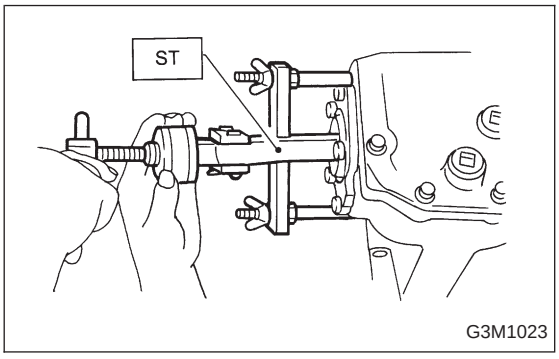
ST 208099PA100 DRIVE SHAFT REMOVER



CAUTION:
When removing the DOJ from the rear differential, fit ST to the bolt as shown in figure so as not to damage the side bearing retainer.

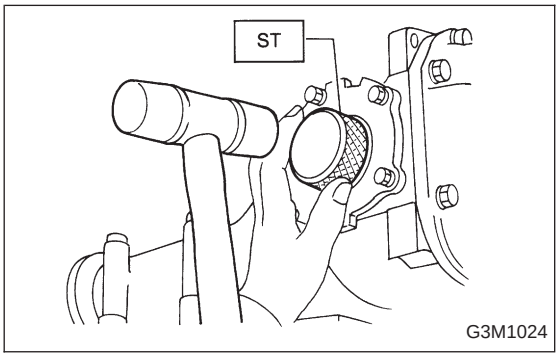


9) Secure rear drive shaft to rear crossmember using wire.



10) Remove side oil seal with ST.

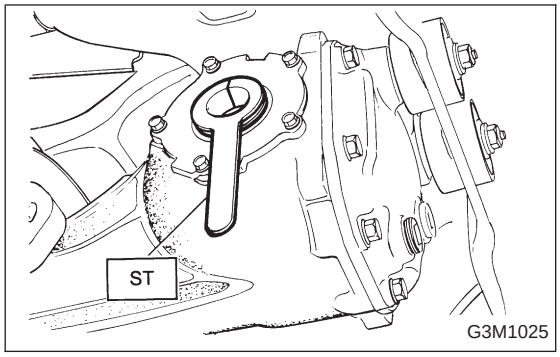
ST 398527700 PULLER ASSY



11) Drive in a new side oil seal with ST.

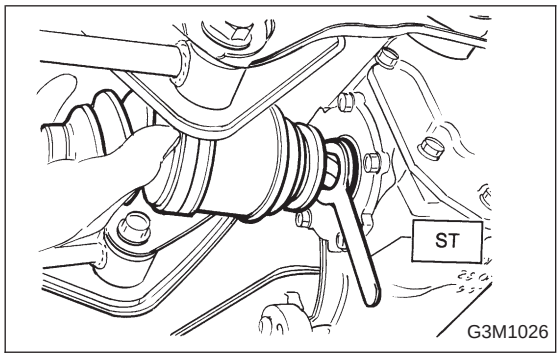
CAUTION:
Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



12) Insert the DOJ into rear differential.
(1) Install ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



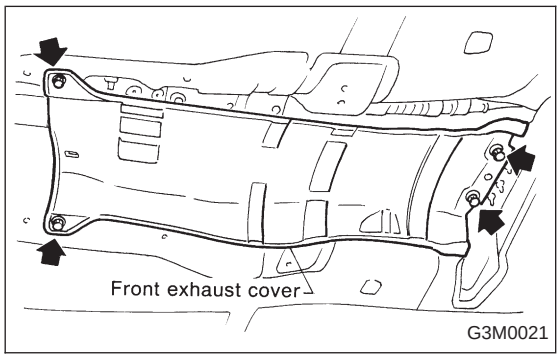
(2) Insert the spline shaft until the spline portion is inside the side oil seal.
(3) Remove ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

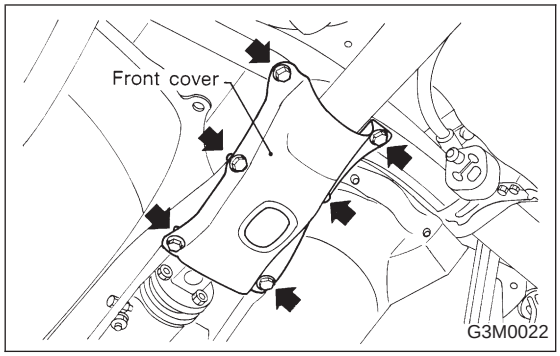
13) Hereafter, re-assemble in reverse order of disassembly.

B: REMOVAL

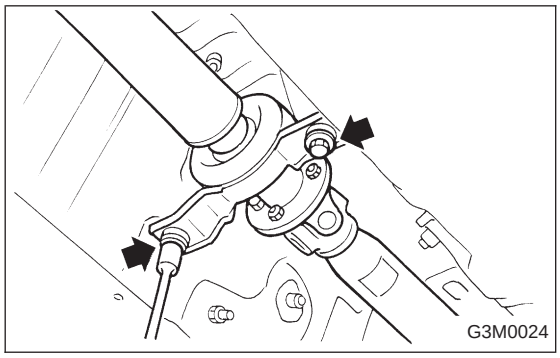
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>



8) Remove front exhaust cover.



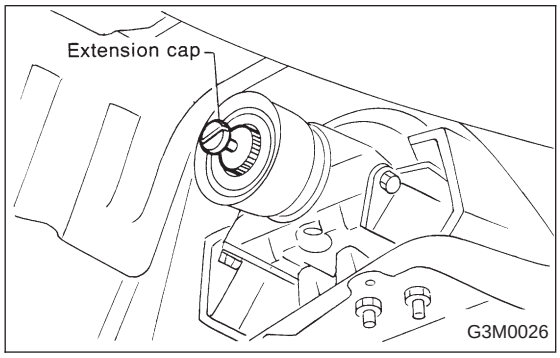
9) Remove front cover of rear differential mount.



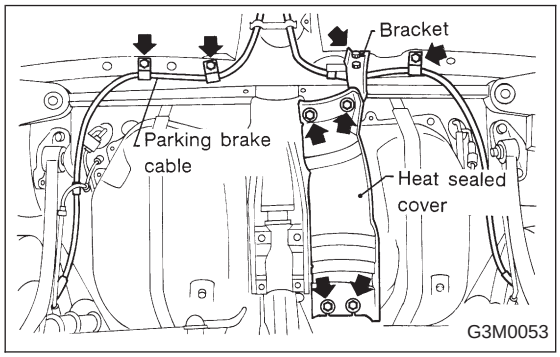
10) Remove propeller shaft.

CAUTION:
When removing propeller shaft, pay attention not to damage the sliding surfaces of rear drive shaft (extension) spline, oil seal and sleeve yoke.

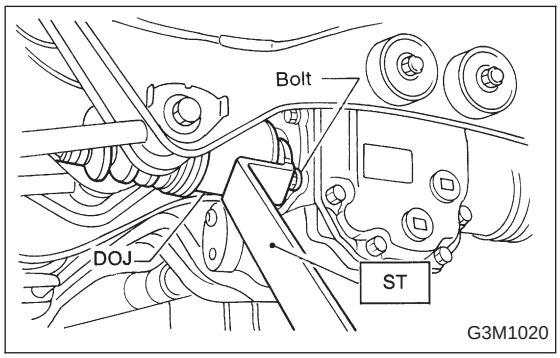
NOTE:
Prepare an oil can and cap since the transmission oil flows out from the extension at removing propeller shaft.



NOTE:
Insert the cap into the extension to prevent transmission oil from flowing out immediately after removing the propeller shaft.

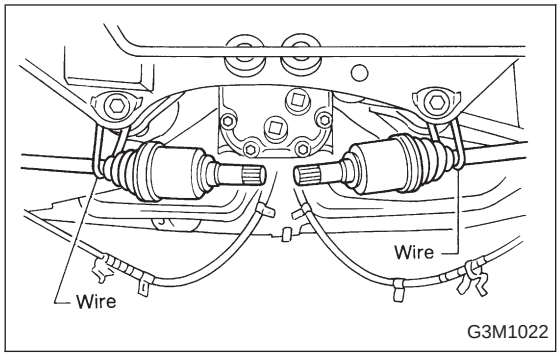


11) Remove heat sealed cover.
12) Remove clamps and bracket of parking brake cable.

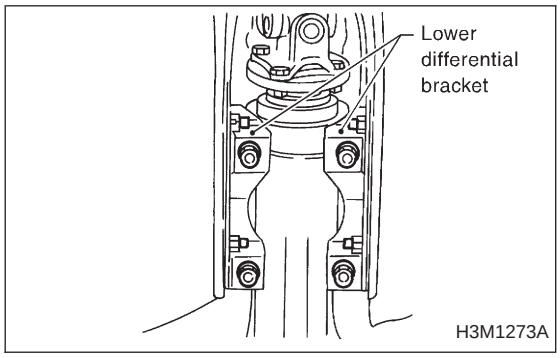


13) Remove DOJ of rear drive shaft from rear differential using ST. <Ref. to 3-4 [W3A2].>

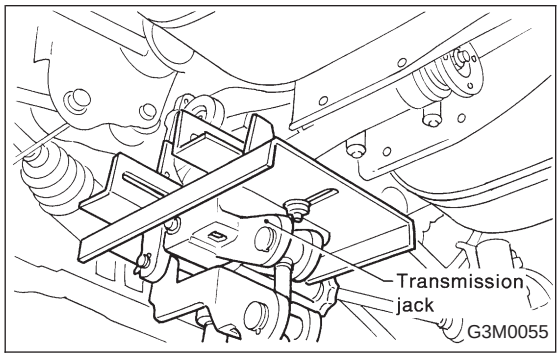
ST 28099PA100 DRIVE SHAFT REMOVER



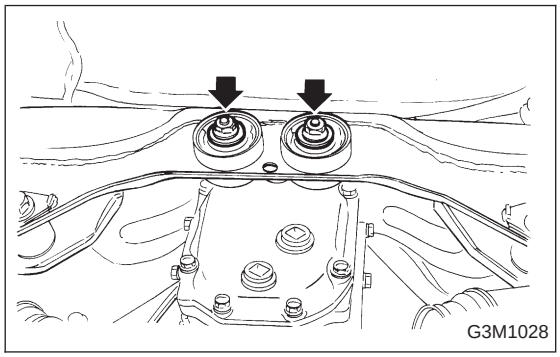
14) Secure rear drive shaft to rear crossmember using wire.



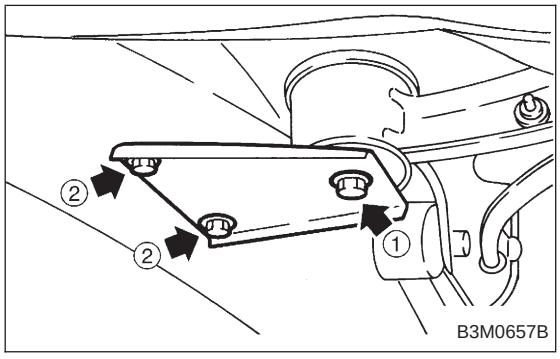
15) Remove lower differential bracket.



16) Support rear differential with transmission jack.



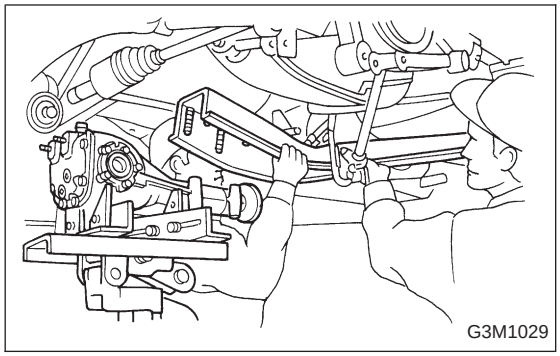
17) Remove self-locking nuts connecting rear differential to rear crossmember.



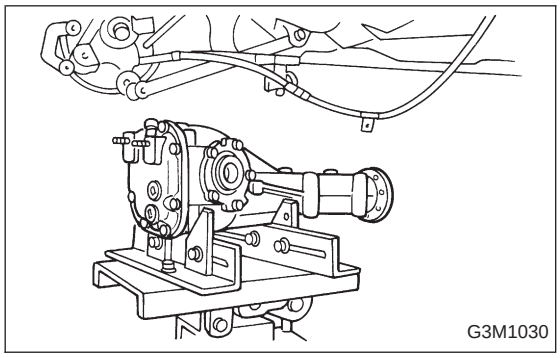
18) Remove bolts which secure rear differential front member to body.
Loosen bolt ① first, then remove bolts ②.

NOTE:
Support front member with the use of a helper to prevent it from dropping.

19) Remove bolt ①.


G3M1029

20) While slowly lowering transmission jack, move rear differential forward and remove front member and rear differential from body.

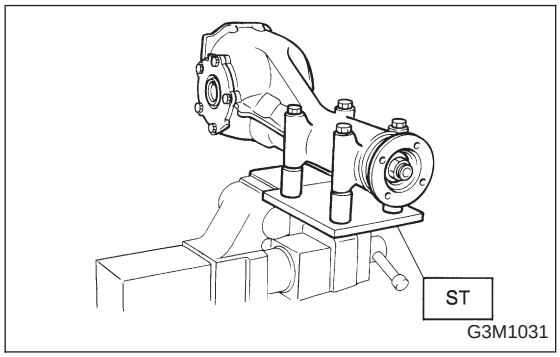

G3M1030

21) Remove rear differential from front member.

C: DISASSEMBLY

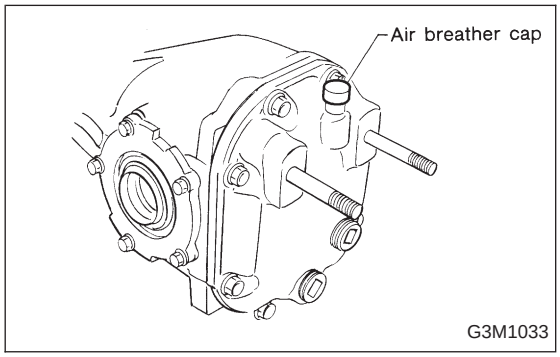
To detect real cause of trouble, inspect the following items before disassembling. <Ref. to 3-4 [W3E0].>

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion



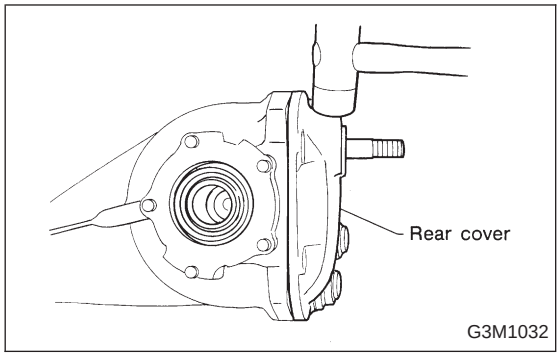
G3M1031

1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT
2) Drain gear oil by removing plug.

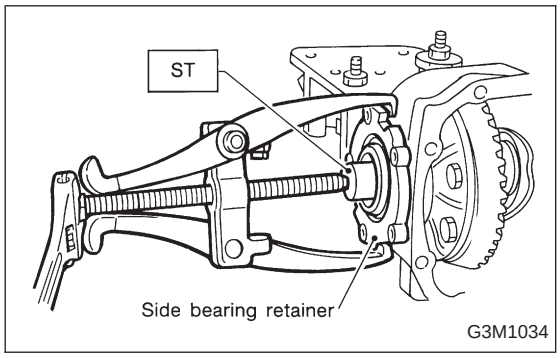


G3M1033

3) Remove the air breather cap.
NOTE:
Do not attempt to replace the air breather cap unless necessary.

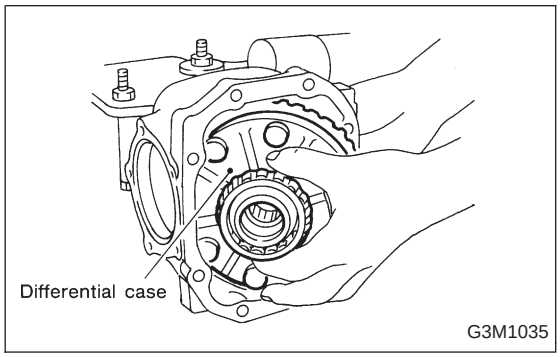


4) Remove rear cover by loosening retaining bolts.



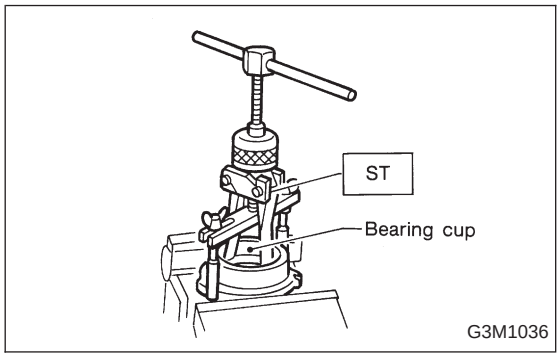
5) Make right and left side bearing retainers in order to identify them at reassembly. Remove side bearing retainer attaching bolts, set ST to differential case, and extract right and left side bearing retainers with a puller.
ST 398457700 ATTACHMENT

CAUTION:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

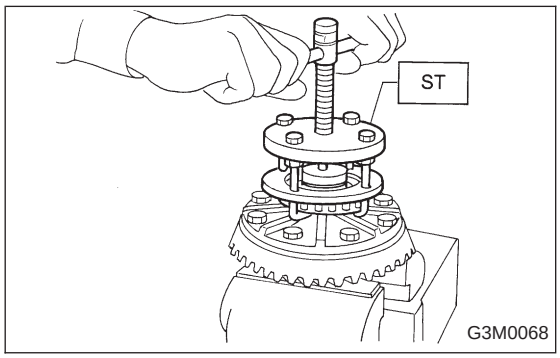


6) Pull out differential assembly from differential carrier.

CAUTION:
Be careful not to hit the teeth against the case.



7) When replacing side bearing, pull bearing cup from side bearing retainer using ST.
ST 398527700 PULLER ASSY

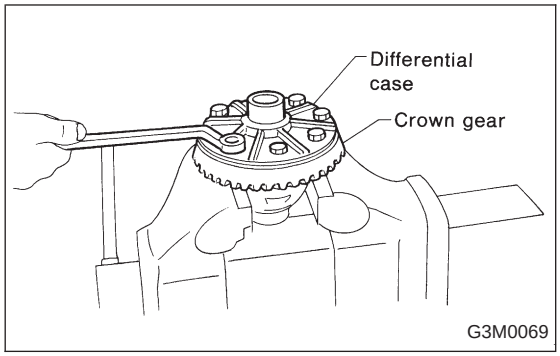


8) Extract bearing cone with ST.

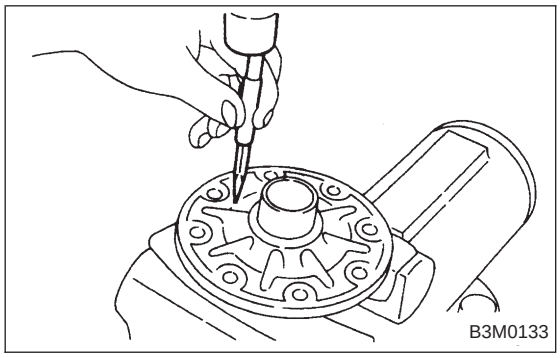
CAUTION:
Do not attempt to disassemble the parts unless necessary.

NOTE:
● Set puller so that its claw catch the edge of the bearing cone.
● Never mix up the right and left hand bearing cups and cones.

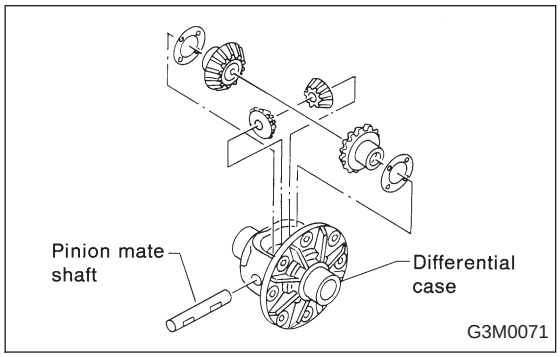
ST 399527700 PULLER SET



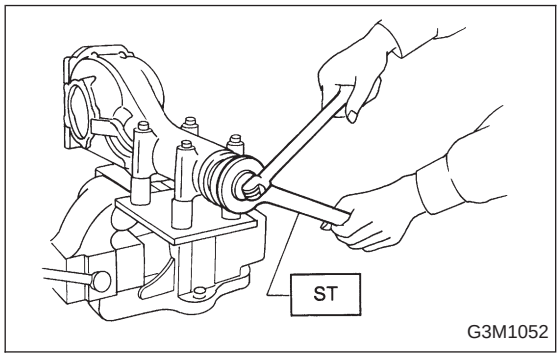
9) Remove crown gear by loosening crown gear bolts.
CAUTION:
Further disassembling is not allowed.



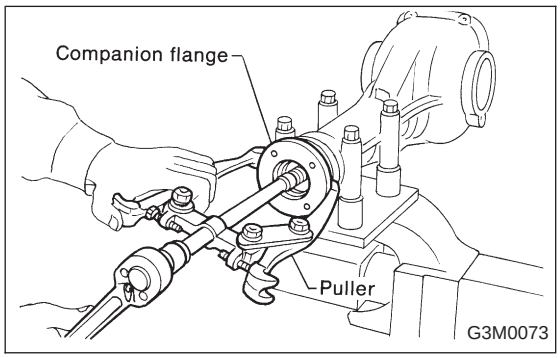
10) Drive out pinion shaft lock pin from crown gear side.
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.
ST 899904100 STRAIGHT PIN REMOVER



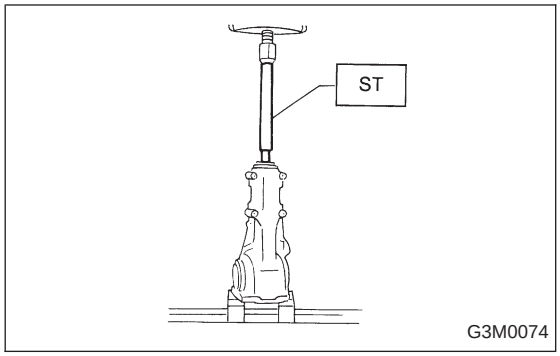
11) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



12) Hold companion flange with ST and remove drive pinion nut.
ST 498427200 FLANGE WRENCH

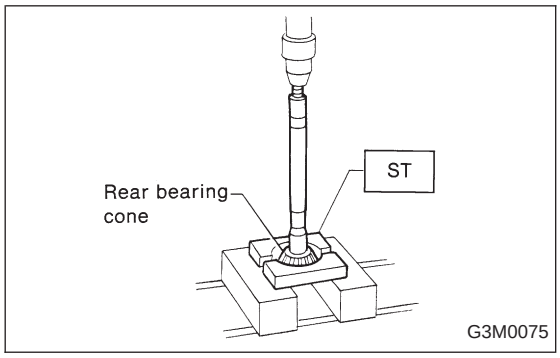


13) Extract the companion flange with a puller.



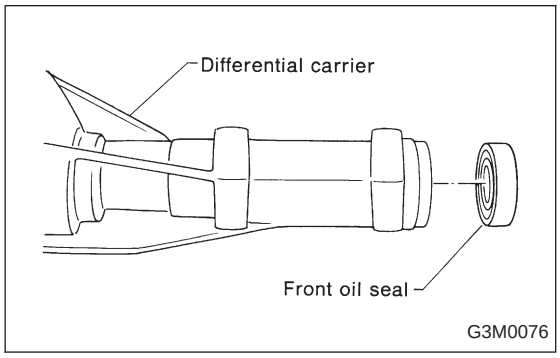
14) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

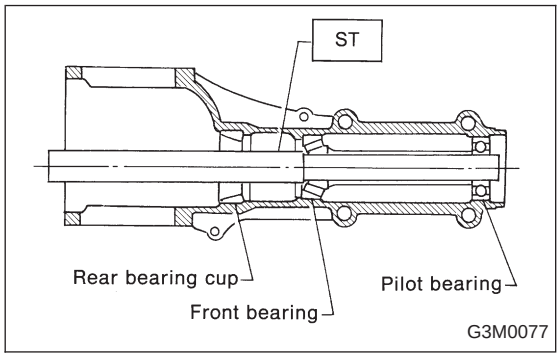


15) Remove rear bearing cone from drive pinion by supporting cone with ST.

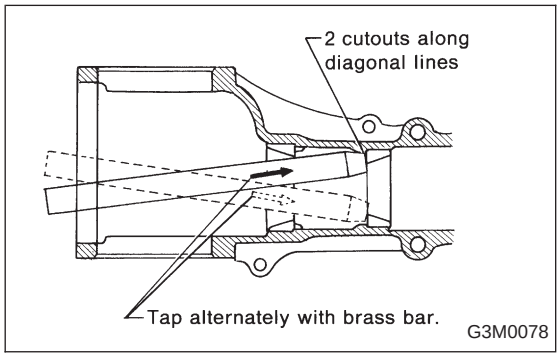
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REPLACER



16) Remove front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



17) Remove pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



18) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.

D: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

(1) If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

(2) If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

(1) Replace if crack, score, or other defects are evident on tooth surface.

(2) Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

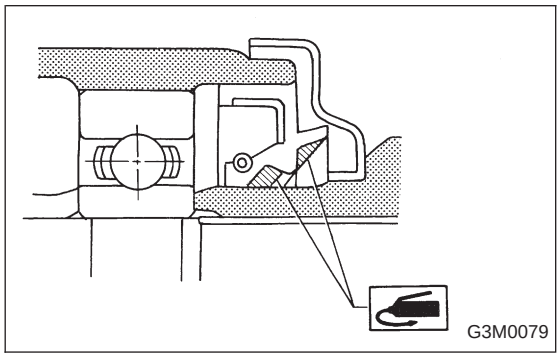
8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

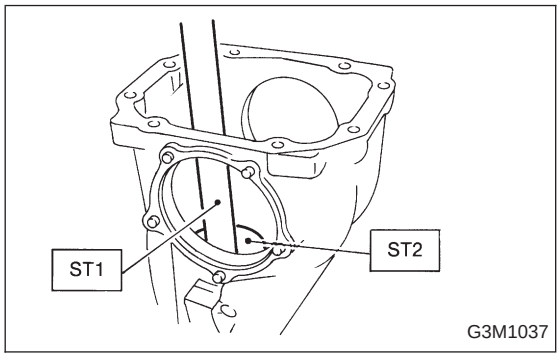
E: ASSEMBLY

1) Precautions for assembling

(1) Assemble in the reverse order of disassembling.
(2) Check and adjust each part during assembly.
(3) Keep the shims and washers in order, so that they are not misinstalled.
(4) Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
(5) Apply gear oil when installing the bearings and thrust washers.
(6) Be careful not to mix up the right and left hand cups of the bearings.


G3M0079

(7) Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



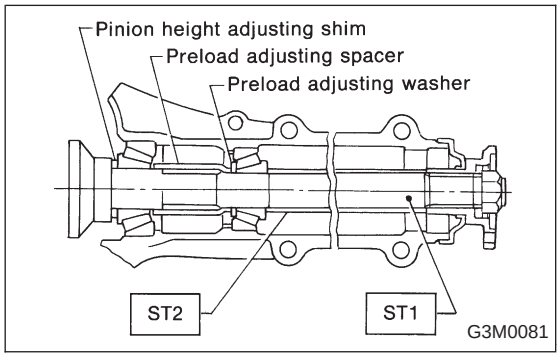
G3M1037

2) Adjusting preload for front and rear bearings

Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398427703 DRIFT 2



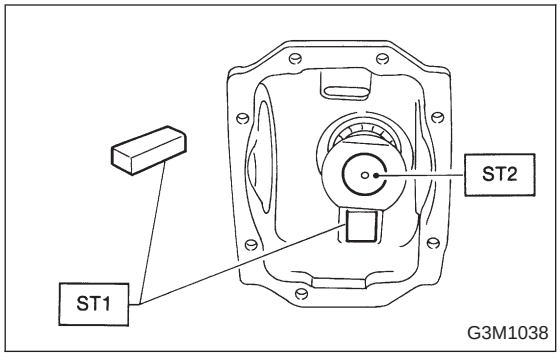
G3M0081

(2) Insert ST1 into case with pinion height adjusting washer and rear bearing cone fitted onto it.

CAUTION:
- **Re-use the used washer if not deformed.**
- **Use a new rear bearing cone.**

(3) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR

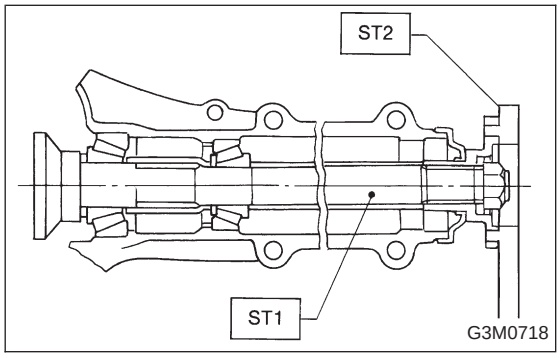


(4) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque with ST2.

ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

CAUTION:
Use a new lock nut.

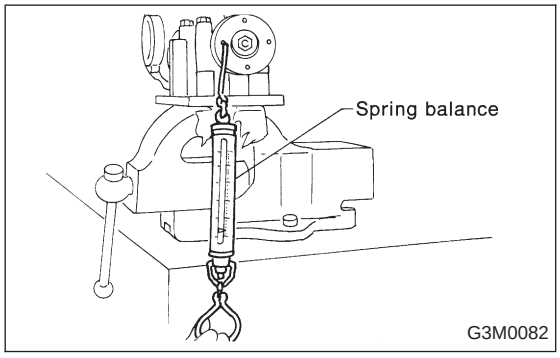
NOTE:
● Be careful not to give excessive preload.



● When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

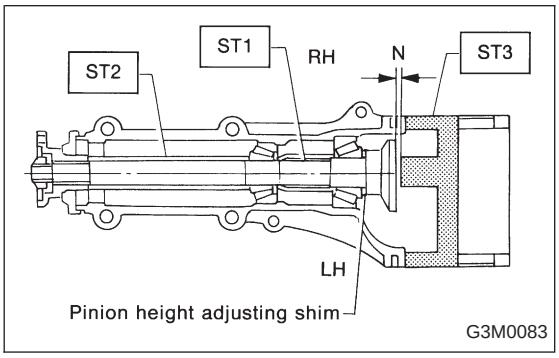
ST1 398507702 DUMMY SHAFT
ST2 498427200 FLANGE WRENCH

Tightening torque:
181±15 N·m (18.5±1.5 kg-m, 134±11 ft-lb)



Front and rear bearing preload
For new bearing: 17.7 — 25.5 N (1.8 — 2.6 kg, 4.0 — 5.7 lb) at companion flange bolt hole

	Part No.	Length mm (in)
● Preload adjusting washer length	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
● Preload adjusting spacer length	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)



3) Adjusting drive pinion height
Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

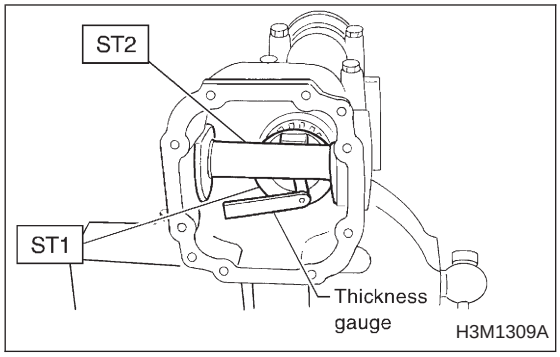
(1) Install ST1, ST2 and ST3, as shown in the figure, and apply the specified preload on the bearings.

Front and rear bearing preload
For new bearing: 17.7 — 25.5 N (1.8 — 2.6 kg, 4.0 — 5.7 lb) at companion flange bolt hole

Adjust preload for front and rear bearings.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR
ST3 398507701 DIFFERENTIAL CARRIER GAUGE

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before.



(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST3.
ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE

(3) Obtain the thickness of pinion height adjusting shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

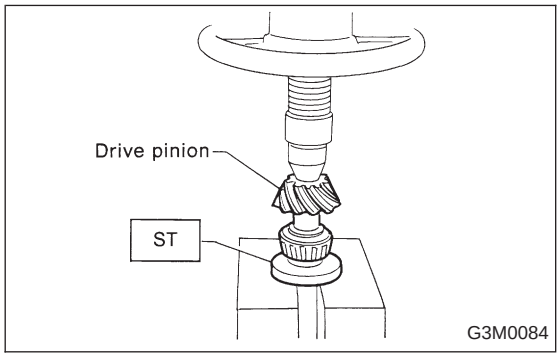
T = To + N − (H x 0.01) − 0.20 (mm)

Where:
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
H = Figure marked on drive pinion head

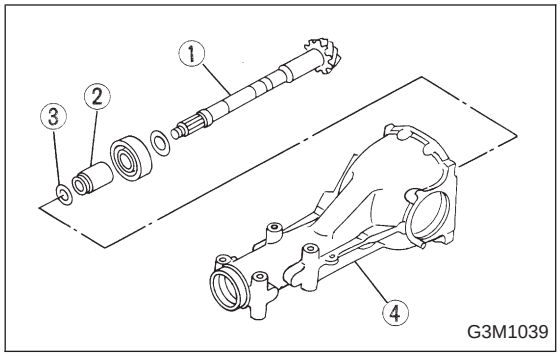
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm H = + 1,
T = 3.40 + 0.23 − 0.01 − 0.20 = 3.42
Result: Thickness = 3.42 mm

Therefore use the shim 383605200.

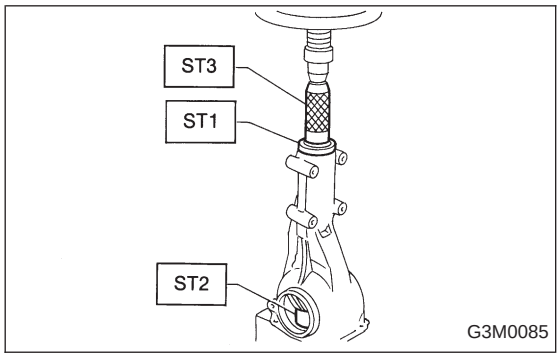
	Part No.	Thickness mm (in)
● Pinion height adjusting shim thickness	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)



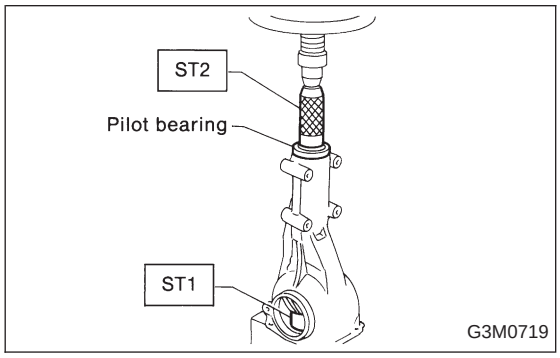
4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 398177700 INSTALLER



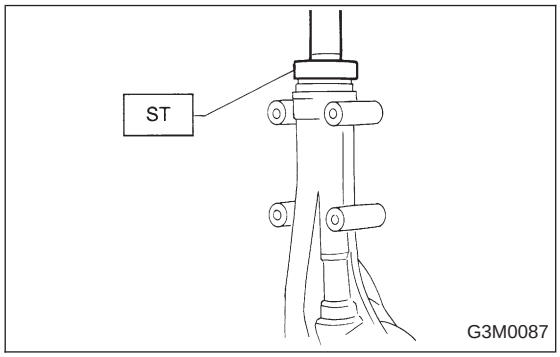
5) Insert drive pinion ① into differential carrier ④, install the previously selected bearing preload adjusting spacer ② and washer ③.



6) Press-fit front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

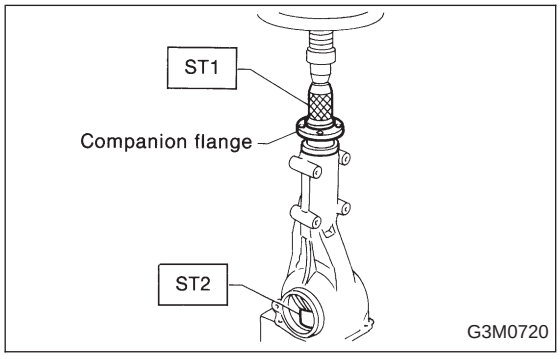


7) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



8) Fit a new oil seal with ST.

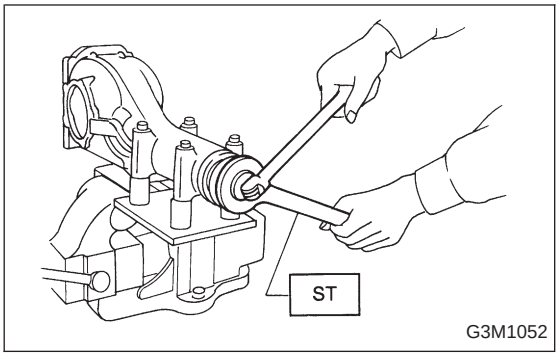
NOTE:
● Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
● Apply grease between the oil seal lips.
ST 498447120 OIL SEAL INSTALLER



9) Press-fit companion flange with ST1 and ST2.

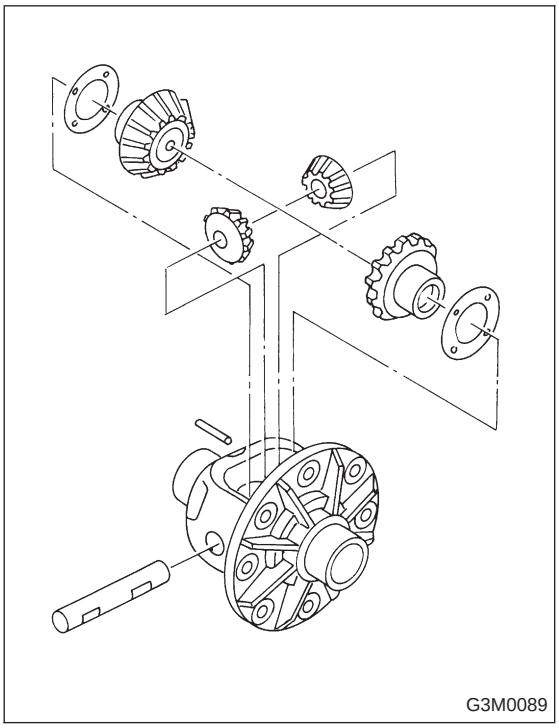
CAUTION:
Be careful not to damage bearing.

ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



10) Install self-locking nut. Then tighten it with ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181±15 N·m (18.5±1.5 kg-m, 134±11 ft-lb)



11) Assembling differential case
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

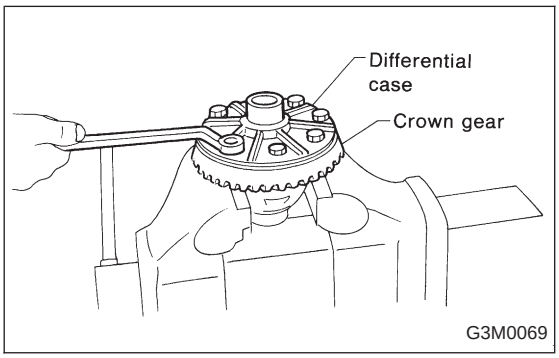
NOTE:
● Apply gear oil on both sides of the washer and on the side gear shaft before installing.
● Insert the pinion mate shaft into the differential case by aligning the lock pin holes.

(1) Measure the clearance between differential case and the back of side gear.
(2) Adjust the clearance as specified by selecting side gear thrust washer.

Side gear backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

	Part No.	Thickness mm (in)
● Side gear thrust washer thickness	383445201	0.75 — 0.8 (0.0295 — 0.0315)
	383445202	0.8 — 0.85 (0.0315 — 0.0335)
	383445203	0.85 — 0.9 (0.0335 — 0.0345)

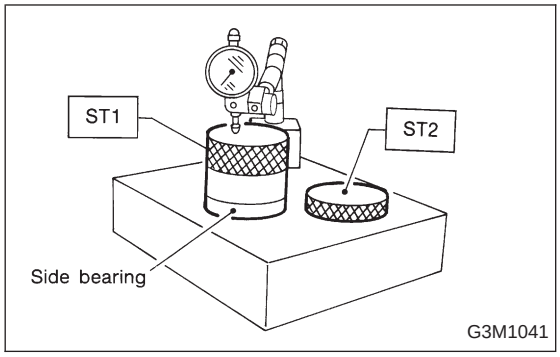
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.



12) Install crown gear on differential case.

Tightening torque:
103±10 N·m (10.5±1.0 kg-m, 76±7 ft-lb)

NOTE:
Tighten diagonally while tapping the bolt heads.

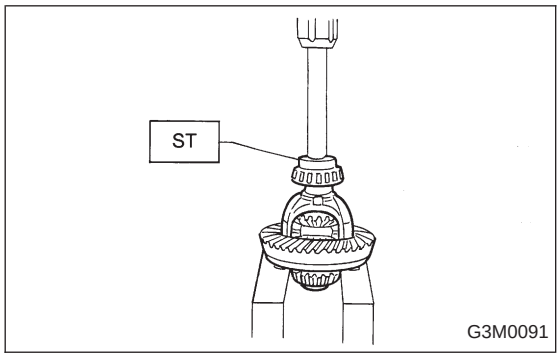


13) Before installing side bearing, measure the bearing width by using a dial gauge, ST1 and ST2.

Standard bearing width:
20.00 mm (0.7874 in)

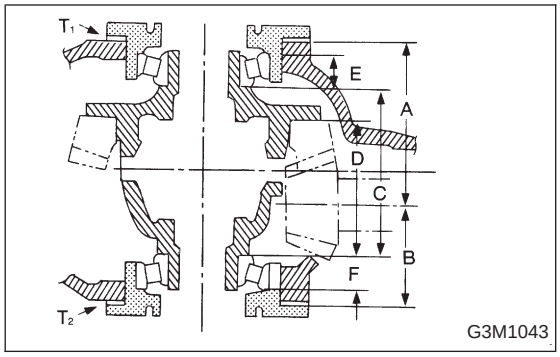
NOTE:
Set the dial gauge needle to zero, using a standard bearing or block of specified height in advance.

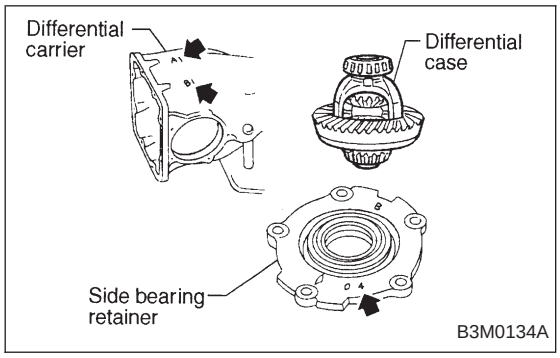
ST1 398227700 WEIGHT
ST2 398237700 GAUGE



14) Press side bearing cone onto differential case with ST1.

ST1 398487700 DRIFT





15) Adjusting side bearing retainer shims

(1) The drive gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) When replacing differential case, differential carrier, side bearing and side bearing retainer, obtain the right and left retainer shim thickness from the following formulas.

T_1 (Left) = (A + C + G_1 − D) x 0.01 + 0.76 − E (mm)
T_2 (Right) = (B + D + G_2) x 0.01 + 0.76 − F (mm)

T_1& T_2 : Thickness of left and right side bearing retainer shim (mm)
A & B : Number marked on differential carrier
C & D : Number marked on differential case
E & F : Difference of width of left and right side bearing from standard width 20.0 mm, expressed in a unit of 0.01 mm. For example, if the bearing measured width is 19.89 mm, value of E or F is as follows. 20.00 −19.89 = 0.11 (E or F)
G_1& G_2 : Number marked on side bearing retainer

If a number is not marked, regard it as zero.

NOTE:
Use several shims to obtain the calculated thickness.

	Part No.	Thickness mm (in)
● Side bearing retainer shim thickness	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)

Example of calculation
Ex. 1
A = 5, B = 5, C = 3, D = 3, G_1 = 4, G_2 = 1,
E = 0.10 mm, F = 0.15 mm
Left side
T_1 = (A + C + G_1 − D) x 0.01 + 0.76 − E
= (5 + 3 + 4 − 3) x 0.01 + 0.76 − 0.10
= 0.09 + 0.76 − 0.10 = 0.75 mm
The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.50	x	1	= 0.50

Total shim thickness = 0.75 mm
Right side
T_2 = (B + D + G_2) x 0.01 + 0.76 − F
= (5 + 3 + 1) x 0.01 + 0.76 − 0.15
= 0.09 + 0.76 − 0.15
= 0.70 mm
The correct shims are as follows:

Thickness		Q'ty	
0.20	x	1	= 0.20
0.50	x	1	= 0.50

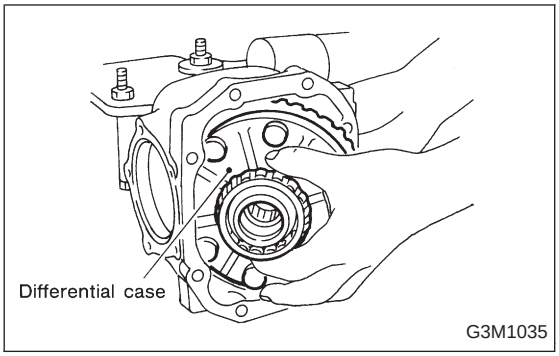
Total shim thickness = 0.70 mm
Ex. 2
A = 2, B = 3, C = 0, D = 3, G_1 = 2, G_2 = 3,
E = 0.22 mm, F = 0.10 mm
Left side
T_1 = (A + C + G_1 − D) x 0.01 + 0.76 − E
= (2 + 0 + 2 − 3) x 0.01 + 0.76 − 0.22
= 0.01 + 0.76 − 0.22
= 0.55 mm
The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.30	x	1	= 0.30

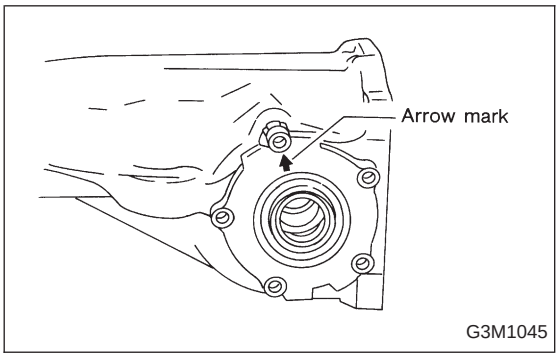
Total shim thickness = 0.55 mm
Right side
T_2 = (B + D + G_2) x 0.01 + 0.76 − F
= (3 + 3 + 3) x 0.01 + 0.76 − 0.10
= 0.09 + 0.76 − 0.10
= 0.75 mm
The correct shims are as follows:

Thickness		Q'ty	
0.25	x	1	= 0.25
0.50	x	1	= 0.50

Total shim thickness = 0.75 mm

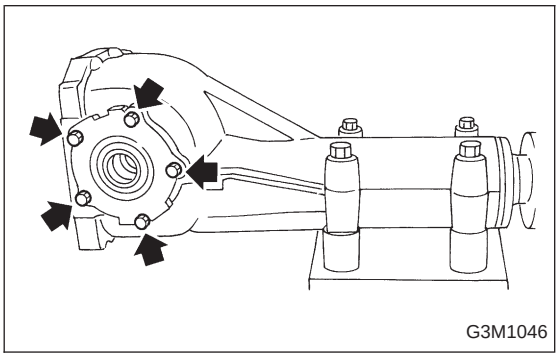


(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



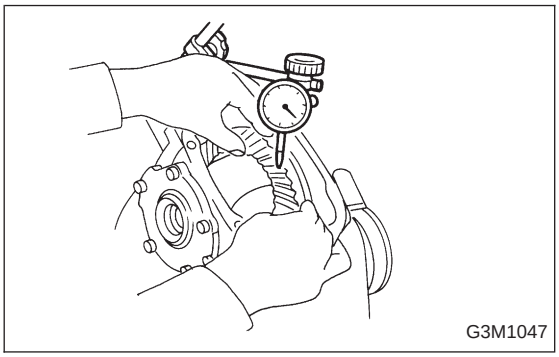
(4) Fit the selected shims and O-ring on side bearing retainer and install them on differential carrier with the arrow mark on the retainer directed as shown in figure.

CAUTION:
Be careful that side bearing cup is not damaged by bearing roller.



(5) Tighten side bearing retainer bolts.

Tightening torque:
10.3±1.5 N·m (1.05±0.15 kg-m, 7.6±1.1 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash.

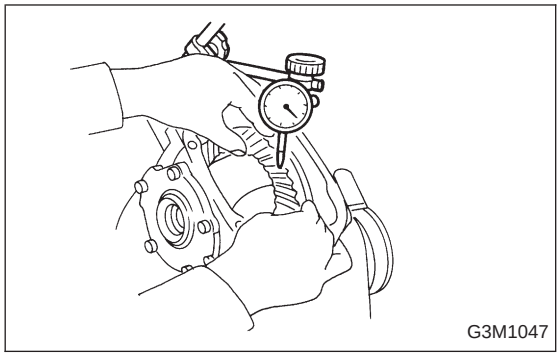
Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

(7) At the same time, measure the turning resistance of drive pinion. Compared with the resistance when differential case is not installed, if the increase of the resistance is not within the specified range, readjust side bearing retainer shims.

Turning resistance increase:
0.1 — 0.6 N·m (1 — 6 kg-cm, 0.9 — 5.2 in-lb)

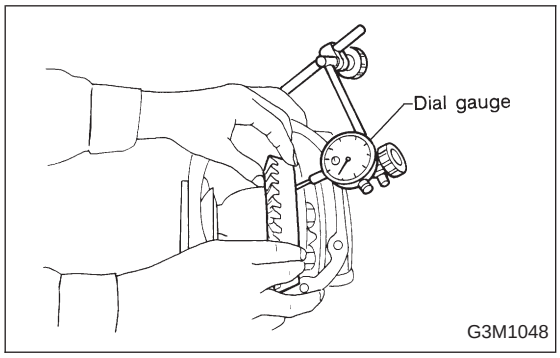
NOTE:
If measured backlash is not within specified range, repeat procedure for side bearing retainer shims adjustment.


G3M1047

16) Re-check crown gear-to-pinion backlash.

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)



G3M1048

17) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)

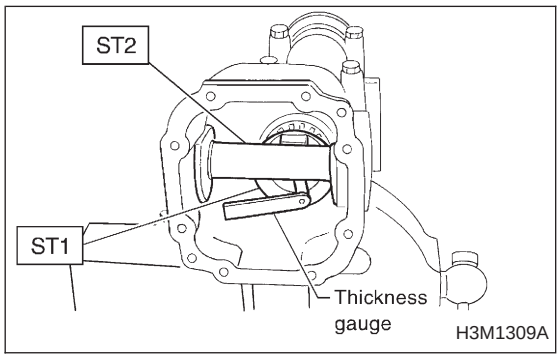
18) Checking and adjusting tooth contact of crown gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in “TOOTH CONTACT PATTERN”.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

19) If proper tooth contact is not obtained, once again adjust the drive pinion height, changing RH and LH side bearing retainer shims and the hypoid gear backlash.



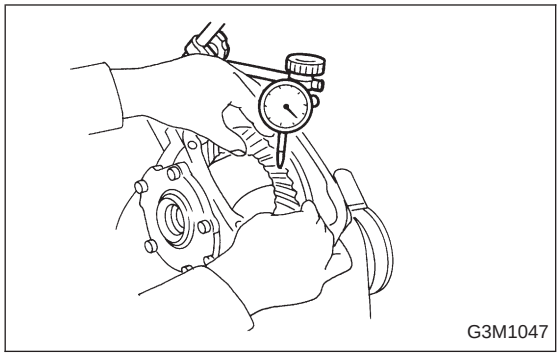
H3M1309A

(1) Drive pinion height

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE

T = To + N − (H x 0.01) − 0.20 (mm)

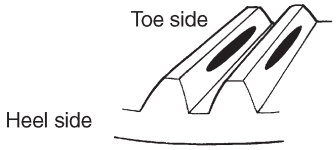
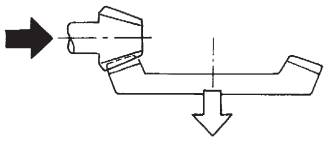
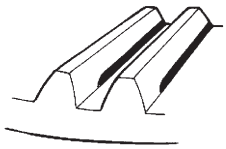
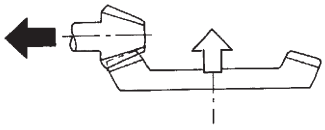
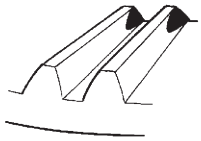
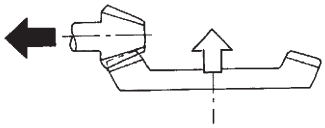
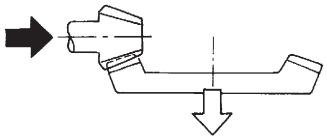
Where:
T = Thickness of pinion height adjusting shim (mm)
To = Thickness of shim temporarily inserted (mm)
N = Reading of thickness gauge (mm)
H = Figure marked on drive pinion head


G3M1047

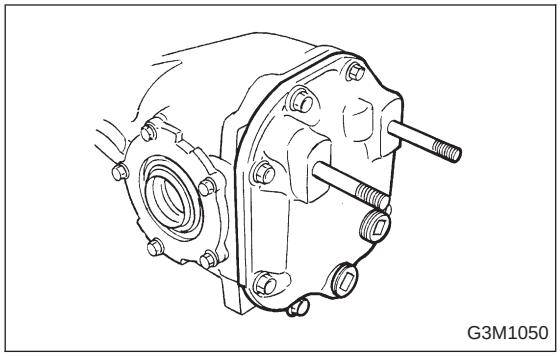
(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.0039 — 0.0079 in)

TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)	 B3M0317A	———
Face contact Backlash is too large.	This may cause noise and chipping at tooth ends.  B3M0319	Increase thickness of drive pinion height adjusting shim in order to bring drive pinion closer to crown gear center.  B3M0323
Flank contact Backlash is too small.	This may cause noise and stepped wear on surfaces.  B3M0320	Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.  B3M0324
Toe contact Contact area is small.	This may cause chipping at toe ends.  B3M0321	Adjust as for flank contact.  B3M0324
Heel contact Contact area is small.	This may cause chipping at heel ends.  B3M0322	Adjust as for face contact.  B3M0323

➡ : Adjusting direction of drive pinion
⇨ : Adjusting direction of crown gear


G3M1050

20) Install rear cover and tighten bolts to specified torque.

Tightening torque:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

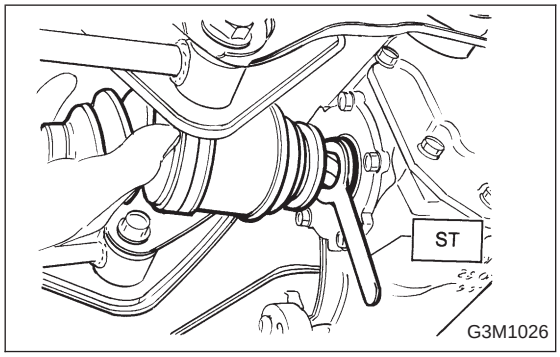
F: INSTALLATION

To install, reverse the removal sequence.

1) Install the air breather cap tapping with a plastic hammer.

CAUTION:
Be sure to install new air breather cap.

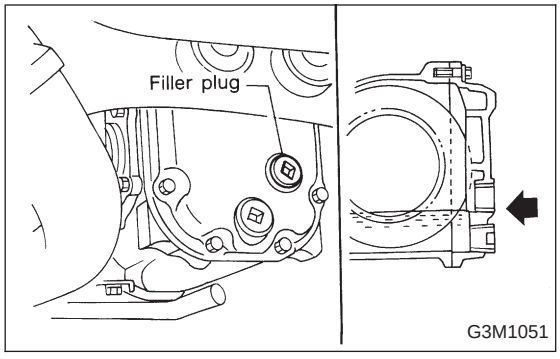
2) Position front member on body by passing it under parking brake cable and securing to rear differential.
NOTE:
When installing rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.



G3M1026

3) Install DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W3A2].>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



G3M1051

4) Installing procedure hereafter is in the reverse order of removal.

5) After installation, fill differential carrier with gear oil to the upper plug level.

CAUTION:
Apply fluid packing to plug.

Fluid packing:
THREE BOND 1205 or equivalent

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

Tightening torque:
44±4 N·m (4.5±0.4 kg-m, 32.5±2.9 ft-lb)

4. Rear Differential Front Member

A: REMOVAL

1. VA-TYPE

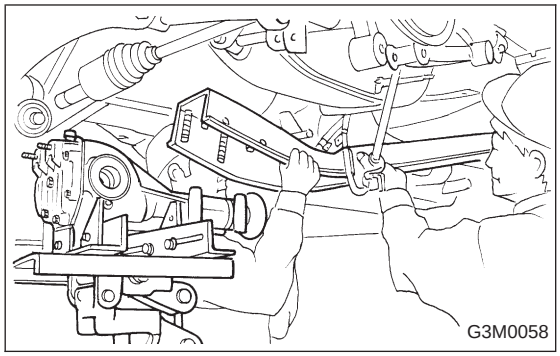
1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>
8) Remove rear differential front member.

NOTE:
When removing rear differential front member, work the removal procedure as rear differential.
<Ref. to 3-4 [W2B0].>

2. T-TYPE

1) Disconnect ground cable from battery.
2) Move selector lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen wheel nuts.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
<Ref. to 2-9 [W2A0], [W3A0].>
8) Remove rear differential front member.

NOTE:
When removing rear differential front member, work the removal procedure as rear differential.
<Ref. to 3-4 [W3B0].>

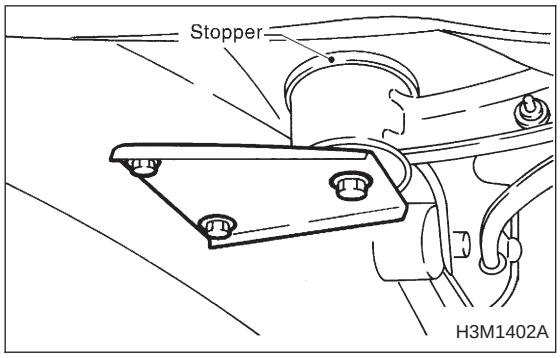

G3M0058

B: INSTALLATION

1. VA-TYPE

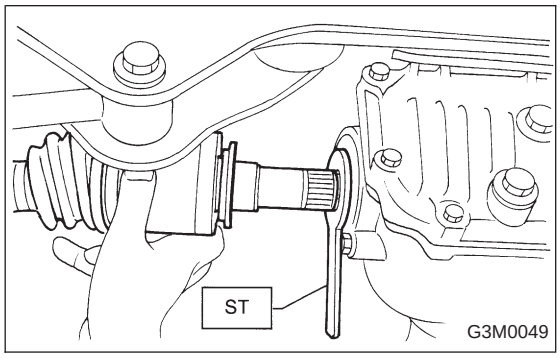
To install, reverse the removal sequence.

1) Position front member on body by passing it under parking brake cable and securing to rear differential.



H3M1402A

NOTE:
When installing rear differential front member, do not confuse the installation sequence of the stopper.



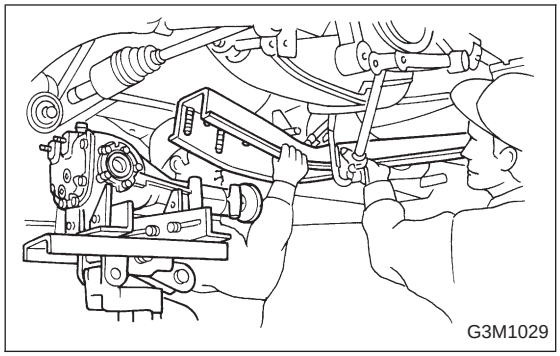
G3M0049

2) Insert DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W2A2].>

ST 28099PA090 SIDE OIL SEAL PROTECTOR

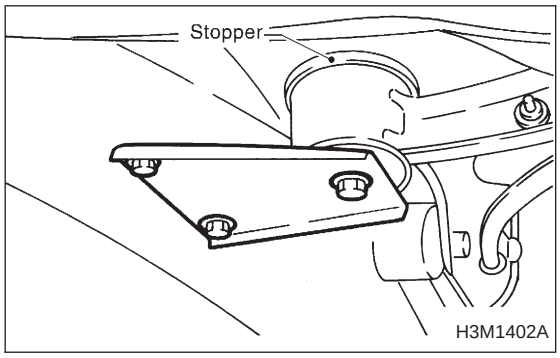
CAUTION:
Before inserting, replace the differential side oil seal with a new one.

3) Installing procedure hereafter is in the reverse order of removal.


G3M1029

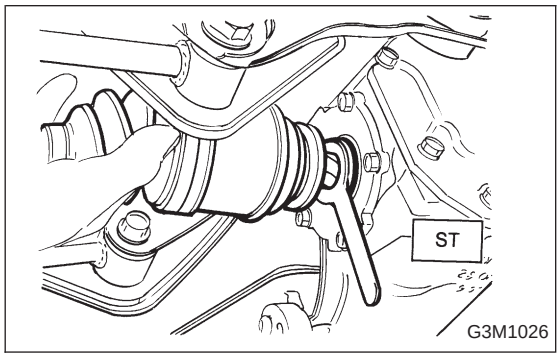
2. T-TYPE

To install, reverse the removal sequence.
1) Position front member on body by passing it under parking brake cable and securing to rear differential.



H3M1402A

NOTE:
When installing rear differential front member, do not confuse the installation sequence of the stopper.



G3M1026

2) Insert DOJ of rear drive shaft into rear differential. <Ref. to 3-4 [W3A2].>

ST 28099PA090 SIDE OIL SEAL PROTECTOR

CAUTION:
Before inserting, replace the differential side oil seal with a new one.

3) Installing procedure hereafter is in the reverse order of removal.

1. Propeller Shaft

Symptom and possible cause	Remedy
1. Vibration of propeller shaft Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increase in proportion to vehicle speed.	
① Worn or damaged universal joint.	Replace.
② Unbalanced propeller shaft due to bend or dent.	Replace.
③ Loose installation of propeller shaft.	Retighten.
④ Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft.	
① Worn or damaged universal joint.	Replace.
② Worn spline of sleeve yoke.	Replace.
③ Loose installation of propeller shaft.	Retighten.
④ Loose installation of joint.	Replace.
⑤ Worn or damaged center bearing and damaged center mounting rubber.	Replace.

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

2. Rear Differential

Symptom and possible cause	Remedy
1. Oil leakage	
① Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
② Clogged or damaged air breather.	Clean, repair or replace.
③ Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
④ Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
⑤ Loose oil filler or drain plug.	Retighten and apply liquid packing.
⑥ Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.	Repair or replace.
2. Seizure Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	
① Insufficient backlash for hypoid gear.	Readjust or replace.
② Excessive preload for side, rear, or front bearing.	Readjust or replace.
③ Insufficient or improper oil used.	Replace seized part and fill with specified oil to specified level.

Symptom and possible cause	Remedy
3. Damage Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	
① Improper backlash for hypoid gear.	Replace.
② Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
③ Excessive backlash for differential gear.	Replace gear or thrust washer.
④ Loose bolts and nuts such as crown gear bolt.	Retighten.
⑤ Damage due to overloading.	Replace.
4. Noises when starting or shifting gears Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	
① Excessive backlash for hypoid gear.	Readjust.
② Excessive backlash for differential gear.	Replace gear or thrust washer.
③ Insufficient preload for front or rear bearing.	Readjust.
④ Loose drive pinion nut.	Tighten to specified torque.
⑤ Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	
① Damaged differential gear.	Replace.
② Excessive wear or damage of thrust washer.	Replace.
③ Broken pinion mate shaft.	Replace.
④ Seized or damaged side bearing.	Replace.
6. Gear noises Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	
① Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
② Improper backlash for hypoid gear.	Readjust.
③ Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
④ Seized hypoid gear.	Replace hypoid gear set.
⑤ Improper preload for front or rear bearings.	Readjust.
⑥ Seized, scored, or chipped front or rear bearing.	Replace.
⑦ Seized, scored, or chipped side bearing.	Replace.
⑧ Vibrating differential carrier.	Replace.

SUSPENSION 4-1

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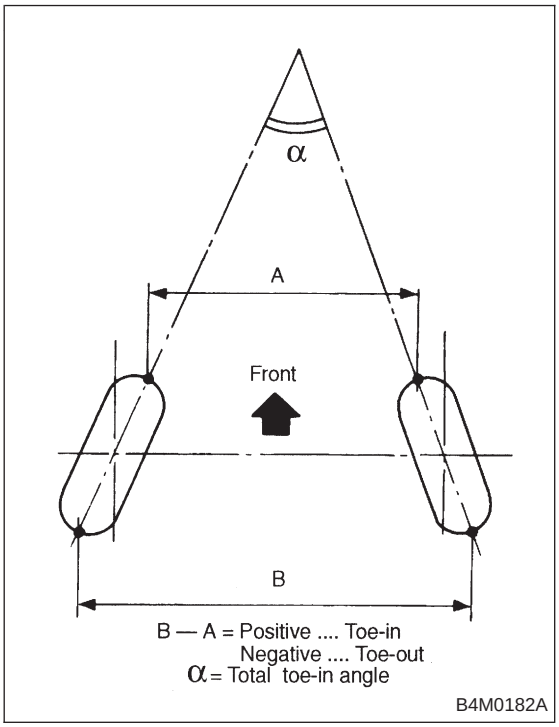
1. Specifications

A: STABILIZER

Model			Bar dia. mm (in)	
			Front	Rear
COUPE	AWD	1800 cc	19 (0.75)	—
		2200 cc	19 (0.75)	13 (0.51)
SEDAN	AWD	1800 cc	18 (0.71)	—
		2200 cc	19 (0.75)	13 (0.51)
WAGON	AWD	1800 cc	19 (0.75)	—
		2200 cc	19 (0.75)	13 (0.51)
OUTBACK	AWD	2200 cc	19 (0.75)	13 (0.51)

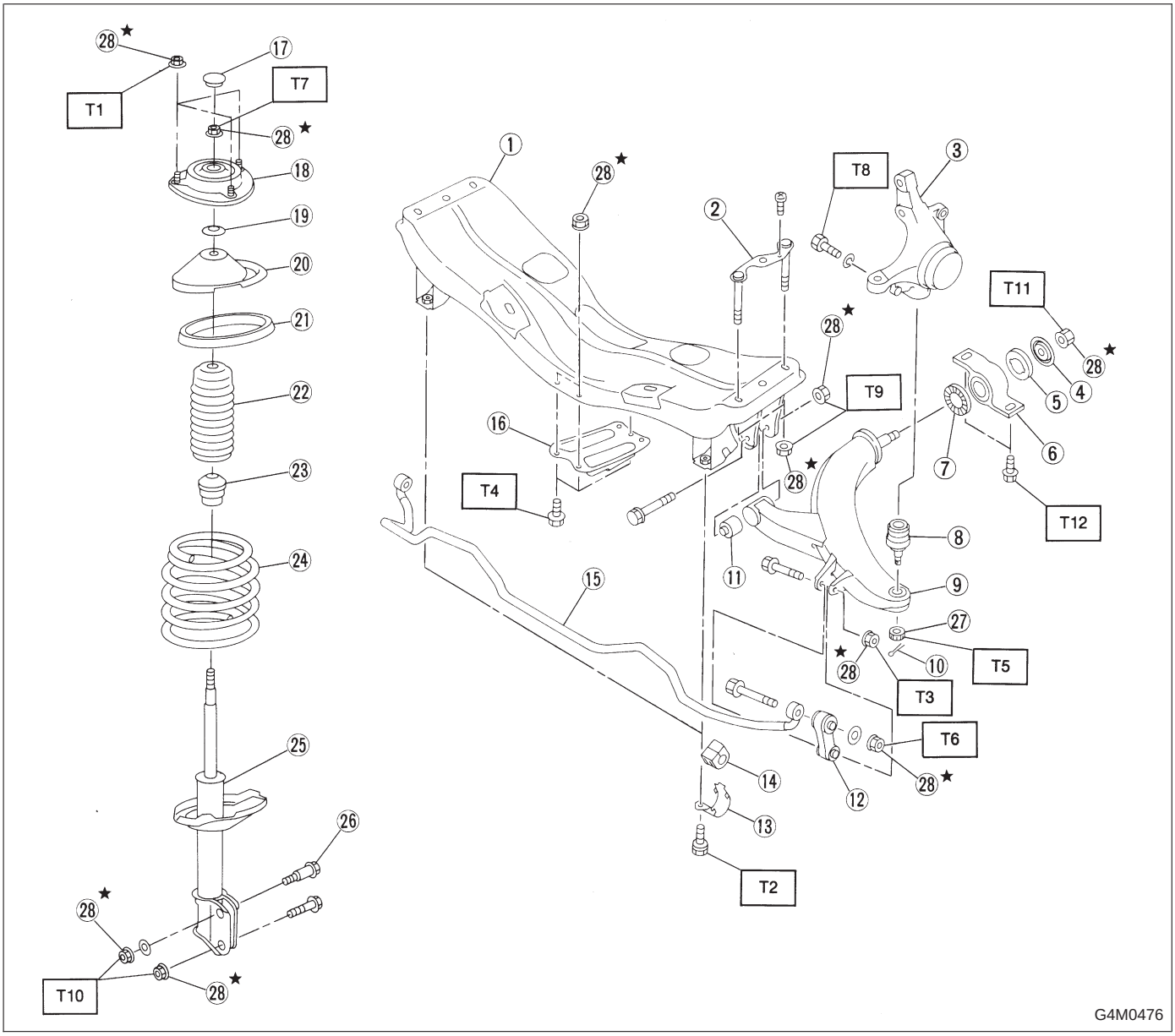
B: WHEEL ALIGNMENT

		Sedan, Coupe	Wagon	OUTBACK
		AWD	AWD	AWD
Front	Camber (tolerance: ±0°30′)	0°	0°	0°
	Caster (common difference: ±1°)	3°	3°	3°
	Toe-in mm (in)	0±3 (0±0.12) Toe-in angle: −0°09′ [when toe-in is −3 (−0.12)] Toe-out angle: 0°09′ [when toe-out is 3 (0.12)]		
	Kingpin angle	14°	14°	14°
	Wheel arch height [tolerance: $^{+12}_{-24}$ mm ($^{+0.47}_{-0.94}$ in)] mm (in)	391 (15.39)	391 (15.39)	394 (15.51)
Rear	Camber (tolerance: ±0°45′)	−0°55′	−0°55′	−0°55′
	Toe-in mm (in)	0±3 (0±0.12) Total toe angle: 0°±18′		
	Wheel arch height [tolerance: ±10 mm (±0.39 in)] mm (in)	379 (14.92)	379 (14.92)	386 (15.20)
	Thrust angle (tolerance: 0°±20′)	0°	0°	0°



NOTE:
- Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the specification.
- The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; and replace with new ones as required.

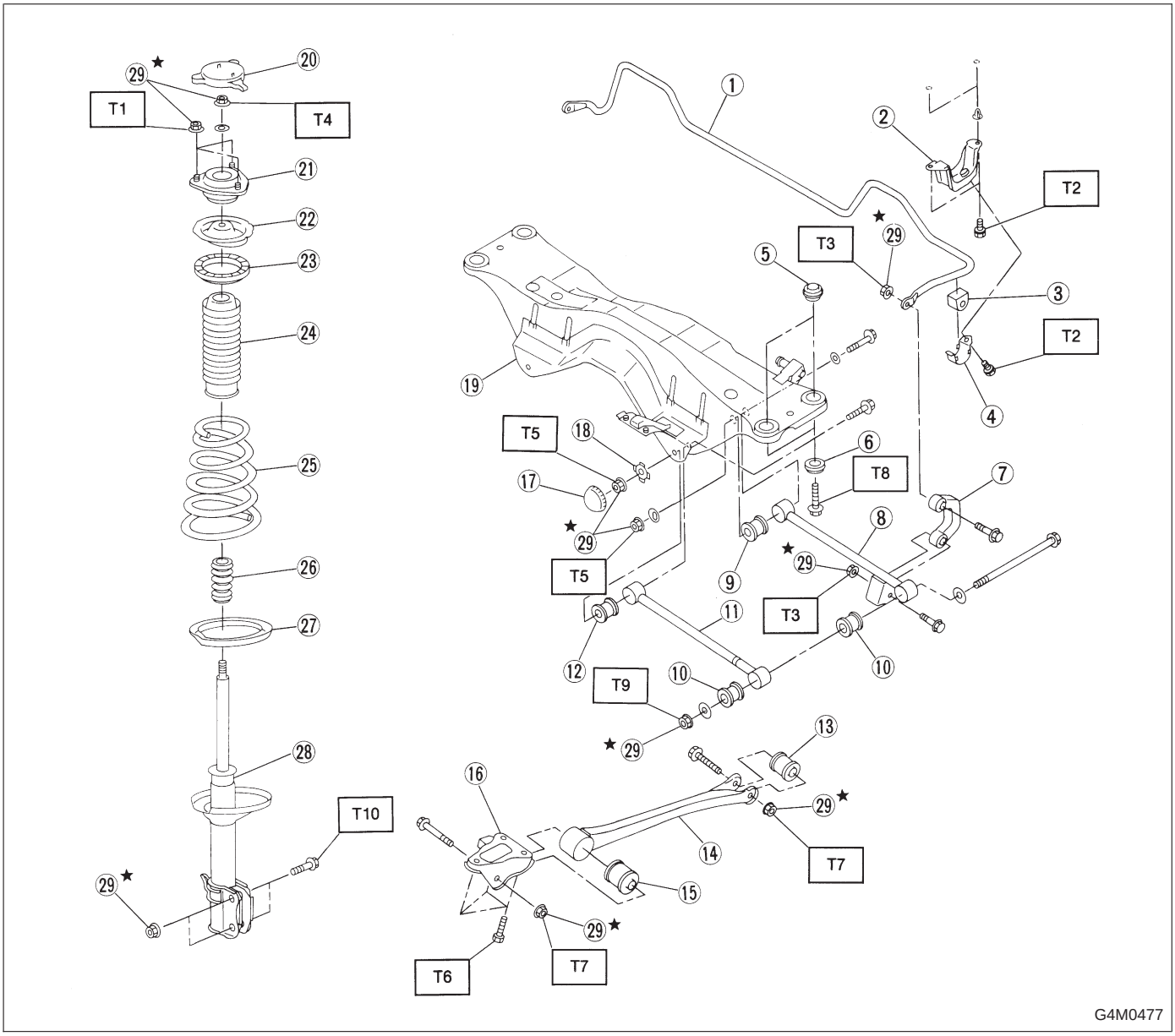
1. Front Suspension



① Crossmember
② Bolt ASSY
③ Housing
④ Washer
⑤ Stop rubber (Rear)
⑥ Rear bushing
⑦ Stop rubber (Front)
⑧ Ball joint
⑨ Transverse link
⑩ Cotter pin
⑪ Front bushing
⑫ Stabilizer link
⑬ Clamp
⑭ Bushing
⑮ Stabilizer
⑯ Jack-up plate
⑰ Dust seal
⑱ Strut mount
⑲ Spacer
⑳ Upper spring seat
㉑ Rubber seat
㉒ Dust cover
㉓ Helper
㉔ Coil spring
㉕ Damper strut
㉖ Adjusting bolt
㉗ Castle nut
㉘ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 25±4 (2.5±0.4, 18.1±2.9)
T3: 29±5 (3.0±0.5, 21.7±3.6)
T4: 32±10 (3.3±1.0, 24±7)
T5: 39 (4, 29)
T6: 44±6 (4.5±0.6, 32.5±4.3)
T7: 49^{+10}_{0} (5.0^{+10}_{0}, 36^{+7}_{0})
T8: 49±10 (5.0±1.0, 36±7)
T9: 98±15 (10.0±1.5, 72±11)
T10:152±20 (15.5±2.0, 112±14)
T11:196±25 (20.0±2.5, 145±18)
T12:245±49 (25.0±5.0, 181±36)

2. Rear Suspension



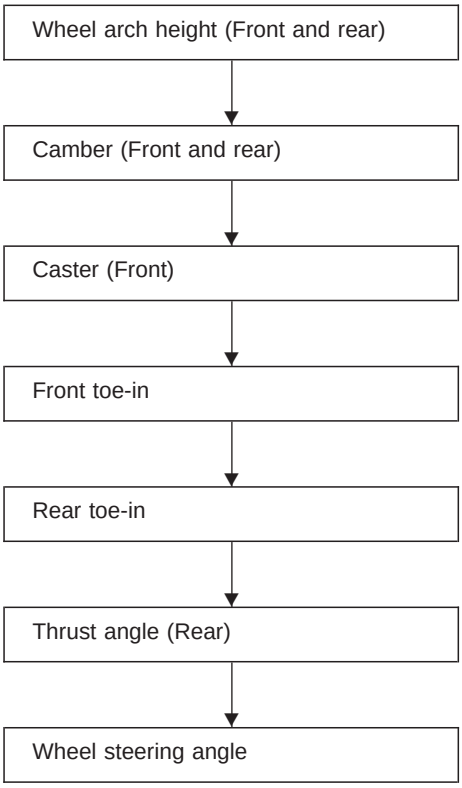
① Stabilizer
② Stabilizer bracket
③ Stabilizer bushing
④ Clamp
⑤ Floating bushing
⑥ Stopper
⑦ Stabilizer link
⑧ Rear lateral link
⑨ Bushing (C)
⑩ Bushing (A)
⑪ Front lateral link
⑫ Bushing (B)
⑬ Trailing link rear bushing
⑭ Trailing link
⑮ Trailing link front bushing
⑯ Trailing link bracket
⑰ Cap
⑱ Washer
⑲ Crossmember
⑳ Cap
㉑ Strut mount
㉒ Spring seat
㉓ Rubber seat upper
㉔ Dust cover
㉕ Coil spring
㉖ Helper
㉗ Rubber seat lower
㉘ Damper strut
㉙ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 25±7 (2.5±0.7, 18.1±5.1)
T3: 44±6 (4.5±0.6, 32.5±4.3)
T4: 59±10 (6.0±1.0, 43±7)
T5: 98±15 (10.0±1.5, 72±11)
T6: 98±20 (10.0±2.0, 72±14)
T7: 113±15 (11.5±1.5, 83±11)
T8: 127±20 (13.0±2.0, 94±14)
T9: 137±20 (14.0±2.0, 101±14)
T10: 196^{+39}_{-10} ($20.0^{+4.0}_{-1.0}$, 145^{+29}_{-7})

1. On-car Services

A: WHEEL ALIGNMENT PROCEDURES

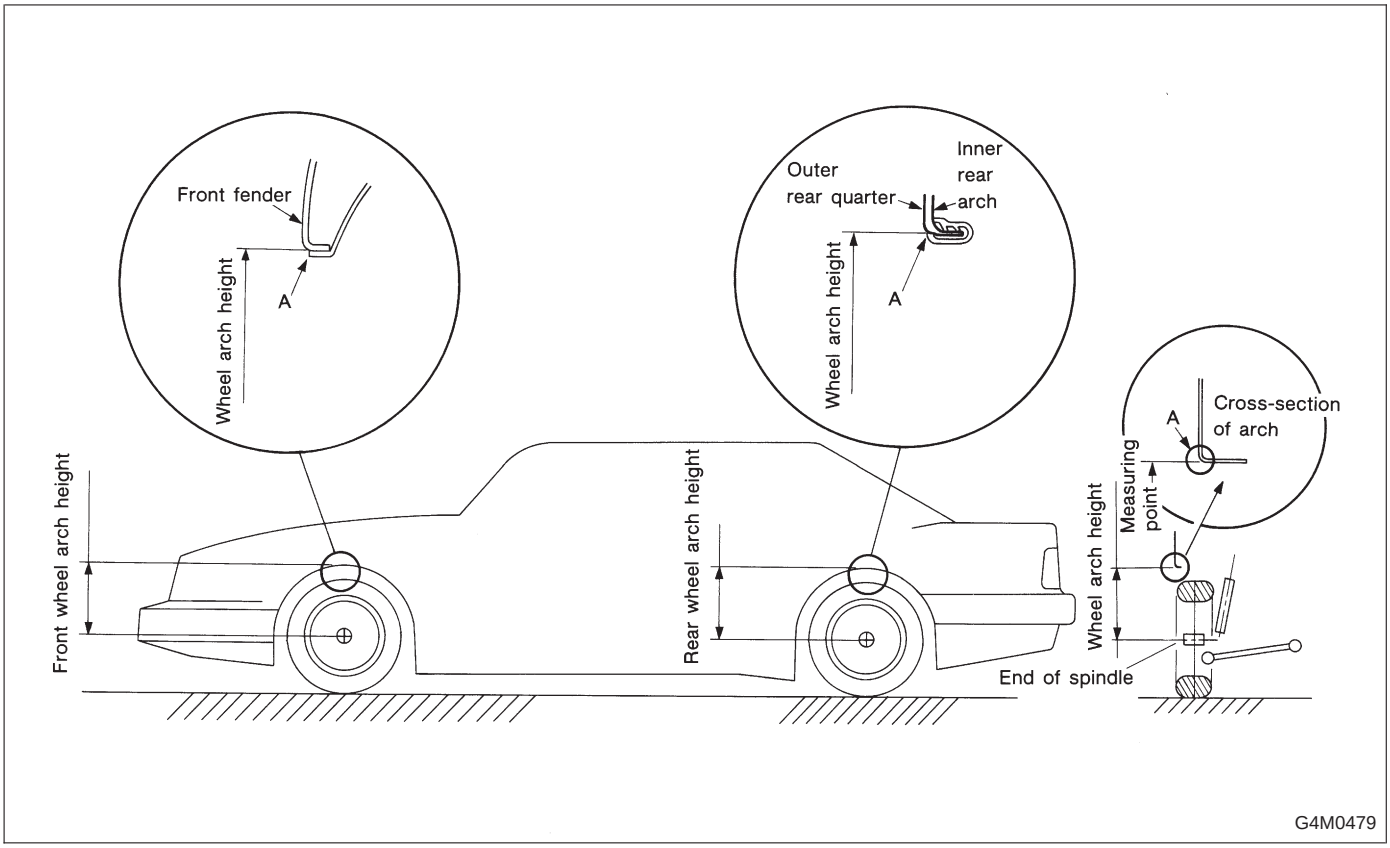
Check, adjust and/or measure wheel alignment in accordance with procedures indicated below:



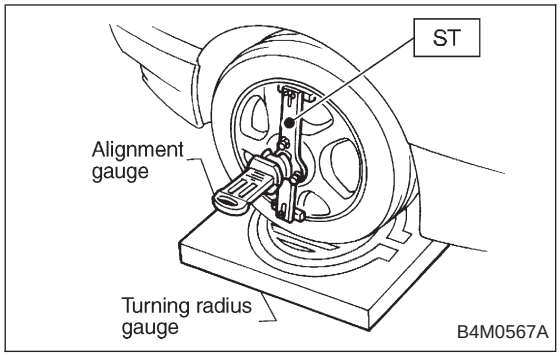
B: INSPECTION AND ADJUSTMENT

1. WHEEL ARCH HEIGHT

1) Adjust tire pressure to specifications.
2) Set vehicle under “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set steering wheel in a wheel-forward position.
4) Suspend thread from wheel arch (point “A” in figure below) to determine a point directly above center of spindle.
5) Measure distance between measuring point “A” and center of spindle.



Vehicles		Specified wheel arch height mm (in)	
		Front	Rear
Coupe, Sedan	AWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	379^{+12}_{-24} ($14.92^{+0.47}_{-0.94}$)
Wagon	AWD	391^{+12}_{-24} ($15.39^{+0.47}_{-0.94}$)	379^{+12}_{-24} ($14.92^{+0.47}_{-0.94}$)
OUTBACK	AWD	394^{+12}_{-24} ($15.51^{+0.47}_{-0.94}$)	386^{+12}_{-24} ($15.20^{+0.47}_{-0.94}$)



2. CAMBER (FRONT AND REAR)

● Inspection

1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set ST into the center of the wheel, and then install the wheel alignment gauge.

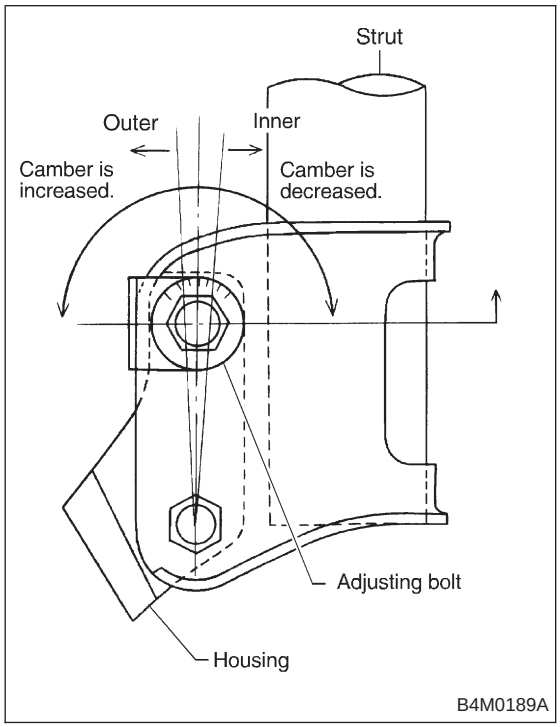
ST 927380000 ADAPTER

NOTE:
Refer to the “SPECIFICATIONS AND SERVICE DATA” for the camber values. <Ref. to 4-1 [S1B0].>

● Front camber adjustment

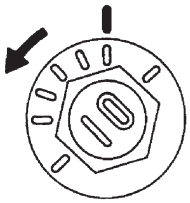
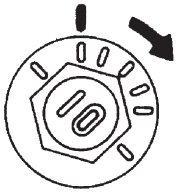
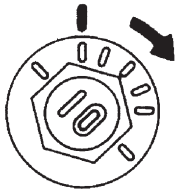
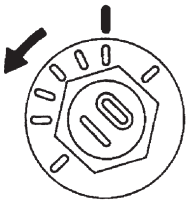
1) Loosen two self-locking nuts located at lower front portion of strut.

CAUTION:
● When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.
● Discard loosened self-locking nut and replace with a new one.



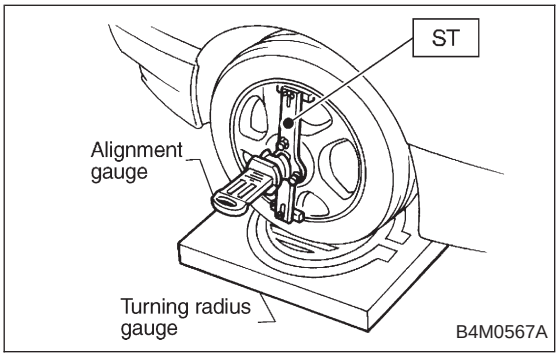
2) Turn camber adjusting bolt so that camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approximately 0°10′.

	Left side	Right side
Camber is increased.	 B4M0190 Rotate counterclockwise.	 B4M0350 Rotate clockwise.
Camber is decreased.	 B4M0350 Rotate clockwise.	 B4M0190 Rotate counterclockwise.

3) Tighten the two self-locking nuts.

Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)



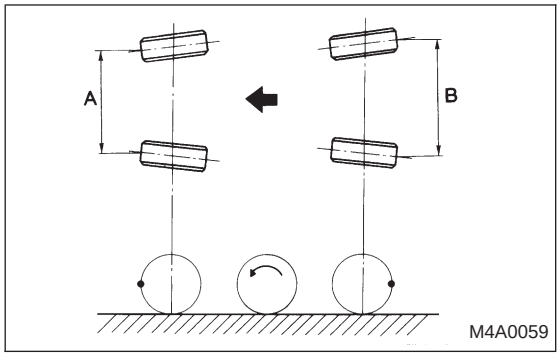
3. CASTER

● Inspection

1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set ST into the center of the wheel, and then install the wheel alignment gauge.

ST 927380000 ADAPTER

NOTE:
Refer to the “SPECIFICATIONS AND SERVICE DATA” for the caster value. <Ref. to 4-1 [S1B0].>



4. FRONT WHEEL TOE-IN

● Inspection

1) Using a toe gauge, measure front wheel toe-in.

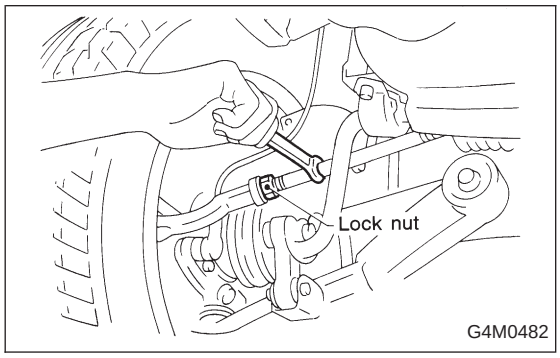
Toe-in: 0±3 mm (0±0.12 in)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “B” between marks.

3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure distance “A” between left and right marks. Toe-in can then be obtained by the following equation:

B − A = Toe-in



● Adjustment

1) Loosen the left and right side steering tie-rods lock nuts.

2) Turn the left and right tie rods equal amounts until the toe-in is at the specification.

Both the left and right tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from the inside of the vehicle).

3) Tighten tie-rod lock nut.

Tightening torque:

83±5 N·m (8.5±0.5 kg-m, 61.5±3.6 ft-lb)

CAUTION:

Correct tie-rod boot, if it is twisted.

NOTE:

Check the left and right wheel steering angle is within specifications.

5. REAR WHEEL TOE-IN

● Inspection

1) Using a toe-in gauge, measure rear wheel toe-in.

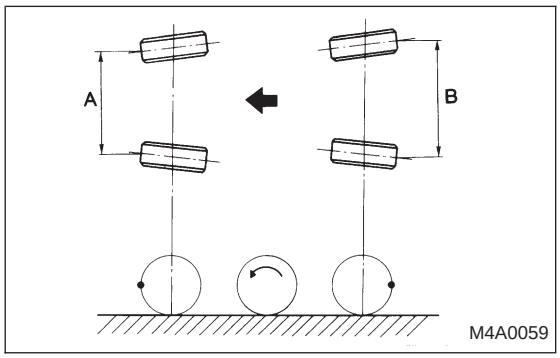
Toe-in: 0±3 mm (0±0.12 in)

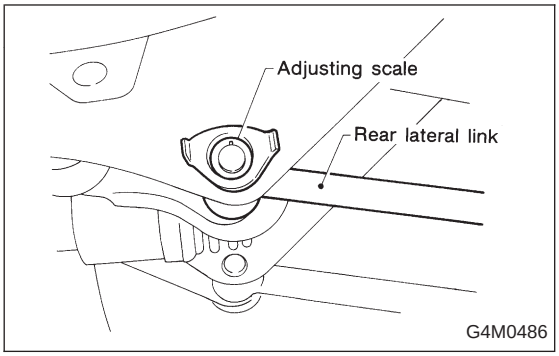
2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “B” between marks.

3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure distance “A” between left and right marks. Toe-in can then be obtained by the following equation:

B − A = Toe-in





● Adjustment

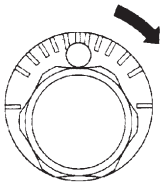
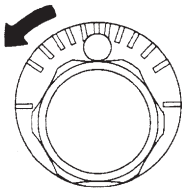
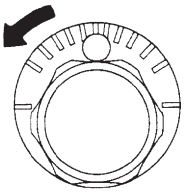
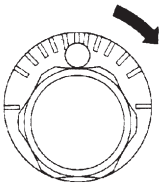
1) Loosen self-locking nut on inner side of rear lateral link.

CAUTION:

● When loosening or tightening adjusting bolt, hold bolt head and turn self-locking nut.

● Discard loosened self-locking nut and replace with a new one.

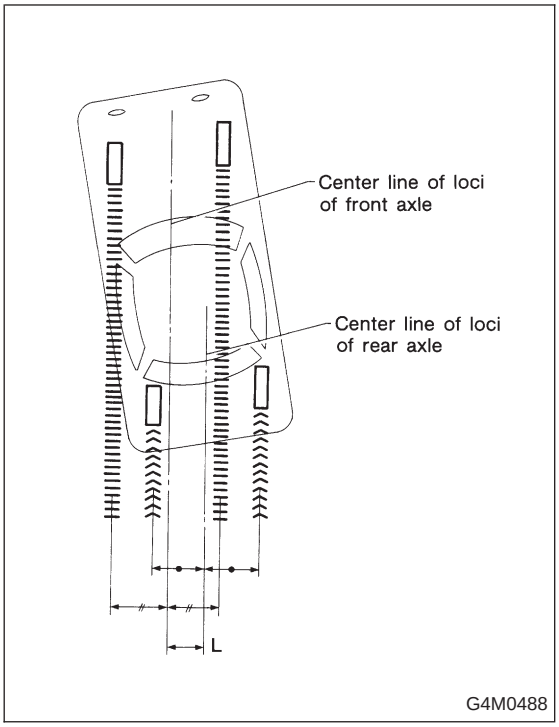
2) Turn adjusting bolt head until toe-in is at the specification.

	Left side	Right side
Toe-in is increased.	 Rotate clockwise. B4M0192	 Rotate counterclockwise. B4M0352
Toe-in is decreased.	 Rotate counterclockwise. B4M0352	 Rotate clockwise. B4M0192

NOTE:
When left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approximately 3 mm (0.12 in).

3) Tighten self-locking nut.

Tightening torque:
98±15 N·m (10±1.5 kg-m, 72±11 ft-lb)



6. THRUST ANGLE

● Inspection

1) Position vehicle on a level surface.
2) Move vehicle 3 to 4 meters directly forward.
3) Determine locus of both front and rear axles.
4) Measure distance “L” between center line of loci of the axles.

Thrust angle:

Less than 20’ when “L” is equal to or less than 15 mm (0.59 in).

● Adjustment

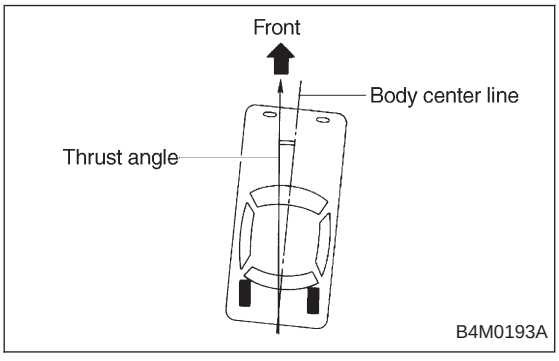
1) Make thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.

NOTE:
On FWD models, turn adjusting wheels one by one, by the some amount in the opposite direction of the adjusting bolts.

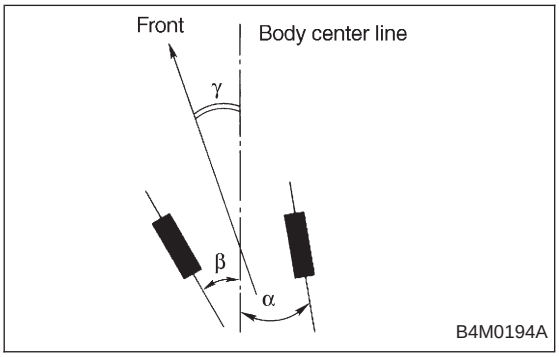
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When left and right adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle of the AWD model will change approximately 10’ [“L” is almost equal to 7.5 mm (0.295 in)] and the thrust angle of the FWD model will change approximately 12’ [“L” is almost equal to 9 mm (0.35 in)].

Thrust angle:

0°±20′



NOTE:
Thrust angle refers to a mean value of left and right rear wheel toe angles in relation to vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.



Thrust angle: r

$$r = \frac{\alpha - \beta}{2}$$

α: Right rear wheel toe angle
β: Left rear wheel toe angle

NOTE:
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.

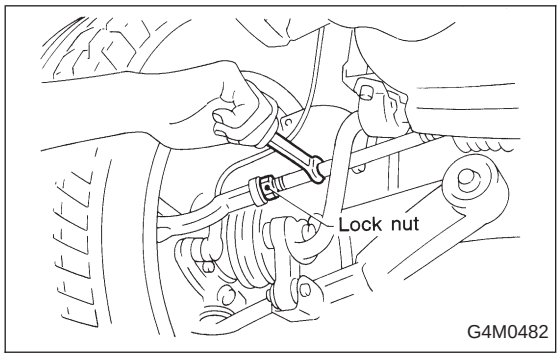
7. STEERING ANGLE

● Inspection

1) Place vehicle on a turning radius gauge.
2) While depressing brake pedal, turn steering wheel fully to the left and right. With steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Steering angle:

Inner wheel	***37.4°±1.5°***
Outer wheel	***32.5°±1.5°***



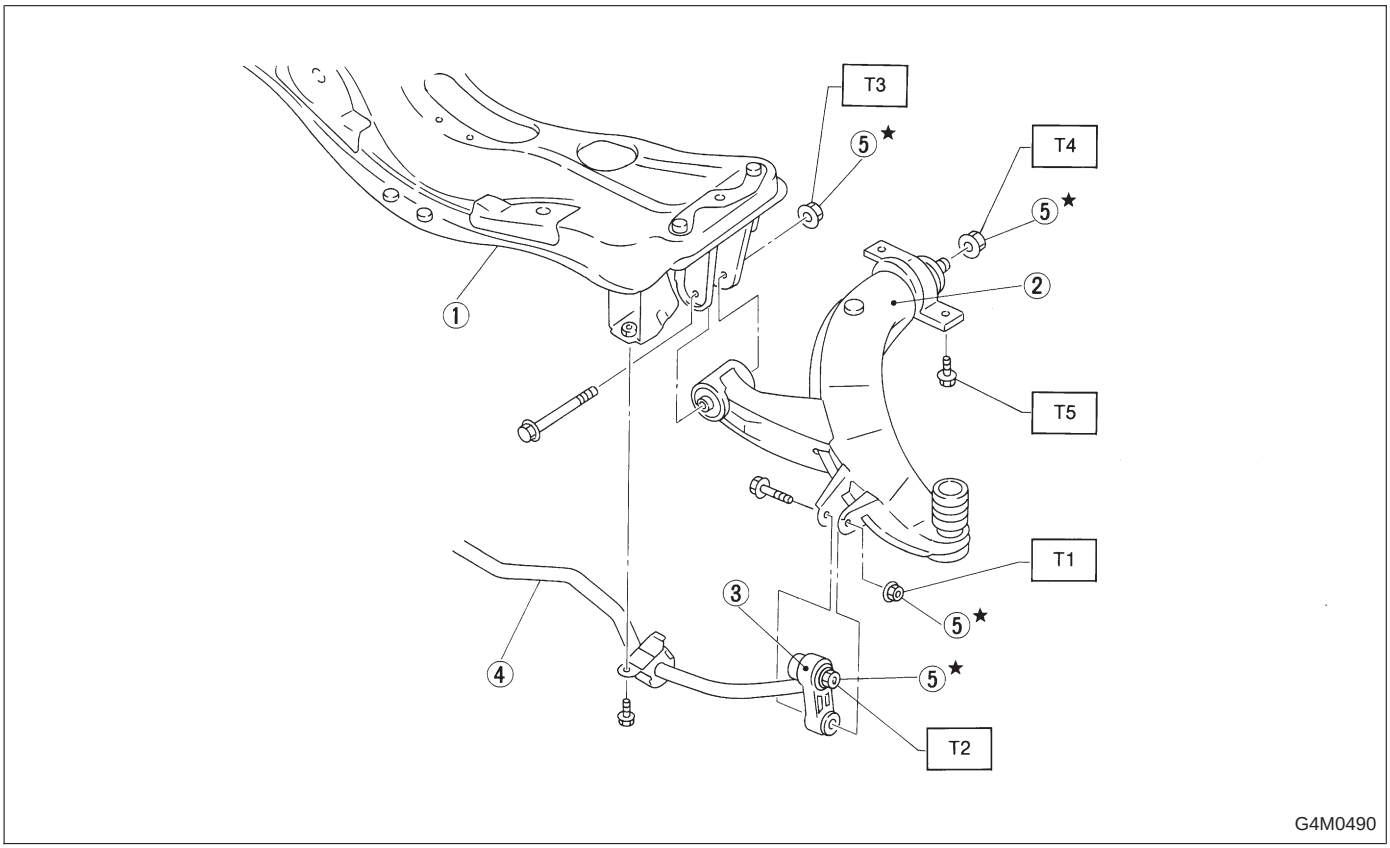
● Adjustment

Turn tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:
- **Check toe-in.**
- **Correct boot if it is twisted.**

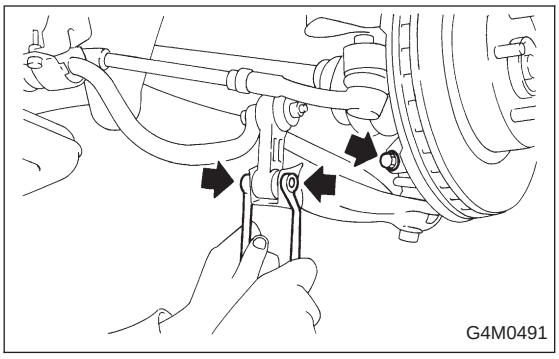
2. Front Transverse Link

A: REMOVAL

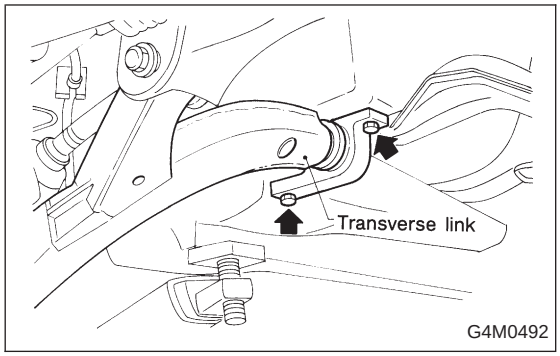


① Front crossmember
② Transverse link
③ Stabilizer link
④ Front stabilizer
⑤ Self-locking nut

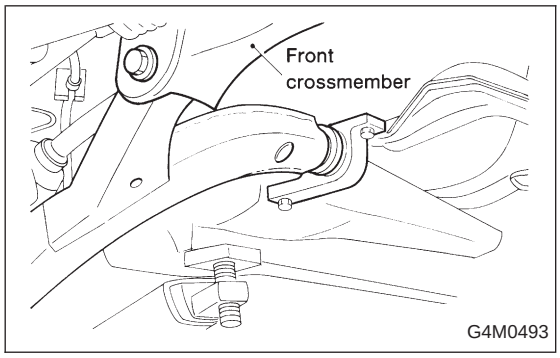
Tightening torque: N·m (kg-m, ft-lb)
T1: 29±5 (3.0±0.5, 21.7±3.6)
T2: 44±6 (4.5±0.6, 32.5±4.3)
T3: 98±15 (10.0±1.5, 72±11)
T4: 196±25 (20.0±2.5, 145±18)
T5: 245±49 (25.0±5.0, 181±36)



1) Disconnect stabilizer link from transverse link.
2) Remove bolt securing ball joint of transverse link to housing.



3) Remove nuts (do not remove bolts.) securing transverse link to crossmember.
4) Remove two bolts securing bushing bracket of transverse link to car body at rear bushing location.



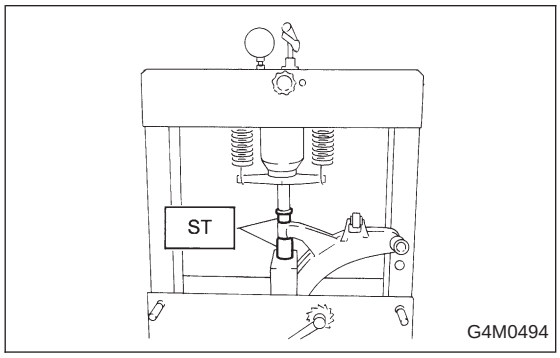
5) Extract ball joint from housing.
6) Remove bolts securing transverse link to crossmember and extract transverse link from crossmember.

B: DISASSEMBLY

1. FRONT BUSHING

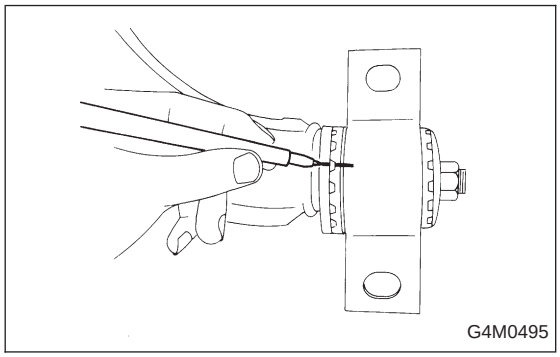
Using ST, press front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



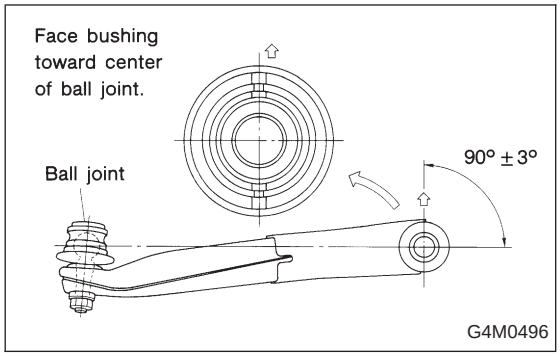
2. REAR BUSHING

1) Scribe an aligning mark on transverse link and rear bushing.
2) Loosen nut and remove rear bushing.



C: INSPECTION

1) Check transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check bushings for cracks, fatigue or damage.
3) Check rear bushing for oil leaks.



D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

CAUTION:
Install front bushing in correct direction, as shown in figure.

2. REAR BUSHING

1) Install rear bushing to transverse link and align aligning marks scribed on the two.
2) Tighten self-locking nut.

CAUTION:
- **Discard loosened self-locking nut and replace with a new one.**
- **While holding rear bushing so as not to change position of aligning marks, tighten self-locking nut.**

Tightening torque:
196±25 N·m (20.0±2.5 kg-m, 145±18 ft-lb)

E: INSTALLATION

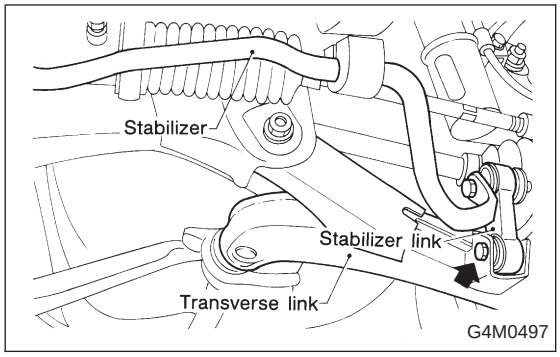
1) Temporarily tighten the two bolts used to secure rear bushing of the transverse link to body.

NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install bolts used to connect transverse link to cross-member and temporarily tighten with nuts.

CAUTION:
Discard loosened self-locking nut and replace with a new one.

3) Insert ball joint into housing.



4) Connect stabilizer link to transverse link, and temporarily tighten bolts.

CAUTION:
Discard loosened self-locking nut and replace with a new one.

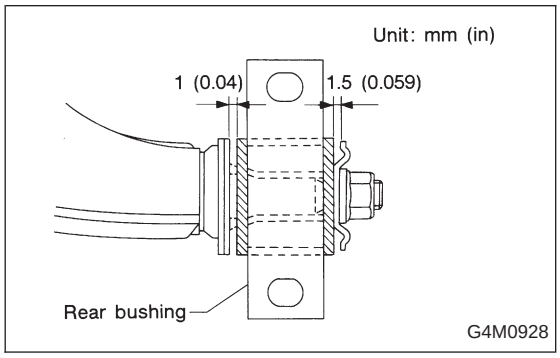
5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is curb weight.

(1) Transverse link and stabilizer

Tightening torque:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

(2) Transverse link and crossmember

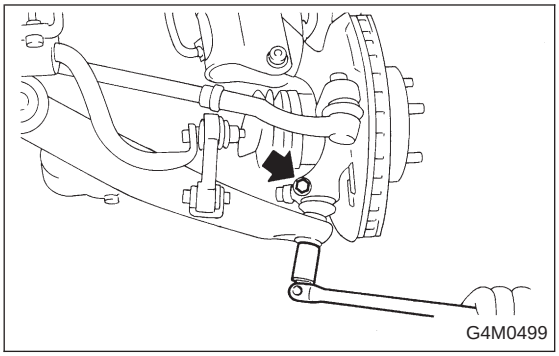
Tightening torque:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)



(3) Transverse link rear bushing and body

Tightening torque:
245±49 N·m (25±5 kg-m, 181±36 ft-lb)

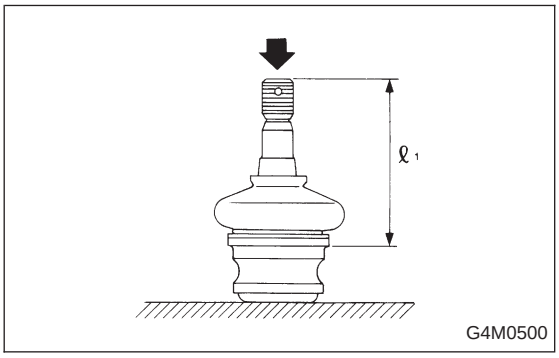
NOTE:
Move rear bushing back and forth until transverse link- to-rear bushing clearance is established (as indicated in figure.) before tightening.


G4M0499

3. Front Ball Joint

A: REMOVAL

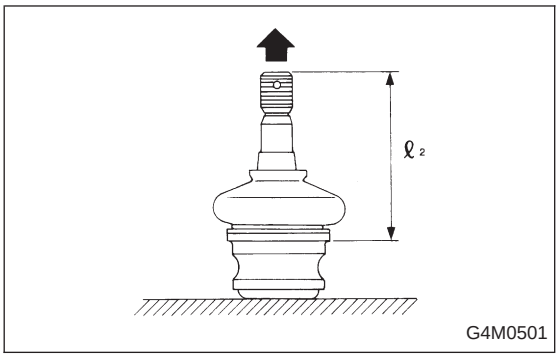
1) Remove the wheels.
2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
3) Remove the bolt securing the ball joint to the housing.
4) Extract the ball joint from the housing.



G4M0500

B: INSPECTION

1) Measure play of ball joint by the following procedures. Replace with a new one when the play exceeds the specified value.
   (1) With 686 N (70 kg, 154 lb) loaded in the direction shown in the figure, measure dimension ℓ_1.



G4M0501

   (2) With 686 N (70 kg, 154 lb) loaded in the opposite direction shown in the figure, measure dimension ℓ_2.
   (3) Calculate plays from the following formula.
   $S = \ell_2 - \ell_1$
   (4) When plays is larger than the following value, replace with a new one.

FRONT BALL JOINT
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

2) When play is smaller than the specified value, visually inspect the dust cover.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
4) If the dust cover is damaged, replace with the new ball joint.

C: INSTALLATION

1) Install ball joint onto housing.

Torque (Bolt):
49 N·m (5.0 kg-m, 36 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

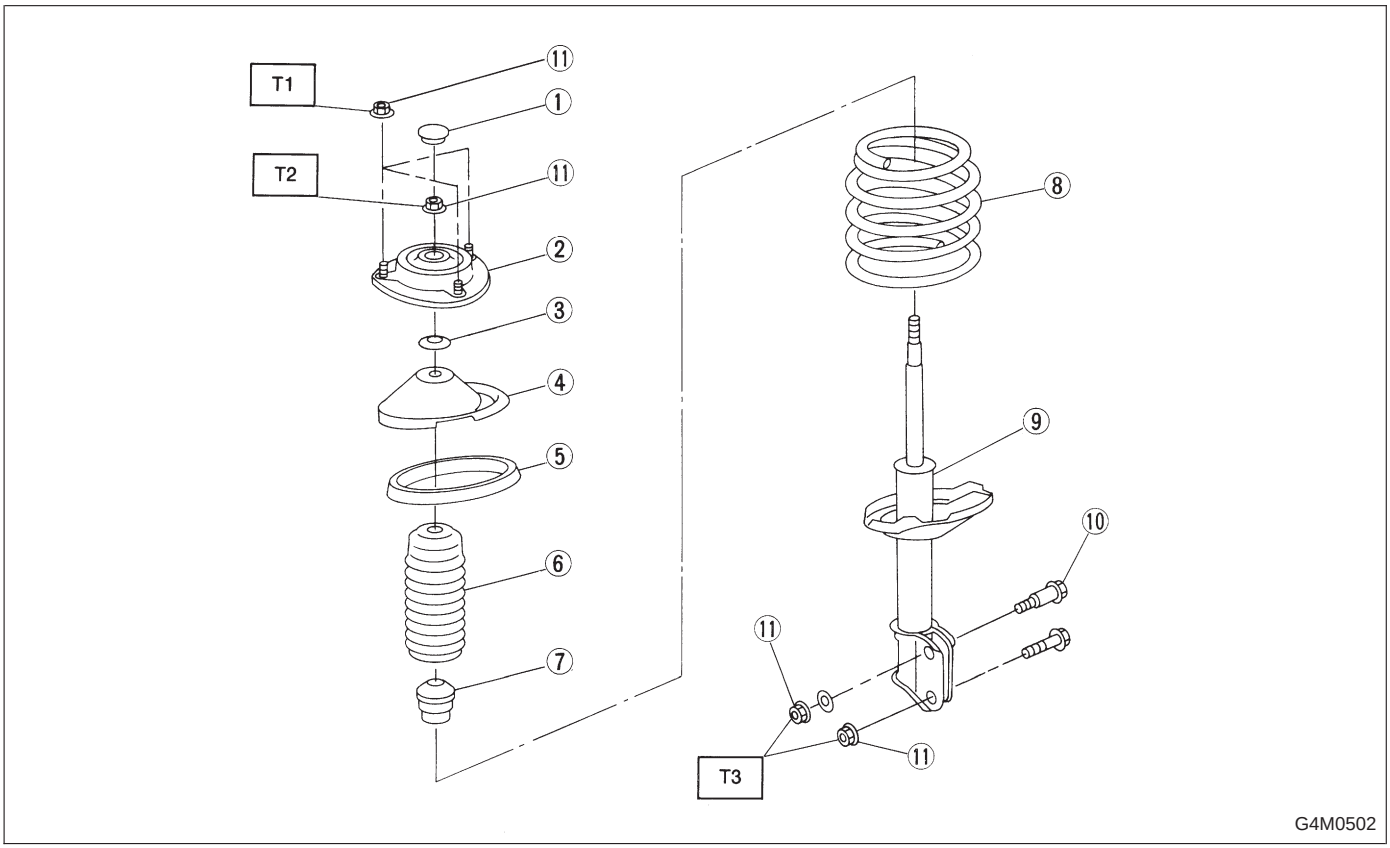
2) Connect ball joint to transverse link.

Torque (Castle nut):
39 N·m (4.0 kg-m, 29 ft-lb)

3) Retighten castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert new cotter pin and bend it around castle nut.
4) Install front wheels.

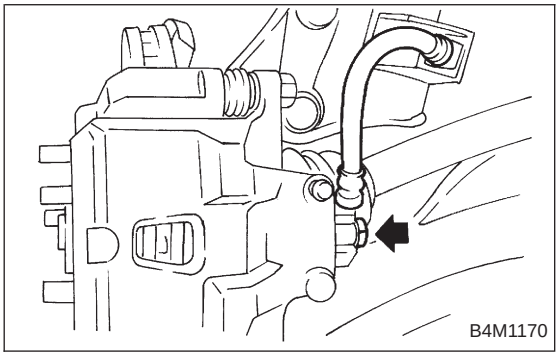
4. Front Strut

A: REMOVAL



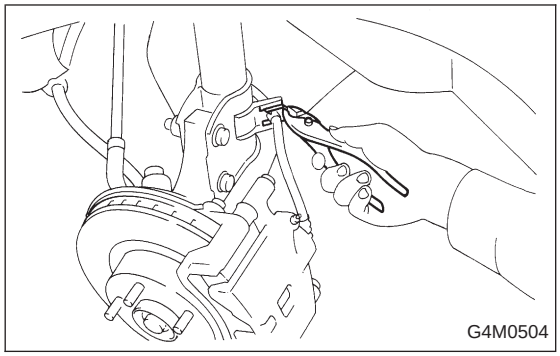
① Dust seal
② Strut mount
③ Spacer
④ Upper spring seat
⑤ Rubber seat
⑥ Dust cover
⑦ Helper
⑧ Coil spring
⑨ Damper strut
⑩ Adjusting bolt
⑪ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 49^{+10}_{-0} (5.0^{+10}_{-0}, 36^{+7}_{-0})
T3: 152±20 (15.5±2.0, 112±14)

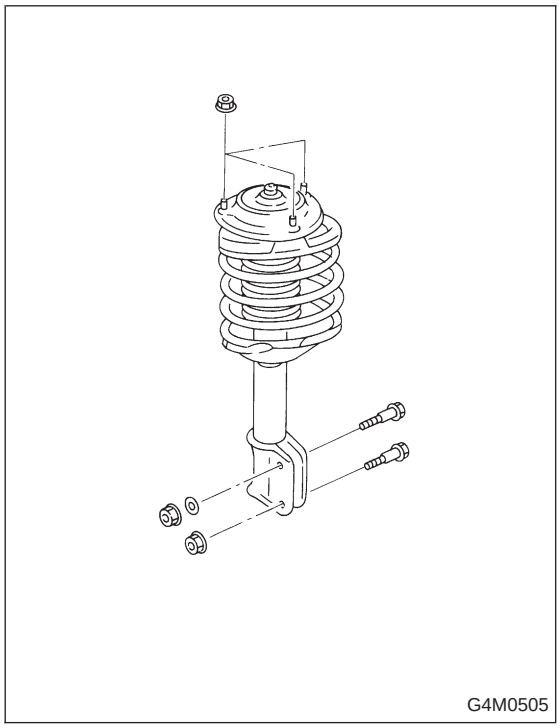


1) Remove wheel.
2) Depress brake pedal and hold it down using a wooden block etc.
3) Remove union bolts from caliper.

CAUTION:
Use brake hose cap to prevent brake fluid from escaping.


G4M0504

4) Remove brake hose clamp and disconnect brake hose from strut. Attach brake hose to body using gum tape.
5) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
6) Remove bolt securing the ABS sensor harness on models equipped with ABS.

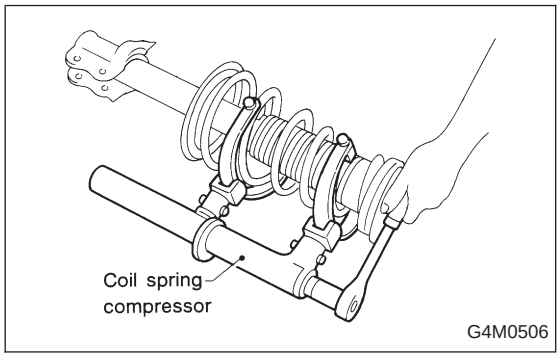

G4M0505

7) Remove two bolts securing housing to strut.

CAUTION:
While holding head of adjusting bolt, loosen self-locking nut.

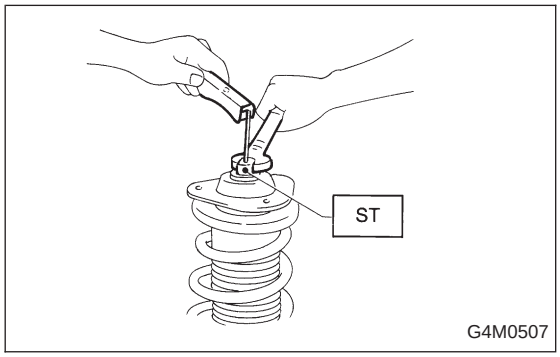
8) Remove the three nuts securing strut mount to body.

B: DISASSEMBLY



G4M0506

1) Using a coil spring compressor, compress coil spring.



G4M0507

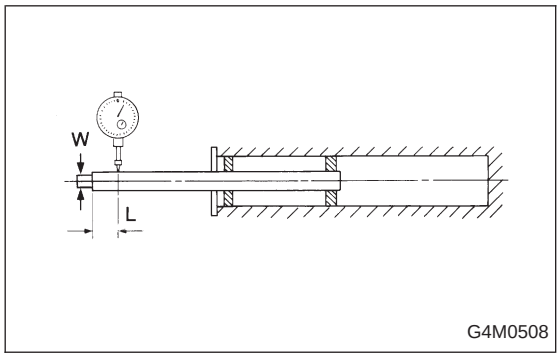
2) Using ST, remove self-locking nut.

ST 927760000 STRUT MOUNT SOCKET

3) Remove strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing compression force, and remove coil spring.
5) Remove dust cover and helper spring.

C: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.



1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check its operates smoothly without any binding.
3) Play of piston rod

● Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of the rod: L [10 mm (0.39 in)], then apply a force of: W [±20 N (±2 kg, ±4 lb)] to threaded portion. With the force of ±20 N (±2 kg, ±4 lb) applied, read both dial gauge readings, P_1 and P_2. The free play is determined by the following equation:

Limit of play:
Less than 0.8 mm (0.031 in)

If the play is greater, replace the strut.

2. STRUT MOUNT

Check rubber part for creep, cracks and deterioration, and replace it with new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

One having permanent strain should be replaced with a new one. When vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check coil spring for its free length, cracks, etc., referring to specifications, and replace it with a new one if defective.

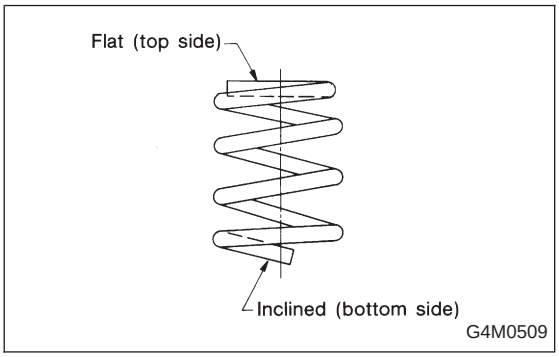
5. HELPER

Replace it with new one if cracked or damaged.

D: ASSEMBLY

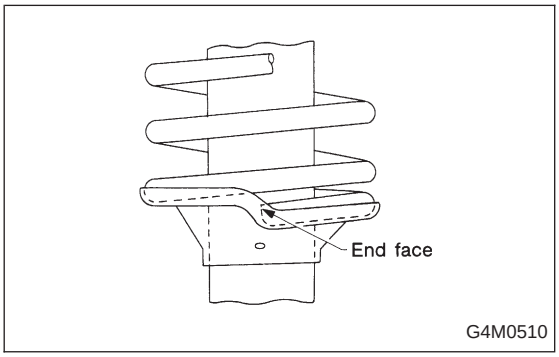
1) Before installing coil spring, strut mount, etc., on the strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in step (3), purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with the piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat steps (1) through (4) above 3 or 4 times.

NOTE:
After completely purging air from the strut, be sure to place the strut with the piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under item 2) above.

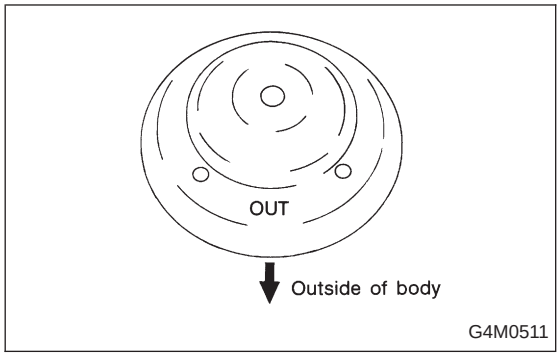


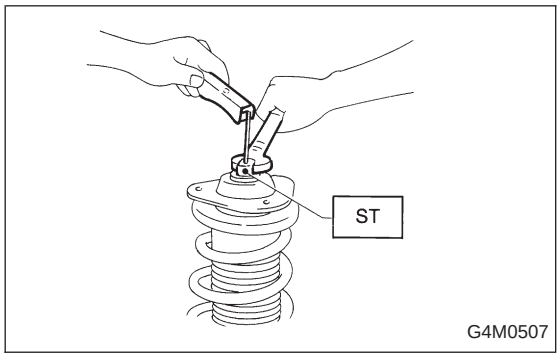
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical installing direction of coil spring is as shown in figure.



5) Set the coil spring correctly so that its end face fits well into the spring seat as shown.
6) Install helper and dust cover to the piston rod.





7) Pull the piston rod fully upward, and install rubber seat and spring seat.

NOTE:
Ensure that upper spring seat is positioned with “OUT” mark facing outward.

8) Install strut mount to the piston rod, and tighten the self-locking nut temporarily.

CAUTION:
Be sure to use a new self-locking nut.

9) Loosen the coil spring carefully.

10) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.

Tightening torque:
49^{+10}_{-0} N·m ($5.0^{+1.0}_{-0}$ kg-m, 36^{+7}_{-0} ft-lb)

ST 927760000 STRUT MOUNT SOCKET

E: INSTALLATION

1) Install upper strut mount at upper side of strut to body and tighten with nuts.

Tightening torque:
20±6 N·m (2.0±0.6 kg-m, 14.5±4.3 ft-lb)

2) Install ABS sensor harness to strut. (ABS equipped models)

Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)

3) Position aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:
- **While holding head of adjusting bolt, tighten self-locking nut.**
- **Be sure to use new self-locking nut.**

Tightening torque:
152±20 N·m (15.5±2.0 kg-m, 112±14 ft-lb)

4) Install brake hose at lower side of strut with clamp.
5) Install union bolts which secure brake caliper to brake hose.

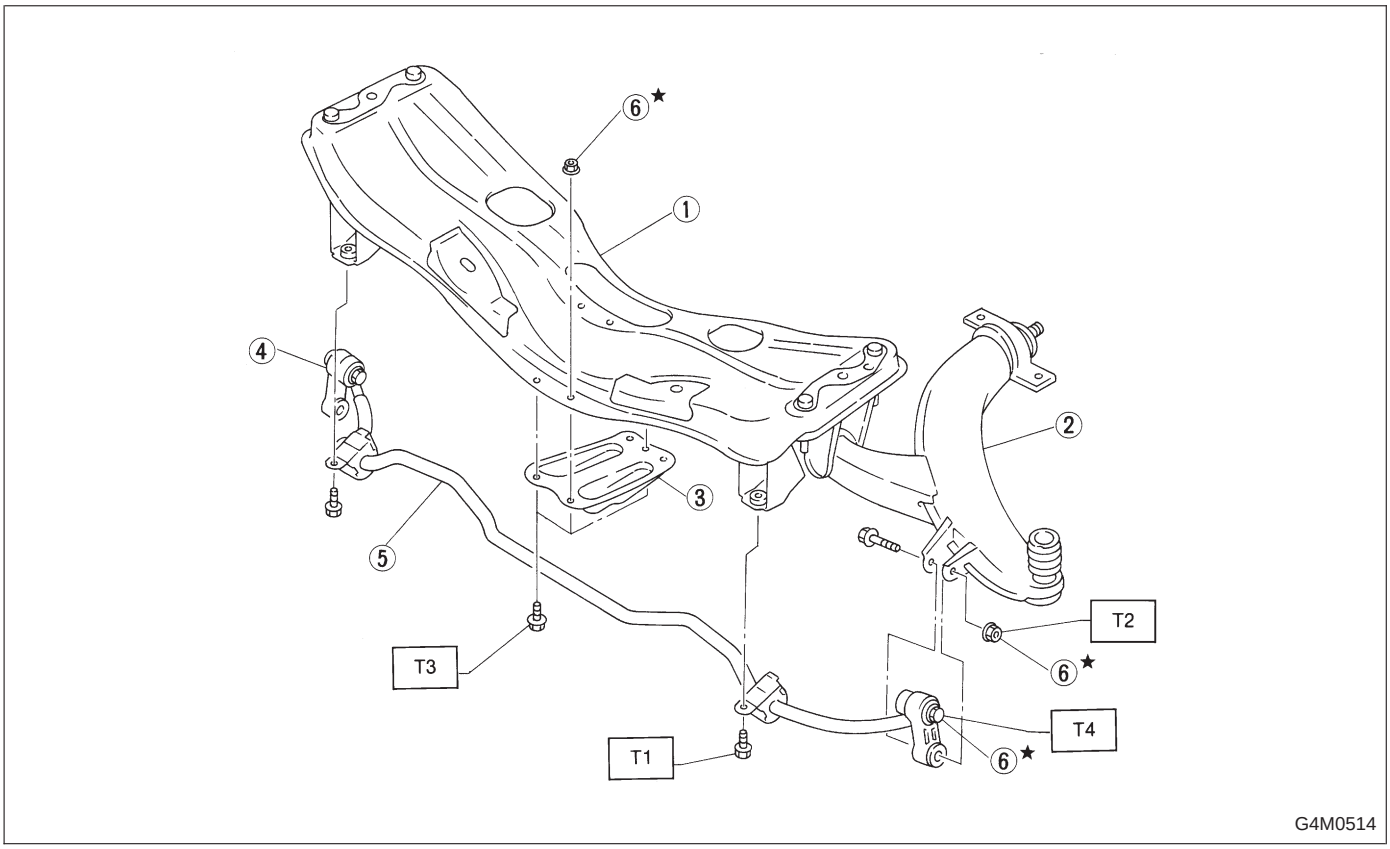
Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

CAUTION:
Be sure to bleed air from brake system.

6) Install wheels.

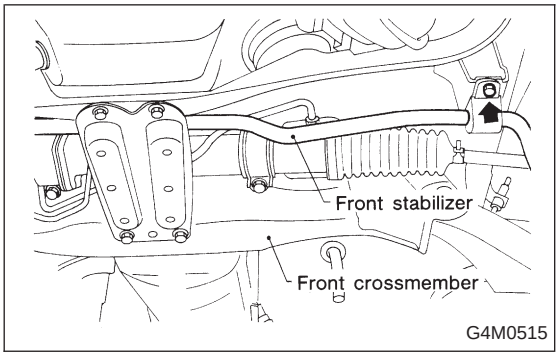
NOTE:
Check wheel alignment and adjust if necessary.

5. Front Stabilizer



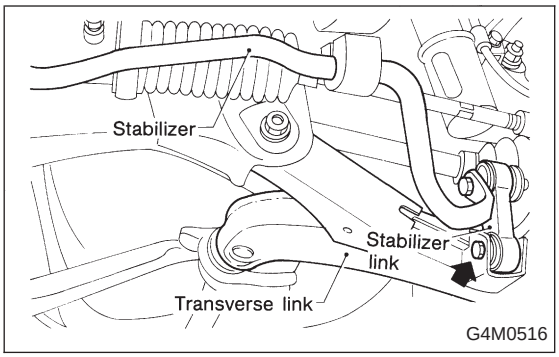
① Front crossmember
② Transverse link
③ Jack-up plate
④ Stabilizer link
⑤ Front stabilizer
⑥ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 25±4 (2.5±0.4, 18.1±2.9)
T2: 29±5 (3.0±0.5, 21.7±3.6)
T3: 32±10 (3.3±1.0, 24±7)
T4: 44±6 (4.5±0.6, 32.5±4.3)



A: REMOVAL

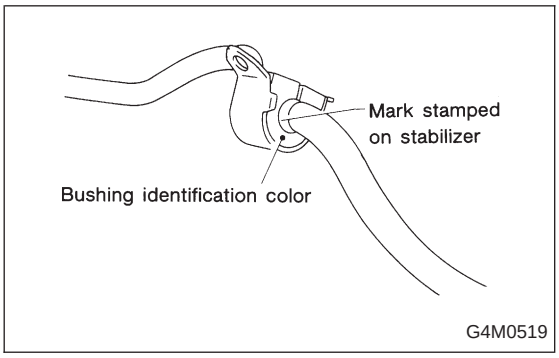
1) Jack-up the front part of the vehicle, support it with safety stands (rigid racks).
2) Remove bolts which secure stabilizer to crossmember.



3) Remove bolts which secure stabilizer link to front transverse link.
4) Remove jack-up plate from lower part of crossmember.

B: INSPECTION

1) Check bushing for cracks, fatigue or damage.
2) Check stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.



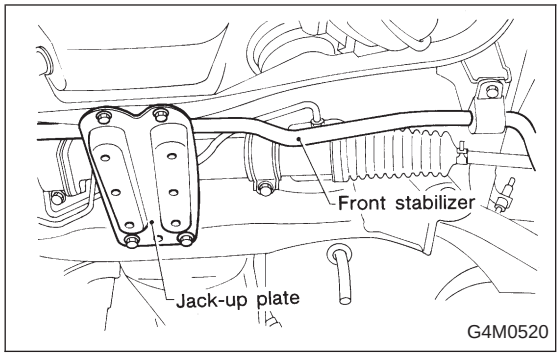
C: INSTALLATION

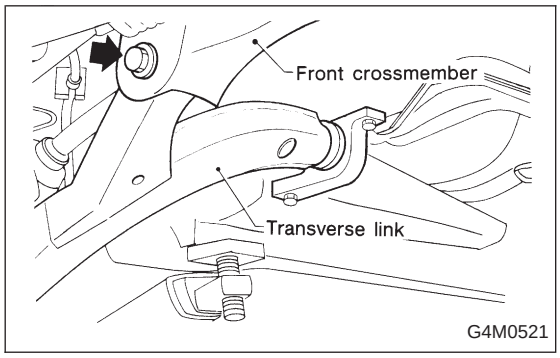
1) To install, reverse the removal procedure.

NOTE:
● Install bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
● Ensure that bushing and stabilizer have the same identification colors when installing.

2) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.
3) Tightening torque:

Jack-up plate to crossmember:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)
Stabilizer link to front transverse link:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)
Stabilizer to crossmember:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)





6. Front Crossmember

A: REMOVAL

1) Disconnect ground cable from battery.
2) Loosen front wheel nuts.
3) Jack-up vehicle, support it with safety stands (rigid racks), and remove front tires and wheels.
4) Remove both stabilizer and jack-up plate.
5) Disconnect tie-rod end from housing.
6) Remove front exhaust pipe.

7) Remove front transverse link from front crossmember.
8) Remove nuts attaching engine mount cushion rubber to crossmember.
9) Remove self-locking nuts connecting steering U/J and pinion shaft.
10) Lift engine by approx. 10 mm (0.39 in) by using chain block.
11) Support crossmember with a jack, remove nuts securing crossmember to body and lower crossmember gradually along with steering gearbox.

CAUTION:
When removing crossmember downward, be careful that tie-rod end does not interfere with DOJ boot.

B: INSTALLATION

1) Installation is in the reverse order of removal procedures.

CAUTION:
Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

2) Tightening torque

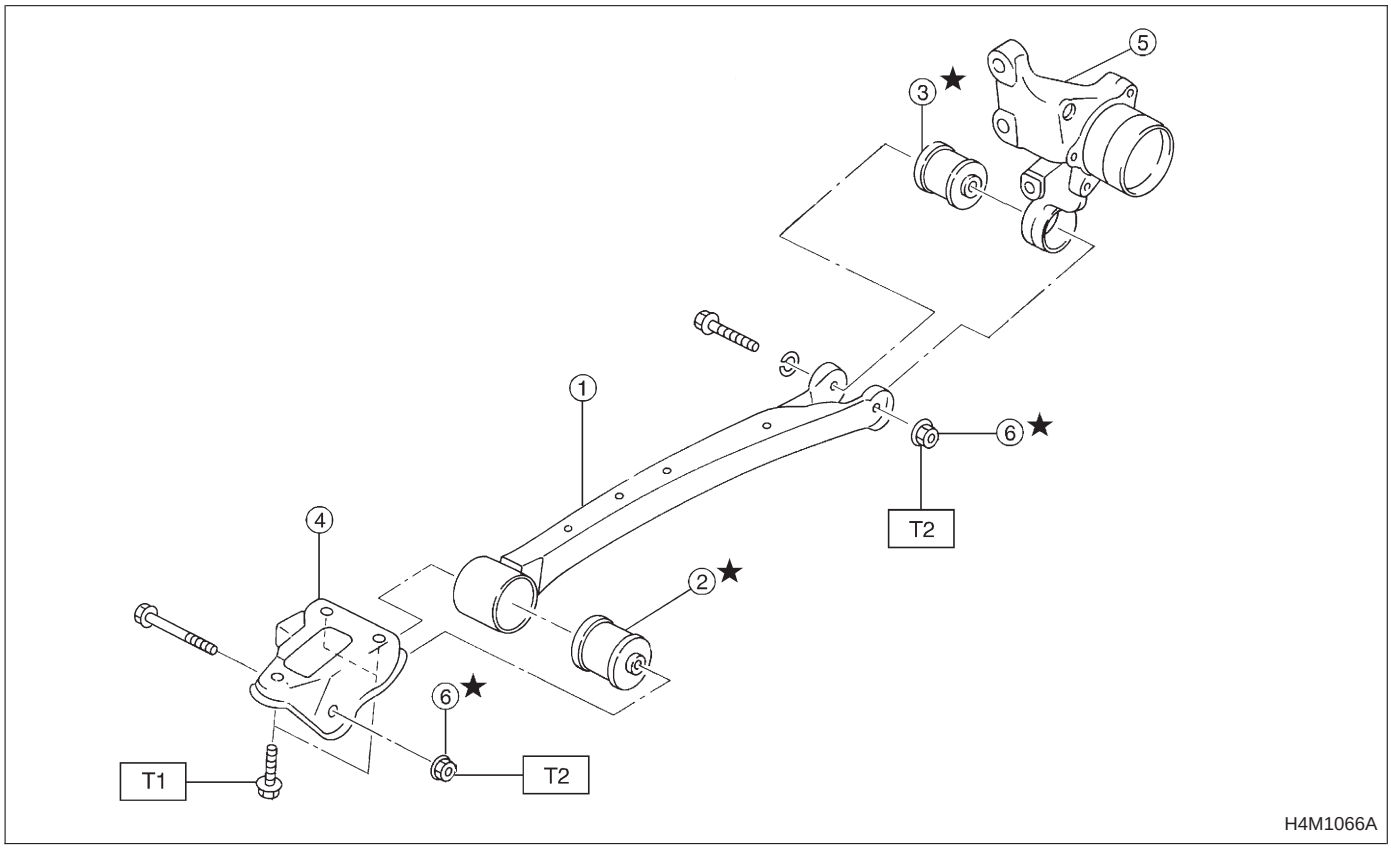
Transverse link bushing to crossmember:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)
Stabilizer to bush:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)
Tie-rod end to housing:
27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 ft-lb)
Front cushion rubber to crossmember:
69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)
Universal joint to pinion shaft:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)
Crossmember to body:
98±15 N·m (10.0±1.5 kg-m, 72±11 ft-lb)

3) Purge air from power steering system.

NOTE:
Check wheel alignment and adjust if necessary.

7. Rear Trailing Link

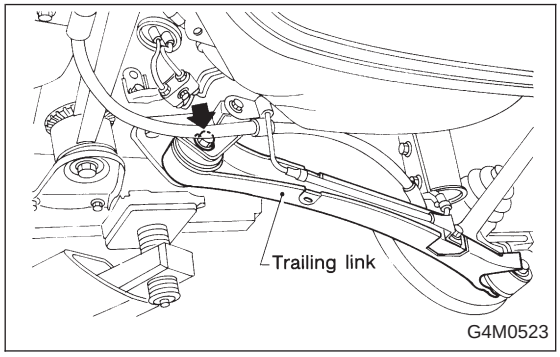
A: REMOVAL



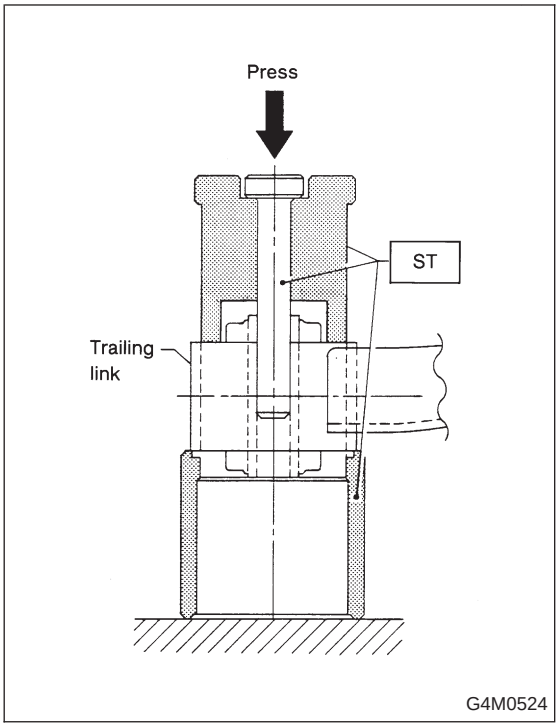
① Trailing link
② Front bushing
③ Rear bushing
④ Bracket
⑤ Housing
⑥ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 98±20 (10.0±2.0, 72±14)
T2: 113±15 (11.5±1.5, 83±11)

1) Loosen rear wheel nuts.
2) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
3) Remove both rear parking brake clamp and ABS sensor harness. (only vehicle equipped with ABS)



4) Remove bolt which secure trailing link to trailing link bracket.
5) Remove bolt which secure trailing link to rear housing.

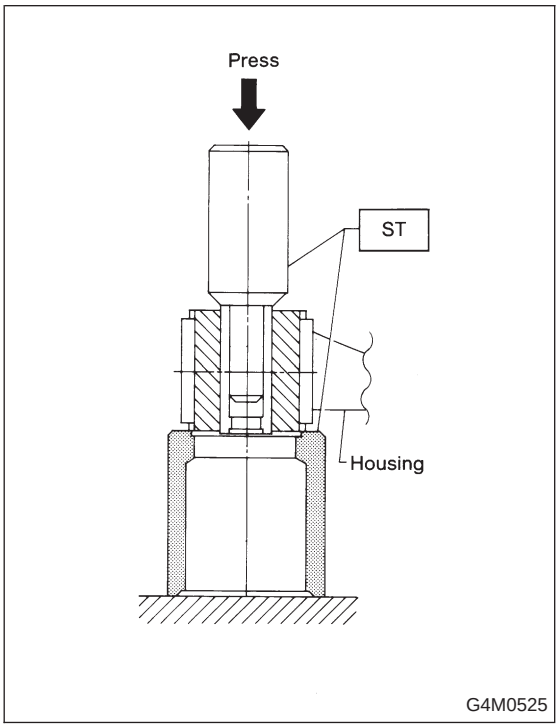


B: DISASSEMBLY

1. FRONT BUSHING

Using ST, press front bushing out of place.

ST 927720000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Remove housing. <Ref. to 4-2 [W2A0].>
2) Using ST, press rear bushing out of place.

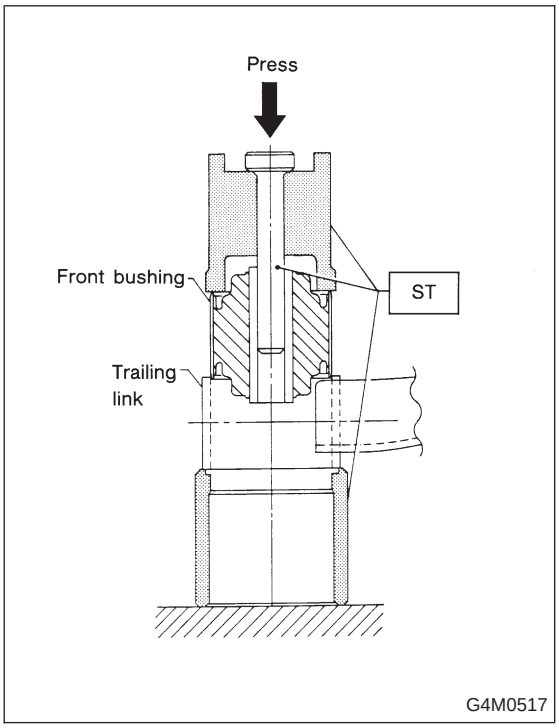
ST 927730000 INSTALLER & REMOVER SET

C: INSPECTION

Check trailing links for bends, corrosion or damage.

D: ASSEMBLY

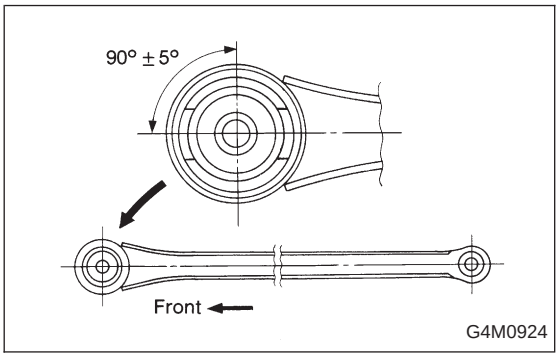
To assemble, reverse above disassembly procedures.



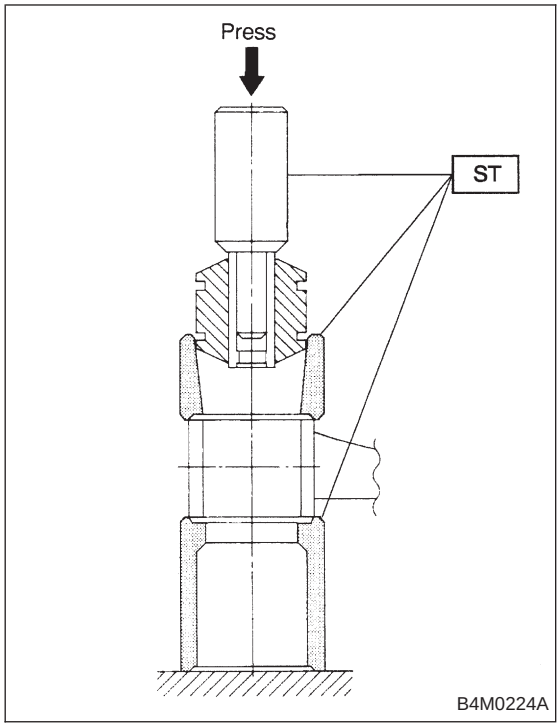
1. FRONT BUSHING

Using ST, press bushing into trailing link.

ST 927720000 INSTALLER & REMOVER SET



CAUTION:
Install front bushing in the proper direction, as shown in figure.



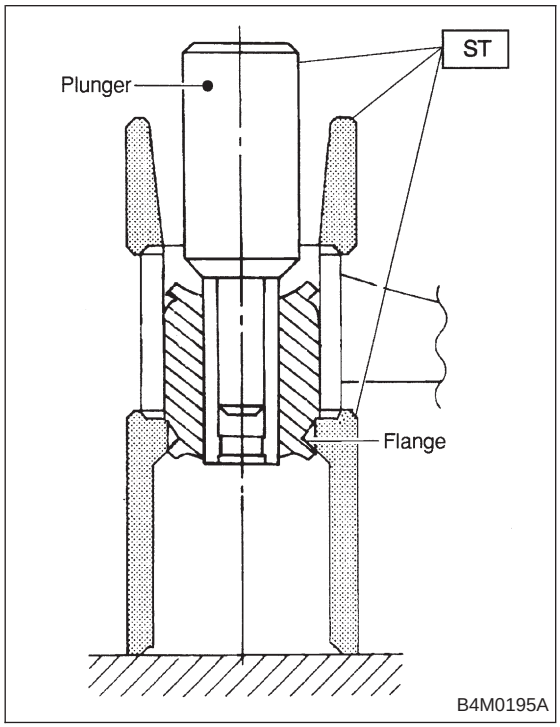
2. REAR BUSHING

1) Using ST, press bushing into trailing link.

ST 927730000 INSTALLER & REMOVER SET

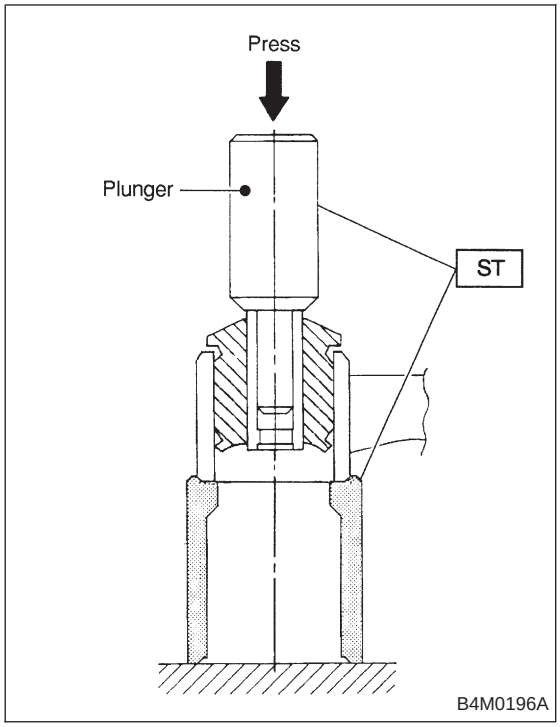
NOTE:
If it is difficult to press bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:
TIRE LUBE : water = 1 : 3



2) Press ST plunger until bushing flange protrudes beyond trailing link.

ST 927730000 INSTALLER & REMOVER SET



3) Turn trailing link upside down. Press ST plunger in the direction opposite that outlined in step 2) until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET

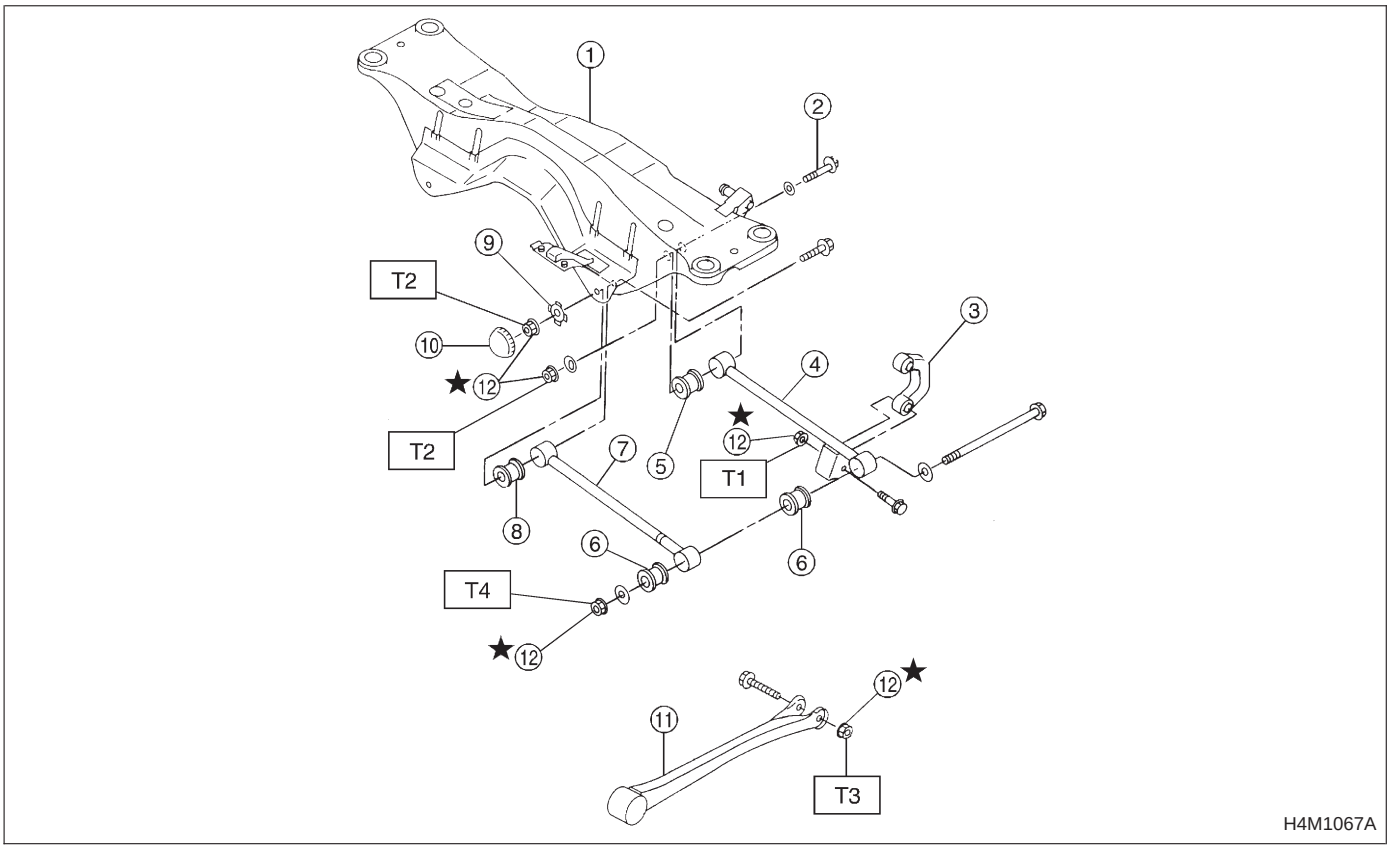
E: INSTALLATION

Installation is in the reverse order of removal.

CAUTION:
Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:
Check wheel alignment and adjust if necessary.

8. Lateral Link



① Crossmember
② Adjusting bolt
③ Stabilizer link
④ Rear lateral link
⑤ Bushing (C)
⑥ Bushing (A)
⑦ Front lateral link
⑧ Bushing (B)
⑨ Washer
⑩ Cap
⑪ Trailing link
⑫ Self-locking nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 44±6 (4.5±0.6, 32.5±4.3)
T2: 98±15 (10.0±1.5, 72±11)
T3: 113±15 (11.5±1.5, 83±11)
T4: 137±20 (14.0±2.0, 101±14)

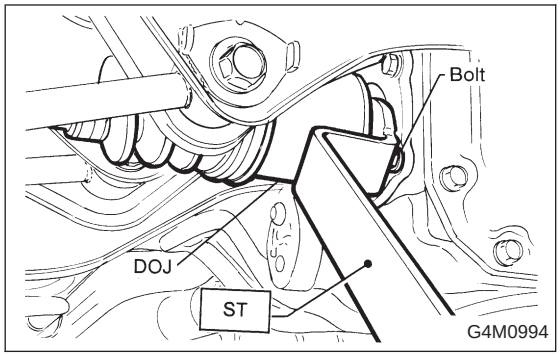
A: REMOVAL

1) Loosen wheel nuts. Jack-up vehicle and remove wheel.
2) Remove stabilizers.
3) (Models equipped with ABS)
Remove ABS sensor harness from trailing link.
4) Remove bolts which secure lateral link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.

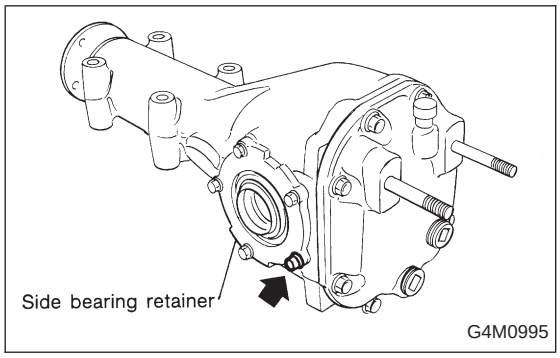
5) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.

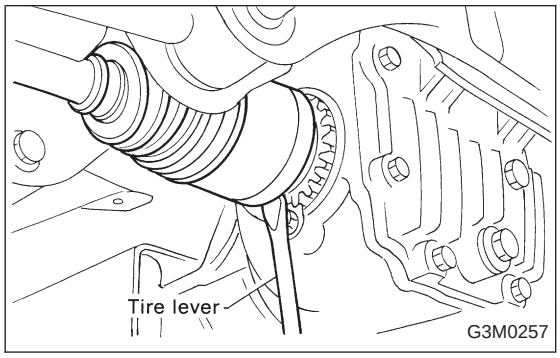


6) Remove DOJ from rear differential using ST. (2200 cc MT model)
ST 28099PA100 DRIVE SHAFT REMOVER

CAUTION:
Do not remove circlip attached to inside of differential.

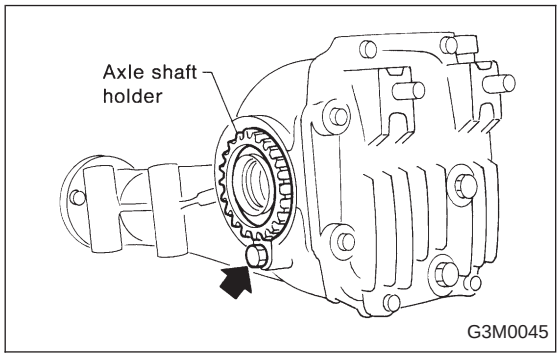


CAUTION:
Be careful not to damage side bearing retainer. Always use bolt as shown in figure, as supporting point for ST during removal.
ST 28099PA100 DRIVE SHAFT REMOVER



7) Remove DOJ from rear differential using tire lever. (Except 2200 cc MT model)

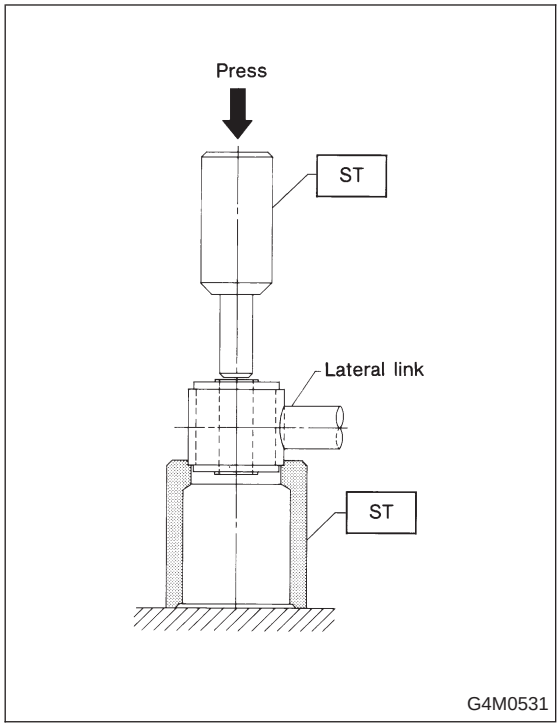
NOTE:
The side spline shaft circlip comes out together with the shaft.



CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.

8) Scribe an alignment mark on rear lateral link adjusting bolt and crossmember.
9) Remove outer lateral link bolt securing lateral link to housing.
10) Remove bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:
To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.



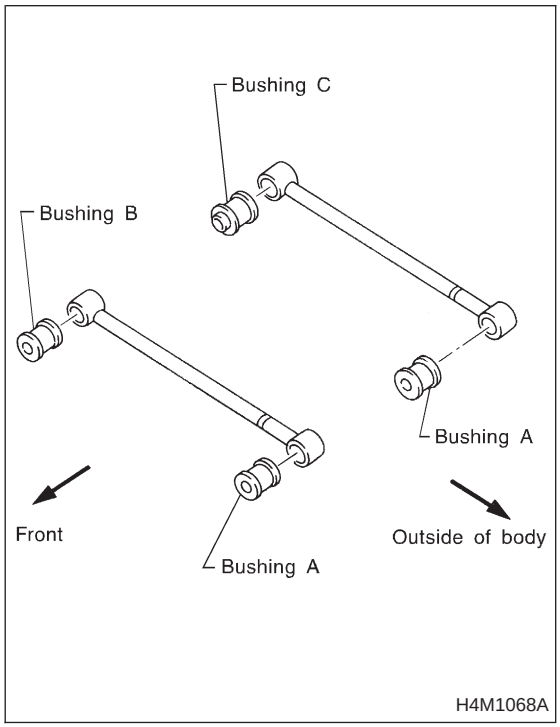
B: DISASSEMBLY

Using ST, press bushing out of place.

NOTE:

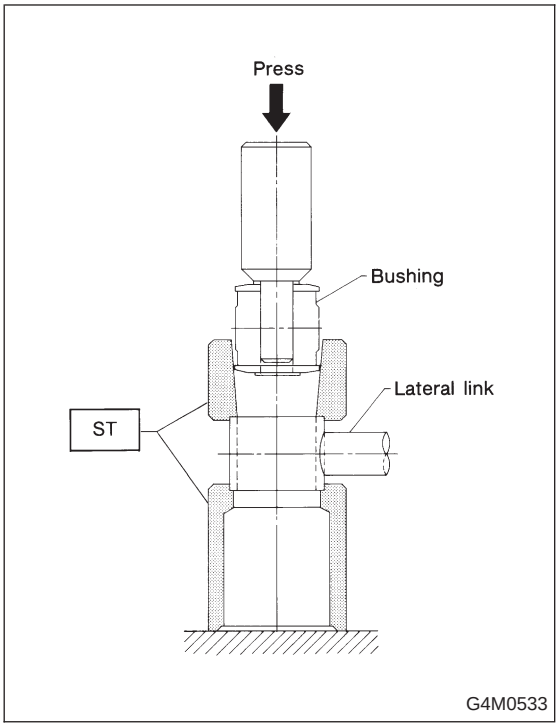
- Using the following figure as a guide, verify the type of bushings.
- Select ST according to the type of bushings used.

Bushing	INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000



C: INSPECTION

Visually check lateral links for damage or bends.



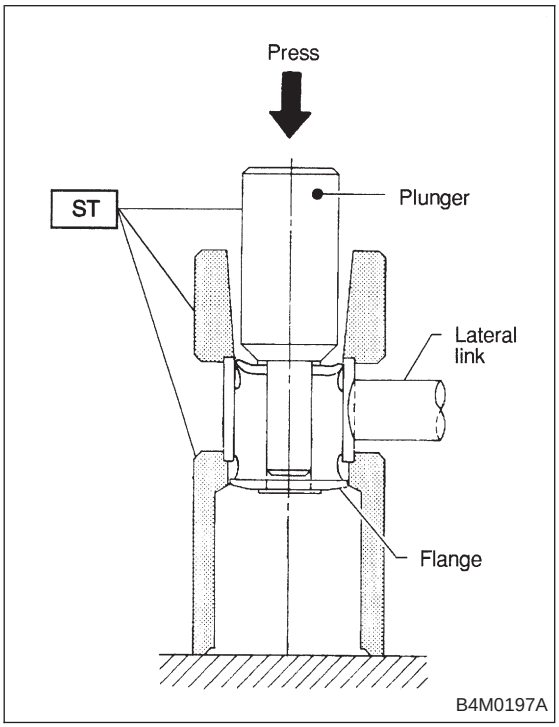
D: ASSEMBLY

1) Using ST, press bushing into place.

CAUTION:
Select ST according to the type of bushings used.

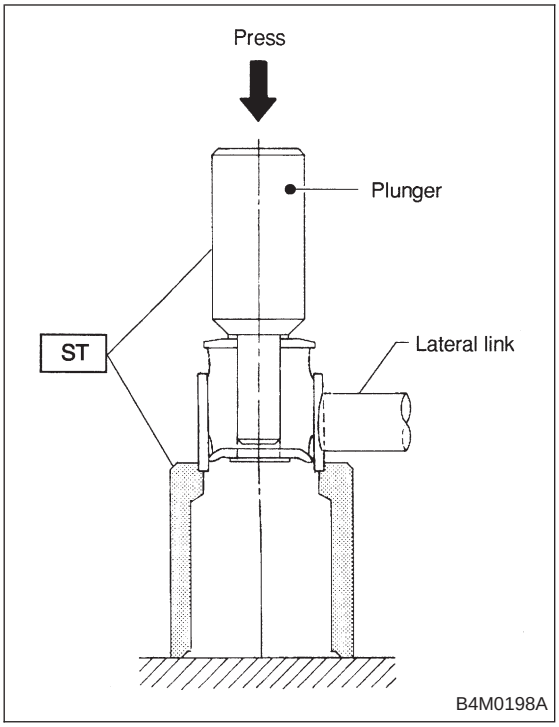
NOTE:
- Use the same ST as that used during disassembly.
- If it is difficult to press bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:
TIRE LUBE : water = 1 : 3



2) Press ST plunger until bushing flange protrudes beyond lateral link.

NOTE:
Use the same ST as that used during disassembly.



3) Turn lateral link upside down. Press ST plunger in the opposite direction that outlined in step 2) until bushing is correctly positioned in trailing link.
NOTE:
Use the same ST as that used during disassembly.

E: INSTALLATION

To install, reverse removal procedures, observing the following instructions.

- Installation of DOJ to differential: <Ref. to 4-2 [W3E2].>

CAUTION:

- **Do not allow DOJ splines to damage side oil seal.**
- **Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.**
- **Tighten nut when installing adjusting bolt.**
- **Replace self-locking nut and DOJ circlip with new ones.**

NOTE:

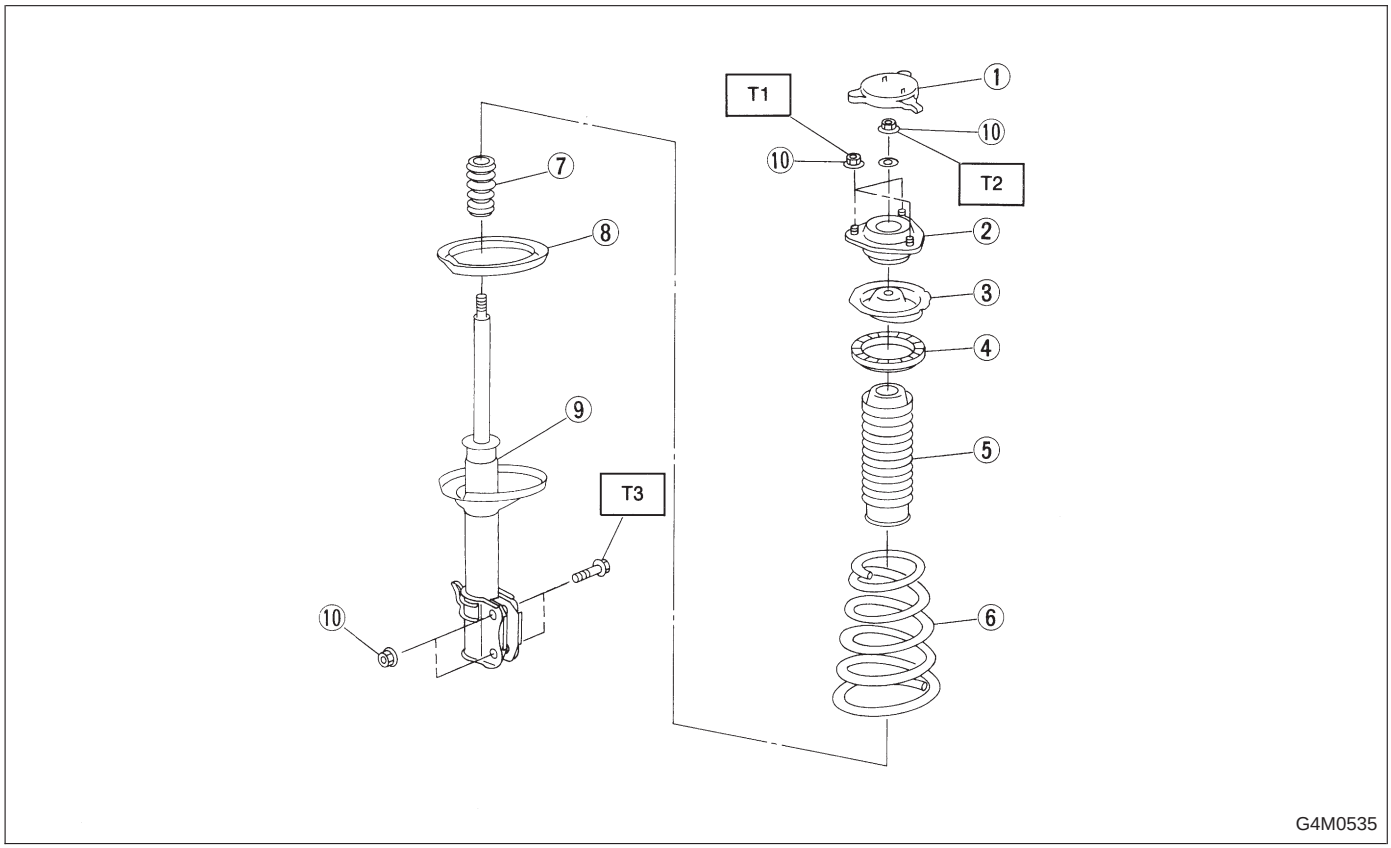
- Lateral link washers for AWD model can be identified by the following color:

  Gold (AWD model)

- Check wheel alignment and adjust if necessary.

9. Rear Strut

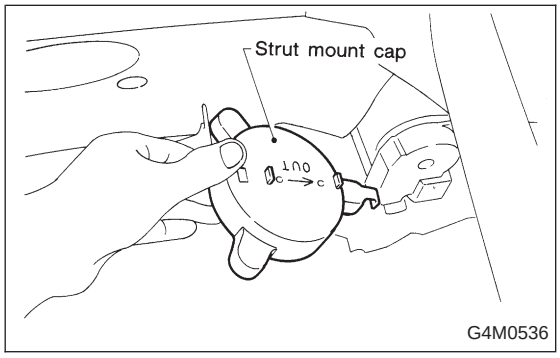
A: REMOVAL



G4M0535

① Cap
② Strut mount
③ Spring seat
④ Rubber seat upper
⑤ Dust cover
⑥ Coil spring
⑦ Helper
⑧ Rubber seat lower
⑨ Damper strut
⑩ Self-locking nut

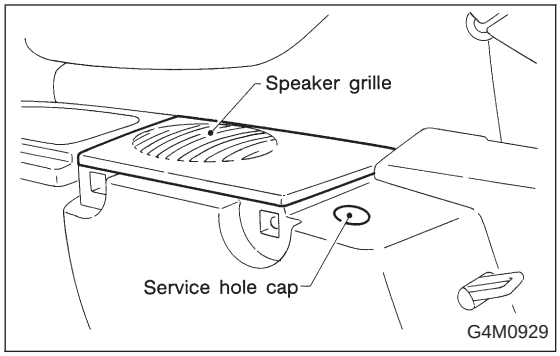
Tightening torque: N·m (kg-m, ft-lb)
T1: 20±6 (2.0±0.6, 14.5±4.3)
T2: 59±10 (6.0±1.0, 43±7)
T3: 196^{+39}_{-10} ($20.0^{+4.0}_{-1.0}$, 145^{+29}_{-7})



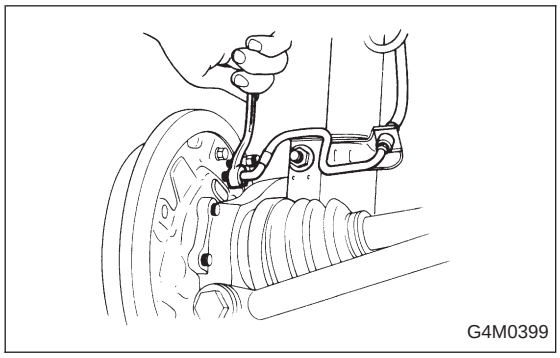
G4M0536

1) Depress brake pedal and secure it in that position using a wooden block, etc.

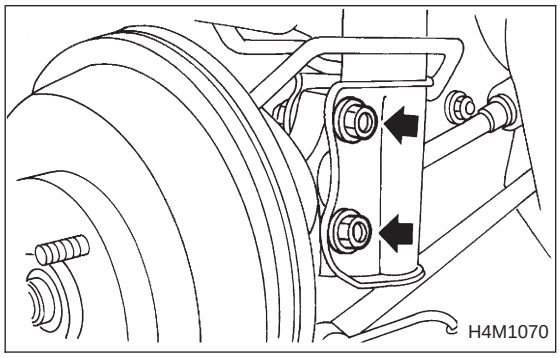
2) Remove rear seat cushion and backrest. (Sedan model)



3) Remove rear speaker grille and service hole cap. (Wagon model)
4) Remove strut mount cap.
5) Loosen rear wheel nuts.
6) Jack-up vehicle, support it with safety stands (rigid racks) and remove rear wheels.
7) Remove brake hose clip.



8) Disconnect brake hose from brake pipe from strut, and disconnect brake pipe from dram brake.



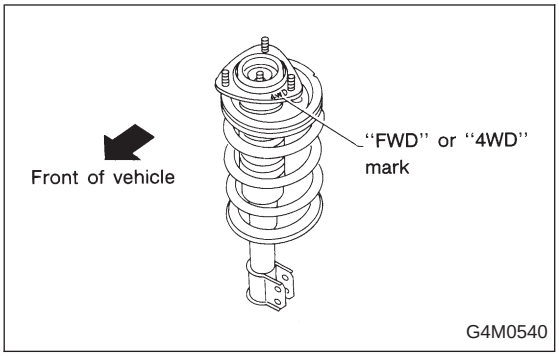
9) Remove bolts which secure rear strut to housing.
10) Remove nuts securing strut mount to body.

B: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide.
<Ref. to 4-1 [W4B0].>

C: INSPECTION

Refer to Front Strut as a guide for inspection procedures.
<Ref. to 4-1 [W4C0].>



D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures. <Ref. to 4-1 [W4D0].>

CAUTION:
Install rear strut with "FWD" or "4WD" mark on strut mount facing outside of car body.

E: INSTALLATION

1) Tighten self-locking nut used to secure strut mount to car body.

CAUTION:
Discard loosened self-locking nut, and replace with a new one.

Tightening torque:
20±6 N·m (2.0±0.6 kg-m, 14.5±4.3 ft-lb)

2) Tighten bolts which secure rear strut to housing.

Tightening torque:
196 $^{+39}_{-10}$ N·m (20.0 $^{+4.0}_{-1.0}$ kg-m, 145 $^{+29}_{-7}$ ft-lb)

Discard loosened self-locking nut, and replace with a new one.

3) Connect brake hose to brake pipe.

Tightening torque:
15 $^{+3}_{-2}$ N·m (1.5 $^{+0.3}_{-0.2}$ kg-m, 10.8 $^{+2.2}_{-1.4}$ ft-lb)

4) Insert brake hose clip between brake hose and lower side of strut.

CAUTION:
- **Check that hose clip is positioned properly.**
- **Check brake hose for twisting, or excessive tension.**
- **(Model equipped with ABS)**

Do not subject ABS sensor harness to excessive tension.

5) Be sure to bleed air from brake system.

6) Lower vehicle and tighten wheel nut.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

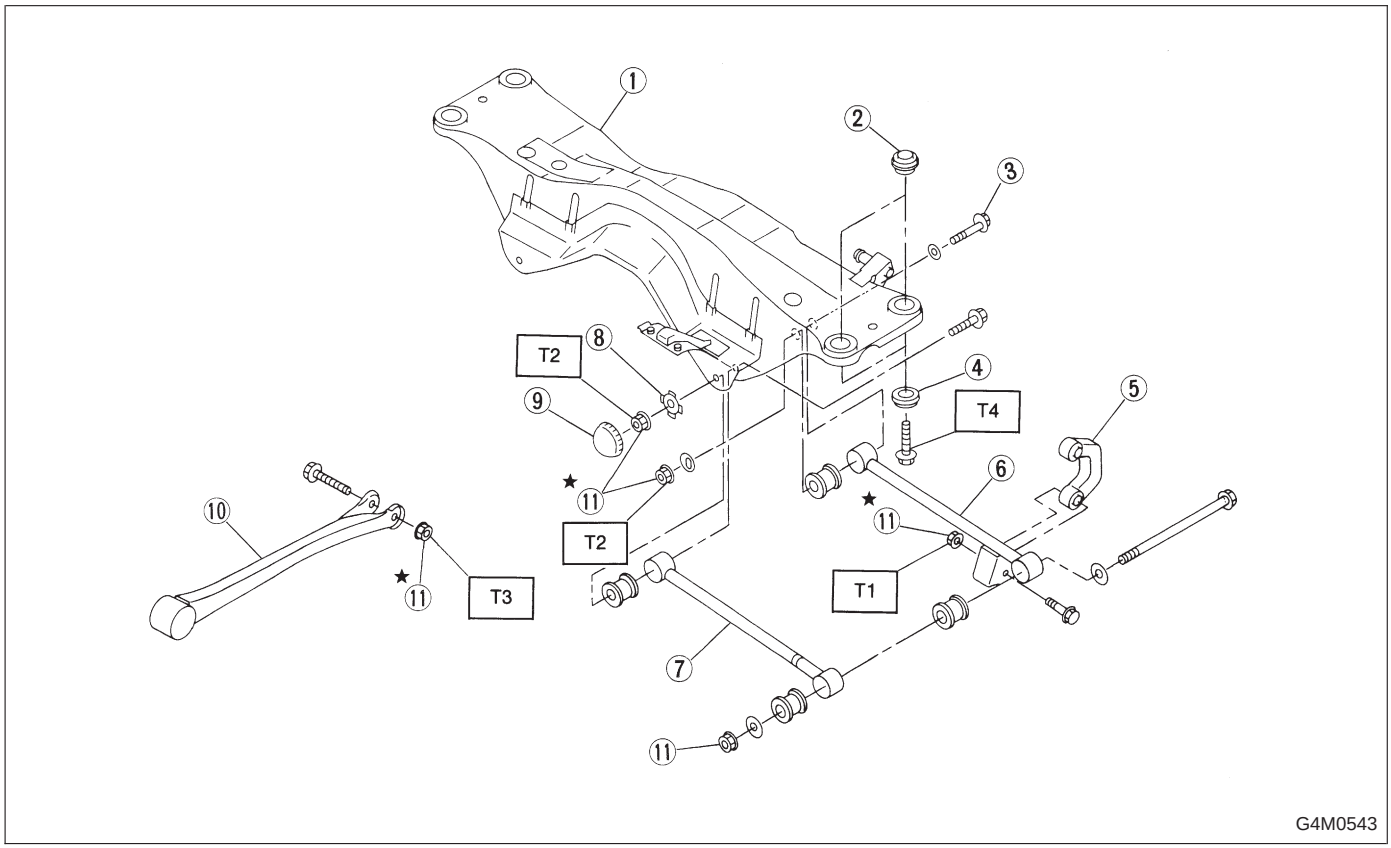
7) Install strut mount cap.

8) (Sedan model)
Install rear seat backrest and rear seat cushion.
(Wagon model)
Install rear speaker grille.

NOTE:
Check wheel alignment and adjust if necessary.

10. Rear Crossmember

A: REMOVAL

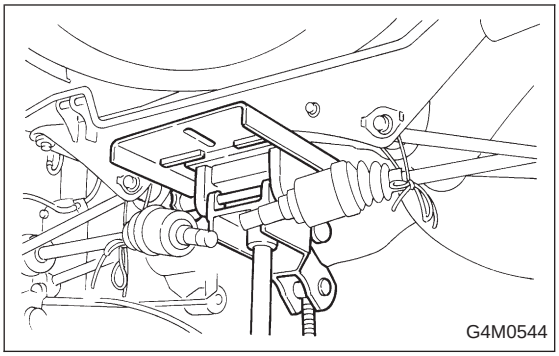


① Crossmember
② Floating bushing
③ Adjusting bolt
④ Stopper
⑤ Stabilizer link
⑥ Rear lateral link
⑦ Front lateral link
⑧ Washer
⑨ Cap
⑩ Trailing link
⑪ Self-locking nut

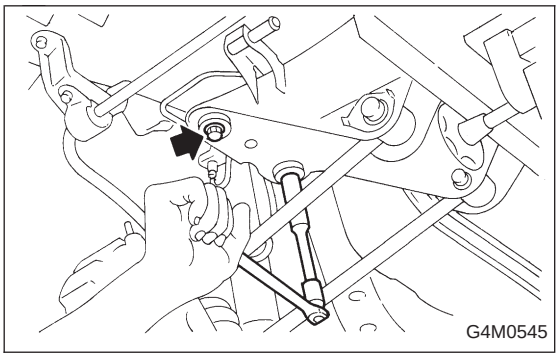
Tightening torque: N·m (kg-m, ft-lb)
T1: 44±6 (4.5±0.6, 32.5±4.3)
T2: 98±15 (10.0±1.5, 72±11)
T3: 113±15 (11.5±1.5, 83±11)
T4: 127±20 (13.0±2.0, 94±14)

CAUTION:
Do not subject ABS sensor harness to excessive tension (if equipped).

1) Separate front exhaust pipe and rear exhaust pipe.
2) Remove rear exhaust pipe and muffler.
3) Remove rear differential. <Ref. to 3-4 [W2B0] or [W3B0].>


G4M0544

4) Place transmission jack under rear crossmember.


G4M0545

5) Remove bolts securing crossmember to car body, and remove crossmember.

6) Scribe an alignment mark on rear lateral link cam bolt and crossmember.
7) Remove front and rear lateral links by loosening nuts.

B: INSPECTION

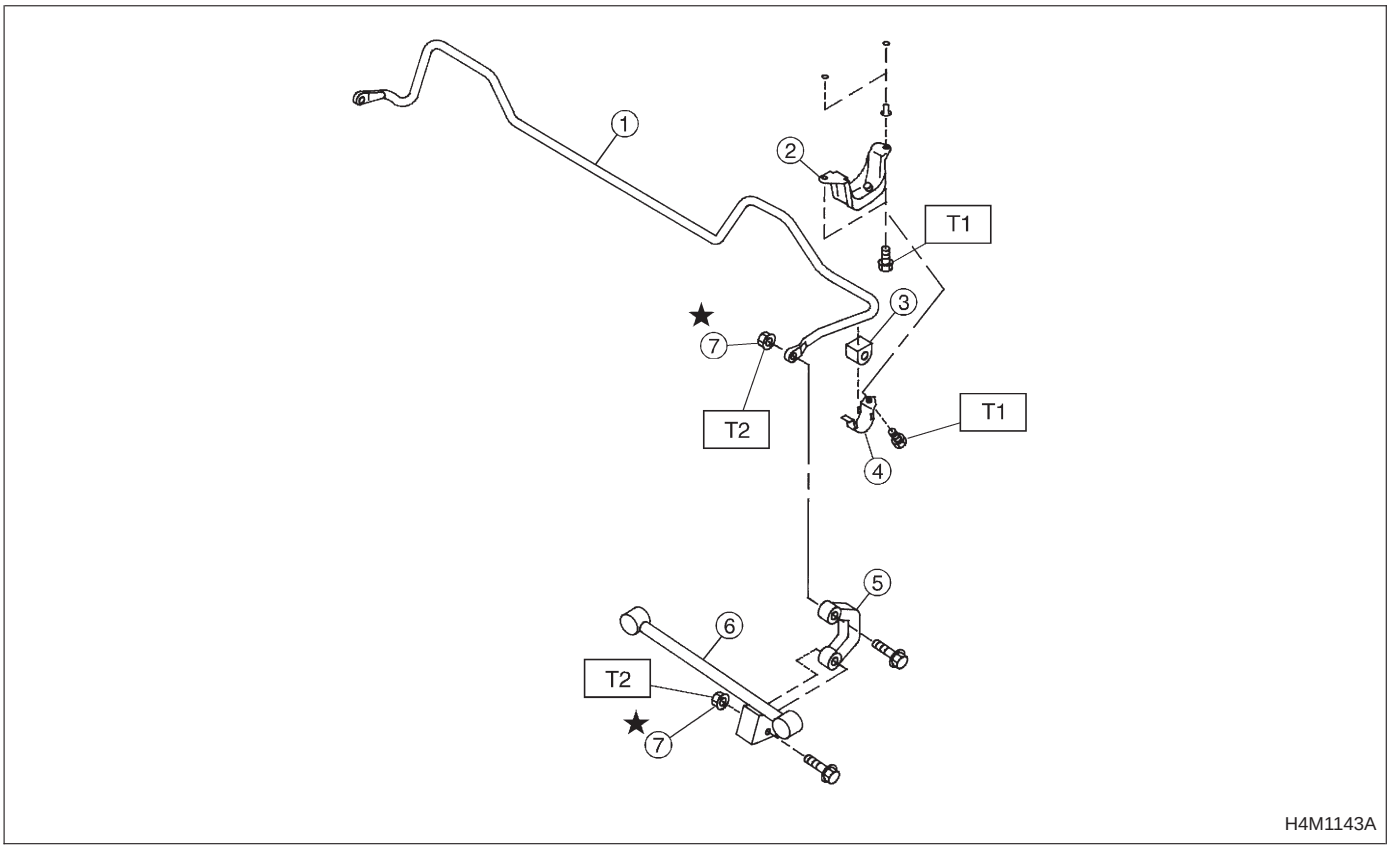
Check removed parts for wear, damage and cracks, and correct or replace if defective.

C: INSTALLATION

1) Install in reverse order of removal.
2) Install rear differential. <Ref. to 3-4 [W2F0] or [W3F0].>
3) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:
Check wheel alignment and adjust if necessary.

11. Rear Stabilizer



① Rear stabilizer
② Stabilizer bracket
③ Stabilizer bushing
④ Clamp
⑤ Stabilizer link
⑥ Rear lateral link
⑦ Self-locking nut

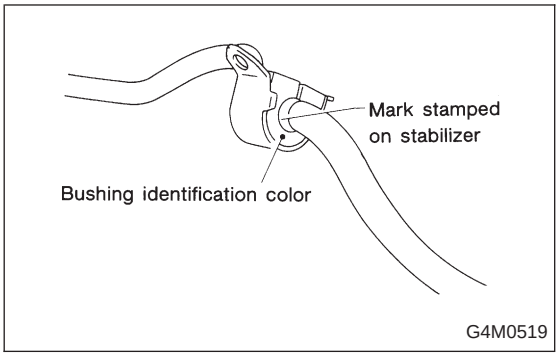
Tightening torque: N·m (kg-m, ft-lb)
T1: 25±7 (2.5±0.7, 18.1±5.1)
T2: 44±6 (4.5±0.6, 32.5±4.3)

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Remove bolts which secure stabilizer link to rear lateral link.
3) Remove bolts which secure stabilizer to stabilizer bracket.

B: INSPECTION

1) Check bushing for cracks, fatigue or damage.
2) Check stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.



C: INSTALLATION

1) To install, reverse the removal procedure.

NOTE:

- Install bushing while aligning it with paint mark on stabilizer.
- Ensure that bushing and stabilizer have the same identification colors when installing.

2) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

3) Tightening torque:

Stabilizer link to rear lateral link:
44±6 N·m (4.5±0.6 kg-m, 32.5±4.3 ft-lb)
Stabilizer to stabilizer bracket:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)

1. Suspension

A: IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut	Replace.
(3) Installation of wrong strut	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

B: POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut	Replace.
(5) Damage or deformation of strut mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly	Replace.

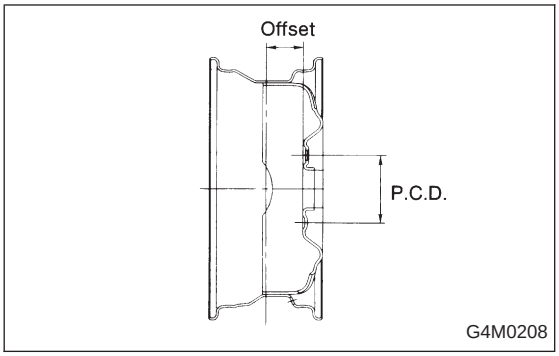
C: NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.

WHEELS AND AXLES 4-2

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1. Specifications

A: TIRE AND WHEEL SIZE

Model		Front and Rear				Spare		
		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)	Tire size	Rim size	Rim offset mm (in)
1800 cc	COUPE WAGON	P175/70R14 84S	14 x 5 1/2JJ	55 (2.17)	100 (3.94) dia.	T125/70D16	16 x 4T	50 (1.97)
2200 cc	COUPE SEDAN WAGON	P195/160R15 87H	15 x 6JJ	55 (2.17)	100 (3.94) dia.	T135/70D16	16 x 4T	50 (1.97)
	OUTBACK	P205/60R15 90S P205/60R15 90H						

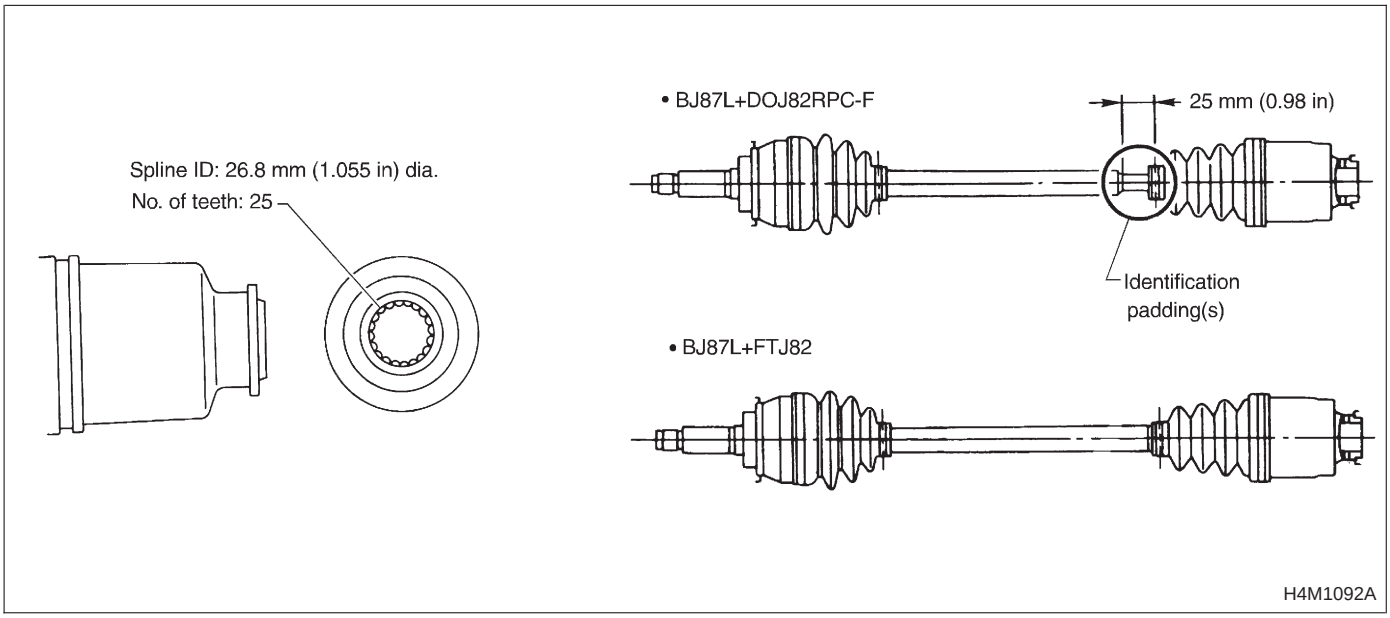
NOTE: “T-type” tire for temporary use is supplied as a spare tire.

B: TIRE INFLATION PRESSURE

Model	Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
		Light load	Full load
Coupe Sedan Wagon	175/70R14 84S P195/60R15 87H	Ft: 220 (2.2, 31) Rr: 200 (2.0, 25)	
Outback	P205/60R15 90S P205/60R15 90H		
T-type tire	T125/70D16 T135/70D16	412 (4.2, 60)	

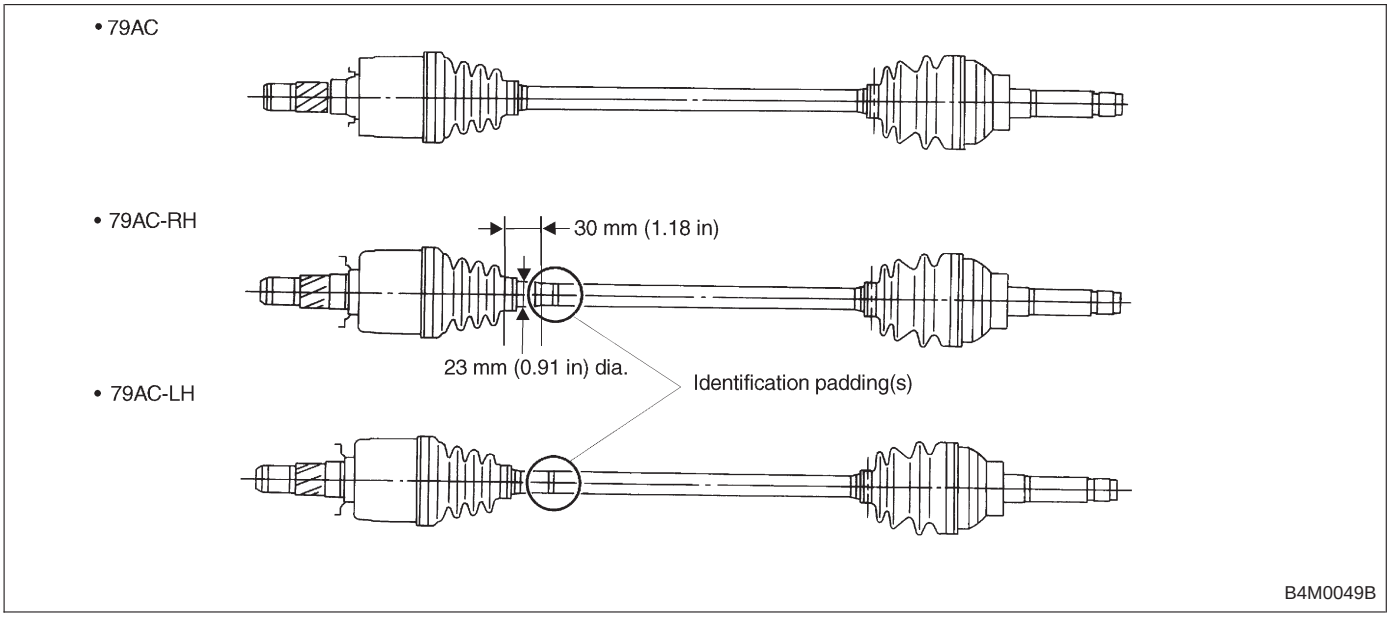
C: FRONT DRIVE SHAFT ASSEMBLY

Type of axle shaft assembly	SHAFT	DOJ or FTJ
	No. of identification paddings on shaft	No. of spline teeth
BJ87L + DOJ82 RPC-F	1 (One)	25
BJ87L + FTJ82	—	25



D: REAR DRIVE SHAFT ASSEMBLY (AWD MODEL)

Type of axle shaft assembly	SHAFT
	No. of identification paddings on shaft
79AC	None
79AC-RH	1 (One)
79AC-LH	1 (One)



E: APPLICATION TABLE

Model	Power unit	Front drive shaft		Rear drive shaft	
		5MT	4AT	5MT	4AT
AWD	1800 cc	BJ87L + DOJ82 RPC-F	—	79AC	79AC
AWD	2200 cc	BJ87L + DOJ82 RPC-F	BJ87L + FTJ82	79AC-RH 79AC-LH	79AC

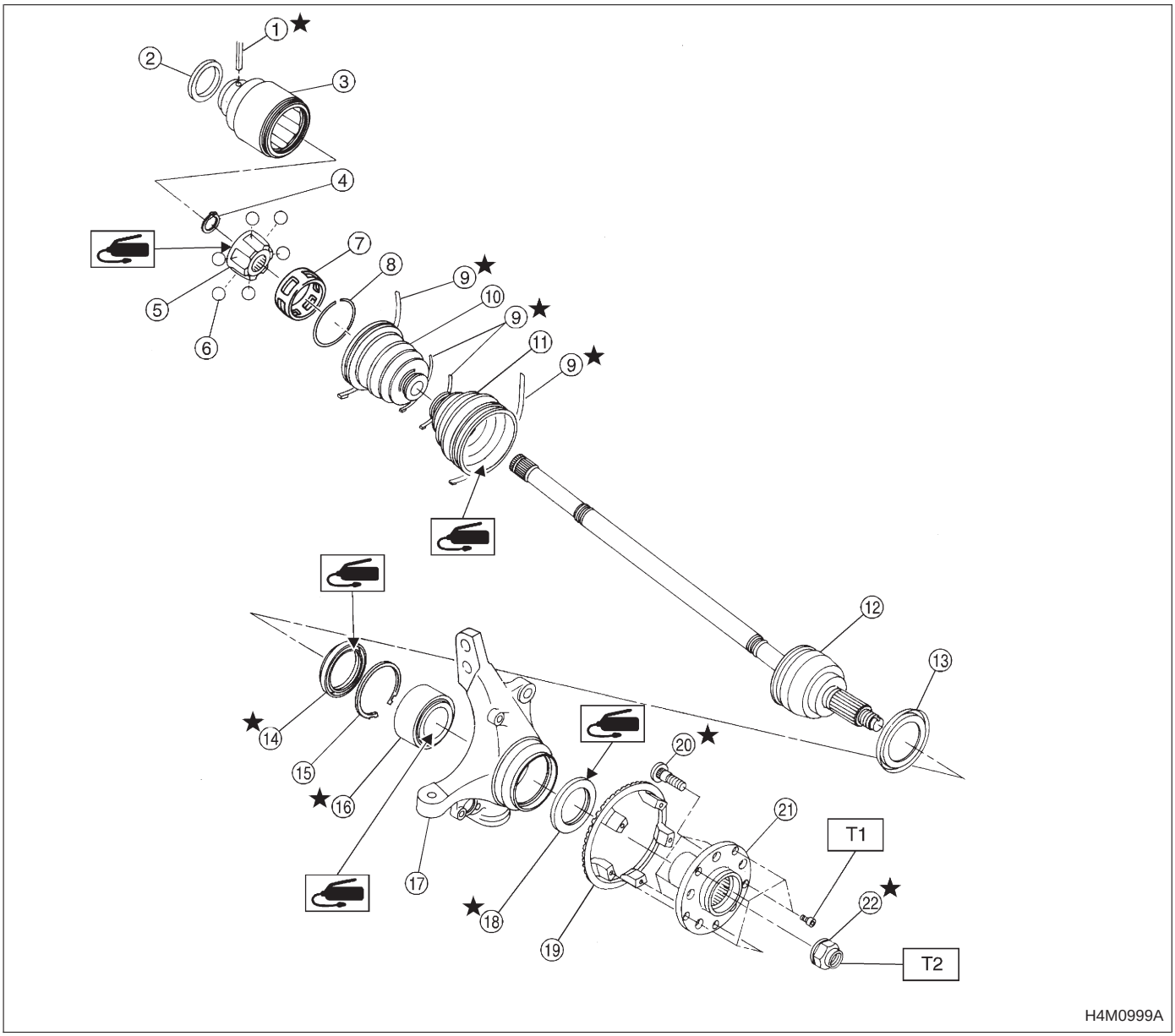
2. Service Data

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight g (oz)
28101AA001	5 (0.18)
28101AA011	10 (0.35)
28101AA021	15 (0.53)
28101AA031	20 (0.71)
28101AA041	25 (0.88)
28101AA051	30 (1.06)
28101AA061	35 (1.23)
28101AA071	40 (1.41)
28101AA081	45 (1.59)
28101AA091	50 (1.76)
28101AA101	55 (1.94)
28101AA111	60 (2.12)

1. Front Axle

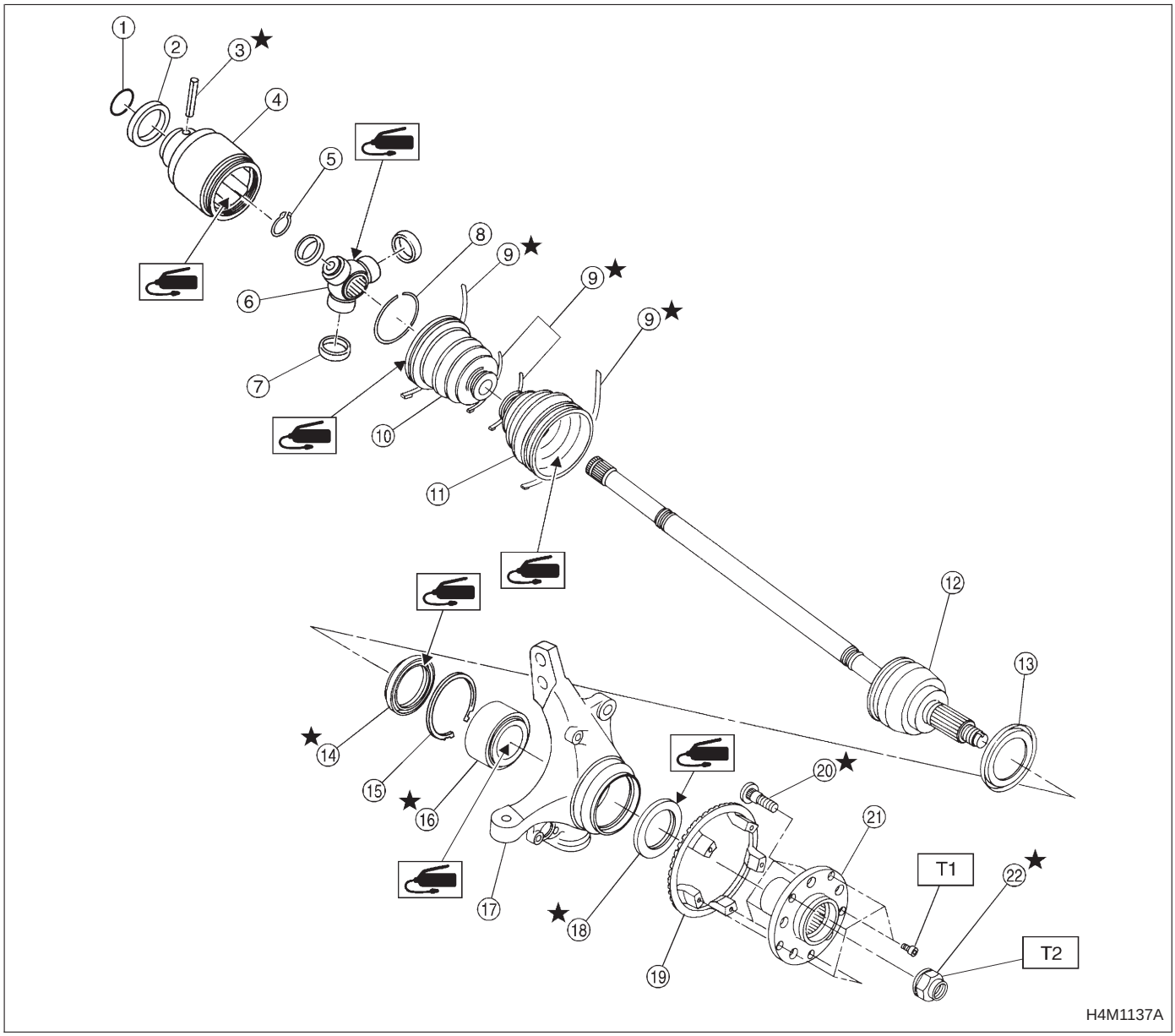
A: EXCEPT 2200 cc AT VEHICLES



① Spring pin
② Baffle plate (DOJ)
③ Outer race (DOJ)
④ Snap ring
⑤ Inner race (DOJ)
⑥ Ball
⑦ Cage
⑧ Circlip
⑨ Boot band
⑩ Boot (DOJ)
⑪ Boot (BJ)
⑫ BJ ASSY
⑬ Baffle plate
⑭ Oil seal (IN)
⑮ Snap ring
⑯ Bearing
⑰ Housing
⑱ Oil seal (OUT)
⑲ Tone wheel
⑳ Hub bolt
㉑ Hub
㉒ Axle nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 186±20 (19±2, 137±14)

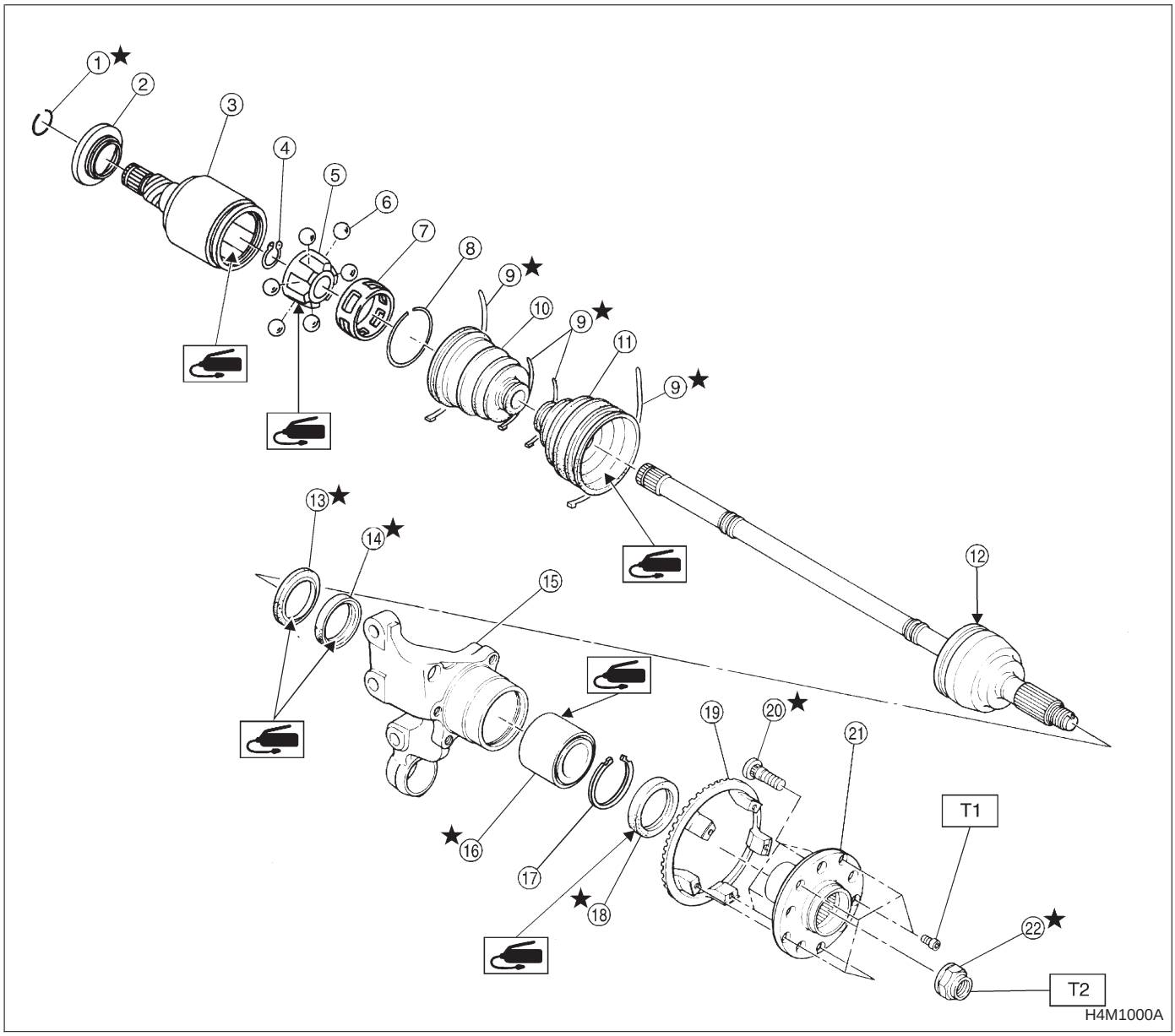
B: 2200 cc AT VEHICLES



① O-ring
② Baffle plate (FTJ)
③ Spring pin
④ Outer race (FTJ)
⑤ Snap ring
⑥ Trunnion
⑦ Free ring
⑧ Circlip
⑨ Boot band
⑩ Boot (FTJ)
⑪ Boot (BJ)
⑫ BJ ASSY
⑬ Baffle plate
⑭ Oil seal (IN)
⑮ Snap ring
⑯ Bearing
⑰ Housing
⑱ Oil seal (OUT)
⑲ Tone wheel
⑳ Hub bolt
㉑ Hub
㉒ Axle nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 186±20 (19±2, 137±14)

2. Rear Axle



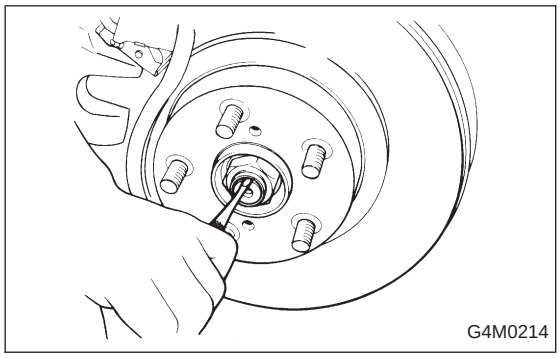
① Circlip (1800 cc model)
② Baffle plate (DOJ)
③ Outer race (DOJ)
④ Snap ring
⑤ Inner race
⑥ Ball
⑦ Cage
⑧ Circlip
⑨ Boot band
⑩ Boot (DOJ)
⑪ Boot (BJ)
⑫ BJ ASSY
⑬ Oil seal (IN. No. 2)
⑭ Oil seal (IN. No. 3)
⑮ Housing
⑯ Bearing
⑰ Snap ring
⑱ Oil seal (OUT)
⑲ Tone wheel
⑳ Hub bolt
㉑ Hub
㉒ Axle nut

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 186±20 (19±2, 137±14)

1. Front Axle

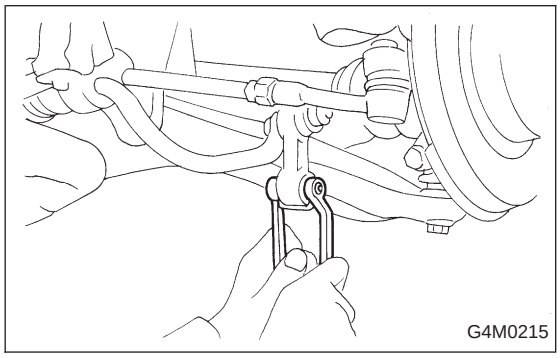
A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands, and remove front wheels.

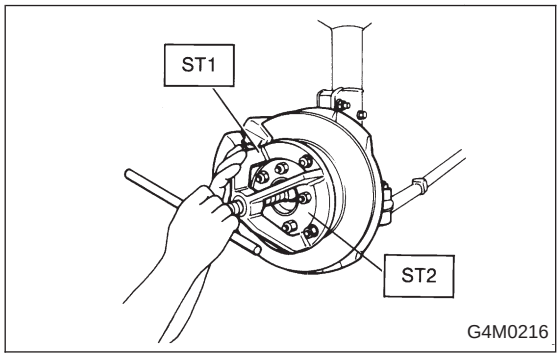

G4M0214

3) Unlock axle nut.
4) Remove axle nut using a socket wrench.

CAUTION:
Be sure to loose and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.


G4M0215

5) Remove stabilizer link.



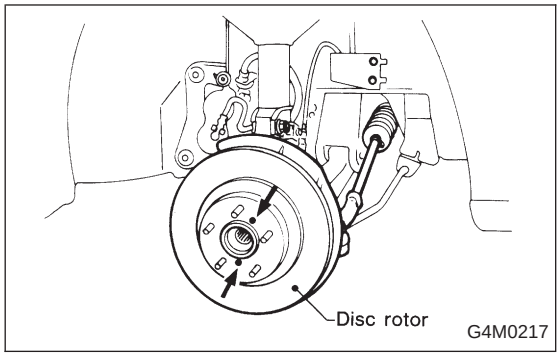
G4M0216

6) Remove DOJ/FTJ from transmission spindle.
7) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.

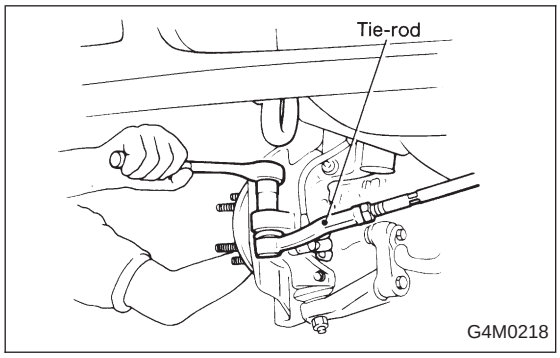
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
- **Be careful not to damage oil seal lip when removing front drive shaft.**
- **When replacing front drive shaft, also replace inner oil seal.**

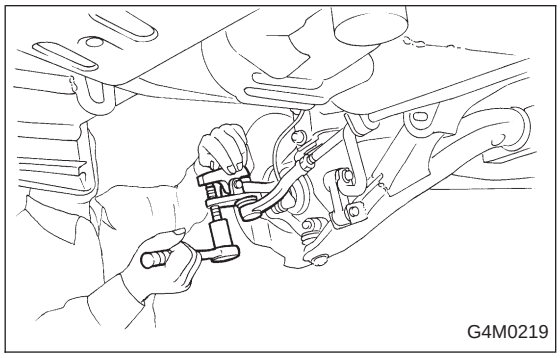
8) Remove disc brake caliper from housing, and suspend it from strut using a wire.



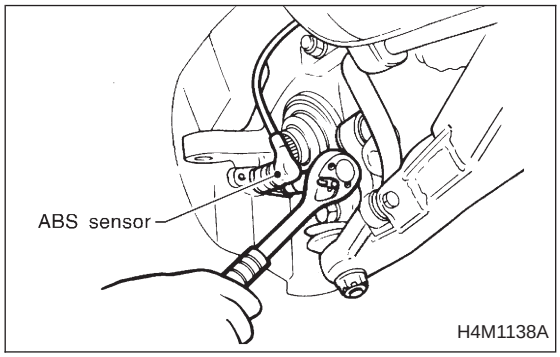
9) Remove disc rotor from hub.
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.



10) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

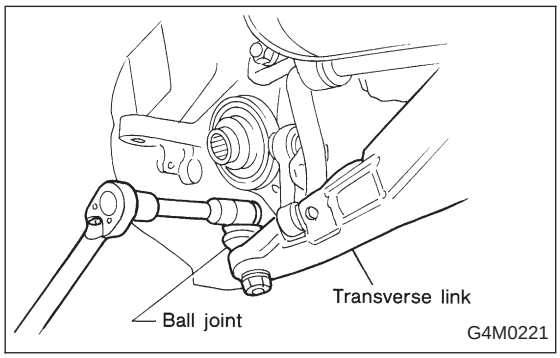


11) Using a puller, remove tie rod ball joint from knuckle arm.

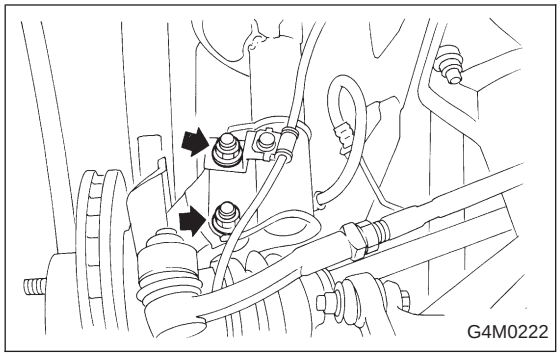


12) On ABS equipped models, remove ABS sensor assembly and harness in advance.

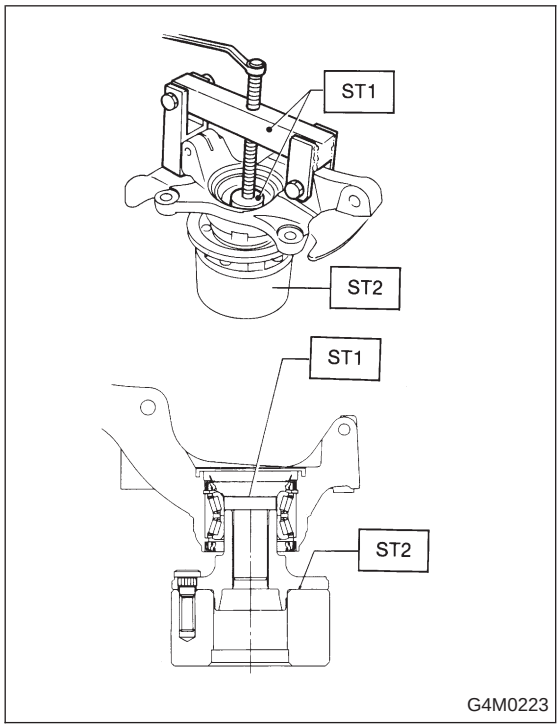
NOTE:
Be sure to use soft jaws (such as aluminum plates) when placing the mating surfaces of housing and strut in a vise.



13) Remove transverse link ball joint from housing.


G4M0222

14) After scribing an alignment mark on camber adjusting bolt head, remove bolts which connect housing and strut, and disconnect housing from strut.

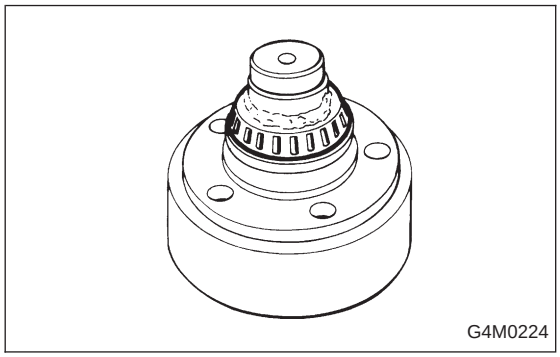


G4M0223

B: DISASSEMBLY

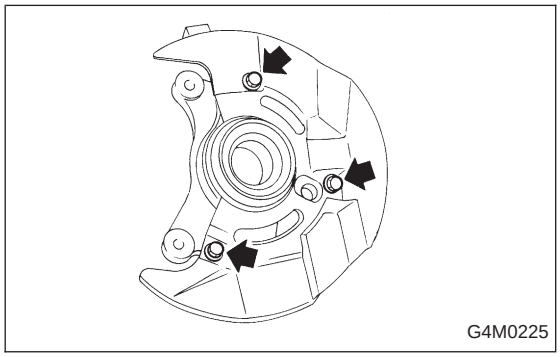
1) Using ST1, support housing and hub securely.
2) Attach ST2 to housing and drive hub out.

ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND


G4M0224

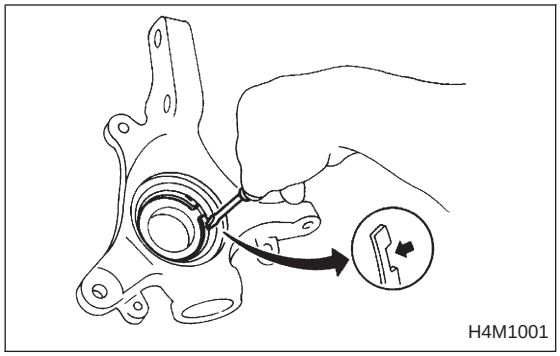
If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:
- **Be careful not to scratch polished area of hub.**
- **Be sure to install inner race on the side of outer race from which it was removed.**

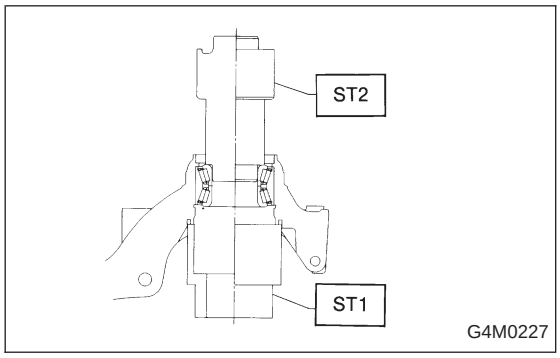

G4M0225

3) Remove disc cover from housing.
4) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:
Do not use old oil seals.


H4M1001

5) Using flat bladed screwdriver, remove snap ring.



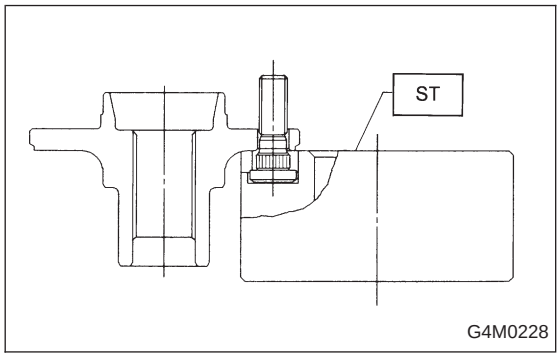
G4M0227

6) Using ST1, support housing securely.
7) Using ST2, press inner race to drive out outer bearing.

ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

CAUTION:
- **Do not remove outer race unless it is faulty.**
- **Discard outer race after removal.**
- **Do not replace inner or outer race separately; always replace as a unit.**

8) Loosen bolts which secure tone wheel to hub. Remove tone wheel (only vehicle equipped with ABS).

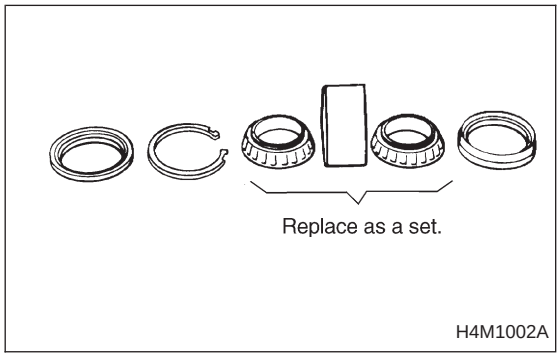


G4M0228

9) Using ST and a hydraulic press, drive hub bolts out.

ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer hub bolts. This may deform hub.

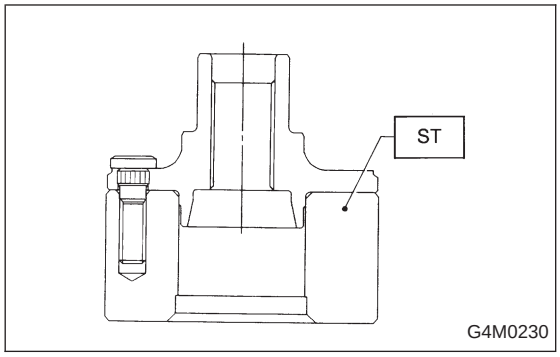


H4M1002A

C: INSPECTION

Check the removed parts for wear and damage. If defective, replace with a new one.

CAUTION:
- **If bearing is faulty, replace it as the bearing set.**
- **Be sure to replace oil seal at every overhaul.**



D: ASSEMBLY

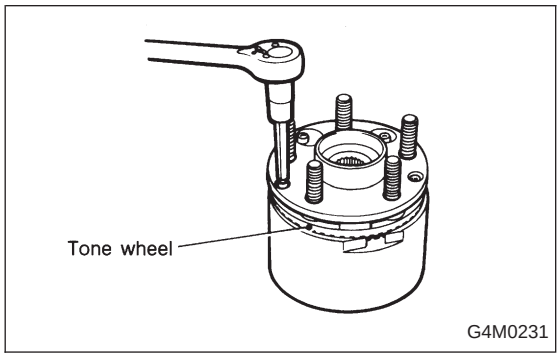
1) Attach hub to ST securely.

ST 927080000 HUB STAND

2) Using a hydraulic press, press new hub bolts into place.

CAUTION:
Be sure to press hub bolts until their seating surfaces contact the hub.

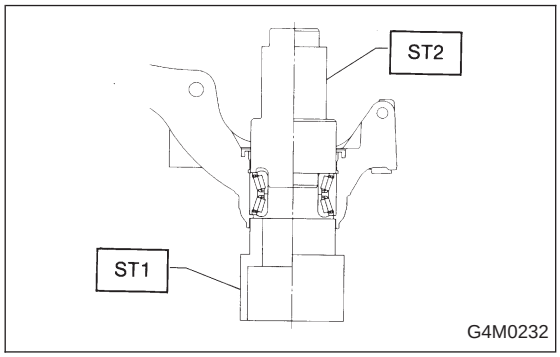
NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.



3) Remove foreign particles (dust, rust, etc.) from mating surfaces of hub and tone wheel, and install tone wheel to hub (only vehicle equipped with ABS).

CAUTION:
- **Be careful not to damage tone wheel teeth.**
- **Ensure tone wheel closely contacts hub.**

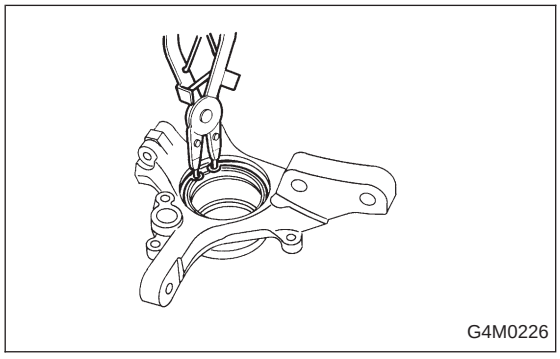
4) Clean dust or foreign particles from inside the housing.



5) Using ST1 and ST2, press a new bearing into place.

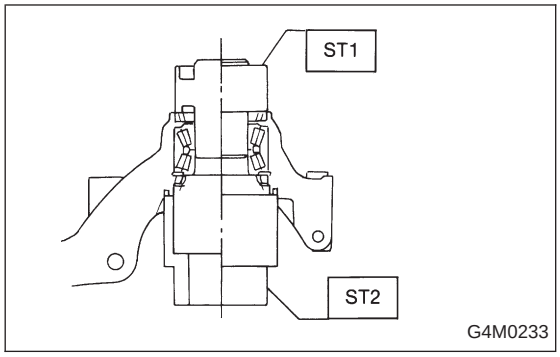
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

CAUTION:
- **Always press outer race when installing bearing.**
- **Be careful not to remove plastic lock from inner race when installing bearing.**
- **Charge bearing with new grease when outer race is not removed.**



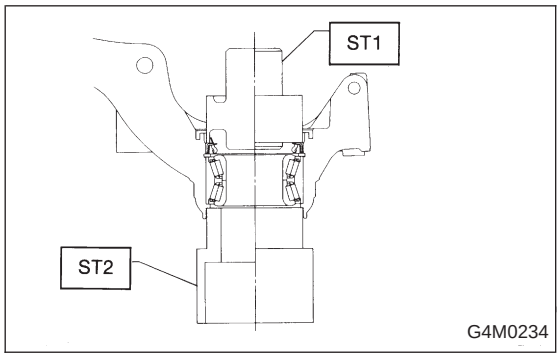
6) Using pliers, install snap ring in its groove.

CAUTION:
Make sure to install it firmly to groove.



7) Using ST1 and ST2, press outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Using ST1 and ST2, press inner oil seal until it contacts circlip.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND

9) Invert ST and housing.

ST 927400000 HOUSING STAND

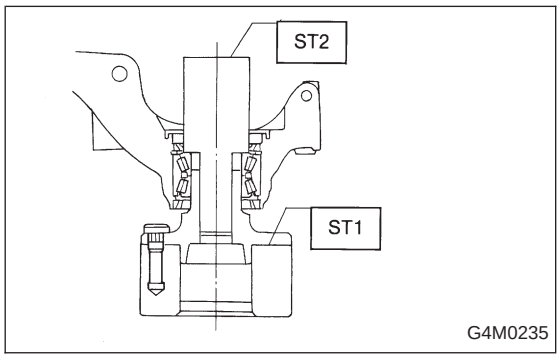
10) Apply sufficient grease to oil seal lip.

Specified grease
SHELL 6459N

CAUTION:
● If specified grease is not available, remove bearing grease and apply Auto Rex A instead.
● Do not mix different types of grease.

11) Install disc cover to housing the three bolts.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)



12) Attach hub to ST1 securely.
13) Clean dust or foreign particles from the polished surface of hub.
14) Using ST2, press bearing into hub by driving inner race.

ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER

E: INSTALLATION

1) Install transverse link ball joint to housing.

Tightening torque:
44±6 N·m (4.5±0.6 kg-m, 32.5±4.3 ft-lb)

2) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

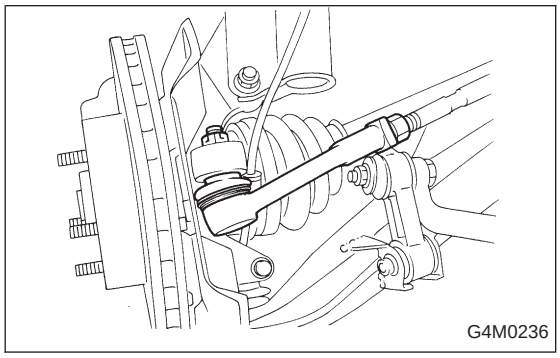
CAUTION:
Use a new self-locking nut.

Tightening torque:
147±15 N·m (15±1.5 kg-m, 108±11 ft-lb)

3) Install speed sensor and harness on housing (only vehicle equipped with ABS).
4) Install disc rotor on hub.
5) Install disc brake caliper on housing.

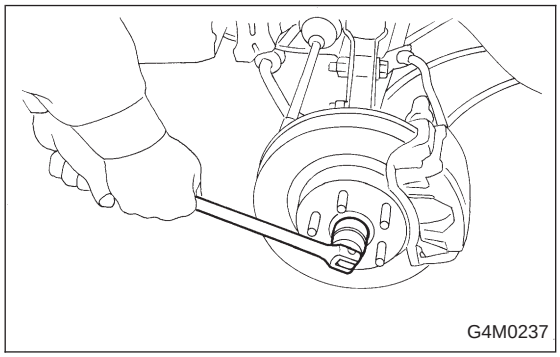
Tightening torque:
59±10 N·m (6±1 kg-m, 43±7 ft-lb)

6) Install front drive shaft. <Ref. to 4-2 [W3E1].>
7) Connect stabilizer link.


G4M0236

8) Install tie-rod end ball joint on housing knuckle arm.

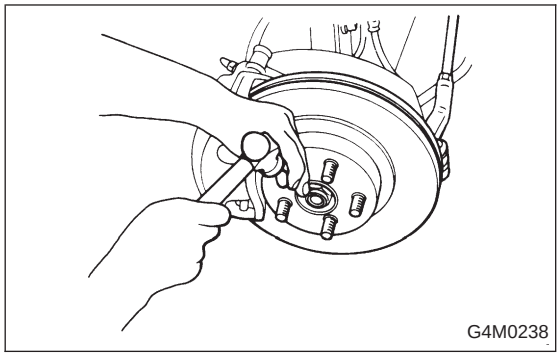
Tightening torque:
27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 ft-lb)


G4M0237

9) While depressing brake pedal, tighten axle nut and lock it securely.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 ft-lb)

CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**



10) After tightening axle nut, lock it securely.
11) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

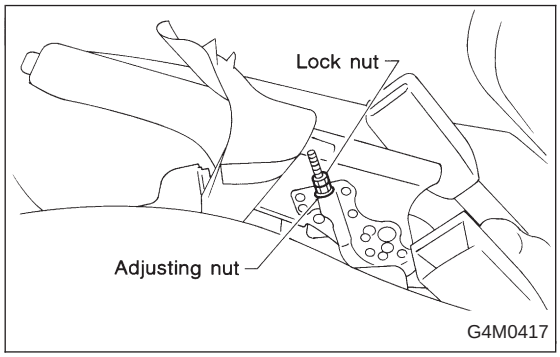
2. Rear Axle

A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove rear wheel cap and wheels.

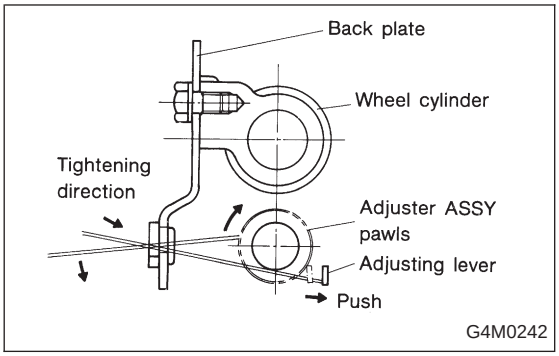
CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Remove axle nut using a socket wrench.

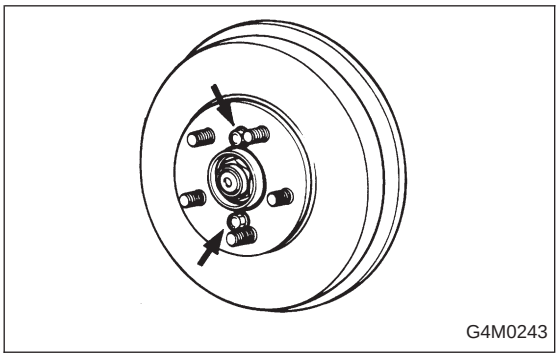


5) Return parking brake lever and loosen adjuster.

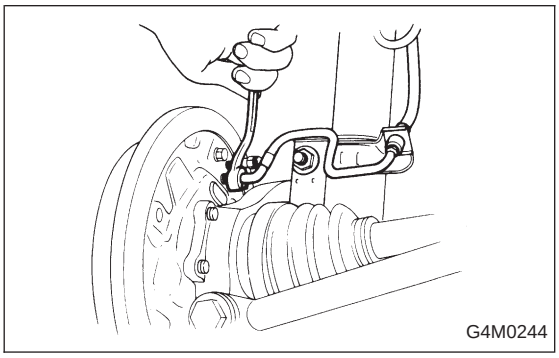
6) Remove brake drum from hub.



7) If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.

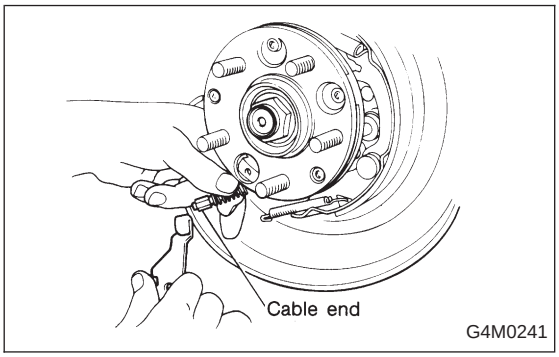


NOTE:
If brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

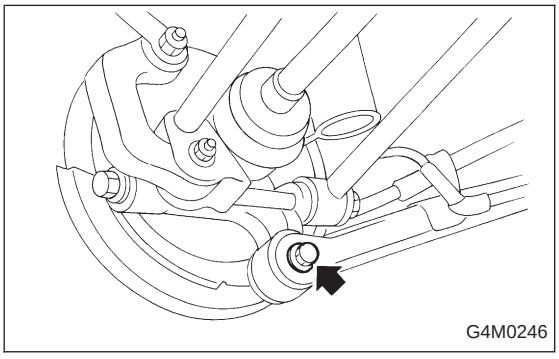


8) Using a flare-nut wrench, disconnect brake pipe from wheel cylinder.

CAUTION:
Cover open end of wheel cylinder to prevent entry of foreign particles.

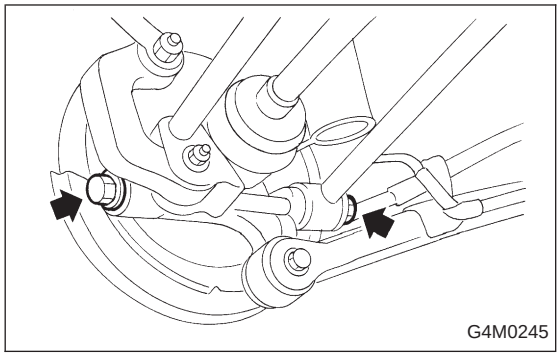


9) Disconnect end of parking brake cable.



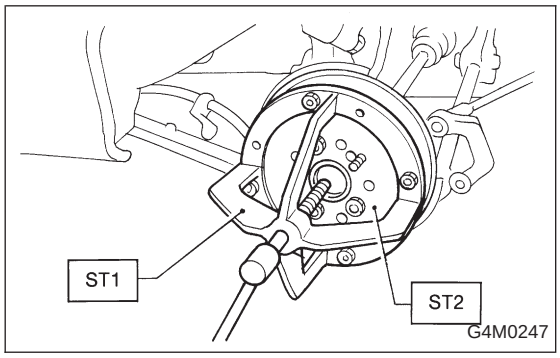
10) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.



11) Remove bolts which secure lateral link assembly to rear housing.

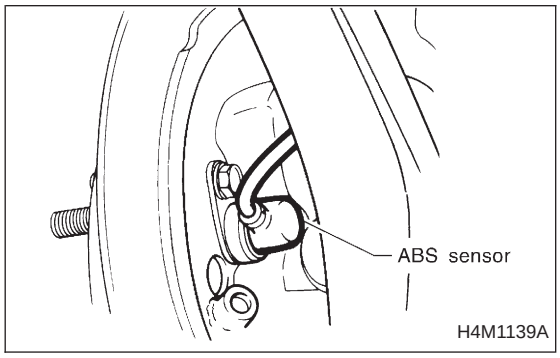
CAUTION:
Discard old self-locking nut. Replace with a new one.



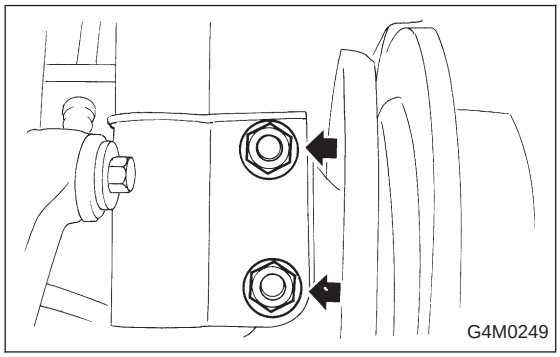
12) Disengage BJ from housing splines, and remove rear drive shaft assembly. If it is hard to remove, use STs.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
- **Be careful not to damage oil seal lip when removing rear drive shaft.**
- **When rear drive shaft is to be replaced, also replace inner oil seal with a new one.**

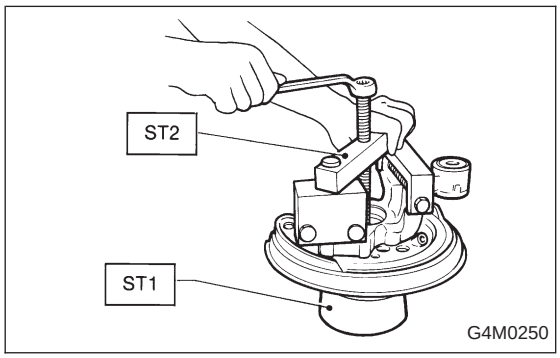


13) Remove rear ABS sensor from back plate (only vehicle equipped with ABS).



14) Remove bolts which secure rear housing to strut, and separate the two.

B: DISASSEMBLY

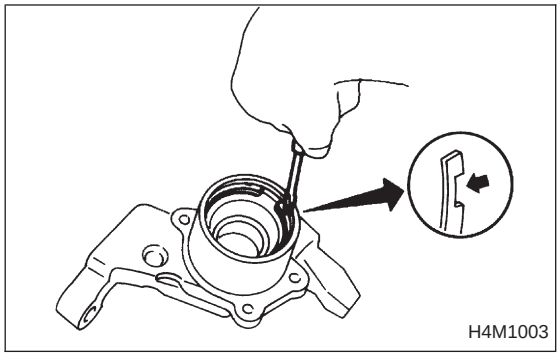


1) Using ST1 and ST2, remove hub from rear housing.

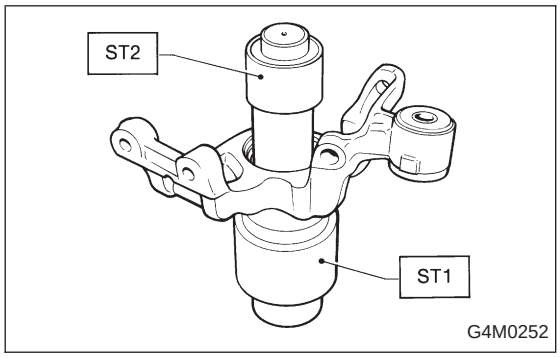
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

2) Remove back plate from rear housing.
3) Using a standard screwdriver, remove outer and inner oil seals.

CAUTION:
Use new oil seals.


H4M1003

4) Using flat bladed screwdriver, remove snap ring.



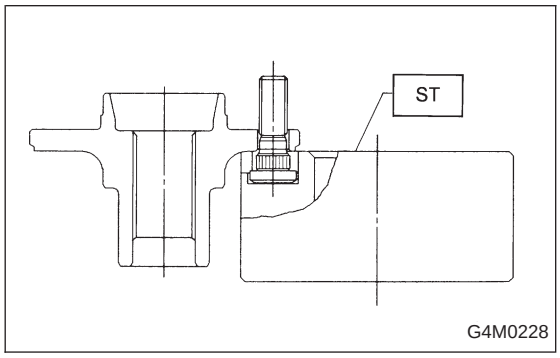
G4M0252

5) Using ST1 and ST2, remove bearing by pressing inner race.

ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Do not remove bearing unless damaged.**
- **Do not re-use bearing after removal.**

6) Remove tone wheel bolts and remove tone wheel from hub (only vehicle equipped with ABS).

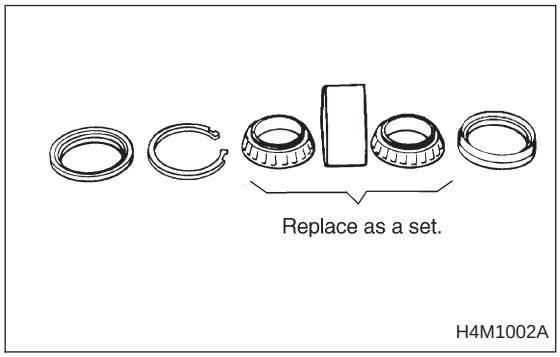


G4M0228

7) Using ST, press hub bolt out.

ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer hub bolts. This may deform hub.

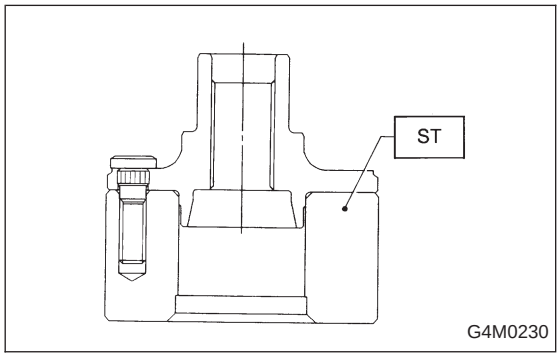


H4M1002A

C: INSPECTION

Check the removed parts for wear and damage. If defective, replace with a new one.

CAUTION:
- **If a bearing is faulty, replace it as the bearing set.**
- **Be sure to replace oil seal at every overhaul.**



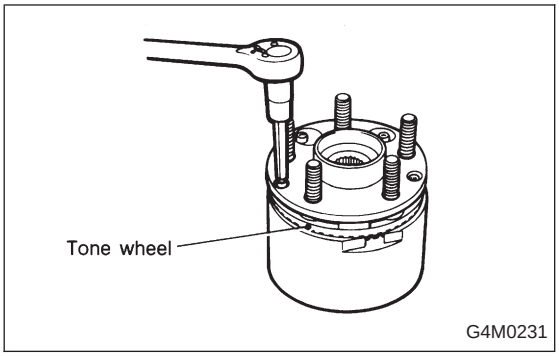
G4M0230

D: ASSEMBLY

1) Using ST, press new hub bolt into place.

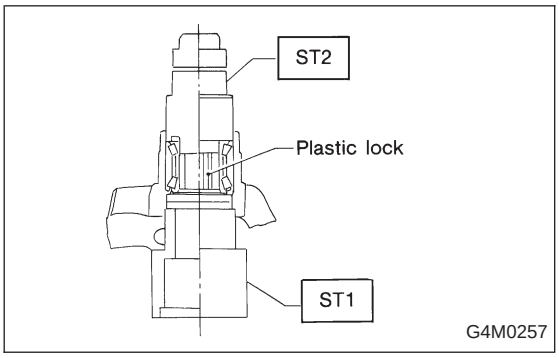
CAUTION:
- **Ensure hub bolt closely contacts hub.**
- **Use a 12 mm (0.47 in) hole in the ST to prevent hub bolt from tilting during installation.**

ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of hub and tone wheel, and install tone wheel to hub (only vehicle equipped with ABS).

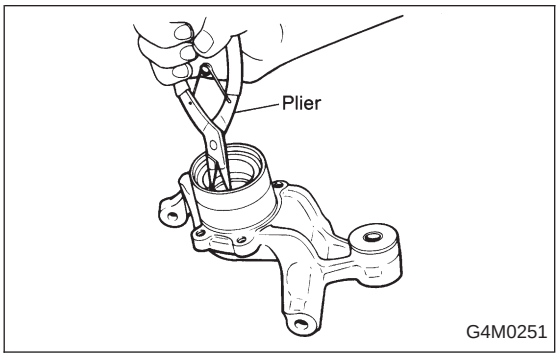
CAUTION:
- **Ensure tone wheel closely contacts hub.**
- **Be careful not to damage tone wheel teeth.**



3) Clean housing interior completely. Using ST1 and ST2, press bearing into housing.

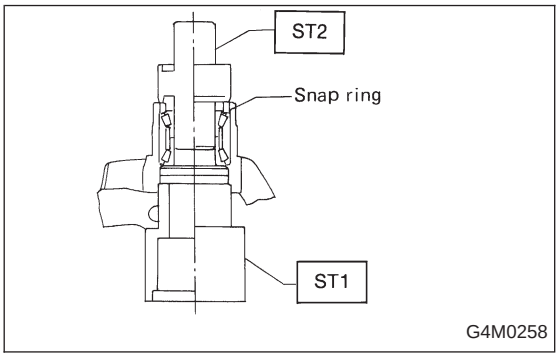
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Always press outer race when installing bearing.**
- **Be careful not to remove plastic lock from inner race when installing bearing.**
- **Charge bearing with new grease when outer race is not removed.**



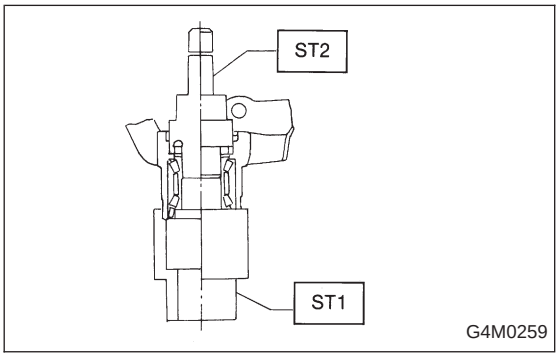
4) Using plier, install snap ring.

CAUTION:
Ensure snap ring fits in groove properly.



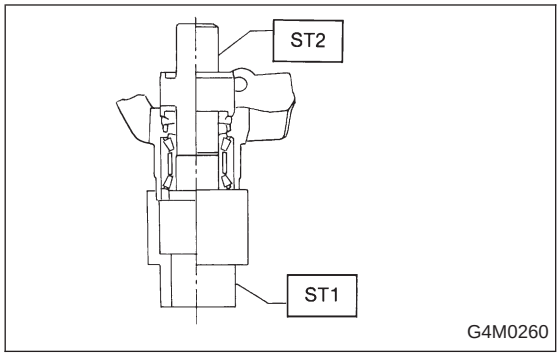
5) Using ST1 and ST2, press outer oil seal until it comes in contact with snap ring.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



6) Invert both ST1 and housing.
7) Using ST2, press inner oil seal into housing until it touches bottom.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using ST1 and ST2, press sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

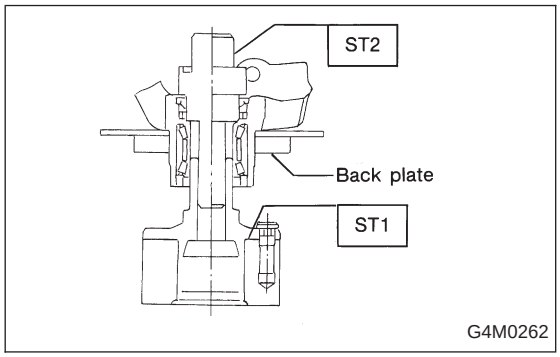
9) Apply sufficient grease to oil seal lip.

Specified grease:
SHELL 6459N

CAUTION:
● If specified grease is not available, remove bearing grease and apply Auto Rex A instead.
● Do not mix different types of grease.

10) Install back plate to rear housing.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)



11) Using ST1 and ST2, press bearing into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER

E: INSTALLATION

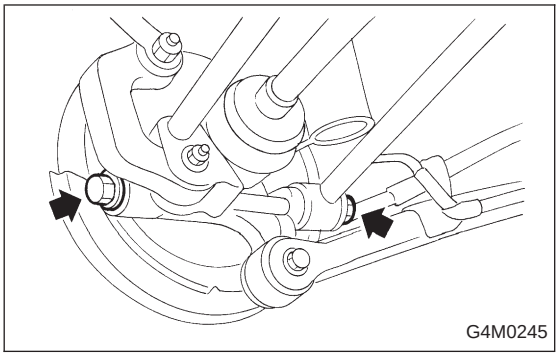
1) Connect rear housing assembly and strut assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
147±15 N·m (15±1.5 kg-m, 108±11 ft-lb)

2) Fit BJ (bell joint) to rear housing splines.

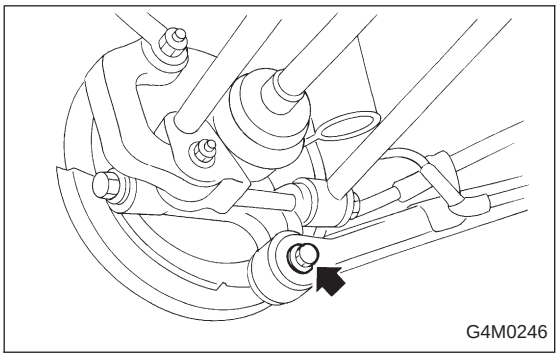
CAUTION:
Be careful not to damage inner oil seal lip.


G4M0245

3) Connect rear housing assembly to lateral link assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)


G4M0246

4) Connect rear housing assembly to trailing link assembly.

CAUTION:
Use a new self-locking nut.

Tightening torque:
98 — 127 N·m (10 — 13 kg-m, 72 — 94 ft-lb)

5) Clean brake pipe connection. Using a flare-nut wrench, connect brake pipe to wheel cylinder.
6) Connect parking brake cable to lever.
7) Install brake drum on rear housing assembly.
8) Install rear speed sensor to back plate (only vehicle equipped with ABS).
9) Bleed air from brake system. <Ref. to 4-4 [W8B0].>
10) Adjust parking brake lever stroke by turning adjuster.
11) Move brake lever back to apply brakes. While depressing brake pedal, tighten axle nut using a socket wrench. Lock axle nut after tightening.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 ft-lb)

CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

12) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

3. Front and Rear Drive Shafts

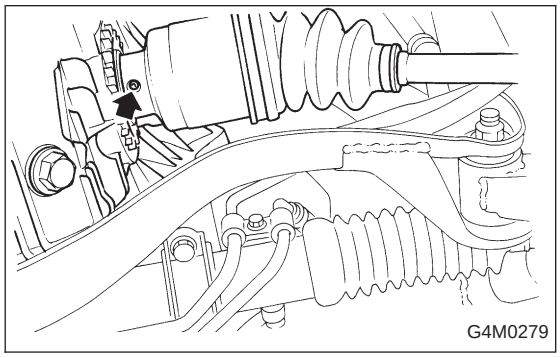
A: REMOVAL

1. FRONT DRIVE SHAFT

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands (rigid rocks), and remove front wheel cap and wheels.
3) Unlock axle nut.
4) Remove axle nut using a socket wrench.

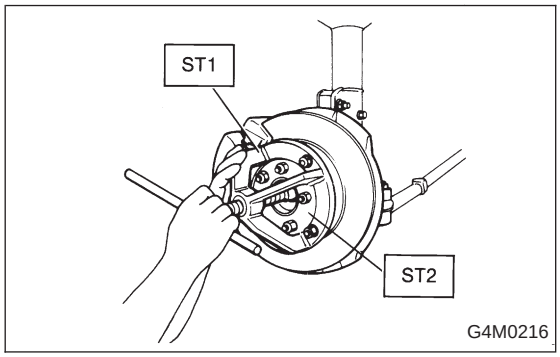
CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

5) Disconnect transverse link from housing.


G4M0279

6) Remove spring pin which secures transmission spindle to DOJ/FTJ.

CAUTION:
Use a new spring pin.



G4M0216

7) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
- **Be careful not to damage oil seal lip when removing front drive shaft.**
- **When front drive shaft is to be replaced, also replace inner oil seal.**

2. REAR DRIVE SHAFT

1) Disconnect ground cable from battery.
2) Lift-up vehicle, and remove rear wheel cap and wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Loosen axle nut using a socket wrench.

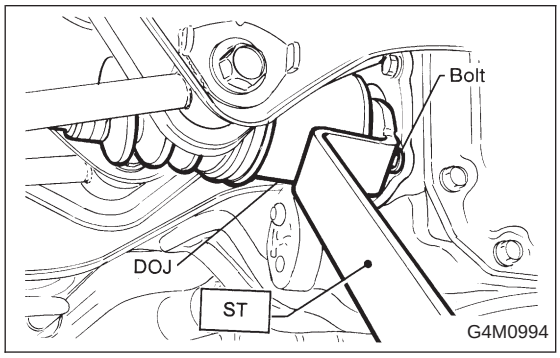
CAUTION:
Do not remove axle nut.

5) Remove ABS sensor clamps and parking brake cable bracket.
6) Remove bolts which secure lateral link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.

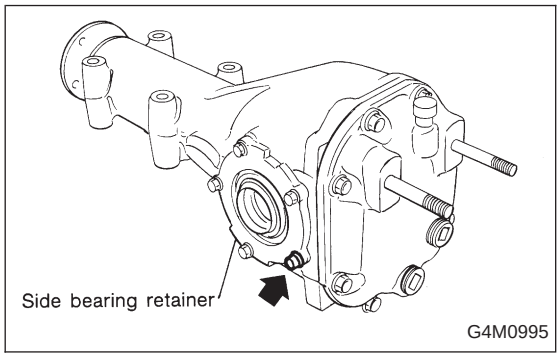
7) Remove bolts which secure trailing link assembly to rear housing.

CAUTION:
Discard old self-locking nut. Replace with a new one.



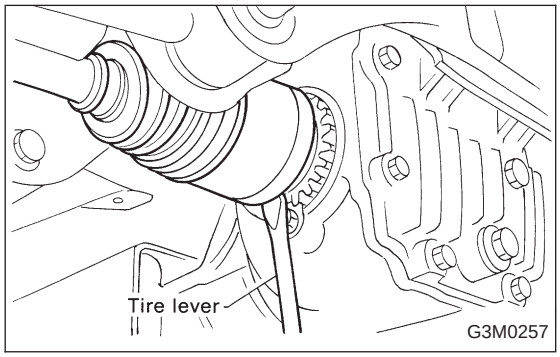
8) Remove DOJ from rear differential using ST. (2200 cc MT vehicles)
ST 28099PA100 DRIVE SHAFT REMOVER

CAUTION:
Do not remove circlip attached to inside of differential.



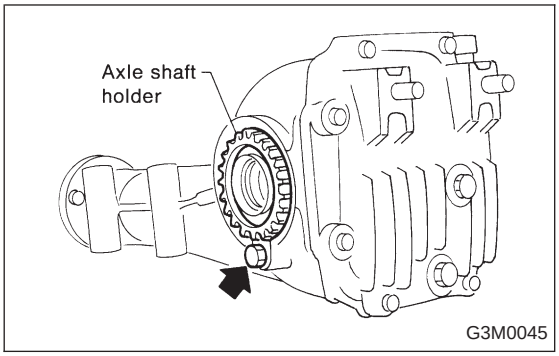
CAUTION:
Be careful not to damage side bearing retainer. Always use bolt as shown in figure, as supporting point for ST during removal.

ST 28099PA100 DRIVE SHAFT REMOVER

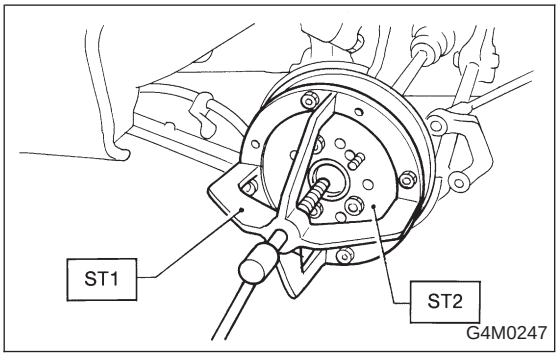


9) Remove DOJ from rear differential using tire lever. (Except 2200 cc MT vehicles)

NOTE:
The side spline shaft circlip comes out together with the shaft.



CAUTION:
When removing the DOJ from the rear differential, fit tire lever to the bolt as shown in figure so as not to damage the axle shaft holder.



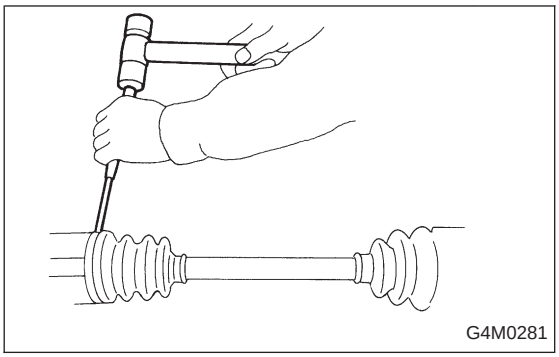
10) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

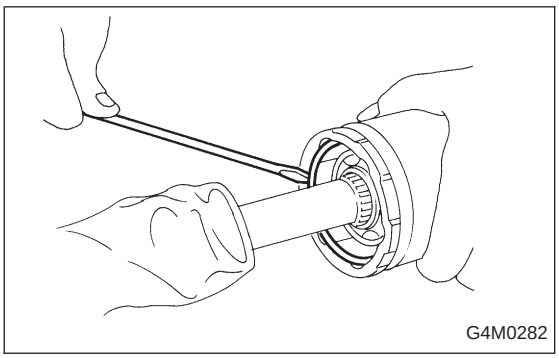
CAUTION:
- **Be careful not to damage oil seal lip when removing rear drive shaft.**
- **When rear drive shaft is to be replaced, also replace inner oil seal with a new one.**

B: DISASSEMBLY

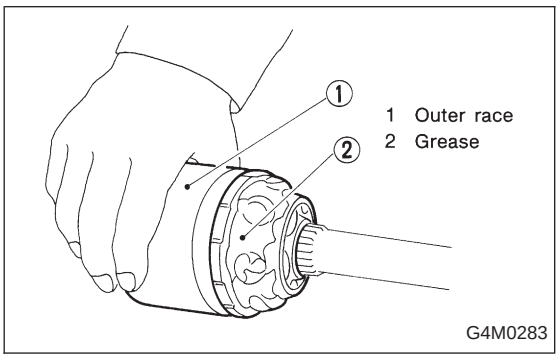
1. FRONT DRIVE SHAFT (EXCEPT 2200 cc AT VEHICLES)



1) Straighten bent claw of larger end of DOJ boot.
2) Loosen band by means of screwdriver or pliers with care of not damaging boot.
3) Remove boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.



5) Pry and remove round circlip located at the neck of DOJ outer race with a screwdriver.



6) Take out DOJ outer race from shaft assembly.
7) Wipe off grease and take out balls.

CAUTION:
The grease is a special grease (grease for constant-velocity joint). Do not confuse with other greases.

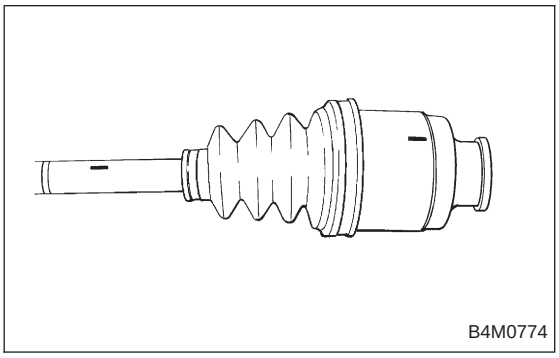
NOTE:
Disassemble exercising care not to lose balls (6 pcs).

8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and shift the cage.

9) Remove snap ring, which fixes inner race to shaft, by using pliers.
10) Take out DOJ inner race.
11) Take off DOJ cage from shaft and remove DOJ boot.

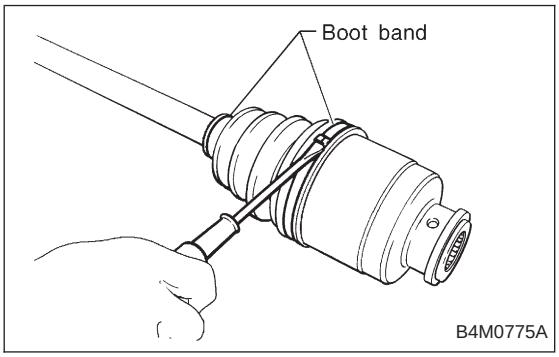
CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

12) Remove BJ boot in the same procedure as steps 1) to 3).
13) Thus, disassembly of axle is completed, but BJ is unable to be disassembled.


B4M0774

2. FRONT DRIVE SHAFT (2200 cc AT VEHICLES)

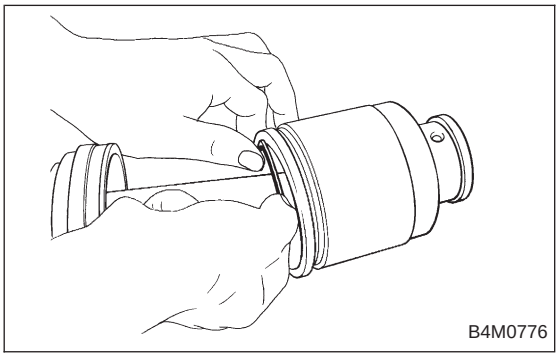
1) Place alignment marks on shaft and outer race.



B4M0775A

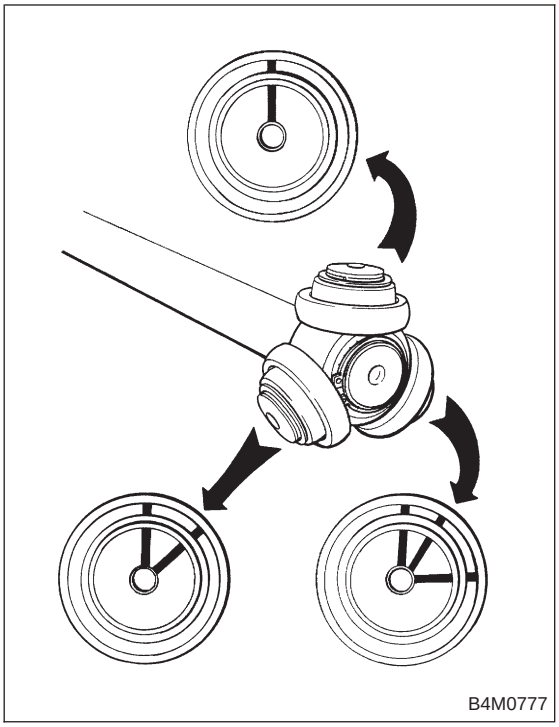
2) Remove FTJ boot band and boot.

CAUTION:
Be careful not to damage boot.

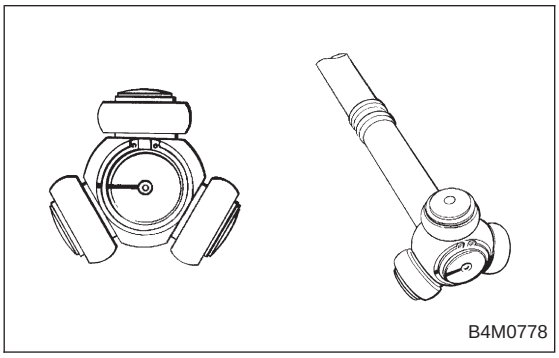

B4M0776

3) Remove circlip from FTJ outer race using screwdriver.
4) Remove FTJ outer race from shaft assembly.
5) Wipe off grease.

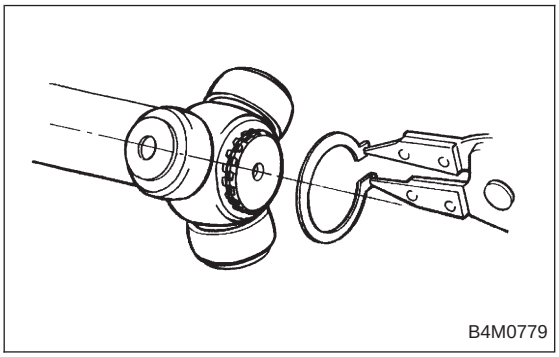
CAUTION:
The grease is a special grease. Do not confuse with other greases.


B4M0777

6) Place alignment mark on free ring and trunnion.
7) Remove free ring from trunnion.


B4M0778

8) Place alignment mark on trunnion and shaft.


B4M0779

9) Remove snap ring and trunnion.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

10) Remove FTJ boot.
11) Remove BJ boot band and boot.

C: INSPECTION

Check the removed parts for damage, wear, corrosion and etc. If faulty, repair or replace.
1) DOJ and FTJ
Check seizure, corrosion, damage, wear and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) BJ
Check seizure, corrosion, damage and excessive play.
4) Boot

Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

D: ASSEMBLY

1. FRONT DRIVE SHAFT (EXCEPT 2200 cc AT VEHICLES)

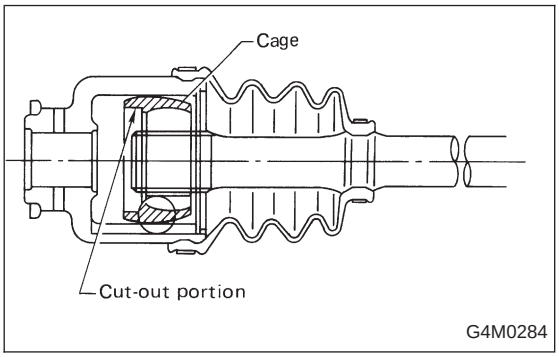
Use specified grease.

Front drive shaft:
BJ — NTG2218 (Part No. 28093AA020)
DOJ — VU-3A702 (Yellow) (Part No. 23223GA050)

Rear drive shaft:
BJ — Molylex No. 2 (Part No. 723223010) or Sunlight TB2-A
DOJ (1800 cc model) — Molylex No. 2 (Part No. 723223010) or Sunlight TB2-A
DOJ (2200 cc model) — VU-3A702 (Yellow) (Part No. 23223GA050)

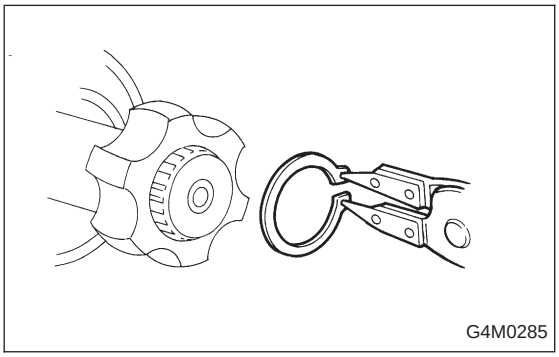
1) Install BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place DOJ boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyltape to prevent boot from scratches.



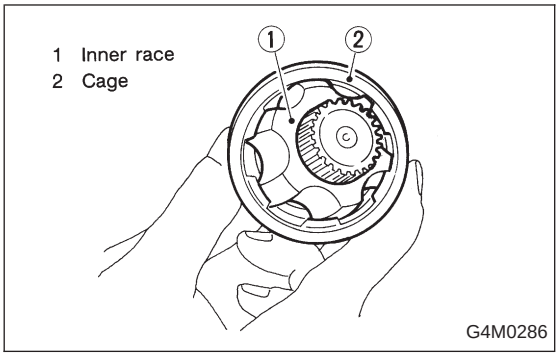
3) Insert DOJ cage onto shaft.

NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



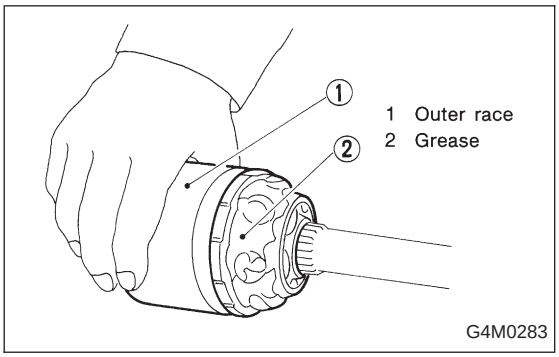
4) Install DOJ inner race on shaft and fit snap ring with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.

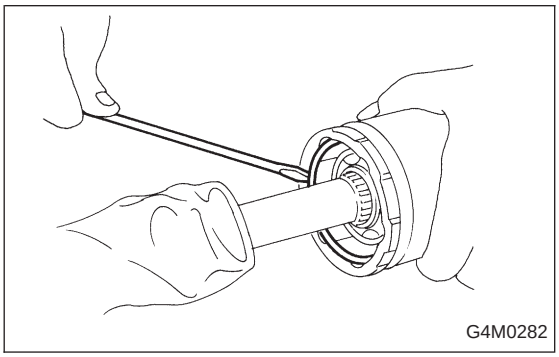


5) Install cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
7) Apply a coat of specified grease to the cage pocket and six balls.
8) Insert six balls into the cage pocket.
9) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



10) Install circlip in the groove on DOJ outer race.

NOTE:
- Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in the ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
12) Install DOJ boot taking care not to twist it.

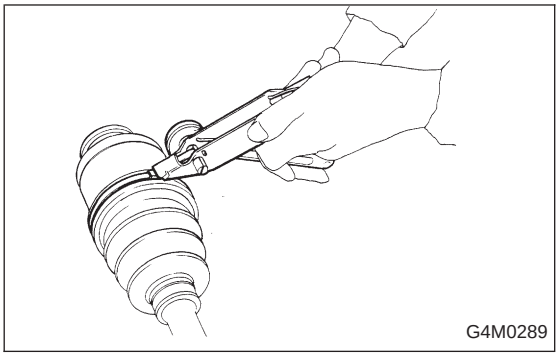
NOTE:
- The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
- When installing DOJ boot, position outer race of DOJ at center of its travel.

13) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:
Use a new band.

14) Pinch the end of band with pliers. Hold the clip and tighten securely.

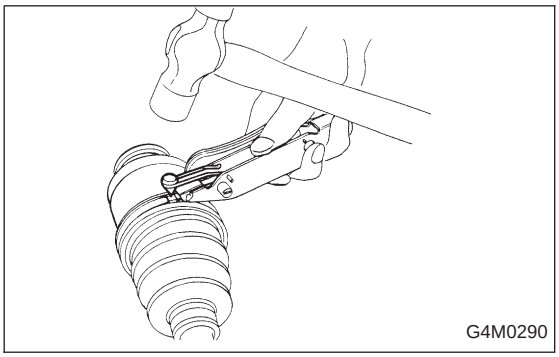
NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.


G4M0289

15) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


G4M0290

16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.

17) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

18) Fix up boot on BJ in the same manner.
19) Install protector onto BJ boot band. (For rear side only)

NOTE:
Extend and retract DOJ to provide equal grease coating.

2. FRONT DRIVE SHAFT (2200 cc AT VEHICLES)

CAUTION:
Use specified grease.

BJ side:
NTG2218 (Part No. 28093AA020)

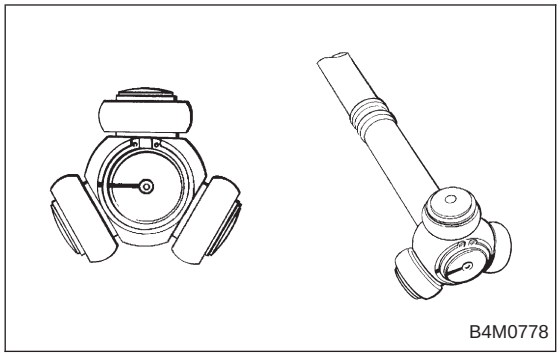
FTJ side:
SSG 6003

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

1) Install BJ boot in specified position and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.

CAUTION:
The inside of the larger end of BJ boot and the boot groove must be cleaned so as to be free from grease and other substances.

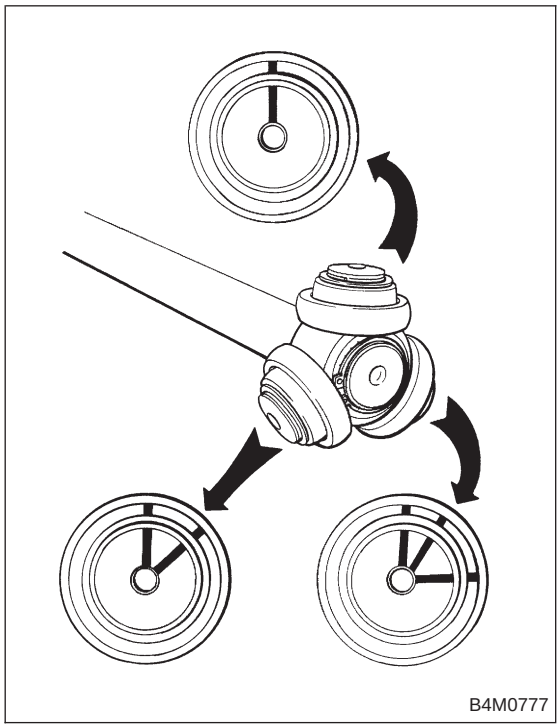
2) Place FTJ boot at the center of shaft.


B4M0778

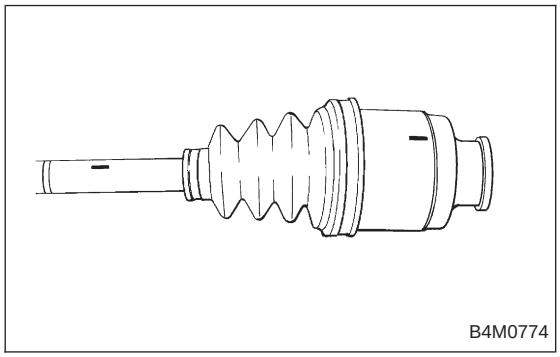
3) Align alignment marks and install trunnion on shaft.
4) Install snap ring to shaft.

CAUTION:
Confirm that the snap ring is completely fitted in the shaft groove.

5) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of FTJ outer race.
6) Apply a coat of specified grease to free ring and trunnion.


B4M0777

7) Align alignment marks on free ring and trunnion and install free ring.


B4M0774

8) Align alignment marks on shaft and outer race, and install outer race.
9) Install circlip in the groove on FTJ outer race.

CAUTION:
Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

10) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
11) Install FTJ boot taking care not to twist it.

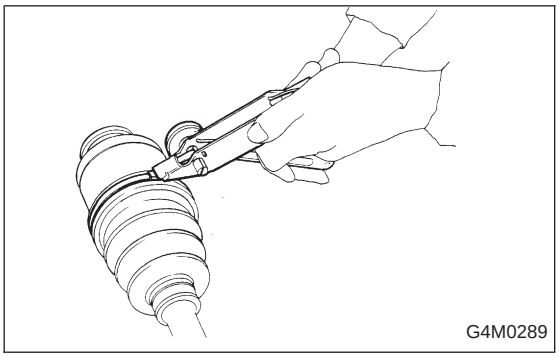
CAUTION:
- **The inside of the larger end of FTJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.**
- **When installing FTJ boot, position outer race of DOJ at center of its travel.**

12) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:
Use a new band.

13) Pinch the end of band with pliers. Hold the clip and tighten securely.

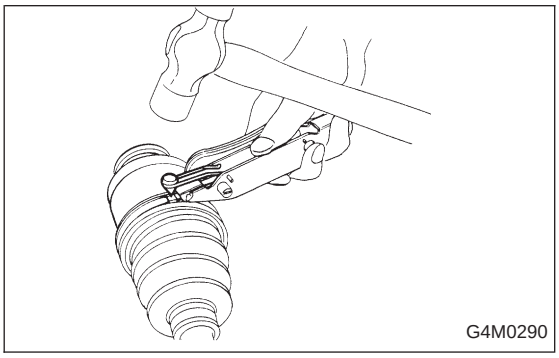
NOTE:
When tightening boot, exercise care so that the air within the boot is appropriate.


G4M0289

14) Tighten band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


G4M0290

15) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

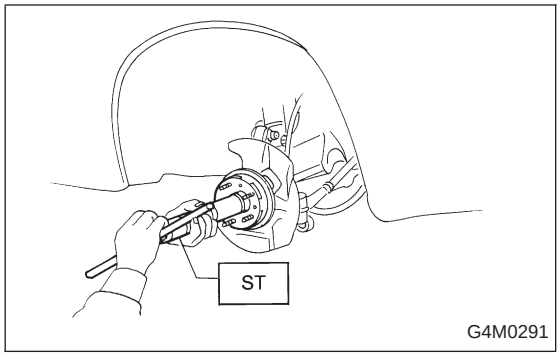
CAUTION:
Tap to an extent that the boot underneath is not damaged.

16) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

17) Fix up boot on BJ in the same manner.

NOTE:
Extend and retract FTJ to provide equal grease coating.



E: INSTALLATION

1. FRONT DRIVE SHAFT

1) Insert BJ into hub splines.

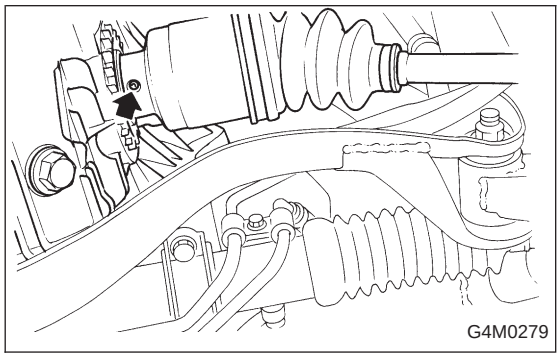
CAUTION:
Be careful not to damage inner oil seal lip.

2) Using ST1 and ST2, pull drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.

3) Tighten axle nut temporarily.



4) Install DOJ on transmission spindle and drive spring pin into place.

CAUTION:
Always use a new spring pin.

5) Connect transverse link to housing.

Torque (self-locking nut):
49±10 N·m (5.0±1.0 kg-m, 36±7 ft-lb)

CAUTION:
Use a new self-locking nut.

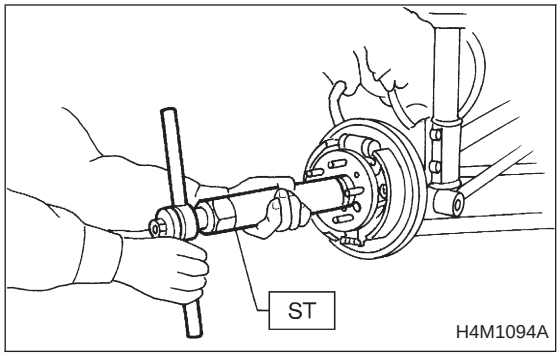
6) Install stabilizer bracket.

7) While depressing brake pedal, tighten axle nut to the specified torque.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 ft-lb)

CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

8) After tightening axle nut, lock it securely.



2. REAR DRIVE SHAFT

1) Insert BJ into rear housing splines.

CAUTION:
Be careful not to damage inner oil seal lip.

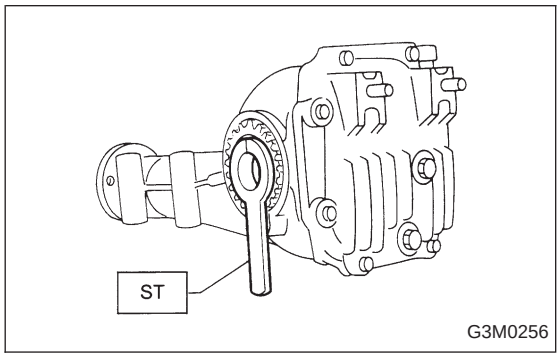
2) Using ST1 and ST2, pull drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.

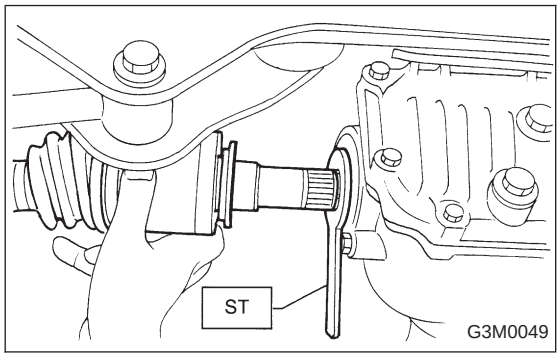
3) Tighten axle nut temporarily.

4) Replace circlips from DOJ spline with new one. (1800 cc vehicles only)



5) Using ST, install DOJ into differential.

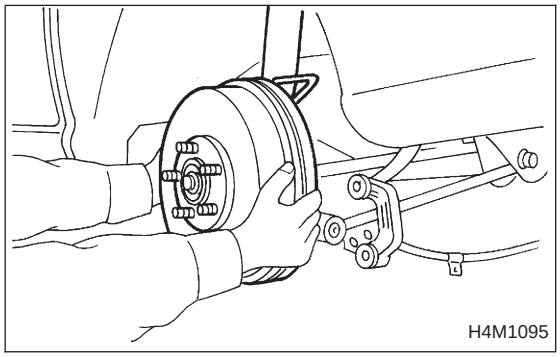
ST 28099PA090 SIDE OIL SEAL PROTECTOR



6) Insert DOJ spline end into bore of side oil seal, and remove ST.

CAUTION:
Do not allow DOJ splines to damage side oil seal.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



7) Align DOJ and differential splines.
8) Push housing to insert DOJ into differential.

NOTE:
Make sure DOJ is inserted properly.

9) Connect rear housing assembly to trailing link assembly, and tighten self-locking nut.

Tightening torque:
113±15 N·m (11.5±1.5 kg-m, 83±11 ft-lb)

10) Connect rear housing assembly to lateral link assembly, and tighten self-locking nut.

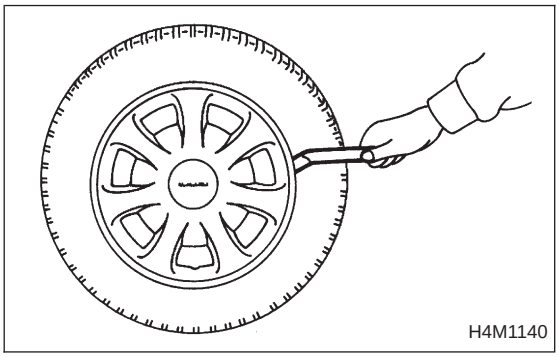
Tightening torque:
137±20 N·m (14±2 kg-m, 101±14 ft-lb)

11) Install stabilizer bracket.
12) While depressing brake pedal, tighten axle nut using a socket wrench.

Tightening torque:
186±20 N·m (19±2 kg-m, 137±14 ft-lb)

CAUTION:
- **Use a new axle nut.**
- **Always tighten axle nut before installing wheel on vehicle. If wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.**
- **Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.**

13) After tightening axle nut, lock it securely.


H4M1140

4. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings in the cap.

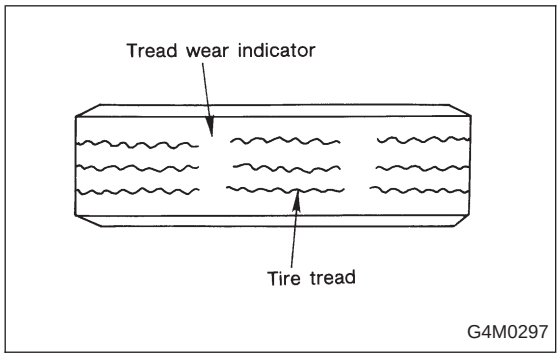
B: INSTALLATION

Align the valve hole in the wheel cap with the valve on the wheel and secure the wheel cap by tapping four points by hand.

5. Steel Wheel and Tire

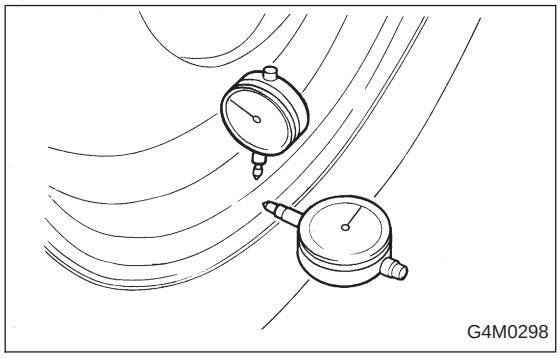
A: INSPECTION

1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack, or damage, and repair or replace as necessary.
2) Take stone, glass, nail etc. off the tread groove.



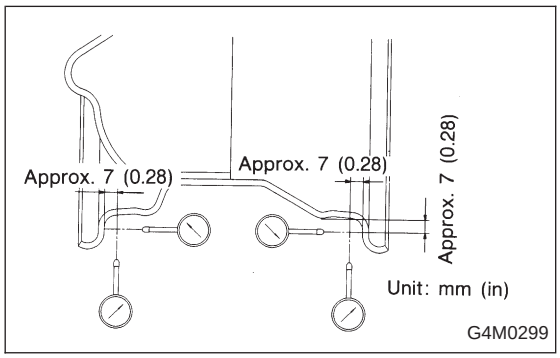
3) Replace tire:
   (1) when large crack on side wall, damage or crack on tread is found.
   (2) when the “tread wear indicator” appears as a solid band across the tread.

CAUTION:
● When replacing a tire, make sure to use only the same size, construction and load range as originally installed.
● Avoid mixing radial, belted bias or bias tires on the vehicle.



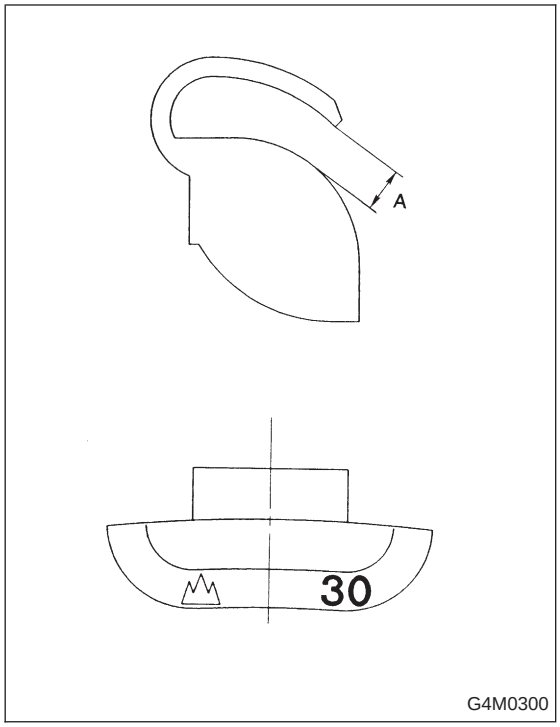
1. INSPECTION OF WHEEL RUNOUT

1) Jack-up vehicle until wheels clear the floor.
2) Slowly rotate wheel to check rim “runout” using a dial gauge.



	Axial runout limit	Radial runout limit
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

3) If rim runout exceeds specifications, remove tire from rim and check runout while attaching dial gauge to positions shown in figure.
4) If measured runout still exceeds specifications, replace the wheel.



6. Wheel Balancing

1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
2) To check for dynamic balance, use a dynamic balancer. Drive in the balance weight on both the top and rear sides of the rim.
3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.
4) Use genuine balance weights.

Service limit: A
1.6 — 2.0 mm (0.063 — 0.079 in)

CAUTION:
Balance weights are available for use with any of 13- to 14-inch wheels.

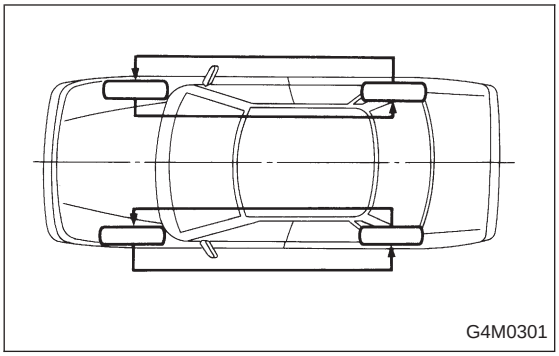
7. Installation of Wheel Assembly to Vehicle

1) Attach the wheel to the hub by aligning the wheel bolt hole with the hub bolt.
2) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
3) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to the guide portion of hub.
4) Tighten the wheel nuts in a diagonal selection to the specified torque. Use a wheel nut wrench.

Wheel nut tightening torque:
88±10 N·m (9±1 kg-m, 65±7 ft-lb)

CAUTION:
● Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to "judder".
● Do not depress the wrench with a foot; Always use both hands when tightening.
● Make sure the bolt, nut and the nut seating surface of the wheel are free from oils.

5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).


G4M0301

8. Tire Rotation

If tires are maintained at the same positions for a long period of time, uneven wear results. Therefore, they should be periodically rotated.
This lengthens service life of tires.

CAUTION:
When rotating tires, replace unevenly worn or damaged tires with new ones.

9. “T-type” Tire

“T-type” tire for temporary use is prepared as a spare tire.

CAUTION:
- **Keep the inflation pressure at 412 kPa (4.2 kg/cm^2, 60 psi) at all times.**
- **When the wear indicator appears on the tread surface, replace the tire with a new one.**
- **Do not use a tire chain with the “T-type” tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.**
- **Do not drive at a speed greater than 80 km/h (50 MPH).**
- **Drive as slowly as possible and avoid passing over bumps.**
- **Replace with a conventional tire as soon as possible since this “T-type” tire is only for temporary use.**

STEERING SYSTEM 4-3

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PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

The Supplemental Restraint System “Airbag” helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the “5-5. SUPPLEMENTAL RESTRAINT SYSTEM” of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System “Airbag”.**

1. Steering System

A: SPECIFICATIONS

Whole system	Minimum turning radius m (ft)	5.1 (16.7)
	Steering angle (Inside-Outside)	37.4°±1.5° — 32.5°±1.5°
	Steering wheel diameter mm (in)	385 (15.16)
	Overall gear ratio (Turns, lock to lock)	16.5 (3.2)
Gearbox	Type	Rack and pinion, Integral
	Backlash	0 (Automatically adjustable)
	Valve (Power steering system)	Rotary valve
Pump (Power steering system)	Type	Vane pump
	Oil tank	Installed on pump
	Output cm^3 (cu in)/rev.	7.2 (0.439)
	Relief pressure kPa (kg/cm^2, psi)	1800 cc model: 6,375 (65, 924) 2200 cc model: 7,355 (75, 1,067)
	Hydraulic fluid control	Dropping in response to increased engine revolutions
	Hydraulic fluid ℓ (US qt, Imp qt)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution rpm	500 — 7,500
	Revolving direction	Clockwise
Working fluid (Power steering system)	Name	ATF DEXRON II, IIE or III
	Capacity Oil tank ℓ (US qt, Imp qt) Total	0.3 (0.3, 0.3) 0.7 (0.7, 0.6)

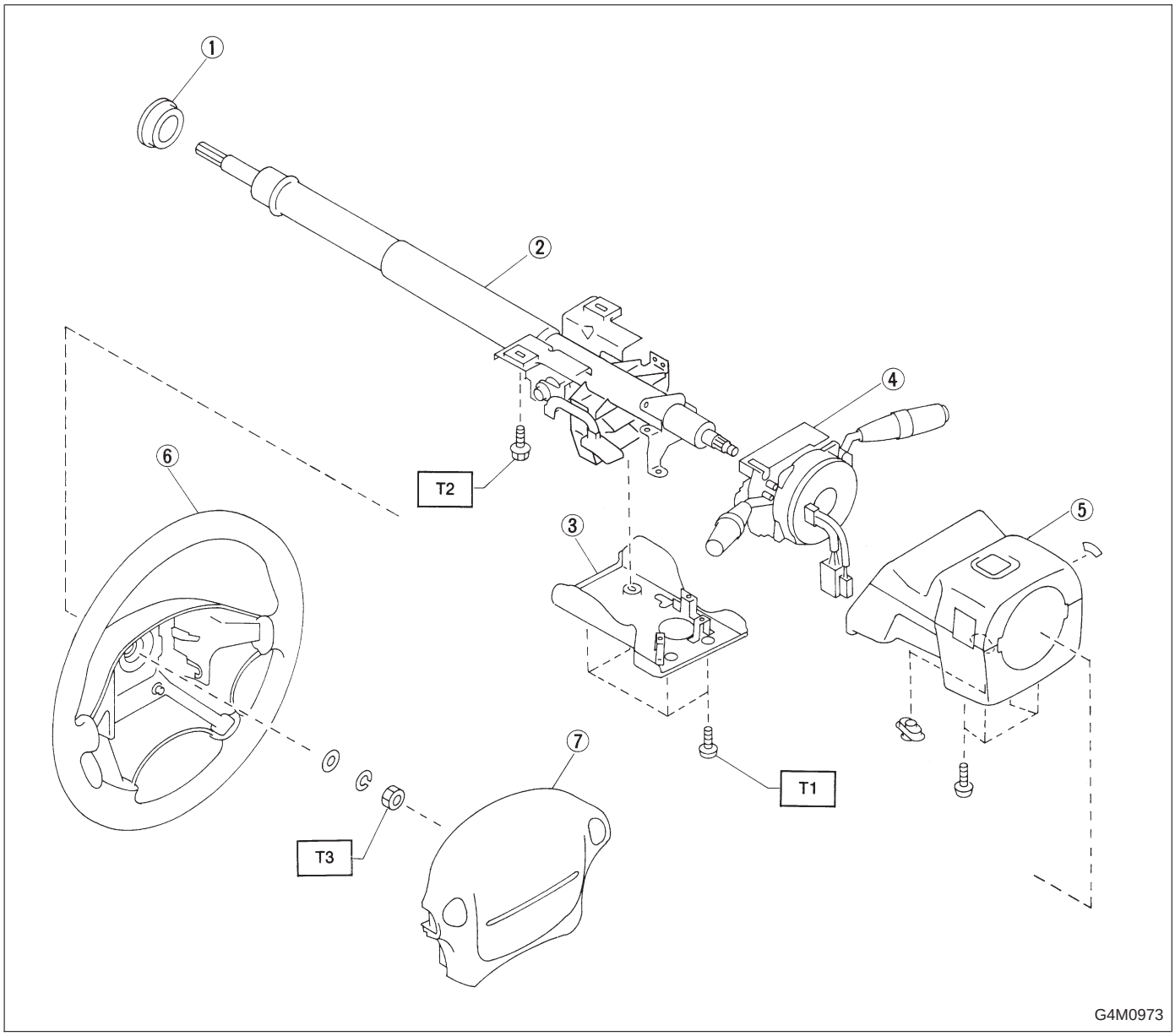
B: SERVICE DATA

Steering wheel	Free play mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	37.4°±1.5°
	Outer tire & wheel	32.5°±1.5°
Steering shaft	Clearance between steering wheel and column cover mm (in)	3.0 (0.118)
Steering gearbox (Power steering system)	Sliding resistance N (kg, lb)	240.3 (24.5, 54.0) or less
	Rack shaft play in radial direction mm (in) Right-turn steering Left-turn steering	 0.15 (0.0059) or less Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less
	Input shaft play mm (in) In radial direction In axial direction	 0.18 (0.0071) or less 0.1 (0.004) or less
	Turning resistance N (kg, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)
Oil pump (Power steering system)	Pulley shaft mm (in) Radial play Axial play	 0.4 (0.016) or less 0.9 (0.035) or less
	Pulley Ditch deflection mm (in) Resistance to rotation N (kg, lb)	 1.0 (0.039) or less 9.22 (0.94, 2.07) or less
	Regular pressure kPa (kg/cm^2, psi)	981 (10, 142) or less
	Relief pressure kPa (kg/cm^2, psi)	6,375 (65, 924)
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road N (kg, lb)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on a concrete road N (kg, lb)	147 (15, 33) or less

C: RECOMMENDED POWER STEERING FLUID

Recommended power steering fluid	Manufacturer
ATF DEXRON II, IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

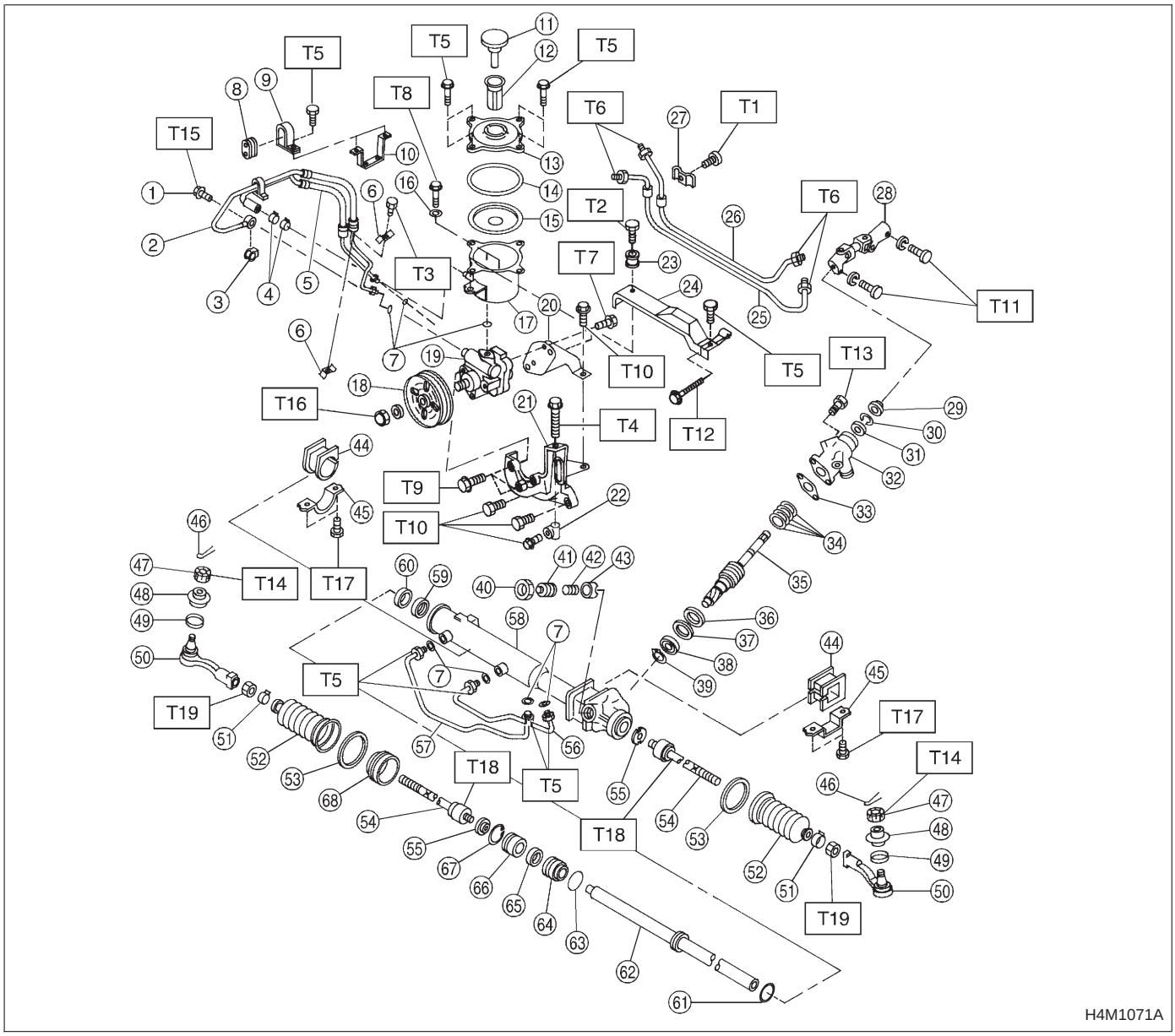
1. Steering Wheel and Column (Tilt)



① Bushing
② Steering shaft
③ Knee protector
④ Steering roll connector
⑤ Column cover
⑥ Steering wheel
⑦ Airbag module

Tightening torque: N·m (kg-m, ft-lb)
T1: 3.4±1.0 (0.35±0.1, 2.5±0.7)
T2: 25±5 (2.5±0.5, 18.1±3.6)
T3: 34±5 (3.5±0.5, 25.3±3.6)

2. Power Steering System



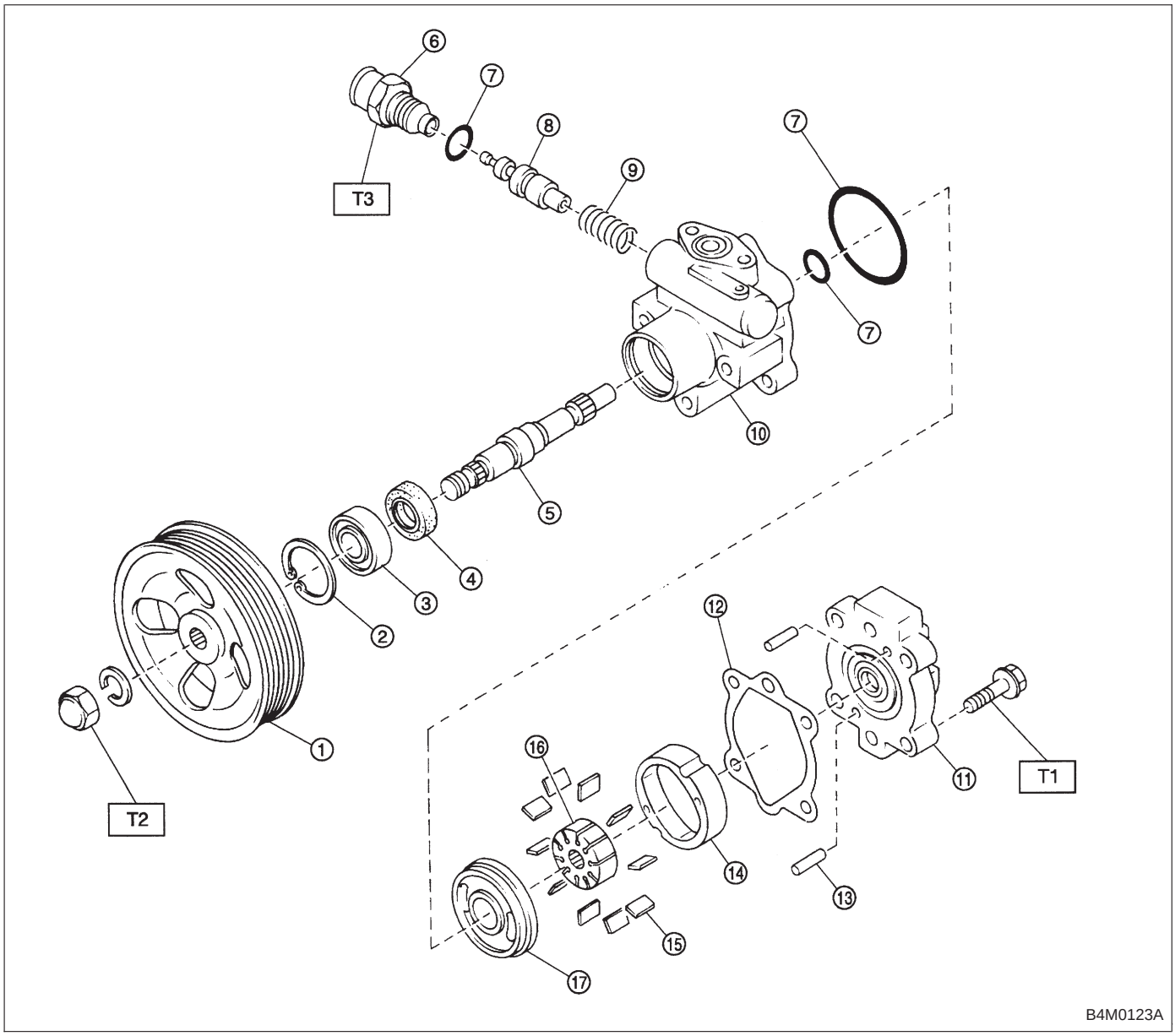
Tightening torque: N·m (kg-m, ft-lb)

- ***T1: 5.4±1.5 (0.55±0.15, 4.0±1.1)***
- ***T2: 6.4±1.0 (0.65±0.1, 4.7±0.7)***
- ***T3: 7.4±2.0 (0.75±0.20, 5.4±1.4)***
- ***T4: 8±2 (0.8±0.2, 5.8±1.4)***
- ***T5: 13±3 (1.3±0.3, 9.4±2.2)***
- ***T6: 15±5 (1.5±0.5, 10.8±3.6)***
- ***T7: 15.7±2.4 (1.60±0.24, 11.6±1.7)***
- ***T8: 18^{+5}_{0} ($1.8^{+0.5}_{0}$, $13.0^{+3.6}_{0}$)***
- ***T9: 20.1±2.5 (2.05±0.25, 14.8±1.8)***
- ***T10: 22±2 (2.2±0.2, 15.9±1.4)***
- ***T11: 24±3 (2.4±0.3, 17.4±2.2)***
- ***T12: 25±2 (2.5±0.2, 18.1±1.4)***
- ***T13: 25±5 (2.5±0.5, 18.1±3.6)***
- ***T14: 27±2 (2.75±0.2, 19.9±1.4)***
- ***T15: 39±5 (4.0±0.5, 28.9±3.6)***
- ***T16: 52±10 (5.3±1.0, 38±7)***
- ***T17: 59±12 (6.0±1.2, 43±9)***
- ***T18: 78±10 (8.0±1.0, 58±7)***
- ***T19: 83±5 (8.5±0.5, 61.5±3.6)***

COMPONENT PARTS

① Eye bolt
② Pipe C
③ Gasket
④ Clip
⑤ Pipe D
⑥ Clamp E
⑦ O-ring
⑧ Adapter
⑨ Clamp
⑩ Hose bracket
⑪ Cap
⑫ Strainer
⑬ Shell upper
⑭ Rubber
⑮ Buffle
⑯ Seal washer
⑰ Shell lower
⑱ Pulley
⑲ Oil pump
⑳ Stiffener
㉑ Bracket
㉒ Belt tension nut
㉓ Bush
㉔ Belt cover
㉕ Pipe E
㉖ Pipe F
㉗ Clamp plate
㉘ Universal joint
㉙ Dust seal
㉚ C-ring
㉛ Oil seal
㉜ Valve housing
㉝ Packing
㉞ Seal ring
㉟ Pinion and valve ASSY
㊱ Oil seal
㊲ Back-up washer
㊳ Ball bearing
㊴ Snap ring
㊵ Lock nut
㊶ Adjusting screw
㊷ Spring
㊸ Sleeve
㊹ Adapter
㊺ Clamp
㊻ Cotter pin
㊼ Castle nut
㊽ Dust seal
㊾ Clip
㊿ Tie-rod end
(51) Small clip
(52) Boot
(53) Large clip
(54) Tie-rod
(55) Lock washer
(56) Pipe B
(57) Pipe A
(58) Housing ASSY
(59) Back-up washer
(60) Oil seal
(61) Piston ring
(62) Rack
(63) O-ring
(64) Rack bushing
(65) Oil seal
(66) Rack stopper
(67) Circlip
(68) Spacer

3. Power Steering Oil Pump



① Pulley
② Snap ring
③ Bearing
④ Oil seal
⑤ Shaft
⑥ Connector
⑦ O-ring
⑧ Spool valve
⑨ Spring
⑩ Front casing
⑪ Rear cover
⑫ Gasket
⑬ Knock pin
⑭ Cam ring
⑮ Vane
⑯ Rotor
⑰ Side plate

Tightening torque: N·m (kg-m, ft-lb)
T1: 16±2 (1.6±0.2, 11.6±1.4)
T2: 61±7 (6.2±0.7, 44.8±5.1)
T3: 74±5 (7.5±0.5, 54.2±3.6)

1. Supplemental Restraint System “Airbag” AIRBAG

A: PRECAUTION

Airbag system wiring harness is routed near the steering wheel, steering shaft and column.

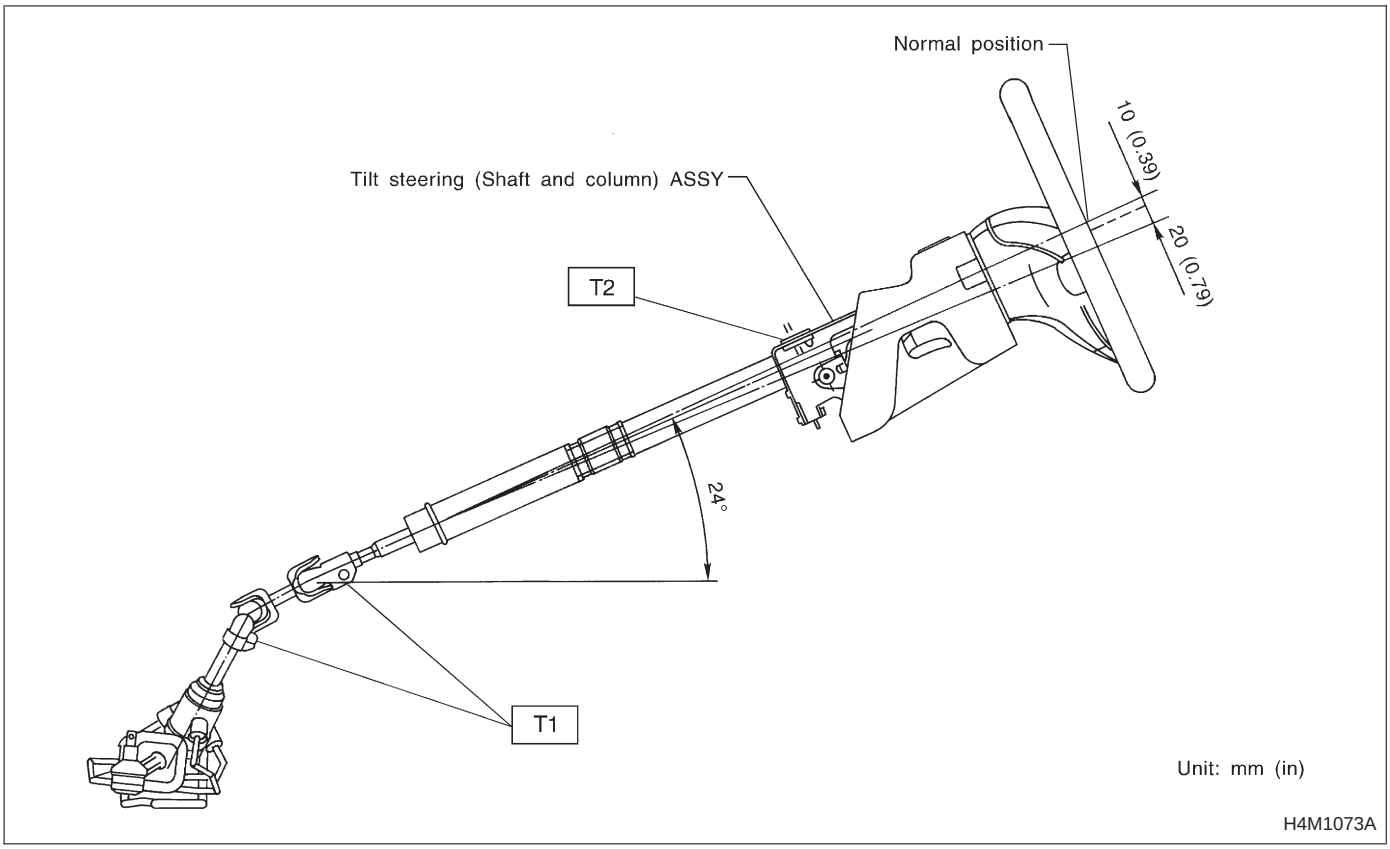
WARNING:

● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.

● Be careful not to damage Airbag system wiring harness when servicing the steering wheel, steering shaft and column.

2. Tilt Steering Column

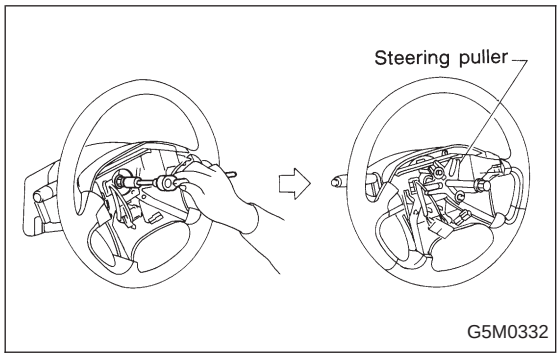
A: REMOVAL



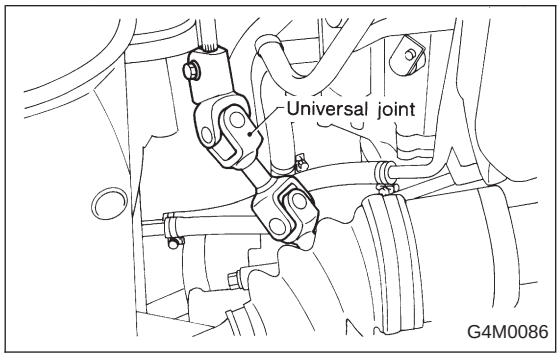
Tightening torque: N·m (kg-m, ft-lb)
T1: 24±3 (2.4±0.3, 17.4±2.2)
T2: 25±5 (2.5±0.5, 18.1±3.6)

1) Disconnect battery minus terminal.
2) Lift-up vehicle.
3) Remove airbag module. (with airbag model) <Ref. to 5-5 [W3A0].>

WARNING:
Always refer to "5-5 Supplemental Restraint System" before performing airbag module service (if so equipped). <Ref. to 5-5 [W3A0].>



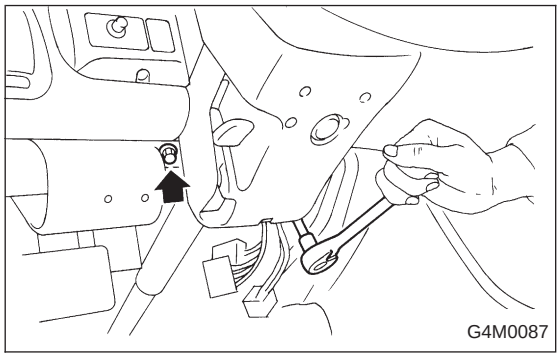
4) Remove steering wheel nut, then draw out steering wheel from shaft using steering puller.



5) Remove universal joint bolts and then remove universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.

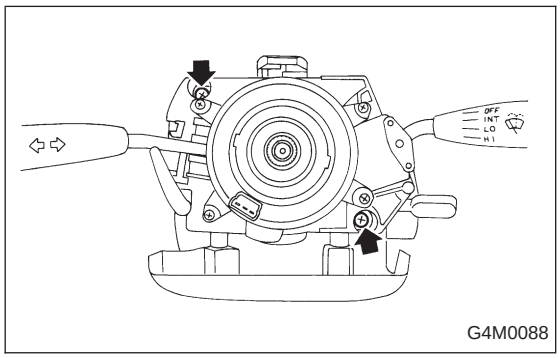
6) Remove trim panel under instrument panel.
7) Disconnect connectors for ignition switch and combination switch wiring harness under instrument panel.



8) Remove the two bolts under instrument panel securing steering shaft.
9) Pull out steering shaft assembly from hole on toe board.

CAUTION:
Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: DISASSEMBLY

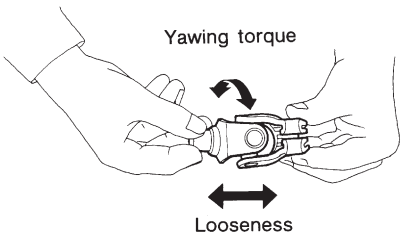
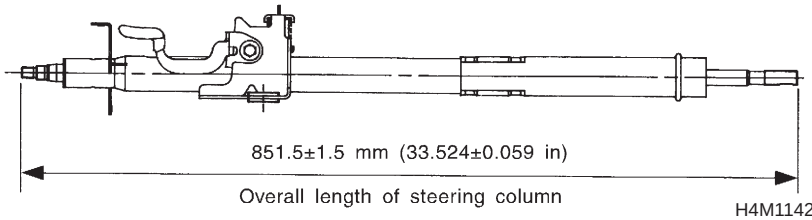


1) Remove the four screws securing upper and lower steering column covers, and the two screws securing combination switch, then remove related parts.

C: INSPECTION

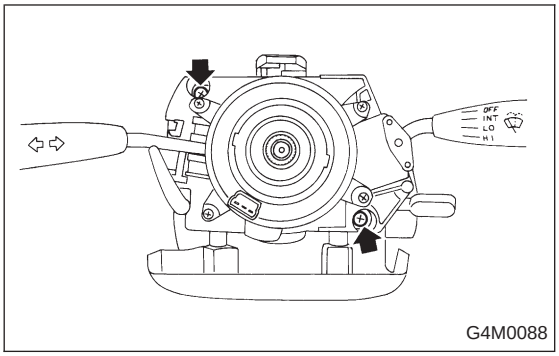
1. BASIC INSPECTION

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Part name	Inspection	Corrective action
Universal joint	● Free play ● Swinging torque Yawing torque Looseness  G4M0089 **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque:** **0.3 N·m (0.03 kg-m, 0.2 ft-lb)**	Replace if faulty.
Steering column	● Overall length of steering column Measure overall length of steering column. Standard overall length of steering column:  H4M1142A	Replace steering column assembly.

2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to 5-5 Supplemental Restraint System. <Ref. to 5-5 [W2F0] and [W2G0].>



G4M0088

D: ASSEMBLY

1) Insert combination switch to upper column shaft, and install lower column cover with tilt lever held in the lowered position. Then route ignition key harness and combination switch harness between column cover mounting bosses.
2) Fit upper column cover to lower column cover, and tighten combination switch and column cover.

Tightening torque:
1.2±0.2 N·m (0.12±0.02 kg-m, 0.9±0.1 ft-lb)

CAUTION:
Don't overtorque screw.

E: INSTALLATION

1) Insert end of steering shaft into toeboard grommet.
2) Tighten steering shaft mounting bolts under instrument panel.

Tightening torque:
25±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)

3) Connect ignition and combination switch connectors under instrument panel.
4) Connect airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

5) Install universal joint.
   (1) Align bolt hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
   (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
   (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
   (4) Tighten bolt on the long yoke side, then that on the short yoke side.

Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)

CAUTION:
● Make sure that universal joint bolts is tightened through notch in shaft serration.
● Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)

6) Align center of roll connector. (with airbag model)
<Ref. to 5-5 [W6B1].>

CAUTION:
Ensure that front wheels are set in straight forward direction.

7) Set steering wheel to neutral and install it onto steering shaft.

Tightening torque:
34±5 N·m (3.5±0.5 kg-m, 25.3±3.6 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.
Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end. (with airbag model)

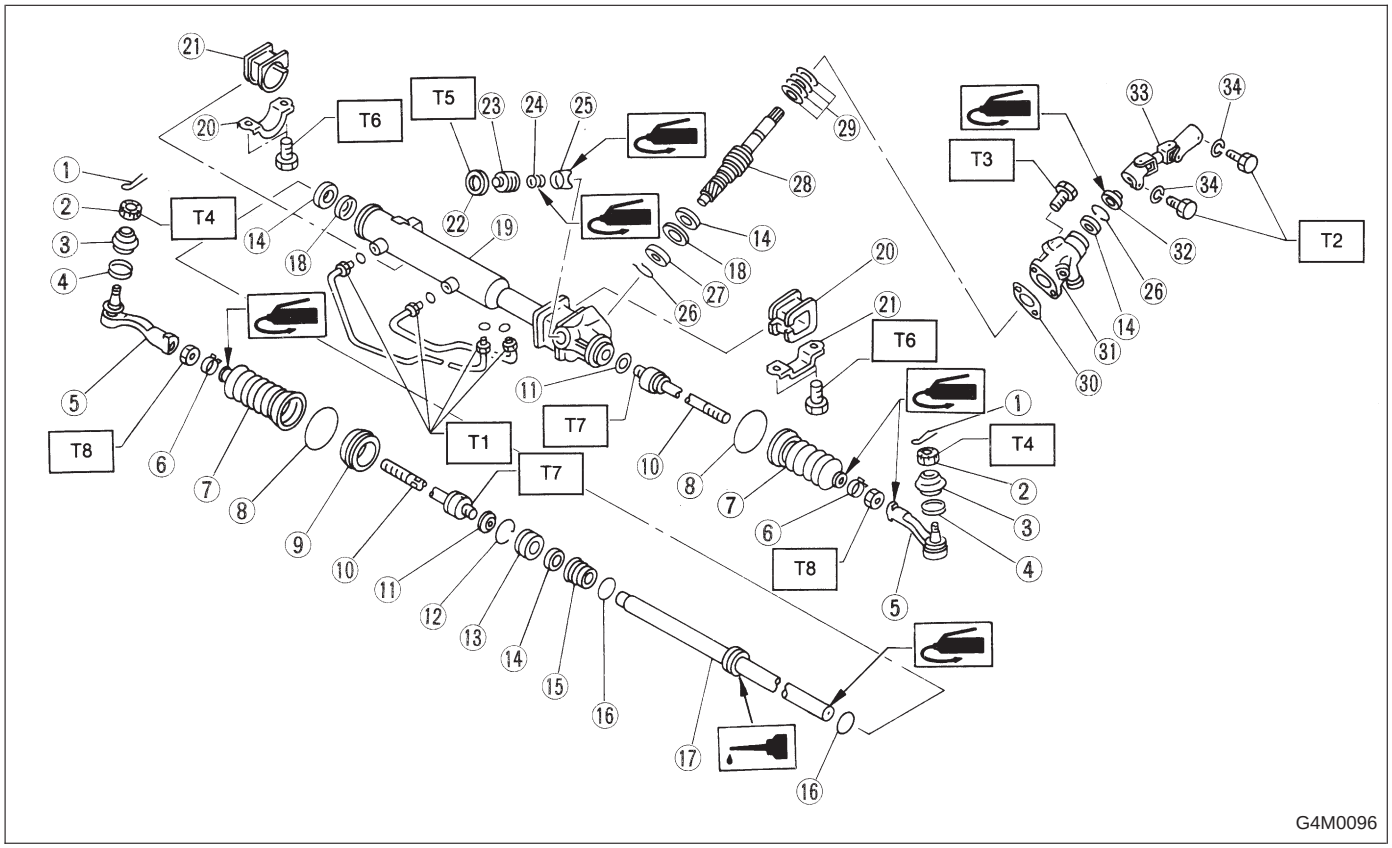
8) Install airbag module to steering wheel. (with airbag model)

WARNING:
Always refer to 5-5 Supplemental Restraint System before performing the service operation. <Ref. to 5-5 [W3A0].>

3. Steering Gearbox (Power Steering System)

A: REMOVAL

NOTE:
For disassembly and assembly of gearbox unit, refer to section Control Valve (Power Steering Gearbox).

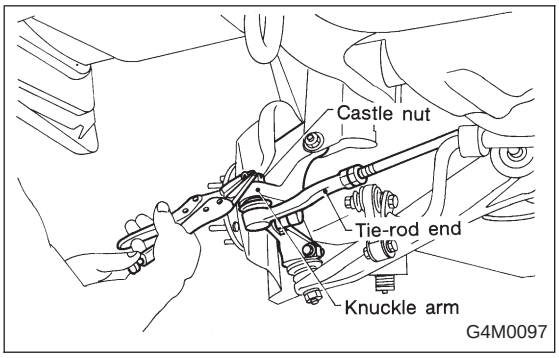


① Cotter pin
② Castle nut
③ Dust cover
④ Clip
⑤ Tie-rod end
⑥ Clip
⑦ Boot
⑧ Clip
⑨ Spacer
⑩ Tie-rod
⑪ Lock washer
⑫ Circlip
⑬ Rack stopper
⑭ Oil seal
⑮ Rack bushing
⑯ O-ring
⑰ Rack
⑱ Back-up washer
⑲ Rack housing
⑳ Adapter
㉑ Clamp
㉒ Lock nut
㉓ Adjusting screw
㉔ Spring
㉕ Sleeve
㉖ C-ring
㉗ Ball bearing
㉘ Valve
㉙ Seal ring
㉚ Packing
㉛ Valve housing
㉜ Dust seal
㉝ Universal joint
㉞ Spring washer

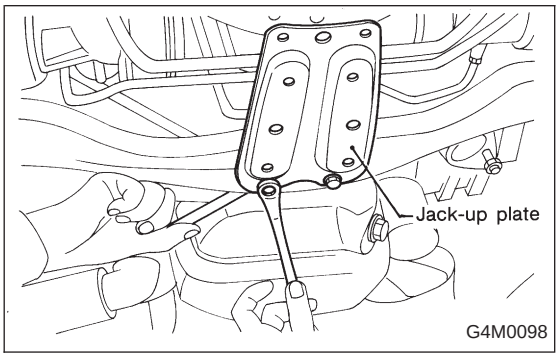
Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 25±5 (2.5±0.5, 18.1±3.6)
T3: 24±3 (2.4±0.3, 17.4±2.2)
T4: 27.0±2.5
(2.75±0.25, 19.9±1.8)
T5: 39±10 (4.0±1.0, 29±7)
T6: 59±12 (6.0±1.2, 43±9)
T7: 78±10 (8.0±1.0, 58±7)
T8: 83±5 (8.5±0.5, 61.5±3.6)

1) Disconnect battery minus terminal.
2) Loosen front wheel nut.
3) Lift vehicle and remove front wheels.
4) Remove front exhaust pipe assembly.

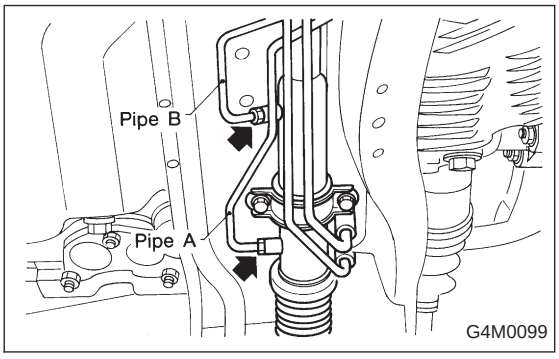
WARNING:
Be careful, exhaust pipe is hot.



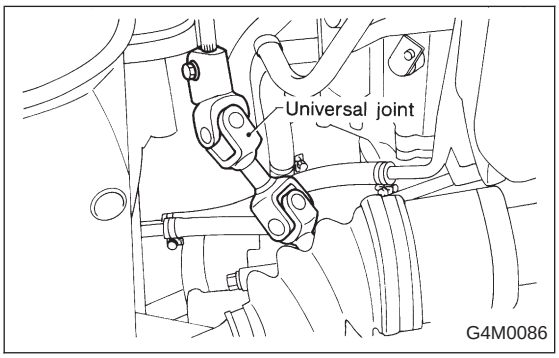
5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



6) Remove jack-up plate and front stabilizer.

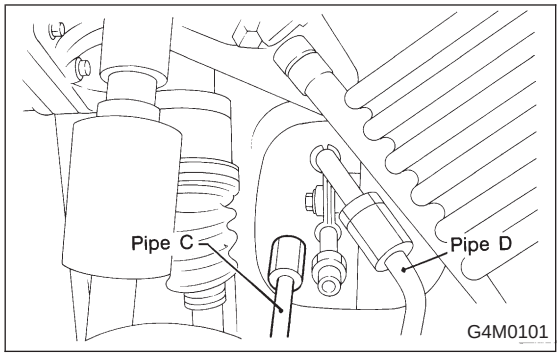


7) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



8) Remove lower side bolt of universal joint, then remove upper side bolt and lift the joint upward.

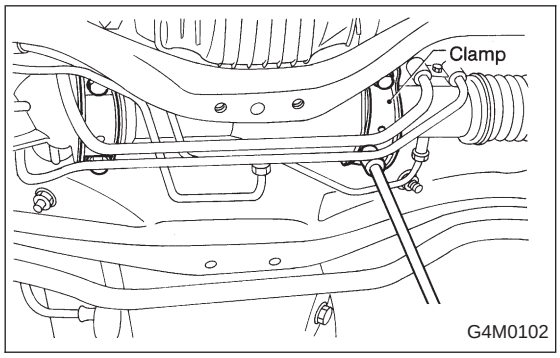
NOTE:
Place a mark on the joint and mating serration so that they can be re-installed at the original position.



9) Disconnect pipes C and D from pipe of gearbox.

CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect upper pipe D first, and lower pipe C second.



10) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.

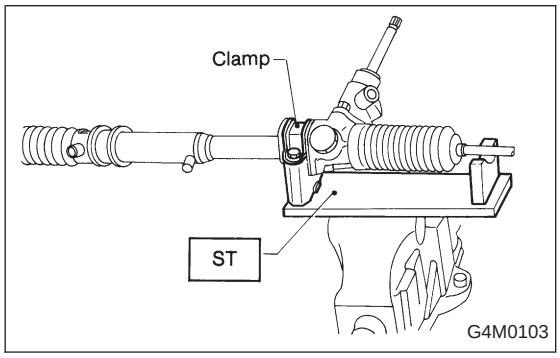
B: DISASSEMBLY

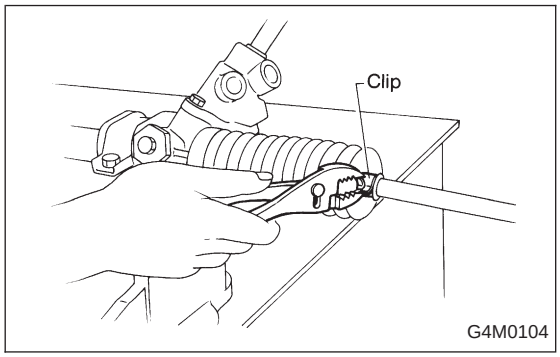
1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

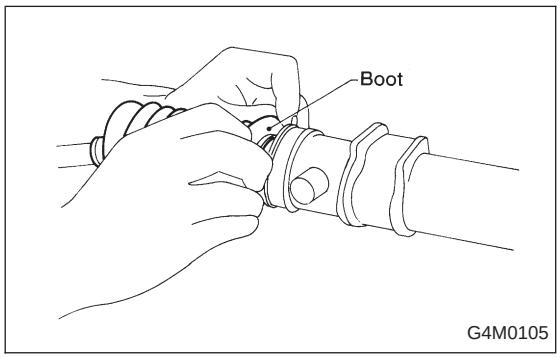
CAUTION:
Secure the gearbox in a vice using the ST as shown. Do not attempt to secure it without this ST.

3) Remove tie-rod end and lock nut from gearbox.

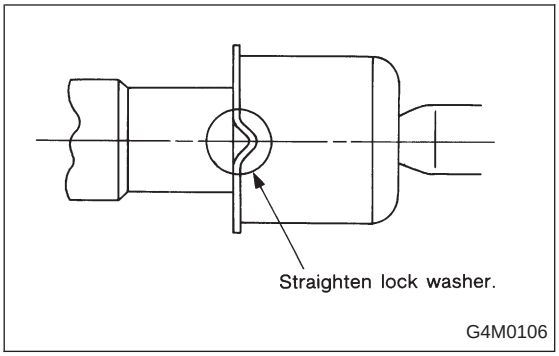




4) Remove small clip from boot using pliers, and move boot to tie-rod end side.

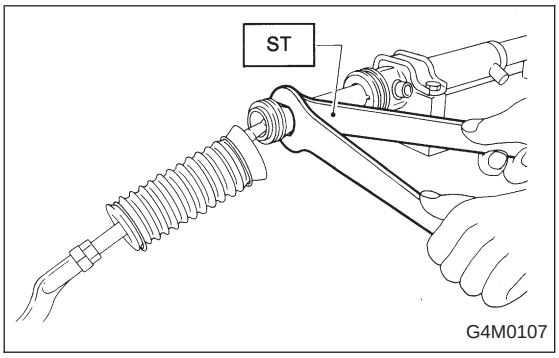


5) Remove boot together with large clips.



6) Straighten lock washer under ball joint.

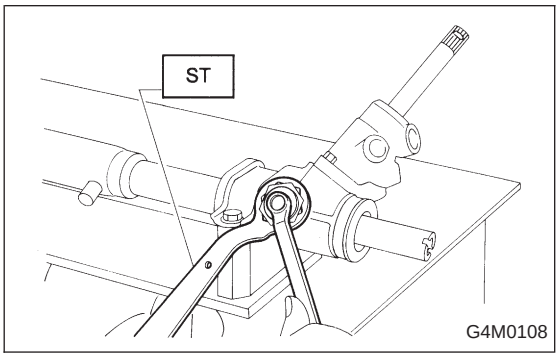
CAUTION:
● Be extremely careful not to hit surface of right hand rack; otherwise, oil leakage may result.
● Tie-rod lock washer must be replaced with a new one whenever it is removed.



7) Loosen ball joint using ST and spanner and remove tie-rod from rack.

NOTE:
When loosening ball joint, securely fix the rack using ST.

ST 925700000 WRENCH



8) Loosen lock nut using ST, and remove adjusting screw.

ST 926230000 SPANNER

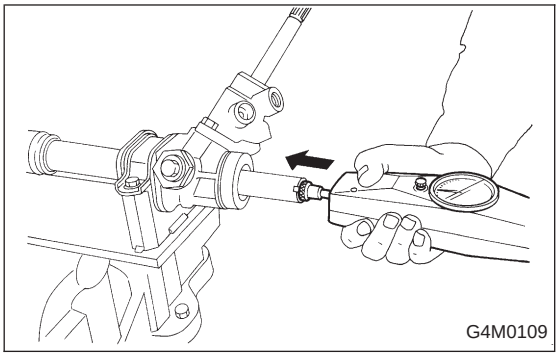
9) Remove spring and sleeve.
10) Remove dust seal.

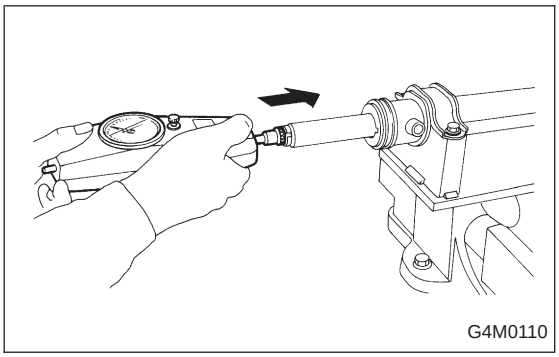
CAUTION:
Be careful not to damage housing and input shaft, or to allow foreign matters to get inside when removing dust seal.

C: INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check inside of gearbox for water. If any water is found, carefully check boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.


G4M0109


G4M0110

1. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

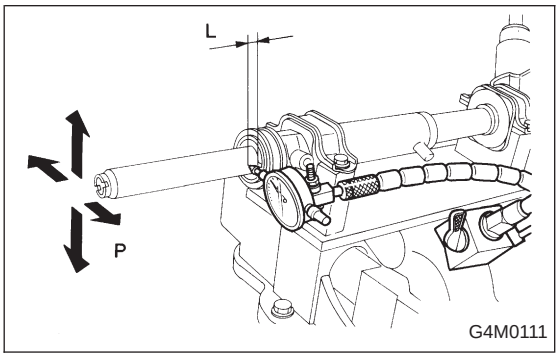
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

240.3 N (24.5 kg, 54.0 lb) or less



G4M0111

2. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

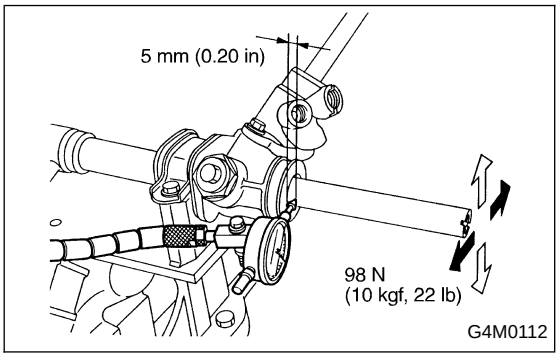
Service limit

0.15 mm (0.0059 in) or less

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kg, 22 lb)



G4M0112

Left-turn steering:

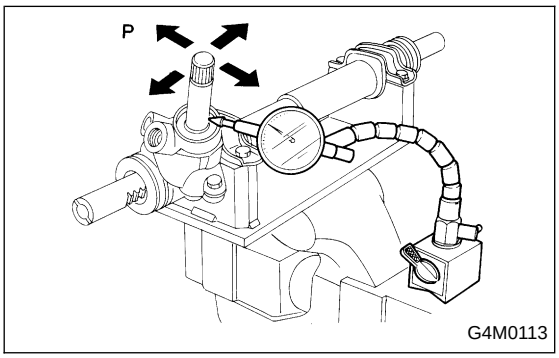
Service limit

Direction ⇦ ⇨

0.3 mm (0.012 in) or less

Direction ⬅ ➡

0.15 mm (0.0059 in) or less



G4M0113

3. INPUT SHAFT PLAY

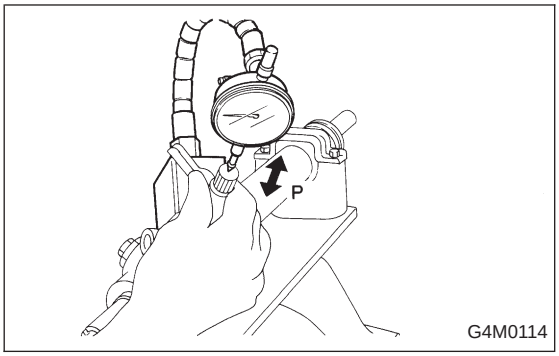
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kg, 22 lb)



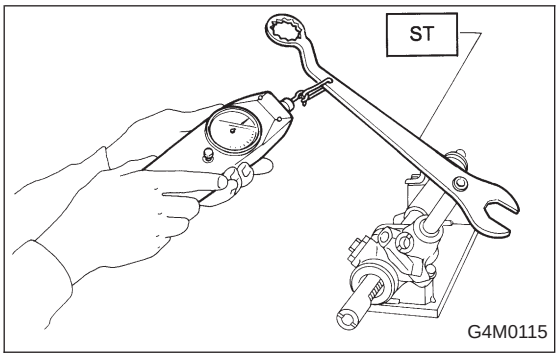
In axial direction:

Service limit

0.1 mm (0.004 in) or less

On condition

P: 20 — 49N (2 — 5 kg, 4 — 11 lb)



4. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.

ST 926230000 SPANNER

Service limit:

Straight-ahead position within 30 mm (1.18 in) from rack center

Less than 11.18 N (1.14 kg, 2.51 lb)

Maximum allowable resistance

12.7 N (1.3 kg, 2.9 lb)

D: ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for gearbox.

Grease:

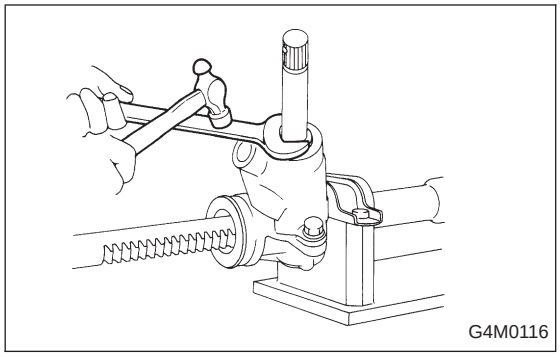
VALIANT GREASE M2
[Part No. 003608001, net 0.5 kg (1.1 lb)]

1) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

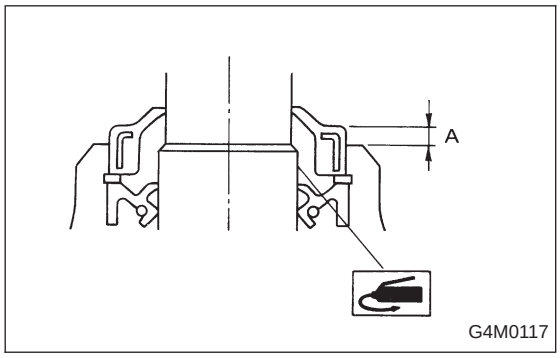
CAUTION:
● When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
● Do not apply grease to threaded portion at end of rack shaft.
● Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

2) Apply grease to sleeve insertion hole.
3) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

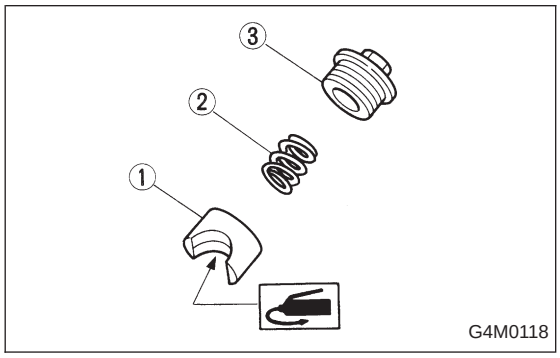

G4M0116

4) Press-fit dust seal into gearbox housing while tapping it via a spanner or the like so that stepping between gearbox and dust seal is normally 2 mm (0.08 in).



G4M0117

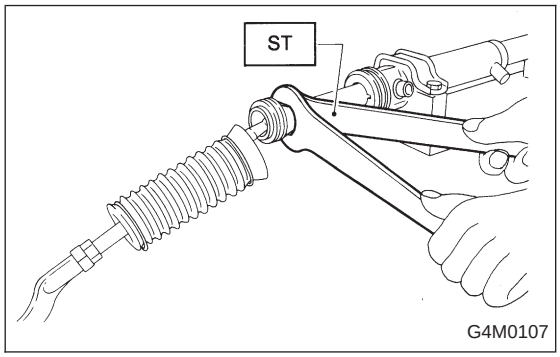
Depth: A
2 mm (0.08 in)



G4M0118

5) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.

① Sleeve
② Spring
③ Adjusting screw



G4M0107

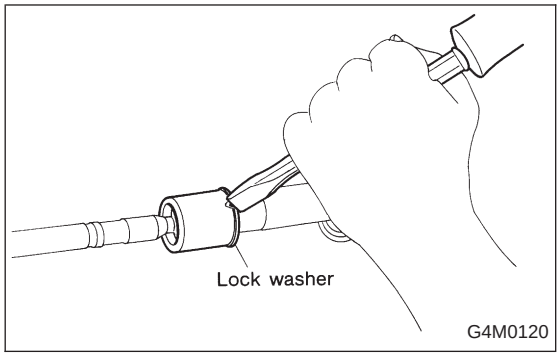
6) Fit new lock washer on screwed portion of rack end. Aligning cut portion of rack and nail of washer, screw in and tighten ball joint by using ST and spanner.

ST 925700000 WRENCH

Tightening torque (Ball joint):
78±10 N·m (8.0±1.0 kg-m, 58±7 ft-lb)

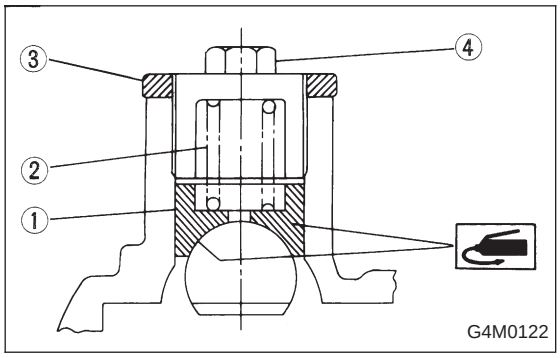
CAUTION:
Pay attention to prevent rack surface on the right side from being damaged by a tool or the like, otherwise oil leakage might be caused.

NOTE:
While tightening ball joint, hold rack with ST to prevent it from revolving.



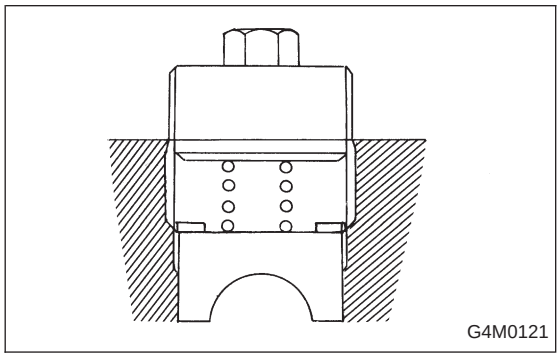
7) Bend lock washer using a chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.

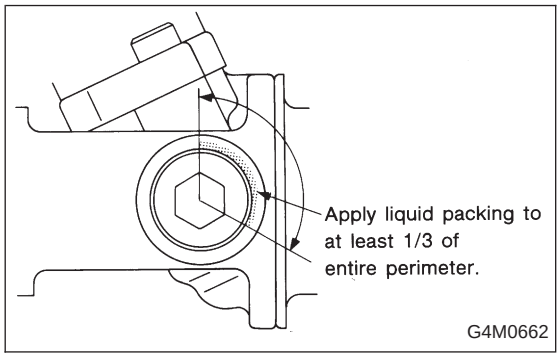


8) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.

① Sleeve
② Spring
③ Lock nut
④ Adjusting screw



(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141

(6) Tighten adjusting screw to 15 N·m (1.5 kg-m, 11 ft-lb) and back off 20°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)

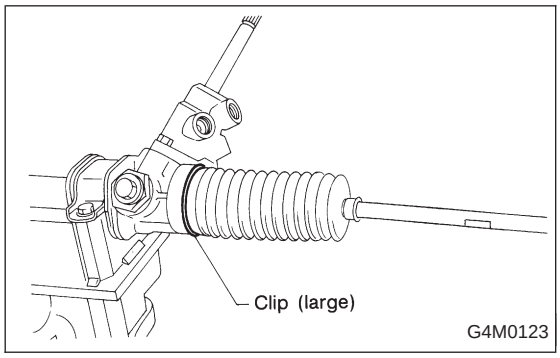
NOTE:
● Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.

● Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

9) Check for service limit as per article of “Service limit”. <Ref. to 4-3 [W3C1].> Make replacement and adjustment if necessary.

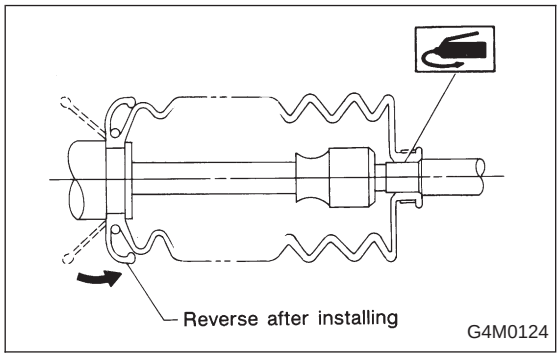
10) Install boot and mounting rubber to housing.

NOTE:
Apply grease through small hole in boot.

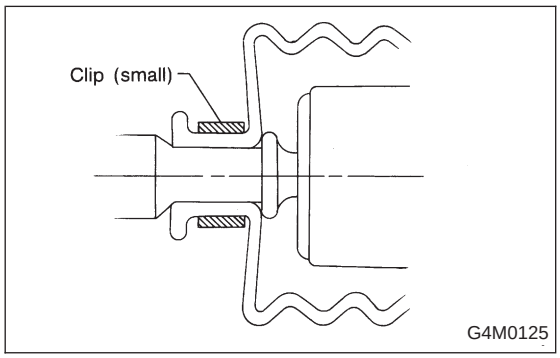


11) Fit clip (large) to boot, and then install boot to gearbox while holding boot flange.
After installing boot, fold back boot flange to the extent that large clip can not be seen.

NOTE:
● Before installing boot, be sure to apply grease to the groove of tie-rod.
● Install fitting portions of boots to the following portions in both sides of assembled steering gearbox.
1. The groove on gearbox
2. The groove on the rod
● Make sure that boot is installed without unusual inflation or deflation.



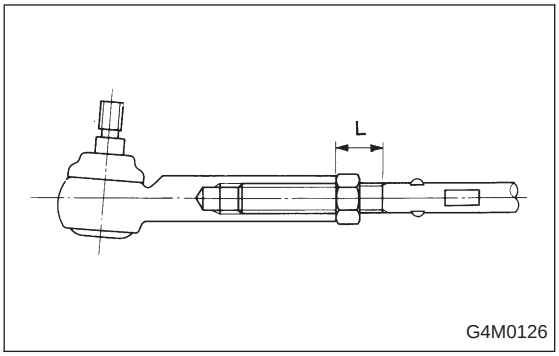
12) Turn boot until it seats well on gearbox and rubber mounting, then bend boot flange back.



13) Fix boot end with clip (small).

CAUTION:
Use screwdriver with blunted tip to prevent boot from damage, when installing.

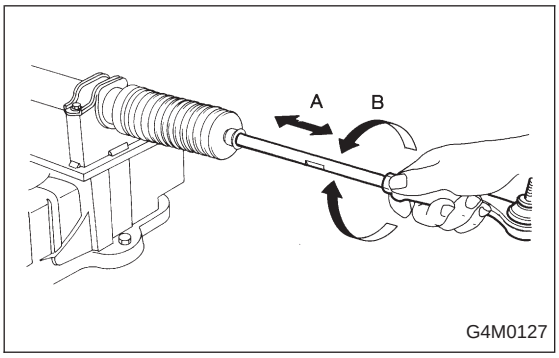
NOTE:
After installing, check boot end is positioned into groove on tie-rod.



14) If tie-rod end was removed, screw in lock nut and tie-rod end to screwed portion of tie-rod, and tighten lock nut temporarily in a position as shown in figure.

Installed tie-rod length: L
15 mm (0.59 in)

NOTE:
Pay attention to difference between right and left tie-rod ends.



15) Inspect gearbox as follows:

A. Holding tie-rod end, repeat lock to lock two (2) or three (3) times as quickly as possible.

B. Holding tie-rod end, turn it slowly at a radius one (1) or two (2) times as large as possible.

After all, make sure that boot is installed in the specified position without deflation.

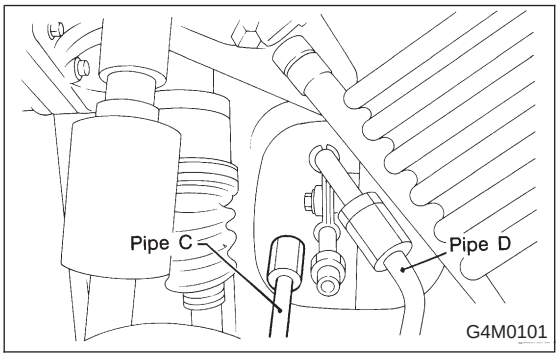
16) Remove gearbox from ST.

ST 926200000 STAND

17) Install four pipes on gearbox.

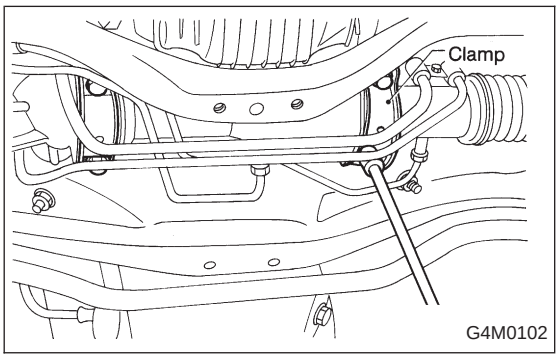
(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)



(2) Connect pipes C and D to gearbox.
Connect lower pipe C first, and upper pipe D second.

Tightening torque:
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)



E: INSTALLATION

1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

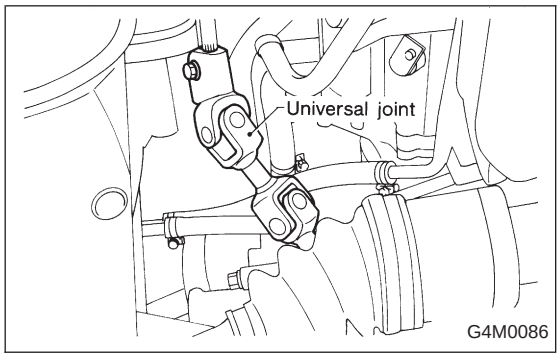
Tightening torque:
59±12 N·m (6.0±1.2 kg-m, 43±9 ft-lb)

3) How to install the joint.

(1) Push the long yoke of the joint, all the way into the serrated portion of the steering shaft, setting the bolt hole in the cutout.

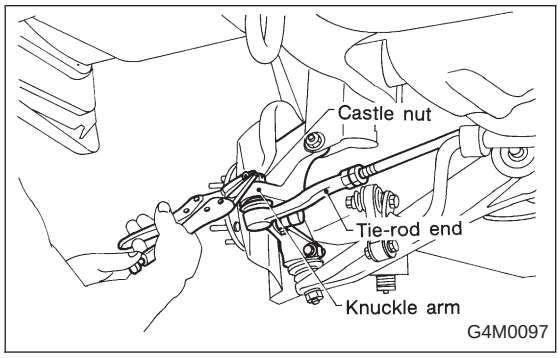
(2) Then pull the short yoke all way out of the serrated portion of the gear box, setting the bolt hole in the cutout.

(3) Insert the bolt through the short yoke, pull the joint and confirm that the bolt is on cutout of the gearbox.



(4) Fasten the short yoke side with a spring washer and bolt, then fasten the long yoke side.

Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)



4) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0±2.5 N·m (2.75±0.25 kg-m, 19.9±1.8 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.

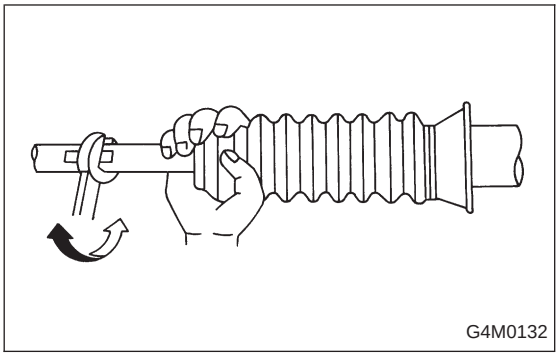
5) Install front stabilizer to vehicle.
6) Install front exhaust pipe assembly.
<Ref. to 2-9 [W1B0].>
7) Install tires.
8) Tighten wheel nuts to the specified torque.

Tightening torque:
88±10 N·m (9.0±1.0 kg-m, 65±7 ft-lb)

9) Connect ground cable to battery.
10) Pour fluid into oil tank, and bleed air. <Ref. to 4-3 [W7A0].>
11) Check for fluid leaks.
12) Install jack-up plate.

WARNING:
Be careful, exhaust manifold is hot.

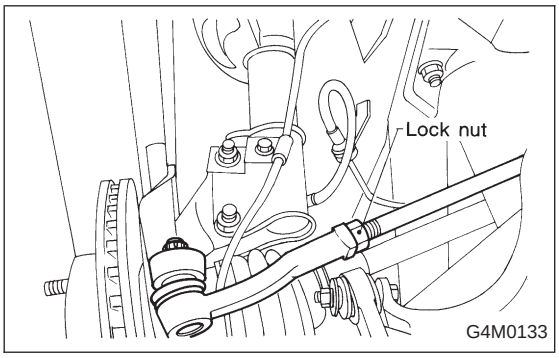
13) Lower vehicle.
14) Check fluid level in oil tank.


G4M0132

15) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:
83±5 N·m (8.5±0.5 kg-m, 61.5±3.6 ft-lb)

CAUTION:
When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



G4M0133

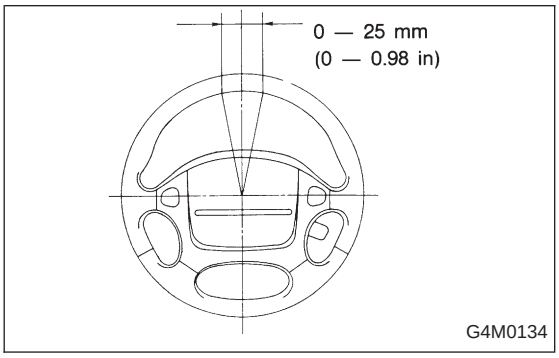
F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)

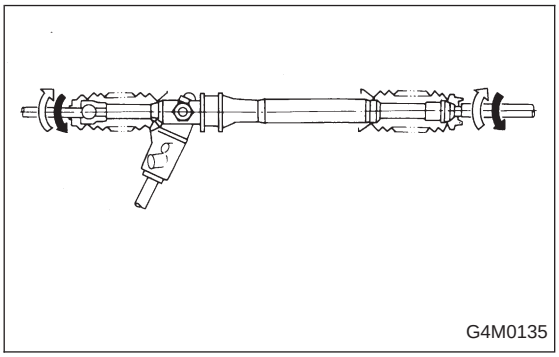
2) Adjust steering angle of wheels.

Inner wheel: 37.4°±1.5°
Outer wheel: 32.5°±1.5°



G4M0134

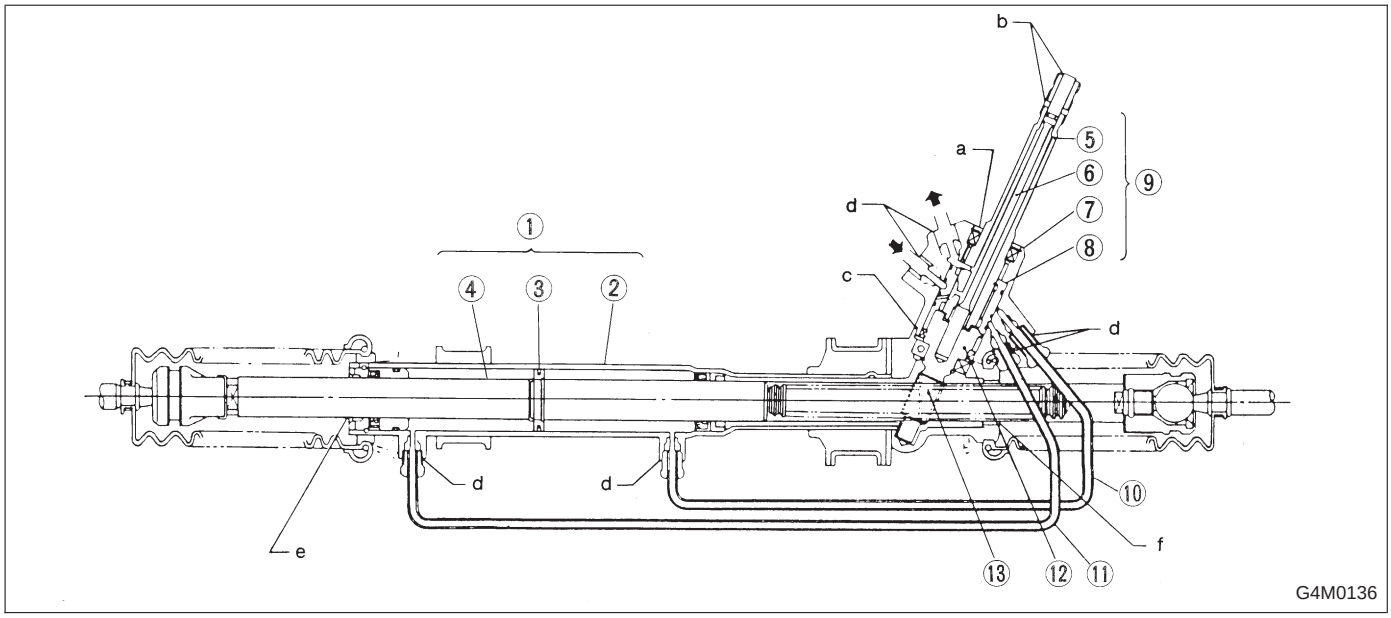
3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.


G4M0135

4) If steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the same direction by the same turns.

4. Control Valve (Power Steering Gearbox)

A: CHECKING OIL LEAKING POINTS



① Power cylinder
② Cylinder
③ Rack piston
④ Rack axle
⑤ Input shaft
⑥ Torsion bar
⑦ Valve housing
⑧ Valve body
⑨ Control valve
⑩ Pipe B
⑪ Pipe A
⑫ Pinion
⑬ Pinion axle

1. OIL LEAKING POINTS

1) If leak point is other than a, b, c, or d, perform check step 5 in “OIL LEAK CHECK PROCEDURE AND REPLACEMENT PARTS” before dismounting gearbox from vehicle. <Ref. to 4-3 [W4A2].> If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.
2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

2. OIL LEAK CHECK PROCEDURE AND REPLACEMENT PARTS

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Leakage from “a”
The oil seal is damaged. Replace valve assembly with a new one.
2) Leakage from “b”
The torsion bar O-ring is damaged. Replace valve assembly with a new one.

3) Leakage from “c”
The oil seal is damaged. Replace valve assembly with a new one.
4) Leakage from “d”
The pipe is damaged. Replace the faulty pipe or O-ring.
5) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from “e”
The cylinder seal is damaged. Replace rack bush with a new one.
(2) Leakage from “f”
There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

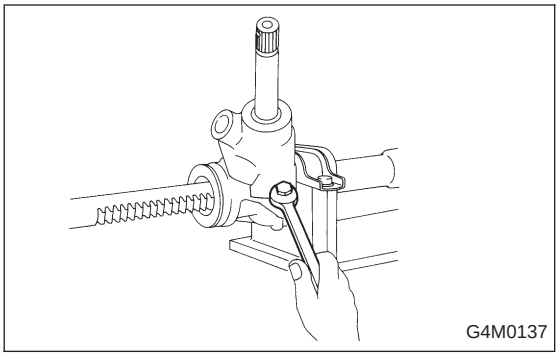
ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

CAUTION:
- **If leakage from “f” is noted again:**

The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.
- **If oil stops leaking from “f”:**

The oil seal of rack housing is damaged.
Replace the oil seal and the parts that are damaged during disassembly with new ones.

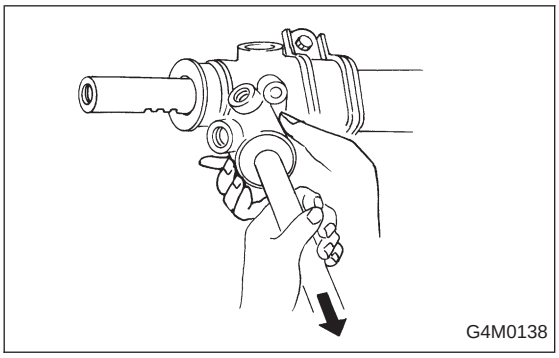

G4M0137

B: DISASSEMBLY

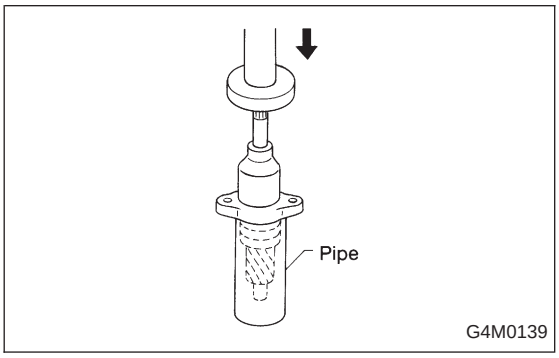
NOTE:
This section focuses on the disassembly and reassembly of control valve. For the inspection and adjustment and the service procedures for associated parts, refer to “Steering Gearbox” <Ref. to 4-3 [W3A0].>

1. VALVE ASSEMBLY

1) Loosen two bolts securing valve assembly.


G4M0138

2) Carefully draw out input shaft and remove valve assembly.

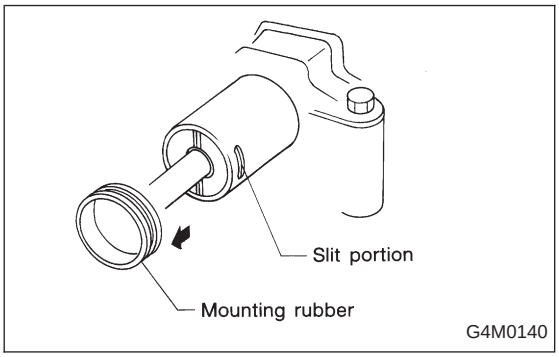


G4M0139

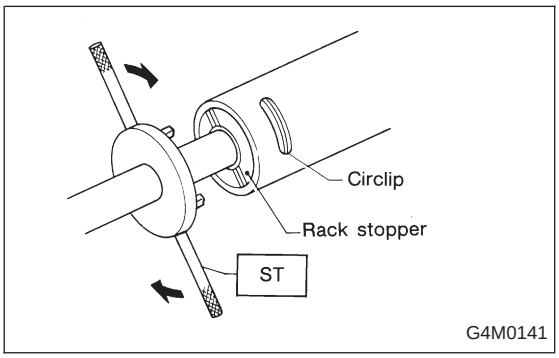
3) Draw out pinion and valve assembly from valve housing, as necessary, using pipe of I.D. 44 to 46 mm (1.73 to 1.81 in) and a press.

2. RACK ASSEMBLY

1) Slide mounting rubber to expose slit.



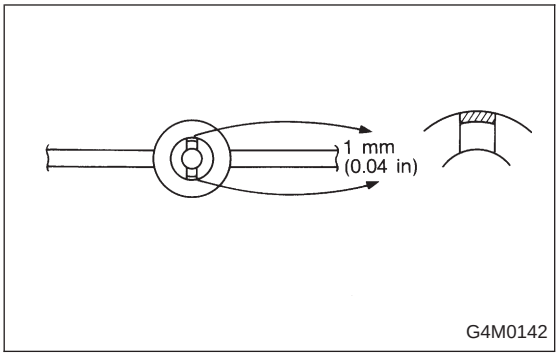
G4M0140



G4M0141

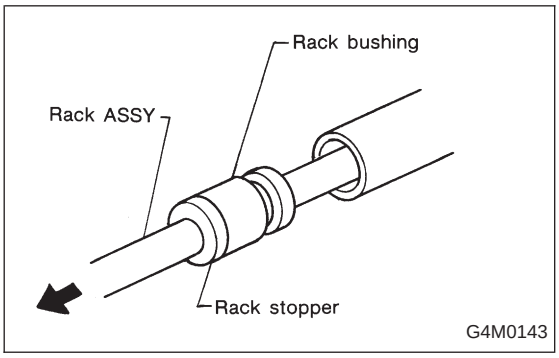
2) Rotate rack stopper in the direction of arrow using ST until the end of circlip comes out of stopper, then rotate it in the opposite direction, and pull out circlip.

ST 926340001 WRENCH



NOTE:
If ST is used, grind area (shown in figure) by 1 mm (0.04 in) in advance.

ST 926340000 WRENCH



3) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with rack assembly.

CAUTION:
Be careful not to contact rack to inner wall of cylinder when drawing out. Any scratch on cylinder inner wall will cause oil leakage.

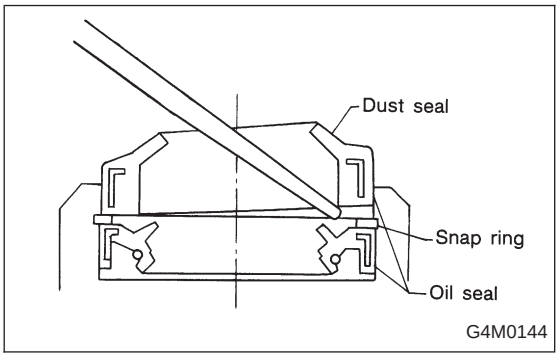
4) Remove rack bushing and rack stopper from rack assembly.

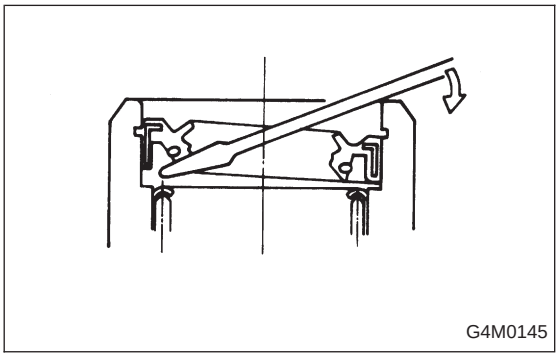
CAUTION:
Do not reuse removed rack bushing and circlip.

C: REPLACEMENT OF SEAL AND PACKING

1. VALVE HOUSING OIL SEAL

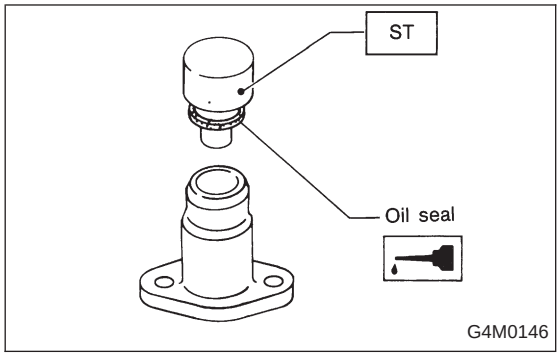
1) Pry off dust seal using screwdriver.
2) Remove snap ring using snap ring pliers.





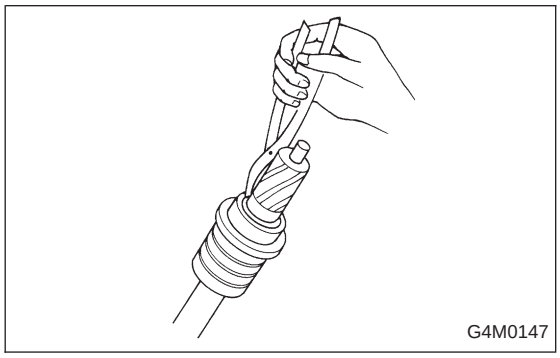
3) Pry off oil seal using screwdriver.

CAUTION:
After removing, check inside surface of valve housing for damage. If oil seal contacting surface is damaged, replace valve housing with a new one.



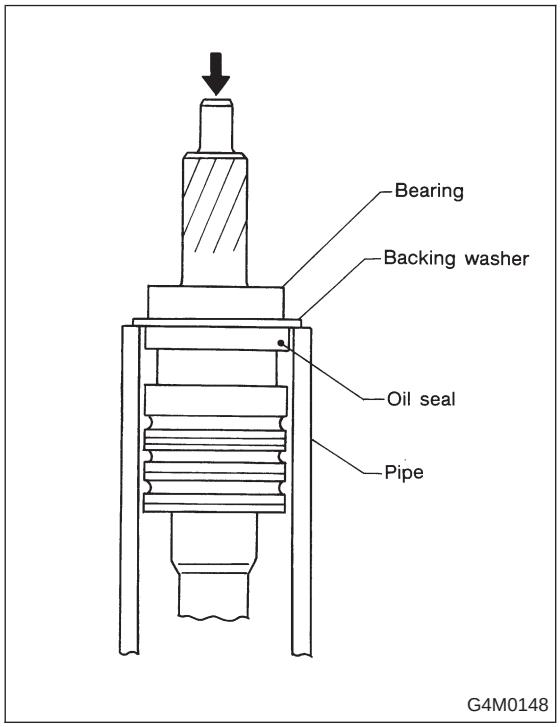
4) Press-fit oil seal into valve housing using ST and press.
ST 927610000 INSTALLER
NOTE:
Before fitting, coat oil seal fully with specified power steering fluid.

5) Fit snap ring in snap ring groove using snap ring pliers.
CAUTION:
Be careful not to scratch oil seal with snap ring pliers.
NOTE:
Rotate snap ring to check for proper installation.



2. PINION AND VALVE ASSEMBLY

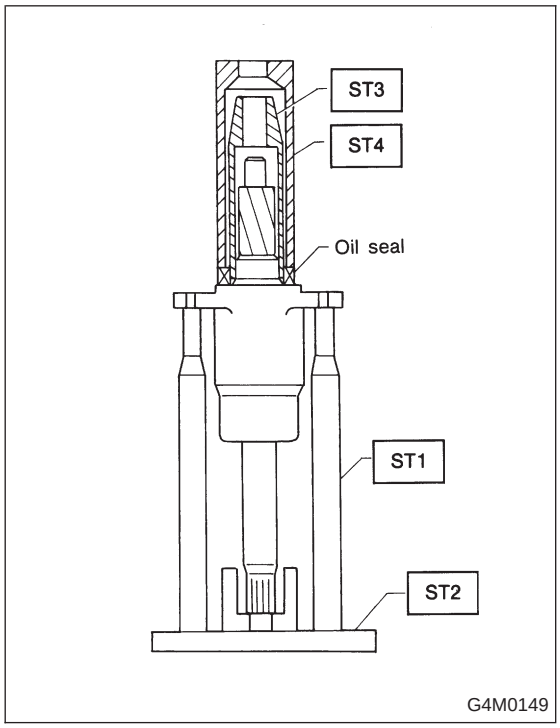
1) Remove snap ring using snap ring pliers.
CAUTION:
- **Do not reuse removed snap ring.**
- **Be careful not to scratch pinion and valve assembly.**



2) Press out bearing together with backing washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.
CAUTION:
Do not reuse removed bearing.
3) Remove oil seal.
CAUTION:
Do not reuse removed oil seal.

4) Fit pinion and valve assembly into valve housing.

NOTE:
Apply specified power steering fluid to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.



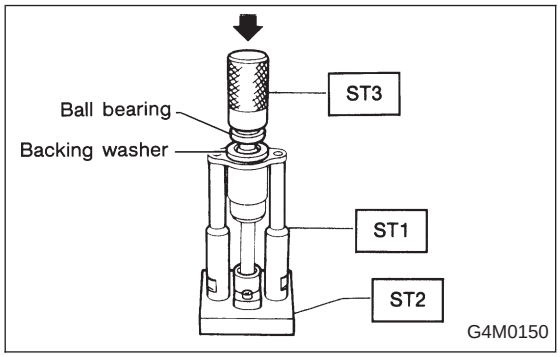
5) Secure valve assembly to ST1 and ST2.

6) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.

NOTE:
- Apply specified power steering fluid to oil seal and ST3, being careful not to damage oil seal lip.
- Push oil seal until ST3 contacts housing end face.

7) Remove ST3, and fit backing washer.

ST1	926370000	INSTALLER A
ST2	927630000	STAND BASE
ST3	926360000	INSTALLER A
ST4	927620000	INSTALLER B



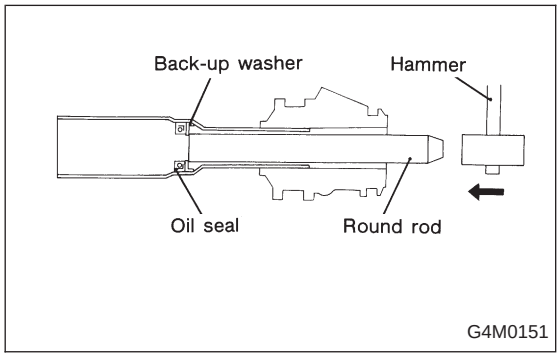
8) Force-fit ball bearing using ST3.

ST1	926370000	INSTALLER A
ST2	927630000	STAND BASE
ST3	927640000	INSTALLER B

NOTE:
Be careful not to tilt ball bearing during installation.

9) Install snap ring using snap ring pliers.

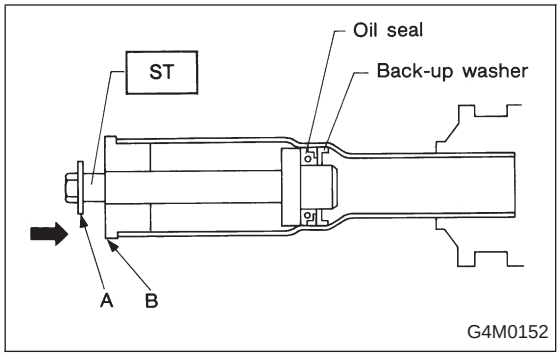
NOTE:
Rotate snap ring to check for proper installation.



3. RACK HOUSING OIL SEAL AND BACK-UP WASHER

1) Insert a round rod [26 — 27 mm (1.02 — 1.06 in) dia.] from pinion housing side and remove oil seal and back-up washer by hammering the rod.

NOTE:
- Discard removed oil seal and back-up washer.
- Apply the unchamfered end of remover to back-up washer.

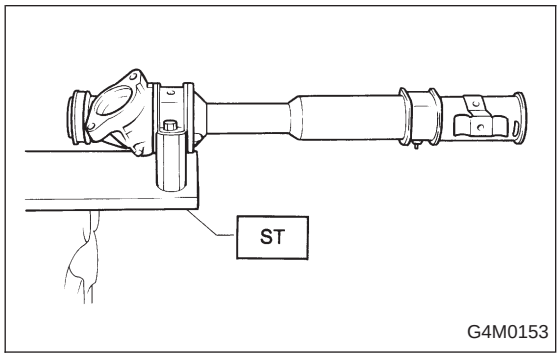


2) Force-fit oil seal and back-up washer using ST.

ST 927650000 INSTALLER

CAUTION:
Be careful not to damage or scratch cylinder inner wall.

NOTE:
- Apply specified power steering fluid to oil seal.
- Pay special attention not to install back-up washer and oil seal in wrong direction.
- Push oil seal until the stepped portion of A contacts end face of B.



D: ASSEMBLY

1. RACK ASSEMBLY

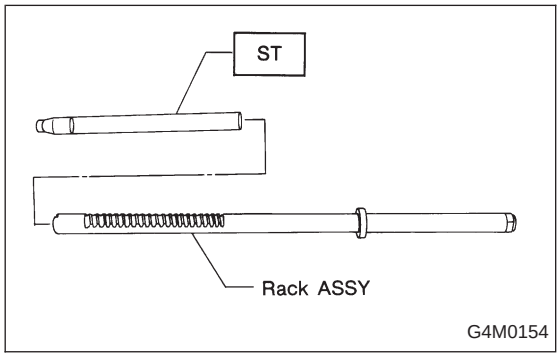
CAUTION:
Use only SUBARU genuine grease for gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Fixing rack housing
Fix rack housing in vice using ST.

ST 926200000 STAND

CAUTION:
- **When fixing rack housing in vice, be sure to use this special tool. Do not fix rack housing in vice using pad such as aluminum plates, etc.**
- **When using old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.**



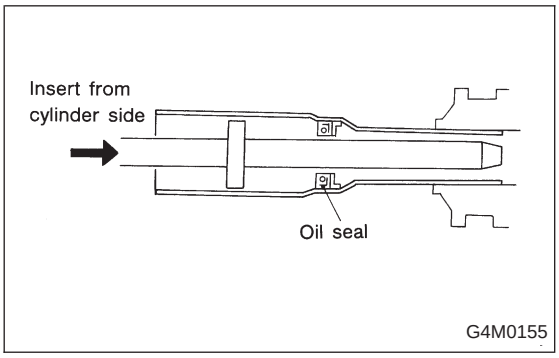
2) Fit ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.

3) Apply genuine grease to teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.

ST 926390001 COVER and REMOVER

CAUTION:
- **Be careful not to block air passage with grease. Remove excessive grease.**

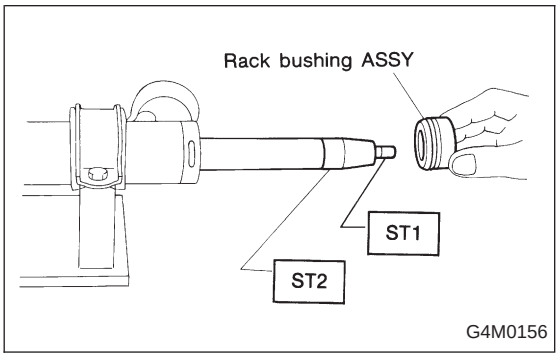
● After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
● Check rack shaft for damage.
● Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.



4) Insert rack assembly into rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

NOTE:
Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.

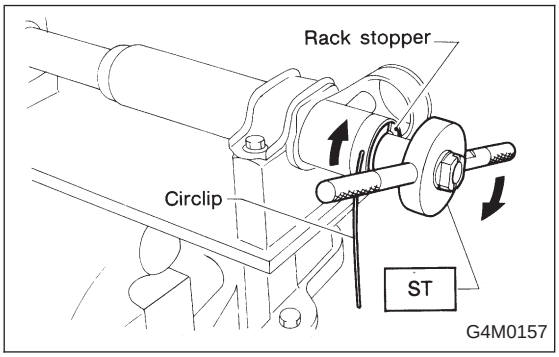
ST 926390001 COVER AND REMOVER



5) Fit ST1 and ST2 over the end of rack, and install rack bushing.

ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
● If burrs, or nicks are found on this guide and rack shaft portion, remove by filing.
● Dip rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



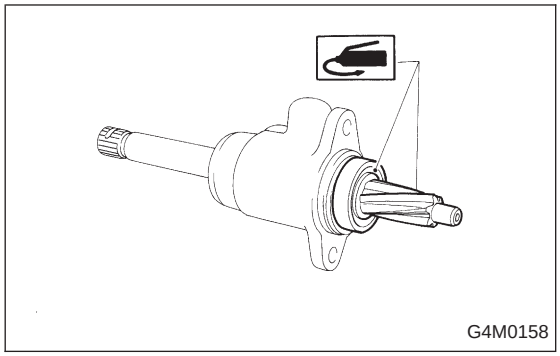
6) Insert rack stopper into cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn rack stopper with ST so that rack stopper hole is seen through cylinder slits.
7) Insert rack stopper into rack housing, and wrap circlip using ST to secure rack stopper in position.

ST 926340001 WRENCH

CAUTION:
Be careful not to scratch rack while winding circlip.

NOTE:
Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.

8) Fit mounting rubber onto rack housing.

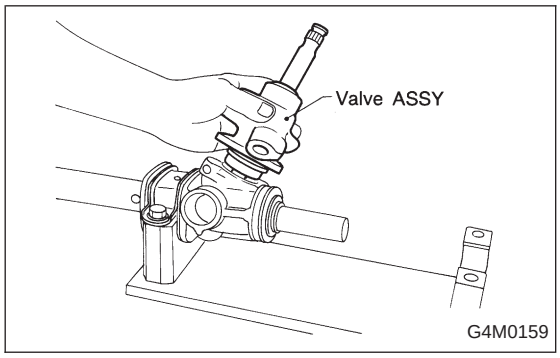

G4M0158

2. VALVE ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Apply genuine grease to pinion gear and bearing of valve assembly.



G4M0159

2) Install packing on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

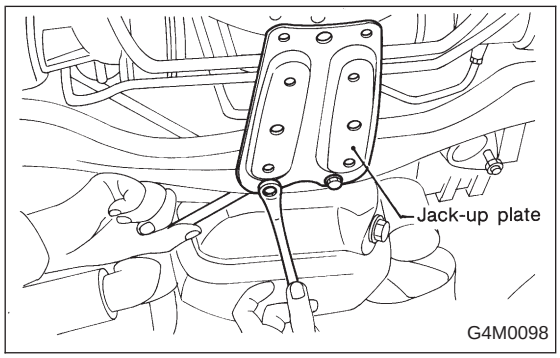
CAUTION:
Be sure to use a new packing.

NOTE:
Do not allow packing to be caught when installing valve assembly.

3) Tighten bolts alternately to secure valve assembly.

Tightening torque:
25±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

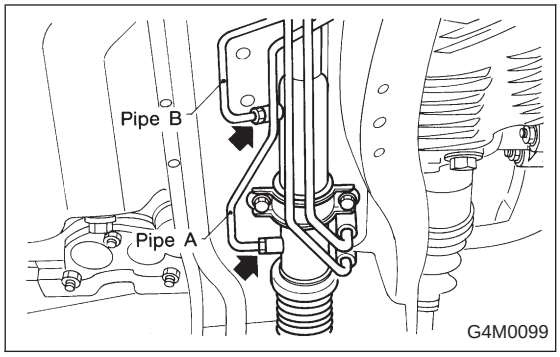


G4M0098

5. Pipe Assembly (Power Steering System)

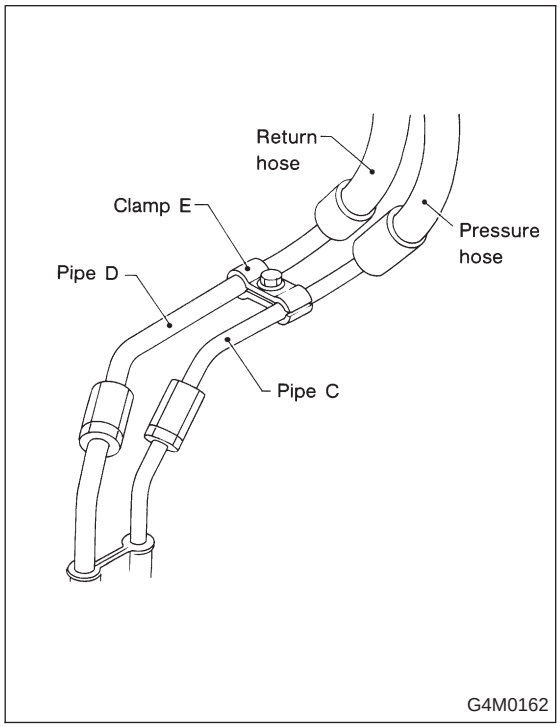
A: REMOVAL

1) Disconnect battery minus terminal.

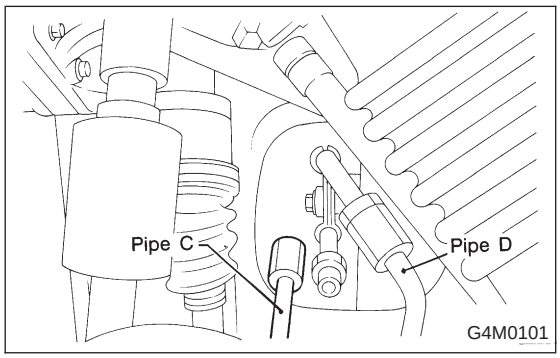


2) Lift vehicle and remove jack-up plate.
3) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.

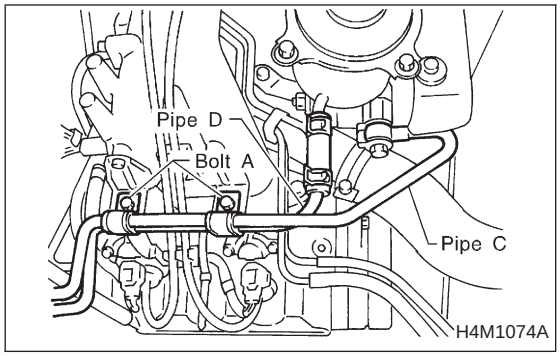


4) Remove clamp E from pipes C and D.



5) Disconnect pipe C from pipe (on the gearbox side).

CAUTION:
● When disconnecting pipe C, use two wrenches to prevent deformities.
● Be careful to keep pipe connections free from foreign matter.



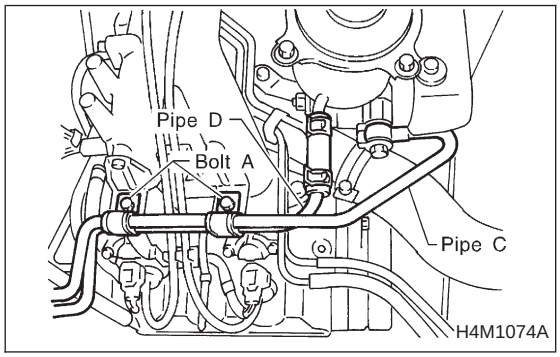
6) Remove bolt A.
Disconnect pipe C from oil pump. Disconnect pipe D from oil tank.

CAUTION:
● Do not allow fluid from the hose end to come into contact with pulley belt.
● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

B: CHECK

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	● O-ring fitting surface for damage ● Nut for damage ● Pipe for damage	Replace with new one.
Clamp B	● Clamps for weak clamping force	Replace with new one.
Clamp C		
Clamp E		
Hose	● Flared surface for damage ● Flare nut for damage ● Outer surface for cracks ● Outer surface for wear ● Clip for damage ● End coupling or adapter for degradation	Replace with new one.



C: ASSEMBLY

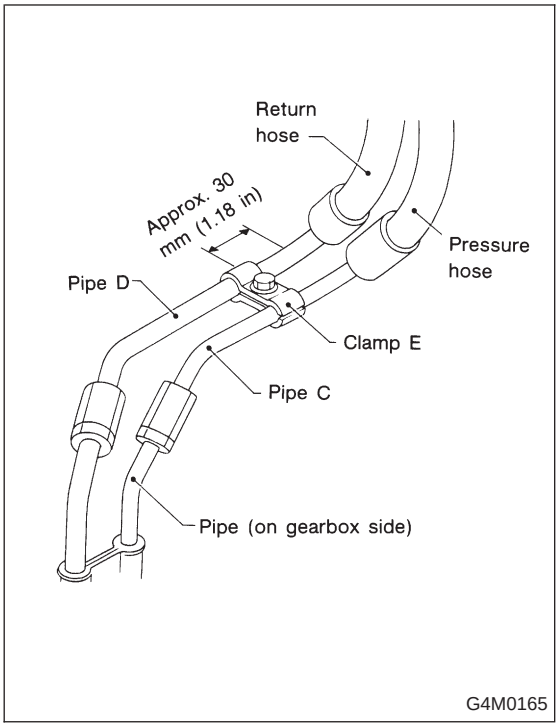
1) Interconnect pipes C and D.

Tightening torque:
Joint nut
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

2) Tighten bolt A.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)



3) Temporarily connect pipes C and D to pipes (on the gearbox side).
4) Temporarily install clamp E on pipes C and D.

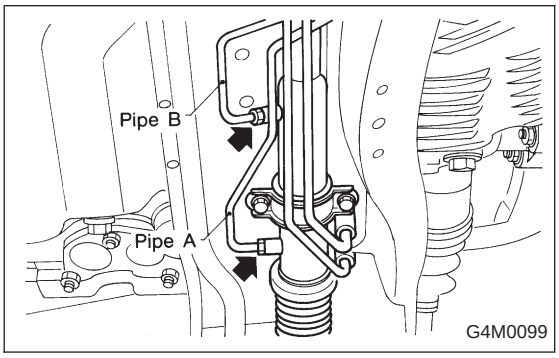
CAUTION:
Ensure that the "8" letter side of clamp E is on the pipe C side.

5) Tighten joint nut.

Tightening torque:
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

6) Tighten clamp E firmly.

Tightening torque:
5.4±1.5 N·m (0.55±0.15 kg-m, 4.0±1.1 ft-lb)

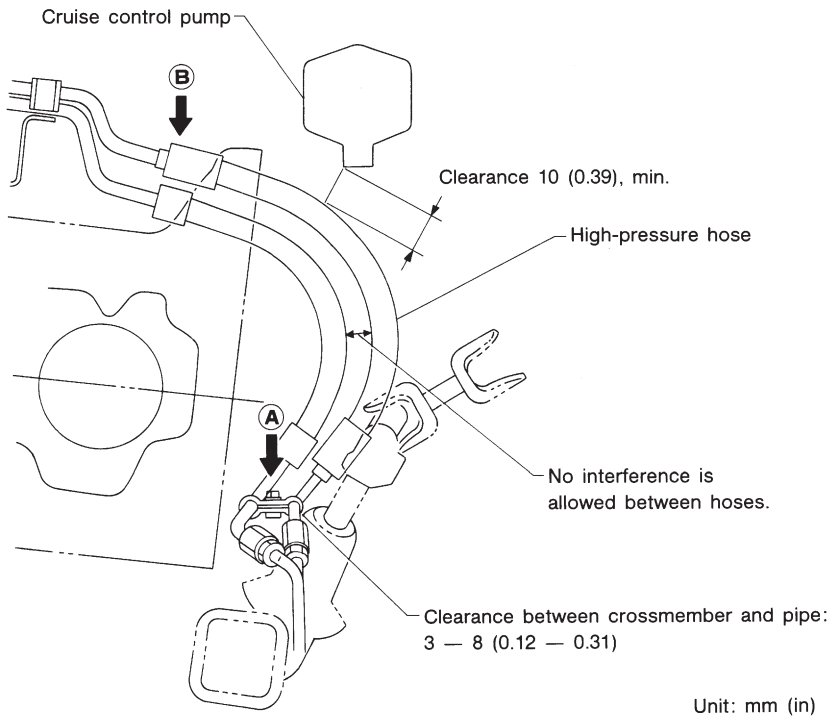


7) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)

8) Install jack-up plate.
9) Connect battery minus terminal.
10) Feed the specified fluid and discharge air.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



11) Finally check clearance between pipes and/or hoses, as shown above.

If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

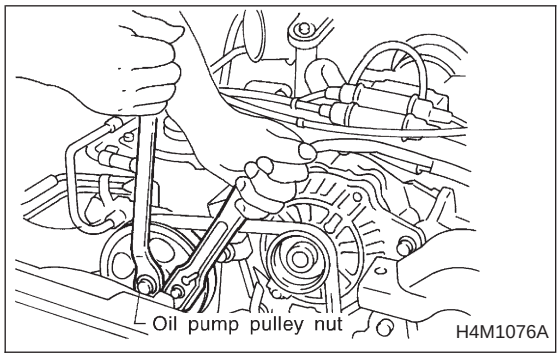
(1) Move clamped section Ⓐ (refer to figure above) down to a point where pipe is close to crossmember (pipe-to-crossmember clearance: 10 mm (0.39 in), min.).

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section Ⓑ down until a clearance of at least 10 mm (0.39 in) is obtained.

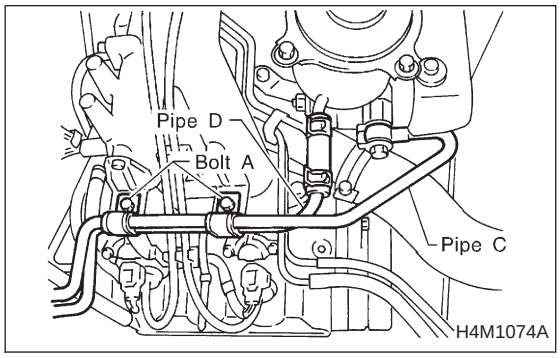
6. Oil Pump (Power Steering System)

A: REMOVAL

1) Remove ground cable from battery.
2) Drain the working fluid about 0.3 ℓ (0.3 US qt, 0.3 Imp qt) from oil tank.
3) Remove pulley belt cover bracket.

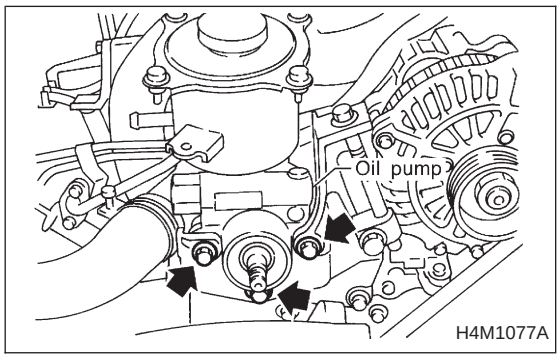


4) Loosen oil pump pulley nut, then remove bolts which secure alternator.
5) Loosen pulley belt(s).
6) Remove the nut and detach oil pump pulley.



7) Disconnect pipe C from oil pump. Disconnect pipe D from oil tank.

CAUTION:
● Do not allow fluid from the hose end to come into contact with pulley belt.
● To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.
● Except when only oil tank needs to be inspected, detach oil tank and oil pump as a unit. Then separate one from the other on a work bench to prevent oil from spilling on any part of the engine.



8) Remove three bolts from the front side of oil pump and detach the pump.
9) Remove three bolts from the lower side of bracket and detach the bracket.

CAUTION:
The bracket does not need to be removed unless it is damaged.

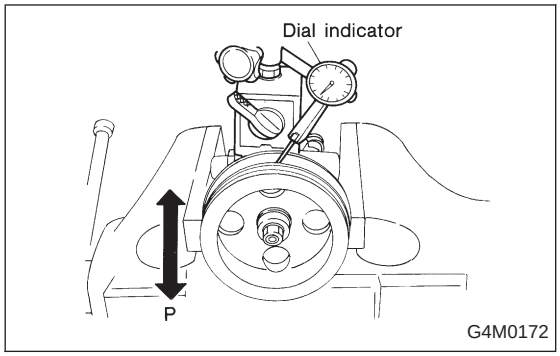
10) Place oil pump in a vise, remove two bolts from the upper side of oil tank and detach oil tank.

CAUTION:
Do not place oil pump directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

B: CHECK

● In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one. <Ref. to 4-3 [W6B1].>
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one. <Ref. to 4-3 [W6B1].>
3	Cap	Crack or damage	Replace it with a new one.
4	Strainer	(1) Clogging with dirt	Wash it.
		(2) Breakage	Replace it with a new one.
5	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one. <Ref. to 4-3 [W6B1].>
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace oil pump with a new one.
6	O-ring	Crack or deterioration	Replace it with a new one.
7	Oil tank	Crack, damage or oil leakage	Replace it with a new one.
8	Bracket	Crack	Replace it with a new one.



1. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:

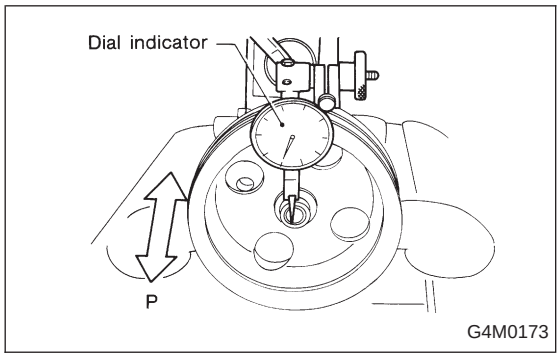
● Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.

● Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

Play of pulley shaft

Service limit:

Radial play (Direction ⟷)
0.4 mm (0.016 in) or less
Axial play (Direction ⟺)
0.9 mm (0.035 in) or less

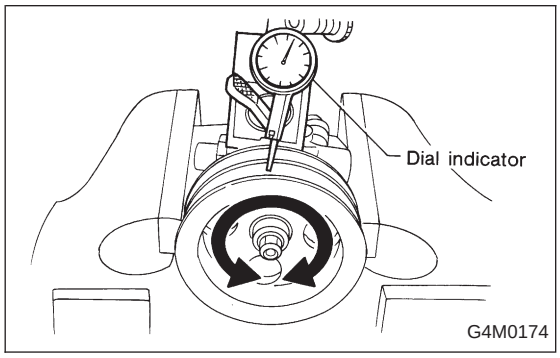


Ditch deflection of pulley

Service limit:

1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

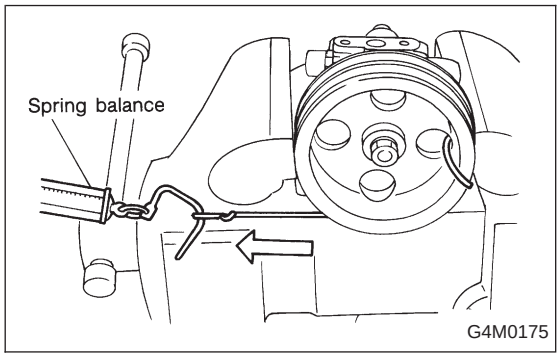


Resistance to rotation of pulley

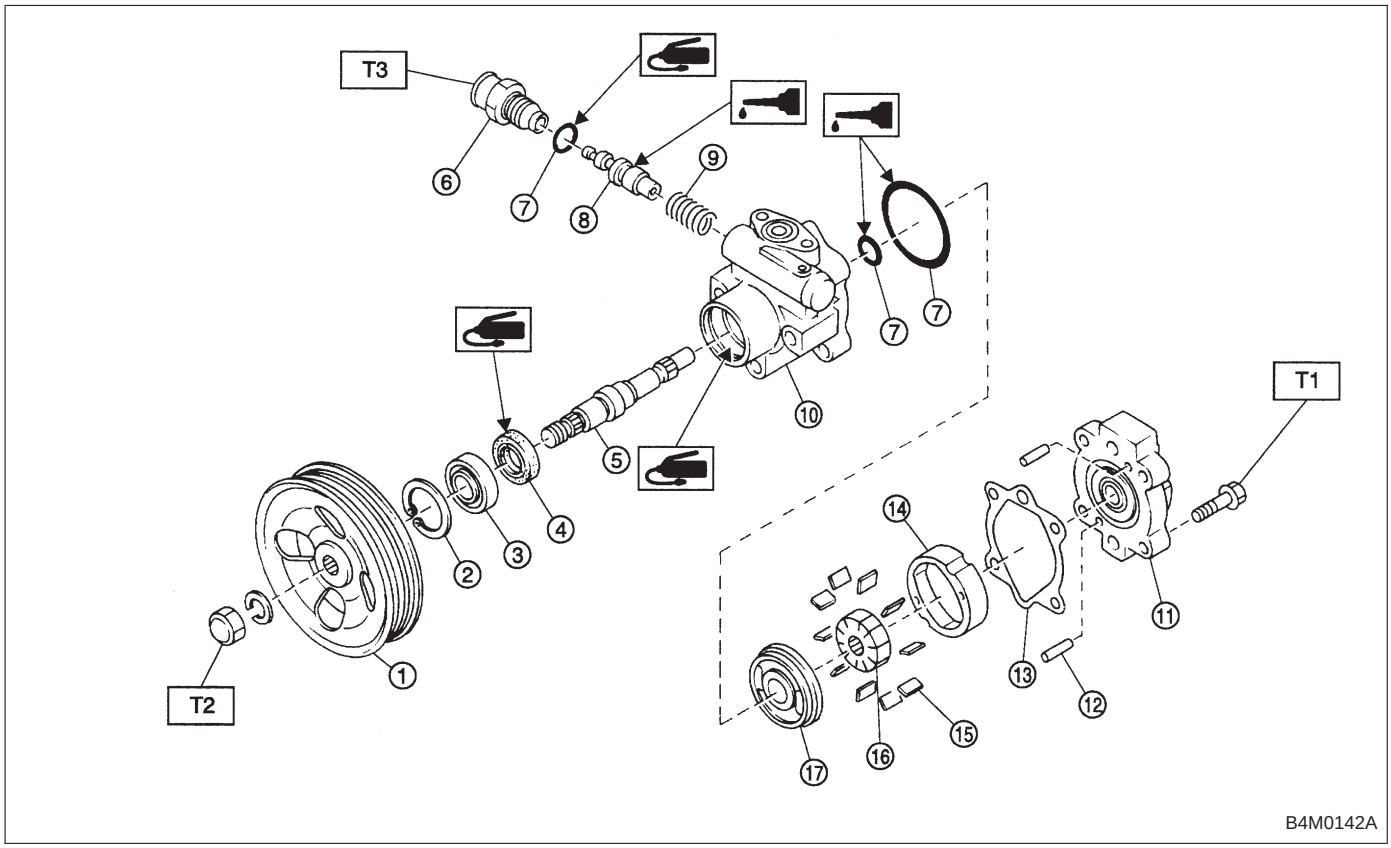
Service limit:

Maximum load; 9.22 N (0.94 kg, 2.07 lb) or less

NOTE:
● A rather higher value may be indicated when pulley starts turning.
● Measure the load during rotation and make a judgment.

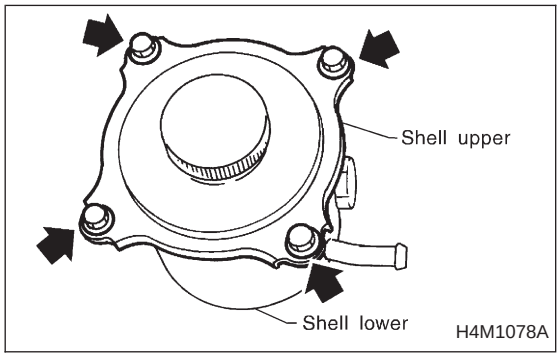


C: DISASSEMBLY



① Pulley
② Snap ring
③ Bearing
④ Oil seal
⑤ Shaft
⑥ Connector
⑦ O-ring
⑧ Spool valve
⑨ Spring
⑩ Front casing
⑪ Rear cover
⑫ Knock pin
⑬ Seal washer
⑭ Cam ring
⑮ Vane
⑯ Rotor
⑰ Side plate

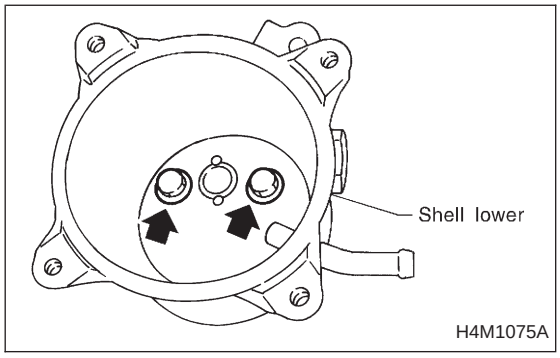
Tightening torque: N·m (kg-m, ft-lb)
T1: 16±2 (1.6±0.2, 11.6±1.4)
T2: 61±7 (6.2±0.7, 45.0±5.2)
T3: 74±5 (7.5±0.5, 54.2±3.6)



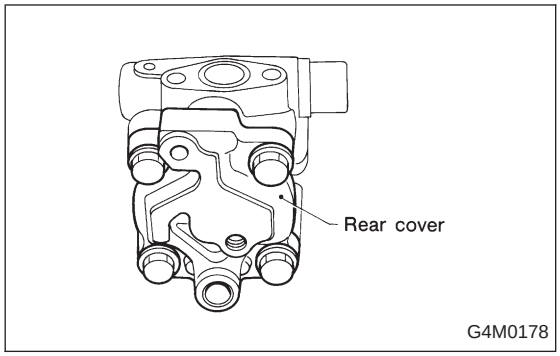
1) Oil pump body

(1) Place oil pump in a vise, and remove shell upper and baffle from shell lower.

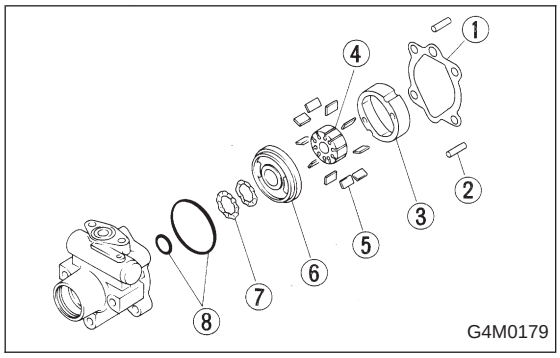
CAUTION:
Do not clamp oil pump too hard; otherwise oil pump may be dented.



(2) Remove shell lower from oil pump.
(3) Remove stay from oil pump.



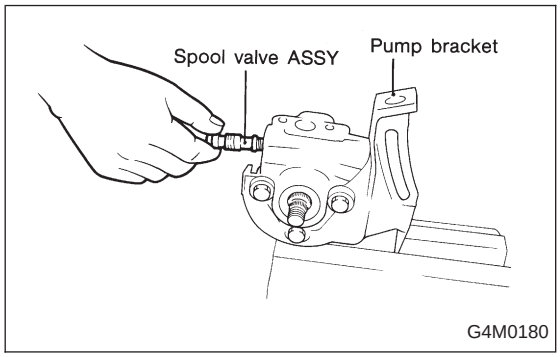
(4) Remove four bolts which secure rear cover.



(5) Remove the following parts from front casing.

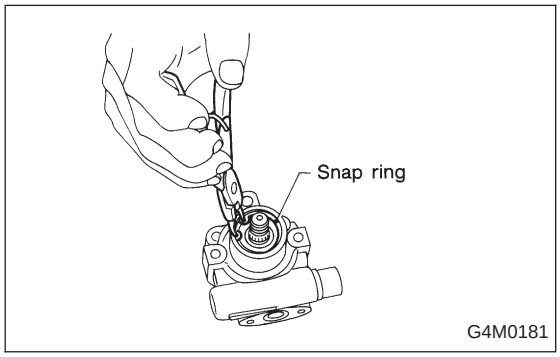
① Seal washer
② Knock pin .....2 ea.
③ Cam ring
④ Rotor
⑤ Vane .....10 ea.
⑥ Side plate
⑦ Wave washer.....2 ea.
⑧ O-ring .....2 ea.

CAUTION:
Discard old seal washer; replace with a new one.

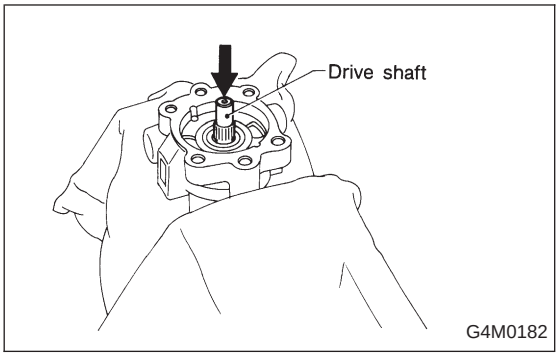


2) Control valve
Slightly loosen outlet connector, and remove connector. Remove the following parts for pump casing.

- Spool valve assembly
- Flow control spring
- Connector
- O-ring

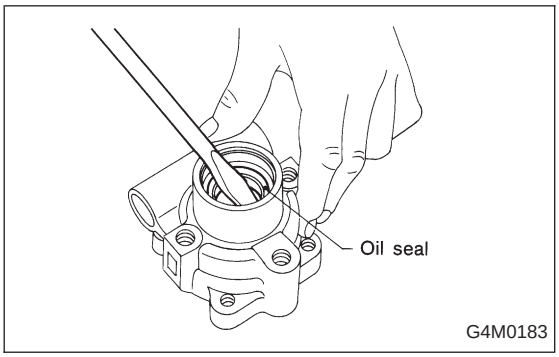


3) Shaft
(1) Remove snap ring from front casing.



(2) Remove shaft using a hand press.

CAUTION:
● Discard old shaft assembly; replace with a new one.
● Be careful not to scratch or dent casing's surface which serves as a seal.



(3) Pry oil seal off using a screwdriver.

CAUTION:
Be careful not to scratch inner surface of casing.

D: INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Side plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source)	
	3) Damage resulting from snap ring removal	Correct with oil stone. If damage is serious, replace with a new cartridge assembly.
8. Spool valve	Damage or burrs on sliding surface periphery	Replace with a new one together with front casing as selective fit is made.
9. Connector	Damage on threads	Replace with a new one.
10. Spring	Damage	Replace with a new one.
11. Bolts and nuts	Damage on threads	Replace with a new one.

E: ASSEMBLY

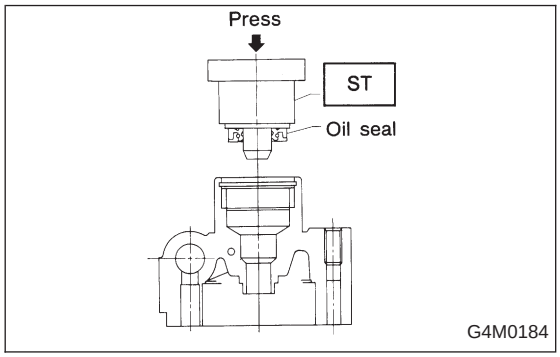
1) Reassembly precautions

(1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
(2) Thoroughly wash parts and allow to dry. They must be kept free from cleaning oil and dust.
(3) Reassembly procedure must be performed in clean place. Ensure that parts are kept away from waste threads or other dust particles.
(4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
(5) Ensure that parts are free from rust. (Use specified power steering fluid for rust prevention after cleaning and drying.)
(6) Reverse the sequence of disassembly procedures.

2) Shaft

(1) Apply grease to oil seal and inner surface of front casing (at bearing location).

CAUTION:
Make sure that the front body internal surfaces are free from damage.

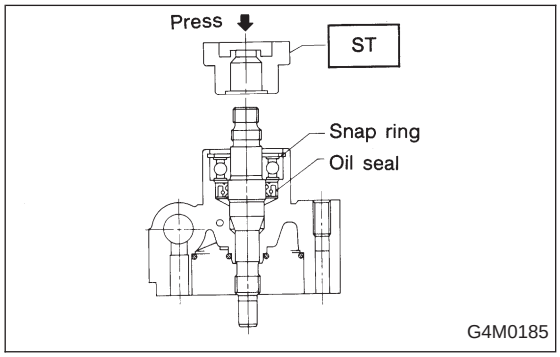


(2) Using ST, press-fit oil seal into front body.

ST 340099AA000 INSTALLER

CAUTION:
When press-fitting, use care to prevent damage to surface mating with rear body.

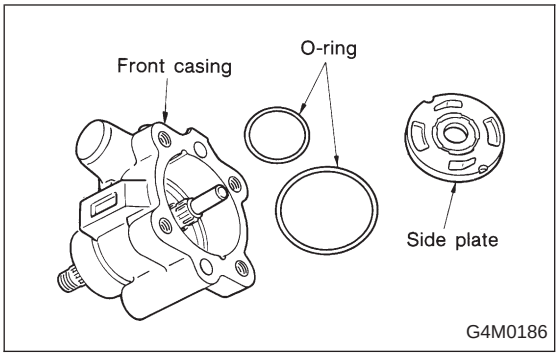
NOTE:
Orient oil seal toward correct direction.



(3) Using ST, press-fit shaft assembly into front body and mount snap ring.

ST 340099AA020 INSTALLER

NOTE:
Turn snap ring to ensure that it fits right into the groove.

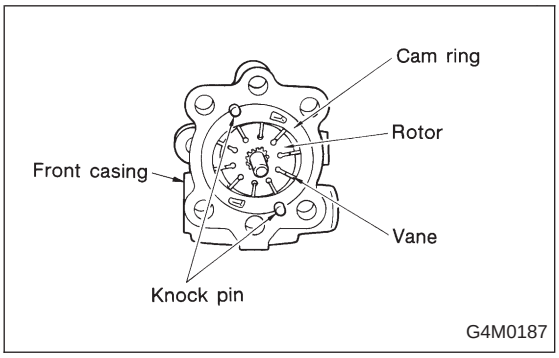


3) Cartridge assembly

(1) Apply specified power steering fluid to O-rings and fit them into front casing.

(2) Install side plate to front casing.

CAUTION:
Use care not to let side plate gall.

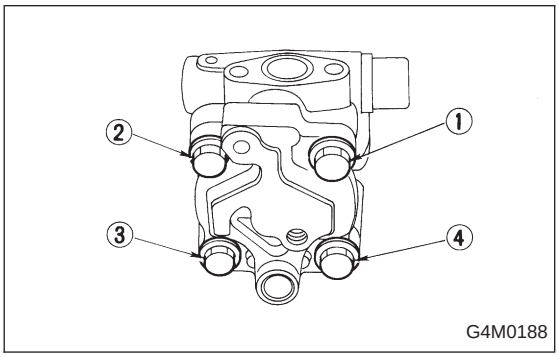


(3) Mount rotor onto shaft.

(4) Install 10 vanes into rotor with their nose radius facing toward cam ring.

(5) Install cam ring to front casing, securing with knock pins.

CAUTION:
Do not use hammer to fit knock pins in position.



4) Rear cover

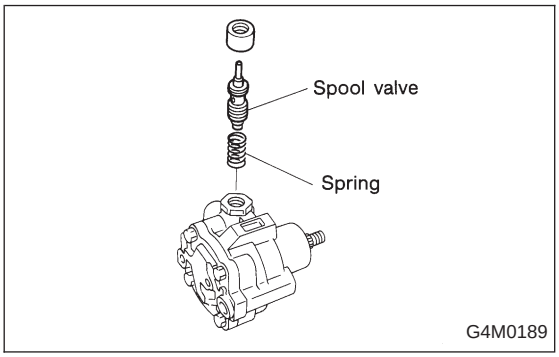
(1) Mount seal washer on front casing.

(2) With knock pin positions aligned, install rear cover.

Tightening torque:
16±2 N·m (1.6±0.2 kg-m, 11.6±1.4 ft-lb)

CAUTION:

Loosely tighten bolts in the sequence ①, ③, ②, and ④ shown in figure. Then, tighten in the same sequence.



5) Spool Valve

(1) Install spring into front casing. Then, with spool valve dipped in specified hydraulic oil, install it into the front casing.

(2) Using a 5-mm dia. round bar, ensure that valve moves smoothly.

(3) Set O-ring, with grease applied to it, onto connector and secure connector to front casing.

Tightening torque:
74±5 N·m (7.5±0.5 kg-m, 54.2±3.6 ft-lb)

CAUTION:
- **Use care to prevent damage to O-ring at installation.**
- **When tightening connector, ensure that O-ring does not protrude or get caught.**

6) Check

(1) When reassembly procedures have been completed, turn shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.

(2) Check followings by referring to “CHECK” article.

- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

F: INSTALLATION

1) Install bracket on engine.

Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)

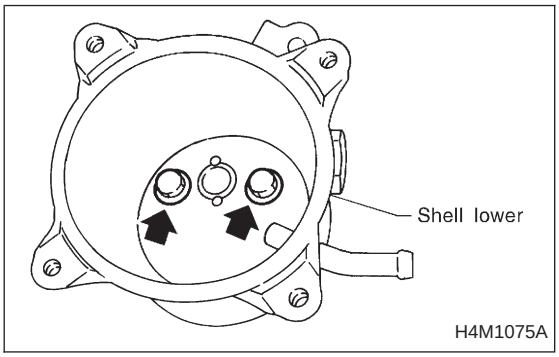
2) Install oil pump on oil tank as follows outside the vehicle:

NOTE:
Prior to installation, make sure that all oil is removed from oil pump, oil tank and pipe.

(1) Place oil pump in a vise and install stay to oil pump.

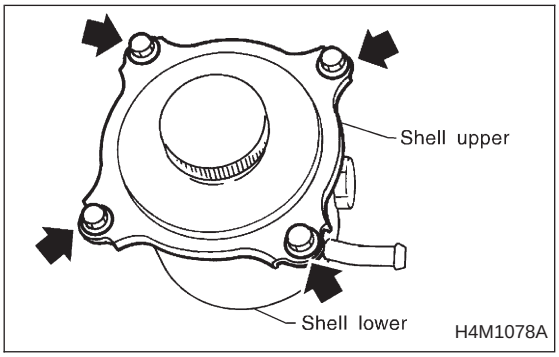
CAUTION:
Do not place oil pump directly in vise; use soft pads and hold oil pump lightly to protect it.

Tightening torque:
15.7±2.4 N·m (1.60±0.24 kg-m, 11.6±1.7 ft-lb)



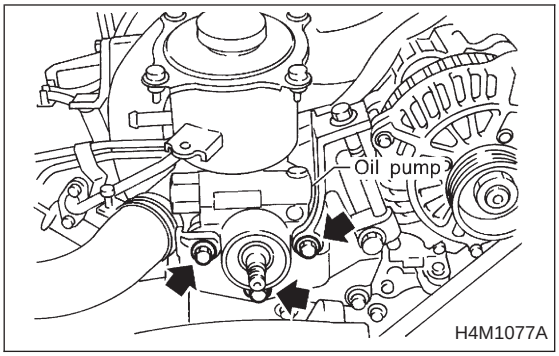
(2) Install shell lower to oil pump.

Tightening torque:
18^{+5}_{0} N·m ($1.8^{+0.5}_{0}$ kg-m, $13.0^{+3.6}_{0}$ ft-lb)



(3) Install shell upper and baffle to shell lower.

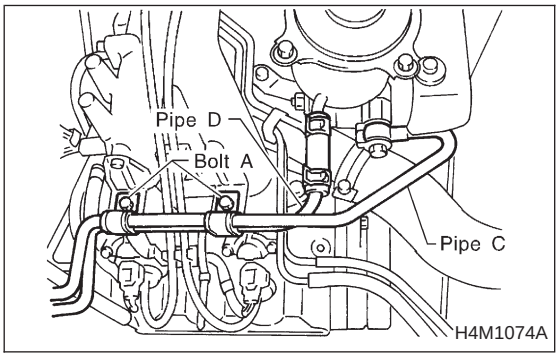
Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)



3) Install oil pump, previously assembled to oil tank, on bracket.

Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)

4) Place oil pump pulley and tighten pulley nut temporarily.



5) Interconnect pipes C and D.

Tightening torque:
Joint nut
15±5 N·m (1.5±0.5 kg-m, 10.8±3.6 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.

6) Install pulley belt to oil pump.
7) Tighten oil pump pulley nut to the specified torque.

Tightening torque:
52±10 N·m (5.3±1.0 kg-m, 38±7 ft-lb)

8) Check pulley belt tension. <Ref. to 1-5 [01A0].>
9) Tighten bolt belt tension.

Tightening torque:
8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 ft-lb)

10) Install pulley belt cover bracket.
11) Connect minus terminal of battery.
12) Feed the specified fluid and discharge air.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

7. Power Steering Fluid

A: RECOMMENDED AIR BLEEDING AND POWER STEERING FLUID

Recommended power steering fluid	Manufacturer
ATF DEXRON II, IIE or III	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

1) Feed the specified fluid with its level being about 4 cm (1.6 in) lower than the mouth of tank.
2) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.

3) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.

4) Start, and idle the engine.

5) Continue to turn steering wheel slowly from lock to lock again until bubbles stop appearing in the tank while keeping the fluid at that level.

It is normal that bubbles stop appearing after three times turning of steering wheel.

6) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.

7) Stop the engine, and take out safety stands after jacking up vehicle again.

Then lower the vehicle, and idle the engine.

8) Continue to turn steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

9) In case the following happens, leave it about half an hour and then do step 8) again.

(1) The fluid level changes over 3 mm (0.12 in).
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.

10) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:

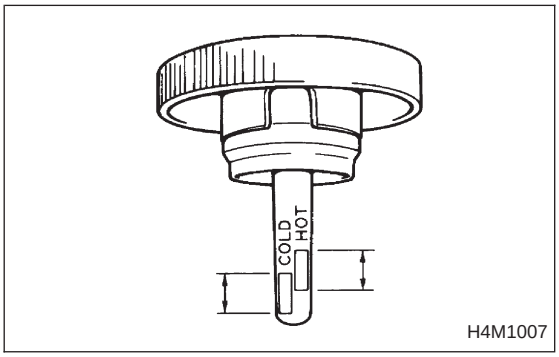
- **Before checking, wipe off any fluid on flare nuts and piping.**
- **In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.**
- **So remove the flare nut, tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace it with a new one.**

11) Inspect fluid level on flat and level surface with engine “OFF” by indicator of filler cap.

If the level is at lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain fluid by using a syringe or the like.

Fluid capacity:

0.7 ℓ (0.7 US qt, 0.6 Imp qt)



(1) Check at temperature 21°C (70°F) on reservoir surface of oil pump, read the fluid level on the “COLD” side.

(2) Check at temperature 60°C (140°F) on reservoir surface of oil pump, read the fluid level on the “HOT” side.

1. Power Steering

A: STEERING CONDITION

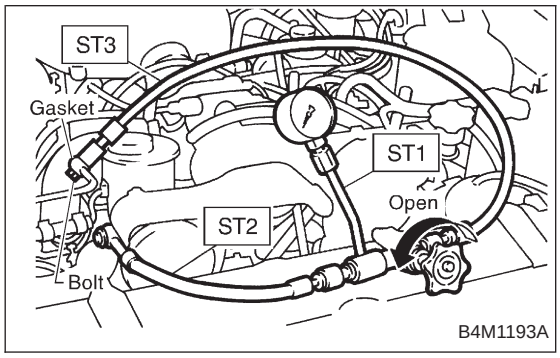
Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and rim • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure. <Ref. to 4-3 [K1B0].>	Replace problem parts.
	6. Measure steering effort. <Ref. to 4-3 [K1C0].>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and rim • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct customer.
	5. Measure steering effort. <Ref. to 4-3 [K1C0].>	Adjust or replace.

***1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.**
***2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.**
***3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.**

B: MEASUREMENT OF HYDRAULIC PRESSURE

CAUTION:
● Be sure to complete all items aforementioned in "STEERING CONDITION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to 4-3 [K1A0].>
● Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
● Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

NOTE:
Keep engine idling during the measurement.



1B1	MEASURE REGULAR PRESSURE.

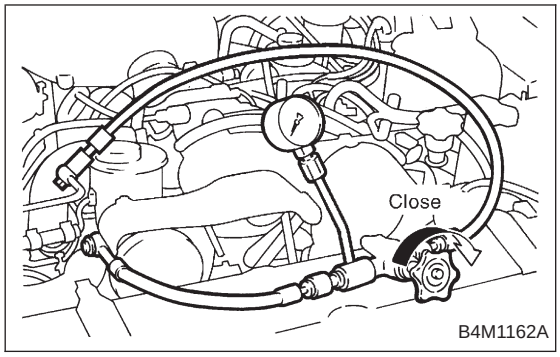
1) Install STs to power steering pump.
   (1) Drain the power steering fluid about 0.35 ℓ (0.4 US qt, 0.3 Imp qt) from oil tank.
   (2) Remove two bolts securing power steering pipes to engine.
   (3) Install ST1, 2 and 3 between power steering pump and pipes using gasket (Part No. 34621AC020) and bolt (Part No. 34620AC010).
   (4) Replenish power steering fluid up to specified level.
2) Open valve, and start the engine.
3) Measure regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

CHECK ***: Is pressure 981 kPa (10 kg/cm^2, 142 psi) or less?***

YES : Go to step **1B2**.

NO : Trouble may be due to crushed pipe or hose, leakage from fluid line, foreign particles in fluid line, etc. Replace faulty parts with new ones.



1B2	MEASURE RELIEF PRESSURE.

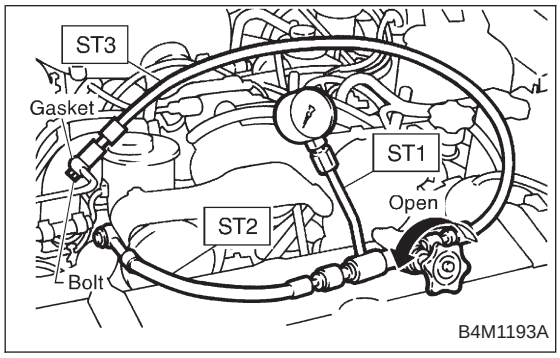
1) Using STs, measure relief pressure.
2) Close valve.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

CHECK ***: Is 1800 cc model's pressure 6,178 — 6,767 kPa (63 — 69 kg/cm^2, 896 — 981 psi), and 2200 cc model's pressure 7,159 — 7,748 kPa (73 — 79 kg/cm^2, 1,038 — 1,123 psi)?***

YES : Go to step **1B3**.

NO : Trouble may be due to malfunctioning relief valve, fluid leaking into oil pump interior, abnormal wear of pump vanes, etc. Replace faulty parts with new ones.



1B3	MEASURE WORKING PRESSURE.

1) Using STs, measure working pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

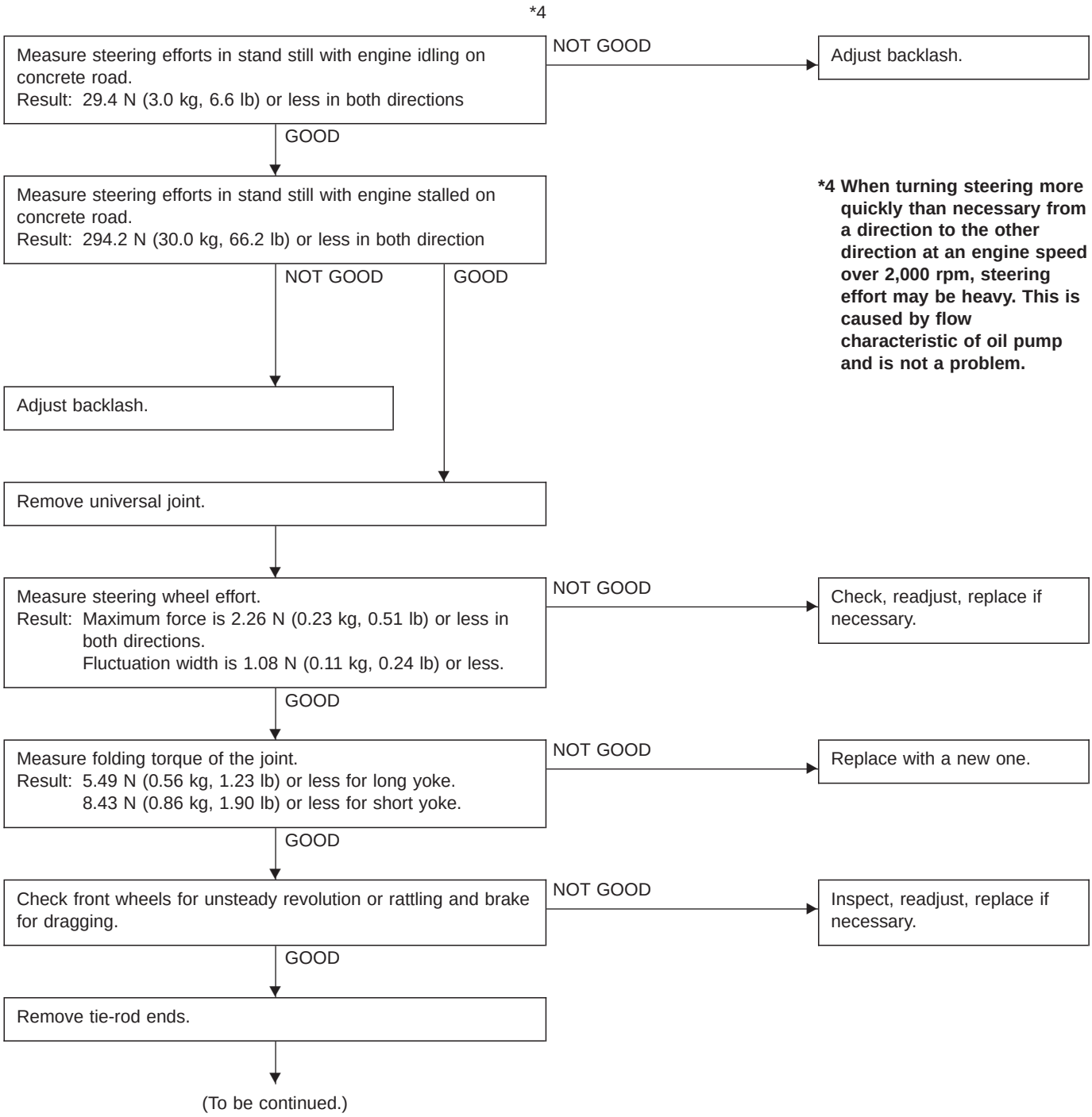
2) Open valve.
3) Measure working pressure of control valve by turning wheel from stop to stop.

CHECK ***: Is 1800 cc model's pressure 6,178 — 6,767 kPa (63 — 69 kg/cm^2, 896 — 981 psi), and 2200 cc model's pressure 7,159 — 7,748 kPa (73 — 79 kg/cm^2, 1,038 — 1,123 psi)?***

YES : Measure steering force. <Ref. to 4-3 [K1C0].>

NO : Control valve is inoperative. Replace control valve itself or control valve and pinion as a single unit with new ones.

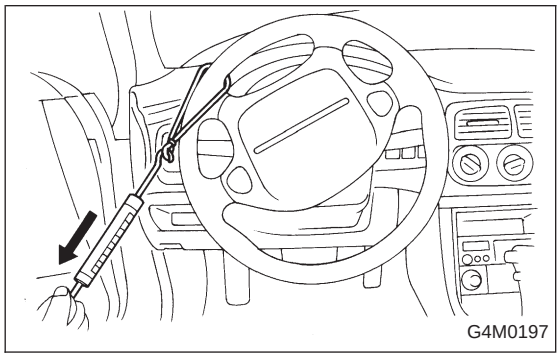
C: MEASUREMENT OF STEERING EFFORT

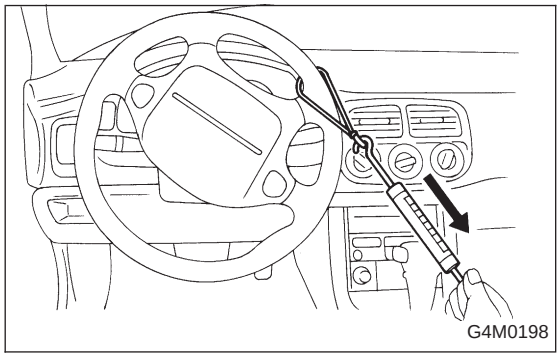


***4 When turning steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.**

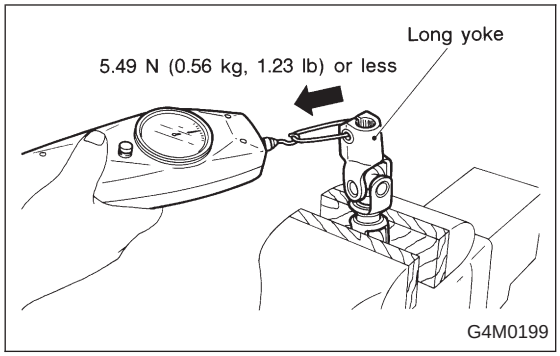
Check tie-rod ends, tie-rods and ball joints of suspension for unsteady revolution or rattling.
NOT GOOD → Inspect, replace if necessary.
GOOD ↓

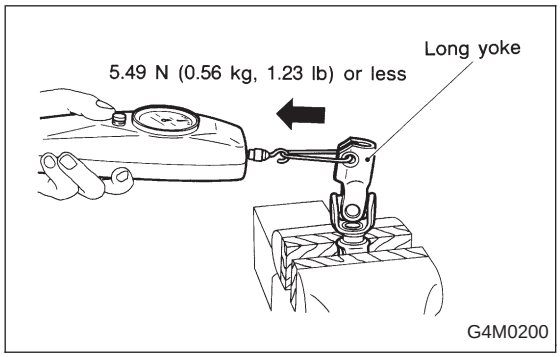
Measure rotating and sliding resistance of gearbox.
Result: Rotating resistance is 11.18 N (1.14 kg, 2.51 lb) or less around center position and 1.79 N (1.61 kg, 3.55 lb) or less in all positions within 20% difference between clockwise and counterclockwise.
Sliding resistance is 304 N (31 kg, 68 lb) or less with 20% difference between left and right directions.
NOT GOOD → Readjust backlash, if ineffective replace bad parts.

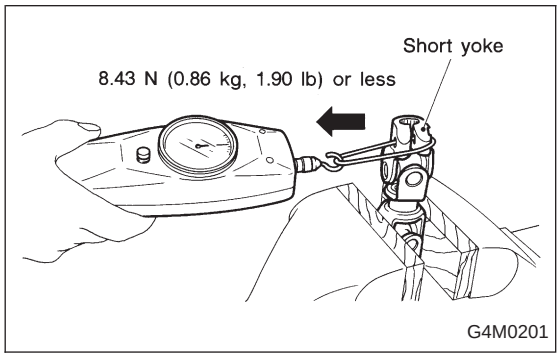

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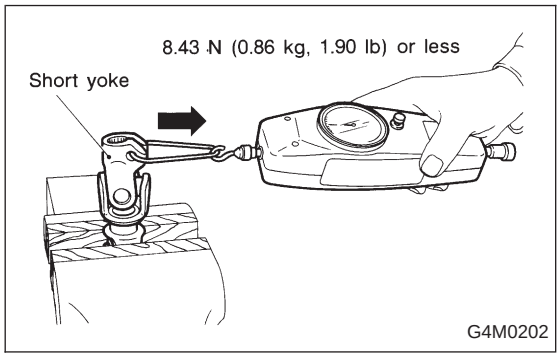

G4M0198

1) Measurement of steering effort is as shown in the figures.

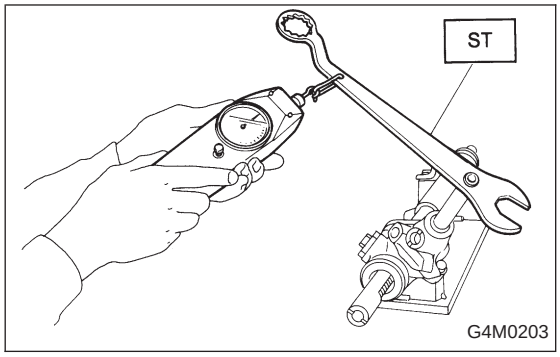








2) Measurement of folding torque of universal joint is as shown in the figures.



3) Using ST, measure resistances of gearbox.

ST 926230000 SPANNER

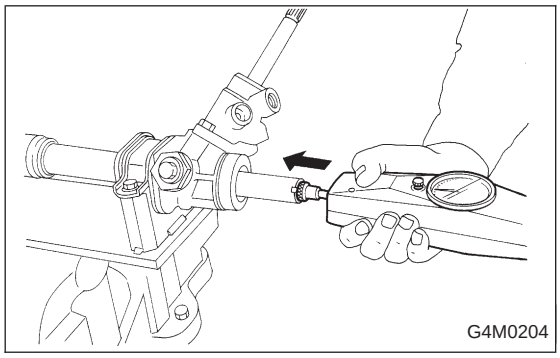
Rotating resistance:

Straight-ahead position within 30 mm (1.18 in) from rack center;

Less than 11.18 N (1.14 kg, 2.51 lb)

Maximum allowable torque;

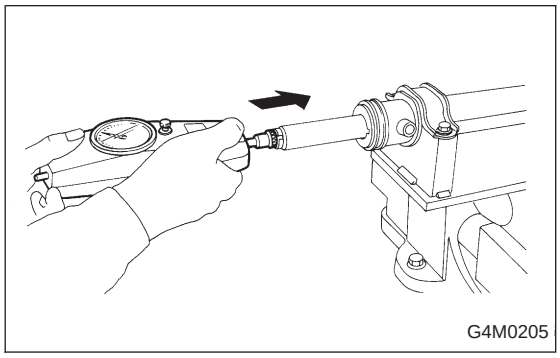
15.7 N (1.6 kg, 3.5 lb)



Sliding resistance:

Right-turn steering;

304 N (31 kg, 68 lb) or less

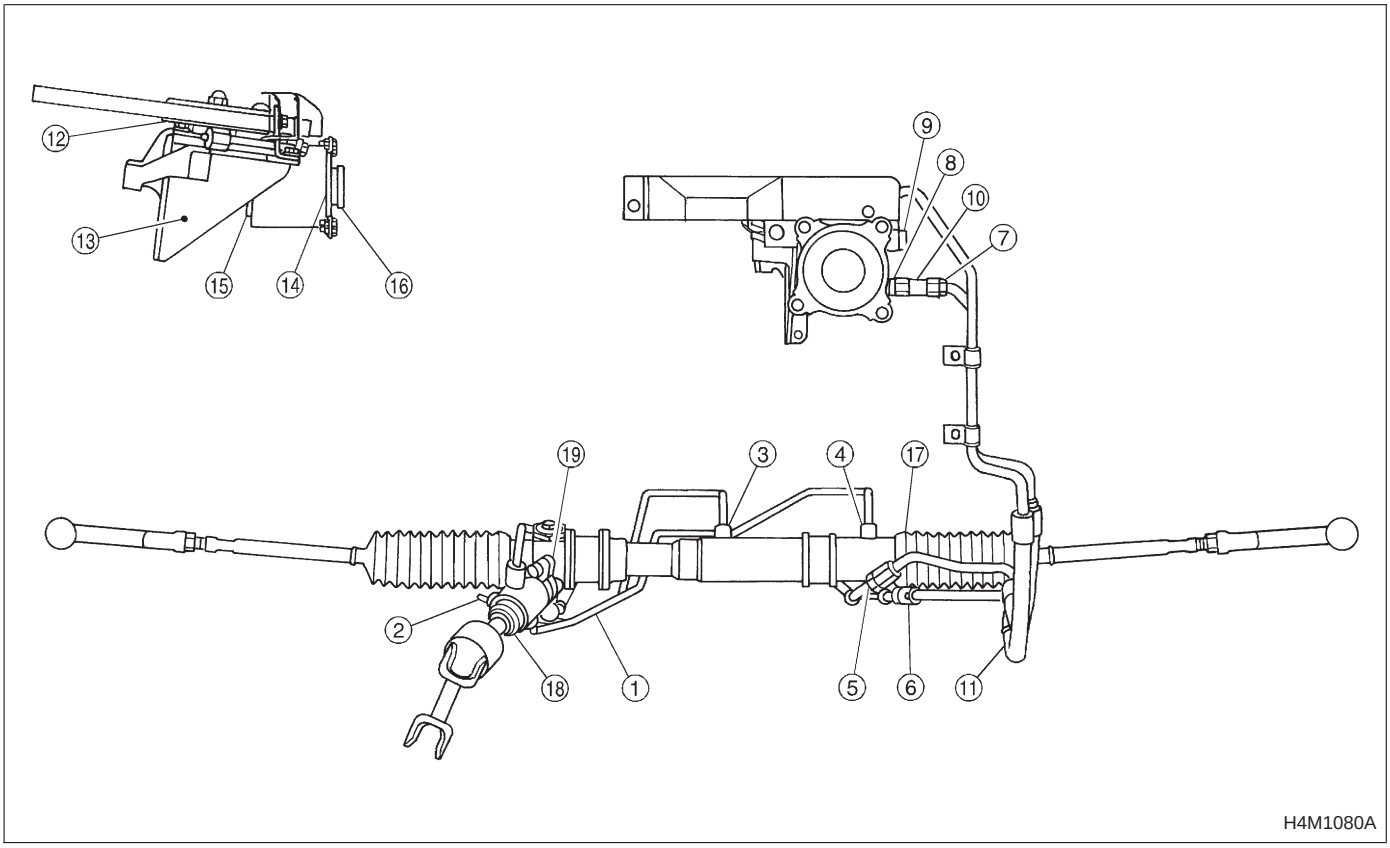


Left-turn steering;

304 N (31 kg, 68 lb) or less

D: FLUID LEAKAGE

CAUTION:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with ① through ⑨ in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring	Replace O-ring pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose ⑩ and ⑪ in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump ⑫ and ⑬ in figure	Damaged O-ring	Replace O-ring.
	Damaged gasket	Replace gasket.
Leakage from oil tank ⑭ and ⑮ in figure	Crack in oil tank, ⑭	Replace oil tank.
	Damaged O-ring, ⑮	Replace O-ring.
Leakage from filler neck ⑯	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox ⑰ in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gearbox ⑱ and ⑲ in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

***1 Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.**

E: NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in “D” range for automatic transmission vehicle.

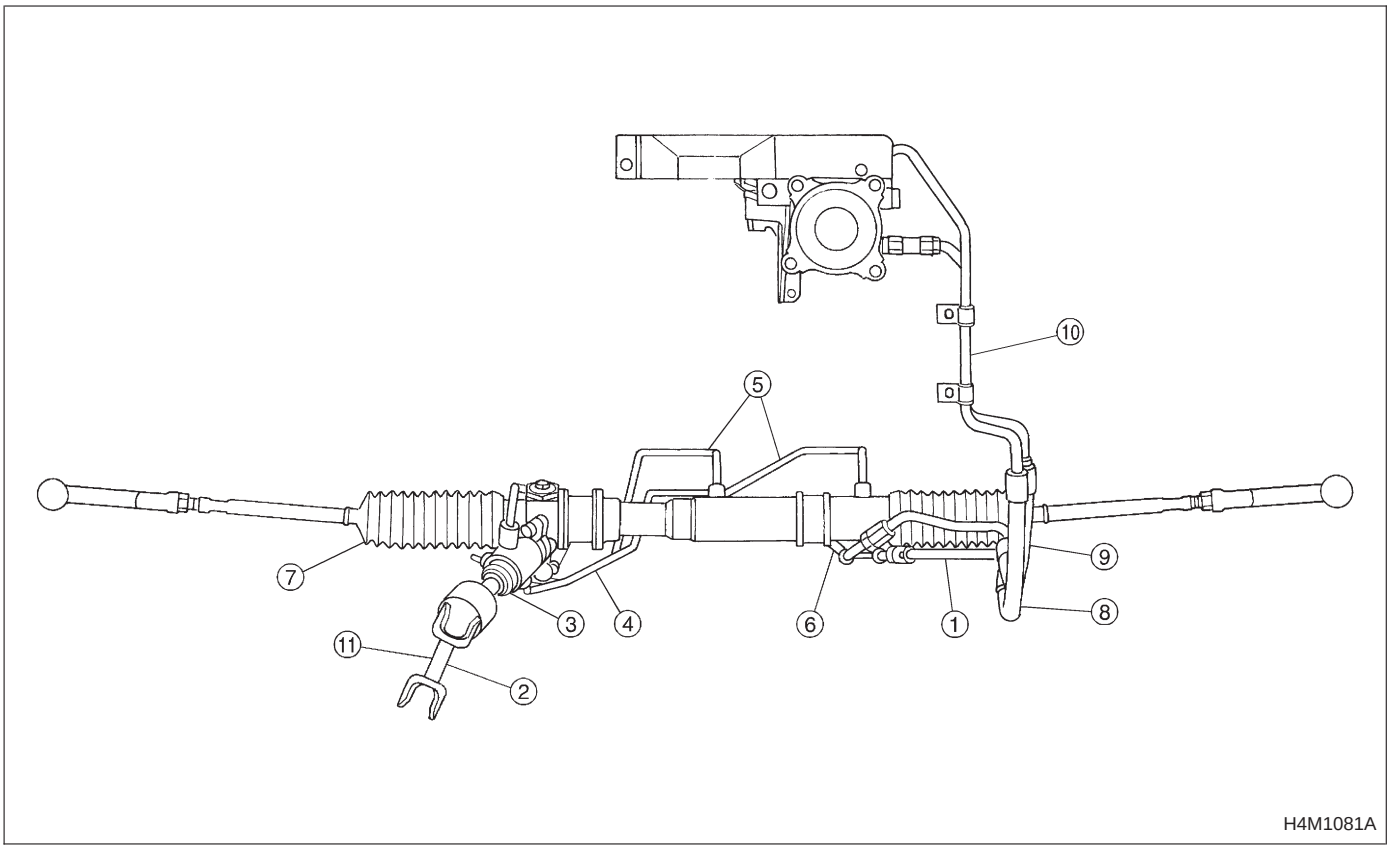
Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don’t keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check clearance. Correct if necessary. <Ref. to 4-3 [K1F0].>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace bad parts of gearbox or hose.

Trouble	Possible cause	Corrective action
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

F: CLEARANCE TABLE

CAUTION:
This table lists various clearances that must be correctly adjusted to ensure normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance mm (in)	Location	Minimum allowance mm (in)
① Crossmember — Pipe	5 (0.20)	⑦ Exhaust pipe — Gearbox bolt	15 (0.59)
② DOJ — Shaft or joint	14 (0.55)	⑧ Side frame — Hose A and B	15 (0.59)
③ DOJ — Valve housing	11 (0.43)	⑨ Cruise control pump — Hose A and B	15 (0.59)
④ Pipe — Pipe	2 (0.08)	⑩ Pipe portion of hose A — Pipe portion of hose B	1.5 (0.059)
⑤ Stabilizer — Pipe	5 (0.20)	⑪ AT cooling hose — Joint	20 (0.79)
⑥ Exhaust pipe — Pipe	15 (0.59)	—	—



G: BREAKAGE OF HOSES

CAUTION:
Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and/or a driving condition in which many steering operations are required in short time. Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.
So, avoid to keep this kind of condition when servicing as well as driving.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

BRAKES 4-4

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PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

1. Specifications

A: COUPE

	Engine (cc)	1800	2200	
	Driving system	AWD	AWD	
		Brighton	Brighton	L
Front brake	Type	Disc (Floating type, ventilated)		
	Effective disc diameter mm (in)	210 (8.27)		
	Disc thickness x outer diameter mm (in)	24 x 260 (0.94 x 10.24)		
	Effective cylinder diameter mm (in)	57.15 (2.2500)		
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)		
	Clearance adjustment	Automatic adjustment		
Rear brake	Type	Drum (Leading-trailing type)		
	Effective drum diameter mm (in)	228.6 (9)		
	Effective cylinder diameter mm (in)	19.05 (0.7500)		
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)		
	Clearance adjustment	Automatic adjustment		
Parking brake	Type	Mechanical on rear brake drums		
	Effective drum diameter mm (in)	228.6 (9)		
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)		
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter mm (in)	23.81 (0.9374)		
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)		
Brake booster	Type	Vacuum suspended		
	Effective diameter mm (in)	230 (9.06)		
Proportioning valve	Split point kPa(kg/cm^2, psi)	2,942 (30.0, 427)		
	Reducing ratio	0.4		
Brake line		Dual circuit system		
ABS		—		

B: SEDAN

	Engine (cc)	2200
	Driving system	AWD
		L
Front brake	Type	Disc (Floating type, ventilated)
	Effective disc diameter mm (in)	210 (8.27)
	Disc thickness x outer diameter mm (in)	24 x 260 (0.94 x 10.24)
	Effective cylinder diameter mm (in)	57.15 (2.2500)
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)
	Clearance adjustment	Automatic adjustment
Rear brake	Type	Drum (Leading-trailing type)
	Effective drum diameter mm (in)	228.6 (9)
	Effective cylinder diameter mm (in)	19.05 (0.7500)
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)
	Clearance adjustment	Automatic adjustment
Parking brake	Type	Mechanical on rear brake drums
	Effective drum diameter mm (in)	228.6 (9)
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)
	Clearance adjustment	Automatic adjustment
Master cylinder	Type	Tandem
	Effective diameter mm (in)	23.81 (0.9374)
	Reservoir type	Sealed type
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)
Brake booster	Type	Vacuum suspended
	Effective diameter mm (in)	230 (9.06)
Proportioning valve	Split point kPa (kg/cm^2, psi)	2,942 (30.0, 427)
	Reducing ratio	0.4
Brake line		Dual circuit system
ABS		—

C: WAGON

	Engine (cc)	1800	2200	
	Driving system	AWD	AWD	
		Brighton	L	OUTBACK
Front brake	Type	Disc (Floating type, ventilated)		
	Effective disc diameter mm (in)	210 (8.27)		
	Disc thickness x outer diameter mm (in)	24 x 260 (0.94 x 10.24)		
	Effective cylinder diameter mm (in)	57.15 (2.2500)		
	Pad dimensions (length x width x thickness) mm (in)	112.4 x 44.3 x 11.0 (4.43 x 1.744 x 0.433)		
	Clearance adjustment	Automatic adjustment		
Rear brake	Type	Drum (Leading-trailing type)		
	Effective drum diameter mm (in)	228.6 (9)		
	Effective cylinder diameter mm (in)	19.05 (0.7500)		
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)		
	Clearance adjustment	Automatic adjustment		
Parking brake	Type	Mechanical on rear brake drums		
	Effective drum diameter mm (in)	228.6 (9)		
	Lining dimensions (length x width x thickness) mm (in)	218.8 x 35.0 x 4.1 (8.61 x 1.378 x 0.161)		
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter mm (in)	23.81 (0.9374)		25.40 (1)
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity cm^3 (cu in)	190 (11.59)		
Brake booster	Type	Vacuum suspended		
	Effective diameter mm (in)	230 (9.06)		180 + 205 (7.09 + 8.07)
Proportioning valve	Split point kPa (kg/cm^2, psi)	2,942 (30.0, 427)		
	Reducing ratio	0.4		
Brake line		Dual circuit system		
ABS		—		STD

2. Service Data

ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	17 mm (0.67 in)	7.5 mm (0.295 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc run-out	—	0.075 mm (0.0030 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.079 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke	7 to 8 notches/196N (20 kg, 44 lb)	

			Without ABS	With ABS
Brake booster		Brake pedal force	Fluid pressure	
	Brake fluid pressure without engine running	147 N (15 kg, 33 lb)	785 kPa (8 kg/cm^2, 114 psi)	588 kPa (6 kg/cm^2, 85 psi)
		294 N (30kg, 66 lb)	2,158 kPa (22 kg/cm^2, 313 psi)	1,863 kPa (19 kg/cm^2, 270 psi)
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kg, 33 lb)	5,492 kPa (56 kg/cm^2, 796 psi)	5,394 kPa (55 kg/cm^2, 782 psi)
		294 N (30kg, 66 lb)	8,434 kPa (86 kg/cm^2, 1,223 psi)	9,219 kPa (94 kg/cm^2, 1,337 psi)

A: RECOMMENDED BRAKE FLUID

FMVSS No. 116, fresh DOT3 or 4 brake fluid

CAUTION:

- **Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.**
- **When brake fluid is supplemented, be careful not to allow any dust into the reservoir.**
- **Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid.**

B: BRAKE FLUID LEVEL INDICATOR

Reserve tank with level indicator:

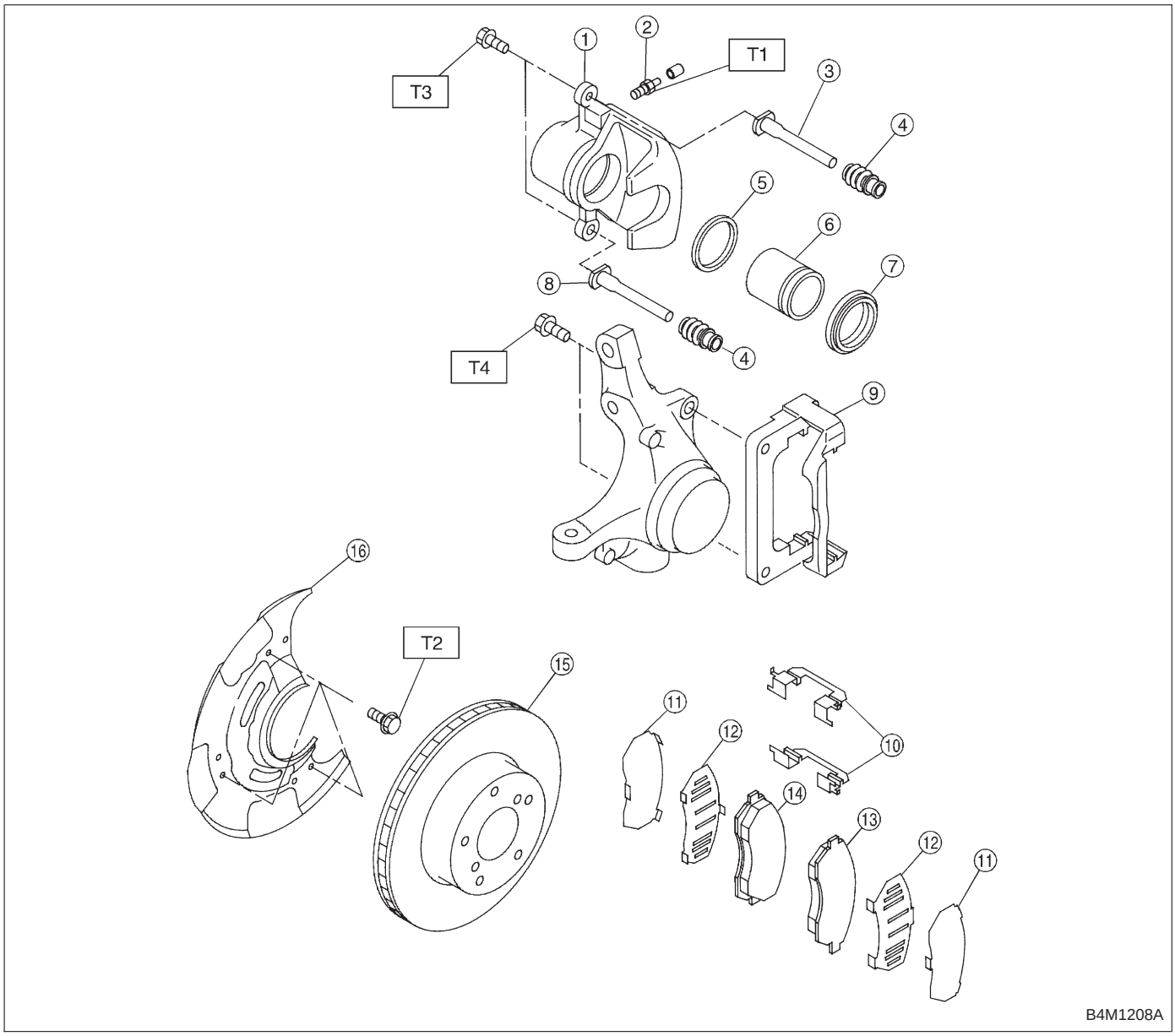
Residual fluid quantity at light ON

Approx. 80 cm^3 (80cc, 4.88 cu in)

Tank capacity

190 cm^3 (190cc, 11.59 cu in)

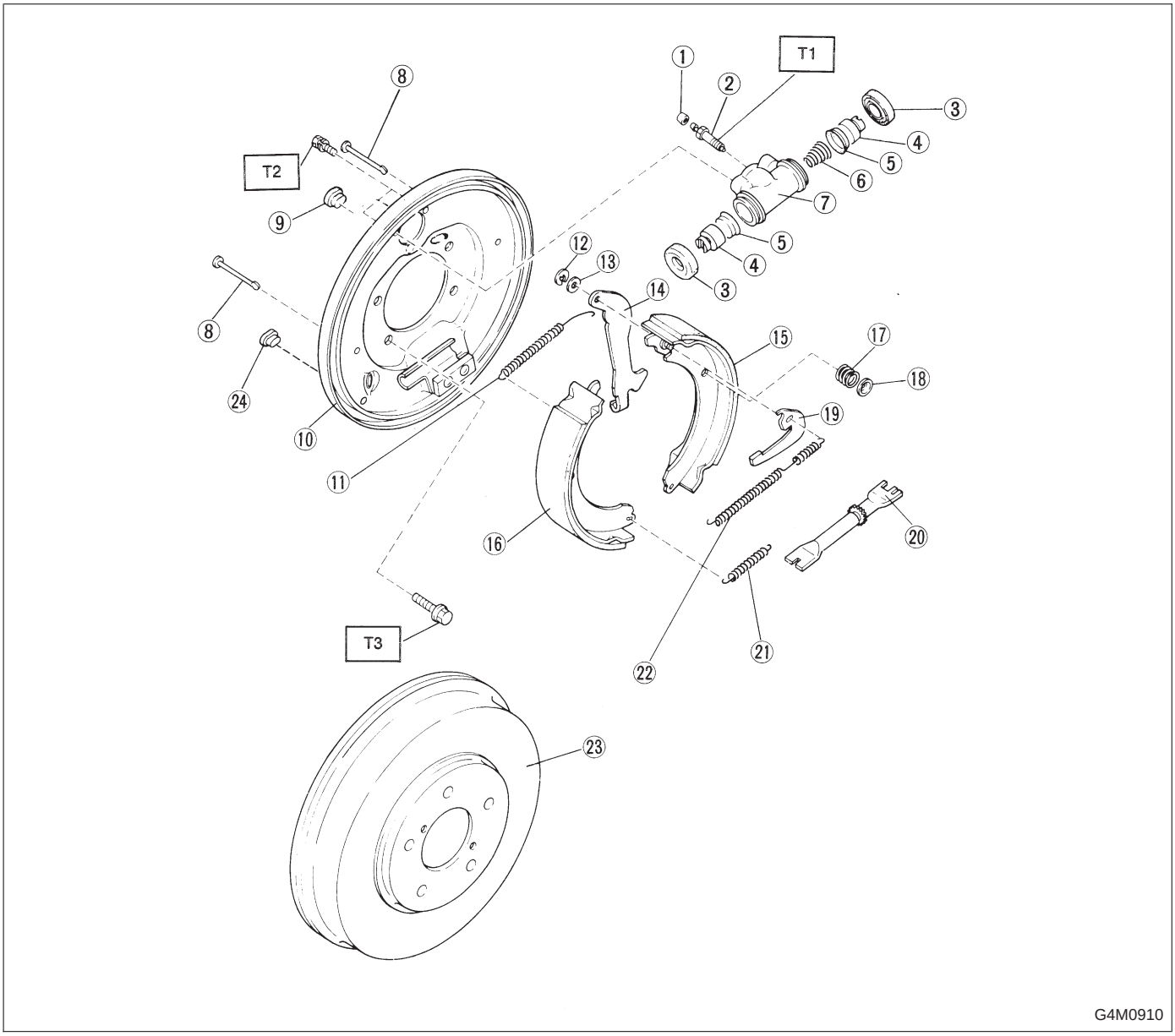
1. Front Disc Brake



① Caliper body
② Air bleeder screw
③ Guide pin (Green)
④ Pin boot
⑤ Piston seal
⑥ Piston
⑦ Piston boot
⑧ Lock pin (Yellow)
⑨ Support
⑩ Pad clip
⑪ Outer shim
⑫ Inner shim
⑬ Pad (Outside)
⑭ Pad (Inside)
⑮ Disc rotor
⑯ Disc cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 37±5 (3.8±0.5, 27.5±3.6)
T4: 78±10 (8.0±1.0, 58±7)

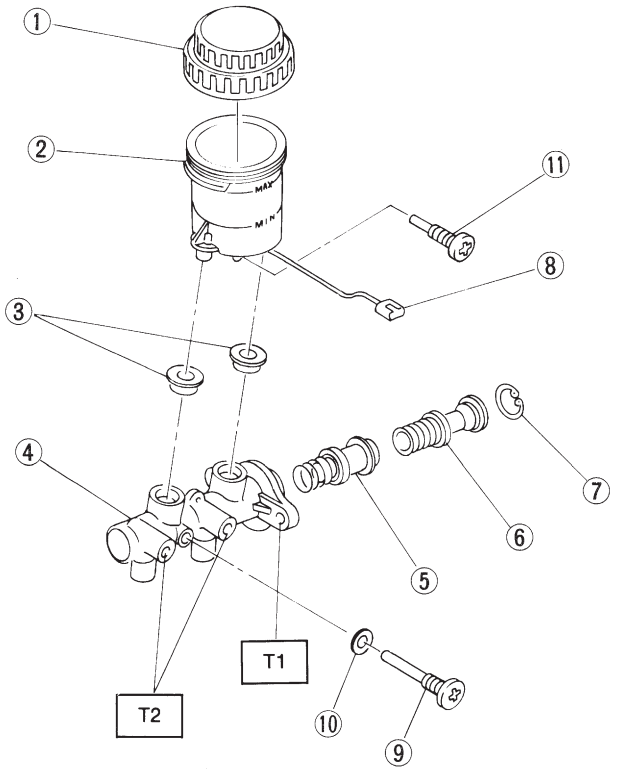
2. Rear Drum Brake



① Air bleeder cap
② Air bleeder screw
③ Boot
④ Piston
⑤ Cup
⑥ Spring
⑦ Wheel cylinder body
⑧ Pin
⑨ Plug
⑩ Back plate
⑪ Upper shoe return spring
⑫ Retainer
⑬ Washer
⑭ Parking brake lever
⑮ Brake shoe (Trailing)
⑯ Brake shoe (Leading)
⑰ Shoe hold-down spring
⑱ Cup
⑲ Adjusting lever
⑳ Adjuster
㉑ Lower shoe return spring
㉒ Adjusting spring
㉓ Drum
㉔ Plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 10±2 (1.0±0.2, 7.2±1.4)
T3: 52±6 (5.3±0.6, 38.3±4.3)

3. Master Cylinder



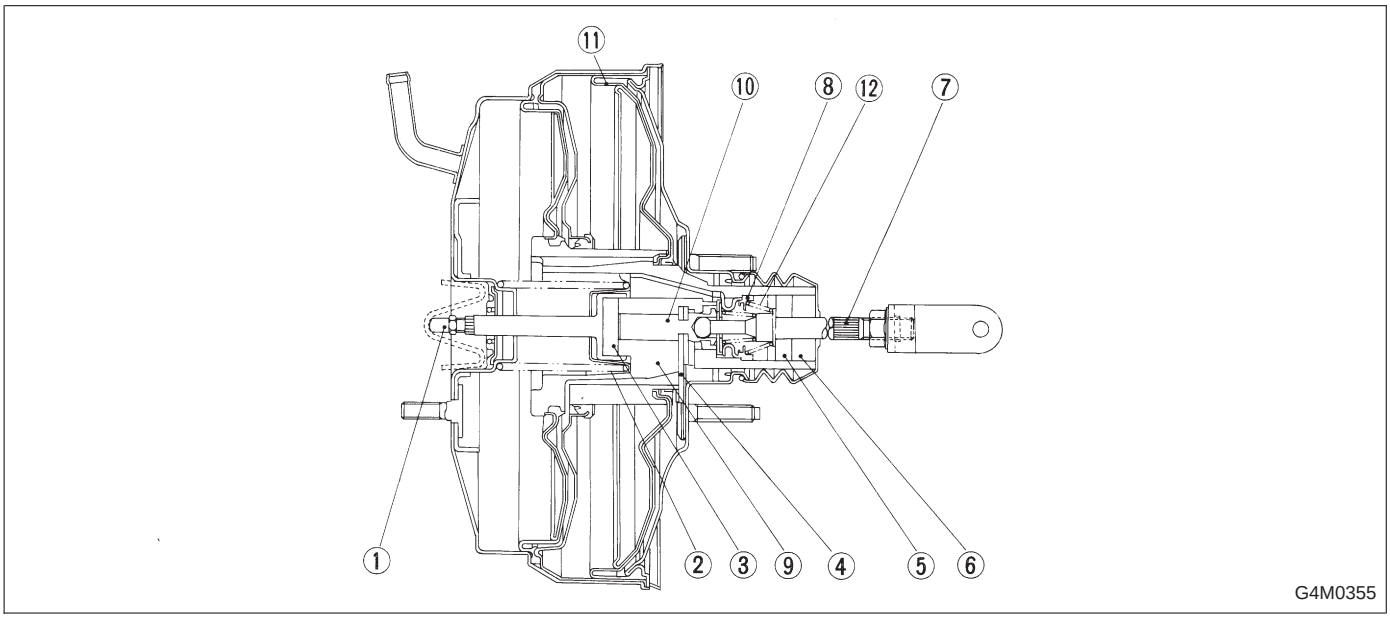
G4M0354

① Cap
② Reserve tank
③ Seal
④ Cylinder body
⑤ Secondary piston
⑥ Primary piston
⑦ C-ring
⑧ Level indicator ASSY
⑨ Supply valve stopper (With ABS)
⑩ Gasket (With ABS)
⑪ Reservoir stopper bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 14±4 (1.4±0.4, 10.1±2.9)
T2: 14.7^{+3}_{-2}
($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)

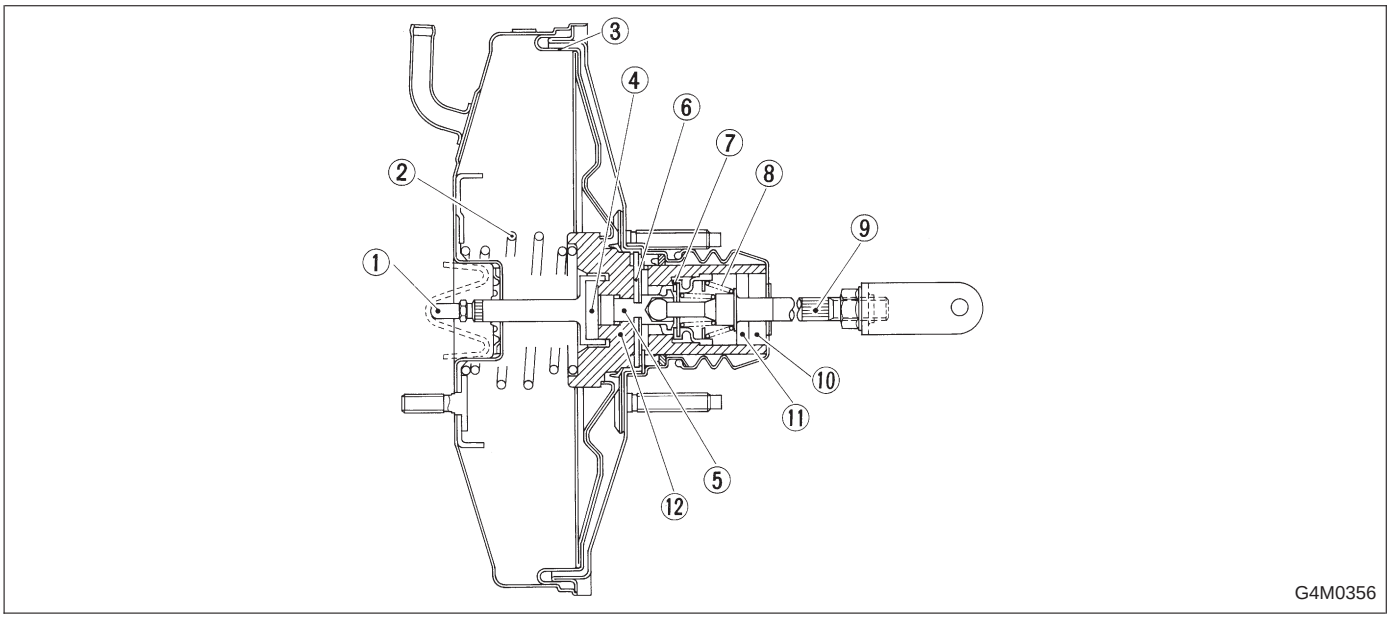
4. Brake Booster

1. MODELS WITH ABS



① Push rod
② Return spring
③ Reaction disc
④ Key
⑤ Filter
⑥ Silencer
⑦ Operating rod
⑧ Poppet valve
⑨ Valve body
⑩ Plunger valve
⑪ Diaphragm plate
⑫ Valve return spring

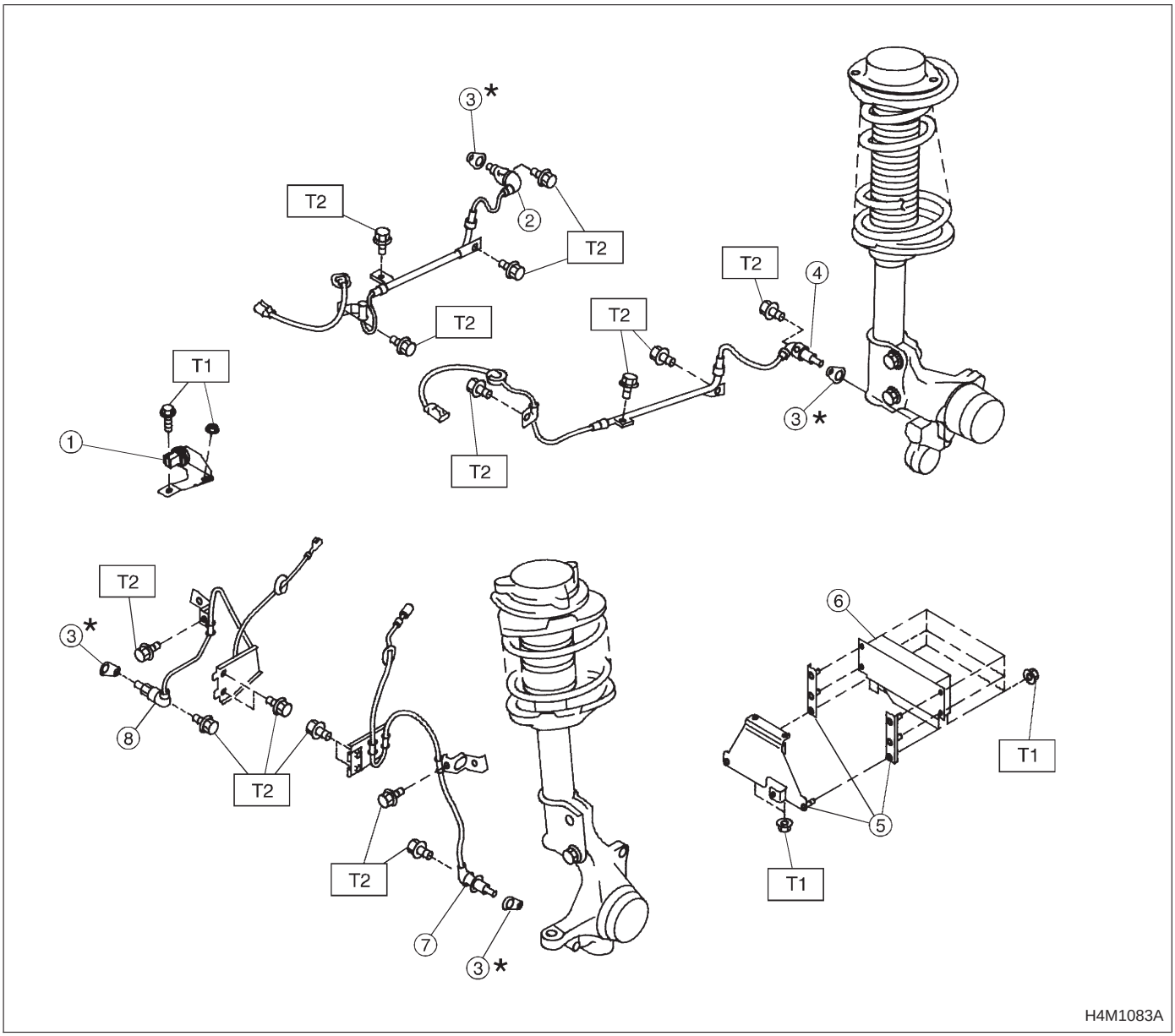
2. MODELS WITHOUT ABS



① Push rod
② Return spring
③ Diaphragm plate
④ Reaction disc
⑤ Plunger valve
⑥ Key
⑦ Poppet valve
⑧ Valve return spring
⑨ Operating rod
⑩ Silencer
⑪ Filter
⑫ Valve body

5. ABS System

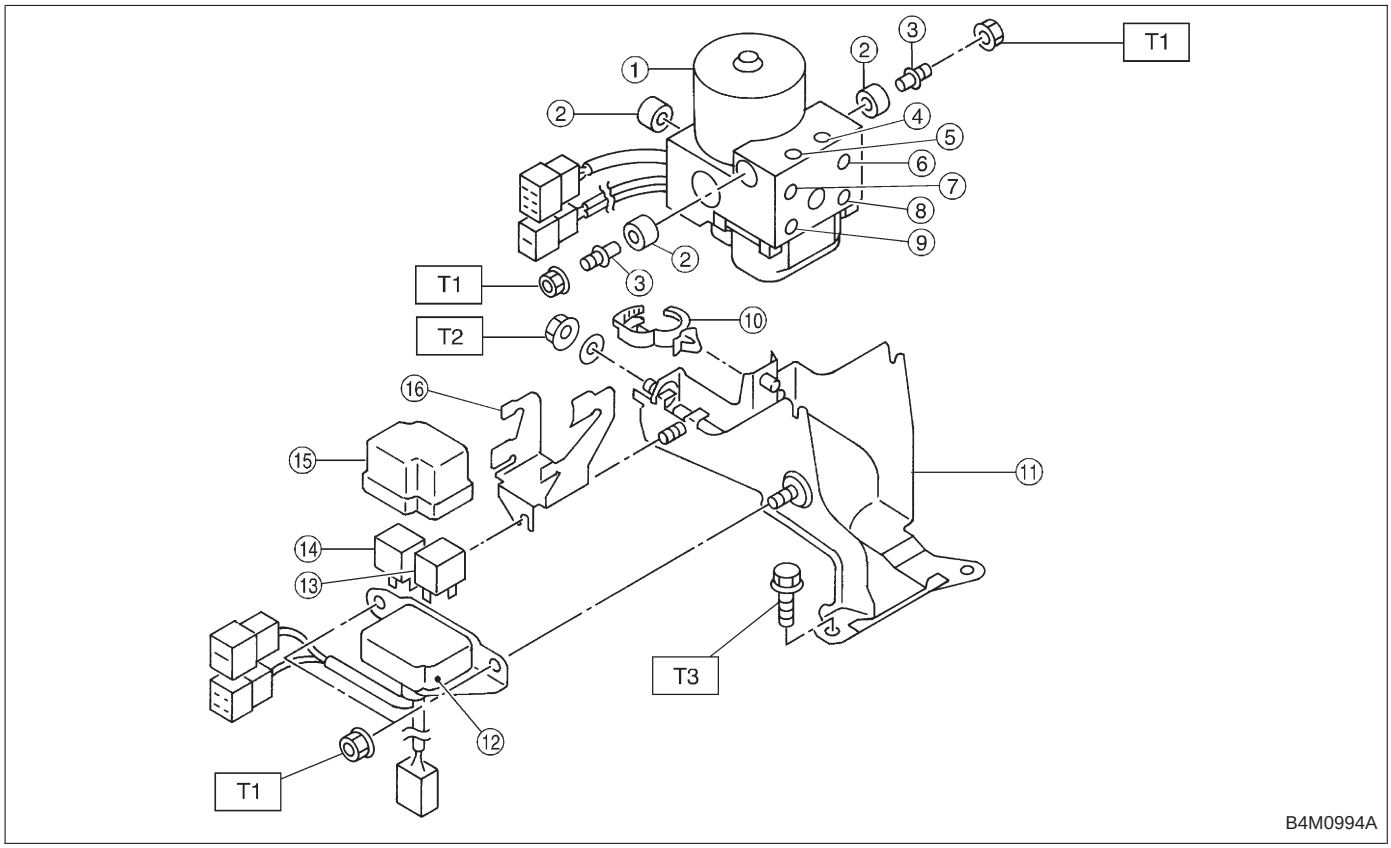
A: SENSOR AND CONTROL MODULE



① G sensor (AWD only)
② Rear ABS sensor RH
③ ABS spacer
④ Rear ABS sensor LH
⑤ Bracket
⑥ ABS control module
⑦ Front ABS sensor LH
⑧ Front ABS sensor RH

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 32±10 (3.3±1.0, 24±7)

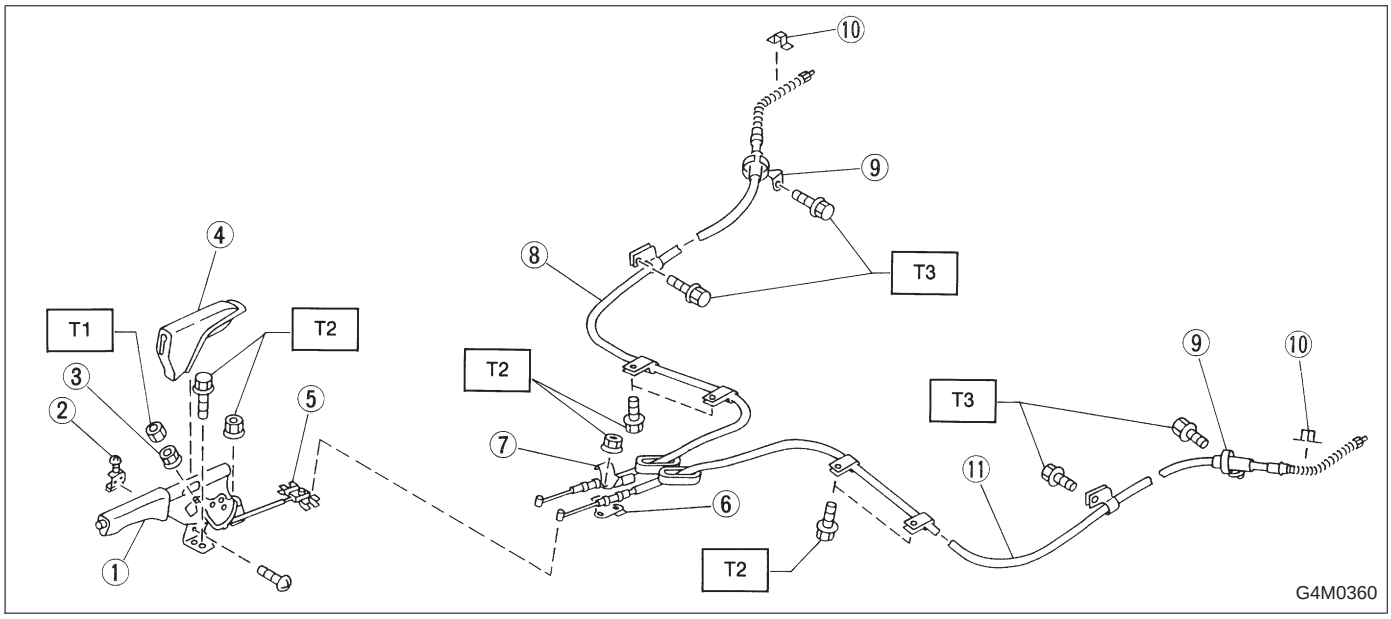
B: HYDRAULIC CONTROL UNIT



① Hydraulic control unit
② Damper
③ Stud bolt
④ Rear-RH outlet
⑤ Rear-LH outlet
⑥ Secondary inlet
⑦ Primary inlet
⑧ Front-LH outlet
⑨ Front-RH outlet
⑩ Cable clip
⑪ Bracket
⑫ Relay box
⑬ Motor relay
⑭ Valve relay
⑮ Cap
⑯ Connector bracket

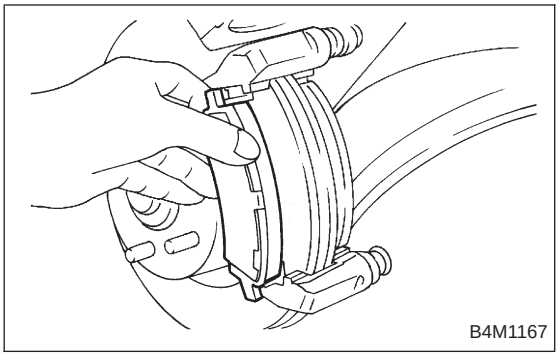
Tightening torque: N·m (kg-m, ft-lb)
T1: 18±5 (1.8±0.5, 13.0±3.6)
T2: 29±7 (3.0±0.7, 21.7±5.1)
T3: 32±10 (3.3±1.0, 24±7)

6. Parking Brake



① Parking brake lever
② Parking brake switch
③ Adjusting nut
④ Cover
⑤ Equalizer
⑥ Bracket
⑦ Clamp
⑧ Parking brake cable RH
⑨ Cable guide
⑩ Clamp
(Rear disc brake model only)
⑪ Parking brake cable LH

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)

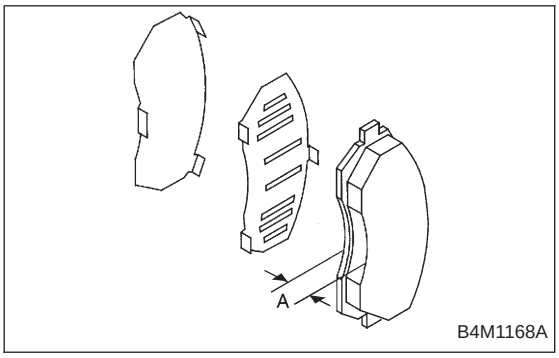

B4M1167

1. Front Disc Brake

A: ON-CAR SERVICE

1. PAD

1) Remove lock pin.
2) Raise caliper body.
3) Remove pad.

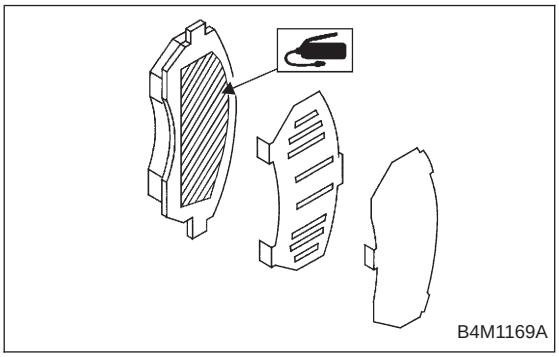


B4M1168A

4) Check pad thickness A.

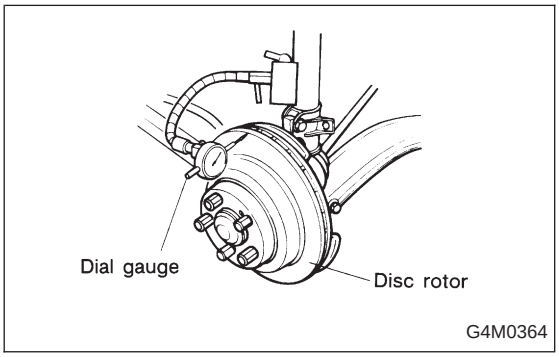
Pad thickness (including back metal) mm (in)	Standard value	17 (0.67)
	Wear limit	7.5 (0.295)

CAUTION:
● Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● Replace pad if there is oil or grease on it.


B4M1169A

5) Apply thin coat of PBC GREASE (Part No. 003607000) to the frictional portion between pad and pad clip.
6) Install pads on support.
7) Install caliper body on support.

NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.



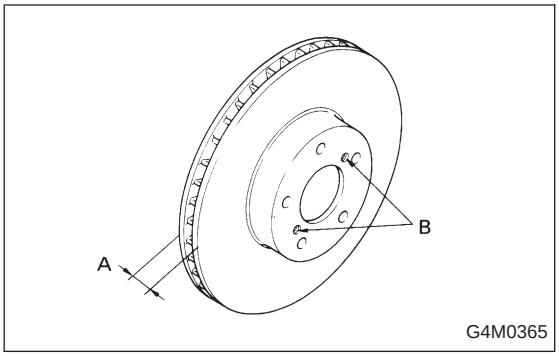
G4M0364

2. DISC ROTOR

1) Install disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

NOTE:
Make sure that dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:
0.075 mm (0.0030 in)

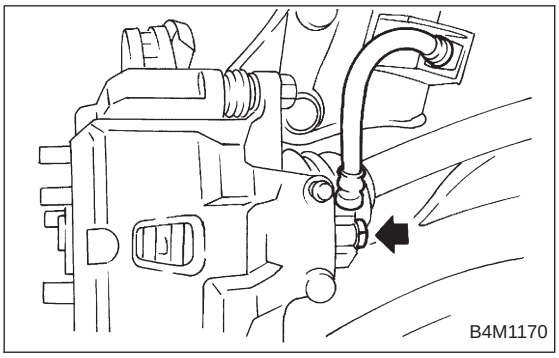


3) Measure disc rotor thickness.

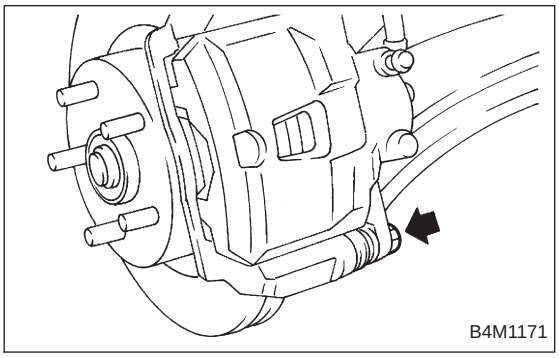
NOTE:
Make sure that micrometer is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor thickness A mm (in)	Standard value	Service limit	Disc outer dia.
	24.0 (0.945)	22.0 (0.866)	260 (10.24)

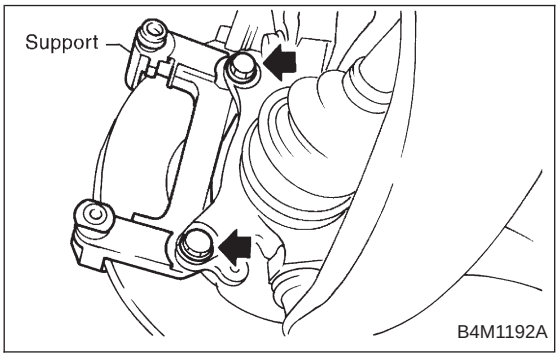
B: REMOVAL



1) Remove union bolt and disconnect brake hose from caliper body assembly.

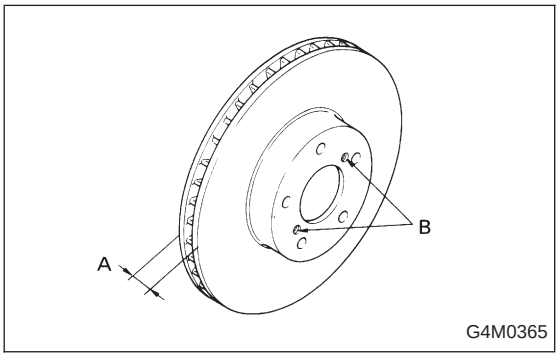


2) Remove bolt securing lock pin to caliper body.
3) Raise caliper body and move it toward vehicle center to separate it from support.



4) Remove support from housing.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.

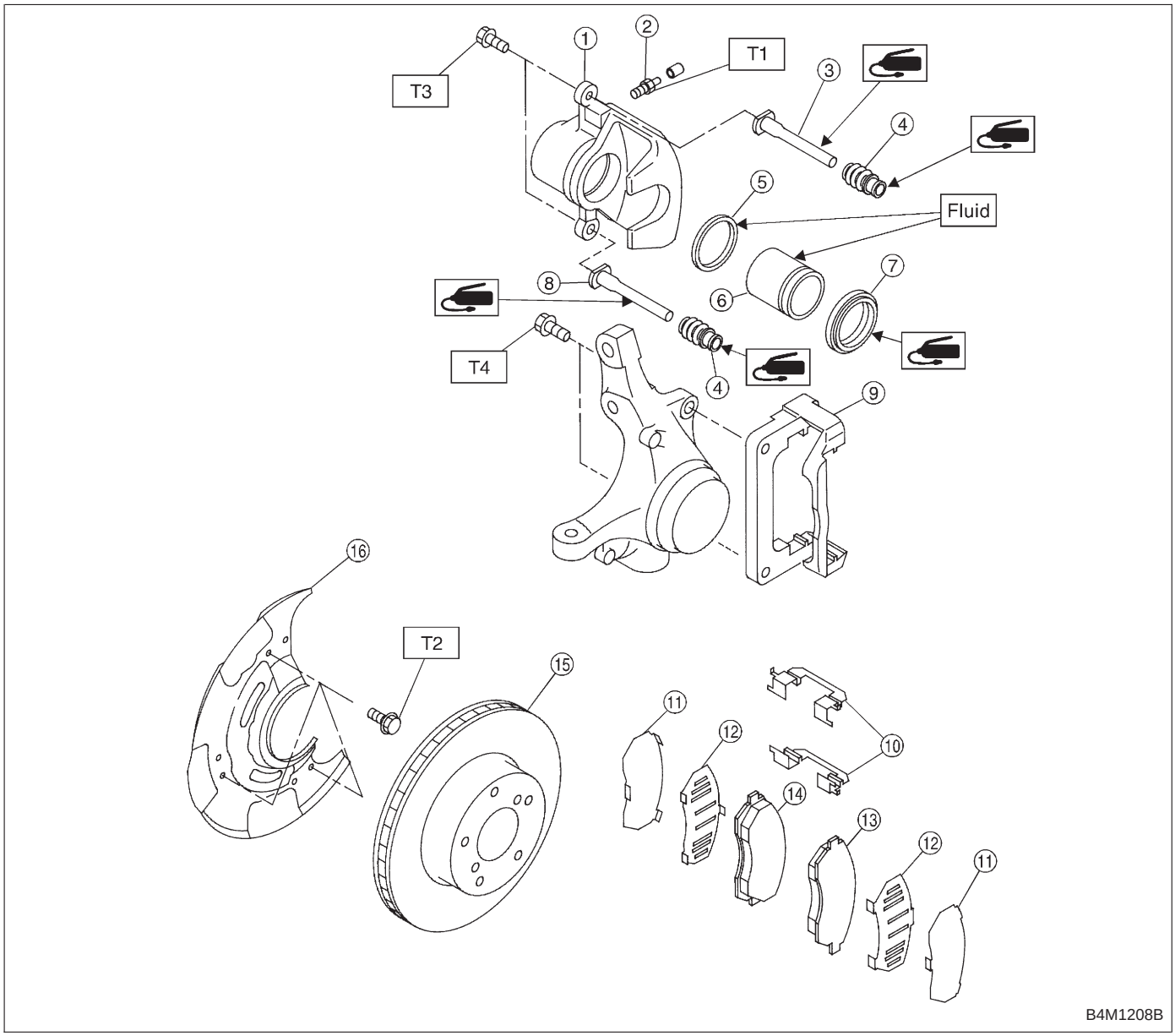


5) Remove disc rotor from hub.

NOTE:
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.

6) Clean mud and foreign particles from caliper body assembly and support.

C: DISASSEMBLY

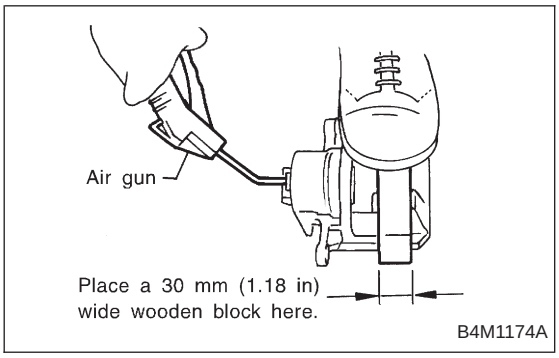


① Caliper body
② Air bleeder screw
③ Guide pin (Green)
④ Pin boot
⑤ Piston seal
⑥ Piston
⑦ Piston boot
⑧ Lock pin (Yellow)
⑨ Support
⑩ Pad clip
⑪ Outer shim
⑫ Inner shim
⑬ Pad (Outside)
⑭ Pad (Inside)
⑮ Disc rotor
⑯ Disc cover

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 37±5 (3.8±0.5, 27.5±3.6)
T4: 78±10 (8.0±1.0, 58±7)

1) Clean mud and foreign particles from caliper body assembly and support.

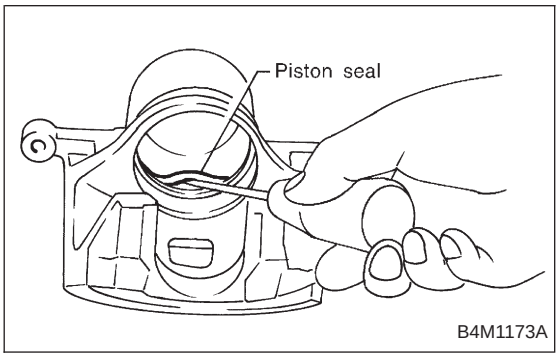
CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).



2) Gradually supply compressed air via caliper body brake hose to force piston out.

CAUTION:
- **Place a wooden block as shown in Figure to prevent damage to piston.**
- **Do not apply excessively high-pressure.**

3) Remove piston boot.



4) Remove piston seal from caliper body cylinder.
5) Remove guide pin and boot from caliper body.

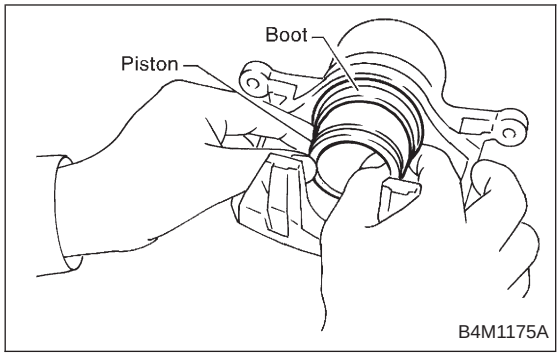
D: INSPECTION

1) Repair or replace faulty parts.
2) Check caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

E: ASSEMBLY

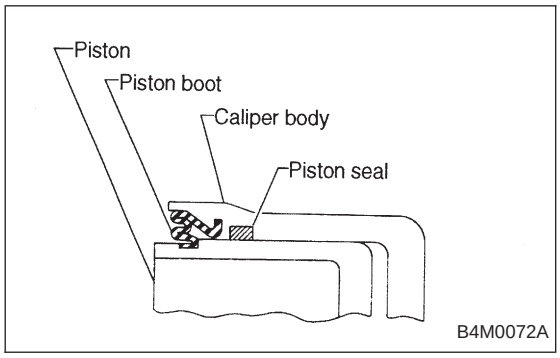
1) Clean caliper body interior using brake fluid.
2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and install piston boot onto cylinder.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

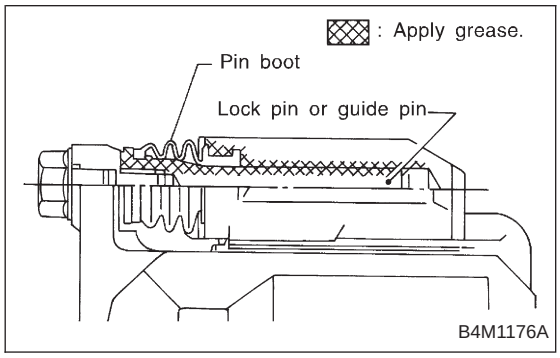


5) Insert piston into cylinder.

CAUTION:
Do not force piston into cylinder.



6) Position boot in grooves on cylinder and piston.



7) Apply a coat of specified grease to lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

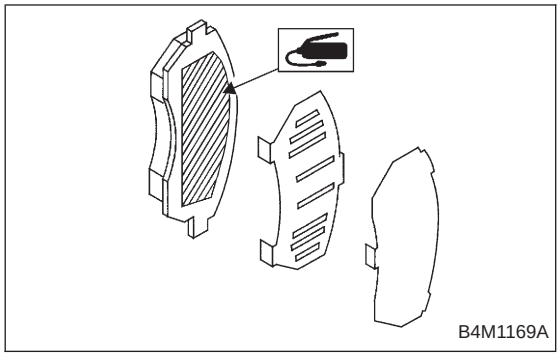
8) Install lock and guide pin boot on support.

F: INSTALLATION

1) Install disc rotor on hub.
2) Install support on housing.

Tightening torque:
78±10 N·m (8±1 kg-m, 58±7 ft-lb)

CAUTION:
● Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
● A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
● When replacing the pad, replace pads of the right and left wheels at the same time.



3) Apply thin coat of PBC GREASE (Part No. 003607000) to the frictional portion between pad and pad clip.
4) Install pads, rubber coated shim and stainless shim on support.
5) Install caliper body on support.

Tightening torque:
39±5 N·m (4±0.5 kg-m, 28.9±3.6 ft-lb)

6) Connect brake hose.

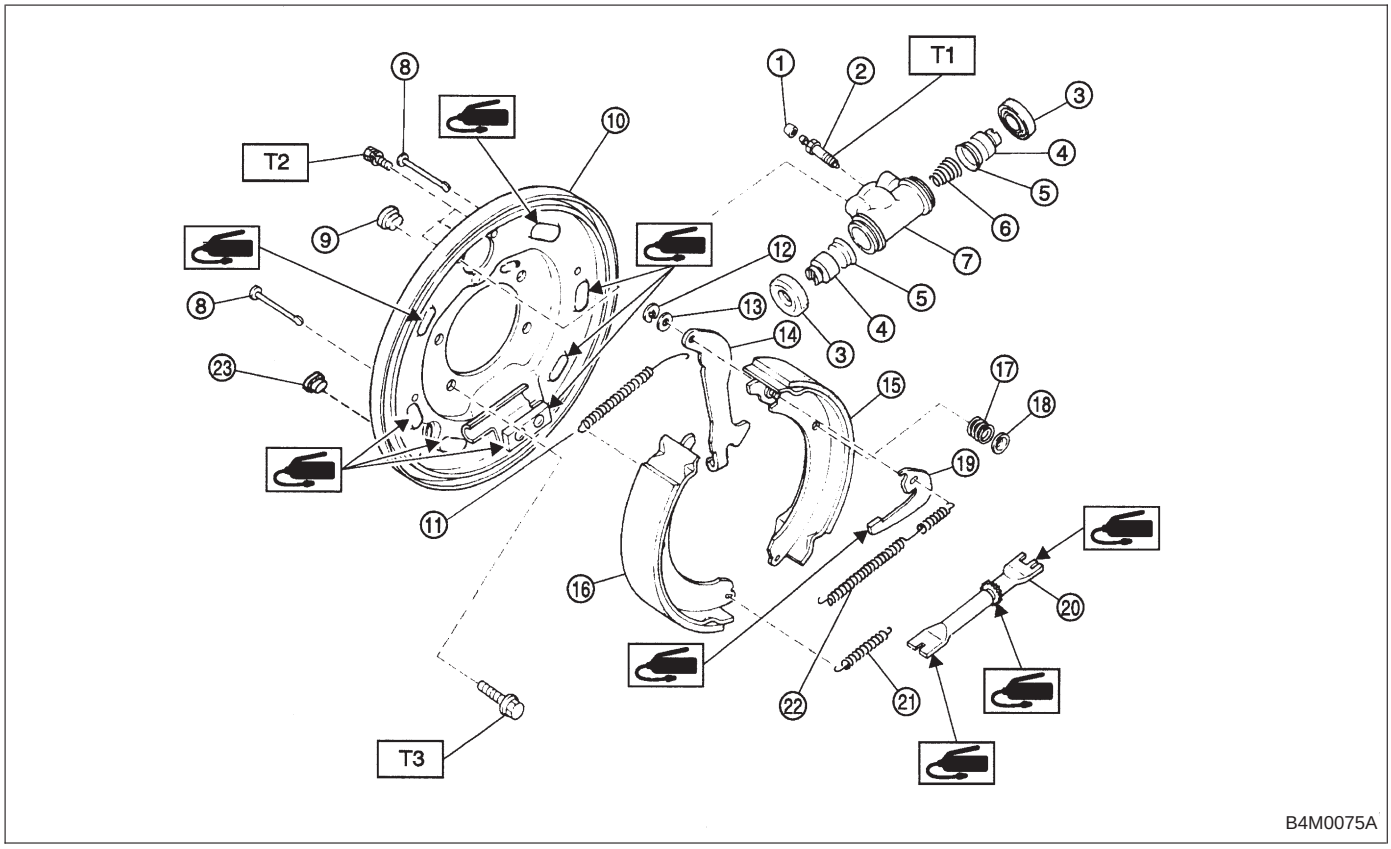
Tightening torque:
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

CAUTION:
Replace brake hose gaskets with new ones.

7) Bleed air from brake system.

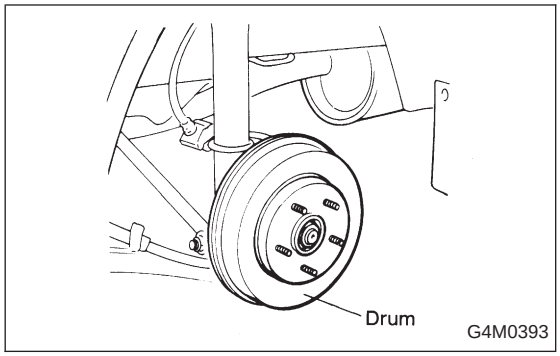
2. Rear Drum Brake

A: REMOVAL



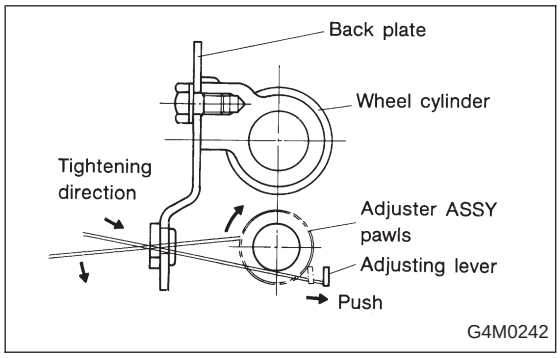
① Air bleeder cap
② Air bleeder screw
③ Boot
④ Piston
⑤ Cup
⑥ Spring
⑦ Wheel cylinder body
⑧ Pin
⑨ Plug
⑩ Back plate
⑪ Upper shoe return spring
⑫ Retainer
⑬ Washer
⑭ Parking brake lever
⑮ Brake shoe (Trailing)
⑯ Brake shoe (Leading)
⑰ Shoe hold-down spring
⑱ Cup
⑲ Adjusting lever
⑳ Adjuster
㉑ Lower shoe return spring
㉒ Adjusting spring
㉓ Plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±1 (0.8±0.1, 5.8±0.7)
T2: 10±2 (1.0±0.2, 7.2±1.4)
T3: 52±6 (5.3±0.6, 38.3±4.3)

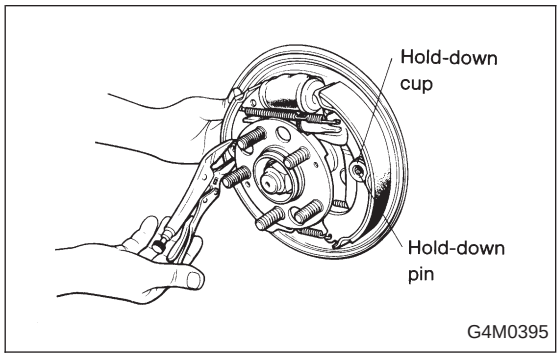


1. BRAKE DRUM AND SHOE

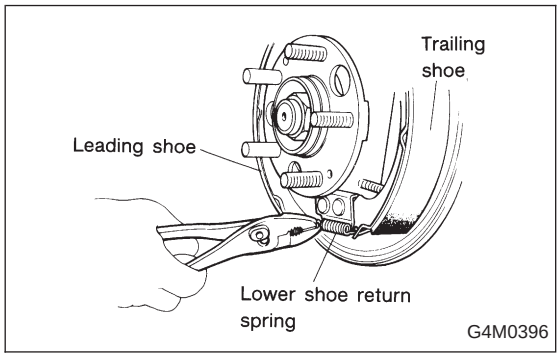
1) Loosen wheel nuts, jack-up vehicle, support it with rigid racks, and remove wheel.
2) Release parking brake.
3) Remove brake drum from brake assembly.



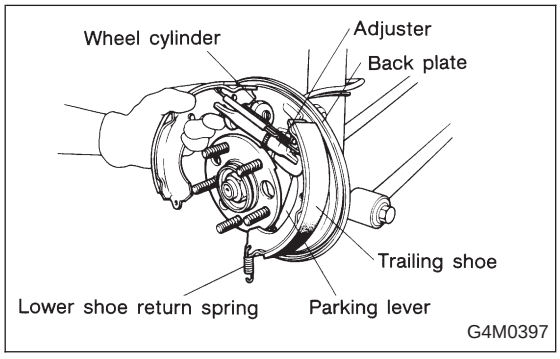
NOTE:
If it is difficult to remove brake drum, remove adjusting hole cover from back plate, and then, turn adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.



4) Hold hold-down pin by securing rear of back plate with your hand.
5) Disconnect hold-down cup from hold-down pin by rotating hold-down cup.



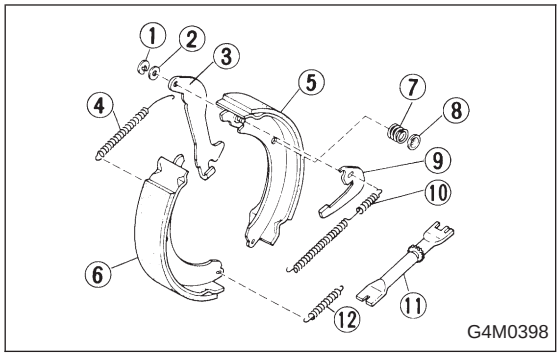
6) Disconnect lower shoe return spring from shoes.



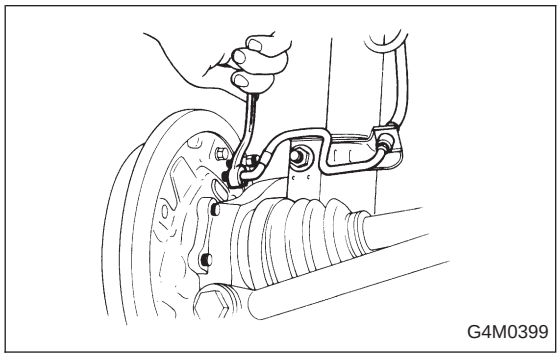
7) Remove shoes one by one from back plate with adjuster.

CAUTION:
Be careful not to bend parking brake cable excessively when removing brake shoes.

8) Disconnect parking brake cable from parking lever.

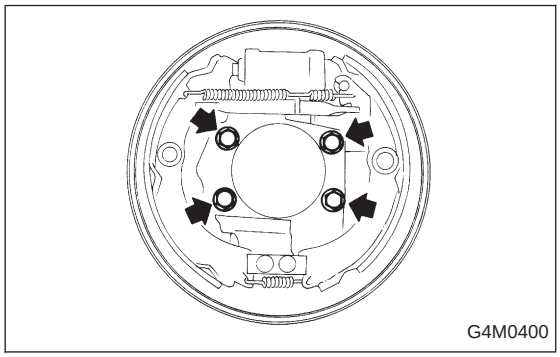


9) Remove the following.
① Retainer
② Washer
③ Parking lever
④ Upper shoe return spring
⑤ Trailing shoe
⑥ Leading shoe
⑦ Shoe hold-down spring
⑧ Shoe hold-down cup
⑨ Adjusting lever
⑩ Adjuster spring
⑪ Adjuster
⑫ Lower shoe return spring

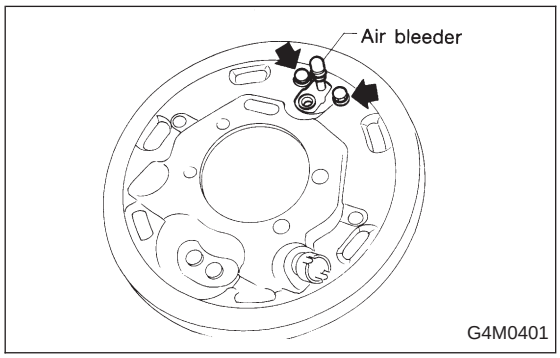


2. BRAKE ASSEMBLY

1) Remove wheel.
2) Remove axle nut.
3) Remove brake drum
4) Unscrew the brake pipe flare nut and disconnect brake pipe.
5) Remove hub. <Ref. to 4-2 [W2A0].>

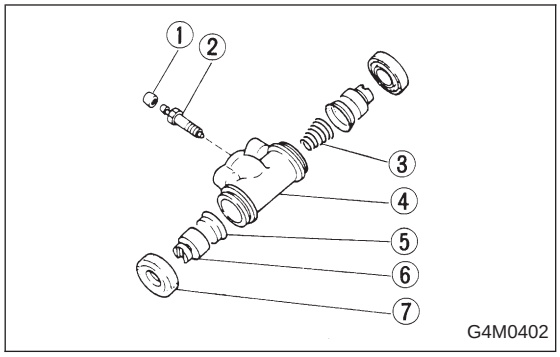


6) Remove the bolts installing back plate, and then, remove brake assembly.



3. WHEEL CYLINDER

1) Remove brake drum and shoes.
2) Unscrew brake pipe flare nut; and disconnect brake pipe.
3) Remove the bolts installing wheel cylinder on back plate, and remove it.

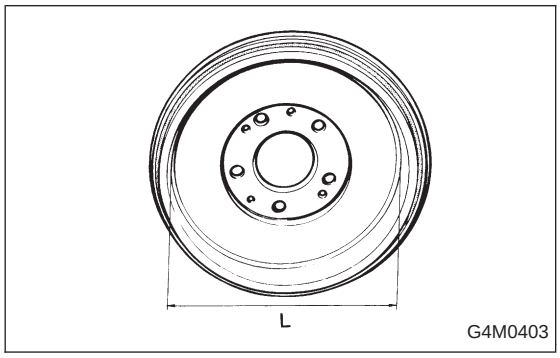


B: DISASSEMBLY

1. WHEEL CYLINDER

1) Remove right and left dust boots from wheel cylinder.
2) Remove piston, cup, spring and air bleeder screw and cap.

① Bleeder cap
② Bleeder screw
③ Spring
④ Cylinder
⑤ Cup
⑥ Piston
⑦ Boot



C: INSPECTION

1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the drum inner diameter.

Drum inner diameter: "L"
Standard: 228.6 mm (9 in)
Service limit: 230.6 mm (9.08 in)

3) Measure the lining thickness.

Lining thickness:
Standard: 4.1 mm (0.161 in)
Service limit: 1.5 mm (0.059 in)

4) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
5) When the shoe return spring tension is excessively weakened, replace it, taking care to identify upper and lower springs.

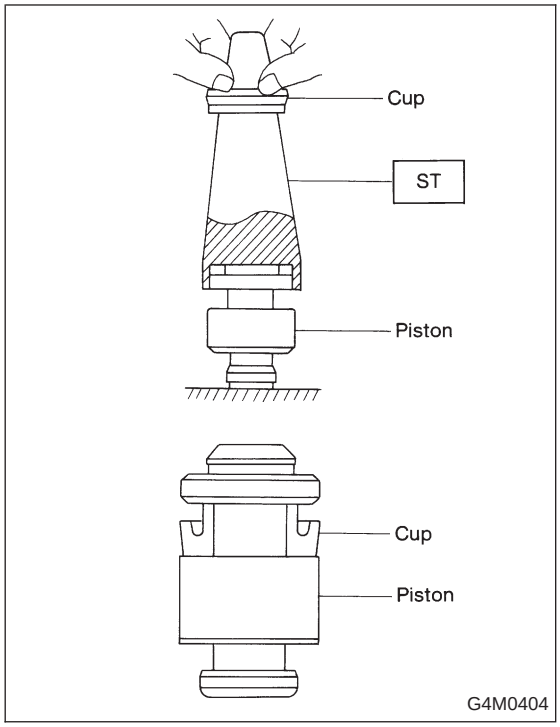
D: ASSEMBLY

1. WHEEL CYLINDER

1) Clean all parts in brake fluid. Check and replace faulty parts.

- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assembly is the reverse order of disassembly.

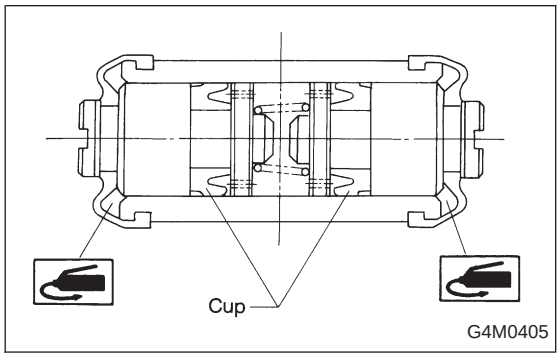


(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.
(2) STs are available in different sizes.

CAUTION:
● When replacing the repair kit, make sure that the sizes of cylinder and cup are the same as those which were replaced.
● Use only the tool of the correct size.

ST: ADAPTER	
Applicable size	Part No.
19.05 mm (3/4 in)	926460000

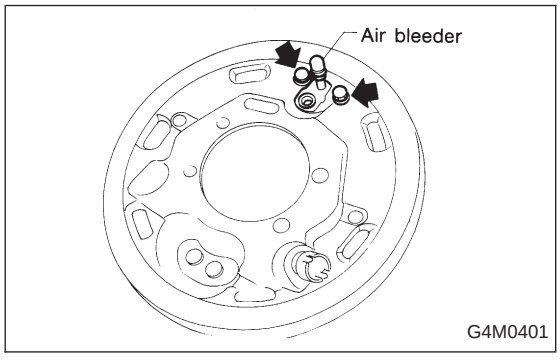
CAUTION:
While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.



3) Apply rubber grease to the boot inside as shown in Figure.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

CAUTION:
Never use brake grease.

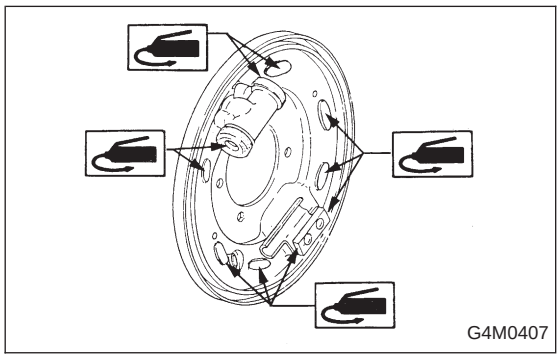


E: INSTALLATION

1. WHEEL CYLINDER

Install wheel cylinder on back plate, and tighten bolts.

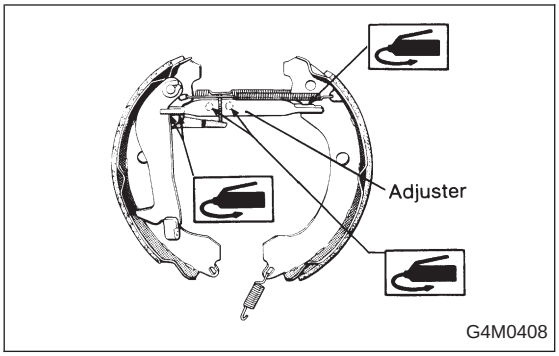
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



2. BRAKE DRUM AND SHOE

1) Clean back plate and wheel cylinder.
2) Apply grease to portions indicated by arrows in Figure.

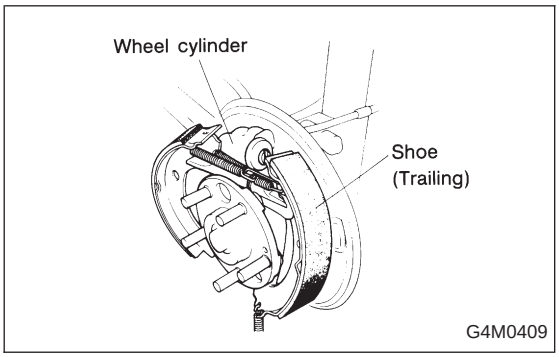
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)



3) Apply grease to adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

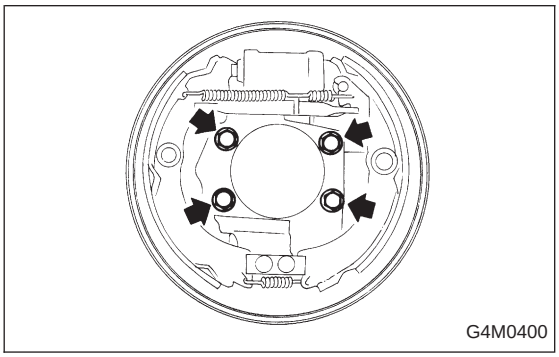
4) Connect upper shoe return spring to shoes.



5) While positioning shoes (one at a time) in groove on wheel cylinder, secure shoes.

6) Connect lower shoe return spring.

7) Fix shoes by connecting hold-down cup to hold-down pin.



3. BRAKE ASSEMBLY

1) Install brake assembly on housing, and tighten bolts to install back plate.

Tightening torque:
52±6 N·m (5.3±0.6 kg-m, 38.3±4.3 ft-lb)

2) Install hub. <Ref. to 4-2 [W2D0].>

3) Connect brake pipe, and tighten brake pipe flange nut.

Tightening torque:
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

4) Set the outside diameter of brake shoes less than 0.5 — 0.8 mm (0.020 — 0.031 in) in comparison with the inside diameter of brake drum.

5) Install brake drum.

6) After installing brake assembly, bleed air from brake line.

3. Master Cylinder

A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect fluid level indicator harness connector.
3) Remove brake pipes from master cylinder.
4) Remove master cylinder mounting nuts, and take out master cylinder from brake booster.

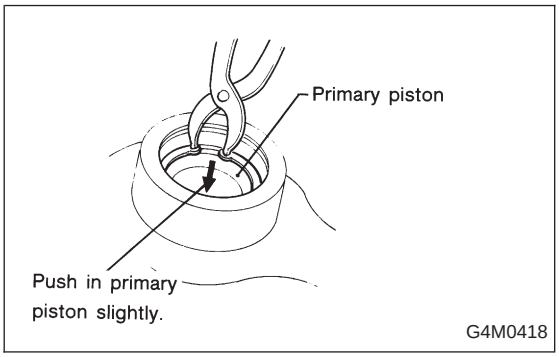
CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wipe it off quickly if spilt.

B: DISASSEMBLY

1. PRECAUTIONS FOR DISASSEMBLING

1) Remove mud and dirt from the surface of brake master cylinder.
2) Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
3) Clean work bench.
4) Tools for disassembly operation:
- 1 Phillips screwdriver
- 1 C-ring pliers

2. DISASSEMBLING PROCEDURE



1) Remove supply valve stopper. (only vehicle equipped with ABS)
2) Remove C-ring with C-ring pliers pushing in primary piston slightly.

NOTE:
Piston may jump out from master cylinder.

3) Extract primary piston assembly and secondary piston assembly.

CAUTION:
- **Do not disassemble the piston assembly; otherwise, the spring set value may be changed.**
- **Use brake fluid or methanol to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing. If methanol is used for washing, do not dip rubber parts, such as piston cups, in it for more than 30 seconds; otherwise, they may become swelled.**

C: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply valve stopper, or gasket, replace the faulty part.

CAUTION:
● The primary and secondary pistons must be replaced as complete assemblies.
● The service limit of the clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).
● When handling parts, be extremely careful not to damage or scratch the parts, or let any foreign matter get on them.

D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

1) When assembling, be sure to use recommended brake fluid.
2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
3) Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
4) Do not drop parts. Never attempt to use any part that has been dropped accidentally.

2. ASSEMBLING OPERATION

1) Assembling piston assembly:
Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.
2) Assembling supply valve stopper:
After installing piston into cylinder, push primary piston in about 10 mm (0.39 in), using a rod, such as push rod then assemble gasket and supply valve stopper.

Tightening torque:
2.2±0.7 N·m (0.225±0.075 kg-m, 1.6±0.5 ft-lb)

CAUTION:
If the gasket and supply valve stopper are assembled without pushing in the primary piston, scratches may be caused on the secondary piston, and no pressure may be built up in the secondary side. To avoid such an error, be sure to push in the primary piston before assembling these parts.

3) Assembling C-ring:
With primary piston pushed in slightly, attach C-ring by using C-ring pliers.

NOTE:
After assembling, ensure that the C-ring is fitted securely in the ring groove.

E: INSTALLATION

To install the master cylinder to the body, reverse the sequence of removal procedure.

Tightening torque:

Master cylinder mounting nut

14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)

Piping flare nut

14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

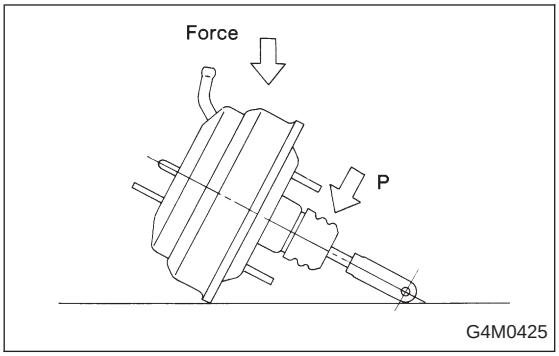
4. Brake Booster

A: REMOVAL

1) Remove the following parts at engine compartment.
   (1) Disconnect connector for brake fluid level indicator.
   (2) Remove brake pipes from master cylinder.
   (3) Remove master cylinder installing nuts.
   (4) Disconnect vacuum hose from brake booster.
2) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin.
   (2) Four brake booster installing nuts.
3) Remove brake booster while shunning brake pipes.

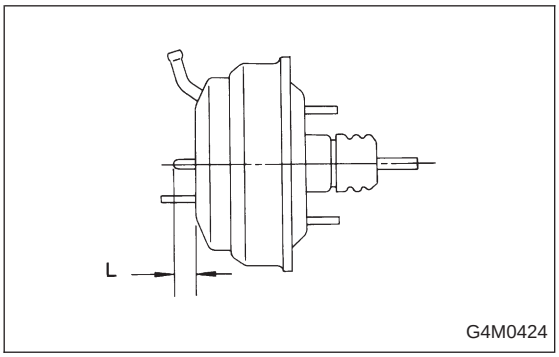
B: HANDLING PRECAUTIONS

1) Be careful not to drop brake booster. Brake booster should be discarded if it has been dropped.
2) Use special care when handling operating rod.
If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.



3) Use care when placing brake booster on the floor.

CAUTION:
If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.

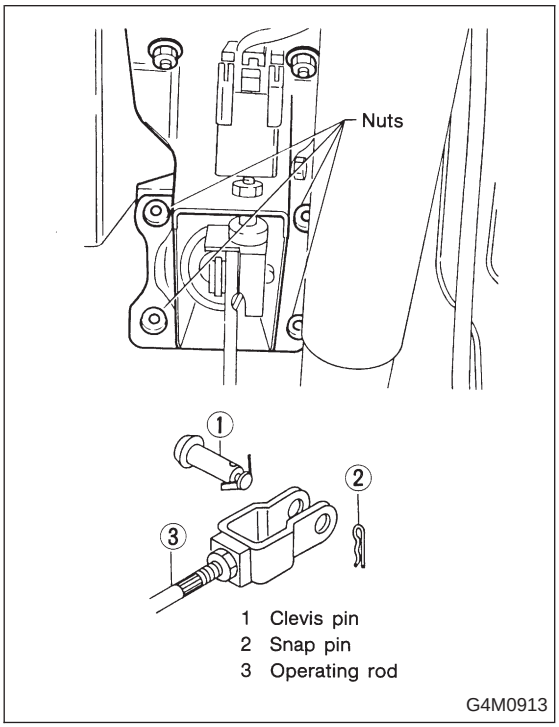


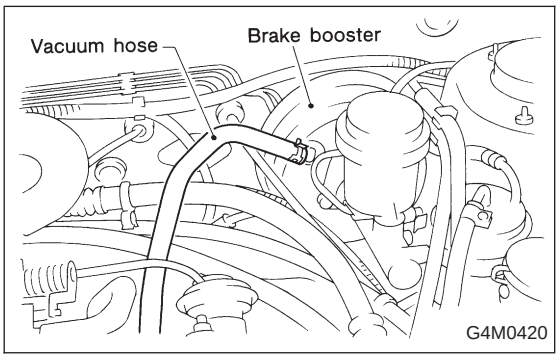
4) Do not change the push rod length. If it has been changed, reset the projected length "L" to the standard length.

Standard:
L = 10 mm (0.39 in)

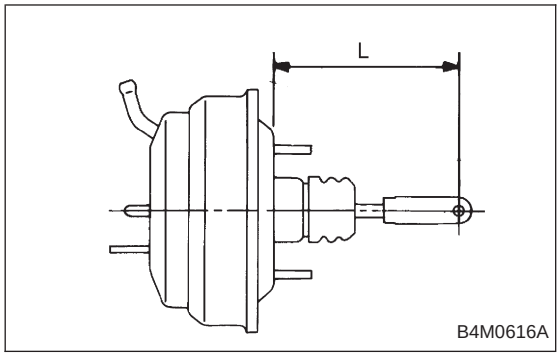
C: INSTALLATION

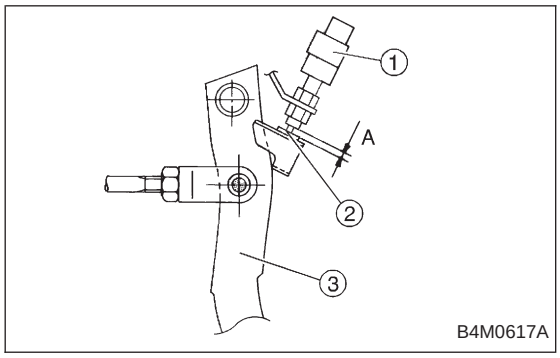
1) Mount brake booster in position.
2) Connect operating rod to brake pedal with clevis pin and snap pin.





3) Connect vacuum hose to brake booster.
4) Mount master cylinder onto brake booster.
5) Connect brake pipes to master cylinder.
6) Connect electric connector for brake fluid level indicator.





7) Adjust operating rod of brake booster.

Standard: L
145.3 mm (5.72 in)

If it is not in specified value, adjust it by adjusting brake booster operating rod.

8) Measure the clearance between threaded end of stop light switch and stopper.

If it is not in specified value, adjust it by adjusting position of stop light switch.

① Stop light switch
② Stopper
③ Brake pedal

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)

9) Apply grease to operating rod connecting pin to prevent it from wearing.

10) Bleed air from brake system.

Tightening torque (Air bleeder screw):
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

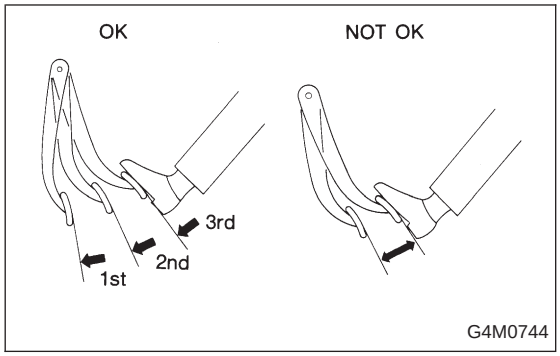
11) Conduct road tests to ensure brakes do not drag.

D: OPERATION CHECK (WITHOUT USING GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

1. CHECKING WITHOUT USING GAUGES

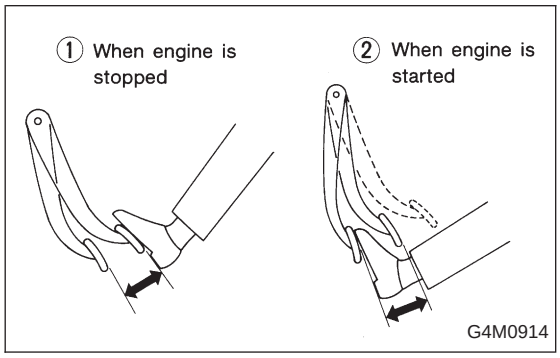
This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of the failure if checking is conducted in accordance with the following procedures.



2. AIR TIGHTNESS CHECK

Start engine, and run it for 1 to 2 minutes, then turn it off. Depress brake pedal several times applying the same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on the 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, brake booster is faulty.

NOTE:
- In the event of defective operation, inspect the condition of the check valve and vacuum hose.
- Replace them if faulty and conduct the test again.
- If no improvement is observed, check precisely with gauges.



3. OPERATION CHECK

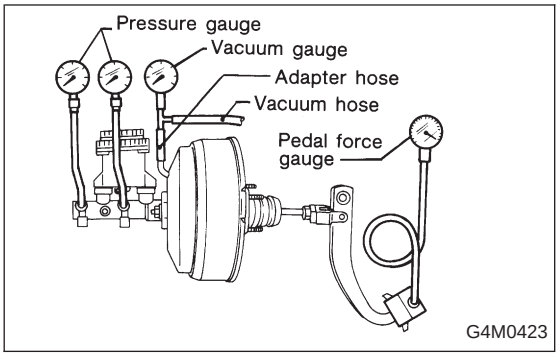
1) With engine off, depress brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.
2) With brake pedal depressed, start engine.
3) As engine starts, brake pedal should move slightly toward the floor. If no change occurs in the pedal height, brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

4. LOADED AIR TIGHTNESS CHECK

Depress brake pedal while engine is running, and turn off engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, brake booster is functioning normally; if the pedal height increases, it is faulty.

NOTE:
If faulty, check precisely with gauges.

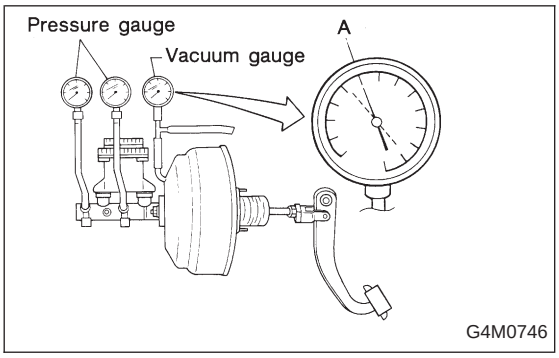


E: OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

1. CHECKING WITH GAUGES

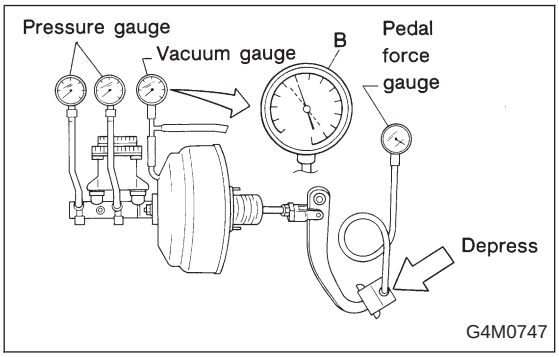
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



2. AIR TIGHTNESS CHECK

1) Start engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress brake pedal.
2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion



3. LOADED AIR TIGHTNESS CHECK

1) Start engine and depress brake pedal with pedal force of 196 N (20 kg, 44 lb). Keep engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.
2) Stop engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”. <Ref. to 4-4 [W4E2].>

4. LACK OF BOOSTING ACTION CHECK

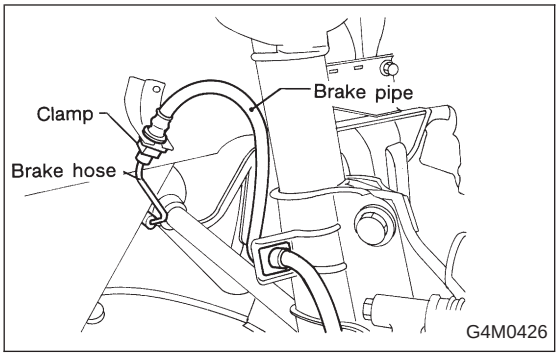
Turn off engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed below.

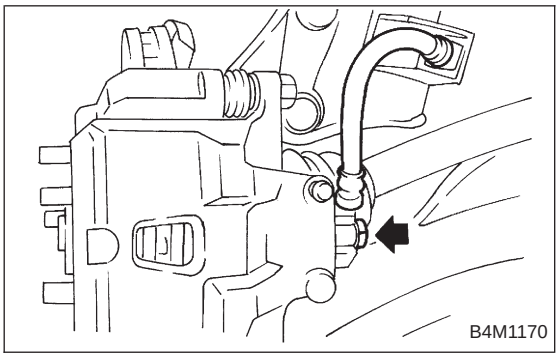
Brake pedal force	147 N (15 kg, 33 lb)	294 N (30kg, 66 lb)
Models without ABS	785 kPa (8 kg/cm^2, 114 psi)	2,158 kPa (22 kg/cm^2, 313 psi)
Models with ABS	588 kPa (6 kg/cm^2, 85 psi)	1,863 kPa (19 kg/cm^2, 270 psi)

5. BOOSTING ACTION CHECK

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed below.

Brake pedal force	147 N (15 kg, 33 lb)	294 N (30kg, 66 lb)
Models without ABS	5,492 kPa (56 kg/cm^2, 796 psi)	8,434 kPa (86 kg/cm^2, 1,223 psi)
Models with ABS	5,394 kPa (55 kg/cm^2, 782 psi)	9,219 kPa (94 kg/cm^2, 1,337 psi)





5. Brake Hose

A: REMOVAL

1) Separate brake pipe from brake hose.
(Always use flare nut wrench and be careful not to deform flare nut.)
2) Pull out clamp to remove brake hose.
3) Remove clamp at strut and union bolt.

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Route end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
2) Tighten end of brake hose at caliper using a union bolt.

Torque (Union bolt):
18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)

3) Secure middle fitting of brake hose to bracket at strut location using a clamp.
4) Position disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

5) Temporarily tighten flare nut to connect brake pipe and hose.
6) Fix brake hose with clamp at wheel apron bracket.
7) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

Torque (Brake pipe flare nut):
14.7^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)

8) Bleed air from the brake system.

2. REAR BRAKE HOSE

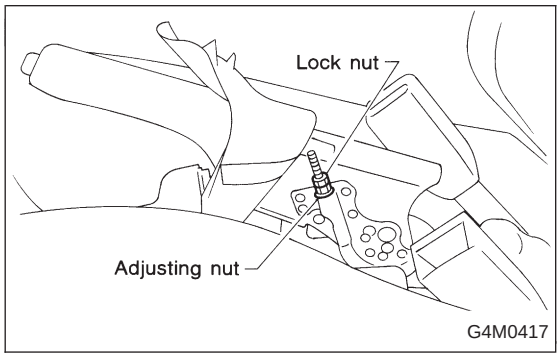
1) Pass brake hose through the hole of bracket, and lightly tighten flare nut to connect brake pipe.
2) Insert clamp upward to fix brake hose.
3) Perform the same procedures as before mentioned in steps 7) and 8).

6. Parking Brake Lever

A: REPLACEMENT

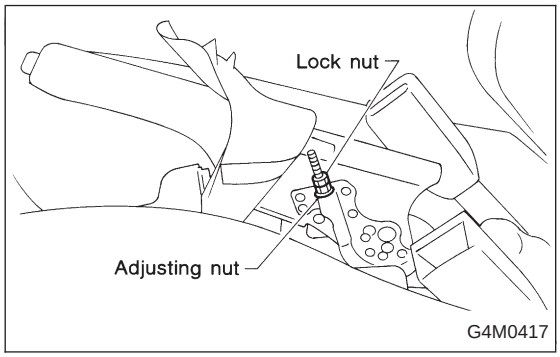
1) Remove console box from front floor.
2) Disconnect electric connector for parking brake switch.
3) Loosen parking brake adjuster, and remove inner cable end from equalizer.
4) Remove parking brake lever.
5) Install parking brake lever in the reverse order of removal.

Torque (Lever installing bolt):
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



6) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kg, 44 lb).
7) Tighten lock nut.

Torque (Adjuster lock nut):
5.9±1.5 N·m (0.60±0.15 kg-m, 4.3±1.1 ft-lb)



B: PARKING BRAKE ADJUSTMENT

1. LEVER STROKE ADJUSTMENT

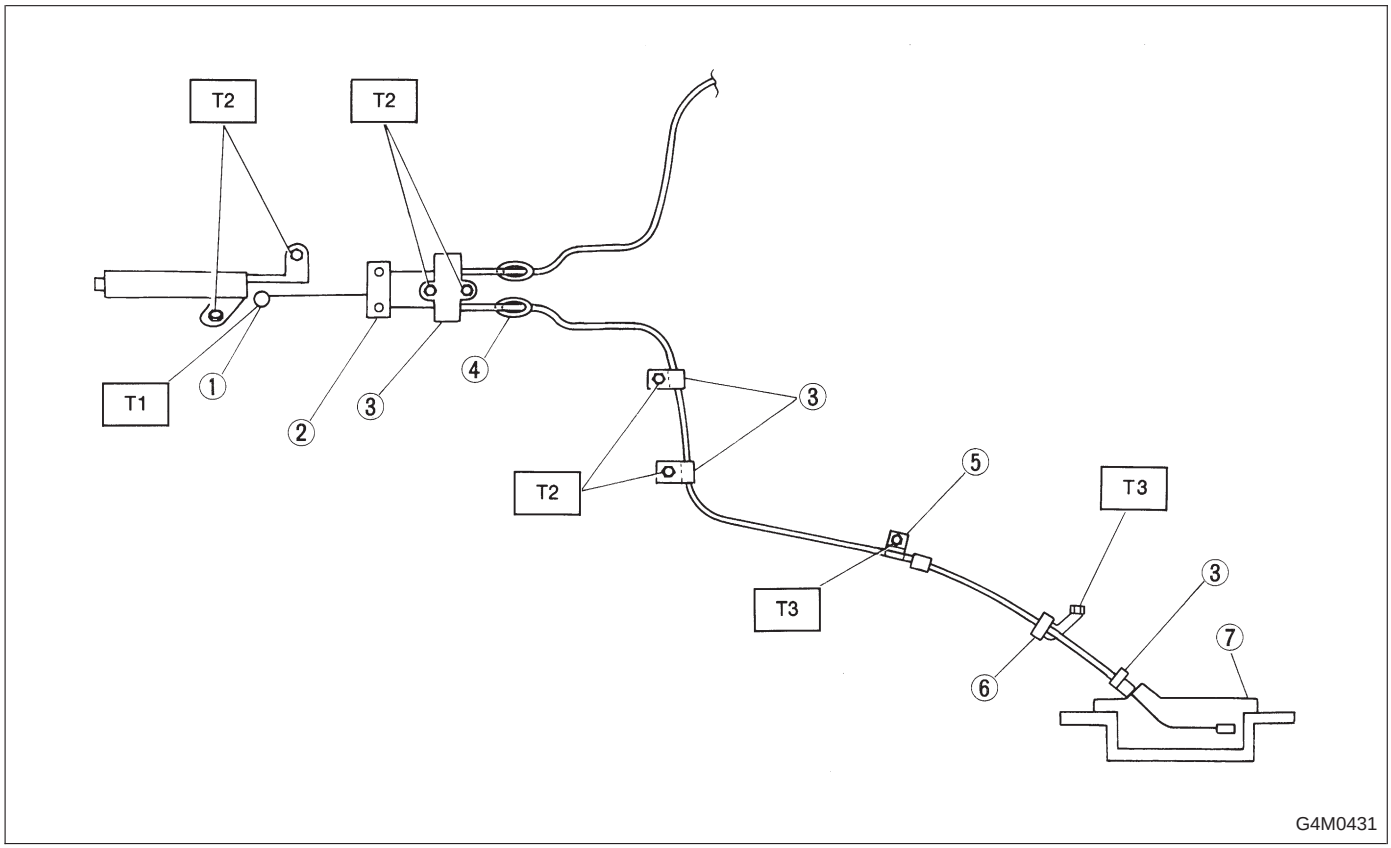
1) Remove console box lid.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kg, 44 lb).
4) Tighten lock nut.
5) Install console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kg, 44 lb)

Tightening torque (Lock nut):
5.9±1.5 N·m (0.60±0.15 kg-m, 4.3±1.1 ft-lb)

7. Parking Brake Cable

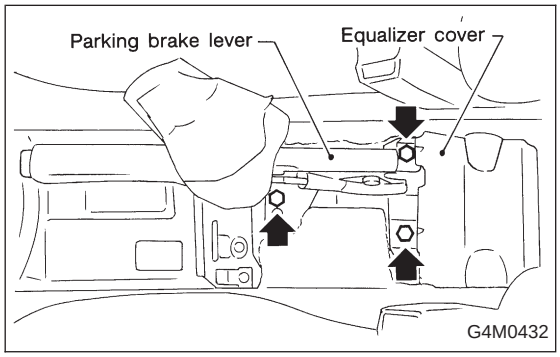
A: REPLACEMENT



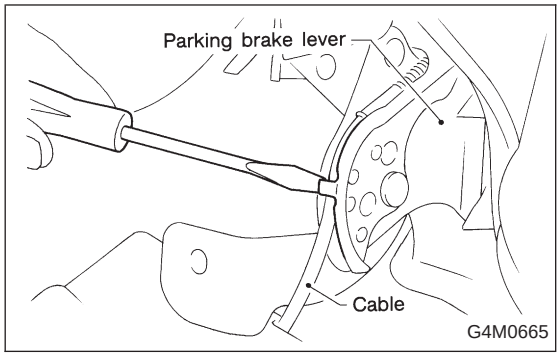
① Adjuster
② Equalizer
③ Clamp
④ Grommet
⑤ Bracket
⑥ Cable guide (Trailing link)
⑦ Parking brake ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 32±10 (3.3±1.0, 24±7)

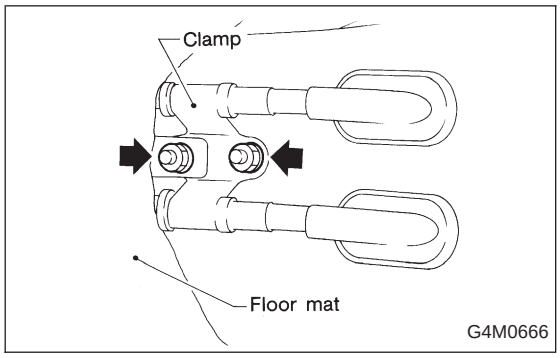
1) Lift-up vehicle.
2) Remove rear tires and wheels.
3) Remove rear cushion.
4) Remove console box from front floor.
5) Loosen parking cable adjuster, then remove inner cable end from equalizer, and detach clamps.



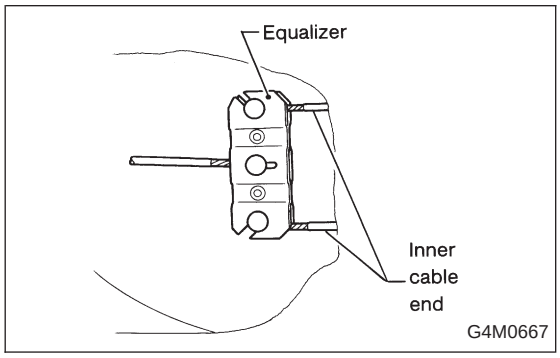
6) Remove parking brake lever.



7) Unbend parking brake lever pawls and remove cable.

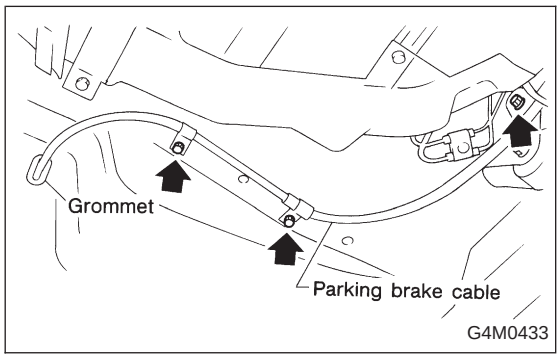


8) Roll up floor mat and remove clamps.
9) Remove equalizer cover.



10) Remove inner cable end from equalizer.

11) Pull out parking brake cable from rear brake.
<Ref. to 4-4 [W2A0].>
12) Pull out clamp from rear brake.
13) Remove bolt and bracket from trailing link bracket.



14) Remove bolt and clamp from rear floor.
15) Detach grommet from rear floor.
16) Remove cable assembly from cabin by forcibly pulling it backward.

17) Detach parking brake cable from cable guide at rear trailing link.
18) Install (new) parking brake assembly in the reverse order of removal.

NOTE:
● Be sure to pass cable through cable guide inside the tunnel.
● Be sure to adjust the lever stroke. <Ref. to 4-4 [W6B1].>

8. Air Bleeding

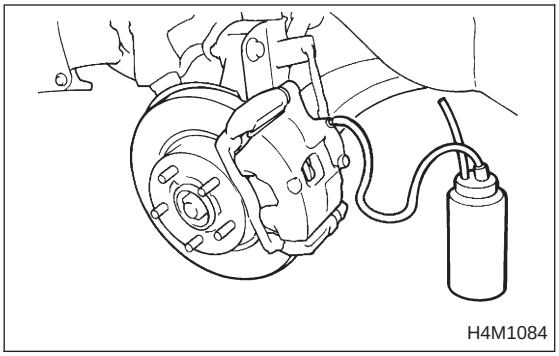
A: GENERAL RULES FOR EFFECTIVE BLEEDING

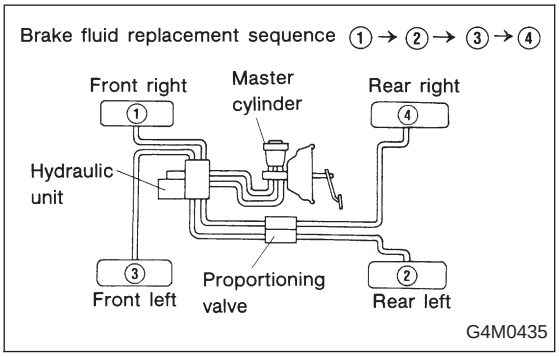
1) Start with the brakes (wheels) connecting to the secondary chamber of the master cylinder.
2) The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) shall be approximately 3 seconds.
3) The air bleeder on each brake shall be released for 1 to 2 seconds.

B: BLEEDING PROCEDURE

CAUTION:
● The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
● Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
● Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
● During bleeding operation, keep the brake reserve tank filled with brake fluid to eliminate entry of air.
● Brake pedal operating must be very slow.
● For convenience and safety, it is advisable to have two men working.


H4M1084



G4M0435

1) Make sure that there is no leak from joints and connections of the brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.
3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

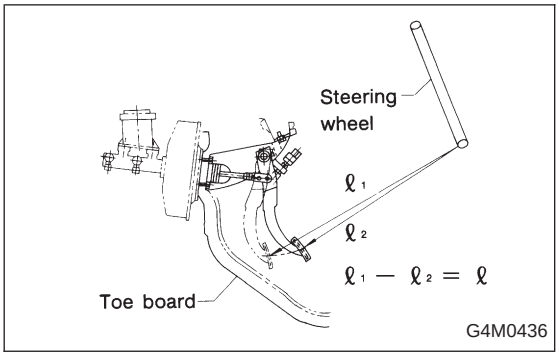
CAUTION:
Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:
Brake pedal operating must be very slow.

4) Tighten air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

5) Perform these steps for the brakes connecting to the secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approximately 20 seconds to make sure that there is no leak evident in the entire system.



G4M0436

6) Perform sequence control. (With ABS model) <Ref. to 4-4 [W12D1].>
7) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kg, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be more than specified.

Specified pedal stroke:
Without ABS
90 mm (3.54 in)
With ABS
95 mm (3.74 in)
When depressing brake pedal with a 490 N (50 kg, 110 lb) load.

(1) Models without ABS
If the distance is more than specifications, there is a possibility that air is in the brake line. Bleed air from the brake line.

(2) Models with ABS
If the distance is more than specifications, there is a possibility air is in the inside of the hydraulic unit. Therefore, air must be bled from the inside of the hydraulic unit to the brake pipes in accordance with the bleeding sequence control. <Ref. to 4-4 [W12D1].>

8) Add brake fluid to the required level (MAX. level) of reserve tank.
9) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

9. Brake Fluid Replacement

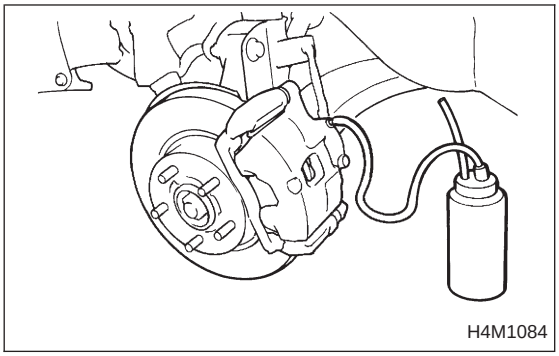
A: REPLACEMENT

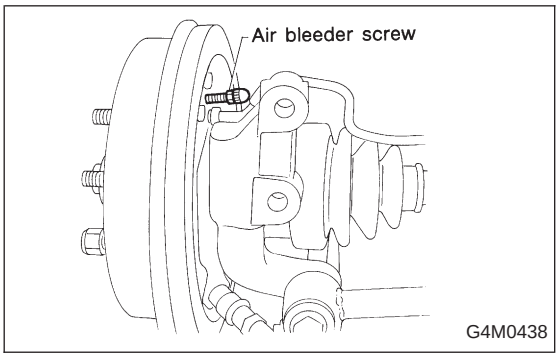
CAUTION:
● To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
● The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
● Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
● Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
● During bleeding operation, keep the brake reserve tank filled with brake fluid to eliminate entry of air.
● Brake pedal operating must be very slow.
● For convenience and safety, it is advisable to have two men working.
● The amount of brake fluid required is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

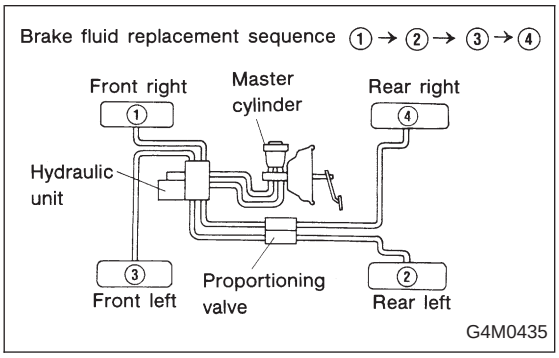
1) Either jack-up vehicle and place a safety stand under it, or lift-up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

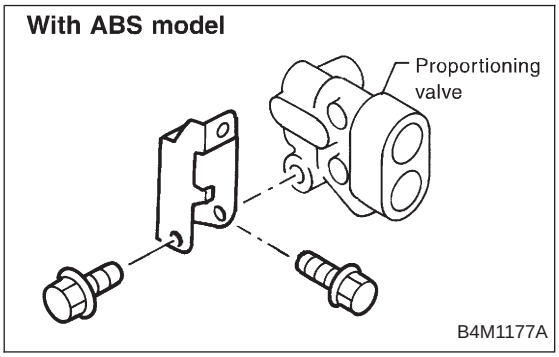

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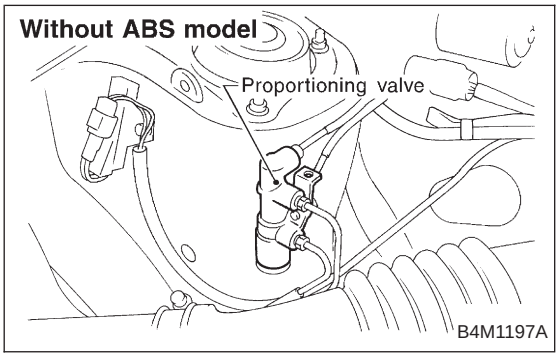
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B4M1177A



B4M1197A

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

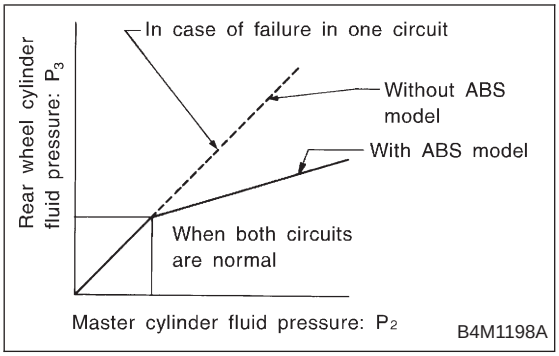
NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

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

Tightening torque (Bleeder screw):
8±1 N·m (0.8±0.1 kg-m, 5.8±0.7 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 7) above.
11) Depress brake pedal with a force of approximately 294 N (30 kg, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.
Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive car for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

10. Proportioning Valve



A: INSPECTION

1) Install the oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from the oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in Figure.
4) For the oil pressure in case of split point, refer to A: SPECIFICATIONS 4-4 [S100].

B: REMOVAL

1) Remove brake pipe from proportioning valve at four places.
2) Remove proportioning valve from its bracket.

CAUTION:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

C: INSTALLATION

1) Install proportioning valve to bracket.
2) Connect brake pipes correctly to proportioning valve.
3) Bleed air, then check each joint of brake pipe for oil leaks.

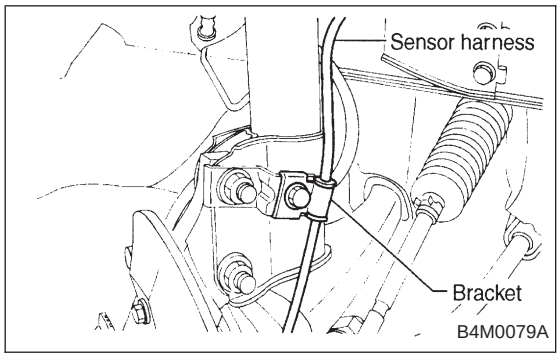
Tightening torque:
Proportioning valve to brake pipe flare nut:
15^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)
Proportioning valve to bracket:
Normal brake vehicle:
22±4.4 N·m (2.25±0.45 kg-m, 16.3±3.3 ft-lb)
ABS equipped vehicle:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

11. ABS Sensor

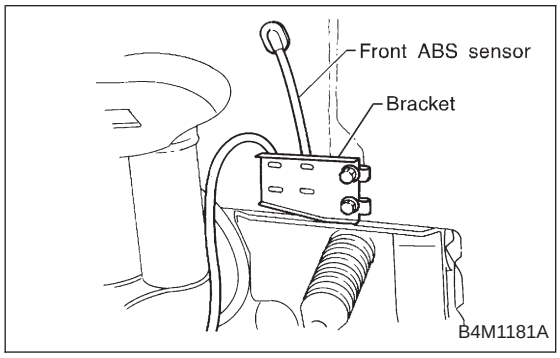
A: REMOVAL

1. FRONT ABS SENSOR

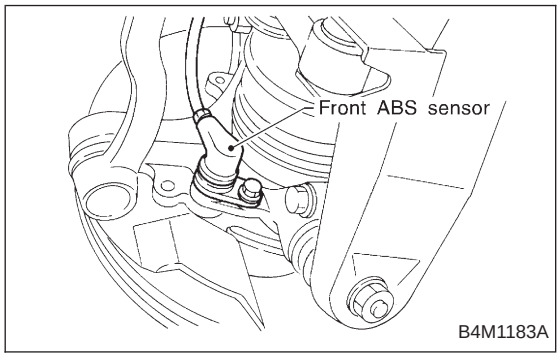
1) Disconnect front ABS sensor connector located in engine compartment.



2) Remove bolts which secure sensor harness to strut.



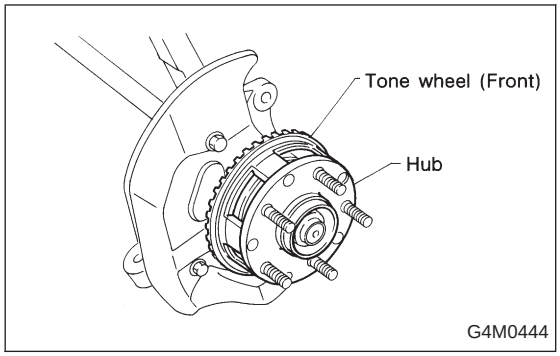
3) Remove bolts which secure sensor harness to body.



4) Remove bolts which secure front ABS sensor to housing, and remove front ABS sensor.

CAUTION:
- **Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.**
- **Do not pull sensor harness during removal.**

5) Remove front disc brake caliper and disc rotor from housing after removing front tire.
6) Remove front drive shaft and housing and hub assembly. <Ref. to 4-2 [W1A0].>

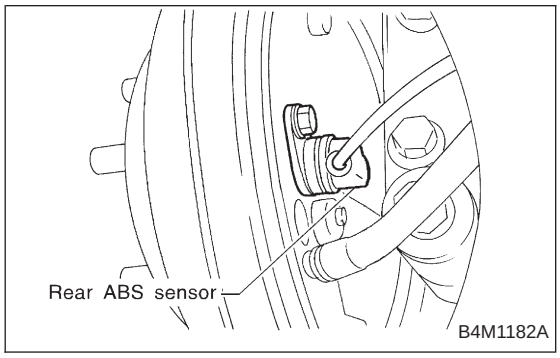


7) Remove tone wheel while removing hub from housing and hub assembly. <Ref. to 4-2 [W1B0].>

CAUTION:
Be careful not to damage teeth faces of tone wheel during removal.

2. REAR ABS SENSOR

1) Remove rear seat and disconnect rear ABS sensor connector.
2) Remove rear sensor harness bracket from rear trailing link and bracket.



3) Remove rear ABS sensor from rear back plate.
4) Remove rear tone wheel while removing hub from housing and hub assembly. <Ref. to 4-2 [W2A0].>

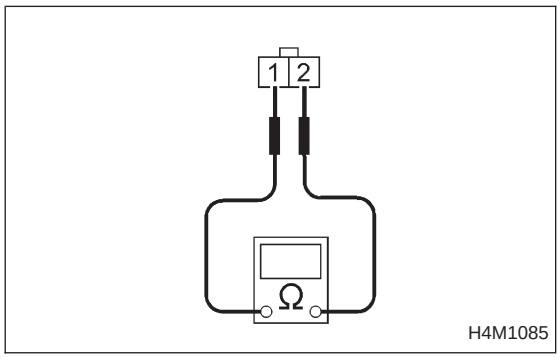
CAUTION:
- **Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.**
- **Do not pull sensor harness during removal.**

B: INSPECTION

1. ABS SENSOR

1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.

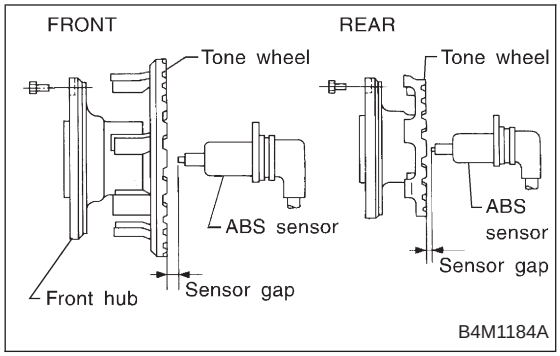
2) Measure ABS sensor resistance.



ABS sensor	Terminal No.	Standard
Front - LH	1 and 2	1.0±0.2 kΩ
Front - RH	1 and 2	
Rear - LH	1 and 2	
Rear - RH	1 and 2	

CAUTION:
If resistance is outside the standard value, replace ABS sensor with new one.

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.



2. TONE WHEEL

1) Check tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.
2) Clearances (sensor gaps) should be measured one by one to ensure tone wheel and speed sensor are installed correctly.

ABS sensor clearance:

Front

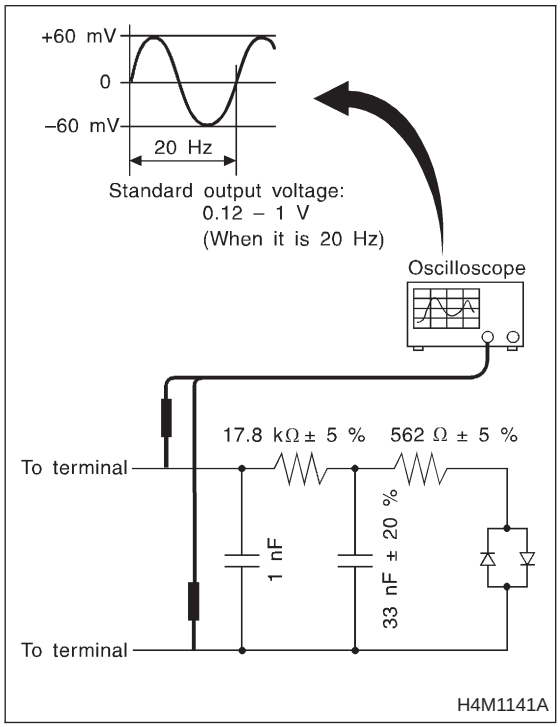
0.9 — 1.4 mm (0.035 — 0.055 in)

Rear

0.7 — 1.2 mm (0.028 — 0.047 in)

NOTE:

- If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
- If clearance is wide, check the outputted voltage then replace ABS sensor or tone wheel if the outputted voltage is outside the specification.



3. OUTPUT VOLTAGE

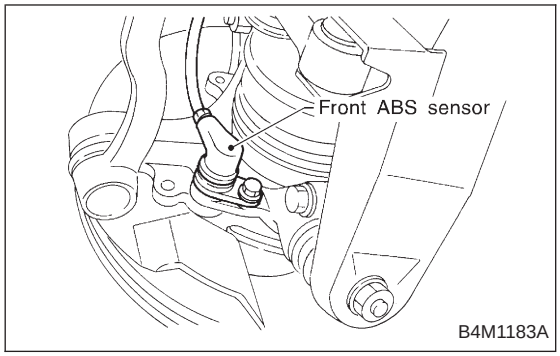
Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR.

C: INSTALLATION

1. FRONT ABS SENSOR

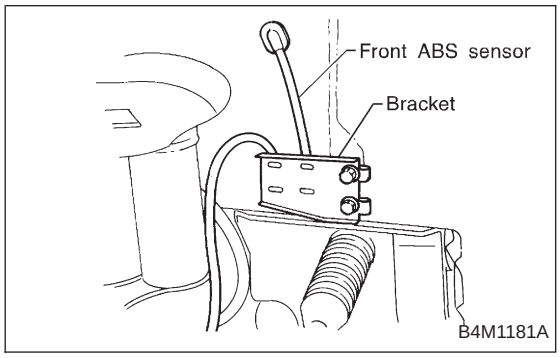
1) Install tone wheel on hub, then install housing on hub assembly. <Ref. to 4-2 [W1D0].>



2) Temporarily install front ABS sensor on housing.

CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.

3) Install front drive shaft to hub spline. <Ref. to 4-2 [W1E0].>



4) Install front ABS sensor on strut and wheel apron bracket.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

5) Place a thickness gauge between ABS sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on housing to specified torque.

ABS sensor standard clearance:
0.9 — 1.4 mm (0.035 — 0.055 in)

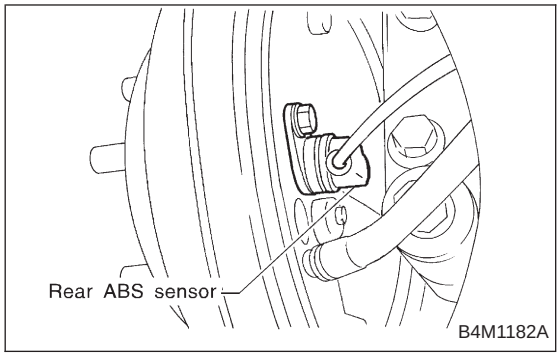
Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CAUTION:
Check the marks on the harness to make sure that no distortion exists. (RH: white, LH: yellow)

NOTE:
If the clearance is outside specifications, readjust.

2. REAR ABS SENSOR

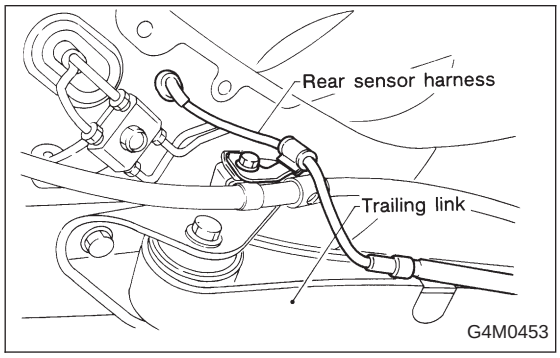
1) Install rear tone wheel on hub, then rear housing on hub. <Ref. to 4-2 [W2D0].>



2) Temporarily install rear ABS sensor on back plate.

CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.

3) Install rear drive shaft to rear housing and rear differential spindle. <Ref. to 4-2 [W2E0].>



4) Install rear sensor harness on rear trailing link.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

5) Place a thickness gauge between ABS sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on back plate to specified torque.

ABS sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

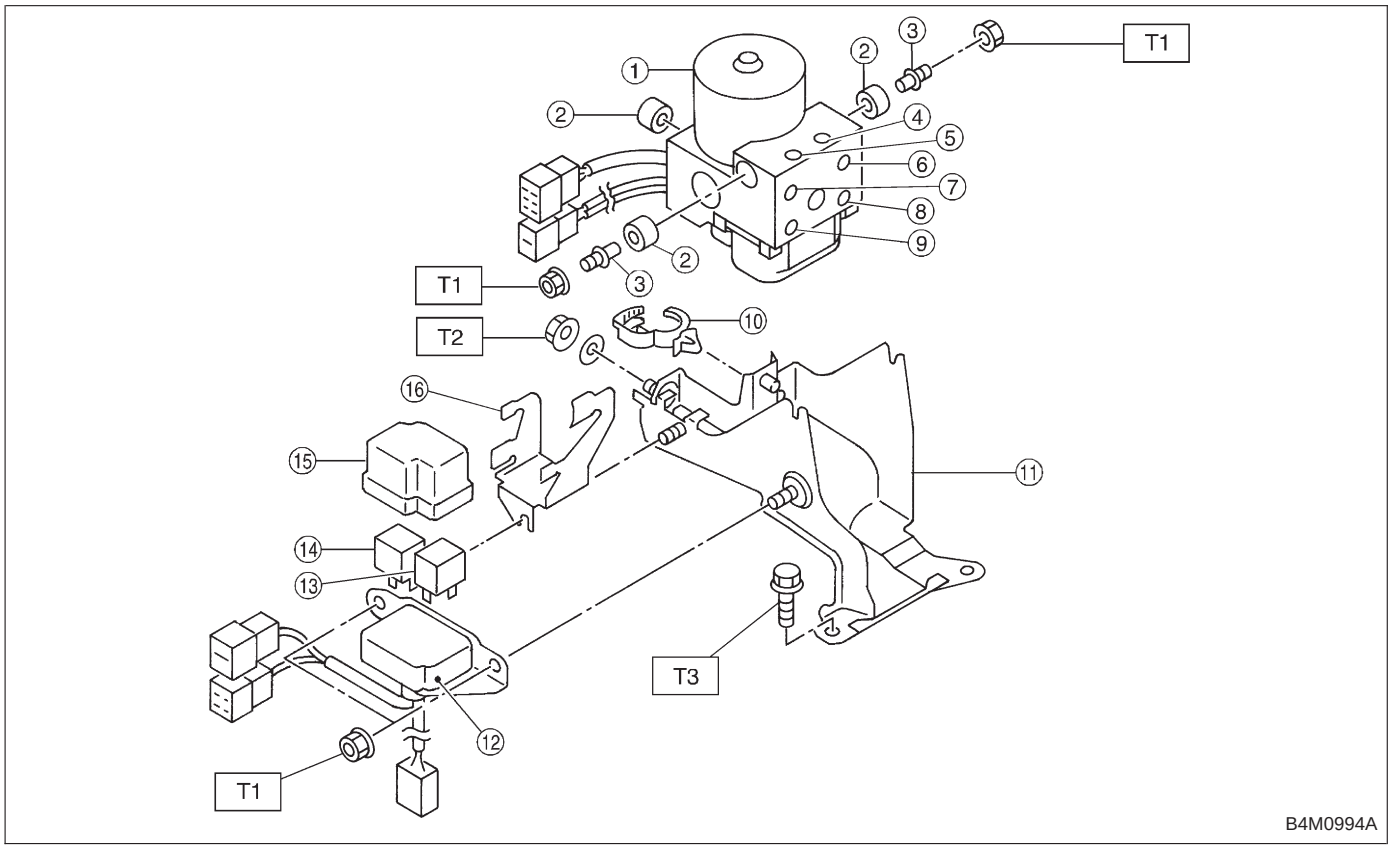
Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CAUTION:
Check the marks on the harness to make sure that no distortion exists. (RH: white, LH: yellow)

NOTE:
If the clearance is outside specifications, readjust.

12. Hydraulic Unit for ABS System

A: REMOVAL



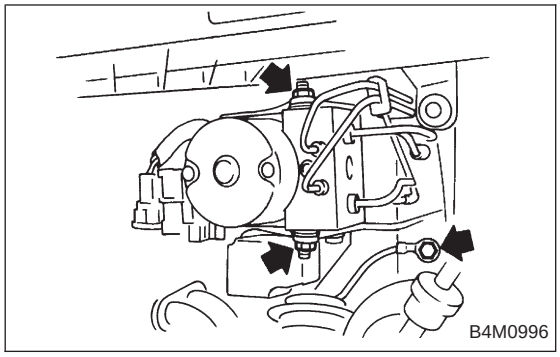
① Hydraulic control unit
② Damper
③ Stud bolt
④ Rear-RH outlet
⑤ Rear-LH outlet
⑥ Secondary inlet
⑦ Primary inlet
⑧ Front-LH outlet
⑨ Front-RH outlet
⑩ Cable clip
⑪ Bracket
⑫ Relay box
⑬ Motor relay
⑭ Valve relay
⑮ Cap
⑯ Connector bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 18±5 (1.8±0.5, 13.0±3.6)
T2: 29±7 (3.0±0.7, 21.7±5.1)
T3: 32±10 (3.3±1.0, 24±7)

1. HYDRAULIC UNIT

1) Disconnect ground cable from battery.
2) Remove air intake duct and canister from engine compartment to facilitate removal of hydraulic unit.
3) Disconnect connector from hydraulic unit.
4) Unlock cable clip.
5) Disconnect brake pipes from hydraulic unit.

CAUTION:
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

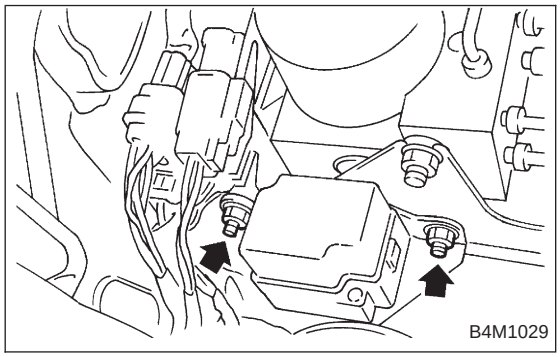

B4M0996

6) Remove nuts and bolt which secure hydraulic unit bracket, and remove hydraulic unit from engine compartment.

CAUTION:
● Hydraulic unit cannot be disassembled. Do not attempt to loosen bolts and nuts.
● Do not drop or bump hydraulic unit.
● Do not turn the hydraulic unit upside down or place it on its side.
● Be careful to prevent foreign particles from getting into hydraulic unit.
● When a new hydraulic unit is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
● Do not pull harness disconnecting harness connector.

2. RELAY BOX

1) Disconnect ground cable from battery.
2) Remove air intake duct and canister from engine compartment to facilitate removal of relay box.

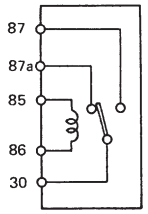
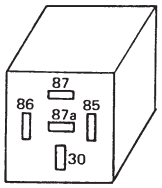
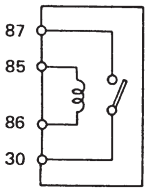
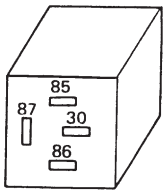

B4M1029

3) Disconnect connector from relay box.
4) Unlock cable clip.
5) Remove nuts which secure relay box, and remove relay box and connector bracket.

CAUTION:
Do not drop or bump relay box.

B: INSPECTION

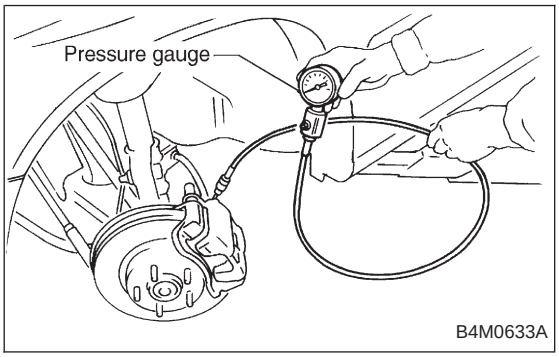
1) Check connected and fixed condition of connector.
2) Check valve relay and motor relay for discontinuity or short circuits.

	Condition	Terminal number	Standard	Diagram	Terminal location
Valve relay	Turning off electricity.	85 — 86	103±10 Ω	 G4M0456	 G4M0457
		30 — 87a	less than 0.5 Ω		
		30 — 87	more than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	more than 1 MΩ		
		30 — 87	less than 0.5 Ω		
Motor relay	Turning off electricity.	85 — 86	80±8 Ω	 G4M0458	 G4M0459
		30 — 87	more than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87	less than 0.5 Ω		

C: CHECKING THE HYDRAULIC UNIT ABS OPERATION

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.



B4M0633A

3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
● Pressure gauges used exclusively for brake fluid must be used.
● Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

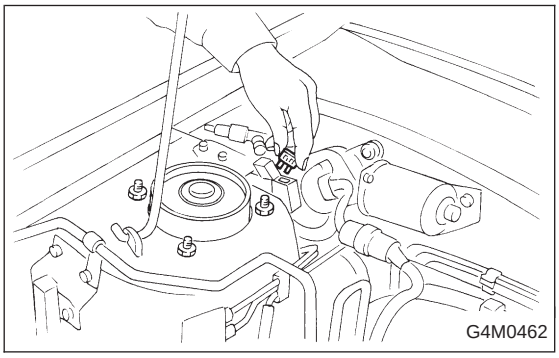
NOTE:
Wrap sealing tape around the pressure gauge.

4) Bleed air from the pressure gauges.
5) Perform ABS sequence control.
<Ref. to 4-4 [W12D1] or 4-4 [W12D2].>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

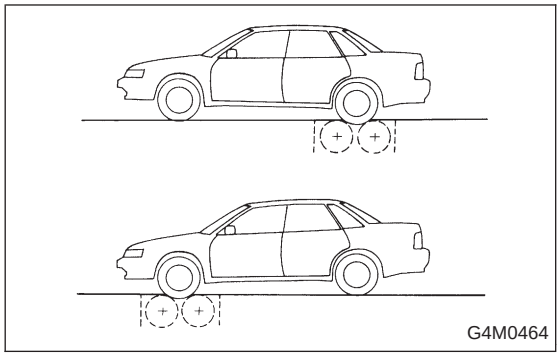
	Initial value	When decompressed	When compressed
Front wheel	3,432 kPa (35 kg/cm^2, 498 psi)	490 kPa (5 kg/cm^2, 71 psi) or less	3,432 kPa (35 kg/cm^2, 498 psi) or more
Rear wheel	3,432 kPa (35 kg/cm^2, 498 psi)	490 kPa (5 kg/cm^2, 71 psi) or less	3,432 kPa (35 kg/cm^2, 498 psi) or more

8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform ABS sequence control.
<Ref. to 4-4 [W12D1] or 4-4 [W12D2].>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.


G4M0462

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the engine compartment to simulate FWD vehicles.
2) Prepare for operating ABS sequence control. <Ref. to 4-4 [W12D1] or 4-4 [W12D2].>


G4M0464

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "neutral".
4) Operate the brake tester.
5) Perform ABS sequence control. <Ref. to 4-4 [W12D1] or 4-4 [W12D2].>
6) Hydraulic unit begins to work; and check the following working sequence.

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

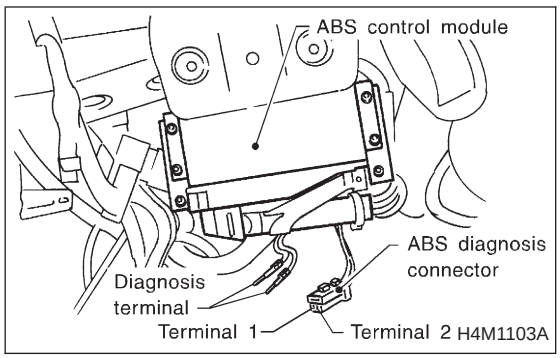
Unit: N (kg, lb)

	Initial value	When decompressed	When compressed
Front wheel	981 (100, 221)	490 (50, 110) or less	981 (100, 221) or more
Rear wheel	981 (100, 221)	490 (50, 110) or less	981 (100, 221) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

D: ABS SEQUENCE CONTROL

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or select monitor.



1. OPERATIONAL GUIDELINES OF THE ABS SEQUENCE CONTROL WITH ABS DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 1 and No. 2 of the diagnosis connector beside driver's seat heater unit.
2) Set the speed of all wheels at 4 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it immediately after ignition switch is turned to ON.

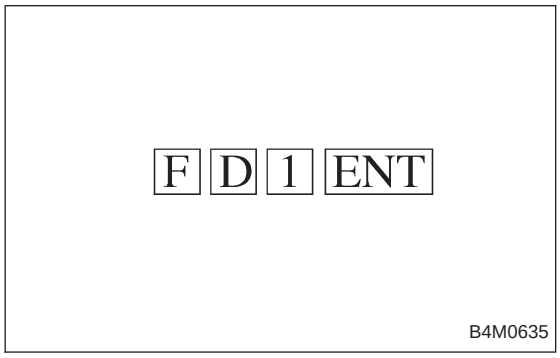
CAUTION:
Do not depress the clutch pedal.

NOTE:
- When the ignition switch is set to on, the brake pedal must not be depressed.
- Engine must not operate.

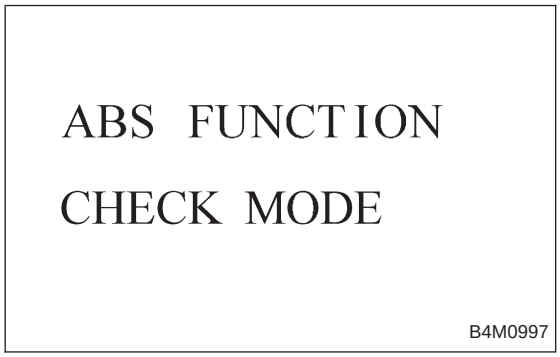
5) After completion of ABS sequence control, turn ignition switch OFF.

2. OPERATIONAL GUIDELINES OF THE ABS SEQUENCE CONTROL WITH SELECT MONITOR

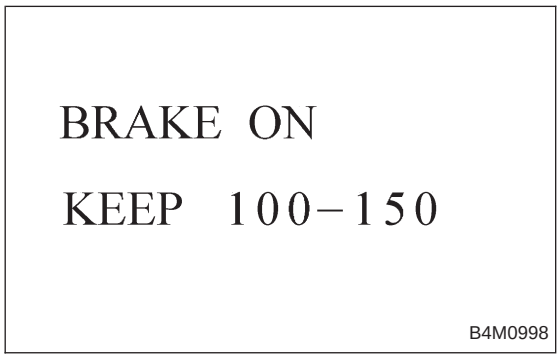
1) Connect select monitor to data link connector beside driver's seat heater unit.
2) Turn ignition switch ON.
3) Put select monitor to ABS mode.



4) Press F D 1 ENT key.



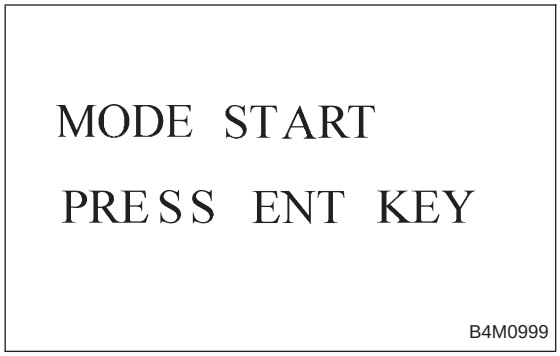
5) The message shown in the figure is displayed.



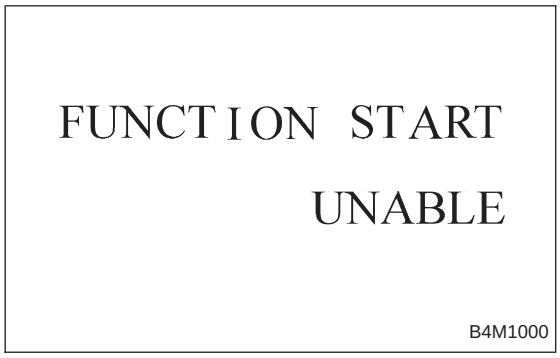
6) The message shown in the figure is displayed as follows:

(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kg, 221 lb).
(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

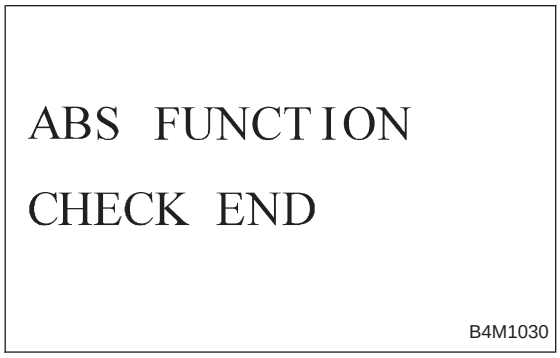
CAUTION:
Do not depress the clutch pedal.



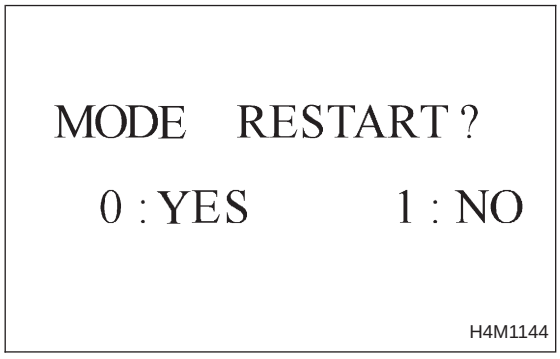
7) When the message shown in the figure is displayed, press ENT key.
8) Check points will be displayed on select monitor.



9) When ABS sequence control cannot be started (by system malfunction, etc.), the message shown in the figure will be displayed.
NOTE:
Read the trouble codes. Repair faulty parts.



10) After completion of ABS sequence control.



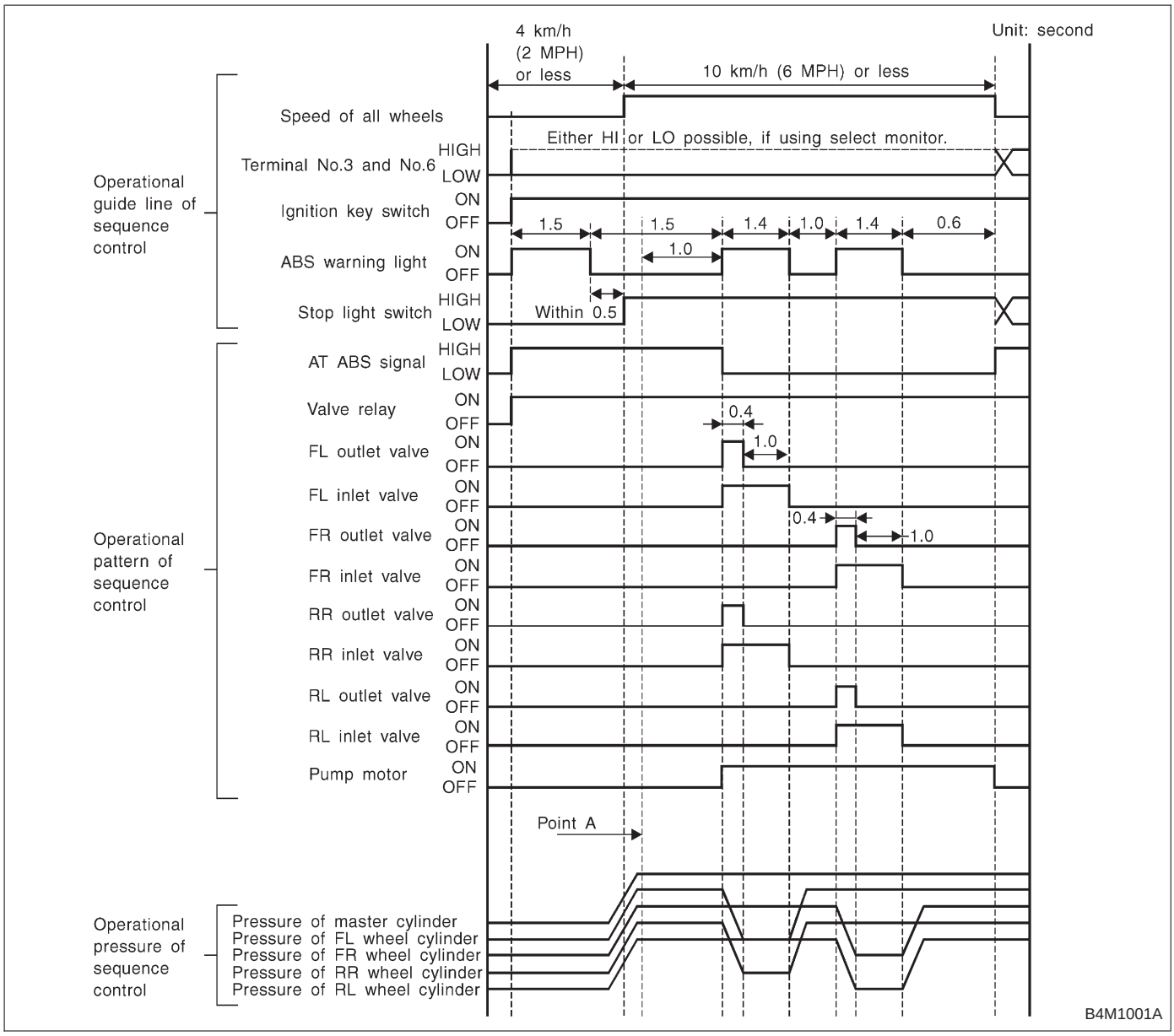
11) Press 0 key to start ABS sequence control again and press 1 key to end.

3. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

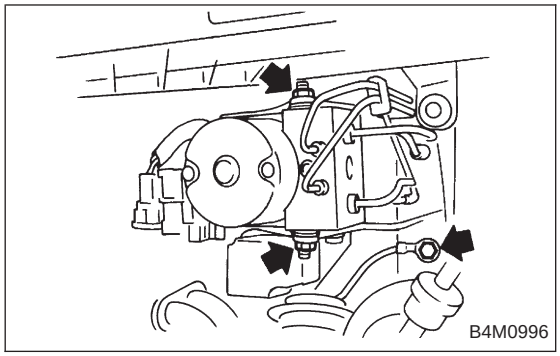
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 3 or No. 6 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

4. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:

- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.



E: INSTALLATION

1. HYDRAULIC UNIT

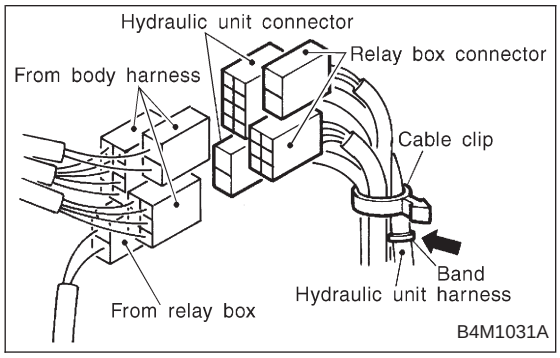
1) Install hydraulic unit.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)

2) Connect hydraulic unit ground cable to body.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

3) Connect brake pipes to their correct hydraulic unit connections. <Ref. to 4-4 [W15A2].>



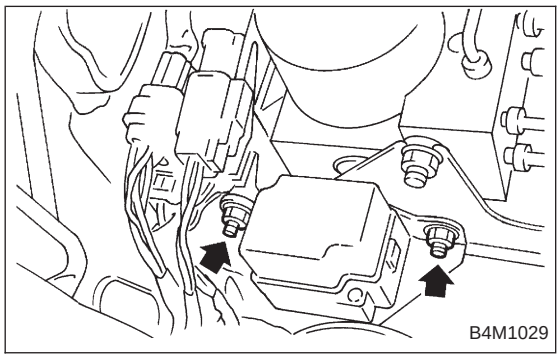
4) Secure hydraulic unit connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

5) Using cable clip, secure hydraulic unit harness to relay box harness.

CAUTION:
Make sure hydraulic unit harness band is secured beneath cable clip.

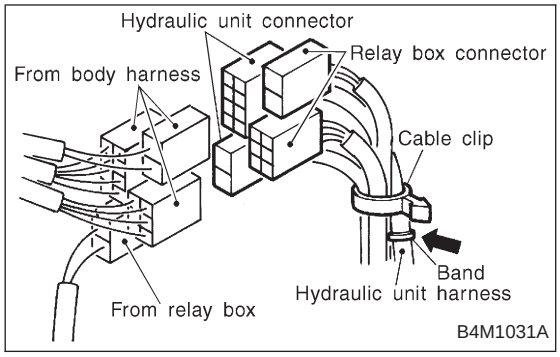
6) Connect connector to hydraulic unit.
7) Install canister.
8) Install air intake duct.
9) Connect ground cable to battery.
10) Bleed air from the brake system.



2. RELAY BOX

1) Install relay box and connector bracket.

Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)



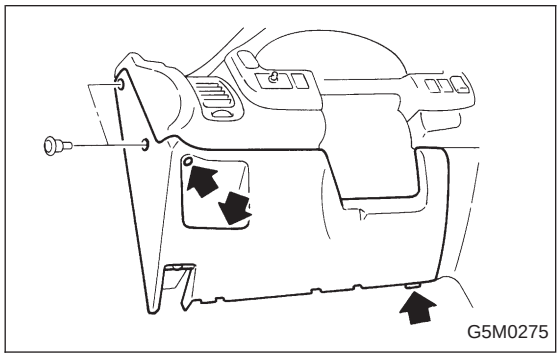
2) Secure relay box connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

3) Using cable clip, secure hydraulic unit harness to relay box harness.

CAUTION:
Make sure hydraulic unit harness band is secured beneath cable clip.

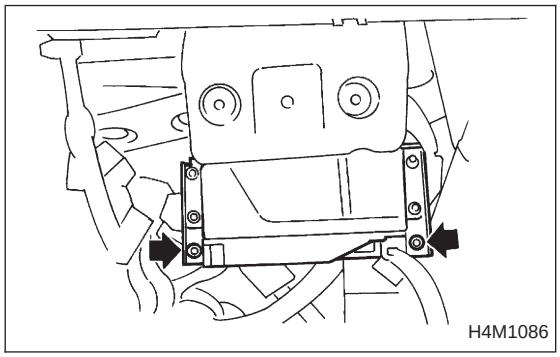
4) Connect connector to relay box.
5) Install canister.
6) Install air intake duct.
7) Connect ground cable to battery.



13. ABS Control Module

A: REMOVAL

1) Turn ignition switch to OFF.
2) Remove lower cover from instrument panel.
3) Disconnect connector from ABSCM.



4) Remove ABSCM.

CAUTION:
Do not drop or bump ABSCM.

B: INSPECTION

Check that connector is connected correctly and that connector terminal sliding resistance is correct.

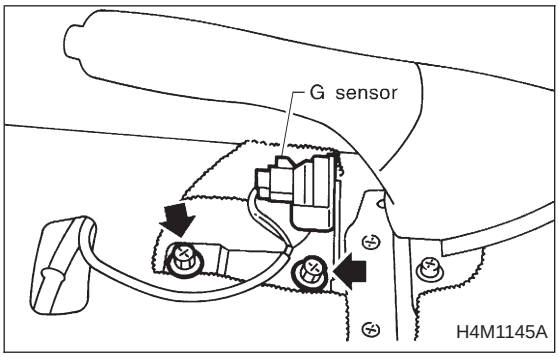
C: INSTALLATION

To install, reverse the removal procedure.

14. G Sensor for ABS System

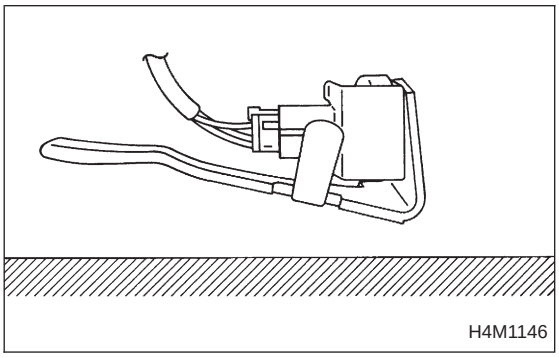
A: REMOVAL AND INSTALLATION

1) Turn ignition switch to OFF.
2) Remove console box. <Ref. to 5-4 [W1A0].>
3) Disconnect connector from G sensor.



4) Remove G sensor from body.
5) To install, reverse the removal procedure.

CAUTION:
Do not drop or bump G sensor.



B: INSPECTION WITH CIRCUIT TESTER

1. CHECK G SENSOR

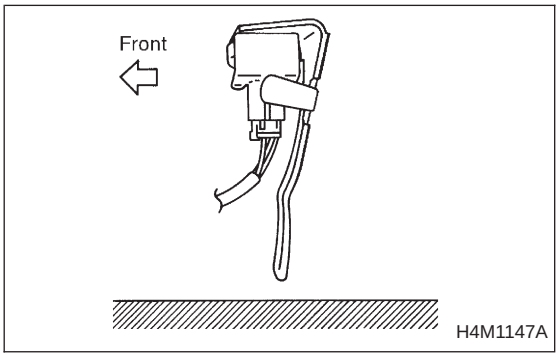
1) Turn ignition switch to OFF.
2) Remove G sensor from vehicle.
3) Connect connector to G sensor.
4) Turn ignition switch to ON.
5) Measure voltage between G sensor connector terminals.

Connector & terminal
(P9) No. 2 (+) — No. 1 (−)

CHECK ***: Is the voltage 2.3±0.2 V when G sensor is horizontal?***

YES : Go to step 2.

NO : Replace G sensor.



2. CHECK G SENSOR (forwards)

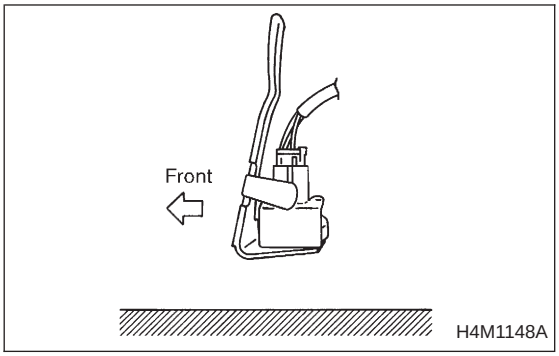
Measure voltage between G sensor connector terminals.

Connector & terminal
(P9) No. 2 (+) — No. 1 (−)

CHECK ***: Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?***

YES : Go to step 3.

NO : Replace G sensor.



3. CHECK G SENSOR (backwards)

Measure voltage between G sensor connector terminals.

Connector & terminal
(P9) No. 2 (+) — No. 1 (−)

CHECK ***: Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?***

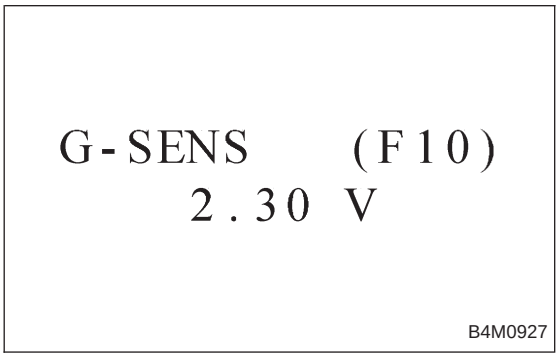
YES : G sensor is normal.

NO : Replace G sensor.

C: INSPECTION WITH SELECT MONITOR

1. CHECK G SENSOR

1) Turn ignition switch to OFF.
2) Connect select monitor connector to data link connector.
3) Turn select monitor into ABS mode.

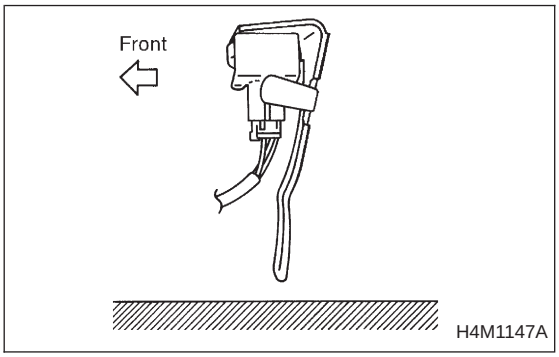


4) Press F , 1 and 0 on the select monitor.
5) Read the select monitor display.

CHECK ***: Is the indicated reading 2.3±0.2 V when the vehicle is in horizontal position?***

YES : Go to step 2.

NO : Replace G sensor.



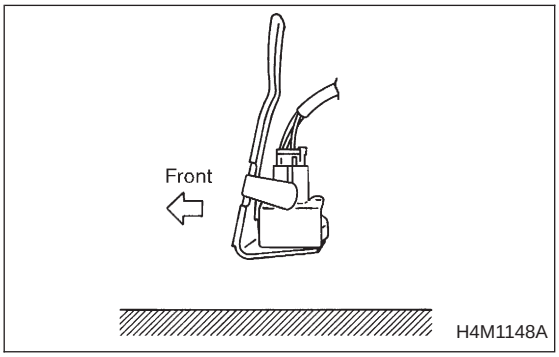
2. CHECK G SENSOR (forwards)

1) Remove console box.
2) Remove G sensor from vehicle. (Do not disconnect connector.)
3) Read the select monitor display.

CHECK ***: Is the indicated reading 3.9±0.2 V when G sensor is inclined forwards to 90°?***

YES : Go to step 3.

NO : Replace G sensor.



3. CHECK G SENSOR (backwards)

Read the select monitor display.

CHECK ***: Is the indicated reading 0.7±0.2 V when G sensor is inclined backwards to 90°?***

YES : G sensor is normal.

NO : Replace G sensor.

15. Brake Hose and Pipe AIRBAG

SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

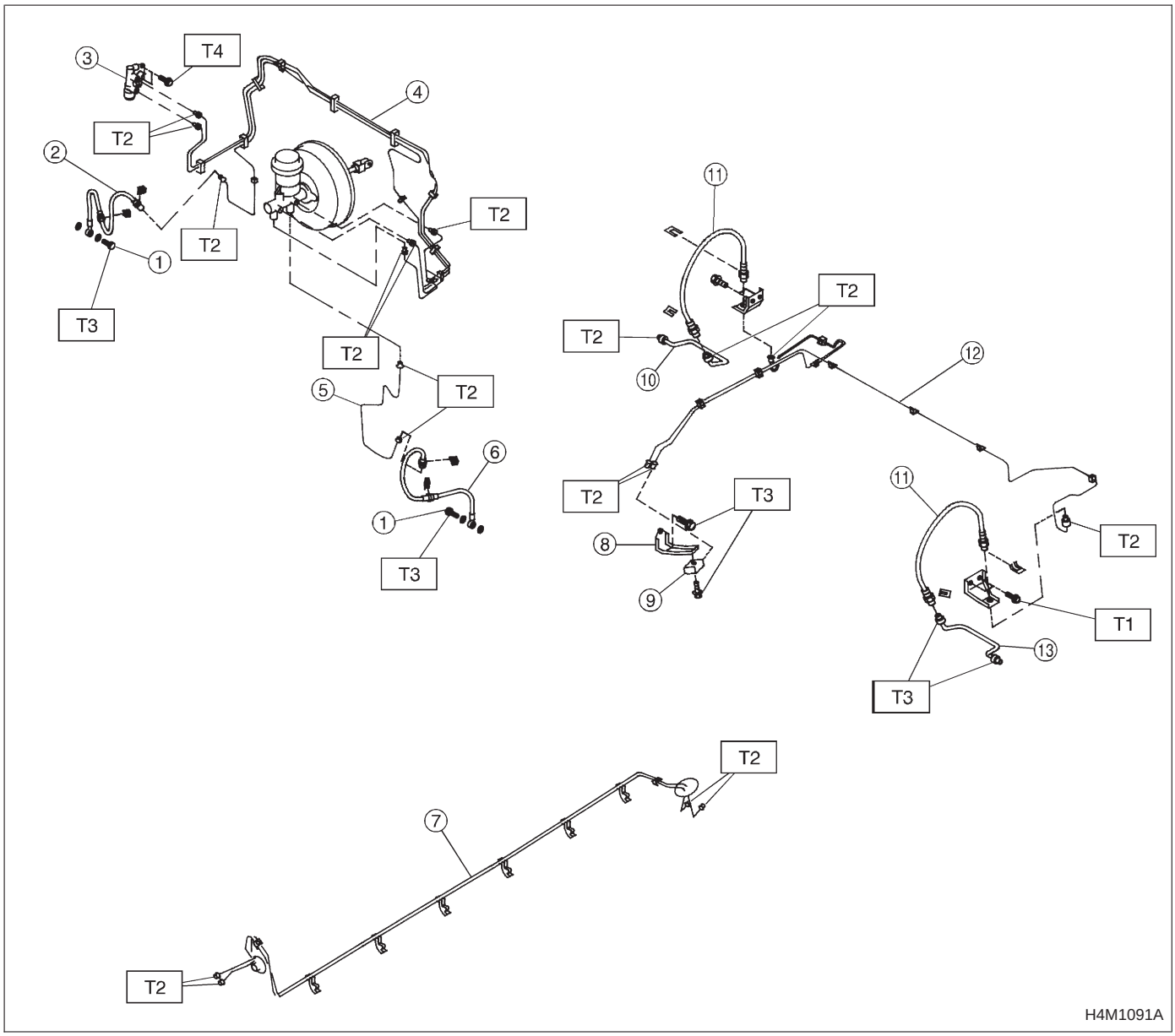
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the center brake pipe.

A: REMOVAL AND INSTALLATION

CAUTION:
● When removing and installing the brake pipe, make sure that it is not bent.
● After installing the brake pipe and hose, bleed the air.
● After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

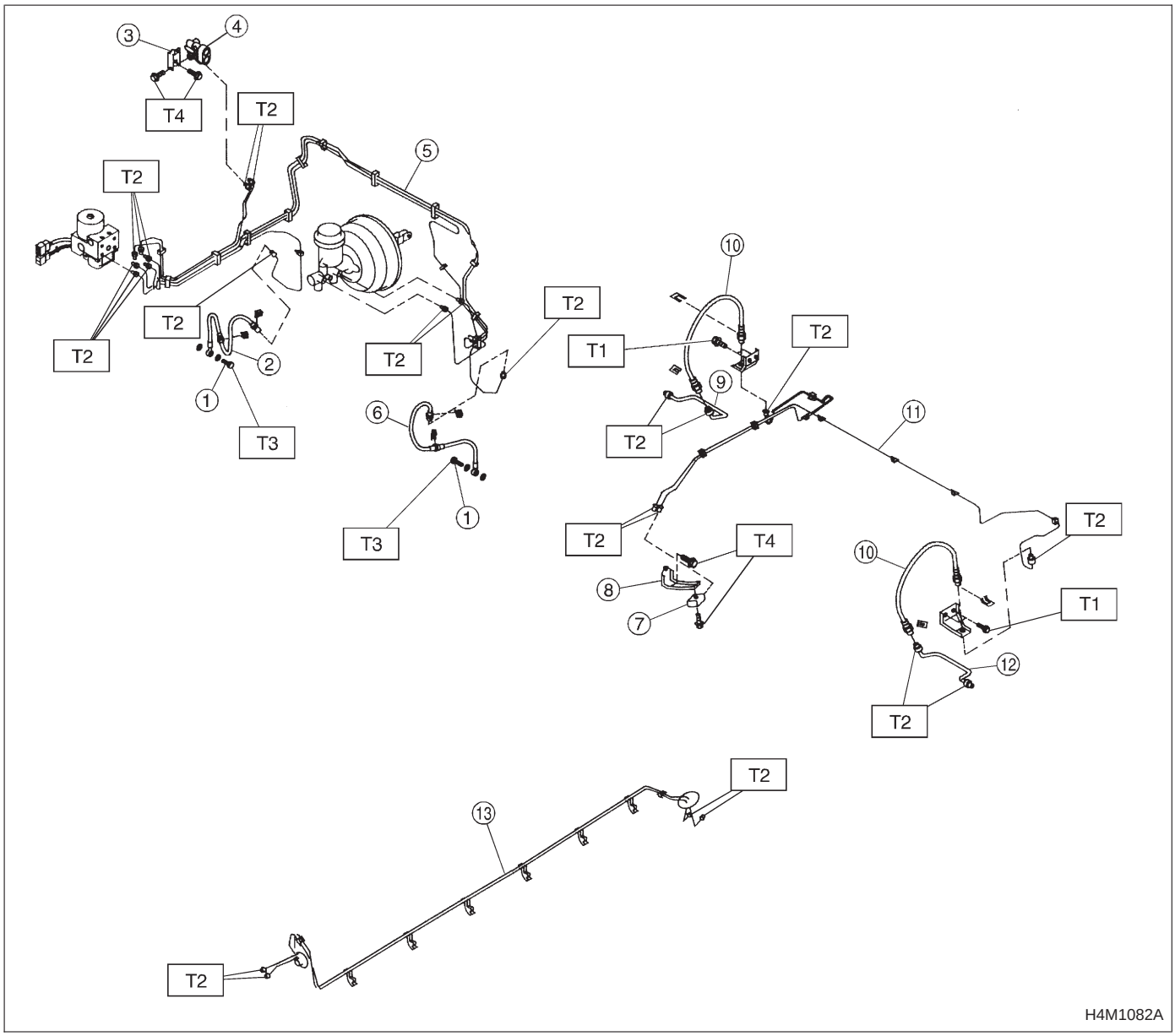
1. MODELS WITHOUT ABS



① Union bolt
② Front brake hose RH
③ Proportioning valve
④ Front brake pipe ASSY
⑤ Front adapter pipe
⑥ Front brake hose LH
⑦ Center brake pipe ASSY
⑧ Connector bracket
⑨ Two-way connector
⑩ Rear brake pipe RH
⑪ Rear brake hose
⑫ Rear brake pipe ASSY
⑬ Rear brake pipe LH

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 14.7^{+3}_{-2} ($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)
T3: 18±3 (1.8±0.3, 13.0±2.2)
T4: 18±5 (1.8±0.5, 13.0±3.6)

2. MODELS WITH ABS



① Union bolt
② Front brake hose RH
③ Valve bracket
④ Proportioning valve
⑤ Front brake pipe ASSY
⑥ Front brake hose LH
⑦ Two-way connector
⑧ Connector bracket
⑨ Rear brake pipe RH
⑩ Rear brake hose
⑪ Rear brake pipe ASSY
⑫ Rear brake pipe LH
⑬ Center brake pipe ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 15^{+3}_{-2} ($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)
T3: 18±3 (1.8±0.3, 13.0±2.2)
T4: 18±5 (1.8±0.5, 13.0±3.6)

1. Entire Brake System

Trouble and possible cause	Corrective action
1. Insufficient braking	
(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
(2) Entry of air into the hydraulic mechanism	Bleed the air.
(3) Excessively wide shoe clearance	Adjust the clearance.
(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	
(1) Fluid on the lining, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
(5) Deformed back plate	Correct or replace.
(6) Improper tire inflation	Inflate to correct pressure.
(7) Disordered wheel alignment	Adjust alignment.
(8) Loosened back plate or the support installing bolts	Retighten.
(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
(11) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	
(1) Entry of air into the hydraulic mechanism	Bleed the air.
(2) Excessive play in the master cylinder push rod	Adjust.
(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
(4) Improperly adjusted shoe clearance	Adjust.
(5) Improper lining contact or worn lining	Correct or replace.

Trouble and possible cause	Corrective action
4. Brake dragging or improper brake return	
(1) Insufficient pedal play	Adjust play.
(2) Improper master cylinder return	Clean or replace the cylinder.
(3) Clogged hydraulic system	Replace.
(4) Improper return or adjustment of parking brake	Correct or adjust.
(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
(6) Excessively narrow shoe clearance	Adjust the clearance.
(7) Improper disc caliper operation	Correct or replace.
(8) Improper adjusted wheel bearing	Adjust or replace.
5. Brake noise (1) (creak sound)	
(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
(2) Worn lining	Replace the shoe assembly or pad.
(3) Loosened back plate or the support installing bolts	Retighten.
(4) Loose wheel bearing	Retighten to normal tightening torque.
(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	
(1) Worn lining	Replace the shoe assembly or pad.
(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
(3) Loose or bent drum or rotor	Retighten or replace.
7. Brake noise (3) (click sound)	
In the case of the disc brake:	
(1) Excessively worn pad or the support	Replace the pad or the support.
In the case of the drum brake:	
(1) Excessively worn shoe ridge	Replace the back plate.
(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

PEDAL SYSTEM AND CONTROL CABLES 4-5

Page

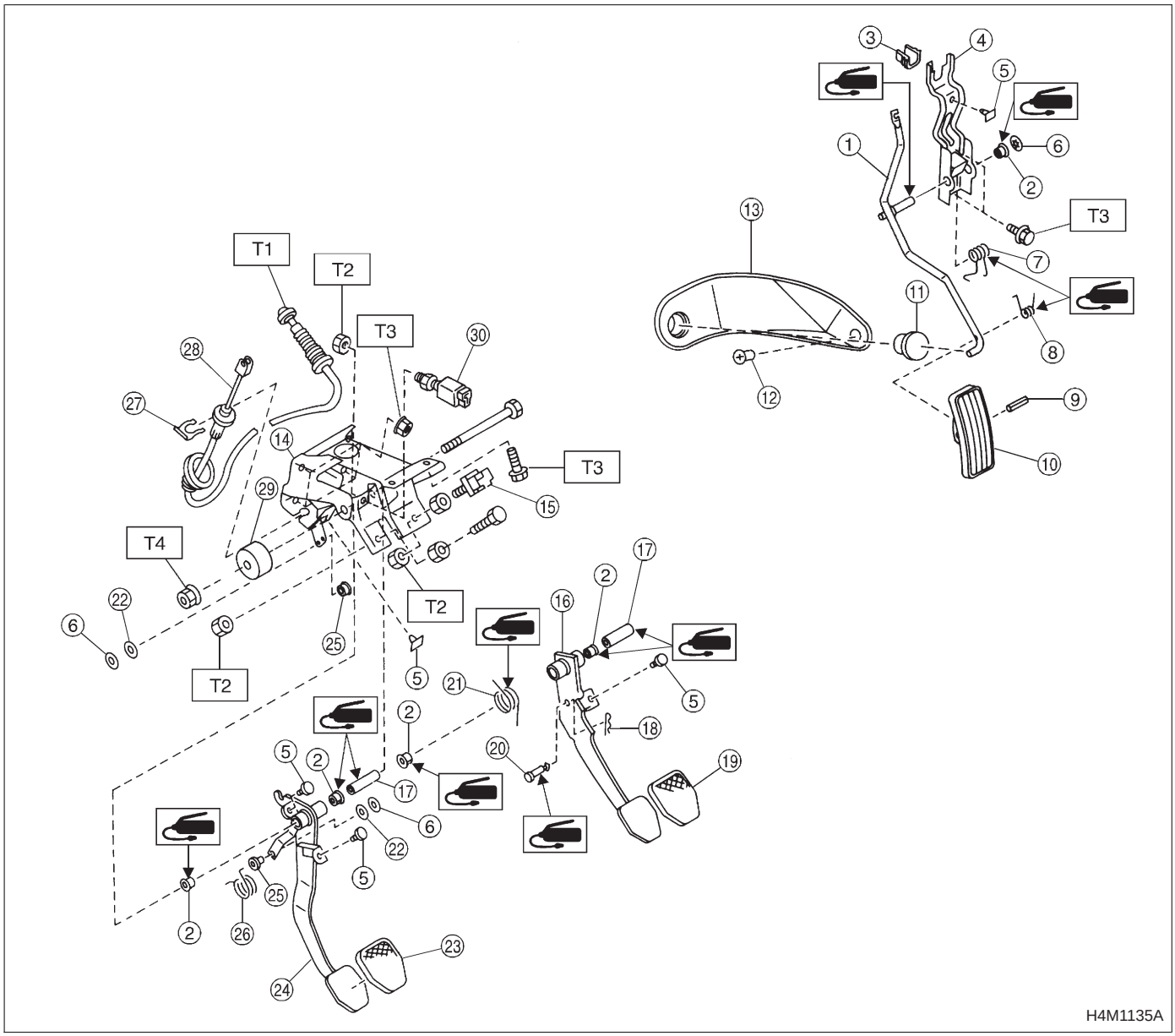
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1. Pedal 5
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3. Accelerator Cable 12
4. Speedometer Cable 14
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1. Pedal System and Control Cables 16

1. Service Data

Brake pedal	Free play		1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kg, 2 lb).]
Clutch pedal	Free play	At clutch pedal pad	10 — 20 mm (0.39 — 0.79 in)
	Full stroke	At clutch pedal pad	140 — 145 mm (5.51 — 5.71 in)
Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	46 — 50 mm (1.81 — 1.97 in)

1. Pedal

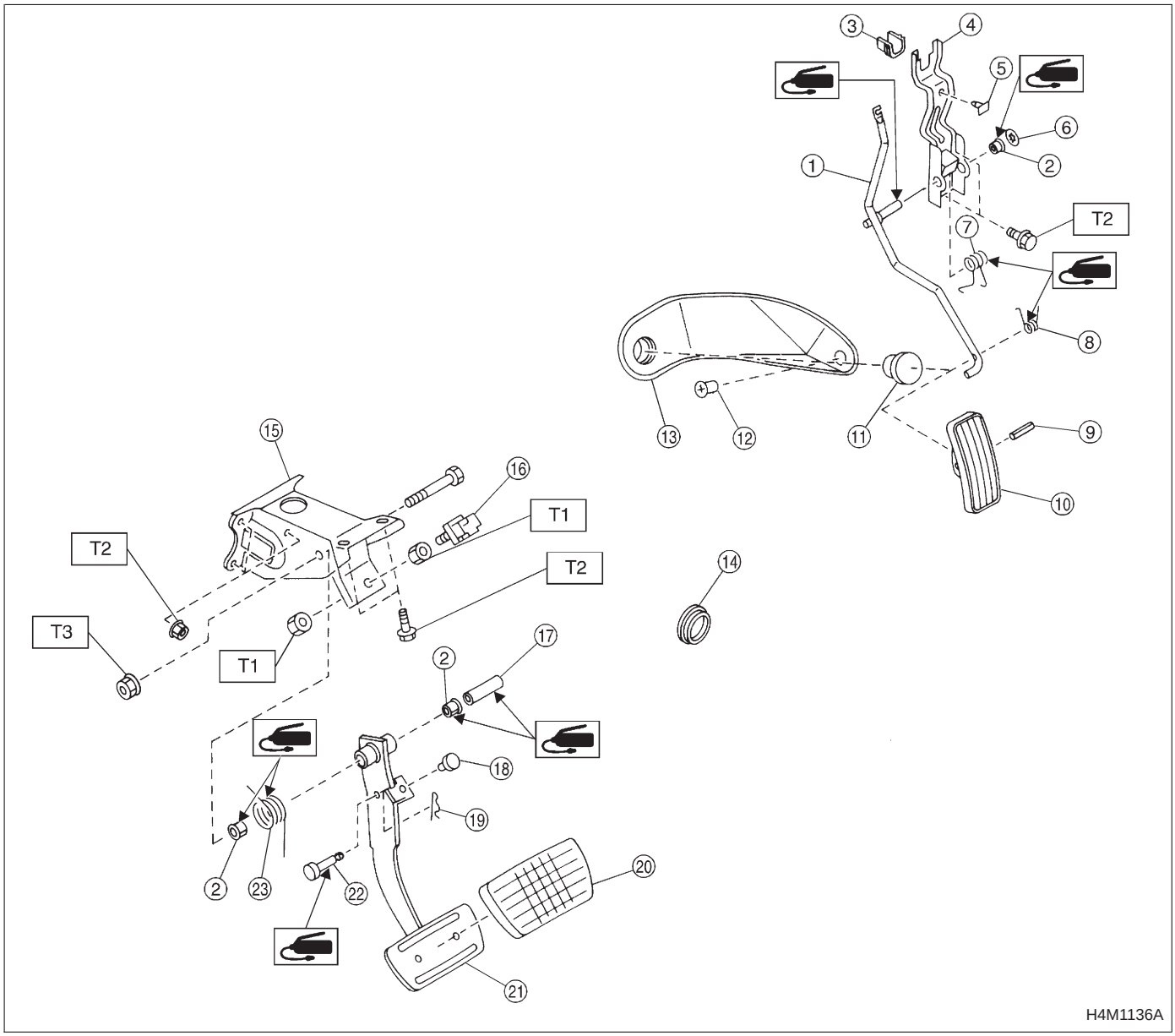
A: MT MODEL



① Accelerator pedal
② Bushing
③ Holder
④ Accelerator bracket
⑤ Stopper
⑥ Clip
⑦ Accelerator spring
⑧ Accelerator pedal spring
⑨ Spring pin
⑩ Accelerator pedal pad
⑪ Accelerator stopper
⑫ Clip
⑬ Accelerator plate
⑭ Pedal bracket
⑮ Stop light switch
⑯ Brake pedal
⑰ Spacer
⑱ Snap pin
⑲ Brake pedal pad
⑳ Clevis pin
㉑ Brake pedal spring
㉒ Washer
㉓ Clutch pedal pad
㉔ Clutch pedal
㉕ Bushing assist
㉖ Spring assist
㉗ Clutch cable clamp
㉘ Clutch cable
㉙ Mass damper
㉚ Clutch switch (Starter interlock)

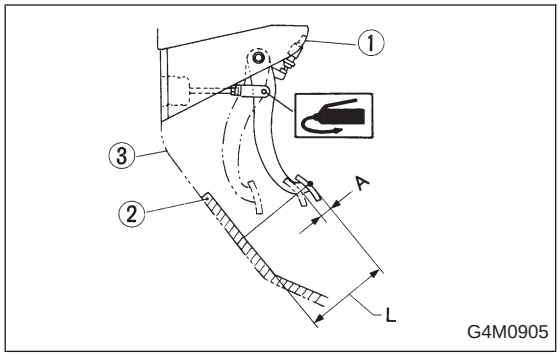
Tightening torque: N·m (kg-m, ft-lb)
T1: 5.9±1.5 (0.60±0.15, 4.3±1.1)
T2: 8±2 (0.8±0.2, 5.8±1.4)
T3: 18±5 (1.8±0.5, 13.0±3.6)
T4: 29±7 (3.0±0.7, 21.7±5.1)

B: AT MODEL



① Accelerator pedal
② Bushing
③ Holder
④ Accelerator bracket
⑤ Stopper
⑥ Clip
⑦ Accelerator spring
⑧ Accelerator pedal spring
⑨ Spring pin
⑩ Accelerator pedal
⑪ Accelerator stopper
⑫ Clip
⑬ Accelerator plate
⑭ Plug
⑮ Pedal bracket
⑯ Stop light switch
⑰ Spacer
⑱ Stopper
⑲ Snap pin
⑳ Brake pedal pad
㉑ Brake pedal
㉒ Clevis pin
㉓ Brake pedal spring

Tightening torque: N·m (kg-m, ft-lb)
T1: 8±2 (0.8±0.2, 5.8±1.4)
T2: 18±5 (1.8±0.5, 13.0±3.6)
T3: 29±7 (3.0±0.7, 21.7±5.1)



1. Pedal

A: ON-CAR SERVICE

1. BRAKE PEDAL

1) Check position of pedal pad.

① Stop light switch
② Mat
③ Toe board

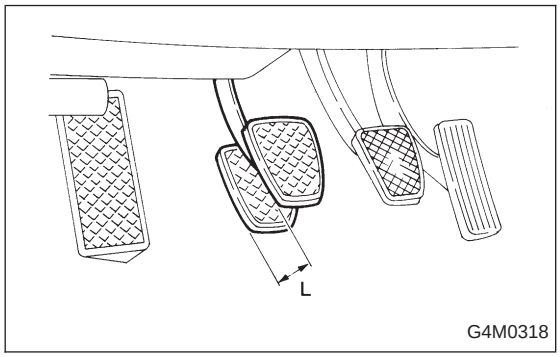
Pedal height: L
158 mm (6.22 in)

2) If it is not in specified value, adjust it by adjusting brake booster operating rod length.
3) Check free play by operating pedal by hand.
If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in)
[Depress brake pedal pad with a force of less than 10 N (1 kg, 2 lb).]

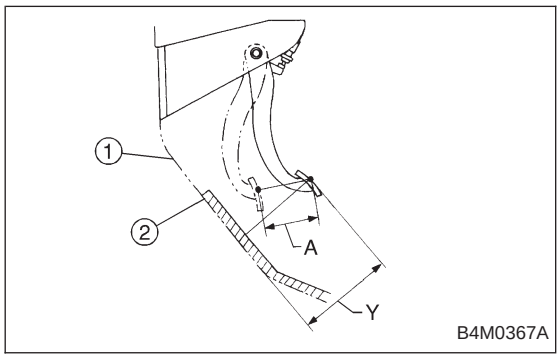
4) Apply grease to operating rod connecting pin to prevent it from wearing.



2. CLUTCH PEDAL

1) Check clutch pedal free play by operating pedal by hand.

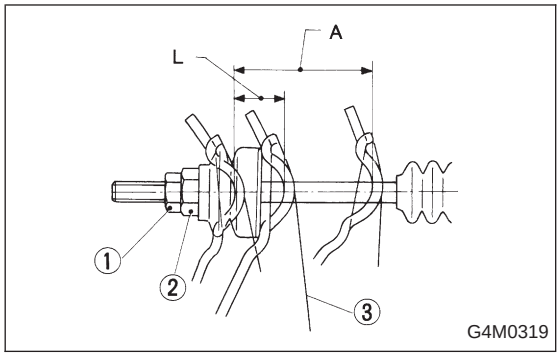
Free play: L (At clutch pedal pad)
10 — 20 mm (0.39 — 0.79 in)



Pedal height: Y
158 mm (6.22 in)

Pedal stroke: A
140 — 145 mm (5.51 — 5.71 in)

① Toe board
② Mat



2) If it is not in specified value, adjust it by turning adjusting nut on engine side end of clutch cable.

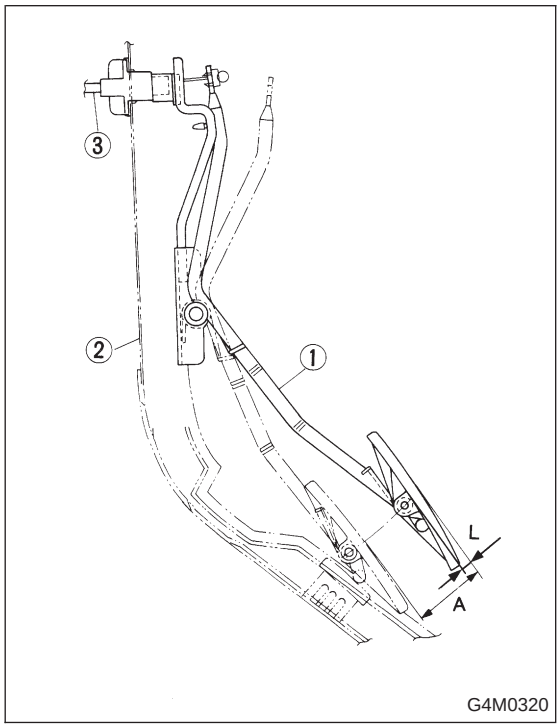
Free play: L
2 — 4 mm (0.08 — 0.16 in)

Full stroke: A
25.5 — 27 mm (1.004 — 1.063 in)

3) Apply grease to connecting portion of clutch pedal and clutch cable.

① Lock nut
② Adjusting nut
③ Release fork

Lock nut tightening torque:
5.9±1.5 N·m (0.60±0.15 kg-m, 4.3±1.1 ft-lb)



3. ACCELERATOR PEDAL

Check pedal stroke and free play by operating accelerator pedal by hand.
If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L
1 — 4 mm (0.04 — 0.16 in)

Stroke at pedal pad: A
46 — 50 mm (1.81 — 1.97 in)

① Accelerator pedal
② Toe board
③ Accelerator cable

Accelerator cable lock nut tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)

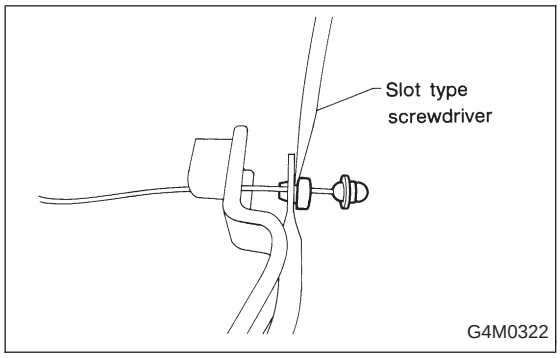
B: REMOVAL

1. ACCELERATOR PEDAL

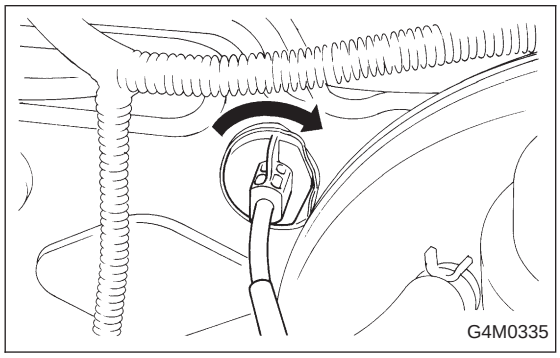
1) Disconnect ground cable from battery.
2) Disconnect accelerator cable from throttle body.

CAUTION:
Be careful not to kink accelerator cable.

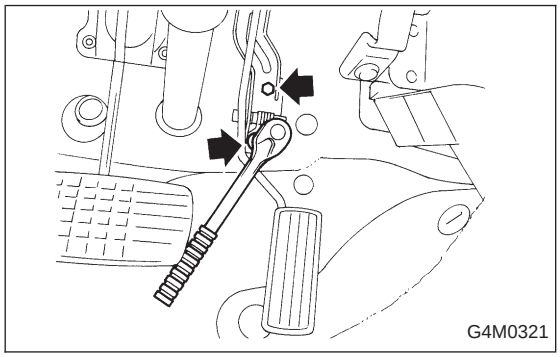
3) Remove instrument panel lower cover from instrument panel, and connector.



4) Disconnect accelerator cable from accelerator pedal lever.



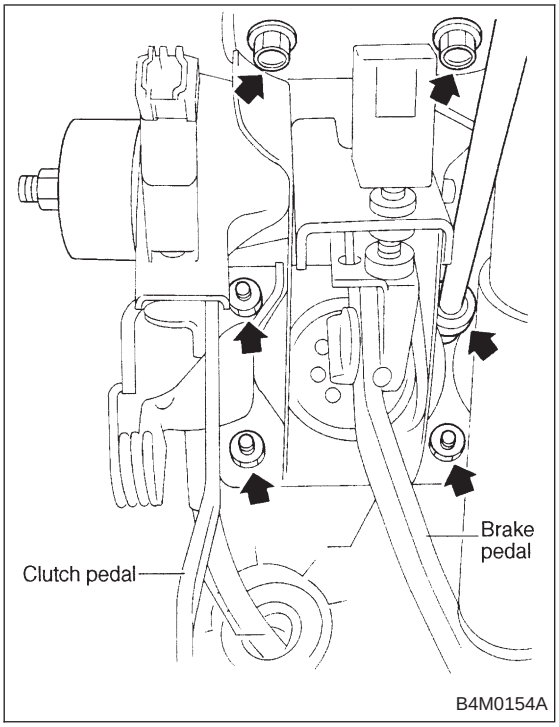
5) Working inside engine compartment, remove casing cap out of the toe board by turning it clockwise.
6) Pull out the cable from the toe board hole.



7) Remove accelerator pedal connecting bolt from accelerator pedal bracket.

2. BRAKE AND CLUTCH PEDAL (MT model)

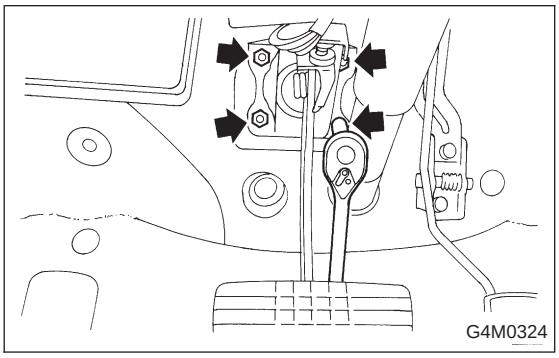
1) Disconnect ground cable from battery.
2) Disconnect clutch cable from release lever.
3) Remove instrument panel lower cover from instrument panel.
4) Disconnect the following parts from pedal bracket.
   (1) Operating rod of brake booster
   (2) Electrical connectors (for stop light switch, etc.)
5) Remove clevis pin which secures pedal to push rod.



6) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal bracket and clutch cable as a unit.

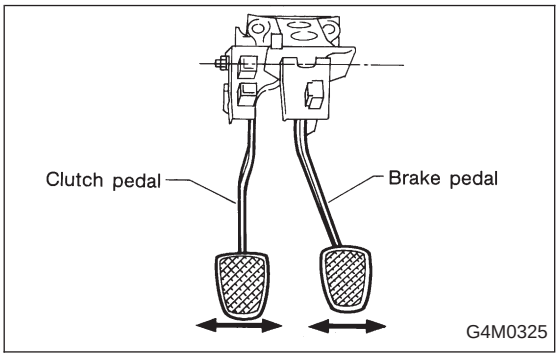
CAUTION:
Before removing clutch cable from toe board, remove grommet. Slowly remove clutch cable, being careful not to scratch it.

7) Depress clutch pedal, disconnect clutch cable from clutch pedal.



3. BRAKE PEDAL (AT model)

1) Disconnect ground cable from battery.
2) Remove instrument panel lower cover from instrument panel.
3) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop lamp switch connector.
4) Remove two bolts and four nuts which secure brake pedal to pedal.



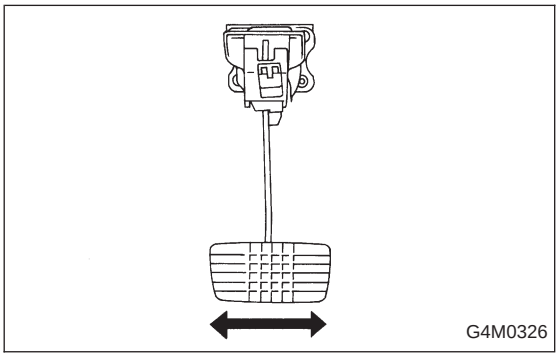
C: INSPECTION

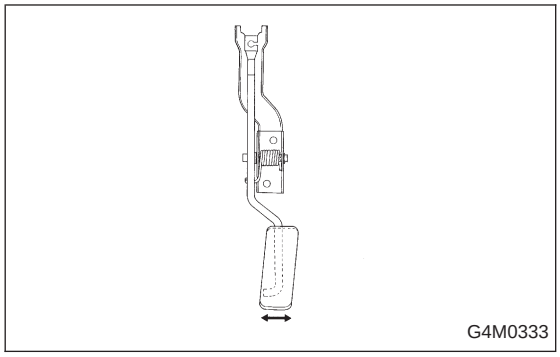
1. BRAKE AND CLUTCH PEDALS

Move brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kg, 2 lb) to ensure pedal deflection is in specified range.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less

CAUTION:
If excessive deflection is noted, replace bushings with new ones.



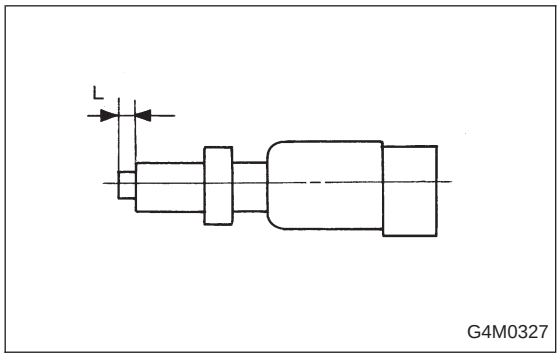

G4M0333

2. ACCELERATOR PEDAL

Lightly move pedal pad in lateral the direction to ensure pedal deflection is in specified range.

Deflection of accelerator pedal:
Service limit
5.0 mm (0.197 in) or less

CAUTION:
If excessive deflection is noted, replace bushing and clip with new ones.

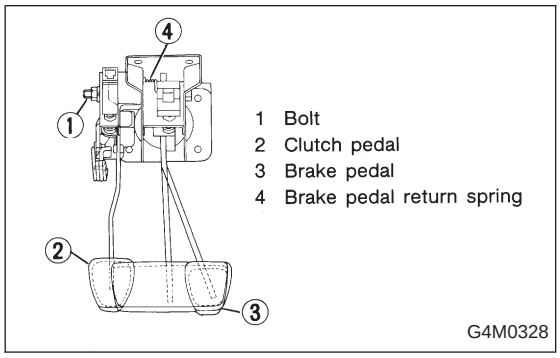


G4M0327

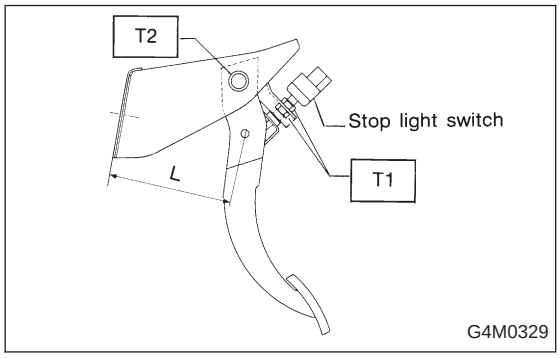
3. STOP LIGHT SWITCH

If stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: L
$2^{+1.5}_{0}$ mm (0.079 $^{+0.059}_{0}$ in)



G4M0328



G4M0329

D: ASSEMBLY

1. BRAKE AND CLUTCH PEDAL

1) Attach stop light switch, etc. to pedal bracket temporarily.

2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.

3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with Hill holder), and then install pedal bolt.

Tightening torque:
T2: 29±7 N·m (3.0±0.7 kg-m, 21.7±5.1 ft-lb)

NOTE:
Clean up inside of bushings and apply grease before installing spacer.

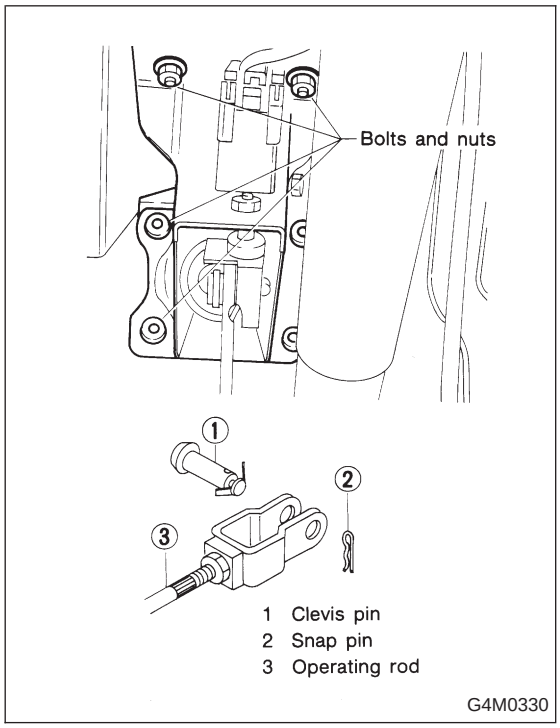
4) Set brake pedal position by adjusting position of stop light switch.

Pedal position: L
125.9 mm (4.96 in)

Tightening torque:
T1: 8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 ft-lb)

2. ACCELERATOR PEDAL

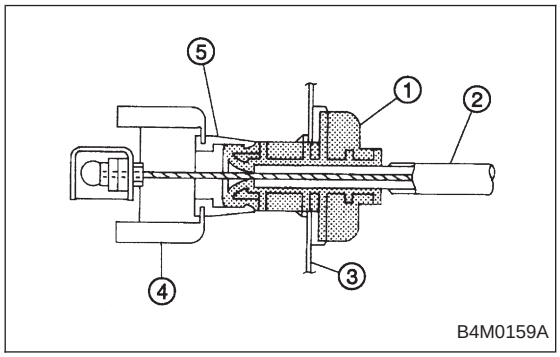
Clean and apply grease to spacer and inside bore of accelerator pedal. Install accelerator pedal onto pedal bracket.



E: INSTALLATION

1) Installation is in the reverse order of removal procedures.

CAUTION:
- **Be careful not to bend clutch cable too much.**
- **Never fail to cover outer cable end with boot.**
- **Be careful not to kink accelerator cable.**



- **Make sure that holder and casing cap are securely connected.**

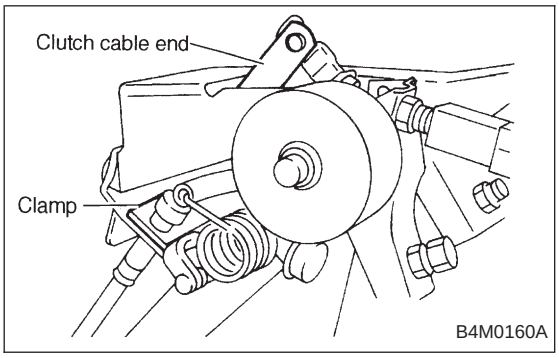
① Casing cap
② Accelerator cable
③ Toe board
④ Accelerator pedal bracket
⑤ Holder

2) Adjustment after pedal installation <Ref. to 4-5 [W1A0].>

2. Clutch Cable

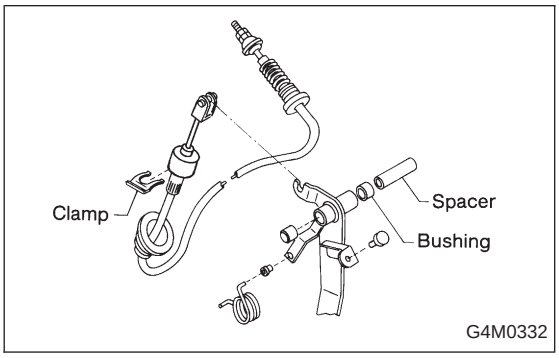
A: REMOVAL

1) Disconnect clutch cable from release lever.



2) Remove clutch cable clamp from pedal bracket.
3) Disconnect clutch cable from pedal bracket and pedal end.
4) Remove clutch cable from body.

CAUTION:
Before removing clutch cable from toe board, remove grommet. Slowly remove clutch cable, being careful not to scratch it.

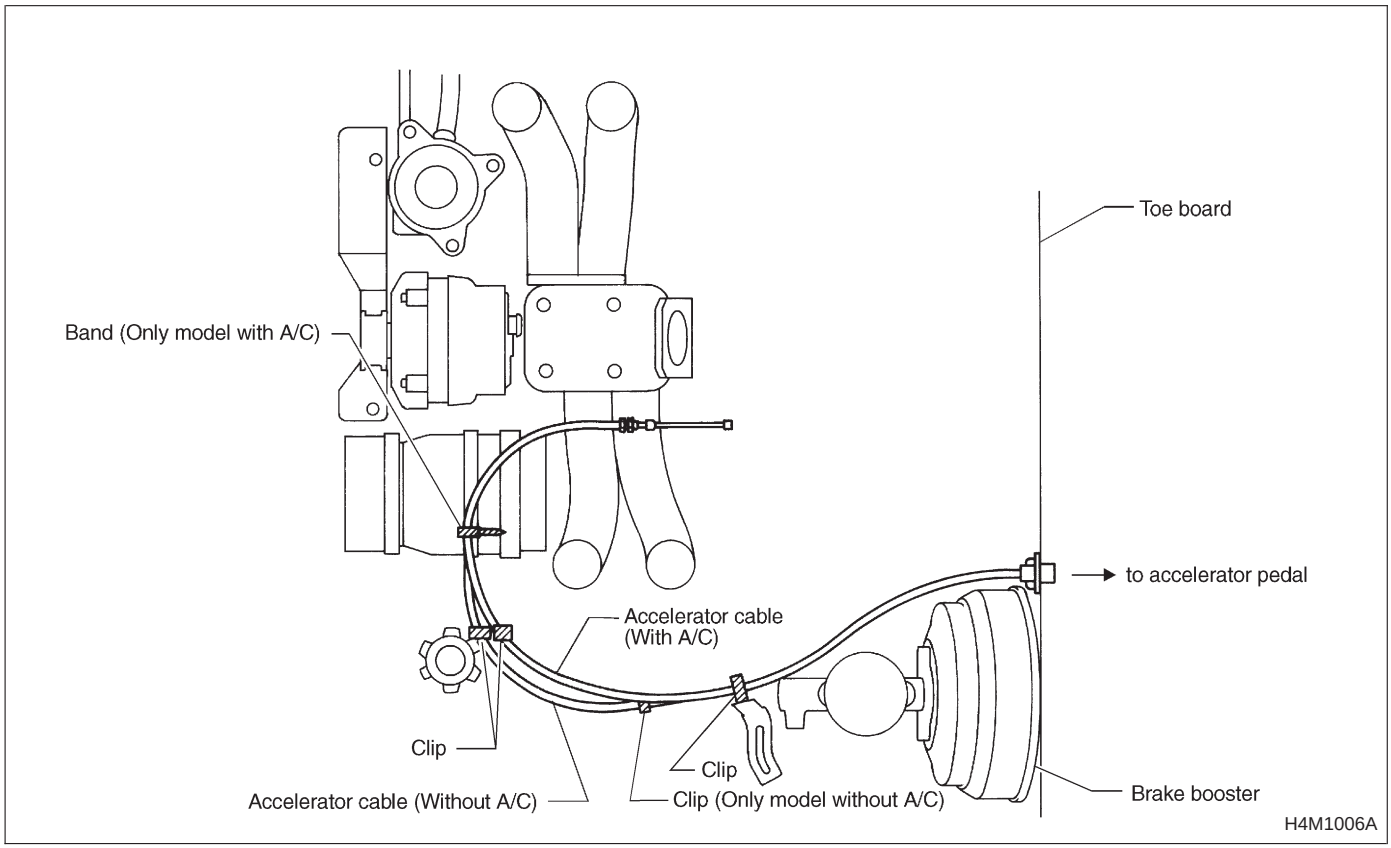


B: INSTALLATION

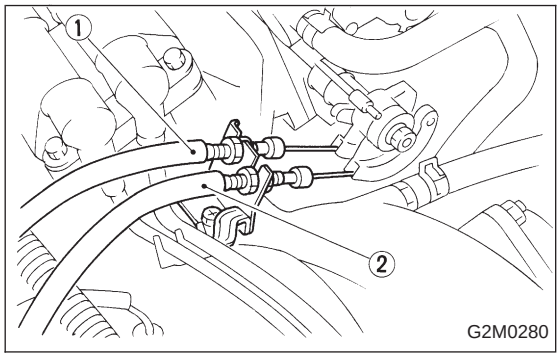
1) Clean clutch pedal fitting hole, and apply grease. Connect clutch cable to clutch pedal.
2) Fit clutch pedal to pedal bolt, and connect clutch cable to bracket with clamp.
3) Connect clutch cable end to pedal end.
4) Connect clutch cable from release lever.
5) Install grommet to toe board.
6) Adjustment after cable installation <Ref. to 4-5 [W1A2].>

3. Accelerator Cable

A: REMOVAL



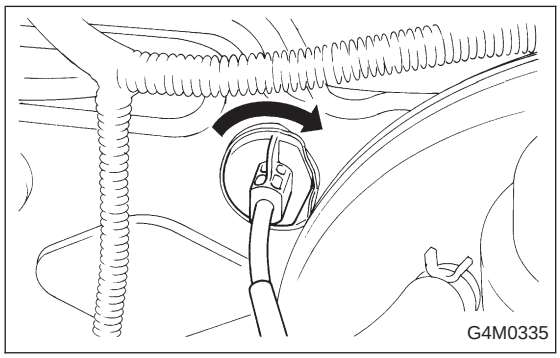
1) Disconnect accelerator cable from connector inside engine compartment first.



2) Remove lock nut from accelerator cable bracket.
3) Separate accelerator cable ① from bracket, then unlock inner cable.
4) Remove cable end from throttle cam using your fingertips.

CAUTION:
Be careful not to bend inner cable.

5) Disconnect cable end from accelerator cable bracket inside driver compartment.
6) Remove clip inside engine compartment.

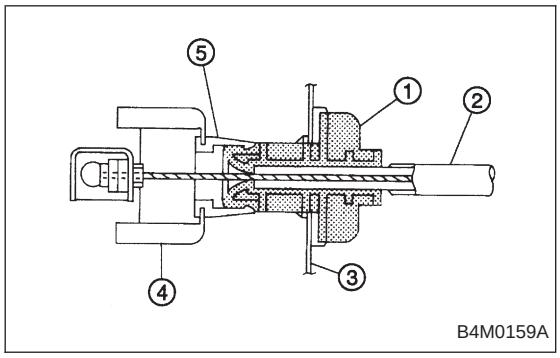


7) Working inside engine compartment, remove cable connection by turning toe board clockwise.
8) Pull out the cable from the toe board hole.

B: INSTALLATION

1) Installation is in the reverse order of removal procedures.

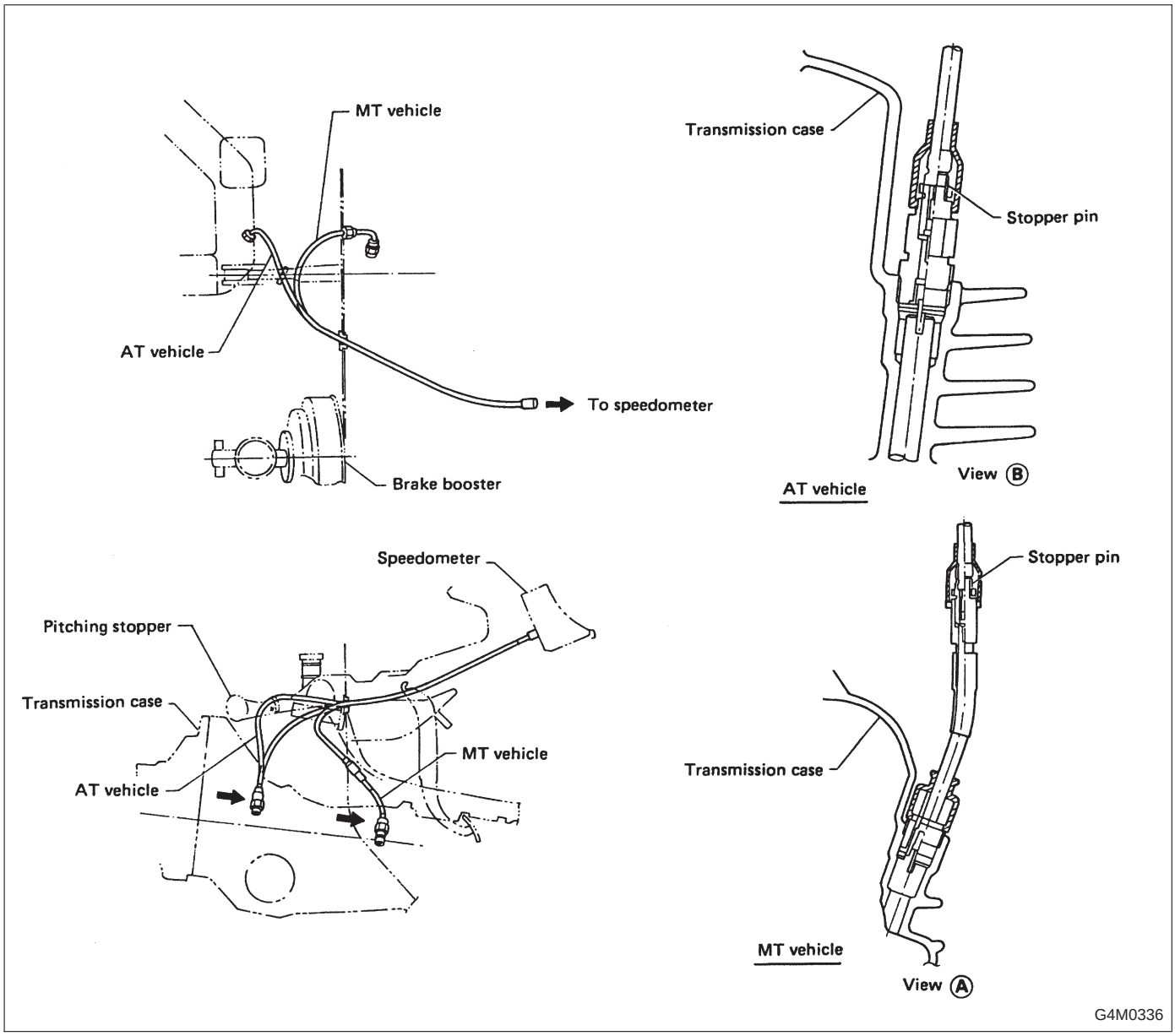
CAUTION:
- **Be careful not to kink accelerator cable.**
- **Make sure that holder and casing cap are securely connected.**



① Casing cap
② Accelerator cable
③ Toe board
④ Accelerator pedal bracket
⑤ Holder

2) Adjustment after cable installation <Ref. to 4-4 [W1A3].>

4. Speedometer Cable



A: REMOVAL

1) Remove speedometer cable, starting with its midpoint connection inside engine compartment.
2) While holding up boot located at speedometer cable connection, slightly expand clip. Extract speedometer cable by pulling it upward 2 to 3 mm (0.08 to 0.12 in) on speedometer side. Then, release clip and remove speedometer cable.
3) After disconnecting cable from speedometer, pull it out of toe board.
4) Remove screw which secures speedometer cable to transmission side.

B: INSTALLATION

1) After manually screwing speedometer cable on transmission side, tighten it 45 to 90° using a wrench.
2) Securely install boot onto midpoint connection of speedometer cable to prevent entry of water.

1. Pedal System and Control Cables

Trouble	Corrective action
Excessively worn brake pedal pad	Replace.
Failure of clutch and/or accelerator pedals to operate	Connect cables correctly.
Speedometer does not work.	Connect speedometer cable correctly.
Stop light switch does not light up.	Adjust position of stop light switch.
Stop light switch is not smooth and/or stroke is not correct.	Replace.
Insufficient pedal play	Adjust pedal play.
Clutch and/or brake pedal free play insufficient	Adjust pedal free play.
Maladjustment of brake pedal or booster push rod	Inspect and adjust.
Excessively worn and damaged pedal shaft and/or bushing	Replace bushing and/or shaft with new one.

HEATER AND VENTILATOR 4-6

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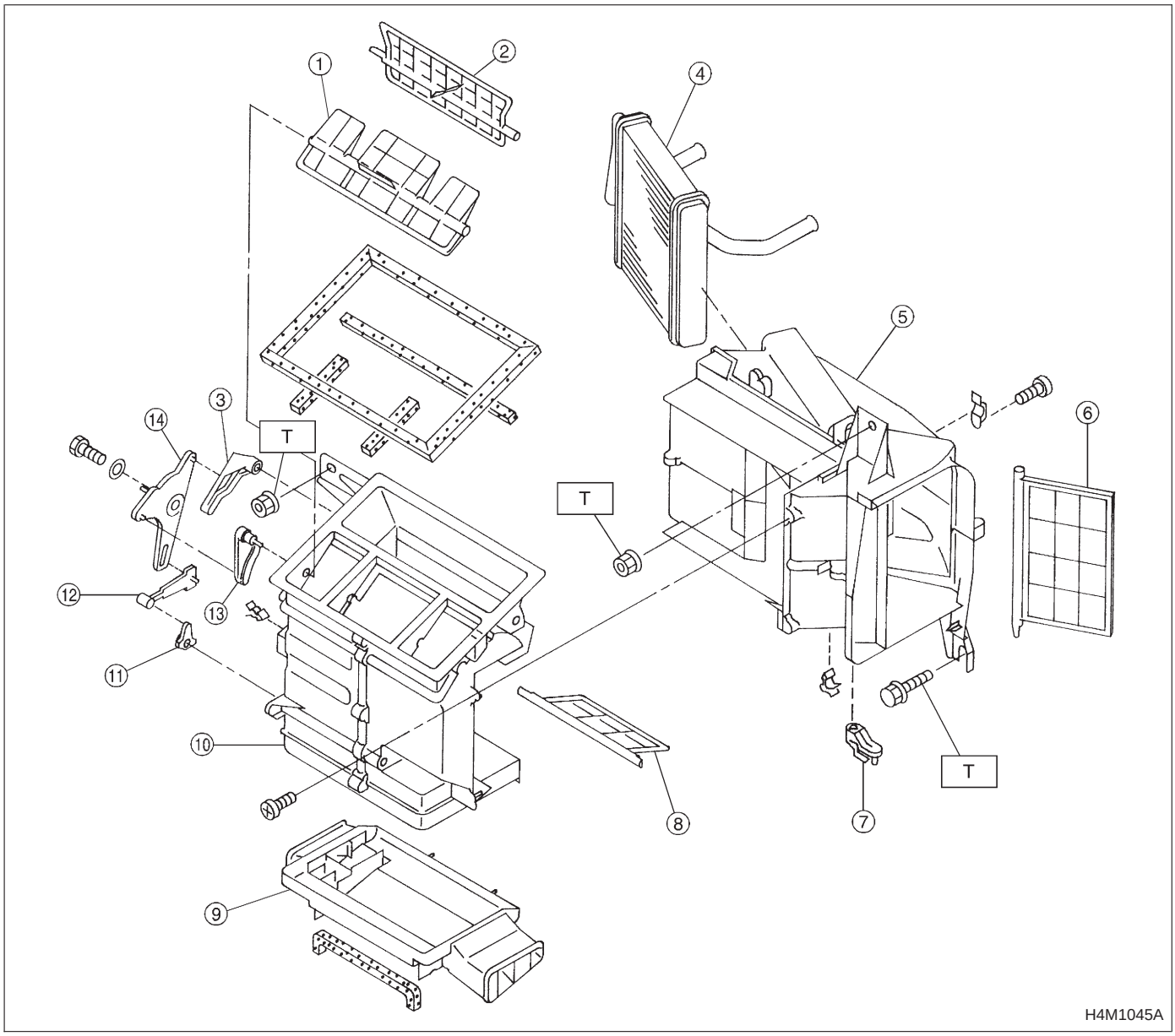
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3. Blower Motor Assembly 7
4. Control Unit 7

1. Specifications

A: HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		4.652 kW (4,000 kcal/h, 15,872 BTU/h) or more	● Mode selector switch : HEAT
			● Temperature control switch : FULL HOT
			● Temperature difference between hot water and inlet air : 65°C (149°F)
			● Hot water flow rate : 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		270 m^3 (9,534 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		480 m^3 (16,949 cu ft)/h	● Temperature control switch : FULL COLD
			● Blower fan speed : 4th position
			● Mode selector lever : RECIRC
Heater core size (height x length x width x thickness)		192.4 x 152.0 x 25.0 x 1.8 mm (7.57 x 5.98 x 0.984 x 0.071 in)	—
Blower motor	Type	Magnet motor 200 W or less	at 12 V
	Fan type and size (diameter x width)	Sirocco fan type 150 x 75 mm (5.91 x 2.95 in)	—

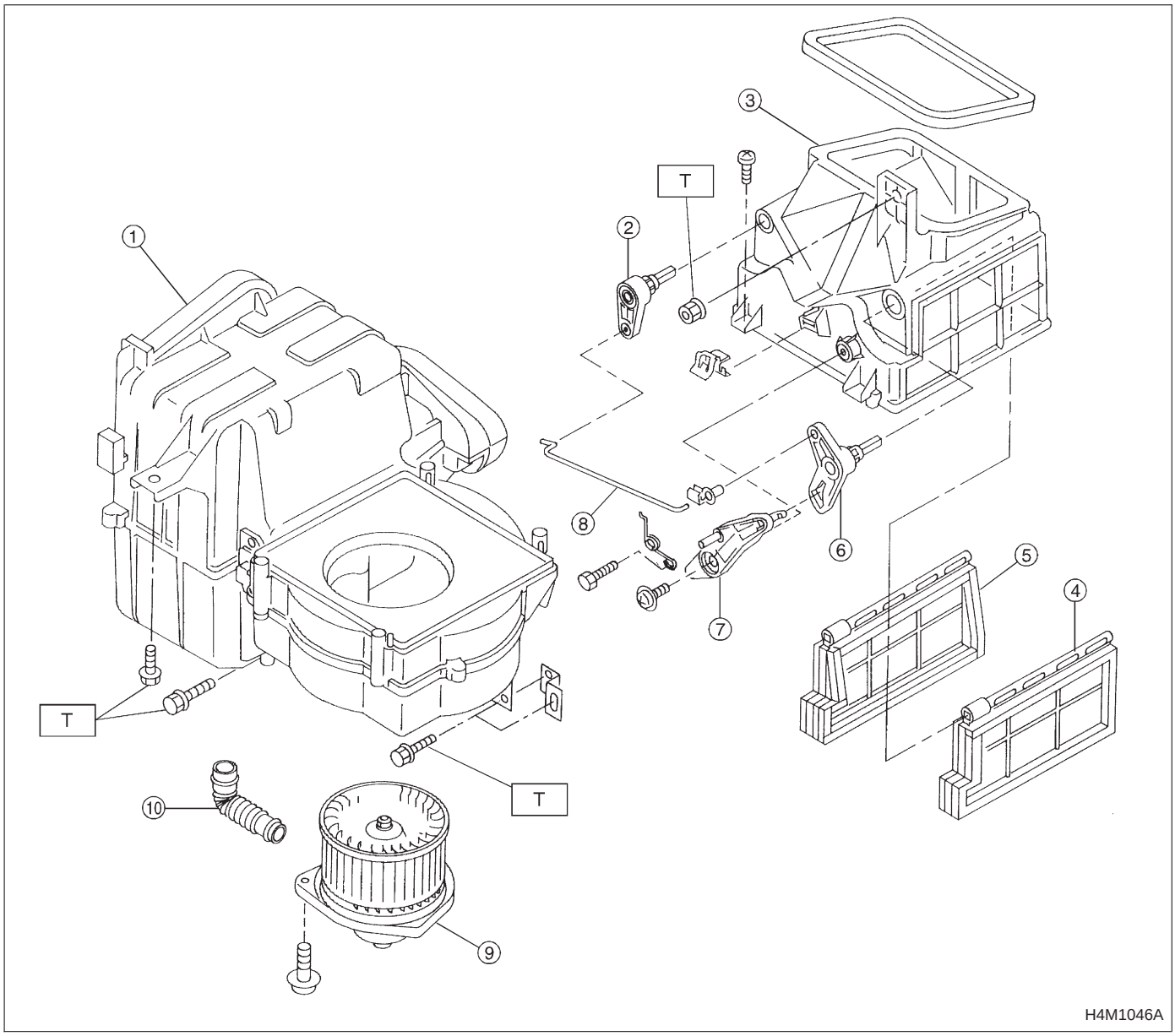
1. Heater Unit



① Vent door
② DEF door
③ DEF lever
④ Heater core
⑤ Heater case FRONT
⑥ Mix door
⑦ Mix lever
⑧ Foot door
⑨ Foot duct
⑩ Heater case REAR
⑪ Foot lever lower
⑫ Foot lever upper
⑬ Vent lever
⑭ Side link

Tightening torque: N·m (kg-m, ft-lb)
T: 7.35±1.96
(0.750±0.200, 5.421±1.446)

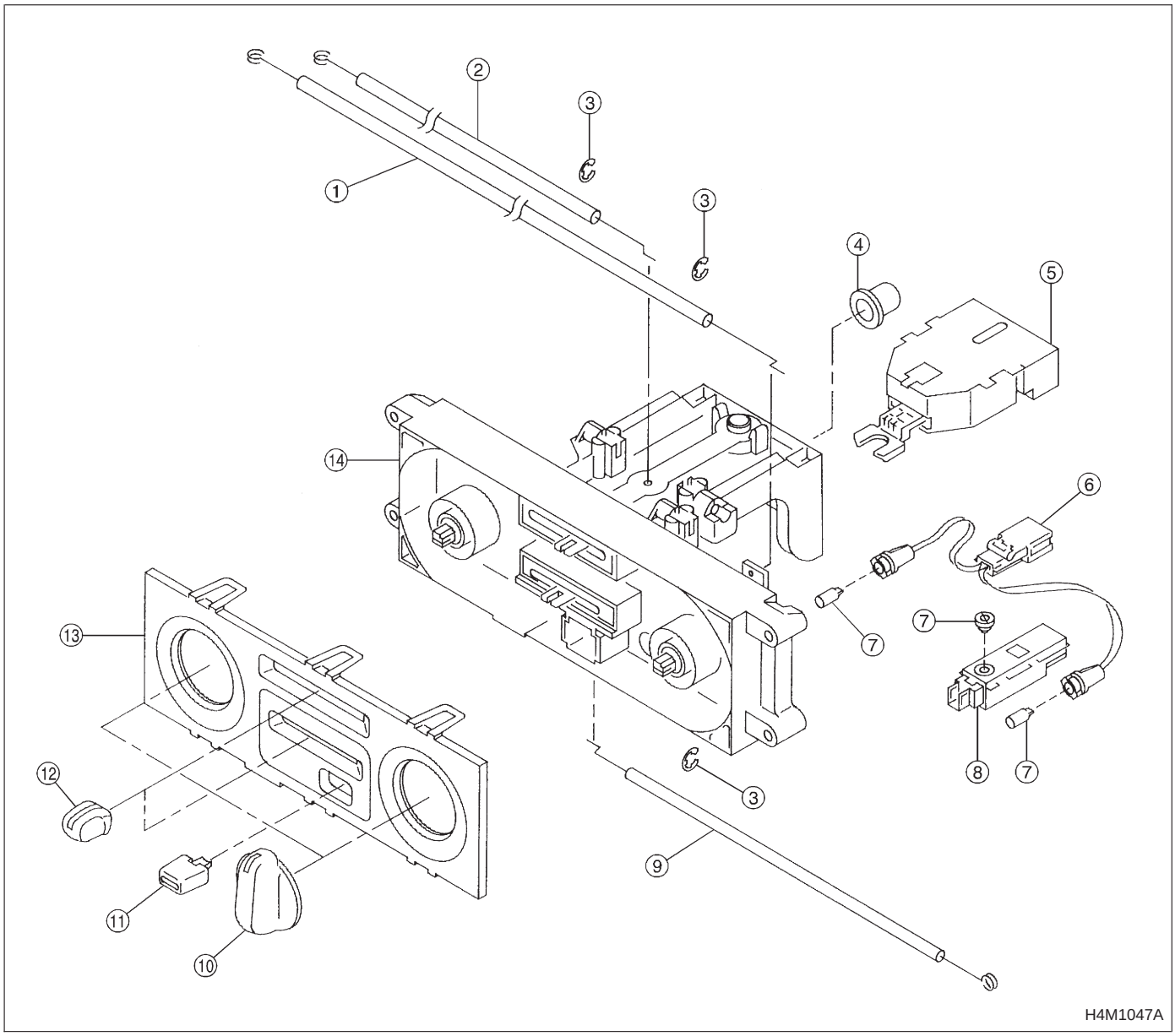
2. Intake Unit



① Intake unit case lower
② Lever (B)
③ Intake unit case upper
④ Door (A)
⑤ Door (B)
⑥ Lever (A)
⑦ Link
⑧ Rod
⑨ Blower motor ASSY
⑩ Aspirator pipe

Tightening torque: N·m (kg-m, ft-lb)
T: 7.35±1.96
(0.750±0.200, 5.421±1.446)

3. Control Unit



① Temperature control cable
② Recirc control cable
③ Clip
④ Grommet
⑤ Blower switch ASSY
⑥ Harness ASSY
⑦ Bulb
⑧ A/C switch ASSY
⑨ Mode control cable
⑩ Control dial knob
⑪ A/C switch knob
⑫ Control lever knob
⑬ Plate
⑭ Base unit

1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed near the instrument panel, heater unit, blower motor and control unit.

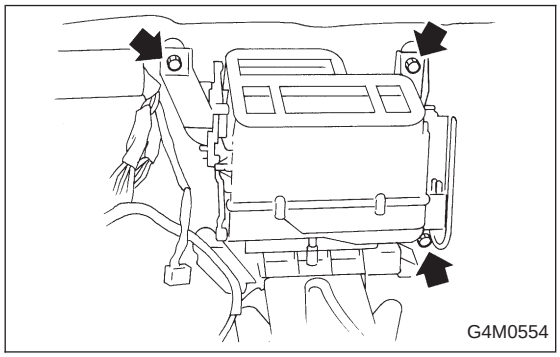
CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the instrument panel, heater unit, blower motor and control unit.

2. Heater Unit

A: REMOVAL AND INSTALLATION

1) Disconnect GND cable from battery.
2) Remove heater hoses (inlet, outlet) in engine compartment.

NOTE:
Drain as much coolant from heater unit as possible, and plug disconnected hose with cloth.
<Ref. to 2-5 [W1A0].>
3) Remove instrument panel.
<Ref. to 5-4 [W1A0].>
4) Remove steering support beam.
<Ref. to 5-1 [C600].>
5) Remove cooling unit.
<Ref. to 4-7 [W14A0].>

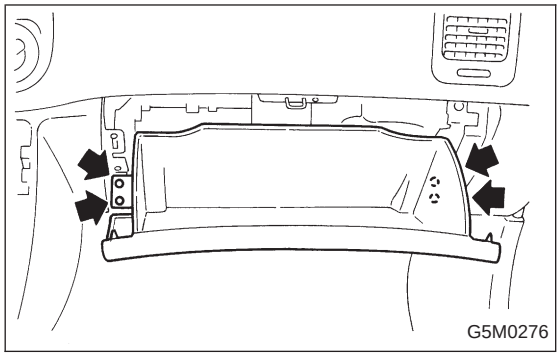

G4M0554

6) Remove heater unit.

7) Installation is in the reverse order of removal.

Fitted length of heater hose over pipe: 27.5±2.5 mm (1.083±0.098 in)

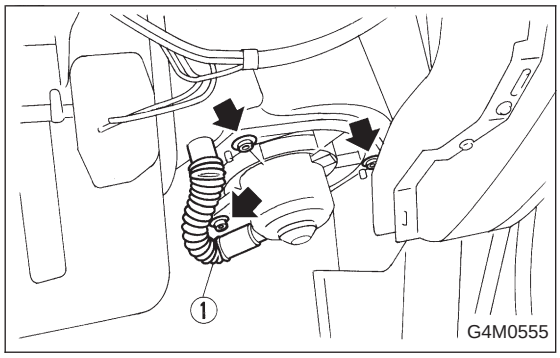
8) Pour coolant.
<Ref. to 2-5 [W1B0].>



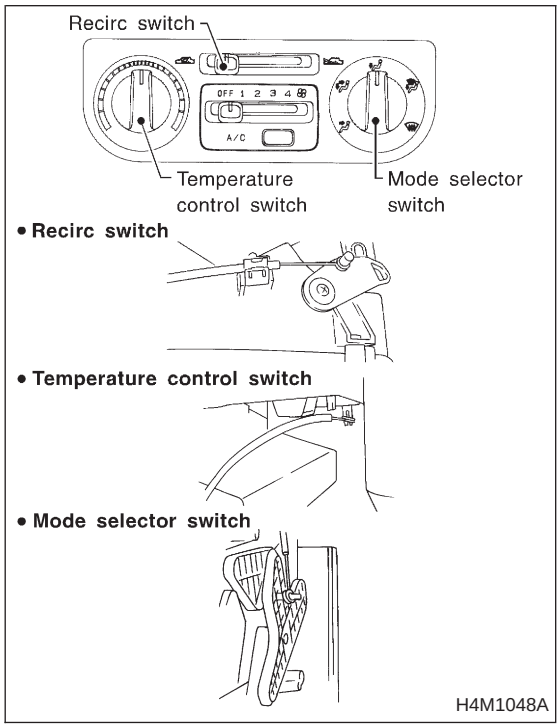
3. Blower Motor Assembly

A: REMOVAL AND INSTALLATION

1) Disconnect GND cable from battery.
2) Remove glove box.
3) Disconnect blower motor harness connector.



4) Disconnect aspirator pipe ①.
5) Remove blower motor mounting screw.
6) Remove blower motor assembly.
7) Installation is in the reverse order of removal.

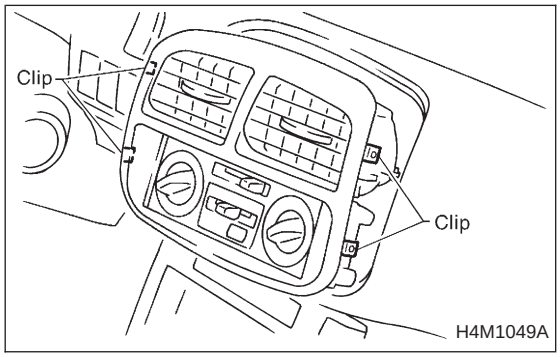


4. Control Unit

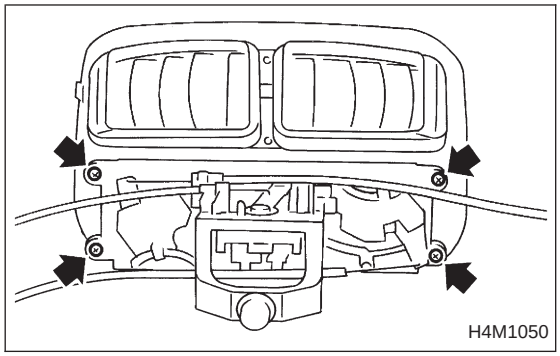
A: REMOVAL AND INSTALLATION

1) Disconnect GND cable from battery.
2) Set temperature control switch to “FULL HOT” and mode selector switch to “DEF” position and recirc switch to “FRESH” position.
3) Disconnect temperature control cable and mode door control cable from heater unit then disconnect recirc control cable from intake unit.

NOTE:
Do not attempt to move links during installation.

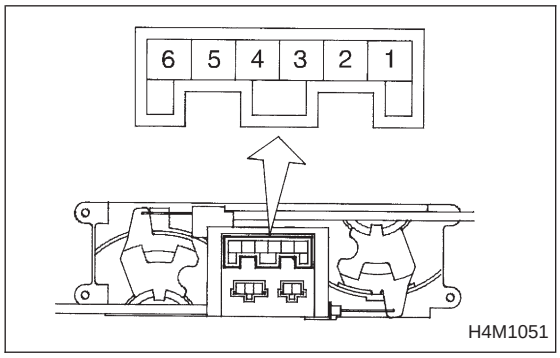


4) Remove center panel from instrument panel then disconnect connectors.


H4M1050

5) Remove control unit assembly from center panel.
6) Installation is in the reverse order of removal.

NOTE:
Before installing control unit, set temperature control switch to “FULL HOT” and mode selector switch to “DEF” position and recirc switch to “FRESH” position.



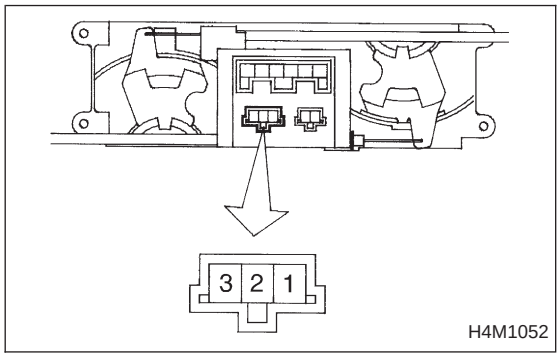
H4M1051

B: INSPECTION

1. FAN SWITCH

Check continuity between terminals at each switch position.

Switch position	Terminals					
	1	2	3	4	5	6
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○
	IGN					GND

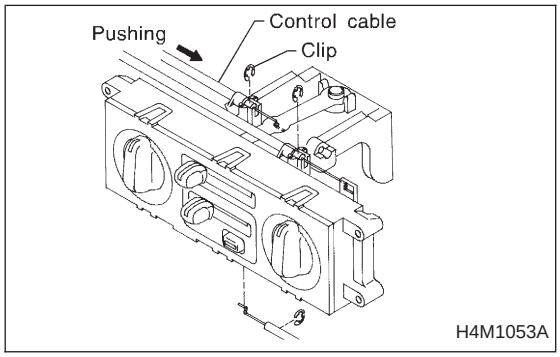


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2. A/C SWITCH

Check A/C switch continuity between each terminal.

Terminal	Switch ON	Illumi.
1		○
2	○	○
3	○	○



H4M1053A

C: ADJUSTMENT

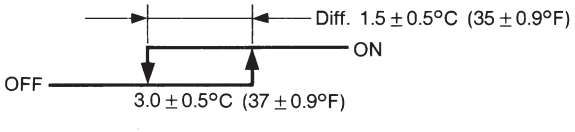
1) Operate temperature control switch to “FULL COLD” and mode selector switch to “VENT” position and recirc switch to “RECIRC” position.
2) Install control cable to lever. While pushing outer cable, secure control cable with clip.

AIR CONDITIONING SYSTEM 4-7

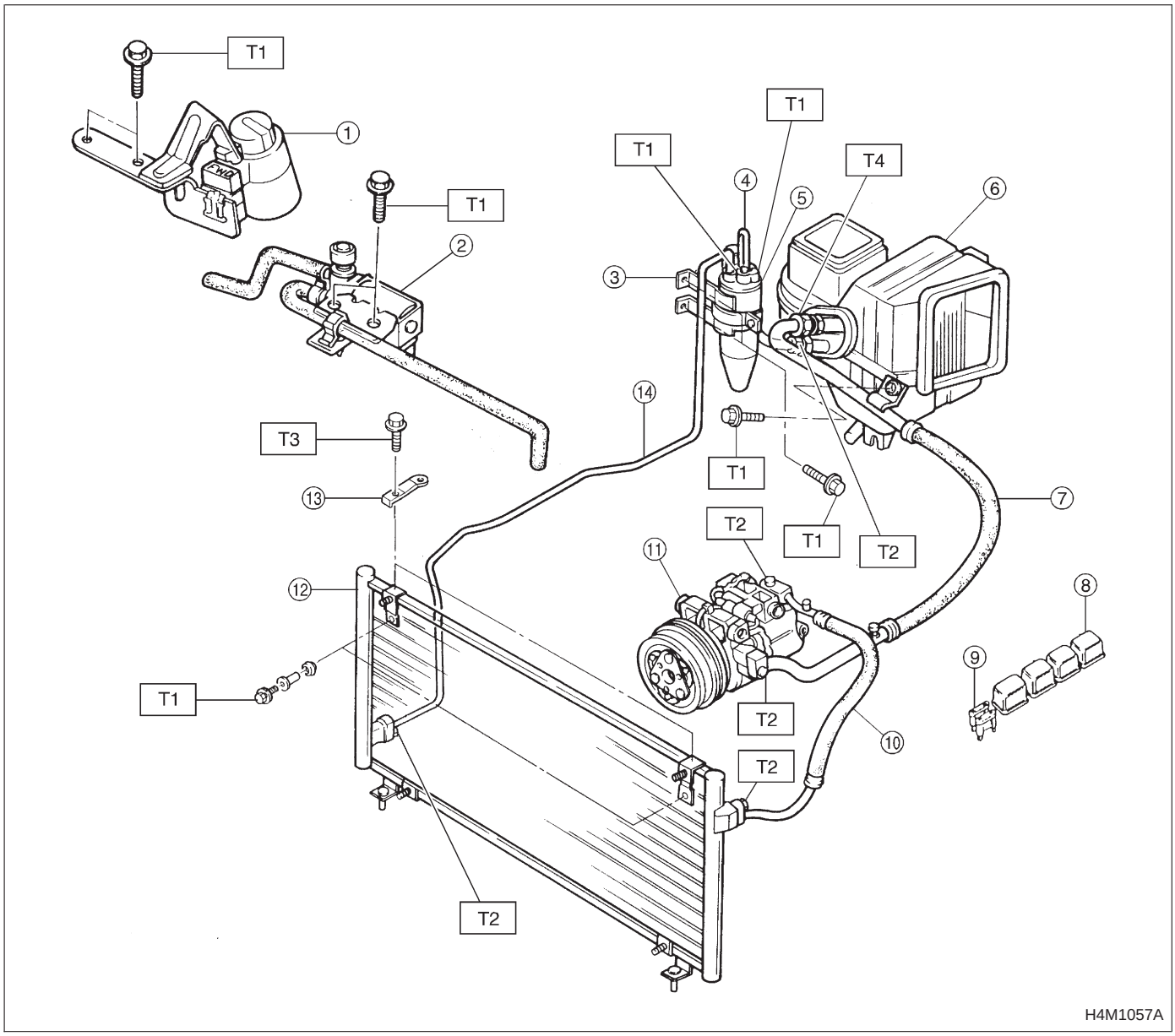
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1. Specifications

Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity			5.234 kW (4,500 kcal/h, 17,856 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.6±0.05 kg (1.3±0.11 lb)]
Compressor		Type	5-vane rotary, fix volume (CR-14)
		Discharge	144 cm^3 (8.79 cu in)/rev
		Max. permissible speed	7,000 rpm
Magnet clutch		Type	Dry, single-disc type
		Power consumption	47 W
		Type of belt	V-Ribbed 4 PK
		Pulley dia. (effective dia.)	125 mm (4.92 in)
		Pulley ratio	2.0/1.8 model: 1.064, 1.6 model: 0.88
Condenser		Type	Corrugated fin (Multi-flow)
		Core face area	0.211 m^2 (2.27 sq ft)
		Core thickness	19 mm (0.75 in)
		Radiation area	5.76 m^2 (62 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	Internal equalizing
Evaporator		Type	Single tank
		Dimensions (W x H x T)	74 x 222 x 235 mm (2.91 x 8.74 x 9.25 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter x width	150 x 75 mm (5.91 x 2.95 in)
		Power consumption	200 W at 12 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	90 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	90 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Idling speed (A/C ON)		MPFI model	850±100 rpm (700±100 rpm "D" range in AT model)
Dual switch (Pressure switch)	Low-pressure switch operating pressure kPa (kg/cm^2, psi)	ON → OFF	176±29 (1.80±0.30, 25.5±4.3)
		OFF → ON	186^{+39}_{-25} ($1.90^{+0.4}_{-0.25}$, $27.0^{+5.7}_{-3.6}$)
	High-pressure switch operating pressure kPa (kg/cm^2, psi)	ON → OFF	2,746±98 (28±1, 398±14)
		DIFF	588±196 (6±2, 85±28)
Compressor relief valve blow-out pressure kPa (kg/cm^2, psi)			3,727±196 (38±2.0, 540±28)
Thermo control amplifier working temperature (Evaporator outlet air)			 G4M0938
Compressor thermocut temperature			140±5°C (284±9°F) Diff. 15±5°C (59±9°F)

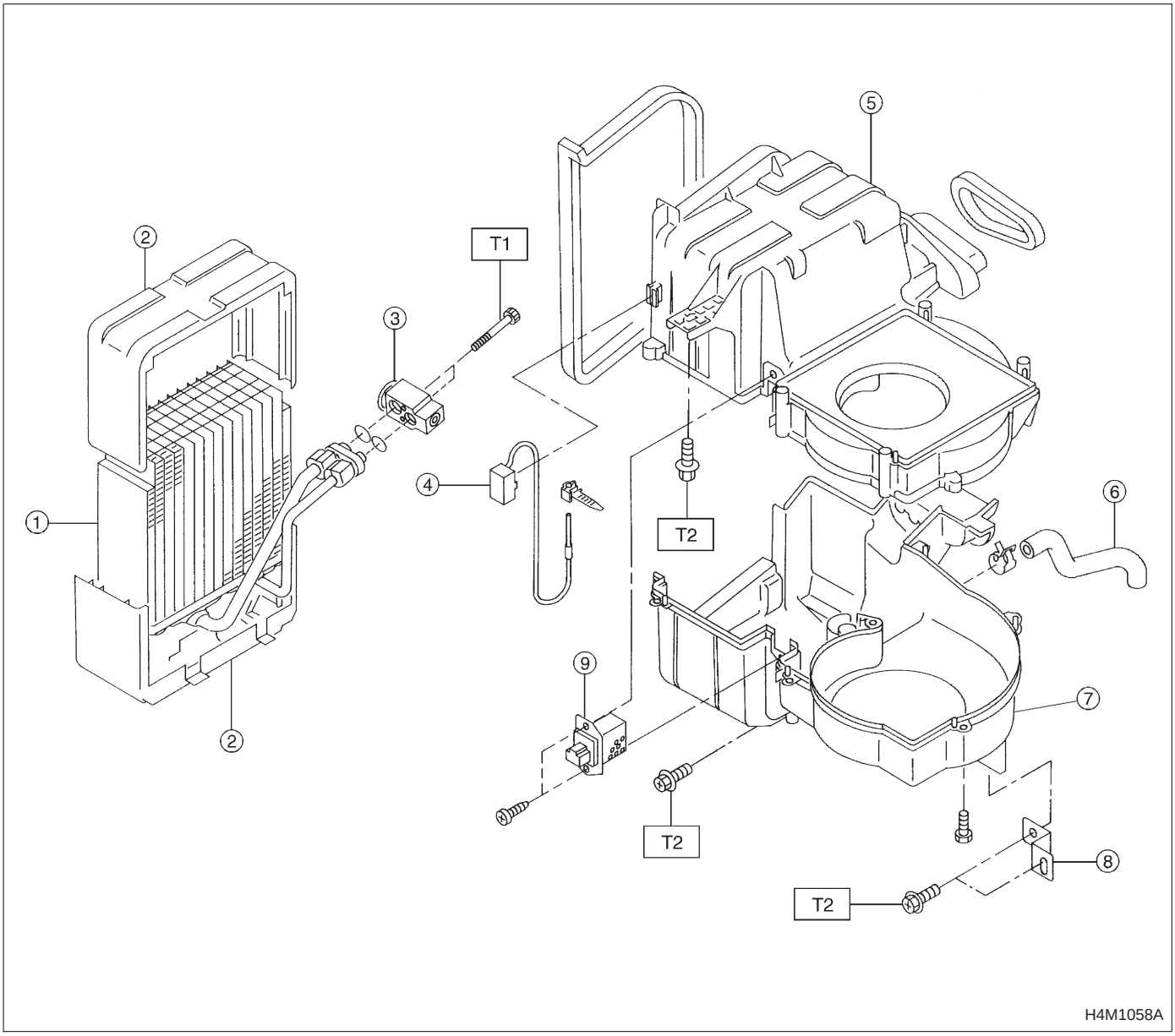
1. Air Conditioning System



① A/C cut relay
② FICD (1800 cc model)
③ Receiver drier bracket
④ Pipe (Receiver drier — C/unit)
⑤ Receiver drier
⑥ Cooling unit
⑦ Hose (Low-pressure)
⑧ A/C relay
⑨ Fuse
⑩ Hose (High-pressure)
⑪ Compressor
⑫ Condenser
⑬ Radiator bracket
⑭ Pipe (Condenser — Receiver drier)

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 18±5 (1.8±0.5, 13±3.6)
T3: 15±5 (1.5±0.5, 11±3.6)
T4: 25±5 (2.5±0.5, 18±3.6)

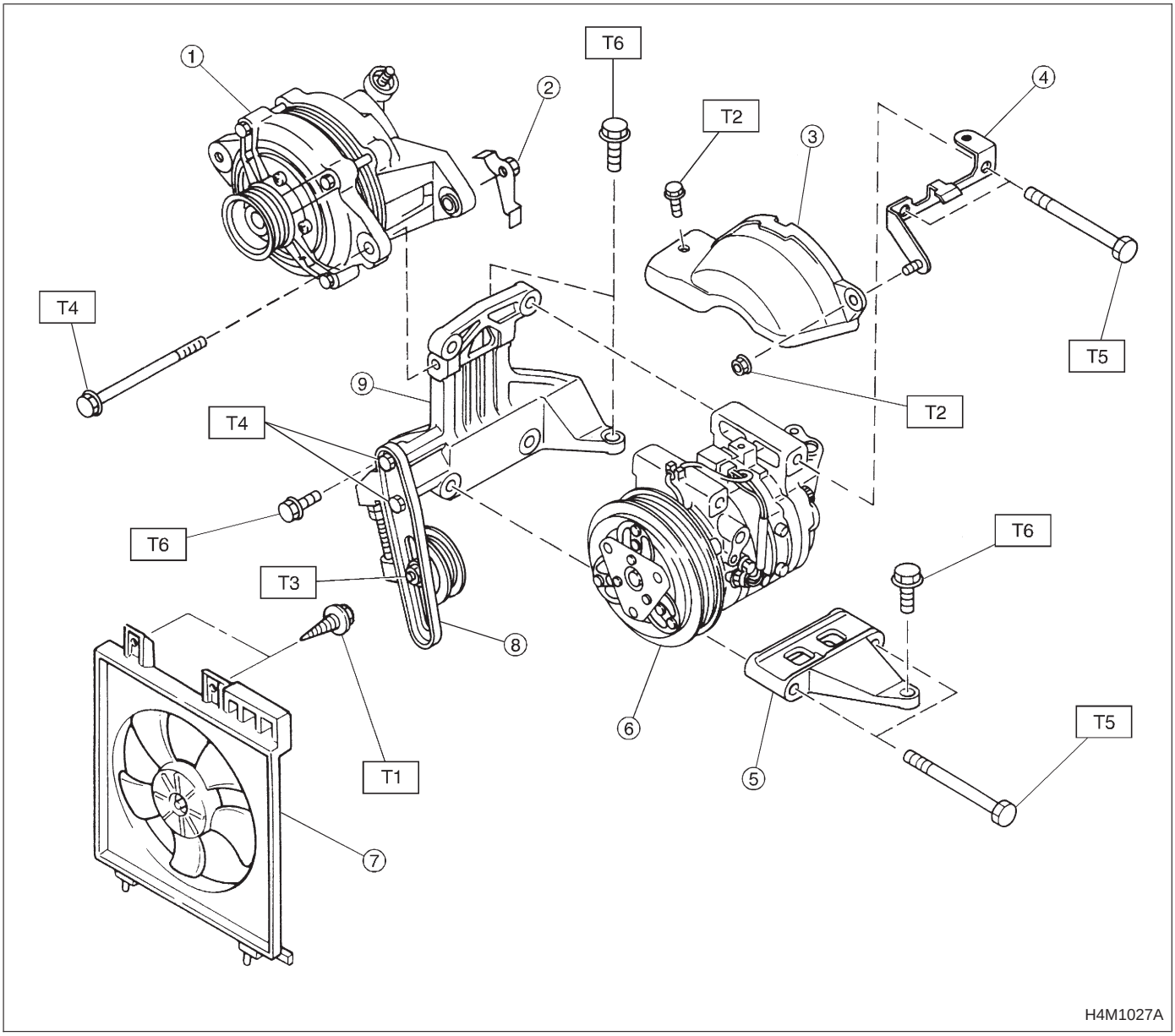
2. Intake Unit with Evaporator



① Evaporator
② Insulator
③ Block expansion valve
④ Thermo control amplifier
⑤ Intake unit case upper
⑥ Drain hose
⑦ Intake unit case lower
⑧ Mount bracket
⑨ Resistor

Tightening torque: N·m (kg-m, ft-lb)
T1: 4±1 (0.4±0.1, 2.9±0.7)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)

3. Compressor



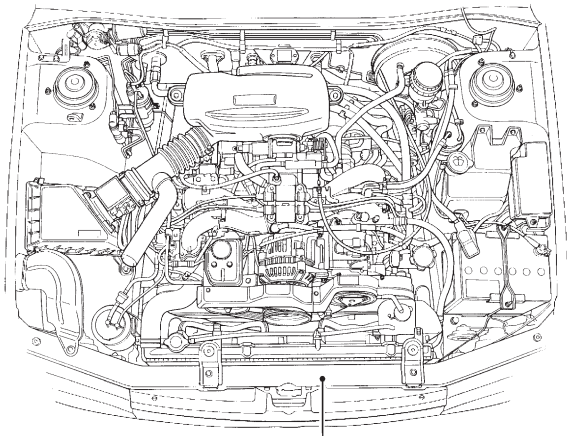
① Alternator
② Alternator bracket nut
③ Compressor belt cover
④ Bracket
⑤ Compressor bracket lower
⑥ Compressor
⑦ Condenser fan motor ASSY
⑧ Idler pulley ASSY
⑨ Compressor bracket upper

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1.5 (0.5±0.15, 3.6±1.1)
T2: 7.4±2 (0.75±0.2, 5.4±1.4)
T3: 23±3 (2.3±0.3, 17±2.2)
T4: 23.0±3 (2.35±0.3, 17.0±2.2)
T5: 28.9±4.4
(2.95±0.45, 21.3±3.3)
T6: 35±4 (3.6±0.4, 26±2.9)

1. Safety Precautions

A: HFC-134a AIR CONDITIONING SYSTEM

Component parts of the cooling system, refrigerant, compressor oil, and other parts are not the same for the HFC-134a system and the older CFC-12 system. Do not interchange parts or liquid.
Vehicles with HFC-134a air conditioning systems, use only HFC-134a parts that are indicated on a label attached to the vehicle. Before performing any maintenance, verify the type of air conditioning system installed in the vehicle.



SUBARU TOKYO JAPAN
AIR CONDITIONER (LI-TYPE)
REFRIGERANT CHARGE:
HFC134a, 19-23 OZ (0.55-0.65kg)
COMPRESSOR OIL : DH-PR
COMPRESSOR BELT: 73323FA030 (1.6L)
73323AC000 or 73323AC010(1.8L,2.0L,2.2L)
REFRIGERANT UNDER HIGH PRESSURE.
CONSULT SERVICE MANUAL.
CAUTION: SYSTEM TO BE SERVICED BY QUALIFIED PERSONNEL.
SAE J639

CAUTION: USE ONLY REFRIGERANT HFC134a AND OIL DH-PR FOR THIS AIR CONDITIONER. DON'T USE REFRIGERANT CFC12 AND OIL DH-150CX.
ATTENTION: UTILISEZ LE LIQUIDE RÉFRIGÉRANT HFC134a ET L'HUILE DH-PR DANS CE CLIMATISEUR. NE JAMAIS UTILISER LE RÉFRIGÉRANT CFC12 ET L'HUILE DH-150CX.
VORSICHT: NUR KÄL TEMITTEL HFC134a UND ÖL DH-PR FÜR DIESE KLIMAANLAGE VERWENDEN. NIEMALS KÄL TEMITTEL CFC12 UND ÖL DH-150CX.

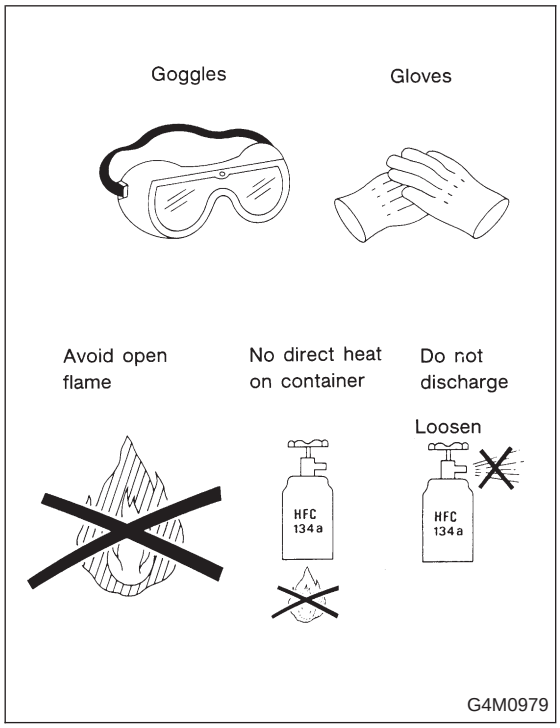
H4M1065A

B: COMPRESSOR OIL

Do not use any compressor oil that is not specifically designated for the HFC-134a air conditioning system; only use DH-PR. Also, do not use HFC-134a compressor oil in the CFC-12 air conditioning system. If compression oils are mixed, poor lubrication will result and the compressor itself may be damaged.
Because HFC-134a compressor oil is very hygroscopic (easily absorbs moisture), when parts of the air conditioning system are being removed, quickly install a blind plug to prevent contact with the outside air. Also, always make sure that the service container for compressor oil is tightly closed except when in use. Store compressor oil in a tightly closed steel container.

C: REFRIGERANT

Do not put CFC-12 refrigerant into a HFC-134a air conditioning system. Also, do not put HFC-134a refrigerant into a CFC-12 air conditioning system. If the wrong refrigerant is used, poor lubrication will result and the compressor itself may be destroyed.



D: HANDLING OF REFRIGERANT

Because refrigerant boils at approx. −30°C (−22°F) at sea level, it is cold enough to give you severe frostbite. Always wear goggles to protect your eyes and gloves to protect your hands. Also, even under the pressures normally found in CFC-12 containers, refrigerant will boil with the addition of heat. This could raise the pressure inside the container to a dangerous level.

Never expose a can of HFC-134a to direct sunlight, or to temperatures over 40°C (104°F). One more thing to remember about HFC-134a is that when it is exposed to an open flame or to hot metal, it forms phosgene, a deadly gas. Do not discharge HFC-134a into the atmosphere on purpose. Always read and follow the precautions on the HFC-134a bottle.

2. Basic Information

1) The combination of moisture and refrigerant forms acid, therefore, moisture should not be allowed to enter the refrigerant.
2) Refrigerant oil readily absorbs moisture, therefore, keep refrigerant oil containers tightly capped.
3) The process of evacuating the system is performed to remove small amounts of moisture. This is accomplished by lowering the pressure inside the system, which allows the moisture to boil off, in much the same way that a pot of water will boil away to nothing given enough time. The evacuation process does not suck the moisture out of the system.
4) A minimum level of vacuum must be reached to satisfactorily evacuate the system. This minimum level of vacuum depends on the temperature inside the system. The chart below shows the level of vacuum required to boil water at various temperatures.
Additionally, the vacuum level shown on a gauge will read approx. 4 kPa (25 mmHg, 1 inHg) less for each 304.8 m (1,000 ft) above sea level, due to the decrease in atmospheric pressure at altitude.

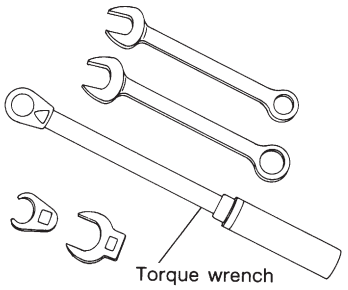
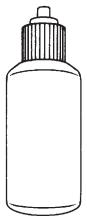
Vacuum level required to boil water (at sea level)	
Temperature °C (°F)	Vacuum kPa (mmHg, inHg)
1.7 (35)	100.9 (757, 29.8)
7.2 (45)	100.6 (754, 29.7)
12.8 (55)	99.9 (749, 29.5)
18.3 (65)	99.2 (744, 29.3)
23.9 (75)	98.5 (739, 29.1)
29.4 (85)	97.2 (729, 28.7)
35 (95)	95.8 (719, 28.3)

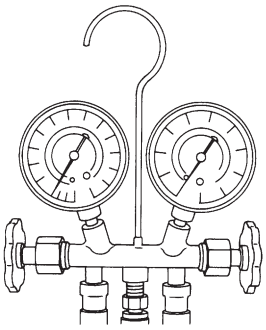
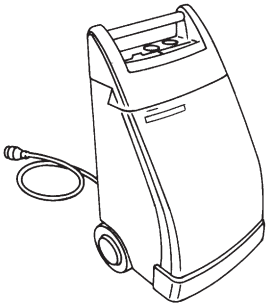
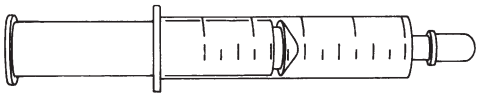
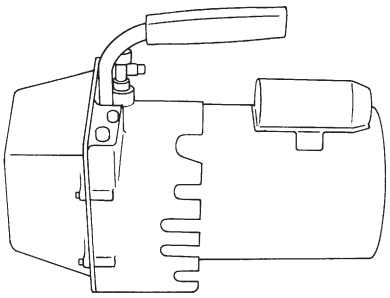
3. Tools and Equipment

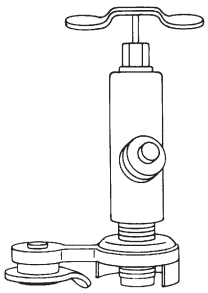
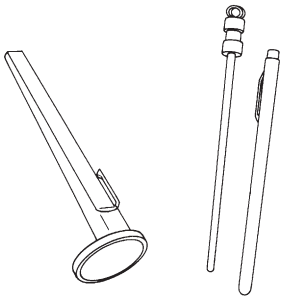
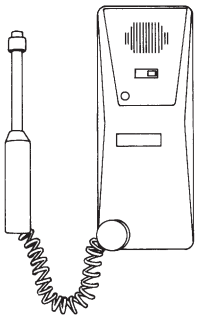
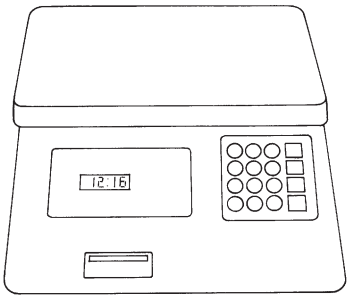
The following section provides information about the tools and equipment that will be necessary to properly service the A/C system.
Since equipment may vary slightly depending on the manufacturer, it is important to always read and follow the manufacturer's instructions.

CAUTION:
When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
● WRENCH Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.	 G4M0571
● APPLICATOR BOTTLE A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.	 G4M0572

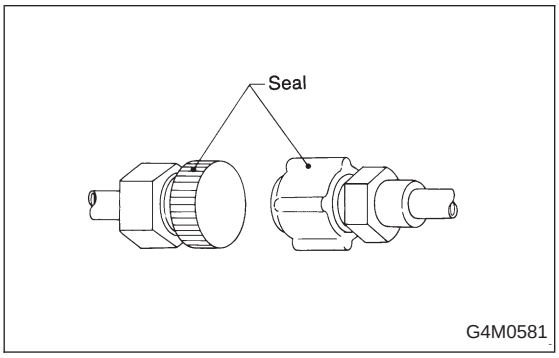
Tools and Equipment	Description
● MANIFOLD GAUGE SET A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.	 G4M0573
● REFRIGERANT RECOVERY SYSTEM A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.	 G4M0574
● SYRINGE A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.	 G4M0575
● VACUUM PUMP A **VACUUM PUMP** (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.	 G4M0576

Tools and Equipment	Description
● CAN TAP A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.	 G4M0577
● THERMOMETER Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.	 G4M0578
● ELECTRONIC LEAK DETECTOR An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an A/C equipment supplier.	 G4M0579
● WEIGHT SCALE A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.	 G4M0580

4. O-ring Connections

A: GENERAL

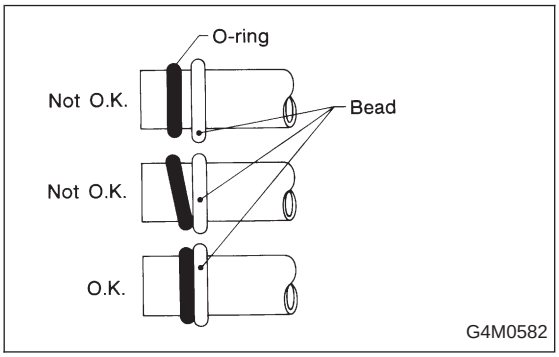
The following points should be kept in mind when assembling O-ring connections:
1) Avoid unnecessary handling and contact of O-rings with your hands, since even clean fingers contain body acids, which can contaminate the O-ring surface.
2) Do not handle O-rings with gloves, shop towels, etc., since lint particles may cling to the O-ring, possibly causing a leak upon assembly.
3) Always lubricate O-rings before assembly to allow the O-ring to seat itself properly.
4) Be certain to use torque wrenches when tightening O-ring fittings, because overtightening can not only damage the O-ring, but it can distort the tube end as well.



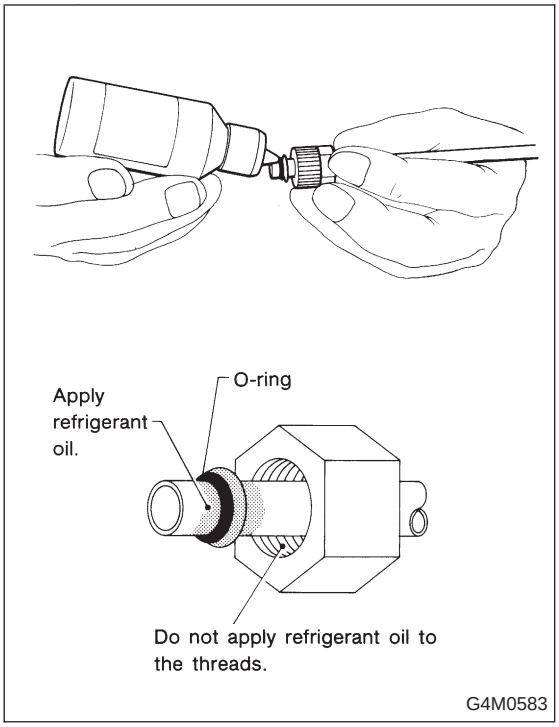
B: REMOVE PROTECTIVE SEALS

1) Just prior to making the connection, remove the protective seals.

CAUTION:
If for any reason you have to stop before making a connection, recap the tube, component or fitting.

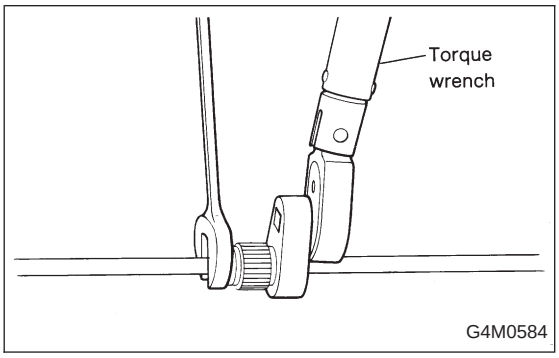


2) Visually inspect the O-ring surface, the O-ring mating surface, the threads and the connection points. If a defective part is found, replace it.
The O-ring must sit square against the tube bead. If necessary, slide the O-ring into proper position with clean hands.



C: LUBRICATE THE COMPONENTS

For lubrication of the components, use only refrigerant oil as described in the appropriate service manual. Apply oil from an oil squirt gun or other closed container. Do not use your finger to spread the oil over the O-ring.
Apply a small amount of refrigerant oil to the top and sides of the O-ring. The area covered by oil should include the O-ring and the tube bead.



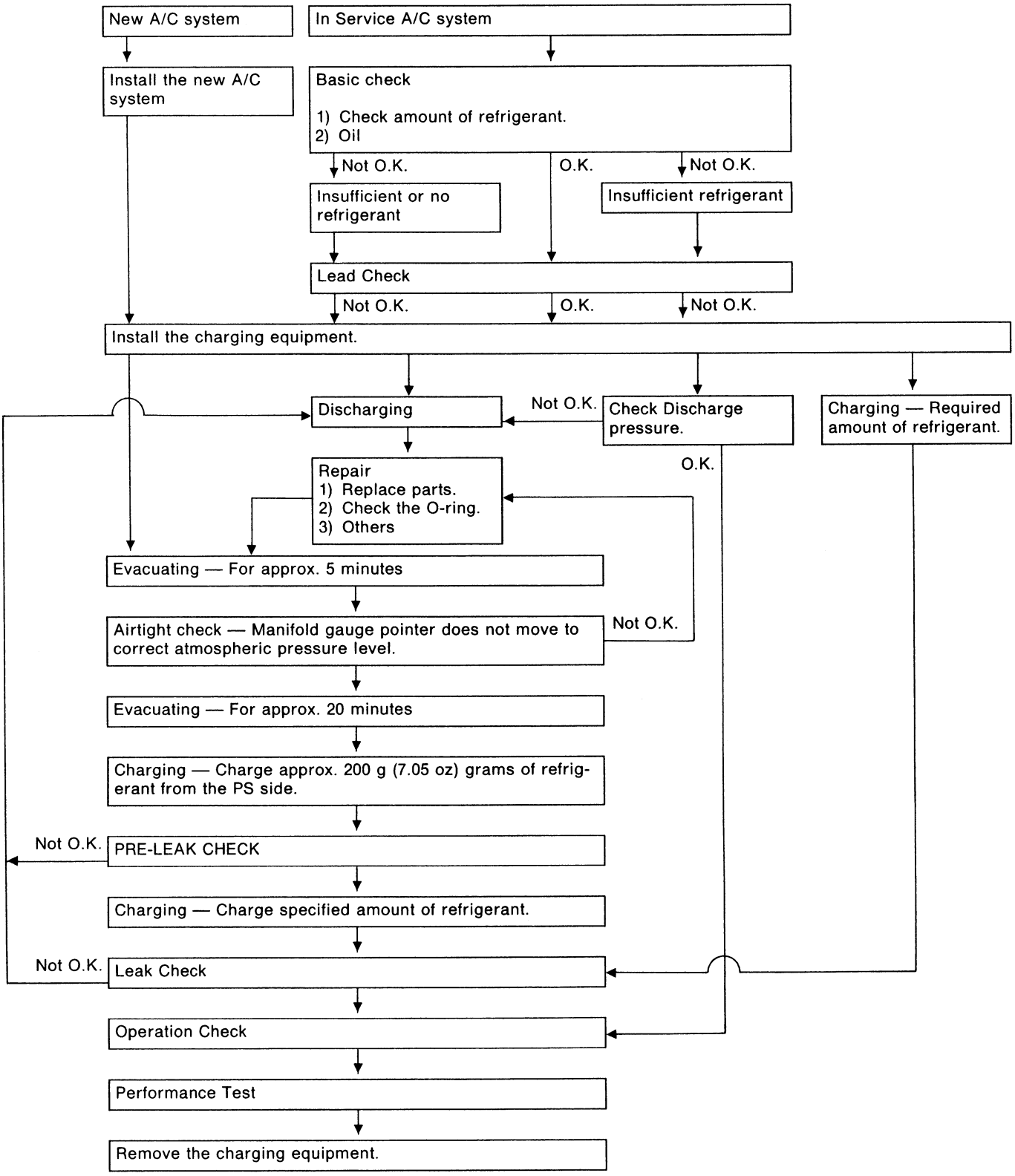
D: TORQUE THE FITTING

Using a back-up wrench in conjunction with a calibrated torque wrench, torque the connection to the midrange of the specification.
After completion of torquing, use a clean shop towel to remove any excess oil from the connection or any oil that may have dripped on the vehicle body or other parts.

CAUTION:
If a leak is suspected after torquing, do not retighten or retorque the connection. Instead, disassemble the connection, remove the O-ring, and inspect the O-ring, threads, joints and seating surfaces.

5. Refrigerant Service Procedure

A: WORK FLOW

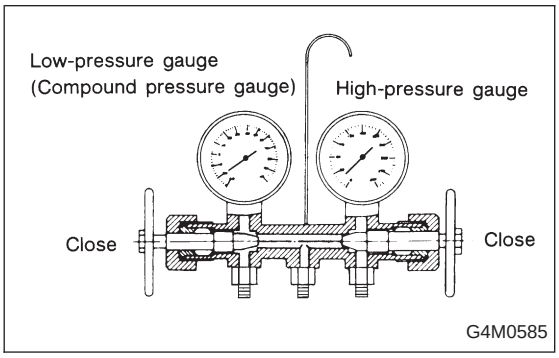


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6. Discharge the System

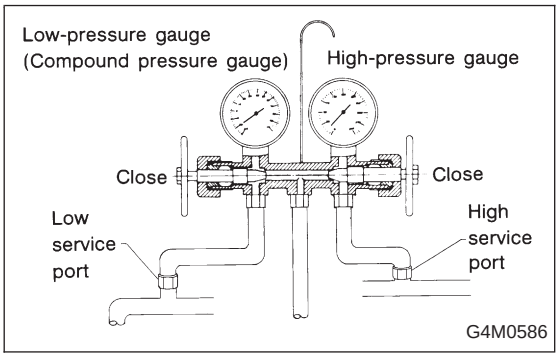
CAUTION:
The following points must be kept in mind when discharging the system.
- **Be certain that goggles and gloves are worn.**
- **Connect refrigerant recovery system to manifold gauge set and remove recycle refrigerant from the A/C system.**

NOTE:
Refer to that refrigerant recovery system instruction manual for operating procedures.



A: CONNECTING THE MANIFOLD GAUGE SET

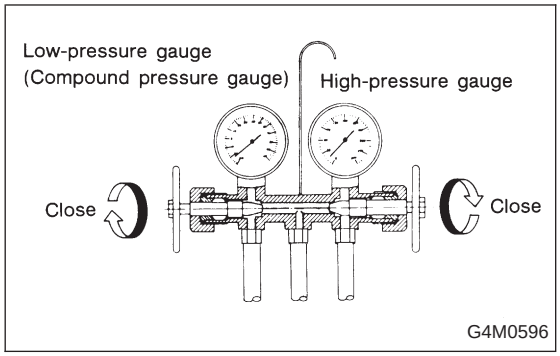
1) Close the high and low side manifold valves



2) Turn the A/C system ON and turn the IG switch OFF.
3) Attach the high- and low-pressure manifolds to the high and low services port on the vehicle.

B: PREPARE FOR DISCHARGING

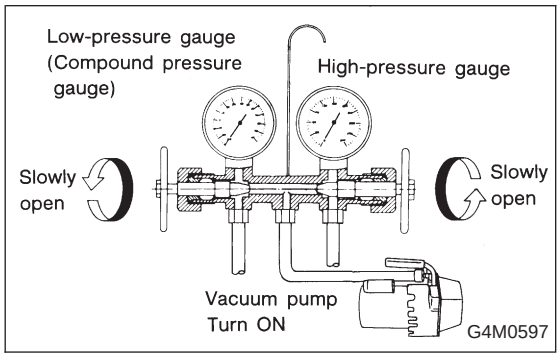
Connect center manifold hose to refrigerant recovery system to recycle refrigerant.



7. Evacuating and Charging

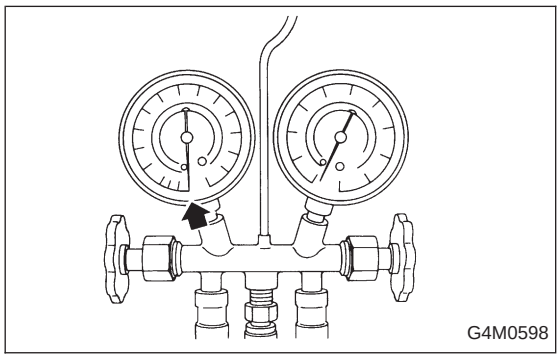
The following points should be kept in mind when evacuating and charging with a manifold gauge set:
1) Be certain that goggles and gloves are worn.
2) If bulk refrigerant [13.6 kg (30 lb) canister] is used, be certain to weigh the charge amount carefully, using the correct equipment, to avoid overcharging the system.
3) The charging procedure described in this section begins by charging liquid refrigerant into the high-pressure side of the system with the engine off. The procedure is completed by charging refrigerant vapor into the low-pressure side of the system with the engine running.

CAUTION:
Never open the high-pressure manifold valve when the engine is running.



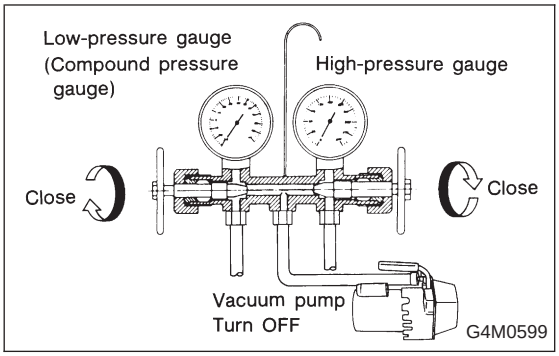
A: CONNECT THE GAUGE SET

1) Close the high- and low-pressure manifold valves
2) Attach the low-pressure manifold hose to the low-pressure service port on the vehicle. Check the low-pressure gauge. If more than 68.6 kPa (0.70 kg/cm^2, 10 psi) is indicated, discharge the system prior to charging.
3) Attach the high-pressure manifold hose to the high-pressure service port on the vehicle.
4) Connect the center hose from the manifold to the vacuum pump.
5) Turn on the vacuum pump.
6) Slowly open the low-pressure manifold valve.
7) When the low-pressure gauge reaches approximately 66.43 kPa (498.3 mmHg, 19.62 inHg), slowly open the high-pressure manifold valve.



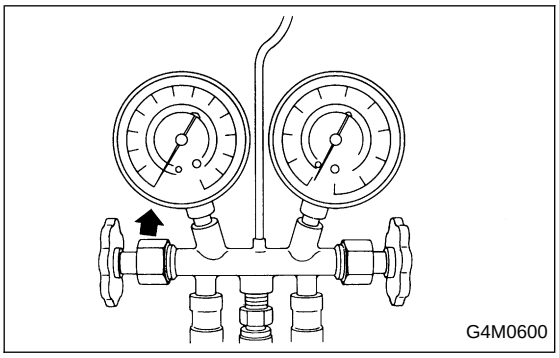
8) Maintain a minimum vacuum level of 100.56 kPa (754.4 mmHg, 29.70 inHg) for a minimum of 15 minutes on a new system or 30 minutes for an in-service system.

NOTE:
The gauge will read 4 kPa (25 mmHg, 1 inHg) less for every 304.8 m (1,000 ft) above sea level.

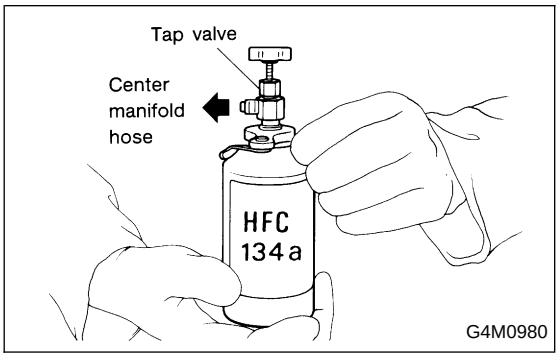


B: PERFORM A VACUUM LEAK TEST

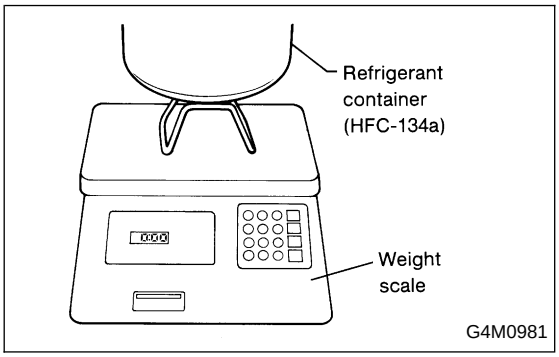
1) After 15 minutes (or more) of evacuation, close the high-pressure manifold valve.
2) Close the low-pressure manifold valve.
3) Turn off the vacuum pump.



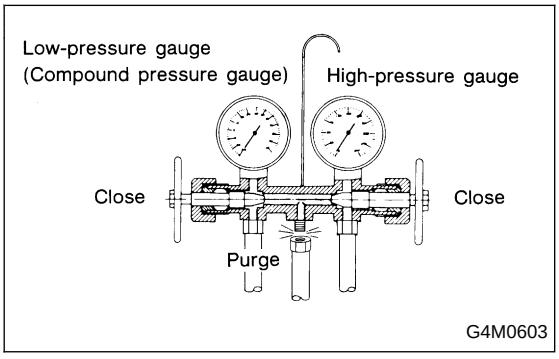
4) Note the low side gauge reading.
5) After 5 minutes, re-check the low-pressure gauge reading.
If the vacuum level has changed more than 4 kPa (25 mmHg, 1 inHg), perform an HFC-134a leak test.
If the vacuum reading is about the same as noted in step 4), continue on to next step.



6) Carefully attach the can tap to the refrigerant can by following the can tap manufacturer's instructions.
7) Disconnect the center manifold hose from the vacuum pump and connect the hose to the tap valve.



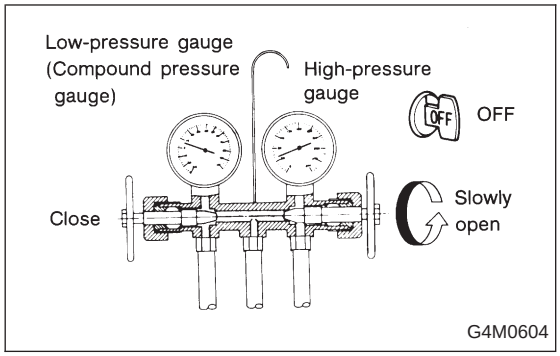
8) If a 13.6 kg (30 lb) container of refrigerant is used a weight scale will be needed. This scale is to determine the amount of refrigerant that is used.
Connect the center hose from the manifold to the valve. Place the 13.6 kg (30 lb) container on the scale, valve end down.



C: PURGE THE CENTER HOSE

CAUTION:
Be certain that goggle and glove are worn.

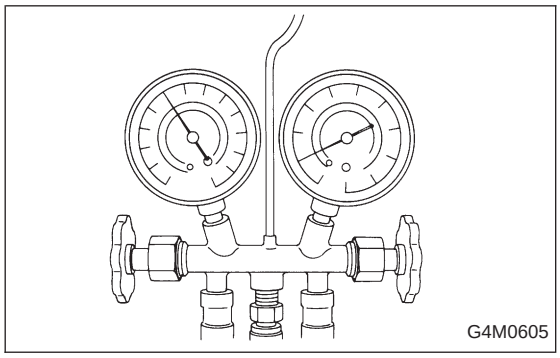
1) Verify that all three hose connections are tight at the manifold gauge set.
2) Open the valve on the HFC-134a source.
3) Loosen the center hose connection at the manifold and allow the HFC-134a to escape for no more than two or three seconds, then quickly retighten the hose fitting at the manifold.



D: INITIAL CHARGING THROUGH THE HIGH SIDE

1) Connect a tachometer to the engine.
2) With the engine off, start charging by slowly opening the high-pressure manifold valve.

NOTE:
The initial charge rate can be increased by immersing the can in lukewarm [below 38°C (100°F)] water for a short time.

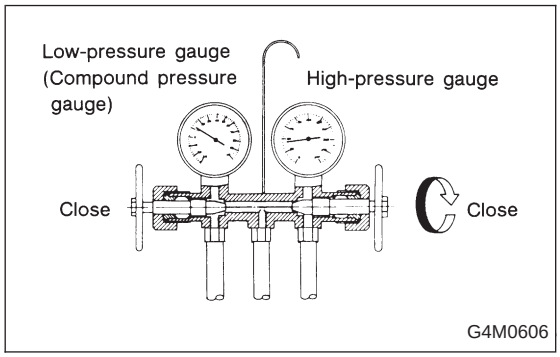


E: CHECK THE GAUGE READINGS

When both the high- and low-pressure gauge readings are about equal, or the HFC-134a source is empty, or the system has been filled to specifications, close the high-pressure manifold valve.

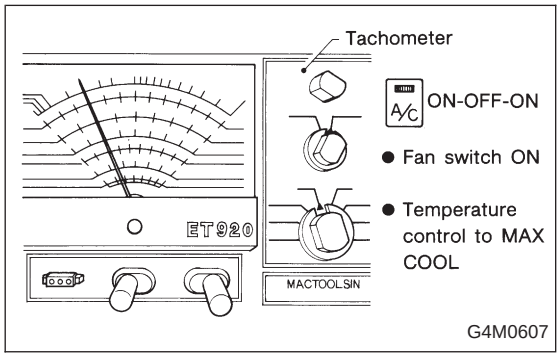
F: ADD ADDITIONAL CANS

If the HFC-134a source is exhausted, first close the high-pressure manifold valve, second, close the can tap valve, then slowly purge the refrigerant from the service hose by loosening the fitting at the can tap.

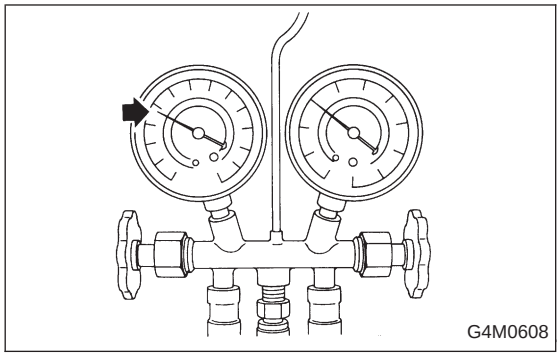


G: COMPLETE CHARGING THROUGH THE LOW SIDE

1) Verify that the high-pressure manifold valve is closed (should have already been closed).
2) Verify that the low-pressure manifold valve is closed (should have already been closed).



3) With the A/C switch off and the windows rolled down, start the engine and run at idle rpm.
4) Set the A/C controls on maximum cool and set the blower speed on the highest setting.
5) Quickly turn the A/C switch on-off-on-off a few times to prevent initial compressor damage due to “load shock.” Finish this operation with the A/C switch in the ON position.
6) Raise engine rpm to approximately 1,500 rpm.



H: CHARGE THE SYSTEM

1) With the refrigerant source connected and the service hose purged, slowly open the low-pressure manifold valve, while checking the low-pressure gauge reading.

CAUTION:
The refrigerant source must be positioned for vapor (valve up).

2) Keep the low side pressure below 276 kPa (2.81 kg/cm^2, 40 psi) by using the low-pressure manifold valve to regulate the flow of refrigerant into the system.
3) When the system is fully charged, close the low- pressure manifold valve.
4) Close the valve at the refrigerant source.

- Refrigerant capacity

Refrigerant	Minimum	Maximum
HFC-134a	0.55 (1.21)	0.65 (1.43)
		Unit: kg (lb)

I: COMPLETE ALL SYSTEM CHECKS

1) Evaluate the system performance. <Ref. to 4-7 [K200].>
2) Perform leak detection test. <Ref. to 4-7 [W8A0].>

CAUTION:
Always perform leak checking in an environment free of refrigerant pollution.
Do not disconnect the high- or low-pressure hoses from the vehicle before leak checking.

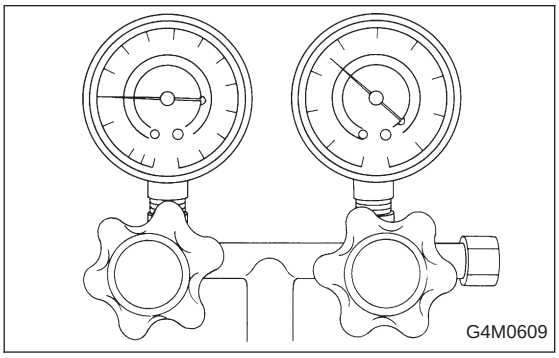
J: DISCONNECT THE MANIFOLD GAUGE SET

Remove the high- or low-pressure hoses from the service ports and install the service port caps.

8. Leak Testing

A: INSPECTION

The following points should be kept in mind when conducting a refrigerant leak test.
1) The A/C system to be tested must have an adequate refrigerant charge to begin with.
2) The area where the leak test is conducted must be free of wind and drafts, with still air being the ideal condition.
3) The atmosphere where the leak test is conducted must be free of refrigerant contamination.
4) Operate the A/C system for approx. 10 minutes, then turn the engine off and begin the leak test.
5) Refrigerant gas is heavier than air, therefore always hold the probe below the connection being tested.
6) When checking for a leak along a length of hose or tube, the leak detector probe must be moved slowly, approx. 25 mm (1 in) per second making sure probe does not come in contact with the component being tested.
7) When checking for a leak at a certain point, the leak detector probe must be held at that point for at least 5 seconds.


G4M0609

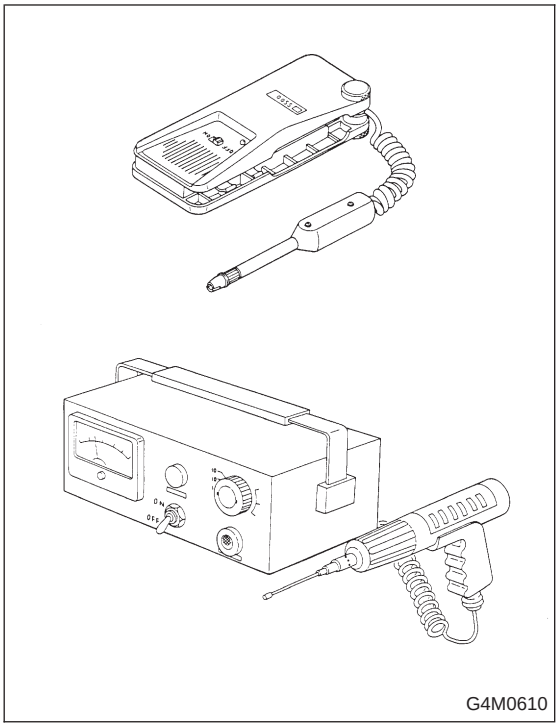
1. CHECK THE SYSTEM PRESSURE

With gauges connected to the A/C system, operate the A/C and confirm that the high side pressure is above 690 kPa (7.03 kg/cm^2, 100 psi). If not, evacuate and charge the system before leak checking. <Ref. to 4-7 [W700].>

2. CLEAN CONNECTIONS BEFORE TESTING

Before testing, use a clean shop towel to wipe off refrigerant oil, dirt, or foreign material from all of the connections and components to be tested.

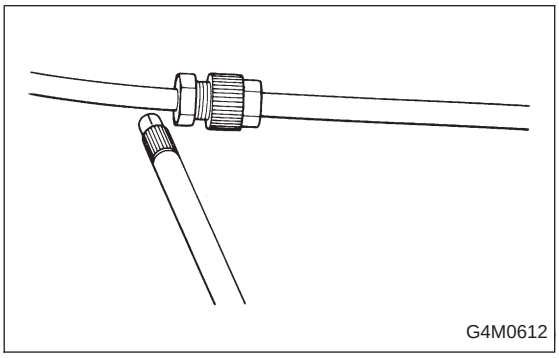
NOTE:
Since refrigerant oil absorbs refrigerant, excess oil on or near a connection may falsely signal a leak.


G4M0610

3. CALIBRATE LEAK DETECTOR

Refer to the manufacturer's instructions for the particular type of detector used and calibrate the instrument.

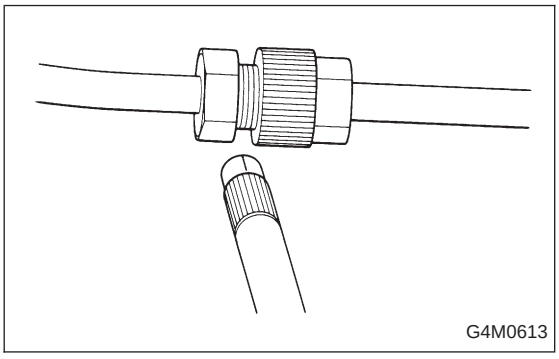
CAUTION:
Always make sure that the probe tip filter is clean and free of contamination.


G4M0612

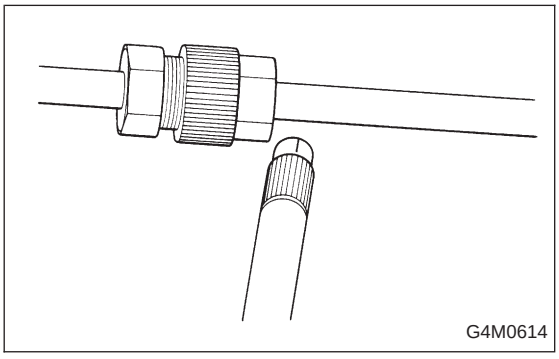
4. LEAK TEST — HIGH-PRESSURE SIDE

Operate the A/C system for approx. 10 minutes, then turn the engine off and begin the leak test.
1) Begin at the connection of the high-pressure tube to the evaporator, and work your way along the high-pressure side of the system to the compressor. There are three places to check each tube connection.
2) Check the area.

- Check the area where the fitting meets the tube.


G4M0613

- Check the area where the two parts of the fitting join each other.


G4M0614

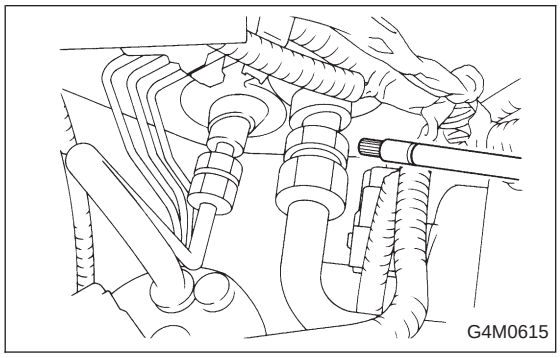
- Check the area where the nut meets the tube.

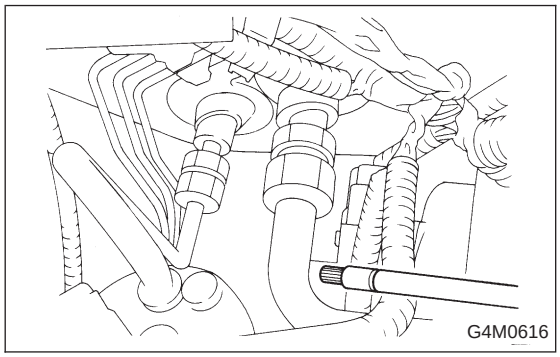
3) Check the area of the pressure switch (dual switch), and also check the seams of the receiver drier.
4) Check the connections of the tubes to the condenser, and also check any welded joints on the condenser.

CAUTION:
An oily area on the fins of the condenser may indicate a leak.

5) Check the area where the hoses attach to the compressor.
6) Check around the machined portions of the compressor (where the compressor sections join each other).
7) If equipped, check the thermal limiter on the compressor housing.
8) Check the compressor shaft seal by probing near the center of the compressor clutch pulley.

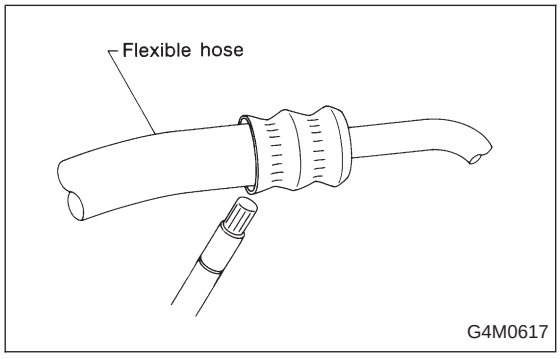
NOTE:
Some shaft seals have a very slight amount of normal leakage [approximately 28 g (1.0 oz) per year].


G4M0615


G4M0616

5. LEAK TEST — LOW-PRESSURE SIDE

1) Begin at the connection of the low pressure tube to the evaporator, and work your way along the low-pressure of the system to the compressor. There are three places to check on each tube connection.
2) Check the area.
   (1) Check the area where the fitting joins the tube.
   (2) Check the area where the two parts of the fitting join each other.
   (3) Check the area where the nut joins the tube.

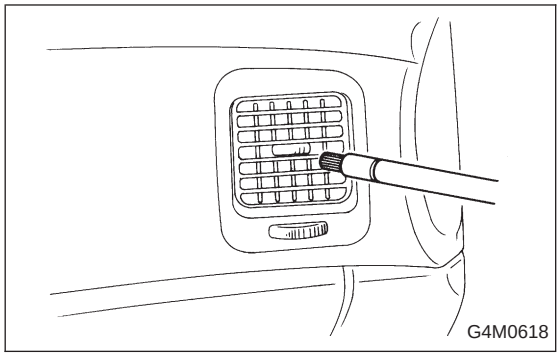


G4M0617

6. CHECK THE FLEXIBLE HOSES

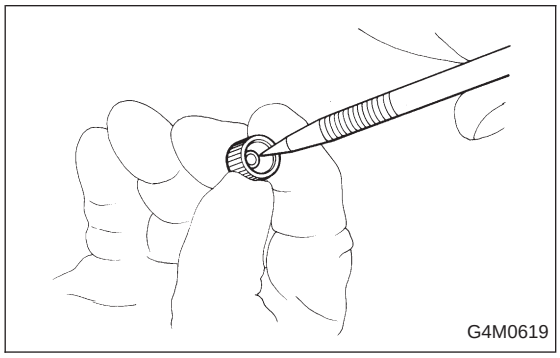
1) Visually inspect the rubber portions of the flexible hoses for cracking. Probe the rubber section, including the ends of any insulators or protectors which may cover sections of the rubber hose, and near the ends where the rubber meets the metal collar.

NOTE:
Be certain to move the probe slowly [approximately 25 mm (1 in) per second] when probing along any length of hose or tube.



7. CHECK THE EVAPORATOR ASSEMBLY

1) Use one or both of the following methods to check the evaporator assembly.
2) Remove the drain hose from the case drain nipple. Hold the probe at the end of the case drain nipple for at least 10 seconds. Be certain to reconnect the drain hose when finished.
3) With the ignition key in the “ACC” position, run the blower on high speed for 1 minute, then turn the blower off. Place the probe in the center instrument panel vent, an turn the blower on low speed for 1 to 2 seconds, then turn the blower off. Leave the probe in the vent for at least 10 seconds.



8. CHECK THE SERVICE PORT CAPS

Visually inspect the inside of the service port caps. Make sure the rubber seal is in place on the inside of the caps. Disconnect the gauges from the vehicle and install the service port caps.

9. Lubrication

A: ADJUSTMENT

1. SYSTEM OIL STABILIZATION

1) Prior to opening the refrigerant system for repairs (except compressor seizure) the system must be stabilized for correct oil replenishment.
2) Follow these procedures:

(1) Engine speed set to 1,500 rpm.
(2) A/C “ON”.
(3) Air source to recirculate
(4) Blower 4th or high speed position

● Make sure the air entering the evaporator is above 26.7°C (80°F).
● The discharge (high) side pressure must be above 588 kPa (6 kg/cm^2, 85 psi).

(5) Operate the A/C for 10 minutes.

2. SYSTEM DISCHARGE

Slowly, discharge the system starting with the high-pressure side until the pressure drops below 345 kPa (3.52 kg/cm^2, 50 psi), then open the low-pressure side.

B: REPLACEMENT

1. OIL REPLACEMENT

1) After stabilization and discharge, replace the component, adding the appropriate amount of oil (DH-PR) to the new component before installation.

Evaporator	114 mℓ (3.9 US fl oz, 4.0 Imp fl oz)
Receiver drier	5 mℓ (0.2 fl oz, 0.2 fl oz)
Condenser	2 mℓ (0.07 fl oz, 0.07 fl oz)
Hose	1 mℓ (0.03 fl oz, 0.04 fl oz)

2) If the compressor is replaced (after stabilization):

(1) Drain and measure the oil from the original compressor.
(2) Drain the oil from the replacement compressor and refill with the same amount that was drained from the original [20 mℓ (0.7 US fl oz, 0.7 Imp fl oz) minimum]. Always use DH-PR for the replacement oil.

10. Performance Test

A: INSPECTION

1. VEHICLE SET UP

In order to obtain meaningful test results, the vehicle must be set up to meet the following conditions:

- Vehicle in shade
- No wind
- All vehicle doors closed
- Front windows open
- Hood open
- Engine speed set at 1,500 rpm.
- A/C ON
- Temperature control dial — Maximum cold
- Air source — Recirculation
- Blower speed — 4th position (High)
- Operate A/C for 10 minutes (Minimum) before taking measurement.

2. MEASUREMENTS

After 10 minutes (Minimum) of A/C operation and using accurate test equipment, take the following measurements (in order):

1) Evaporator intake air temperature at recirculation door.
2) Evaporator discharge air temperature at center grill.
3) Condenser (Ambient) intake air temperature measured 0.9 m (3 ft) in front and in line with the center of the condenser
4) Suction (Low) side pressure
5) Discharge (High) side pressure

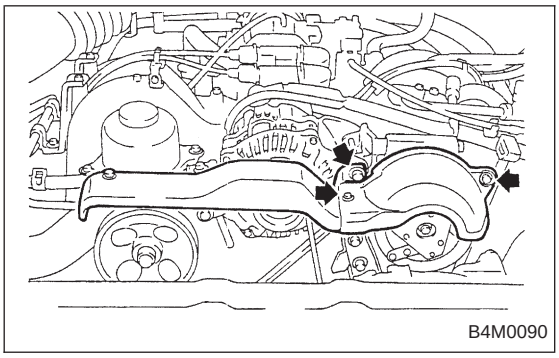
NOTE:
If only one thermometer is available; 1) take the ambient measurement first; then 2) the intake air; and 3) discharge air temperature.

11. Compressor

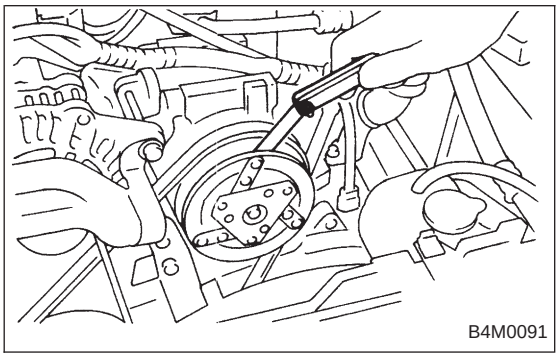
A: INSPECTION

1. COMPRESSOR CLUTCH

NOTE:
● Compressor is a 5-vane rotary type. When trouble occurs, replace compressor as a single unit.
● Compressor clutch trouble is often caused by clutch slippage and noise. Check and take corrective measures, as required.


B4M0090

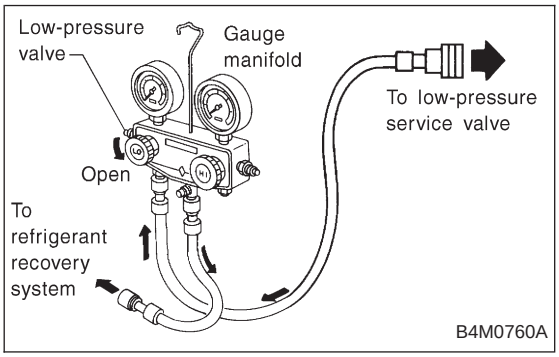
1) Remove belt cover.


B4M0091

2) Check that clearance between drive plate and pulley over the entire perimeter is within specifications.

Clearance:
0.45±0.15 mm (0.0177±0.0059 in)

3) Check that voltage applied to magnetic coil is at least 10.5 volts.
4) When noise is noted, check that it originates in either compressor or pulley bearing.

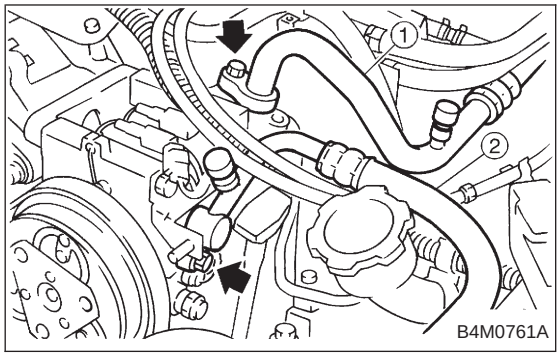


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B: REMOVAL

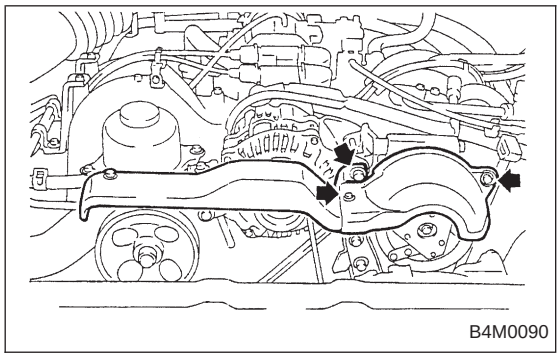
1) Disconnect ground cable from battery.
2) Discharge refrigerant using refrigerant recovery system. <Ref. to 4-7 [W600].>
(1) Fully close low-pressure valve of manifold gauge.
(2) Connect low-pressure charging hose of manifold gauge to low-pressure service valve.
(3) Open low-pressure manifold gauge valve slightly, and slowly discharge refrigerant from system.

CAUTION:
Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

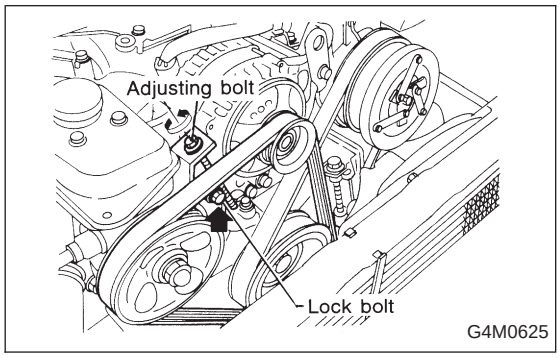


3) Remove low-pressure hose ① (Flexible hose Ps) and high-pressure hose ② (Flexible hose Pd).

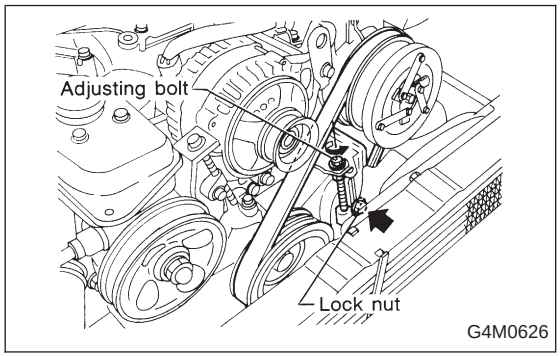
CAUTION:
- **Be careful not to lose O-ring of low-pressure hose.**
- **Plug the opening to prevent foreign matter from entering.**



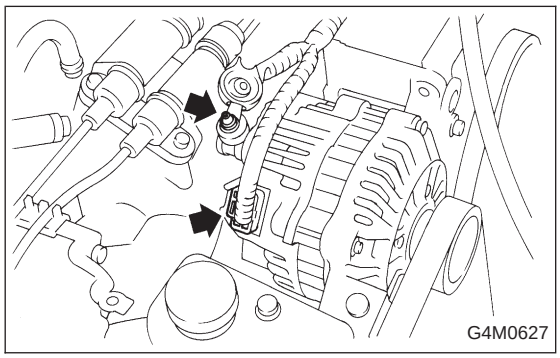
4) Compressor belt cover and generator belt cover:
Remove bolts which secure belt covers.



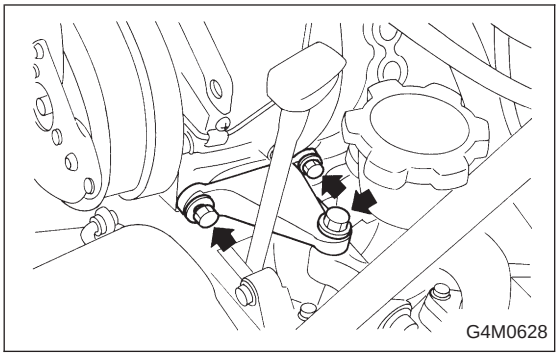
5) Remove alternator V-belt:
(1) Loosen lock bolt on generator bracket.
(2) Turn adjusting bolt and remove V-belt.



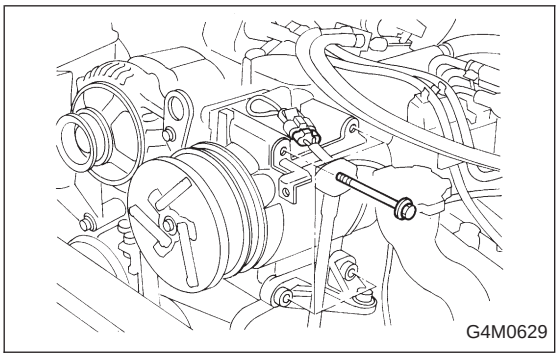
6) Remove compressor V-belt:
(1) Loosen lock bolt on idler pulley.
(2) Turn adjusting bolt and remove V-belt.



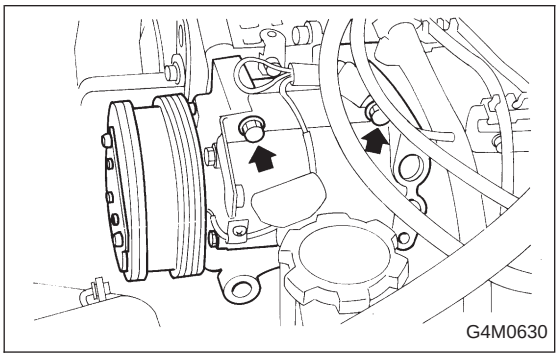
7) Disconnect alternator harness.


G4M0628

8) Disconnect compressor harness:
Disconnect compressor harness from body harness.
9) Remove lower bracket:
Remove bolts which secure lower compressor bracket.


G4M0629

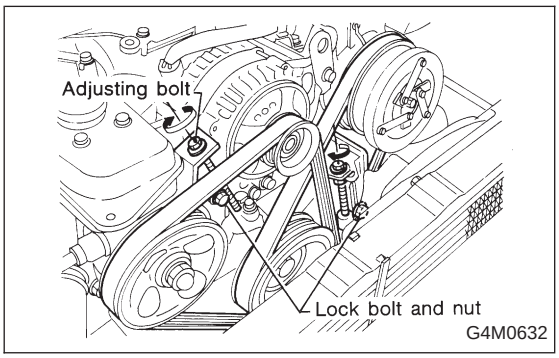
10) Remove compressor:
(1) Remove bolts which secure compressor.
(2) Remove compressor from bracket.


G4M0630

C: INSTALLATION

1) Install compressor:
Install compressor on bracket.

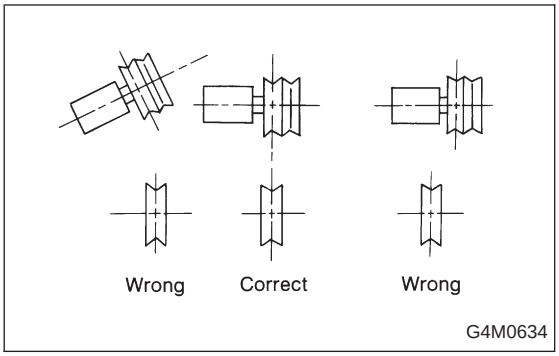
2) Connect compressor harness.
3) Connect alternator harness.
4) Install compressor V-belt (Rear):
After adjusting belt tension, tighten tension pulley lock bolt securely.



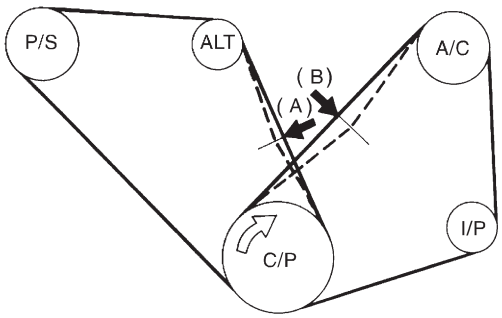
G4M0632

5) Install alternator V-belt:
After adjusting V-belt tension, tighten generator bracket lock bolt securely.

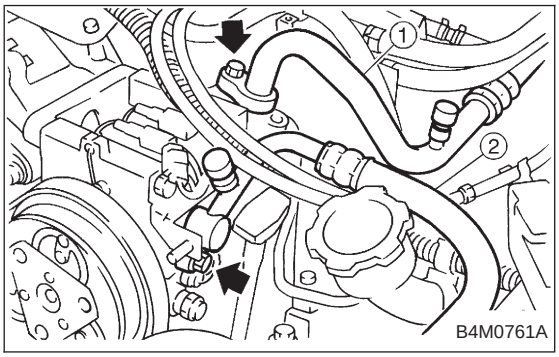
6) Check drive belt tension and adjust it if necessary by changing alternator position and/or idler pulley position.



CAUTION:
● Ensure that the V-belt is aligned correctly. If it is not, check for loose bolts.
● The V-belt should not be too tight or too loose.
A belt which is too tight may break bearing or cause gas to leak from the shaft seal. A belt which is too loose slips, thereby causing the belt cut.
● After completing the compressor installation and testing the system operation, check and adjust the tension of both V-belts again.

Pulley arrangement	Tension mm (in)/98N (10 kg, 22 lb)	
	(A)	(B)
	*New belt: 7.0 – 9.0 (0.276 – 0.354) Existing belt: 9.0 – 11.0 (0.354 – 0.433)	*New belt: 7.5 – 8.5 (0.295 – 0.335) Existing belt: 9.0 – 10.0 (0.354 – 0.394)
Figures in table refer to the number of grooves in pulleys. C/P: Crankshaft pulley ALT: Alternator pulley P/S: Power steering oil pump pulley A/C: Air conditioner compressor pulley I/P: Idler pulley	*When replacing belts with new ones, adjust tensions to specification and then readjust to the same specification after running engine for 5 minutes.	

B4M1098A



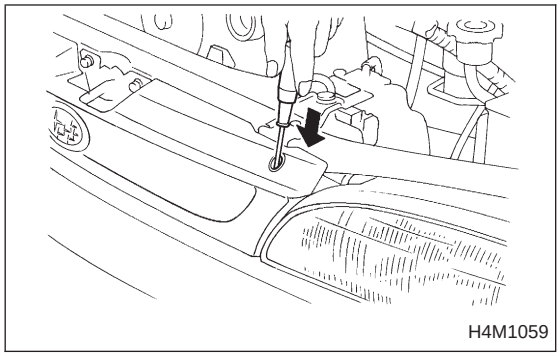
7) Install high-pressure hose ② (Flexible hose Pd) and low-pressure hose ① (Flexible hose Ps):
Connect high-pressure hose and low-pressure hose with compressor.

CAUTION:
Be sure to apply compressor oil to the periphery of O-ring.

8) Install belt cover.

CAUTION:
● After installing belt cover, make sure it is not misaligned or twisted.
● After installing belt cover, check the clearance between pulley and belt cover.

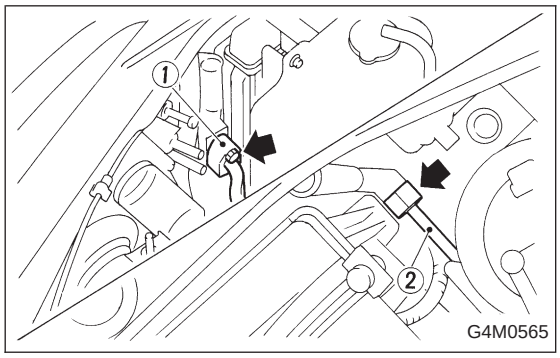
9) Connect ground cable to negative terminal of battery.
10) Charging refrigerant. <Ref. to 4-7 [W700].>


H4M1059

12. Condenser

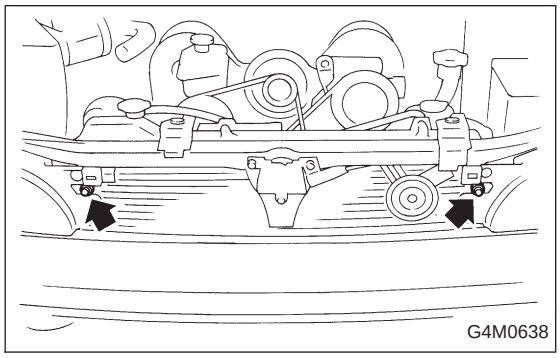
A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant using refrigerant recovery system. <Ref. to 4-7 [W600].>
3) Remove front grille.

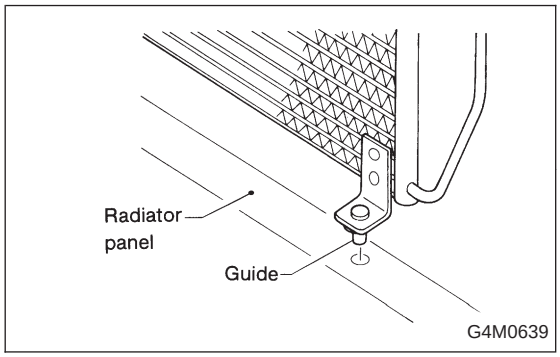


G4M0565

4) Remove the radiator bracket.
5) Disconnect high-pressure hose ① and high-pressure pipe ② from condenser.


G4M0638

6) Remove the two bolts which secure condenser. While lifting condenser, remove it through space between radiator and radiator panel.



G4M0639

7) The condenser should be installed in the reverse order in which it was removed.
When installing the condenser, pay attention to the following:

CAUTION:
Before connecting the pipe, be sure to apply oil to the periphery of O-ring.

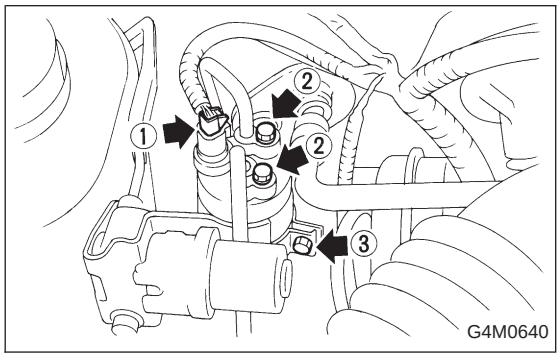
NOTE:
After installing condenser, ensure that guide on lower side of condenser is inserted into hole in radiator panel. Tighten attaching bolts.
8) Charge refrigerant. <Ref. to 4-7 [W700].>

B: INSPECTION

1) Make sure the condenser fins are free from dust and insects. If the fins are clogged, clean by blowing air or water through them.

NOTE:
To prevent dust and water from getting into the condenser, this work must be done when the condenser is installed in an actual vehicle.

2) Check the condenser to see if it shows any sign of oil. If oil ooze or gas leak occur from the condenser, replace it with a new one.



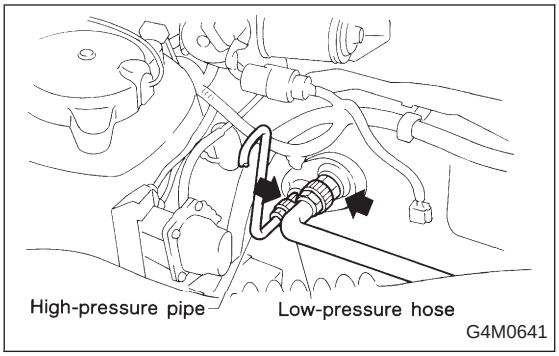
13. Receiver Drier

A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant using refrigerant recovery system. <Ref. to 4-7 [W600].>
3) Disconnect pressure switch harness ①.
4) Disconnect pipes ②.
5) Remove mounting bolt ③ and remove receiver drier.

CAUTION:
The receiver drier contains a desiccant. Be sure to put a blind plug in the detached receiver drier to protect it from moisture.

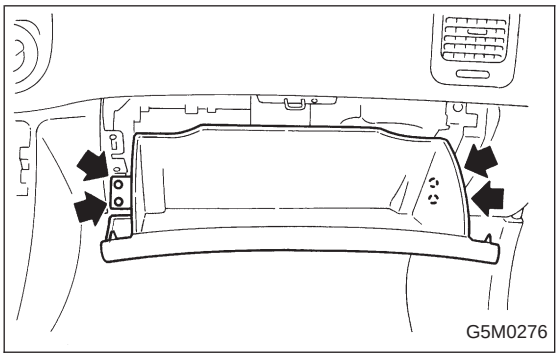
6) Install the receiver drier in the reverse order of removal.
7) Charge refrigerant. <Ref. to 4-7 [W700].>



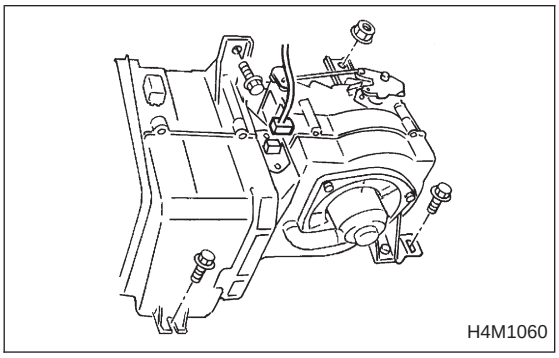
14. Intake Unit with Evaporator

A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant using refrigerant recovery system. <Ref. to 4-7 [W600].>
3) Disconnect discharge pipe, suction pipe and grommets.

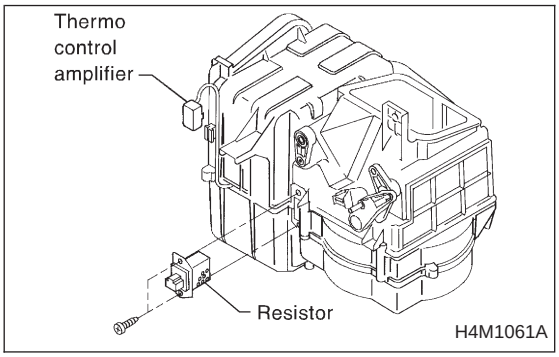


4) Remove glove box.

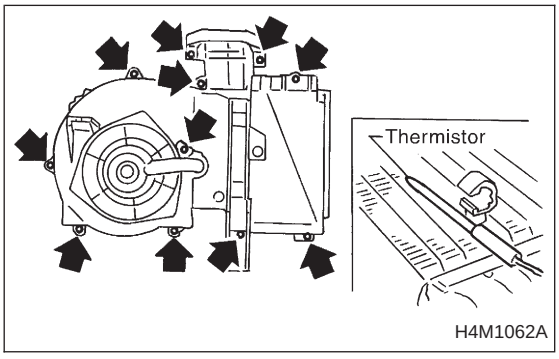


5) Disconnect the harness connector from intake unit.
6) Disconnect drain hose.
7) Remove intake unit mounting bolt and nut.
8) Install the intake unit in the reverse order of removal.
9) Charge refrigerant. <Ref. to 4-7 [W700].>

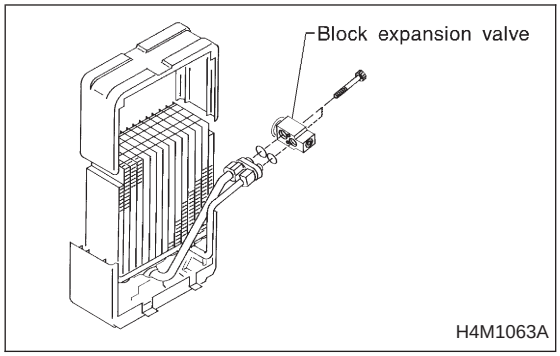
B: DISASSEMBLY AND ASSEMBLY



1) Remove resistor assembly and remove thermo control amplifier from intake unit case.



2) Remove some screws then separate intake unit case.
3) Remove thermistor from clip with the evaporator.

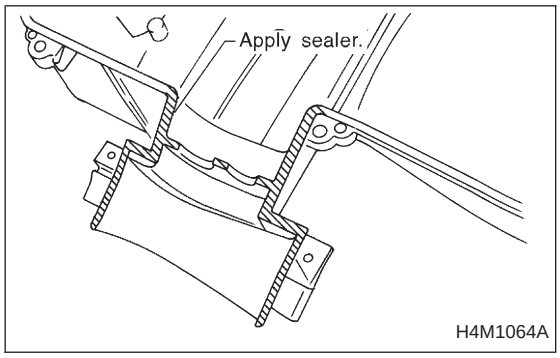


4) Remove the block expansion valve from pipes.

5) Check to see if the evaporator fins are clogged. If they are, clean them with compressed air.

CAUTION:
Water must never be used to clean the evaporator.

6) Check parts that have been removed for cracks or scratches, and repair or replace them with new ones, if necessary.

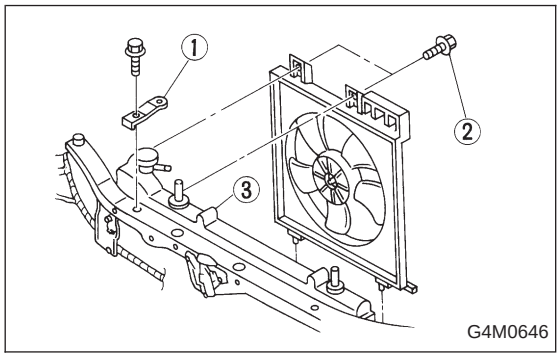


7) Before assembling intake unit, apply sealer to flange of intake unit case.

Sealer:
THREE BOND 1215 or equivalent

8) Reassemble the intake unit in the reverse order of disassembly.

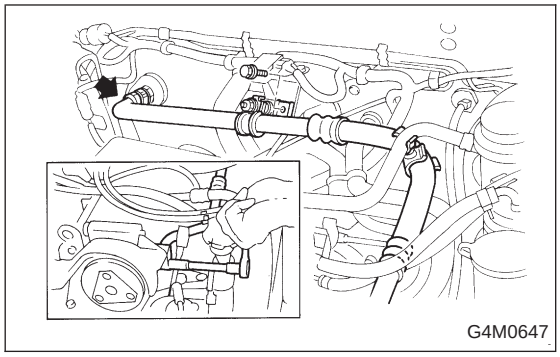
NOTE:
Confirm that the O-ring is inserted in the specified position.



15. Condenser Fan Assembly

A: REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Disconnect harness connector from fan motor.
3) Remove radiator bracket (RH) ① and remove condenser fan bolt ② from radiator ③.
4) Pull condenser fan assembly.
5) Install the condenser fan assembly in the reverse order of removal.


G4M0647

16. Flexible Hose

A: REMOVAL AND INSTALLATION

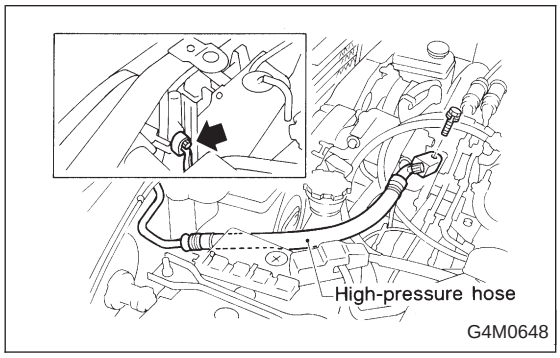
1) Disconnect battery negative terminal.
2) Discharge refrigerant using refrigerant recovery system. <Ref. to 4-7 [W600].>
3) Remove low-pressure hose:

CAUTION:
With the following cautions, replace flexible hoses with new ones if they are damaged or swollen.
● The flexible hoses should be free from twists and tension after they have been connected.
● The flexible hoses must not be bent or twisted forcibly.

(1) Remove hose attaching bolts.
(2) Remove hose clip.

CAUTION:
Plug the opening to prevent foreign matter from getting in.

(3) Disconnect the connector at evaporator unit.



G4M0648

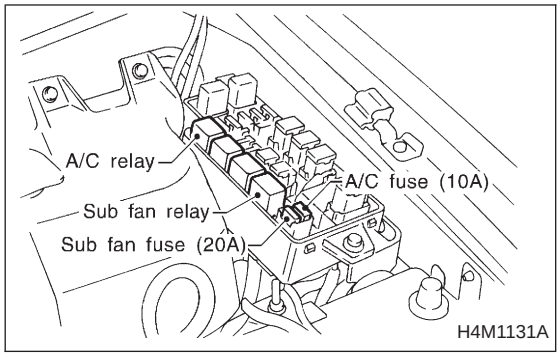
4) Remove high-pressure hose:

CAUTION:
With the following cautions, replace flexible hoses with new ones if they are damaged or swollen.
● The flexible hoses should be free from twists and tension after they have been connected.
● The flexible hoses must not be bent or twisted forcibly.

(1) Disconnect hose attaching bolt (compressor side).
(2) Disconnect hose attaching bolt (condenser side).

CAUTION:
Plug the opening to prevent foreign matter from getting in.

5) Installation is in the reverse order of removal.
6) Charge refrigerant. <Ref. to 4-7 [W700].>

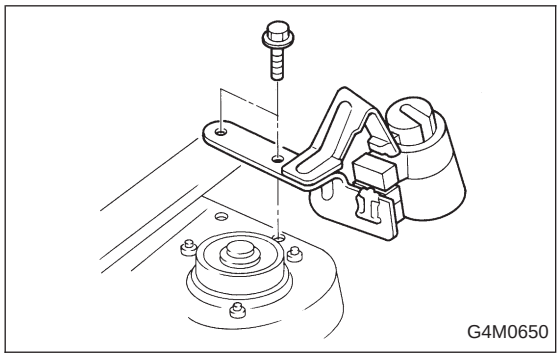


17. Relay and Fuse

A: LOCATION

Relays used with A/C system are located as shown in figure.

- A/C relay
- Sub fan (condenser fan) relay
- Fuses (10 A and 20 A)

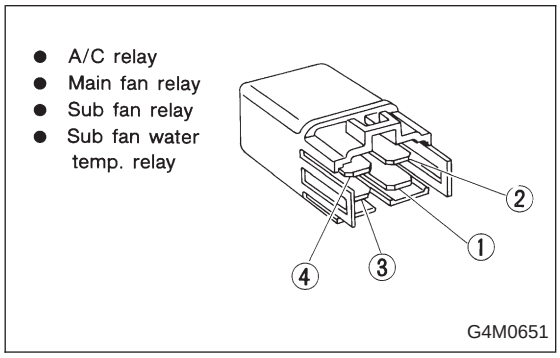


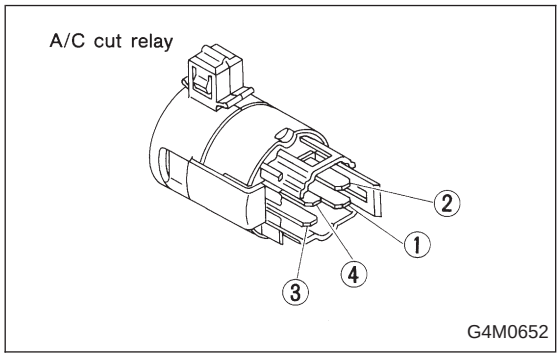
- A/C cut relay

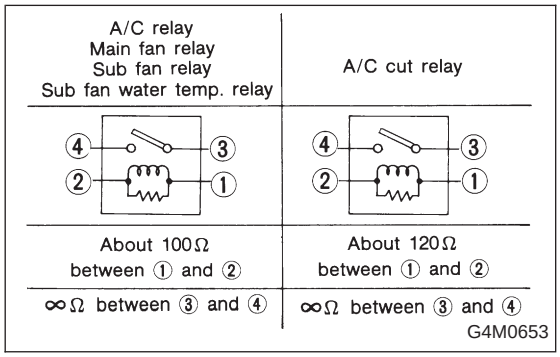
A/C cut relay is attached by a bolt to top of front suspension bracket (RH) via a bracket.

B: INSPECTION

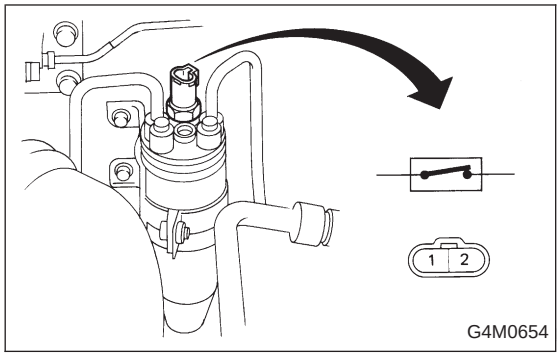
1) Check conduction with a circuit tester (ohm range) according to the following table in figure.







2) Replace relays which do not meet specifications.



18. Pressure Switch (Dual Switch)

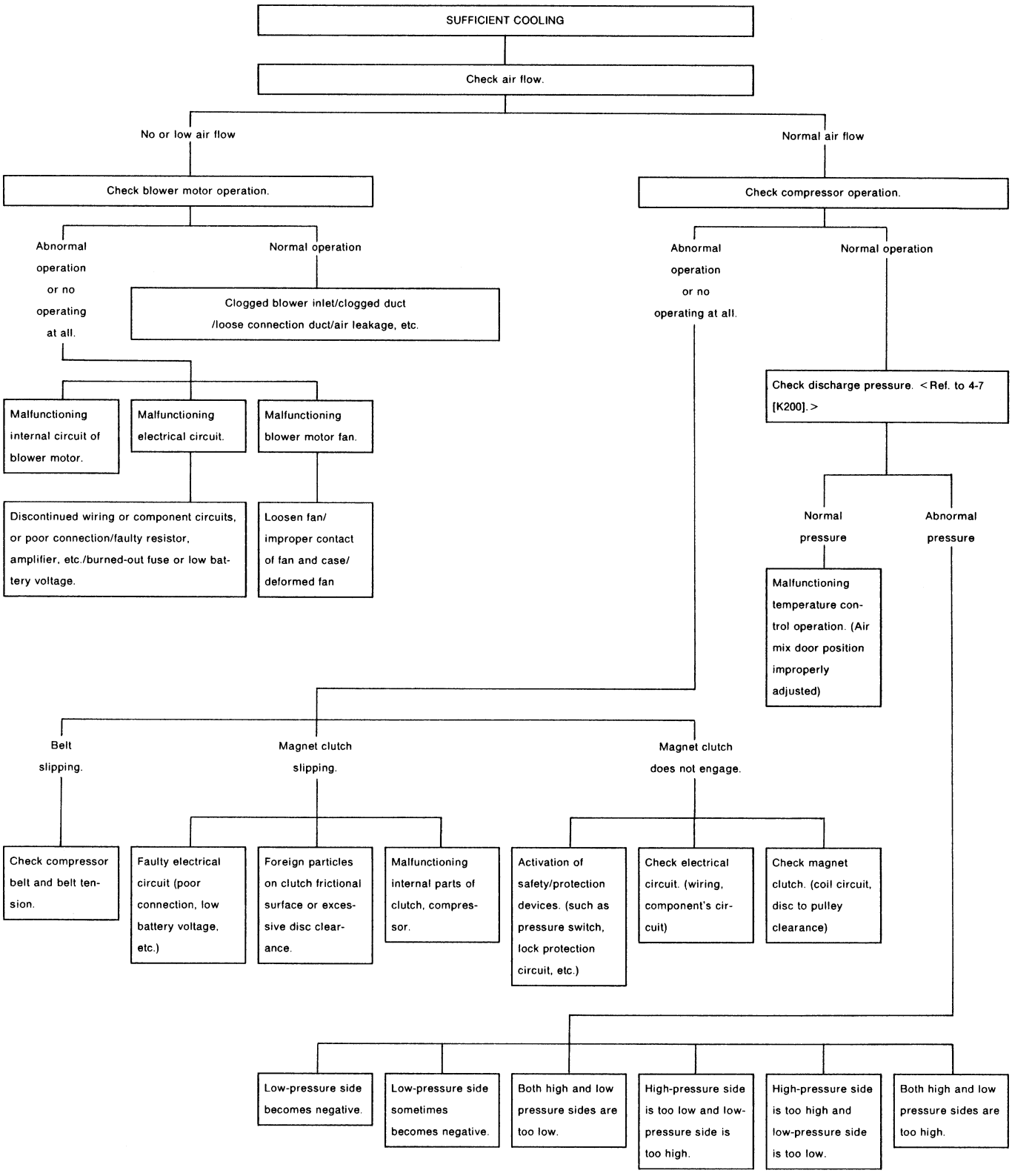
A: INSPECTION

NOTE:
Pressure switch is attached to receiver dryer. It has two built-in switches.

1) Remove cap from high-pressure line service valve, and connect gauge manifold to service valve.
2) Disconnect pressure switch harness connector, and check pressure switch for proper ON-OFF operation. Use a circuit tester.

	Terminal	Operation	High-pressure side line pressure kPa (kg/cm^2, psi)
High and low pressure switch	① — ②	Turns OFF.	Increasing to 2,746±98 (28±1, 398±14)
			Decreasing to 177±29 (1.8±0.3, 26±4)
		Turns ON.	Increasing to 186^{+39}_{-25} ($1.9^{+0.4}_{-0.25}$, $27^{+5.7}_{-3.6}$)
			Decreasing to 2,059±196 (21±2, 299±28)

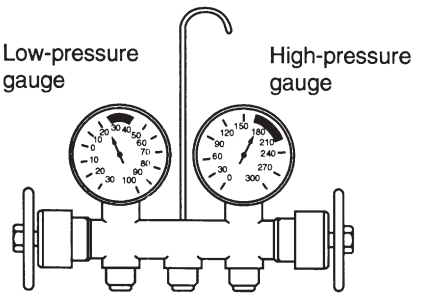
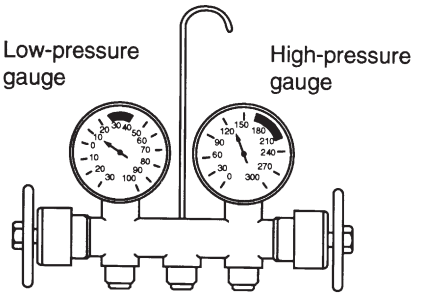
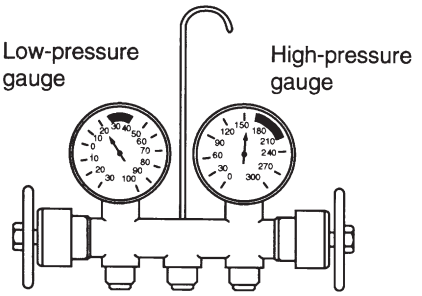
1. Air Conditioning System Diagnosis

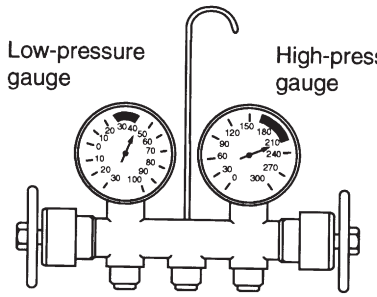
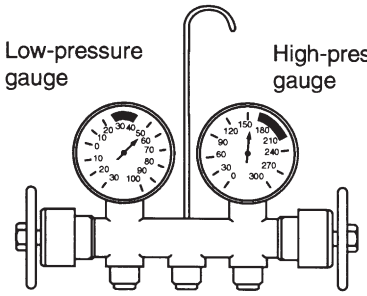
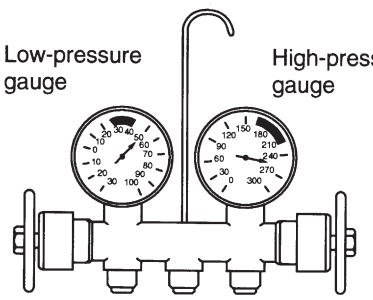
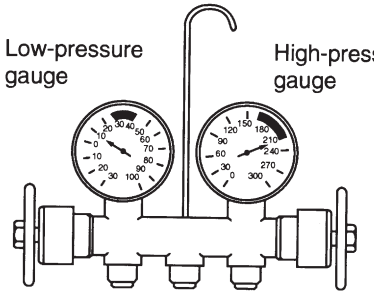


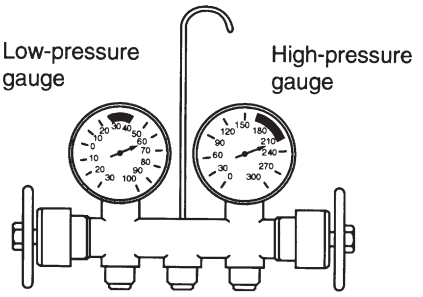
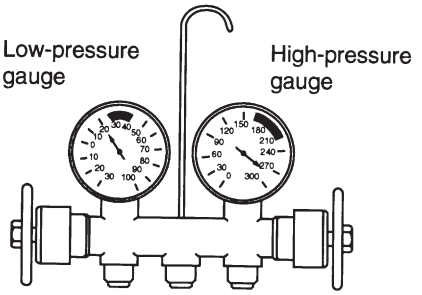
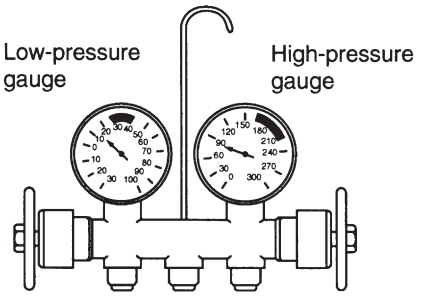
EPA0068

2. Performance Test Diagnosis

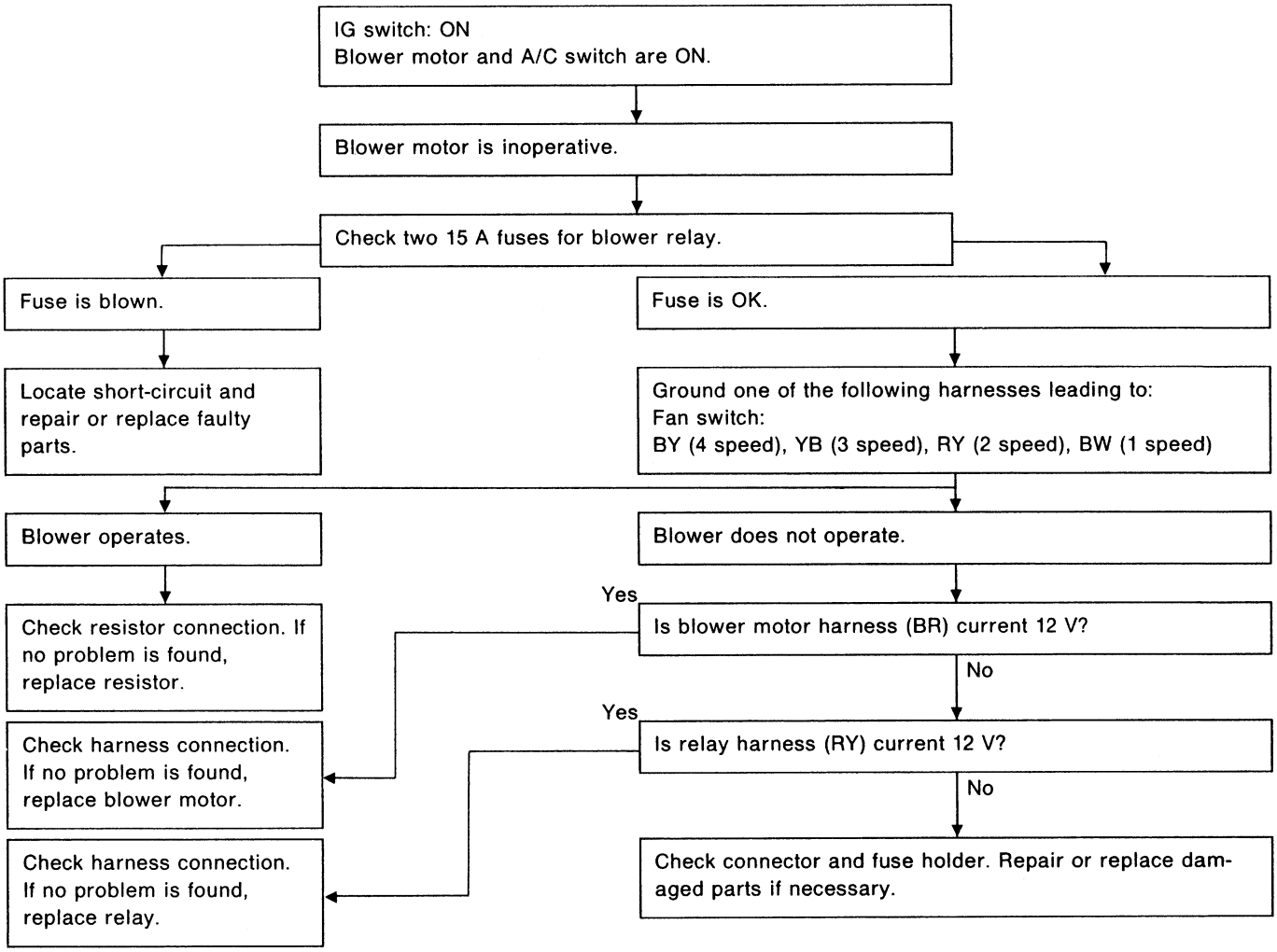
If various conditions caused to other air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.
As to the method of a performance test, refer to the item of “Performance Test”.
Each shaded area on the following tables indicates a reading of the normal system when the temperature of outside air is 32.5°C (91°F).

Condition		Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  G4M0673	Insufficient cooling.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  G4M0674	No cooling action.	Serious refrigerant leak.	**Stop compressor immediately.** 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE  G4M0675	Slight cooling. Sweating or frosted expansion valve inlet.	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. ● Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition		Probable cause	Corrective action
 G4M0676  G4M0677	Insufficient cooling. Sweated suction line. No cooling. Sweating or frosted suction line.	Expansion valve allows too much refrigerant through evaporator. Faulty seal of O-ring in expansion valve.	Check valve for operation. If suction side does not show a pressure decrease, replace valve. 1. Discharge system. 2. Remove expansion valve and replace O-ring. 3. Evacuate and replace system.
AIR IN SYSTEM  G4M0678	Insufficient cooling.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM  G4M0679	After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows 39 kPa (0.4 kg/cm^2, 6 psi) vibration.	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely (Repeat 30 minute evacuating three times.). 4. Recharge system.

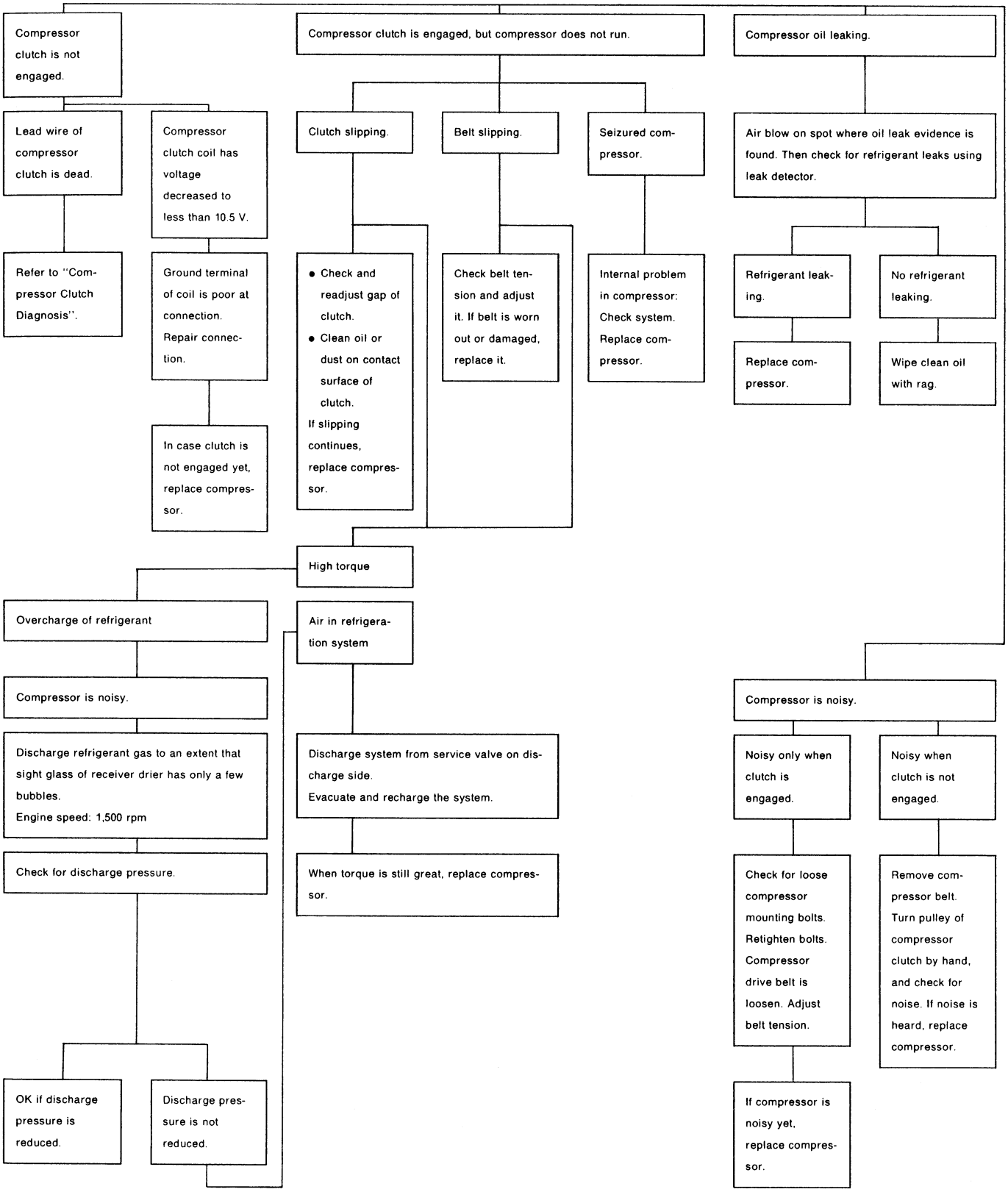
Condition		Probable cause	Corrective action
FAULTY CONDENSER  G4M0680	No cooling action. Engine may overheat. Suction line is very hot.	Condenser is often found not functioning well.	• Check condenser cooling fan. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH-PRESSURE LINE BLOCKED  G4M0681	Insufficient cooling. Frosted high-pressure liquid line.	Drier clogged, or restriction in high-pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
FAULTY COMPRESSOR  G4M0682	Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

3. Blower Motor Diagnosis



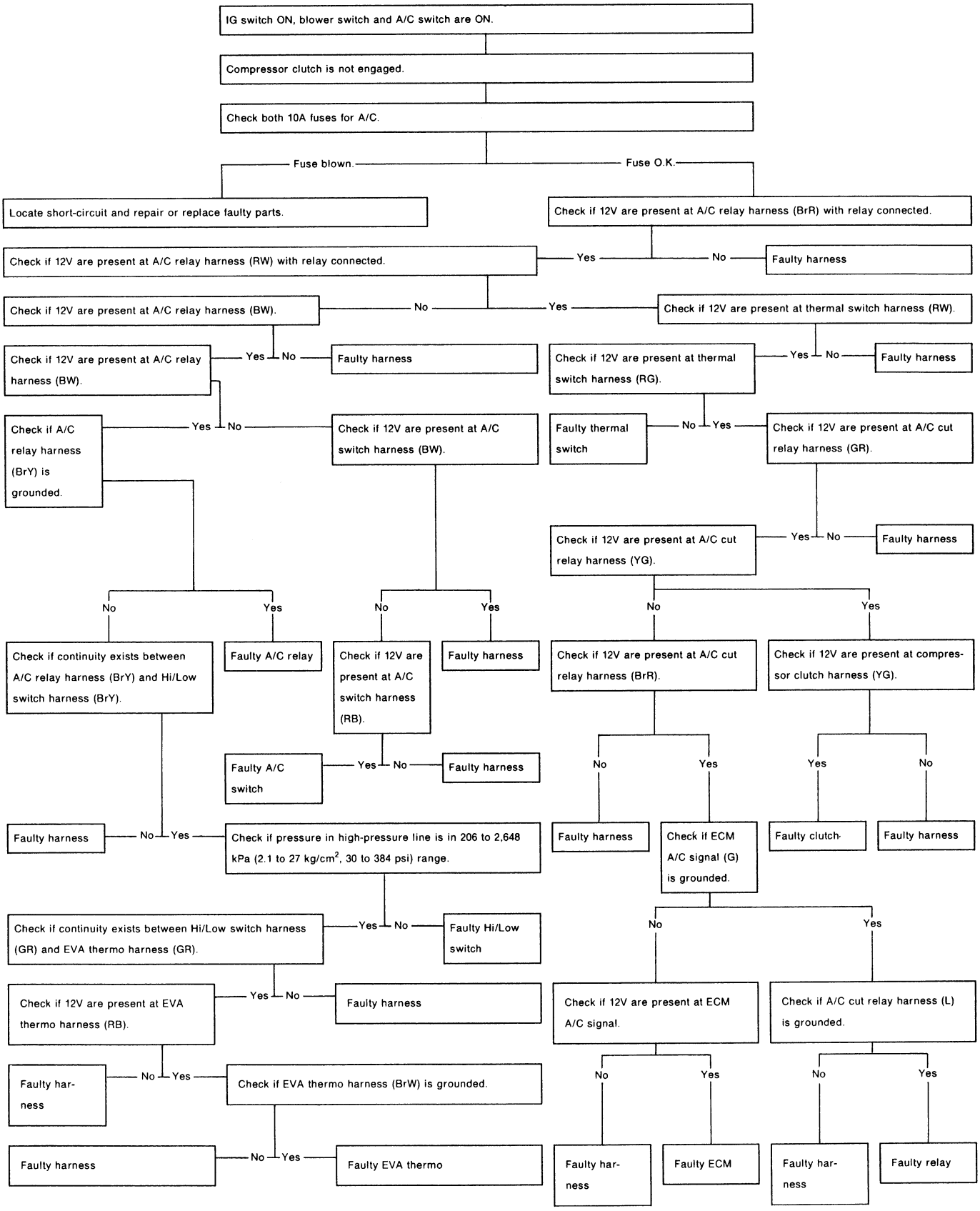
EPA0069

4. COMPRESSOR DIAGNOSIS



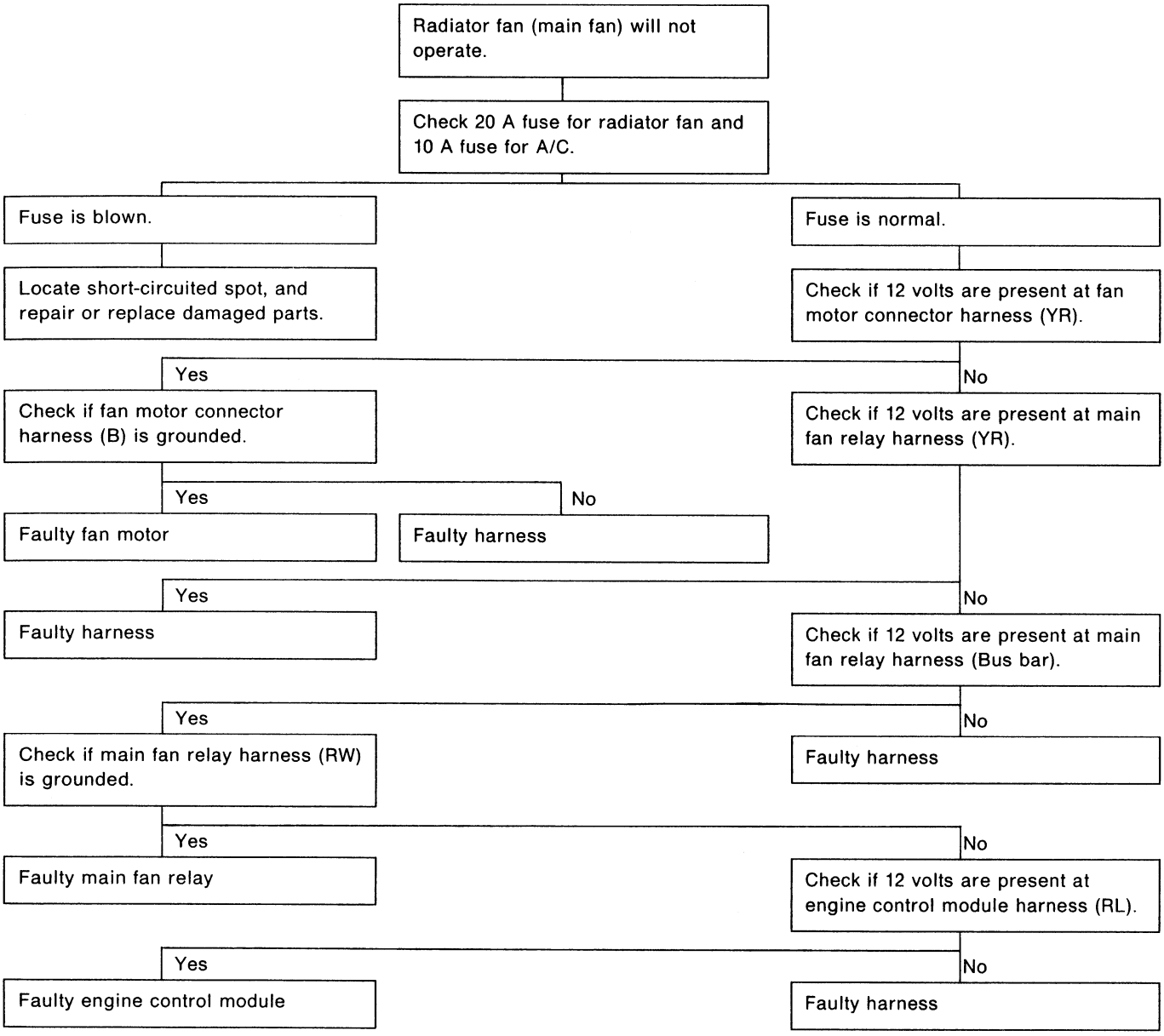
EPA0070

5. COMPRESSOR CLUTCH DIAGNOSIS



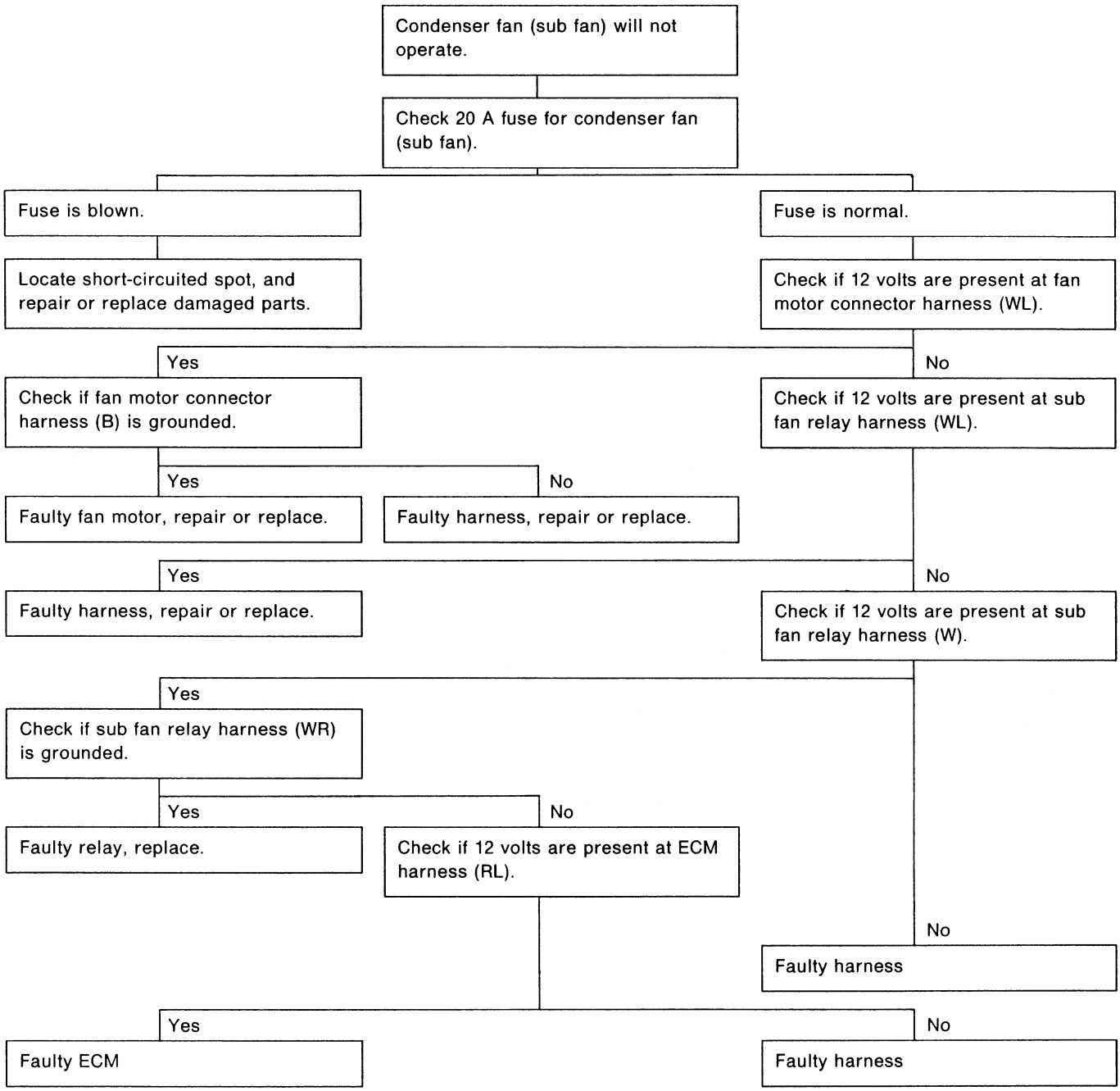
EPA0071

6. RADIATOR FAN (MAIN FAN) DIAGNOSIS



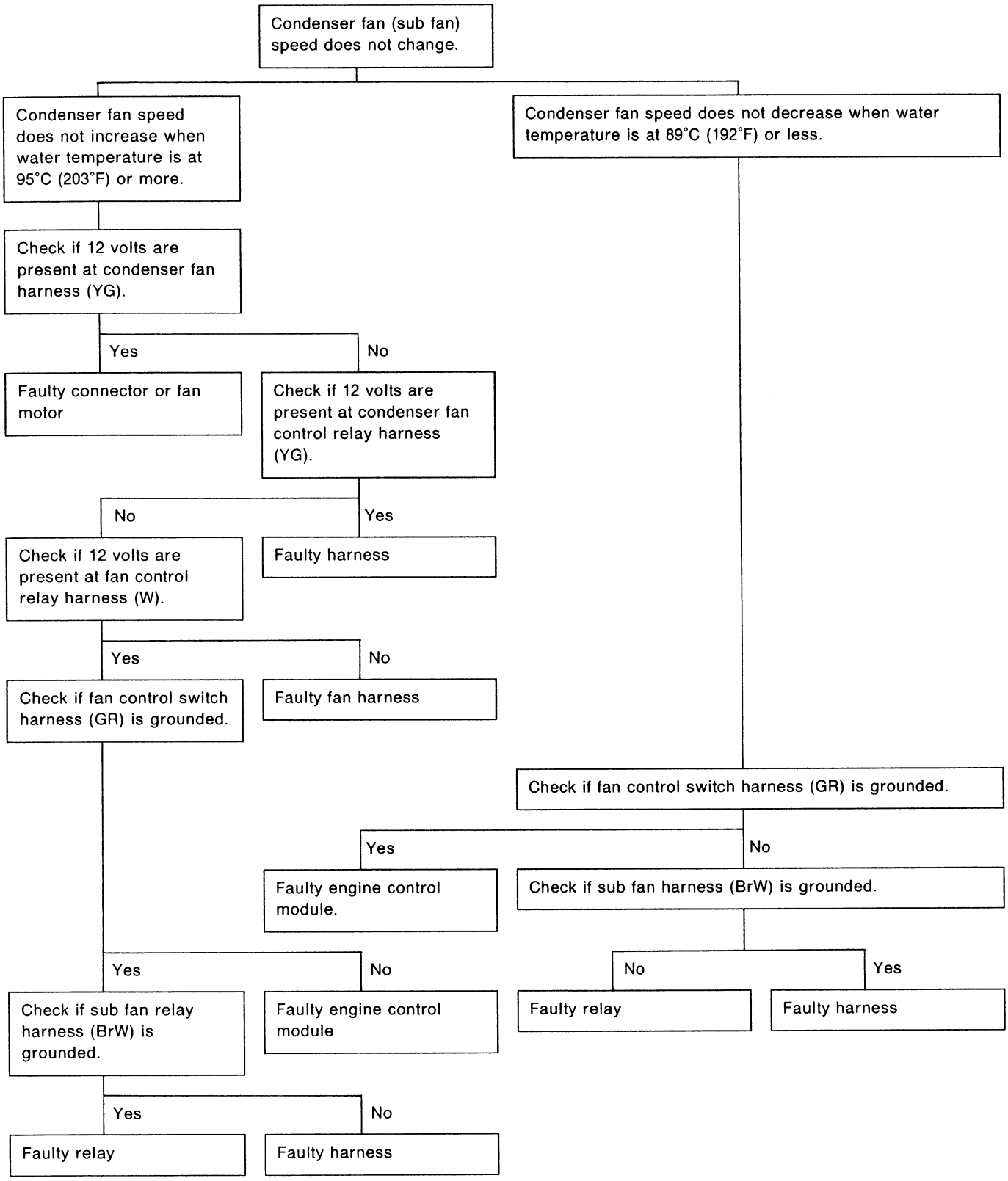
EPA0072

7. CONDENSER FAN (SUB FAN) DIAGNOSIS (I)



EPA0073

8. CONDENSER FAN (SUB FAN) DIAGNOSIS (II)



EPA0074

BODY AND EXTERIOR 5-1

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1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed on and along body panels.

CAUTION:

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when repairing the body panel.**

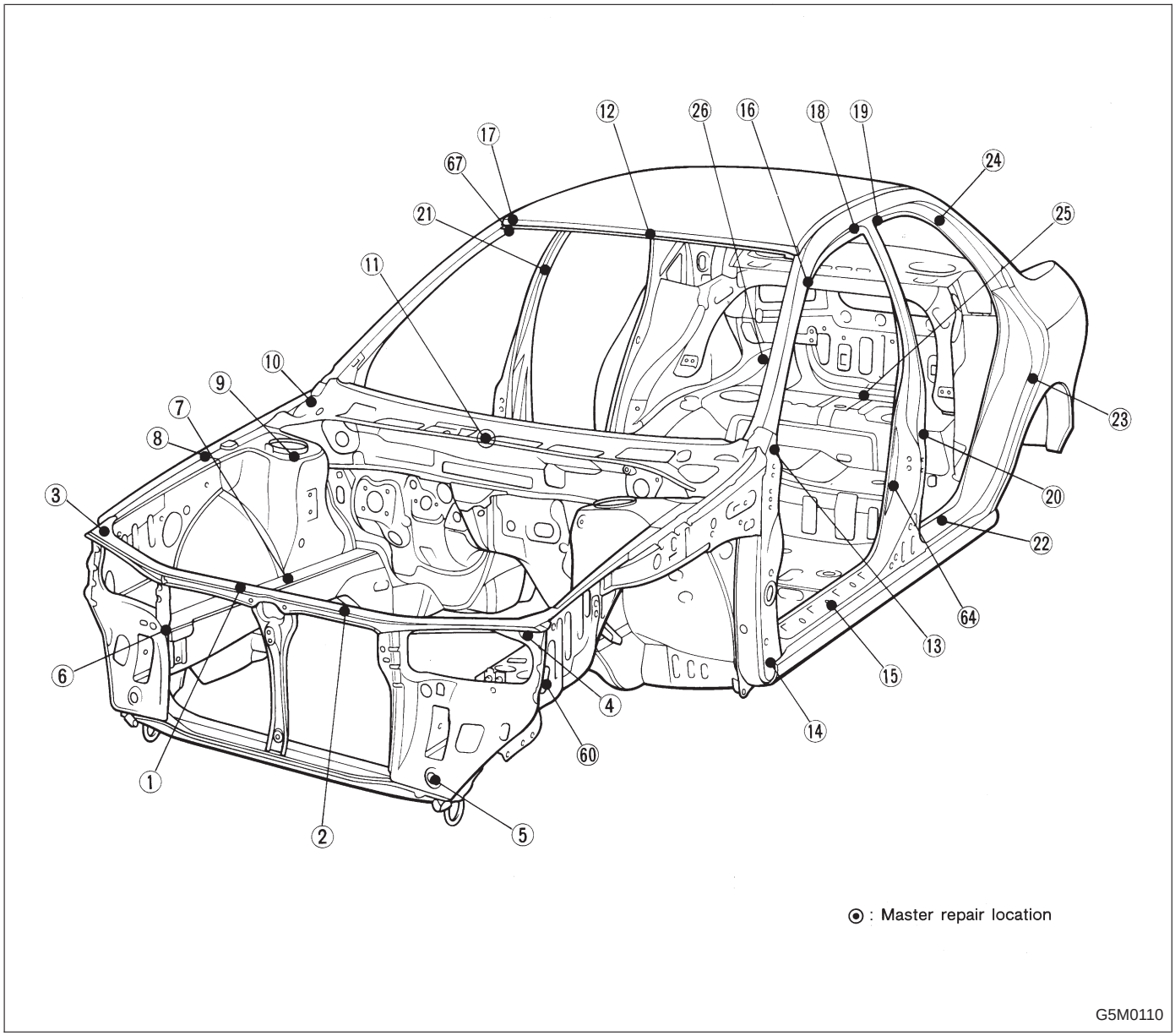
2. Body Datum Points

Various master repair locations are established as datum points used during body repairs. In addition, guide holes, locators and indents are provided to facilitate panel replacement and achieve alignment accuracy.

NOTE:
Left and right datum points are all symmetrical to each other.

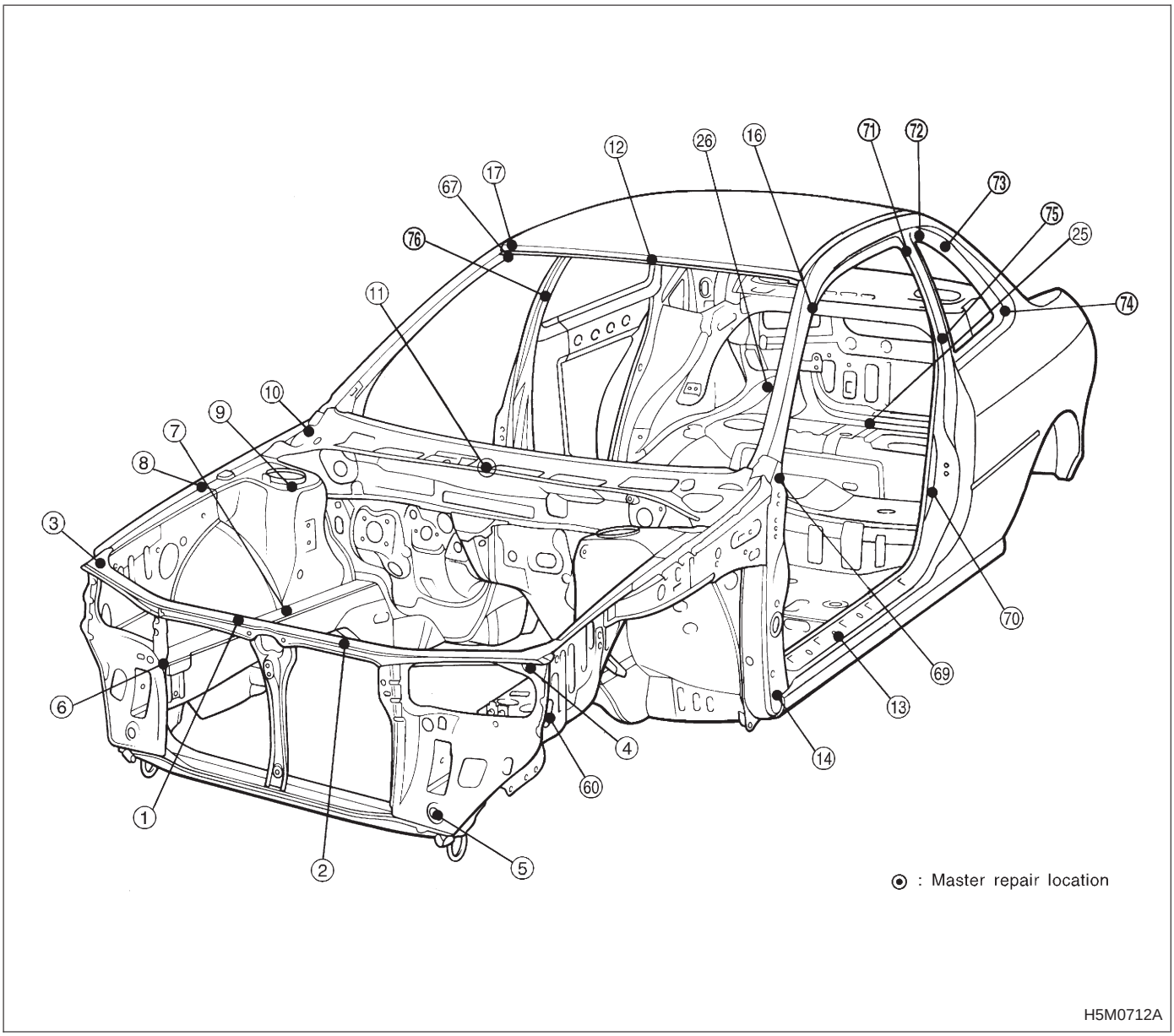
A: ENGINE COMPARTMENT AND ROOM

1. SEDAN AND WAGON



① Radiator panel (UPR) repair bolt hole M8 (Right)
② Radiator panel (UPR) repair bolt hole M8 (Left)
③ Fender attaching bolt hole M6 (Symmetrical)
④ Headlight attaching bolt hole M6 (Symmetrical)
⑤ Radiator panel side gauge hole 24 mm (0.94 in) dia. (Symmetrical)
⑥ Front bumper mounting hole 14 x 17 mm (0.55 x 0.67 in) dia. (Symmetrical)
⑦ Front crossmember attaching bolt hole 12.4 mm (0.488 in) dia. (Symmetrical)
⑧ Fender attaching bolt hole M6 (Symmetrical)
⑨ Front strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
⑩ Hood hinge attaching bolt hole M8 (Symmetrical)
⑪ Cowl panel mounting hole 5 mm (0.20 in) dia.
(Located in center of vehicle.)
⑫ Front rail (Inner) mirror attaching bolt hole 8 mm (0.31 in) dia.
⑬ Fender attaching bolt hole M6 (Symmetrical)
⑭ Front pillar gauge hole 20 mm (0.79 in) dia. (Symmetrical)
⑮ Wax coat hole, 20 mm (0.79 in) dia. (Symmetrical)
⑯ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑰ Sun visor attaching hole 20 mm (0.79 in) dia. (Symmetrical)
⑱ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑲ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑳ Center pillar gauge hole 10 mm (0.39 in) dia. (Symmetrical)
㉑ Belt anchor attaching bolt hole (Symmetrical)
㉒ Wax coat hole, 20 mm (0.79 in) dia. (Symmetrical)
㉓ Rear door switch attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㉔ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
㉕ Spare tire attaching bolt hole M8
㉖ Air draw hole 7 mm (0.28 in) dia. (Symmetrical)
㊿ Fender attaching bolt hole M6 (Symmetrical)
㊹ Door switch attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㊼ Front glass attaching hole
Right 6.5 mm (0.256 in) dia.
Left 6.5 x 10 mm (0.256 x 0.39 in) dia.

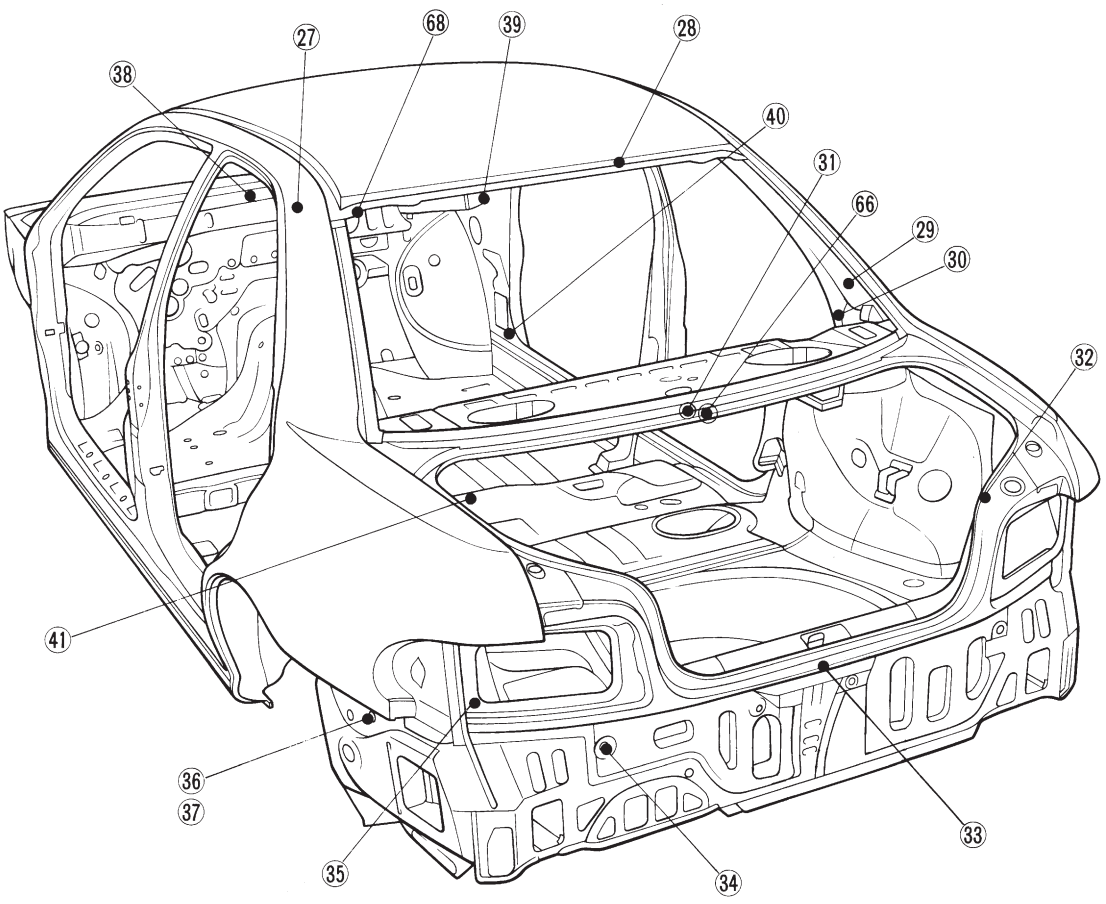
2. COUPE



① Radiator panel (UPR) repair bolt hole M8 (Right)
② Radiator panel (UPR) repair bolt hole M8 (Left)
③ Fender attaching bolt hole M6 (Symmetrical)
④ Headlight attaching bolt hole M6 (Symmetrical)
⑤ Radiator panel side gauge hole 24 mm (0.94 in) dia. (Symmetrical)
⑥ Front bumper mounting hole 14 x 17 mm (0.55 x 0.67 in) dia. (Symmetrical)
⑦ Front crossmember attaching bolt hole 12.4 mm (0.488 in) dia. (Symmetrical)
⑧ Fender attaching bolt hole M6 (Symmetrical)
⑨ Front strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
⑩ Hood hinge attaching bolt hole M8 (Symmetrical)
⑪ Cowl panel mounting hole 5 mm (0.20 in) dia.
(Located in center of vehicle.)
⑫ Front rail (Inner) mirror attaching bolt hole 8 mm (0.31 in) dia.
⑬ Fender attaching bolt hole M6 (Symmetrical)
⑭ Front pillar gauge hole 20 mm (0.79 in) dia. (Symmetrical)
⑯ Retainer attaching square hole 7 mm (0.28 in) (Symmetrical)
⑰ Sun visor attaching hole 20 mm (0.79 in) dia. (Symmetrical)
㉕ Spare tire attaching bolt hole M8
㉖ Air draw hole 7 mm (0.28 in) dia. (Symmetrical)
㊵ Fender attaching bolt hole M6 (Symmetrical)
㊼ Front glass attaching hole
Right 6.5 mm (0.256 in) dia.
Left 6.5 x 10 mm (0.256 x 0.39 in) dia.
㊾ Wax coat hole 20 mm (0.79 in) dia. (Symmetrical)
㊿ Door switch attaching hole 13.5 mm (0.531 in) dia. (Symmetrical)
(71) Retainer attaching square hole 8 mm (0.31 in). (Symmetrical)
(72) Rear quarter glass attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(73) Rear quarter glass attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(74) Rear quarter glass attaching hole 8 x 5.5 mm (0.31 x 0.217 in) dia. (Symmetrical)
(75) Retainer attaching square hole 8 mm (0.31 in). (Symmetrical)
(76) Seat belt anchor attaching bolt hole 16 mm (0.63 in) dia. (Symmetrical)

B: LUGGAGE COMPARTMENT AND ROOM

1. SEDAN AND COUPE

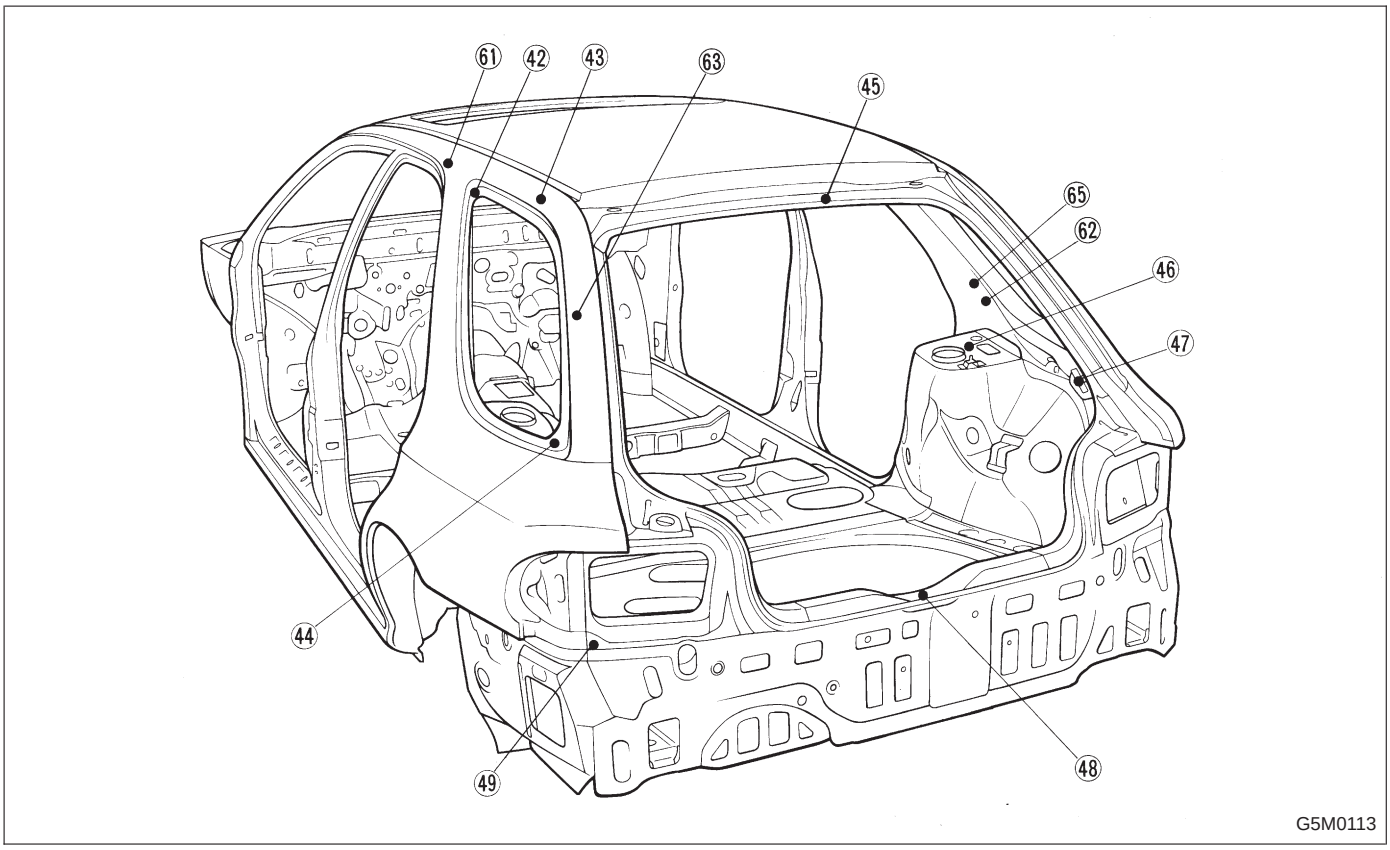


⊙ : Master repair location

G5M0111

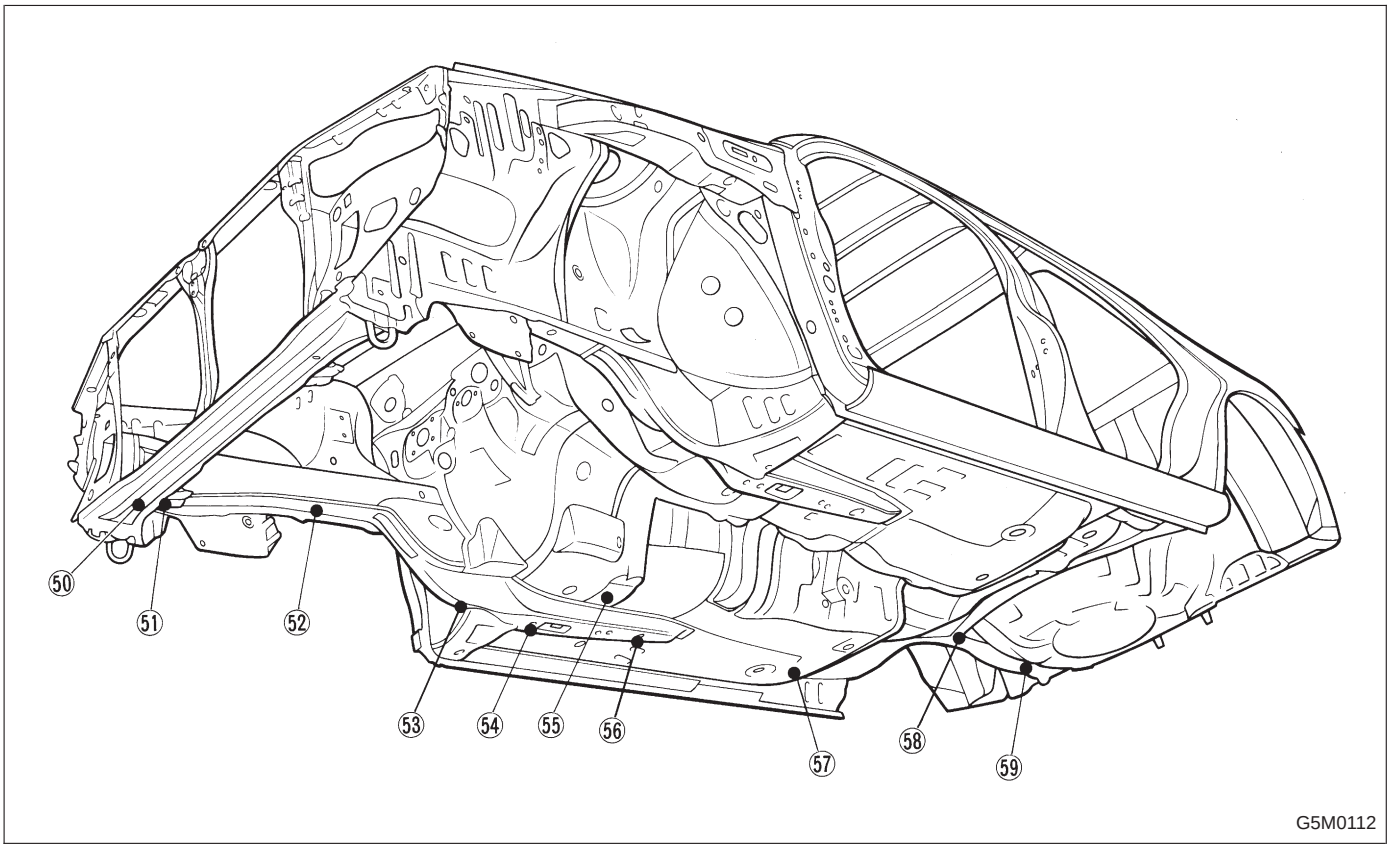
㉗ Rear pillar (Inner) gauge hole 8 mm (0.31 in) dia. (Symmetrical)
㉘ Rear roof trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
㉙ Rear quarter trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
㉚ Seat belt anchor attaching bolt hole (Symmetrical)
㉛ Reinforcement (Rear panel rear) repair locator (Located in center of vehicle)
㉜ Rear corner patch at flange (Symmetrical)
㉝ Rear skirt (UPR) cutout (Repair locator)
㉞ Rear skirt gauge hole 20 mm (0.79 in) dia. (Symmetrical)
㉟ Rear combination light mounting hole 9 mm (0.35 in) dia. (Symmetrical)
㊱ Rear quarter bumper side gauge hole 20 mm (0.79 in) dia. (Left)
㊲ Rear quarter bumper side gauge hole 20 mm (0.79 in) dia. (Right)
㊳ Instrument panel attaching square hole 22 x 34.5 mm (0.87 x 1.358 in) (Right)
㊴ Steering support beam attaching bolt hole M8 (Symmetrical)
㊵ Front pillar (Inner) gauge hole 10 mm (0.39 in) dia. (Symmetrical)
㊶ Floor mat attaching clip hole 8 mm (0.31 in) dia. (Symmetrical)
㊻ Rear panel (Center) repair locator (Located in center of vehicle.)
㊽ Rear glass attaching hole
(Right): 6.5 mm (0.256 in) dia.
(Left): 6.5 x 10 mm (0.256 x 0.39 in) dia.

2. WAGON



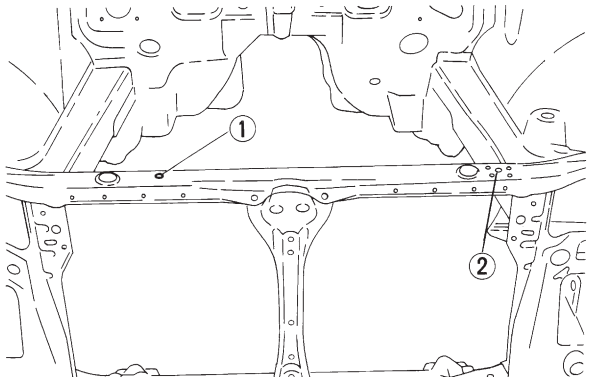
(42) Rear quarter glass attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(43) Roof rail attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(44) Rear quarter glass attaching hole 8 x 15 mm (0.31 x 0.59 in) dia. (Symmetrical)
(45) Rear roof trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(46) Rear strut mounting hole 10 mm (0.39 in) dia. (Symmetrical)
(47) Rear gate stay attaching bolt hole M8 (Symmetrical)
(48) Child seat anchor attaching bolt hole
(49) Rear combination light mounting hole 10 mm (0.39 in) dia. (Symmetrical)
(61) Side rail (Inner) gauge hole 8 mm (0.31 in) dia. (Symmetrical)
(62) Rear quarter trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)
(63) Rear quarter harness attaching clip hole 7 mm (0.28 in) dia. (Symmetrical)
(65) Seat belt anchor attaching bolt hole (Symmetrical)

C: UNDER BODY

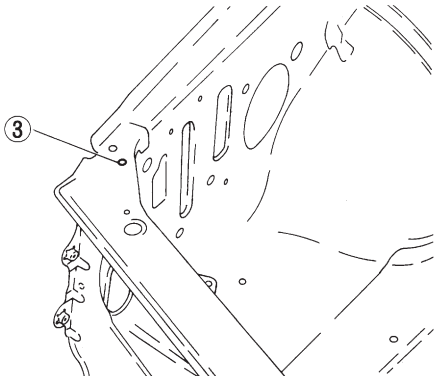


(50) Radiator panel (LWR) frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)
(51) Front side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(52) Front crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)
(53) Front suspension attaching bolt hole M14
(54) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(55) Transmission mount attaching bolt hole M10 (Symmetrical)
(56) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)
(57) Rear differential attaching bolt hole M12 (Symmetrical)
(58) Rear suspension attaching bolt hole M12 (Symmetrical)
(59) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

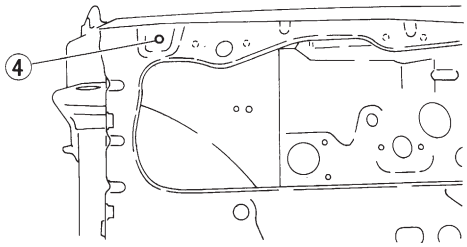
D: DATUM POINT LOCATION



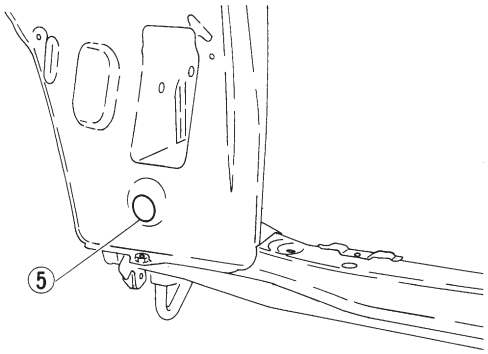
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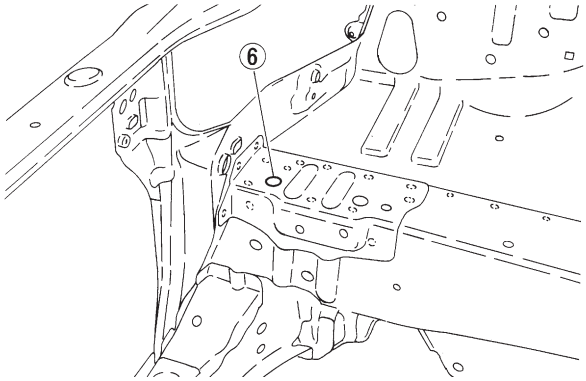
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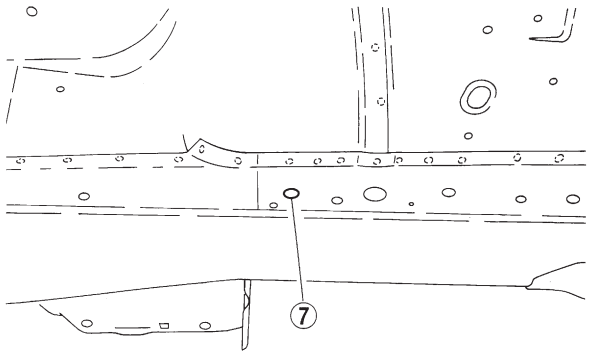
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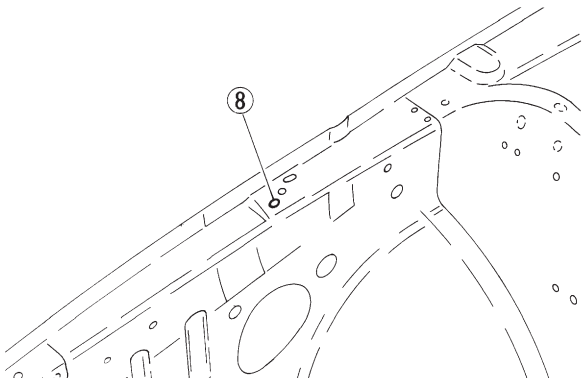
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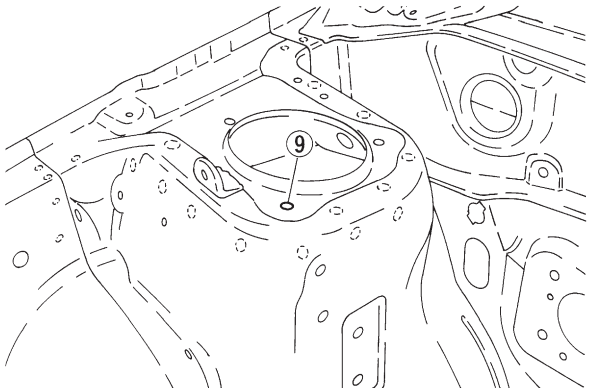
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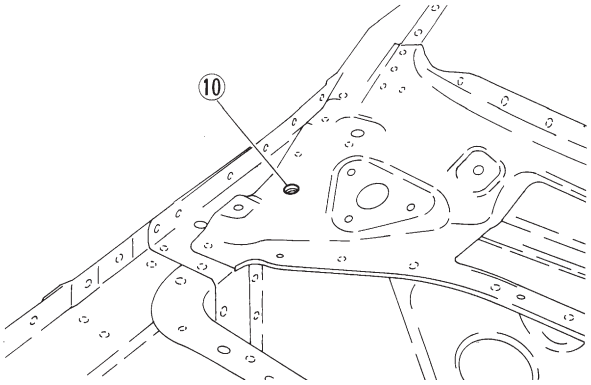
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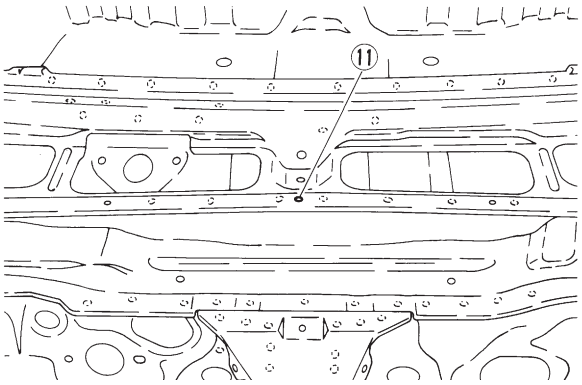
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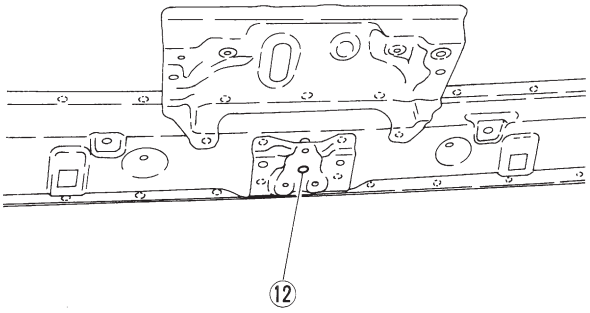
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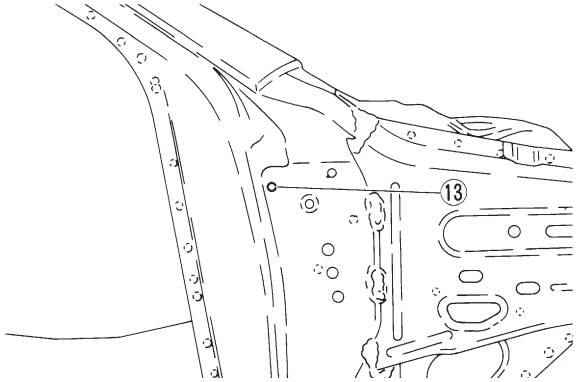
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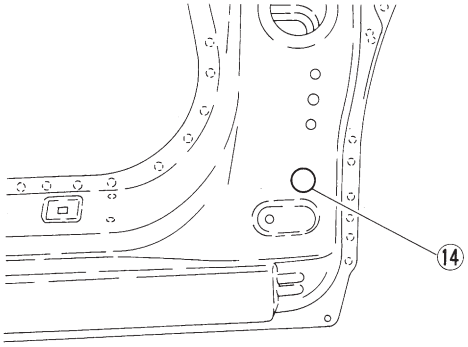
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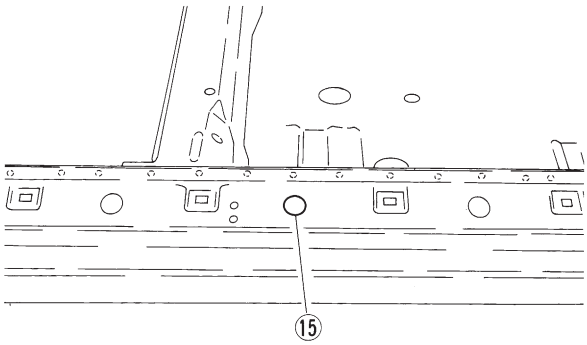
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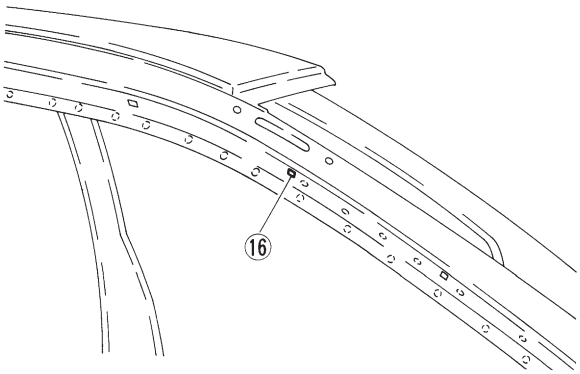
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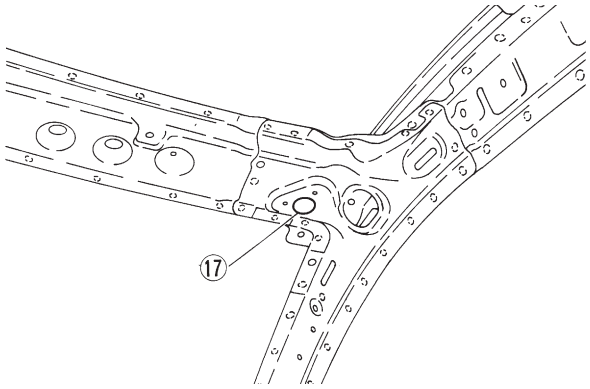
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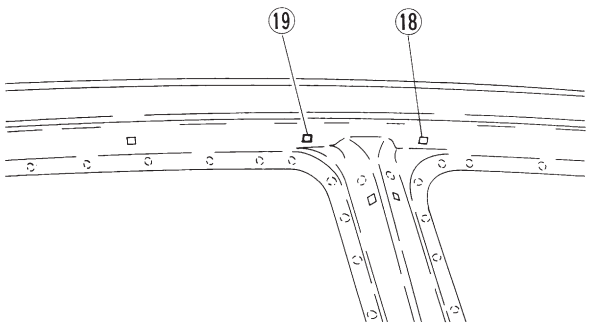
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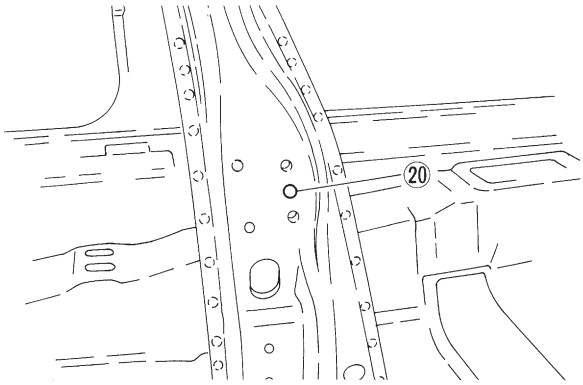
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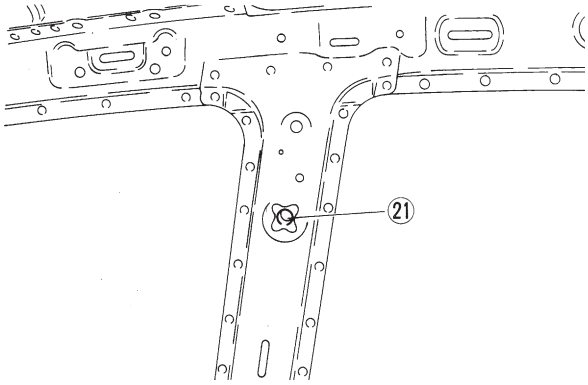
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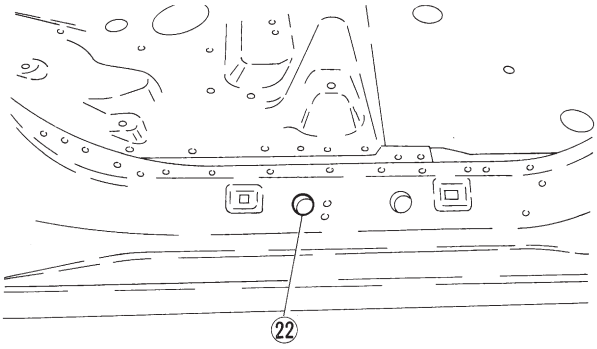
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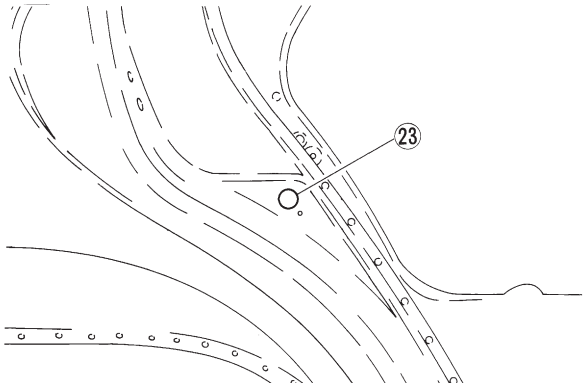
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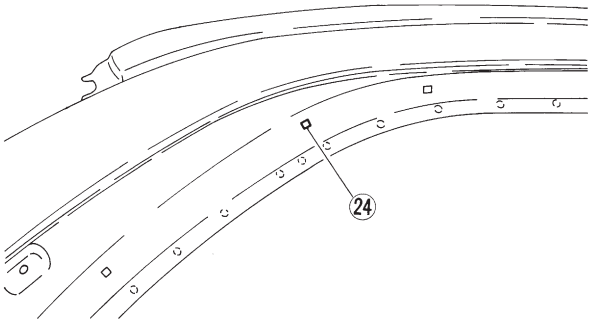
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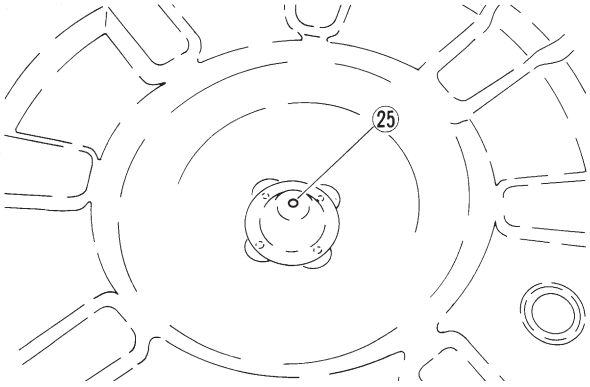
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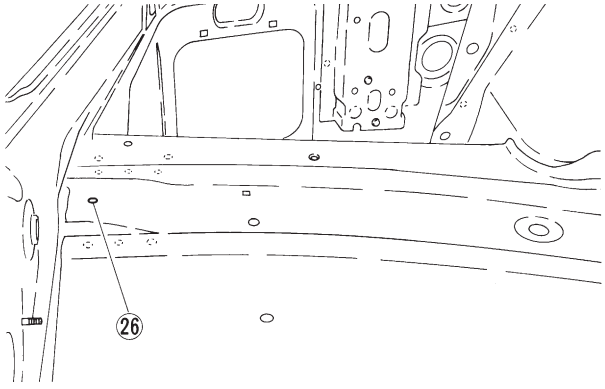
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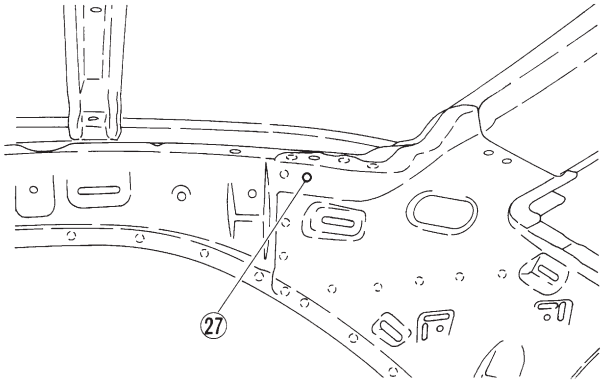
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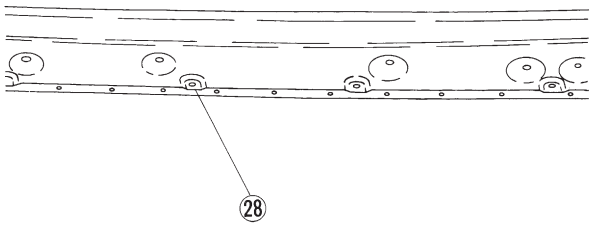


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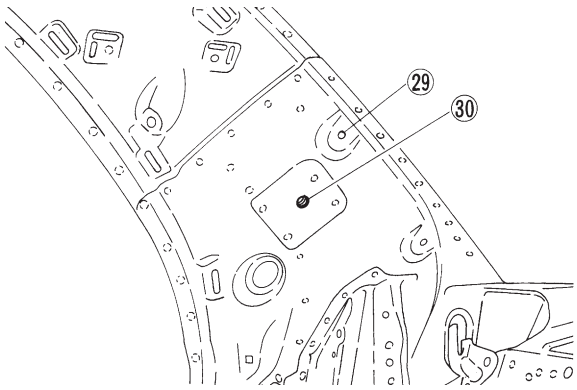


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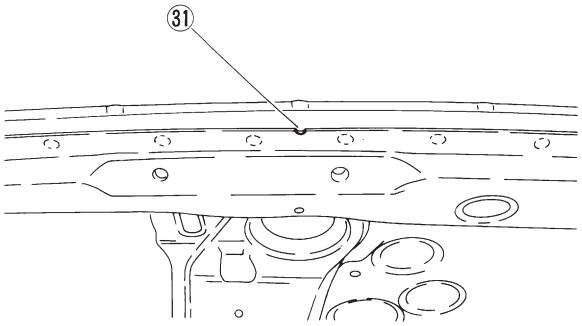


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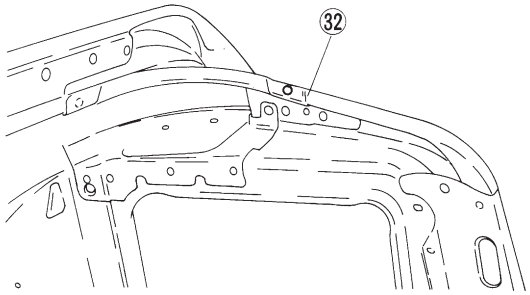


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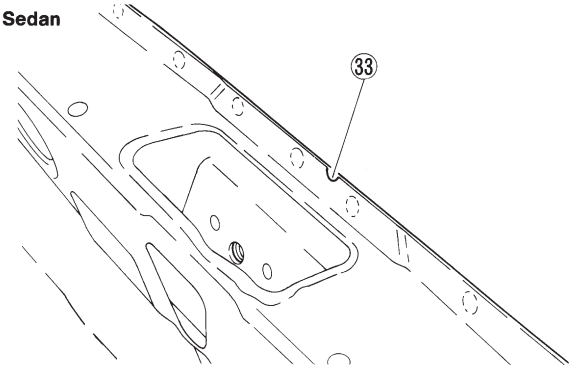


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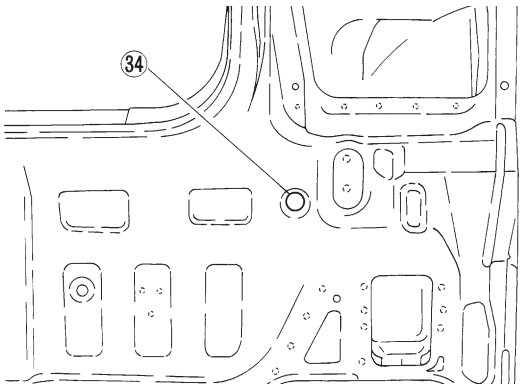


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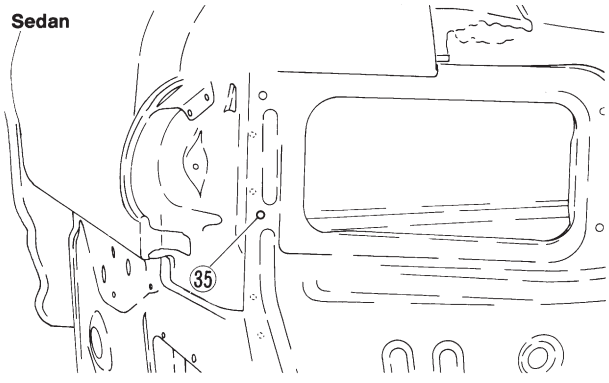


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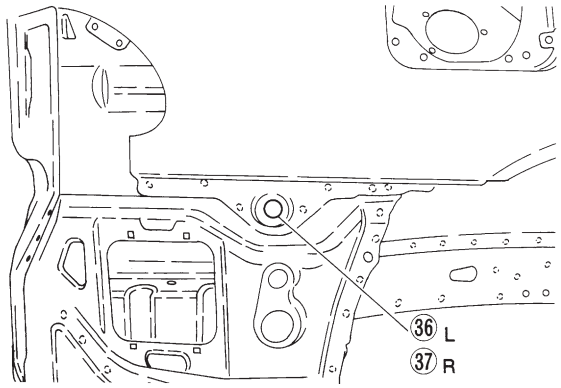


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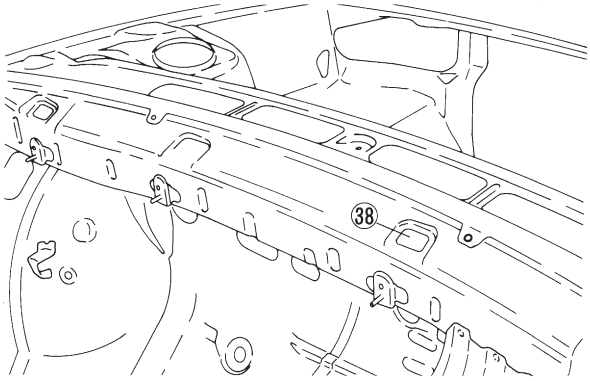
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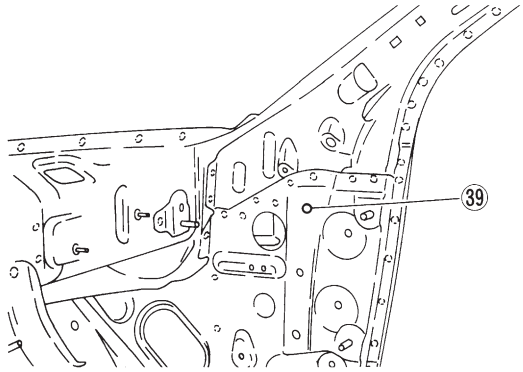
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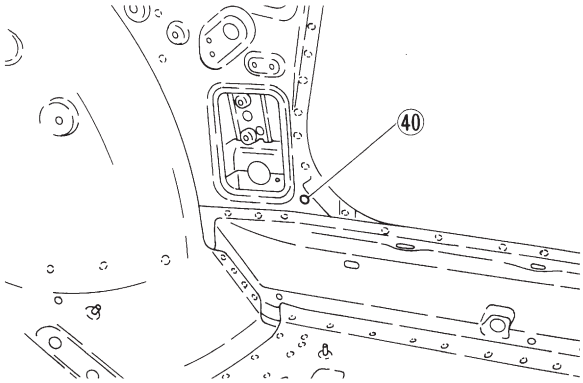
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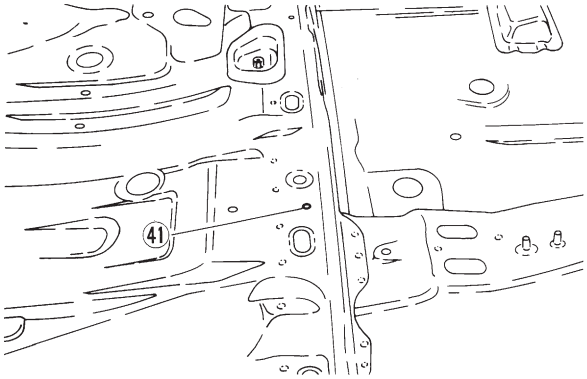
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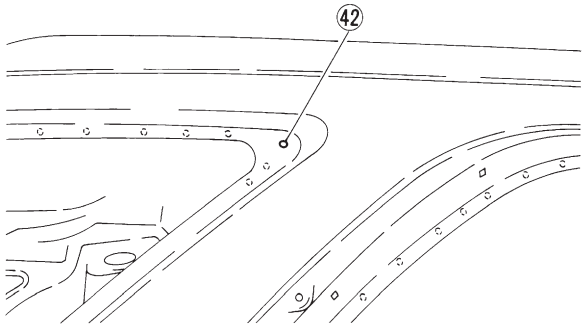


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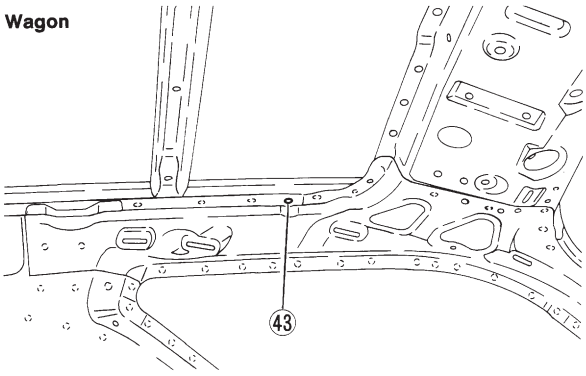
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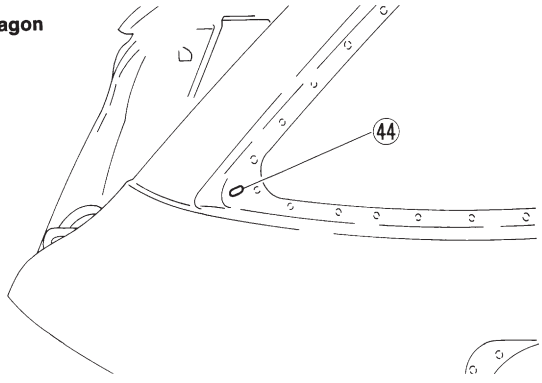
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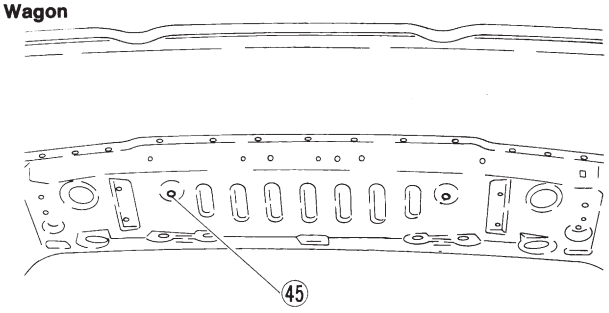
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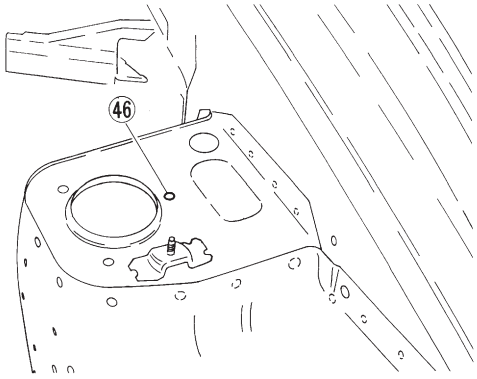


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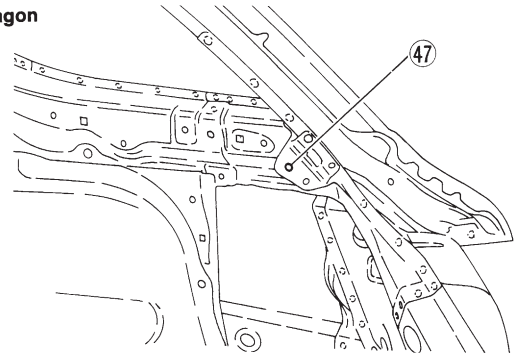


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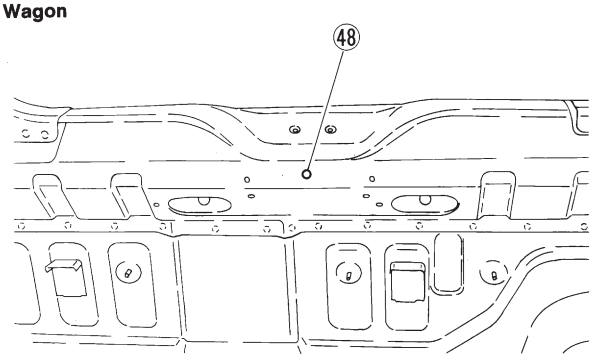
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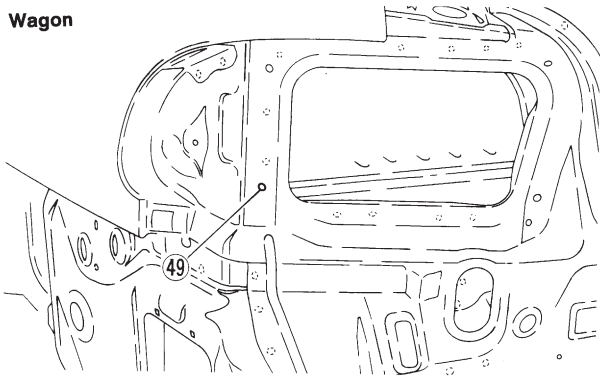
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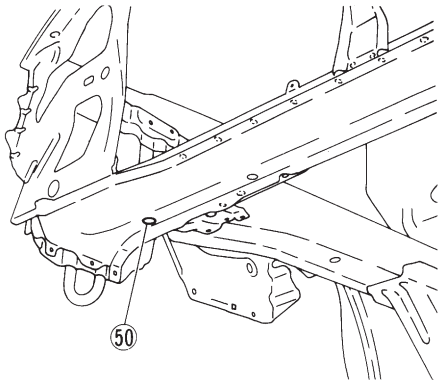


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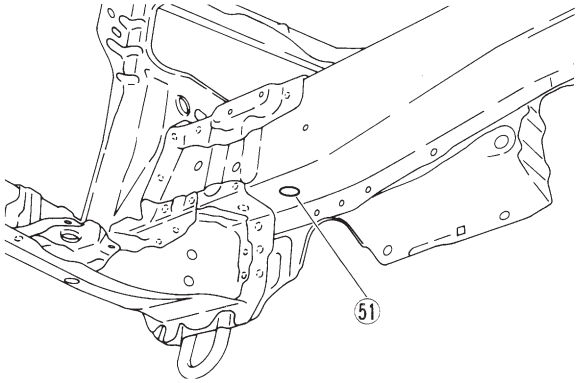
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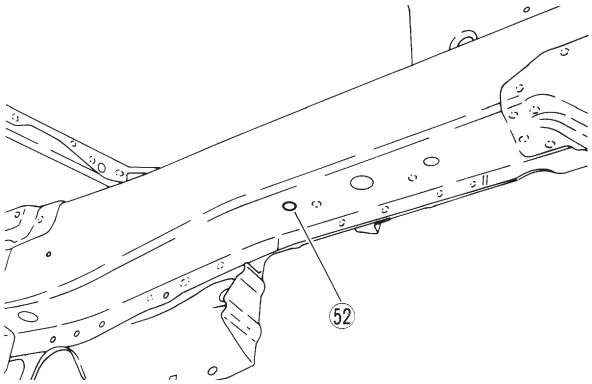
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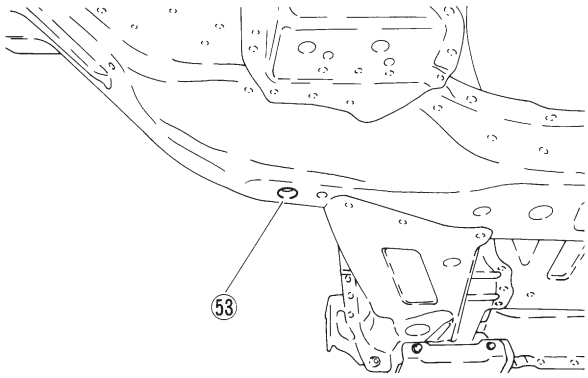
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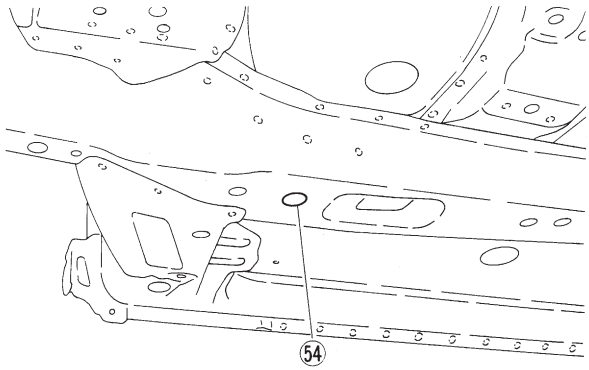
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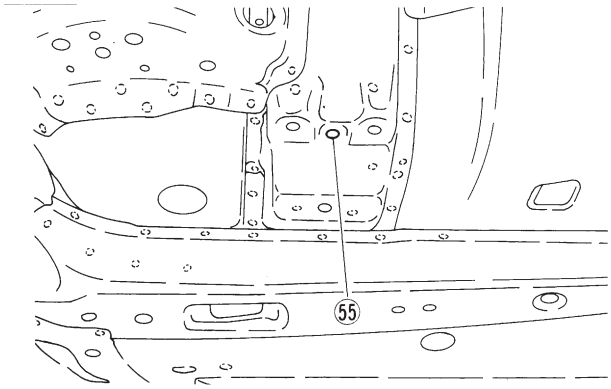
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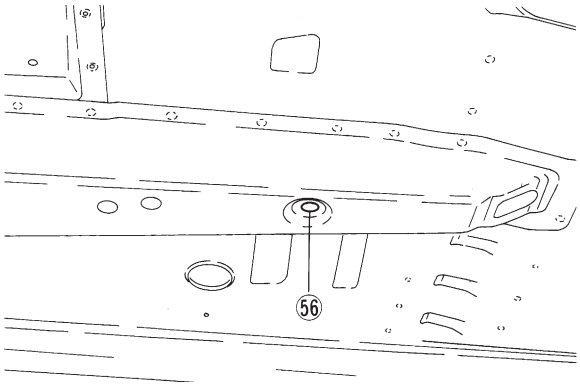
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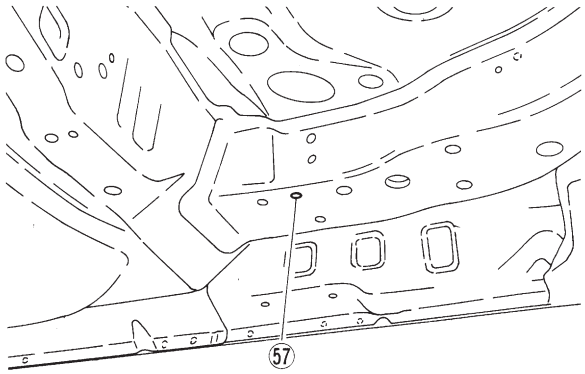
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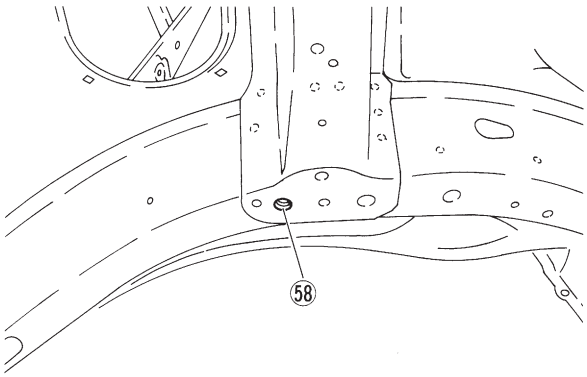
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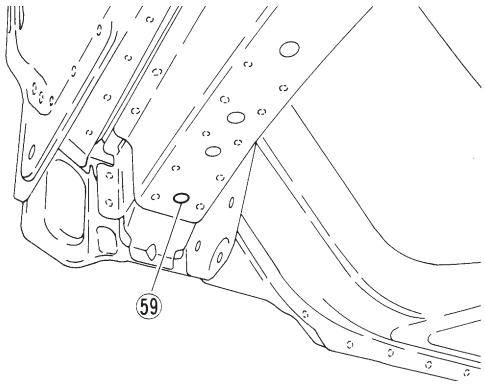
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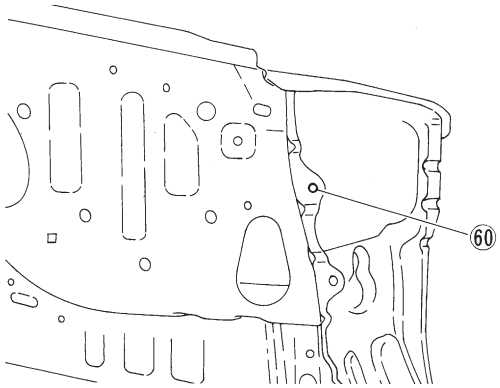
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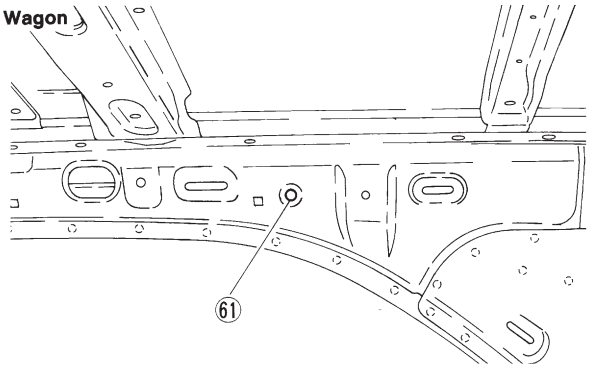


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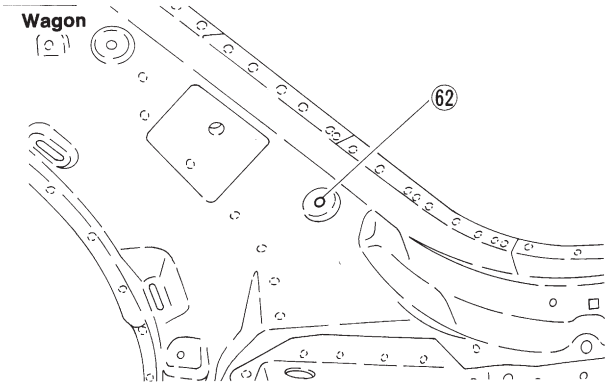
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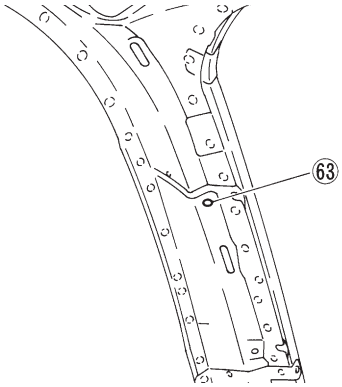
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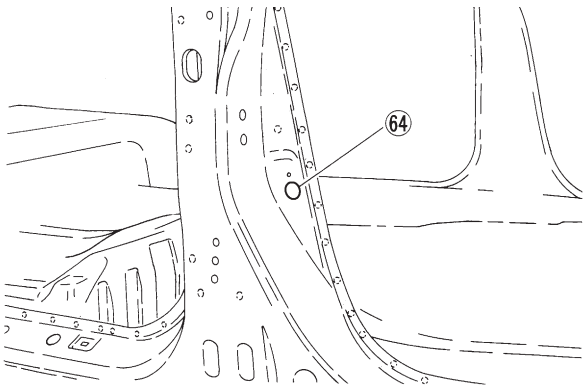


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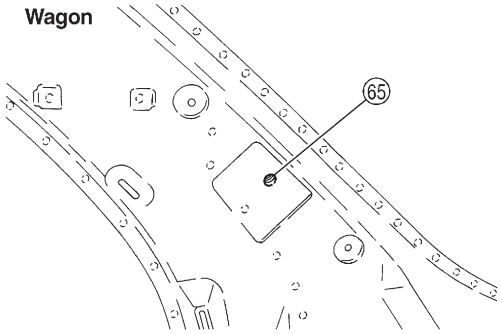


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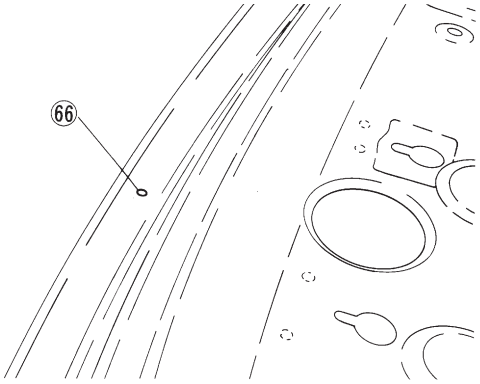
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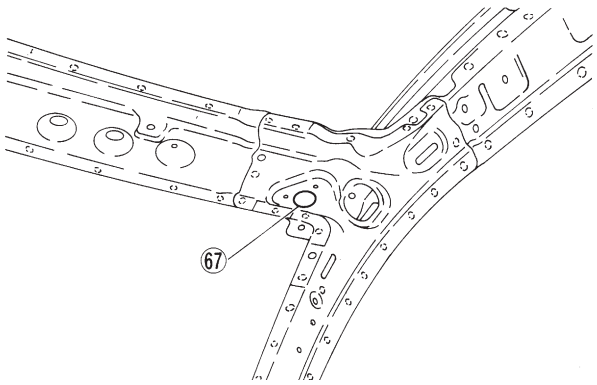


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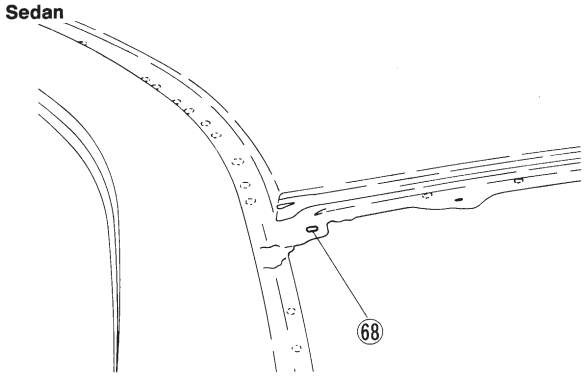


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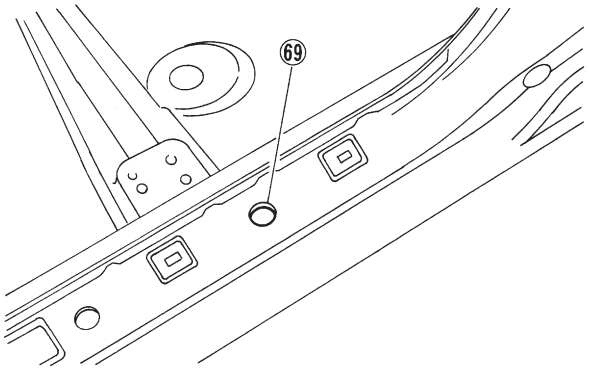


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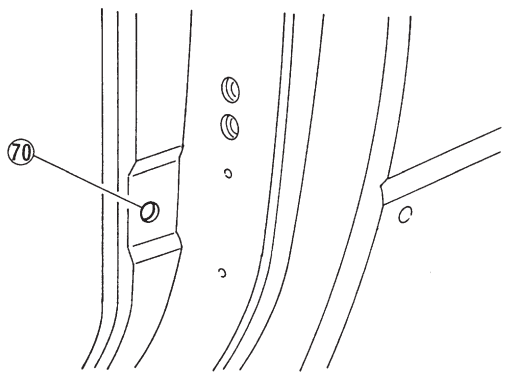
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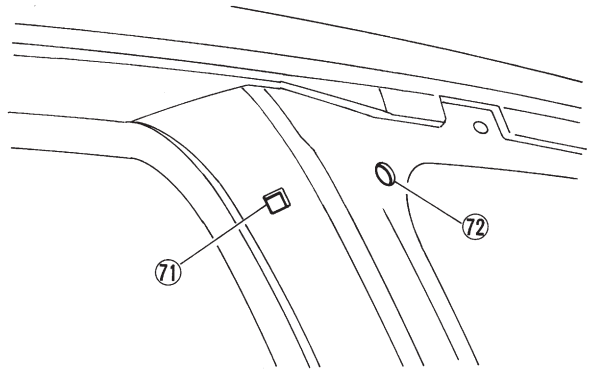
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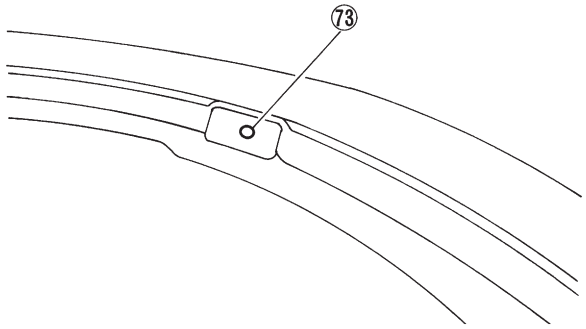
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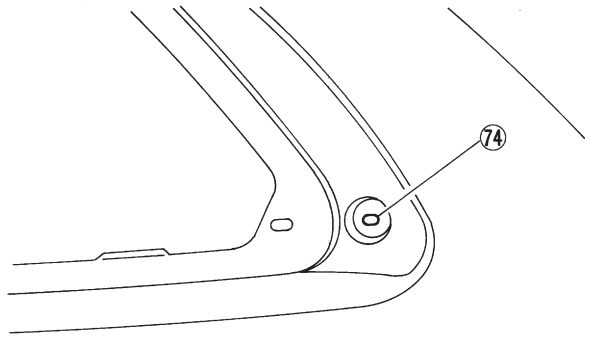
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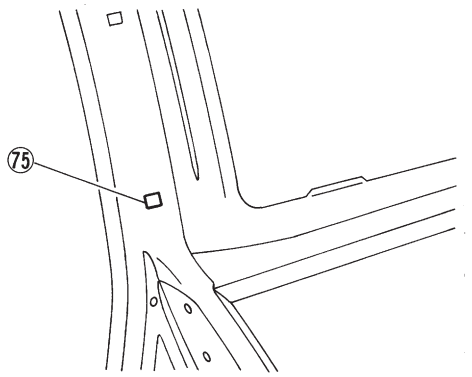
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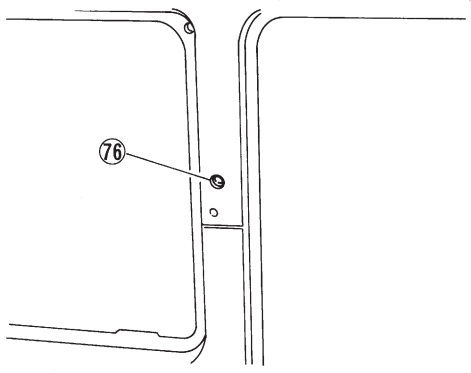
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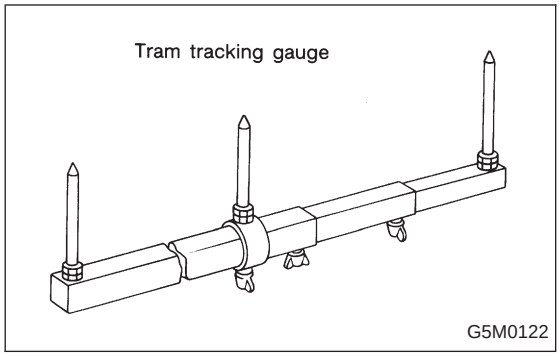
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G5M0649



G5M0650



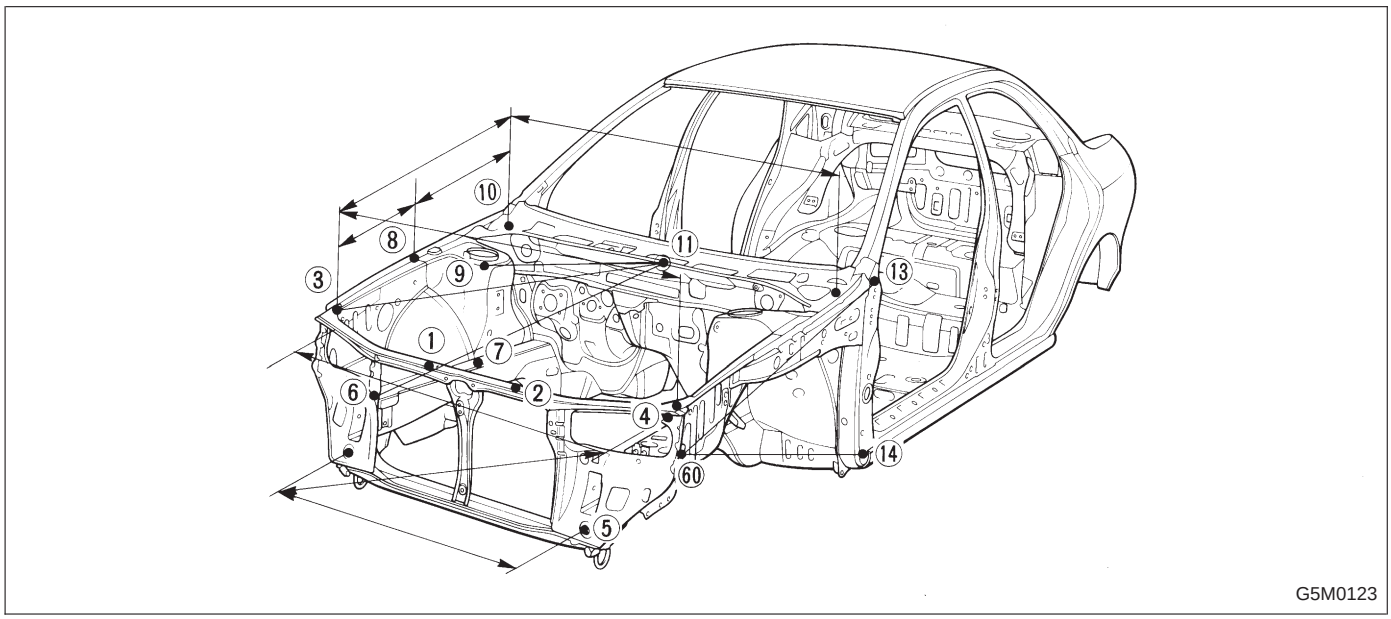
3. Datum Dimensions

Use a tram tracking gauge to measure all dimensions. If a measuring tape is used, be extremely careful because it tends to deflect or twist, which results in a false reading.

NOTE:

- A suffix character “R” or “L” refers to the right or the left.
- All dimensions refer to the distance between the centers of holes measured in a straight line.
- Each dimension indicates a projected dimension between hole centers.

A: FRONT STRUCTURE

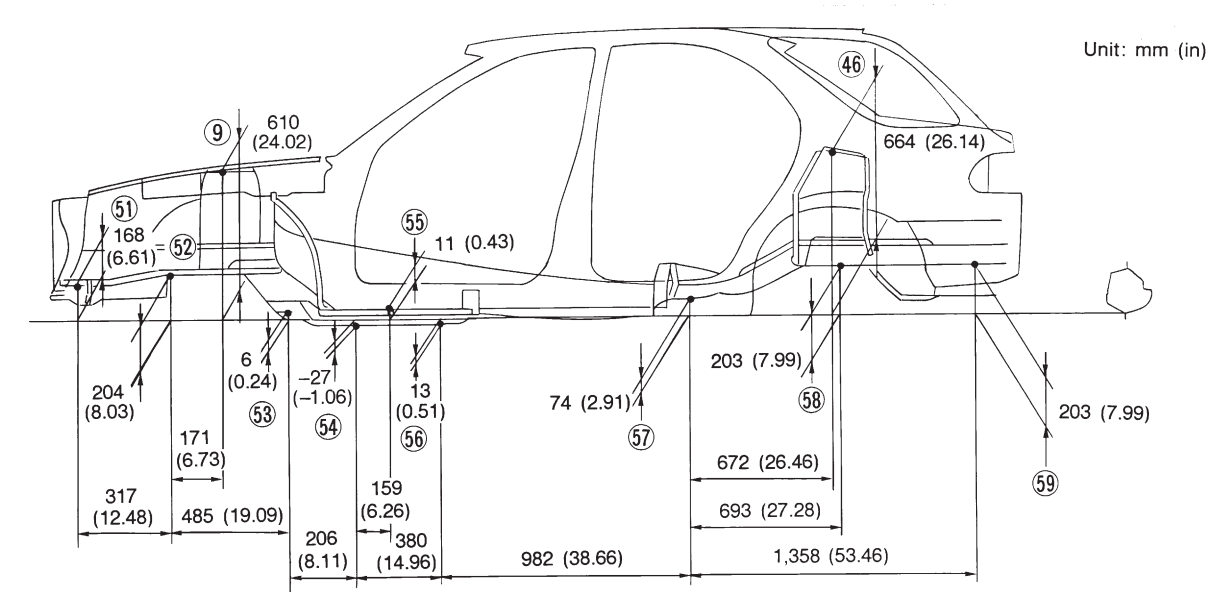


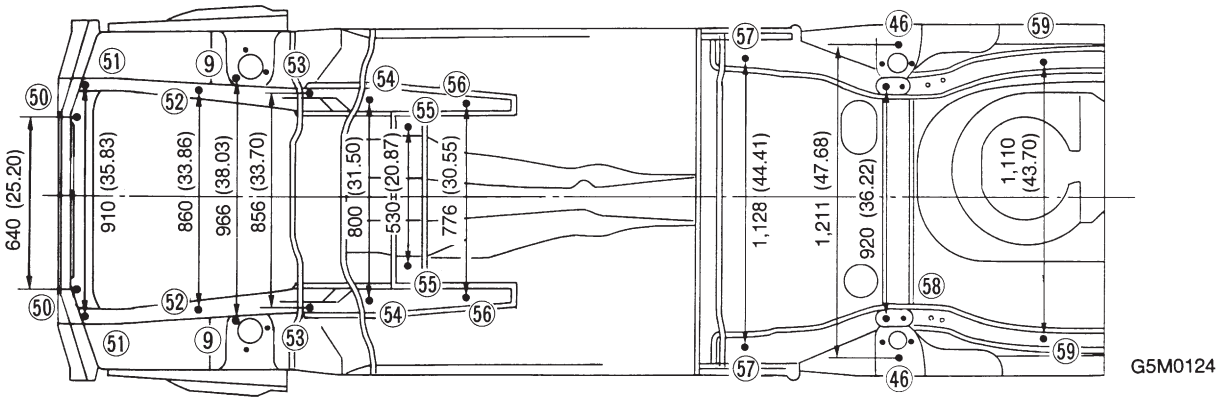
Unit: mm (in)

⑪	—	⑨R	:	525 (20.67)
⑪	—	⑨L		
⑪	—	⑥R	:	988 (38.90)
⑪	—	⑥L		
⑪	—	③R	:	990 (38.98)
⑪	—	③L		
⑩R	—	③R	:	829 (32.64)
⑩L	—	③L		
⑩R	—	⑧R	:	567 (22.32)
⑩L	—	⑧L		
⑧R	—	③R	:	264 (10.39)
⑧L	—	③L		

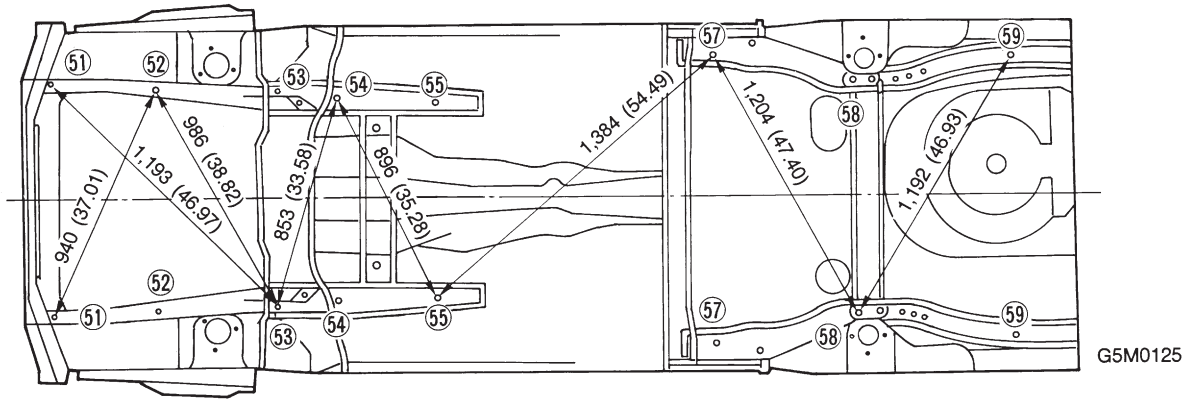
⑩R	—	⑩L	:	1,382 (54.41)
③R	—	③L	:	1,336 (52.60)
⑤R	—	⑤L	:	942 (37.09)
⑤R	—	④R	:	1,174 (46.22)
⑤L	—	④L		
④R	—	④L	:	1,269 (49.96)
⑥⓪R	—	⑬R	:	1,113 (43.82)
⑥⓪L	—	⑬L		
⑥⓪R	—	⑭R	:	1,076 (42.36)
⑥⓪L	—	⑭L		
①	—	⑪	:	882 (34.72)
②	—	⑪	:	913 (35.94)

B: CENTER STRUCTURE





G5M0124

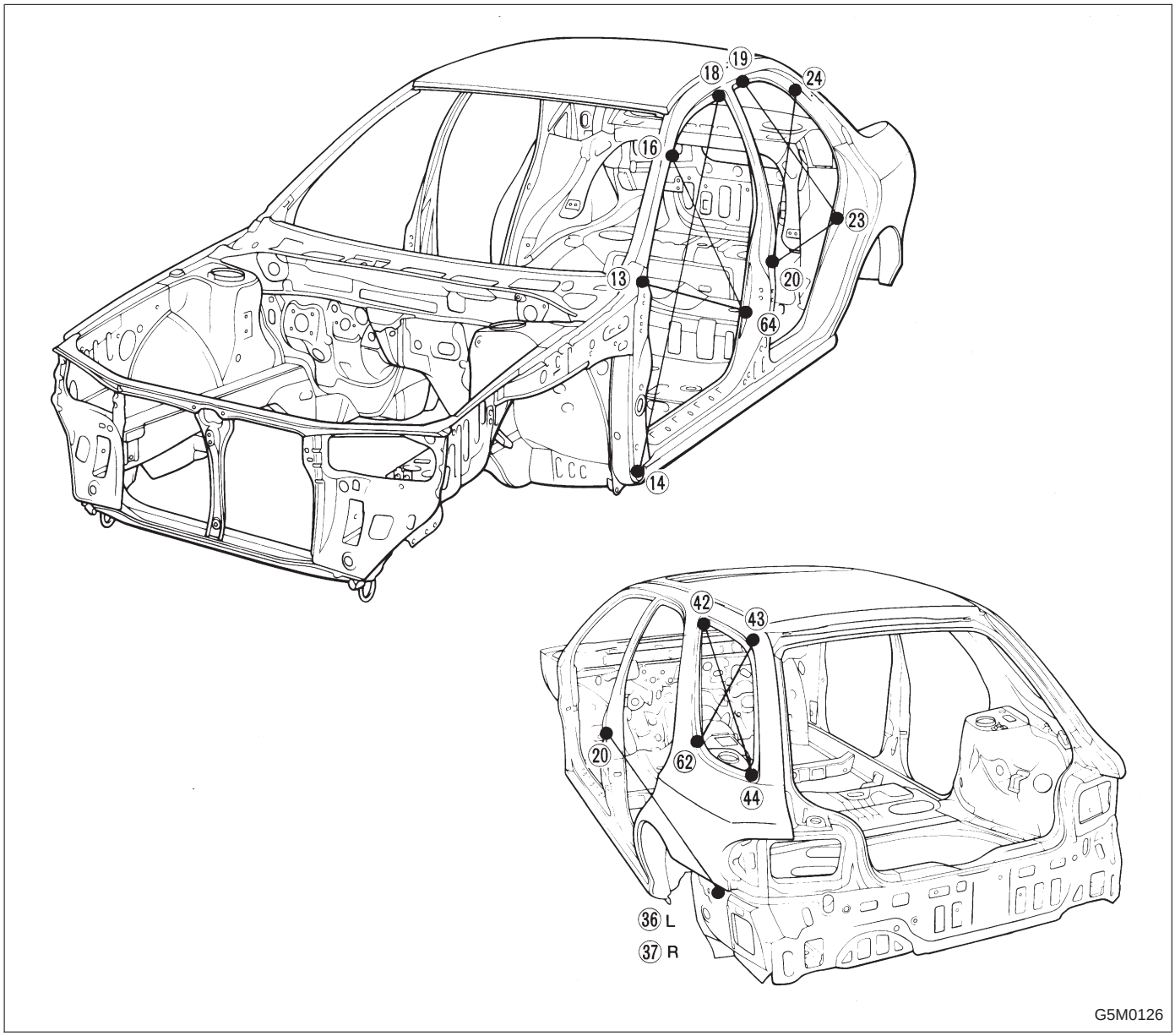


G5M0125

G5M0124

C: DOORS AND REAR QUARTER

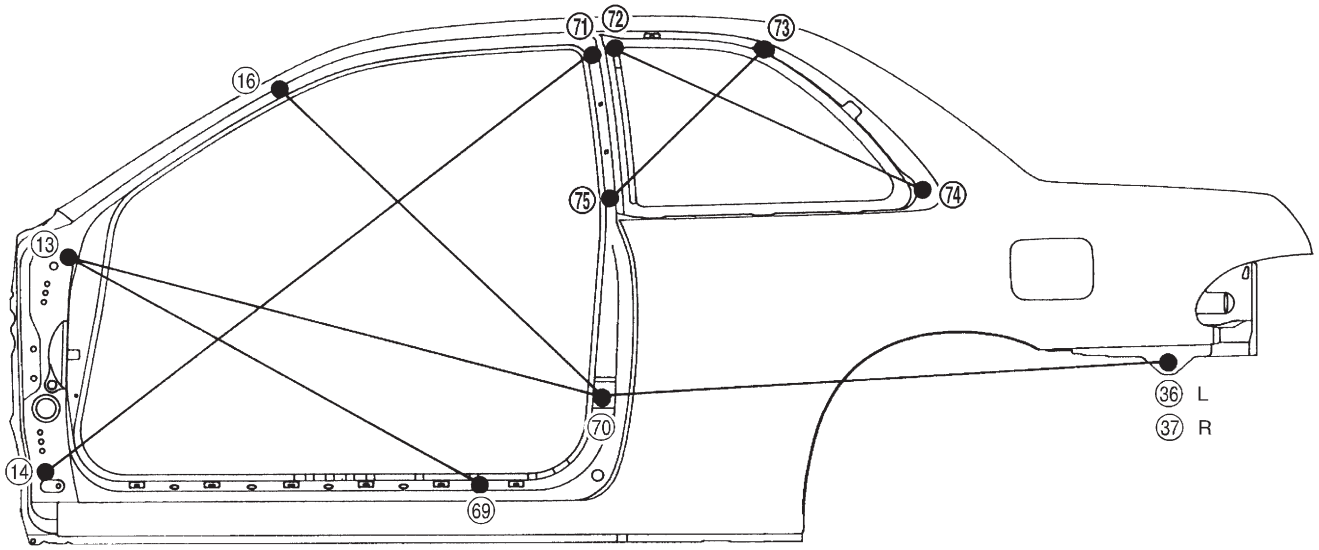
1. SEDAN AND WAGON



Unit: mm (in)

14	—	18	:	1,495 (58.86)	19	—	23	: 912 (35.91)
13	—	64	:	947 (37.28)	20	—	36 L	: 1,462 (57.56) (Wagon)
16	—	64	:	976 (38.43)	20	—	37 R	: 1,481 (58.31) (Wagon)
20	—	23	:	803 (31.61)	62	—	43	: 377 (14.84) (Wagon)
20	—	24	:	829 (32.64)	42	—	44	: 847 (33.35) (Wagon)

2. COUPE

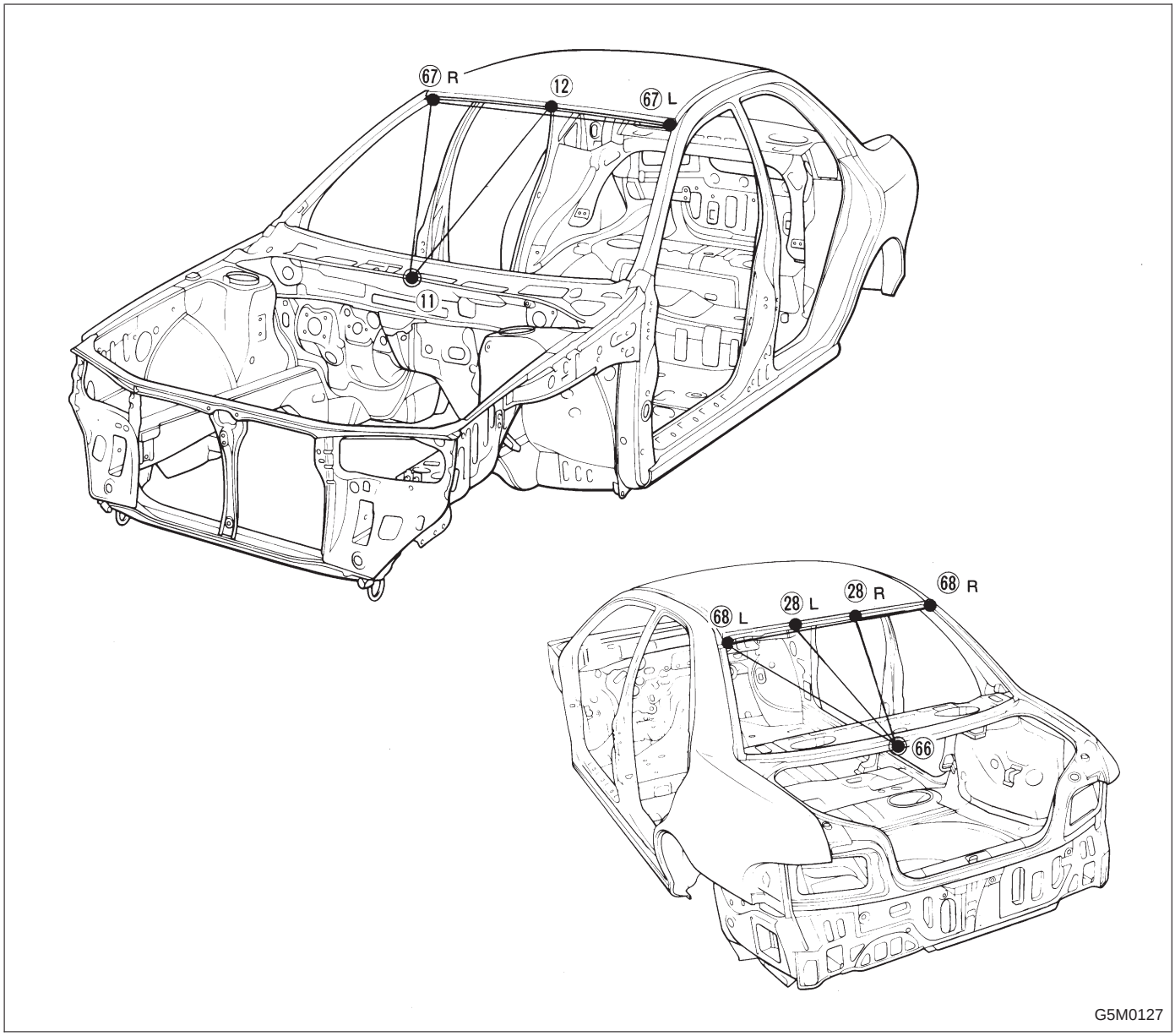


H5M0713A

Unit: mm (in)

⑭	—	⑦①	:	1,576 (62.05)	⑦③	—	⑦⑤	: 512 (20.16)
⑬	—	⑦⓪	:	1,251 (49.25)	⑦⓪	—	③⑥ L	: 1,295 (50.98)
⑯	—	⑦⓪	:	997 (39.25)	⑦⓪	—	③⑦ R	: 1,243 (48.94)
⑬	—	⑥⑨	:	1,063 (41.85)				
⑦②	—	⑦④	:	778 (30.63)				

D: FRONT WINDSHIELD AND REAR WINDOW

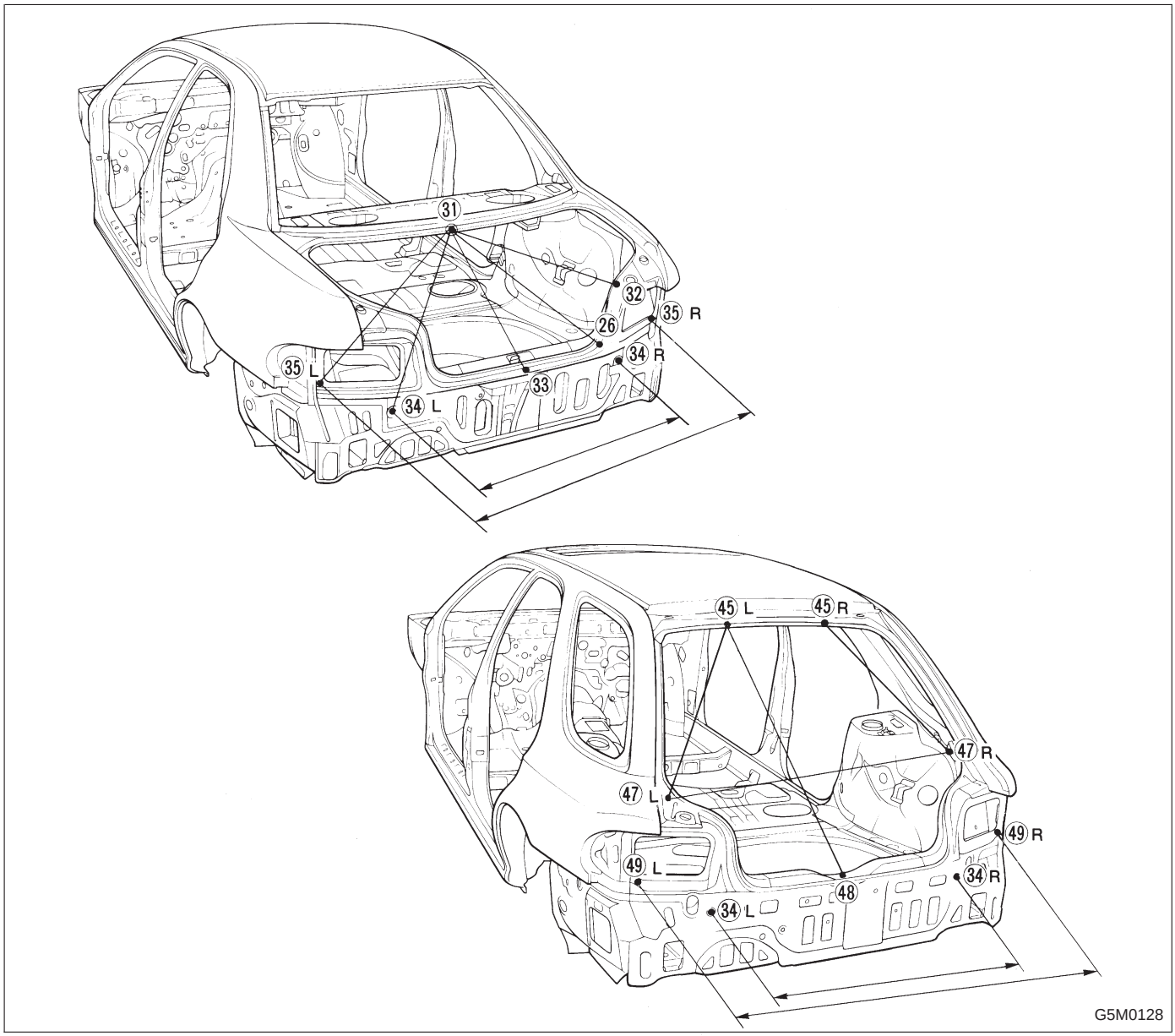


Unit: mm (in)

11	—	12	:	989 (38.94)
67 R	—	67 L	:	1,012 (39.84)
11	—	67 R	:	1,116 (43.94)
11	—	67 L		

66	—	28 R	:	714 (28.11)
66	—	28 L		
66	—	68 R	:	856 (33.70)
66	—	68 L		
68 R	—	68 L	:	1,012 (39.84)

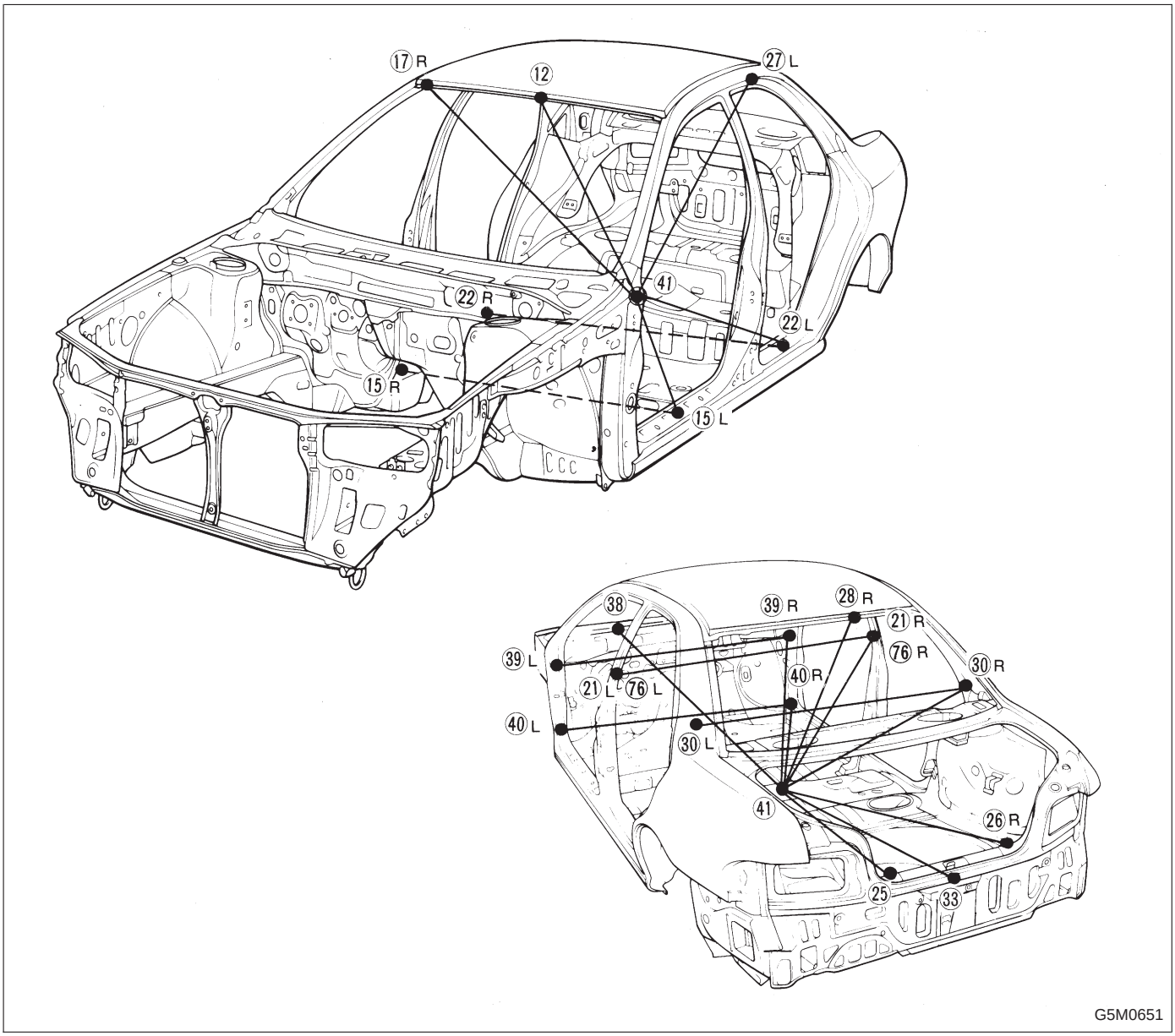
E: TRUNK LID AND REAR GATE



Unit: mm (in)

TRUNK LID				REAR GATE			
㉛	—	㉜R	575 (22.64)	㊺R	—	㊽	988 (38.90)
㉛	—	㉜L		㊺L	—	㊽	
㉛	—	㉖R	812 (31.97)	㊺R	—	㊼R	926 (36.46)
㉛	—	㉖L		㊺L	—	㊼L	
㉛	—	㉝	522 (20.55)	㊼R	—	㊼L	1,043 (41.06)
㉛	—	㉟R	794 (31.26)	㊾R	—	㊾L	1,335 (52.56)
㉛	—	㉟L		㉞R	—	㉞L	890 (35.04)
㉞R	—	㉞L	890 (35.04)				
㉟R	—	㉟L	1,364 (53.70)				

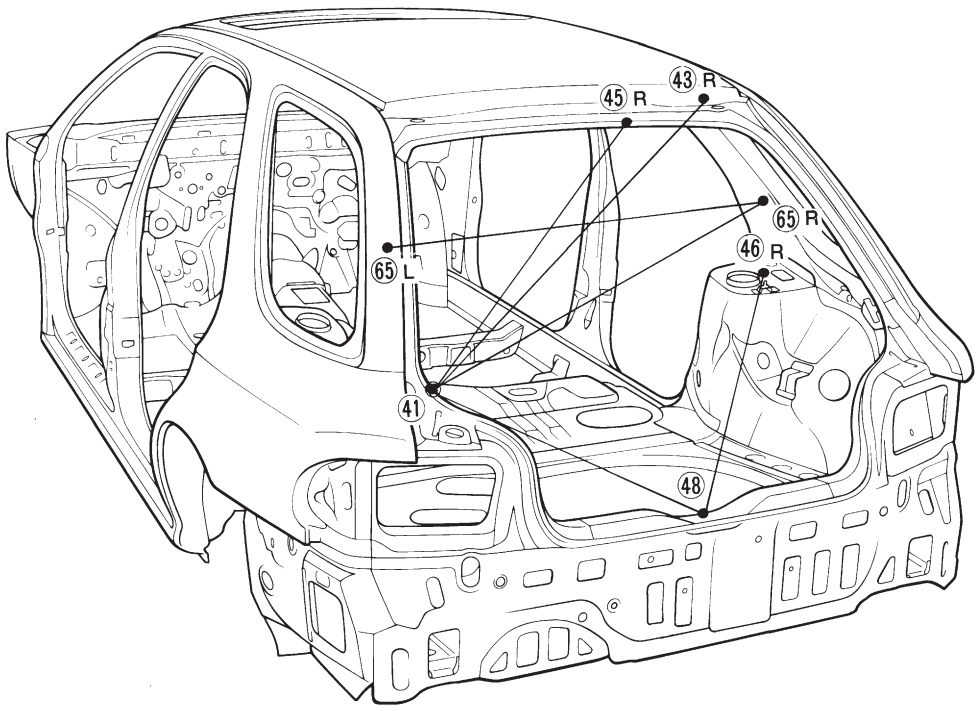
F: COMPARTMENT



Unit: mm (in)

30 R	—	30 L	:	1,197 (47.13)	41	—	15 R, 15 L	:	1,140 (44.88)	41	— 30 R, 30 L : 1,168 (45.98) (Sedan)
21 R	—	21 L	:	1,061 (41.77)						41	— 28 R, 28 L : 1,050 (41.34) (Sedan)
15 R	—	15 L	:	1,453 (57.20)	41	—	22 R, 22 L	:	733 (28.86)		
22 R	—	22 L	:	1,453 (57.20)	41	—	12	:	1,156 (45.51)	41	— 21 R, 21 L : 1,038 (40.87)
39 R	—	39 L	:	1,388 (54.65)	41	—	27 R, 27 L	:	1,085 (42.72)		
40 R	—	40 L	:	1,401 (55.16)						41	— 17 R, 17 L : 1,208 (47.56)
41	—	38	:	1,527 (60.12)	41	—	26 R, 26 L	:	1,568 (61.73)		
41	—	39 R, 39 L	:	1,524 (60.00)	41	—	25	:	1,184 (46.61)	41	— 33 : 1,569 (61.77) (Sedan)
41	—	40 R, 40 L	:	1,756 (69.13)						76 R	— 76 L : 1,212 (47.72) (Coupe)

G: LUGGAGE ROOM



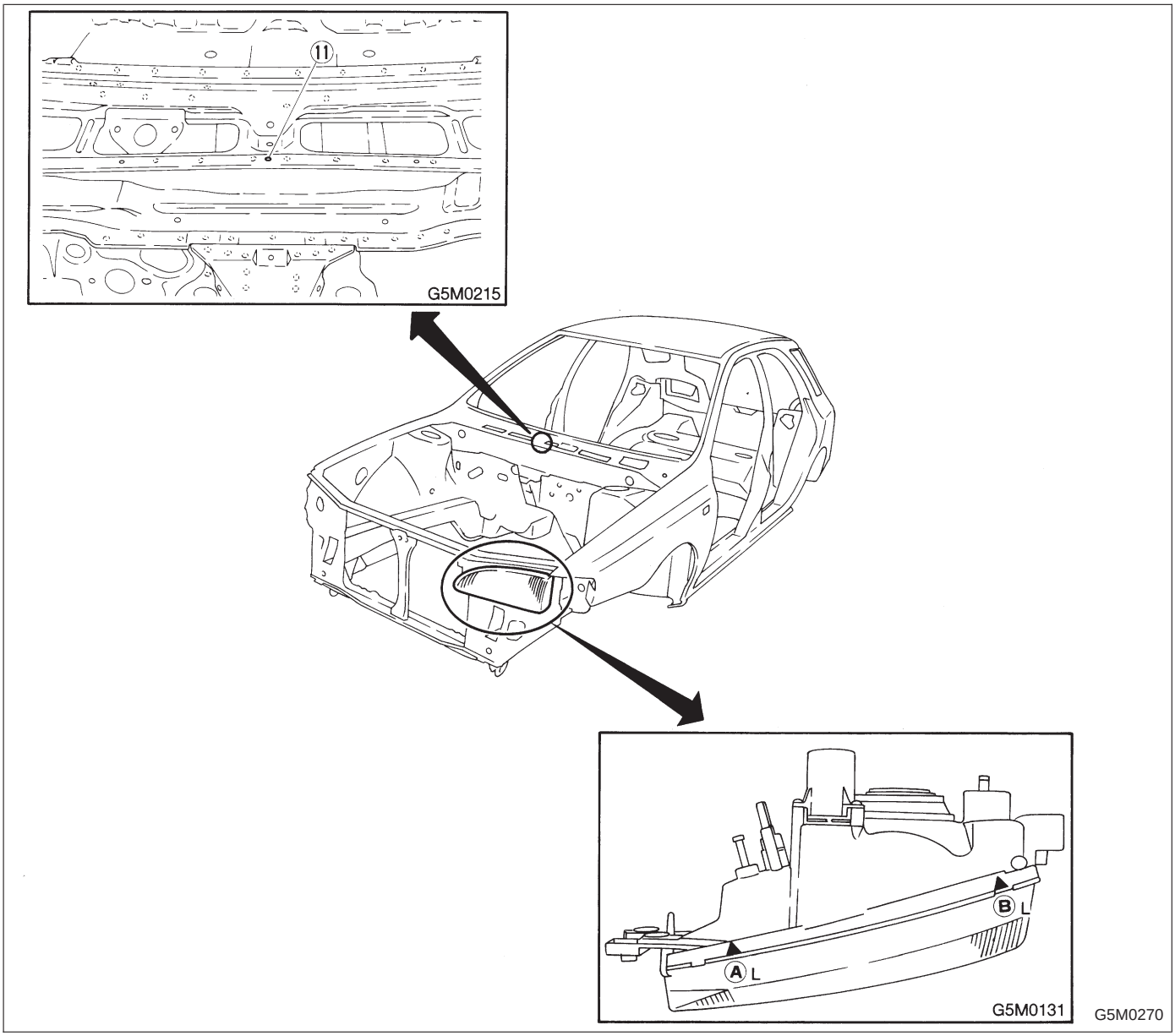
G5M0130

Unit: mm (in)

41	—	65 R	: 1,122 (44.17)	41	—	43 R	: 1,237 (48.70)
41	—	65 L		41	—	43 L	
41	—	45 R	: 1,225 (48.23)	48	—	46 R	: 971 (38.23)
41	—	45 L		48	—	46 L	
41	—	48	: 1,446 (56.93)	65 R	—	65 L	: 1,235 (48.62)

4. Datum Points and Dimensions Concerning On-Board Aiming Adjustment

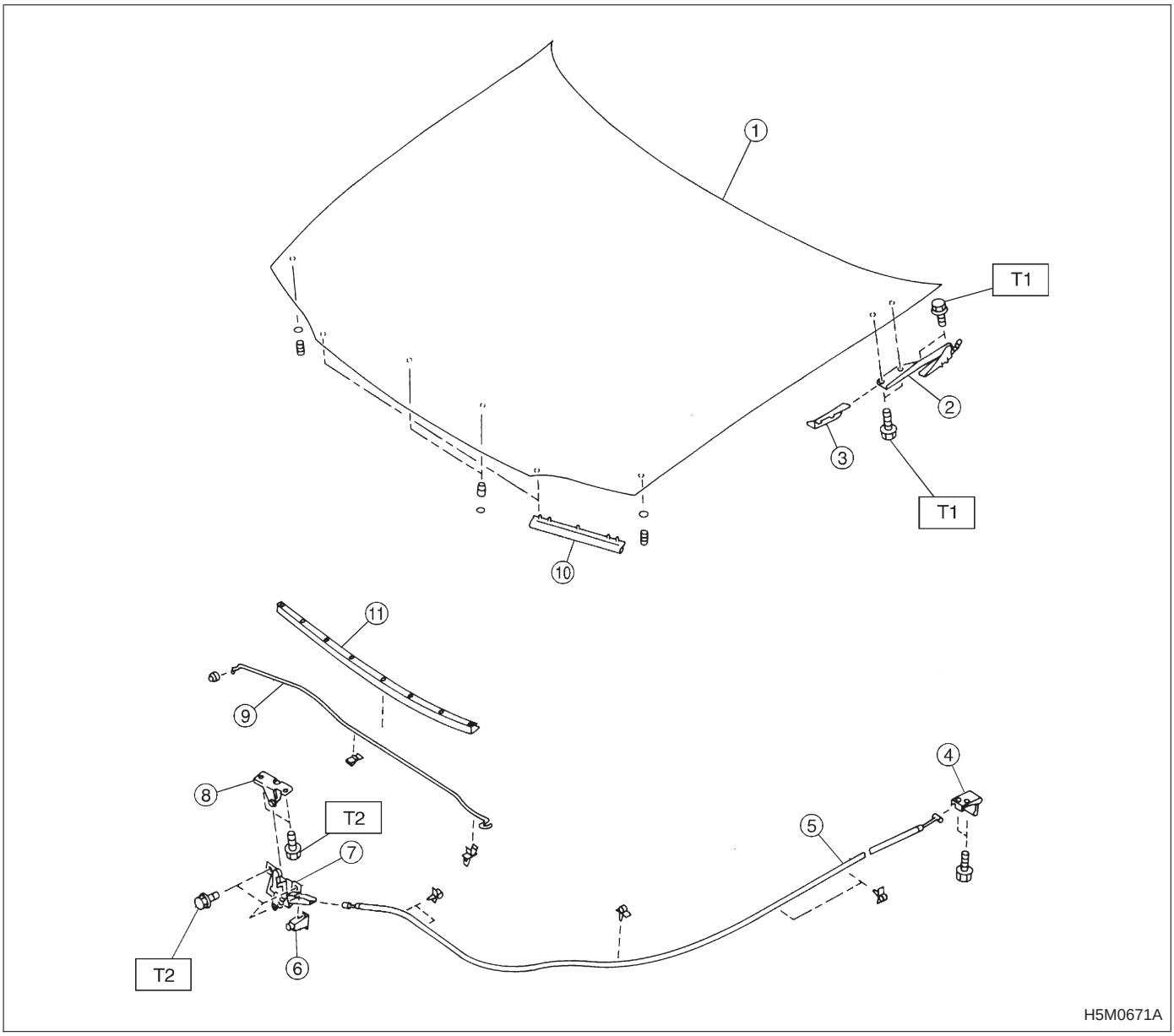
If headlight aiming is misaligned due to damaged body panel, repair headlight mating surface using body and headlight datum points as a guide.



Unit: mm (in)

11 — A L 11 — A R	:	993 (39.09)		11 — B L 11 — B R	:	1,048 (41.26)	

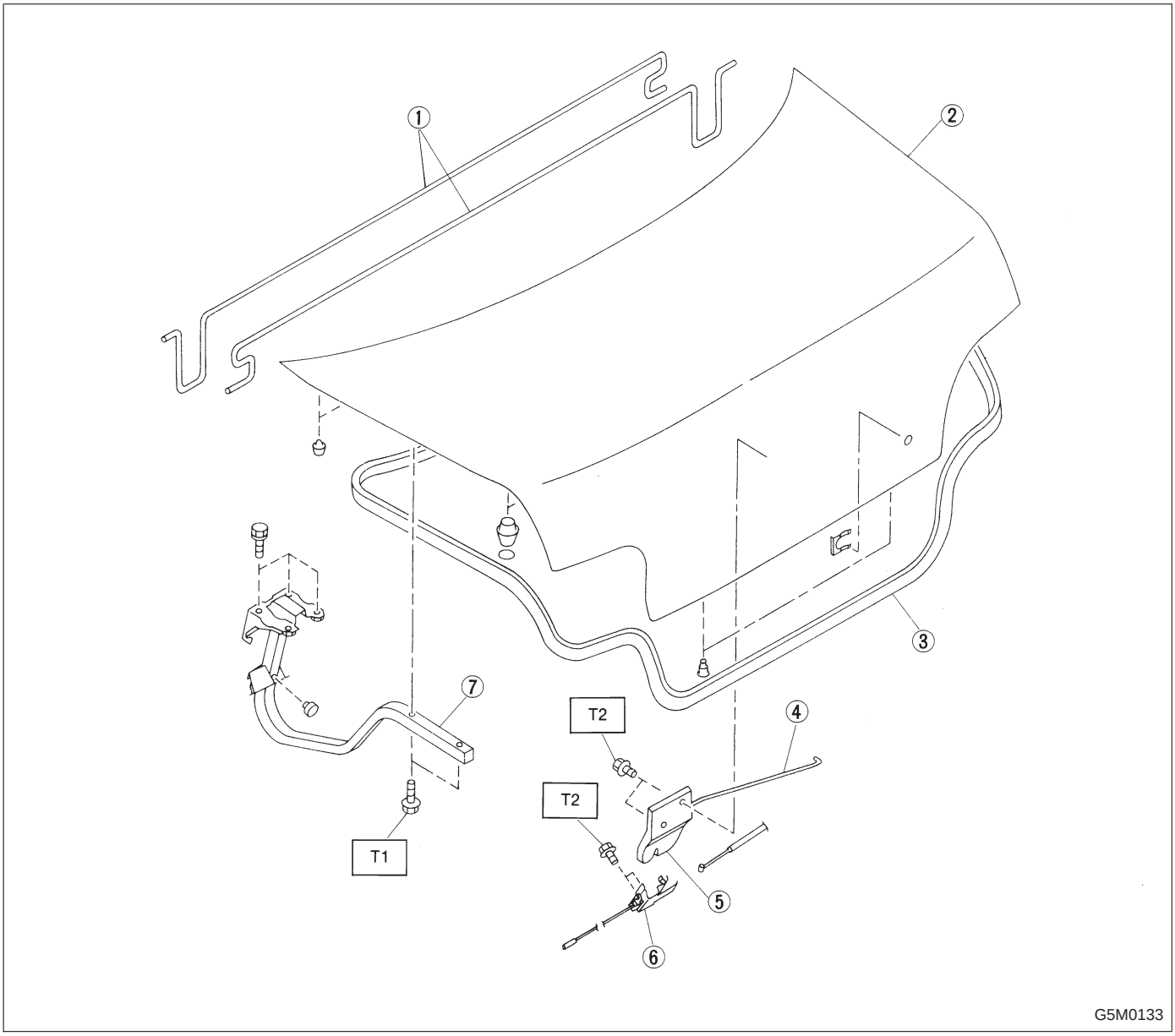
1. Front Hood and Hood Lock



① Front hood
② Hinge (RH, LH)
③ Hood hinge cover (RH, LH)
④ Lever ASSY
⑤ Cable
⑥ Stopper
⑦ Hood lock ASSY
⑧ Striker
⑨ Front hood stay
⑩ Seal (Front hood) SD
⑪ Seal (Front hood) CTR

Tightening torque: N·m (kg-m, ft-lb)
T1: 14±9 (1.4±0.9, 10.1±6.5)
T2: 32±1 (3.3±0.1, 23.9±0.7)

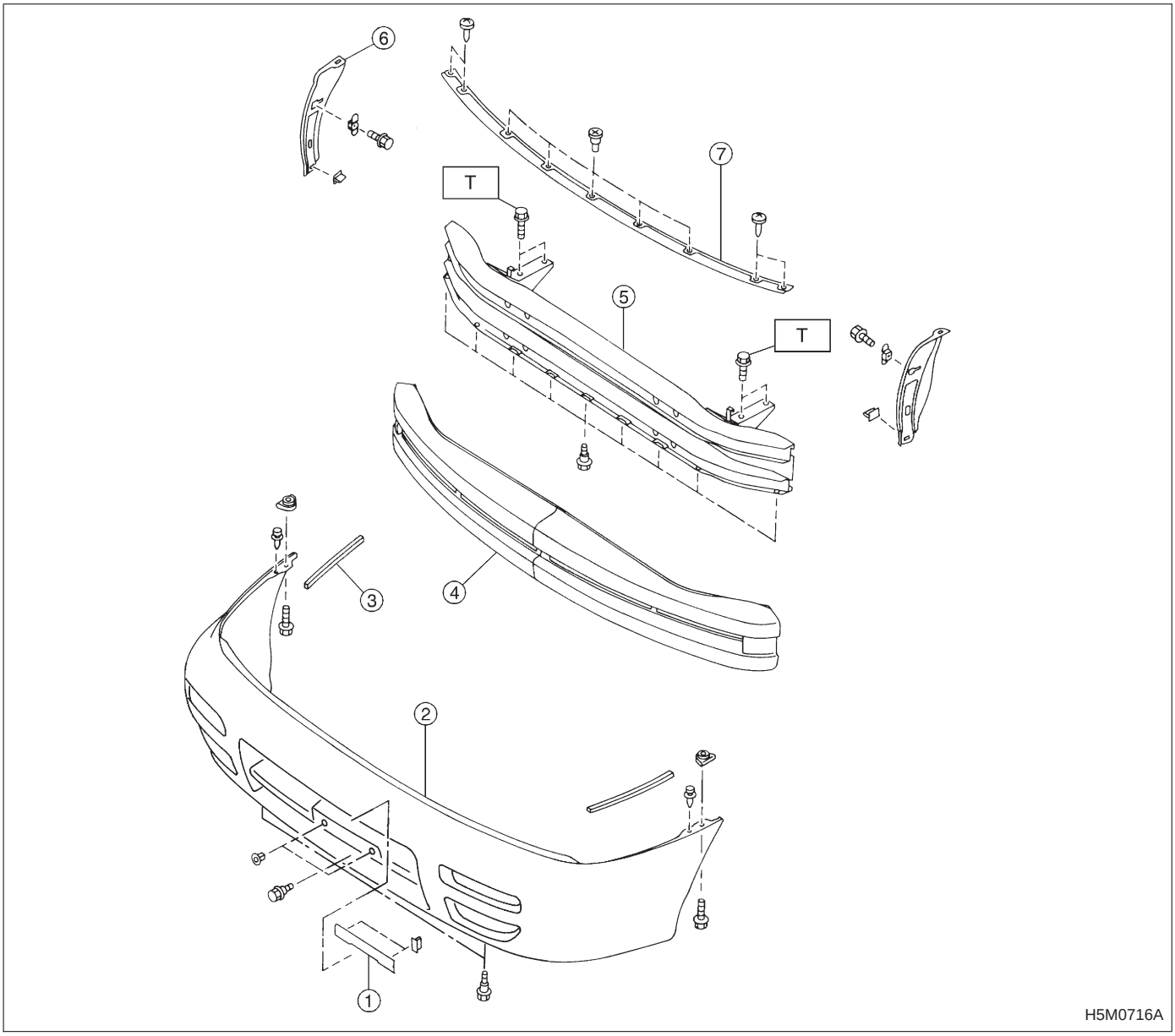
2. Trunk Lid



① Torsion bar
② Trunk lid
③ Weatherstrip
④ Rod
⑤ Trunk lid lock ASSY
⑥ Striker
⑦ Hinge ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 14±4 (1.4±0.4, 10.1±2.9)
T2: 18±5 (1.8±0.5, 13.0±3.6)

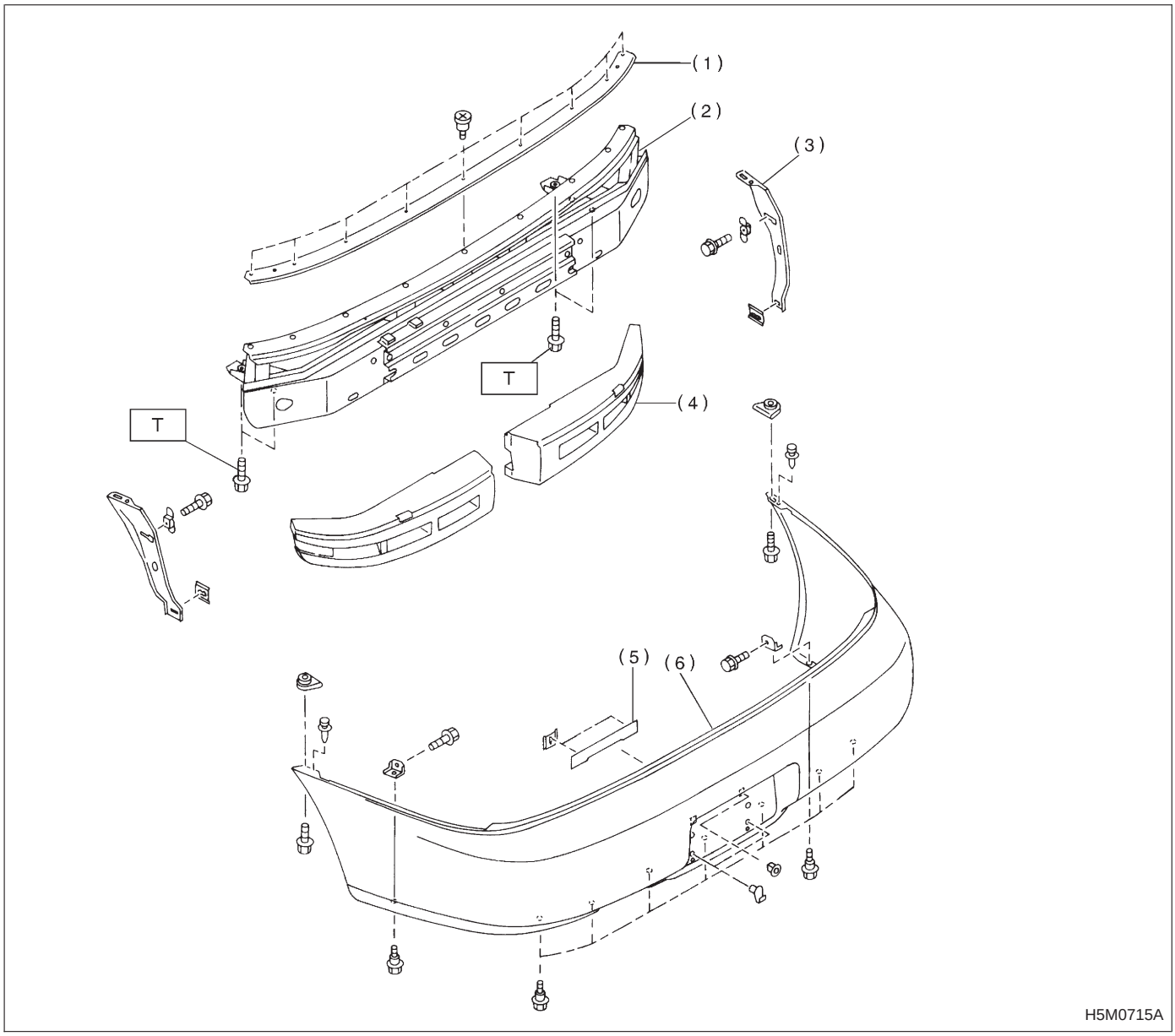
3. Front Bumper



① Plate
② Bumper face
③ Spacer
④ E/A from bumper
⑤ Front beam
⑥ Bracket (Side)
⑦ Holder upper

Tightening torque: N·m (kg-m, ft-lb)
T: 93±25 (9.5±2.5, 69±18)

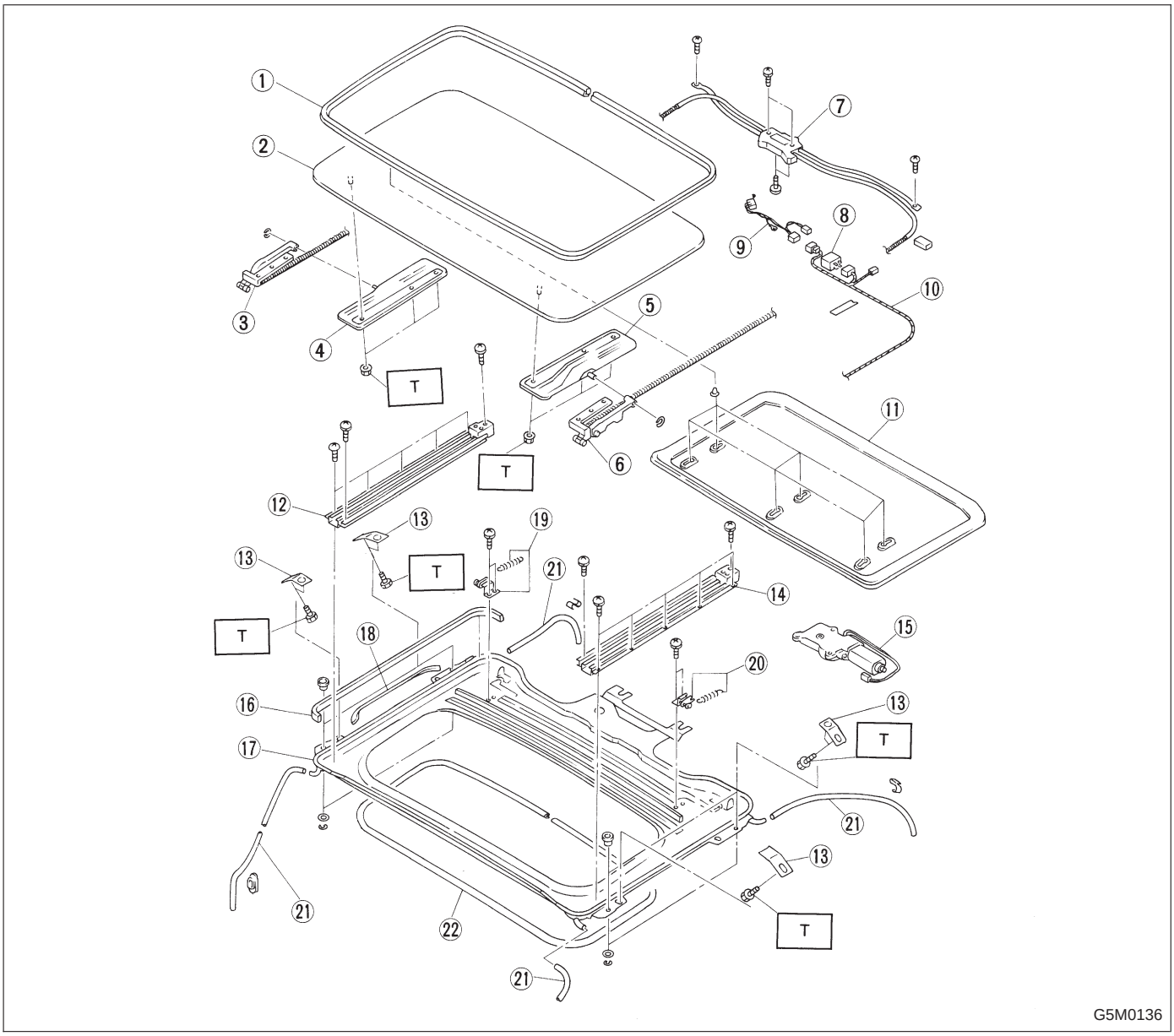
4. Rear Bumper



① Holder upper
② Bumper beam
③ Bracket (Side)
④ E/A from bumper
⑤ Plate
⑥ Bumper surface

Tightening torque: N·m (kg-m, ft-lb)
T: 93±25 (9.5±2.5, 69±18)

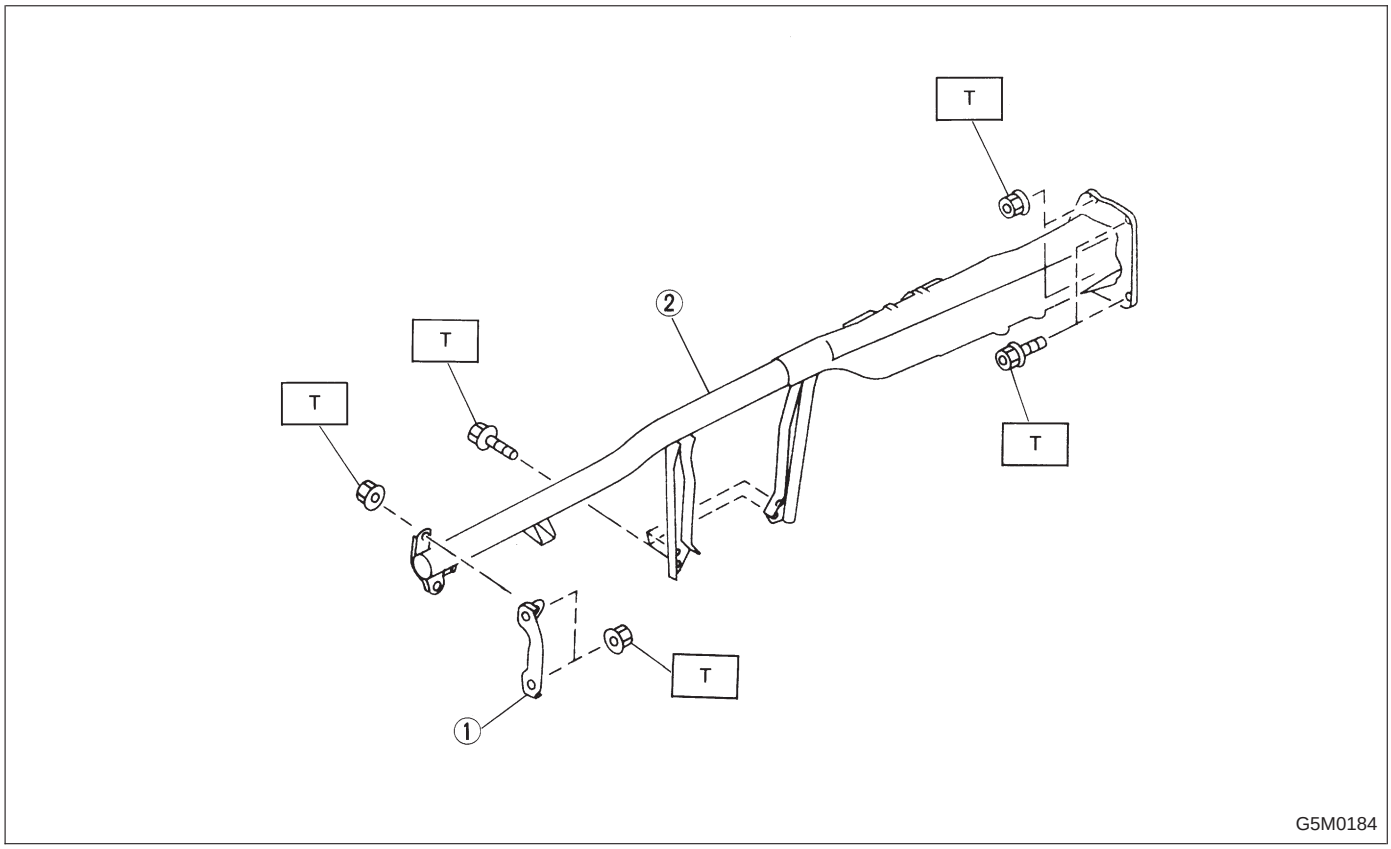
5. Sunroof



① Weatherstrip
② Sunroof panel
③ Rear guide ASSY
④ Lower panel
⑤ Lower panel
⑥ Rear guide ASSY
⑦ Drive unit
⑧ Relay
⑨ Harness
⑩ Harness
⑪ Sunroof trim
⑫ Guide rail
⑬ Set bracket
⑭ Guide rail
⑮ Motor ASSY
⑯ Sealed tape
⑰ Frame ASSY
⑱ Sealed cushion
⑲ Shutting ASSY (RH)
⑳ Shutting ASSY (LH)
㉑ Drain tube
㉒ Garnish

Tightening torque: N·m (kg-m, ft-lb)
T: 7.4±2.0 (0.75±0.2, 5.4±1.4)

6. Steering Support Beam

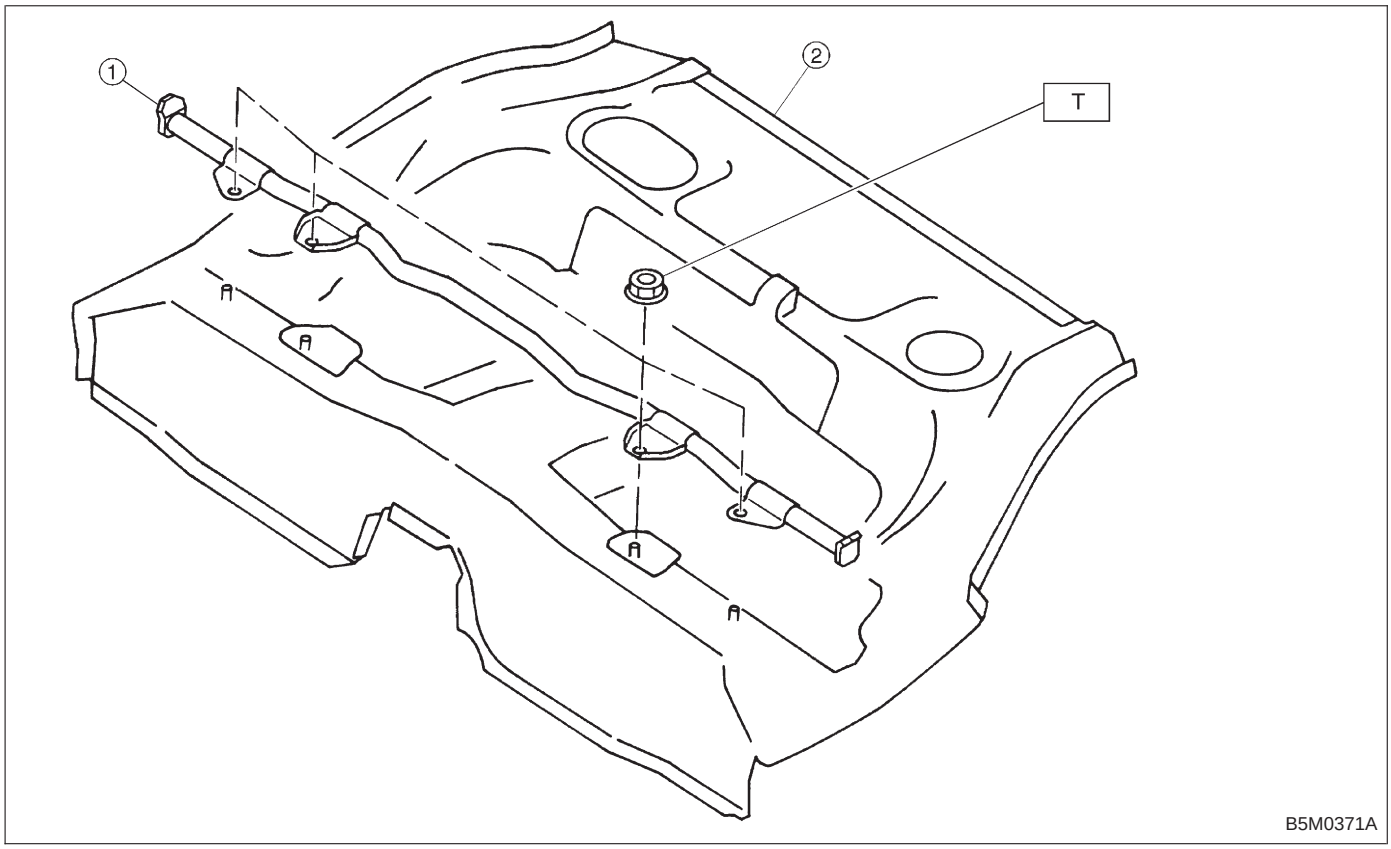


G5M0184

① Bracket
② Steering beam

Tightening torque: N·m (kg-m, ft-lb)
T: 18±5 (1.8±0.5, 13.0±3.6)

7. Guard Pipe



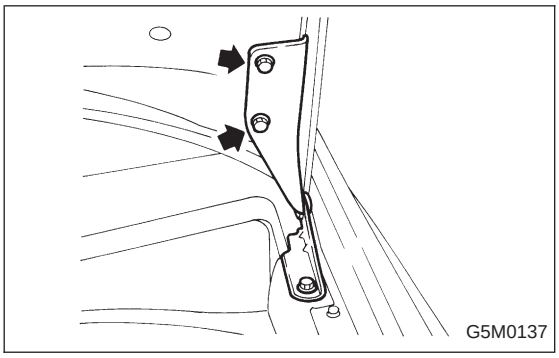
① Guard pipe
② Rear floor panel

Tightening torque: N·m (kg-m, ft-lb)
T: 32±10 (3.3±1.0, 23.9±7)

1. Hood

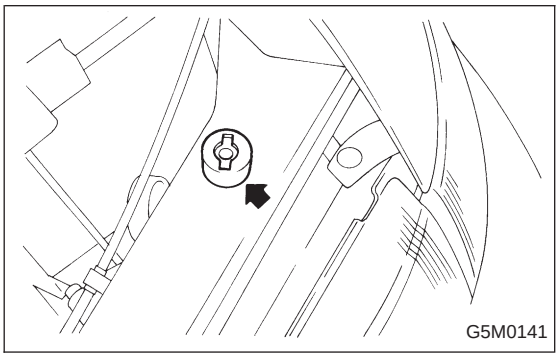
A: REMOVAL AND INSTALLATION

NOTE:
The hood lock has a dual locking design which consists of a main lock and a safety lock mechanism. When the release knob located at the front pillar on the driver's side is pulled back, the main lock is released through the cable attached to the knob.
The safety lock can be released by pushing the lever protruding above the front grill while opening the hood.


G5M0137

1. HOOD

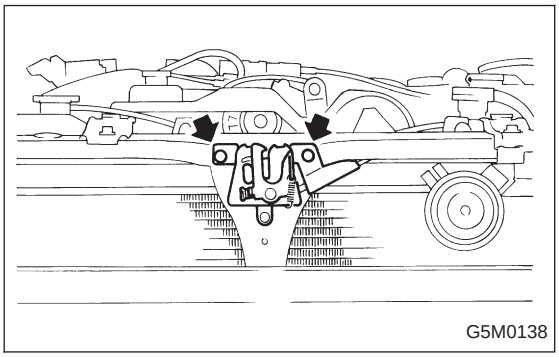
1) Open front hood, and remove washer hose.
2) Remove attaching bolts.
3) Detach front hood from hinges.


G5M0141

4) Installation is in the reverse order of removal.

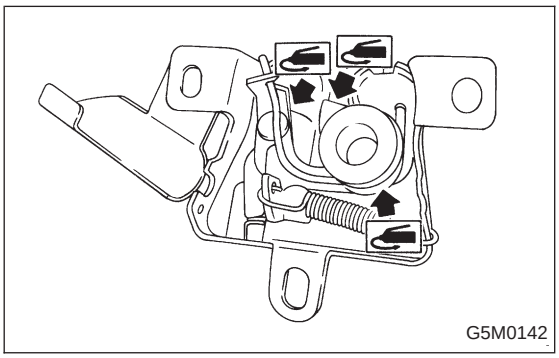
CAUTION:
Adjust buffer assembly on each end so that main lock is applied securely when hood is released from a height of approx. 20 mm (0.79 in).

NOTE:
Align the center of striker with lock during installation. Make sure safety lever is properly caught by striker under the hood's own weight.

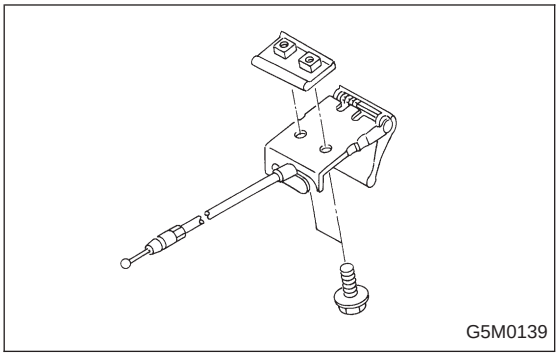

G5M0138

2. HOOD LOCK

1) Open front hood and remove front grille.
2) Remove bolts which secure lock assembly to radiator panel, and remove lock assembly.
3) Disconnect release cable from lock assembly.
4) Installation is in the reverse order of removal.

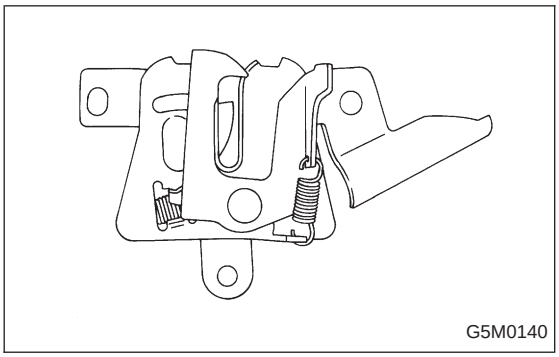

G5M0142

NOTE:
- Route hood lock release cable and hold with clips.
- After installing release cable, ensure it operates smoothly.
- Apply grease to sliding surfaces of parts.


G5M0139

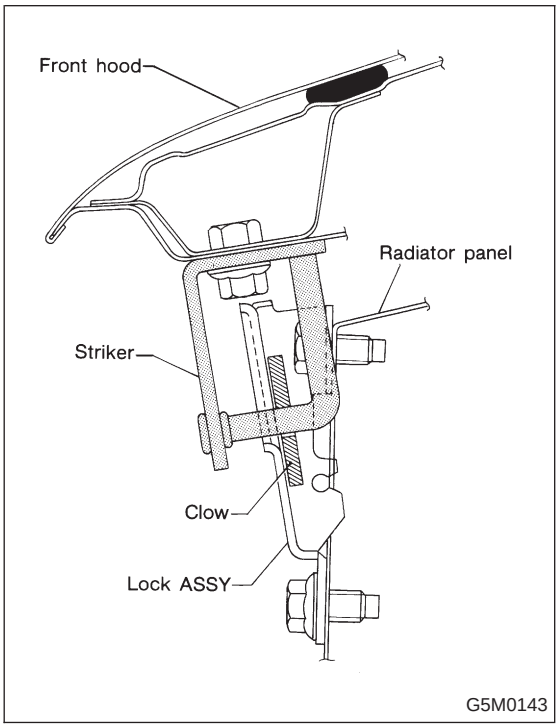
3. RELEASE CABLE

1) Remove front grille.
2) Remove release cable from lock assembly.
3) Remove cable clip from engine compartment.
4) Remove bracket from front pillar.
5) Installation is in the reverse order of removal.


G5M0140

B: POINTS TO CHECK

1) Check striker for bending or abnormal wear.
2) Check safety lever for improper movement.
3) Check other levers and spring for rust formation and unsmooth movement.



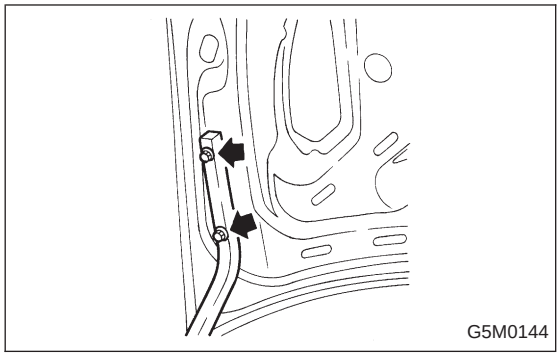
G5M0143

C: ADJUSTMENT

1) Fore-aft and left-right adjustments
Loosen striker mounting bolts and adjust fore-and-aft position of striker.

CAUTION:
Do not adjust striker position using the lock. Doing so may result in a misaligned front grille.

2) Up-down adjustment
Make up-and-down adjustment of striker only when hood does not properly contact buffer or hood is not flush with fender, or when release cable does not properly operate. Adjustment can be made by adjusting the stroke length of striker after lock assembly mounting screws are removed.

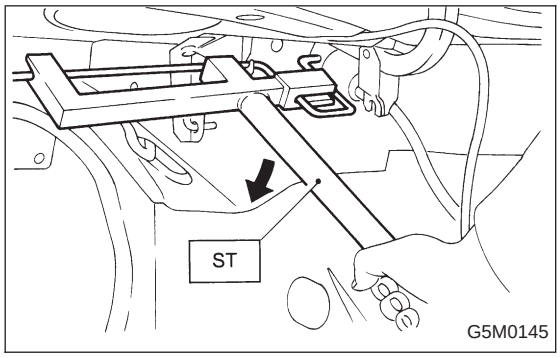

G5M0144

2. Trunk Lid

A: REMOVAL AND INSTALLATION

1. TRUNK LID

1) Open trunk lid.
2) Remove trunk lid mounting bolts and detach trunk lid from hinges.
3) Installation is in the reverse order of removal.



G5M0145

2. TORSION BAR

1) Open trunk lid. Remove torsion bars from hinge links using ST.

ST 927780000 REMOVER

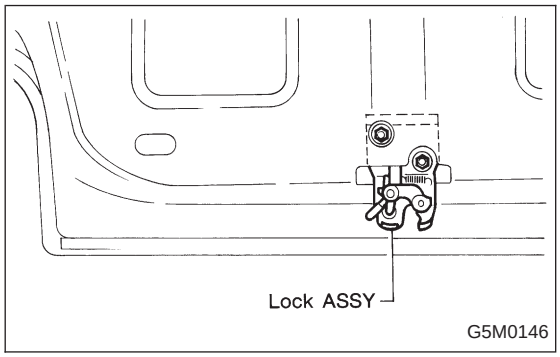
CAUTION:
Be careful because torsion bar quickly swings back when released.

2) Remove the left and right torsion bars.

WARNING:
Be careful because trunk lid drops under its own weight when torsion bars are removed.

3) Installation is in the reverse order of removal.

NOTE:
Apply a coat of grease to the rotary section of hinges and contact surfaces of torsion bars.



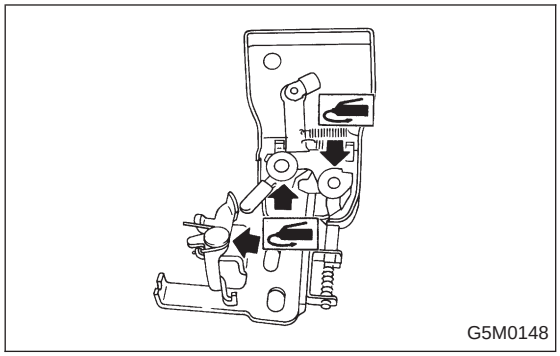
G5M0146

3. TRUNK LID LOCK ASSEMBLY AND KEY CYLINDER

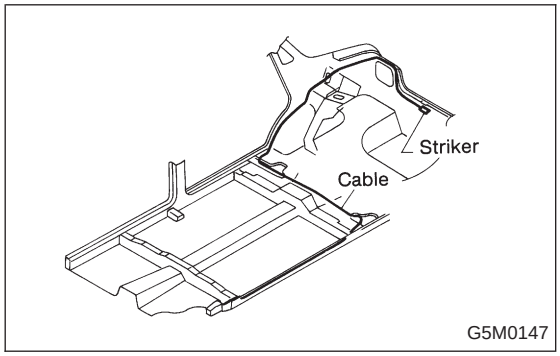
1) Remove rod of lock assembly from rod holder of key lock assembly.
2) Remove bolts which hold lock assembly and remove lock assembly.

NOTE:
- Always remove rear skirt trim panel beforehand, if so equipped.
- Be careful not to bend opener cable.

3) Remove clip and detach key cylinder from trunk lid.
4) Installation is in the reverse order of removal.


G5M0148

NOTE:
Apply grease to sliding surfaces of lock assembly and striker.



G5M0147

4. TRUNK LID OPENER

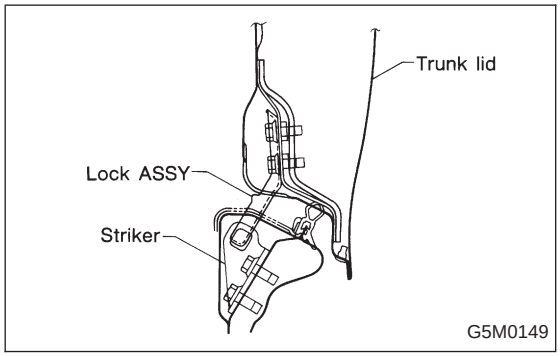
1) Remove driver's seat, rear seats, center pillar lower cover, floor mat, rear arch cover and side sill cover (on the driver's side).
2) Remove all clips which hold cable.
3) Disconnect cable from pull handle assembly.
4) Remove bolts and detach pull handle assembly.
5) Loosen bolts which hold lock assembly, and remove it.
6) Remove striker from trunk lid.
7) Disconnect cable from striker.

NOTE:
Be careful not to bend or break cable.

8) Installation is in the reverse order of removal.

CAUTION:
• When installing cover to pull handle assembly, observe the following:
- **Be careful not to catch harness.**
- **Engage pull handle assembly pawls firmly.**

NOTE:
After installing opener cable, ensure it moves smoothly.

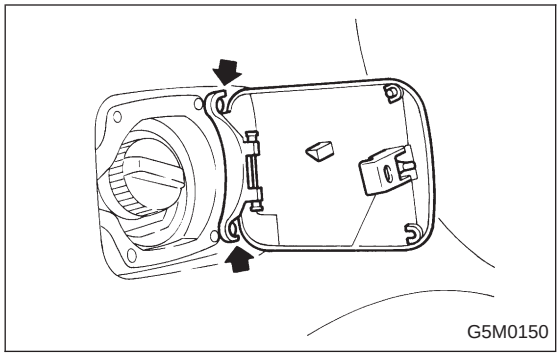


G5M0149

B: ADJUSTMENT

1. TRUNK LID

1) To adjust left-right lid positioning, loosen bolts which hold trunk lid to hinges.
2) To adjust up-down lid alignment, place washer(s) between trunk lid and hinges or move trunk lock assembly up or down.


G5M0150

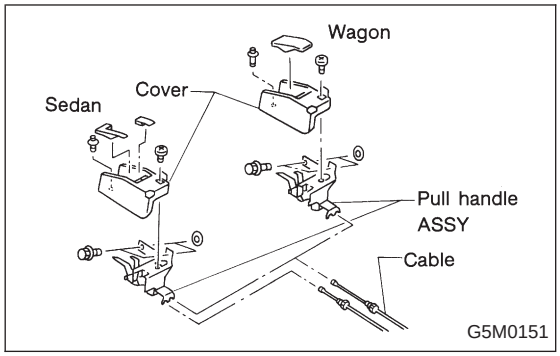
3. Fuel Flap

A: REMOVAL AND INSTALLATION

1. FUEL FLAP

1) Remove bolts which hold hinge to car body, and detach fuel flap and hinge as a unit.
2) Installation is in the reverse order of removal.

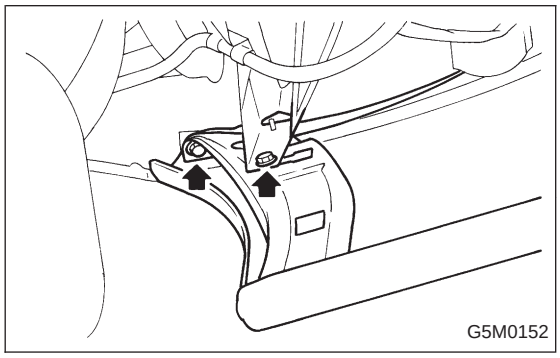
CAUTION:
Make sure the clearance between fuel flap and car body is equal at all points.



2. FUEL FLAP OPENER

1) Remove driver's seat, rear seats, center pillar lower cover, floor mat, rear arch cover/rear quarter trim (wagon), and side sill cover (on the driver's side).
2) Remove all clips which hold cable.
3) Disconnect cable from pull handle.
4) Detach pull handle by removing bolts.
5) Detach fuel lock holder by turning it.
6) Installation is in the reverse order of removal.

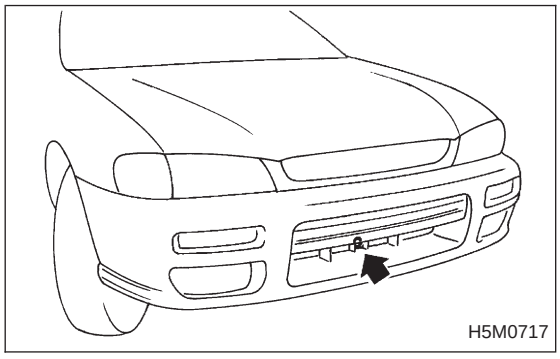
CAUTION:
• When installing cover to pull handle assembly, observe the following:
  • Be careful not to catch harness.
  • Engage pull handle assembly pawls firmly.
• After installing opener cable, ensure it moves smoothly.



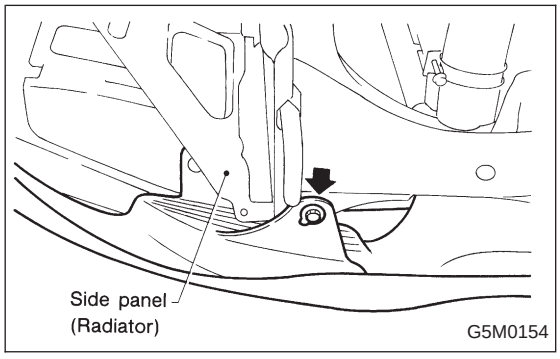
4. Front Bumper

A: REMOVAL AND INSTALLATION

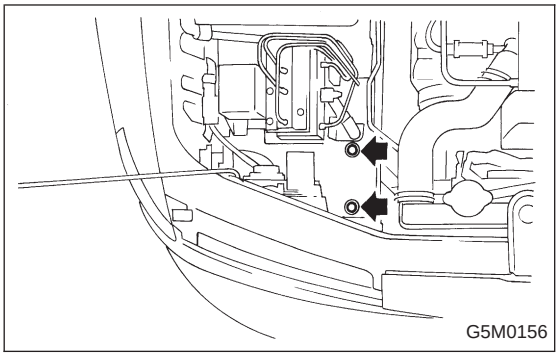
1) Disconnect the ground cable from the battery.
2) Remove the canister.
3) Remove the front grille.
4) Remove the parking light and headlight LH.
5) Remove the mud guard.
6) Remove bolts from side of bumper.



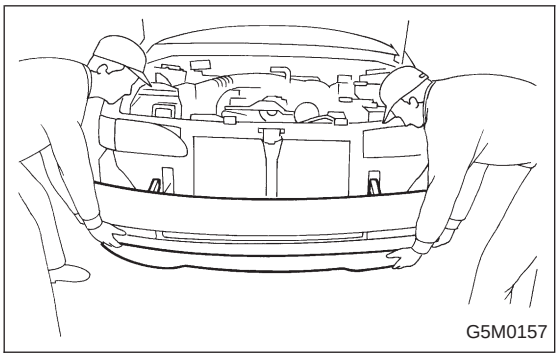
7) Remove bolt from lower center of bumper.



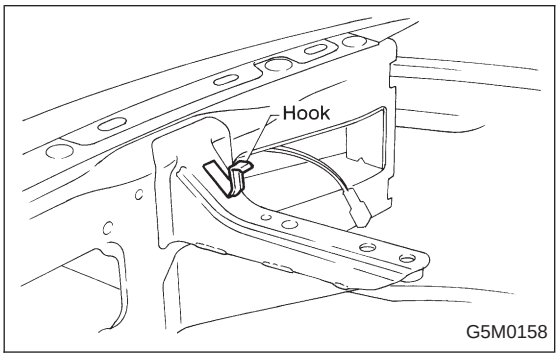
8) Remove bolts from lower side of bumper.


G5M0156

9) Remove bolts (engine compartment side) from bumper stays.
10) Remove turn signal light connector.


G5M0157

11) Remove bumper assembly.



G5M0158

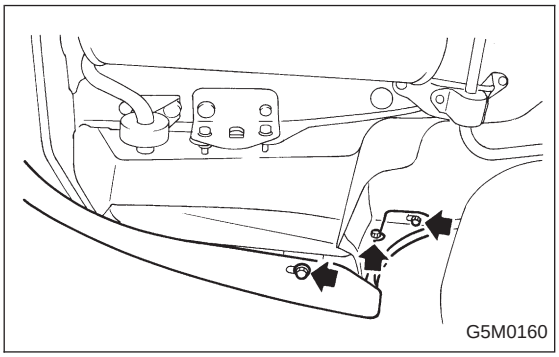
12) Installation is in the reverse order of removal.

CAUTION:
● Be extremely careful to prevent scratches on bumper face as it is made of resin.
● Be careful not to scratch the body when removing or installing the bumper.
● To facilitate installation of front bumper, attach hook (located at stay) to body panel.
● When installing canister, insert air vent hose of canister into the hole on body.

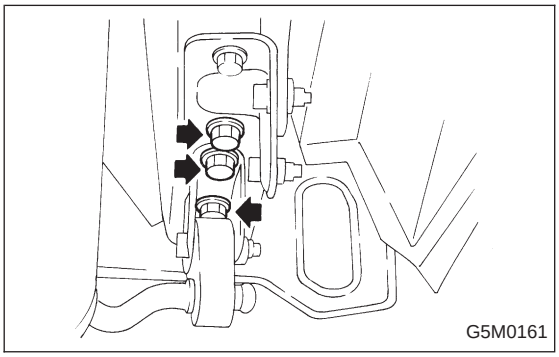
5. Rear Bumper

A: REMOVAL AND INSTALLATION

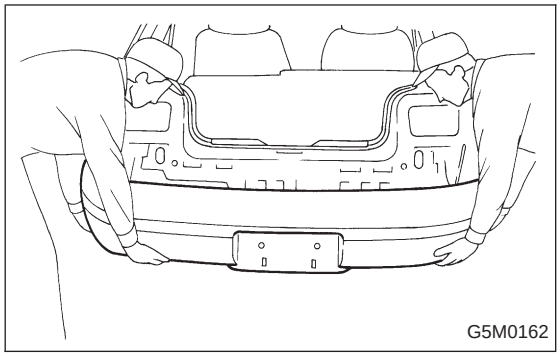
1. SEDAN


G5M0160

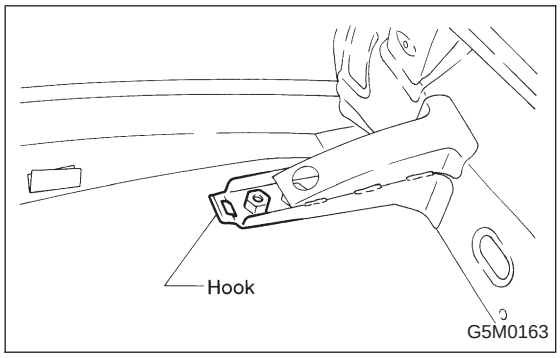
1) Open trunk lid. Remove trunk trim panel clips and detach trim.
2) Disconnect license plate light connector.
3) Remove bolts from side of bumper.


G5M0161

4) Remove bolts from bumper stay.


G5M0162

5) Remove rear bumper.



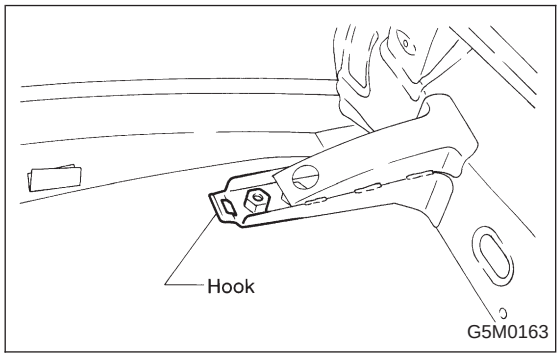
G5M0163

6) Installation is in the reverse order of removal.

CAUTION:
● Be extremely careful to prevent scratches on bumper face as it is made of resin.
● Be careful not to scratch the body when removing or installing bumper.
● To facilitate installation of rear bumper, attach hook (located at stay) to body panel.

2. WAGON

1) Open rear gate and rear quarter trim lid.
2) Disconnect license plate light connector.
3) Remove bolts from side of bumper.
4) Remove bolts from bumper stays.
5) Remove bumper assembly.



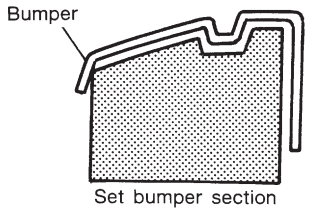
G5M0163

6) Installation is in the reverse order of removal.

CAUTION:
● Be extremely careful to prevent scratches on bumper face as it is made of resin.
● Be careful not to scratch the body when removing or installing bumper.
● To facilitate installation of rear bumper, attach hook (located at stay) to body panel.

6. Coating Method for PP Bumper

A: PROCESS STEPS

Process No.	Process name	Job contents	
1	Bumper mounting	Set bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 G5M0164
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. ● Paint in use (for each color): Solid paint Hardener PB Thinner T-301 ● Mixing ratio: Main agent vs. hardener = 4:1 ● Viscosity: 10 — 13 sec/20°C (68°F) ● Film thickness: 35 — 45μ ● Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use section (block) paint for top coat. ● Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 ● Mixing ratio: Main agent vs. hardener = 10:1 ● Viscosity: 10 — 13 sec/20°C (68°F) ● Film thickness: 15 — 20μ ● Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minute intervals. ● Paint in use Metallic paint Hardener PB Thinner T-301 ● Mixing ratio: Clear vs. hardener = 6:1 ● Viscosity: 14 — 16 sec/20°C (68°F) ● Film thickness: 25 — 30μ ● Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove masking in process No. 2.	

7. Repair Instructions for Colored PP Bumper

All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter.
Repair methods are outlined below, based on a classification of the extent of damage.

A: MINOR DAMAGE CAUSING ONLY A CHANGE IN THE LUSTRE OF THE BUMPER DUE TO A LIGHT TOUCH

Almost restorable.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the area to be repaired using water.</td></tr>
<tr><td>2</td><td>Sanding</td><td colspan="2">Grind the repairing area with #500 sandpaper in a “feathering” motion.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Repeatedly apply wax to the affected area using a soft cloth (such as flannel).
Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.</td><td rowspan="2">Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the “(3)” section, depending on the degree and nature of damage.</td></tr>
<tr><td>Polish the waxed area with a clean cloth after 5 to 10 minutes.</td></tr>
</table>

B: DEEP DAMAGE CAUSED BY SCRATCHING FENCES, ETC.

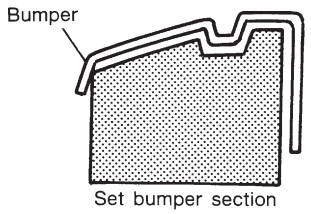
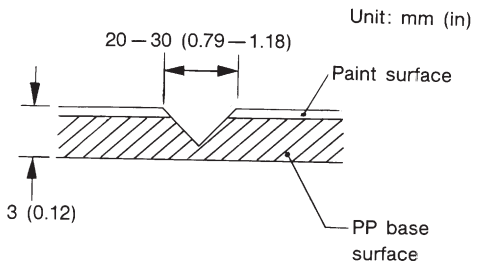
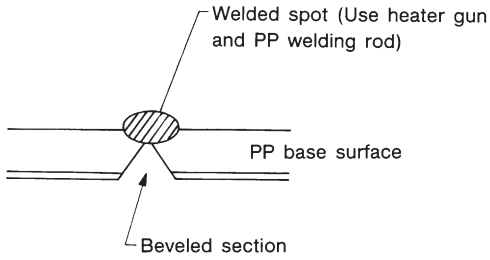
A dent cannot be repaired but a whitened or swelled part can be removed.

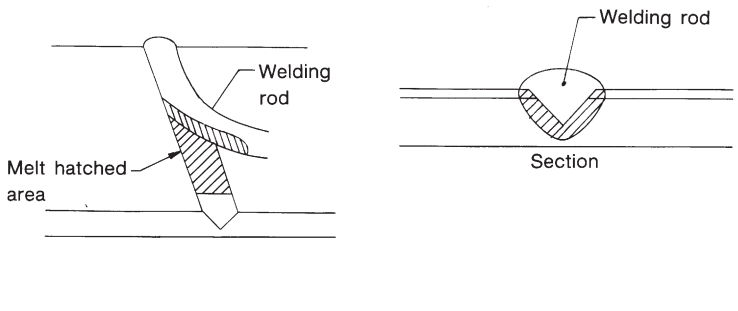
<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean damaged area with water.</td></tr>
<tr><td>2</td><td>Removal of damaged area</td><td colspan="2">Cut off protruding area, if any, due to collision, using a putty knife.</td></tr>
<tr><td>3</td><td>Sanding</td><td colspan="2">Grind the affected area with #100 to #500 sandpaper.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Same as Process No. 3 in the “(1)” section.</td><td>Perform Process No. 12 and subsequent operations in the “(3)” section.</td></tr>
</table>

C: DEEP DAMAGE SUCH AS A BREAK OR HOLE THAT REQUIRES FILLING

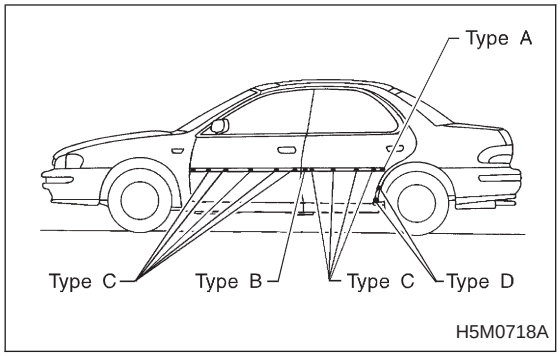
Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)

Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove bumper as required.	
2	Part removal	Remove parts built into bumper as required.	
3	Bumper placement	Place bumper on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper.	 G5M0164
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).	
5	Cutting	If nature of damage is cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or "vee-out" the affected area using a knife or grinder.	 G5M0165
6	Sanding (I)	Grind beveled surface with sandpaper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	Grind the side just opposite the beveled area with sandpaper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.	 G5M0166 NOTE: ● Do not melt welding rod until it flows out. This results in reduced strength. ● Leave the welded spot unattended until it cools completely.

Process No.	Process name	Job contents
9	Welding	Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.  G5M0167 NOTE: ● Melt the sections indicated by hatched area. ● Do not melt welding rod until it flows out, in order to provide strength. ● Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. ● Leave the welded spot unattended until it cools completely.
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.  G5M0168 Sand the welded spot smooth with #240 sand paper.
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent
12	Cleaning/degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm^2, 36 to 50 psi) with a spray gun.
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampended with alcohol. (Do not use thinner since the coated area tends to melt.)
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: ● UPS 300 Flex Primer ● No. 303 UPS 300 Exclusive hardener ● NPS 725 Exclusive Reducer (thinner) ● Mixing ratio: 2 : 1 (UPS 300: No. 303) ● Viscosity: 12 — 14 sec/20°C (68°F) ● Coated film thickness: 40 — 50μ
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sandpaper and water.

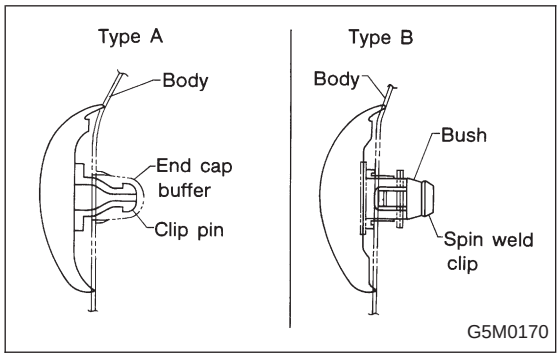
Process No.	Process name	Job contents	
18	Cleaning/degreasing	Same as Process No. 12.	
19	Top coat (I)	Solid color	Metallic color
		Use a “block” coating method. ● Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) ● Mixing ratio: 3 : 1 (Suncryl: No. 307) ● Viscosity: 11 — 13 sec/20°C (68°F) ● Coated film thickness: 40 — 50µ ● Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use a “block” coating method. ● Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) ● Mixing ratio: 3 : 1 (Suncryl: No. 307) ● Viscosity: 11 — 13 sec/20°C (68°F) ● Coated film thickness: 20 — 30µ ● Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. ● Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) ● Mixing ratio: 3 : 1 (SC710: No. 307) ● Viscosity: 10 — 13 sec/20°C (68°F) ● Coated film thickness: 20 — 30µ ● Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	
24	Masking removal	Remove masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install parts on bumper in reverse order of removal.	
26	Bumper installation	Install bumper.	



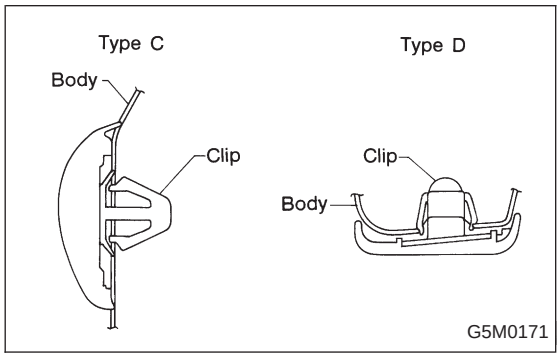
8. Side Protector

A: REMOVAL AND INSTALLATION

NOTE:
Do not re-use protector.



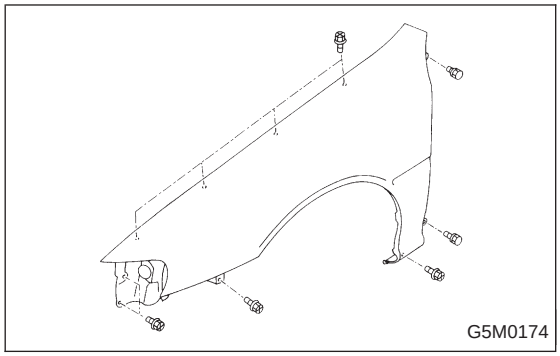
1) Type A and B:
Protector is attached to body with clips.
While holding end of protector by hand, force protector out.

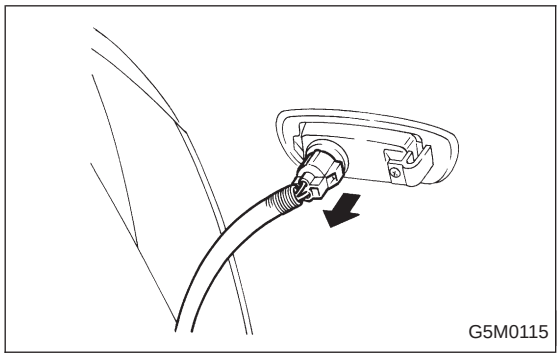


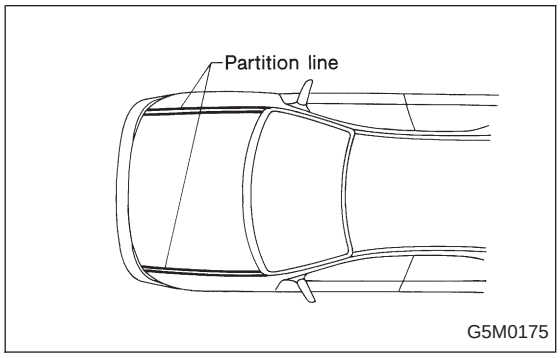
2) Type C:
Protector is attached to body with clips.
Remove door inner trim, and detach protector by pushing clip pawl from inside.
3) Type D:
Protector is attached to body with clips.
While holding end of protector by hand, force protector out.

4) Installation is in the reverse order of removal.

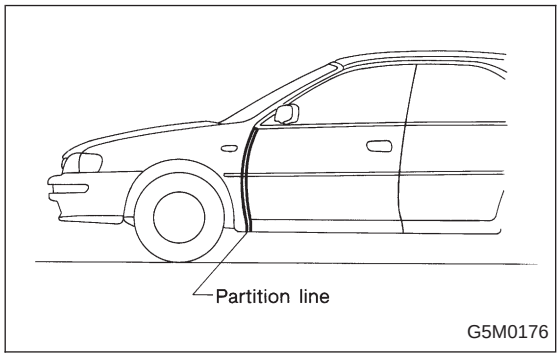
NOTE:
- Type A: Insert clip pins into holes in body, then fit end cap buffers into place.
- Type B: Insert spin weld clips into holes in body, then fit bushings into place.
- Type C and D: Align the clips with holes in body and insert them.
- Install clips in standard holes first.


G5M0174


G5M0115



G5M0175



G5M0176

9. Front Fender

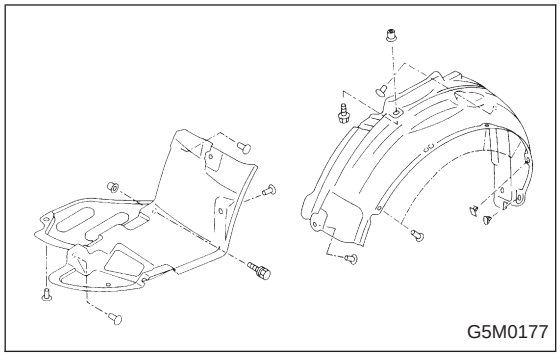
A: REMOVAL AND INSTALLATION

1) Disconnect ground cable from battery.
2) Remove mud guard.
3) Remove parking light and headlight.
4) Remove front bumper.
5) Remove bolts which secure fender to radiator panel and turn signal light connector.
6) Remove body protector. (This step may be skipped if fender is to be reused.)
7) Remove attaching bolt to remove fender.

CAUTION:
Be careful not to scratch body panels with fender edges when removing it.

8) Installation is in the reverse order of removal.

NOTE:
Check for alignment of front fender with hood and front door with front fender at all points. Adjust, if necessary.


G5M0177

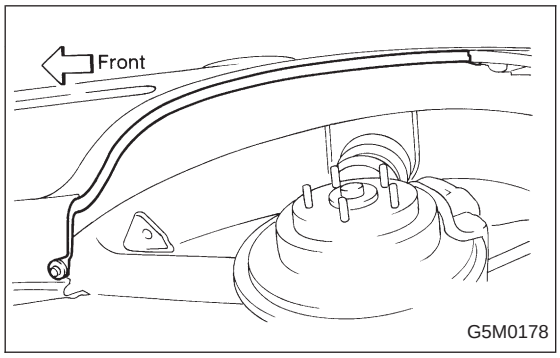
10. Mud Guard and Arch Protector

A: REMOVAL AND INSTALLATION

1. MUD GUARD

1) Jack-up vehicle to remove tire.
2) Remove screws and clips. Move mud guard toward the center of the body and remove mud guard.
3) Installation is in the reverse order of removal.

CAUTION:
Only use new nuts and clips.

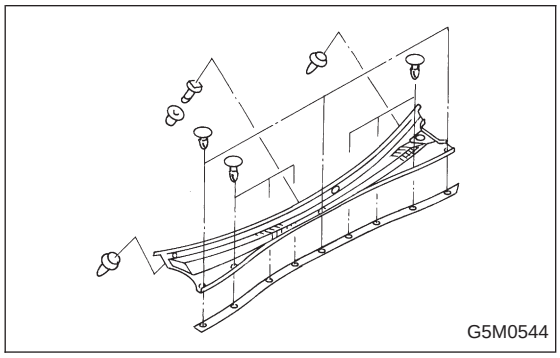


G5M0178

2. REAR ARCH PROTECTOR

1) Remove clip and screws.
2) Remove arch protectors.
3) Installation is in the reverse order of removal.

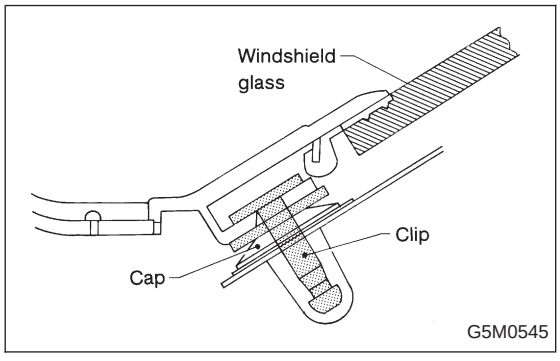
CAUTION:
Only use new nuts and clips.


G5M0544

11. Cowl Panel

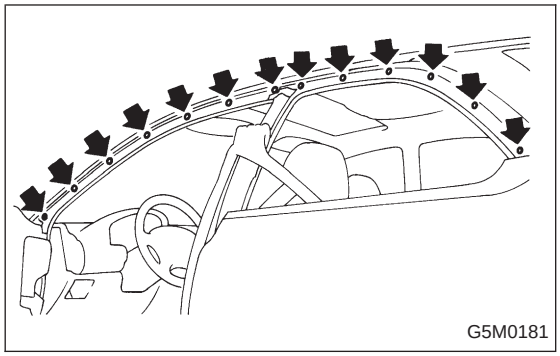
A: REMOVAL AND INSTALLATION

1) Remove wiper arms.
2) Open front hood.
3) Pry clip off front hood seal using a screwdriver.
4) Lift cowl panel and remove clips from windshield.
5) Installation is in the reverse order of removal.



G5M0545

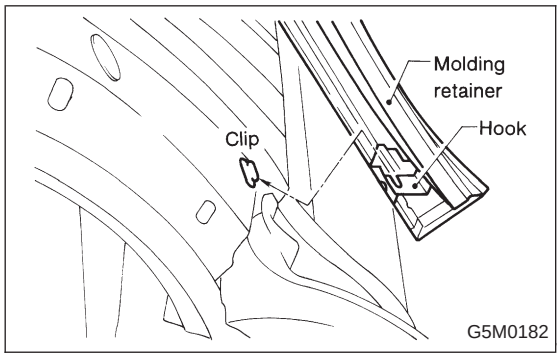
NOTE:
Install middle clip and other clips in that order.


G5M0181

12. Molding and Retainer

A: REMOVAL AND INSTALLATION

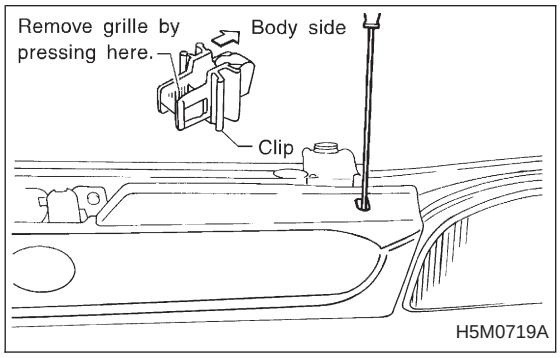
1) Remove weatherstrip.
2) Remove tapping screws.



G5M0182

3) Installation is in the reverse order of removal.

NOTE:
Insert clips onto hooks, then fasten with screws.



H5M0719A

13. Front Grille

A: REMOVAL AND INSTALLATION

1) Remove two upper clips from body panel. To facilitate removal, press portion shown in figure using screwdriver while lightly pulling front grille.
2) Installation is in the reverse order of removal.

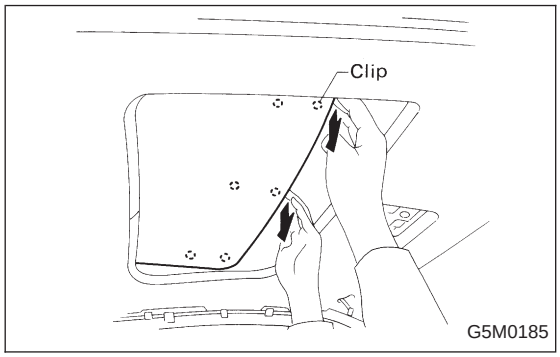
NOTE:
Attach all clips to grille. Align them with clip hole in body and push them into place.

14. Sunroof

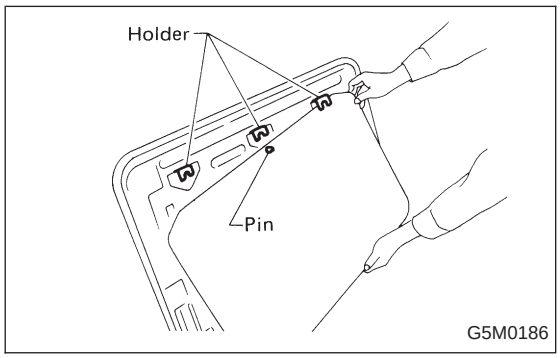
A: REMOVAL

1. SUNROOF PANEL

1) Open sunroof approx. 1/3.
2) Remove clips attached to front side of sunroof trim by pulling trim from inside of compartment.

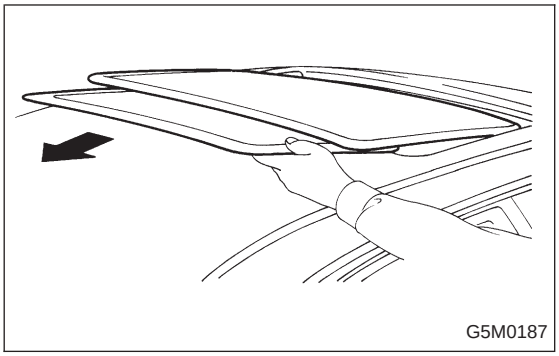


G5M0185

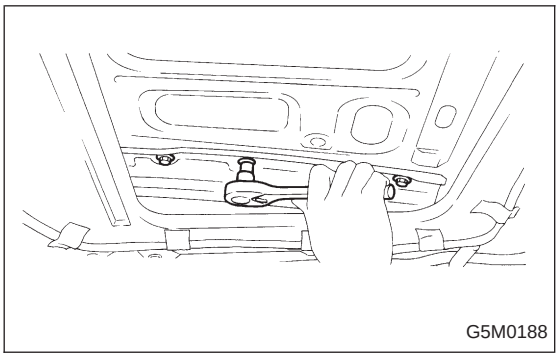


G5M0186

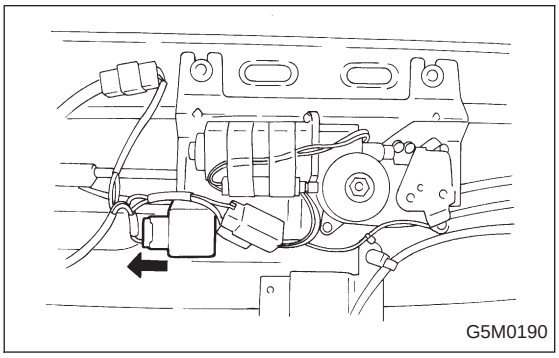
3) Move trim forward, and detach trim end from holder.


G5M0187

4) Detach trim.

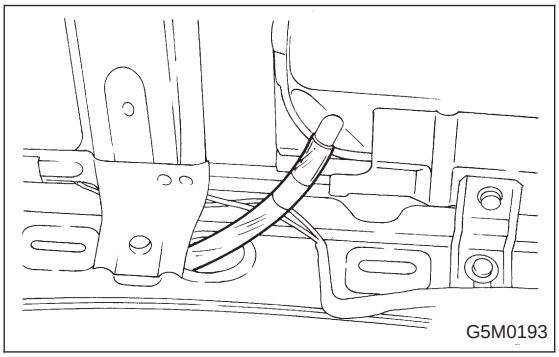

G5M0188

5) Close sunroof and remove nuts.
6) Remove sunroof panel.
7) Installation is in the reverse order of removal.
NOTE:
Sunroof trim reference pin must be fitted in holder notch.


G5M0190

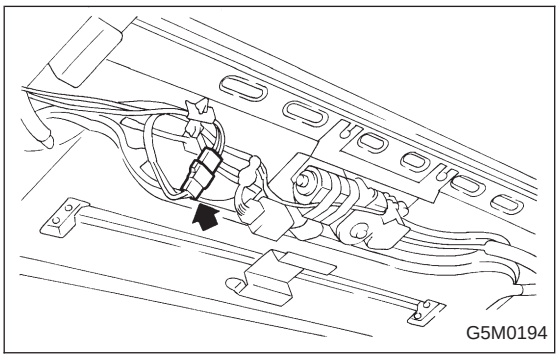
2. SUNROOF MOTOR AND RELAY

1) Remove roof trim, rear quarter trim, pillar trim, etc. <Ref. to 5-3 [W5A0].>
2) Remove screw.
3) Disconnect connector.
4) Remove relay by pulling it out.

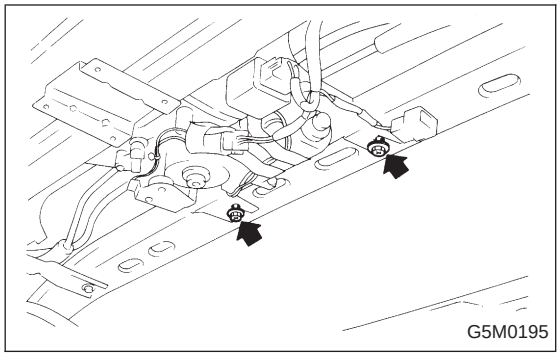

G5M0193

3. SUNROOF FRAME

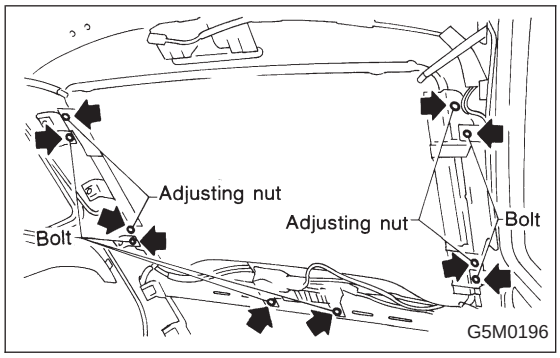
1) Remove roof trim, rear quarter trim, pillar trim, etc. <Ref. to 5-3 [W5A0].>
2) Remove sunroof panel.
3) Disconnect front and rear drain tubes.


G5M0194

4) Disconnect connector between body harness and sunroof harness.

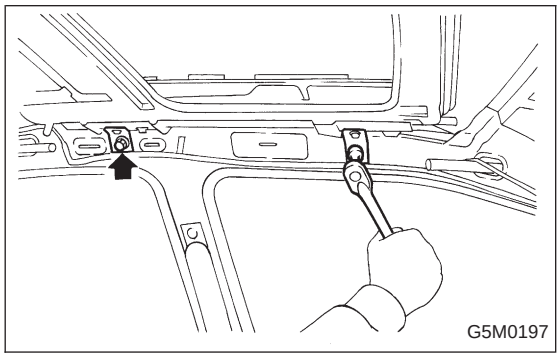

G5M0195

5) Loosen two mounting bolts near motor. (Do not remove bolts.)



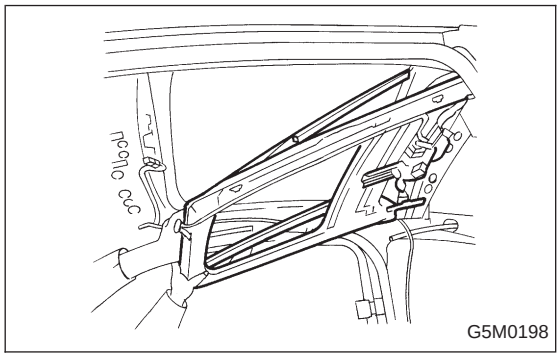
G5M0196

6) Remove six bolts, and four adjusting nuts.

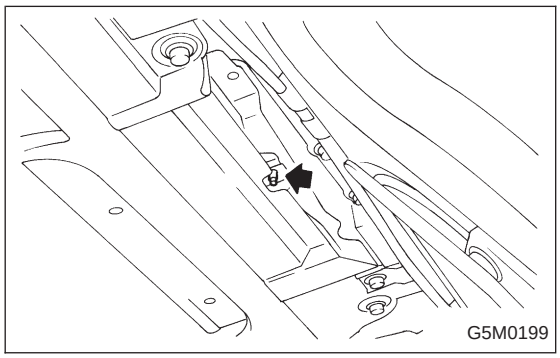

G5M0197

7) Remove sunroof frame.
8) Loosen set bracket mounting bolt.

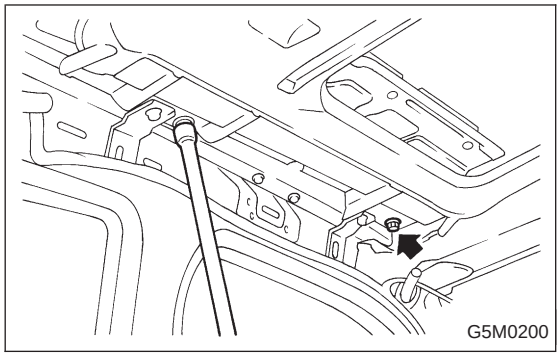
B: INSTALLATION


G5M0198

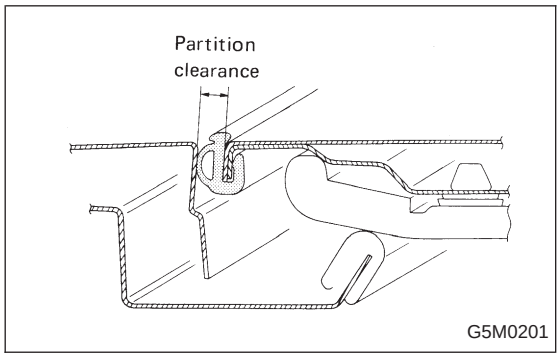
1) Insert frame rear end slit to two bolts fitted temporarily to roof brace.


G5M0199

2) Align frame to reference pin installed on roof.

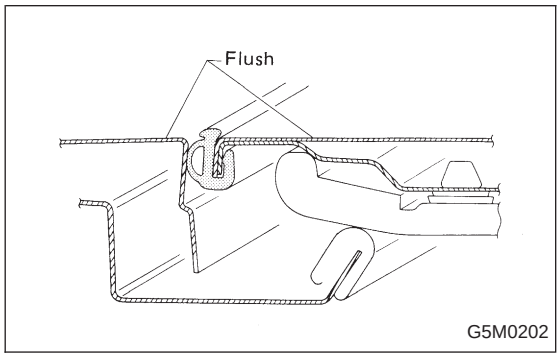


3) Tighten adjusting nut (that is, set frame at highest position).
Temporarily tighten bolts.

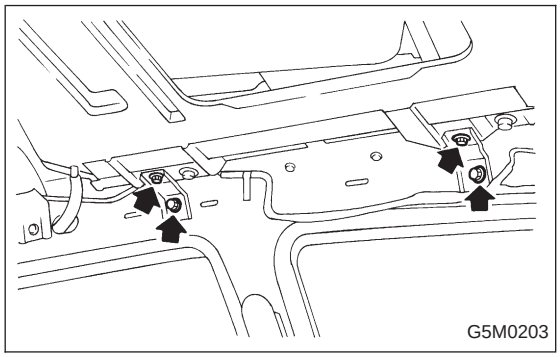


4) Install sunroof panel.
5) Adjust height by turning adjusting nut.
Also adjust front, rear, right, and left side partitions.

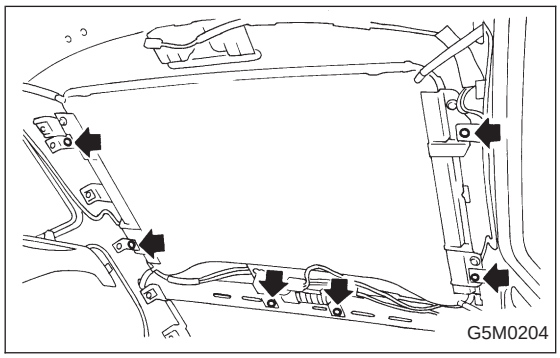
Partition clearance:
5.9±0.5 mm (0.232±0.020 in)



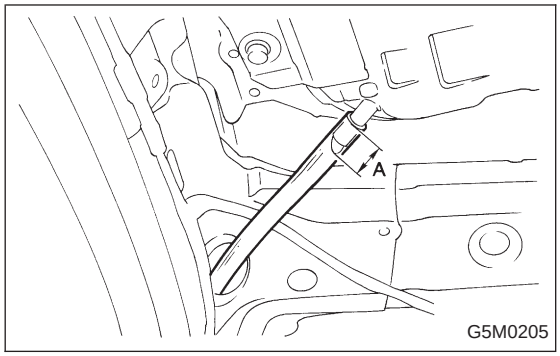
Difference in height between roof panel and sunroof panel:
0±1.0 mm (0±0.039 in)



6) Tighten set bracket mounting bolts.



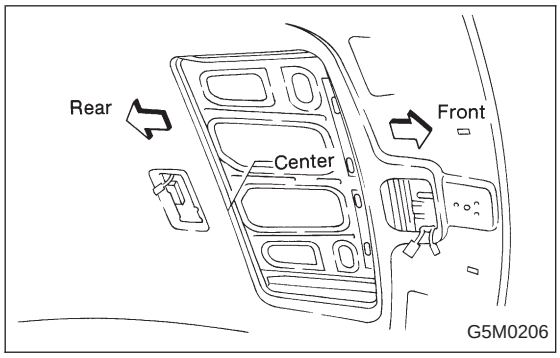
7) Tighten bolts.



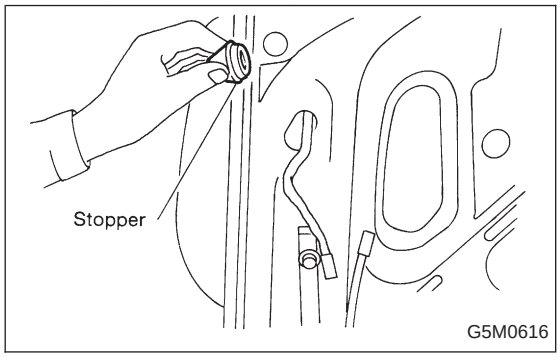
8) Install drain tubes.

CAUTION:
Insert drain tube securely into drain pipe.

Length: A
Approx. 20 mm (0.79 in)



9) Install roof trim.
10) Install garnish.
NOTE:
Place garnish joint at rear center of body.
11) Install sunroof trim, pillar trim, rear quarter trim etc.
12) Check the following items after assembling all parts;
(1) Garnish must be free from waves.
(2) When sunroof is fully closed, must be no clearance between garnish and sunroof trim.
(3) Sunroof must be free from slack and noise when it is fully opened and closed.

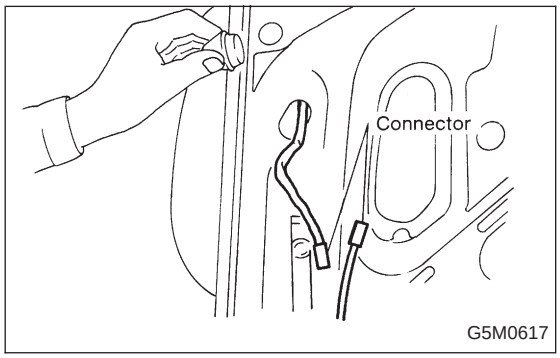


15. Rear Spoiler

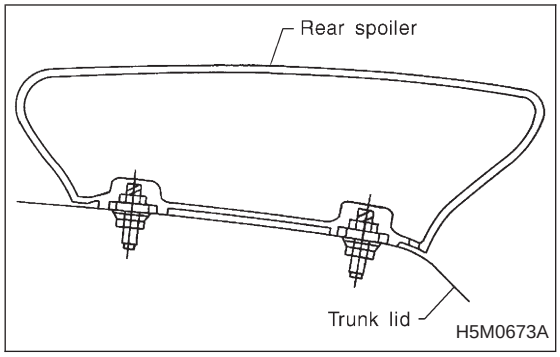
A: REMOVAL AND INSTALLATION

1. COUPE

1) Remove stoppers from both sides of trunk lid.



2) Disconnect high-mount stop light connector.



3) Remove nuts from rear spoiler.

CAUTION:
Be careful not to drop nuts into box section of trunk lid.

4) Lift rear spoiler and unfasten clips.
5) Remove spoiler from trunk lid.

CAUTION:
Be careful not to damage trunk lid.

6) Installation is in the reverse order of removal.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

1. Sunroof

Entry of water into compartment	① Check roof panel and sunroof panel for improper or poor sealing. ② Check drain tube for clogging. ③ Check sunroof frame seal and body for improper fit.
Booming noise	① Check roof panel and roof panel for improper clearance. ② Check sunroof trim and roof trim for improper clearance.
Abnormal motor noise	① Check motor for looseness. ② Check gears and bearings for wear. ③ Check cable for wear. ④ Check cable pipe for deformities.
Failure of sunroof to operate (Motor operates properly.)	① Check guide rail for foreign particles. ② Check guide rail for improper installation. ③ Check parts for mutual interference. ④ Check cable slider for improper clinching. ⑤ Check cable for improper installation. ⑥ Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly. (Use sunroof wrench to check operation.)	① Check fuse for blowout. ② Check switch for improper function. ③ Check motor for incorrect terminal voltage. ④ Check relay for improper operation. ⑤ Check poor grounding system. ⑥ Check cords for discontinuity and terminals for poor connections. ⑦ Check limit switch for improper operation.

DOORS AND WINDOWS 5-2

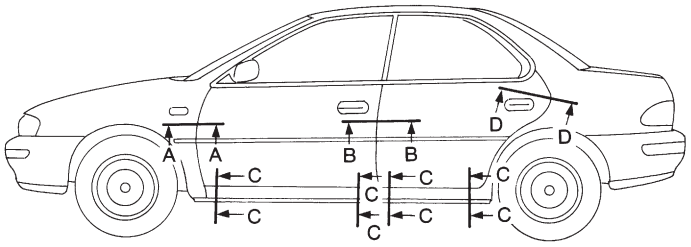
Page

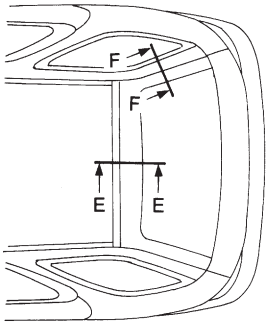
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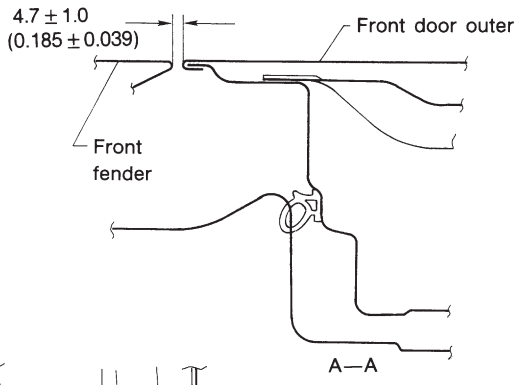
1. Service Data

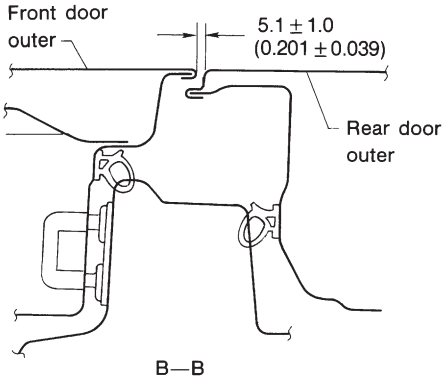
A: DOOR ALIGNMENT

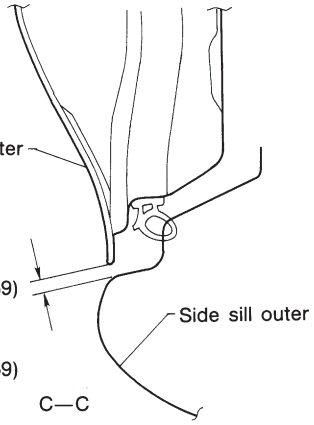
1. SEDAN AND WAGON MODEL



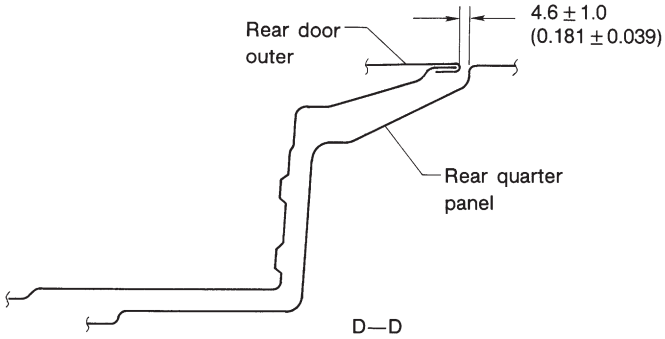


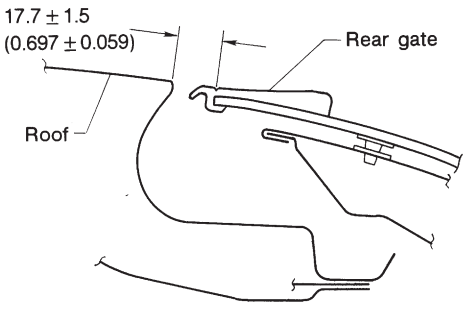


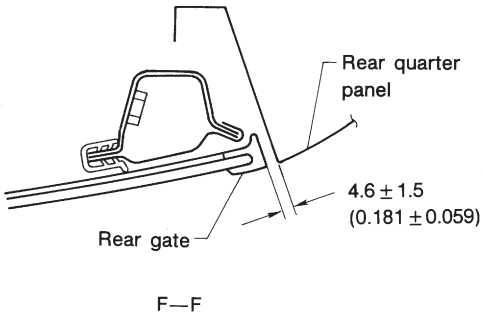




- Front door
  Front part:
  5.2 ± 1.5
  (0.205 ± 0.059)
  Back part:
  5.4 ± 1.5
  (0.213 ± 0.059)
- Rear door
  Front part:
  5.4 ± 1.5
  (0.213 ± 0.059)
  Back part:
  6.1 ± 1.5
  (0.240 ± 0.059)



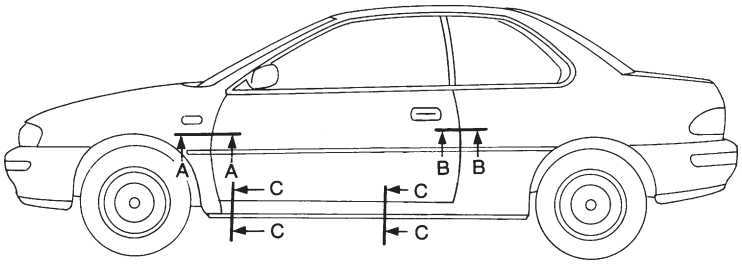


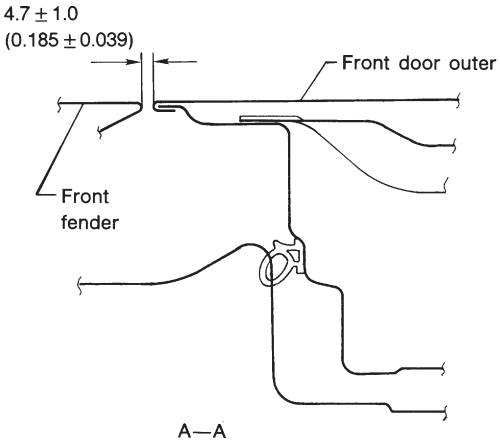


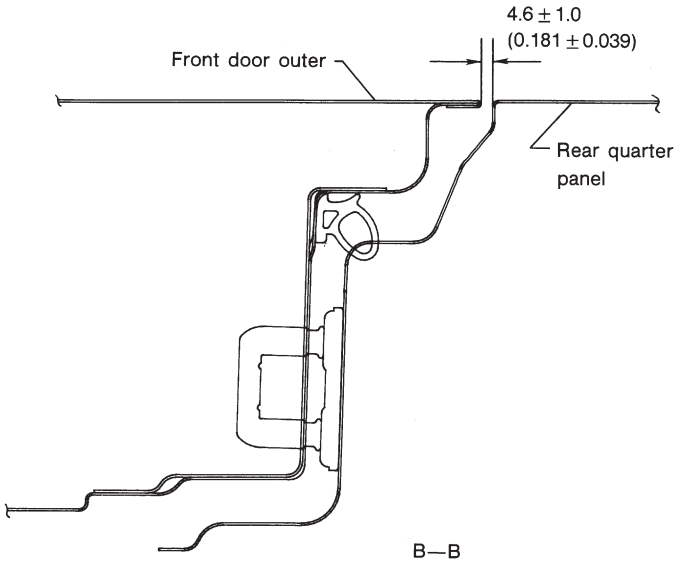
Unit: mm (in)

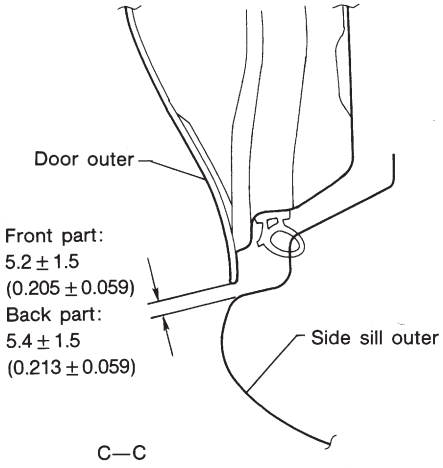
G5M0485

2. COUPE MODEL





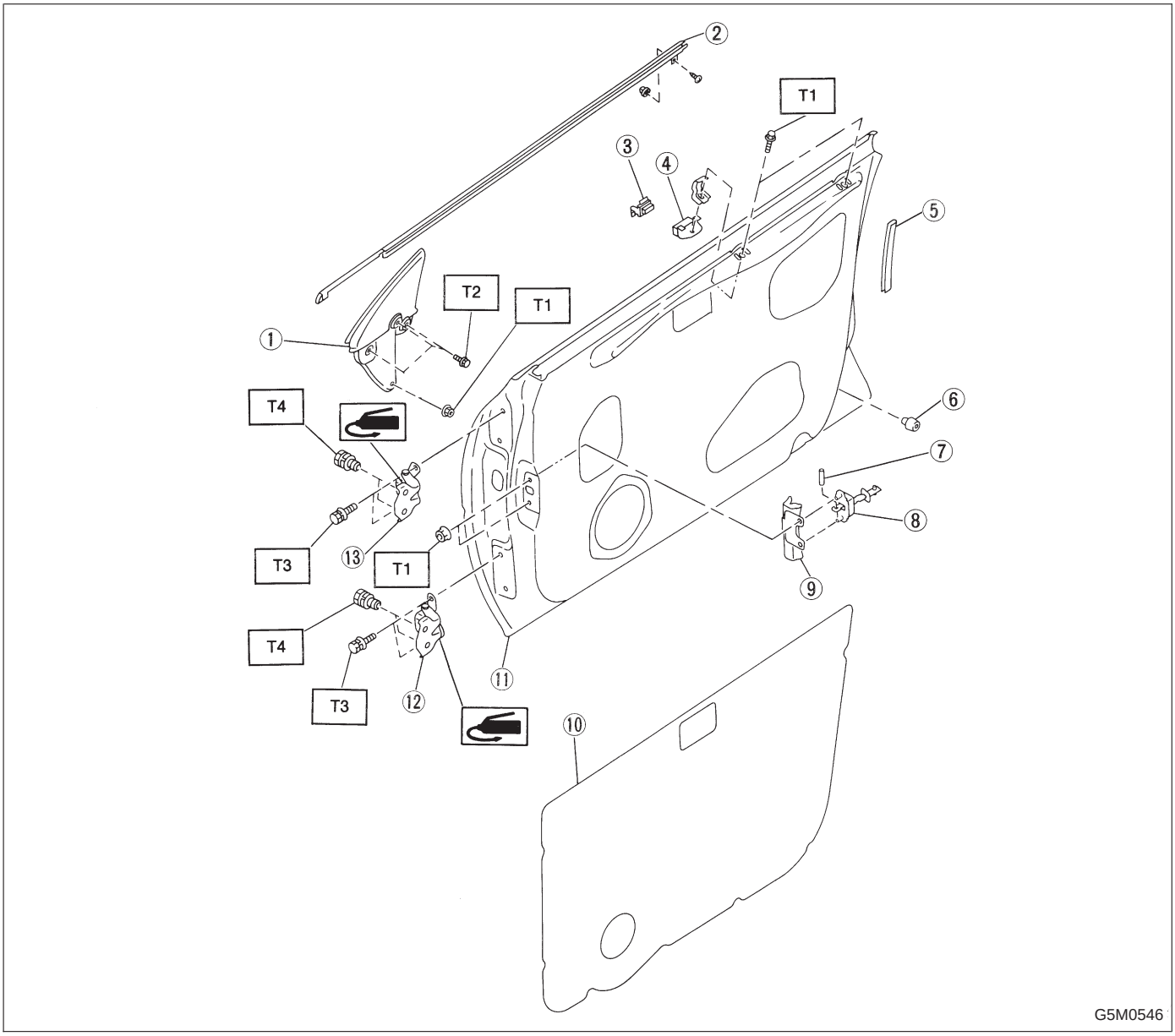




Unit: mm (in)

G5M0637

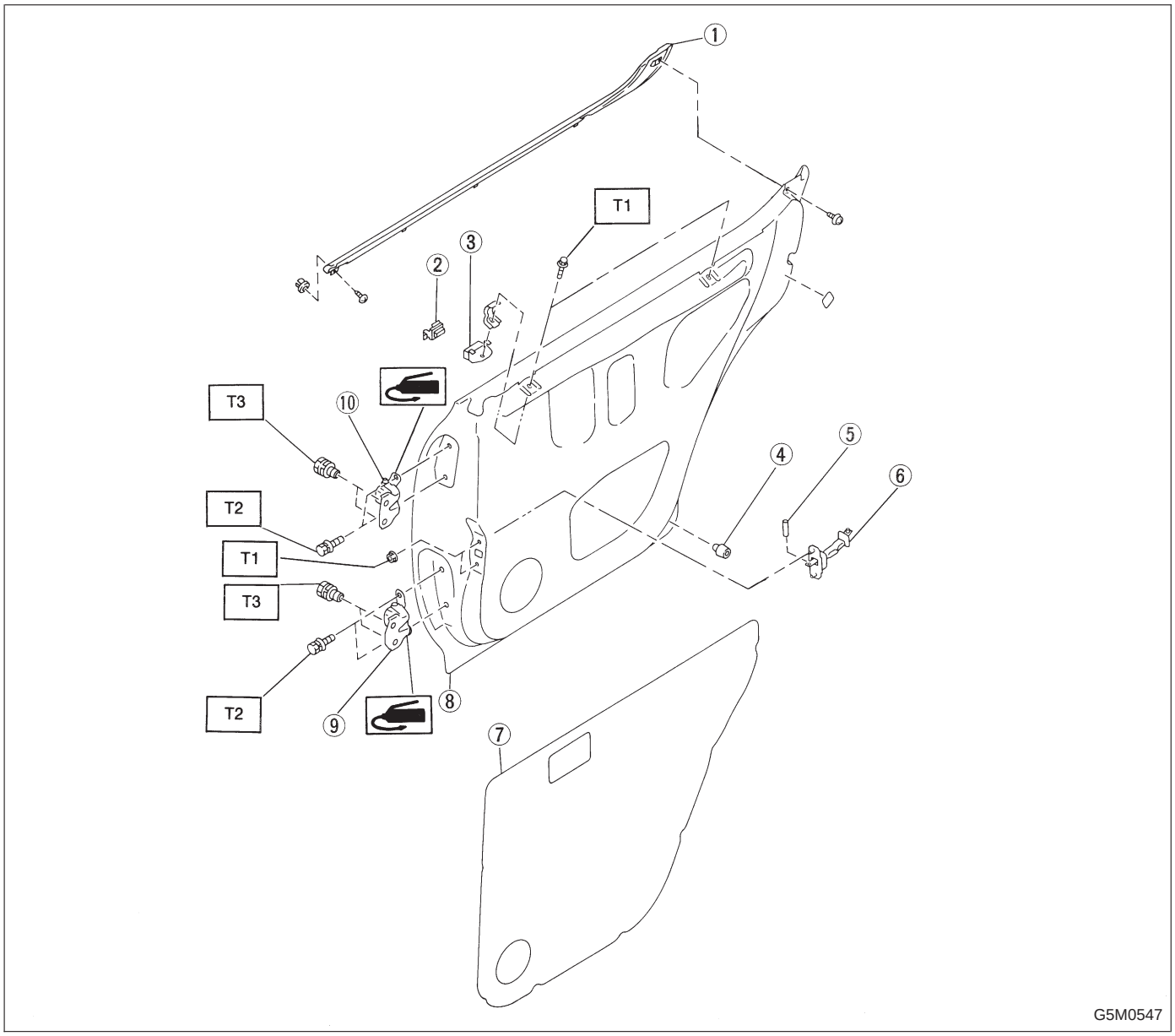
1. Front Door



① Gusset
② Weatherstrip
③ Stabilizer (Outer)
④ Stabilizer (Inner)
⑤ Protector
⑥ Stopper
⑦ Knock pin
⑧ Checker
⑨ Guide
⑩ Sealing cover
⑪ Door panel
⑫ Lower hinge
⑬ Upper hinge

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 13±3 (1.3±0.3, 9.4±2.2)
T3: 25±3 (2.5±0.3, 18.1±2.2)
T4: 29±5 (3.0±0.5, 21.7±3.6)

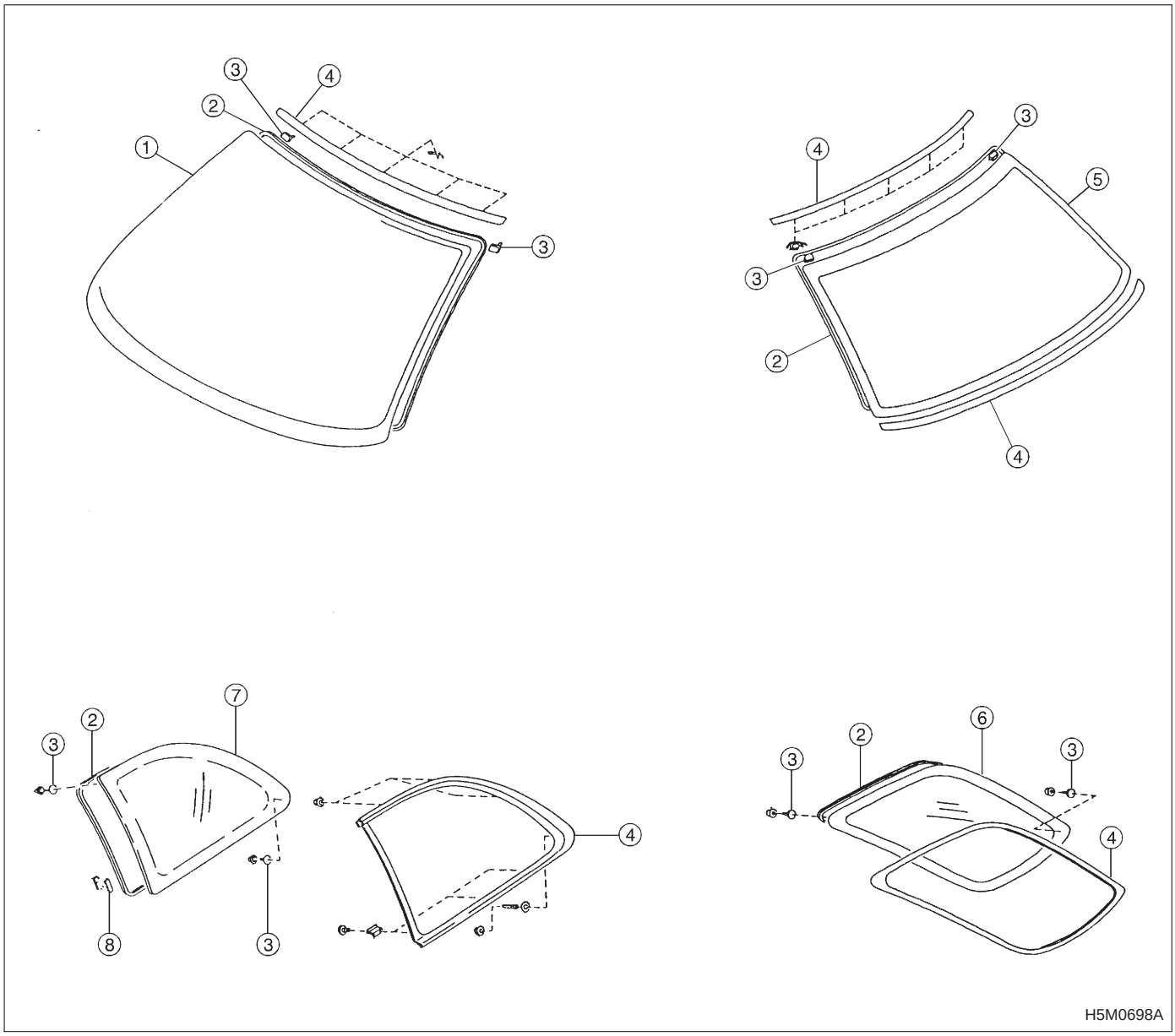
2. Rear Door



① Weatherstrip
② Stabilizer (Outer)
③ Stabilizer (Inner)
④ Stopper
⑤ Knock pin
⑥ Checker
⑦ Seating cover
⑧ Door panel
⑨ Lower hinge
⑩ Upper hinge

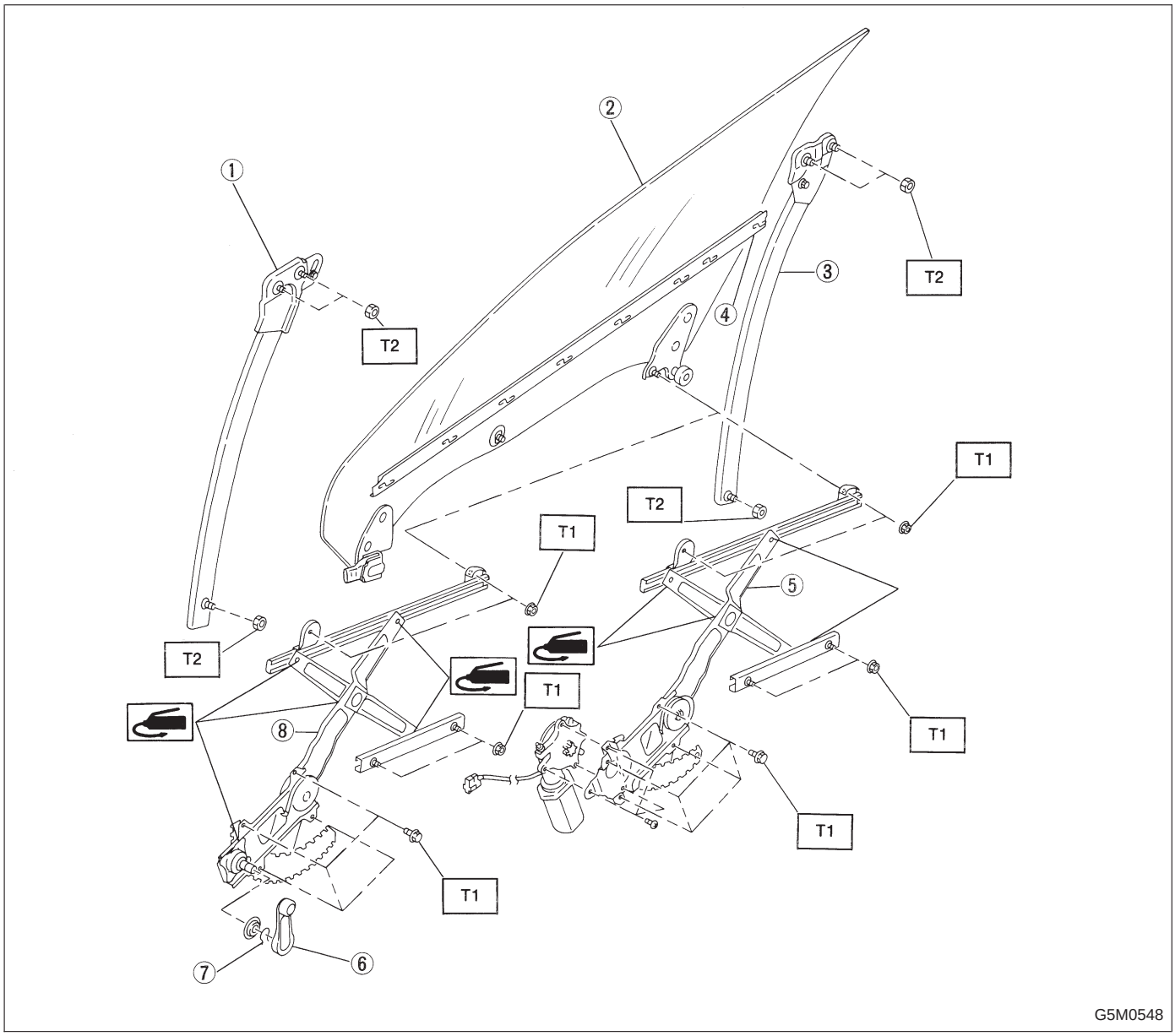
Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 25±3 (2.5±0.3, 18.1±2.2)
T3: 29±5 (3.0±0.5, 21.7±3.6)

3. Fixed Glass



① Windshield glass
② Dam rubber
③ Locate pin
④ Molding
⑤ Rear window glass
⑥ Rear quarter glass (Wagon)
⑦ Rear quarter glass (Coupe)
⑧ Fastener

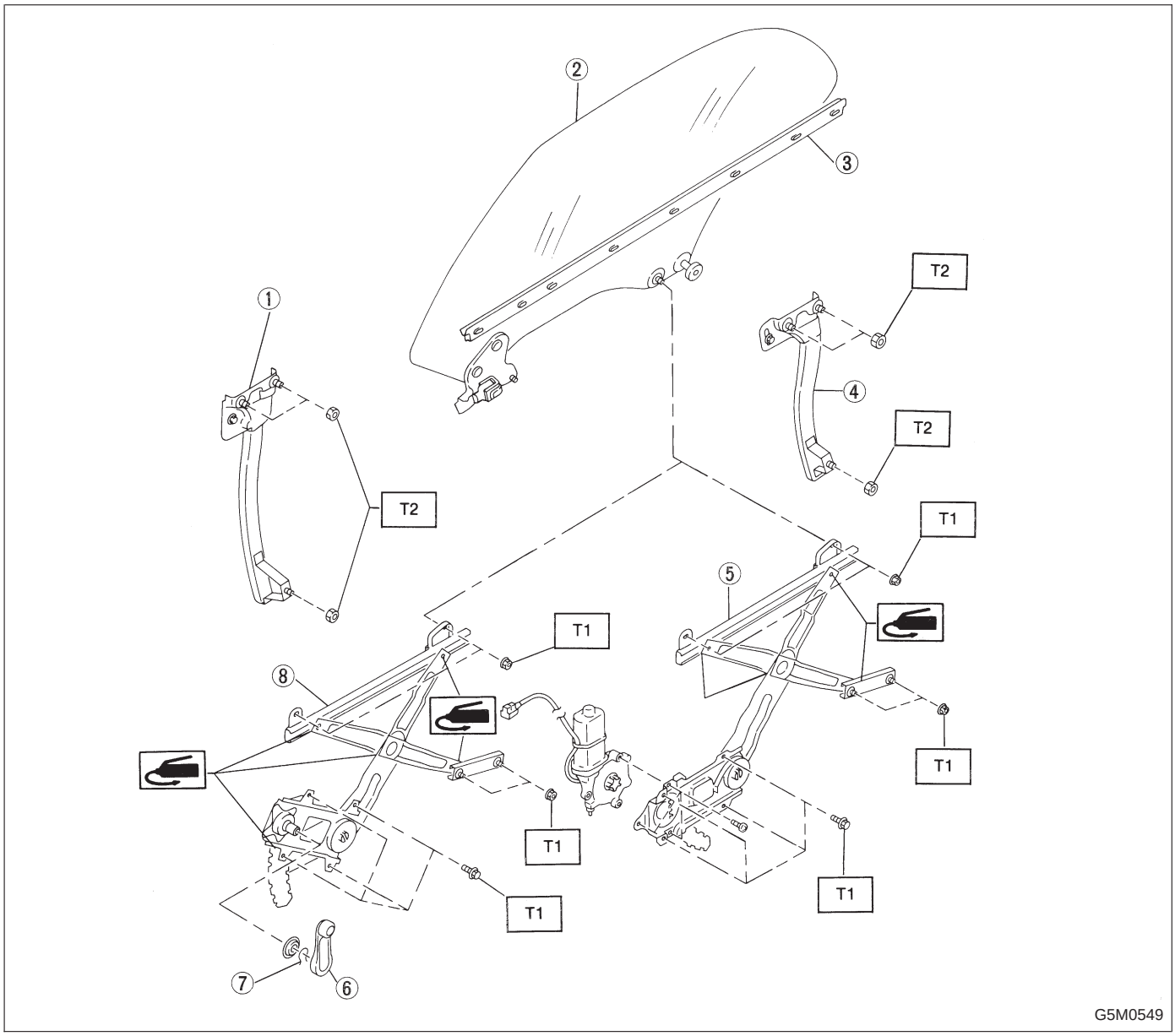
4. Front Door Glass



① Door sash (Front)
② Glass
③ Door sash (Rear)
④ Weatherstrip (Inner)
⑤ Regulator and motor ASSY
⑥ Regulator handle (Except power window)
⑦ Retainer spring
⑧ Regulator ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 14±4 (1.4±0.4, 10.1±2.9)

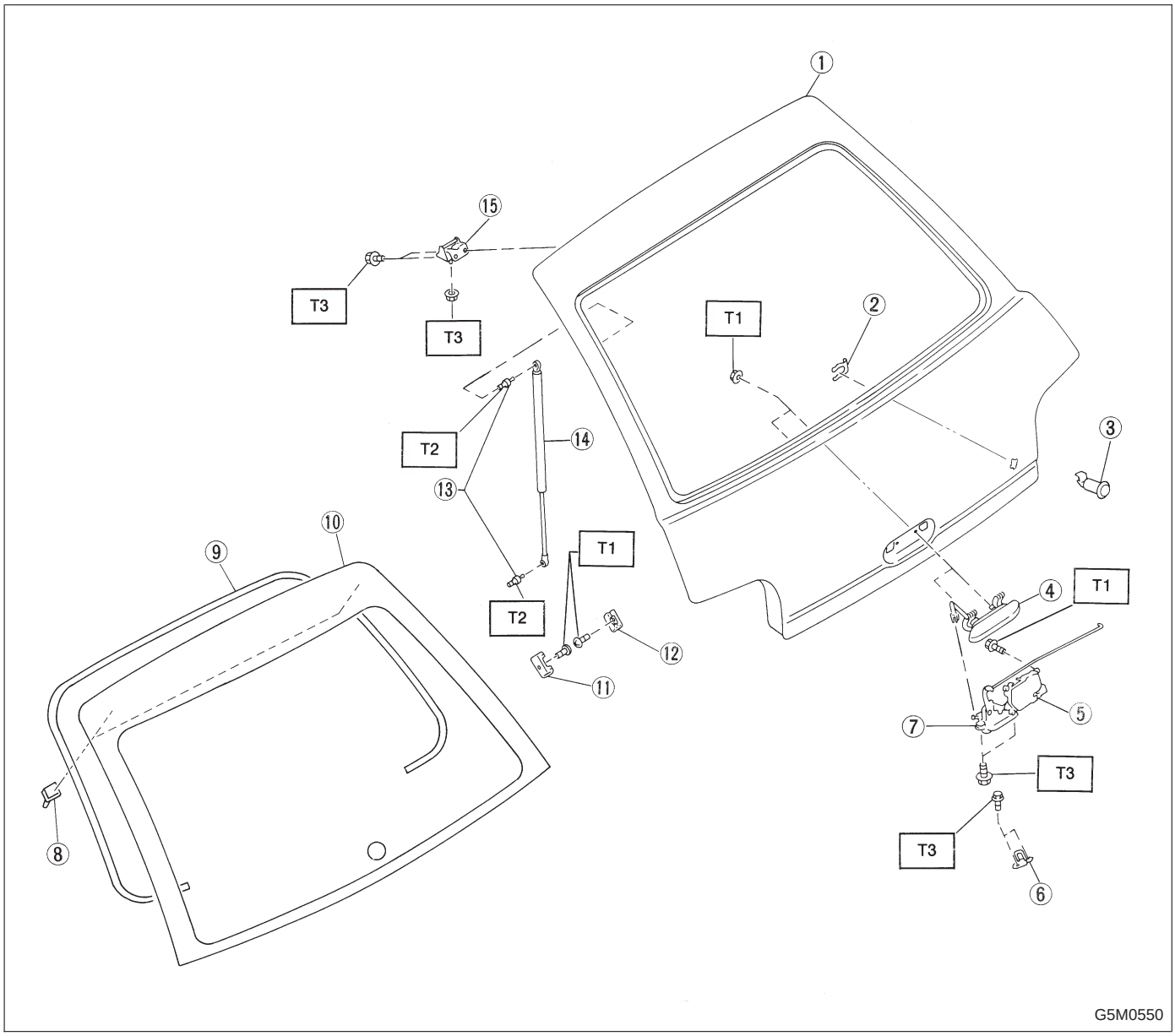
5. Rear Door Glass



① Door sash (Front)
② Glass
③ Weatherstrip (Inner)
④ Door sash (Rear)
⑤ Regulator and motor ASSY
⑥ Regulator handle (Except power window)
⑦ Retainer spring
⑧ Regulator ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 14±4 (1.4±0.4, 10.1±2.9)

6. Rear Gate and Glass

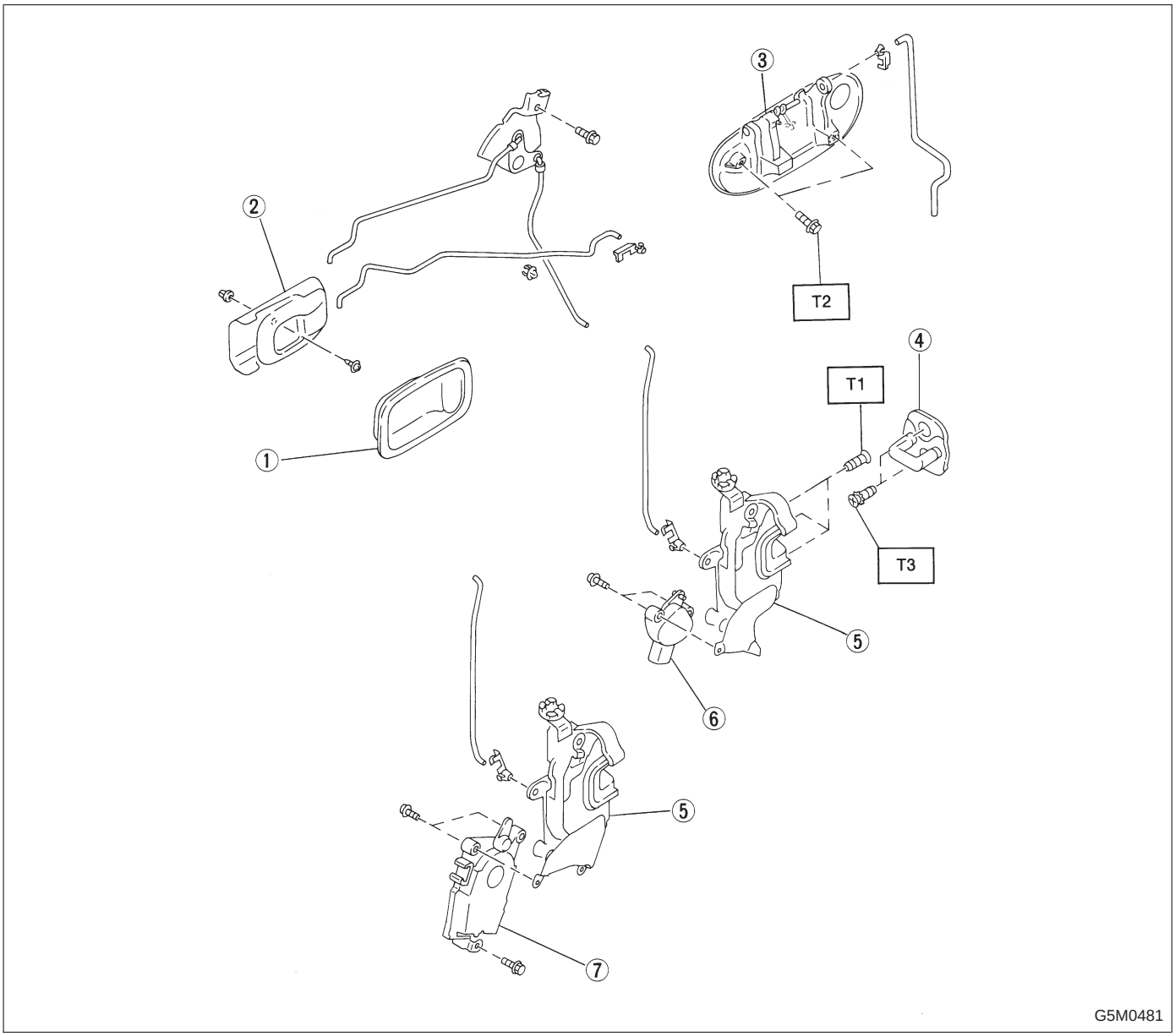


① Rear gate
② Clip
③ Key cylinder
④ Outer handle
⑤ Auto-door lock actuator
⑥ Striker
⑦ Latch
⑧ Glass pin
⑨ Trim
⑩ Glass
⑪ Buffer
⑫ Rear gate side buffer
⑬ Stud
⑭ Gas stay
⑮ Hinge

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 14±4 (1.4±0.4, 10.1±2.9)
T3: 25±5 (2.5±0.5, 18.1±3.6)

7. Door Lock Assembly

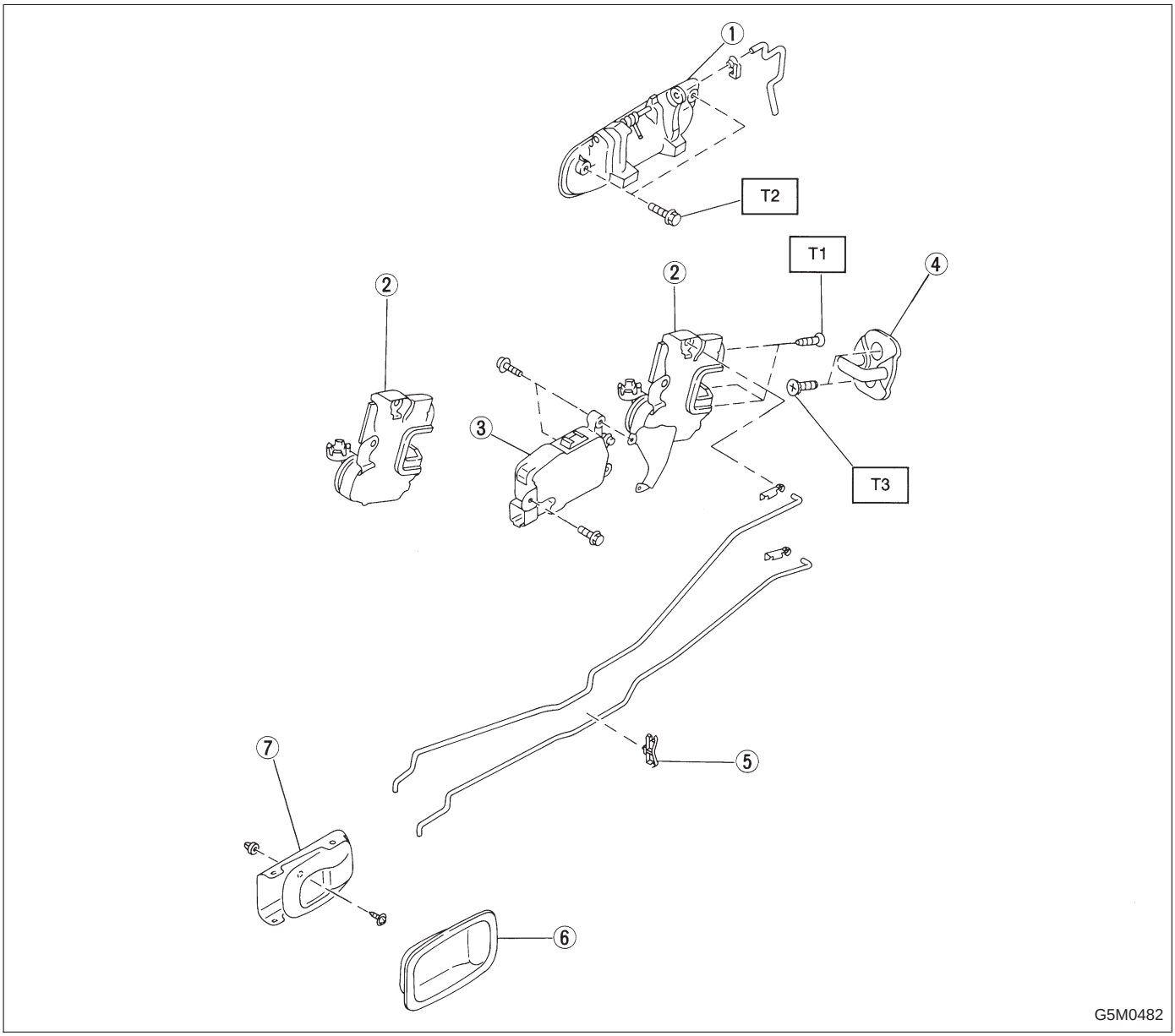
A: FRONT DOOR



① Cover
② Inner remote ASSY
③ Door outer handle
④ Striker
⑤ Door latch
⑥ Switch ASSY
⑦ Auto-door lock actuator

Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±2.0 (0.65±0.2, 4.7±1.4)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 14±4 (1.4±0.4, 10.1±2.9)

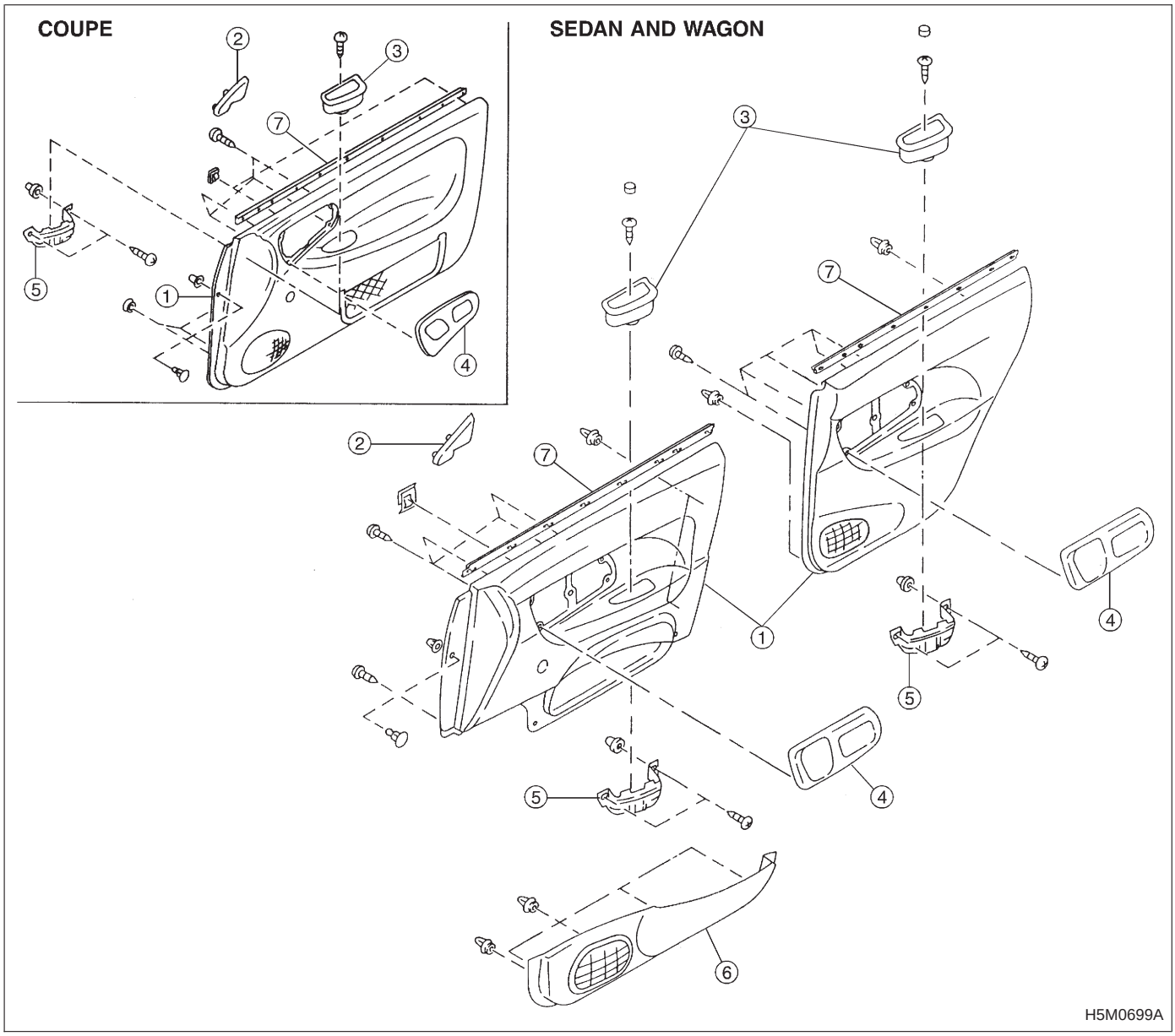
B: REAR DOOR



① Door outer handle
② Door latch
③ Auto-door lock actuator
④ Striker
⑤ Rod holder
⑥ Cover
⑦ Inner remote ASSY

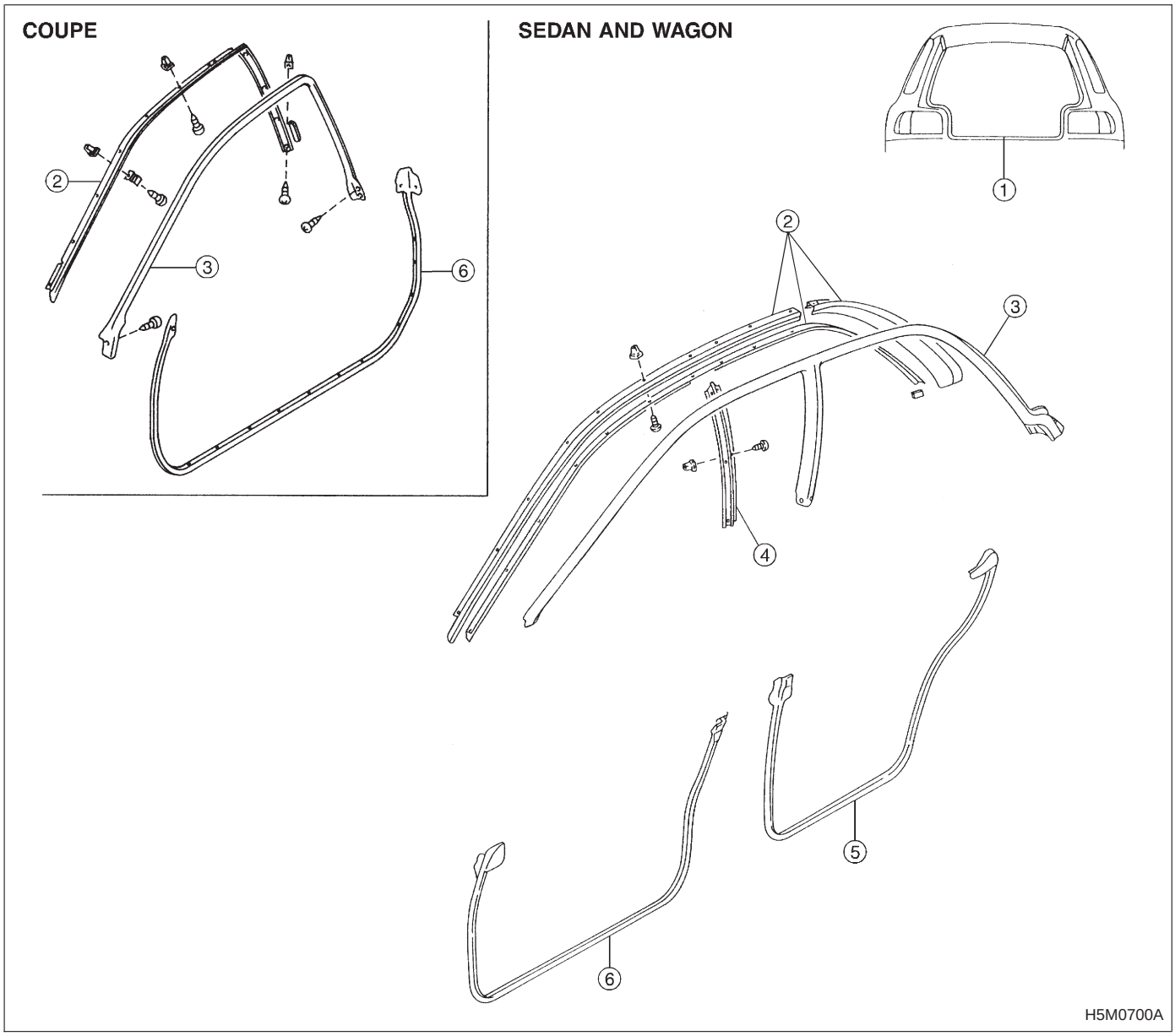
Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±2.0 (0.65±0.2, 4.7±1.4)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 14±4 (1.4±0.4, 10.1±2.9)

8. Door Trim



① Trim panel
② Gusset cover
③ Pull handle
④ Cover
⑤ Bracket
⑥ Pocket
⑦ Weatherstrip

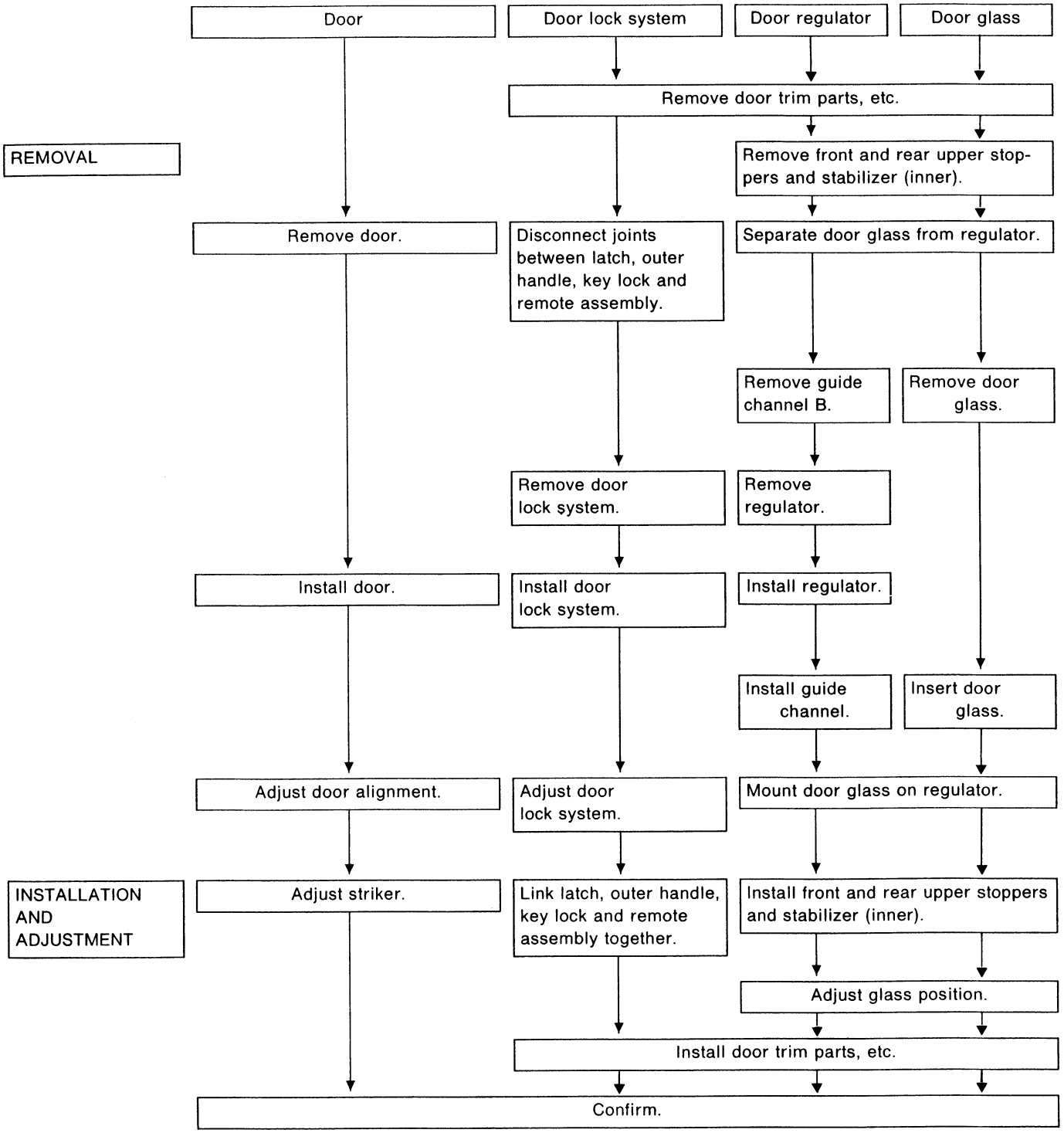
9. Weatherstrip

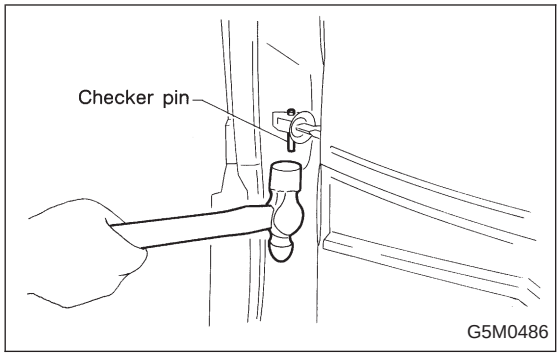


① Rear gate weatherstrip (Wagon only)
② Retainer and molding
③ Upper and side weatherstrip
④ Retainer (Center)
⑤ Weatherstrip (Rear door)
⑥ Weatherstrip (Front door)

1. Procedure Chart for Removing and Installing Door and Related Parts

NOTE:
This flowchart shows the main procedures for removing and installing the door and its related parts. For details, refer to the text.



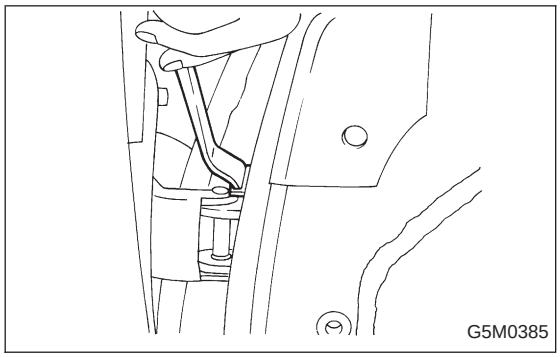


2. Door

A: REMOVAL AND INSTALLATION

1. DOOR ASSEMBLY

1) Remove lower trim and disconnect connectors from body harness.
2) Place a cloth or a wood block under door to prevent damage, and support it with a jack.
3) Remove checker pin by driving it upward. Be careful not to damage door and body.



4) Remove bolts (M8) securing upper and lower hinges to door, and remove door from hinges.

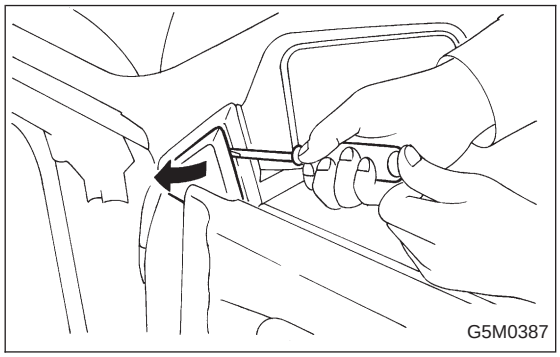
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)

5) Remove hinges by loosening hinges mounting bolt (M8) off of body.

Tightening torque:
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

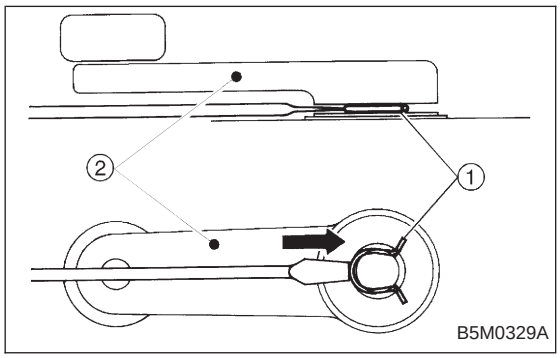
CAUTION:
Work carefully to avoid damaging door.

6) Installation is in the reverse order of removal.
NOTE:
Apply grease to moving parts of door hinges.

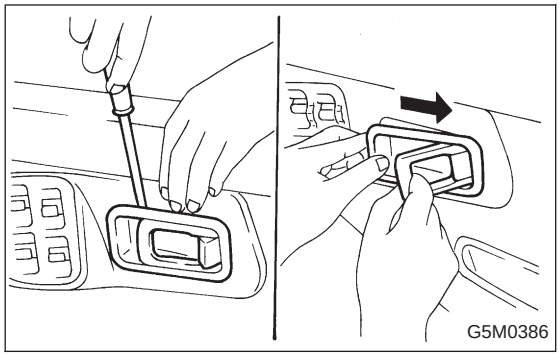


2. TRIM PANEL

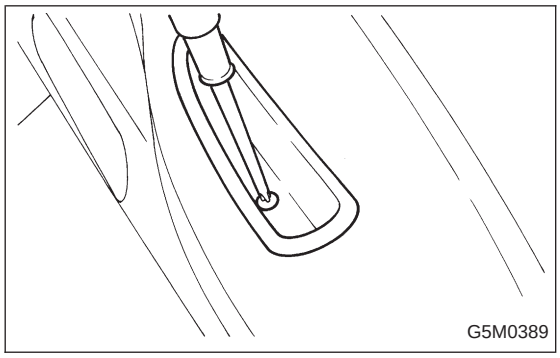
1) Remove gusset cover.



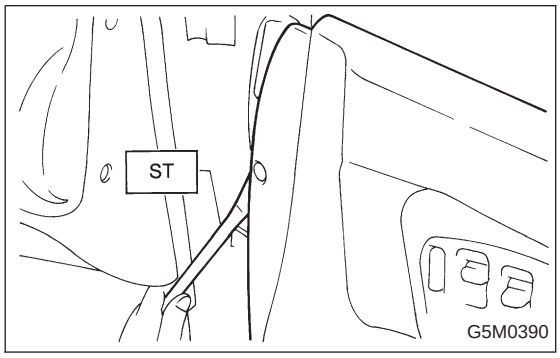
2) Press retainer spring ① with a thin flat-bladed screwdriver and then remove regulator handle ②. (models without power window)



3) Remove remote handle cover.



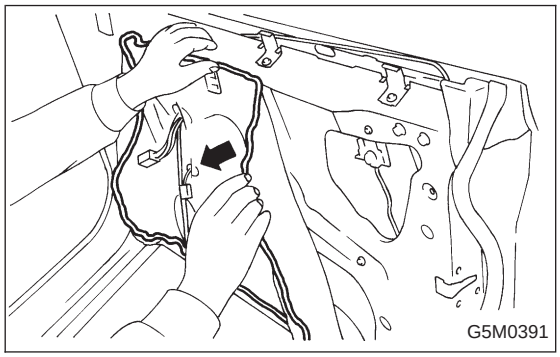
4) Remove pull handle attaching screw and then remove pull handle.



5) Using ST, disengage the clip.
ST 925580000 PULLER
6) Remove trim panel and then disconnect connector. (models with power window)

CAUTION:
Be careful not to break clip by applying undue force.

7) Installation is in the reverse order of removal.



3. SEALING COVER

1) Remove trim panel.
2) Remove speaker, trim bracket and remote assembly and disconnect connectors.
3) Remove sealer with a spatula.

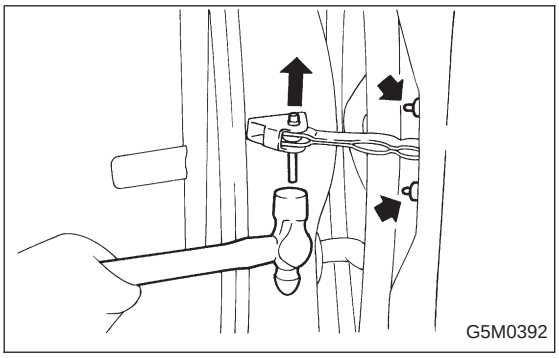
CAUTION:
Be careful because cover may break if sealer is removed forcefully.

4) Installation is in the reverse order of removal.

NOTE:
● Confirm that sealer is properly applied without breaks. Then install sealing cover.
● When repairing or replacing sealing cover, use “CEMEDINE 5430L” as sealer. It may be overlaid on existing sealer.

Sealer:
CEMEDINE 5430L

CAUTION:
● Any breaks in sealer can cause water leakage or entry of air and dust. Be sure sealer is applied in a continuous line.
● Make sure sealing cover bonded areas are free from wrinkles or openings.


G5M0392

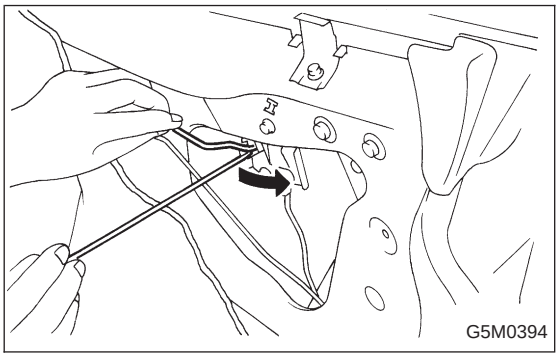
4. CHECKER

1) Remove trim panel.
2) Remove sealing cover.
3) Apply a cloth to door and body to prevent damaging them, and remove checker pin by driving it upward.

CAUTION:
Be careful not to damage door and body.

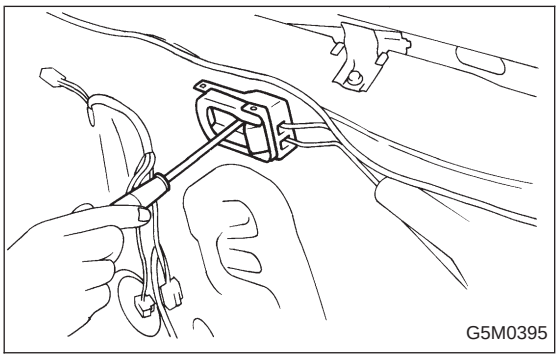
4) Completely close door glass.
5) Loosen two nuts securing checker, and take out checker through access hole in underside.
6) Installation should be made in the reverse order of removal.

Tightening torque:
7.5±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)


G5M0394

5. INNER REMOTE

1) Remove trim panel.
2) Remove sealing cover.
3) Disconnect joints of two rods.
4) Unlatch rod holder.

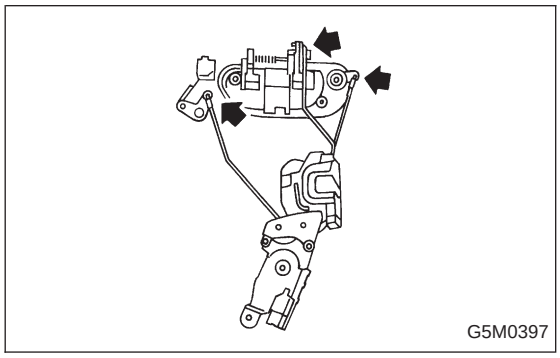

G5M0395

5) Remove screws holding remote assembly.

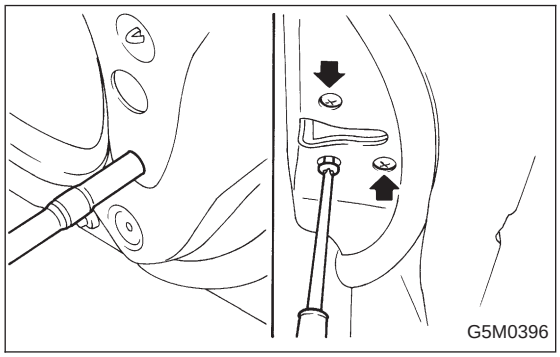
6) Installation is in the reverse order of removal.
NOTE:
If rear door is equipped with child safety lock, check that child lock lever moves without dragging.

6. DOOR LATCH

1) Remove trim panel.
2) Remove inner remote assembly.
3) Remove sealing cover around latch service hole.
4) Completely close door glass.


G5M0397

5) Remove latch and actuator assembly:
   (1) Turn rod holder to disconnect joint between key lock and rod.
   (2) Turn rod holder to disconnect joint between outer handle and rod.
   (3) Turn rod holder to disconnect joint between crank and rod.


G5M0396

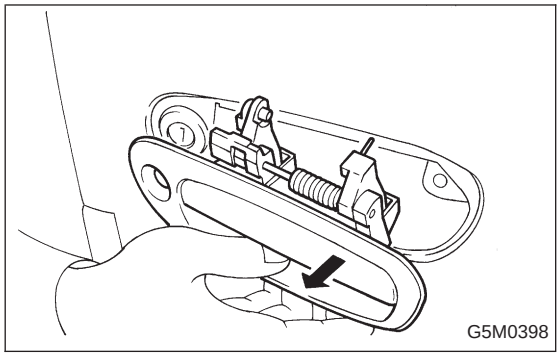
6) Loosen screws securing both latch and actuator, then remove latch and actuator assembly through service hole in bottom.

Tightening torque (screw):
6.4±2.0 N·m (0.65±0.2 kg-m, 4.7±1.4 ft-lb)

7) Installation is in the reverse order of removal.

NOTE:
- Check operation of each part.
- Check each sliding part for proper lubrication.

CAUTION:
After installation, be sure lock mechanism operates normally.


G5M0398

7. OUTER HANDLE

1) Remove trim panel.
2) Remove sealing cover.
3) Detach door latch rod from outer handle and key lock.
4) Loosen nut securing outer handle and then remove outer handle from outside.

CAUTION:
Be careful not to damage door.

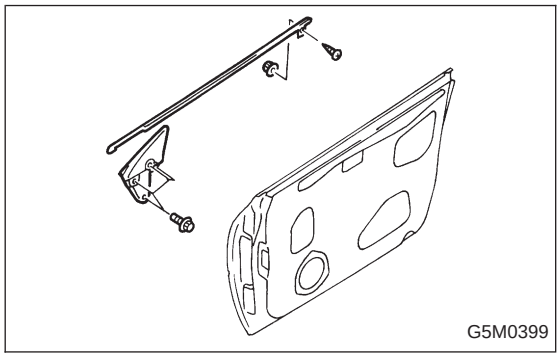
5) Installation is in the reverse order of removal.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

8. KEY LOCK

1) Remove trim panel.
2) Remove sealing cover.
3) Completely close door glass.
4) Remove outer handle.
5) Loosen spring securing key lock.
6) Remove key lock from outer handle.
7) Installation is in the reverse order of removal.

NOTE:
Install so that key slot in key lock comes to center of hole in outer handle.


G5M0399

9. GUSSET

1) Be sure window is all the way down.
2) Remove gusset cover.
3) Remove trim panel.
4) Remove door rearview mirror.
5) Remove outer weatherstrip.
6) Remove sealing cover.

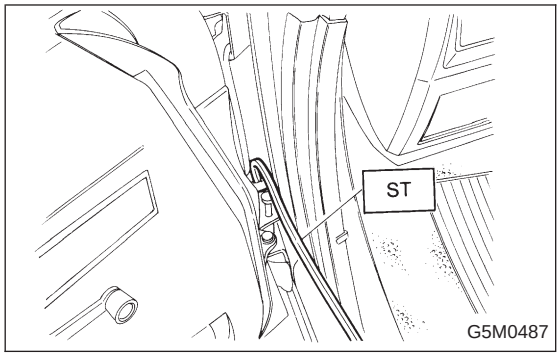
NOTE:
Be careful not to drop nuts on the “IN” side.

7) Remove bolts and nuts which secure gusset.

Tightening torque: Bolt
13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)

Tightening torque: Nut
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

8) Lift out gusset.
9) Installation is in the reverse order of removal.



B: ADJUSTMENT

1. DOOR ASSEMBLY

1) Using ST, loosen bolts securing upper and lower hinges to body, and adjust fore-and-aft and vertical alignment of door.

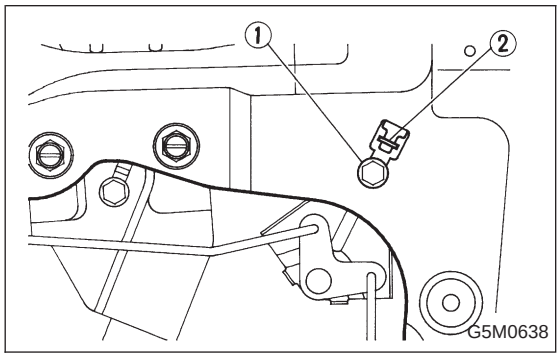
ST 925610000 DOOR HINGE WRENCH

2) Loosen screw one complete rotation, and adjust opening/closing direction of door using a hammer covered with a cloth.

CAUTION:
Be careful not to damage striker.

Hinge tightening torque (body side):
29±5 N·m (3.0±0.5 kg-m, 21.7±3.6 ft-lb)

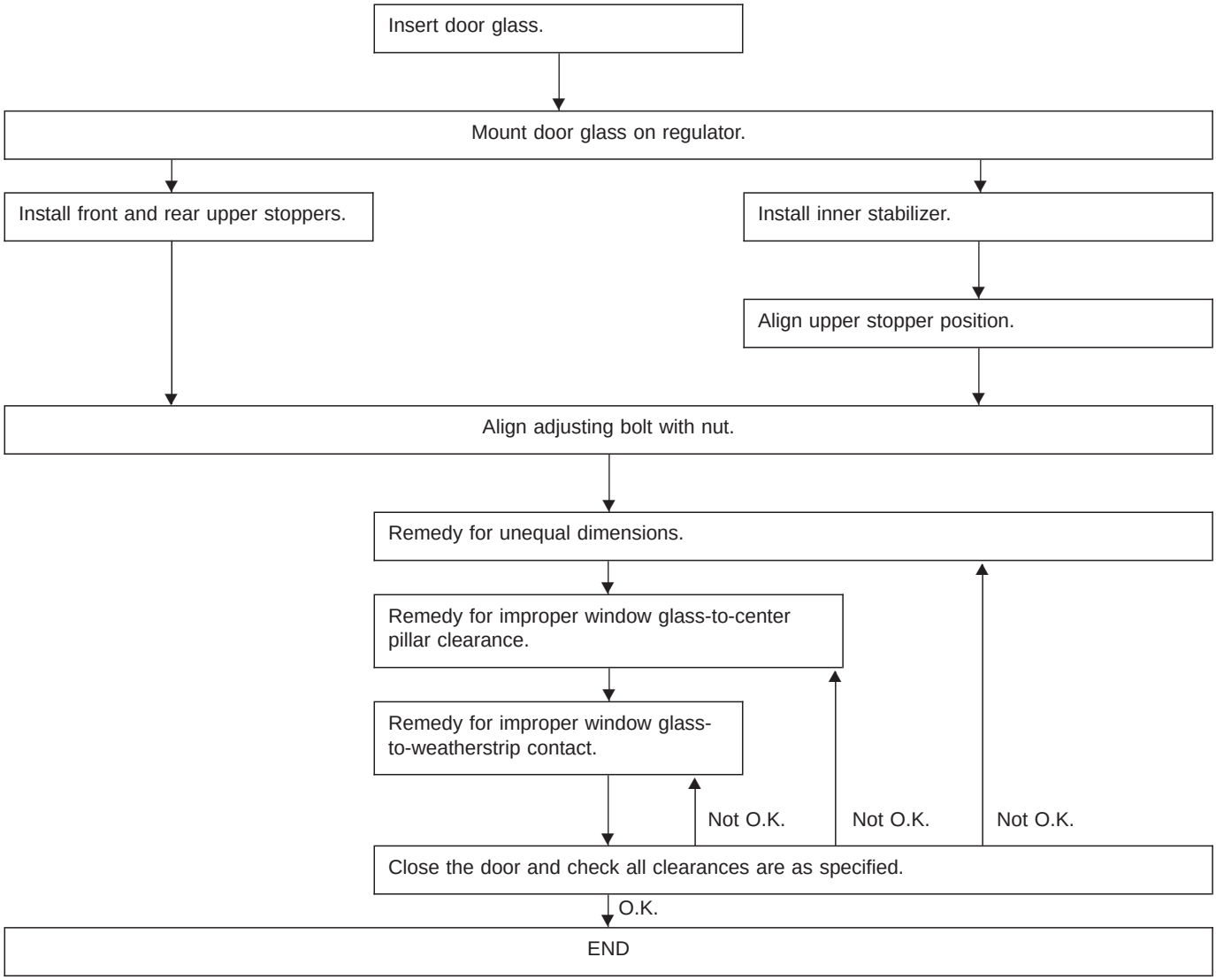
Striker tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)



2. INNER REMOTE

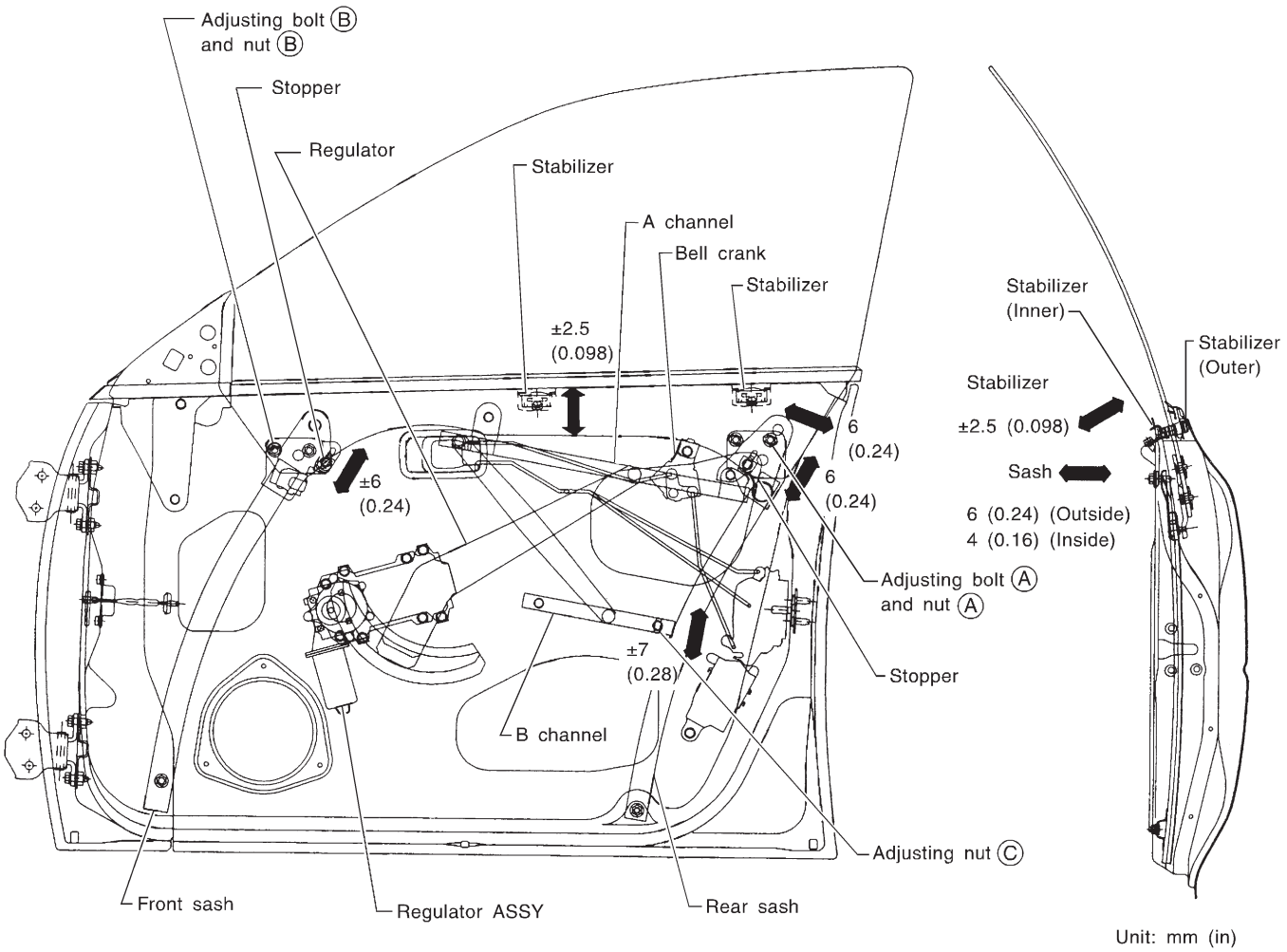
1) Lock the door.
2) Loosen bolt ①.
3) Lower bell crank ② and then tighten bolt ①.

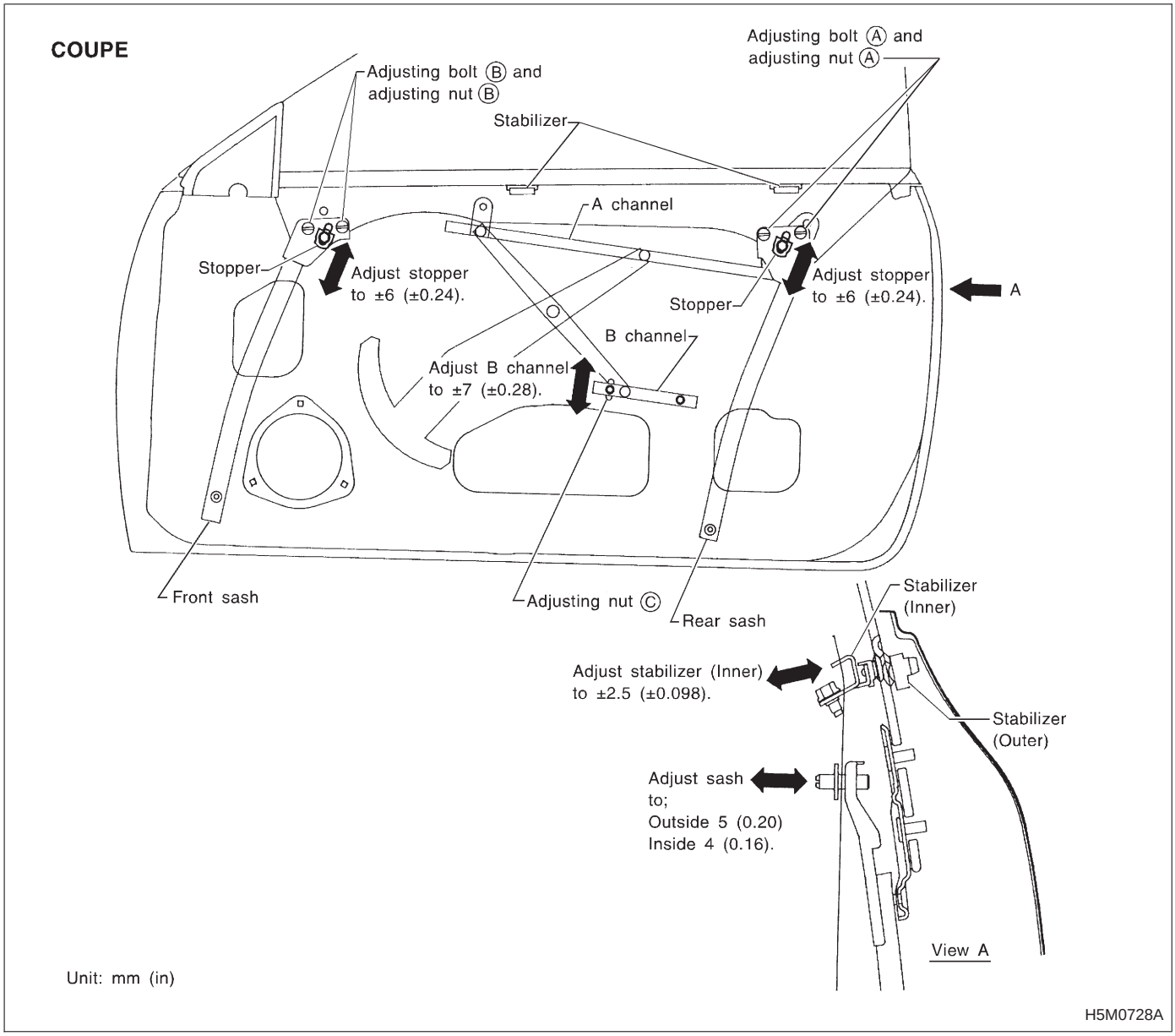
3. PROCEDURE CHART FOR ADJUSTING DOOR GLASS

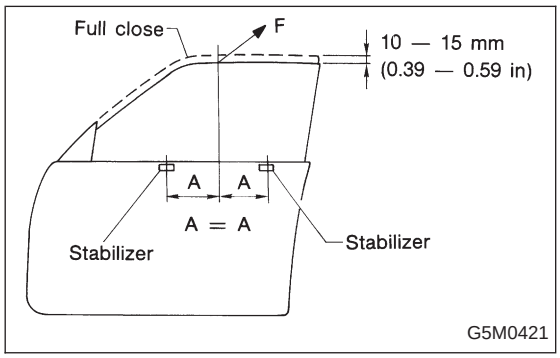


4. FRONT DOOR GLASS

SEDAN AND WAGON







- **Door glass fit adjustment**

Before adjusting door glass alignment, ensure adjusting bolts for stabilizers, upper stoppers and sashes are loose and glass is raised so that it is in contact with upper and side weatherstrip.

1) Temporarily tighten one of the two rear sash adjusting bolts, at midpoint of oblong hole on inner panel.

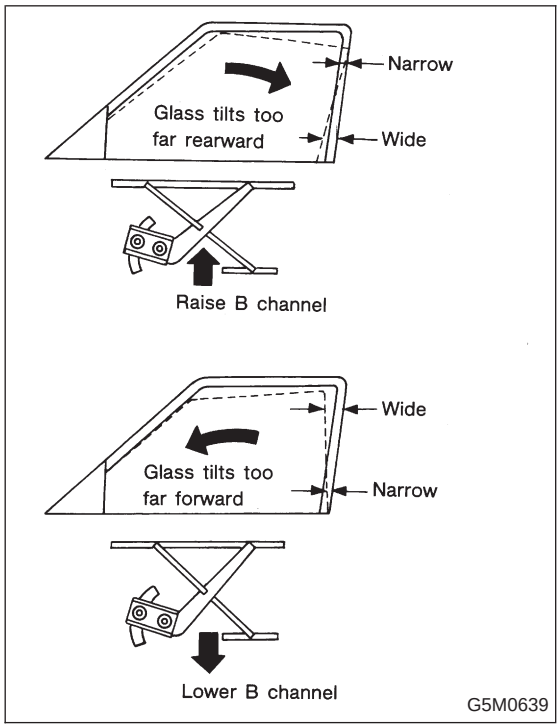
2) Temporarily tighten regulator B channel at a position slightly lower than midpoint of oblong hole on inner panel.

3) Lower door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure (load) to upper edge of glass above midpoint of two outer stabilizers, press inner stabilizer until it just touches the glass, then secure it.

Load: F

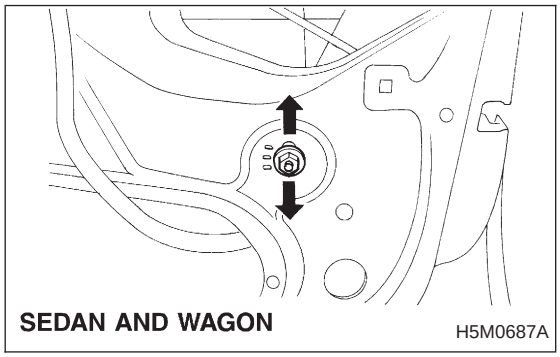
Front door glass 44.1±4.9 N
(4.5±0.5 kg, 9.9±1.1 lb)

Rear door glass 44.1±4.9 N
(4.5±0.5 kg, 9.9±1.1 lb)



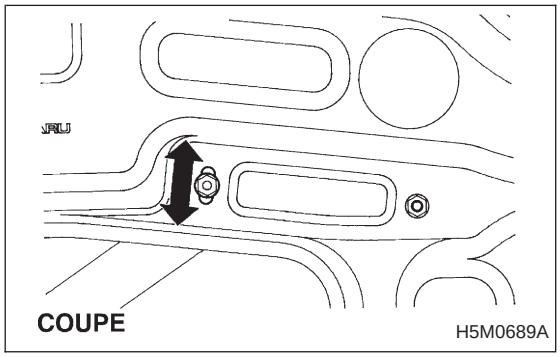
● Remedy for unequal dimensions, between upper, lower and center pillar sides

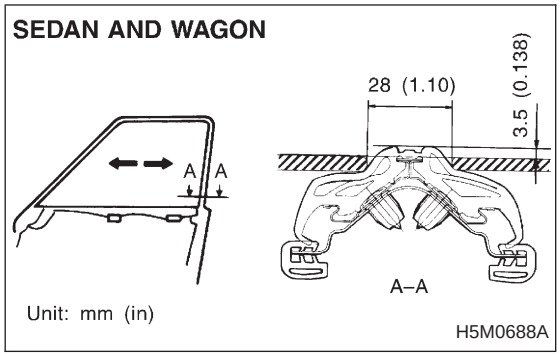
1) Close front door and raise door glass.
2) Make sure of unequal dimensions.

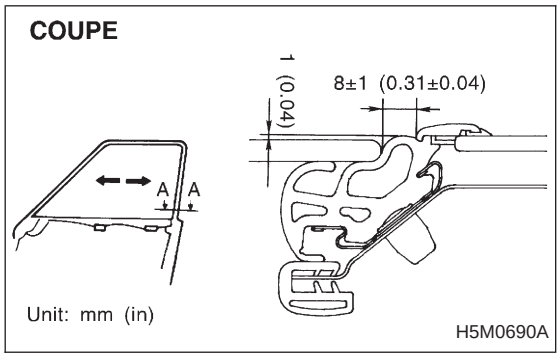


3) If glass tilts to far rearward, loosen adjusting nut Ⓒ and adjust glass to be parallel with center pillar, then after adjustment, tighten adjusting nut Ⓒ.

Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

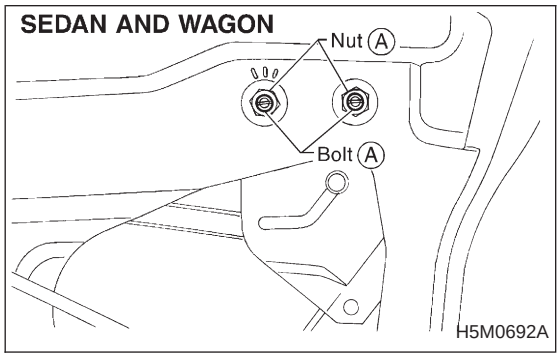




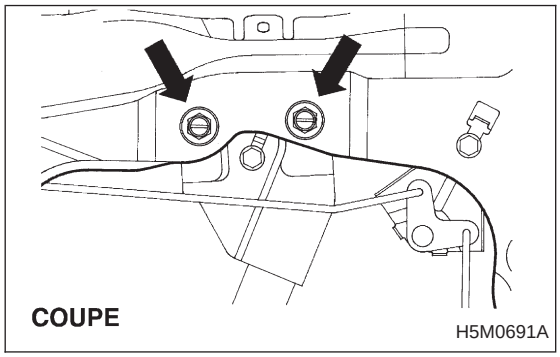


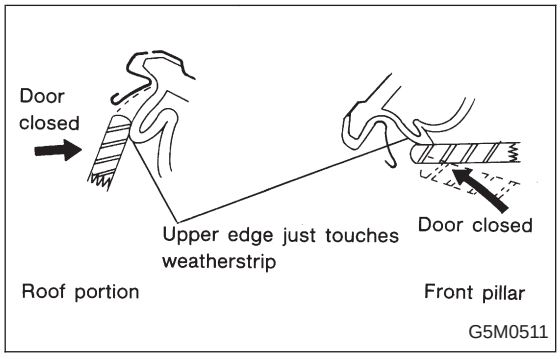
● **Remedy for improper glass to center pillar clearance**

1) Close front door and raise door glass.
2) Make sure of improper clearance.



3) If clearance is improper, loosen adjusting nut Ⓐ, bolt Ⓐ and adjust glass to center pillar.

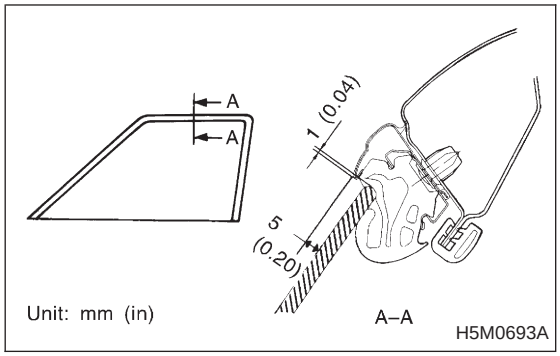




● **Remedy for improper upper stop point of door glass**

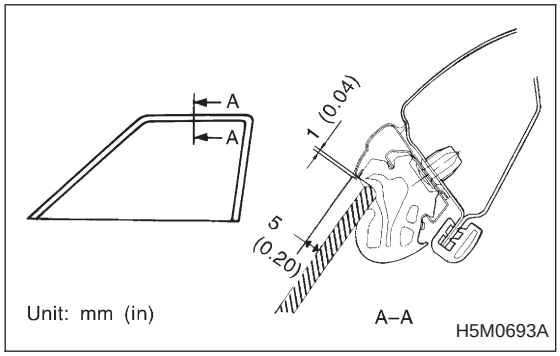
1) Loosen front and rear sash stoppers.
2) Increase the upward travel of window glass up to the position where upper edge just touches weatherstrip surface with door closed.
3) After adjustment, temporarily tighten stoppers.

NOTE:
Make sure that each glass stopper is touched.



● **Remedy for incorrect contact of door glass to weatherstrip**

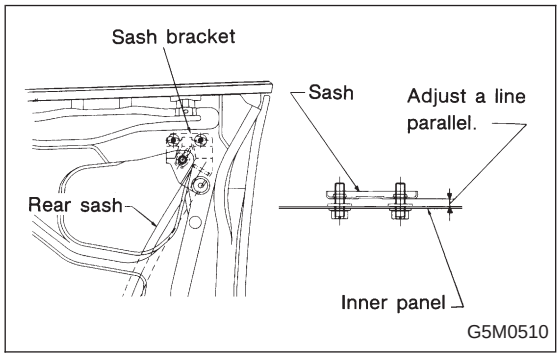
1) Close front door and raise door glass.
2) If clearance is below specifications, loosen bolt Ⓐ and bolt Ⓑ.
3) If clearance is over specifications, tighten bolt Ⓐ and bolt Ⓑ.



● **Fit adjustment**

Door glass fit is adjusted by displacing the glass front edge with a stabilizer.
NOTE:
Before adjusting glass fit, visually check to determine relative adjusting positions of retainer and molding (on roof side) and glass surface.
1) Alternately adjust two rear sash adjusting bolts Ⓐ until dimensions are obtained.

CAUTION:
Do not loosen two adjusting nuts Ⓐ at the same time, as this moves sash fore and aft, creating unequal glass-to-sash clearance. During adjustment, loosen only one nut and keep the other tightened.

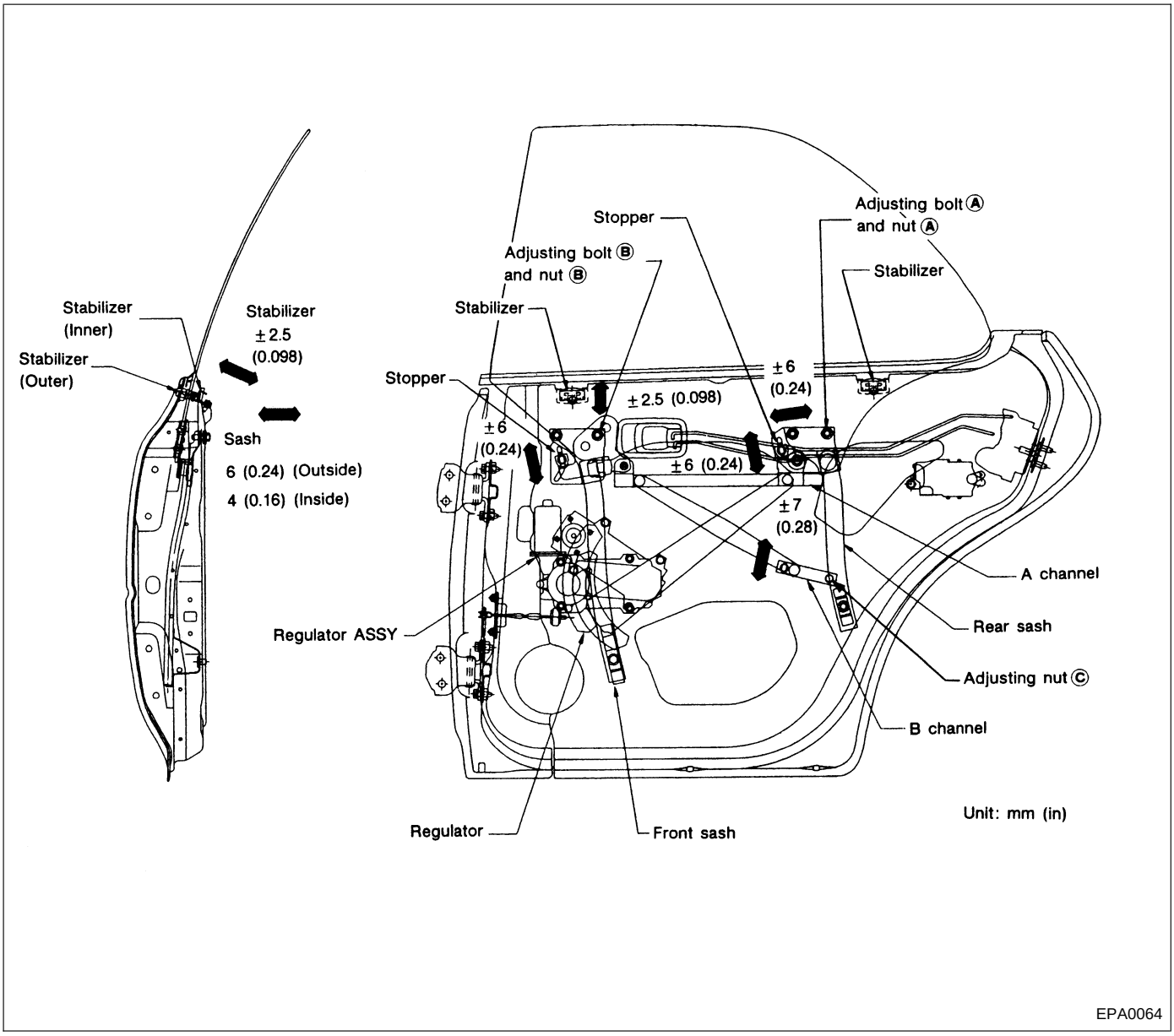


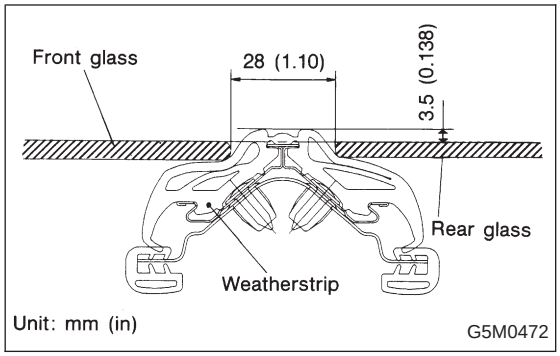
NOTE:
Always adjust two rear sash adjusting bolts Ⓐ by the same amount. Do not adjust the adjusting bolts with sash bracket inclined toward inner panel, as this increases effort required to operate regulator.

2) Adjust front sash fit using rear sash adjustment procedure outlined in the former procedure as a guide. Two adjusting bolts must be adjusted by the same amount.
NOTE:
● Front and rear sash adjustment procedures are basically the same; however, the amount of adjustment is not always the same due to alignment dispersion of individual doors.
● Adjust front and rear sash fit, as equally as possible. Otherwise, effort required to operate regulator may increase.
3) After adjusting front sash-to-glass fit, secure front sash.

5. REAR DOOR GLASS

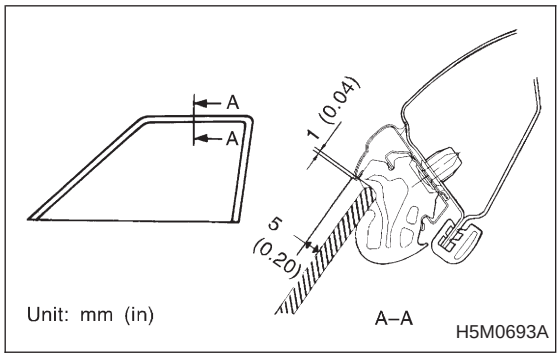
Alignment of rear door glass is basically the same as for the front door glass. Due to slight difference in adjustment dimensions for fore-aft, up-down, and in-out alignments, key points for rear door adjustment are described.





● **Fore-aft adjustment**

1) Door glass alignment must be adjusted so that glass-to-center pillar fit is equal at all points. Always use dimensions as a guide during adjustment.
NOTE:
If dimensions are smaller than those indicated, glass will be caught in weatherstrip and may not raise to the fully closed position.
2) After making fore-aft adjustment, raise and lower glass to ensure it is free from any binding.



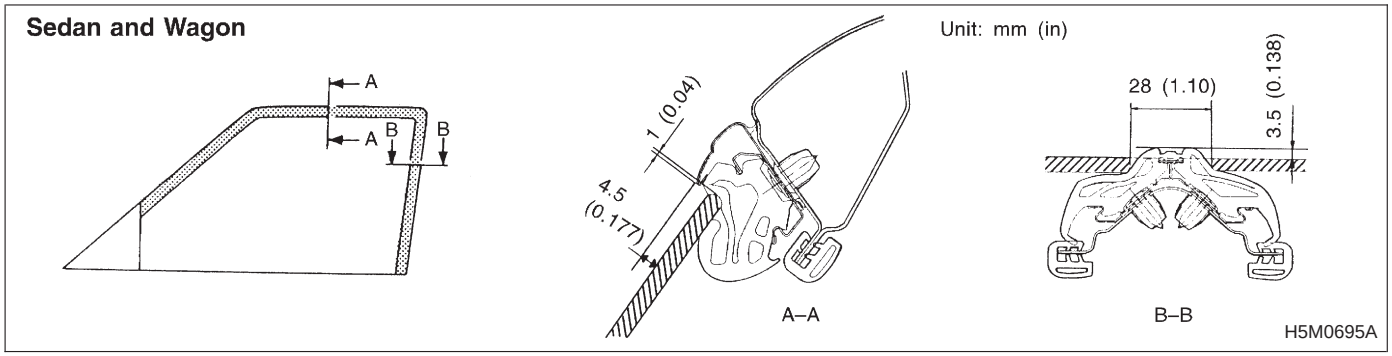
● **Fit adjustment**

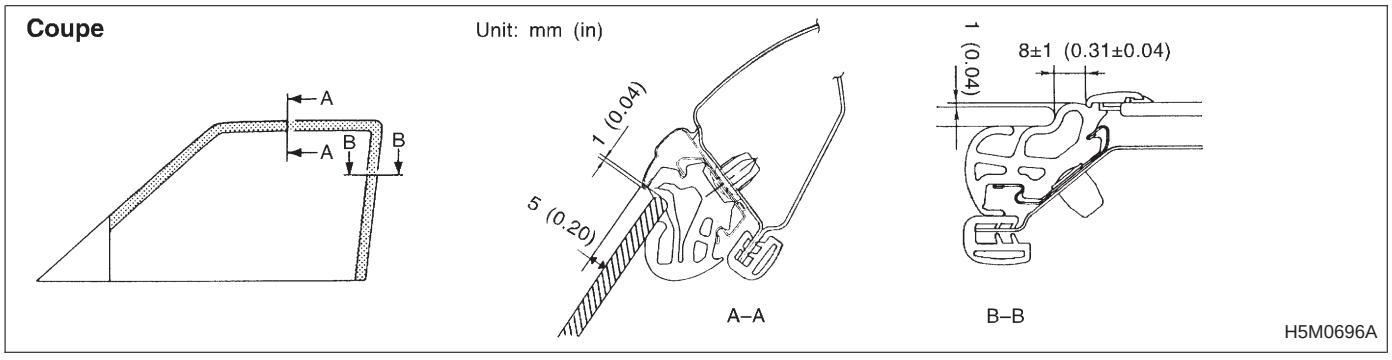
Increasing contact pressure causes rear door glass to be caught in center pillar upper and lower weatherstrip; this will cause premature weatherstrip wear. For this reason, always use dimensions indicated in figure as a guide during glass fit adjustment.

C: INSPECTION

1. FRONT DOOR GLASS

1) Close front door and make sure of all clearances.



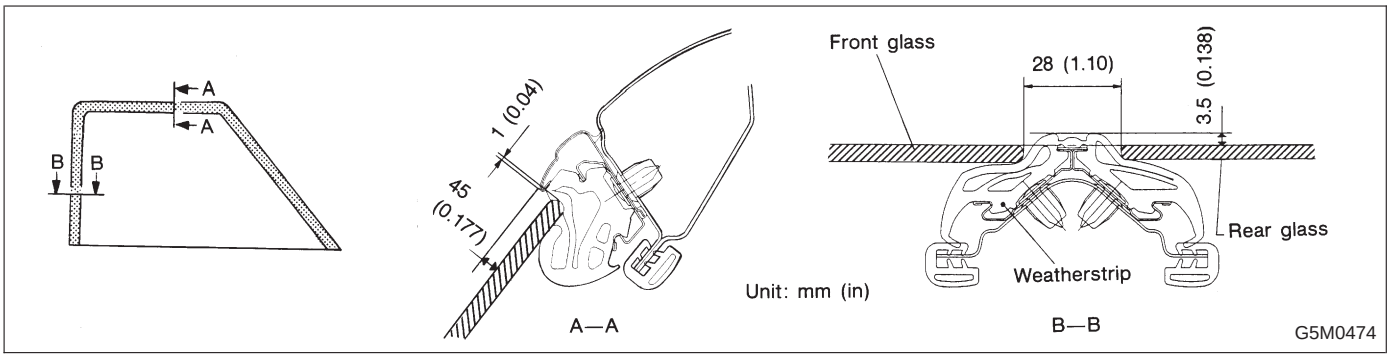


2) If any clearance is not correct, adjust affected parts. Re-check that all clearances are correct.

CAUTION:
● Repeatedly adjust parts until all clearances are correct.
● After clearance adjustment, make sure that all adjusting bolts and nuts are tightened.

2. REAR DOOR GLASS

1) Close rear door and make sure of all clearances.



2) If any clearance is not correct, adjust affected parts. Re-check that all clearances are correct.

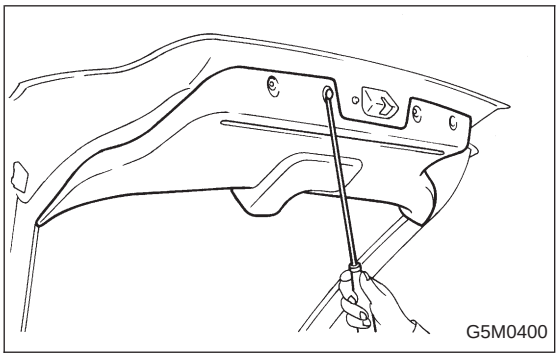
CAUTION:

- **Repeatedly adjust parts until all clearances are correct.**
- **After clearance adjustment, make sure that all adjusting bolts and nuts are tightened.**

3. Rear Gate

A: REMOVAL AND INSTALLATION

CAUTION:
● Be careful not to scratch coated surfaces of vehicle body and window glass during removal. Place a cloth over the affected area.
● Be careful not to damage trim panels.
● Use an assistant when handling heavy parts.
● Be careful not to damage or lose small parts.

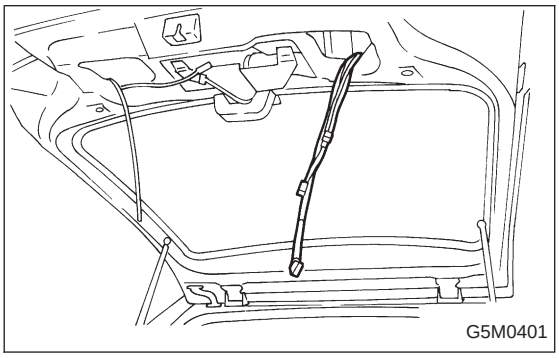

G5M0400

1. REAR GATE ASSEMBLY

1) Remove clips from trim panel and detach trim panel.

CAUTION:
Be careful not to damage clips or their holes.

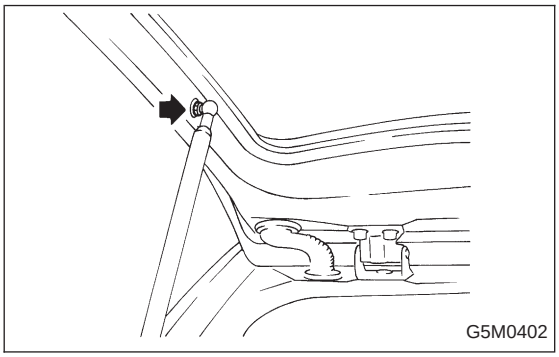
2) Disconnect connectors and terminal.
3) Disconnect rear washer hose from wiper motor.
4) Remove high-mounted stop light.


G5M0401

5) If disconnected harness is re-used, tie connector with a string and place on the upper side of rear gate for ready use.

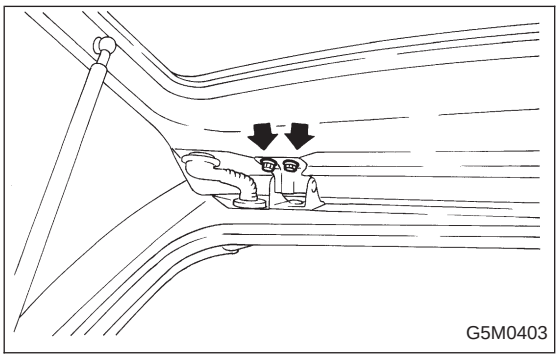
CAUTION:
Do not forcefully pull cords, lead wires, etc. since damage may result; carefully extract them in a wavy motion while holding connectors.

6) Remove rear wiper. <Ref. to 6-2 [W6B0].>
7) Remove both rubber ducts and then extract washer hose and harness connector.

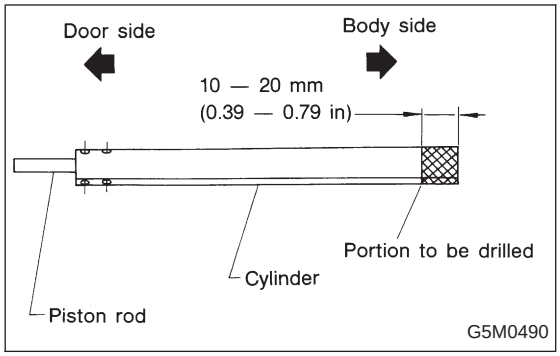

G5M0402

8) Gas stay:
   (1) Completely open rear gate.
   (2) Remove bolts which hold gas stay to rear gate.

CAUTION:
● Be careful because rear gate drops while removing bolts. Have an assistant support it while removing bolts.
● Be sure to place a folded cloth between rear gate and body to prevent scratches.


G5M0403

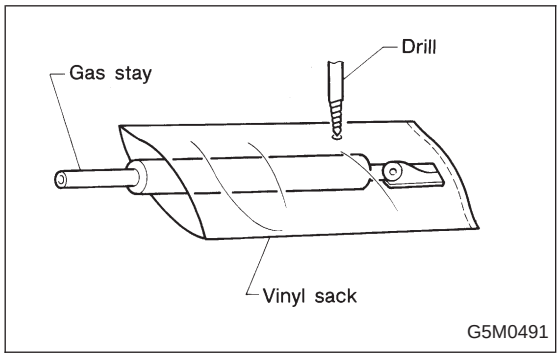
9) Remove the bolts which hold rear gate to hinge and then detach rear gate.



10) General precautions in handling rear gate gas stay

CAUTION:

- **Do not attempt to disassemble gas stay because its cylinder is filled with gas.**
- **Before discarding gas stay, place it at a slight angle with the cylinder body side facing up and drill a 2 to 3 mm (0.08 to 0.12 in) dia. hole to completely discharge the content. (Gas is odorless, colorless and harmless; however, metal powder may come out of the hole.)**

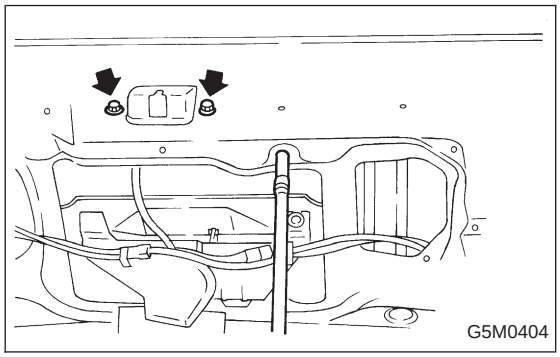


- **It is good practice to place a vinyl sack over it before drilling the hole because oil may spurt out. Be careful to prevent vinyl cover from becoming entangled on the drill.**
- **Be careful not to scratch the exposed section of piston rod or allow oil or paint to come in contact with it.**
- **Do not attempt to rotate the extended piston rod.**

11) Installation is in the reverse order of removal.

CAUTION:

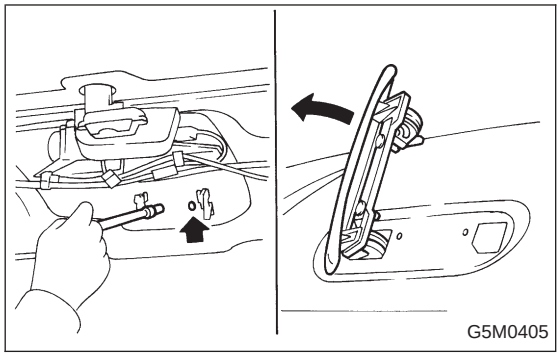
- **Be careful not to mistake RH and LH body side buffers.**
- **Be sure to add sealer to hinge.**
- **When installing rear gate, be careful not to damage coating on body and rear gate.**



2. LATCH

1) Remove trim panel.
2) Disengage rod from holder (= key cylinder).
3) Remove bolts from auto-door lock actuator.
4) Remove bolts from latch, and detach latch.
5) Disconnect rear gate switch connector.
6) Disconnect auto-door lock actuator connector.
7) Detach latch.
8) Installation is in the reverse order of removal.

CAUTION:
Firmly join latch with key cylinder, and outer handle.



3. OUTER HANDLE

1) Remove trim panel.
2) Remove latch.
3) Remove two nuts used to hold outer handle to the inside of rear gate, and detach outer handle.

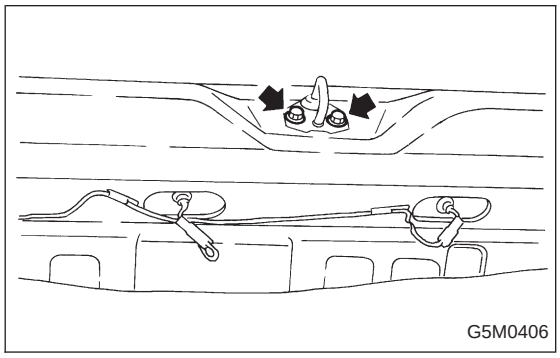
CAUTION:
Be careful not to damage packing when removing outer handle.

4) Installation is in the reverse order of removal.

CAUTION:
Completely insert latch pin into handle lever.

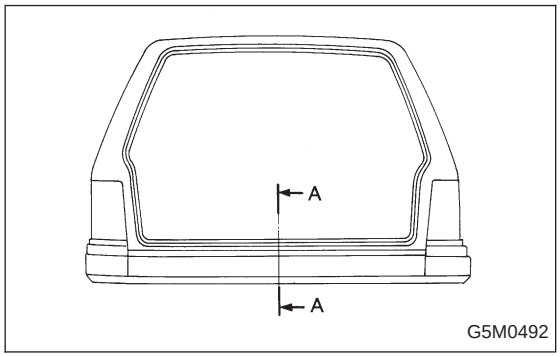
4. KEY CYLINDER

1) Remove trim panel.
2) Disengage rod from holder.
3) Remove retaining spring from key cylinder, and detach key cylinder from outside.
4) Installation is in the reverse order of removal.



5. STRIKER

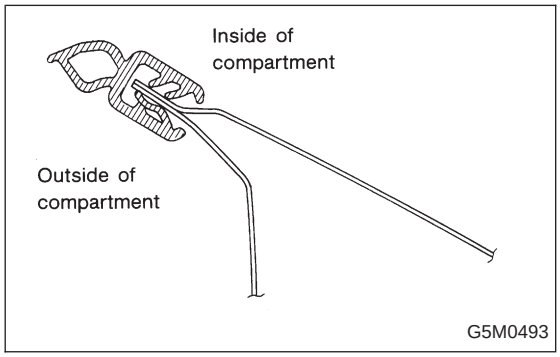
1) Remove rear skirt trim.
2) Remove two bolts from striker and detach striker.
3) Installation is in the reverse order of removal.



6. WEATHERSTRIP

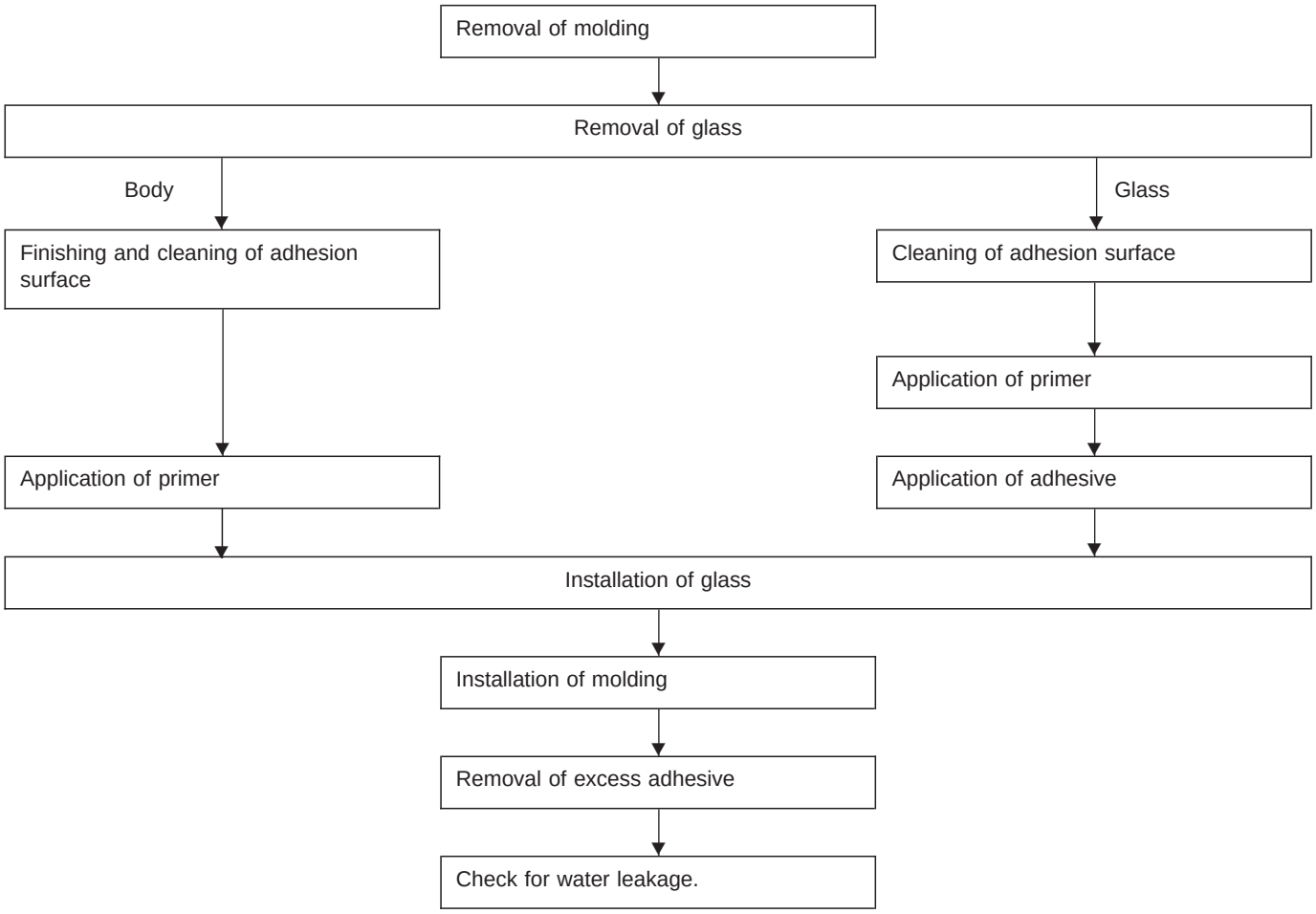
1) Place weatherstrip so that its joints meet at lower center of vehicle body, and install by inserting flanged portion from below, as shown in section A—A in figure.
2) Tap along entire length with a rubber hammer to firmly insert body flange into weatherstrip.

CAUTION:
- **Be careful not to install in wrong direction.**
- **Install weatherstrip carefully and firmly.**



4. Procedure Chart for Removal and Installing Window Glass

A: REMOVAL AND INSTALLATION



1. MATERIALS REQUIRED FOR APPLICATION

Description	Remarks
Repair adhesive set ● Cartridge of single-liquid urethane adhesive ● Primer for glass and body	Sunstar No. 580 or Essex Chemical Corp's Urethane E Sunstar No. 435-580
Windshield knife or piano wire	For cutting windshield
Sealant gun	For applying adhesive
Suction cups	For holding glass
Putty knife	For finishing adhesion surface and cutting spacer
Sponge	For applying primer
Gauze or cloth	For cleaning
Alcohol or white gasoline	For cleaning adhesion surface
Tape	For preventing damage to painted surface

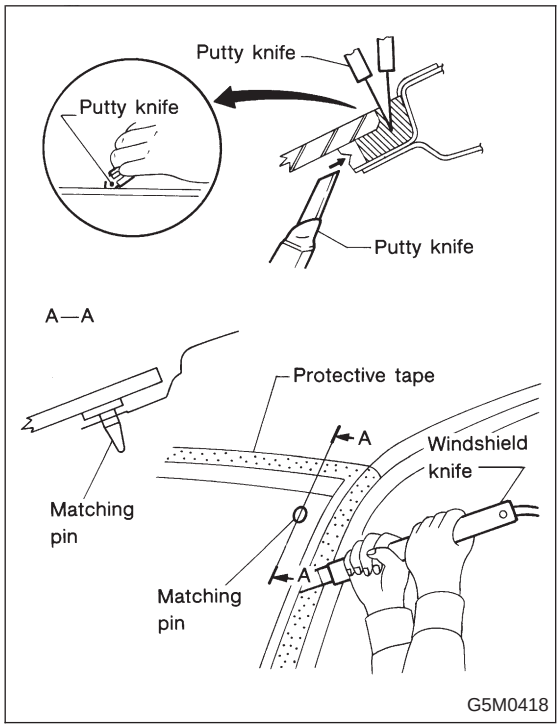
5. Windshield

A: REMOVAL

1. USING WINDSHIELD KNIFE

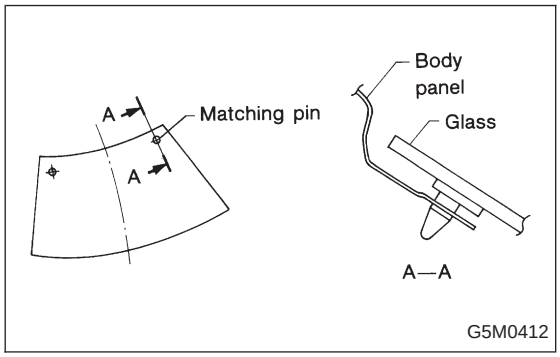
The following procedure for the front windshield can also be applied to other window glass.

1) Remove wiper arm and cowl panel.
2) Remove roof molding and front window molding upper.



3) Remove glass:
   (1) Put protective tape on body to prevent damage.
   (2) Apply soapy water to the surface of the adhesive agent so the knife blade slides smoothly.
   (3) Cut off excess adhesive agent.
   (4) Put windshield knife into layer of adhesive.
   (5) Cut adhesive layer with the windshield knife.

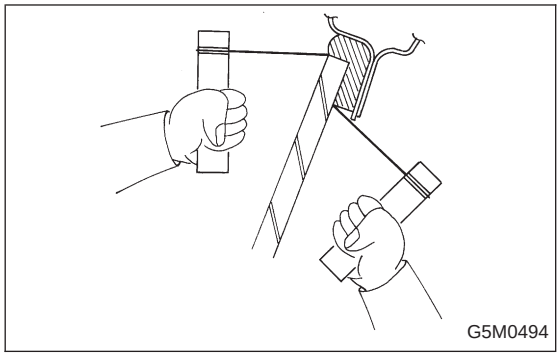
CAUTION:
- **Keep knife edge along glass surface and end face.**
- **When first putting knife into layer of adhesive, select point with wide gap between body and glass.**



NOTE:
A matching pin is cemented to corners of glass on compartment side.
Use a piano wire when cutting each pin.

2. USING PIANO WIRE

1) Remove wiper arm and cowl panel.
2) Remove roof molding and front window molding upper.

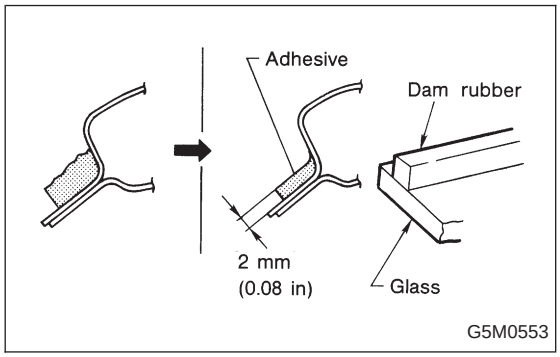

G5M0494

3) Remove glass:
(1) Put protective tape on body to prevent damage.
(2) Using drill or putty knife, make through-hole (one place) in adhesive agent.
(3) Pass piano wire through the hole from inside the compartment, and connect both ends of wire securely to wooden blocks.
(4) Cut adhesive layer with the wire by pulling it back and forth.

CAUTION:
When making through-hole into adhesive layer and cutting the adhesive, be careful not to damage interior and exterior parts.

B: INSTALLATION

1) After cutting layer of adhesive, remove gum rubber remaining on body.

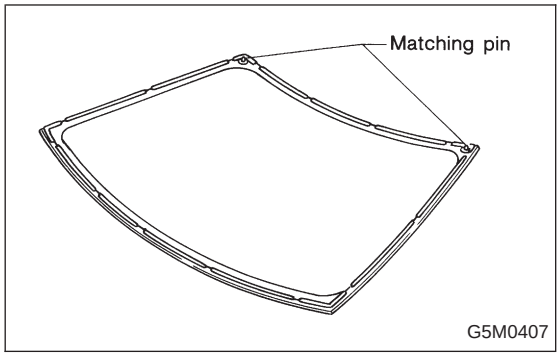


G5M0553

2) Finishing adhesion surface on body side:
Using a cutter knife etc., cut layer of adhesive sticking firmly to body, and finish it to a smooth surface of about 2 mm (0.08 in) in thickness.

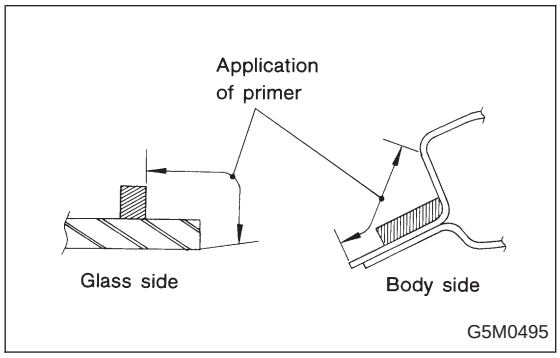
CAUTION:
Take extra care not to cause damage to body paint.

3) Cleaning body surface:
(1) Thoroughly remove chips, dirt and dust from body surface.
(2) Clean body wall surface and upper surface of layer of adhesive with a solvent such as alcohol or white gasoline.



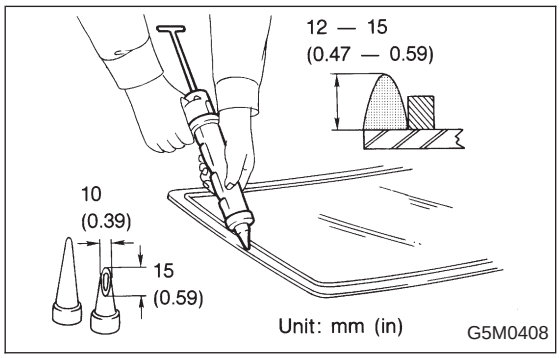
4) Positioning glass:
(1) Mount glass on body.
(2) Adjust position of glass so that gap between body and glass is uniform on all sides.
(3) Put matching pin on body and glass in several places.

5) Cleaning glass:
(1) Dismount glass from body.
(2) Clean surface of glass to be adhered with alcohol or white gasoline.

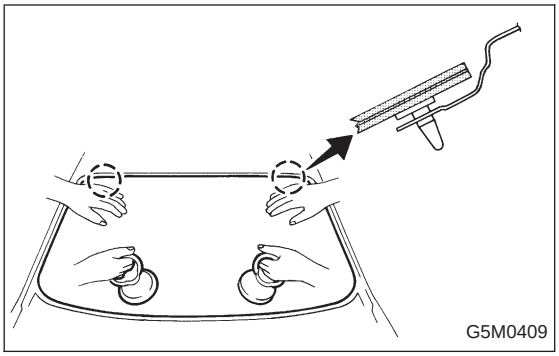


6) Application of primer:
(1) Using a sponge, apply primer to part of glass to be adhered.
(2) Apply primer to part of body to be adhered.

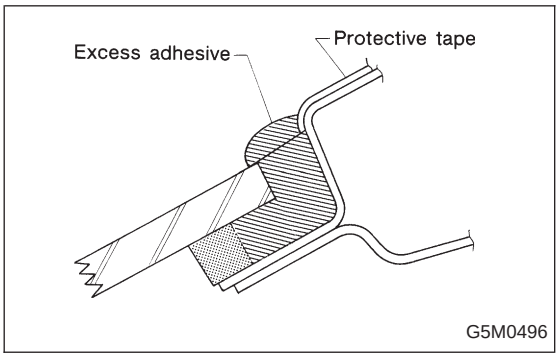
CAUTION:
- **Primer is hard to wipe off of body paint, instrument panel, inner trim, etc. So put masking around these areas for protection.**
- **After application, let 1st primer dry spontaneously for about 10 minutes.**
- **Do not touch primer-coated surface under any circumstances.**



7) Application of adhesive:
(1) Cut nozzle tip of cartridge as shown in figure.
(2) Open cartridge and put it into a gun with nozzle attached.
(3) Apply adhesive uniformly to all sides of adhesion surface while operating gun along glass end face.


G5M0409

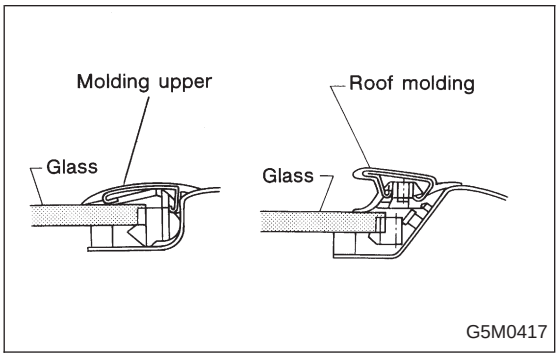
8) Installation of glass:
(1) Hold glass with rubber suction cups.
(2) Mount glass on body with matching pin aligned.
(3) Stick them fast by pressing all sides lightly.



G5M0496

9) Installation of molding:
(1) Remove adhesive overflowing from outside of glass until it becomes level with outer height of glass. Then, add adhesive to portions that need it, and clean with alcohol or white gasoline.
(2) Firstly, press-fit front window molding upper and lastly, roof molding.

CAUTION:
Do not open and close door after moldings have been installed. When opening and closing door for unavoidable reason, lower door glass and gently move door.



G5M0417

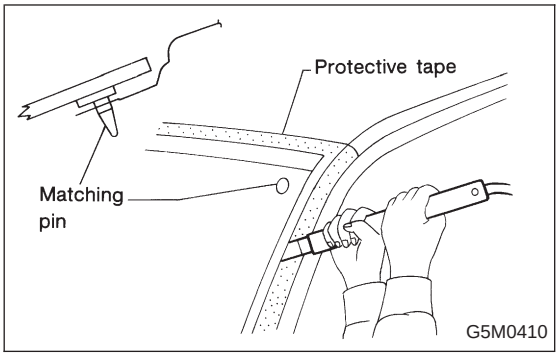
10) Water leakage test:
Test for water leakage about one hour after installation.

CAUTION:
- **Move vehicle very gently.**
- **Do not squirt strong hose stream on vehicle.**

11) Spontaneous drying:
After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him that vehicle should not be subjected to heavy shocks for at least three days.

12) Install cowl panel and wiper arm.

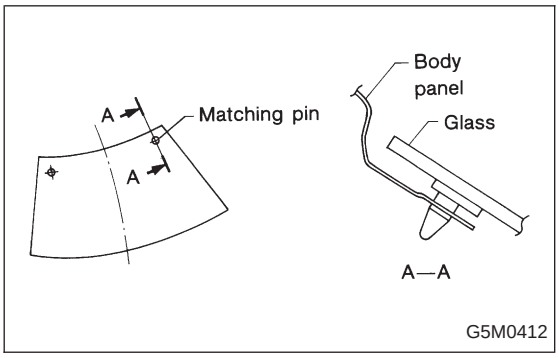


6. Rear Window Glass

A: REMOVAL

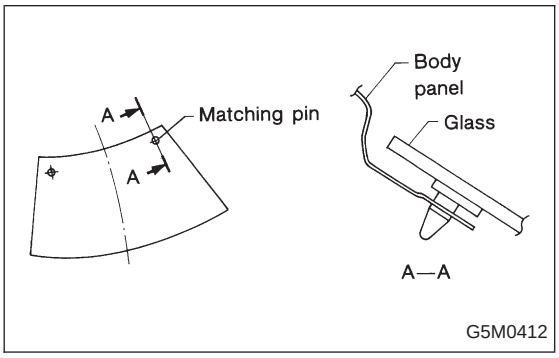
1. SEDAN AND COUPE MODEL

1) Remove roof molding.
2) Remove rear window molding upper and lower.
3) Disconnect connector from rear defogger terminal.
4) Remove glass in same manner as in windshield.



NOTE:
A matching pin is cemented to the corners of glass on compartment side. Use a piano wire when cutting each pin.

2. WAGON MODEL

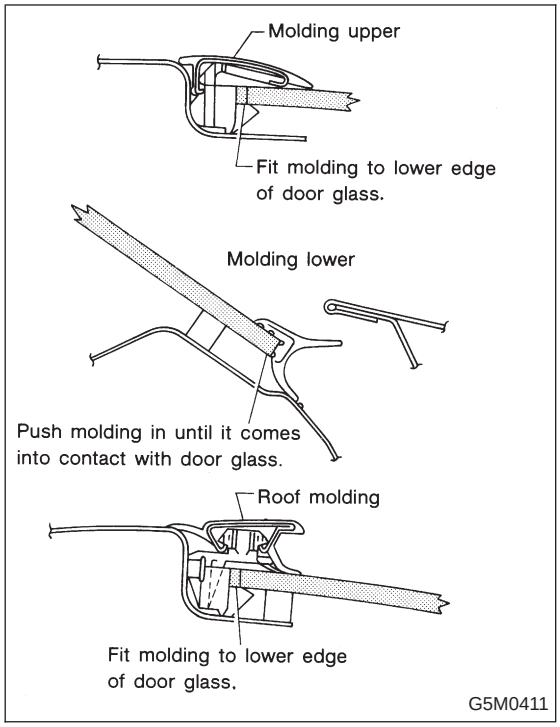


NOTE:
It is impossible to remove the molding from the glass.
If molding is broken, replace rear glass.

1) Remove rear wiper and rear gate trim.
2) Disconnect connector from rear defogger terminal.
3) Remove high mount stop light.
4) Remove glass in same manner as for windshield.

CAUTION:
Be careful not to damage molding re-installing the old rear window glass using a piano wire.

NOTE:
A matching pin is cemented to corners of glass on compartment side. Use a piano wire when cutting each pin.

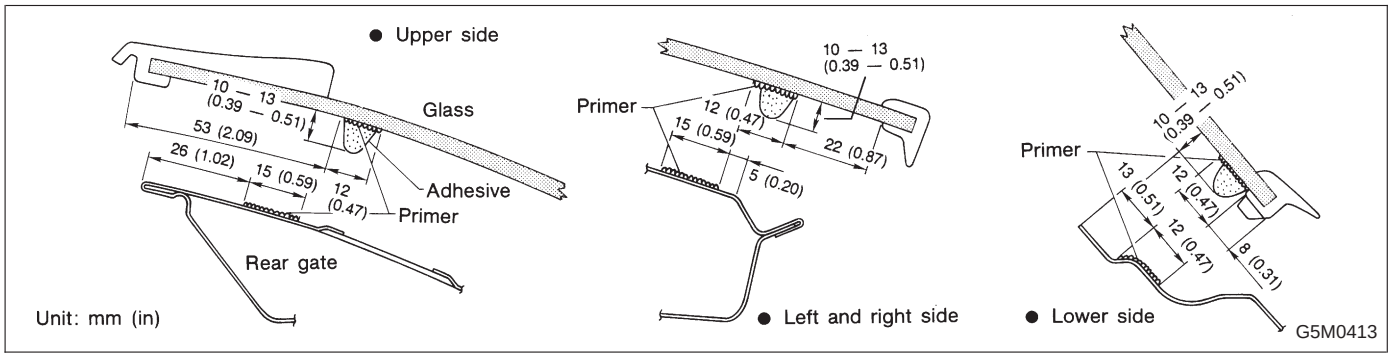


B: INSTALLATION

1. SEDAN AND COUPE MODEL

1) Install glass in same manner as in windshield.
2) Firstly, press-fit molding upper, then lower and lastly, roof molding.
3) After installation, test for water leakage after about one hour, and leave vehicle alone for 24 hours.
4) Make rear defogger connections.

2. WAGON MODEL

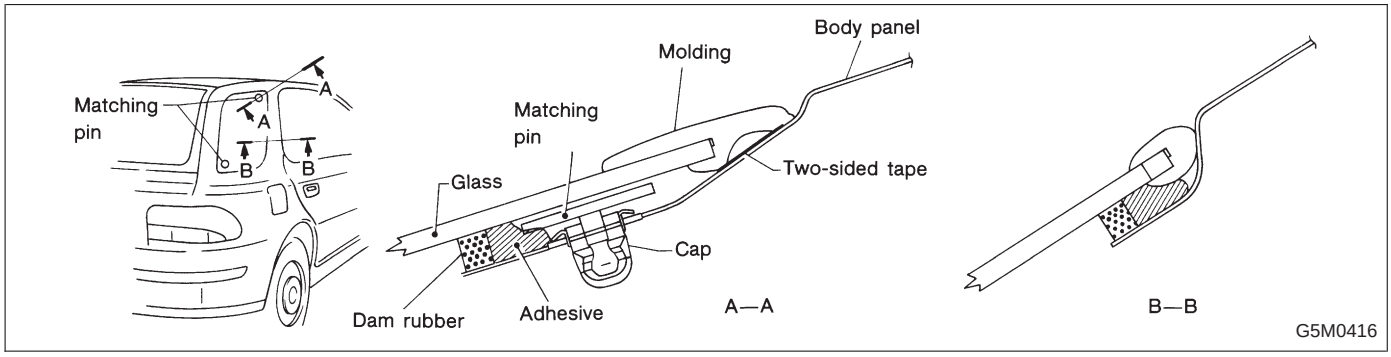


1) Install rear gate trim.
2) Install glass in same manner as windshield.
3) About one hour after installation, test for water leakage. Leave vehicle for 24 hours before using it.
4) Connect rear defogger connections.
5) Install high mount stop light and rear wiper.

7. Rear Quarter Glass

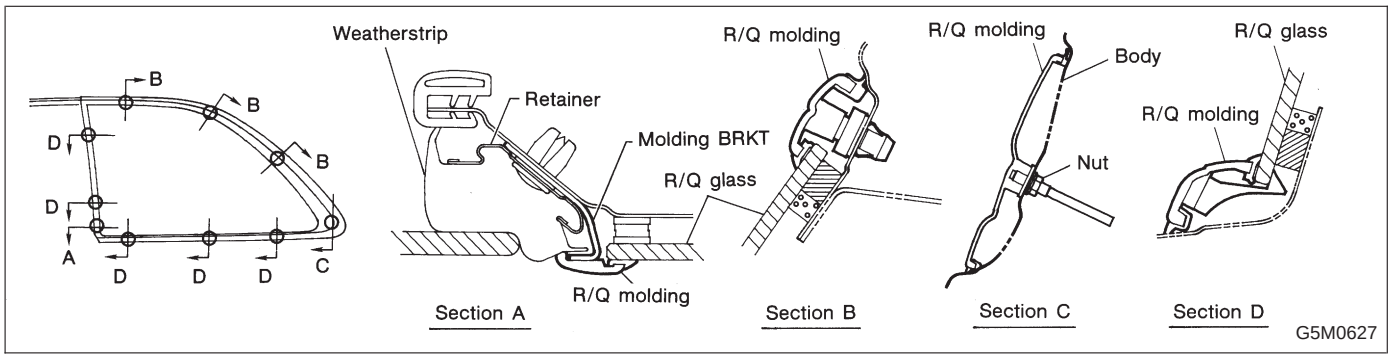
A: REMOVAL

1. WAGON MODEL

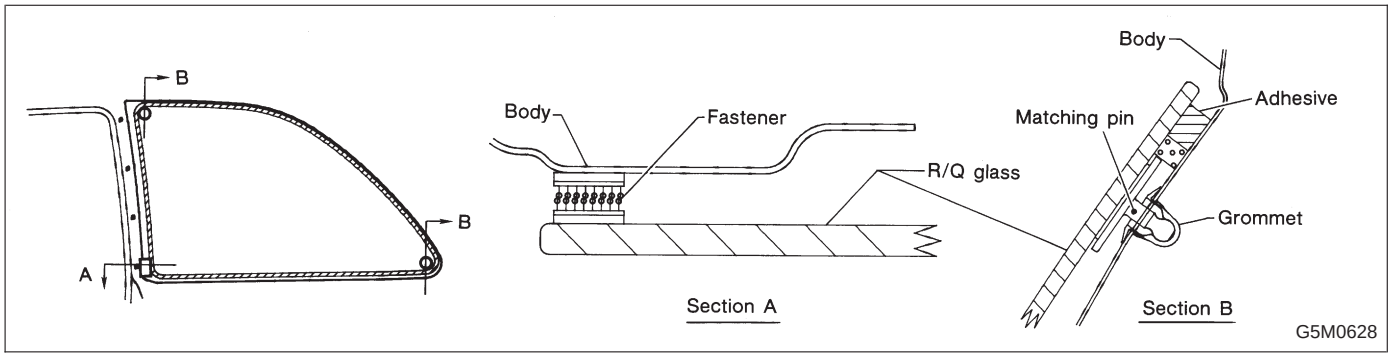


1) Remove rear quarter molding on corner.
2) Remove glass in same manner as in windshield.

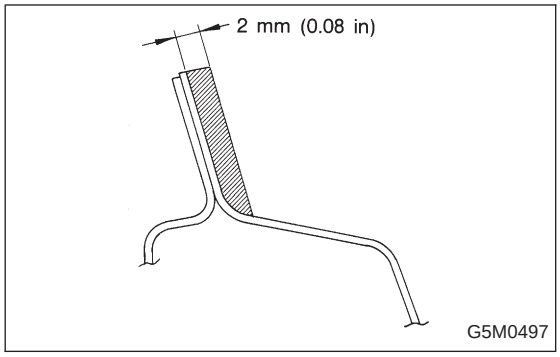
2. COUPE MODEL



1) Remove rear quarter molding.



2) Remove glass in same manner as in windshield.



B: INSTALLATION

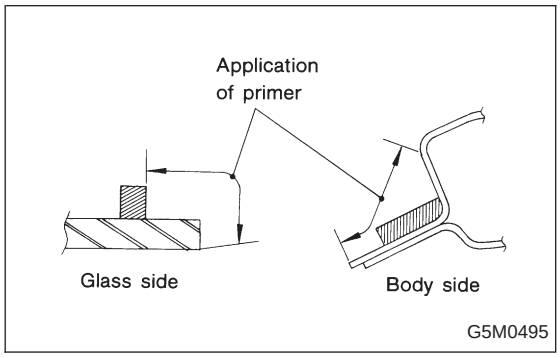
1. WAGON MODEL

1) Finish surface of adhesive layer on body:
Using a putty knife, etc., cut layer of adhesive stick firmly to body and finish it into a smooth surface of about 2 mm (0.08 in) in thickness.

CAUTION:
Be careful not to damage body finish.

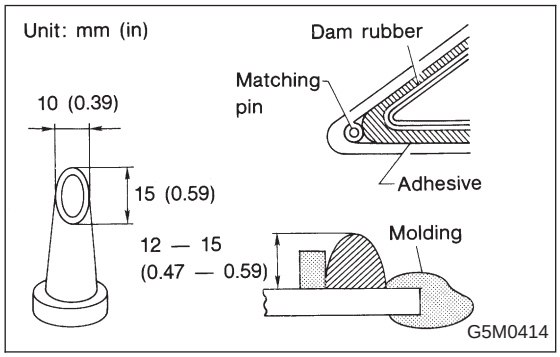
2) Cleaning of body surface:
   (1) Remove chips, dirt and dust from body surface.
   (2) Clean body wall surface and upper surface of adhesive layer with a solvent such as alcohol or white gasoline.

3) Cleaning glass:
   (1) Remove dirt and dust from surface of glass to be adhered.
   (2) Clean surface of glass to be adhered with alcohol or white gasoline.

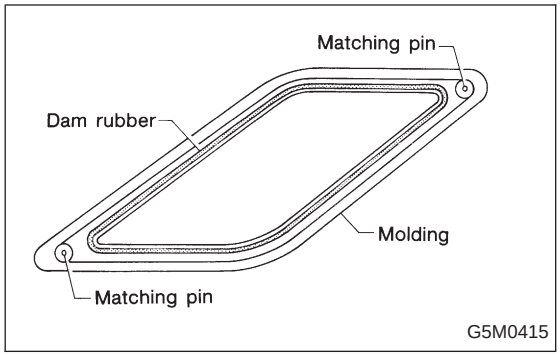


4) Application of primer:
   (1) Using a sponge, apply primer to surface of glass to be adhered.
   (2) Apply primer to surface of body to be adhered.

CAUTION:
● If primer has dropped on body finish, it is hard to wipe it off. So protect with masking.
● Primer must not project from black frame of glass.
● After applying primer, let it dry spontaneously for about 10 minutes.



5) Application of adhesive:
   (1) Cut nozzle tip as shown in figure.
   (2) Open cartridge and put it into a gun with nozzle attached.
   (3) Apply adhesive uniformly to all sides of adhesion surface while operating gun along glass end face.



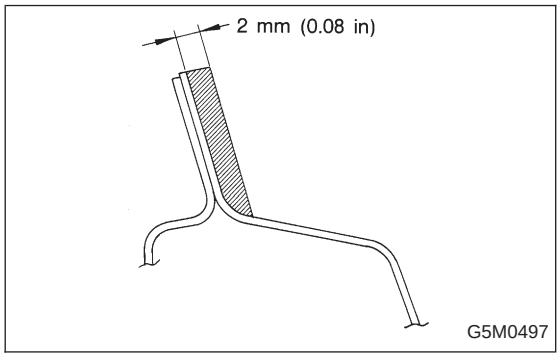
6) Installation of glass:
(1) Hold glass with rubber suction cups.
(2) Mount glass on body with matching pin aligned.
(3) Stick them fast by pressing all sides lightly.

7) Water leakage test:
After installing glass, test for water leakage after about one hour.

CAUTION:
- **Move vehicle slowly.**
- **When opening and closing door, lower door glass and move door gently.**
- **Do not squirt strong hose stream on vehicle.**

8) Spontaneous drying:
After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him or her that vehicle should not be subjected to heavy shocks for at least three days.



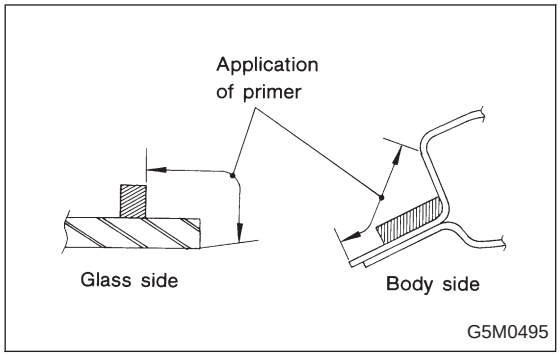
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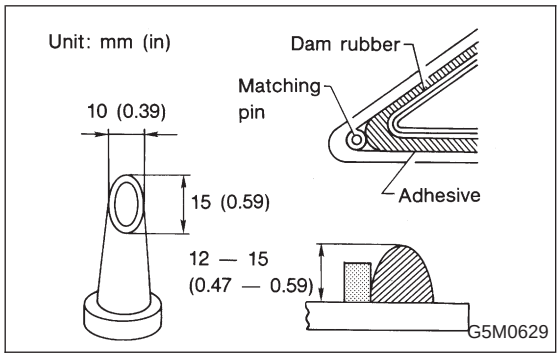
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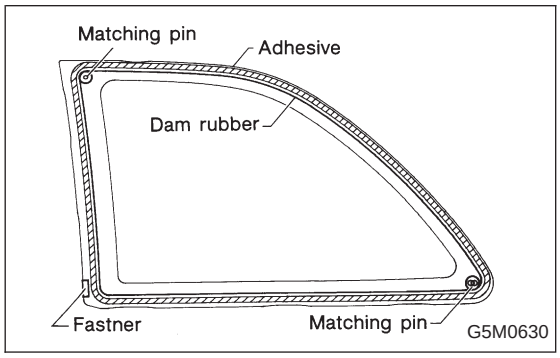


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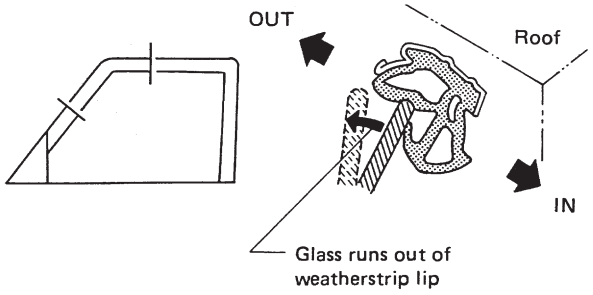
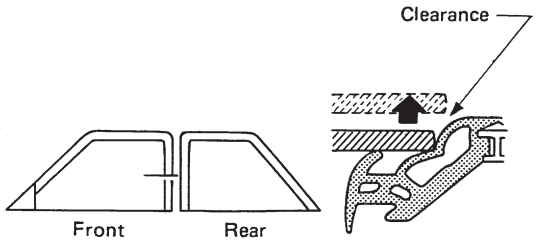
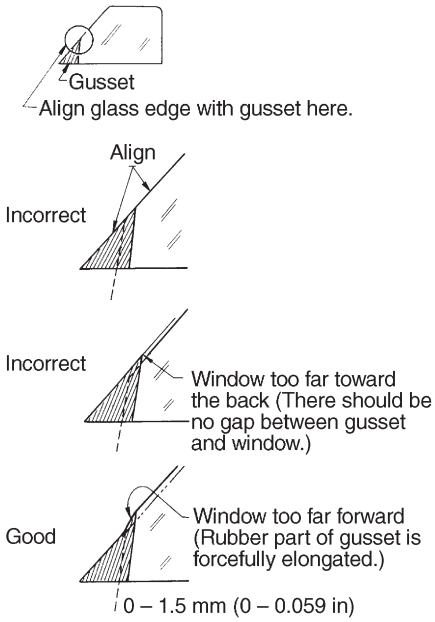
7) Water leakage test:
After installing glass, test for water leakage after about one hour.

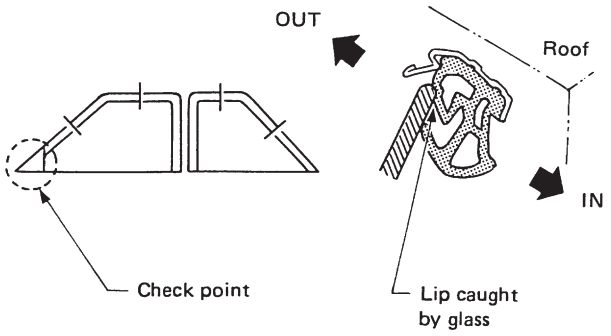
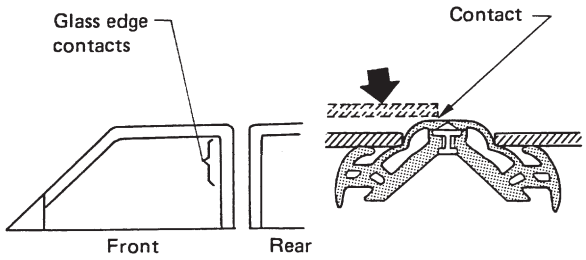
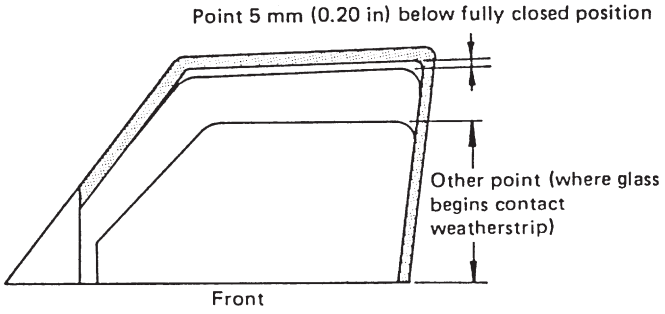
CAUTION:
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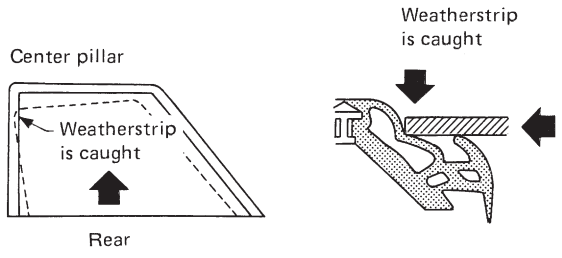
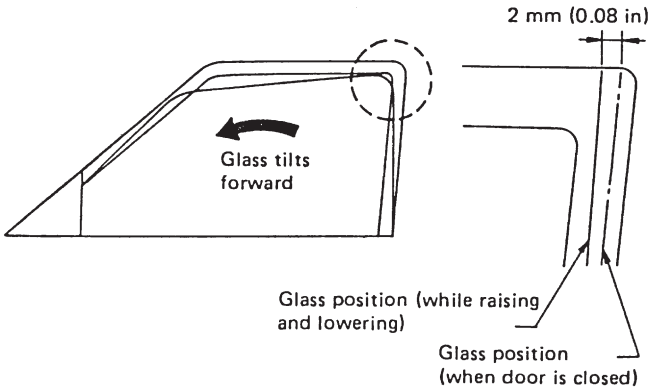
8) Spontaneous drying:
After completing all operations, leave vehicle alone for 24 hours.

CAUTION:
When delivering vehicle to user, tell him or her that vehicle should not be subjected to heavy shocks for at least three days.

1. Door Glass

	Condition	Apparent cause/Correction
Glass in fully closed position	1) Glass runs out of weatherstrip lip when considerable hand pressure is applied to it from inside.  G5M0502 (This condition may cause wind/booming noise during high-speed operation.)	• Insufficient upward travel of glass Increase upward travel of glass.
	2) Clearance exists between glass and weatherstrip when light hand pressure is applied to it at center and rear pillar locations.  G5M0503 (This condition may cause wind noise and/or water leakage.)	• Insufficient glass-to-door weatherstrip contact Check stabilizer and glass for proper contact. Increase contact using upper sash adjustment bolt. • Improper adjustment of striker in “in-out” direction Close door and check for alignment of striker with car body.
	3) Adjust door glass so that it is aligned with door rearview mirror gusset.  H5M0672A	• Window is not properly adjusted in up-down/fore-aft direction. Adjust window. If necessary, move “B” channel for regulator to eliminate window “tilt”. • Gusset is not properly adjusted in fore-aft direction. Adjust gusset after loosing all bolts and nuts witch tightening it.

	Condition	Apparent cause/Correction
Door in fully closed/ open position	1) Glass rides over weatherstrip lip when door is closed.  G5M0505 (This condition increases wind/booming noise, leakage and/or effort required to close door.)	● Improper up-up and in-out glass alignments Adjust glass for up-down and in-out alignments (incl. rear sash, upper stopper adjustment, etc.). If necessary, correct glass tilt by moving regulator “B” channel.
	2) Edge of glass contacts retainer when door is fully closed.  G5M0506	● Improper glass-to-center pillar weatherstrip or excessive glass contact to weatherstrip Excessive adjusting in contact to weatherstrip. Causes rear edge of glass to tilt inboard closer to center pillar. Adjust rear sash adjustment bolt to reduce glass contact to weatherstrip.
Raise or lower window glass	1) Considerable effort or time is required to operate regulator. Standard operating effort: ● Entire up-down travel except for point 5 mm (0.20 in) below fully closed position: 29.4 N (3.0 kg, 6.6 lb) ● Point 5 mm (0.20 in) below fully closed position: 45.0 N (4.5 kg, 10.12 lb)  G5M0507	● Sliding resistance increased due to high stabilizer-to-glass contact pressure Reduce contact by mounting inner stabilizer to inside of the car. ● High glass-to-windshield contact pressure Reduce contact using upper sash adjustment bolt. ● Unequal contact adjustment stroke between front and rear sashes Set to equal stroke. ● Tilt of rear sash adjustment bolt mounting bracket Correct tilt of bracket so it is parallel to inner panel.

	Condition	Apparent cause/Correction
Raise or lower window glass	2) Center pillar weatherstrip is caught by rear window glass when glass is raised.  G5M0508	● Improper fore-aft or in-out alignment of window glass Lower regulator “B” channel to tilt window glass back.
	3) Glass tilts forward by more than 2 mm (0.08 in).  G5M0509 (Excessive tilt of glass forward is due to excessive glass “contact” which causes reaction of center pillar weatherstrip.) Glass can be tilted forward due to increase in reaction of shoulder weatherstrip or free play between sash and roller. Taking these symptoms into account, glass should be aligned.	● Excessive glass contact pressure or improper in-out alignment 1) Lower regulator “B” channel to tilt glass rearward. 2) Reduce contact pressure using upper sash adjustment bolt.

2. Door Lock System

No.	Trouble	Possible cause	Remedy
1	Door cannot be opened by outer handle. (Door can be opened by inner handle.)	Disconnect outer handle rod.	Connect firmly.
2	Door cannot be opened by inner handle. (Door can be opened by outer handle.)	a. Joint of upper rod is disconnected. b. Rear door child lock lever is set to lock side.	Connect firmly. Functionally normal.
3	Door does not open when outer or inner handle is operated with inner lock knob set to unlock position.	a. Joint of lower rod is disconnected. b. Lock is not released due to improper adjustment of lower rod.	Connect firmly. Remove rod from latch. Adjust rod so that lock knob is set in “lock” position is locked.
4	Door opens even when inner lock knob is set to lock position. (Keyless locking is impossible.)	a. Lower rod joint is separated. b. Door is not locked due to improperly adjusted lower rod.	Same as a in No. 3. Same as a in No. 3.
5	Child lock lever will not come up.	a. Inner handle fails to return completely. b. Joint of upper rod is disconnected.	Refer to No. 6.
6	Inner handle stops halfway.	Contact of upper rod with inner handle mounting case.	Eliminate contact by bending upper rod properly.
7	Door cannot be locked or unlocked by key.	Joint of key lock rod is disconnected.	Connect firmly.
8	Auto door-lock switch does not act when inner lock knob is pushed.	Auto door-lock switch does not act due to improperly adjusted lower rod.	Same as a in No. 3.

3. Power Window

Symptom	Battery	Fuse in fuse box	Circuit breaker and relay	Main switch	Sub switch of each passenger side	Motor of driver side	Motor of each passenger side	Regulator assembly of each window	Power supply line of main switch	Ground line	Harness and connector
All windows does not move.	①	②	③	④					⑤	⑥	⑦
The window of driver side does not move.				①		②			③		④
The window of driver side does not move “AUTO” up-down.				①		②			③		④
The window of each passenger side does not move.				①	②		③	④			⑤
				①	②		③	④			⑤
				①	②		③	④			⑤

◯: Figures in a circle refer to diagnostic procedures.

SEATS, SEAT BELTS, AND INTERIOR 5-3

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3. Front Seat Belt.....13
4. Rear Seat Belt.....15
5. Inner Trim Panel.....16

PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

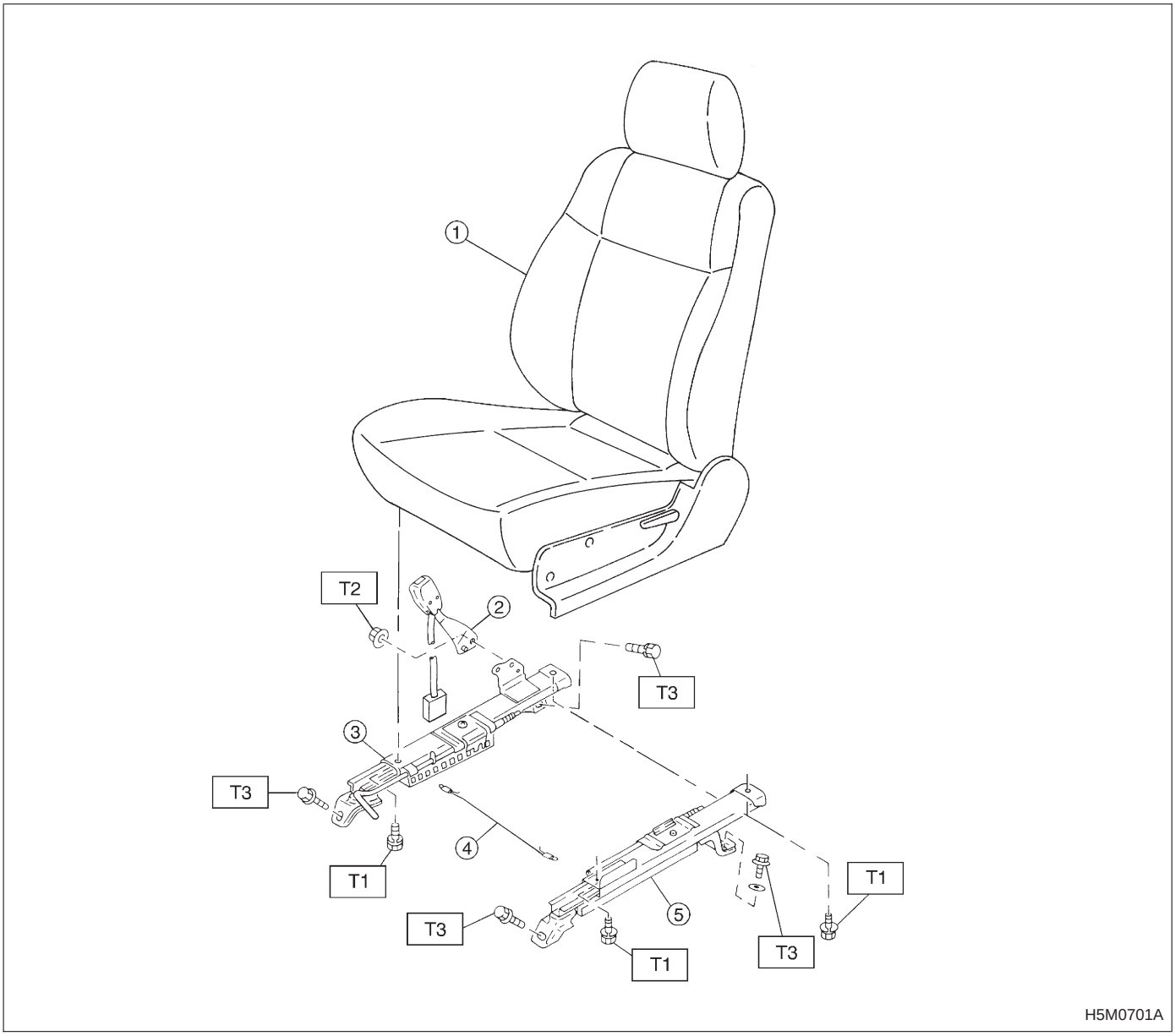
The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

1. Front Seat

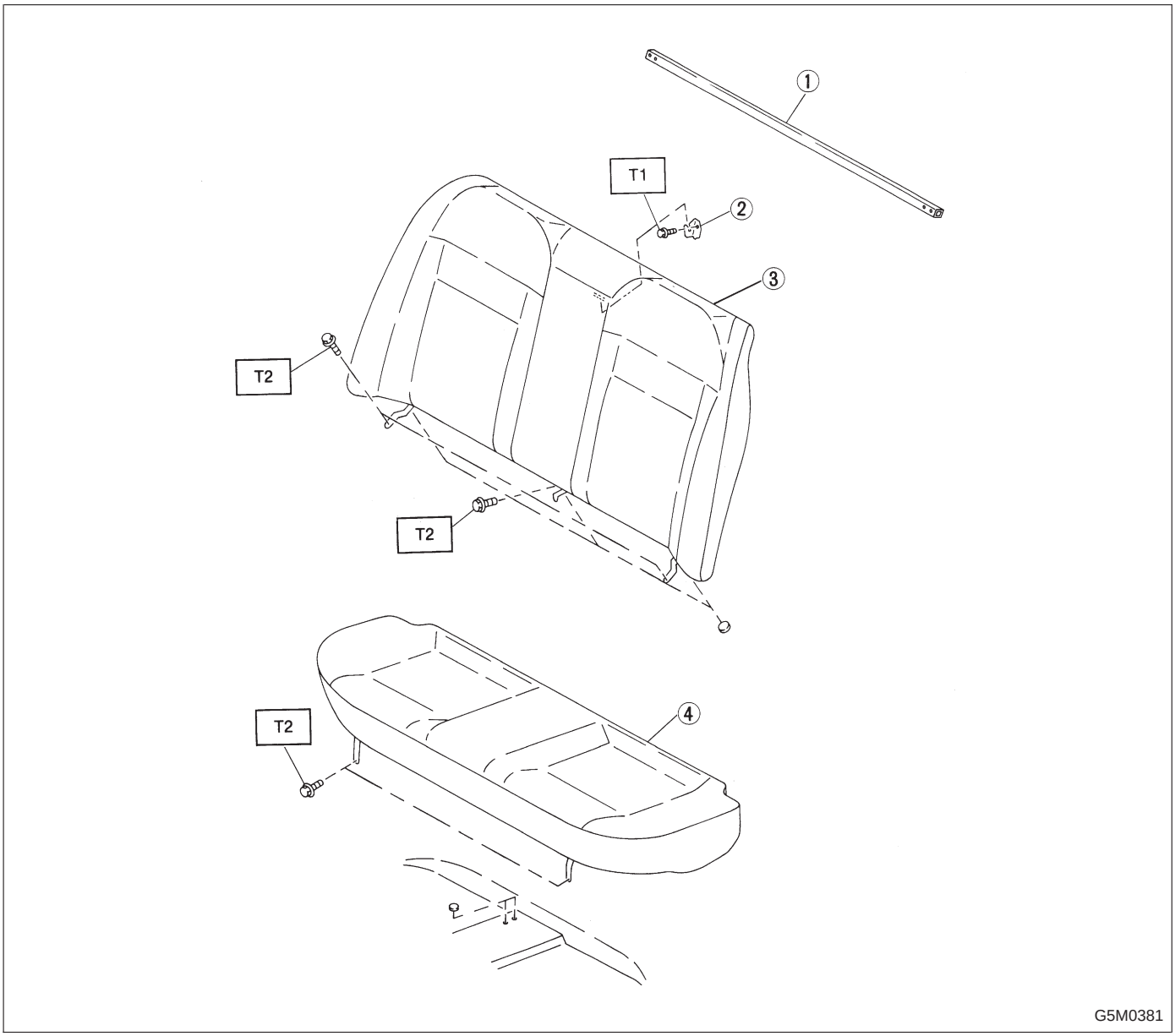


① Front seat ASSY
② Inner belt ASSY
③ Inner slide rail ASSY
④ Connect wire
⑤ Outer slide rail ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 23±5 (2.3±0.5, 16.6±3.6)
T2: 29±7 (3.0±0.7, 21.7±5.1)
T3: 52±10 (5.3±1.0, 38±7)

2. Rear Seat

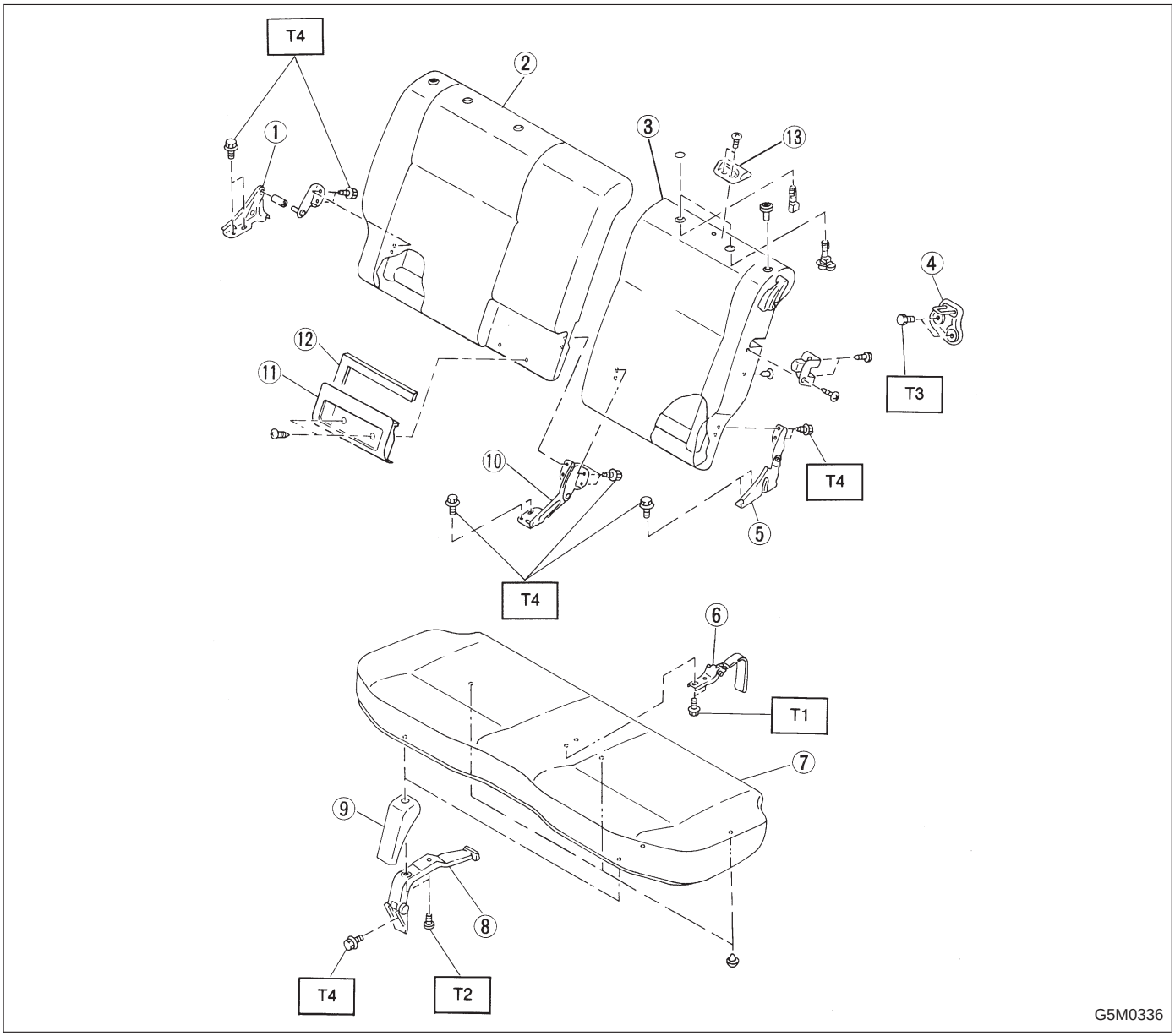
A: SEDAN AND COUPE MODEL



① Rear seat reinforcement
② Hook
③ Backrest
④ Rear cushion

Tightening torque: N·m (kg-m, ft-lb)
T1: 10±3 (1.0±0.3, 7.2±2.2)
T2: 25±7 (2.5±0.7, 18.1±5.1)

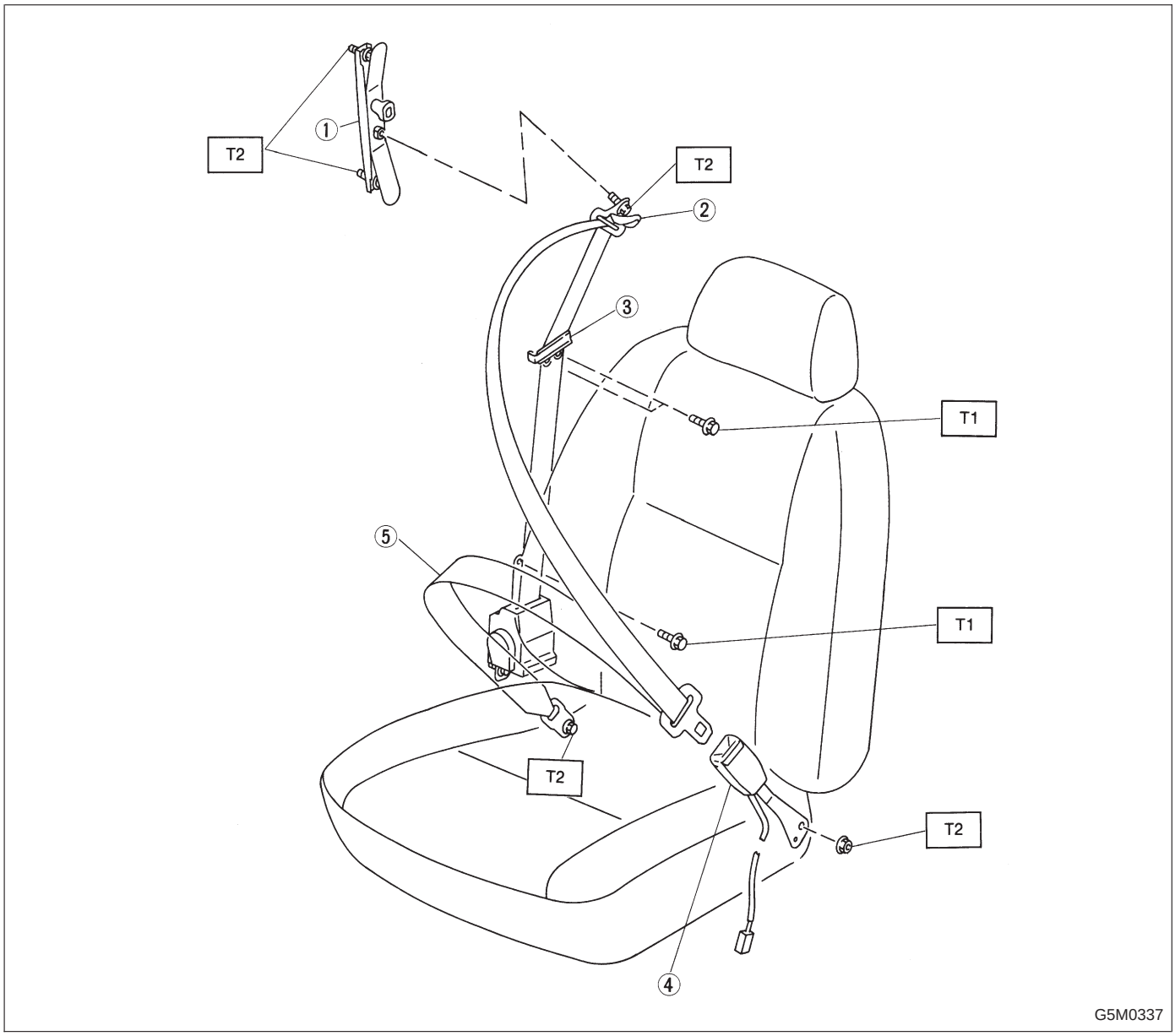
B: WAGON MODEL



① Hinge bracket (RH)
② Backrest (RH)
③ Backrest (LH)
④ Striker
⑤ Hinge bracket (LH)
⑥ Lock hinge
⑦ Rear cushion
⑧ Hinge
⑨ Hinge cover
⑩ Backrest center hinge
⑪ Belt pocket
⑫ Pad ASSY pocket
⑬ Hook

Tightening torque: N·m (kg-m, ft-lb)
T1: 2±1 (0.2±0.1, 1.4±0.7)
T2: 5.9±1.5 (0.6±0.15, 4.3±1.1)
T3: 10±3 (1.0±0.3, 7.2±2.2)
T4: 25±7 (2.5±0.7, 18.1±5.1)

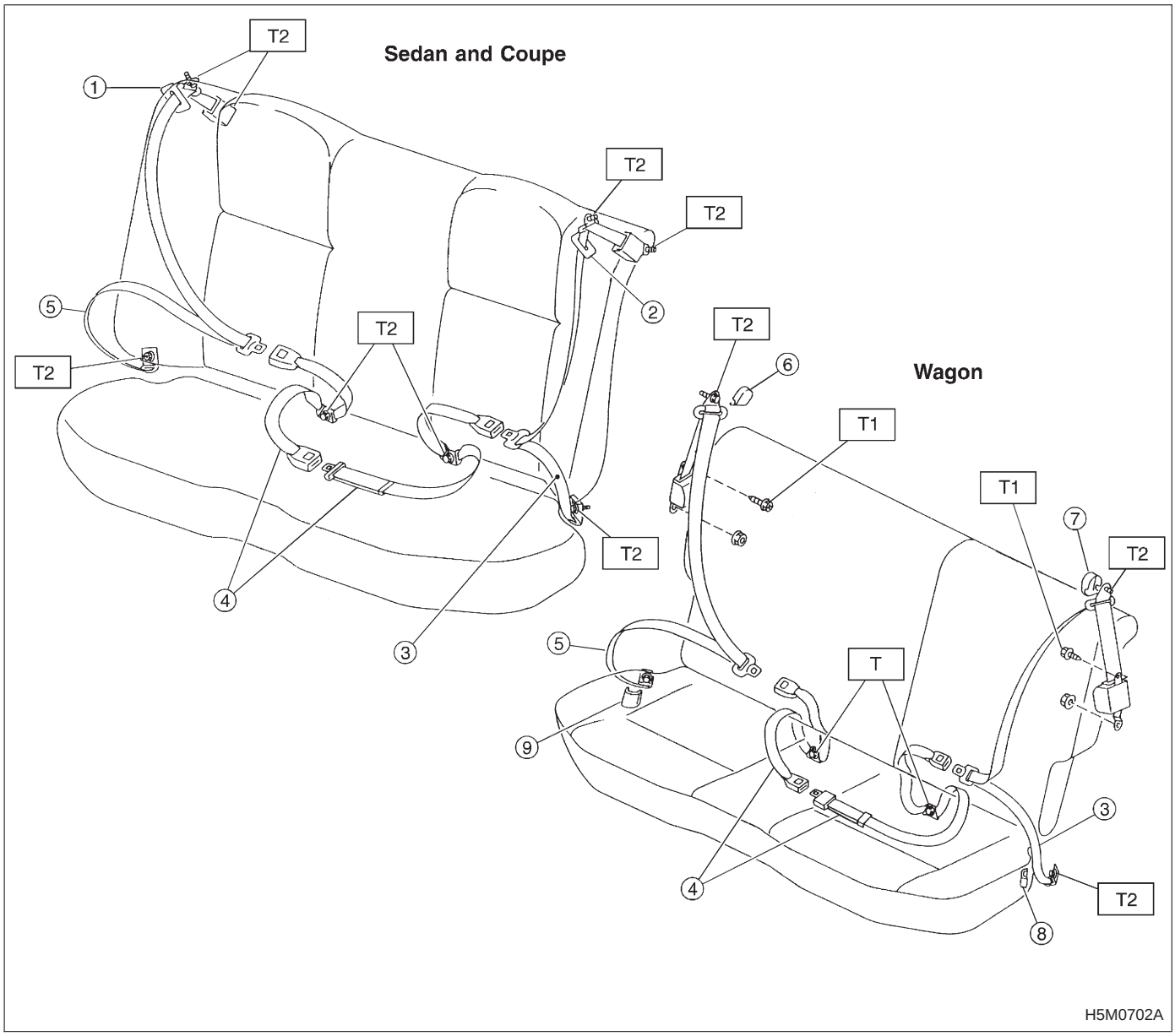
3. Front Seat Belt



① Adjuster anchor ASSY
② Through cover
③ Webbing guide
④ Inner belt ASSY
⑤ Outer belt ASSY

Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 35±13 (3.6±1.3, 26±9)

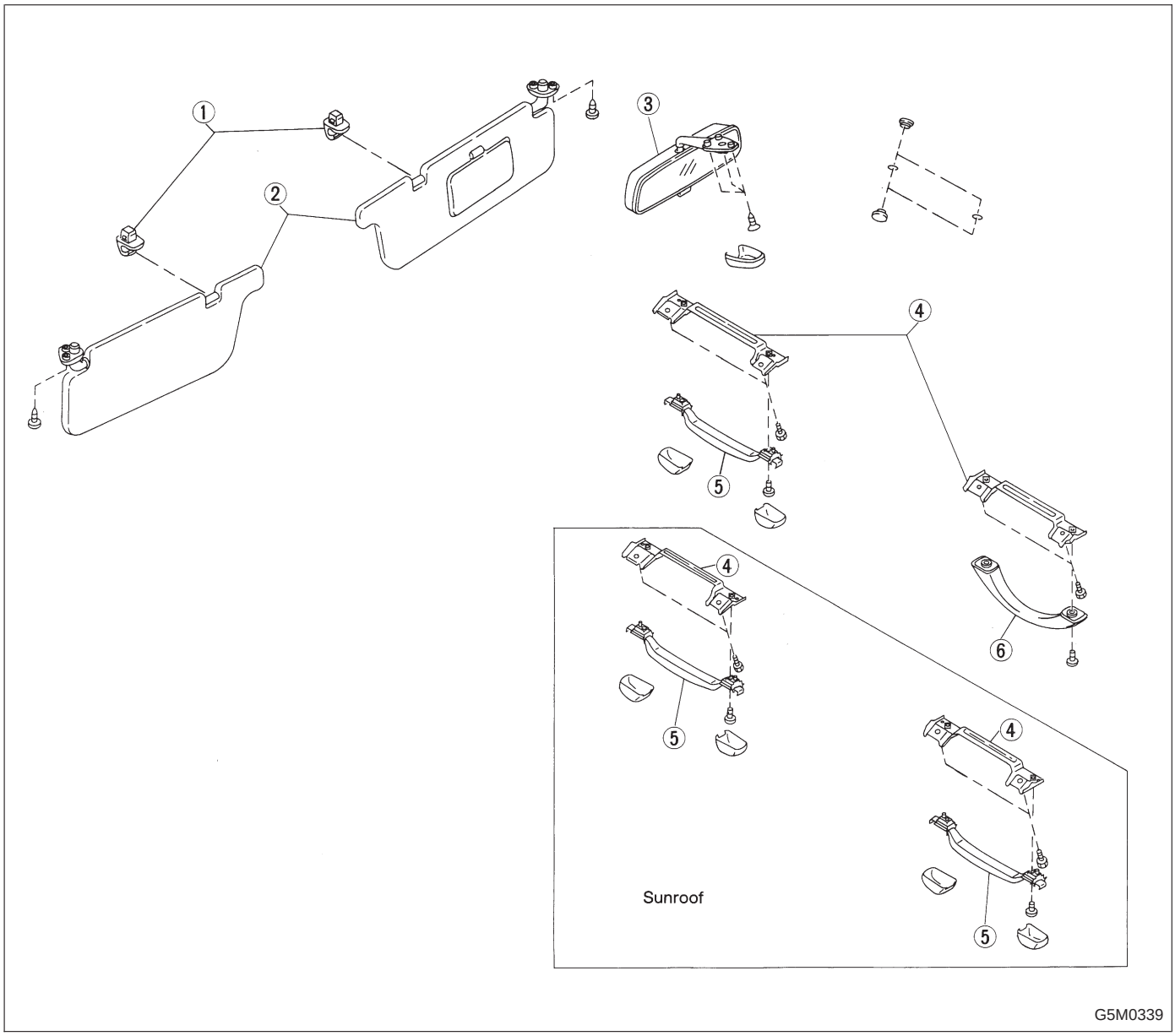
4. Rear Seat Belt



① Webbing cover (RH)
② Webbing cover (LH)
③ Outer seat belt (LH)
④ Center seat belt
⑤ Outer seat belt (RH)
⑥ Through cap (RH)
⑦ Through cap (LH)
⑧ Lap anchor cover (LH)
⑨ Lap anchor cover (RH)

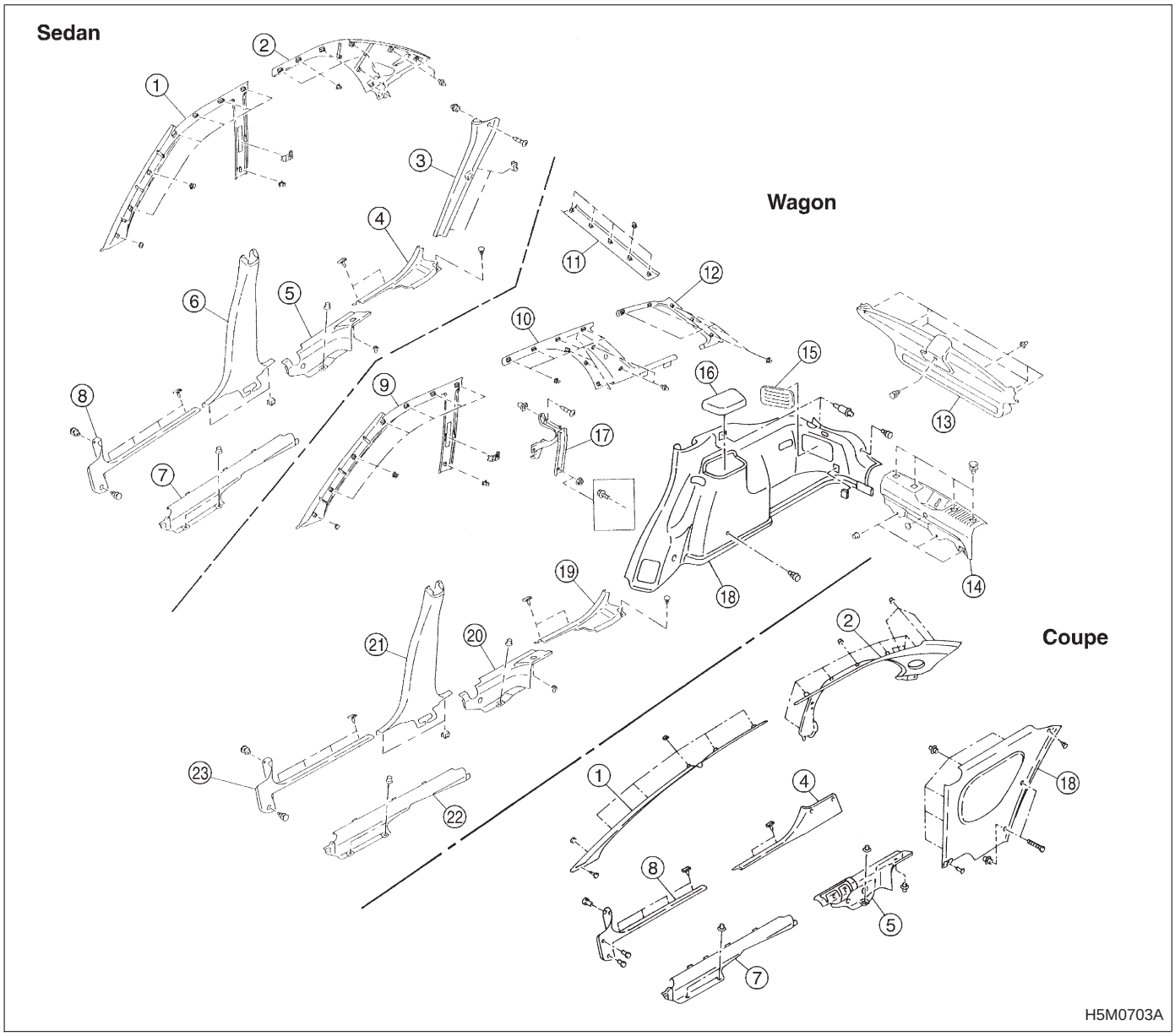
Tightening torque: N·m (kg-m, ft-lb)
T1: 13±3 (1.3±0.3, 9.4±2.2)
T2: 35±13 (3.6±1.3, 26±9)

5. Inner Accessories

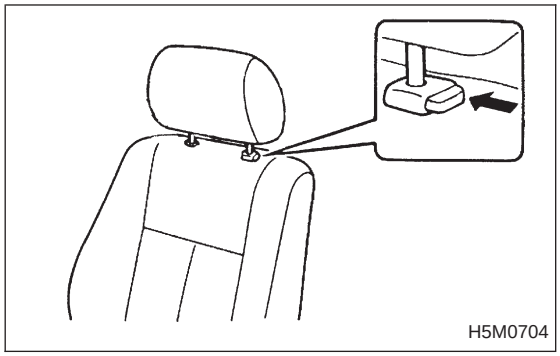


① Hook
② Sun visor
③ Rearview mirror
④ Assist rail bracket
⑤ Assist grip (retractable)
⑥ Assist grip (fixed)

6. Inner Trim



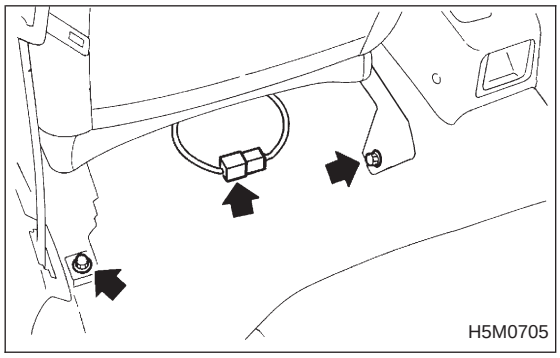
① Front pillar upper trim
② Rear pillar upper trim
③ Rear pillar lower trim
④ Side sill rear upper cover
⑤ Side sill rear lower cover
⑥ Center pillar lower trim
⑦ Side sill front lower cover
⑧ Front pillar lower trim
⑨ Front pillar upper trim
⑩ Rear quarter upper front trim
⑪ Rear rail trim
⑫ Rear quarter upper rear trim
⑬ Rear gate trim
⑭ Rear skirt trim
⑮ Lamp cover
⑯ Cover
⑰ Trim bracket
⑱ Rear quarter lower trim
⑲ Side sill rear upper cover
⑳ Side sill rear lower cover
㉑ Center pillar lower trim
㉒ Side sill front lower cover
㉓ Front pillar lower trim


H5M0704

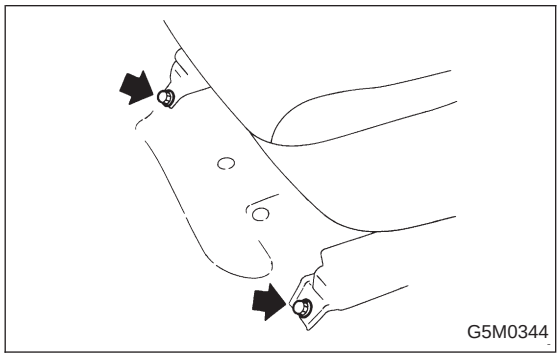
1. Front Seat

A: REMOVAL

1) While operating button (located on top of backrest), lift headrest out with hand placed between backrest and headrest.
2) Pull reclining lever back to fold backrest all the way forward. While pulling slide adjuster lever, move seat all the way forward.


H5M0705

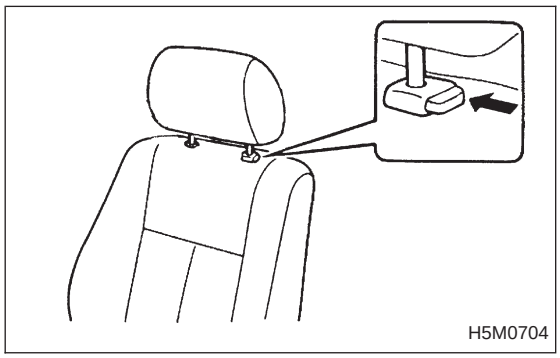
3) Disconnect connector under driver's seat.
4) Remove bolt cover at rear end of slide rail.
5) Remove bolts securing seat rear.


G5M0344

6) While pulling slide adjuster lever, slide seat all the way back.
7) Remove bolts securing front of seat.

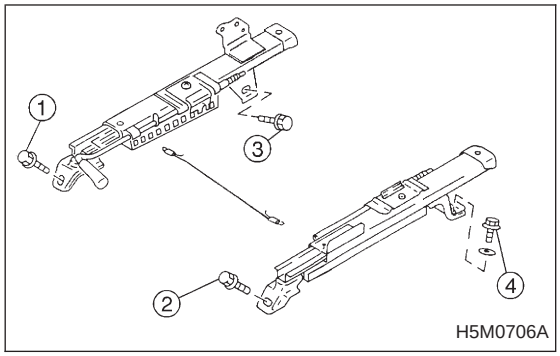
8) Remove front seat from vehicle.

CAUTION:
Be careful not to scratch seat when removing it from vehicle.


H5M0704

B: INSTALLATION

1) While operating button (located on top of backrest), lift headrest out by placing your hand between backrest and headrest.
2) Pull reclining lever back to fold backrest all the way forward. Pull slide adjuster lever and move lower slide rail all the way backward.

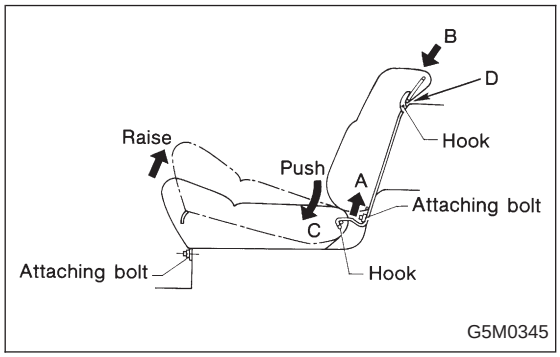


H5M0706A

3) Position seat in compartment and align the holes on the seat with the holes on the car body side.
4) Secure the front of seat using inward and outward bolts ① and ② in that order.
5) While pulling slide adjuster lever, move seat all the way forward.
6) Secure the rear of seat using inward and outward bolts ③ and ④.
7) Connect connector under driver's seat.

CAUTION:
Check that all lock plate pawls are completely and equally inserted into the holes in the slide rail brackets.

8) After installation, ensure that all mechanisms operate properly and lock.
9) If any mechanism does not function properly, loosen bolts ③ and ④, slide seat as required, insert all lock plate pawls into holes in slide rail brackets, and tighten bolts ③ and ④ in that order.
10) Install bolt cover on rear end of slide rail.
11) Install headrest on backrest.
NOTE:
Tighten bolts in the designated order.



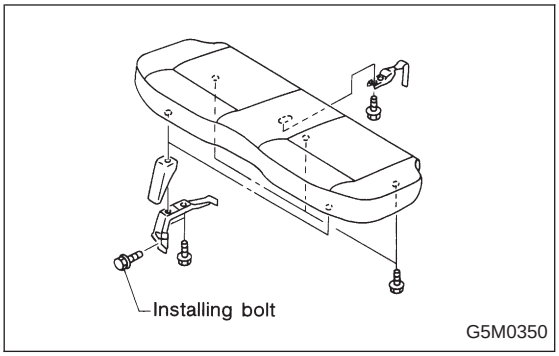
G5M0345

2. Rear Seat

A: REMOVAL

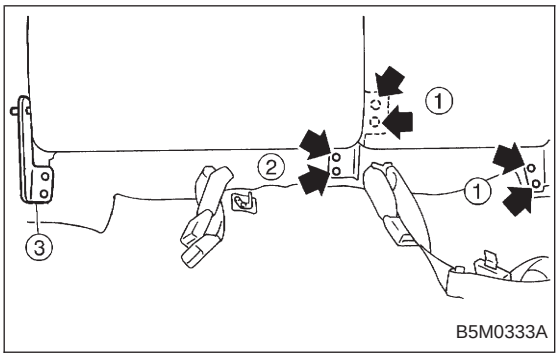
1. SEDAN AND COUPE MODEL

1) Remove bolts securing hinges (located at front of cushion) to body.
2) Slightly raise front of cushion while pushing down on cushion in the direction of "C". With cushion held in that position, move it forward until it is unhooked.
3) Remove bolts securing lower portion of backrest to body.
4) Lift rear seat backrest in direction "A" until it is released from upper hooks.

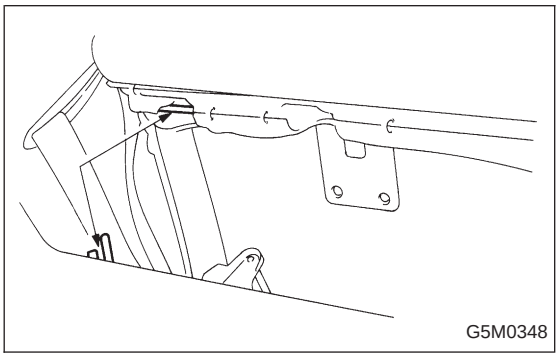


2. WAGON MODEL

1) Remove bolts securing hinges (located at front of seat) to body.
2) Pull strap (located in middle rear portion of cushion) to release lock. Lift cushion out and away from body.
3) Pull knobs (located at each side of backrest's upper portion) up to release lock, and fold backrest all the way forward.



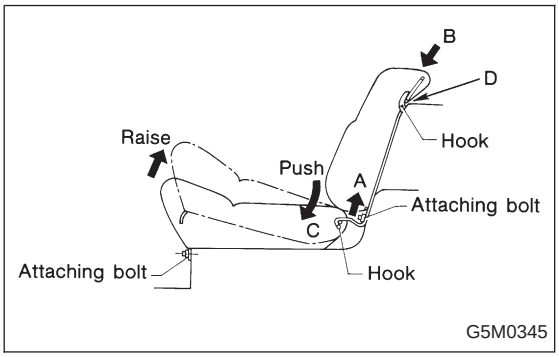
4) Remove the bolt ① and then remove backrest (LH side).
5) Remove the bolt ② and then remove backrest (RH side) from hinge bracket ③.



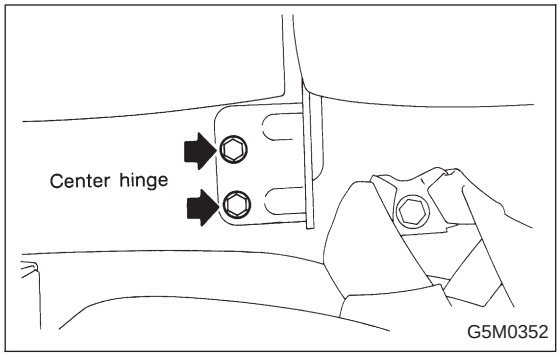
B: INSTALLATION

1. SEDAN AND COUPE MODEL

1) Before installing backrest, ensure that trim panel, insulator and seat belt are properly installed.
2) Transfer outer seat belt webbing to front of backrest and fold backrest forward. Attach seat belt webbing to upper hooks (2 places), and move pillow in the direction of "B" until backrest is aligned with lower mounting holes in body.
3) Secure lower center and both sides of backrest to body with bolts.
4) Slightly raise front section of cushion while pushing down on cushion in the direction of "C". With cushion held in that position, attach rear section of cushion to hooks at lower frame location.
5) Secure front of cushion to body with bolts.

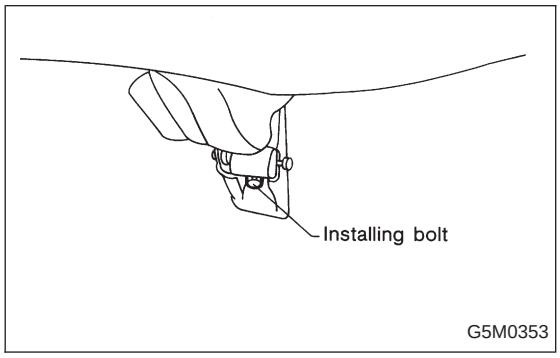


CAUTION:
- **Before installing seat, ensure that seat belt is placed on cushion.**
- **Confirm that winding of three-point type seat belt can operate regularly.**



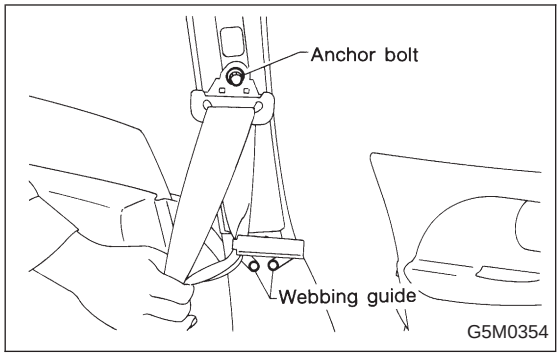
2. WAGON MODEL

1) Install hinge bracket to body.
2) Insert right backrest hinge pin into hole in bracket. Tilt backrest backward until striker engages with lock.
3) Secure right backrest center hinge to body using a bolt.
4) Temporarily install left backrest side hinge to body using a bolt, and fold backrest forward to the floor.
5) Roll up mat (located at rear of left backrest), and install center hinge using a bolt.
6) Tilt left backrest until striker engages with lock, and tighten bolt.



7) Install hinges to front of cushion and tighten with bolts. Check that lock properly engages.
8) Fold backrest onto cushion and overlap trunk mat and mat at rear of backrest.

CAUTION:
● Do not allow center seat belt to get under cushion when folding cushion.
● Ensure that side seat belt tongue is free from cushion and trim panel.
● Lift front of cushion to ensure that cushion is properly locked.

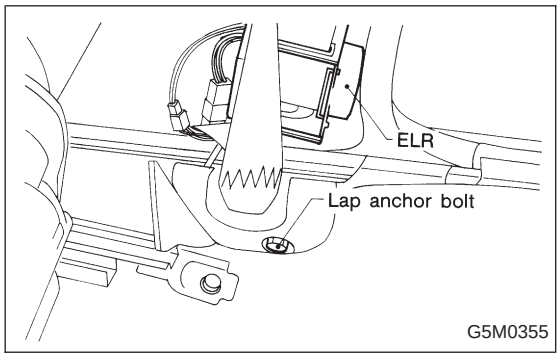


3. Front Seat Belt

A: REMOVAL AND INSTALLATION

1. OUTER BELT (Sedan and Wagon)

1) Remove through-anchor cover cap.
2) Remove shoulder anchor bolt.
3) Remove webbing guide.

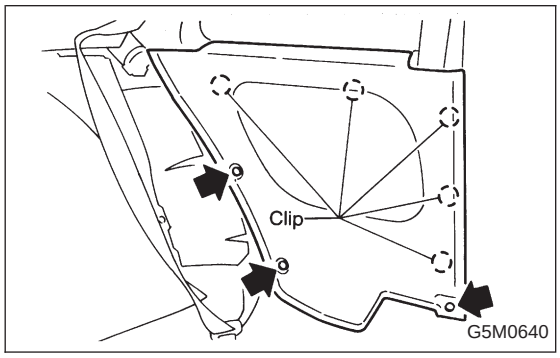


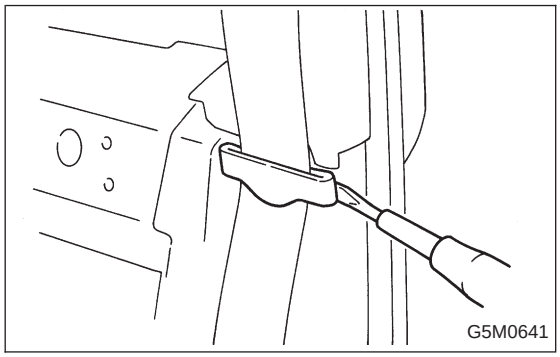
4) Remove center lower pillar trim panel.
5) Remove front cover side plate.
6) Roll up floor mat at the bottom of center pillar.
7) Remove lap anchor bolt.
8) Remove belt retractor and outer belt.
9) Installation is in the reverse order of removal.

CAUTION:
● The left and right ELR's are not mutually interchangeable because different sensors are used.
● Be careful not to twist belts during installation.

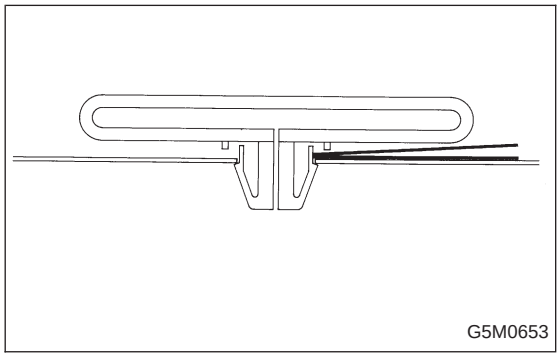
2. OUTER BELT (Coupe)

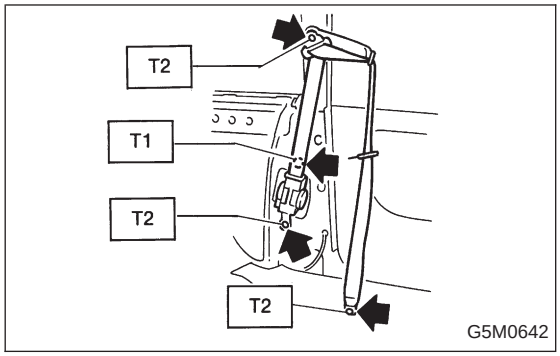
1) Remove rear seat cushion and backrest.
<Ref. to 5-3 [W2A1].>
2) Remove rear quarter trim.





3) Remove webbing guide.





4) Remove anchor cover cap.
5) Remove four bolts and then belt retractor and outer belt.

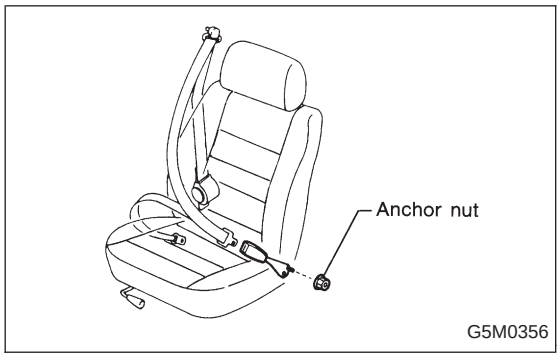
Tightening torque:
T1: 13±3 N·m (1.3±0.3 kg-m, 9.4±2.2 ft-lb)
T2: 35±13 N·m (3.6±1.3 kg-m, 26±9 ft-lb)

6) Installation is in the reverse order of removal.

CAUTION:
● The left and right ELR's are not mutually interchangeable because different sensors are used.
● Be careful not to twist belts during installation.

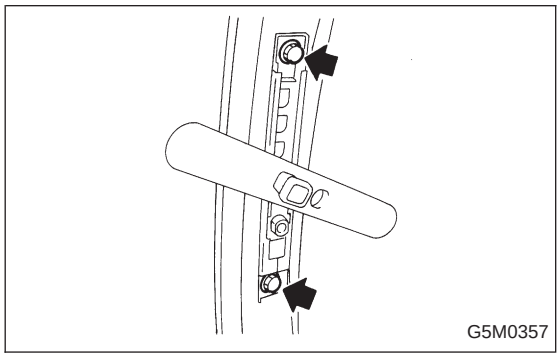
3. INNER BELT

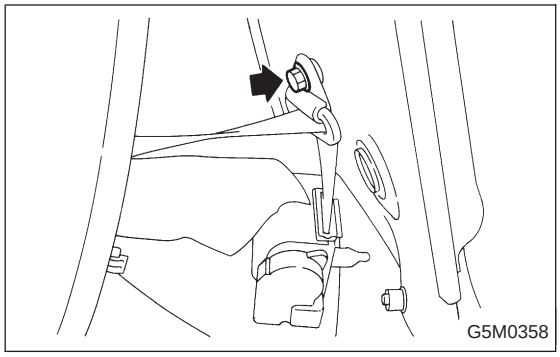
Remove anchor nut.



4. ADJUSTABLE SHOULDER ANCHOR

1) Remove shoulder anchor bolt.
2) Remove lower center pillar trim.
3) Remove front and front pillar trim panel.
4) Remove adjustable shoulder anchor assembly.
5) Installation is in the reverse order of removal.



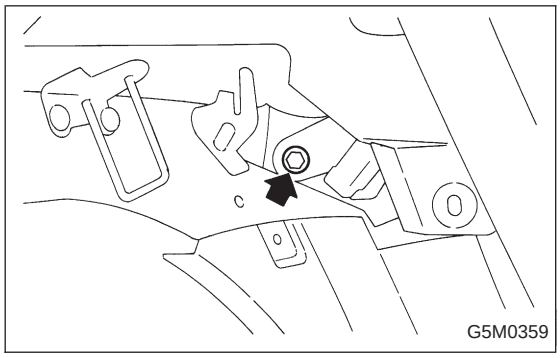


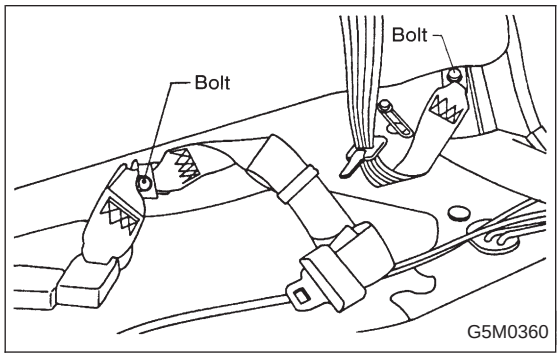
4. Rear Seat Belt

A: REMOVAL AND INSTALLATION

1. SEDAN AND COUPE MODEL

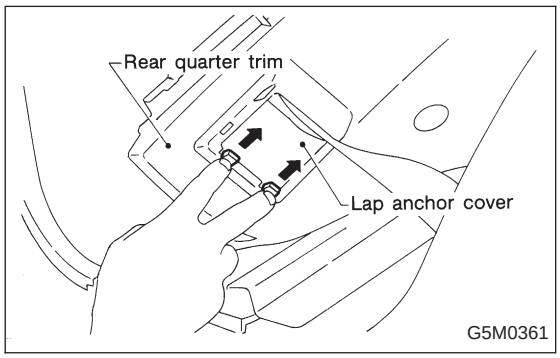
1) Remove rear cushion from body.
2) Remove rear backrest from body.
3) Remove screw from lower side of rear quarter trim, and lift-up lower side of rear quarter trim.
4) Remove trim panel rear bracket upper.
5) Remove rear quarter trim.
6) Remove outer anchor bolts.
7) Remove rear bolt from ELR.
8) Remove belt from outlet in rear quarter along slit.





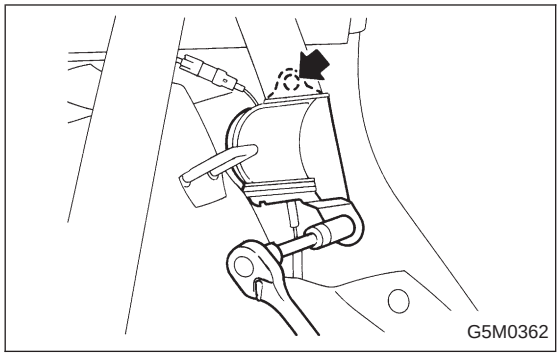
9) Remove inner bolts which secure outer seat.
10) Remove washer from bolt, then remove bolt, belt assembly, and anchor plate bracket.
11) Remove inner bolts (2 places) from center seat.
12) Remove washer from bolt, and remove bolt, belt assembly and anchor plate bracket.
13) Installation is in the reverse order of removal. Ensure that seat belt is properly reeled on and off after installation of ELR.

CAUTION:
● Be extremely careful not to confuse center seat anchor plate with outer seat anchor plate during installation.
● Ensure that seat belts are free from twisting after installation.
● Ensure that tongues, buckles and belts are properly placed on seat.



2. WAGON MODEL

1) Raise rear cushion.
2) Remove rear backrest from body.
Remove shoulder anchor cover and anchor bolt.
3) Remove lower portion of rear quarter trim.
4) Remove lap anchor cover and bolt.

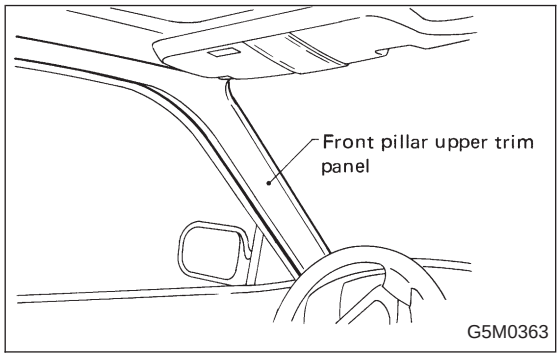

G5M0362

5) Remove 7/16-20 UNF nuts which secure ELR and remove ELR.

CAUTION:
Remove outer seat belt and center seat belt in similar manner used to remove those from Sedan.

6) Installation is in the reverse order of removal. Ensure that seat belt is properly reeled on and off after installation of ELR.

CAUTION:
● Be extremely careful not to confuse center seat anchor plate with outer seat anchor plate during installation.
● Ensure that seat belts are free from twisting after installation.
● Ensure that tongues, buckles and belts are properly placed on seat.



G5M0363

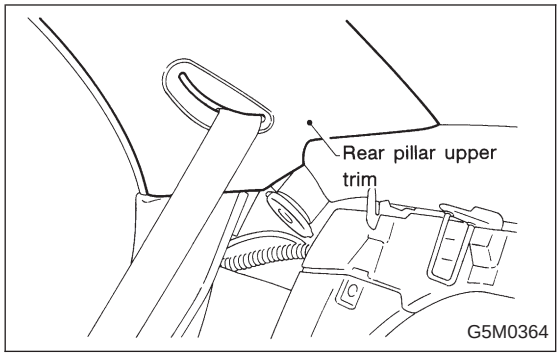
5. Inner Trim Panel

A: REMOVAL AND INSTALLATION

1. FRONT PILLAR UPPER TRIM PANEL

1) Remove center pillar lower trim panel.
2) Remove seat belt anchor bolts.
3) Pry pawls off body flange of front pillar upper trim panel using screwdriver.
4) Remove clips which hold front pillar upper trim panel, and lift trim panel out by moving it toward the compartment.
5) Installation is in the reverse order of removal.

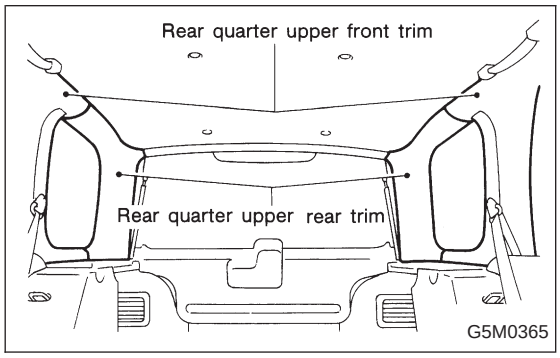
CAUTION:
Be sure to securely hook pawls of front pillar upper trim panel on body flange.



2. REAR PILLAR UPPER TRIM PANEL (Sedan)

1) Remove rear seat cushion and backrest.
2) Remove tapping screw from rear pillar lower trim panel, and remove trim panel by sliding it forward.
3) Remove front pillar upper trim end.
4) Pry the pawl off front end using screwdriver.
5) Remove clips which hold rear pillar upper trim, and remove trim panel by sliding it forward.
6) Installation is in the reverse order of removal.

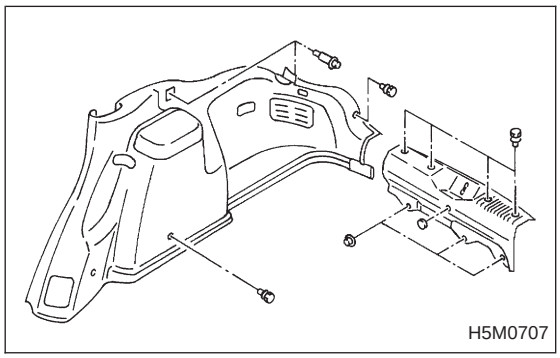
CAUTION:
Be sure to securely hook pawls of rear pillar upper trim panel on body flange.



3. REAR QUARTER PILLAR UPPER TRIM PANEL (Wagon)

1) Set rear seat cushion up.
2) Remove rear seat backrest.
3) Remove rear quarter lower trim.
4) Remove rear rail trim.
5) Remove rear quarter upper front trim.
6) Remove rear quarter upper rear trim.
7) Installation is in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of rear quarter pillar trim panel on body flange.



4. REAR QUARTER LOWER TRIM PANEL (Wagon)

1) Remove luggage cover.
2) Set rear seat cushion up.
3) Remove rear seat backrest.
4) Remove rear skirt trim.
5) Remove clip and screw then disconnect connector (RH side).
6) Remove rear seat belt lower anchor then remove rear quarter lower trim.
7) Installation is in the reverse order of removal.

CAUTION:
Be careful not to ride trim panel over harness, insulators, etc.

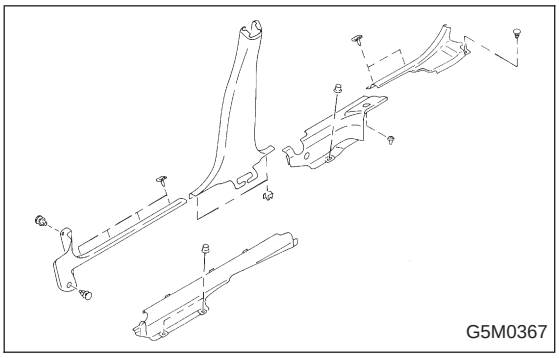
5. FLOOR MAT AIRBAG

Supplemental Restraint System "Airbag"

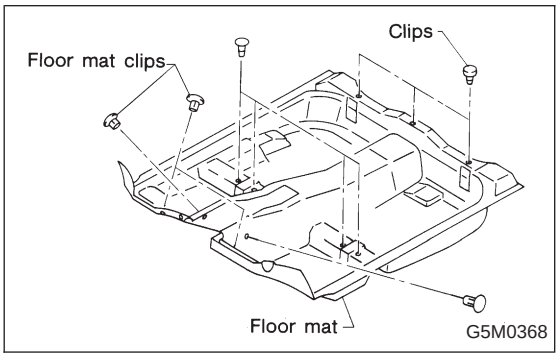
Airbag system wiring harness is routed near floor mat.

CAUTION:

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when servicing floor mat.**


G5M0367

1) Remove front seats.
2) Remove rear seat cushion.
3) Remove center tray, indicator cover, cover assembly, and console box, depending on the specifications.
4) Remove front pillar lower trim panel.
5) Remove center pillar lower trim panel.
6) Remove three clips under rear seat cushion.
7) Remove rear cover side plate and rear pillar lower trim.
8) Pull out edge in the groove of side sill cover.



G5M0368

9) Remove four clips under front seat.
10) Remove four clips in toe board area.

NOTE:
When pulling out edge, do not pull mat alone; pull mat together with edge.
Pry off two steel clips on side sill front cover and one on side sill rear cover using screwdriver.

11) Remove mat hook.
12) Remove mat from toe board area.
13) Remove mat from heater unit.
14) Roll mat, and take it out of opened rear door.
15) Installation is in the reverse order of removal.

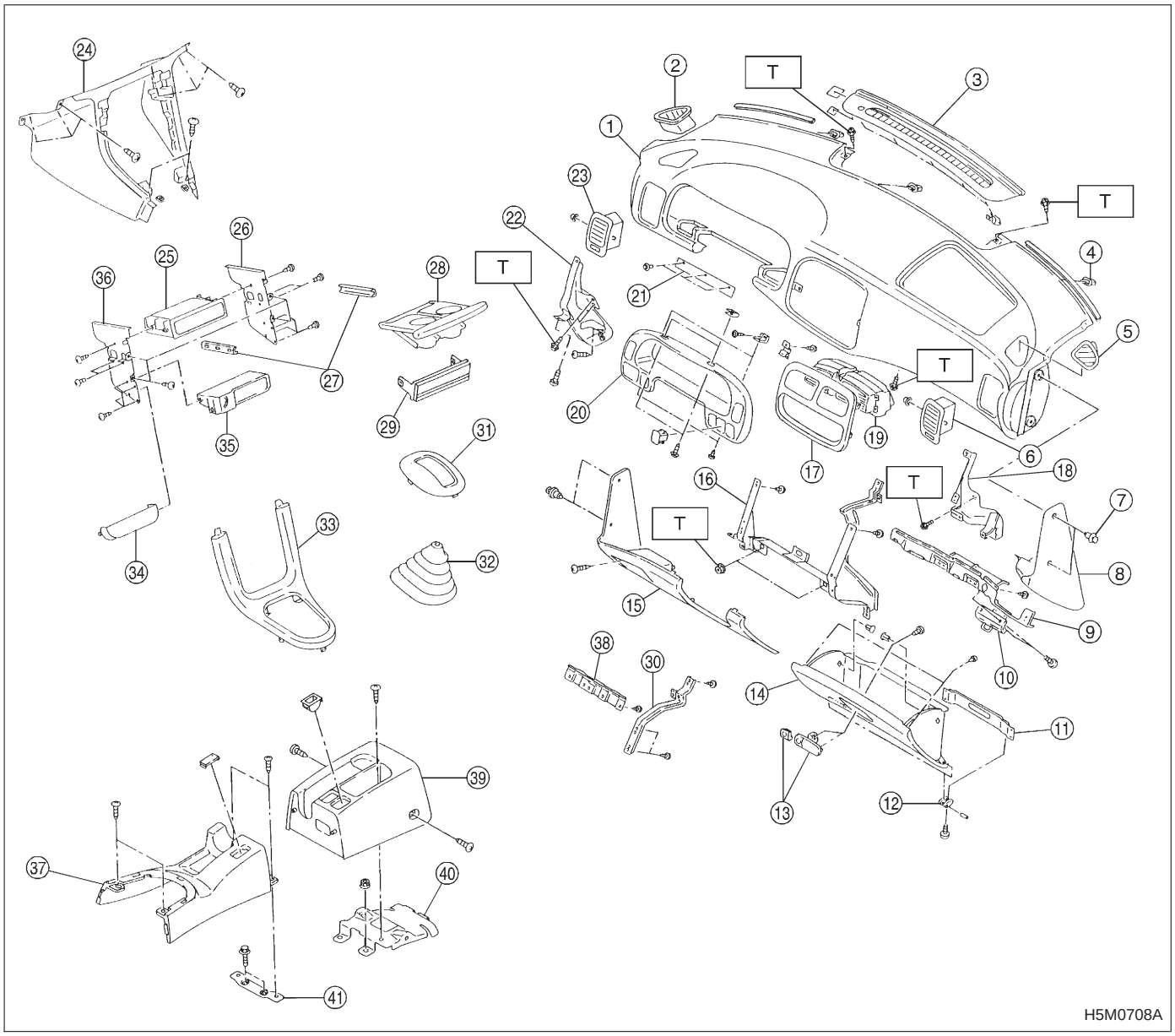
NOTE:
- Secure mat firmly with hook and velcro tape.
- Insert mat edge firmly into the groove of side sill cover.

INSTRUMENT PANEL 5-4

Page

C COMPONENT PARTS.....2
1. Instrument Panel.....2
W SERVICE PROCEDURE.....3
1. Instrument Panel AIRBAG.....3

1. Instrument Panel



① Pad & frame
② Grille SD def. (D)
③ Front def. grille
④ Grommet
⑤ Grille SD def. (P)
⑥ Grille vent (P)
⑦ Clip
⑧ SD panel (P)
⑨ Reinf. airbag CTR
⑩ Striker
⑪ Frame pocket
⑫ Hinge
⑬ Lock ASSY
⑭ Pocket ASSY
⑮ Lower cover ASSY
⑯ Reinf. CTR
⑰ Panel CTR (A)
⑱ Reinf. (P)
⑲ Grille CTR def.
⑳ Meter visor
㉑ Cover
㉒ Reinf. (D)
㉓ Grille vent (D)
㉔ Instrument panel console
㉕ Pocket CTR
㉖ BRKT (Radio) RH
㉗ Rail (Cup holder)
㉘ Cup holder
㉙ Panel (Radio)
㉚ Reinf. airbag B
㉛ Panel (AT) ASSY
㉜ Shift boot
㉝ Console cover
㉞ Panel (Airbag)
㉟ Housing (Ash tray)
㊱ BRKT (Radio) LH
㊲ Center console
㊳ Reinf. airbag UPPER
㊴ Rear console box
㊵ Rear console BRKT
㊶ Center console BRKT

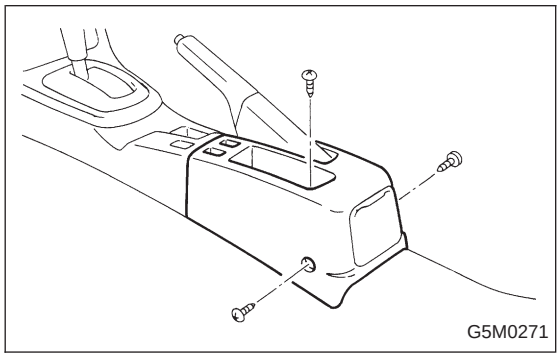
Tightening torque: N·m (kg-m, ft-lb)
T: 7±1 (0.7±0.1, 5.1±0.7)

1. Instrument Panel AIRBAG

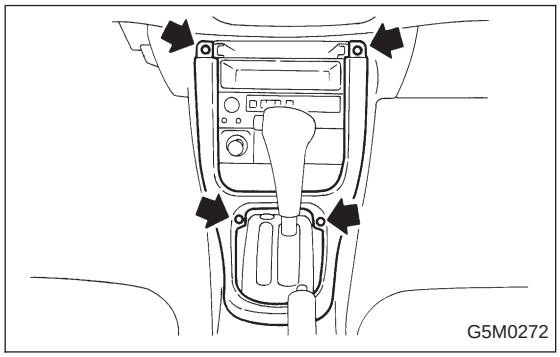
A: REMOVAL

Airbag system wiring harness is routed near combination meter.

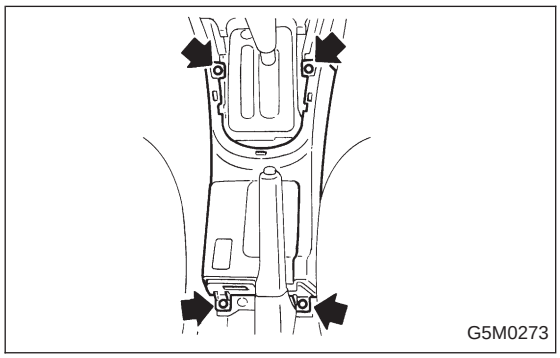
CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
● Be careful not to damage Airbag system wiring harness when servicing the combination meter.


G5M0271

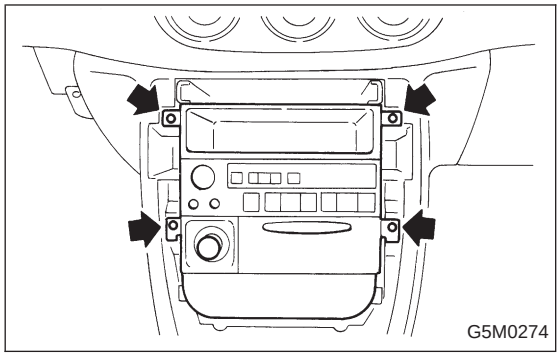
1) Disconnect GND cable from battery.
2) Remove rear console box.


G5M0272

3) Pull cup holder.
4) Turn over shift lever boot of front end (MT model). Remove select lever cover (AT model).
5) Remove console cover.

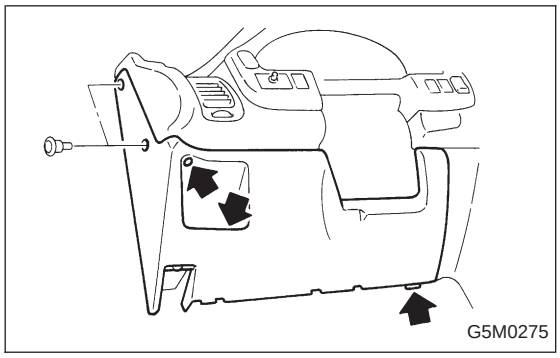

G5M0273

6) Remove center console.

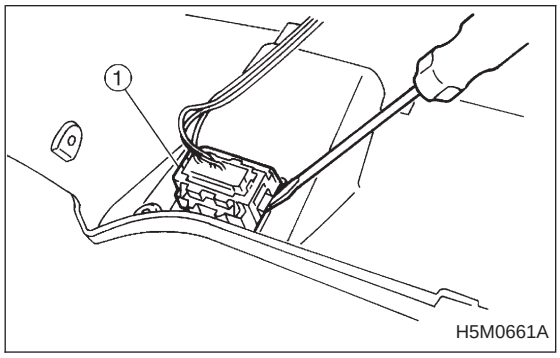

G5M0274

7) Remove audio assembly and then disconnect radio antenna feeder and connectors.

CAUTION:
Be sure to hold socket section and not harness when disconnecting.

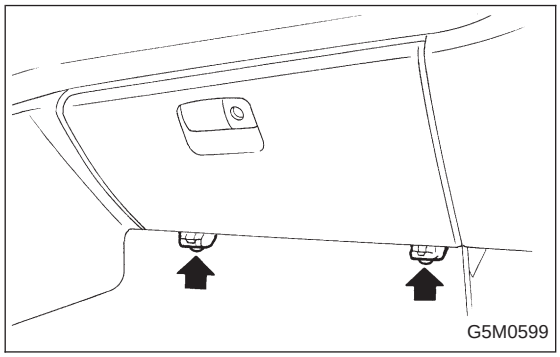

G5M0275

8) Remove lower cover and then disconnect connector.

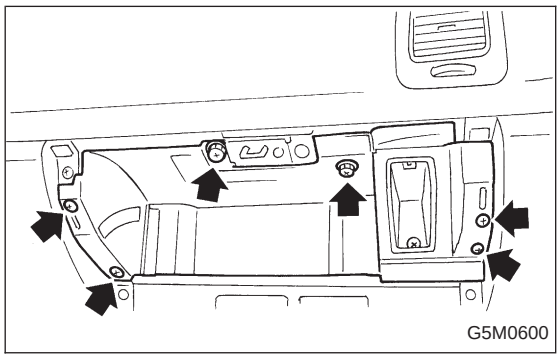


H5M0661A

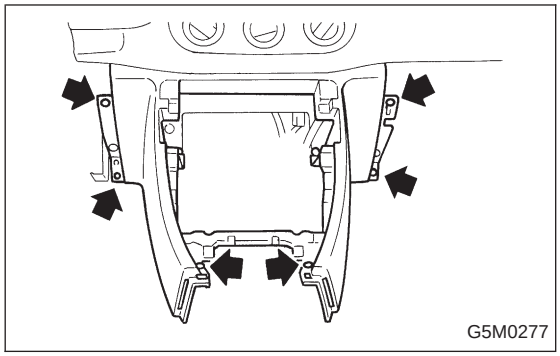
9) Disconnect data link connector ① from lower cover.


G5M0599

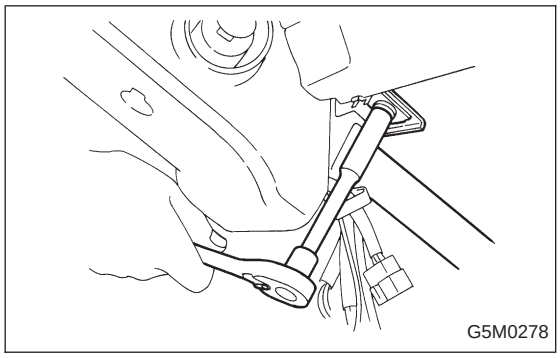
10) Remove glove box.


G5M0600

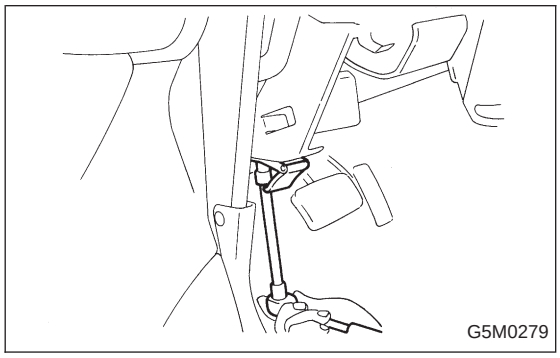
11) Remove pocket back panel.


G5M0277

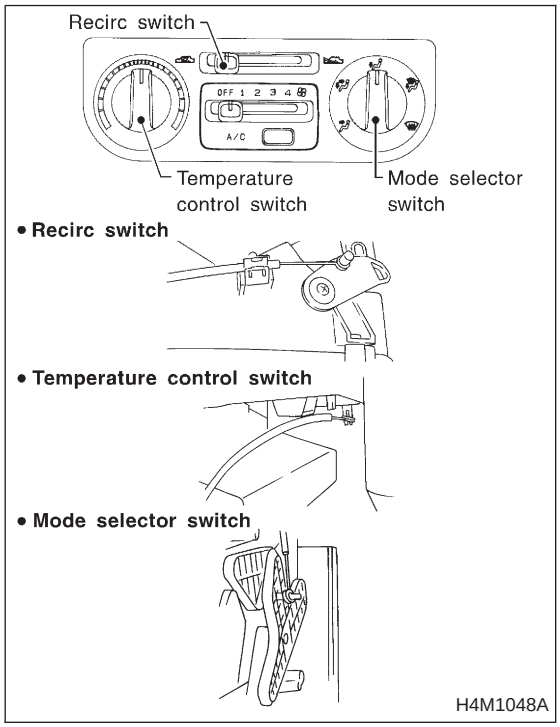
12) Remove instrument panel console.


G5M0278

13) Remove two bolts and lower steering column.


G5M0279

14) Remove hood opener lever.



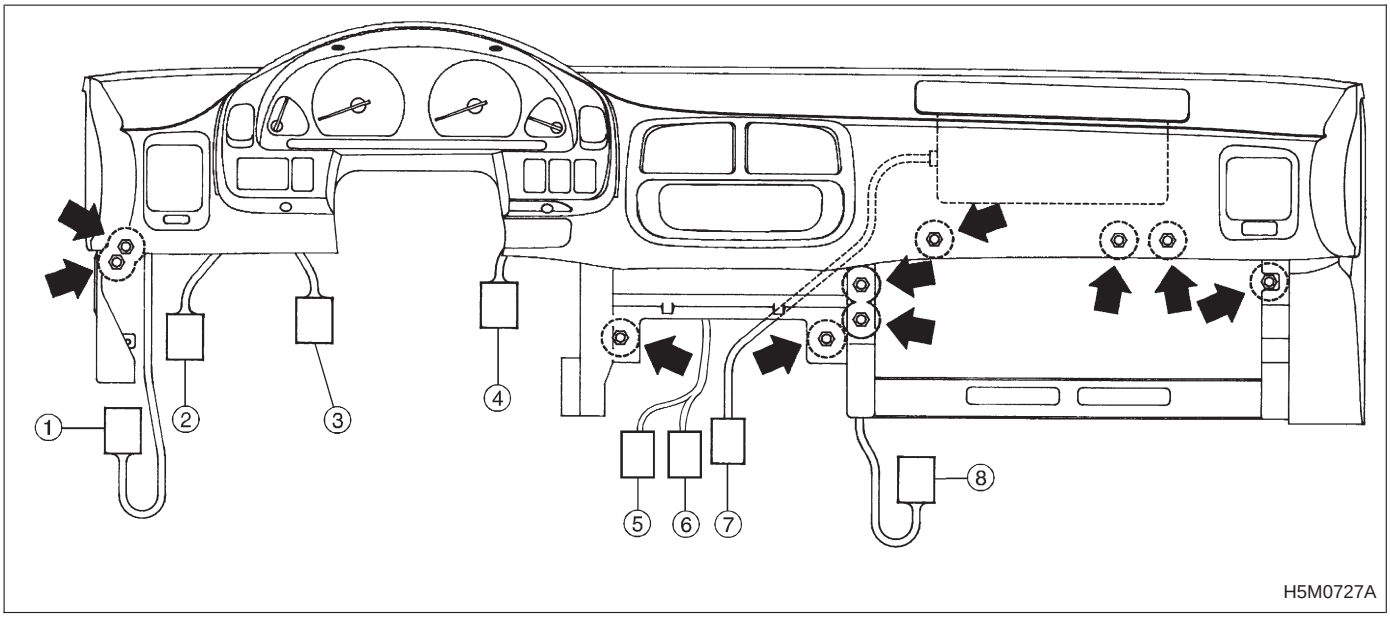
H4M1048A

15) Set temperature control switch to “FULL HOT”, mode selector switch to “DEF” position and recirc switch to “FRESH” position.
16) Disconnect temperature control cable and mode control cable from heater unit then disconnect recirc control cable from intake unit.

NOTE:
Do not move switch and link when installing.

17) Disconnect harness connectors.

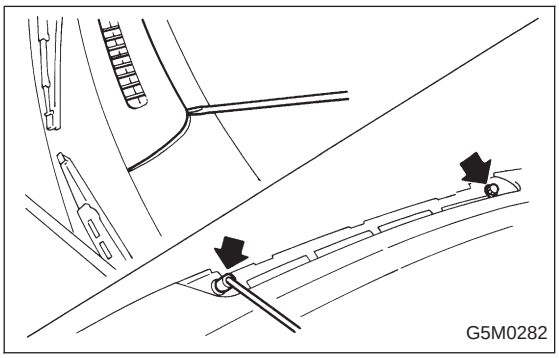
①	15P/Gray
②	24P/Black
③	8P/Natural & black
④	4P/Blue
⑤	12P/Natural
⑥	20P/Blue
⑦	Airbag connector (AB10)/Yellow
⑧	6P/Black



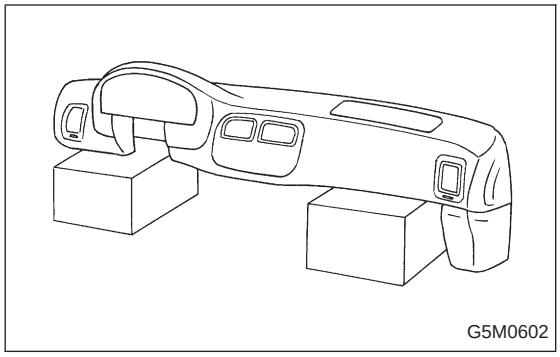
CAUTION:
Be sure to hold socket section and not harness when disconnecting.

NOTE:
Put matching mark, if necessary, for easy re-assembly.

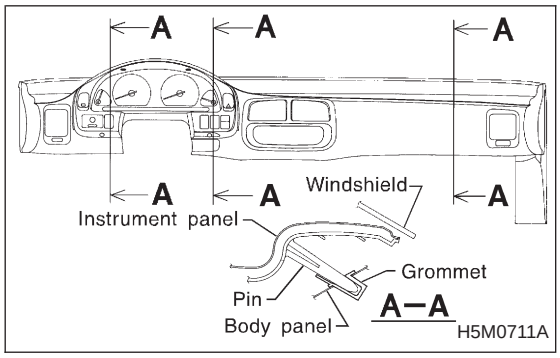
18) Remove the ten bolts and nuts.



19) Remove front defroster grille and two bolts.
20) Remove instrument panel carefully from the body and then disconnect speedometer cable from back of combination meter.


G5M0602

CAUTION:
When storing removed instrument panel with passenger airbag module, place it standing up on the floor.



H5M0711A

B: INSTALLATION

1) Installation is in the reverse order of removal.

NOTE:
When setting instrument panel into position, push three pins into grommet on body panel.

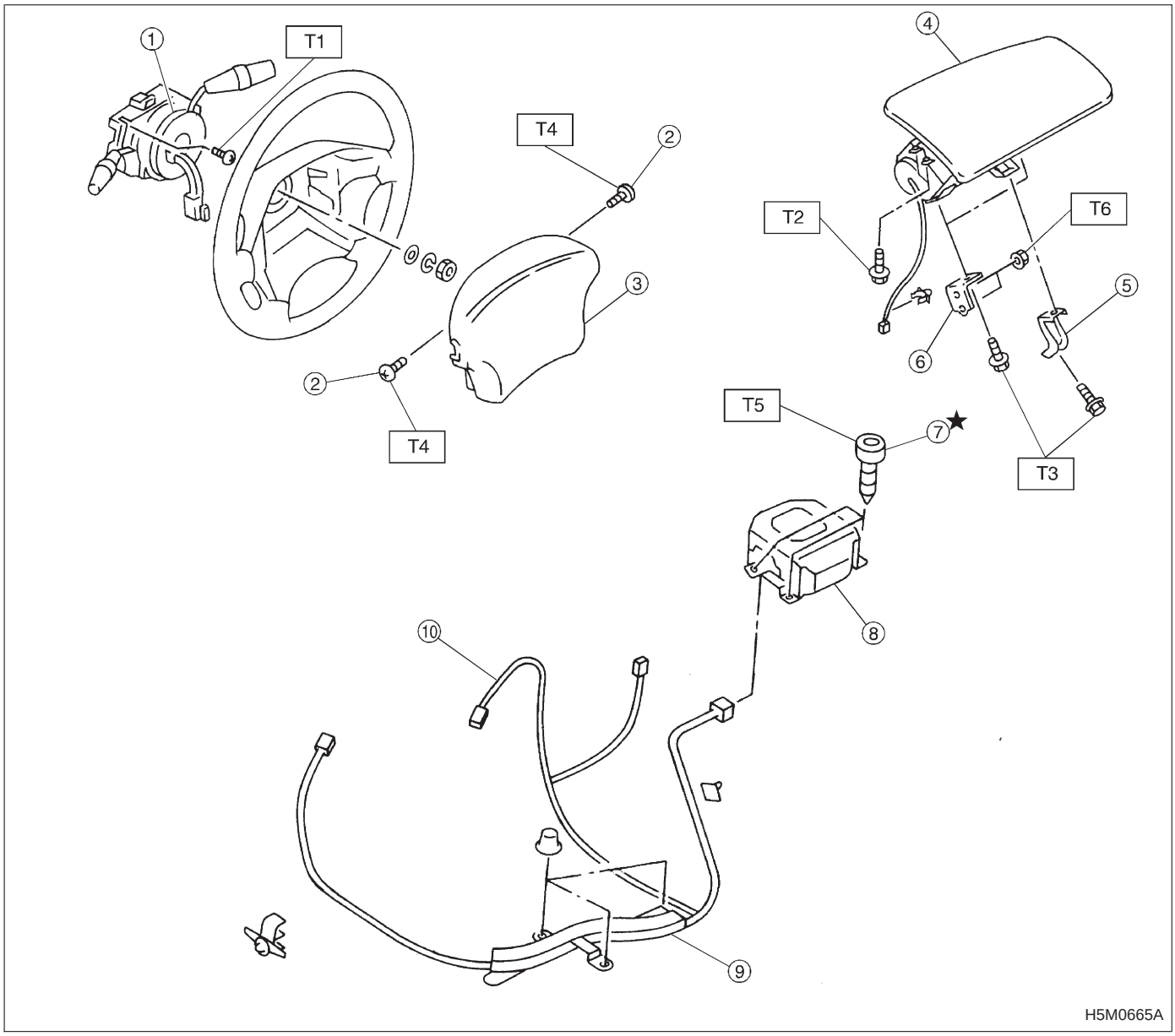
CAUTION:
- **Be careful not to snag the harness.**
- **Make sure to connect harness connectors.**
- **Take care not to scratch the instrument panel and related parts.**

SUPPLEMENTAL RESTRAINT SYSTEM 5-5

Page

C COMPONENT PARTS.....2
1. SRS Airbag 2
W SERVICE PROCEDURE 3
1. Precaution 3
2. Inspection and Replacement Standards.....5
3. Airbag Module.....8
4. Main Harness 11
5. Airbag Control Module 12
6. Combination Switch 14

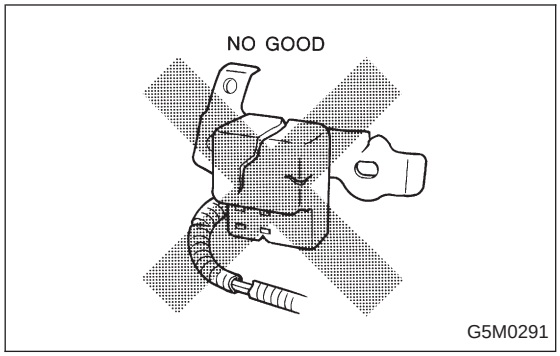
1. SRS Airbag



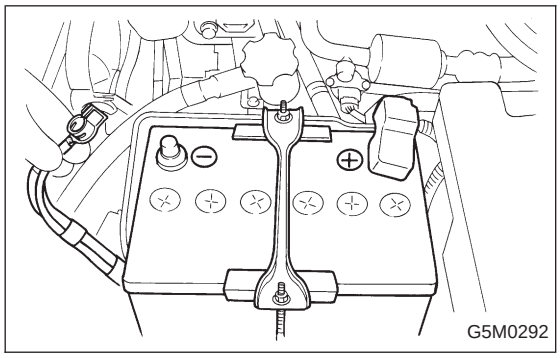
① Combination switch ASSY with roll connector
② TORX bolt
③ Airbag module ASSY (Driver)
④ Airbag module ASSY (Passenger)
⑤ BRKT A
⑥ BRKT B
⑦ TORX bolt
⑧ Airbag control module
⑨ Protector LH
⑩ Airbag main harness

Tightening torque: N·m (kg-cm, in-lb)
T1: 2.5±0.5 (25±5, 21.7±4.3)
T2: 4.4±1.5 (45±15, 39±13)
T3: 7.4±0.2 (75±2, 65.1±1.7)
T4: 9.8±2.0 (100±20, 87±17)
T5: 9.81±2.45 (100.0±25.0, 86.8±21.7)
T6: 17.7±4.9 (180±50, 156±43)

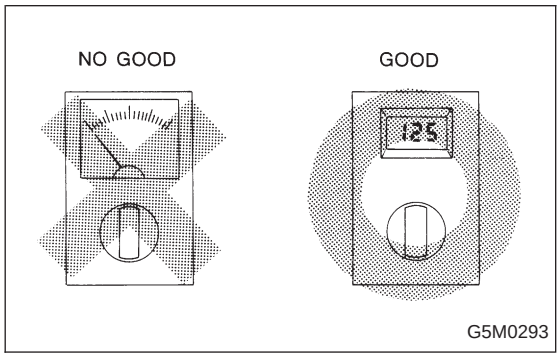
1. Precaution



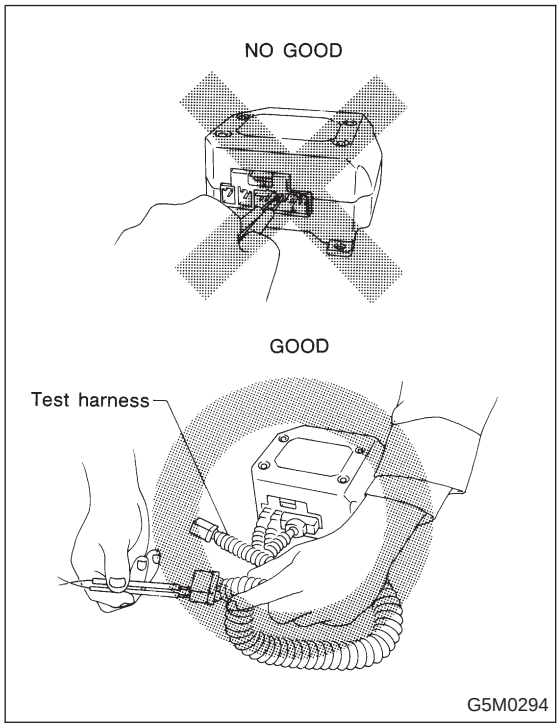
● If any of the airbag system parts such as sensors, airbag module, airbag control module and harness are damaged or deformed, replace with new genuine parts.

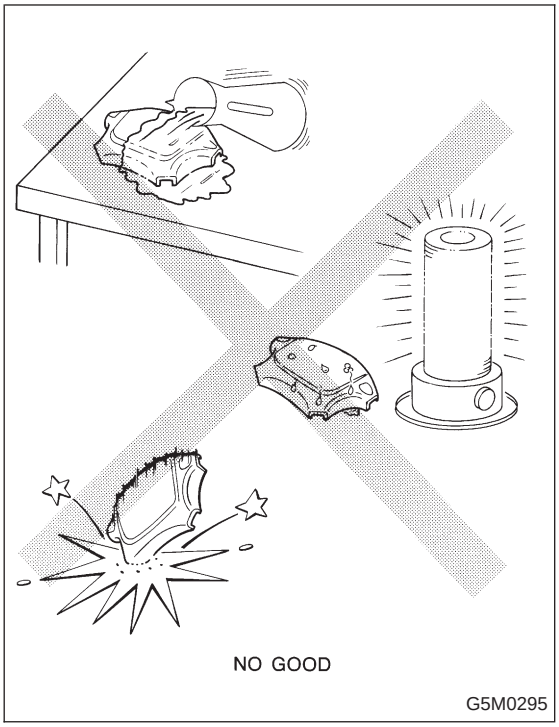


● When servicing, be sure to turn the ignition switch off, disconnect the negative (−) battery terminal then the positive (+) terminal in advance, and wait for more than 20 seconds before starting work.

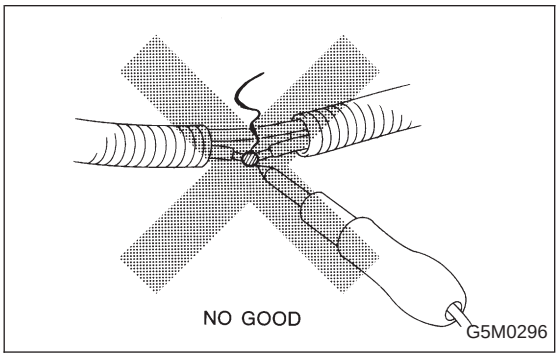


● When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously. Do not directly apply the tester probe to any connector terminal of the airbag. When checking, use a test harness.

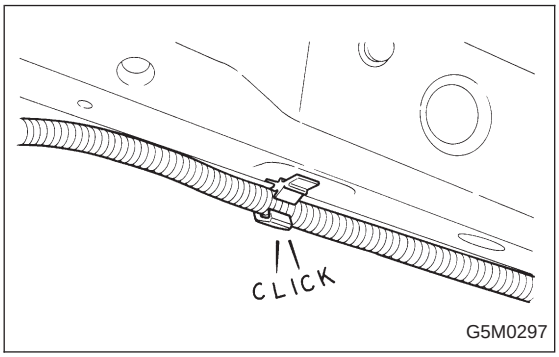




● Do not drop the airbag modulator parts, subject it to high temperatures over 90°C (194°F), or apply oil, grease, or water to it; otherwise, the internal parts may be damaged and its reliability greatly lowered.

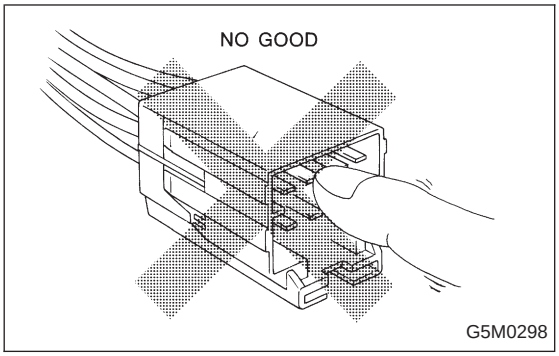


● If any damage or open is found on the SRS airbag system wire harness, do not attempt to repair using soldering, etc. Be sure to replace the faulty harness with a new genuine part.



● Install the wire harness securely with the specified clips so as to avoid interference or jamming with other parts.

● Before connecting the airbag system to ground, make sure that the grounding terminal is free from paint and contamination.



● Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.

2. Inspection and Replacement Standards

A: VEHICLES WHICH BECOME INVOLVED IN A COLLISION

If the vehicle equipped with an SRS airbag system is damaged in a collision, the airbag system parts must be checked and replaced in accordance with the following standards:

● After faulty parts are replaced, the warning light operation must be checked.

● When the ignition switch is turned ON, it lights up for 8 seconds and then it goes out for at least 30 seconds.

● The trouble code stored in memory must be erased after the check.

B: AIRBAG MODULE (DRIVER AND PASSENGER)

1. INSPECTION STANDARD

● The vehicle damaged in a collision (regardless of whether or not airbag is deployed).

● The designated trouble code is output during self-diagnosis. (Refer to “Diagnostics” Section.)

2. REPLACEMENT STANDARD

● Airbag is deployed.

● The pad surface is scratched or cracked.

● Harness and/or connector is deformed or cracked, their circuits are broken, lead wire is exposed, etc.

● Mounting bracket is cracked or deformed.

● The module surface is fouled with foreign matter. (grease, oil, water, cleaning solvent, etc.)

● Airbag module dropped to the floor/ground.

● Airbag module determined as faulty during self-diagnosis.

C: MAIN HARNESS

1. INSPECTION STANDARD

● A vehicle damaged in a collision (regardless of whether or not airbag is deployed).

● The designated trouble code is output during self-diagnosis. (Refer to “Diagnostics” Section.)

2. REPLACEMENT STANDARD

● Harness circuit is broken, lead wire is exposed, corrugated tube is cracked, etc.
● Connector is scratched or cracked.
● The designated trouble code is output during self-diagnosis.

D: AIRBAG CONTROL MODULE

1. INSPECTION STANDARD

● A vehicle damaged in a collision (regardless of whether or not airbag is deployed).
● The designated trouble code is output during self-diagnosis. (Refer to “Diagnostics” Section.)

2. REPLACEMENT STANDARD

● Control module is cracked or deformed.
● Mounting bracket is cracked or deformed.
● Connector is scratched or cracked.
● Control module dropped to the floor/ground.
● Control module determined as faulty during diagnostics.
● Airbag is deployed.

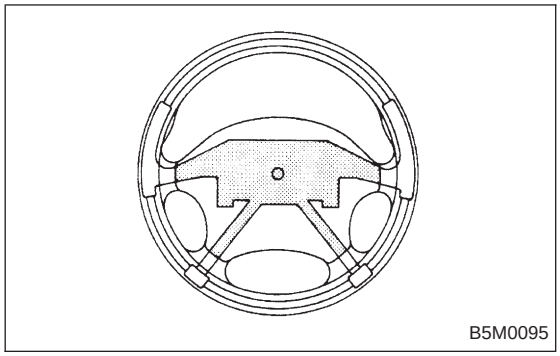
E: COMBINATION SWITCH

1. INSPECTION STANDARD

● A vehicle damaged in a collision (regardless of whether or not airbag is deployed).
● The designated trouble code is output during self-diagnosis. (Refer to “Diagnostics” Section.)

2. REPLACEMENT STANDARD

● Combination switch or steering roll connector is deformed or cracked.


B5M0095

F: STEERING WHEEL

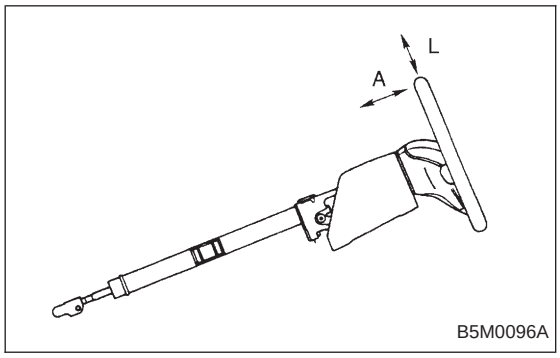
1. INSPECTION STANDARD

● A vehicle damaged in a collision (regardless of whether or not airbag is deployed).

2. REPLACEMENT STANDARD

● Check steering wheel insert for cracks or deformities.
● Check to ensure that new airbag module is properly installed in steering wheel.

● After installing airbag module, check to ensure that it is free of interference with steering wheel and that clearance between the two is equal at all points.



G: STEERING COLUMN ASSEMBLY

1. INSPECTION STANDARD

● A vehicle damaged in a collision (regardless of whether or not airbag is deployed).

2. REPLACEMENT STANDARD

● Check steering wheel free play in axial and radial directions.

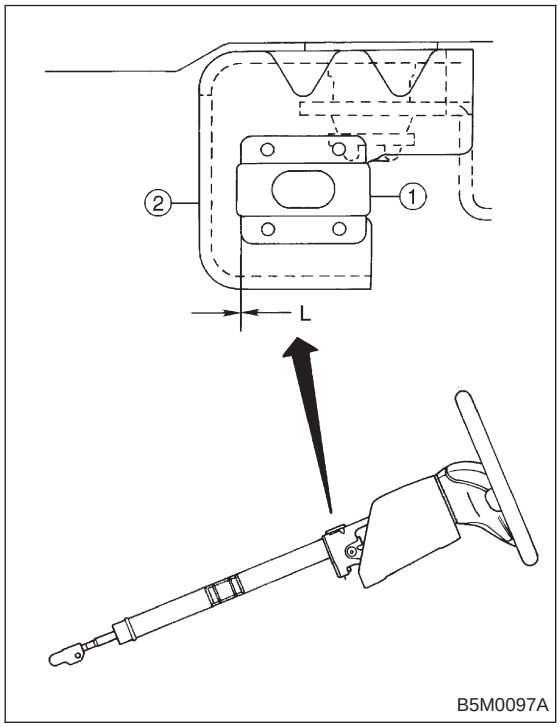
Specifications:

Axial free play A

Less than ±6 mm (0.24 in)

Radial free play L

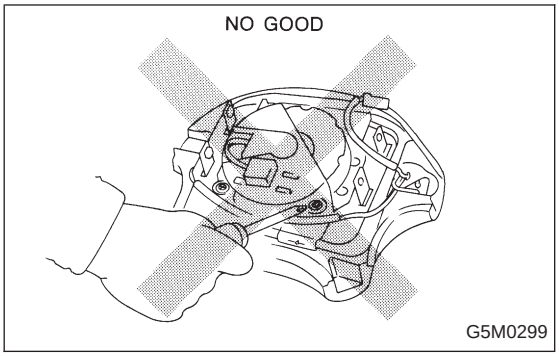
Less than ±7 mm (0.28 in)



● Check to ensure that clearance between capsule ① (at steering column) and cutout portion of column bracket ② on steering column upper side is within specifications.

Clearance between capsule and cutout portion of column bracket: L

Less than 0.5 mm (0.020 in)

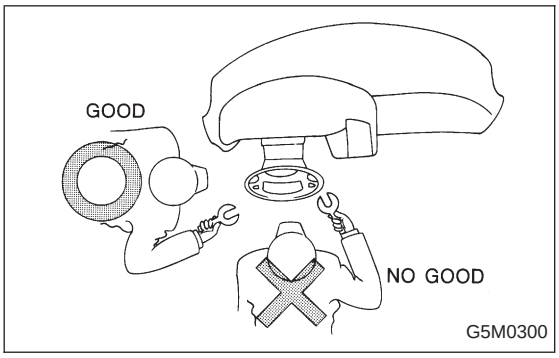


3. Airbag Module

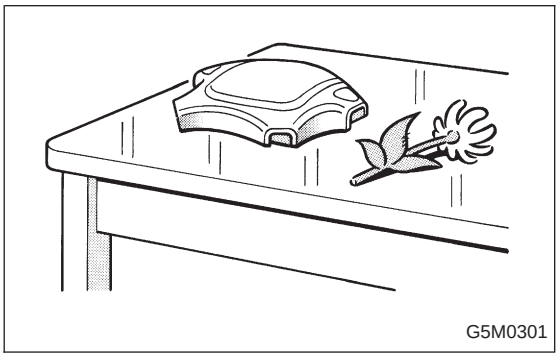
A: REMOVAL AND INSTALLATION

CAUTION:

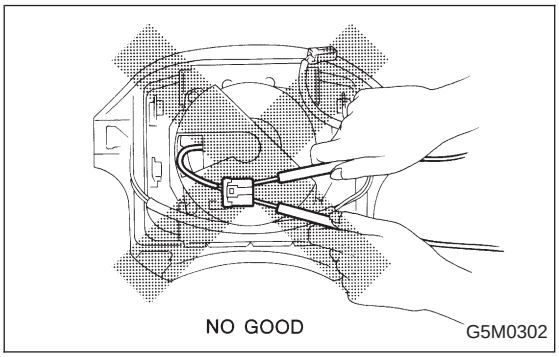
● The airbag module (driver side and passenger side) must not be disassembled. The airbag module cannot be used again once inflated.



● When removing and installing the airbag module (driver side and passenger side), the operator should stand, as much as possible, on the side of the airbag module.



● After removal, the airbag module (driver side and passenger side) should be kept away from heat and light sources, and stored on a clean, flat surface to prevent from any damage to its lower structure.

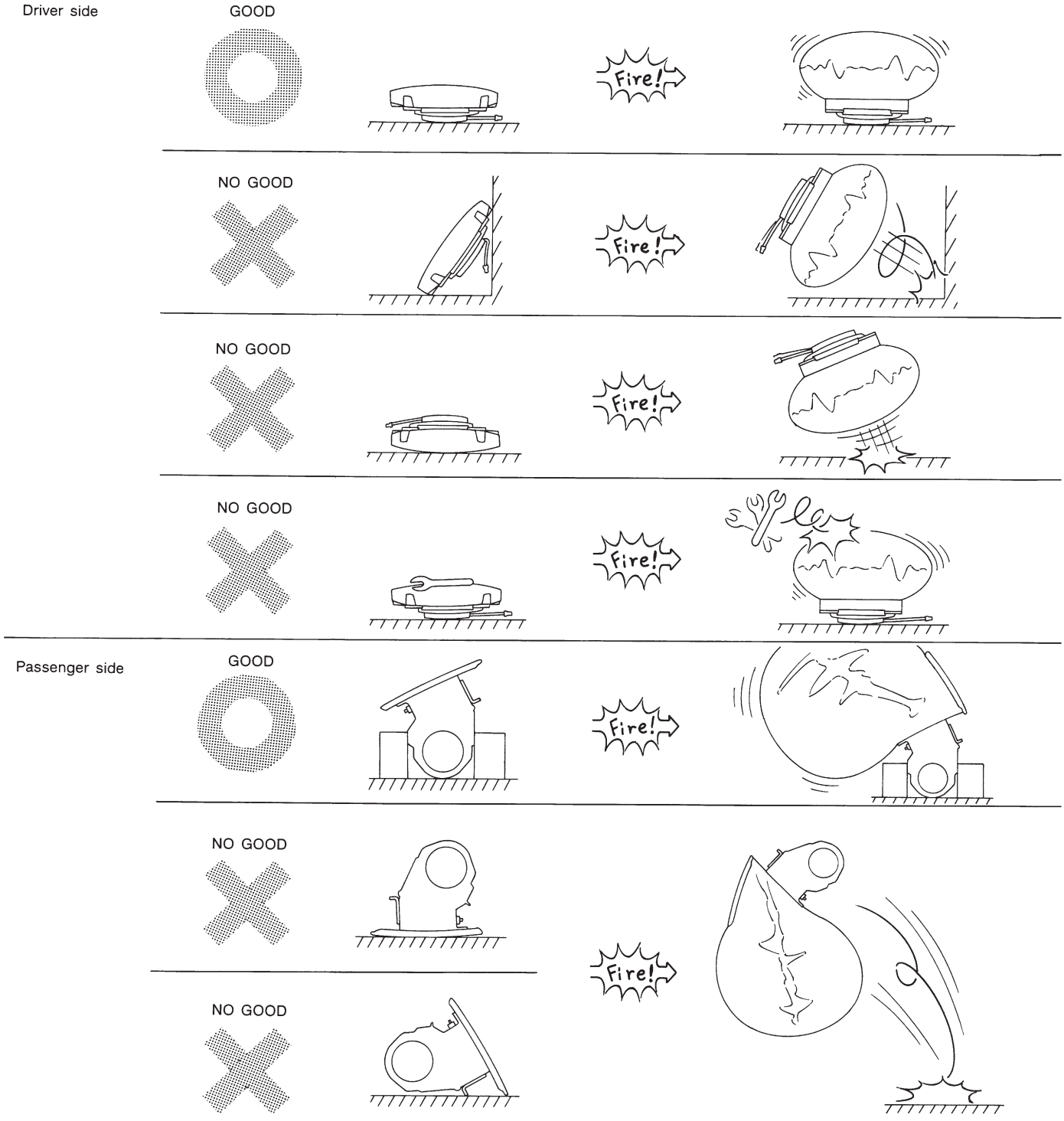


● Do not check airbag module (driver side and passenger side) continuity with airbag removed from the vehicle body.

● Replace airbag module (driver side and passenger side) with a new one, should any of the following conditions develop:

- **Pad surface is scratched or cracked.**
- **Connector harness is damaged.**
- **Inflator side structure of module is cracked or deformed.**
- **Module is excessively stained with water, oil, etc.**
- **Module was accidentally dropped.**

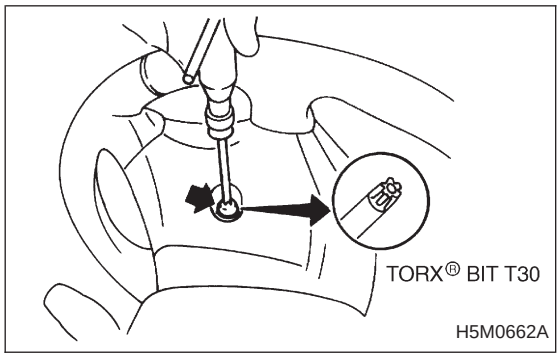
● When storing a removed airbag module (driver side and passenger side), be sure to place it in parallel with floor with the pad facing up. Do not place it against a wall, or place anything on the pad; otherwise, a dangerous condition may be created if the module malfunctions.



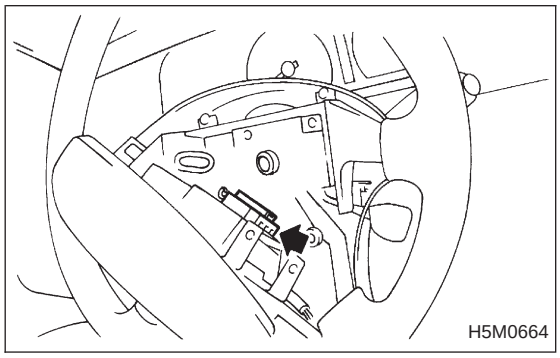
G5M0604

1. DRIVER SIDE

1) Set front wheels in straight ahead position.
2) Turn ignition switch off.
3) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.



4) Using TORX BIT T30, remove two TORX bolts.



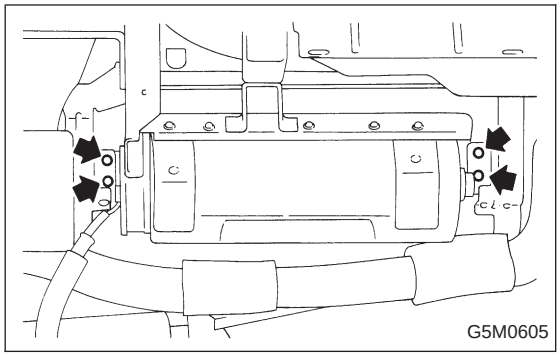
5) Disconnect airbag connector on back of airbag module. <Ref. to 5-5 [M2E2].>

6) Refer to "**CAUTION:**" for handling of a removed airbag module. <Ref. to 5-5 [W3A0].>
7) Installation is in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get caught with other parts.

2. PASSENGER SIDE

1) Remove instrument panel. <Ref. to 5-4 [W1A0].>


G5M0605

2) Remove four bolts and then carefully remove airbag module.

3) Refer to "**CAUTION:**" for handling of a removed airbag module. <Ref. to 5-5 [W3A0].>

4) Installation is in the reverse order of removal.

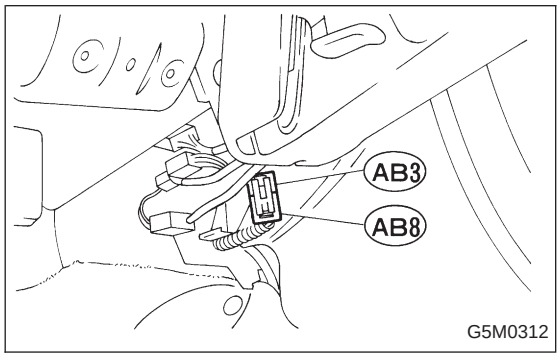
CAUTION:
Do not allow harness and connectors to interfere or get caught with other parts.

4. Main Harness

A: REMOVAL AND INSTALLATION

1) Turn ignition switch off.

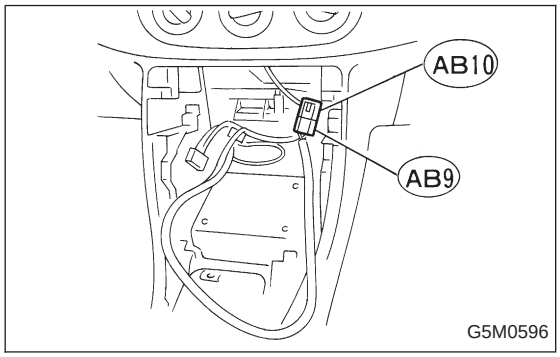
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.



G5M0312

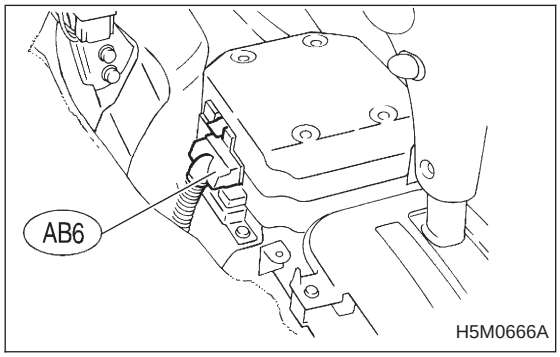
3) Remove lower cover. <Ref. to 5-4 [W1A0].>
Disconnect airbag connector (AB3) and (AB8) below steering column.

CAUTION:
Do not reconnect airbag connector at steering column until main harness are securely re-installed.



G5M0596

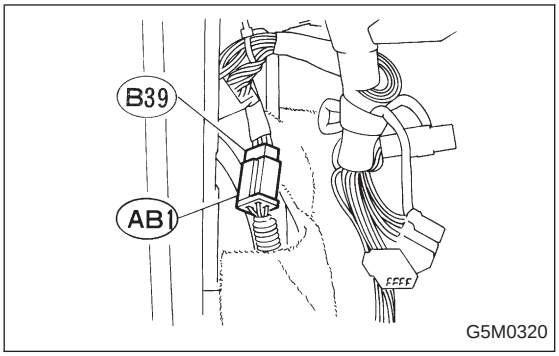
4) Disconnect airbag connector (AB9) and (AB10).



H5M0666A

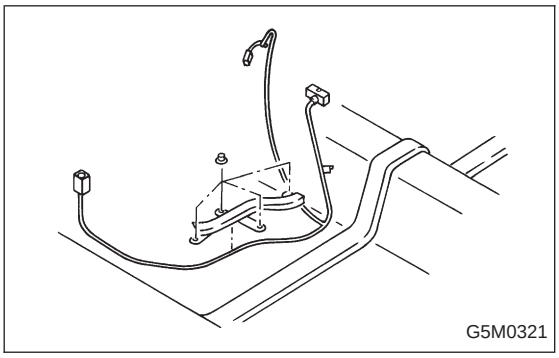
5) Remove instrument panel console. <Ref. to 5-4 [W1A0].>

6) Disconnect 12-pin yellow connector (AB6) from airbag control module. <Ref. to 5-5 [M2E1].>

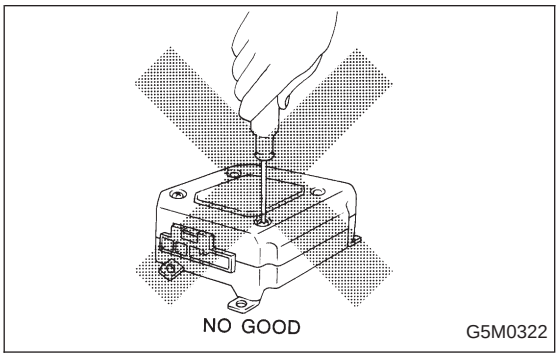


G5M0320

7) Disconnect body harness connector (B39) from connector (AB1).


G5M0321

8) Roll up floor mat and side sill cover (LH side). Remove main harness from clip and protector.
9) Installation is in the reverse order of removal.

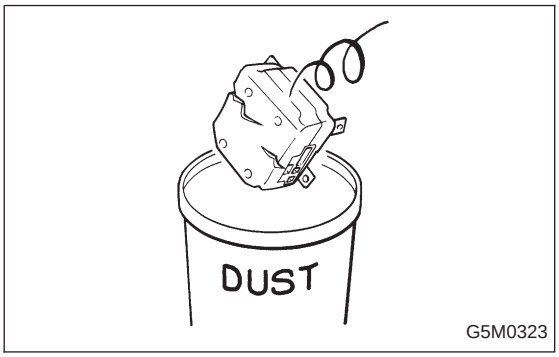


G5M0322

5. Airbag Control Module

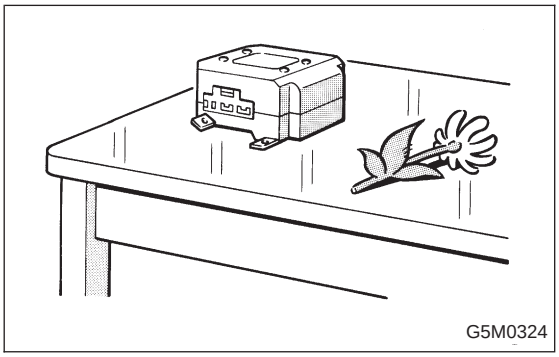
A: REMOVAL AND INSTALLATION

CAUTION:
- **Do not disassemble the airbag control module.**



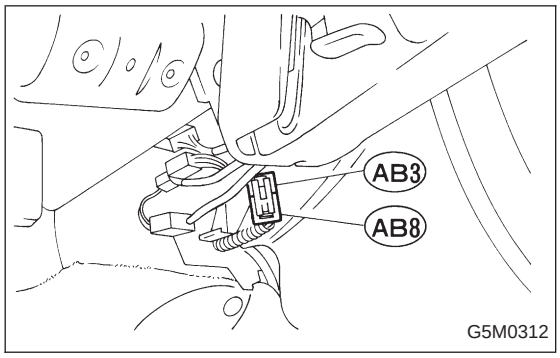
G5M0323

- **If the airbag control module is deformed, or if water damage is suspected, replace the airbag control module with a new genuine part.**


G5M0324

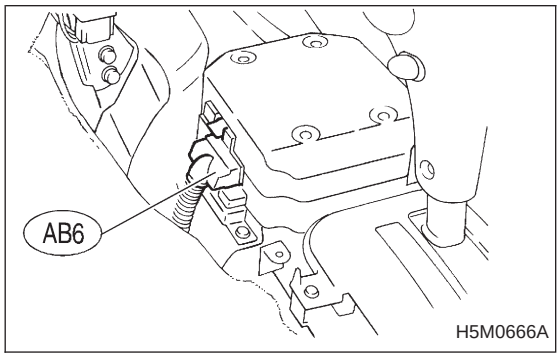
- **After removal, keep the airbag control module on a dry, clean surface away from heat and light sources, and moisture and dust.**

1) Turn ignition switch off.
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.

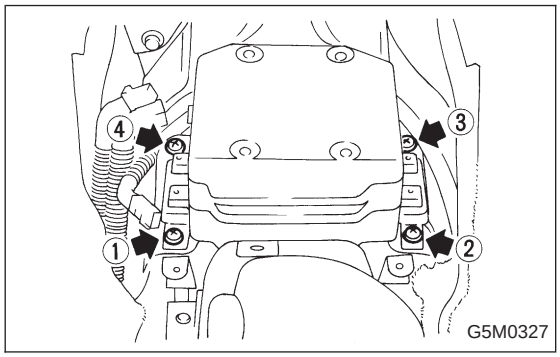


3) Remove lower cover. <Ref. to 5-4 [W1A0].>
Disconnect airbag connector (AB3) and (AB8) below steering column.

CAUTION:
Do not reconnect airbag connector at steering column until airbag control module is securely re-installed.



4) Remove instrument panel console. <Ref. to 5-4 [W1A0].>
5) Disconnect 12-pin yellow connector (AB6) from airbag control module. <Ref. to 5-5 [M2E1].>



6) Using T30 TORX® bit (Tamper resistant type), remove four TORX® bolts in numerical sequence shown in figure. Discard the old TORX® bolts.

CAUTION:
Use new TORX bolts during re-assembly.

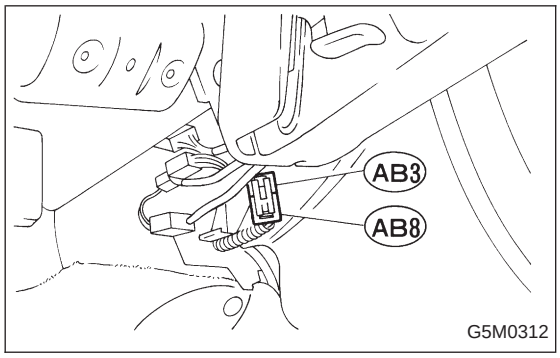
7) Installation is in the reverse order of removal.

CAUTION:
Be sure to fully secure all airbag system connectors during re-assembly and confirm that all green double lock mechanisms are engaged.

6. Combination Switch

A: REMOVAL

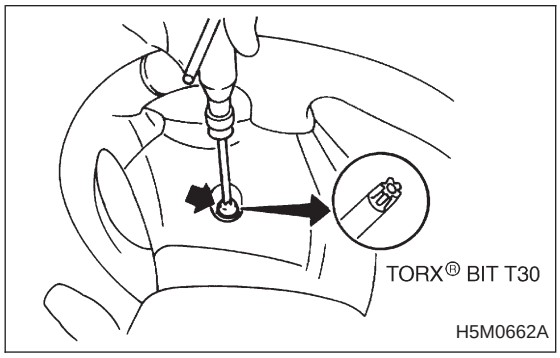
1) Turn ignition switch off.
2) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.



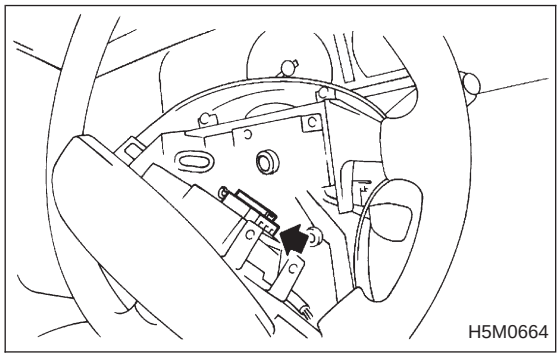
3) Remove lower cover. <Ref. to 5-4 [W1A0].> Disconnect airbag connector (AB3) and (AB8) below steering column.

CAUTION:
Do not reconnect airbag connector at steering column until combination switch is securely re-installed.

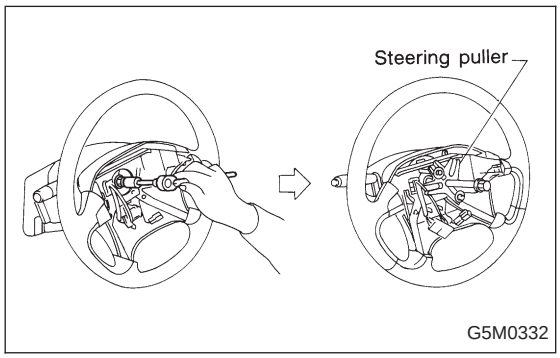
4) Disconnect combination switch connectors from body harness connector.



5) Set front wheels in straight ahead position. Using T30 TORX bit, remove two TORX® bolts.

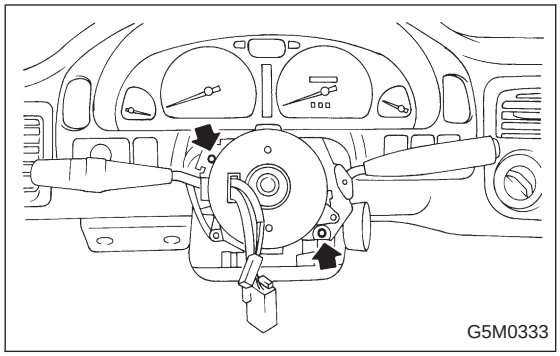


6) Disconnect airbag connector on back of airbag module. Remove airbag module, and place it with pad side facing upward. <Ref. to 5-5 [W3A0].>



7) Using steering puller, remove steering wheel.

CAUTION:
Do not allow connector to interfere when removing steering wheel.

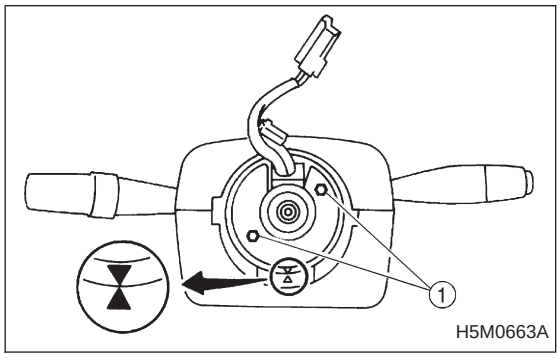

G5M0333

8) Remove steering column covers.
9) Removing two retaining screws, remove combination switch.

B: ADJUSTMENT

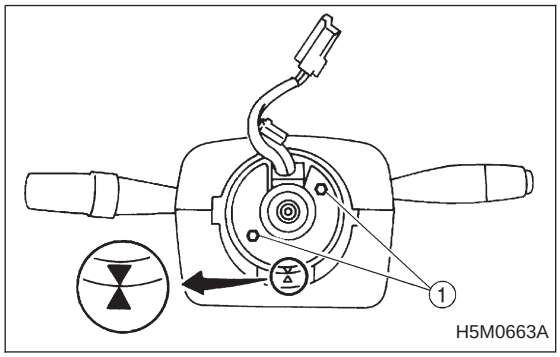
1. CENTERING ROLL CONNECTOR

Before installing steering wheel, make sure to center roll connector built into combination switch.
1) Make sure that front wheels are positioned straight ahead.



H5M0663A

2) Install steering gearbox, steering shaft and combination switch properly. Turn roll connector pin ① **clockwise** until it stops.
3) Then, back off roll connector pin ① approximately 2.65 turns until "▲" marks aligned.



H5M0663A

C: INSTALLATION

CAUTION:
Failure to do this might damage roll connector.

1) Before installing combination switch, check to ensure that combination switch is off and front wheels are set in the straight ahead position.
2) Install column cover and center roll connector. <Ref. to 5-5 [W6B1].>

3) Install steering wheel in neutral position. Carefully insert roll connector pin ① into hole on steering wheel.

NOTE:
If steering wheel angle requires fine adjustment, adjust tie-rod. <Ref. to 4-3 [W3F0].>

4) Install airbag module and lower cover in the reverse order of removal.

ENGINE ELECTRICAL SYSTEM 6-1

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4. Ignition Coil 21
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1. Specifications

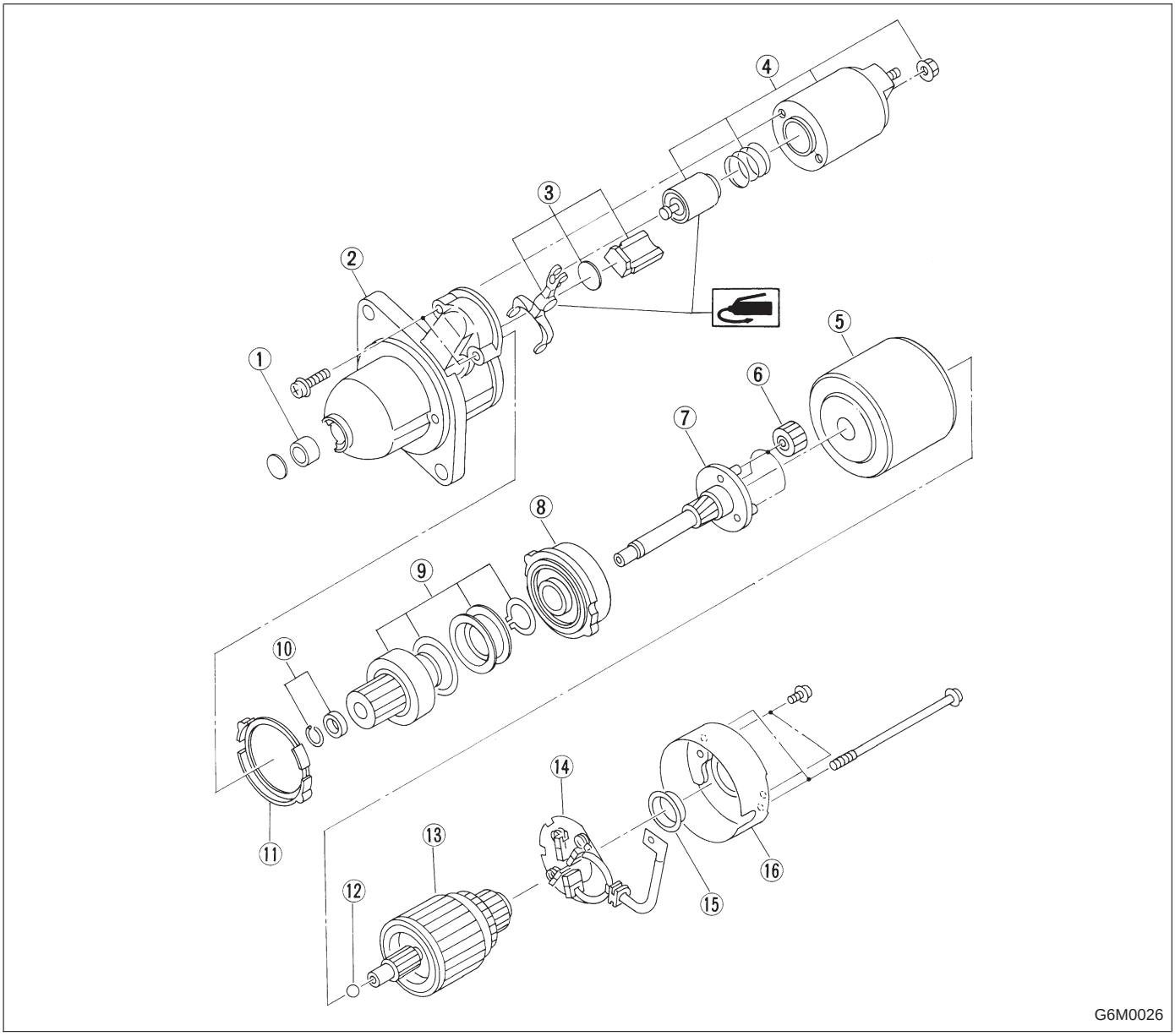
A: 1800 cc MODEL

Item			Designation
Starter	Type		Reduction type
	Model		MT M001T77181
	Manufacturer		MITSUBISHI
	Voltage and output		12 V — 1.0 kW
	Direction of rotation		Counterclockwise (when observed from pinion)
	Number of pinion teeth		8
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	3,000 rpm or more
	Load characteristics	Voltage	8 V
		Current	280 A or less
		Torque	8.5 N·m (0.87 kg-m, 6.3 ft-lb)
		Rotating speed	980 rpm or more
	Lock characteristics	Voltage	4 V
		Current	780 A or less
		Torque	17.6 N·m (1.80 kg-m, 13.0 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type
	Model		A2T39091
	Manufacturer		Mitsubishi Electric
	Voltage and output		12 V — 75 A
	Polarity on ground side		Negative
	Rotating direction		Clockwise (when observed from pulley side)
	Armature connection		3-phase Y-type
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more
	Regulated voltage		$14.5^{+0.3}_{-0.4}$ V [20°C (68°F)]
Ignition coil	Model		CM12-100
	Manufacturer		HITACHI
	Primary coil resistance		0.63 — 0.77 Ω
	Secondary coil resistance		10.4 — 15.6 kΩ
	Insulation resistance between primary terminal and case		More than 10 MΩ
Spark plug	Type and manufacturer		BKR6E-11 ..... NGK RC8YC4 ..... CHAMPION
	Thread size	mm	14, P = 1.25
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)

B: 2200 cc MODEL

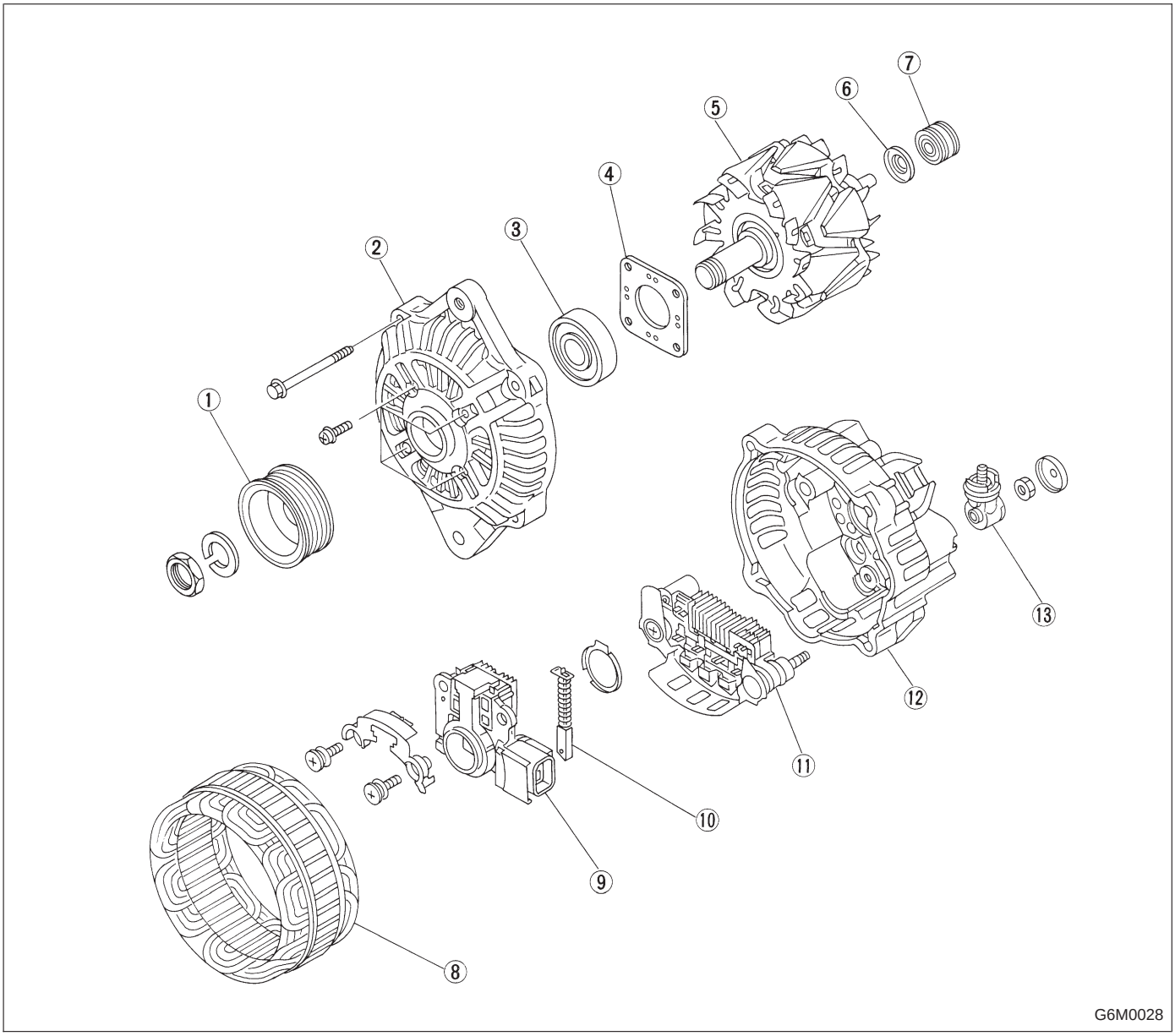
Item			Designation	
Starter	Type		Reduction type	
	Model		MT M001T77181	AT M001T75681
	Manufacturer		MITSUBISHI	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	3,000 rpm or more	
	Load characteristics	Voltage	8 V	7.7 V
		Current	280 A or less	300 A or less
		Torque	8.5 N·m (0.87 kg-m, 6.27 ft-lb)	9.81 N·m (1.00 kg-m, 7.24 ft-lb)
		Rotating speed	980 rpm or more	1,000 rpm or more
	Lock characteristics	Voltage	4 V	
		Current	780 A or less	980 A or less
		Torque	17.6 N·m (1.80 kg-m, 13.0 ft-lb) or more	23 N·m (2.3 kg-m, 17 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type	
	Model		A2T39091	
	Manufacturer		MITSUBISHI	
	Voltage and output		12 V — 75 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (when observed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage		$14.5^{+0.3}_{-0.4}$ V [20°C (68°F)]	
Ignition coil	Model		FH0047-01R	
	Manufacturer		DEMCO	
	Primary coil resistance		0.73 Ω±10%	
	Secondary coil resistance		12.8 kΩ±15%	
	Insulation resistance between primary terminal and case		More than 10 MΩ	
Spark plug	Type and manufacturer		Alternate (RC8YC4, RC10YC4 ..... CHAMPION BKR6E-11 ..... NGK K20PR-U11 ..... NIPPONDENSO)	
	Thread size	mm	14, P = 1.25	
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

1. Starter

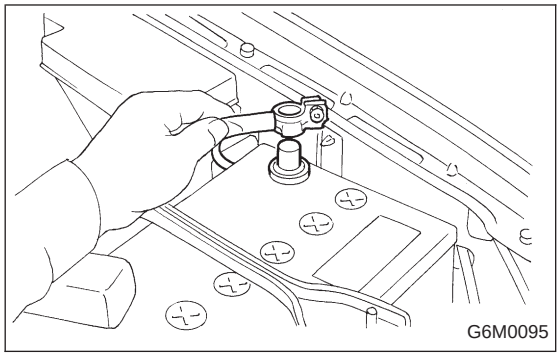


① Sleeve bearing
② Front bracket
③ Lever set
④ Magnet switch Assy
⑤ Yoke
⑥ Gear ASSY
⑦ Shaft ASSY
⑧ Internal gear ASSY
⑨ Over running clutch
⑩ Stopper set
⑪ Packing
⑫ Ball
⑬ Armature
⑭ Brush holder
⑮ Bearing
⑯ Rear bracket

2. Generator



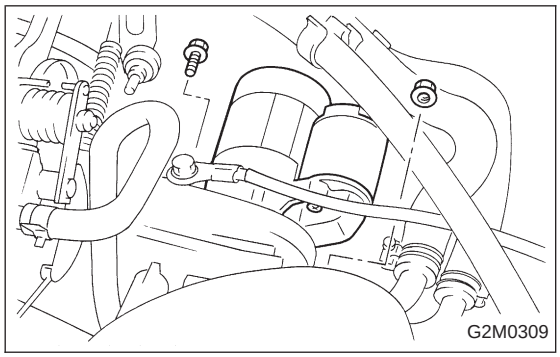
① Pulley
② Front cover
③ Ball bearing
④ Bearing retainer
⑤ Rotor
⑥ Holder
⑦ Bearing
⑧ Stator coil
⑨ Brush holder
⑩ Brush
⑪ IC regulator
⑫ Rear cover
⑬ Terminal


G6M0095

1. Starter

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.
2) Remove air intake chamber. <Ref. to 2-7 [W18A0].>


G2M0309

3) Disconnect connector and terminal from starter.
4) Remove starter from transmission.
5) Installation is in the reverse order of removal.

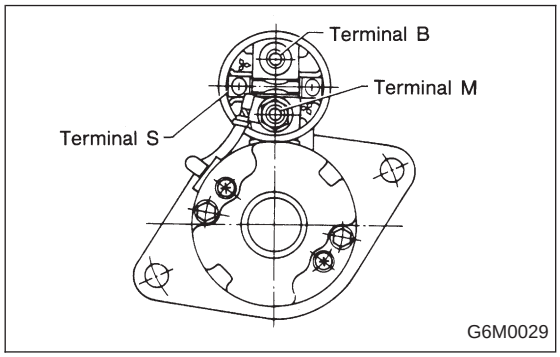
Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 37±2.9 ft-lb)

B: TEST

1. SWITCH ASSEMBLY OPERATION

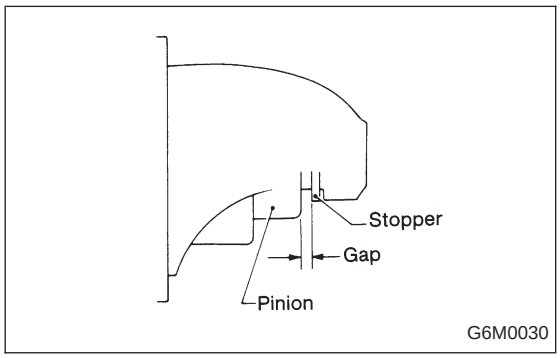
1) Connect terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on shaft.

CAUTION:
With pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.



G6M0029

2) Disconnect connector from terminal M, and connect positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, pinion should return to its original position even when it is pulled out with a screwdriver.



G6M0030

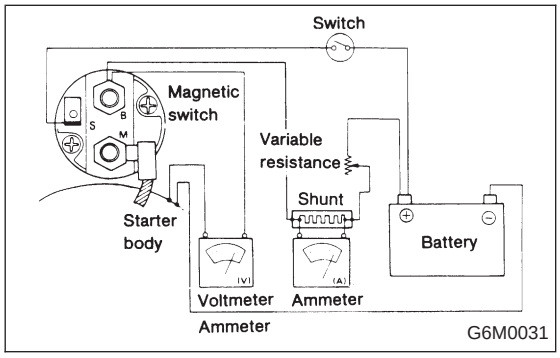
2. PINION GAP

1) With pinion forced endwise on shaft, as outlined in step 1) above, measure pinion gap.

Pinion gap:
0.5 — 2.0 mm (0.020 — 0.079 in)

If motor is running with the pinion forced endwise on the shaft, disconnect connector from terminal M of switch assembly and connect terminal M to ground terminal (−) of battery with a lead wire. Next, gently push pinion back with your fingertips and measure pinion gap.

2) If pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.



3. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.

1) No-load test
With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

No-load test (Standard):
Voltage / Current
11 V / 90 A or less
Rotating speed
3,000 rpm or more

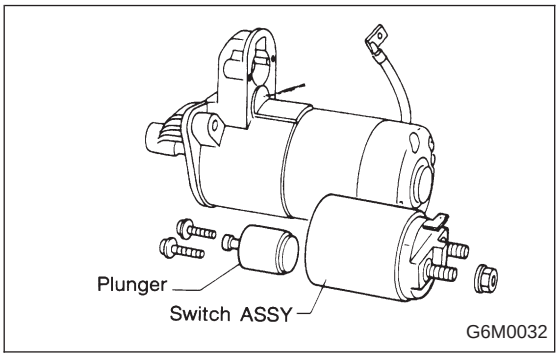
2) Load test
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):
● ***MT vehicles***
Voltage / Load
8 V / 8.5 N·m (0.87 kg-m, 6.27 ft-lb)
Current / Speed
280 A / 980 rpm or more

● ***AT vehicles***
Voltage / Load
7.7 V / 9.81 N·m (1.00 kg-m, 7.24 ft-lb)
Current / Speed
300 A max. / 1,000 rpm or more

3) Lock test
With starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

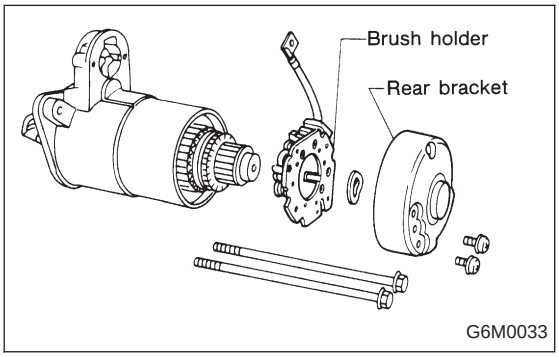
Lock test (Standard):
● ***MT vehicles***
Voltage / Load
4 V / 780 A or less
Torque
17.6 N·m (1.80 kg-m, 13.0 ft-lb) or more
● ***AT vehicles***
Voltage / Current
4 V / 980 A or less
Torque
23 N·m (2.3 kg-m, 17 ft-lb) or more



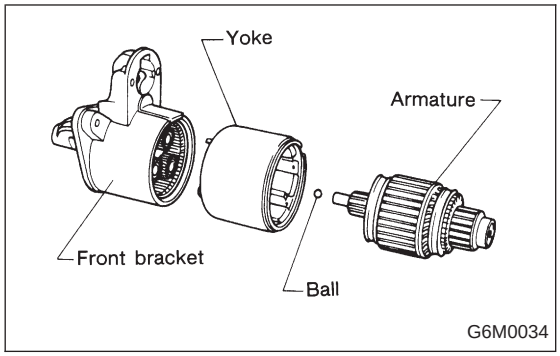
C: DISASSEMBLY

1) Loosen nut which holds terminal M of switch assembly, and disconnect connector.
2) Remove bolts which hold switch assembly, and remove switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:
Be careful because pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

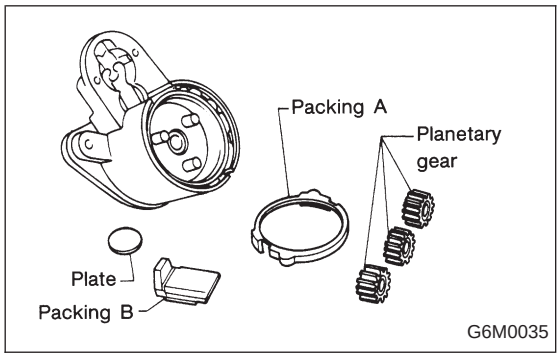


3) Remove both through-bolts and brush holder screws, and detach rear bracket and brush holder.

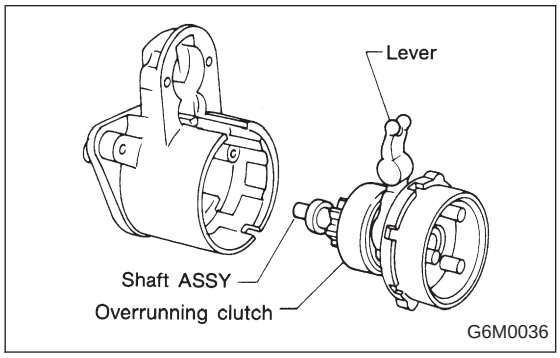


4) Remove armature and yoke. Ball used as a bearing will then be removed from the end of armature.

CAUTION:
Be sure to mark an alignment mark on yoke and front bracket before removing yoke.

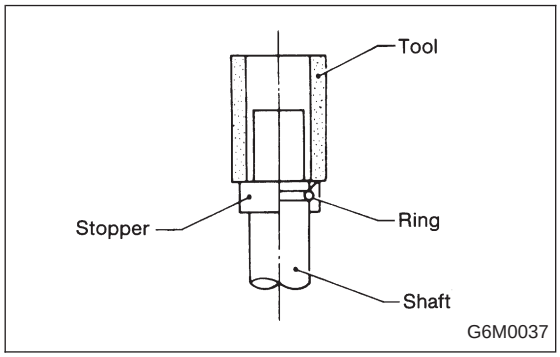


5) Remove packing A, three planetary gears, packing B and plate.



6) Remove shaft assembly and overrunning clutch as a unit.

CAUTION:
Record the direction of lever before removing.



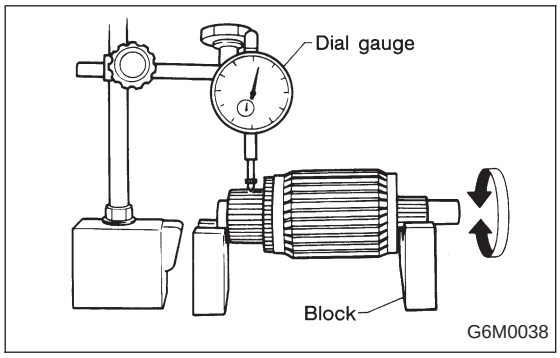
7) Remove overrunning clutch from shaft assembly as follows:

(1) Remove stopper from ring by lightly tapping a fit tool placed on stopper.
(2) Remove ring, stopper and clutch from shaft.

D: INSPECTION

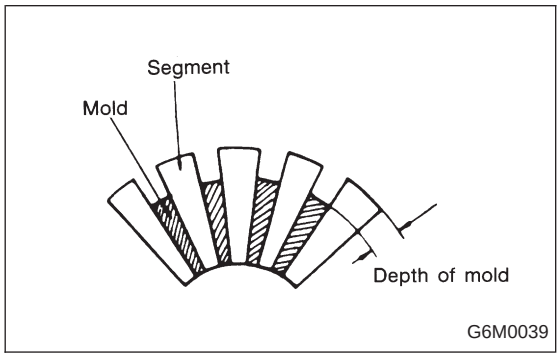
1. ARMATURE

1) Check commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.



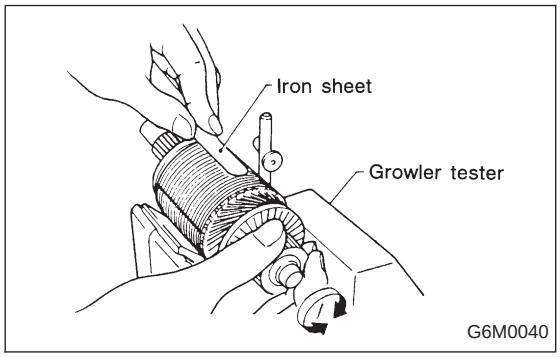
2) Run-out test
Check the commutator run-out and replace if it exceeds the limit.

Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)

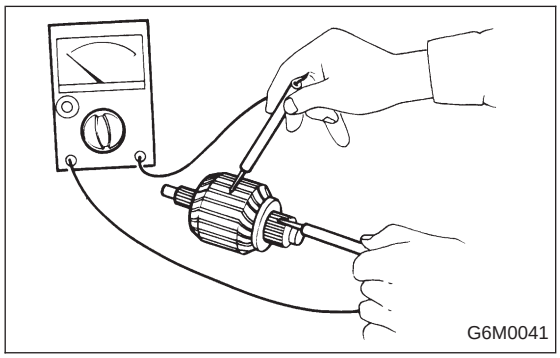


3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 — 0.8 mm (0.020 — 0.031 in)



4) Armature short-circuit test
Check armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



5) Armature ground test
Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is a continuity, armature is grounded.
Replace armature if it is grounded.

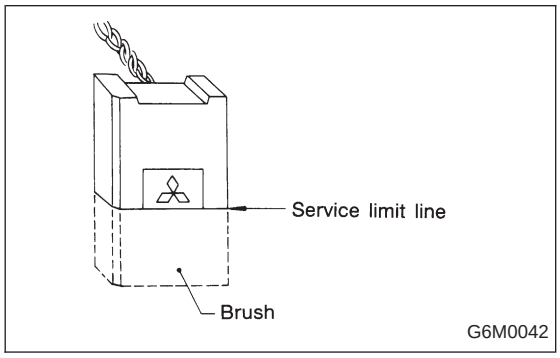
2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it damaged. Rotate pinion in direction of rotation (clockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:
Do not clean overrunning clutch with oil to prevent grease from flowing out.



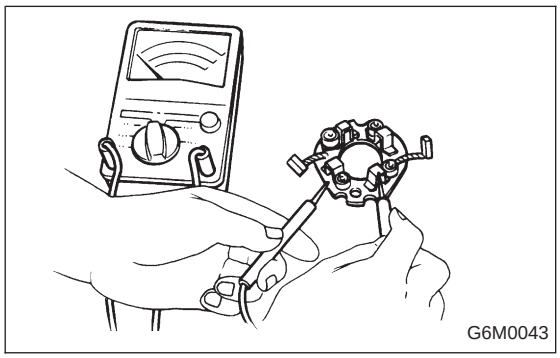
4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length and replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:

Standard	***17.0 mm (0.669 in)***
Service limit	***11.5 mm (0.453 in)***

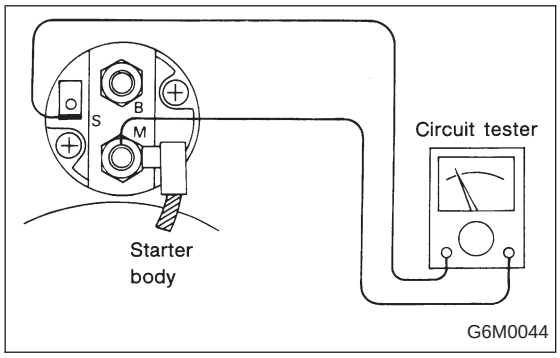
2) Brush movement
Be sure brush moves smoothly inside brush holder.



3) Insulation resistance of brush holder
Be sure there is no continuity between brush holder and its plate.

4) Brush spring force
Measure brush spring force with a spring scale. If it is less than the service limit, replace brush spring.

Brush spring force:
Standard
18.6 N (1.9 kg, 4.2 lb) (when new)
Service limit
6.9 N (0.7 kg, 1.5 lb)



5. SWITCH ASSEMBLY

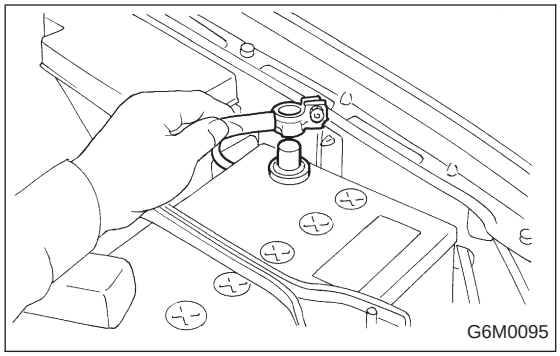
Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:
S — M / 10 Ω or less
S — Ground / 10 Ω or less
M — B / 1 MΩ or more

E: ASSEMBLY

Assembly is in the reverse order of disassembly procedures. Observe the following:
1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.
2) Apply grease to the following parts during assembly.
- Front bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

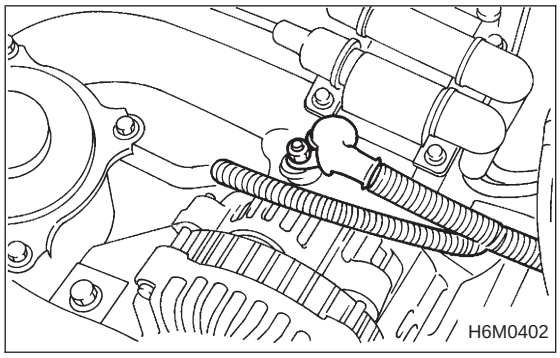
3) After assembling parts correctly, check to be sure starter operates properly.


G6M0095

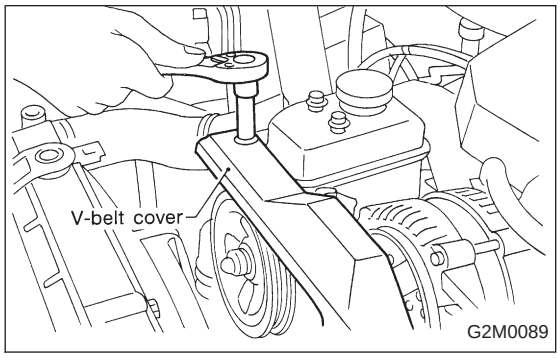
2. Generator

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.

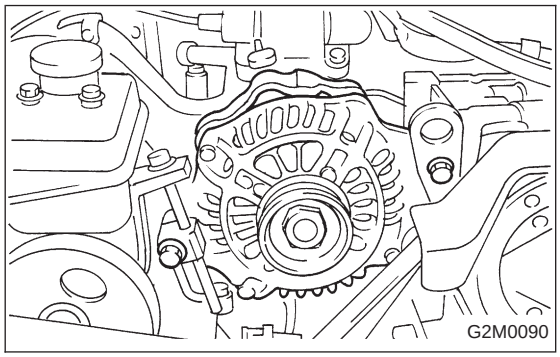

H6M0402

2) Disconnect connector and terminal from generator.

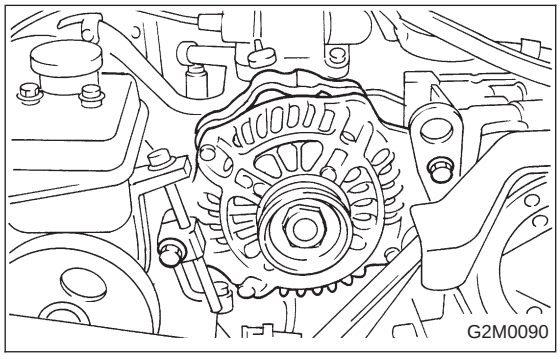


G2M0089

3) Remove V-belt cover.
4) Remove front side V-belt.

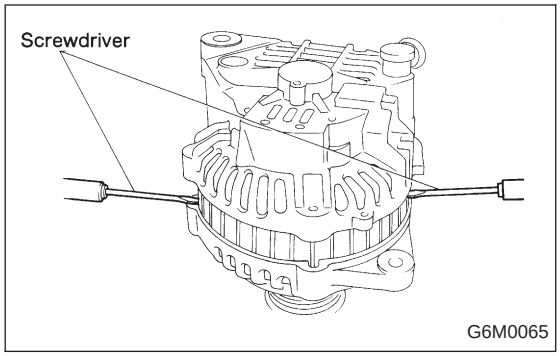

G2M0090

5) Remove bolts which install generator onto bracket.


G2M0090

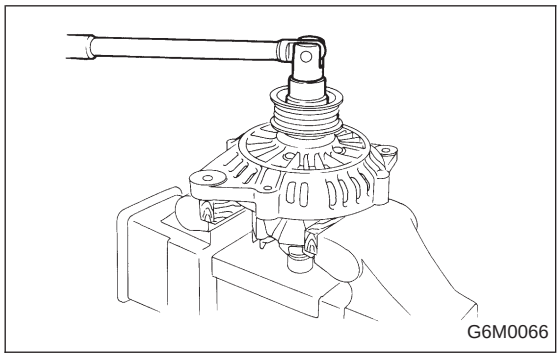
6) Installation is in the reverse order of removal.

CAUTION:
Check and adjust V-belt tension. <Ref. to 1-5 [W1A0].>

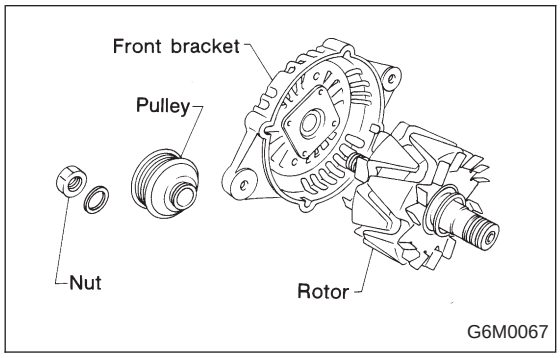


B: DISASSEMBLY

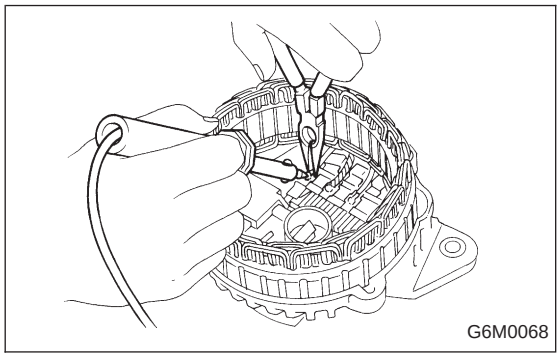
1) Remove the four through bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator core and front bracket. Pry then apart to disassemble.



2) Hold rotor with a vise and remove pulley nut.

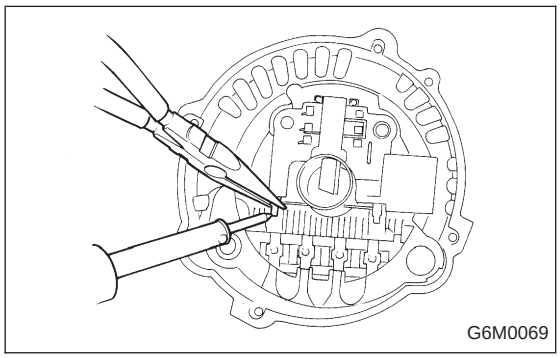


CAUTION:
When holding rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.

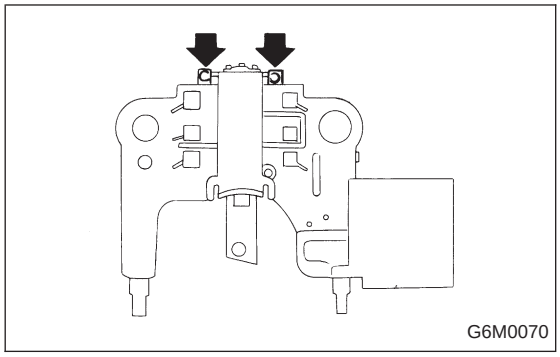


3) Unsolder connection between rectifier and stator coil to remove stator coil.

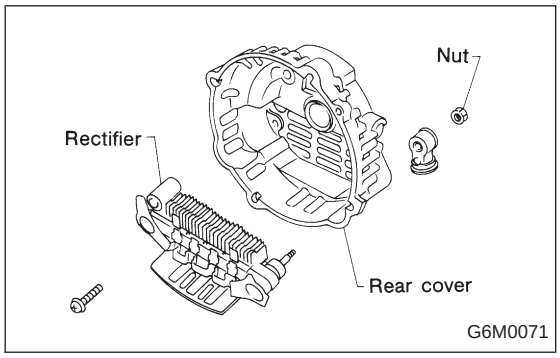
CAUTION:
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



4) Remove screws which secure IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove IC regulator.


G6M0070

5) Remove the brushes by unsoldering at the pigtails.



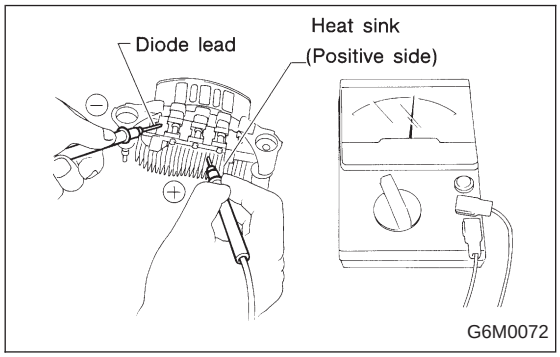
G6M0071

6) Remove the nut and insulating bushing at terminal B. Remove rectifier.

C: INSPECTION AND REPAIR

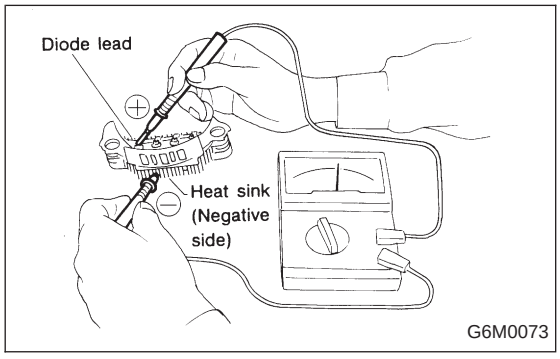
1. DIODE

CAUTION:
Never use a megger tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.



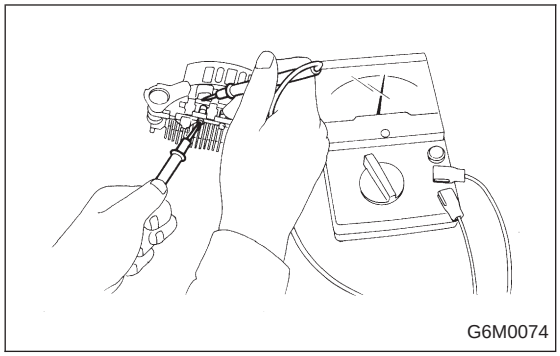
G6M0072

1) Checking positive diode
Check for continuity between the diode lead and the positive side heat sink. The positive diode is in good condition if continuity exists only in the direction from the diode lead to the heat sink.



G6M0073

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if continuity exists only in the direction from the heat sink to the diode lead.


G6M0074

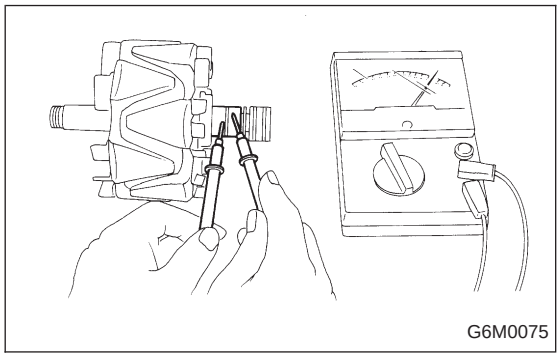
3) Checking trio diode
Check the trio diode using a circuit tester. It is in good condition if continuity exists only in one direction.

2. ROTOR

1) Slip ring surface
Inspect slip rings for contamination or any roughness of the sliding surface. Repair slip ring surface using a lathe or sand paper.

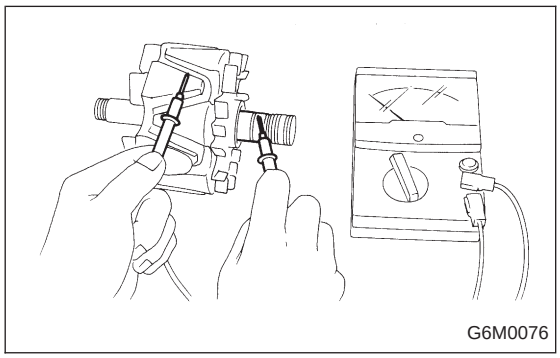
2) Slip ring outer diameter
Measure slip ring outer diameter. If slip ring is worn replace rotor assembly.

Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

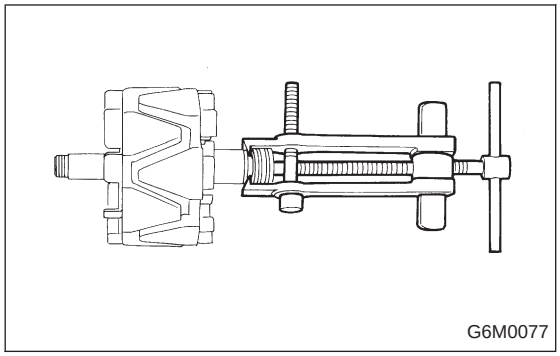

G6M0075

3) Continuity test
Check resistance between slip rings using circuit tester.
If the resistance is not within specification, replace rotor assembly.

Specified resistance:
Approx. 3 Ω (A2T39091)


G6M0076

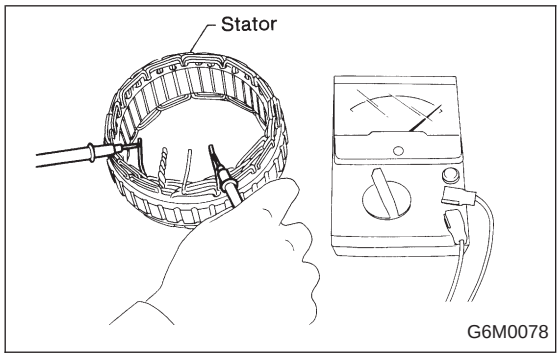
4) Insulation test
Check continuity between slip ring and rotor core or shaft. If continuity exists, the rotor coil is short-circuited, and so replace rotor assembly.


G6M0077

5) Ball bearing (rear side)

(1) Check rear ball bearing. Replace if it is noisy or if rotor does not turn smoothly.

(2) The rear bearing can be removed by using common bearing puller.

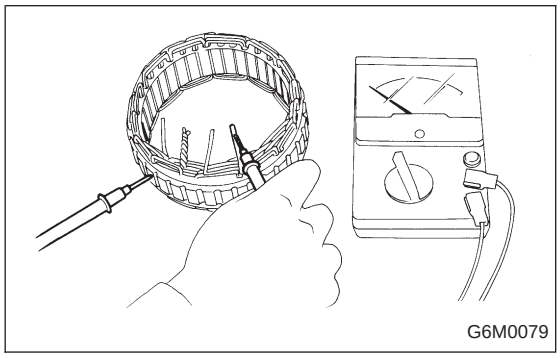


G6M0078

3. STATOR

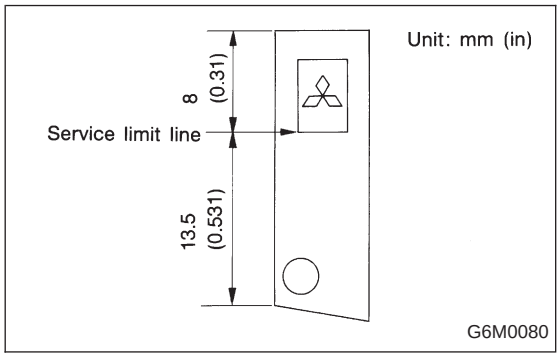
1) Continuity test

Inspect stator coil for continuity between each end of the lead wires. If there is no continuity between individual lead wires, the lead wire is broken, and so replace stator assembly.


G6M0079

2) Insulation test

Inspect stator coil for continuity between stator core and each end of the lead wire. If there is continuity, the stator coil is short-circuited, and so replace stator assembly.



G6M0080

4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark on it.

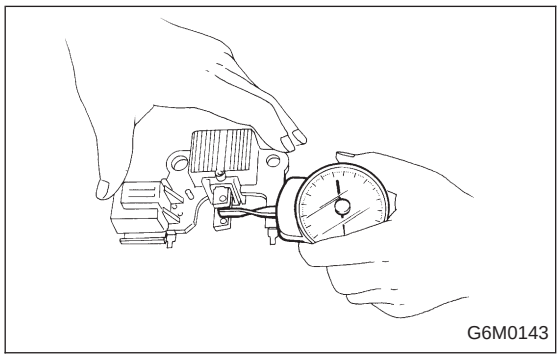
Brush length:

Standard

21.5 mm (0.846 in)

Service limit

8.0 mm (0.315 in)

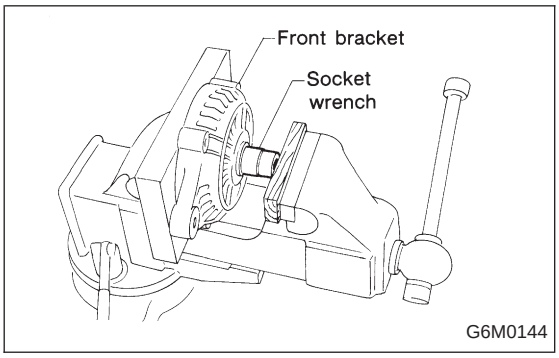

G6M0143

2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 3.236 N (330 g, 11.64 oz), replace the brush spring with a new one. The new spring must have a pressure of 5.786 to 6.963 N (590 to 710 g, 20.81 to 25.04 oz).

5. BEARING (FRONT SIDE)

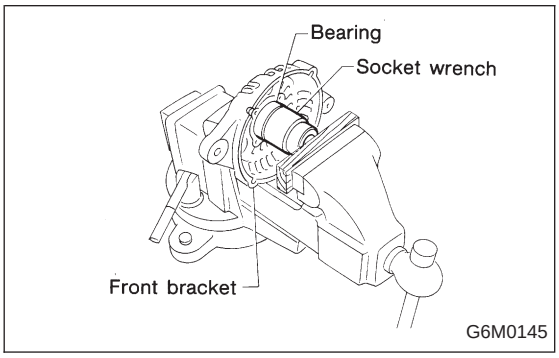
1) Check front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.



2) Replacing front bearing

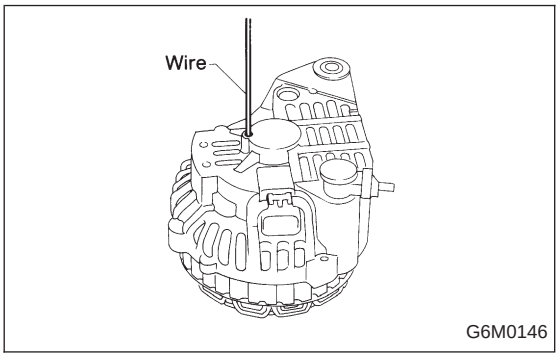
(1) Remove front bearing retainer.

(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.



(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.

(4) Install front bearing retainer.



D: ASSEMBLY

To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.

2) Heat the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket. Then lubricate the rear bracket.

3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

3. Spark Plug

A: REMOVAL AND INSTALLATION

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:
- ***1800 cc model***

NGK: BKR6E-11
CHAMPION: RC8YC4
- ***2200 cc model***

CHAMPION: RC8YC4, RC10YC4
(Alternate)
NGK: BKR6E-11
NIPPONDENSO: K20PR-U11

1) Remove spark plug cords by pulling boot, not cord itself.
2) Remove spark plugs.
3) When installing spark plugs on cylinder head, use spark plug wrench.

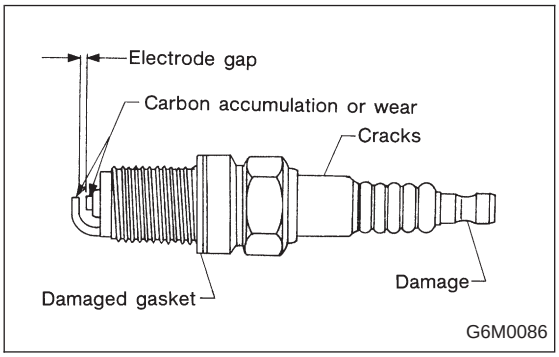
Tightening torque (Spark plug):
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)

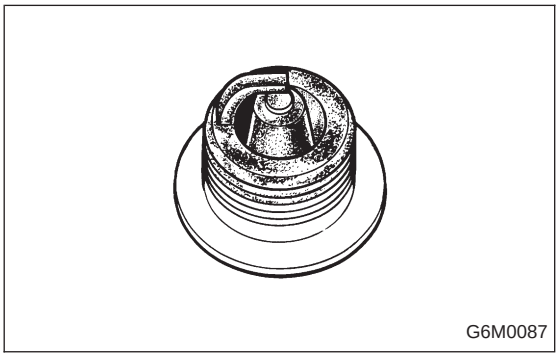
CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid their over-stressing.

4) Connect spark plug cords.

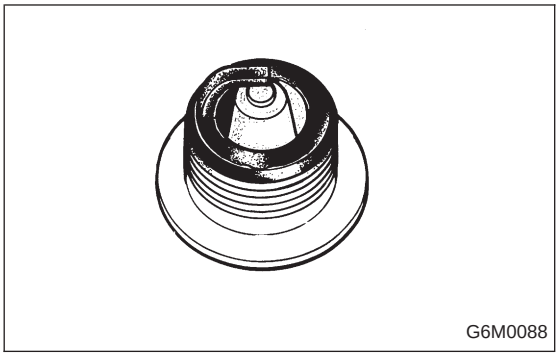
B: INSPECTION

Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

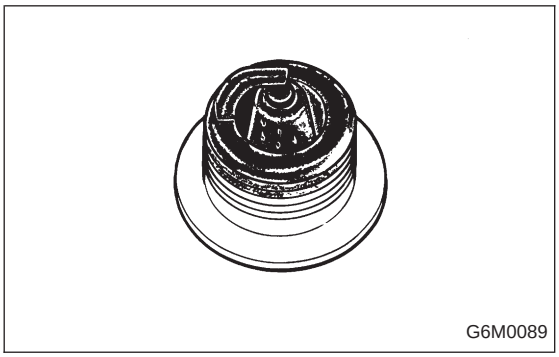




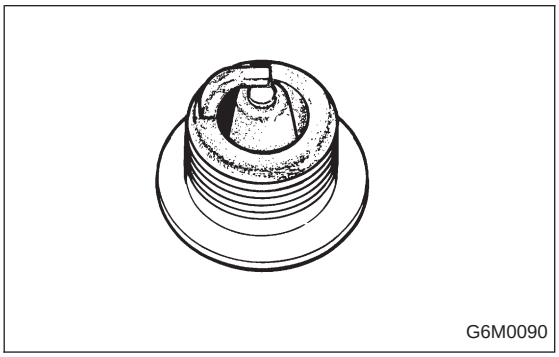
1) Normal
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.


G6M0088

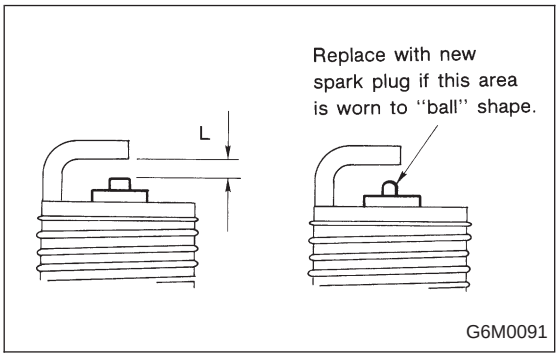
2) Carbon fouled
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


G6M0089

3) Oil fouled
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If same condition remains after repair, use a hotter plug.


G6M0090

4) Overheating
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

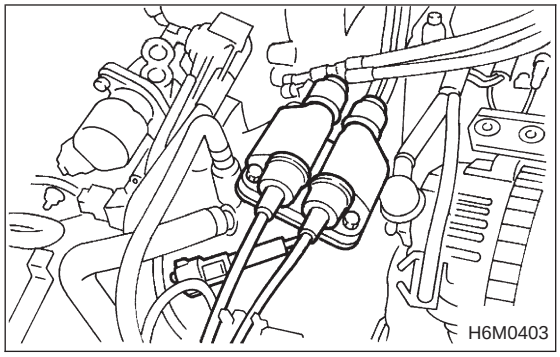


G6M0091

C: CLEANING AND REGAPPING

Clean spark plugs in a sand blast type cleaner.
Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, discard plugs.
After cleaning spark plugs, recondition firing surface of electrodes with file. Then correct the spark plug gap using a gap gauge.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)


H6M0403

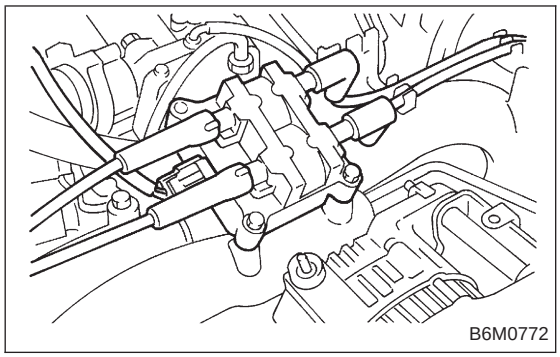
4. Ignition Coil

A: REMOVAL AND INSTALLATION

1. 1800 cc MODEL

1) Disconnect battery ground cable.
2) Disconnect connector from ignition coil.
3) Remove ignition coil.
4) Installation is in the reverse order of removal.

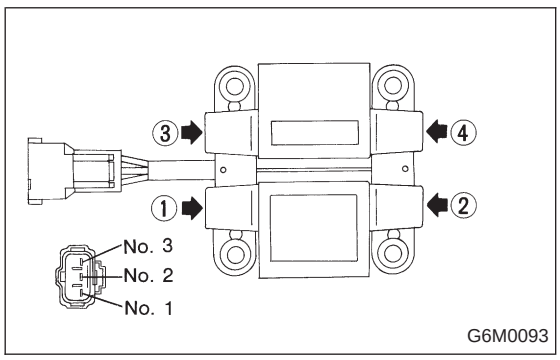
CAUTION:
Be sure to connect wires to their proper positions. Failure to do so will damage unit.


B6M0772

2. 2200 cc MODEL

1) Disconnect battery ground cable.
2) Disconnect connector from ignition coil.
3) Disconnect spark plug cords from ignition coil.
4) Remove ignition coil.
5) Installation is in the reverse order of removal.

CAUTION:
Be sure to connect wires to their proper positions. Failure to do so will damage unit.



G6M0093

B: INSPECTION

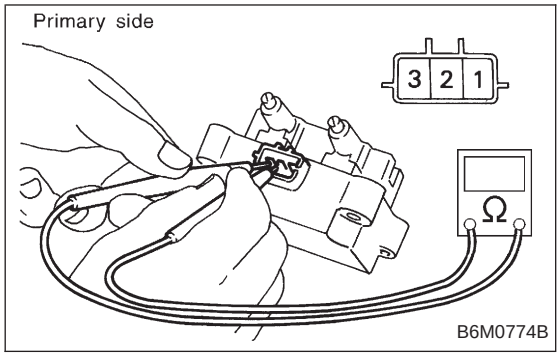
1. 1800 cc MODEL

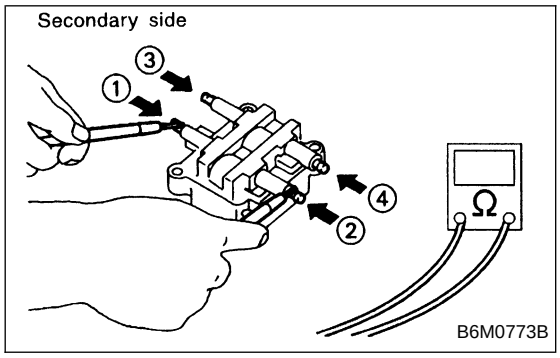
Using accurate tester, inspect the following items, and replace if defective.
1) Primary resistance
2) Secondary coil resistance

CAUTION:
If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:
[Primary side]
Between terminal No. 1 and No. 2
Between terminal No. 2 and No. 3
0.62 — 0.76 Ω
[Secondary side]
Between ① and ②
Between ③ and ④
17.9 — 24.5 kΩ

3) Insulation between primary terminal and case: 10 MΩ or more.





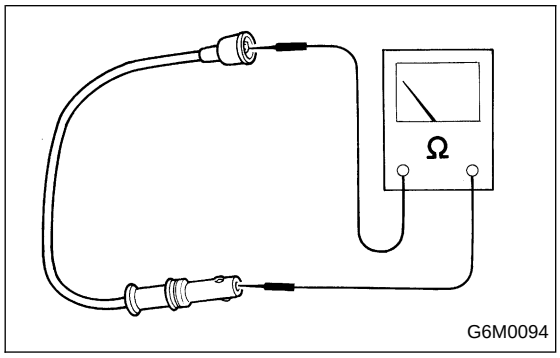
2. 2200 cc MODEL

Using accurate tester, inspect the following items, and replace if defective.
1) Primary resistance
2) Secondary coil resistance

CAUTION:
If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:
[Primary side]
Between terminal No. 1 and No. 2
Between terminal No. 2 and No. 3
0.73 Ω±10%
[Secondary side]
Between ① and ②
Between ③ and ④
12.8 kΩ±15%

3) Insulation between primary terminal and case: 10 MΩ or more.



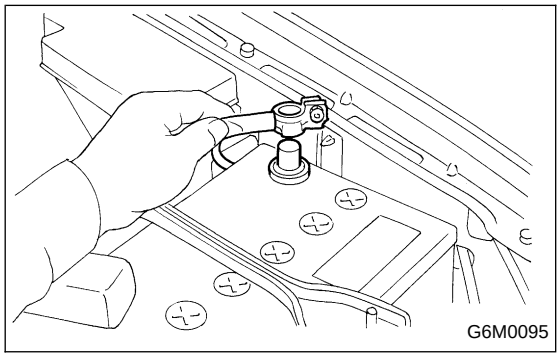
5. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, buring or rust formation of terminals
2) Resistance values of cords

Resistance value:

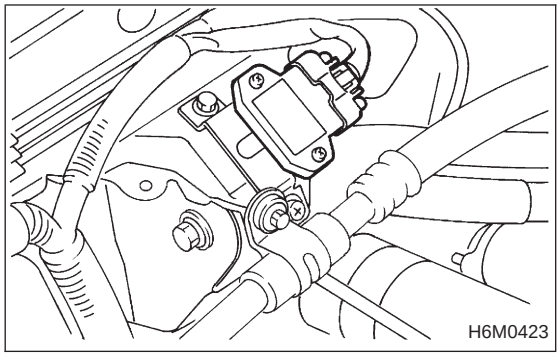
- ***1800 cc model***
  #1 and #3 cords 4.95 — 11.56 kΩ
  #2 cord 4.86 — 11.33 kΩ
  #4 cord 5.24 — 12.23 kΩ
- ***2200 cc model***
  5.12 — 12.34 kΩ



6. Ignitor

A: REMOVAL AND INSTALLATION

1) Disconnect battery ground cable.
2) Remove intake air chamber. <Ref. to 2-7 [W18A0].>



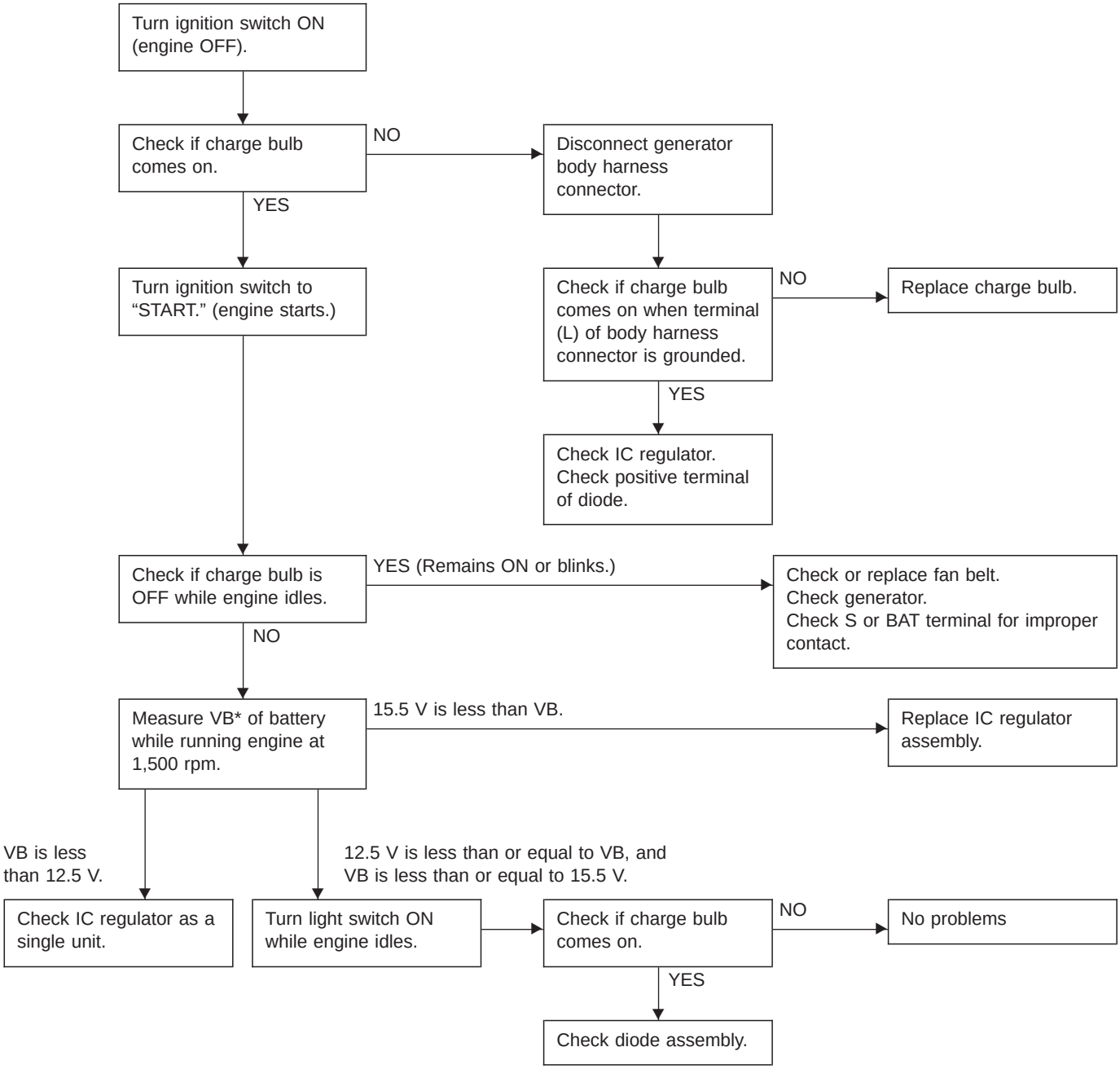
3) Disconnect connector from ignitor.
4) Remove screws which hold ignitor onto body.
5) Installation is in the reverse order of removal.

1. General Diagnostics

A: STARTER

Trouble		Probable cause
Starter does not start.	Magnet switch does not operate. (no clicks are heard.)	Magnet switch poor contact or discontinuity of pull-in coil circuit
		Improper sliding of magnet switch plunger
	Magnet switch operates. (clicks are issued.)	Poor contact of magnet switch's main contact point
		Layer short of armature
		Contaminants on armature commutator
		High armature mica
		Improper grounding of yoke field coil
		Insufficient carbon brush length
		Insufficient brush spring pressure
Starter starts but does not crank engine.	Failure of pinion gear to engage ring gear	Worn pinion teeth
		Improper sliding of overrunning clutch
		Improper adjustment of stud bolt
	Clutch slippage	Faulty clutch roller spring
Starter starts but engine cranks too slowly.		Poor contact of magnet switch's main contact point
		Layer short of armature
		Discontinuity, burning or wear of armature commutator
		Poor grounding of yoke field coil
		Insufficient brush length
		Insufficient brush spring pressure
		Abnormal brush wear
Starter overruns.		Magnet switch coil is a layer short.

B: GENERATOR



*: Terminal voltage

BODY ELECTRICAL SYSTEM 6-2

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PRECAUTION FOR SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The Supplemental Restraint System "Airbag" helps to reduce the risk or severity of injury to the driver in a frontal collision.

The Supplemental Restraint System consists of an airbag module (located in the center of the steering wheel), sensors, a control module, warning light, wiring harness and roll connector.

Information necessary to service the safety is included in the "5-5. SUPPLEMENTAL RESTRAINT SYSTEM" of this Service Manual.

WARNING:

- **To avoid rendering the Airbag system inoperative, which could lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized SUBARU dealer.**
- **Improper maintenance, including incorrect removal and installation of the Airbag system, can lead to personal injury caused by unintentional activation of the Airbag system.**
- **All Airbag system electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the Supplemental Restraint System "Airbag".**

1. Body Electrical

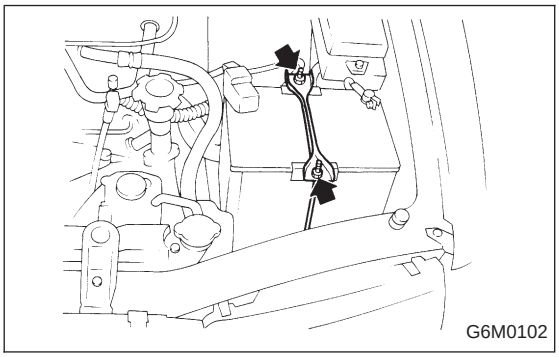
Battery	Type		MT model: 55D23L (MF) AT model: 75D23L (MF)
	Capacity	Reverse capacity	MT model: 100 minutes AT model: 120 minutes
		Cold cranking ampere	MT model: 430 amperes AT model: 520 amperes
Combination meter	Speedometer		Eddy current type
	Temperature gauge		Thermistor cross coil type
	Fuel gauge		Resistance cross coil type
	Tachometer		Electric impulse type
	Turn signal indicator light		12 V — 1.4 W
	Charge indicator light		12 V — 1.4 W
	Oil pressure indicator light		12 V — 1.4 W
	ABS warning light		12 V — 1.4 W
	CHECK ENGINE warning light (Malfunction indicator light)		12 V — 1.4W
	HI-beam indicator light		12 V — 3.4 W
	Door open warning light		12 V — 1.4 W
	Seat belt warning light		12 V — 1.4 W
	Brake fluid and parking brake warning light		12 V — 3.4 W
	FWD indicator light		12 V — 1.4 W
	AIRBAG warning light		12 V — 1.4 W
	Meter illumination light		12 V — 3.4 W
	AT OIL TEMP. warning light		12 V — 1.4 W
Headlight			12 V — 60/55 W (Halogen)
Front turn signal light			12 V — 27 W
Side turn signal light			12 V — 3.8 W
Side marker/Parking light			12 V — 3.8 W
Rear combination light		Tail/Stop light	12 V — 8/27 W
		Turn signal light	12 V — 27W
		Back-up light	12 V — 27 W
License plate light			12 V — 3.8 W
High-mount stop light			Sedan: 12 V — 18 W Wagon: 12 V — 13 W
Room light			12 V — 8 W
Spot light			12 V — 8 W
Trunk room light			12 V — 5 W
Luggage room light			12 V — 5 W
Front wiper motor	Input		12 V — 54 W or less
Rear wiper motor	Input		12 V — 42 W or less
Front washer motor	Pump type		Centrifugal
	Input		12 V — 36 W or less
Rear washer motor	Pump type		Centrifugal
	Input		12 V — 36 W or less
Horn			12 V — 350 Hz
Cigarette lighter	Input		12 V — 120 W
Rear window defogger	Input		12 V — 160 W
	Indicator light		12 V — 50 mA
Cargo socket	Input		12 V — 120 W

1. Precaution

● Before disassembling or reassembling parts, always disconnect battery ground cable. When repairing radio, control units, etc. which are provided with memory functions, record memory contents before disconnecting battery ground cable. Otherwise, these contents are cancelled upon disconnection.
● Reassemble parts in reverse order of disassembly procedure unless otherwise indicated.
● Adjust parts to specifications contained in this manual if so designated.
● Connect connectors and hoses securely during reassembly.
● After reassembly, ensure functional parts operate smoothly.

CAUTION:
● Airbag system wiring harness is routed near the electrical parts and switch.

● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the ignition key cylinder.


G6M0102

2. Battery

A: REMOVAL AND INSTALLATION

1) Disconnect the positive (+) terminal after disconnecting the negative (−) terminal of battery.
2) Remove flange nuts from battery rods and take off battery holder.
3) Remove battery.
4) Installation is in the reverse order of removal.

Tightening torque:
3.4±1.0 N·m (0.35±0.1 kg-m, 2.5±0.7 ft-lb)

NOTE:
● Clean battery cable terminals and apply grease to retard the formation of corrosion.
● Connect the positive (+) terminal of battery and then the negative (−) terminal of the battery.

B: INSPECTION

WARNING:

- **Electrolyte has toxicity; be careful handling the fluid.**
- **Avoid contact with skin, eyes or clothing. Especially at contact with eyes, blush with water for 15 minutes and get prompt medical attention.**
- **Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.**
- **Ventilate when charging or using in enclosed space.**
- **For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.**
- **Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.**
- **To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it WHILE you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.**

1. BATTERY

1) External parts:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

2) Electrolyte level:

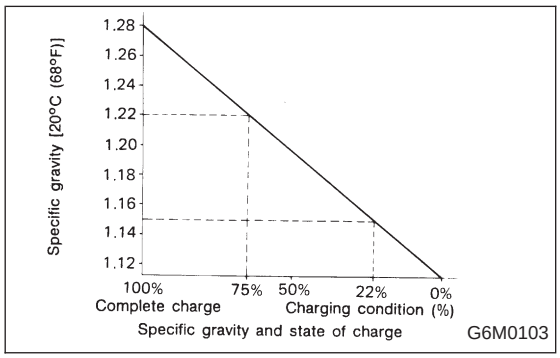
Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3) Specific gravity of electrolyte:

(1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following Equation:

S_{20} = St + 0.0007 x (t − 20)

S_{20}:Specific gravity corrected at electrolyte temperature of 20°C
St :Measured specific gravity
t :Measured temperature (°C)



Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]

(2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

C: CHARGING

WARNING:
● Do not bring an open flame close to the battery at this time.

CAUTION:
● Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
● Be careful since battery electrolyte overflows while charging the battery.
● Observe instructions when handling battery charger.
● Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere- hour rating.

2. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
● Observe the items in 1. NORMAL CHARGING.
● Never use more than 10 amperes when charging the battery because that will shorten battery life.

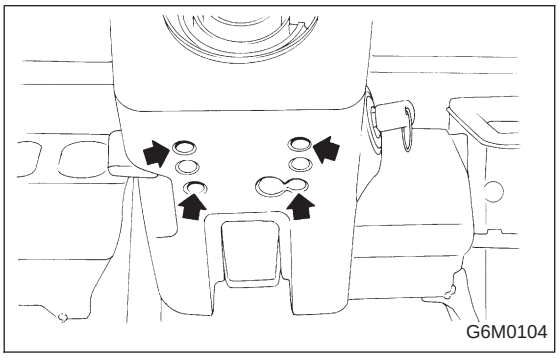
3. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

4. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

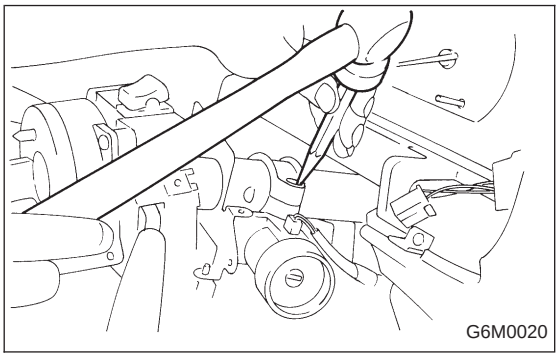
*: Check electrical system before replacement.


G6M0104

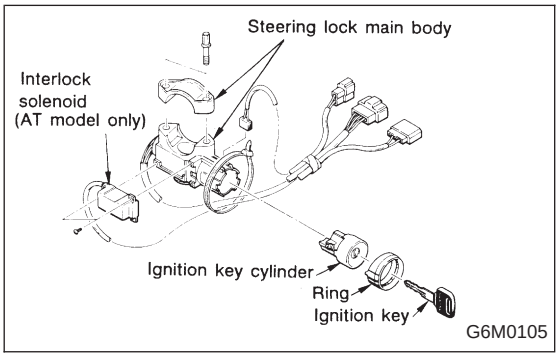
3. Ignition Switch

A: REMOVAL AND INSTALLATION

1) Remove screws, separate upper column cover and lower column cover.
2) Remove knee protector.
3) Remove meter visor.


G6M0020

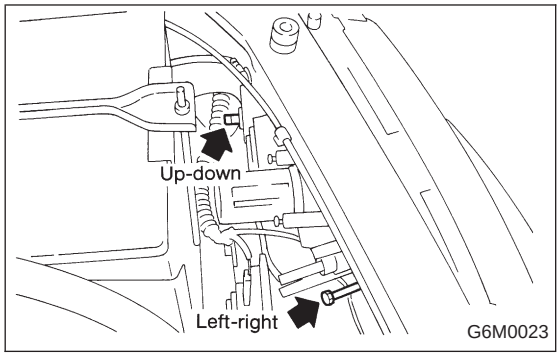
4) Disconnect ignition switch connector from body harness.
5) Using a drift and hammer, hit the torn bolt head to loosen and remove the ignition switch.



G6M0105

6) Installation is in the reverse order of removal.

NOTE:
When installing, tighten the connecting bolt until its head twists off.



4. Lighting

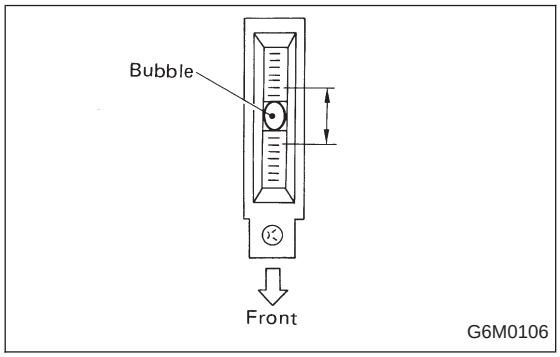
A: ADJUSTMENT

1. HEADLIGHT AIMING

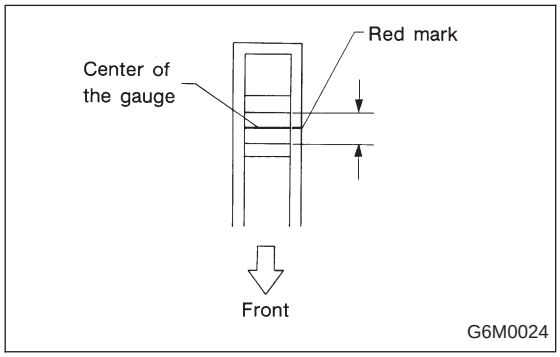
1) Adjust the headlight aiming by turning the adjusting screws.

CAUTION:
Before checking the headlight aiming, be sure of the following:
- **Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.**
- **The area around the headlight has not sustained any accident, damage or other type of deformation.**
- **Vehicle is parked on level ground.**
- **The inflation pressure of tires is correct.**
- **Vehicle's gas tank is fully charged.**
- **Bounce the vehicle several times to normalize the suspension.**
- **Make certain that someone is seated in the driver's seat.**

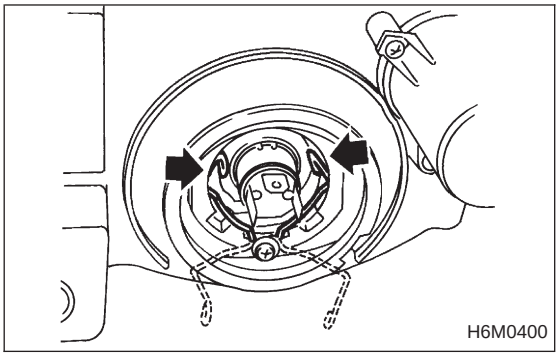
NOTE:
Adjust vertical aim first, then horizontal aim.



2) Look at the beam angle gauge (vertical movement). The bubble on the gauge should not deviate from the center of the gauge.



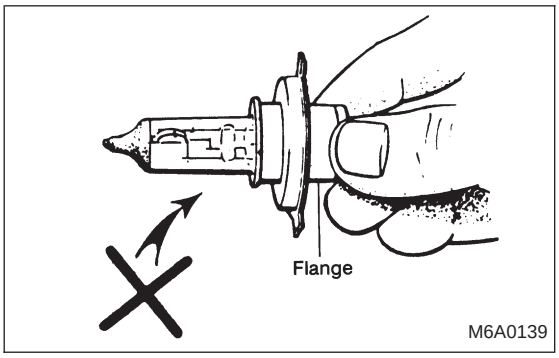
3) Look at the beam angle gauge (horizontal movement). The center mark (the red line on the inner scale) should not deviate from the red line on the outer case.


H6M0400

B: REMOVAL AND INSTALLATION

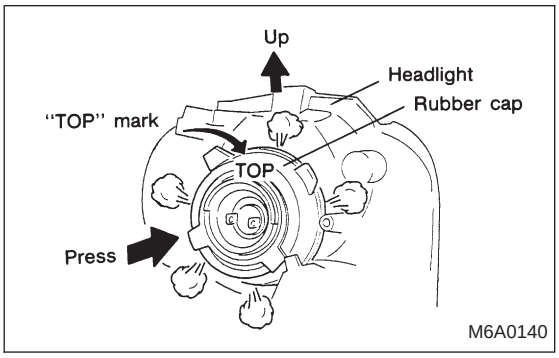
1. HEADLIGHT BULB

1) Disconnect the connector from inside of the engine compartment.
2) Remove rubber cap.
3) Remove the light bulb retaining spring to remove the bulb.
4) Replace the bulb with a new one and hook the spring.
5) Attach the rubber cap and connect the connector.



M6A0139

CAUTION:
● Since the tungsten halogen bulb operates at high temperature, dirt and oil on the bulb surface decreases the bulb's useful life. When replacing the bulb, hold the flange portion and do not touch the glass portion.

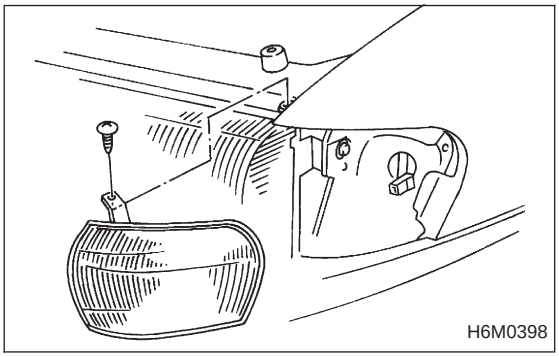


M6A0140

● Attach the rubber cap with letters TOP on the top so that the drain hole will be on the lower side.
● To keep water out, correctly engage the groove portion of the rubber cap.

2. HEADLIGHT AND SIDE MARKER LIGHT

1) Remove front grille and disconnect connector from headlight.
2) Remove screws which secure side marker light.
3) Remove side marker light while disconnecting connector.

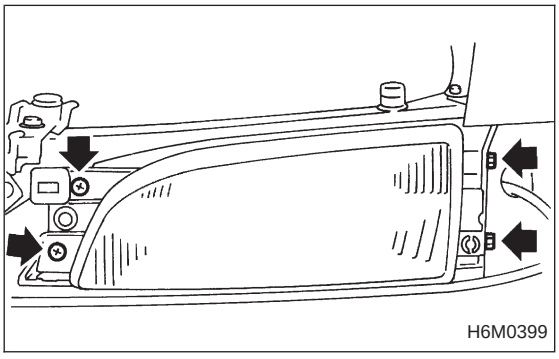

H6M0398

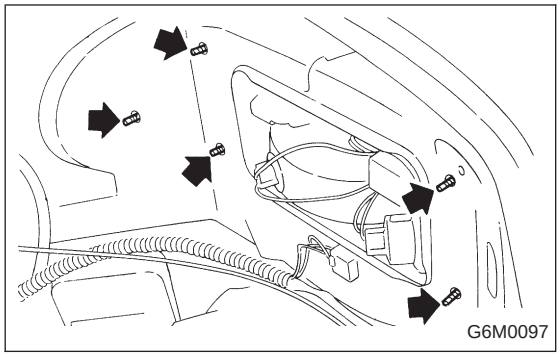
4) Remove screws and bolts which secure headlight and remove headlight.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

5) Installation is in the reverse order of removal.

NOTE:
When installing, securely fit clip (on fender side) into locating (on side marker light side).


H6M0399


G6M0097

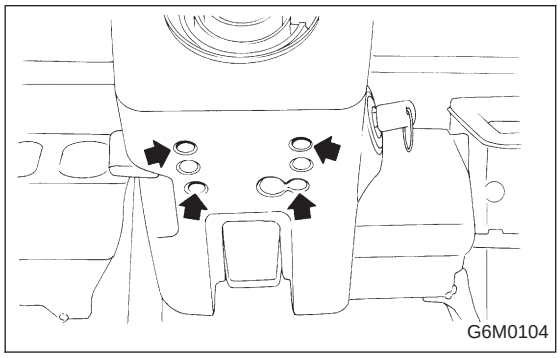
3. REAR COMBINATION LIGHT

1) Remove rear trim.
2) Remove nuts and disconnect connector.

Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

3) Attach adhesive cloth tape to body area around rear combination light.
4) Using a standard screwdriver, carefully pry rear combination light off and away from the front of vehicle.
5) Installation is in the reverse order of removal.

CAUTION:
● Do not pry rear combination light forcefully as this may scratch vehicle body.
● Remove all traces of adhesive tape from body before installation.
● Attach butyl rubber tape to back of rear combination light before installing rear combination light on body for sealing purposes.


G6M0104

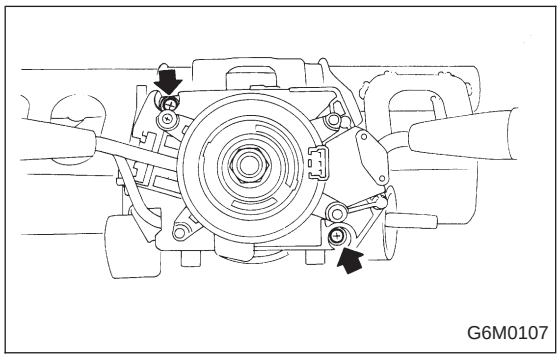
4. COMBINATION SWITCH (WITHOUT AIRBAG MODEL)

NOTE:
For the removal procedure of combination switch, refer to procedure for removal of combination switch on airbag equipped model. <Ref. to 5-5 [W6A0].>

1) Remove steering wheel.
2) Remove screws which secure upper column cover to lower column cover.
3) Remove screws which secure knee protector and remove knee protector.

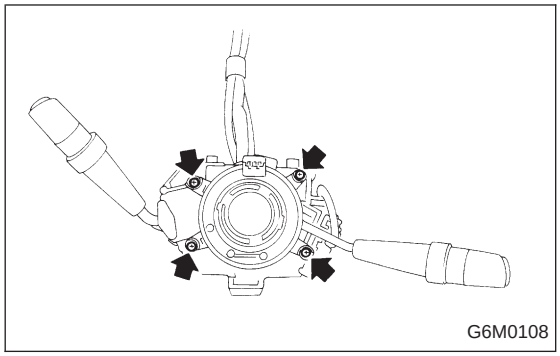
CAUTION:
When installing knee protector, ensure that harness is not caught by adjacent parts.

4) Disconnect connector from body harness and undo holddown band.


G6M0107

5) Remove screws which secure switch and remove switch.
6) Installation is in the reverse order of removal.

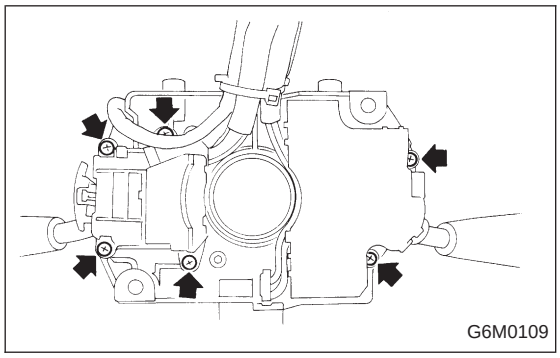
CAUTION:
During installation (with key interlock):
● When routing combination switch harness around steering system, do not place it over key interlock release knob.
● After installing lower column cover, ensure that key interlock release knob is accessible.


G6M0108

C: DISASSEMBLY AND ASSEMBLY

1. COMBINATION SWITCH

1) Remove screws which secure slip ring to combination switch, and remove slip ring.

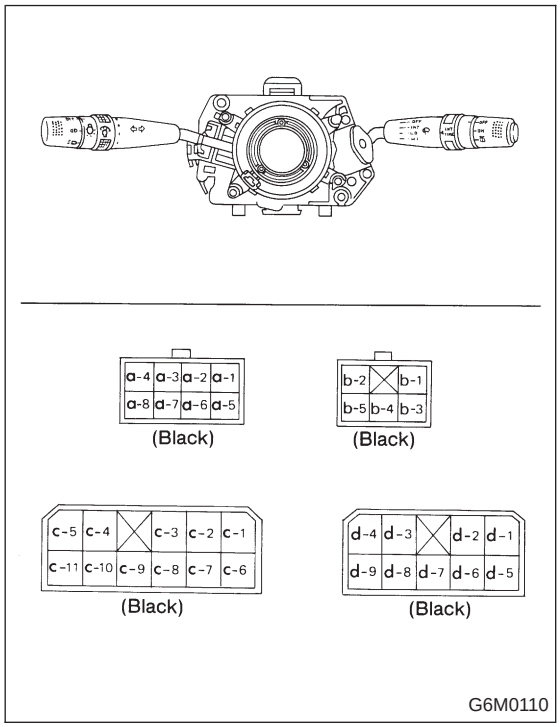

G6M0109

2) Remove screws which secure lighting switch, wiper and washer switch. Remove both switches.
3) Assembly is in the reverse order of disassembly.

D: INSPECTION

1. COMBINATION SWITCH (ON-CAR)

1) Remove instrument panel lower cover.
2) Remove lower column cover.



G6M0110

3) Unfasten holddown clip which secures harness, and disconnect connectors from body harness.

4) Move combination switch to respective positions and check continuity between terminals.

LIGHTING SWITCH

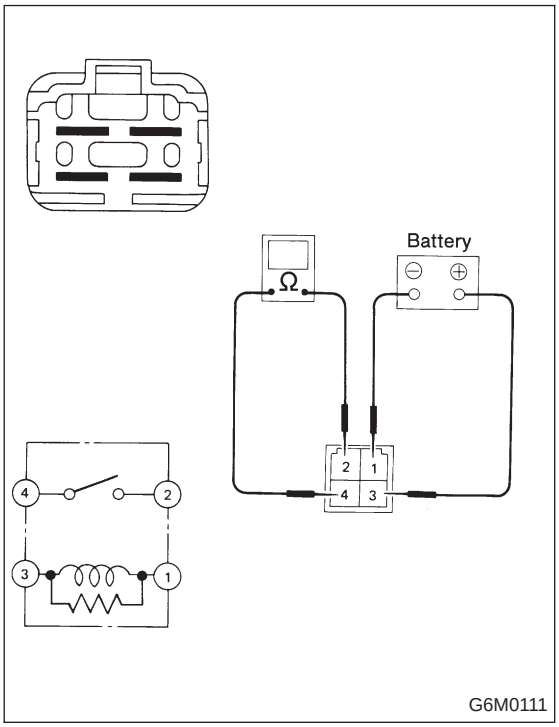
Terminal (Wire color) / Switch position	c-1 (W)	c-2 (W)	c-3 (R)
OFF			
Tail	○	○	
Head	○	○	○

PARKING SWITCH

Terminal (Wire color) / Switch position	c-10 (R)	c-11 (RG)	c-9 (RW)
OFF	○	○	
ON		○	○

DIMMER AND PASSING SWITCH

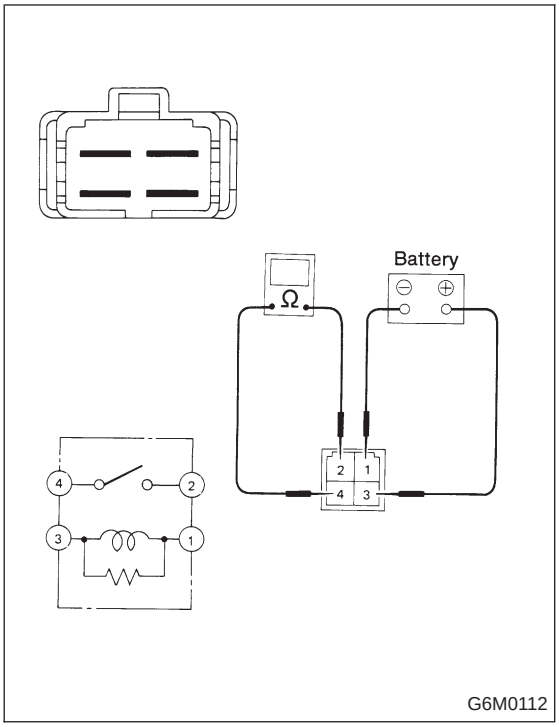
Terminal (Wire color) / Switch position	a-3 (B)	a-2 (RB)	a-1 (RY)	a-4 (YR)
Flash	○		○	○
Low beam	○	○		
HI-beam	○		○	



2. HEADLIGHT RELAY

Check continuity between terminals when terminal No. 3 is connected to battery and terminal No. 1 is grounded.

When current flows.	Between terminals No. 2 and No. 4	Continuity exists.
When current does not flow.	Between terminals No. 2 and No. 4	Continuity does not exist.
	Between terminals No. 1 and No. 3	Continuity exists.

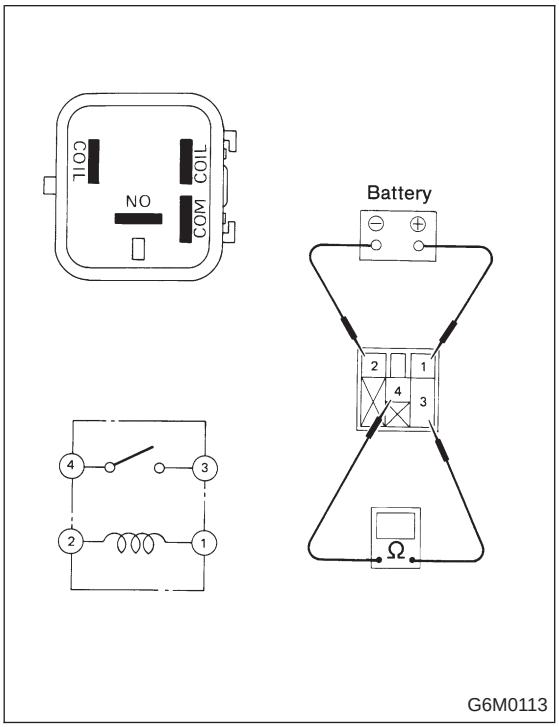


G6M0112

3. TAIL AND ILLUMINATION RELAY

Check continuity between terminals (indicated in table below) when terminal No. 3 is connected to battery and terminal No. 1 is grounded.

When current flows.	Between terminals No. 2 and No. 4	Continuity exists.
When current does not flow.	Between terminals No. 2 and No. 4	Continuity does not exist.
	Between terminals No. 1 and No. 3	Continuity exists.

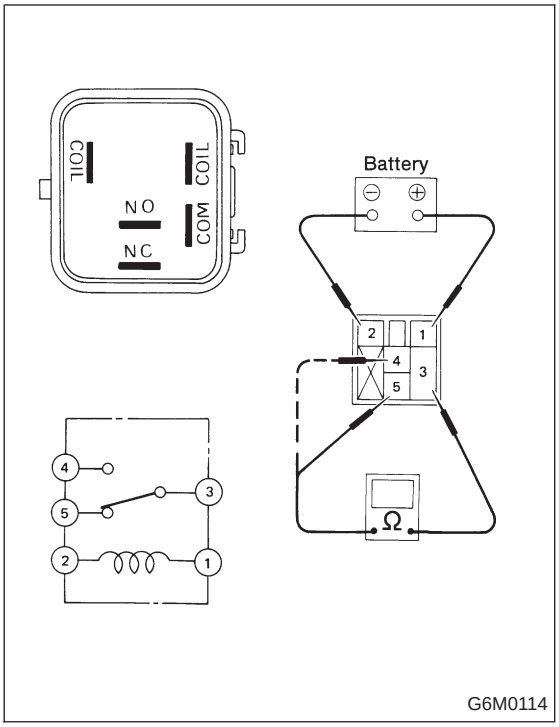


G6M0113

4. DAYTIME RUNNING LIGHT RELAY

1) Check continuity between terminals when terminal No. 1 is connected to battery and terminal No. 2 is grounded.

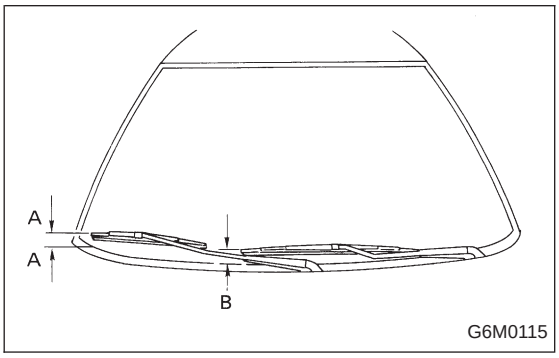
When current flows.	Between terminals No. 3 and No. 4	Continuity exists.
When current does not flow.	Between terminals No. 3 and No. 4	Continuity does not exist.
	Between terminals No. 1 and No. 2	Continuity exists.



G6M0114

2) Check continuity between terminals when terminal No. 1 is connected to battery and terminal No. 2 is grounded.

When current flows.	Between terminals No. 3 and No. 5	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.
When current does not flow.	Between terminals No. 3 and No. 5	Continuity exists.
	Between terminals No. 3 and No. 4	Continuity does not exist.
	Between terminals No. 1 and No. 2	Continuity exists.



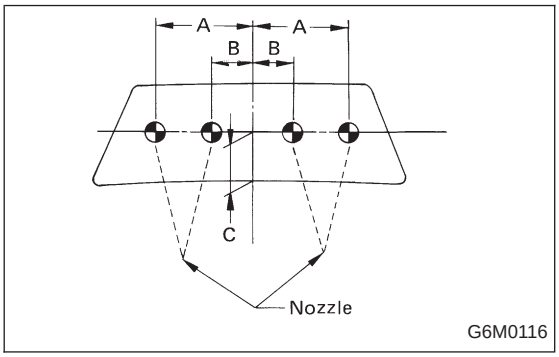
G6M0115

5. Front Wiper and Washer

A: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) Adjust blades in original position as shown in figure by changing wiper arm installation.

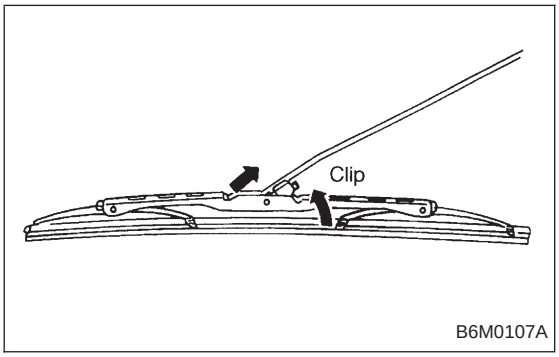
Original position:
A: 22.5±7.5 mm (0.886±0.295 in)
B: 32.5±7.5 mm (1.280±0.295 in)



G6M0116

3) Adjust washer ejecting point on windshield glass as shown in figure when car stops.

Ejecting point:
A: 375 mm (14.76 in)
B: 150 mm (5.91 in)
C: 350 mm (13.78 in)

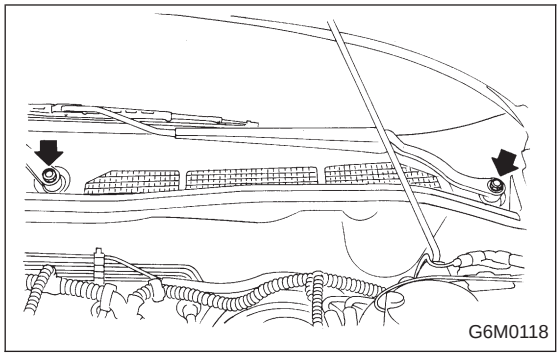


B6M0107A

B: REMOVAL AND INSTALLATION

1. BLADE

1) Pull out blade following the arrow direction, from arm while pushing up locking clip.
2) Installation is in the reverse order of removal.


G6M0118

2. WIPER ARM

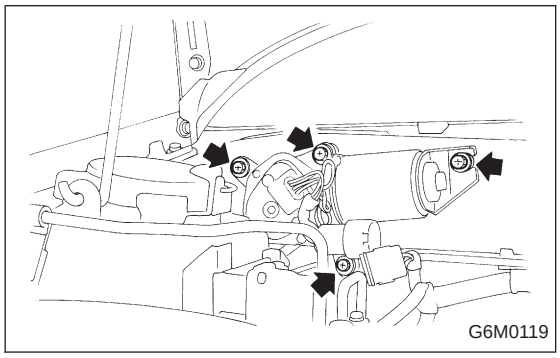
1) Open front hood.
2) Remove cap. Remove the nut which secure wiper arm, and remove wiper arm.
3) Installation is in the reverse order of removal.

Tightening torque:
14±4 N·m (1.4±0.4 kg-m, 10.1±2.9 ft-lb)

3. WIPER MOTOR AND LINK

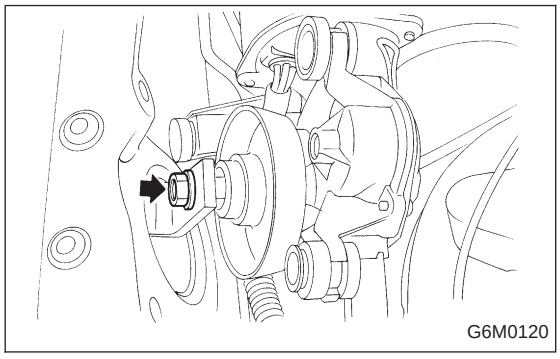
1) Detach weatherstrip and cowl panel. <Ref. to 5-1 [W11A0].>

NOTE:
Apply silicone oil or soap water to both sides of cowl net to facilitate removal.


G6M0119

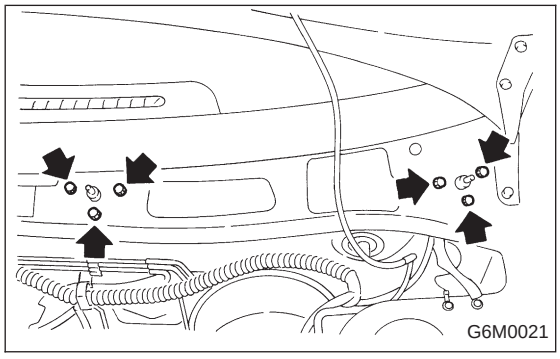
2) Disconnect electric connector, and remove motor attaching bolts.

Tightening torque:
5.9±1.5 N·m (0.6±0.15 kg-m, 4.3±1.1 ft-lb)


G6M0120

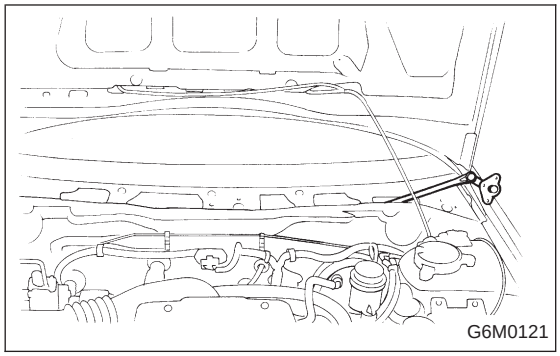
3) Remove nut securing motor link on the back side of motor.

Tightening torque:
15±3 N·m (1.5±0.3 kg-m, 11±2.2 ft-lb)

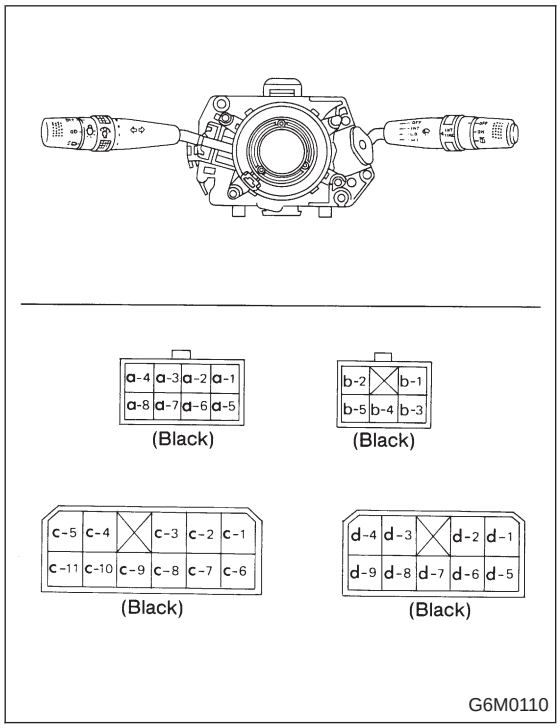

G6M0021

4) Remove nuts which secure sleeve unit.

Tightening torque:
5.9±1.5 N·m (0.6±0.15 kg-m, 4.3±1.1 ft-lb)


G6M0121

5) Remove wiper link from service hole in front panel.
6) Installation is in the reverse order of removal.



G6M0110

C: INSPECTION

1. COMBINATION SWITCH (ON-CAR)

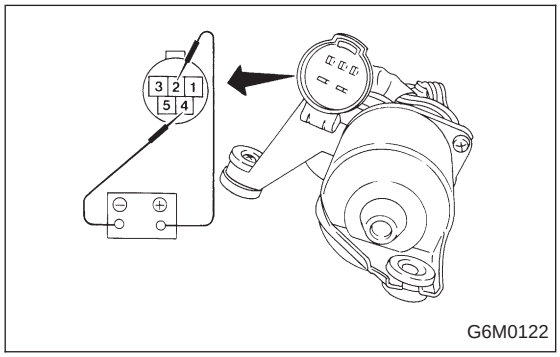
Set wiper switch to each position and check continuity between terminals.

Wiper switch

Terminal (Wire color) / Switch position		d-9 (Y)	d-8 (L)	d-6 (LY)	d-7 (LW)	INT1	INT2
OFF	OFF	○	○				
		x		x			
	MIST		○	○			
INT	OFF	○	○			○	○
		x		x			
	MIST		○	○		○	○
		x		x			
LO	OFF		○	○			
	MIST		○	○			
HI	OFF			○	○		
	MIST		○	○	○		

Washer switch

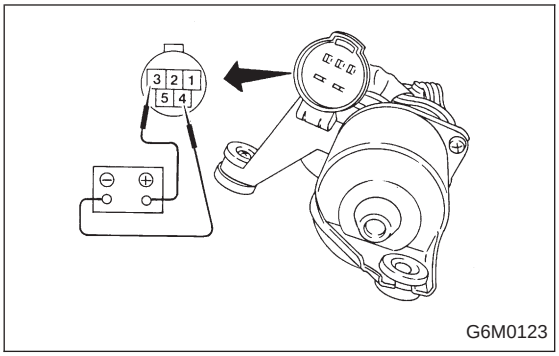
Terminal (Wire color) / Switch position	d-5 (B)	d-2 (W)
OFF		
ON	○	○



G6M0122

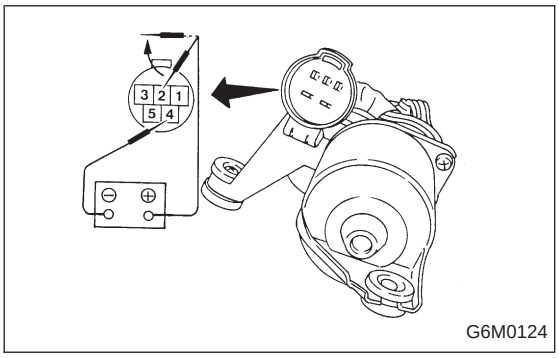
2. WIPER MOTOR

1) Check wiper motor operation at low speed:
Connect battery to wiper motor. Check wiper motor for proper operation at low speed.



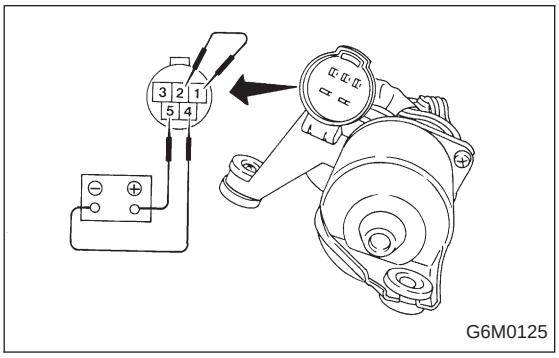
G6M0123

2) Check wiper motor operation at high speed:
Connect battery wiper motor. Check wiper motor for proper operation at high speed.



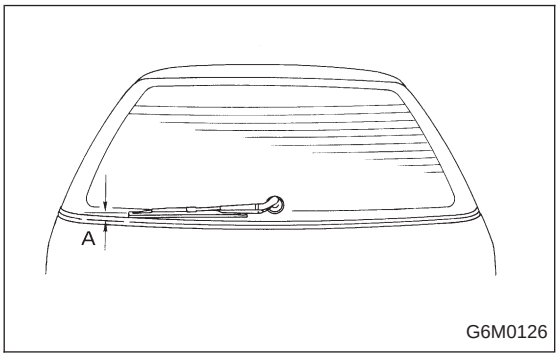
G6M0124

3) Check wiper motor for proper stoppage:
Connect battery to wiper motor. After operating wiper motor at low speed, disconnect battery to stop it.



G6M0125

4) Reconnect battery and ensure that wiper motor stops at “AUTO STOP” after operating at low speed.



G6M0126

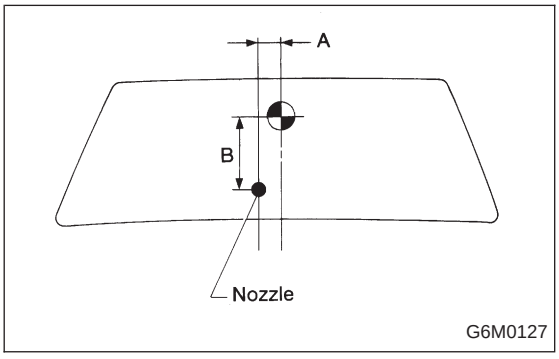
6. Rear Wiper and Washer

A: ADJUSTMENT

1) Adjust wiper blade in original position as shown in figure by changing wiper arm installation.

Original position:

A: 30±5 mm (1.18±0.20 in)



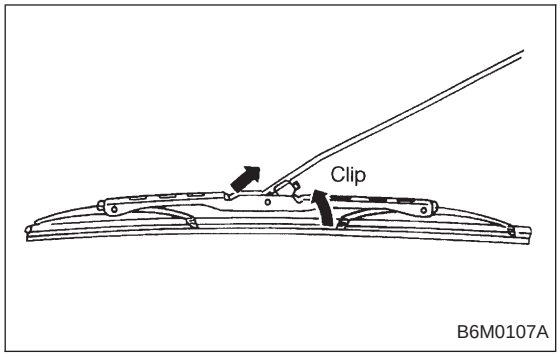
G6M0127

2) Adjust washer ejecting point on rear gate window as shown in figure when the vehicle stops.

Ejecting point:

A: 25 mm (0.98 in)

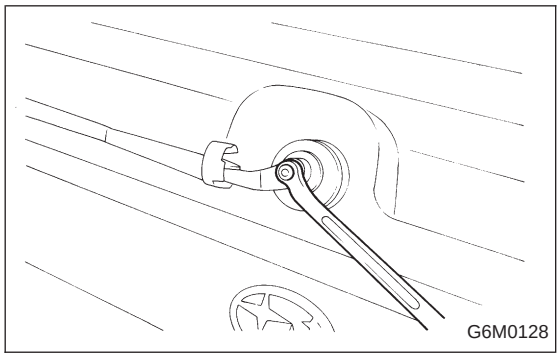
B: 200 — 300 mm (7.87 — 11.81 in)



B: REMOVAL AND INSTALLATION

1. BLADE

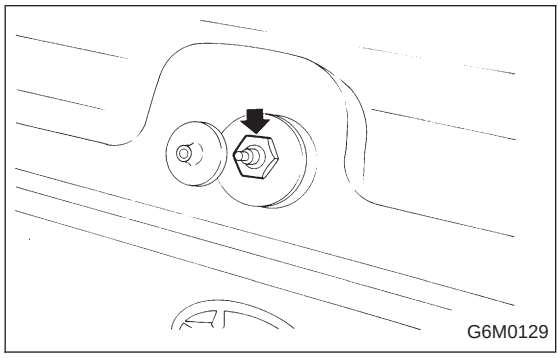
1) Pull out blade following the arrow direction, from arm while pushing up locking clip.
2) Installation is in the reverse order of removal.



2. WIPER ARM

1) Remove head cover.
2) Remove nut and wiper arm.
3) Installation is in the reverse order of removal.

Tightening torque:
5.9±1.5 N·m (0.6±0.15 kg-m, 4.3±1.1 ft-lb)



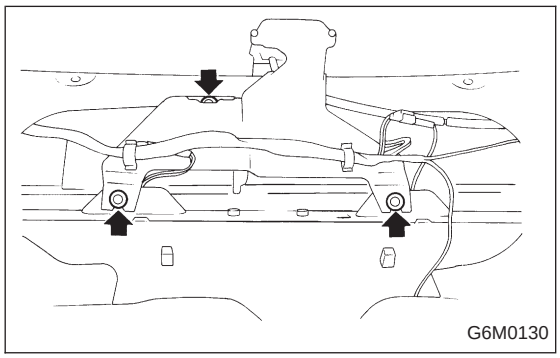
3. WIPER MOTOR

1) Remove cap and special nut.

CAUTION:
Be careful not to strike service tool against nozzle during removal.

Tightening torque:
7.4±1.5 N·m (0.75±0.15 kg-m, 5.4±1.1 ft-lb)

2) Remove rear gate trim. <Ref. to 5-2 [W3A0].>
3) Undo clips which secure harness, and disconnect connector of wiper motor.

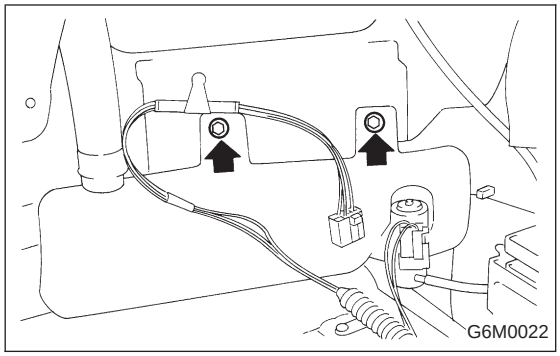


4) Separate washer hoses at joint.
5) Remove attaching screws and take out wiper motor assembly.

CAUTION:
Be careful not to damage O-ring when removing wiper motor assembly.

6) Installation is in the reverse order of removal.

Tightening torque:
5.9±1.5 N·m (0.6±0.15 kg-m, 4.3±1.1 ft-lb)



4. WASHER TANK

1) Remove rear quarter trim.
2) Disconnect washer hose and connector.
3) Remove attaching bolts.
4) Installation is in the reverse order of removal.

Tightening torque:
5.9±1.5 N·m (0.6±0.15 kg-m, 4.3±1.1 ft-lb)

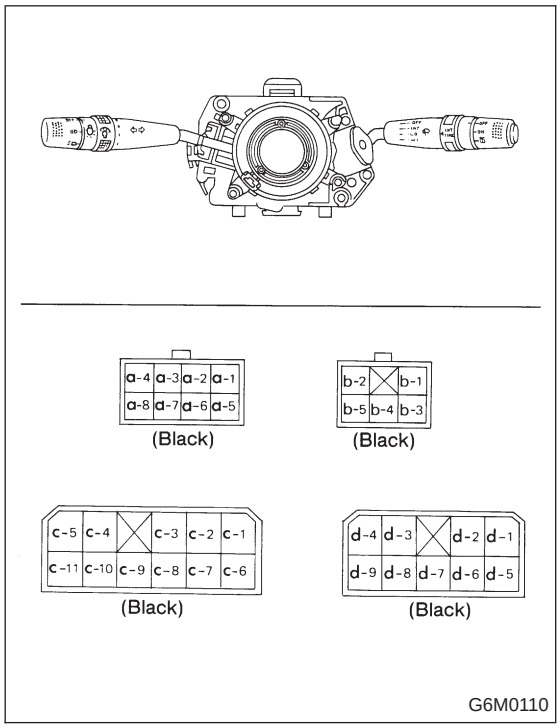
C: INSPECTION

1. COMBINATION SWITCH (ON-CAR)

Set rear wiper and washer switch to each position and check continuity between terminals.

WITHOUT INTERMITTENT REAR WIPER

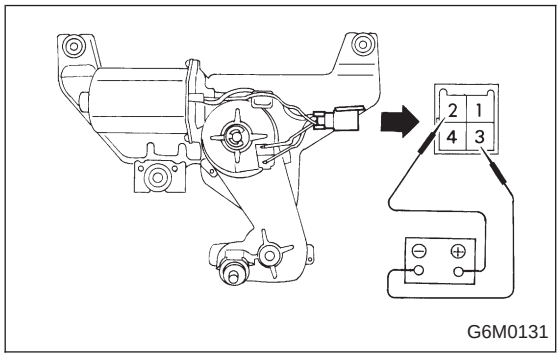
Terminal / Switch position	d-2	d-1		d-3
WASH	○	○		○
OFF				
ON	○			○
WASH	○	○		○



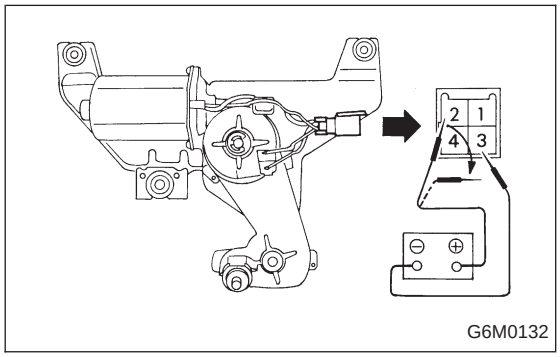
2. WIPER MOTOR

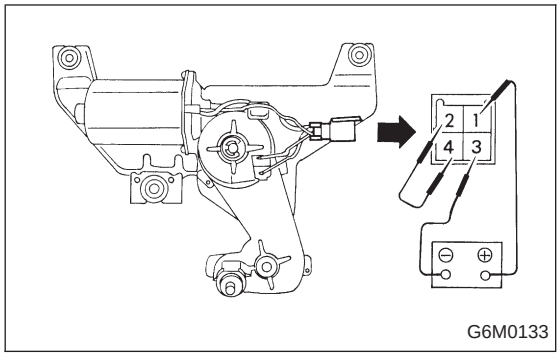
1) Operational check:

Connect battery to wiper motor and check operation of wiper motor.



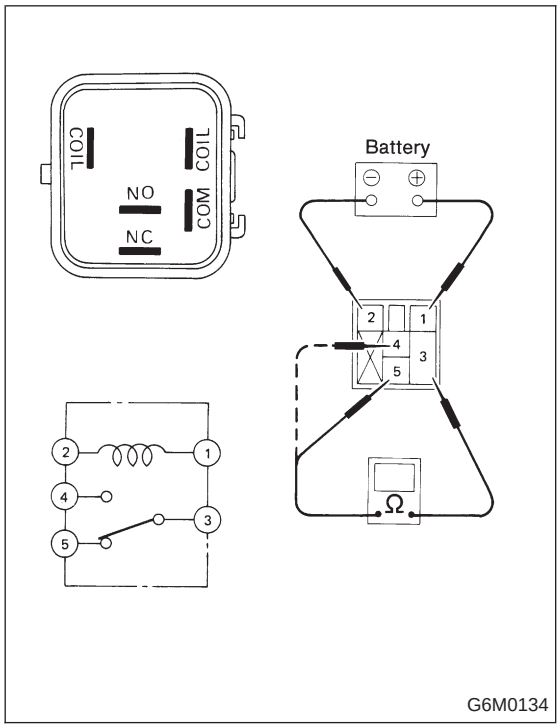
2) Check wiper motor for proper stoppage:
After operating wiper motor, disconnect battery from wiper motor.





G6M0133

3) Reconnect battery and ensure that wiper motor stops at "AUTO STOP" after it has been operated.

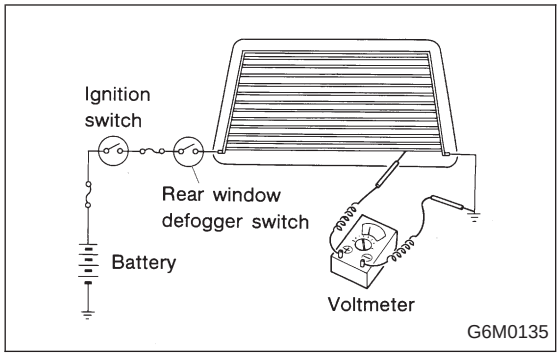


G6M0134

3. REAR WIPER RELAY

1) Connect battery to terminal No. 1 and ground terminal No. 2.
2) Check continuity between terminals.

When current flows.	Between terminals No. 3 and No. 5	Continuity does not exist.
	Between terminals No. 3 and No. 4	Continuity exists.
When current does not flow.	Between terminals No. 3 and No. 5	Continuity exists.
	Between terminals No. 3 and No. 4	Continuity does not exist.
	Between terminals No. 1 and No. 2	Continuity exists.



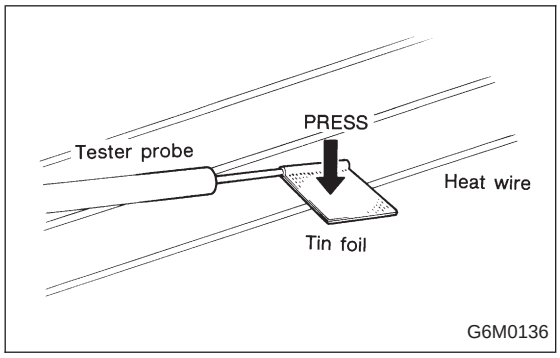
7. Rear Window Defogger

A: INSPECTION

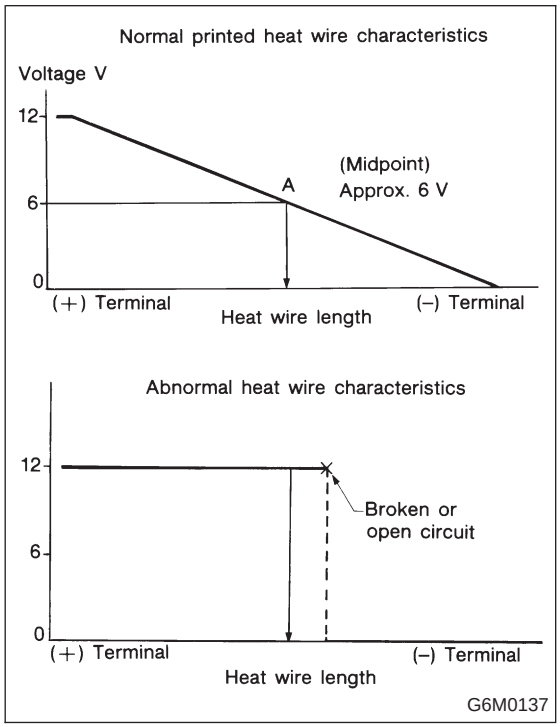
1. HEAT WIRES

1) Start the engine so that battery is being charged.
2) Turn defogger switch ON.
3) Check each heat wire at its center position for discontinuity by setting direct current voltmeter.

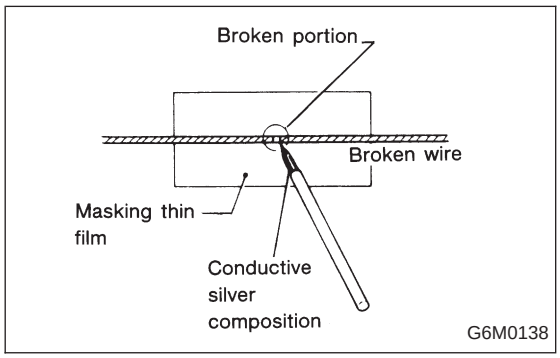
NOTE:
Normal indication is about 6 volts.



NOTE:
When measuring voltage, wind a piece of tin foil around the tip of the tester probe and press the foil against the wire with your finger.

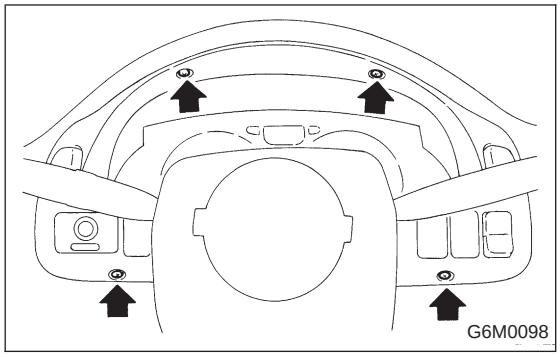


4) When tester indicates 12 volts when its probe reaches point “A”, a broken circuit occurs between point “A” and the negative terminal. Slowly move tester probe toward the negative terminal while contacting it on heat wire to locate point where tester indication changes abruptly (0 volts). This is the point where a broken circuit occurs.
When tester indicates 0 volts when its probe reaches point “A”, a broken circuit occurs between point “A” and the positive terminal. Locate a point where tester indication changes abruptly (12 volts) while slowly moving tester probe toward the positive terminal.



B: REPAIR

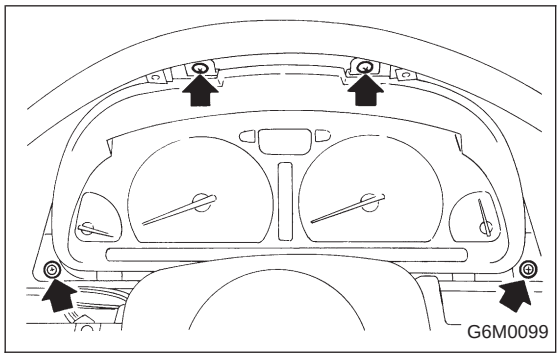
1) Clean broken wire and its surrounding area.
2) Cut off slit on (used) thin film by 0.5 mm (0.020 in) width and 10 mm (0.39 in) length.
3) Place the slit on glass along the broken wire, and deposit conductive silver composition (DUPONT No. 4817) on the broken portion.
4) Dry out the deposited portion.
5) Inspect the repaired wire for continuity.



8. Combination Meter

A: REMOVAL AND INSTALLATION

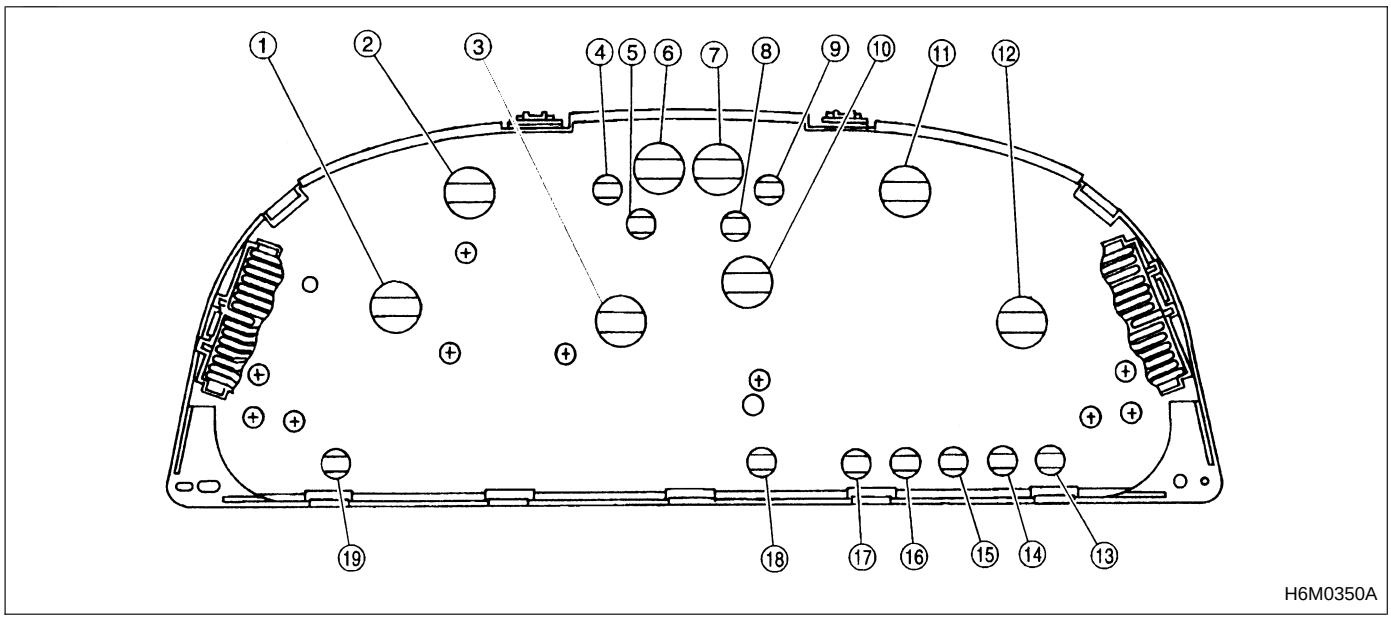
1) Move steering wheel down.
2) Remove screws which secure visor and remove visor.
3) Disconnect switch connectors.



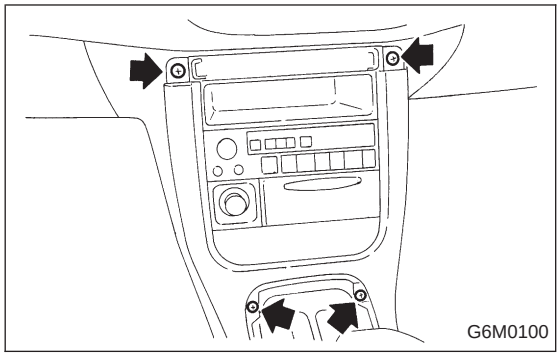
4) Remove screws which secure combination meter, and pull combination meter out.
5) Disconnect connector and speedometer cable from back of combination meter.
6) Installation is in the reverse order of removal.

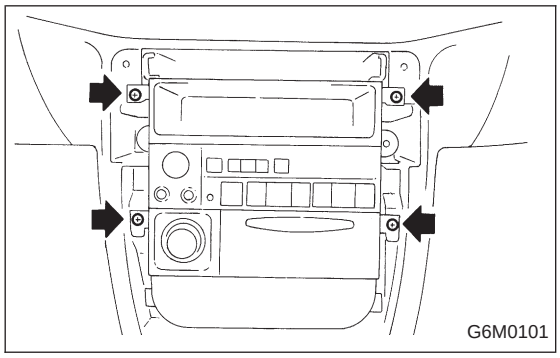
CAUTION:
When installing combination meter, be sure to connect speedometer cable and connectors to backside of combination meter.

B: BULB REPLACEMENT



① Speedometer and fuel gauge
② Speedometer
③ Speedometer
④ Turn RH
⑤ Door open
⑥ HI-beam
⑦ Brake
⑧ Seat belt
⑨ Turn LH
⑩ Tachometer
⑪ Tachometer
⑫ Tachometer and temperature gauge
⑬ Check engine
⑭ Charge
⑮ Oil pressure
⑯ AT oil temp.
⑰ ABS
⑱ Rear defogger
⑲ FWD


G6M0100


G6M0101

9. Radio, Speaker and Antenna

A: REMOVAL AND INSTALLATION

1. RADIO BODY

1) Remove cup holder.
2) Remove AT cover (AT model).
3) Remove screws which secure center panel. Remove center panel.
4) Remove fitting screws, and slightly pull radio out of instrument panel.
5) Disconnect electric connectors and antenna feeder cord.
6) Installation is in the reverse order of removal.

2. FRONT SPEAKER

1) Remove front door trim and disconnect connector. <Ref. to 5-2 [W2A2].>
2) Remove screws which secure front speaker.
3) Remove speaker and disconnect connector.
4) Installation is in the reverse order of removal.

3. REAR SPEAKER (WAGON)

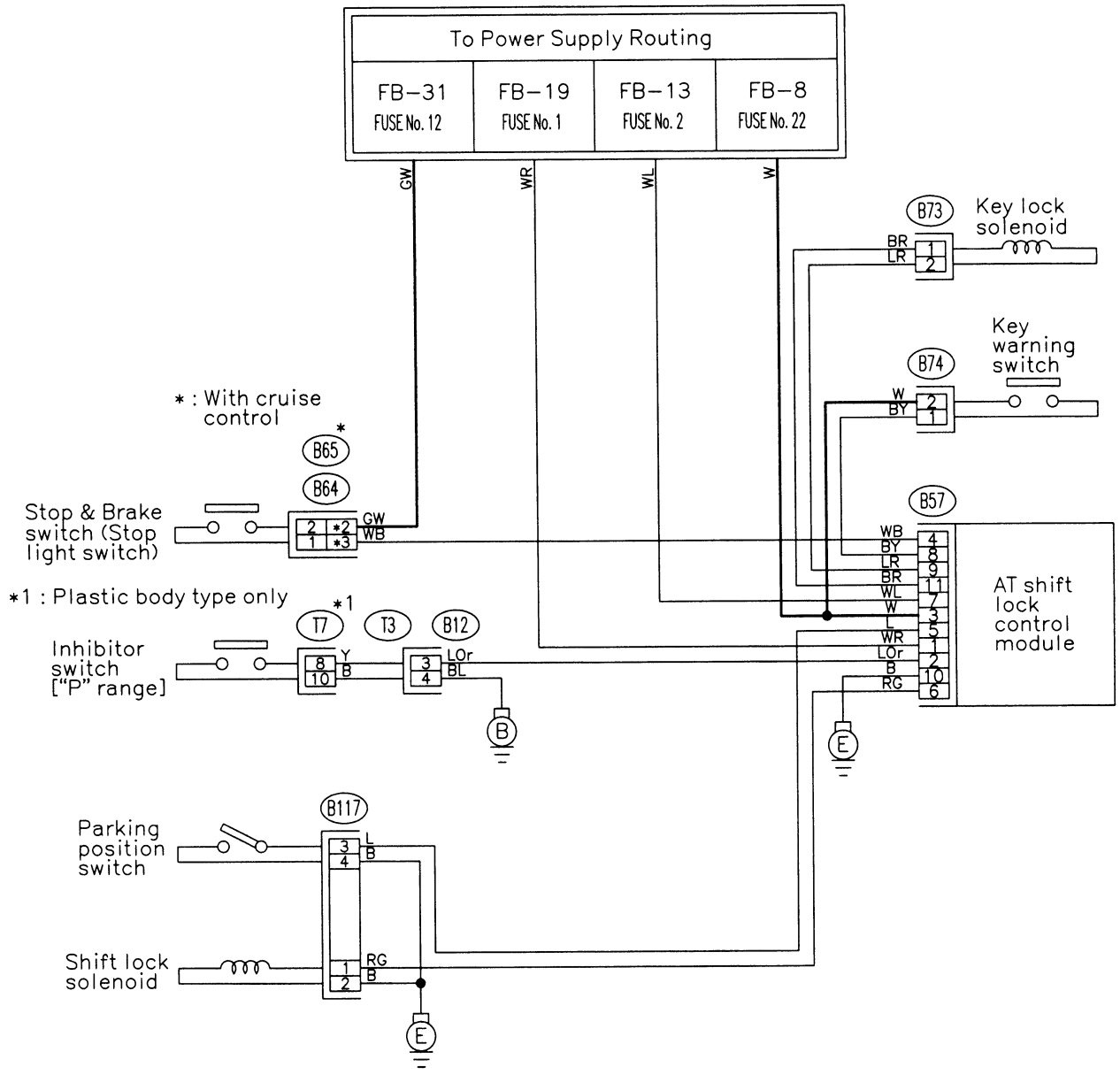
1) Remove rear door trim and disconnect connector. <Ref. to 5-2 [W2A2].>
2) Remove screws which secure rear speaker.
3) Remove speaker and disconnect connector.
4) Installation is in the reverse order of removal.

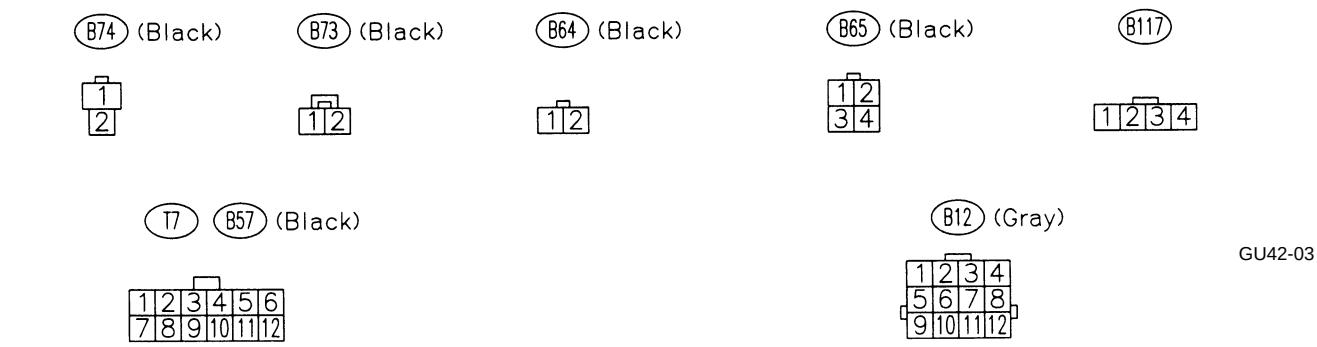
4. REAR SPEAKER (SEDAN)

1) Remove rear shelf trim panels.
2) Remove screws which secure rear speakers.
3) Disconnect connector and remove speakers.
4) Installation is in the reverse order of removal.

1. AT Shift Lock System

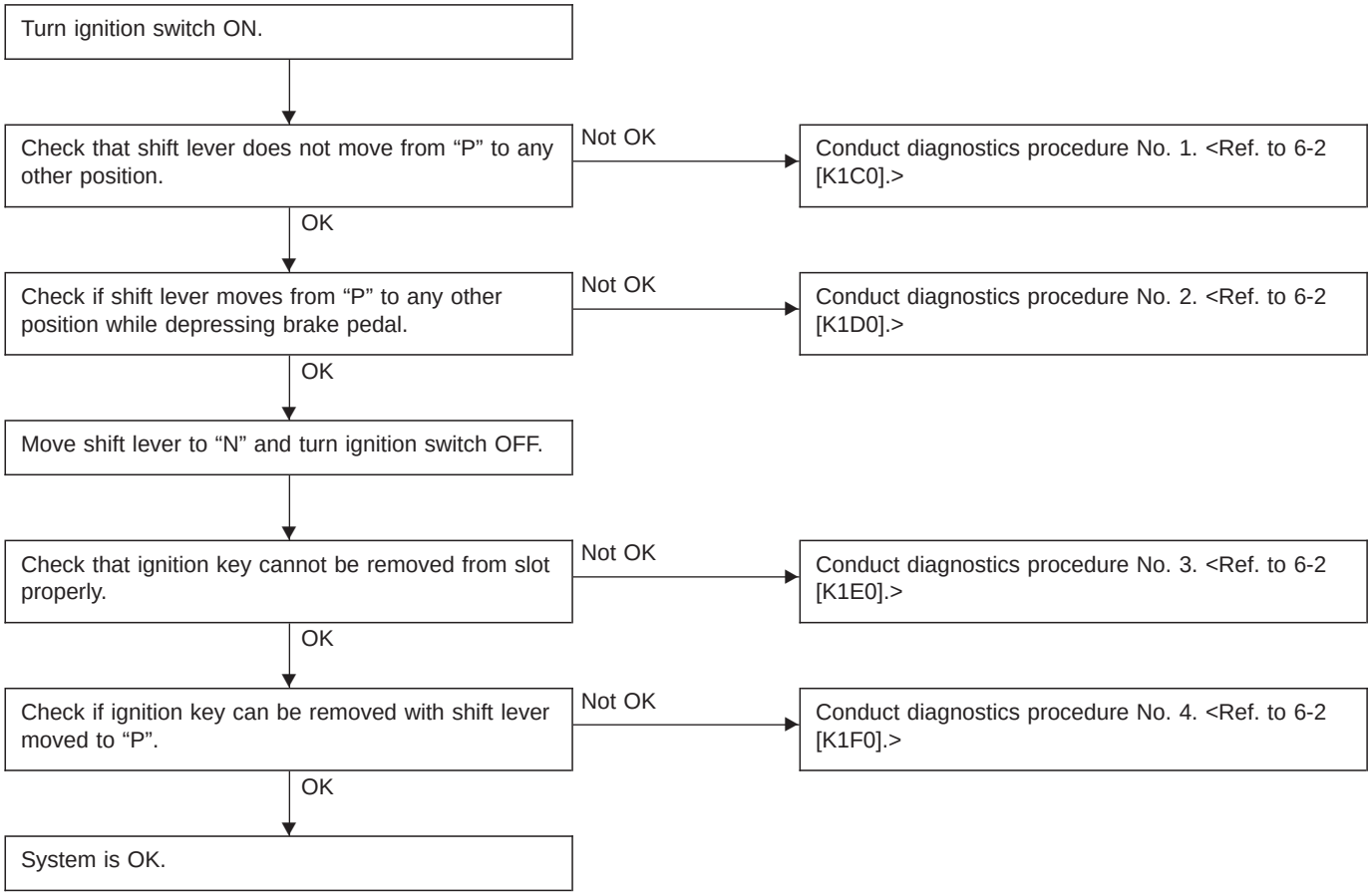
A: WIRING DIAGRAM



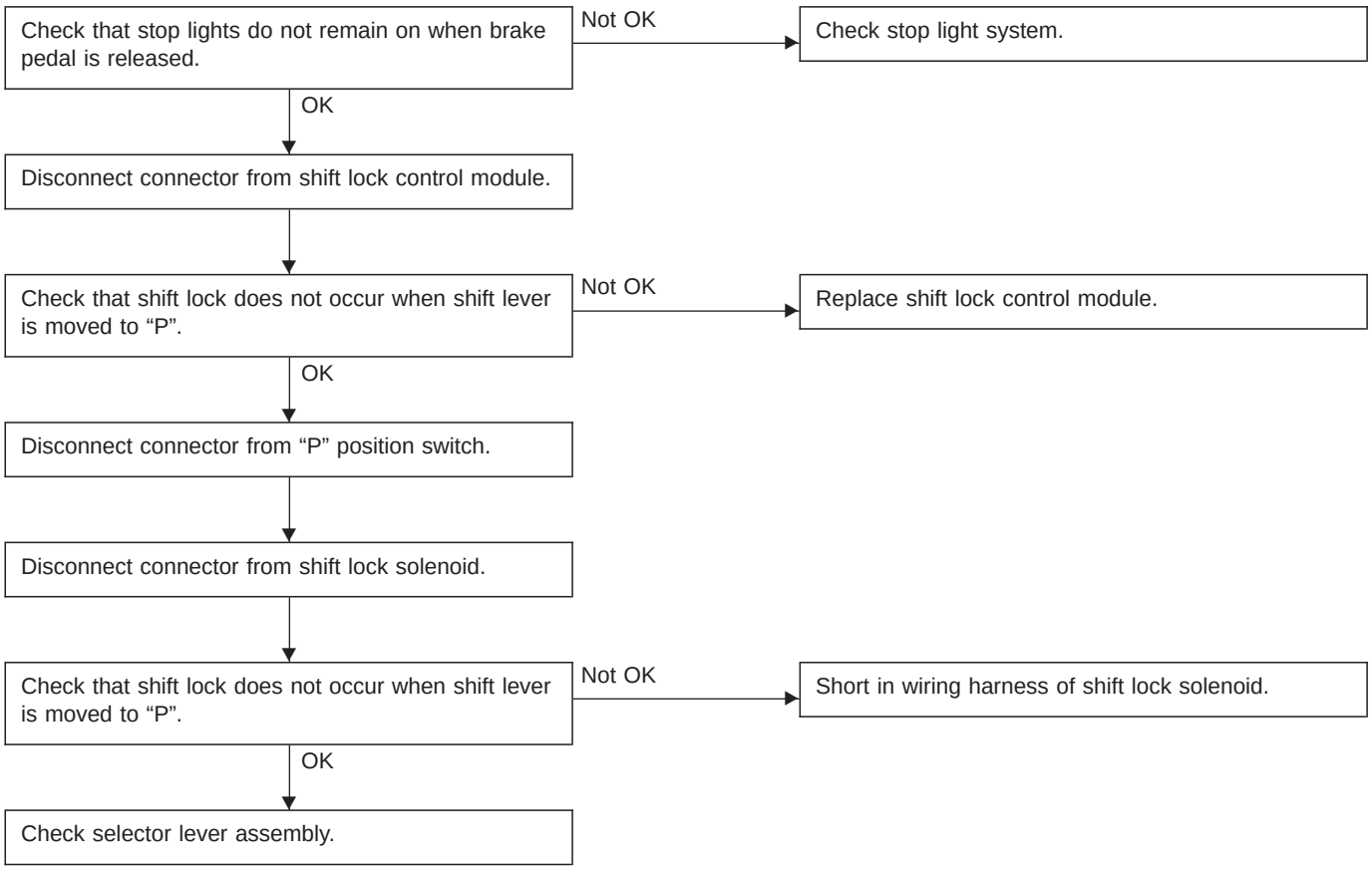


GU42-03

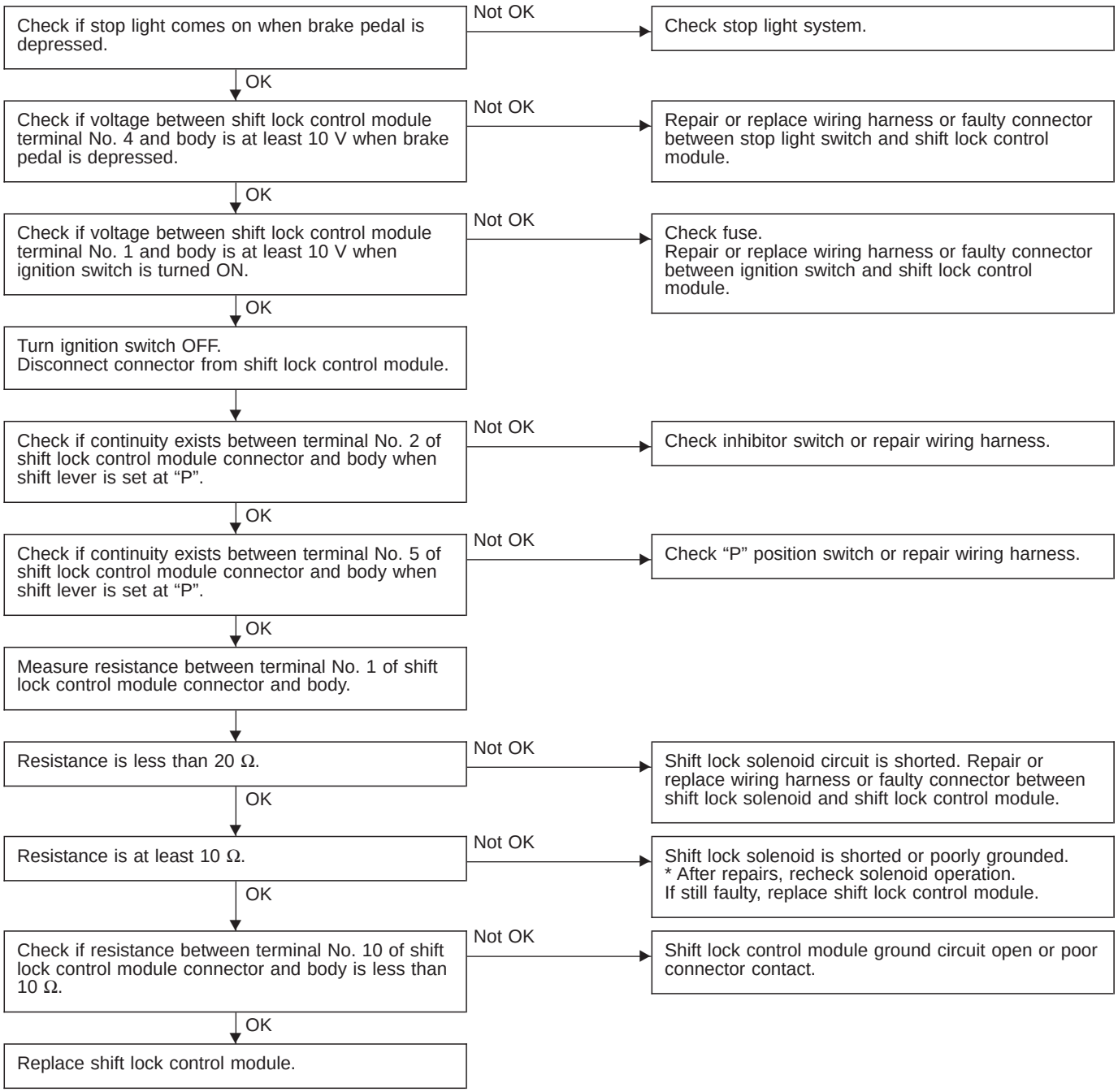
B: BASIC DIAGNOSTICS CHART



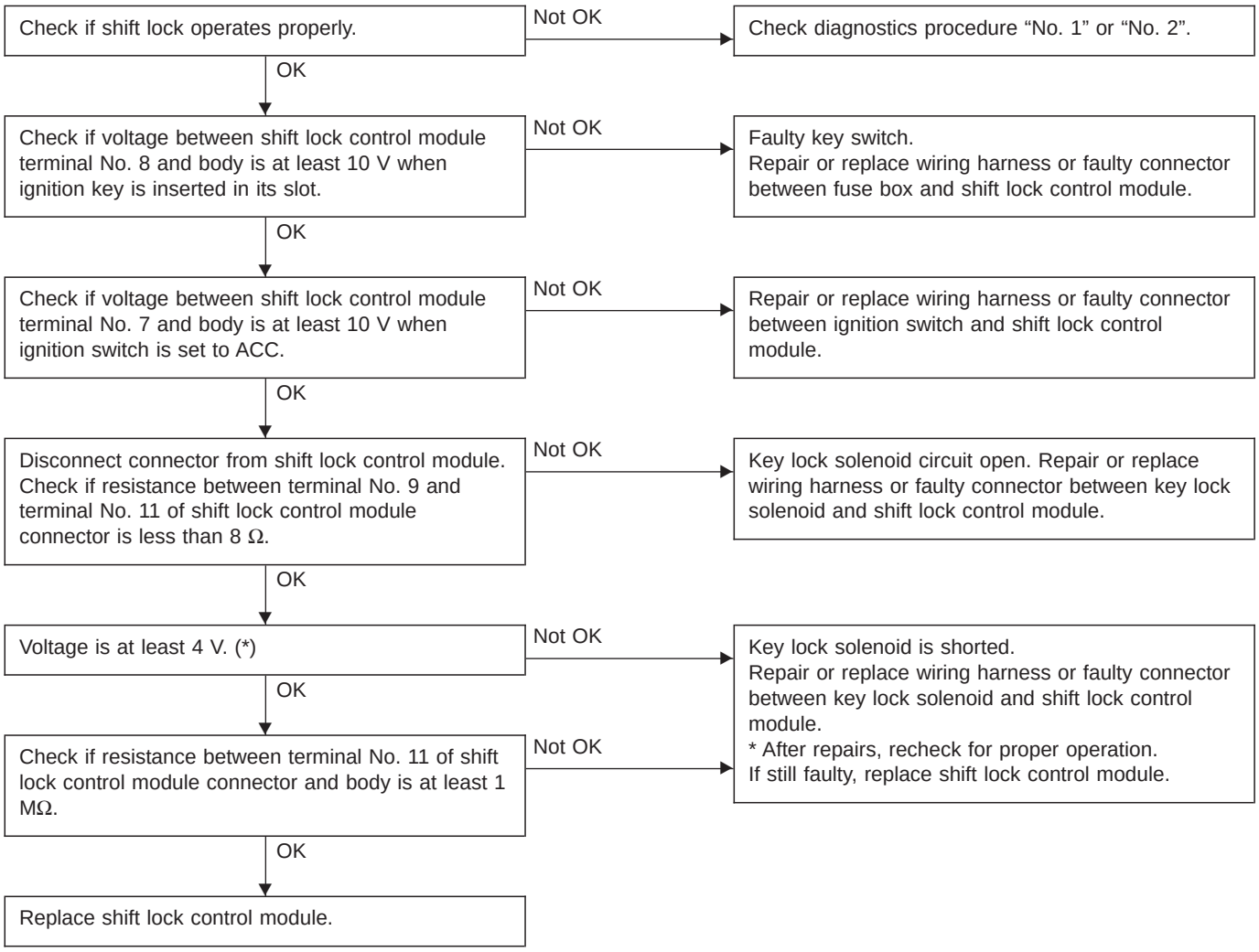
C: DIAGNOSTICS PROCEDURE No. 1



D: DIAGNOSTICS PROCEDURE No. 2 (SHIFT LOCK DOES NOT RELEASE.)

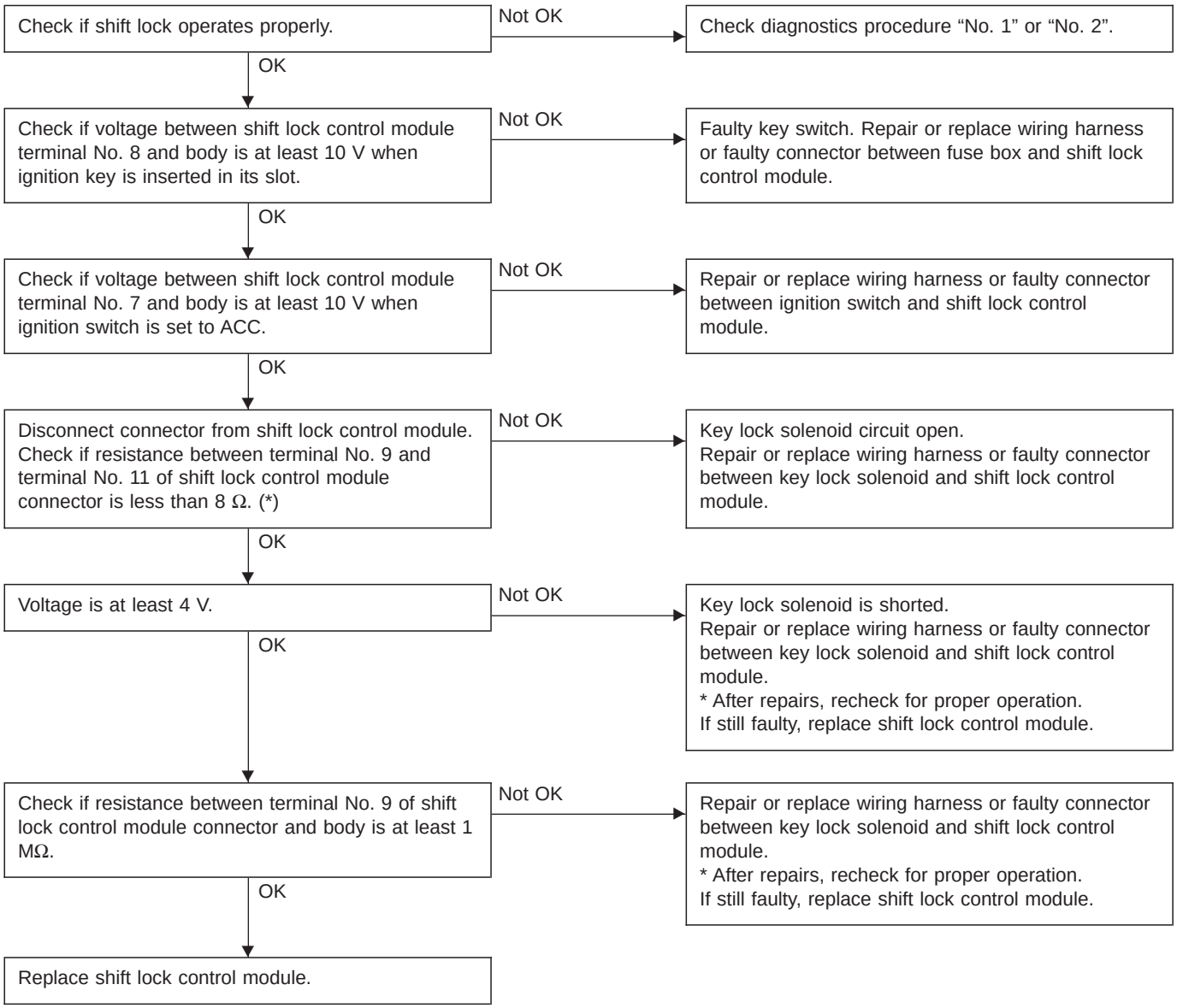


E: DIAGNOSTICS PROCEDURE No. 3 (KEY INTERLOCK DOES NOT OPERATE.)



***: When conducting operational checks of the key lock solenoid, do not apply 12 V to solenoid for more than one second, since this may break solenoid circuit.**

F: DIAGNOSTICS PROCEDURE No. 4 (KEY INTERLOCK DOES NOT RELEASE.)



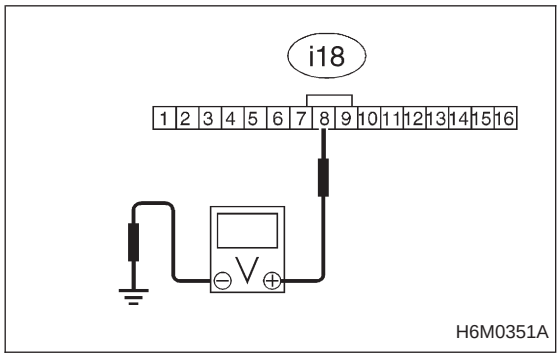
***: When conducting operational checks of the key lock solenoid, do not apply 12 V to solenoid for more than one second, since this may break solenoid circuit.**

2. Combination Meter

A: DIAGNOSTICS PROCEDURE

If speedometer does not operate, or operates abnormally, check combination meter circuit.

CAUTION:
Make sure that trouble code of vehicle speed sensor 2 system appears in electrical system on-board diagnosis.



2A1	CHECK POWER SUPPLY FOR COMBINATION METER.

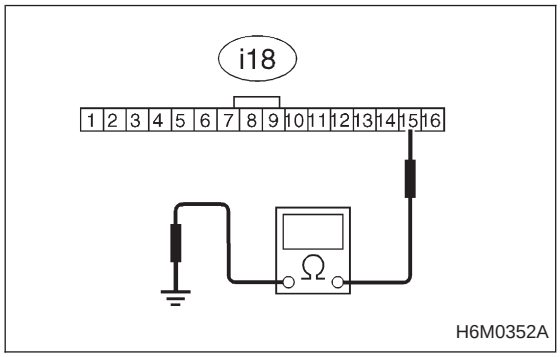
1) Remove combination meter.
2) Turn ignition switch to ON.
3) Measure voltage between combination meter connector and chassis ground.

CHECK : ***Connector & terminal***
(i18) No. 8 (+) — Chassis ground (−):
Is the voltage more than 10 V?

YES : Go to step **2A2**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between combination meter and battery.
- Poor contact in coupling connectors (i18) and combination meter connector. <Ref. to FOREWORD [T3C1].>



2A2	CHECK GROUND CIRCUIT OF COMBINATION METER.

1) Turn ignition switch to OFF.
2) Measure resistance of harness between combination meter connector and chassis ground.

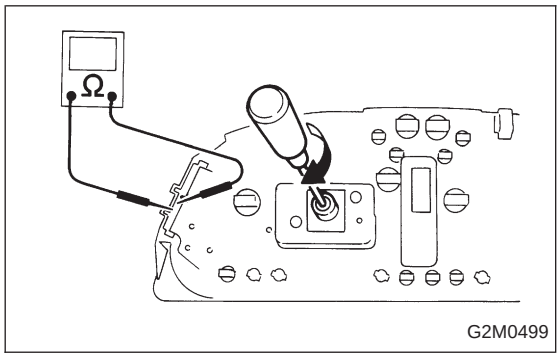
CHECK : ***Connector & terminal***
(i18) No. 15 (+) — Chassis ground (−):
Is the resistance less than 10 Ω?

YES : Go to step **2A3**.

NO : Repair harness and connector.

2A3	CHECK VEHICLE SPEED SENSOR 2.

NOTE:
● If resistance between terminals of vehicle speed sensor 2 is out of specification, the sensor may have a failure.
● If resistance is OK, mechanical trouble may be present in combination meter, speedometer cable and speedometer drive/driven gears in transmission.



1) Remove combination meter.
2) Measure resistance between terminals of combination meter by rotating rotor of speedometer cable hole with screwdriver.

CHECK ***: Terminals***
No. 8 — No. 15:
Is the resistance between 10 Ω and 1 MΩ
(Four times per rotation)?

YES : Repair or replace combination meter.

NO : Replace speedometer.

DIAGNOSTICS SECTION

FOREWORD

This portion of the service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
The diagnostics relating to the Electronic Control System which is made up of various electronic components (ECM's etc.) are explained in this manual.
For the repair of exchange of defective parts, please refer to the SERVICE MANUAL (Repair Section).
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD.

ENGINE COOLING SYSTEM	2-5
ON-BOARD DIAGNOSTICS II SYSTEM	2-7
AUTOMATIC TRANSMISSION AND DIFFERENTAIL	3-2
BRAKES	4-4
SUPPLEMENTAL RESTRAINT SYSTEM	5-5

1. Important Safety Notice

● Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.

● In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.

● It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if he used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

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2. How to Use this Manual

● This Service Manual is divided into four volumes by section so that it can be used with ease at work. Refer to the Table of Contents, select and use the necessary section.

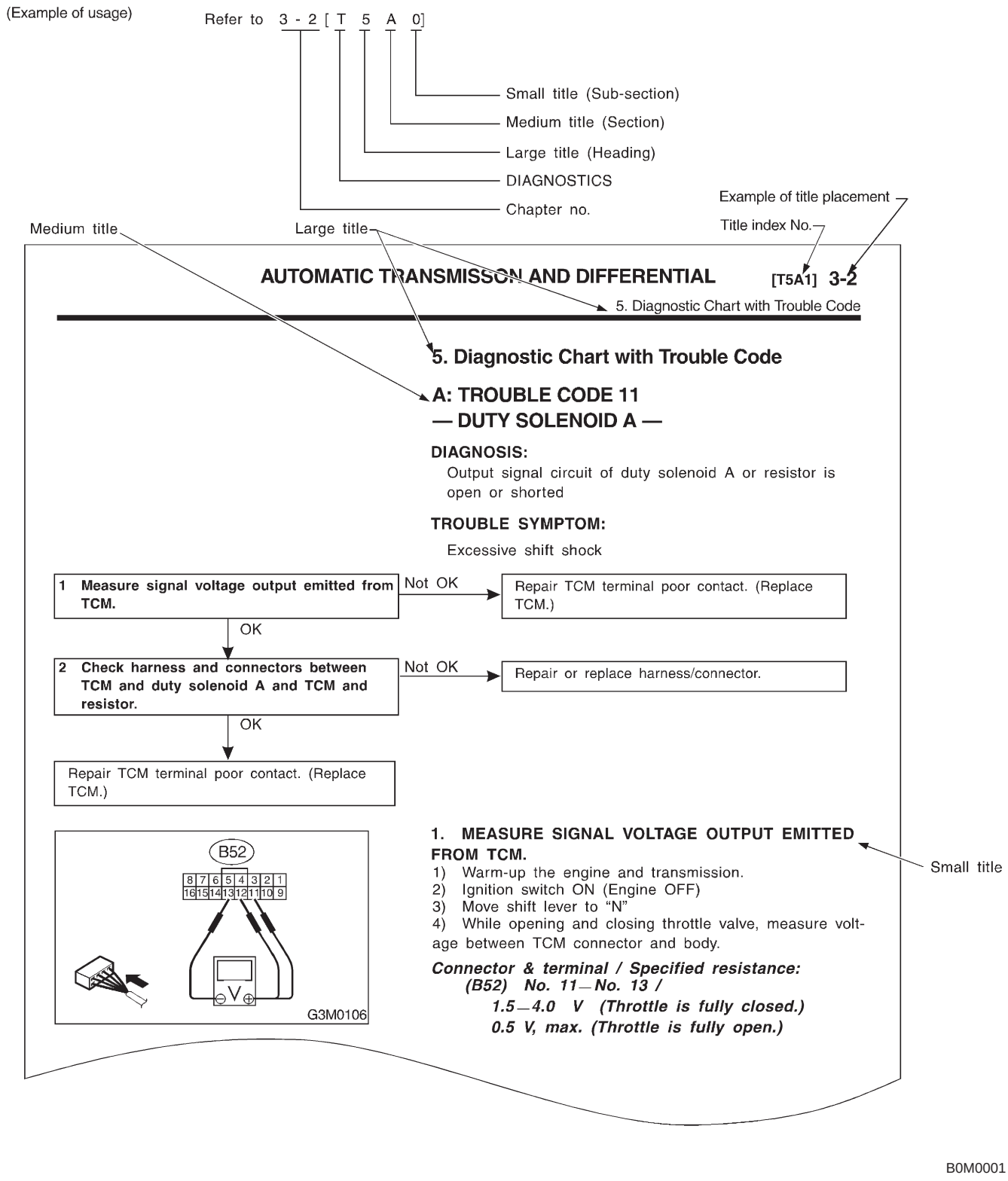
- GENERAL INFORMATION SECTION
- REPAIR SECTION
- DIAGNOSTICS SECTION
- WIRING DIAGRAM SECTION

● The description of each area is provided with four types of titles different in size as shown below. The Title No. or Symbol prefixes each title in order that the construction of the article and the flow of explanation can be easily understood.

[Example of each title]

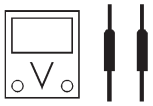
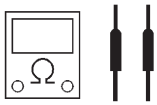
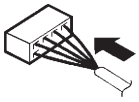
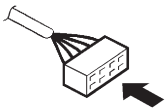
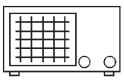
● Area title:	T. DIAGNOSTICS
● Large title (Heading):	1. Diagnostics Chart with Select Monitor (to denote the main item of explanation.)
● Medium title (Section):	A: BASIC DIAGNOSTICS CHART (to denote the type of work in principle.)
● Small title (Sub-section):	1. CHECK INPUT SIGNAL FOR ECM (to denote a derivative item of explanation.)

● The Title Index No. is indicated on the top left (or right) side of the page as the book is opened. This is useful for retrieving the necessary portion.



B0M0001

- In this manual, the following symbols are used.

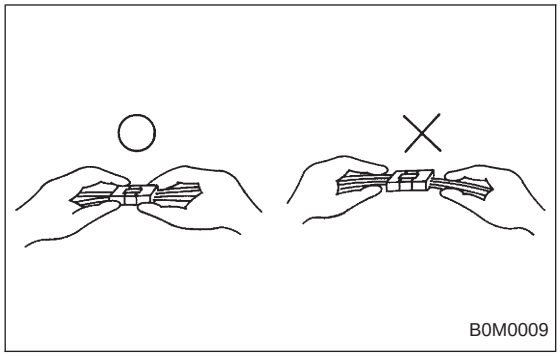
Character	Description
 B0M0002	Circuit tester ● Voltage measurement
 B0M0003	Circuit tester ● Resistance measurement
 B0M0004	The arrow indicates that insertion of the probe or numbering of the connector pins is made from the side.
 B0M0005	The arrow indicates that insertion of the probe or numbering of the connector pins is made from the side.
 B0M0006	Oscilloscope
B0M0007	Oscilloscope positive probe
B0M0008	Oscilloscope earth head

- **WARNING**, **CAUTION**, NOTE

  - **WARNING:** Indicates the item which must be observed precisely during performance of maintenance services in order to avoid injury to the mechanics and other persons.

  - **CAUTION:** Indicates that item which must be followed precisely during performance of maintenance services so as to avoid damage and breakage to the vehicle and its parts and components.

  - NOTE: Indicates the hints, knacks, etc. which make the maintenance job easier.

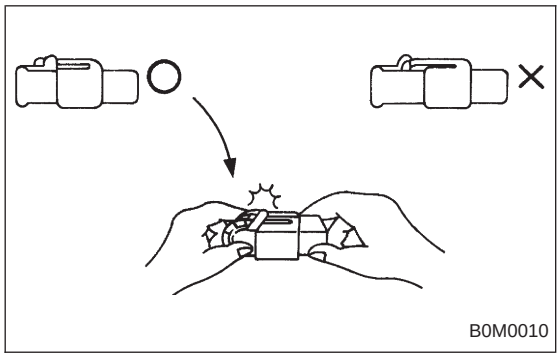

B0M0009

3. Basic Checks

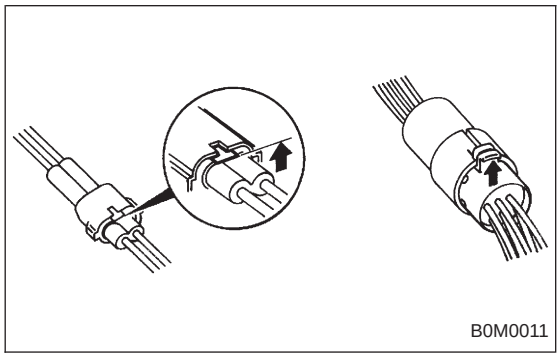
A: DISCONNECTING CONNECTORS

● Always hold the connector itself.

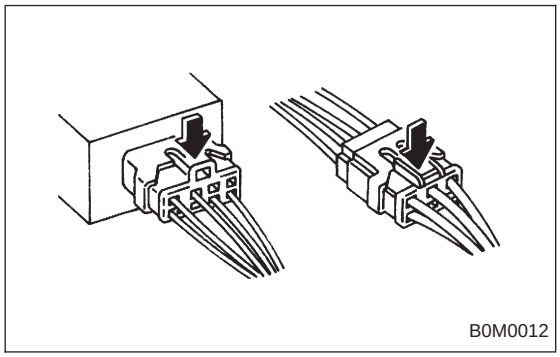
CAUTION:
Don't pull the harness.


B0M0010

● Inspect a connector by pushing it all the way in. If the connector is equipped with a locking device, push it in until a clicking sound is heard.

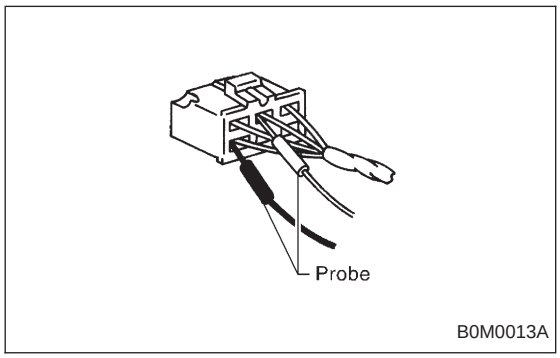

B0M0011

● To disconnect a locking connector, first release the lock, then pull the connector off.
<Unlock by pulling the locking tab.>


B0M0012

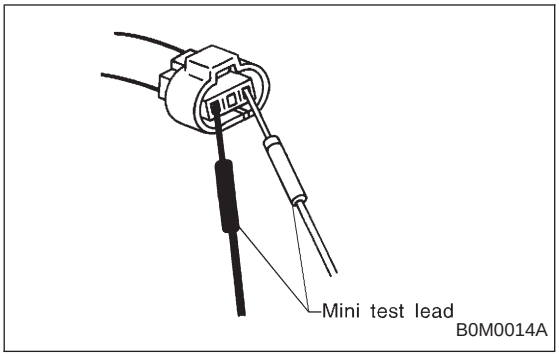
<Unlock by pushing the locking tab.>

B: INSERTING A PROBE

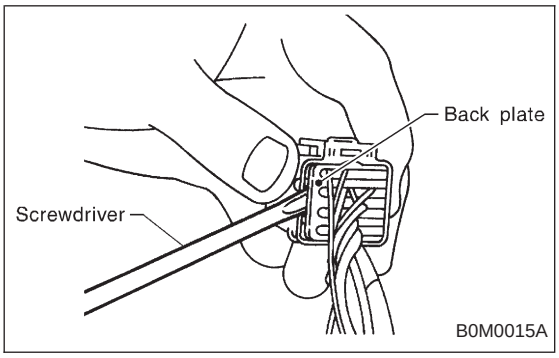


B0M0013A

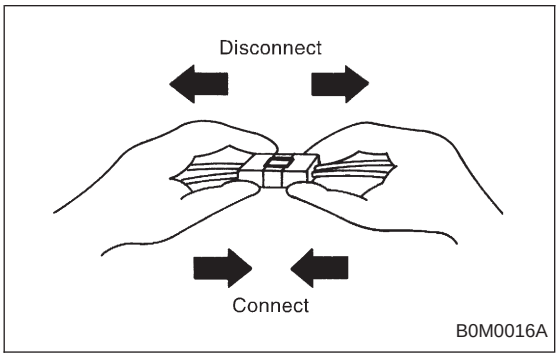
● Generally, probes are inserted into connectors from the rear side (wire side).
● When removing the shock protector take care not to deform it; this also applies to waterproof connectors, which cannot be tested from the wire side.



● Connectors equipped with shock protectors must be checked with a mini probe (thin), or it will be necessary to remove the shock protector.



● When the connector has a back plate, remove the plate after removing the projection of the plate first. (Be careful not to use excessive force, since the terminals might brake off.)



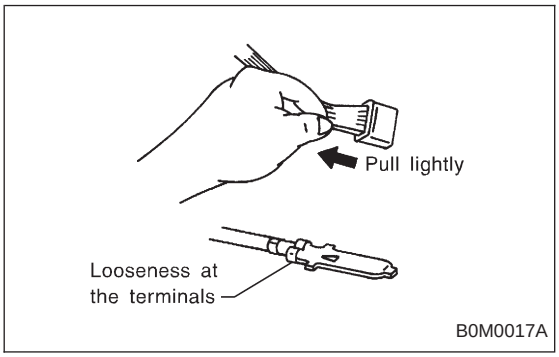
C: CHECKING FOR POOR CONTACT ON PLUG-IN CONNECTORS

1. POOR CONTACT

Poor contact is frequently caused by corroded terminals, dirt, foreign substances, weak contact points between male and female connectors, etc. Quite often a plug with poor contact will work perfectly again after it has been pulled off and reconnected. If harness and connector checks do not reveal any defect, it can be assumed that an intermittent contact in a connector is the source of trouble.

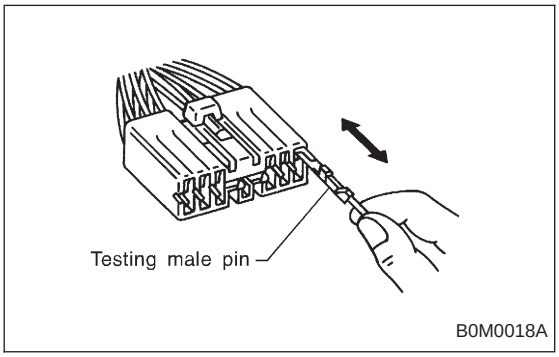
2. VISUAL INSPECTION

1) Disconnect the two connector halves.
2) Check the connector pins for signs of corrosion or foreign material.
3) Check the connector for loose and damaged terminals, and make sure they are set correctly in the connector.

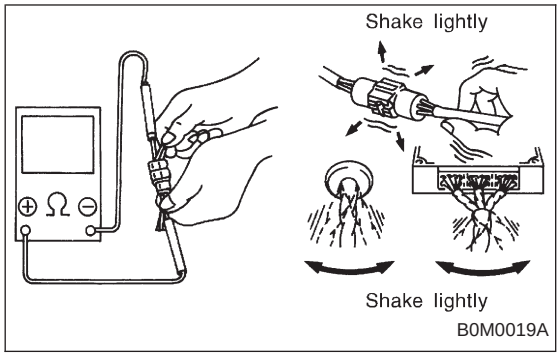


NOTE:
When the harness is pulled lightly, the terminals should not come out.

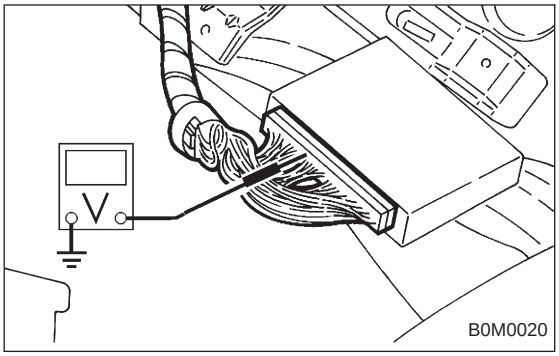
4) Insert the male pin of the connector into the female pin, then pull it out.

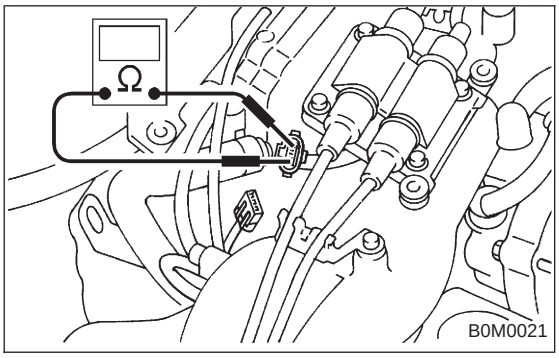


NOTE:
If one of the pins allows to pull out easily, it is a likely source of a malfunction.



5) Shake lightly the connector and the harness, and check for sudden changes in voltage or resistance.





4. Diagnosis and Checking Procedure Using Instruments

A: USING A CIRCUIT TESTER

1. VOLTAGE CHECK (range set to DC V)

Connect the positive probe to the terminal to be tested, and the negative probe to body ground. (or the ground terminal of the ECM)

2. CHECKING THE CONNECTION (range set to Ω)

Measure the resistance and check for open or shorted wire in the harness or the connector.

NOTE:
This check must be carried out with both connectors disconnected.
(This avoids by-passing the connection through other circuits.)

1) Check for open circuit. (range: Ω x 1K)
Measure the resistance between the respective pins in both connectors.

Specified resistance:
More than 1 MΩ (No continuity) Open circuit
Less than 10 Ω (Continuity) O.K.

2) Check for correct insulation value. (range: Ω x 1K)
Measure the resistance between the pins in both connectors, as well as between the suspected pin and the body. (body short)

Specified resistance:
More than 1 MΩ (No continuity) O.K.
Less than 10 Ω (Continuity) Short circuit

3) Resistance measurement (range set to Ω)
Measuring the internal resistance of sensors, solenoid valves etc. to check the operating condition of components.

NOTE:
● Select the appropriate range for measuring the internal resistance, or the measurement will result in an incorrect reading.
● Before changing the measurement range the gauge must be reset to zero.

B: USING A SUBARU SELECT MONITOR

With this testing procedure the defective component can be determined by directly monitoring input/output signals of the ECM or the trouble codes.

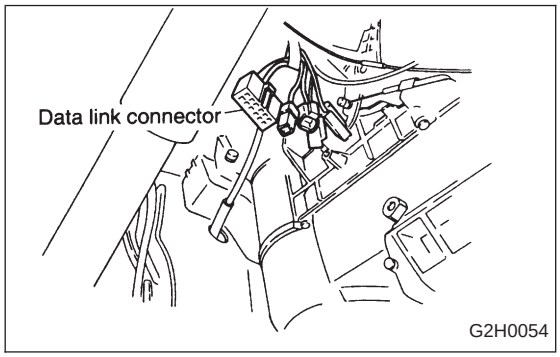
1. FEATURES

● A variety of data can be checked without movements from the drivers seat, passenger's seat or from outside the vehicle.
● This unit allows the identification of the type of malfunction, for example whether the cause is an open or shorted wire in the input/output signal line, or whether the breakdown of a component is caused by a lack of maintenance.

2. DIAGNOSIS

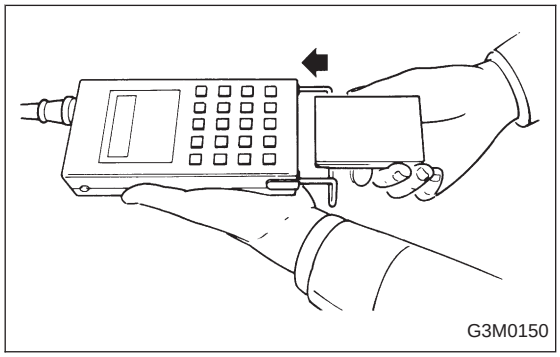
● Refer to the reference values for input/output and control data to determine whether the malfunction is caused by a worn out component, an open wire, a short etc.
● Perform the diagnostics procedure as described in chapter "Check based on trouble codes" by monitoring the trouble codes.

NOTE:
It will be easier to determine a malfunction if the vehicle data for normal conditions are available for comparison.

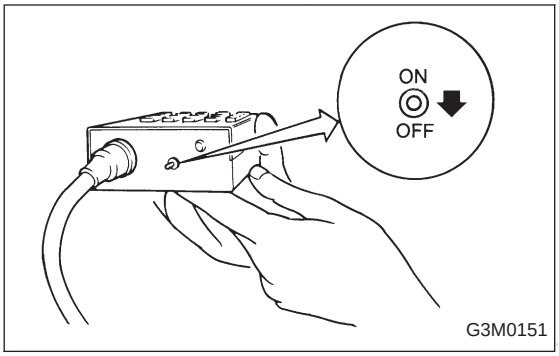


3. CONNECT SELECT MONITOR.

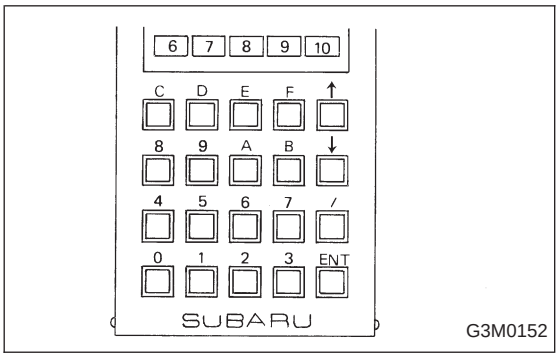
1) Connect select monitor to data link connector located under instrument panel. (on driver's side)



2) Insert cartridge into select monitor.

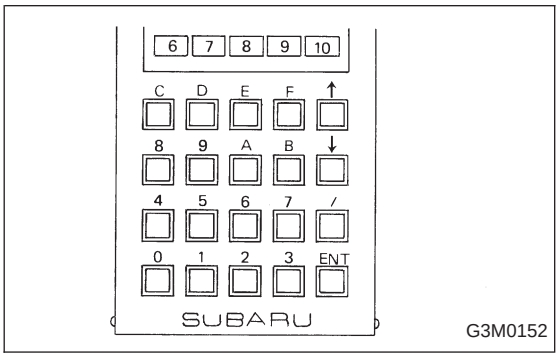


3) Turn ignition switch and select monitor switch ON.
4) After display is shown, press slash "/" key.
5) After AT mode is displayed, press function "[0]".
(Display returns to AT mode when slash "/" is pressed during on-board diagnostic operation.)



4. READ TROUBLE CODE SHOWN ON DISPLAY.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.
3) Ensure trouble code(s) is shown.



5. PREVIOUS TROUBLE CODE READING

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.
3) Ensure displayed trouble code(s).

C: USING AN OSCILLOSCOPE

A malfunction can be determined by displaying the waveforms of input/output signals on the oscilloscope.

1. DIAGNOSIS

A simple comparison of the waveforms may lead to an incorrect diagnosis. To exactly determine the sources of the malfunction it will be necessary to determine them under consideration about information other than waveforms.

2. APPLYING INPUT/OUTPUT SIGNALS

Connect the probe directly with the terminal of the signal.

5. Table of Contents

DIAGNOSTICS SECTION	**2-5**	**Engine Cooling System**
	2-7	**On-Board Diagnostics II System**
	3-2	**Automatic Transmission and Differential**
	4-4	**Brakes**
	5-5	**Supplemental Restraint System**

ENGINE COOLING SYSTEM 2-5

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1. Radiator Main Fan

A: OPERATION (WITHOUT A/C MODEL)

DETECTING CONDITION:

● Engine coolant temperature is above 95°C (203°F).

TROUBLE SYMPTOM:

● Radiator main fan does not operate under the above condition.

1A1	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.**

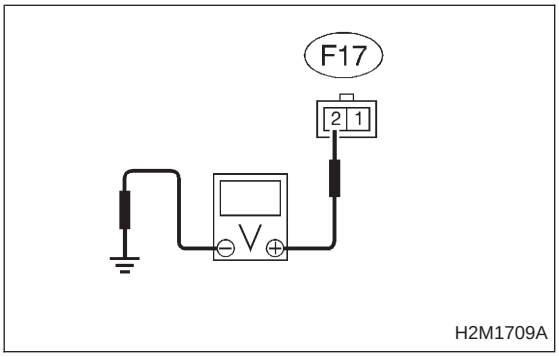
CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.

2) Disconnect connector from main fan motor.

3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).

4) Stop the engine and turn ignition switch to ON.



5) Measure voltage between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 2 (+) — Chassis ground (−):

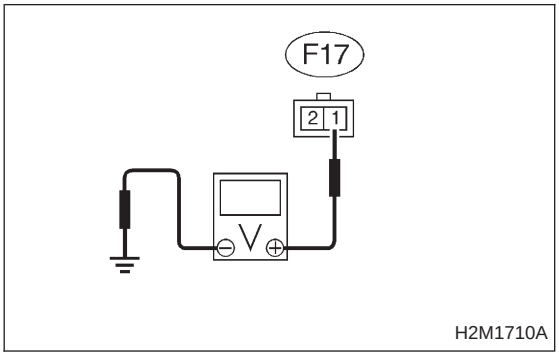
CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **1A2**.

NO : Go to step **1A5**.

1A2	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.**

1) Turn ignition switch to OFF.



2) Measure resistance between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 1 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **1A3**.

NO : Repair open circuit in harness between main fan motor connector and chassis ground.

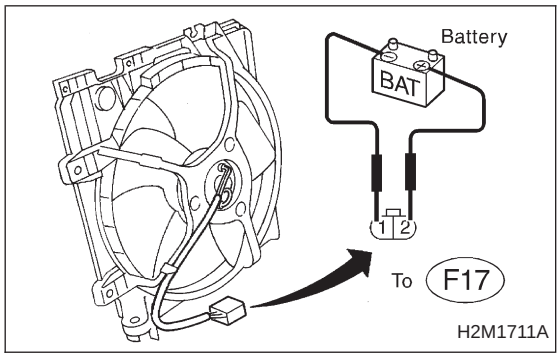
1A3	CHECK POOR CONTACT.

Check poor contact in main fan motor connector. <Ref. to FOREWORD [T3C1].>

CHECK : ***Is there poor contact in main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Go to step **1A4**.



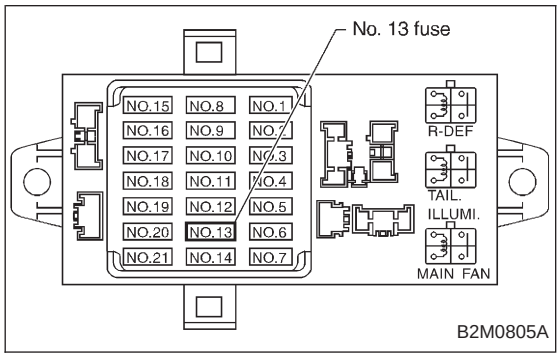
1A4	CHECK MAIN FAN MOTOR.

Connect battery positive (+) terminal to terminal No. 2 and negative (−) terminal to terminal No. 1 of main fan motor connector.

CHECK : ***Does the main fan rotate?***

YES : Repair poor contact in main fan motor connector.

NO : Replace main fan motor with a new one.



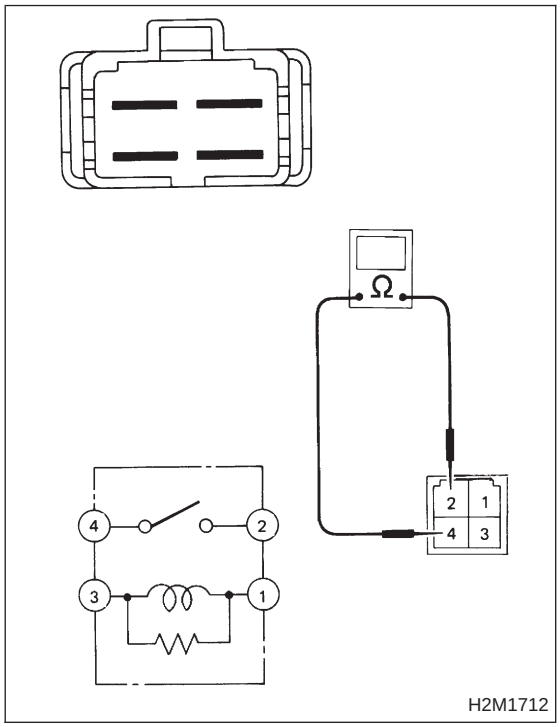
1A5	CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 13 from fuse and relay box.
3) Check condition of fuse.

CHECK : ***Is the fuse blown-out?***

YES : Replace fuse.

NO : Go to step **1A6**.



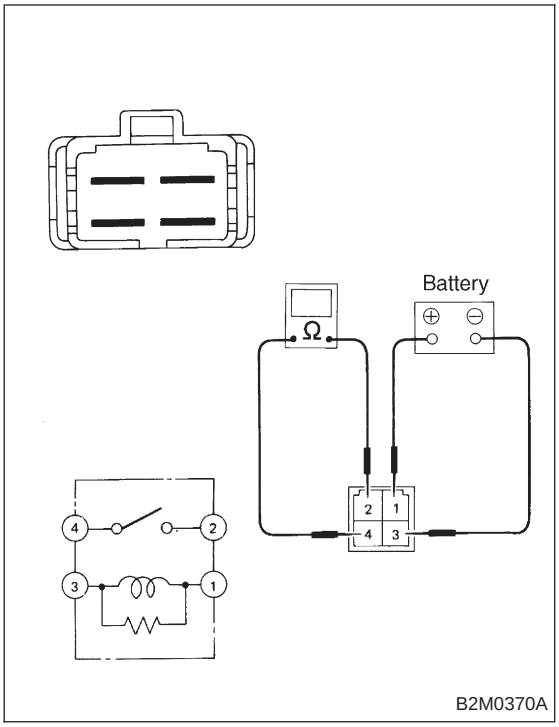
1A6	CHECK MAIN FAN RELAY.

1) Remove main fan relay from fuse and relay box.
2) Check continuity between main fan relay terminals.

CHECK : ***Does no continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **1A7**.

NO : Replace main fan relay.



1A7	CHECK MAIN FAN RELAY.

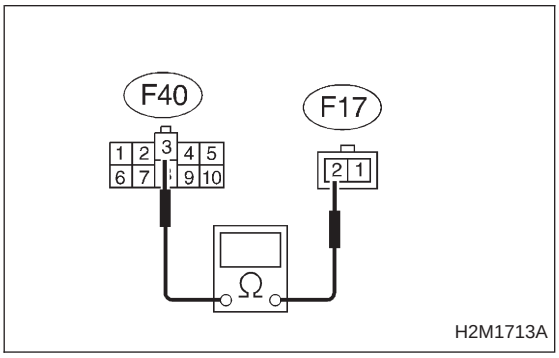
1) Connect battery positive (+) terminal to terminal No. 1 of main fan relay, and negative (−) terminal to terminal No. 3.

2) Check continuity between main fan relay terminals.

CHECK ***: Does continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **1A8**.

NO : Replace main fan relay.



1A8	CHECK HARNESS CONNECTOR BETWEEN FUSE AND RELAY BOX AND MAIN FAN MOTOR.

1) Disconnect connector from fuse and relay box.

2) Measure resistance of harness connector between fuse and relay box and main fan motor.

Connector & terminal
(F40) No. 3 — (F17) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **1A9**.

NO : Repair open circuit in harness between fuse and relay box and main fan motor connector.

1A9	CHECK POOR CONTACT.

Check poor contact in fuse and relay box connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in fuse and relay box connector?***

YES : Repair poor contact in fuse and relay box connector.

NO : Go to step **1A10**.

1A10	CHECK POOR CONTACT.

Check poor contact in main fan motor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

B: OPERATION (WITH A/C MODEL)

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 95°C (203°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under conditions (1) and (2) above.

1B1	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.**

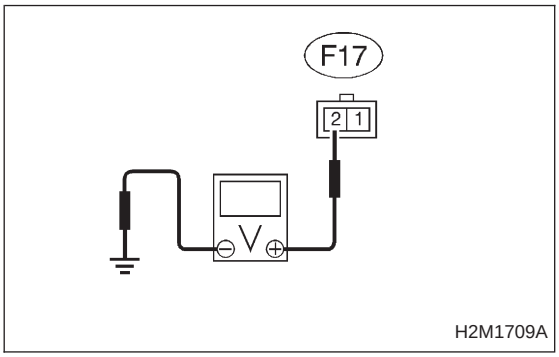
CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.

2) Disconnect connector from main fan motor.

3) Warm-up the engine until engine coolant temperature increases over 95°C (203°F).

4) Stop the engine and turn ignition switch to ON.



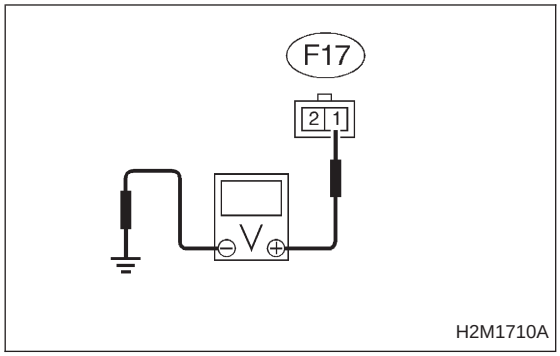
5) Measure voltage between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **1B2**.

NO : Go to step **1B5**.

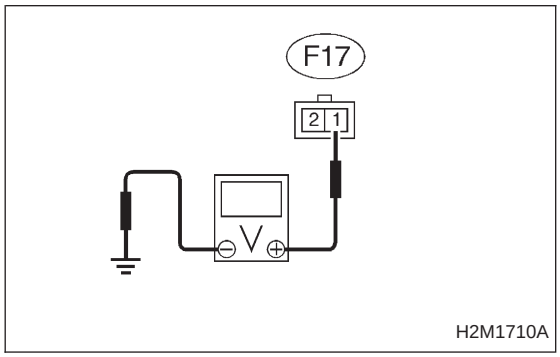


1B2	CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Measure resistance between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 1 — Chassis ground:

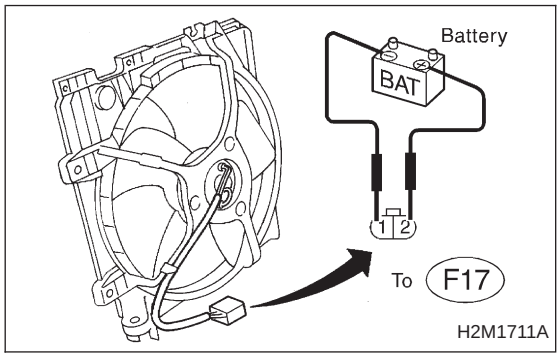
CHECK ***: Is the resistance less than 5 Ω?***
YES : Go to step **1B3**.
NO : Repair open circuit in harness between main fan motor connector and chassis ground.



1B3	CHECK POOR CONTACT.

Check poor contact in main fan motor connector. <Ref. to FOREWORD [T3C1].>

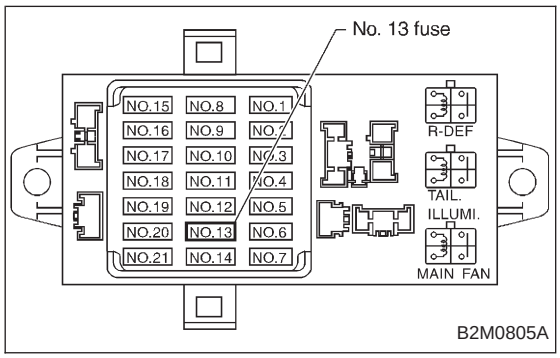
CHECK ***: Is there poor contact in main fan motor connector?***
YES : Repair poor contact in main fan motor connector.
NO : Go to step **1B4**.



1B4	CHECK MAIN FAN MOTOR.

Connect battery positive (+) terminal to terminal No. 2, and negative (−) terminal to terminal No. 1 of main fan motor connetor.

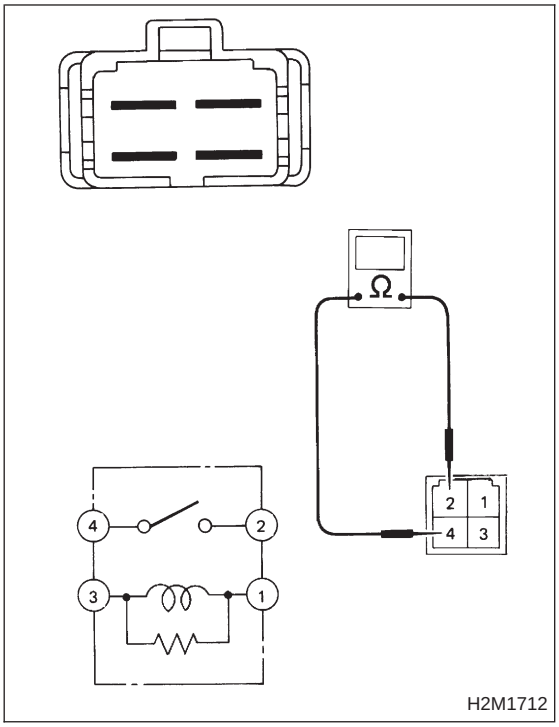
CHECK ***: Does the main fan rotate?***
YES : Repair poor contact in main fan motor connector.
NO : Replace main fan motor with a new one.



1B5	CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 13 from fuse and relay box.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***
YES : Replace fuse.
NO : Go to step **1B6**.



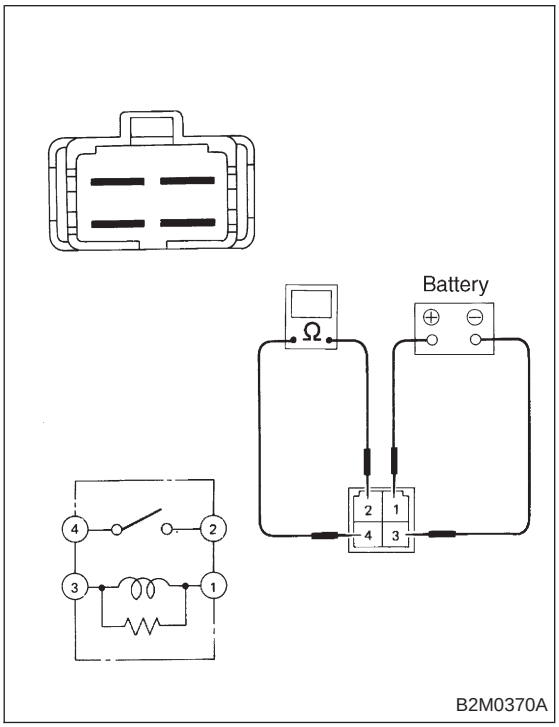
H2M1712

1B6	CHECK MAIN FAN RELAY.

1) Remove main fan relay from fuse and relay box.
2) Check continuity between main fan relay terminals.

CHECK : ***Does no continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **1B7**.
NO : Replace main fan relay.



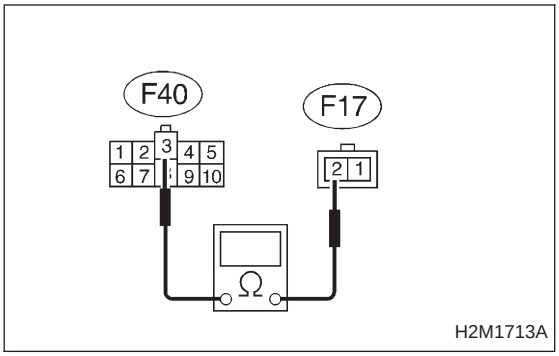
B2M0370A

1B7	CHECK MAIN FAN RELAY.

1) Connect battery to terminals No. 1 and No. 3 of main fan relay.
2) Check continuity between main fan relay terminals.

CHECK : ***Does continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **1B8**.
NO : Replace main fan relay.



1B8	CHECK HARNESS CONNECTOR BETWEEN FUSE AND RELAY BOX AND MAIN FAN MOTOR.

1) Disconnect connector from fuse and relay box.

2) Measure resistance of harness connector between fuse and relay box and main fan motor.

Connector & terminal
(F40) No. 3 — (F17) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **1B9**.

NO : Repair open circuit in harness between fuse and relay box and main fan motor connector.

1B9	CHECK POOR CONTACT.

Check poor contact in fuse and relay box connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact fuse and relay box connector?***

YES : Repair poor contact in fuse and relay box connector.

NO : Go to step **1B10**.

1B10	CHECK POOR CONTACT.

Check poor contact in main fan motor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in main fan motor connector?***

YES : Repair poor contact in main fan motor connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

2. Radiator Sub Fan (With A/C model only)

A: OPERATION

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

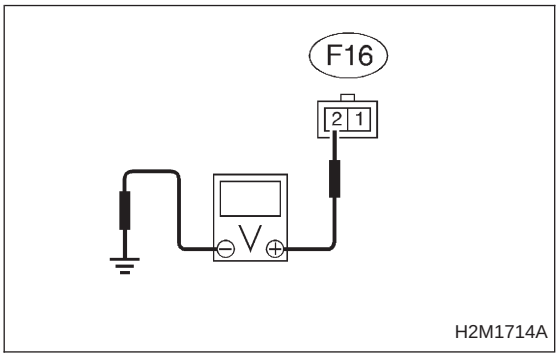
TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

2A1	**CHECK POWER SUPPLY TO SUB FAN MOTOR.**

CAUTION:
Be careful not to overheat engine during repair.

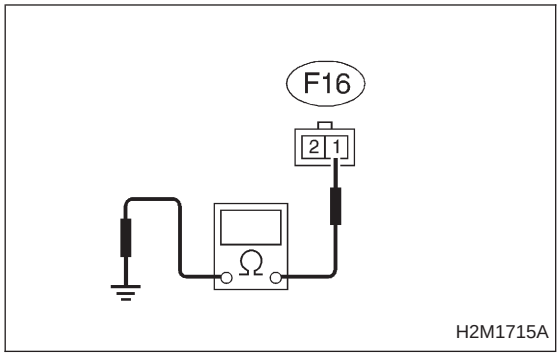
1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor.
3) Warm-up the engine until engine coolant temperature increases over 100°C (212°F).
4) Stop the engine and turn ignition switch to ON.



5) Measure voltage between sub fan motor connector and chassis ground.

Connector & terminal
(F16) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **2A2**.
NO : Go to step **2A5**.



2A2	CHECK GROUND CIRCUIT OF SUB FAN MOTOR.

1) Turn ignition switch to OFF.

2) Measure resistance between sub fan motor connector and chassis ground.

Connector & terminal
(F16) No. 1 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **2A3**.

NO : Repair open circuit in harness between sub fan motor connector and chassis ground.

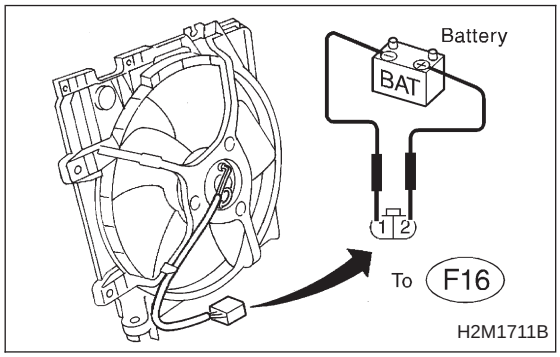
2A3	CHECK POOR CONTACT.

Check poor contact in sub fan motor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in sub fan motor connector?***

YES : Repair poor contact in sub fan motor connector.

NO : Go to step **2A4**.



2A4	CHECK SUB FAN MOTOR.

Connect battery positive (+) terminal to terminal No. 2, and negative (−) terminal to terminal No. 1 of sub fan motor connector.

CHECK ***: Does the sub fan rotate?***

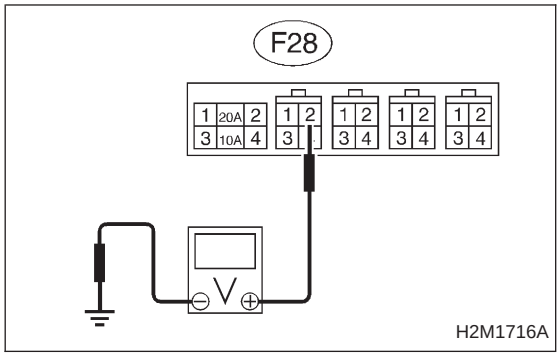
YES : Repair poor contact in sub fan motor connector.

NO : Replace sub fan motor with a new one.

2A5	CHECK POWER SUPPLY TO SUB FAN RELAY.

1) Turn ignition switch to OFF.

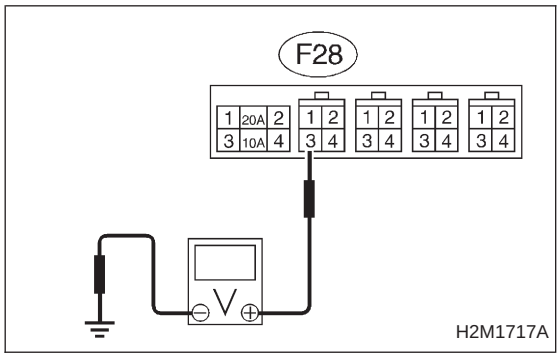
2) Remove sub fan relay from A/C relay holder.



3) Measure voltage between sub fan relay terminal and chassis ground.

Connector & terminal
(F28) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **2A6**.
NO : Go to step **2A7**.

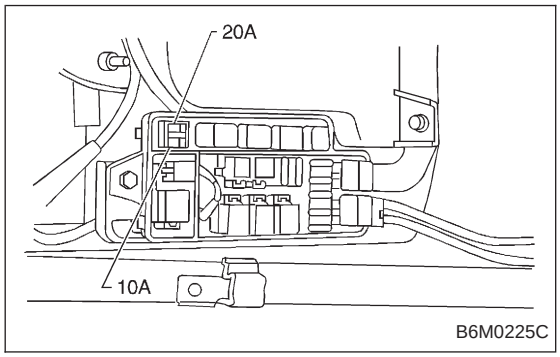


2A6	CHECK POWER SUPPLY TO SUB FAN RELAY.

1) Turn ignition swith to ON.
2) Measure voltage between sub fan relay terminal and chassis ground.

Connector & terminal
(F28) No. 3 (+) — Chassis ground (−):

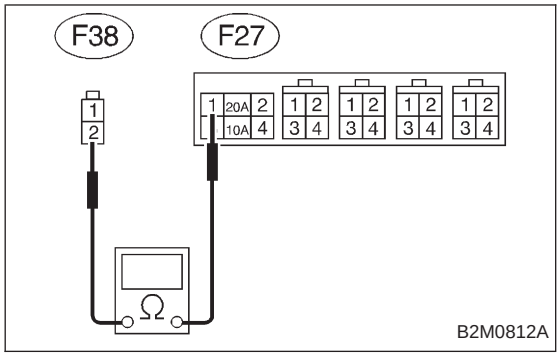
CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **2A17**.
NO : Go to step **2A12**.



2A7	CHECK 20 A FUSE.

1) Remove 20 A fuse from A/C relay holder.
2) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***
YES : Replace fuse.
NO : Go to step **2A8**.



2A8	CHECK HARNESS CONNECTOR BETWEEN MAIN FUSE BOX AND A/C RELAY HOLDER 20 A FUSE.

1) Disconnect connector from main fuse box.

2) Disconnect connectors (F25) and (F26) from generator, and (F34) from SBF holder.

3) Measure resistance of harness connector between main fuse box connector and A/C relay holder 20 A fuse terminal.

Connector & terminal
(F38) No. 2 — (F27) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **2A9**.

NO : Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.

2A9	CHECK POOR CONTACT.

Check poor contact in main fuse box connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in main fuse box connector?***

YES : Repair poor contact in main fuse box connector.

NO : Go to step **2A10**.

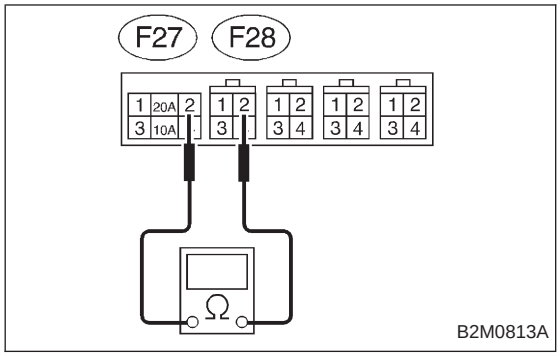
2A10	CHECK POOR CONTACT.

Check poor contact in A/C relay holder 20 A fuse connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in A/C relay holder 20 A fuse connector?***

YES : Repair poor contact in 20 A fuse connector.

NO : Go to step **2A11**.

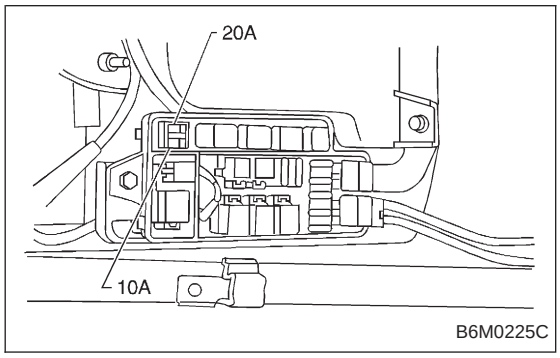


2A11	**CHECK HARNESS CONNECTOR BETWEEN 20 A FUSE AND SUB FAN RELAY IN A/C RELAY HOLDER.**

Measure resistance of harness between 20 A fuse and sub fan relay terminal.

Connector & terminal
(F27) No. 2 — (F28) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Repair poor contact in sub fan relay connector.
NO : Repair open circuit in harness between 20 A fuse and sub fan relay connector.



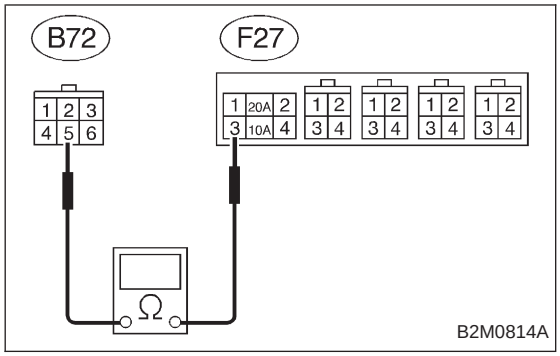
2A12	**CHECK 10 A FUSE.**

1) Turn ignition switch to OFF.
2) Remove 10 A fuse from A/C relay holder.
3) Check condition of fuse.

CHECK ***: Is the fuse blown-out?***
YES : Replace fuse.
NO : Go to step **2A13**.

2A13	**CHECK HARNESS CONNECTOR BETWEEN IGNITION SWITCH AND A/C RELAY HOLDER 10 A FUSE.**

1) Disconnect connector from ignition switch.
2) Disconnect connectors (F42) and (B52) from fuse and relay box, and (F39) from main fuse box.



3) Measure resistance of harness between ignition switch connector and A/C relay holder 10 A fuse terminal.

Connector & terminal
(B72) No. 5 — (F27) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to step **2A14**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ignition switch connector and 10 A fuse terminal.
- Poor contact in coupling connector (B61).

2A14	CHECK POOR CONTACT.

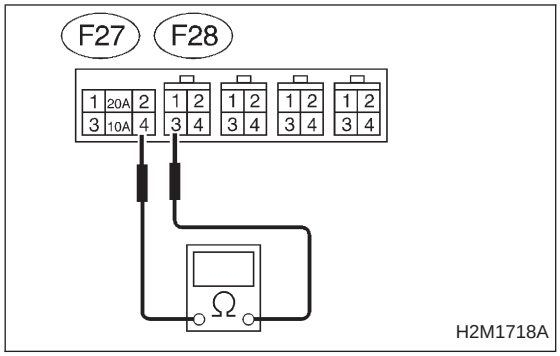
Check poor contact in ignition switch connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ignition switch connector?***
YES : Repair poor contact in ignition switch connector.
NO : Go to step **2A15**.

2A15	CHECK POOR CONTACT.

Check poor contact in A/C relay holder 10 A fuse connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in A/C relay holder 10 A fuse connector?***
YES : Repair poor contact in 10 A fuse connector.
NO : Go to step **2A16**.



2A16	CHECK HARNESS CONNECTOR BETWEEN 10 A FUSE AND SUB FAN RELAY IN A/C RELAY HOLDER.

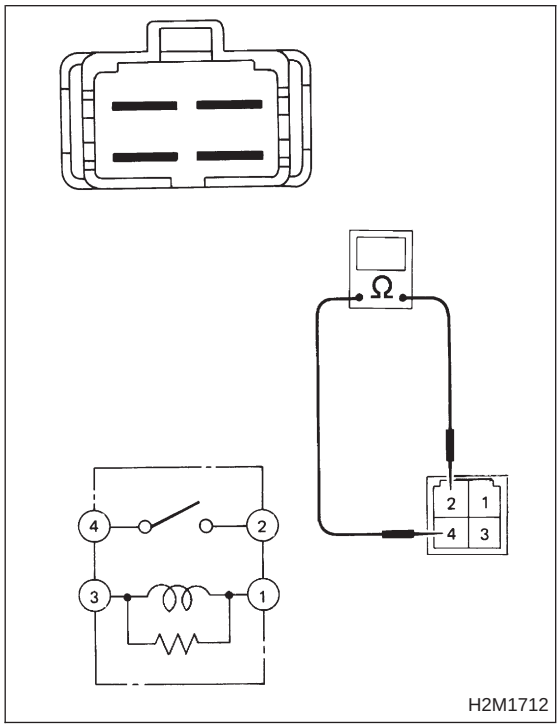
Measure resistance of harness between 10 A fuse and sub fan relay terminal.

Connector & terminal
(F27) No. 4 — (F28) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Repair poor contact in sub fan relay connector.

NO : Repair open circuit in harness between 10 A fuse and sub fan relay connector.



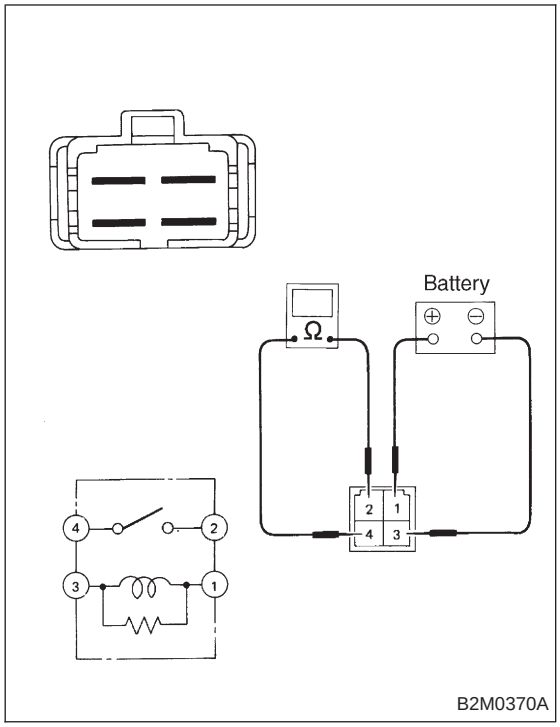
2A17	CHECK SUB FAN RELAY.

1) Turn ignition switch to OFF.
2) Check continuity between sub fan relay terminals.

CHECK ***: Does no continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **2A18**.

NO : Replace sub fan relay.



2A18	CHECK SUB FAN RELAY.

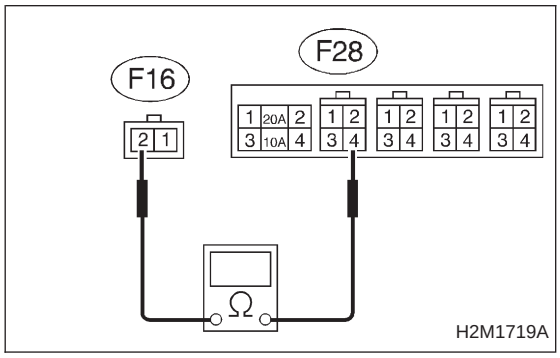
1) Connect battery to terminals No. 1 and No. 3 of sub fan relay.

2) Check continuity between sub fan relay terminals.

CHECK : ***Does continuity exist between terminals No. 2 and No. 4?***

YES : Go to step **2A19**.

NO : Replace sub fan relay.



2A19	CHECK HARNESS CONNECTOR BETWEEN SUB FAN RELAY AND SUB FAN MOTOR.

Measure resistance of harness between sub fan motor connector and sub fan relay terminal.

Connector & terminal
(F16) No. 2 — (F28) No. 4:

CHECK : ***Is the resistance less than 1 Ω?***

YES : Go to step **2A20**.

NO : Repair open circuit in harness between sub fan motor and sub fan relay connector.

2A20	CHECK POOR CONTACT.

Check poor contact in sub fan relay connector. <Ref. to FOREWORD [T3C1].>

CHECK : ***Is there poor contact in sub fan relay connector?***

YES : Repair poor contact in sub fan relay connector.

NO : Go to step **2A21**.

2A21	CHECK POOR CONTACT.

Check poor contact in sub fan relay connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in sub fan motor connector?***

YES : Repair poor contact in sub fan motor connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

ON-BOARD DIAGNOSTICS II SYSTEM 2-7

Page

T DIAGNOSTICS AIRBAG 2
1. General 2
2. Electrical Components Location 10
3. Diagnosis System 34
4. Cautions 76
5. Specified Data 79
6. Basic Diagnostic Procedure 85
7. Diagnostics for CHECK ENGINE Malfunction Indicator Lamp (MIL) 89
8. Diagnostics for Engine Starting Failure 98
9. General Diagnostic Table 122
10. Diagnostic Chart with Trouble Code 130

1. General

A: GENERAL DESCRIPTION

● The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
● Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
● The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
● When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
● The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
● If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
● When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
● The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
● The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru select monitor or the OBD-II general scan tool to the vehicle.

B: ENGINE

1. ENGINE AND EMISSION CONTROL SYSTEM

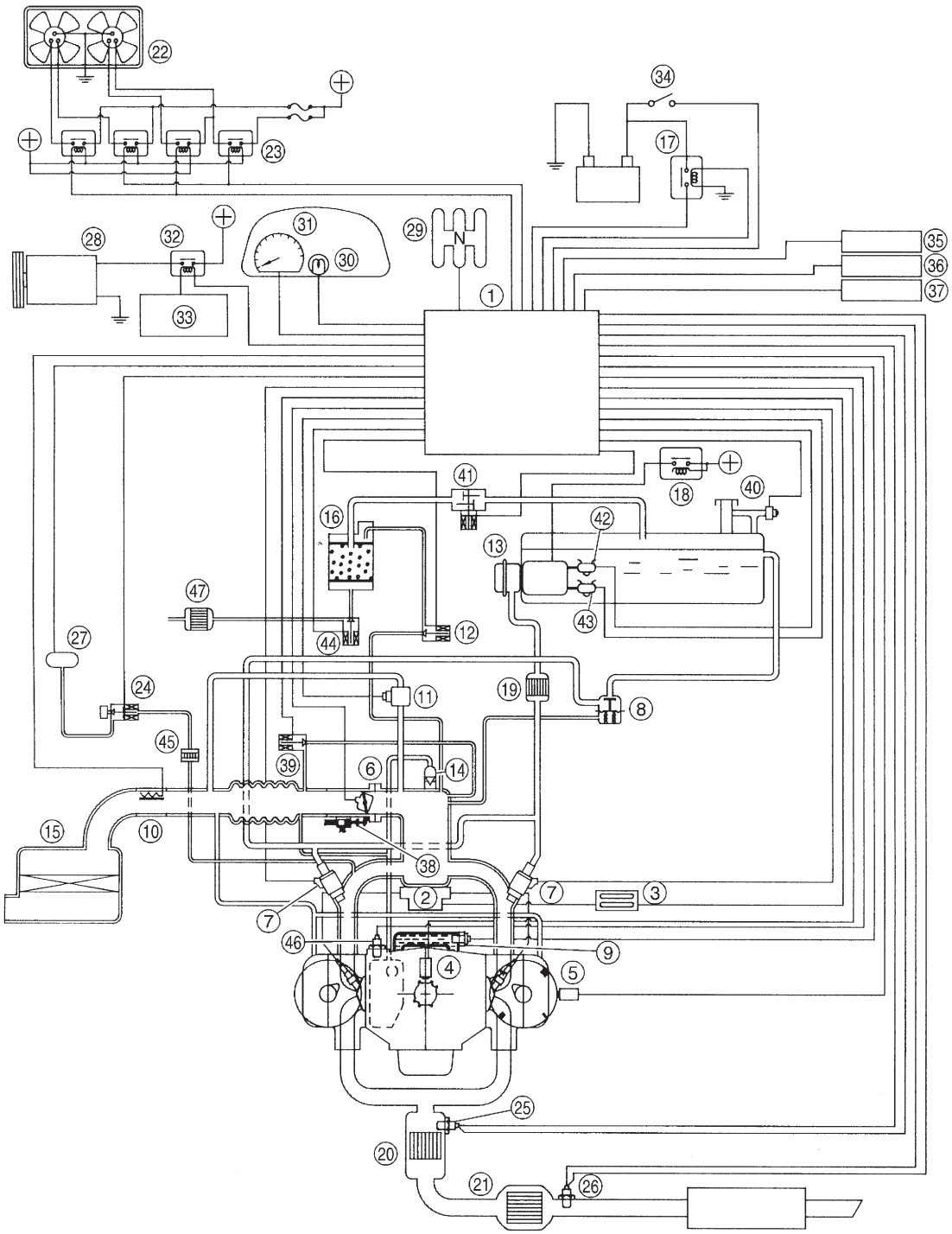
● The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quan-

tity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

● Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc. The MFI system also has the following features:

1) Reduced emission of harmful exhaust gases.
2) Reduced in fuel consumption.
3) Increased engine output.
4) Superior acceleration and deceleration.
5) Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

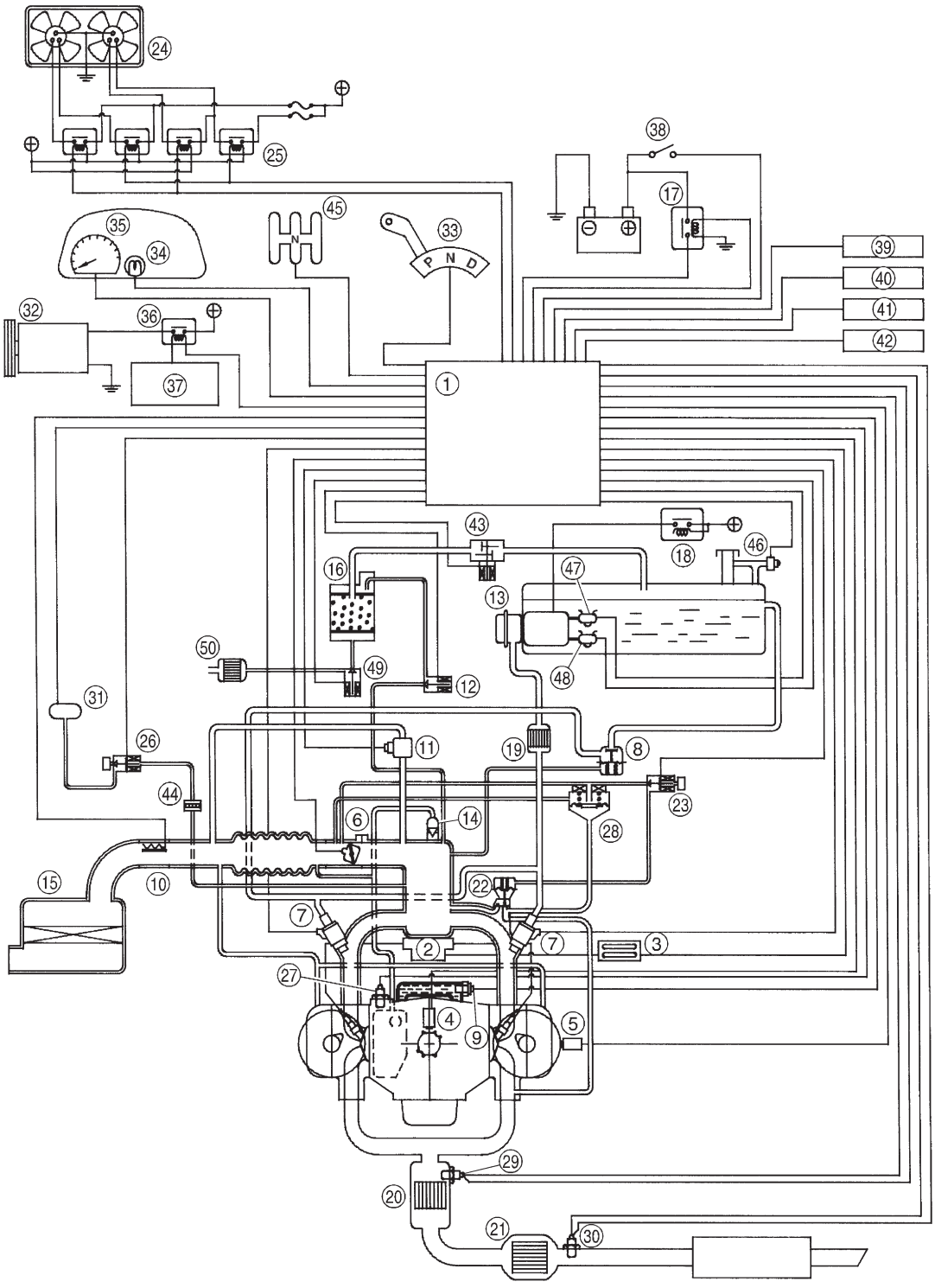
2. SCHEMATIC (1800 cc MODEL)



H2M1595A

① Engine control module (ECM)
② Ignition coil
③ Ignitor
④ Crankshaft position sensor
⑤ Camshaft position sensor
⑥ Throttle position sensor
⑦ Fuel injectors
⑧ Pressure regulator
⑨ Engine coolant temperature sensor
⑩ Mass air flow sensor
⑪ Idle air control solenoid valve
⑫ Purge control solenoid valve
⑬ Fuel pump
⑭ PCV valve
⑮ Air cleaner
⑯ Canister
⑰ Main relay
⑱ Fuel pump relay
⑲ Fuel filter
⑳ Front catalytic converter
㉑ Rear catalytic converter
㉒ Radiator fan
㉓ Radiator fan relay
㉔ Pressure sources switching solenoid valve
㉕ Front oxygen sensor
㉖ Rear oxygen sensor
㉗ Pressure sensor
㉘ A/C compressor (With A/C models)
㉙ Neutral position switch
㉚ CHECK ENGINE malfunction indicator lamp (MIL)
㉛ Tachometer
㉜ A/C relay (With A/C models)
㉝ A/C control module (With A/C models)
㉞ Ignition switch
㉟ Vehicle speed sensor
㊱ Data link connector (For Subaru select monitor)
㊲ Data link connector (For Subaru select monitor and OBD-II general scan tool)
㊳ Throttle opener
㊴ FICD solenoid valve (With A/C models)
㊵ Fuel tank pressure sensor
㊶ Pressure control solenoid valve
㊷ Fuel temperature sensor
㊸ Fuel level sensor
㊹ Vent control solenoid valve
㊺ Filter
㊻ Knock sensor
㊼ Air filter

3. SCHEMATIC (2200 cc MODEL)



H2M2340A

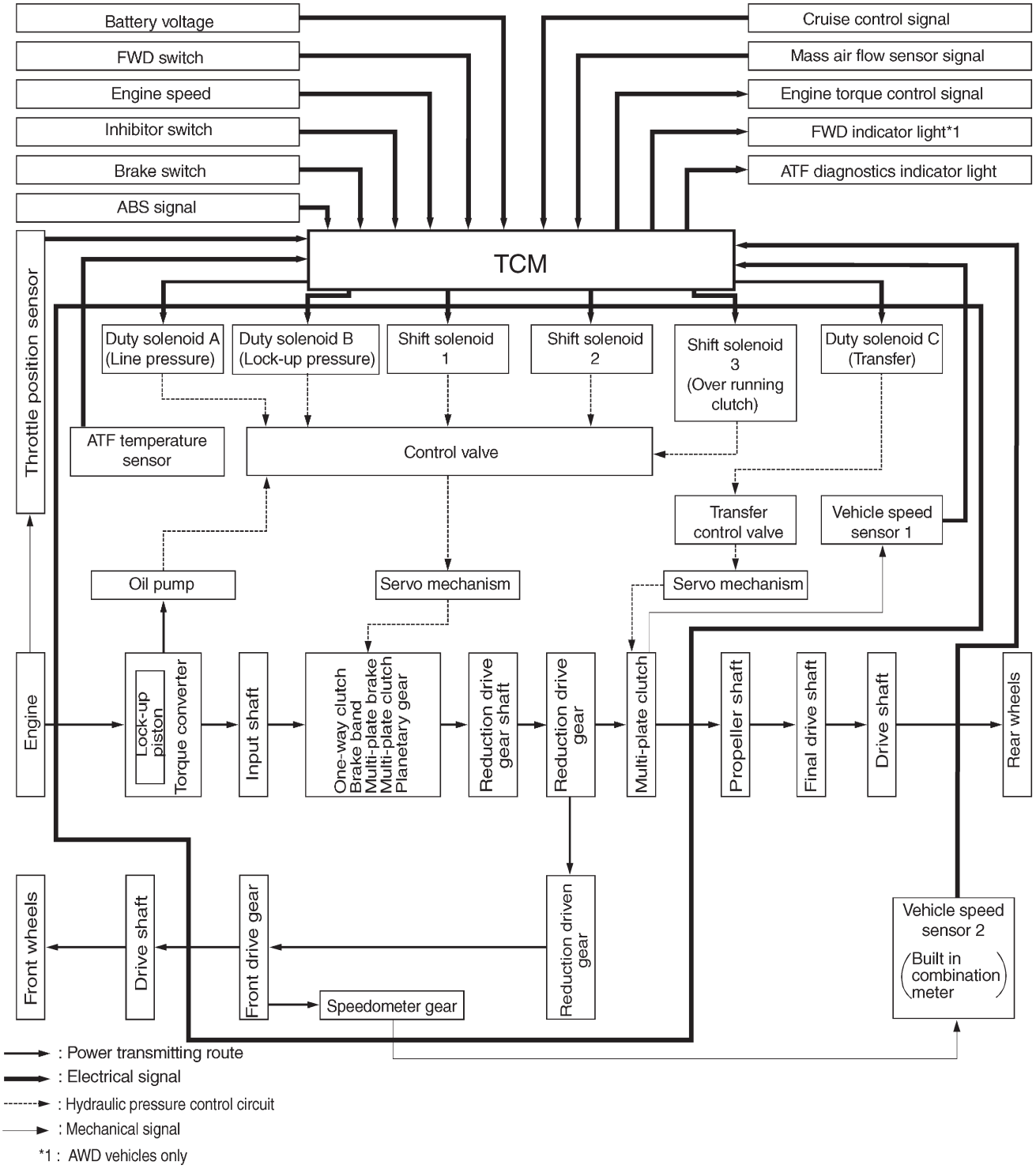
① Engine control module (ECM)
② Ignition coil
③ Ignitor
④ Crankshaft position sensor
⑤ Camshaft position sensor
⑥ Throttle position sensor
⑦ Fuel injectors
⑧ Pressure regulator
⑨ Engine coolant temperature sensor
⑩ Mass air flow sensor
⑪ Idle air control solenoid valve
⑫ Purge control solenoid valve
⑬ Fuel pump
⑭ PCV valve
⑮ Air cleaner
⑯ Canister
⑰ Main relay
⑱ Fuel pump relay
⑲ Fuel filter
⑳ Front catalytic converter
㉑ Rear catalytic converter
㉒ EGR valve (AT vehicles only)
㉓ EGR control solenoid valve (AT vehicles only)
㉔ Radiator fan
㉕ Radiator fan relay
㉖ Pressure sources switching solenoid valve
㉗ Knock sensor
㉘ Back-pressure transducer
㉙ Front oxygen sensor
㉚ Rear oxygen sensor
㉛ Pressure sensor
㉜ A/C compressor
㉝ Inhibitor switch (AT vehicles)
㉞ CHECK ENGINE malfunction indicator lamp (MIL)
㉟ Tachometer
㊱ A/C relay
㊲ A/C control module
㊳ Ignition switch
㊴ Transmission control module (TCM)
㊵ Vehicle speed sensor
㊶ Data link connector (Subaru select monitor)
㊷ Data link connector (OBD-II general scan tool)
㊸ Pressure control solenoid valve
㊹ Filter
㊺ Neutral position switch (MT vehicles)
㊻ Fuel tank pressure sensor
㊼ Fuel temperature sensor
㊽ Fuel level sensor
㊾ Vent control solenoid valve
㊿ Air filter

C: AUTOMATIC TRANSMISSION

1. ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and 3 and duty solenoids A, B and C (a total of six solenoids).

2. SCHEMATIC

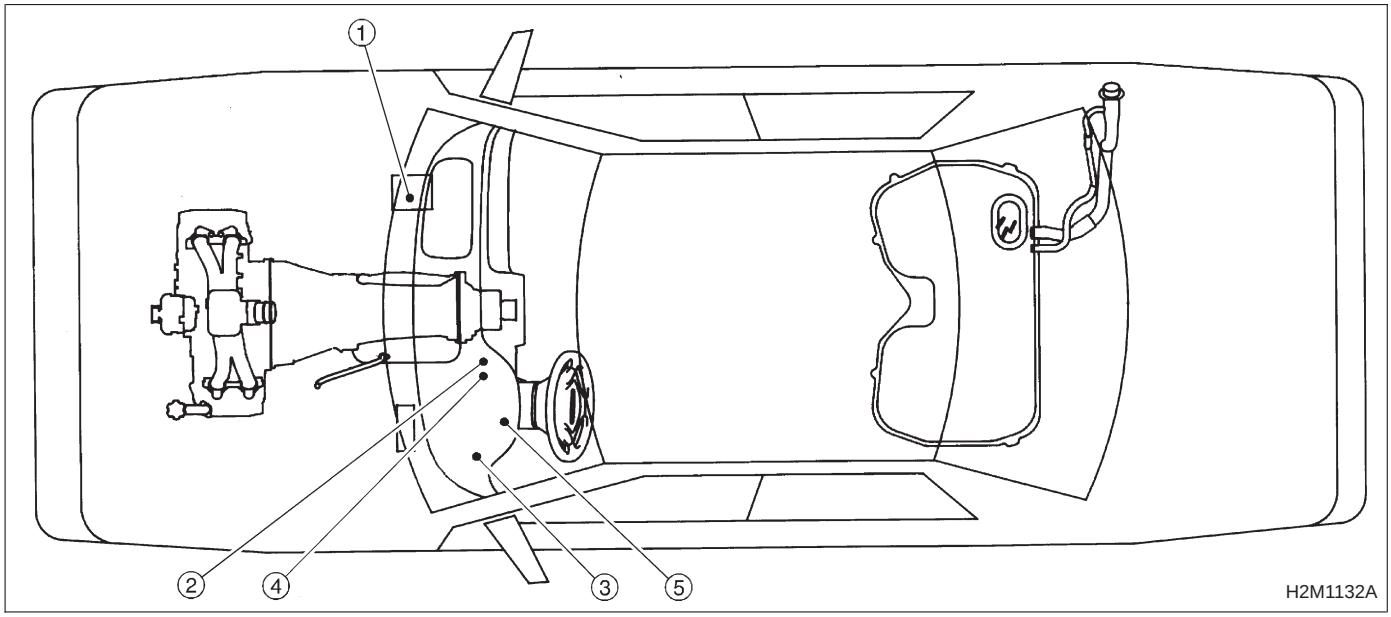


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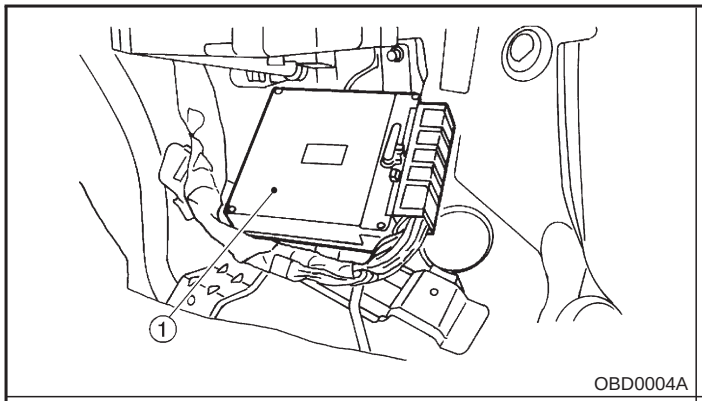
2. Electrical Components Location

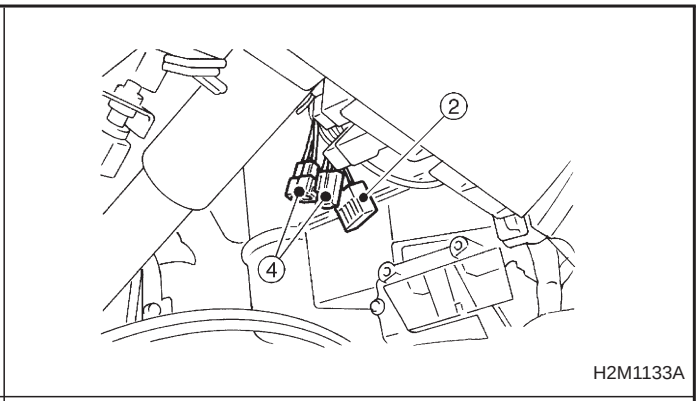
A: ENGINE (1800 cc MODEL)

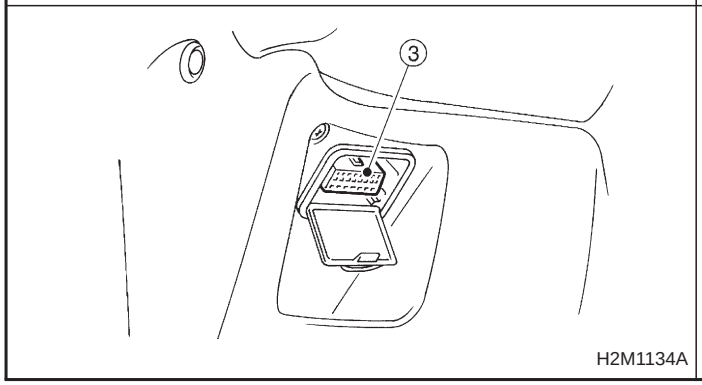
1. MODULE

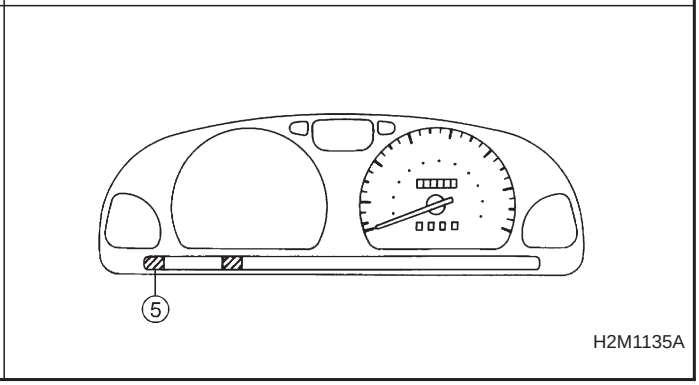


① Engine control module (ECM)
② Data link connector (for Subaru select monitor only)
③ Data link connector (for Subaru select monitor and OBD-II general scan tool)
④ Test mode connector
⑤ CHECK ENGINE malfunction indicator lamp (MIL)

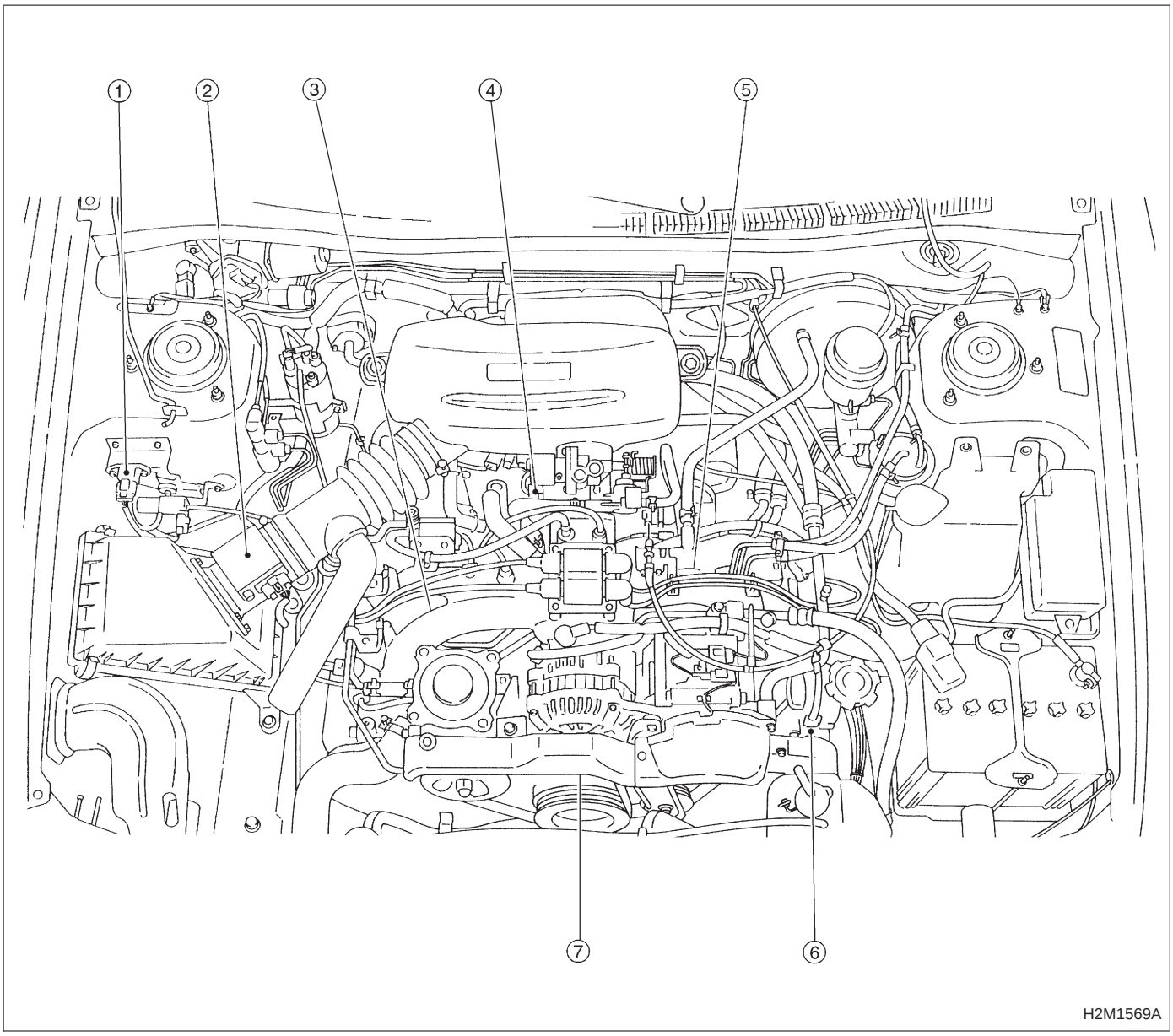




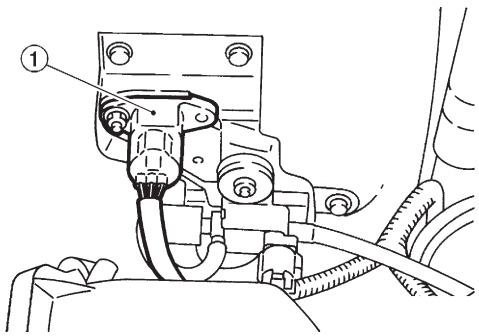




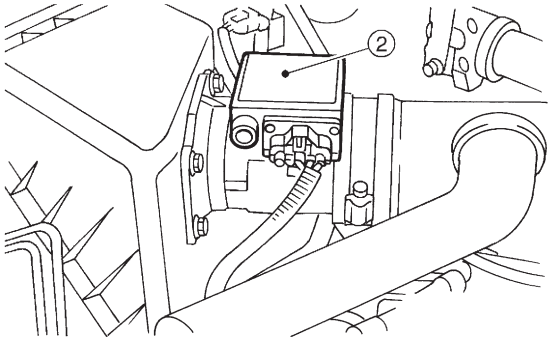
2. SENSOR



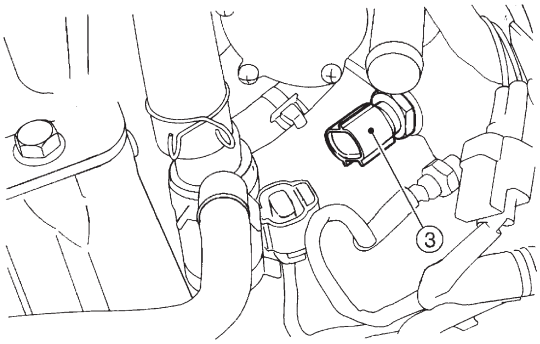
① Pressure sensor
② Mass air flow sensor
③ Engine coolant temperature sensor
④ Throttle position sensor
⑤ Knock sensor
⑥ Camshaft position sensor
⑦ Crankshaft position sensor



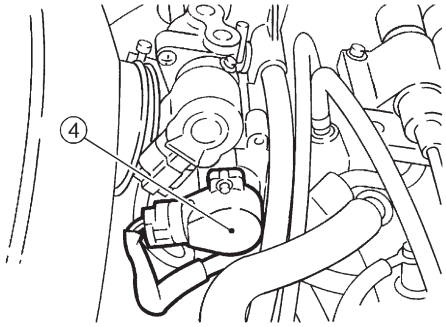
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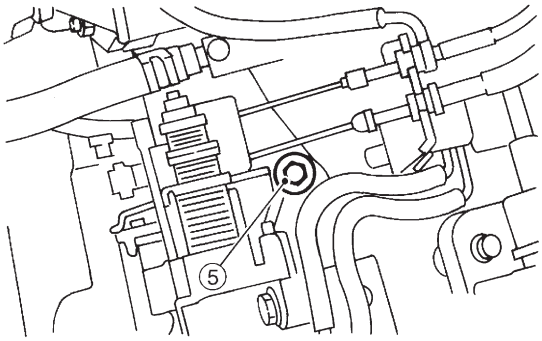
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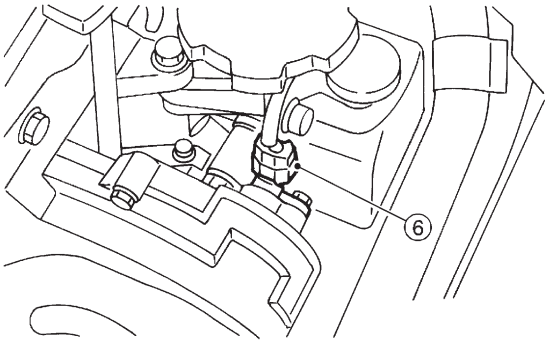
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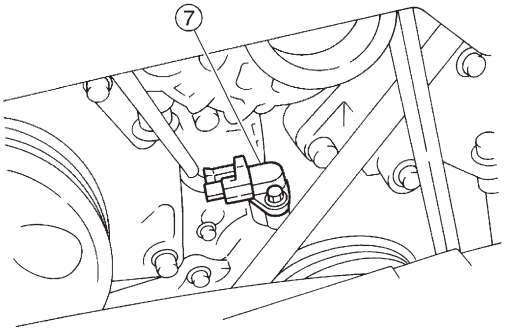
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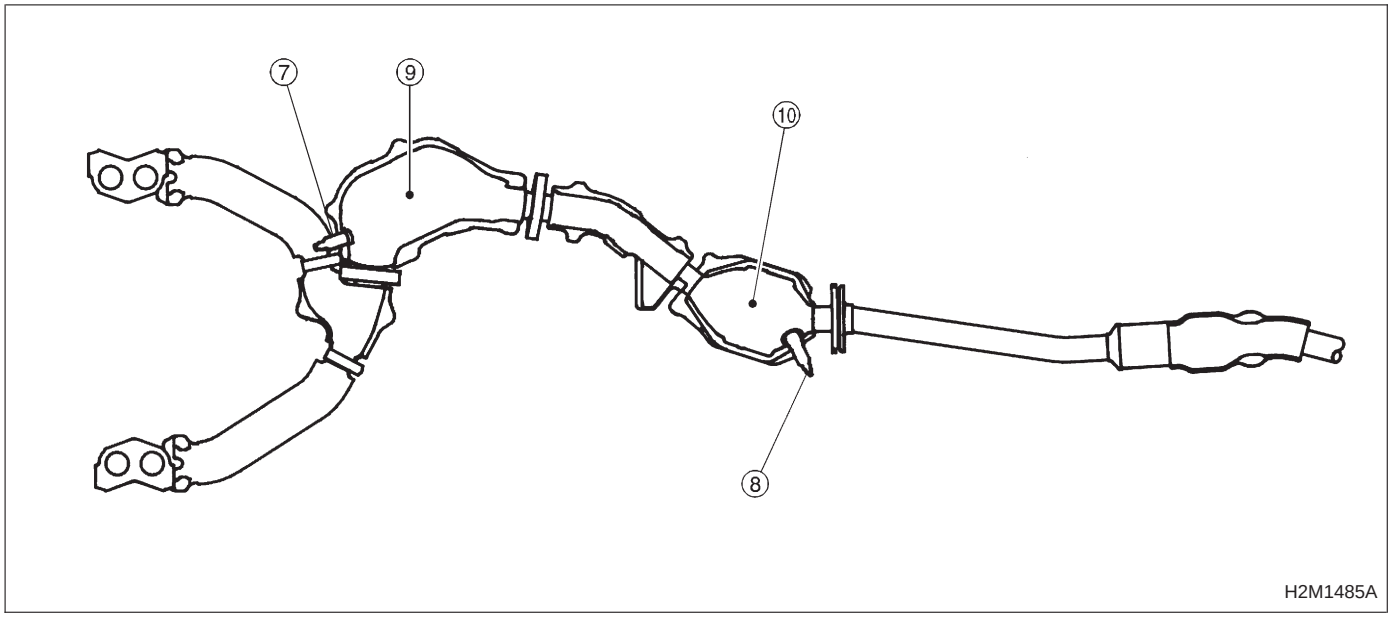
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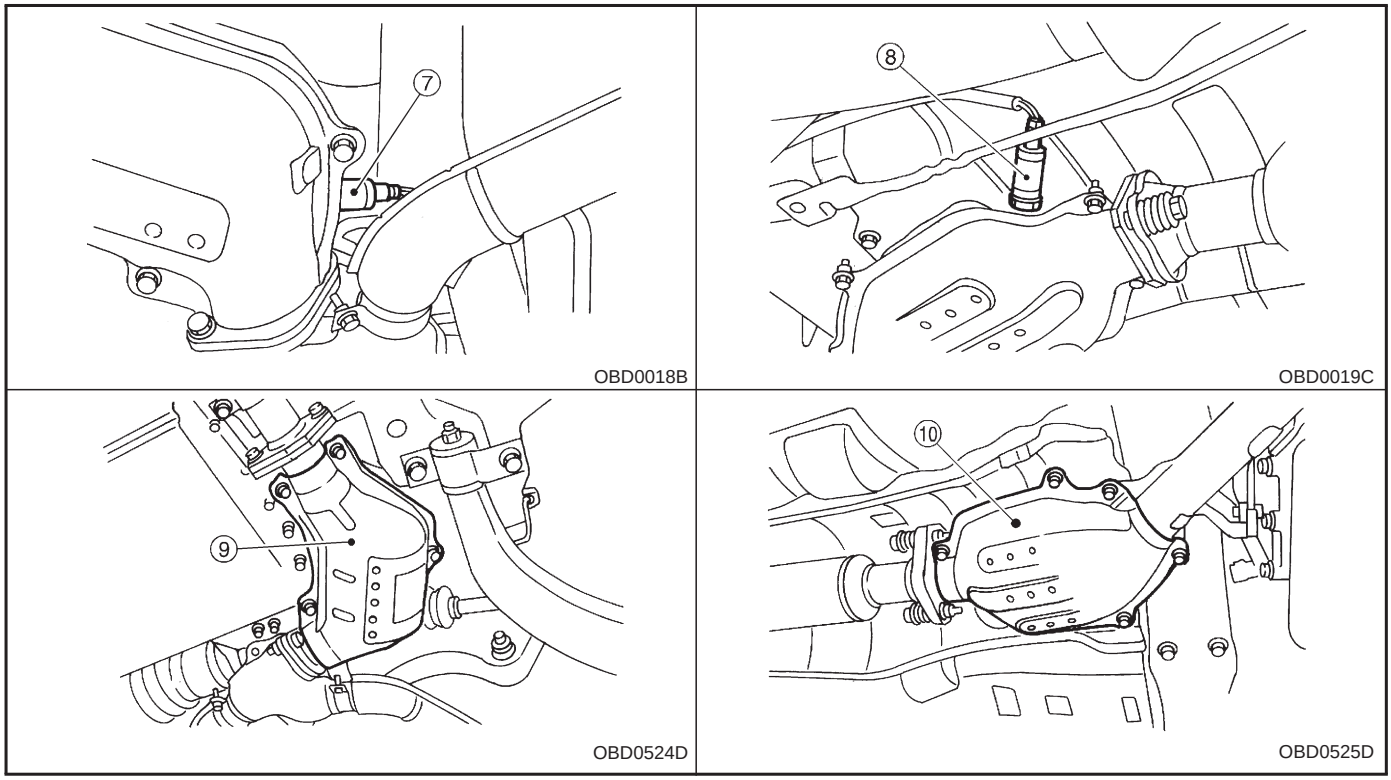
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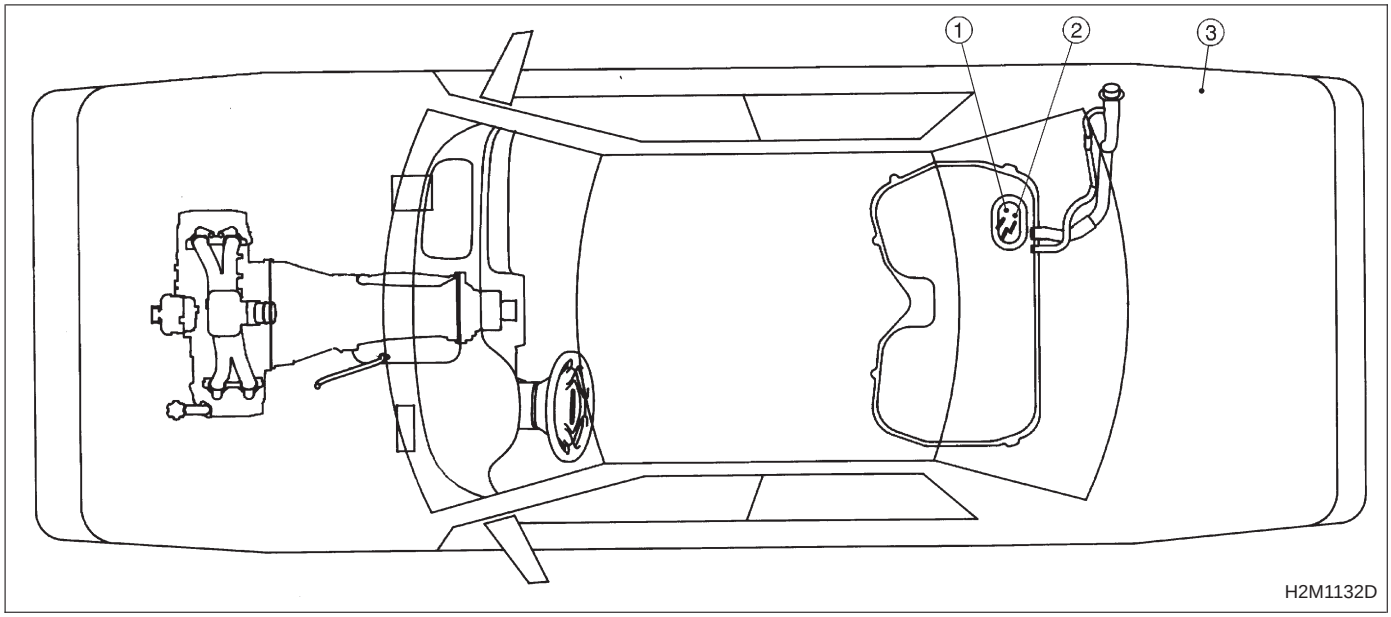


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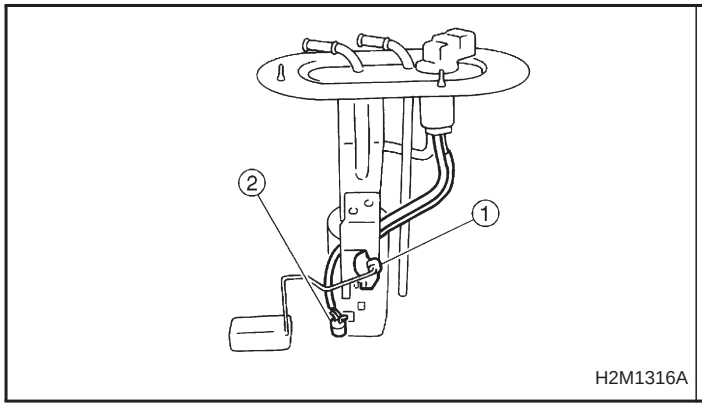


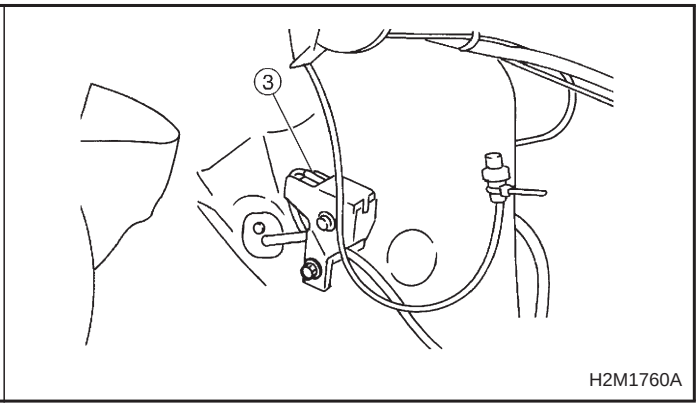
⑦ Front oxygen sensor
⑧ Rear oxygen sensor
⑨ Front catalytic converter
⑩ Rear catalytic converter



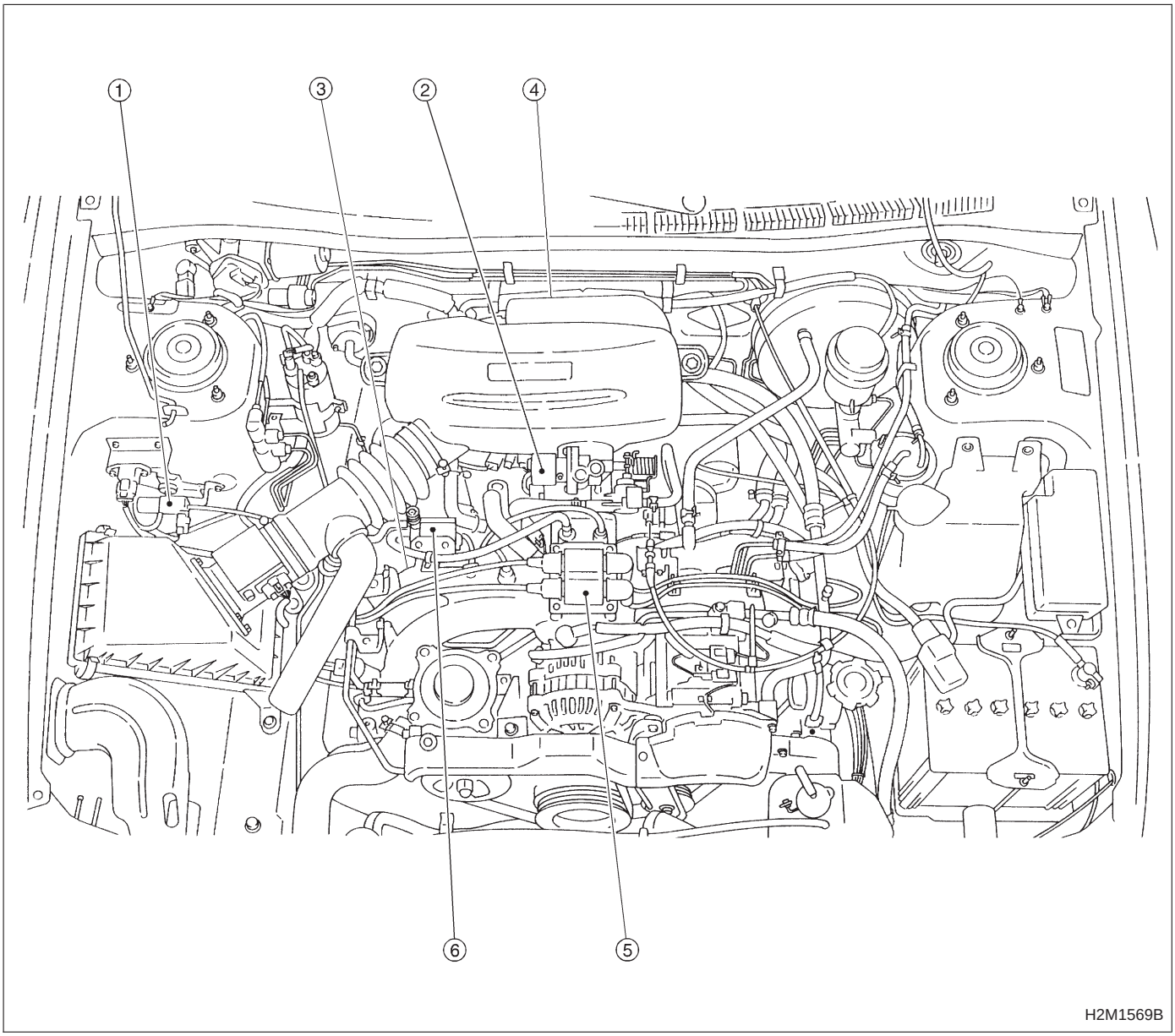


① Fuel level sensor
② Fuel temperature sensor
③ Fuel tank pressure sensor

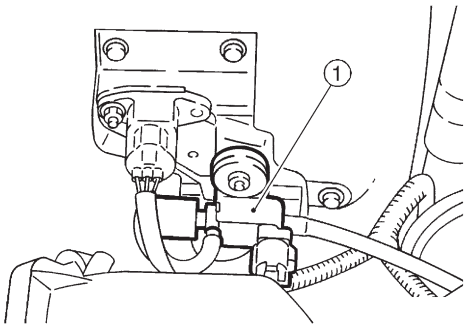




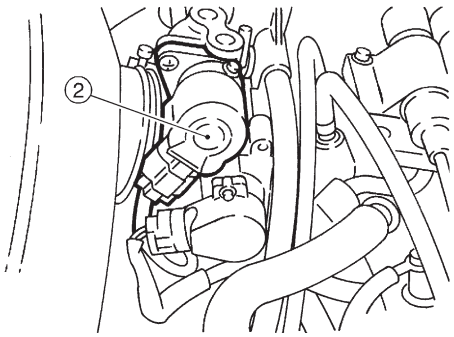
3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



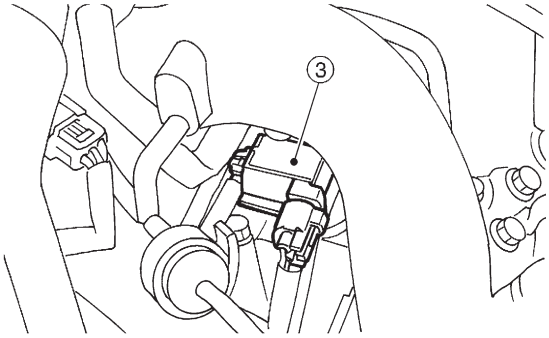
① Pressure sources switching solenoid valve
② Idle air control solenoid valve
③ Purge control solenoid valve
④ Ignitor
⑤ Ignition coil
⑥ FICD solenoid valve (With A/C models)



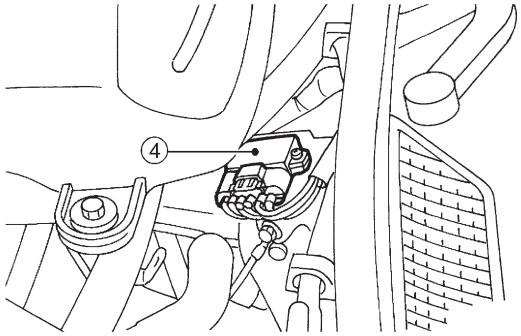
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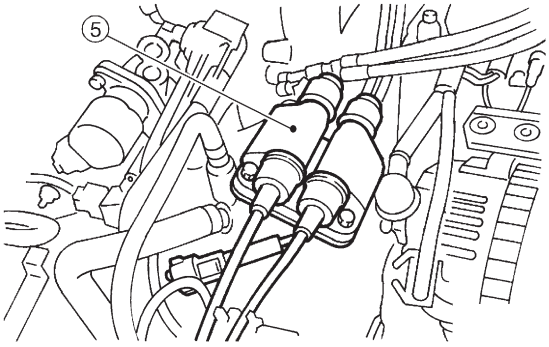
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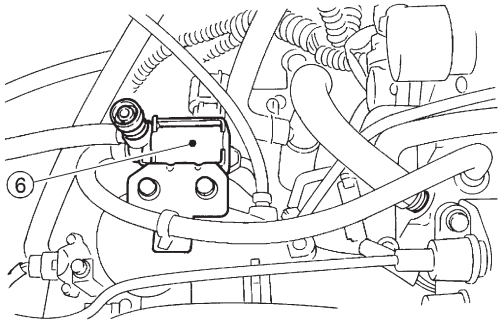
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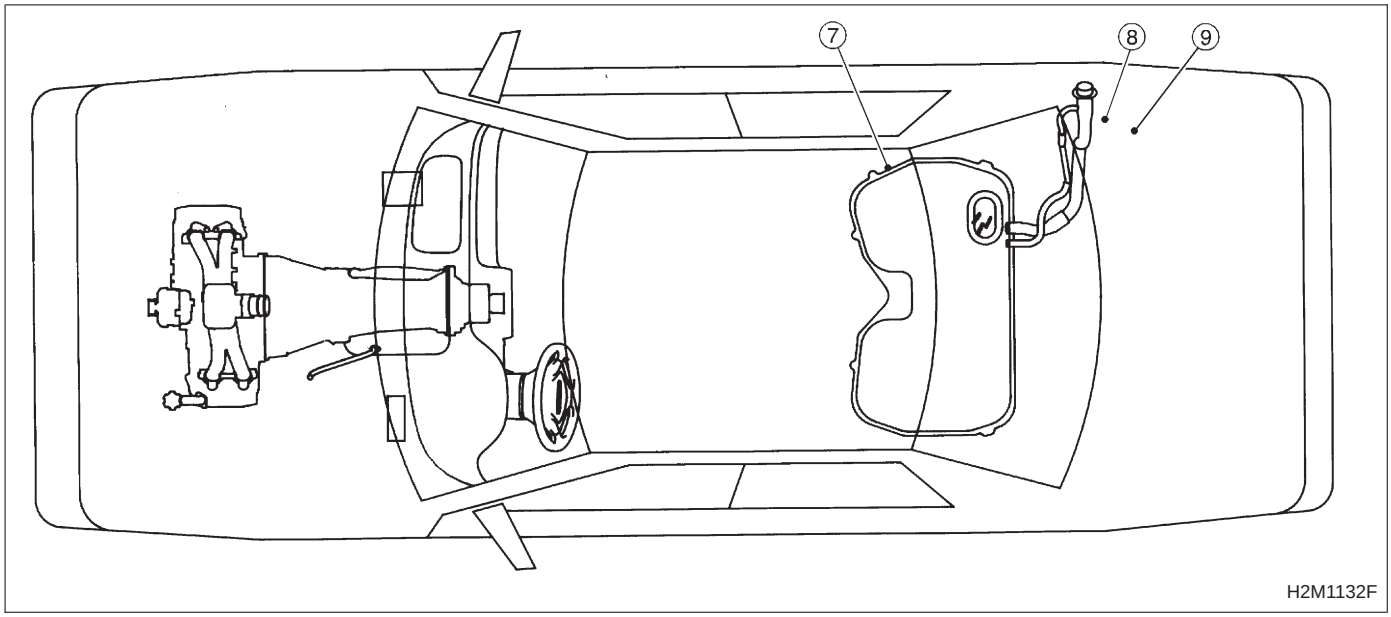
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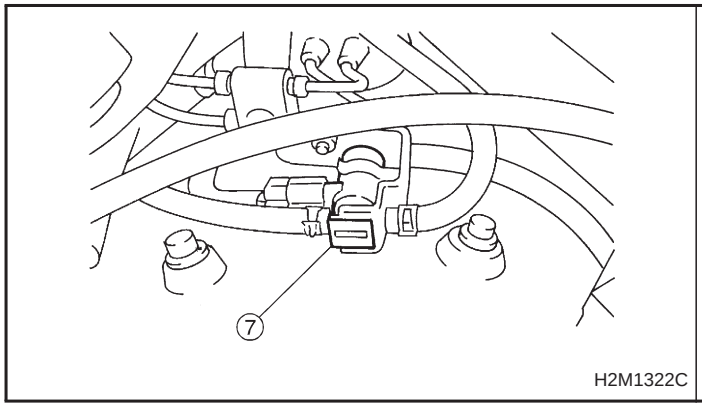
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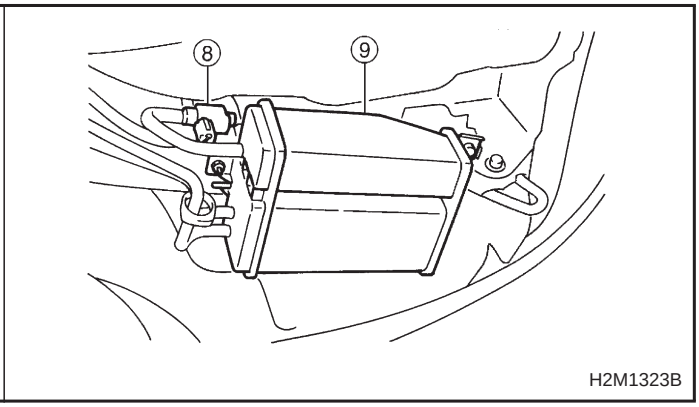


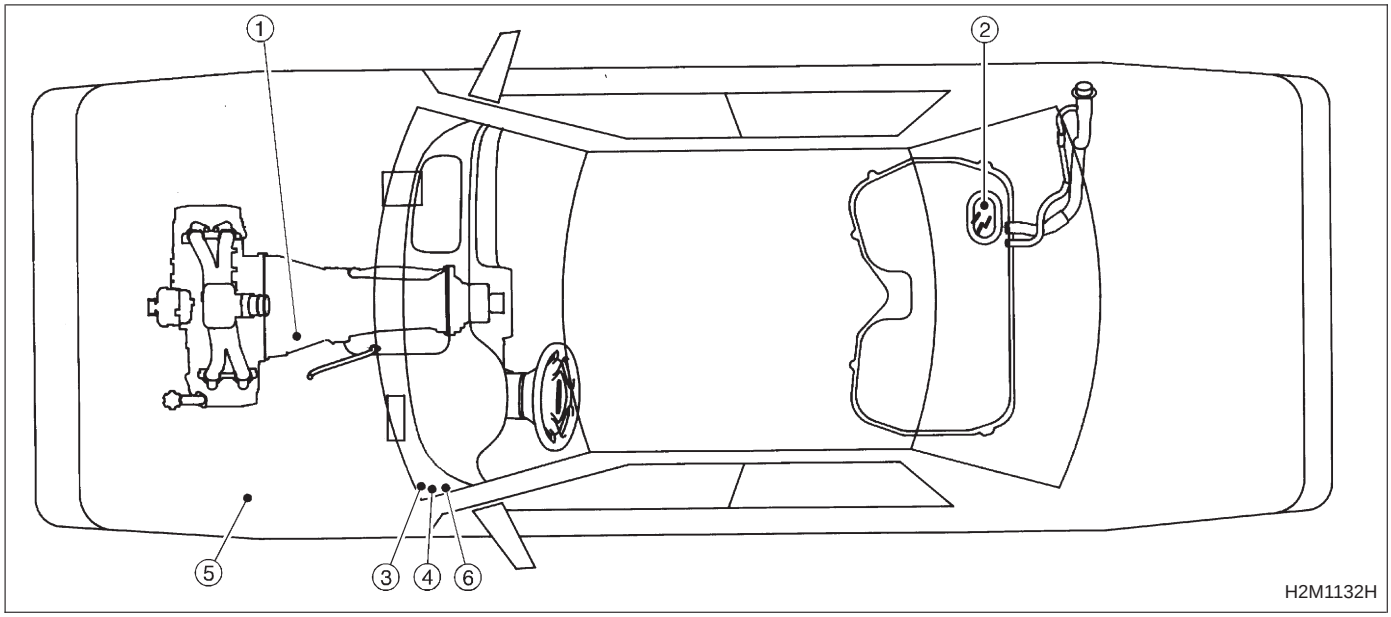
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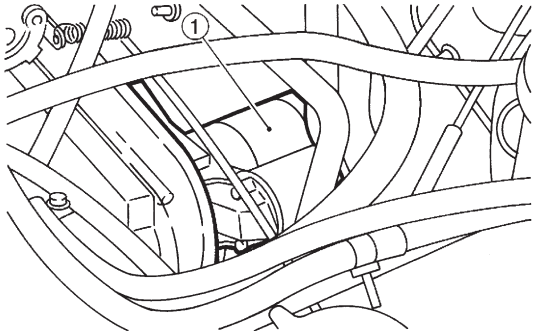
⑦ Pressure control solenoid valve
⑧ Vent control solenoid valve
⑨ Canister



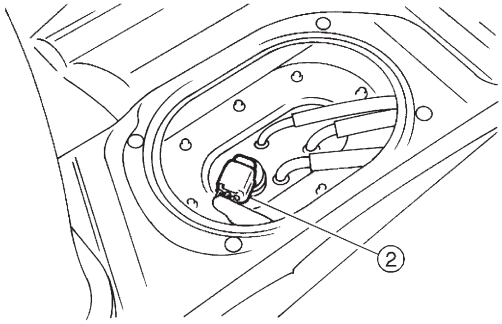




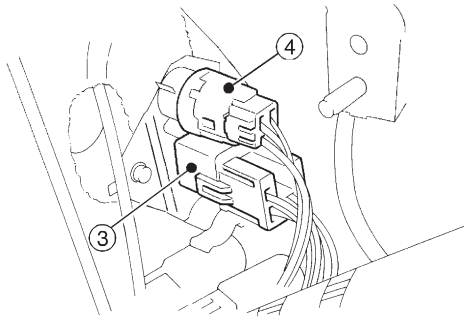
① Starter
② Fuel pump
③ Main relay
④ Fuel pump relay
⑤ Radiator sub fan relay (With A/C models only)
⑥ Main fan relay



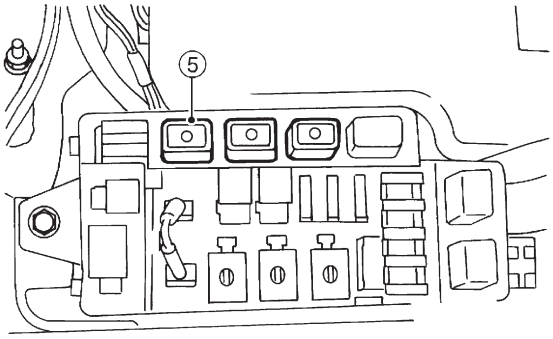
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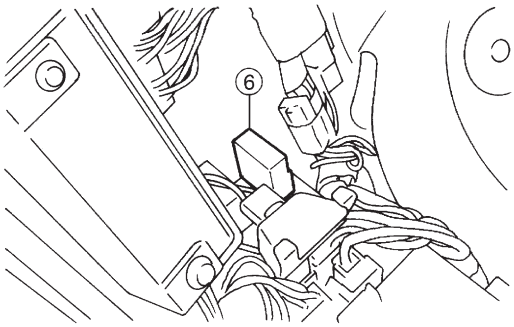
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B2M0218B



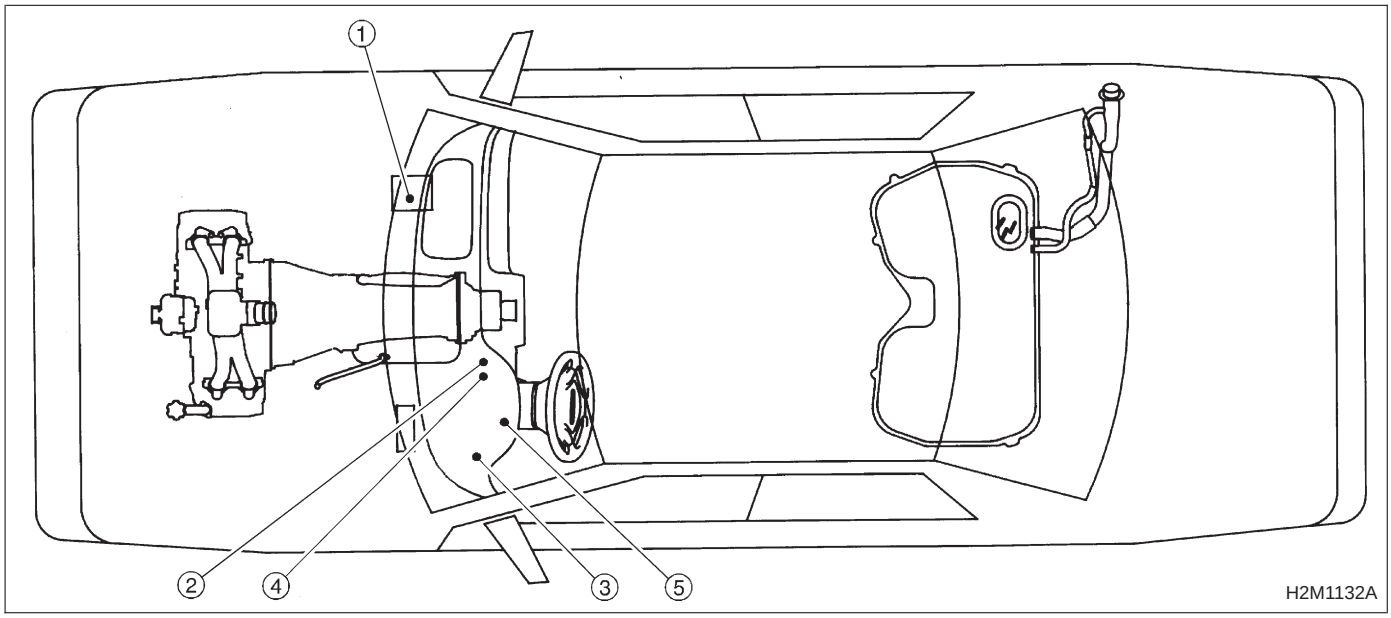
OBD0034B



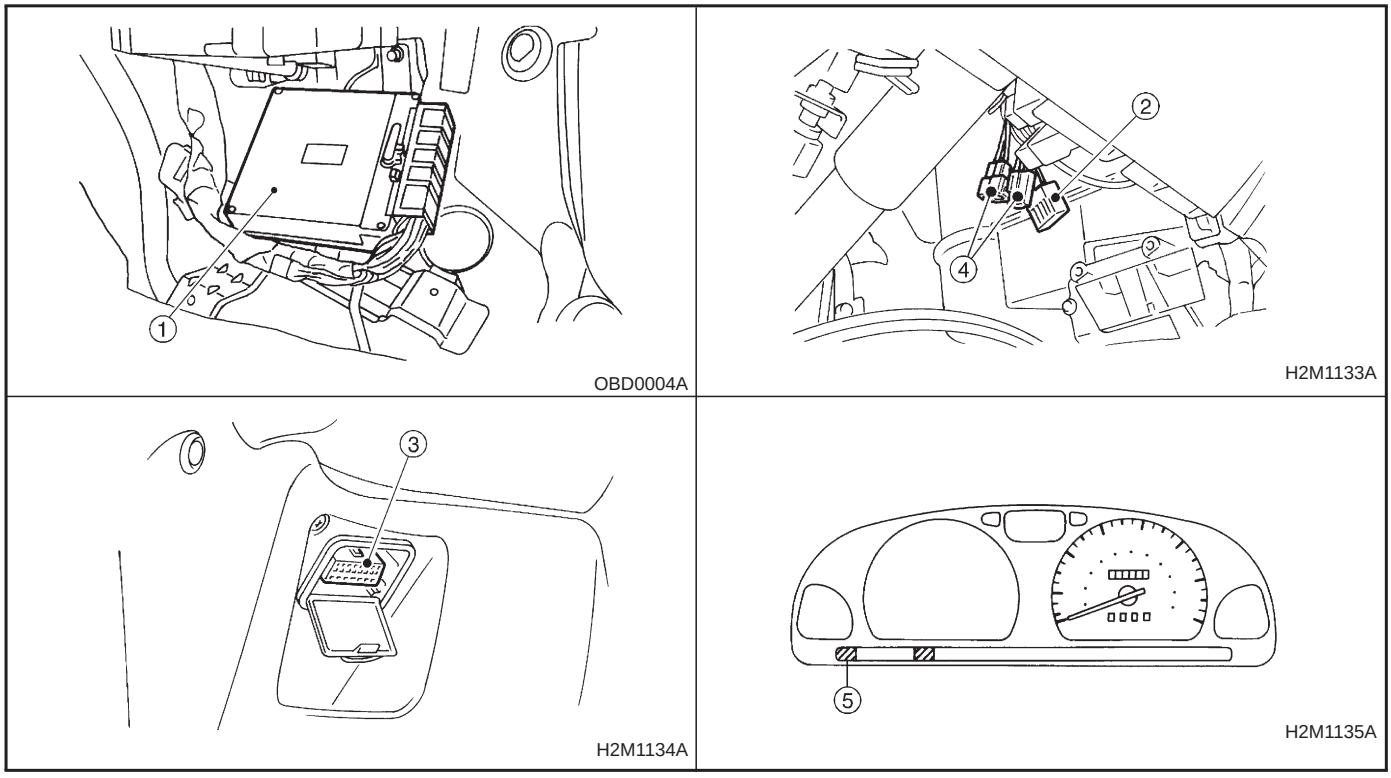
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B: ENGINE (2200 cc MODEL)

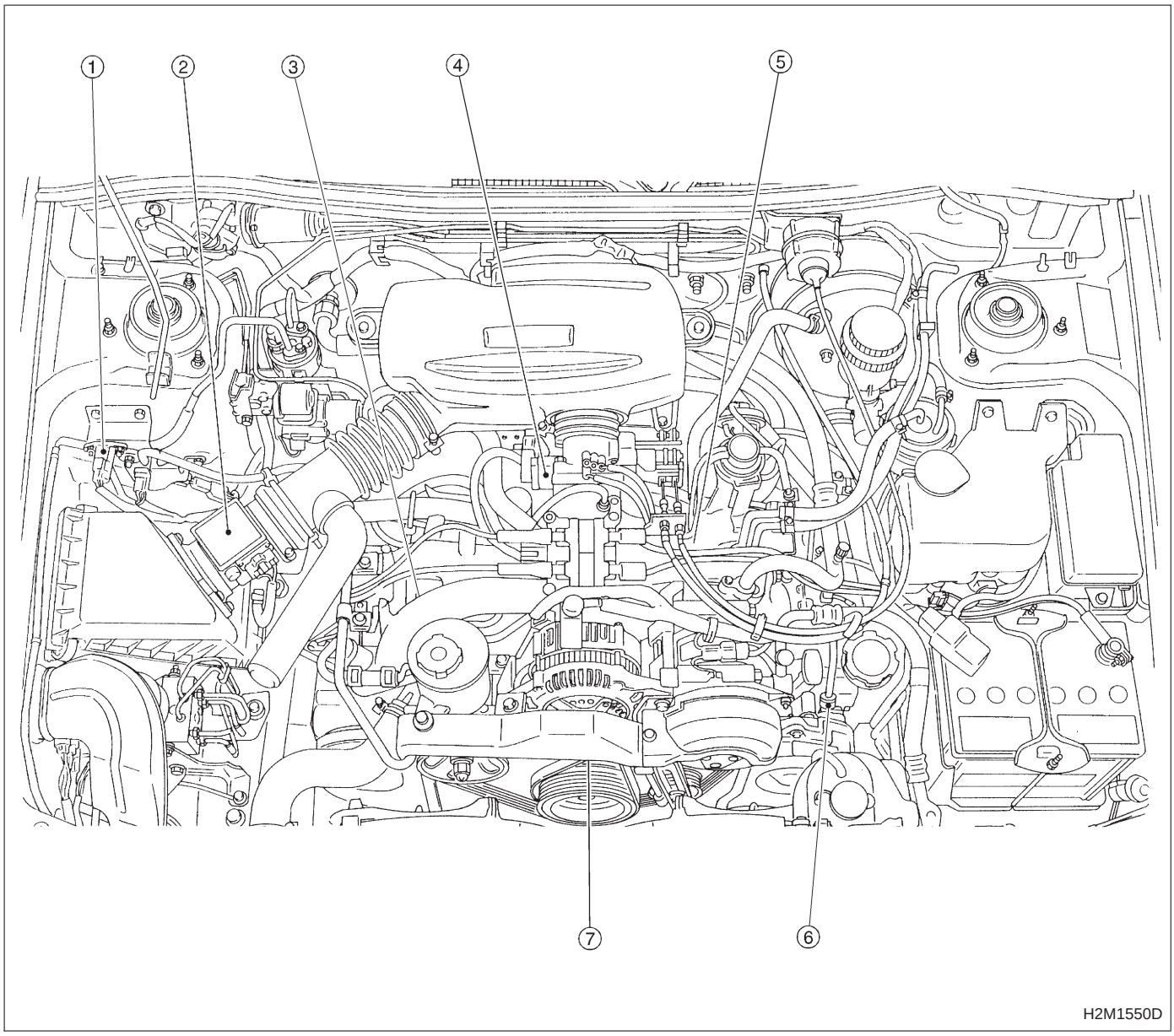
1. MODULE



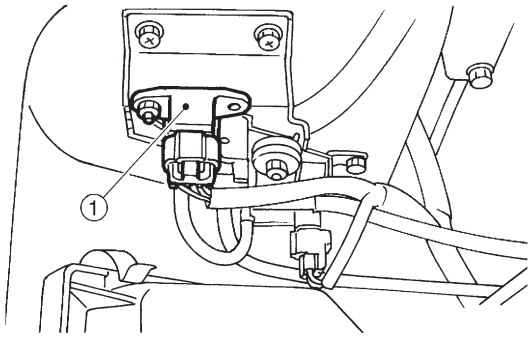
① Engine control module (ECM)
② Data link connector (for Subaru select monitor only)
③ Data link connector (for Subaru select monitor and OBD-II general scan tool)
④ Test mode connector
⑤ CHECK ENGINE malfunction indicator lamp (MIL)



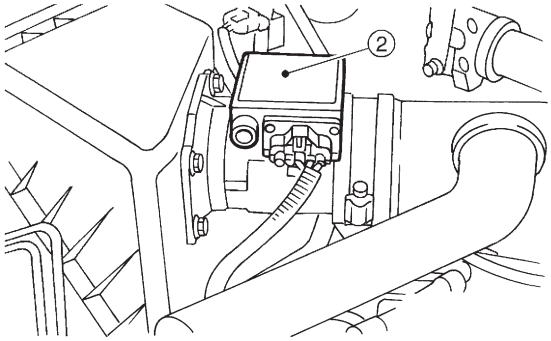
2. SENSOR



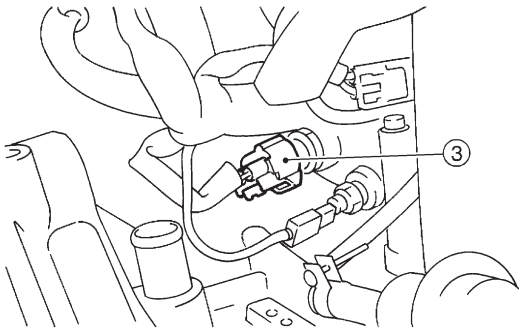
① Pressure sensor
② Mass air flow sensor
③ Engine coolant temperature sensor
④ Throttle position sensor
⑤ Knock sensor
⑥ Camshaft position sensor
⑦ Crankshaft position sensor



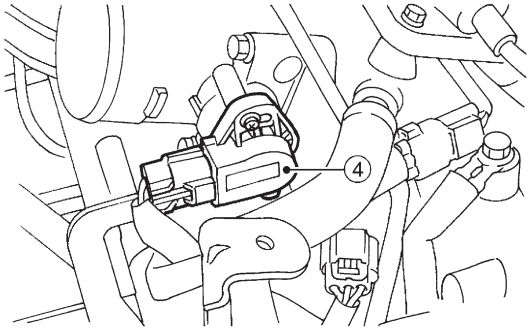
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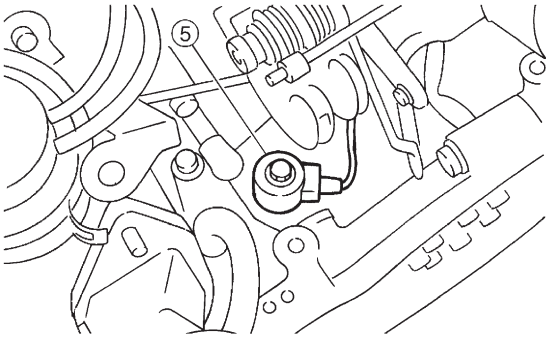
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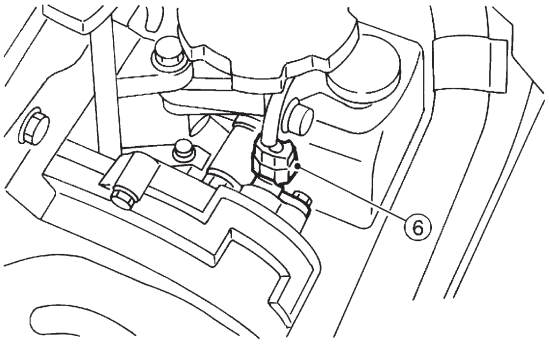
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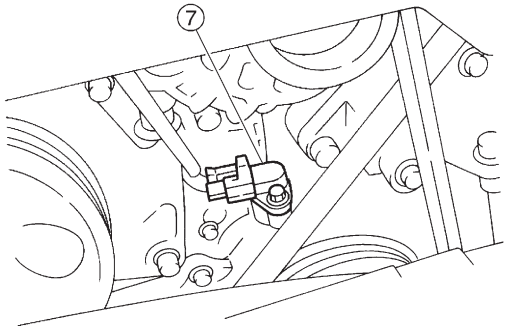
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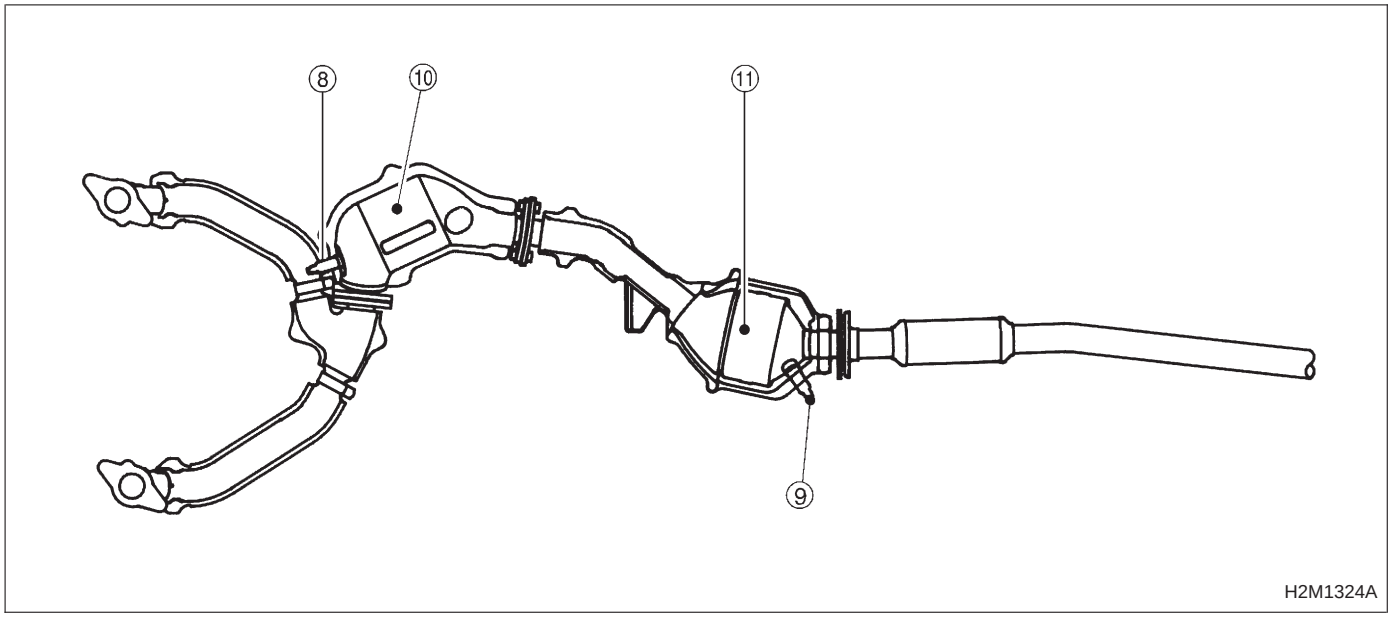
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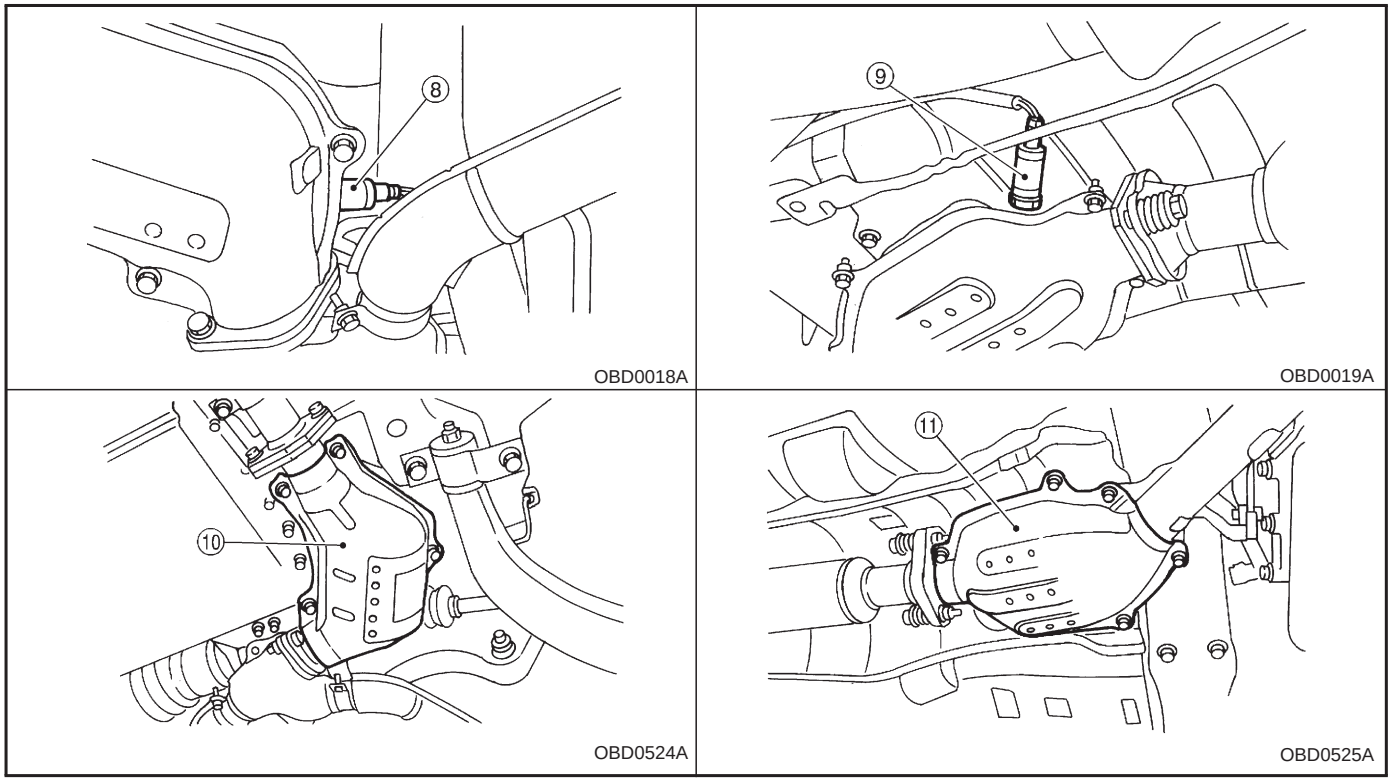
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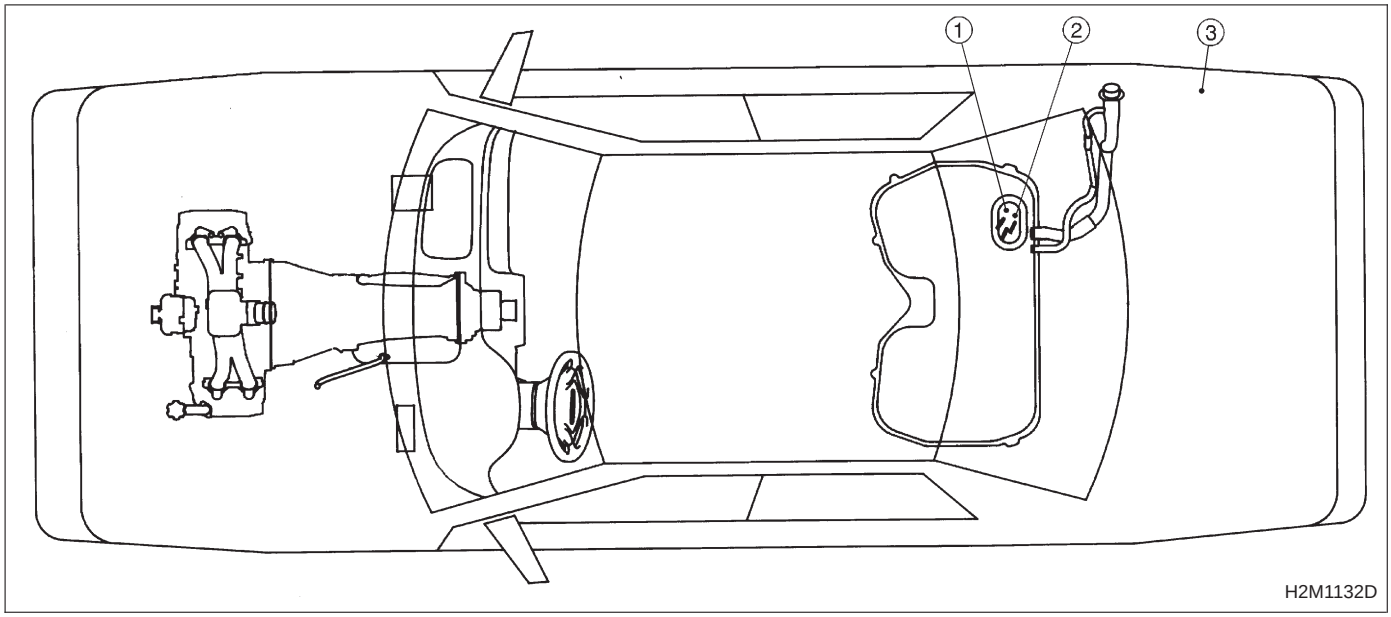


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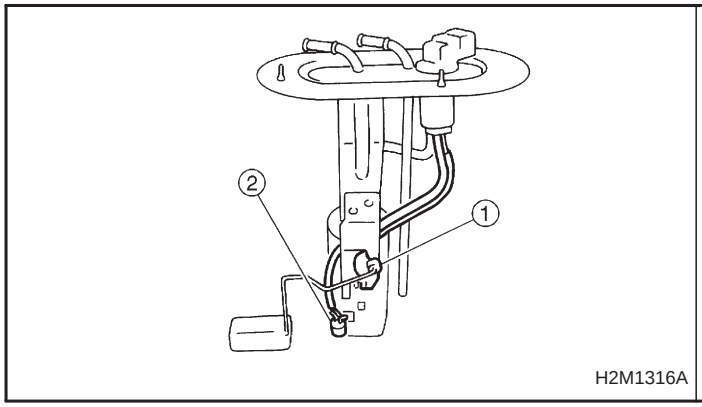


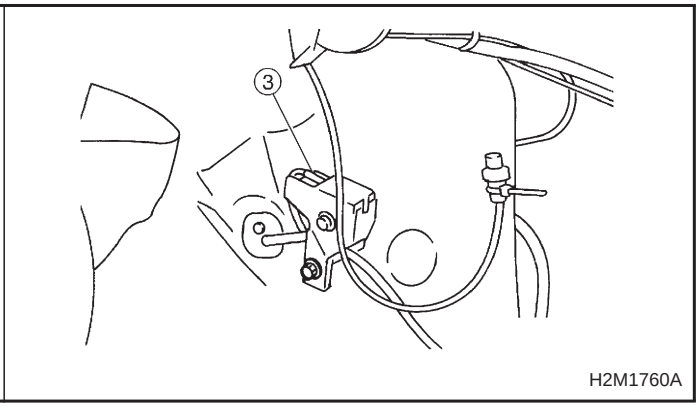
⑧ Front oxygen sensor
⑨ Rear oxygen sensor
⑩ Front catalytic converter
⑪ Rear catalytic converter



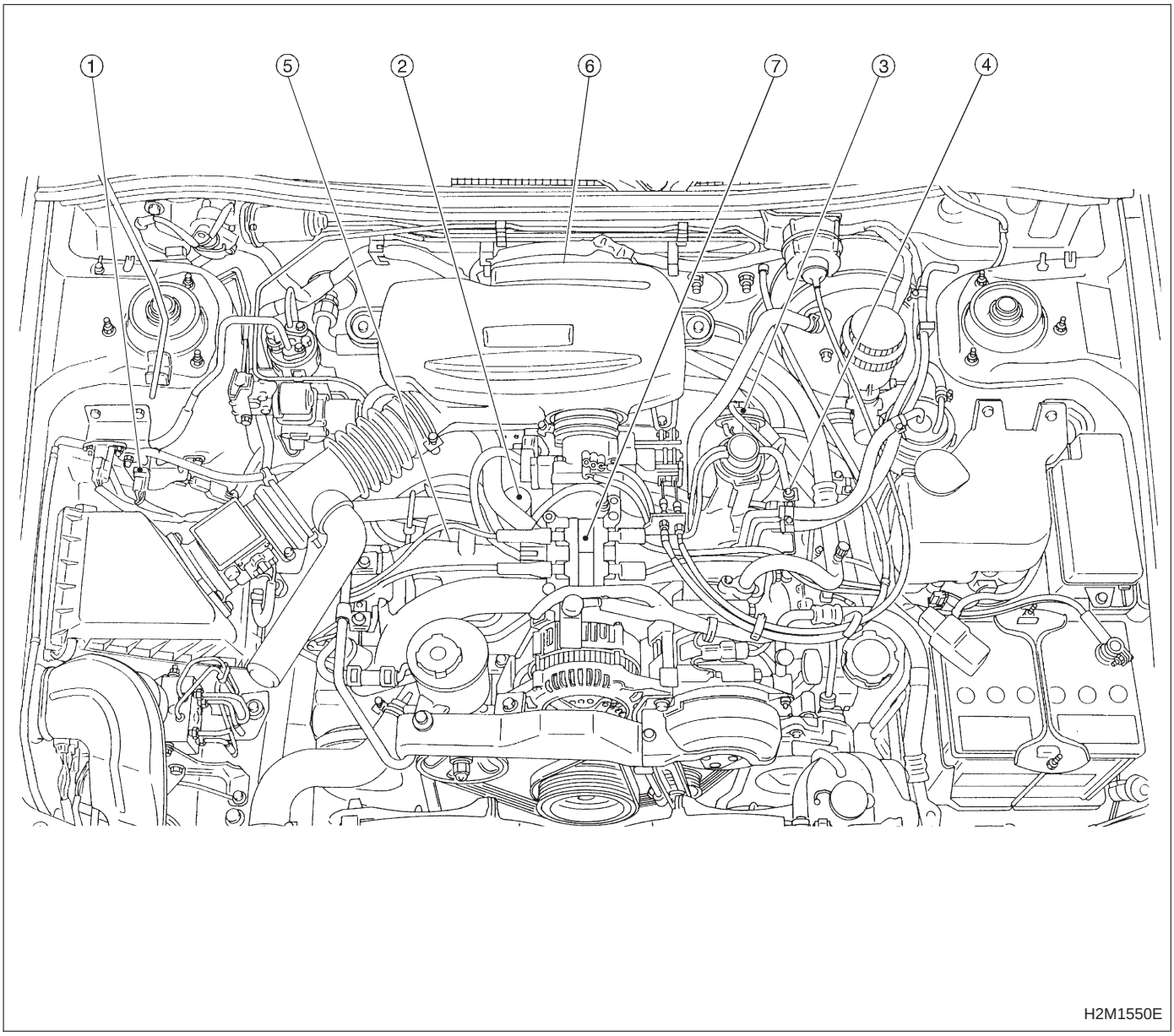


① Fuel level sensor
② Fuel temperature sensor
③ Fuel tank pressure sensor

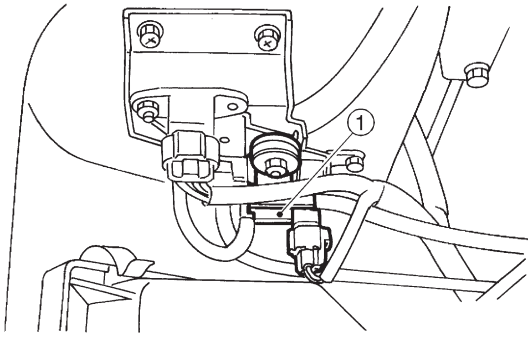




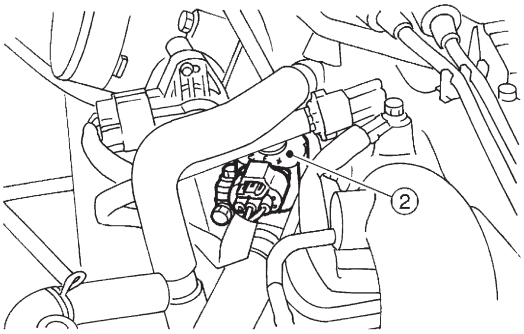
3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



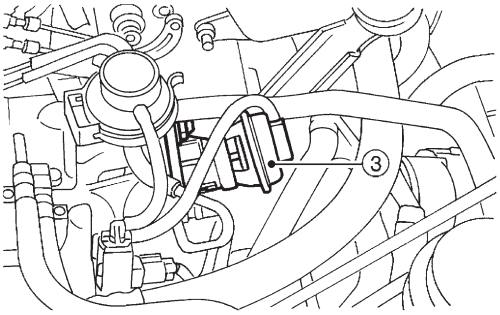
① Pressure sources switching solenoid valve
② Idle air control solenoid valve
③ EGR valve (AT vehicles)
④ EGR control solenoid valve (AT vehicles)
⑤ Purge control solenoid valve
⑥ Ignitor
⑦ Ignition coil



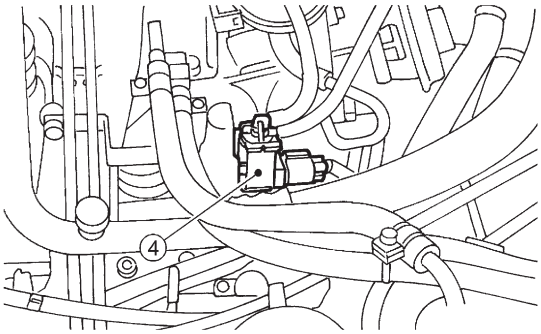
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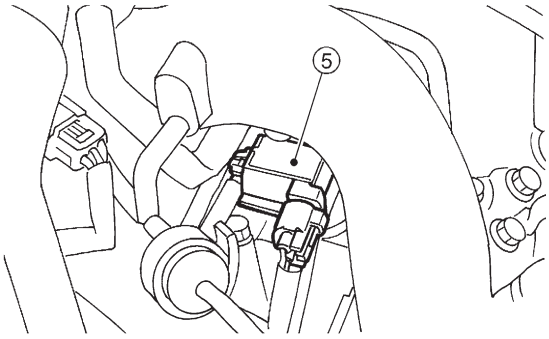
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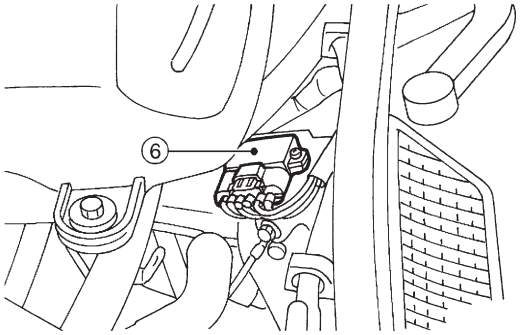
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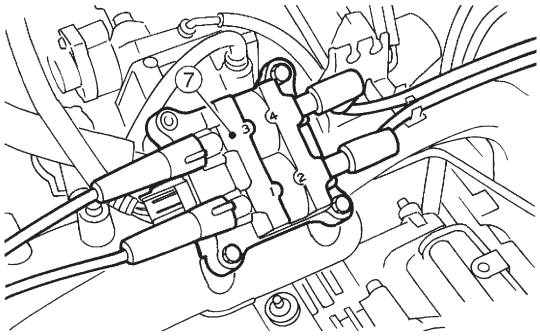
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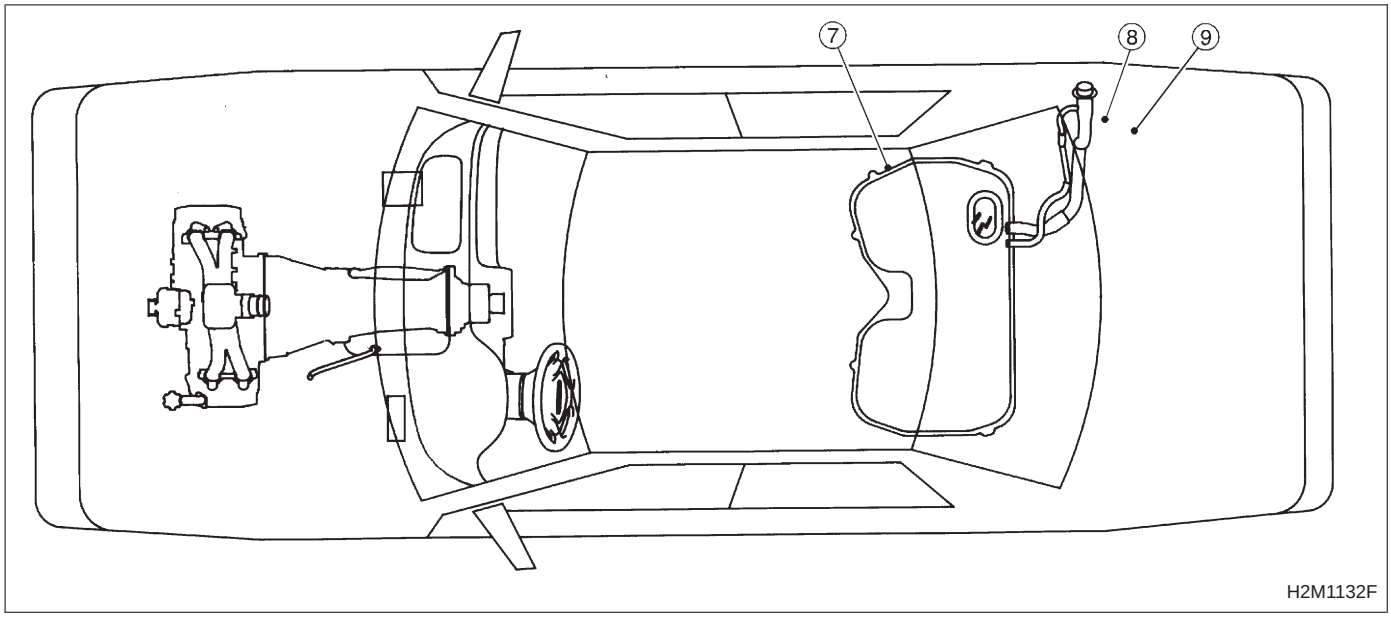
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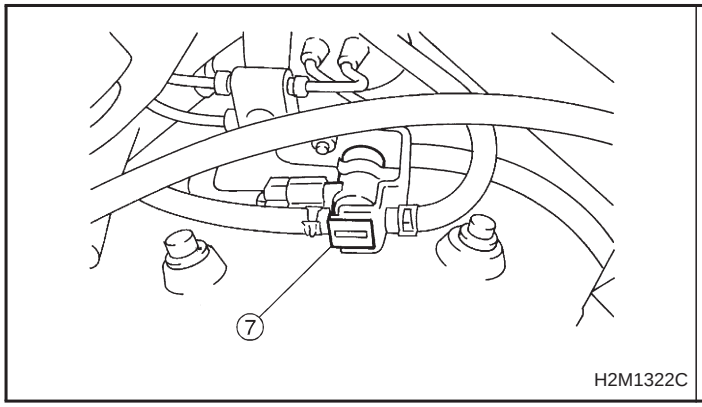
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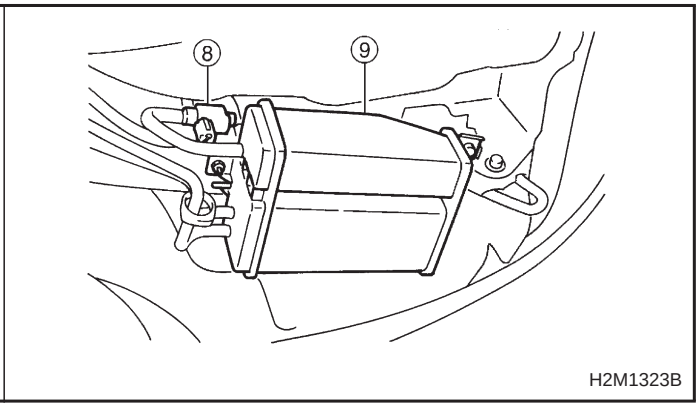


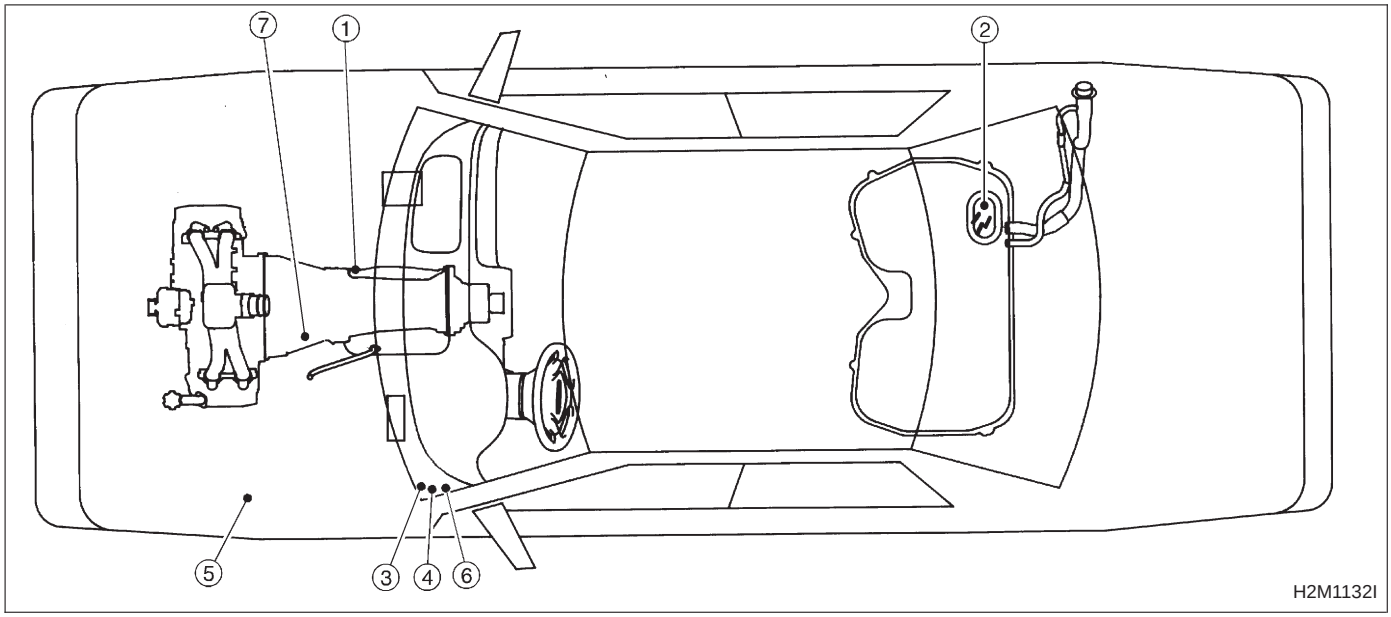
B2M1041B



⑦ Pressure control solenoid valve
⑧ Vent control solenoid valve
⑨ Canister

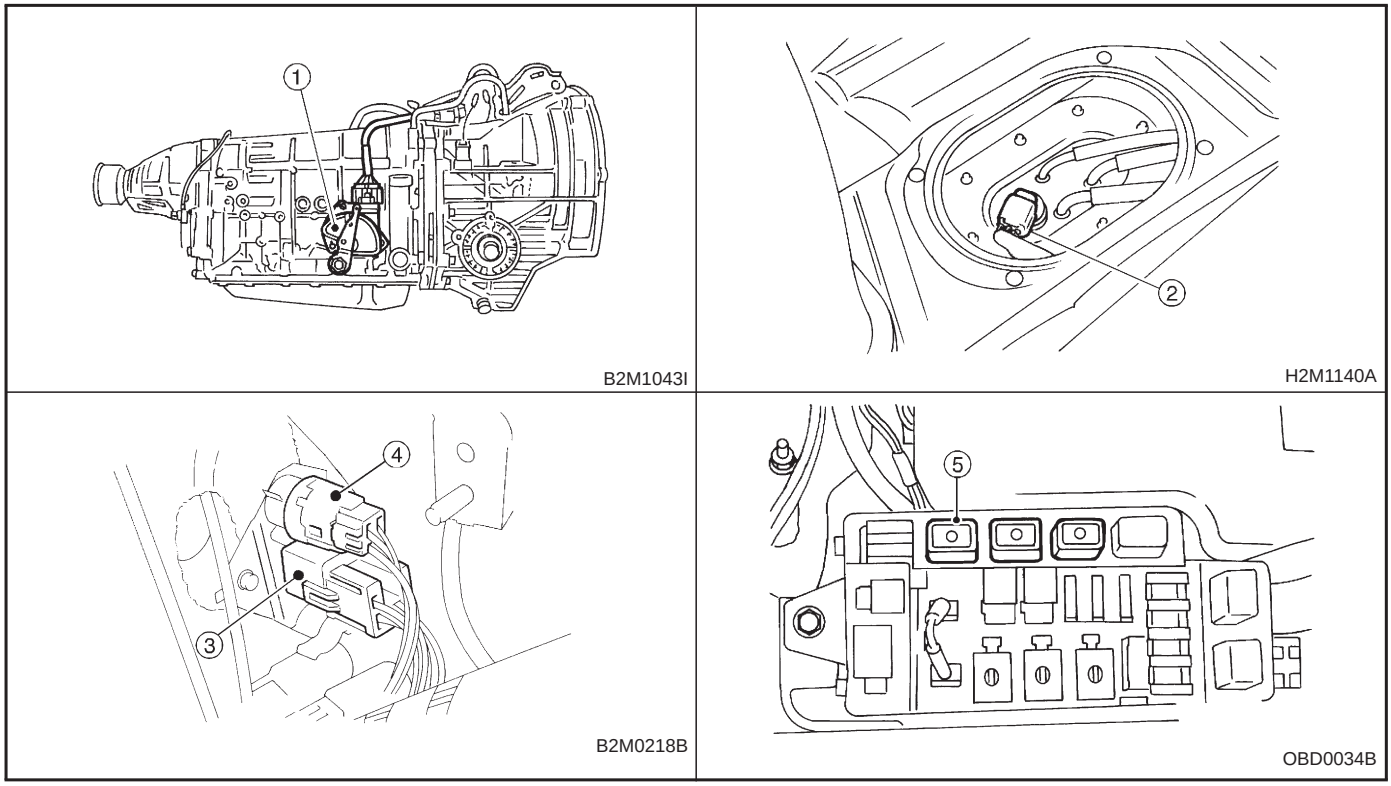


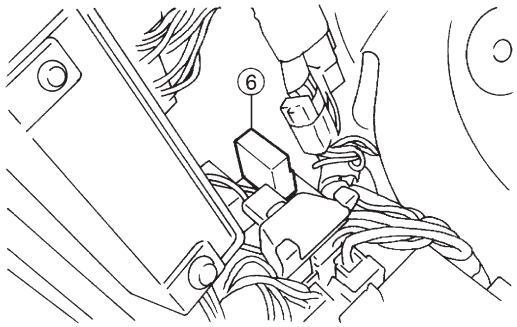




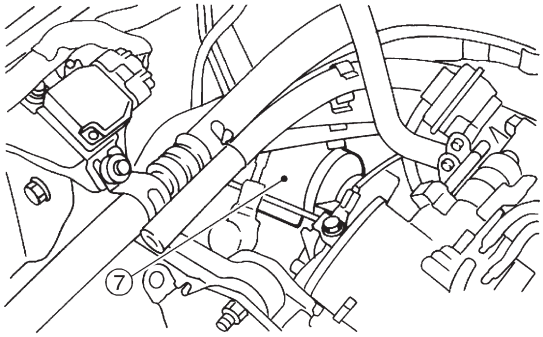
H2M1132I

① Inhibitor switch
② Fuel pump
③ Main relay
④ Fuel pump relay
⑤ Radiator sub fan relay (With A/C models only)
⑥ Main fan relay
⑦ Starter





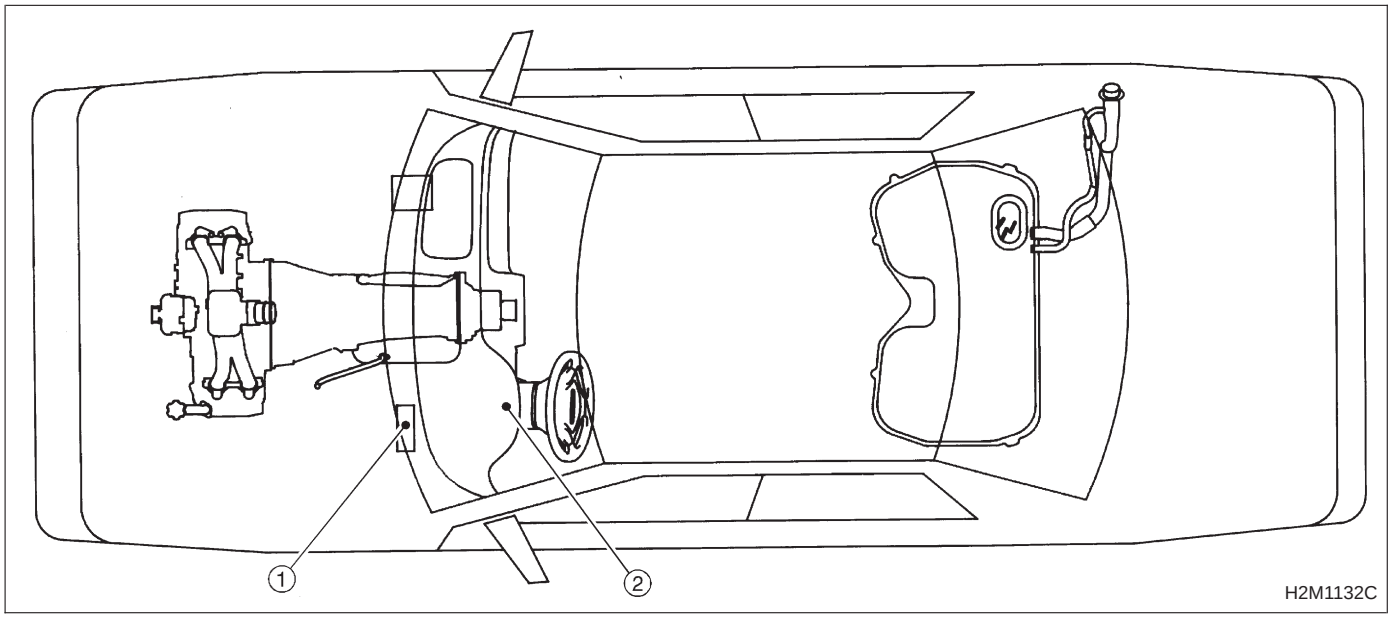
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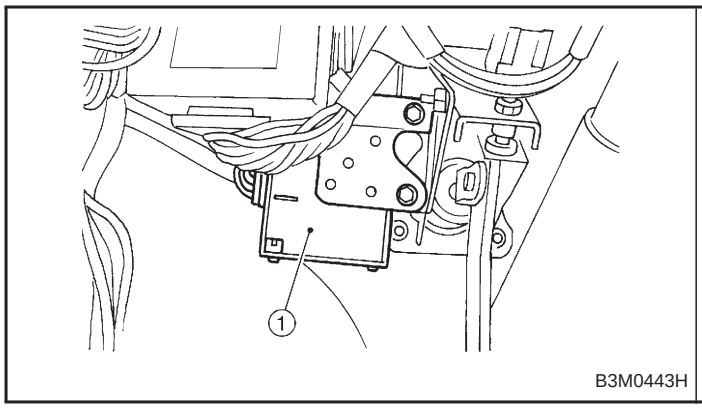
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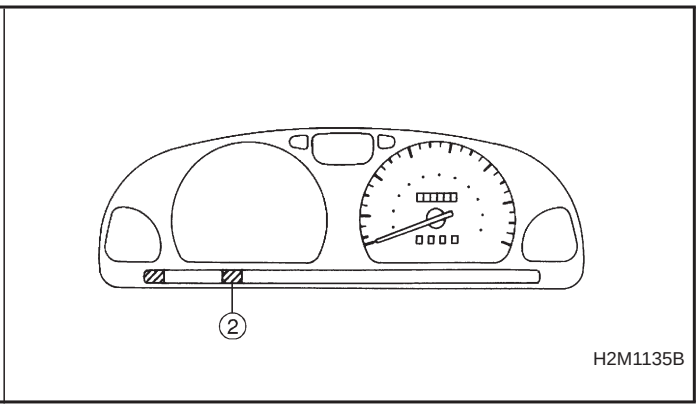
C: TRANSMISSION

1. MODULE

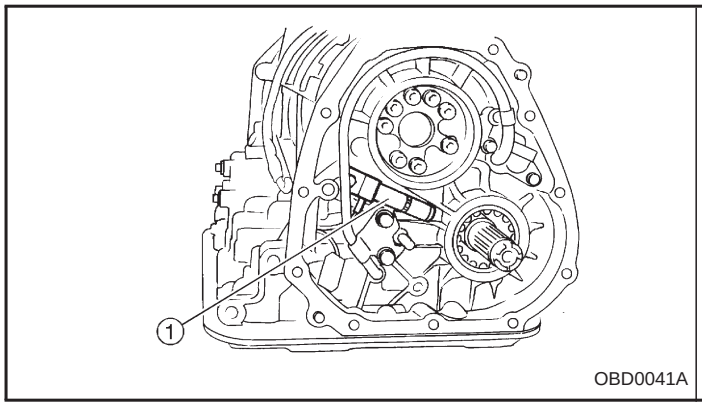


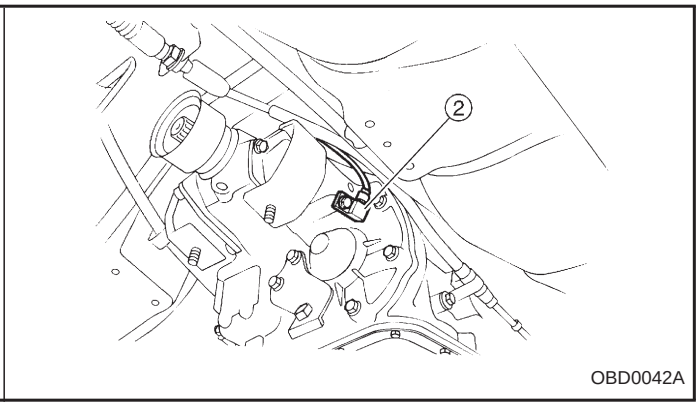
① Transmission Control Module (TCM) (for AT vehicles)
② AT diagnostic indicator light (for AT vehicles)



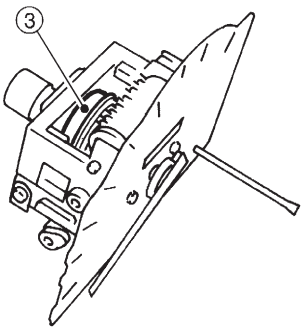


2. SENSOR

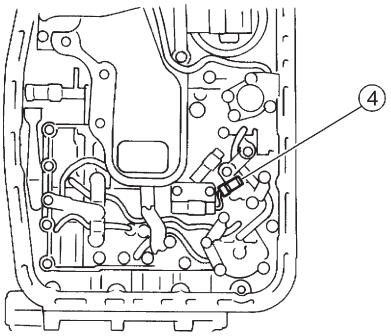




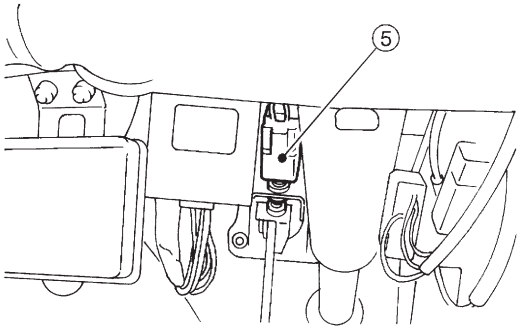
① Vehicle speed sensor 1 (for AT FWD vehicles)
② Vehicle speed sensor 1 (for AT AWD vehicles)



H2M1144B



H2M1145D

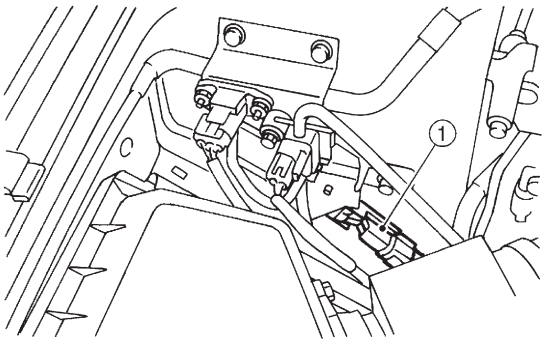


H2M1146B

③ Vehicle speed sensor 2
④ ATF temperature sensor (for AT vehicles)
⑤ Brake light switch

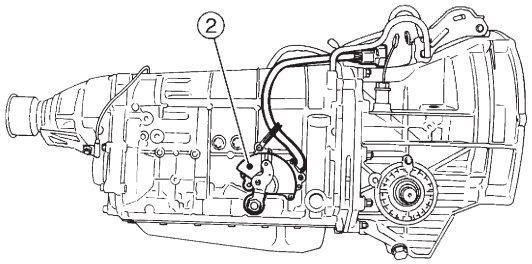
3. SOLENOID VALVE AND RELAY

- **For AT vehicles**



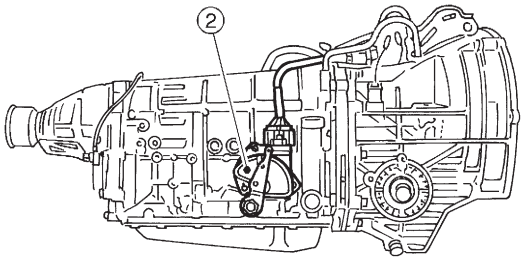
OBD0046B

Aluminum body type

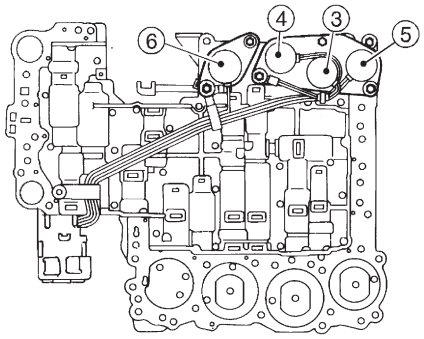


OBD0047D

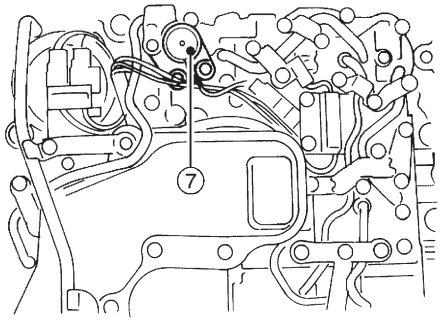
Plastic body type



B2M1043D



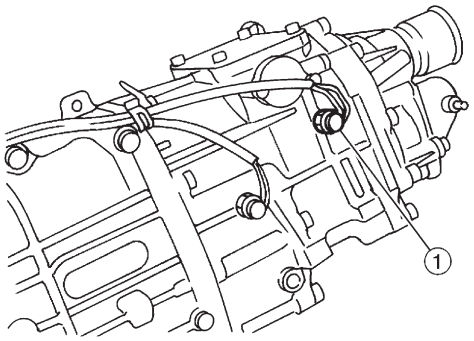
OBD0048A



H2M1147A

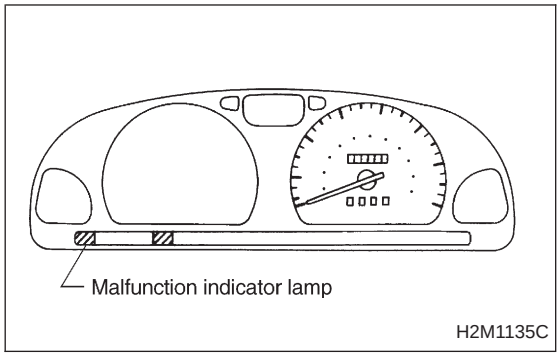
① Dropping resistor
② Inhibitor switch
③ Shift solenoid valve 1
④ Shift solenoid valve 2
⑤ Shift solenoid valve 3
⑥ Duty solenoid valve A
⑦ Duty solenoid valve B

● **For MT vehicles**



OBD0526B

① Neutral position switch (AWD models)

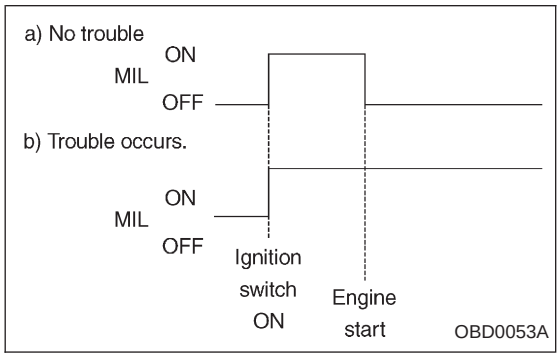


3. Diagnosis System

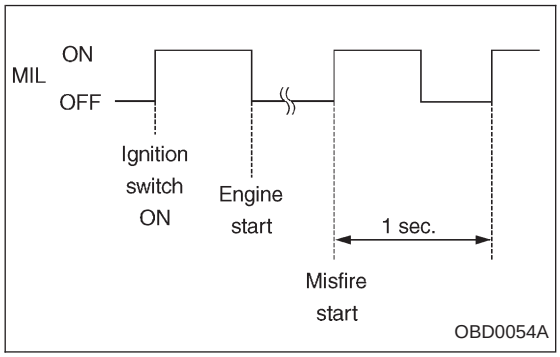
A: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

1. ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

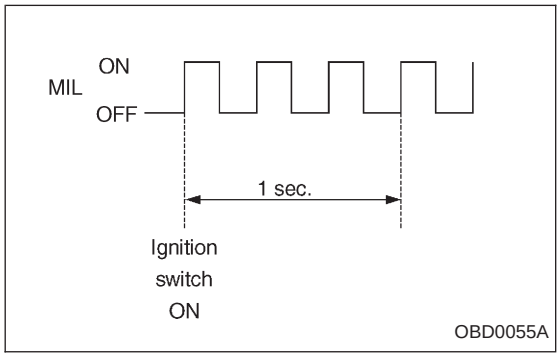
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to 2-7 [T700].>



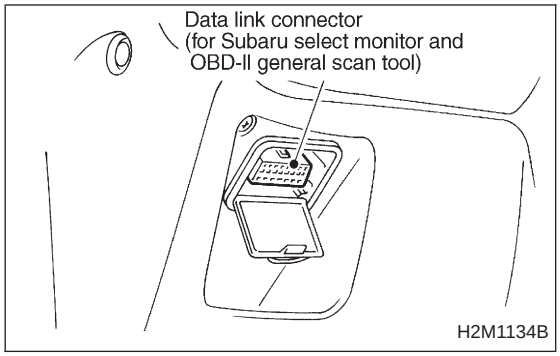
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



4) When ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



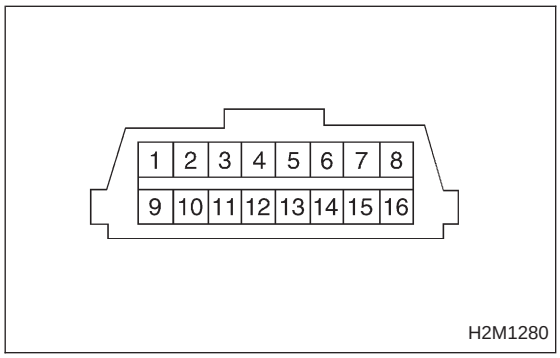
B: OBD-II GENERAL SCAN TOOL

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to the data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.
3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.
OBD-II general scan tool functions consist of:

(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $05: Oxygen sensor monitoring test results

Read out data according to repair procedures.
(For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)
NOTE:
For details concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST, 2-7 [T10A0].



2. DATA LINK CONNECTOR (FOR OBD-II GENERAL SCAN TOOL AND SUBARU SELECT MONITOR)

1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.

Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Subaru Select Monitor clock*	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

*: Circuit only for Subaru Select Monitor

3. CURRENT POWERTRAIN DIAGNOSTIC DATA (MODE $01)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

4. POWERTRAIN FREEZE FRAME DATA (MODE $02)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

5. EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (MODE $03)

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST. <Ref. to 2-7 [T10A0].>
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

6. CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION (MODE $04)

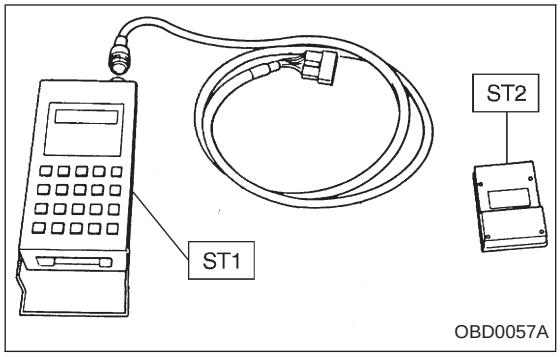
Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

7. OXYGEN SENSOR MONITORING TEST RESULTS (MODE $05)

Refers to the mode using oxygen sensor output data while the on-board diagnosis system is performing diagnosis on the oxygen sensor.
A list of the support oxygen sensor output data and test ID (identification) are shown in the following table.

Test ID	Data	Unit of measure
01	Rich to lean sensor threshold voltage (constant)	V
02	Lean to rich sensor threshold voltage (constant)	V
03	Low sensor voltage for switch time calculation (constant)	V
04	High sensor voltage for switch time calculation (constant)	V
05	Rich to lean sensor switch time (calculated)	sec.
06	Lean to rich sensor switch time (calculated)	sec.
07	Minimum sensor voltage for test cycle (calculated)	V
08	Maximum sensor voltage for test cycle (calculated)	V

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access oxygen sensor monitoring test results (MODE $05).

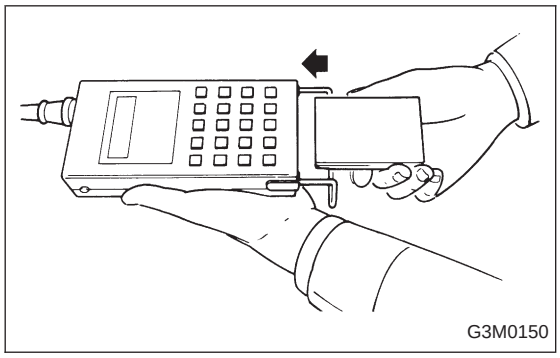


C: SUBARU SELECT MONITOR

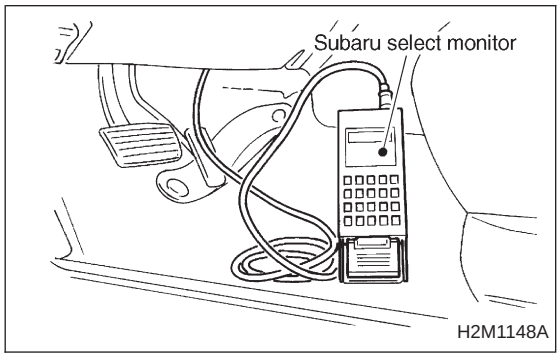
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru select monitor and cartridge.

ST1 498307500 SELECT MONITOR KIT
ST2 498346200 CARTRIDGE

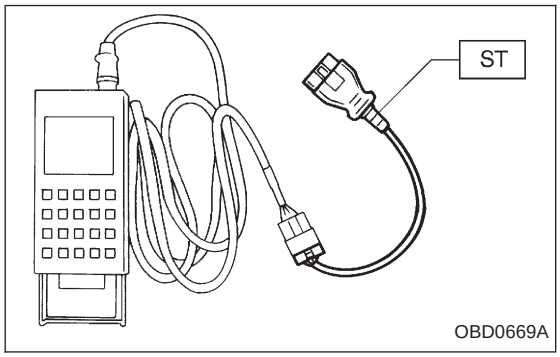


2) Turn ignition switch and Subaru select monitor switch to OFF.
3) Insert cartridge into Subaru select monitor.



4) Connect Subaru select monitor to data link connector.

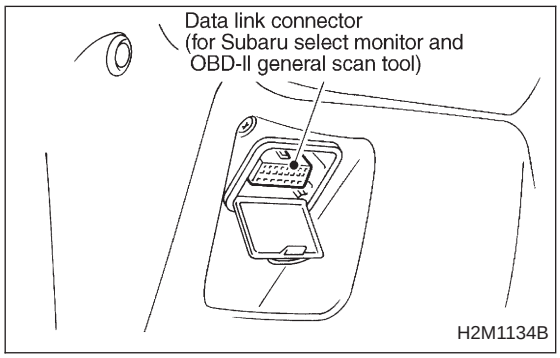
- Using data link connector for Subaru select monitor only, connect Subaru select monitor to its data link connector located in the lower portion of the instrument panel (on the driver's side), to the side of the center console box.



- Using data link connector for Subaru select monitor and OBD-II general scan tool;

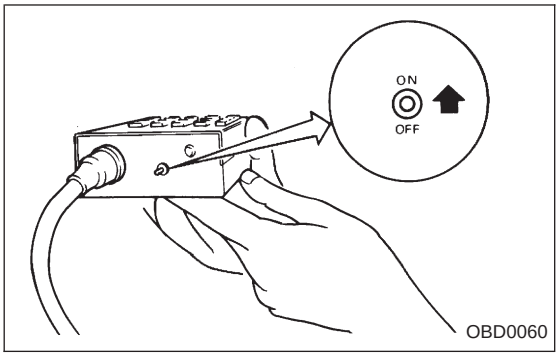
(1) Connect ST to Subaru select monitor cable.

ST 498357200 ADAPTER CABLE



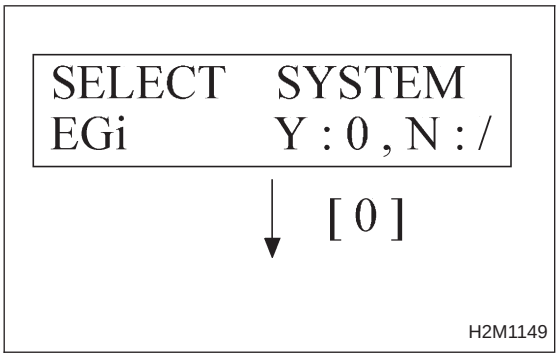
(2) Open the cover and connect Subaru select monitor to data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.

CAUTION:
Do not connect scan tools except for Subaru select monitor and OBD-II general scan tool.



OBD0060

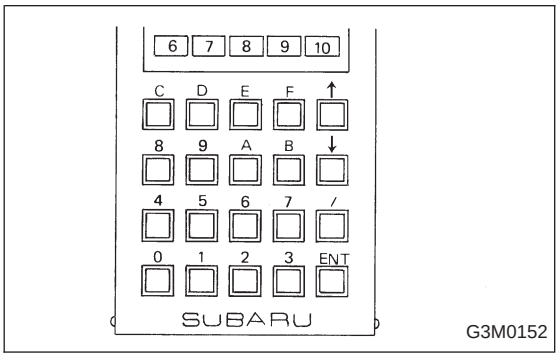
5) Turn ignition switch ON (engine OFF) and Subaru select monitor switch ON.
6) Using Subaru select monitor, call up diagnostic trouble code(s) and various data, then record them.



H2M1149

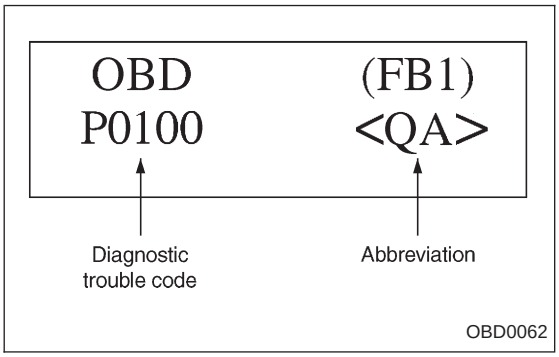
2. READ DIAGNOSTIC TROUBLE CODE (DTC) SHOWN ON DISPLAY. (MODE FB1)

1) Select engine mode using function key.
Press the function key [0].



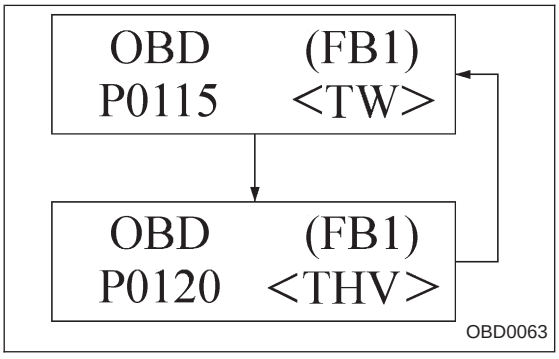
G3M0152

2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.



OBD0062

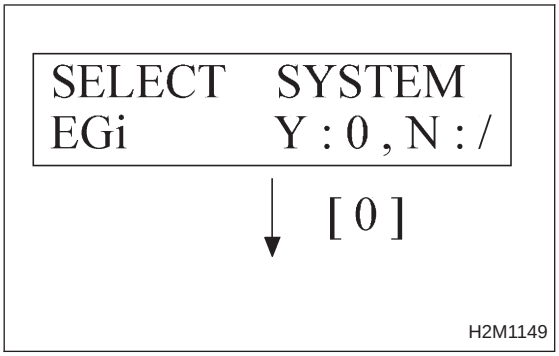
3) Ensure diagnostic trouble code(s) is shown.
(1) When there is only one diagnostic trouble code.



OBD0063

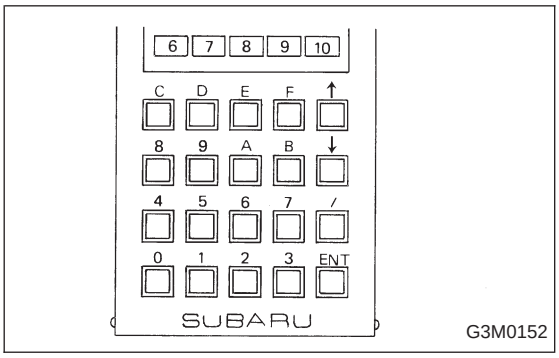
(2) When there are multiple diagnostic trouble codes.

NOTE:
For details concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST. <Ref. to 2-7 [T10A0].>

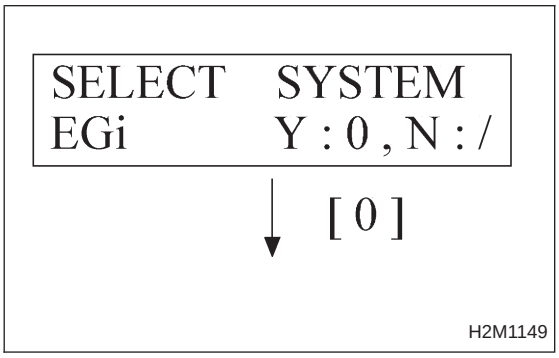


3. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. (FUNCTION MODE)

1) Select engine mode using function key.
Press the function key [0].

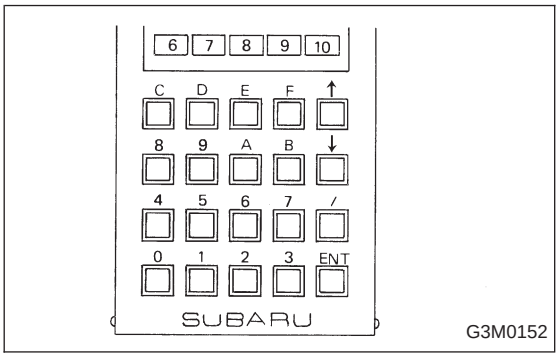


2) Designate mode using function key.
<Ref. to 2-7 [T3C6].>
(Example: Press [F] [0] [1] [ENT] in that order.)
3) Ensure data of input or output signal is shown.

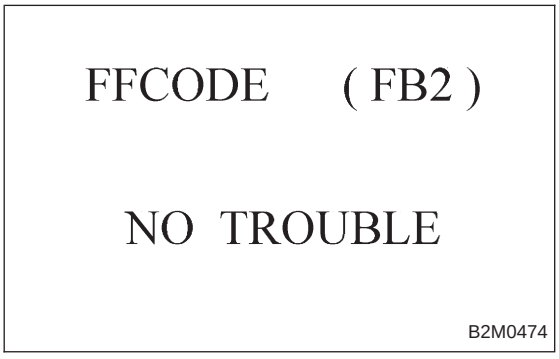


4. READ FREEZE FRAME DATA SHOWN ON DISPLAY. (MODE FB2)

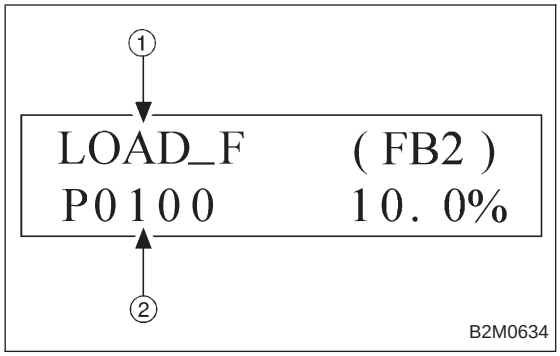
1) Select engine mode using function key.
Press the function key [0].



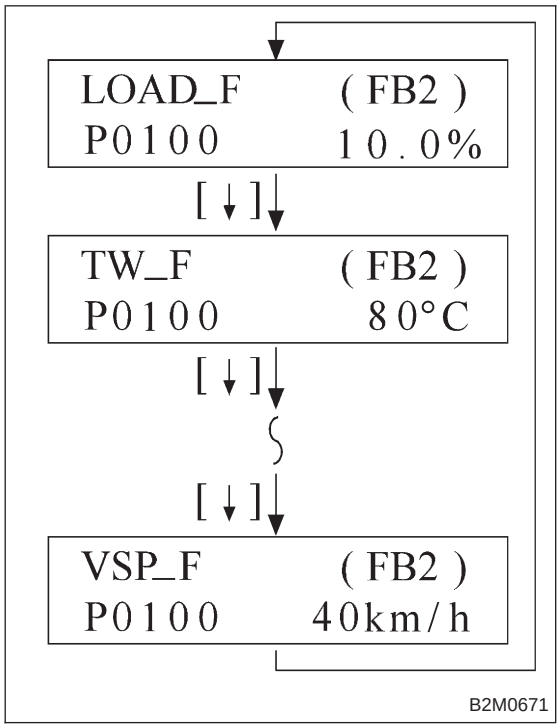
2) Designate mode using function key.
Press [F] [B] [2] [ENT] in that order.



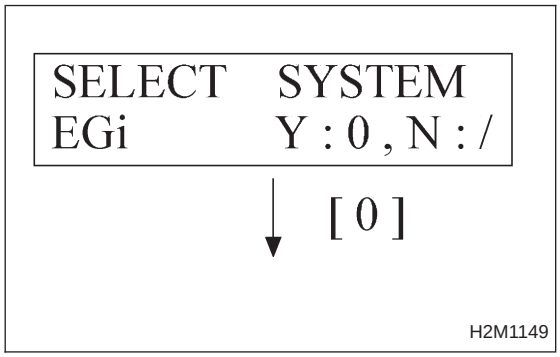
3) Ensure freeze frame data(s) is (are) shown.
(1) When no trouble is detected, or after memory is cleared.



(2) When some trouble is detected.
① Abbreviation
② Diagnostic trouble code of trouble occurred

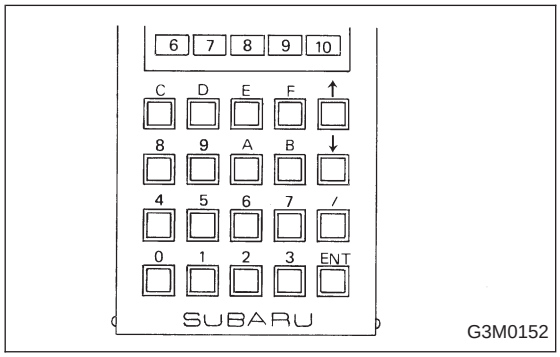


NOTE:
Other freeze frame data is shown on display by pushing the function key [↓].

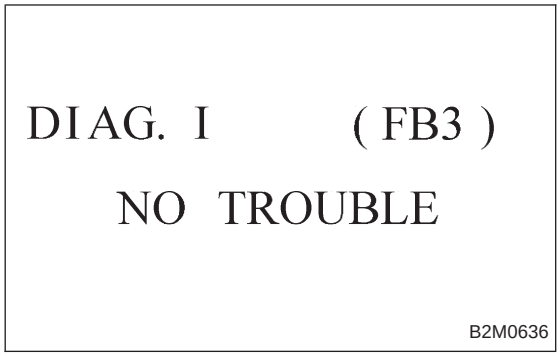


5. READ FREEZE FRAME DATA SHOWN ON DISPLAY. (MODE FB3)

NOTE:
● For items and contents shown on display, refer to “6. READ DATA FUNCTION KEY LIST FOR ENGINE”. <Ref. to 2-7 [T3C6].>
● Freeze frame data will not erase without clearing memory.
1) Select engine mode using function key.
Press the function key [0].

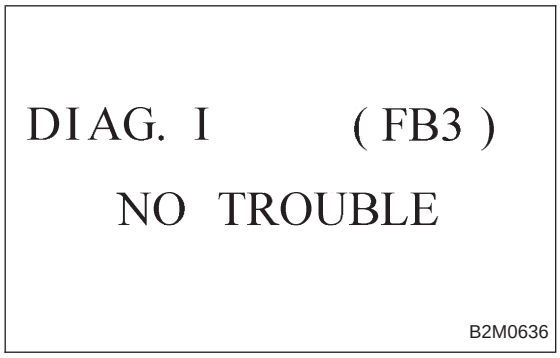


2) Designate mode using function key.
Press [F] [B] [3] [ENT] in that order.

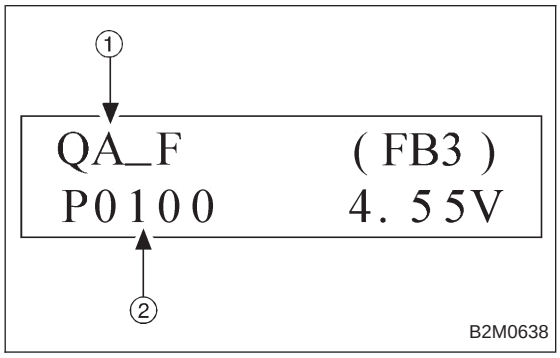


3) Ensure freeze frame data(s) is (are) shown.

(1) When no trouble is detected, or after memory is cleared.

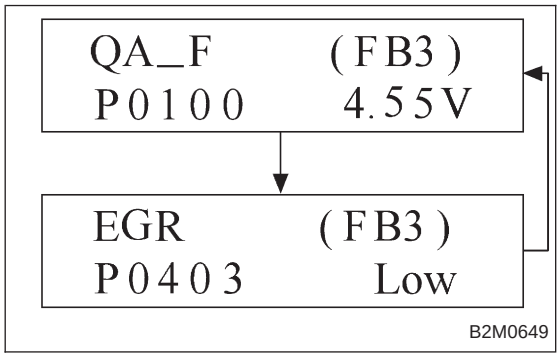


(2) When a trouble occurs but the corresponding item is not displayed.



(3) When only one trouble corresponding to the displayed item has occurred.

① Abbreviation
② Diagnostic trouble code of trouble occurred



(4) When multiple troubles corresponding to the displayed item are detected.

NOTE:
Freeze frame data is shown on display for 2 seconds at a time.

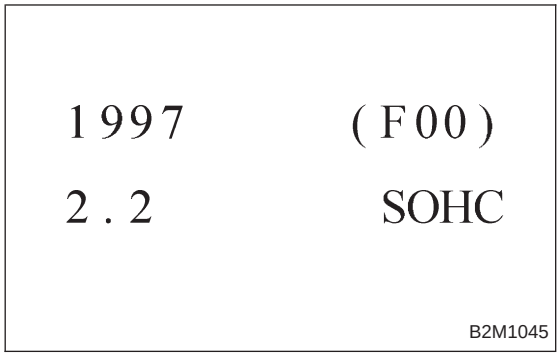
6. READ DATA FUNCTION KEY LIST FOR ENGINE

Function mode	Contents	Abbreviation	Unit of measure
F00	ROM ID number	YEAR	—
F01	Battery voltage	VB	V
F02	Vehicle speed signal	VSP	km/h, MPH
F03	Engine speed signal	EREV	rpm
F04	Engine coolant temperature signal	TW	°C, °F
F05	Ignition signal	ADVS	deg
F06	Mass air flow signal	QA	g/s, V
F07	Throttle position signal	THV	%, V
F08	Injector pulse width	TIM	mS
F09	Idle air control signal	ISC	%
F10	Load data	LOAD	%
F11	Front oxygen sensor output signal	O2	V
F12	Front oxygen sensor maximum and minimum output signal	O2max - min	V, V
F13	Rear oxygen sensor output signal	RO2	V
F14	Rear oxygen sensor maximum and minimum output signal	RO2max - min	V, V
F17	Short term fuel trim	ALPHA	%
F19	Knock sensor signal	KNOCK	deg
F20	Atmospheric absolute pressure signal	BARO. P	kPa, mmHg
F21	Intake manifold absolute pressure signal	MANI. P	kPa, mmHg
F29	A/F correction (short term trim) by rear oxygen sensor	PHOS	%
F30	Long term fuel trim	KBLRC	%
F31	Long term whole fuel trim	K0	%
F32	Front oxygen sensor heater current	FO2H	A
F33	Rear oxygen sensor heater current	RO2H	A
F35	Purge control solenoid valve duty ratio	CPCD	%
F36	Maximum value of cylinder #1 misfire times during 100 rotations	MF1	%
F37	Maximum value of cylinder #2 misfire times during 100 rotations	MF2	%
F38	Maximum value of cylinder #3 misfire times during 100 rotations	MF3	%
F39	Maximum value of cylinder #4 misfire times during 100 rotations	MF4	%
F42	Maximum and minimum EGR system pressure value (AT vehicles only)	EGR max - min	kPa
F43	Fuel tank pressure signal	TNKP	kPa, mmHg
F44	Fuel temperature signal	TNKT	°C, °F
F45	Fuel level signal	FLEVEL	V
FA0	ON ↔ OFF signal	—	—
FA1	ON ↔ OFF signal	—	—
FA2	ON ↔ OFF signal	—	—
FA3	ON ↔ OFF signal	—	—
FA4	ON ↔ OFF signal	—	—
FA5	ON ↔ OFF signal	—	—
FB0	Diagnostic trouble code (DTC)	INSPECT	—
FB1	Diagnostic trouble code (DTC)	OBD	—

Function mode	Contents	Abbreviation	Unit of measure
FB2	Load data (Freeze frame data)	LOAD−F	%
	Engine coolant temperature signal (Freeze frame data)	TW−F	°C
	Short term fuel trim (Freeze frame data)	ALPH−F	%
	Long term fuel trim (Freeze frame data)	KBLR−F	%
	Intake manifold absolute pressure signal (Freeze frame data)	MANI−F	kPa
	Engine speed signal (Freeze frame data)	EREV−F	rpm
	Vehicle speed signal (Freeze frame data)	VSP−F	km/h
FB3	Mass air flow signal (Freeze frame data)	QA−F (P0100)	V
	Pressure signal (Freeze frame data)	PS−F (P0105)	V
	Pressure signal (Freeze frame data)	PR−F (P0106)	V
	Engine coolant temperature signal (Freeze frame data)	TW−F (P0115)	V
	Throttle position signal (Freeze frame data)	THV−F (P0120)	V
	EGR control solenoid valve signal (Freeze frame data)	EGR (P0403)	—*1
	Purge control solenoid valve signal (Freeze frame data)	CPC (P0443)	—*1
	Start switch signal (Freeze frame data)	STSW (P1100)	—*1
	Pressure sources switching solenoid valve signal (Freeze frame data)	BR1 (P1102)	—*1
	Radiator fan relay 1 signal (Freeze frame data)	FAN1 (P1500)	—*1
FC0	Clear memory	—	—
FD01	Compulsory fuel pump relay operation check	FUEL PUMP	—
FD02	Compulsory purge control solenoid valve operation check	CPC SOL	—
FD03	Compulsory radiator fan relay operation check	RAD FAN	—
FD04	Compulsory A/C relay operation check	A/C RELAY	—
FD05	Compulsory EGR control solenoid valve operation check	EGR SOL	—
FD07	Compulsory pressure control solenoid valve operation check	PCV SOL	—
FD08	Compulsory vent control solenoid valve operation check	VENT SOL	—
FD09	Compulsory FICD solenoid valve operation check	FICD SOL	—
FD10	Compulsory pressure sources switching solenoid valve operation check	BR SOL	—

NOTE:
- Subaru select monitor is also available for monitoring information other than that used for check and repair of the vehicle.
- F42 (Maximum and minimum EGR system pressure value) will not read accurately until the EGR flow diagnosis terminates.

EGR flow diagnosis terminates when LED No. 2 illuminates at function mode FA4.
- *1: “Hi” or “Low” is shown instead of measured value.
- Because ASV solenoid valve and air injection system diagnosis solenoid valve are not installed, FD06 and FD11 will be displayed but non-functional.



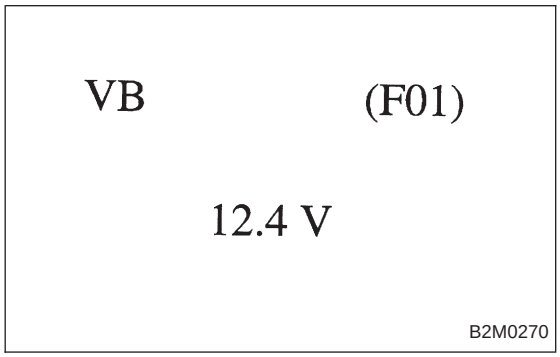
7. FUNCTION MODE: F00 — ROM ID NUMBER (YEAR) —

CONDITION:
Ignition switch “ON”

SPECIFIED DATA:
Presentation display

- Probable cause (Item outside “specified data”)

1. Error 1	Check for loose or disconnected connector, and discontinued circuit, etc.
2. Error 2	Check for poor contact of cartridge, or different type cartridge.



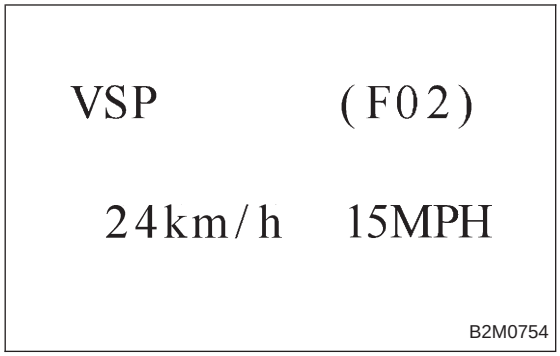
8. FUNCTION MODE: F01 — BATTERY VOLTAGE (VB) —

CONDITION:
(1) Ignition switch “ON”
(2) Idling after warm-up

SPECIFIED DATA:
(1) 11±1 V
(2) 13±1 V

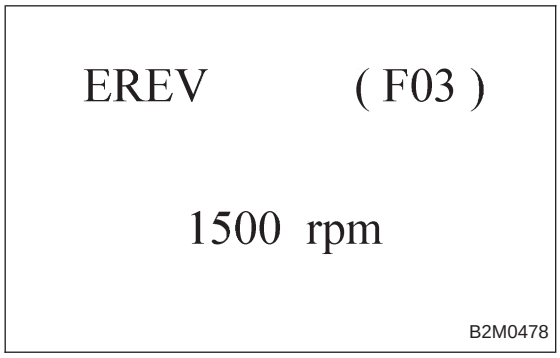
- Probable cause (Item outside “specified data”)

1. Battery	Check battery voltage and electrolyte’s specific gravity.
2. Charging system	● Check regulating voltage. (On no-load) ● Check alternator.
3. Power supply line	● Check main relay. <Ref. to 2-7 [T8C1].> ● Check harness connector of ECM power supply line. <Ref. to 2-7 [T8C2], [T8C3].>

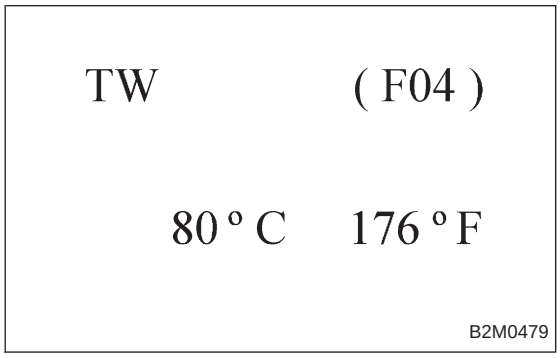


9. FUNCTION MODE: F02
— VEHICLE SPEED SIGNAL (VSP) —

● Vehicle speed is indicated in kilometer per hour (km/h) and mile per hour (MPH) at the same time.

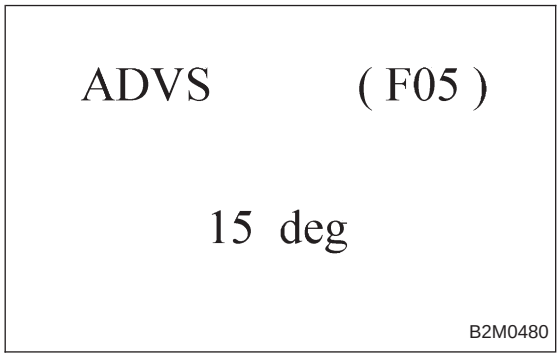


10. FUNCTION MODE: F03
— ENGINE SPEED SIGNAL (EREV) —



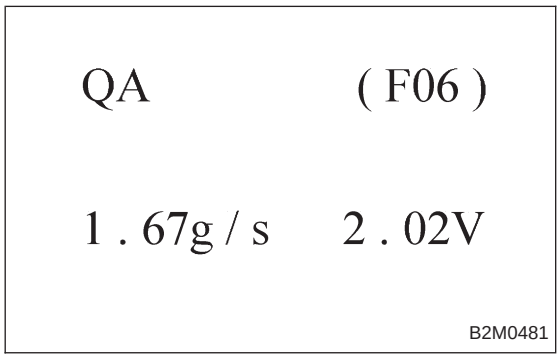
11. FUNCTION MODE: F04
— ENGINE COOLANT TEMPERATURE SIGNAL (TW) —

● Engine coolant temperature is indicated in "°C" and "°F" at the same time.



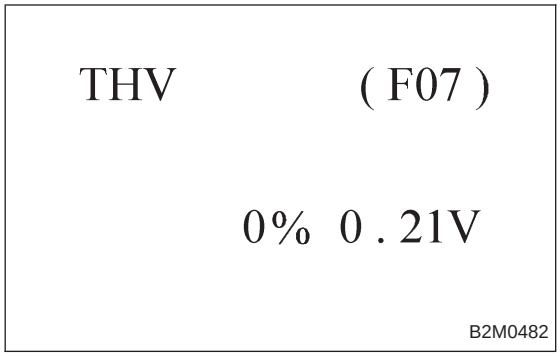
12. FUNCTION MODE: F05
— IGNITION SIGNAL (ADVS) —

NOTE:
The ignition timing value displayed in mode F05 is a value computed by ECM and will not always correspond with the value measured with a timing light.



13. FUNCTION MODE: F06
— MASS AIR FLOW SIGNAL (QA) —

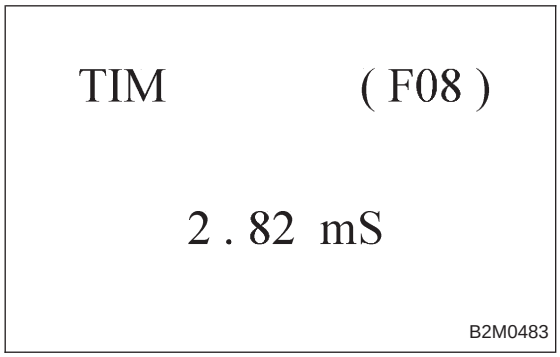
● Mass air flow and voltage input from mass air flow sensor are shown on display at the same time.



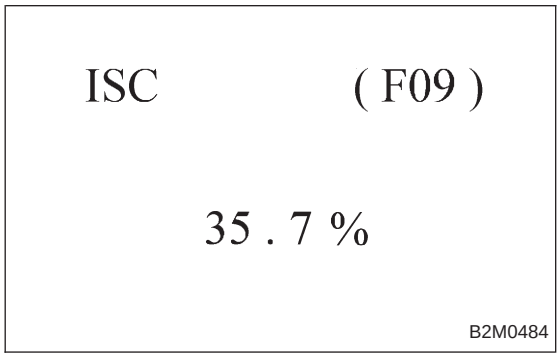
14. FUNCTION MODE: F07
— THROTTLE POSITION SIGNAL (THV) —

- Throttle position is indicated in percentage (%) and voltage (V) at the same time.

NOTE:
Be sure that the displayed value changes smoothly when changing throttle valve from fully closed to fully opened.



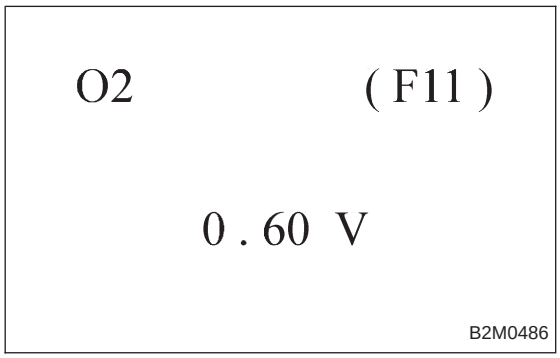
15. FUNCTION MODE: F08
— INJECTOR PULSE WIDTH (TIM) —



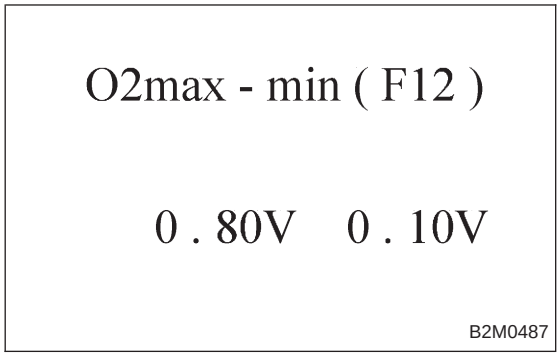
16. FUNCTION MODE: F09
— IDLE AIR CONTROL SIGNAL (ISC) —



17. FUNCTION MODE: F10
— LOAD DATA (LOAD) —



18. FUNCTION MODE: F11
— FRONT OXYGEN SENSOR OUTPUT SIGNAL (O2) —

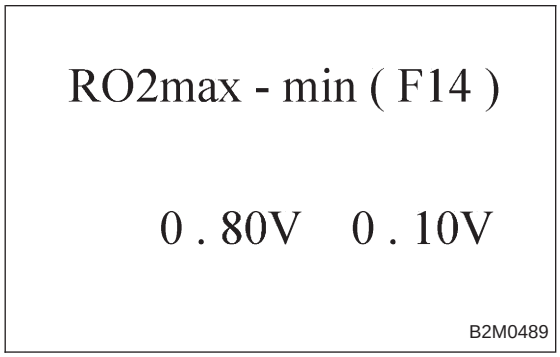


19. FUNCTION MODE: F12
— FRONT OXYGEN SENSOR MAXIMUM AND MINIMUM OUTPUT SIGNAL (FO2MAX - MIN) —

- Front oxygen sensor maximum and minimum output signals are indicated at the same time.



20. FUNCTION MODE: F13
— REAR OXYGEN SENSOR OUTPUT SIGNAL (RO2) —

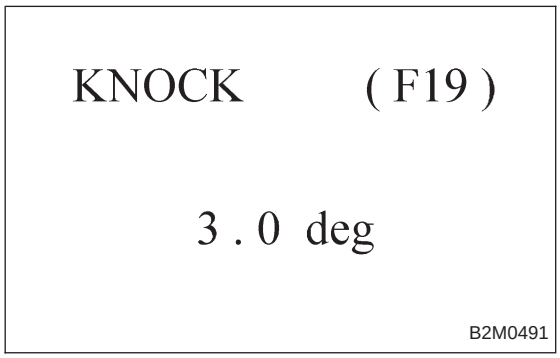


21. FUNCTION MODE: F14
— REAR OXYGEN SENSOR MAXIMUM AND MINIMUM OUTPUT SIGNAL (RO2MAX - MIN) —

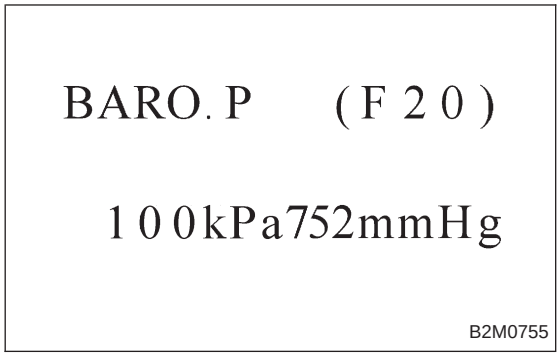
- Rear oxygen sensor maximum and minimum output signals are indicated at the same time.



22. FUNCTION MODE: F17
— SHORT TERM FUEL TRIM [A/F CORRECTION COEFFICIENT] (ALPHA) —

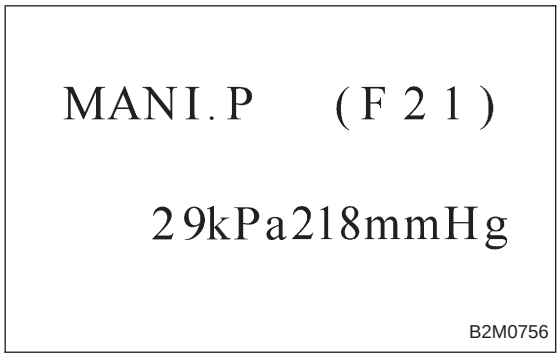


23. FUNCTION MODE: F19
— KNOCK SENSOR SIGNAL [IGNITION TIMING CORRECTION COEFFICIENT] (KNOCK) —



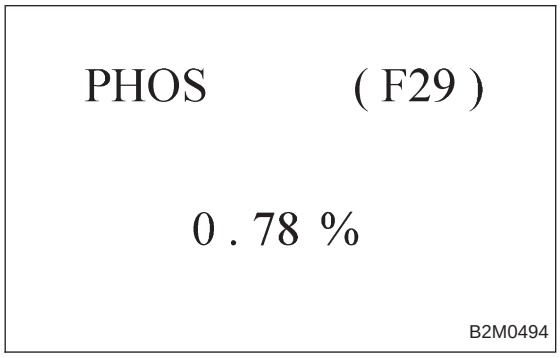
24. FUNCTION MODE: F20
— ATMOSPHERIC ABSOLUTE PRESSURE SIGNAL (BARO. P) —

- Atmospheric absolute pressure is indicated in “kPa” and “mmHg” at the same time.

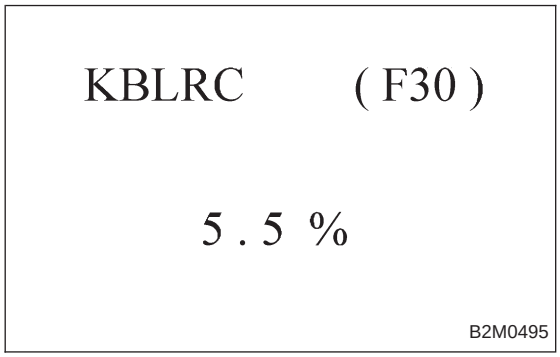


25. FUNCTION MODE: F21
— INTAKE MANIFOLD ABSOLUTE PRESSURE SIGNAL (MANI. P) —

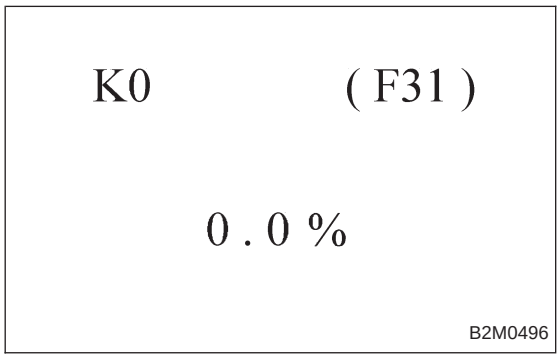
- Intake manifold absolute pressure is indicated in “kPa” and “mmHg” at the same time.



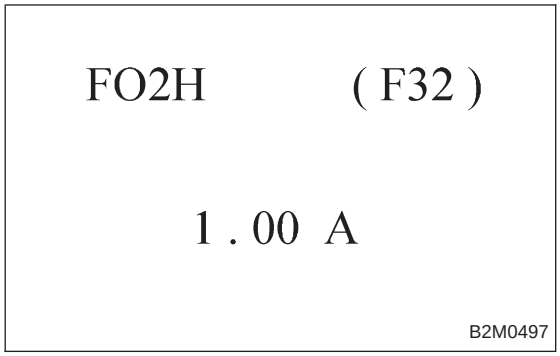
26. FUNCTION MODE: F29
— A/F CORRECTION COEFFICIENT [SHORT TERM TRIM] BY REAR OXYGEN SENSOR (PHOS) —



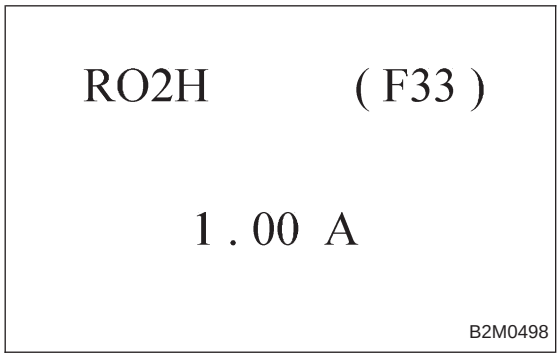
27. FUNCTION MODE: F30
— LONG TERM FUEL TRIM [A/F LEARNING CORRECTION COEFFICIENT] (KBLRC) —



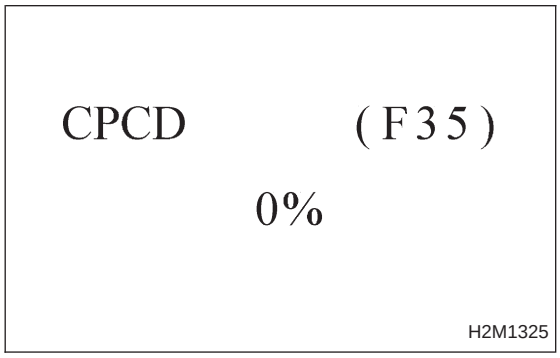
28. FUNCTION MODE: F31
— LONG TERM FUEL TRIM WHOLE [A/F LEARNING CONTROL COEFFICIENT] (K0) —



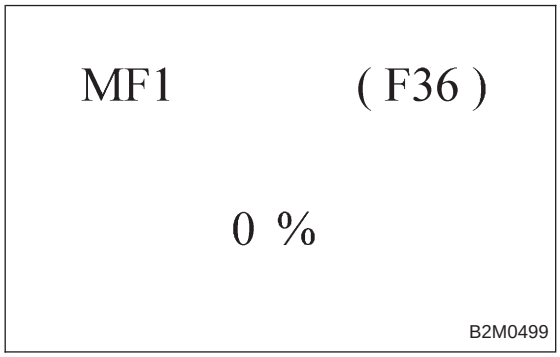
29. FUNCTION MODE: F32
— FRONT OXYGEN SENSOR HEATER CURRENT (FO2H) —



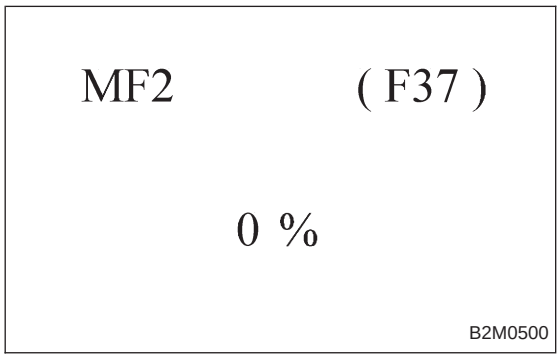
30. FUNCTION MODE: F33
— REAR OXYGEN SENSOR HEATER CURRENT (RO2H) —



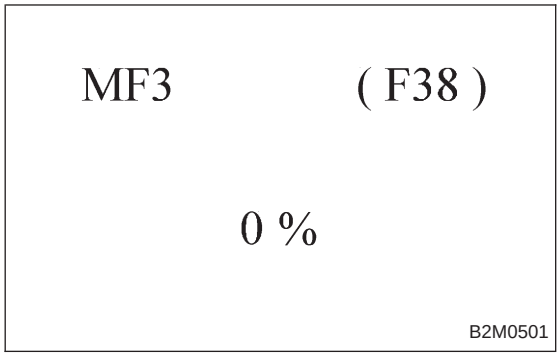
31. FUNCTION MODE: F35
— PURGE CONTROL SOLENOID VALVE DUTY RATIO (CPCD) —



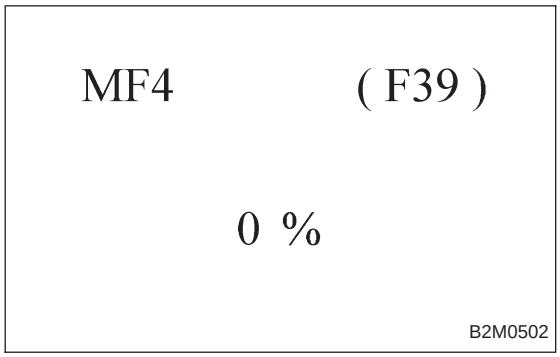
32. FUNCTION MODE: F36
— MAXIMUM VALUE OF CYLINDER #1 MISFIRE RATE DURING 100 ROTATIONS (MF1) —



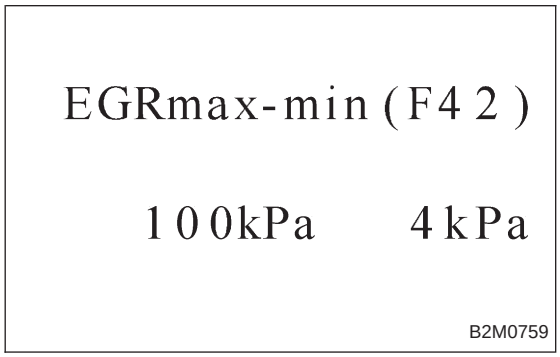
33. FUNCTION MODE: F37
— MAXIMUM VALUE OF CYLINDER #2 MISFIRE RATE DURING 100 ROTATIONS (MF2) —



34. FUNCTION MODE: F38
— MAXIMUM VALUE OF CYLINDER #3 MISFIRE RATE DURING 100 ROTATIONS (MF3) —

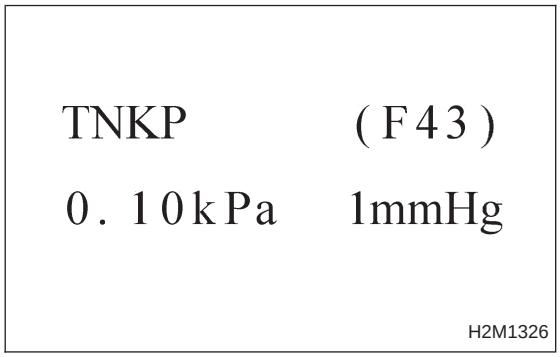


35. FUNCTION MODE: F39
— MAXIMUM VALUE OF CYLINDER #4 MISFIRE RATE DURING 100 ROTATIONS (MF4) —

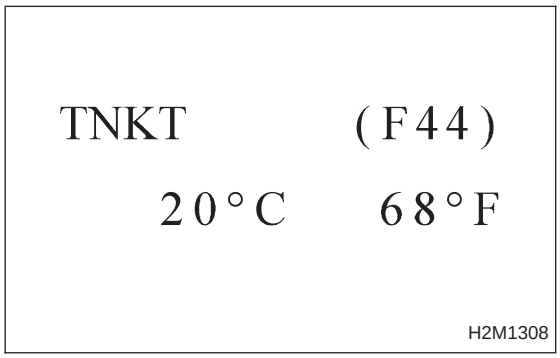


36. FUNCTION MODE: F42
— MAXIMUM AND MINIMUM EGR SYSTEM PRESSURE VALUE [AT VEHICLES] (EGRMAX-MIN) —

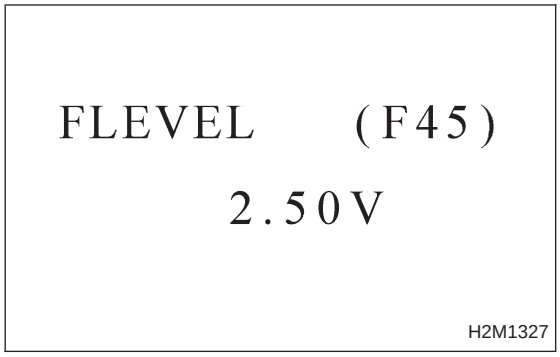
- Maximum and minimum EGR system pressure value are indicated at the same time.



37. FUNCTION MODE: F43
— FUEL TANK PRESSURE SIGNAL (TNKP) —



38. FUNCTION MODE: F44
— FUEL TEMPERATURE SIGNAL (TNKT) —



39. FUNCTION MODE: F45
— FUEL LEVEL SIGNAL (FLEVEL) —

40. FA MODE FOR ENGINE

Function mode	LED No.	Contents	Display	LED “ON” requirements
FA0	3	Neutral switch	NT	When neutral position signal is entered.
	7	Test mode connector	UD	When test mode connector is connected.
	8	AT/MT identification signal	AT	When AT identification signal is entered.
	9	Ignition switch	IG	When ignition switch is turned ON.
FA1	1	Radiator fan relay 2	R2	When radiator fan relay 2 is in function.
	2	Knock signal	KS	When knock signal is entered.
	3	Purge control solenoid valve	CN	When purge control solenoid valve is in function.
	4	Fuel pump relay	FP	When fuel pump relay is in function.
	6	Radiator fan relay 1	R1	When radiator fan relay 1 is in function.
	7	Air conditioner relay	AR	When air conditioner relay is in function.
	8	Air conditioner switch	AC	When air conditioner switch is turned ON.
FA2	1	FICD solenoid valve	AF	When FICD solenoid valve is in function.
	2	AEC signal	EC	When AEC signal is entered.
	3	EAM signal	AM	When EAM signal is gone out.
	4	AEB signal	EB	When AEB signal is entered.
	6	AET signal	ET	When AET signal is entered.
	7	Engine torque control signal	TR	When engine torque control signal is entered.
FA3	7	Pressure sources switching solenoid valve	BR	When pressure sources switching solenoid valve is in function.
FA4	1	Catalyst	CA	When diagnosis of catalyzer is finished.
	2	EGR system	E1	When diagnosis of EGR system is finished.
	3	Federal spec. vehicle identification signal	FC	When Federal spec. vehicle identification signal is entered.
	8	Rear oxygen sensor signal	OR	When rear oxygen sensor mixture ratio is rich.
	9	Front oxygen sensor signal	O2	When front oxygen sensor mixture ratio is rich.
FA5	6	Vent control solenoid valve	AL	When vent control solenoid valve is in function.
	7	EGR solenoid valve	ER	When EGR solenoid valve is in function.
	8	Pressure control solenoid valve	PC	When pressure control solenoid valve is in function.

LED No.	Signal name	Display
1	—	—
2	—	—
3	Neutral switch	NT
4	—	—
5	—	—
6	—	—
7	Test mode connector	UD
8	Identification of AT model	AT
9	Ignition switch	IG
0	—	—

—	—	NT	—	—
—	UD	AT	IG	—
1	2	3	4	5
6	7	8	9	0

41. FUNCTION MODE: FA0

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 3 ● On MT model, gear position is in neutral.
● On AT model, shift position is in “P” or “N”.
LED No. 7 Test mode connector is connected.
LED No. 8 Vehicle is AT model.
LED No. 9 Ignition switch is turned ON.

LED No.	Signal name	Display
1	Radiator fan relay 2	R2
2	Knock signal	KS
3	Purge control solenoid valve	CN
4	Fuel pump relay	FP
5	—	—
6	Radiator fan relay 1	R1
7	A/C relay	AR
8	A/C switch	AC
9	—	—
0	—	—

R2	KS	CN	FP	—
R1	AR	AC	—	—
1	2	3	4	5
6	7	8	9	0

42. FUNCTION MODE: FA1

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Radiator fan relay 2 is turned ON.
LED No. 2 Engine is knocking.
LED No. 3 Purge control solenoid valve is in function.
LED No. 4 Fuel pump relay is turned ON.
LED No. 6 Radiator fan relay 1 is turned ON.
LED No. 7 A/C relay is turned ON.
LED No. 8 A/C switch is turned ON.

NOTE:
● When LED No. 1, 3, 4, 6 and 7 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.
● When LED No. 4 illuminates for only 2 seconds after the ignition switch is turned to ON, (and then goes out), the corresponding part is functioning properly.
● LED No. 3 is applicable only to the models not equipped with enhanced evaporative emission control system.

LED No.	Signal name	Display
1	FICD solenoid valve	AF
2	AEC signal	EC
3	EAM signal	AM
4	AEB signal	EB
5	—	—
6	AET signal	ET
7	Engine torque control signal	TR
8	—	—
9	—	—
0	—	—

AF	EC	AM	EB	—
ET	TR	—	—	—

1	2	3	4	5
6	7	8	9	0

43. FUNCTION MODE: FA2

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 FICD solenoid valve is in function.
LED No. 2 ECM entered the AEC signal emitted from TCS C/M.
LED No. 3 EAM signal goes out.
LED No. 4 ECM entered the AEB signal emitted from TCS C/M.
LED No. 6 ECM entered the AET signal emitted from TCS C/M.
LED No. 7 ECM entered the torque control signal emitted from TCM.

NOTE:
When LED No. 1 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.

LED No.	Signal name	Display
1	—	—
2	—	—
3	—	—
4	—	—
5	—	—
6	—	—
7	Pressure sources switching solenoid valve	BR
8	—	—
9	—	—
0	—	—

—	—	—	—	—
—	BR	—	—	—

1	2	3	4	5
6	7	8	9	0

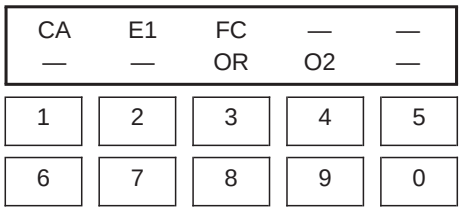
44. FUNCTION MODE: FA3

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 7 Pressure sources switching solenoid valve is in function.

NOTE:
When LED No. 7 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.

LED No.	Signal name	Display
1	Catalyst	CA
2	EGR system	E1
3	Federal spec. vehicle identification signal	FC
4	—	—
5	—	—
6	—	—
7	—	—
8	Rear oxygen sensor signal	OR
9	Front oxygen sensor signal	O2
0	—	—

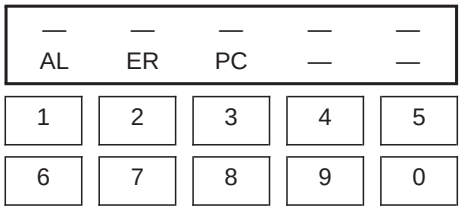


45. FUNCTION MODE: FA4

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Diagnosis of catalyzer is finished.
LED No. 2 Diagnosis of EGR system is finished.
LED No. 3 Vehicle is Federal spec. vehicles.
LED No. 8 Rear oxygen sensor mixture ratio is rich.
LED No. 9 Front oxygen sensor mixture ratio is rich.

LED No.	Signal name	Display
1	—	—
2	—	—
3	—	—
4	—	—
5	—	—
6	Vent control solenoid valve	AL
7	EGR solenoid valve	ER
8	Pressure control solenoid valve	PC
9	—	—
0	—	—



46. FUNCTION MODE: FA5

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 6 Vent control solenoid valve is in function.
LED No. 7 EGR solenoid valve is in function.
LED No. 8 Pressure control solenoid valve is in function.

NOTE:
When LED No. 6, 7 and 8 blinks with the test mode connector connected and the ignition switch turned to ON, the corresponding part is functioning properly.

47. FB MODE FOR ENGINE

Function mode	Abbreviation	Contents	Contents of display	Page
FB0	INSPECT	On-board diagnostics (Inspection)	Current trouble code indicated by on-board diagnostics after clear memory.	67 <Ref. to 2-7 [T3E0].>
FB1	OBD	On-board diagnostics (Read data)	Current trouble code indicated by on-board diagnostics.	40 <Ref. to 2-7 [T3C2].>
FB2	LOAD−F	Load data	● Freeze frame data ● Data stored at the time of trouble occurrence, is shown on display.	41 <Ref. to 2-7 [T3C4].>
	TW−F	Engine coolant temperature signal		
	ALPH−F	Throttle position signal		
	KBLR−F	Long term fuel trim		
	MANI−F	Intake manifold absolute pressure signal		
	EREV−F	Engine speed signal		
	VSP−F	Vehicle speed signal		
FB3	QA−F (P0100)	Mass air flow signal	● Freeze frame data ● Data stored at the time of trouble occurrence, is shown on display.	42 <Ref. to 2-7 [T3C5].>
	PS−F (P0105)	Pressure signal		
	PR−F (P0106)	Pressure signal		
	TW−F (P0115)	Engine coolant temperature signal		
	THV−F (P0120)	Throttle position signal		
	EGR (P0403)	EGR control solenoid valve signal		
	CPC (P0443)	Purge control solenoid valve signal		
	STSW (P1100)	Start switch signal		
	BR1 (P1102)	Pressure sources switching solenoid valve signal		
	FAN1 (P1500)	Radiator fan relay 1 signal		

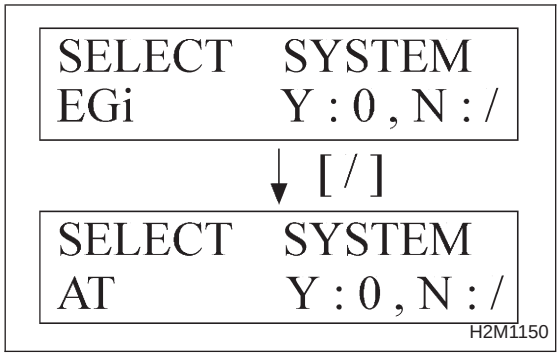
48. FC MODE FOR ENGINE

Function mode	Abbreviation	Contents	Contents of display	Page
FC0	MEMORY CLR	Back-up memory clear	Function of clearing trouble code stored in memory.	66 <Ref. to 2-7 [T3D0].>

49. FD MODE FOR ENGINE

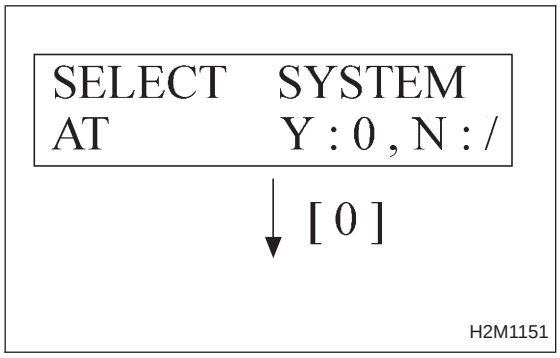
Function mode	Abbreviation	Contents	Contents of display	Page
FD01	FUEL PUMP	Compulsory valve operation check	Function of checking operation of fuel pump relay, purge control solenoid valve, radiator fan relay, A/C relay, EGR control solenoid valve, pressure control solenoid valve, vent control solenoid valve and pressure sources switching solenoid valve.	72 <Ref. to 2-7 [T3F0].>
FD02	CPC SOL			
FD03	RAD FAN			
FD04	A/C RELAY			
FD05	EGR SOL			
FD07	PCV SOL			
FD08	VENT SOL			
FD09	FICD SOL			
FD10	BR SOL			

NOTE:
Because ASV solenoid valve and air injection system diagnosis solenoid valve are not installed, FD06 and FD11 will be displayed but non-functional.

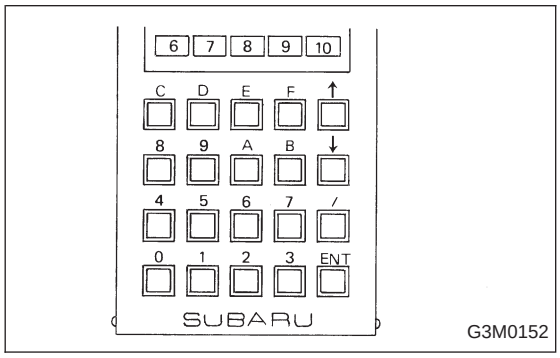


50. READ CURRENT DATA SHOWN ON DISPLAY FOR AT. (FUNCTION MODE)

1) Select AT mode using function key.
Press the function key [/], and change to AT mode.



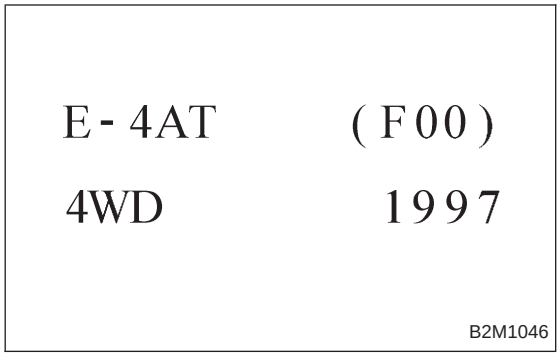
2) Press the function key [0].



3) Designate mode using function key.
<Ref. to 2-7 [T3C51].>
(Example: Press [F] [0] [2] [ENT] in that order.)
4) Ensure data of input or output signal is shown.

51. READ DATA FUNCTION KEY LIST FOR AT

Function mode	Contents	Abbr.	Unit
F00	Mode display	E-4AT	—
F01	Battery voltage	VB	V
F02	Vehicle speed sensor 1 signal	VSP1	m/h
F03	Vehicle speed sensor 1 signal	VSP1	km/h
F04	Vehicle speed sensor 2 signal	VSP2	m/h
F05	Vehicle speed sensor 2 signal	VSP2	km/h
F06	Engine speed	EREV	rpm
F07	ATF temperature sensor signal	ATFT	deg F
F08	ATF temperature sensor signal	ATFT	deg C
F09	Throttle position sensor signal	THV	V
F10	Gear position	GEAR	—
F11	Line pressure duty ratio	PLDTY	%
F12	Lock-up duty ratio	LUDTY	%
F13	AWD duty ratio	4WDTY	%
F14	Throttle position sensor power supply voltage	THVCC	V
F15	Mass air flow sensor signal	AFM	V



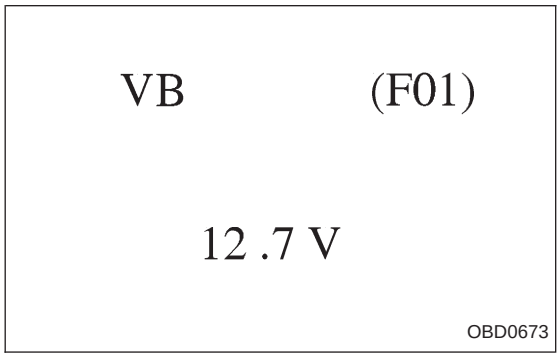
52. FUNCTION MODE: F00 — MODE DISPLAY —

SPECIFIED DATA:

Data at the left should be indicated.

Probable cause (if outside “specified data”)

1. Communication failure (No communication method can be confirmed with power ON.)	(1)	Check loose or poor connectors, or shortcircuit.
	(2)	Check type of cartridge.
2. Vehicle types cannot be identified (due to communication failure).		Check improper cartridge. Replace with proper one.



53. FUNCTION MODE: F01 — BATTERY VOLTAGE (VB) —

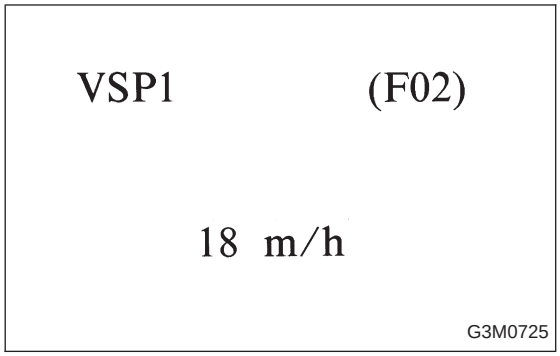
CONDITION:

(1) Ignition switch ON
(2) Engine idling after warm-up

SPECIFIED DATA:

(1) 12±1 V
(2) 13±1 V

1. Battery		Check battery voltage and specific gravity of electrolyte.
2. Charging system	(1)	Measure regulating voltage under no loads.
	(2)	Check generator (as a single unit).



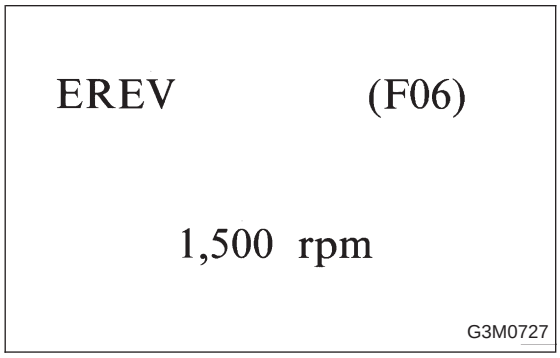
54. FUNCTION MODE: F02
— VEHICLE SPEED SENSOR 1 SIGNAL (VSP1) —

- F02: Vehicle speed is indicated in mile per hour (m/h).
- F03: Vehicle speed is indicated in kilometer per hour (km/h).

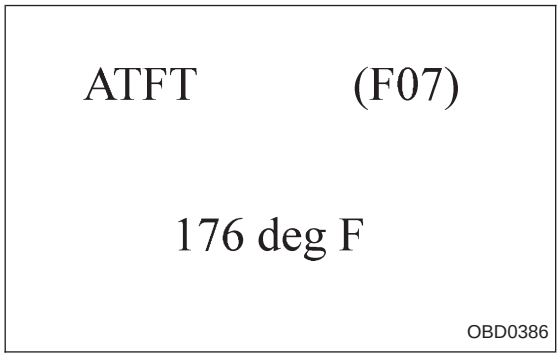


55. FUNCTION MODE: F04
— VEHICLE SPEED SENSOR 2 SIGNAL (VSP2) —

- F04: Vehicle speed is indicated in mile per hour (m/h).
- F05: Vehicle speed is indicated in kilometer per hour (km/h).

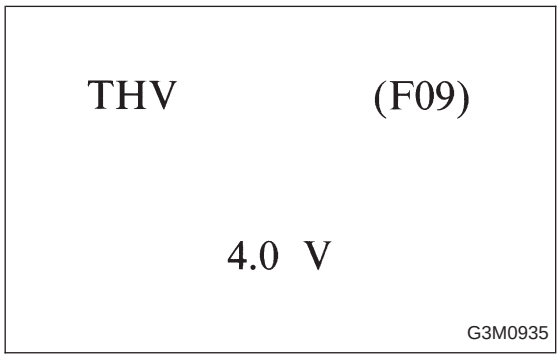


56. FUNCTION MODE: F06
— ENGINE SPEED (EREV) —

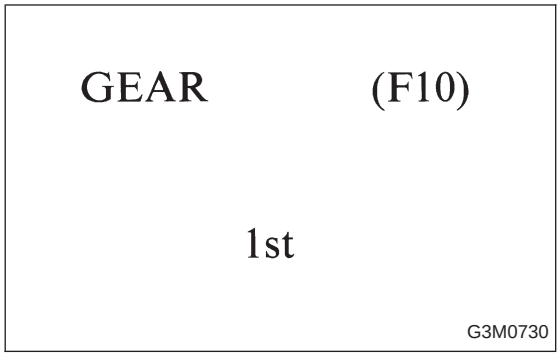


57. FUNCTION MODE: F07
— ATF TEMPERATURE SENSOR SIGNAL (ATFT) —

- F07: ATF temperature is indicated in “deg F”.
- F08: ATF temperature is indicated in “deg C”.



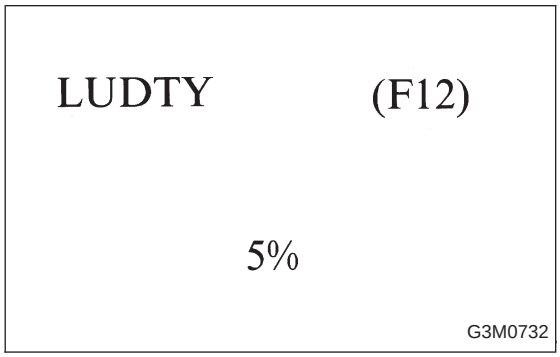
58. FUNCTION MODE: F09
— THROTTLE POSITION SENSOR SIGNAL (THV) —



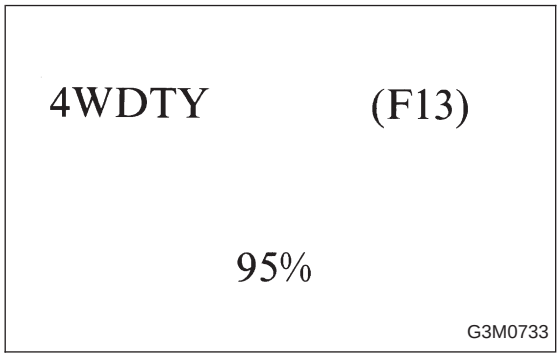
59. FUNCTION MODE: F10
— GEAR POSITION (GEAR) —



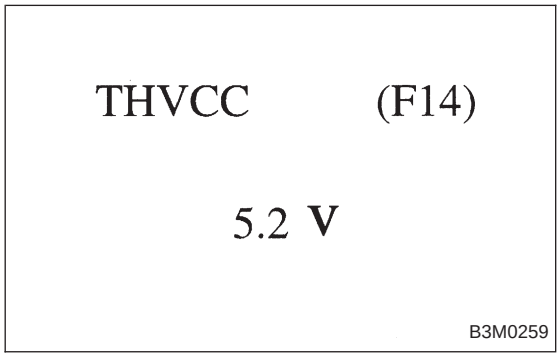
60. FUNCTION MODE: F11
— LINE PRESSURE DUTY RATIO (PLDTY) —



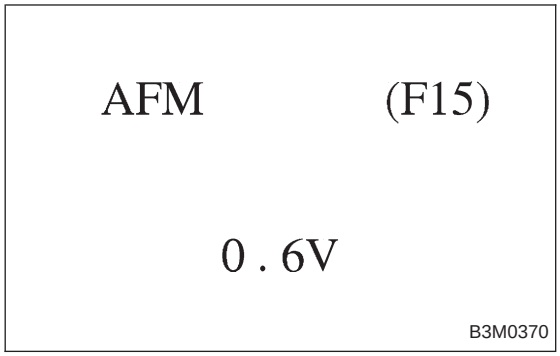
61. FUNCTION MODE: F12
— LOCK-UP DUTY RATIO (LUDTY) —



62. FUNCTION MODE: F13
— AWD DUTY RATIO (4WDTY) —



63. FUNCTION MODE: F14
— THROTTLE POSITION SENSOR POWER SUPPLY VOLTAGE (THVCC) —



64. FUNCTION MODE: F15
— MASS AIR FLOW SENSOR SIGNAL (AFM) —

LED No.	Signal name	Display
1	FWD switch	FF
2	Kick-down switch	KD
3	—	—
4	—	—
5	Brake switch	BR
6	ABS switch	AB
7	Cruise control set	CR
8	Power switch	PW
9	—	—
10	—	—

FF	KD	—	—	BR
AB	CR	PW	—	—

1	2	3	4	5
6	7	8	9	10

65. FUNCTION MODE: FA0

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 Fuse is installed in FWD switch.
LED No. 2 Kick-down switch is turned ON. (Europe and General models only)
LED No. 5 Brake pedal is depressed.
LED No. 6 ABS signal is entered.
LED No. 7 Cruise control is set.
LED No. 8 Power switch is turned ON. (Europe and General models only)

LED No.	Signal name	Display
1	N/P range switch	NP
2	R range switch	RR
3	D range switch	RD
4	3 range switch	R3
5	2 range switch	R2
6	1 range switch	R1
7	Diagnosis switch	SS
8	—	—
9	—	—
10	—	—

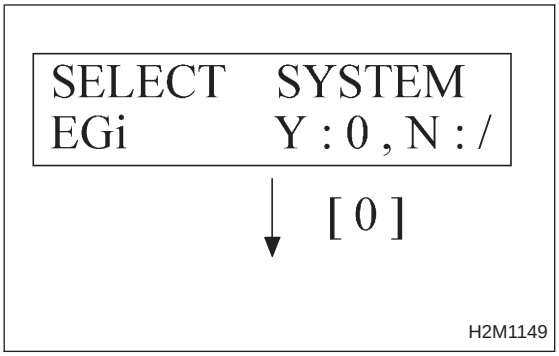
NP	RR	RD	R3	R2
R1	SS	—	—	—

1	2	3	4	5
6	7	8	9	10

66. FUNCTION MODE: FA1

— ON ↔ OFF SIGNAL —

Requirement for LED “ON”.
LED No. 1 “N” or “P” range is selected.
LED No. 2 “R” range is selected.
LED No. 3 “D” range is selected.
LED No. 4 “3” range is selected.
LED No. 5 “2” range is selected.
LED No. 6 “1” range is selected.
LED No. 7 Diagnosis connector is connected.



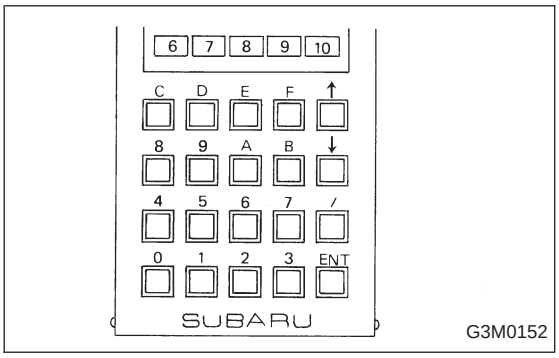
D: CLEAR MEMORY MODE

1. SUBARU SELECT MONTOR

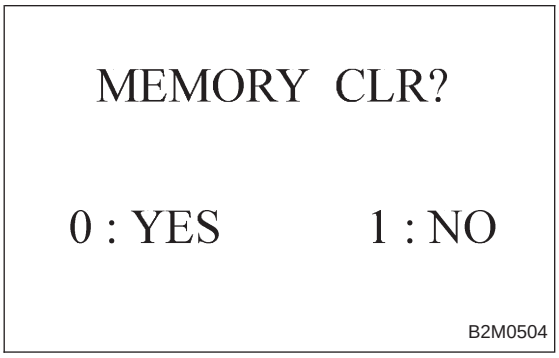
1) Select engine mode or AT mode using function key.
- Engine mode:

Press the function key [0].
- AT mode:

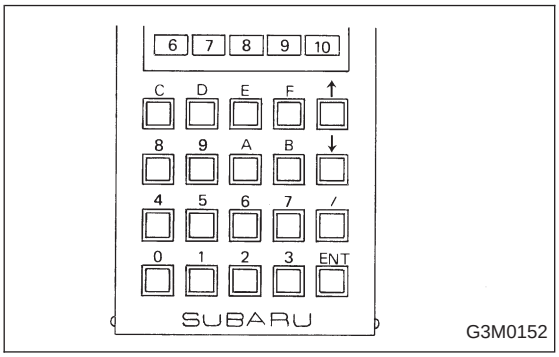
Press the function key [/] [0] in that order.



2) Designate mode using function key.
Press [F] [C] [0] [ENT] in that order.



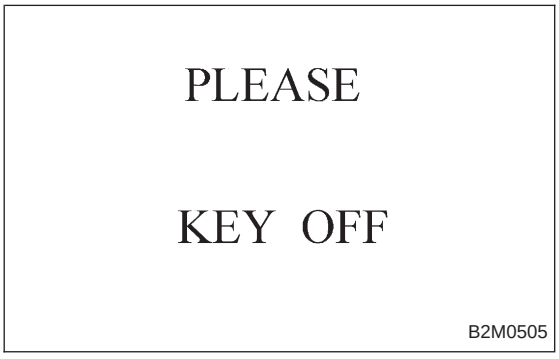
3) Ensure displayed message.



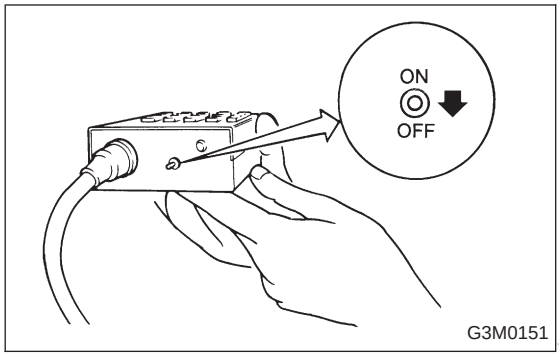
4) Press function key.
- When executing, (YES)

Press [0] [ENT] in that order.
- When not executing, (NO)

Press [1] [ENT] in that order.



5) When executed, the indication as shown here appears for approximately four seconds, and the past trouble history is deleted.

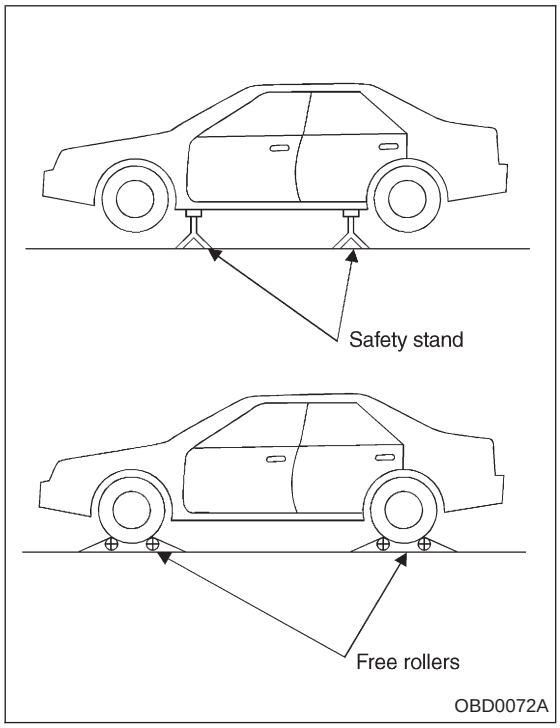


6) After the display is gone, turn Subaru select monitor switch and ignition switch to OFF.

NOTE:
When the ECM, battery terminals, etc. are disconnected after memory is cleared, idling speed may increase. This is not considered a problem because the ISC valve duty controlled learning value has been cleared. To return the engine to idling speed, idle for approximately 2 minutes with air conditioner off.

2. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.



E: INSPECTION MODE

1. PREPARATIONS FOR THE INSPECTION MODE

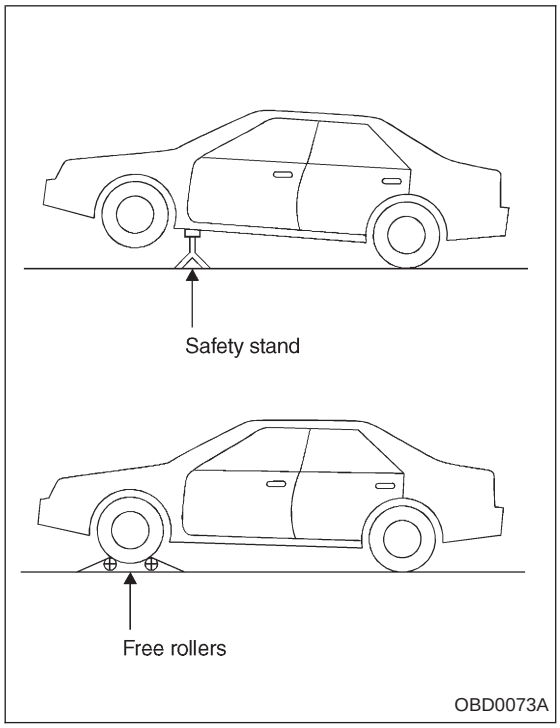
Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

- **FULL-TIME AWD MODELS**

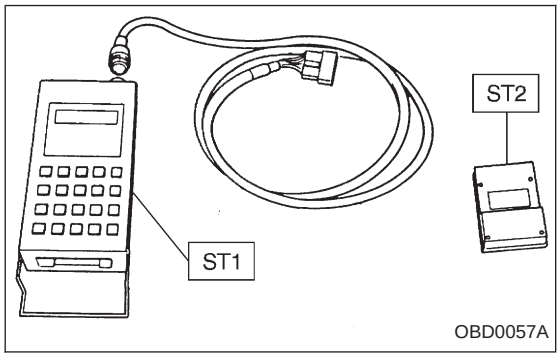
WARNING:

- **Before raising the vehicle, ensure parking brakes are applied.**
- **Do not use a pantograph jack in place of a safety stand.**
- **Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.**
- **Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.**
- **In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.**

● Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

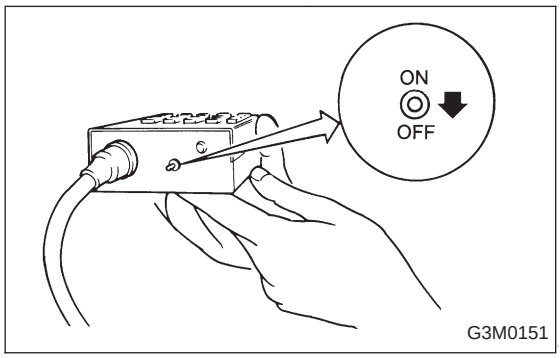


● FWD MODELS
WARNING:
● Before raising the vehicle, ensure parking brakes are applied.
● Do not use a pantograph jack in place of a safety stand.
● If only the front wheels are raised or placed on a free roller, apply parking brakes and lock the rear wheels.
● Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
● Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
● In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
● Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

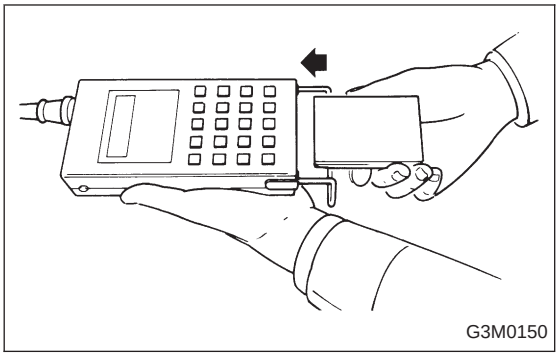


2. SUBARU SELECT MONITOR

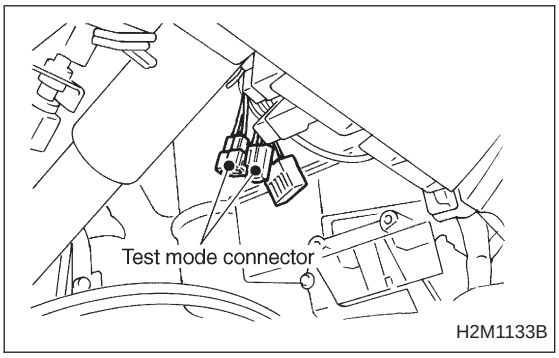
After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.
1) Prepare Subaru select monitor and cartridge.
ST1 498307500 SELECT MONITOR KIT
ST2 498346200 CARTRIDGE



2) Turn ignition switch and Subaru select monitor switch to OFF.

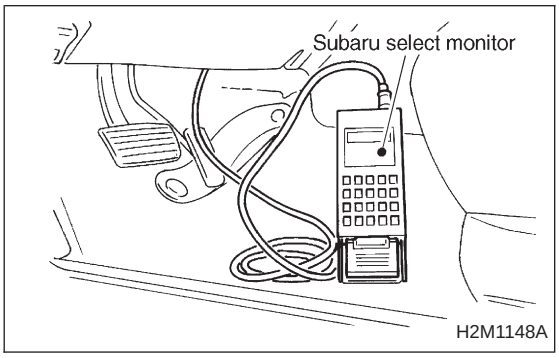

G3M0150

3) Insert cartridge into Subaru select monitor.



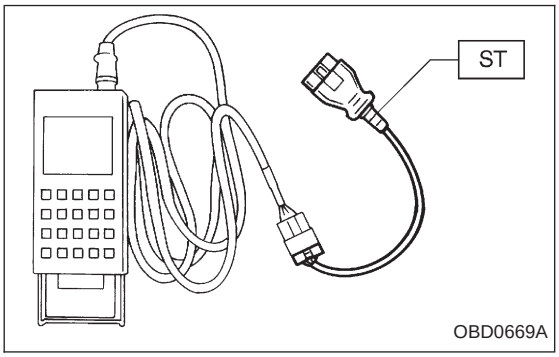
H2M1133B

4) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



H2M1148A

5) Connect Subaru select monitor to data link connector.
● Using data link connector for Subaru select monitor only:
Connect Subaru select monitor to its data link connector located in the lower portion of the instrument panel (on the driver's side), to the side of the center console box.

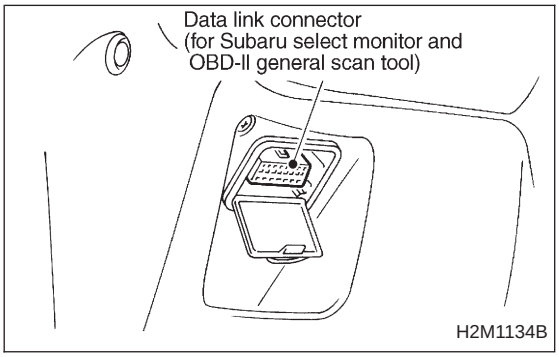


OBD0669A

● Using data link connector for Subaru select monitor and OBD-II general scan tool:

(1) Connect ST to Subaru select monitor cable.

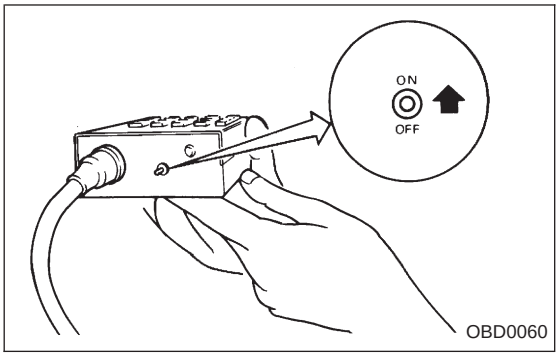
ST 498357200 ADAPTER CABLE



H2M1134B

(2) Open the cover and connect Subaru select monitor to data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.

CAUTION:
Do not connect scan tools except for Subaru select monitor and OBD-II general scan tool.



6) Turn ignition switch to ON (engine OFF) and Subaru select monitor switch to ON.

7) Start the engine.

NOTE:

- Ensure the selector lever is placed in the “P” position before starting. (AT vehicles)
- Depress clutch pedal when starting the engine. (MT vehicles)

8) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.

9) Depress the brake pedal to turn the brake switch ON. (AT vehicles)

10) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

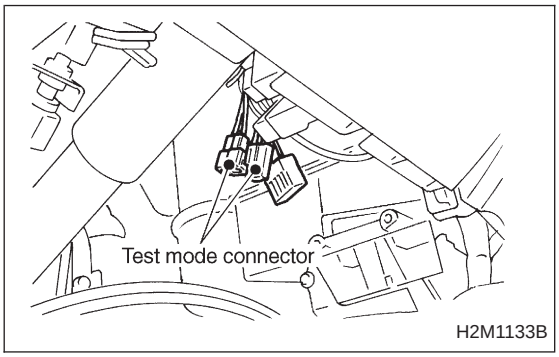
NOTE:

On models without tachometer, use the Subaru select monitor or tachometer (Secondary pickup type).

11) Place the selector lever or shift lever in the “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

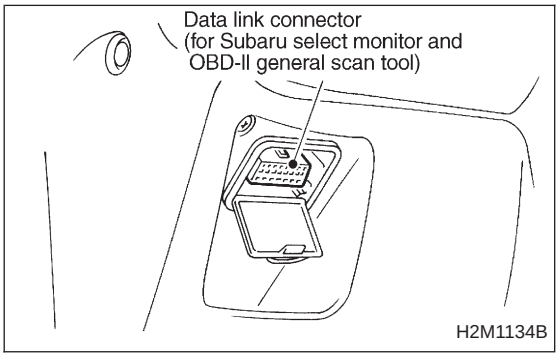
- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to 4-4 [T6D2].> or <Ref. to 4-4 [T9J0].>



3. OBD-II GENERAL SCAN TOOL

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data:

1) Connect test mode connector at the lower side of the instrument panel (on the driver’s side), to the side of the center console box.

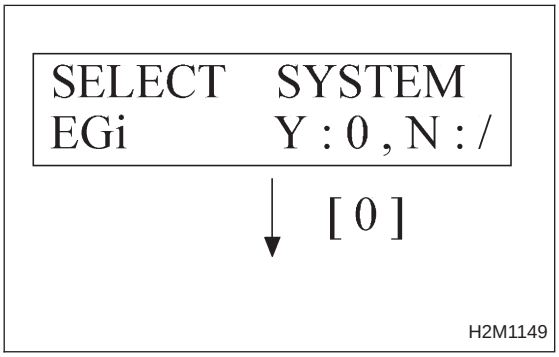


2) Open the cover and connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver’s side), to the lower cover.

CAUTION:
Do not connect the scan tools except for Subaru select monitor and OBD-II general scan tool.

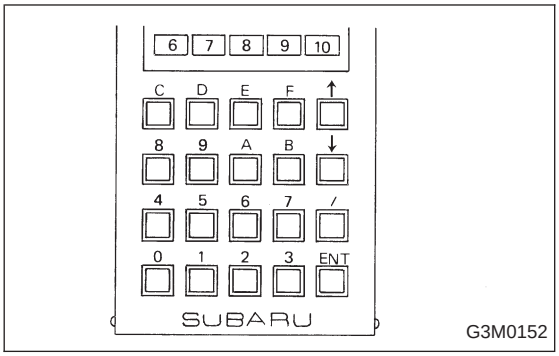
3) Start the engine.
NOTE:
● Ensure the selector lever is placed in the “P” position before starting. (AT vehicles)
● Depress clutch pedal when starting the engine. (MT vehicles)
4) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.
5) Depress the brake pedal to turn the brake switch ON. (AT vehicles)
6) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
NOTE:
On models without tachometer, use the Subaru select monitor or tachometer (Secondary pickup type).
7) Place the selector lever or shift lever in the “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).
NOTE:
● On AWD vehicles, release the parking brake.
● The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to 4-4 [T6D2].> or <Ref. to 4-4 [T9J0].>

8) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).
NOTE:
● For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
● For details concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST. <Ref. to 2-7 [T10A0].>



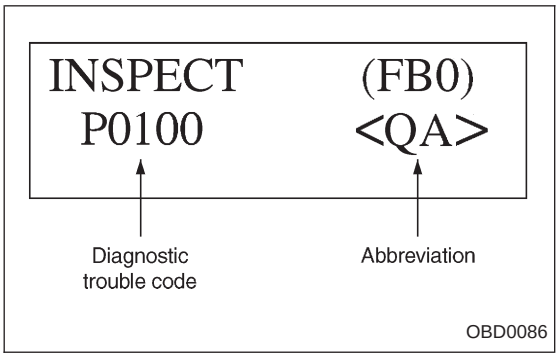
4. READ DIAGNOSTIC TROUBLE CODE (DTC) SHOWN ON DISPLAY. (MODE FB0 <INSPECTION MODE>)

Using Subaru select monitor, check for diagnostic trouble code(s) and record the result(s).
1) Select engine mode using function key.
Press the function key [0].



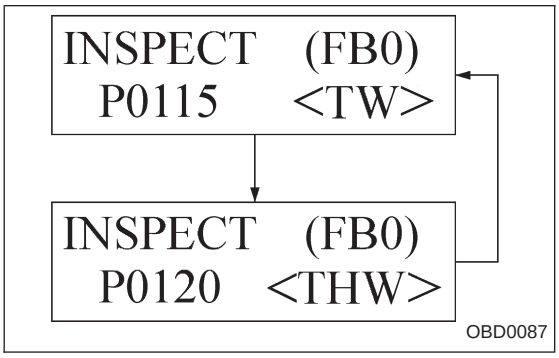
G3M0152

2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.



OBD0086

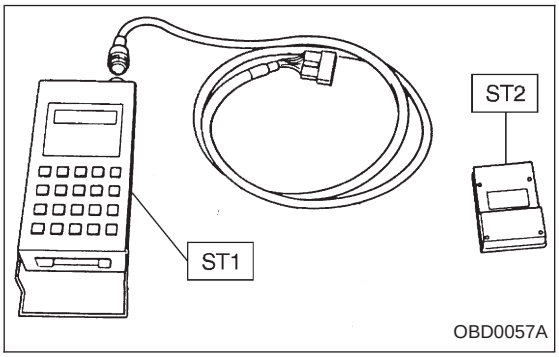
3) Ensure diagnostic trouble code(s) is shown.
(1) When there is only one diagnostic trouble code.



OBD0087

(2) When there are multiple diagnostic trouble codes.

NOTE:
For details concerning diagnostic trouble code(s), refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST. <Ref. to 2-7 [T10A0].>

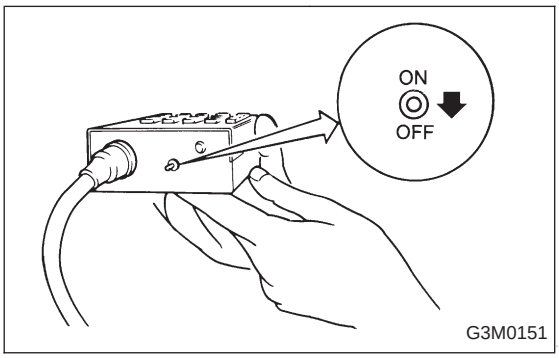


OBD0057A

F: COMPULSORY VALVE OPERATION CHECK MODE (FD MODE)

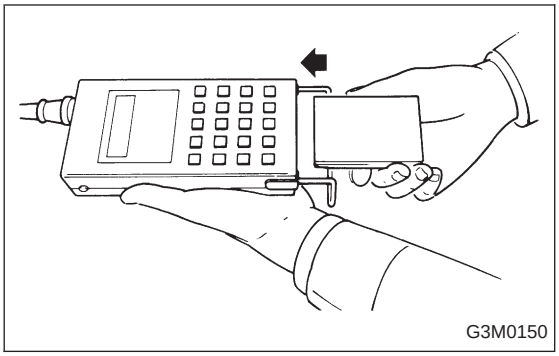
1. SUBARU SELECT MONITOR

1) Prepare Subaru select monitor and cartridge.
ST1 498307500 SELECT MONITOR KIT
ST2 498346200 CARTRIDGE

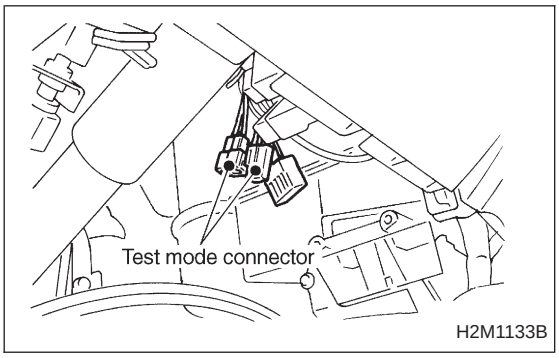


G3M0151

2) Turn ignition switch and Subaru select monitor switch to OFF.

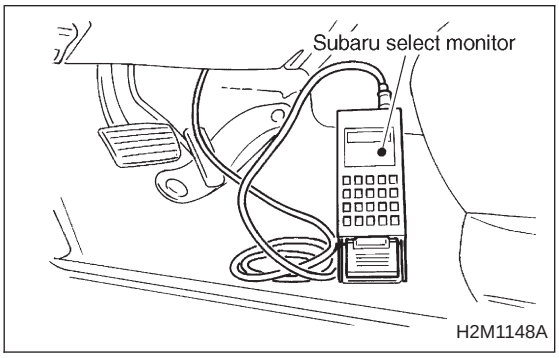

G3M0150

3) Insert cartridge into Subaru select monitor.



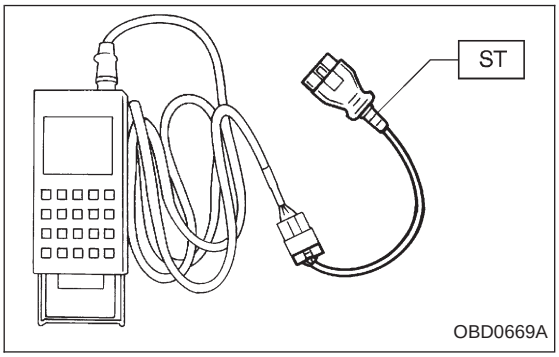
H2M1133B

4) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



H2M1148A

5) Connect Subaru select monitor to data link connector.
● Using data link connector for Subaru select monitor only:
Connect Subaru select monitor to its data link connector located in the lower portion of the instrument panel (on the driver's side), to the side of the center console box.

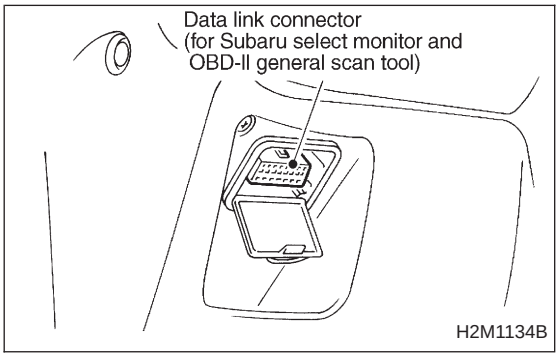


OBD0669A

● Using data link connector for Subaru select monitor and OBD-II general scan tool:

(1) Connect ST to Subaru select monitor cable.

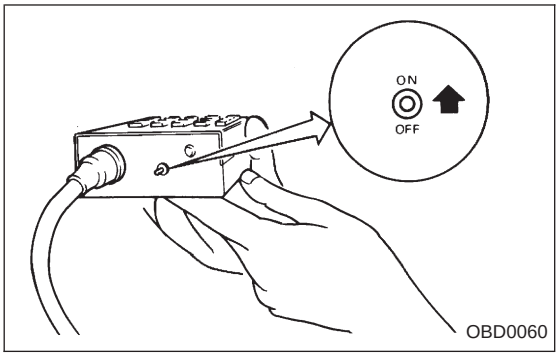
ST1 498357200 ADAPTER CABLE



H2M1134B

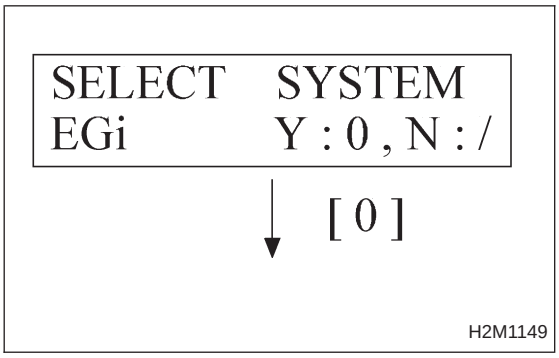
(2) Open the cover and connect Subaru select monitor to data link connector located in the lower portion of the instrument panel (on the driver's side), to the lower cover.

CAUTION:
Do not connect scan tools except for Subaru select monitor and OBD-II general scan tool.



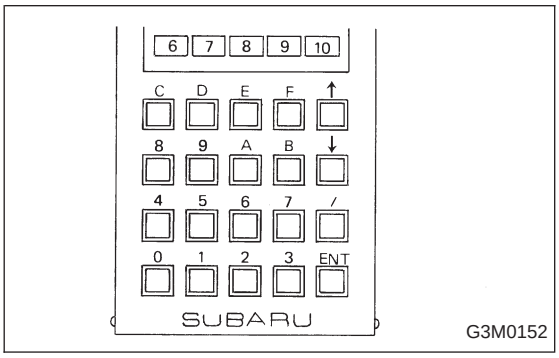
OBD0060

6) Turn ignition switch to ON (engine OFF) and Subaru select monitor switch to ON.



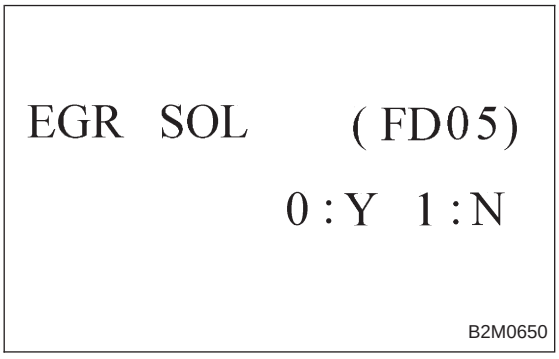
H2M1149

7) Select engine mode using function key.
Press the function key [0].



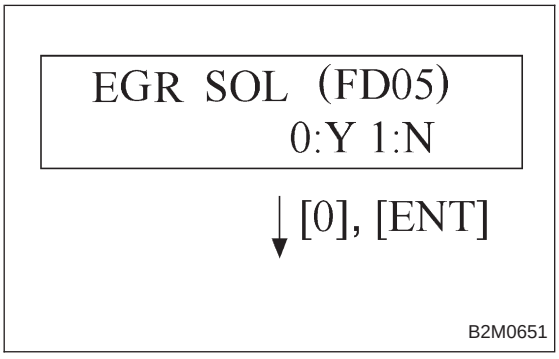
G3M0152

8) Designate mode using function key.
<Ref. to 2-7 [T3C6].>
(Example: Press [F] [D] [0] [5] [ENT] in that order.)



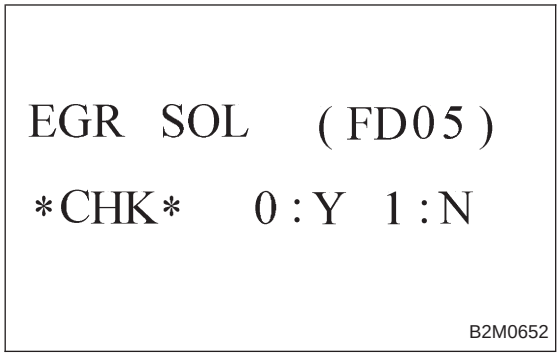
B2M0650

9) Ensure displayed message.

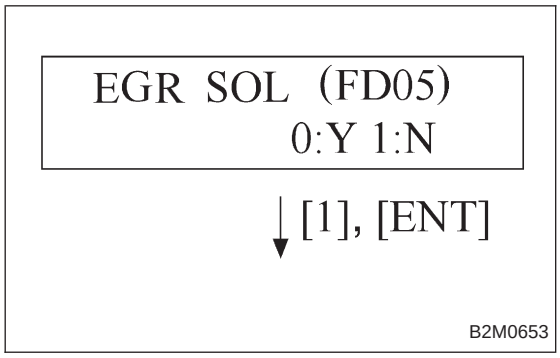


B2M0651

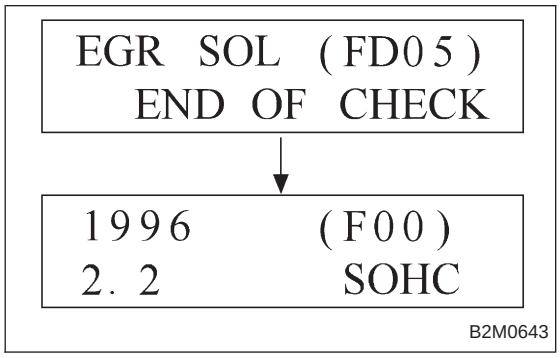
10) Press the function key.
(1) When executing, press the function key [0].



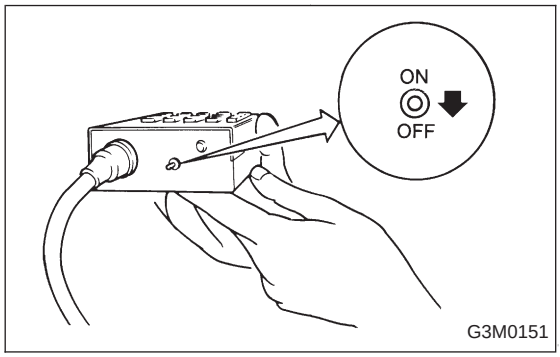
NOTE:
When in compulsory valve operation check mode the monitor indicates the execution of valve check on display.



(2) When not executing or stopping the compulsory valve check mode, press the function key [1].



11) When compulsory valve operation check mode is exited or check completed, the monitor indicates the completion of compulsory valve operation check on the display, and automatically returns to the initial mode (FUNCTION MODE: F00).



G: FINISHING DIAGNOSIS OPERATION

1. SUBARU SELECT MONITOR

1) Disconnect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.
2) Turn Subaru select monitor switch and ignition switch to OFF.
3) Disconnect Subaru select monitor from its data link connector.

4. Cautions

A: SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.**

B: PRECAUTIONS

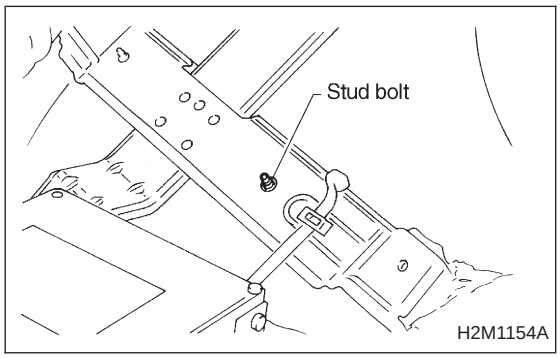
1) Never connect the battery in reverse polarity.
- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

2) Do not disconnect the battery terminals while the engine is running.
- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

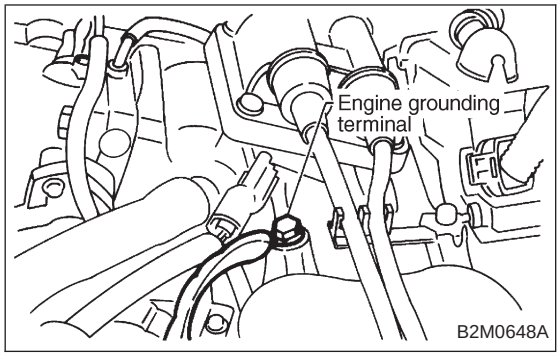
3) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

4) Before removing ECM from the located position, disconnect two cables on battery.
- Otherwise, the ECM may be damaged.

5) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.



6) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



7) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.

8) Every MFI-related part is a precision part. Do not drop them.
9) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
● The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
● The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
● Carefully adjust the antenna for correct matching.
● When mounting a large power type radio, pay special attention to the three items above mentioned.
● Incorrect installation of the radio may affect the operation of the ECM.

10) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
11) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
12) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
13) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
14) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to 4-4 [T6D2].> or <Ref. to 4-4 [T9J0].>

C: PRE-INSPECTION

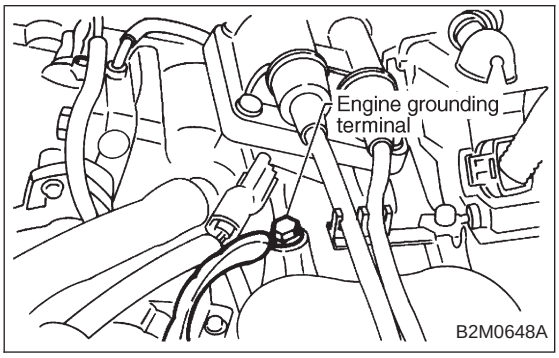
Before performing diagnostics, check the following items which might affect engine problems:

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V
Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

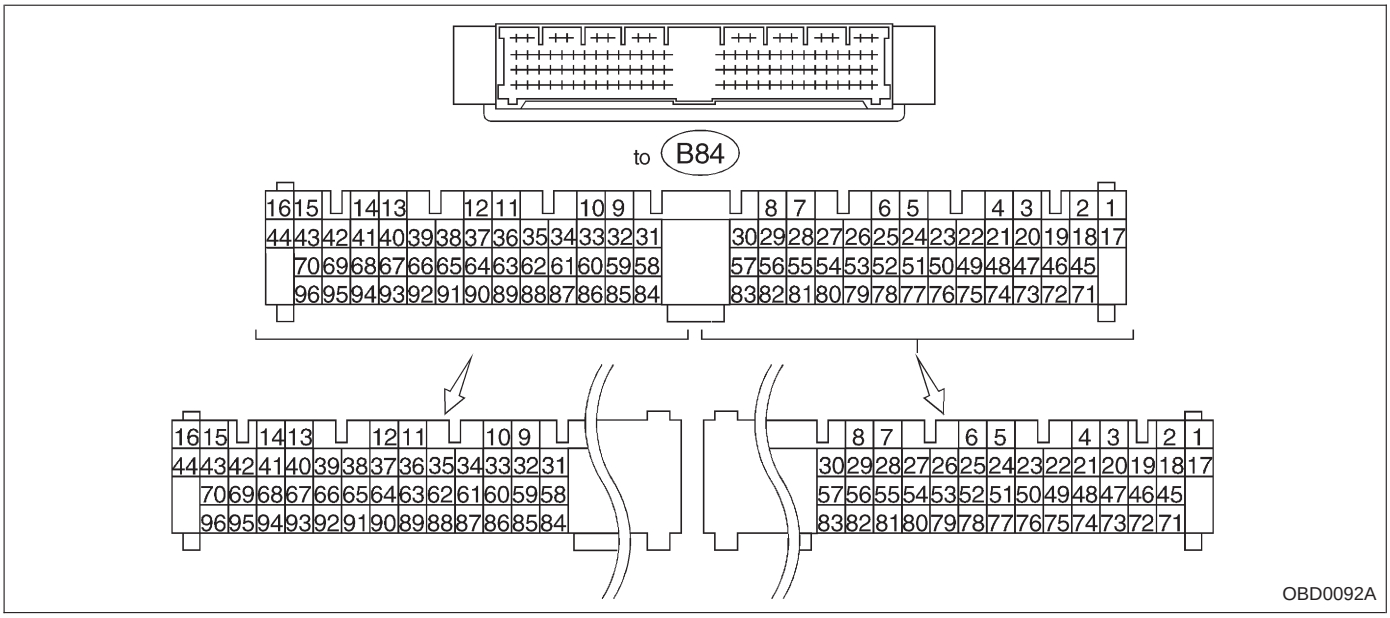


2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.

5. Specified Data

A: ENGINE CONTROL MODULE (ECM) I/O SIGNAL



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B84	8	0	−7 — +7	Sensor output waveform
	Signal (−)	B84	29	0	0	—
	Shield	B84	20	0	0	1800 cc model
		B84	54	0	0	2200 cc model
Camshaft position sensor	Signal (+)	B84	7	0	−7 — +7	Sensor output waveform
	Signal (−)	B84	28	0	0	—
	Shield	B84	20	0	0	1800 cc model
		B84	54	0	0	2200 cc model
Mass air flow sensor	Signal	B84	5	0 — 0.3	0.8 — 1.2	—
	Shield	B84	57	0	0	—
	GND	B84	53	0	0	—
Throttle position sensor	Signal	B84	6	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B84	21	5	5	—
	GND	B84	20	0	0	—
Front oxygen sensor	Signal	B84	23	0	0 — 0.9	—
	Shield	B84	56	0	0	—
Rear oxygen sensor	Signal	B84	24	0	0 — 0.9	—
	Shield	B84	56	0	0	—
Engine coolant temperature sensor		B84	22	1.0 — 1.4	1.0 — 1.4	After warm-up
Vehicle speed sensor 2		B84	83	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		B84	86	0	0	Cranking: 8 to 14

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
A/C switch		B84	60	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B84	85	10 — 13	13 — 14	—
Neutral position switch (MT)		B84	82	ON: 5.0±0.5 OFF: 0		● On MT vehicles; switch is ON when gear is in neutral position.
Neutral position switch (AT)				ON: 0 OFF: 5.0±0.5		● On AT vehicles; switch is ON when shift is in “N” or “P” position.
Test mode connector		B84	84	5	5	When connected: 0
Knock sensor	Signal	B84	3	2.8	2.8	2200 cc model only
	Shield	B84	56	0	0	
AT/MT identification		B84	81	(AT) 5 (MT) 0	(AT) 5 (MT) 0	When measuring voltage between ECM and body.
Back-up power supply		B84	39	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B84	1	10 — 13	13 — 14	—
			2			
Ignition control	# 1, # 2	B84	41	0	1 — 3.4	—
	# 3, # 4	B84	40	0	1 — 3.4	—
Fuel injector	# 1	B84	96	10 — 13	1 — 14	Waveform
	# 2	B84	70	10 — 13	1 — 14	Waveform
	# 3	B84	44	10 — 13	1 — 14	Waveform
	# 4	B84	16	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	OPEN end	B84	14	—	1 — 13	Waveform
	CLOSE end	B84	13	—	13 — 1	Waveform
Fuel pump relay control		B84	32	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B84	31	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B84	74	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B84	73	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		B84	63	10 — 13	13 — 14	—
Malfunction indicator lamp		B84	58	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B84	64	—	0 — 13, or more	Waveform
Torque control signal		B84	79	5	5	2200 cc model only
Mass air flow signal for AT		B84	47	0 — 0.3	0.8 — 1.2	2200 cc model only
Purge control solenoid valve		B84	72	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Atmospheric pressure sensor		B84	26	3.9 — 4.1	2.0 — 2.3	—
Pressure sources switching solenoid valve		B84	15	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
EGR solenoid valve		B84	71	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	2200 cc AT vehicles only
Front oxygen sensor heater signal		B84	38	0 — 1.0	0 — 1.0	—

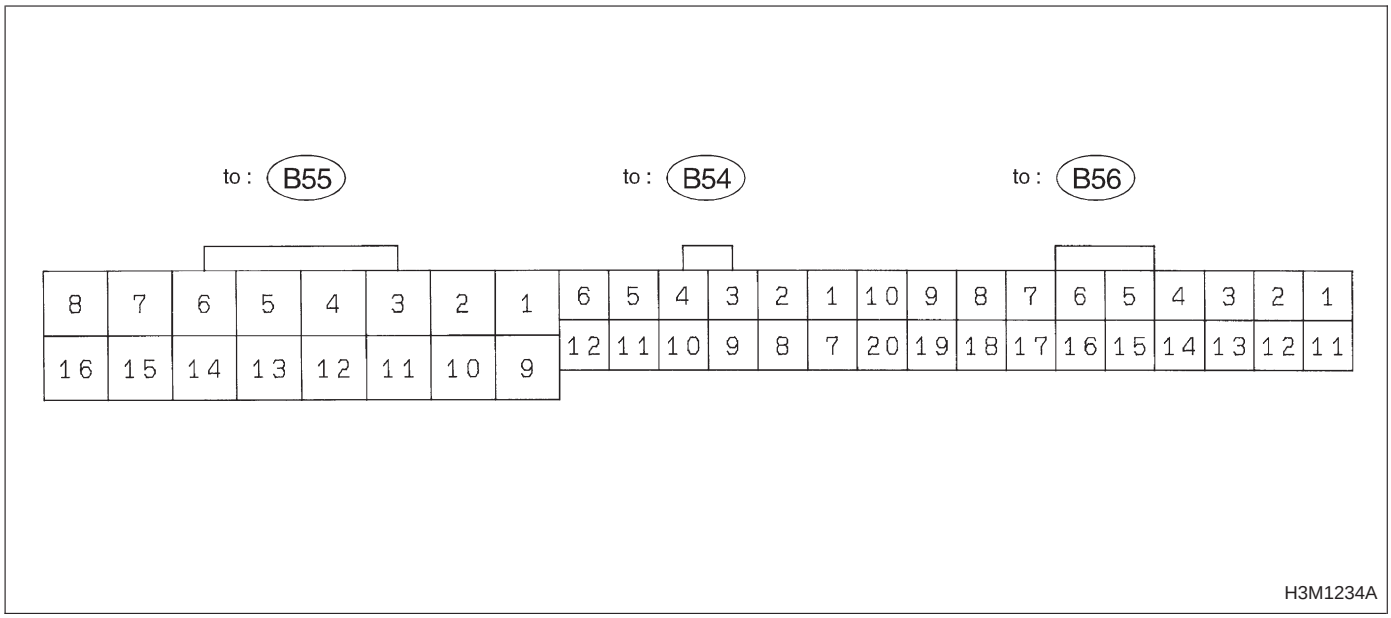
Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Rear oxygen sensor heater signal		B84	37	0 — 1.0	0 — 1.0	—
Fuel temperature sensor		B84	25	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Fuel level sensor		B84	27	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B84	4	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	Power supply	B84	21	5	5	—
	GND	B84	20	0	0	—
Fuel tank pressure control solenoid valve		B84	10	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Vent control solenoid valve		B84	35	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
FICD control solenoid valve		B84	9	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	● 1800 cc model only ● A/C equipped model
AT diagnosis input signal		B84	80	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
GND (sensors)		B84	20	0	0	—
GND (injectors)		B84	69 95	0	0	—
GND (ignition system)		B84	94	0	0	—
GND (power supply)		B84	19 46	0	0	—
GND (control systems)		B84	17 18	0	0	—
GND (oxygen sensor heater)		B84	42	0	0	—

B: ENGINE CONDITION DATA

Content	Model	Specified data
Mass air flow	1800 cc	1.6 — 2.8 (g/sec): Idling
		6.1 — 10.3 (g/sec): 2,500 rpm racing
	2200 cc	1.7 — 3.3 (g/sec): Idling
		7.1 — 14.2 (g/sec): 2,500 rpm racing
Engine load	1800 cc	1.7 — 3.0 (%): Idling
		6.6 — 11.2 (%): 2,500 rpm racing
	2200 cc	1.6 — 2.9 (%): Idling
		6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

C: TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

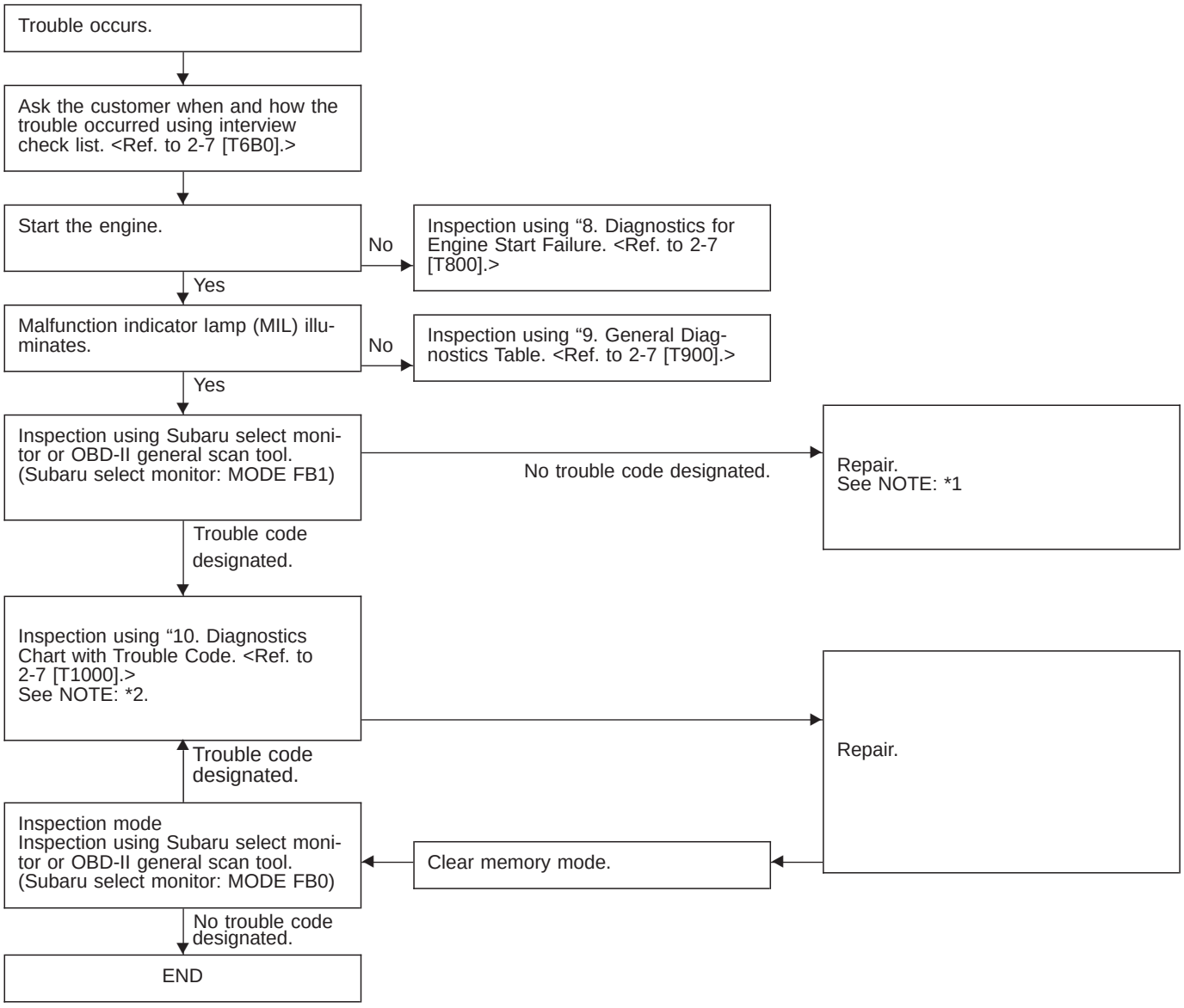


Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Back-up power supply		B56	14	Ignition switch OFF	10 — 16
Ignition power supply		B54	6	Ignition switch ON (with engine OFF)	10 — 16
		B55	1		
Inhibitor switch	“P” range switch	B56	9	Selector lever in “P” range	Less than 1
				Selector lever in any other than “P” range	More than 8
	“N” range switch	B56	8	Selector lever in “N” range	Less than 1
				Selector lever in any other than “N” range	More than 8
	“R” range switch	B56	10	Selector lever in “R” range	Less than 1
				Selector lever in any other than “R” range	More than 6
	“D” range switch	B54	1	Selector lever in “D” range	Less than 1
				Selector lever in any other than “D” range	More than 6
	“3” range switch	B54	2	Selector lever in “3” range	Less than 1
				Selector lever in any other than “3” range	More than 6
	“2” range switch	B54	3	Selector lever in “2” range	Less than 1
				Selector lever in any other than “2” range	More than 6
	“1” range switch	B54	4	Selector lever in “1” range	Less than 1
				Selector lever in any other than “1” range	More than 6
Brake switch		B56	7	Brake pedal depressed	More than 10.5
				Brake pedal released	Less than 1
ABS signal		B56	5	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5
AT diagnostics signal		B55	12	Ignition switch ON (with engine OFF)	Less than 1
				Ignition switch ON (with engine ON)	More than 10
Diagnosis switch		B56	6	Diagnosis connector connected.	Less than 1
				Diagnosis connector disconnected.	More than 6

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B54	8	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B56	19	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	10	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	1.0 — 1.4	275 — 375
Vehicle speed sensor 1	B54	12	Vehicle stopped.	0	450 — 720
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed sensor 2	B56	11	When vehicle is slowly moved at least 2 meters (7ft).	Less than 1↔More than 9	—
Engine speed signal	B54	5	Ignition switch ON (with engine OFF).	More than 10.5	—
			Ignition switch ON (with engine ON).	8 — 11	
Cruise set signal	B56	3	When cruise control is set (SET lamp ON).	Less than 1	—
			When cruise control is not set (SET lamp OFF).	More than 6.5	
Torque control signal	B55	16	Ignition switch ON	4 — 6	—
Mass air flow signal	B54	9	Engine idling after warm-up	0.5 — 1.2	—
Shift solenoid 1	B55	14	1st or 4th gear	More than 9	20 — 32
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B55	13	1st or 2nd gear	More than 9	20 — 32
			3rd or 4th gear	Less than 1	
Shift solenoid 3	B55	15	Selector lever in “N” range (with throttle fully closed).	Less than 1	20 — 32
			Selector lever in “D” range (with throttle fully closed).	More than 9	
Duty solenoid A	B55	8	Throttle fully closed (with engine OFF) after warm-up.	2.0 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B55	7	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	12 — 18
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Duty solenoid B	B55	5	When lock up occurs.	More than 8.5	9 — 17
			When lock up is released.	Less than 0.5	
Duty solenoid C (AWD model only)	B55	3	Fuse on FWD switch	More than 8.5	9 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Sensor ground line 1	B54	7	—	0	Less than 1
Sensor ground line 2	B56	20	—	0	Less than 1
System ground line	B56	1	—	0	Less than 1
Power system ground line	B55	10	—	0	Less than 1
FWD switch (AWD model only)	B56	2	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	
Data link signal (Subaru select monitor)	B56	12	—	—	—
		13	—	—	
AT diagnosis signal	B56	11	Ignition switch ON	Less than 1 ↔ More than 4	—

6. Basic Diagnostic Procedure



NOTE:
●*1: If trouble code is not shown on display although the MIL illuminates, perform diagnostics of the MIL (CHECK ENGINE LIGHT) circuit or combination meter. <Ref. to 2-7 [T700].>
●*2: Carry out the basic check, only when trouble code about automatic transmission is shown on display. <Ref. to 2-7 [T6A0].>

A: BASIC CHECK ITEMS FOR AT

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to 3-2 [W1B1].>
2) Differential gear oil level check <Ref. to 3-2 [W1B2].>
3) ATF leak check <Ref. to 3-2 [W1B3].>
4) Differential gear oil leak check <Ref. to 3-2 [W1B3].>
5) Brake band adjustment <Ref. to 3-2 [W2B0].>
6) Stall test <Ref. to 3-2 [W8A0].>
7) Line pressure test <Ref. to 3-2 [W10A0].>
8) Transfer clutch pressure test <Ref. to 3-2 [W11A0].>
9) Time lag test <Ref. to 3-2 [W9A0].>
10) Road test <Ref. to 3-2 [W7A0].>
11) Shift characteristics <Ref. to 3-2 [W7A0].>

B: CHECK LIST FOR INTERVIEW

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	F(°C)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON/☐ OFF	Rear defogger	☐ ON/☐ OFF
Blower	☐ ON/☐ OFF	Radio	☐ ON/☐ OFF
A/C compressor	☐ ON/☐ OFF	CD/Cassette	☐ ON/☐ OFF
Cooling fan	☐ ON/☐ OFF	Car phone	☐ ON/☐ OFF
Front wiper	☐ ON/☐ OFF	CB	☐ ON/☐ OFF
Rear wiper	☐ ON/☐ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ☐ Yes/☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
● Lack of gasoline: ☐ Yes/☐ No ● Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes/☐ No
● What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes/☐ No
● What:
e) Installing of parts other than genuine parts: ☐ Yes/☐ No
● What: ● Where:
f) Occurrence of noise: ☐ Yes/☐ No
● From where: ● What kind:
g) Occurrence of smell: ☐ Yes/☐ No
● From where: ● What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes/☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ No shift ☐ Excessive shift shock

7. Diagnostics for CHECK ENGINE Malfunction Indicator Lamp (MIL)

A: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

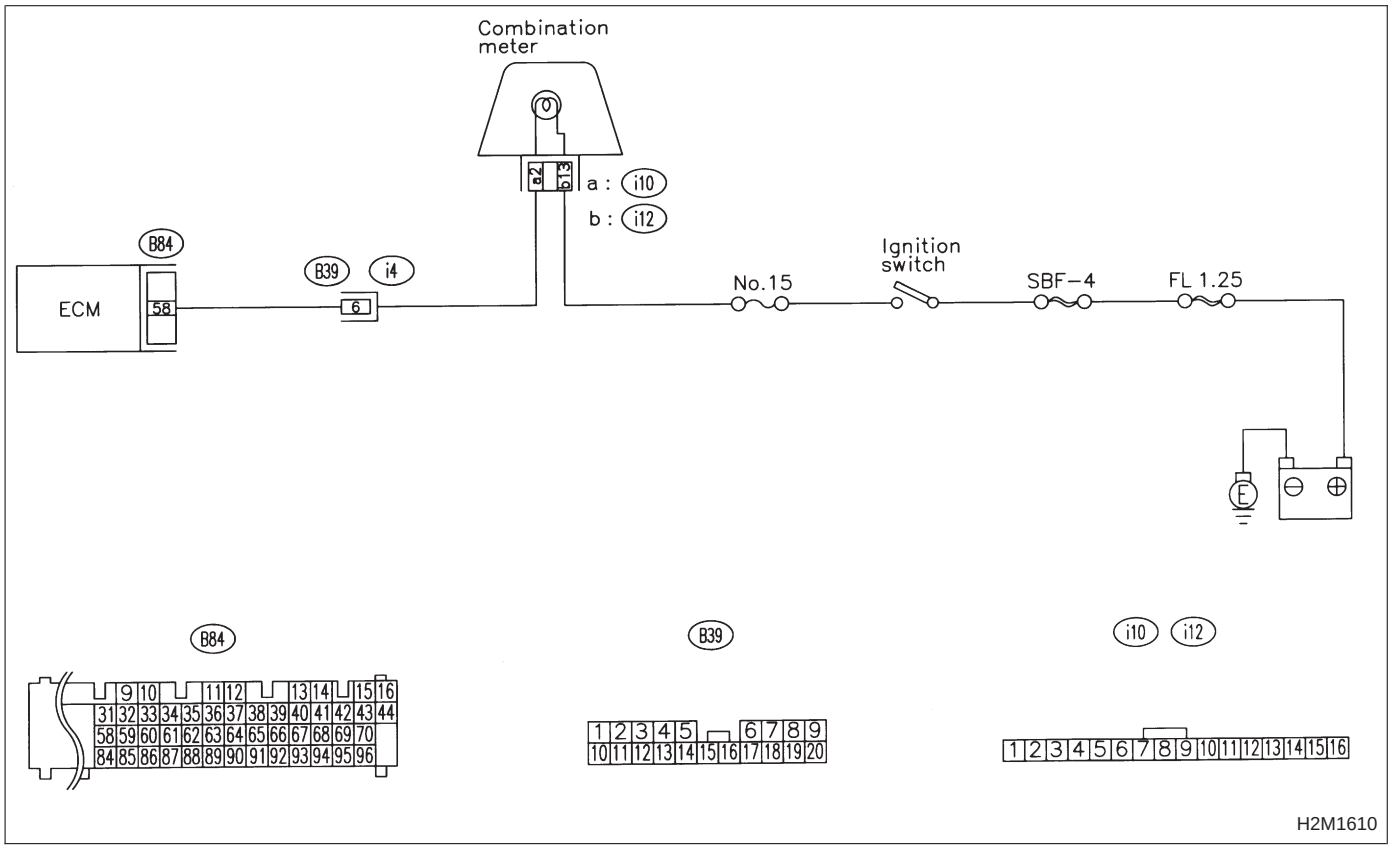
DIAGNOSIS:

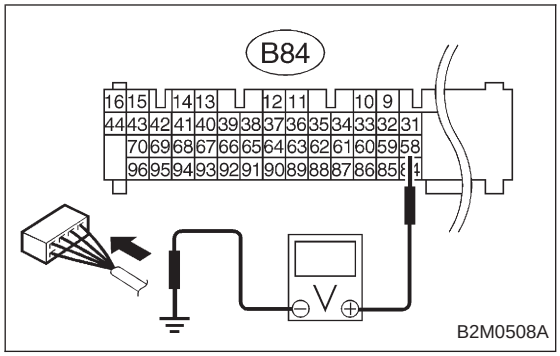
● The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.

TROUBLE SYMPTOM:

● When ignition switch is turned ON (engine OFF), MIL does not come on.

WIRING DIAGRAM:



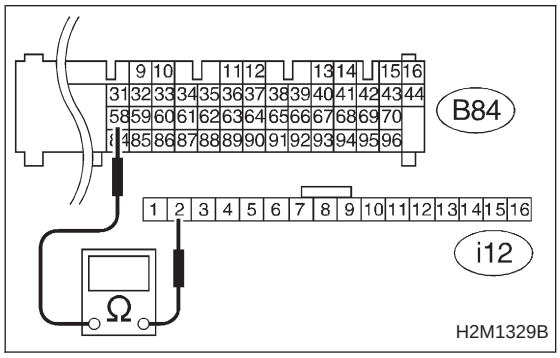


7A1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 58 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **7A2**.
NO : Go to next CHECK .
CHECK ***: Does the MIL come on when shaking or pulling ECM connector and harness?***
YES : Repair poor contact in ECM connector.
NO : Go to next CHECK .
CHECK ***: Is ECM connector correctly connected?***
YES : Replace ECM.
NO : Repair connection of ECM connector.



7A2	CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove combination meter. <Ref. to 6-2 [W8A0].>
3) Disconnect connector from ECM and combination meter.
4) Measure resistance of harness between ECM and combination meter connector.

Connector & terminal
(B84) No. 58 — (i12) No. 2:

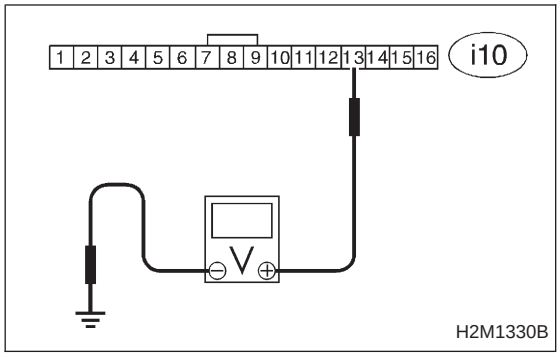
CHECK ***: Is resistance less than 1 Ω?***
YES : Go to step **7A3**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and combination meter connector
- Poor contact in coupling connector (B39)

7A3	CHECK POOR CONTACT.

Check poor contact in combination meter connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in combination meter connector?***
YES : Repair poor contact in combination meter connector.
NO : Go to step **7A4**.



7A4	CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.

1) Turn ignition switch to ON.
2) Measure voltage between combination meter connector and chassis ground.

Connector & terminal
(i10) No. 13 (+) — Chassis ground (−):

CHECK ***: Is voltage more than 10 V?***

YES : Go to step **7A5**.

NO : Check the following and repair if necessary.

- Blown out fuse (No. 15).

NOTE:
If replaced fuse (No. 15) blows easily, check the harness for short circuit of harness between fuse (No. 15) and combination meter connector.

- Open or short circuit in harness between fuse (No. 15) and combination meter connector
- Open or short circuit in harness between fuse (No. 15) and ignition switch connector
- Poor contact in ignition switch connector

7A5	CHECK POOR CONTACT.

Check poor contact in combination meter connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in combination meter connector?***

YES : Repair poor contact in combination meter connector.

NO : Replace bulb or combination meter.

B: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

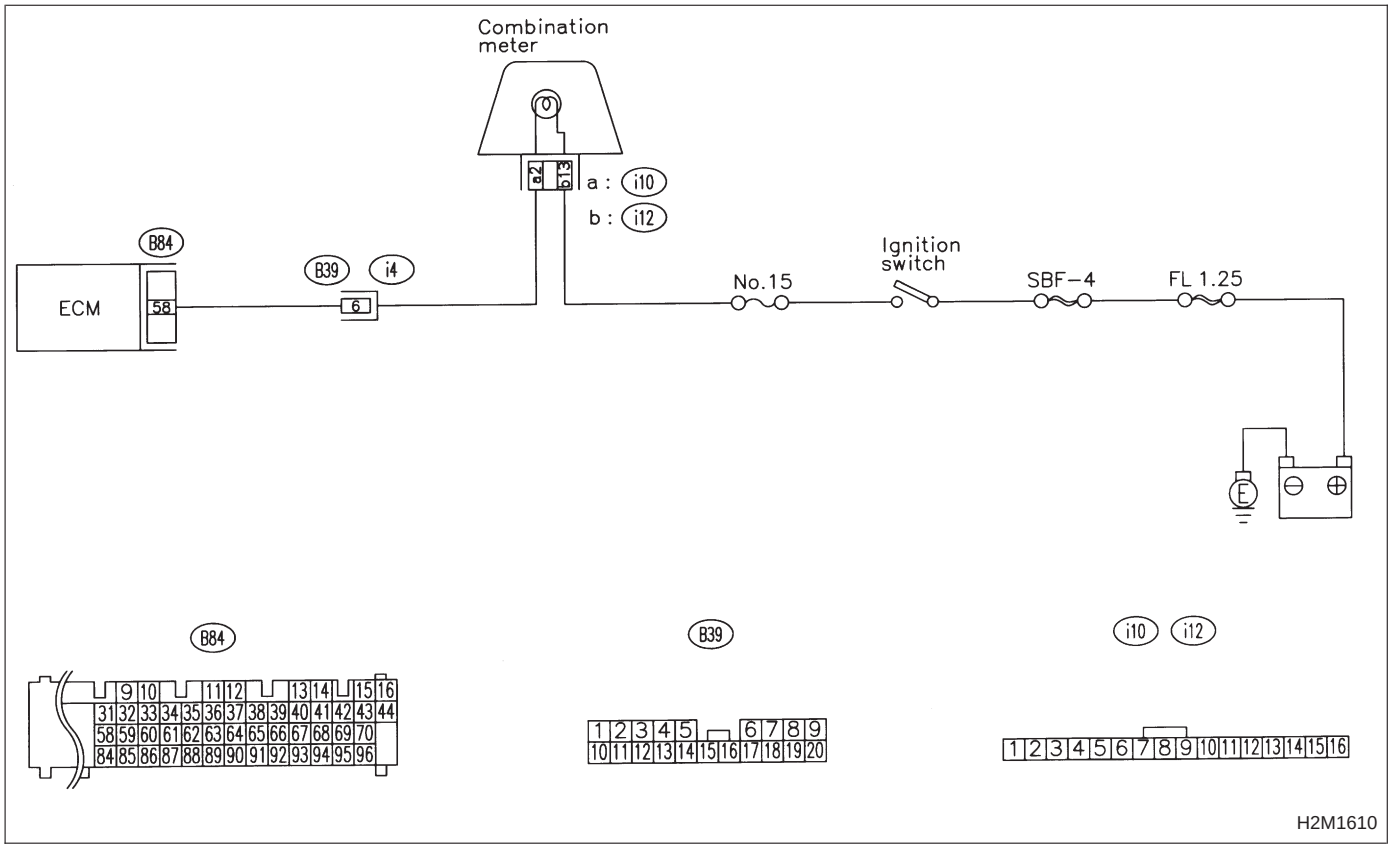
DIAGNOSIS:

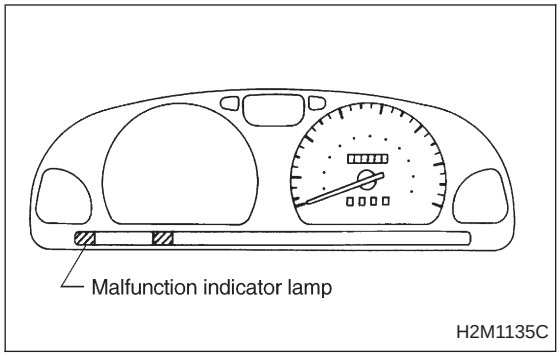
● The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.

TROUBLE SYMPTOM:

● Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.

WIRING DIAGRAM:





7B1	CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Turn ignition switch to ON.

CHECK ***: Does the MIL come on?***

YES : Repair short circuit in harness between combination meter and ECM connector.

NO : Replace ECM.

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

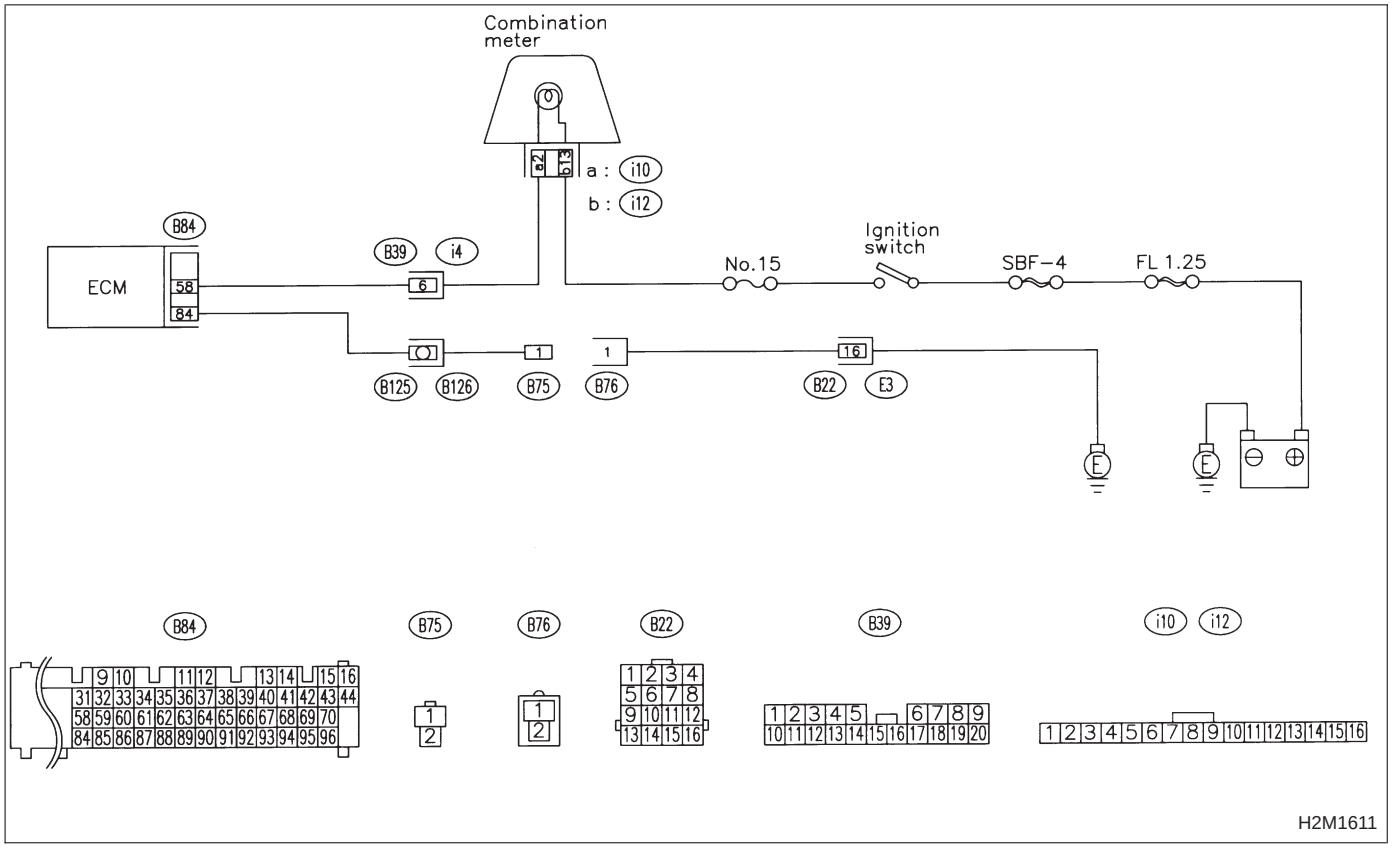
DIAGNOSIS:

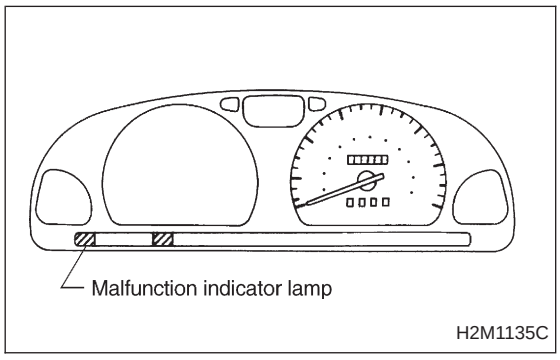
- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- Test mode connector circuit is in open.

TROUBLE SYMPTOM:

- When inspection mode, MIL does not blink at a cycle of 3 Hz.

WIRING DIAGRAM:





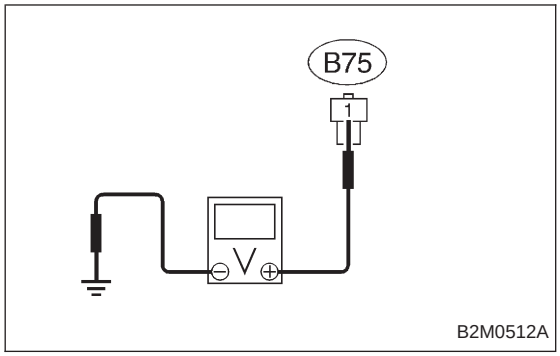
7C1	CHECK OPERATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).

1) Turn ignition switch to OFF.
2) Disconnect test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does the MIL come on?***

YES : Go to step **7C2**.

NO : Repair the MIL circuit. <Ref. to 2-7 [T700].>



7C2	CHECK OUTPUT SIGNAL FROM ECM.

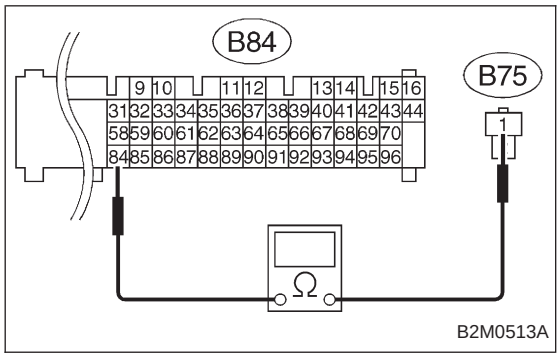
Measure voltage between test mode connector and chassis ground.

Connector & terminal
(B75) No.1 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 1 V?***

YES : Go to step **7C3**.

NO : Go to step **7C5**.



7C3	CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and test mode connector.

Connector & terminal
(B84) No.84 — (B75) No.1:

CHECK ***: Is resistance less than 1 Ω?***

YES : Go to step **7C4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and test mode connector
- Poor contact in coupling connector (B125)

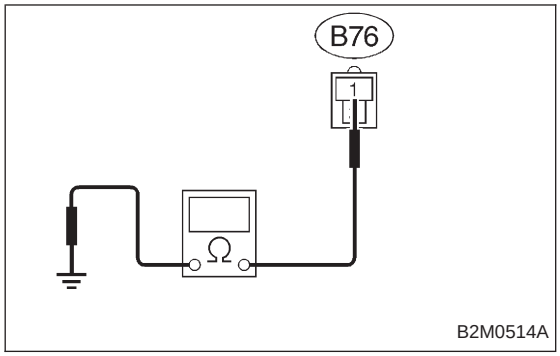
7C4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



7C5	CHECK GROUND CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure resistance of harness between test mode connector and chassis ground.

Connector & terminal
(B76) No.1 — Chassis ground:

CHECK ***: Is resistance less than 5 Ω?***

YES : Repair poor contact in test mode connector.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between test mode and engine grounding terminal
- Poor contact in coupling connector (B22)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 Hz.

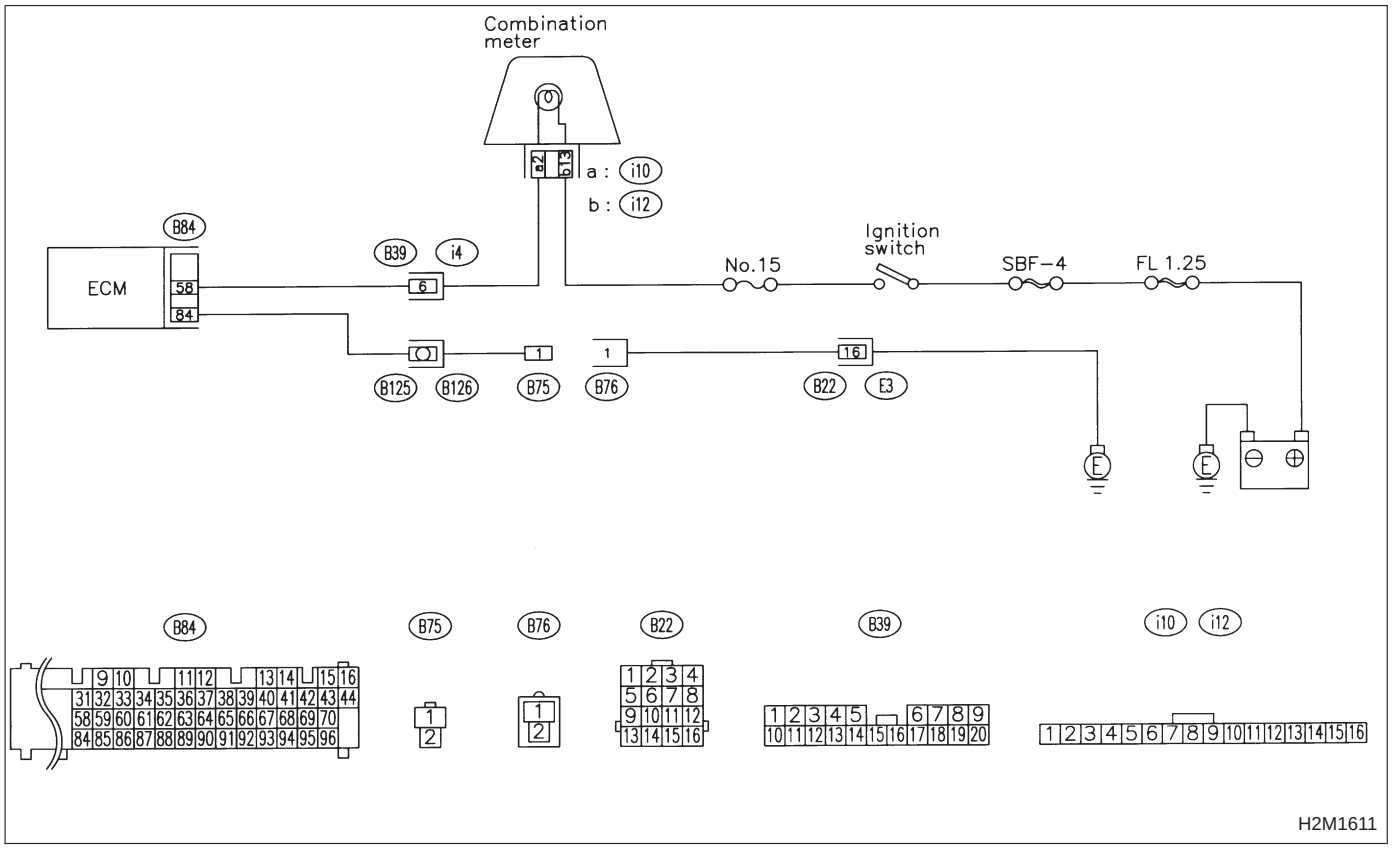
DIAGNOSIS:

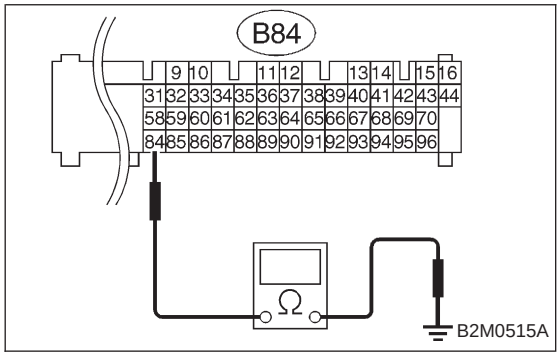
- Test mode connector circuit is shorted.

TROUBLE SYMPTOM:

- Even though test mode connector is disconnected, MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.

WIRING DIAGRAM:





7D1	CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No.84 — Chassis ground:

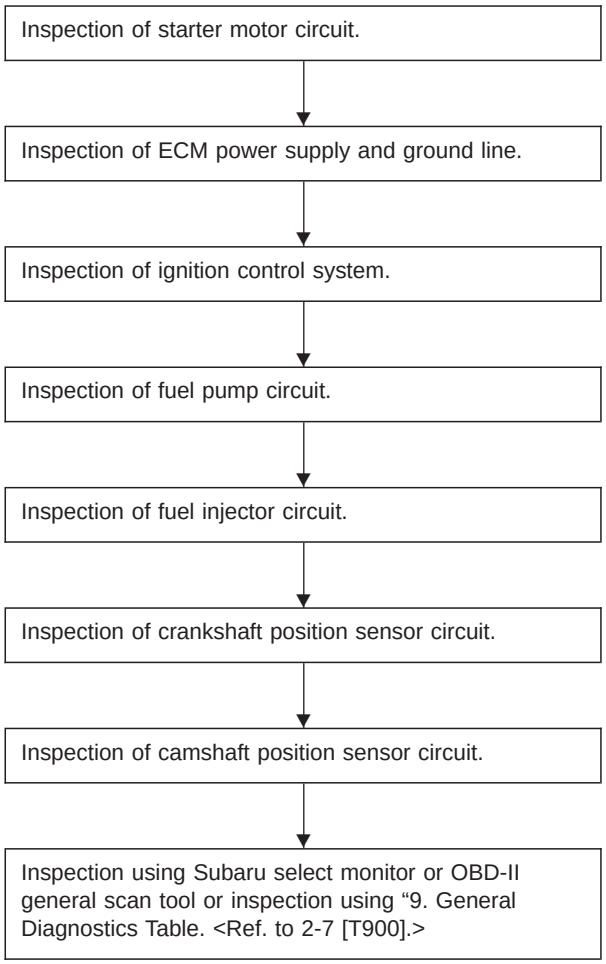
CHECK ***: Is resistance less than 5 Ω?***

YES : Repair short circuit in harness between ECM and test mode connector.

NO : Replace ECM.

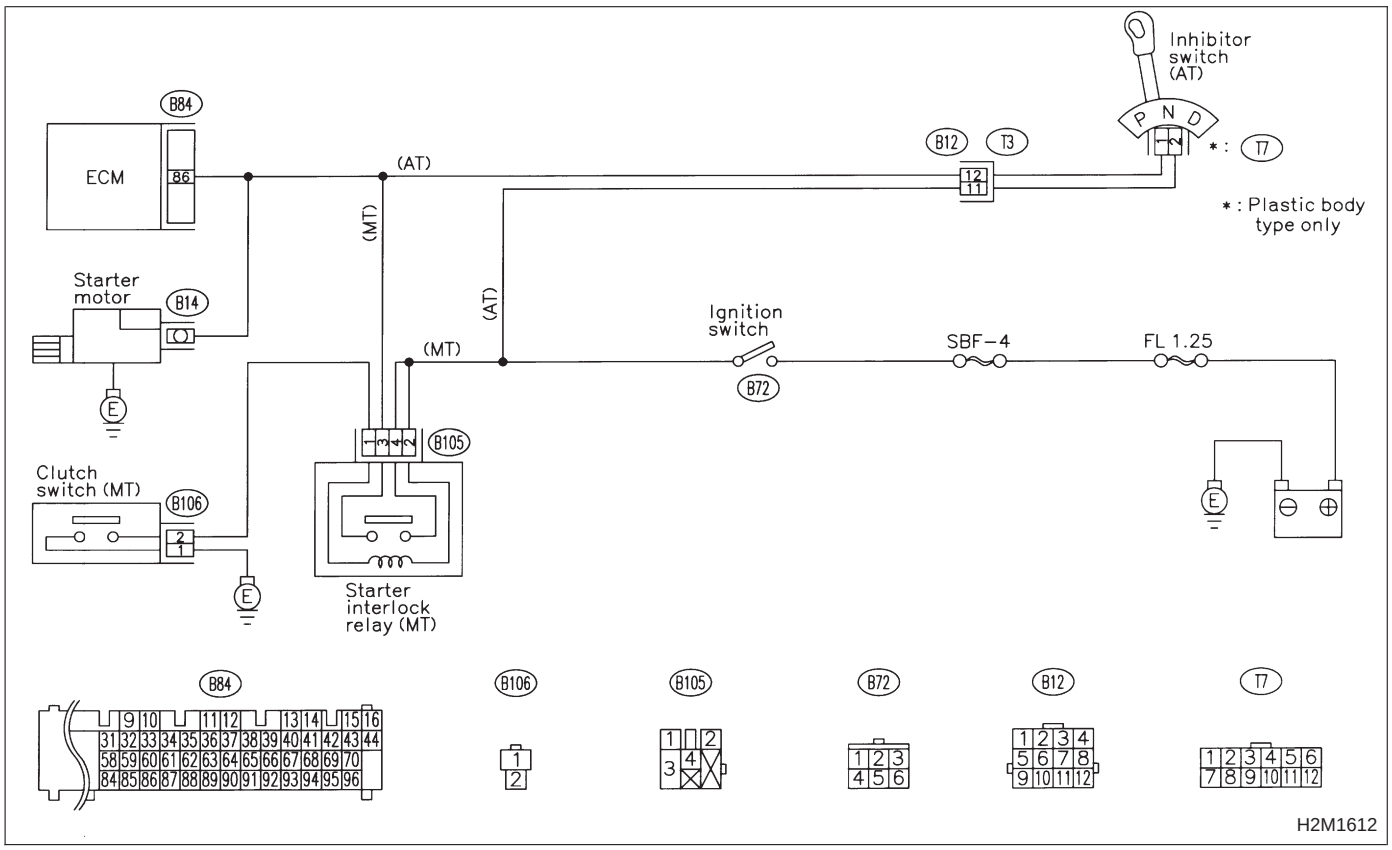
8. Diagnostics for Engine Starting Failure

A: BASIC DIAGNOSTICS CHART

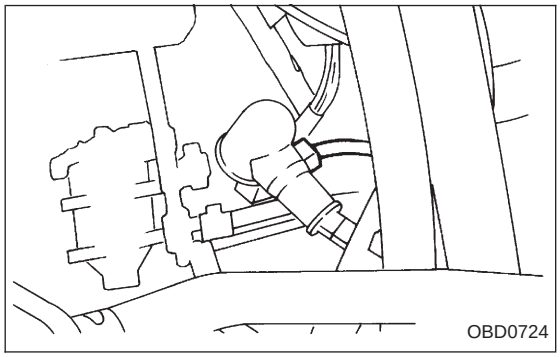


B: STARTER MOTOR CIRCUIT

WIRING DIAGRAM:

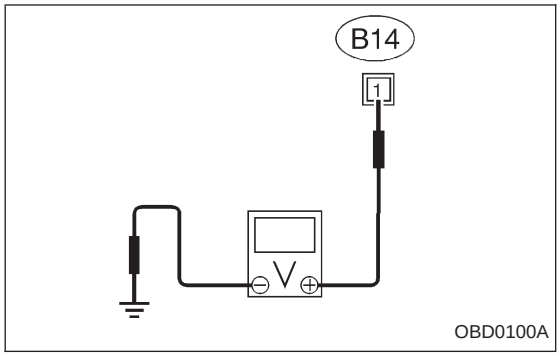


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



8B1	**CHECK INPUT SIGNAL FOR STARTER MOTOR.**

1) Turn ignition switch to OFF.
2) Disconnect connector from starter motor.
3) Turn ignition switch to ST.



4) Measure power supply voltage between starter motor connector terminal and engine ground.

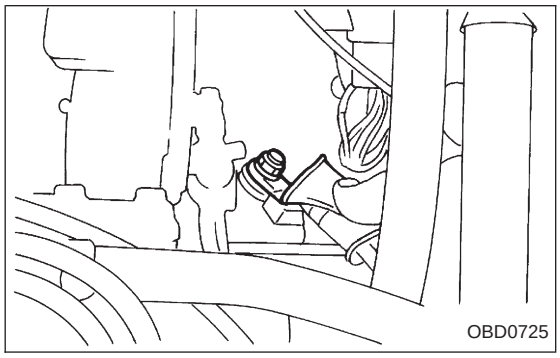
Connector & terminal
(B14) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

NOTE:
- On AT vehicles, place the selector lever in the “P” or “N” position.
- On MT vehicles, depress the clutch pedal.

YES : Go to step **8B2**.

NO : Go to step **8B3**.



8B2	CHECK GROUND CIRCUIT OF STARTER MOTOR.

1) Turn ignition switch to OFF.
2) Disconnect terminal from starter motor.
3) Measure resistance of ground cable between ground cable terminal and engine ground.

CHECK ***: Is resistance less than 5 Ω?***

YES : Check starter motor. <Ref. to 6-1 [K1A0].>

NO : Repair open circuit of ground cable.

8B3	CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.

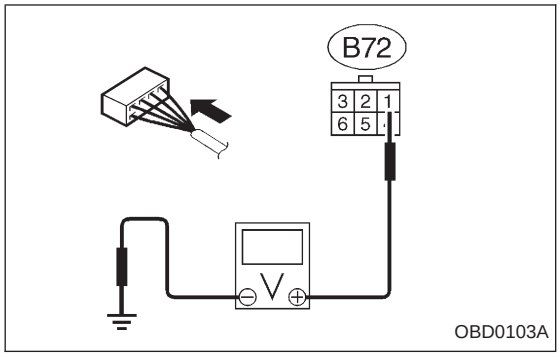
1) Turn ignition switch to OFF.
2) Remove SBF No. 4 from main fuse box.
3) Measure resistance of fuse.

CHECK ***: Is resistance less than 1 Ω?***

NO : Replace SBF No. 4.

YES : Go to next step 4).

4) Install SBF No. 4 to main fuse box.
5) Turn ignition switch to ON.



6) Measure power supply voltage between ignition switch connector and chassis ground.

Connector & terminal
(B72) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **8B4**.

NO : Repair open circuit in harness between ignition switch and SBF No. 4 connector.

8B4	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type AT?***

YES : Go to step **8B5**.

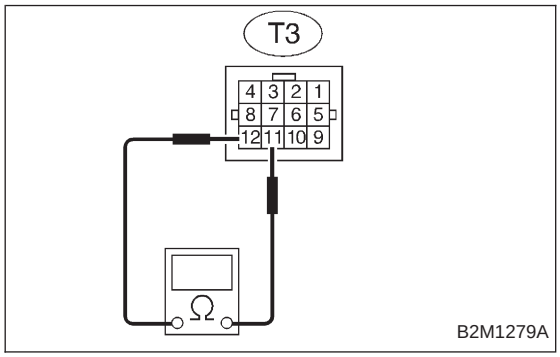
NO : Go to step **8B10**.

8B5	CHECK INHIBITOR SWITCH TYPE.

CHECK ***: Is inhibitor switch type plastic body?***

YES : Go to step **8B6**.

NO : Go to step **8B9**.



8B6	CHECK INHIBITOR SWITCH.

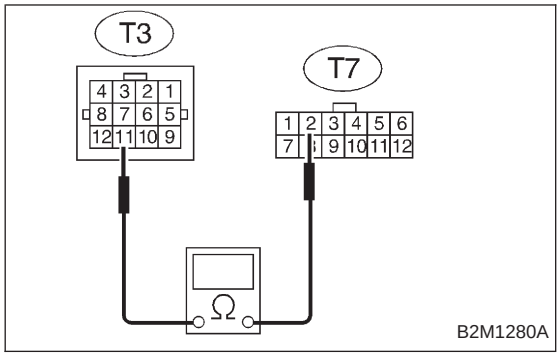
1) Turn ignition switch to OFF.
2) Place the selector lever in the “P” or “N” position.
3) Measure resistance between transmission harness connector receptacle’s terminals.

Connector & terminal
(T3) No. 11 — No. 12:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Repair open circuit in harness between starter motor and ignition switch connector.

NO : Go to step **8B7**.



8B7	CHECK TRANSMISSION HARNESS.

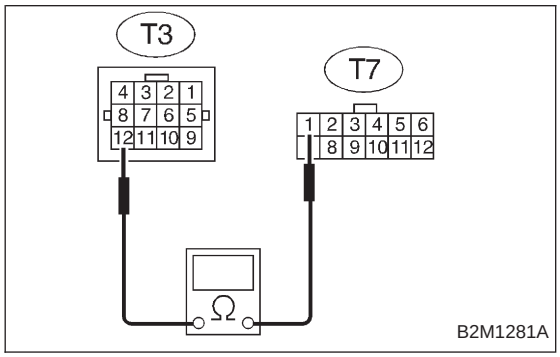
1) Disconnect connector from inhibitor switch.
2) Measure resistance of harness between transmission harness and inhibitor switch connector.

Connector & terminal
(T3) No. 11 — (T7) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair open circuit in harness between transmission harness and inhibitor switch connector.



3) Measure resistance of harness between transmission harness and inhibitor switch connector.

Connector & terminal
(T3) No. 12 — (T7) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8B8**.

NO : Repair open circuit in harness between transmission harness and inhibitor switch connector.

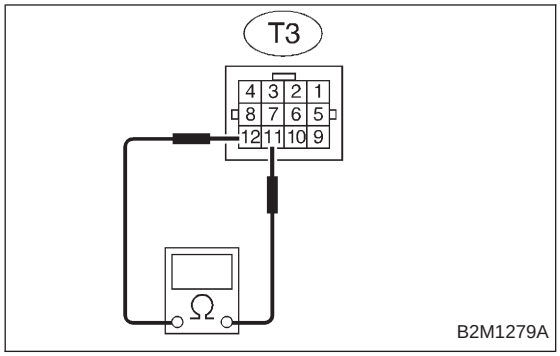
8B8	CHECK POOR CONTACT.

Check poor contact in inhibitor switch connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in inhibitor switch connector?***

YES : Repair poor contact in inhibitor switch connector.

NO : Replace inhibitor switch.



8B9	CHECK INHIBITOR SWITCH.

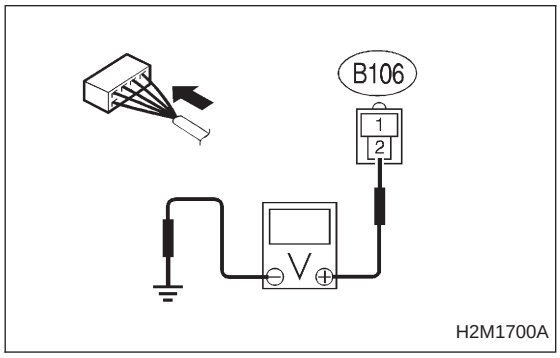
1) Turn ignition switch to OFF.
2) Place the selector lever in the “P” or “N” position.
3) Disconnect connector from transmission harness connector.
4) Measure resistance between transmission harness connector receptacle’s terminals.

Connector & terminal
(T3) No. 11 — No. 12:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Repair open circuit in harness between starter motor and ignition switch connector.

NO : Replace inhibitor switch.



8B10	CHECK STARTER INTERLOCK CIRCUIT.

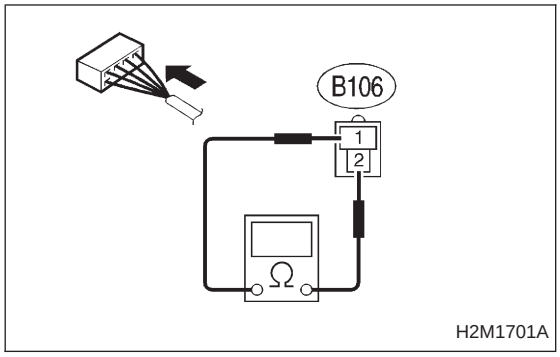
1) Turn ignition switch to “ST”.
2) Measure voltage between clutch switch connector and chassis ground.

Connector & terminal
(B106) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

NO : Replace starter interlock relay.

YES : Go to next step 3).



3) Turn ignition switch to OFF.
4) Measure resistance between clutch switch connector terminals while depressing the clutch pedal.

Connector & terminal
(B106) No. 1 — No. 2:

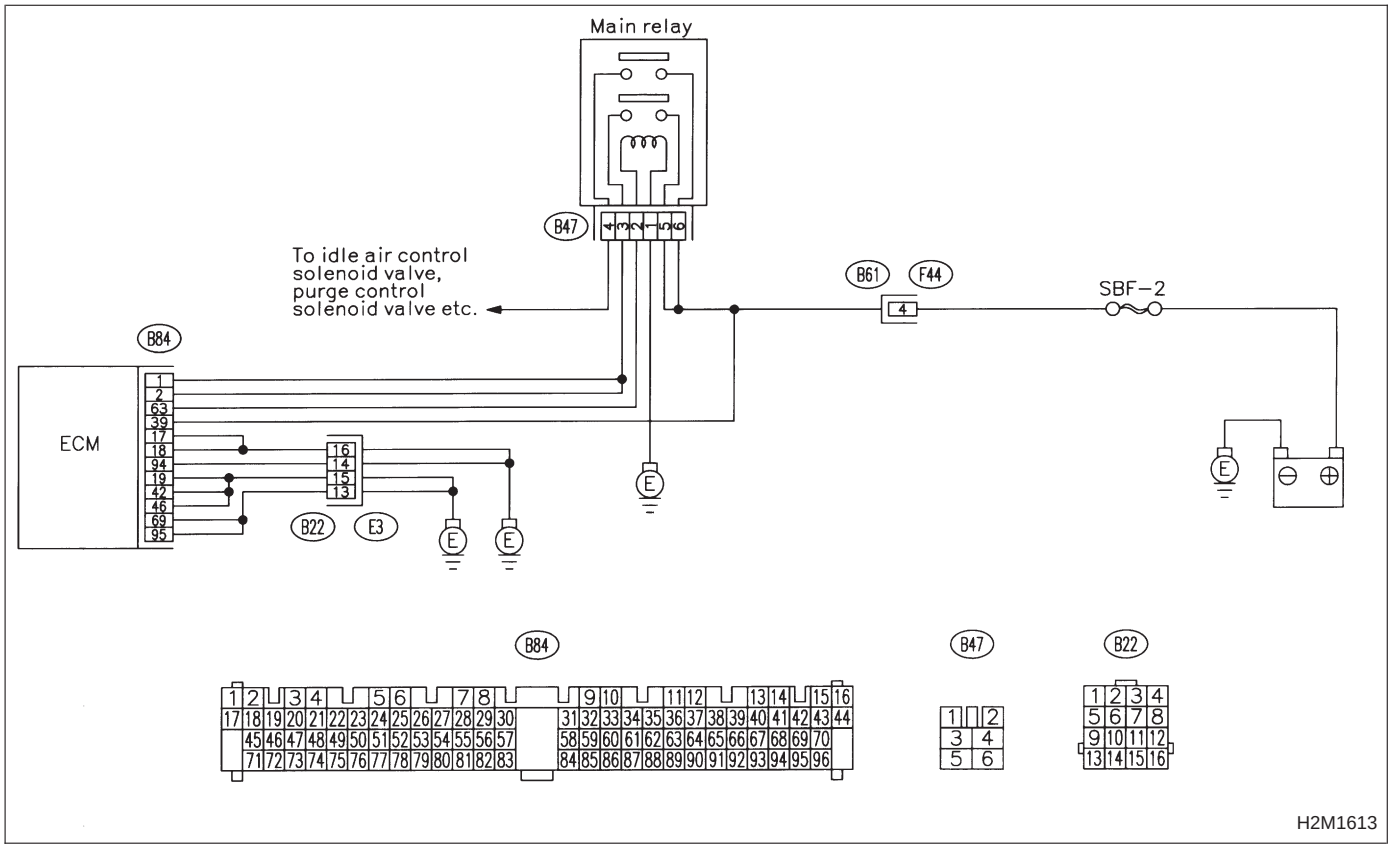
CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair open circuit in harness between starter motor and ignition switch connector.

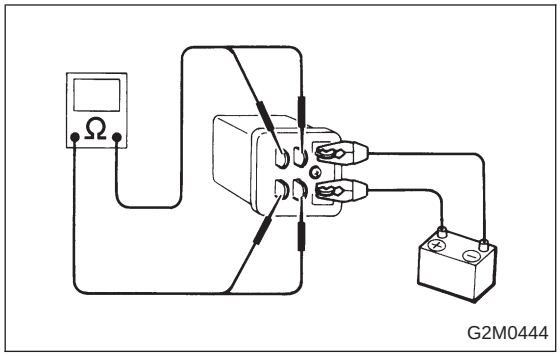
NO : Replace clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



8C1	CHECK MAIN RELAY.

1) Turn the ignition switch to OFF.
2) Remove main relay.
3) Connect battery to main relay terminals No. 1 and No. 2.
4) Measure resistance between main relay terminals.

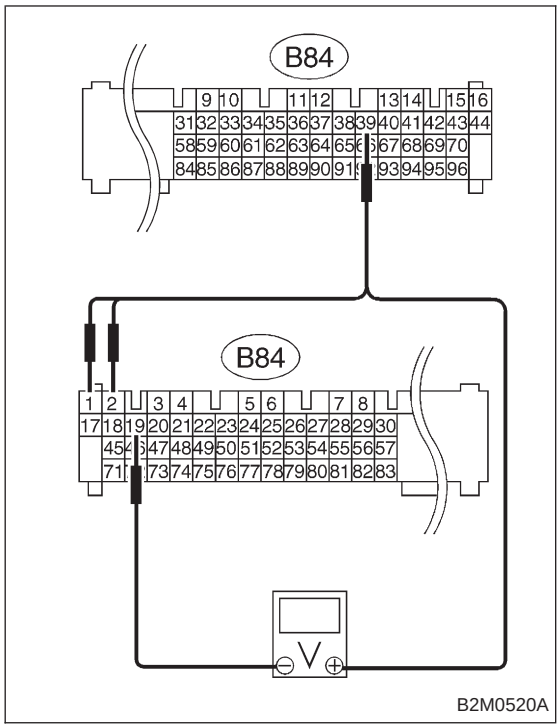
Terminals
No. 3 — No. 5:

CHECK ***: Is the resistance less than 10 Ω?***
YES : Go to next step 5).
YES : Replace main relay.

5) Measure resistance between main relay terminals.

Terminals
No. 4 — No. 6:

CHECK ***: Is the resistance less than 10 Ω?***
YES : Go to step **8C2**.
NO : Replace main relay.



8C2	CHECK POWER SUPPLY CIRCUIT OF ECM.

1) Install main relay.
2) Disconnect connectors from ECM.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ECM connector terminals.

Connector & terminal
(B84) No. 1 (+) — No. 19 (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to next step 5).
NO : Repair open or ground short circuit in harness of power supply circuit.

5) Measure power supply voltage between ECM connector terminals.

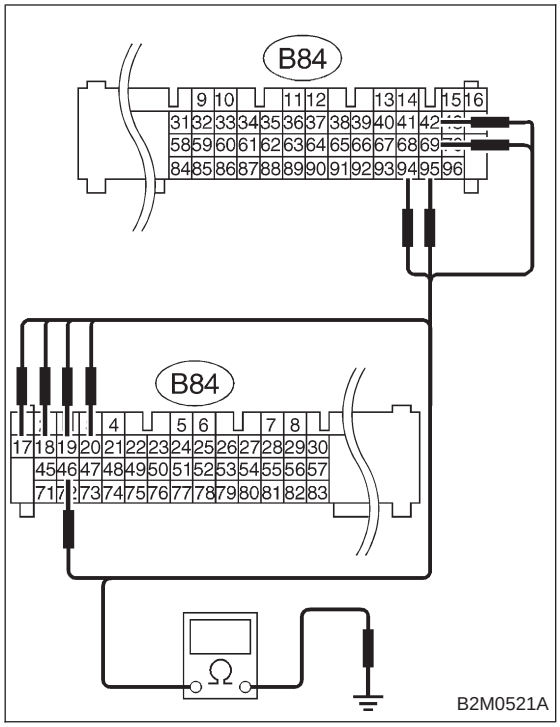
Connector & terminal
(B84) No. 2 (+) — No. 19 (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to next step 6).
NO : Repair open or ground short circuit in harness of power supply circuit.

6) Measure power supply voltage between ECM connector terminals.

Connector & terminal
(B84) No. 39 (+) — No. 19 (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **8C3**.
NO : Repair open or ground short circuit in harness of power supply circuit.



8C3	CHECK GROUND CIRCUIT OF ECM.

1) Turn ignition switch to OFF.
2) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 17 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 3).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

3) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 18 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

4) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 19 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 5).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

5) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 20 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 6).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

6) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 42 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 7).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

7) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 46 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 8).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

8) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 69 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 9).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

9) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 94 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 10).

NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

10) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 95 — Chassis ground:

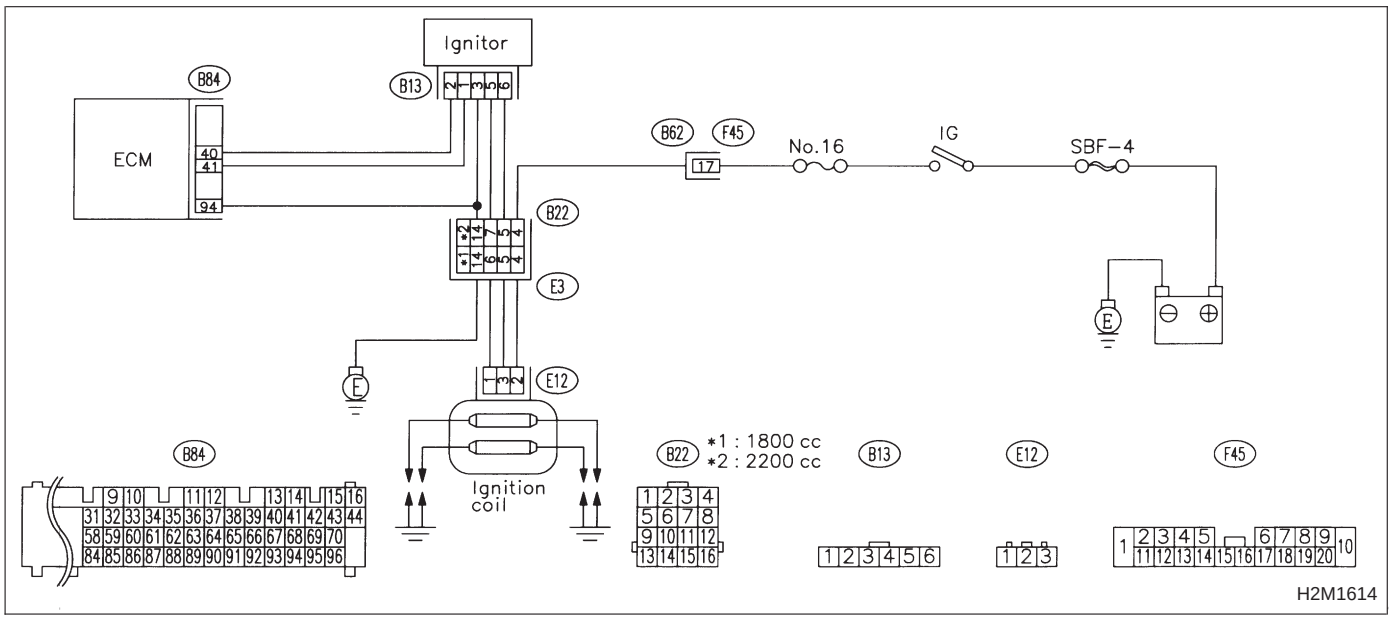
CHECK ***: Is the resistance less than 5 Ω?***

YES : Check ignition control system. <Ref. to 2-7 [T8D0].>

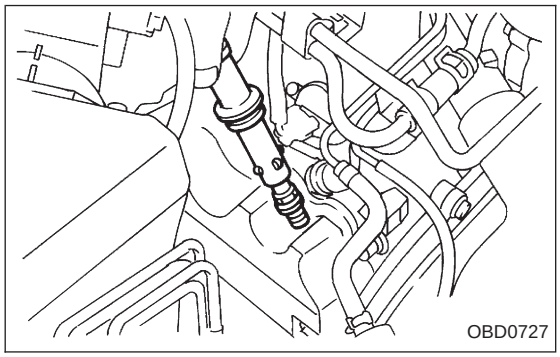
NO : Repair open circuit in harness between ECM connector and engine grounding terminal.

D: IGNITION CONTROL SYSTEM

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



8D1	CHECK IGNITION SYSTEM FOR SPARKS.

1) Remove plug cord cap from each spark plug.
2) Install new spark plug on plug cord cap.

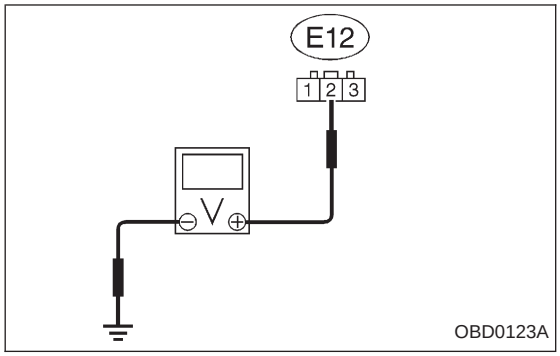
CAUTION:
Do not remove spark plug from engine.

3) Contact spark plug's thread portion on engine.
4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.

CHECK ***: Does spark occur at each cylinder?***

YES : Check fuel pump system. <Ref. to 2-7 [T8E0].>

NO : Go to step **8D2**.



8D2	CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignition coil.
3) Turn ignition switch to ON.
4) Measure power supply voltage between ignition coil connector and engine ground.

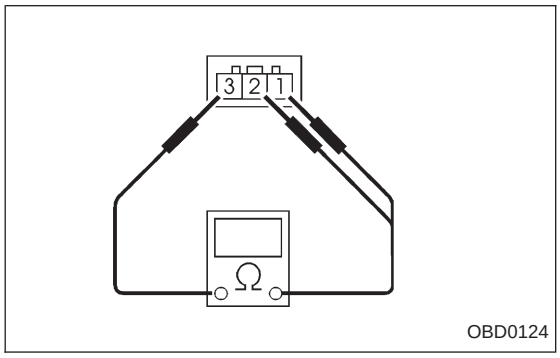
Connector & terminal
(E12) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **8D3**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ignition coil and ignition switch connector
- Poor contact in coupling connectors (B22 and F45)



8D3	CHECK IGNITION COIL.

1) Measure resistance between ignition coil terminals to check primary coil.

Terminals
No. 2 — No. 1:

CHECK ***: Is the resistance between 0.4 and 1.0 Ω?***

YES : Go to next step 2).

NO : Replace ignition coil.

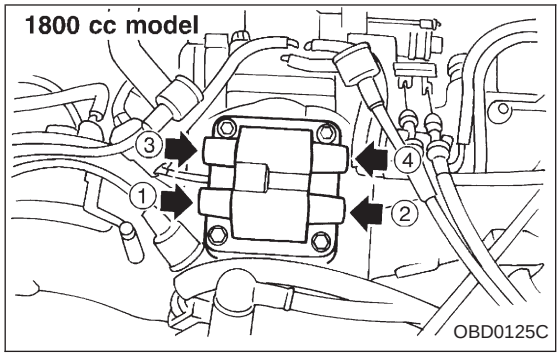
2) Measure resistance between ignition coil terminals to check primary coil.

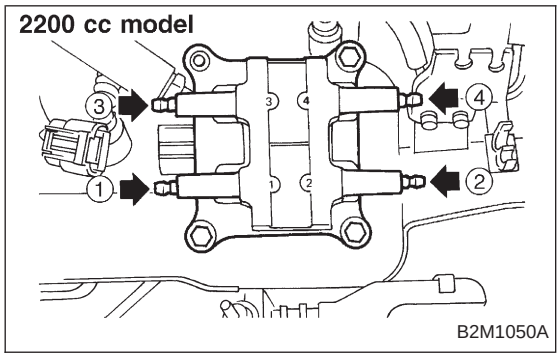
Terminals
No. 2 — No. 3:

CHECK ***: Is the resistance between 0.4 and 1.0 Ω?***

NO : Replace ignition coil.

YES : Go to next step 3).





3) Measure resistance between spark plug cord contact portions to check secondary coil.

Terminals
#1 — #2:

CHECK ***: ● 1800 cc model***
Is the resistance between 18 and 24 Ω?
● 2200 cc model
Is the resistance between 10 and 15 kΩ?

YES : Go to next step 4).

NO : Replace ignition coil.

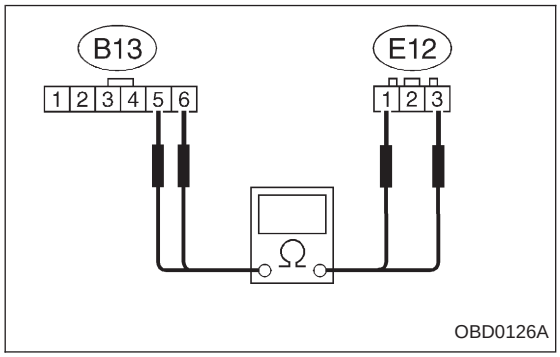
4) Measure resistance between spark plug cord contact portions to check secondary coil.

Terminals
#3 — #4:

CHECK ***: ● 1800 cc model***
Is the resistance between 18 and 24 Ω?
● 2200 cc model
Is the resistance between 10 and 15 kΩ?

YES : Go to step **8D4**.

NO : Replace ignition coil.



8D4	CHECK HARNESS BETWEEN IGNITOR AND IGNITION COIL CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ignitor.
3) Measure resistance of harness between ignition coil and ignitor connector.

Connector & terminal
(B13) No. 5 — (E12) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

YES : Go to step **8D5**.

4) Measure resistance of harness between ignition coil and ignitor connector.

Connector & terminal
(B13) No. 6 — (E12) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8D6**.

NO : Go to step **8D5**.

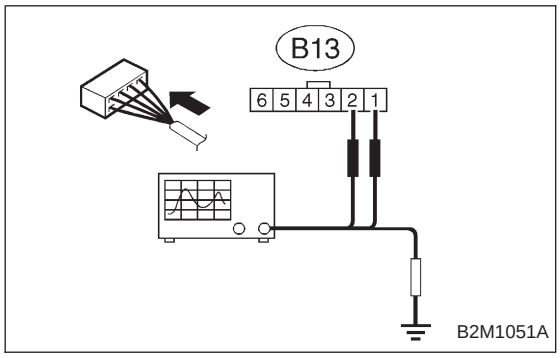
8D5	CHECK POOR CONTACT.

Check poor contact in coupling connector (B22). <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in coupling connector (B22)?***

YES : Repair poor contact in coupling connector (B22).

NO : Repair open circuit in harness between ignition coil and ignitor connector.



8D6	CHECK INPUT SIGNAL FOR IGNITOR.

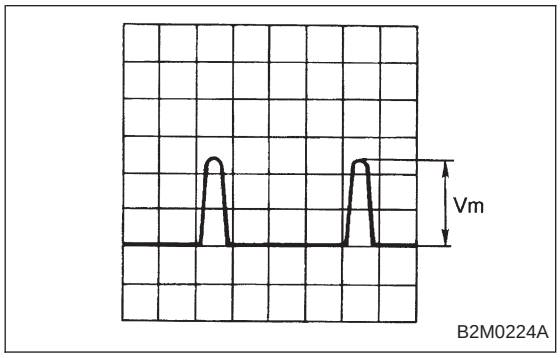
1) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignitor connector and engine ground.

Connector & terminal:
(B13) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to next step 2).

NO : Replace ignitor.



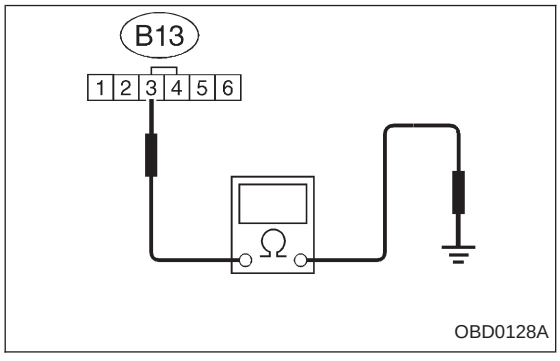
2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignitor connector and engine ground.

Connector & terminal:
(B13) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **8D7**.

NO : Replace ignitor.



8D7	CHECK HARNESS OF IGNITOR GROUND CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure resistance between ignitor and engine ground.

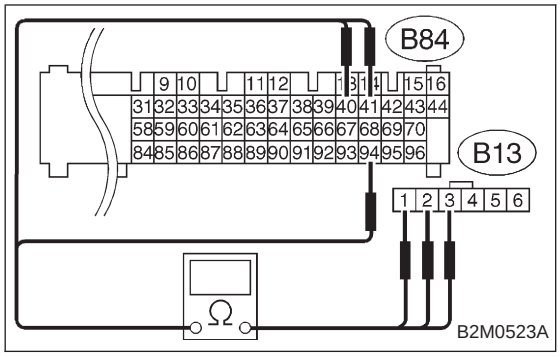
Connector & terminal
(B13) No. 3 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **8D8**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ignitor connector and engine grounding terminal
- Poor contact in coupling connector (B22)



8D8	CHECK HARNESS BETWEEN ECM AND IGNITOR CONNECTOR.

1) Disconnect connector from ECM.
2) Measure resistance of harness between ECM and ignitor connector.

Connector & terminal
(B84) No. 41 — (B13) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair open circuit in harness between ECM and ignitor connector.

3) Measure resistance of harness between ECM and ignitor connector.

Connector & terminal
(B84) No. 40 — (B13) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between ECM and ignitor connector.

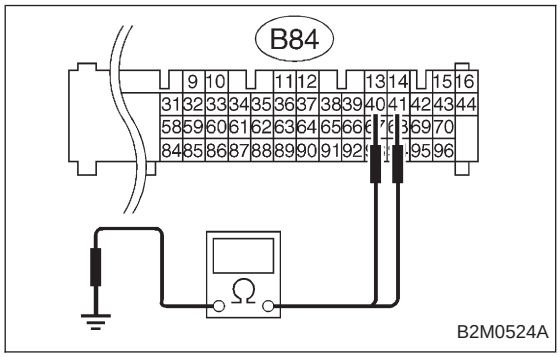
4) Measure resistance of harness between ECM and ignitor connector.

Connector & terminal
(B84) No. 94 — (B13) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

NO : Repair open circuit in harness between ECM and ignitor connector.

YES : Go to next step 5).



5) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 41 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next step 6).

NO : Repair ground short circuit in harness between ECM and ignitor connector.

6) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 40 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8D9**.

NO : Repair ground short circuit in harness between ECM and ignitor connector.

8D9	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

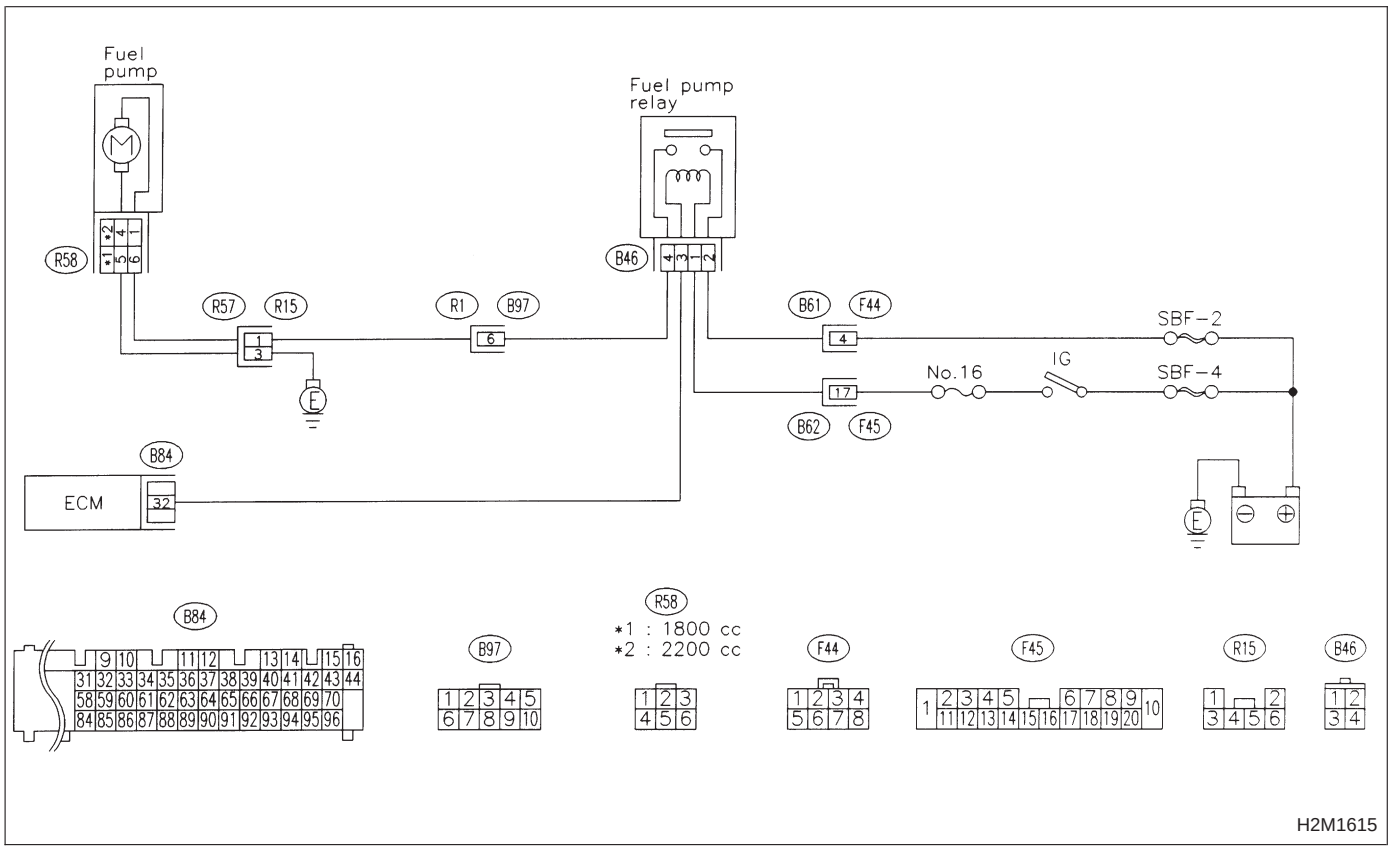
CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Check fuel pump circuit. <Ref. to 2-7 [T8E0].>

E: FUEL PUMP CIRCUIT

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

8E1	CHECK OPERATING SOUND OF FUEL PUMP.

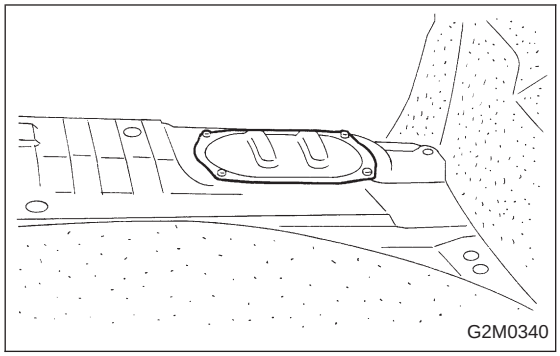
Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON.

CHECK ***: Does fuel pump produce operating sound?***

NOTE:
Fuel pump operation check can also be executed using Subaru Select Monitor (Function mode: FD01).
For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

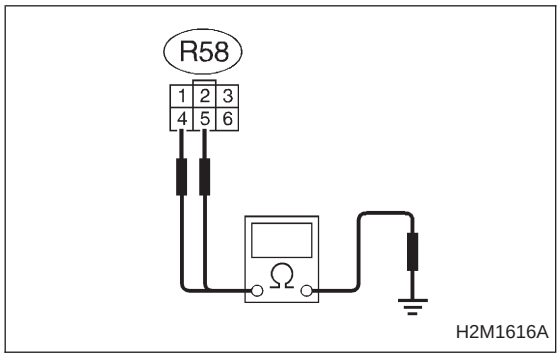
YES : Check fuel injector circuit. <Ref. to 2-7 [T8F0].>

NO : Go to step **8E2**.


G2M0340

8E2	CHECK GROUND CIRCUIT OF FUEL PUMP.

1) Turn ignition switch to OFF.
2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).



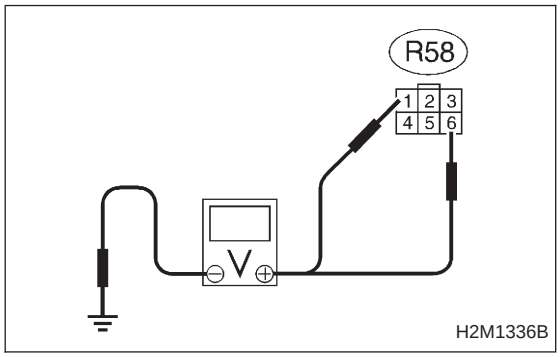
H2M1616A

3) Disconnect connector from fuel pump.
4) Measure resistance of harness connector between fuel pump and chassis ground.

Connector & terminal
● ***1800 cc model***
(R58) No. 5 — Chassis ground:
● ***2200 cc model***
(R58) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***
YES : Go to step **8E3**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between fuel pump connector and chassis grounding terminal
● Poor contact in coupling connector (R15)



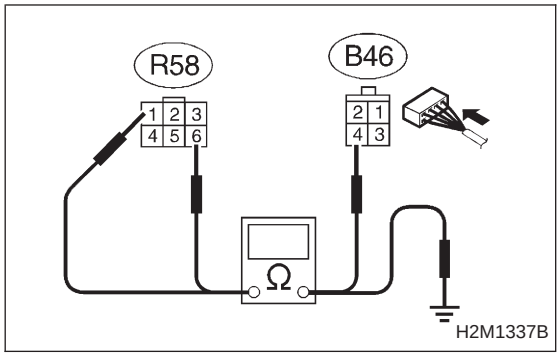
H2M1336B

8E3	CHECK POWER SUPPLY TO FUEL PUMP.

1) Turn ignition switch to ON.
2) Measure voltage of power supply circuit between fuel pump connector and chassis ground.

Connector & terminal
● ***1800 cc model***
(R58) No. 6 (+) — Chassis ground (−):
● ***2200 cc model***
(R58) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Replace fuel pump.
NO : Go to step **8E4**.



8E4	CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.

1) Turn ignition switch to OFF.
2) Measure resistance of harness between fuel pump and fuel pump relay connector.

Connector & terminal
● 1800 cc model
(R58) No. 6 — (B46) No. 4:
● 2200 cc model
(R58) No. 1 — (B46) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between fuel pump and fuel pump relay connector
● Poor contact in coupling connectors (R15 and B97)

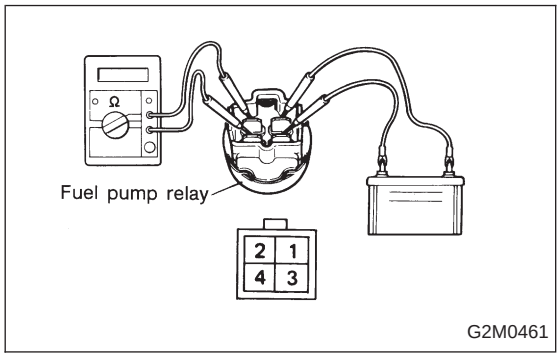
3) Measure resistance of harness between fuel pump and fuel pump relay connector.

Connector & terminal
● 1800 cc model
(R58) No. 6 — Chassis ground:
● 2200 cc model
(R58) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8E5**.

NO : Repair short circuit in harness between fuel pump and fuel pump relay connector.



8E5	CHECK FUEL PUMP RELAY.

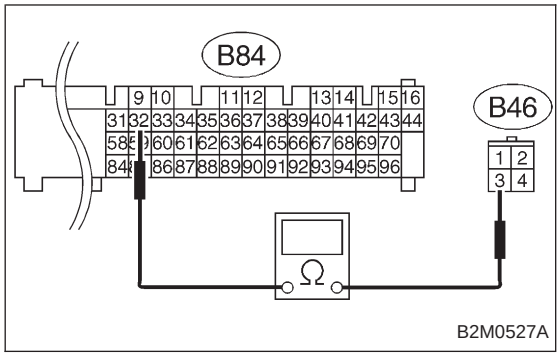
1) Disconnect connectors from fuel pump relay and main relay.
2) Remove fuel pump relay and main relay with bracket.
3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3.
4) Measure resistance between connector terminals of fuel pump relay.

Terminals
No. 2 — No. 4:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Go to step **8E6**.

NO : Replace fuel pump relay.



8E6	CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.

1) Disconnect connectors from ECM.
2) Measure resistance of harness between ECM and fuel pump relay connector.

Connector & terminal
(B84) No. 32 — (B46) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8E7**.

NO : Repair open circuit in harness between ECM and fuel pump relay connector.

8E7	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

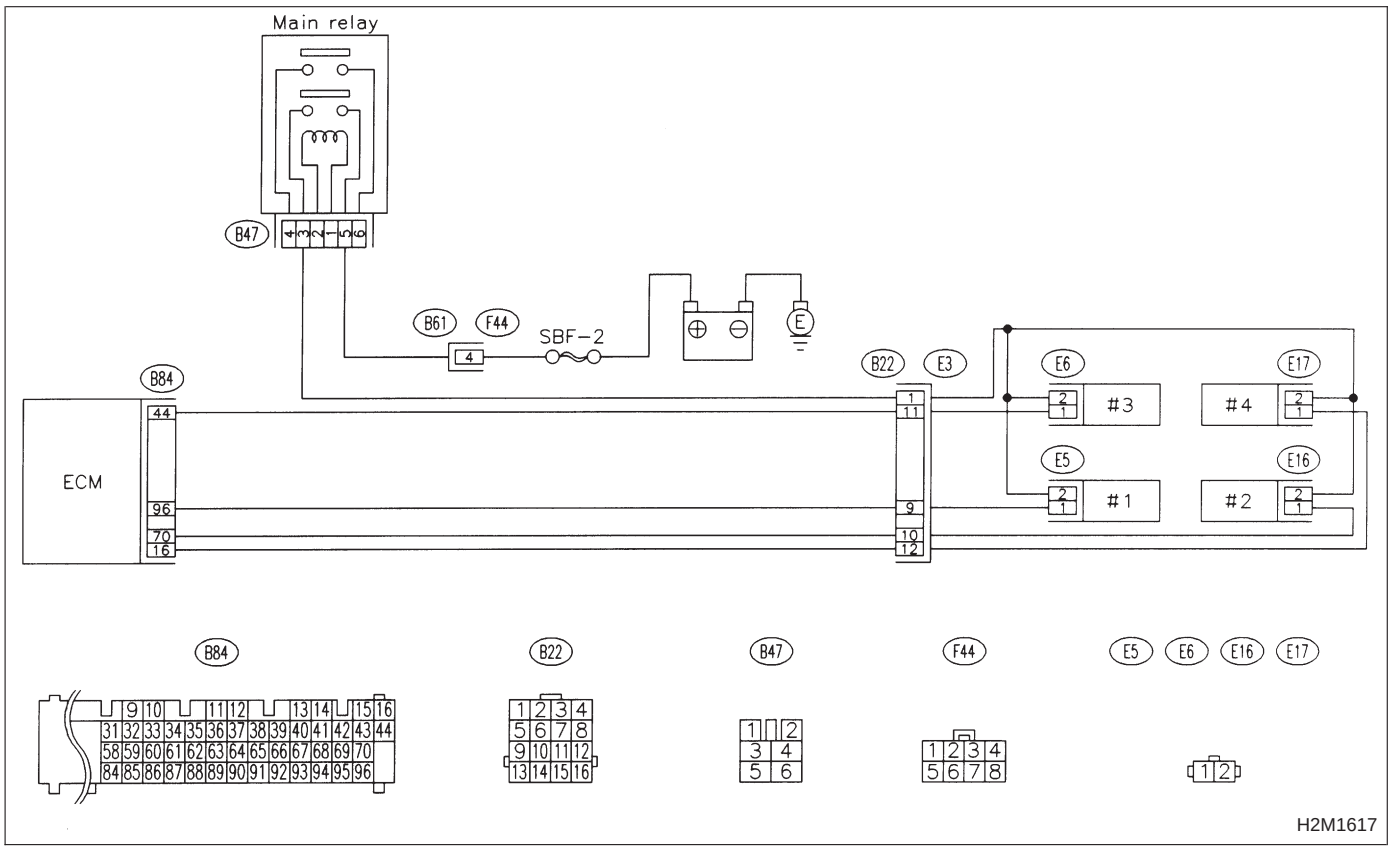
CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Check fuel injector circuit. <Ref. to 2-7 [T8F0].>

F: FUEL INJECTOR CIRCUIT

WIRING DIAGRAM:

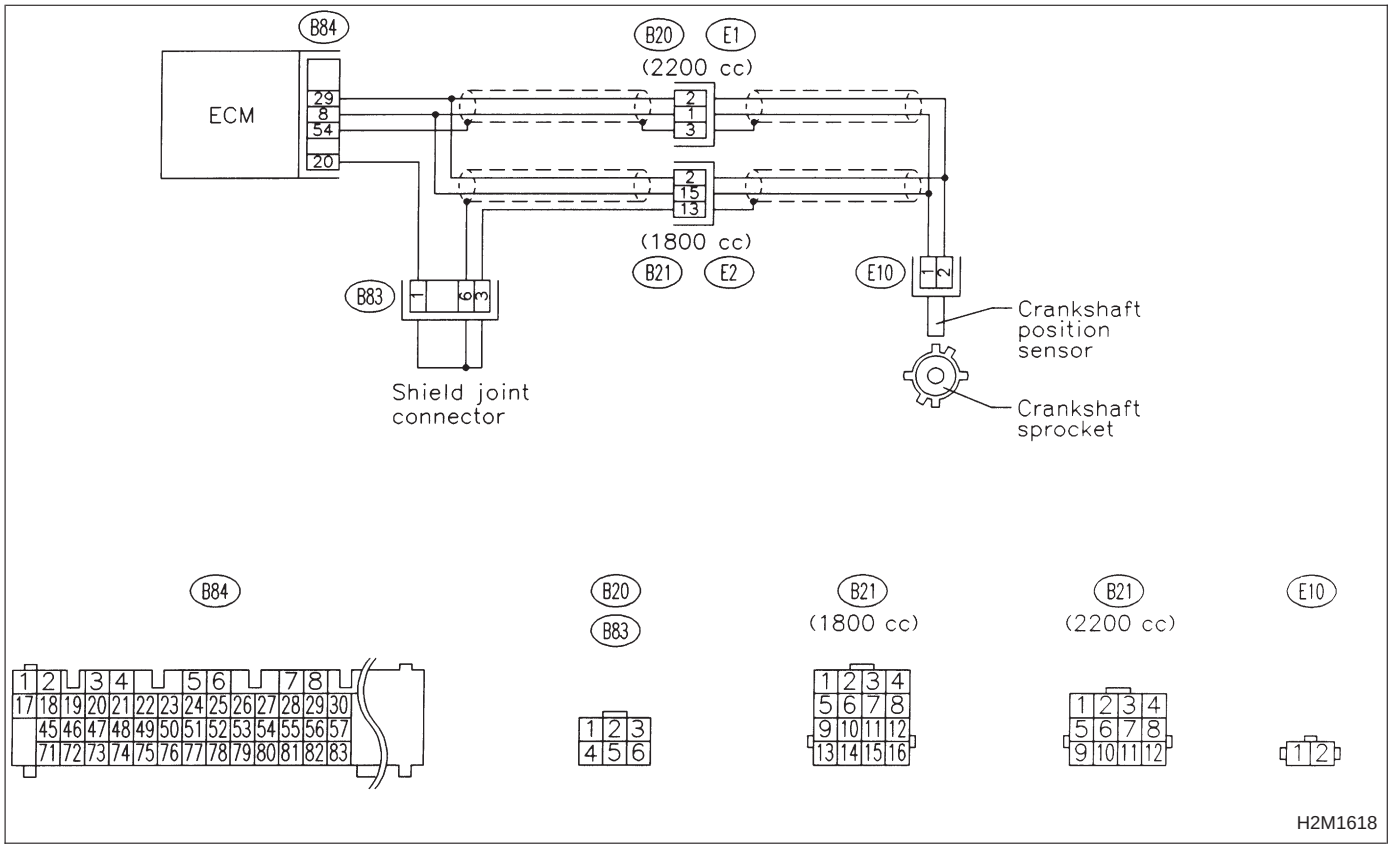


CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7 [T3D0] and [T3E0].>**

NOTE:
Check fuel injector circuit. <Ref. to 2-7 [T10AA0] or [T10AE0].>

G: CRANKSHAFT POSITION SENSOR CIRCUIT

WIRING DIAGRAM:

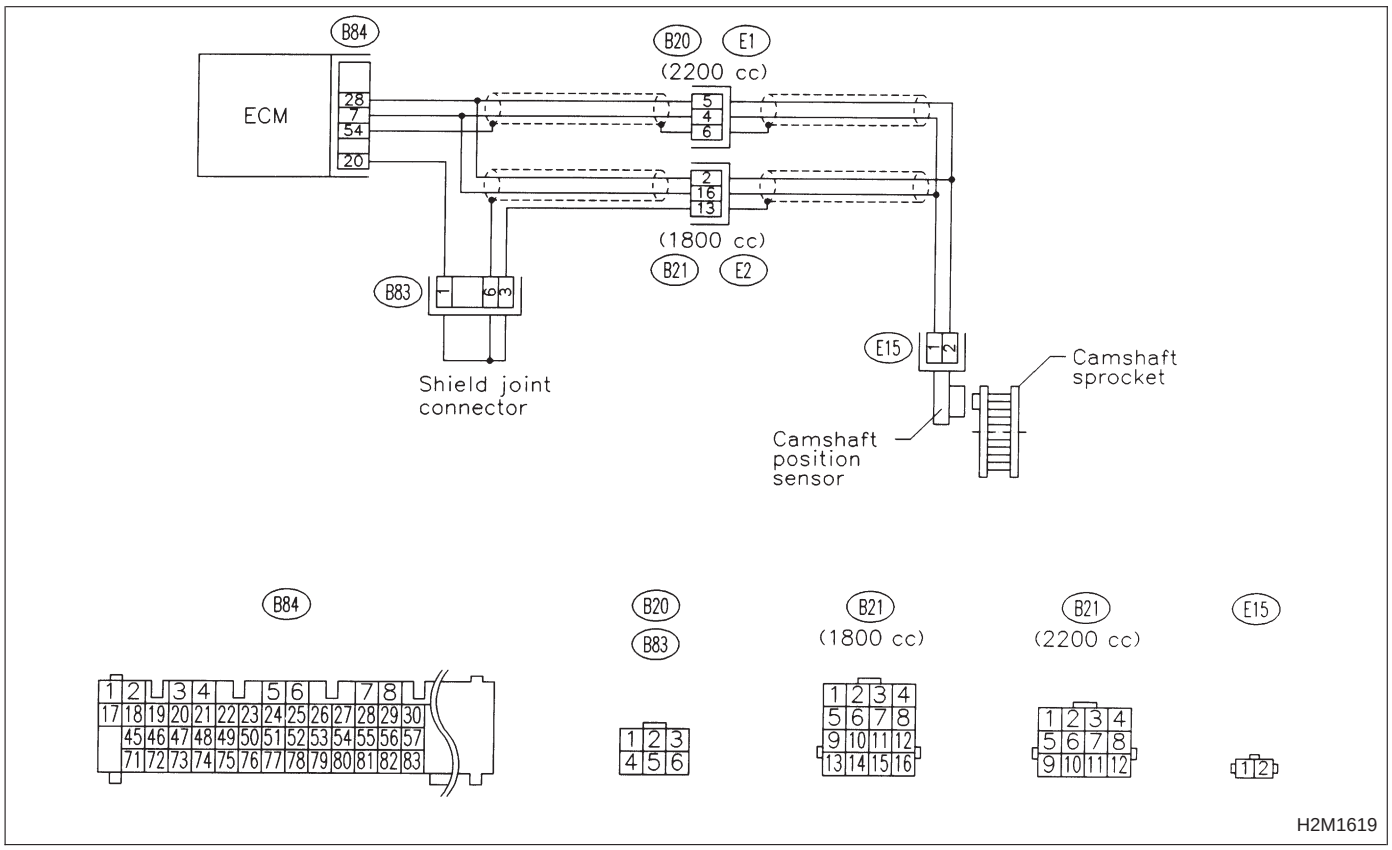


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

NOTE:
Check crankshaft position sensor circuit. <Ref. to 2-7 [T10AK0].>

H: CAMSHAFT POSITION SENSOR CIRCUIT

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

NOTE:
Check camshaft position sensor circuit. <Ref. to 2-7 [T10AM0].>

9. General Diagnostic Table

A: GENERAL DIAGNOSTICS TABLE WITH NONCONFORMITY SYMPTOM FOR ENGINE

NOTE:
Malfunction of parts other than those listed is also possible.
<Ref. to 2-3 [K100].>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Mass air flow sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) EGR valve 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Mass air flow sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) EGR valve 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Mass air flow sensor
4. Poor acceleration	1) Mass air flow sensor 2) Throttle position sensor 3) Fuel injection parts (*4) 4) Fuel pump and fuel pump relay 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) A/C switch and A/C cut relay 9) Engine torque control signal circuit 10) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Mass air flow sensor 2) Engine coolant temperature sensor (*2) 3) Crankshaft position sensor (*3) 4) Camshaft position sensor (*3) 5) Purge control solenoid valve 6) EGR valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
6. Surge	1) Mass air flow sensor 2) Engine coolant temperature sensor (*2) 3) Crankshaft position sensor (*3) 4) Camshaft position sensor (*3) 5) EGR valve 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Mass air flow sensor 2) Engine coolant temperature sensor 3) Knock sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Mass air flow sensor 2) Engine coolant temperature sensor (*2) 3) Fuel injection parts (*4) 4) Fuel pump and fuel pump relay

*1: Check ignitor, ignition coil and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

B: GENERAL DIAGNOSTICS TABLE WITH NONCONFORMITY SYMPTOM FOR AUTOMATIC TRANSMISSION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N”; starter rotates when select lever is in “R”, “D”, “3” or “2”.	1) Inhibitor switch 2) Select cable 3) Select lever 4) Starter motor and harness
Abnormal noise when select lever is in “P” or “N”.	1) Strainer 2) Duty solenoid C 3) Oil pump 4) Drive plate 5) ATF level too high or too low
Hissing noise occurs during standing start.	1) Strainer 2) ATF level too high or too low
Noise occurs while driving in “D1”.	1) Final gear 2) Planetary gear 3) Reduction gear 4) Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	1) Final gear 2) Low & reverse brake 3) Reduction gear 4) Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	1) Final gear 2) Low & reverse brake 3) Planetary gear 4) Reduction gear 5) Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	1) Control valve 2) Lock-up damper 3) Engine performance
Vehicle moves when select lever is in “N”.	1) Control unit 2) Inhibitor switch 3) Forward clutch
Shock occurs when select lever is moved from “N” to “D”.	1) Control module 2) Accumulator (“N” to “D”) 3) Control valve 4) ATF deterioration 5) Dropping resistor
Excessive time lag occurs when select lever is moved from “N” to “D”.	1) Control module 2) Control valve 3) Forward clutch 4) Duty solenoid A 5) Forward clutch seal ring 6) Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R”.	1) Control module 2) Accumulator (4A) 3) Control valve 4) ATF deterioration 5) Dropping resistor
Excessive time lag occurs when select lever is moved from “N” to “R”.	1) Control valve 2) Low & reverse clutch 3) Reverse clutch 4) Duty solenoid A 5) Forward clutch seal ring 6) Front gasket transmission case

Symptom	Problem parts
Vehicle does not start in any shift range (engine stalls).	1) Parking brake mechanism 2) Planetary gear
Vehicle does not start in any shift range (engine revving up).	1) Strainer 2) Duty solenoid A 3) Control valve 4) Drive pinion 5) Hypoid gear 6) Axle shaft 7) Differential gear 8) Oil pump 9) Input shaft 10) Output shaft 11) Planetary gear 12) Drive plate 13) ATF level too low 14) Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	1) Select cable 2) Select lever 3) Control valve 4) Low & reverse clutch 5) Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	1) Forward clutch 2) Band brake 3) Planetary gear 4) Parking brake mechanism
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	1) Forward clutch 2) One-way clutch (1-2)
Vehicle does not start in “D”, “3”, “2” or “1” range only (engine revving up).	1) Forward clutch
Vehicle does not start in “D”, “3”, “2” or “1” range only (engine stalls).	1) Reverse clutch
Vehicle starts in “R” range only (engine revving up).	1) Control valve
Acceleration during standing starts is poor (high stall rpm).	1) Control valve 2) Forward clutch 3) Reverse clutch 4) ATF level too low 5) Front gasket transmission case
Acceleration during standing starts is poor (low stall rpm).	1) Oil pump 2) Torque converter one-way clutch 3) Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	1) Control module 2) Control valve 3) High clutch 4) Brake band 5) Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	1) Control module 2) Overrunning clutch 3) High clutch 4) Brake band 5) Planetary gear

Symptom	Problem parts
No shift occurs from 1st to 2nd gear.	1) Control module 2) Vehicle speed sensor 1 3) Vehicle speed sensor 2 4) Throttle position sensor 5) Shift solenoid 1 6) Shift solenoid 2 7) Control valve 8) Brake band
No shift occurs from 2nd to 3rd gear.	1) Control module 2) Control valve 3) High clutch 4) One-way clutch (3-4)
No shift occurs from 3rd to 4th gear.	1) Control module 2) Accumulator (3R) 3) ATF temperature sensor 4) Control valve 5) Band brake
Engine brake is not effected when select lever is in “3” range.	1) Inhibitor switch 2) Control module 3) Throttle position sensor 4) Control valve 5) Shift solenoid 3
Engine brake is not effected when select lever is in “3” or “2” range.	1) Control valve 2) Overrunning clutch
Engine brake is not effected when select lever is in “1” range.	1) Control valve 2) Low & reverse brake clutch
Shift characteristics are erroneous.	1) Inhibitor switch 2) Control module 3) Vehicle speed sensor 1 4) Vehicle speed sensor 2 5) Throttle position sensor 6) Control valve
No lock-up occurs.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Control valve 5) Lock-up facing 6) Engine speed signal
Parking brake is not effected.	1) Select cable 2) Select lever 3) Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	1) ATF level too high
Differential oil spurts out.	1) Differential gear oil too high
Differential oil level changes excessively.	1) Seal pipe 2) Double oil seal
Odor is produced from ATF supply pipe.	1) Transfer clutch 2) Forward clutch 3) Overrunning clutch 4) High clutch 5) Band brake 6) Low & reverse clutch 7) Reverse clutch 8) Lock-up facing 9) ATF deterioration

Symptom	Problem parts
Shock occurs from 1st to 2nd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (2A) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake 8) ATF deterioration 9) Engine performance 10) Dropping resistor
Slippage occurs from 1st to 2nd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (2A) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake
Shock occurs from 2nd to 3rd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (3R) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) High clutch 8) Band brake 9) ATF deterioration 10) Engine performance 11) Dropping resistor
Slippage occurs from 2nd to 3rd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (3R) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) High clutch 8) Band brake
Shock occurs from 3rd to 4th gear.	1) Control module 2) Throttle position sensor 3) Accumulator 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Overrunning clutch 8) Band brake 9) ATF deterioration 10) Engine performance
Slippage occurs from 3rd to 4th gear.	1) Control module 2) Throttle position sensor 3) Accumulator 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake

Symptom	Problem parts
Shock occurs when select lever is moved from “3” to “2” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Overrunning clutch 7) Band brake 8) ATF deterioration
Shock occurs when select lever is moved from “D” to “1” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) ATF deterioration 7) Low & reverse brake
Shock occurs when select lever is moved from “2” to “1” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Low & reverse clutch 7) ATF deterioration
Shock occurs when accelerator pedal is released at medium speeds.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Lock-up damper 7) Engine performance
Vibration occurs during straight-forward operation.	1) Control module 2) Duty solenoid B 3) Lock-up facing 4) Lock-up damper
Vibration occurs during turns (tight corner “braking” phenomenon).	1) Control module 2) Vehicle speed sensor 1 3) Vehicle speed sensor 2 4) Throttle position sensor 5) ATF temperature sensor 6) Transfer clutch 7) Transfer valve 8) Duty solenoid C 9) ATF deterioration
Front wheel slippage occurs during standing starts.	1) Control module 2) Vehicle speed sensor 2 3) FWD switch 4) Throttle position sensor 5) ATF temperature sensor 6) Control valve 7) Transfer clutch 8) Transfer valve 9) Transfer pipe 10) Duty solenoid C 11) Transfer clutch hub
Vehicle is not set in FWD mode.	1) Control module 2) FWD switch 3) Transfer clutch 4) Transfer valve 5) Duty solenoid C

Symptom	Problem parts
Select lever is hard to move.	1) Select cable 2) Select lever 3) Detent spring 4) Manual plate
Select lever is too high to move (unreasonable resistance).	1) Detent spring 2) Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	1) Select cable 2) Select lever 3) Detent spring 4) Manual plate

10. Diagnostic Chart with Trouble Code

A: DIAGNOSTIC TROUBLE CODE (DTC) LIST

DTC No.	Abbreviation (Subaru Select Monitor)	Item	Page
P0101	QA—RLOW	Mass air flow sensor circuit range/performance problem (low input)	133
P0102	QA—LOW	Mass air flow sensor circuit low input	135
P0103	QA—HI	Mass air flow sensor circuit high input	140
P0106	PS—R2	Pressure sensor circuit range/performance problem	143
P0107	P—SLOW	Pressure sensor circuit low input	147
P0108	P—SHI	Pressure sensor circuit high input	151
P0116	TW—LOW	Engine coolant temperature sensor circuit low input	156
P0117	TW—HI	Engine coolant temperature sensor circuit high input	159
P0121	TH—RHI	Throttle position sensor circuit range/performance problem (high input)	163
P0122	THV—LOW	Throttle position sensor circuit low input	165
P0123	THV—HI	Throttle position sensor circuit high input	170
P0125	TW—CL	Insufficient coolant temperature for closed loop fuel control	173
P0130	FO2—V	Front oxygen sensor circuit malfunction	175
P0133	FO2—R	Front oxygen sensor circuit slow response	178
P0135	FO2H	Front oxygen sensor heater circuit malfunction	180
P0136	RO2—V	Rear oxygen sensor circuit malfunction	184
P0139	RO2—R	Rear oxygen sensor circuit slow response	187
P0141	RO2H	Rear oxygen sensor heater circuit malfunction	189
P0170	FUEL	Fuel trim malfunction	193
P0181	TNKT—F	Fuel temperature sensor A circuit range/performance problem	198
P0182	TNKT—LOW	Fuel temperature sensor A circuit low input	200
P0183	TNKT—HI	Fuel temperature sensor A circuit high input	203
P0261	INJ1	Fuel injector circuit low input - #1	209
P0262	INJ1—HI	Fuel injector circuit high input - #1	214
P0264	INJ2	Fuel injector circuit low input - #2	209
P0265	INJ2—HI	Fuel injector circuit high input - #2	214
P0267	INJ3	Fuel injector circuit low input - #3	209
P0268	INJ3—HI	Fuel injector circuit high input - #3	214
P0270	INJ4	Fuel injector circuit low input - #4	209
P0271	INJ4—HI	Fuel injector circuit high input - #4	214
P0301	MIS—1	Cylinder 1 misfire detected	218
P0302	MIS—2	Cylinder 2 misfire detected	218
P0303	MIS—3	Cylinder 3 misfire detected	218
P0304	MIS—4	Cylinder 4 misfire detected	218
P0325	KNOCK	Knock sensor circuit malfunction	227
P0335	CRANK	Crankshaft position sensor circuit malfunction	230
P0336	CRANK—R	Crankshaft position sensor circuit range/performance problem	233
P0340	CAM	Camshaft position sensor circuit malfunction	235
P0341	CAM—R	Camshaft position sensor circuit range/performance problem	238

DTC No.	Abbreviation (Subaru Select Monitor)	Item	Page
P0400	EGR	Exhaust gas recirculation flow malfunction	240
P0403	EGRSOL	Exhaust gas recirculation circuit low input	245
P0420	CAT	Catalyst system efficiency below threshold	249
P0440	EVAP	Evaporative emission control system malfunction	251
P0441	CPC—F	Evaporative emission control system incorrect purge flow	255
P0443	CPC	Evaporative emission control system purge control valve circuit low input	257
P0446	VCMSOL—LO	Evaporative emission control system vent control low input	261
P0451	TNKP—F	Evaporative emission control system pressure sensor range/performance problem	265
P0452	TNKP—LOW	Evaporative emission control system pressure sensor low input	267
P0453	TNKP—HI	Evaporative emission control system pressure sensor high input	272
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P0462	FLVL—LOW	Fuel level sensor circuit low input	280
P0463	FLVL—HI	Fuel level sensor circuit high input	290
P0500	VSP	Vehicle speed sensor malfunction	298
P0505	ISC	Idle control system malfunction	300
P0506	ISC—RLOW	Idle control system RPM lower than expected	307
P0507	ISC—RHI	Idle control system RPM higher than expected	309
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P0601	RAM	Internal control module memory check sum error	313
P0703	ATBRK	Brake switch input malfunction	314
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P0710	ATF	Transmission fluid temperature sensor circuit malfunction	336
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P0725	ATNE	Engine speed input circuit malfunction	338
P0731	ATGR1	Gear 1 incorrect ratio	339
P0732	ATGR2	Gear 2 incorrect ratio	339
P0733	ATGR3	Gear 3 incorrect ratio	339
P0734	ATGR4	Gear 4 incorrect ratio	339
P0740	ATLU—F	Torque converter clutch system malfunction	343
P0743	ATLU	Torque converter clutch system electrical	347
P0748	ATPL	Pressure control solenoid electrical	348
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P0763	ATOVR	Shift solenoid C electrical	355
P1100	ST—SWOFF	Starter switch circuit low input	356
P1101	N—SW	Neutral position switch circuit malfunction [MT vehicles]	358
P1101	N—SWOFF	Neutral position switch circuit high input [AT vehicles]	362
P1102	BR	Pressure sources switching solenoid valve circuit low input	367
P1103	TRQ	Engine torque control signal circuit malfunction	371
P1120	ST—SWON	Starter switch circuit high input	374

DTC No.	Abbreviation (Subaru Select Monitor)	Item	Page
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P1142	TH—RLOW	Throttle position sensor circuit range/performance problem (low input)	384
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P1144	PS—RHI	Pressure sensor circuit range/performance problem (high input)	390
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P1420	PCVSOL—HI	Fuel tank pressure control solenoid valve circuit high input	396
P1421	EGRSOL—HI	Exhaust gas recirculation circuit high input	399
P1422	CPC—HI	Evaporative emission control system purge control valve circuit high input	402
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P1440	PCV—FLOW	Fuel tank pressure control system function problem (low input)	408
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OBD (FB1)

P0101 <QA_RLOW>

B2M1056

B: DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

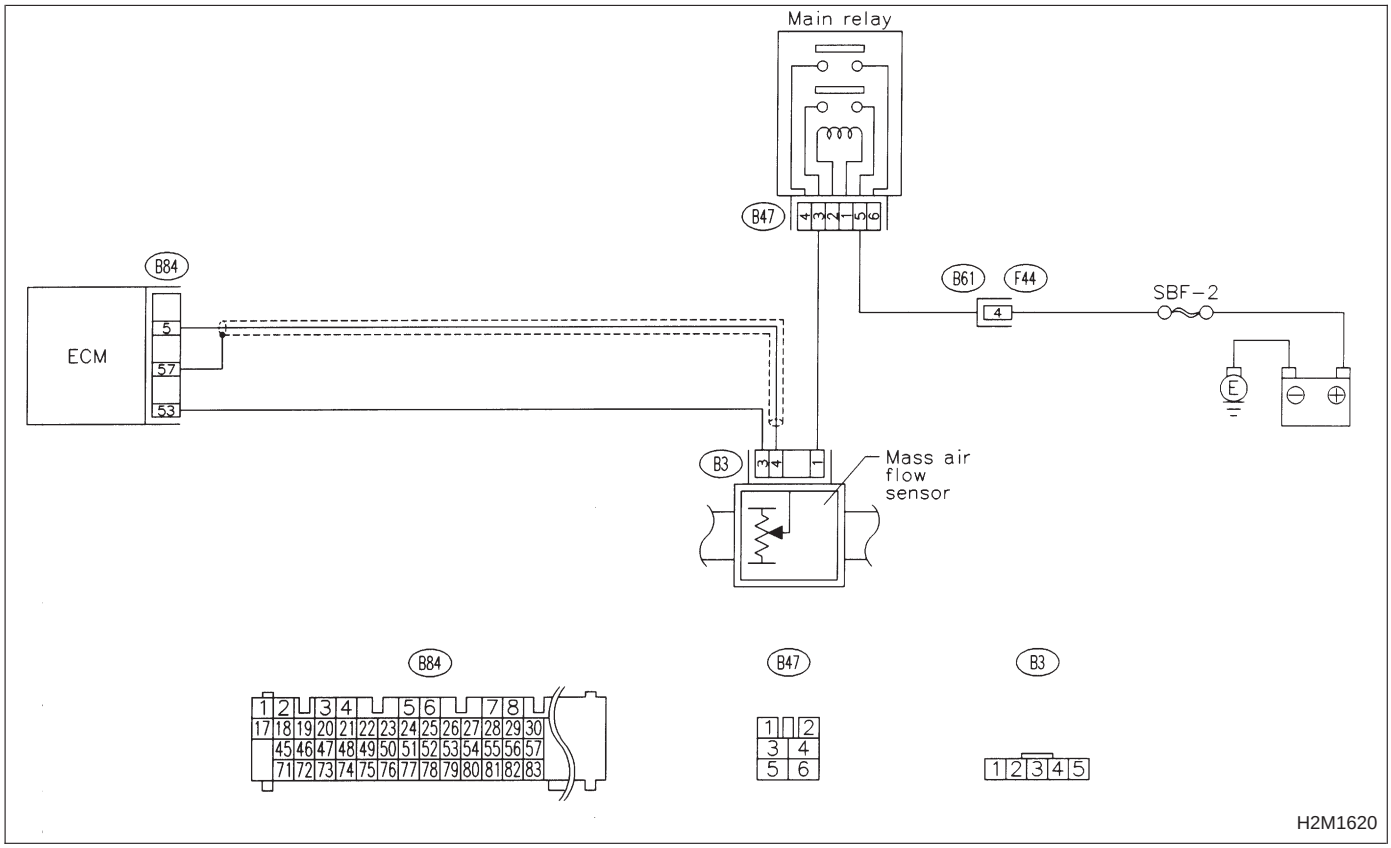
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



H2M1620

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10B1	**CHECK DTC P0102 OR P0103 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0102 or P0103?***

YES : Inspect DTC P0102 or P0103 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0101.

NO : Replace mass air flow sensor.

OBD (FB1)
P0102 <QA_LOW>
B2M1058

C: DTC P0102 — MASS AIR FLOW SENSOR CIRCUIT LOW INPUT —

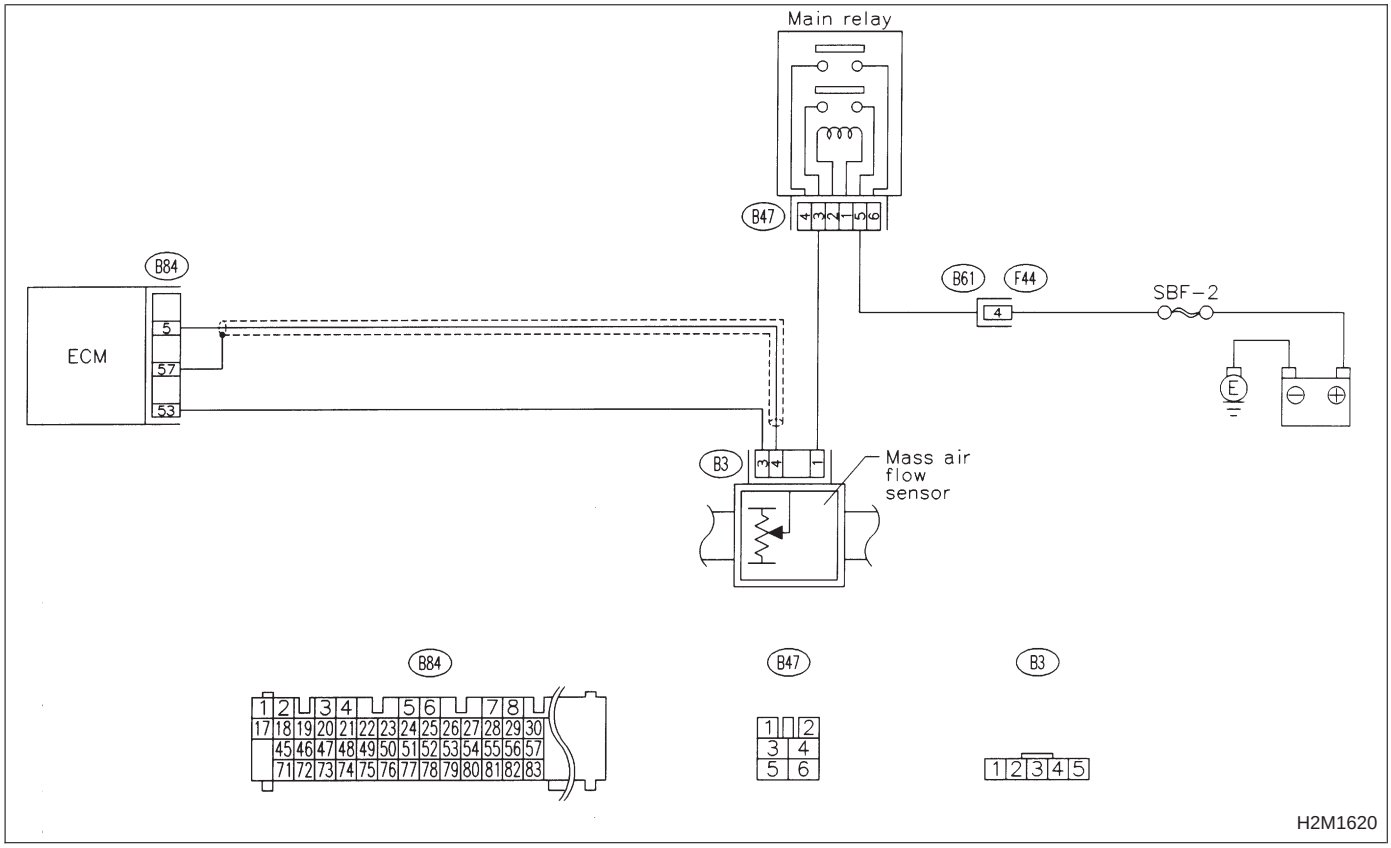
DTC DETECTING CONDITION:

- Immediately at fault recognition

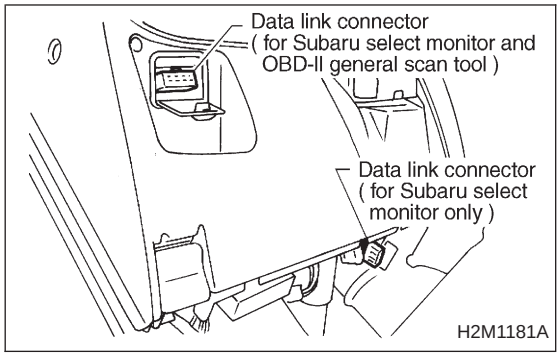
TROUBLE SYMPTOM:

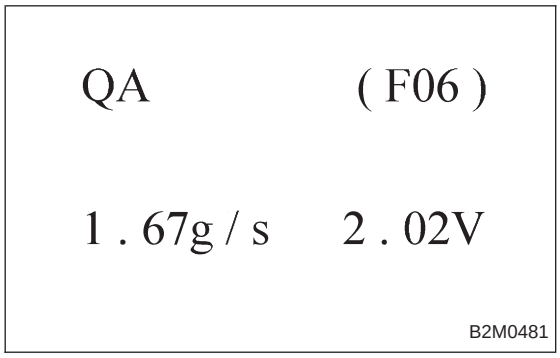
- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10C1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F06

● F06: Mass air flow and voltage input from mass air flow sensor are shown on display at the same time.

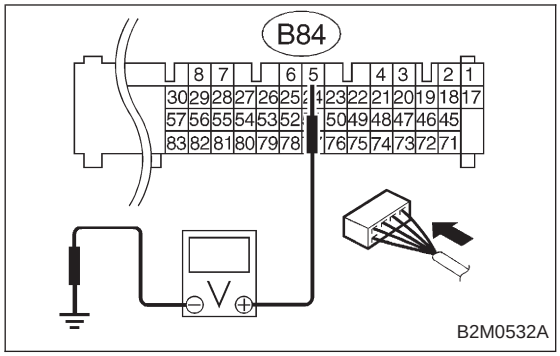
CHECK ***: Is the value equal to or more than 1.3 g/sec or 0.3 V and equal to or less than 250 g/sec or 5.0 V in function mode F06?***

Probable cause: Poor connect of connectors, circuit and grounding line.

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the mass air flow sensor.

NOTE:
In this case, repair the following:
● Open or ground short circuit in harness between mass air flow sensor and ECM connector
● Poor contact in mass air flow sensor or ECM connector

NO : Go to step **10C2**.



10C2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

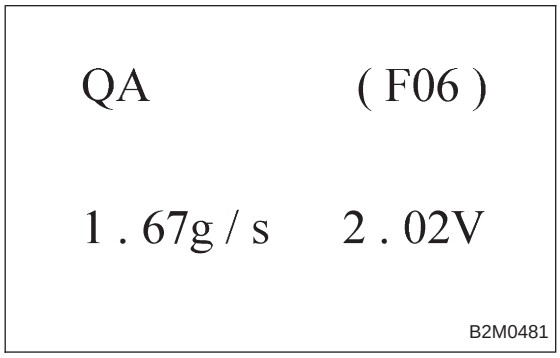
1) Measure voltage between ECM connector and chassis ground while engine is idling.

Connector & terminal
(B84) No. 5 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.3 V?***

YES : Go to step **10C3**.

NO : Go to next step 2).



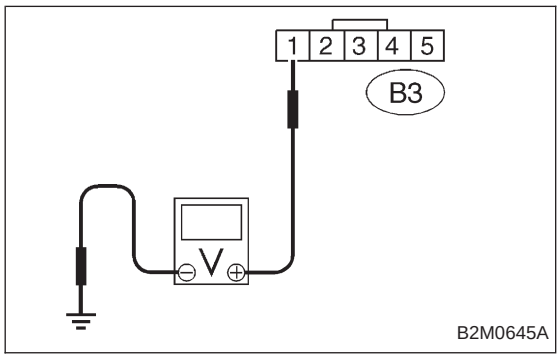
2) Measure voltage between ECM connector and chassis ground while engine is idling.

CHECK ***: Does the voltage change more than 0.3 V by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10C3	CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.

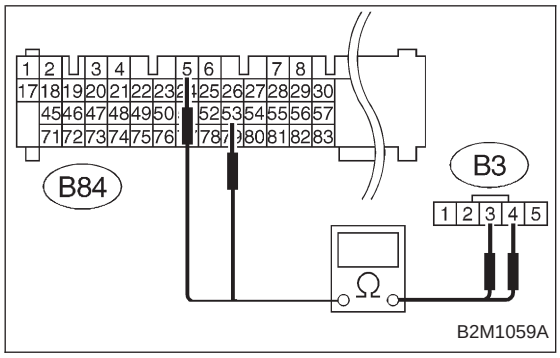
1) Turn ignition switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Turn ignition switch to ON.
4) Measure voltage between mass air flow sensor connector and engine ground.

Connector & terminal
(B3) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10C4**.

NO : Repair open circuit in harness between main relay and mass air flow sensor connector.



10C4	CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and mass air flow sensor connector.

Connector & terminal
(B84) No. 5 — (B3) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and mass air flow sensor connector
- Poor contact in mass air flow sensor connector
- Poor contact in ECM connector

4) Measure resistance of harness between ECM and mass air flow sensor connector.

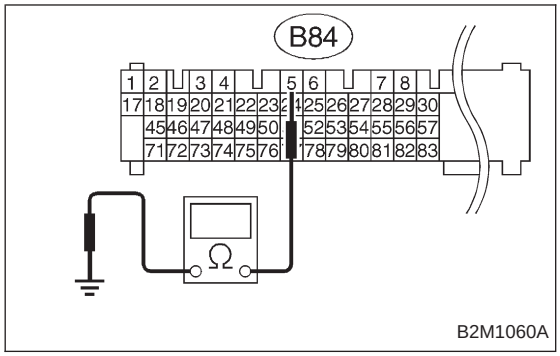
Connector & terminal
(B84) No. 53 — (B3) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10C5**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and mass air flow sensor connector
- Poor contact in mass air flow sensor connector
- Poor contact in ECM connector



10C5	CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.

Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 5 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Replace mass air flow sensor.

NO : Repair ground short circuit in harness between ECM and mass air flow sensor connector.

OBD (FB1)
P0103 <QA_HI>
B2M1061

D: DTC P0103 — MASS AIR FLOW SENSOR CIRCUIT HIGH INPUT —

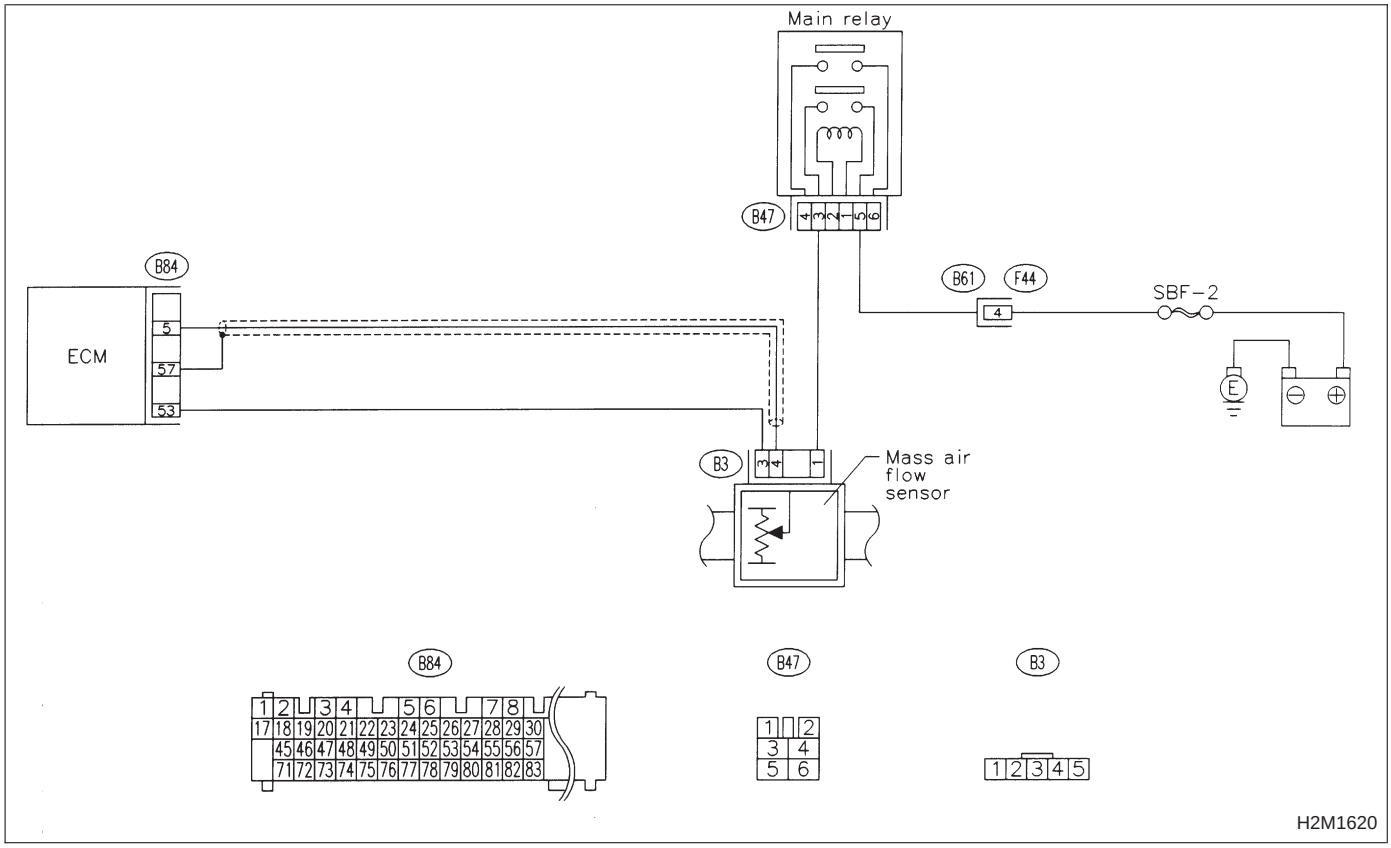
DTC DETECTING CONDITION:

- Immediately at fault recognition

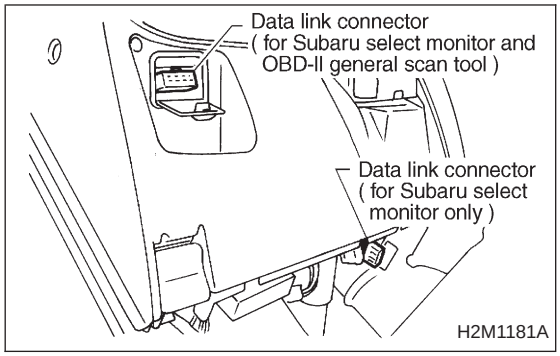
TROUBLE SYMPTOM:

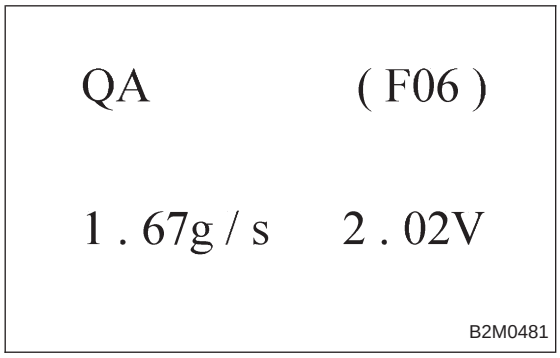
- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10D1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F06

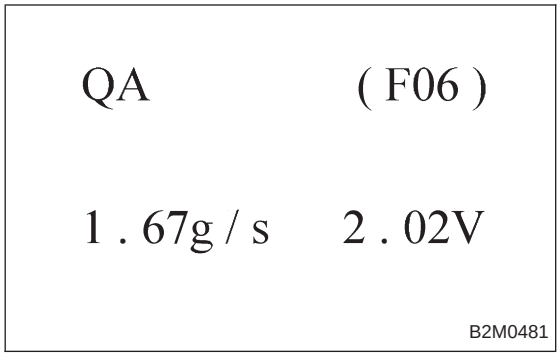
● F06: Mass air flow and voltage input from mass air flow sensor are shown on display at the same time.

CHECK ***: Is the value equal to or more than 1.3 g/sec or 0.3 V and equal to or less than 250 g/sec or 5.0 V in function mode F06?***

Probable cause: Poor connect of connectors, circuit and grounding line.

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time.

NO : Go to step **10D2**.



10D2	CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.

1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF.
2) Disconnect connector from mass air flow sensor.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Read data on Subaru select monitor or OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F06

CHECK ***: Is the value more than 250 g/sec or 5 V in function mode F06?***

YES : Repair battery short circuit in harness between mass air flow sensor and ECM connector. After repair, replace ECM.

NO : Replace mass air flow sensor.

● OBD-II general scan tool

For detailed operation procedures, refer to OBD-II General Scan Tool Instruction Manual.

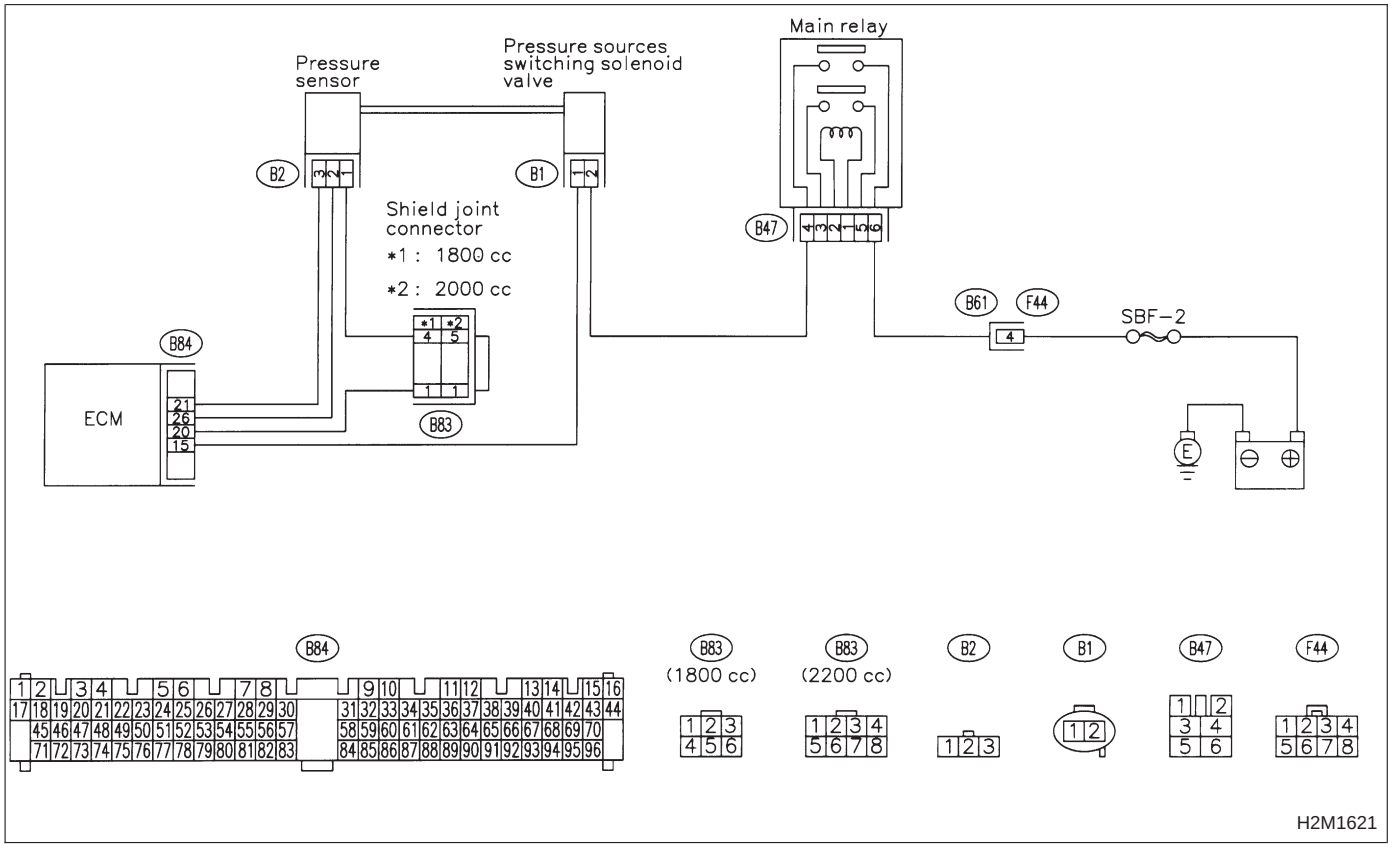
OBD (FB1)
P0106 <PS_R2>
B2M1062

E: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

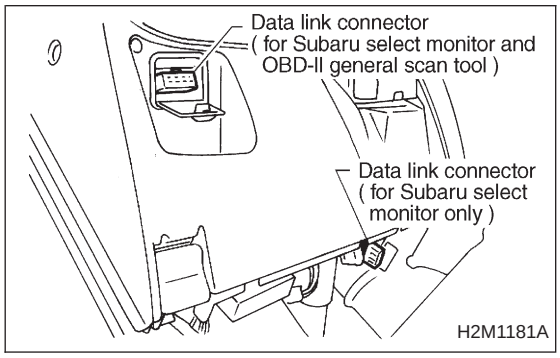
10E1	CHECK DTC P0107, P0108, P1102 OR P1122 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0107, P0108, P1102 OR P1122?***

YES : Inspect DTC P0107, P0108, P1102 OR P1122 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

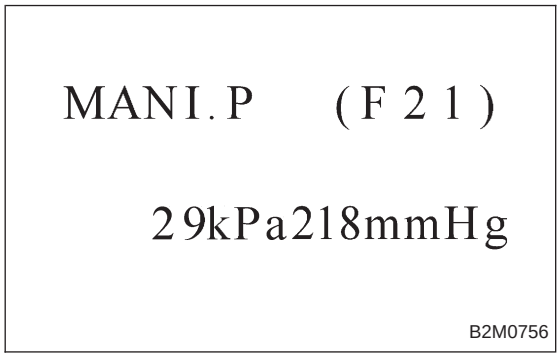
NOTE:
In this case, it is not necessary to inspect DTC P0106.

NO : Go to step **10E2**.



10E2	CHECK DATA FOR CONTROL.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch ON and Subaru Select Monitor or the OBD-II general scan tool switch ON.
4) Start engine.



5) Read data on Subaru Select Monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

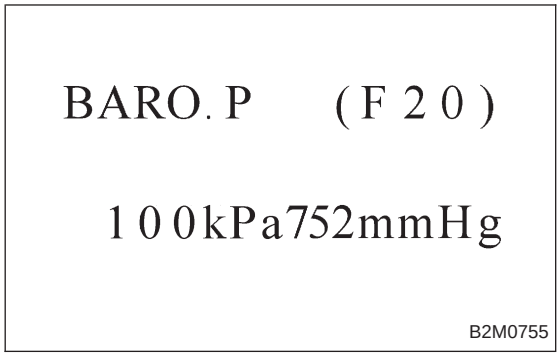
Function mode: F21 and F20

- F21: Display shows pressure signal value sent from the pressure sensor.
- F20: Display shows pressure signal value sent from the pressure sensor.

CHECK : ***Is the value more than 85 kPa in function mode F21?***

YES : Go to step **10E3**.

NO : Go to next step 6).

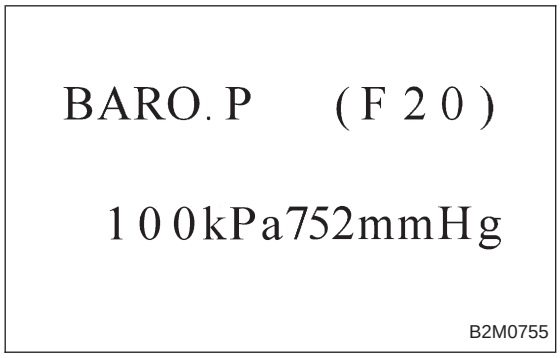


6) Read data on Subaru Select Monitor or OBD-II general scan tool.

CHECK ***: Is the value less than 32 kPa in function mode F20?***

YES : Go to step **10E4**.

NO : Go to step 7).



7) Read data on Subaru Select Monitor or OBD-II general scan tool.

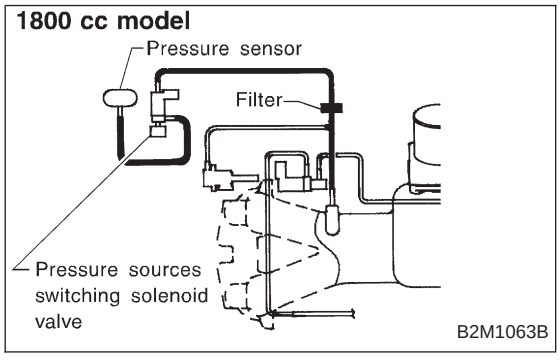
CHECK ***: Is the value more than 133 kPa in function mode F20?***

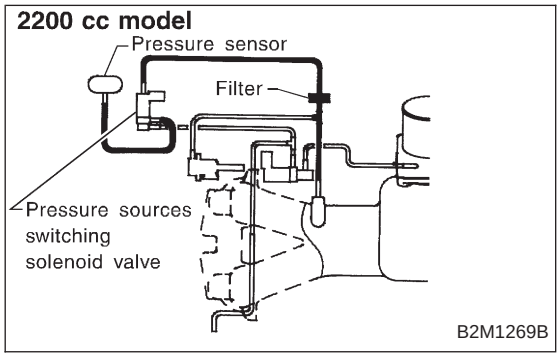
YES : Replace pressure sensor.

NO : Repair poor contact in pressure sensor connector, pressure sources switching solenoid valve connector, and ECM connector.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.





10E3	CHECK VACUUM HOSE.

CHECK ***: Is there a fault in vacuum hose?***

NOTE:

Check the following items.

● Disconnection of the vacuum hose from pressure sources switching solenoid valve to intake manifold

● Holes in the vacuum hose between pressure sources switching solenoid valve to intake manifold

● Clogging of the vacuum hose between pressure sources switching solenoid valve to intake manifold

● Disconnection of the vacuum hose from pressure sensor to pressure sources switching solenoid valve

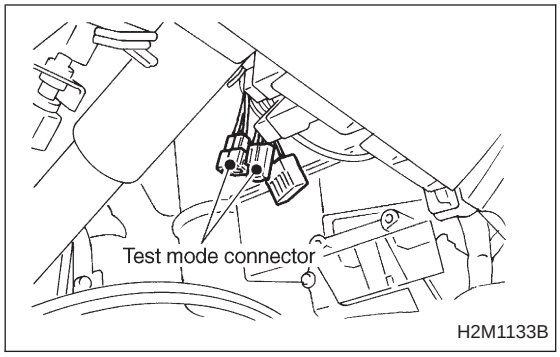
● Holes in the vacuum hose between pressure sensor and pressure sources switching solenoid valve

● Clogging of the vacuum hose between pressure sensor and pressure sources switching solenoid valve

● Clogging of the filter

YES : Repair or replace hoses or filter.

NO : Go to step **10E4**.



10E4	CHECK PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does pressure sources switching solenoid valve produce operating sound? (ON ↔ OFF each 1.5 sec.)***

NOTE:
Pressure sources switching solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD10). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Replace pressure sensor.

NO : Replace pressure sources switching solenoid valve.

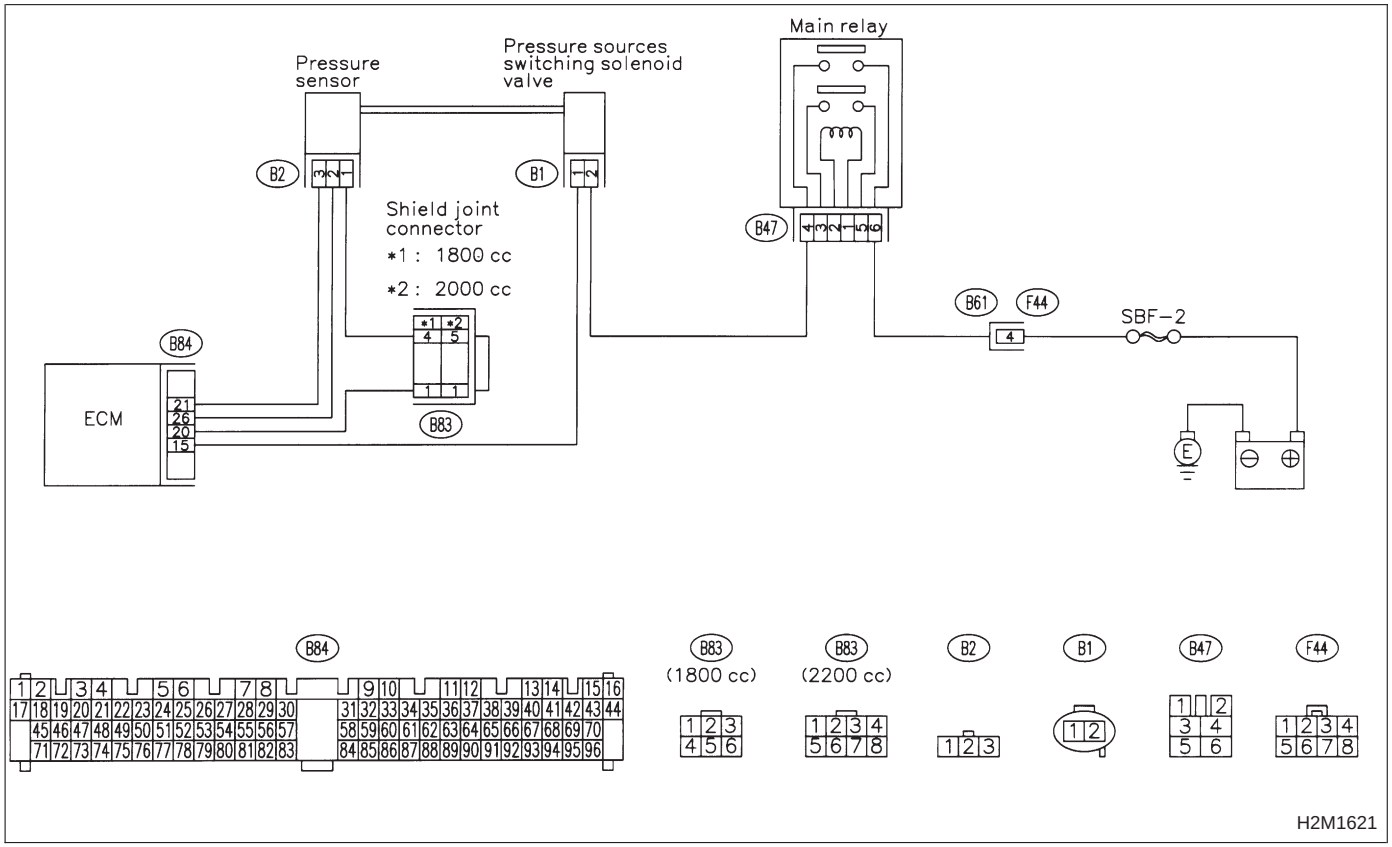


F: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

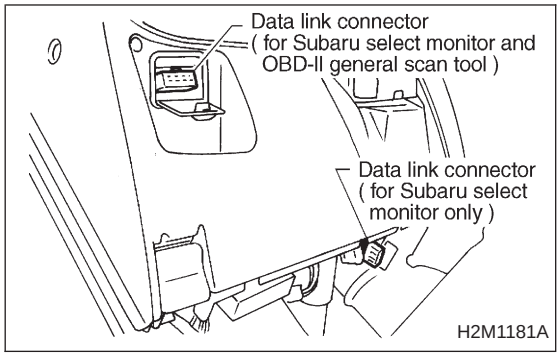
DTC DETECTING CONDITION:

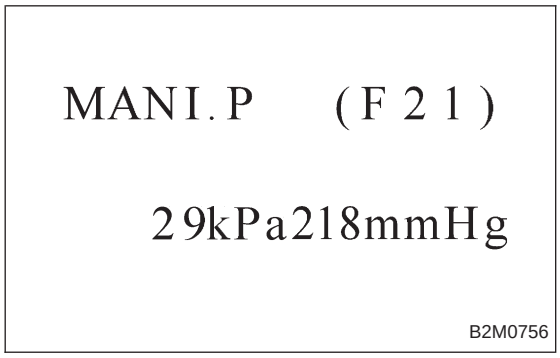
- Immediately at fault recognition

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10F1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.

5) Read the data on Subaru Select Monitor or the OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F21

● F21: Display shows pressure signal value sent from pressure sensor.

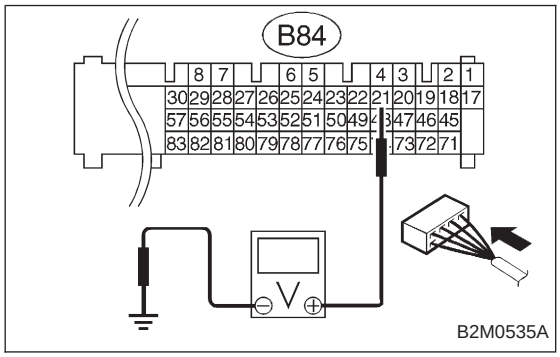
CHECK ***: Is the value less than 0 kPa in function mode F21?***

YES : Go to step **10F2**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10F2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

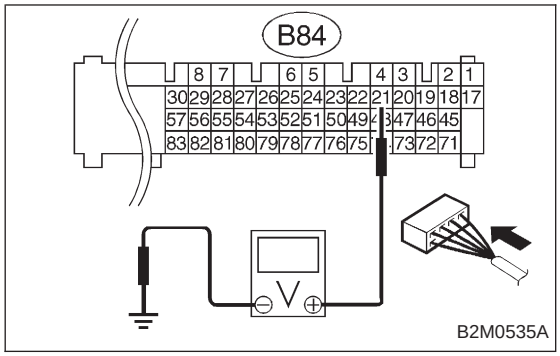
1) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 21 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 2).

NO : Go to next CHECK .

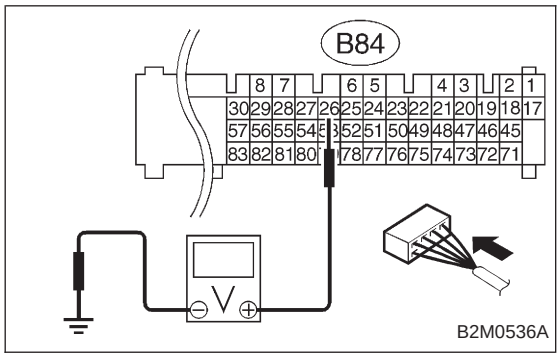


CHECK : ***Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



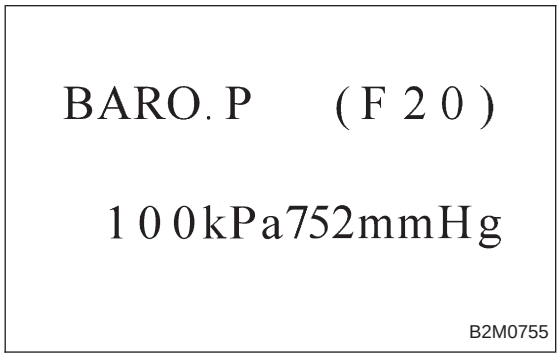
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 26 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 0.2 V?***

YES : Go to step **10F3**.

NO : Go to next step 3).



3) Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

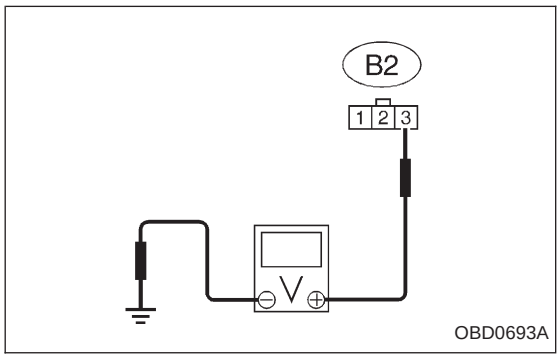
Function mode: F20

● F20: Display shows pressure signal value sent from pressure sensor.

CHECK : ***Does the value change more than 0 kPa by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Go to step **10F3**.



10F3	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.

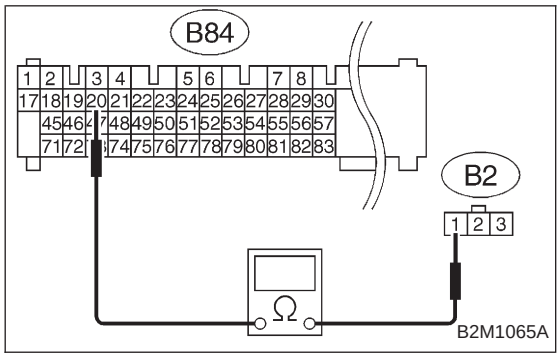
1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sensor.
3) Turn ignition switch to ON.
4) Measure voltage between pressure sensor connector and engine ground.

Connector & terminal
(B2) No. 3 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 5).

NO : Repair open circuit in harness between ECM and pressure sensor connector.



5) Turn ignition switch to OFF.
6) Disconnect connector from ECM.
7) Measure resistance of harness between ECM and pressure sensor connector.

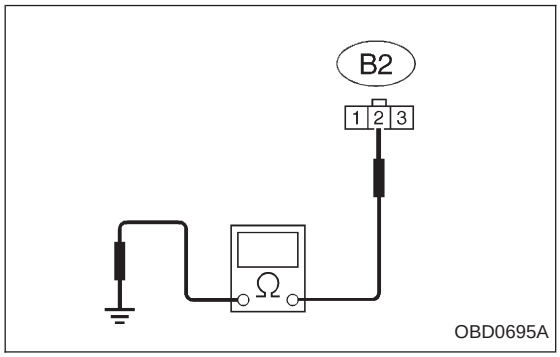
Connector & terminal
(B84) No. 20 — (B2) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 8).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and pressure sensor connector
- Poor contact in shield joint connector (B83)



8) Measure resistance of harness between pressure sensor connector and engine ground.

Connector & terminal
(B2) No. 2 — Engine ground:

CHECK ***: Is the resistance more than 500 kΩ?***

YES : Go to step **10F4**.

NO : Repair ground short circuit in harness between ECM and pressure sensor connector.

10F4	CHECK POOR CONTACT.

Check poor contact in pressure sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in pressure sensor connector?***

YES : Repair poor contact in pressure sensor connector.

NO : Replace pressure sensor.

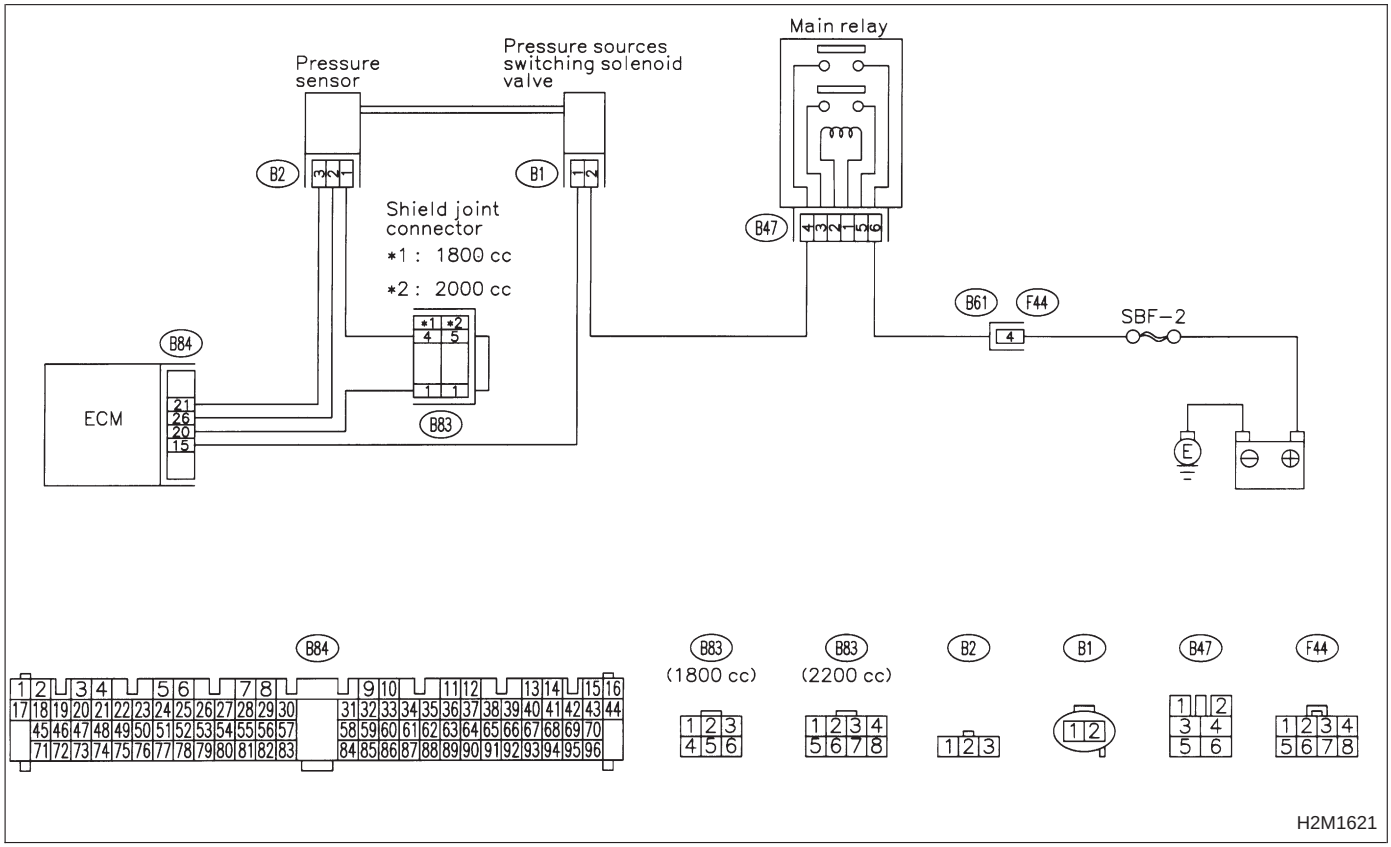
OBD (FB1)
P0108 <P_SHI>
B2M1066

G: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

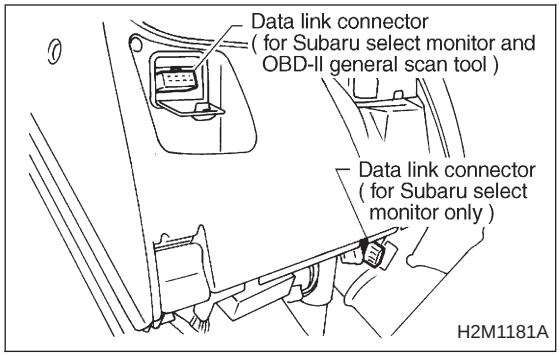
DTC DETECTING CONDITION:

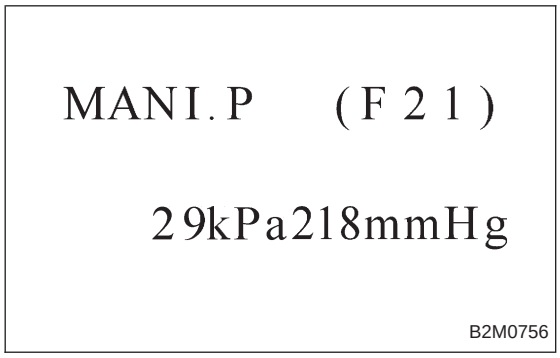
- Immediately at fault recognition

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10G1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Start engine.

5) Read the data on Subaru Select Monitor or the OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F21

● F21: Display shows pressure signal value sent from pressure sensor.

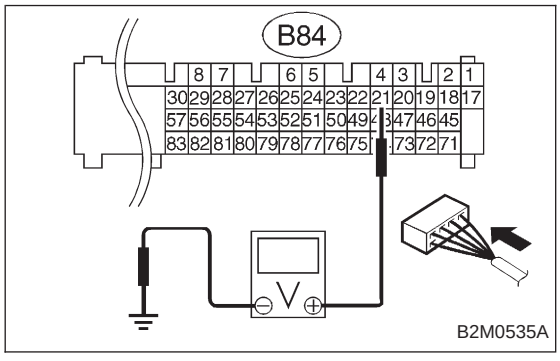
CHECK ***: Is the value more than 140 kPa in function mode F21?***

YES : Go to step **10G5**.

NO : Go to step **10G2**.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10G2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

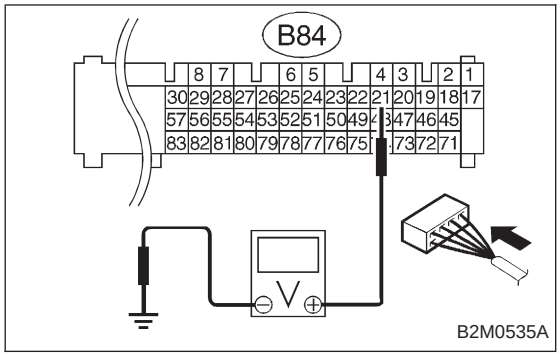
1) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 21 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 2).

NO : Go to next CHECK .

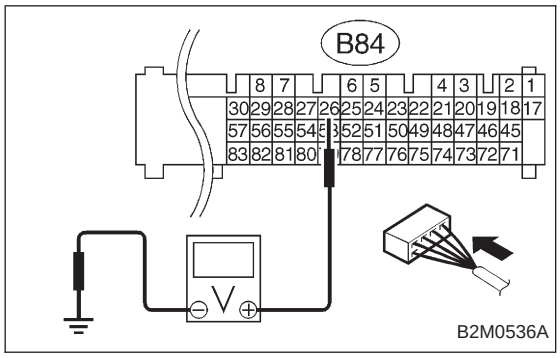


CHECK : ***Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



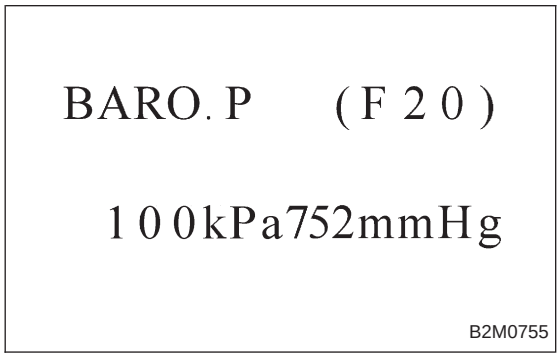
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 26 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.2 V?***

YES : Go to step **10G3**.

NO : Go to next step 3).



3) Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

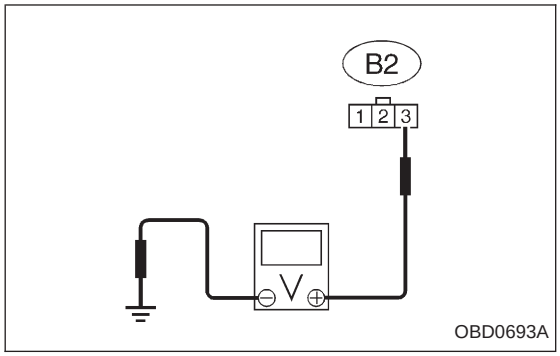
Function mode: F20

● F20: Display shows pressure signal value sent from pressure sensor.

CHECK ***: Does the value change more than 0 kPa by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Go to step **10G3**.



10G3	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.

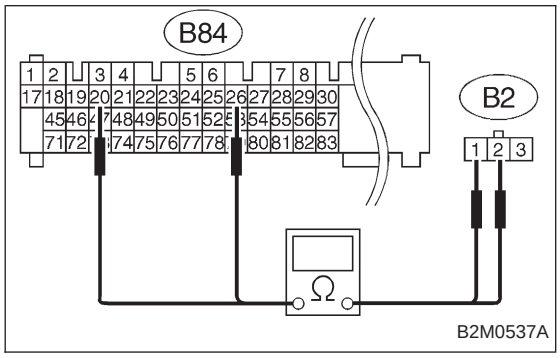
1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sensor.
3) Turn ignition switch to ON.
4) Measure voltage between pressure sensor connector and engine ground.

Connector & terminal
(B2) No. 3 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 5).

NO : Repair open circuit in harness between ECM and pressure sensor connector.



5) Turn ignition switch to OFF.
6) Disconnect connector from ECM.
7) Measure resistance of harness between ECM and pressure sensor connector.

Connector & terminal
(B84) No. 26 — (B2) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 8).

NO : Repair open circuit in harness between ECM and pressure sensor connector.

8) Measure resistance of harness between ECM and pressure sensor connector.

Connector & terminal
(B84) No. 20 — (B2) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10G4**.

NO : Repair harness and connector

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and pressure sensor connector
- Poor contact in shield joint connector (B83)

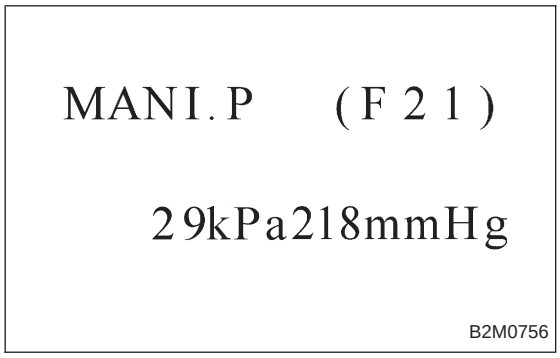
10G4	CHECK POOR CONTACT.

Check poor contact in pressure sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in pressure sensor connector?***

YES : Repair poor contact in pressure sensor connector.

NO : Replace pressure sensor.



10G5	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.

1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF.
2) Disconnect connector from pressure sensor.
3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
4) Read data on Subaru select monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F21

CHECK ***: Is the value more than 140 kPa in function mode F21?***

YES : Repair battery short circuit in harness between ECM and pressure sensor connector.

NO : Replace pressure sensor.

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

OBD (FB1)
P0116 <TW_LOW>
B2M1067

H: DTC P0116 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

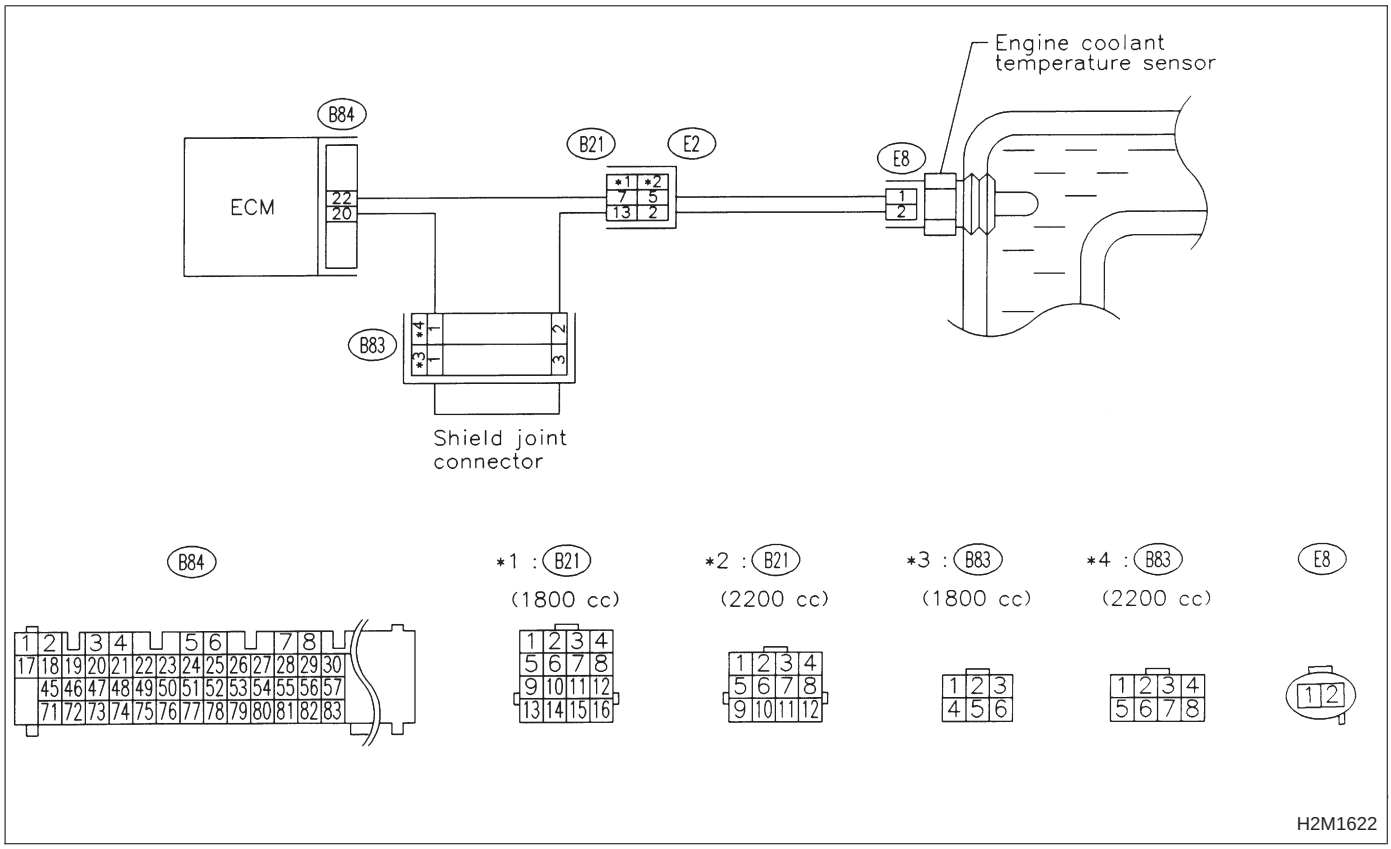
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

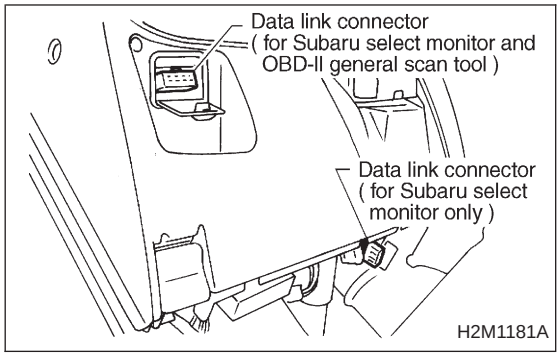
- Hard to start
- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



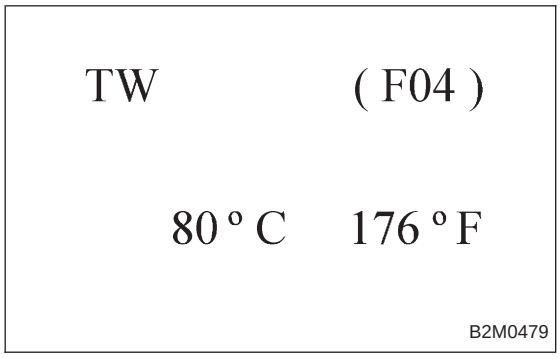
H2M1622

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10H1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F04

- F04: Water temperature is indicated in "°C" and "°F".

CHECK ***: Is the value greater than 150°C or 300°F in function mode F04?***

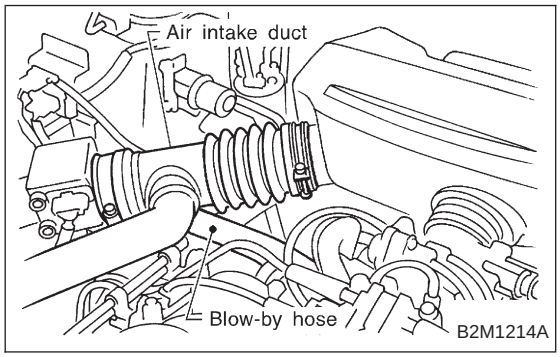
YES : Go to step **10H2**.

NO : Repair poor contact.

NOTE:
In this case, repair the following:

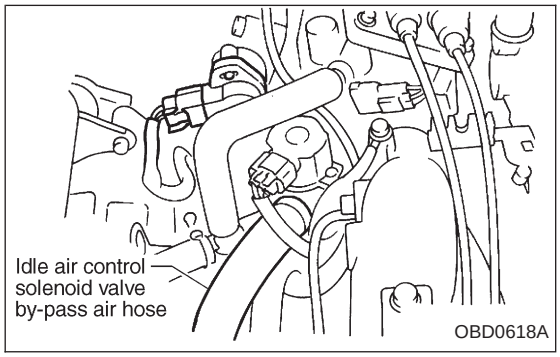
- Poor contact in engine coolant temperature sensor
- Poor contact in ECM
- Poor contact in coupling connector (B21)
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

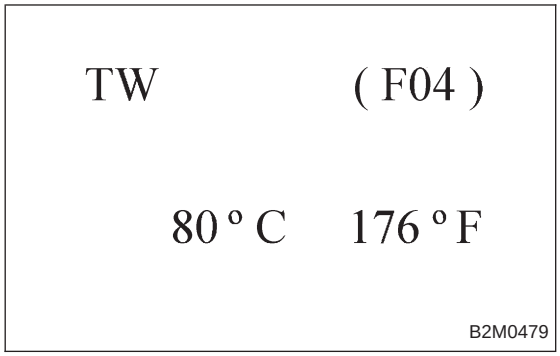


10H2	CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove air intake duct. <Ref. to 2-7 [W1A0].>



3) Remove idle air control solenoid valve by-pass air hose (2200 cc model).
4) Disconnect connector from engine coolant temperature sensor.
5) Turn ignition switch and Subaru Select Monitor or OBD-II general scan tool switch to ON.



6) Read data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F04

● F04: Water temperature is indicated in "°C" and "°F".

CHECK ***: Is the value less than −40°C or −40°F in function mode F04?***

YES : Replace engine coolant temperature sensor.

NO : Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

OBD (FB1)
P0117 <TW_HI>
B2M1068

I: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

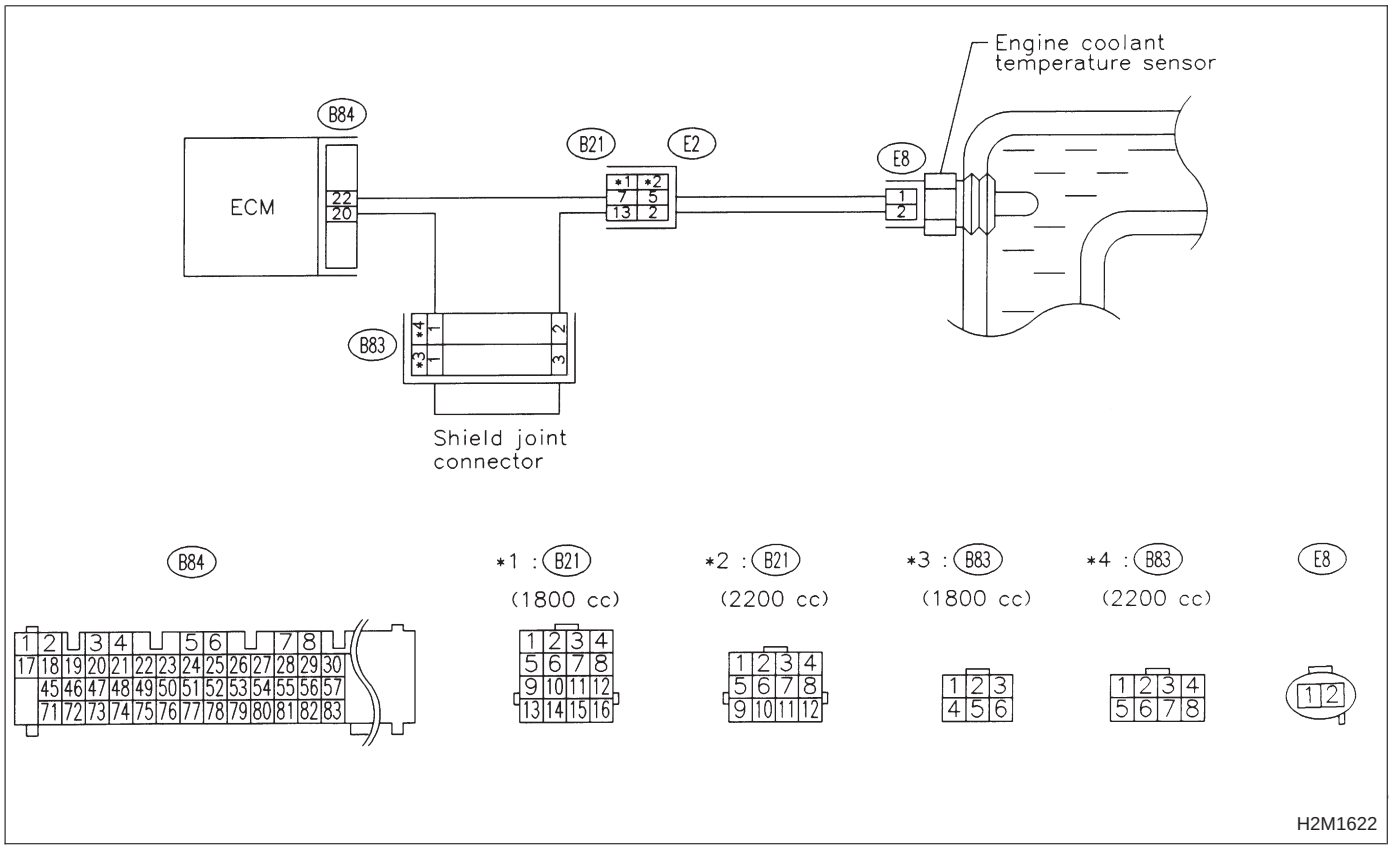
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

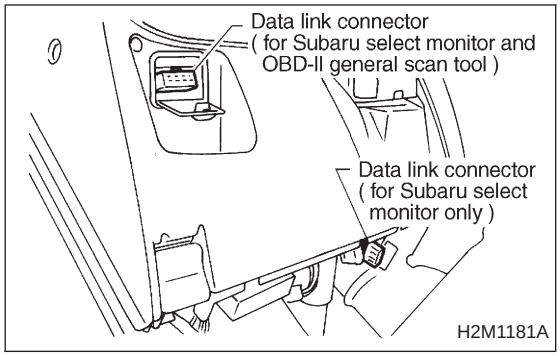
- Hard to start
- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



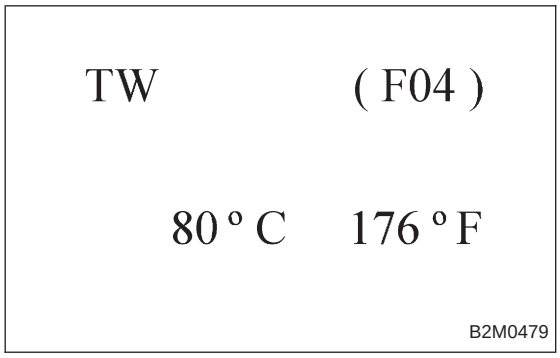
H2M1622

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10I1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F04

- F04: Water temperature is indicated in "°C" and "°F".

CHECK ***: Is the value less than −40°C or −40°F in function mode F04?***

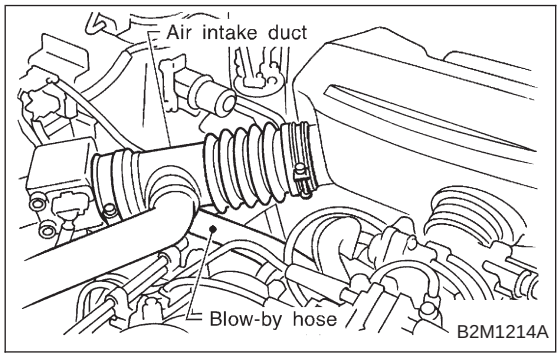
YES : Go to step **10I2**.

NO : Repair poor contact.

NOTE:
In this case, repair the following:

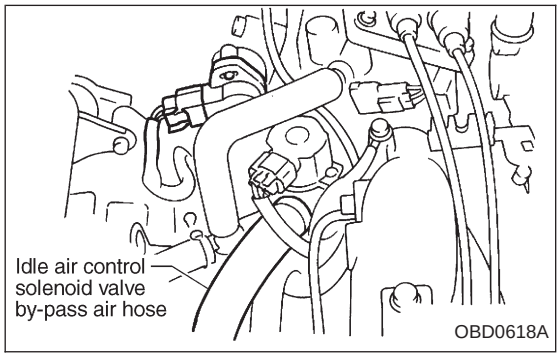
- Poor contact in engine coolant temperature sensor
- Poor contact in ECM
- Poor contact in coupling connector (B21)
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

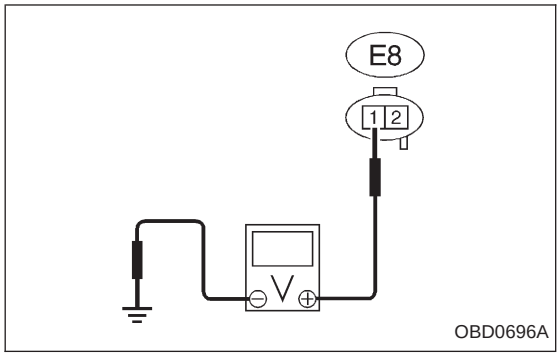


10I2	CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove air intake duct. <Ref. to 2-7 [W1A0].>



3) Remove idle air control solenoid valve by-pass air hose. (2200 cc model)
4) Disconnect connector from engine coolant temperature sensor.



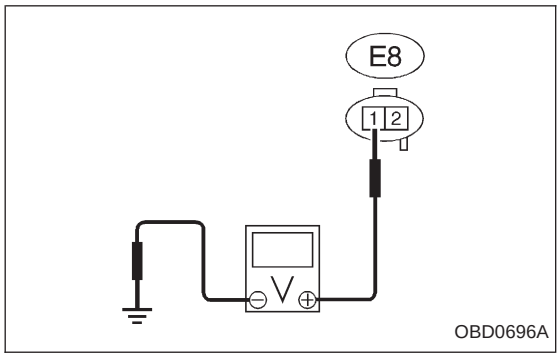
5) Measure voltage between engine coolant temperature sensor connector and engine ground.

Connector & terminal
(E8) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.

NO : Go to next step 6).



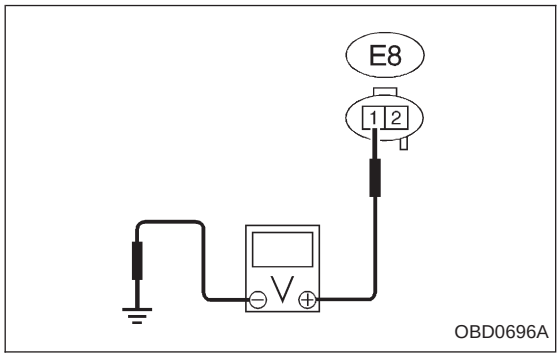
6) Turn ignition switch to ON.
7) Measure voltage between engine coolant temperature sensor connector and engine ground.

Connector & terminal
(E8) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.

NO : Go to step **10I3**.



10I3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.**

1) Measure voltage between engine coolant temperature sensor connector and engine ground.

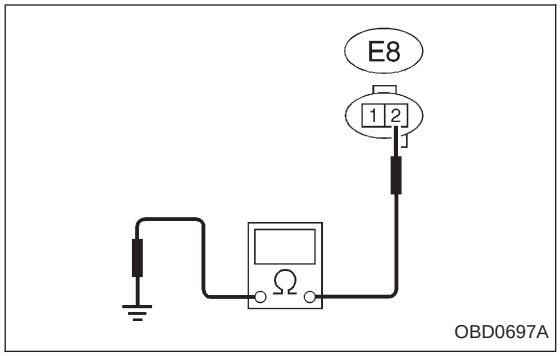
Connector & terminal
(E8) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 4 V?***

YES : Go to next step 2).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and engine coolant temperature sensor connector
- Poor contact in engine coolant temperature sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)



2) Turn ignition switch to OFF.

3) Measure resistance of harness between engine coolant temperature sensor connector and engine ground.

Connector & terminal
(E8) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Replace engine coolant temperature sensor.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and engine coolant temperature sensor connector
- Poor contact in engine coolant temperature sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)
- Poor contact in shield joint connector (B83)

OBD (FB1)

P0121 <TH_RHI>

B2M1069

J: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

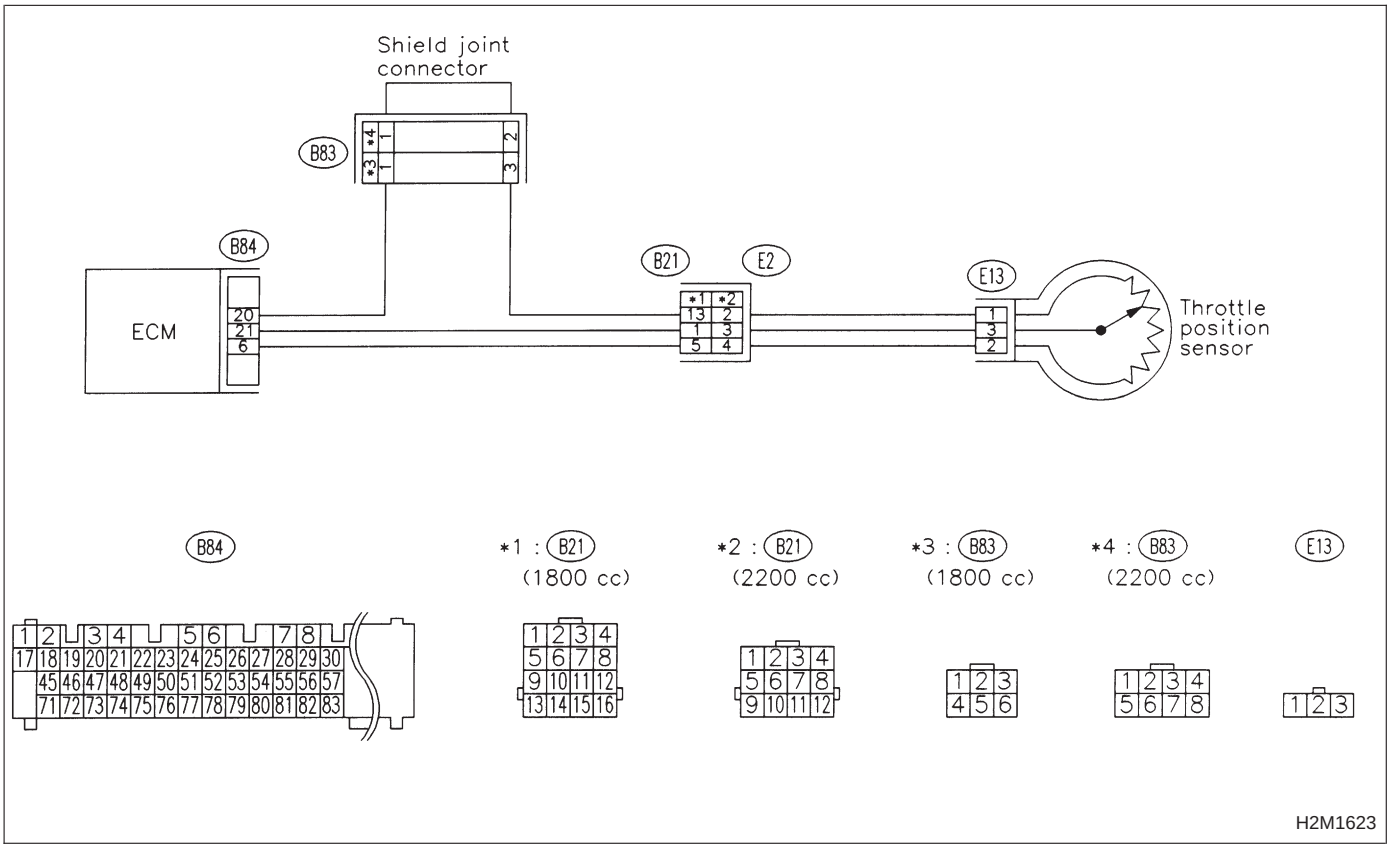
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



H2M1623

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10J1	**CHECK DTC P0122 OR P0123 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0122 or P0123?***

YES : Inspect DTC P0122 or P0123 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0121.

NO : Replace throttle position sensor.

OBD (FB1)

P0122 <THV_LOW>

B2M1070

K: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

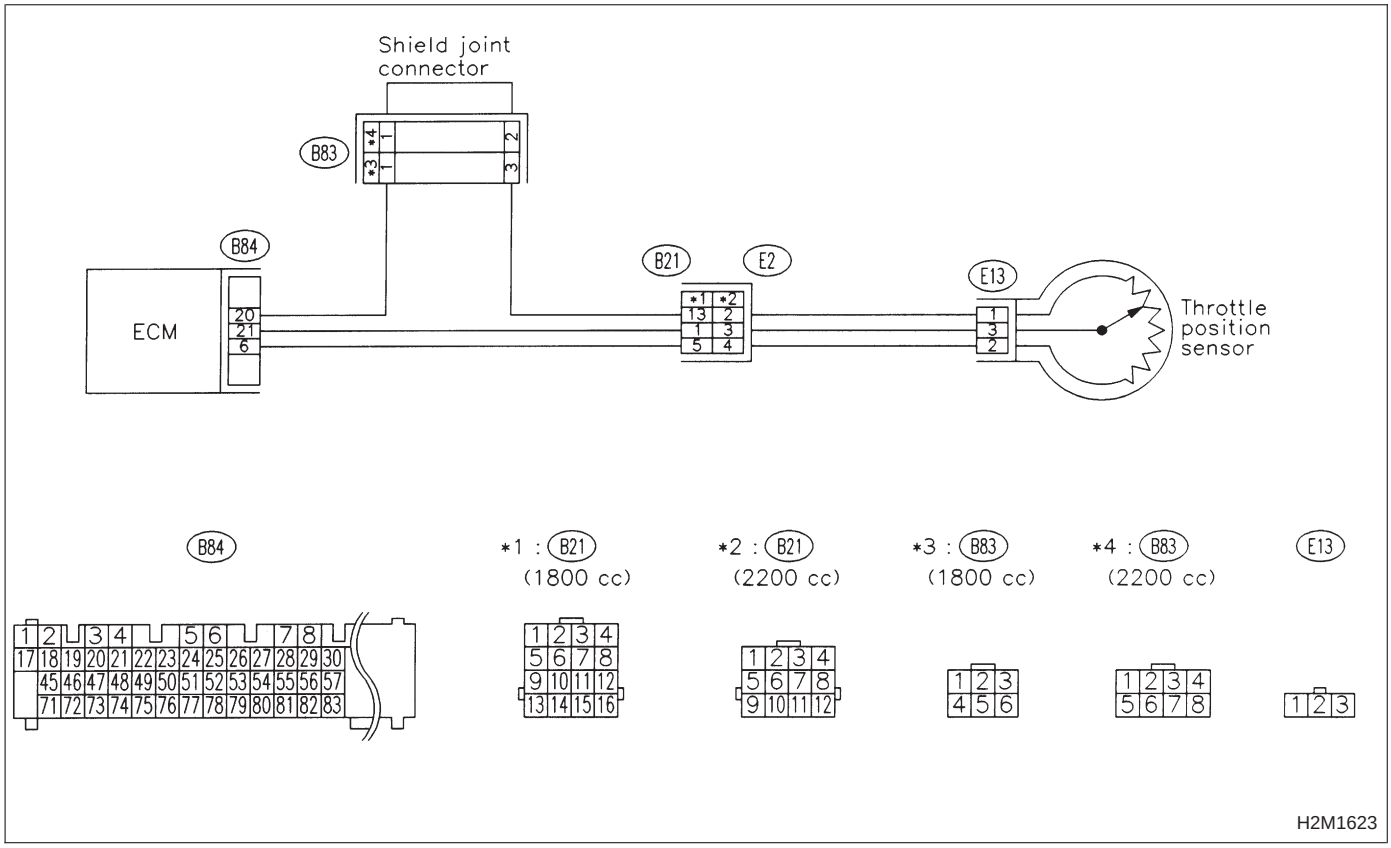
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

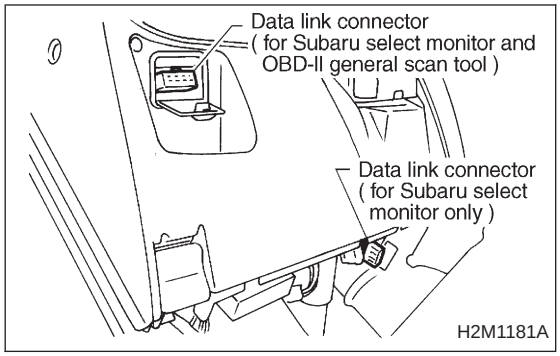
- Erroneous idling
- Engine stalls.
- Poor driving performance

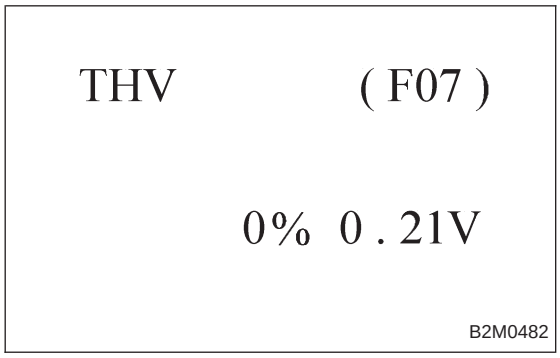
WIRING DIAGRAM:



H2M1623

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10K1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F07

- F07: Throttle position sensor output signal is indicated.

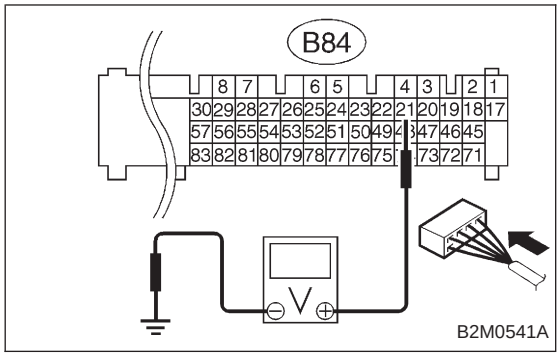
CHECK ***: Is the value less than 0.1 V in function mode F07?***

YES : Go to step **10G2**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in throttle position sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10K2	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER AND SUBARU SELECT MONITOR.)

1) Measure voltage between ECM connector and chassis ground while throttle valve is fully closed.

Connector & terminal
(B84) No. 21 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 2).

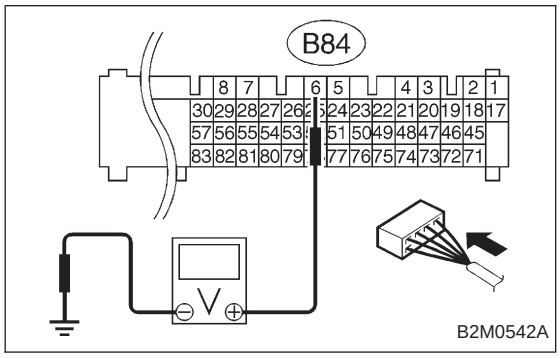
NO : Go to next CHECK .

CHECK ***: Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



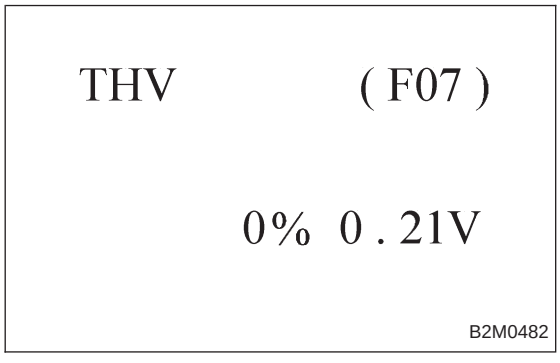
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 6 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.1 V?***

YES : Go to step **10K3**.

NO : Go to next step 3).

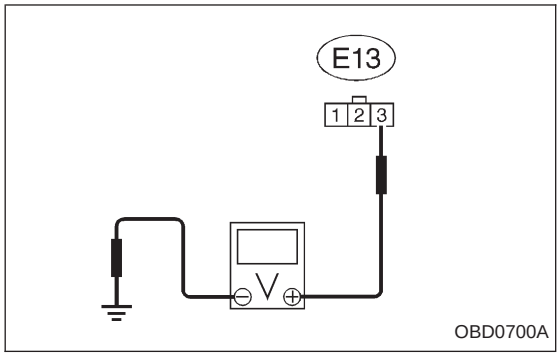


3) Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

YES : Repair poor contact in ECM connector.

NO : Go to step **10K3**.



10K3	CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from throttle position sensor.
3) Turn ignition switch to ON.
4) Measure voltage between throttle position sensor connector and engine ground.

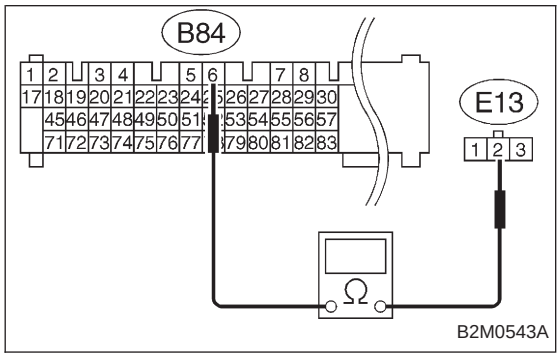
Connector & terminal
(E13) No. 3 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to next step 5).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between throttle position sensor and ECM connector
- Poor contact in throttle position sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)



5) Turn ignition switch to OFF.
6) Measure resistance of harness between ECM connector and throttle position sensor connector.

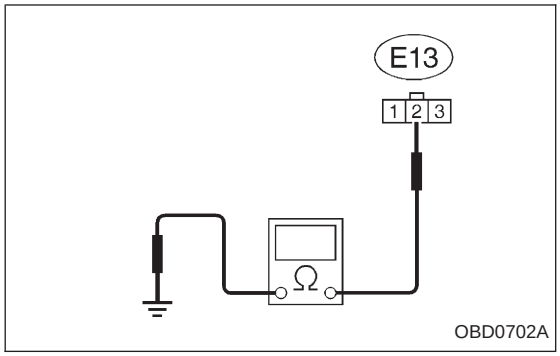
Connector & terminal
(B84) No. 6 — (E13) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 7).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between throttle position sensor and ECM connector
- Poor contact in ECM connector
- Poor contact in throttle position sensor connector
- Poor contact in coupling connector (B21)



7) Measure resistance of harness between throttle position sensor connector and engine ground.

Connector & terminal
(E13) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between throttle position sensor and ECM connector.

NO : Go to step **10K4**.

10K4	CHECK POOR CONTACT.

Check poor contact in throttle position sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in throttle position sensor connector?***

YES : Repair poor contact in throttle position sensor connector.

NO : Replace throttle position sensor.

OBD (FB1)
P0123 <THV_HI>
B2M1071

L: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

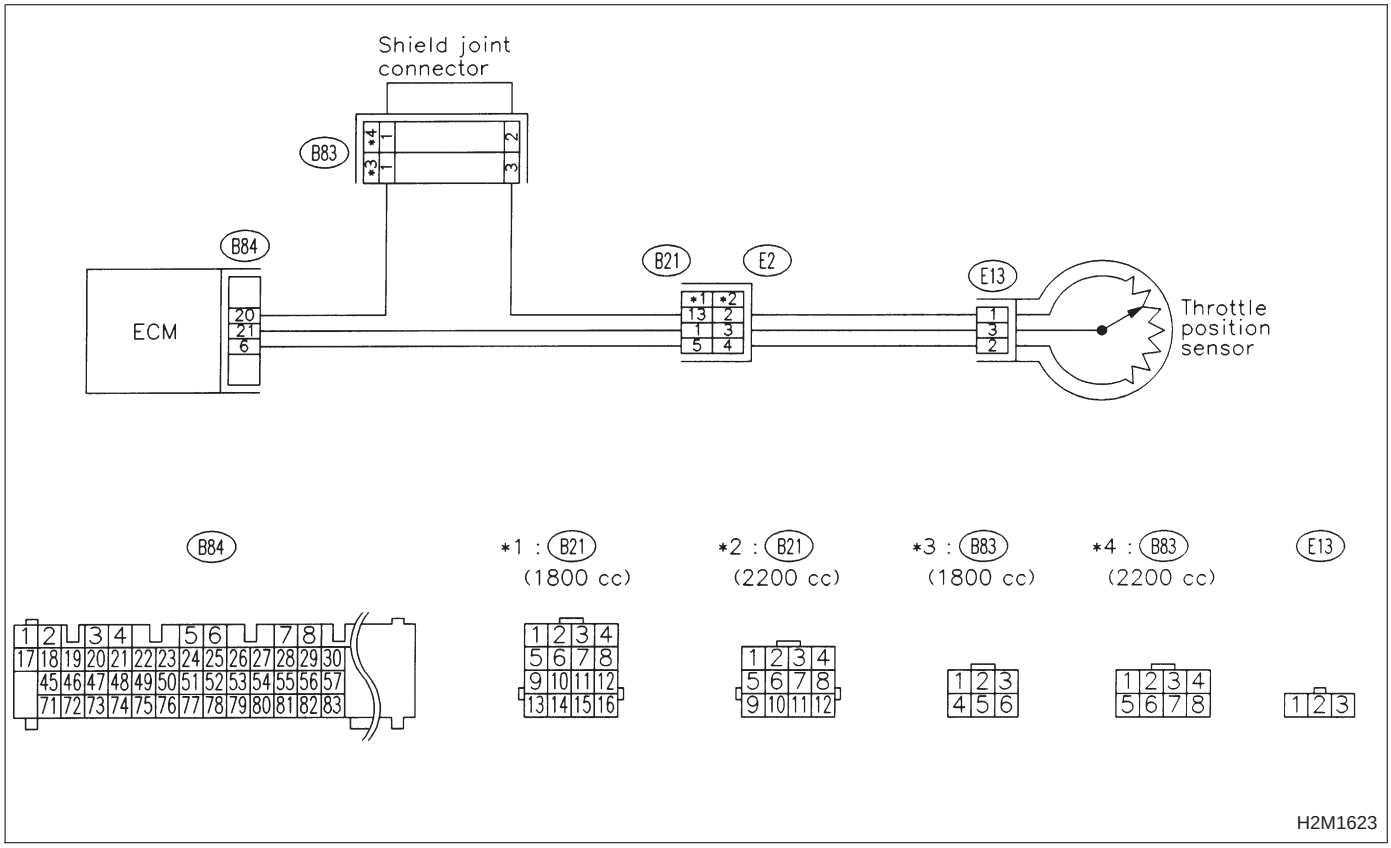
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

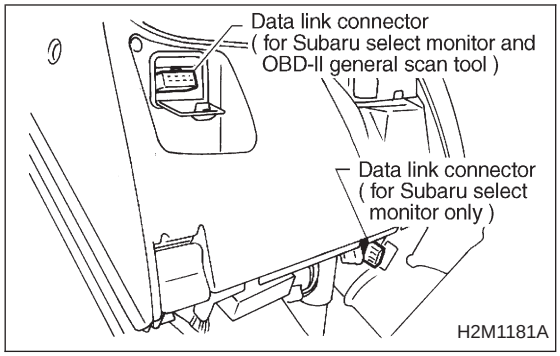
- Erroneous idling
- Engine stalls.
- Poor driving performance

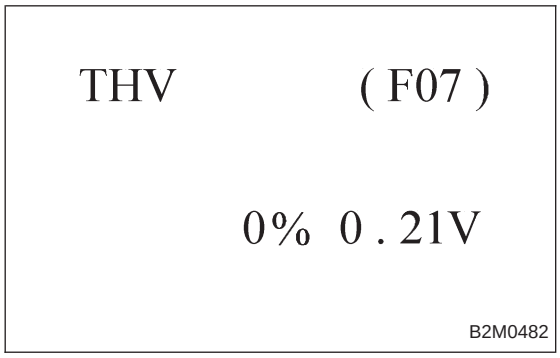
WIRING DIAGRAM:



H2M1623

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10L1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.

5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F07

- F07: Throttle position sensor output signal is indicated.

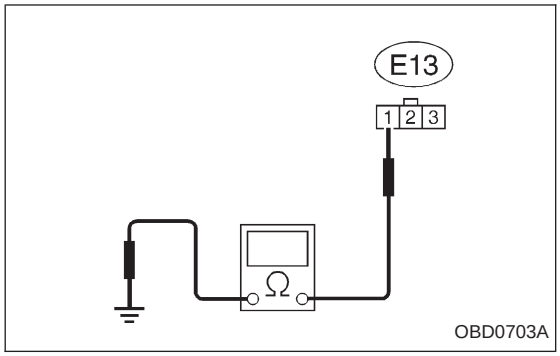
CHECK ***: Is the value more than 4.9 V in function mode F07?***

YES : Go to step **10L2**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in throttle position sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)
- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10L2	CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from throttle position sensor.
3) Measure resistance of harness between throttle position sensor connector and engine ground.

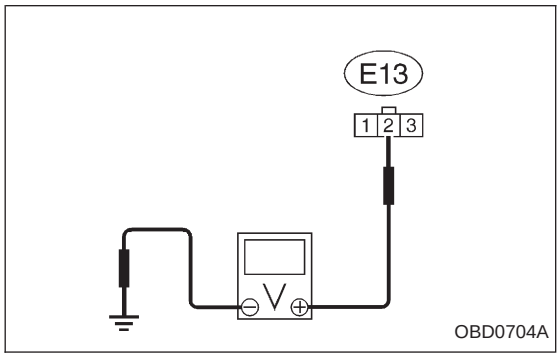
Connector & terminal
(E13) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between throttle position sensor and ECM connector
- Poor contact in shield joint connector (B83)



4) Turn ignition switch to ON.
5) Measure voltage between throttle position sensor connector and engine ground.

Connector & terminal
(E13) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 4.9 V?***

YES : Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM.

NO : Replace throttle position sensor.

OBD (FB1)

P0125 <TW_CL>

OBD0191

M: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

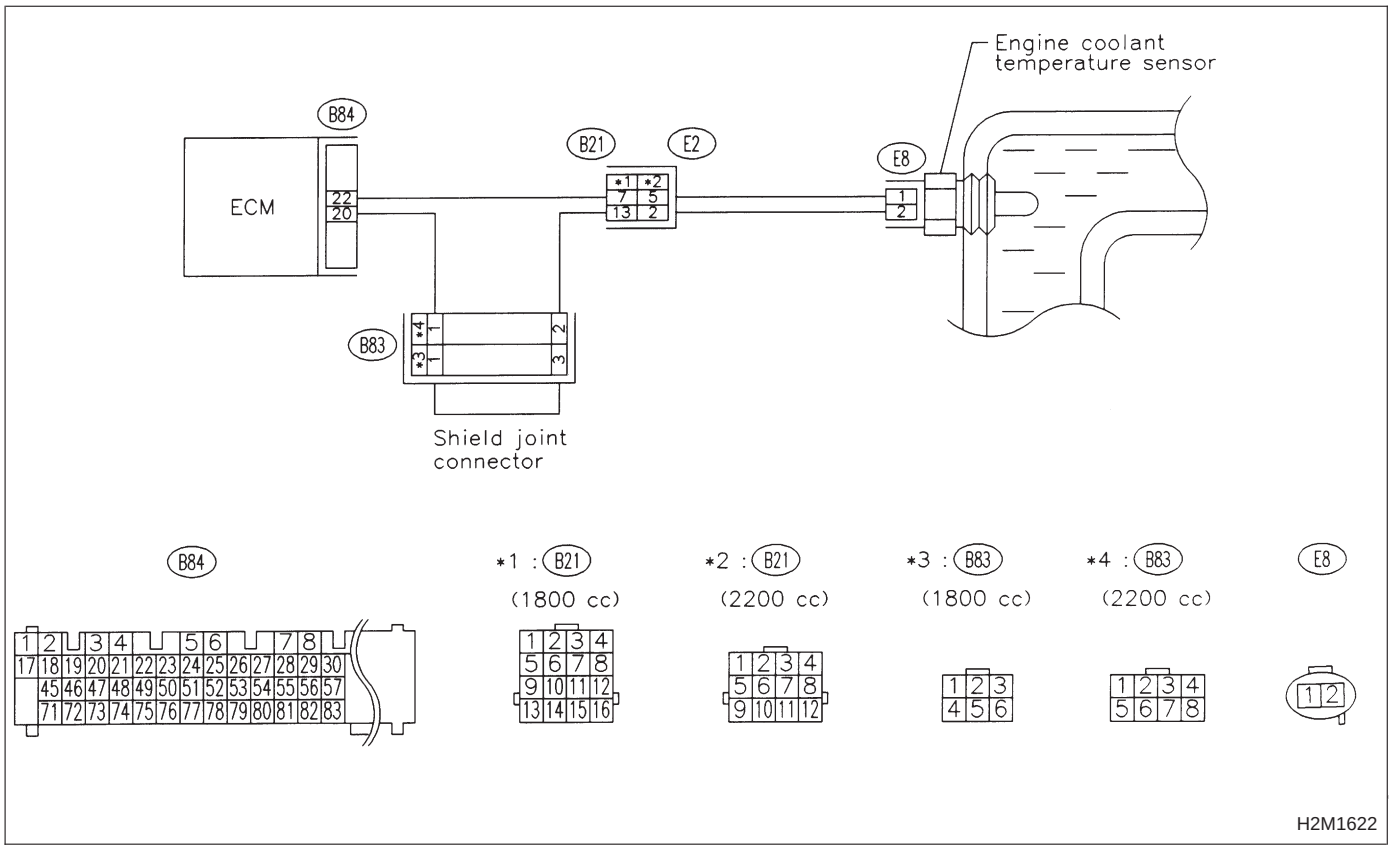
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine would not return to idling.

WIRING DIAGRAM:



H2M1622

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10M1	**CHECK DTC P0116 OR P0117 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0116 or P0117?***

YES : Inspect DTC P0116 or P0117 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0125.

NO : Replace engine coolant temperature sensor.

OBD (FB1)

P0130 <FO2_V>

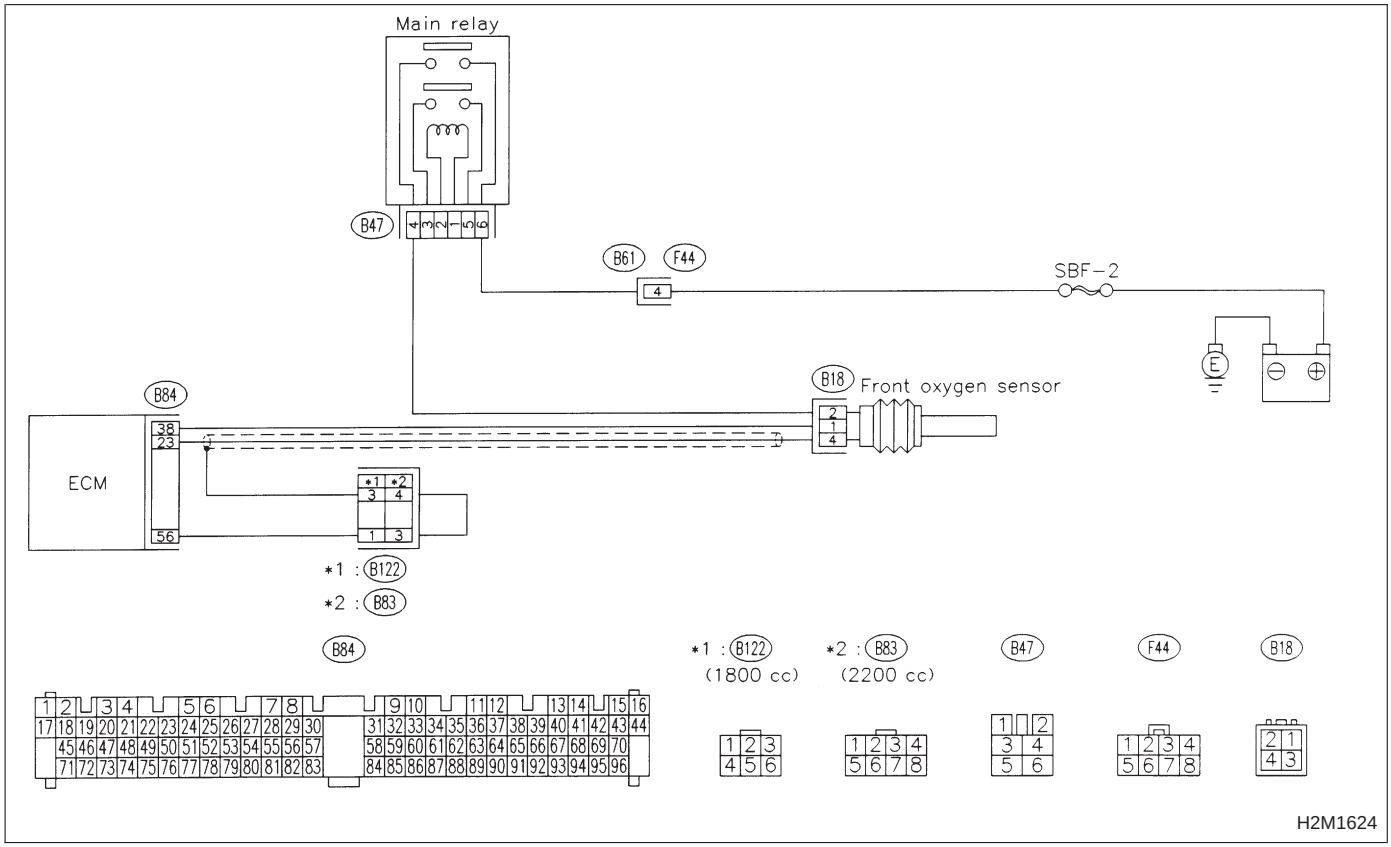
OBD0199

N: DTC P0130 — FRONT OXYGEN SENSOR CIRCUIT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

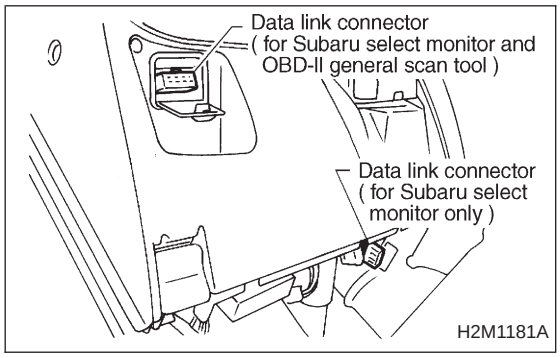
10N1	CHECK FOR OTHER CAUSES AFFECTING EXHAUST GAS.

CHECK ***: Is CO % more than 2 % after engine warm-up?***

YES : Check fuel system.

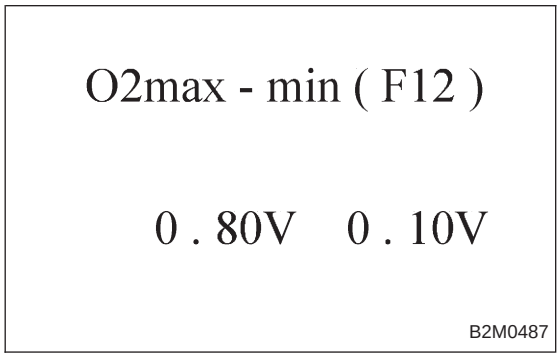
NOTE:
- Check for use of improper fuel.
- Check if engine oil or coolant level is extremely low.

NO : Go to step **10N2**.



10N2	CHECK FRONT OXYGEN SENSOR DATA.

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Start engine and Turn the Subaru Select Monitor and the OBD-II general scan tool switch to ON.
4) Warm-up the engine until coolant temperature is above 70°C (160°F) and keep the engine speed at 2,000 rpm to 3,000 rpm for one minute.



5) Read data on Subaru Select Monitor or the OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F12

- F12: Front oxygen sensor max. and min. output signals are indicated at the same time.

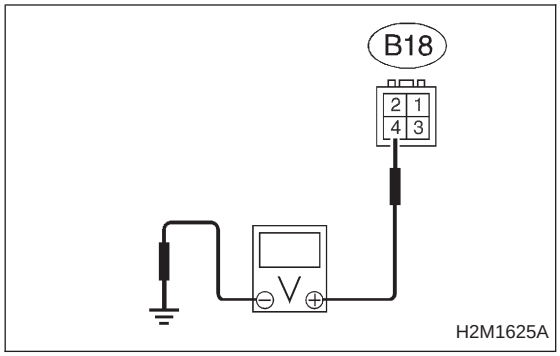
CHECK ***: Is the difference of voltage less than 0.1 V between the value of max. output and min. output with function mode F12?***

YES : Go to step **10N3**.

NO : Replace front oxygen sensor.

- OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10N3	CHECK HARNESS BETWEEN FRONT OXYGEN SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from front oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between front oxygen sensor harness connector and engine ground.

Connector & terminal
(B18) No. 4 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 0.2 V?***

YES : Go to step **10N4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and front oxygen sensor connector
- Poor contact in the ECM connector

10N4	CHECK POOR CONTACT.

Check poor contact in front oxygen sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in front oxygen sensor connector?***

YES : Repair poor contact in front oxygen sensor connector.

NO : Replace front oxygen sensor.

OBD (FB1)

P0133 <FO2_R>

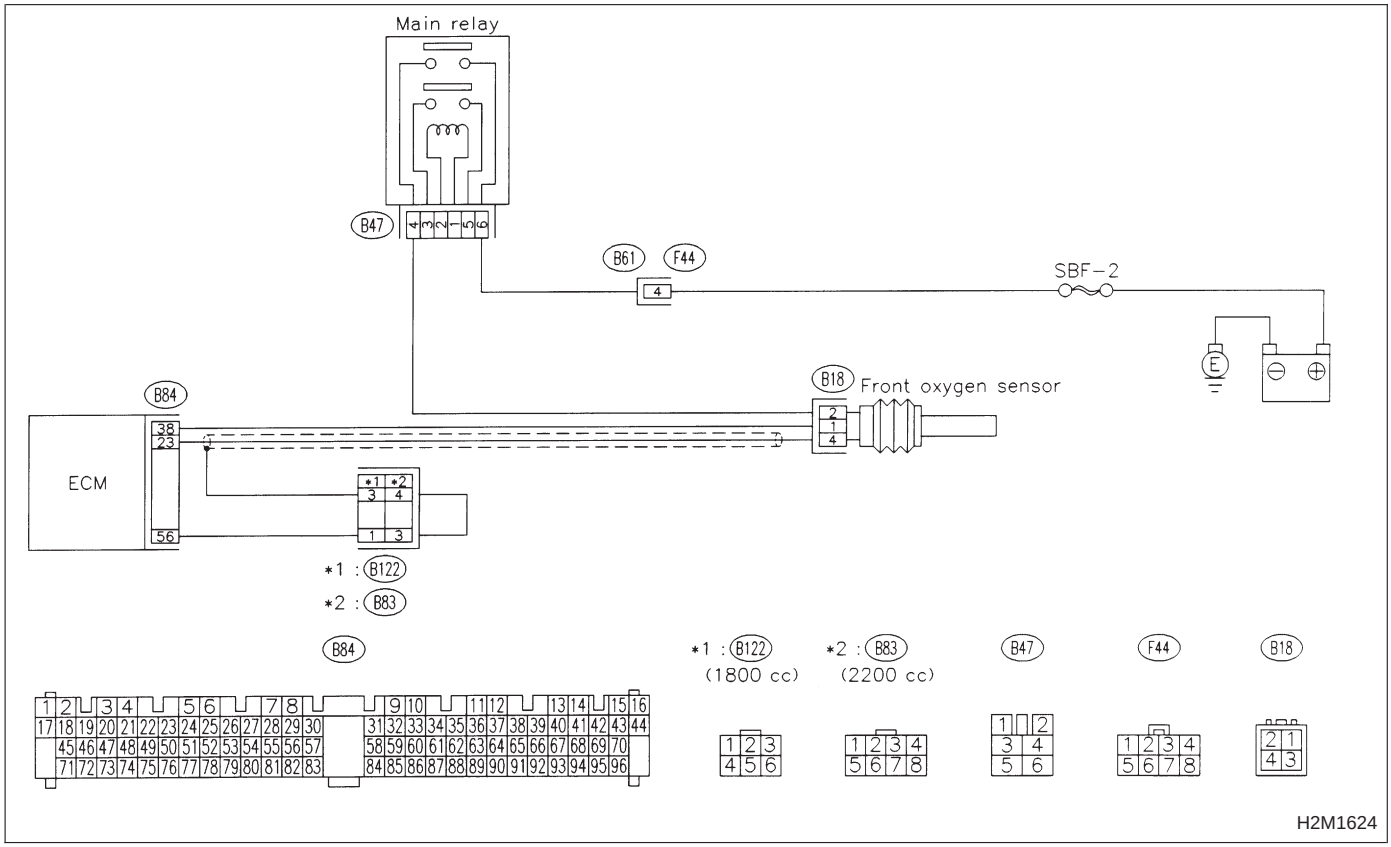
OBD0209

O: DTC P0133 — FRONT OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10O1	CHECK DTC P0130 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0130?***

YES : Inspect DTC P0130 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0133.

NO : Go to step **10O2**.

10O2	CHECK EXHAUST SYSTEM.

CHECK : ***Is there a fault in exhaust system?***

NOTE:
Check the following items.
- Loose installation of front portion of exhaust pipe onto cylinder heads
- Loose connection between front exhaust pipe and front catalytic converter
- Damage of exhaust pipe resulting in a hole

YES : Repair exhaust system.

NO : Replace front oxygen sensor.

OBD (FB1)

P0135 <FO2H>

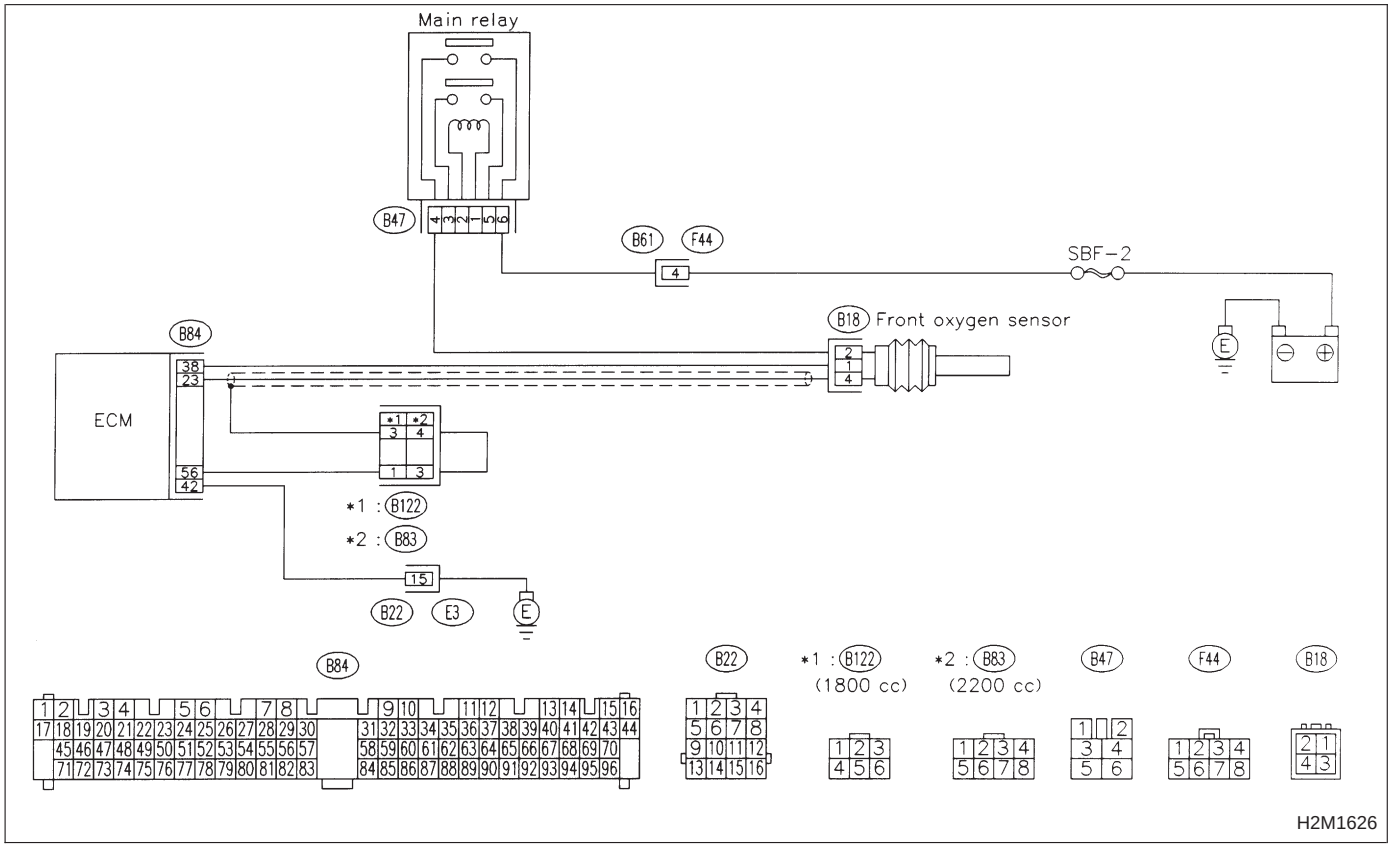
OBD0212

P: DTC P0135 — FRONT OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



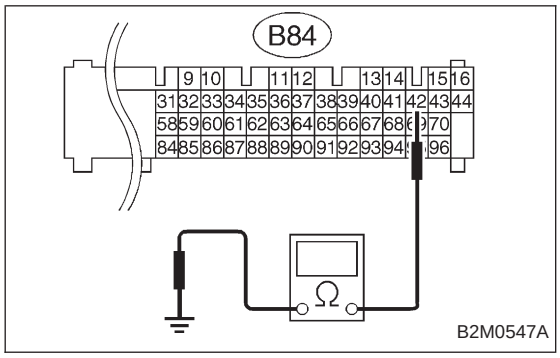
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10P1	CHECK DTC P0141 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0135 and P0141 at the same time?***

YES : Go to next step 1).

NO : Go to step **10P2**.



1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

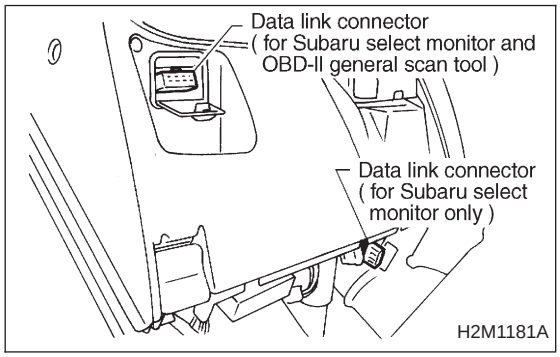
Connector & terminal
(B84) No. 42 — Chassis ground:

CHECK : ***Is the resistance less than 5 Ω?***

YES : Repair poor contact in ECM connector.

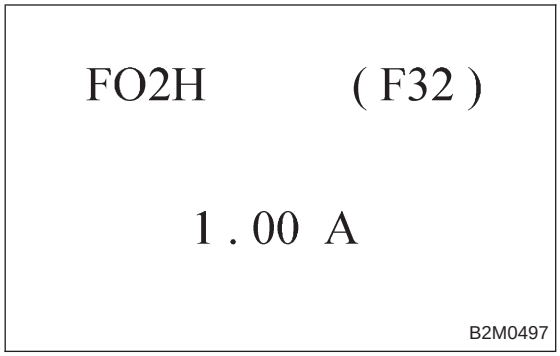
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and coupling connector (B22)
- Open circuit in harness between coupling connector (B22) and engine grounding terminal
- Poor contact in front oxygen sensor connector
- Poor contact in coupling connector (B22)



10P2	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F32

- F32: Front oxygen sensor heater current is indicated.

CHECK ***: Is the value more than 0.2 A in function mode F32?***

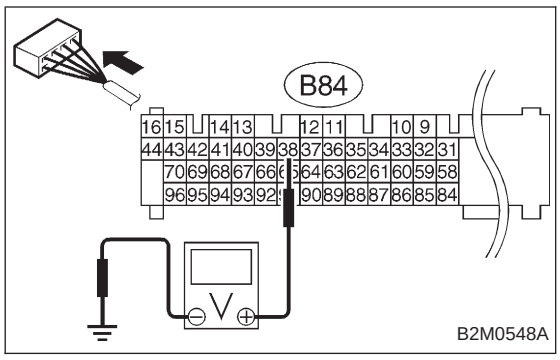
YES : Repair connector.

NOTE:
In this case, repair the following:
- Poor contact in front oxygen sensor connector
- Poor contact in ECM connector

NO : Go to step **10P3**.

- OBD-II scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10P3	CHECK OUTPUT SIGNAL FROM ECM. (USING VOLTAGE METER.)

1) Start and idle the engine.
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 38 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1.0 V?***

YES : Go to step **10P4**.

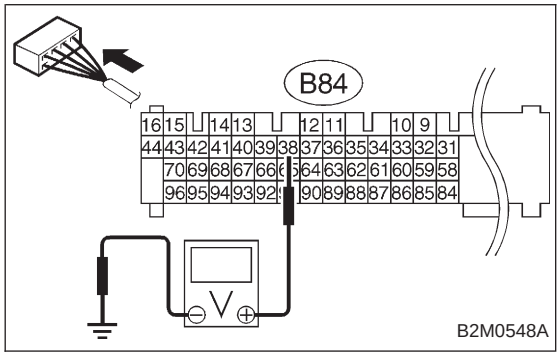
NO : Go to next step 3).

3) Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Go to next step 4).



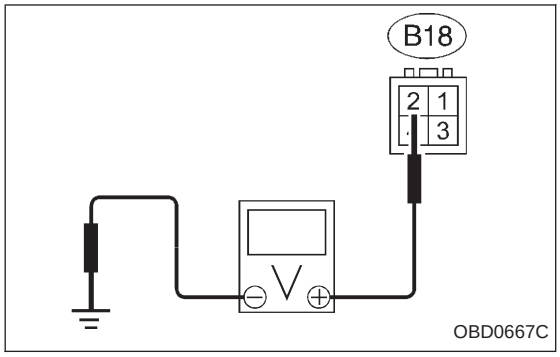
4) Disconnect connector from front oxygen sensor.
5) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 38 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1.0 V?***

YES : Replace ECM.

NO : Repair battery short circuit in harness between ECM and front oxygen sensor connector. After repair, replace ECM.



10P4	CHECK POWER SUPPLY TO FRONT OXYGEN SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from front oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between front oxygen sensor connector and engine ground.

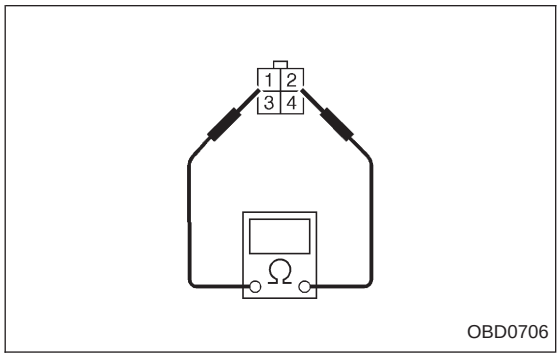
Connector & terminal
(B18) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10P5**.

NO : Repair power supply line.

NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and front oxygen sensor connector
- Poor contact in front oxygen sensor connector
- Poor contact in main relay connector



10P5	CHECK FRONT OXYGEN SENSOR.

1) Turn ignition switch to OFF.
2) Measure resistance between front oxygen sensor connector terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 30 Ω?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between front oxygen sensor and ECM connector
- Poor contact in front oxygen sensor connector
- Poor contact in ECM connector

NO : Replace front oxygen sensor.

OBD (FB1)

P0136 <RO2_V>

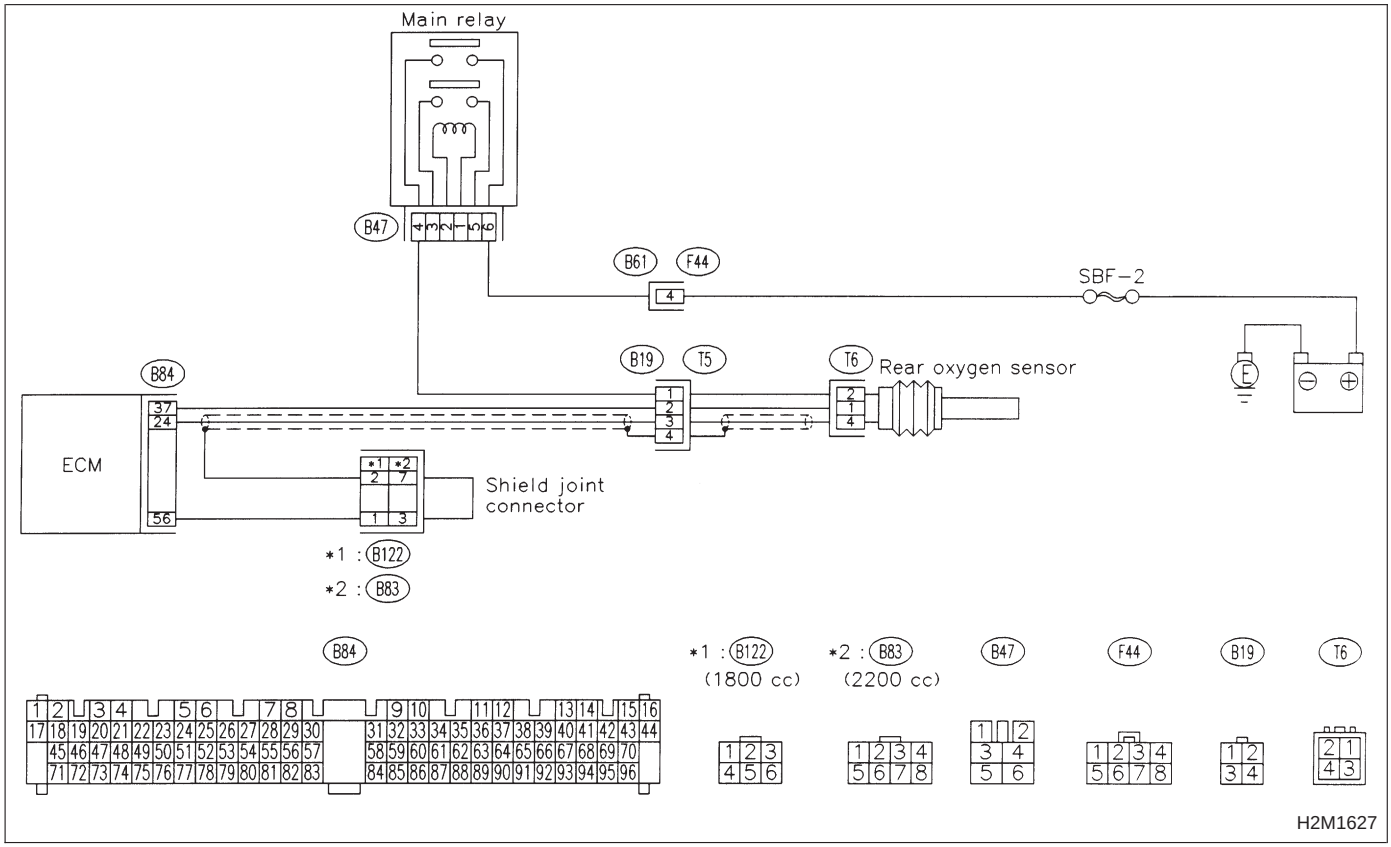
OBD0220

Q: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10Q1	CHECK DTC P0130 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0130?***

YES : Go to step **10Q2**.

NO : Go to step **10Q3**.

10Q2	CHECK FAILURE CAUSE OF P0130.

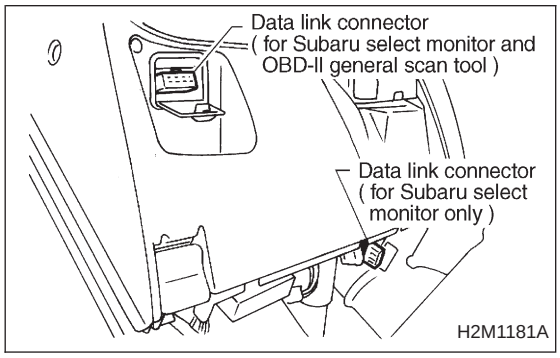
Perform the step **10N1** of DTC P0130. <Ref. to 2-7 [T10N1].>

CHECK : ***Is the failure cause of P0130 in the fuel system?***

YES : Check fuel system.

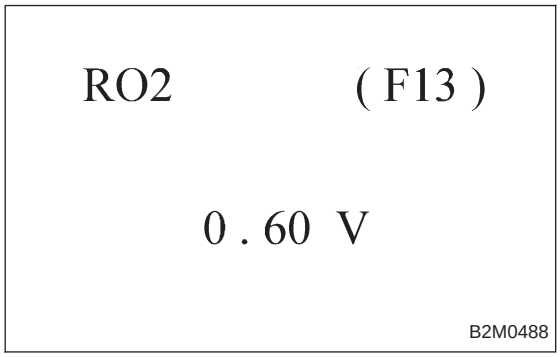
NOTE:
In this case, it is not necessary to inspect DTC P0136.

NO : Go to step **10Q3**.



10Q3	CHECK REAR OXYGEN SENSOR DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or OBD-II general scan tool to data link connector.
3) Start the engine, and turn Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Warm-up the engine until engine coolant temperature is above 70°C (160°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

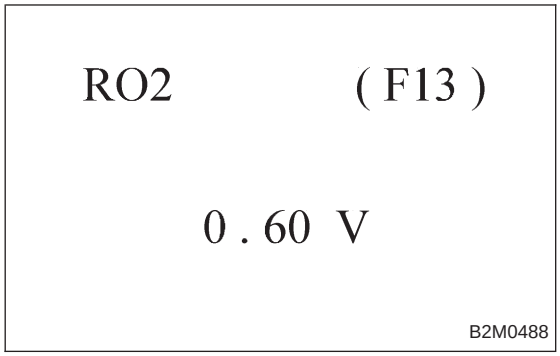
Function mode: F13

- F13: Rear oxygen sensor output signal is indicated.

CHECK : ***Does the value fluctuate in function mode F13?***

YES : Go to step **10Q5**.

NO : Go to next step 6).



6) Read data on Subaru Select Monitor or OBD-II General Scan Tool.

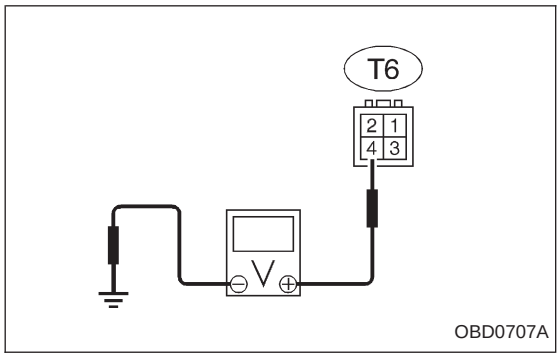
CHECK ***: Is the value fixed between 0.2 and 0.4 V in function mode F13?***

YES : Go to step **10Q4**.

NO : Replace rear oxygen sensor.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10Q4	CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from rear oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground.

Connector & terminal
(T6) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 0.2 V?***

YES : Replace rear oxygen sensor.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between rear oxygen sensor and ECM connector
● Poor contact in rear oxygen sensor connector
● Poor contact in ECM connector
● Poor contact in rear oxygen sensor connecting harness connector

10Q5	CHECK EXHAUST SYSTEM.

CHECK ***: Is there a fault in exhaust system?***

NOTE:
Check the following items.
● Loose installation of portions
● Damage (crack, hole etc.) of parts
● Looseness and ill fitting of parts between front oxygen sensor and rear oxygen sensor

YES : Repair or replace faulty parts.

NO : Replace rear oxygen sensor.

OBD	(FB1)
P0139	<RO2_R>

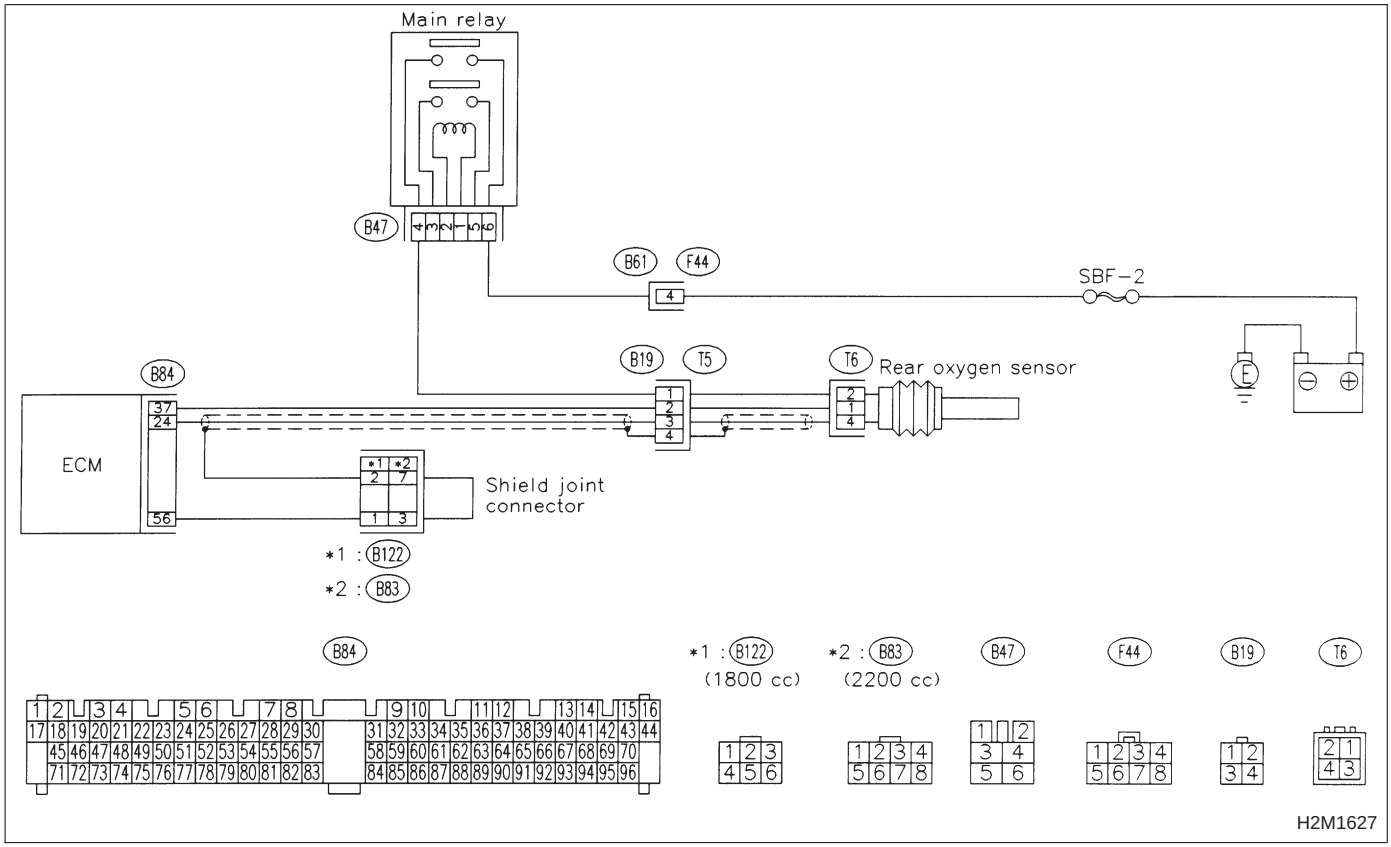
OBD0229

R: DTC P0139
— REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10R1	CHECK DTC P0136 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0136?***

YES : Inspect DTC P0136 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0139.

NO : Replace rear oxygen sensor.

OBD (FB1)

P0141 <RO2H>

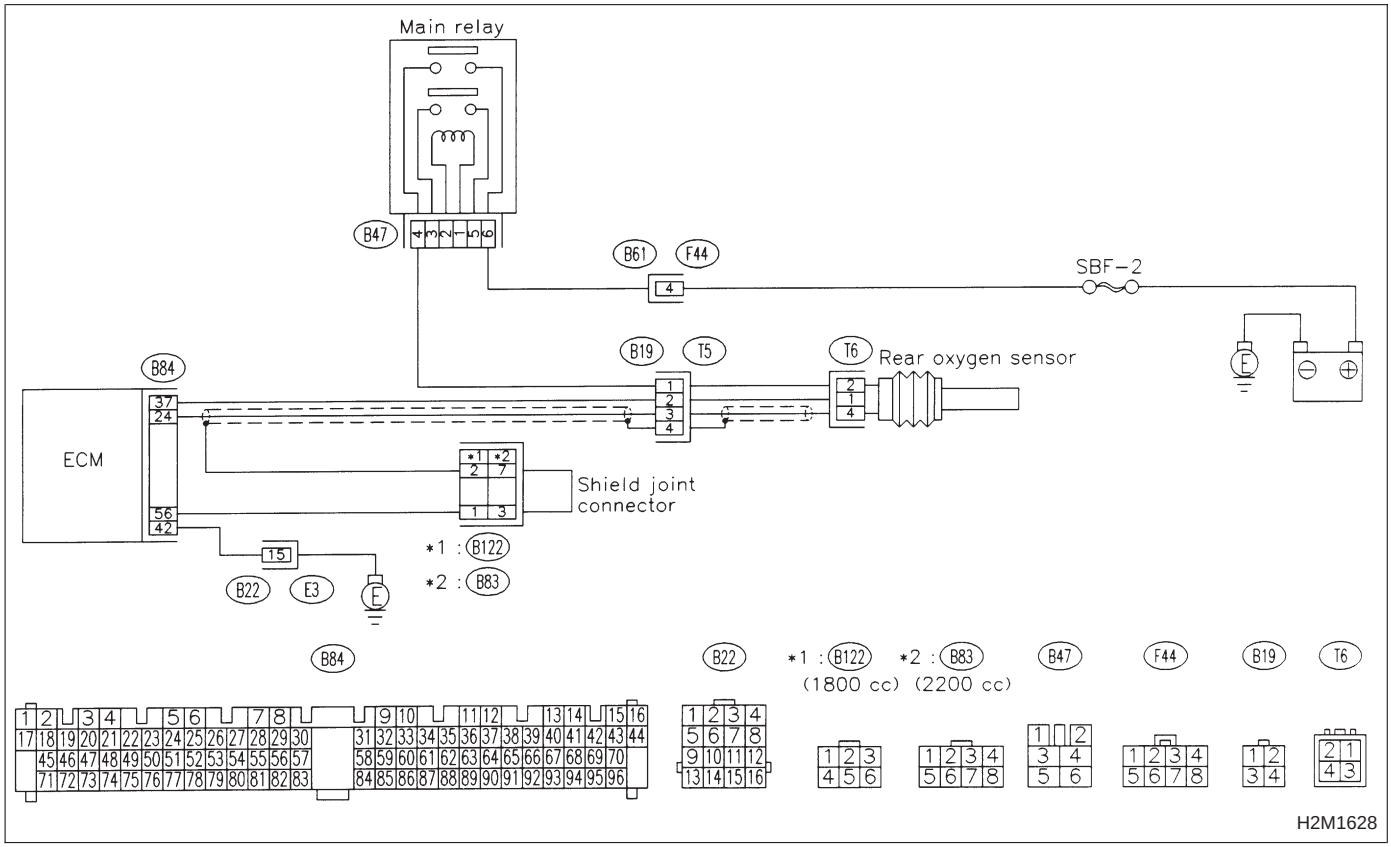
OBD0232

S: DTC P0141 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



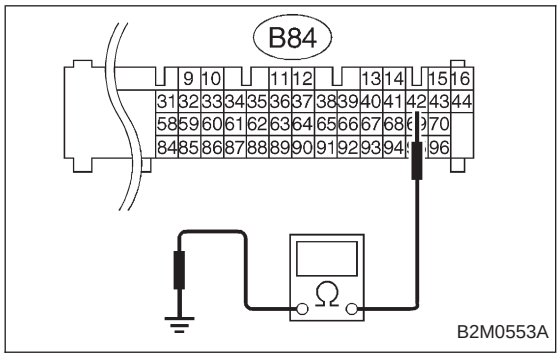
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10S1	CHECK DTC P0135 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0141 and P0135 at the same time?***

YES : Go to next step 1).

NO : Go to step **10S2**.



1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

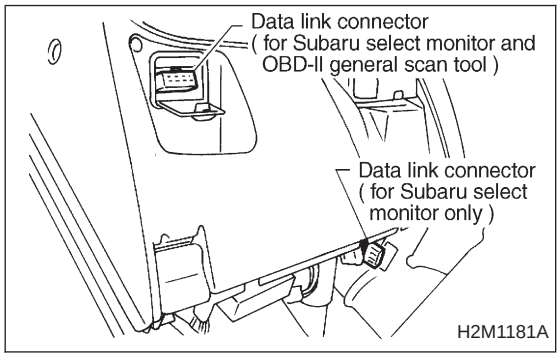
Connector & terminal
(B84) No. 42 — Chassis ground:

CHECK : ***Is the resistance less than 5 Ω?***

YES : Repair poor contact in ECM connector.

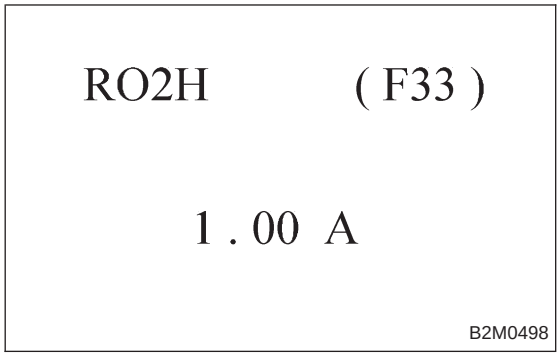
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and coupling connector (B22)
- Open circuit in harness between coupling connector (B22) and engine grounding terminal
- Poor contact in engine grounding terminal
- Poor contact in coupling connector (B22)



10S2	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.
- Subaru Select Monitor

Designate mode using function key.

Function mode: F33

- F33: Rear oxygen sensor heater current is indicated.

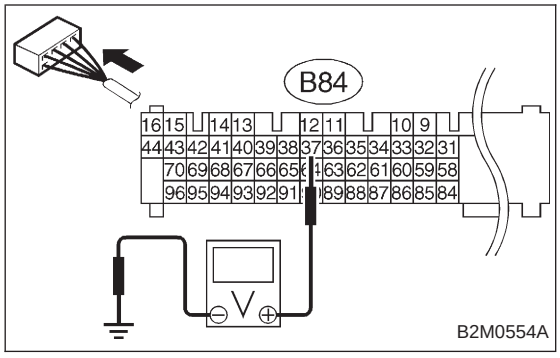
CHECK ***: Is the value more than 0.2 A in function mode F33?***

YES : Repair connector.

NOTE:
In this case, repair the following:
- Poor contact in rear oxygen sensor connector
- Poor contact in rear oxygen sensor connecting harness connector
- Poor contact in ECM connector

NO : Go to step **10S3**.
- OBD-II scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10S3	CHECK OUTPUT SIGNAL FROM ECM. (USING VOLTAGE METER.)

1) Start and idle the engine.
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 37 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1.0 V?***

YES : Go to step **10S4**.

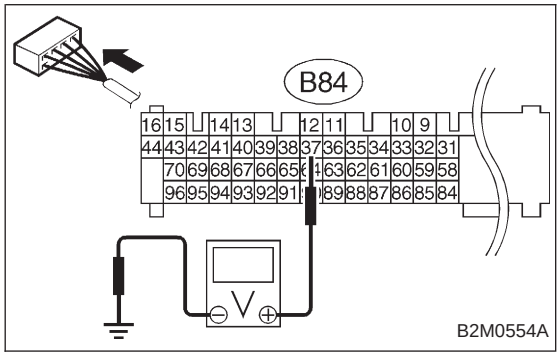
NO : Go to next step 3).

3) Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Go to next step 4).



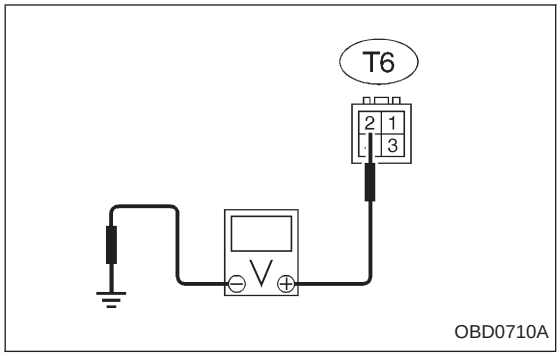
4) Disconnect connector from rear oxygen sensor.
5) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 37 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1.0 V?***

YES : Replace ECM.

NO : Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM.



10S4	CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from rear oxygen sensor.
3) Turn ignition switch to ON.
4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground.

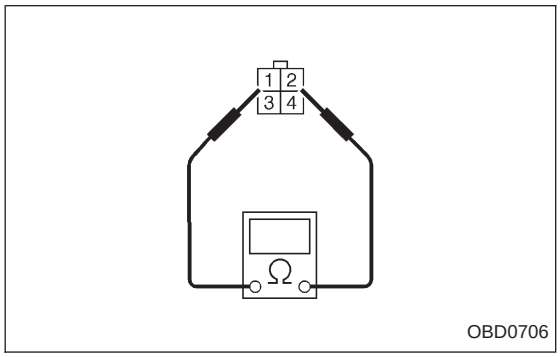
Connector & terminal
(T6) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10S5**.

NO : Repair power supply line.

NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and rear oxygen sensor connector
- Poor contact in rear oxygen sensor connector
- Poor contact in rear oxygen sensor connecting harness connector



10S5	CHECK REAR OXYGEN SENSOR.

1) Turn ignition switch to OFF.
2) Measure resistance between rear oxygen sensor connector terminals.

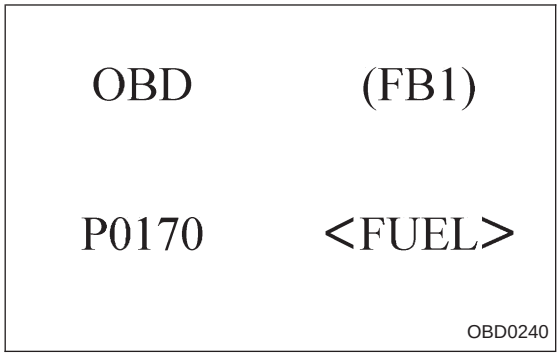
Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 30 Ω?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between rear oxygen sensor and ECM connector
- Poor contact in rear oxygen sensor connector
- Poor contact in ECM connector
- Poor contact in rear oxygen sensor connecting harness connector

NO : Replace rear oxygen sensor.



T: DTC P0170
— FUEL TRIM MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7 [T3D0] and [T3E0].>

10T1	CHECK EXHAUST SYSTEM.

CHECK : ***Are there holes or loose bolts on exhaust system?***

YES : Repair exhaust system.

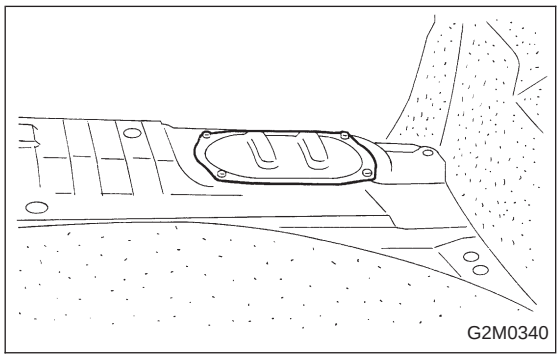
NO : Go to step **10T2**.

10T2	CHECK AIR INTAKE SYSTEM.

CHECK : ***Are there holes, loose bolts or disconnection of hose on air intake system?***

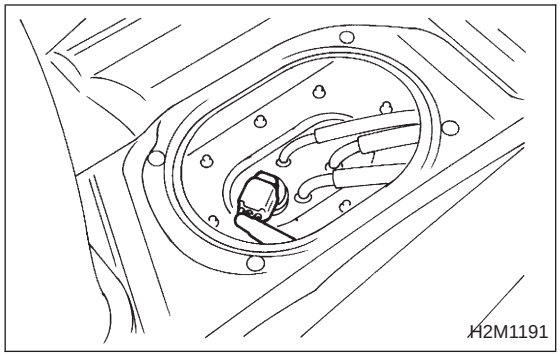
YES : Repair air intake system.

NO : Go to step **10T3**.

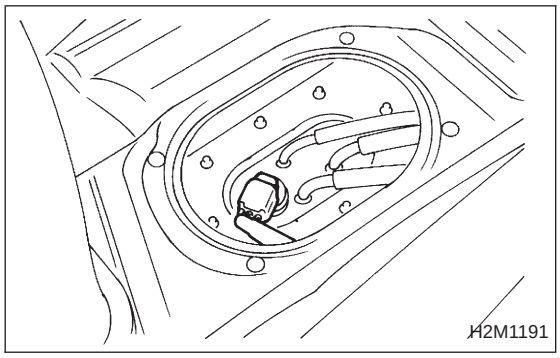


10T3	CHECK FUEL PRESSURE.

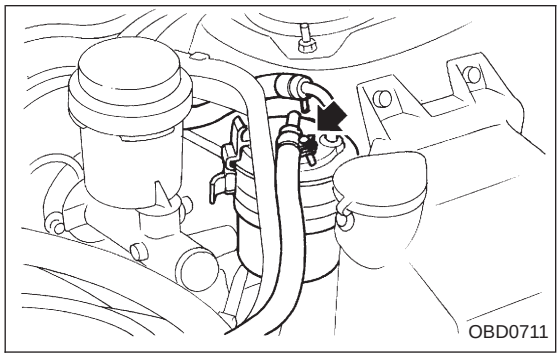
1) Release fuel pressure.
   (1) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).



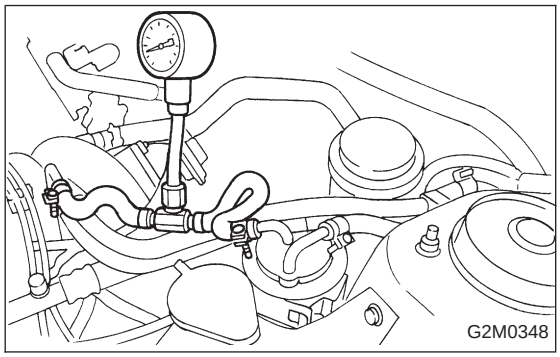
(2) Disconnect connector from fuel tank.
(3) Start the engine, and run it until it stalls.
(4) After stopping the engine, crank the engine for 5 to 7 seconds to reduce fuel pressure.
(5) Turn ignition switch to OFF.



2) Connect connector to fuel tank.



3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge.



4) Start the engine and idle while gear position is neutral.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

CHECK ***: Is fuel pressure between 226 and 275 kPa (2.3 — 2.8 kg/cm^2, 33 — 40 psi)?***

YES : Go to next step 6).

NO : Repair the following items.

Fuel pressure too high	• Clogged fuel return line or bent hose
Fuel pressure too low	• Improper fuel pump discharge • Clogged fuel supply line

6) After connecting pressure regulator vacuum hose, measure fuel pressure.

CHECK ***: Is fuel pressure between 157 and 206 kPa (1.6 — 2.1 kg/cm^2, 23 — 30 psi)?***

YES : Go to step **10T4**.

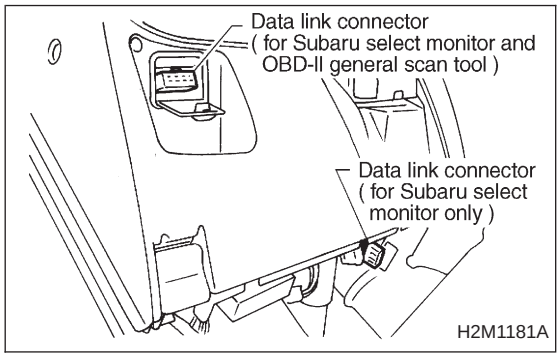
NO : Repair the following items.

Fuel pressure too high	● Faulty pressure regulator ● Clogged fuel return line or bent hose
Fuel pressure too low	● Faulty pressure regulator ● Improper fuel pump discharge ● Clogged fuel supply line

WARNING:
Before removing fuel pressure gauge, release fuel pressure.

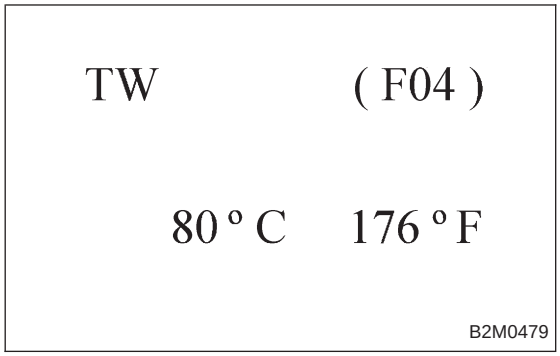
NOTE:

● If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.
● If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.



10T4	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** **<REF. TO 2-7 [T10H0] OR [T10I0].>**

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Start the engine and warm-up completely.



4) Read data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F04

● F04: Water temperature is indicated in "°C" and "°F".

CHECK ***: Is temperature greater than 60°C or 140°F in function mode F04?***

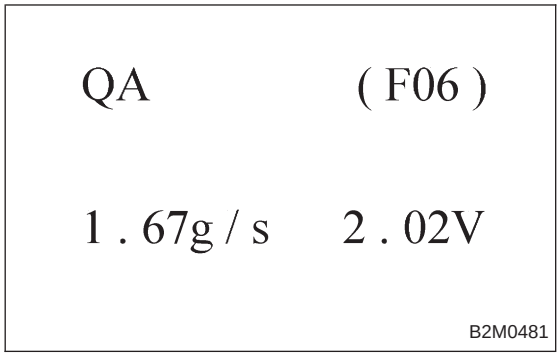
YES : Go to step **10T5**.

NO : Replace engine coolant temperature sensor.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

10T5	CHECK MASS AIR FLOW SENSOR.

1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).
2) Place the selector lever in "N" or "P" position.
3) Turn A/C switch to OFF.
4) Turn all accessory switches to OFF.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F06

● F06: Mass air flow and voltage input from mass air flow sensor are shown on display.

CHECK ***: Is the voltage in function mode F06 within the specifications shown in the following table?***

Model	Engine speed	Specified value
1800 cc	Idling	1.6 — 2.8 (g/sec)
	2,500 rpm	6.1 — 10.3 (g/sec)
2200 cc	Idling	1.7 — 3.3 (g/sec)
	2,500 rpm	7.1 — 14.2 (g/sec)

YES : Contact with SOA service.
NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

NO : Replace mass air flow sensor.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

OBD (FB1)

P0181 <TNKT_F>

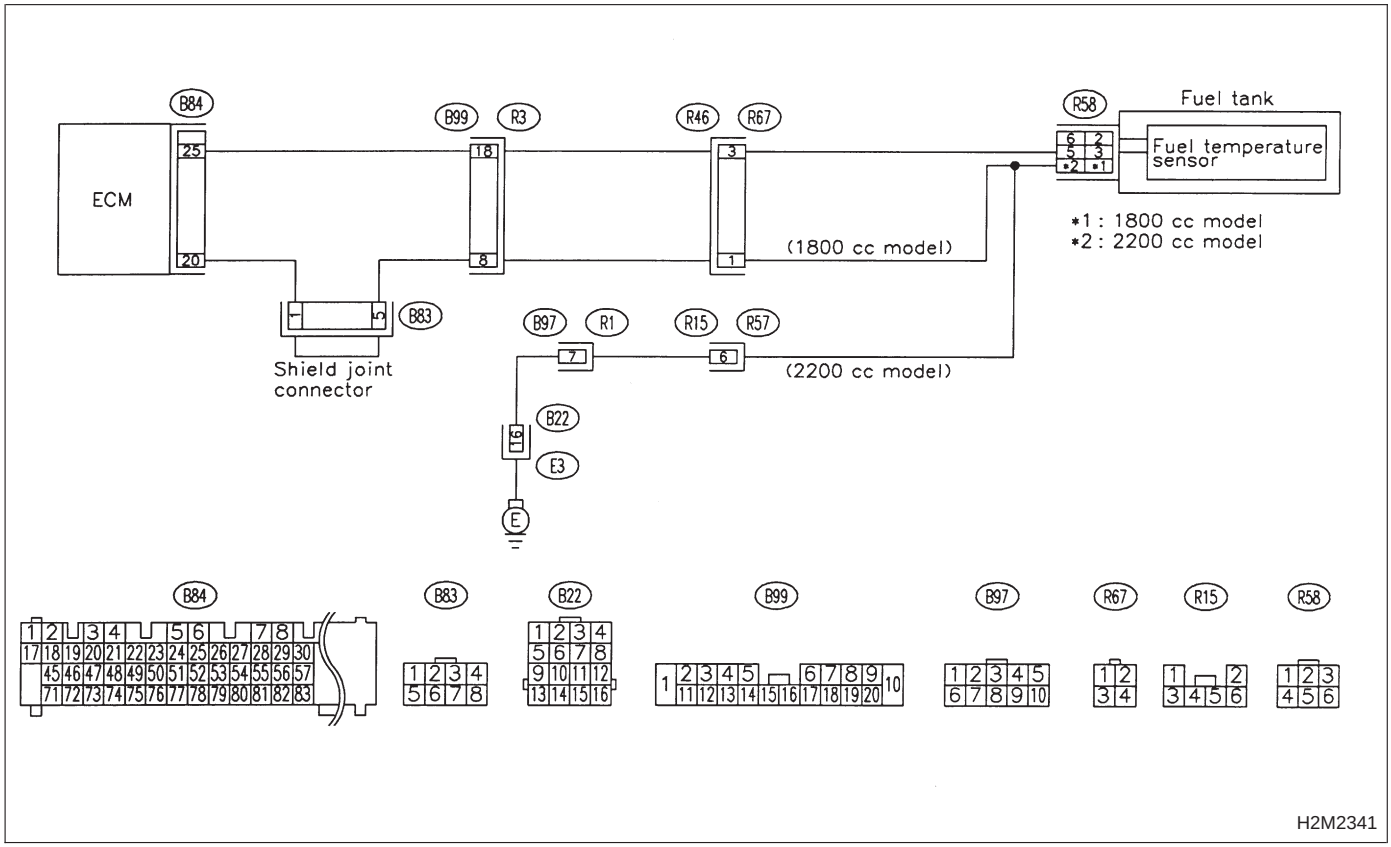
H2M1350

U: DTC P0181
— FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



H2M2341

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10U1	**CHECK DTC P0182 OR P0183 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0182 or P0183?***

YES : Inspect DTC P0182 or P0183 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0181.

NO : Replace fuel temperature sensor.

OBD (FB1)

P0182 <TNKT_LOW>

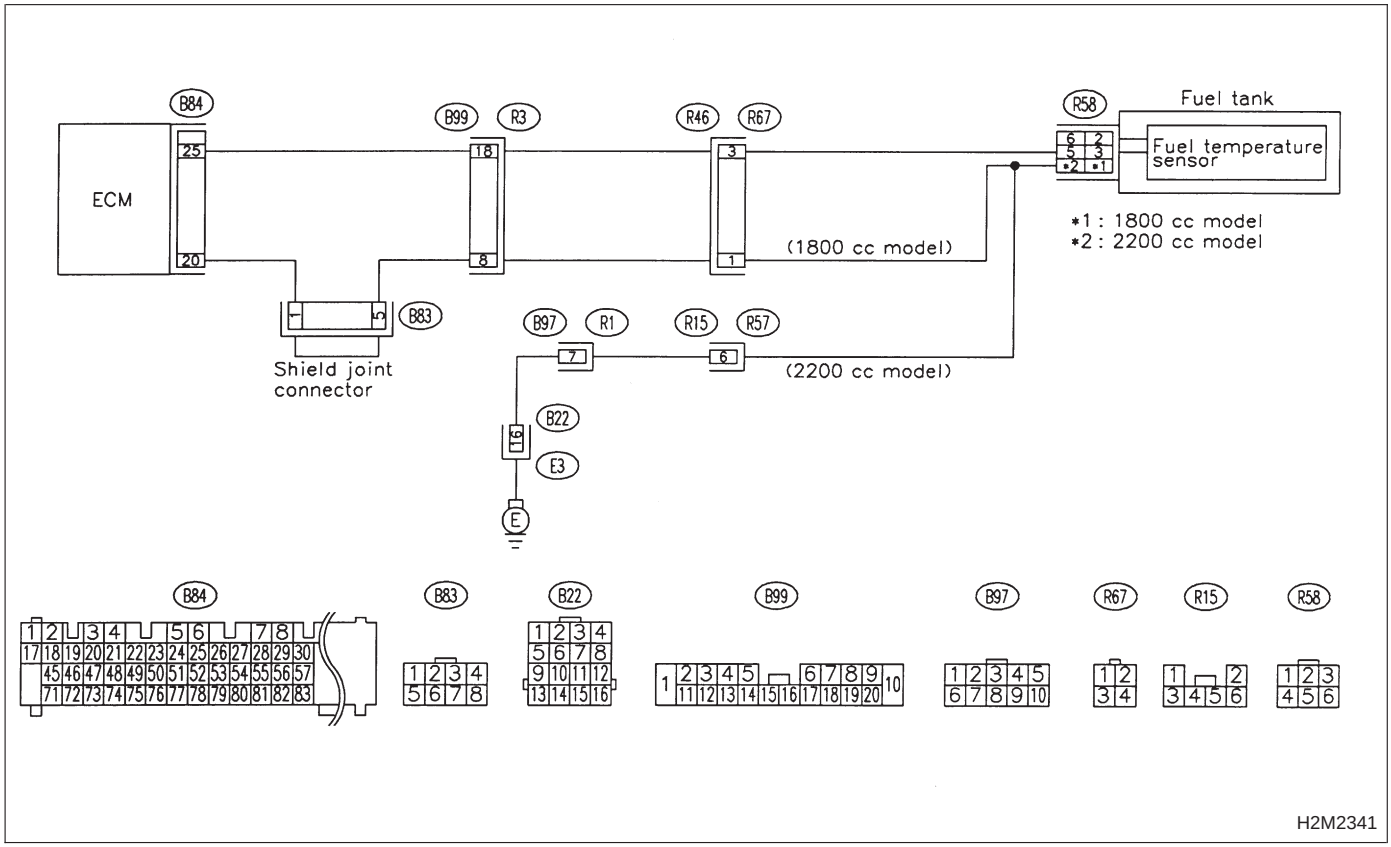
B2M1079

V: DTC P0182 — FUEL TEMPERATURE SENSOR A CIRCUIT LOW INPUT —

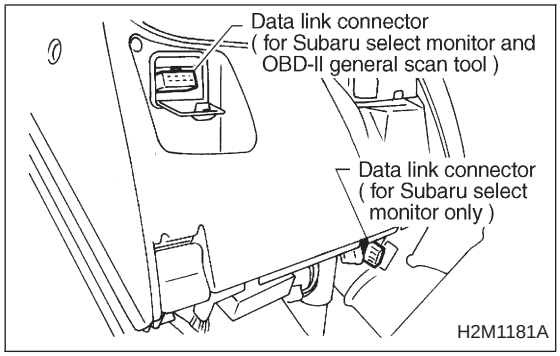
DTC DETECTING CONDITION:

- Immediately at fault recognition

WIRING DIAGRAM:

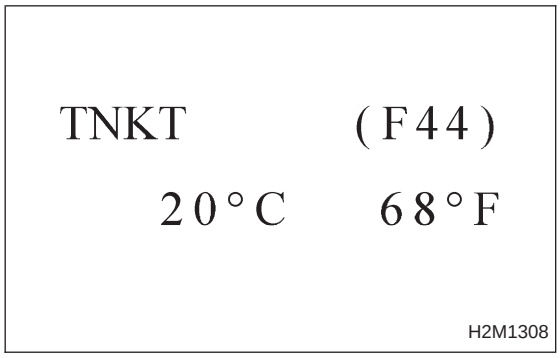


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10V1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F44

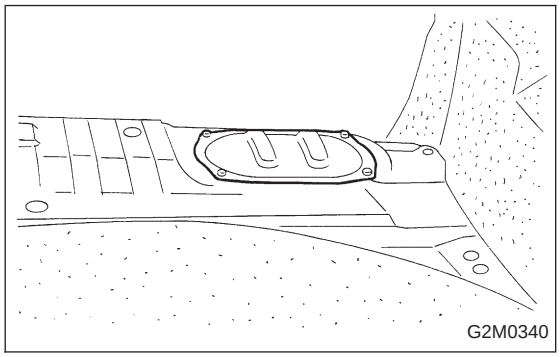
● F44: Fuel temperature is indicated in "°C" and "°F".

CHECK ***: Is the value greater than 150°C or 300°F in function mode F44?***

YES : Go to step **10V2**.

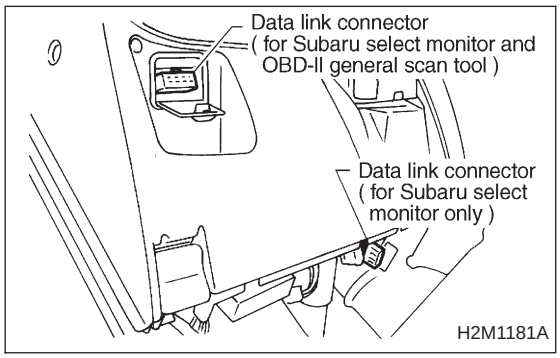
NO : Even if MIL lights up, the circuit has returned to a normal condition at this time.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

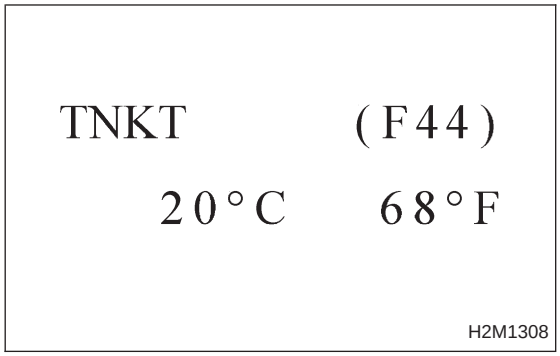


10V2	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove access hole lid.
3) Disconnect connector from fuel pump.



4) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
5) Turn ignition switch and Subaru Select Monitor or OBD-II general scan tool switch to ON.



6) Read data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F44

● F44: Fuel temperature is indicated in "°C" and "°F".

CHECK ***: Is the value less than −40°C or −40°F in function mode F44?***

YES : Replace fuel temperature sensor.

NO : Repair ground short circuit in harness between fuel pump and ECM connector.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

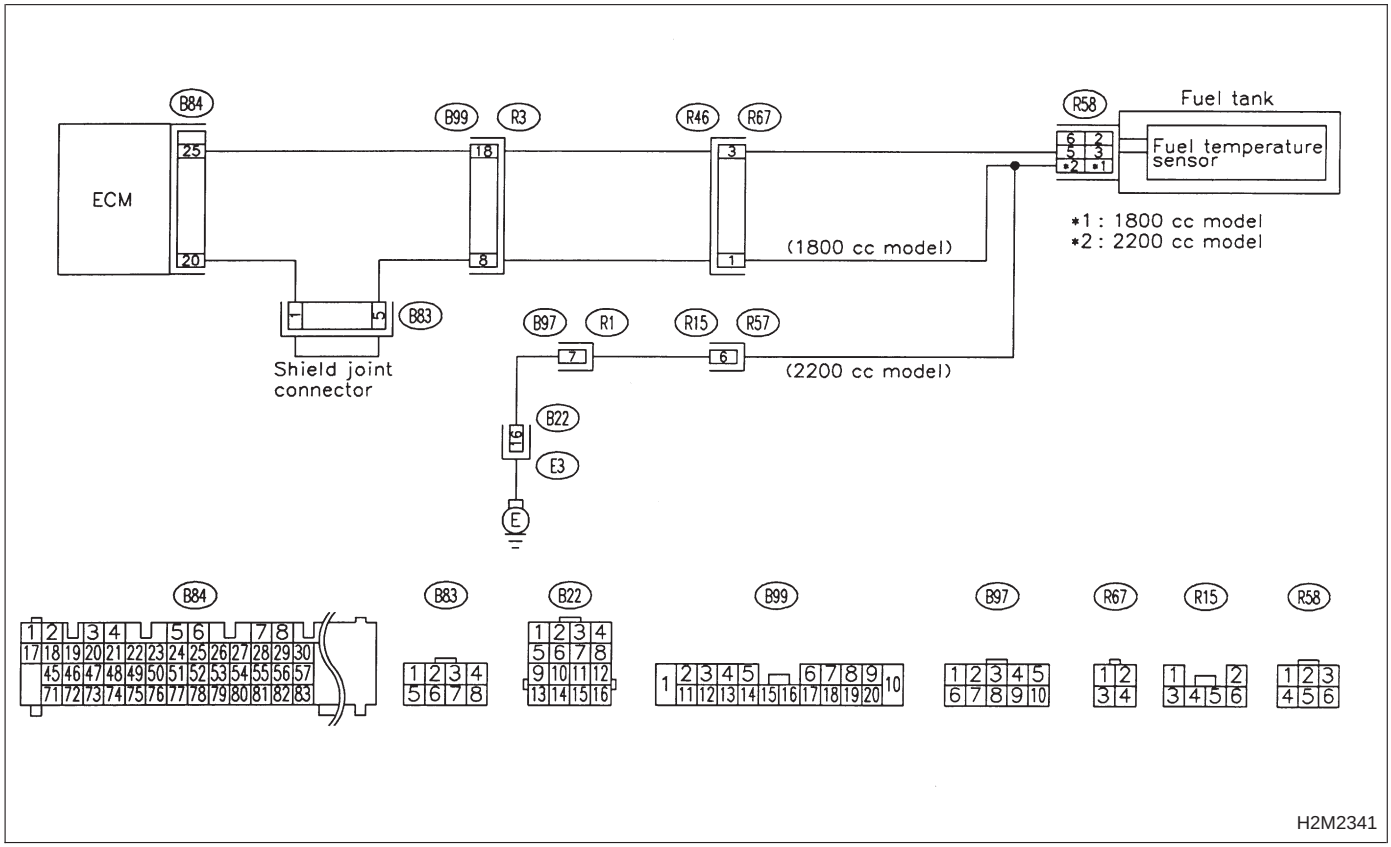
OBD (FB1)
P0183 <TNKT_HI>
B2M1080

W: DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —

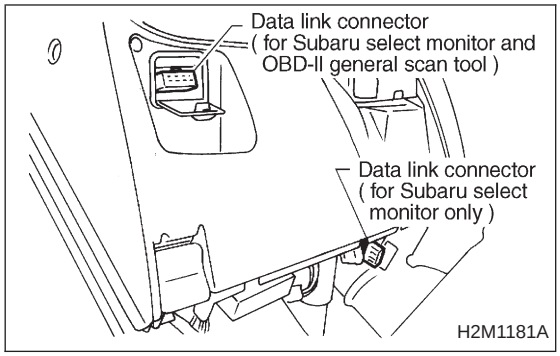
DTC DETECTING CONDITION:

- Immediately at fault recognition

WIRING DIAGRAM:

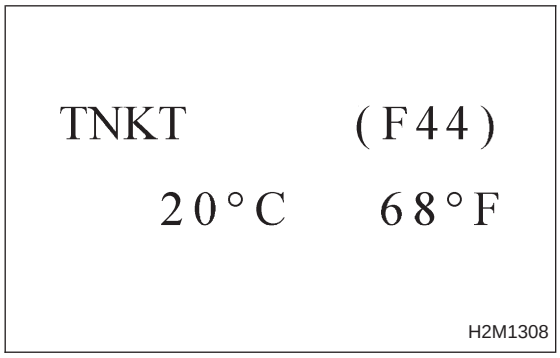


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10W1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.**

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON.
4) Start engine.



5) Read data on Subaru Select Monitor or OBD-II general scan tool.

- Subaru Select Monitor

Designate mode using function key.

Function mode: F44

- F44: Fuel temperature is indicated in "°C" and "°F".

CHECK ***: Is the value less than −40°C or −40°F in function mode F44?***

YES : Go to step **10W2**.

NO : Repair poor contact.

NOTE:
In this case, repair the following:

- Poor contact in fuel pump connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B83, B99 and R67)
- OBD-II general scan tool

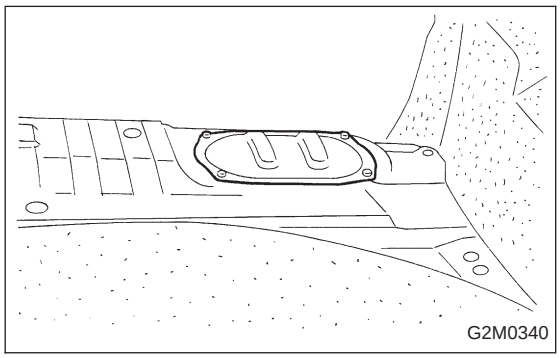
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

10W2	**CHECK ENGINE DISPLACEMENT.**

CHECK ***: Is the engine 1800 cc model?***

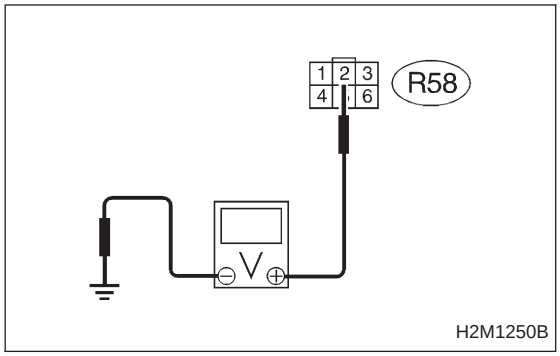
YES : Go to **10W3**.

NO : Go to **10W7**.



10W3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.**

1) Turn ignition switch to OFF.
2) Remove access hole lid.
3) Disconnect connector from fuel pump.



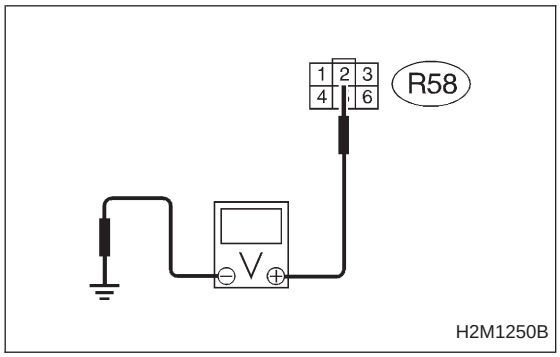
4) Measure voltage between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and fuel pump connector.

NO : Go to step **10W4**.



10W4	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

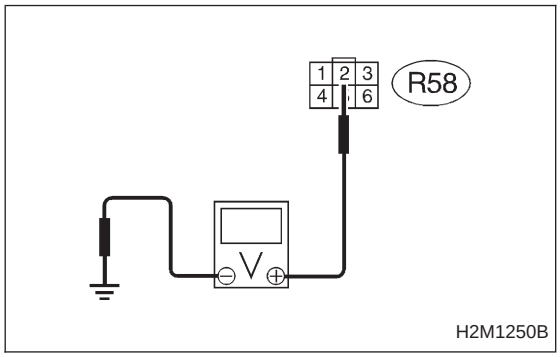
1) Turn ignition switch to ON.
2) Measure voltage between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and fuel pump connector.

NO : Go to step **10W5**.



10W5	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

Measure voltage between fuel pump connector and chassis ground.

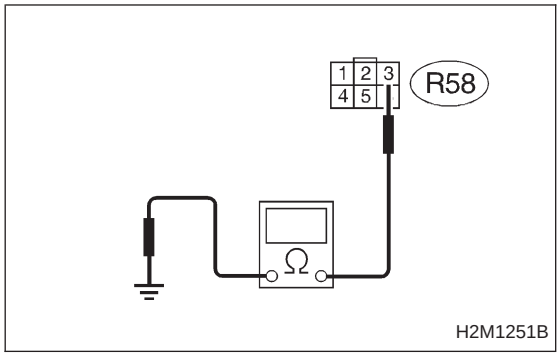
Connector & terminal
(R58) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4 V?***

YES : Go to step **10W6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel pump connector
- Poor contact in fuel pump connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B99 and R67)



10W6	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.

2) Measure resistance of harness between fuel pump connector and chassis ground.

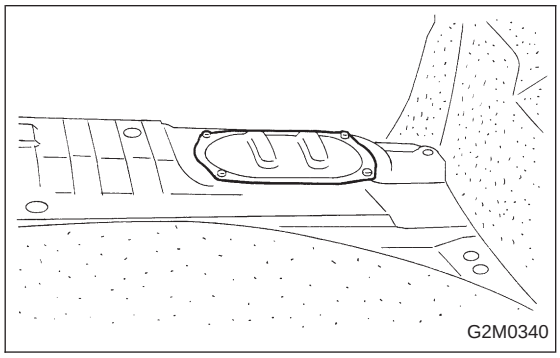
Connector & terminal
(R58) No. 3 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Replace fuel temperature sensor.

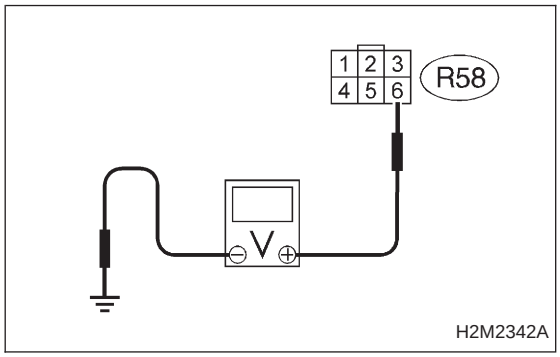
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel pump connector
- Poor contact in fuel pump connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B83, B99 and R67)



10W7	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove access hole lid.
3) Disconnect connector from fuel pump.



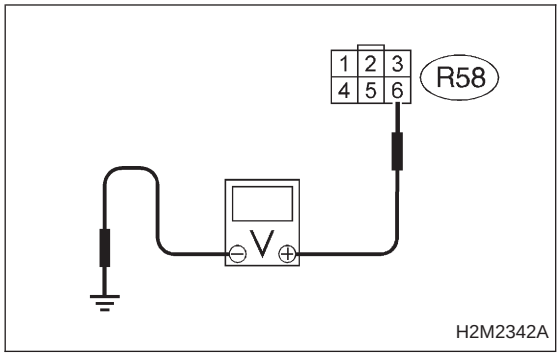
4) Measure voltage between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 6 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and fuel pump connector.

NO : Go to step **10W8**.



10W8	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

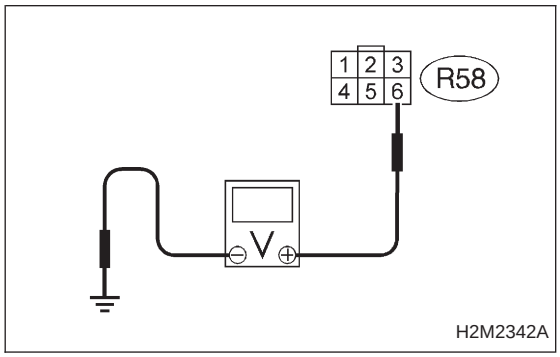
1) Turn ignition switch to ON.
2) Measure voltage between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 6 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and fuel pump connector.

NO : Go to step **10W9**.



10W9	CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.

Measure voltage between fuel pump connector and chassis ground.

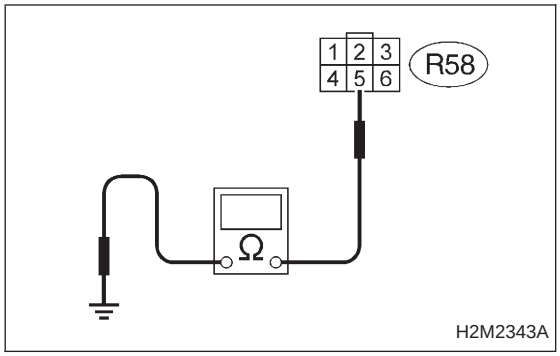
Connector & terminal
(R58) No. 6 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4 V?***

YES : Go to step **10W10**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel pump connector
- Poor contact in fuel pump connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B99 and R67)



10W10	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.**

1) Turn ignition switch to OFF.

2) Measure resistance of harness between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 5 — Chassis ground:

CHECK ***: Is the resistance less than 5 Ω?***

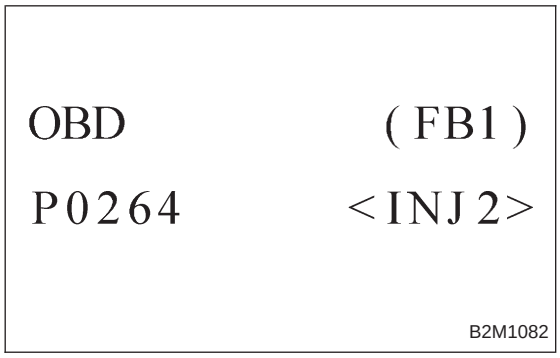
YES : Replace fuel temperature sensor.

NO : Repair harness and connector.

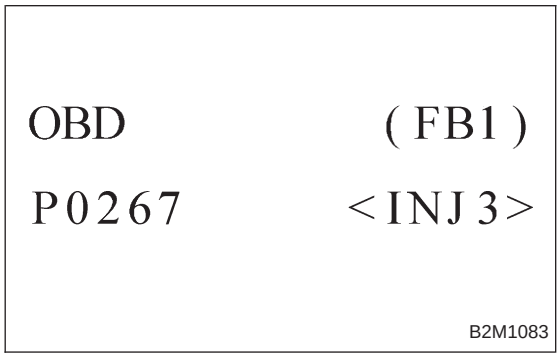
NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel pump connector
- Poor contact in fuel pump connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B22, B97 and R15)



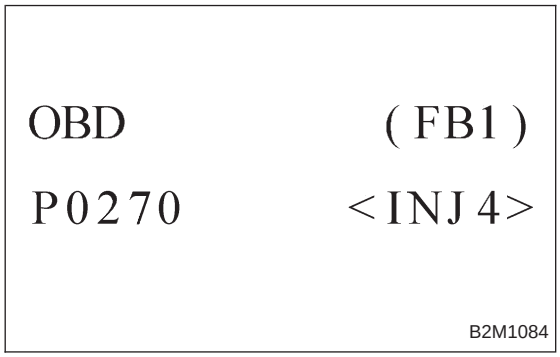
X: DTC P0261
— FUEL INJECTOR CIRCUIT LOW INPUT - #1 —



Y: DTC P0264
— FUEL INJECTOR CIRCUIT LOW INPUT - #2 —



Z: DTC P0267
— FUEL INJECTOR CIRCUIT LOW INPUT - #3 —



AA: DTC P0270
— FUEL INJECTOR CIRCUIT LOW INPUT - #4 —

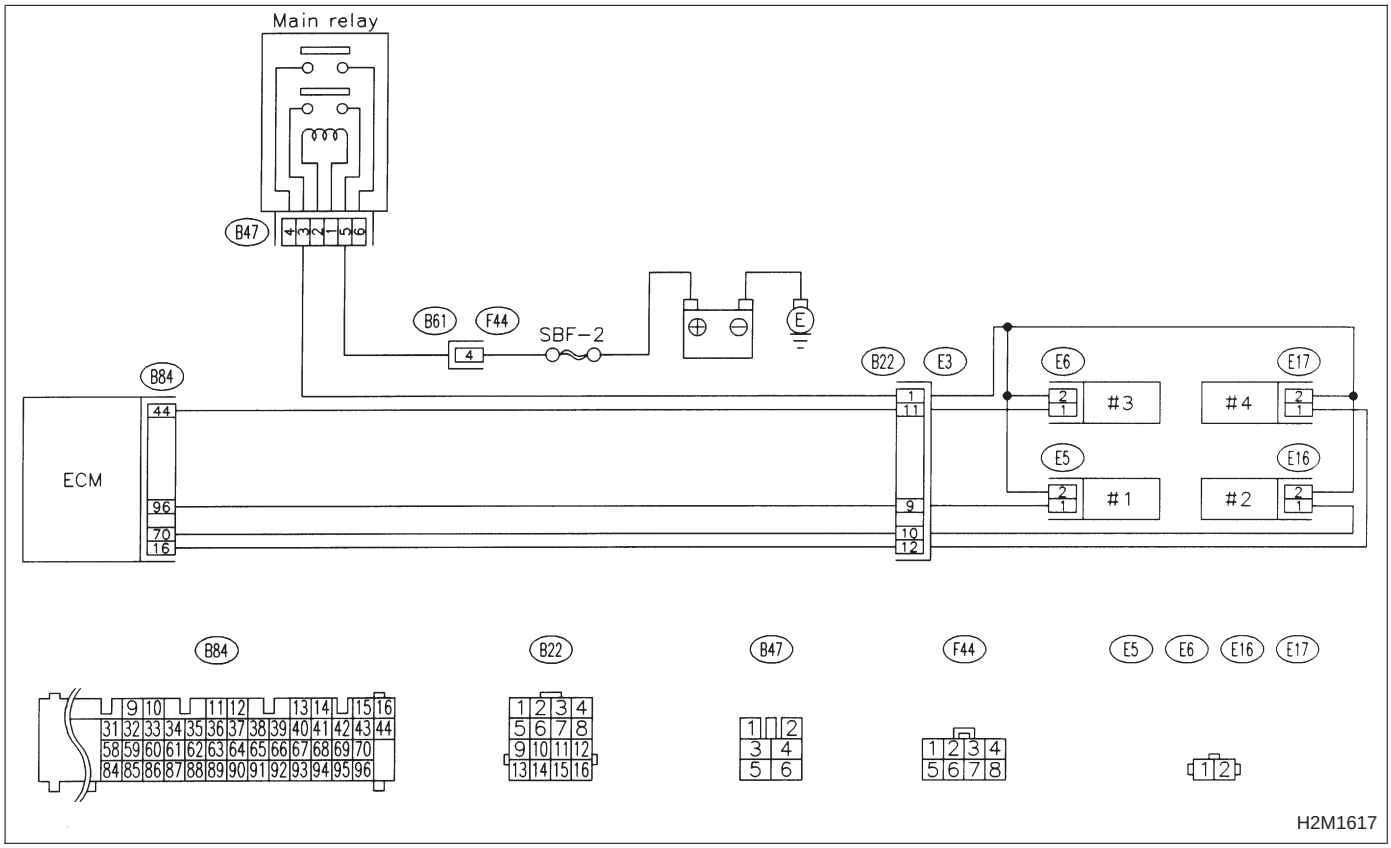
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

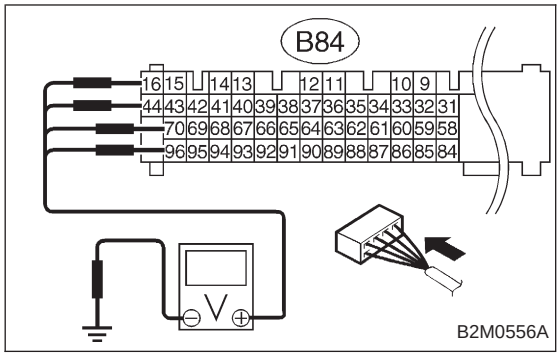
- Failure of engine to start
- Engine stalls.
- Erroneous idling
- Rough driving

WIRING DIAGRAM:



CAUTION:

- **Check or repair only faulty cylinders.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7 [T3D0] and [T3E0].>**



10AA1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and chassis ground on faulty cylinders.

Connector & terminal
#1 (B84) No. 96 (+) — Chassis ground (−):
#2 (B84) No. 70 (+) — Chassis ground (−):
#3 (B84) No. 44 (+) — Chassis ground (−):
#4 (B84) No. 16 (+) — Chassis ground (−):

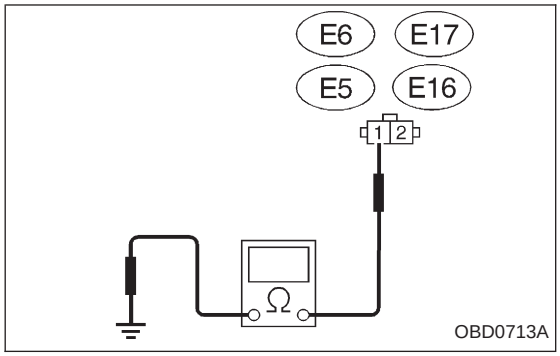
CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **10AA2**.
NO : Go to step **10AA3**.

10AA2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10AA3	CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.

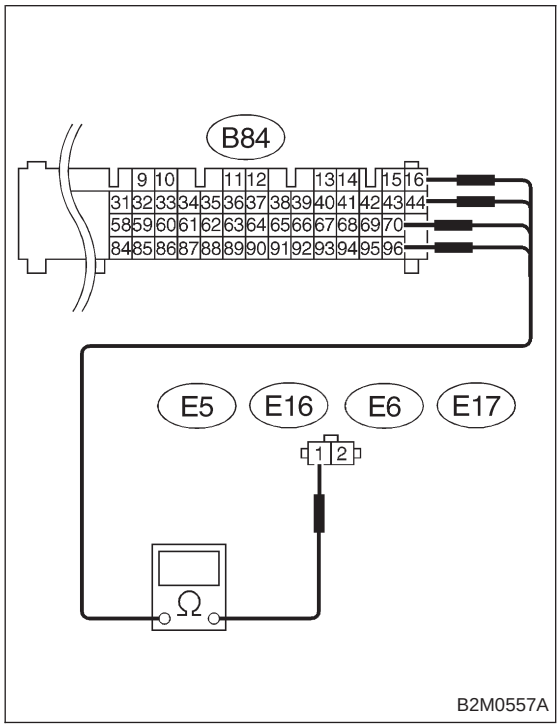
1) Turn ignition switch to OFF.
2) Disconnect connector from fuel injector on faulty cylinders.
3) Measure resistance between ECM connector and engine ground on faulty cylinders.

Connector & terminal
#1 (E5) No. 1 — Engine ground:
#2 (E16) No. 1 — Engine ground:
#3 (E6) No. 1 — Engine ground:
#4 (E17) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between fuel injector and ECM connector.

NO : Go to next step 4).



4) Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders.

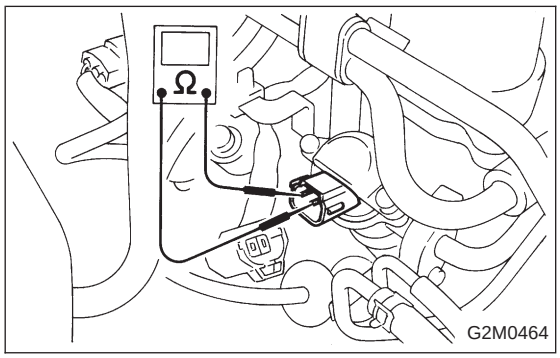
Connector & terminal
#1 (B84) No. 96 — (E5) No. 1:
#2 (B84) No. 70 — (E16) No. 1:
#3 (B84) No. 44 — (E6) No. 1:
#4 (B84) No. 16 — (E17) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AA4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel injector connector
- Poor contact in coupling connector (B22)



10AA4	CHECK FUEL INJECTOR.

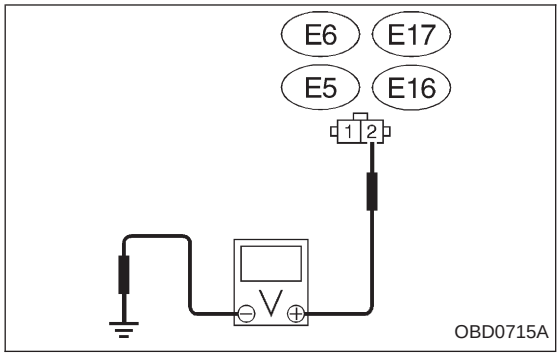
Measure resistance between fuel injector terminals on faulty cylinder.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 5 and 20 Ω?***

NO : Replace faulty fuel injector.

YES : Go to step **10AA5**.



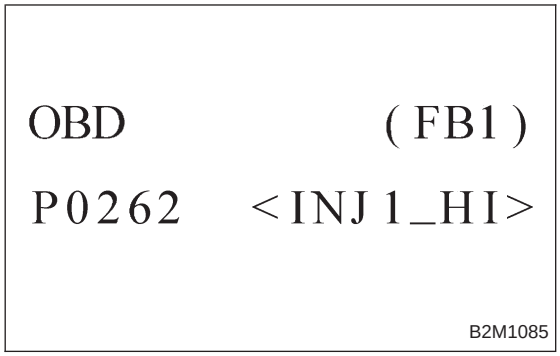
10AA5	CHECK POWER SUPPLY LINE.

1) Turn ignition switch to ON.
2) Measure voltage between fuel injector and engine ground on faulty cylinders.

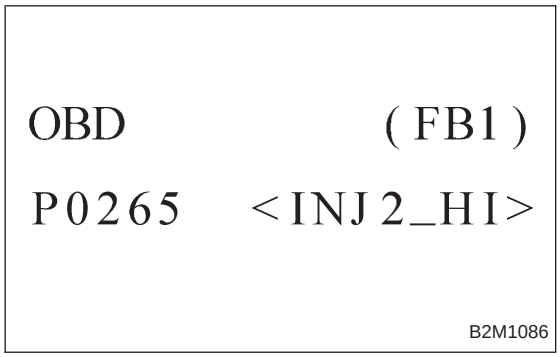
Connector & terminal
#1 (E5) No. 2 (+) — Engine ground (−):
#2 (E16) No. 2 (+) — Engine ground (−):
#3 (E6) No. 2 (+) — Engine ground (−):
#4 (E17) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Repair poor contact in all connectors in fuel injector circuit.
NO : Repair harness and connector.

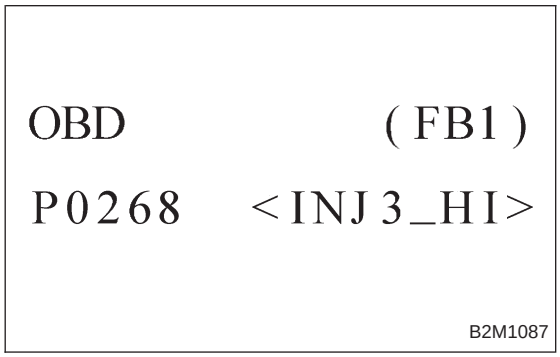
NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and fuel injector connector on faulty cylinders
- Poor contact in coupling connector (B22)
- Poor contact in main relay connector
- Poor contact in fuel injector connector on faulty cylinders



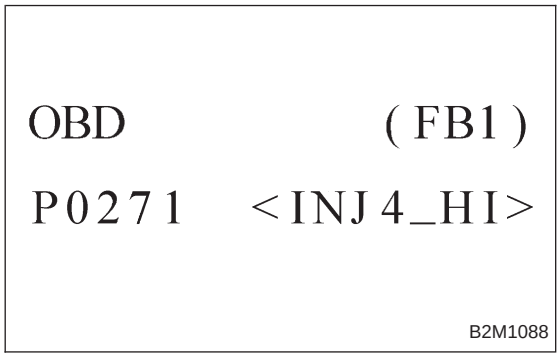
AB: DTC P0262
— FUEL INJECTOR CIRCUIT HIGH INPUT - #1 —



AC: DTC P0265
— FUEL INJECTOR CIRCUIT HIGH INPUT - #2 —



AD: DTC P0268
— FUEL INJECTOR CIRCUIT HIGH INPUT - #3 —



AE: DTC P0271
— FUEL INJECTOR CIRCUIT HIGH INPUT - #4 —

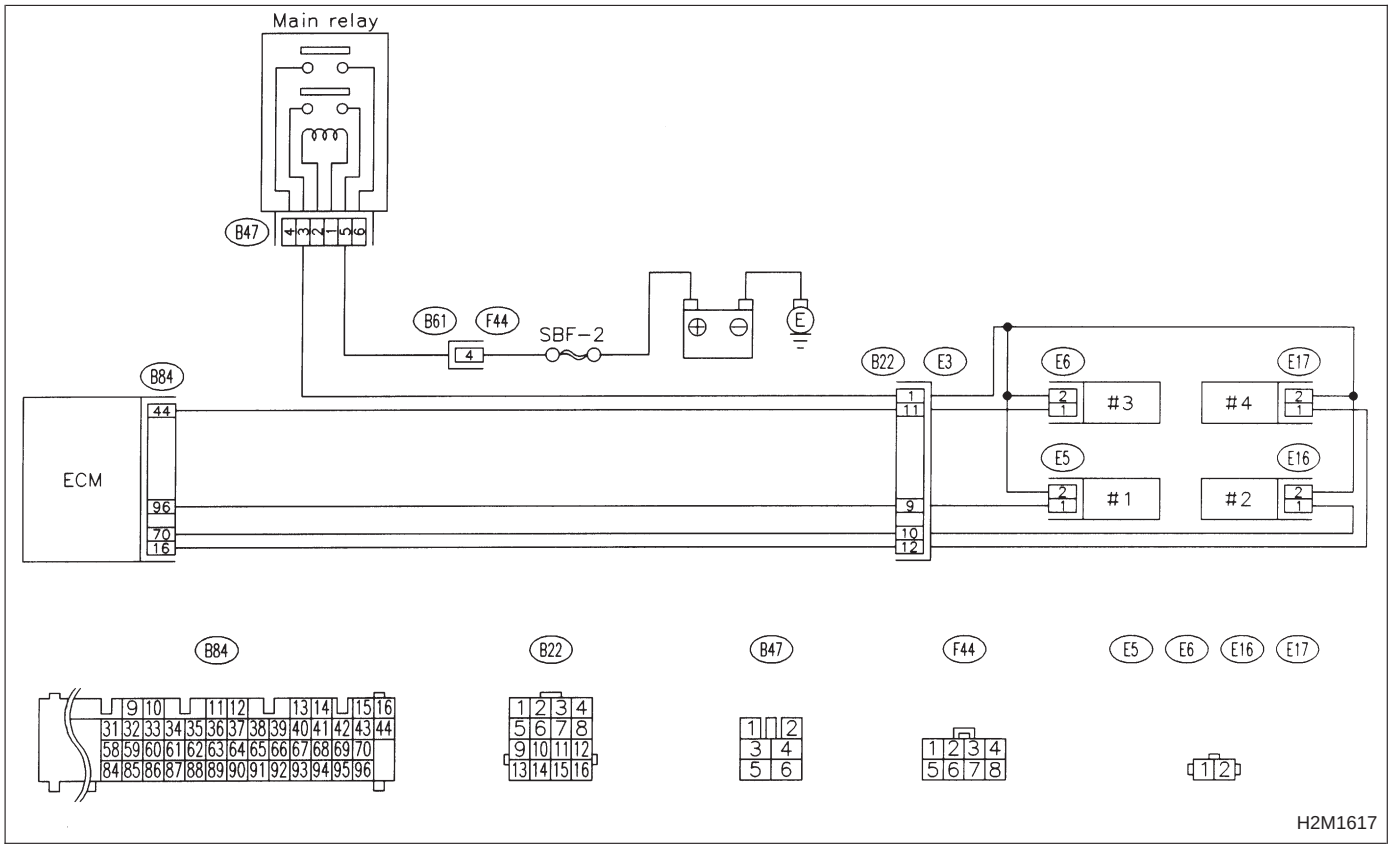
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

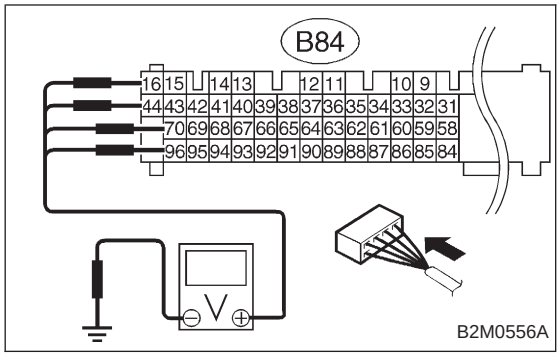
- Failure of engine to start
- Engine stalls.
- Erroneous idling
- Rough driving

WIRING DIAGRAM:



CAUTION:

- **Check or repair only faulty cylinders.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7 [T3D0] and [T3E0].>**



10AE1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM connector and chassis ground on faulty cylinders.

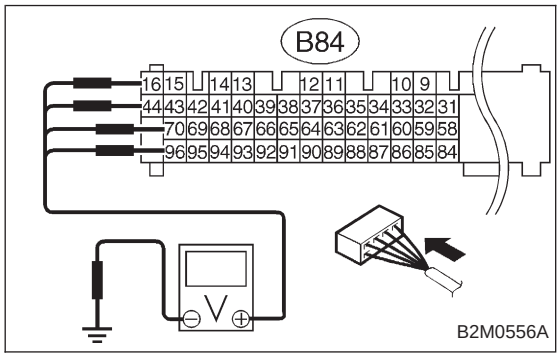
Connector & terminal
#1 (B84) No. 96 (+) — Chassis ground (−):
#2 (B84) No. 70 (+) — Chassis ground (−):
#3 (B84) No. 44 (+) — Chassis ground (−):
#4 (B84) No. 16 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to step **10AE3**.
NO : Go to step **10AE2**.

10AE2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM.

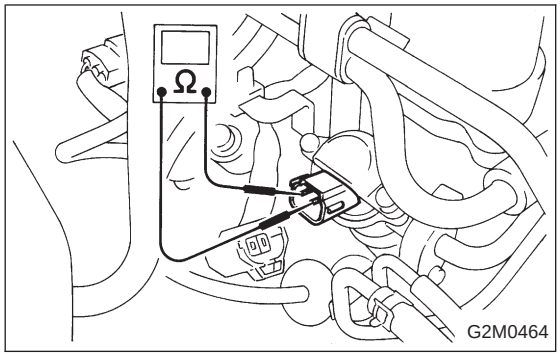


10AE3	CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from fuel injector on faulty cylinder.
3) Turn ignition switch to ON.
4) Measure voltage between ECM connector and chassis ground on faulty cylinders.

Connector & terminal
#1 (B84) No. 96 (+) — Chassis ground (−):
#2 (B84) No. 70 (+) — Chassis ground (−):
#3 (B84) No. 44 (+) — Chassis ground (−):
#4 (B84) No. 16 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM.
NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between fuel injector terminals on faulty cylinder.

Terminals
No. 1 — No. 2 :

CHECK ***: Is the resistance less than 1 Ω?***
YES : Replace faulty fuel injector and ECM.
NO : Go to step **10AE4**.

10AE4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM.



AF: DTC P0301
— CYLINDER 1 MISFIRE DETECTED —



AG: DTC P0302
— CYLINDER 2 MISFIRE DETECTED —



AH: DTC P0303
— CYLINDER 3 MISFIRE DETECTED —



AI: DTC P0304
— CYLINDER 4 MISFIRE DETECTED —

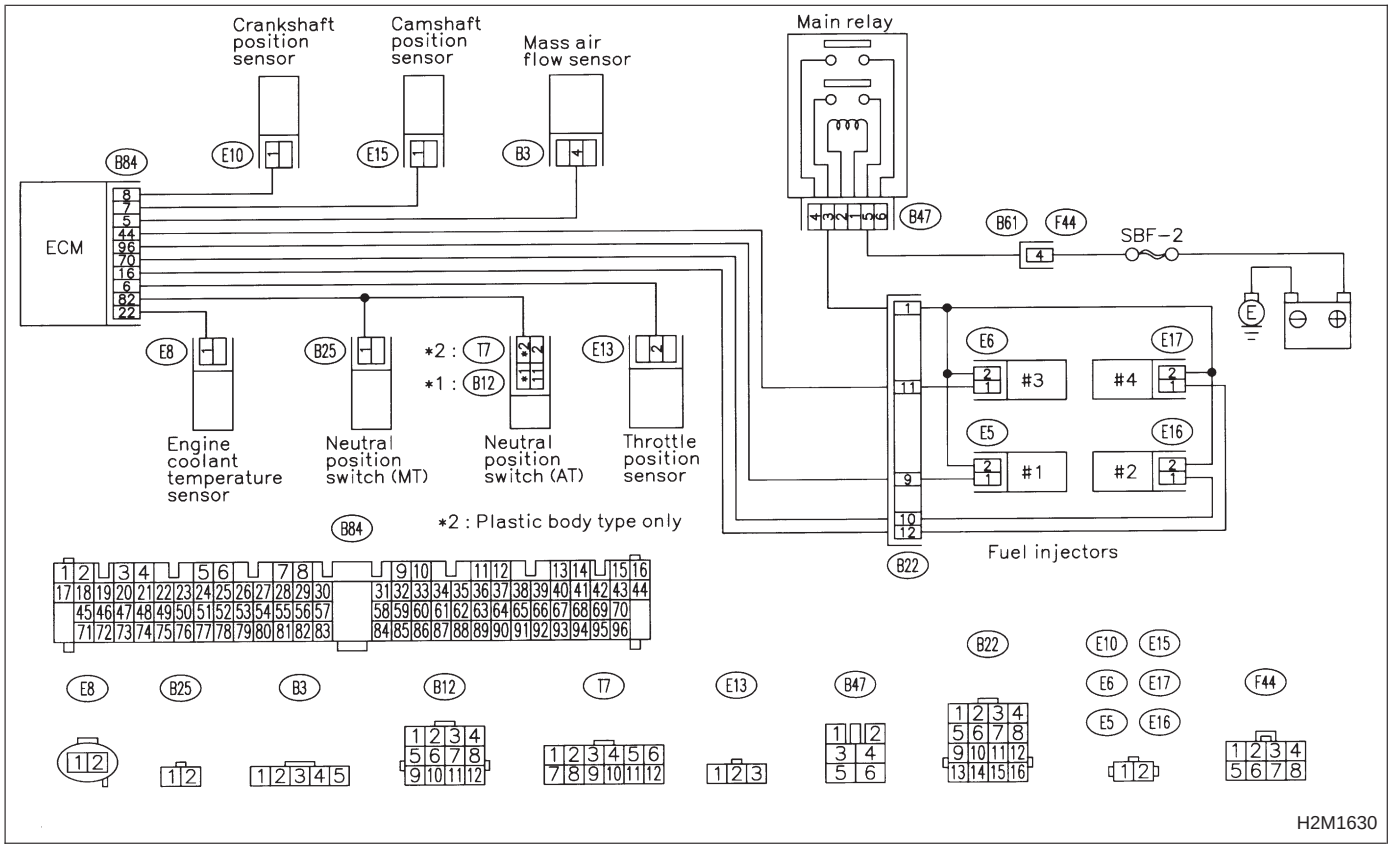
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

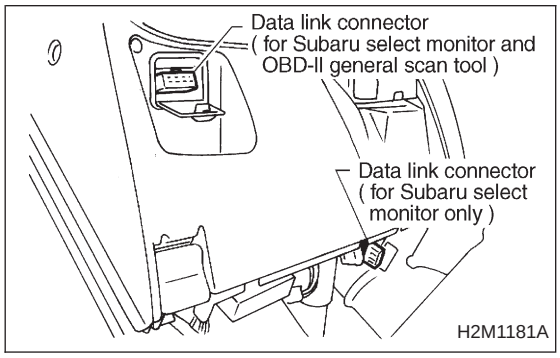
10AI1	**CHECK DTC P0101, P0102, P0103, P0116, P0117, P0125, P0261, P0262, P0264, P0265, P0267, P0268, P0270 OR P0271 ON DISPLAY.**

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0101, P0102, P0103, P0116, P0117, P0125, P0261, P0262, P0264, P0265, P0267, P0268, P0270 or P0271?***

YES : Inspect DTC P0101, P0102, P0103, P0116, P0117, P0125, P0261, P0262, P0264, P0265, P0267, P0268, P0270 or P0271 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

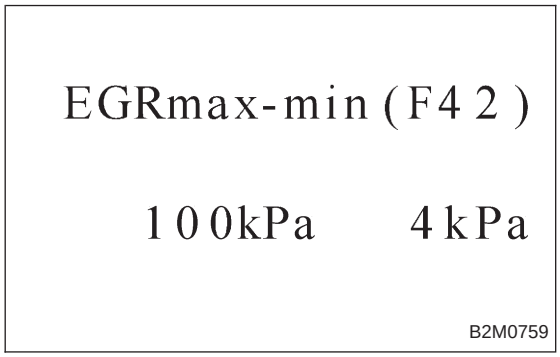
NOTE:
In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.

NO : Go to step **10AI2**.



10AI2	**CONNECT SUBARU SELECT MONITOR AND READ DATA.**

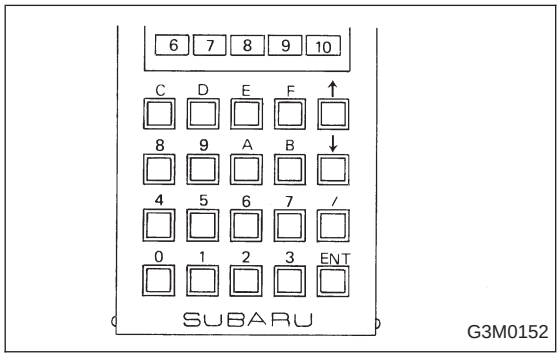
1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to the data link connector.
3) Turn ignition switch to ON and turn Subaru Select Monitor switch to ON.



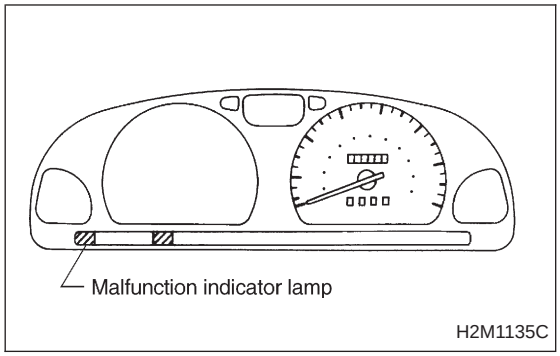
4) Read data on Subaru Select Monitor.
Designate mode use function key.

Function mode: F42

NOTE:
F42: Maximum and minimum EGR system pressure value are indicated at the same time.
5) Print out the displayed data on paper.



6) Clear memory on Subaru Select Monitor.
Designate mode use function key.
Press [F], [C], [0], [ENT] in that order.



7) Start engine, and drive the vehicle more than 10 minutes.

CHECK ***: Is the MIL coming on or blinking?***

YES : Go to step **10AI3**.

NO : Go to next CHECK .

CHECK ***: Has the vehicle been run empty of fuel?***

YES : Finish diagnostics operation, if the engine has no abnormality.

NO : Go to next CHECK .

CHECK ***: Was the cause of misfire diagnosed when the engine is running?***

NOTE:
Ex. Remove spark plug cord, etc.

YES : Finish diagnostics operation, if the engine has no abnormality.

NO : Repair poor connector.

NOTE:
In this case, repair the following:
- Poor contact in ignitor connector
- Poor contact in ignition coil connector
- Poor contact in fuel injector connector on faulty cylinders
- Poor contact in ECM connector
- Poor contact in coupling connector (B22)

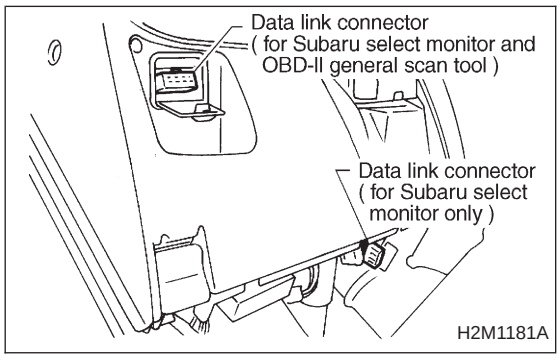
10AI3	CHECK AIR INTAKE SYSTEM.

CHECK ***: Is there a fault in air intake system?***

NOTE:
Check the following items:
- Are there air leaks or air suction caused by loose or dislocated nuts and bolts?
- Are there cracks or any disconnection of hoses?

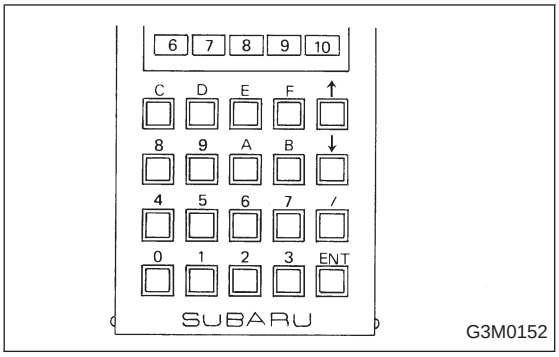
YES : Repair air intake system.

NO : Go to step **10AI4**.



10AI4	CHECK MISFIRE SYMPTOM.

1) Turn ignition switch to OFF.
2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch to ON, and turn Subaru Select Monitor or OBD-II general scan tool switch to ON.



4) Read diagnostic trouble code (DTC).
● Subaru Select Monitor
Designate mode use function key.

Function mode: FB1

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.

NOTE:
Perform diagnosis according to the items listed below.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate only one DTC?***

YES : Go to step **10AI5**.

NO : Go to next CHECK .

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0301 and P0302?***

YES : Go to step **10AI6**.

NO : Go to next CHECK .

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0303 and P0304?***

YES : Go to step **10AI7**.

NO : Go to next CHECK .

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0301 and P0303?***

YES : Go to step **10AI8**.

NO : Go to next CHECK .

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0302 and P0304?***

YES : Go to step **10AI9**.

NO : Go to step **10AI10**.

10AI5	ONLY ONE CYLINDER

CHECK ***: Is there a fault in that cylinder?***

NOTE:
Check the following items.
- Spark plug
- Spark plug cord
- Fuel injector
- Compression ratio

YES : Repair or replace faulty parts.

NO : Go to step **10AI11**.

10AI6	GROUP OF #1 AND #2 CYLINDERS

CHECK ***: Are there faults in #1 and #2 cylinders?***

NOTE:
- Check the following items.
  - Spark plugs
  - Fuel injectors
  - Ignition coil
- If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to 2-7 [T8D0].>

YES : Repair or replace faulty parts.

NO : Go to step **10AI11**.

10AI7	GROUP OF #3 AND #4 CYLINDERS

CHECK ***: Are there faults in #3 and #4 cylinders?***

NOTE:
- Check the following items.
  - Spark plugs
  - Fuel injectors
  - Ignition coil
- If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to 2-7 [T8D0].>

YES : Repair or replace faulty parts.

NO : Go to step **10AI11**.

10AI8	GROUP OF #1 AND #3 CYLINDERS

CHECK ***: Are there faults in #1 and #3 cylinders?***

NOTE:
Check the following items.
- Spark plugs
- Fuel injectors
- Skipping timing belt teeth

YES : Repair or replace faulty parts.

NO : Go to step **10AI11**.

10AI9	GROUP OF #2 AND #4 CYLINDERS

CHECK ***: Are there faults in #2 and #4 cylinders?***

NOTE:
Check the following items.
- Spark plugs
- Fuel injectors
- Skipping timing belt teeth

YES : Repair or replace faulty parts.

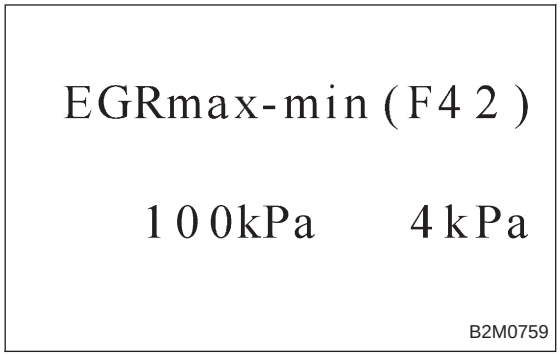
NO : Go to step **10AI11**.

10AI10	THE CYLINDER AT RANDOM

CHECK ***: Is the engine idle rough?***

YES : Go to step **10AI11**.

NO : Go to DTC P0170. <Ref. to 2-7 [T10T3], [T10T4] and [T10T5].>



10AI11	CHECK EGR SYSTEM.

CHECK : ***Is the minimum EGR system pressure value (value of function mode (F42) less than 1 kPa?***

NOTE:
Use the value read in step **10X2** for function mode F42.

YES : Clean EGR valve.

CAUTION:
Do not use solvent when cleaning EGR valve assembly, as it can damage diaphragm.

NOTE:
- Remove and blow away the exhaust deposits. Make sure the valve operates smoothly and the valve seat area is completely cleaned.
- Replace EGR valve as required.

NO : Go to DTC P0170. <Ref. to 2-7 [T10T3], [T10T4] and [T10T5].>

OBD (FB1)

P0325 <KNOCK>

OBD0283

AJ: DTC P0325 — KNOCK SENSOR CIRCUIT MALFUNCTION —

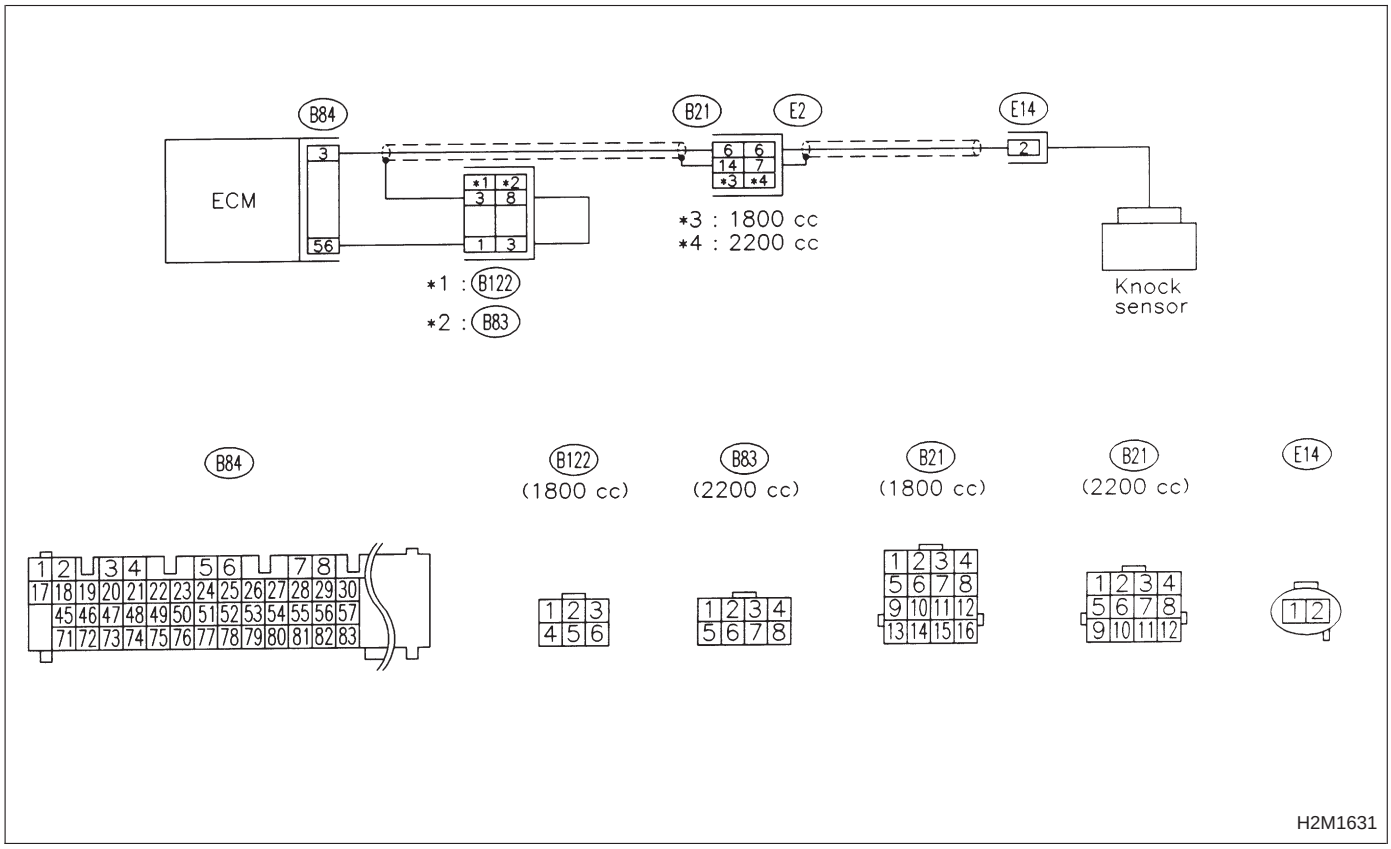
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

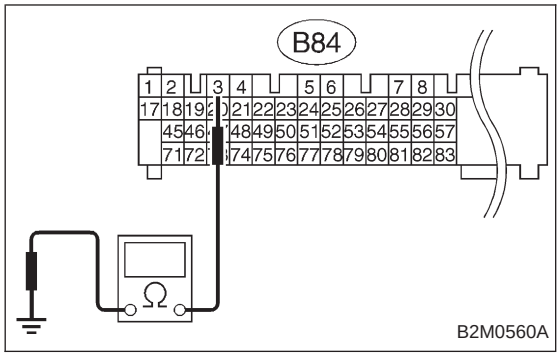
- Poor driving performance
- Knocking occurs.

WIRING DIAGRAM:



H2M1631

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10AJ1	CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.

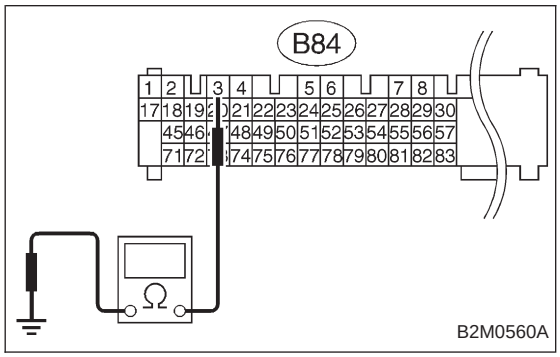
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 700 kΩ?***

YES : Go to step **10AJ2**.

NO : Go to next step 4).



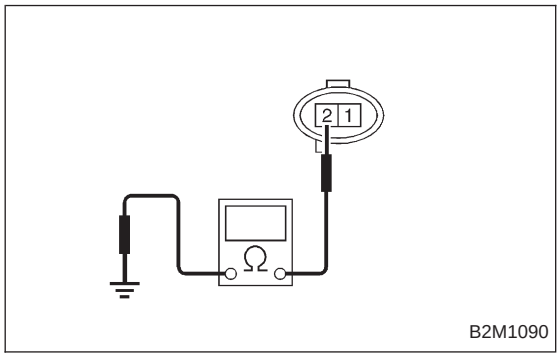
4) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 3 — Chassis ground:

CHECK ***: Is the resistance less than 400 kΩ?***

YES : Go to step **10AJ3**.

NO : Go to step **10AJ4**.



10AJ2	CHECK KNOCK SENSOR.

1) Disconnect connector from knock sensor.
2) Measure resistance between knock sensor connector terminal and engine ground.

Terminal
No. 2 — Engine ground:

CHECK ***: Is the resistance more than 700 kΩ?***

YES : Go to next CHECK .

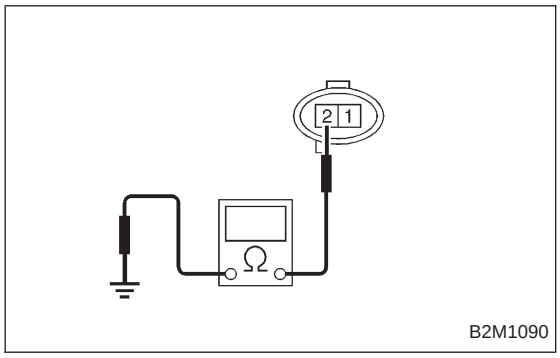
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between knock sensor and ECM connector
- Poor contact in knock sensor connector
- Poor contact in coupling connector (B21)

CHECK ***: Is the knock sensor installation bolt tightened securely?***

YES : Replace knock sensor.

NO : Tighten knock sensor installation bolt securely.



10AJ3	CHECK KNOCK SENSOR.

1) Disconnect connector from knock sensor.
2) Measure resistance between knock sensor connector terminal and engine ground.

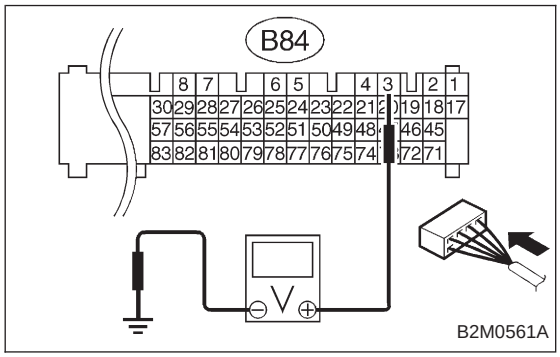
Terminal
No. 2 — Engine ground:

CHECK ***: Is the resistance less than 400 kΩ?***

YES : Replace knock sensor.

NO : Repair ground short circuit in harness between knock sensor connector and ECM connector.

NOTE:
The harness between both connectors is shielded. Repair short circuit of harness together with shield.



10AJ4	CHECK INPUT SIGNAL FOR ECM.

1) Connect connector to ECM.
2) Turn ignition switch to ON.
3) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 2 V?***

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)

NOTE:
In this case, repair the following:
- Poor contact in knock sensor connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)

NO : Repair poor contact in ECM connector.

OBD (FB1)

P0335 <CRANK>

OBD0292

AK: DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

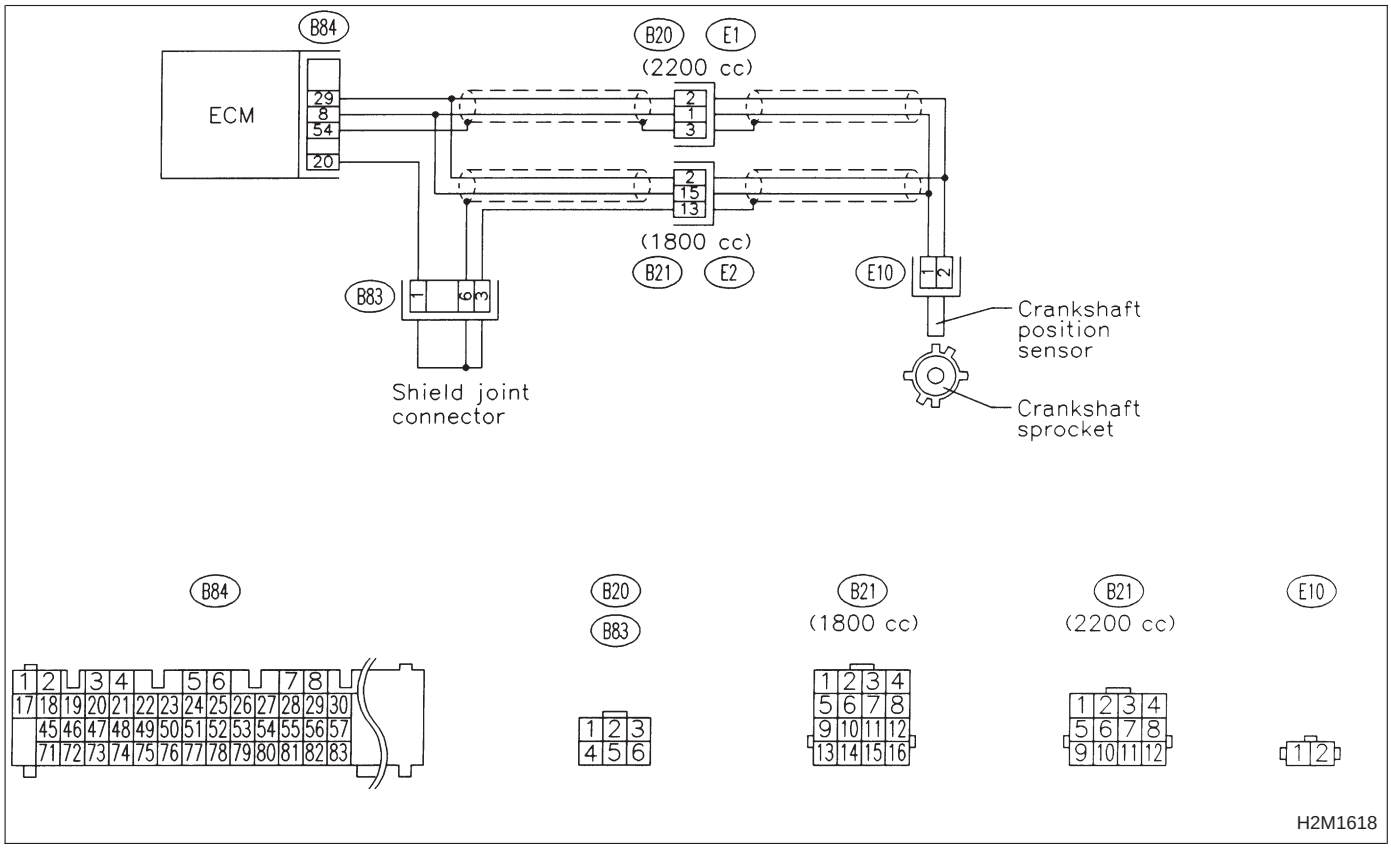
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

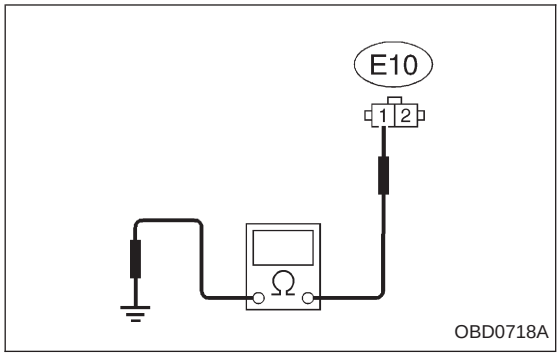
- Engine stalls.
- Failure of engine to start

WIRING DIAGRAM:



H2M1618

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10AK1	CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from crankshaft position sensor.
3) Measure resistance of harness between crankshaft position sensor connector and engine ground.

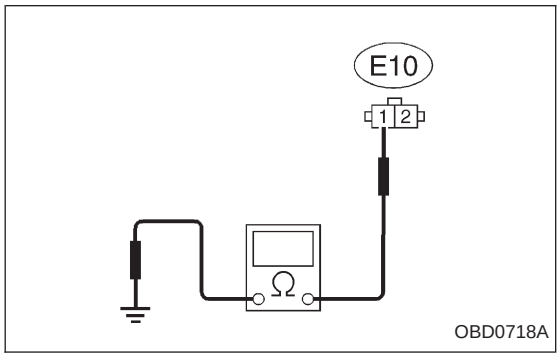
Connector & terminal
(E10) No. 1 — Engine ground:

CHECK ***: Is the resistance more than 100 kΩ?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between crankshaft position sensor and ECM connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B20) [2200 cc]

NO : Go to next step 4).



4) Measure resistance of harness between crankshaft position sensor connector and engine ground.

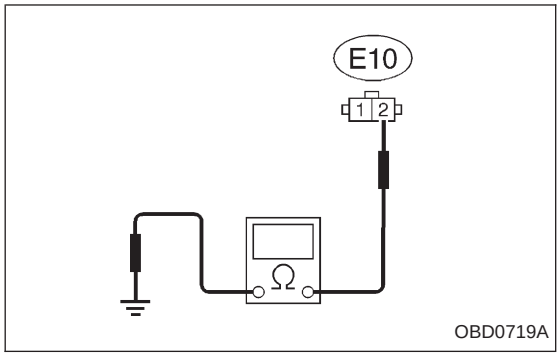
Connector & terminal
(E10) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between crankshaft position sensor and ECM connector.

NOTE:
The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.

NO : Go to next step 5).



5) Measure resistance of harness between crankshaft position sensor connector and engine ground.

Connector & terminal
(E10) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **10AK2**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

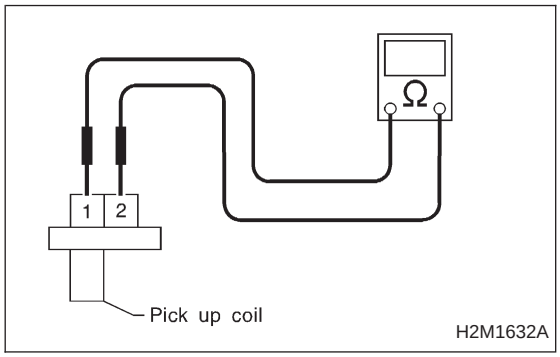
- Open circuit in harness between crankshaft position sensor and ECM connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B20) [2200 cc]

10AK2	CHECK CRANKSHAFT POSITION SENSOR.

CHECK ***: Is the crankshaft position sensor installation bolt tightened securely?***

YES : Go to next step 1).

NO : Tighten crankshaft position sensor installation bolt securely.



1) Remove crankshaft position sensor.
2) Measure resistance between connector terminals of crankshaft position sensor.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 1 and 4 kΩ?***

YES : Repair poor contact in crankshaft position sensor connector.

NO : Replace crankshaft position sensor.

OBD (FB1)

P0336 <CRANK_R>

B2M1091

AL: DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

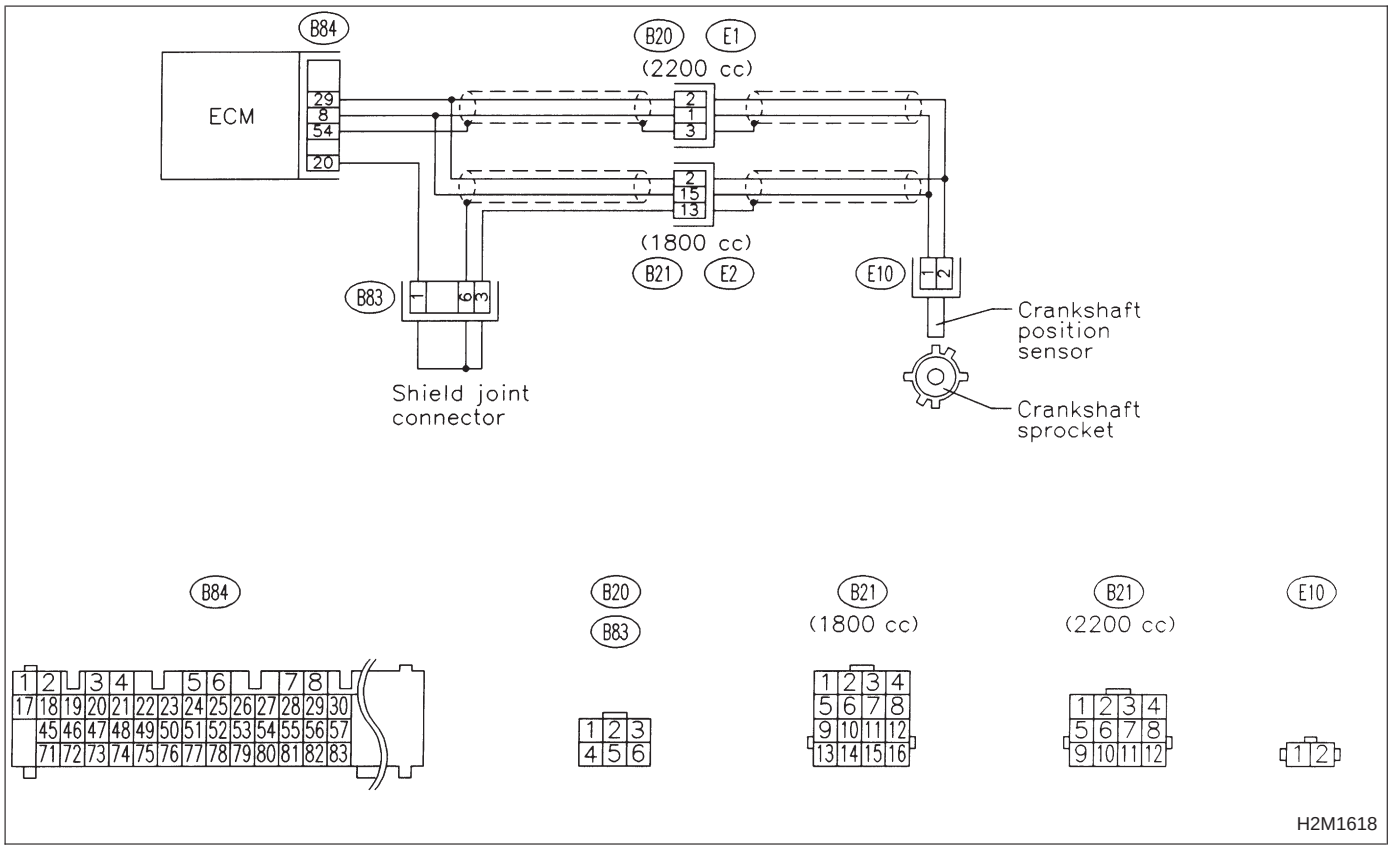
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

WIRING DIAGRAM:



H2M1618

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AL1	CHECK DTC P0335 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0335?***

YES : Inspect DTC P0335 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Replace crankshaft position sensor.

OBD	(FB1)
P0340	<CAM>

OBD0304

AM: DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

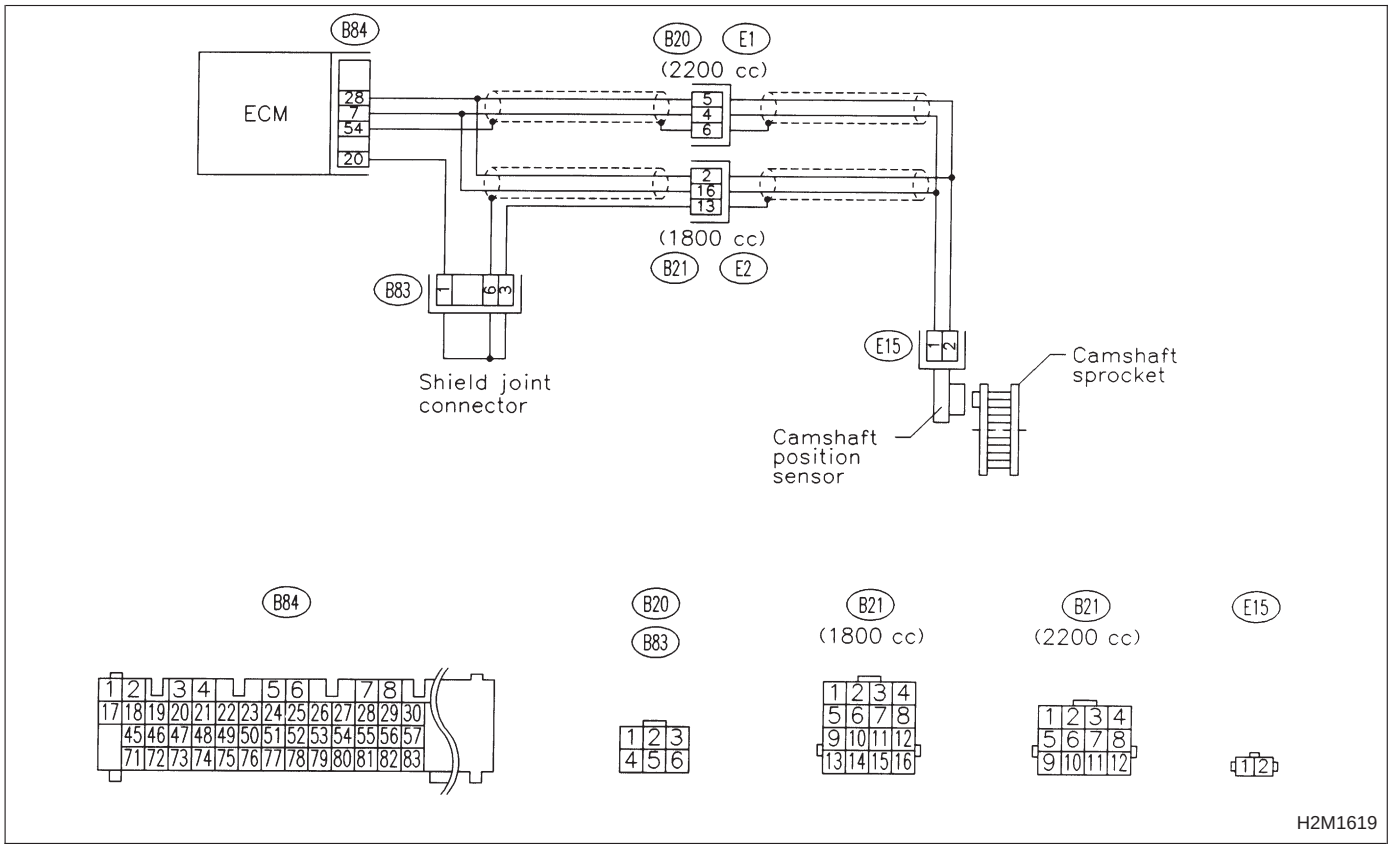
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

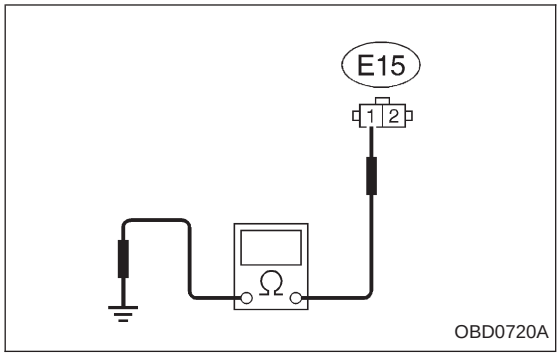
- Engine stalls.
- Failure of engine to start

WIRING DIAGRAM:



H2M1619

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10AM1	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from camshaft position sensor.
3) Measure resistance of harness between camshaft position sensor connector and engine ground.

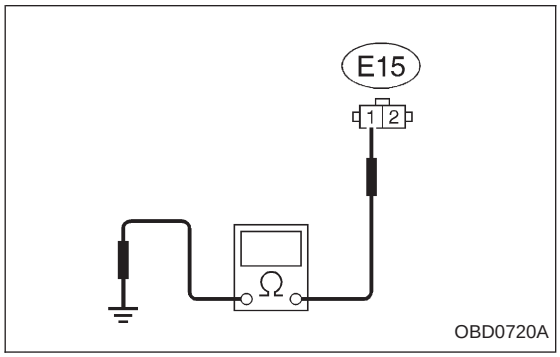
Connector & terminal
(E15) No. 1 — Engine ground:

CHECK ***: Is the resistance more than 100 kΩ?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between camshaft position sensor and ECM connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B20) [2200 cc]

NO : Go to next step 4).



4) Measure resistance of harness between camshaft position sensor connector and engine ground.

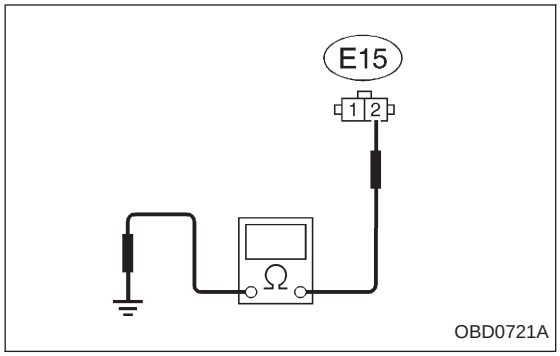
Connector & terminal
(E15) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between camshaft position sensor connector and ECM connector.

NOTE:
The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.

NO : Go to next step 5).



5) Measure resistance of harness between camshaft position sensor connector and engine ground.

Connector & terminal
(E15) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **10AM2**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

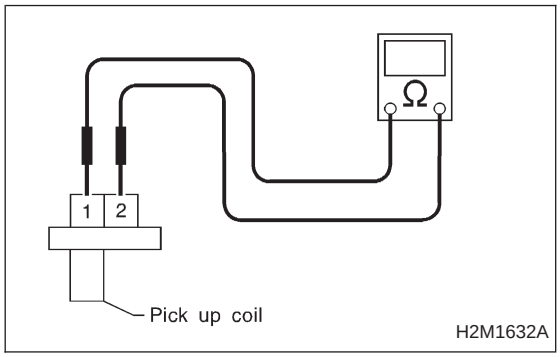
- Open circuit in harness between camshaft position sensor and ECM connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B20) [2200 cc]

10AM2	CHECK CAMSHAFT POSITION SENSOR.

CHECK ***: Is the camshaft position sensor installation bolt tightened securely?***

YES : Go to next step 1).

NO : Tighten camshaft position sensor installation bolt securely.



1) Remove camshaft position sensor.
2) Measure resistance between connector terminals of camshaft position sensor.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 1 and 4 kΩ?***

YES : Repair poor contact in camshaft position sensor connector.

NO : Replace camshaft position sensor.

OBD (FB1)
P0341 <CAM_R>
B2M1092

AN: DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

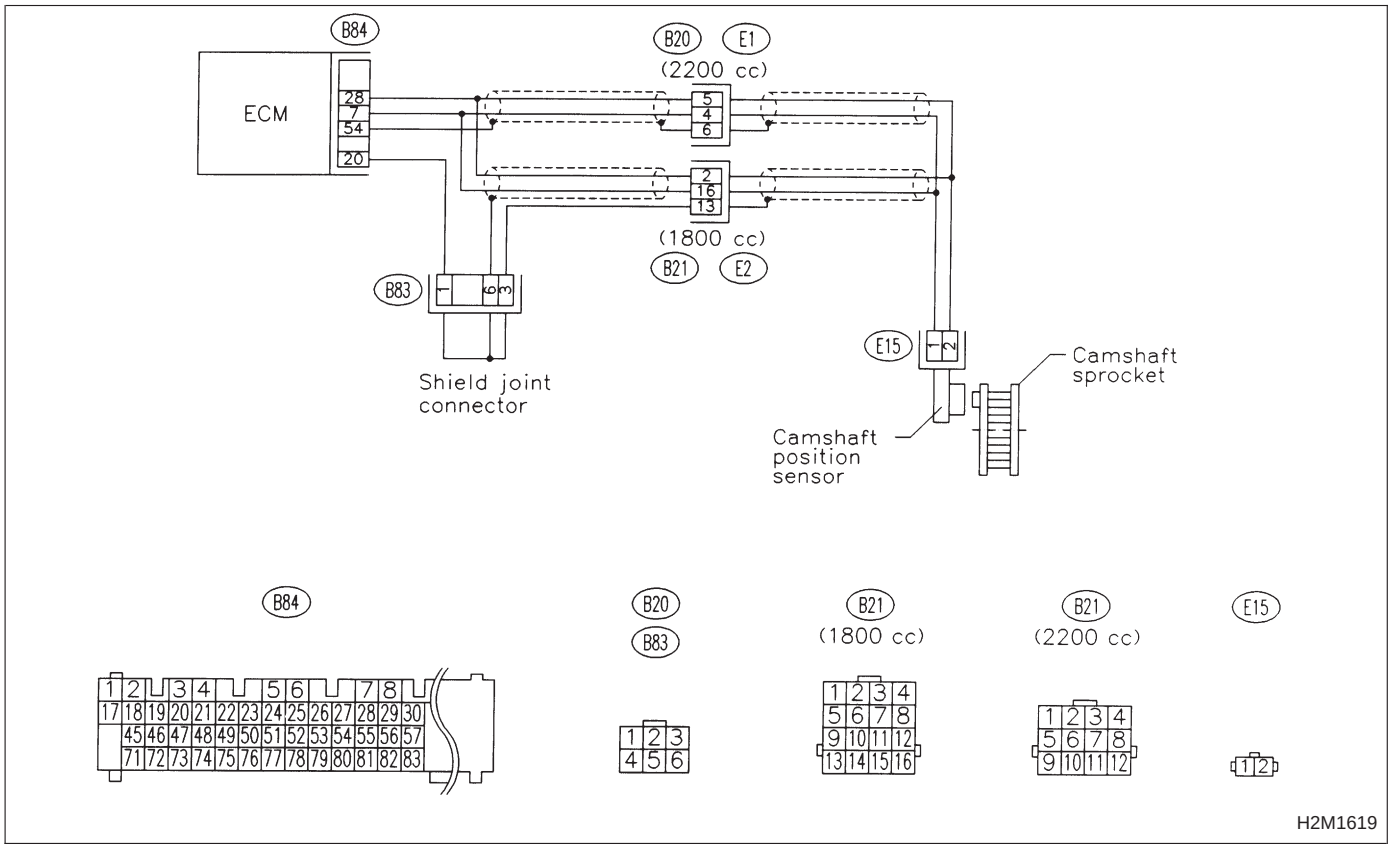
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

WIRING DIAGRAM:



H2M1619

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AN1	CHECK DTC P0340 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0340?***

YES : Inspect DTC P0340 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Replace camshaft position sensor.

OBD	(FB1)
P0400	<EGR>

OBD0315

AO: DTC P0400 — EXHAUST GAS RECIRCULATION FLOW MALFUNCTION —

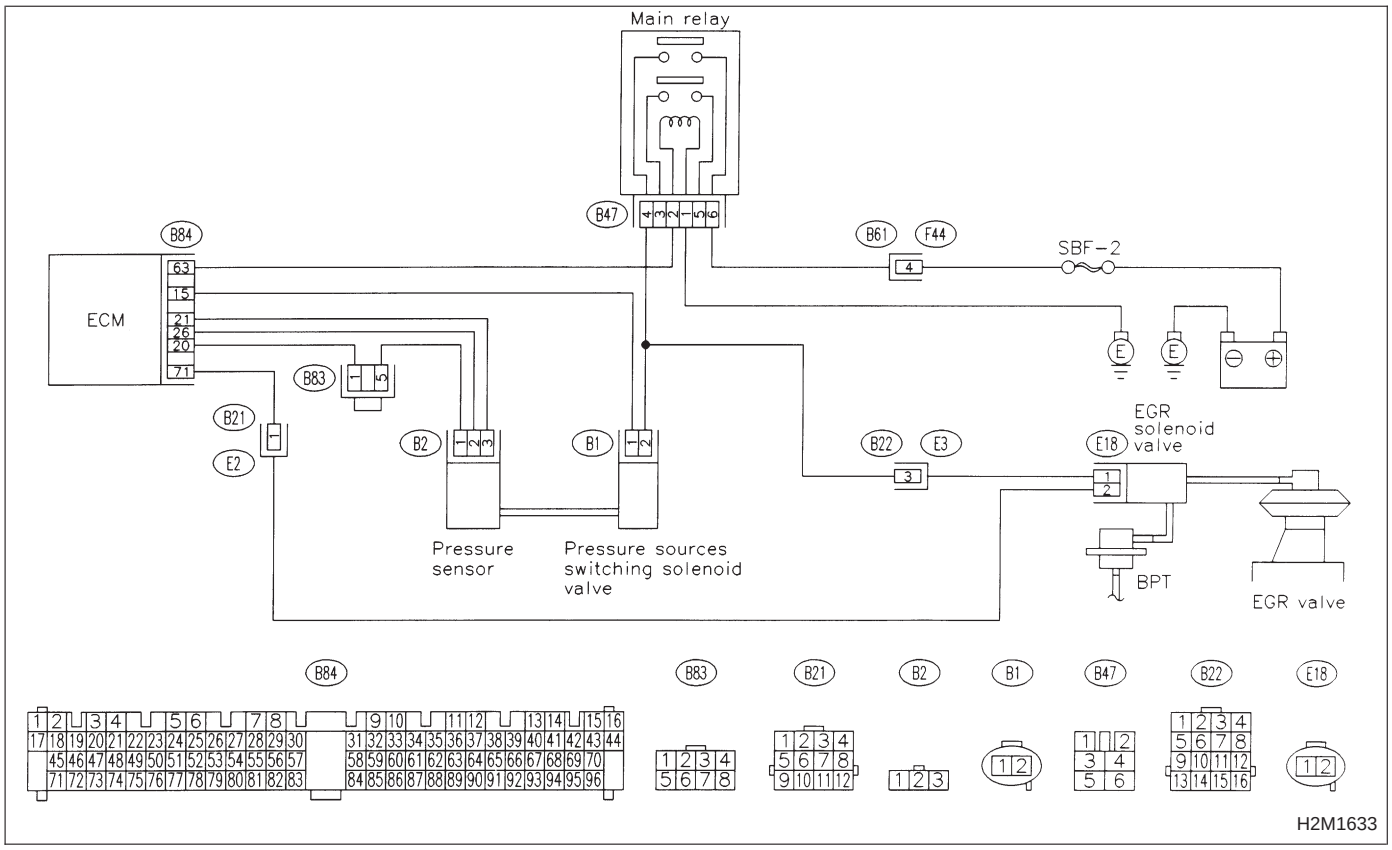
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Poor driving performance on low engine speed

WIRING DIAGRAM:



CAUTION:

Before confirmation of actual driving pattern, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7 [T3D0] and [T3E0].>

10AO1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type MT?***

YES : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>

NO : Go to step **10AO2**.

10AO2	CHECK DTC P0106, P0107, P0108, P0403, P1102, P1122 OR P1421 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0403, P1102, P1122 or P1421?***

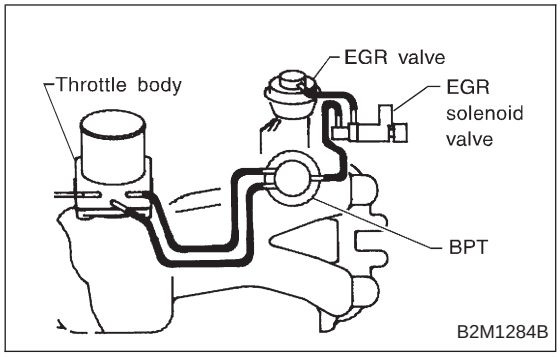
YES : ● Inspect DTC P0106, P0107, P0108, P0403, P1102, P1122 or P1421 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>
● Manually check that EGR valve diaphragm is not stuck.

WARNING:
Be careful when checking EGR valve, since it may be extremely hot.

NOTE:
In this case, it is not necessary to inspect DTC P0400.

After checking the above item, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NO : Go to step **10AO3**.



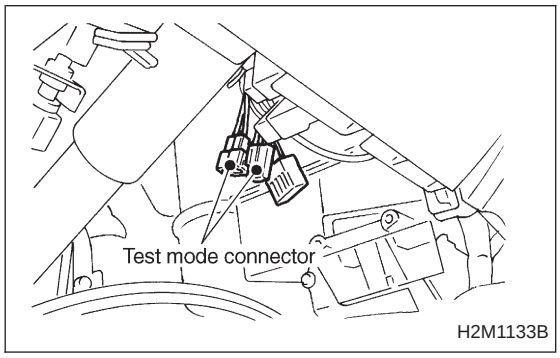
10AO3	CHECK VACUUM LINE.

CHECK ***: Is there a fault in vacuum line?***

NOTE:
Check the following items.
- Disconnection, leakage and clogging of the two vacuum hoses and pipes between throttle body and BPT
- Disconnection, leakage and clogging of the vacuum hose and pipe between EGR solenoid valve and BPT
- Disconnection, leakage and clogging of the vacuum hose between EGR solenoid valve and EGR valve
- Disconnection, leakage and clogging of BPT pressure transmitting hose

YES : Repair or replace hoses and pipes.
And after the checking and repairing, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN**.

NO : Go to step **10AO4**.



10AO4	CHECK OPERATION OF EGR SYSTEM.

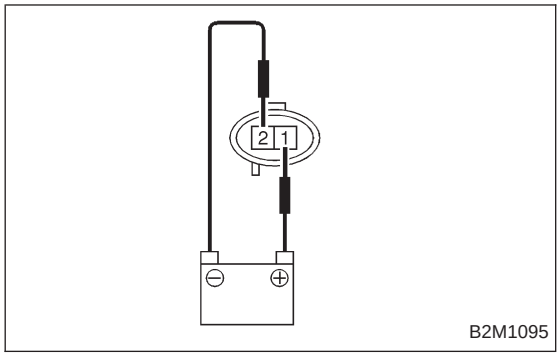
1) Turn ignition switch to OFF.
2) Connect the test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does EGR solenoid valve produce operating sound?***

NOTE:
EGR control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD05). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to next step 4).

NO : Replace EGR solenoid valve.



4) Turn ignition switch to OFF.
5) Disconnect connector from EGR solenoid valve.
6) Connect 12 V battery's ground ⊖ terminal to one terminal of the EGR solenoid valve. Then connect 12 V battery's ⊕ terminal to the other terminal of it.

CAUTION:
Do not use the 12 V battery installed in the vehicle, because the electrical system may be damaged.

7) Start the engine.

CHECK ***: Does EGR valve operate at a throttle valve opening of 5 to 10 degrees with visually check?***

YES : Possibly EGR valve malfunction may be due to freezing or clogging by foreign matter. At this point in time do not replace EGR valve, since it is not faulty. And after the checking, go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NOTE:
If malfunction is detected again in the confirmation of actual driving pattern, EGR valve is faulty. Go to next step 8).

NO : Go to next step 8).

8) Turn ignition switch to OFF.

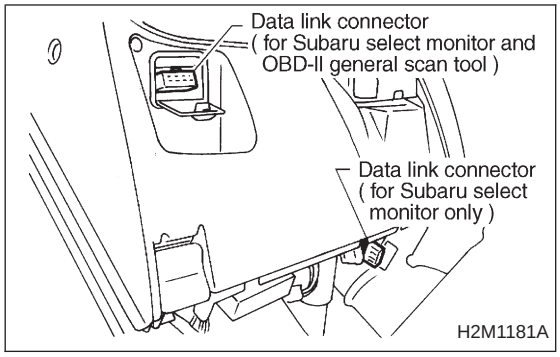
CHECK ***: Is there clogging in the gas outlets of intake manifold or cylinder head, checking by breathing into the outlets?***

YES : Repair or replace intake manifold or cylinder head. And go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

NO : Clean EGR valve. And go to **CONFIRMATION OF ACTUAL DRIVING PATTERN.**

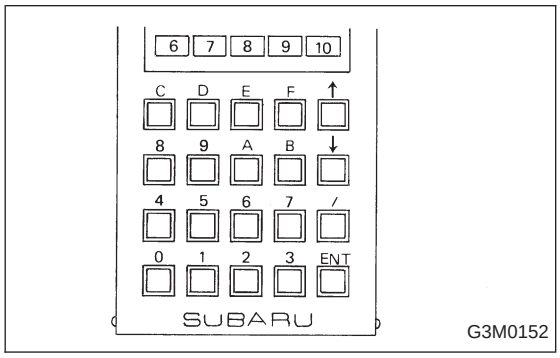
CAUTION:
Do not use solvent when cleaning EGR valve assembly, as it can damage diaphragm.

NOTE:
- Remove and blow away the exhaust deposits. Make sure the valve operates smoothly and the valve seat area is completely cleaned.
- Replace EGR valve as required.

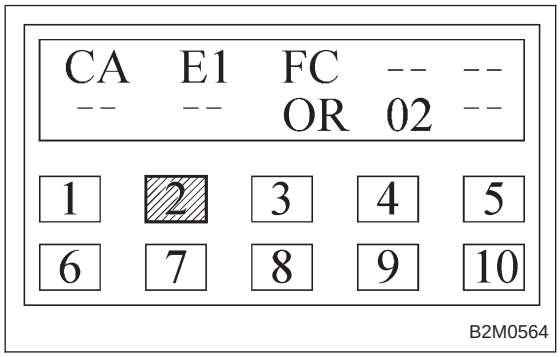


CONFIRMATION OF ACTUAL DRIVING PATTERN.

1) Conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to 2-7 [T3D0] and [T3E0].>
2) Connect Subaru select monitor to its data link connector.
3) Start and warm-up the engine until the radiator fan makes one complete rotation. (All accessory switches are OFF.)
4) Turn Subaru select monitor switch to ON.

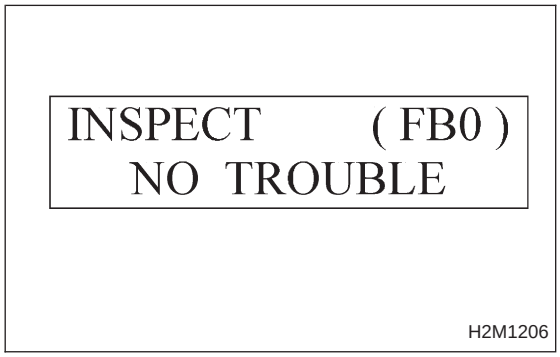


5) Designate mode using function key.
Function mode: FA4



6) Drive at 88±5 km/h (55±3 MPH) until the LED No. 2 comes on.

NOTE:
Keep the throttle valve opening at the same degree, since diagnosis will be interrupted when the opening varies.
Diagnosis starts in 190 seconds after starting engine and takes 4 seconds.
Put the gear to “D” range for the diagnosis.



7) Designate mode using function key.
Function mode: FB0
8) Confirm the “No trouble” indication on Subaru select monitor.

OBD	(FB1)
P0403	<EGRSOL>

OBD0323

AP: DTC P0403 — EXHAUST GAS RECIRCULATION CIRCUIT LOW INPUT —

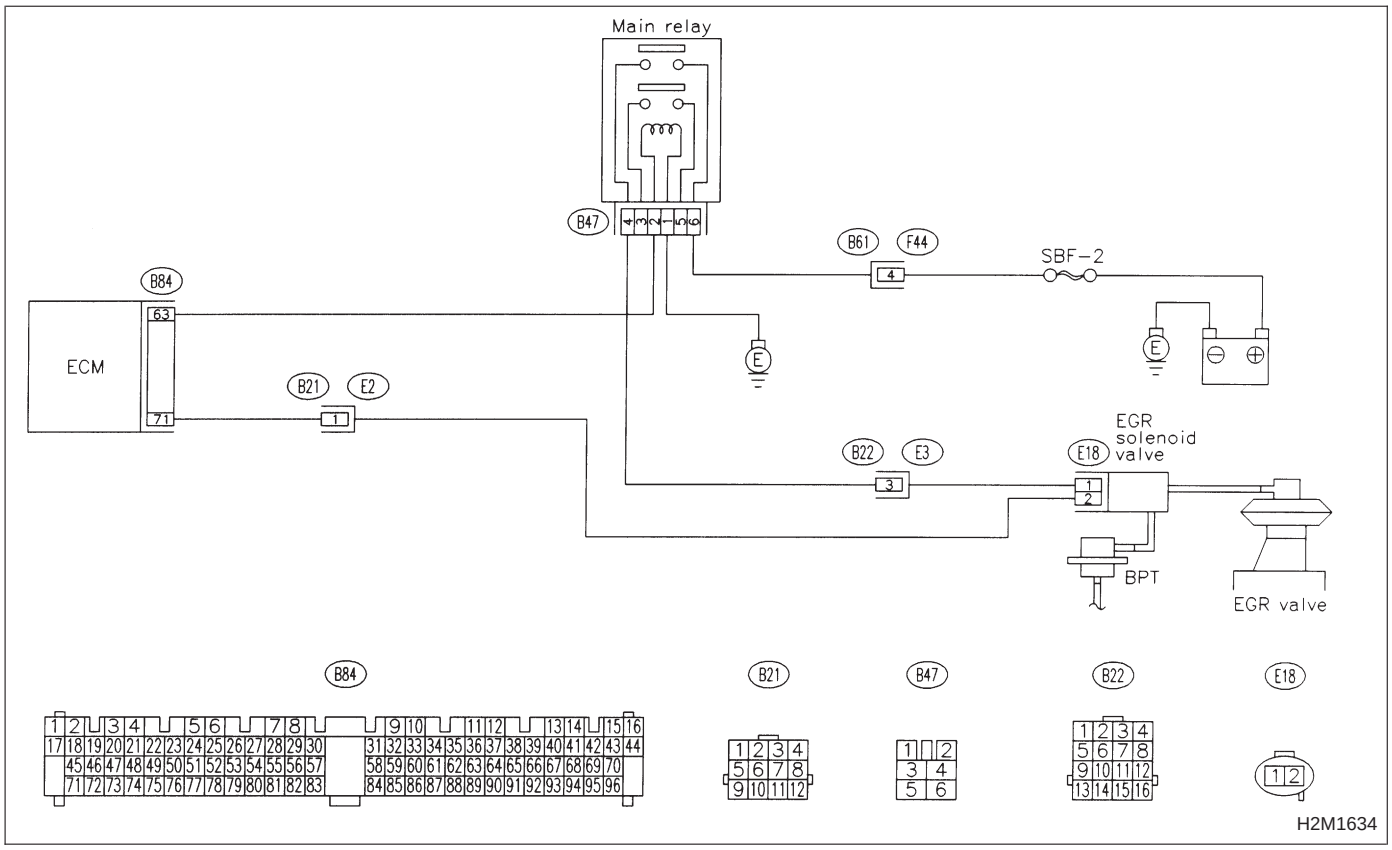
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Poor driving performance on low engine speed

WIRING DIAGRAM:



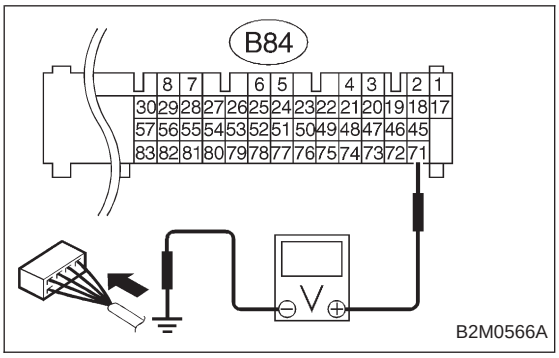
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AP1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type MT?***

YES : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>

NO : Go to step **10AP2**.



10AP2	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 71 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to **10AP3**.

NO : Go to step **10AP4**.

10AP3	CHECK POOR CONTACT.

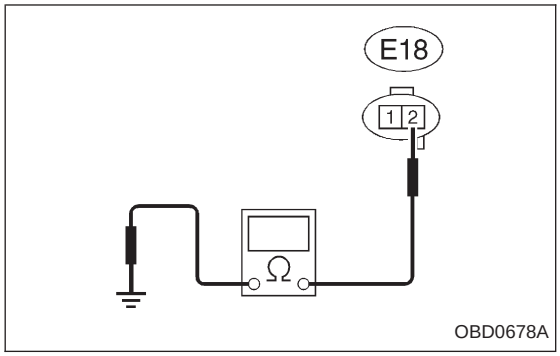
Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)

NOTE:
In this case, repair the following:
- Poor contact in EGR solenoid valve connector
- Poor contact in ECM connector
- Poor contact in coupling connector (B21)



10AP4	CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.

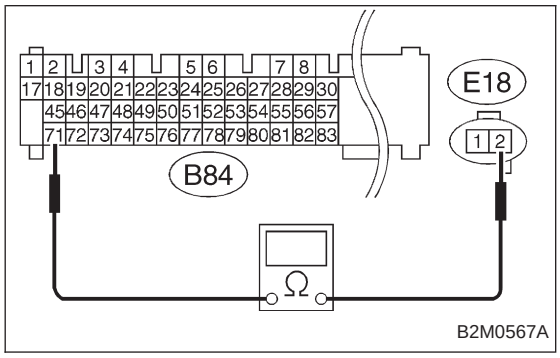
1) Turn ignition switch to OFF.
2) Disconnect connectors from EGR solenoid valve and ECM.
3) Measure resistance of harness between EGR solenoid valve connector and engine ground.

Connector & terminal
(E18) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and EGR solenoid valve connector.

NO : Go to next step 4).



4) Measure resistance of harness between ECM and EGR solenoid valve connector.

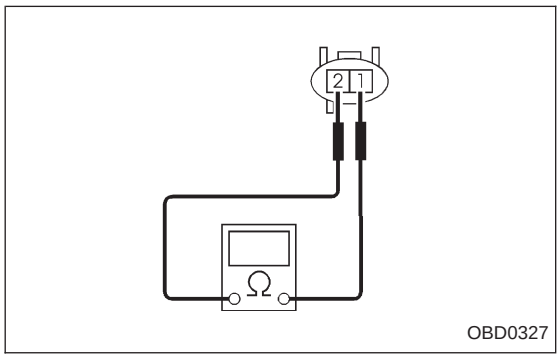
Connector & terminal
(B84) No. 71 — (E18) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AP5**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between EGR solenoid valve and ECM connector
- Poor contact in coupling connector (B21)
- Poor contact in EGR solenoid valve connector
- Poor contact in ECM connector



10AP5	CHECK EGR SOLENOID VALVE.

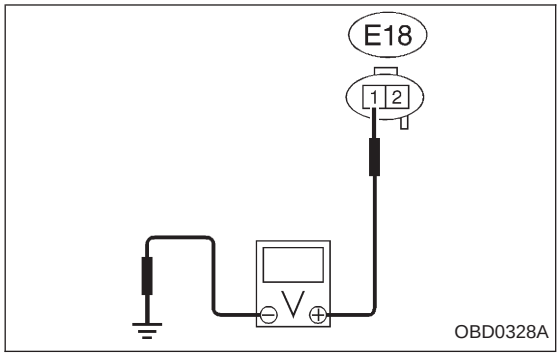
Measure resistance between EGR solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 10 and 100 Ω?***

YES : Go to step **10AP6**.

NO : Replace EGR solenoid valve.



10AP6	CHECK POWER SUPPLY TO EGR SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between EGR solenoid valve and engine ground.

Connector & terminal
(E18) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10AP7**.

NO : Repair open circuit in harness between main relay and EGR solenoid valve connector.

10AP7	CHECK POOR CONTACT.

Check poor contact in EGR solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in EGR solenoid valve connector?***

YES : Repair poor contact in EGR solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD	(FB1)
P0420	<CAT>

OBD0329

AQ: DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

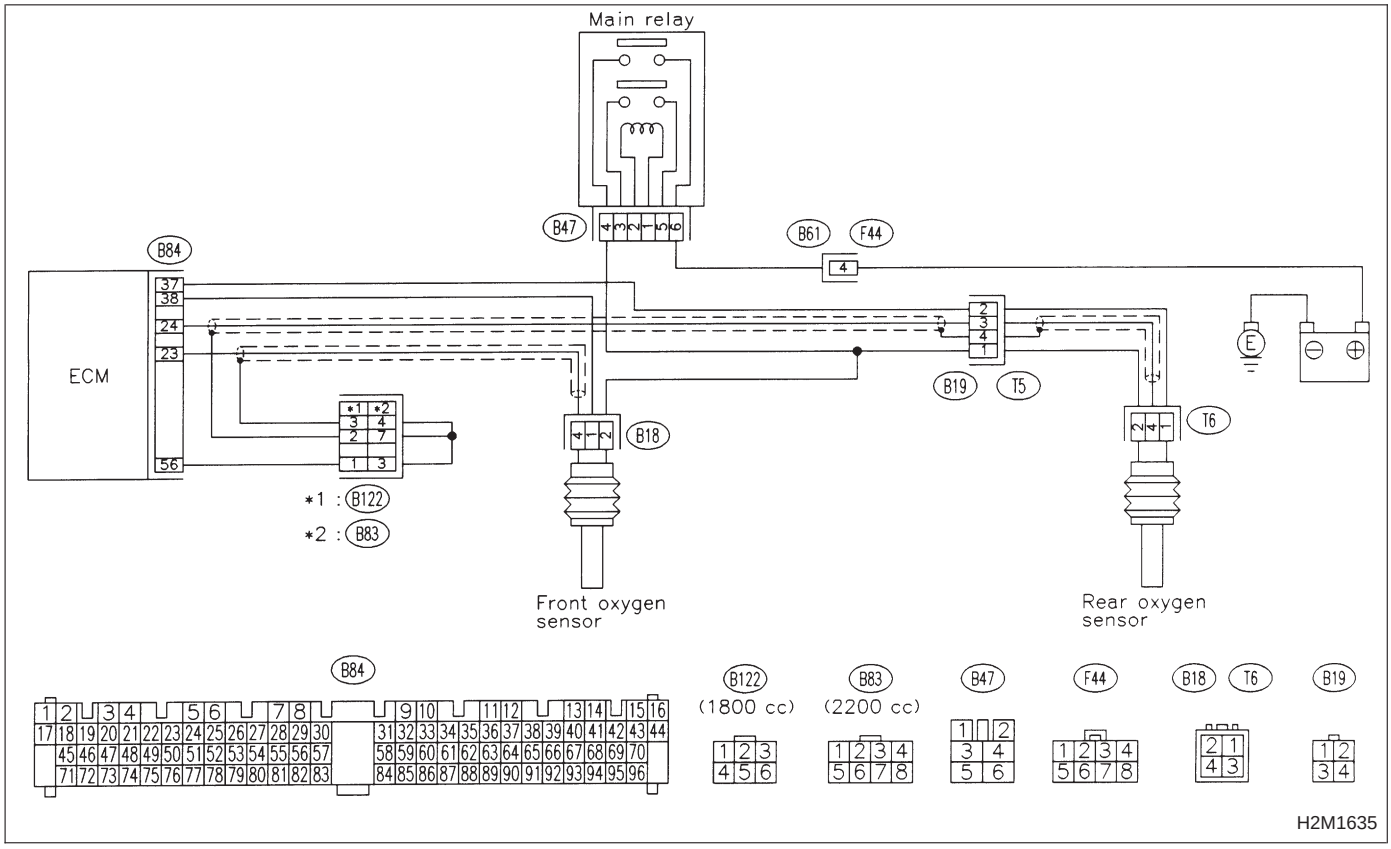
DTC DETECTING CONDITION:

- Immediately at fault recognition (2200 cc Federal spec. vehicles only)
- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AQ1	CHECK ANY OTHER DTC P0130, P0133, P0135, P0136, P0139 AND P0141 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0130, P0133, P0135, P0136, P0139 and P0141?***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0420.

NO : Go to step **10AQ2**.

10AQ2	CHECK EXHAUST SYSTEM.

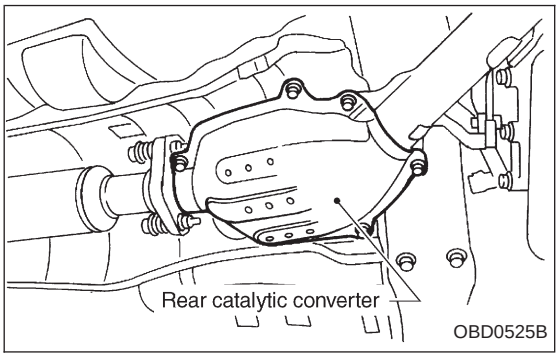
Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.

CHECK : ***Is there a fault in exhaust system?***

NOTE:
Check the following positions.
- Between cylinder head and front exhaust pipe
- Between front exhaust pipe and front catalytic converter
- Between front catalytic converter and rear catalytic converter

YES : Repair or replace exhaust system.

NO : Go to step **10AQ3**.



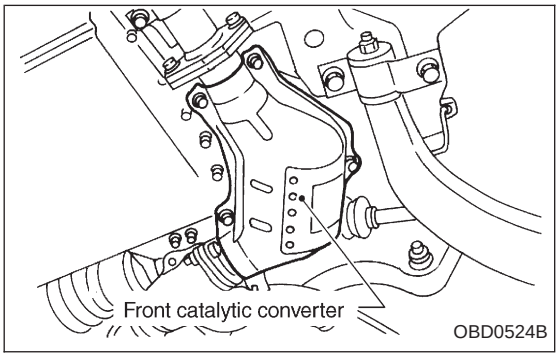
10AQ3	CHECK REAR CATALYTIC CONVERTER.

1) Separate rear catalytic converter from rear exhaust pipe.

CHECK : ***Is there damage at rear face of rear catalyst?***

YES : Replace front and rear catalytic converters.

NO : Go to next step 2).



2) Remove front catalytic converter.

CHECK : ***Is there damage at rear face or front face of front catalyst?***

YES : Replace front catalytic converter.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)
P0440 <EVAP>

H2M1365

AR: DTC P0440 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —

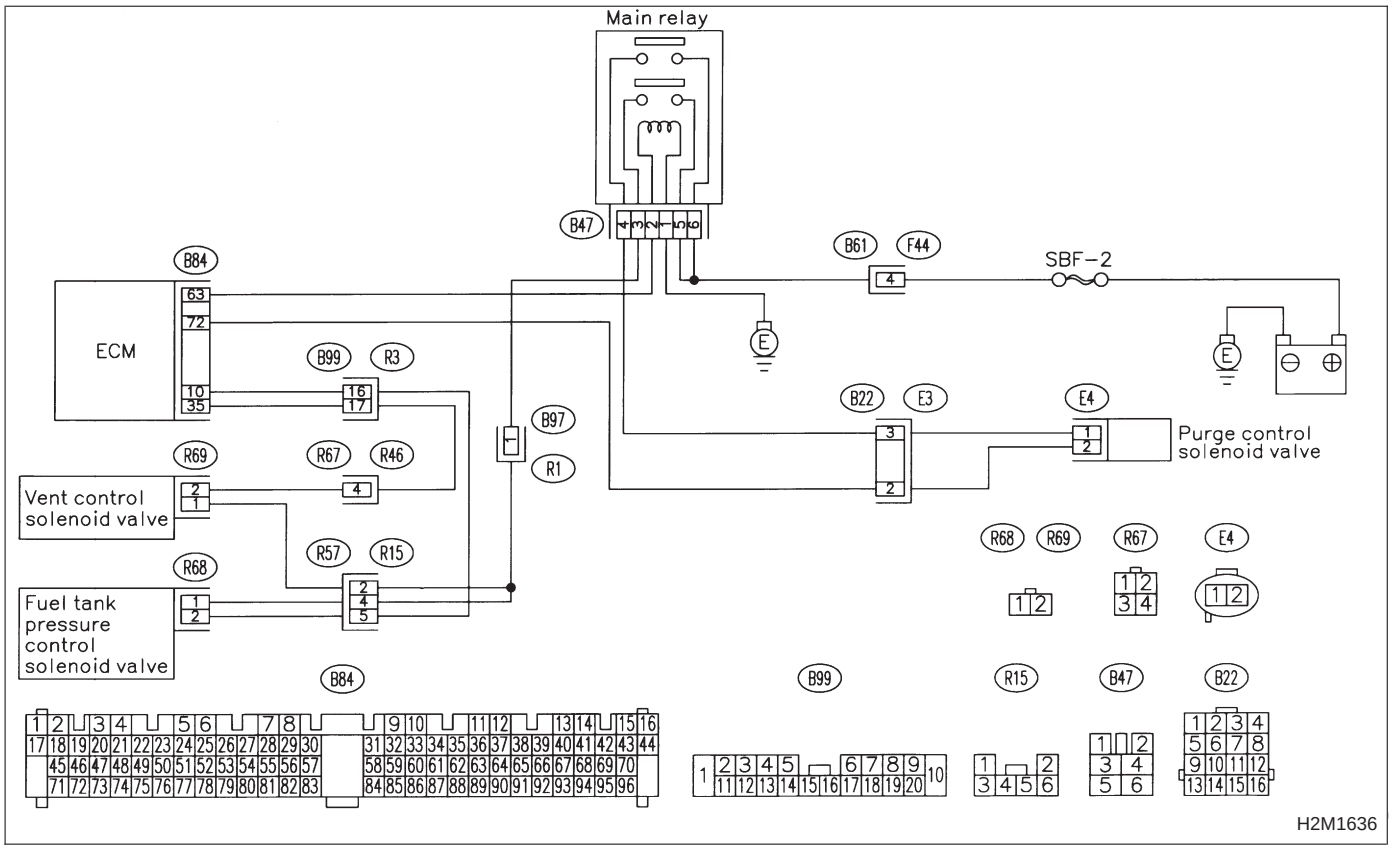
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Gasoline smell

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AR1	CHECK ANY OTHER DTC (BESIDES DTC P0440) ON DISPLAY.

CHECK ***: Is there any other DTC on display?***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10AR2**.

10AR2	CHECK FUEL FILLER CAP AND FUEL FILLER PIPE.

1) Turn ignition switch to OFF.
2) Open the fuel flap.

CHECK ***: Is the fuel filler cap tightened securely?***

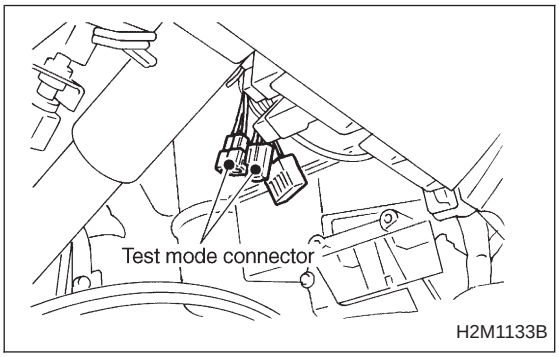
YES : Tighten fuel filler cap securely.

NO : Go to next CHECK .

CHECK ***: Is there any damage to the seal between fuel filler cap and fuel filler pipe?***

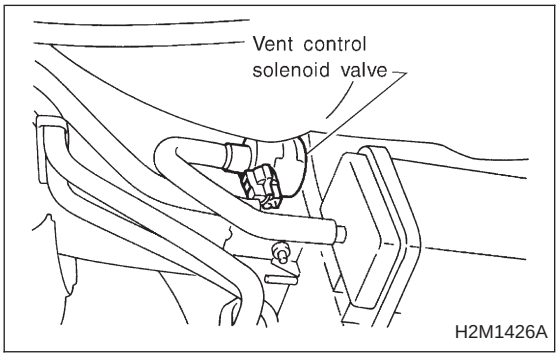
YES : Repair or replace fuel filler cap and fuel filler pipe.

NO : Go to step **10AR3**.



10AR3	CHECK VENT CONTROL SOLENOID VALVE.

1) Connect test mode connector.
2) Turn ignition switch to ON.

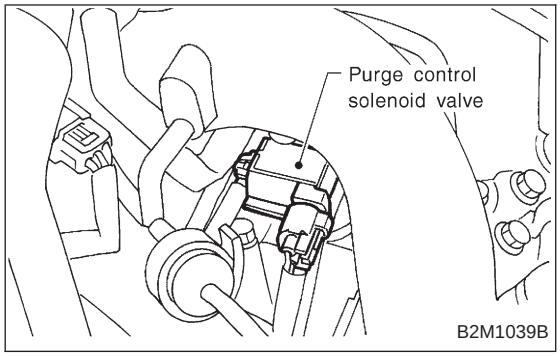


CHECK ***: Does vent control solenoid valve produce operating sound?***

NOTE:
Vent control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD08). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10AR4**.

NO : Replace vent control solenoid valve.



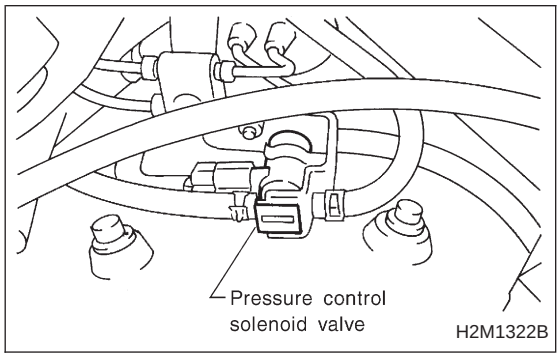
10AR4	CHECK PURGE CONTROL SOLENOID VALVE.

CHECK ***: Does purge control solenoid valve produce operating sound?***

NOTE:
Purge control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD02). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10AR5**.

NO : Replace purge control solenoid valve.



10AR5	CHECK PRESSURE CONTROL SOLENOID VALVE.

CHECK ***: Does pressure control solenoid valve produce operating sound?***

NOTE:
Pressure control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD07). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10AR6**.

NO : Replace pressure control solenoid valve.

10AR6	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.

Turn ignition switch to OFF.

CHECK ***: Does fuel leak in fuel line?***

YES : Repair or replace fuel line.

NO : Go to next CHECK .

CHECK ***: Is there any damage at canister?***

YES : Repair or replace canister.

NO : Go to next CHECK .

CHECK ***: Is there any damage at fuel tank?***

YES : Repair or replace fuel tank.

NO : Go to next CHECK .

CHECK ***: Are there holes, cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?***

YES : Repair or replace hoses or pipes.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD	(FB1)
P0441	<CPC_F>

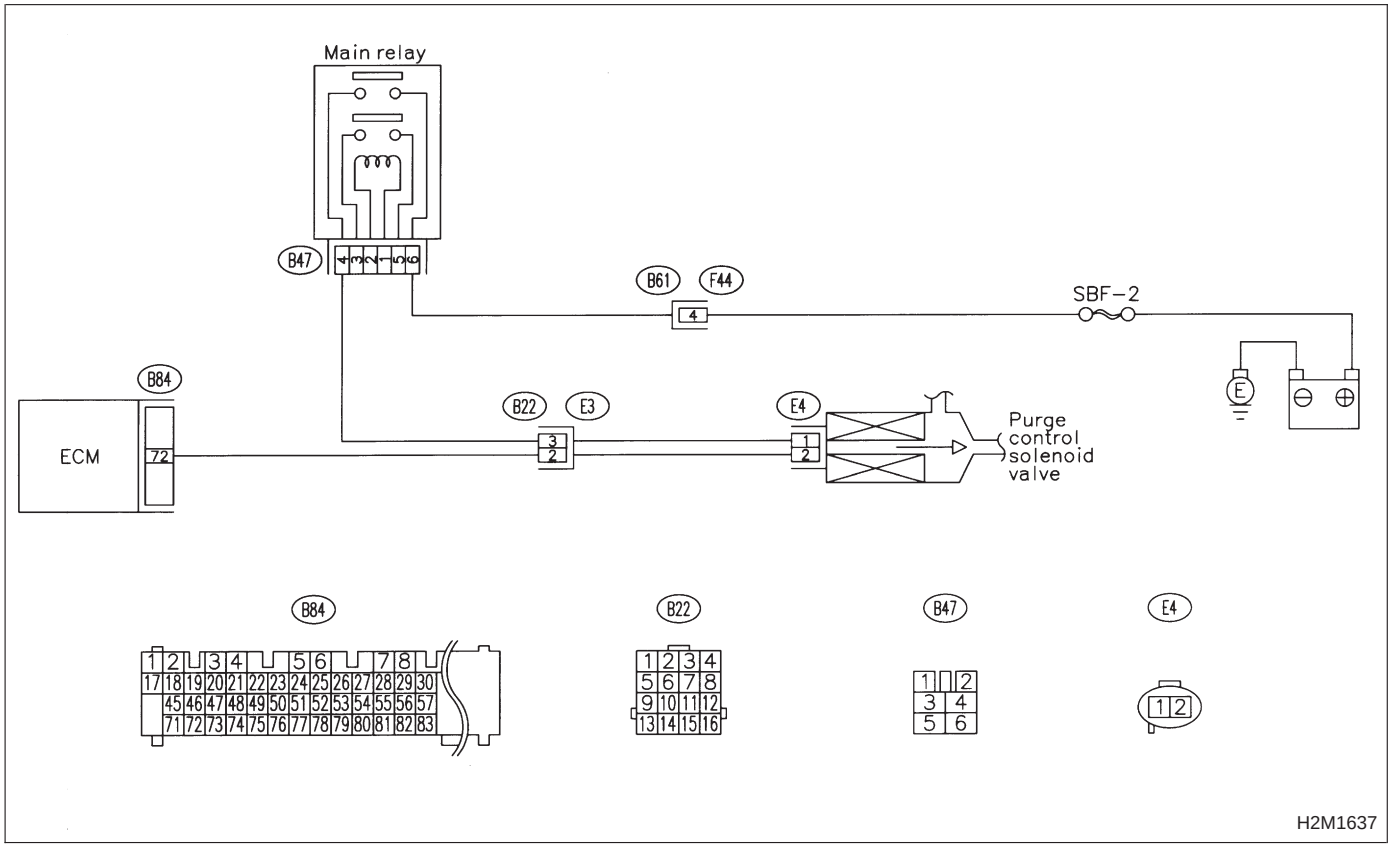
OBD0331

AS: DTC P0441 — EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

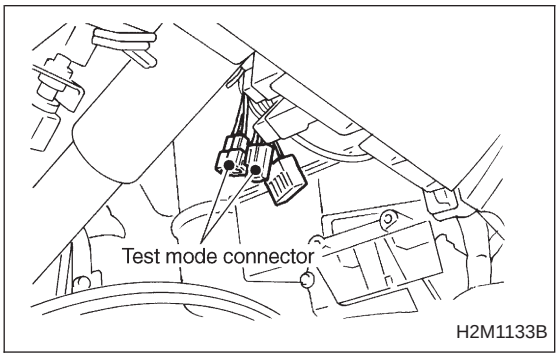
10AS1	CHECK DTC P0106, P0107, P0108, P0443, P1102, P1122 OR P1422 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0443, P1102, P1122 or P1422?***

YES : Inspect the relevant DTC P0106, P0107, P0108, P0443, P1102, P1122 or P1422 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0441.

NO : Go to step **10AS2**.



10AS2	CHECK PURGE CONTROL SOLENOID VALVE OPERATION.

1) Turn ignition switch to OFF.
2) Connect test mode connector at the lower portion of instrument panel (on the driver’s side), to the side of the center console box.
3) Turn ignition switch to ON.

CHECK ***: Does purge control solenoid valve produce operating sound at about 0.3 Hz?***

NOTE:
Purge control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD02). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to next step 4).

NO : Replace purge control solenoid valve.

4) Disconnect canister purge hose from canister.

CHECK ***: Does pulsation occur by blowing through the canister purge hose?***

YES : Repair or replace evaporation line.

NOTE:
In this case, repair the following:
- Loose connections in evaporation line
- Cracks in evaporation line
- Clogging in evaporation line

NO : Replace purge control solenoid valve.

OBD (FB1)

P0443 <CPC>

OBD0335

AT: DTC P0443 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

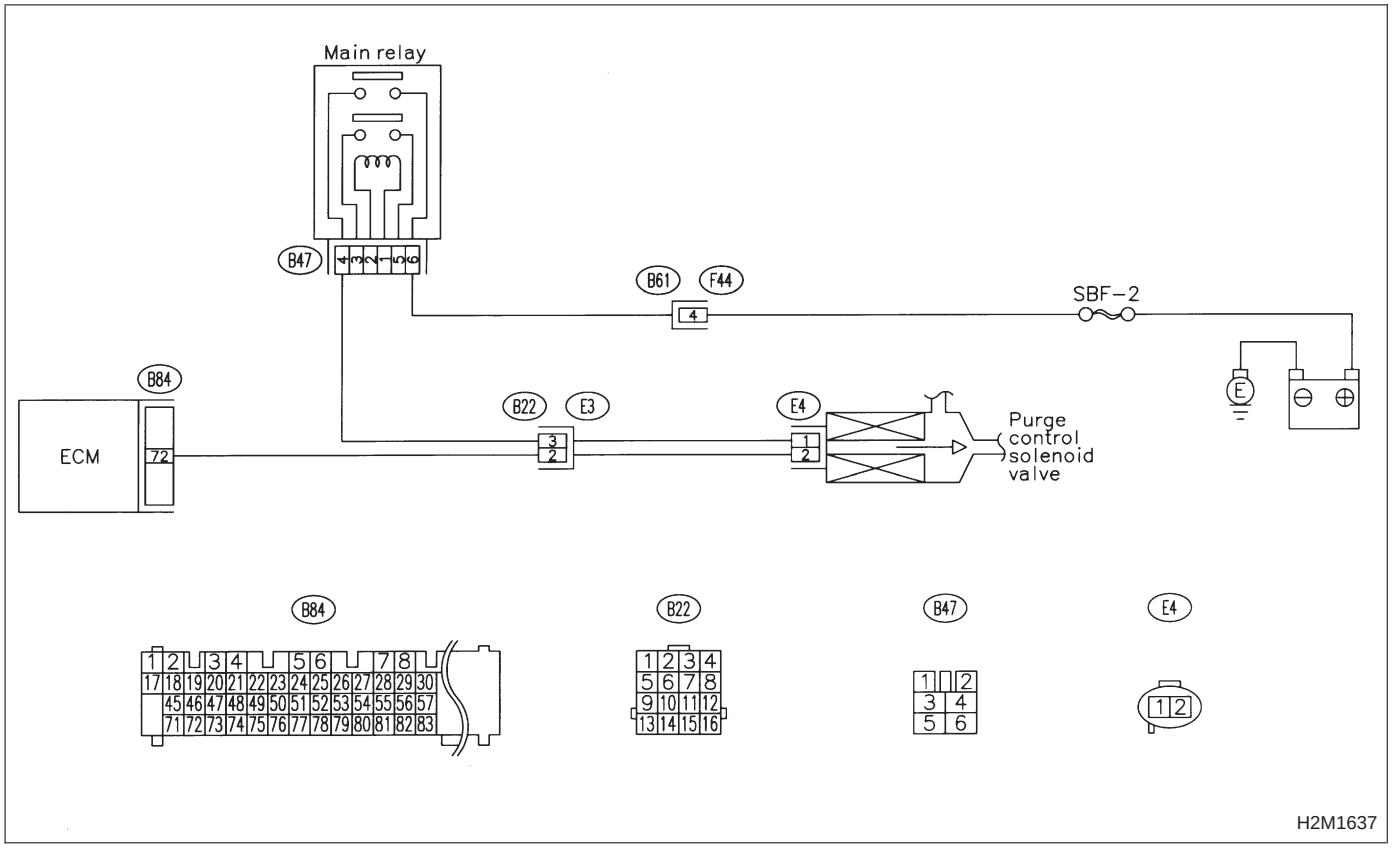
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

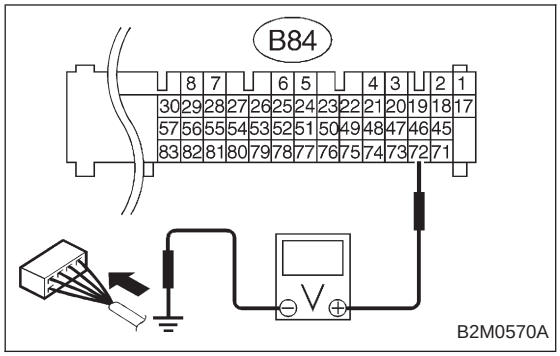
TROUBLE SYMPTOM:

- Erroneous idling

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10AT1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

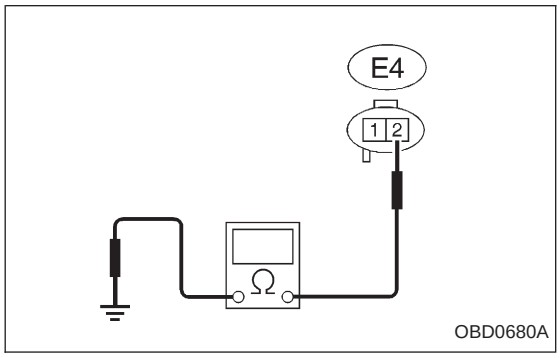
Connector & terminal
(B84) No. 72 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

NO : Go to step **10AT2**.



10AT2	CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.

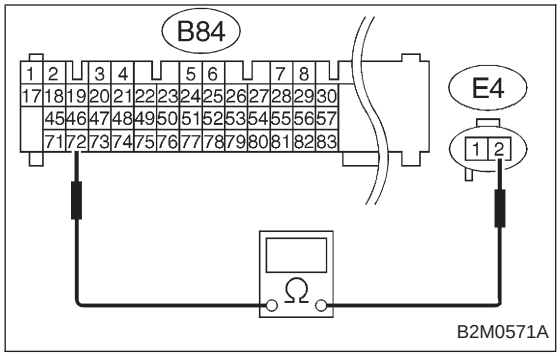
1) Turn ignition switch to OFF.
2) Disconnect connectors from purge control solenoid valve and ECM.
3) Measure resistance of harness between purge control solenoid valve connector and engine ground.

Connector & terminal
(E4) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and purge control solenoid valve connector.

NO : Go to next step 4).



4) Measure resistance of harness between ECM and purge control solenoid valve of harness connector.

Connector & terminal
(B84) No. 72 — (E4) No. 2:

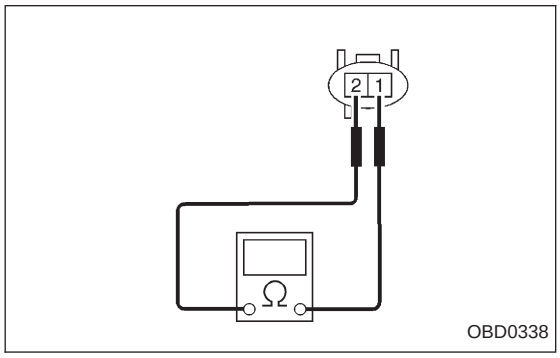
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AT3**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and purge control solenoid valve connector
- Poor contact in coupling connector (B22)



10AT3	CHECK PURGE CONTROL SOLENOID VALVE.

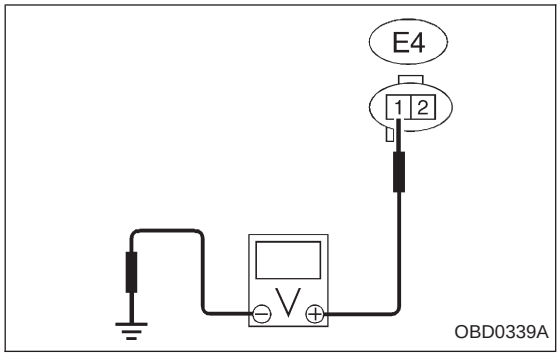
1) Remove purge control solenoid valve.
2) Measure resistance between purge control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 10 and 100 Ω?***

YES : Go to step **10AT4**.

NO : Replace purge control solenoid valve.



10AT4	CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between purge control solenoid valve and engine ground.

Connector & terminal
(E4) No. 1 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10AT5**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and purge control solenoid valve connector
- Poor contact in coupling connector (B22)
- Poor contact in main relay connector

10AT5	CHECK POOR CONTACT.

Check poor contact in purge control solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in purge control solenoid valve connector?***

YES : Repair poor contact in purge control solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P0446<VCMSOL_LO>

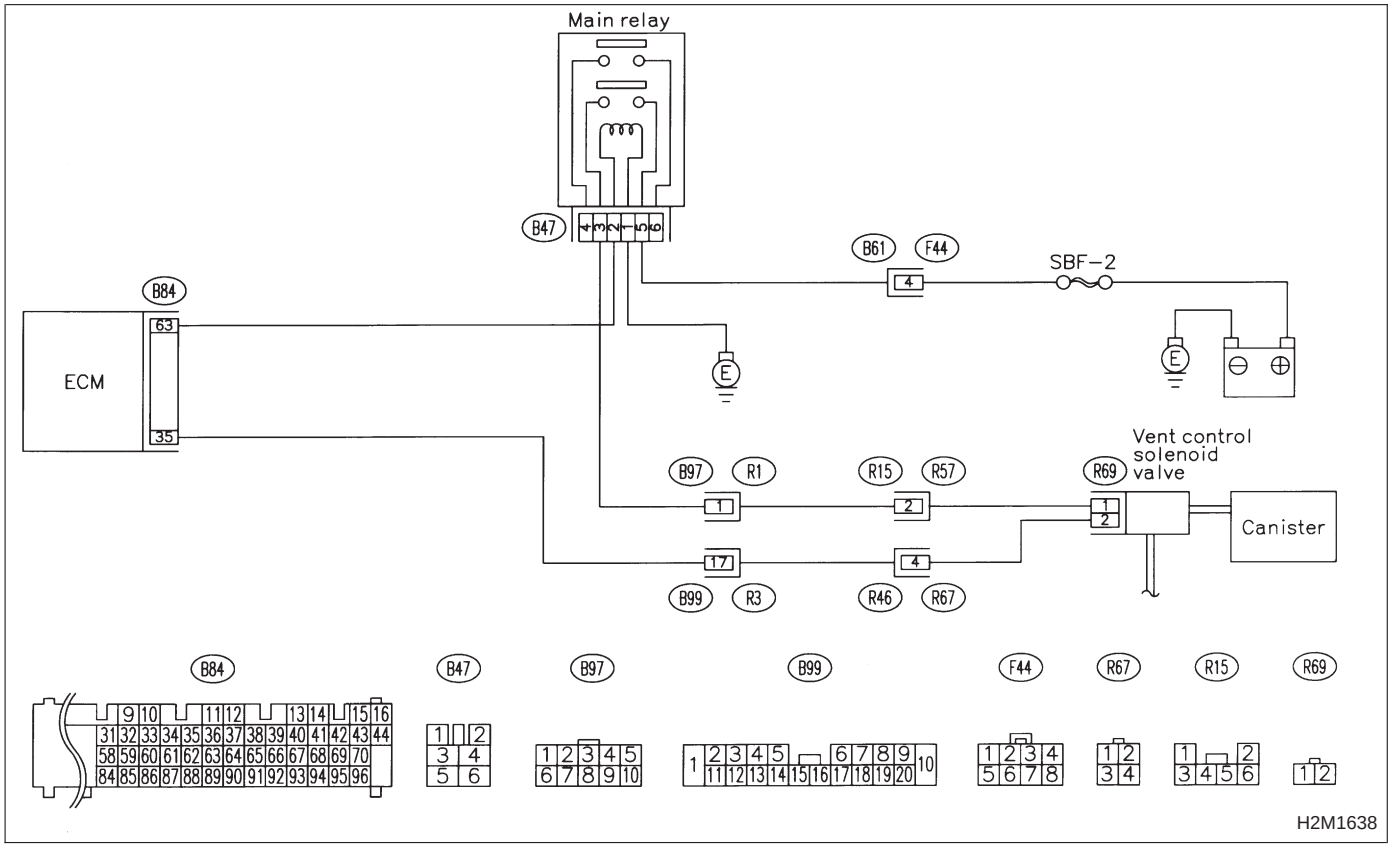
B2M1098

AU: DTC P0446 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —

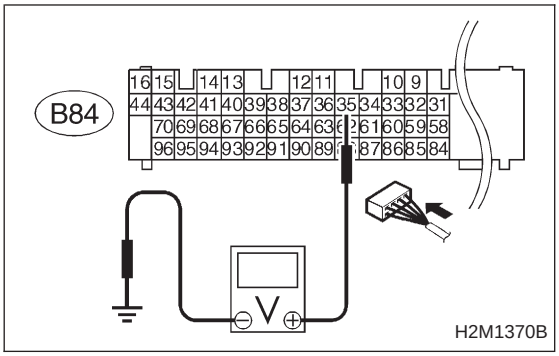
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10AU1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 35 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10AU2**.

NO : Go to step **10AU3**.

10AU2	CHECK POOR CONTACT.

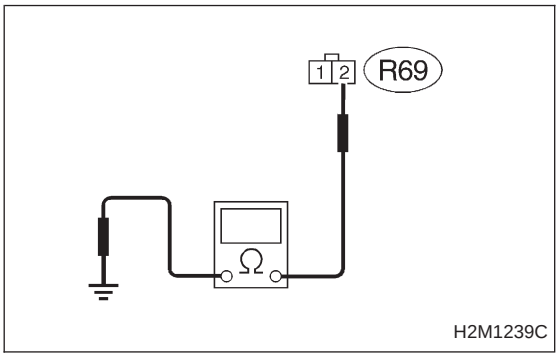
Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)

NOTE:
In this case, repair the following:
- Poor contact in vent control solenoid valve connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B97, B99, R15 and R67)



10AU3	CHECK HARNESS BETWEEN VENT CONTROL SOLENOID VALVE AND ECM CONNECTOR.

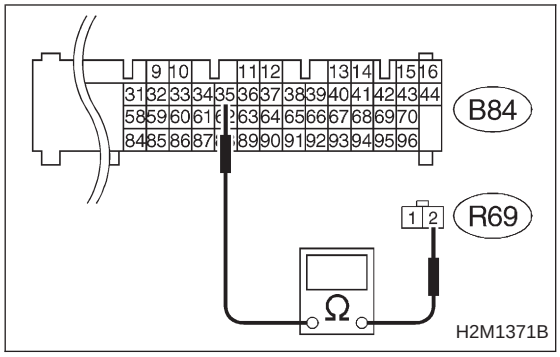
1) Turn ignition switch to OFF.
2) Disconnect connectors from vent control solenoid valve and ECM.
3) Measure resistance of harness between vent control solenoid valve connector and chassis ground.

Connector & terminal
(R69) No. 2 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and vent control solenoid valve connector.

NO : Go to next step 4).



4) Measure resistance of harness between ECM and vent control solenoid valve connector.

Connector & terminal
(B84) No. 35 — (R69) No. 2:

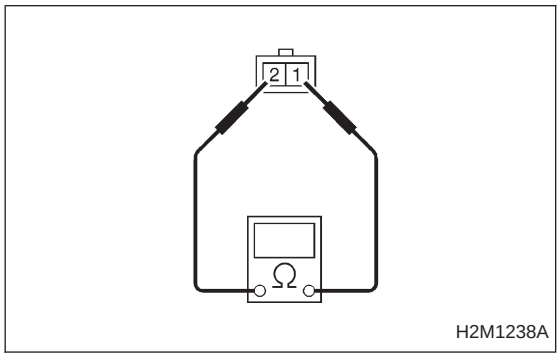
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AU4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and vent control solenoid valve connector
- Poor contact in coupling connectors (B99 and R67)



10AU4	CHECK VENT CONTROL SOLENOID VALVE.

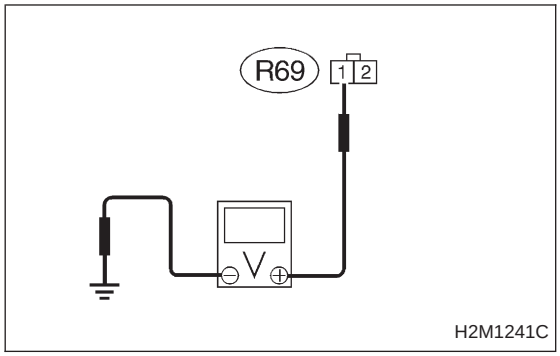
Measure resistance between vent control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 10 and 100 Ω?***

YES : Go to step **10AU5**.

NO : Replace vent control solenoid valve.



10AU5	CHECK POWER SUPPLY TO VENT CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between vent control solenoid valve and chassis ground.

Connector & terminal
(R69) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10AU6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and vent control solenoid valve
- Poor contact in coupling connectors (B97 and R15)
- Poor contact in main relay connector

10AU6	CHECK POOR CONTACT.

Check poor contact in vent control solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in vent control solenoid valve connector?***

YES : Repair poor contact in vent control solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P0451 <TNKP_F>

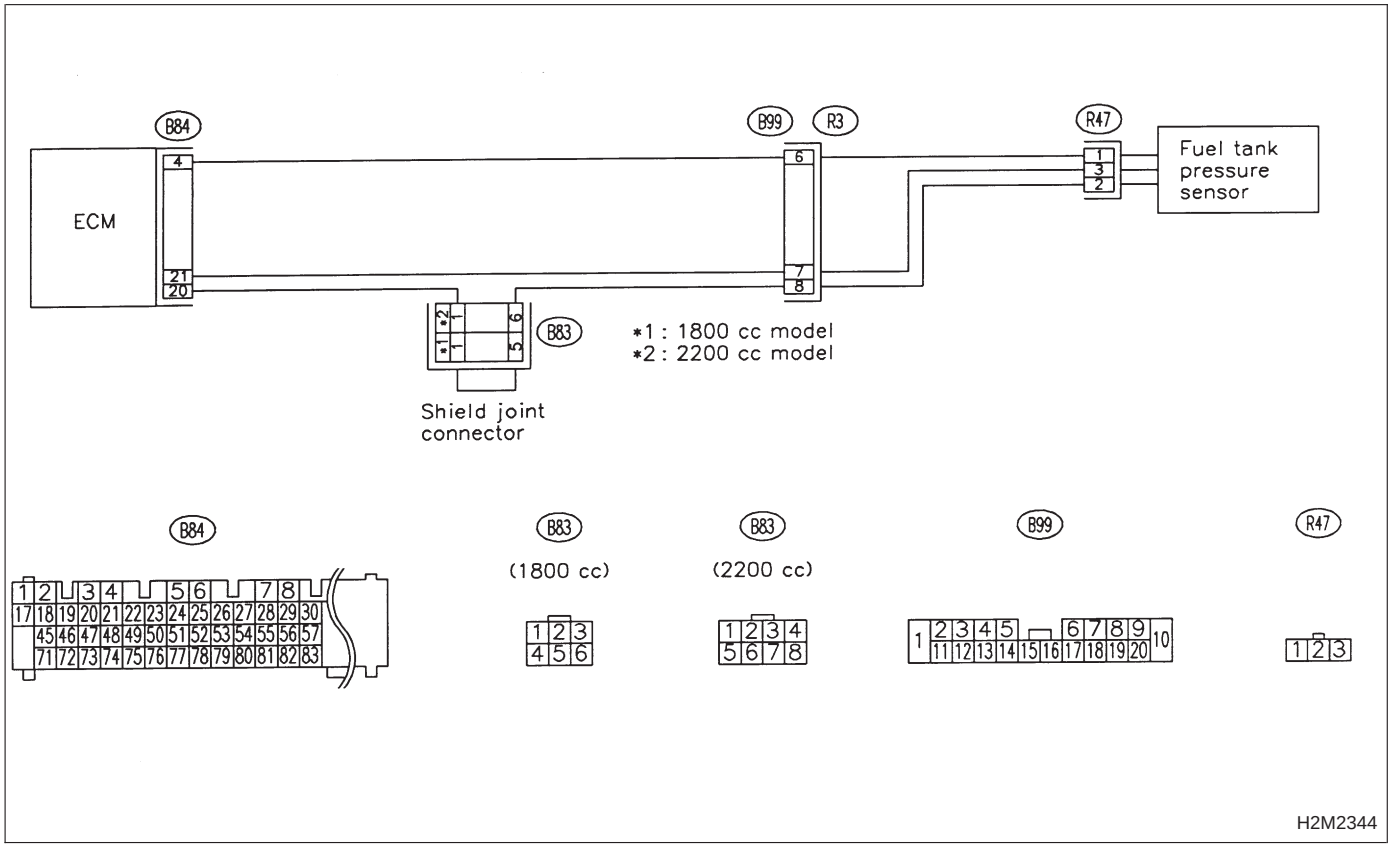
H2M1377

AV: DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



H2M2344

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AV1	CHECK PRESSURE/VACUUM LINE.

CHECK ***: Is there a fault in pressure/vacuum line?***

NOTE:
Check the following items.

- Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank
- Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank

YES : Repair or replace hoses and pipes.

NO : Replace fuel tank pressure sensor.

OBD (FB1)

P0452 <TNKP_LOW>

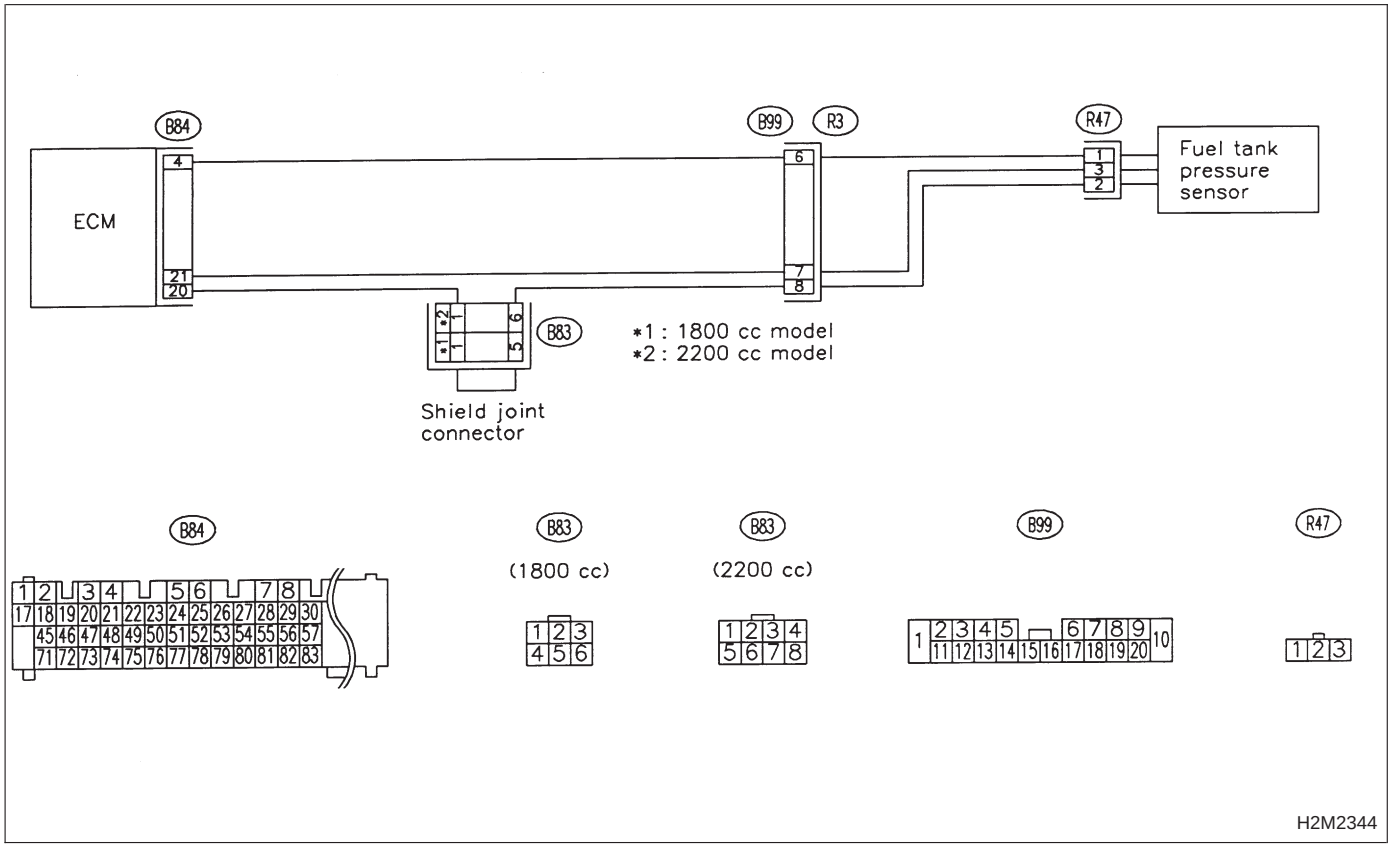
B2M1099

AW: DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

DTC DETECTING CONDITION:

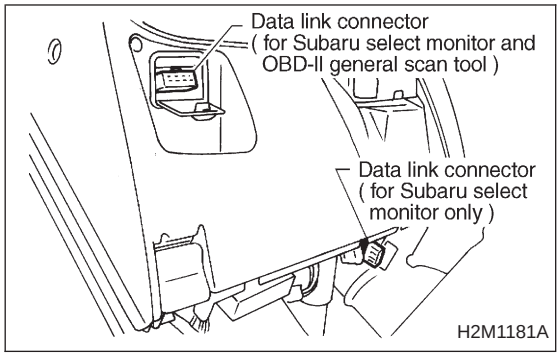
- Immediately at fault recognition

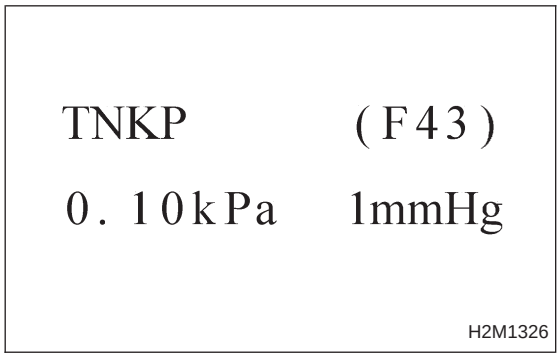
WIRING DIAGRAM:



H2M2344

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10AW1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Remove fuel filler cap.
3) Install fuel filler cap.
4) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
5) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
6) Read the data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F43

● F43: Display shows pressure signal value sent from fuel tank pressure sensor.

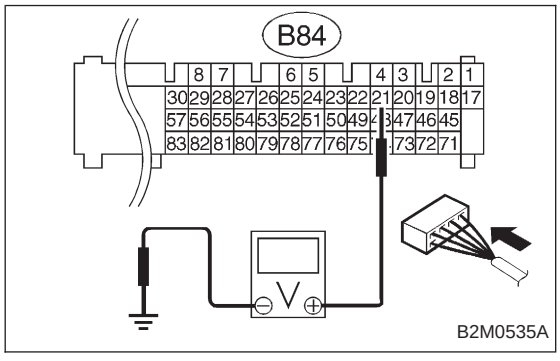
CHECK ***: Is the value less than −2.8 kPa in function mode F43?***

YES : Go to step **10AW2**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10AW2	CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.

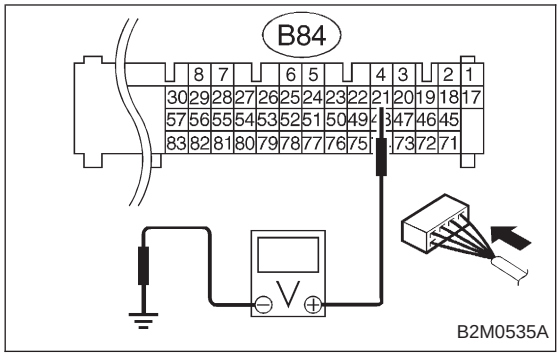
Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 21 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to step **10AW4**.

NO : Go to step **10AW3**.



10AW3	CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.

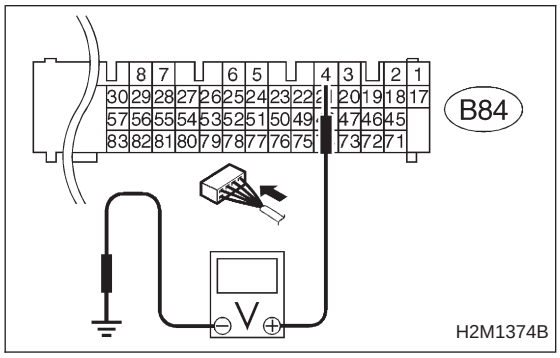
Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10AW4	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER.)

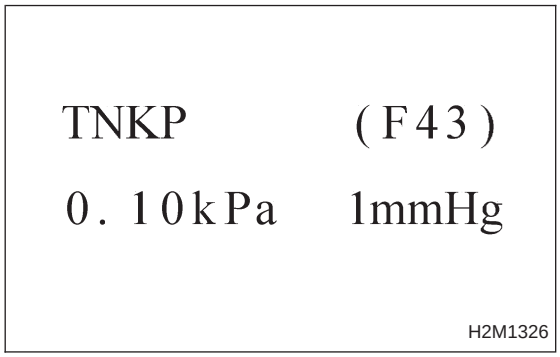
Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.2 V?***

YES : Go to step **10AW6**.

NO : Go to step **10AW5**.



10AW5	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)

Read data on Subaru Select Monitor.
● Subaru Select Monitor
Designate mode using function key.

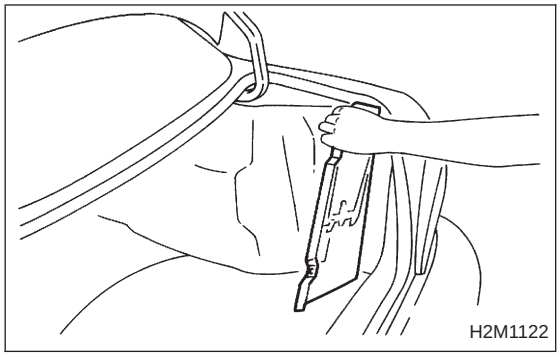
Function mode: F43

● F43: Display shows pressure signal value sent from fuel tank pressure sensor.

CHECK ***: Does the value change more than −2.8 kPa by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

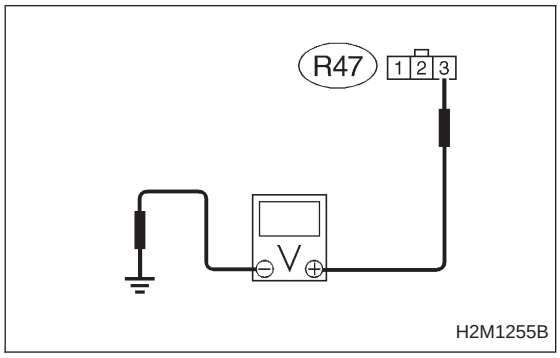
YES : Repair poor contact in ECM connector.

NO : Go to step **10AW6**.


H2M1122

10AW6	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.**

1) Turn ignition switch to OFF.
2) Detach right side trunk side trim panel (Sedan) or right side rear quarter trim panel (Wagon).



H2M1255B

3) Disconnect connector from fuel tank pressure sensor.
4) Turn ignition switch to ON.
5) Measure voltage between fuel tank pressure sensor connector and chassis ground.

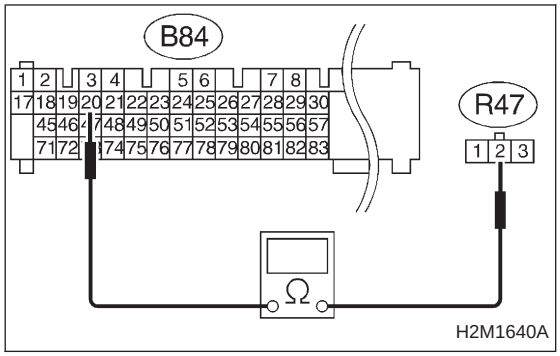
Connector & terminal
(R47) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to step **10AW7**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel tank pressure sensor connector
- Poor contact in coupling connector (B99)



10AW7	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and pressure sensor connector.

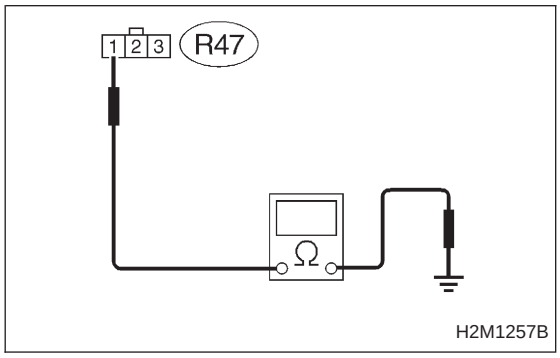
Connector & terminal
(B84) No. 20 — (R47) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AW8**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel tank pressure sensor connector
- Poor contact in coupling connectors (B83 and B99)



10AW8	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

Measure resistance of harness between fuel tank pressure sensor connector and chassis ground.

Connector & terminal
(R47) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 500 kΩ?***

YES : Go to step **10AW9**.

NO : Repair ground short circuit in harness between ECM and fuel tank pressure sensor connector.

10AW9	CHECK POOR CONTACT.

Check poor contact in fuel tank pressure sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in fuel tank pressure sensor connector?***

YES : Repair poor contact in fuel tank pressure sensor connector.

NO : Replace fuel tank pressure sensor.

OBD (FB1)

P0453 <TNKP_HI>

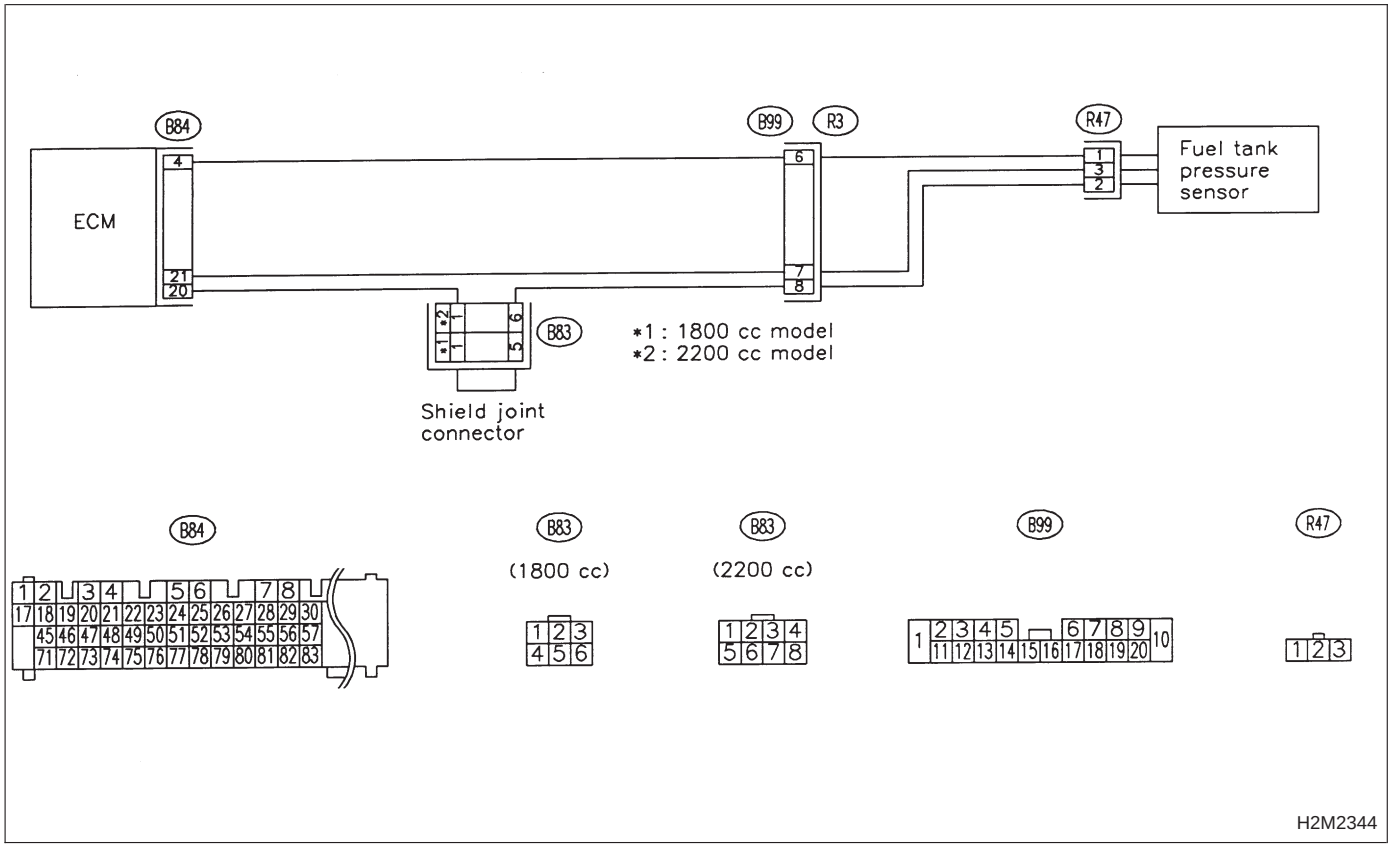
B2M1100

AX: DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

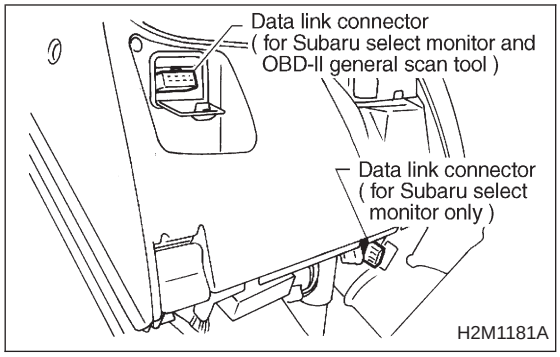
DTC DETECTING CONDITION:

- Immediately at fault recognition

WIRING DIAGRAM:

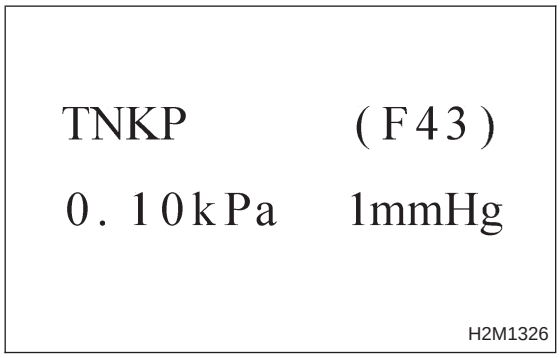


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

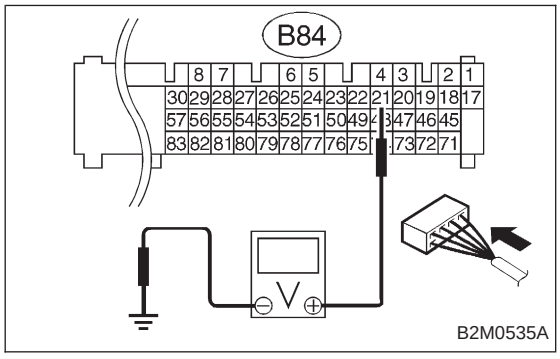


10AX1	CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.

1) Turn ignition switch to OFF.
2) Remove fuel filler cap.
3) Install fuel filler cap.
4) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
5) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.

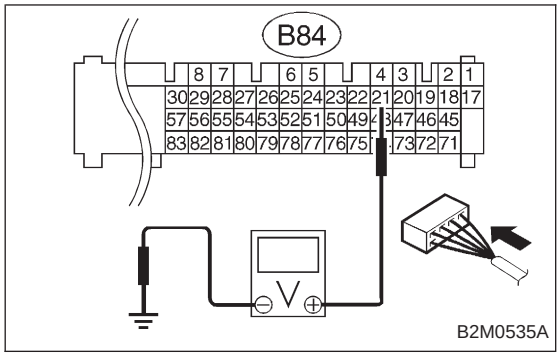


6) Read the data on Subaru Select Monitor or the OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.
Function mode: F43
● F43: Display shows pressure signal value sent from fuel tank pressure sensor.
CHECK ***: Is the value more than 2.8 kPa in function mode F43?***
YES : Go to step **10AX10**.
NO : Go to step **10AX2**.
● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10AX2	CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.

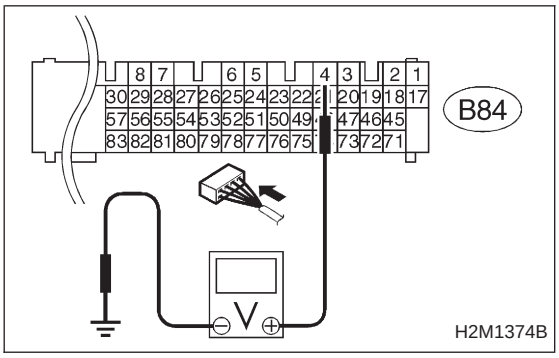
Measure voltage between ECM connector and chassis ground.
Connector & terminal
(B84) No. 21 (+) — Chassis ground (−):
CHECK ***: Is the voltage more than 4.5 V?***
YES : Go to step **10AX4**.
NO : Go to step **10AX3**.



10AX3	CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.

Measure voltage between ECM connector and chassis ground.
CHECK ***: Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?***
YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10AX4	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER.)

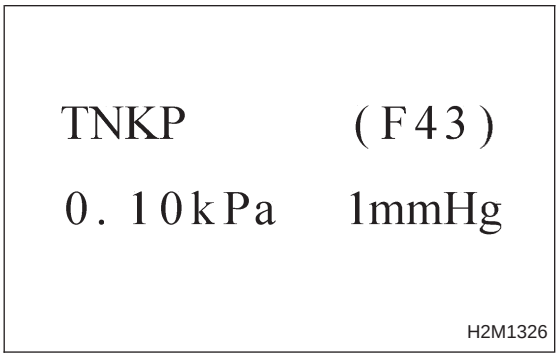
Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.2 V?***

YES : Go to step **10AX6**.

NO : Go to step **10AX5**.



10AX5	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)

Read data on Subaru Select Monitor.
- Subaru Select Monitor

Designate mode using function key.

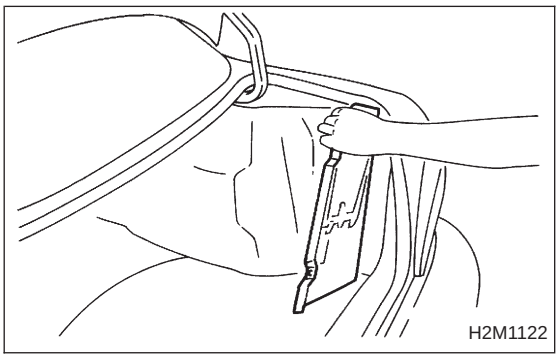
Function mode: F43

- F43: Display shows pressure signal value sent from fuel tank pressure sensor.

CHECK ***: Does the value change more than −2.8 kPa by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?***

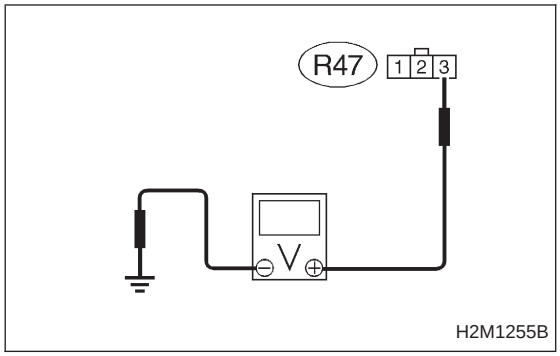
YES : Repair poor contact in ECM connector.

NO : Go to step **10AX6**.



10AX6	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

1) Turn ignition switch to OFF.
2) Detach right side trunk side trim panel (Sedan) or right side rear quarter trim panel (Wagon).



3) Disconnect connector from fuel tank pressure sensor.
4) Turn ignition switch to ON.
5) Measure voltage between fuel tank pressure sensor connector and chassis ground.

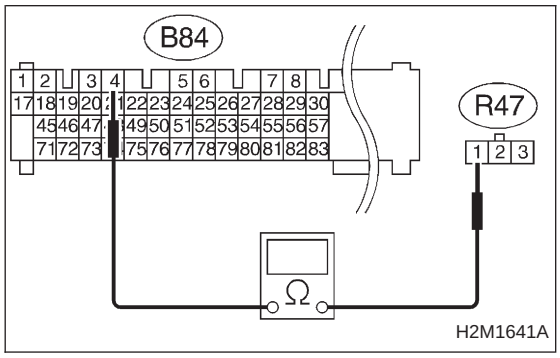
Connector & terminal
(R47) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to step **10AX7**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel tank pressure sensor connector
- Poor contact in coupling connector (B99)



10AX7	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and pressure sensor connector.

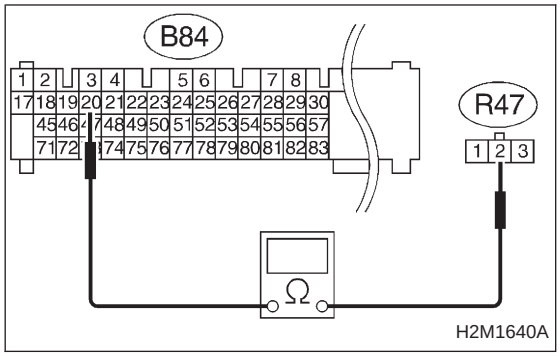
Connector & terminal
(B84) No. 4 — (R47) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AX8**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and fuel tank pressure sensor connector
- Poor contact in coupling connector (B99)



10AX8	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

Measure resistance of harness between ECM and pressure sensor connector.

Connector & terminal
(B84) No. 20 — (R47) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10AX9**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and fuel tank pressure sensor connector
- Poor contact in coupling connectors (B83 and B99)

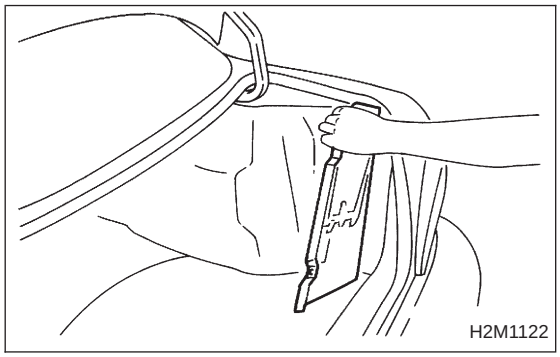
10AX9	CHECK POOR CONTACT.

Check poor contact in fuel tank pressure sensor connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in fuel tank pressure sensor connector?***

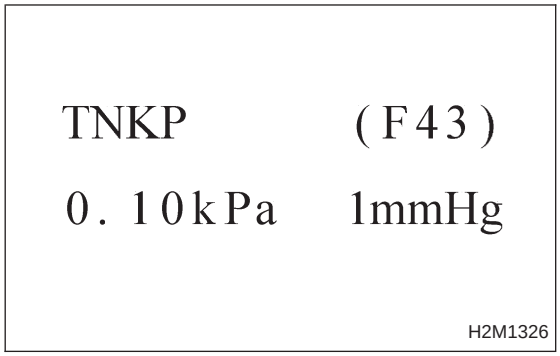
YES : Repair poor contact in fuel tank pressure sensor connector.

NO : Replace fuel tank pressure sensor.



10AX10	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.

1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF.
2) Detach right side trunk side trim panel (Sedan) or right side rear quarter trim panel (Wagon).



3) Disconnect connector from fuel tank pressure sensor.
4) Remove fuel filler cap.
5) Install fuel filler cap.
6) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.
7) Read data on Subaru select monitor or the OBD-II general scan tool.

● Subaru Select Monitor

Designate mode using function key.

Function mode: F43

CHECK ***: Is the value more than 2.8 kPa in function mode F43?***

YES : Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.

NO : Replace fuel tank pressure sensor.

● OBD-II general scan tool

For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

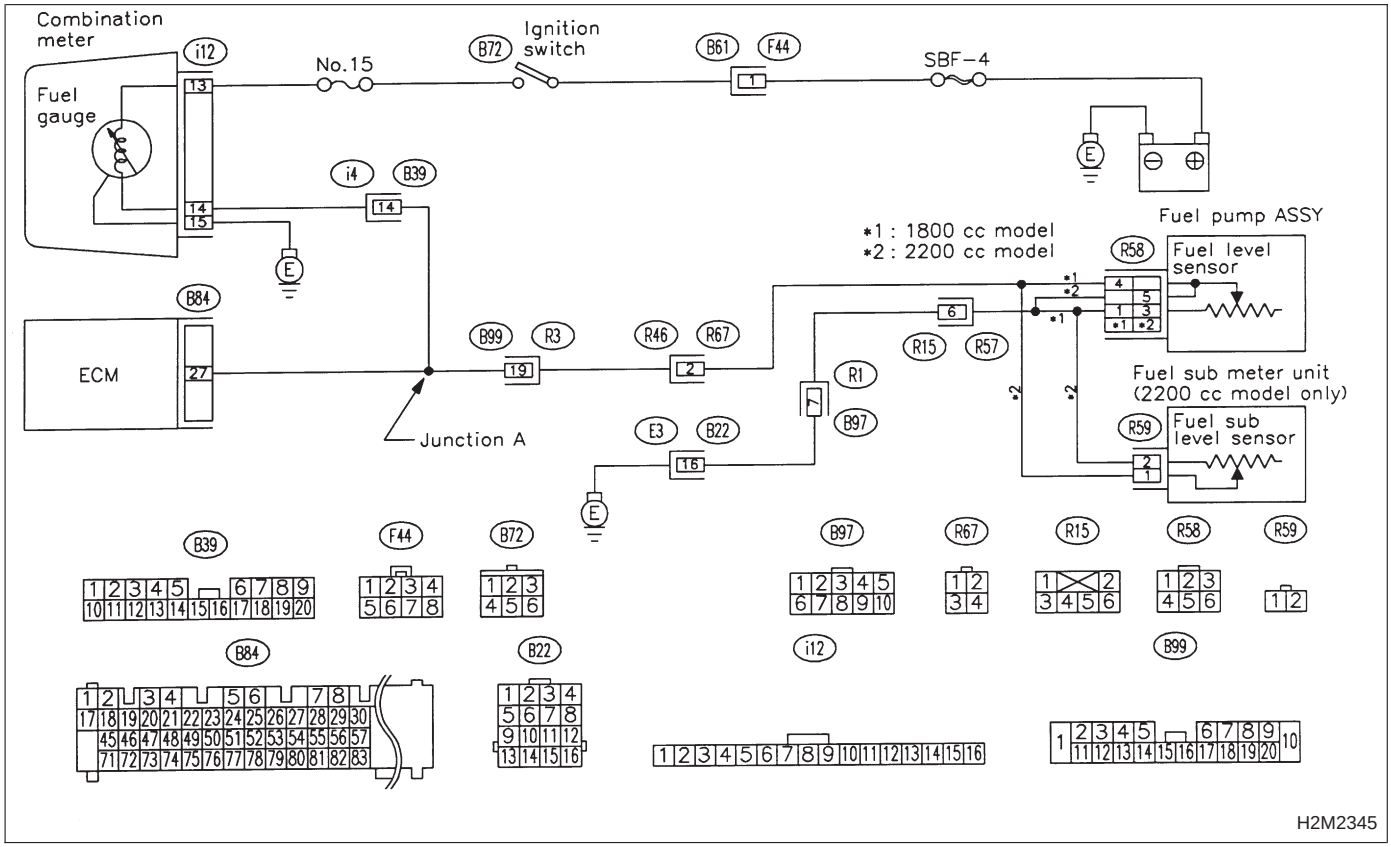
OBD (FB1)
P0461 <FLVL_R>
B2M1101

AY: DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/ PERFORMANCE PROBLEM —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AY1	**CHECK DTC P0462 OR P0463 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0462 or P0463?***

YES : Inspect DTC P0462 or P0463 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect this trouble.

NO : Replace fuel sending unit and fuel sub meter unit.

OBD (FB1)

P0462 <FLVL_LOW>

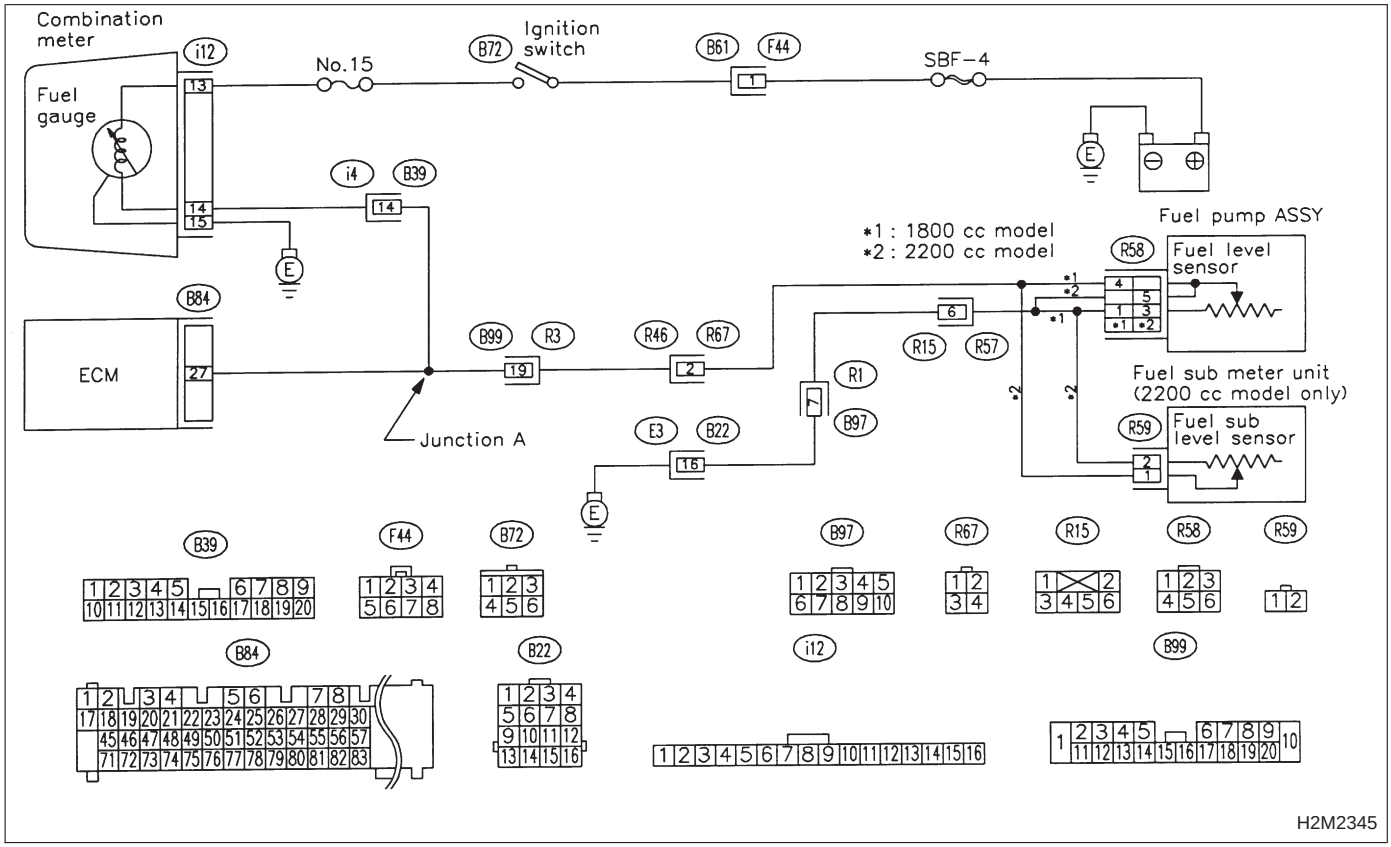
B2M1102

AZ: DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



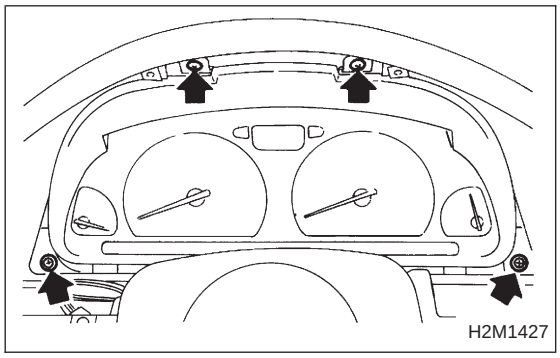
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10AZ1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.

CHECK ***: Does speedometer and tachometer operate normally?***

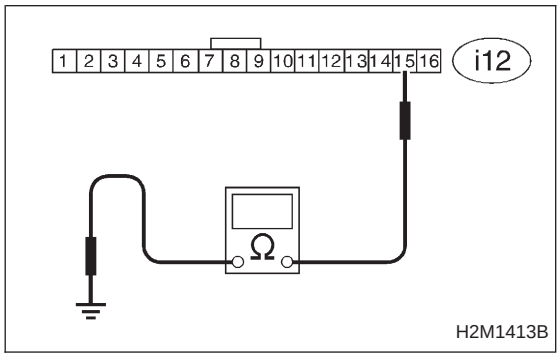
YES : Go to step **10AZ3**.

NO : Go to step **10AZ2**.


H2M1427

10AZ2	CHECK GROUND CIRCUIT OF COMBINATION METER.

1) Turn ignition switch to OFF.
2) Pull out combination meter from instrument panel. <Ref. to 6-2 [W8A0].>
3) Disconnect connector from combination meter.



H2M1413B

4) Measure resistance of harness between combination meter connector and chassis ground.

Connector & terminal
(i12) No. 15 — Chassis ground:

CHECK ***: Is resistance less than 5 Ω?***

YES : Repair or replace combination meter.

NO : Repair harness and connector.

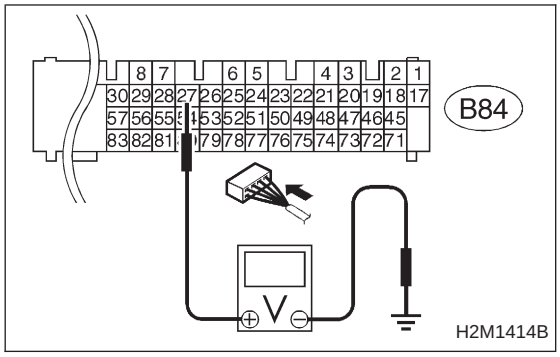
NOTE:
In this case, repair the following:
- Open circuit in harness between combination meter connector and grounding terminal
- Poor contact in combination meter connector
- Poor contact in grounding terminal

10AZ3	CHECK ENGINE DISPLACEMENT.

CHECK ***: Is the engine 1800 cc model?***

YES : Go to step **10AZ4**.

NO : Go to step **10AZ10**.



10AZ4	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER.)

1) Turn ignition switch to ON. (Engine OFF)
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.12 V?***

YES : Go to step **10AZ6**.

NO : Go to step **10AZ5**.



10AZ5	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)

Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?***

- Subaru Select Monitor

Designate mode using function key.

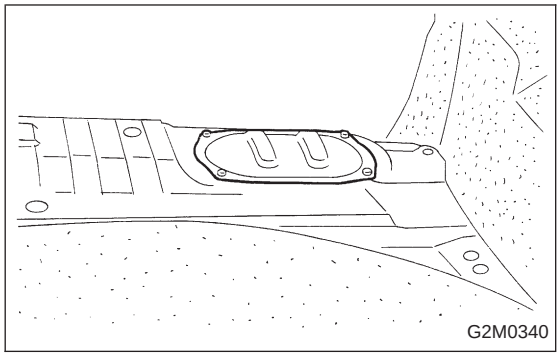
Function mode: F45

- F45: Fuel level sensor output signal is indicated.

YES : Repair poor contact in ECM connector.

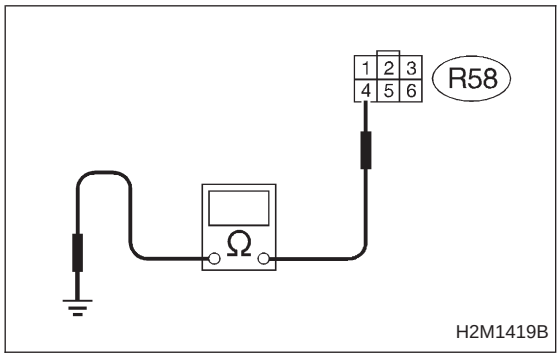
NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in combination meter connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B39, B22, B99, B97, R67 and R15)


G2M0340

10AZ6	CHECK HARNESS BETWEEN ECM, COMBINATION METER AND FUEL PUMP CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).

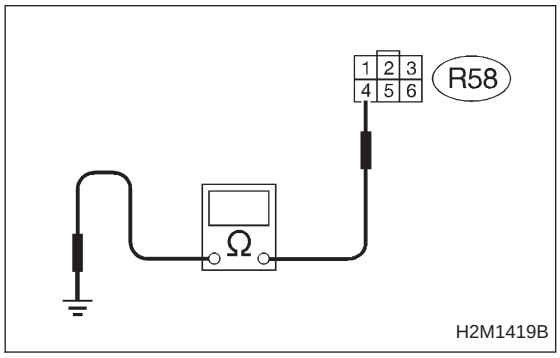


H2M1419B

3) Disconnect connector from fuel pump.
4) Measure resistance of harness between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***
YES : Go to step **10AZ7**.
NO : Go to step **10AZ17**.



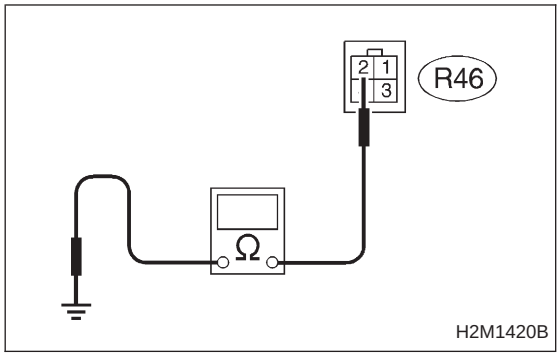
H2M1419B

10AZ7	CHECK FUEL TANK CORD.

1) Separate fuel tank cord connector (R67) and rear wiring harness connector (R46).
2) Measure resistance of harness between fuel sub meter unit connector and chassis ground.

Connector & terminal
(R58) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***
YES : Repair ground short circuit in fuel tank cord.
NO : Go to step **10AZ8**.



10AZ8	CHECK REAR WIRING HARNESS.

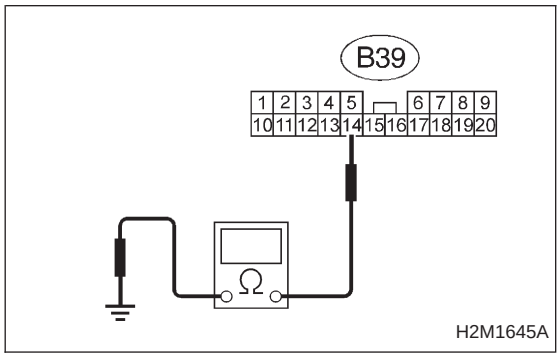
1) Separate rear wiring harness connector (R3) and bulkhead wiring harness connector (B99).
2) Measure resistance of harness between rear wiring harness connector and chassis ground.

Connector & terminal
(R46) No. 2 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in rear wiring harness.

NO : Go to step **10AZ9**.



10AZ9	CHECK BULKHEAD AND INSTRUMENT PANEL WIRING HARNESS.

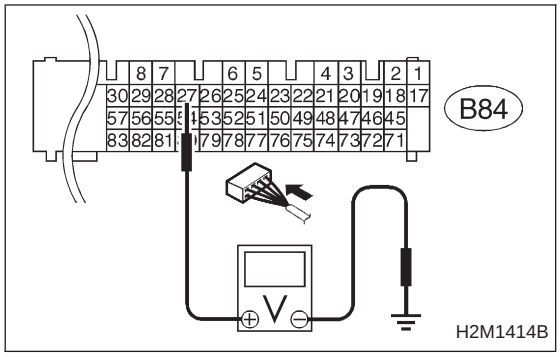
1) Separate bulkhead wiring harness connector (B39) and instrument panel wiring harness connector (i4).
2) Measure resistance of harness between bulkhead wiring harness connector and chassis ground.

Connector & terminal
(B39) No. 14 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in bulkhead wiring harness.

NO : Repair ground short circuit in instrument panel wiring harness.



10AZ10	CHECK INPUT SIGNAL FOR ECM. (USING VOLTAGE METER.)

1) Turn ignition switch to ON. (Engine OFF)
2) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 0.12 V?***

YES : Go to step **10AZ12**.

NO : Go to step **10AZ11**.



10AZ11	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)

Measure voltage between ECM connector and chassis ground.

CHECK ***: Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?***

- Subaru Select Monitor

Designate mode using function key.

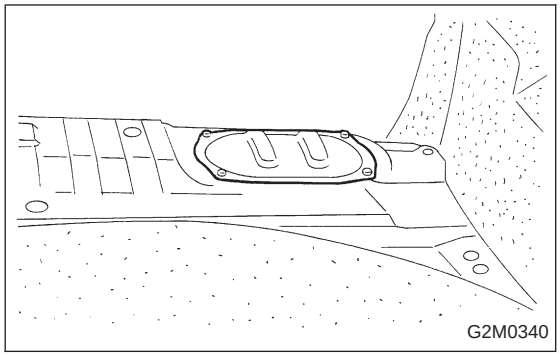
Function mode: F45

- F45: Fuel level sensor output signal is indicated.

YES : Repair poor contact in ECM connector.

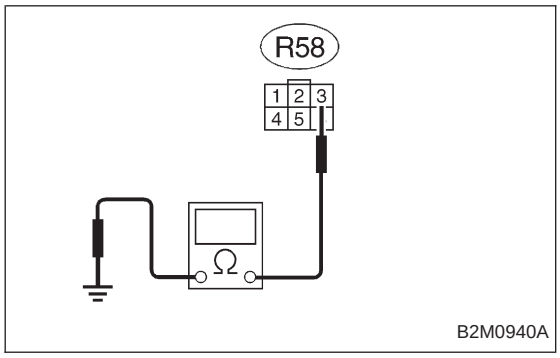
NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in fuel sub meter unit connector
- Poor contact in combination meter connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B39, B22, B99, B97, R67 and R15)


G2M0340

10AZ12	CHECK HARNESS BETWEEN ECM, COMBINATION METER AND FUEL PUMP CONNECTOR.

1) Turn ignition switch to OFF.
2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).



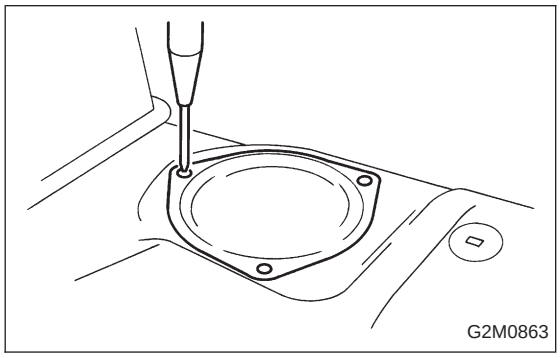
B2M0940A

3) Disconnect connector from fuel pump.
4) Measure resistance of harness between fuel pump connector and chassis ground.

CHECK ***: Connector & terminal (R58) No. 3 — Chassis ground: Is the resistance less than 10 Ω?***

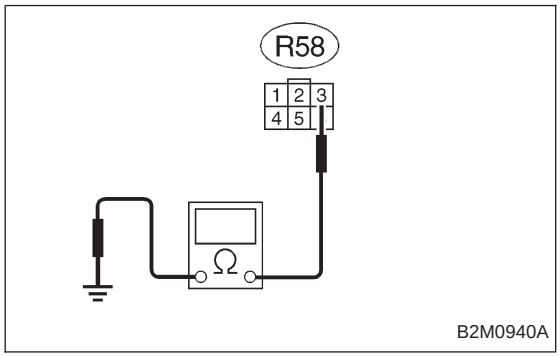
YES : Go to step **10AZ13**.

NO : Go to step **10AZ17**.


G2M0863

10AZ13	CHECK HARNESS BETWEEN FUEL PUMP AND FUEL SUB METER UNIT CONNECTOR.

1) Remove service hole cover located on the left rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).



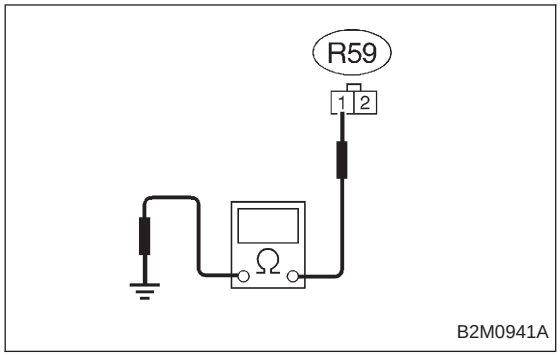
B2M0940A

2) Disconnect connector from fuel sub meter unit.
3) Measure resistance of harness between fuel pump connector and chassis ground.

CHECK ***: Connector & terminal (R58) No. 3 — Chassis ground: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between fuel pump and fuel sub meter unit connector.

NO : Go to step **10AZ14**.



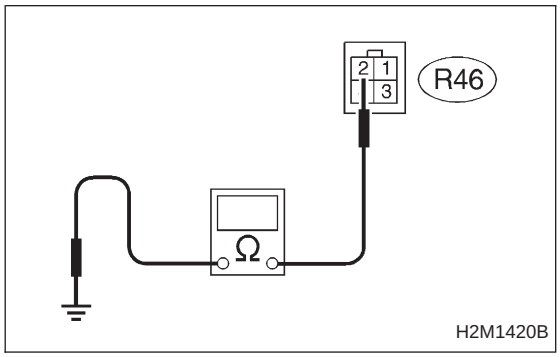
10AZ14	CHECK FUEL TANK CODE.

1) Separate fuel tank cord connector (R67) and rear wiring harness connector (R46).
2) Measure resistance of harness between fuel sub meter unit connector and chassis ground.

CHECK ***: Connector & terminal (R59) No. 1 — Chassis ground: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in fuel tank cord.

NO : Go to step **10AZ15**.



10AZ15	CHECK REAR WIRING HARNESS.

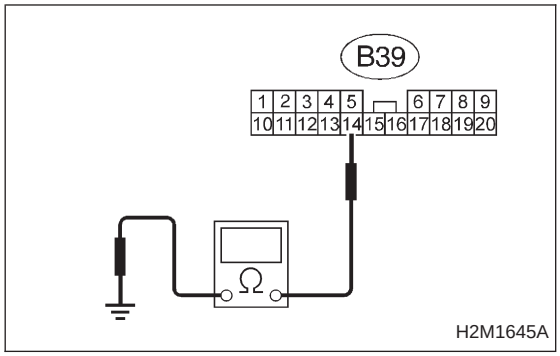
1) Separate rear wiring harness connector (R3) and bulkhead wiring harness connector (B99).
2) Measure resistance of harness between rear wiring harness connector and chassis ground.

Connector & terminal (R46) No. 2 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in rear wiring harness.

NO : Go to step **10AZ16**.



10AZ16	CHECK BULKHEAD AND INSTRUMENT PANEL WIRING HARNESS.

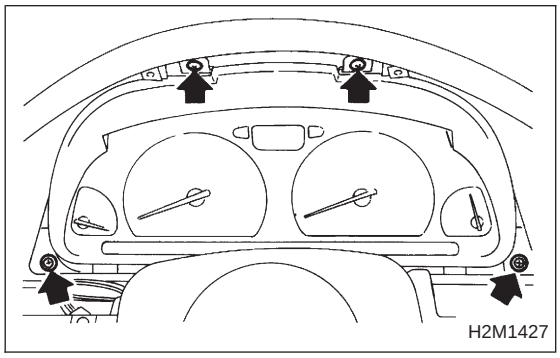
1) Separate bulkhead wiring harness connector (B39) and instrument panel wiring harness connector (i4).
2) Measure resistance of harness between bulkhead wiring harness connector and chassis ground.

Connector & terminal
(B39) No. 14 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

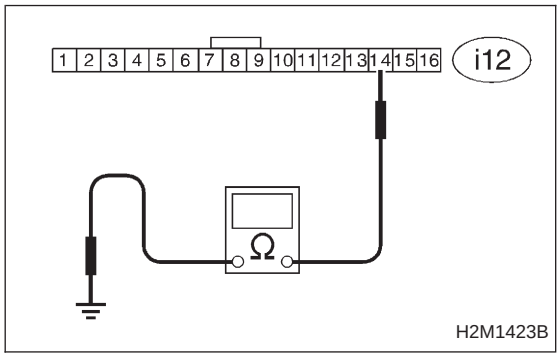
YES : Repair ground short circuit in bulkhead wiring harness.

NO : Repair ground short circuit in instrument panel wiring harness.



10AZ17	CHECK HARNESS BETWEEN COMBINATION METER AND FUEL PUMP CONNECTOR.

1) Connect connector to fuel pump.
2) Pull out combination meter from instrument panel. <Ref. to 6-2 [W8A0].>
3) Disconnect connector from combination meter.



4) Measure resistance of harness between combination meter connector and chassis ground.

Connector & terminal
(i12) No. 14 — Chassis ground:
Is the resistance less than 200 Ω?

YES : Go to step **10AZ18**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between combination meter connector and junction A on rear wiring harness
- Poor contact in coupling connector (B39)

10AZ18	CHECK COMBINATION METER.

Disconnect speedometer cable from combination meter and remove combination meter.

CHECK ***: Is the fuel meter installation screw tightened securely?***

YES : Go to step **10AZ19**.

NO : Tighten fuel meter installation screw securely.

10AZ19	CHECK PRINTED CIRCUIT PLATE.

Remove printed circuit plate assembly from combination meter assembly.

CHECK ***: Is there flaw or burning on printed circuit plate assembly?***

YES : Replace printed circuit plate assembly.

NO : Replace fuel meter assembly.

OBD (FB1)

P0463 <FLVL_HI>

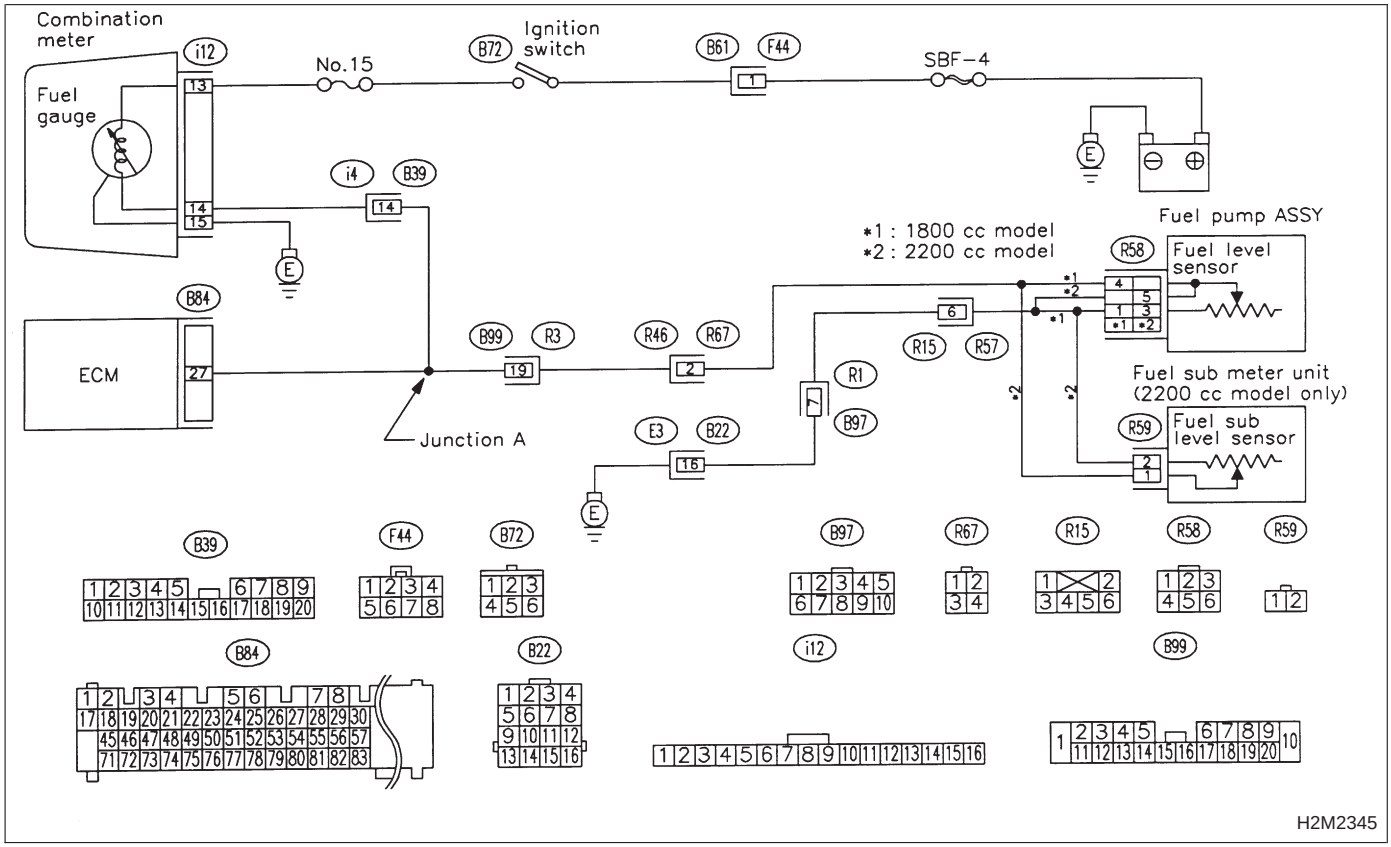
B2M1103

BA: DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



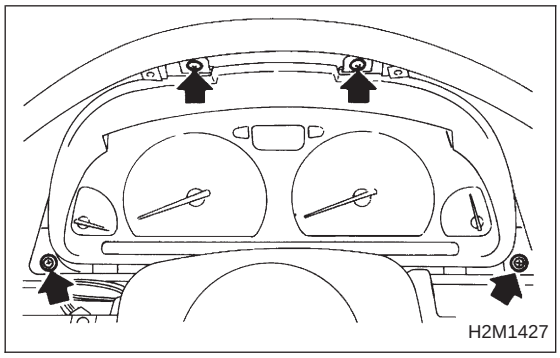
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BA1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.

CHECK : ***Does speedometer and tachometer operate normally?***

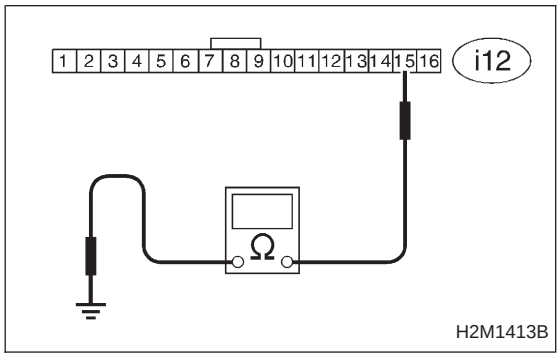
YES : Go to step **10BA3**.

NO : Go to step **10BA2**.



10BA2	CHECK GROUND CIRCUIT OF COMBINATION METER.

1) Turn ignition switch to OFF.
2) Pull out combination meter from instrument panel. <Ref. to 6-2 [W8A0].>
3) Disconnect connector from combination meter.



4) Measure resistance of harness between combination meter connector and chassis ground.

Connector & terminal
(i12) No. 15 — Chassis ground:

CHECK : ***Is resistance less than 5 Ω?***

YES : Repair or replace combination meter.

NO : Repair harness and connector.

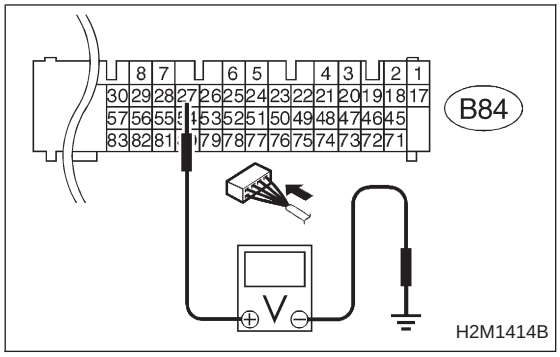
NOTE:
In this case, repair the following:
- Open circuit in harness between combination meter connector and grounding terminal
- Poor contact in combination meter connector
- Poor contact in grounding terminal

10BA3	CHECK ENGINE DISPLACEMENT.

CHECK : ***Is the engine 1800 cc model?***

YES : Go to step **10BA4**.

NO : Go to step **10BA9**.



10BA4	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON. (Engine OFF)
2) Measure voltage between ECM connector and chassis ground.

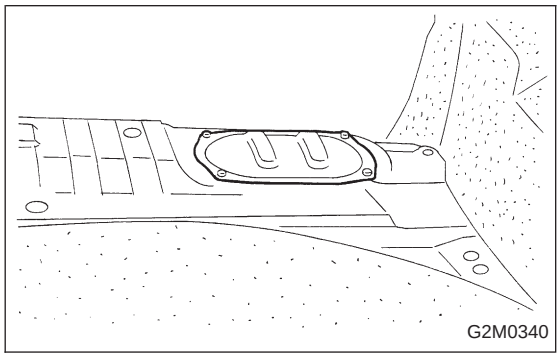
Connector & terminal
(B84) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.75 V?***

YES : Go to step **10BA5**.

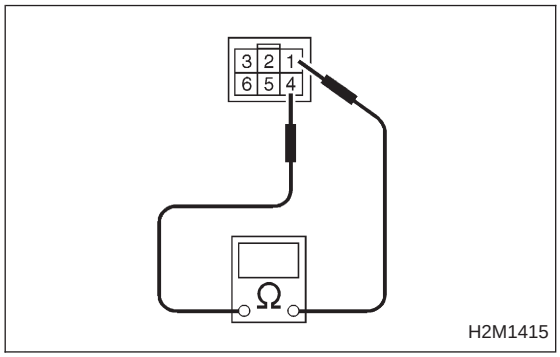
NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in combination meter connector
- Poor contact in ECM connector
- Poor contact in coupling connectors (B39, B22, B99, B97, R67 and R15)



10BA5	CHECK FUEL LEVEL SENSOR.

1) Turn ignition switch to OFF.
2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).



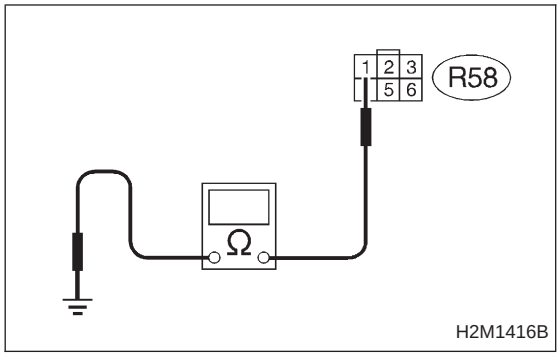
3) Disconnect connector from fuel pump.
4) Measure resistance between connector terminals of fuel pump.

Terminals
No. 1 — No. 4:

CHECK ***: Is the resistance less than 100 Ω?***

YES : Go to step **10BA6**.

NO : Replace fuel sending unit.



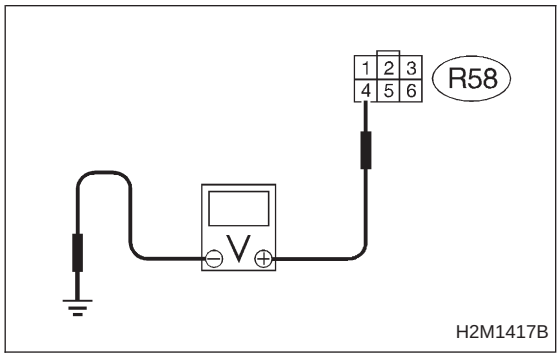
10BA6	CHECK GROUND CIRCUIT OF FUEL LEVEL SENSOR.

Measure resistance of harness between fuel pump connector and chassis ground.

Connector & terminal
(R58) No. 1 — Chassis ground:
Is the resistance less than 5 Ω?

YES : Go to step **10BA7**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between fuel pump connector and chassis grounding terminal
- Poor contact in fuel pump connector
- Poor contact in coupling connectors (R15, B97 and B22)



10BA7	CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONNECTOR.

1) Turn ignition switch to ON.
2) Measure voltage between fuel pump connector and chassis ground.

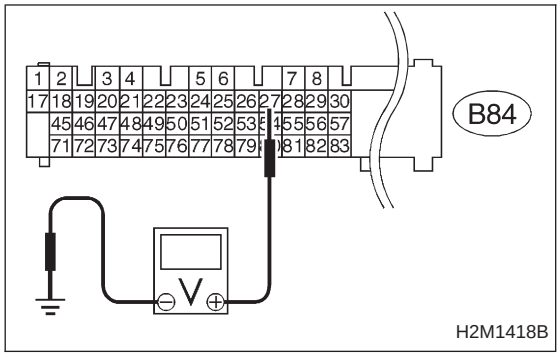
Connector & terminal
(R58) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between fuel pump connector and junction A on rear wiring harness
- Poor contact in fuel pump connector
- Poor contact in coupling connector (R67)

NO : Go to step **10BA8**.



10BA8	CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Turn ignition switch to ON.
4) Measure voltage between ECM connector and chassis ground.

Connector & terminal
(B84) No. 27 (+) — Chassis ground:

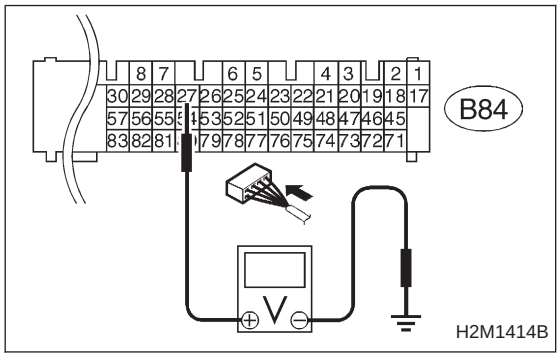
CHECK ***: Is the voltage less than 1 V?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM connector and junction A on rear wiring harness
- Poor contact in coupling connector (B99)

NO : Repair connector.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in ECM connector



10BA9	CHECK INPUT SIGNAL FOR ECM.

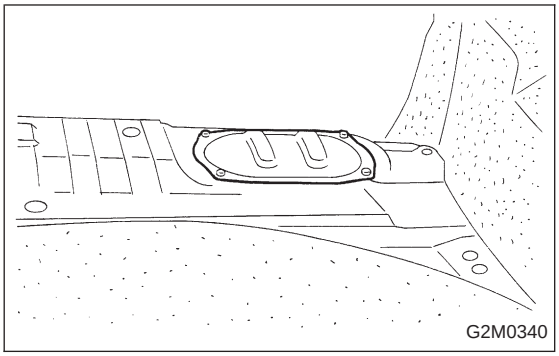
1) Turn ignition switch to ON. (Engine OFF)
2) Measure voltage between ECM connector and chassis ground.

CHECK ***: Connector & terminal***
(B84) No. 27 (+) — Chassis ground (−):
Is the voltage more than 4.75 V?

YES : Go to step **10BA10**.

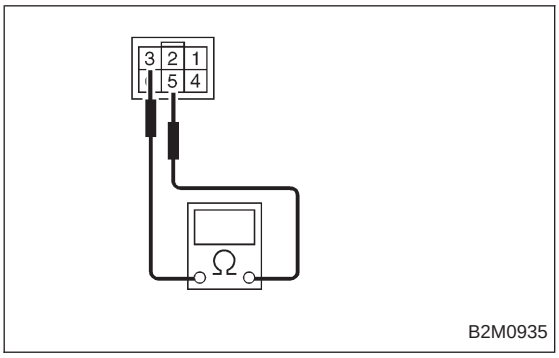
NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in fuel sub meter unit connector
- Poor contact in combination meter connector
- Poor contact in ECM connector
- Poor contact in coupling connector (i3, B99, B22, B98 and R57)


G2M0340

10BA10	CHECK FUEL LEVEL SENSOR.

1) Turn ignition switch to OFF.
2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).

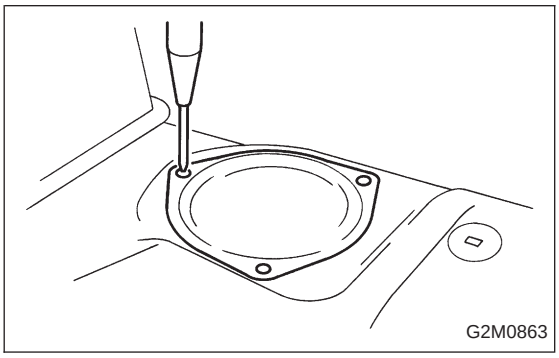


B2M0935

3) Disconnect connector from fuel pump.
4) Measure resistance between connector terminals of fuel pump.

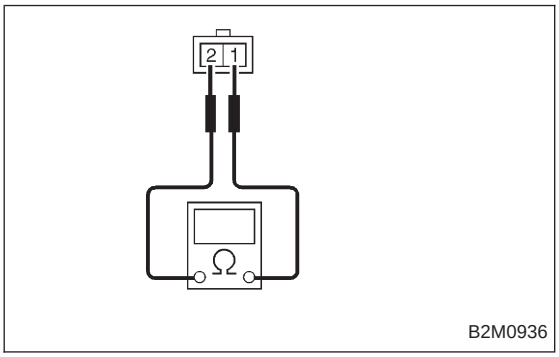
CHECK ***: Terminals***
No. 3 — No. 5:
Is the resistance less than 100 Ω?

YES : Go to step **10BA11**.
NO : Replace fuel sending unit.


G2M0863

10BA11	CHECK FUEL SUB LEVEL SENSOR.

1) Remove service hole cover located on the left rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon).

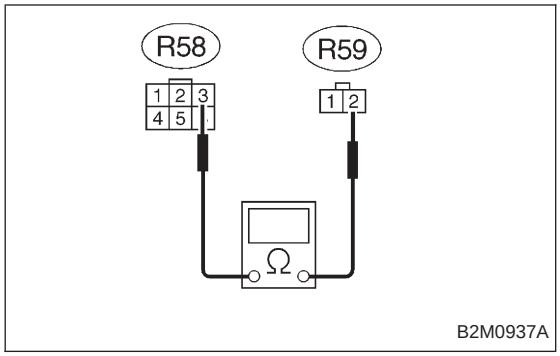


B2M0936

2) Disconnect connector from fuel sub meter unit.
3) Measure resistance between connector terminals of fuel sub meter unit.

CHECK ***: Terminals***
No. 1 — No. 2:
Is the resistance less than 100 Ω?

YES : Go to step **10BA12**.
NO : Replace fuel sub meter unit.



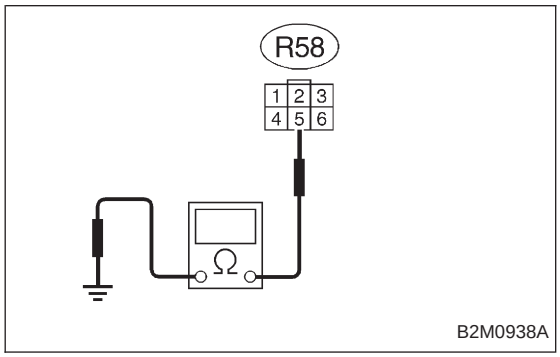
10BA12	CHECK HARNESS BETWEEN FUEL PUMP AND FUEL SUB METER UNIT CONNECTOR.

Measure resistance of harness between fuel pump and fuel sub meter unit connector.

CHECK : ***Connector & terminal (R58) No. 3 — (R59) No. 2: Is the resistance less than 1 Ω?***

YES : Go to step **10BA13**.

NO : Repair open circuit in harness between fuel pump and fuel sub meter unit connector.



10BA13	CHECK GROUND CIRCUIT OF FUEL LEVEL SENSOR.

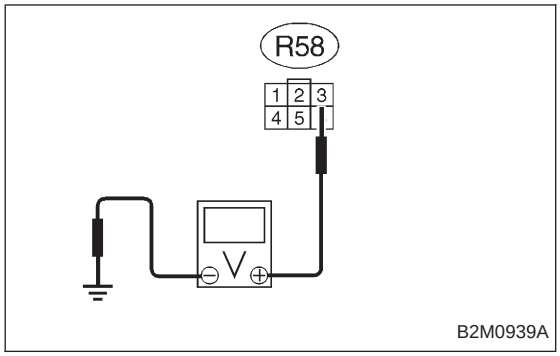
Measure resistance of harness between fuel pump connector and chassis ground.

CHECK : ***Connector & terminal (R58) No. 5 — Chassis ground: Is the resistance less than 5 Ω?***

YES : Go to step **10BA14**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between fuel pump connector and chassis grounding terminal
- Poor contact in fuel pump connector
- Poor contact in coupling connectors (R15, B97 and B22)



10BA14	CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONNECTOR.

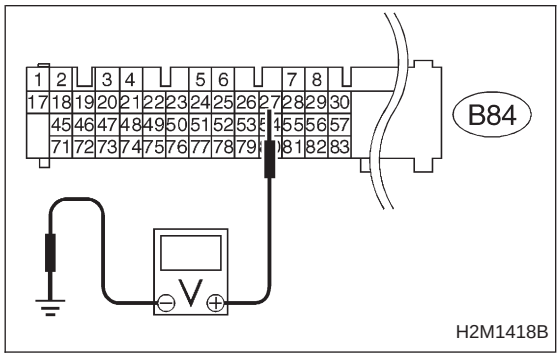
1) Connect connector to fuel sub meter unit.
2) Turn ignition switch to ON.
3) Measure voltage between fuel pump connector and chassis ground.

CHECK ***: Connector & terminal***
(R58) No. 3 (+) — Chassis ground (−):
Is the voltage less than 1 V?

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between fuel pump connector and junction A on rear wiring harness
- Poor contact in fuel sub meter unit connector
- Poor contact in fuel pump connector
- Poor contact in coupling connectors (R67 and B99)

NO : Go to step **10BA15**.



10BA15	CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Turn ignition switch to ON.
4) Measure voltage between ECM connector and chassis ground.

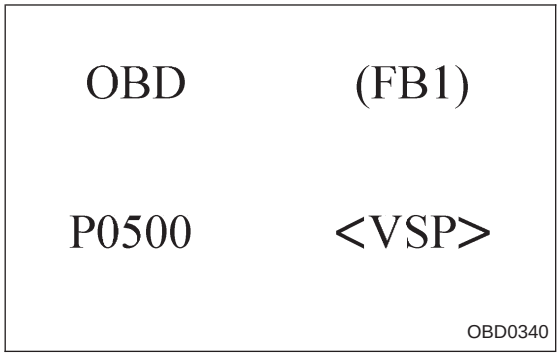
CHECK ***: Connector & terminal***
(B84) No. 27 (+) — Chassis ground:
Is the voltage less than 1 V?

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM connector and junction A on rear wiring harness
- Poor contact in coupling connector (B99)

NO : Repair connector.

NOTE:
In this case, repair the following:
- Poor contact in fuel pump connector
- Poor contact in fuel sub meter unit
- Poor contact in ECM connector

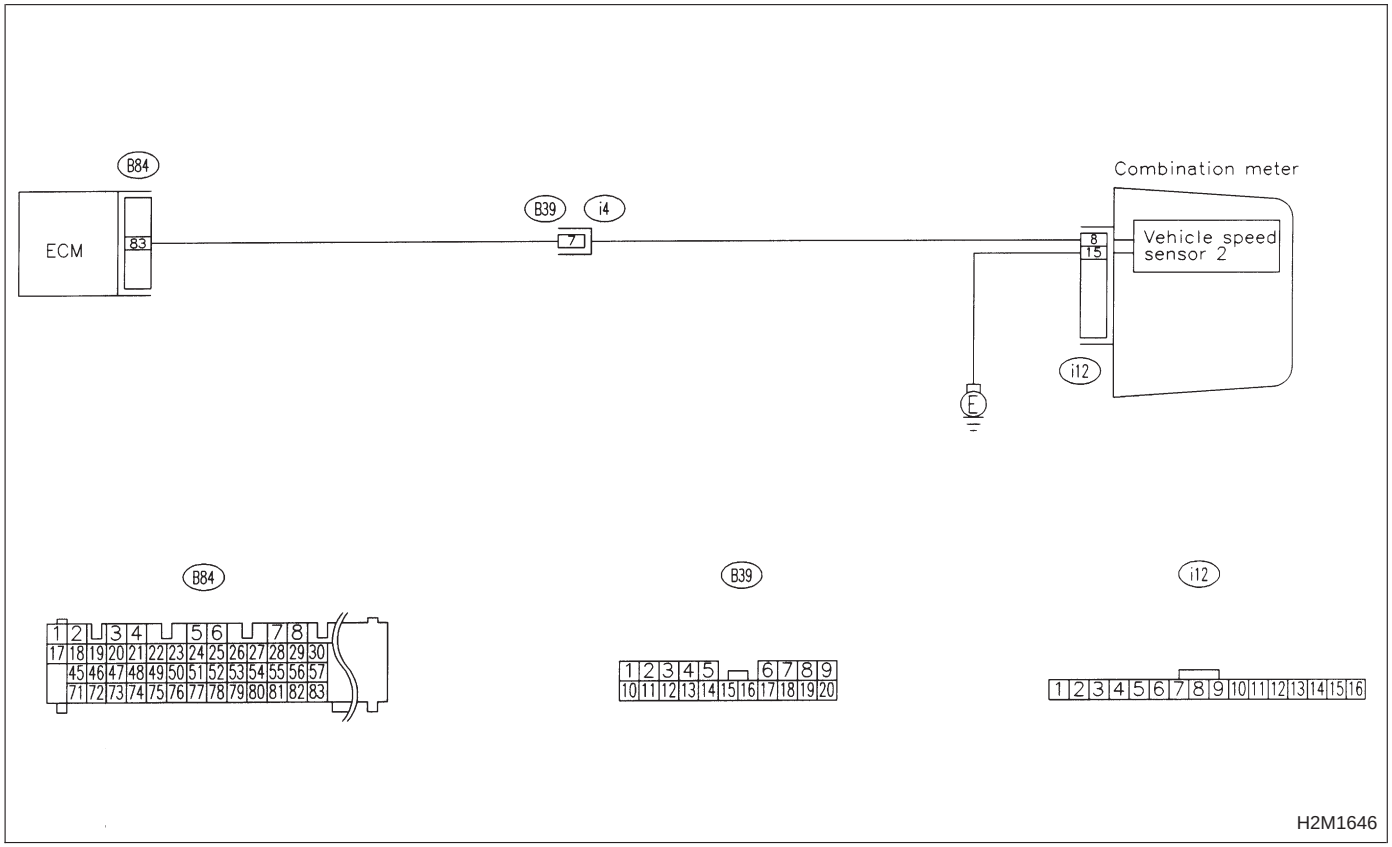


BB: DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

DTC DETECTING CONDITION:

- Immediately at fault recognition

WIRING DIAGRAM:



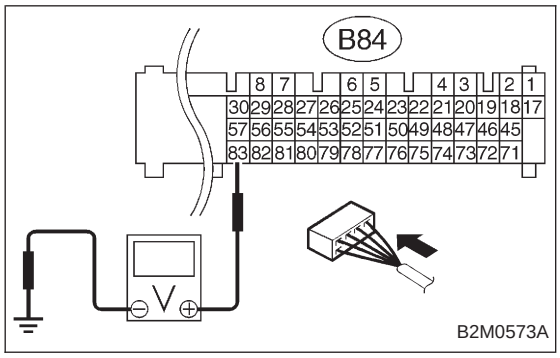
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BB1	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.

CHECK ***: Does speedometer operate normally?***

YES : Go to step **10BB2**.

NO : Check speedometer and vehicle speed sensor 2 <Ref. to 6-2 [K2A0].>.



10BB2	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

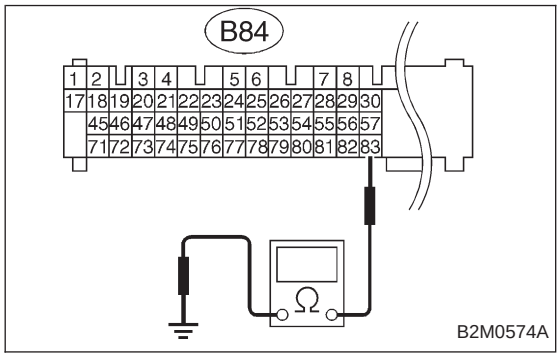
Connector & terminal
(B84) No. 83 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 2 V?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and combination meter connector
- Poor contact in ECM connector
- Poor contact in combination meter connector
- Poor contact in coupling connector (B39)

NO : Go to step **10BB3**.



10BB3	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 83 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and combination meter connector.

NO : Repair poor contact in ECM connector.

OBD	(FB1)
P0505	<ISC>

OBD0358

BC: DTC P0505 — IDLE CONTROL SYSTEM MALFUNCTION —

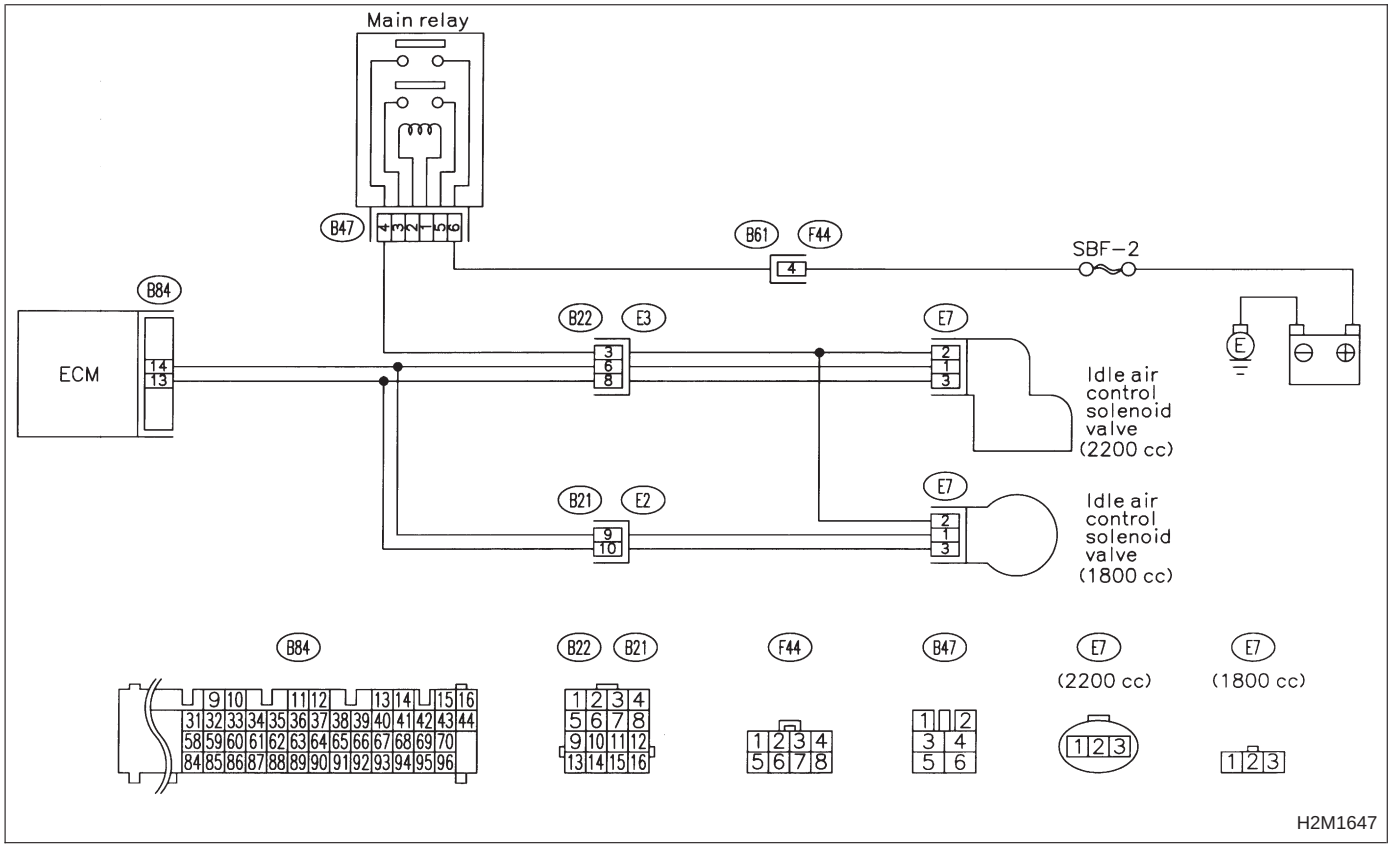
DTC DETECTING CONDITION:

- Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BC1	CHECK AIR INTAKE SYSTEM.

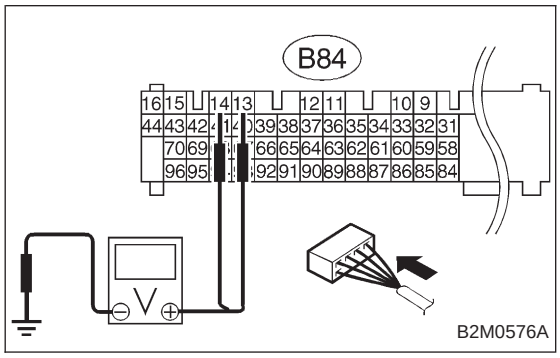
1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK ***: Is there a fault in air intake system?***

NOTE:
Check the following items.
- Loose installation of intake manifold, idle air control solenoid valve and throttle body
- Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket
- Loose connections and cracks of idle air control solenoid valve by-pass hoses
- Disconnections of vacuum hoses

YES : Repair or replace air intake system.

NO : Go to step **10BC2**.



10BC2	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 13 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 3 V?***

YES : Go to next step 3).

NO : Go to step **10BC5**.

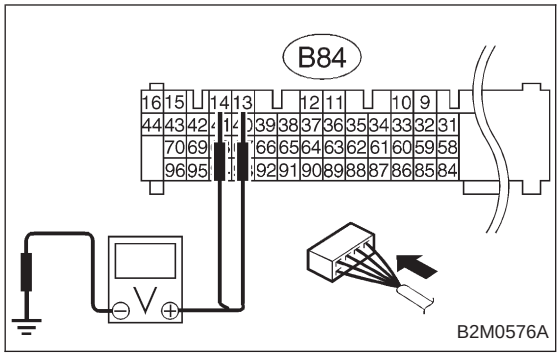
3) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 14 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 3 V?***

YES : Go to next step 4).

NO : Go to step **10BC5**.



4) Turn ignition switch to OFF.
5) Disconnect connector from idle air control solenoid valve.
6) Turn ignition switch to ON.
7) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 13 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM.

NO : Go to next step 8).

8) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 14 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM.

NO : Go to step **10BC3**.

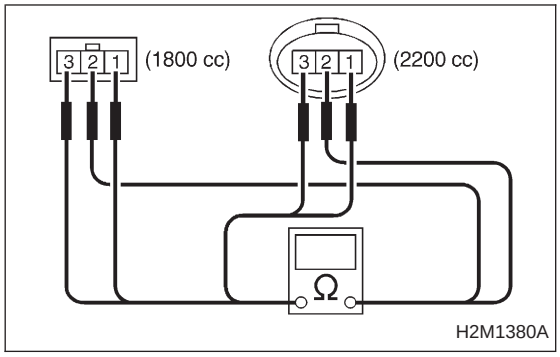
10BC3	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Go to step **10BC4**.



10BC4	CHECK IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Measure resistance between idle air control solenoid valve connector terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance more than 20 Ω?***
YES : Replace idle air control solenoid valve.
NO : Go to next step 3).

3) Measure resistance between idle air control solenoid valve connector terminals.

Terminals
No. 2 — No. 3:

CHECK ***: Is the resistance more than 20 Ω?***
YES : Replace idle air control solenoid valve.
NO : Go to next step 4).

4) Measure resistance between idle air control solenoid valve connector terminals.

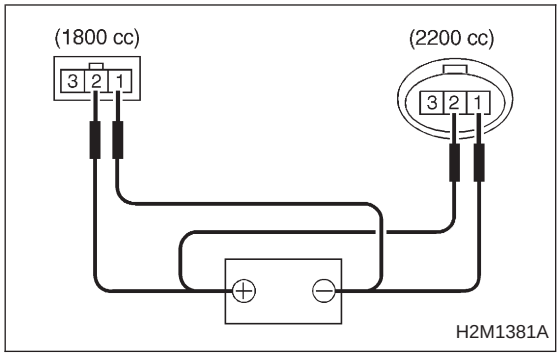
Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 5 Ω?***
YES : Replace idle air control solenoid valve and ECM.
NO : Go to next step 5).

5) Measure resistance between idle air control solenoid valve connector terminals.

Terminals
No. 2 — No. 3:

CHECK ***: Is the resistance less than 5 Ω?***
YES : Replace idle air control solenoid valve and ECM.
NO : Go to next step 6).

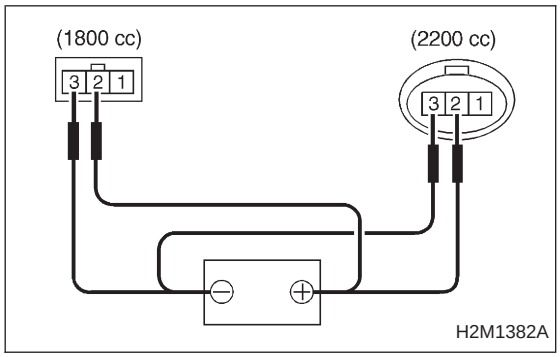


6) Remove idle air control solenoid valve. <Ref. to 2-7 [W12A0].>
7) Check operation of idle air control solenoid valve.

CHECK ***: Is idle air control solenoid valve fully opened when applying the battery to terminals No. 2 (+) and No. 1 (−)?***

YES : Go to next step 8).

NO : Clean idle air control solenoid valve. <Ref. to 2-7 [W12B0].>

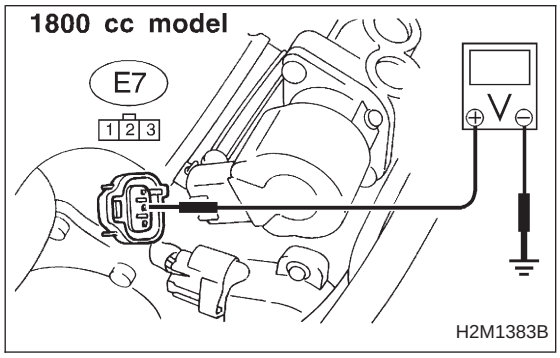


8) Check operation of idle air control solenoid valve.

CHECK ***: Is idle air control solenoid valve fully closed when applying the battery to terminals No. 2 (+) and No. 3 (−)?***

YES : Go to step **10BC5**.

NO : Clean idle air control solenoid valve. <Ref. to 2-7 [W12B0].>



10BC5	CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from idle air control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between idle air control solenoid valve and engine ground.

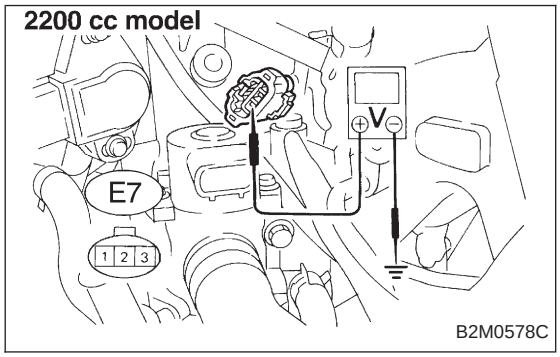
Connector & terminal
(E7) No. 2 (+) — Engine ground (−):

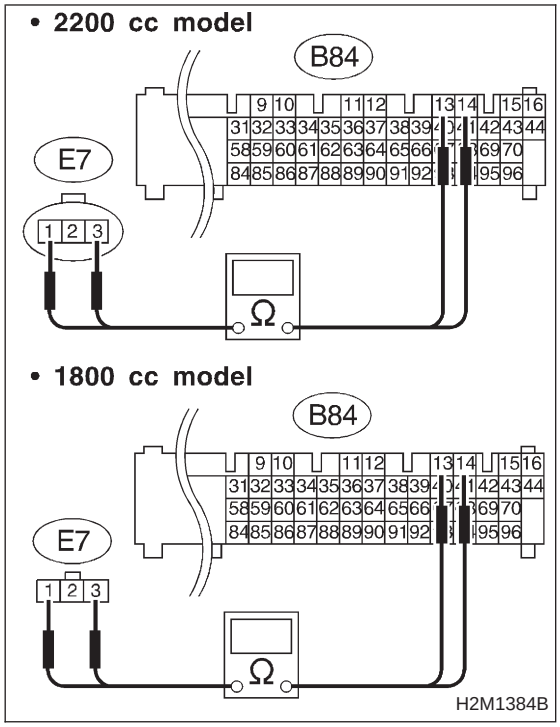
CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10BC6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between idle air control solenoid valve and main relay connector
- Poor contact in coupling connector (B22)





10BC6	CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and idle air control solenoid valve connector.

Connector & terminal
(B84) No. 14 — (E7) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and idle air control solenoid valve connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B22) [2200 cc]

4) Measure resistance of harness between ECM and idle air control solenoid valve connector.

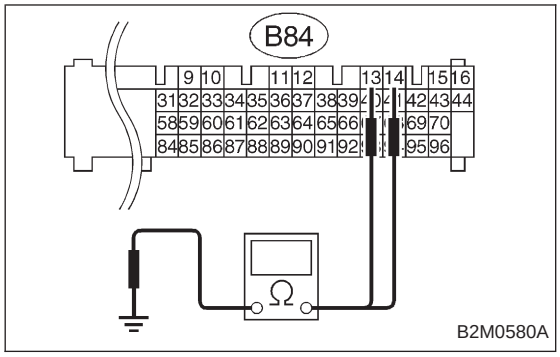
Connector & terminal
(B84) No. 13 — (E7) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 5).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and idle air control solenoid valve connector
- Poor contact in coupling connector (B21) [1800 cc]
- Poor contact in coupling connector (B22) [2200 cc]



5) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 13 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.

NO : Go to next step 6).

6) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 14 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.

NO : Go to step **10BC7**.

10BC7	CHECK POOR CONTACT.

Check poor contact in idle air control solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in idle air control solenoid valve connector?***

YES : Repair poor contact in idle air control solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P0506 <ISC_RLOW>

B2M1104

BD: DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

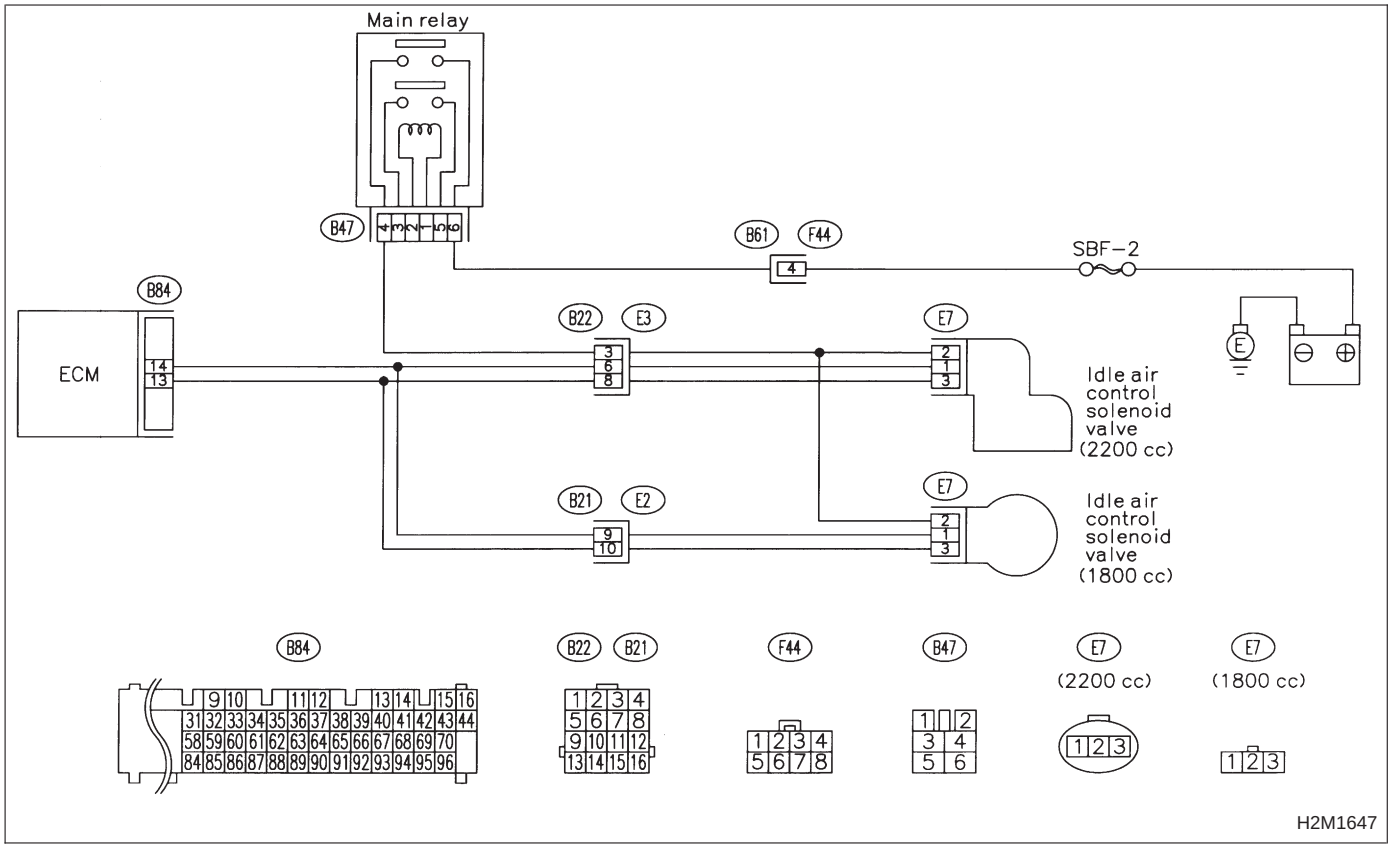
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

WIRING DIAGRAM:



H2M1647

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BD1	CHECK DTC P0505 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0505?***

YES : Inspect DTC P0505 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0506.

NO : Go to step **10BD2**.

10BD2	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK ***: Is clogging the by-pass line between by-pass hose and intake duct?***

YES : Repair the by-pass line.

NO : Replace idle air control solenoid valve.

OBD (FB1)
P0507 <ISC_RHI>
B2M1105

BE: DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

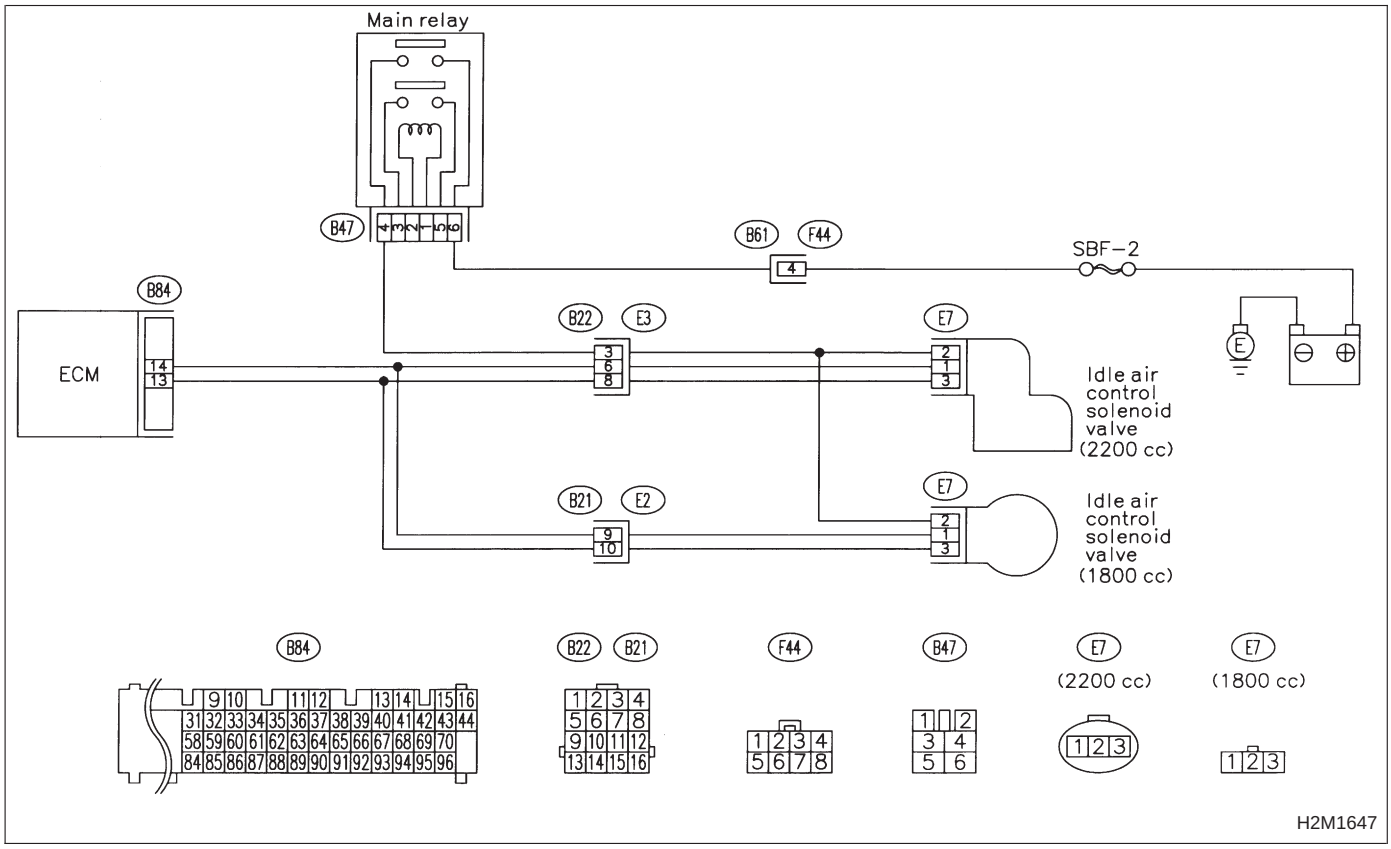
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BE1	CHECK DTC P0505 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0505?***

YES : Inspect DTC P0505 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P0507.

NO : Go to step **10BE2**.

10BE2	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK ***: Is there a fault in air intake system?***

NOTE:
Check the following items.
- Loose installation of intake manifold, idle air control solenoid valve and throttle body
- Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket
- Loose connections and cracks of idle air control solenoid valve by-pass hoses
- Disconnections of vacuum hoses

YES : Repair air suction and leaks.

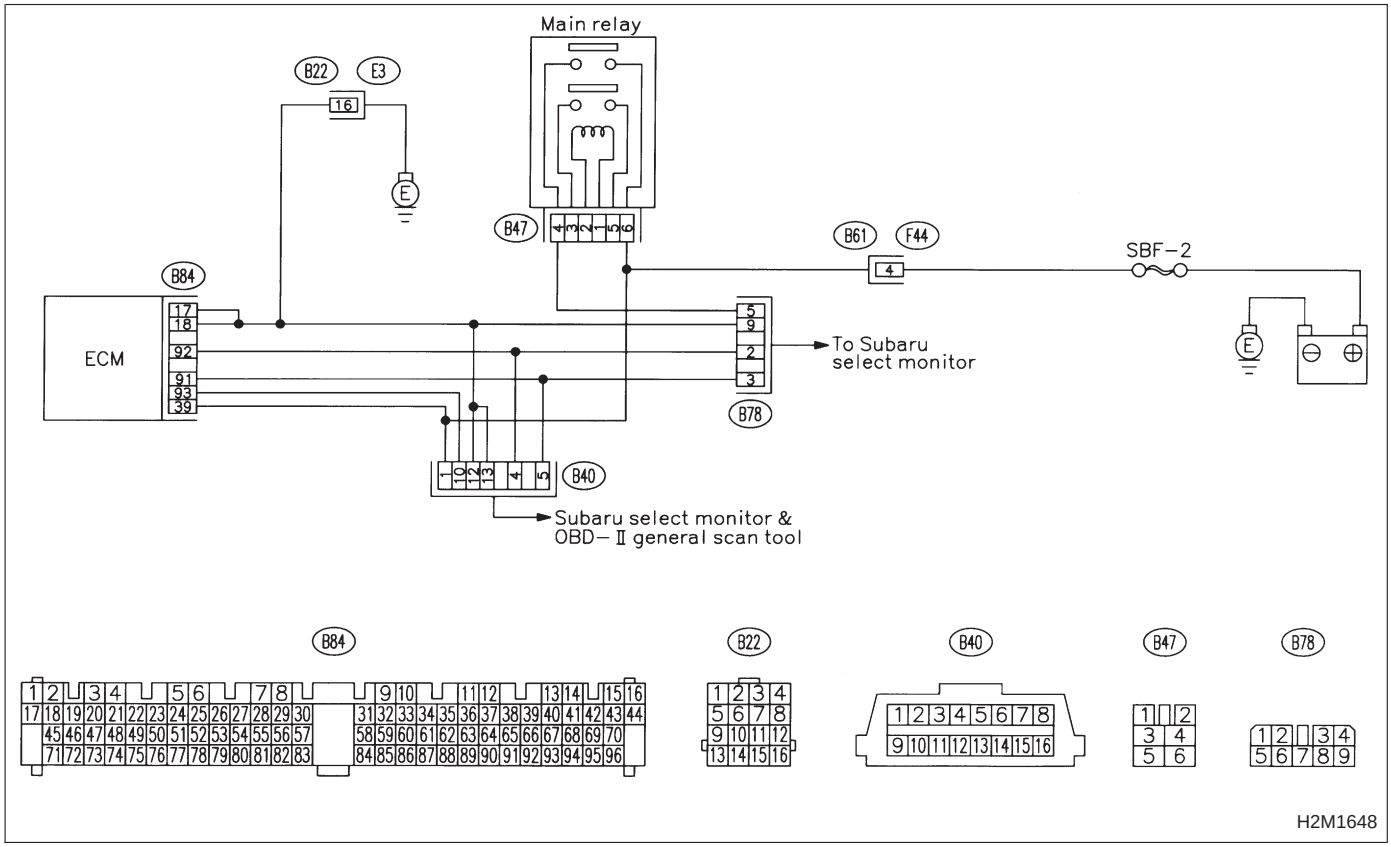
NO : Replace idle air control solenoid valve.

BF: DTC P0600 — SERIAL COMMUNICATION LINK MALFUNCTION —

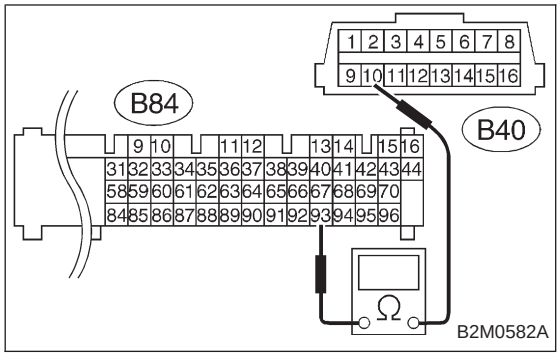
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10BF1	CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.

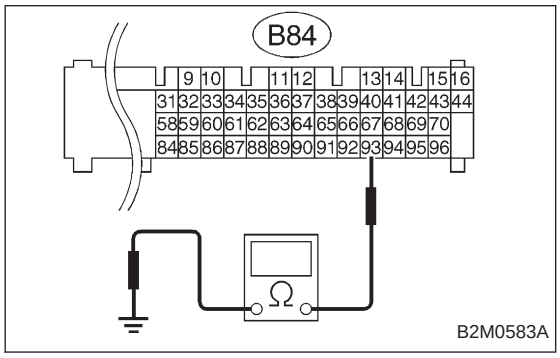
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM and data link connector (for Subaru Select Monitor & OBD-II general scan tool).

Connector & terminal
(B84) No. 93 — (B40) No. 10:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between ECM and data link connector.



4) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 93 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and data link connector.

NO : Repair poor contact in ECM connector and data link connector.

OBD	(FB1)
P0601	<RAM>

OBD0376

BG: DTC P0601 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

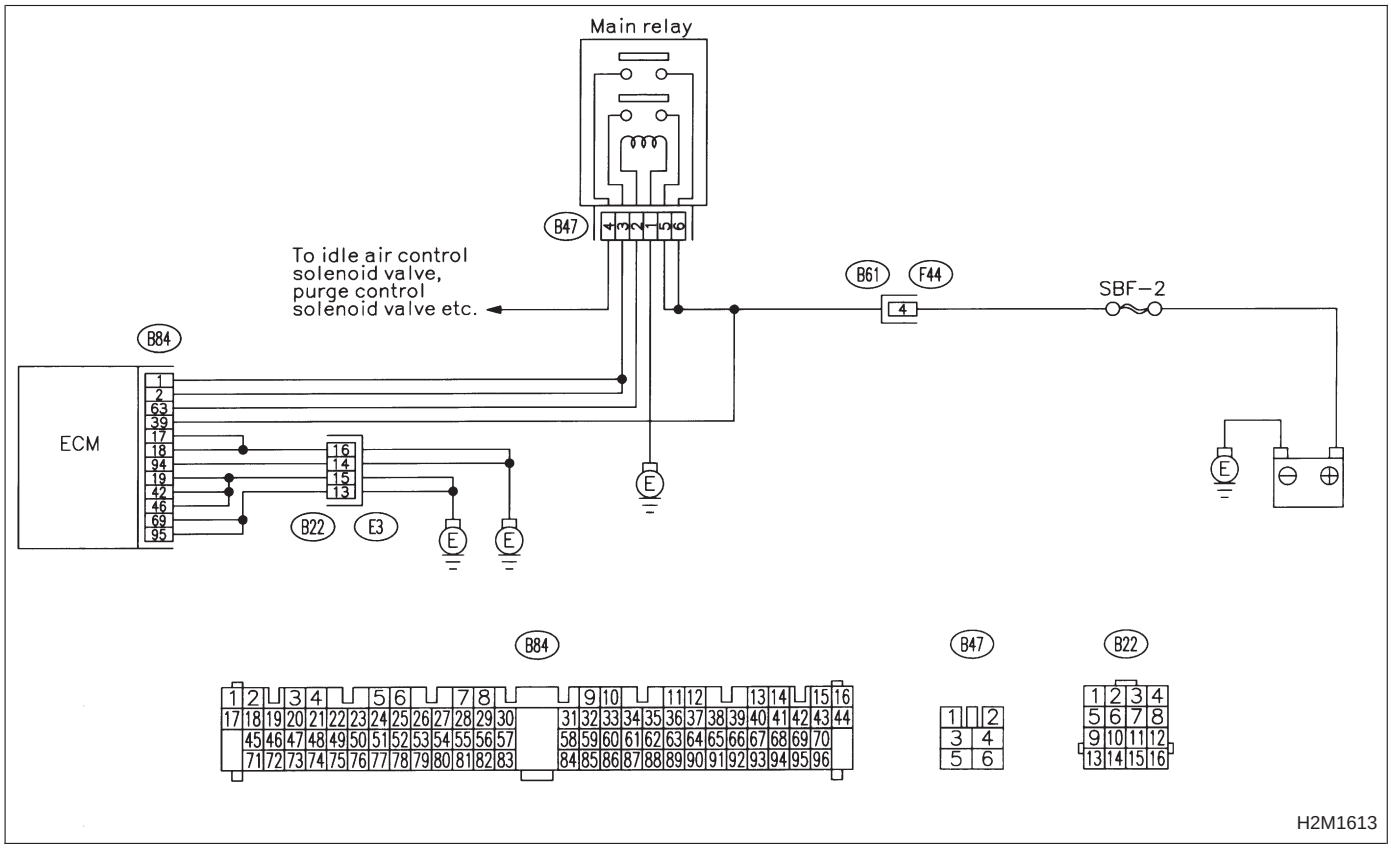
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

WIRING DIAGRAM:



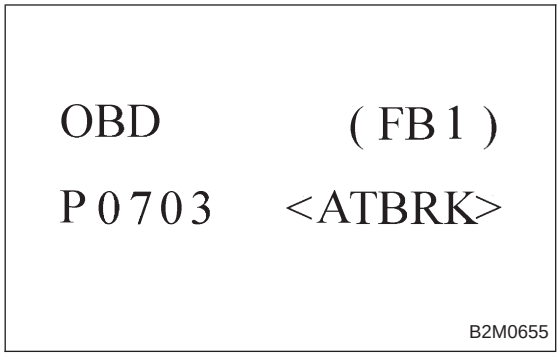
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BG1	CHECK DTC P0601 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0601?***

YES : Replace ECM.

NO : It is not necessary to inspect DTC P0601.

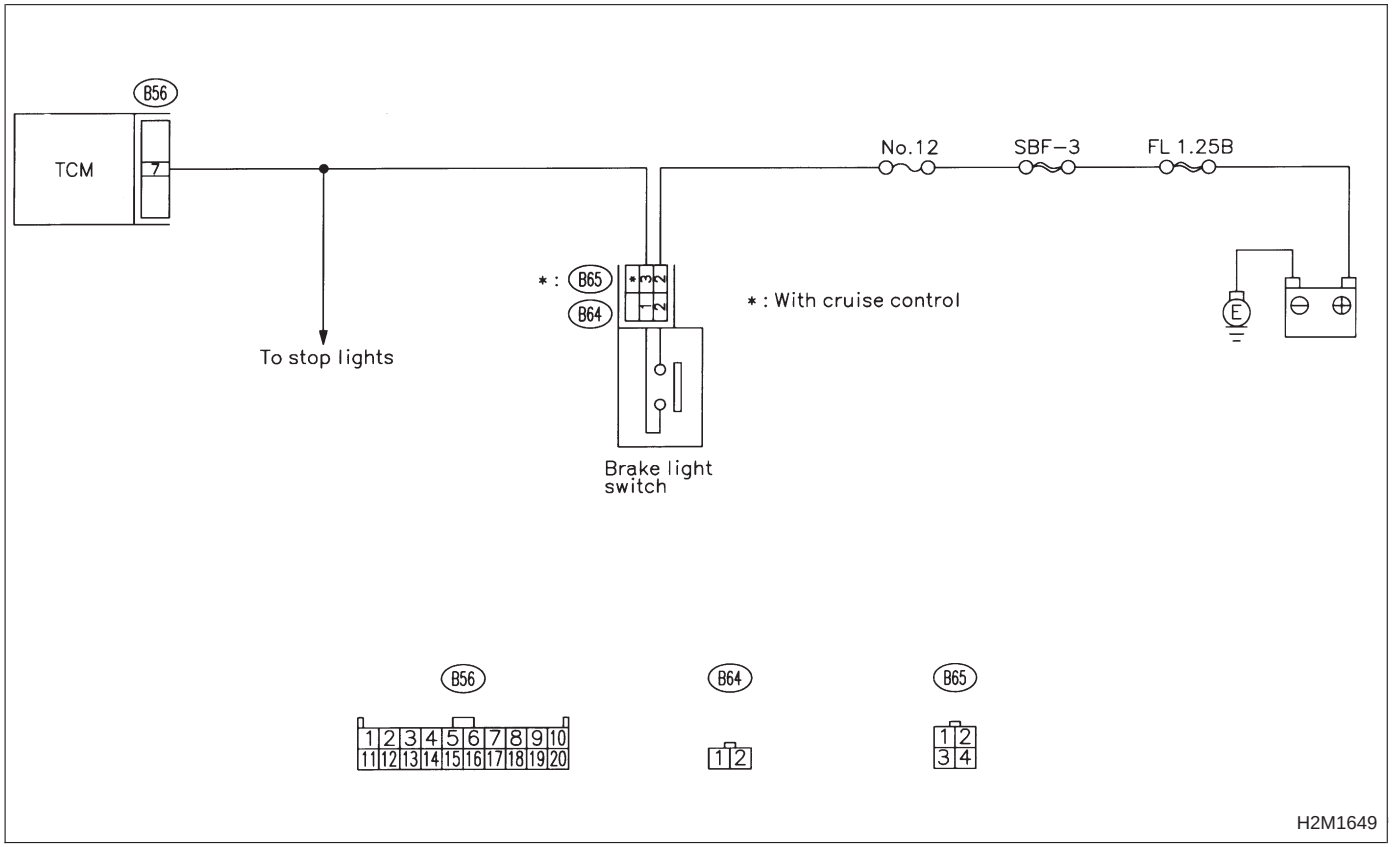


BH: DTC P0703
— BRAKE SWITCH INPUT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



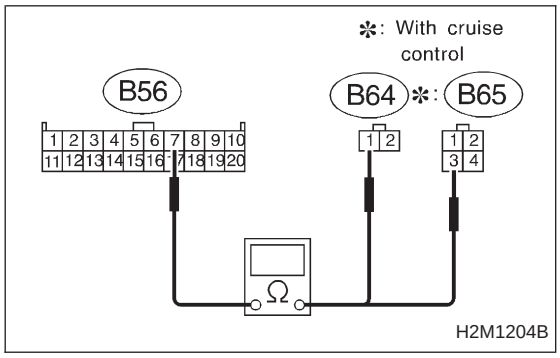
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BH1	CHECK OPERATION OF BRAKE LIGHT.

CHECK : ***Does brake light come on when depressing the brake pedal?***

YES : Go to step **10BH2**.

NO : Repair or replace brake light circuit.



10BH2	CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.

1) Disconnect connectors from TCM and brake light switch.

2) Measure resistance of harness between TCM and brake light switch connector.

Connector & terminal

(B56) No. 7 — (B64) No. 1 (Without cruise control):

(B56) No. 7 — (B65) No. 3 (With cruise control):

CHECK ***: Is the resistance less than 1 Ω?***

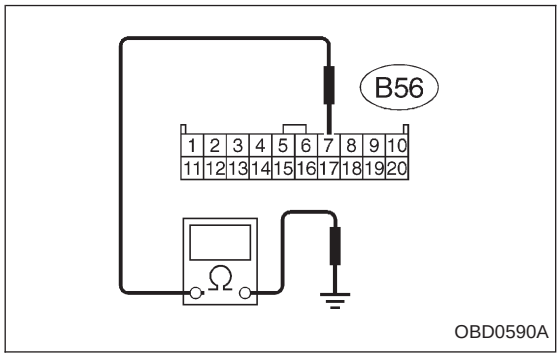
YES : Go to next step 3).

NO : Repair or replace harness and connector.

NOTE:

In this case, repair the following:

- Open circuit in harness between TCM and brake light switch connector
- Poor contact in TCM connector
- Poor contact in brake light switch connector



3) Measure resistance of harness between TCM and chassis ground.

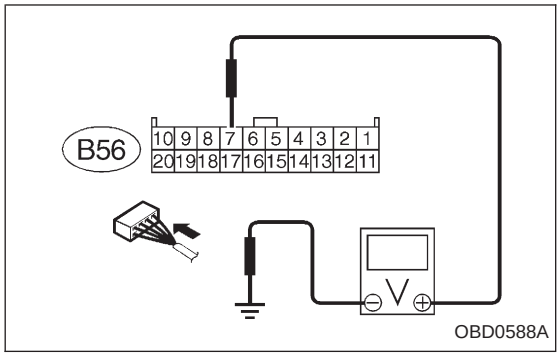
Connector & terminal

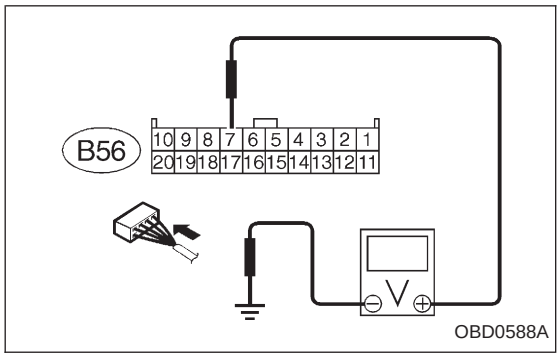
(B56) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BH3**.

NO : Repair ground short circuit in harness between TCM and brake light switch connector.





10BH3	CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and brake light switch.
2) Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V when releasing the brake pedal?***

YES : Go to next step 3).

NO : Adjust or replace brake light switch.

3) Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V when depressing the brake pedal?***

YES : Go to step **10BH4**.

NO : Adjust or replace brake light switch.

10BH4	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

OBD (FB1)

P0705 <ATRNG>

B2M0656

BI: DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION —

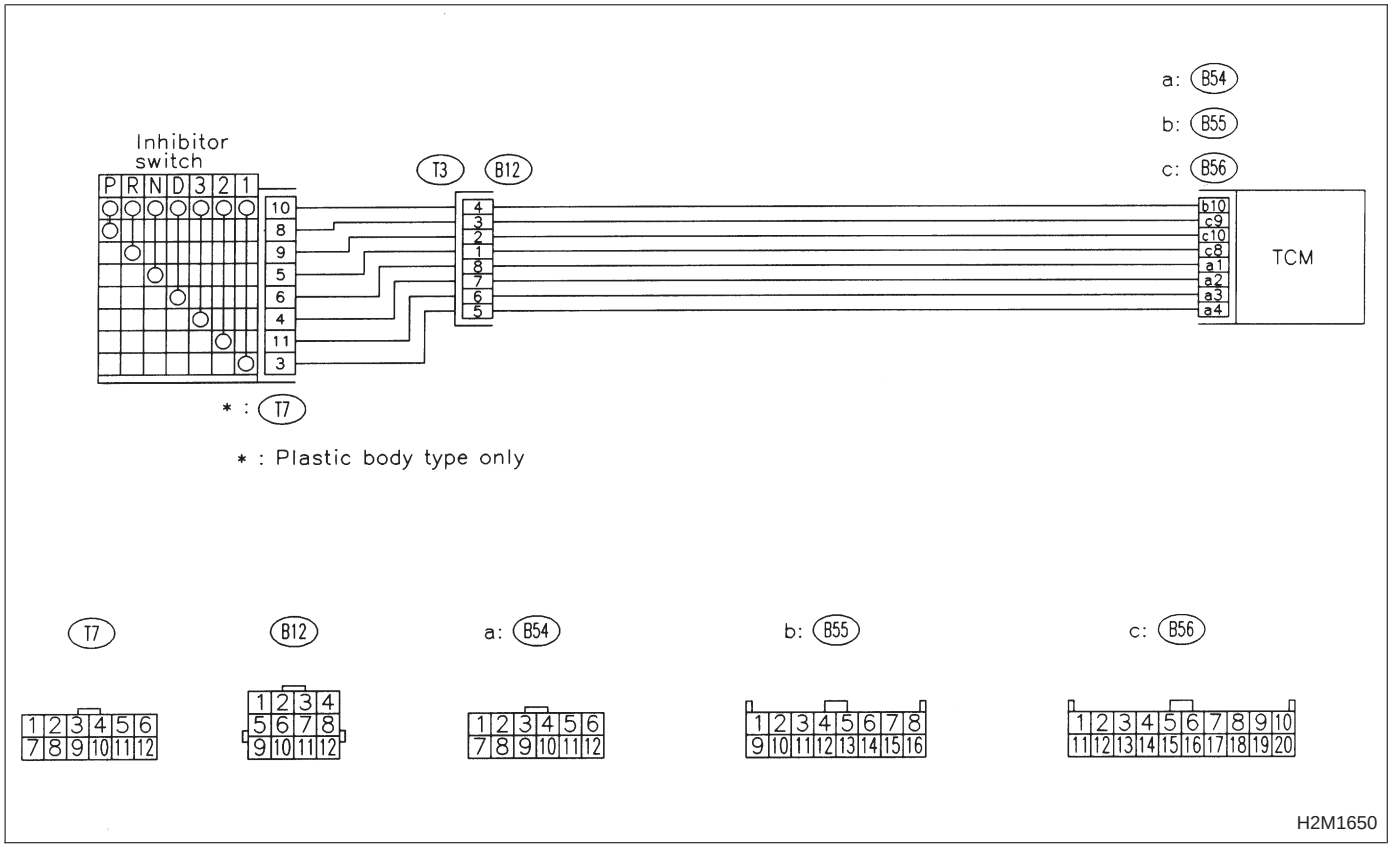
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Starter does not rotate when selector lever is in “P” or “N” range.
- Starter rotates when selector lever is in “R”, “D”, “3”, “2” or “1” range.
- Engine brake is not effected when selector lever is in “3” range.
- Shift characteristics are erroneous.

WIRING DIAGRAM:

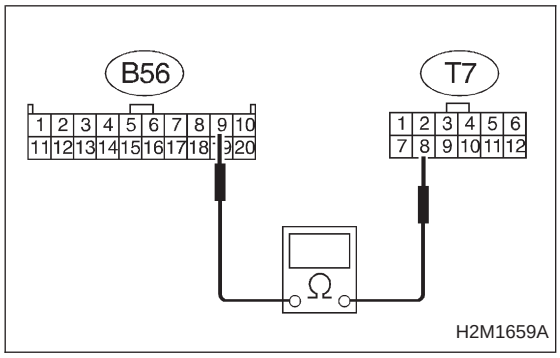


H2M1650

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BI1	CHECK INHIBITOR SWITCH TYPE.

CHECK ***: Is inhibitor switch type plastic body?***
YES : Go to step **10BI2**.
NO : Go to step **10BI24**.



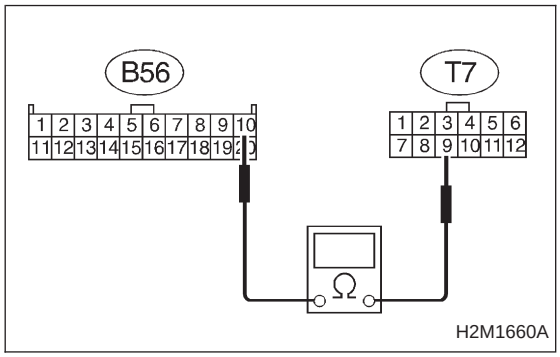
10BI2	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission.
3) Measure resistance of harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 9 — (T7) No. 8:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to step **10BI3**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and inhibitor switch connector
- Poor contact in coupling connector (B12)



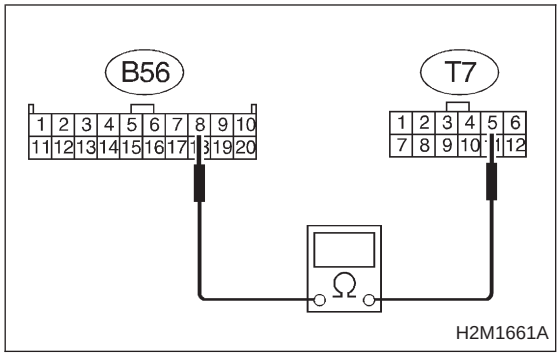
10BI3	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 10 — (T7) No. 9:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to step **10BI4**.
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and inhibitor switch connector
- Poor contact in coupling connector (B12)



10BI4	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 8 — (T7) No. 5:

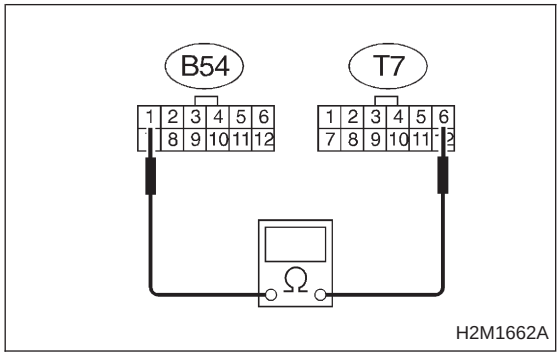
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10BI5**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and inhibitor switch connector.
- Poor contact in coupling connector (B12)



10BI5	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 1 — (T7) No. 6:

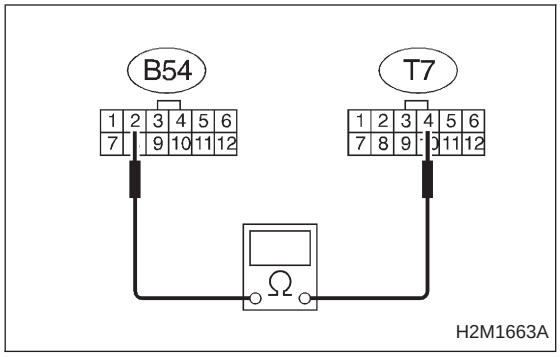
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10BI6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and inhibitor switch connector
- Poor contact in coupling connector (B12)



10BI6	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

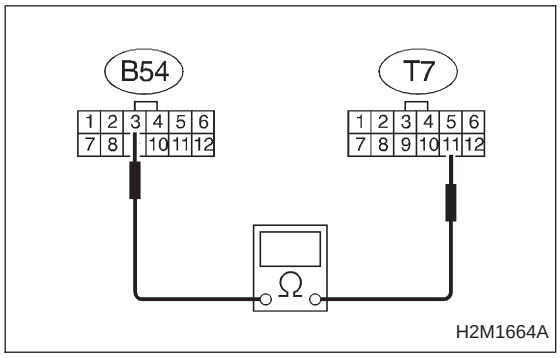
Connector & terminal
(B54) No. 2 — (T7) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10BI7**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between ECM and inhibitor switch connector
● Poor contact in coupling connector (B12)



10BI7	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

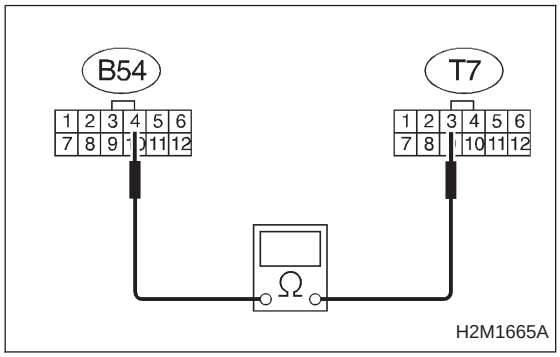
Connector & terminal
(B54) No. 3 — (T7) No. 11:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10BI8**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between ECM and inhibitor switch connector
● Poor contact in coupling connector (B12)



10BI8	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

Measure resistance of harness between TCM and transmission harness connector.

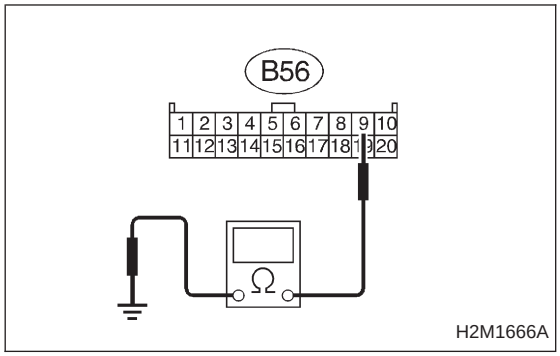
Connector & terminal
(B54) No. 4 — (T7) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10BI9**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between ECM and inhibitor switch connector
● Poor contact in coupling connector (B12)



10BI9	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

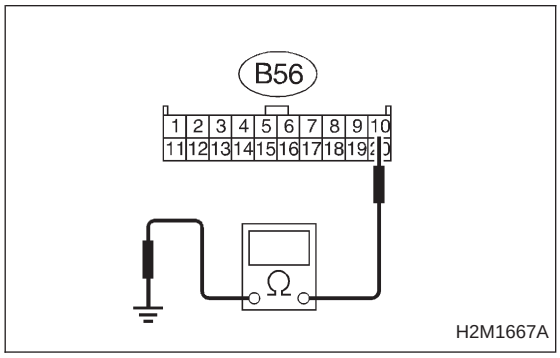
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B56) No. 9 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI10**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI10	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

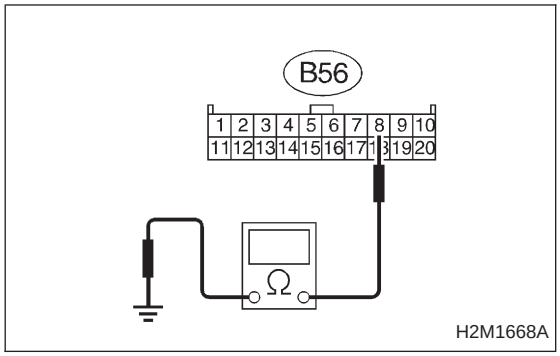
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B56) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI11**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI11	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

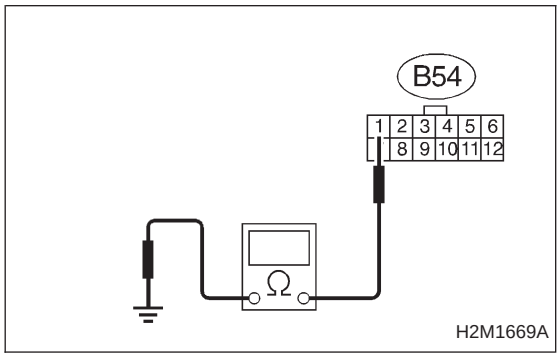
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B56) No. 8 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI12**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI12	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

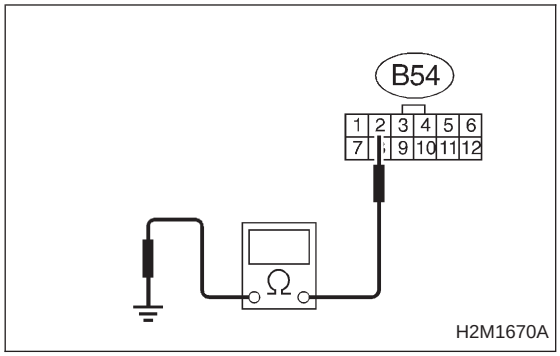
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B54) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI13**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI13	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

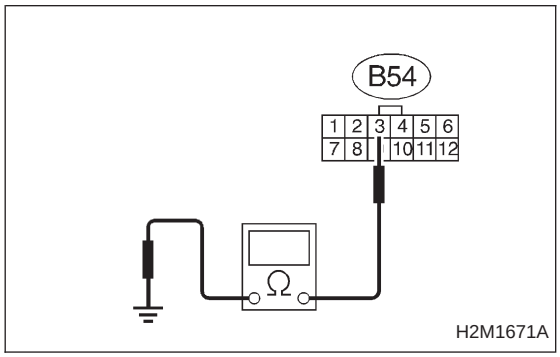
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B54) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI14**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI14	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

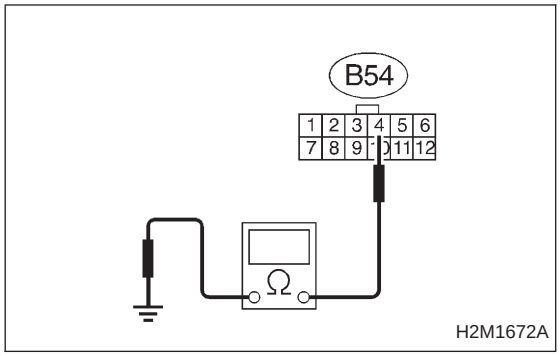
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B54) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI15**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI15	CHECK HARNESS BETWEEN TCM AND INHIBITOR SWITCH CONNECTOR.

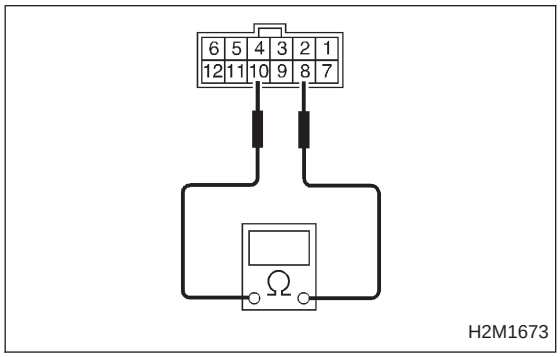
Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B54) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI16**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI16	CHECK INHIBITOR SWITCH.

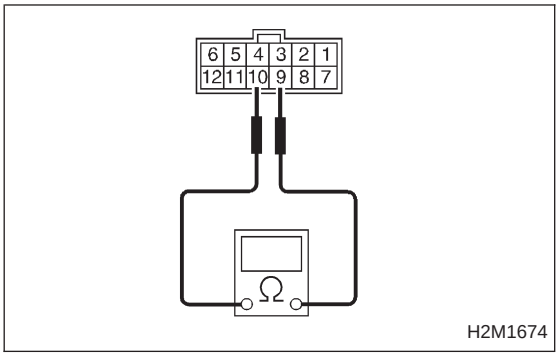
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 8 — No. 10

CHECK ***:***
- ***Is the resistance less than 1 Ω in "P" position?***
- ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI17**.

NO : Go to step **10BI23**.



10BI17	CHECK INHIBITOR SWITCH.

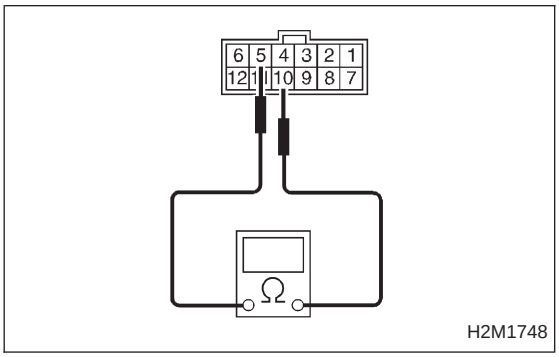
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 9 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "R" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI18**.

NO : Go to step **10BI23**.



10BI18	CHECK INHIBITOR SWITCH.

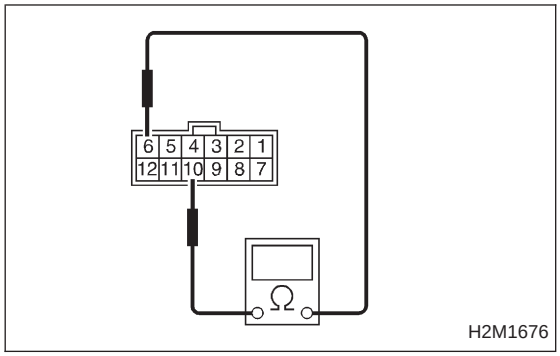
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 5 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "N" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI19**.

NO : Go to step **10BI23**.



10BI19	CHECK INHIBITOR SWITCH.

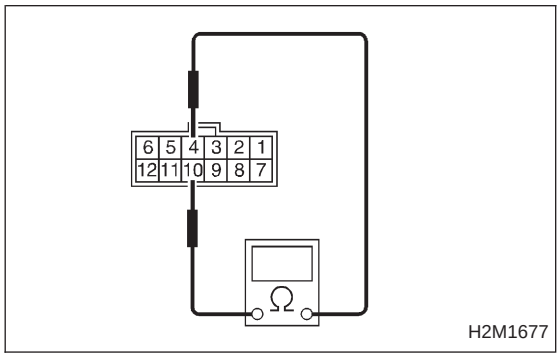
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 6 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "D" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI20**.

NO : Go to step **10BI23**.



10BI20	CHECK INHIBITOR SWITCH.

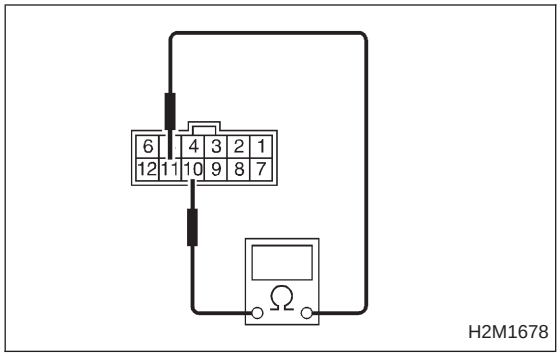
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 4 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "3" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI21**.

NO : Go to step **10BI23**.



10BI21	CHECK INHIBITOR SWITCH.

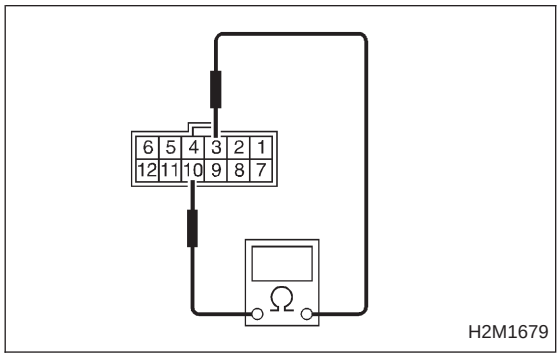
Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 11 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "2" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI22**.

NO : Go to step **10BI23**.



10BI22	CHECK INHIBITOR SWITCH.

Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 3 — No. 10

CHECK : ● ***Is the resistance less than 1 Ω in "1" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to step **10BI26**.

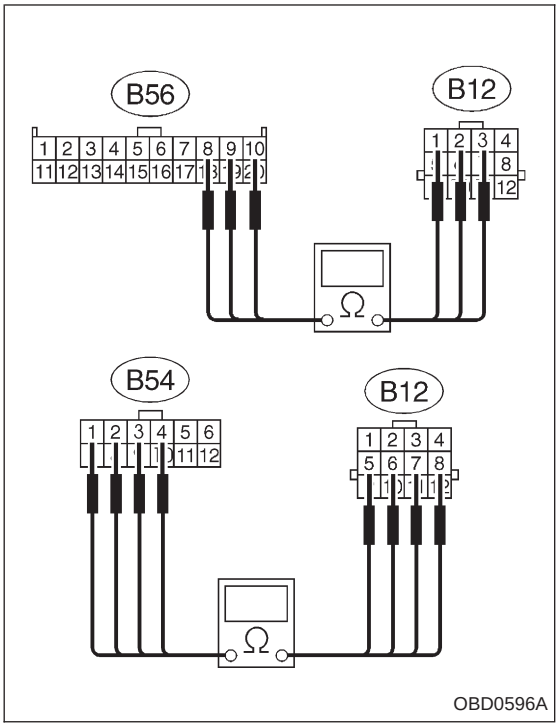
NO : Go to step **10BI23**.

10BI23	CHECK SELECTOR CABLE.

CHECK : ***Is there faulty connection in the selector cable?***

YES : Repair connection of selector cable.

NO : Replace inhibitor switch.



10BI24	CHECK HARNESS BETWEEN TCM AND TRANSMISSION HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and transmission harness connector.
3) Measure resistance of harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 9 — (B12) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 10 — (B12) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 8 — (B12) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 1 — (B12) No. 8:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 2 — (B12) No. 7:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 3 — (B12) No. 6:

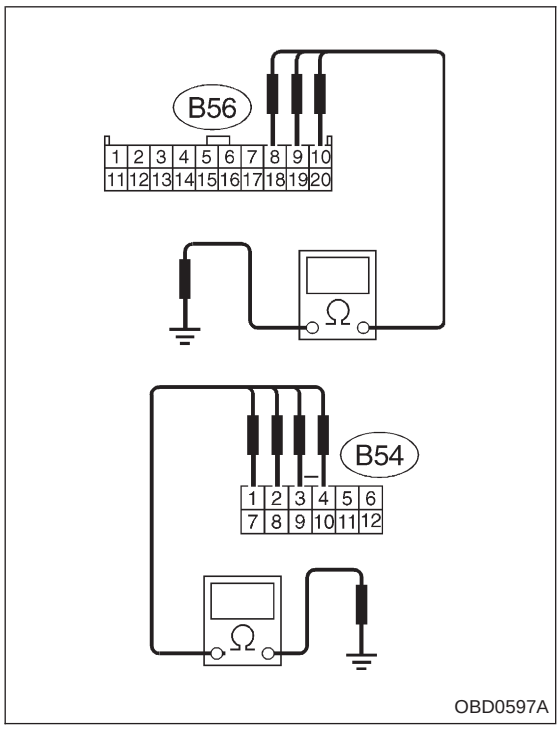
CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 4 — (B12) No. 5:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between TCM and transmission harness connector.



4) Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B56) No. 9 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B56) No. 8 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

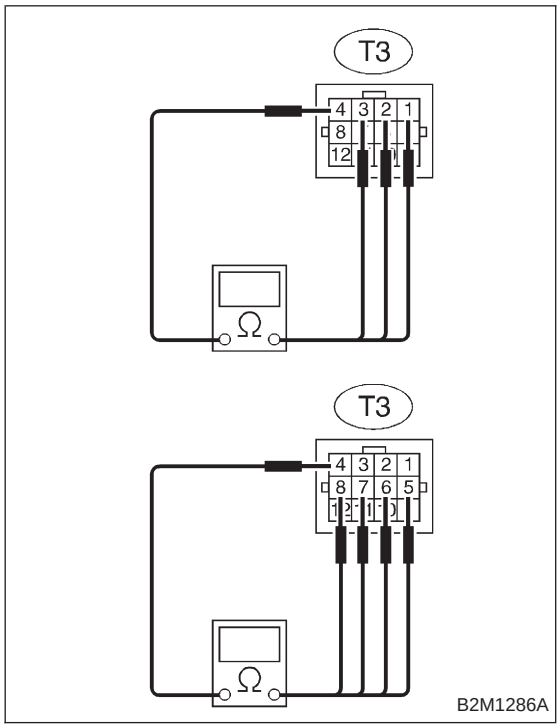
NO : Repair ground short circuit in harness between TCM and transmission harness connector.

Connector & terminal
(B54) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10BI25**.

NO : Repair ground short circuit in harness between TCM and transmission harness connector.



10BI25	CHECK INHIBITOR SWITCH.

Measure resistance between transmission harness connector receptacle's terminals.

Connector & terminal
(T3) No. 3 — No. 4

CHECK ***: ● Is the resistance less than 1 Ω in "P" position?***
● Is the resistance more than 1 MΩ in other positions?

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 2 — No. 4

CHECK ***: ● Is the resistance less than 1 Ω in "R" position?***
● Is the resistance more than 1 MΩ in other positions?

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 1 — No. 4

CHECK ***: ● Is the resistance less than 1 Ω in "N" position?***
● Is the resistance more than 1 MΩ in other positions?

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 8 — No. 4

CHECK ***: ● Is the resistance less than 1 Ω in "D" position?***
● Is the resistance more than 1 MΩ in other positions?

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 7 — No. 4

CHECK : ● ***Is the resistance less than 1 Ω in "3" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 6 — No. 4

CHECK : ● ***Is the resistance less than 1 Ω in "2" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

YES : Go to next CHECK .

NO : Go to CHECK1 .

Connector & terminal
(T3) No. 5 — No. 4

CHECK : ● ***Is the resistance less than 1 Ω in "1" position?***
● ***Is the resistance more than 1 MΩ in other positions?***

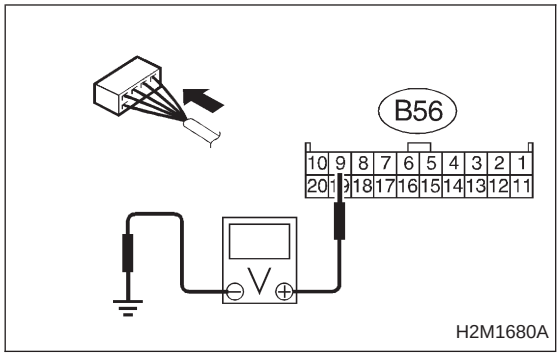
YES : Go to step **10BI26**.

NO : Go to CHECK1 .

CHECK1 : ***Is there faulty connection in the selector cable?***

YES : Repair connection of selector cable.

NO : Replace inhibitor switch.



10BI26	CHECK INPUT SIGNAL FOR TCM.

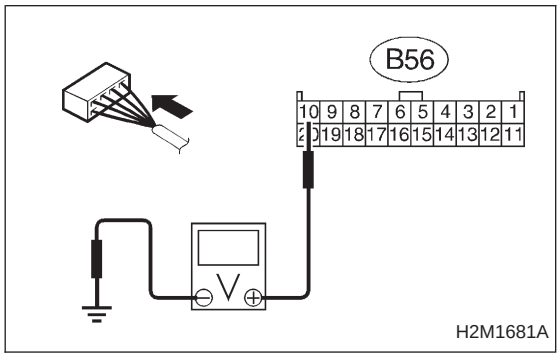
1) Turn ignition switch to OFF.
2) Connect connector to TCM and transmission.
3) Turn ignition switch to ON.
4) Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 9 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "P" and "N" positions?***
● ***Is the voltage more than 8 V in other positions?***

YES : Go to step **10BI27**.

NO : Go to step **10BI33**.



10BI27	CHECK INPUT SIGNAL FOR TCM.

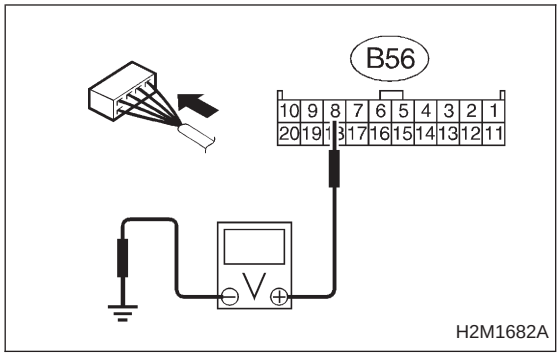
Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 10 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "R" position?***
● ***Is the voltage more than 6 V in other positions?***

YES : Go to step **10BI28**.

NO : Go to step **10BI33**.



10BI28	CHECK INPUT SIGNAL FOR TCM.

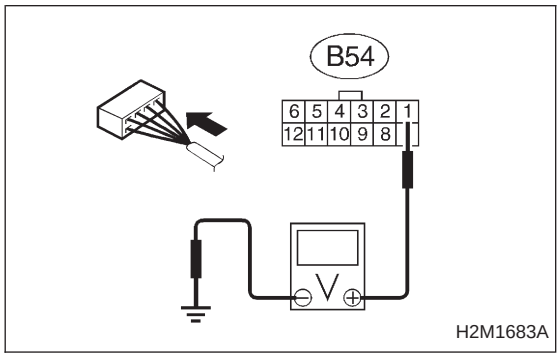
Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 8 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "N" and "P" positions?***
● ***Is the voltage more than 8 V in other positions?***

YES : Go to step **10BI29**.

NO : Go to step **10BI33**.



10BI29	CHECK INPUT SIGNAL FOR TCM.

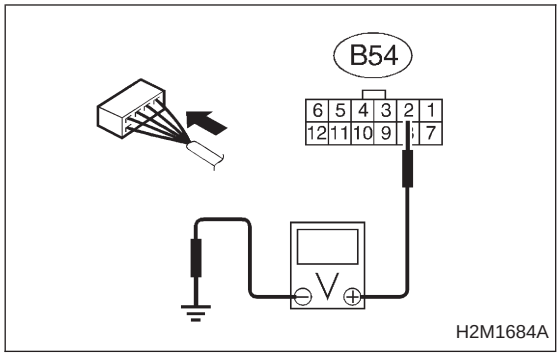
Measure voltage between TCM and chassis ground.

Connector & terminal
(B54) No. 1 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "D" position?***
● ***Is the voltage more than 6 V in other positions?***

YES : Go to step **10BI30**.

NO : Go to step **10BI33**.



10BI30	CHECK INPUT SIGNAL FOR TCM.

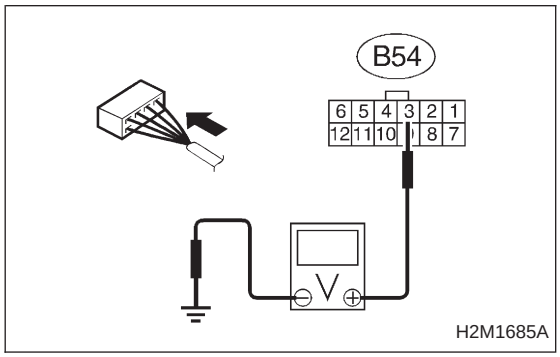
Measure voltage between TCM and chassis ground.

Connector & terminal
(B54) No. 2 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "3" position?***
● ***Is the voltage more than 6 V in other positions?***

YES : Go to step **10BI31**.

NO : Go to step **10BI33**.



10BI31	CHECK INPUT SIGNAL FOR TCM.

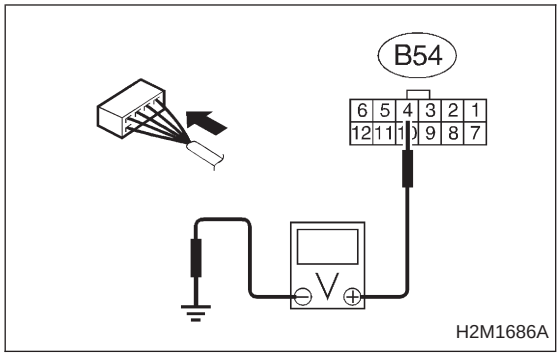
Measure voltage between TCM and chassis ground.

Connector & terminal
(B54) No. 3 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "2" position?***
● ***Is the voltage more than 6 V in other positions?***

YES : Go to step **10BI32**.

NO : Go to step **10BI33**.



10BI32	CHECK INPUT SIGNAL FOR TCM.

Measure voltage between TCM and chassis ground.

Connector & terminal
(B54) No. 4 (+) — Chassis ground (−):

CHECK : ● ***Is the voltage less than 1 V in "1" position?***
● ***Is the voltage more than 6 V in other positions?***

YES : Repair poor contact in TCM connector.

NO : Go to step **10BI33**.

10BI33	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

OBD	(FB1)
P0710	<ATF>

OBD0380

BJ: DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT MALFUNCTION —

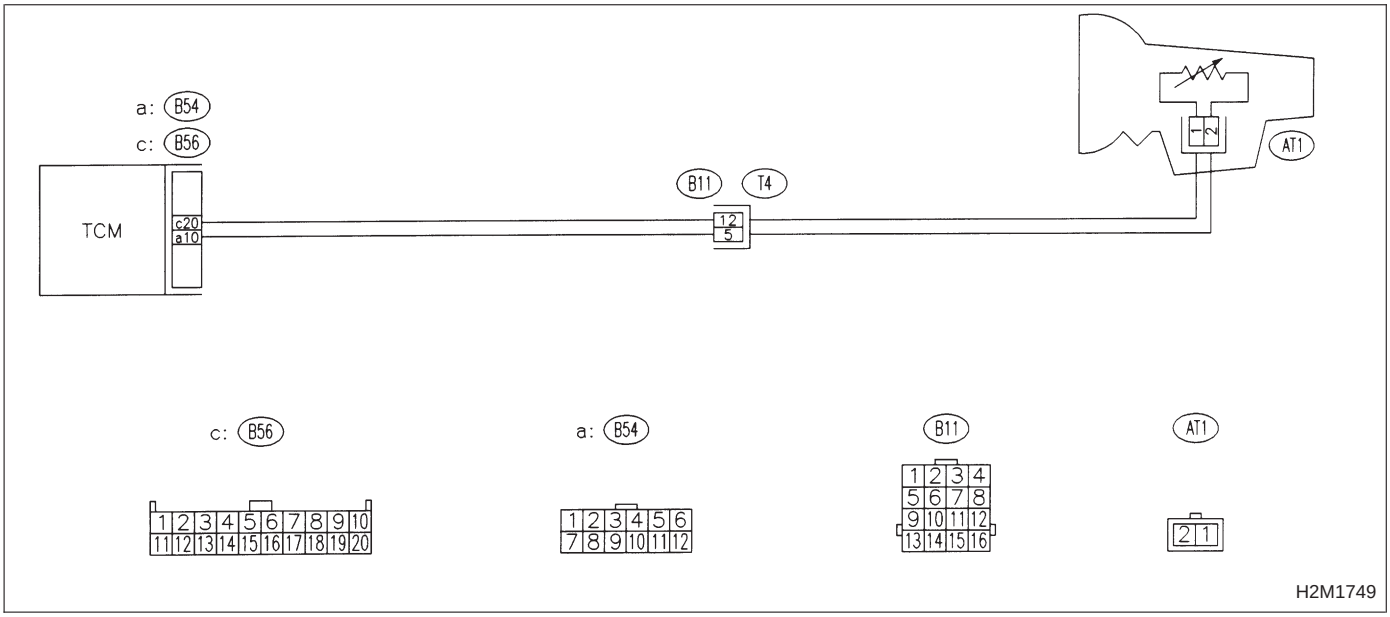
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No shift up to 4th speed (after engine warm-up)
- No lock-up (after engine warm-up)
- Excessive shift shock

WIRING DIAGRAM:



H2M1749

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BJ1	CHECK DTC P0710 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0710?***

YES : Check ATF temperature sensor circuit. <Ref. to 3-2 [T8H0].>

NO : It is not necessary to inspect DTC P0710.

OBD	(FB1)
P0720	<ATVSP>

OBD0392

BK: DTC P0720 — OUTPUT SPEED SENSOR (VEHICLE SPEED SENSOR 1) CIRCUIT MALFUNCTION —

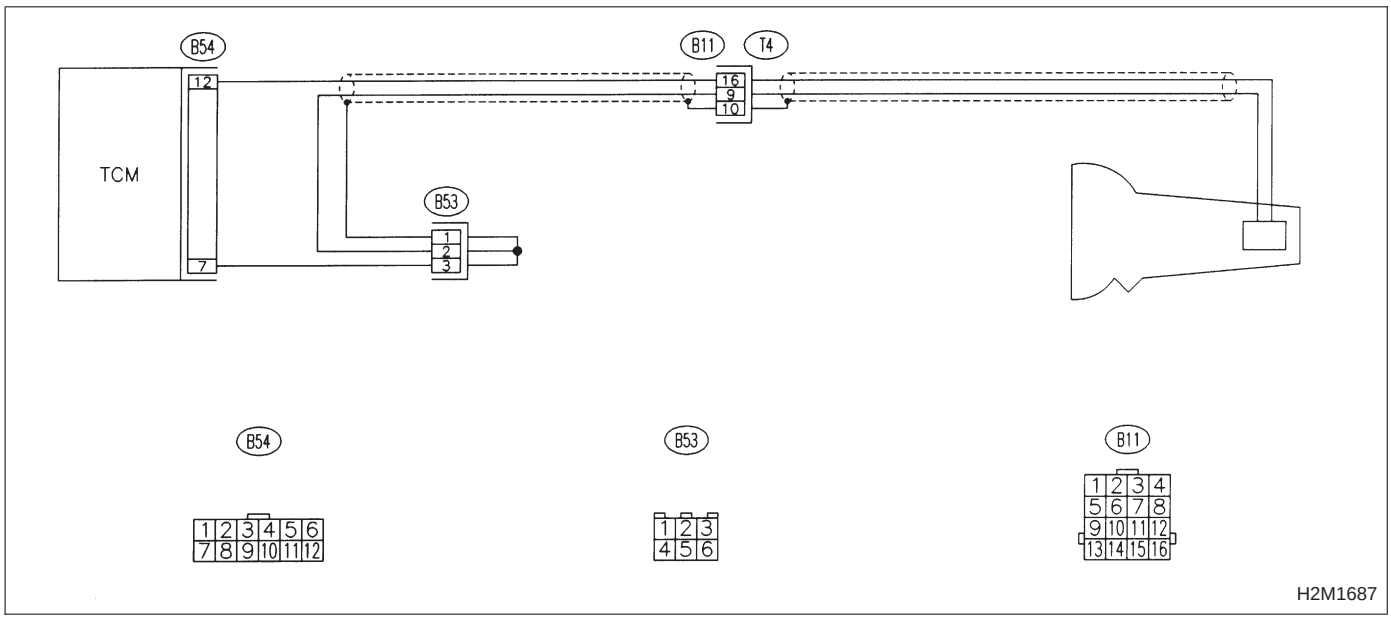
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No shift or excessive tight corner “braking”

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BK1	CHECK DTC P0720 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0720?***

YES : Check vehicle speed sensor 1 circuit. <Ref. to 3-2 [T8N0].>

NO : It is not necessary to inspect DTC P0720.

OBD	(FB1)
P0725	<ATNE>

OBD0404

BL: DTC P0725 — ENGINE SPEED INPUT CIRCUIT MALFUNCTION —

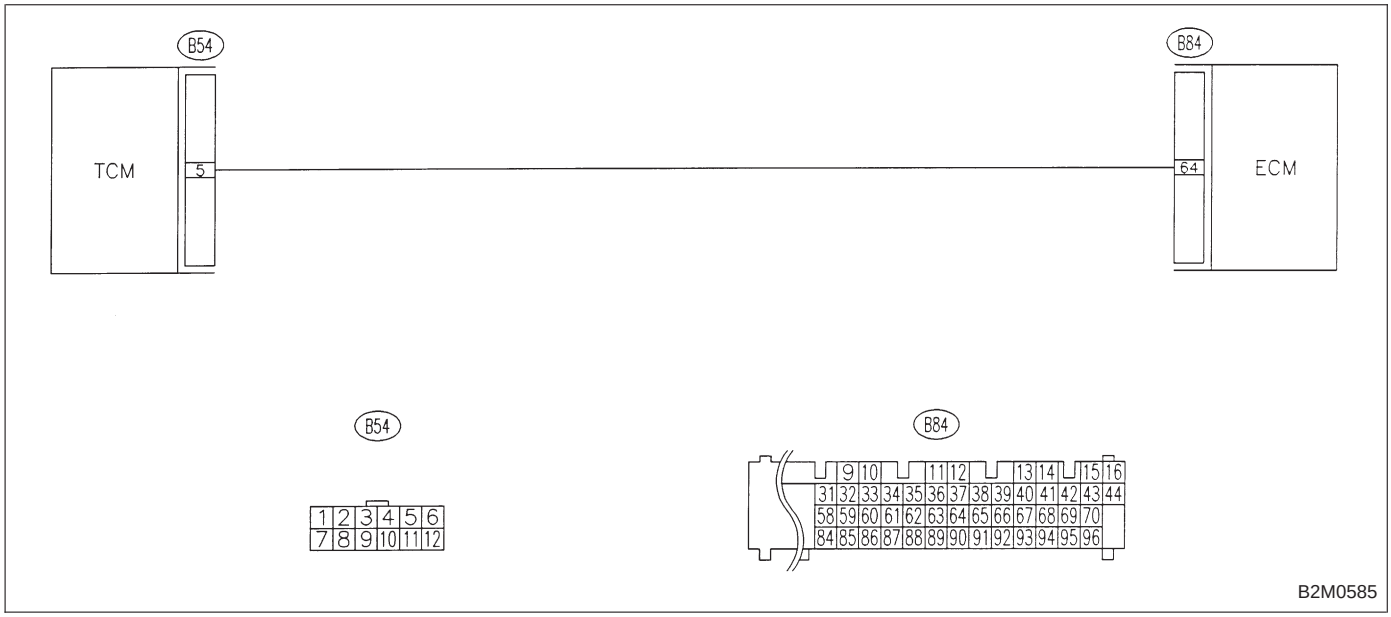
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- AT diagnostic indicator light (AT OIL TEMP indicator light) remains on when vehicle speed is “0”.

WIRING DIAGRAM:



B2M0585

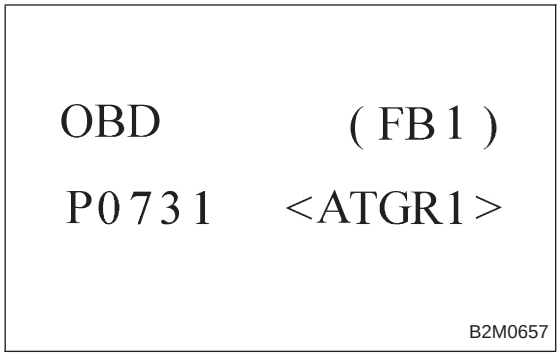
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BL1	CHECK DTC P0725 ON DISPLAY.

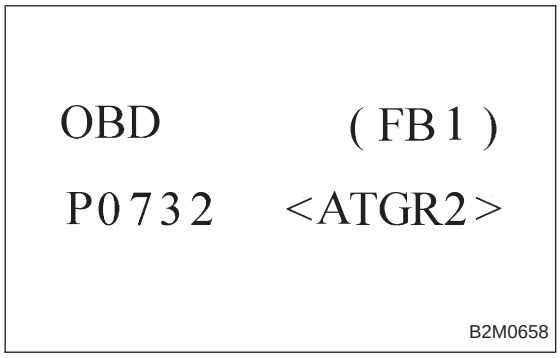
CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0725?***

YES : Check engine speed input signal circuit. <Ref. to 3-2 [T8J0].>

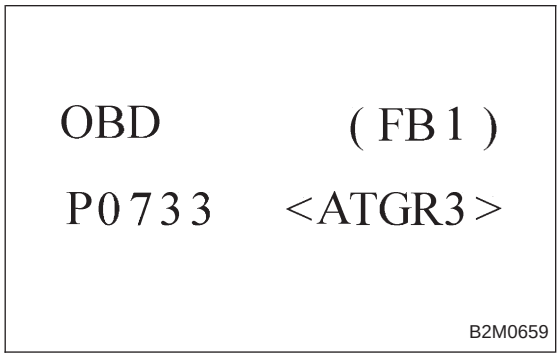
NO : It is not necessary to inspect DTC P0725.



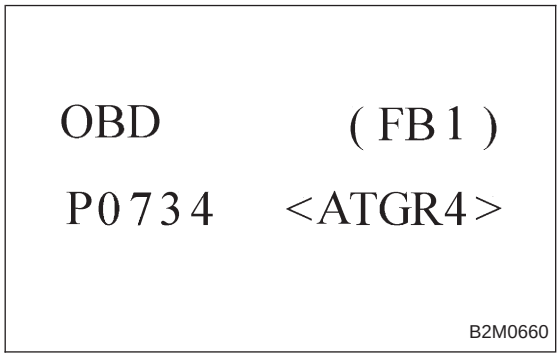
BM: DTC P0731 — GEAR 1 INCORRECT RATIO —



BN: DTC P0732 — GEAR 2 INCORRECT RATIO —



BO: DTC P0733 — GEAR 3 INCORRECT RATIO —



BP: DTC P0734 — GEAR 4 INCORRECT RATIO —

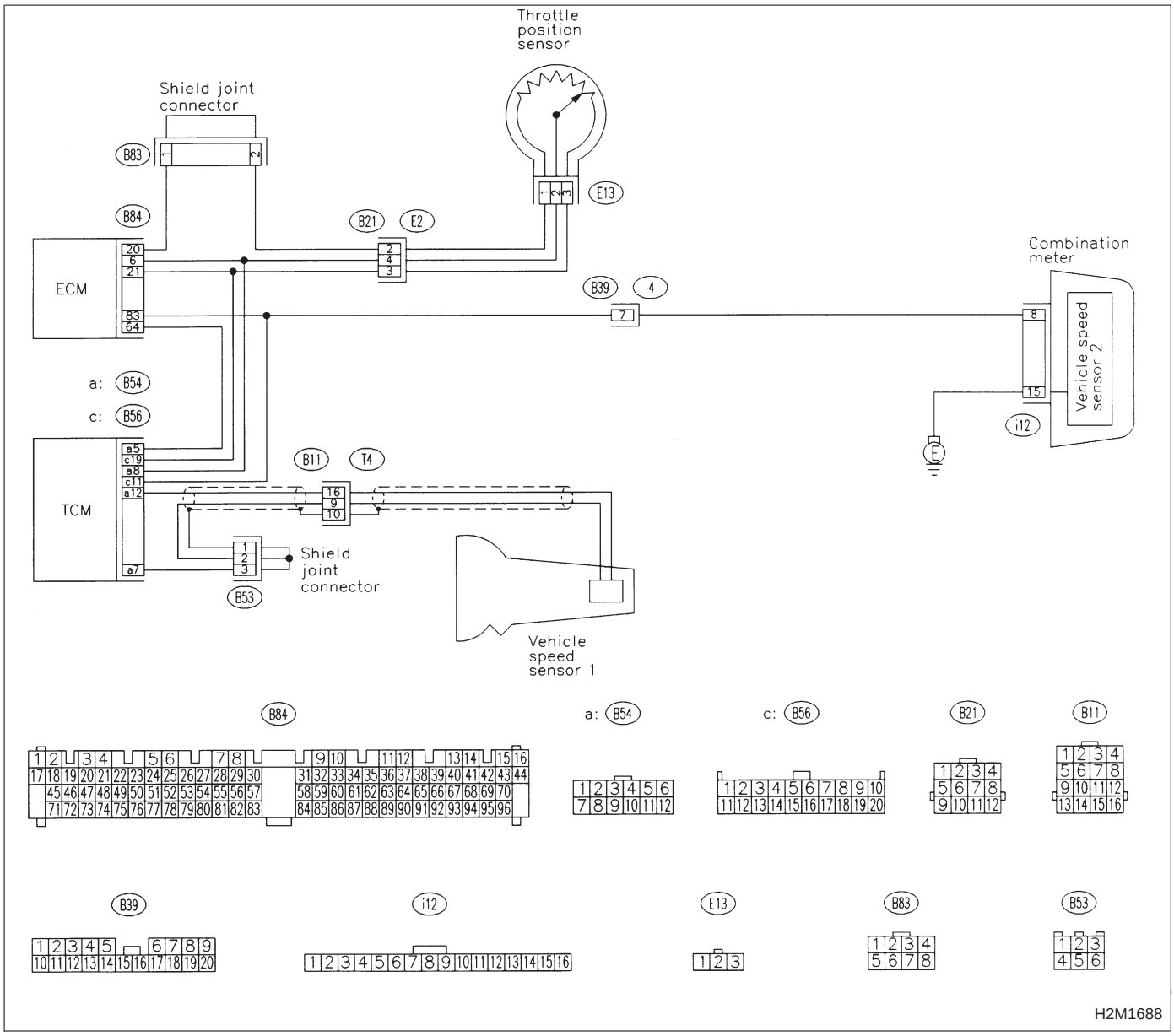
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BP1	**CHECK ANY OTHER DTC (BESIDES DTC P0731, P0732, P0733, P0734) ON DISPLAY.**

CHECK ***: Is there any other DTC on display?***

YES : Inspect relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10BP2**.

10BP2	CHECK THROTTLE POSITION SENSOR CIRCUIT.

Check throttle position sensor circuit. <Ref. to 3-2 [T8M0].>

CHECK ***: Is there any trouble in throttle position sensor circuit?***

YES : Repair or replace throttle position sensor circuit.

NO : Go to step **10BP3**.

10BP3	CHECK VEHICLE SPEED SENSOR 1 CIRCUIT.

Check vehicle speed sensor 1 circuit. <Ref. to 3-2 [T8N0].>

CHECK ***: Is there any trouble in vehicle speed sensor 1 circuit?***

YES : Repair or replace vehicle speed sensor 1 circuit.

NO : Go to step **10BP4**.

10BP4	CHECK VEHICLE SPEED SENSOR 2 CIRCUIT.

Check vehicle speed sensor 2 circuit. <Ref. to 3-2 [T8O0].>

CHECK ***: Is there any trouble in vehicle speed sensor 2 circuit?***

YES : Repair or replace vehicle speed sensor 2 circuit.

NO : Go to step **10BP5**.

10BP5	CHECK ENGINE SPEED INPUT CIRCUIT.

Check engine speed input circuit. <Ref. to 3-2 [T8J0].>

CHECK ***: Is there any trouble in engine speed input circuit?***

YES : Repair or replace engine speed input circuit.

NO : Go to step **10BP6**.

10BP6	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to step **10BP7**.

10BP7	CHECK MECHANICAL TROUBLE.

Check mechanical trouble in automatic transmission.

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM.

OBD (FB1)

P0740 <ATLU_F>

B2M0661

BQ: DTC P0740 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —

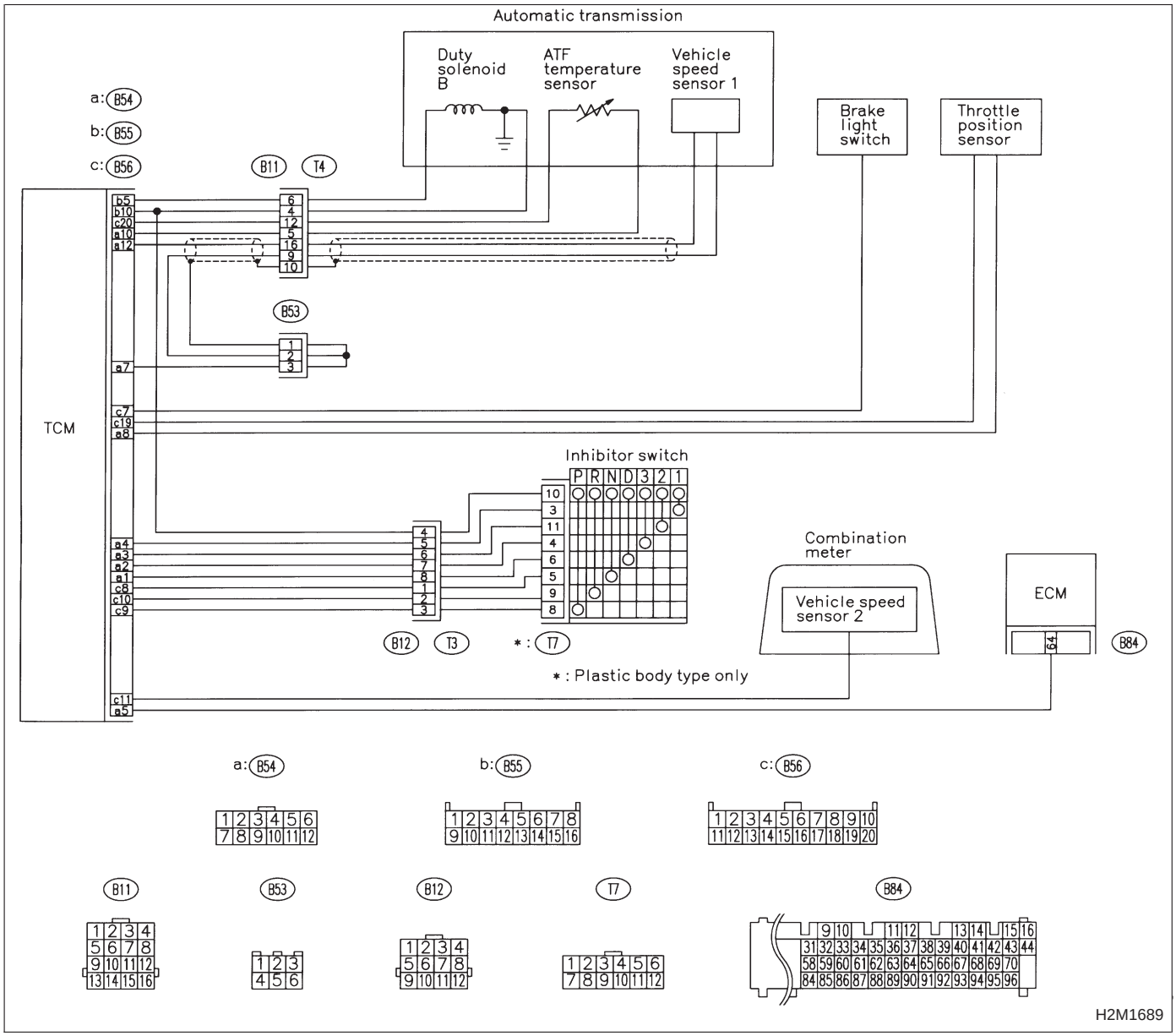
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BQ1	CHECK ANY OTHER DTC (BESIDES DTC P0740) ON DISPLAY.

CHECK ***: Is there any other DTC on display?***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10BQ2**.

10BQ2	CHECK DUTY SOLENOID B CIRCUIT.

Check duty solenoid B circuit. <Ref. to 3-2 [T8D0].>

CHECK ***: Is there any trouble in duty solenoid B circuit?***

YES : Repair or replace duty solenoid B circuit.

NO : Go to step **10BQ3**.

10BQ3	CHECK THROTTLE POSITION SENSOR CIRCUIT.

Check throttle position sensor circuit. <Ref. to 3-2 [T8M0].>

CHECK ***: Is there any trouble in throttle position sensor circuit?***

YES : Repair or replace throttle position sensor circuit.

NO : Go to step **10BQ4**.

10BQ4	CHECK VEHICLE SPEED SENSOR 1 CIRCUIT.

Check vehicle speed sensor 1 circuit. <Ref. to 3-2 [T8N0].>

CHECK ***: Is there any trouble in vehicle speed sensor 1 circuit?***

YES : Repair or replace vehicle speed sensor 1 circuit.

NO : Go to step **10BQ5**.

10BQ5	CHECK VEHICLE SPEED SENSOR 2 CIRCUIT.

Check vehicle speed sensor 2 circuit. <Ref. to 3-2 [T8O0].>

CHECK ***: Is there any trouble in vehicle speed sensor 2 circuit?***

YES : Repair or replace vehicle speed sensor 2 circuit.

NO : Go to step **10BQ6**.

10BQ6	CHECK ENGINE SPEED INPUT CIRCUIT.

Check engine speed input circuit. <Ref. to 3-2 [T8J0].>

CHECK ***: Is there any trouble in engine speed input circuit?***

YES : Repair or replace engine speed input circuit.

NO : Go to step **10BQ7**.

10BQ7	CHECK INHIBITOR SWITCH CIRCUIT.

Check inhibitor switch circuit. <Ref. to 2-7 [T10BI0].>

CHECK ***: Is there any trouble in inhibitor switch circuit?***

YES : Repair or replace inhibitor switch circuit.

NO : Go to step **10BQ8**.

10BQ8	CHECK BRAKE LIGHT SWITCH CIRCUIT.

Check brake light switch circuit. <Ref. to 2-7 [T10BH0].>

CHECK ***: Is there any trouble in brake light switch circuit?***

YES : Repair or replace brake light switch circuit.

NO : Go to step **10BQ9**.

10BQ9	CHECK ATF TEMPERATURE SENSOR CIRCUIT.

Check ATF temperature sensor circuit. <Ref. to 3-2 [T8H0].>

CHECK ***: Is there any trouble in ATF temperature sensor circuit?***

YES : Repair or replace ATF temperature sensor circuit.

NO : Go to step **10BQ10**.

10BQ10	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to step **10BQ11**.

10BQ11	CHECK MECHANICAL TROUBLE.

Check mechanical trouble in automatic transmission.

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM.

OBD (FB1)
P0743 <ATLU>
B2M0662

BR: DTC P0743 — TORQUE CONVERTER CLUTCH SYSTEM (DUTY SOLENOID B) ELECTRICAL —

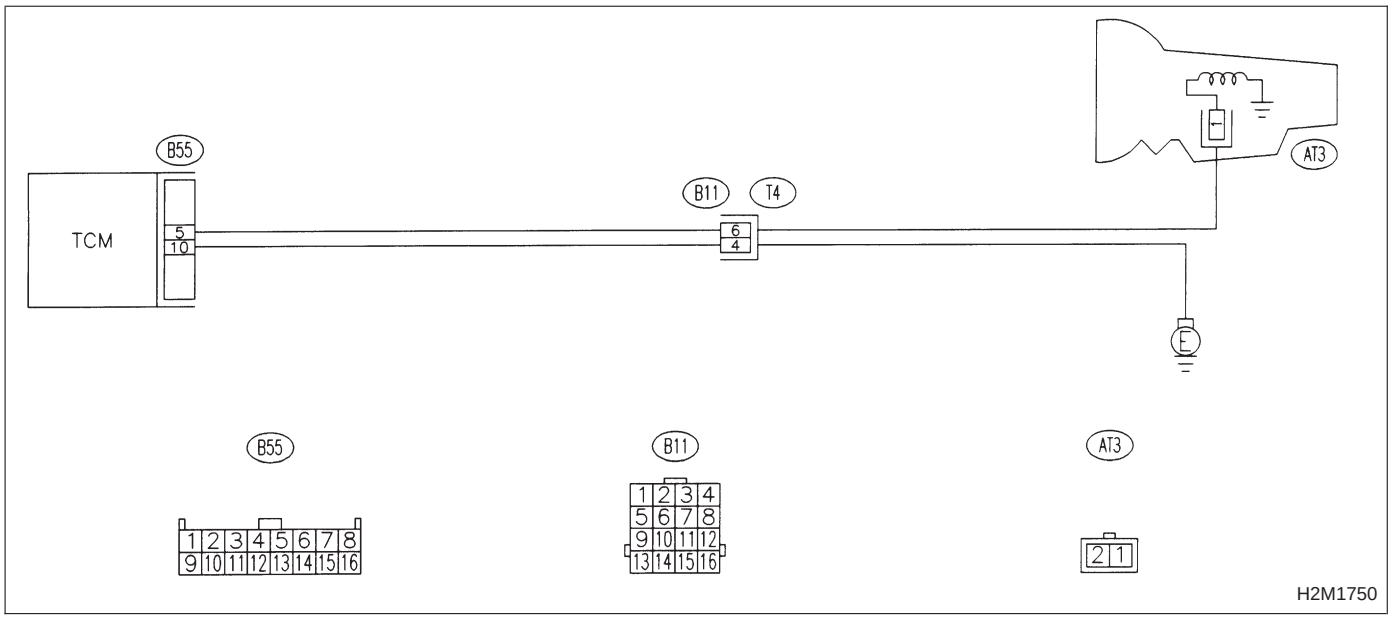
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BR1	**CHECK DTC P0743 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0743?***

YES : Check duty solenoid B circuit. <Ref. to 3-2 [T8D0].>

NO : It is not necessary to inspect DTC P0743.

OBD (FB1)
P0748 <ATPL>
B2M0663

BS: DTC P0748 — PRESSURE CONTROL SOLENOID (DUTY SOLENOID A) ELECTRICAL —

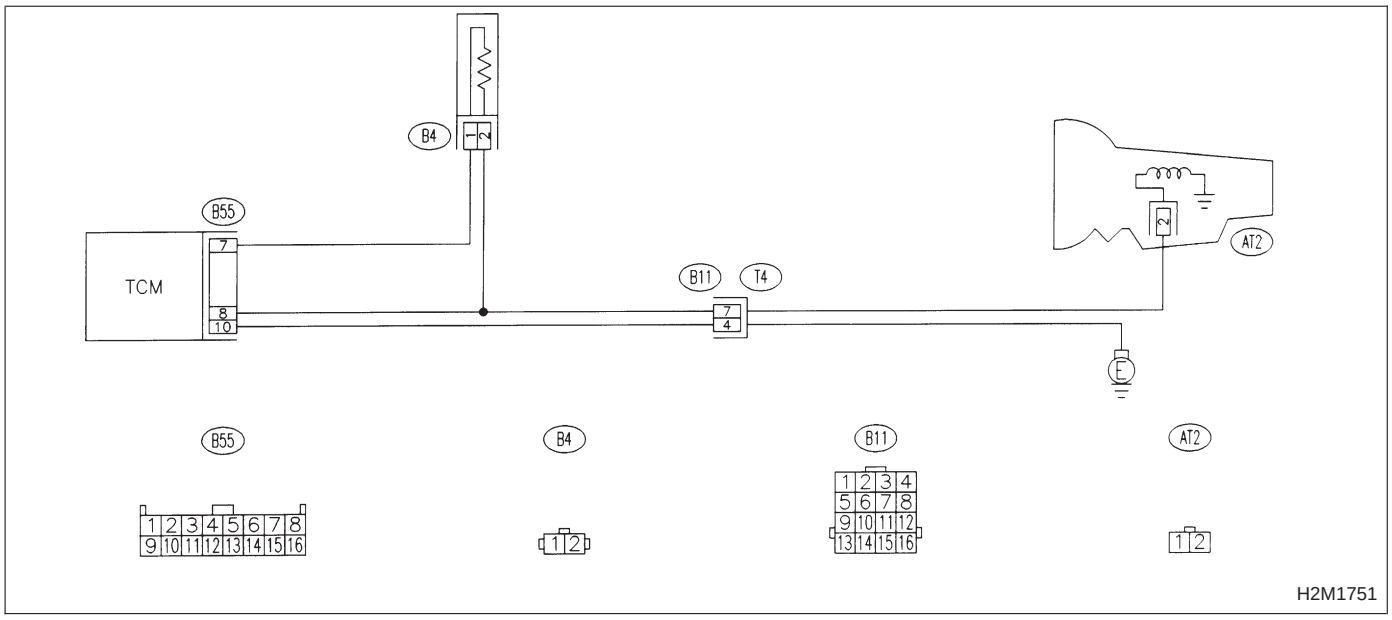
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Excessive shift shock

WIRING DIAGRAM:



H2M1751

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BS1	CHECK DTC P0748 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0748?***

YES : Check duty solenoid A circuit. <Ref. to 3-2 [T8C0].>

NO : It is not necessary to inspect DTC P0748.

OBD (FB1)

P0753 <ATSFT1>

B2M0664

BT: DTC P0753 — SHIFT SOLENOID A (SHIFT SOLENOID 1) ELECTRICAL —

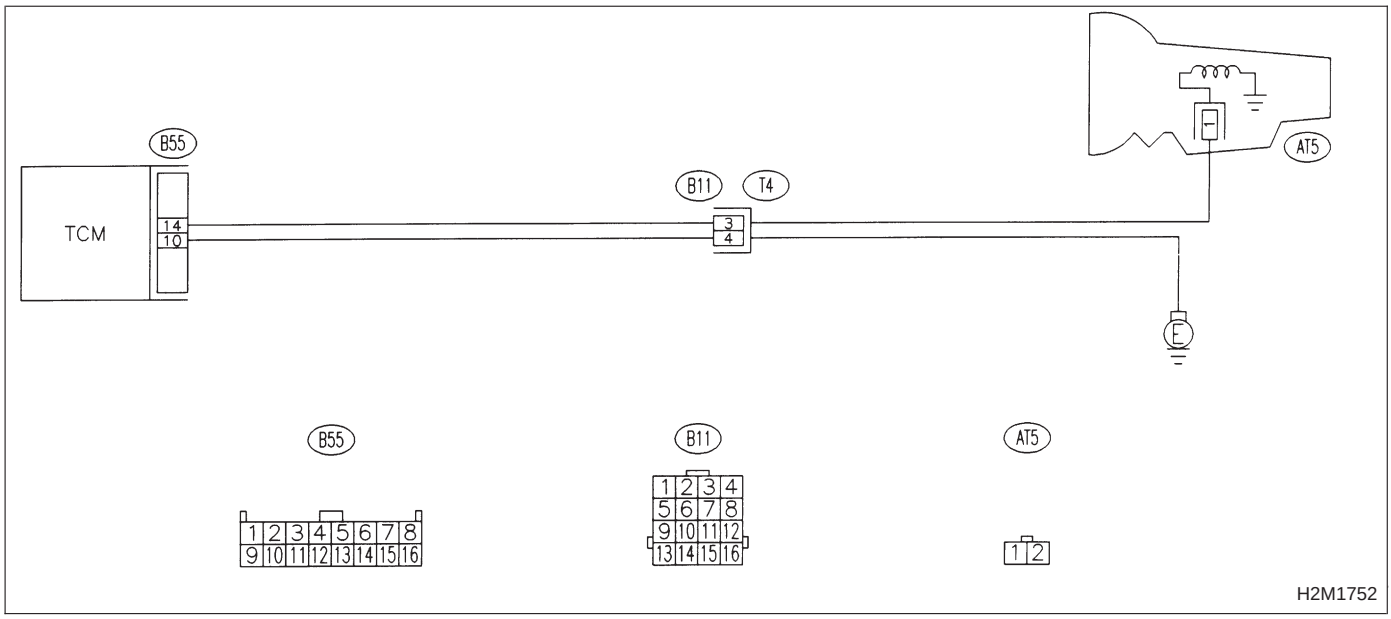
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No shift

WIRING DIAGRAM:



H2M1752

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BT1	**CHECK DTC P0753 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0753?***

YES : Check shift solenoid 1 circuit. <Ref. to 3-2 [T8G0].>

NO : It is not necessary to inspect DTC P0753.

OBD (FB1)

P0758 <ATSFT2>

B2M0665

BU: DTC P0758 — SHIFT SOLENOID B (SHIFT SOLENOID 2) ELECTRICAL —

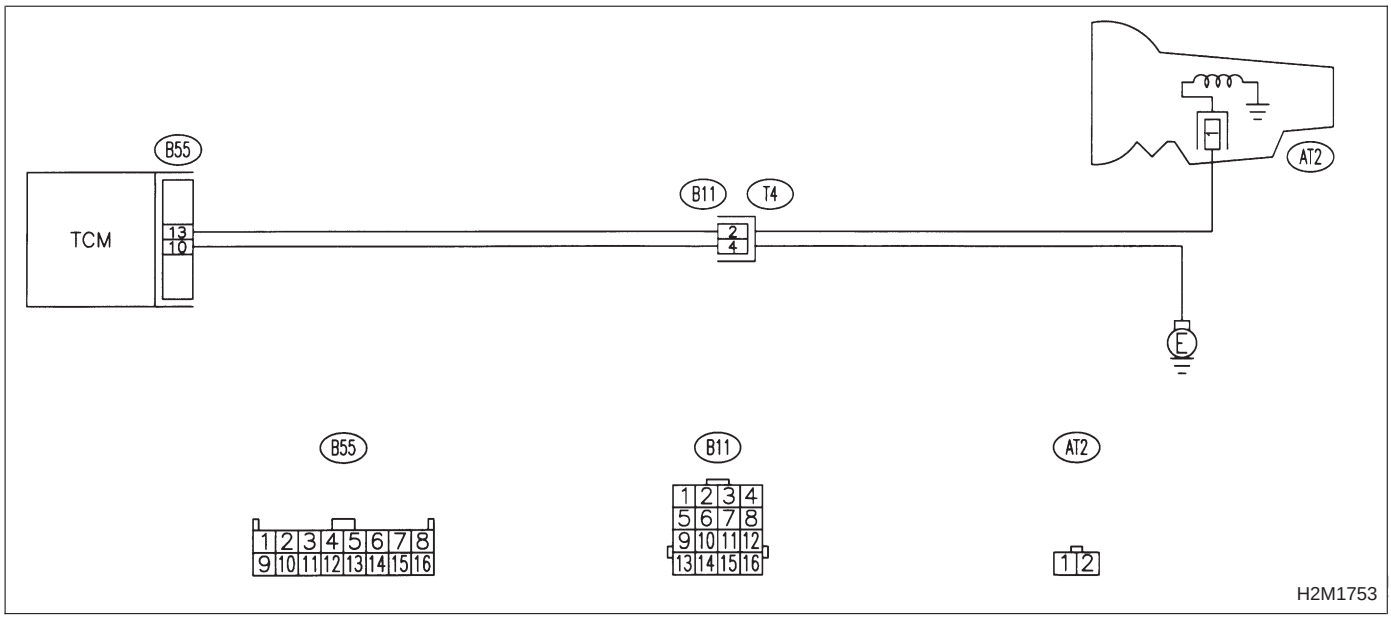
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No shift

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BU1	**CHECK DTC P0758 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0758?***

YES : Check shift solenoid 2 circuit. <Ref. to 3-2 [T8F0].>

NO : It is not necessary to inspect DTC P0758.

OBD (FB1)

P0760<ATOVR_F>

B2M0666

BV: DTC P0760 — SHIFT SOLENOID C (SHIFT SOLENOID 3) MALFUNCTION —

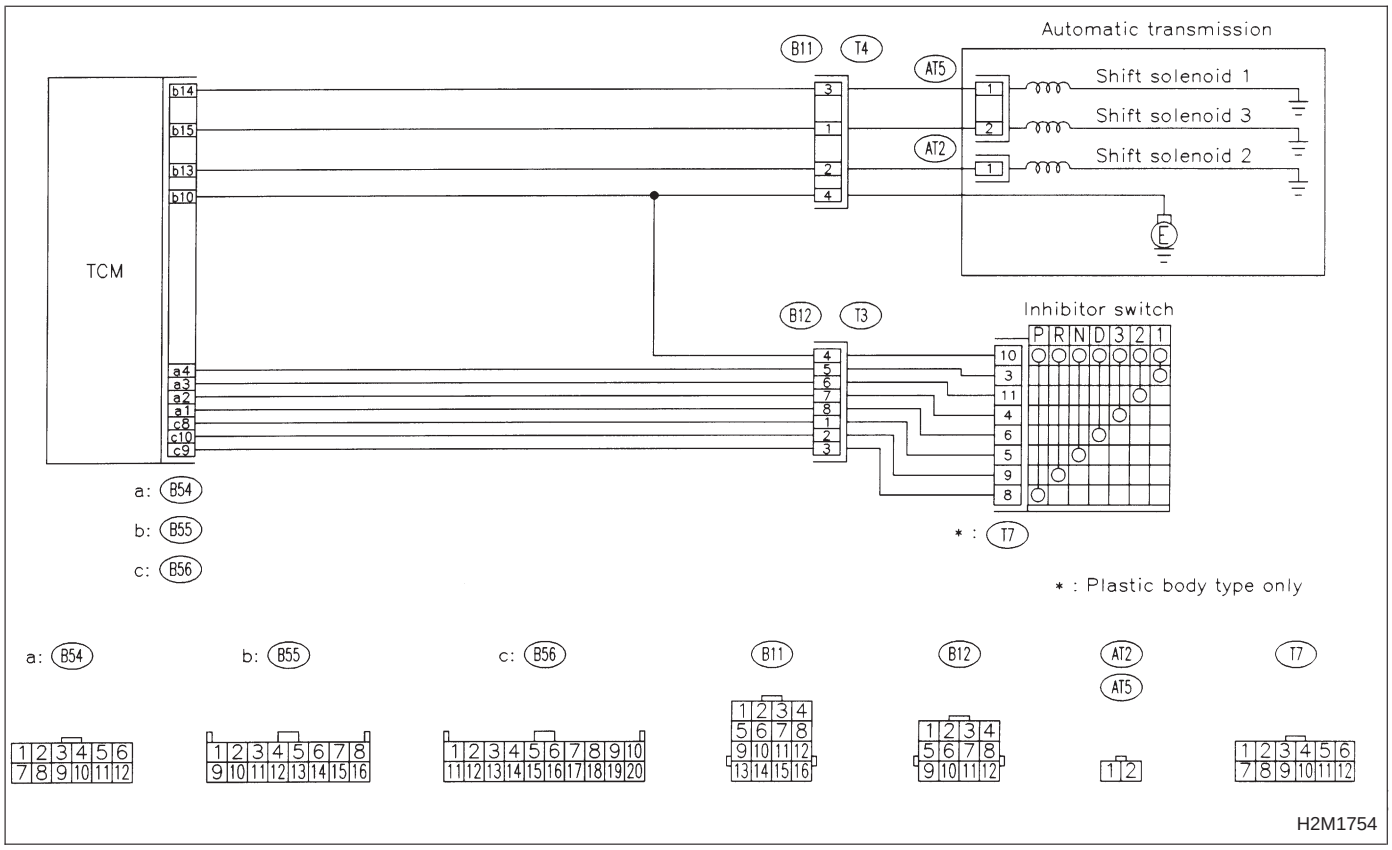
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Ineffective engine brake with selector lever in “3”

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BV1	**CHECK ANY OTHER DTC (BESIDES DTC P0760) ON DISPLAY.**

CHECK ***: Is there any other DTC on display?***

YES : Inspect relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10BV2**.

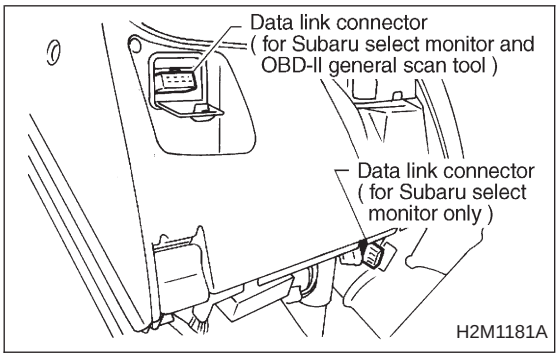
10BV2	CHECK INHIBITOR SWITCH CIRCUIT.

Check inhibitor switch circuit. <Ref. to 2-7 [T10BI0].>

CHECK ***: Is there any trouble in inhibitor switch circuit?***

YES : Repair or replace inhibitor switch circuit.

NO : Go to step **10BV3**.

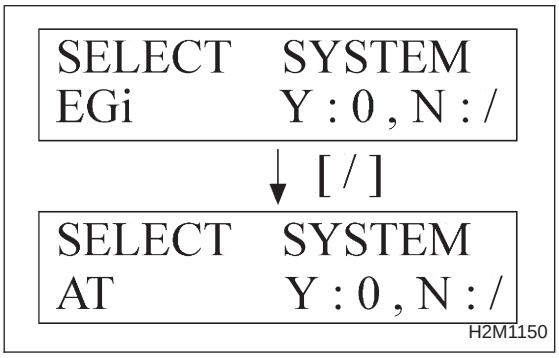


10BV3	CHECK GEAR POSITION.

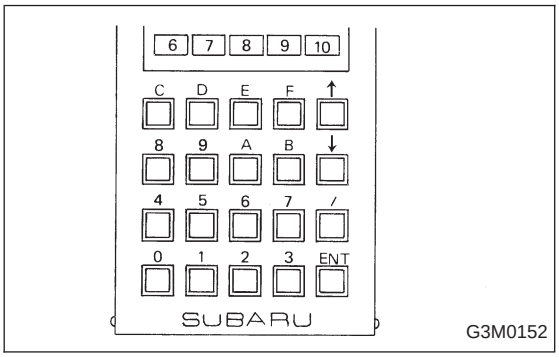
1) Turn ignition switch to OFF.
2) Connect the Subaru select monitor to data link connector.
3) Lift-up or raise the vehicle and support with safety stands.

CAUTION:
On AWD models, raise all wheels off ground.

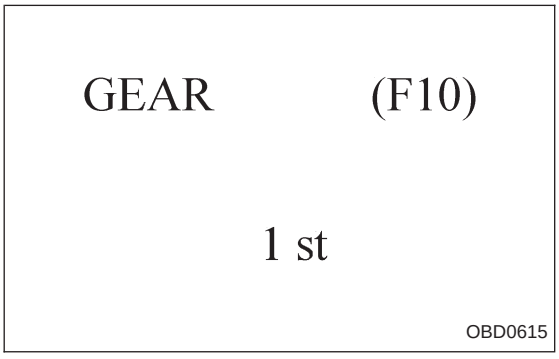
4) Start and warm-up the engine and transmission.



5) Subaru select monitor switch to ON.
6) Select AT mode using function key.
Press the function key [/], and change to AT mode.
7) Press the function key [0].



8) Designate mode using function key.
Function mode for AT: F10



9) Move selector lever to “D” and drive the vehicle.
10) Read data on Subaru select monitor.

CHECK ***: Does gear position change according to throttle position and vehicle speed?***

YES : Go to step **10BV4**.

NO : Go to step **10BV6**.

10BV4	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to step **10BV5**.

10BV5	CHECK MECHANICAL TROUBLE.

Check mechanical trouble in automatic transmission.

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM.

10BV6	CHECK SHIFT SOLENOID 1 CIRCUIT.

Check shift solenoid 1 circuit. <Ref. to 3-2 [T8G0].>

CHECK ***: Is there any trouble in shift solenoid 1 circuit?***

YES : Repair or replace shift solenoid 1 circuit.

NO : Go to step **10BV7**.

10BV7	CHECK SHIFT SOLENOID 2 CIRCUIT.

Check shift solenoid 2 circuit. <Ref. to 3-2 [T8F0].>

CHECK ***: Is there any trouble in shift solenoid 2 circuit?***

YES : Repair or replace shift solenoid 2 circuit.

NO : Go to step **10BV8**.

10BV8	CHECK SHIFT SOLENOID 3 CIRCUIT.

Check shift solenoid 3 circuit. <Ref. to 3-2 [T8E0].>

CHECK ***: Is there any trouble in shift solenoid 3 circuit?***

YES : Repair or replace shift solenoid 3 circuit.

NO : Go to step **10BV9**.

10BV9	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Go to step **10BV10**.

10BV10	CHECK MECHANICAL TROUBLE.

Check mechanical trouble in automatic transmission.

CHECK ***: Is there any mechanical trouble in automatic transmission?***

YES : Repair or replace automatic transmission.

NO : Replace TCM.

OBD (FB1)
P0763 <ATOVR>
B2M0667

BW: DTC P0763 — SHIFT SOLENOID C (SHIFT SOLENOID 3) ELECTRICAL —

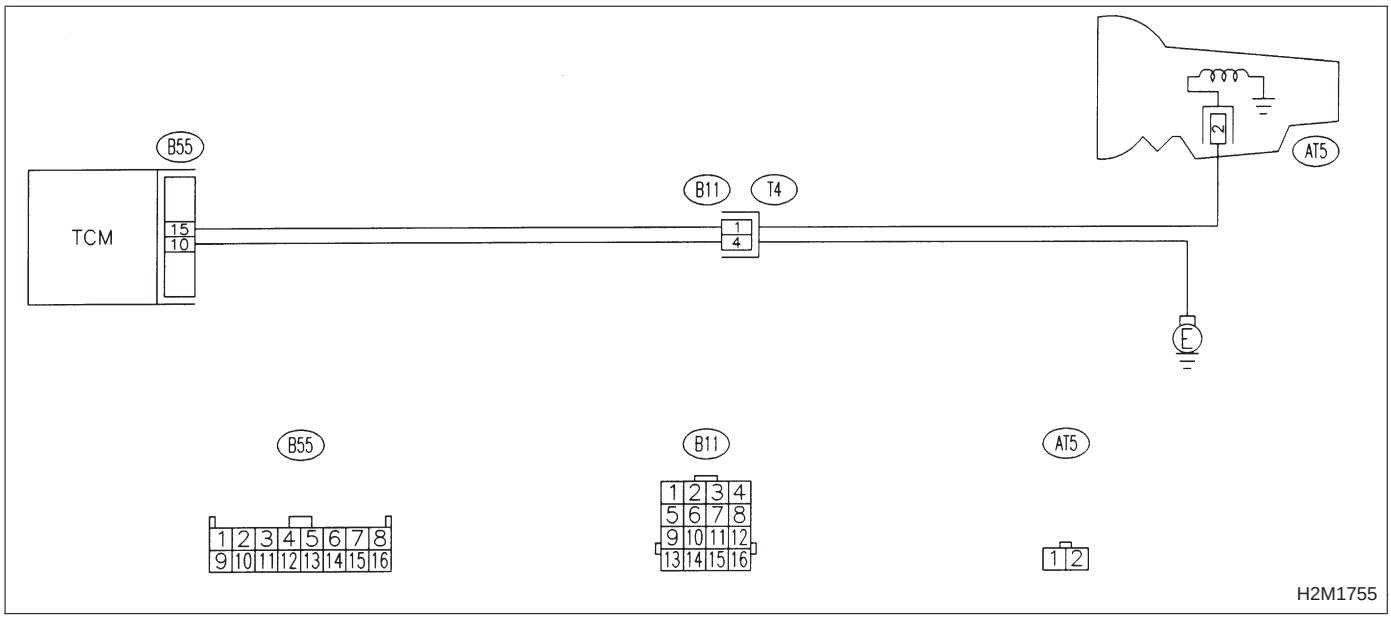
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Ineffective engine brake with selector lever in “3”

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BW1	**CHECK DTC P0763 ON DISPLAY.**

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0763?***

YES : Check shift solenoid 3 circuit. <Ref. to 3-2 [T8E0].>

NO : It is not necessary to inspect DTC P0763.

OBD (FB1)

P1100 <ST_SWOFF>

B2M1113

BX: DTC P1100 — STARTER SWITCH CIRCUIT LOW INPUT —

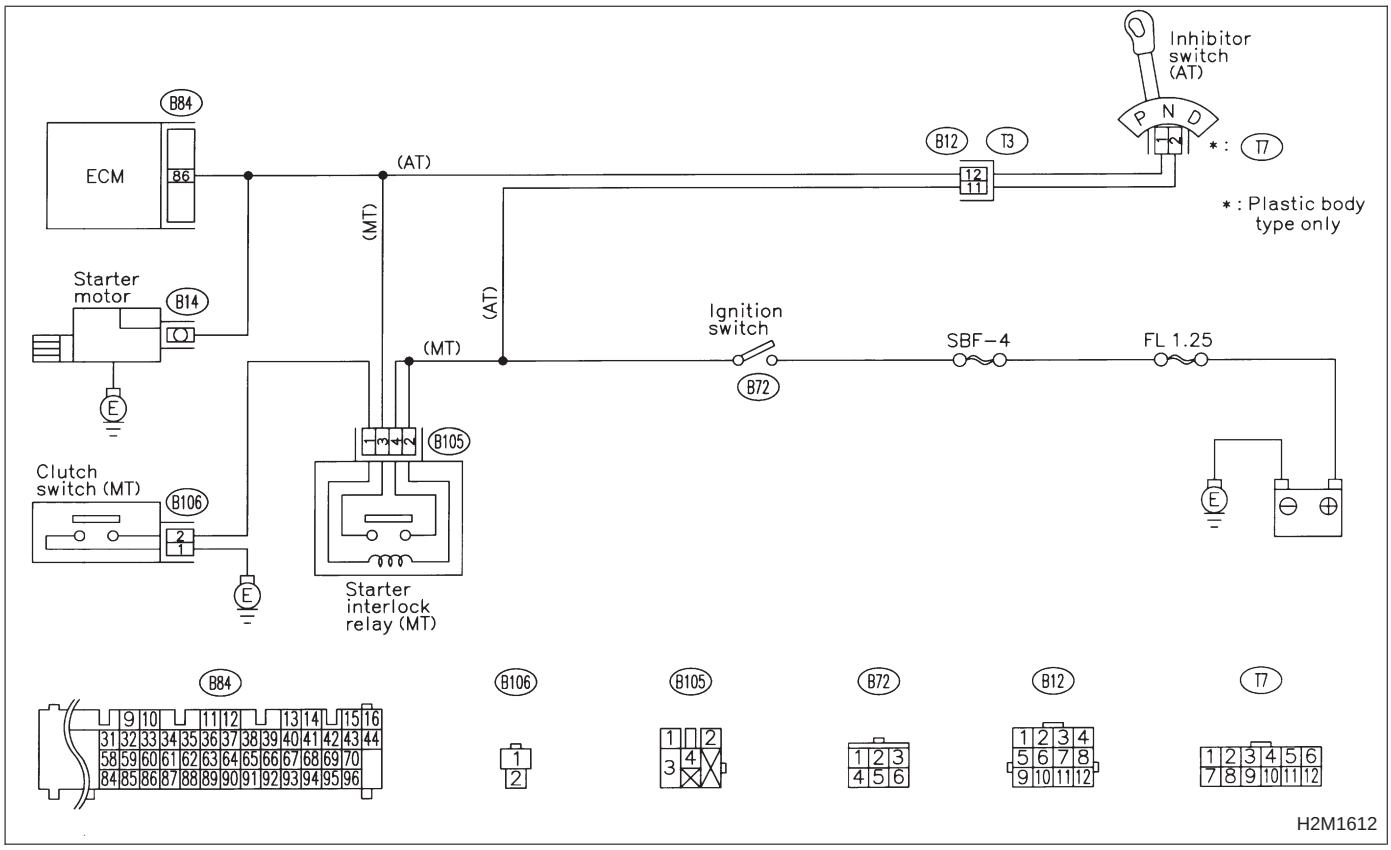
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Failure of engine to start

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BX1	CHECK OPERATION OF STARTER MOTOR.

CHECK ***: Does starter motor operate when ignition switch to “ST”?***

NOTE:
- On AT vehicles, place the inhibitor switch in the “P” or “N” position.
- On MT vehicles, depress the clutch pedal.

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open or ground short circuit in harness between ECM and starter motor connector.
- Poor contact in ECM connector.

NO : Check starter motor circuit. <Ref. to 2-7 [T8B0].>

OBD (FB1)
P1101 <N_SW>

B2M1114

BY: DTC P1101 — NEUTRAL POSITION SWITCH CIRCUIT MALFUNCTION [MT VEHICLES] —

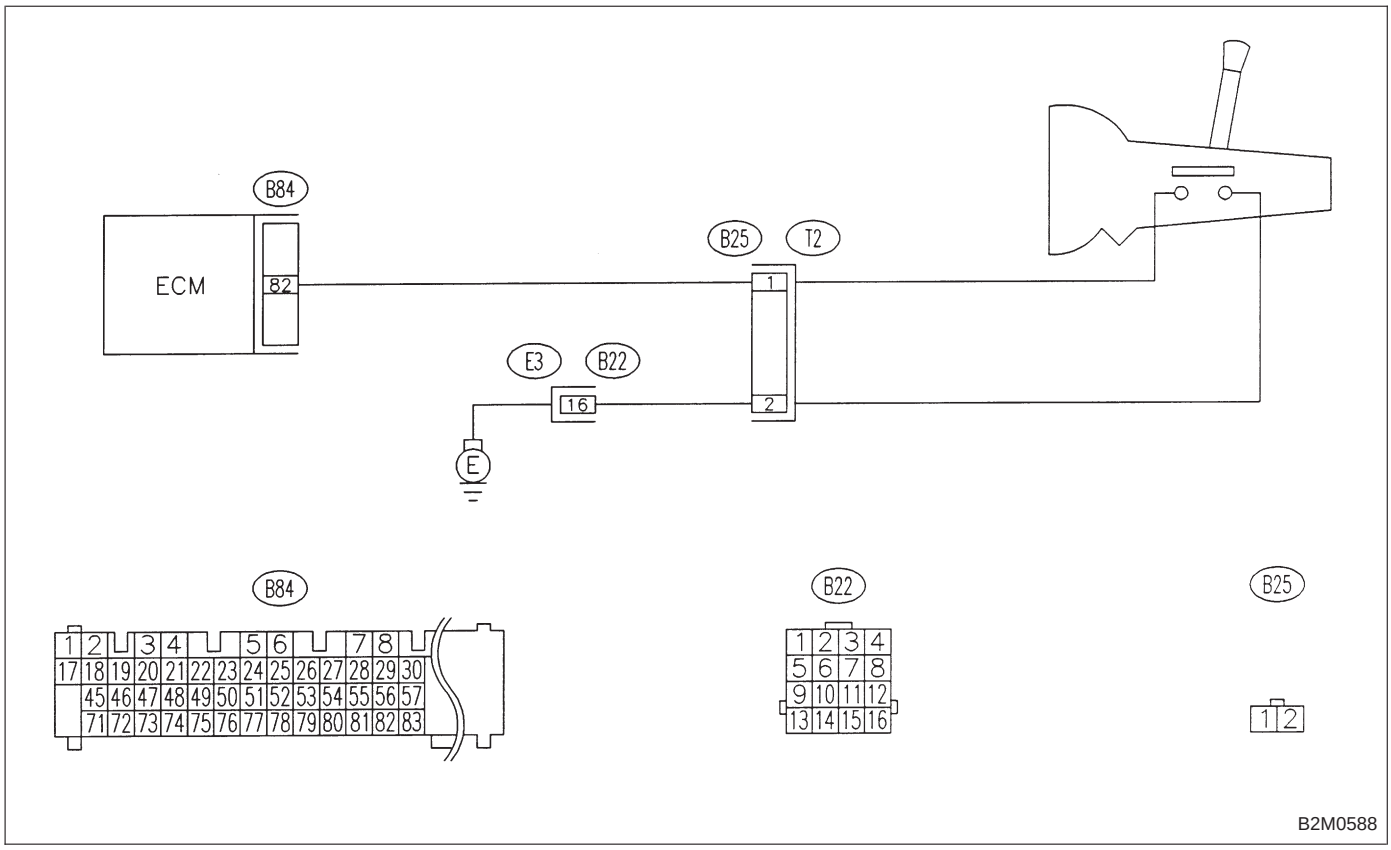
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

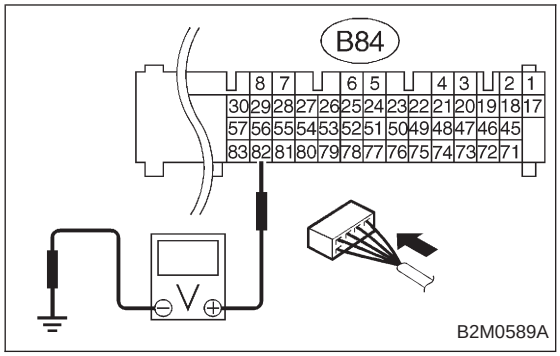
- Erroneous idling

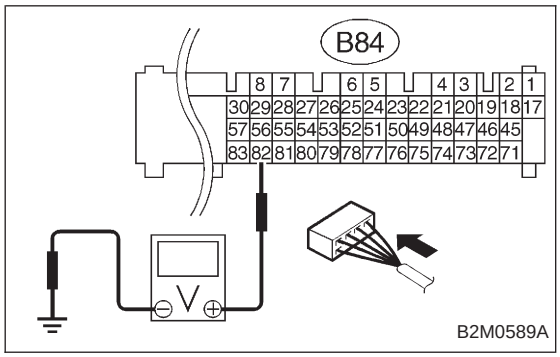
WIRING DIAGRAM:



B2M0588

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10BY1	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 4.5 and 5.5 V in neutral position?***

YES : Go to next step 3).

NO : Go to step **10BY3**.

3) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V in other positions?***

YES : Go to step **10BY2**.

NO : Go to step **10BY3**.

10BY2	CHECK POOR CONTACT.

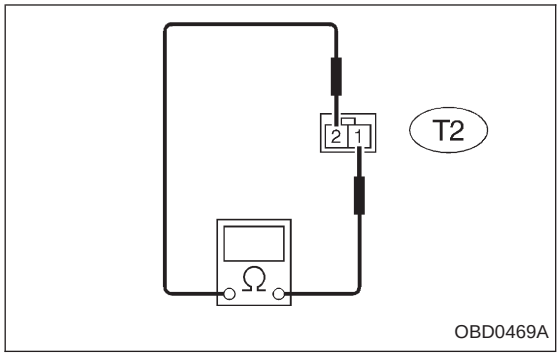
Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10BY3	CHECK NEUTRAL POSITION SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission harness.
3) Measure resistance between transmission harness and connector terminals.

Connector & terminal
(T2) No. 1 — No. 2:

CHECK ***: Is the resistance more than 1 MΩ in neutral position?***

YES : Go to next step 4).

NO : Repair short circuit in transmission harness or replace neutral position switch.

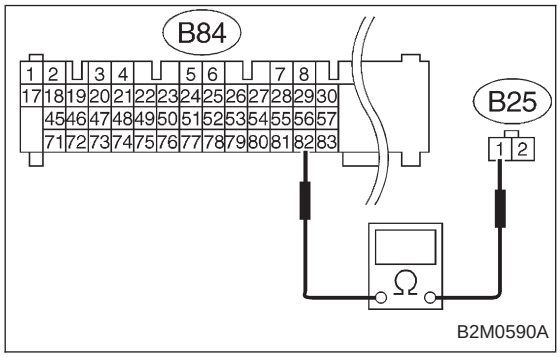
4) Measure resistance between transmission harness connector terminals.

Connector & terminal
(T2) No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω in other positions?***

YES : Go to step **10BY4**.

NO : Repair open circuit in transmission harness or replace neutral position switch.



10BY4	CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH.

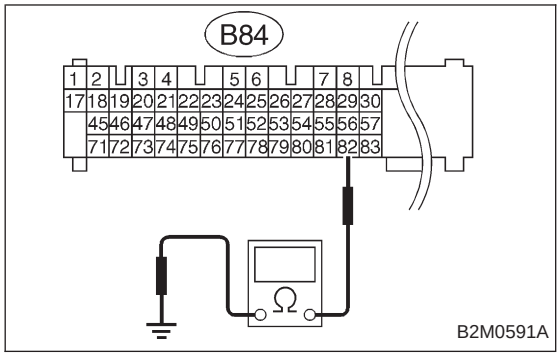
1) Disconnect connector from ECM.
2) Measure resistance of harness between ECM and transmission harness connector.

Connector & terminal
(B84) No. 82 — (B25) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair open circuit in harness between ECM and transmission harness connector.



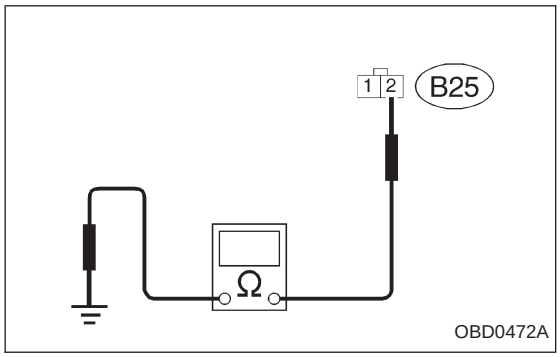
3) Measure resistance between ECM and chassis ground.

Connector & terminal
(B84) No. 82 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and transmission harness connector.

NO : Go to next step 4).



4) Measure resistance of harness between transmission harness connector and engine ground.

Connector & terminal
(B25) No. 2 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **10BY5**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between transmission harness connector and engine grounding terminal
- Poor contact in coupling connector (B22)

10BY5	CHECK POOR CONTACT.

Check poor contact in transmission harness connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in transmission harness connector?***

YES : Repair poor contact in transmission harness connector.

NO : Replace ECM.

OBD (FB1)

P1101 <N_SWOFF>

B2M1115

BZ: DTC P1101 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT [AT VEHICLES] —

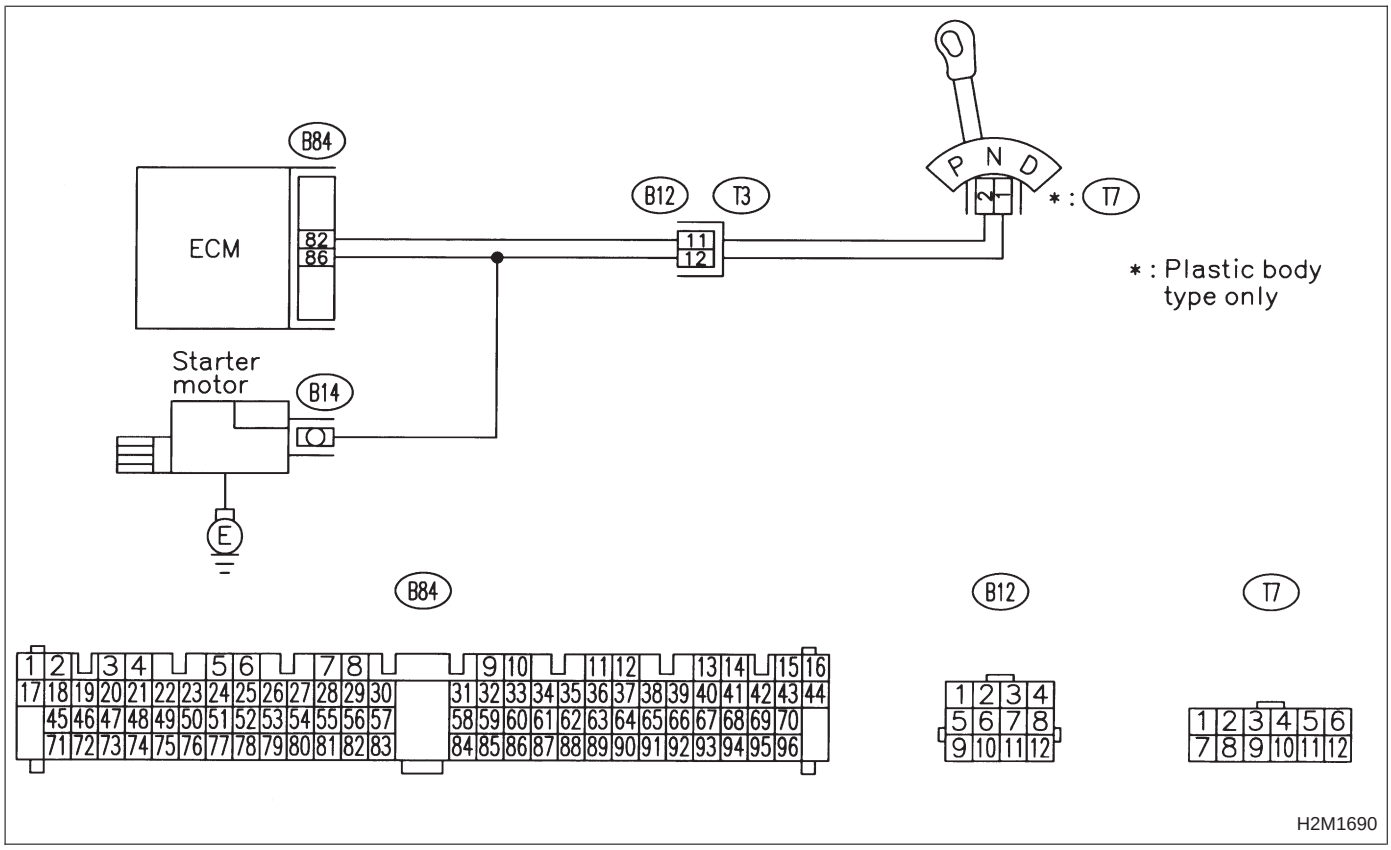
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling

WIRING DIAGRAM:



H2M1690

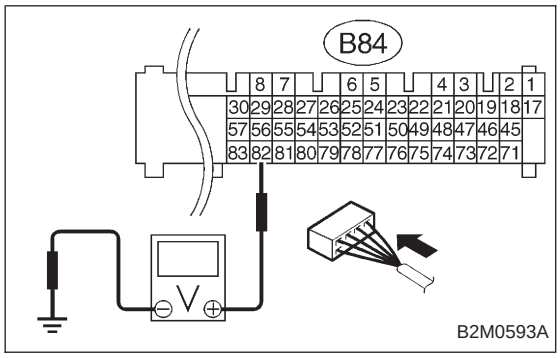
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10BZ1	CHECK DTC P0705 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0705?***

YES : Inspect DTC P0705 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10BZ2**.



10BZ2	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

CHECK : ***Is the voltage less than 1 V in “N” and “P” positions?***

YES : Go to next step 3).

NO : Go to step **10BZ4**.

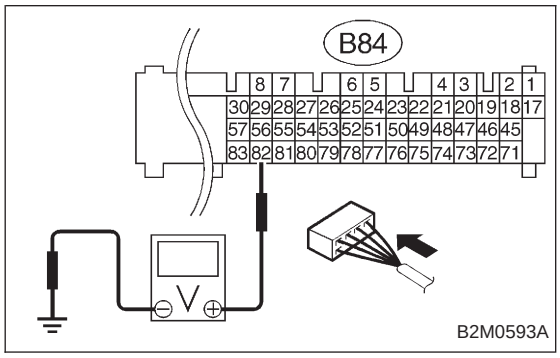
3) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

CHECK : ***Is the voltage between 4.5 and 5.5 V in other positions?***

YES : Go to step **10BZ3**.

NO : Go to step **10BZ4**.



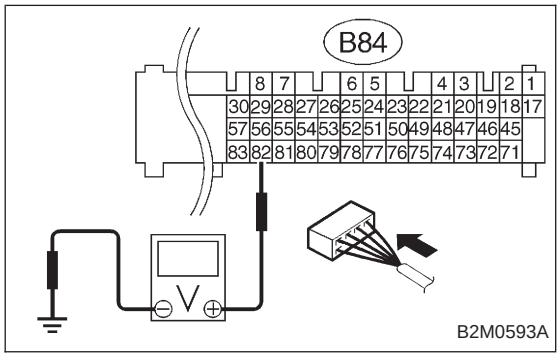
10BZ3	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK : ***Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10BZ4	CHECK INPUT SIGNAL FOR ECM.

Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

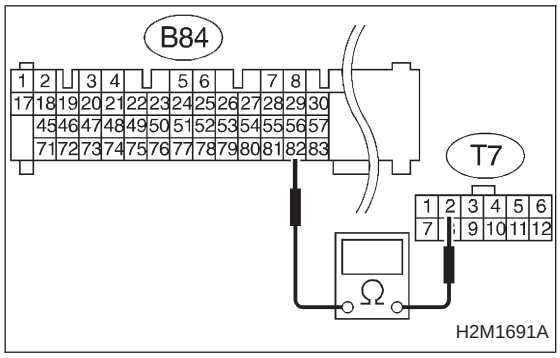
CHECK : ***Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and inhibitor switch connector.

NO : Go to step **10BZ5**.

10BZ5	CHECK INHIBITOR SWITCH TYPE.

CHECK ***: Is inhibitor switch type plastic body?***
YES : Go to step **10BZ6**.
NO : Go to step **10BZ8**.



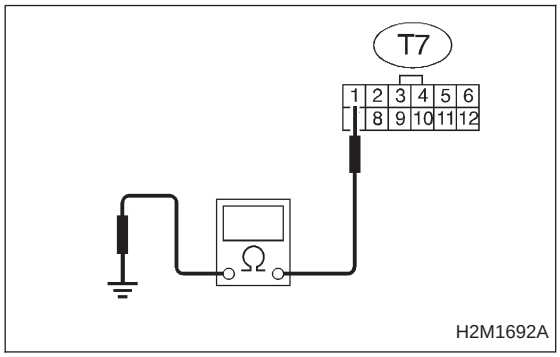
10BZ6	CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and inhibitor switch.
3) Measure resistance of harness between ECM and inhibitor switch connector.

Connector & terminal
(B84) No. 82 — (T7) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next step 4).
NO : Repair harness and connector.

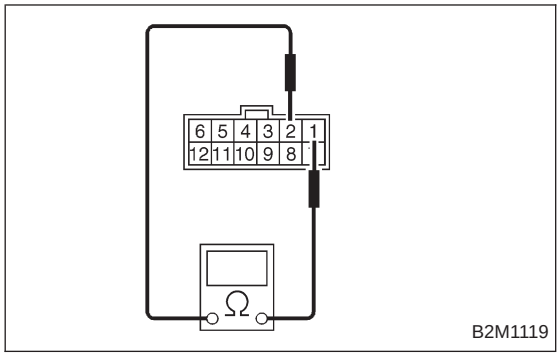
NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and inhibitor switch connector
- Poor contact in coupling connector (B12)
- Poor contact in inhibitor switch connector
- Poor contact in ECM connector



4) Measure resistance of harness between inhibitor switch connector and engine ground.

Connector & terminal
(T7) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***
YES : Go to step **10BZ7**.
NO : Repair open circuit in inhibitor switch ground line.



10BZ7	CHECK INHIBITOR SWITCH.

Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω in "N" and "P" positions?***

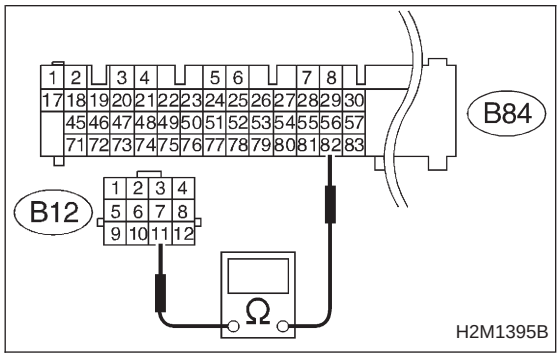
YES : Go to next CHECK .

NO : Replace inhibitor switch.

CHECK ***: Is there any fault in selector cable connection to inhibitor switch?***

YES : Repair selector cable connection. <Ref. to 3-2 [W3B0].>

NO : Replace ECM.



10BZ8	CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and transmission harness connector.
3) Measure resistance of harness between ECM and transmission harness connector.

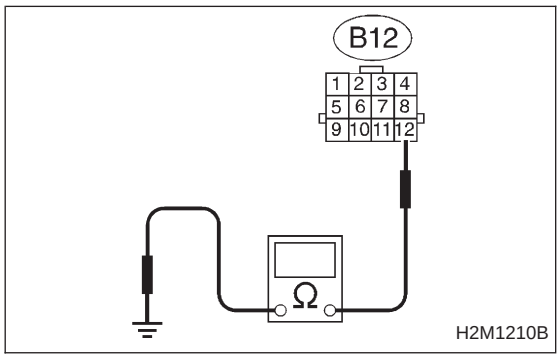
Connector & terminal
(B84) No. 82 — (B12) No. 11:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and transmission harness connector
- Poor contact in transmission harness connector
- Poor contact in ECM connector



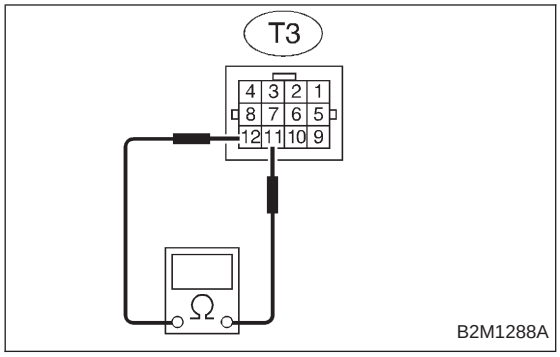
4) Measure resistance of harness between transmission harness connector and engine ground.

Connector & terminal
(B12) No. 12 — Engine ground:

CHECK ***: Is the resistance less than 5 Ω?***

YES : Go to step **10BZ9**.

NO : Repair open circuit in inhibitor switch ground line.



10BZ9	CHECK INHIBITOR SWITCH.

Measure resistance between transmission harness connector receptacle's terminals.

Connector & terminal
(T3) No. 11 — No. 12:

CHECK ***: Is the resistance less than 1 Ω in "N" and "P" positions?***

YES : Go to next CHECK .

NO : Replace inhibitor switch.

CHECK ***: Is there any fault in selector cable connection to inhibitor switch?***

YES : Repair selector cable connection. <Ref. to 3-2 [W3B0].>

NO : Replace ECM.

OBD (FB1)

P1102

OBD0481

CA: DTC P1102 — PRESSURE SOURCES SWITCHING SOLENOID VALVE CIRCUIT LOW INPUT —

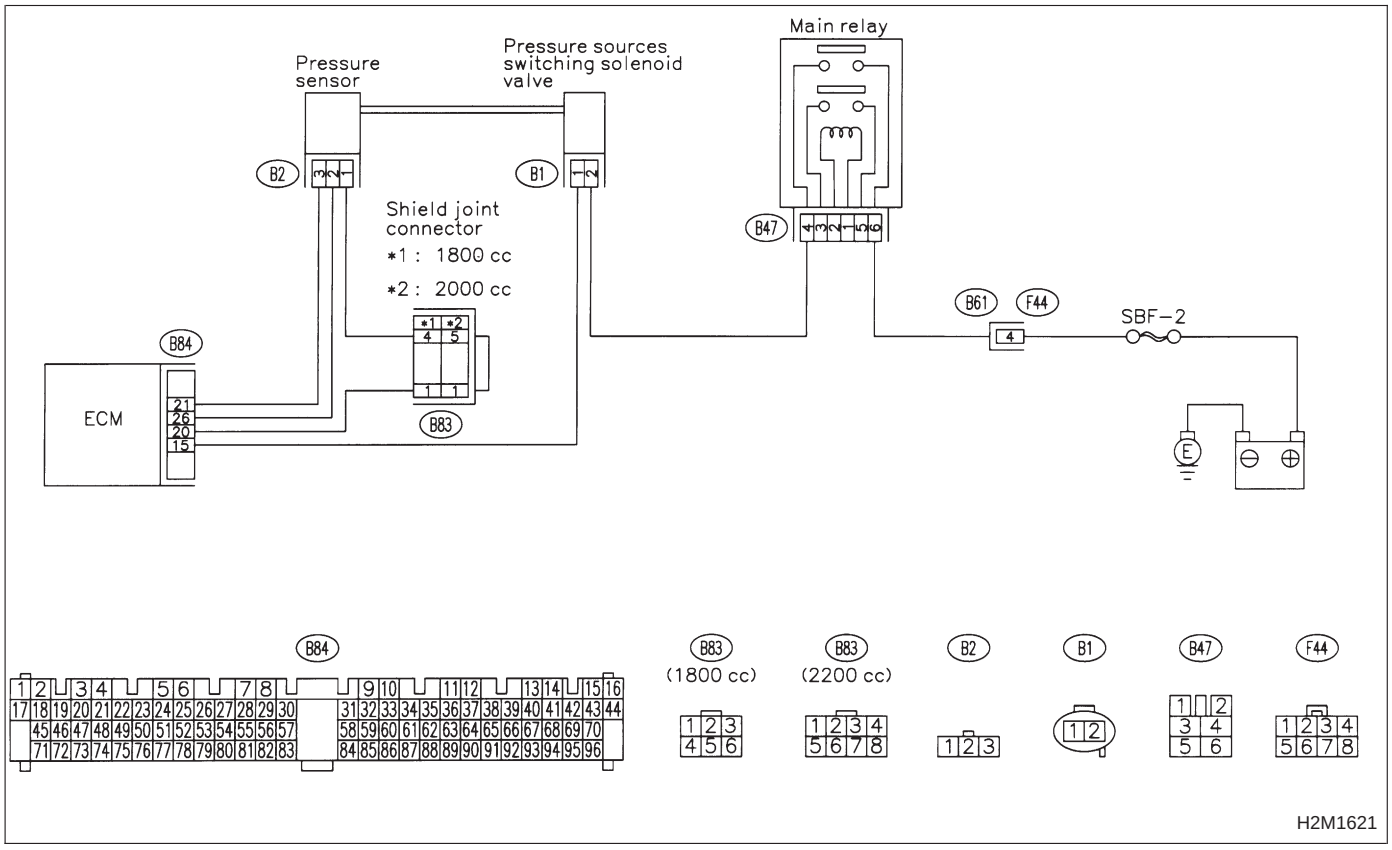
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

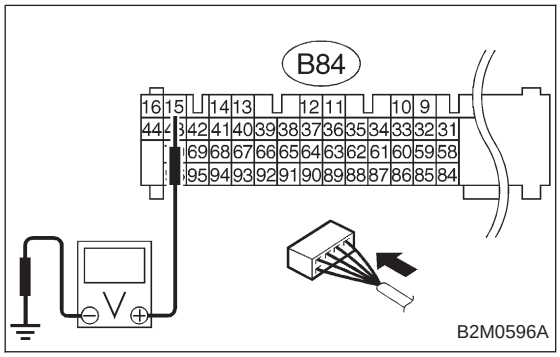
TROUBLE SYMPTOM:

- Erroneous idling
- Failure of engine to start

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CA1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 15 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CA2**.

NO : Go to step **10CA3**.

10CA2	CHECK POOR CONTACT.

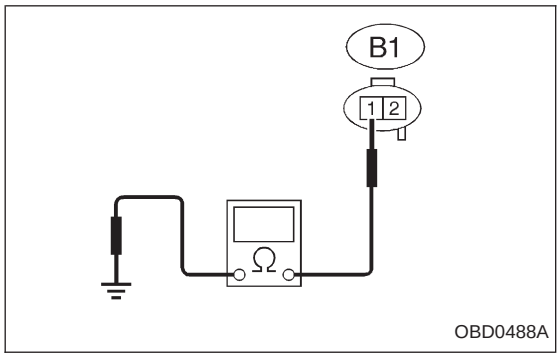
Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10CA3	CHECK HARNESS BETWEEN ECM AND PRESSURE SOURCES SWITCHING SOLENOID VALVE CONNECTOR.

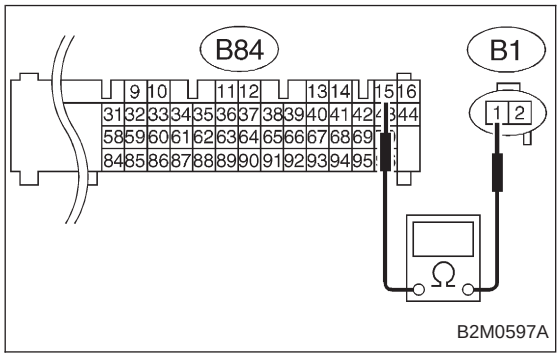
1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sources switching solenoid valve and ECM.
3) Measure resistance of harness between pressure sources switching solenoid valve connector and engine ground.

Connector & terminal
(B1) No. 1 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and pressure sources switching solenoid valve connector.

NO : Go to next step 4).



4) Measure resistance of harness between ECM and pressure sources switching solenoid valve connector.

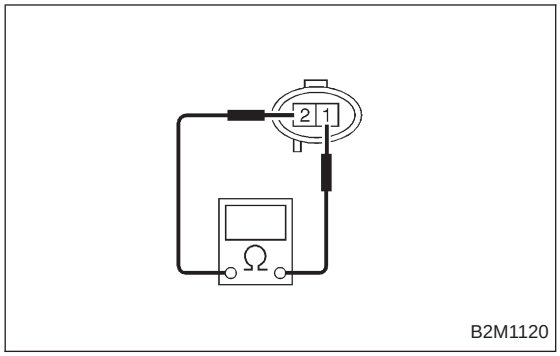
Connector & terminal
(B84) No. 15 — (B1) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10CA4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and pressure sources switching solenoid valve connector
- Poor contact in shield joint connector (B83)



10CA4	CHECK PRESSURE SOURCES SWITCHING SOLENOID VALVE.

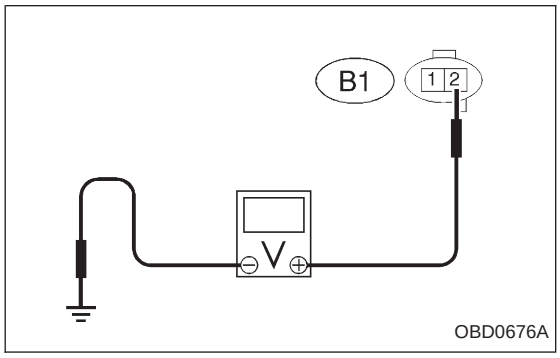
Measure resistance between pressure sources switching solenoid valve connector terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 10 and 100 Ω?***

YES : Go to step **10CA5**.

NO : Replace pressure sources switching solenoid valve.



10CA5	CHECK POWER SUPPLY TO PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between pressure sources switching solenoid valve harness connector and engine ground.

Connector & terminal
(B1) No. 2 (+) — Engine ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CA6**.

NO : Repair open circuit in harness between main relay and pressure sources switching solenoid valve connector.

10CA6	CHECK POOR CONTACT.

Check poor contact in pressure sources switching solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in pressure sources switching solenoid valve connector?***

YES : Repair poor contact in pressure sources switching solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1103 <TRQ>

OBD0489

CB: DTC P1103 — ENGINE TORQUE CONTROL SIGNAL CIRCUIT MALFUNCTION —

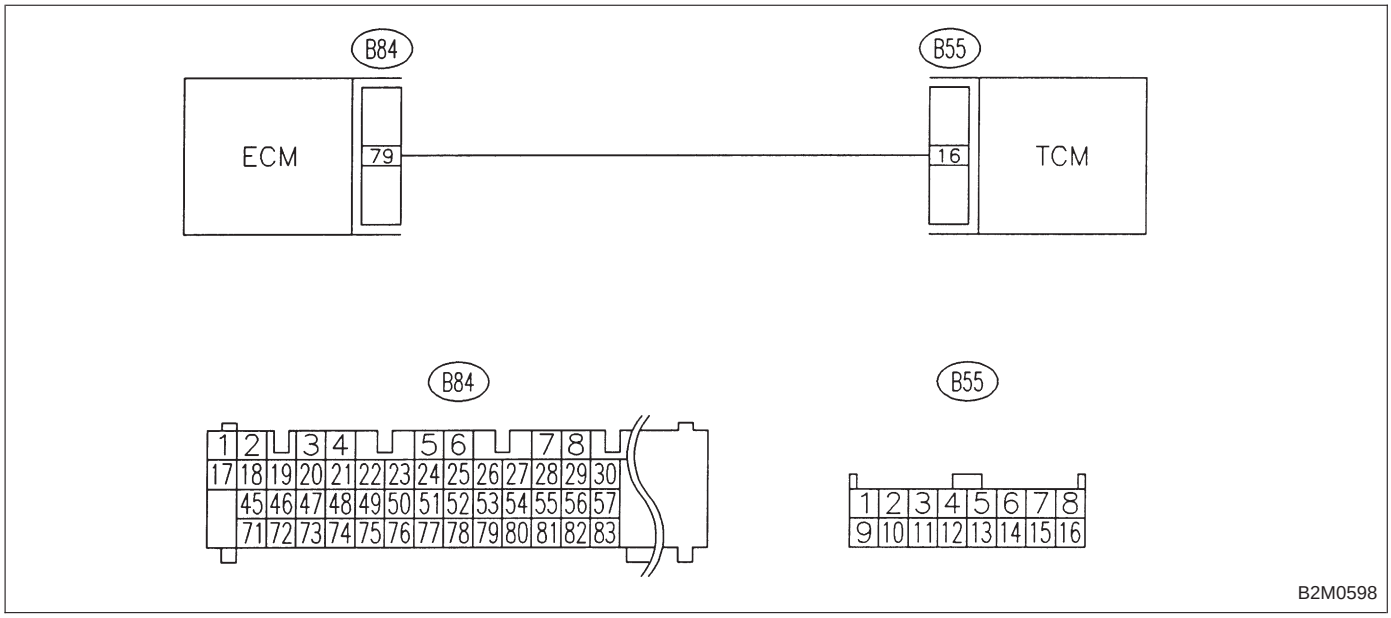
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

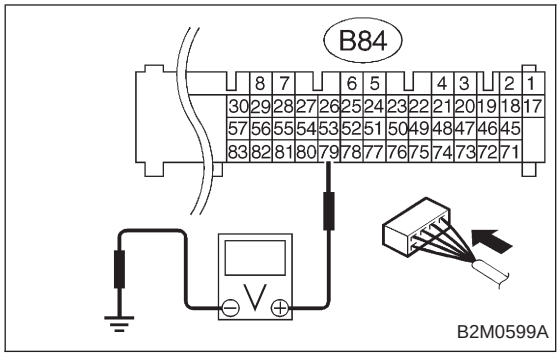
- Excessive shift shock

WIRING DIAGRAM:



B2M0598

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CB1	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 79 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4.5 V?***

YES : Go to step **10CB2**.

NO : Go to step **10CB3**.

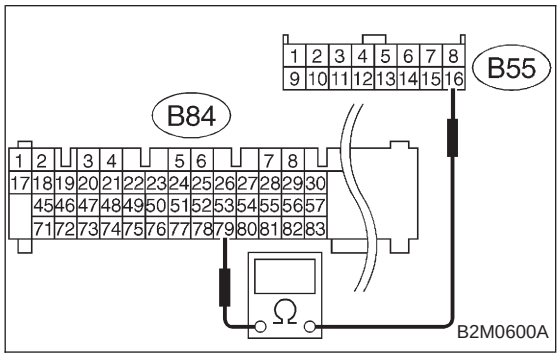
10CB2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CB3	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

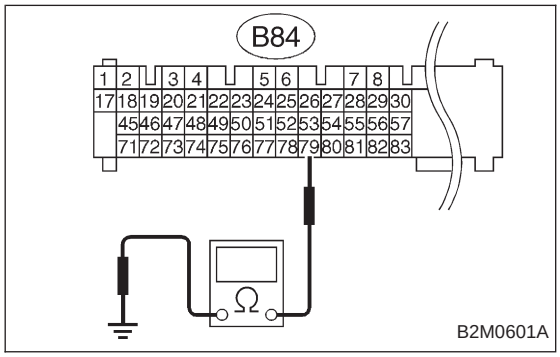
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and TCM.
3) Measure resistance of harness between ECM and TCM connector.

Connector & terminal
(B84) No. 79 — (B55) No. 16:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between ECM and TCM connector.



4) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 79 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and TCM connector.

NO : Go to step **10CB4**.

10CB4	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

OBD (FB1)

P1120 <ST_SWON>

B2M1122

CC: DTC P1120 — STARTER SWITCH CIRCUIT HIGH INPUT —

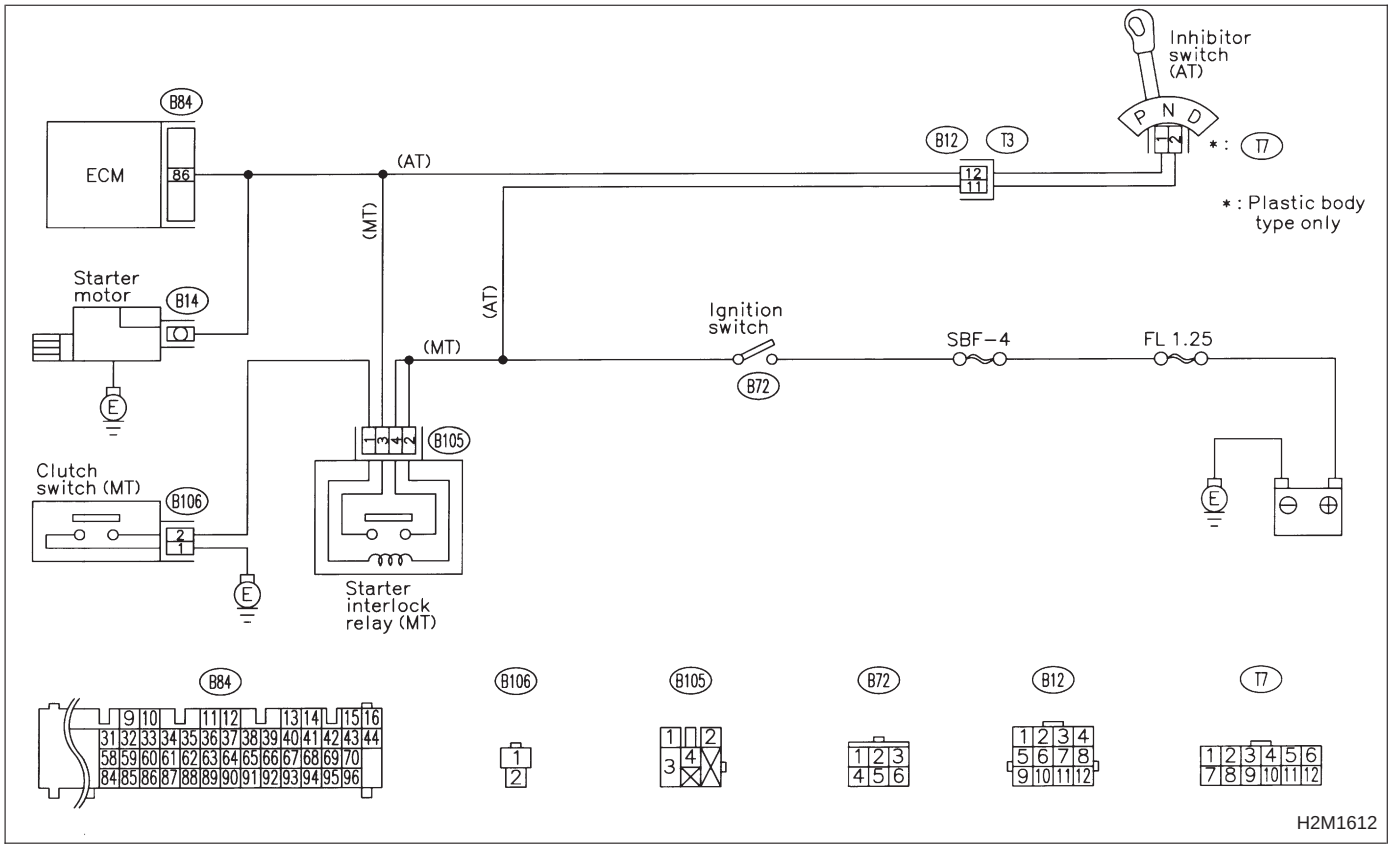
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Failure of engine to start

WIRING DIAGRAM:



H2M1612

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CC1	CHECK OPERATION OF STARTER MOTOR.

CHECK ***: Does starter motor operate when ignition switch to "ON"?***

NOTE:
- On AT vehicles, place the inhibitor switch in each position.
- On MT vehicles, depress or release the clutch pedal.

YES : Repair battery short circuit in starter motor circuit. After repair, replace ECM.

NO : Check starter motor circuit. <Ref. to 2-7 [T8B0].>

OBD (FB1)
P1121 <N_SWON>
B2M1123

CD: DTC P1121 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT [AT VEHICLES] —

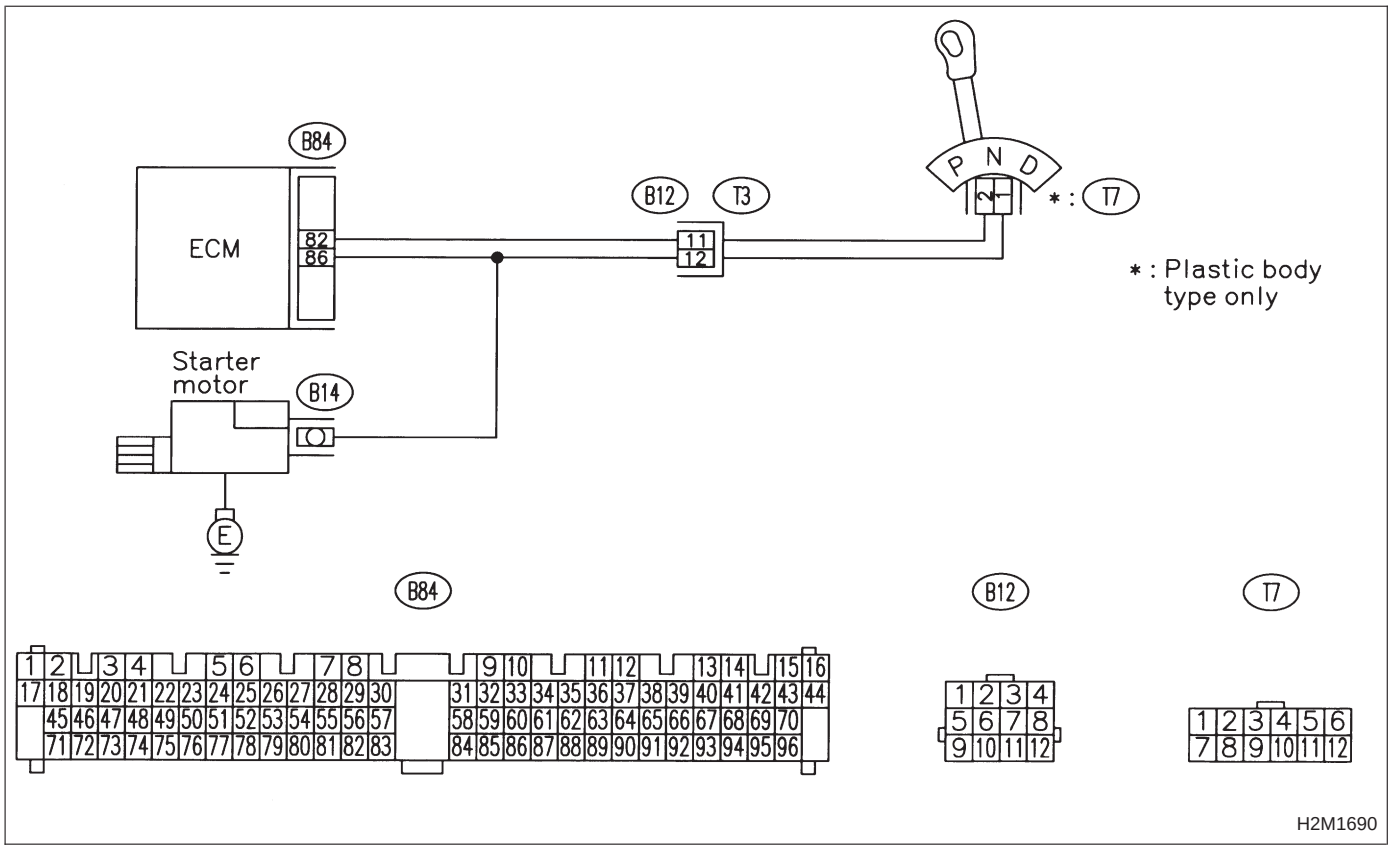
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling

WIRING DIAGRAM:



H2M1690

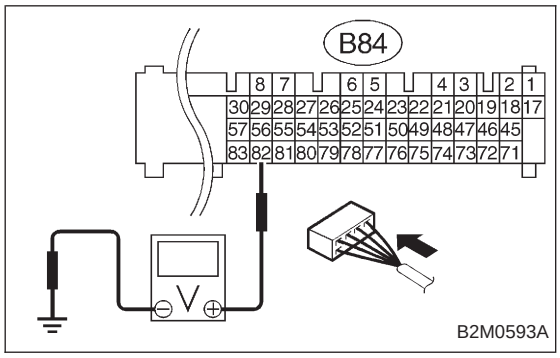
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CD1	CHECK DTC P0705 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0705?***

YES : Inspect DTC P0705 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Go to step **10CD2**.



10CD2	CHECK INPUT SIGNAL FOR ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 82 (+) — Chassis ground (−):

CHECK : ***Is the voltage between 4.5 and 5.5 V in other positions?***

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time.

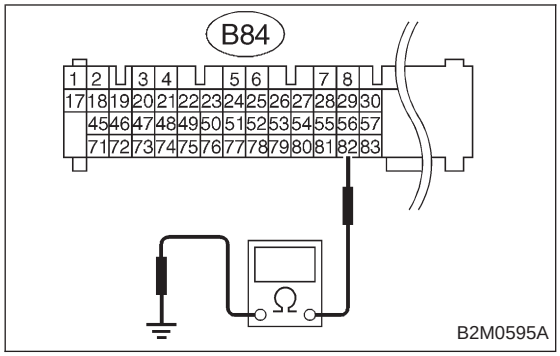
NO : Go to step **10CD3**.

10CD3	CHECK INHIBITOR SWITCH TYPE.

CHECK : ***Is inhibitor switch type plastic body?***

YES : Go to step **10CD4**.

NO : Go to step **10CD7**.



10CD4	CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.

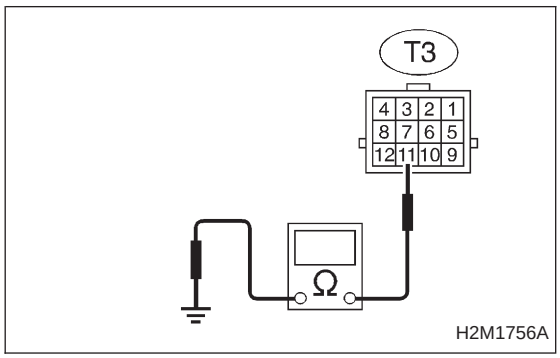
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and transmission harness connector.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 82 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and transmission harness connector.

NO : Go to step **10CD5**.



10CD5	CHECK TRANSMISSION HARNESS CONNECTOR.

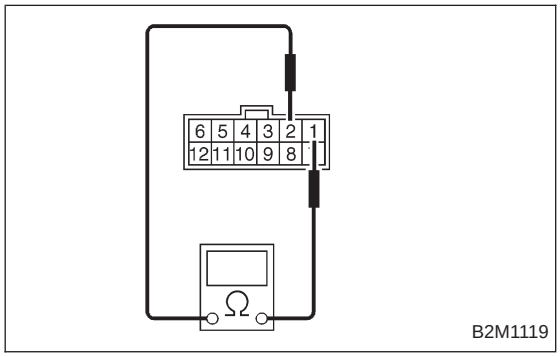
1) Disconnect connector from inhibitor switch.
2) Measure resistance of harness between transmission harness connector and engine ground.

Connector & terminal
(T3) No. 11 — Engine ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between transmission harness and inhibitor switch connector.

NO : Go to step **10CD6**.



10CD6	CHECK INHIBITOR SWITCH.

Measure resistance between inhibitor switch connector receptacle's terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance more than 1 MΩ in other positions?***

YES : Go to next CHECK .

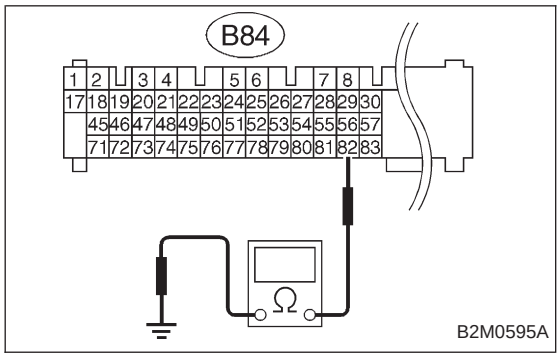
NO : Replace inhibitor switch.

CHECK ***: Is there any fault in selector cable connection to inhibitor switch?***

YES : Repair selector cable connection. <Ref. to 3-2 [W3B0].>

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10CD7	CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.

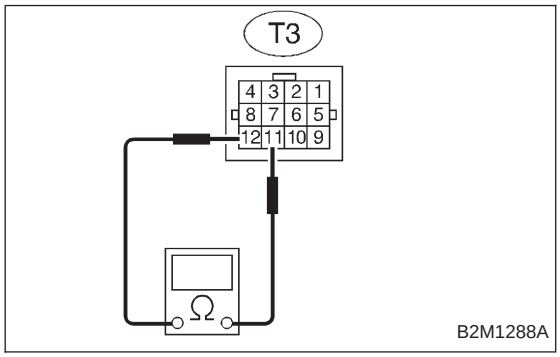
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM and transmission harness connector.
3) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 82 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair short circuit in harness between ECM and transmission harness connector.

NO : Go to step **10CD8**.



10CD8	CHECK INHIBITOR SWITCH.

Measure resistance between transmission harness connector receptacle's terminals.

Connector & terminal
(T3) No. 11 — No. 12:

CHECK ***: Is the resistance more than 1 MΩ in other positions?***

YES : Go to next CHECK .

NO : Replace inhibitor switch.

CHECK ***: Is there any fault in selector cable connection to inhibitor switch?***

YES : Repair selector cable connection. <Ref. to 3-2 [W3B0].>

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)
P1122 <BR_HI>
B2M1124

CE: DTC P1122 — PRESSURE SOURCES SWITCHING SOLENOID VALVE CIRCUIT HIGH INPUT —

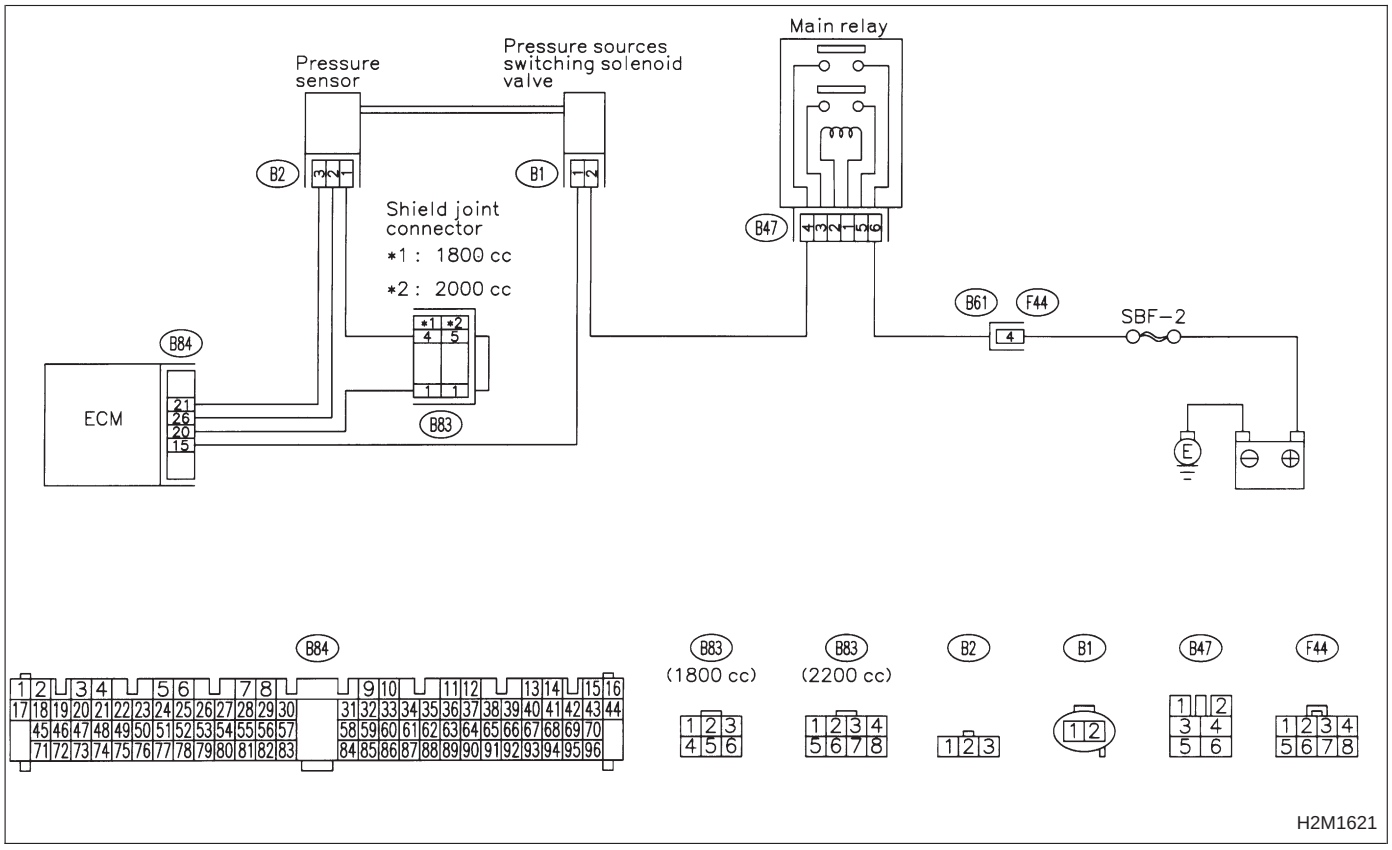
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

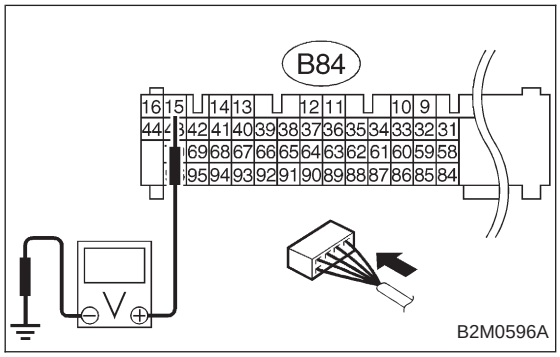
TROUBLE SYMPTOM:

- Erroneous idling
- Failure of engine to start

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CE1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 15 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CE3**.

NO : Go to step **10CE2**.

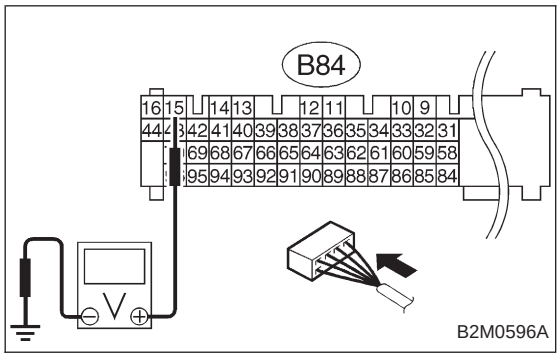
10CE2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CE3	CHECK HARNESS BETWEEN ECM AND PRESSURE SOURCES SWITCHING SOLENOID VALVE CONNECTOR.

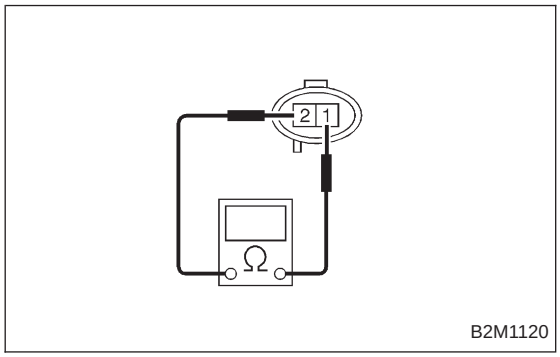
1) Turn ignition switch to OFF.
2) Disconnect connector from pressure sources switching solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 15 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and pressure sources switching solenoid valve connector. After repair, replace ECM.

NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between pressure sources switching solenoid valve connector terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Replace pressure sources switching solenoid valve and ECM.

NO : Go to step **10CE4**.

10CE4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.

OBD (FB1)

P1141 <QA_RHI>

B2M1126

CF: DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

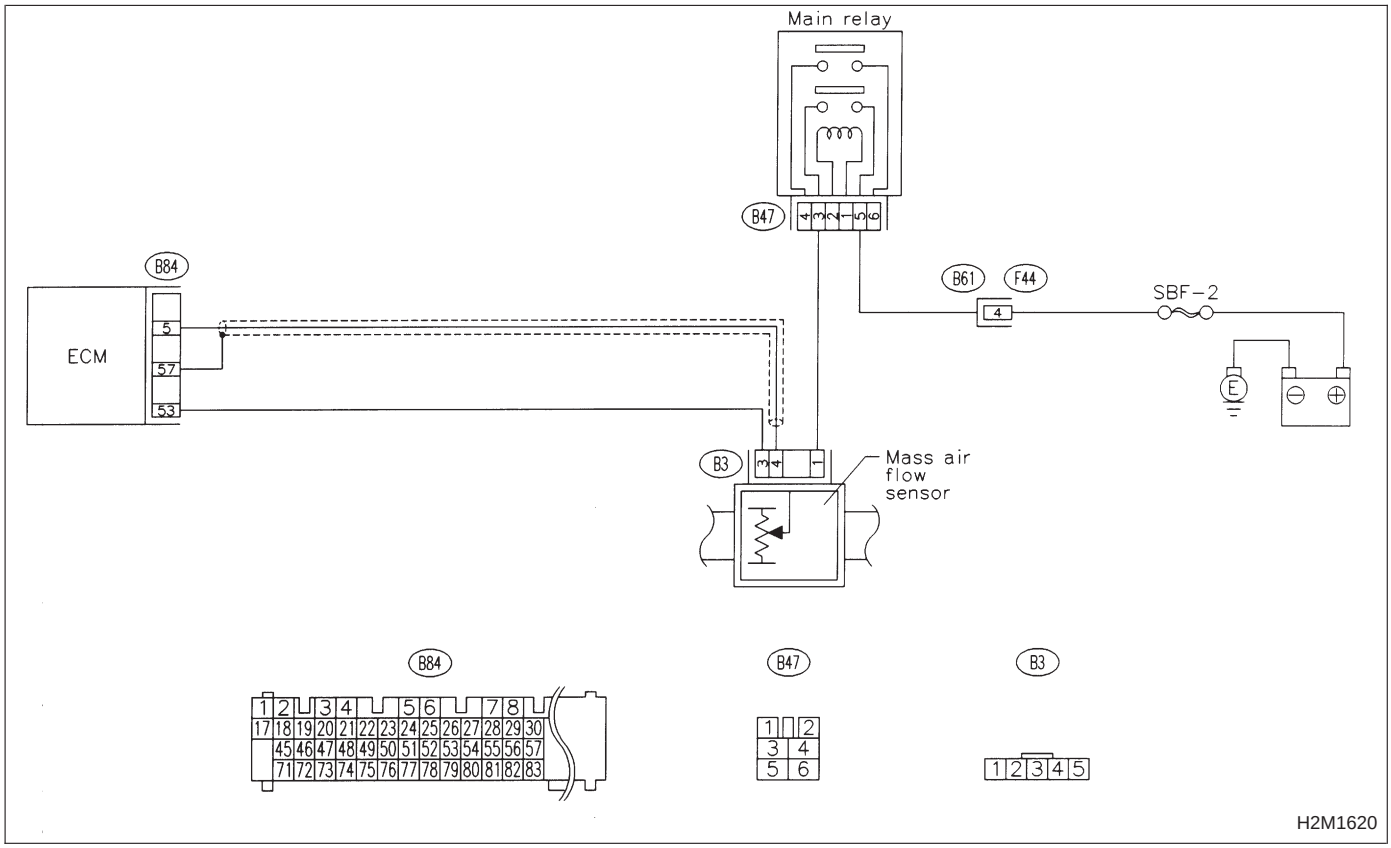
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



H2M1620

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CF1	CHECK DTC P0102 OR P0103 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0102 or P0103?***

YES : Inspect DTC P0102 or P0103 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P1141.

NO : Replace mass air flow sensor.

OBD (FB1)

P1142 <TH_RLOW>

B2M1127

CG: DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

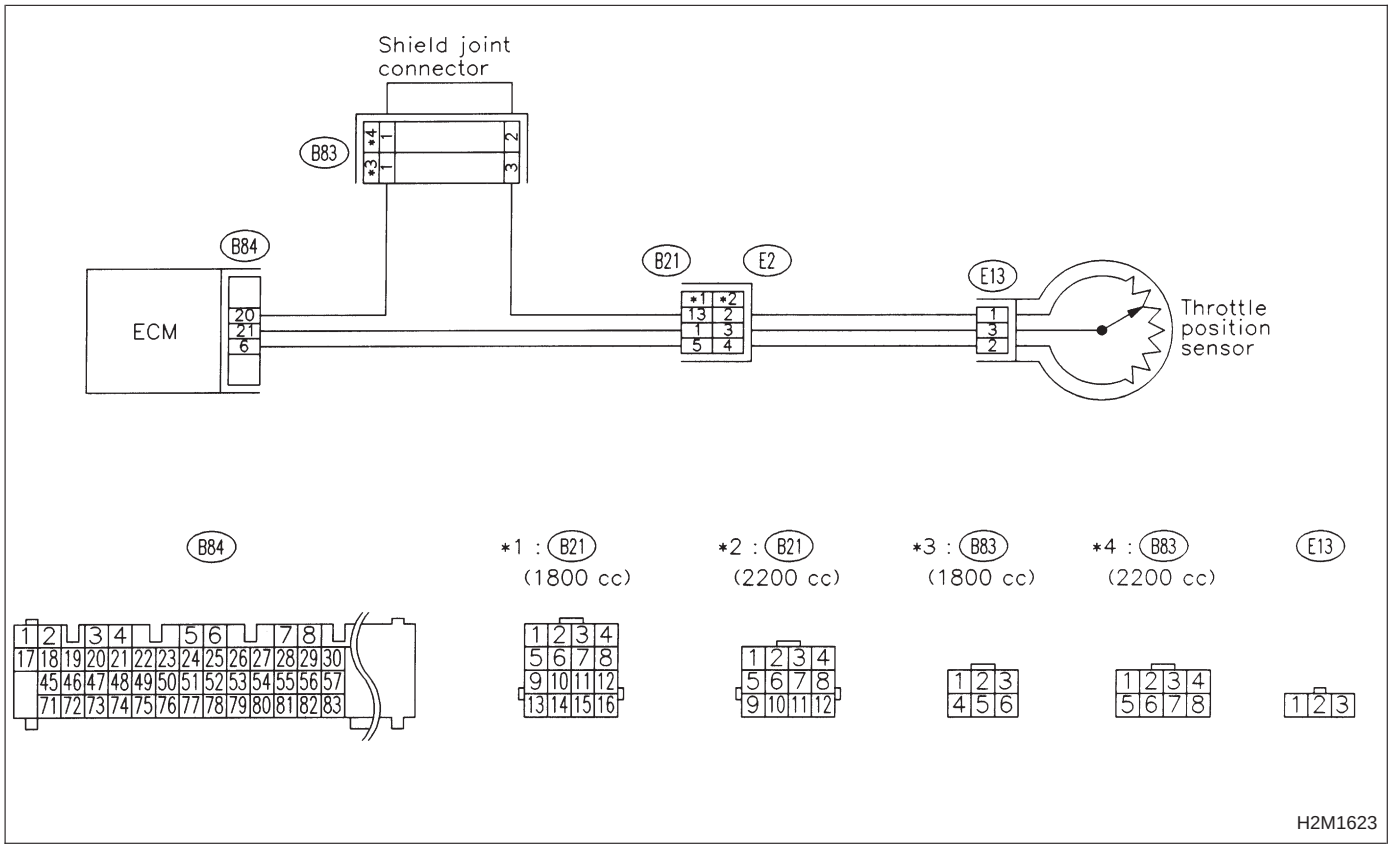
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



H2M1623

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CG1	CHECK DTC P0122 OR P0123 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0122 or P0123?***

YES : Inspect DTC P0122 or P0123 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P1142.

NO : Replace throttle position sensor.

OBD (FB1)

P1143 <PS_RLOW>

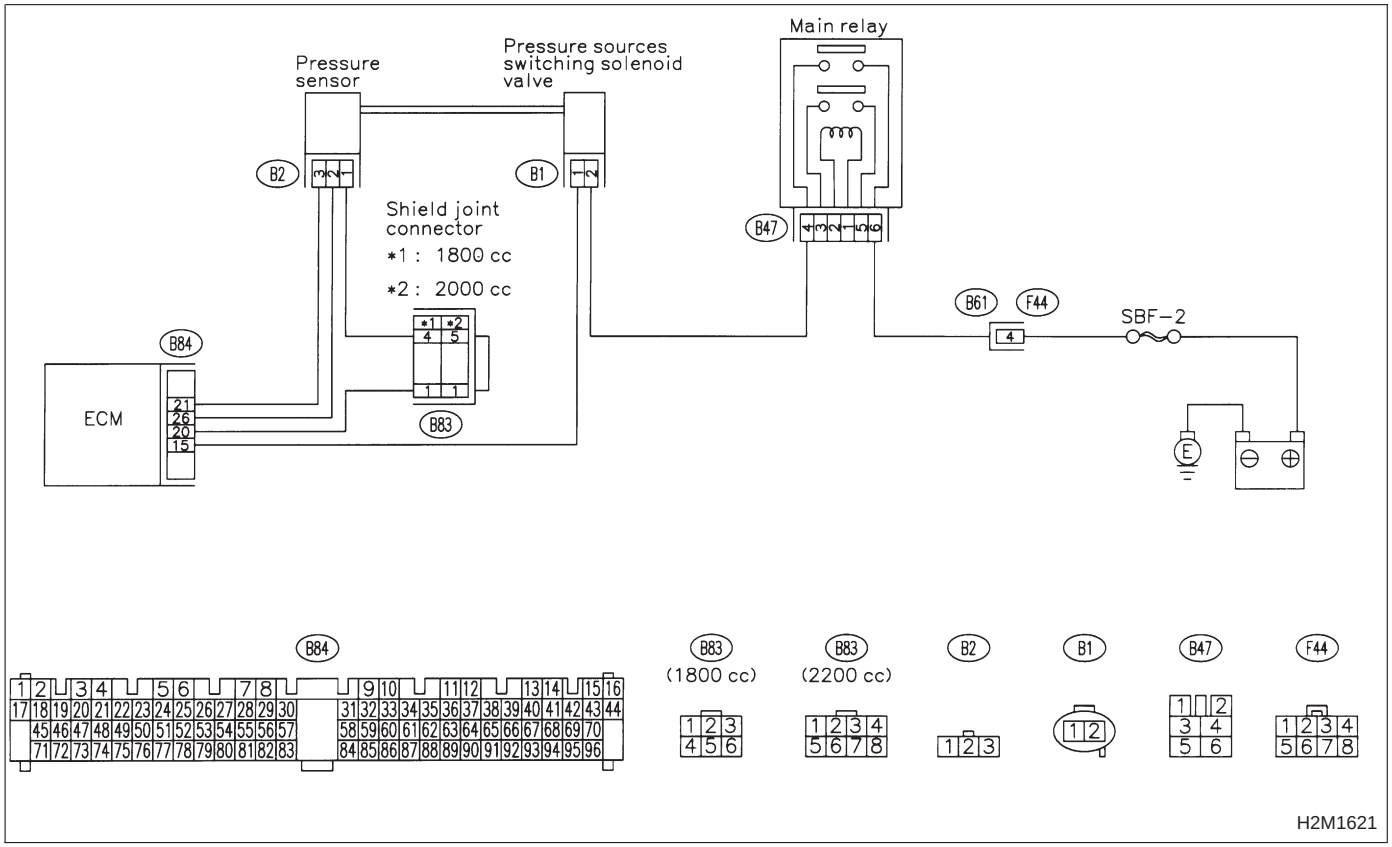
B2M1128

CH: DTC P1143 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

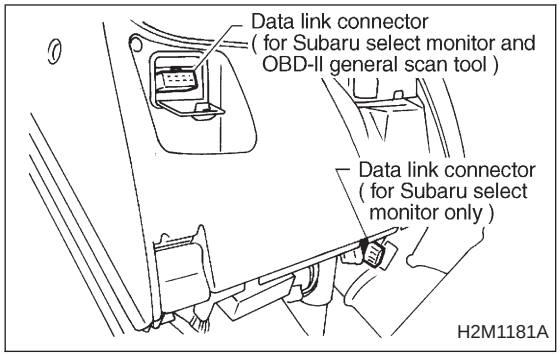
DTC DETECTING CONDITION:

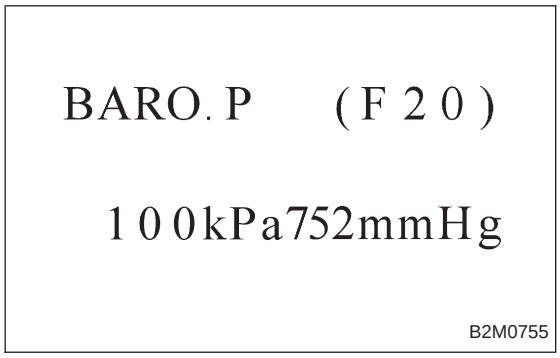
- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>





10CH1	CHECK DATA FOR CONTROL.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch ON and Subaru Select Monitor or the OBD-II general scan tool switch ON.
4) Start engine.
5) Read data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F20

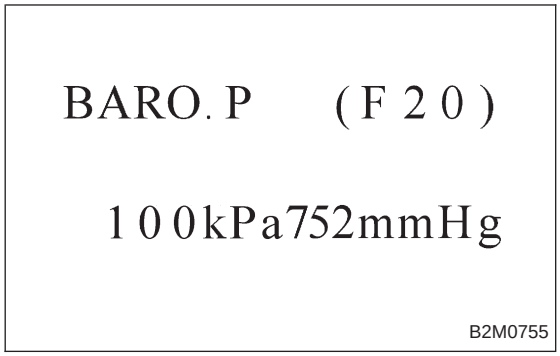
● F20: Display shows pressure signal value sent from the pressure sensor.

CHECK ***: Is the value less than 32 kPa in function mode F20?***

YES : Go to step **10CH3**.

NO : Go to step **10CH2**.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.



10CH2	CHECK PRESSURE SENSOR.

1) Measure actual atmospheric pressure.
2) Read data on Subaru Select Monitor or OBD-II general scan tool.
● Subaru Select Monitor
Designate mode using function key.

Function mode: F20

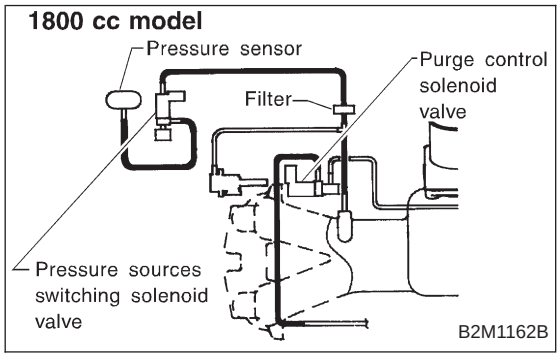
● F20: Display shows pressure signal value sent from the pressure sensor.

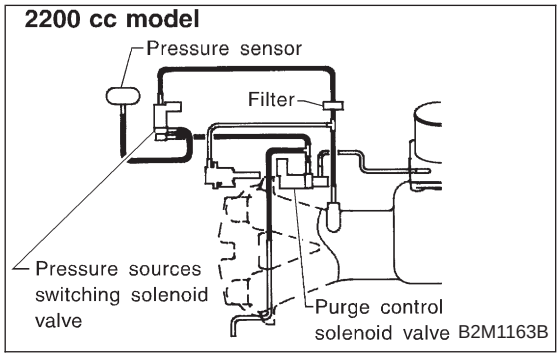
CHECK ***: Is the difference between absolute value of Subaru Selector Monitor indication and actual atmospheric pressure greater than 10 kPa (0.102 kg/cm^2, 1.45 psi)?***

YES : Replace pressure sensor.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.





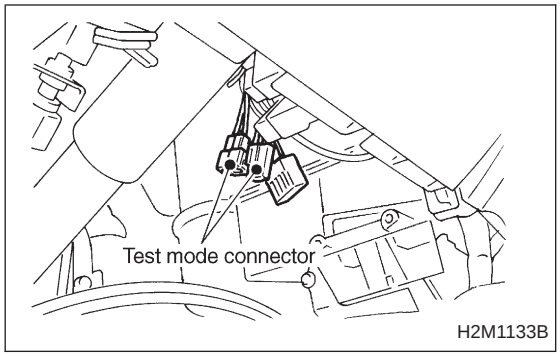
10CH3	CHECK VACUUM HOSE.

CHECK ***: Is there a fault in vacuum hose?***

NOTE:
Check the following item.
Incorrect hose connections in line between the pressure sources switching solenoid valve and pressure sensor, intake manifold and/or CPC solenoid valve.

YES : Repair or replace hoses or filter.

NO : Go to step **10CH4**.



10CH4	CHECK PRESSURE SOURCES SWITCHING SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does pressure sources switching solenoid valve produce operating sound? (ON ↔ OFF each 1.5 sec.)***

NOTE:
Pressure sources switching solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD10). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Replace pressure sensor.

NO : Replace pressure sources switching solenoid valve.

OBD (FB1)

P1144 <PS_RHI>

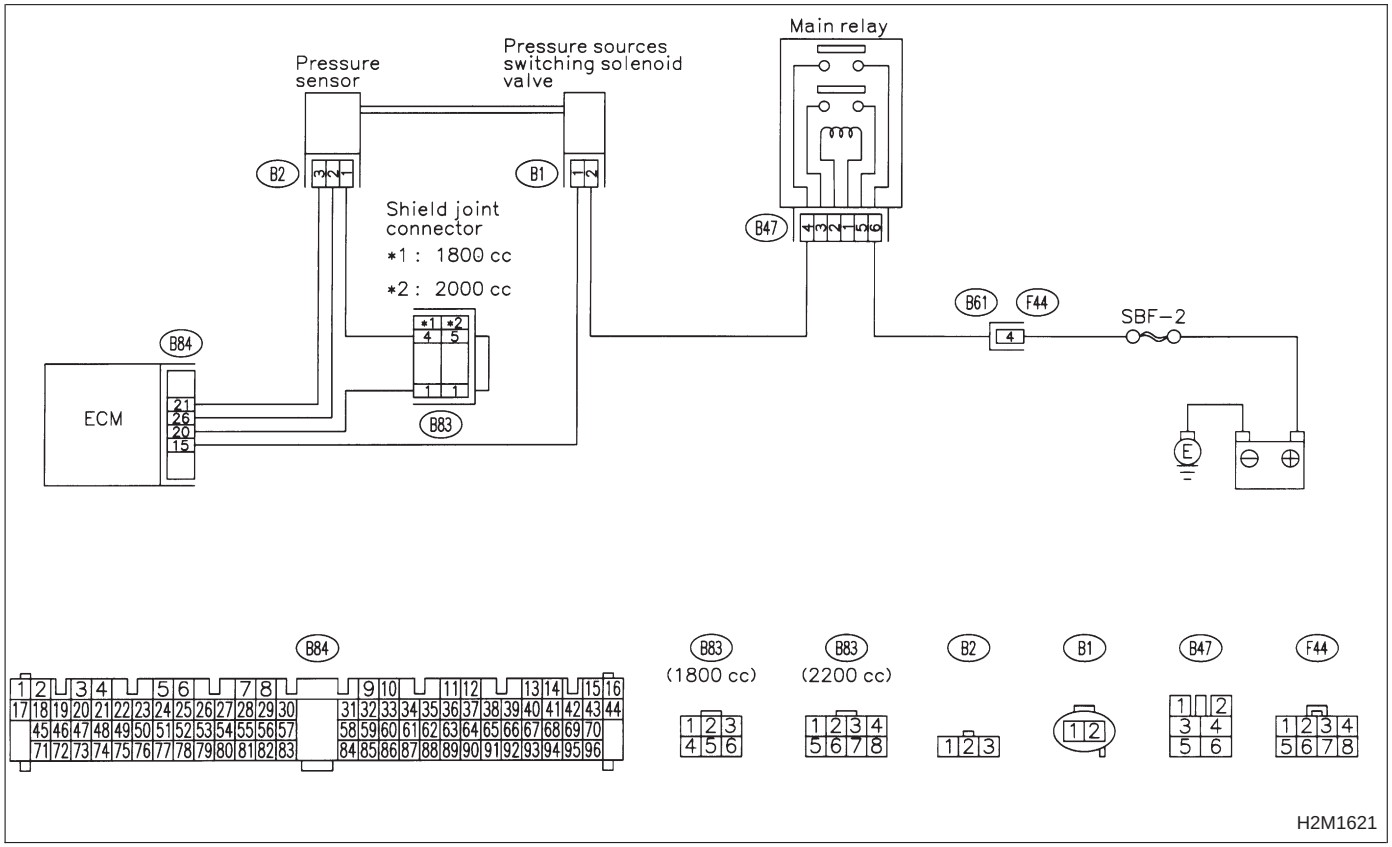
B2M1129

CI: DTC P1144 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

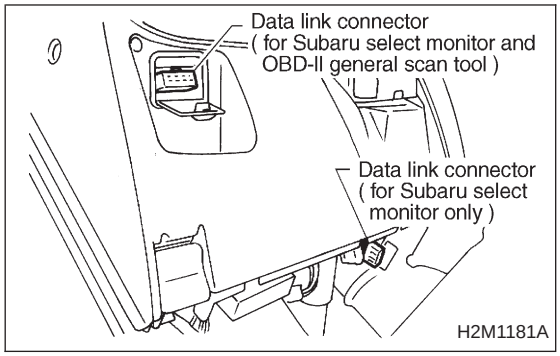
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



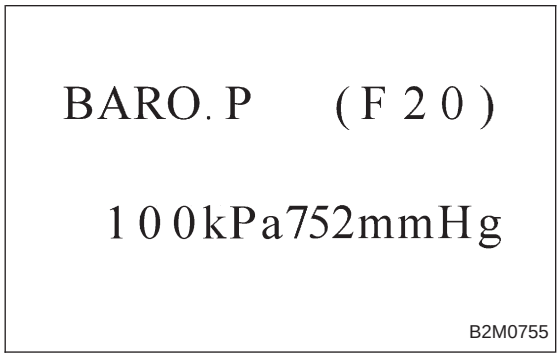
10CI1	CHECK DATA FOR CONTROL.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor or the OBD-II general scan tool to data link connector.
3) Turn ignition switch ON and Subaru Select Monitor or the OBD-II general scan tool switch ON.
4) Start engine.
5) Read data on Subaru Select Monitor or the OBD-II general scan tool.

● Subaru Select Monitor
Designate mode using function key.

Function mode: F20

● F20: Display shows pressure signal value sent from the pressure sensor.



CHECK ***: Is the value more than 133 kPa in function mode F20?***

YES : Replace pressure sensor.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

● OBD-II general scan tool
For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.

OBD (FB1)

P1400<PCVSOL_LO>

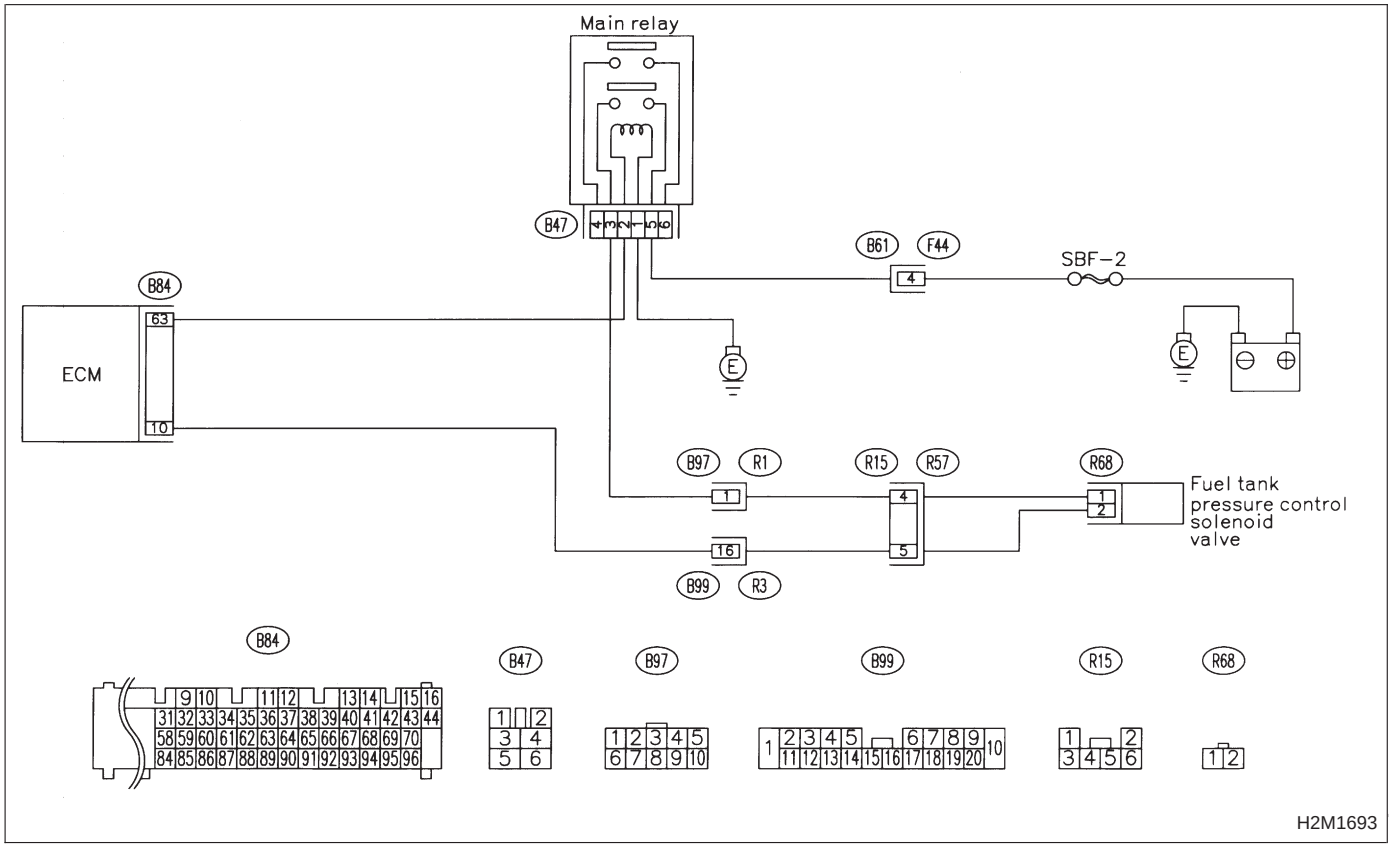
B2M1130

CJ: DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —

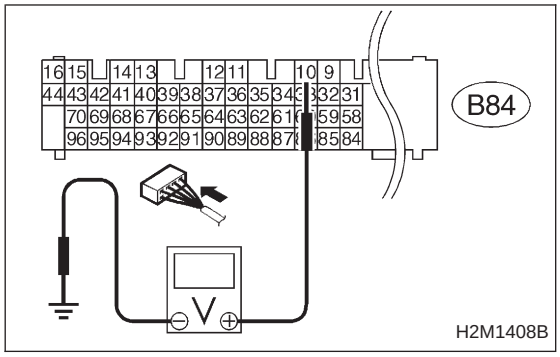
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CJ1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CJ2**.

NO : Go to step **10CJ3**.

10CJ2	CHECK POOR CONTACT.

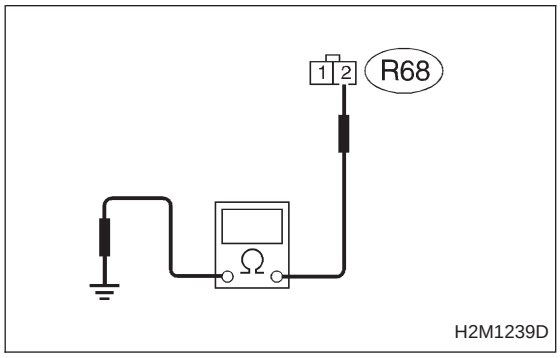
Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10CJ3	CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.

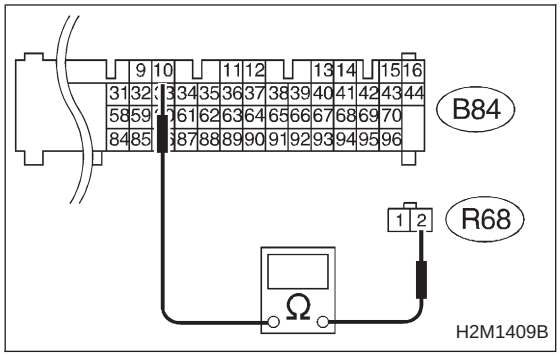
1) Turn ignition switch to OFF.
2) Disconnect connectors from fuel tank pressure control solenoid valve and ECM.
3) Measure resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground.

Connector & terminal
(R68) No. 2 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and fuel tank pressure control solenoid valve connector.

NO : Go to next step 4).



4) Measure resistance of harness between ECM and fuel tank pressure control solenoid valve connector.

Connector & terminal
(B84) No. 10 — (R68) No. 2:

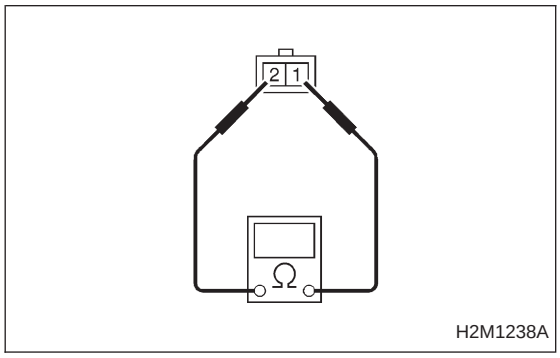
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10CJ4**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between ECM and fuel tank pressure control solenoid valve connector
- Poor contact in coupling connectors (B99 and R15)



10CJ4	CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

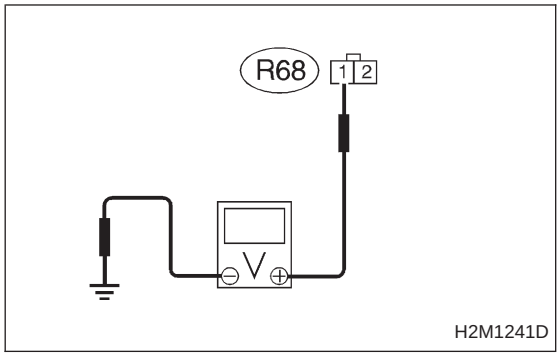
Measure resistance between fuel tank pressure control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance between 10 and 100 Ω?***

YES : Go to step **10CJ5**.

NO : Replace fuel tank pressure control solenoid valve.



10CJ5	CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between fuel tank pressure control solenoid valve and chassis ground.

Connector & terminal
(R68) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CJ6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between main relay and fuel tank pressure control solenoid valve connector
- Poor contact in coupling connectors (B97 and R15)
- Poor contact in main relay connector

10CJ6	CHECK POOR CONTACT.

Check poor contact in fuel tank pressure control solenoid valve connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in fuel tank pressure control solenoid valve connector?***

YES : Repair poor contact in fuel tank pressure control solenoid valve connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1420<PCVSOL_HI>

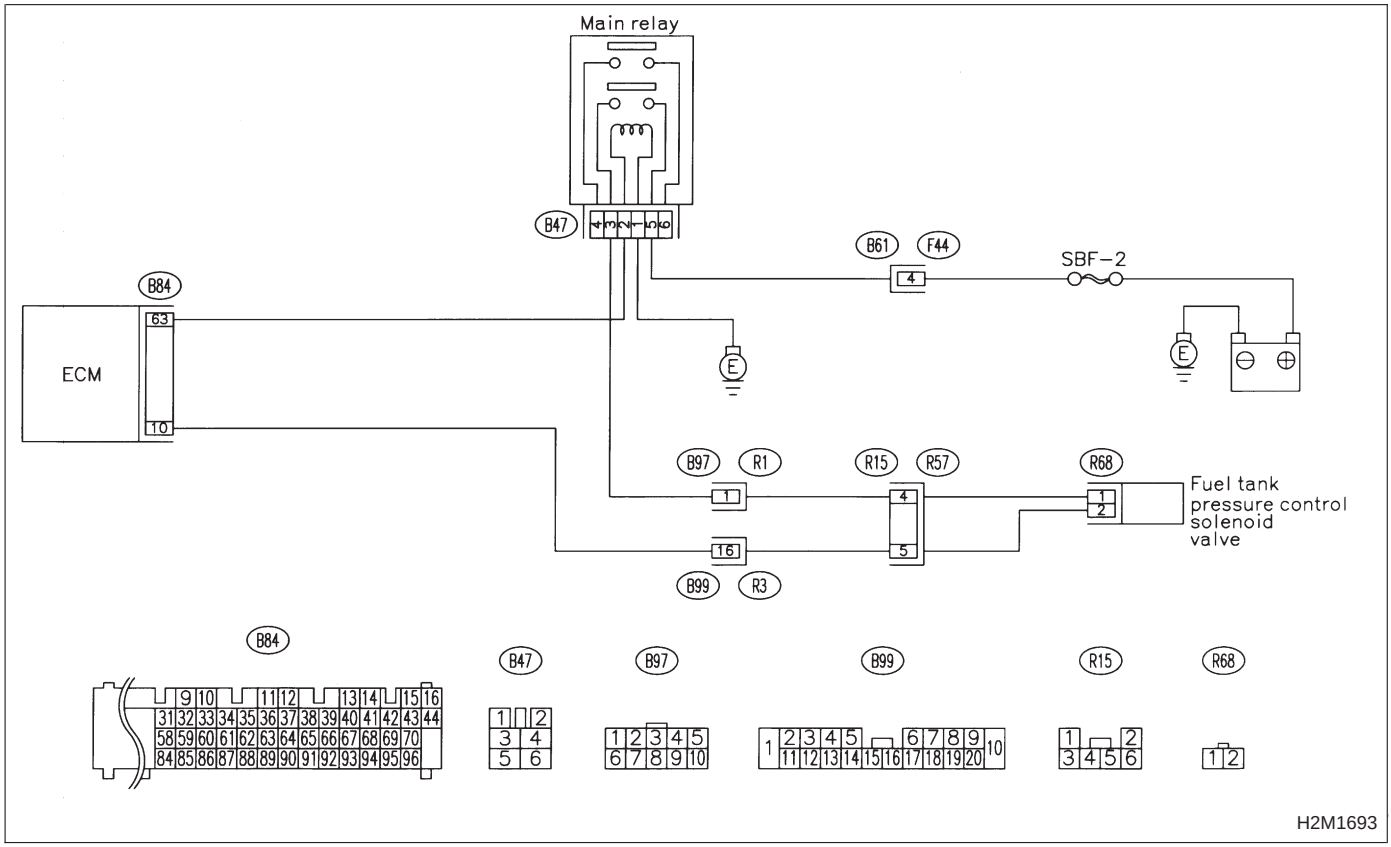
B2M1131

CK: DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —

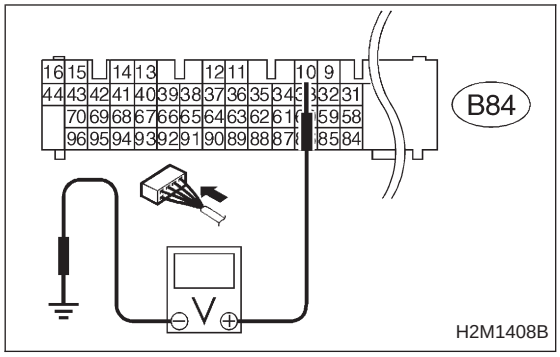
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CK1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CK3**.

NO : Go to step **10CK2**.

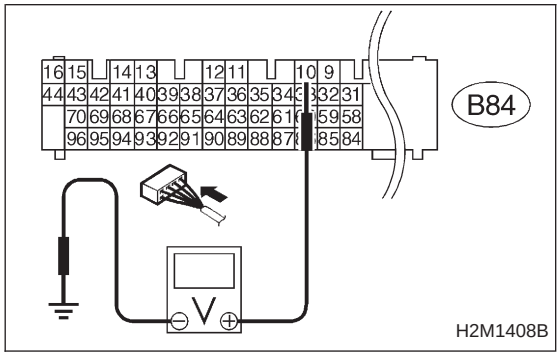
10CK2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CK3	CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.

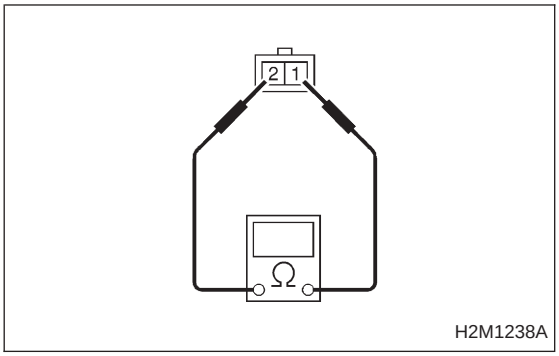
1) Turn ignition switch to OFF.
2) Disconnect connector from fuel tank pressure control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace ECM.

NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between fuel tank pressure control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Replace fuel tank pressure control solenoid valve and ECM.

NO : Go to step **10CK4**.

10CK4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.

OBD (FB1)

P1421<EGRSOL_HI>

B2M1132

CL: DTC P1421 — EXHAUST GAS RECIRCULATION CIRCUIT HIGH INPUT —

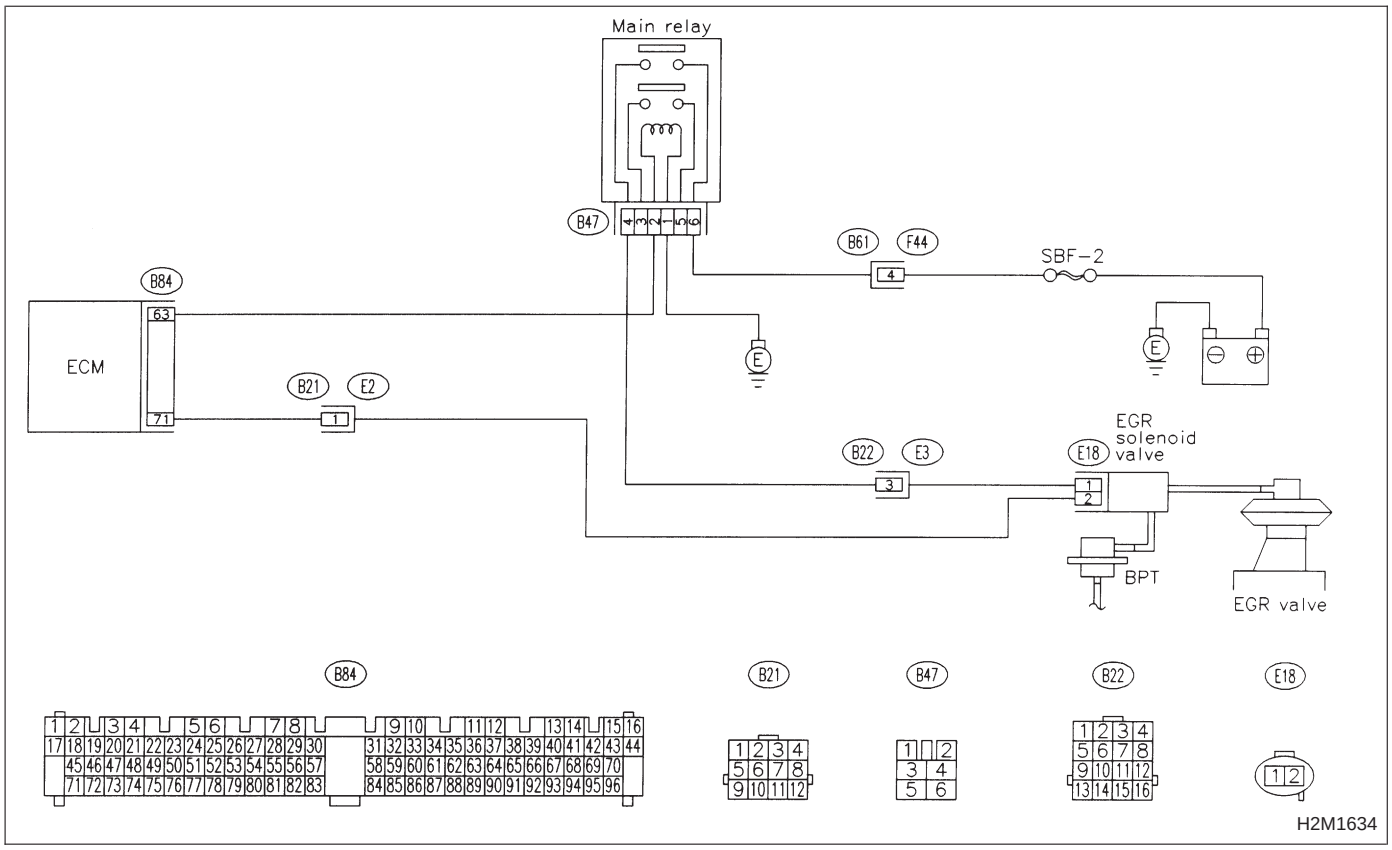
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Poor driving performance on low engine speed

WIRING DIAGRAM:



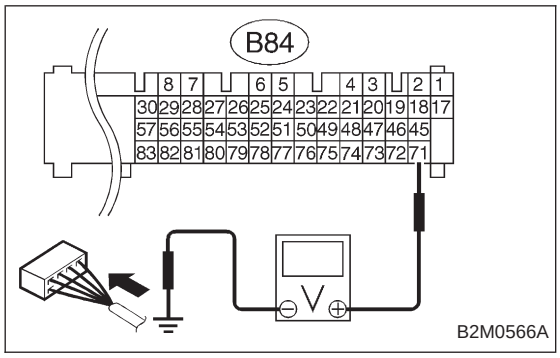
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CL1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type MT?***

YES : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>

NO : Go to step **10CL2**.



10CL2	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 71 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CL4**.

NO : Go to step **10CL3**.

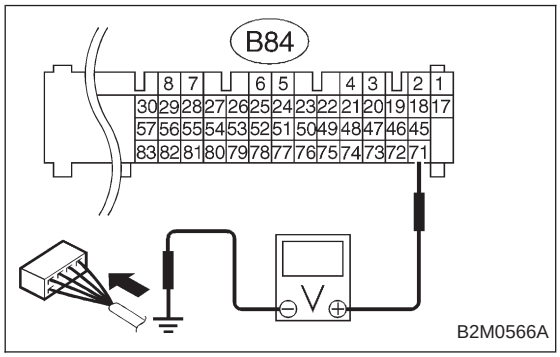
10CL3	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CL4	CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.

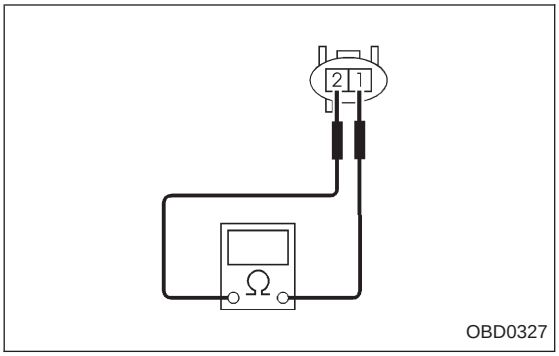
1) Turn ignition switch to OFF.
2) Disconnect connector from EGR solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 71 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and EGR solenoid valve connector. After repair, replace ECM.

NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between EGR solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Replace EGR solenoid valve and ECM.
NO : Go to step **10CL5**.

10CL5	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM.

OBD (FB1)

P1422 <CPC_HI>

B2M1133

CM: DTC P1422 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

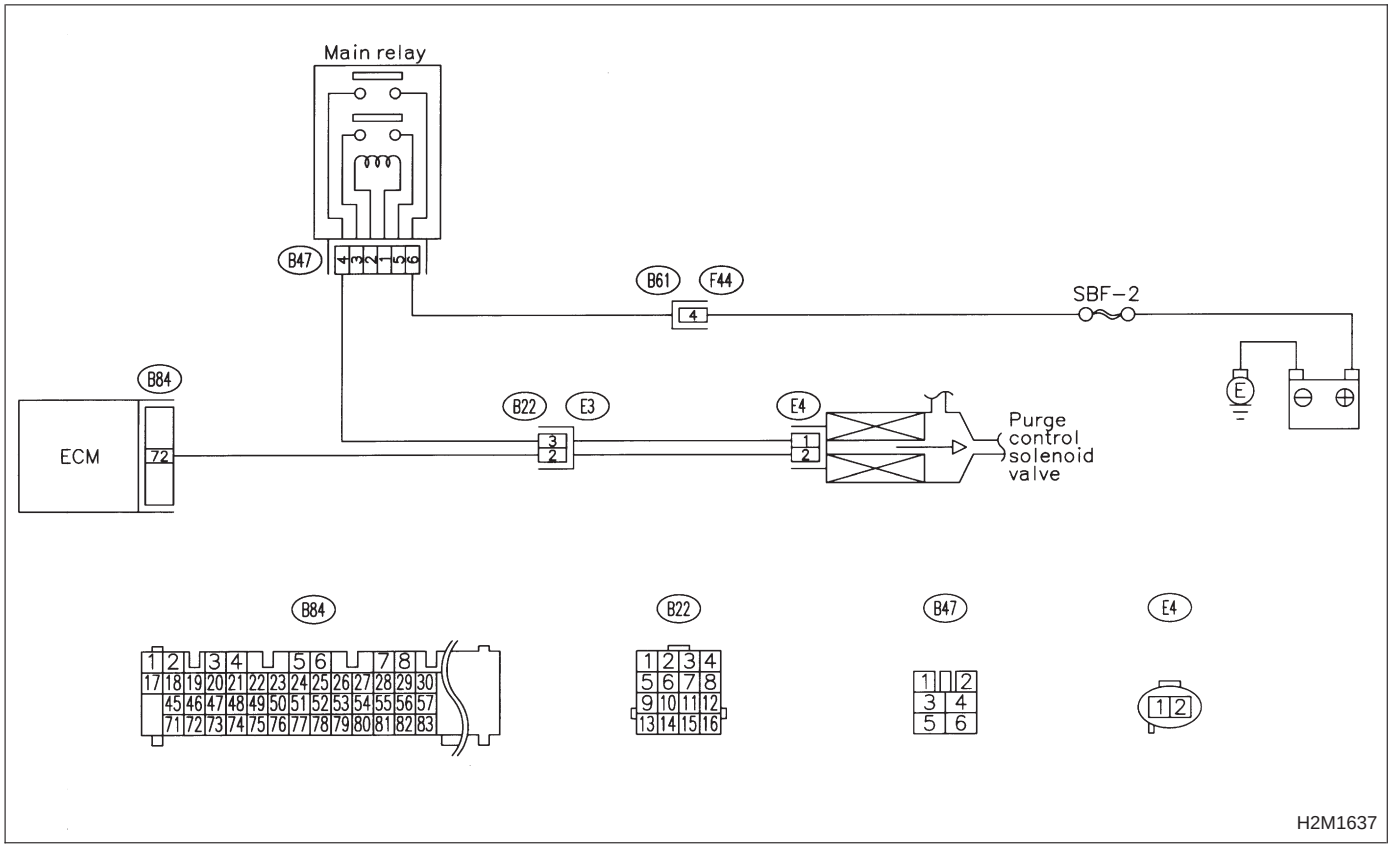
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

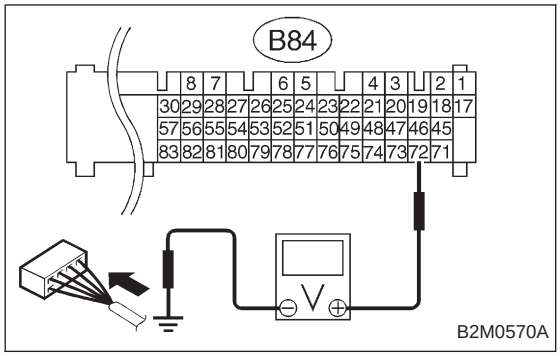
TROUBLE SYMPTOM:

- Erroneous idling

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CM1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 72 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CM3**.

NO : Go to step **10CM2**.

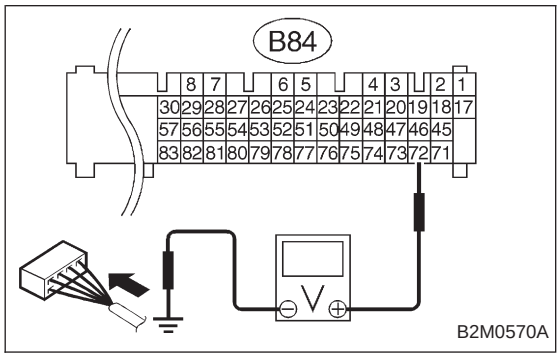
10CM2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CM3	CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.

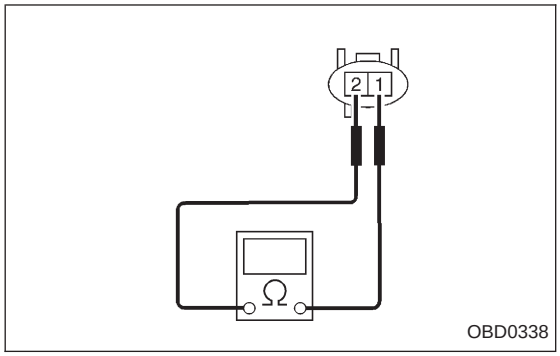
1) Turn ignition switch to OFF.
2) Disconnect connector from purge control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 72 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM.

NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between purge control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Replace purge control solenoid valve and ECM.
NO : Go to step **10CM4**.

10CM4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***
YES : Repair poor contact in ECM connector.
NO : Replace ECM.

OBD (FB1)

P1423<VCMSOL_HI>

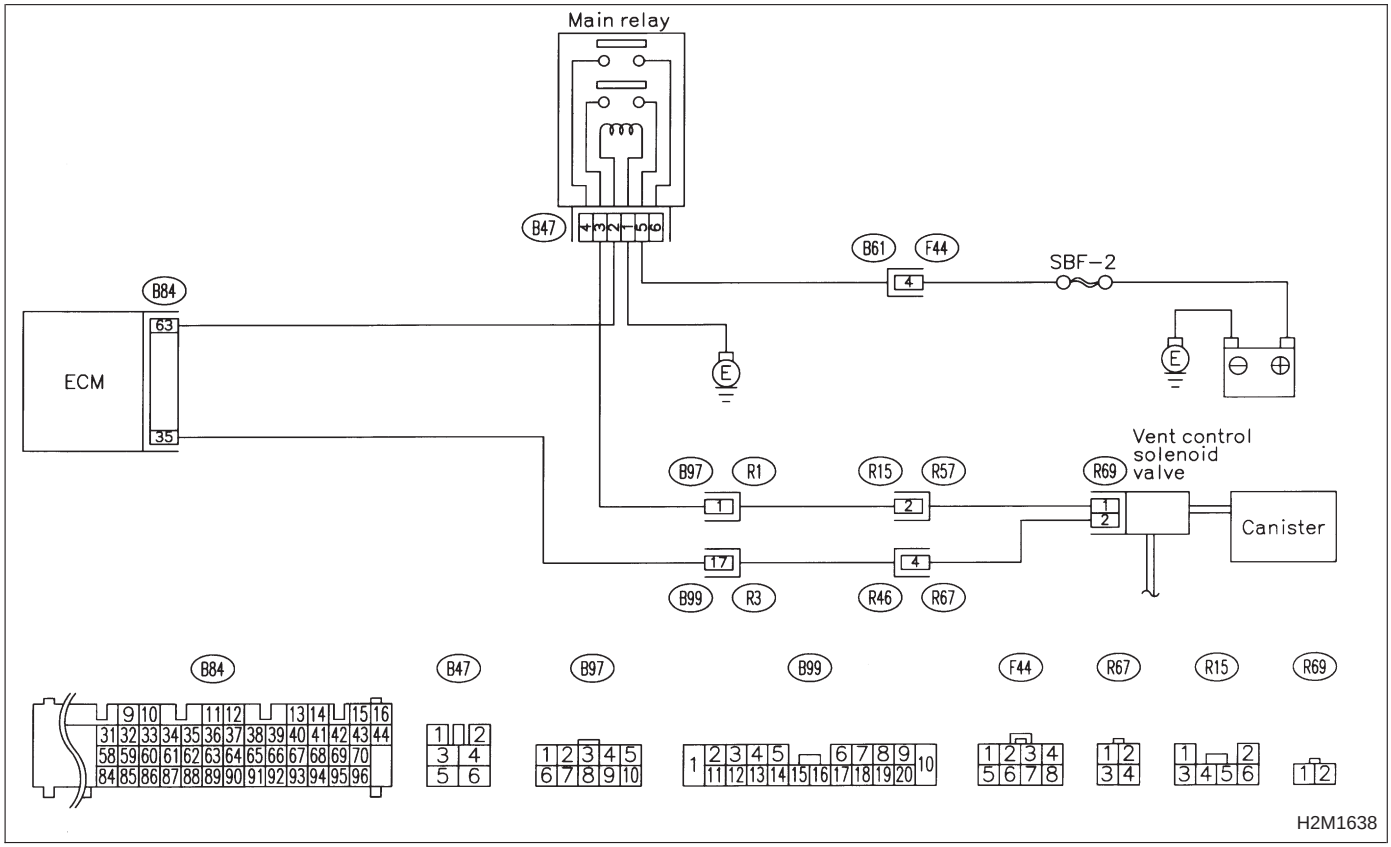
B2M1134

CN: DTC P1423 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —

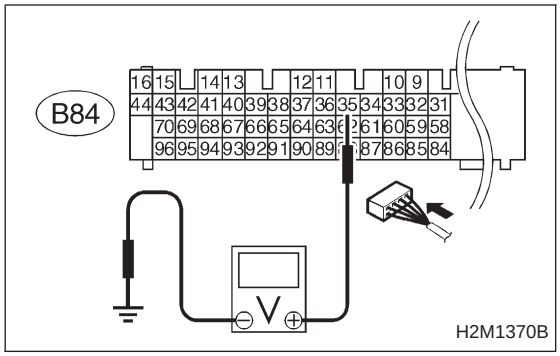
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CN1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 35 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CN3**.

NO : Go to step **10CN2**.

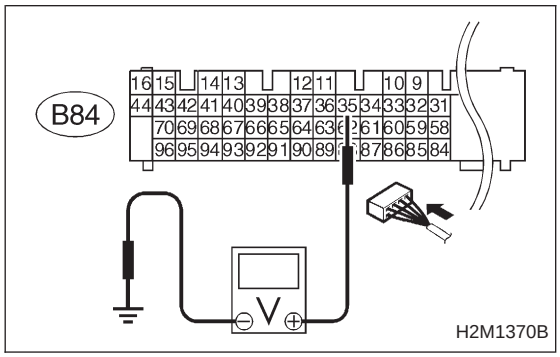
10CN2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.



10CN3	CHECK HARNESS BETWEEN VENT CONTROL SOLENOID VALVE AND ECM CONNECTOR.

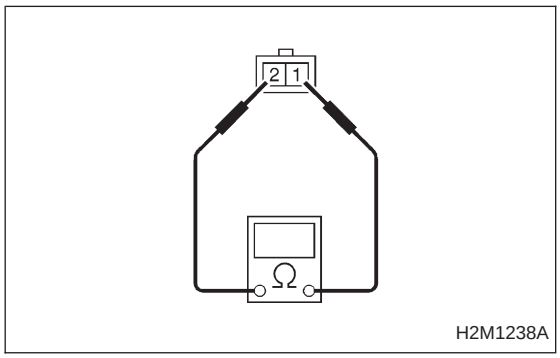
1) Turn ignition switch to OFF.
2) Disconnect connector from vent control solenoid valve.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 35 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and vent control solenoid valve connector. After repair, replace ECM.

NO : Go to next step 5).



5) Turn ignition switch to OFF.
6) Measure resistance between vent control solenoid valve terminals.

Terminals
No. 1 — No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Replace vent control solenoid valve and ECM.

NO : Go to step **10CN4**.

10CN4	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.

OBD (FB1)

P1440 <PCV_FLOW>

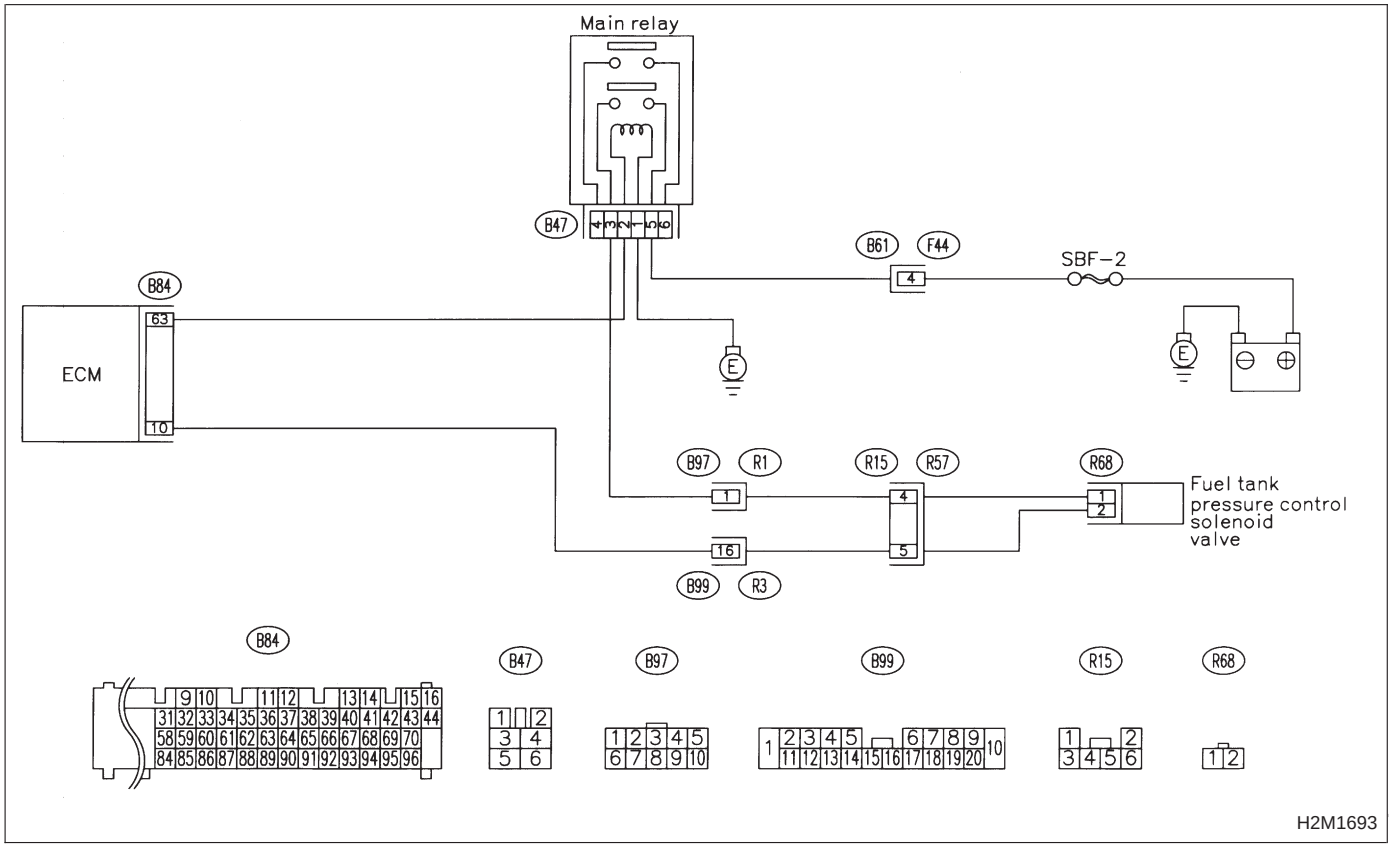
B2M1135

CO: DTC P1440 — FUEL TANK PRESSURE CONTROL SYSTEM FUNCTION PROBLEM (LOW INPUT) —

DTC DETECTING CONDITION:

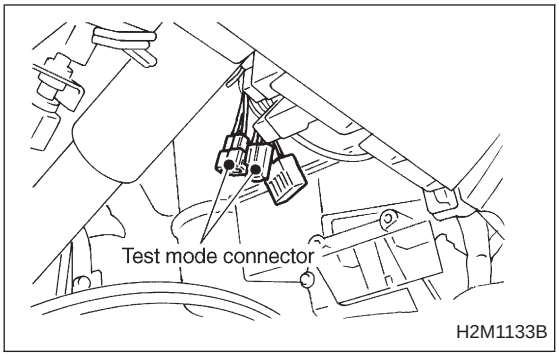
- Two consecutive driving cycles with fault

WIRING DIAGRAM:



H2M1693

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CO1	CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does fuel tank pressure control solenoid valve produce operating sound?***

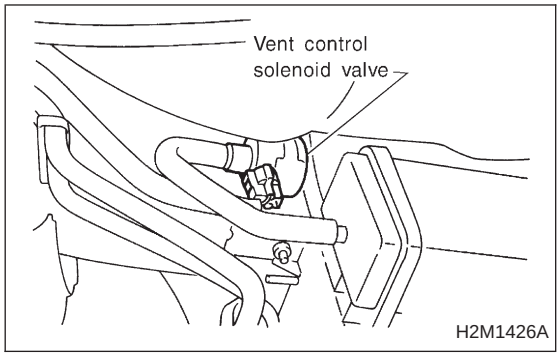
NOTE:
Fuel tank pressure control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD07). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CO2**.
NO : Replace fuel tank pressure control solenoid valve.

10CO2	CHECK FUEL FILLER CAP AND FUEL FILLER PIPE.

1) Turn ignition switch to OFF.
2) Open the fuel flap.

CHECK ***: Is the fuel filler cap tightened securely?***
YES : Tighten fuel filler cap securely.
NO : Go to next CHECK .
CHECK ***: Is there any damage to the seal between fuel filler cap and fuel filler pipe?***
YES : Repair or replace fuel filler cap and fuel filler pipe.
NO : Go to step **10CO3**.



10CO3	CHECK VENT CONTROL SOLENOID VALVE.

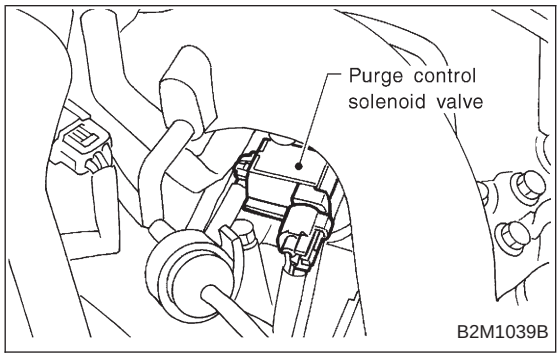
Turn ignition switch to ON.

CHECK ***: Does vent control solenoid valve produce operating sound?***

NOTE:
Vent control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD08). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CO4**.

NO : Replace vent control solenoid valve.



10CO4	CHECK PURGE CONTROL SOLENOID VALVE.

CHECK ***: Does purge control solenoid valve produce operating sound?***

NOTE:
Purge control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD02). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CO5**.

NO : Replace purge control solenoid valve.

10CO5	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.

Turn ignition switch to OFF.

CHECK ***: Does fuel leak in fuel line?***

YES : Repair or replace fuel line.

NO : Go to next CHECK .

CHECK ***: Is there any damage at canister?***

YES : Repair or replace canister.

NO : Go to next CHECK .

CHECK ***: Is there any damage at fuel tank?***

YES : Repair or replace fuel tank.

NO : Go to next CHECK .

CHECK ***: Are there holes, cracks or disconnections of hoses or pipes in evaporative emission control system?***

YES : Repair or replace hoses or pipes.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1441 <PCV_FHI>

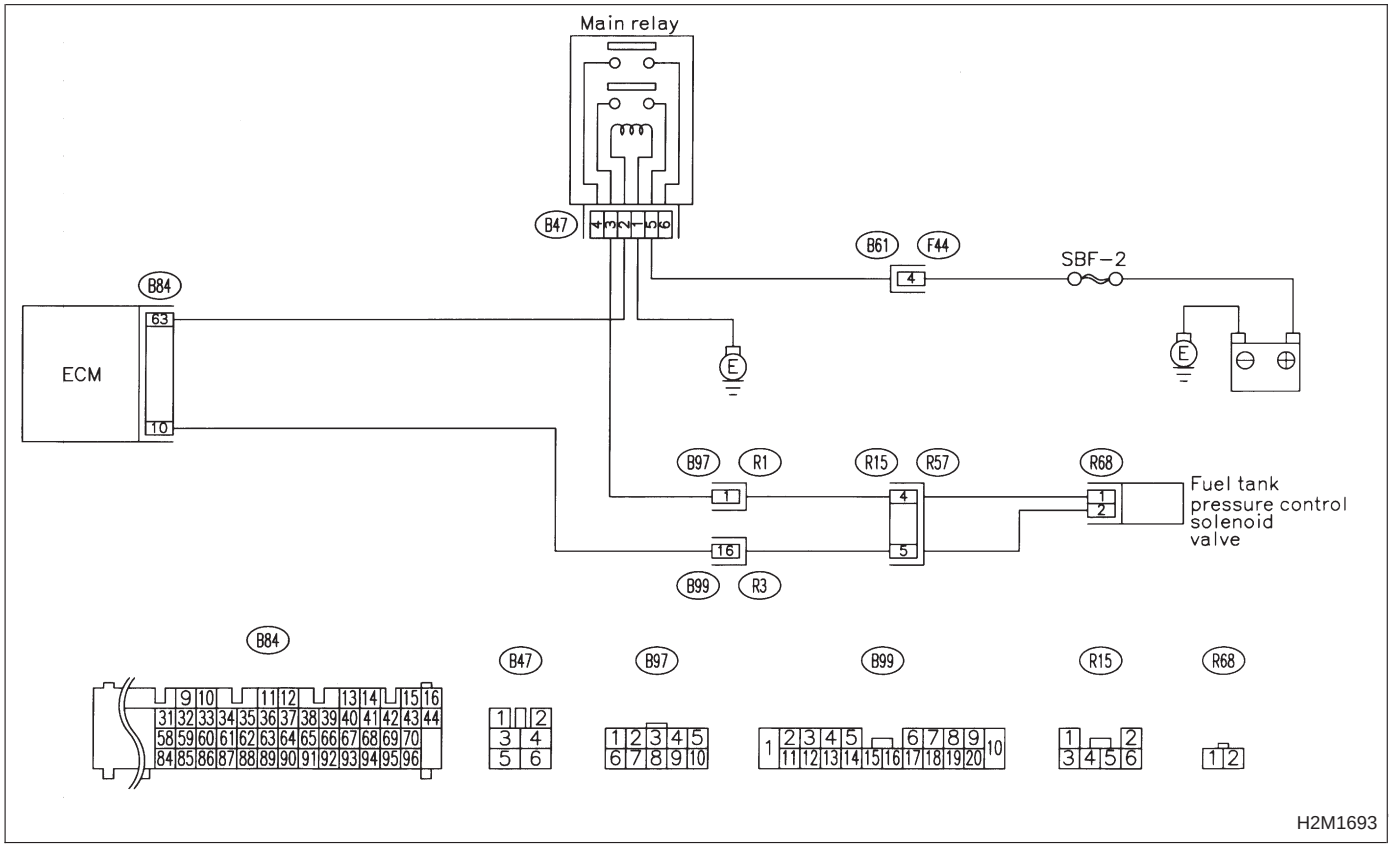
B2M1136

CP: DTC P1441 — FUEL TANK PRESSURE CONTROL SYSTEM FUNCTION PROBLEM (HIGH INPUT) —

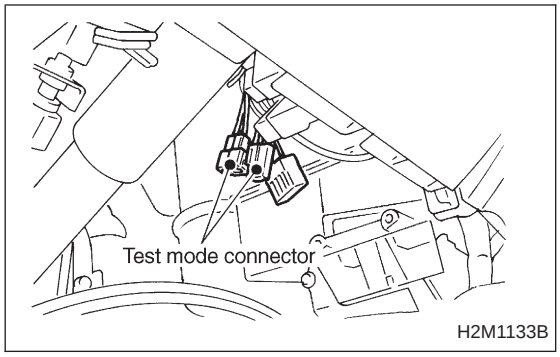
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CP1	CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Connect test mode connector.
3) Turn ignition switch to ON.

CHECK ***: Does fuel tank pressure control solenoid valve produce operating sound?***

NOTE:
Fuel tank pressure control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD07). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CP2**.

NO : Replace fuel tank pressure control solenoid valve.

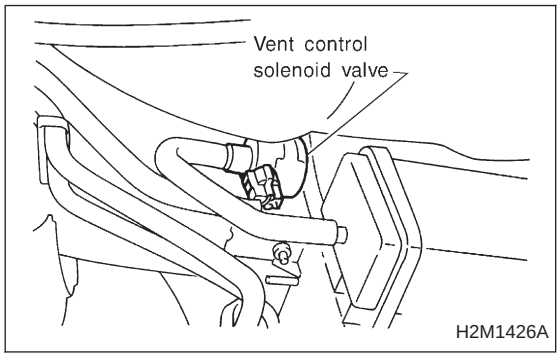
10CP2	CHECK FUEL FILLER CAP AND FUEL FILLER PIPE.

1) Turn ignition switch to OFF.
2) Open the fuel flap.

CHECK ***: Is there any damage at fuel filler cap and fuel filler pipe?***

YES : Repair or replace fuel filler cap and fuel filler pipe.

NO : Go to step **10CP3**.



10CP3	CHECK VENT CONTROL SOLENOID VALVE.

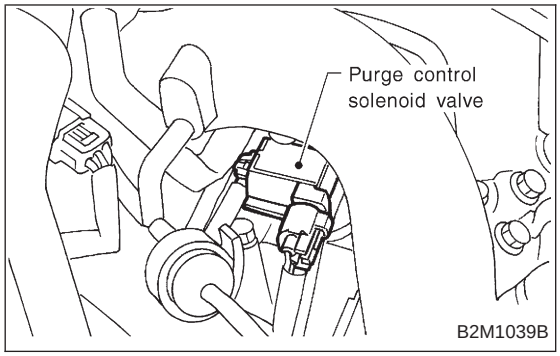
Turn ignition switch to ON.

CHECK ***: Does vent control solenoid valve produce operating sound?***

NOTE:
Vent control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD08). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CP4**.

NO : Replace vent control solenoid valve.



10CP4	CHECK PURGE CONTROL SOLENOID VALVE.

CHECK ***: Does purge control solenoid valve produce operating sound?***

NOTE:
Purge control solenoid valve operation check can also be executed using Subaru Select Monitor (Function mode: FD02). For the procedure, refer to “COMPULSORY VALVE OPERATION CHECK MODE”. <Ref. to 2-7 [T3F0].>

YES : Go to step **10CP5**.

NO : Replace purge control solenoid valve.

10CP5	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.

Turn ignition switch to OFF.

CHECK ***: Is there any damage at canister?***

YES : Repair or replace canister.

NO : Go to next CHECK .

CHECK ***: Is there any damage at fuel tank?***

YES : Repair or replace fuel tank.

NO : Go to next CHECK .

CHECK ***: Is there clogging of hoses or pipes in evaporative emission control system?***

YES : Repair or replace hoses or pipes.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1442 <FLVL_R2>

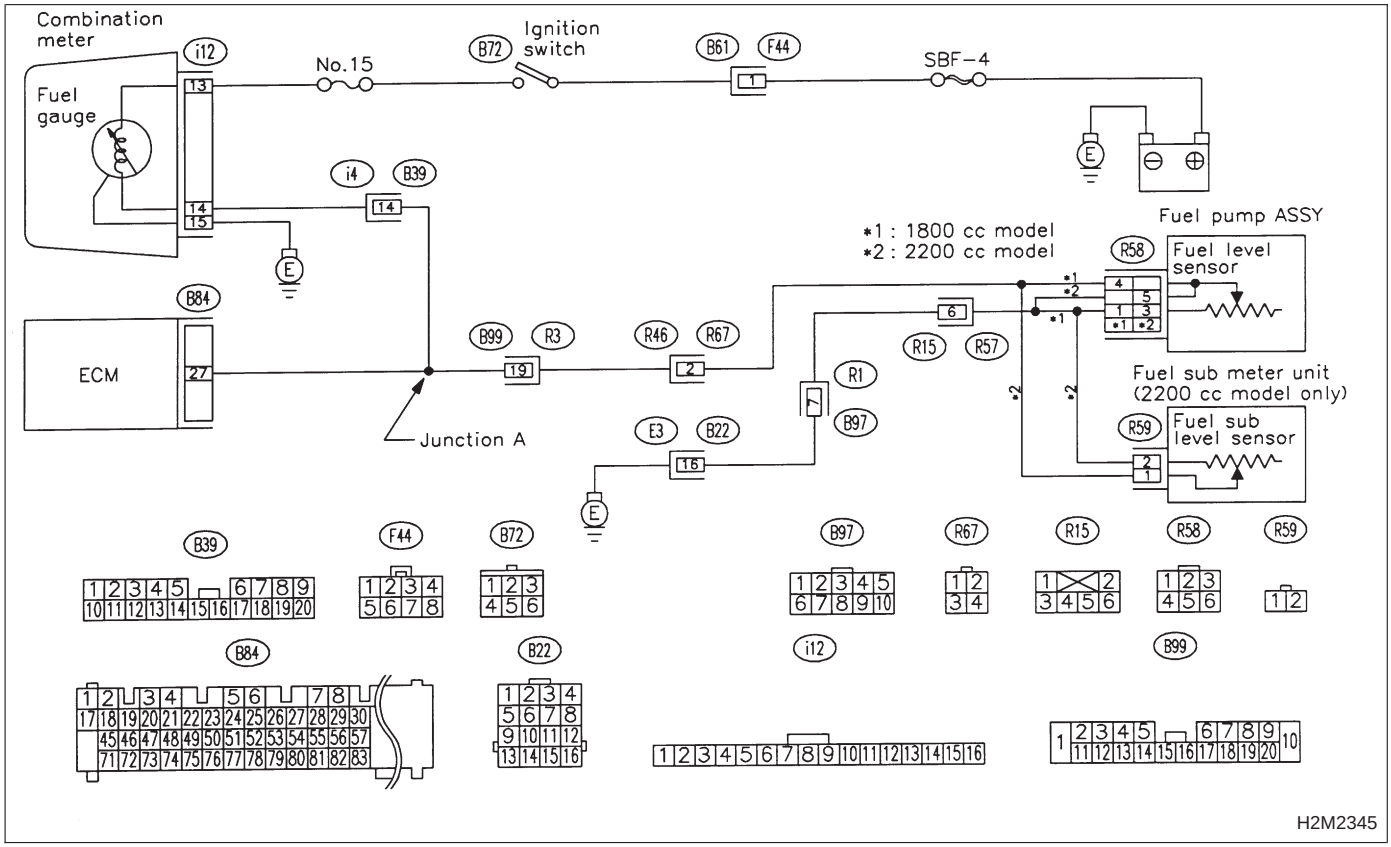
B2M1137

CQ: DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/ PERFORMANCE PROBLEM 2 —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CQ1	CHECK DTC P0461, P0462 OR P0463 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0461, P0462 or P0463?***

YES : Inspect DTC P0461, P0462 or P0463 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect this trouble.

NO : Replace fuel sending unit and fuel sub meter unit.

OBD (FB1)

P1500 <FAN_1>

OBD0527

CR: DTC P1500 — RADIATOR FAN RELAY 1 CIRCUIT LOW INPUT —

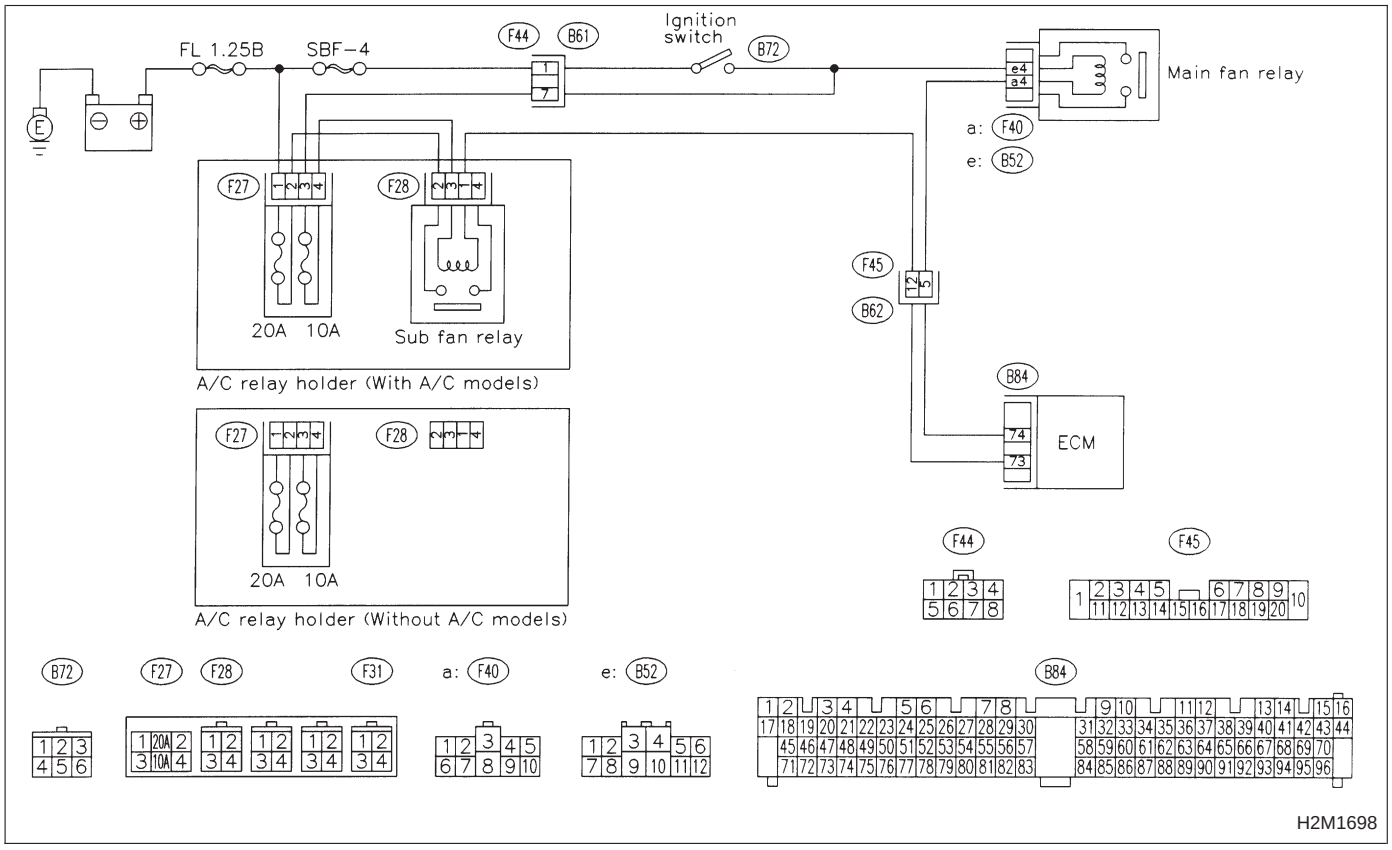
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

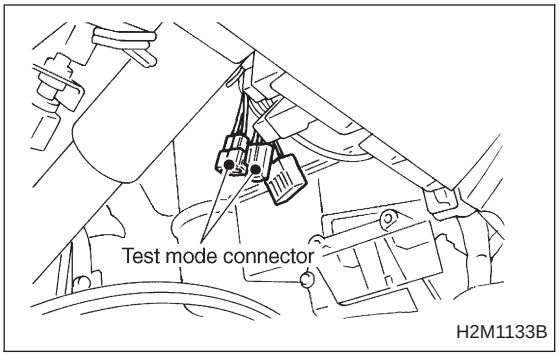
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

WIRING DIAGRAM:

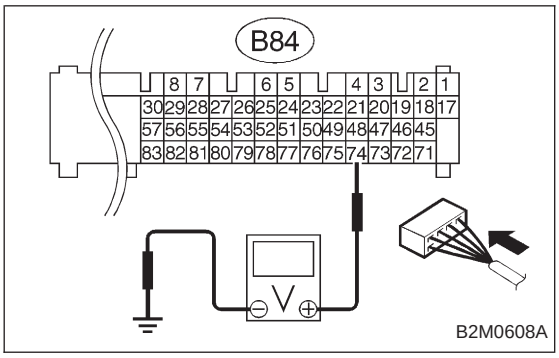


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CR1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to OFF.
2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.
3) Turn ignition switch to ON.



4) Measure voltage between ECM and chassis ground.

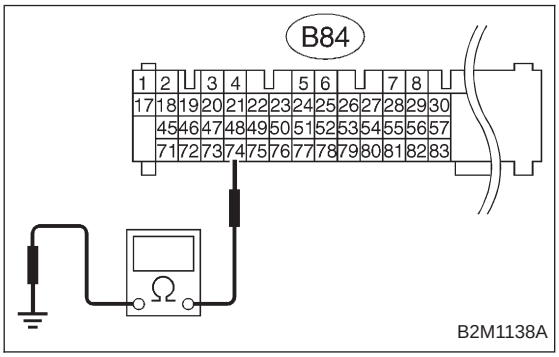
Connector & terminal
(B84) No. 74 (+) — Chassis ground:

CHECK ***: Does voltage change between 0 and 10 volts?***

NOTE:
Radiator fan relay operation check can be executed using Subaru Select Monitor (Function mode: FD03). For procedure, refer to "COMPULSORY VALVE OPERATION CHECK MODE". <Ref. to 2-7 [T3F0].>

YES : Repair poor contact in ECM connector.

NO : Go to step **10CR2**.



10CR2	CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.

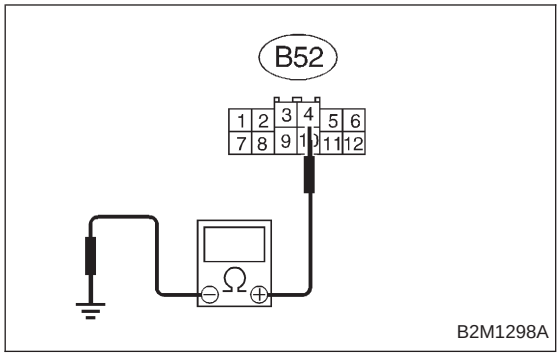
1) Turn ignition switch to OFF.
2) Disconnect connectors from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 74 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in radiator fan relay 1 control circuit.

NO : Go to step **10CR3**.



10CR3	CHECK POWER SUPPLY FOR RELAY.

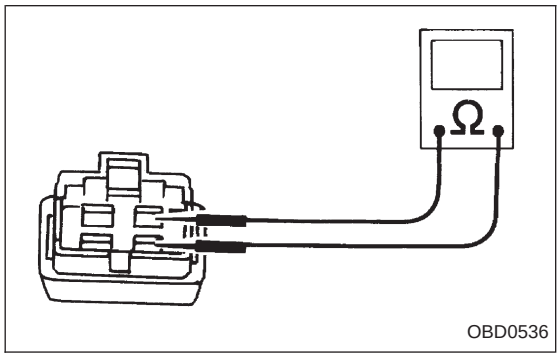
1) Disconnect connector (B52) from fuse and relay box (F/B).
2) Turn ignition switch to ON.
3) Measure voltage between fuse and relay box (F/B) connector and chassis ground.

Connector & terminal
(B52) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10CR4**.

NO : Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.



10CR4	CHECK MAIN FAN RELAY.

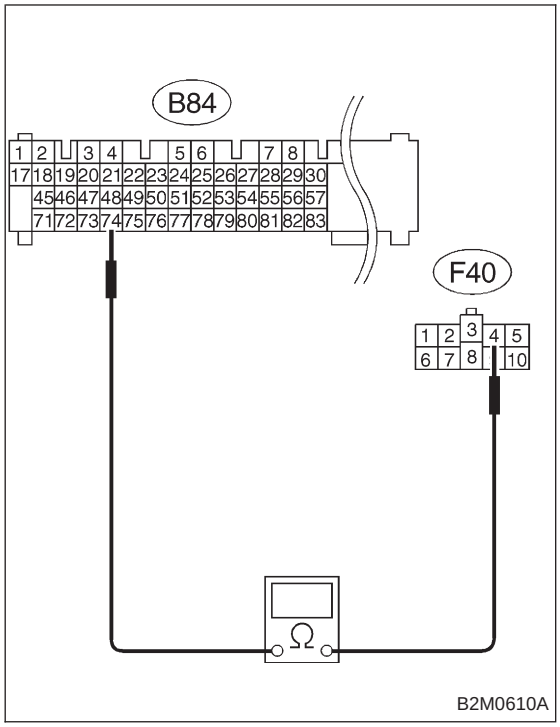
1) Turn ignition switch to OFF.
2) Remove main fan relay.
3) Measure resistance between main fan relay terminals.

Terminal
No. 1 — No. 3:

CHECK ***: Is the resistance between 83 and 117 Ω?***

YES : Go to step **10CR5**.

NO : Replace main fan relay.



10CR5	CHECK OPEN CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.

1) Disconnect connector (F40) from fuse and relay box (F/B).

2) Measure resistance of harness between ECM and main fan relay connector.

Connector & terminal
(B84) No. 74 — (F40) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **10CR6**.

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and main fan relay connector
- Poor contact in coupling connector (F45)

10CR6	CHECK POOR CONTACT.

Check poor contact in ECM or main fan relay connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM or main fan relay connector?***

YES : Repair poor contact in ECM or main fan relay connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1502 <FAN_F>

OBD0538

CS: DTC P1502
— RADIATOR FAN FUNCTION PROBLEM —

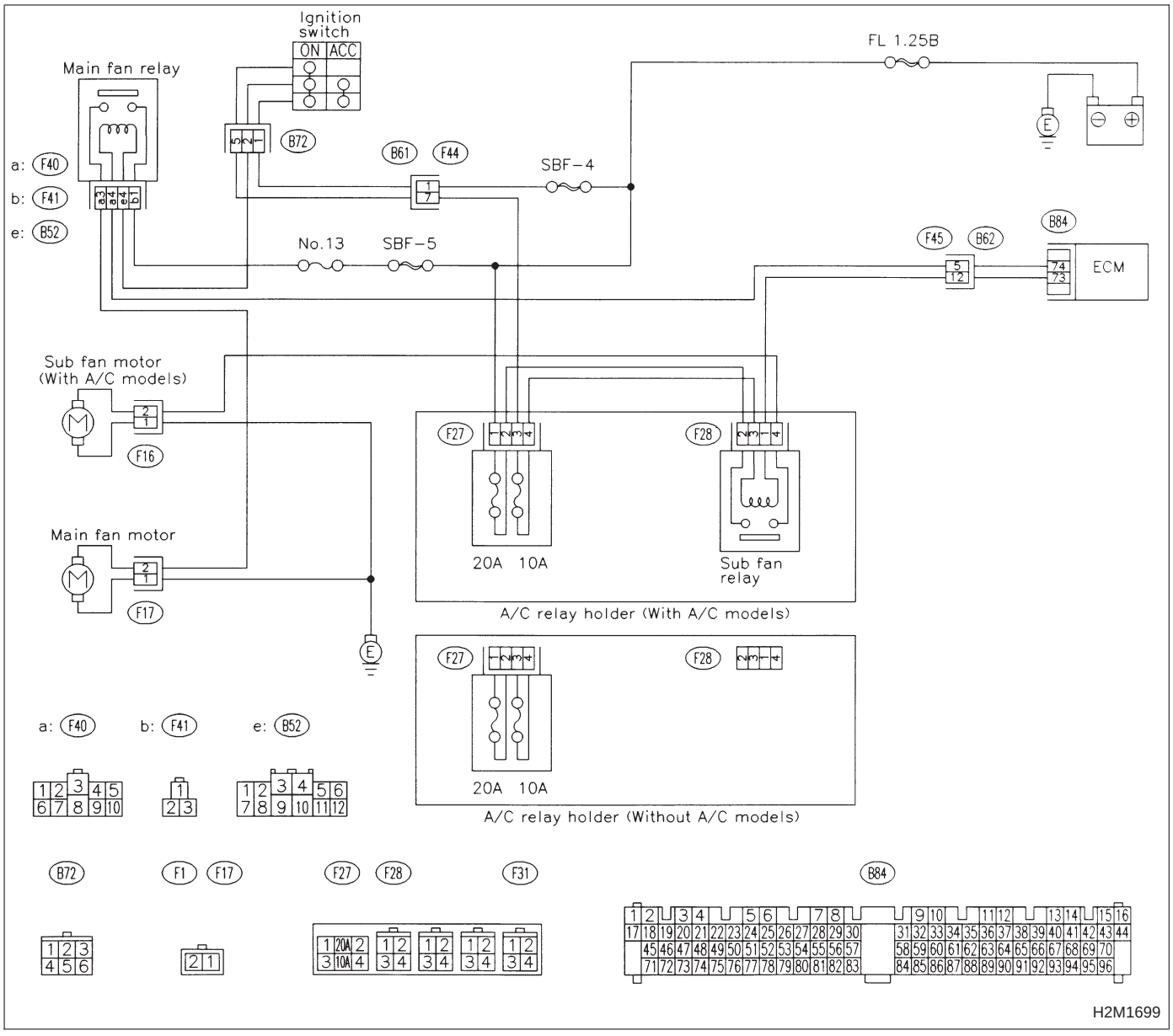
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

10CS1	**CHECK ANY OTHER DTC (BESIDE DTC P1502) ON DISPLAY.**

CHECK ***: Is there any other DTC on display?***

YES : Inspect the relevant DTC using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NO : Check engine cooling system. <Ref. to 2-5 [K100].>

OBD (FB1)
P1507 <ISC_SHI>
B2M1140

CT: DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

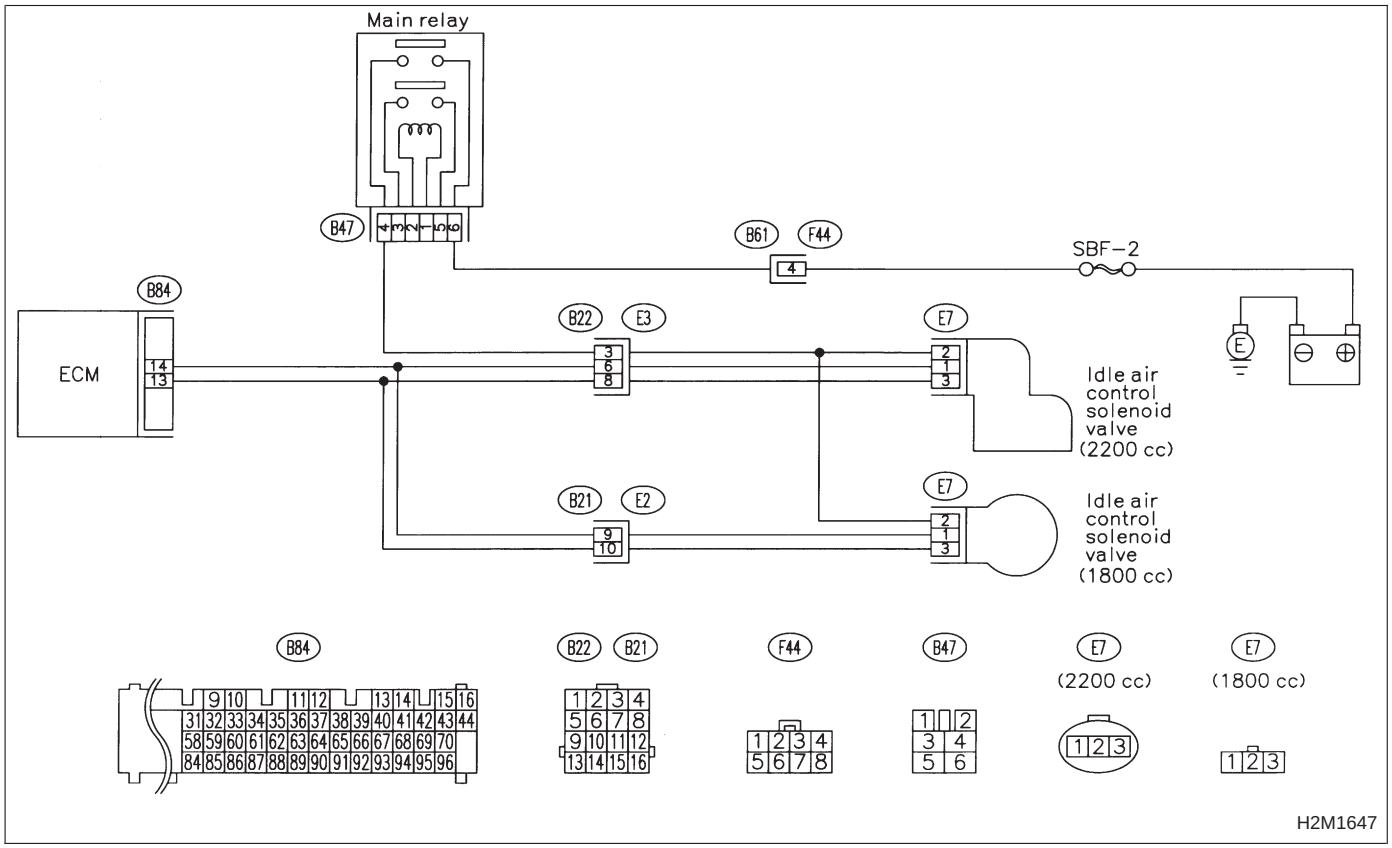
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CT1	CHECK DTC P0505 ON DISPLAY.

CHECK ***: Does the Subaru select monitor or OBD-II general scan tool indicate DTC P0505?***

YES : Inspect DTC P0505 using “10. Diagnostics Chart with Trouble Code”. <Ref. to 2-7 [T10A0].>

NOTE:
In this case, it is not necessary to inspect DTC P1507.

NO : Go to step **10CT2**.

10CT2	CHECK AIR INTAKE SYSTEM.

1) Turn ignition switch to ON.
2) Start engine, and idle it.

CHECK ***: Is there a fault in air intake system?***

NOTE:
Check the following items.
- Loose installation of intake manifold, idle air control solenoid valve and throttle body
- Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket
- Loose connections and cracks of idle air control solenoid valve by-pass hoses
- Disconnections of vacuum hoses

YES : Repair air suction and leaks.

NO : Replace idle air control solenoid valve.

OBD (FB1)

P1520 <FAN_1HI>

B2M1141

CU: DTC P1520 — RADIATOR FAN RELAY 1 CIRCUIT HIGH INPUT —

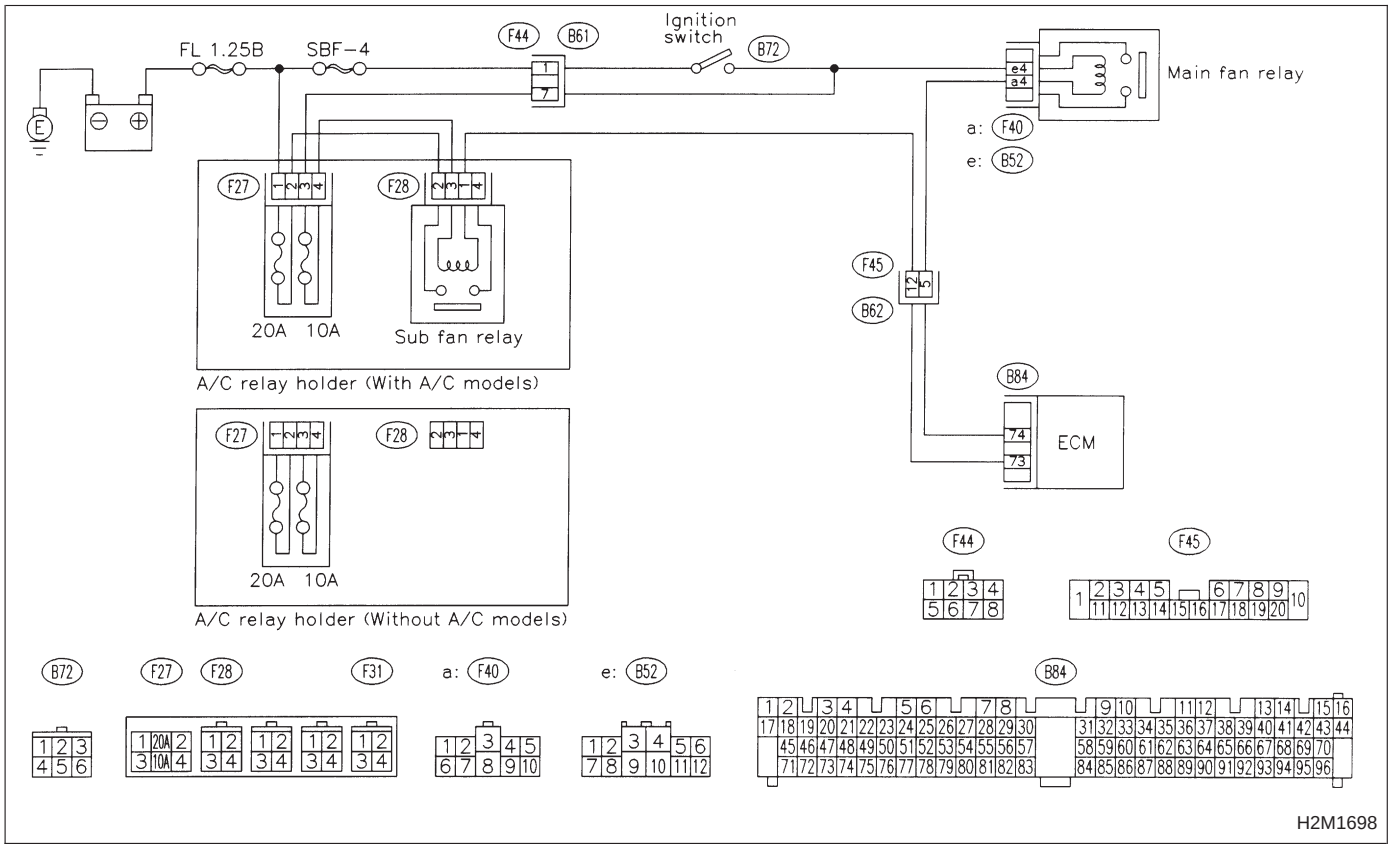
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

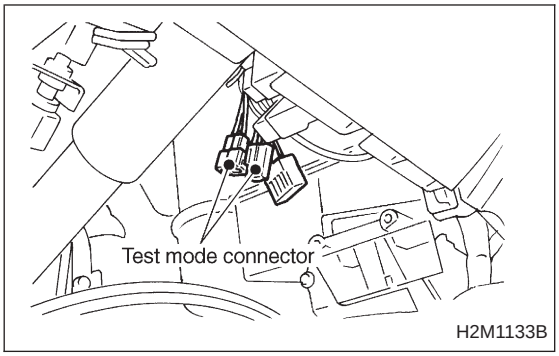
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

WIRING DIAGRAM:

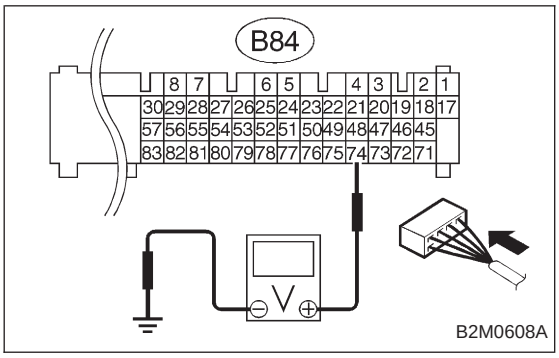


CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODE.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CU1	CHECK OUTPUT SIGNAL FROM ECM.

1) Turn ignition switch to OFF.
2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box.
3) Turn ignition switch to ON.



4) Measure voltage between ECM and chassis ground.

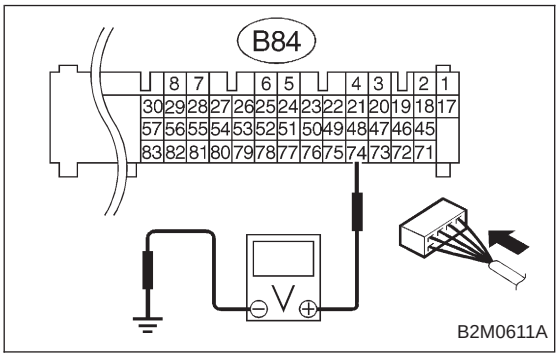
Connector & terminal
(B84) No. 74 (+) — Chassis ground:

CHECK ***: Does voltage change between 0 and 10 volts?***

NOTE:
Radiator fan relay operation check can be executed using Subaru Select Monitor (Function mode: FD03). For procedure, refer to "COMPULSORY VALVE OPERATION CHECK MODE". <Ref. to 2-7 [T3F0].>

YES : Go to step **10CU2**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.



10CU2	CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.

1) Turn ignition switch to OFF.
2) Remove main fan relay 1 and sub fan relay 1. (with A/C models)
Remove main fan relay. (without A/C models)
3) Disconnect test mode connector.
4) Turn ignition switch to ON.
5) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 74 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in radiator fan relay 1 control circuit. After repair, replace ECM.

NO : Go to step **10CU3**.

10CU3	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Replace ECM.

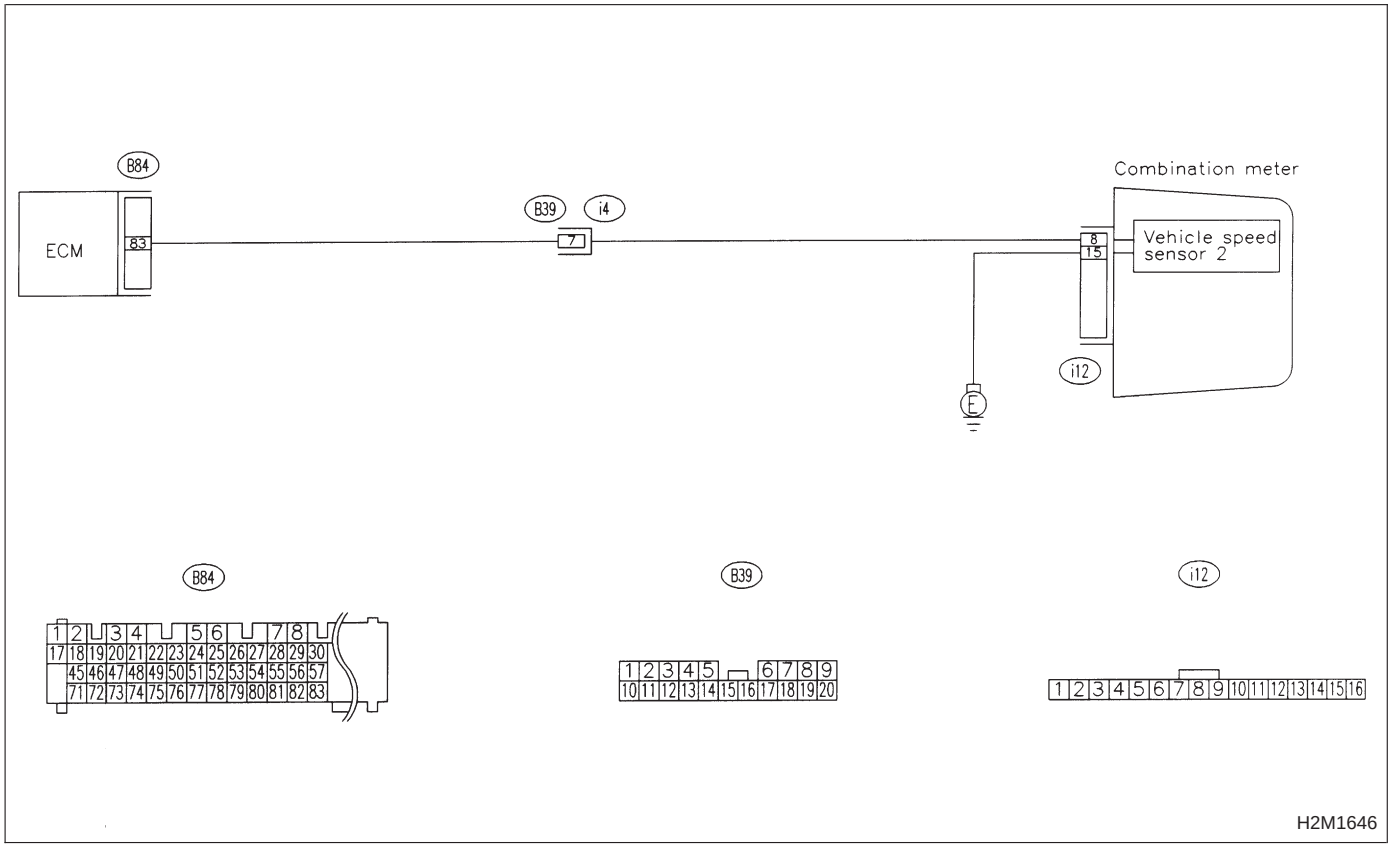
OBD (FB1)
P1540 <VSP_S>
B2M1142

CV: DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —

DTC DETECTING CONDITION:

- Immediately at fault recognition

WIRING DIAGRAM:



H2M1646

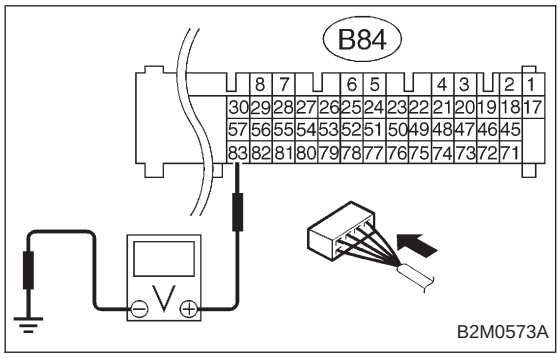
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CV1	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.

CHECK ***: Does speedometer operate normally?***

YES : Go to step **10CV2**.

NO : Check speedometer and vehicle speed sensor 2. <Ref. to 6-2 [K2A0].>



10CV2	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Turn ignition switch to ON.
4) Measure voltage between ECM and chassis ground.

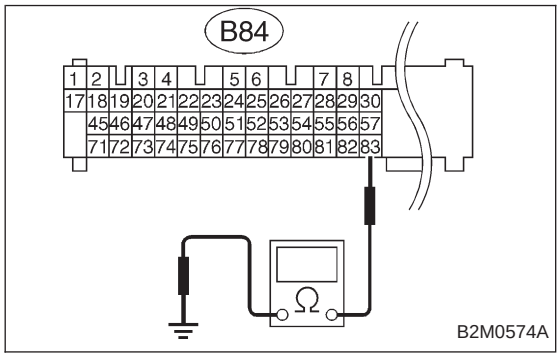
Connector & terminal
(B84) No. 83 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 2 V?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM and combination meter connector
- Poor contact in ECM connector
- Poor contact in combination meter connector
- Poor contact in coupling connector (B39)

NO : Go to step **10CV3**.



10CV3	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between ECM connector and chassis ground.

Connector & terminal
(B84) No. 83 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and combination meter connector.

NO : Repair poor contact in ECM connector.

OBD (FB1)

P1700 <ATTH>

OBD0501

CW: DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —

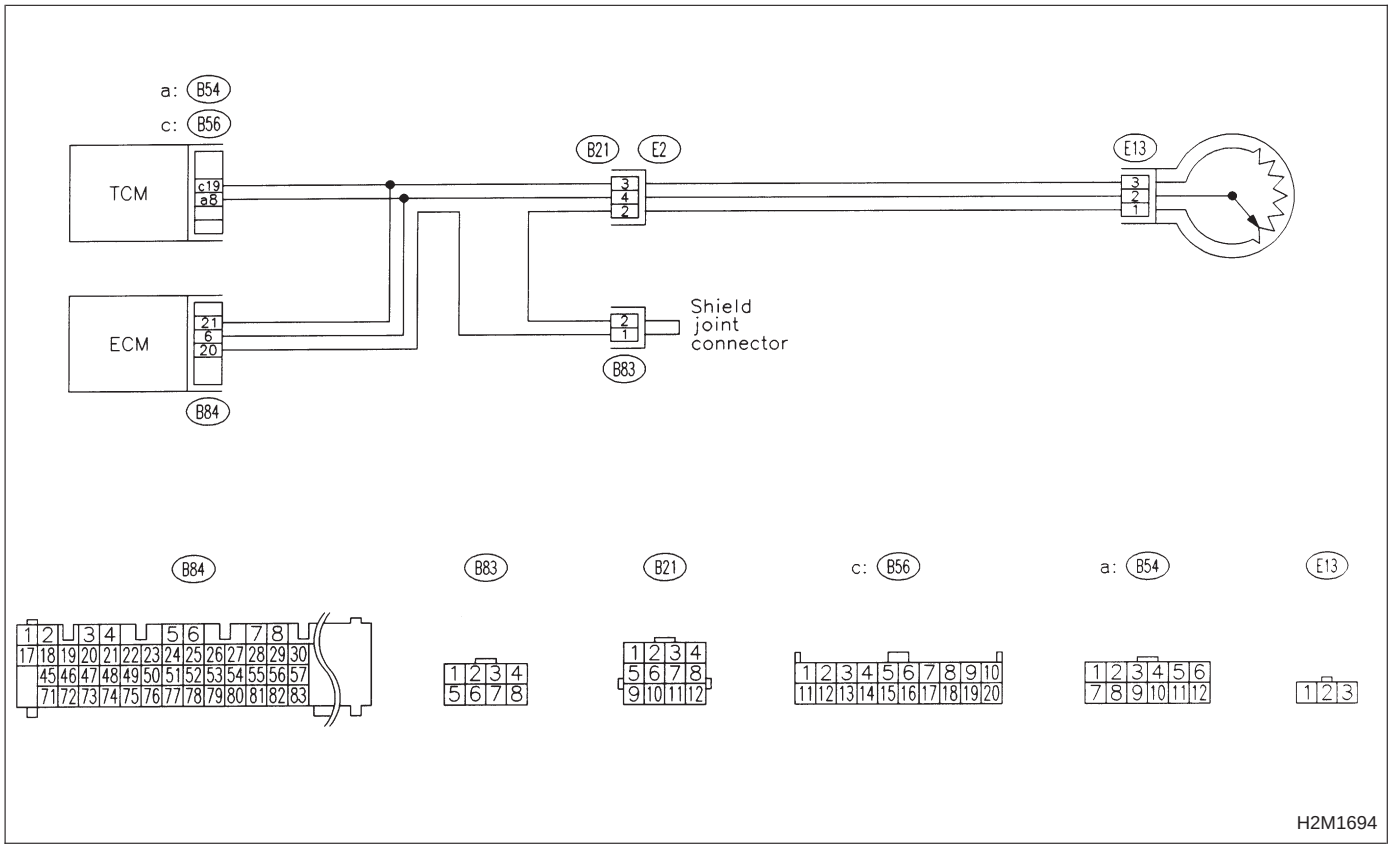
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

WIRING DIAGRAM:



H2M1694

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CW1	CHECK DTC P1700 ON DISPLAY.

CHECK : ***Does the Subaru select monitor or OBD-II general scan tool indicate DTC P1700?***

YES : Check throttle position sensor circuit. <Ref. to 3-2 [T8M0].>

NO : It is not necessary to inspect DTC P1700.

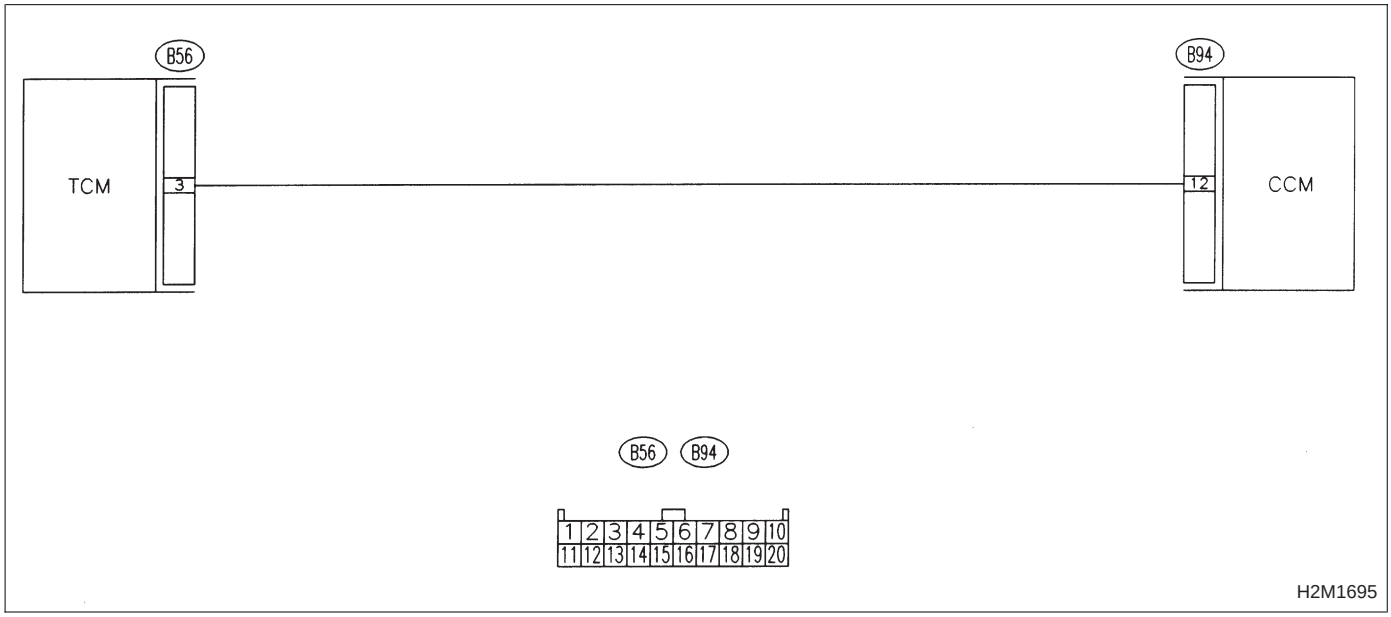
OBD (FB1)
P1701 <ATCRS>
B2M0669

CX: DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —

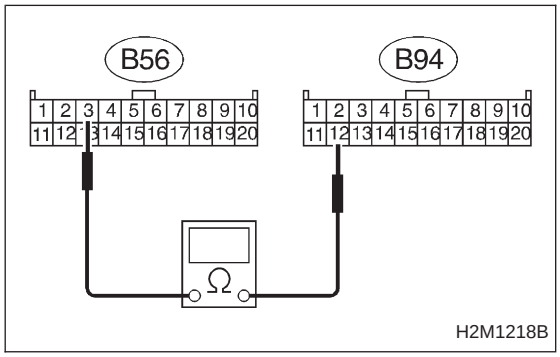
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10CX1	CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.

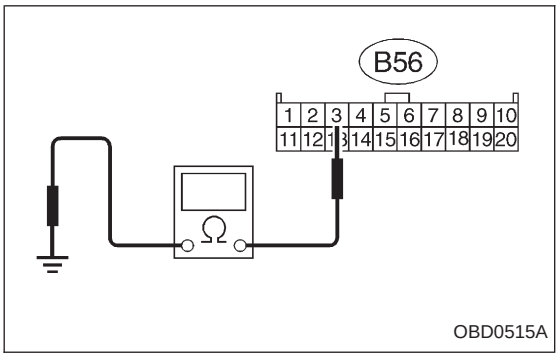
1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and CCM.
3) Measure resistance of harness between TCM and CCM connector.

Connector & terminal
(B56) No. 3 — (B94) No. 12:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair open circuit in harness between TCM and CCM connector.



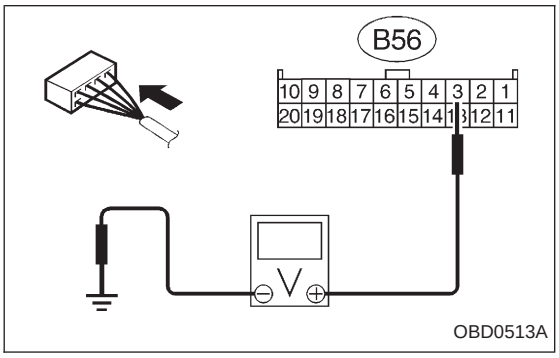
4) Measure resistance of harness between TCM and chassis ground.

Connector & terminal
(B56) No. 3 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair short circuit in harness between TCM and CCM connector.

NO : Go to step **10CX2**.



10CX2	CHECK INPUT SIGNAL FOR TCM.

1) Connect connector to TCM and CCM.
2) Lift-up the vehicle or set the vehicle on free rollers.

CAUTION:
On AWD models, raise all wheels off ground.

3) Start the engine.
4) Cruise control main switch to ON.
5) TCS OFF switch to ON. (with TCS models only)
6) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH).
7) Cruise control set switch to ON.
8) Measure voltage between TCM and chassis ground.

Connector & terminal
(B56) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10CX3**.

NO : Check cruise control set circuit. <Ref. to 6-3 [D5011].>

10CX3	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

OBD (FB1)

P1702<ATDIAG_LO>

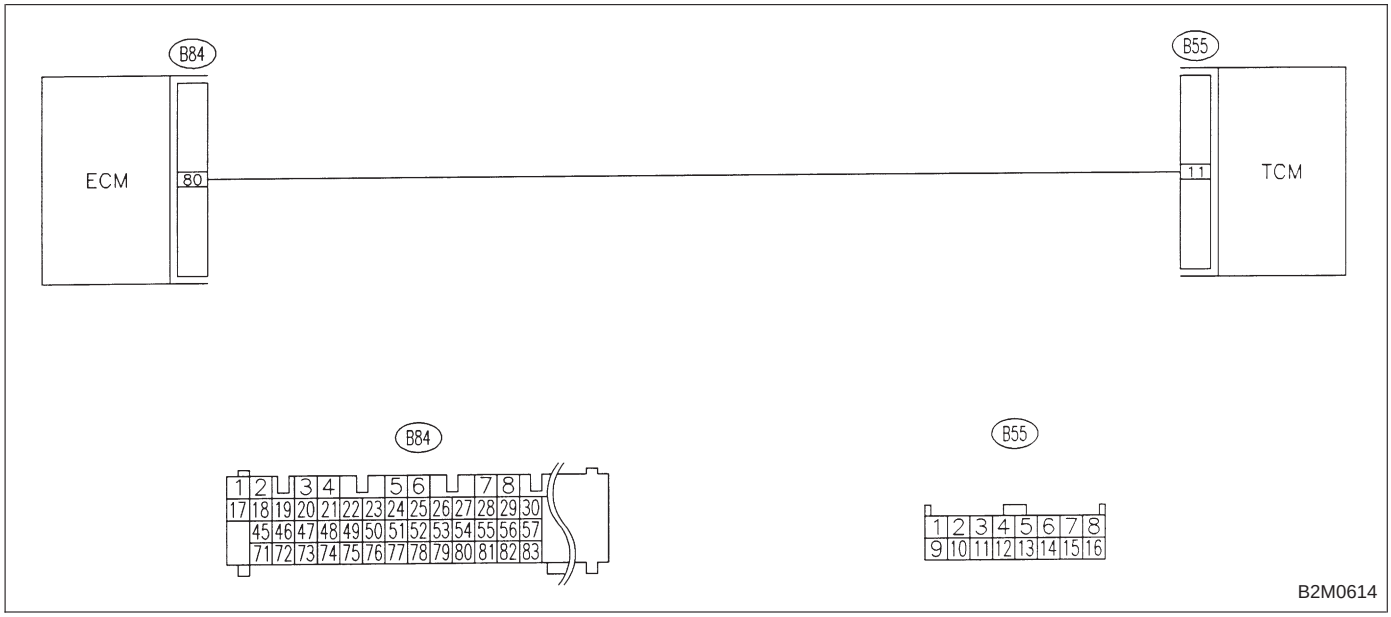
B2M1143

CY: DTC P1702 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



B2M0614

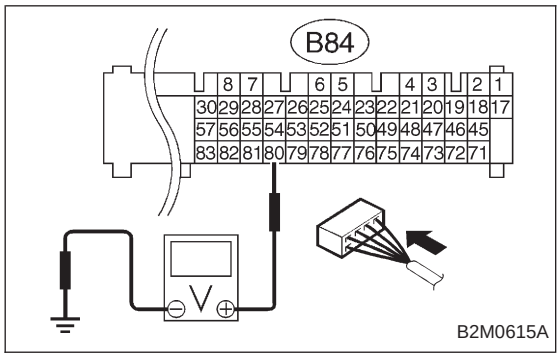
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CY1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type AT?***

YES : Go to step **10CY2**.

NO : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>



10CY2	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

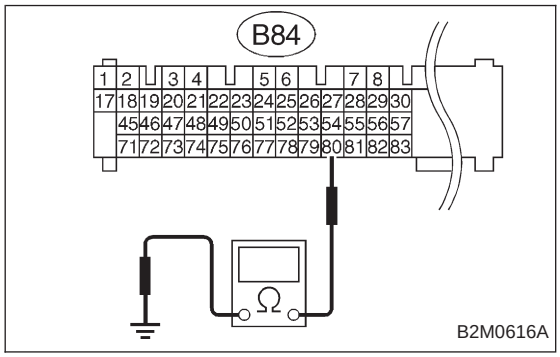
Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10CY3**.

NO : Even if MIL lights up, the circuit has returned to a normal condition at this time.

NOTE:
In this case, repair the following:
- Poor contact in ECM connector
- Poor contact in TCM connector



10CY3	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

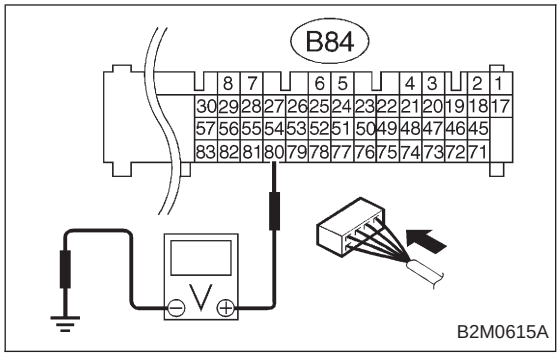
1) Turn ignition switch to OFF.
2) Disconnect connector from ECM and TCM.
3) Measure resistance of harness between ECM and chassis ground.

Connector & terminal
(B84) No. 80 — Chassis ground:

CHECK ***: Is the resistance less than 10 Ω?***

YES : Repair ground short circuit in harness between ECM and TCM connector.

NO : Go to step **10CY4**.



10CY4	CHECK ECM.

1) Connect connector to ECM.
2) Turn ignition switch to ON.
3) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 5 V?***

YES : Replace TCM.

NO : Contact SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

OBD (FB1)

P1722<ATDIAG_HI>

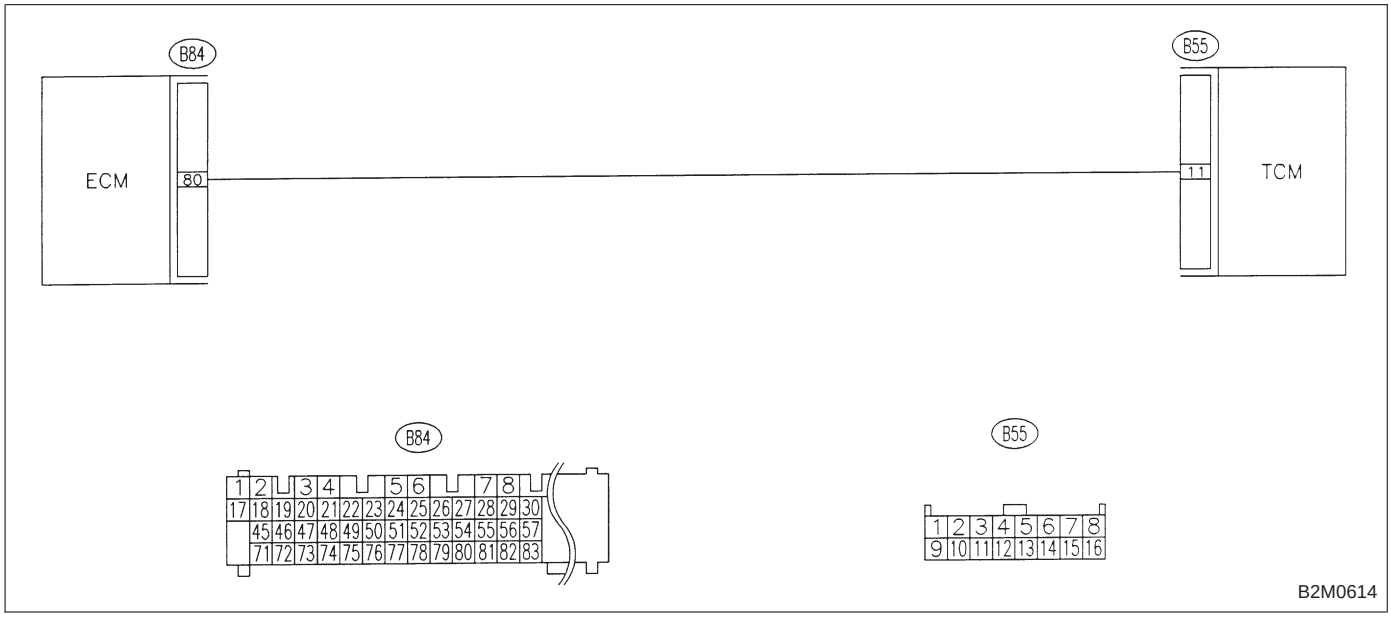
B2M1144

CZ: DTC P1722 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



B2M0614

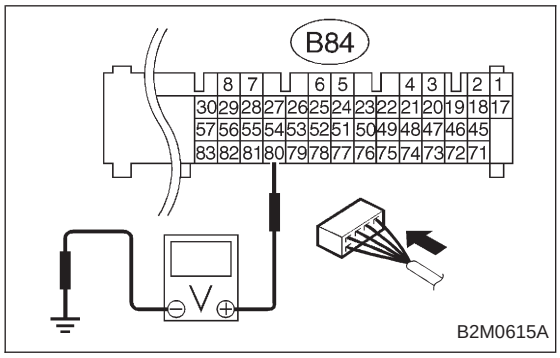
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10CZ1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type AT?***

YES : Go to step **10CZ2**.

NO : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>



10CZ2	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

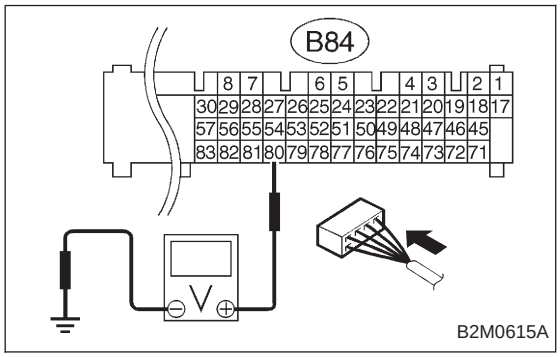
1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM.

NO : Go to step **10CZ3**.



10CZ3	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

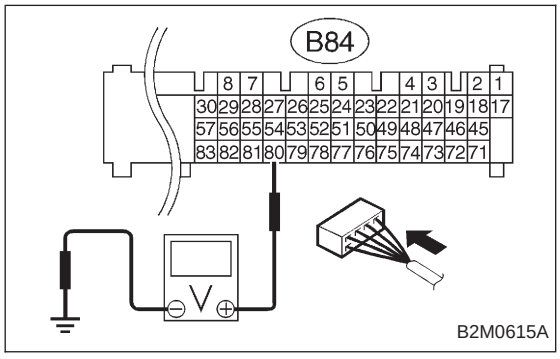
1) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4 V?***

YES : Go to step **10CZ4**.

NO : Go to next step 2).



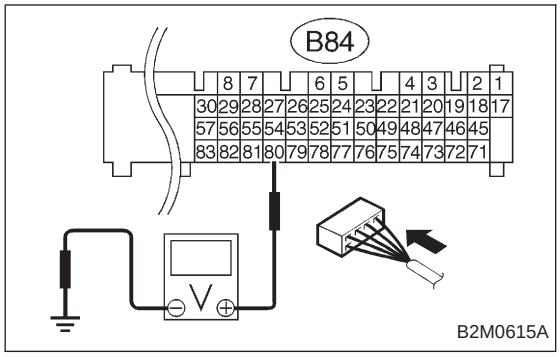
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Repair poor contact in ECM connector.

NO : Go to next step 3).



3) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 80 (+) — Chassis ground (−):

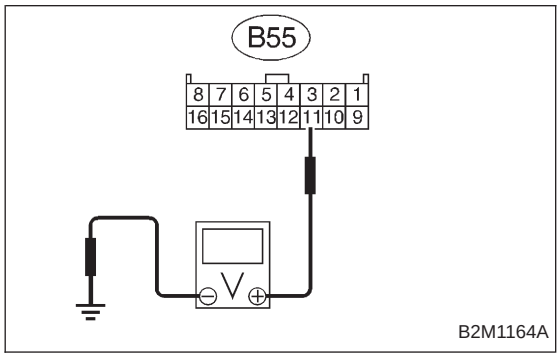
CHECK ***: Does the voltage change from 1 V to 4 V while monitoring the value with voltage meter?***

YES : Even if MIL lights up, the circuit has returned to a normal condition at this time.

NOTE:
In this case, repair the following:
- Poor contact in ECM connector
- Poor contact in TCM connector

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.



10CZ4	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.

Measure voltage between TCM and chassis ground.

Connector & terminal
(B55) No. 11 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 4 V?***

YES : Go to step **10CZ5**.

NO : Repair open circuit in harness between ECM and TCM connector.

10CZ5	CHECK POOR CONTACT.

Check poor contact in TCM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in TCM connector?***

YES : Repair poor contact in TCM connector.

NO : Check TCM power supply line and grounding line.

OBD (FB1)

P1742 <ATDIAG_2>

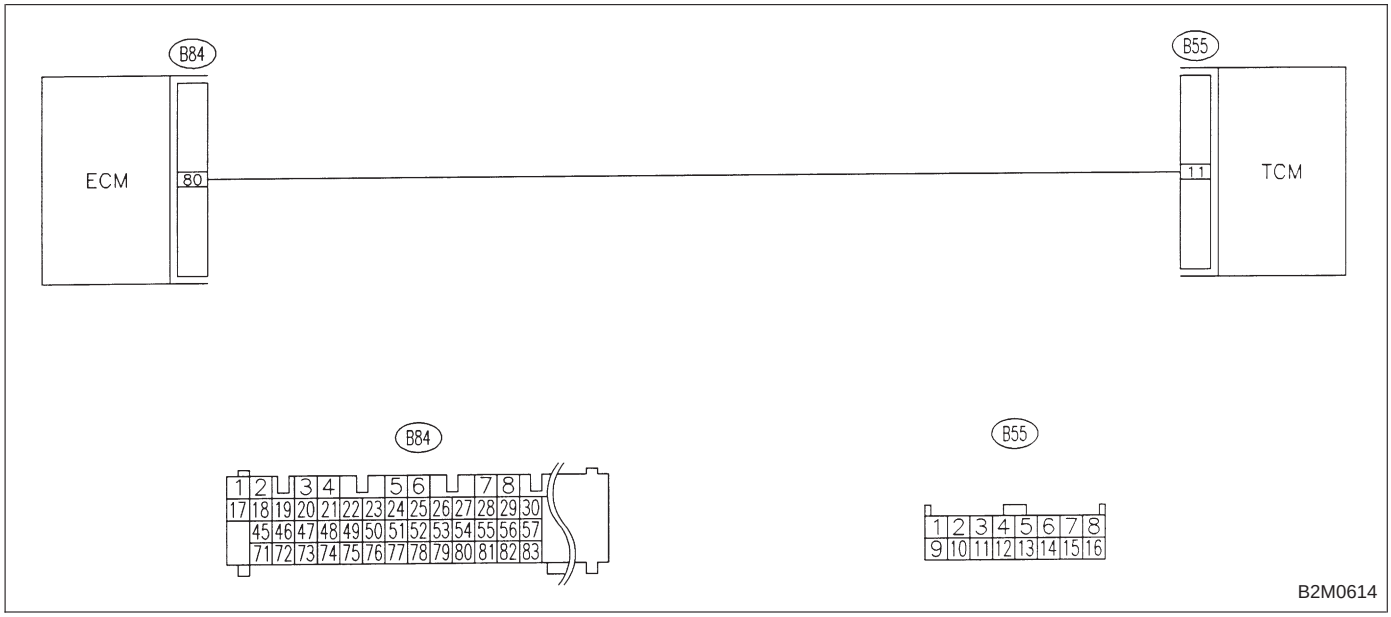
B2M1147

DA: DTC P1742 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

WIRING DIAGRAM:



B2M0614

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>

10DA1	CHECK TRANSMISSION TYPE.

CHECK ***: Is transmission type AT?***

YES : Go to step **10DA2**.

NO : Check AT/MT identification circuit. <Ref. to 2-7 [T10DB0].>

10DA2	CHECK DRIVING CONDITION.

1) Start and warm-up the engine until the radiator fan makes one complete rotation.
2) Drive the vehicle.

CHECK ***: Is AT shift control functioning properly?***

YES : Go to step **10DA3**.

NO : Replace TCM.

10DA3	CHECK ACCESSORY.

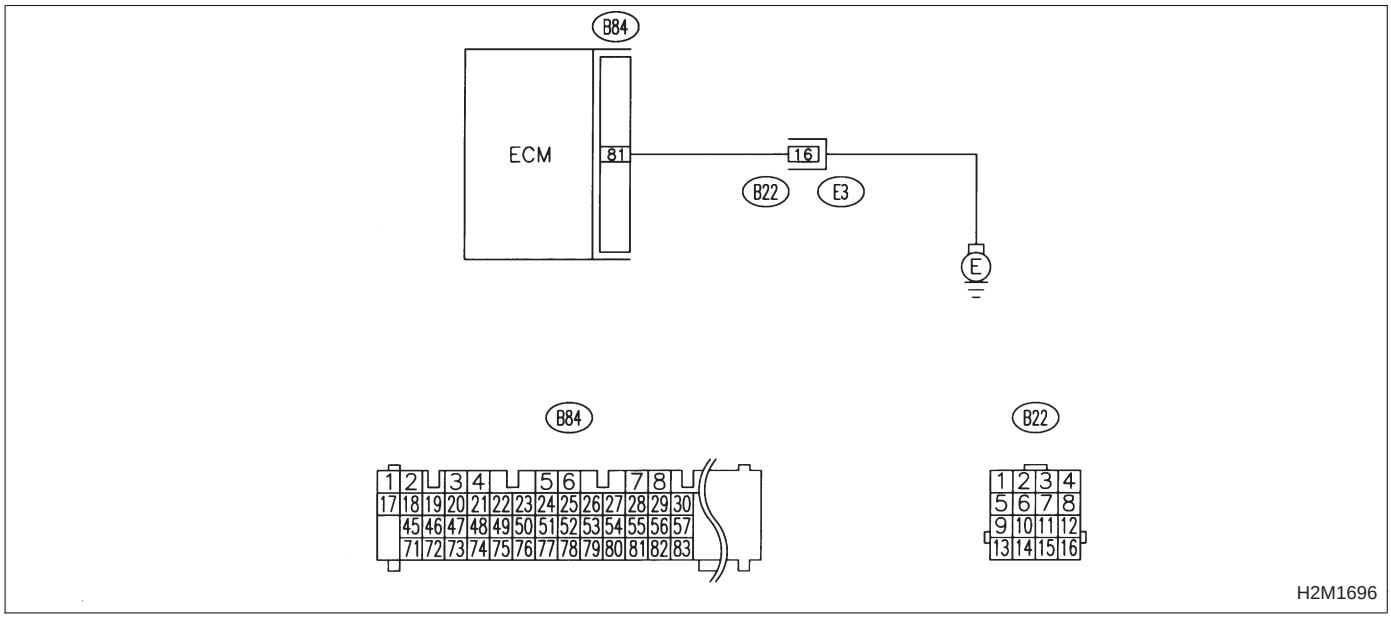
CHECK ***: Are car phone and/or CB installed on vehicle?***

YES : Repair grounding line of car phone or CB system.

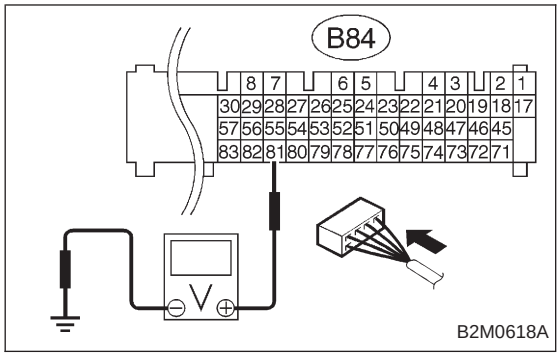
NO : Replace TCM.

DB: — AT/MT IDENTIFICATION CIRCUIT MALFUNCTION [MT VEHICLES] —

WIRING DIAGRAM:



CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES.
<Ref. to 2-7 [T3D0] and [T3E0].>



10DB1	CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS GROUND.

1) Turn ignition switch to ON.
2) Measure voltage between ECM and chassis ground.

Connector & terminal
(B84) No. 81 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 2 V?***

YES : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between ECM connector and engine grounding terminal
- Poor contact in engine grounding terminal
- Poor contact in coupling connector (B22)

NO : Go to step **10DB2**.

10DB2	CHECK POOR CONTACT.

Check poor contact in ECM connector. <Ref. to FOREWORD [T3C1].>

CHECK ***: Is there poor contact in ECM connector?***

YES : Repair poor contact in ECM connector.

NO : Contact with SOA service.

NOTE:
Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AUTOMATIC TRANSMISSION AND DIFFERENTIAL 3-2

Page

T DIAGNOSTICS AIRBAG 2
1. Supplemental Restraint System “Airbag” 2
2. Pre-inspection 2
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4. Schematic 9
5. Transmission Control Module (TCM) I/O Signal.....10
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10. General Diagnostic Table.....134

1. Supplemental Restraint System “Airbag”

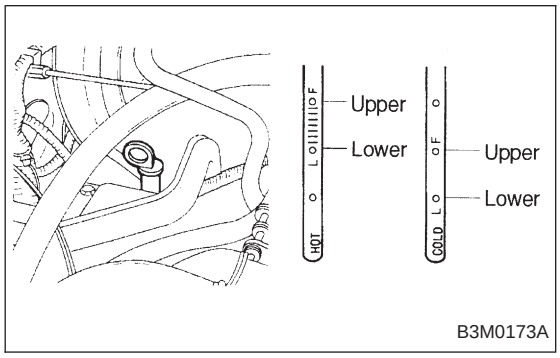
Airbag system wiring harness is routed near the transmission control module (TCM).

- **All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.**
- **Be careful not to damage Airbag system wiring harness when performing diagnostics and servicing the TCM.**

2. Pre-inspection

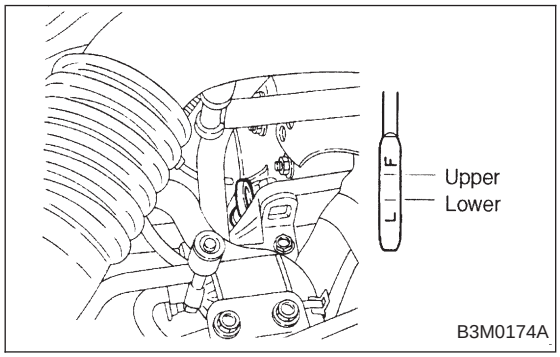
1. ATF LEVEL

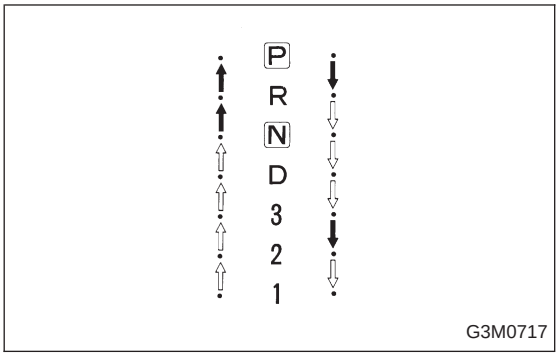
Make sure that ATF level is in the specification.



2. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification.





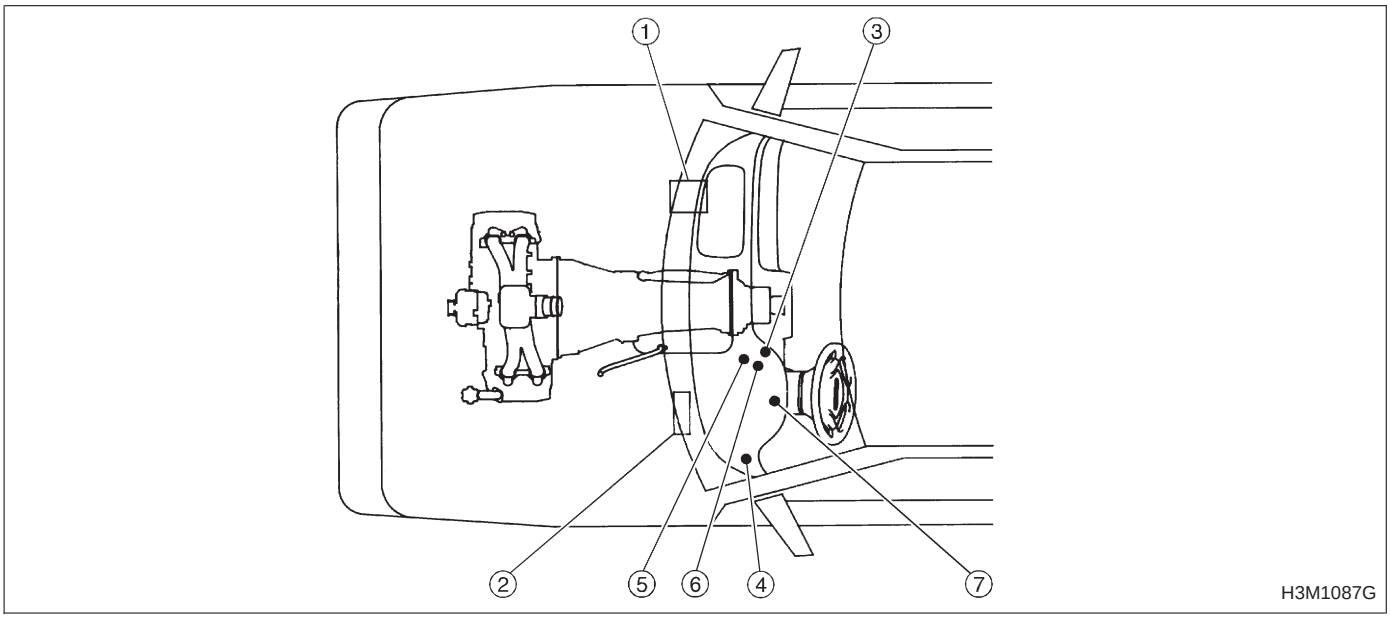
3. OPERATION OF SHIFT SELECTOR LEVER

WARNING:
Stop the engine while checking operation of selector lever.

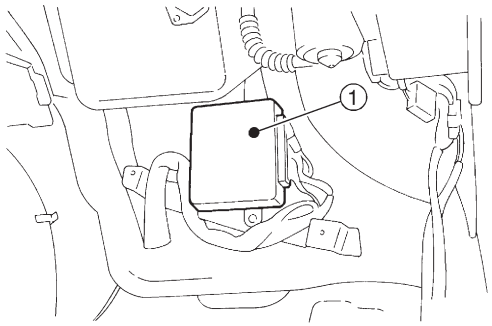
1) Check that selector lever does not move from “N” to “R” without pushing the button.
2) Check that selector lever does not move from “R” to “P” without pushing the button.
3) Check that selector lever does not move from “P” to “R” without pushing the button.
4) Check that selector lever does not move from “3” to “2” without pushing the button.

3. Electrical Components Location

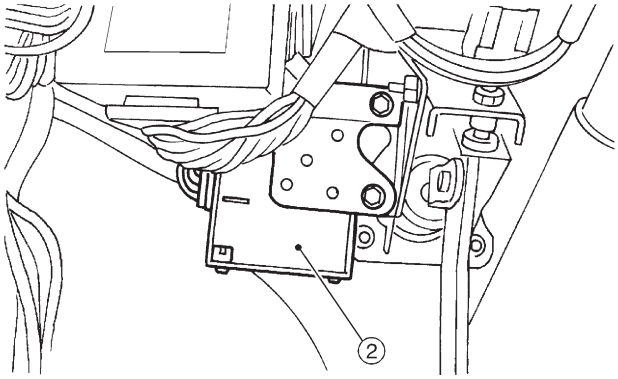
1. MODULE



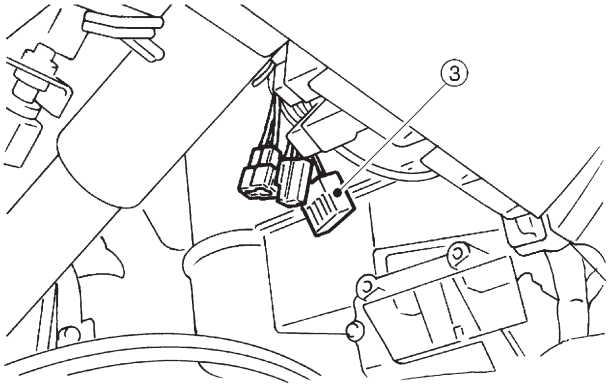
① ECM
② TCM
③ Data link connector (for Subaru select monitor only)
④ Data link connector (for Subaru select monitor and OBD-II general scan tool)
⑤ Diagnosis connector
⑥ Diagnosis terminal
⑦ AT OIL TEMP indicator light (AT diagnostic indicator light)



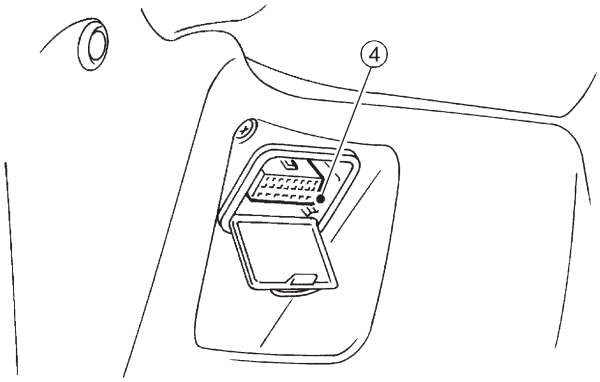
B3M0183D



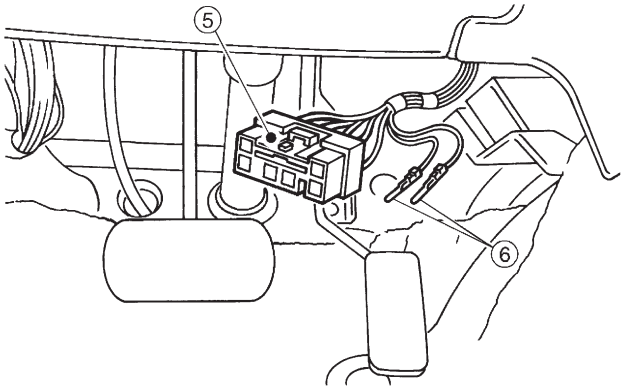
B3M0443I



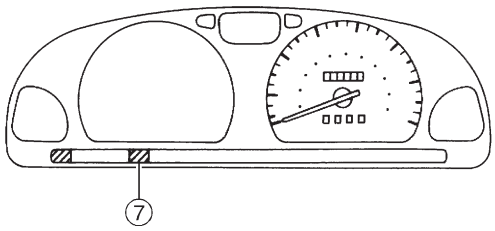
H2M1133C



H2M1134E

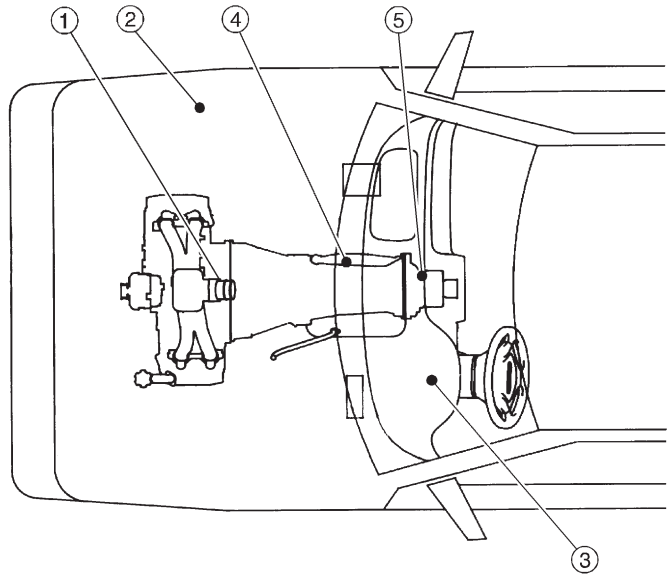


H3M1161E



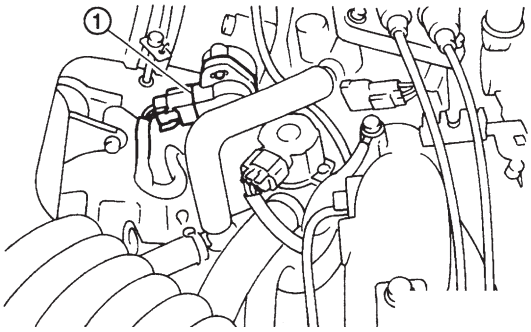
H2M1135F

2. SENSOR

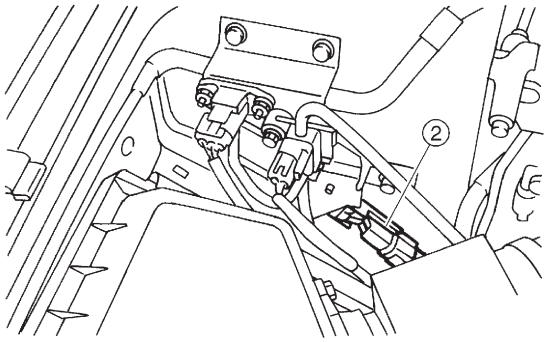


H3M1087H

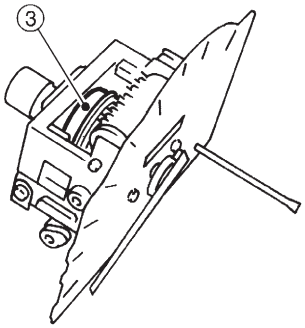
① Throttle position sensor
② Dropping resistor
③ Vehicle speed sensor 2
④ Inhibitor switch
⑤ Vehicle speed sensor 1



B2M0155A

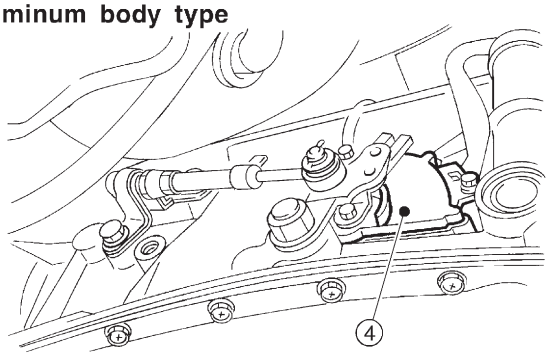


OBD0046A

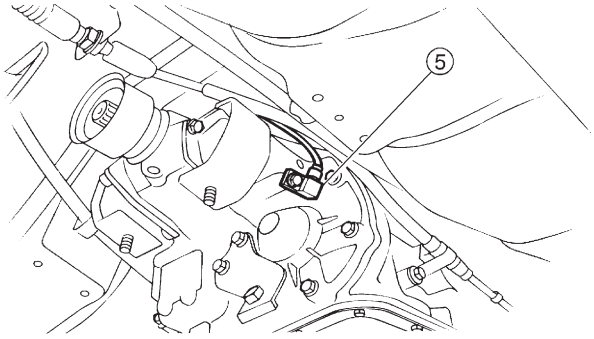


H2M1144B

Aluminum body type

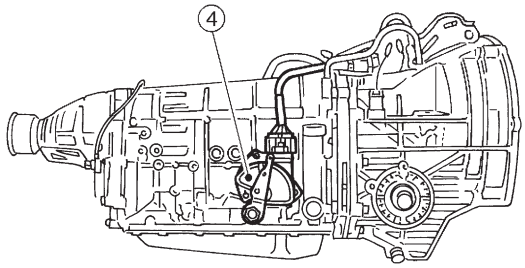


B3M0182C



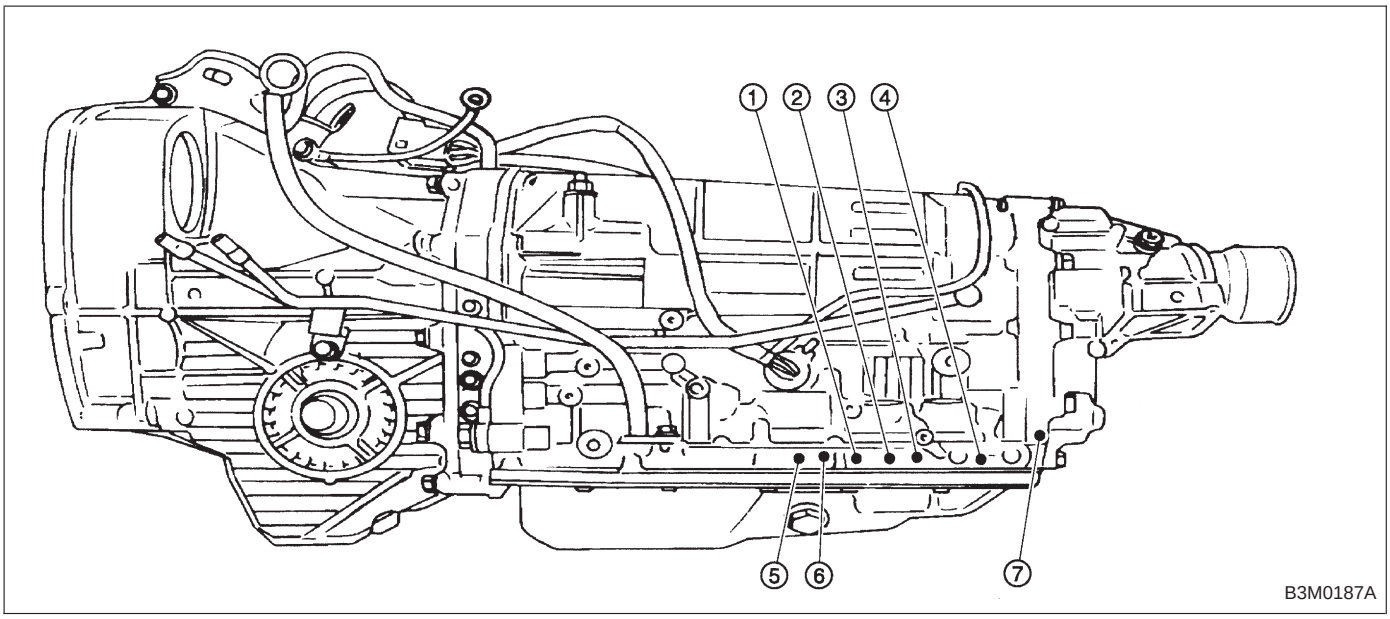
B3M0184D

Plastic body type

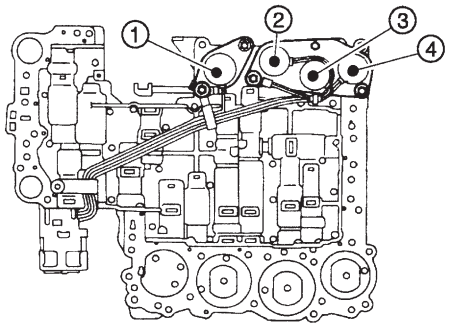


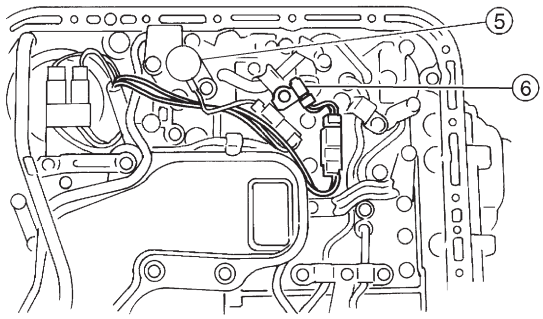
B2M1043C

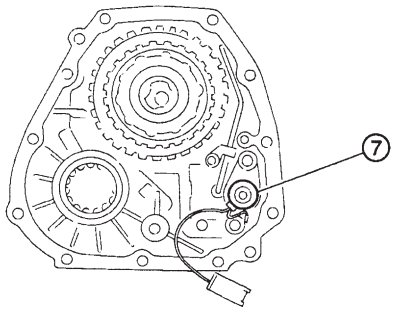
3. SOLENOID



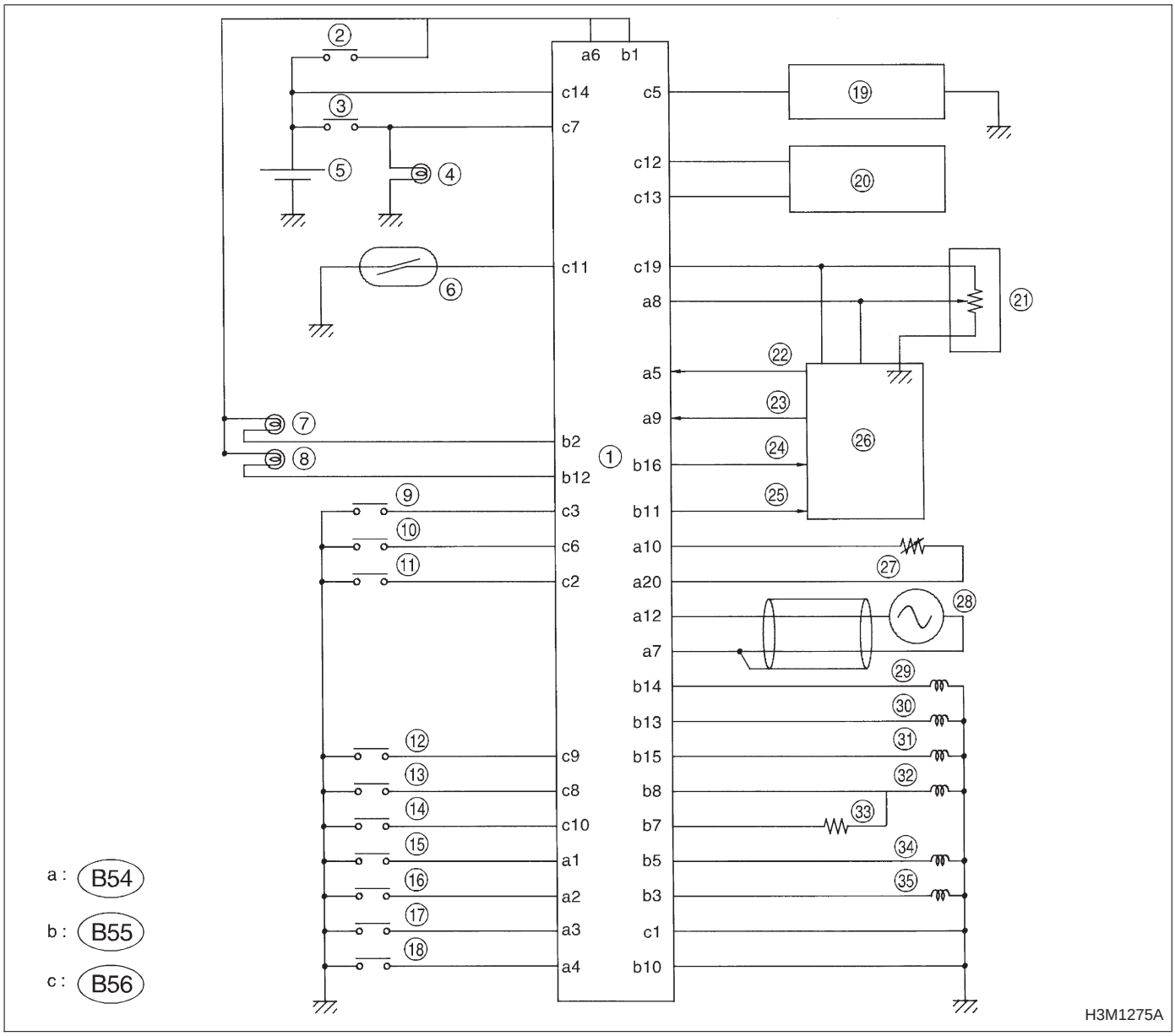
① Duty solenoid A
② Solenoid 2
③ Solenoid 1
④ Solenoid 3
⑤ Duty solenoid B
⑥ ATF temperature sensor
⑦ Duty solenoid C (AWD)





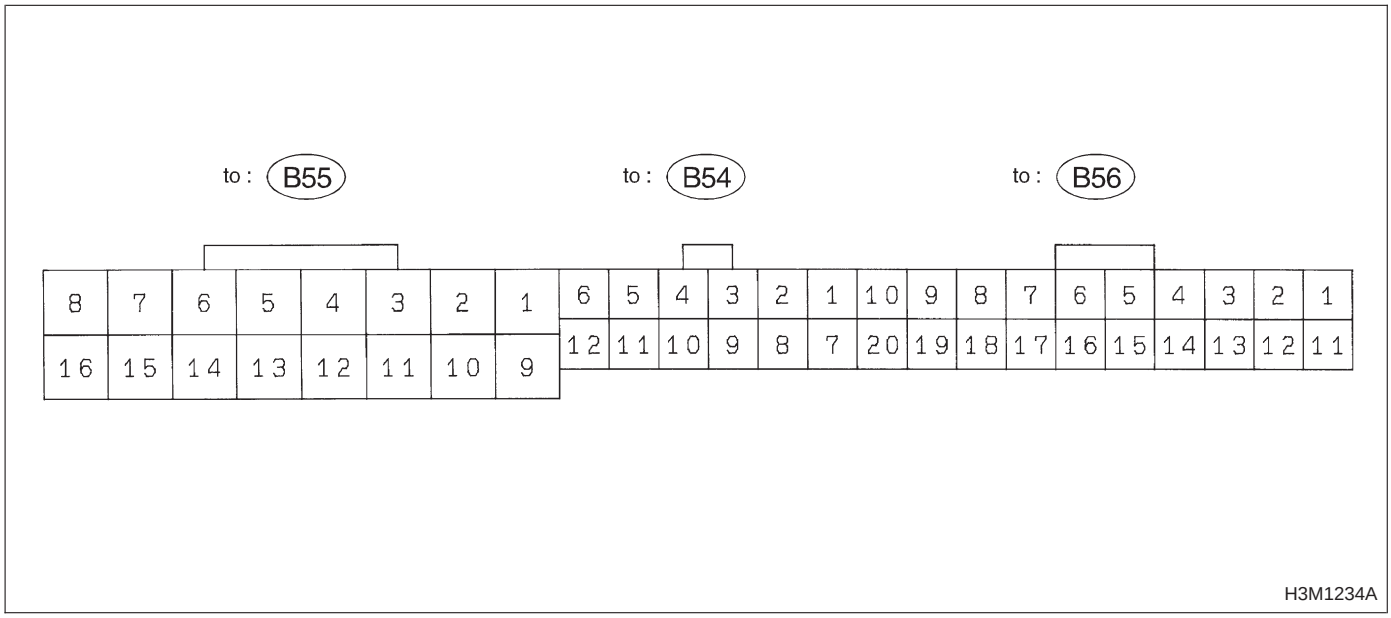


4. Schematic



① Transmission control module
② Ignition switch
③ Brake switch
④ Brake light
⑤ Battery
⑥ Vehicle speed sensor 2
⑦ FWD indicator light
⑧ AT OIL TEMP indicator light
⑨ Cruise set switch
⑩ Diagnosis switch
⑪ FWD switch
⑫ “P” range switch
⑬ “R” range switch
⑭ “N” range switch
⑮ “D” range switch
⑯ “3” range switch
⑰ “2” range switch
⑱ “1” range switch
⑲ ABS control module
⑳ Data link connector
㉑ Throttle position sensor
㉒ Engine speed signal
㉓ Mass air flow signal
㉔ Torque control signal
㉕ AT diagnostics signal
㉖ Engine control module
㉗ ATF temperature sensor
㉘ Vehicle speed sensor 1
㉙ Shift solenoid 1
㉚ Shift solenoid 2
㉛ Shift solenoid 3
㉜ Duty solenoid A
㉝ Dropping resistor
㉞ Duty solenoid B
㉟ Duty solenoid C

5. Transmission Control Module (TCM) I/O Signal



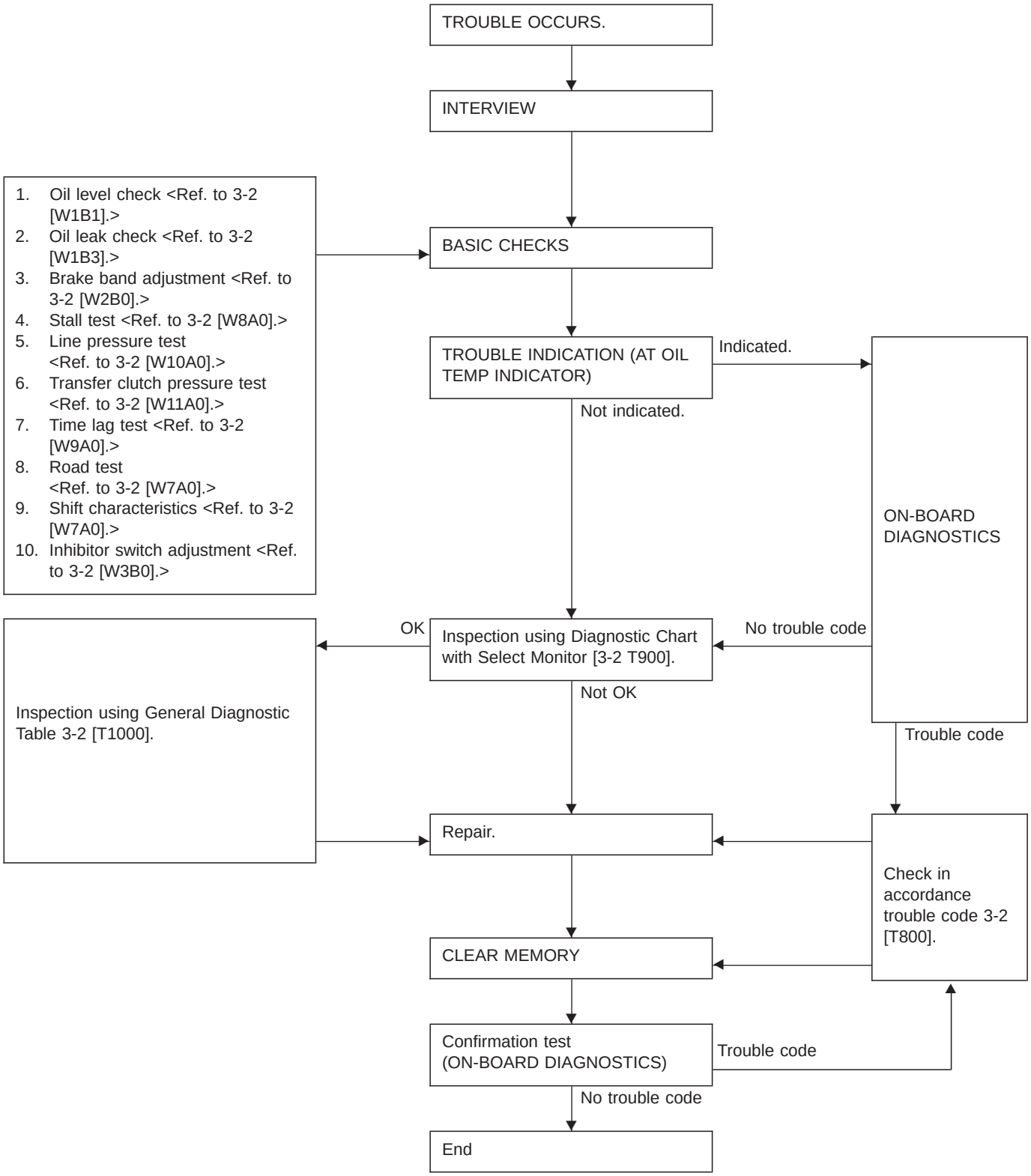
Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Back-up power supply		B56	14	Ignition switch OFF	10 — 16
Ignition power supply		B54	6	Ignition switch ON (with engine OFF)	10 — 16
		B55	1		
Inhibitor switch	“P” range switch	B56	9	Select lever in “P” range	Less than 1
				Select lever in any other than “P” range (except “N” range)	More than 8
	“N” range switch	B56	8	Select lever in “N” range	Less than 1
				Select lever in any other than “N” range (except “P” range)	More than 8
	“R” range switch	B56	10	Select lever in “R” range	Less than 1
				Select lever in any other than “R” range	More than 6
	“D” range switch	B54	1	Select lever in “D” range	Less than 1
				Select lever in any other than “D” range	More than 6
	“3” range switch	B54	2	Select lever in “3” range	Less than 1
				Select lever in any other than “3” range	More than 6
	“2” range switch	B54	3	Select lever in “2” range	Less than 1
				Select lever in any other than “2” range	More than 6
	“1” range switch	B54	4	Select lever in “1” range	Less than 1
				Select lever in any other than “1” range	More than 6
Diagnosis switch		B56	6	Diagnosis connector connected	Less than 1
				Diagnosis connector disconnected	More than 6
Brake switch		B56	7	Brake pedal depressed.	More than 10.5
				Brake pedal released.	Less than 1
ABS signal		B56	5	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5
AT diagnostic signal		B55	11	Ignition switch ON (With engine OFF)	Less than 1
				Ignition switch ON (With engine ON)	More than 10

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B54	8	Throttle fully closed.	0.5±0.2	—
			Throttle fully open.	4.6±0.3	
Throttle position sensor power supply	B56	19	Ignition switch ON (With engine OFF)	5.05±0.25	—
ATF temperature sensor	B54	10	ATF temperature 20°C (68°F)	3.45±0.55	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	1.2±0.2	272 — 374
Vehicle speed sensor 1	B54	12	Vehicle stopped.	0	450 — 720
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed sensor 2	B56	11	When vehicle is slowly moved at least 2 meters (7ft).	Less than 1↔More than 4	—
Engine speed signal	B54	5	Ignition switch ON (with engine OFF).	More than 10.5	—
			Ignition switch ON (with engine ON).	8 — 11	
Cruise set signal	B56	3	When cruise control is set (SET lamp ON).	Less than 1	—
			When cruise control is not set (SET lamp OFF).	More than 6.5	
Torque control signal	B55	16	Ignition switch ON	5±1	—
Mass air flow signal	B54	9	Engine idling after warm-up	0.5 — 1.2	—
Shift solenoid 1	B55	14	1st or 4th gear	More than 9	20 — 32
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B55	13	1st or 2nd gear	More than 9	20 — 32
			3rd or 4th gear	Less than 1	
Shift solenoid 3	B55	15	Select lever in “N” range (with throttle fully closed).	Less than 1	20 — 32
			Select lever in “D” range (with throttle fully closed).	More than 9	
Duty solenoid A	B55	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B55	7	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	12 — 18
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Duty solenoid B	B55	5	When lock up occurs.	More than 8.5	9 — 17
			When lock up is released.	Less than 0.5	
Duty solenoid C	B55	3	Fuse on FWD switch	More than 8.5	9 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
Sensor ground line 1	B54	7	—	0	Less than 1
Sensor ground line 2	B56	20	—	0	Less than 1
System ground line	B56	1	—	0	Less than 1
Power system ground line	B55	10	—	0	Less than 1
FWD switch	B56	2	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	

6. Diagnostic Chart for On-board Diagnostics System

A: BASIC DIAGNOSTICS PROCEDURE

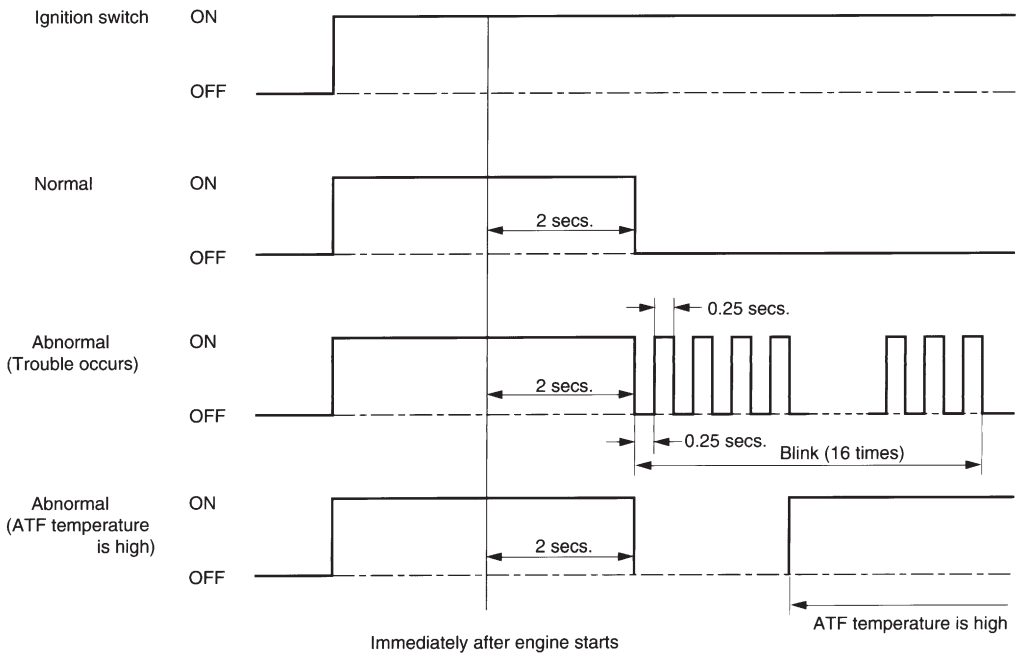


B: ABNORMAL DISPLAY ON AT OIL TEMP INDICATOR

When any on-board diagnostics item is malfunctioning, the display on the AT OIL TEMP indicator blinks immediately after the engine starts.
The malfunctioning part or unit can be determined by a trouble code during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function.
If the AT OIL TEMP indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using the select monitor.
Indicator signal is as shown in the figure.

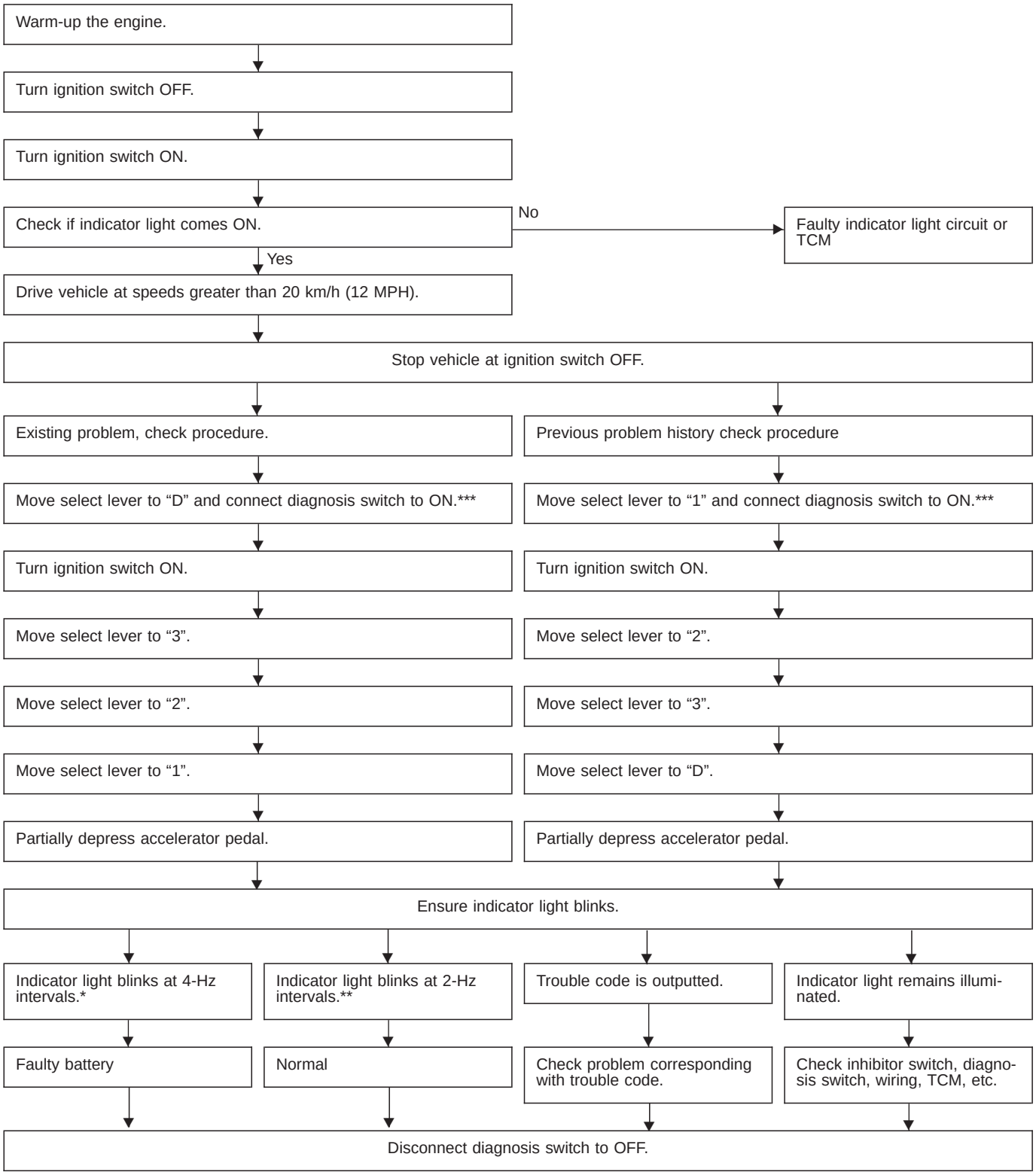
WARNING:

Warning can be noticed only when the engine is initially started.



H3H1066

C: ON-BOARD DIAGNOSTICS



* : Blinks every 0.125 (1/8) seconds (until ignition switch is turned OFF).
** : Blinks every 0.25 (1/4) seconds (until ignition switch is turned OFF).
***: Plug in diagnosis terminal to diagnosis connector No. 5 located below instrument lower cover.

7. Diagnostics for On-board Diagnostics Failed

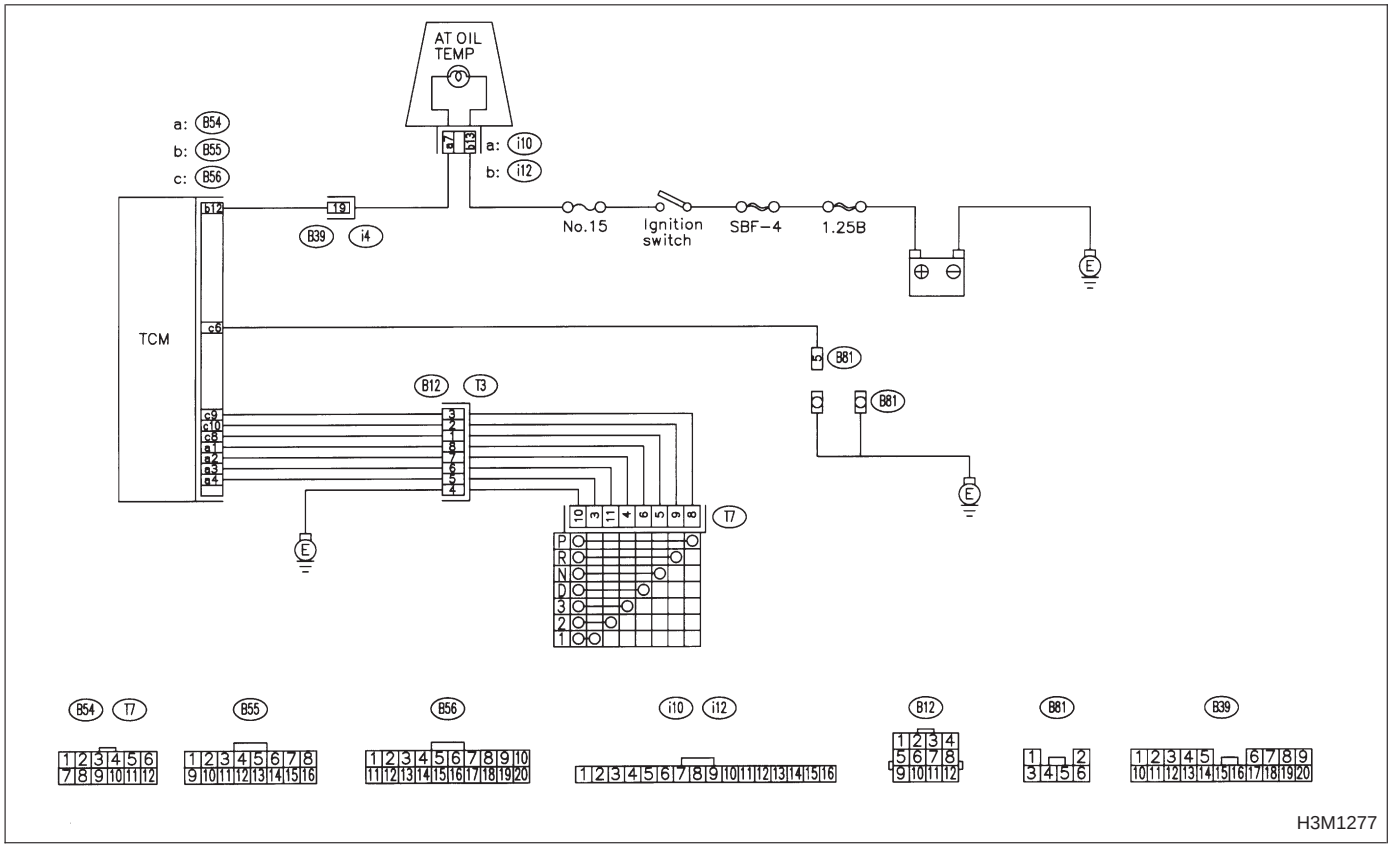
A: AT OIL TEMP INDICATOR LIGHT

DIAGNOSIS:

● The AT OIL TEMP indicator light circuit is open or shorted.

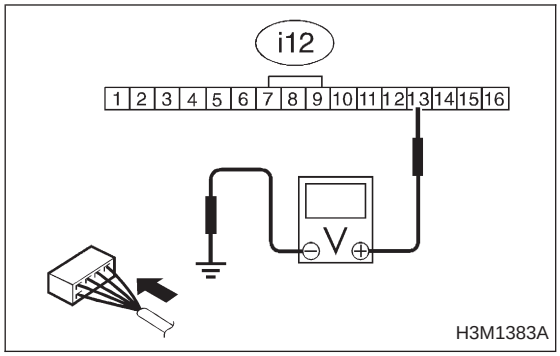
TROUBLE SYMPTOM:

● When ignition switch is turned to ON (engine OFF), AT OIL TEMP indicator light does not illuminate.
..... TROUBLE 1
● When on board diagnostics is performed, AT OIL TEMP indicator light remains illuminated. ..... TROUBLE 2



7A1	CLASSIFY THE MALFUNCTION. IS IT TROUBLE 1 OR TROUBLE 2?

If the malfunction shows TROUBLE 1, go to **7A2**.
If the malfunction shows TROUBLE 2, go to **7A5**.



7A2	CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.

1) Turn ignition switch to OFF.
2) Remove combination meter.
3) Turn ignition switch to ON (engine OFF).
4) Measure voltage between combination meter connector and chassis ground.

Connector & terminal
(i12) No. 13 (+) — Chassis ground (−):

CHECK ***: Is voltage more than 10 V?***

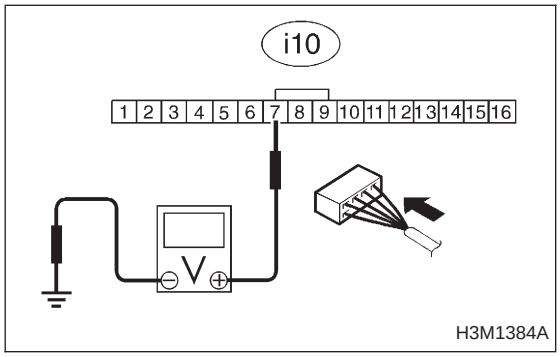
YES : Go to next CHECK .

NO : Check the following and repair if necessary.

- Check that fuse (No. 15) is not blown out.

NOTE:
If replaced fuse (No. 15) blows out easily, check the harness for short circuit between fuse (No. 15) and combination meter.

- Check that harness from fuse to combination meter is not open.



Connector & terminal
(i10) No. 7 (+) — Chassis ground (−):

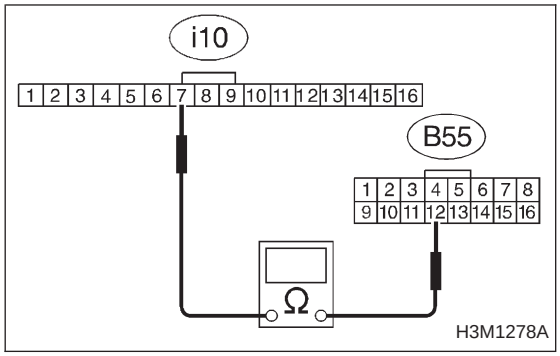
CHECK ***: Is voltage less than 1 V?***

YES : Go to step **7A3**.

NO : Replace bulb or combination meter.

7A3	CHECK OPEN CIRCUIT OF HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM and combination meter connector.



3) Measure resistance of harness between TCM and combination meter.

Connector & terminal
(B55) No. 12 — (i10) No. 7:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **7A4**.

NO : Repair harness connector.

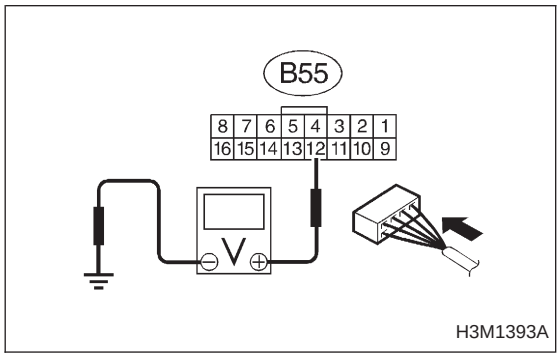
NOTE:
In this case, repair the following:

● Open circuit in harness between TCM and combination meter.
● Poor contact in coupling connector (B39).

7A4	CHECK INPUT SIGNAL FROM TCM.

1) Turn ignition switch to OFF.
2) Connect connector to TCM and combination meter.
3) Install combination meter.
4) Turn ignition switch to ON (engine OFF).
5) Measure voltage between TCM connector and chassis ground.

Connector & terminal
(B55) No. 12 (+) — Chassis ground (−):



CHECK ***: Is the voltage less than 1 V?***

YES : Even if AT OIL TEMP indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

NO : Replace TCM.

7A5	CHECK INHIBITOR SWITCH.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Turn ignition switch to ON.
4) Subaru Select Monitor to ON.
5) Read data on Subaru Select Monitor.
6) Designate mode using function key.

Function mode FA1

● FA1: Check the range switch ON ↔ OFF signal.

CHECK ***: When each range is selected, does LED of Subaru Select Monitor light up?***

YES : Go to step **7A6**.

NO : Check inhibitor switch circuit.

NOTE:
For the diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

7A6	CHECK DIAGNOSIS SWITCH.

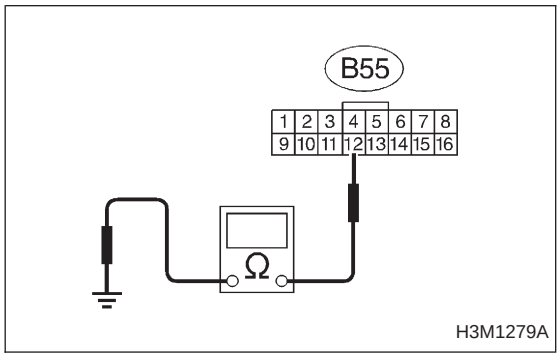
1) Designate mode using function key.
Function mode FA1
● FA1: Check diagnosis switch (SS) ON ↔ OFF signal.
2) Diagnosis switch to ON.

CHECK ***: Does LED of diagnosis switch on Subaru Select Monitor light up?***

YES : Go to step **7A7**.

NO : Check diagnosis switch circuit.

NOTE:
For the diagnosis procedure on diagnosis switch circuit, refer to 3-2 [T9R0].



7A7	CHECK SHORT CIRCUIT OF HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Remove combination meter.
4) Disconnect connector from combination meter.
5) Measure resistance of harness connector between TCM and combination meter.

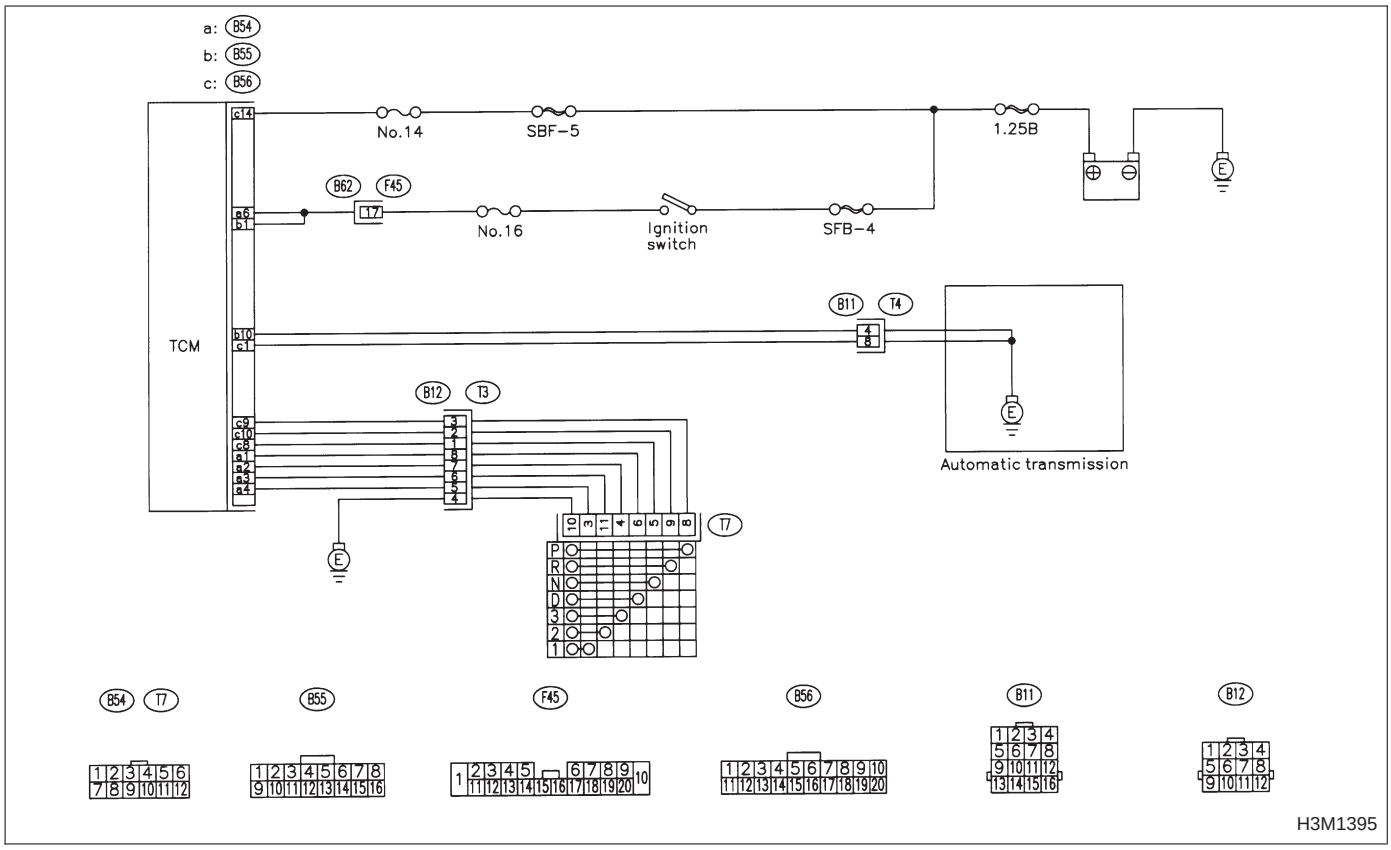
Connector & terminal/specified resistance (B55) No. 12 — Chassis ground:

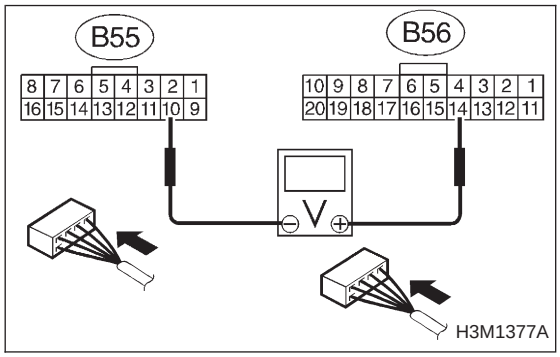
CHECK ***: Is the resistance less than 1 MΩ?***

YES : Replace TCM.

NO : Repair short circuit in harness between combination meter connector and TCM connector.

B: CONTROL MODULE POWER SUPPLY AND GROUND LINE



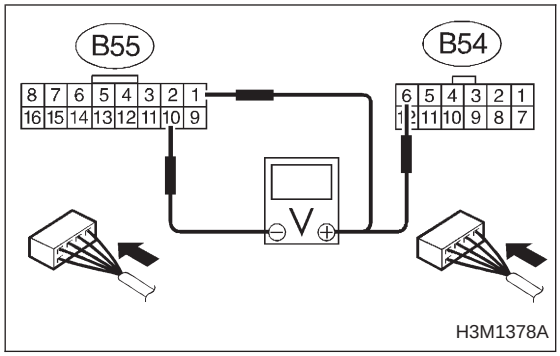


7B1	CHECK BACK-UP POWER SUPPLY CIRCUIT.

1) Turn ignition switch to OFF.
2) Measure back-up power supply voltage between TCM connector terminal.

Connector & terminal
(B56) No. 14 (+) — (B55) No. 10 (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to next CHECK .
NO : Repair harness of back-up power supply circuit.
CHECK ***: Is there poor contact of TCM connector?***
YES : Repair poor contact in TCM connector.
NO : Go to step **7B2**.

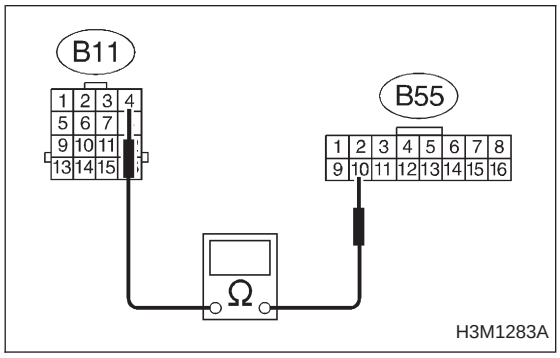


7B2	CHECK IGNITION POWER SUPPLY CIRCUIT.

1) Turn ignition switch to ON (engine OFF).
2) Measure ignition power supply voltage between TCM connector terminal.

Connector & terminal
(B54) No. 6 (+) — (B55) No. 10 (−):
(B55) No. 1 (+) — No. 10 (−):

CHECK ***: Is the voltage more than 10 V?***
YES : Go to next CHECK .
NO : Repair harness of ignition power supply circuit.
CHECK ***: Is there poor contact of TCM connector?***
YES : Repair poor contact in TCM connector.
NO : Go to step **7B3**.

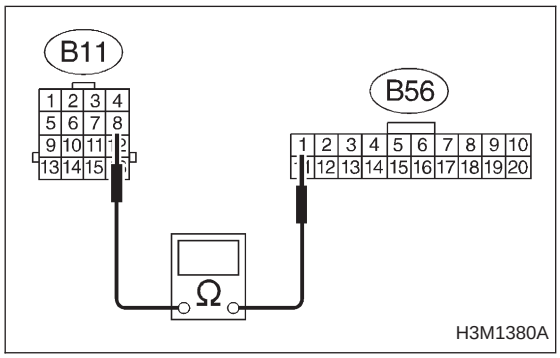


7B3	CHECK HARNESS CONNECTOR BETWEEN TCM, INHIBITOR SWITCH AND TRANSMISSION.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM, transmission and inhibitor switch.
3) Measure resistance between TCM connector.

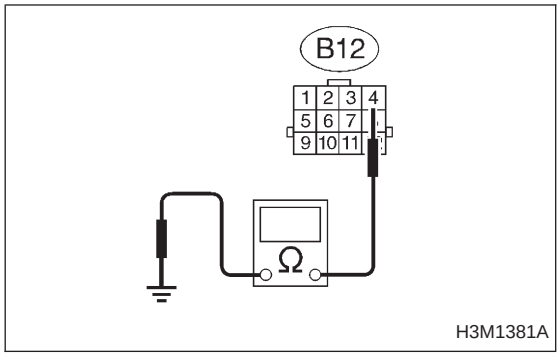
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission.



Connector & terminal
(B56) No. 1 — (B11) No. 8:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair open circuit in harness between TCM and transmission.

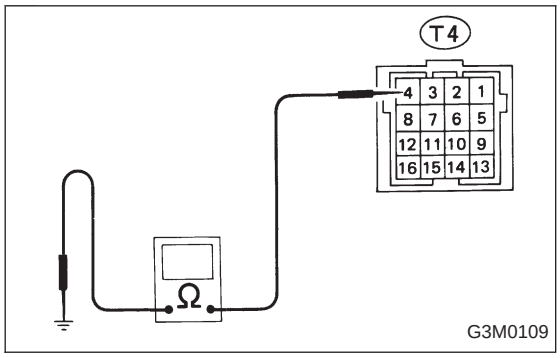


Connector & terminal
(B12) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **7B4**.

NO : Repair open circuit in harness between TCM and transmission.



7B4	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.**

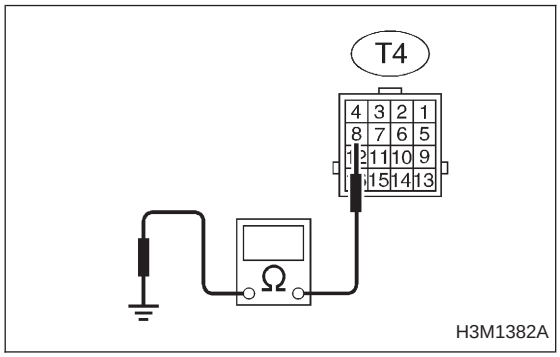
1) Drain automatic transmission fluid.
2) Remove oil pan.
3) Measure resistance of harness between transmission and transmission ground.

Connector & terminal
(T4) No. 4 — Transmission ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair open circuit in harness between transmission and transmission ground.



Connector & terminal
(T4) No. 8 — Transmission ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Repair transmission ground terminal.

NO : Repair open circuit in harness between transmission and transmission ground.

8. Diagnostic Chart with Trouble Code

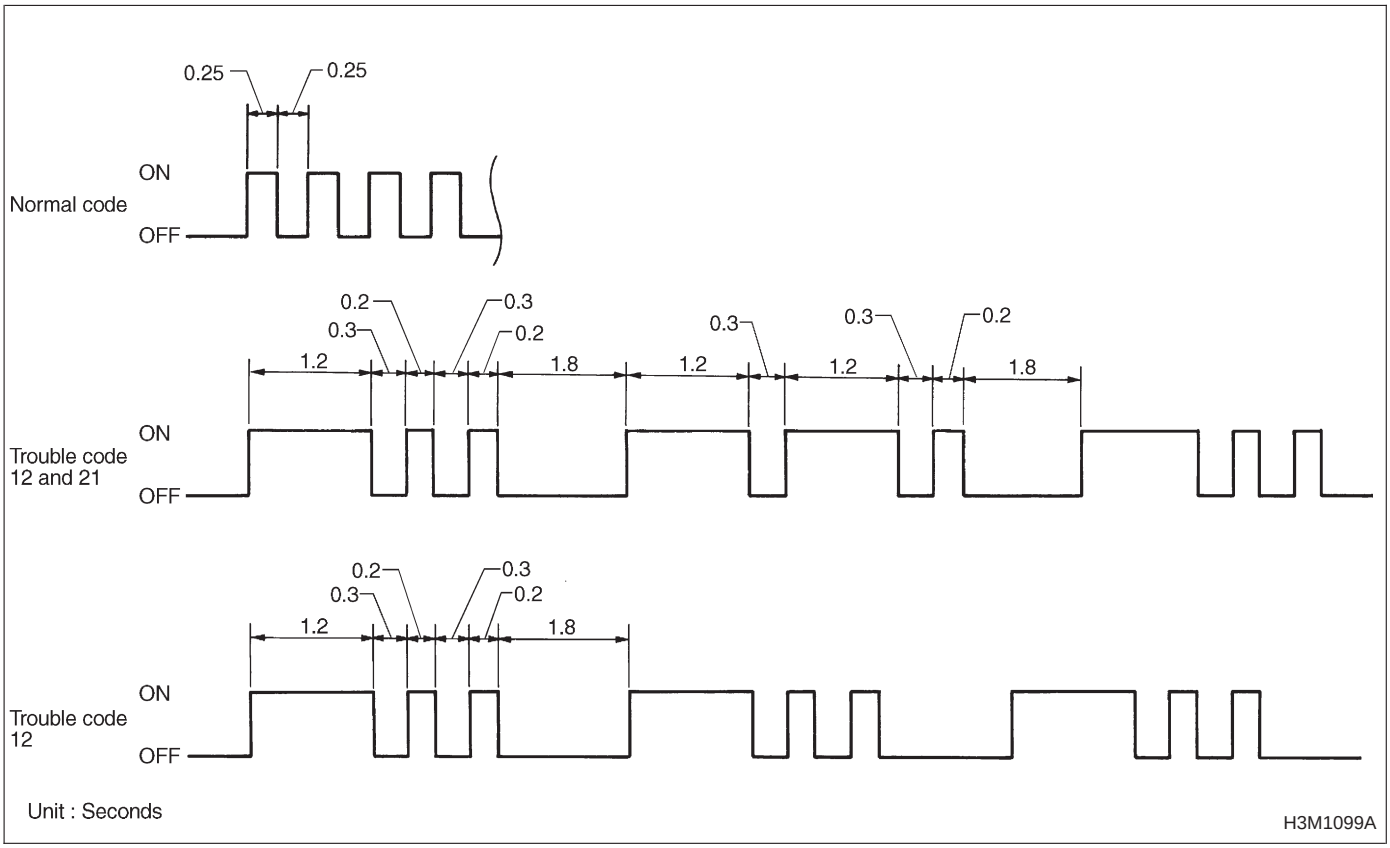
A: LIST OF TROUBLE CODE

1. TROUBLE CODE

Trouble code	Item	Content of diagnosis	Abbr. (Select monitor)	Page
11	Duty solenoid A	Detects open or shorted drive circuit, as well as valve seizure.	PL	24
12	Duty solenoid B	Detects open or shorted drive circuit, as well as valve seizure.	L/U	33
13	Shift solenoid 3	Detects open or shorted drive circuit, as well as valve seizure.	OVR	41
14	Shift solenoid 2	Detects open or shorted drive circuit, as well as valve seizure.	SFT2	47
15	Shift solenoid 1	Detects open or shorted drive circuit, as well as valve seizure.	SFT1	52
21	ATF temperature sensor	Detects open or shorted input signal circuit.	ATFT	57
22	Mass air flow signal	Detects open or shorted input signal circuit.	AFM	64
23	Engine speed signal	Detects open or shorted input signal circuit.	EREV	67
24	Duty solenoid C	Detects open or shorted drive circuit, as well as valve seizure.	4WD	70
25	Torque control signal	Detects open or shorted input signal circuit.	TQ.CT	76
31	Throttle position sensor	Detects open or shorted input signal circuit.	THV	78
32	Vehicle speed sensor 1	Detects open or shorted input signal circuit.	VSP1	85
33	Vehicle speed sensor 2	Detects open or shorted input signal circuit.	VSP2	91

2. HOW TO READ TROUBLE CODE OF INDICATOR LIGHT

The AT OIL TEMP indicator light flashes the code corresponding to the faulty part.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.



B: CLEAR MEMORY

Current trouble codes shown on the display are cleared by turning the ignition switch OFF after conducting on-board diagnostics operation. Previous trouble codes, however, cannot be cleared since they are stored in the TCM memory which is operating on the back-up power supply. These trouble codes can be cleared by removing the specified fuse (located under the right lower portion of the instrument panel).

CLEAR MEMORY:

Removal of No. 14 fuse (for at least one minute)

- The No. 14 fuse is located in the line to the memory back-up power supply of the TCM and ECM (MFI). Removal of this fuse clears the previous trouble codes stored in the TCM and ECM (MFI) memory.
- Be sure to remove the No. 14 fuse for at least the specified length of time. Otherwise, trouble codes may not be cleared.

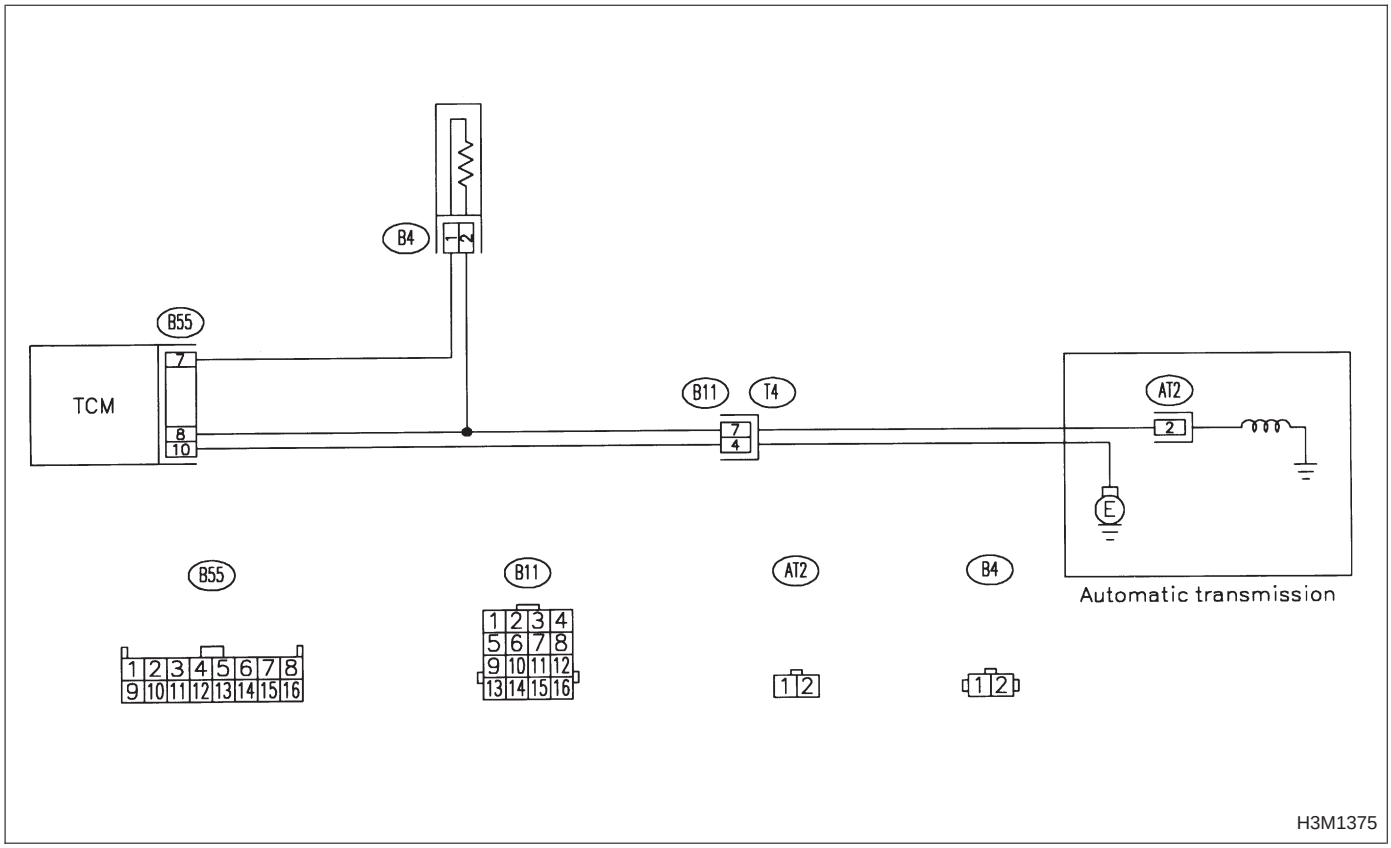
C: TROUBLE CODE 11 — DUTY SOLENOID A —

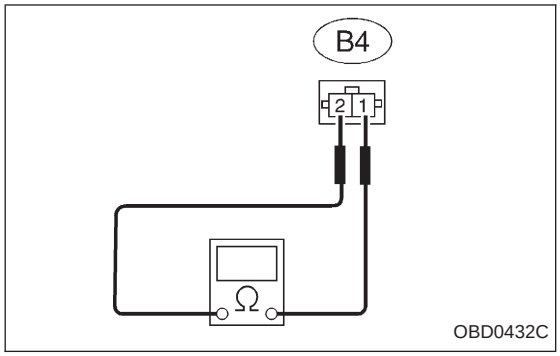
DIAGNOSIS:

Output signal circuit of duty solenoid A or resistor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.



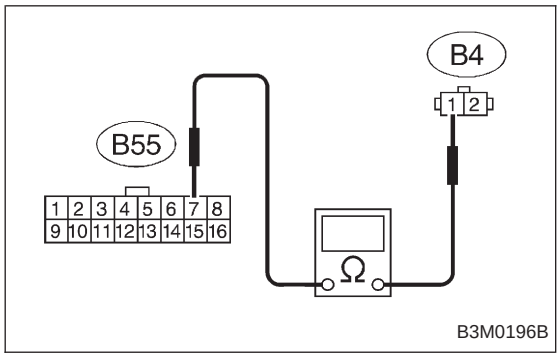


8C1	CHECK RESISTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from dropping resistor.
3) Measure resistance between dropping resistor terminal.

Terminals
(B4) No. 1 — No. 2:

CHECK ***: Is the resistance between 9 and 15 Ω?***
YES : Go to step **8C2**.
NO : Replace dropping resistor.



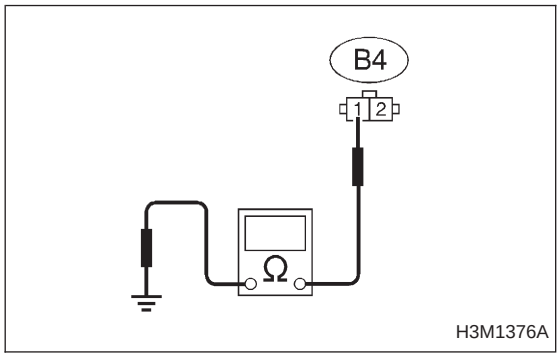
8C2	CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Measure resistance of harness between TCM connector and dropping resistor connector.

Connector & terminal
(B55) No. 7 — (B4) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next step 4).
NO : Repair harness and connector.

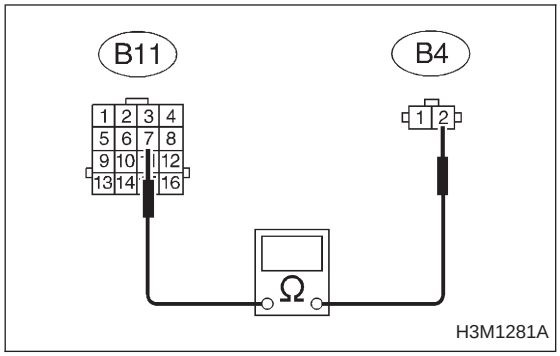
NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and dropping resistor connector.
- Poor contact in TCM connector.
- Poor contact in dropping resistor connector.



4) Measure resistance of harness between dropping resistor connector and chassis ground.

Connector & terminal
(B4) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8C3**.
NO : Repair short circuit in harness between TCM and dropping resistor connector.



8C3	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.

1) Disconnect connector from transmission.
2) Measure resistance of harness between transmission and dropping resistor connector.

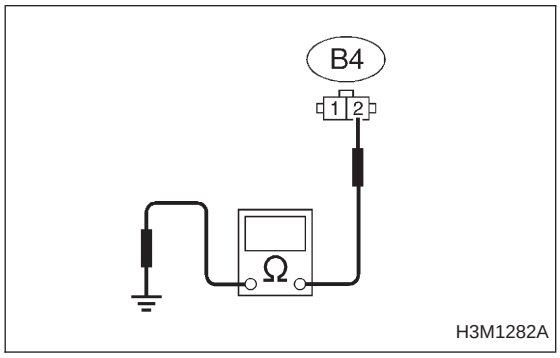
Connector & terminal
(B4) No. 2 — (B11) No. 7:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between dropping resistor and transmission connector.
- Poor contact in transmission connector.
- Poor contact in dropping resistor connector.



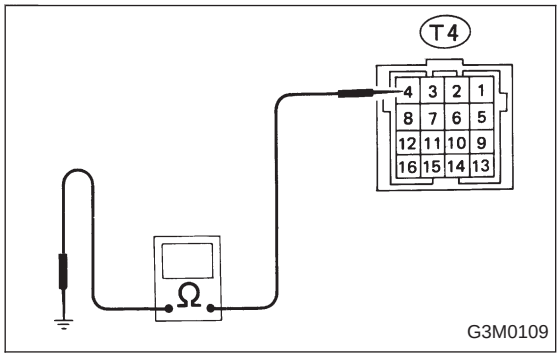
3) Measure resistance of harness between dropping resistor connector and chassis ground.

Connector & terminal
(B4) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8C4**.

NO : Repair short circuit in harness between dropping resistor and transmission connector.



8C4	CHECK DUTY SOLENOID A GROUND LINE.

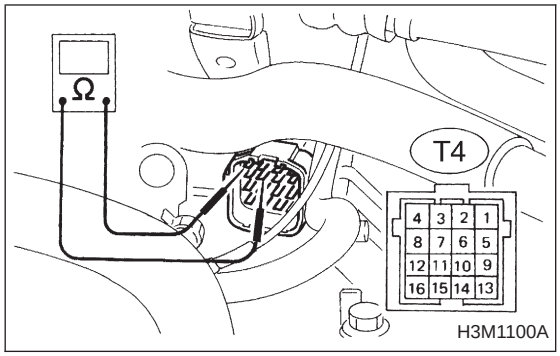
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission ground.

Connector & terminal
(T4) No. 4 — Transmission ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8C5**.

NO : Repair open circuit in transmission harness connector.



8C5	CHECK DUTY SOLENOID A.

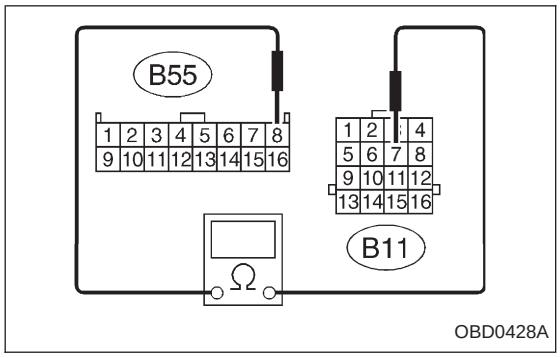
Measure resistance between transmission connector receptacle's terminals.

Connector & terminal
(T4) No. 7 — No. 4:

CHECK ***: Is the resistance between 1.5 and 4.5 Ω?***

YES : Go to step **8C6**.

NO : Go to step **8C8**.



8C6	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Turn ignition switch to OFF.
2) Disconnect connectors from transmission and TCM.
3) Measure resistance of harness between TCM and transmission connector.

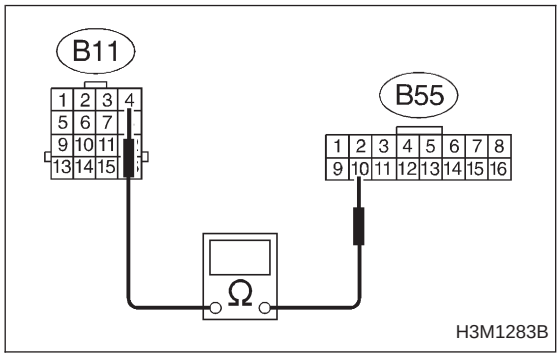
Connector & terminal
(B55) No. 8 — (B11) No. 7:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



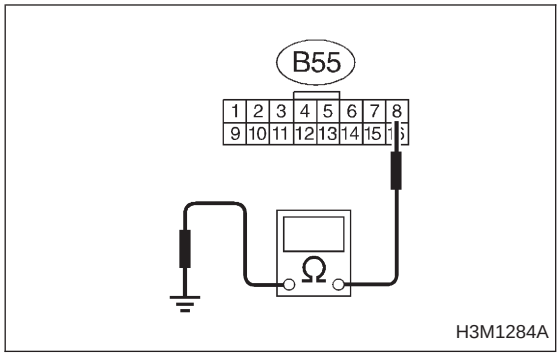
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.

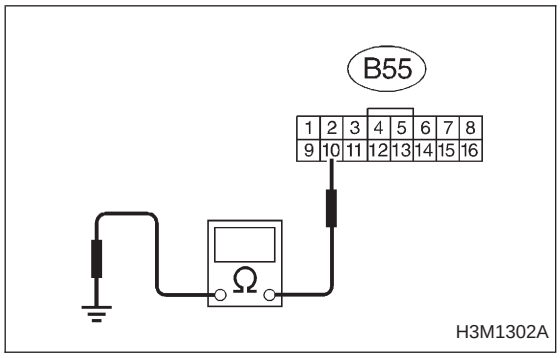


Connector & terminal
(B55) No. 8 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8C7**.

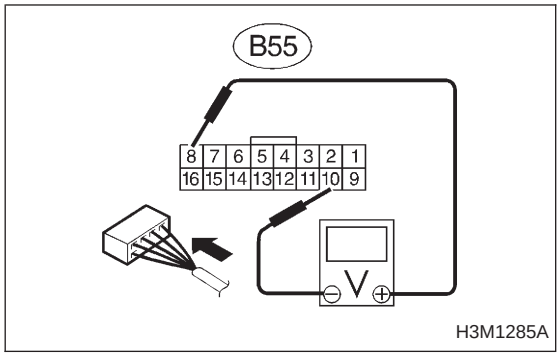
NO : Repair short circuit harness between TCM and transmission connector.

8C7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.**

1) Turn ignition switch to OFF.
2) Connect connectors to TCM, transmission and dropping resistor.
3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

4) Turn ignition switch to ON (engine OFF).
5) Move selector lever to “N”.



6) Measure voltage between TCM connector terminal.

Connector & terminal
(B55) No. 8 (+) — No. 10 (−):

CHECK ***: Is the voltage between 1.5 and 4.0 V with throttle fully closed?***

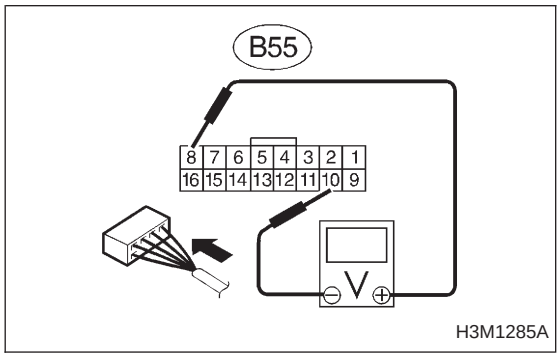
YES : Go to next step CHECK1 .

NO : Go to next CHECK .

CHECK ***: Is the voltage between 1.5 and 4.0 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



Connector & terminal
(B55) No. 8 (+) — No. 10 (−):

CHECK1 ***: Is the voltage less than 1 V with throttle fully open?***

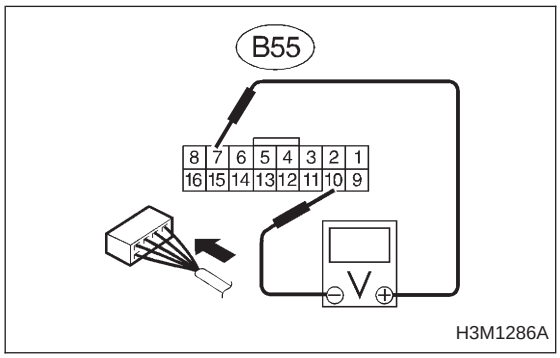
YES : Go to next step CHECK1 .

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



Connector & terminal
(B55) No. 7 (+) — No. 10 (−):

CHECK1 ***: Is the voltage between 5 and 14 V with throttle fully closed?***

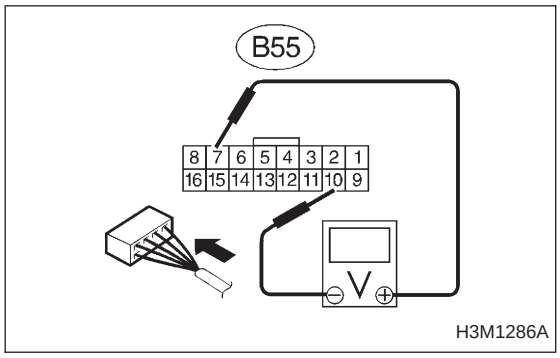
YES : Go to next step CHECK1 .

NO : Go to next CHECK .

CHECK ***: Is the voltage between 5 and 14 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



Connector & terminal
(B55) No. 7 (+) — No. 10 (−):

CHECK1 ***: Is the voltage less than 1 V with throttle fully open?***

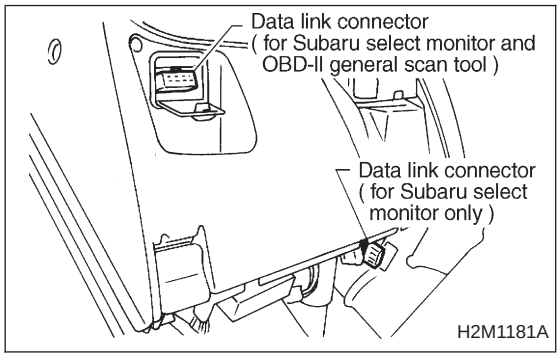
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 5 and 14 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



● Using Subaru Select Monitor

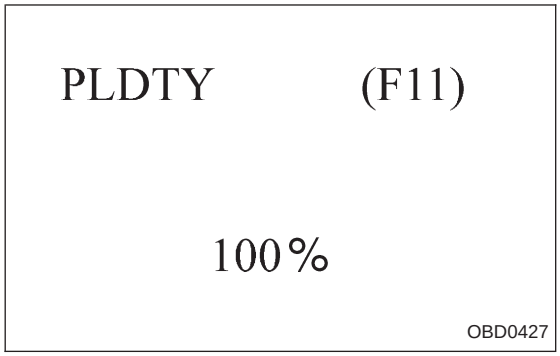
1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

6) Stop the engine and turn ignition switch to ON (engine OFF).
7) Move selector lever to “N”.
8) Read data on Subaru Select Monitor.
9) Designate mode using function key.

Function mode F11

● F11: Line pressure duty is indicated in “%”.



10) Throttle is fully closed.

CHECK ***: Is the value 100% in function mode F11?***

YES : Go to next step 11).

NO : Go to next CHECK .

CHECK ***: Is the value 100% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.



11) Throttle is fully open.

CHECK ***: Is the value 15% in function mode F11?***

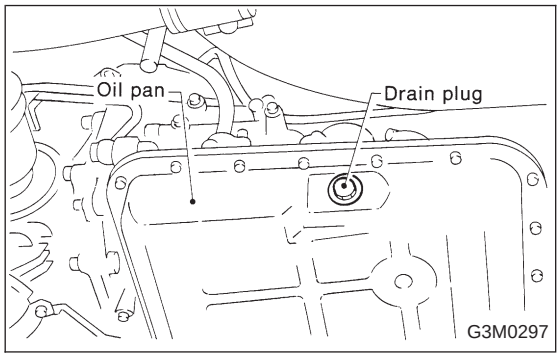
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

NO : Go to next CHECK .

CHECK ***: Is the value 15% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

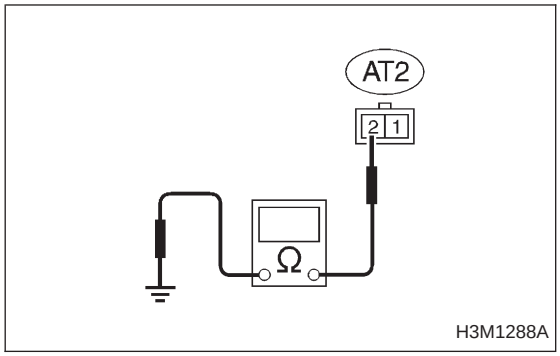


8C8	CHECK DUTY SOLENOID A (IN TRANSMISSION).

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

5) Remove oil pan, and disconnect connector from duty solenoid A.



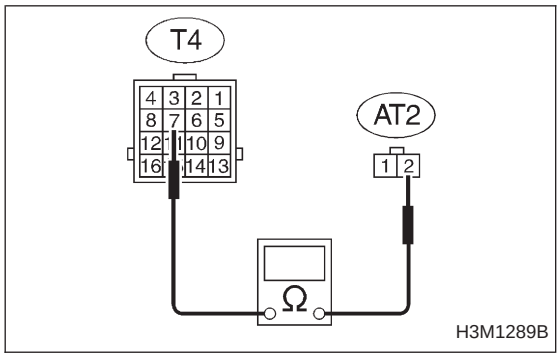
6) Measure resistance between duty solenoid A connector and transmission ground.

Terminal
(AT2) No. 2 — Transmission ground:

CHECK ***: Is the resistance 1.5 and 4.5 Ω?***

YES : Go to step **8C9**.

NO : Replace duty solenoid A.



8C9	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DUTY SOLENOID A.

1) Disconnect connector from transmission.
2) Measure resistance of harness between duty solenoid A and transmission connector.

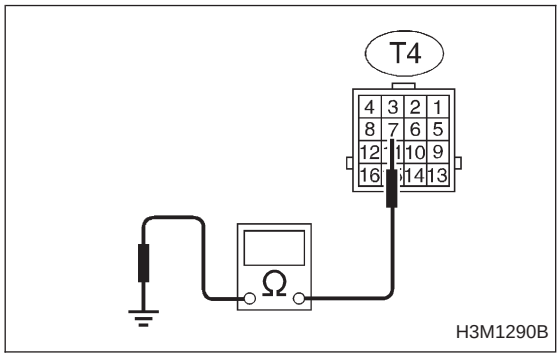
Connector & terminal
(T4) No. 7 — (AT2) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between duty solenoid A and transmission connector.
- Poor contact in duty solenoid A connector.
- Poor contact in transmission connector.



3) Measure resistance of harness between transmission connector and transmission ground.

Connector & terminal
(T4) No. 7 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in duty solenoid A and transmission connector.

NO : Repair short circuit in harness between duty solenoid A and transmission connector.

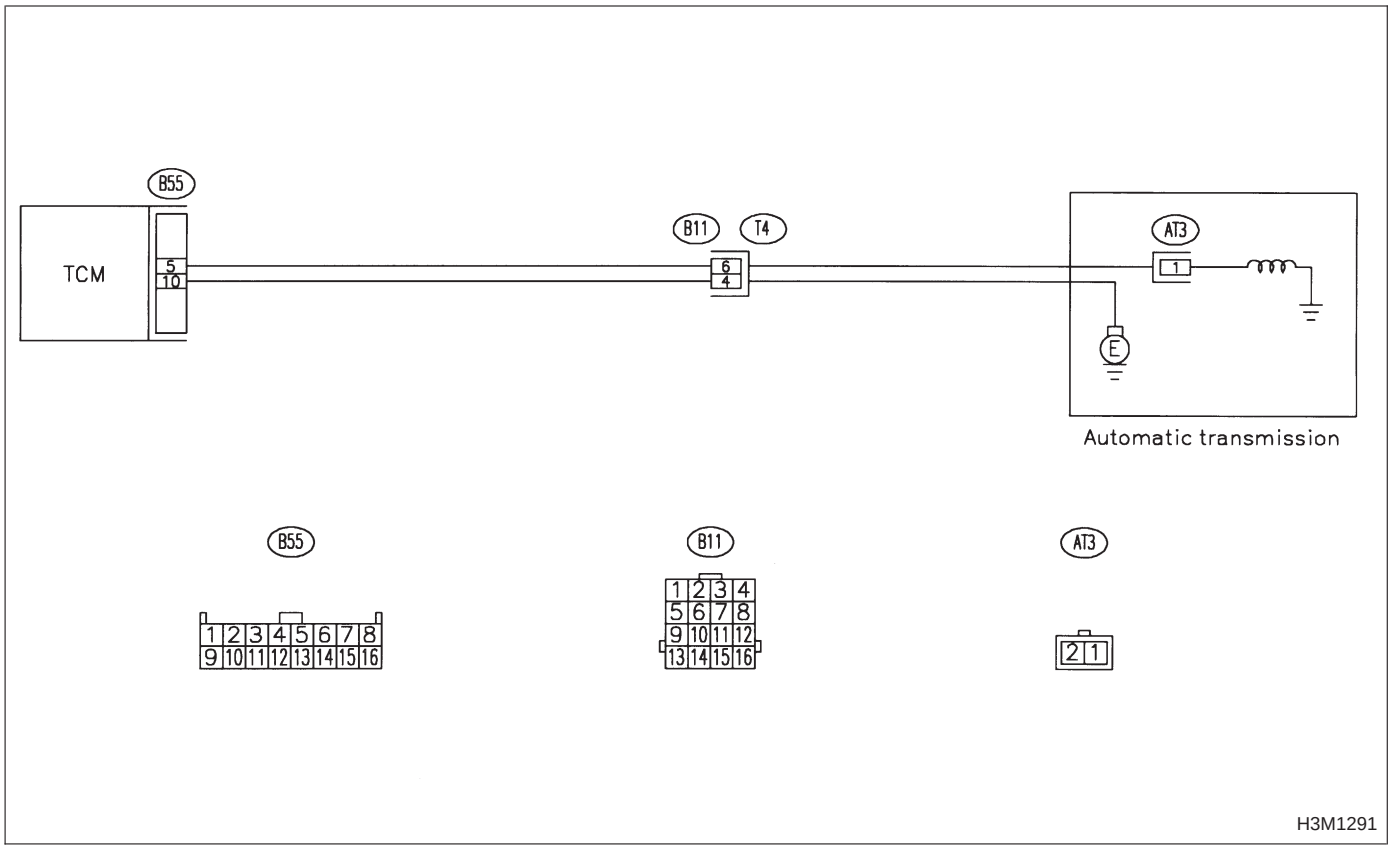
D: TROUBLE CODE 12 — DUTY SOLENOID B —

DIAGNOSIS:

Output signal circuit of duty solenoid B is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

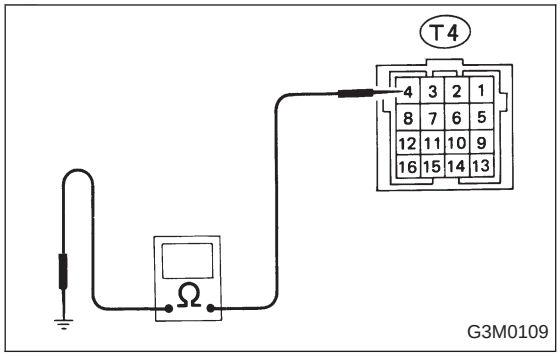


8D1	CHECK TROUBLE CODE.

CHECK ***: Do multiple trouble codes appear in the on-board diagnostics test mode?***

YES : Go to another trouble code.

NO : Go to step **8D2**.



8D2	CHECK DUTY SOLENOID B GROUND LINE.

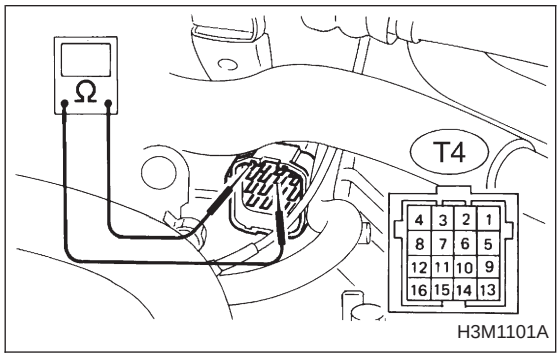
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector receptacle's terminals.

Connector & terminal
(T4) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8D3**.

NO : Repair open circuit in transmission harness connector.



8D3	CHECK DUTY SOLENOID B.

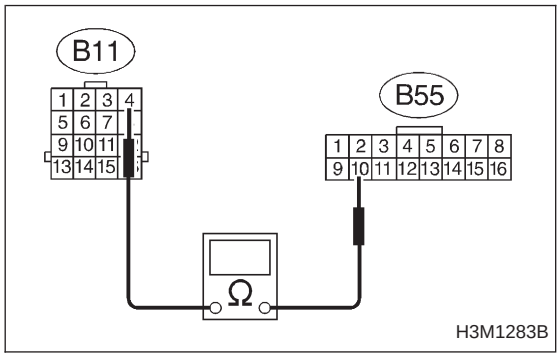
Measure resistance between transmission connector receptacle's terminals.

Connector & terminal
(T4) No. 6 — No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8D4**.

NO : Go to step **8D7**.



8D4	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Turn ignition switch to OFF.
2) Disconnect connectors from transmission and TCM.
3) Measure resistance of harness between TCM and transmission connector.

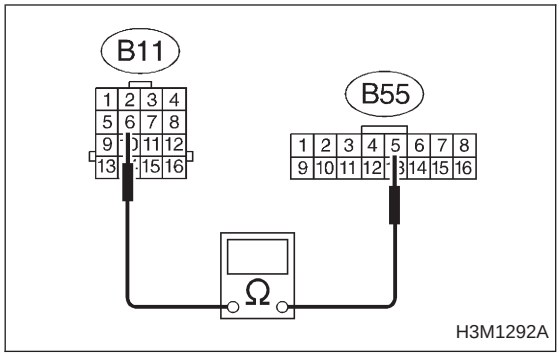
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.



Connector & terminal
(B55) No. 5 — (B11) No. 6:

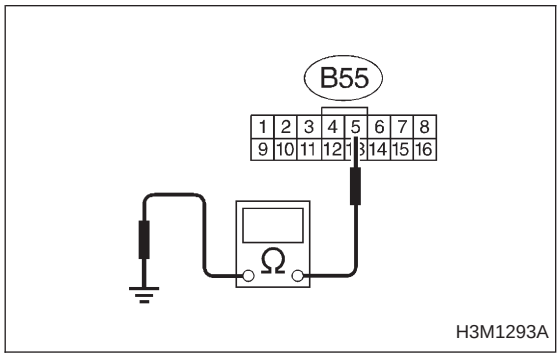
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.

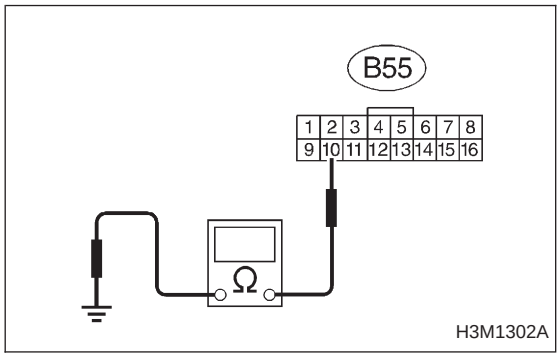


Connector & terminal
(B55) No. 5 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8D5**.

NO : Repair short circuit in harness between TCM and transmission connector.

8D5	CHECK OUTPUT SIGNAL EMITTED FROM TCM.

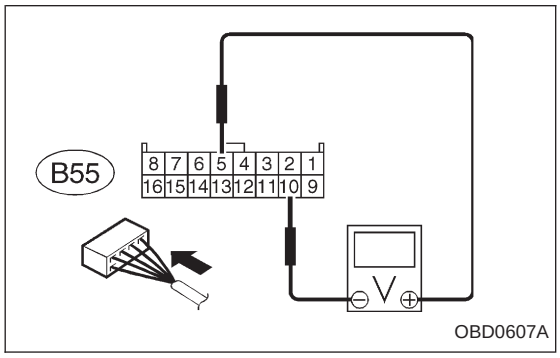
1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.

4) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

5) Move selector lever to “D” and slowly increase vehicle speed to 75 km/h (47 m/h). Wheels will lock-up.



6) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 5 (+) — No. 10 (−):

CHECK ***: Is the voltage more than 8.5 V?***

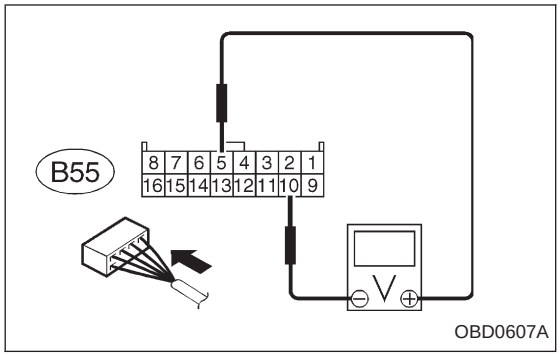
YES : Go to next step 7).

NO : Go to next CHECK .

CHECK ***: Is the voltage more than 8.5 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



7) Return the engine to idling speed and move selector lever to “N”.
8) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 5 (+) — No. 10 (−):

CHECK ***: Is the voltage less than 0.5 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 0.5 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

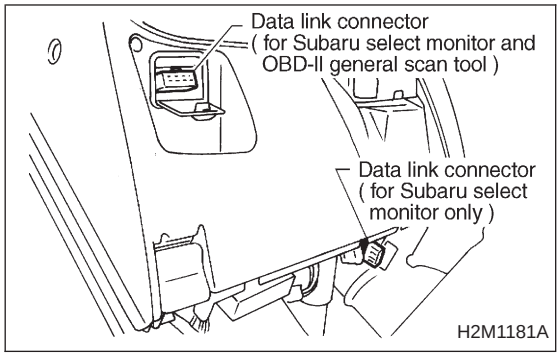
NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

● Using Subaru Select Monitor

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Lift-up the vehicle and place safety stand.

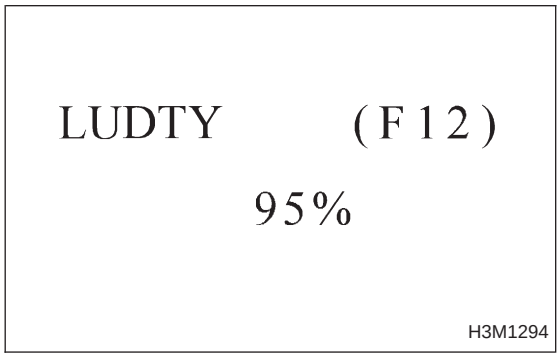
CAUTION:
On AWD models, make sure that all wheels are raised off floor.



4) Connect Subaru Select Monitor to data link connector.
5) Start the engine, and turn Subaru Select Monitor switch to ON.
6) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

7) Read data on Subaru Select Monitor.
8) Designate mode using function key.
Function mode F12
- F12: Lock-up duty is indicated in “%”.



9) Move selector lever to “D” and slowly increase vehicle speed to 75 km/h (47 m/h). Wheels will lock-up.

CHECK ***: Is the value 95% in function mode F12?***

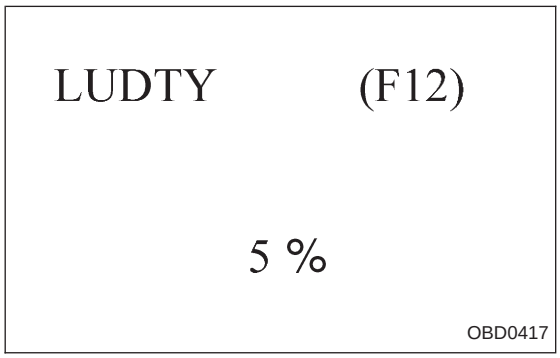
YES : Go to next step 10).

NO : Go to next CHECK .

CHECK ***: Is the value 95% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.



10) Return the engine to idling speed and move selector lever to “N”.

CHECK ***: Is the value 5% in function mode F12?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

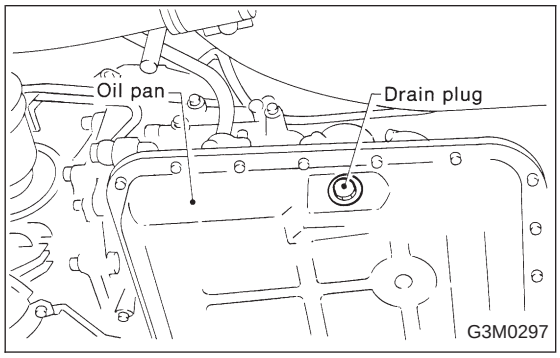
NO : Go to next CHECK .

CHECK ***: Is the value 5% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

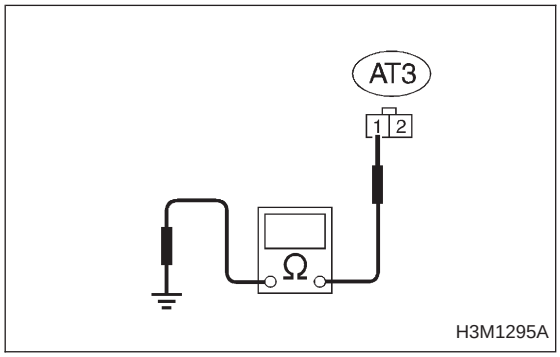


8D6	CHECK DUTY SOLENOID B (IN TRANSMISSION).

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

5) Remove oil pan, and disconnect connector from duty solenoid B.



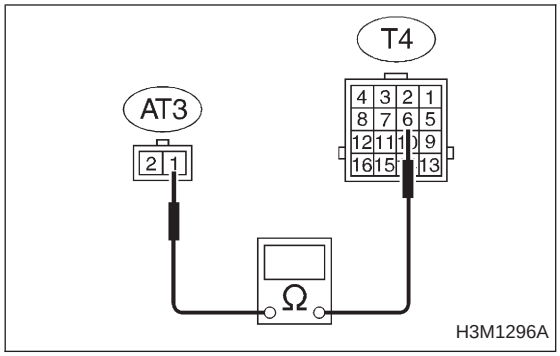
6) Measure resistance between duty solenoid B connector and transmission ground.

Connector & terminal
(AT3) No. 1 — Transmission ground:

CHECK ***: Is the resistance between 9 and 17 Ω?***

YES : Go to step **8D7**.

NO : Replace duty solenoid B.



8D7	**CHECK HARNESS CONNECTOR BETWEEN DUTY SOLENOID B AND TRANSMISSION.**

1) Disconnect connector from transmission.
2) Measure resistance of harness between duty solenoid B and transmission connector.

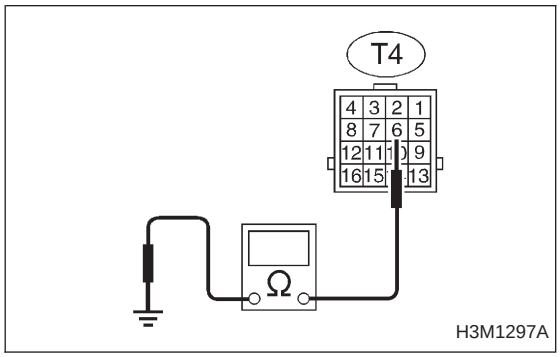
Connector & terminal
(T4) No. 6 — (AT3) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.



3) Measure resistance of harness between transmission connector and transmission ground.

Connector & terminal
(T4) No. 6 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in duty solenoid B and transmission connector.

NO : Repair short circuit in harness between TCM and transmission connector.

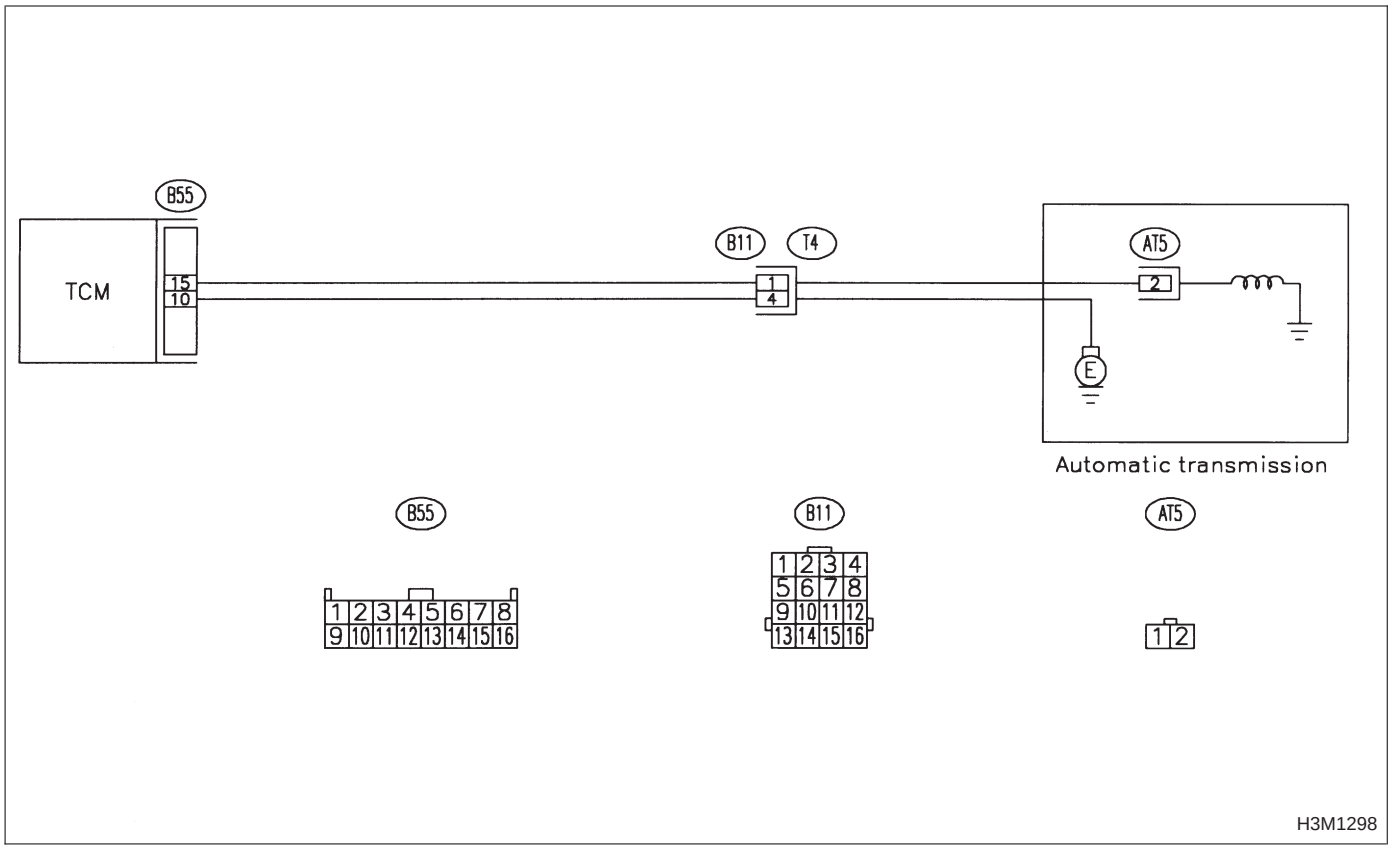
E: TROUBLE CODE 13 — SHIFT SOLENOID 3 —

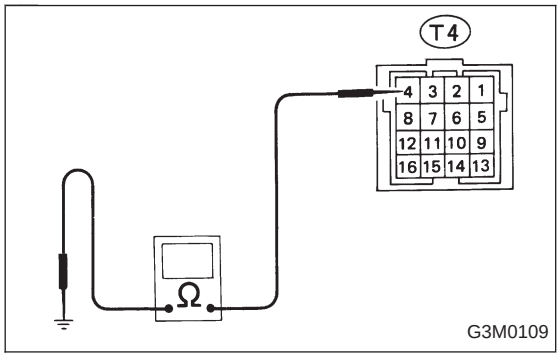
DIAGNOSIS:

Output signal circuit of shift solenoid 3 is open or shorted.

TROUBLE SYMPTOM:

Ineffective engine brake with shift lever in “3”.





8E1	**CHECK SHIFT SOLENOID 3 GROUND LINE.**

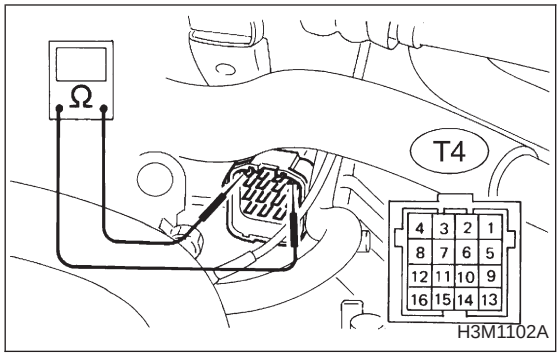
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission ground.

Connector & terminal
(T4) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8E2**.

NO : Repair open circuit in transmission harness connector.



8E2	CHECK SHIFT SOLENOID 3.

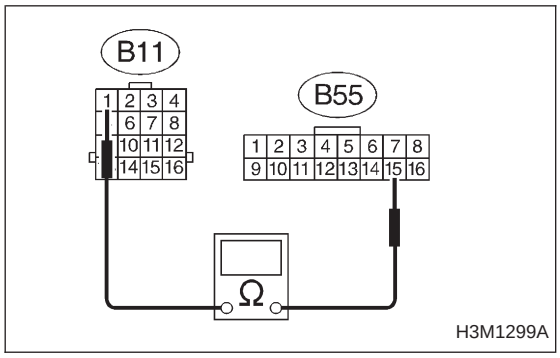
Measure resistance between transmission connector terminals.

Connector & terminal
(T4) No. 1 — No. 4:

CHECK ***: Is the resistance between 20 and 32 Ω?***

YES : Go to step **8E3**.

NO : Go to step **8E5**.



8E3	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Disconnect connector from TCM.
2) Measure resistance of harness between TCM and transmission connector.

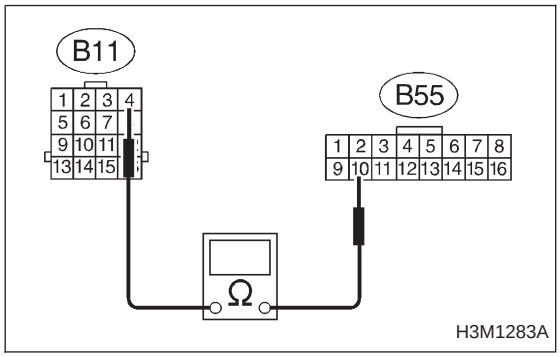
Connector & terminal
(B55) No. 15 — (B11) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



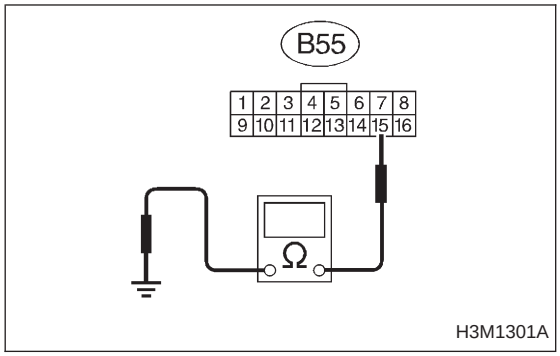
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



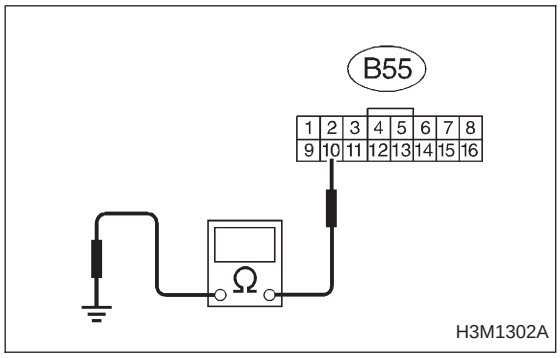
3) Measure resistance of harness between TCM connector and transmission ground.

Connector & terminal
(B55) No. 15 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8E4**.

NO : Repair short circuit in harness between TCM and transmission connector.

8E4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.**

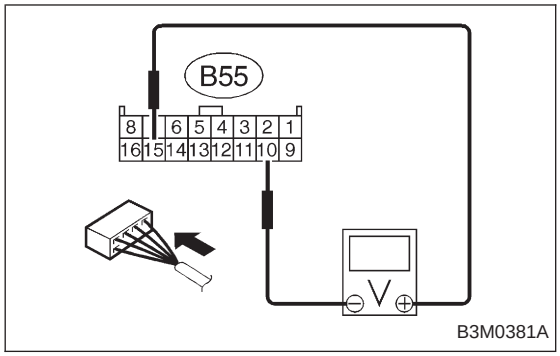
1) Connect connectors to TCM and transmission.
2) Lift-up or raise the vehicle and support with safety stand.

CAUTION:
On AWD models, raise all wheels off ground.

3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

4) Move selector lever to “2”, and slowly increase vehicle speed to 35 km/h (22 m/h).



5) Measure voltage between TCM connector terminals.
Connector & terminal
(B55) No. 15 (+) — No. 10 (−):

CHECK ***: Is the voltage less than 1 V?***

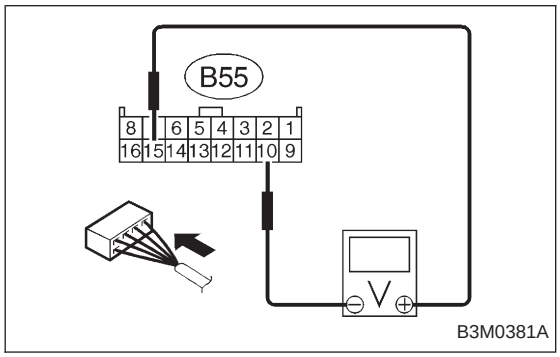
YES : Go to next step 6).

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



6) Move selector lever to “D”, and slowly increase vehicle speed to 65 km/h (41 m/h).
7) Measure voltage between TCM connector terminals.
Connector & terminal
(B55) No. 15 (+) — No. 10 (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.

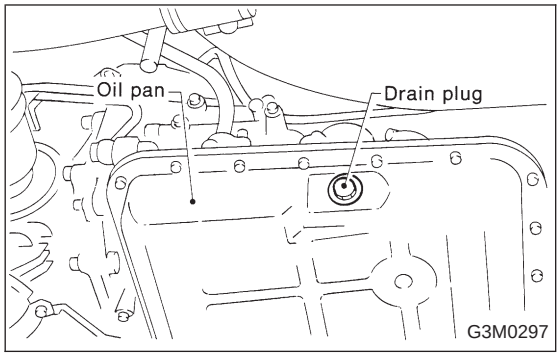
NO : Go to next CHECK .

CHECK ***: Is the voltage more than 10 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>



8E5	CHECK SHIFT SOLENOID 3 (IN TRANSMISSION).

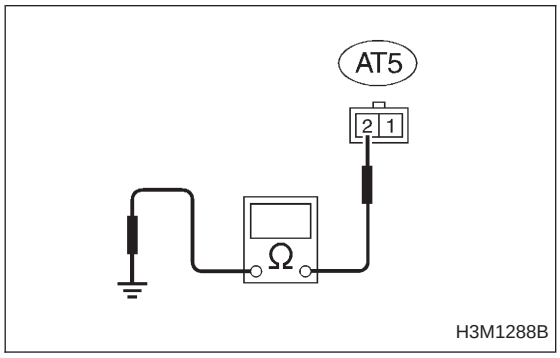
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Lift-up or raise the vehicle and support with safety stand.

CAUTION:
On AWD models, raise all wheels off ground.

5) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

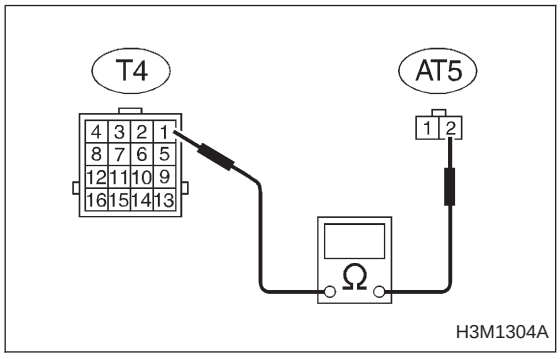
6) Remove oil pan, and disconnect connector from shift solenoid 3.



7) Measure resistance between shift solenoid 3 connector and transmission ground.

Terminal
(AT5) No. 2 — Transmission ground:

CHECK ***: Is the resistance between 20 and 32 Ω?***
YES : Go to step **8E6**.
NO : Replace shift solenoid assembly.



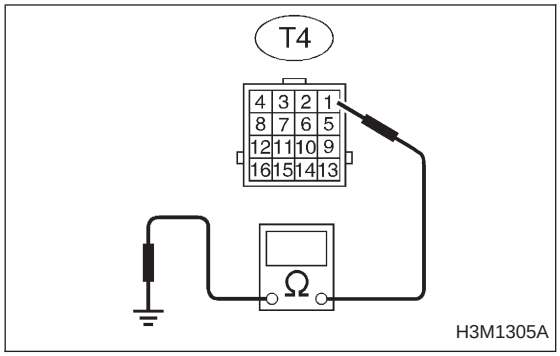
8E6	CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 3 AND TRANSMISSION.

1) Measure resistance of harness between shift solenoid 3 and transmission connector.

Connector & terminal
(AT5) No. 2 — (T4) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next step 2).
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between shift solenoid 3 and transmission connector.
- Poor contact in shift solenoid 3 connector.
- Poor contact in transmission connector.



2) Measure resistance of harness between shift solenoid 3 connector and transmission ground.

Connector & terminal
(T4) No. 1 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.

- Poor contact in shift solenoid 3 connector.
- Poor contact in transmission connector.

NO : Repair short circuit harness between TCM and transmission connector.

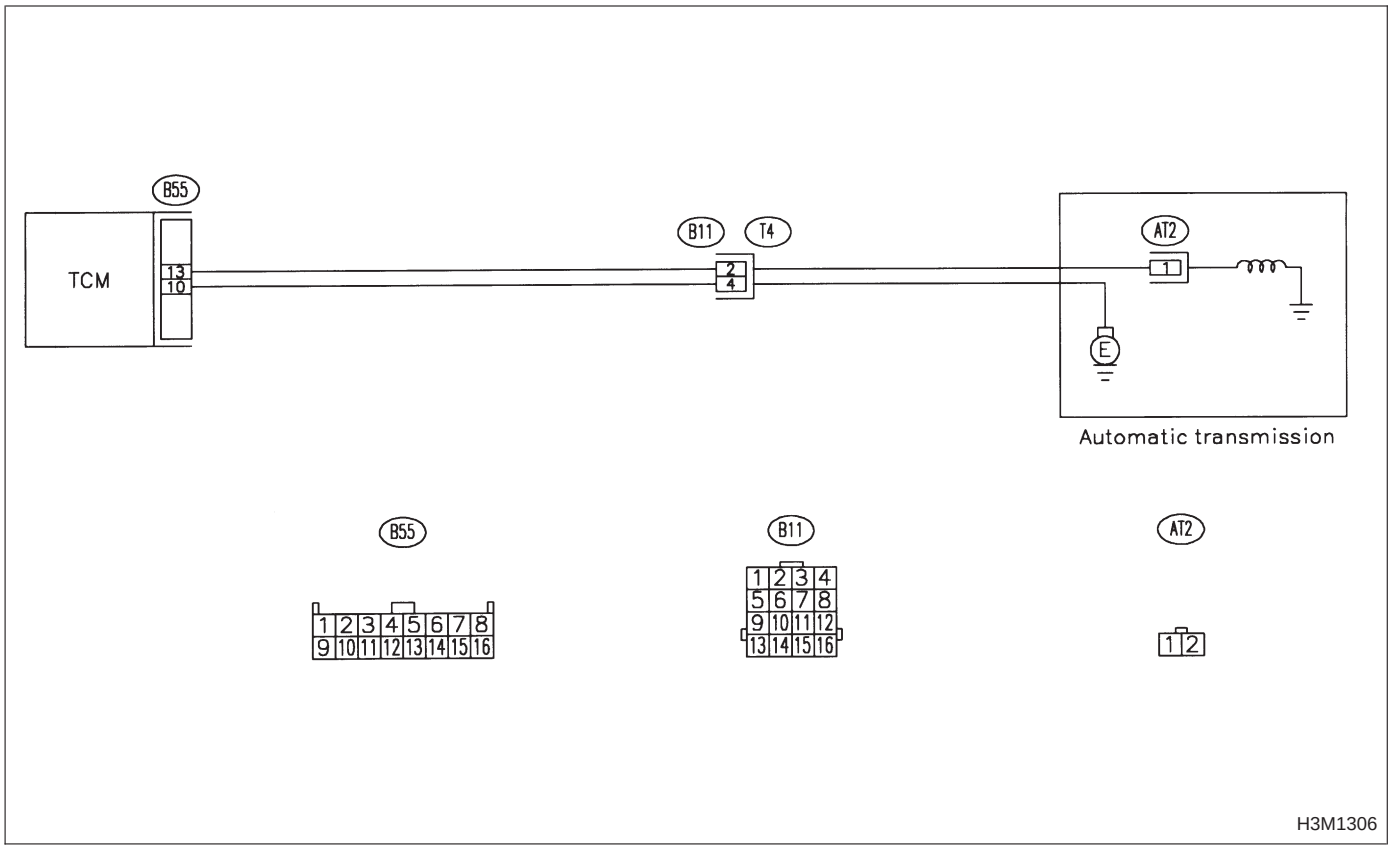
F: TROUBLE CODE 14 — SHIFT SOLENOID 2 —

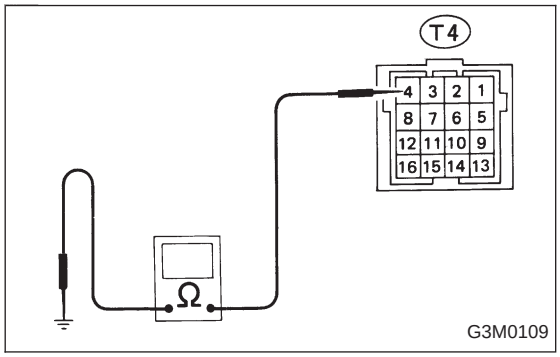
DIAGNOSIS:

Output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.





8F1	**CHECK SHIFT SOLENOID 2 GROUND LINE.**

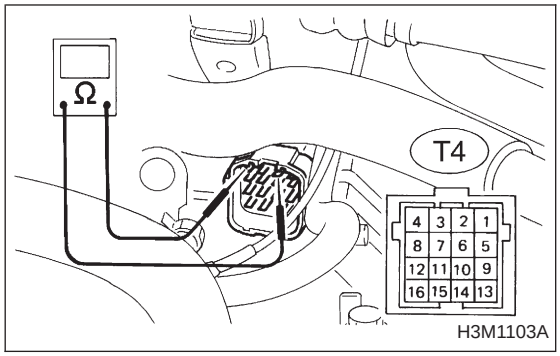
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission ground.

Connector & terminal
(T4) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8F2**.

NO : Repair open circuit in transmission harness connector.



8F2	CHECK SHIFT SOLENOID 2.

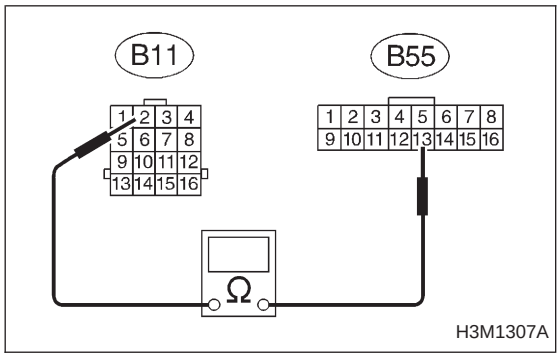
Measure resistance between transmission connector terminals.

Connector & terminal
(T4) No. 2 — No. 4:

CHECK ***: Is the resistance between 20 and 32 Ω?***

YES : Go to step **8F3**.

NO : Go to step **8F5**.



8F3	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Disconnect connector from TCM.
2) Measure resistance of harness between TCM and shift solenoid 2 connector.

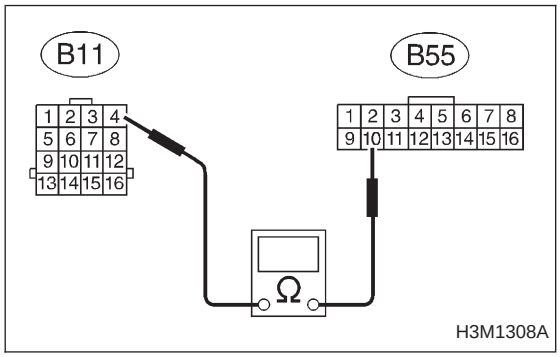
Connector & terminal
(B55) No. 13 — (B11) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



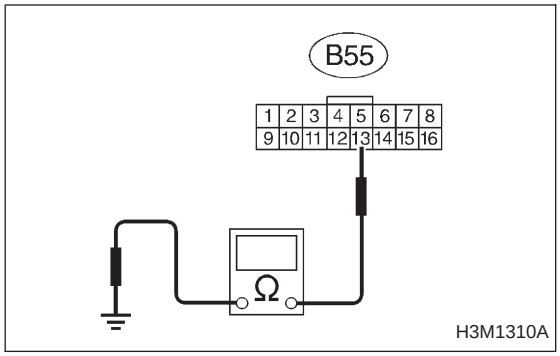
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



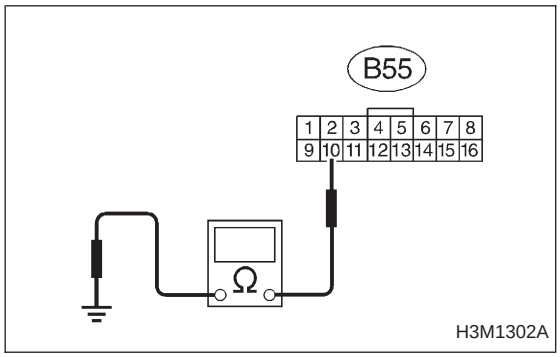
3) Measure resistance of harness between TCM connector and transmission ground.

Connector & terminal
(B55) No. 13 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8F4**.

NO : Repair short circuit in harness between TCM and transmission connector.

8F4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.**

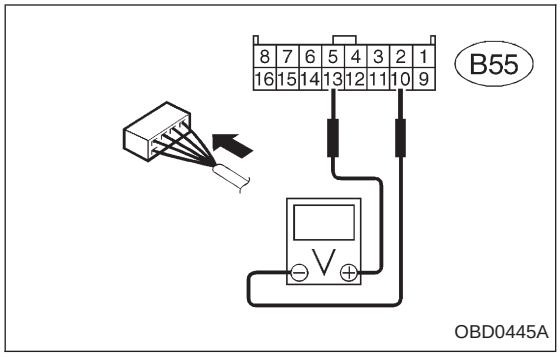
1) Connect connectors to TCM and transmission.
2) Lift-up or raise the vehicle and support with safety stand.

CAUTION:
On AWD models, raise all wheels off ground.

3) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

4) Move selector lever to “D”, and slowly increase vehicle speed to 50 km/h (31 m/h).



5) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 13 (+) — No. 10 (−):

CHECK ***: Is the voltage 9 V → 1 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.

NO : Go to next step 6).

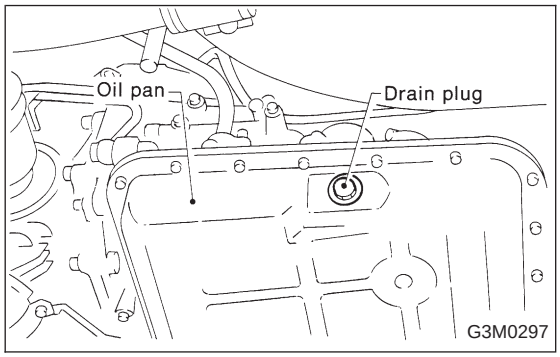
6) Move selector lever to “D”, and slowly increase vehicle speed to 50 km/h (31 m/h).

CHECK ***: Is the voltage changing 9 V → 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

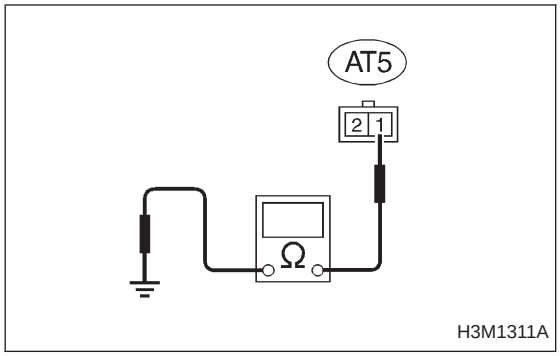


8F5	CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

5) Remove oil pan, and disconnect connector from shift solenoid 2.



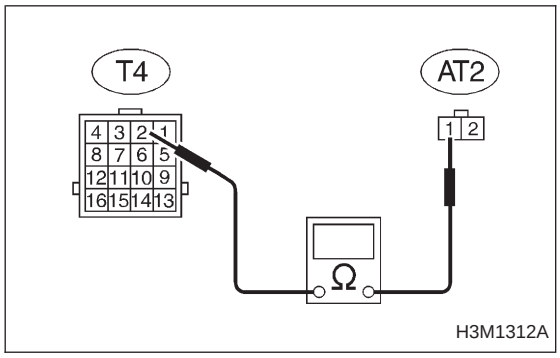
6) Measure resistance between shift solenoid 2 connector and transmission ground.

Terminal
(AT2) No. 1 — Transmission ground:

CHECK ***: Is the resistance between 20 and 32 Ω?***

YES : Go to step **8F6**.

NO : Replace shift solenoid assembly.



8F6	CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.

1) Measure resistance of harness between shift solenoid 2 and transmission connector.

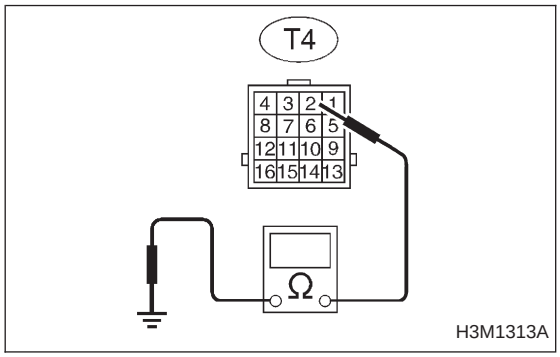
Connector & terminal
(AT2) No. 1 — (T4) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 2).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between shift solenoid 2 and transmission connector.
- Poor contact in shift solenoid 2 connector.
- Poor contact in transmission connector.



2) Measure resistance of harness between shift solenoid 2 connector and transmission ground.

Connector & terminal
(T4) No. 2 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.
- Poor contact in shift solenoid 2 connector.
- Poor contact in transmission connector.

NO : Repair short circuit harness between TCM and transmission connector.

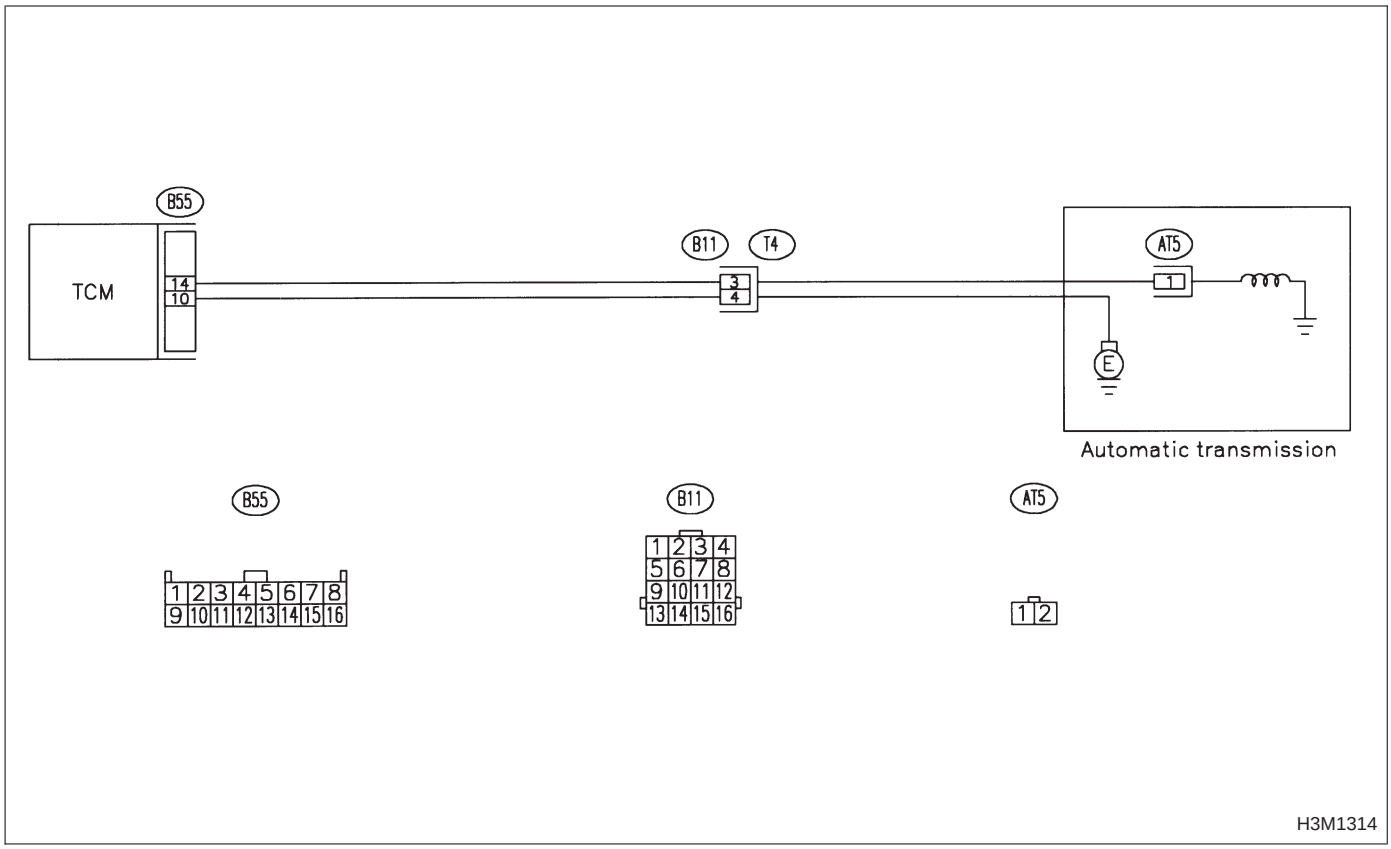
G: TROUBLE CODE 15 — SHIFT SOLENOID 1 —

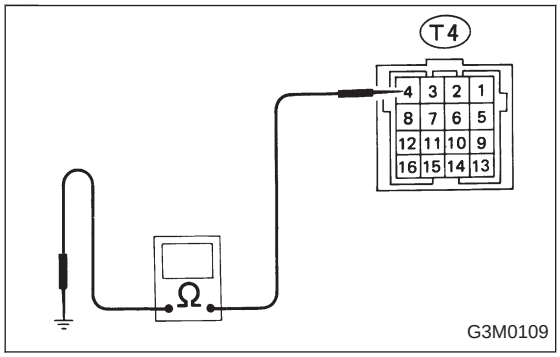
DIAGNOSIS:

Output signal circuit of shift solenoid 3 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.





8G1	CHECK SHIFT SOLENOID 1 GROUND LINE.

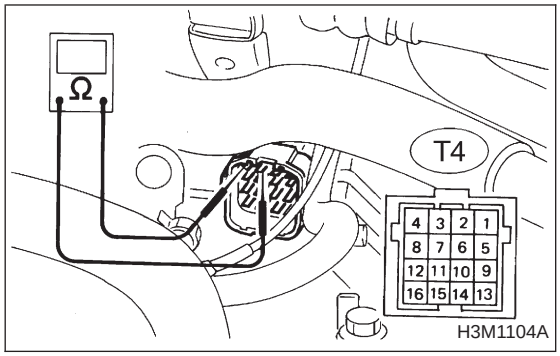
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission ground.

Connector & terminal
(T4) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8G2**.

NO : Repair open circuit in transmission harness connector.



8G2	CHECK SHIFT SOLENOID 1.

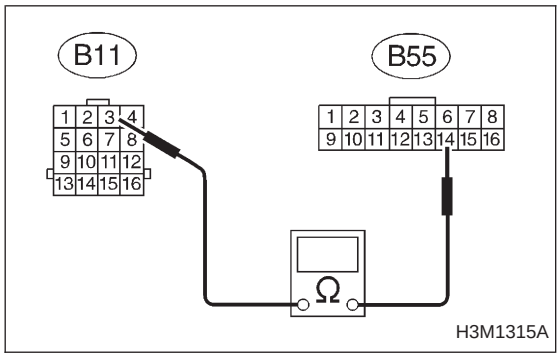
Measure resistance between transmission connector terminals.

Connector & terminal
(T4) No. 3 — No. 4:

CHECK ***: Is the resistance between 20 and 32 Ω?***

YES : Go to step **8G3**.

NO : Go to step **8G5**.



8G3	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Disconnect connector from TCM.
2) Measure resistance of harness between TCM and shift solenoid 1 connector.

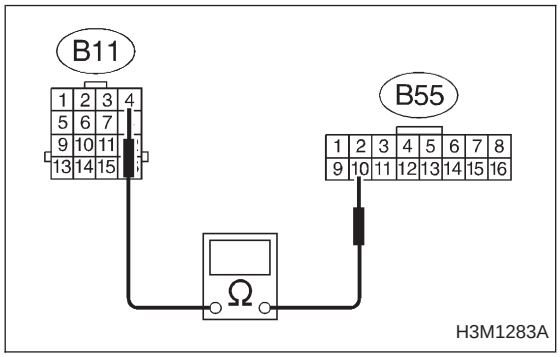
Connector & terminal
(B55) No. 14 — (B11) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



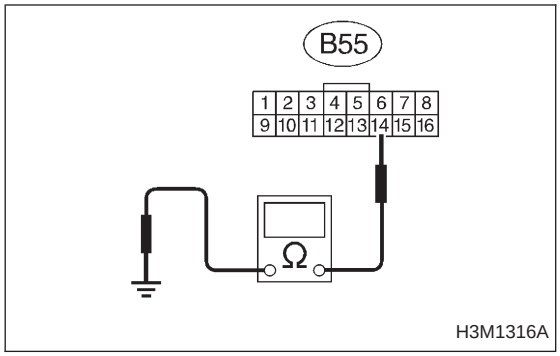
Connector & terminal
(B55) No. 10 — (B11) No. 4:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM connector.
- Poor contact in transmission connector.



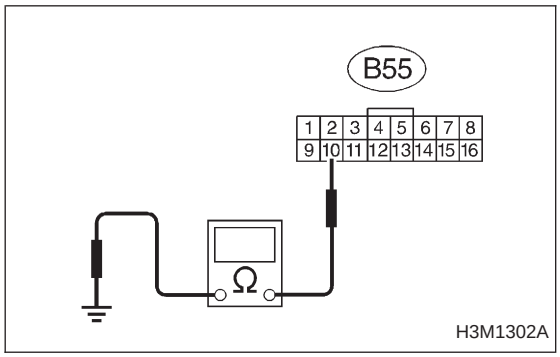
3) Measure resistance of harness between TCM connector and transmission ground.

Connector & terminal
(B55) No. 14 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8G4**.

NO : Repair short circuit in harness between TCM and transmission connector.

8G4	CHECK OUTPUT SIGNAL EMITTED FROM TCM.

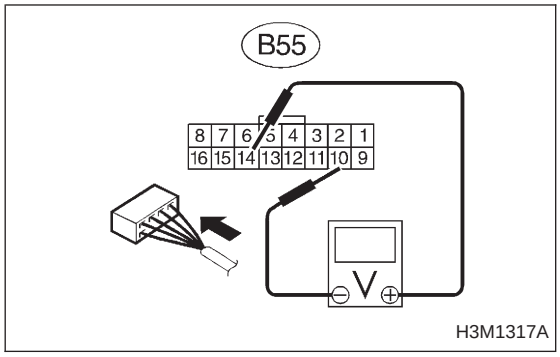
1) Connect connectors to TCM and transmission.
2) Lift-up or raise the vehicle and support with safety stand.

CAUTION:
On AWD models, raise all wheels off ground.

3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

4) Move selector lever to “D”, and slowly increase vehicle speed to 50 km/h (31 m/h).



5) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 14 (+) — No. 10 (−):

CHECK ***: Is the voltage 1 V → 9 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next step 7).

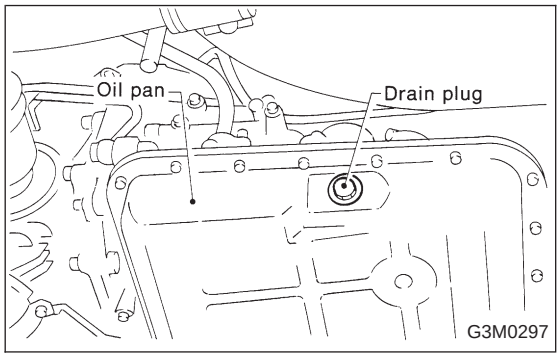
6) Move selector lever to “D”, and slowly increase vehicle speed to 50 km/h (31 m/h).

CHECK ***: Is the voltage changing 1 V → 9 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

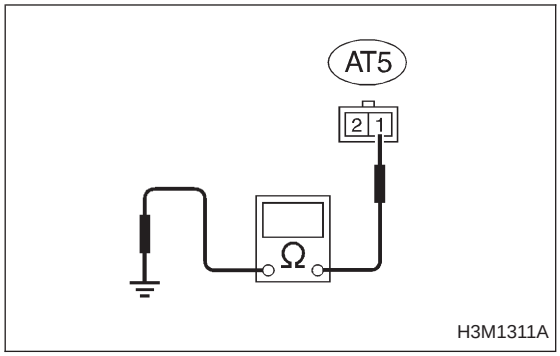


8G5	CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Lift-up or raise the vehicle and support with safety stand.

CAUTION:
On AWD models, raise all wheels off ground.

5) Drain automatic transmission fluid.
6) Remove oil pan, and disconnect connector from shift solenoid 1.



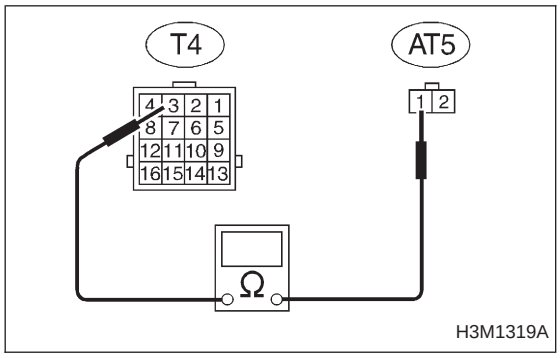
7) Measure resistance between shift solenoid 1 connector and transmission ground.

Terminal
(AT5) No. 1 — Transmission ground:

CHECK ***: Is the resistance between 20 and 32 Ω?***

YES : Go to step **8G6**.

NO : Replace shift solenoid assembly.



8G6	CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.

1) Measure resistance of harness between shift solenoid 1 and transmission connector.

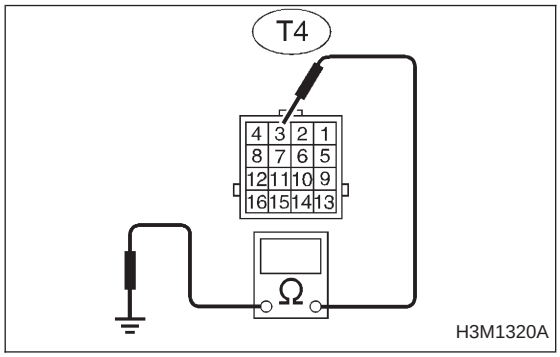
Connector & terminal
(AT5) No. 1 — (T4) No. 3:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 2).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in shift solenoid 1 connector.
- Poor contact in transmission connector.



2) Measure resistance of harness between shift solenoid 1 connector and transmission ground.

Connector & terminal
(T4) No. 3 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NOTE:
In this case, repair the following:
- Poor contact in shift solenoid 1 connector.
- Poor contact in transmission connector.

NO : Repair short circuit harness between TCM and transmission connector.

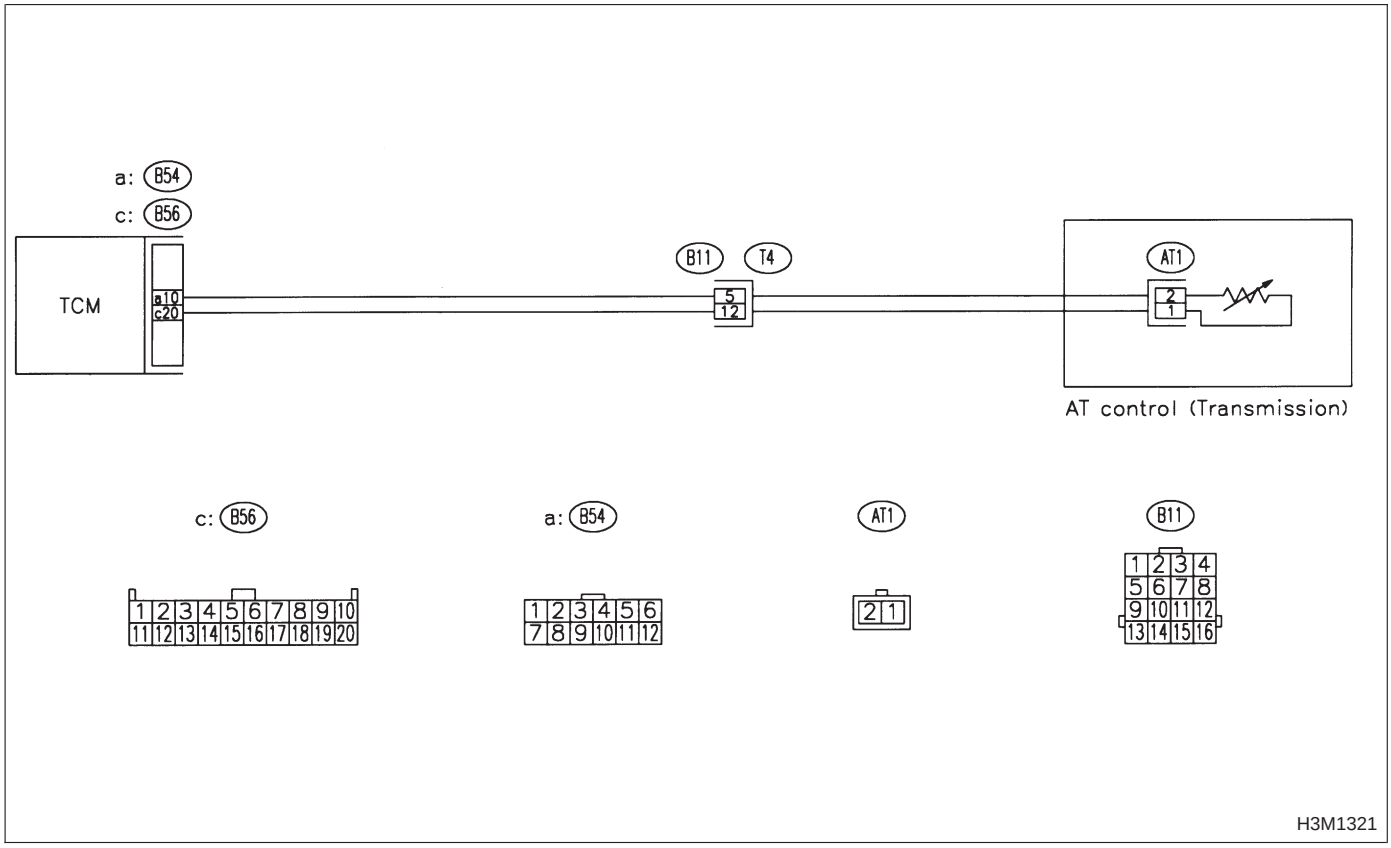
H: TROUBLE CODE 21
— ATF TEMPERATURE SENSOR —

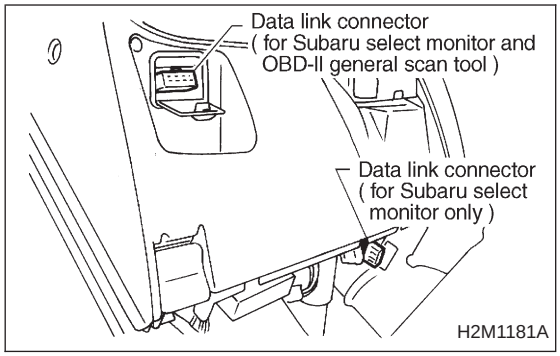
DIAGNOSIS:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.





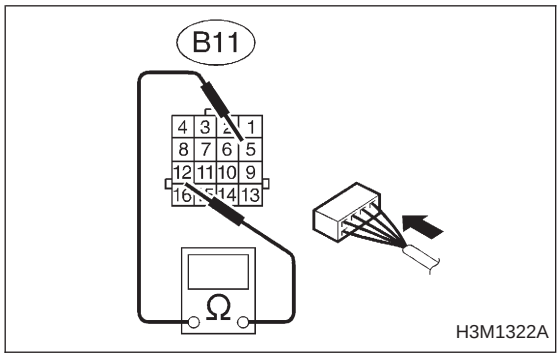
8H1	CHECK ATF TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
4) Start engine.
5) Read data on Subaru Select Monitor.
6) Designate mode function key.

Function mode F07 or F08

- F07: ATF temperature is indicated in “°F”.

● F08: ATF temperature is indicated in "°C".

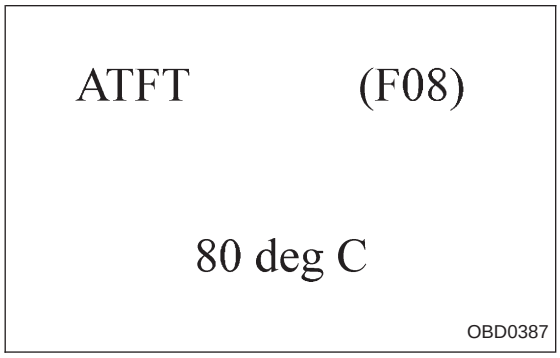


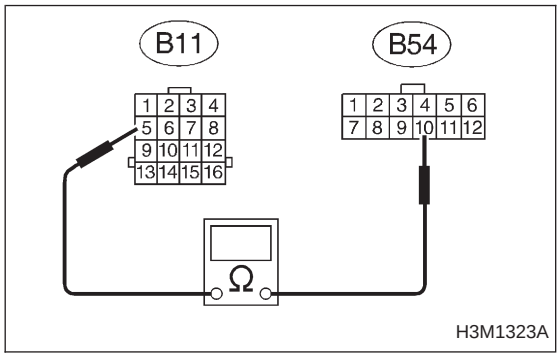
7) Measure resistance between transmission connector receptacle's terminals shown in the following table.

Connector & terminal
(B11) No. 12 — No. 5:

Function mode F07 (°F)	Function mode F08 (°C)	Resistance (kΩ)
68	20	2.1 — 2.9
104	40	0.96 — 1.36
140	60	0.49 — 0.69
176	80	0.272 — 0.374

CHECK ***: Is the resistance in range?***
YES : Go to step **8H2**.
NO : Go to step **8H4**.





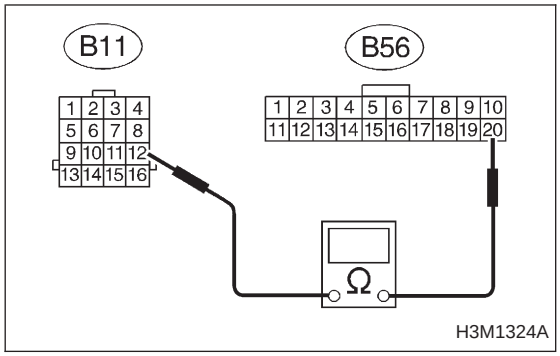
8H2	CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission and TCM.
3) Measure resistance of harness between TCM and transmission connector.

Connector & terminal
(B54) No. 10 — (B11) No. 5:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
● Open circuit in harness between TCM and transmission connector.
● Poor contact in TCM.
● Poor contact in transmission connector.



Connector & terminal
(B56) No. 20 — (B11) No. 12:

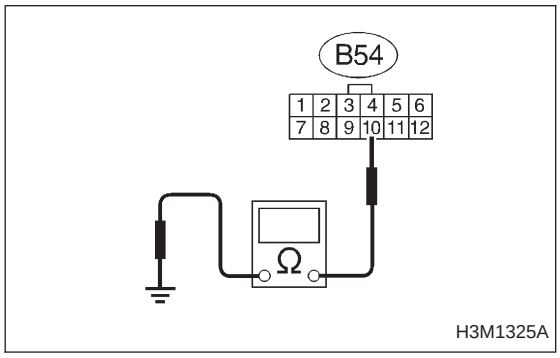
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.



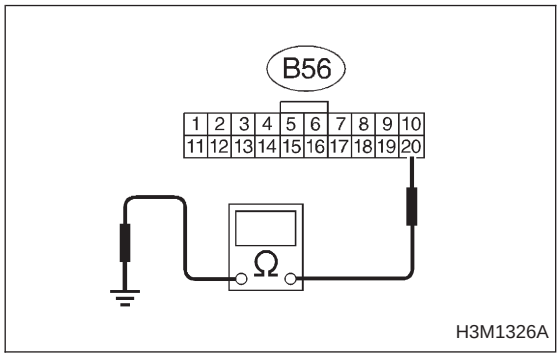
4) Measure resistance of harness between TCM connector and transmission ground.

Connector & terminal
(B54) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.

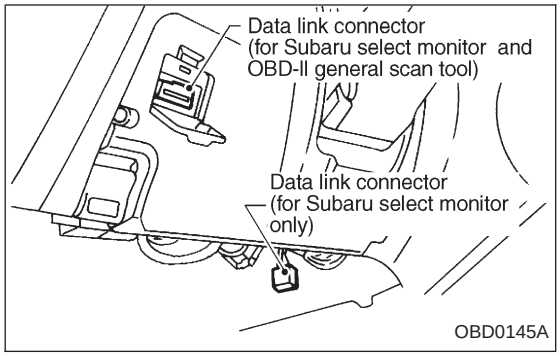


Connector & terminal
(B56) No. 20 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8H3**.

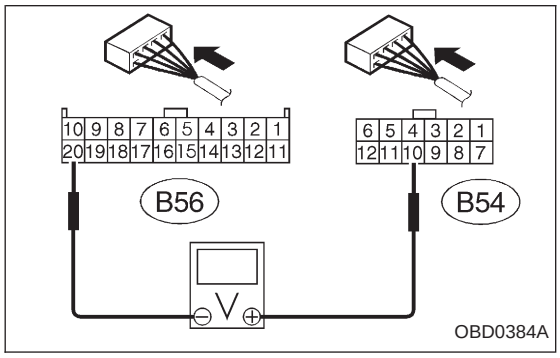
NO : Repair short circuit in harness between TCM and transmission connector.



8H3	CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Connect Subaru Select Monitor to data link connector.
4) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
5) Start engine.
6) Read data on Subaru Select Monitor.
7) Designate mode function key.
Function mode F07 or F08
- F07: ATF temperature is indicated in "°F".
- F08: ATF temperature is indicated in "°C".

8) ATF temperature is above 20°C (68°F) in function mode F08 (F07).



9) Measure voltage between TCM connector terminal.
Connector & terminal
(B54) No. 10 (+) — (B56) No. 20 (−):

CHECK ***: Is the voltage between 2.9 and 4.0 V?***

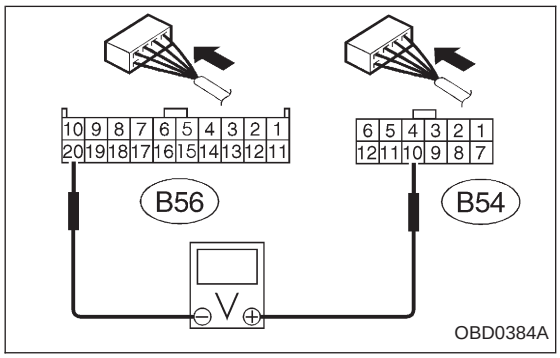
YES : Go to next step 10).

NO : Go to next CHECK .

CHECK ***: Is the voltage between 2.9 and 4.0 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



10) Warm-up the transmission until ATF temperature is about 80°C (176°F) in function mode F08 (F07).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

11) Measure voltage between TCM connector terminal.
Connector & terminal
(B54) No. 10 (+) — (B56) No. 20 (−):

CHECK ***: Is the voltage between 1.0 and 1.4 V?***

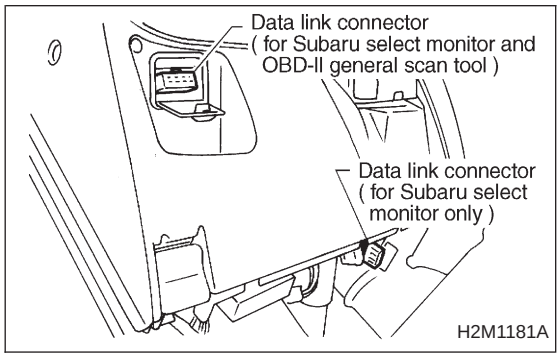
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 1.0 and 1.4 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



- Using Subaru Select Monitor

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

6) Read data on Subaru Select Monitor.
7) Designate mode function key.

Function mode F07 or F08

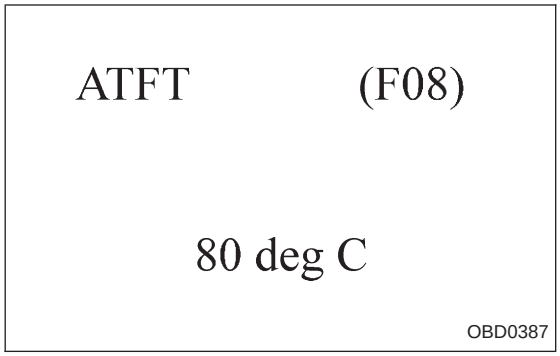
- F07: ATF temperature is indicated in “°F”.
- F08: ATF temperature is indicated in “°C”.



CHECK ***: Is the ATF temperature between 70 and 110°C (158 and 230°F).***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the ATF temperature sensor and transmission connector.

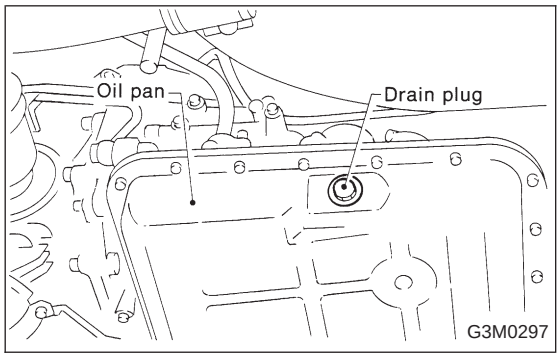
NO : Go to next CHECK .



CHECK : ***Is the ATF temperature between 70 and 110°C (158 and 230°F) by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



8H4	CHECK ATF TEMPERATURE SENSOR (IN TRANSMISSION).

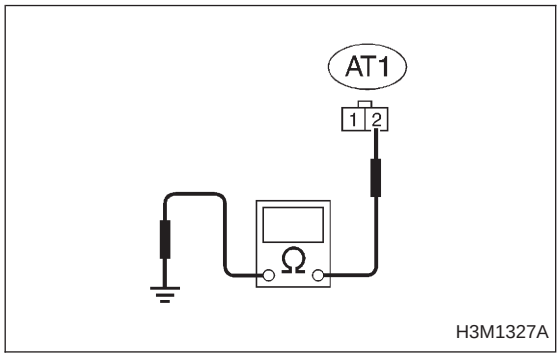
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Remove transmission connector from bracket.
4) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.

5) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

6) Remove oil pan, and disconnect connector from ATF temperature sensor connector.



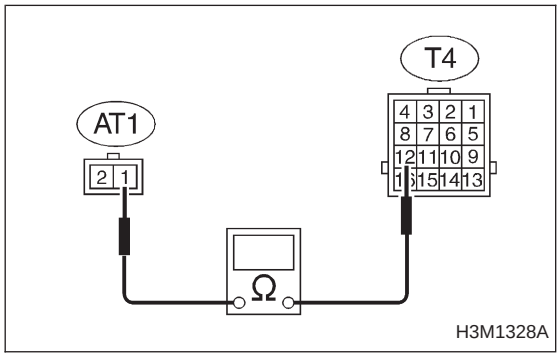
7) Measure resistance between ATF temperature sensor connector and transmission ground.

Connector & terminal
(AT1) No. 2 — Transmission ground:

CHECK : ***Is the resistance between 1.5 and 4.5 Ω?***

YES : Go to step **8H5**.

NO : Replace ATF temperature sensor.

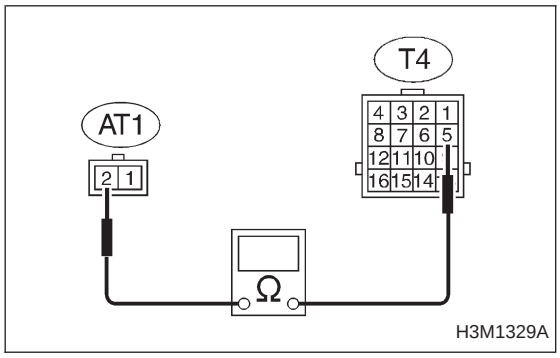


8H5	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.

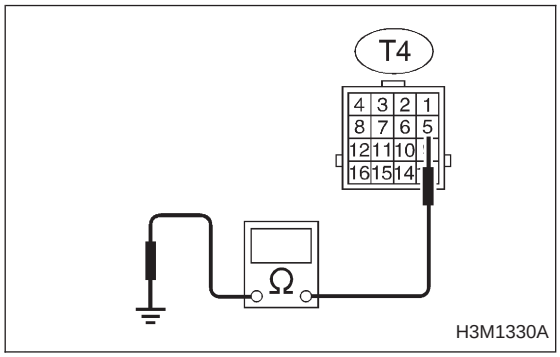
1) Disconnect connector from transmission.
2) Measure resistance of harness between ATF temperature sensor and transmission connector.

Connector & terminal
(T4) No. 12 — (AT1) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair harness and connector.
NOTE:
In this case, repair the following:
- Open circuit in harness between ATF temperature sensor and transmission connector.
- Poor contact in ATF temperature sensor connector.
- Poor contact in transmission connector.

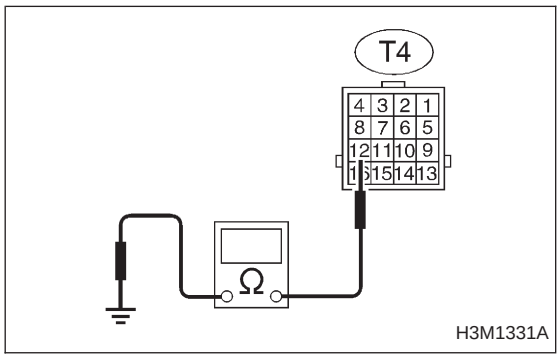


Connector & terminal
(T4) No. 5 — (AT1) No. 2:
CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next step 3).
NO : Repair harness and connector.
NOTE:
In this case, repair the following:
- Open circuit in harness between ATF temperature sensor and transmission connector.
- Poor contact in ATF temperature sensor connector.
- Poor contact in transmission connector.



3) Measure resistance of harness between transmission connector and transmission ground.

Connector & terminal
(T4) No. 5 — Transmission ground:
CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to next CHECK .
NO : Repair short circuit in harness between ATF temperature sensor and transmission connector.



Connector & terminal
(T4) No. 12 — Transmission ground:
CHECK ***: Is the resistance more than 1 MΩ?***
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the ATF temperature sensor and transmission connector.
NO : Repair short circuit in harness between ATF temperature sensor and transmission connector.

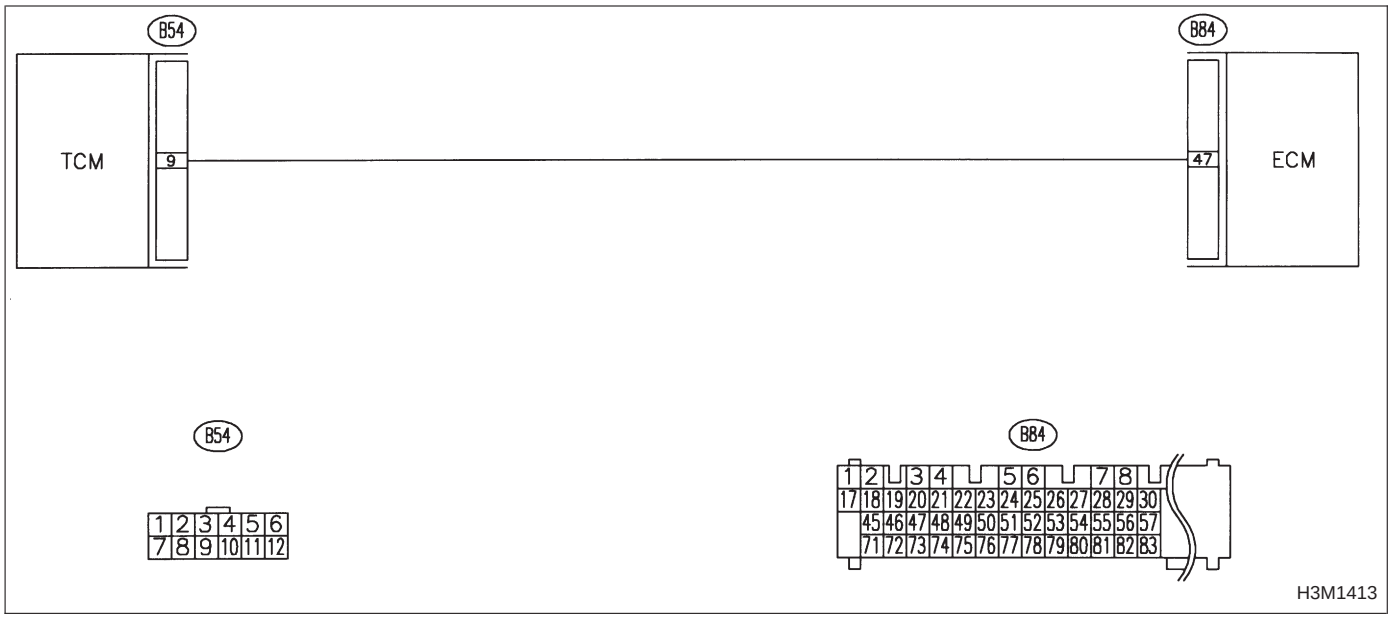
I: TROUBLE CODE 22 — MASS AIR FLOW SIGNAL —

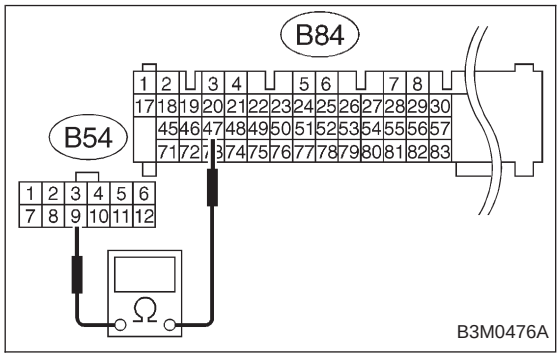
DIAGNOSIS:

Input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.





8I1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.**

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness between TCM and ECM connector.

Connector & terminal
(B54) No. 9 — (B84) No. 47:

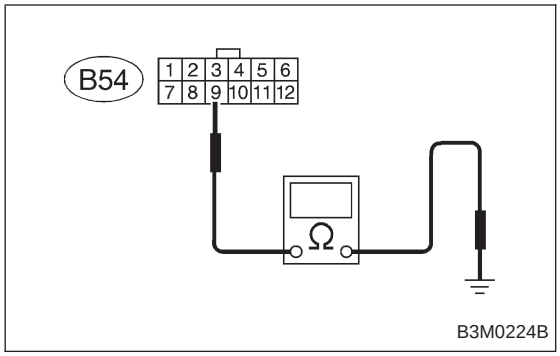
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and ECM connector.
- Poor contact in TCM connector.
- Poor contact in ECM connector.



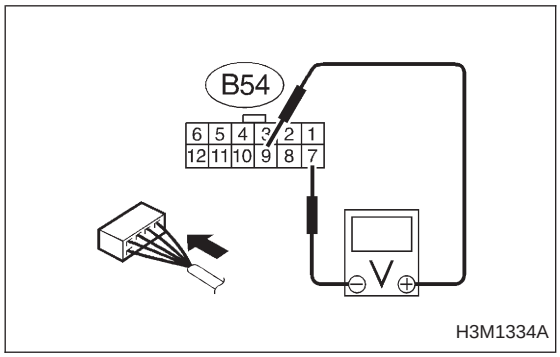
4) Measure resistance of harness between TCM connector and chassis ground.

Connector & terminal
(B54) No. 9 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8I2**.

NO : Repair short circuit in harness between TCM and ECM connector.



8I2	CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and ECM.
2) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

3) Engine idling.
4) Measure voltage between TCM connectors.

Connector & terminal
(B54) No. 9 (+) — No. 7 (−):

CHECK ***: Is the voltage between 0.5 and 1.2 V?***

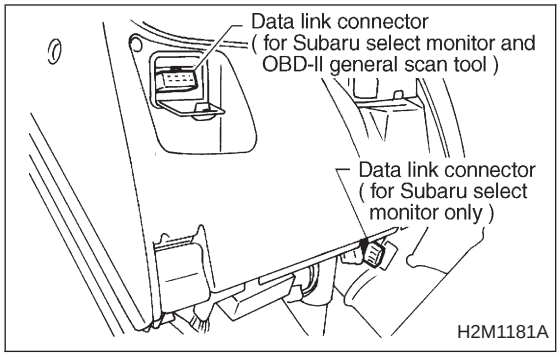
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

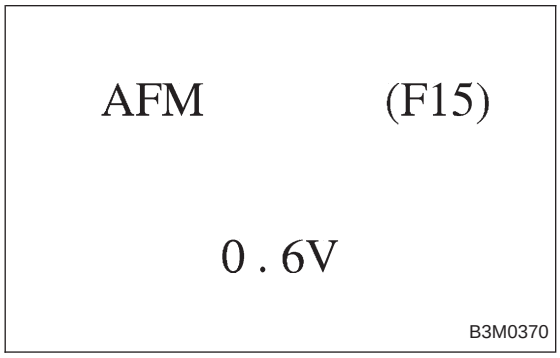
CHECK ***: Is the voltage between 0.5 V and 1.2 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



● Using Subaru Select Monitor
1) Connect connectors to TCM and ECM.
2) Turn ignition switch to OFF.
3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select monitor switch to ON.
5) Warm-up the engine until engine coolant temperature is above 80°C (176°F).
6) Engine idling.
7) Read data on Subaru Select Monitor.
8) Designate mode using function key.
Function mode: F15
● F15: Display shows mass air flow signal value sent from ECM.



CHECK ***: Is the value between 0.5 and 1.2 V in function mode F15?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 0.5 V and 1.2 V by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

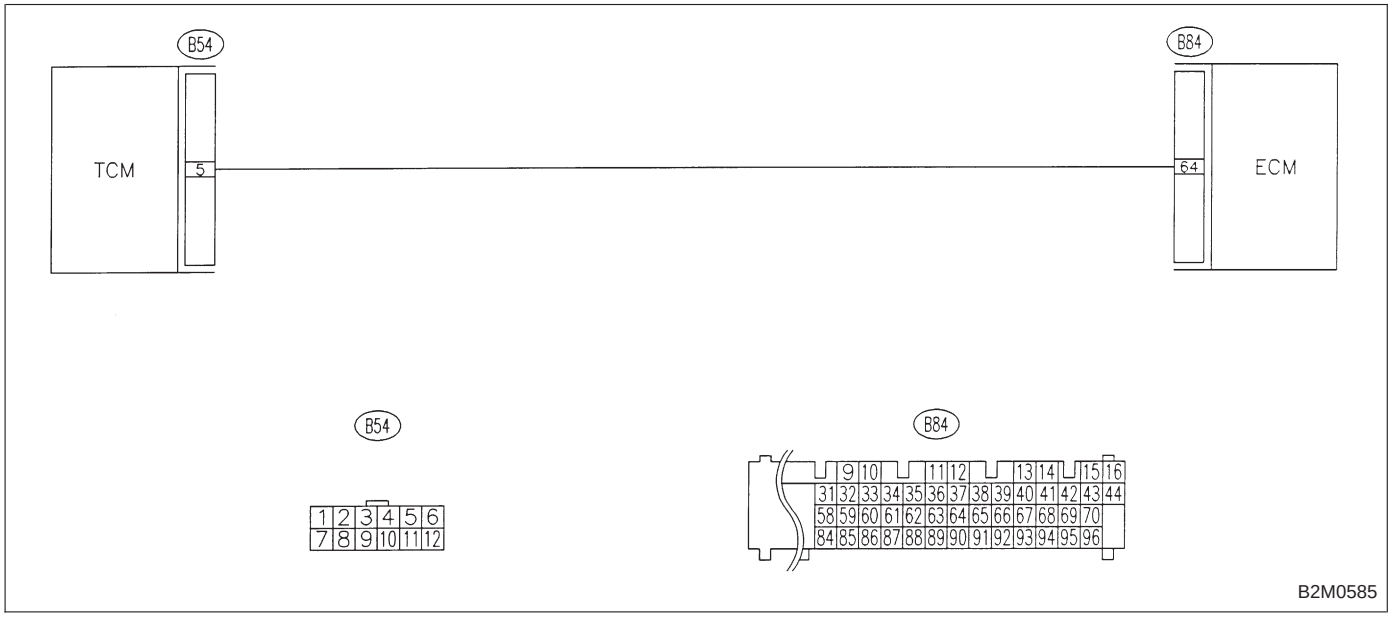
J: TROUBLE CODE 23 — ENGINE SPEED SIGNAL —

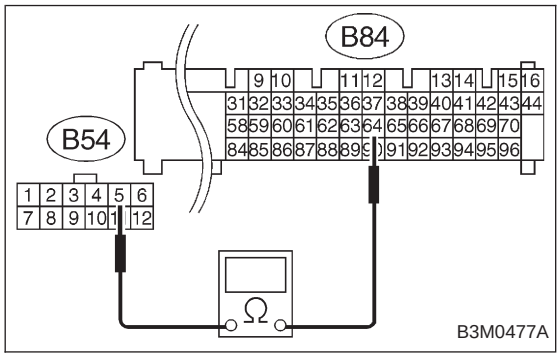
DIAGNOSIS:

Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- AT OIL TEMP indicator remains on when vehicle speed is “0”.





8J1	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness between TCM and ECM connector.

Connector & terminal
(B54) No. 5 — (B84) No. 64:

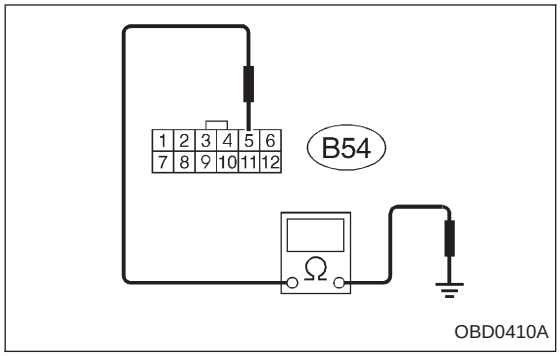
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and ECM connector.
- Poor contact in TCM connector.
- Poor contact in ECM connector.



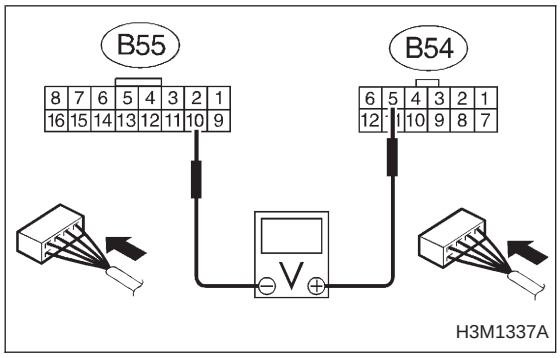
4) Measure resistance of harness between TCM connector and chassis ground.

Connector & terminal
(B54) No. 5 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8J2**.

NO : Repair short circuit in harness between TCM and ECM connector.



8J2	CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM and ECM.
2) Turn ignition switch to ON (engine OFF).
3) Measure voltage between TCM connectors.

Connector & terminal
(B54) No. 5 (+) — (B55) No. 10 (−):

CHECK ***: Is the voltage more than 10.5 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage more than 10.5 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

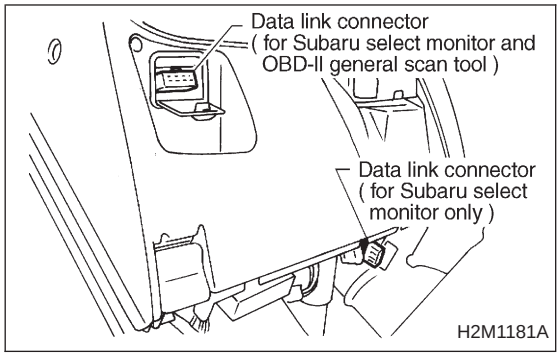
NO : Go to next CHECK .

CHECK ***: Replace ECM with a new one. Does the trouble code appear again, after the memory has been cleared?***

YES : Replace TCM.

NOTE:
Install the old ECM.

NO : Replace ECM.



● Using Subaru Select Monitor
1) Connect connectors to TCM and ECM.
2) Turn ignition switch to OFF.
3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Warm-up the engine until engine coolant temperature is above 80°C (176°F).
6) Engine idling.
7) Read on Subaru Select Monitor.
8) Designate mode using function key.
Function mode: F06
● F06: Display shows engine speed signal value sent from ECM.

CHECK ***: Is the revolution value the same as the tachometer reading shown on the combination meter?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Does the value shown on Subaru Select Monitor become equal to the tachometer reading when shaking TCM connector and harness?***

YES : Repair poor contact in TCM connector.

NO : Replace TCM.

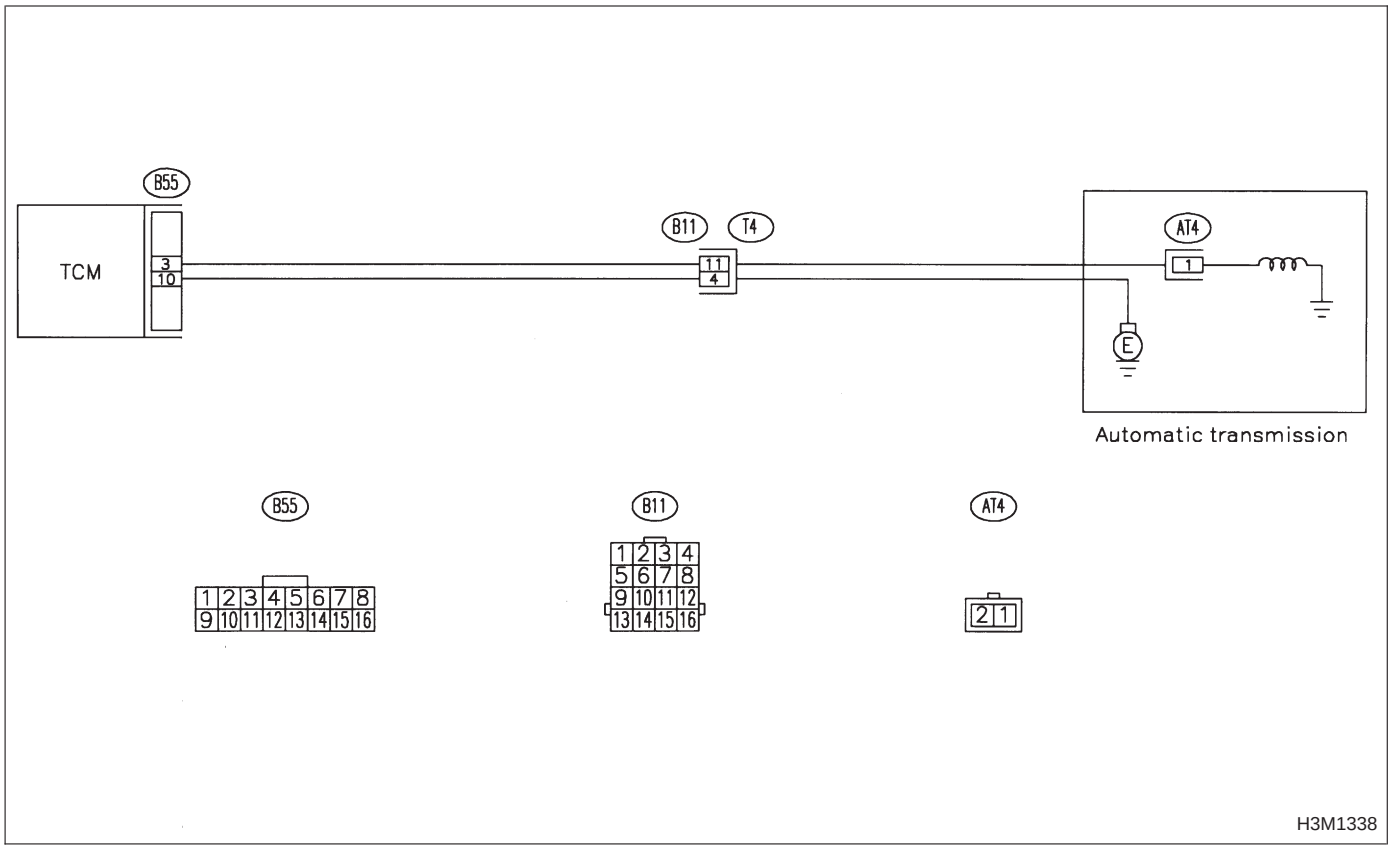
K: TROUBLE CODE 24 — DUTY SOLENOID C —

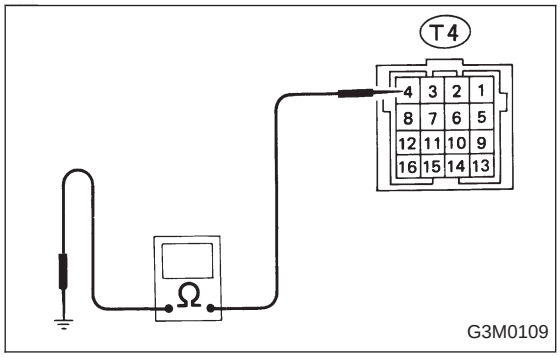
DIAGNOSIS:

Output signal circuit of duty solenoid C is open or shorted.

TROUBLE SYMPTOM:

Excessive “braking” in tight corners.





8K1	**CHECK DUTY SOLENOID C GROUND LINE.**

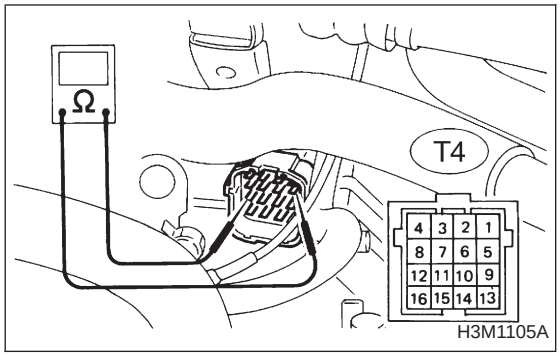
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission ground.

Connector & terminal
(T4) No. 4 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **8K2**.

NO : Repair open circuit in transmission harness connector.



8K2	CHECK DUTY SOLENOID C.

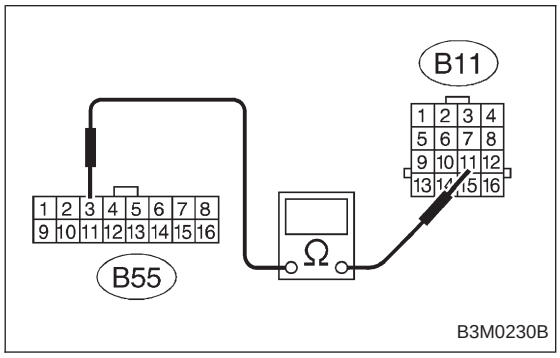
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector and transmission terminals.

Connector & terminal
(T4) No. 11 — No. 4:

CHECK ***: Is the resistance between 9 and 17 Ω?***

YES : Go to step **8K3**.

NO : Go to step **8K5**.



8K3	CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission and TCM.
3) Measure resistance of harness between TCM and transmission connector.

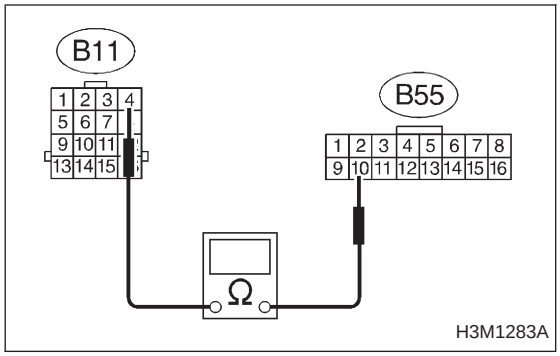
Connector & terminal
(B55) No. 3 — (B11) No. 11:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.



Connector & terminal
(B55) No. 10 — (B11) No. 4:

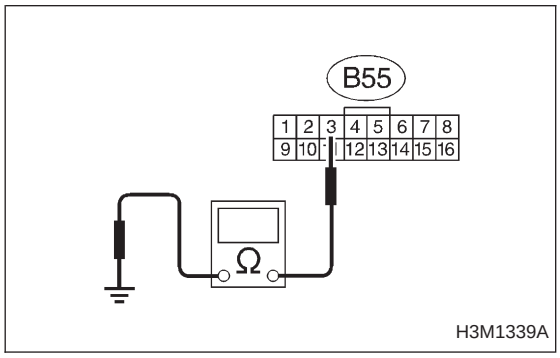
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission connector.

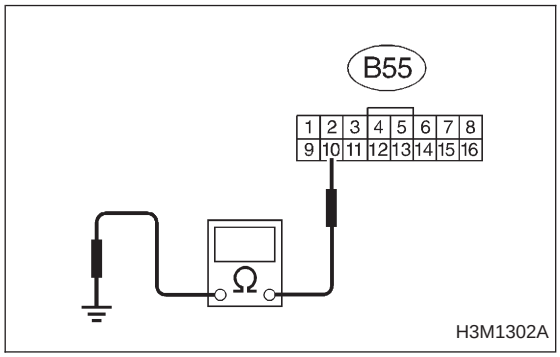


Connector & terminal
(B55) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8K4**.

NO : Repair short circuit in harness between TCM and transmission connector.

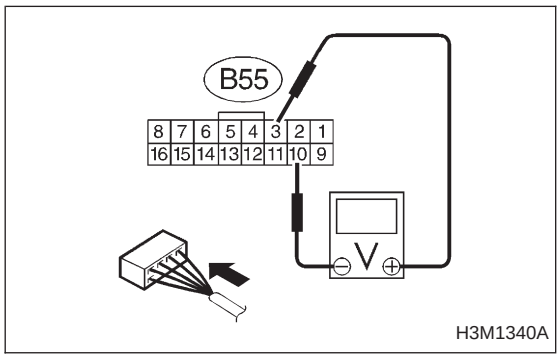


Connector & terminal
(B55) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8K4**.

NO : Repair short circuit in harness between TCM and transmission connector.



8K4	CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Turn ignition switch to ON (engine OFF).
4) Throttle is fully closed.
5) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 3 (+) — No. 10 (−):

CHECK ***: Is the voltage less than 1 V in "P" position?***

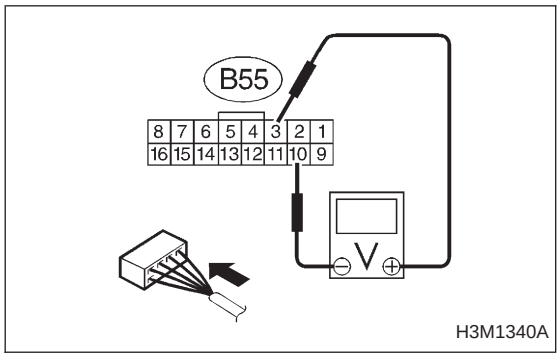
YES : Go to next step CHECK1 .

NO : Go to next CHECK .

CHECK ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



Connector & terminal
(B55) No. 3 (+) — No. 10 (−):

CHECK1 ***: Is the voltage between 5 V and 7 V in "D" position?***

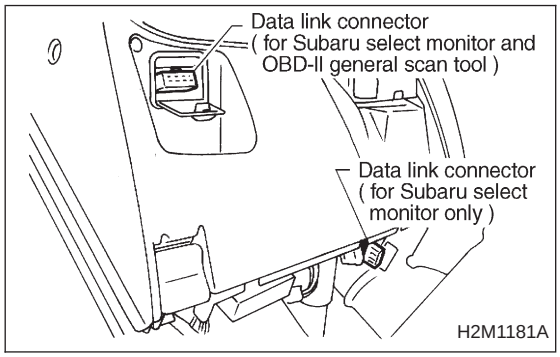
YES : Even if "AT OIL TEMP" lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the ATF temperature sensor and transmission connector.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 5 V and 7 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

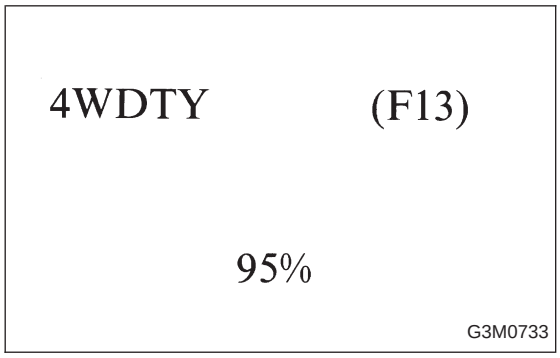
NO : Replace TCM.



● Using Subaru Select Monitor
1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Connect Subaru Select Monitor to data link connector.
4) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON.
5) Move selector lever to "D" with throttle fully open (vehicle speed 0 km/h or 0 m/h).
6) Read data on Subaru Select Monitor.
7) Designate mode using function key.
Function mode F13
● F13: AWD duty is indicated in "%".



CHECK ***: Is the value 25% in function mode F13?***
YES : Go to next step 8).
NO : Go to next CHECK .
CHECK ***: Is the value 25% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***
YES : Repair poor contact in TCM.
NO : Replace TCM.

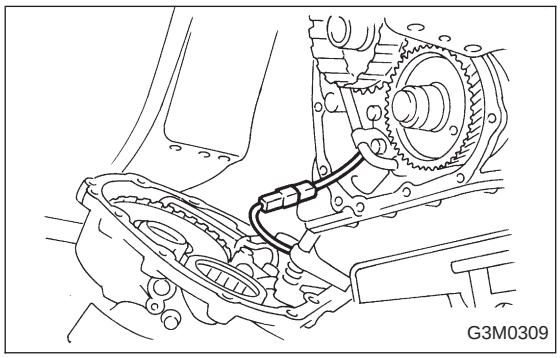


8) Set FWD mode.
9) Throttle fully closed.
CHECK ***: Is the value 95% in function mode F13?***
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the ATF temperature sensor and transmission connector.
NO : Go to next CHECK .
CHECK ***: Is the value 95% by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***
YES : Repair poor contact in TCM.
NO : Replace TCM.

8K5	**CHECK DUTY SOLENOID C (IN TRANSMISSION).**

1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

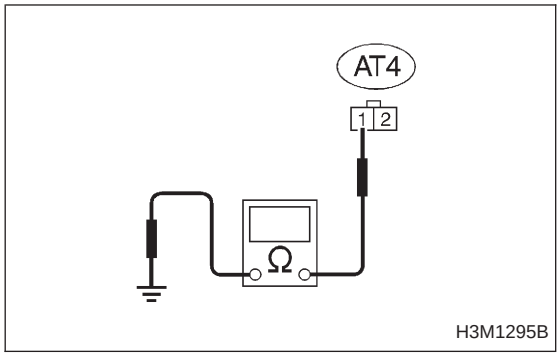
CAUTION:
On AWD models, make sure that all wheels are raised off floor.



3) Drain automatic transmission fluid.

CAUTION:
Do not drain the automatic transmission fluid until it cools down.

4) Remove extension case, and disconnect connector from duty solenoid C.
<Ref. to 3-2 [W6A0].>

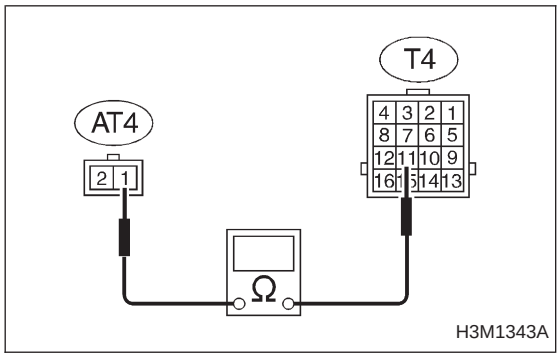


5) Measure resistance between duty solenoid C connector and transmission ground.

CHECK ***: Terminal***
(AT4) No. 1 — Transmission ground:
Is the resistance between 9 and 17 Ω?

YES : Go to step **8K6**.

NO : Replace duty solenoid C.



8K6	**CHECK HARNESS CONNECTOR BETWEEN DUTY SOLENOID C AND TRANSMISSION.**

1) Disconnect connector from transmission.
2) Remove transmission bracket.
3) Measure resistance of harness between duty solenoid C and transmission connector.

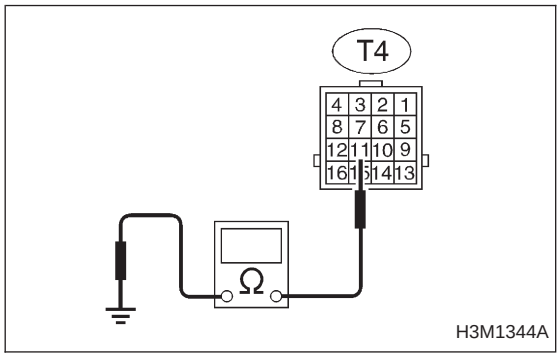
Connector & terminal
(T4) No. 11 — (AT4) No. 1:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between duty solenoid C and transmission connector.
- Poor contact in duty solenoid C connector.
- Poor contact in transmission connector.



4) Measure resistance of harness between transmission connector and transmission ground.

Connector & terminal
(T4) No. 11 — Transmission ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the duty solenoid C and transmission connector.

NO : Repair short circuit in harness between duty solenoid C and transmission connector.

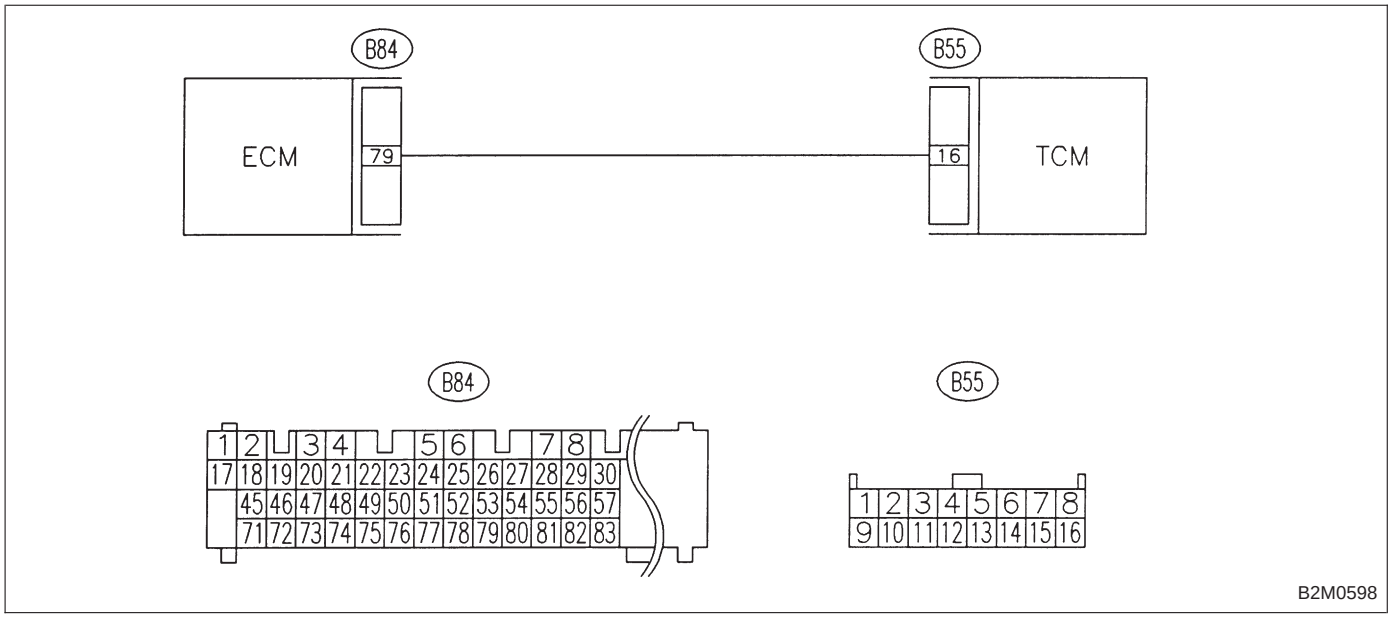
L: TROUBLE CODE 25 — TORQUE CONTROL SIGNAL —

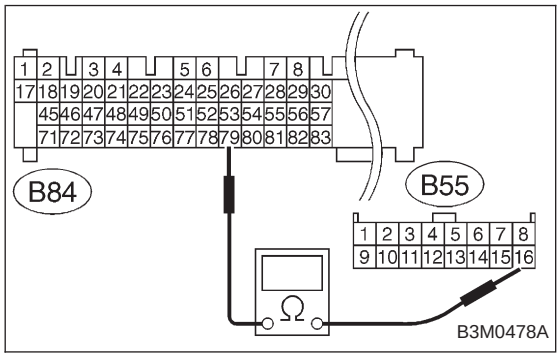
DIAGNOSIS:

- Torque control signal is not emitted from TCM.
- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.





8L1	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

1) Turn ignition switch to OFF.
2) Disconnect connectors from TCM and ECM.
3) Measure resistance of harness between TCM and ECM connector.

Connector & terminal
(B55) No. 16 — (B84) No. 79:

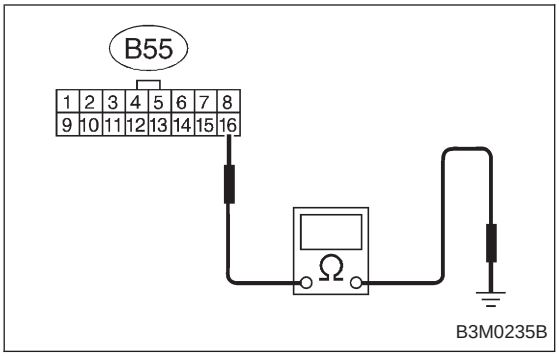
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and ECM connector.
- Poor contact in TCM connector.
- Poor contact in ECM connector.



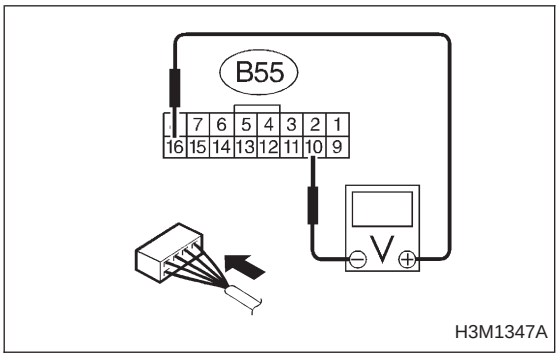
4) Measure resistance of harness between TCM connector and chassis ground.

Connector & terminal
(B55) No. 16 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8L2**.

NO : Repair short circuit in harness between TCM and ECM connector.



8L2	CHECK OUTPUT SIGNAL EMITTED FROM TCM.

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and ECM.
3) Turn ignition switch to ON (engine OFF).
4) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 16 (+) — No. 10 (−):

CHECK ***: Is the voltage between 4 and 6 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 4 V and 6 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Go to next CHECK .

CHECK ***: Replace ECM with a new one. Does the trouble code appear again, after the memory has been cleared?***

YES : Replace TCM.

NOTE:
Install the old ECM.

NO : Replace ECM.

M: TROUBLE CODE 31

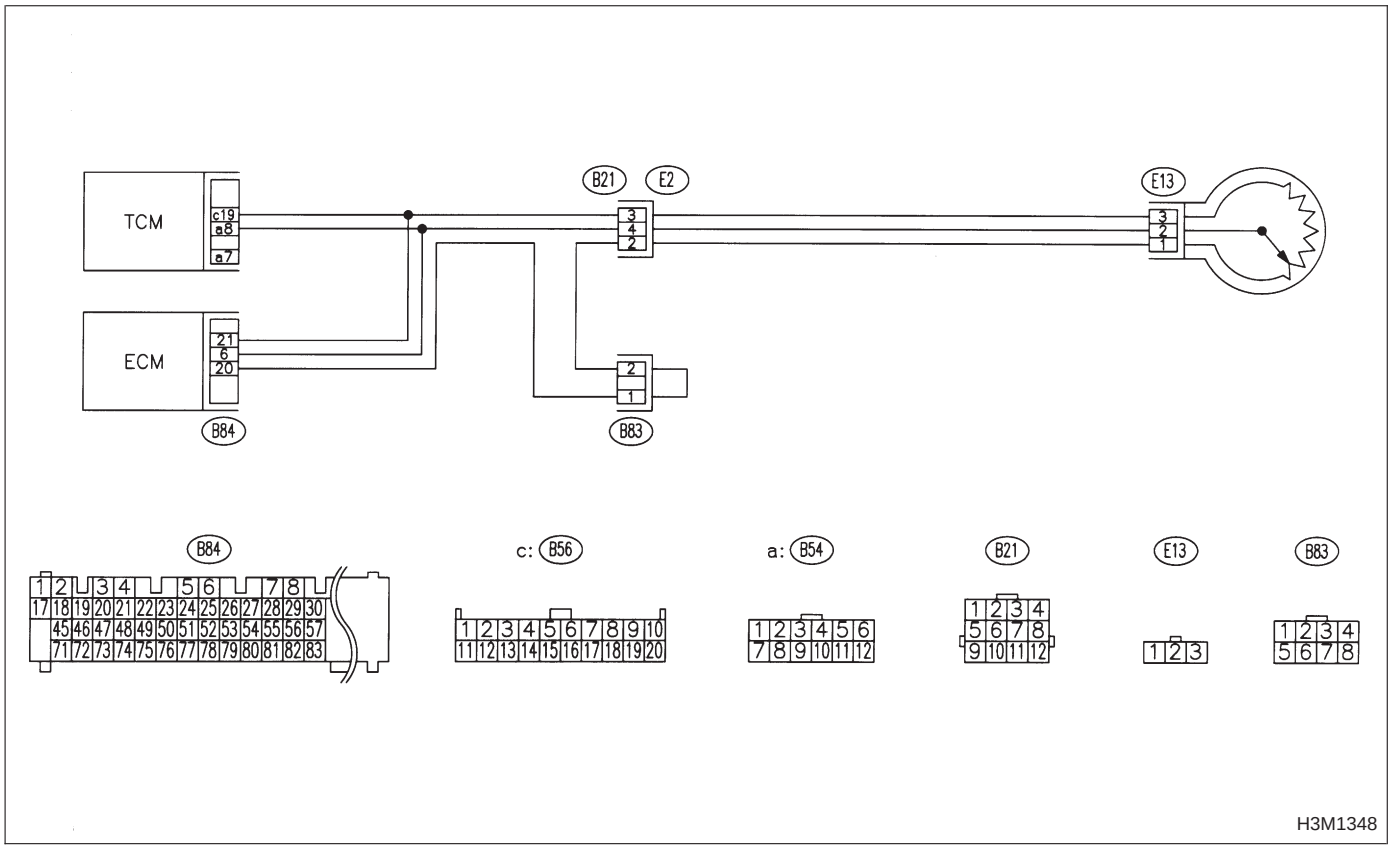
— THROTTLE POSITION SENSOR —

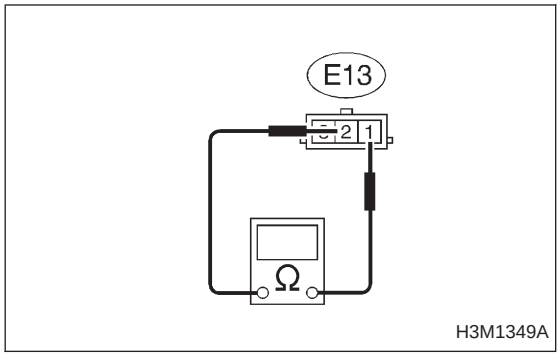
DIAGNOSIS:

Input signal circuit of throttle position sensor is open or shorted.

TROUBLE SYMPTOM:

Shift point too high or too low; engine brake not effected in “3” range: excessive shift shock; excessive tight corner “braking”.



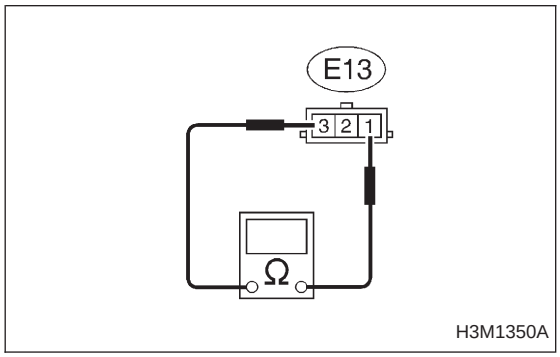


8M1	CHECK THROTTLE POSITION SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from throttle position sensor.
3) Measure resistance between throttle position sensor connector receptacle's terminals.

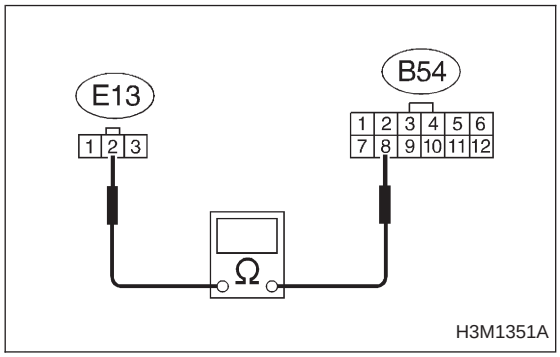
Terminals
(E13) No. 1 — No. 2:

CHECK ***: Is the resistance between 0.3 and 0.7 kΩ?***
YES : Go to next CHECK .
NO : Replace throttle position sensor.



Terminals
(E13) No. 1 — No. 3:

CHECK ***: Is the resistance between 3.5 and 6.5 kΩ?***
YES : Go to step **8M2**.
NO : Replace throttle position sensor.



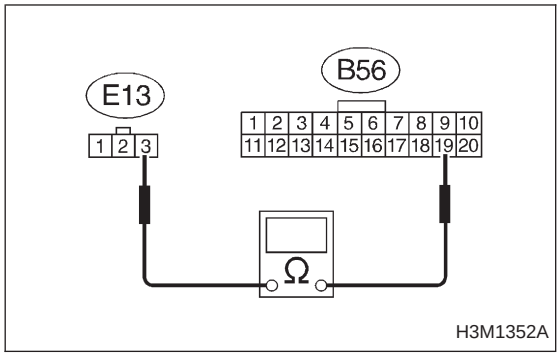
8M2	CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.

1) Disconnect connector from TCM.
2) Measure resistance of harness between TCM and throttle position sensor connector.

Connector & terminal
(B54) No. 8 — (E13) No. 2:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and throttle position sensor.
- Poor contact in TCM connector.
- Poor contact in throttle position sensor connector.
- Poor contact in coupling connector (B21).



Connector & terminal
(B56) No. 19 — (E13) No. 3:

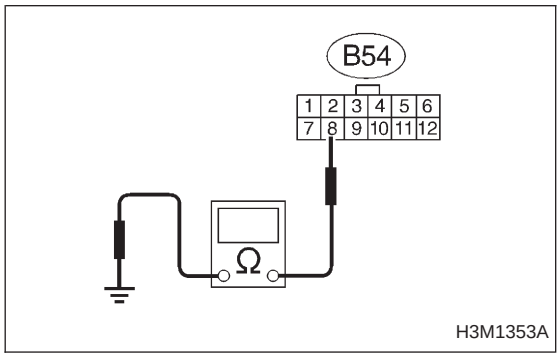
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 3).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Open circuit in harness between TCM and throttle position sensor.
- Poor contact in TCM connector.
- Poor contact in throttle position sensor connector.
- Poor contact in coupling connector (B21).



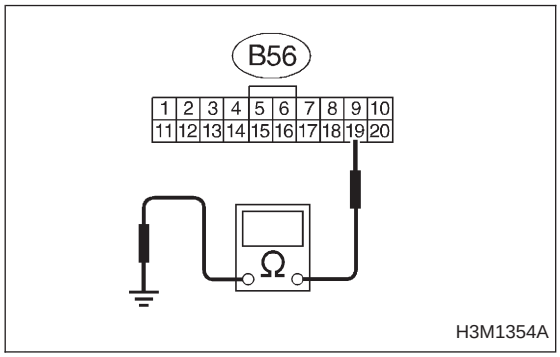
3) Measure resistance of harness between TCM connector and chassis ground.

Connector & terminal
(B54) No. 8 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and throttle position sensor.

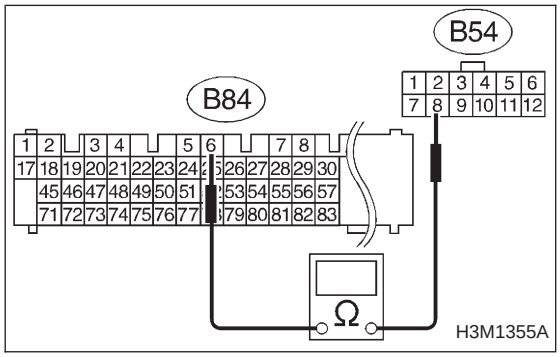


Connector & terminal
(B56) No. 19 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8M3**.

NO : Repair short circuit in harness between TCM and throttle position sensor.

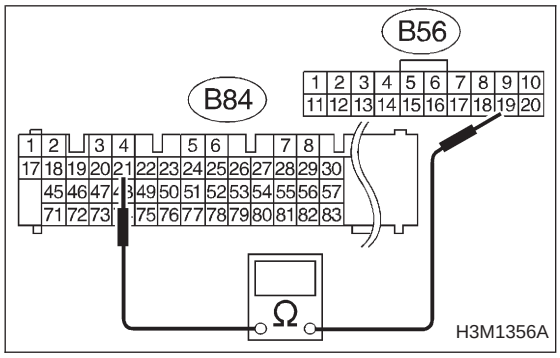


8M3	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.

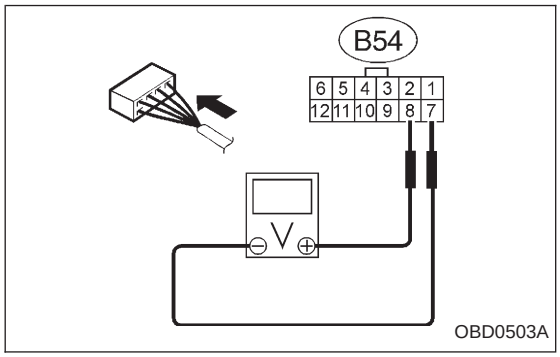
1) Disconnect connector from ECM.
2) Measure resistance of harness between TCM and ECM connector.

Connector & terminal
(B54) No. 8 — (B84) No. 6:

CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to next CHECK .
NO : Repair harness and connector.
NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and ECM.
- Poor contact in TCM connector.
- Poor contact in ECM connector.



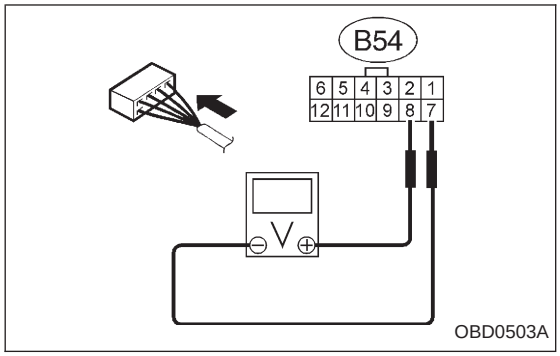
Connector & terminal
(B56) No. 19 — (B84) No. 21:
CHECK ***: Is the resistance less than 1 Ω?***
YES : Go to step **8M4**.
NO : Repair harness and connector.
NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and ECM.
- Poor contact in TCM connector.
- Poor contact in ECM connector.



8M4	CHECK INPUT SIGNAL FOR TCM.

1) Connect connectors to TCM, throttle position sensor and ECM.
2) Turn ignition switch to ON (engine OFF).
3) Measure voltage between TCM connector terminals.

Connector & terminal
(B54) No. 8 (+) — No. 7 (−):
CHECK ***: Is the voltage between 0.3 and 0.7 V in throttle fully closed?***
YES : Go to next step CHECK .
NO : Go to next CHECK1 .
CHECK1 ***: Is the voltage between 0.3 and 0.7 V while shaking harness and connector of TCM?***
YES : Repair poor contact in TCM.
NO : Replace TCM.



Connector & terminal
(B54) No. 8 (+) — No. 7 (−):

CHECK ***: Is the voltage between 4.3 and 4.9 V with throttle fully open?***

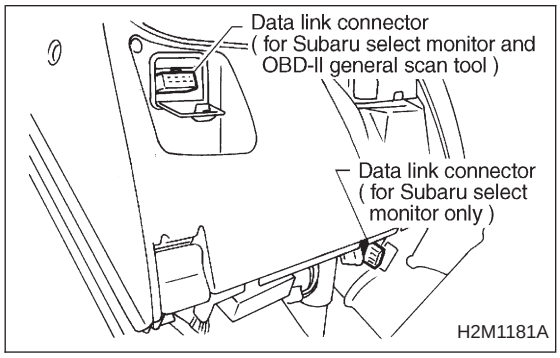
YES : Go to step **8M5**.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 4.3 and 4.9 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

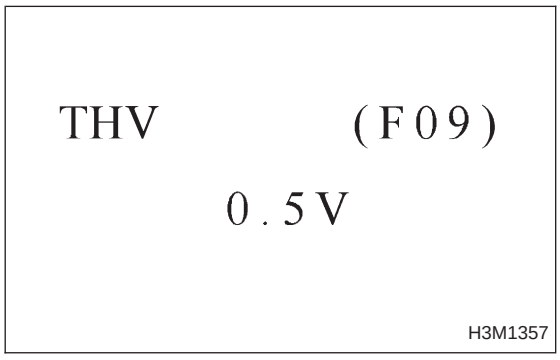


● Using Subaru Select Monitor

1) Connect connectors to TCM, throttle position sensor and ECM.
2) Connect Subaru Select Monitor to data link connector.
3) Turn ignition switch to ON (engine OFF).
4) Turn Subaru Select Monitor switch to ON.
5) Throttle fully closed.
6) Read data on Subaru Select Monitor.
7) Designate mode using function key.

Function mode F09

● F09: Throttle position sensor input signal is indicated.



CHECK ***: Is the value voltage between 0.3 and 0.7 V in function mode F09?***

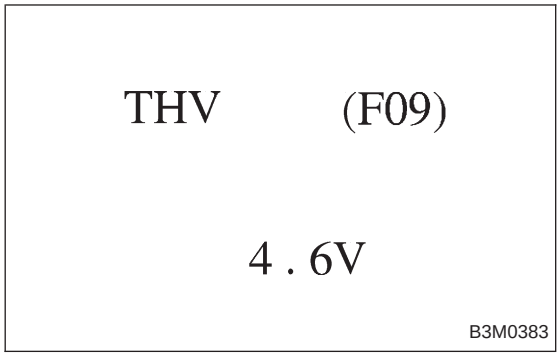
YES : Go to next step 8).

NO : Go to next CHECK .

CHECK ***: Is the voltage between 0.3 and 0.7 V by shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



8) Throttle fully open.

CHECK ***: Is the value voltage between 4.3 and 4.9 V in function model F09?***

NOTE:
Must be changed correspondingly with accelerator pedal operation (from “released” to “depressed” position).

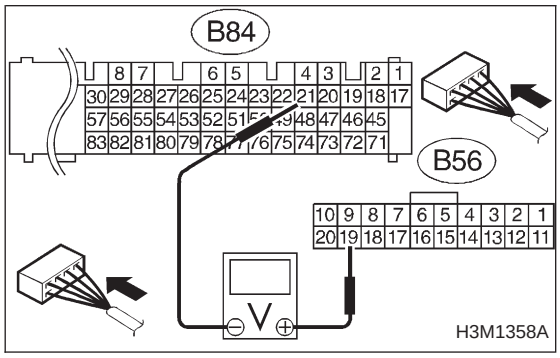
YES : Go to step **8M5**.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 4.3 and 4.9 V by shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



8M5	CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).

Measure voltage between TCM connector terminals.

Connector & terminal
(B56) No. 19 (+) — (B84) No. 21 (−):

CHECK ***: Is the voltage between 5.02 and 5.22 V?***

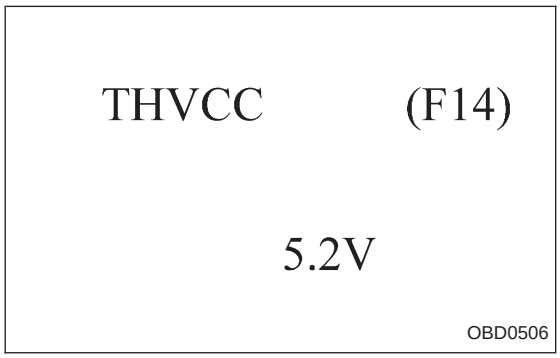
YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage between 5.02 and 5.22 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



● Using Subaru Select Monitor
1) Read data on Subaru Select Monitor.
2) Designate mode using function key.
Function mode F14
● F14: Throttle position sensor power supply voltage is indicated.

CHECK ***: Is the value voltage between 5.02 and 5.22 V in function mode F14?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in TCM.

CHECK ***: Is the voltage between 5.02 and 5.22 V by shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

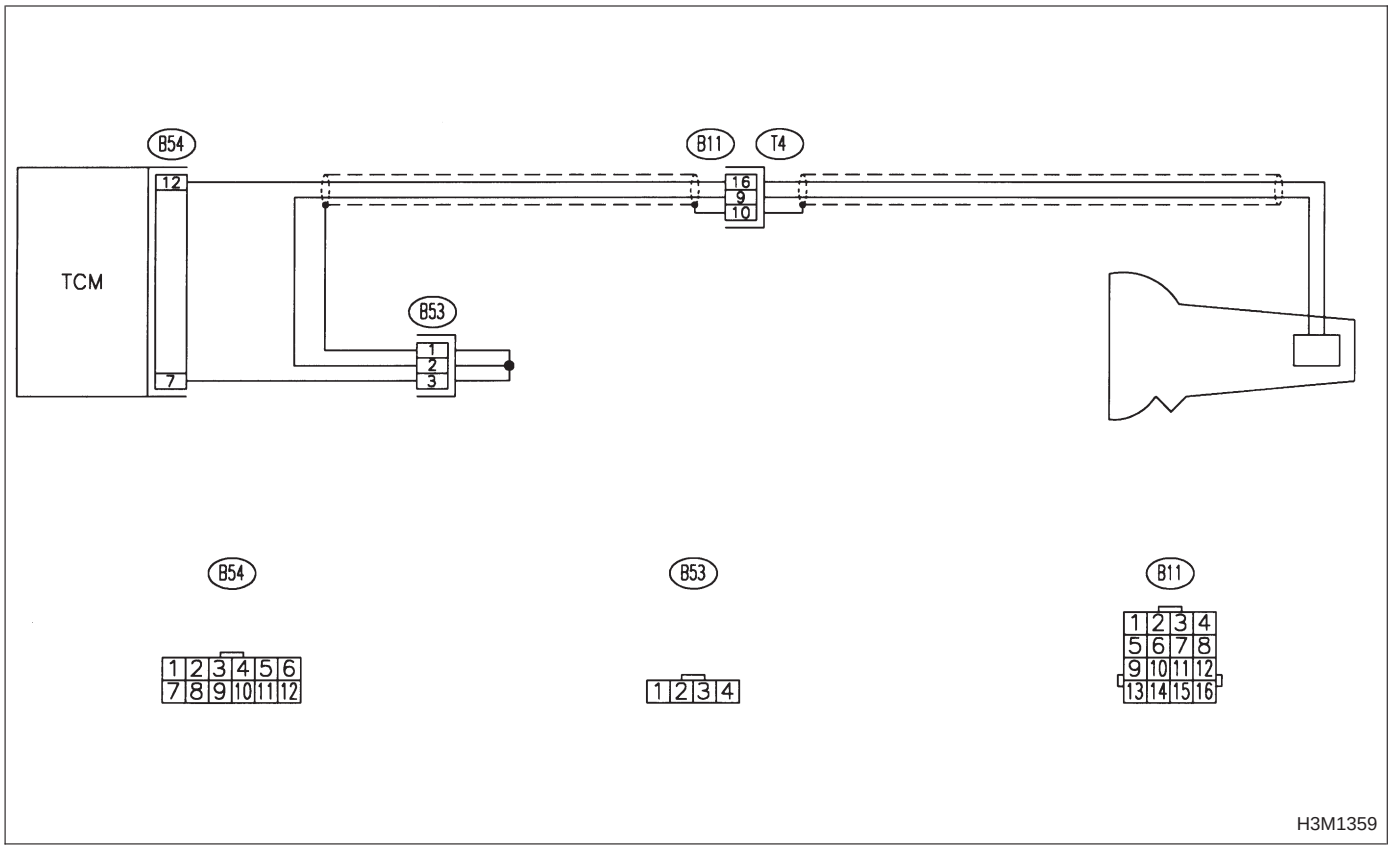
N: TROUBLE CODE 32 — VEHICLE SPEED SENSOR 1 —

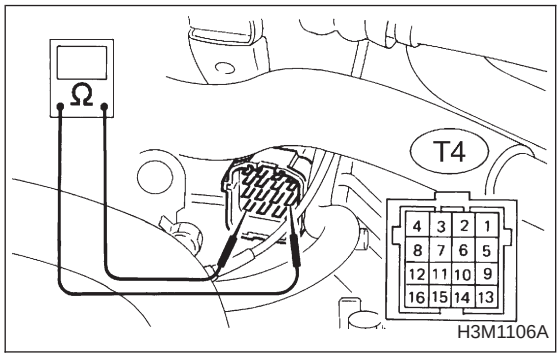
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.





8N1	CHECK VEHICLE SPEED SENSOR 1.

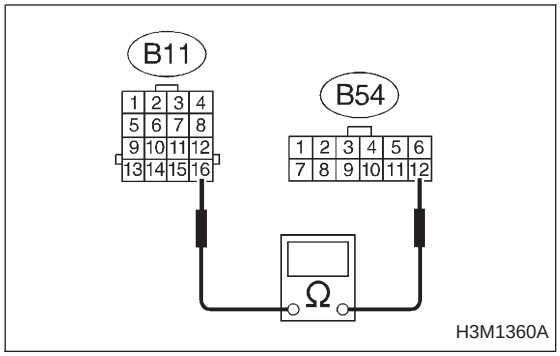
1) Turn ignition switch to OFF.
2) Disconnect connector from transmission.
3) Measure resistance between transmission connector receptacle’s terminals.

Connector & terminal
(T4) No. 16 — No. 9:

CHECK ***: Is the resistance between 450 and 720 Ω?***

YES : Go to step **8N2**.

NO : Replace vehicle speed sensor 1 connector.



8N2	CHECK HARNESS BETWEEN TCM AND TRANSMISSION CONNECTOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from transmission and TCM.
3) Measure resistance of harness between TCM and transmission connector.

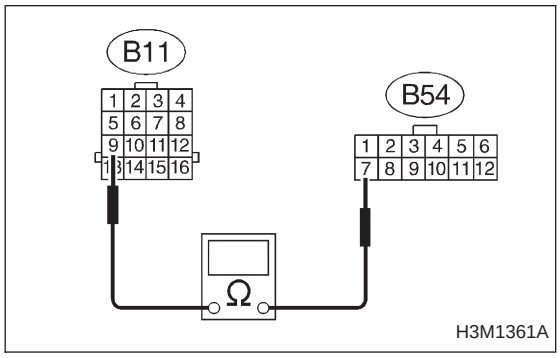
Connector & terminal
(B54) No. 12 — (B11) No. 16:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission.



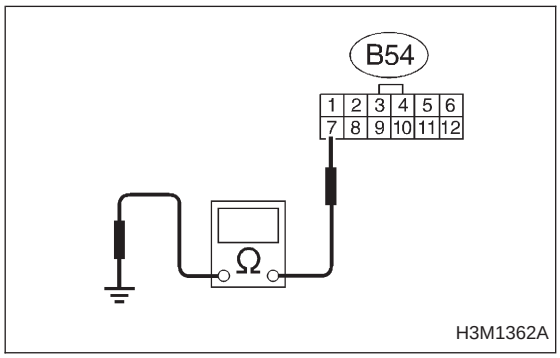
Connector & terminal
(B54) No. 7 — (B11) No. 9:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and transmission connector.
- Poor contact in TCM.
- Poor contact in transmission.
- Poor contact in shield joint connector (B53).

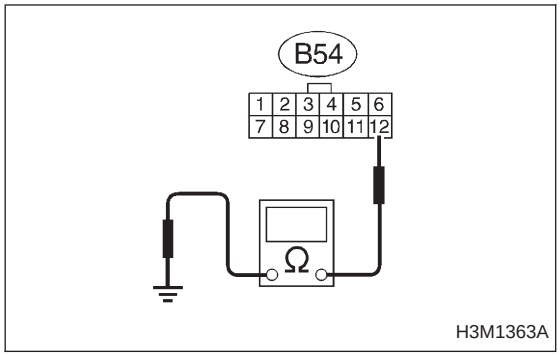


Connector & terminal
(B54) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to next CHECK .

NO : Repair short circuit in harness between TCM and transmission connector.



Connector & terminal
(B54) No. 12 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8N3**.

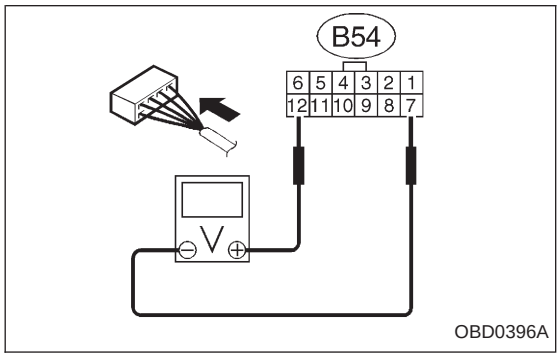
NO : Repair short circuit in harness between TCM and transmission connector.

8N3	CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Lift-up or raise the vehicle and place safety stands.

CAUTION:
On AWD models, raise all wheels off floor.

4) Start the engine and set vehicle in 20 km/h (12 m/h) condition.



5) Measure voltage between TCM connector terminals.

Connector & terminal
(B54) No. 12 (+) — No. 7 (−):

CHECK ***: Is the voltage more than AC 1 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

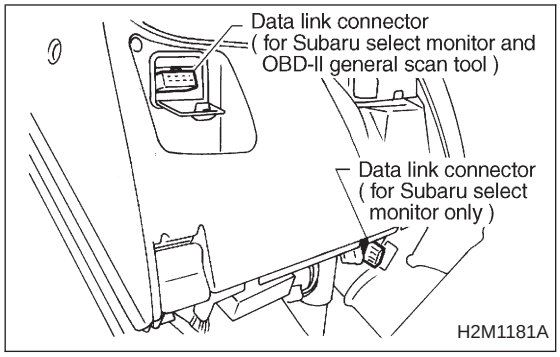
NO : Go to next CHECK .

CHECK ***: Is the voltage more than AC 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

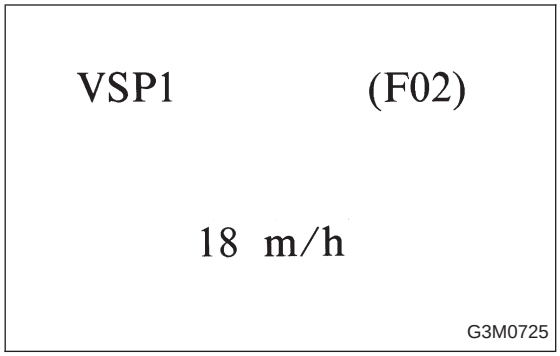


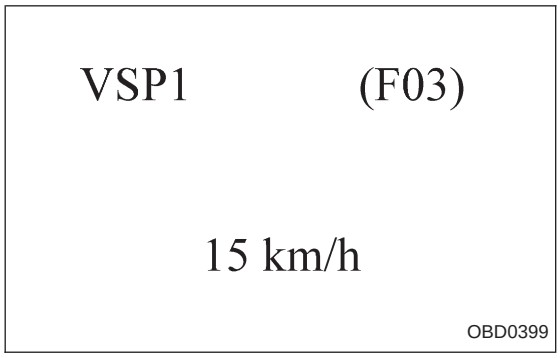
● Using Subaru Select Monitor
1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Connect Subaru Select Monitor to data link connector.

4) Lift-up or raise the vehicle and place safety stands.

CAUTION:
On AWD models, raise all wheels off floor.

5) Turn ignition switch to ON and turn Subaru Select Monitor switch to ON.
6) Start the engine.
7) Read data on Subaru Select Monitor.
8) Designate mode using function key.
Function mode F02 or F03
● F02: Compare speedometer with Subaru Select Monitor indications.
● F02: Vehicle speed is indicated in “m/h”.
● F03: Compare speedometer with Subaru Select Monitor indications.
● F03: Vehicle speed is indicated in “km/h”.





CHECK ***: Are Select Monitor indications noted anywhere between vehicle speeds listed under the F02 and/or F03 function modes, and speedometer indications? Refer to the table below.***

Speedometer (in combination meter)	Function mode F02	Function mode F03
20 (m/h or km/h)	19 — 22 (m/h)	18 — 23 (km/h)
40 (m/h or km/h)	39 — 42 (m/h)	38 — 43 (km/h)
60 (m/h or km/h)	58 — 62 (m/h)	58 — 63 (km/h)

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the vehicle speed within the range of table by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

YES : Repair poor contact in TCM.

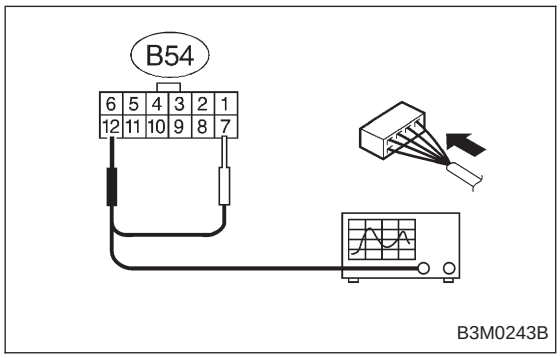
NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

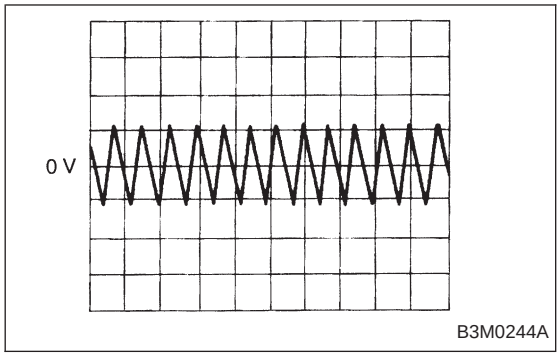
- Using Oscilloscope

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and transmission.
3) Lift-up or raise the vehicle and place safety stands.

CAUTION:
On AWD models, raise all wheels off floor.



4) Set oscilloscope to TCM connector terminals.
Position prove; (B54) No. 12
Earth lead; (B54) No. 7
5) Start the engine and set vehicle in 20 km/h (12 m/h) condition.
6) Measure signal voltage indicated on oscilloscope.



CHECK ***: Is the signal voltage more than AC 1 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage more than AC 1 V by shaking harness and connector of TCM while monitoring the value with oscilloscope?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

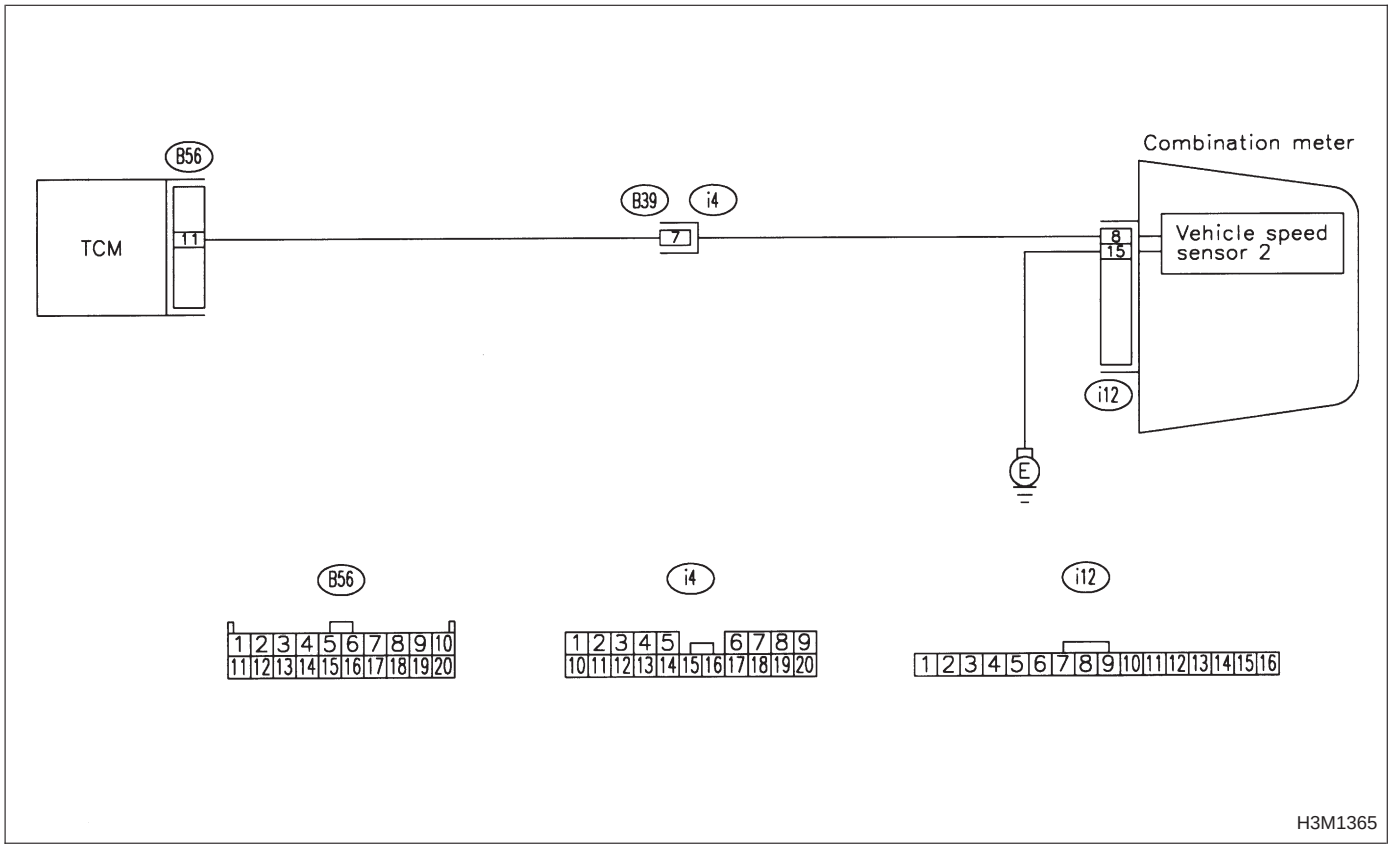
O: TROUBLE CODE 33
— VEHICLE SPEED SENSOR 2 —

DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

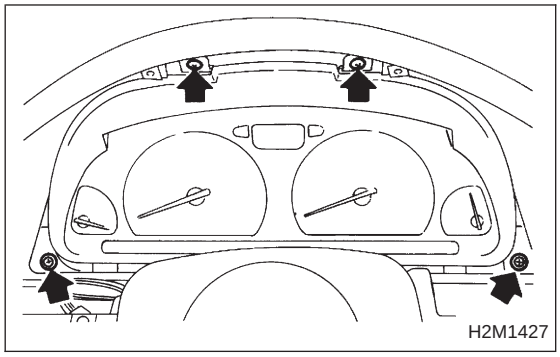


8O1	CHECK OPERATION OF SPEEDOMETER.

CHECK ***: Does speedometer operate normally?***

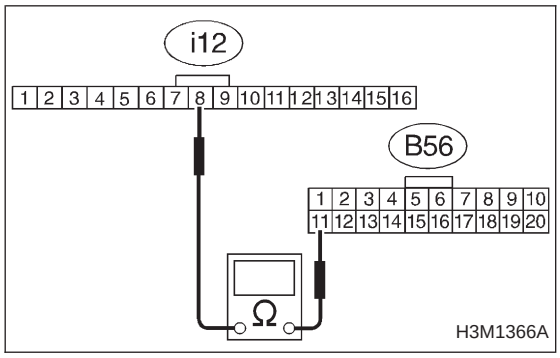
YES : Go to step **8O2**.

NO : Check speedometer. <Ref. to 6-2 [K2A0].>


H2M1427

8O2	CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.

1) Turn ignition switch to OFF.
2) Remove combination meter.



H3M1366A

3) Disconnect connectors from TCM and combination meter.
4) Measure resistance of harness between TCM and combination meter connector.

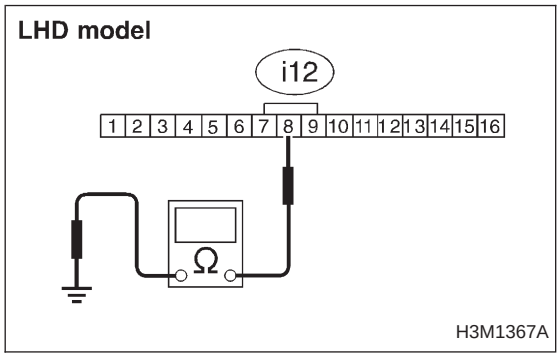
Connector & terminal
(B56) No. 11 — (i12) No. 8:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next CHECK .

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Open circuit in harness between TCM and combination meter connector.
- Poor contact in TCM connector.
- Poor contact in combination meter connector.
- Poor contact in coupling connector (B39).



H3M1367A

Connector & terminal
(i12) No. 8 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

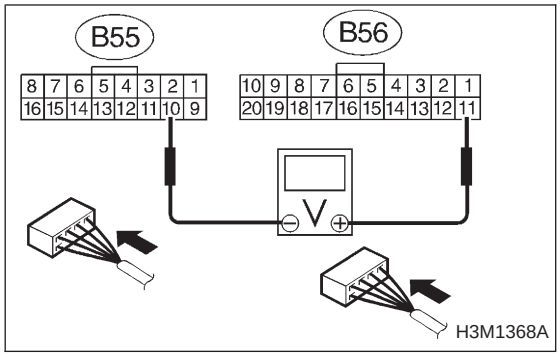
YES : Go to step **8O3**.

NO : Repair short circuit in harness between TCM and combination meter connector.

8O3	CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and combination meter.
3) Install combination meter.
4) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.



5) Start the engine, and set vehicle in 10 km/h (6 m/h).
6) Measure voltage between TCM connector terminals.

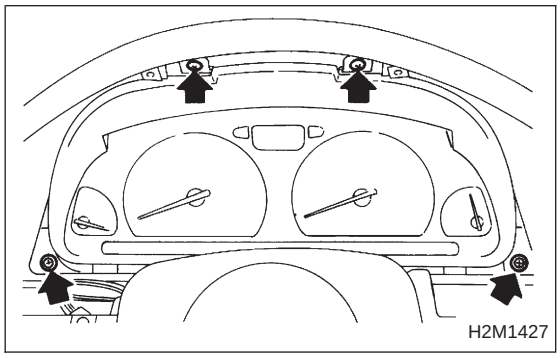
Connector & terminal
(B56) No. 11 (+) — (B55) No. 10 (−):

CHECK ***: Is the voltage less than 1 V ↔ more than 4 V?***

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Is the voltage changing less than 1 V ↔ more than 4 V while shaking harness and connector of TCM?

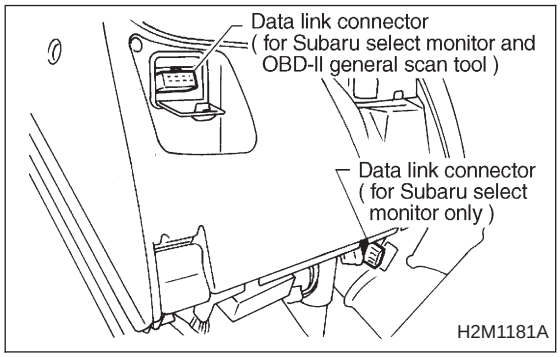
NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>



- Using Subaru Select Monitor

1) Turn ignition switch to OFF.
2) Connect connectors to TCM and combination meter.
3) Install combination meter.
4) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.

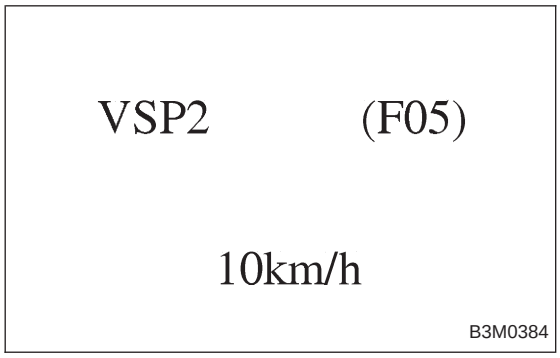


5) Connect Subaru Select Monitor to data link connector.
6) Turn ignition switch to ON and Subaru Select Monitor switch to ON.
7) Start the engine, and drive all wheels.
8) Read data on Subaru Select Monitor.
9) Designate mode using function key.

Function mode F04 or F05

- F04: Compare speedometer with Subaru Select Monitor indications.
- F04: Vehicle speed is indicated in “m/h”.
- F05: Compare speedometer with Subaru Select Monitor indications.
- F05: Vehicle speed is indicated in “km/h”.





CHECK ***: Are Select Monitor indications noted anywhere between vehicle speeds listed under the F04 and/or F05 function modes, and speedometer indications? Refer to the table below.***

Speedometer (in combination meter)	Function mode F04	Function mode F05
20 (m/h or km/h)	19 — 22 (m/h)	18 — 23 (km/h)
40 (m/h or km/h)	39 — 42 (m/h)	38 — 43 (km/h)
60 (m/h or km/h)	58 — 62 (m/h)	58 — 63 (km/h)

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the vehicle speed within the range of table by shaking harness and connector of TCM while monitoring the value with Subaru Select Monitor?***

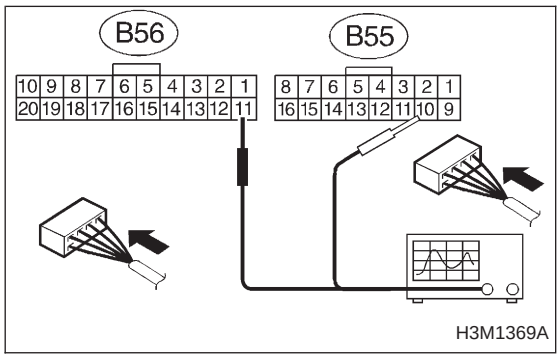
YES : Repair poor contact in TCM.

NO : Replace TCM.

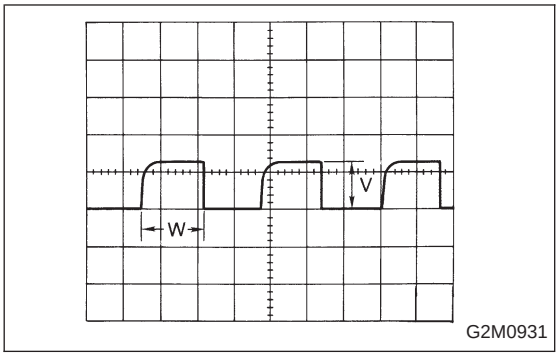
NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

● Using Oscilloscope
1) Turn ignition switch to OFF.
2) Connect connectors to TCM and combination meter.
3) Install combination meter.
4) Lift-up or raise the vehicle and place safety stands.

CAUTION:
On AWD models, raise all wheels off floor.



5) Set oscilloscope to TCM connector terminals.
Positive prove; (B56) No. 11
Earth lead; (B55) No. 10
6) Start the engine.
7) Shift on the gear position, and keep the vehicle speed at constant.



8) Measure signal voltage indicated on oscilloscope.

CHECK ***: Is the voltage more than AC 2 V?***

NOTE:
If vehicle speed increases, the width of amplitude (W) decreases.

YES : Even if “AT OIL TEMP” lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM.

NO : Go to next CHECK .

CHECK ***: Is the voltage more than AC 2 V by shaking harness and connector of TCM while monitoring the value with oscilloscope?***

NOTE:
If vehicle speed increases, the width of amplitude (W) decreases.

YES : Repair poor contact in TCM.

NO : Replace TCM.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

9. Diagnostic Chart with Select Monitor

A: BASIC DIAGNOSTIC CHART

If no trouble codes appear in the on-board diagnostics operation (although problems have occurred or are occurring), measure performance characteristics of sensors, actuators, etc., in the “F” mode (select monitor function), and compare with the “basic data” to determine the cause of problems.

1) Trouble occurs.
2) No trouble codes appear in on-board diagnostics operation.
3) Measure each item in select mode function.
4) Compare measured values with basic data.
5) Determine item which is outside basic data specifications.
6) Check sensor and actuator affected.

B: LIST OF OUTPUT MODES

1. FUNCTION MODE

Mode	Contents	Abbr.	Unit	Contents of display	Page
F00	Mode display	—	—	AT or EGI mode (when monitor is connected.)	98
F01	Battery voltage	VB	V	Battery voltage applied to control unit.	98
F02	Vehicle speed sensor 1	VSP1	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 1.	99
F03	Vehicle speed sensor 1	VSP1	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 1.	99
F04	Vehicle speed sensor 2	VSP2	m/h	Vehicle speed (miles/h) sent from vehicle speed sensor 2.	101
F05	Vehicle speed sensor 2	VSP2	km/h	Vehicle speed (km/h) sent from vehicle speed sensor 2.	101
F06	Engine speed signal	EREV	rpm	Engine speed sent from ECM.	102
F07	ATF temperature sensor	ATFT	°F	ATF temperature (°F) sent from ATF temperature sensor.	103
F08	ATF temperature sensor	ATFT	°C	ATF temperature (°C) sent from ATF temperature sensor.	103
F09	Throttle position sensor	THV	V	Voltage sent from throttle position sensor.	105
F10	Gear position	GEAR	—	Transmission gear position	106
F11	Line pressure duty	PLDTY	%	Duty ratio flowing through duty solenoid A.	107
F12	Lock-up duty	LUDTY	%	Duty ratio flowing through duty solenoid B.	110
F13	AWD duty	4WDTY	%	Duty ratio flowing through duty solenoid C.	113
F14	Throttle position sensor power supply	THVCC	V	Power supply voltage to throttle position sensor	117
F15	Mass air flow signal	AFM	V	Output voltage from air flow sensor	118

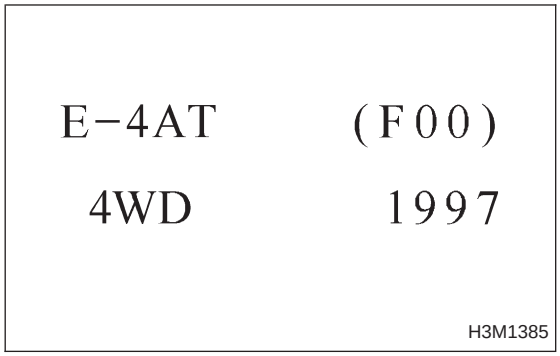
2. ON ←→ OFF SIGNAL LIST

Mode	LED No.	Signal name	Display	LED "ON" requirements	Page
FA0	1	FWD switch	FF	When fuse is installed in FWD switch.	121
	2*	Kick-down switch	KD	—	—
	3	—	—	—	—
	4	—	—	—	—
	5	Brake switch	BR	When brake switch is turned ON.	—
	6	ABS switch	AB	When ABS signal is entered.	—
	7	Cruise control set	CR	When cruise control is set.	—
	8*	Power switch	PW	—	—
	9	—	—	—	—
	10	—	—	—	—
FA1	1	P/N range switch	NP	When P or N range is selected.	—
	2	R range switch	RR	When R range is selected.	—
	3	D range switch	RD	When D range is selected.	—
	4	3 range switch	R3	When 3 range is selected.	—
	5	2 range switch	R2	When 2 range is selected.	—
	6	1 range switch	R1	When 1 range is selected.	—
	7	Diagnosis switch	SS	When diagnosis switch is turned ON.	127
	8	—	—	—	—
	9	—	—	—	—
	10	—	—	—	—

*: LED Nos. 2 and 8 cannot be turned on.

3. DIAGNOSIS MODE

Mode	Contents	Abbr.	Contents of display
FB0	On-board diagnostics	DIAG.U	Current trouble code determined by on-board diagnostics.
FB1	On-board diagnostics	DIAG.M	Previous trouble code stored in memory by on-board diagnostics.
FC0	Back-up clear	—	Function of clearing trouble code stored in memory.



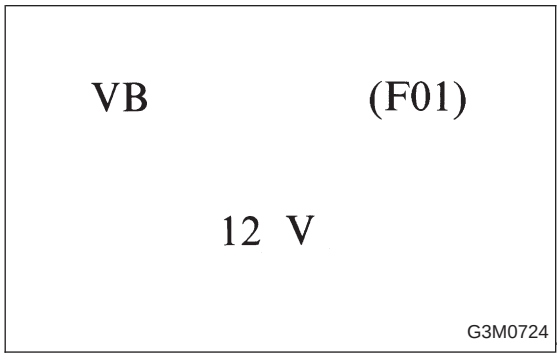
C: MODE F00 — MODE DISPLAY —

SPECIFIED DATA:

Data at the left should be indicated.

Probable cause (if outside “specified data”)

1. Communication failure (No communication method can be confirmed with power ON.)	(1) (2)	Check loose or poor connectors, or short circuit. Check type of cartridge.
2. Vehicle types cannot be identified (due to communication failure).		Check improper cartridge. Replace with proper one.



D: MODE F01 — BATTERY VOLTAGE (VB) —

CONDITION:

- Ignition switch ON
- Engine idling after warm-up

SPECIFIED DATA:

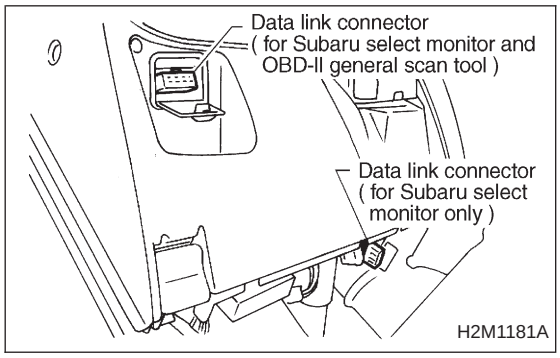
VB: 10 — 16 V

1. Battery		Check battery voltage and specific gravity of electrolyte.
2. Charging system	(1) (2)	Measure regulating voltage under no loads. Check generator (as a single unit).

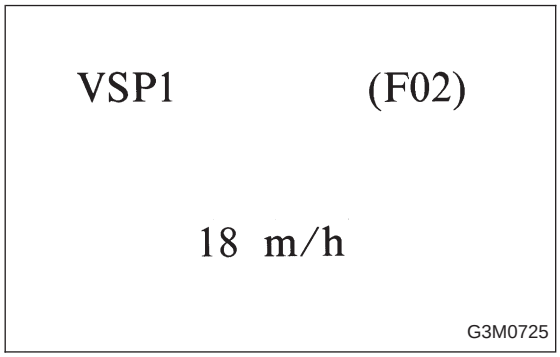
E: MODE F02 OR F03 — CHECK VEHICLE SPEED SENSOR 1 —

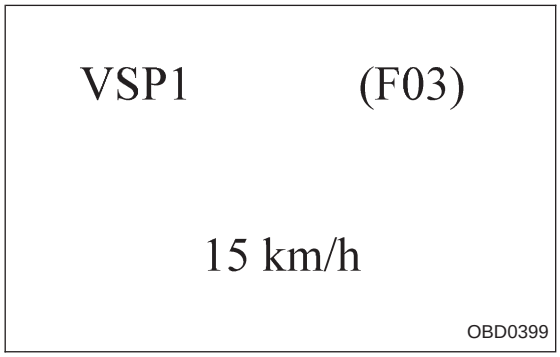
1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.



3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Read data on Subaru Select Monitor.
6) Designate mode using function key.
Function mode: F02 or F03
- F02: Compare speedometer with Subaru Select Monitor indications.
- F02: Vehicle speed is indicated in “m/h”.
- F03: Compare speedometer with Subaru Select Monitor indications.
- F03: Vehicle speed is indicated in “km/h”.





CHECK : ***Are Select Monitor indications noted anywhere between vehicle speeds listed under the F02 and/or F03 function modes, and speedometer indications? Refer to the table below.***

Speedometer (in combination meter)	Function mode F02	Function mode F03
20 (m/h or km/h)	19 — 22 (m/h)	18 — 23 (km/h)
40 (m/h or km/h)	39 — 42 (m/h)	38 — 43 (km/h)
60 (m/h or km/h)	58 — 62 (m/h)	58 — 63 (km/h)

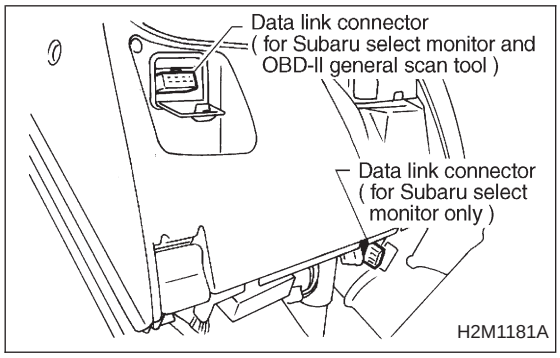
YES : Go to step MODE F04 or F05.
NO : Check vehicle speed sensor 1 circuit.

NOTE:
● For the diagnostics procedure on vehicle speed sensor 1 circuit, refer to 3-2 [T8N0].
● The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

F: MODE F04 OR F05 — CHECK VEHICLE SPEED SENSOR 2 —

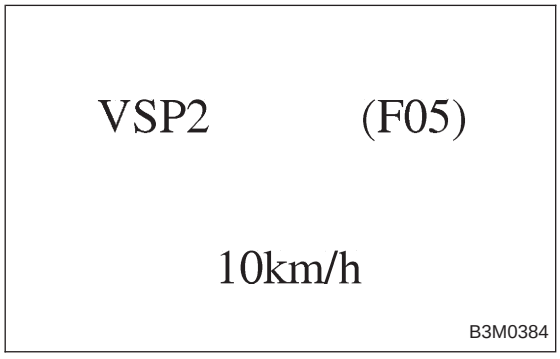
1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.



3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Read data on Subaru Select Monitor.
6) Designate mode using function key.
Function mode: F04 or F05
- F04: Compare speedometer with Subaru Select Monitor indications.
- F04: Vehicle speed is indicated in “m/h”.
- F05: Compare speedometer with Subaru Select Monitor indications.
- F05: Vehicle speed is indicated in “km/h”.





CHECK : ***Are Select Monitor indications noted anywhere between vehicle speeds listed under the F04 and/or F05 function modes, and speedometer indications? Refer to the table below.***

Speedometer (in combination meter)	Function mode F04	Function mode F05
20 (m/h or km/h)	19 — 22 (m/h)	18 — 23 (km/h)
40 (m/h or km/h)	39 — 42 (m/h)	38 — 43 (km/h)
60 (m/h or km/h)	58 — 62 (m/h)	58 — 63 (km/h)

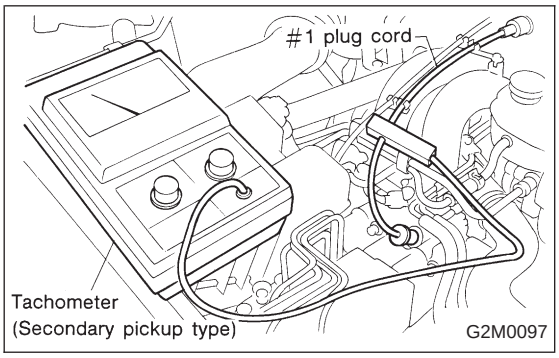
YES : Go to step MODE F06.
NO : Check vehicle speed sensor 2 circuit.

NOTE:
- For the diagnostics procedure on vehicle speed sensor 2 circuit, refer to 3-2 [T8O0].
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

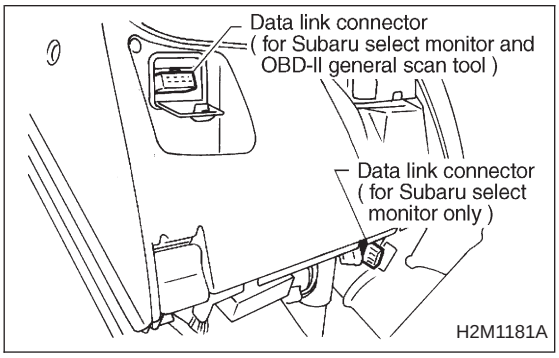
G: MODE F06
— CHECK ENGINE SPEED SIGNAL —

1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

CAUTION:
On AWD models, make sure that all wheels are raised off floor.



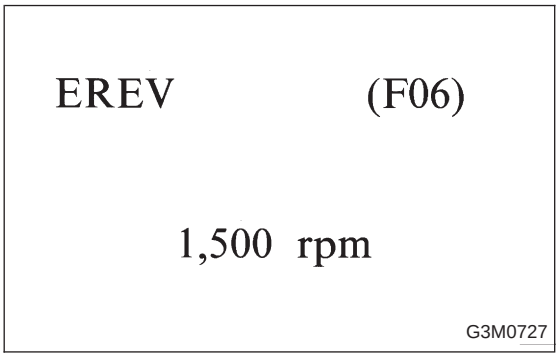
3) Attach the pickup sensor on tachometer (secondary pickup type) to #1 cylinder spark plug cord (without tachometer models).
4) Turn A/C switch to OFF (with A/C models).



5) Connect Subaru Select Monitor to data link connector.
6) Start the engine, and turn Subaru Select Monitor switch to ON.
7) Warm-up the engine until engine coolant temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

8) Read data on Subaru Select Monitor.
9) Designate mode using function key.
Function mode: F06
- F06: Engine revolution is indicated in “rpm”.



CHECK ***: Is the revolution in function mode F06 and tachometer within the specifications shown in the following table?***

Tachometer (in combination meter)	Function mode F06
Idling	600 — 800 rpm
1,000 rpm	925 — 1,075 rpm
2,000 rpm	1,890 — 2,145 rpm

YES : Go to step MODE F07.
NO : Check engine speed signal circuit.

NOTE:
- For the diagnostics procedure on engine speed signal circuit, refer to 3-2 [T8J0].
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

H: MODE F07 OR F08 — CHECK ATF TEMPERATURE SENSOR —

1) Turn ignition switch to OFF.
2) Start engine.

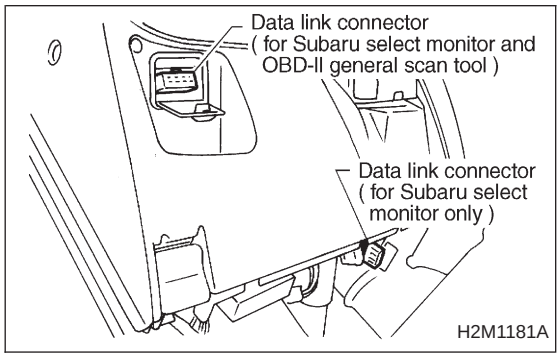
CHECK ***: Does the AT OIL TEMP warning light remain on 2 seconds after the engine has been started?***

YES : Go to next step 3).

NO : Check ATF temperature sensor and combination meter circuit.

NOTE:

For the diagnostics procedure on ATF temperature sensor and combination meter circuit, refer to 3-2 [T8H0].



3) Turn ignition switch to OFF.
4) Connect Subaru Select Monitor to data link connector.
5) Turn ignition switch to ON (engine OFF).
6) Turn Subaru Select Monitor switch to ON.
7) Start engine.
8) Read data on Subaru Select Monitor.
9) Designate mode using function key.

Function mode: F07 or F08

- F07: ATF temperature is indicated in "°F".
- F08: ATF temperature is indicated in "°C".

10) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:

If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.



11) Turn ignition switch to OFF.

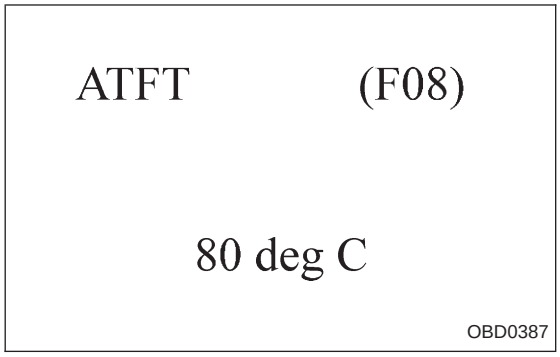
CHECK ***: Does the ATF temperature change from 176°F (80°C)?***

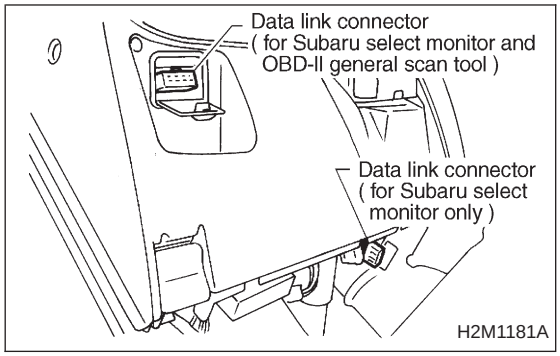
YES : Go to step MODE F09.

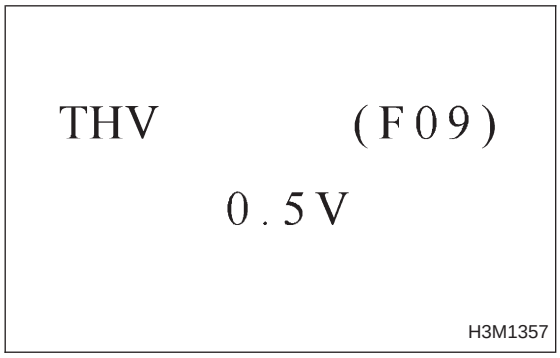
NO : Check ATF temperature sensor circuit.

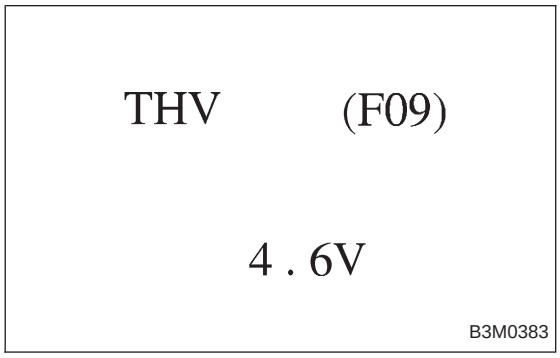
NOTE:

For the diagnostics procedure on ATF temperature sensor circuit, refer to 3-2 [T8H0].


ATFT (F08)
80 deg C
OBD0387







I: MODE F09
— CHECK THROTTLE POSITION SENSOR —

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Turn ignition switch to ON.
4) Turn Subaru Select Monitor switch to ON.
5) Read data on Subaru Select Monitor.
6) Designate mode using function key.

Function mode: F09

- F09: Throttle position sensor input signal is indicated.

CHECK ***: Is voltage between 0.3 and 0.7 V in the function mode F09 when the accelerator pedal is completely released?***

YES : Go to next CHECK .

NO : Check throttle position sensor circuit.

NOTE:
For the diagnostics procedure on throttle position sensor circuit, refer to 3-2 [T8M0].

CHECK ***: Is voltage between 4.4 and 4.8 V in the function mode F09 when the accelerator pedal is completely depressed?***

YES : Go to next CHECK .

NO : Check throttle position sensor circuit.

NOTE:
For the diagnostics procedure on throttle position sensor circuit, refer to 3-2 [T8M0].

CHECK ***: Does voltage in the function mode F09 decrease smoothly when the accelerator pedal is fully depressed and then fully released?***

YES : Go to step MODE F10.

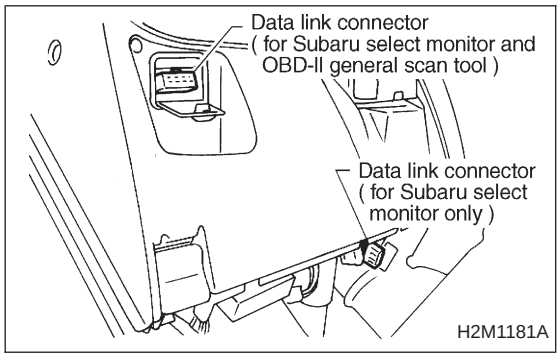
NO : Check throttle position sensor circuit.

NOTE:
For the diagnostics procedure on throttle position sensor circuit, refer to 3-2 [T8M0].

J: MODE F10
— CHECK GEAR POSITION —

1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

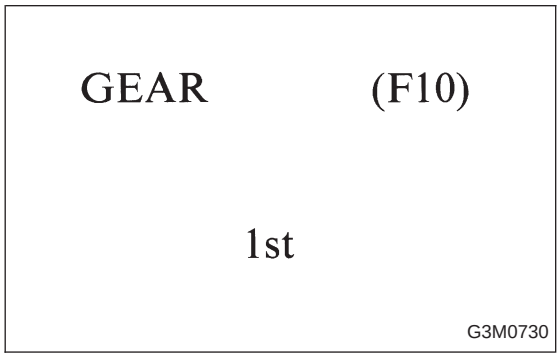
CAUTION:
On AWD models, make sure that all wheels are raised off floor.



3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Select D range, and drive vehicle.
6) Read data on Subaru Select Monitor.
7) Designate mode using function key.

Function mode: F10

- F10: Gear position is indicated.



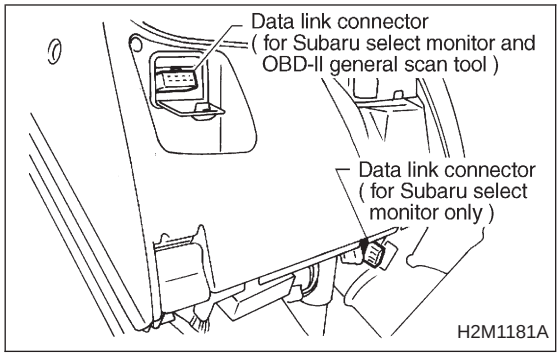
CHECK ***: Does the transmission gear correspond to the gear which is shown on display in the F10 mode?***

YES : Go to step MODE F11.

NO : Check shift solenoid 1 and shift solenoid 2 signal circuit.

NOTE:

- For the diagnostics procedure on shift solenoid 1 and shift solenoid 2 signal circuit, refer to 3-2 [T8F0] and [T8G0].
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

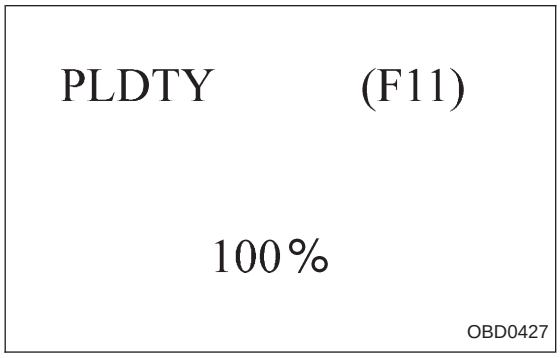


K: MODE F11
— CHECK LINE PRESSURE DUTY —

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Start the engine, and turn Subaru Select Monitor switch to ON.
4) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

5) Stop the engine and turn ignition switch to ON (engine OFF).
6) Move selector lever to “N”.
7) Read data on Subaru Select Monitor.
8) Designate mode using function key.
Function mode: F11
- F11: Line pressure duty is indicated in “%”.



CHECK ***: Does the function mode F11 indicate 100% when the accelerator pedal is completely released?***

YES : Go to next CHECK .
NO : Go to step **9K1**.

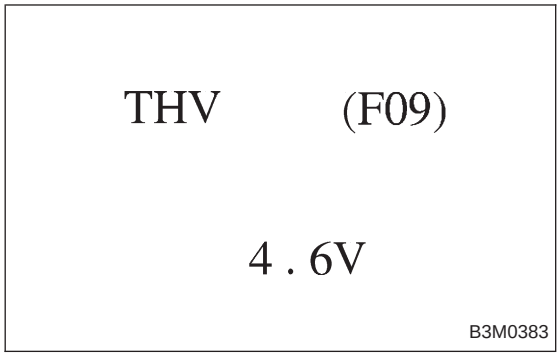


CHECK ***: Does the function mode F11 indicate 15% or less when the accelerator pedal is completely depressed?***

YES : Go to next CHECK .
NO : Go to step **9K1**.

CHECK ***: Does the function mode F11 change smoothly when the accelerator pedal is fully depressed and then fully released?***

YES : Go to step MODE F12.
NO : Go to step **9K1**.



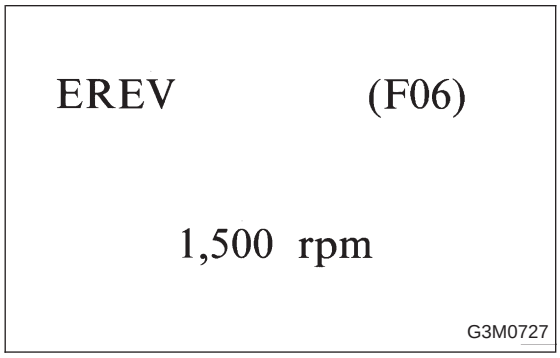
9K1	CHECK THROTTLE POSITION SENSOR CIRCUIT (FUNCTION MODE F09).

CHECK ***: Is there any trouble in throttle position sensor circuit?***

NOTE:
For the diagnostics procedure on throttle position sensor circuit (mode F09), refer to 3-2 [T9I0].

YES : Repair or replace throttle position sensor circuit, refer to 3-2 [T8M0].

NO : Go to step **9K2**.



9K2	CHECK ENGINE SPEED SIGNAL CIRCUIT (FUNCTION MODE F06).

CHECK ***: Is there any trouble in engine speed signal circuit?***

NOTE:
For the diagnostics procedure on engine speed signal circuit (mode F06), refer to 3-2 [T9G0].

YES : Repair or replace engine speed signal circuit, refer to 3-2 [T8J0].

NO : Go to step **9K3**.



9K3	CHECK ATF TEMPERATURE SENSOR CIRCUIT (FUNCTION MODE F07 OR F08).

CHECK ***: Is there any trouble in ATF temperature sensor circuit?***

NOTE:
For the diagnostics procedure on ATF temperature sensor circuit (mode F07 or F08), refer to 3-2 [T9H0].

YES : Repair or replace ATF temperature sensor circuit, refer to 3-2 [T8H0].

NO : Go to step **9K4**.

9K4	CHECK INHIBITOR SWITCH.

1) Turn ignition switch and Subaru Select Monitor to ON.
2) Read data on Subaru Select Monitor.
3) Designate mode using function key.

Function mode: FA1

- FA1: Check the inhibitor switch ON ↔ OFF signal.

CHECK ***: When each range is selected, does LED of the range switch on Subaru Select Monitor light up?***

YES : Go to step MODE FA12.

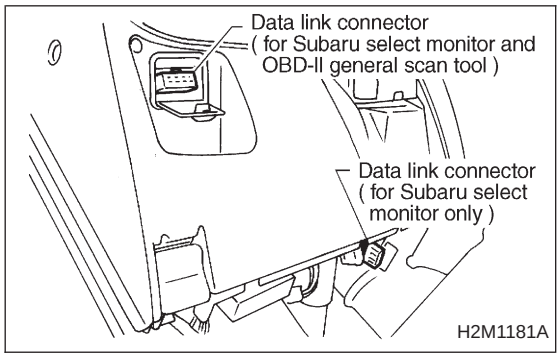
NO : Check inhibitor switch circuit.

NOTE:
For the diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

L: MODE F12
— CHECK LOCK-UP DUTY —

1) Turn ignition switch to OFF.
2) Lift-up the vehicle and place safety stand.

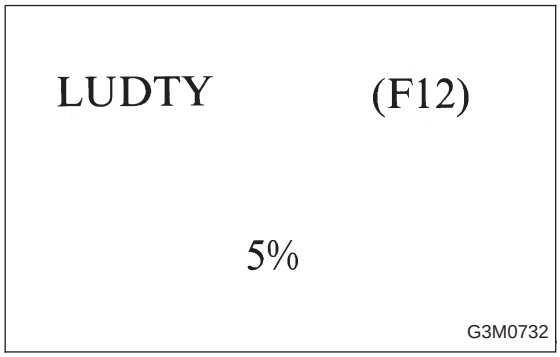
CAUTION:
On AWD models, make sure that all wheels are raised off floor.



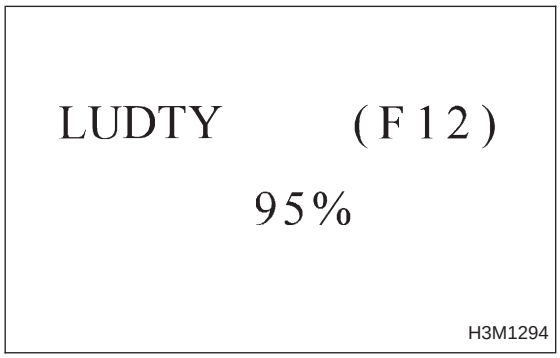
3) Connect Subaru Select Monitor to data link connector.
4) Start the engine, and turn Subaru Select Monitor switch to ON.
5) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

6) Read data on Subaru Select Monitor.
7) Designate mode using function key.
Function mode: F12
- F12: Lock-up duty is indicated in “%”.



CHECK ***: Does the function mode F12 indicate 5%?***
YES : Go to next step 8).
NO : Go to step **9L1**.

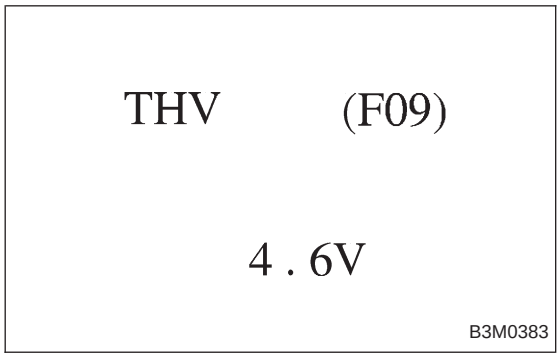


8) Move selector lever to “D” and slowly increase vehicle speed to 75 km/h (47 m/h).

CHECK ***: Does the function mode F12 indicate 95%?***
YES : Go to step MODE F13.

NOTE:
The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to 4-4 [T6D2] or [T9J0].>

NO : Go to step **9L1**.



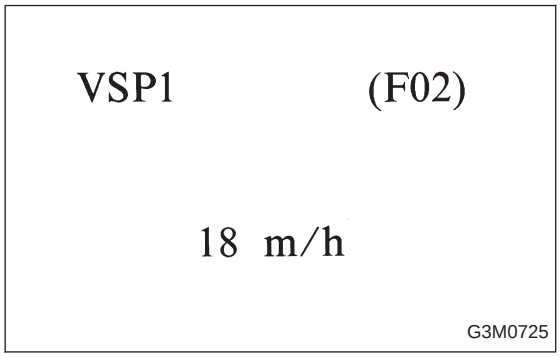
9L1	CHECK THROTTLE POSITION SENSOR CIRCUIT (FUNCTION MODE F09).

CHECK : ***Is there any trouble in throttle position sensor circuit?***

NOTE:
For the diagnostics procedure on throttle position sensor circuit (mode F09), refer to 3-2 [T9I0].

YES : Repair or replace throttle position sensor circuit, refer to 3-2 [T8M0].

NO : Go to step **9L2**.



9L2	CHECK VEHICLE SPEED SENSOR 1 CIRCUIT (FUNCTION MODE F02 OR F03).

CHECK : ***Is there any trouble in vehicle speed sensor 1 circuit?***

NOTE:
For the diagnostics procedure on vehicle speed sensor 1 circuit (mode F02 or F03), refer to 3-2 [T9E0].

YES : Repair or replace vehicle speed sensor 1 circuit, refer to 3-2 [T8N0].

NO : Go to step **9L3**.



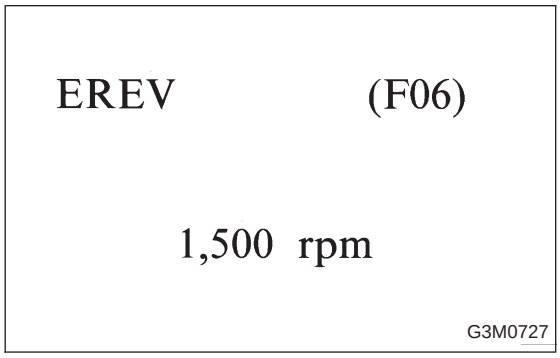
9L3	CHECK VEHICLE SPEED SENSOR 2 CIRCUIT (FUNCTION MODE F04 OR F05).

CHECK : ***Is there any trouble in vehicle speed sensor 2 circuit?***

NOTE:
For the diagnostics procedure on vehicle speed sensor 2 circuit (mode F04 or F05), refer to 3-2 [T9F0].

YES : Repair or replace vehicle speed sensor 2 circuit, refer to 3-2 [T8O0].

NO : Go to step **9L4**.



9L4	CHECK ENGINE SPEED SIGNAL CIRCUIT (FUNCTION MODE F06).

CHECK : ***Is there any trouble in engine speed signal circuit?***

NOTE:
For the diagnostics procedure on engine speed signal circuit (mode F06), refer to 3-2 [T9G0].

YES : Repair or replace engine speed signal circuit, refer to 3-2 [T8J0].

NO : Go to step **9L5**.

9L5	CHECK INHIBITOR SWITCH.

1) Turn ignition switch and Subaru Select Monitor to ON.
2) Read data on Subaru Select Monitor.
3) Designate mode using function key.

Function mode: FA1

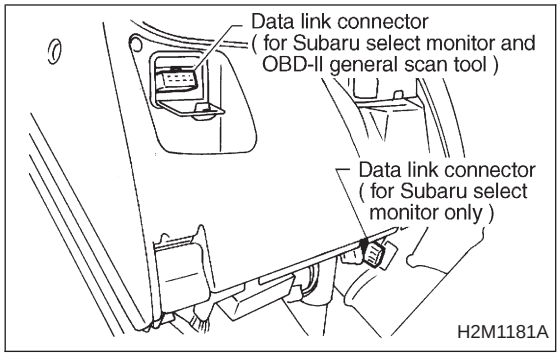
- FA1: Check the inhibitor switch ON ↔ OFF signal.

CHECK : ***When each range is selected, does LED of the range switch on Subaru Select Monitor light up?***

YES : Go to MODE F13.

NO : Check inhibitor switch circuit.

NOTE:
For the diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].



M: MODE F13
— CHECK AWD DUTY —

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Start the engine, and turn Subaru Select Monitor switch to ON.
4) Warm-up the transmission until ATF temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

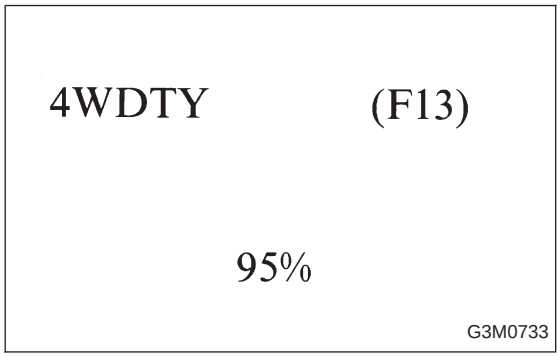
5) Turn ignition switch to ON (engine OFF).
6) Move selector lever to “D”.
7) Read data on Subaru Select Monitor.
8) Designate mode using function key.

Function mode: F13
- F13: AWD duty is indicated in “%”.

CHECK ***: Does the duty ratio change in response to the depress-release motion of the accelerator pedal in the function mode F13?***

YES : Go to next step 9).

NO : Go to step **9M1**.

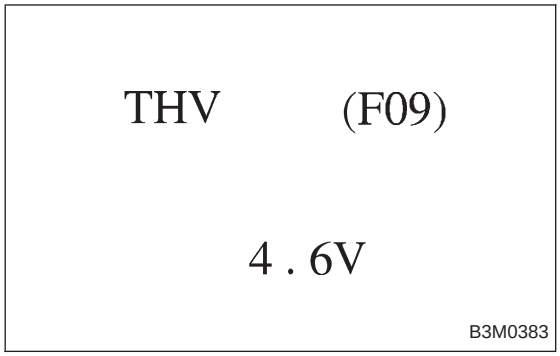


9) Turn ignition switch to OFF.
10) Set FWD mode.
11) Turn ignition switch to ON (engine OFF).

CHECK ***: Does the function mode F13 indicate 95%?***

YES : Go to step MODE F14.

NO : Go to step **9M1**.



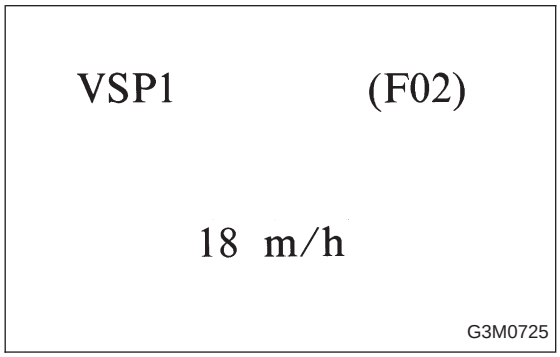
9M1	CHECK THROTTLE POSITION SENSOR (FUNCTION MODE F09).

CHECK : ***Is there any trouble in throttle position sensor circuit?***

NOTE:
For the diagnostics procedure on throttle position sensor circuit (mode F09), refer to 3-2 [T9I0].

YES : Repair or replace throttle position sensor circuit, refer to 3-2 [T8M0].

NO : Go to step **9M2**.



9M2	CHECK VEHICLE SPEED SENSOR 1 (FUNCTION MODE F02 OR F03).

CHECK : ***Is there any trouble in vehicle speed sensor 1 circuit?***

NOTE:
For the diagnostics procedure on vehicle speed sensor 1 circuit (mode F02 or F03), refer to 3-2 [T9E0].

YES : Repair or replace vehicle speed sensor 1 circuit, refer to 3-2 [T8N0].

NO : Go to step **9M3**.



9M3	CHECK VEHICLE SPEED SENSOR 2 (FUNCTION MODE F04 OR F05).

CHECK ***: Is there any trouble in vehicle speed sensor 2 circuit?***

NOTE:
For the diagnostics procedure on vehicle speed sensor 2 circuit (mode F04 or F05), refer to 3-2 [T9F0].

YES : Repair or replace vehicle speed sensor 2 circuit, refer to 3-2 [T8O0].

NO : Go to step **9M4**.



9M4	CHECK ATF TEMPERATURE SENSOR CIRCUIT (FUNCTION MODE F07 OR F08).

CHECK ***: Is there any trouble in ATF temperature sensor circuit?***

NOTE:
For the diagnostics procedure on ATF temperature sensor circuit (mode F07 or F08), refer to 3-2 [T9H0].

YES : Repair or replace ATF temperature sensor circuit, refer to 3-2 [T8H0].

NO : Go to step **9M5**.

9M5	CHECK INHIBITOR SWITCH CIRCUIT.

1) Turn ignition switch and Subaru Select Monitor to ON.
2) Read data on Subaru Select Monitor.
3) Designate mode using function key.
Function mode: FA1
● FA1: Check the inhibitor switch ON ↔ OFF signal.

CHECK ***: When each range is selected, does LED of range switch on Subaru Select Monitor light up?***

YES : Go to step **9M6**.

NO : Check inhibitor switch circuit.

NOTE:
For the diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9M6	CHECK ABS SIGNAL.

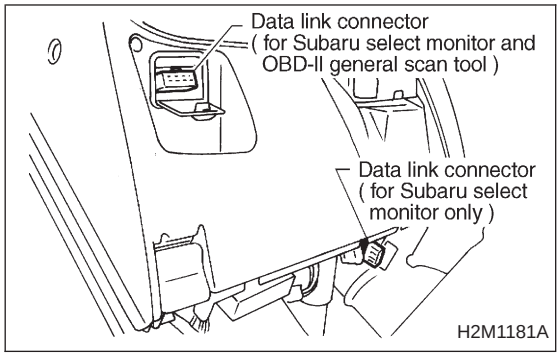
1) Start the engine, and turn Subaru Select Monitor switch to ON.
2) Read data on Subaru Select Monitor.
Designate mode using function key.
Function mode: FA0
● FA0: Check the ABS switch (AB) ON ↔ OFF signal.

CHECK ***: Does the ABS switch (AB) flash while the vehicle is being driven at speeds of 6 km/h (4 MPH) or more, and less than 10 km/h (6 MPH)?***

YES : Go to step MODE F14.

NO : Check ABS signal circuit.

NOTE:
For the diagnostics procedure on ABS signal circuit, refer to 4-4 [T8I0].

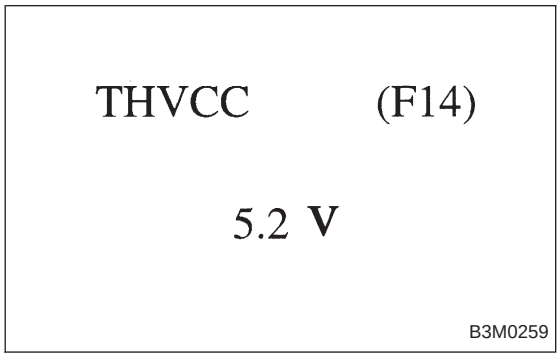


N: MODE F14
— CHECK THROTTLE POSITION SENSOR POWER SUPPLY —

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.
4) Read data on Subaru Select Monitor.
5) Designate mode using function key.

Function mode: F14

● Throttle position sensor power supply voltage is indicated.

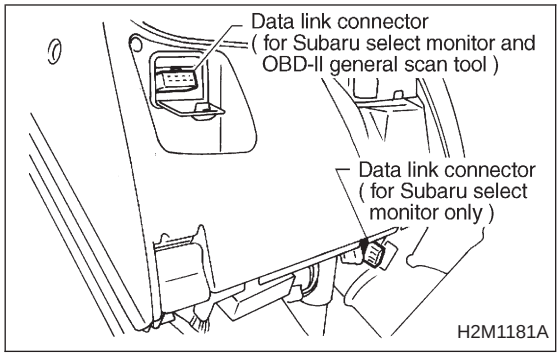


CHECK ***: Is the value fixed between 5.02 and 5.22 V in function mode F14?***

YES : Go to step MODE F15.

NO : Check throttle position sensor power supply circuit.

NOTE:
For the diagnostics procedure on throttle position sensor power supply circuit, refer to 3-2 [T8M0].



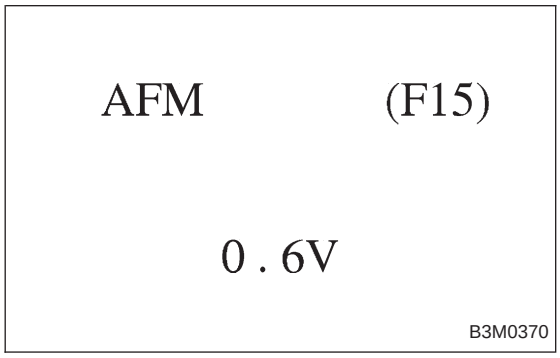
O: MODE F15
— CHECK MASS AIR FLOW SIGNAL —

1) Turn ignition switch to OFF.
2) Connect Subaru Select Monitor to data link connector.
3) Start the engine, and turn Subaru Select Monitor switch to ON.
4) Warm-up the engine until engine coolant temperature is above 80°C (176°F).

NOTE:
If ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.

5) Engine idling after warm-up.
6) Move selector lever to “N”.
7) Read data on Subaru Select Monitor.
8) Designate mode using function key.

Function mode: F15
● F15: Display shows mass air flow signal value sent from ECM.



CHECK ***: Does voltage change in response to the depress-release motion of the accelerator pedal in the function mode F15?***

YES : Go to next CHECK .

NO : Check mass air flow signal circuit.

NOTE:
For the diagnostics procedure on mass air flow signal circuit, refer to 3-2 [T8I0].

CHECK ***: Has trouble been eliminated after ECM replacement?***

YES : Replace ECM.

NO : Go to next CHECK .

NOTE:
Install the old ECM.

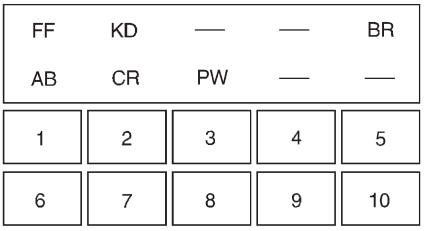
CHECK ***: Has trouble been eliminated after TCM replacement?***

YES : Replace TCM.

NO : Go to MODE FA0.

DISPLAY

LED No.	Signal name	Symbol
1	FWD switch	FF
2	Kick-down switch	KD
3	—	—
4	—	—
5	Brake	BR
6	ABS switch	AB
7	Cruise control set	CR
8	Power switch	PW
9	—	—
10	—	—



H3M1373A

P: MODE FA0
— SWITCH 1 (SW1) —

Reference values

- Lights up when the fuse is installed in FWD switch (No. 1).
- Light up when the brake pedal is depressed (No. 5)
- Light up when the ABS signal is entered (No. 6).
- Lights up when the cruise control is set (No. 7).

NOTE:
Kick-down switch and power switch are not installed. Therefore, LEDs of kick-down switch (KD) and power switch (PW) do not light up.

9P1	CHECK FWD SWITCH (FF).

CHECK : ***When fuse is inserted in FWD switch, does LED (FF) light up?***

YES : Go to step **9P2**.

NO : Check FWD switch circuit.

NOTE:
For diagnostics procedure on FWD switch circuit , refer to 3-2 [T9Q0].

9P2	CHECK BRAKE (BR).

CHECK : ***When the brake pedal is depressed, does LED (BR) light up?***

YES : Go to **9P3**.

NO : Check brake switch circuit.

NOTE:
For diagnostics procedure on brake switch circuit, refer to 2-7 [T10BH0].

9P3	CHECK ABS SWITCH (AB).

Engine start.

CHECK ***: Does the LED (AB) flash while the vehicle is being driven at speed of 6 km/h (4 MPH) or more, and less than 10 km/h (6 MPH)?***

YES : Go to **9P4**.

NO : Check ABS switch circuit.

NOTE:
For diagnostics procedure or ABS switch circuit, refer to 4-4 [T8I0].

9P4	CHECK CRUISE CONTROL SET (CR).

CHECK ***: When cruise control is set, does LED (CR) light up?***

YES : Go to MODE FA1.

NO : Check cruise control set circuit.

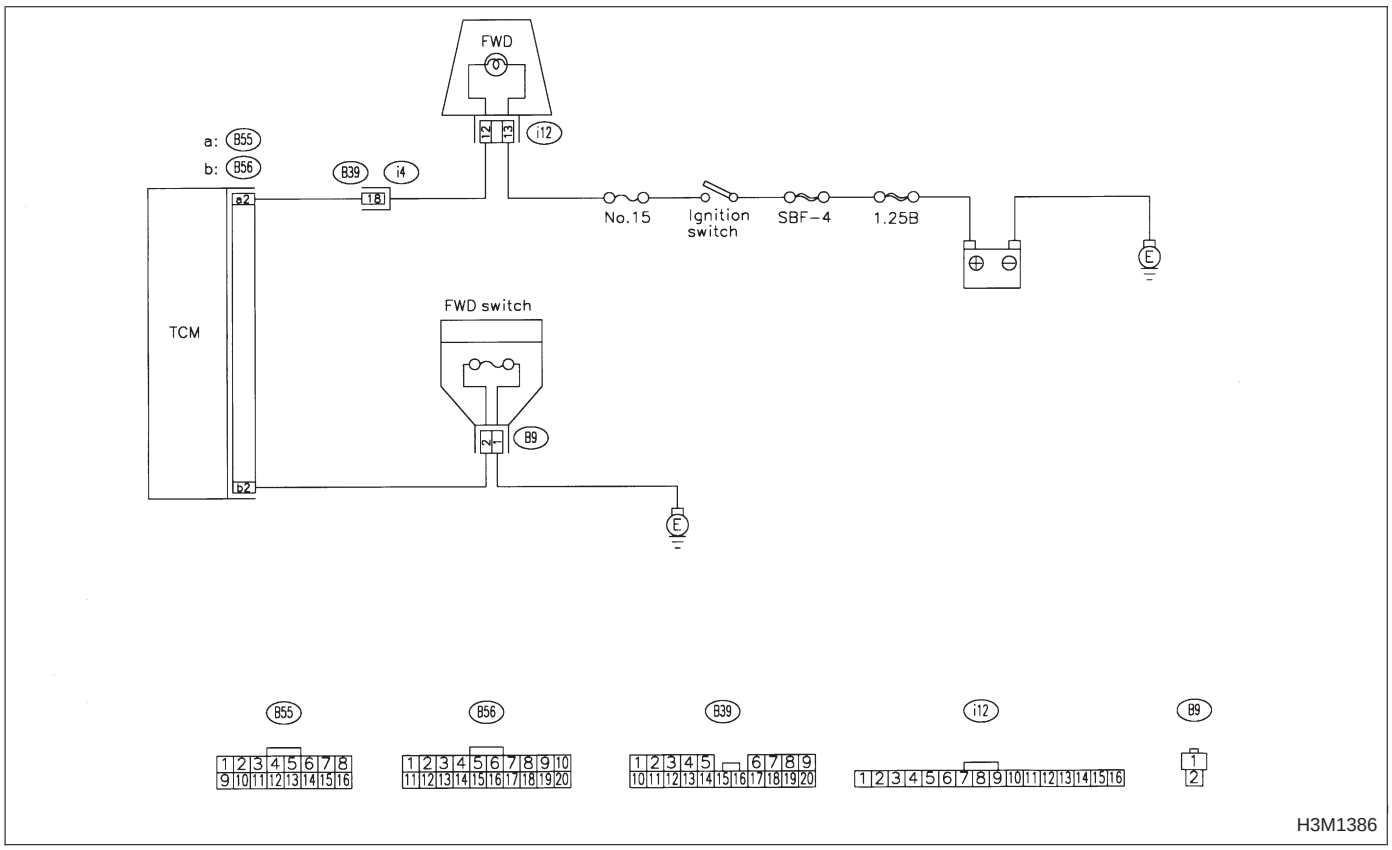
NOTE:
For diagnostics procedure on cruise control circuit, refer to 2-7 [T10CX0].

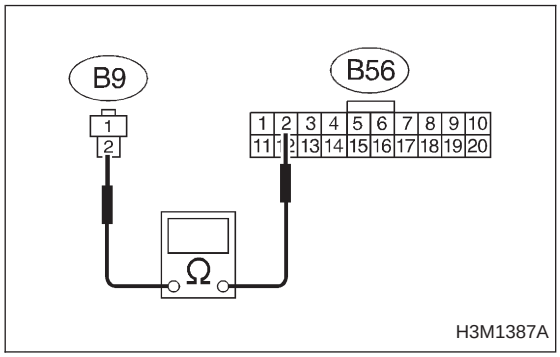
Q: MODE FA0

— LED NO. 1, FWD SWITCH —

DIAGNOSIS:

- LED does not come on even if FWD switch is ON.
- Diagnosis switch circuit is open or short.





9Q1	CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM and FWD switch.
3) Measure resistance of harness between TCM and FWD switch connector.

Connector & terminal
(B56) No. 2 — (B9) No. 2:

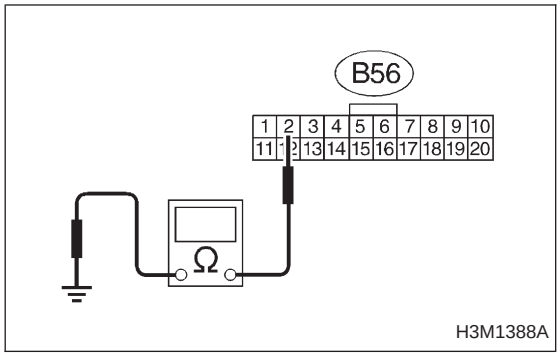
CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:

- Poor contact in TCM connector.
- Poor contact in FWD switch.
- Open circuit in harness between TCM and FWD switch connector.



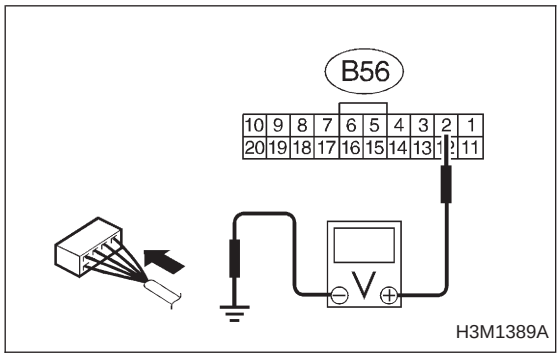
4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal
(B56) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **9Q2**.

NO : Repair short circuit in harness connector between TCM and chassis ground.



9Q2	CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connector to TCM and FWD switch.
3) Turn ignition switch to ON.
4) Measure signal voltage for TCM while installing and removing the fuse to FWD switch connector.

Connector & terminal
(B56) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V in FWD switch while installing?***

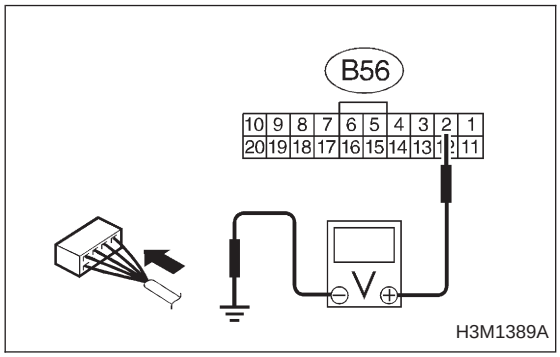
YES : Go to next step CHECK .

NO : Go to next CHECK1 .

CHECK1 ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

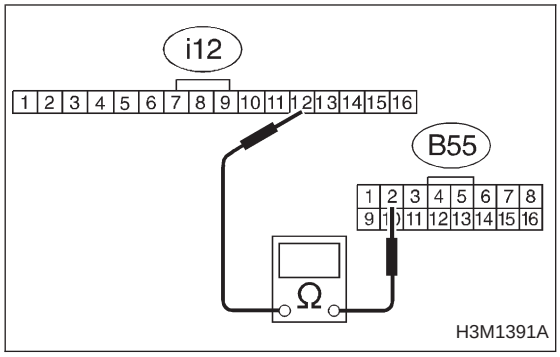


Connector & terminal
(B56) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V in FWD switch while removing?***

YES : Go to step **9Q3**.

NO : Replace TCM.



9Q3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.**

1) Turn ignition switch to OFF.
2) Remove combination meter.
3) Disconnect connector from TCM and combination meter.
4) Measure resistance of harness between TCM and diagnosis connector.

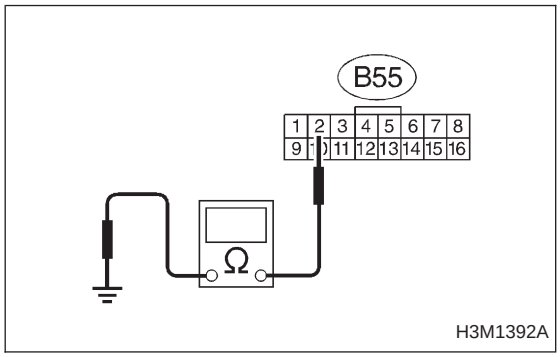
Connector & terminal
(B55) No. 2 — (i12) No. 12:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Poor contact in TCM connector.
- Poor contact in combination meter.
- Open circuit in harness between TCM and combination meter.
- Poor contact in coupling connector (B39).



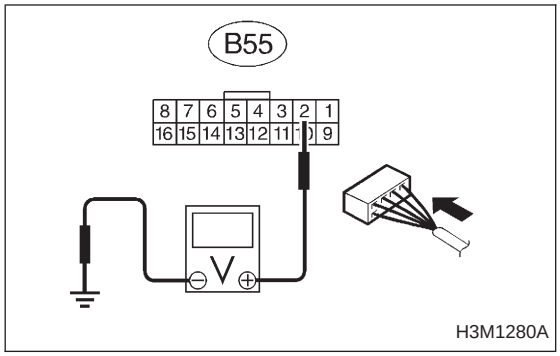
4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal
(B55) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **9Q4**.

NO : Repair short circuit in harness connector between TCM and combination meter.



9Q4	CHECK OUTPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connector to TCM and combination meter.
3) Install combination meter.
4) Turn ignition switch to ON.
5) Measure signal voltage for TCM while installing and removing the fuse to FWD switch connector.

Connector & terminal
(B55) No. 2 — Chassis ground:

CHECK ***: Is the voltage less than 1 V in FWD switch while installing?***

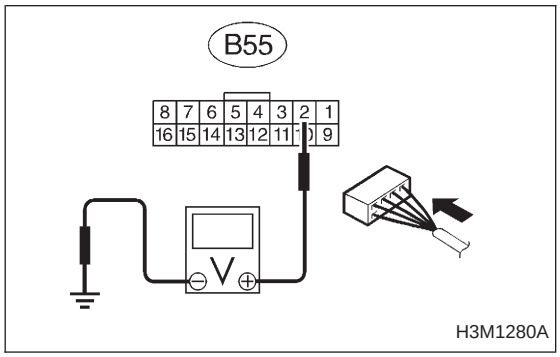
YES : Go to next step CHECK .

NO : Go to next CHECK1 .

CHECK1 ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



Connector & terminal
(B55) No. 2 — Chassis ground:

CHECK ***: Is the voltage more than 10 V in FWD switch while removing?***

YES : Go to next CHECK .

NO : Replace TCM.

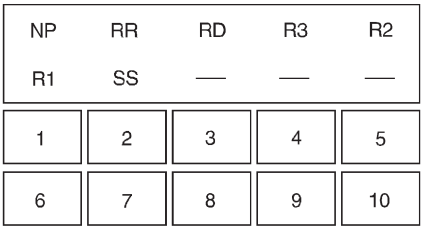
CHECK ***: Is the voltage more than 10 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

DISPLAY

LED No.	Signal name	Symbol
1	N/P range switch	NP
2	R range switch	RR
3	D range switch	RD
4	3 range switch	R3
5	2 range switch	R2
6	1 range switch	R1
7	Diagnosis switch	SS
8	—	—
9	—	—
10	—	—



H3M1374A

R: MODE FA1
— SWITCH 2 (SW2) —

Reference values

- Lights up when the N or P range is selected (No. 1).
- Lights up when the R range is selected (No. 2).
- Lights up when the D range is selected (No. 3).
- Lights up when the 3 range is selected (No. 4).
- Lights up when the 2 range is selected (No. 5).
- Lights up when the 1 range is selected (No. 6).
- Lights up when the diagnosis switch is connected (No. 7).

9R1	CHECK N/P RANGE SWITCH (NP).

CHECK : ***When N and P ranges are selected, does LED (NP) light up?***

YES : Go to step **9R2**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R2	CHECK R RANGE SWITCH (RR).

CHECK : ***When the R range is selected, does LED (RR) light up?***

YES : Go to step **9R3**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R3	CHECK D RANGE SWITCH (RD).

CHECK : ***When the D range is selected, does LED (RD) light up?***

YES : Go to step **9R4**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R4	CHECK 3 RANGE SWITCH (R3).

CHECK : ***When the 3 range is selected, does LED (R3) light up?***

YES : Go to step **9R5**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R5	CHECK 2 RANGE SWITCH (R2).

CHECK : ***When the 2 range is selected, does LED (R2) light up?***

YES : Go to step **9R6**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R6	CHECK 1 RANGE SWITCH (R1).

CHECK : ***When the 1 range is selected, does LED (R1) light up?***

YES : Go to step **9R7**.

NO : Check inhibitor switch circuit.

NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 2-7 [T10BI0].

9R7	CHECK DIAGNOSIS SWITCH (SS).

CHECK : ***When the diagnosis switch is turned on, does LED (SS) light up?***

YES : Go to general diagnostics table.

NOTE:
Inspect using general diagnostics table, refer to 3-2 [T1000].

NO : Check diagnosis switch circuit.

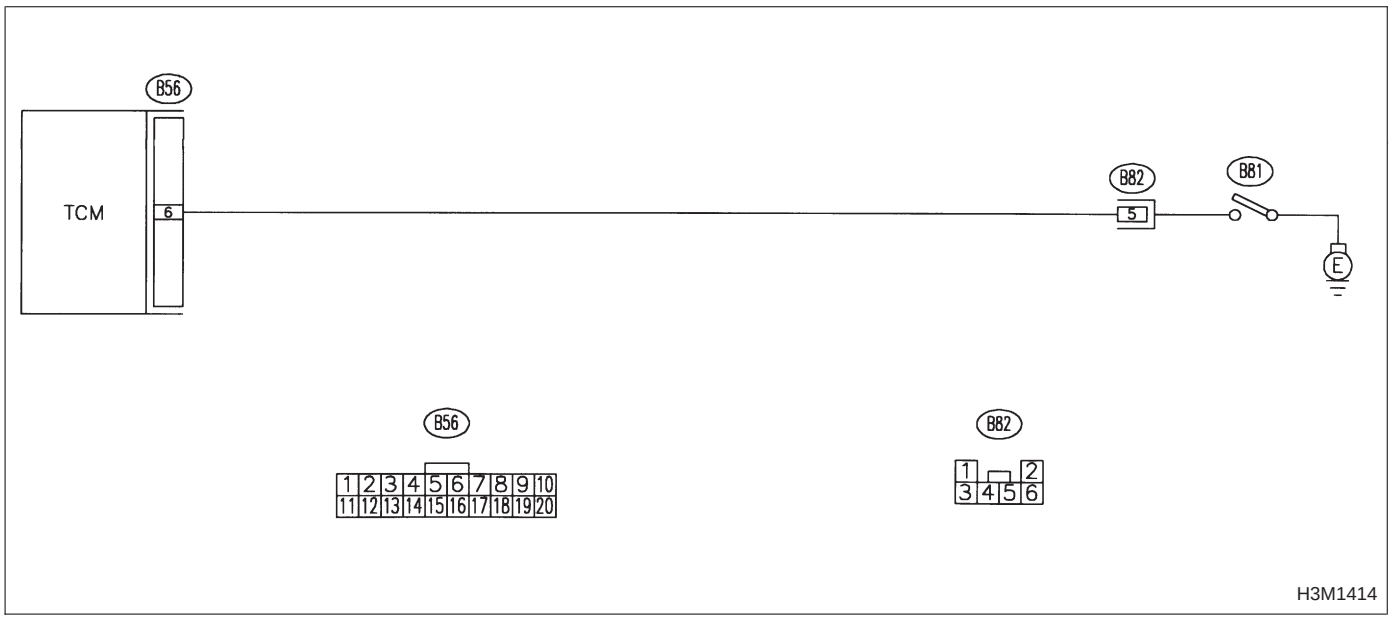
NOTE:
For diagnostics procedure on inhibitor switch circuit, refer to 3-2 [T9R0].

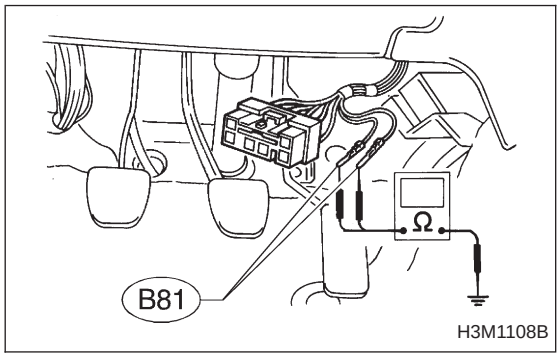
S: MODE FA1

— LED NO. 7, DIAGNOSIS SWITCH —

DIAGNOSIS:

- LED does not come on even if diagnosis switch is ON.
- Diagnosis switch circuit is open or short.





9S1	CHECK DIAGNOSIS SWITCH GROUND LINE.

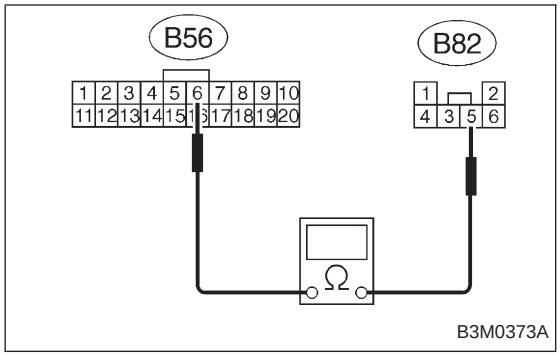
1) Turn ignition switch to OFF.
2) Measure resistance of harness between diagnosis ground terminals and chassis ground.

Terminal
(B81) — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **9S2**.

NO : Repair open circuit in diagnosis ground terminals.



9S2	CHECK HARNESS CONNECTOR BETWEEN TCM AND DIAGNOSIS SWITCH.

1) Turn ignition switch to OFF.
2) Disconnect connector from TCM.
3) Measure resistance of harness between TCM and diagnosis connector.

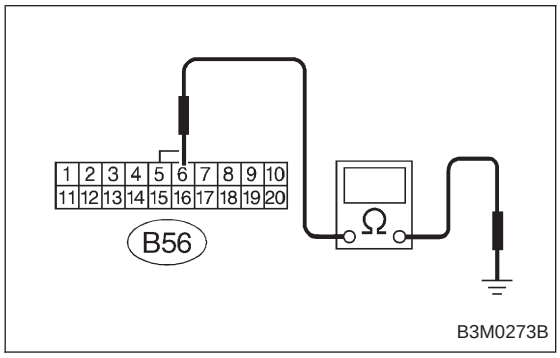
Connector & terminal
(B56) No. 6 — (B82) No. 5:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to next step 4).

NO : Repair harness and connector.

NOTE:
In this case, repair the following:
- Poor contact in TCM connector.
- Poor contact in diagnosis switch.
- Open circuit in harness between TCM and diagnosis connector.



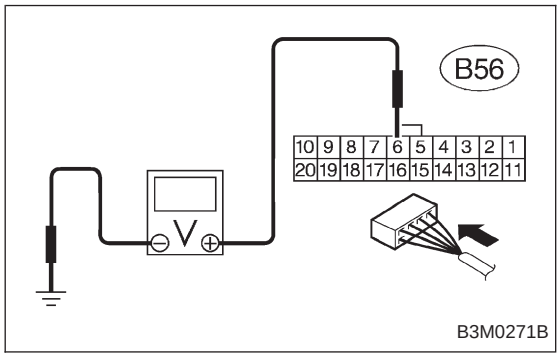
4) Measure resistance of harness connector between TCM and body to make sure that circuit does not short.

Connector & terminal
(B56) No. 6 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **3**.

NO : Repair short circuit in harness connector between TCM and chassis ground.



9S3	CHECK INPUT SIGNAL FOR TCM.

1) Turn ignition switch to OFF.
2) Connect connector to TCM.
3) Turn ignition switch to ON.
4) Measure signal voltage for TCM while connecting and disconnecting the diagnosis terminal to diagnosis connector.

Connector & terminal
(B56) No. 6 — Chassis ground:

CHECK ***: Is the voltage less than 1 V in diagnosis connector connected?***

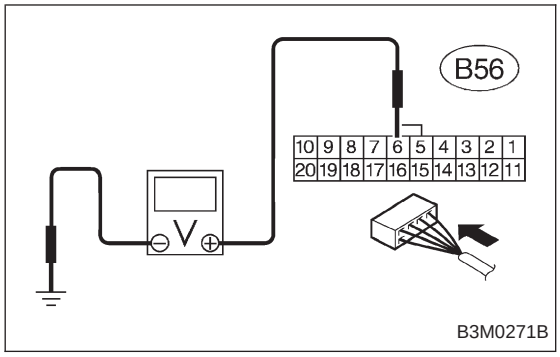
YES : Go to next step CHECK .

NO : Go to next CHECK1 .

CHECK1 ***: Is the voltage less than 1 V while shaking harness and connector of TCM?***

YES : Repair poor contact in TCM.

NO : Replace TCM.

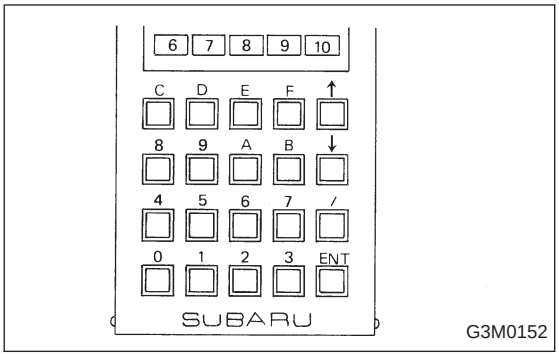


Connector & terminal
(B56) No. 6 — Chassis ground:

CHECK ***: Is the voltage more than 6 V in diagnosis connector disconnected?***

YES : Repair poor contact in TCM.

NO : Replace TCM.



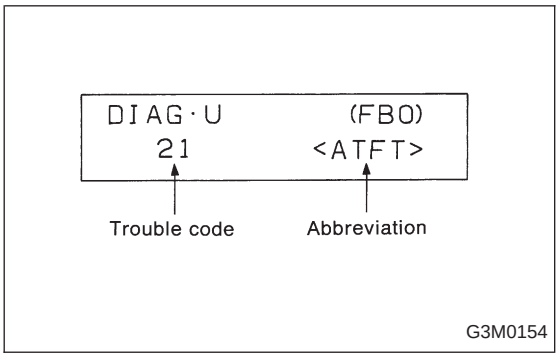
G3M0152

T: MODE FB0
— ON-BOARD DIAGNOSTICS (DIAG. U) —

DISPLAY:

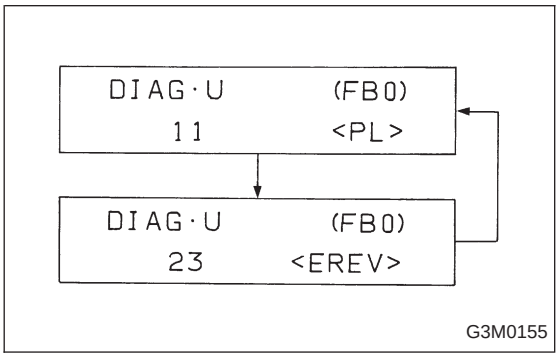
Current trouble code determined by on-board diagnostics.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [0] [ENT] in that order.



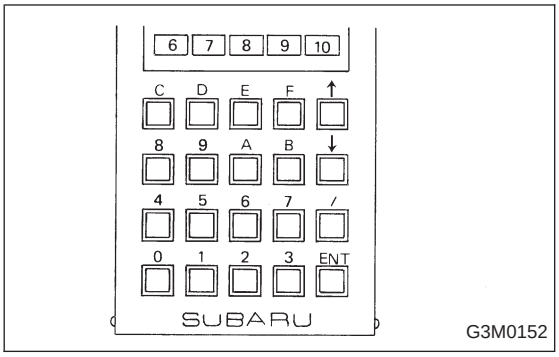
G3M0154

3) Ensure displayed trouble code(s).
- When there is only one trouble code



G3M0155

- When there are multiple trouble codes



G3M0152

U: MODE FB1
— ON-BOARD DIAGNOSTICS (DIAG. M) —

DISPLAY:

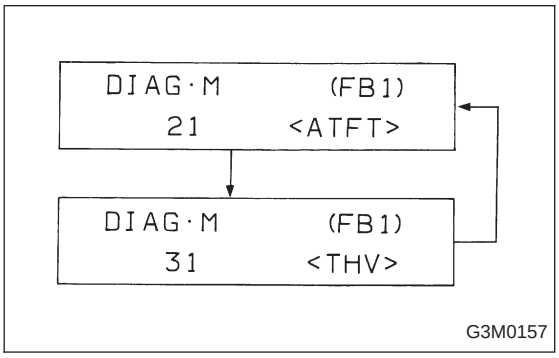
Previous trouble code stored in by on-board diagnostics.

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [B] [1] [ENT] in that order.



G3M0156

3) Ensure displayed trouble code(s).
- When there is only one trouble code



G3M0157

- When there are multiple trouble codes

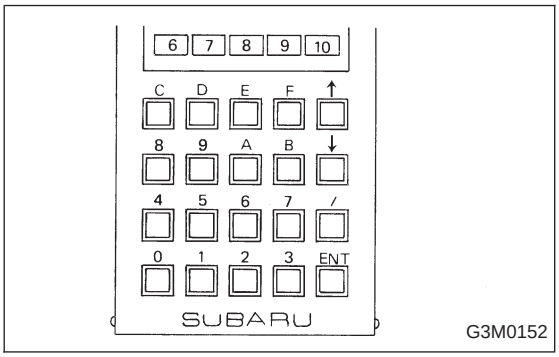
V: MODE FC0 — BACK-UP CLEAR —

DISPLAY:

Function of clearing trouble code stored in memory.

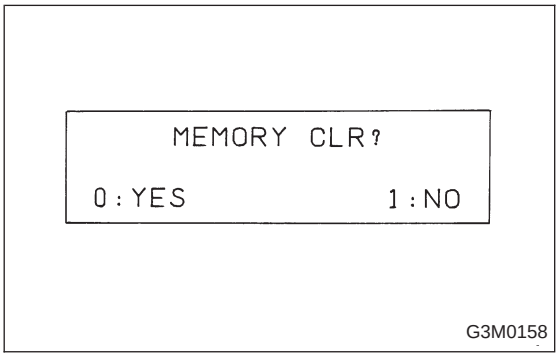
The current trouble history code is deleted from the monitor when the ignition switch is turned OFF after performing on-board diagnostics. However, past trouble history code are stored in TCM. They remain in memory even when the ignition switch is turned OFF, because there is a memory back-up battery. The current trouble history code can be displayed again when on-board diagnostics is performed after driving, provided that no inspection or repair has been made.
To delete past trouble history codes, first perform on-board diagnostics after inspection and repair using the current trouble history code, then confirm that no trouble code is displayed. Next, select and execute a particular mode on the select monitor.

NOTE:
● Since the past trouble history is deleted, it is necessary when erasing the trouble code to inspect and make repairs according to the trouble code, and ensure that no trouble code is indicated in on-board diagnostics.
● The past trouble history will not be not lost, provided inspection and repairs are performed according to the current trouble history code, and that no trouble remains.



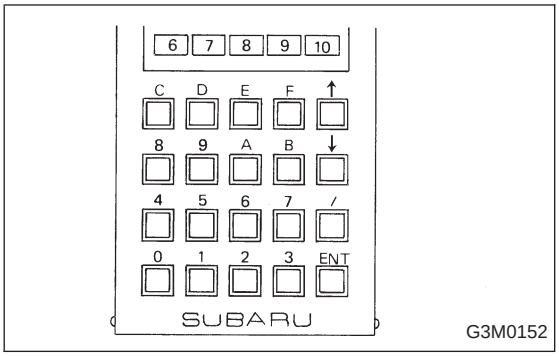
G3M0152

1) Connect select monitor.
2) Designate mode using function key.
Press [F] [C] [0] [ENT] in that order.



G3M0158

3) Ensure displayed message.

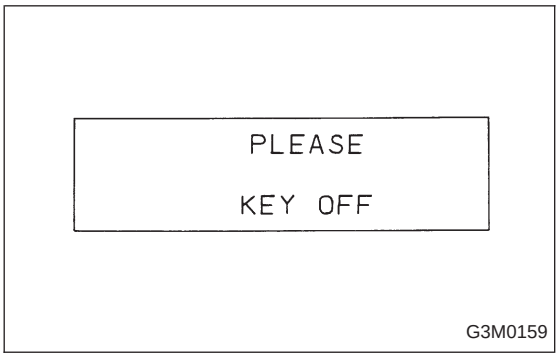


G3M0152

4) Press [ENT] key.
- When executing, (YES)

Press [0] [ENT] in that order.
- When not executing, (NO)

Press [1] [ENT] in that order.



G3M0159

5) When executed, the indication as shown here appears for approximately four seconds, and the past trouble history is deleted.

6) After the display is gone, turn ignition switch to OFF.

10. General Diagnostic Table

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N”; starter rotates when select lever is in “R”, “D”, “3” or “2”.	1) Inhibitor switch 2) Select cable 3) Select lever 4) Starter motor and harness
Abnormal noise when select lever is in “P” or “N”.	1) Strainer 2) Duty solenoid C 3) Oil pump 4) Drive plate 5) ATF level too high or too low
Hissing noise occurs during standing start.	1) Strainer 2) ATF level too high or too low
Noise occurs while driving in “D1”.	1) Final gear 2) Planetary gear 3) Reduction gear 4) Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	1) Final gear 2) Low & reverse brake 3) Reduction gear 4) Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	1) Final gear 2) Low & reverse brake 3) Planetary gear 4) Reduction gear 5) Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	1) Control valve 2) Lock-up damper 3) Engine performance
Vehicle moves when select lever is in “N”.	1) Control unit 2) Inhibitor switch 3) Forward clutch
Shock occurs when select lever is moved from “N” to “D”.	1) Control module 2) Accumulator (“N” to “D”) 3) Control valve 4) ATF deterioration 5) Dropping resistor
Excessive time lag occurs when select lever is moved from “N” to “D”.	1) Control module 2) Control valve 3) Forward clutch 4) Duty solenoid A 5) Forward clutch seal ring 6) Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R”.	1) Control module 2) Accumulator (4A) 3) Control valve 4) ATF deterioration 5) Dropping resistor
Excessive time lag occurs when select lever is moved from “N” to “R”.	1) Control valve 2) Low & reverse clutch 3) Reverse clutch 4) Duty solenoid A 5) Forward clutch seal ring 6) Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	1) Parking brake mechanism 2) Planetary gear

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	1) Strainer 2) Duty solenoid A 3) Control valve 4) Drive pinion 5) Hypoid gear 6) Axle shaft 7) Differential gear 8) Oil pump 9) Input shaft 10) Output shaft 11) Planetary gear 12) Drive plate 13) ATF level too low 14) Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	1) Select cable 2) Select lever 3) Control valve 4) Low & reverse clutch 5) Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	1) Forward clutch 2) Band brake 3) Planetary gear 4) Parking brake mechanism
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	1) Forward clutch 2) One-way clutch (1-2)
Vehicle does not start in “D”, “3”, “2” or “1” range only (engine revving up).	1) Forward clutch
Vehicle does not start in “D”, “3”, “2” or “1” range only (engine stalls).	1) Reverse clutch
Vehicle starts in “R” range only (engine revving up).	1) Control valve
Acceleration during standing starts is poor (high stall rpm).	1) Control valve 2) Forward clutch 3) Reverse clutch 4) ATF level too low 5) Front gasket transmission case
Acceleration during standing starts is poor (low stall rpm).	1) Oil pump 2) Torque converter one-way clutch 3) Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	1) Control module 2) Control valve 3) High clutch 4) Brake band 5) Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	1) Control module 2) Overrunning clutch 3) High clutch 4) Brake band 5) Planetary gear
No shift occurs from 1st to 2nd gear.	1) Control module 2) Vehicle speed sensor 1 3) Vehicle speed sensor 2 4) Throttle position sensor 5) Shift solenoid 1 6) Shift solenoid 2 7) Control valve 8) Brake band

Symptom	Problem parts
No shift occurs from 2nd to 3rd gear.	1) Control module 2) Control valve 3) High clutch 4) One-way clutch (3-4)
No shift occurs from 3rd to 4th gear.	1) Control module 2) Accumulator (3R) 3) ATF temperature sensor 4) Control valve 5) Band brake
Engine brake is not effected when select lever is in “3” range.	1) Inhibitor switch 2) Control module 3) Throttle position sensor 4) Control valve 5) Shift solenoid 3
Engine brake is not effected when select lever is in “3” or “2” range.	1) Control valve 2) Overrunning clutch
Engine brake is not effected when select lever is in “1” range.	1) Control valve 2) Low & reverse brake clutch
Shift characteristics are erroneous.	1) Inhibitor switch 2) Control module 3) Vehicle speed sensor 1 4) Vehicle speed sensor 2 5) Throttle position sensor 6) Control valve
No lock-up occurs.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Control valve 5) Lock-up facing 6) Engine speed signal
Parking brake is not effected.	1) Select cable 2) Select lever 3) Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	1) ATF level too high
Differential oil spurts out.	1) Differential gear oil too high
Differential oil level changes excessively.	1) Seal pipe 2) Double oil seal
Odor is produced from ATF supply pipe.	1) Transfer clutch 2) Forward clutch 3) Overrunning clutch 4) High clutch 5) Band brake 6) Low & reverse clutch 7) Reverse clutch 8) Lock-up facing 9) ATF deterioration
Shock occurs from 1st to 2nd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (2A) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake 8) ATF deterioration 9) Engine performance 10) Dropping resistor

Symptom	Problem parts
Slippage occurs from 1st to 2nd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (2A) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake
Shock occurs from 2nd to 3rd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (3R) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) High clutch 8) Band brake 9) ATF deterioration 10) Engine performance 11) Dropping resistor
Slippage occurs from 2nd to 3rd gear.	1) Control module 2) Throttle position sensor 3) Accumulator (3R) 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) High clutch 8) Band brake
Shock occurs from 3rd to 4th gear.	1) Control module 2) Throttle position sensor 3) Accumulator 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Overrunning clutch 8) Band brake 9) ATF deterioration 10) Engine performance
Slippage occurs from 3rd to 4th gear.	1) Control module 2) Throttle position sensor 3) Accumulator 4) ATF temperature sensor 5) Duty solenoid A 6) Control valve 7) Band brake
Shock occurs when select lever is moved from “3” to “2” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Overrunning clutch 7) Band brake 8) ATF deterioration
Shock occurs when select lever is moved from “D” to “1” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) ATF deterioration 7) Low & reverse brake

Symptom	Problem parts
Shock occurs when select lever is moved from “2” to “1” range.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Low & reverse clutch 7) ATF deterioration
Shock occurs when accelerator pedal is released at medium speeds.	1) Control module 2) Throttle position sensor 3) ATF temperature sensor 4) Duty solenoid A 5) Control valve 6) Lock-up damper 7) Engine performance
Vibration occurs during straight-forward operation.	1) Control module 2) Duty solenoid B 3) Lock-up facing 4) Lock-up damper
Vibration occurs during turns (tight corner “braking” phenomenon).	1) Control module 2) Vehicle speed sensor 1 3) Vehicle speed sensor 2 4) Throttle position sensor 5) ATF temperature sensor 6) Transfer clutch 7) Transfer valve 8) Duty solenoid C 9) ATF deterioration
Front wheel slippage occurs during standing starts.	1) Control module 2) Vehicle speed sensor 2 3) FWD switch 4) Throttle position sensor 5) ATF temperature sensor 6) Control valve 7) Transfer clutch 8) Transfer valve 9) Transfer pipe 10) Duty solenoid C 11) Transfer clutch hub
Vehicle is not set in FWD mode.	1) Control module 2) FWD switch 3) Transfer clutch 4) Transfer valve 5) Duty solenoid C
Select lever is hard to move.	1) Select cable 2) Select lever 3) Detent spring 4) Manual plate
Select lever is too high to move (unreasonable resistance).	1) Detent spring 2) Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	1) Select cable 2) Select lever 3) Detent spring 4) Manual plate

BRAKES 4-4

Page

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1. Supplemental Restraint System “Airbag”

Airbag system wiring harness is routed near the ABS control module, ABS sensor and hydraulic control unit.

CAUTION:
● All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
● Be careful not to damage Airbag system wiring harness when servicing the ABS control module, ABS sensor and hydraulic control unit.

2. Pre-inspection

Before performing diagnostics, check the following items which might affect ABS problems:

A: MECHANICAL INSPECTION

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more
Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. BRAKE DRAG

Check brake drag. <Ref. to 4-4 [K100].>

4. BRAKE PAD AND ROTOR

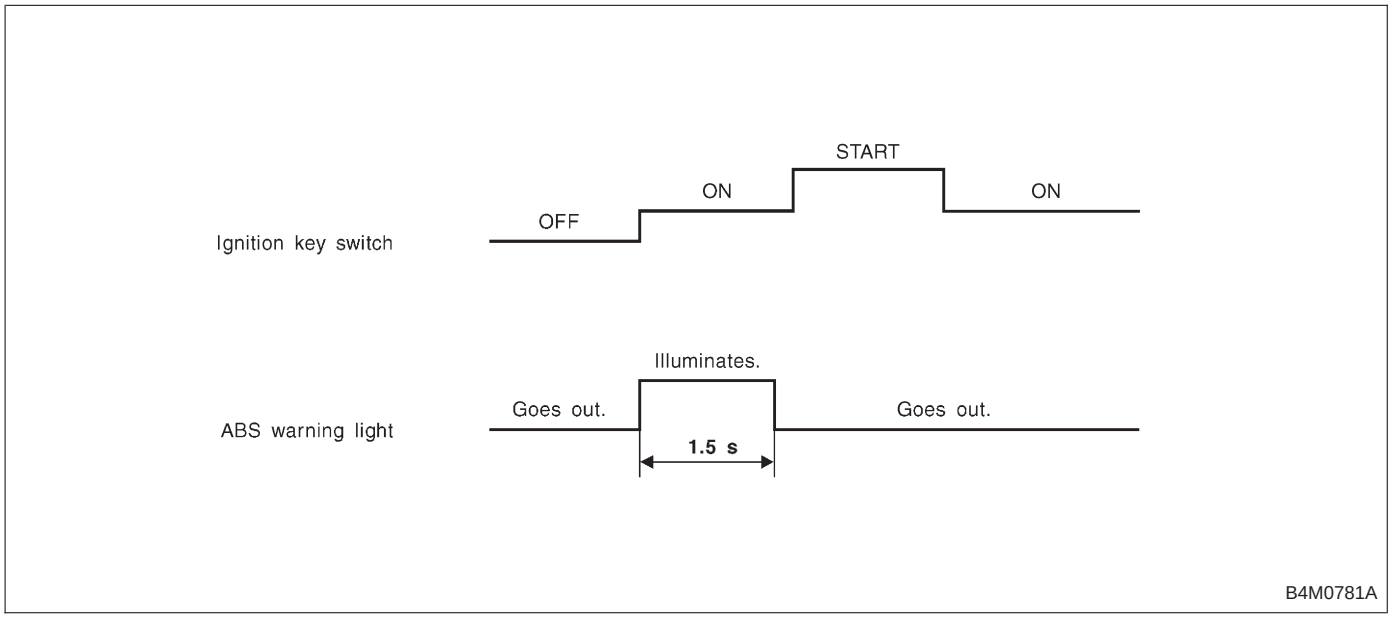
Check brake pad and rotor. <Ref. to 4-4 [K100].>

5. TIRE SPECIFICATIONS, TIRE WEAR AND AIR PRESSURE

Check tire specifications, tire wear and air pressure. <Ref. to 4-2 [S1A0], [S1B0].>

B: ELECTRICAL INSPECTION

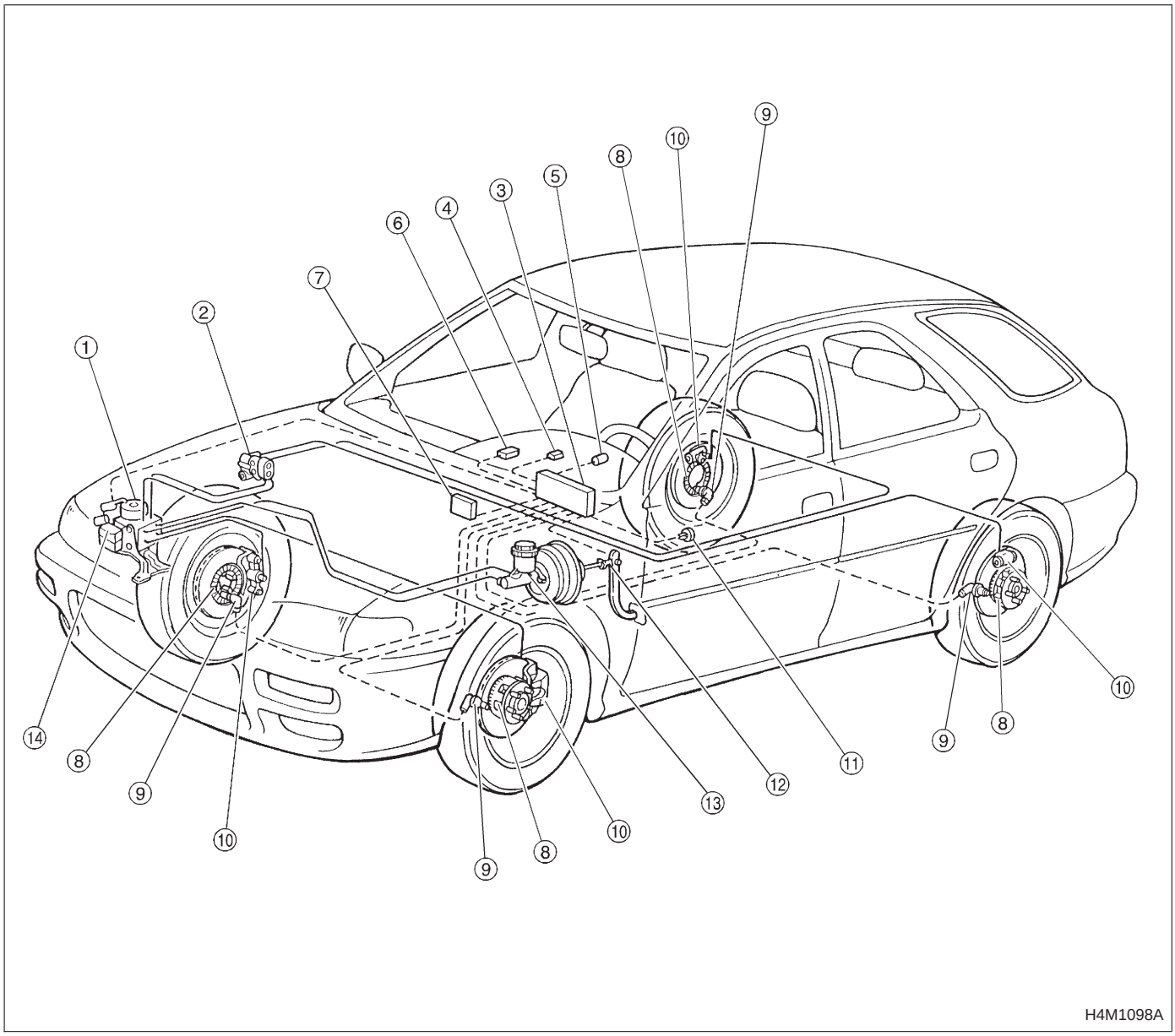
1. WARNING LIGHT ILLUMINATION PATTERN



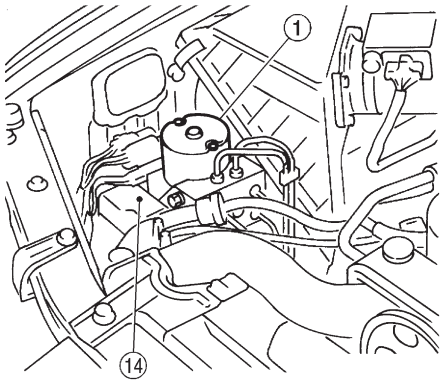
1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to 4-4 [T7A0].>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

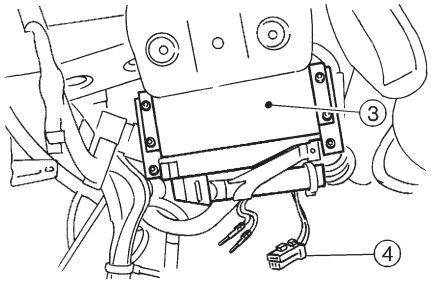
3. Electrical Components Location



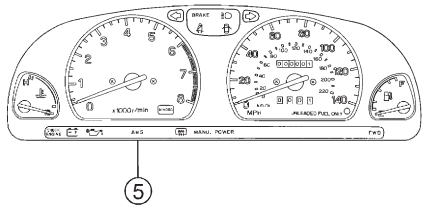
① Hydraulic control unit (H/U)
② Proportioning valve
③ ABS control module (ABSCM)
④ ABS diagnosis connector
⑤ ABS warning light
⑥ Data link connector (for Subaru select monitor)
⑦ Transmission control module (only AT vehicle)
⑧ Tone wheel
⑨ ABS sensor
⑩ Wheel cylinder
⑪ G sensor (only AWD vehicle)
⑫ Brake switch
⑬ Master cylinder
⑭ Relay box



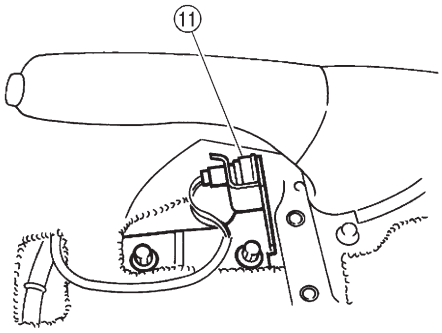
B4M0783A



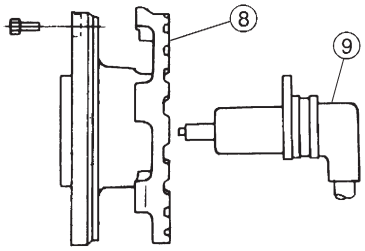
H4M1099A



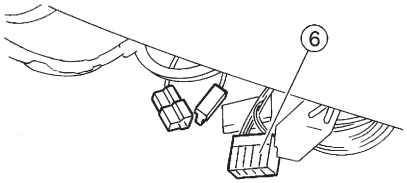
H4M1100A



H4M1152A

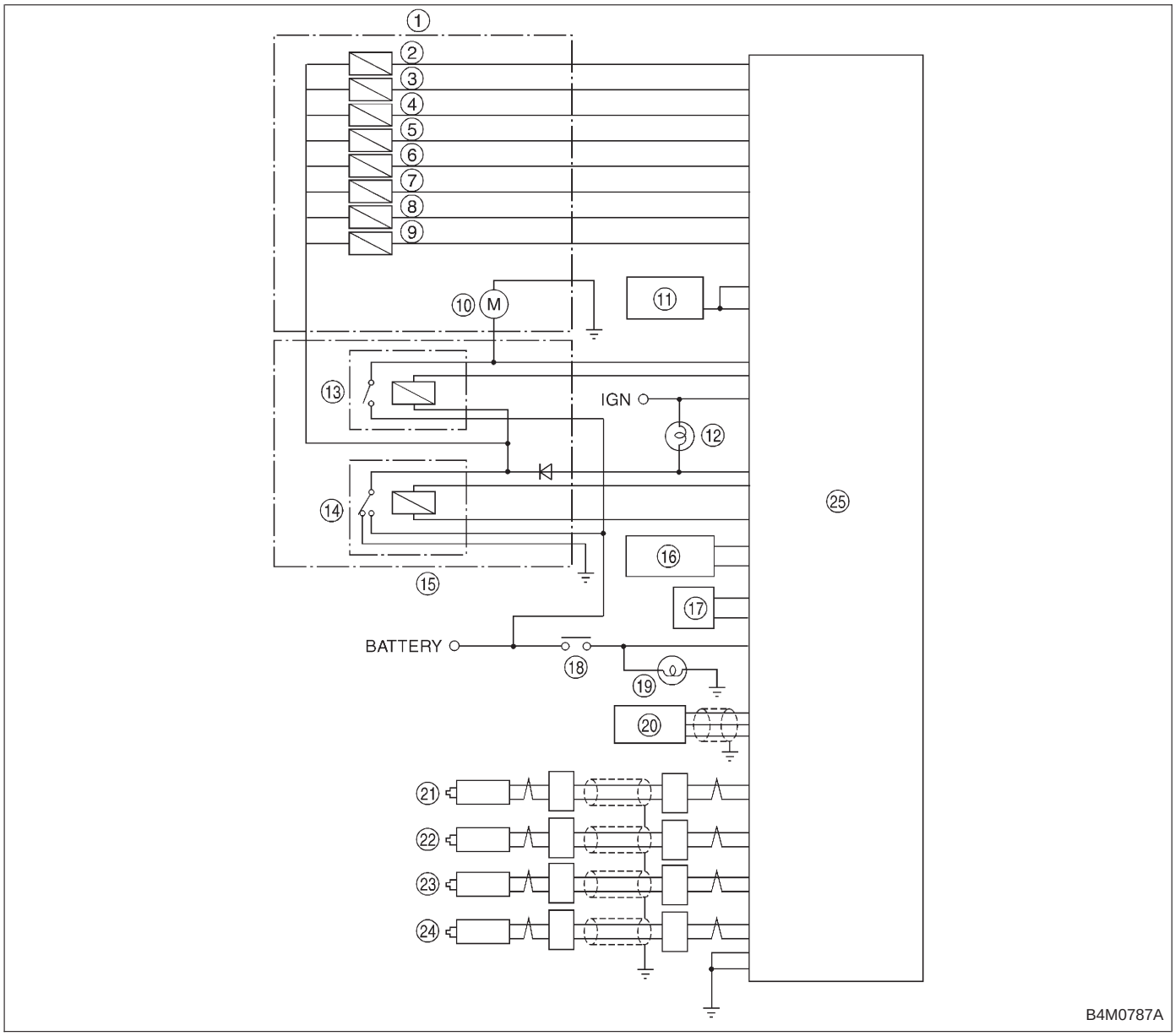


B4M0646B



B4M0645B

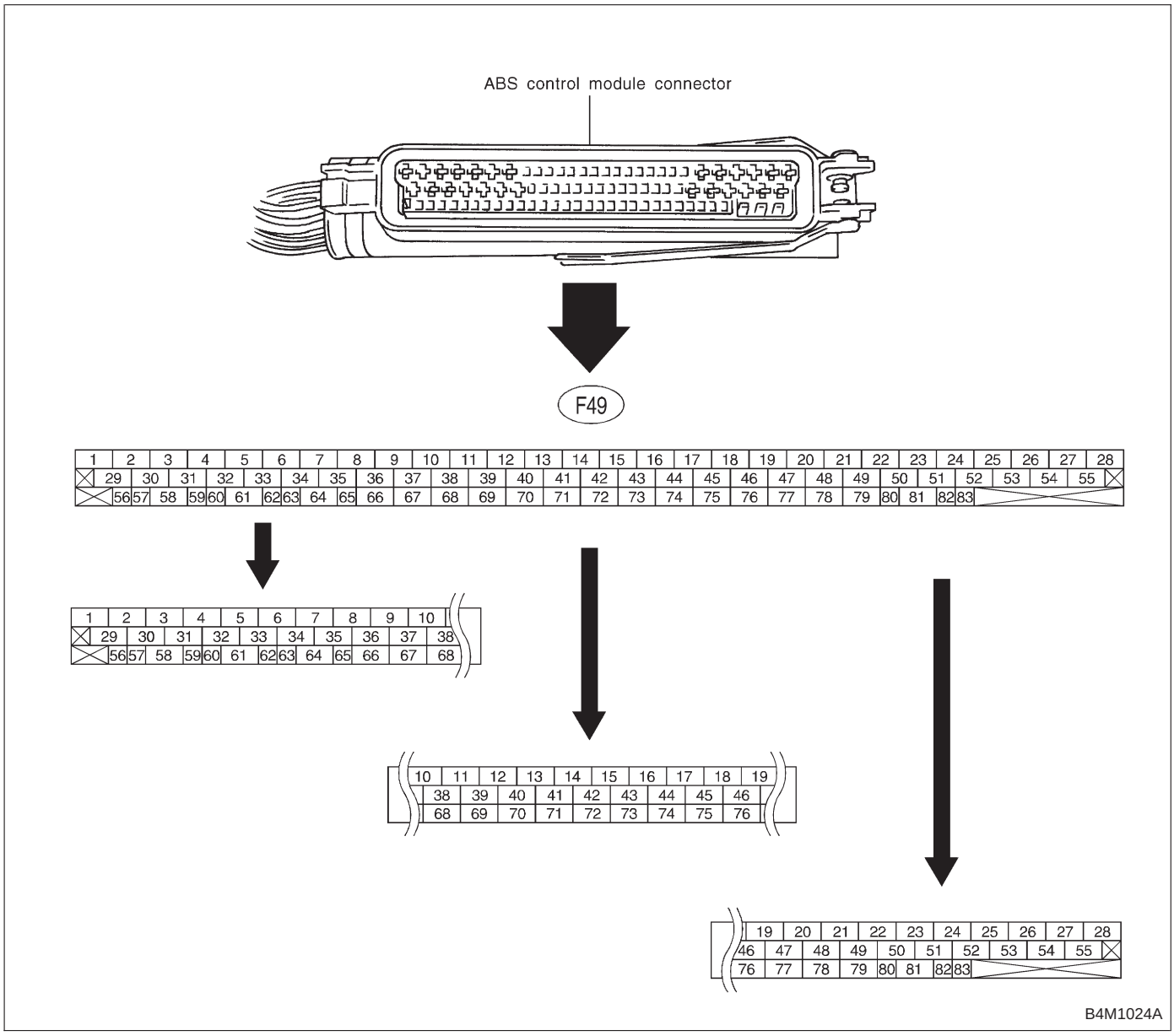
4. Schematic



① Hydraulic control unit (H/U)
② Front left inlet solenoid valve
③ Front left outlet solenoid valve
④ Front right inlet solenoid valve
⑤ Front right outlet solenoid valve
⑥ Rear left inlet solenoid valve
⑦ Rear left outlet solenoid valve
⑧ Rear right inlet solenoid valve
⑨ Rear right outlet solenoid valve
⑩ Motor
⑪ Transmission control module (only AT model)
⑫ ABS warning light
⑬ Motor relay
⑭ Valve relay
⑮ Relay box
⑯ Data link connector
⑰ ABS diagnosis connector
⑱ Stop light switch
⑲ Stop light
⑳ G sensor (only AWD model)
㉑ Front left ABS sensor
㉒ Front right ABS sensor
㉓ Rear left ABS sensor
㉔ Rear right ABS sensor
㉕ ABS control module (ABSCM)

5. Control Module I/O Signal

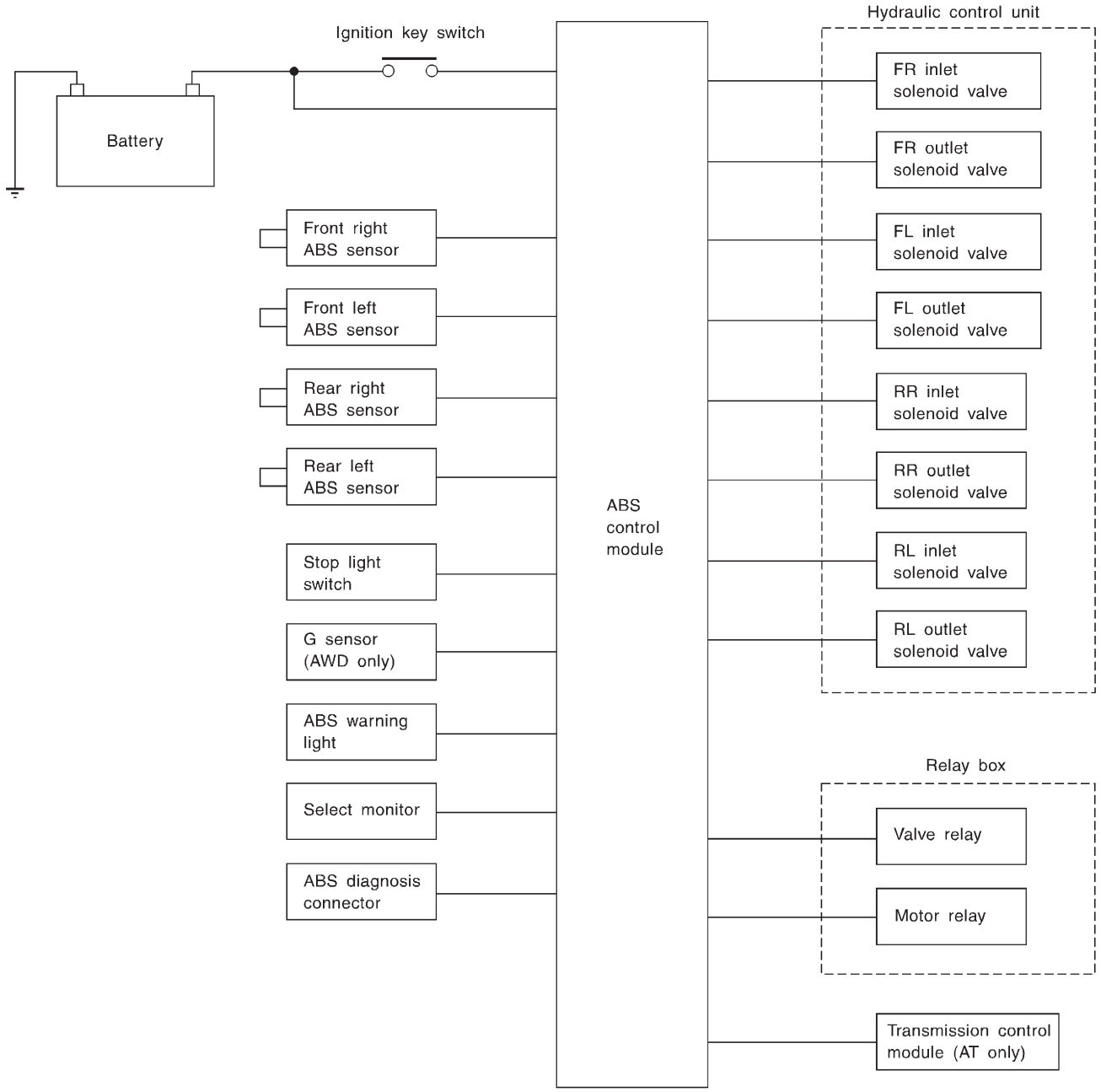
1. I/O SIGNAL VOLTAGE



NOTE:
The terminal numbers in the ABS control module connector are as shown in the figure.

Contents			Terminal No.	Input/Output signal Measured value and measuring conditions
ABS sensor (Wheel speed sensor)	Front left wheel		49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel		14—15	
	Rear left wheel		16—17	
	Rear right wheel		18—46	
Hydraulic control unit	Solenoid valve	Front left outlet	51—1	10 — 13 V when the valve is OFF and less than 1.5 V when the valve is ON.
		Front right outlet	3—1	
		Rear left outlet	4—1	
		Rear right outlet	50—1	
		Front left inlet	24—1	
		Front right inlet	30—1	
		Rear left inlet	31—1	
		Rear right inlet	23—1	
Relay box	Valve relay power supply		27—1	10 — 13 V when ignition switch is ON.
	Valve relay coil		47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil		22—1	More than 10 V when the ABS control does not operate still and less than 1.5 V when ABS operates.
	Motor monitoring		10—1	Less than 1.5 V when the ABS control does not operate still and more than 10 V when ABS operates.
G sensor (AWD model only)	power supply		8—45	4.75 — 5.25 V
	ground		45	—
	output		7—45	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch			36—1	Less than 1.5 V when the stop light is OFF and more than 4.5 V when the stop light is ON.
ABS warning light			54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 14 V after 1.5 seconds.
AT ABS signal (AT model only)			12—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
ABS operation signal monitor			39—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
Select monitor	Data is received.		11—1	Less than 1.5 V when no data is received.
	Data is sent.		38—1	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 1		5—1	10 — 14 V when ignition switch is ON.
	Terminal No. 2		13—1	10 — 14 V when ignition switch is ON.
Power supply			28—1	10 — 14 V when ignition switch is ON.
Grounding line			1	—
Grounding line			55	—

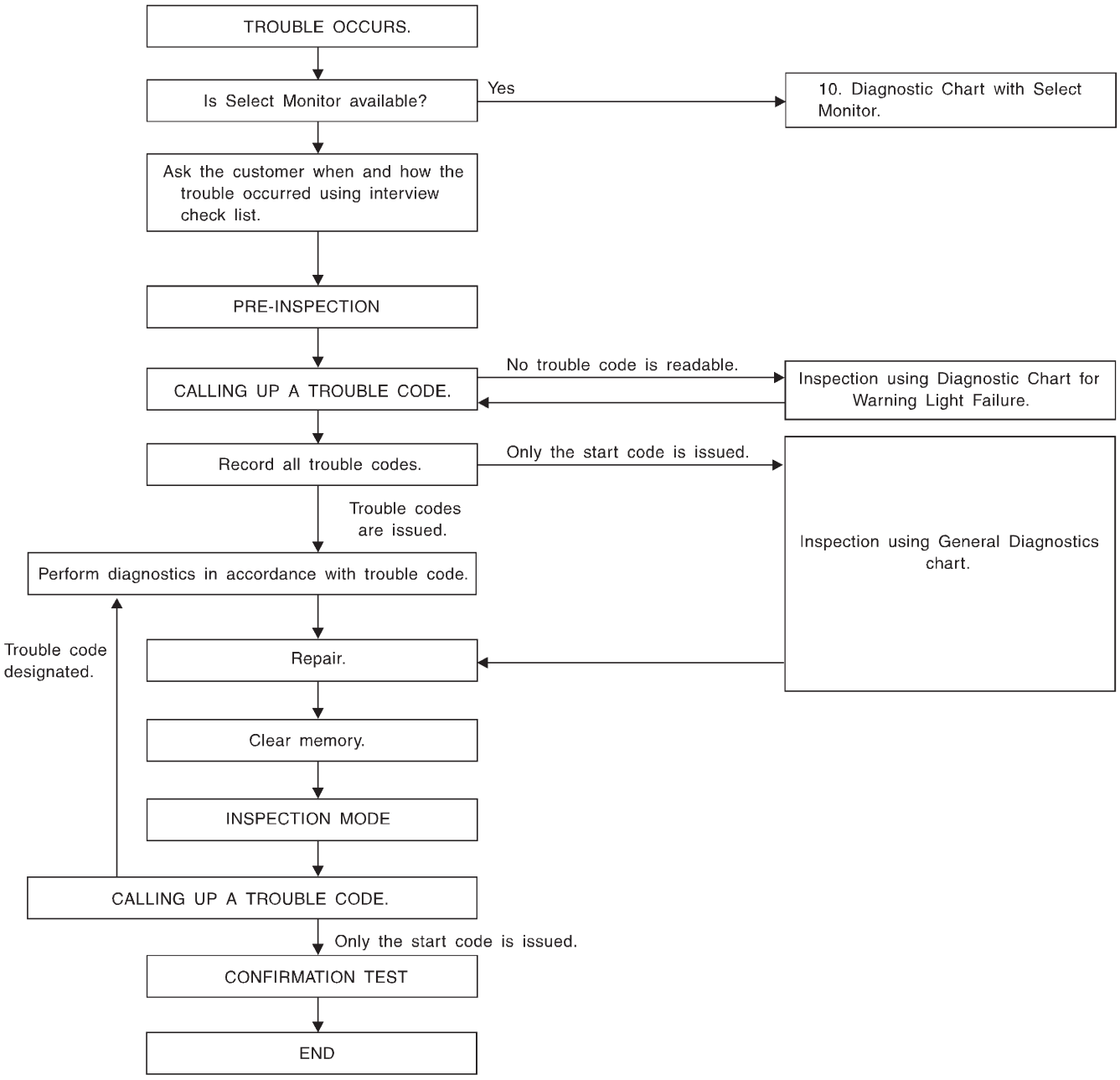
2. I/O SIGNAL DIAGRAM



B4M0788B

6. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE



B4M1051A

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS warning light illuminates, read and record trouble code indicated by ABS warning light.

B: CHECK LIST FOR INTERVIEW

Check the following items about the vehicle's state.

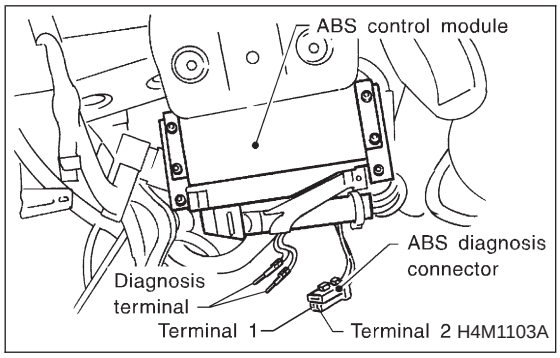
1. THE STATE OF THE ABS WARNING LIGHT			
ABS warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on ● When /how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		
Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to	km/h
		MPH to	MPH
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to	km/h
		MPH to	MPH
	☐When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
	☐ When moving other electrical parts		
	● Parts name : ● Operating condition :		
2. SYMPTOMS			
ABS operating condition	☐ Performs no work.		
	☐ Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	● How to step on brake pedal :		
	a) Operating time :		sec
	b) Operating noise : ☐ Produce / ☐ Does not produce		
	● What kind of noise?	☐ Knock ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others :	
	c) Reaction force of brake pedal		
		☐ Stick ☐ Press down once with a clunk ☐ Press and released ☐ Others :	

Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : ☐ Yes / ☐No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : ☐ Yes / ☐No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	c) Brakes are out of order : ☐ Yes / ☐No	
	● What :	☐ Braking distance is long ☐ Brakes lock or drag ☐ Pedal stroke is long ☐ Pedal sticks ☐ Others :
	d) Poor acceleration : ☐ Yes / ☐No	
	● What :	☐ Fails to accelerate ☐ Engine stalls ☐ Others :
	e) Occurrence of vibration : ☐ Yes / ☐No	
	● Where ● What kind :	
	f) Occurrence of abnormal noise : ☐ Yes / ☐No	
	● Where ● What kind :	
	g) Occurrence of other phenomena : ☐ Yes / ☐No	
	● What kind :	
3. CONDITIONS UNDER WHICH TROUBLE OCCURS		
Environment	a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others :
	b) Ambient temperature	F(°C)
	c) Road	☐ Urban area ☐ Suburbs ☐ Highway ☐ General road ☐ Ascending slope ☐ Descending slope ☐ Paved road ☐ Gravel road ☐ Muddy road ☐ Sandy place ☐ Others :
	d) Road surface	☐ Dry ☐ Wet ☐ New-fallen snow ☐ Compressed snow ☐ Frozen slope ☐ Others :

Condition	a) Brakes	Deceleration :	g
		☐ Continuous / ☐Intermittent	
	b) Accelerator	Acceleration :	g
		☐ Continuous / ☐ Intermittent	
	c) Vehicle speed	km/h	MPH
		☐ Advancing ☐ Accelerating ☐ Reducing speed ☐ Low speed ☐ Turning ☐ Others :	
	d) Tire inflation pressure	Front RH tire :	kPa
		Front LH tire :	kPa
		Rear RH tire :	kPa
		Rear LH tire :	kPa
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Genuine parts are used. : ☐Yes / ☐No		
	g) Chain is passed around tires. : ☐Yes / ☐No		
	h) T tire is used. : ☐Yes / ☐No		
	i) Condition of suspension alignment :		
	j) Loading state :		
	k) Repair parts are used. : ☐Yes / ☐No		
	● What :		
	l) Others :		

C: INSPECTION MODE

Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.



D: TROUBLE CODES

When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a trouble code. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

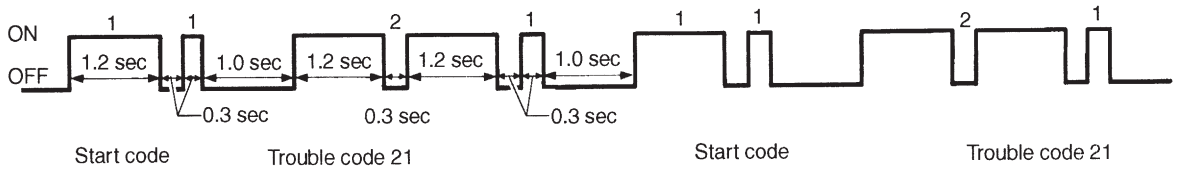
1. CALLING UP A TROUBLE CODE

1) Take out ABS diagnosis connector from side of driver's seat heater unit.
2) Turn ignition switch OFF.
3) Connect ABS diagnosis connector terminal 2 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify trouble code.
6) After the start code (11) is shown, the trouble codes will be shown in order of the last information first.
These repeat for a maximum of 5 minutes.

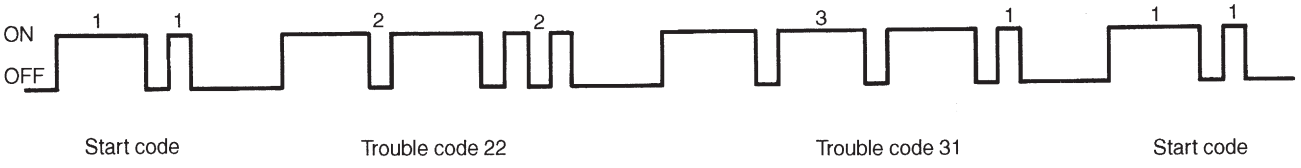
NOTE:
When there are no trouble codes in memory, only the start code (11) is shown.

Example of code indication

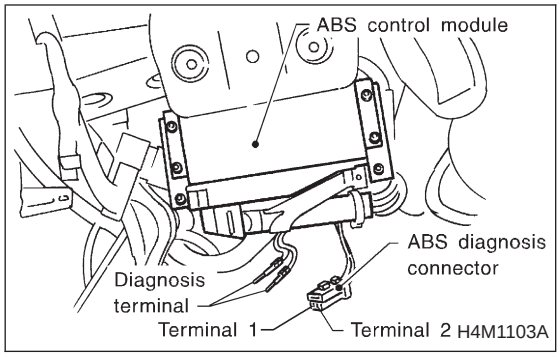
Trouble code: 21



Trouble code: 22, 31

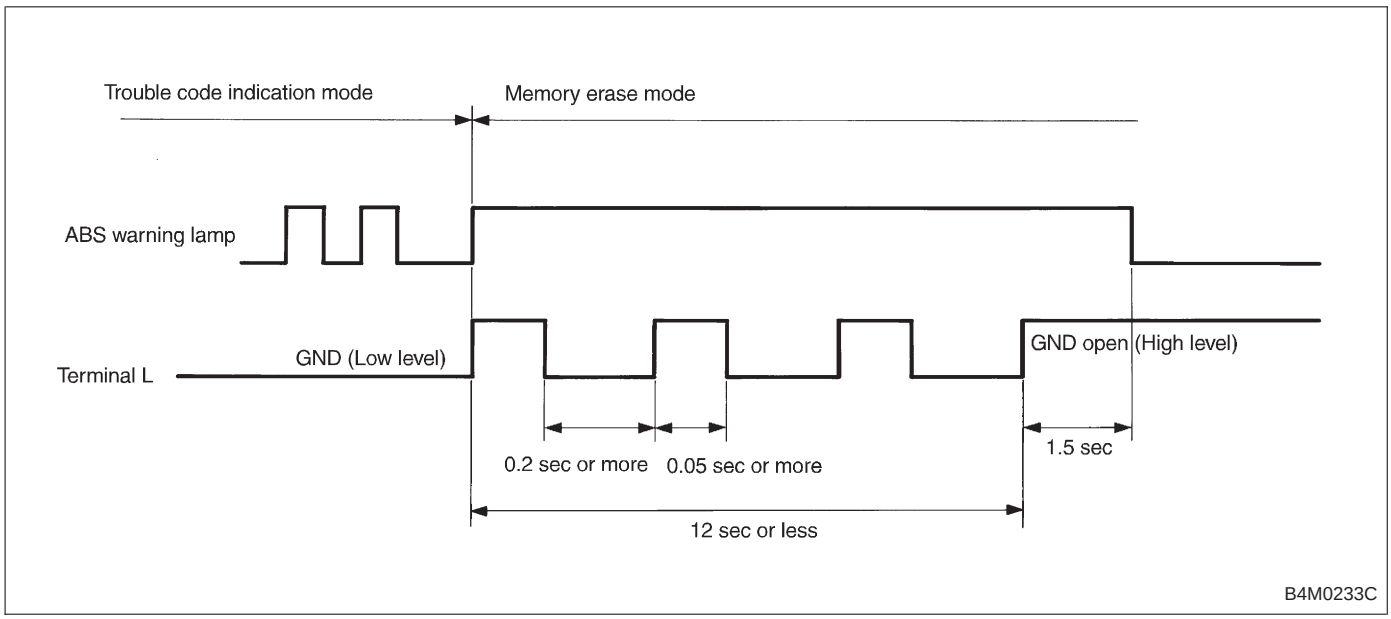


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2. CLEARING MEMORY

1) After calling up a trouble code, disconnect ABS diagnosis connector terminal 2 from diagnosis terminal.
2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 2 and diagnosis terminal for at least 0.05 seconds each time.



NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

7. Diagnostics Chart for ABS Warning Light Circuit and Diagnosis Circuit Failure

A: ABS WARNING LIGHT DOES NOT COME ON.

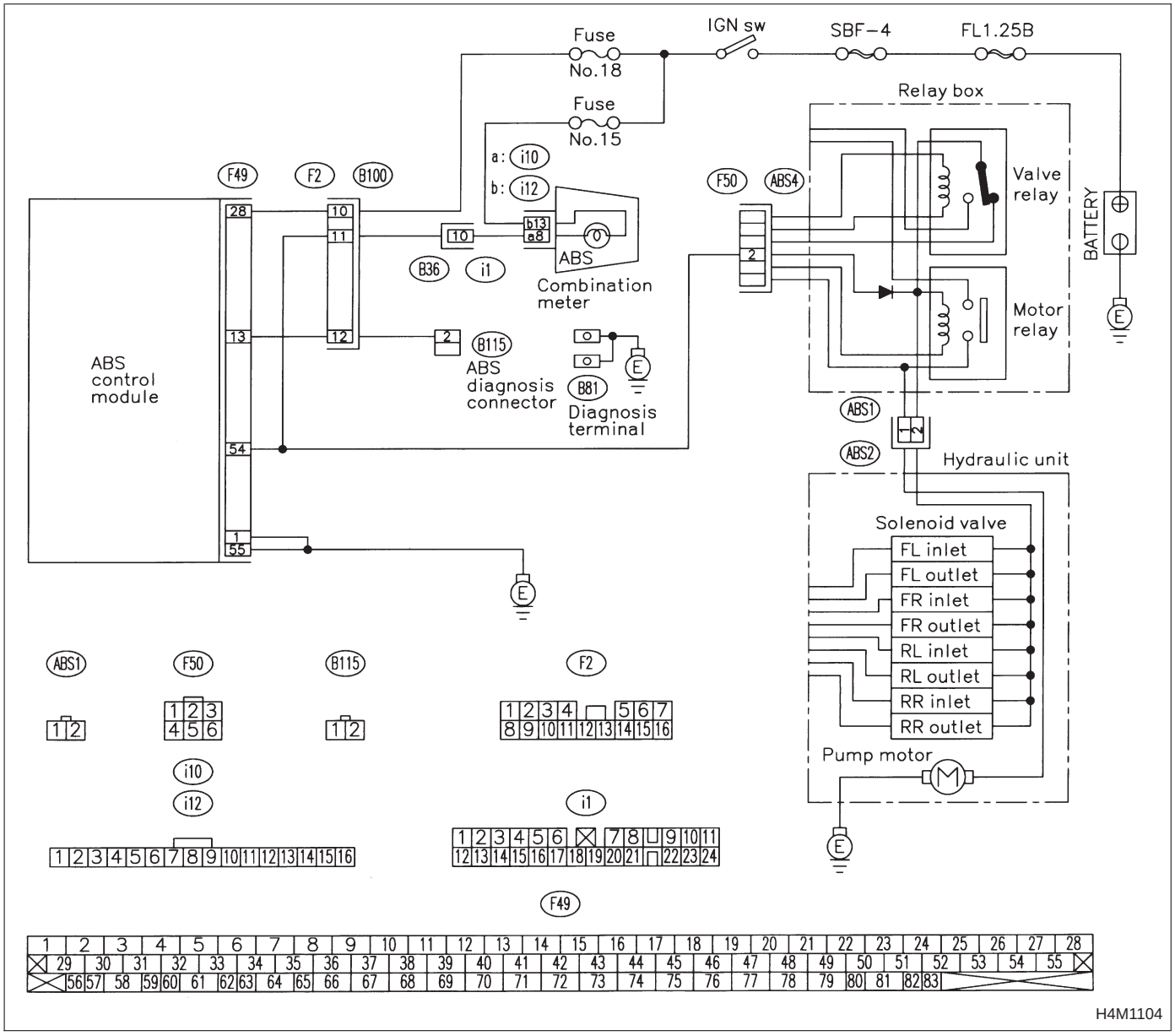
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When ignition switch is turned ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:



7A1	CHECK IF OTHER WARNING LIGHTS TURN ON.

Turn ignition switch to ON (engine OFF).

CHECK ***: Do other warning lights turn on?***

YES : Go to step **7A2.**

NO : Repair combination meter.

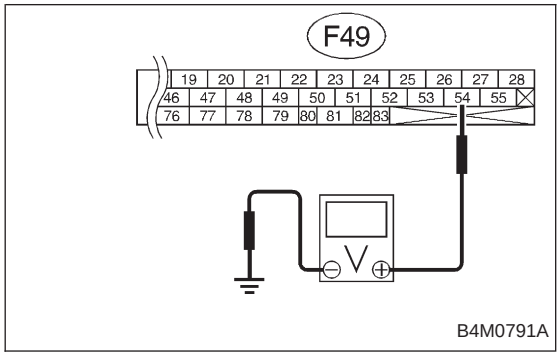
7A2	CHECK ABS WARNING LIGHT BULB.

1) Turn ignition switch to OFF.
2) Remove combination meter.
3) Remove ABS warning light bulb from combination meter.

CHECK ***: Is ABS warning light bulb OK?***

YES : Go to step **7A3.**

NO : Replace ABS warning light bulb.



7A3	CHECK WIRING HARNESS.

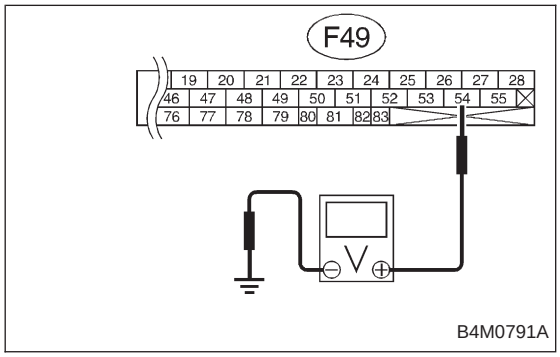
1) Disconnect connector from ABSCM.
2) Disconnect connector (F50) from relay box.
3) Turn ignition switch to ON.
4) Measure voltage between connector (F49) and chassis ground.

Connector & terminal
(F49) No. 54 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **7A4**.

NO : Repair broken wire in harness or connector.



7A4	CHECK WIRING HARNESS.

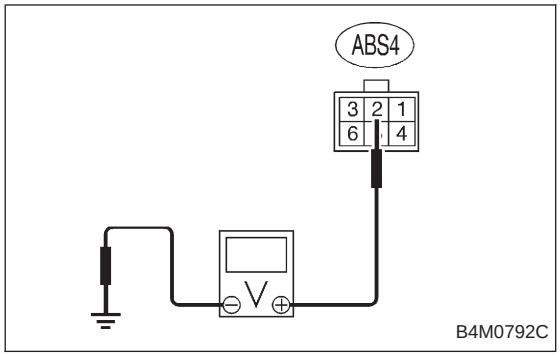
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector (F49) and chassis ground.

Connector & terminal
(F49) No. 54 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 3 V?***

YES : Go to step **7A5**.

NO : Repair battery short of harness.

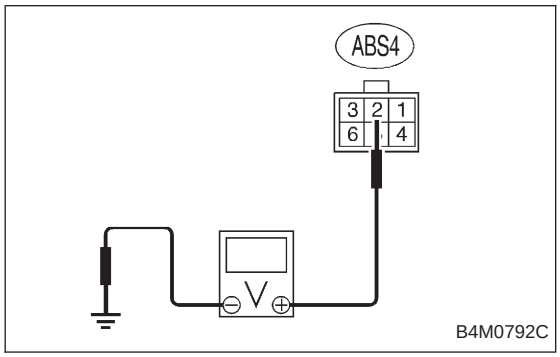


7A5	CHECK BATTERY SHORT OF RELAY BOX.

1) Disconnect connector from relay box.
2) Measure voltage between relay box and chassis ground.

Connector & terminal
(ABS4) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **7A6**.
NO : Replace relay box.



7A6	CHECK BATTERY SHORT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box and chassis ground.

Connector & terminal
(ABS4) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **7A7**.
NO : Replace relay box.

7A7	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connectors between combination meter and ABSCM? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Replace ABSCM.

B: ABS WARNING LIGHT DOES NOT GO OFF.

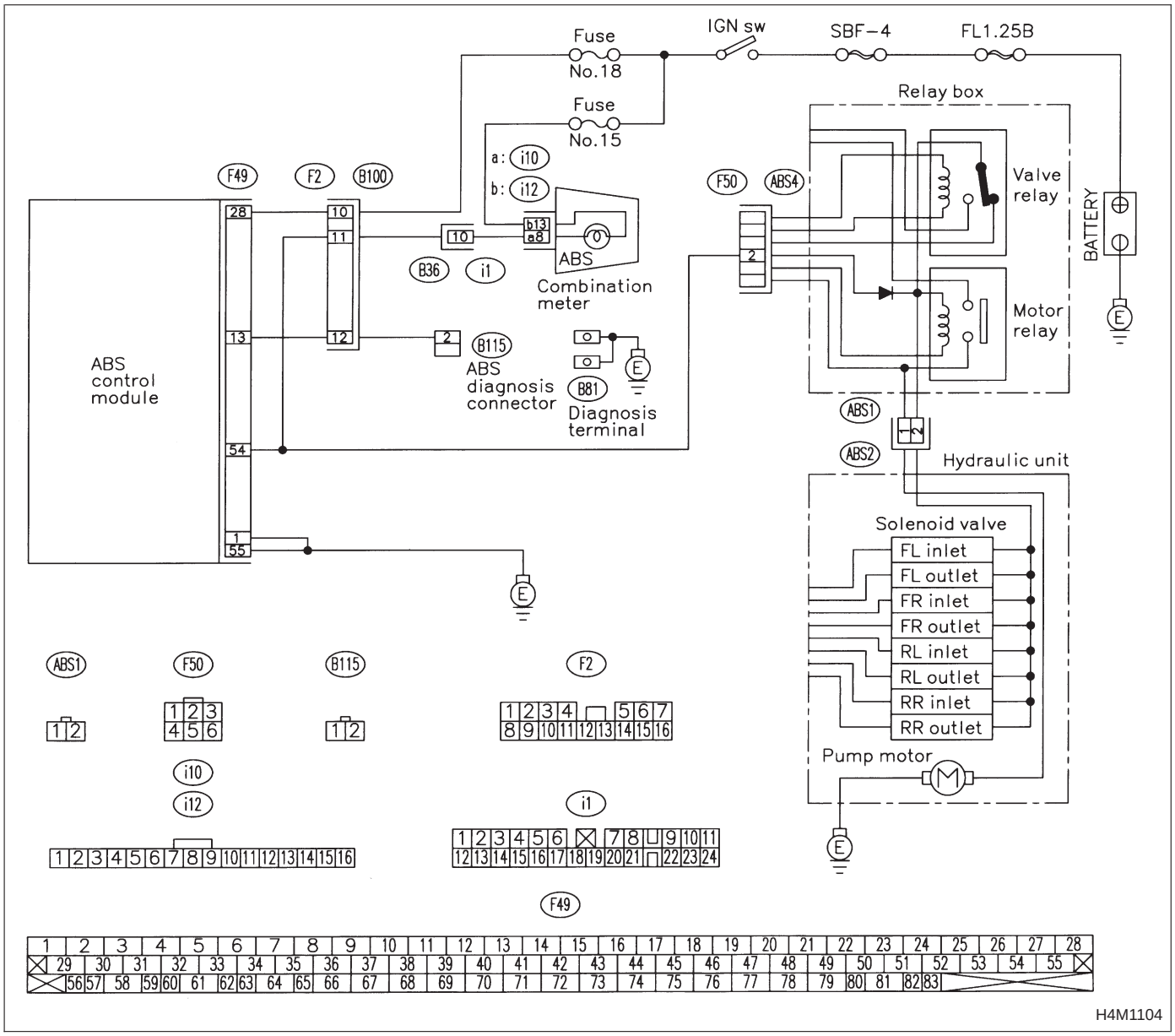
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:



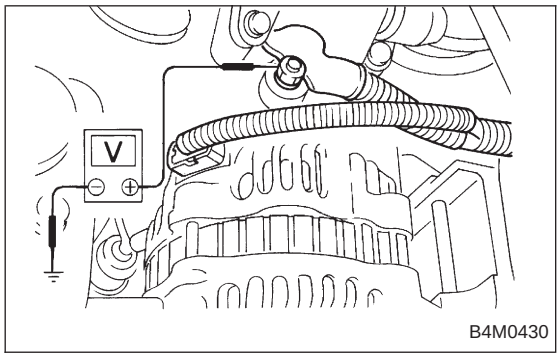
7B1	CHECK INSTALLATION OF ABSCM CONNECTOR.

Turn ignition switch to OFF.

CHECK ***: Is ABSCM connector inserted into ABSCM until the clamp locks onto it?***

YES : Go to step **7B2.**

NO : Insert ABSCM connector into ABSCM until the clamp locks onto it.



7B2	CHECK GENERATOR.

1) Start the engine.
2) Idle the engine.
3) Measure voltage between generator and chassis ground.

Terminal
Generator B terminal (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 and 15 V?***

YES : Go to step **7B3**.

NO : Repair generator.

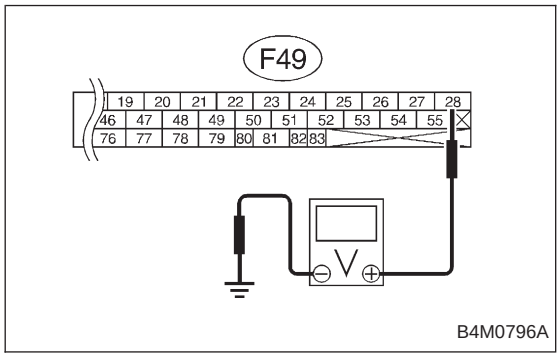
7B3	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact at battery terminal?***

YES : Repair battery terminal.

NO : Go to step **7B4**.



7B4	CHECK POWER SUPPLY OF ABSCM.

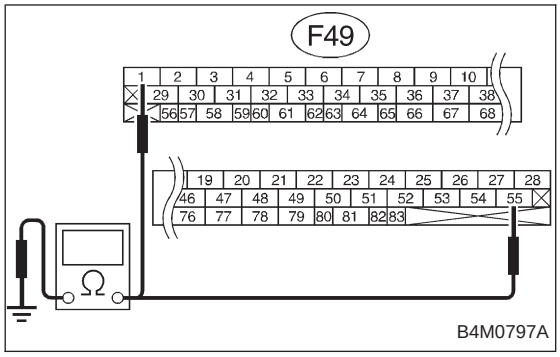
1) Disconnect connector from ABSCM.
2) Start engine.
3) Idle the engine.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 and 15 V?***

YES : Go to step **7B5**.

NO : Repair ABSCM power supply circuit.



7B5	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **7B6**.
NO : Repair ABSCM ground harness.

7B6	CHECK WIRING HARNESS.

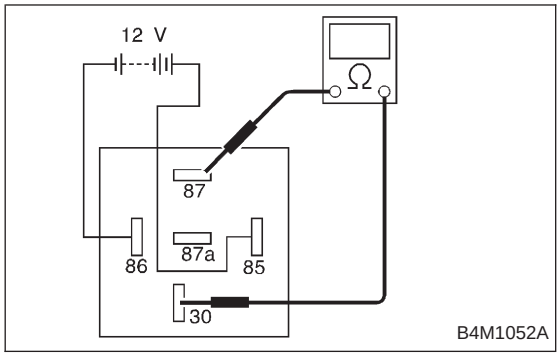
1) Disconnect connector (F50) from relay box.
2) Turn ignition switch to ON.

CHECK ***: Does the ABS warning light remain off?***
YES : Go to step **7B7**.
NO : Repair front wiring harness.

7B7	CHECK RELAY BOX.

1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Remove valve relay from relay box.
4) Disconnect connector (ABS1) from hydraulic control unit.
5) Turn ignition switch to ON.

CHECK ***: Does the ABS warning light remain off?***
YES : Go to step **7B8**.
NO : Repair relay box and check fuse.

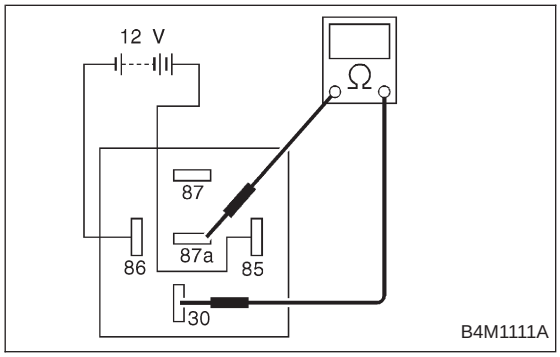


7B8	CHECK CONTACT POINT OF VALVE RELAY.

1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **7B9**.
NO : Replace valve relay.

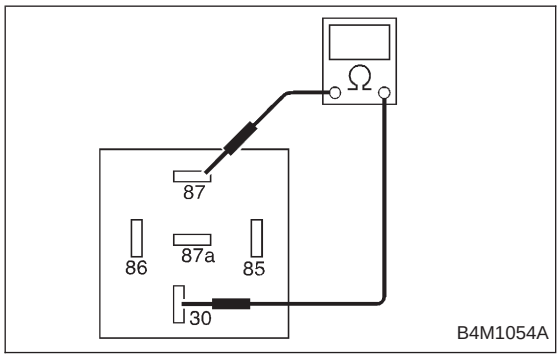


7B9	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:
Is the resistance more than 1 MΩ?

YES : Go to step **7B10**.
NO : Replace valve relay.

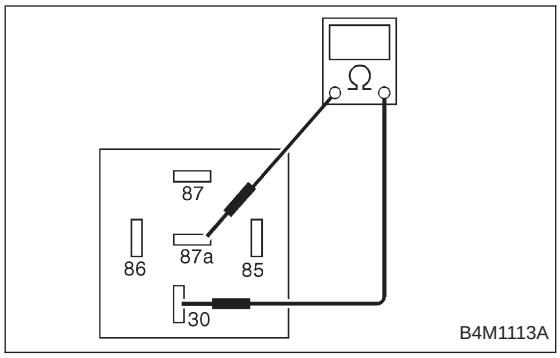


7B10	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **7B11**.
NO : Replace valve relay.



7B11	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **7B12**.
NO : Replace valve relay.

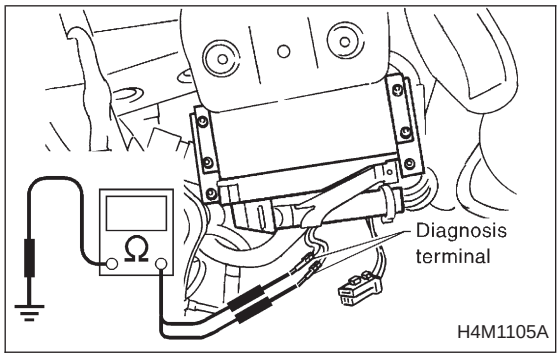
7B12	CHECK HYDRAULIC CONTROL UNIT.

1) Turn ignition switch to OFF.
2) Connect connector (ABS1) to hydraulic control unit.
3) Turn ignition switch to ON.

CHECK ***: Is the ABS warning light off?***

YES : Go to step **7B13**.

NO : Replace hydraulic control unit and check fuse No. 19.



7B13	CHECK DIAGNOSIS TERMINAL.

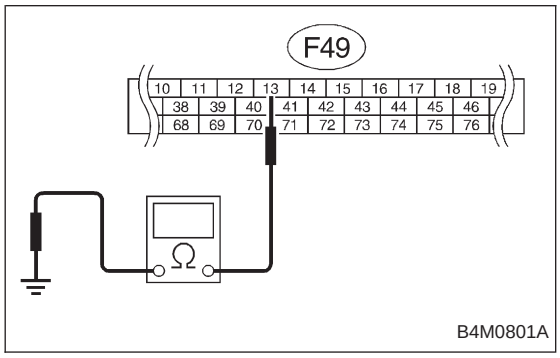
Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals
Diagnosis terminal (A) — Chassis ground:
Diagnosis terminal (B) — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **7B14**.

NO : Repair diagnosis terminal harness.



7B14	CHECK DIAGNOSIS LINE.

1) Turn ignition switch to OFF.
2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 13 — Chassis ground:

CHECK ***: Is the resistance less than 1 Ω?***

YES : Go to step **7B15**.

NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7B15	CHECK POOR CONTACT IN ABSCM CONNECTOR.

CHECK ***: Is there poor contact in ABSCM connector? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Replace ABSCM.

C: TROUBLE CODE DOES NOT APPEAR.

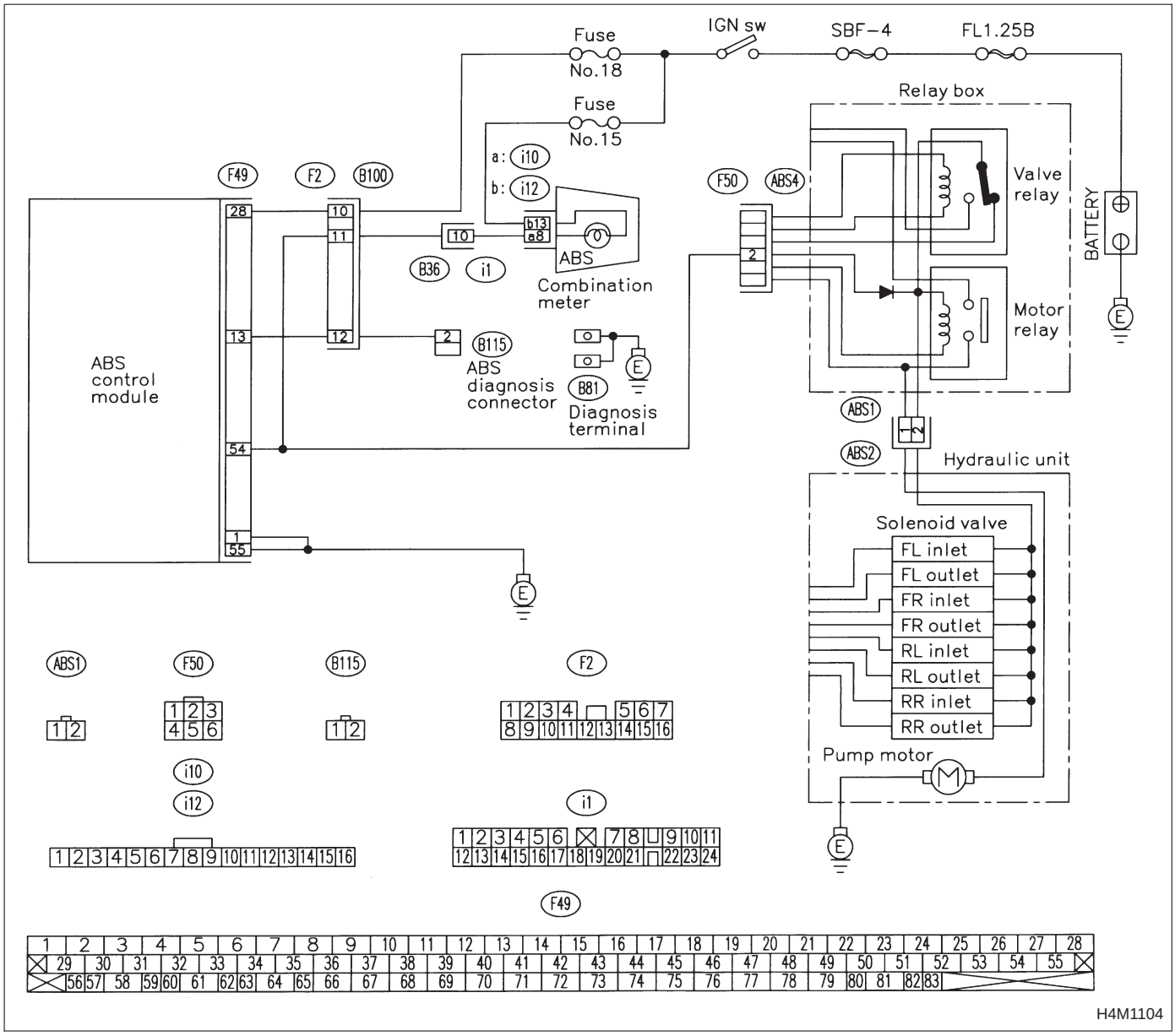
DIAGNOSIS:

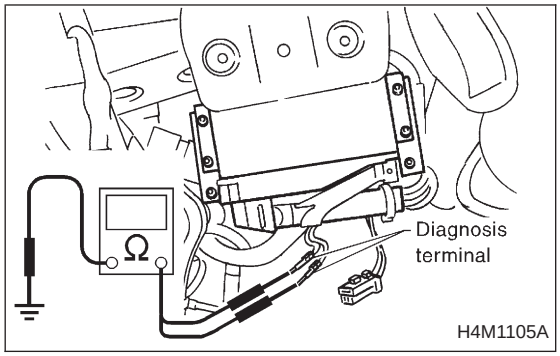
- Diagnosis circuit is open.

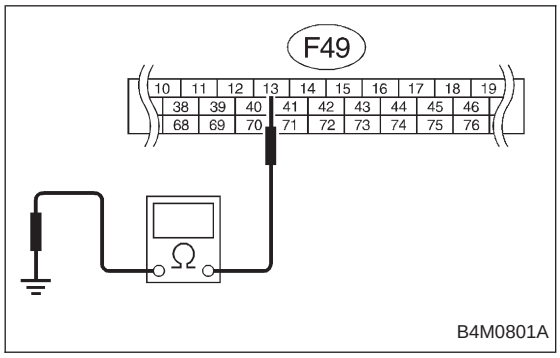
TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:







7C1	CHECK DIAGNOSIS TERMINAL.

Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals
Diagnosis terminal (A) — Chassis ground:
Diagnosis terminal (B) — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **7C2**.
NO : Repair diagnosis terminal harness.

7C2	CHECK DIAGNOSIS LINE.

1) Turn ignition switch to OFF.
2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 13 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **7C3**.
NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7C3	CHECK POOR CONTACT IN ABSCM CONNECTOR.

CHECK ***: Is there poor contact in ABSCM connector? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Replace ABSCM.

8. Diagnostics Chart with Trouble Code by ABS Warning Light

A: LIST OF TROUBLE CODE

Trouble code	Contents of diagnosis		Ref. to 4-4
11	Start code ● Trouble code is shown after start code. ● Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	[T8B0]
23		Front left ABS sensor	[T8C0]
25		Rear right ABS sensor	[T8D0]
27		Rear left ABS sensor	[T8E0]
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	[T8F0]
24		Front left ABS sensor	[T8G0]
26		Rear right ABS sensor	[T8H0]
28		Rear left ABS sensor	[T8I0]
29		Any one of four	[T8J0]
31	Abnormal solenoid valve circuit(s) in hydraulic unit	Front right inlet valve	[T8K0]
32		Front right outlet valve	[T8O0]
33		Front left inlet valve	[T8L0]
34		Front left outlet valve	[T8P0]
35		Rear right inlet valve	[T8M0]
36		Rear right outlet valve	[T8Q0]
37		Rear left inlet valve	[T8N0]
38		Rear left outlet valve	[T8R0]
41	Abnormal ABS control module		[T8S0]
42	Source voltage is low.		[T8T0]
44	A combination of AT control abnormal		[T8U0]
46	Abnormal G sensor power supply voltage		[T8V0]
51	Abnormal valve relay		[T8W0]
52	Abnormal motor and/or motor relay		[T8X0]
54	Abnormal stop light switch		[T8Y0]
56	Abnormal G sensor output voltage		[T8Z0]

B: TROUBLE CODE 21 (FRONT RH)
C: TROUBLE CODE 23 (FRONT LH)
D: TROUBLE CODE 25 (REAR RH)
E: TROUBLE CODE 27 (REAR LH)
— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —

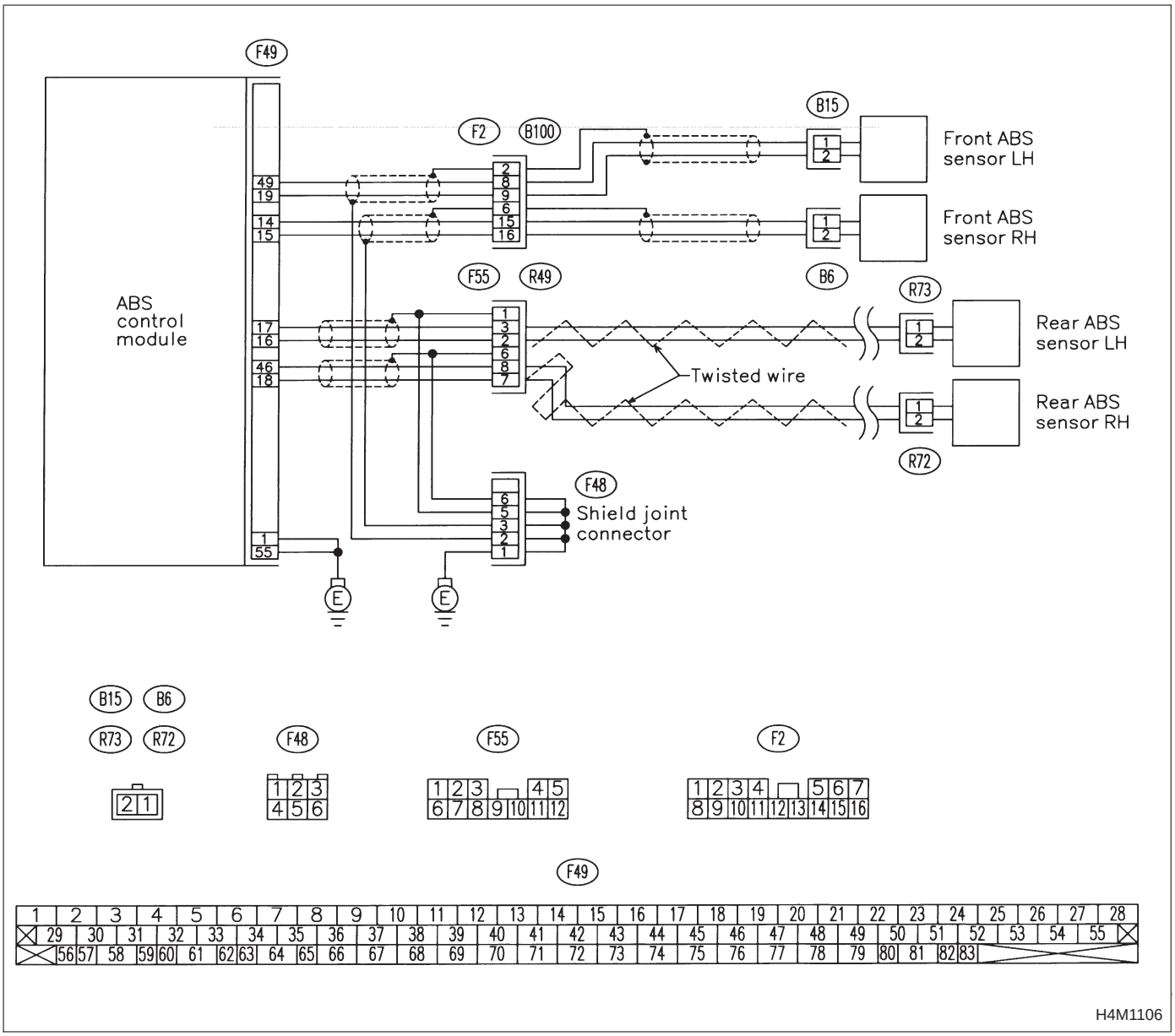
DIAGNOSIS:

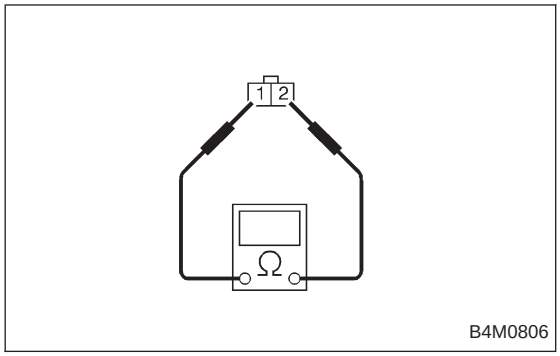
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



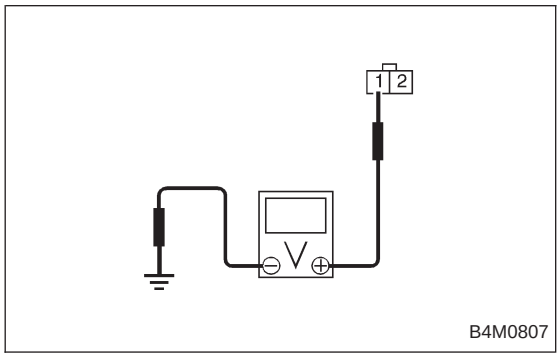


8E1	CHECK ABS SENSOR.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance of ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8E2**.
NO : Replace ABS sensor.

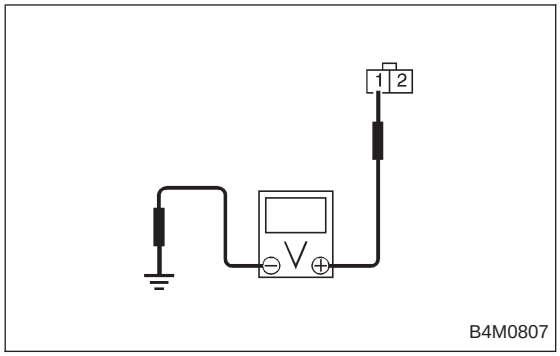


8E2	CHECK BATTERY SHORT OF ABS SENSOR.

1) Disconnect connector from ABSCM.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (−):
Front LH No. 1 (+) — Chassis ground (−):
Rear RH No. 1 (+) — Chassis ground (−):
Rear LH No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8E3**.
NO : Replace ABS sensor.

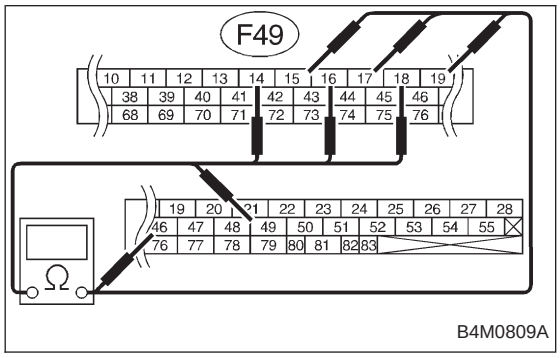


8E3	CHECK BATTERY SHORT OF ABS SENSOR.

1) Turn ignition switch to ON.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (−):
Front LH No. 1 (+) — Chassis ground (−):
Rear RH No. 1 (+) — Chassis ground (−):
Rear LH No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8E4**.
NO : Replace ABS sensor.

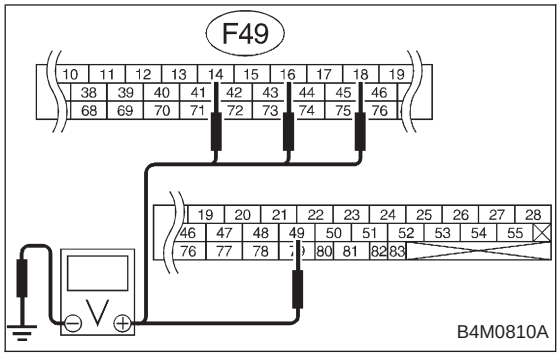


8E4	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

1) Turn ignition switch to OFF.
2) Connect connector to ABS sensor.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 21 / (F49) No. 14 — No. 15:
Trouble code 23 / (F49) No. 49 — No. 19:
Trouble code 25 / (F49) No. 18 — No. 46:
Trouble code 27 / (F49) No. 16 — No. 17:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8E5**.
NO : Repair harness/connector between ABSCM and ABS sensor.



8E5	CHECK BATTERY SHORT OF HARNESS.

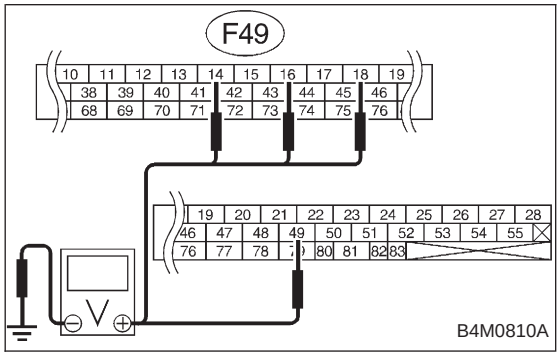
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 (+) — Chassis ground (−):
Trouble code 23 / (F49) No. 49 (+) — Chassis ground (−):
Trouble code 25 / (F49) No. 18 (+) — Chassis ground (−):
Trouble code 27 / (F49) No. 16 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8E6**.

NO : Repair harness between ABSCM and ABS sensor.



8E6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 (+) — Chassis ground (−):
Trouble code 23 / (F49) No. 49 (+) — Chassis ground (−):
Trouble code 25 / (F49) No. 18 (+) — Chassis ground (−):
Trouble code 27 / (F49) No. 16 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8E7**.

NO : Repair harness between ABSCM and ABS sensor.

8E7	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **8E8**.

NO : Tighten ABS sensor installation bolts securely.

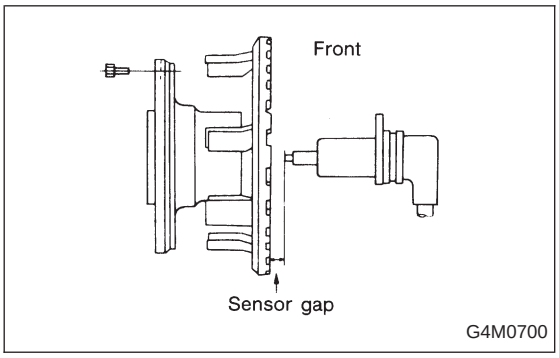
8E8	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **8E9**.

NO : Tighten tone wheel installation bolts securely.

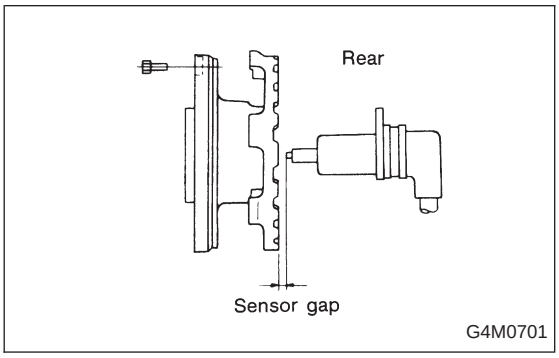


8E9	CHECK ABS SENSOR GAP.

Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)



YES : Go to step **8E10**.

NO : Adjust the gap.

NOTE:
Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8E10	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8E11**.

NO : Repair hub.

8E11	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8E12**.

8E12	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8E13**.

8E13	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

NOTE:
Check harness and connectors between ABSCM and ABS sensor.

F: TROUBLE CODE 22 (FRONT RH)
G: TROUBLE CODE 24 (FRONT LH)
H: TROUBLE CODE 26 (REAR RH)
I: TROUBLE CODE 28 (REAR LH)
— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —

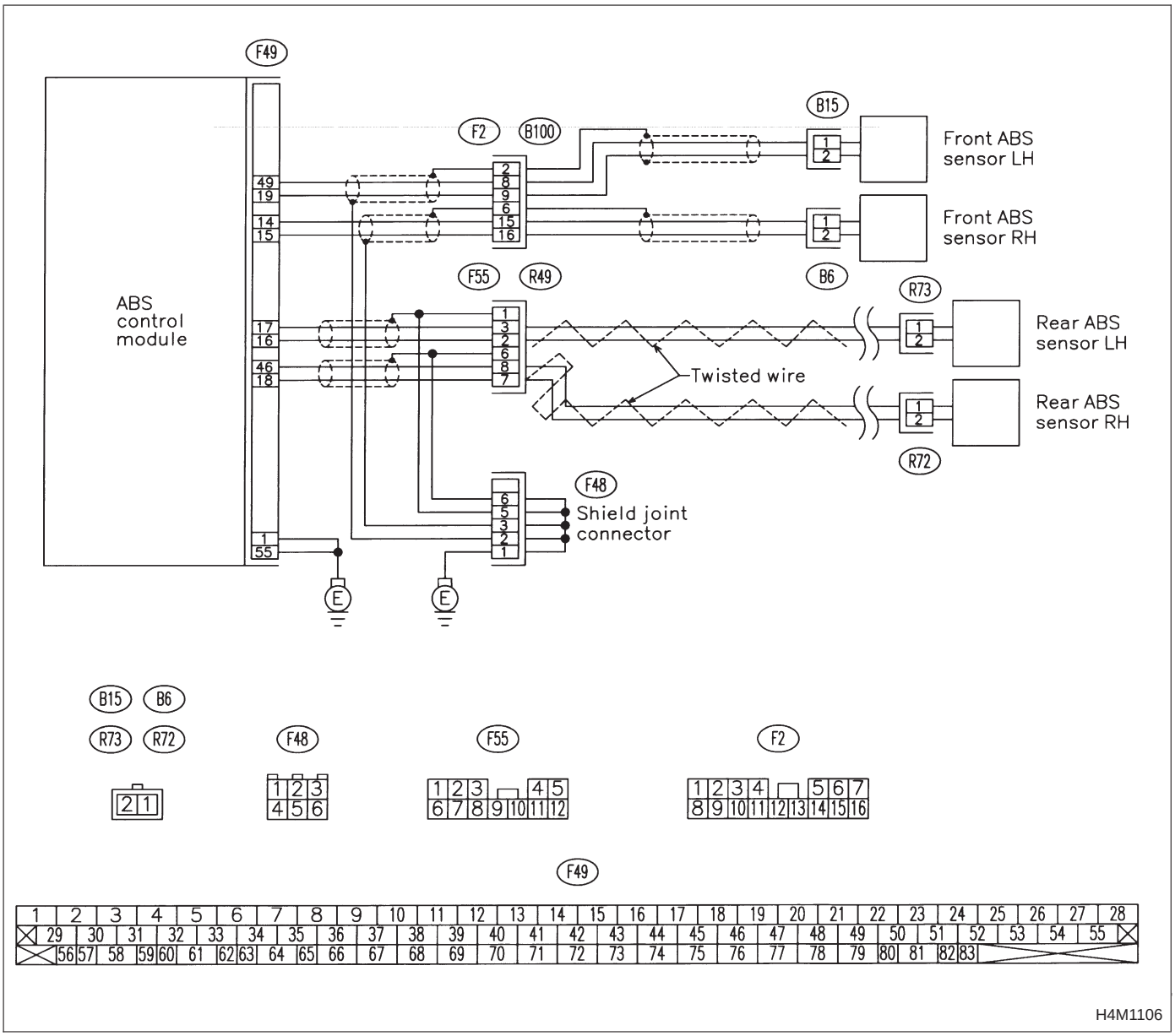
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



8I1	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **8I2**.

NO : Tighten ABS sensor installation bolts securely.

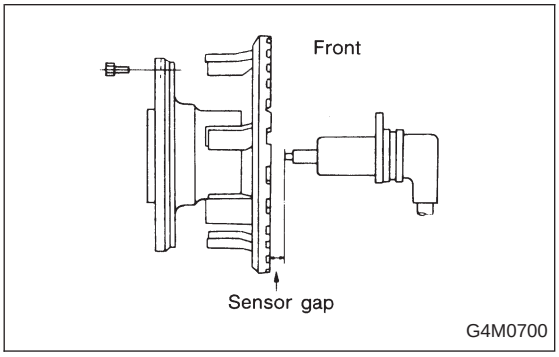
8I2	CHECK INSTALLATION OF TONE WHEEL.

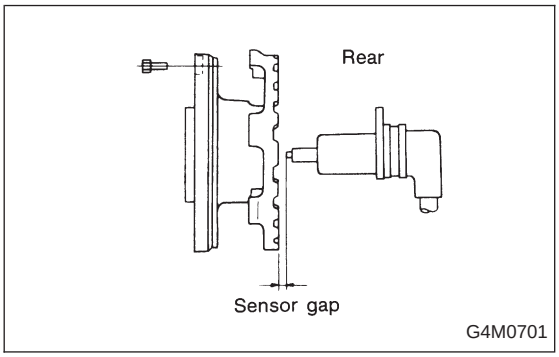
Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **8I3**.

NO : Tighten tone wheel installation bolts securely.





8I3	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES : Go to step **8I4**.

NO : Adjust the gap.

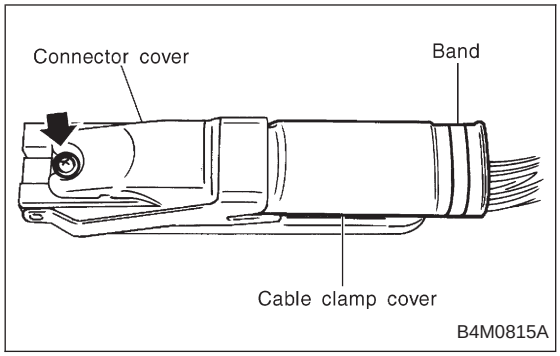
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8I4	CHECK OSCILLOSCOPE.

CHECK ***: Is an oscilloscope available?***

YES : Go to step **8I5**.

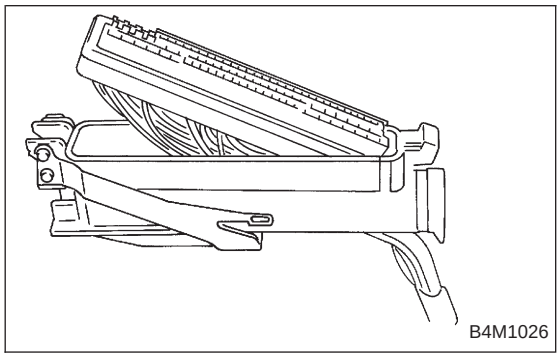
NO : Go to step **8I6**.



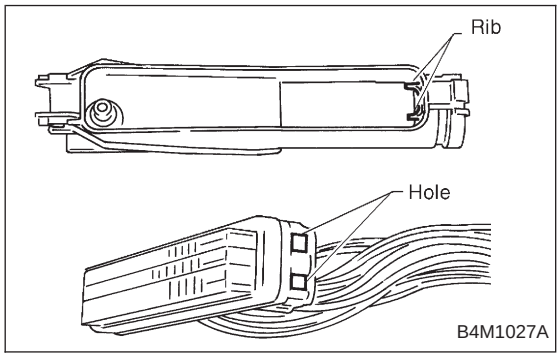
8I5	CHECK ABS SENSOR SIGNAL.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

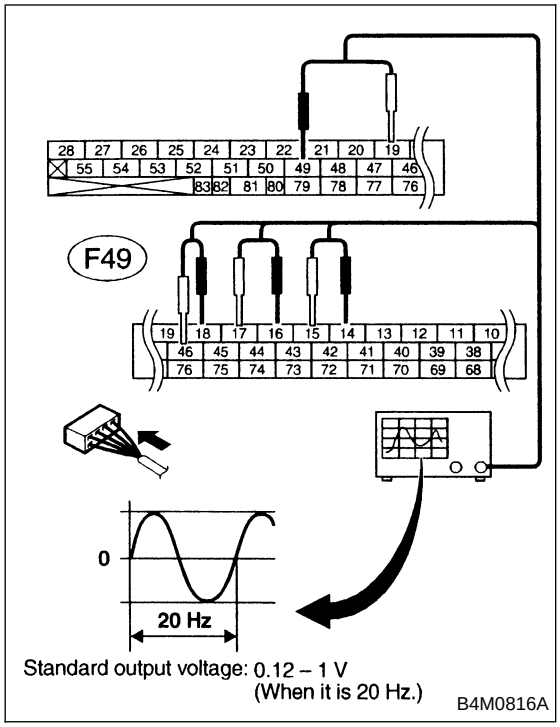


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
Trouble code 22 / (F49) No. 14 (+) — No. 15 (−):
Trouble code 24 / (F49) No. 49 (+) — No. 19 (−):
Trouble code 26 / (F49) No. 18 (+) — No. 46 (−):
Trouble code 28 / (F49) No. 16 (+) — No. 17 (−):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK ***: Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **8I9**.
NO : Go to step **8I6**.

8I6	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor or drum from hub in accordance with trouble code.

CHECK ***: Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.
NO : Go to step **8I7**.

8I7	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK ***: Are there broken or damaged in the ABS sensor pole piece or the tone wheel?***

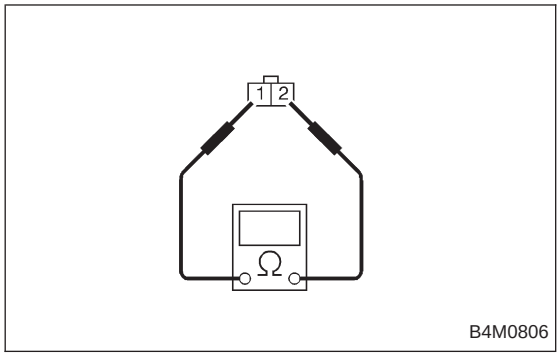
YES : Replace ABS sensor or tone wheel.
NO : Go to step **8I8**.

8I8	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8I9**.
NO : Repair hub.

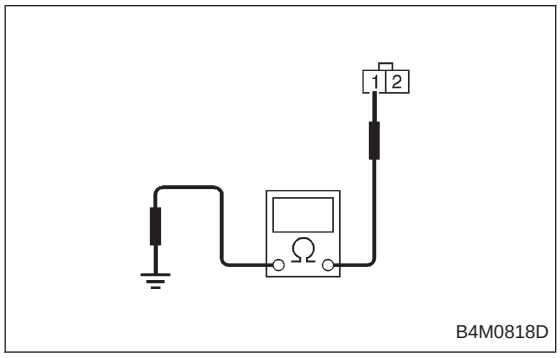


8I9	CHECK RESISTANCE OF ABS SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance between ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8I10**.
NO : Replace ABS sensor.

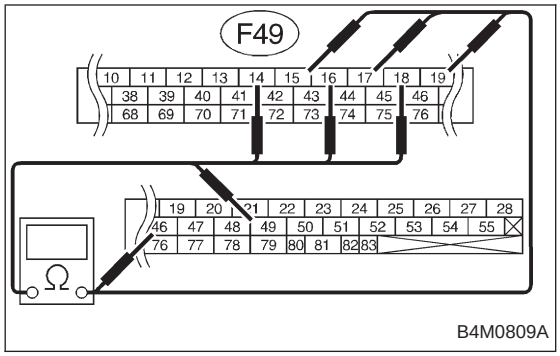


8I10	CHECK GROUND SHORT OF ABS SENSOR.

Measure resistance between ABS sensor and chassis ground.

Terminal
Front RH No. 1 — Chassis ground:
Front LH No. 1 — Chassis ground:
Rear RH No. 1 — Chassis ground:
Rear LH No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8I11**.
NO : Replace ABS sensor.

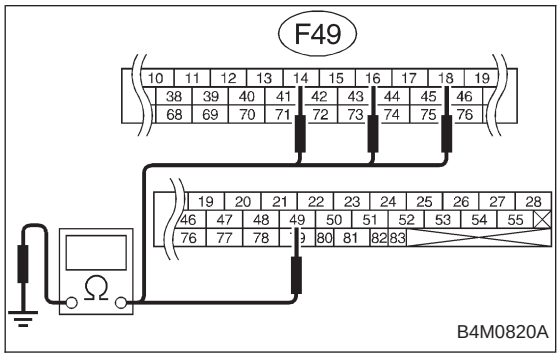


8I11	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

1) Connect connector to ABS sensor.
2) Disconnect connector from ABS control module.
3) Measure resistance at ABSCM connector terminals.

Connector & terminal
Trouble code 22 / (F49) No. 14 — No. 15:
Trouble code 24 / (F49) No. 49 — No. 19:
Trouble code 26 / (F49) No. 18 — No. 46:
Trouble code 28 / (F49) No. 16 — No. 17:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **8I12**.
NO : Repair harness/connector between ABSCM and ABS sensor.

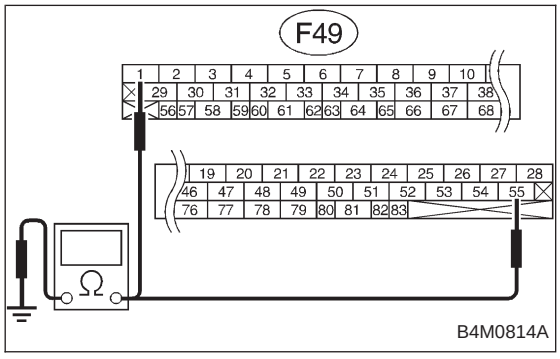


8I12	CHECK GROUND SHORT OF HARNESS.

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 22 / (F49) No. 14 — Chassis ground:
Trouble code 24 / (F49) No. 49 — Chassis ground:
Trouble code 26 / (F49) No. 18 — Chassis ground:
Trouble code 28 / (F49) No. 16 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8I13**.
NO : Repair harness/connector between ABSCM and ABS sensor.



8I13	CHECK GROUND CIRCUIT OF ABSCM.

Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — GND:
(F49) No. 55 — GND:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8I14**.
NO : Repair ABSCM ground harness.

8I14	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8I15**.

8I15	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Is the car telephone or the wireless transmitter properly installed?***

YES : Go to step **8I16**.

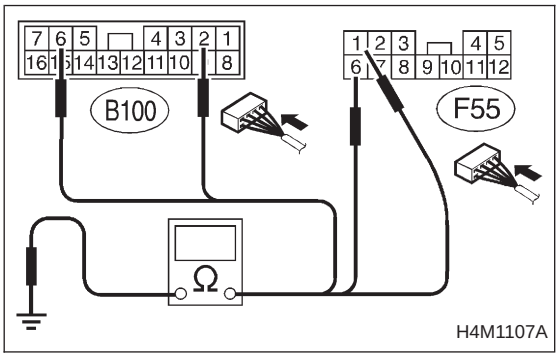
NO : Properly install the car telephone or the wireless transmitter.

8I16	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Are noise sources (such as an antenna) installed near the sensor harness?***

YES : Install the noise sources apart from the sensor harness.

NO : Go to step **8I17**.



8I17	CHECK SHIELD CIRCUIT.

1) Connect all connectors.
2) Measure resistance between shield connector and chassis ground.

Connector & terminal
Trouble code 22 / (B100) No. 6 — Chassis ground:
Trouble code 24 / (B100) No. 2 — Chassis ground:
Trouble code 26 / (F55) No. 6 — Chassis ground:
Trouble code 28 / (F55) No. 1 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **8I18**.

NO : Repair shield harness.

8I18	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8I19**.

8I19	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary noise interference.

J: TROUBLE CODE 29 — ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —

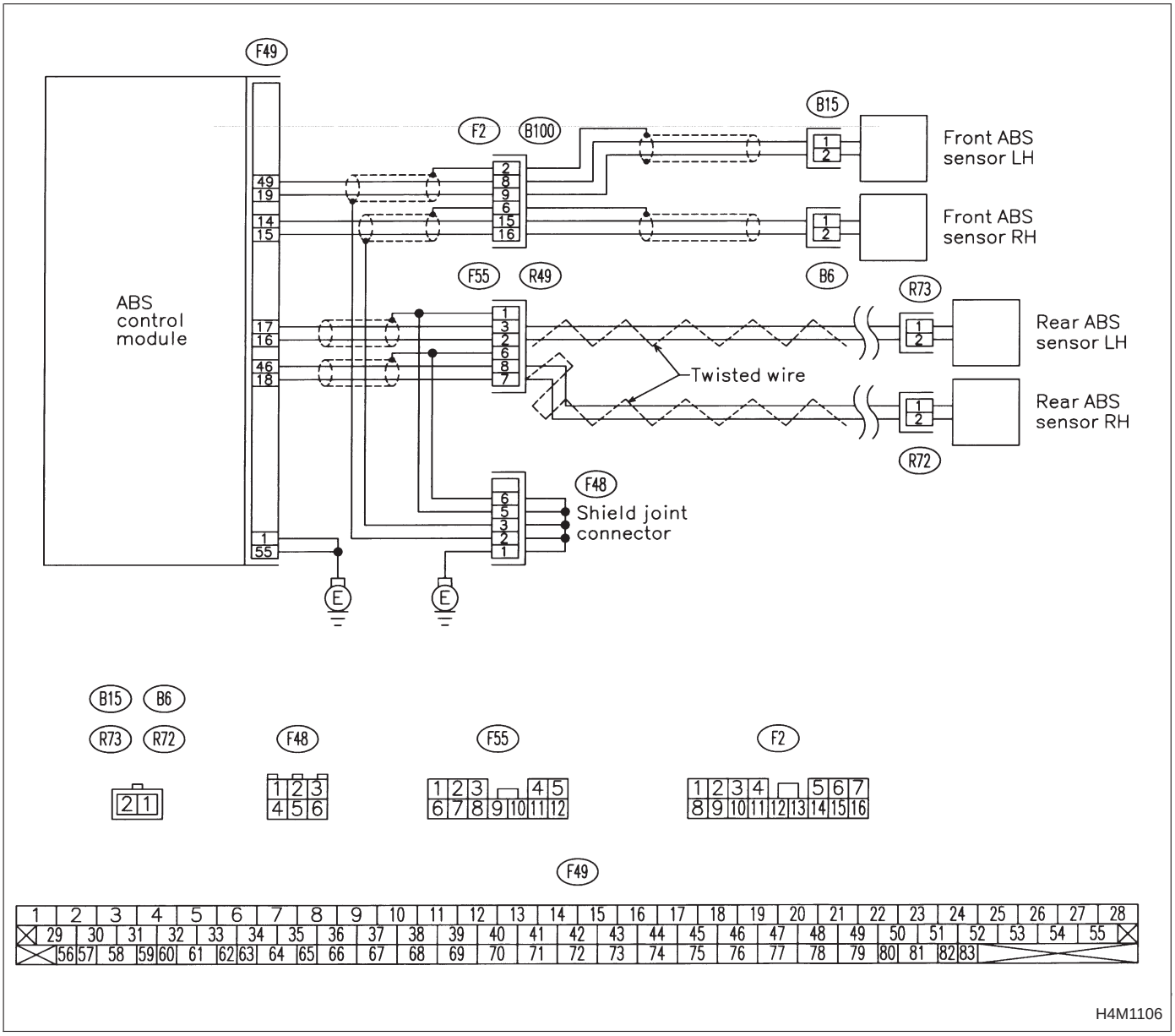
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



8J1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.

CHECK : ***Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.***

YES : The ABS is normal. Erase the trouble code.

NOTE:
When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.

NO : Go to step **8J2**.

8J2	CHECK TIRE SPECIFICATIONS.

CHECK ***: Are the tire specifications correct?***

YES : Go to step **8J3**.

NO : Replace tire.

8J3	CHECK WEAR OF TIRE.

CHECK ***: Is the tire worn excessively?***

YES : Replace tire.

NO : Go to step **8J4**.

8J4	CHECK TIRE PRESSURE.

CHECK ***: Is the tire pressure correct?***

YES : Go to step **8J5**.

NO : Adjust tire pressure.

8J5	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **8J6**.

NO : Tighten ABS sensor installation bolts securely.

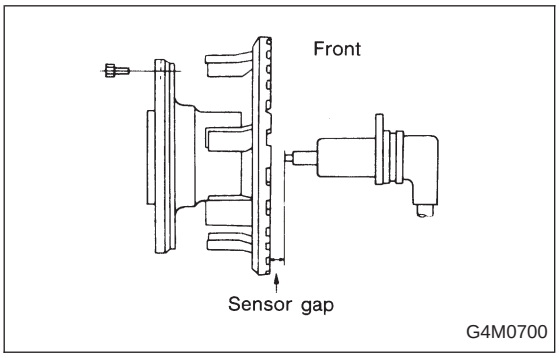
8J6	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **8J7**.

NO : Tighten tone wheel installation bolts securely.

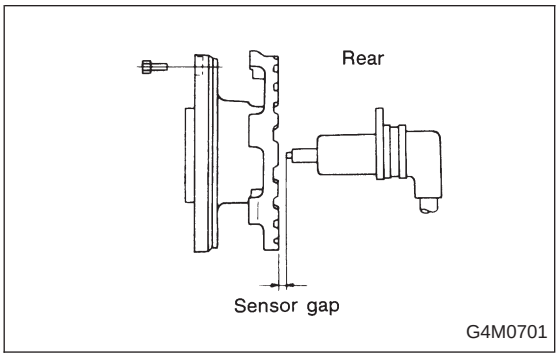


8J7	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)



YES : Go to step **8J8**.

NO : Adjust the gap.

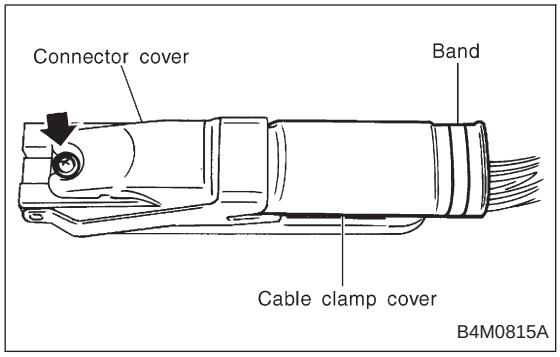
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8J8	CHECK OSCILLOSCOPE.

CHECK ***: Is an oscilloscope available?***

YES : Go to step **8J9**.

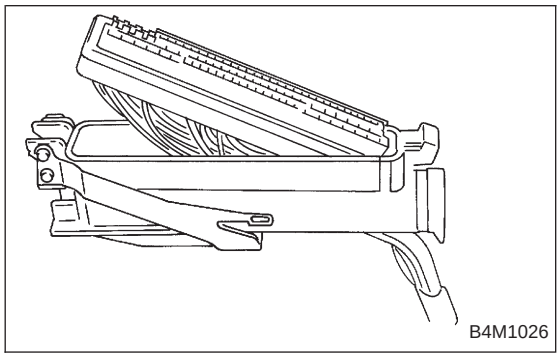
NO : Go to step **8J10**.



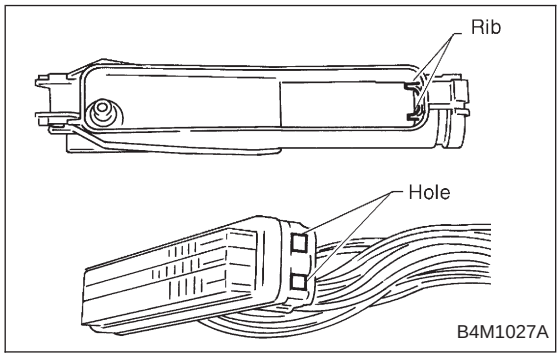
8J9	CHECK ABS SENSOR SIGNAL.

1) Raise all four wheels of ground.
2) Turn ignition switch OFF.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

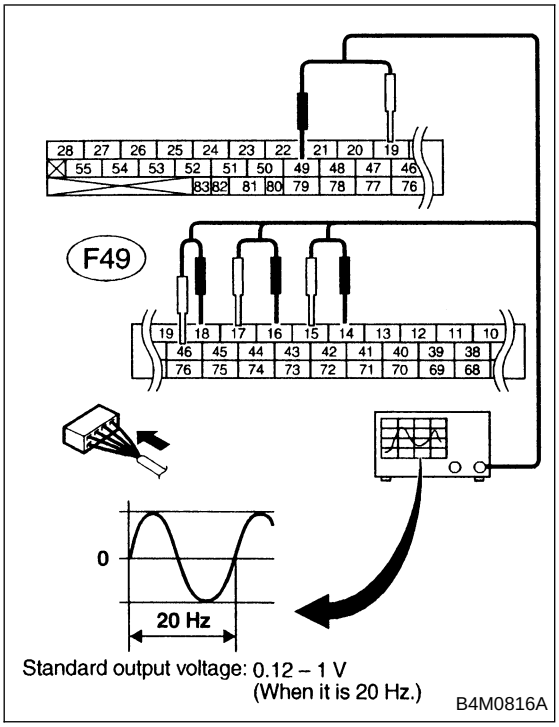


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
(F49) No. 14 (+) — No. 15 (−) (Front RH):
(F49) No. 49 (+) — No. 19 (−) (Front LH):
(F49) No. 18 (+) — No. 46 (−) (Rear RH):
(F49) No. 16 (+) — No. 17 (−) (Rear LH):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK ***: Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **8J13**.

NO : Go to step **8J10**.

8J10	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor from hub.

CHECK ***: Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.

NO : Go to step **8J11**.

8J11	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK ***: Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?***

YES : Replace ABS sensor or tone wheel.

NO : Go to step **8J12**.

8J12	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **8J13**.

NO : Repair hub.

8J13	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.

5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8J14**.

8J14	**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

K: TROUBLE CODE 31 (FRONT RH)
L: TROUBLE CODE 33 (FRONT LH)
M: TROUBLE CODE 35 (REAR RH)
N: TROUBLE CODE 37 (REAR LH)
— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN HYDRAULIC UNIT —

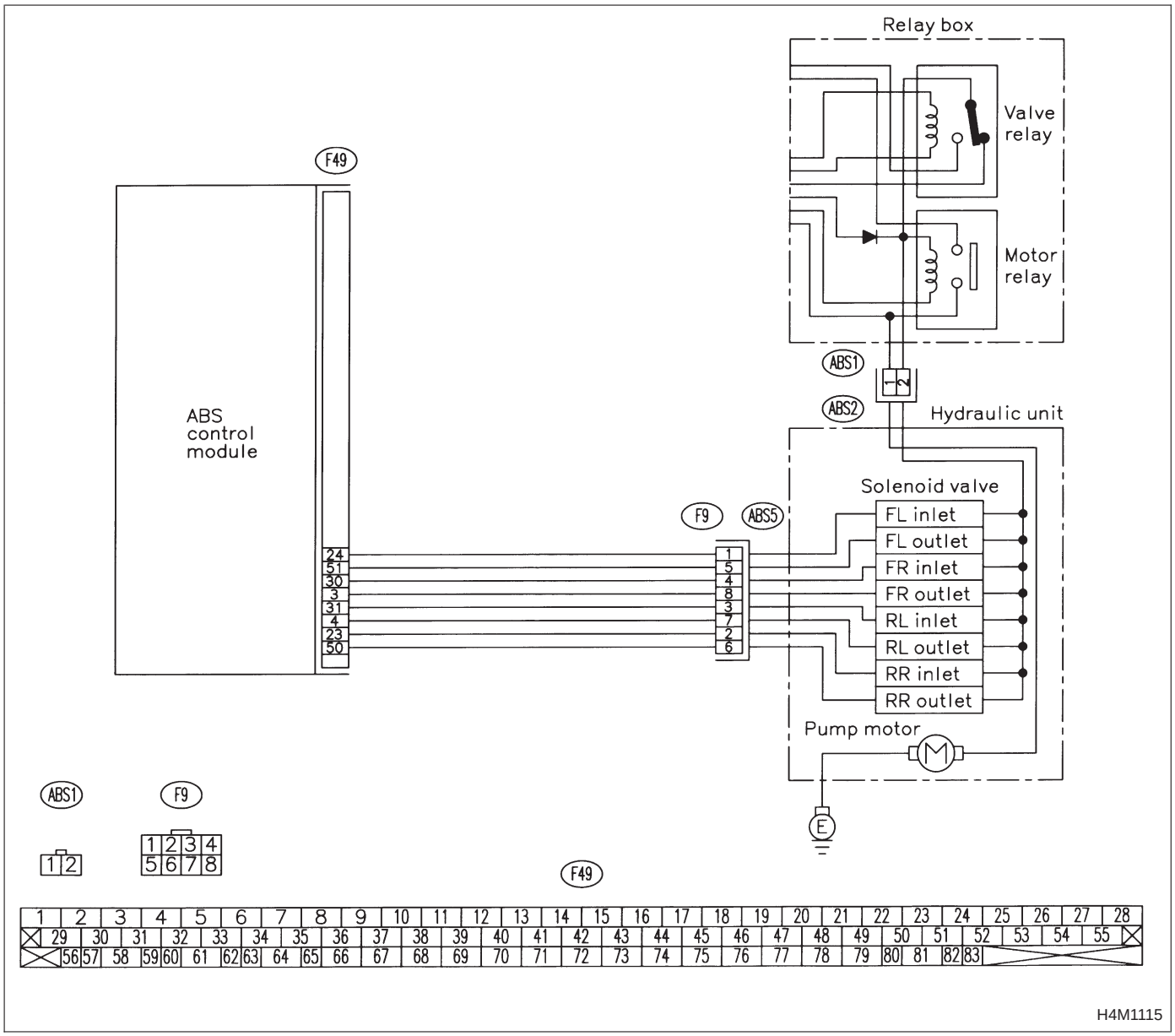
DIAGNOSIS:

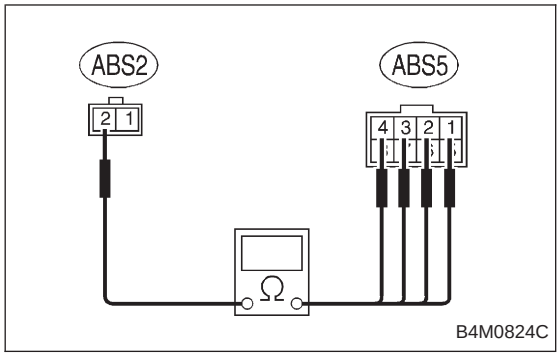
- Faulty harness/connector
- Faulty inlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



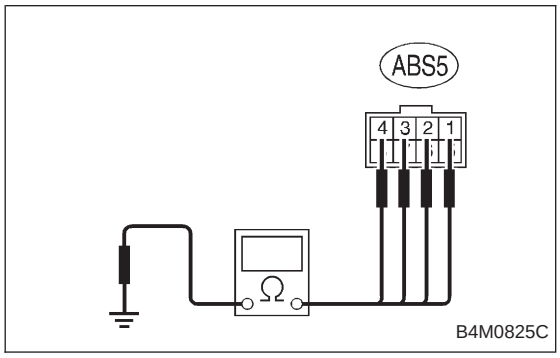


8N1	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — (ABS2) No. 2:
Trouble code 33 / (ABS5) No. 1 — (ABS2) No. 2:
Trouble code 35 / (ABS5) No. 2 — (ABS2) No. 2:
Trouble code 37 / (ABS5) No. 3 — (ABS2) No. 2:

CHECK ***: Is the resistance between 7.8 and 9.2 Ω?***
YES : Go to step **8N2**.
NO : Replace hydraulic unit.

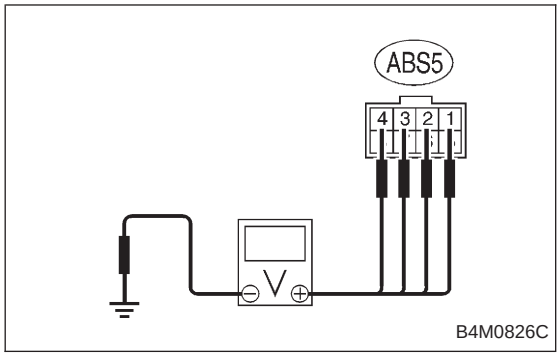


8N2	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — Chassis ground:
Trouble code 33 / (ABS5) No. 1 — Chassis ground:
Trouble code 35 / (ABS5) No. 2 — Chassis ground:
Trouble code 37 / (ABS5) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8N3**.
NO : Replace hydraulic unit.

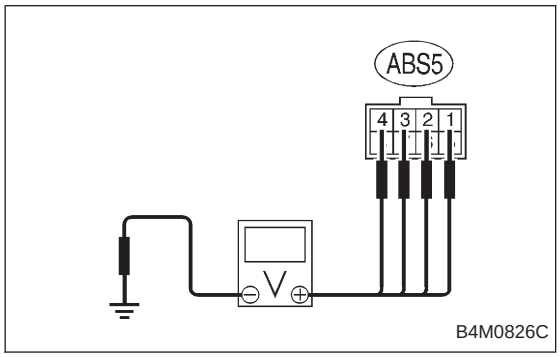


8N3	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8N4**.
NO : Replace hydraulic unit.

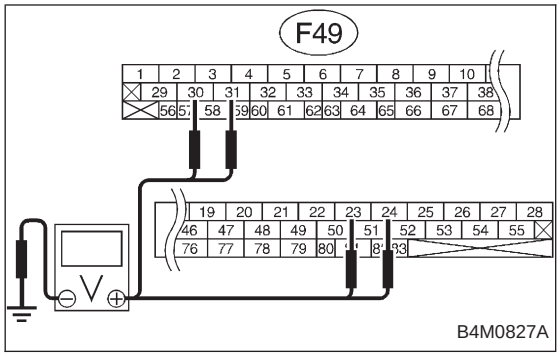


8N4	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8N5**.
NO : Replace hydraulic unit.



8N5	CHECK BATTERY SHORT OF HARNESS.

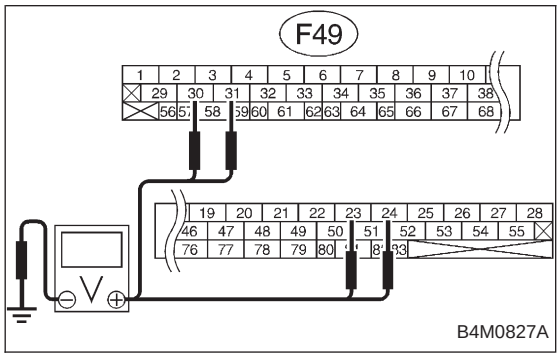
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8N6**.

NO : Repair harness between ABSCM and hydraulic unit.



8N6	CHECK BATTERY SHORT OF HARNESS.

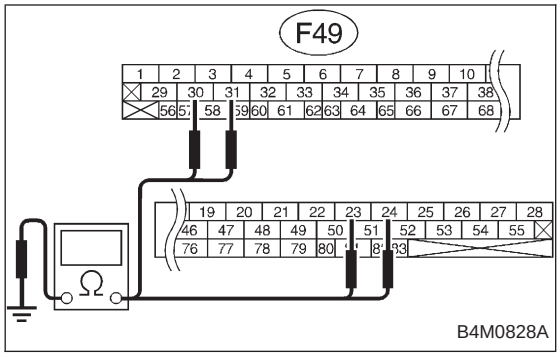
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8N7**.

NO : Repair harness between ABSCM and hydraulic unit.

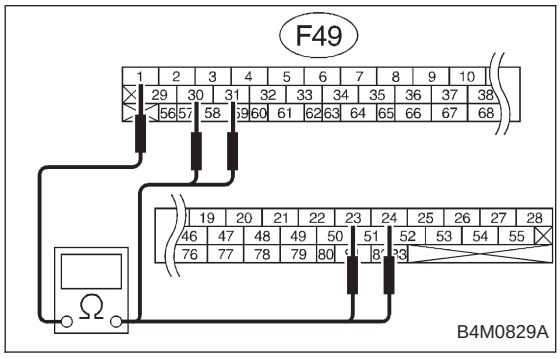


8N7	CHECK GROUND SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 — Chassis ground:
Trouble code 33 / (F49) No. 24 — Chassis ground:
Trouble code 35 / (F49) No. 23 — Chassis ground:
Trouble code 37 / (F49) No. 31 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8N8**.
NO : Repair harness between ABSCM and hydraulic unit.



8N8	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 31 / (F49) No. 30 — No. 1:
Trouble code 33 / (F49) No. 24 — No. 1:
Trouble code 35 / (F49) No. 23 — No. 1:
Trouble code 37 / (F49) No. 31 — No. 1:

CHECK ***: Is the resistance between 8.3 and 9.7 Ω?***
YES : Go to step **8N9**.
NO : Repair harness/connector between ABSCM and hydraulic unit.

8N9	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8N10**.

8N10	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8N11**.

8N11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

O: TROUBLE CODE 32 (FRONT RH)
P: TROUBLE CODE 34 (FRONT LH)
Q: TROUBLE CODE 36 (REAR RH)
R: TROUBLE CODE 38 (REAR LH)
— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN HYDRAULIC UNIT —

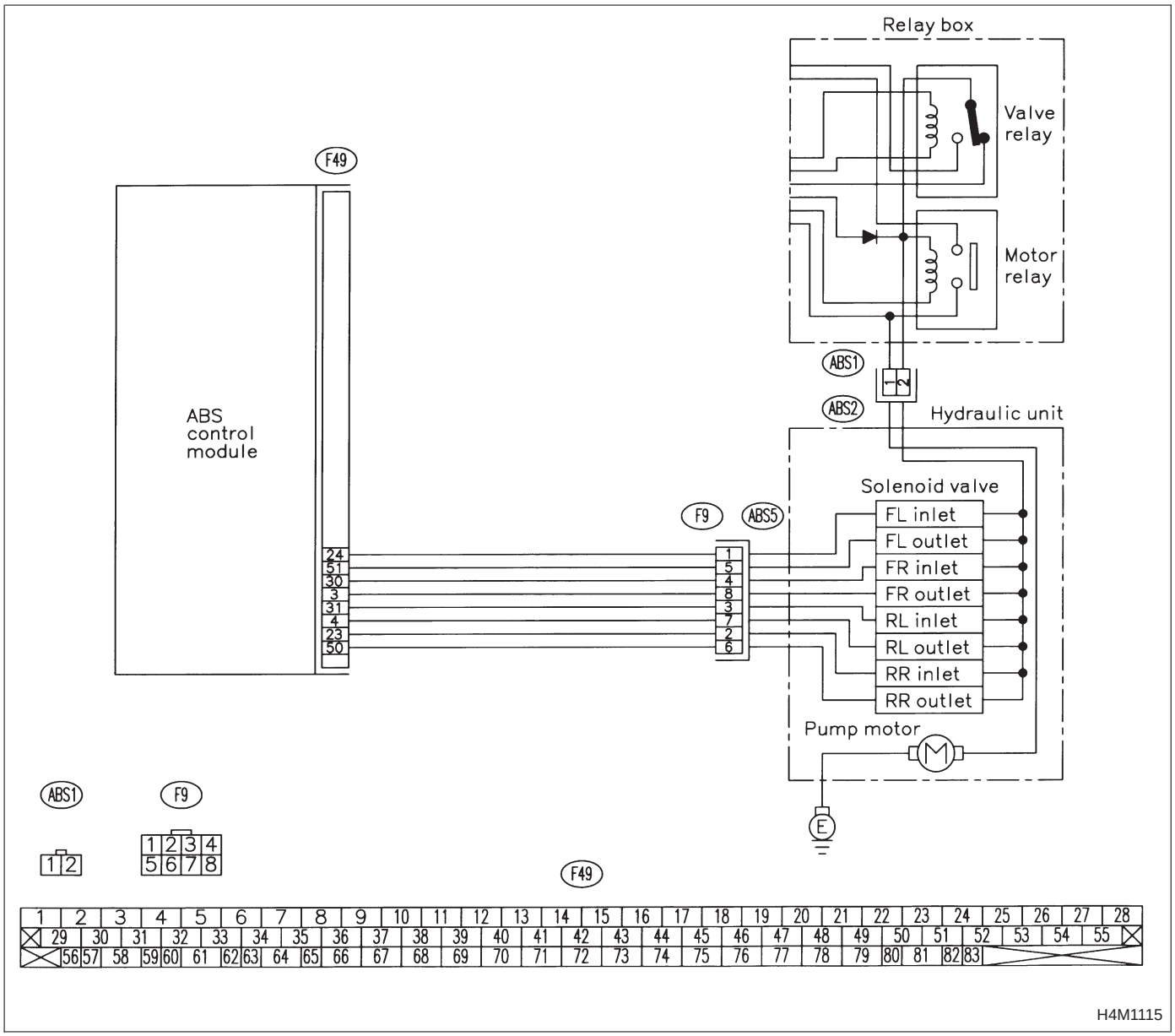
DIAGNOSIS:

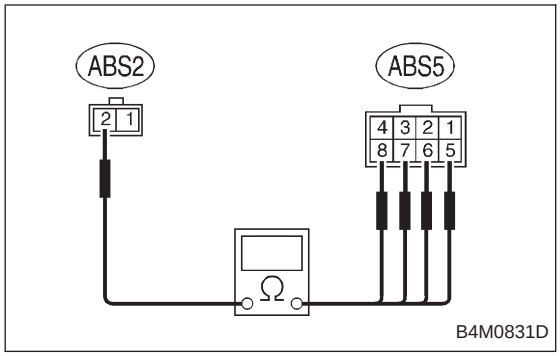
- Faulty harness/connector
- Faulty outlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



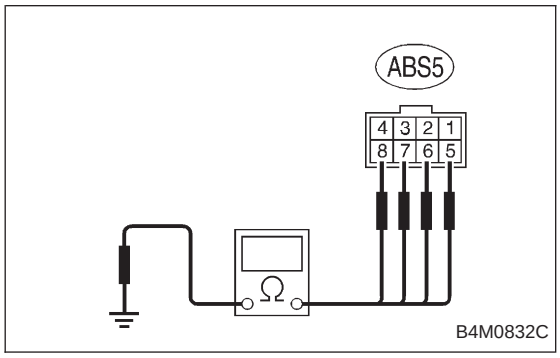


8R1	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — (ABS2) No. 2:
Trouble code 34 / (ABS5) No. 5 — (ABS2) No. 2:
Trouble code 36 / (ABS5) No. 6 — (ABS2) No. 2:
Trouble code 38 / (ABS5) No. 7 — (ABS2) No. 2:

CHECK ***: Is the resistance between 3.8 and 4.8 Ω?***
YES : Go to step **8R2**.
NO : Replace hydraulic unit.

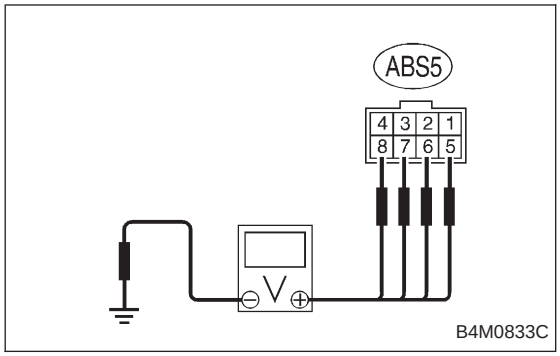


8R2	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — Chassis ground:
Trouble code 34 / (ABS5) No. 5 — Chassis ground:
Trouble code 36 / (ABS5) No. 6 — Chassis ground:
Trouble code 38 / (ABS5) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8R3**.
NO : Replace hydraulic unit.

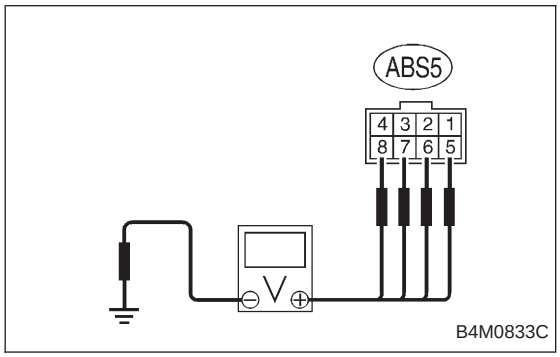


8R3	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8R4**.
NO : Replace hydraulic unit.

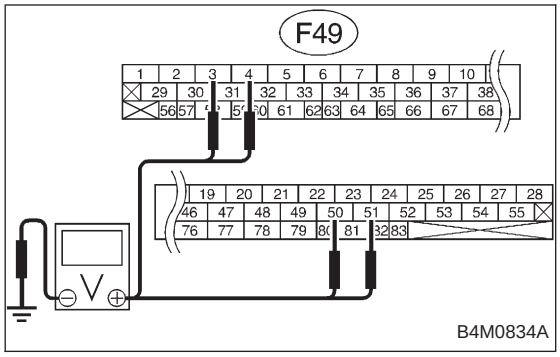


8R4	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8R5**.
NO : Replace hydraulic unit.

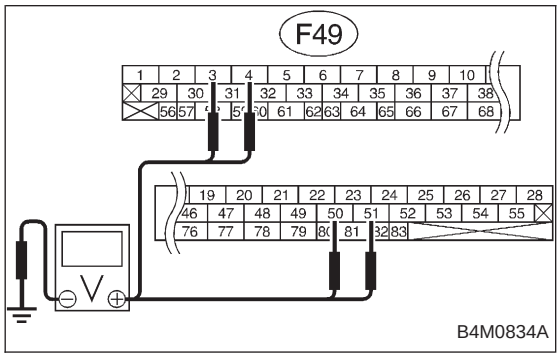


8R5	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8R6**.
NO : Repair harness between ABSCM and hydraulic unit.

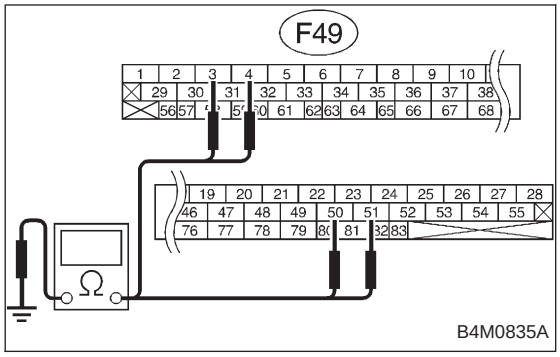


8R6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8R7**.
NO : Repair harness between ABSCM and hydraulic unit.

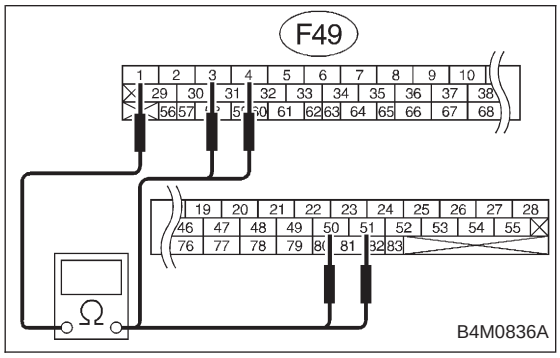


8R7	CHECK GROUND SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 — Chassis ground:
Trouble code 34 / (F49) No. 51 — Chassis ground:
Trouble code 36 / (F49) No. 50 — Chassis ground:
Trouble code 38 / (F49) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8R8**.
NO : Repair harness between ABSCM and hydraulic unit.



8R8	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 32 / (F49) No. 3 — No. 1:
Trouble code 34 / (F49) No. 51 — No. 1:
Trouble code 36 / (F49) No. 50 — No. 1:
Trouble code 38 / (F49) No. 4 — No. 1:

CHECK ***: Is the resistance between 4.3 and 5.3 Ω?***
YES : Go to step **8R9**.
NO : Repair harness/connector between ABSCM and hydraulic unit.

8R9	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8R10**.

8R10	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8R11**.

8R11	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

S: TROUBLE CODE 41
— ABNORMAL ABS CONTROL MODULE —

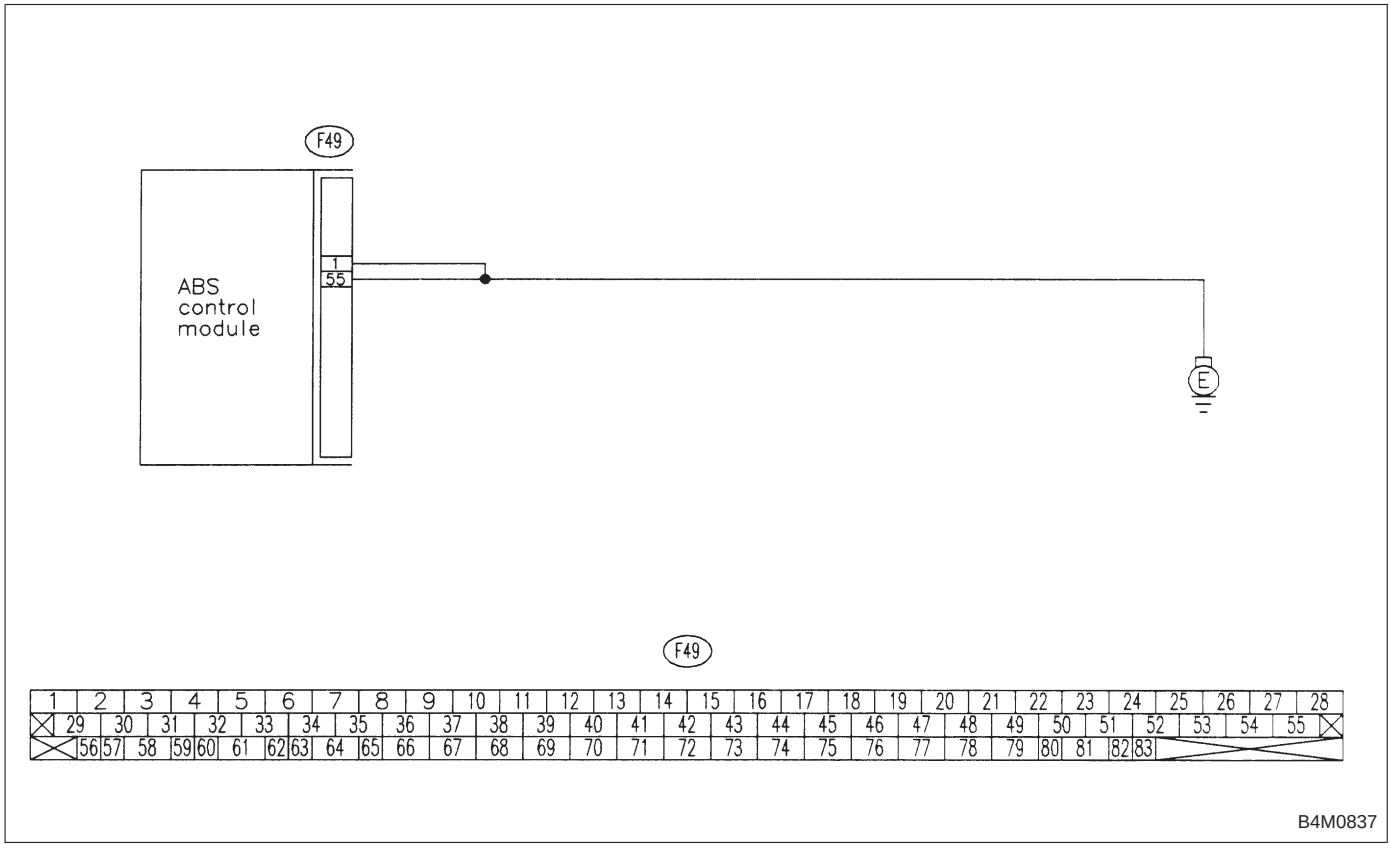
DIAGNOSIS:

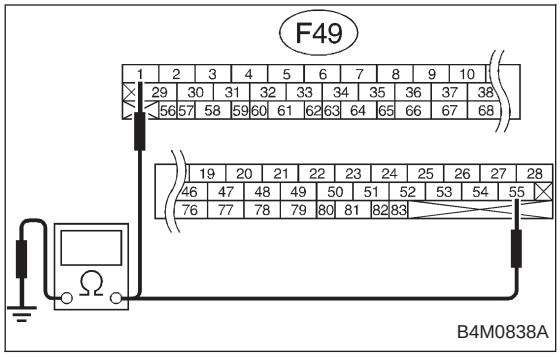
- Faulty ABSCM

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





8S1	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8S2**.
NO : Repair ABSCM ground harness.

8S2	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between battery, ignition switch and ABSCM? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8S3**.

8S3	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Is the car telephone or the wireless transmitter properly installed?***
YES : Go to step **8S4**.
NO : Properly install the car telephone or the wireless transmitter.

8S4	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Are noise sources (such as an antenna) installed near the sensor harness?***
YES : Install the noise sources apart from the sensor harness.
NO : Go to step **8S5**.

8S5	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **8S6**.

8S6	**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

T: TROUBLE CODE 42 — SOURCE VOLTAGE IS LOW. —

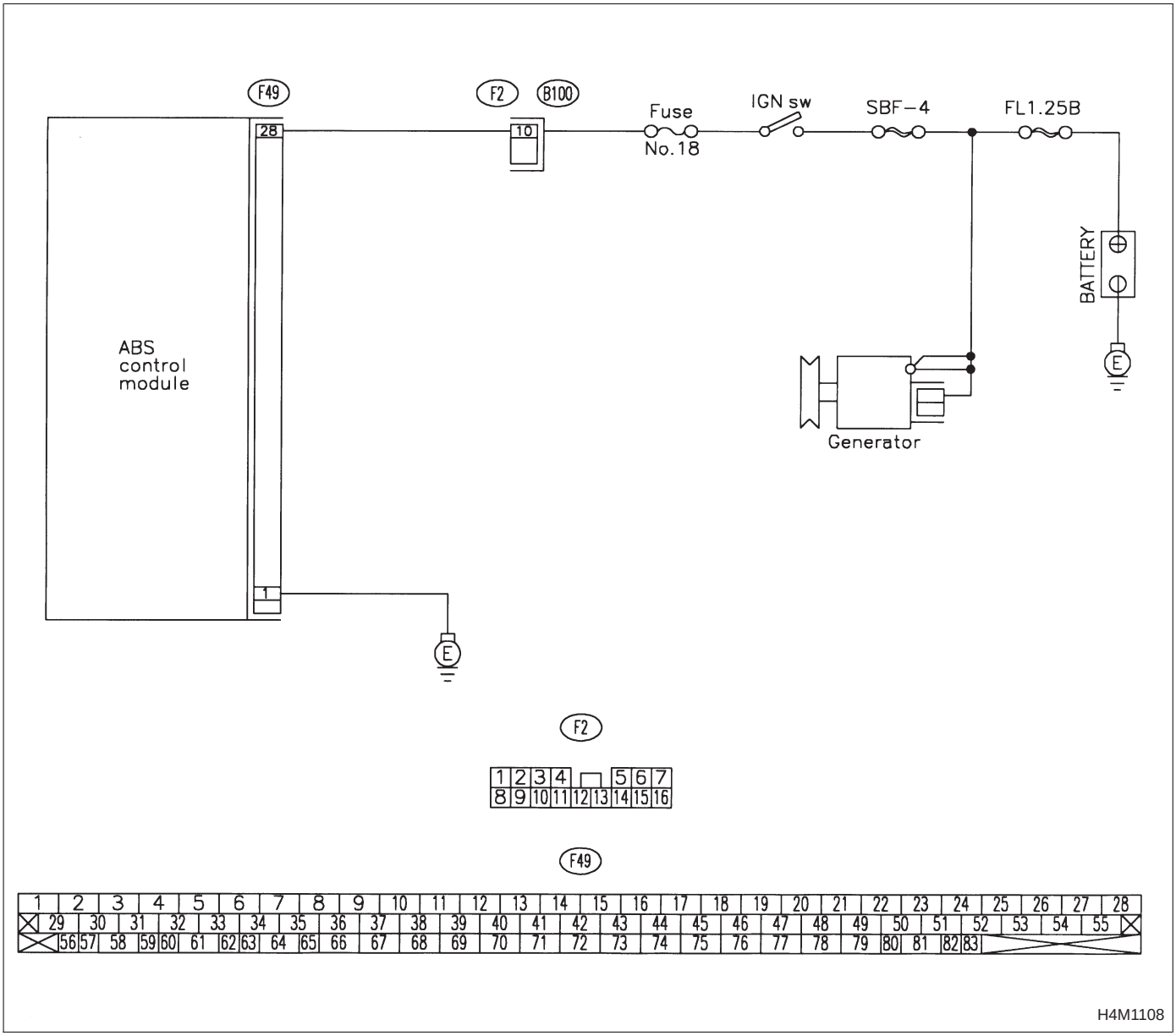
DIAGNOSIS:

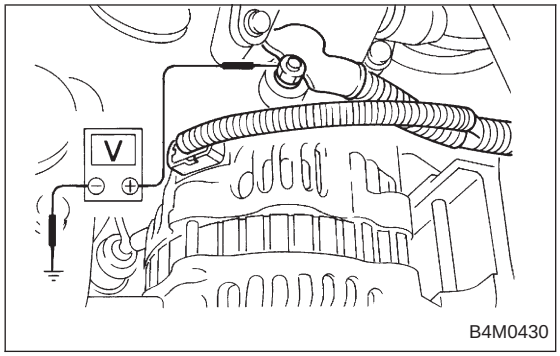
- Power source voltage of the ABSCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





8T1	CHECK GENERATOR.

1) Start engine.
2) Idling after warm-up.
3) Measure voltage between generator B terminal and chassis ground.

Terminal
Generator B terminal — Chassis ground:

CHECK ***: Is the voltage between 10 V and 15 V?***

YES : Go to step **8T2**.

NO : Repair generator.

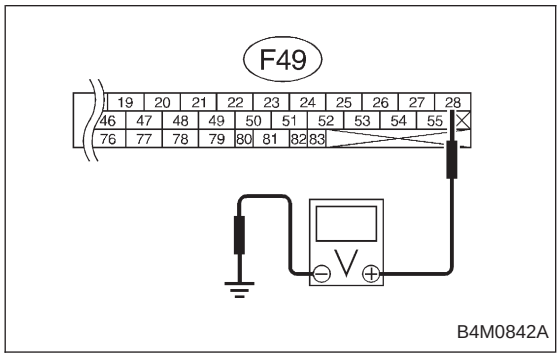
8T2	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK ***: Are the positive and negative battery terminals tightly clamped?***

YES : Go to step **8T3**.

NO : Tighten the clamp of terminal.



8T3	CHECK INPUT VOLTAGE OF ABSCM.

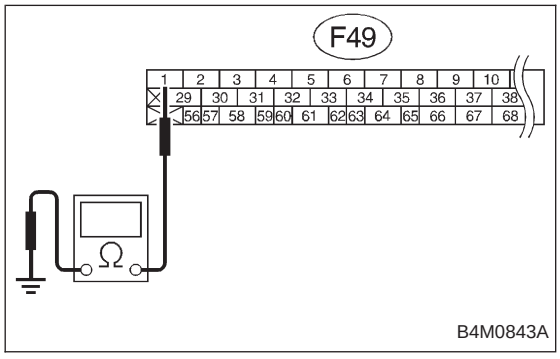
1) Disconnect connector from ABSCM.
2) Run the engine at idle.
3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 15 V?***

YES : Go to step **8T4**.

NO : Repair harness connector between battery, ignition switch and ABSCM.



8T4	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **8T5**.

NO : Repair ABSCM ground harness.

8T5	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between generator, battery and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8T6**.

8T6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8T7**.

8T7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

U: TROUBLE CODE 44 — A COMBINATION OF AT CONTROL ABNORMAL —

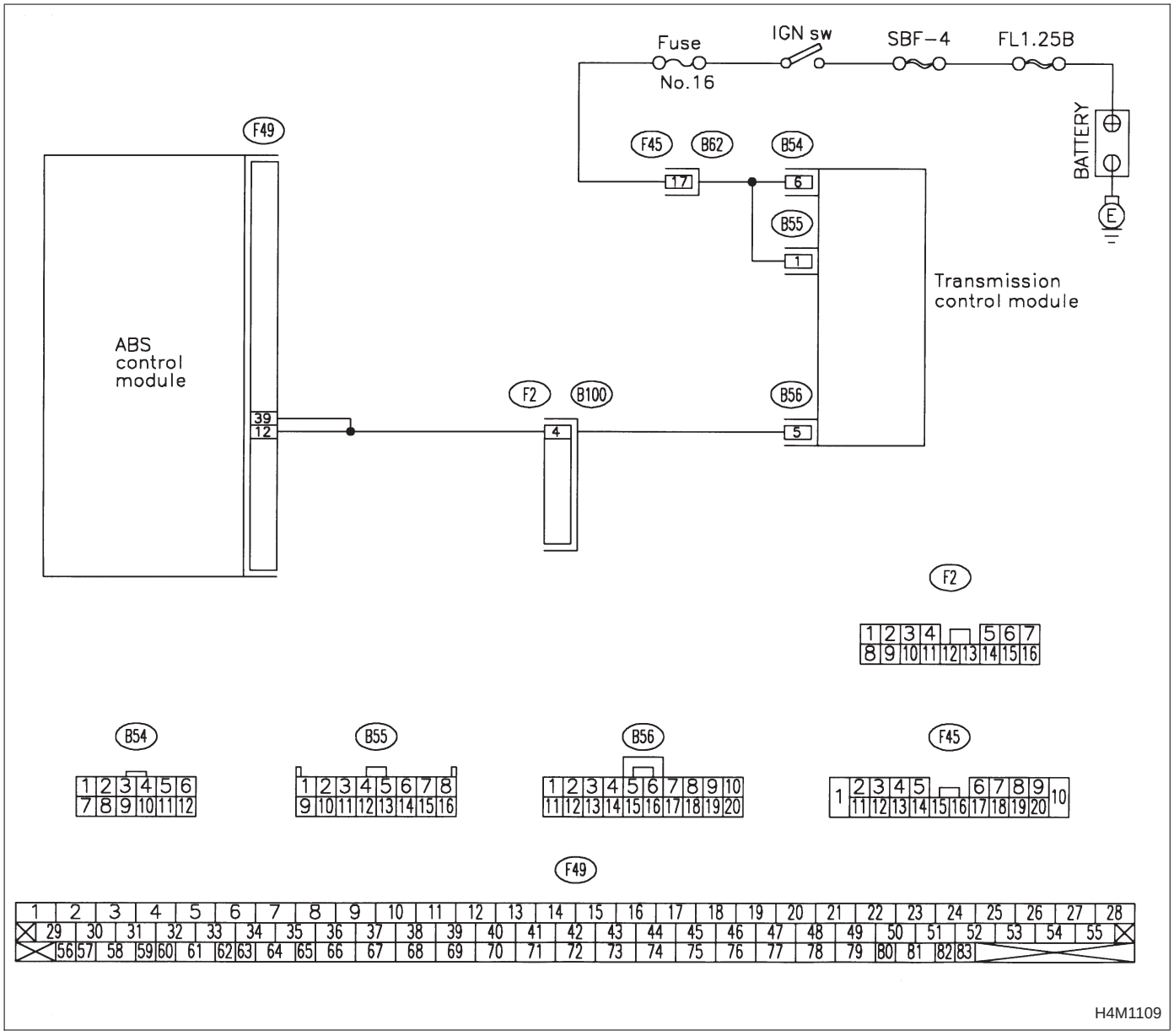
DIAGNOSIS:

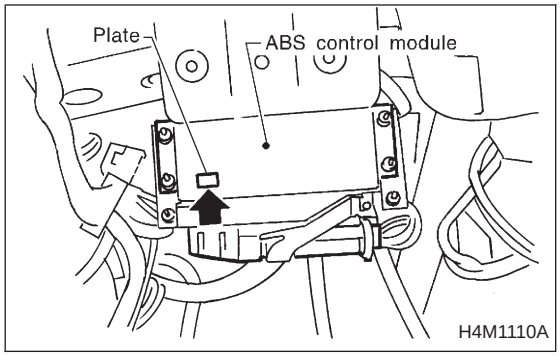
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





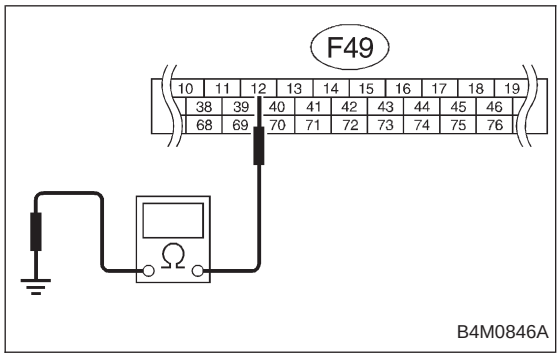
8U1	CHECK SPECIFICATIONS OF THE ABSCM.

Check specifications of the plate attached to the ABSCM.

CHECK ***: Is an ABSCM for AT model installed on a MT model?***

YES : Replace ABSCM.

NO : Go to step **8U2**.



8U2	CHECK GROUND SHORT OF HARNESS.

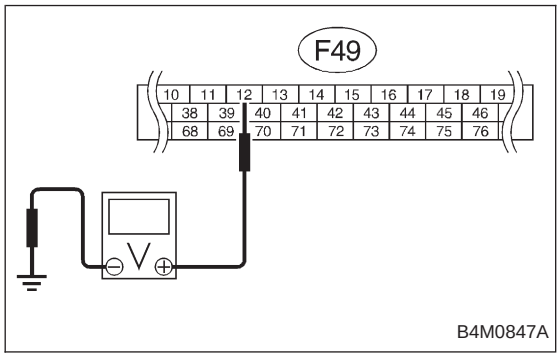
1) Turn ignition switch to OFF.
2) Disconnect two connectors from TCM.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8U3**.

NO : Repair harness between TCM and ABSCM.



8U3	CHECK BATTERY SHORT OF HARNESS.

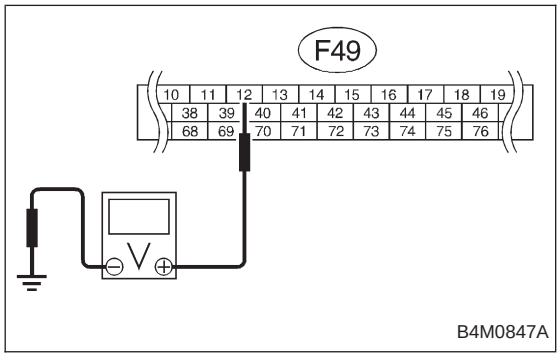
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8U4**.

NO : Repair harness between TCM and ABSCM.



8U4	CHECK BATTERY SHORT OF HARNESS.

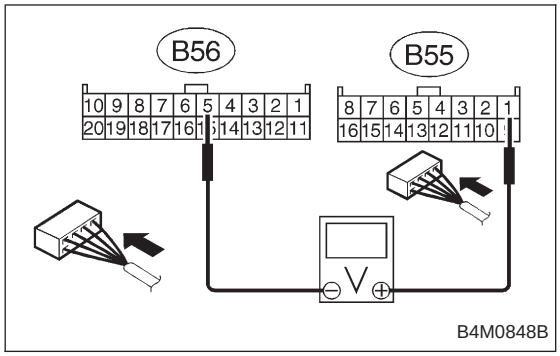
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8U5**.

NO : Repair harness between TCM and ABSCM.



8U5	CHECK TCM.

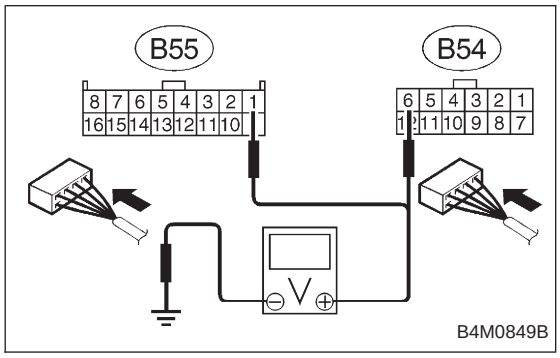
1) Turn ignition switch to OFF.
2) Connect all connectors to TCM.
3) Turn ignition switch to ON.
4) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 1 (+) — (B56) No. 5 (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **8U7**.

NO : Go to step **8U6**.



8U6	CHECK TCM.

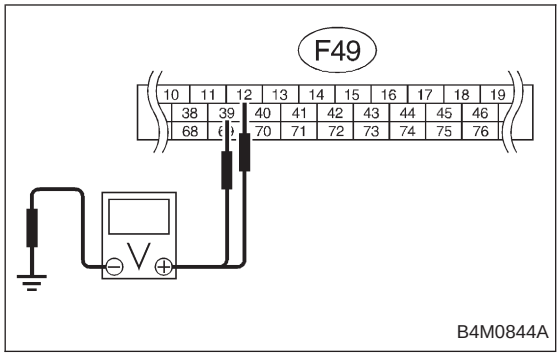
Measure voltage between TCM connector and chassis ground.

Connector & terminal
(B54) No. 6 (+) — Chassis ground (−):
(B55) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Replace TCM.

NO : Repair harness/connector between battery, ignition switch and TCM.



8U7	CHECK OPEN CIRCUIT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):
(F49) No. 39 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***
YES : Go to step **8U8**.
NO : Repair harness/connector between TCM and ABSCM.

8U8	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between TCM and ABSCM? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8U9**.

8U9	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **8U10**.

8U10	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

V: TROUBLE CODE 46 — ABNORMAL G SENSOR POWER SUPPLY VOLTAGE —

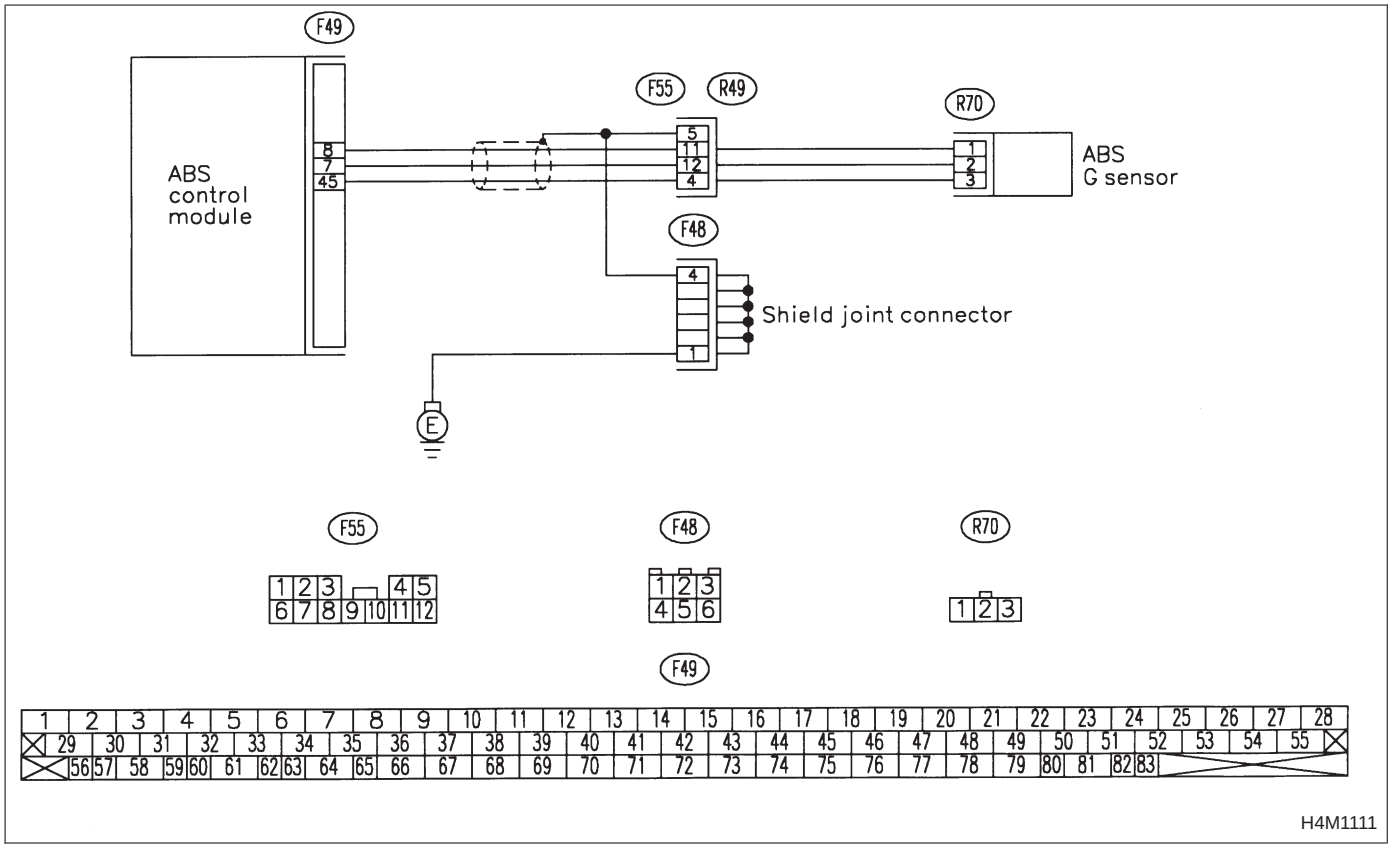
DIAGNOSIS:

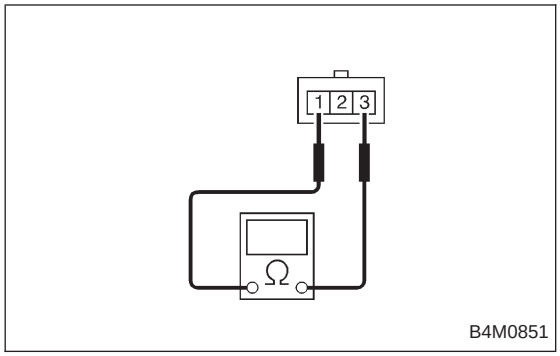
- Faulty G sensor power supply voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



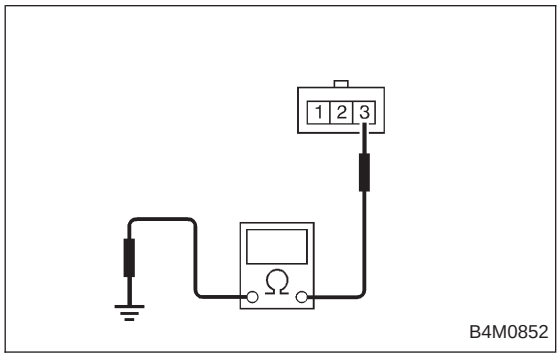


8V1	CHECK G SENSOR.

1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect connector from G sensor.
4) Measure resistance of G sensor.

Terminal
No. 1 — No. 3:

CHECK ***: Is the resistance between 42 and 58 kΩ?***
YES : Go to step **8V2**.
NO : Replace G sensor.

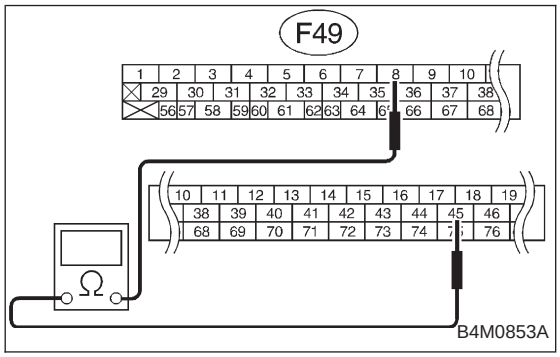


8V2	CHECK GROUND SHORT OF G SENSOR.

Measure resistance between G sensor and bracket.

Terminal
No. 3 — Bracket:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8V3**.
NO : Replace G sensor.

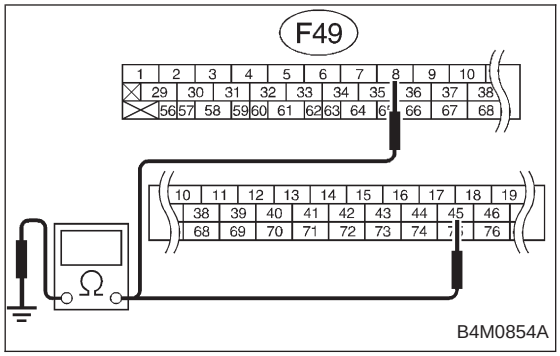


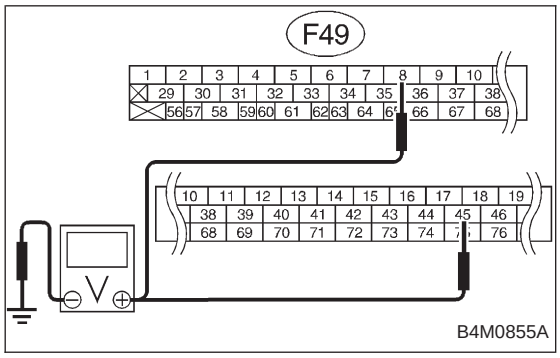
8V3	CHECK SHORT CIRCUIT IN HARNESS BETWEEN ABSCM AND G SENSOR.

1) Disconnect connector from ABSCM.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 45 — No. 8:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8V4**.
NO : Repair harness between ABSCM and G sensor.





8V4	CHECK GROUND SHORT OF HARNESS.

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 — Chassis ground:
(F49) No. 45 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8V5**.

NO : Repair harness between ABSCM and G sensor.

8V5	CHECK BATTERY SHORT OF HARNESS.

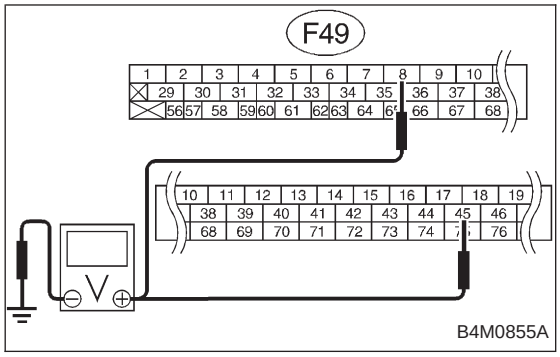
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (−):
(F49) No. 45 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8V6**.

NO : Repair harness between ABSCM and G sensor.



8V6	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (−):
(F49) No. 45 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8V7**.
NO : Repair harness between ABSCM and chassis ground.

8V7	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **8V8**.

8V8	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **8V9**.

8V9	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

W: TROUBLE CODE 51
— ABNORMAL VALVE RELAY —

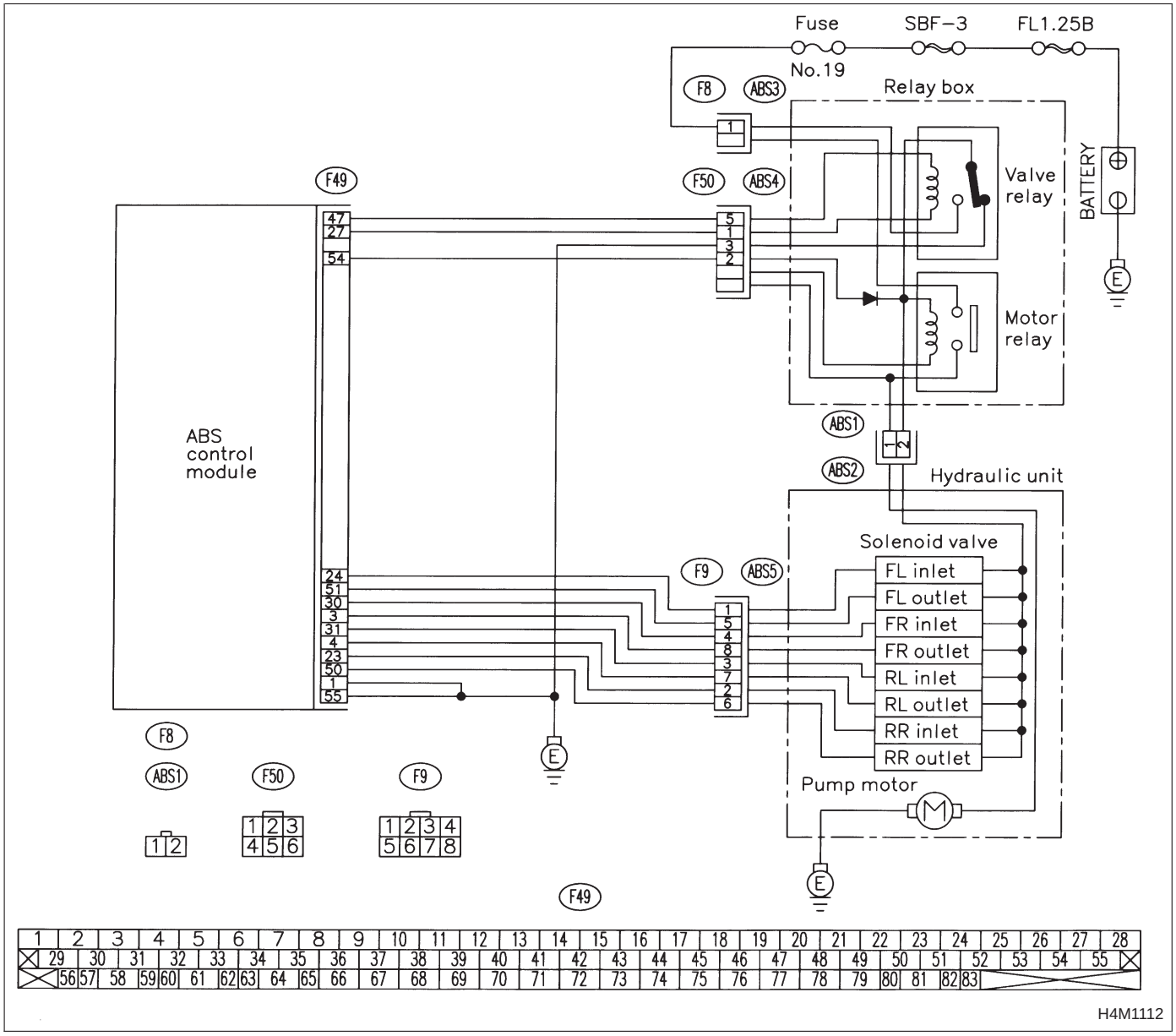
DIAGNOSIS:

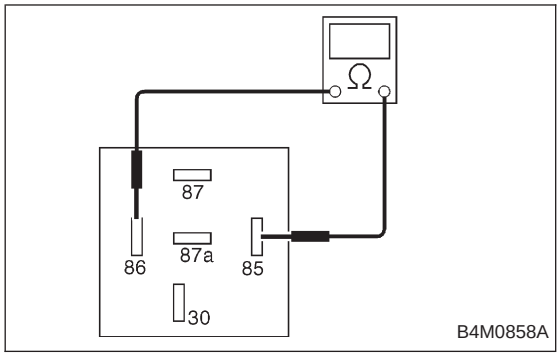
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





8W1	CHECK RESISTANCE OF VALVE RELAY.

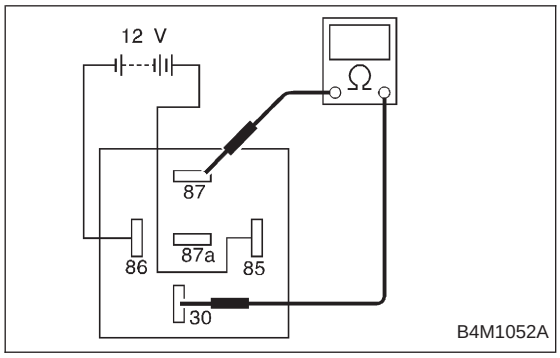
1) Turn ignition switch to OFF.
2) Remove valve relay from relay box.
3) Measure resistance between valve relay terminals.

Terminals
No. 85 — No. 86:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **8W2**.

NO : Replace valve relay.



8W2	CHECK CONTACT POINT OF VALVE RELAY.

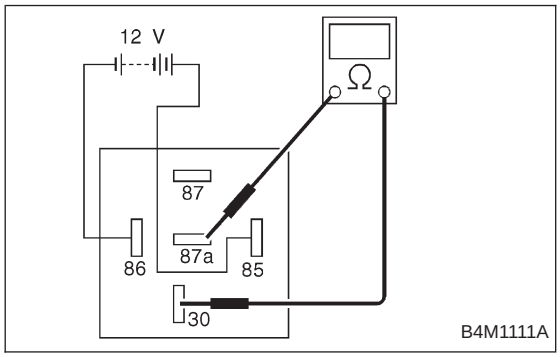
1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **8W3**.

NO : Replace valve relay.



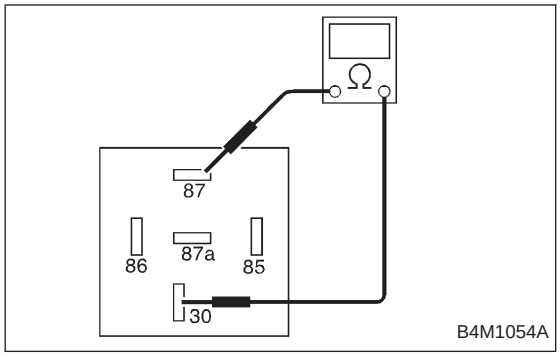
8W3	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:
Is the resistance more than 1 MΩ?

YES : Go to step **8W4**.

NO : Replace valve relay.



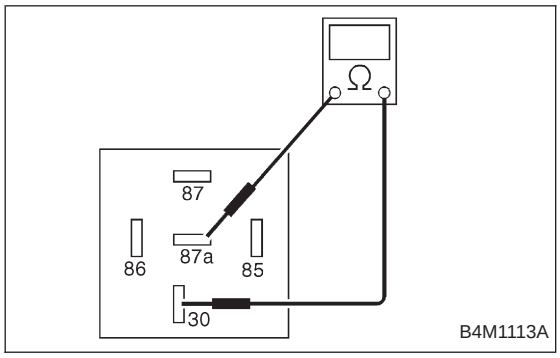
B4M1054A

8W4	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W5**.
NO : Replace valve relay.



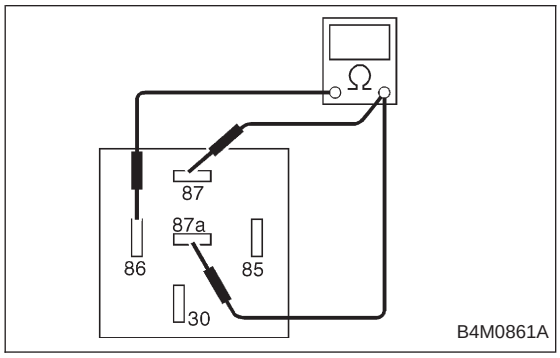
B4M1113A

8W5	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8W6**.
NO : Replace valve relay.



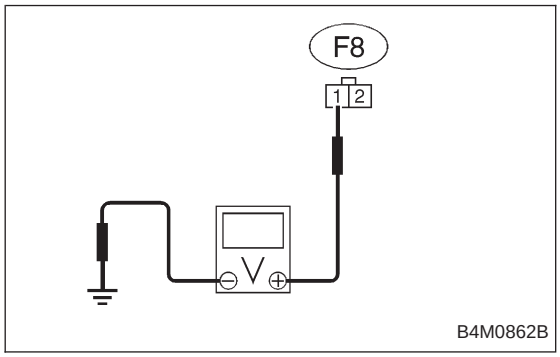
B4M0861A

8W6	CHECK SHORT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 86 — No. 87:
No. 86 — No. 87a:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W7**.
NO : Replace valve relay.



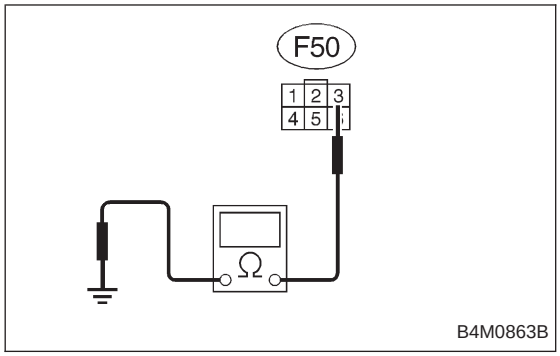
B4M0862B

8W7	CHECK POWER SUPPLY FOR VALVE RELAY.

1) Disconnect connector (F8) from relay box.
2) Turn ignition switch to ON.
3) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***
YES : Go to step **8W8**.
NO : Repair harness between battery and relay box connector. Check fuse No. 19.

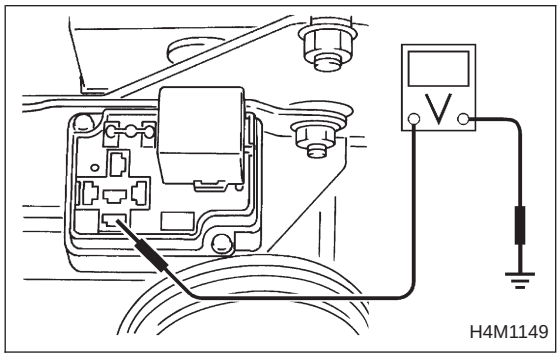


8W8	CHECK GROUND CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (F50) from relay box.
3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 3 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8W9**.
NO : Repair relay box ground harness.

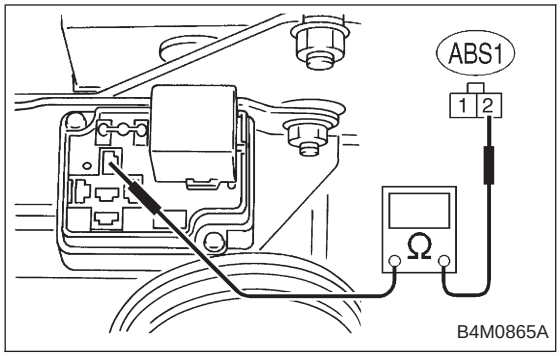


8W9	CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.

1) Disconnect connector (ABS1) from hydraulic unit.
2) Connect connector (F8) to relay box.
3) Turn ignition switch to ON.
4) Measure voltage of relay box.

Connector & terminal
Valve relay installing point No. 87 — Chassis ground:

CHECK ***: Is the voltage between 10 V and 13 V?***
YES : Go to step **8W10**.
NO : Replace relay box and check fuse No. 19.

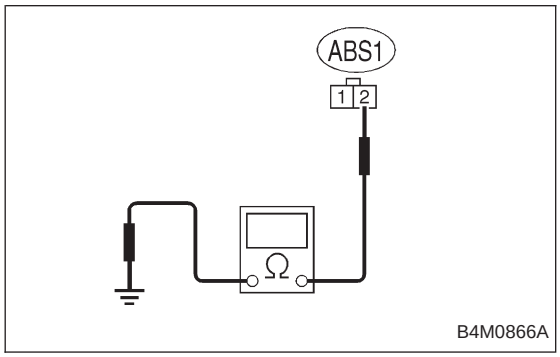


8W10	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Measure resistance between hydraulic unit connector and valve relay installing point.

Connector & terminal
(ABS1) No. 2 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8W11**.
NO : Replace relay box.

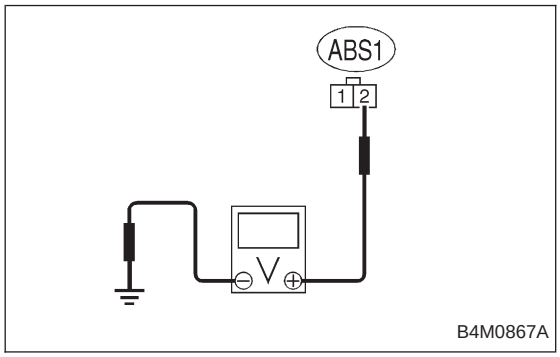


8W11	CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W12**.
NO : Replace relay box and check fuse SBF6.

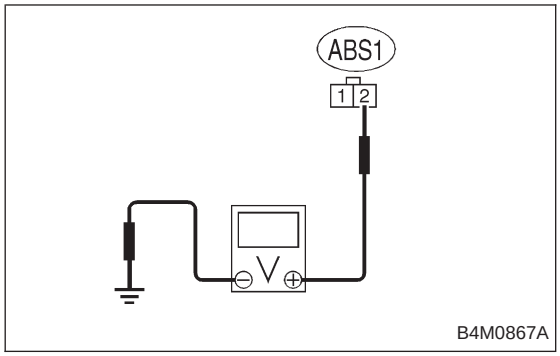


8W12	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8W13**.
NO : Replace relay box. Check fuse No. 19 and SBF6.



8W13	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

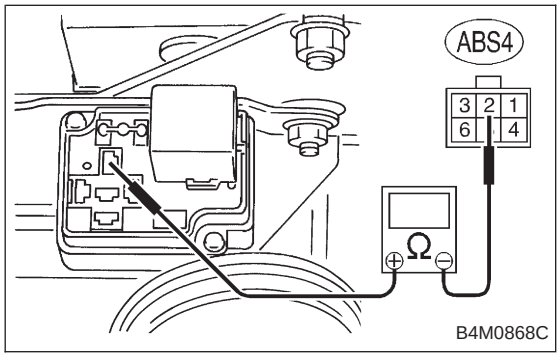
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W14**.

NO : Replace relay box. Check fuse No. 19 and SBF6.



8W14	CHECK DIODE OF RELAY BOX.

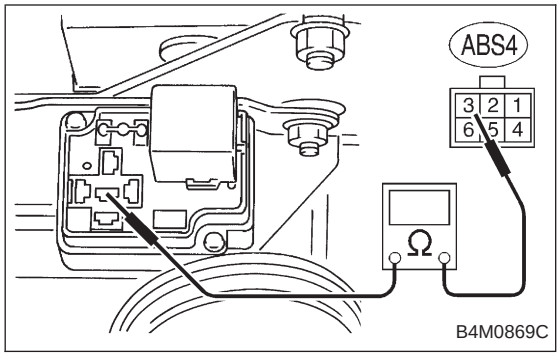
1) Turn ignition switch to OFF.
2) Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
Valve relay installing point No. 30 (+) — (ABS4) No. 2 (−):

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8W15**.

NO : Replace relay box.



8W15	CHECK OPEN CIRCUIT IN GROUND CIRCUIT OF RELAY BOX.

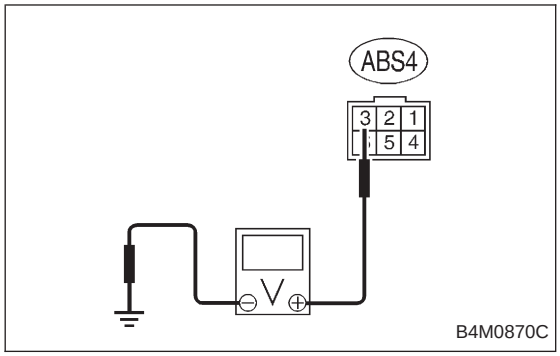
Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
(ABS4) No. 3 — Valve relay installing point No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **8W16**.

NO : Replace relay box.



8W16	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

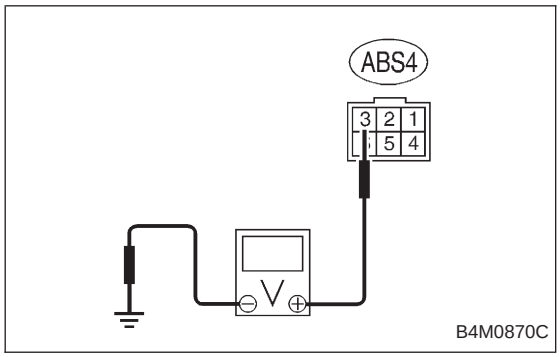
Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W17**.

NO : Replace relay box and check all fuses.



8W17	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

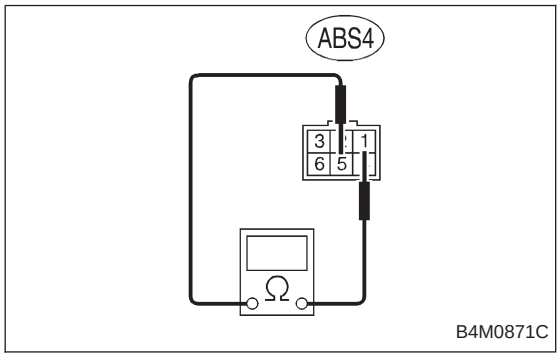
1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W18**.

NO : Replace relay box and check all fuses.



8W18	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

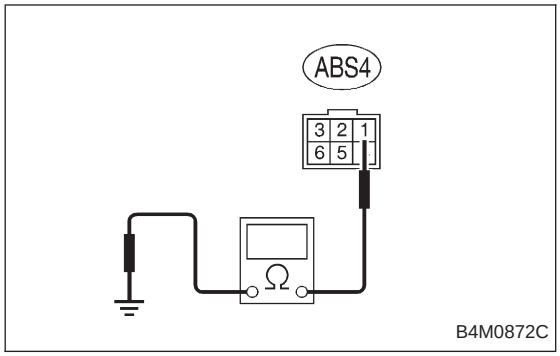
1) Turn ignition switch to OFF.
2) Install valve relay to relay box.
3) Measure resistance between relay box connector terminals.

Connector & terminal
(ABS4) No. 1 — No. 5:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **8W19**.

NO : Replace relay box.

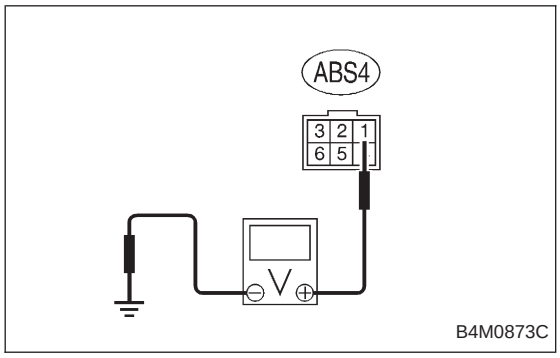


8W19	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W20**.
NO : Replace relay box and check all fuses.

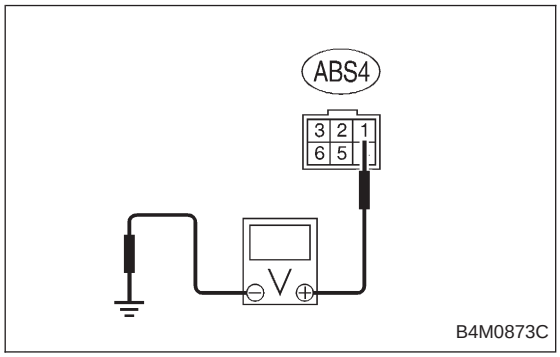


8W20	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8W21**.
NO : Replace relay box. Check fuse No. 19 and SBF45A.

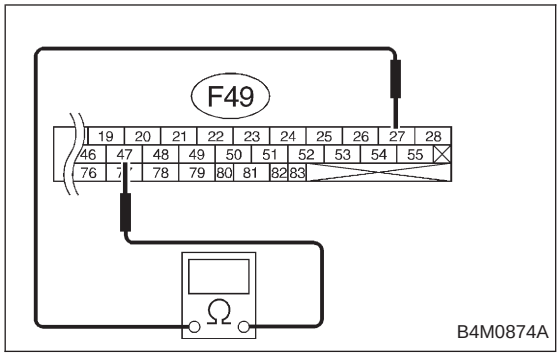


8W21	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8W22**.
NO : Replace relay box. Check fuse No. 19 and SBF45A.



8W22	CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

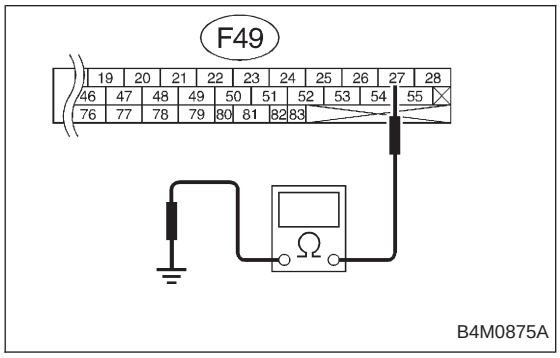
1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 27 — No. 47:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **8W23**.

NO : Repair harness between ABSCM and relay box. Check fuse No. 18.



8W23	CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

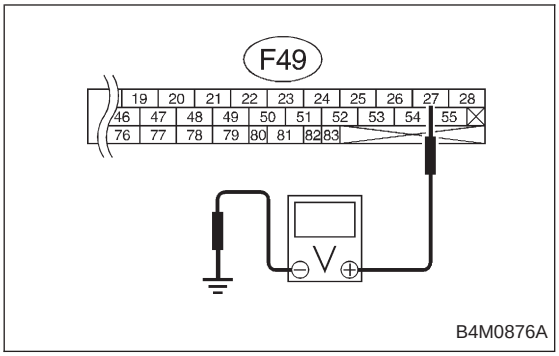
Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8W24**.

NO : Repair harness between ABSCM and relay box. Check fuse No. 18.



8W24	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

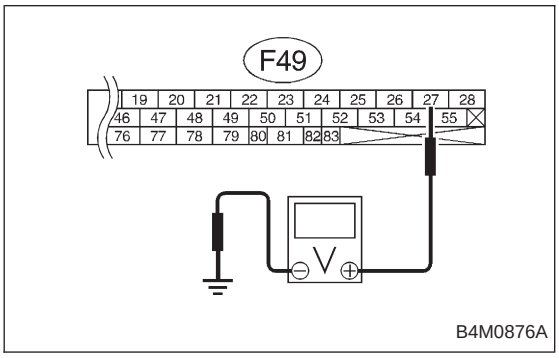
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W25**.

NO : Repair harness between ABSCM and relay box and check all fuses.



8W25	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

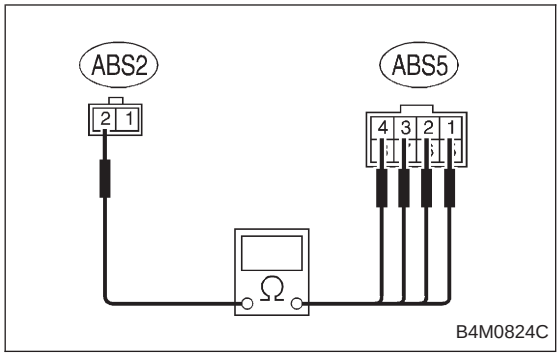
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W26**.

NO : Repair harness between ABSCM and relay box and check all fuses.

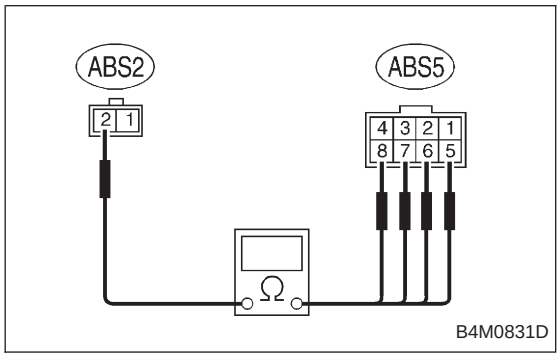


8W26	CHECK RESISTANCE OF INLET SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 4 — (ABS2) No. 2:
(ABS5) No. 1 — (ABS2) No. 2:
(ABS5) No. 2 — (ABS2) No. 2:
(ABS5) No. 3 — (ABS2) No. 2:

CHECK ***: Is the resistance between 7.8 and 9.2 Ω?***
YES : Go to step **8W27**.
NO : Replace hydraulic unit.

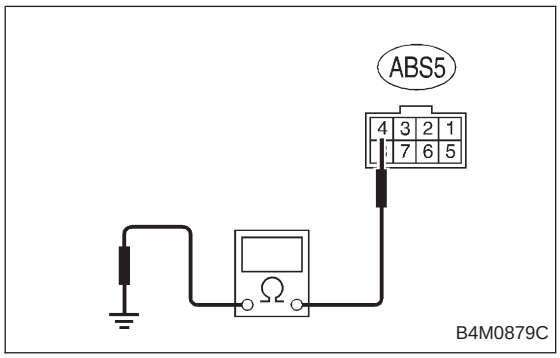


8W27	CHECK RESISTANCE OF OUTLET SOLENOID VALVE.

Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 8 — (ABS2) No. 2:
(ABS5) No. 5 — (ABS2) No. 2:
(ABS5) No. 6 — (ABS2) No. 2:
(ABS5) No. 7 — (ABS2) No. 2:

CHECK ***: Is the resistance between 3.8 and 4.8 Ω?***
YES : Go to step **8W28**.
NO : Replace hydraulic unit.

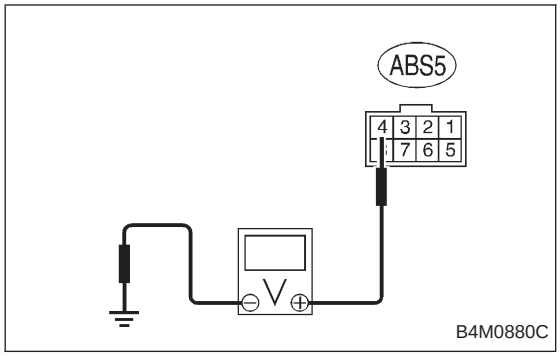


8W28	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8W29**.
NO : Replace hydraulic unit and check all fuses.



8W29	CHECK BATTERY SHORT OF SOLENOID VALVE.

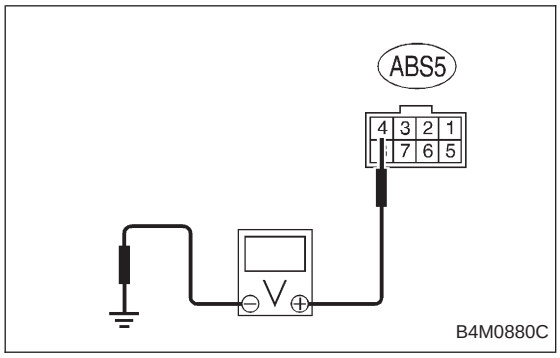
Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W30**.

NO : Replace hydraulic unit and check all fuses.



8W30	CHECK BATTERY SHORT OF SOLENOID VALVE.

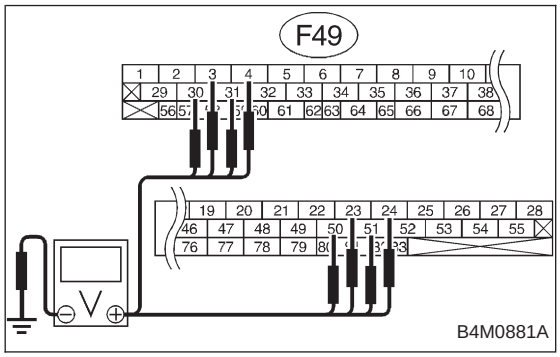
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W31**.

NO : Replace hydraulic unit and check all fuses.



8W31	CHECK BATTERY SHORT OF HARNESS.

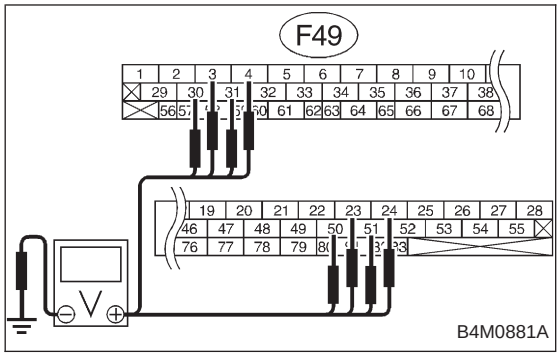
1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W32**.

NO : Repair harness between hydraulic unit and ABSCM and check all fuses.



8W32	CHECK BATTERY SHORT OF HARNESS.

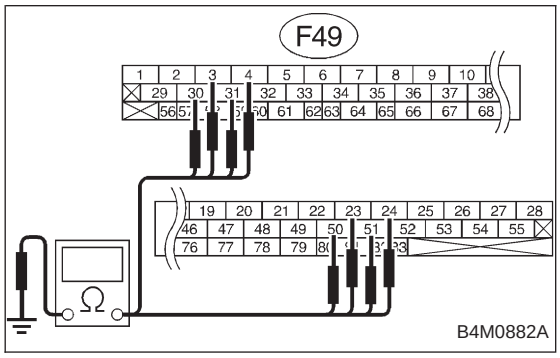
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8W33**.

NO : Repair harness between hydraulic unit and ABSCM and check all fuses.



8W33	CHECK GROUND SHORT OF HARNESS.

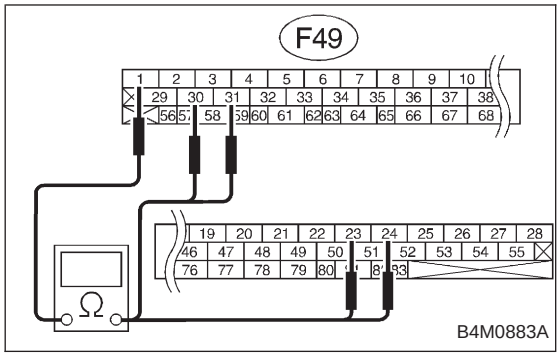
1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 — Chassis ground:
(F49) No. 24 — Chassis ground:
(F49) No. 23 — Chassis ground:
(F49) No. 31 — Chassis ground:
(F49) No. 3 — Chassis ground:
(F49) No. 51 — Chassis ground:
(F49) No. 50 — Chassis ground:
(F49) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8W34**.

NO : Repair harness between hydraulic unit and ABSCM.



8W34	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

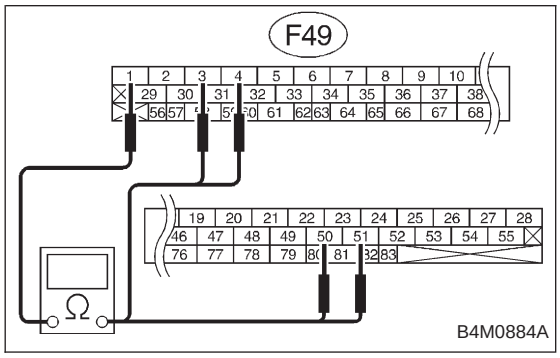
1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 30 — No. 1:
(F49) No. 24 — No. 1:
(F49) No. 23 — No. 1:
(F49) No. 31 — No. 1:

CHECK ***: Is the resistance between 8.3 and 9.7 Ω?***

YES : Go to step **8W35**.

NO : Repair harness/connector between hydraulic unit and ABSCM.



8W35	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 3 — No. 1:
(F49) No. 51 — No. 1:
(F49) No. 50 — No. 1:
(F49) No. 4 — No. 1:

CHECK ***: Is the resistance between 4.3 and 5.3 Ω?***

YES : Go to step **8W36**.

NO : Repair harness/connector between hydraulic unit and ABSCM.

8W36	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8W37**.

8W37	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8W38**.

8W38	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

X: TROUBLE CODE 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —

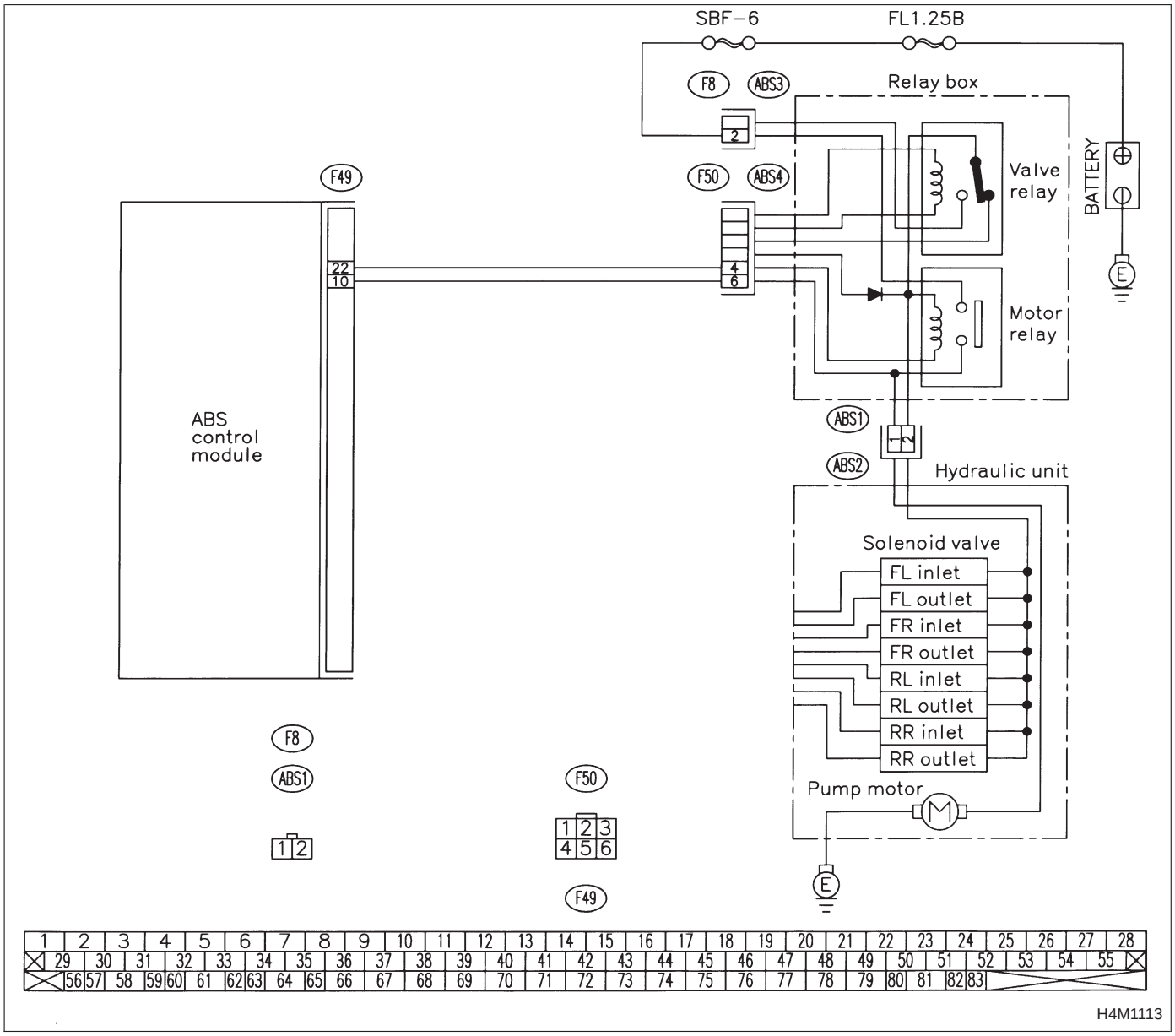
DIAGNOSIS:

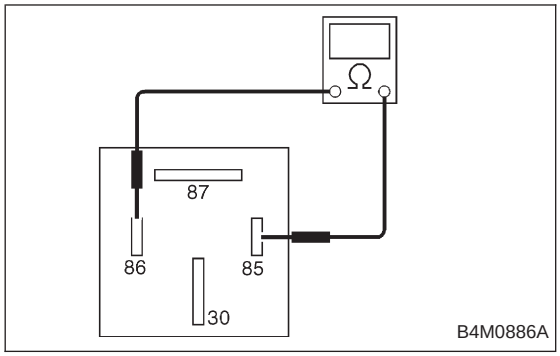
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



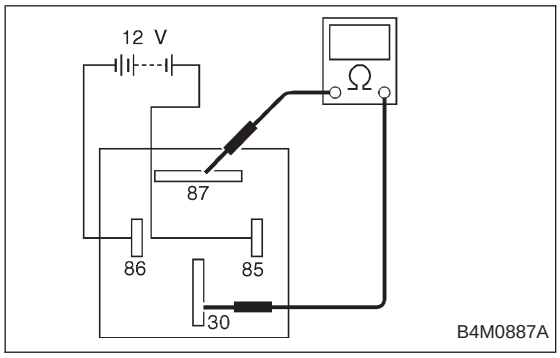


8X1	CHECK RESISTANCE OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Remove motor relay from relay box.
3) Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 86:

CHECK ***: Is the resistance between 70 and 90 Ω?***
YES : Go to step **8X2**.
NO : Replace motor relay.

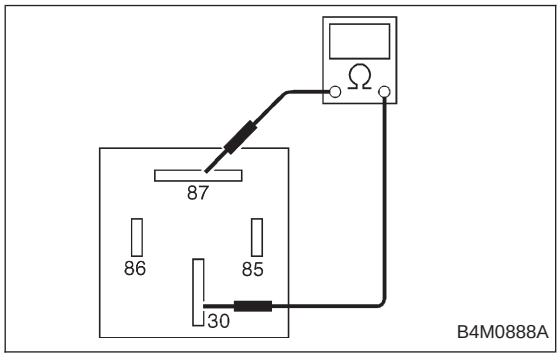


8X2	CHECK CONTACT POINT OF MOTOR RELAY.

1) Connect battery to motor relay terminals No. 85 and No. 86.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X3**.
NO : Replace motor relay.

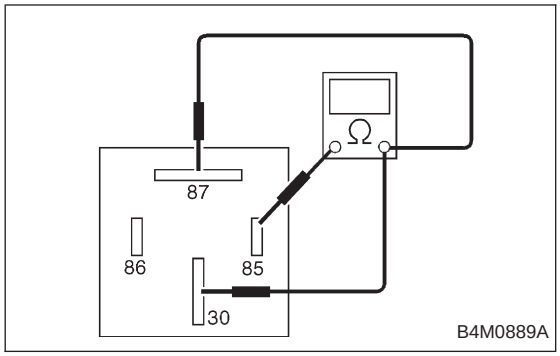


8X3	CHECK CONTACT POINT OF MOTOR RELAY.

1) Disconnect battery from motor relay terminals.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8X4**.
NO : Replace motor relay.



8X4	CHECK SHORT OF MOTOR RELAY.

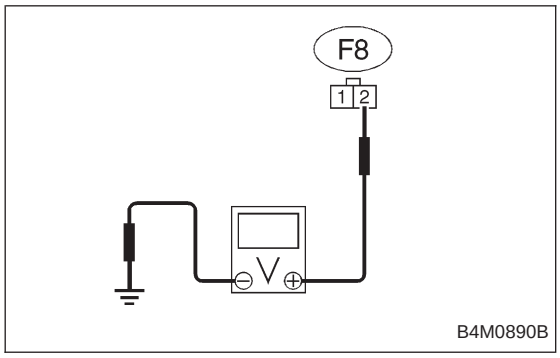
Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 30:
No. 85 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8X5**.

NO : Replace motor relay.



8X5	CHECK INPUT VOLTAGE OF RELAY BOX.

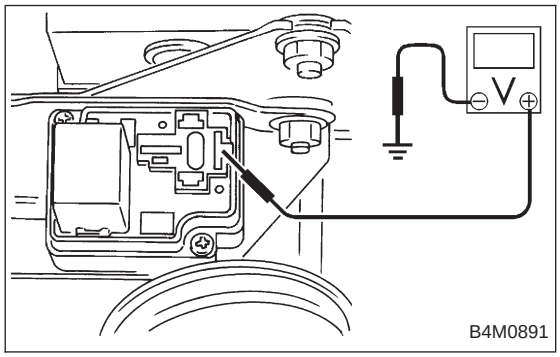
1) Disconnect connector (F8) from relay box.
2) Turn ignition switch to ON.
3) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **8X6**.

NO : Repair harness/connector between battery and relay box, and check fuse SBF6.



8X6	CHECK INPUT VOLTAGE OF MOTOR RELAY.

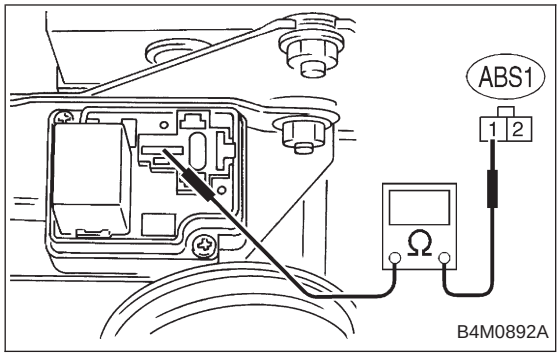
1) Turn ignition switch to OFF.
2) Connect connector (F8) to relay box.
3) Turn ignition switch to ON.
4) Measure voltage between relay box and chassis ground.

Connector & terminal
Relay installing point No. 87 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **8X7**.

NO : Replace relay box, and check fuse SBF6.

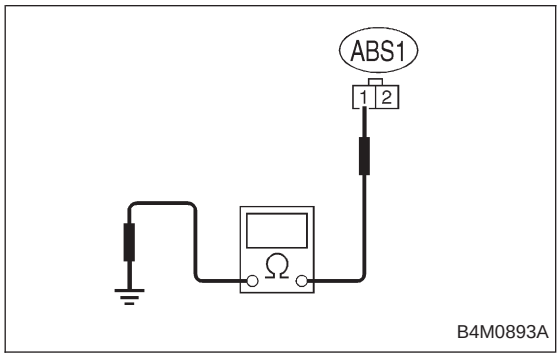


8X7	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (ABS1) from hydraulic unit.
3) Measure resistance between hydraulic unit and motor relay installing portion.

Connector & terminal
(ABS1) No. 1 — Motor relay installing portion No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X8**.
NO : Replace relay box.

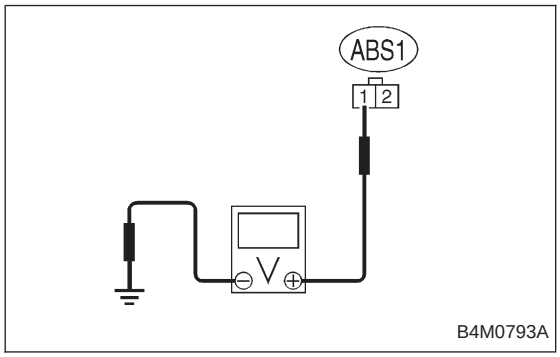


8X8	CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit and chassis ground.

Connector & terminal
(ABS1) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8X9**.
NO : Replace relay box. Check fuse No. 19.

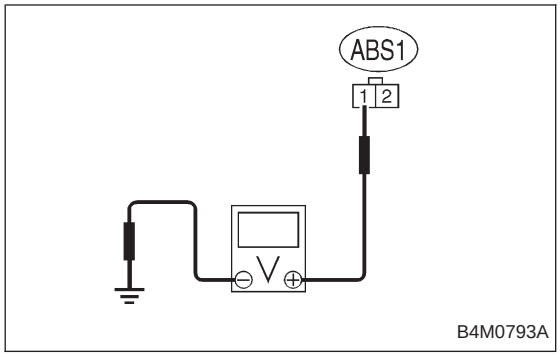


8X9	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X10**.
NO : Replace relay box.

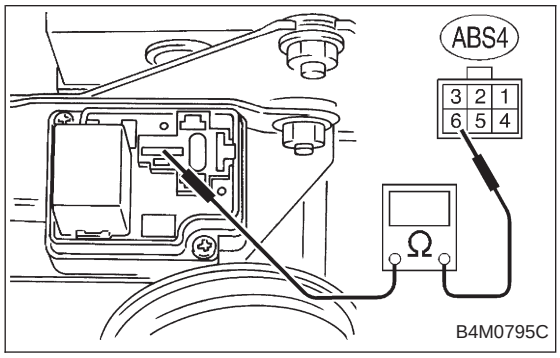


8X10	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X11**.
NO : Replace relay box.

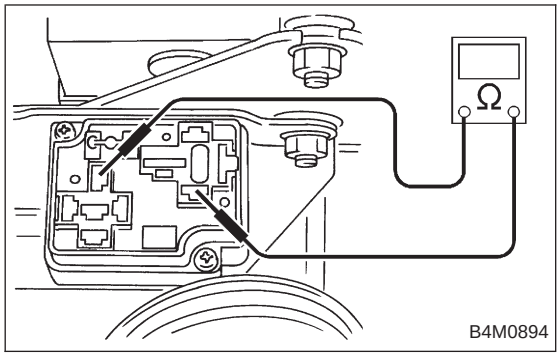


8X11	CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Disconnect connector (F50) from relay box.
3) Measure resistance between relay box connector and motor relay installing point.

Connector & terminal
(ABS4) No. 6 — Motor relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X12**.
NO : Replace relay box.

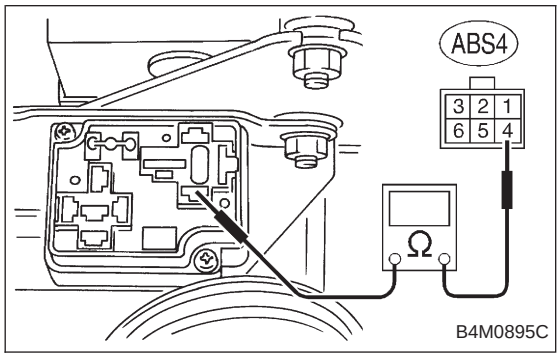


8X12	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

1) Remove valve relay from relay box.
2) Measure resistance between motor relay installing point and valve relay installing point.

Connector & terminal
Motor relay installing point No. 86 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X13**.
NO : Replace relay box.

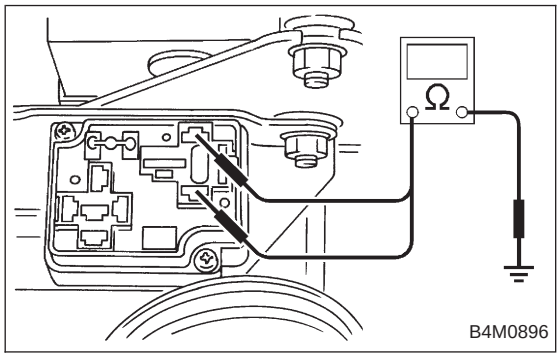


8X13	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between motor relay installing point and relay box connector.

Connector & terminal
Motor relay installing point No. 86 — (ABS4) No. 4:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X14**.
NO : Replace relay box.

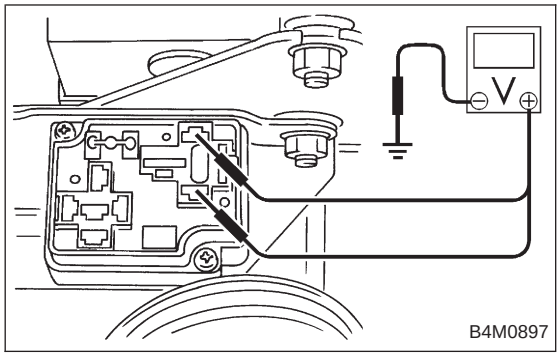


8X14	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box and chassis ground.

Connector & terminal
Motor relay installing point No. 86 — Chassis ground:
Motor relay installing point No. 85 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **8X15**.
NO : Replace relay box. Check fuse No. 19.

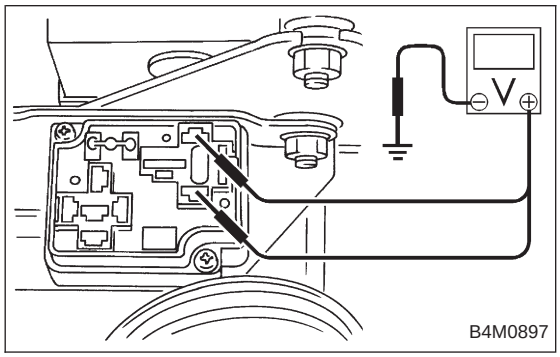


8X15	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure voltage between motor relay installing point and chassis ground.

Connector & terminal
Motor relay installing point (+) No. 86 — Chassis ground (−):
Motor relay installing point (+) No. 85 — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X16**.
NO : Replace relay box and check all fuses.

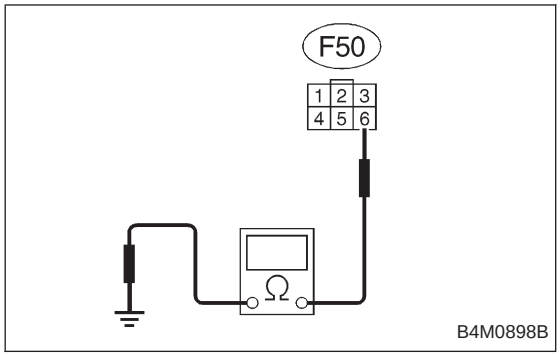


8X16	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between motor relay installing point and chassis ground.

Connector & terminal
Motor relay installing point (+) No. 86 — Chassis ground:
Motor relay installing point (+) No. 85 — Chassis ground:

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X17**.
NO : Replace relay box and check all fuses.



8X17	CHECK OPEN CIRCUIT IN MONITOR SYSTEM HARNESS.

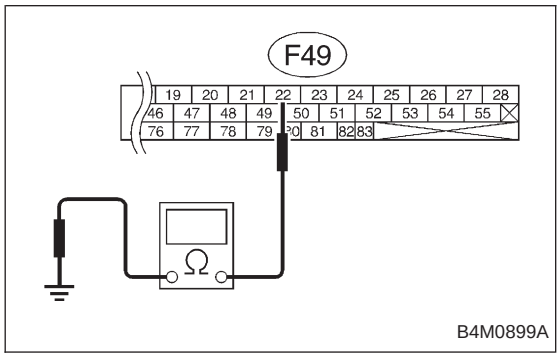
1) Turn ignition switch to OFF.
2) Connect between terminals No. 10 and No. 1 of ABSCM connector (F49) with a lead wire.
3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 6 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **8X18**.

NO : Repair harness/connector between ABSCM and relay box.



8X18	CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.

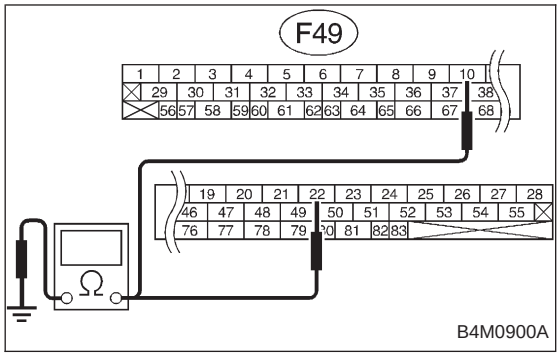
1) Connect valve relay and motor relay to relay box.
2) Connect connector (F50) to relay box.
3) Connect connector to hydraulic unit.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:

CHECK ***: Is the resistance between 70 and 90 Ω?***

YES : Go to step **8X19**.

NO : Repair harness/connector between ABSCM and relay box.



8X19	CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

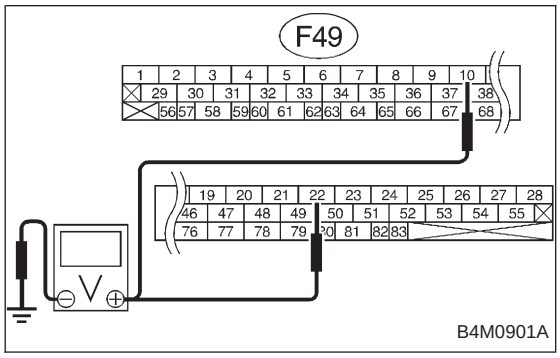
1) Disconnect connector (F50) from relay box.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:
(F49) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8X20**.

NO : Repair harness between ABSCM and relay box. Check fuse No. 19 and SBF6.



8X20	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

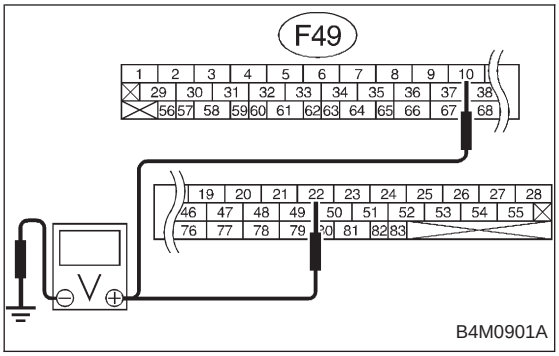
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8X21**.

NO : Repair harness between relay box and ABSCM. Check fuse SBF6.

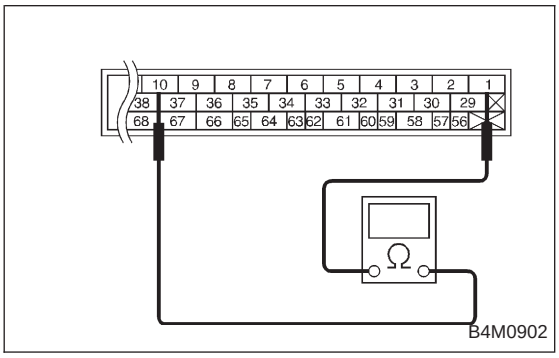


8X21	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **8X22**.
NO : Repair harness between relay box and ABSCM. Check fuse SBF6.

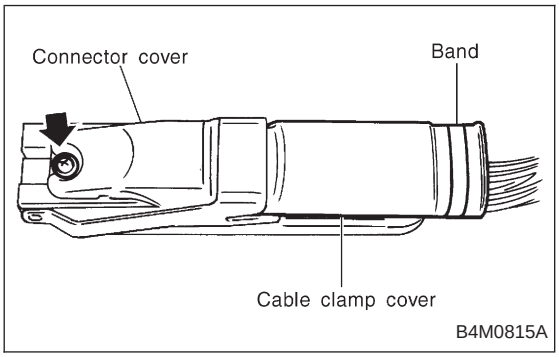


8X22	CHECK GROUND SHORT AT ABSCM MONITOR TERMINAL.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM terminals.

Terminal
No. 10 — No. 1:

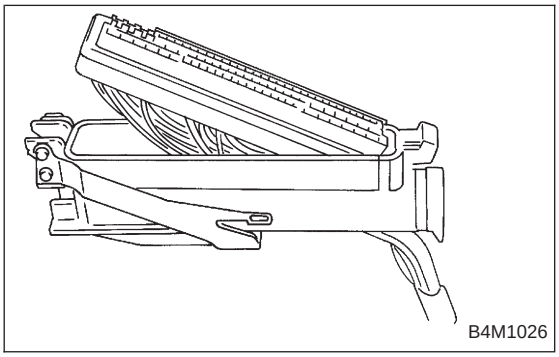
CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **8X23**.
NO : Replace ABSCM.



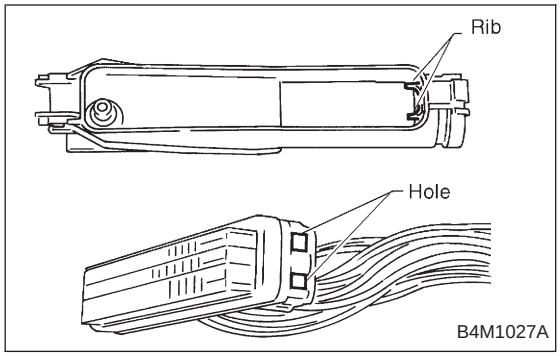
8X23	CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.

1) Remove band.
2) Remove cable clamp cover.
3) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

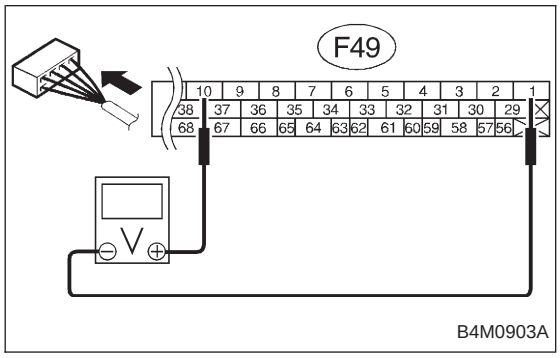


4) Remove connector cover.

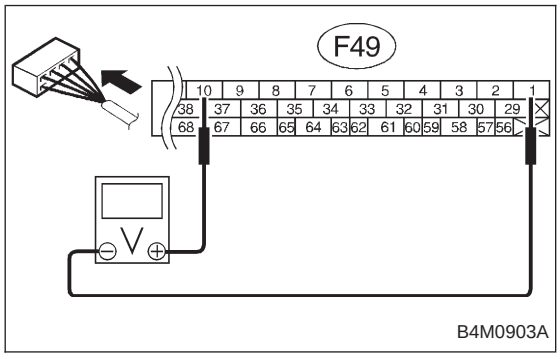


NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

5) Connect all connectors.

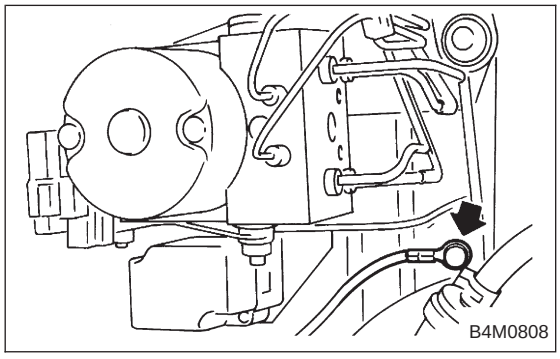


6) Measure voltage between ABSCM connector terminals.
Connector & terminal
(F49) No. 10 (+) — No. 1 (−):
CHECK ***: Is the voltage less than 2 V?***
YES : Go to step **8X24**.
NO : Replace ABSCM.



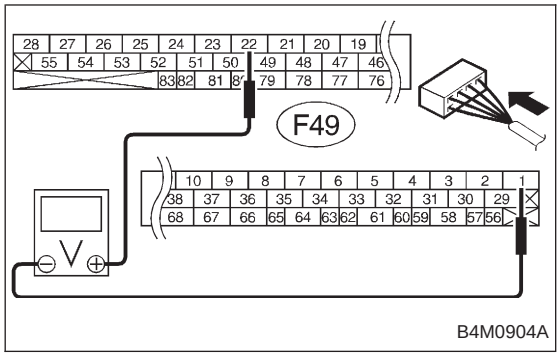
8X24	CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector terminals.
Connector & terminal
(F49) No. 10 (+) — No. 1 (−):
CHECK ***: Is the voltage less than 2 V?***
YES : Go to step **8X25**.
NO : Replace ABSCM.



8X25	CHECK CONDITION OF MOTOR GROUND.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb):
CHECK ***: Is the motor ground terminal tightly clamped?***
YES : Go to step **8X26**.
NO : Tighten the clamp of motor ground terminal.



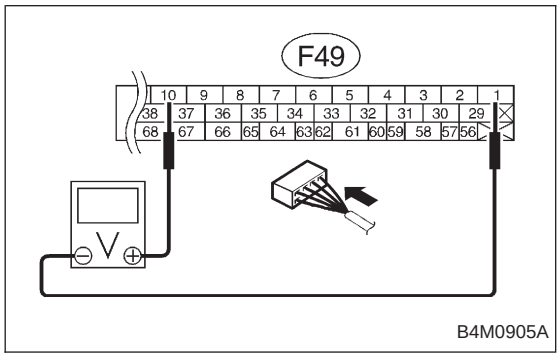
8X26	CHECK ABSCM MOTOR DRIVE TERMINAL.

1) Operate the check sequence. <Ref. to 4-4 [W12D0].>
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 22 (+) — No. 1 (−):

CHECK ***: Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?***

YES : Go to step **8X27**.
NO : Replace ABSCM.



8X27	CHECK MOTOR OPERATION.

1) Operate the check sequence. <Ref. to 4-4 [W12D0].>
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Does the voltage raise from less than 1.5 V to between 10 V and 13 V, and return to less than 1.5 V again when carrying out the check sequence?***

YES : Go to step **8X28**.
NO : Replace hydraulic unit.

8X28	CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W12D0].>

CHECK ***: Can motor revolution noise (buzz) be heard when carrying out the check sequence?***

YES : Go to step **8X29**.
NO : Replace hydraulic unit.

8X29	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connector between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.
NO : Go to step **8X30**.

8X30	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8X31**.

8X31	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

Y: TROUBLE CODE 54
— ABNORMAL STOP LIGHT SWITCH —

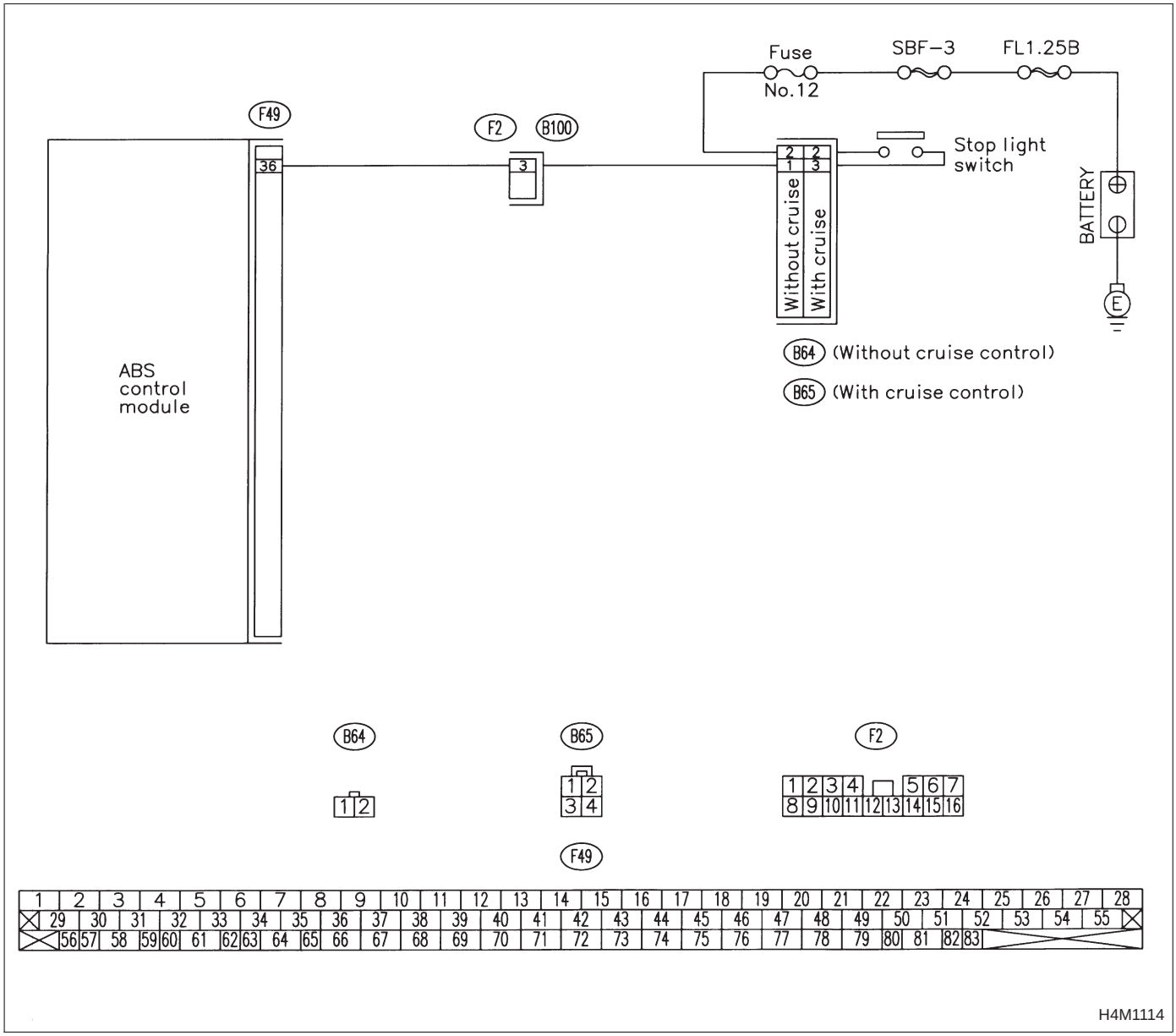
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



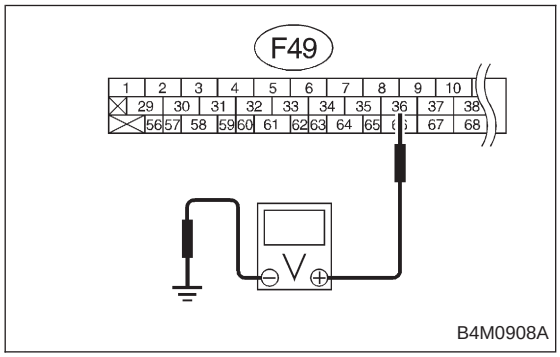
8Y1	CHECK STOP LIGHTS COME ON.

Depress the brake pedal.

CHECK ***: Do stop lights come on?***

YES : Go to step **8Y2.**

NO : Repair stop lights circuit.



8Y2	CHECK OPEN CIRCUIT IN HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Depress brake pedal.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 36 — Chassis ground:

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **8Y3**.

NO : Repair harness between stop light switch and ABSCM.

8Y3	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between stop light switch and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8Y4**.

8Y4	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **8Y5**.

8Y5	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

Z: TROUBLE CODE 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —

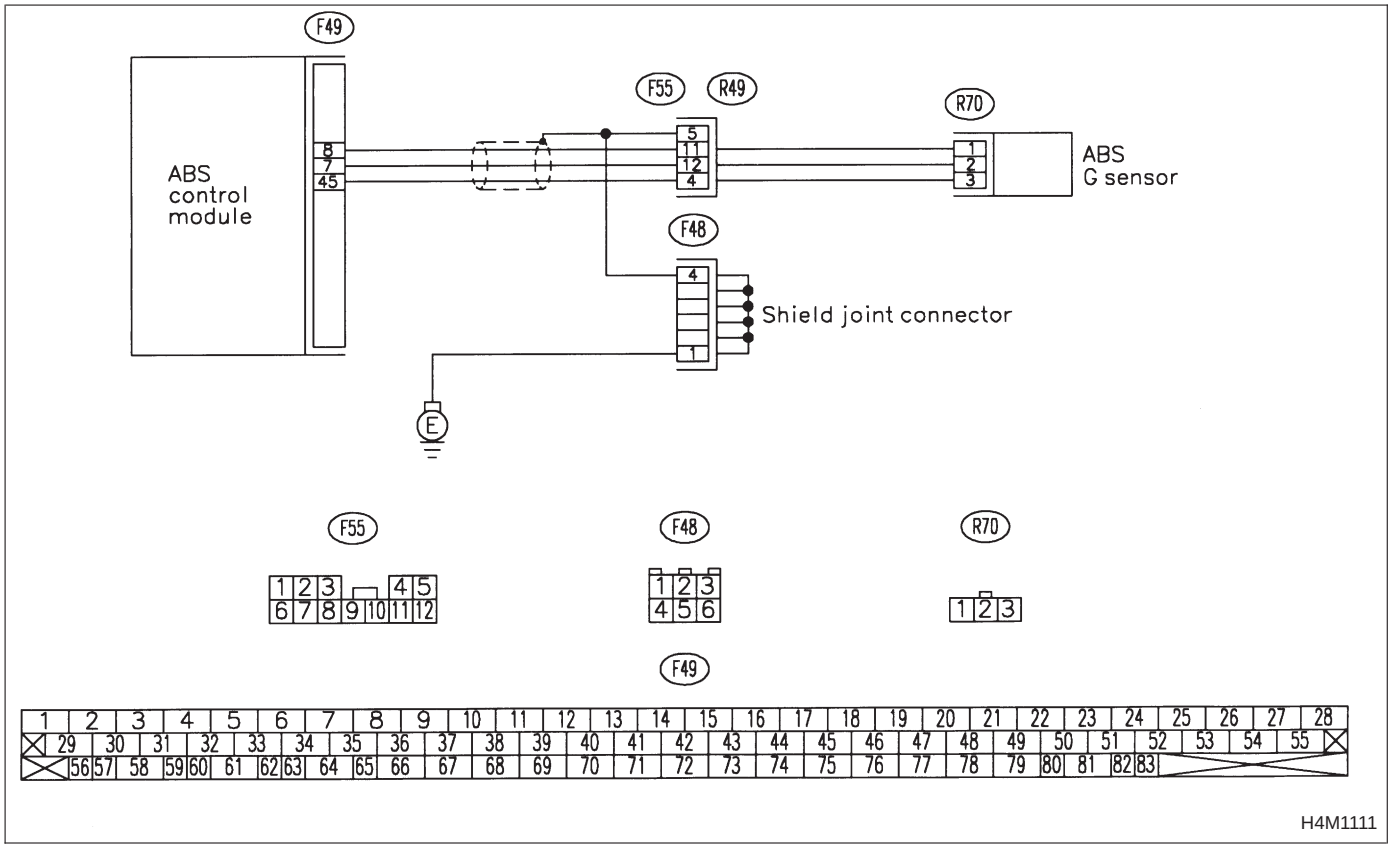
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

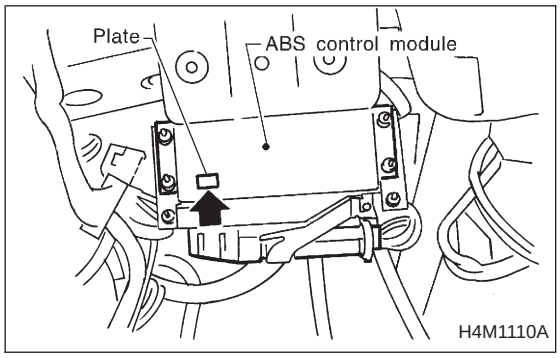


8Z1	CHECK ALL FOUR WHEELS FOR FREE TURNING.

CHECK : ***Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?***

YES : The ABS is normal. Erase the trouble code.

NO : Go to step **8Z2**.



8Z2	CHECK SPECIFICATIONS OF ABSCM.

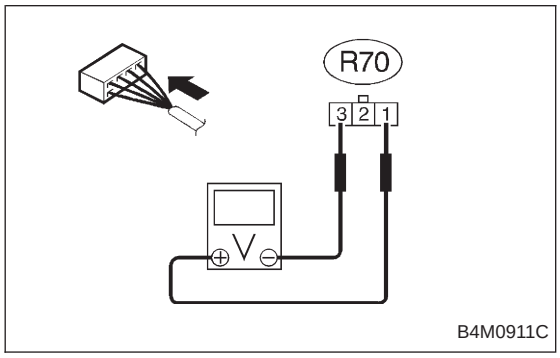
Check specifications of the plate attached to the ABSCM.

CHECK : ***Is an ABSCM for 4WD model installed on a FWD model?***

CAUTION:
Be sure to turn ignition switch to OFF when removing ABSCM.

YES : Replace ABSCM.

NO : Go to step **8Z3**.



8Z3	CHECK INPUT VOLTAGE OF G SENSOR.

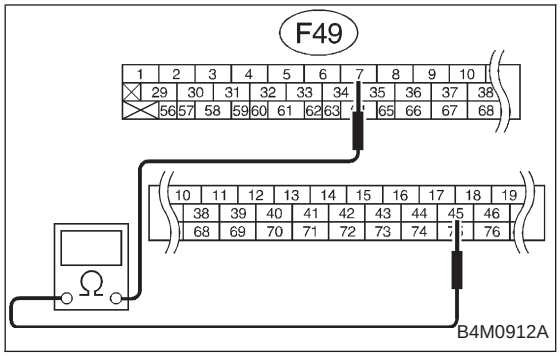
1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect G sensor from body. (Do not disconnect connector.)
4) Turn ignition switch to ON.
5) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 1 (+) — No. 3 (−):

CHECK : ***Is the voltage between 4.75 and 5.25 V?***

YES : Go to step **8Z4**.

NO : Repair harness/connector between G sensor and ABSCM.



8Z4	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

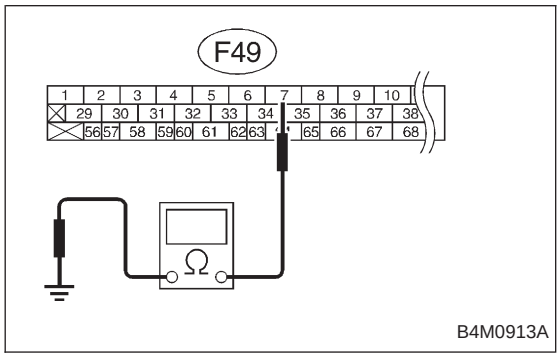
1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK ***: Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **8Z5**.

NO : Repair harness/connector between G sensor and ABSCM.



8Z5	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.

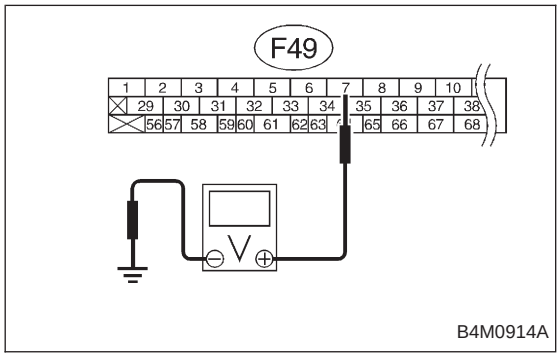
1) Disconnect connector from G sensor.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **8Z6**.

NO : Repair harness between G sensor and ABSCM.



8Z6	CHECK BATTERY SHORT OF HARNESS.

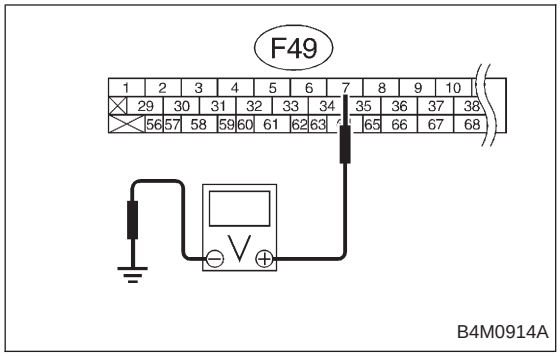
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8Z7**.

NO : Repair harness between G sensor and ABSCM.



8Z7	CHECK BATTERY SHORT OF HARNESS.

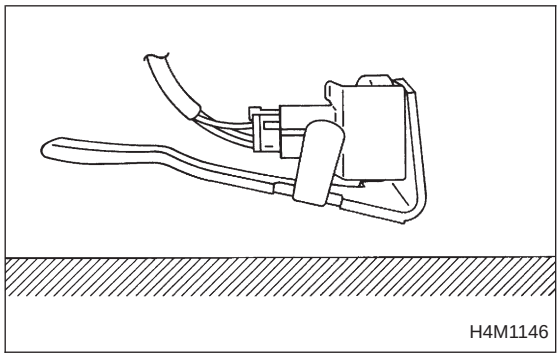
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **8Z8**.

NO : Repair harness between G sensor and ABSCM.



8Z8	CHECK G SENSOR.

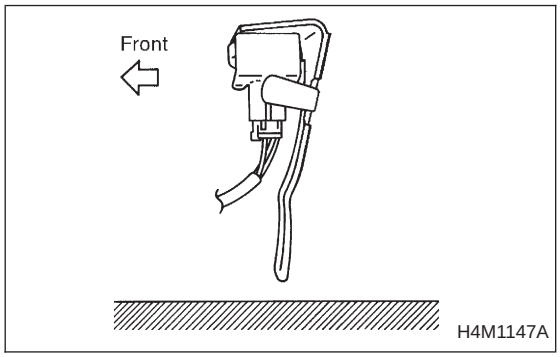
1) Turn ignition switch to OFF.
2) Remove G sensor from vehicle.
3) Connect connector to G sensor.
4) Connect connector to ABSCM.
5) Turn ignition switch to ON.
6) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 2.1 and 2.4 V when G sensor is horizontal?***

YES : Go to step **8Z9**.

NO : Replace G sensor.



8Z9	CHECK G SENSOR.

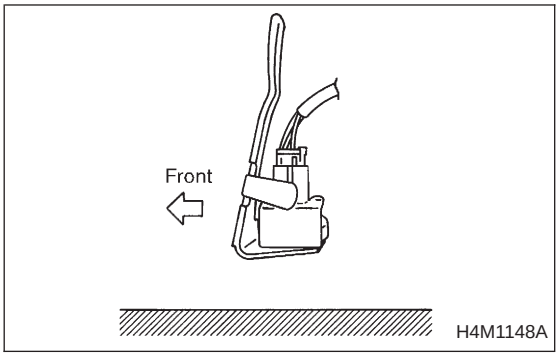
Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **8Z10**.

NO : Replace G sensor.



8Z10	CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **8Z11**.

NO : Replace G sensor.

8Z11	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **8Z12**.

8Z12	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

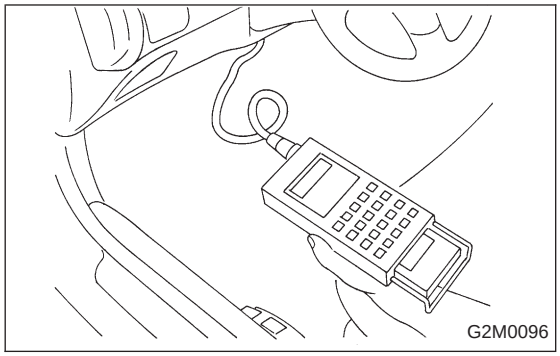
NO : Go to step **8Z13**.

8Z13	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



9. Select Monitor Function Mode

Applicable cartridge of select monitor: No. 498346200

A: LIST OF FUNCTION MODE

1. F MODE (ROM ID, ANALOG DATA ARE DISPLAYED.)

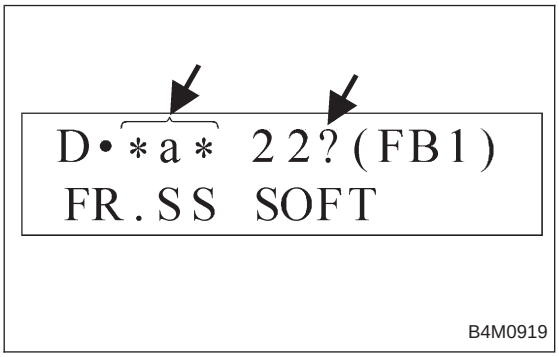
Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
F00	ROM ID	ECM identification	ROM ID number of ECM is read and enabled communication state is displayed.	Possible	[T9B0]
F01	FR	FR wheel speed (mile/h)	Wheel speed detected by the FR ABS sensor is displayed in mile/h.	Possible	[T9C0]
F02	FL	FL wheel speed (mile/h)	Wheel speed detected by the FL ABS sensor is displayed in mile/h.	Possible	[T9D0]
F03	RR	RR wheel speed (mile/h)	Wheel speed detected by the RR ABS sensor is displayed in mile/h.	Possible	[T9E0]
F04	RL	RL wheel speed (mile/h)	Wheel speed detected by the RL ABS sensor is displayed in mile/h.	Possible	[T9F0]
F05	FR	FR wheel speed (km/h)	Wheel speed detected by the FR ABS sensor is displayed in km/h.	Possible	[T9C0]
F06	FL	FL wheel speed (km/h)	Wheel speed detected by the FL ABS sensor is displayed in km/h.	Possible	[T9D0]
F07	RR	RR wheel speed (km/h)	Wheel speed detected by the RR ABS sensor is displayed in km/h.	Possible	[T9E0]
F08	RL	RL wheel speed (km/h)	Wheel speed detected by the RL ABS sensor is displayed in km/h.	Possible	[T9F0]
F09	BLS	Stop light switch monitor	Stop light switch monitor voltage is displayed.	Possible	[T9G0]
F10	G-SENS	G sensor output voltage (V)	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.	Possible	[T9H0]

2. FA MODE (ON/OFF DATA ARE DISPLAYED.)

Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
FA0	B1	Stop light switch	LED 1 comes on with the switch on (with the brake pedal down).	Possible	[T9I0]
	VR	Valve relay signal	LED 2 comes on with the valve relay off.		
	MR	Motor relay signal	LED 3 comes on with the motor on.		
	AT	AT ABS signal	LED 4 comes on when ABS control is on.		
	AW	ABS warning light	LED 6 comes on when the warning light is on.		
	VM	Valve relay monitor	LED 1 comes on with the valve relay off.		
	MM	Motor relay monitor	LED 8 comes on when the motor relay is on.		
	CM	CCM signal	LED 9 comes on when ABS control is on.		

3. FB MODE (TROUBLE CODES ARE DISPLAYED.)

Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
FB1	D·ALL	History of trouble codes is displayed.	A maximum of 3 trouble codes are displayed in order of occurrence.	Possible	[T10B0]
	D·NEW		The most recent trouble code appears on the select monitor display.		
	D·MID		The second most recent trouble code appears on the select monitor display.		
	D·OLD		The third most recent trouble code appears on the select monitor display.		



NOTE:
- If a particular trouble code is not properly stored in memory (due to a drop in ABSCM power supply, etc.) when a problem occurs, the trouble code, followed by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.
- * a * refers to the troubles in order of occurrence (NEW. MID and OLD).

4. FC MODE (TROUBLE CODES ARE ERASED.)

Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
FC0	D·CLR	History of trouble codes is erased.	Function of clearing trouble code.	Possible	[T9J0]

5. FD MODE (ABS SEQUENCE CHECK MODE)

Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
FD1	A·CHK	ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	Impossible	[W12D0]

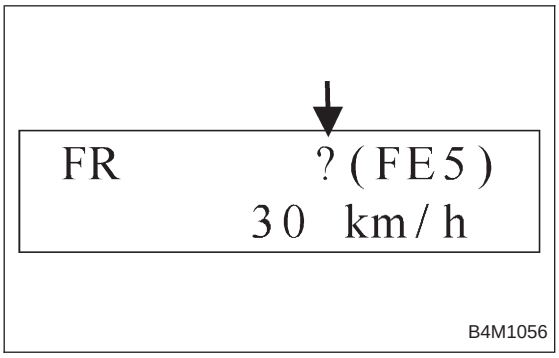
6. FE MODE (FREEZE FRAME DATA)

NOTE:

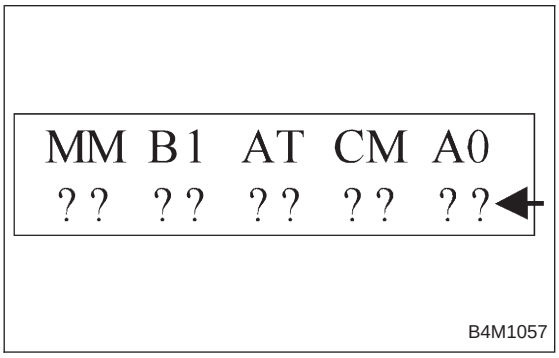
- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.

Function code		Measuring items	Contents to be monitored	Scroll	Ref. to 4-4
Code	Abbreviation				
FE1	FR	FR wheel speed (mile/h)	Wheel speed detected by the FR ABS sensor is displayed in mile/h.	Possible	[T9K0]
FE2	FL	FL wheel speed (mile/h)	Wheel speed detected by the FL ABS sensor is displayed in mile/h.	Possible	[T9L0]
FE3	RR	RR wheel speed (mile/h)	Wheel speed detected by the RR ABS sensor is displayed in mile/h.	Possible	[T9M0]
FE4	RL	RL wheel speed (mile/h)	Wheel speed detected by the RL ABS sensor is displayed in mile/h.	Possible	[T9N0]
FE5	FR	FR wheel speed (km/h)	Wheel speed detected by the FR ABS sensor is displayed in km/h.	Possible	[T9K0]
FE6	FL	FL wheel speed (km/h)	Wheel speed detected by the FL ABS sensor is displayed in km/h.	Possible	[T9L0]
FE7	RR	RR wheel speed (km/h)	Wheel speed detected by the RR ABS sensor is displayed in km/h.	Possible	[T9M0]
FE8	RL	RL wheel speed (km/h)	Wheel speed detected by the RL ABS sensor is displayed in km/h.	Possible	[T9N0]
FE13	POWER	ABSCM power supply voltage (V)	Power (in volts) supplied to ABSCM appears on the select monitor display.	Possible	[T9O0]
FE14	G-SENS	G sensor output voltage (V)	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.	Possible	[T9P0]
FE15	MM	Motor relay monitor	LED 1 comes on when motor relay is on.	Possible	[T9Q0]
	B1	Stop light switch	LED 2 comes on with the stop light switch on (with the brake pedal depressed).		
	AT	AT ABS signal	LED 3 comes on when ABS control is on.		
	CM	CCM signal	LED 4 comes on when ABS control is on.		
	A0	ABS control	LED 5 comes on when ABS control is on.		
FE16	CODE	Trouble code	The most recent trouble code appears on select monitor display.	Possible	[T9R0]

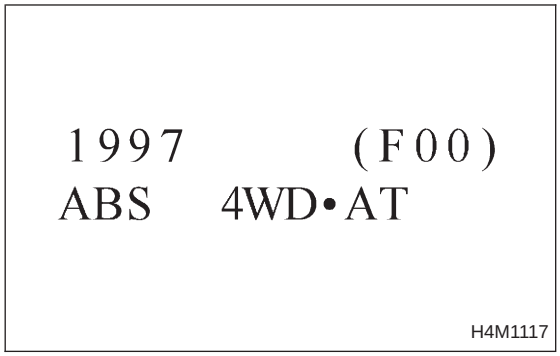
1) When a trouble code is not stored in memory, activating the FE mode causes the initial value to appear on the select monitor display.
- FE1 — 4: 159 mile/h
- FE5 — 8: 255 km/h
- FE13: 16.84 V
- FE14: 5.00 V
- FE15: The MM, B1 and A0 LEDs are on. The AT and CM LEDs are out.
- FE16: NO HISTORY OF OCCURED



2) If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a trouble code, preceded by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.



3) When a trouble code is detected in the FE mode, a question mark "?" appears continuously on the select monitor display until the freeze frame data is stored in memory.



B: MODE F00 — ROM ID NUMBER (ROM) —

CONDITION:

Ignition switch ON

SPECIFIED DATA:

Presentation display

9B1	CHECK MESSAGE OF DISPLAY.

CHECK ***: Does display indicate message "Error 1"?***

YES : Repair loose or disconnect connector, or discontinued circuit in data link circuit.

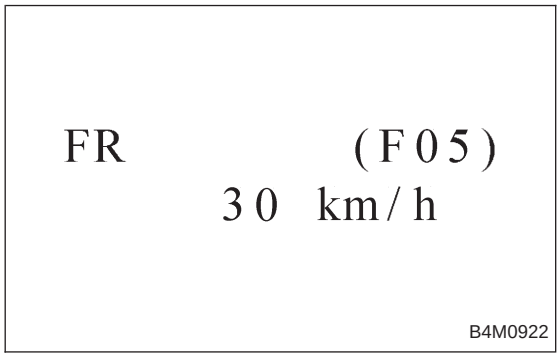
NO : Go to step **9B2**.

9B2	CHECK MESSAGE OF DISPLAY.

CHECK ***: Does display indicate message "Error 2"?***

YES : Repair poor contact of select monitor cartridge, or installation of different type select monitor cartridge.

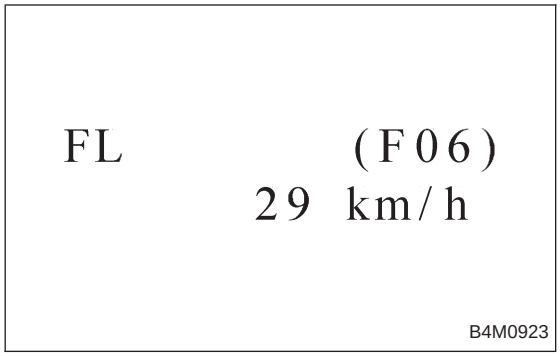
NO : Data link system is normal.



C: MODE F01 AND F05 — FRONT RIGHT WHEEL SPEED SIGNAL (FR) —

- Compare speedometer with monitor indications.
- F01: FR wheel speed is indicated in mile per hour (mile/h).
- F05: FR wheel speed is indicated in kilometer per hour (km/h).

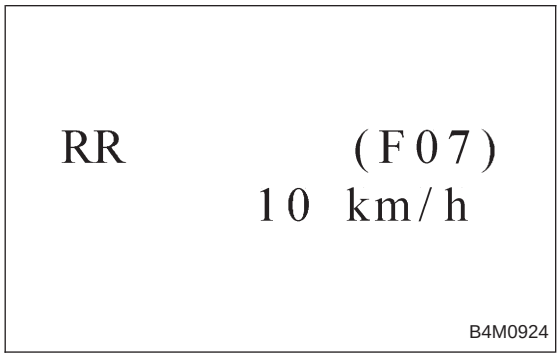
NOTE:
The monitor as shown, indicates that FR wheel speed is 30 km/h.



D: MODE F02 AND F06 — FRONT LEFT WHEEL SPEED SIGNAL (FL) —

- Compare speedometer with monitor indications.
- F02: FL wheel speed is indicated in mile per hour (mile/h).
- F06: FL wheel speed is indicated in kilometer per hour (km/h).

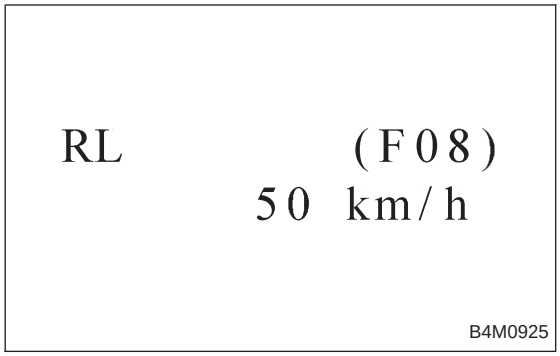
NOTE:
The monitor as shown, indicates that FL wheel speed is 29 km/h.



E: MODE F03 AND F07 — REAR RIGHT WHEEL SPEED SIGNAL (RR) —

- Compare speedometer with monitor indications.
- F03: RR wheel speed is indicated in mile per hour (mile/h).
- F07: RR wheel speed is indicated in kilometer per hour (km/h).

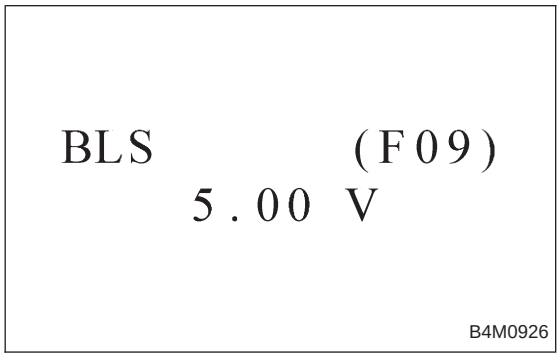
NOTE:
The monitor as shown, indicates that RR wheel speed is 10 km/h.



F: MODE F04 AND F08 — REAR LEFT WHEEL SPEED SIGNAL (RL) —

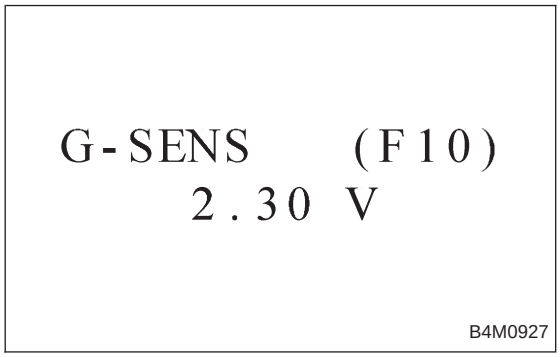
- Compare speedometer with monitor indications.
- F04: RL wheel speed is indicated in mile per hour (mile/h).
- F08: RL wheel speed is indicated in kilometer per hour (km/h).

NOTE:
The monitor as shown, indicates that RL wheel speed is 50 km/h.



G: MODE F09 — STOP LIGHT SWITCH MONITOR (BLS) —

- Stop light switch monitor voltage is displayed.

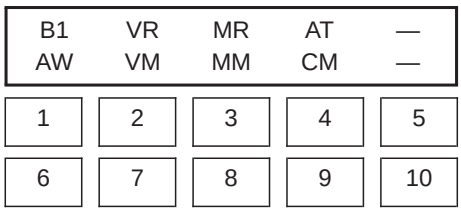


H: MODE F10 — G SENSOR OUTPUT VOLTAGE (G-SENS) —

- Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.

NOTE:
Only AWD model

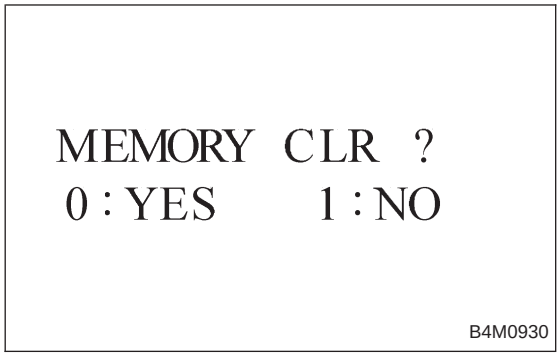
LED No.	Signal name	Display
1	Stop light switch	B1
2	Valve relay signal	VR
3	Motor relay signal	MR
4	AT ABS signal	AT
5	—	—
6	ABS warning light	AW
7	Valve relay monitor	VM
8	Motor relay monitor	MM
9	CCM signal	CM
10	—	—



I: MODE FA0
— ON ↔ OFF SIGNAL —

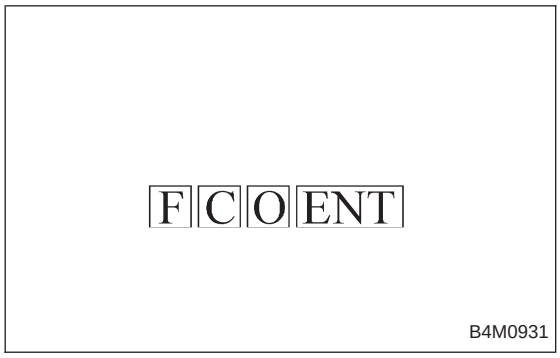
Requirement for LED “ON”

LED No. 1 Stop light switch is turned ON. (With brake pedal depressed.)
LED No. 2 Valve relay is turned OFF.
LED No. 3 Motor relay is turned ON.
LED No. 4 ABS control operates.
LED No. 6 ABS warning light is ON.
LED No. 7 Valve relay is turned OFF.
LED No. 8 Motor relay is turned ON.
LED No. 9 ABS control operates.

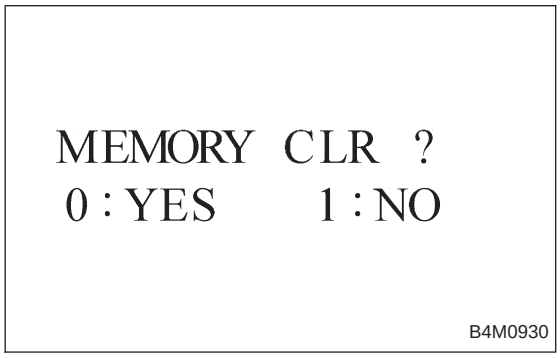


J: MODE FC0 — HISTORY OF TROUBLE CODES IS ERASED (D·CLR) —

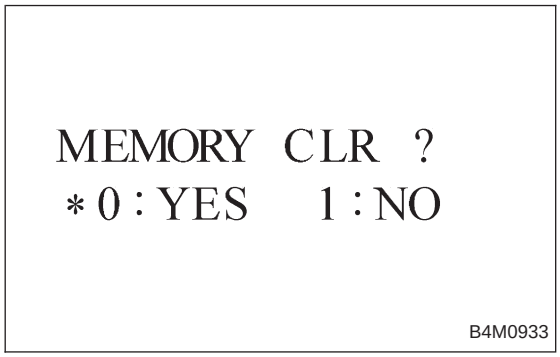
● Deletes the recorded trouble codes in ABS control module.



1) Press the function key [F] [C] [O] [ENT] in that order.



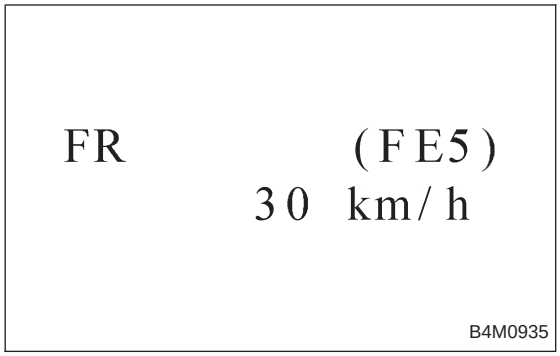
2) System indicates as shown.



3) Press the function key [0], to clear memories. The indication of ∗ is added to screen.



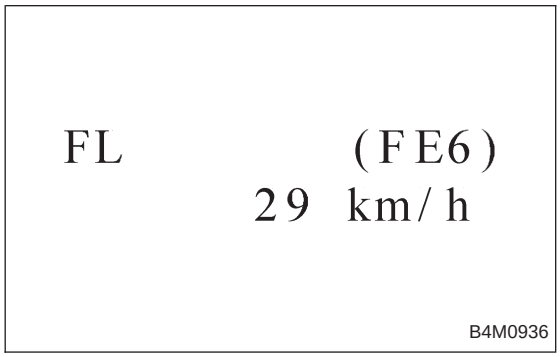
4) Press the function key [ENT]. System indicates as shown.
5) Turn ignition switch to OFF.



K: MODE FE1 AND FE5 — FRONT RIGHT WHEEL SPEED SIGNAL (FR) —

- The wheel speed is indicated at the time of malfunction.
- FE1: FR wheel speed is indicated in mile per hour (mile/h).
- FE5: FR wheel speed is indicated in kilometer per hour (km/h).

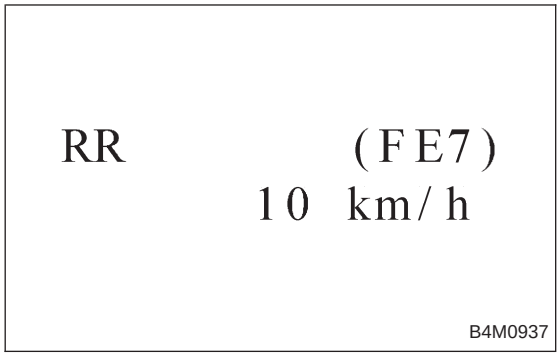
NOTE:
The monitor as shown, indicates that FR wheel speed is 30 km/h.



L: MODE FE2 AND FE6 — FRONT LEFT WHEEL SPEED SIGNAL (FL) —

- The wheel speed is indicated at the time of malfunction.
- FE2: FL wheel speed is indicated in mile per hour (mile/h).
- FE6: FL wheel speed is indicated in kilometer per hour (km/h).

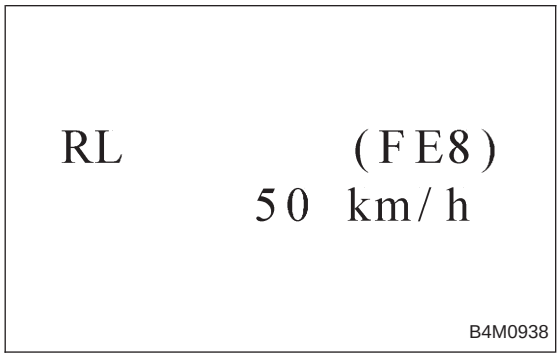
NOTE:
The monitor as shown, indicates that FL wheel speed is 29 km/h.



M: MODE FE3 AND FE7 — REAR RIGHT WHEEL SPEED SIGNAL (RR) —

- The wheel speed is indicated at the time of malfunction.
- FE3: RR wheel speed is indicated in mile per hour (mile/h).
- FE7: RR wheel speed is indicated in kilometer per hour (km/h).

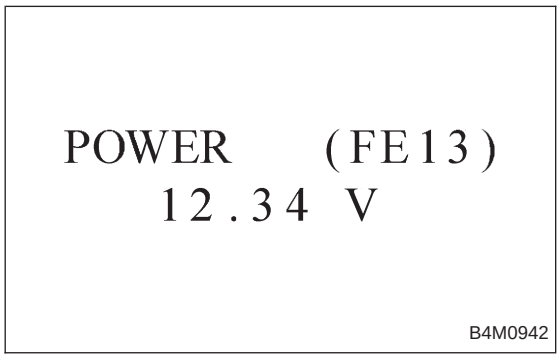
NOTE:
The monitor as shown, indicates that RR wheel speed is 10 km/h.



N: MODE FE4 AND FE8 — REAR LEFT WHEEL SPEED SIGNAL (RL) —

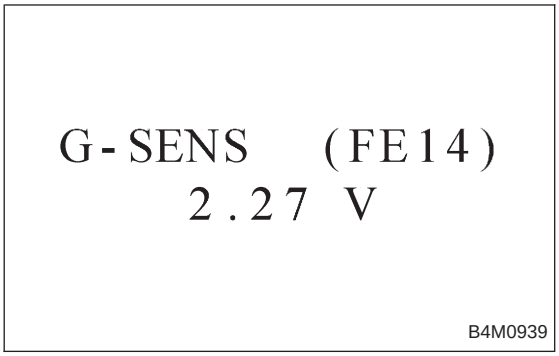
- The wheel speed is indicated at the time of malfunction.
- FE4: RL wheel speed is indicated in mile per hour (mile/h).
- FE8: RL wheel speed is indicated in kilometer per hour (km/h).

NOTE:
The monitor as shown, indicates that RL wheel speed is 50 km/h.



O: MODE FE13 — ABSCM POWER SUPPLY VOLTAGE (POWER) —

- ABSCM power supply voltage is indicated at the time of malfunction.

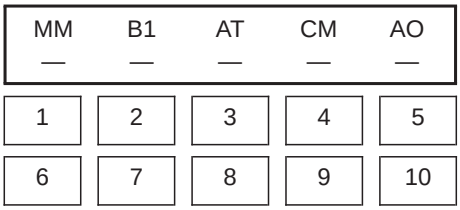


P: MODE FE14 — G SENSOR OUTPUT VOLTAGE (G-SENS) —

● Refers to vehicle acceleration detected by the analog G sensor at the time of malfunction. It appears on the select monitor display in volts.

NOTE:
Only AWD model

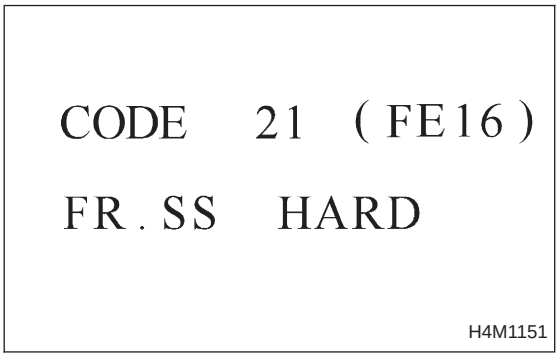
LED No.	Signal name	Display
1	Motor relay monitor	MM
2	Stop light switch	B1
3	AT ABS signal	AT
4	CCM signal	CM
5	ABS signal	AO
6	—	—
7	—	—
8	—	—
9	—	—
10	—	—



Q: MODE FE15 — ON ↔ OFF SIGNAL —

● ON or OFF is indicated at the time of malfunction.
● Requirement for LED “ON”

LED No. 1 Motor relay is turned ON.
LED No. 2 Stop light switch is turned ON. (With brake pedal depressed.)
LED No. 3 ABS control operates.
LED No. 4 ABS control operates.
LED No. 5 ABS control operates.



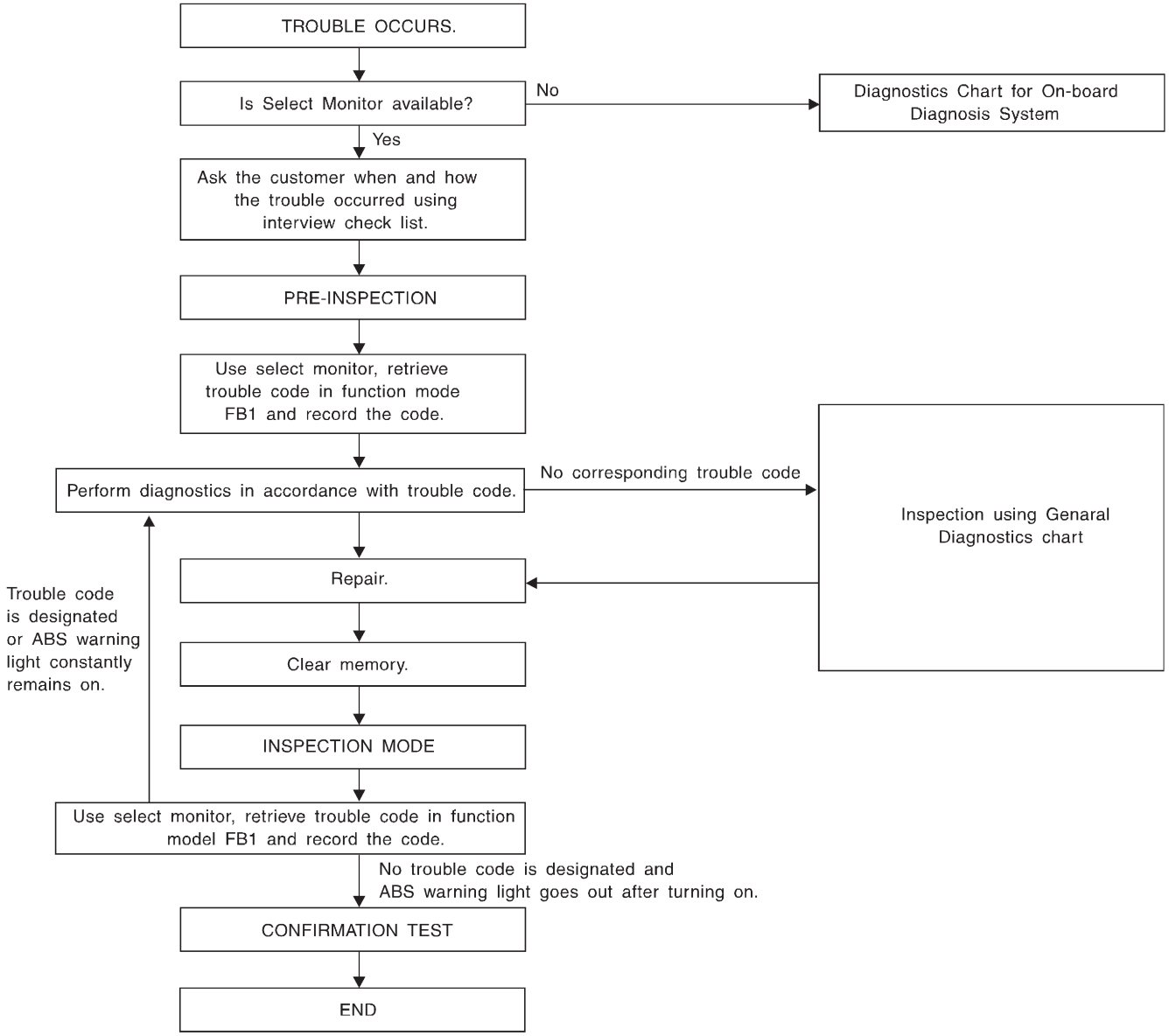
R: MODE FE16 — TROUBLE CODE (CODE) —

● When freeze frame data is stored in memory, trouble code appears on monitor.

NOTE:
The monitor as shown, indicates trouble code 21.

10. Diagnostics Chart with Select Monitor

A: BASIC DIAGNOSTIC CHART



B4M1076A

NOTE:
To check harness for broken wires or short circuits, shake it while holding it or the connector.

B: LIST OF TROUBLE CODE

Code	Display screen (FB1)	Contents of diagnosis	Ref. to 4-4
—	ERROR 3 (1)	Select monitor communication failure	[T10C0]
11	NO TROUBLE	Although no trouble appears on the select monitor display, the ABS warning light remains on	[T10D0]
21	FR. SS HARD	Open circuit or input voltage too high of FR sensor	[T10E0]
22	FR. SS SOFT	Abnormal ABS sensor signal of FR sensor	[T10I0]
23	FL. SS HARD	Open circuit or input voltage too high of FL sensor	[T10F0]
24	FL. SS SOFT	Abnormal ABS sensor signal of FL sensor	[T10J0]
25	RR. SS HARD	Open circuit or input voltage too high of RR sensor	[T10G0]
26	RR. SS SOFT	Abnormal ABS sensor signal of RR sensor	[T10K0]
27	RL. SS HARD	Open circuit or input voltage too high of RL sensor	[T10H0]
28	RL. SS SOFT	Abnormal ABS sensor signal of RL sensor	[T10L0]
29	EITHER. SS SOFT	Abnormal ABS sensor signal (any one of four)	[T10M0]
31	FR. EV VALVE	Abnormal FR inlet valve	[T10N0]
32	FR. AV VALVE	Abnormal FR outlet valve	[T10R0]
33	FL. EV VALVE	Abnormal FL inlet valve	[T10O0]
34	FL. AV VALVE	Abnormal FL outlet valve	[T10S0]
35	RR. EV VALVE	Abnormal RR inlet valve	[T10P0]
36	RR. AV VALVE	Abnormal RR outlet valve	[T10T0]
37	RL. EV VALVE	Abnormal RL inlet valve	[T10Q0]
38	RL. AV VALVE	Abnormal RL outlet valve	[T10U0]
41	ECU	Abnormal ABSCM	[T10V0]
42	LOW VOLTAGE	Source voltage is low	[T10W0]
44	CCM LINE	A combination of AT control abnormals (ABS not in control)	[T10X0]
	CCM OPEN	A combination of AT control abnormals (ABS in control)	[T10Y0]
46	GS POWER OVER	G sensor line voltage too high	[T10Z0]
	GS POWER LOW	G sensor line voltage too low	[T10AA0]
51	V. RELAY	Abnormal valve relay	[T10AB0]
	V. RELAY ON	Valve relay ON failure	[T10AC0]
52	M. RELAY OPEN	Open circuit of motor relay	[T10AD0]
	M. RELAY ON	Motor relay ON failure	[T10AE0]
	MOTOR	Abnormal motor	[T10AF0]
54	BLS	Abnormal stop light switch	[T10AG0]
56	G SENSOR LINE	Open or short circuit of G sensor	[T10AH0]
	G SENSOR +B	Battery short of G sensor	[T10AI0]
	G SENSOR H μ	Abnormal G sensor high μ output	[T10AJ0]
	G SENSOR STICK	G sensor output is stuck	[T10AK0]

NOTE:
High μ means high friction coefficient against road surface.



C: ERROR 3 (1) — SELECT MONITOR COMMUNICATION FAILURE —

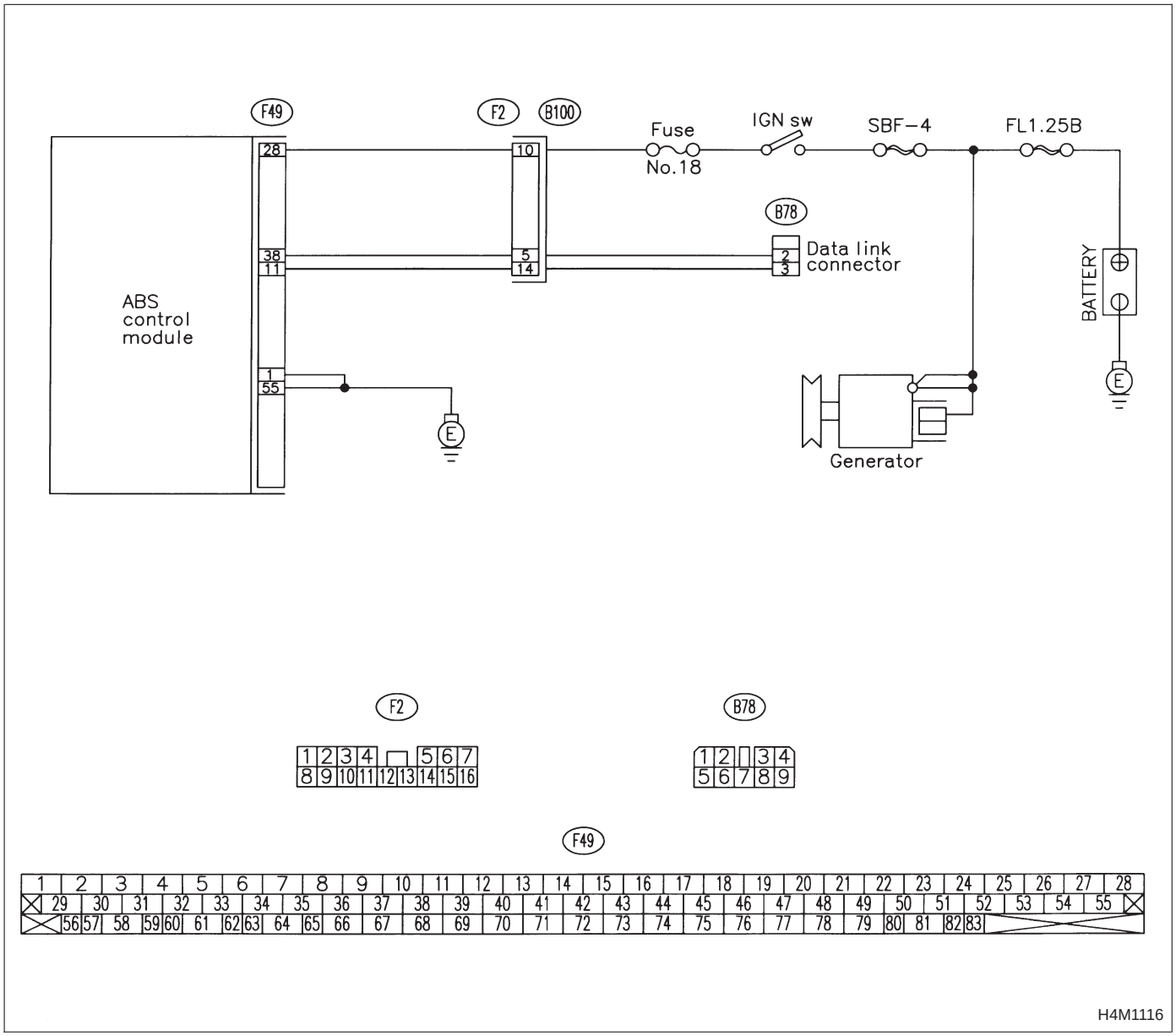
DIAGNOSIS:

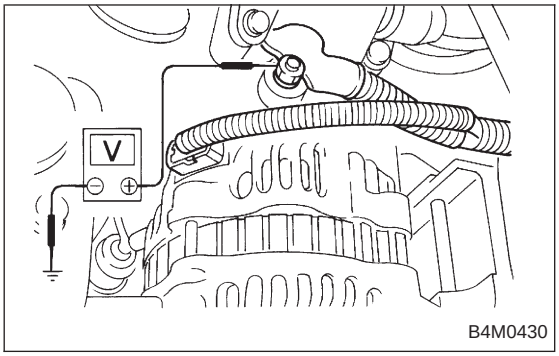
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.
- ERROR 3 or 1 appears on the select monitor display.

WIRING DIAGRAM:





10C1	CHECK GENERATOR.

1) Start the engine.
2) Idle the engine.
3) Measure voltage between generator and chassis ground.

Terminal
Generator B terminal (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 and 15 V?***
YES : Go to step **10C2**.
NO : Repair generator.

10C2	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact at battery terminal?***
YES : Repair battery terminal.
NO : Go to step **10C3**.

10C3	CHECK COMMUNICATION OF SELECT MONITOR.

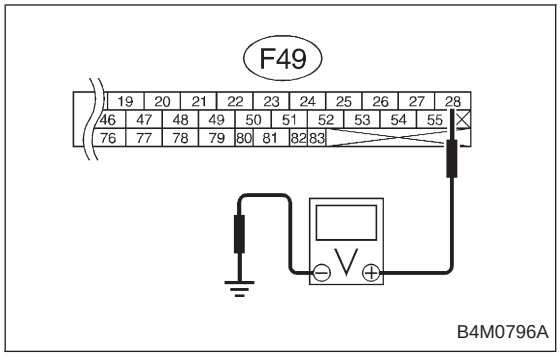
Using the select monitor, check whether communication to other system (such as engine, AT, etc.) can be executed normally.

CHECK ***: Are the name and year of the system displayed on the select monitor?***
YES : Go to step **10C4**.
NO : Repair select monitor communication cable and connector.

10C4	CHECK INSTALLATION OF ABSCM CONNECTOR.

Turn ignition switch to OFF.

CHECK ***: Is ABSCM connector inserted into ABSCM until the clamp locks onto it?***
YES : Go to step **10C5**.
NO : Insert ABSCM connector into ABSCM until the clamp locks onto it.



10C5	CHECK POWER SUPPLY OF ABSCM.

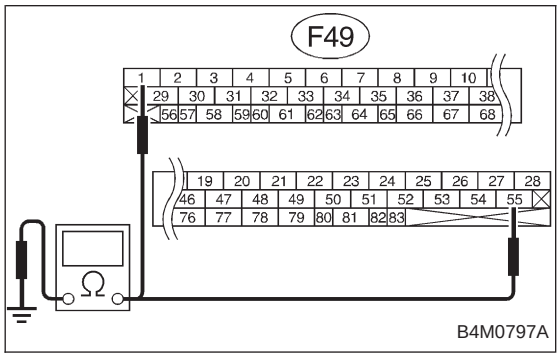
1) Disconnect connector from ABSCM.
2) Start engine.
3) Idle the engine.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 and 15 V?***

YES : Go to step **10C6**.

NO : Repair ABSCM power supply circuit.



10C6	CHECK GROUND CIRCUIT OF ABSCM.

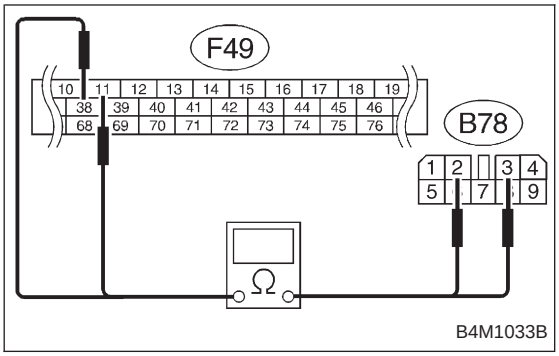
1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Repair harness/connector between ABSCM and select monitor.

NO : Go to step **10C7**.



10C7	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND DATA LINK.

1) Turn ignition switch OFF.
2) Measure resistance between ABSCM connector and data link connector.

Connector & terminal
(F49) No. 11 — (B78) No. 3:
(F49) No. 38 — (B78) No. 2:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Repair harness and connector between ABSCM and data link connector.

NO : Go to step **10C8**.

10C8	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and data link? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Replace ABSCM.

D•ALL 11 (FB1)
NO TROUBLE

B4M0944

D: NO TROUBLE — ALTHOUGH NO TROUBLE APPEARS ON THE SELECT MONITOR DISPLAY, THE ABS WARNING LIGHT REMAINS ON —

DIAGNOSIS:

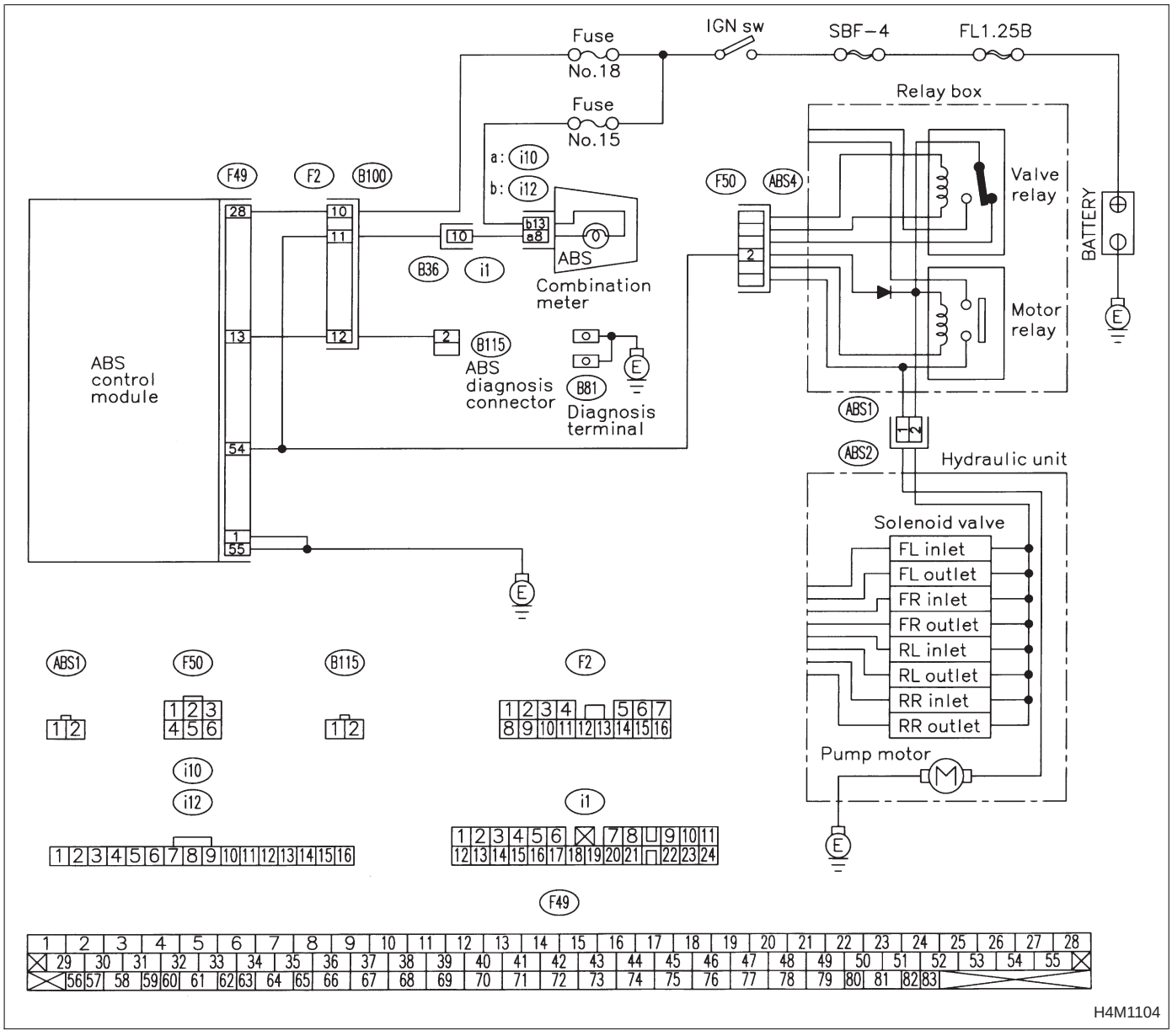
- ABS warning light circuit is shorted.

TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE displayed on the select monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE” is displayed on the select monitor, the system is in normal condition.

WIRING DIAGRAM:



10D1	CHECK GROUND SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Disconnect connector (F50) from relay box.
4) Turn ignition switch to ON.

CHECK ***: Does the ABS warning light remain OFF?***

YES : Go to step **10D2**.

NO : Repair harness between ABSCM, relay box ABS warning light.

10D2	CHECK GROUND SHORT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Disconnect connector (ABS1) from hydraulic unit.
4) Remove valve relay from relay box.
5) Turn ignition switch to ON.

CHECK ***: Does the ABS warning light remain OFF?***

YES : Replace ABSCM.

NO : Replace relay box.



E: TROUBLE CODE 21 FR. SS HARD — ABNORMAL FRONT RH ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —



F: TROUBLE CODE 23 FL. SS HARD — ABNORMAL FRONT LH ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —



G: TROUBLE CODE 25 RR. SS HARD — ABNORMAL REAR RH ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —



H: TROUBLE CODE 27 RL. SS HARD — ABNORMAL REAR LH ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —

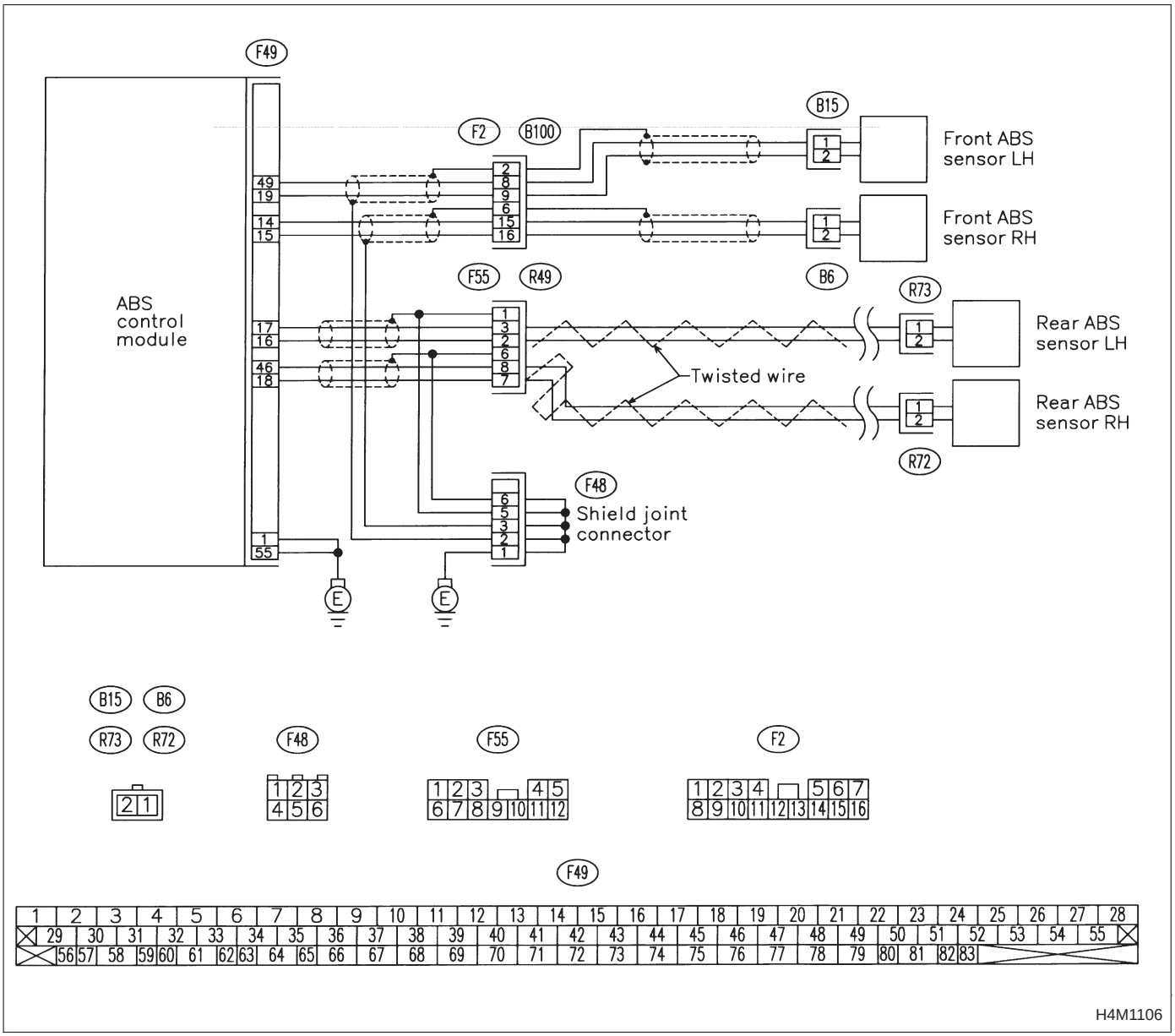
DIAGNOSIS:

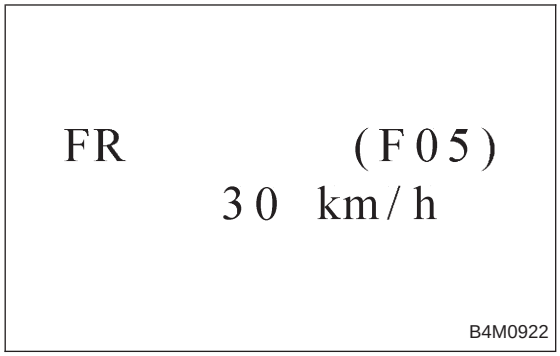
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10H1	CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.

Read the ABS sensor output corresponding to the faulty system in the select monitor function mode.

NOTE:
The select monitor display shows that the front right wheel is rotating at 30 km/h.

CHECK ***: Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?***

YES : Go to step **10H2**.

NO : Go to step **10H9**.

10H2	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **10H3**.

NO : Tighten ABS sensor installation bolts securely.

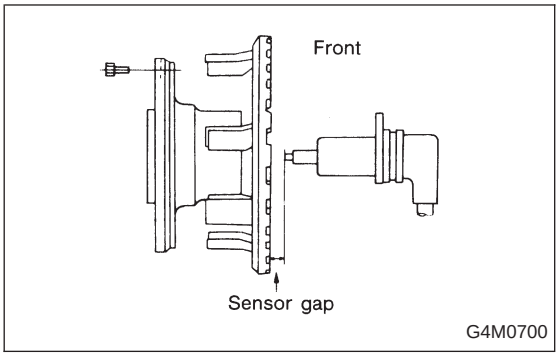
10H3	CHECK INSTALLATION OF TONE WHEEL.

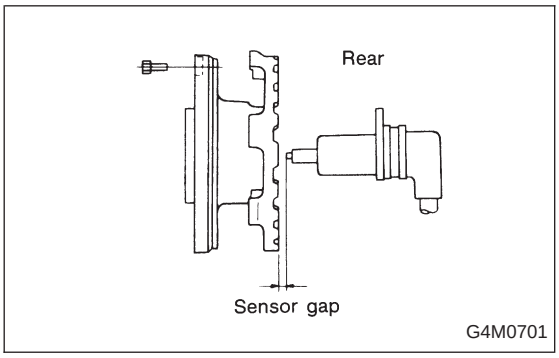
Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **10H4**.

NO : Tighten tone wheel installation bolts securely.





10H4	CHECK ABS SENSOR GAP.

Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

Specifications	Front wheel	Rear wheel
	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES : Go to step **10H5**.

NO : Adjust the gap.

NOTE:
Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

10H5	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **10H6**.

NO : Repair hub.

10H6	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10H7**.

10H7	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10H8**.

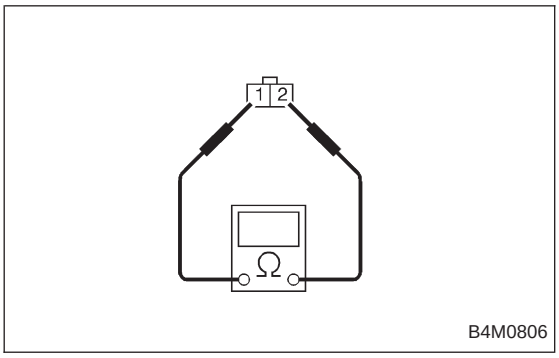
10H8	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

NOTE:
Check harness and connectors between ABSCM and ABS sensor.



10H9	CHECK RESISTANCE OF ABS SENSOR.

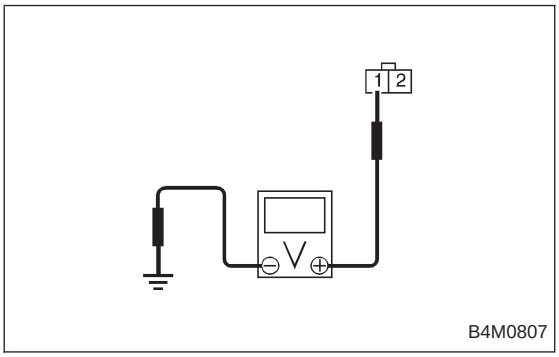
1) Turn ignition switch to OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance of ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***

YES : Go to step **10H10**.

NO : Replace ABS sensor.



10H10	CHECK BATTERY SHORT OF ABS SENSOR.

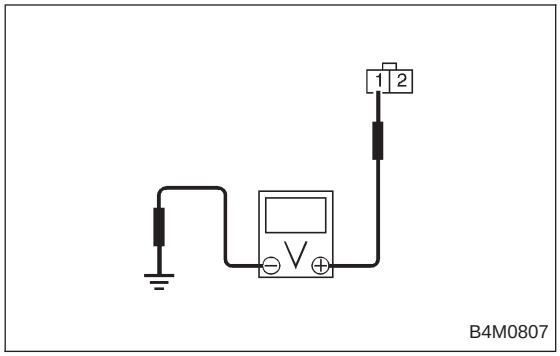
1) Disconnect connector from ABSCM.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (−):
Front LH No. 1 (+) — Chassis ground (−):
Rear RH No. 1 (+) — Chassis ground (−):
Rear LH No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10H11**.

NO : Replace ABS sensor.

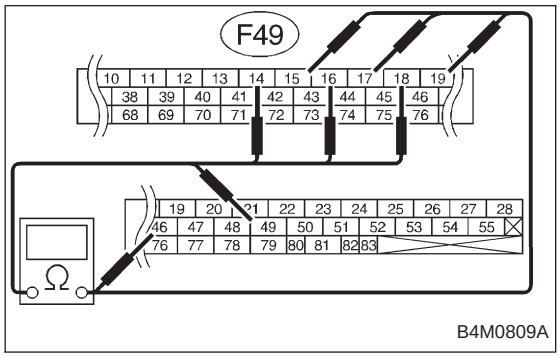


10H11	CHECK BATTERY SHORT OF ABS SENSOR.

1) Turn ignition switch to ON.
2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (−):
Front LH No. 1 (+) — Chassis ground (−):
Rear RH No. 1 (+) — Chassis ground (−):
Rear LH No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10H12**.
NO : Replace ABS sensor.

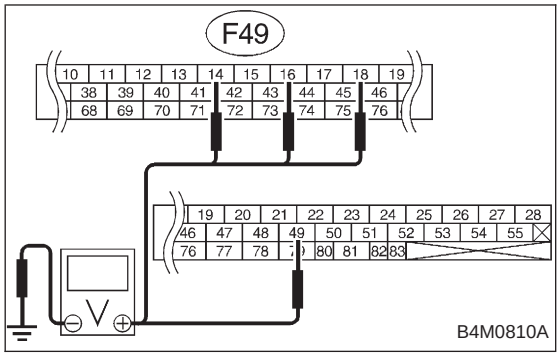


10H12	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

1) Connect connector to ABS sensor.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 21 / (F49) No. 14 — No. 15:
Trouble code 23 / (F49) No. 49 — No. 19:
Trouble code 25 / (F49) No. 18 — No. 46:
Trouble code 27 / (F49) No. 16 — No. 17:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **10H13**.
NO : Repair harness/connector between ABSCM and ABS sensor.



10H13	CHECK BATTERY SHORT OF HARNESS.

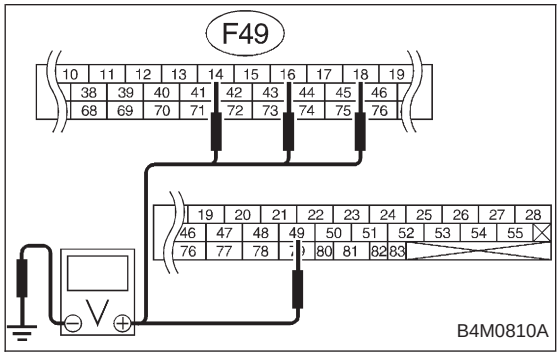
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 — Chassis ground:
Trouble code 23 / (F49) No. 49 — Chassis ground:
Trouble code 25 / (F49) No. 18 — Chassis ground:
Trouble code 27 / (F49) No. 16 — Chassis ground:

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10H14**.

NO : Repair harness between ABSCM and ABS sensor.



10H14	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 21 / (F49) No. 14 — Chassis ground:
Trouble code 23 / (F49) No. 49 — Chassis ground:
Trouble code 25 / (F49) No. 18 — Chassis ground:
Trouble code 27 / (F49) No. 16 — Chassis ground:

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10H15**.

NO : Repair harness between ABSCM and ABS sensor.

10H15	CHECK INSTALLATION OF ABS SENSOR.

CHECK ***: Tightening torque:***
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)
Are the ABS sensor installation bolts tightened securely?

YES : Go to step **10H16**.

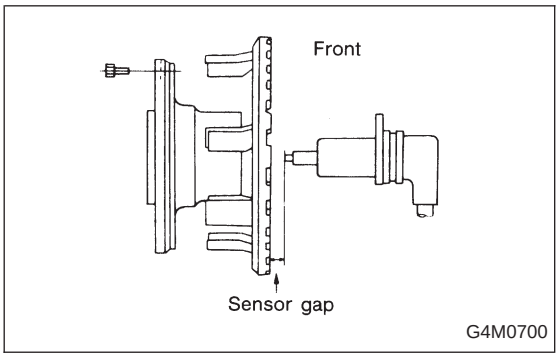
NO : Tighten ABS sensor installation bolts securely.

10H16	CHECK INSTALLATION OF TONE WHEEL.

CHECK : ***Tightening torque:***
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)
Are the tone wheel installation bolts tightened securely?

YES : Go to step **10H17**.

NO : Tighten tone wheel installation bolts securely.

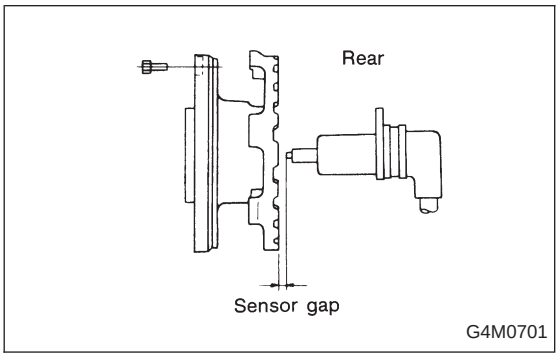


10H17	CHECK ABS SENSOR GAP.

Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

CHECK : ***Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)



YES : Go to step **10H18**.

NO : Adjust the gap.

NOTE:
Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

10H18	CHECK HUB RUNOUT.

Measure hub runout.

CHECK : ***Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **10H19**.

NO : Repair hub.

10H19	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10H20**.

10H20	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10H21**.

10H21	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

NOTE:
Check harness and connectors between ABSCM and ABS sensor.



I: TROUBLE CODE 22 FR. SS SOFT — ABNORMAL FRONT RH ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —



J: TROUBLE CODE 24 FL. SS SOFT — ABNORMAL FRONT LH ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —



K: TROUBLE CODE 26 RR. SS SOFT — ABNORMAL REAR RH ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —



L: TROUBLE CODE 28 RL. SS SOFT — ABNORMAL REAR LH ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —

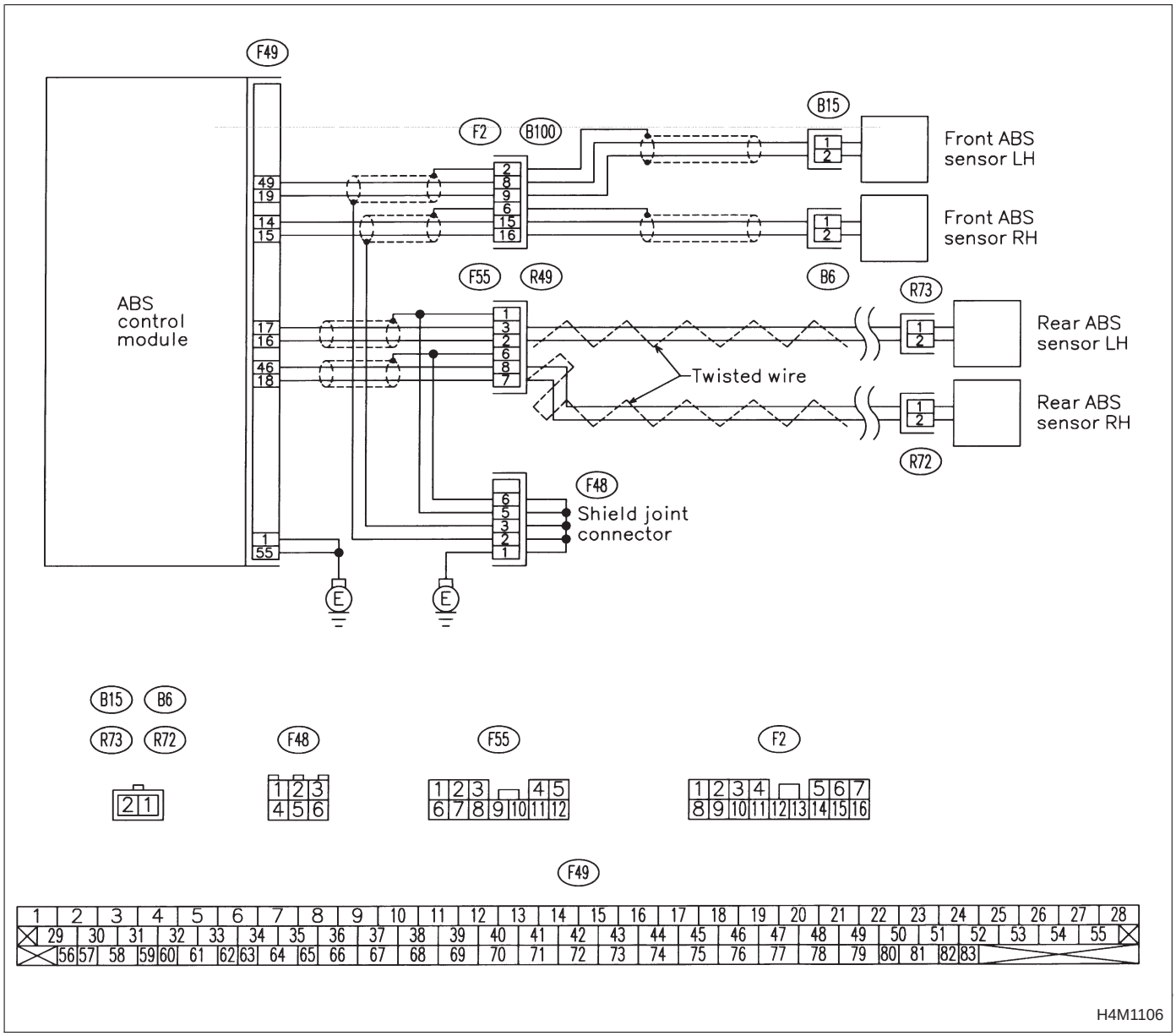
DIAGNOSIS:

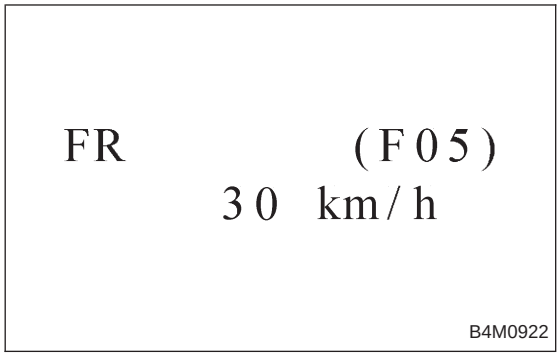
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10L1	CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.

Read the ABS sensor output corresponding to the faulty system in the select monitor function mode.

NOTE:
The select monitor display shows that the front right wheel is rotating at 30 km/h.

CHECK ***: Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?***

YES : Go to step **10L2**.

NO : Go to step **10L8**.

10L2	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connectors between ABSCM and ABS sensor?***

YES : Repair connector.

NO : Go to step **10L3**.

10L3	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Is the car telephone or the wireless transmitter properly installed?***

YES : Go to step **10L4**.

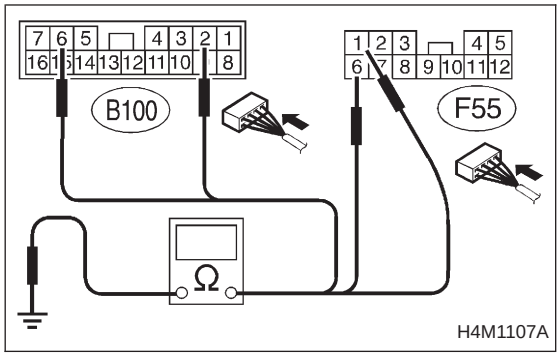
NO : Properly install the car telephone or the wireless transmitter.

10L4	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Are noise sources (such as an antenna) installed near the sensor harness?***

YES : Install the noise sources apart from the sensor harness.

NO : Go to step **10L5**.



10L5	CHECK SHIELD CIRCUIT.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Measure resistance between shield connector and chassis ground.

Connector & terminal
Trouble code 22 / (B100) No. 6 — Chassis ground:
Trouble code 24 / (B100) No. 2 — Chassis ground:
Trouble code 26 / (F55) No. 6 — Chassis ground:
Trouble code 28 / (F55) No. 1 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10L6**.
NO : Repair shield harness.

10L6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **10L7**.

10L7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary noise interference.

10L8	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***
YES : Go to step **10L9**.
NO : Tighten ABS sensor installation bolts securely.

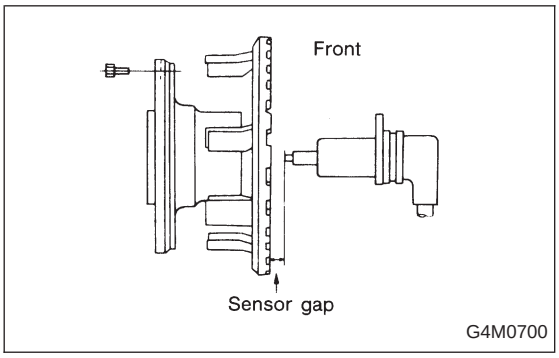
10L9	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **10L10**.

NO : Tighten tone wheel installation bolts securely.

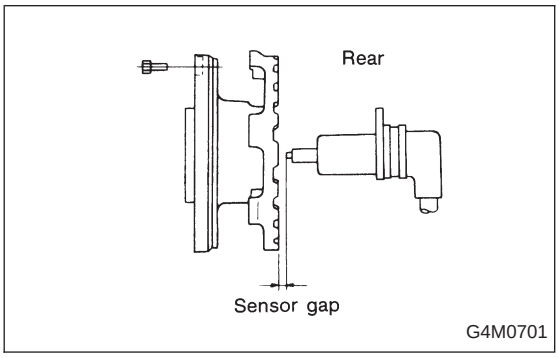


10L10	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)



YES : Go to step **10L11**.

NO : Adjust the gap.

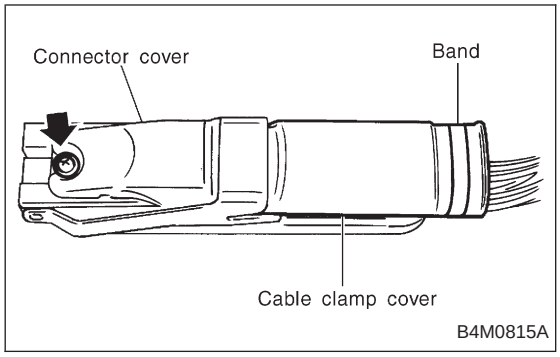
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

10L11	CHECK OSCILLOSCOPE.

CHECK ***: Is an oscilloscope available?***

YES : Go to step **10L12**.

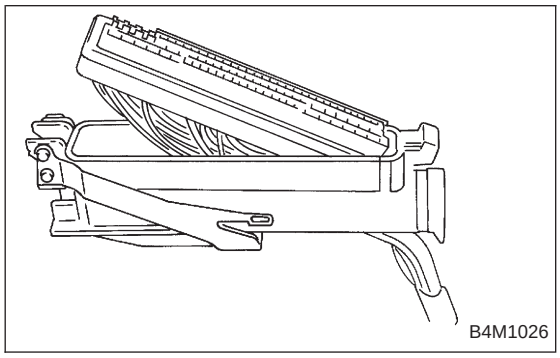
NO : Go to step **10L13**.



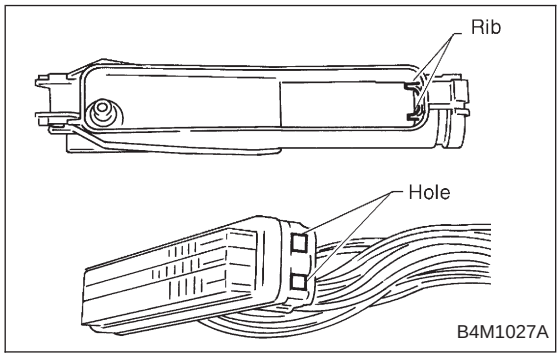
10L12	CHECK ABS SENSOR SIGNAL.

1) Turn ignition switch OFF.
2) Raise all four wheels of ground.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

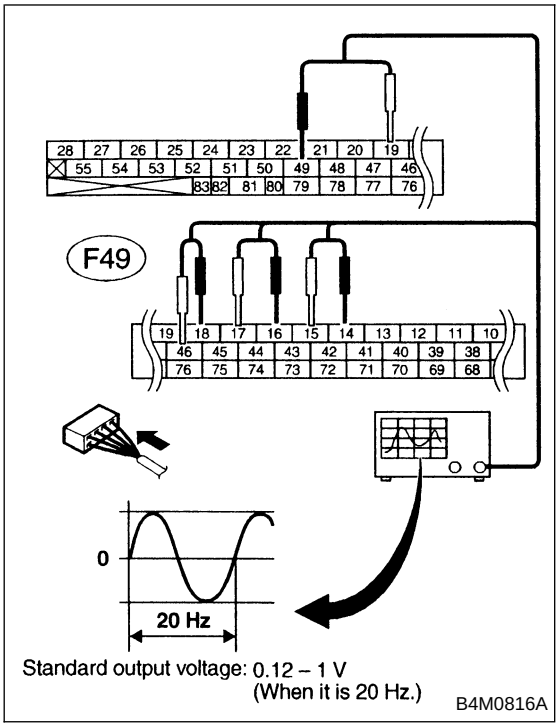


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
Trouble code 22 / (F49) No. 14 (+) — No. 15 (−):
Trouble code 24 / (F49) No. 49 (+) — No. 19 (−):
Trouble code 26 / (F49) No. 18 (+) — No. 46 (−):
Trouble code 28 / (F49) No. 16 (+) — No. 17 (−):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK ***: Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **10L16**.
NO : Go to step **10L13**.

10L13	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor or drum from hub in accordance with trouble code.

CHECK ***: Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.
NO : Go to step **10L14**.

10L14	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK ***: Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?***

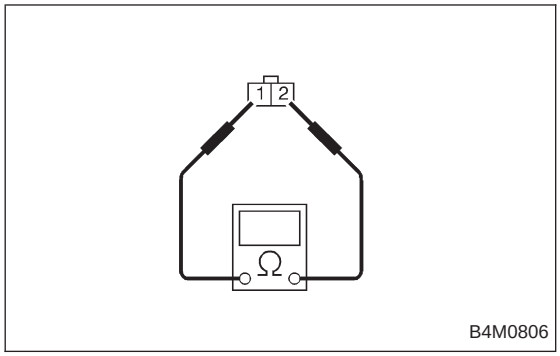
YES : Replace ABS sensor or tone wheel.
NO : Go to step **10L15**.

10L15	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **10L16**.
NO : Repair hub.

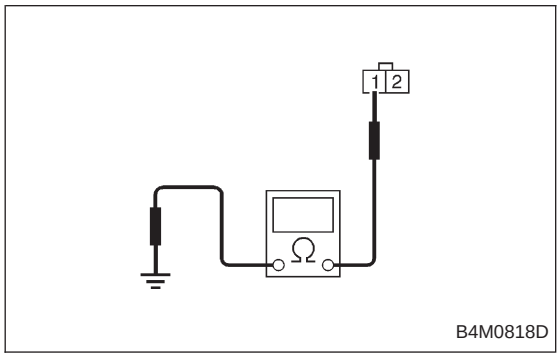


10L16	CHECK RESISTANCE OF ABS SENSOR.

1) Turn ignition switch OFF.
2) Disconnect connector from ABS sensor.
3) Measure resistance between ABS sensor connector terminals.

Terminal
Front RH No. 1 — No. 2:
Front LH No. 1 — No. 2:
Rear RH No. 1 — No. 2:
Rear LH No. 1 — No. 2:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***
YES : Go to step **10L17**.
NO : Replace ABS sensor.

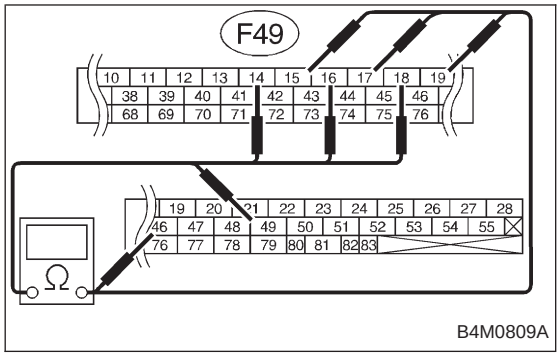


10L17	CHECK GROUND SHORT OF ABS SENSOR.

Measure resistance between ABS sensor and chassis ground.

Terminal
Front RH No. 1 — Chassis ground:
Front LH No. 1 — Chassis ground:
Rear RH No. 1 — Chassis ground:
Rear LH No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10L18**.
NO : Replace ABS sensor.



10L18	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

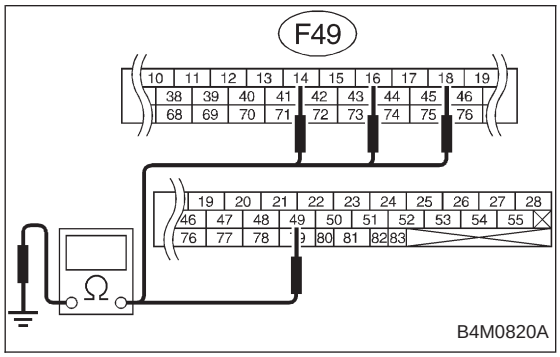
1) Connect connector to ABS sensor.
2) Disconnect connector from ABSCM.
3) Measure resistance at ABSCM connector terminals.

Connector & terminal
Trouble code 22 / (F49) No. 14 — No. 15:
Trouble code 24 / (F49) No. 49 — No. 69:
Trouble code 26 / (F49) No. 18 — No. 46:
Trouble code 28 / (F49) No. 16 — No. 17:

CHECK ***: Is the resistance between 0.8 and 1.2 kΩ?***

YES : Go to step **10L19**.

NO : Repair harness/connector between ABSCM and ABS sensor.



10L19	CHECK GROUND SHORT OF HARNESS.

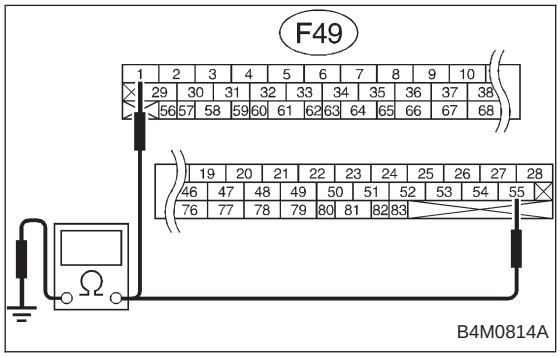
Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 22 / (F49) No. 14 — Chassis ground:
Trouble code 24 / (F49) No. 49 — Chassis ground:
Trouble code 26 / (F49) No. 18 — Chassis ground:
Trouble code 28 / (F49) No. 16 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10L20**.

NO : Repair harness between ABSCM and ABS sensor.



10L20	CHECK GROUND CIRCUIT OF ABSCM.

Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **10L21**.

NO : Repair ABSCM ground harness.

10L21	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10L22**.

10L22	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Is the car telephone or the wireless transmitter properly installed?***

YES : Go to step **10L23**.

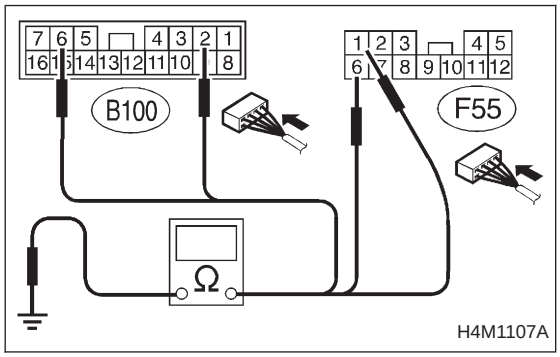
NO : Properly install the car telephone or the wireless transmitter.

10L23	CHECK SOURCES OF SIGNAL NOISE.

CHECK : ***Are noise sources (such as an antenna) installed near the sensor harness?***

YES : Install the noise sources apart from the sensor harness.

NO : Go to step **10L24.**



10L24	CHECK SHIELD CIRCUIT.

1) Connect all connectors.
2) Measure resistance between shield connector and chassis ground.

Connector & terminal
Trouble code 22 / (B100) No. 6 — Chassis ground:
Trouble code 24 / (B100) No. 2 — Chassis ground:
Trouble code 26 / (F55) No. 6 — Chassis ground:
Trouble code 28 / (F55) No. 1 — Chassis ground:

CHECK : ***Is the resistance less than 0.5 Ω?***

YES : Go to step **10L25**.

NO : Repair shield harness.

10L25	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10L26**.

10L26	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary noise interference.

D•NEW 29 (FB1)
EITHER. SS SOFT

B4M0952

M: TROUBLE CODE 29 EITHER. SS SOFT — ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —

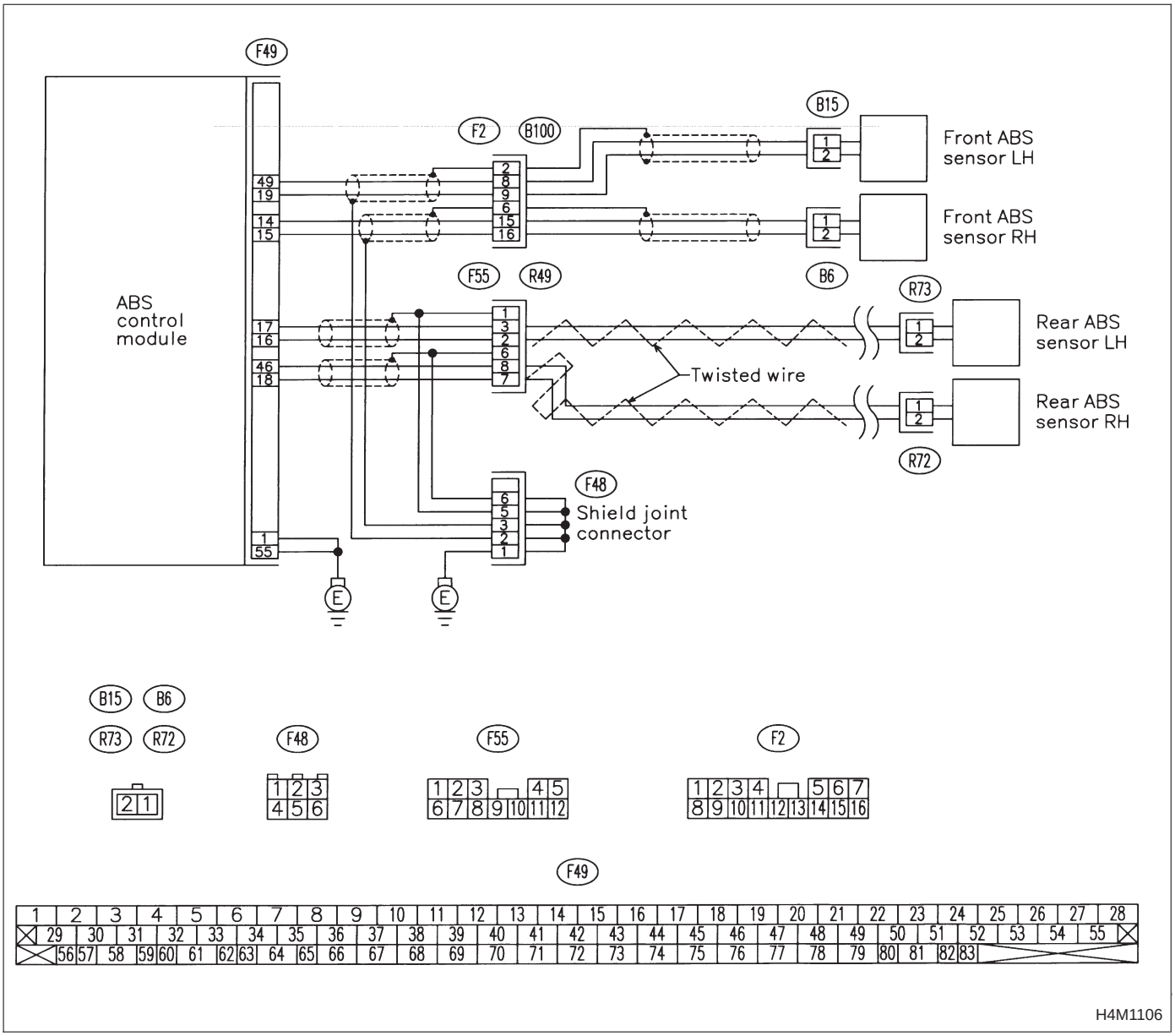
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1106

10M1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.

CHECK : ***Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.***

YES : The ABS is normal. Erase the trouble code.

NOTE:
When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.

NO : Go to step **10M2**.

10M2	CHECK TIRE SPECIFICATIONS.

Turn ignition switch to OFF.

CHECK ***: Are the tire specifications correct?***

YES : Go to step **10M3**.

NO : Replace tire.

10M3	CHECK WEAR OF TIRE.

CHECK ***: Is the tire worn excessively?***

YES : Replace tire.

NO : Go to step **10M4**.

10M4	CHECK TIRE PRESSURE.

CHECK ***: Is the tire pressure correct?***

YES : Go to step **10M5**.

NO : Adjust tire pressure.

10M5	CHECK INSTALLATION OF ABS SENSOR.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Are the ABS sensor installation bolts tightened securely?***

YES : Go to step **10M6**.

NO : Tighten ABS sensor installation bolts securely.

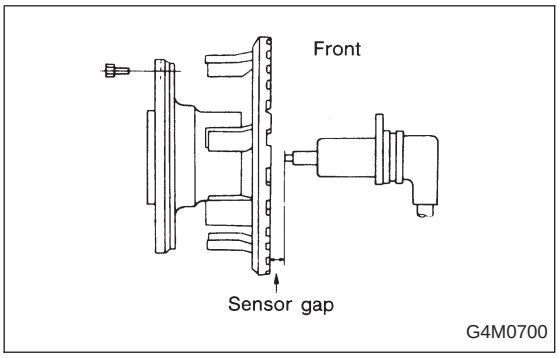
10M6	CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
13±3 N·m (1.3±0.3 kg-m, 9±2.2 ft-lb)

CHECK ***: Are the tone wheel installation bolts tightened securely?***

YES : Go to step **10M7**.

NO : Tighten tone wheel installation bolts securely.

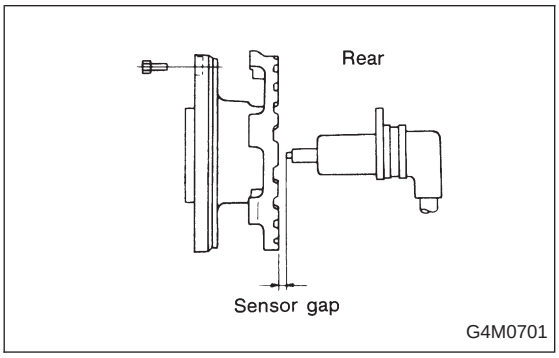


10M7	CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK ***: Is the gap within the specifications shown in the following table?***

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)



YES : Go to step **10M8**.

NO : Adjust the gap.

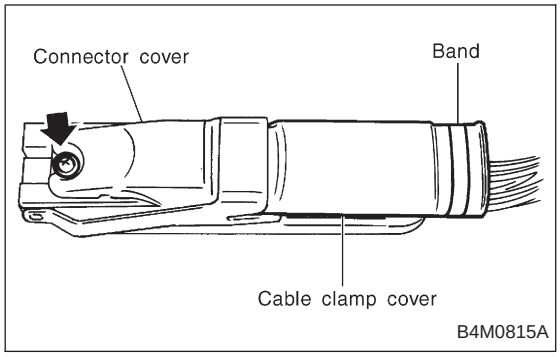
NOTE:
Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

10M8	CHECK OSCILLOSCOPE.

CHECK ***: Is an oscilloscope available?***

YES : Go to step **10M9**.

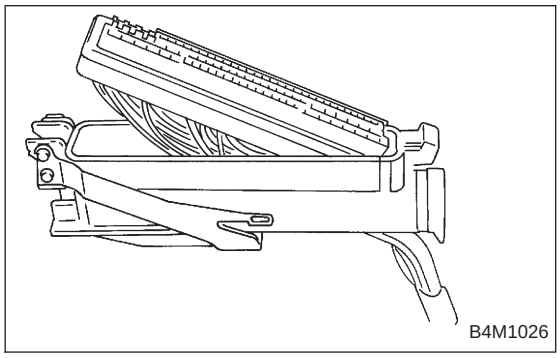
NO : Go to step **10M10**.



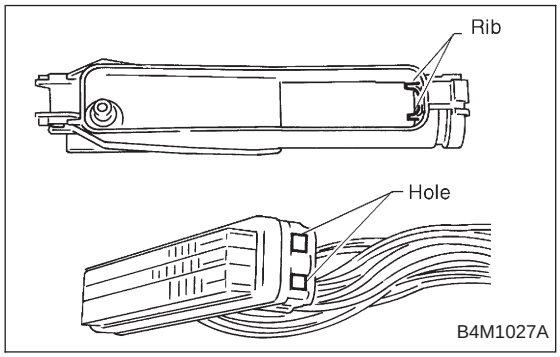
10M9	CHECK ABS SENSOR SIGNAL.

1) Turn ignition switch OFF.
2) Raise all four wheels of ground.
3) Disconnect connector from ABS control module.
4) Remove band.
5) Remove cable clamp cover.
6) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

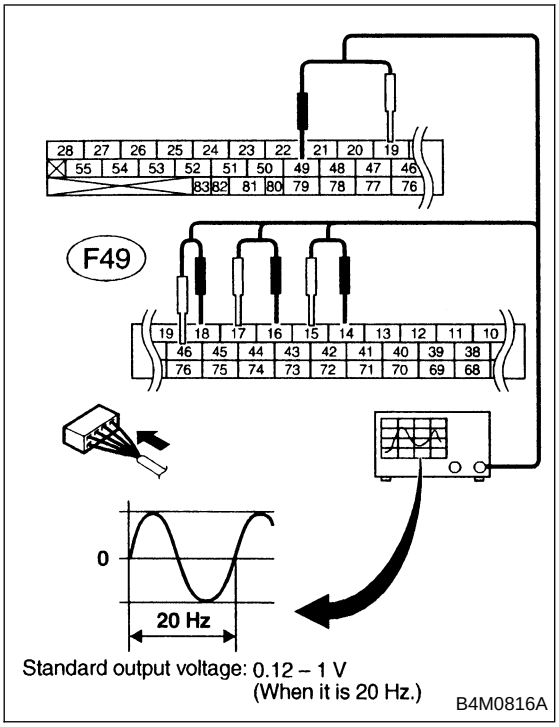


7) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.
9) Connect the oscilloscope to the ABS control module connector.
10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:
When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal
(F49) No. 14 (+) — No. 15 (−) (Front RH):
(F49) No. 49 (+) — No. 19 (−) (Front LH):
(F49) No. 18 (+) — No. 46 (−) (Rear RH):
(F49) No. 16 (+) — No. 17 (−) (Rear LH):
Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK ***: Is oscilloscope pattern smooth, as shown in figure?***

YES : Go to step **10M13**.
NO : Go to step **10M10**.

10M10	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor from hub.

CHECK ***: Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?***

YES : Thoroughly remove dirt or other foreign matter.
NO : Go to step **10M11**.

10M11	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK ***: Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?***

YES : Replace ABS sensor or tone wheel.
NO : Go to step **10M12**.

10M12	CHECK HUB RUNOUT.

Measure hub runout.

CHECK ***: Is the runout less than 0.05 mm (0.0020 in)?***

YES : Go to step **10M13**.
NO : Repair hub.

10M13	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10M14**.

10M14	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

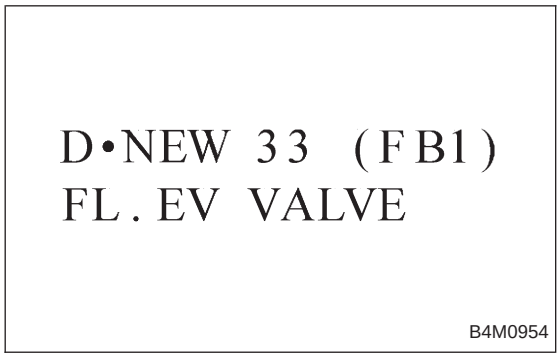
CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

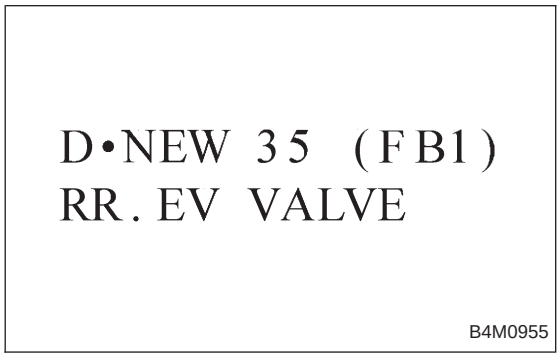
NO : A temporary poor contact.



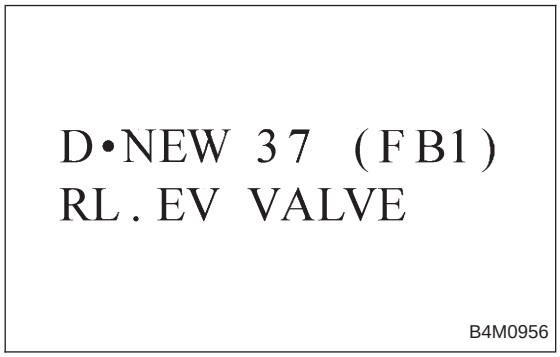
N: TROUBLE CODE 31 FR. EV VALVE — ABNORMAL FRONT RH INLET SOLENOID VALVE —



O: TROUBLE CODE 33 FL. EV VALVE — ABNORMAL FRONT LH INLET SOLENOID VALVE —



P: TROUBLE CODE 35 RR. EV VALVE — ABNORMAL REAR RH INLET SOLENOID VALVE —



Q: TROUBLE CODE 37 RL. EV VALVE — ABNORMAL REAR LH INLET SOLENOID VALVE —

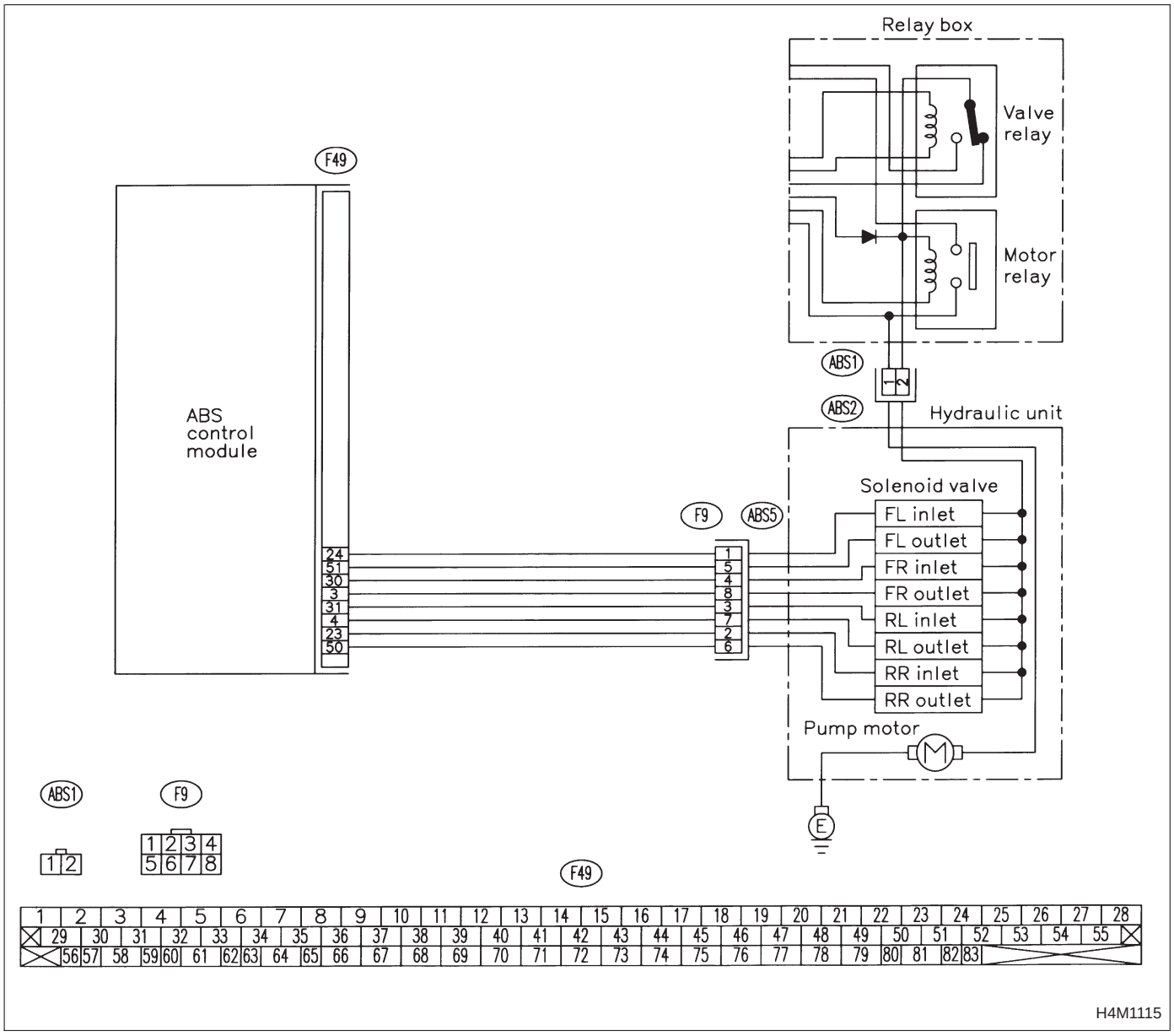
DIAGNOSIS:

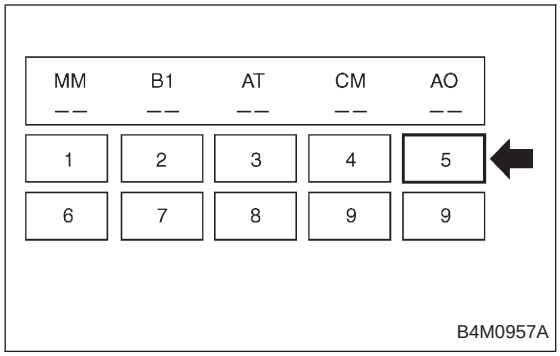
- Faulty harness/connector
- Faulty inlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10Q1	CHECK FREEZE FRAME DATA.

Press [F], [E], [1] and [5] on the select monitor.

CHECK : ***Is the select monitor LED 5 off? Was the ABS inactive when the problem occurred?***

YES : Go to step **10Q2**.

NO : Go to step **10Q15**.

10Q2	CHECK THE CONDITION WHEN THE TROUBLE OCCURRED.

Ask the vehicle owner about driving conditions when the trouble occurred. Attempt to duplicate the conditions.

CHECK : ***Is the trouble immediately apparent?***

YES : Go to step **10Q3**.

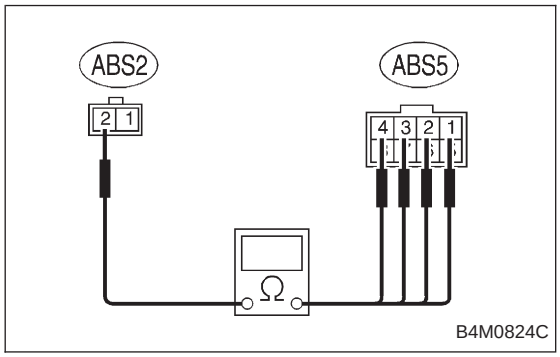
NO : Go to step **10Q15**.

10Q3	CHECK THE CONDITION WHEN THE TROUBLE OCCURRED.

CHECK : ***Did the trouble occur immediately after engine starting or during standing starts?***

YES : Go to step **10Q11**.

NO : Go to step **10Q4**.



10Q4	CHECK RESISTANCE OF SOLENOID VALVE.

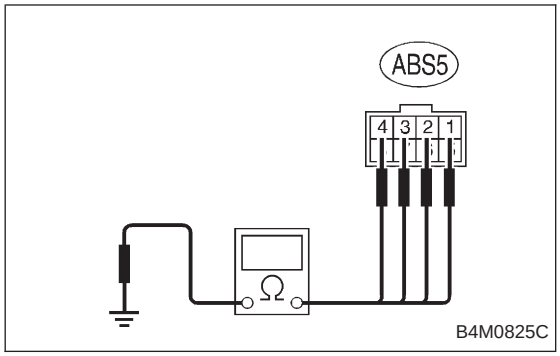
1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — (ABS2) No. 2:
Trouble code 33 / (ABS5) No. 1 — (ABS2) No. 2:
Trouble code 35 / (ABS5) No. 2 — (ABS2) No. 2:
Trouble code 37 / (ABS5) No. 3 — (ABS2) No. 2:

CHECK : ***Is the resistance between 7.8 and 9.2 Ω?***

YES : Go to step **10Q5**.

NO : Replace hydraulic unit.



10Q5	CHECK GROUND SHORT OF SOLENOID VALVE.

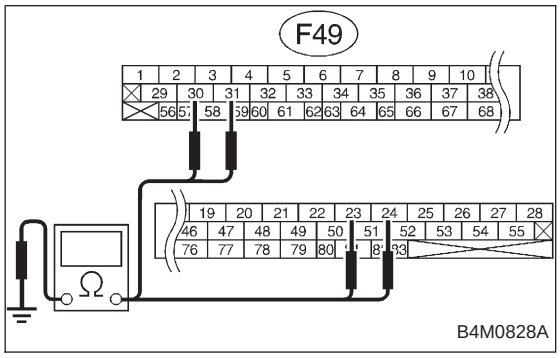
Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — Chassis ground:
Trouble code 33 / (ABS5) No. 1 — Chassis ground:
Trouble code 35 / (ABS5) No. 2 — Chassis ground:
Trouble code 37 / (ABS5) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10Q6**.

NO : Replace hydraulic unit.



10Q6	CHECK GROUND SHORT OF HARNESS.

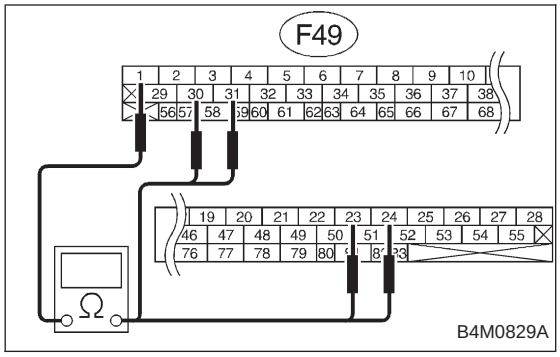
1) Disconnect connector from ABSCM.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 — Chassis ground:
Trouble code 33 / (F49) No. 24 — Chassis ground:
Trouble code 35 / (F49) No. 23 — Chassis ground:
Trouble code 37 / (F49) No. 31 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10Q7**.

NO : Repair harness between ABSCM and hydraulic unit.



10Q7	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 31 / (F49) No. 30 — No. 1:
Trouble code 33 / (F49) No. 24 — No. 1:
Trouble code 35 / (F49) No. 23 — No. 1:
Trouble code 37 / (F49) No. 31 — No. 1:

CHECK ***: Is the resistance between 8.3 and 9.7 Ω?***
YES : Go to step **10Q8**.
NO : Repair harness/connector between ABSCM and hydraulic unit.

10Q8	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **10Q9**.

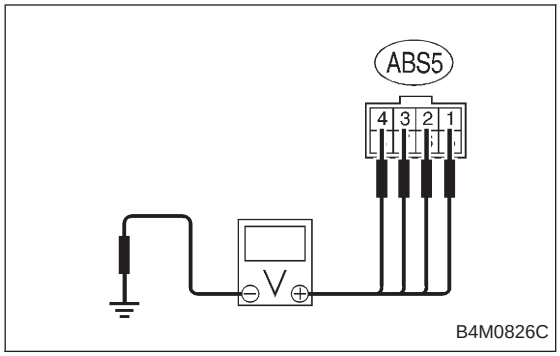
10Q9	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **10Q10**.

10Q10	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

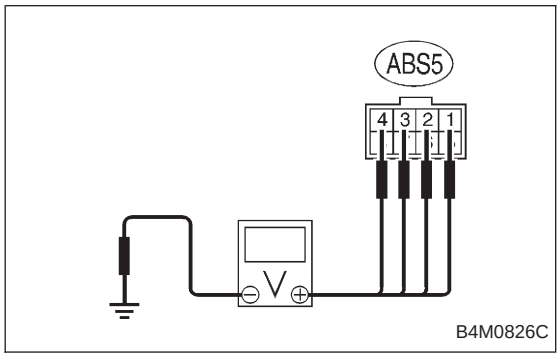


10Q11	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Disconnect connector from ABSCM.
4) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10Q12**.
NO : Replace hydraulic unit.

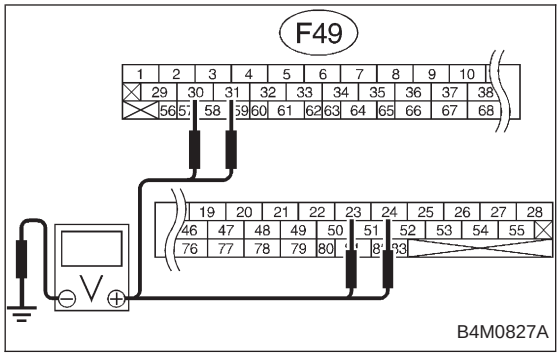


10Q12	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10Q13**.
NO : Replace hydraulic unit.



10Q13	CHECK BATTERY SHORT OF HARNESS.

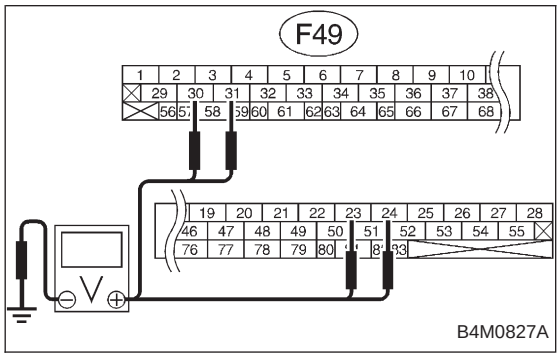
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Q14**.

NO : Repair harness between ABSCM and hydraulic unit.



10Q14	CHECK BATTERY SHORT OF HARNESS.

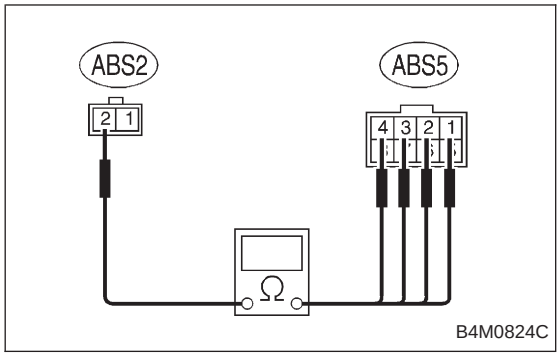
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Replace ABSCM.

NO : Repair harness between ABSCM and hydraulic unit.

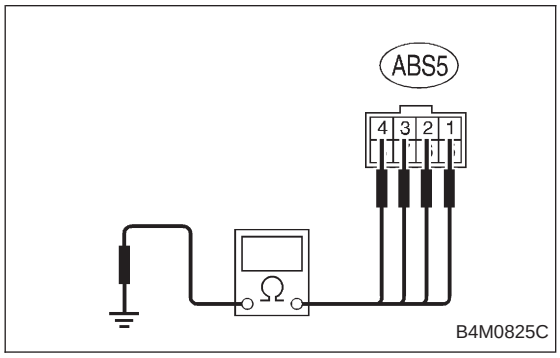


10Q15	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — (ABS2) No. 2:
Trouble code 33 / (ABS5) No. 1 — (ABS2) No. 2:
Trouble code 35 / (ABS5) No. 2 — (ABS2) No. 2:
Trouble code 37 / (ABS5) No. 3 — (ABS2) No. 2:

CHECK ***: Is the resistance between 7.8 and 9.2 Ω?***
YES : Go to step **10Q16**.
NO : Replace hydraulic unit.

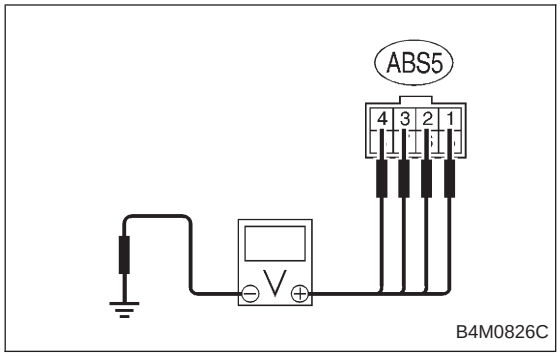


10Q16	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — Chassis ground:
Trouble code 33 / (ABS5) No. 1 — Chassis ground:
Trouble code 35 / (ABS5) No. 2 — Chassis ground:
Trouble code 37 / (ABS5) No. 3 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10Q17**.
NO : Replace hydraulic unit.

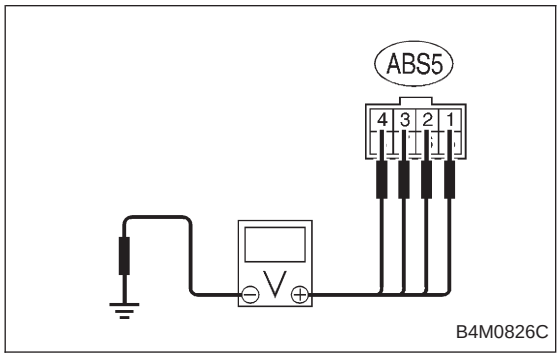


10Q17	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10Q18**.
NO : Replace hydraulic unit.

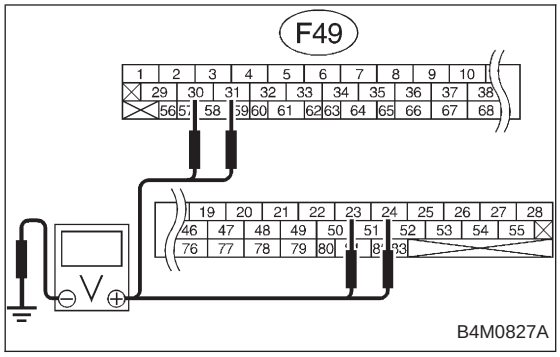


10Q18	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (−):
Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (−):
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (−):
Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10Q19**.
NO : Replace hydraulic unit.



10Q19	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Q20**.

NO : Repair harness between ABSCM and hydraulic unit.

10Q20	CHECK BATTERY SHORT OF HARNESS.

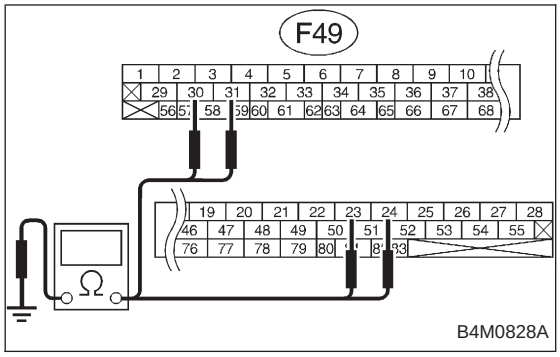
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (−):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (−):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (−):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Q21**.

NO : Repair harness between ABSCM and hydraulic unit.



10Q21	CHECK GROUND SHORT OF HARNESS.

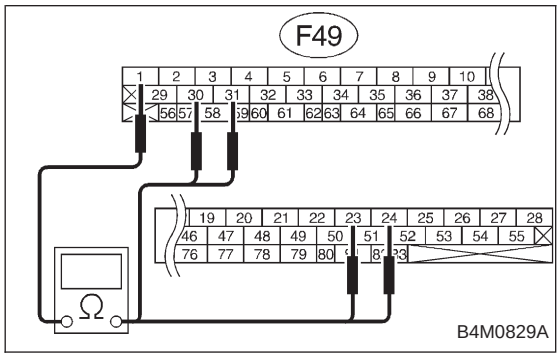
1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 — Chassis ground:
Trouble code 33 / (F49) No. 24 — Chassis ground:
Trouble code 35 / (F49) No. 23 — Chassis ground:
Trouble code 37 / (F49) No. 31 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10Q22**.

NO : Repair harness between ABSCM and hydraulic unit.



10Q22	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 31 / (F49) No. 30 — No. 1:
Trouble code 33 / (F49) No. 24 — No. 1:
Trouble code 35 / (F49) No. 23 — No. 1:
Trouble code 37 / (F49) No. 31 — No. 1:

CHECK ***: Is the resistance between 8.3 and 9.7 Ω?***

YES : Go to step **10Q23**.

NO : Repair harness/connector between ABSCM and hydraulic unit.

10Q23	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10Q24**.

10Q24	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

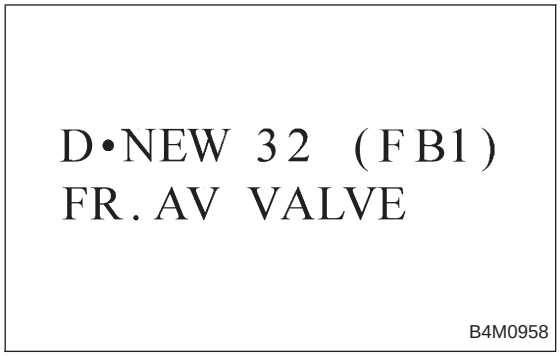
NO : Go to step **10Q25**.

10Q25	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

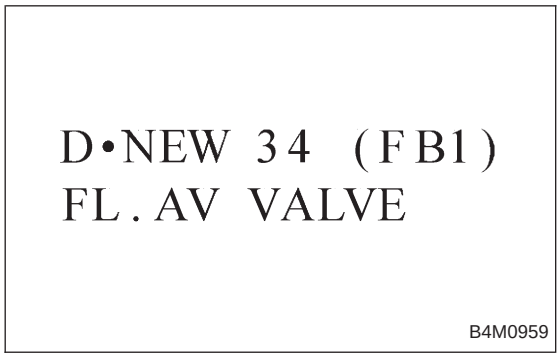
CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

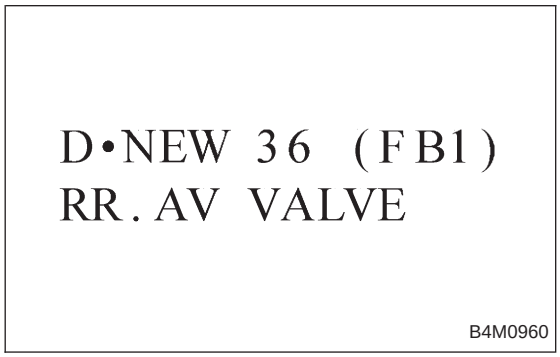
NO : A temporary poor contact.



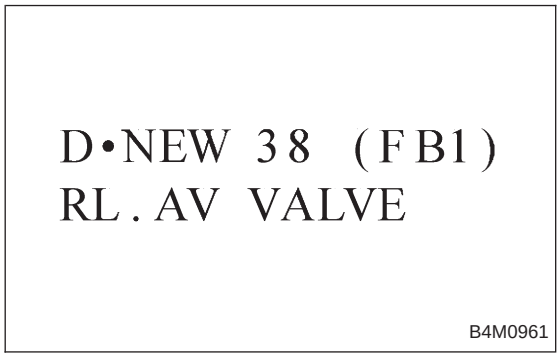
R: TROUBLE CODE 32 FR. AV VALVE — ABNORMAL FRONT RH OUTLET SOLENOID VALVE —



S: TROUBLE CODE 34 FL. AV VALVE — ABNORMAL FRONT LH OUTLET SOLENOID VALVE —



T: TROUBLE CODE 36 RR. AV VALVE — ABNORMAL REAR RH OUTLET SOLENOID VALVE —



U: TROUBLE CODE 38 RL. AV VALVE — ABNORMAL REAR LH OUTLET SOLENOID VALVE —

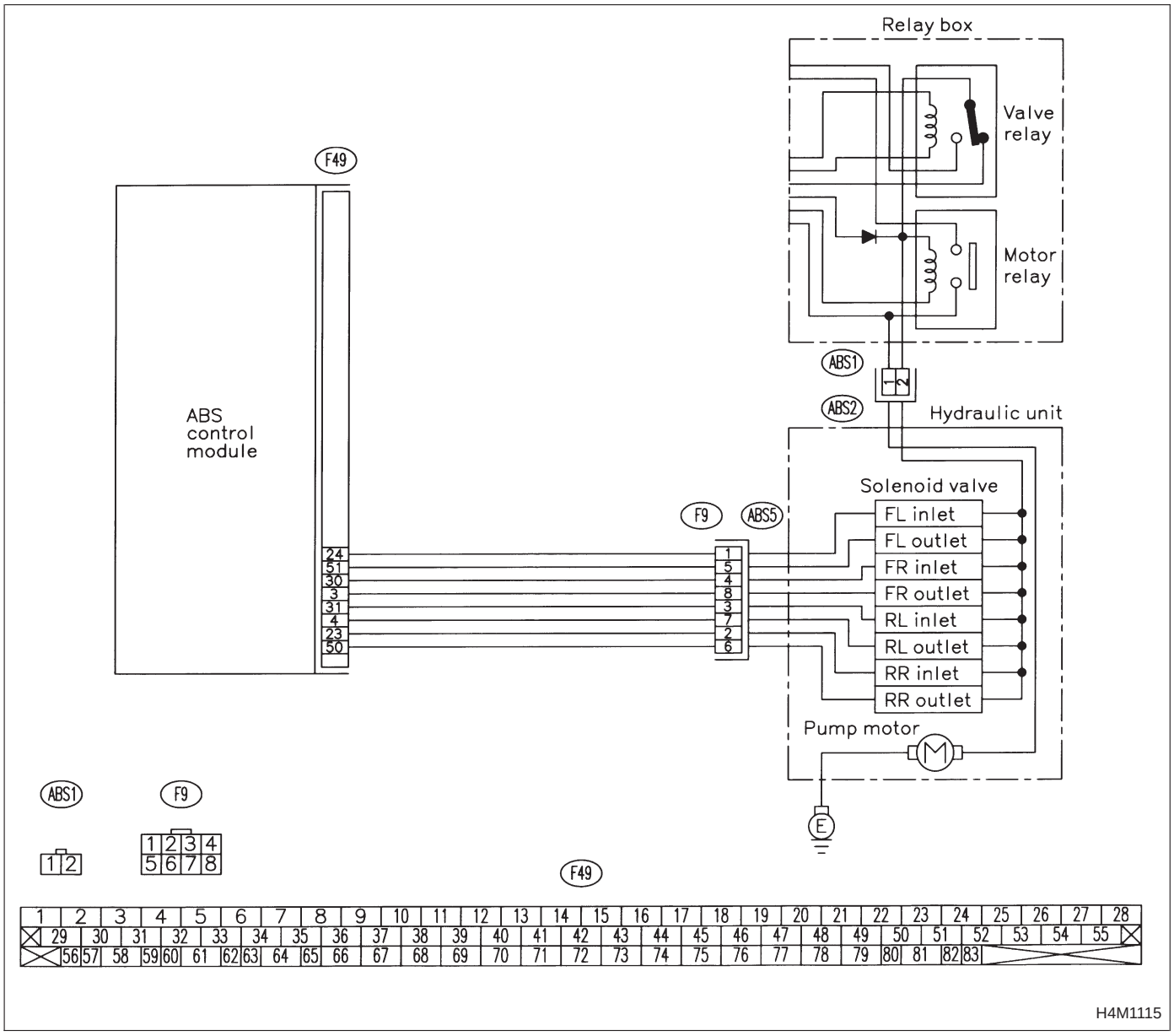
DIAGNOSIS:

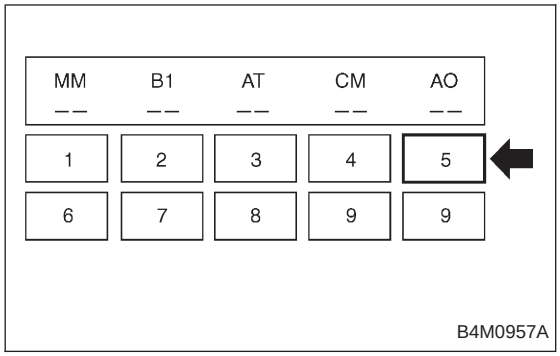
- Faulty harness/connector
- Faulty outlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10U1	CHECK FREEZE FRAME DATA.

Press [F], [E], [1] and [5] on the select monitor.

CHECK : ***Is the select monitor LED 5 off? Was the ABS inactive when the problem occurred?***

YES : Go to step **10U2**.

NO : Go to step **10U15**.

10U2	CHECK THE CONDITION WHEN THE TROUBLE OCCURRED.

Ask the vehicle owner about driving conditions when the trouble occurred. Attempt to duplicate the conditions.

CHECK : ***Is the trouble immediately apparent?***

YES : Go to step **10U3**.

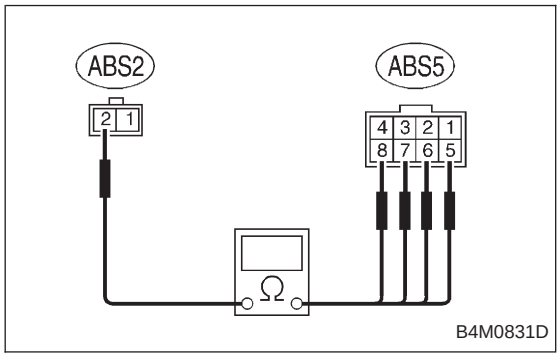
NO : Go to step **10U15**.

10U3	CHECK THE CONDITION WHEN THE TROUBLE OCCURRED.

CHECK : ***Did the trouble occur immediately after engine starting or during standing starts?***

YES : Go to step **10U11**.

NO : Go to step **10U4**.



10U4	CHECK RESISTANCE OF SOLENOID VALVE.

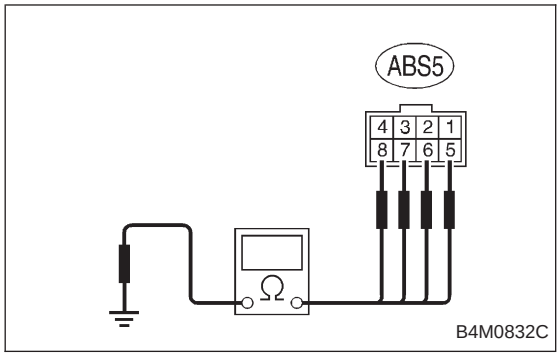
1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — (ABS2) No. 2:
Trouble code 34 / (ABS5) No. 5 — (ABS2) No. 2:
Trouble code 36 / (ABS5) No. 6 — (ABS2) No. 2:
Trouble code 38 / (ABS5) No. 7 — (ABS2) No. 2:

CHECK : ***Is the resistance between 3.8 and 4.8 Ω?***

YES : Go to step **10U5**.

NO : Replace hydraulic unit.



10U5	CHECK GROUND SHORT OF SOLENOID VALVE.

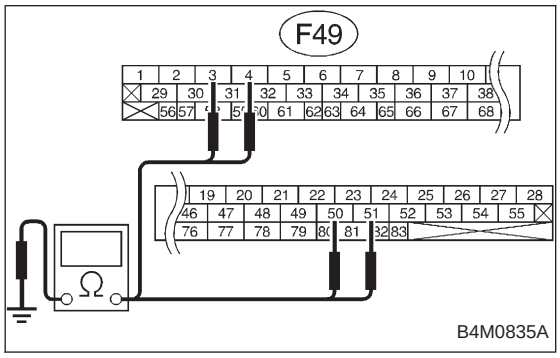
Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — Chassis ground:
Trouble code 34 / (ABS5) No. 5 — Chassis ground:
Trouble code 36 / (ABS5) No. 6 — Chassis ground:
Trouble code 38 / (ABS5) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10U6**.

NO : Replace hydraulic unit.



10U6	CHECK GROUND SHORT OF HARNESS.

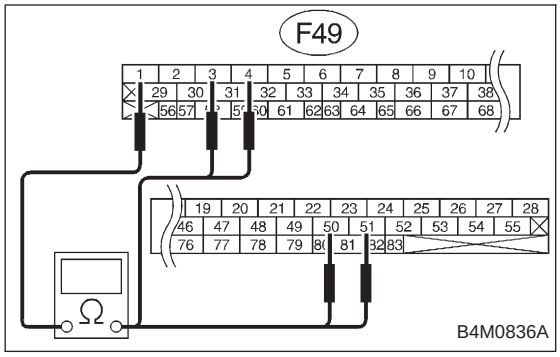
1) Disconnect connector from ABSCM.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 — Chassis ground:
Trouble code 34 / (F49) No. 51 — Chassis ground:
Trouble code 36 / (F49) No. 50 — Chassis ground:
Trouble code 38 / (F49) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10U7**.

NO : Repair harness between ABSCM and hydraulic unit.



10U7	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 32 / (F49) No. 3 — No. 1:
Trouble code 34 / (F49) No. 51 — No. 1:
Trouble code 36 / (F49) No. 50 — No. 1:
Trouble code 38 / (F49) No. 4 — No. 1:

CHECK ***: Is the resistance between 4.3 and 5.3 Ω?***
YES : Go to step **10U8**.
NO : Repair harness/connector between ABSCM and hydraulic unit.

10U8	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **10U9**.

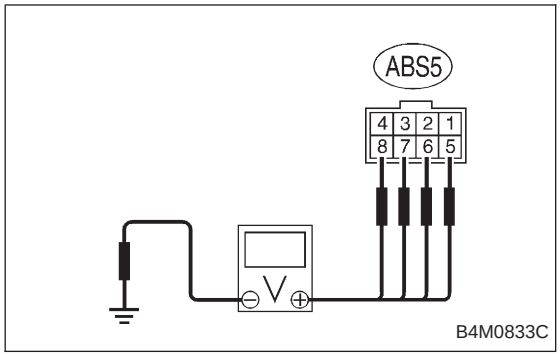
10U9	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **10U10**.

10U10	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

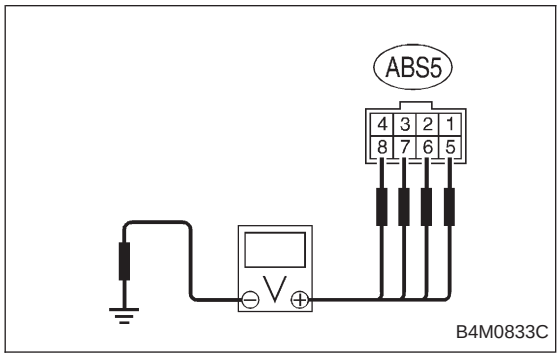


10U11	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Disconnect connector from ABSCM.
4) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10U12**.
NO : Replace hydraulic unit.

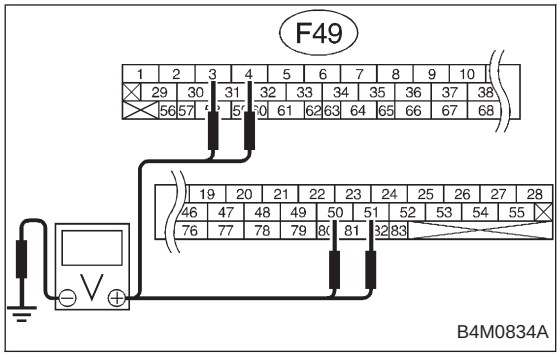


10U12	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10U13**.
NO : Replace hydraulic unit.

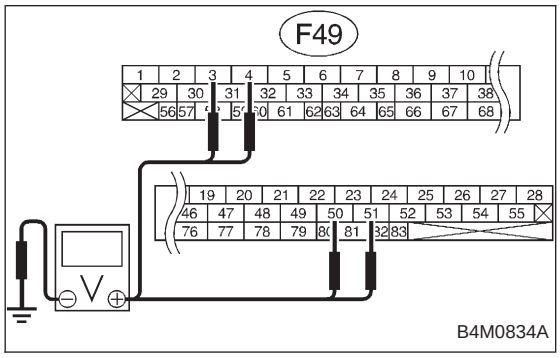


10U13	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10U14**.
NO : Repair harness between ABSCM and hydraulic unit.

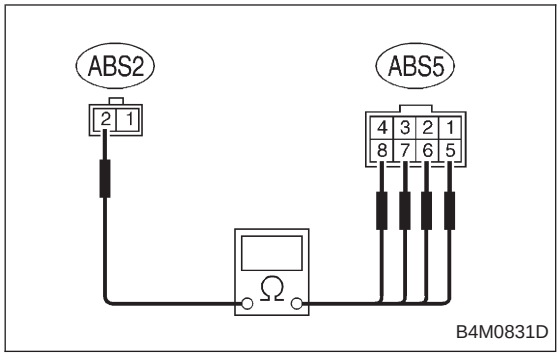


10U14	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Replace ABSCM.
NO : Repair harness between ABSCM and hydraulic unit.

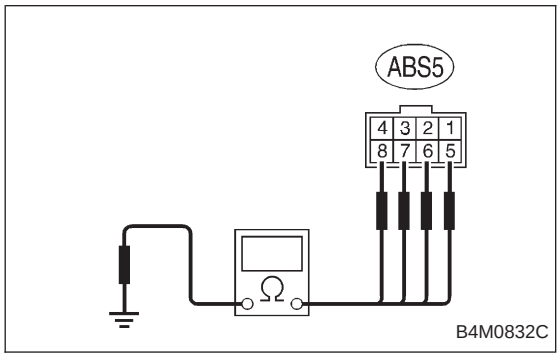


10U15	CHECK RESISTANCE OF SOLENOID VALVE.

1) Turn ignition switch to OFF.
2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — (ABS2) No. 2:
Trouble code 34 / (ABS5) No. 5 — (ABS2) No. 2:
Trouble code 36 / (ABS5) No. 6 — (ABS2) No. 2:
Trouble code 38 / (ABS5) No. 7 — (ABS2) No. 2:

CHECK ***: Is the resistance between 3.8 and 4.8 Ω?***
YES : Go to step **10U16**.
NO : Replace hydraulic unit.

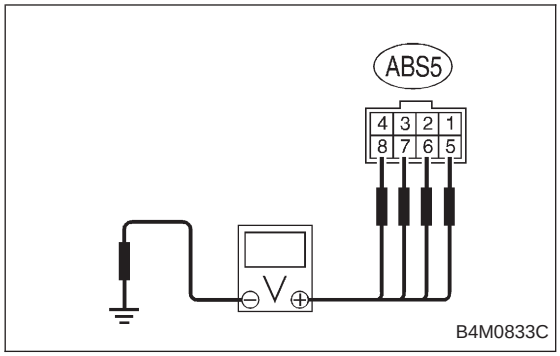


10U16	CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 — Chassis ground:
Trouble code 34 / (ABS5) No. 5 — Chassis ground:
Trouble code 36 / (ABS5) No. 6 — Chassis ground:
Trouble code 38 / (ABS5) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10U17**.
NO : Replace hydraulic unit.

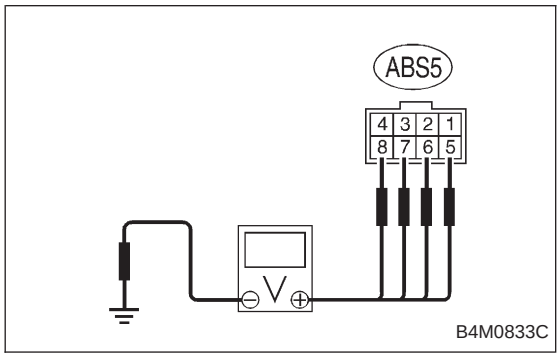


10U17	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Disconnect connector from ABSCM.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10U18**.
NO : Replace hydraulic unit.

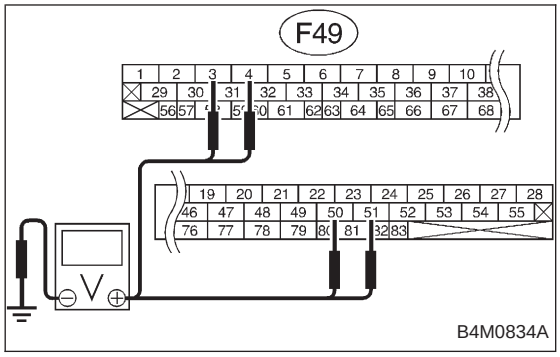


10U18	CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (−):
Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (−):
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (−):
Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10U19**.
NO : Replace hydraulic unit.



10U19	CHECK BATTERY SHORT OF HARNESS.

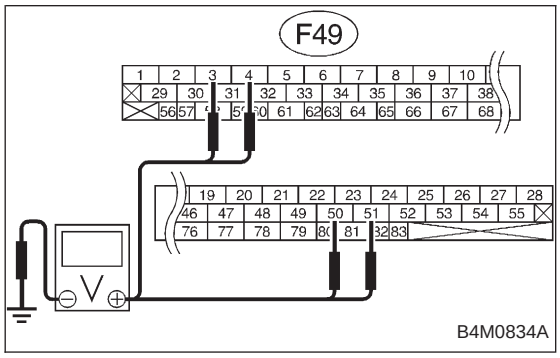
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10U20**.

NO : Repair harness between ABSCM and hydraulic unit.



10U20	CHECK BATTERY SHORT OF HARNESS.

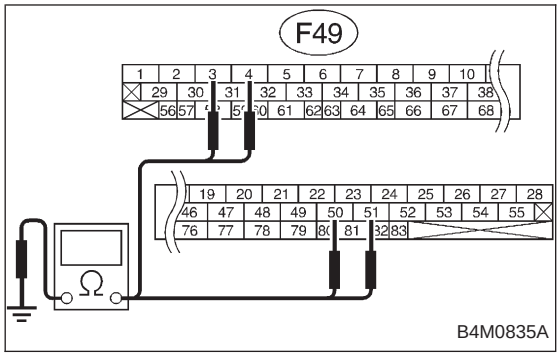
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 (+) — Chassis ground (−):
Trouble code 34 / (F49) No. 51 (+) — Chassis ground (−):
Trouble code 36 / (F49) No. 50 (+) — Chassis ground (−):
Trouble code 38 / (F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10U21**.

NO : Repair harness between ABSCM and hydraulic unit.



10U21	CHECK GROUND SHORT OF HARNESS.

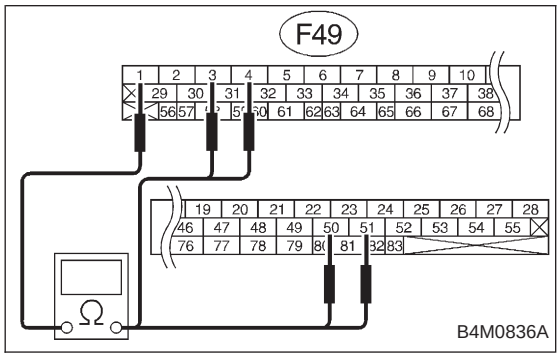
1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 32 / (F49) No. 3 — Chassis ground:
Trouble code 34 / (F49) No. 51 — Chassis ground:
Trouble code 36 / (F49) No. 50 — Chassis ground:
Trouble code 38 / (F49) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10U22**.

NO : Repair harness between ABSCM and hydraulic unit.



10U22	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 32 / (F49) No. 3 — No. 1:
Trouble code 34 / (F49) No. 51 — No. 1:
Trouble code 36 / (F49) No. 50 — No. 1:
Trouble code 38 / (F49) No. 4 — No. 1:

CHECK ***: Is the resistance between 4.3 and 5.3 Ω?***

YES : Go to step **10U23**.

NO : Repair harness/connector between ABSCM and hydraulic unit.

10U23	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10U24**.

10U24	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

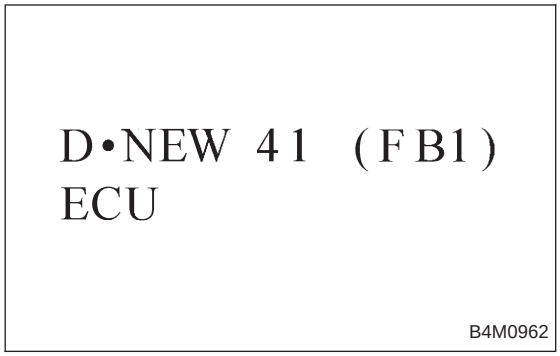
NO : Go to step **10U25**.

10U25	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



V: TROUBLE CODE 41 ECU — ABNORMAL ABS CONTROL MODULE —

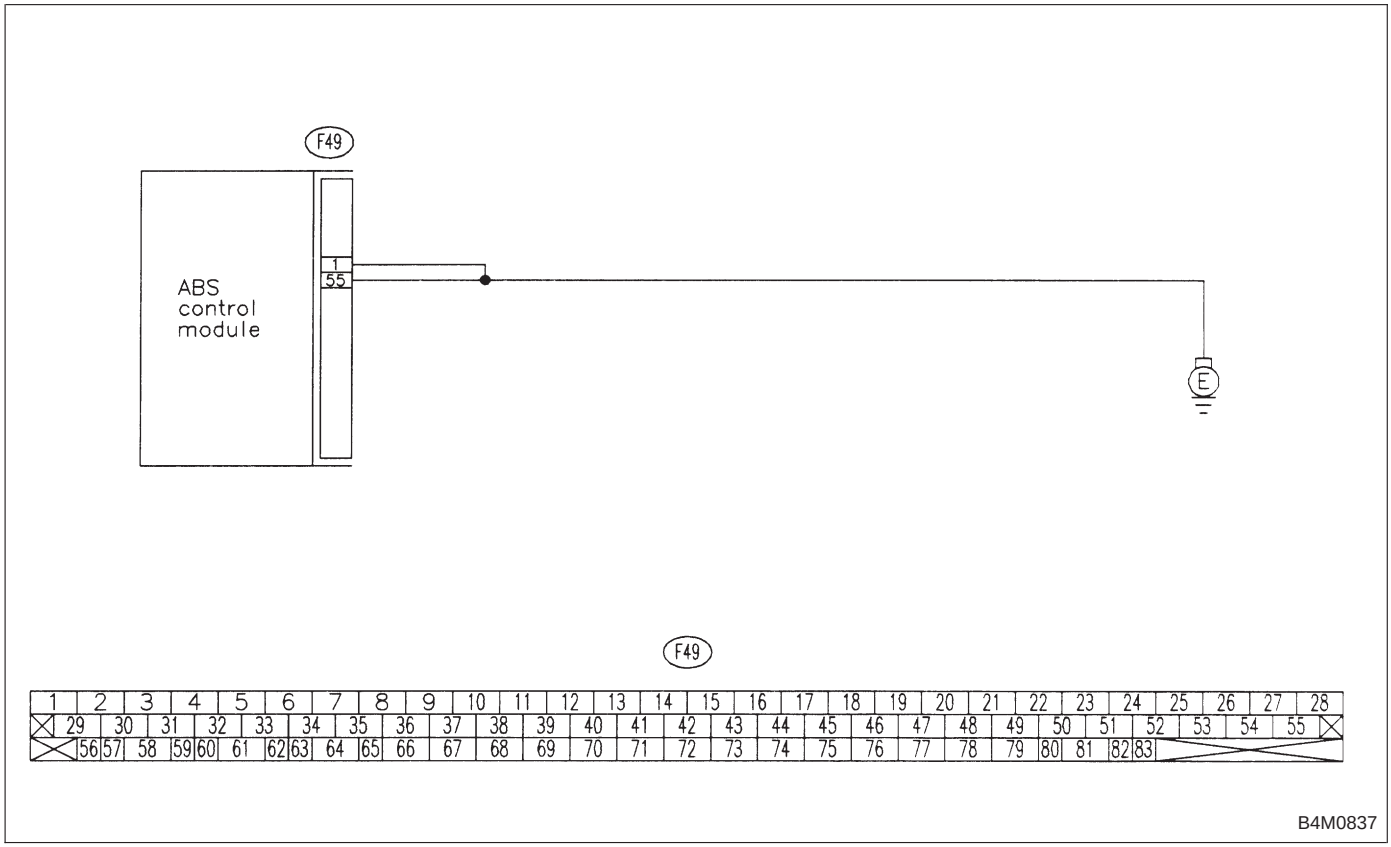
DIAGNOSIS:

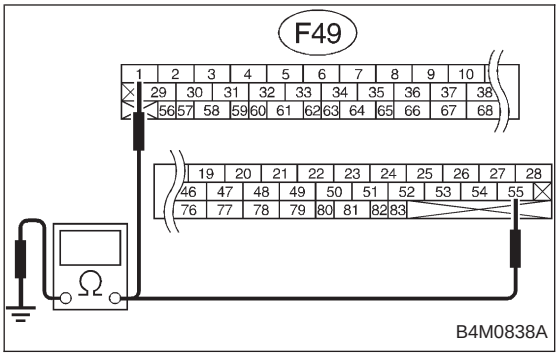
- Faulty ABSCM

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10V1	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:
(F49) No. 55 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10V2**.
NO : Repair ABSCM ground harness.

10V2	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between battery, ignition switch and ABSCM? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **10V3**.

10V3	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Is the car telephone or the wireless transmitter properly installed?***
YES : Go to step **10V4**.
NO : Properly install the car telephone or the wireless transmitter.

10V4	CHECK SOURCES OF SIGNAL NOISE.

CHECK ***: Are noise sources (such as an antenna) installed near the sensor harness?***
YES : Install the noise sources apart from the sensor harness.
NO : Go to step **10V5**.

10V5	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **10V6**.

10V6	**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 42 (FB1)
LOW VOLTAGE

B4M0963

W: TROUBLE CODE 42 LOW VOLTAGE — SOURCE VOLTAGE IS LOW —

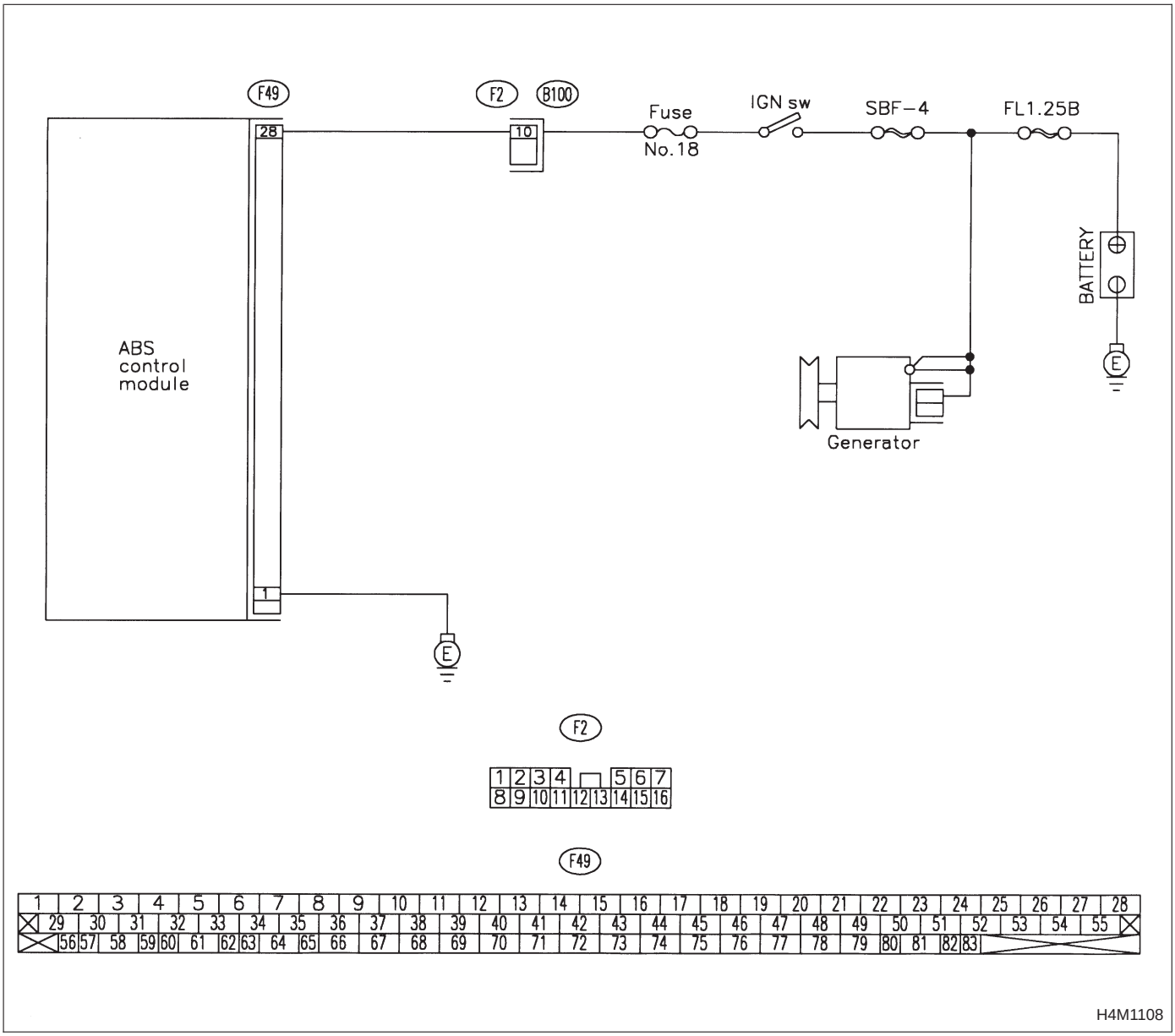
DIAGNOSIS:

- Power source voltage of the ABSCM is low.

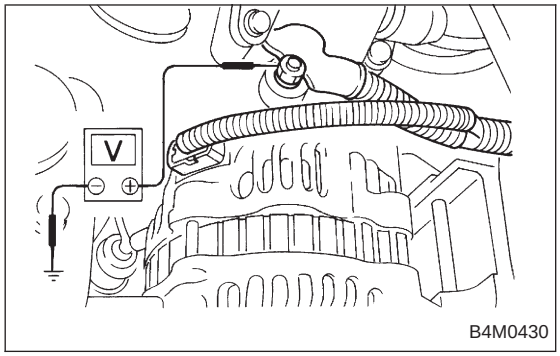
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1108



10W1	CHECK GENERATOR.

1) Start engine.
2) Idling after warm-up.
3) Measure voltage between generator B terminal and chassis ground.

Terminal
Generator B terminal — Chassis ground:

CHECK ***: Is the voltage between 10 V and 15 V?***

YES : Go to step **10W2**.

NO : Repair generator.

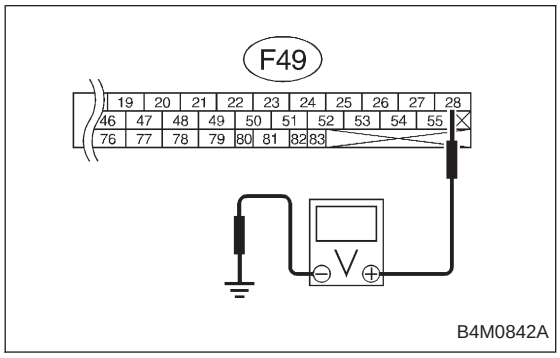
10W2	CHECK BATTERY TERMINAL.

Turn ignition switch to OFF.

CHECK ***: Are the positive and negative battery terminals tightly clamped?***

YES : Go to step **10W3**.

NO : Tighten the clamp of terminal.



10W3	CHECK INPUT VOLTAGE OF ABSCM.

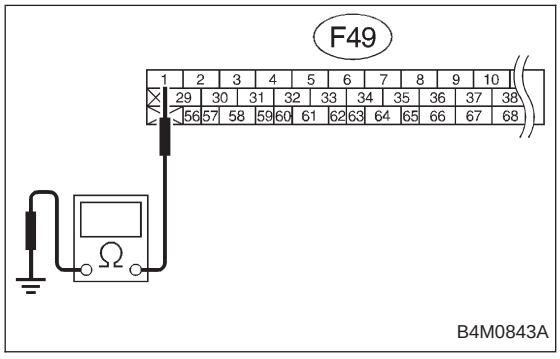
1) Disconnect connector from ABSCM.
2) Run the engine at idle.
3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 28 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 15 V?***

YES : Go to step **10W4**.

NO : Repair harness connector between battery, ignition switch and ABSCM.



10W4	CHECK GROUND CIRCUIT OF ABSCM.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 1 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **10W5**.

NO : Repair ABSCM ground harness.

10W5	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connectors between generator, battery and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10W6**.

10W6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10W7**.

10W7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 44 (FB1)
CCM LINE

B4M0964

X: TROUBLE CODE 44 CCM LINE — A COMBINATION OF AT CONTROL ABNORMALS —

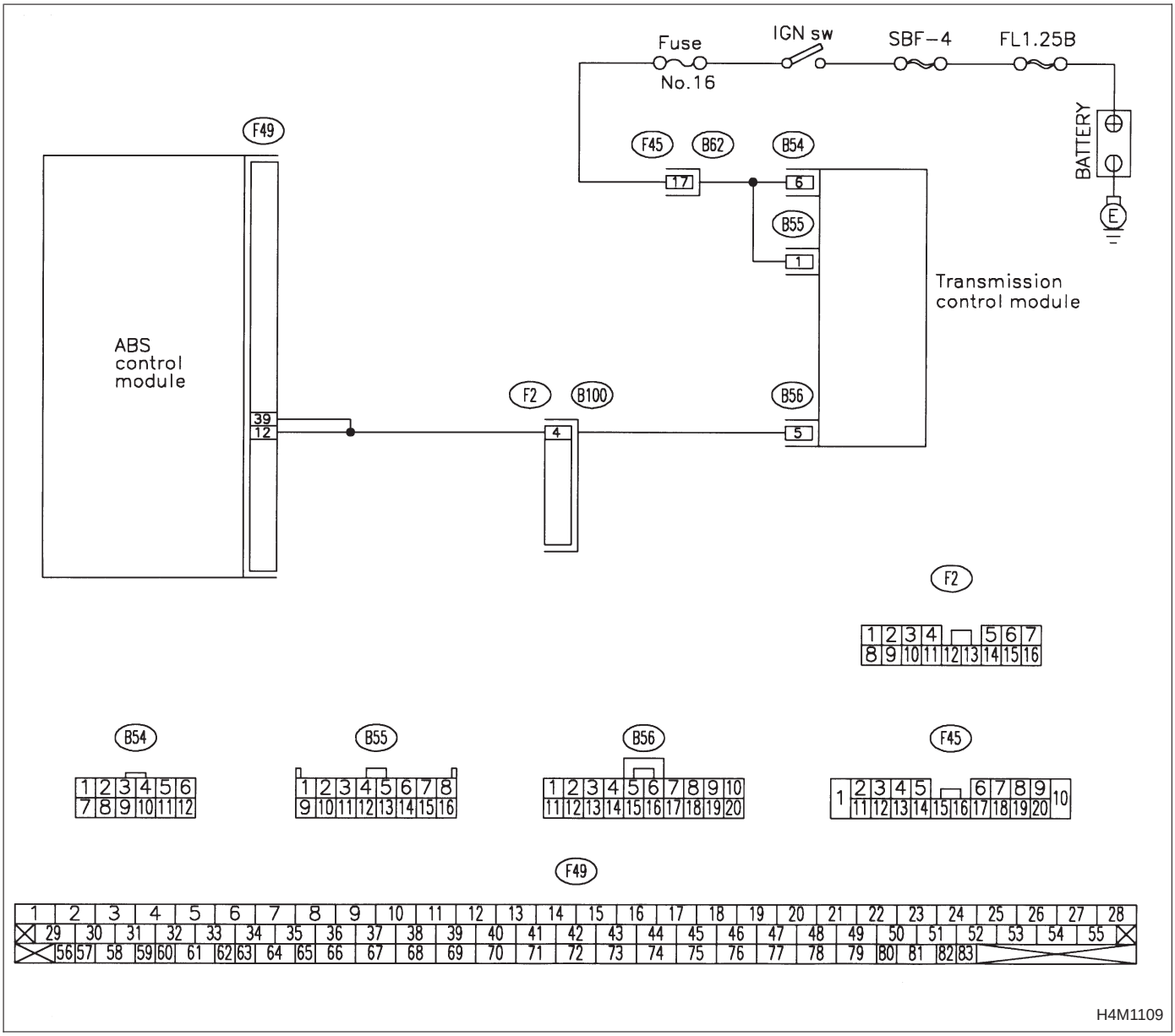
DIAGNOSIS:

- Combination of AT control faults

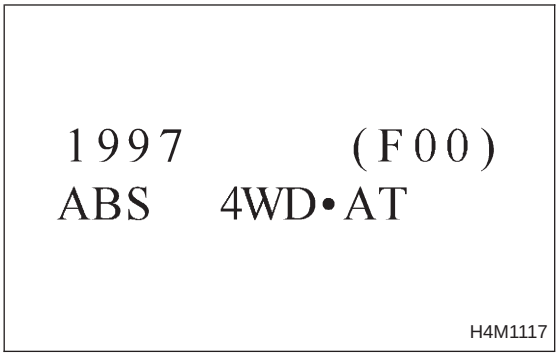
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1109



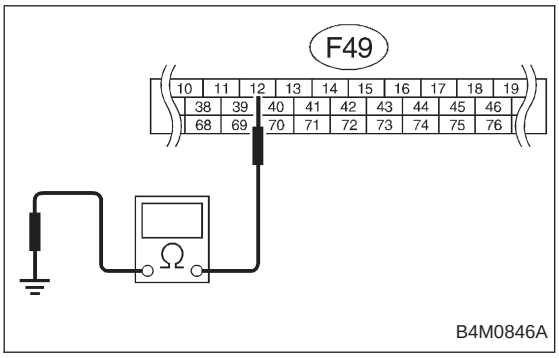
10X1	CHECK SPECIFICATIONS OF ABSCM USING SELECT MONITOR.

1) Press [F], [0] and [0] on the select monitor.
2) Read the select monitor display.

CHECK ***: Is an ABSCM for AT model installed on a MT model?***

YES : Replace ABSCM.

NO : Go to step **10X2**.



10X2	CHECK GROUND SHORT OF HARNESS.

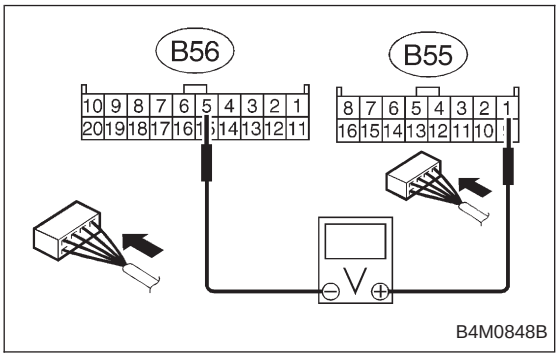
1) Turn ignition switch to OFF.
2) Disconnect two connectors from TCM.
3) Disconnect connector from ABSCM.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10X3**.

NO : Repair harness between TCM and ABSCM.



10X3	CHECK TCM.

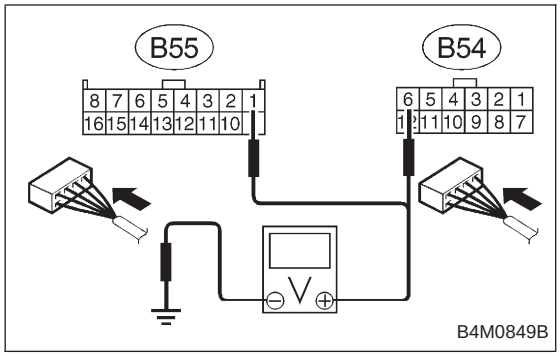
1) Connect all connectors to TCM.
2) Turn ignition switch to ON.
3) Measure voltage between TCM connector terminals.

Connector & terminal
(B55) No. 1 (+) — (B56) No. 5 (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10X5**.

NO : Go to step **10X4**.



10X4	CHECK POWER SUPPLY FOR TCM.

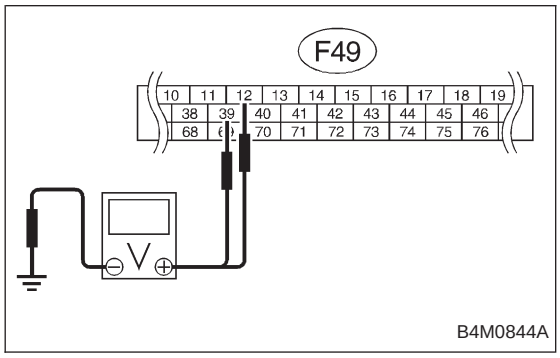
Measure voltage between TCM connector and chassis ground.

Connector & terminal
(B54) No. 6 (+) — Chassis ground (−):
(B55) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Replace TCM.

NO : Repair harness/connector between battery, ignition switch and TCM.



10X5	CHECK OPEN CIRCUIT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):
(F49) No. 39 (+) — Chassis ground (−):

CHECK ***: Is the voltage more than 10 V?***

YES : Go to step **10X6**.

NO : Repair harness/connector between AT control module and ABSCM.

10X6	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between AT control module and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10X7**.

10X7	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10X8**.

10X8	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 44 (FB1)
CCM OPEN

B4M0965

Y: TROUBLE CODE 44 CCM OPEN — A COMBINATION OF AT CONTROL ABNORMALS —

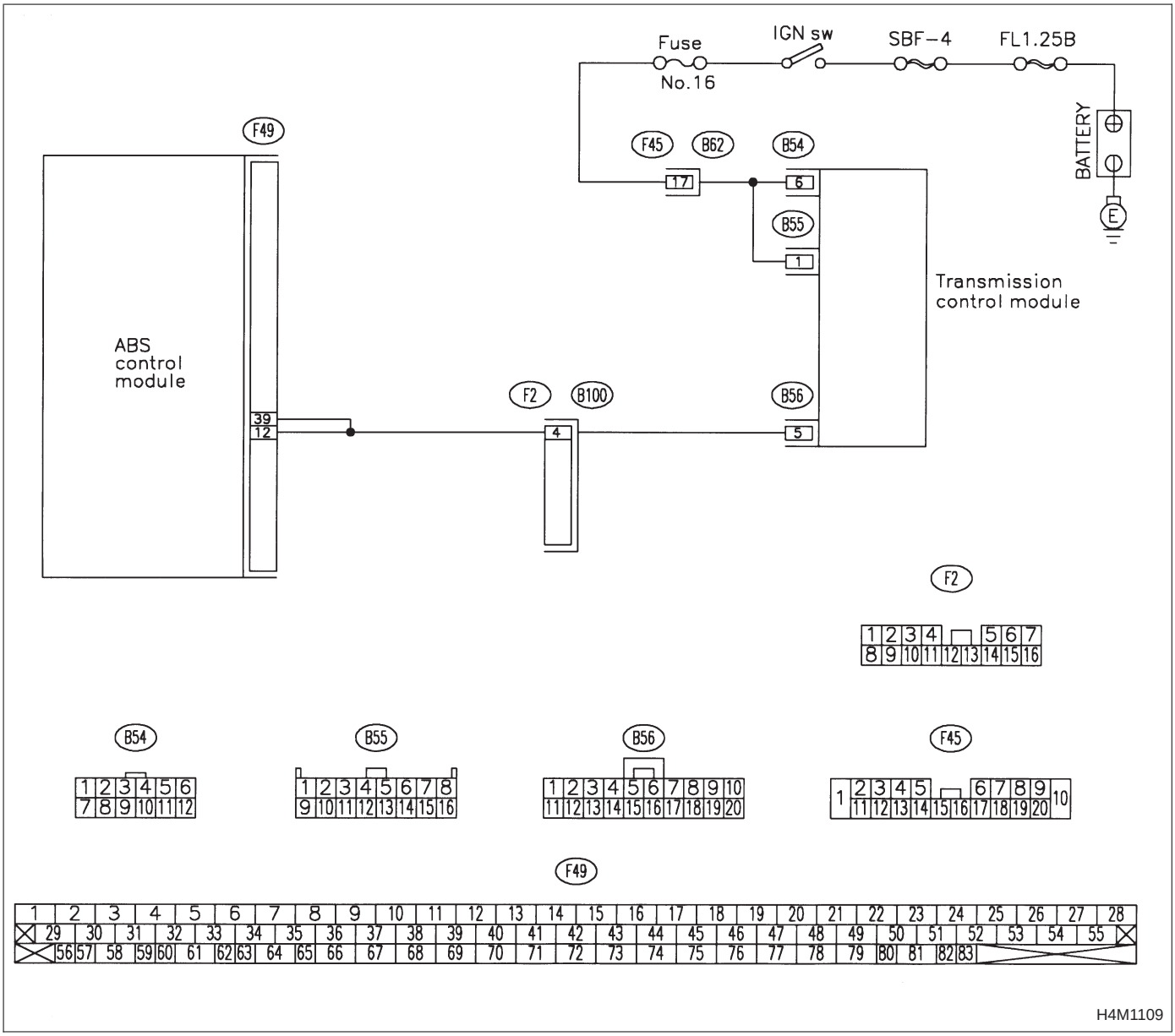
DIAGNOSIS:

- Combination of AT control faults

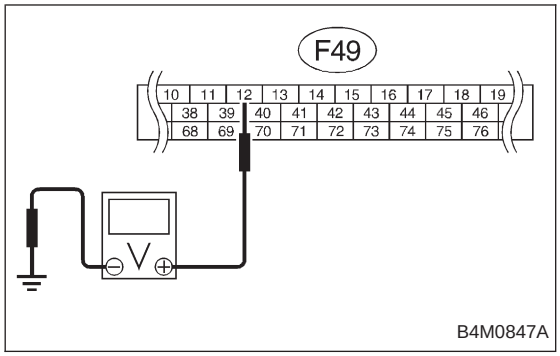
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1109



10Y1	CHECK BATTERY SHORT OF HARNESS.

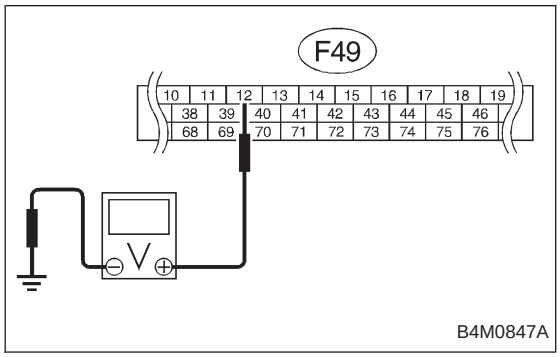
1) Turn ignition switch to OFF.
2) Disconnect two connectors from AT control module.
3) Disconnect connector from ABSCM.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Y2**.

NO : Repair harness between AT control module and ABSCM.



10Y2	CHECK BATTERY SHORT OF HARNESS.

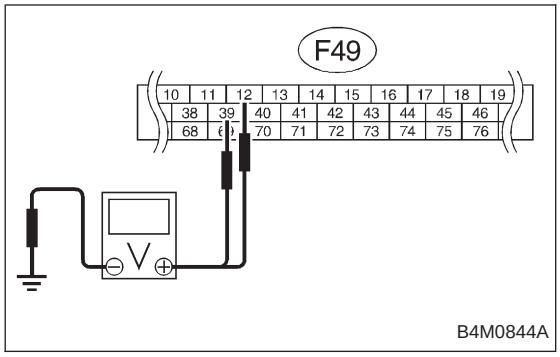
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Y3**.

NO : Repair harness between AT control module and ABSCM.



10Y3	CHECK OPEN CIRCUIT OF HARNESS.

1) Turn ignition switch to OFF.
2) Connect all connectors to TCM.
3) Turn ignition switch to ON.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 12 (+) — Chassis ground (−):
(F49) No. 39 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10Y4**.

NO : Repair harness/connector between TCM and ABSCM.

10Y4	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connectors between AT control module and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10Y5**.

10Y5	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10Y6**.

10Y6	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 46 (FB1)
GS POWER OVER

B4M0966

Z: TROUBLE CODE 46 GS POWER OVER — G SENSOR LINE VOLTAGE TOO HIGH —

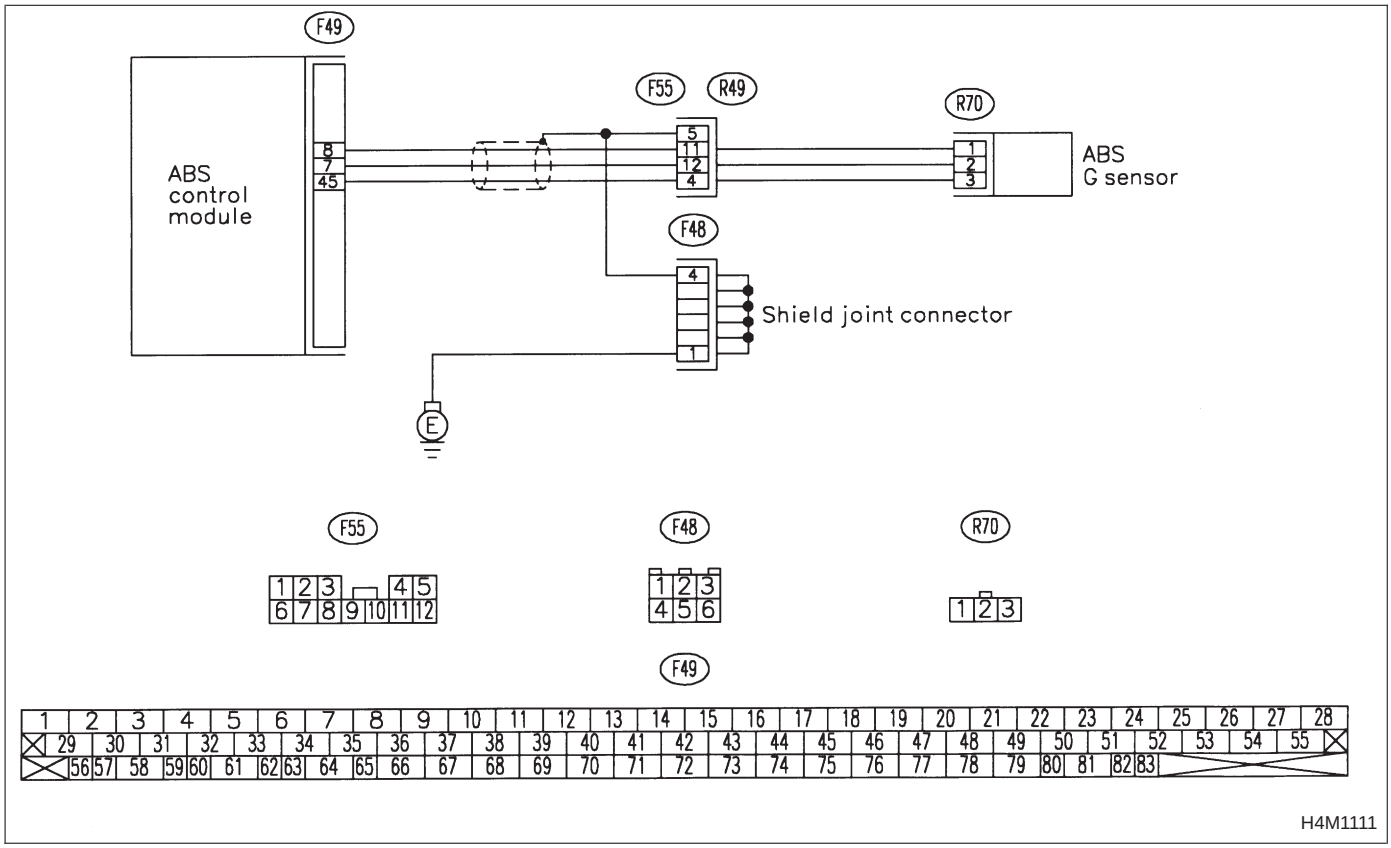
DIAGNOSIS:

- Faulty G sensor power supply voltage

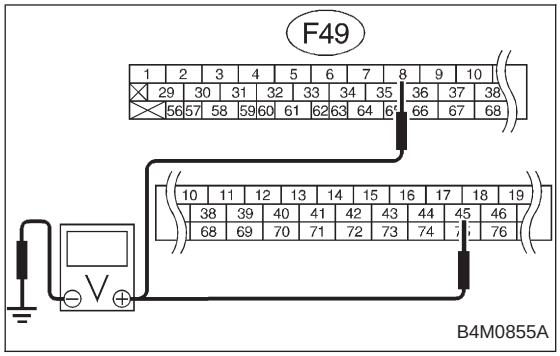
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1111



10Z1	CHECK BATTERY SHORT OF HARNESS.

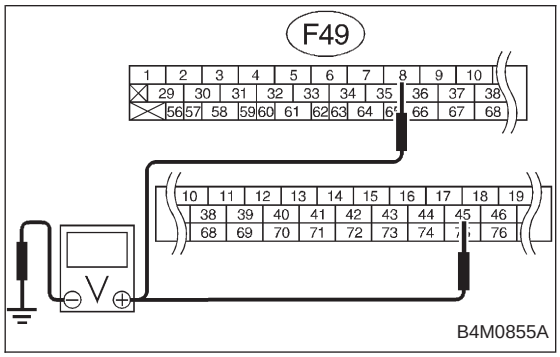
1) Turn ignition switch to OFF.
2) Remove console cover from console box.
3) Disconnect connector from G sensor.
4) Disconnect connector from ABSCM.
5) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (−):
(F49) No. 45 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10Z2**.

NO : Repair harness between ABSCM and G sensor.



10Z2	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM and chassis ground.

Connector & terminal
(F49) No. 8 (+) — Chassis ground (−):
(F49) No. 45 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Replace ABSCM.

NO : Repair harness between ABSCM and chassis ground.

D•NEW 46 (FB1)
GS POWER LOW

B4M0967

AA: TROUBLE CODE 46 GS POWER LOW — G SENSOR LINE VOLTAGE TOO LOW —

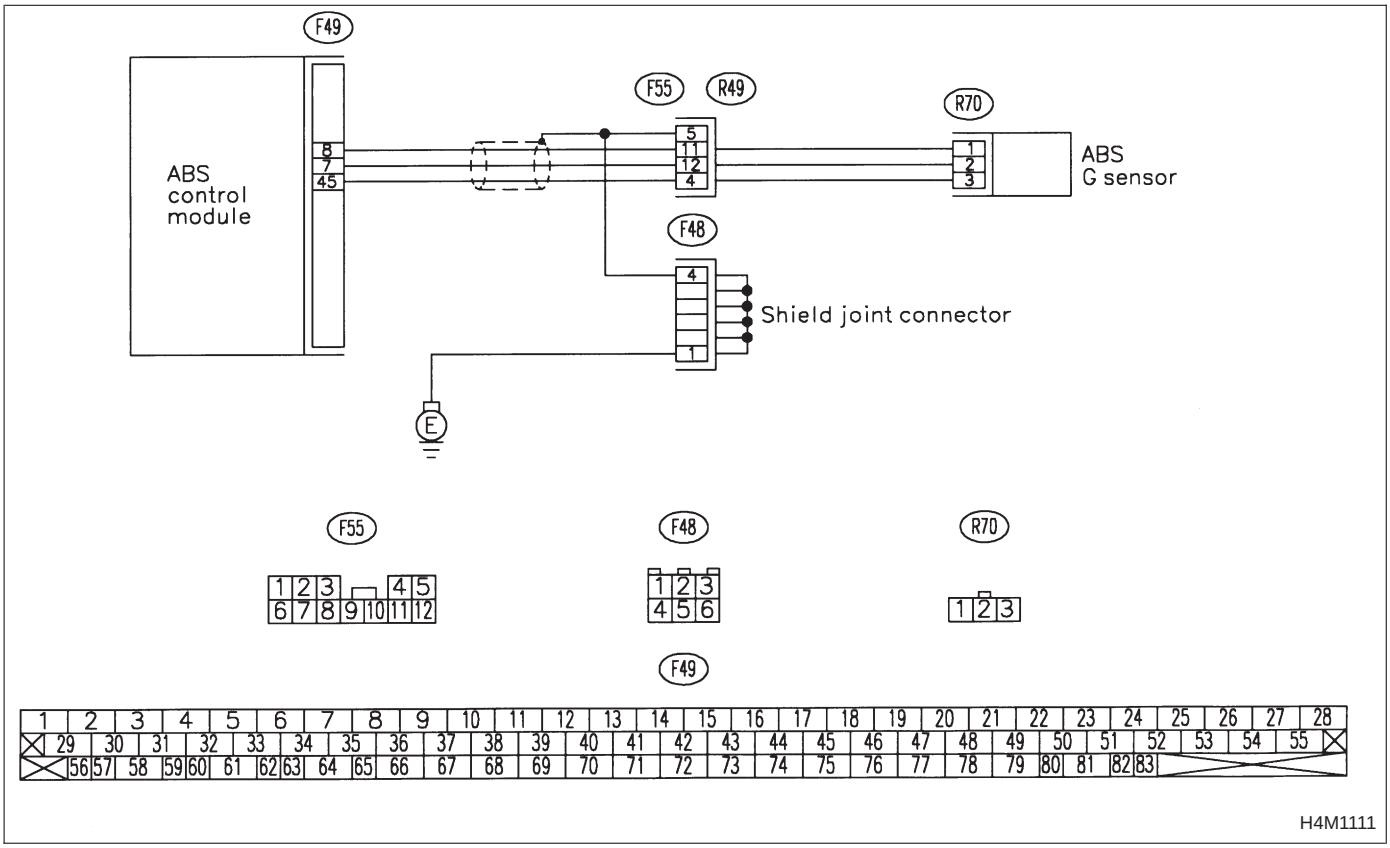
DIAGNOSIS:

- Faulty G sensor power supply voltage

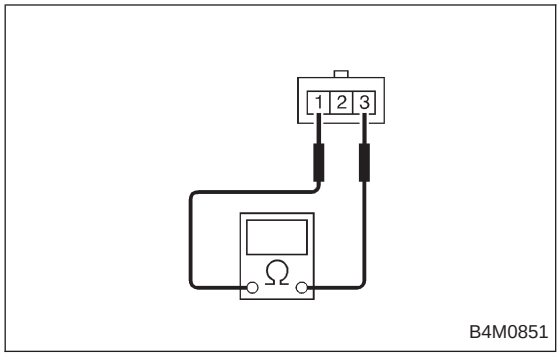
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1111



10AA1	CHECK G SENSOR.

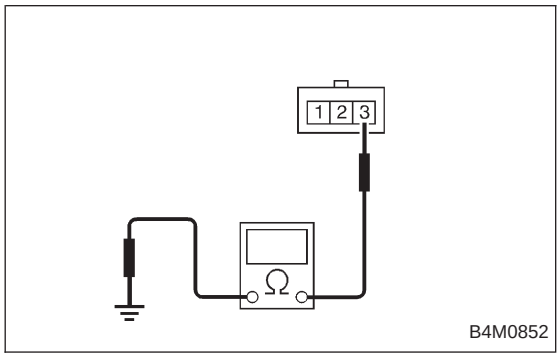
1) Turn ignition switch to OFF.
2) Remove console cover from console box.
3) Disconnect connector from G sensor.
4) Measure resistance of G sensor.

Terminal
No. 1 — No. 3:

CHECK ***: Is the resistance between 42 and 58 kΩ?***

YES : Go to step **10AA2**.

NO : Replace G sensor.



10AA2	CHECK GROUND SHORT OF G SENSOR.

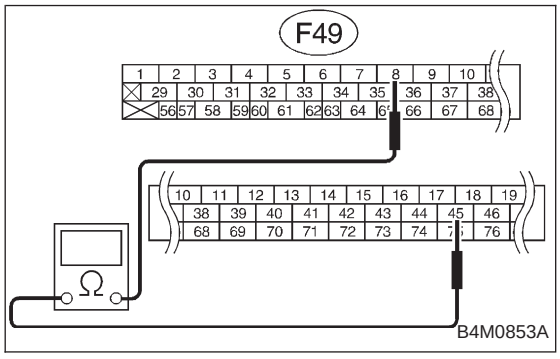
Measure resistance between G sensor and bracket.

Terminal
No. 3 — Bracket:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AA3**.

NO : Replace G sensor.



10AA3	CHECK SHORT OF HARNESS BETWEEN ABSCM AND G SENSOR.

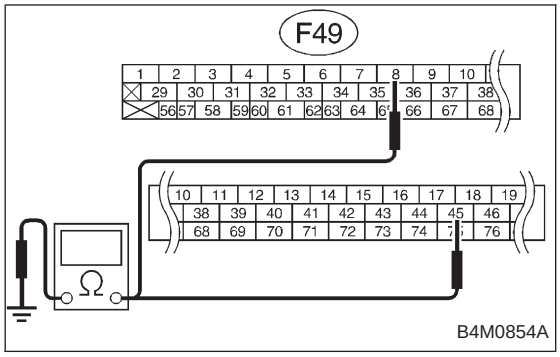
1) Disconnect connector from ABSCM.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 45 — No. 8

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AA4**.

NO : Repair harness between ABSCM and G sensor.



10AA4	CHECK GROUND SHORT OF HARNESS.

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 8 — Chassis ground:
(F49) No. 45 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AA5**.
NO : Repair harness between ABSCM and G sensor.

10AA5	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***
YES : Repair connector.
NO : Go to step **10AA6**.

10AA6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***
YES : Replace ABSCM.
NO : Go to step **10AA7**.

10AA7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***
YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

D•NEW 51 (FB1)
V.RELAY

B4M0968

AB: TROUBLE CODE 51 V. RELAY — ABNORMAL VALVE RELAY —

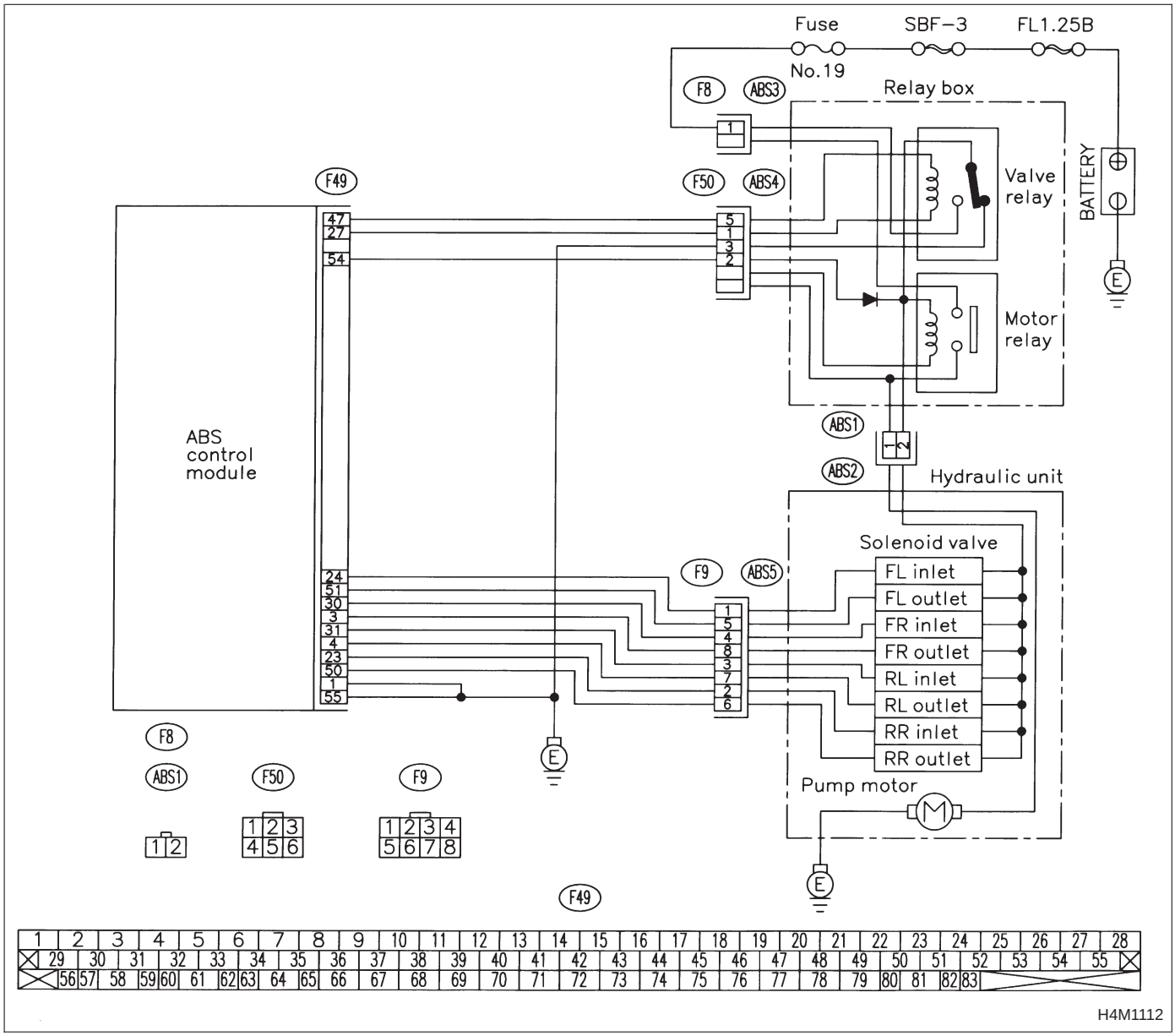
DIAGNOSIS:

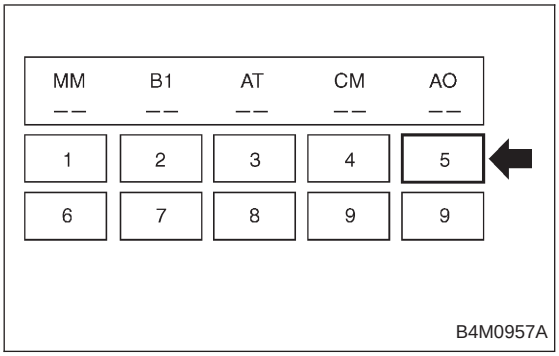
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





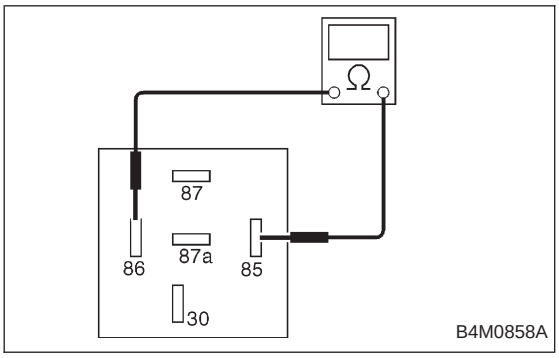
10AB1	CHECK FREEZE FRAME DATA.

Press [F], [E], [1] and [5] on the select monitor.

CHECK ***: Is the select monitor LED 5 off? Was the ABS inactive when the problem occurred?***

YES : Go to step **10AB2**.

NO : Go to step **10AB32**.



10AB2	CHECK RESISTANCE OF VALVE RELAY.

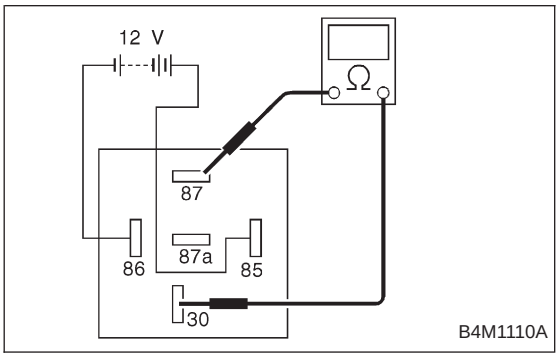
1) Turn ignition switch to OFF.
2) Remove valve relay from relay box.
3) Measure resistance between valve relay terminals.

Terminals
No. 85 — No. 86:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **10AB3**.

NO : Replace valve relay.



10AB3	CHECK CONTACT POINT OF VALVE RELAY.

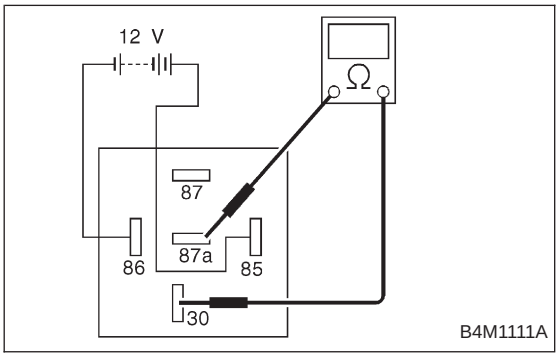
1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **10AB4**.

NO : Replace valve relay.



10AB4	CHECK CONTACT POINT OF VALVE RELAY.

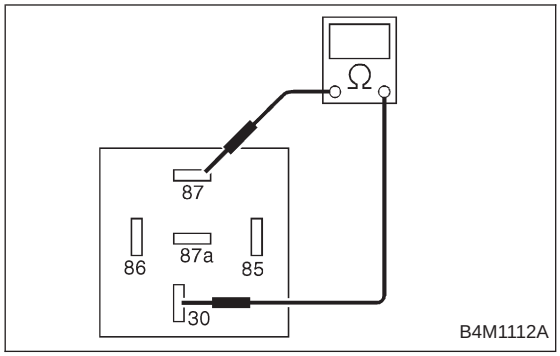
Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AB5**.

NO : Replace valve relay.



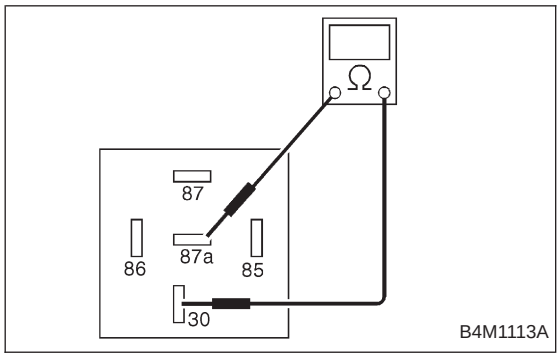
B4M1112A

10AB5	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AB6**.
NO : Replace valve relay.



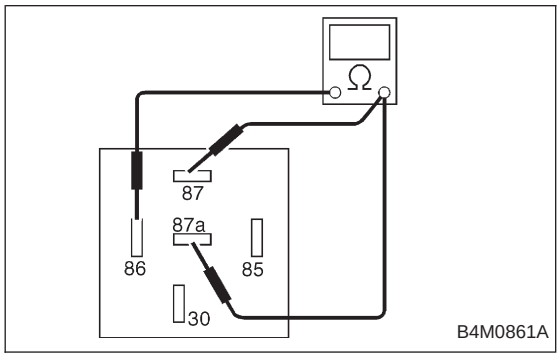
B4M1113A

10AB6	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AB7**.
NO : Replace valve relay.



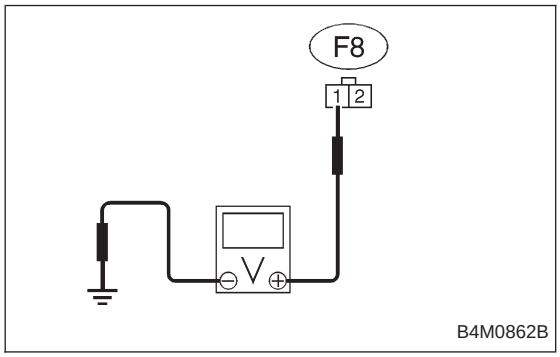
B4M0861A

10AB7	CHECK SHORT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 86 — No. 87:
No. 86 — No. 87a:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AB8**.
NO : Replace valve relay.



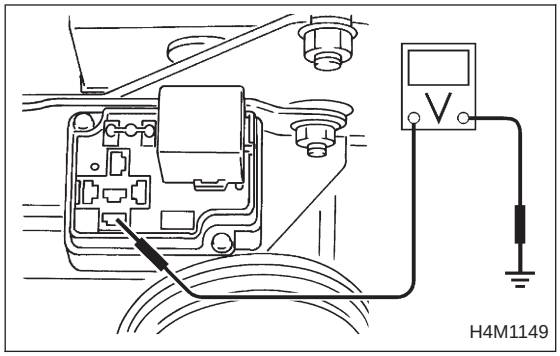
B4M0862B

10AB8	CHECK POWER SUPPLY VOLTAGE AT VALVE RELAY CONTACT POINT.

1) Disconnect connector (F8) from relay box.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***
YES : Go to step **10AB9**.
NO : Repair harness connector between battery and relay box, and check fuse No. 19.



10AB9	CHECK OPEN AND GROUND SHORT CIRCUIT IN POWER SUPPLY CIRCUIT OF RELAY BOX.

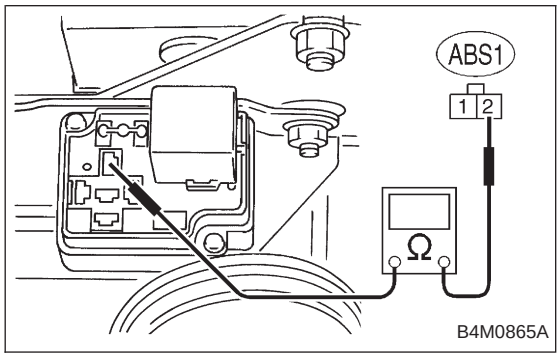
1) Disconnect connector (ABS1) from hydraulic unit.
2) Connect connector (F8) to relay box.
3) Disconnect connector (F50) from relay box.
4) Measure voltage of relay box.

Connector & terminal
Valve relay installing point No. 87 — Chassis ground:

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10AB10**.

NO : Replace relay box, and check fuse No. 19.



10AB10	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

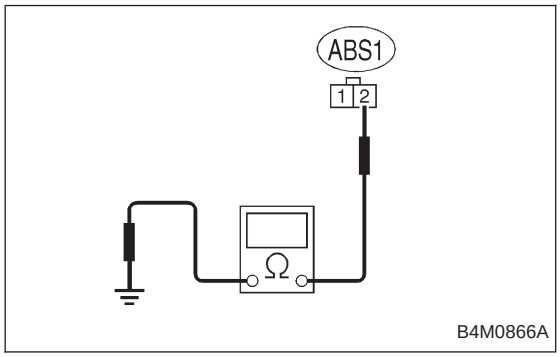
Measure resistance between hydraulic unit connector and valve relay installing point.

Connector & terminal
(ABS1) No. 2 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **10AB11**.

NO : Replace relay box.



10AB11	CHECK GROUND SHORT CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

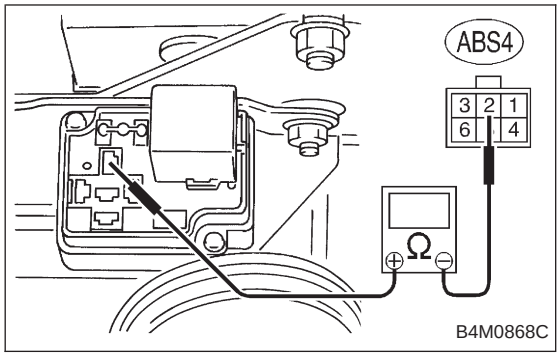
Measure resistance between relay box connector and chassis ground.

Connector & terminal
(ABS1) No. 2 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AB12**.

NO : Replace relay box, and check fuse SBF6.

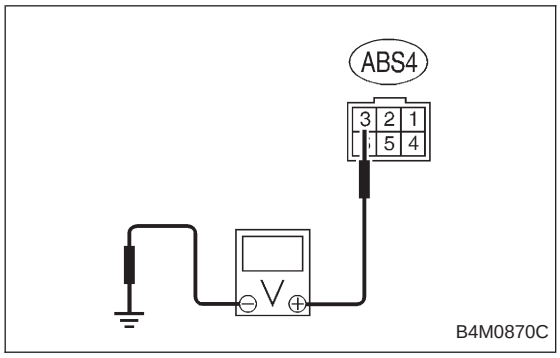


10AB12	CHECK DIODE OF RELAY BOX.

Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
Valve relay installing point No. 30 (+) — (ABS4) No. 2 (−):

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AB13**.
NO : Replace relay box.

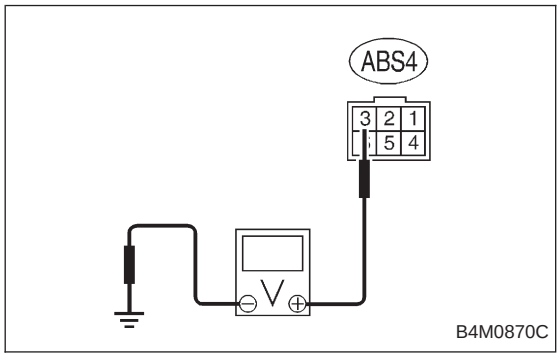


10AB13	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AB14**.
NO : Replace relay box, and check all fuses.

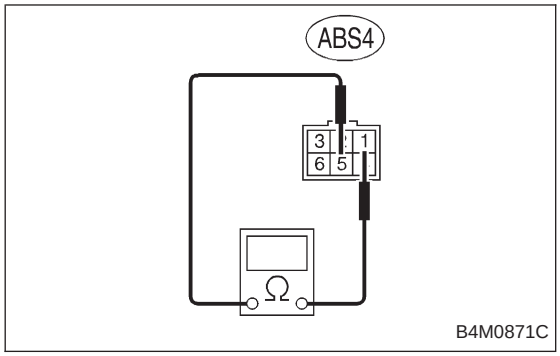


10AB14	CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 3 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AB15**.
NO : Replace relay box, and check all fuses.

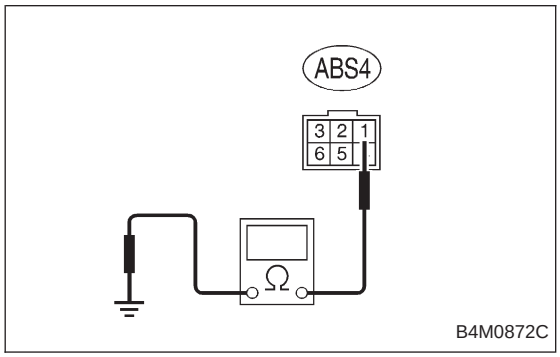


10AB15	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Install valve relay to relay box.
3) Measure resistance between relay box connector terminals.

Connector & terminal
(ABS4) No. 1 — No. 5:

CHECK ***: Is the resistance between 93 and 113 Ω?***
YES : Go to step **10AB16**.
NO : Replace relay box.

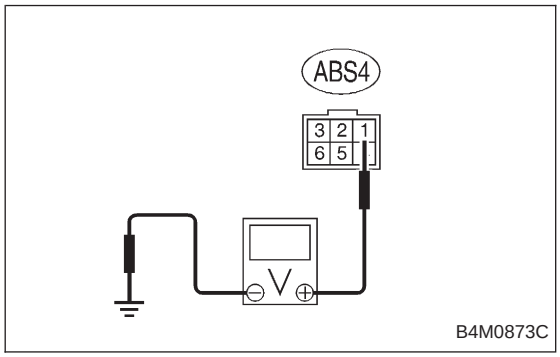


10AB16	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AB17**.
NO : Replace relay box, and check all fuses.

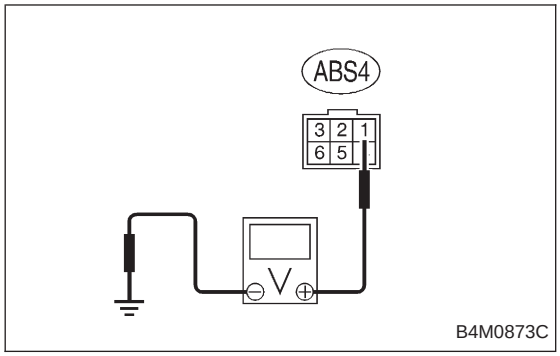


10AB17	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AB18**.
NO : Replace relay box, and check fuse No. 19 and SBF6.



10AB18	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

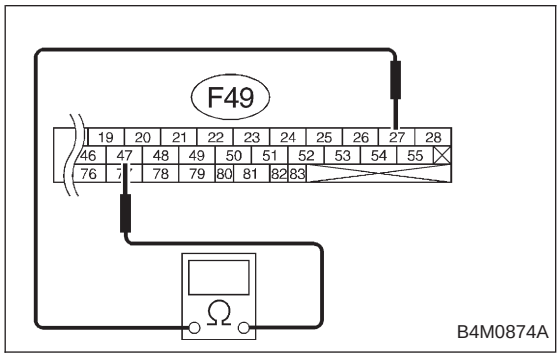
1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB19**.

NO : Replace relay box, and check fuse No. 19 and SBF6.



10AB19	CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

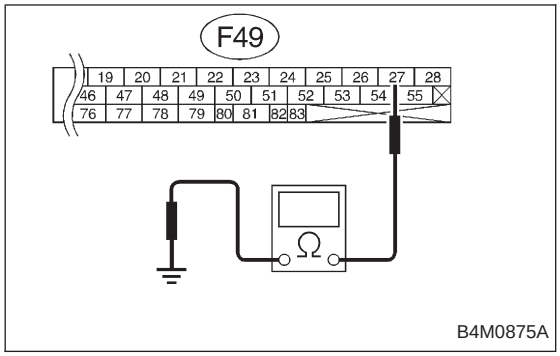
1) Turn ignition switch to OFF.
2) Connect connector (F50) to relay box.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 27 — No. 47:

CHECK ***: Is the resistance between 93 and 113 Ω?***

YES : Go to step **10AB20**.

NO : Repair harness between ABSCM and relay box, and check fuse No. 18.

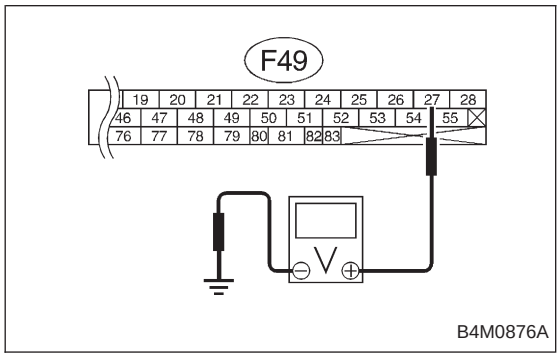


10AB20	CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

1) Disconnect connector (F50) from relay box.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AB21**.
NO : Repair harness between ABSCM and relay box, and check fuse No. 18.

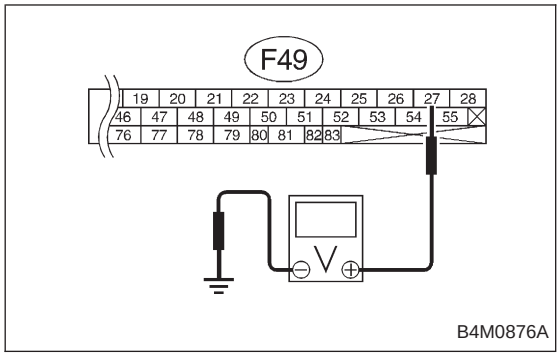


10AB21	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

1) Connect connector (F50) to relay box.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AB22**.
NO : Repair harness between ABSCM and relay box, and check all fuses.



10AB22	CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

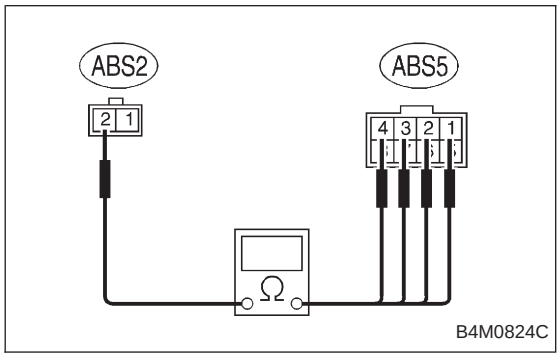
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB23**.

NO : Repair harness between ABSCM and relay box, and check all fuses.



10AB23	CHECK RESISTANCE OF INLET SOLENOID VALVE.

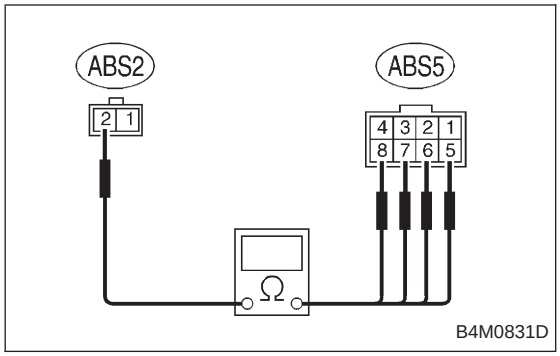
1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 4 — (ABS2) No. 2:
(ABS5) No. 1 — (ABS2) No. 2:
(ABS5) No. 2 — (ABS2) No. 2:
(ABS5) No. 3 — (ABS2) No. 2:

CHECK ***: Is the resistance between 7.8 and 9.2 Ω?***

YES : Go to step **10AB24**.

NO : Replace hydraulic unit.



10AB24	CHECK RESISTANCE OF OUTLET SOLENOID VALVE.

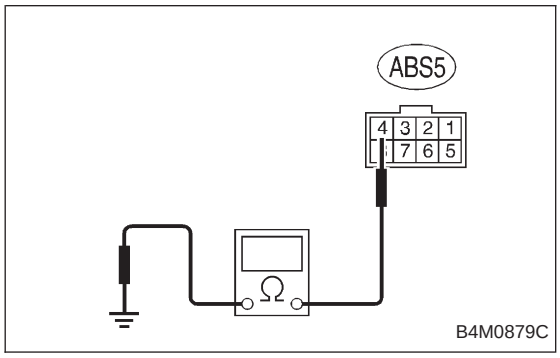
Measure resistance between hydraulic unit connector terminals.

Connector & terminal
(ABS5) No. 8 — (ABS2) No. 2:
(ABS5) No. 5 — (ABS2) No. 2:
(ABS5) No. 6 — (ABS2) No. 2:
(ABS5) No. 7 — (ABS2) No. 2:

CHECK ***: Is the resistance between 3.8 and 4.8 Ω?***

YES : Go to step **10AB25**.

NO : Replace hydraulic unit.



10AB25	CHECK GROUND SHORT OF SOLENOID VALVE.

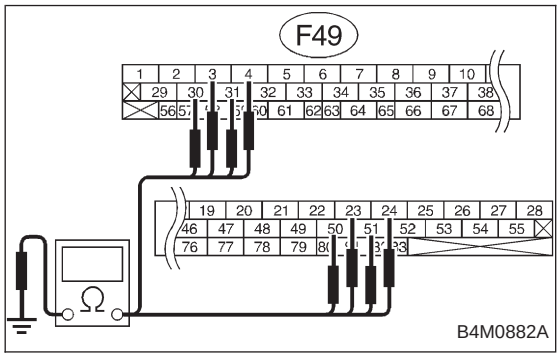
Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AB26**.

NO : Replace hydraulic unit, and check all fuses.



10AB26	CHECK GROUND SHORT OF HARNESS.

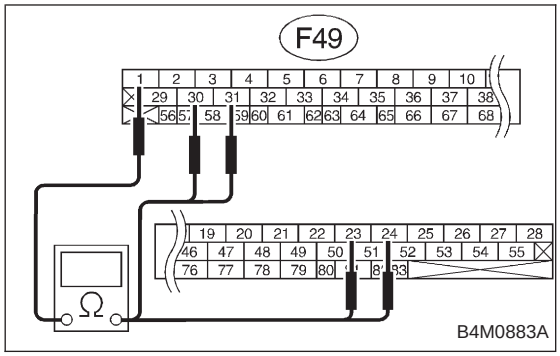
1) Disconnect connector from hydraulic unit.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 — Chassis ground:
(F49) No. 24 — Chassis ground:
(F49) No. 23 — Chassis ground:
(F49) No. 31 — Chassis ground:
(F49) No. 3 — Chassis ground:
(F49) No. 51 — Chassis ground:
(F49) No. 50 — Chassis ground:
(F49) No. 4 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AB27**.

NO : Repair harness between hydraulic unit and ABSCM.



10AB27	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

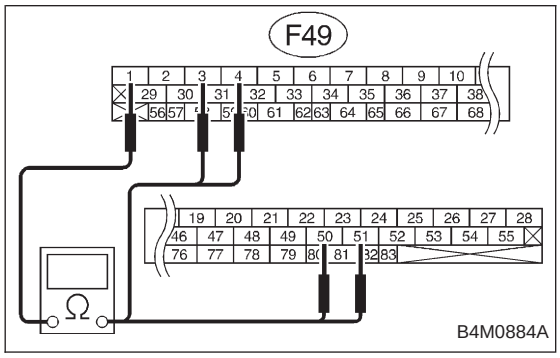
1) Connect connector to hydraulic unit.
2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 30 — No. 1:
(F49) No. 24 — No. 1:
(F49) No. 23 — No. 1:
(F49) No. 31 — No. 1:

CHECK ***: Is the resistance between 8.3 and 9.7 Ω?***

YES : Go to step **10AB28**.

NO : Repair harness/connector between hydraulic unit and ABSCM.



10AB28	CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 3 — No. 1:
(F49) No. 51 — No. 1:
(F49) No. 50 — No. 1:
(F49) No. 4 — No. 1:

CHECK ***: Is the resistance between 4.3 and 5.3 Ω?***

YES : Go to step **10AB29**.

NO : Repair harness/connector between hydraulic unit and ABSCM.

10AB29	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AB30**.

10AB30	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

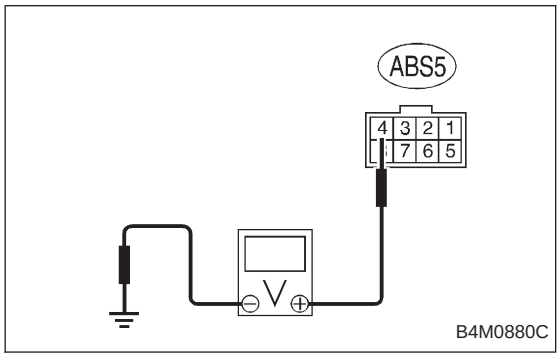
NO : Go to step **10AB31**.

10AB31	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



10AB32	CHECK BATTERY SHORT OF SOLENOID VALVE.

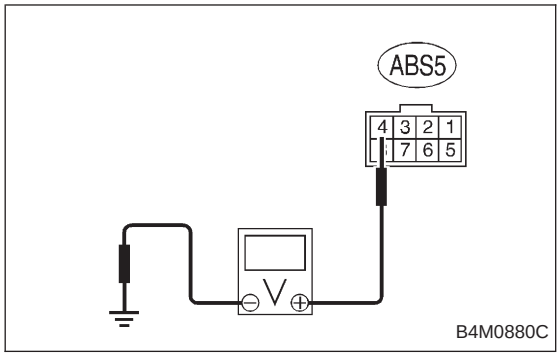
1) Turn ignition switch to OFF.
2) Disconnect connectors (ABS1, F9) from hydraulic unit.
3) Disconnect connector from ABSCM.
4) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB33**.

NO : Replace hydraulic unit, and check all fuses.



10AB33	CHECK BATTERY SHORT OF SOLENOID VALVE.

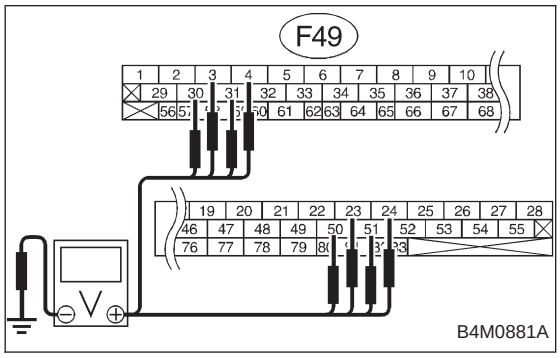
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB34**.

NO : Replace hydraulic unit, and check all fuses.



10AB34	CHECK BATTERY SHORT OF HARNESS.

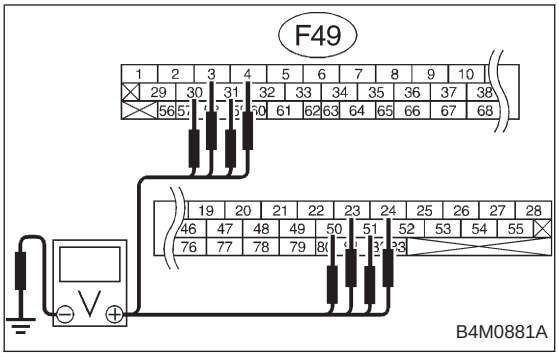
1) Turn ignition switch to OFF.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB35**.

NO : Repair harness between hydraulic unit and ABSCM, and check all fuses.



10AB35	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AB36**.

NO : Repair harness between hydraulic unit and ABSCM, and check all fuses.

10AB36	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10AB37**.

10AB37	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 51 (FB1)
V.RELAY ON

B4M0802

AC: TROUBLE CODE 51 V. RELAY ON — VALVE RELAY ON FAILURE —

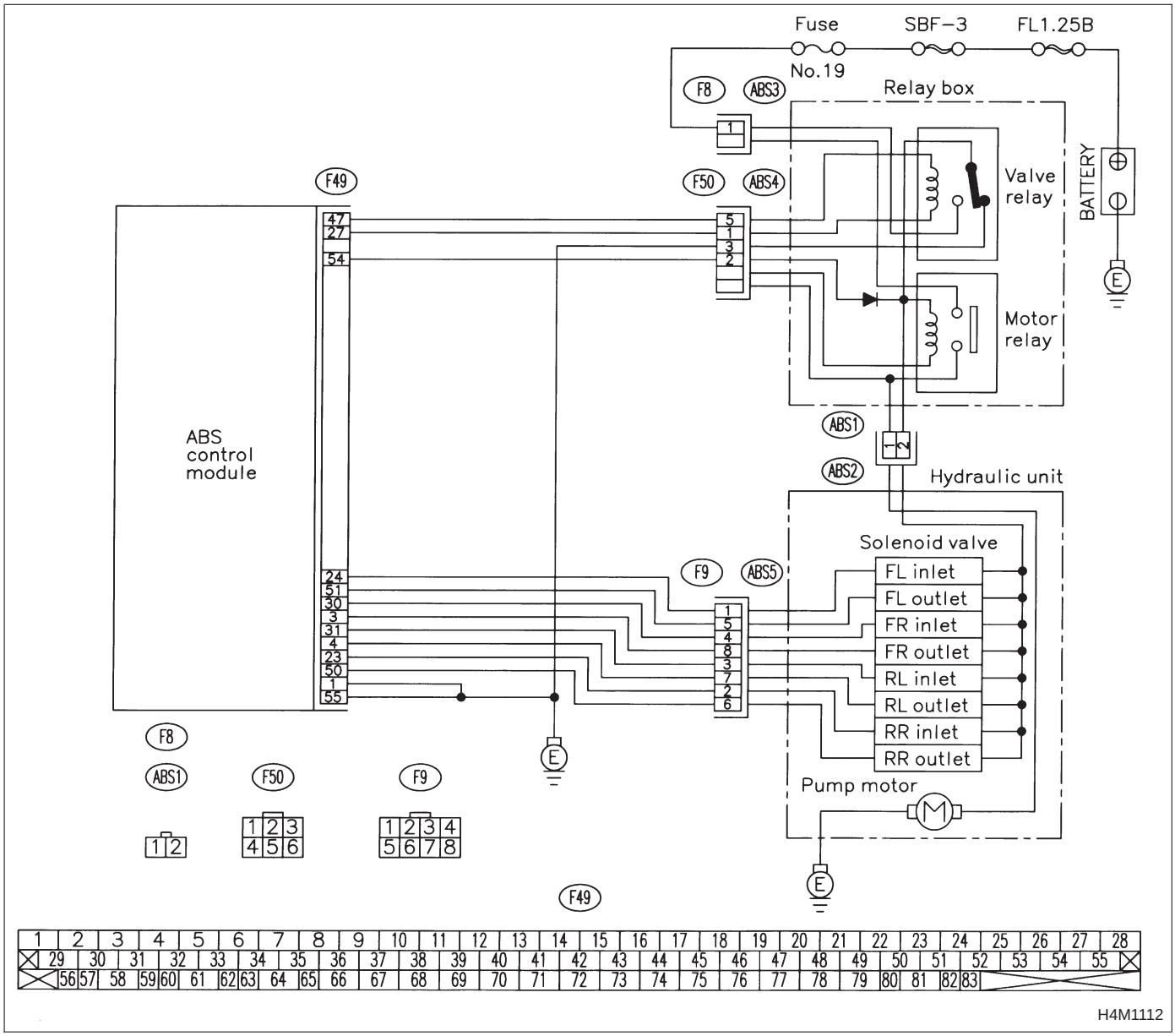
DIAGNOSIS:

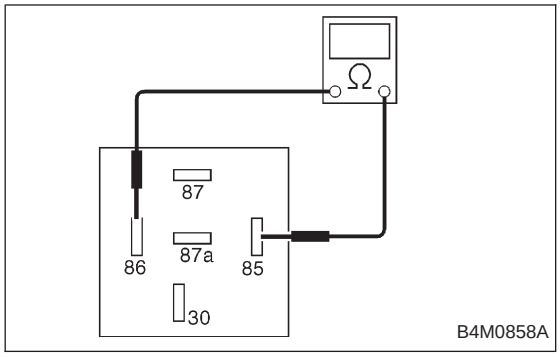
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



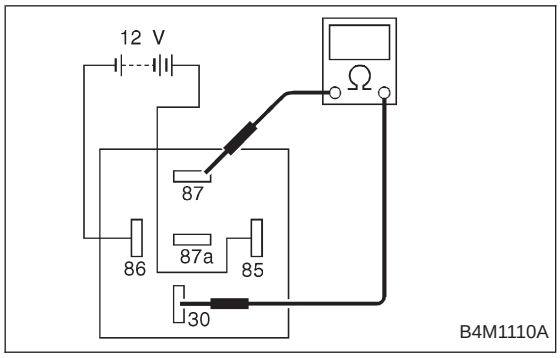


10AC1	CHECK RESISTANCE OF VALVE RELAY.

1) Turn ignition switch to OFF.
2) Remove valve relay from relay box.
3) Measure resistance between valve relay terminals.

Terminals
No. 85 — No. 86:

CHECK ***: Is the resistance between 93 and 113 Ω?***
YES : Go to step **10AC2**.
NO : Replace valve relay.

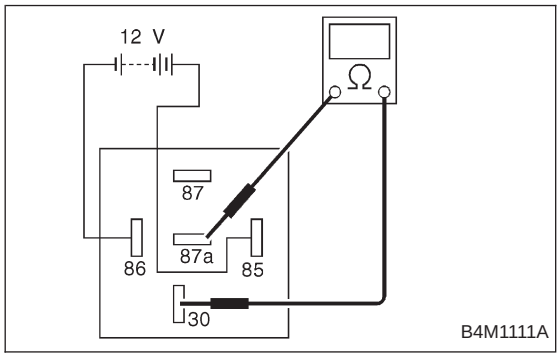


10AC2	CHECK CONTACT POINT OF VALVE RELAY.

1) Connect battery to valve relay terminals No. 85 and No. 86.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AC3**.
NO : Replace valve relay.

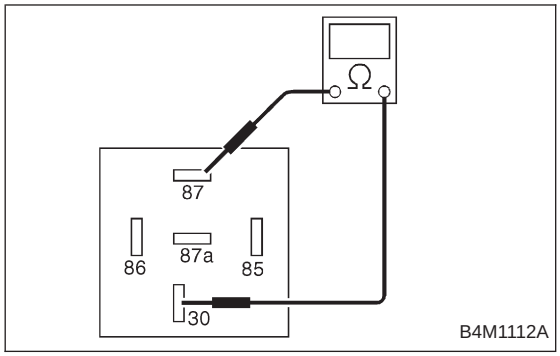


10AC3	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AC4**.
NO : Replace valve relay.



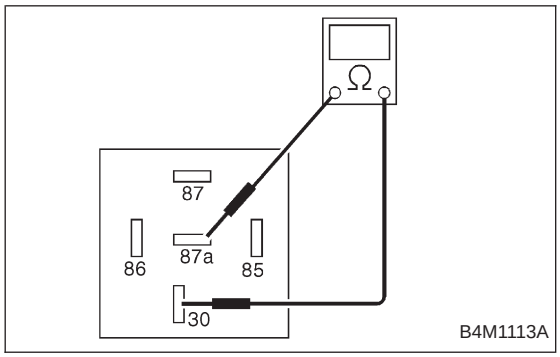
B4M1112A

10AC4	CHECK CONTACT POINT OF VALVE RELAY.

1) Disconnect battery from valve relay terminals.
2) Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AC5**.
NO : Replace valve relay.



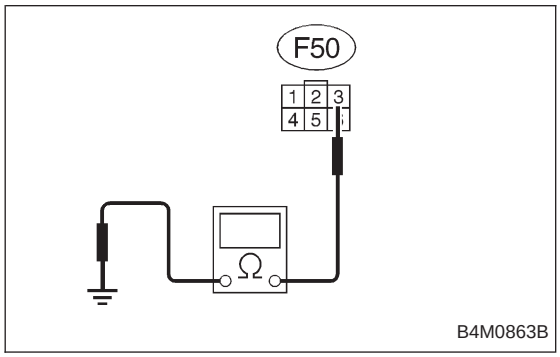
B4M1113A

10AC5	CHECK CONTACT POINT OF VALVE RELAY.

Measure resistance between valve relay terminals.

Terminals
No. 30 — No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AC6**.
NO : Replace valve relay.



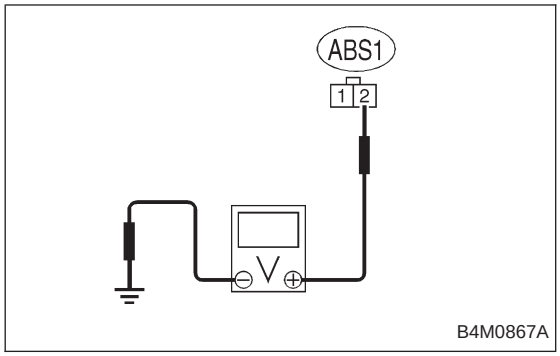
B4M0863B

10AC6	CHECK GROUND CIRCUIT OF RELAY BOX.

1) Disconnect connector (F50) from relay box.
2) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 3 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AC7**.
NO : Repair relay box ground harness.



10AC7	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

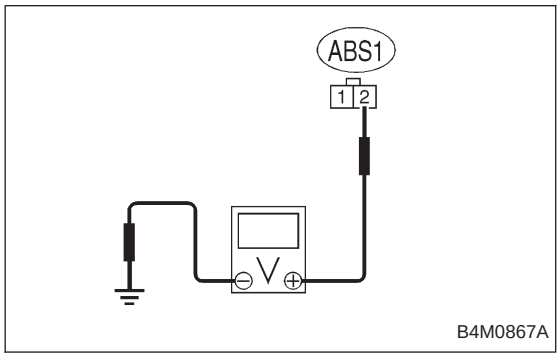
1) Disconnect connector from ABSCM.
2) Disconnect connector (ABS1) from hydraulic unit.
3) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC8**.

NO : Replace relay box, and check fuse No. 19 and SBF6.



10AC8	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

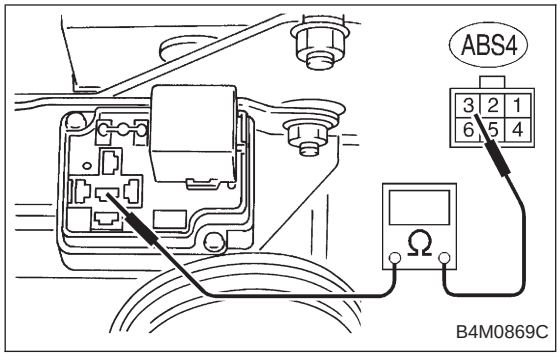
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS1) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC9**.

NO : Replace relay box, and check fuse No. 9 and SBF6.

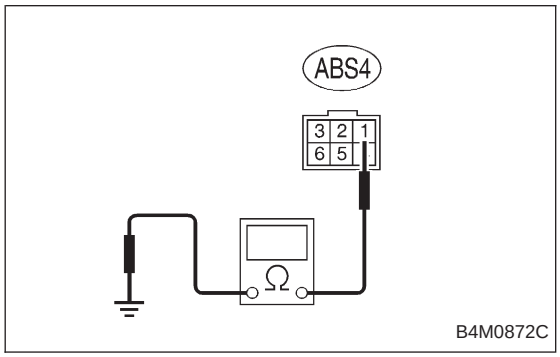


10AC9	CHECK OPEN CIRCUIT IN GROUND CIRCUIT OF RELAY BOX.

1) Turn ignition switch to OFF.
2) Measure resistance between relay box connector and valve relay installing point.

Connector & terminal
(ABS4) No. 3 — Valve relay installing point No. 87a:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AC10**.
NO : Replace relay box.

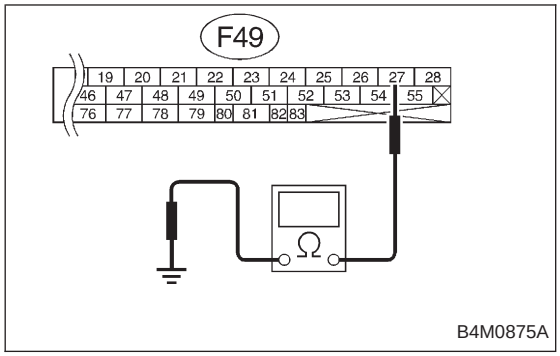


10AC10	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Install valve relay to relay box.
2) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(ABS4) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AC11**.
NO : Replace relay box, and check all fuses.



10AC11	CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

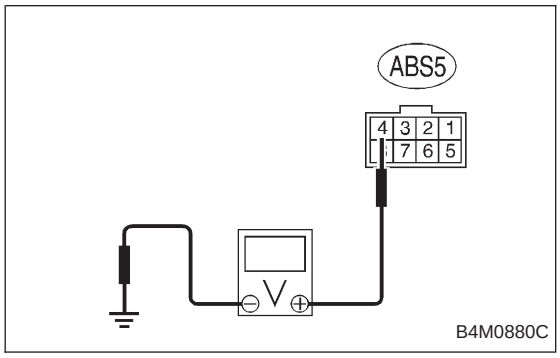
Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 27 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AC12**.

NO : Repair harness between ABSCM and relay box, and check fuse No. 18.



10AC12	CHECK BATTERY SHORT OF SOLENOID VALVE.

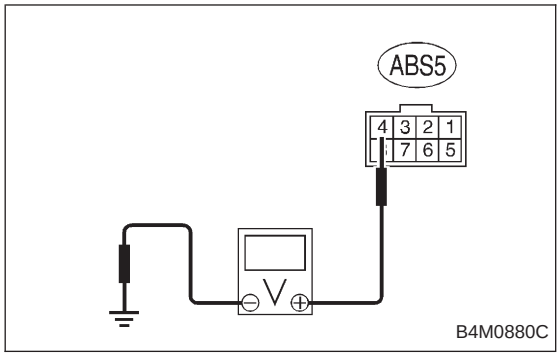
1) Disconnect connector (ABS1, F9) from hydraulic unit.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC13**.

NO : Replace hydraulic unit, and check all fuses.



10AC13	CHECK BATTERY SHORT OF SOLENOID VALVE.

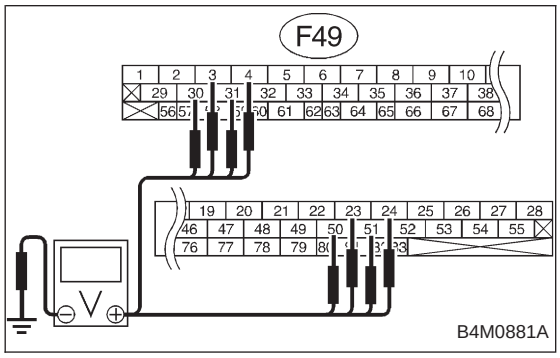
1) Turn ignition switch to ON.
2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal
(ABS5) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC14**.

NO : Replace hydraulic unit, and check all fuses.



10AC14	CHECK BATTERY SHORT OF HARNESS.

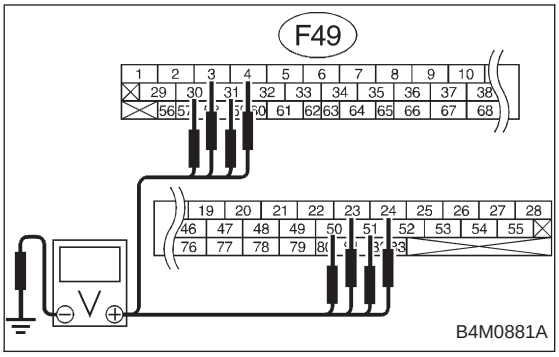
1) Turn ignition switch to OFF.
2) Disconnect connector from hydraulic unit.
3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC15**.

NO : Repair harness between hydraulic unit and ABSCM, and check all fuses.



10AC15	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 30 (+) — Chassis ground (−):
(F49) No. 24 (+) — Chassis ground (−):
(F49) No. 23 (+) — Chassis ground (−):
(F49) No. 31 (+) — Chassis ground (−):
(F49) No. 3 (+) — Chassis ground (−):
(F49) No. 51 (+) — Chassis ground (−):
(F49) No. 50 (+) — Chassis ground (−):
(F49) No. 4 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AC16**.

NO : Repair harness between hydraulic unit and ABSCM, and check all fuses.

10AC16	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AC17**.

10AC17	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10AC18**.

10AC18	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 52 (FB1)
M. RELAY OPEN

B4M0969

AD: TROUBLE CODE 52 M. RELAY OPEN — OPEN CIRCUIT OF MOTOR RELAY —

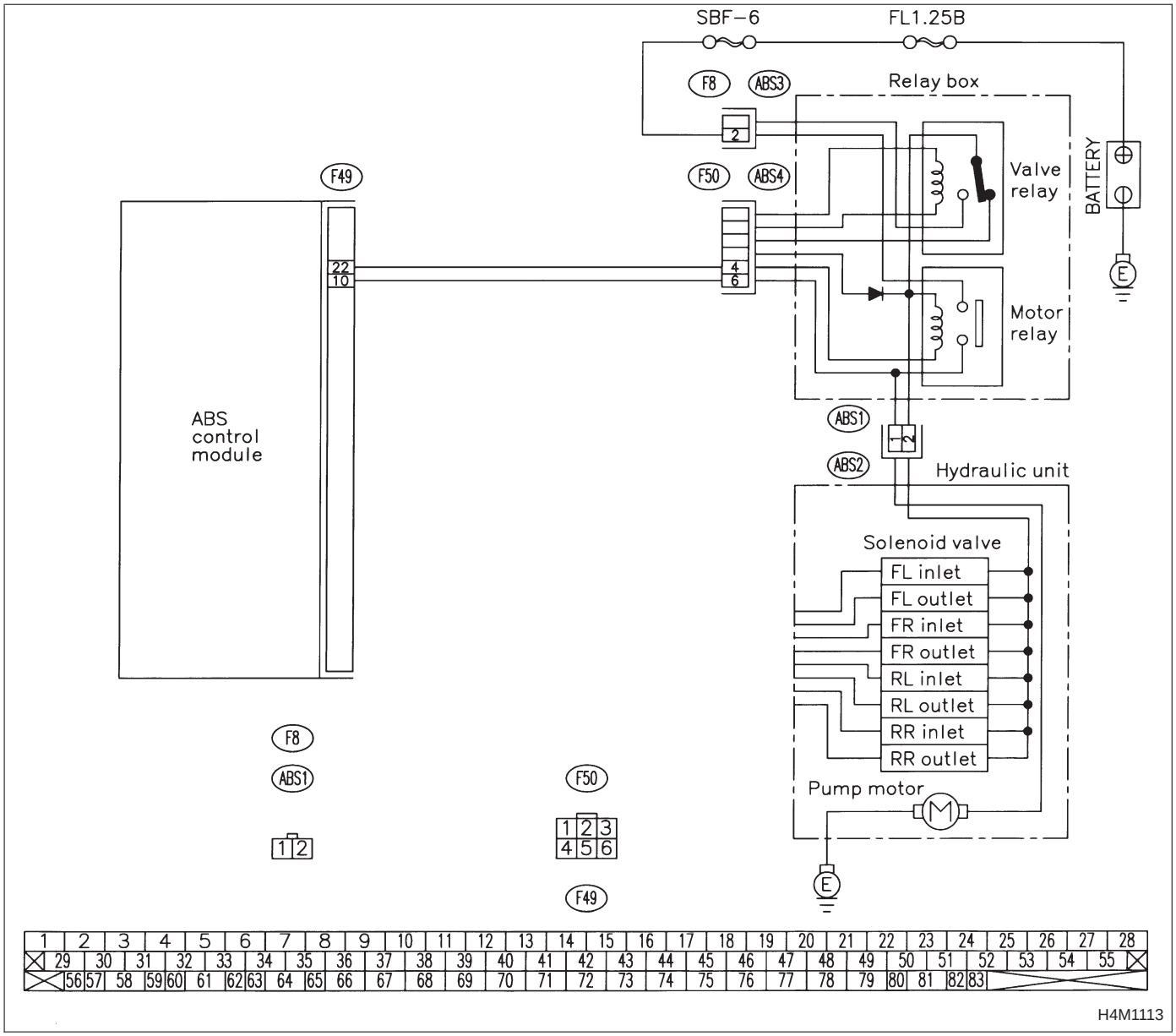
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

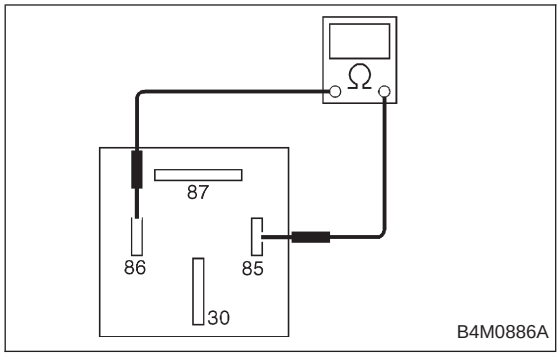
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1113

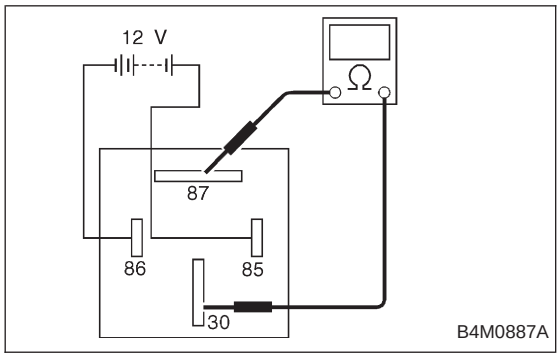


10AD1	CHECK RESISTANCE OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Remove motor relay from relay box.
3) Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 86:

CHECK ***: Is the resistance between 70 and 90 Ω?***
YES : Go to step **10AD2**.
NO : Replace motor relay.

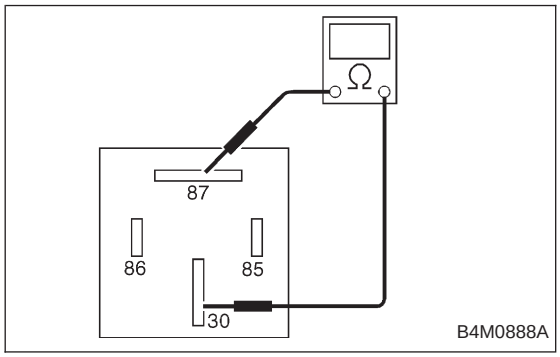


10AD2	CHECK CONTACT POINT OF MOTOR RELAY.

1) Connect battery to motor relay terminals No. 85 and No. 86.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AD3**.
NO : Replace motor relay.

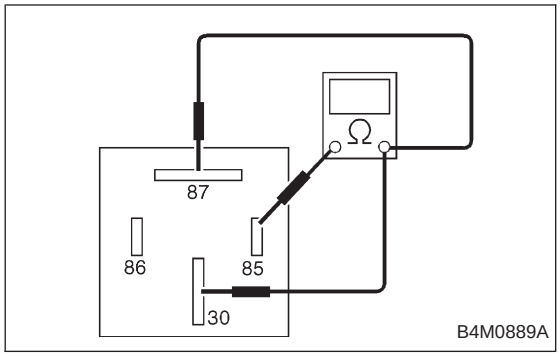


10AD3	CHECK CONTACT POINT OF MOTOR RELAY.

1) Disconnect battery from motor relay terminals.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AD4**.
NO : Replace motor relay.



10AD4	CHECK SHORT OF MOTOR RELAY.

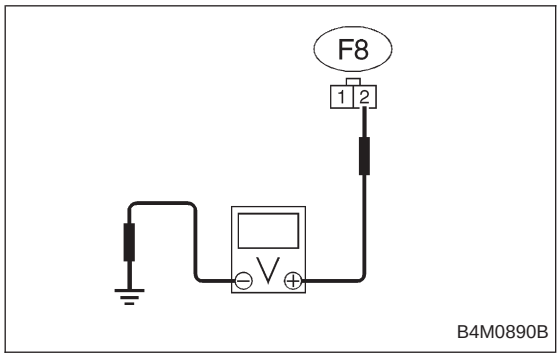
Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 30:
No. 85 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AD5**.

NO : Replace motor relay.



10AD5	CHECK INPUT VOLTAGE OF RELAY BOX.

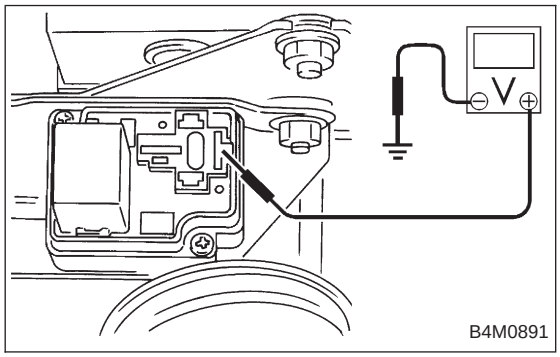
1) Disconnect connector (F8) from relay box.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10AD6**.

NO : Repair harness/connector between battery and relay box, and check fuse SBF6.



10AD6	CHECK INPUT VOLTAGE OF MOTOR RELAY.

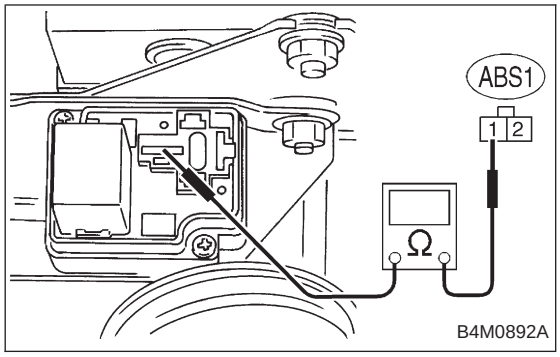
1) Connect connector (F8) to relay box.
2) Measure voltage between relay box and chassis ground.

Connector & terminal
Relay installing point No. 87 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10AD7**.

NO : Replace relay box, and fuse SBF6.

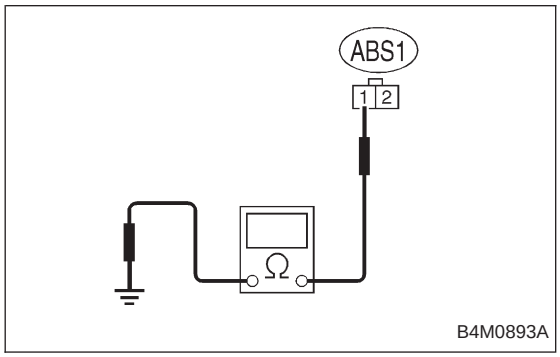


10AD7	CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector (ABS1) from hydraulic unit.
2) Measure resistance between hydraulic unit and motor relay installing portion.

Connector & terminal
(ABS1) No. 1 — Motor relay installing portion No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AD8**.
NO : Replace relay box.

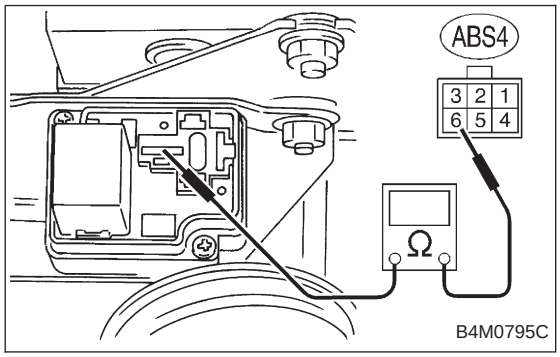


10AD8	CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit and chassis ground.

Connector & terminal
(ABS1) No. 1 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AD9**.
NO : Replace relay box, and check fuse No. 19.

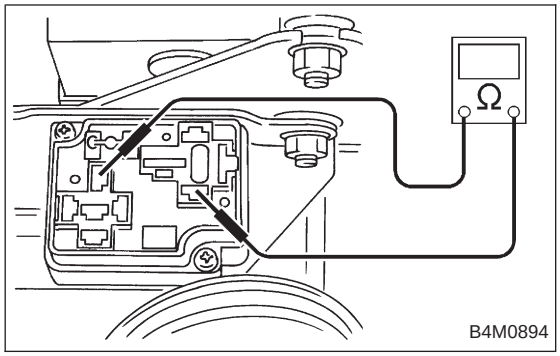


10AD9	CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.

1) Disconnect connector (F50) from relay box.
2) Measure resistance between relay box connector and motor relay installing point.

Connector & terminal
(ABS4) No. 6 — Motor relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AD10**.
NO : Replace relay box.

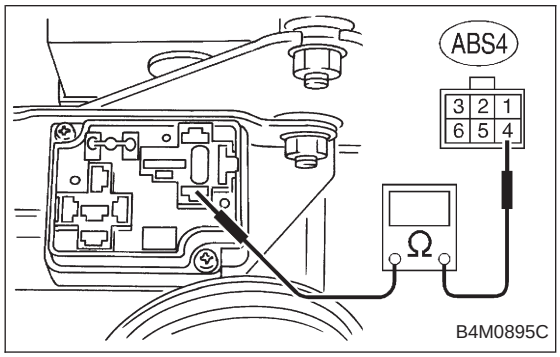


10AD10	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

1) Remove valve relay from relay box.
2) Measure resistance between motor relay installing point and valve relay installing point.

Connector & terminal
Motor relay installing point No. 86 — Valve relay installing point No. 30:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AD11**.
NO : Replace relay box.

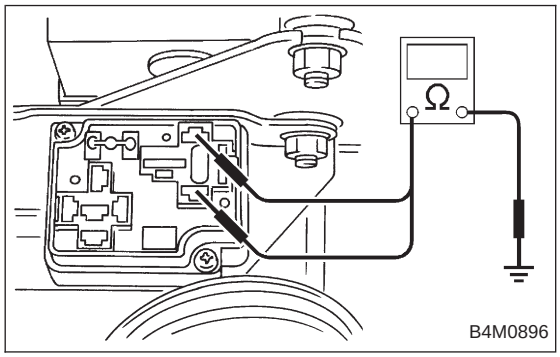


10AD11	CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between motor relay installing point and relay box connector.

Connector & terminal
Motor relay installing point No. 86 — (ABS4) No. 4:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AD12**.
NO : Replace relay box.

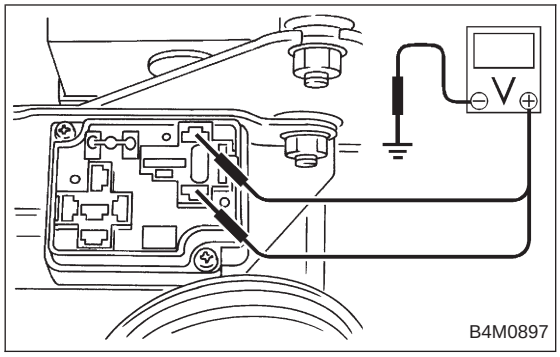


10AD12	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box and chassis ground.

Connector & terminal
Motor relay installing point No. 86 — Chassis ground:
Motor relay installing point No. 85 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AD13**.
NO : Replace relay box, and check fuse No. 19.

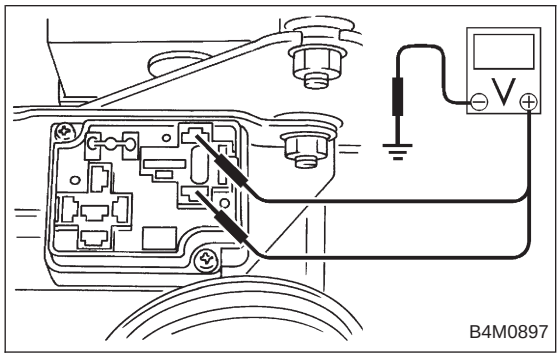


10AD13	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Measure voltage between motor relay installing point and chassis ground.

Connector & terminal
Motor relay installing point No. 85 (+) — Chassis ground (−):
Motor relay installing point No. 86 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AD14**.
NO : Replace relay box, and check all fuses.

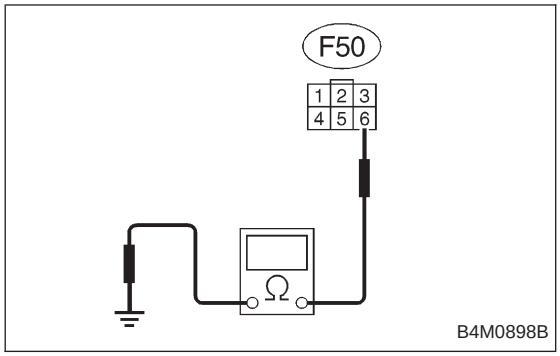


10AD14	CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between motor relay installing point and chassis ground.

Connector & terminal
Motor relay installing point No. 85 (+) — Chassis ground (−):
Motor relay installing point No. 86 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AD15**.
NO : Replace relay box, and check all fuses.



10AD15	CHECK OPEN CIRCUIT IN MONITOR SYSTEM HARNESS.

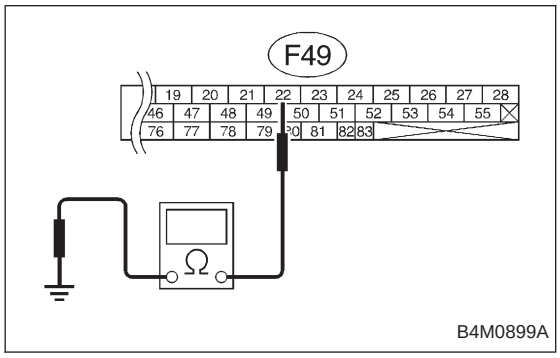
1) Turn ignition switch to OFF.
2) Connect between terminals No. 10 and No. 1 of ABSCM connector (F49) with a lead wire.
3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 6 — Chassis ground:

CHECK ***: Is the resistance less than 0.5 Ω?***

YES : Go to step **10AD16**.

NO : Repair harness/connector between ABSCM and relay box.



10AD16	CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.

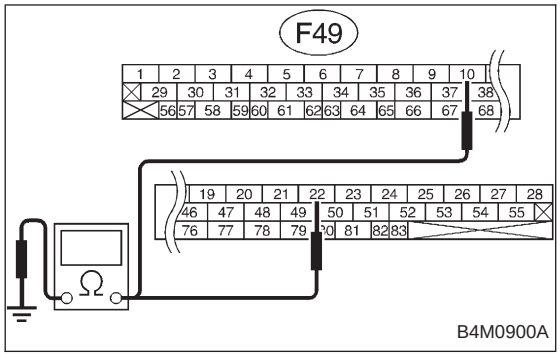
1) Connect valve relay and motor relay to relay box.
2) Connect connector (F50) to relay box.
3) Connect connector to hydraulic unit.
4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:

CHECK ***: Is the resistance between 70 and 90 Ω?***

YES : Go to step **10AD17**.

NO : Repair harness/connector between ABSCM and relay box.



10AD17	CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

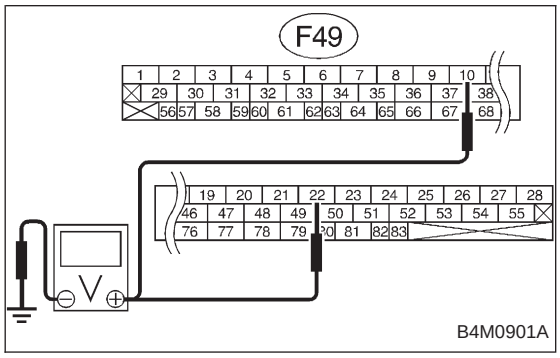
1) Disconnect connector (F50) from relay box.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:
(F49) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AD18**.

NO : Repair harness between ABSCM and relay box, and check fuse No. 19 and SBF6.



10AD18	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

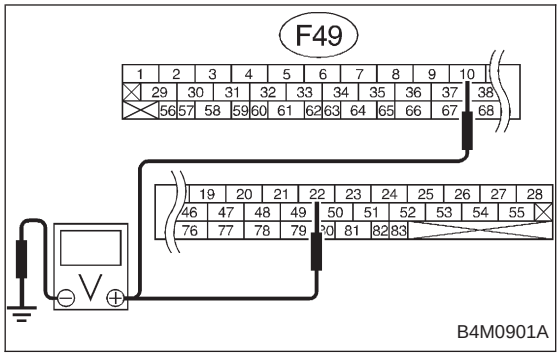
Measure voltage between ABSCM and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AD19**.

NO : Repair harness between relay box and ABSCM, and check fuse SBF6.

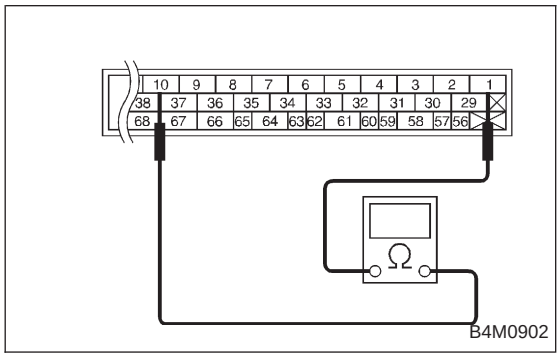


10AD19	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AD20**.
NO : Repair harness between relay box and ABSCM, and check fuse SBF6.

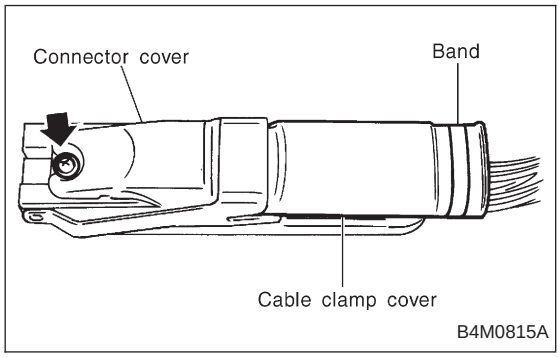


10AD20	CHECK GROUND SHORT AT ABSCM MONITOR TERMINAL.

1) Turn ignition switch to OFF.
2) Measure resistance between ABSCM terminals.

Terminal
No. 10 — No. 1:

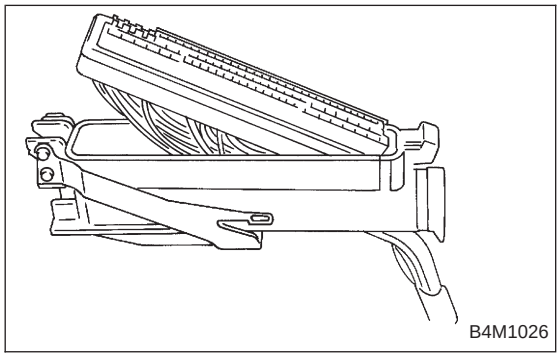
CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AD21**.
NO : Replace ABSCM.



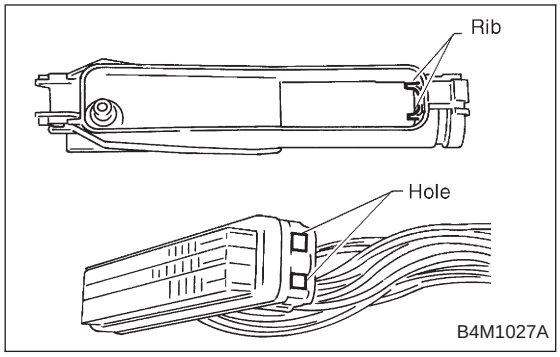
10AD21	CHECK ABSCM MOTOR DRIVE TERMINAL.

1) Disconnect connector cover from ABSCM connector.
2) Remove band.
3) Remove cable clamp cover.
4) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

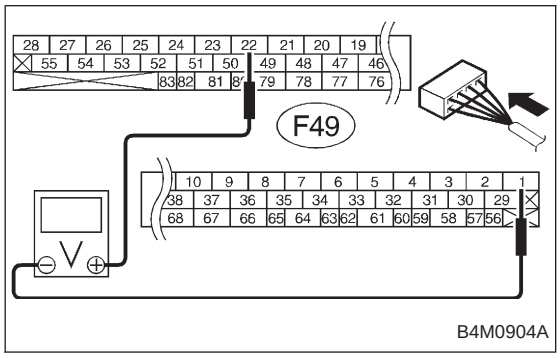


5) Remove connector cover.



NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

6) Connect all connectors.



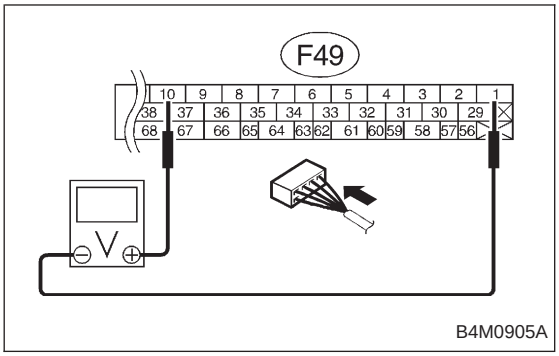
7) Measure voltage between ABSCM connector terminals.
8) Operate the check sequence. <Ref. to 4-4 [W12D0].>

Connector & terminals
(F49) No. 22 (+) — No. 1 (−):

CHECK ***: Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?***

YES : Go to step **10AD22**.

NO : Replace ABSCM.



10AD22	CHECK MOTOR OPERATION.

1) Measure voltage between ABSCM connector terminal.
2) Operate the check sequence. <Ref. to 4-4 [W12D0].>

Connector & terminals
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Does the voltage raise from less than 1.5 V to between 10 V and 13 V and return to less than 1.5 V again when carrying out the check sequence?***

YES : Go to step **10AD23**.
NO : Replace hydraulic unit.

10AD23	CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W12D0].>

CHECK ***: Can motor revolution noise (buzz) be heard when carrying out the check sequence?***

YES : Go to step **10AD24**.
NO : Replace hydraulic unit.

10AD24	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connectors between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.
NO : Go to step **10AD25**.

10AD25	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.
NO : Go to step **10AD26**.

10AD26	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

D•NEW 52 (FB1)
M. RELAY ON

B4M0970

AE: TROUBLE CODE 52 M. RELAY ON — MOTOR RELAY ON FAILURE —

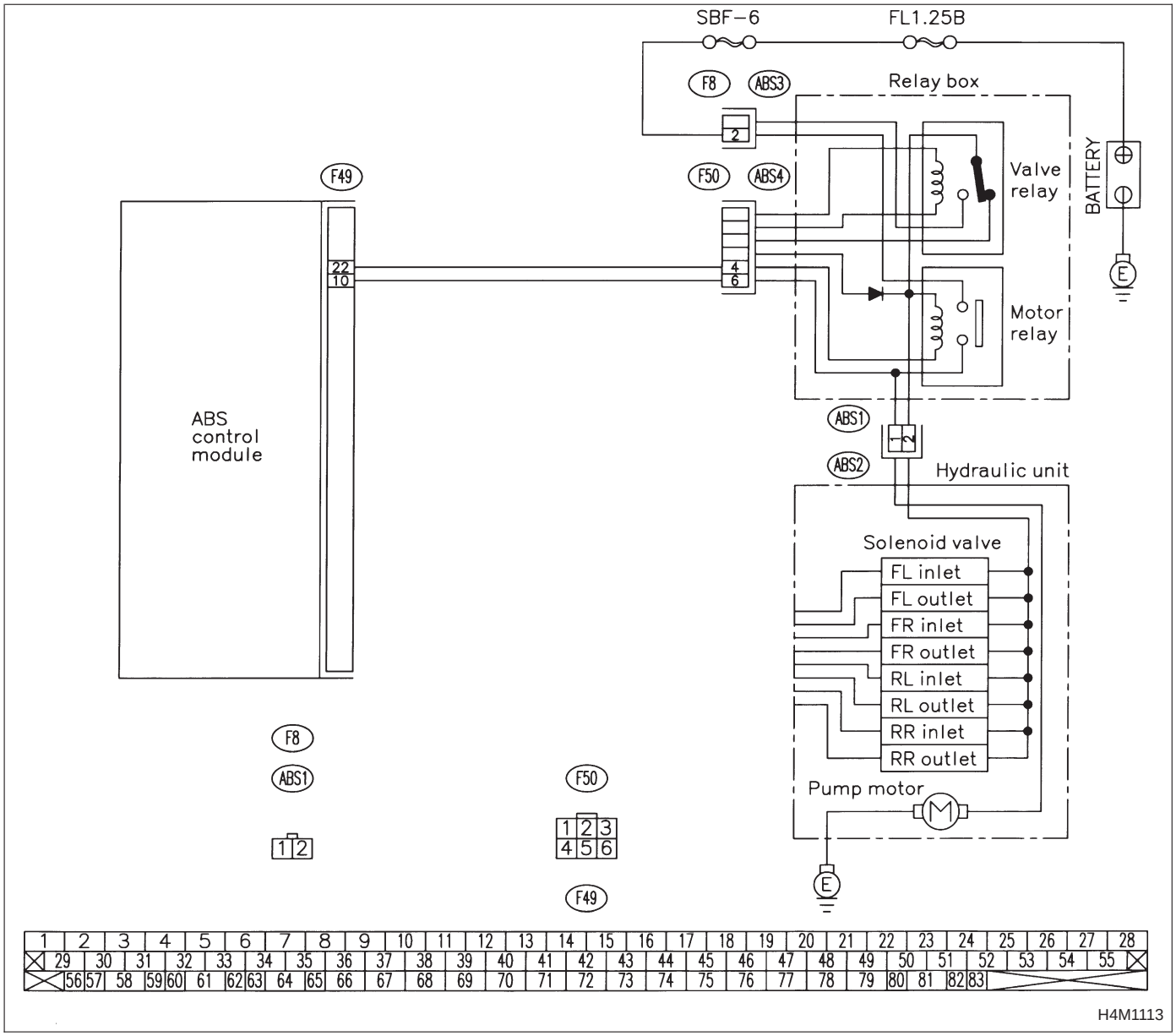
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

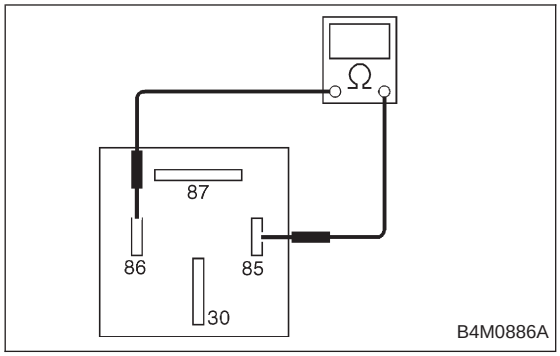
TROUBLE SYMPTOM:

- ABS does not operate.

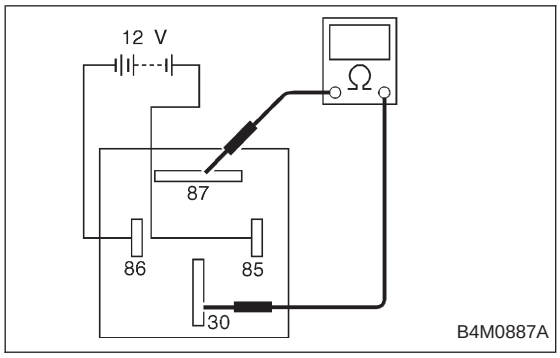
WIRING DIAGRAM:



H4M1113



B4M0886A



B4M0887A

10AE1	CHECK RESISTANCE OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Remove motor relay from relay box.
3) Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 86:

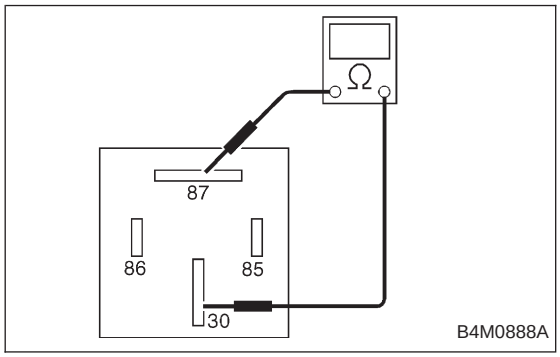
CHECK ***: Is the resistance between 70 and 90 Ω?***
YES : Go to step **10AE2**.
NO : Replace motor relay.

10AE2	CHECK CONTACT POINT OF MOTOR RELAY.

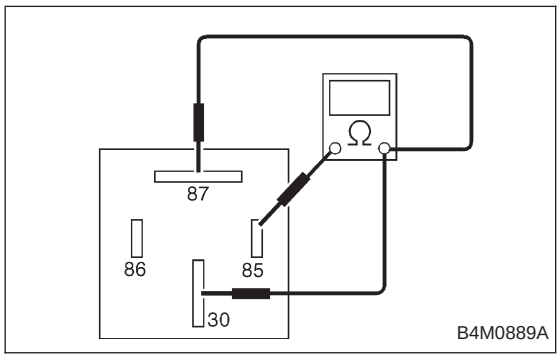
1) Connect battery to motor relay terminals No. 85 and No. 86.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AE3**.
NO : Replace motor relay.



B4M0888A



B4M0889A

10AE3	CHECK CONTACT POINT OF MOTOR RELAY.

1) Disconnect battery from motor relay terminals.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

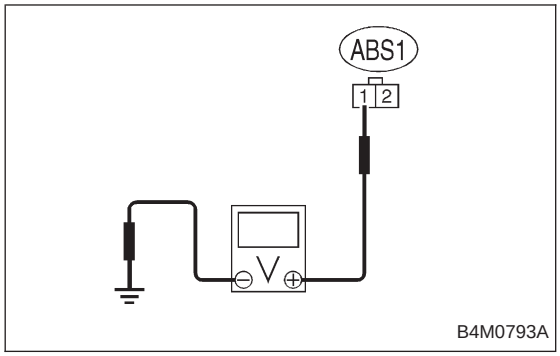
CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AE4**.
NO : Replace motor relay.

10AE4	CHECK SHORT OF MOTOR RELAY.

Measure resistance between motor relay terminals.

Terminals
No. 85 — No. 30:
No. 85 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AE5**.
NO : Replace motor relay.

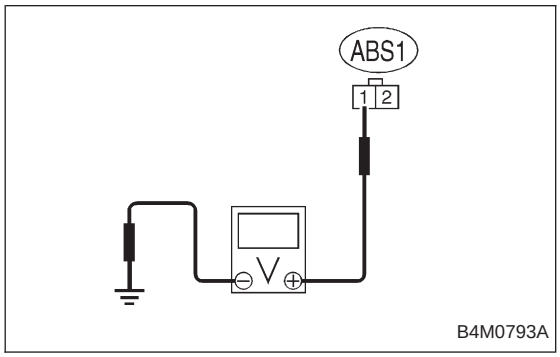


10AE5	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Disconnect connector from ABSCM.
2) Disconnect connector (ABS1) from hydraulic unit.
3) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AE6**.
NO : Replace relay box.

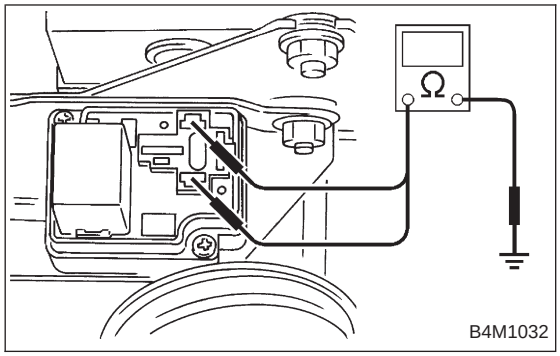


10AE6	CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***
YES : Go to step **10AE7**.
NO : Replace relay box.



10AE7	CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

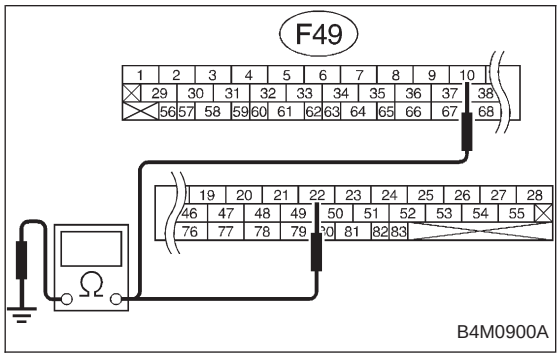
1) Turn ignition switch to OFF.
2) Disconnect connector (F50) from relay box.
3) Measure resistance between relay box and chassis ground.

Connector & terminal
Motor relay installing point No. 85 — Chassis ground:
Motor relay installing point No. 86 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AE8**.

NO : Replace relay box, and check fuse No. 19.



10AE8	CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

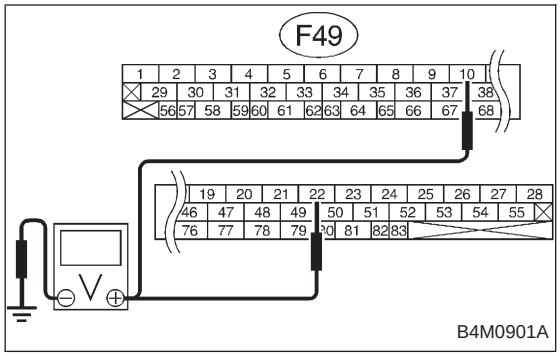
1) Disconnect connector (F49) from ABSCM.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 — Chassis ground:
(F49) No. 10 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AE9**.

NO : Repair harness between ABSCM and relay box, and check fuse No. 19 and SBF6.



10AE9	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

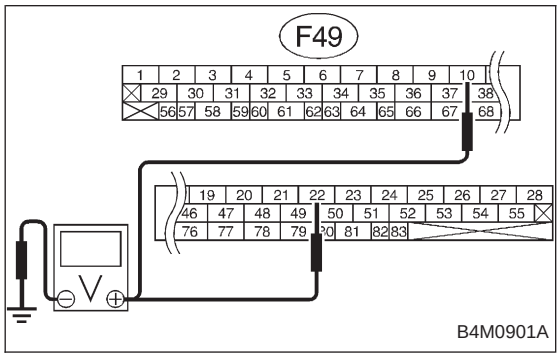
Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AE10**.

NO : Repair harness between relay box and ABSCM connector, and check fuse SBF6.



10AE10	CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

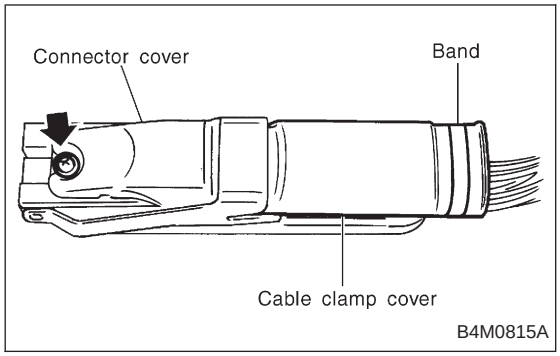
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

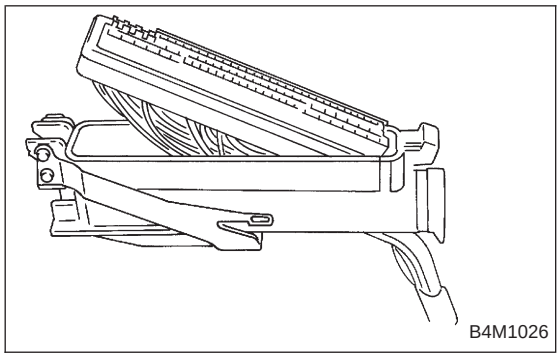
Connector & terminal
(F49) No. 22 (+) — Chassis ground (−):
(F49) No. 10 (+) — Chassis ground (−):

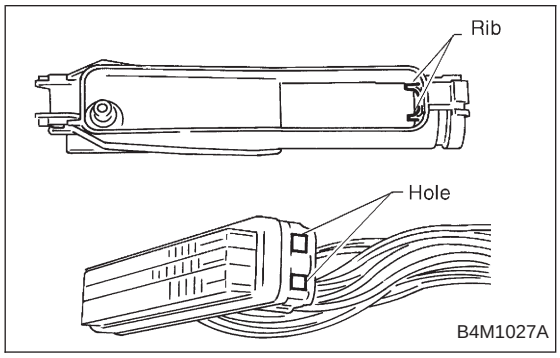
CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AE11**.

NO : Repair harness between relay box and ABSCM, and check fuse SBF6.







10AE11	CHECK BATTERY SHORT AT ABSCM MONITOR TERMINAL.

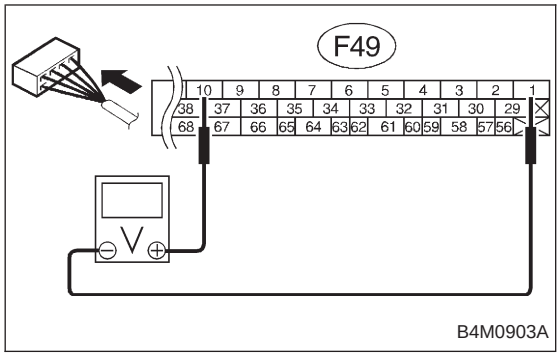
1) Turn ignition switch to OFF.
2) Disconnect connector from ABS control module.
3) Remove band.
4) Remove cable clamp cover.
5) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.

6) Remove connector cover.

NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

7) Connect all connectors.



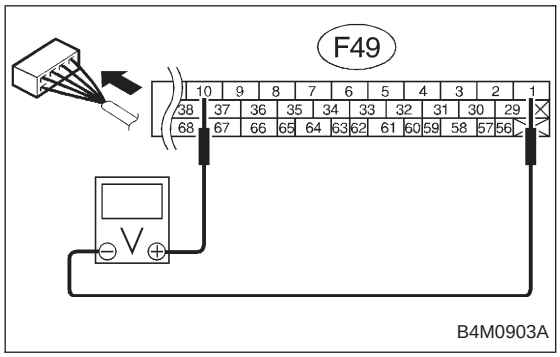
8) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Is the voltage less than 2 V?***

YES : Go to step **10AE12**.

NO : Replace ABSCM.



10AE12	CHECK BATTERY SHORT AT ABSCM MONITOR TERMINAL.

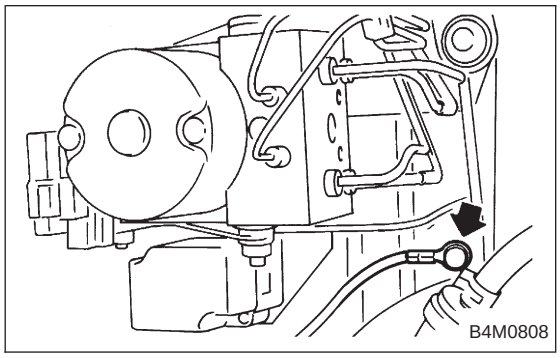
1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector terminals.

Connector & terminal
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Is the voltage less than 2 V?***

YES : Go to step **10AE13**.

NO : Replace ABSCM.



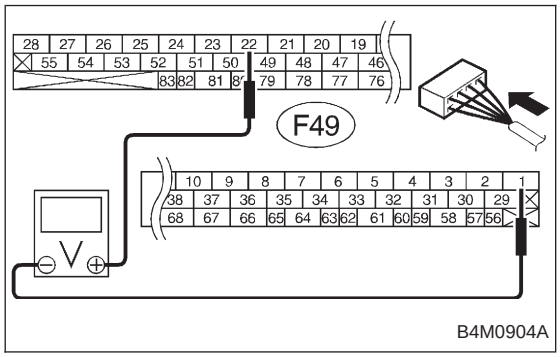
10AE13	CHECK MOTOR GROUND.

Turn ignition switch to OFF.

CHECK ***: Tightening torque:***
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)
Is the motor ground terminal tightly clamped?

YES : Go to step **10AE14**.

NO : Tighten the clamp of motor ground terminal.



10AE14	CHECK ABSCM MOTOR DRIVE TERMINAL.

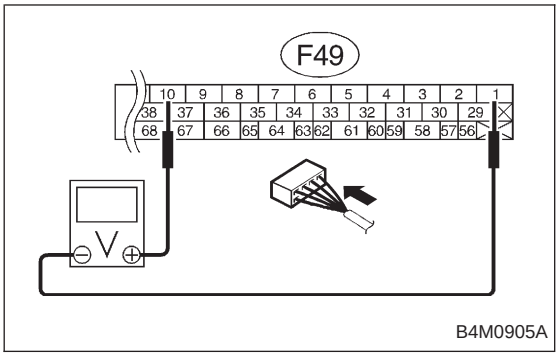
1) Measure voltage between ABSCM connector terminals.
2) Operate the check sequence. <Ref. to 4-4 [W12D0].>

Connector & terminals
(F49) No. 22 (+) — No. 1 (−):

CHECK ***: Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?***

YES : Go to step **10AE15**.

NO : Replace ABSCM.



10AE15	CHECK MOTOR OPERATION.

1) Measure voltage between ABSCM connector terminal.
2) Operate the check sequence. <Ref. to 4-4 [W12D0].>

Connector & terminals
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Does the voltage raise from less than 1.5 V to between 10 V and 13 V, and return to less than 1.5 V again when carrying out the check sequence?***

YES : Go to step **10AE16**.
NO : Replace hydraulic unit.

10AE16	CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W12D0].>

CHECK ***: Can motor revolution noise (buzz) be heard when carrying out the check sequence?***

YES : Go to step **10AE17**.
NO : Replace hydraulic unit.

10AE17	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connector between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.
NO : Go to step **10AE18**.

10AE18	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.
NO : Go to step **10AE19**.

10AE19	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

D•NEW 52 (FB1)
MOTOR

B4M0971

AF: TROUBLE CODE 52 MOTOR — ABNORMAL MOTOR —

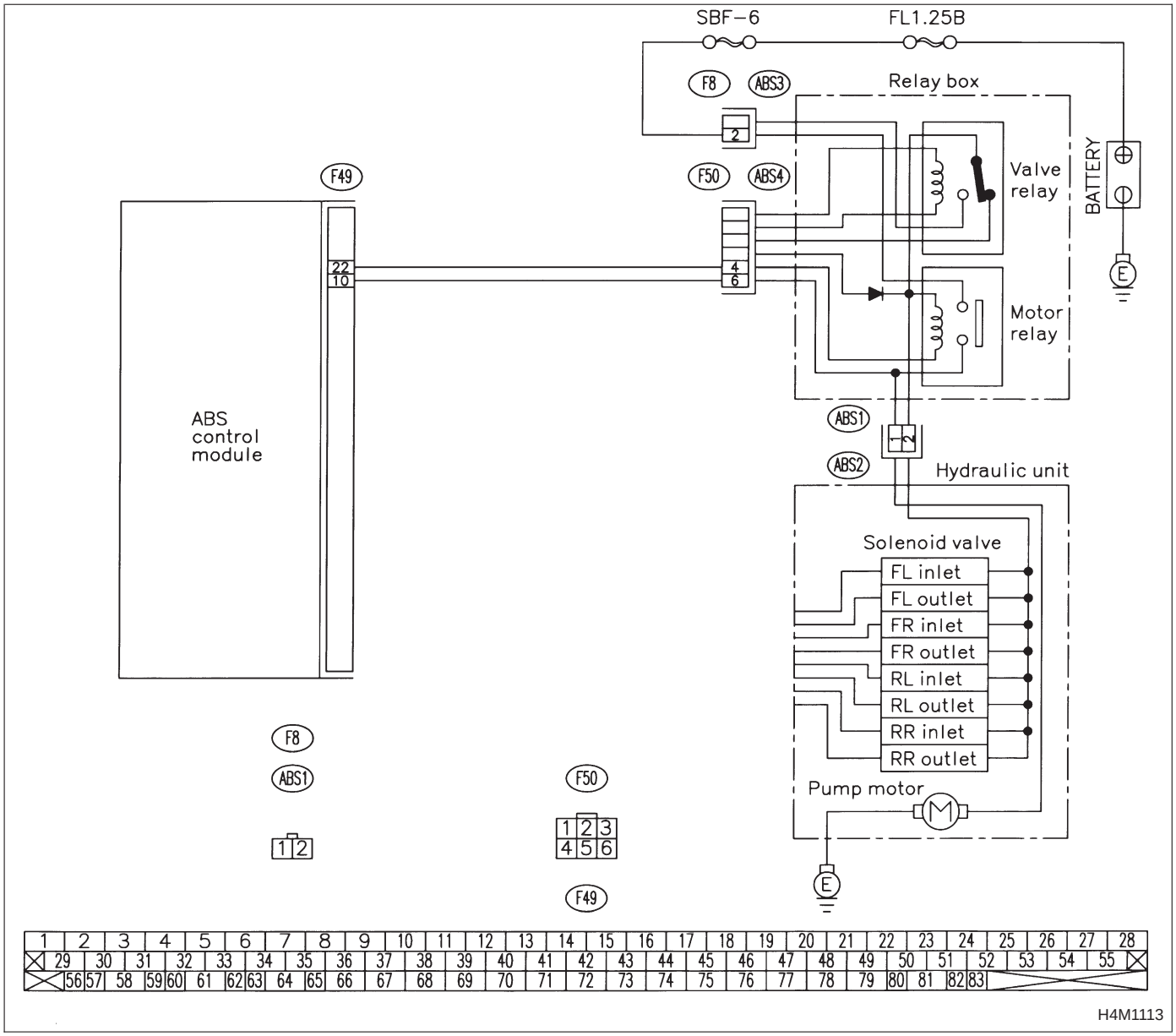
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

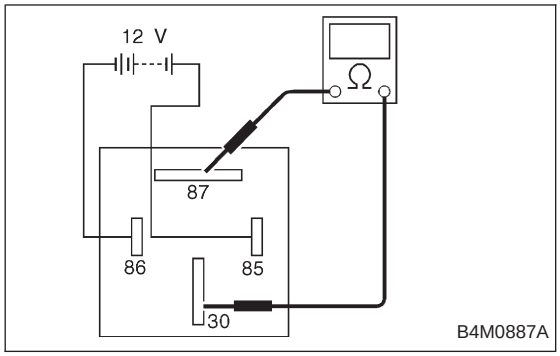
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1113

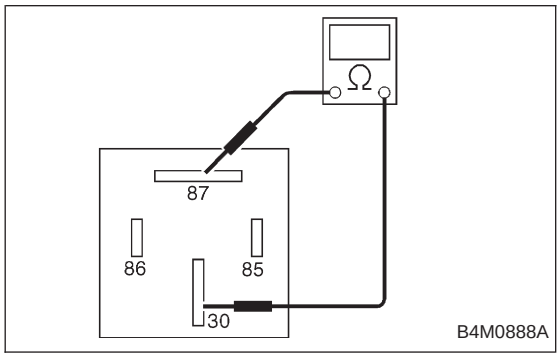


10AF1	CHECK CONTACT POINT OF MOTOR RELAY.

1) Turn ignition switch to OFF.
2) Remove motor relay from relay box.
3) Connect battery to motor relay terminals No. 85 and No. 86.
4) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance less than 0.5 Ω?***
YES : Go to step **10AF2**.
NO : Replace motor relay.

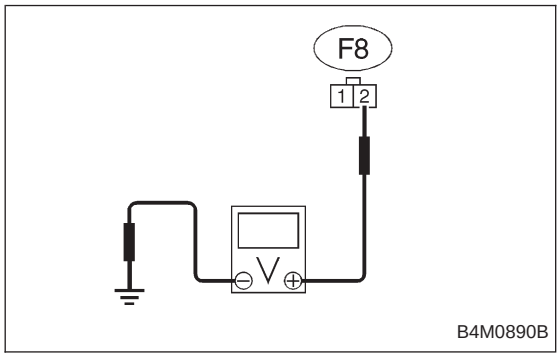


10AF2	CHECK CONTACT POINT OF MOTOR RELAY.

1) Disconnect battery from motor relay terminals.
2) Measure resistance between motor relay terminals.

Terminals
No. 30 — No. 87:

CHECK ***: Is the resistance more than 1 MΩ?***
YES : Go to step **10AF3**.
NO : Replace motor relay.

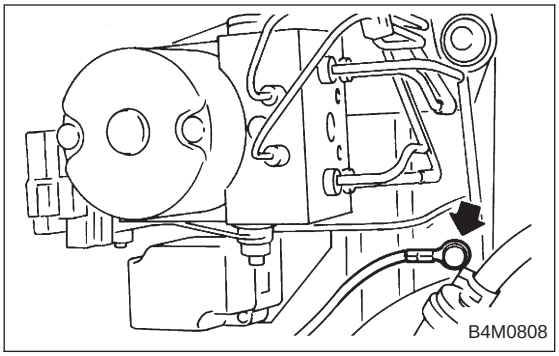


10AF3	CHECK INPUT VOLTAGE OF RELAY BOX.

1) Disconnect connector (F8) from relay box.
2) Measure voltage between relay box connector and chassis ground.

Connector & terminal
(F8) No. 2 (+) — Chassis ground (−):

CHECK ***: Is the voltage between 10 V and 13 V?***
YES : Go to step **10AF4**.
NO : Repair harness/connector between battery and relay box, and check fuse SBF6.


B4M0808

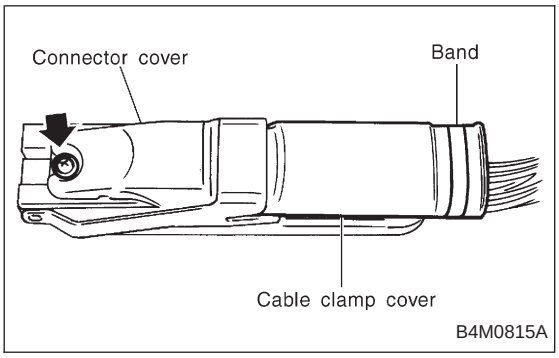
10AF4	CHECK MOTOR GROUND.

Tightening torque:
32±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)

CHECK ***: Is the motor ground terminal tightly clamped?***

YES : Go to step **10AF5**.

NO : Tighten the clamp of motor ground terminal.

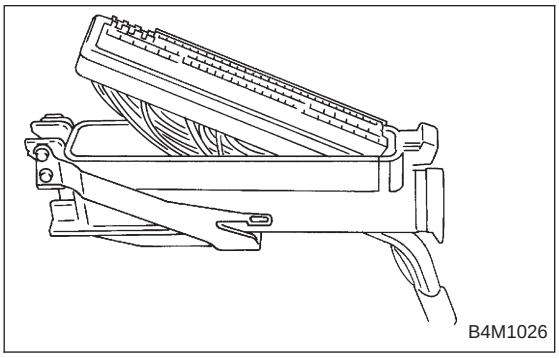


B4M0815A

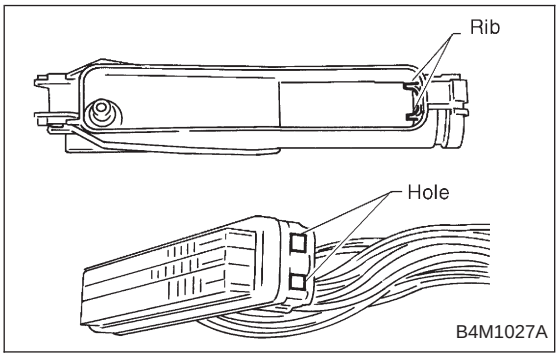
10AF5	CHECK MOTOR OPERATION.

1) Disconnect connector from ABS control module.
2) Remove band.
3) Remove cable clamp cover.
4) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.


B4M1026

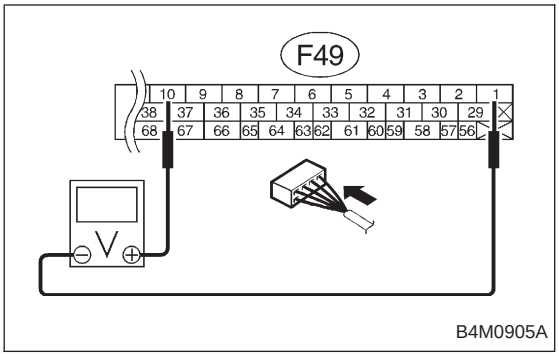
5) Remove connector cover.



B4M1027A

NOTE:
- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

6) Connect connector to ABSCM.
7) Connect motor relay to relay box.
8) Connect all connectors.



9) Measure voltage between ABSCM connector terminal.
10) Operate the check sequence. <Ref. to 4-4 [W12D0].>

Connector & terminals
(F49) No. 10 (+) — No. 1 (−):

CHECK ***: Does the voltage raise from less than 1.5 V to between 10 V and 13 V, and return to less than 1.5 V again when carrying out the check sequence?***

YES : Go to step **10AF6**.
NO : Replace hydraulic unit.

10AF6	CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W12D0].>

CHECK ***: Can motor revolution noise (buzz) be heard when carrying out the check sequence?***

YES : Go to step **10AF7**.
NO : Replace hydraulic unit.

10AF7	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connector between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.
NO : Go to step **10AF8**.

10AF8	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.
NO : Go to step **10AF9**.

10AF9	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.

D•NEW 54 (FB1)
BLS

B4M0972

AG: TROUBLE CODE 54 BLS — ABNORMAL STOP LIGHT SWITCH —

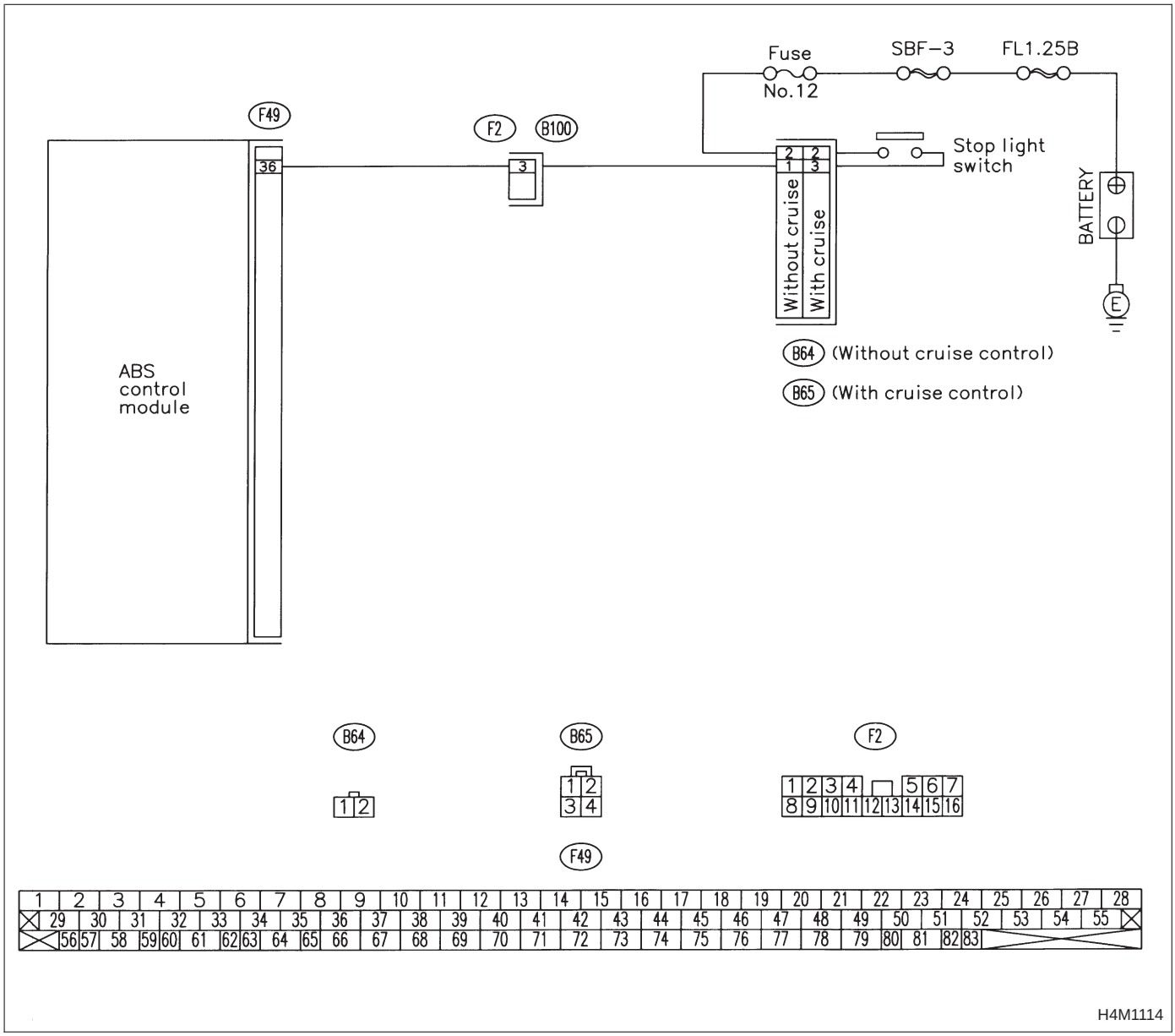
DIAGNOSIS:

- Faulty stop light switch

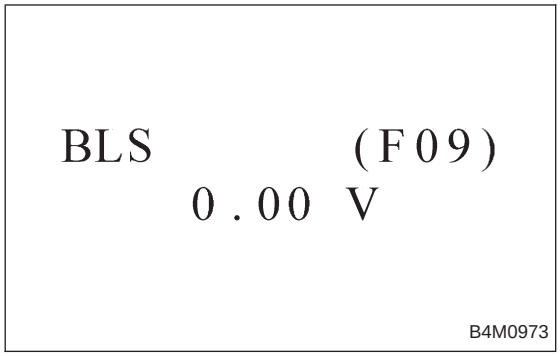
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1114

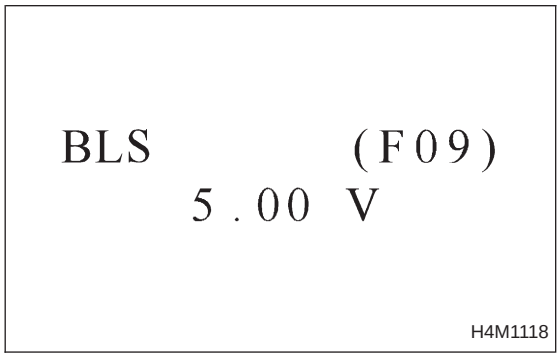


10AG1	CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.

1) Press [F], [0] and [9] on the select monitor.
2) Depress the brake pedal.
3) Read the stop light switch output on the select monitor display.

CHECK ***: Is the reading indicated on monitor display less than 1.5 V?***

YES : Go to step **10AG2**.
NO : Go to step **10AG3**.



10AG2	CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.

1) Release the brake pedal.
2) Read the stop light switch output on the select monitor display.

CHECK ***: Is the reading indicated on monitor display greater than 4.5 V?***

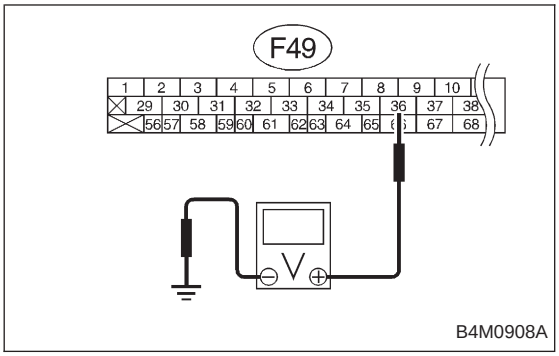
YES : Go to step **10AG5**.
NO : Go to step **10AG3**.

10AG3	CHECK IF STOP LIGHTS COME ON.

Depress the brake pedal.

CHECK ***: Do stop lights turn on?***

YES : Go to step **10AG4**.
NO : Repair stop lights circuit.



10AG4	CHECK OPEN CIRCUIT IN HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Depress brake pedal.
4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 36 — Chassis ground:

CHECK ***: Is the voltage between 10 V and 13 V?***

YES : Go to step **10AG5**.

NO : Repair harness between stop light switch and ABSCM connector.

10AG5	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between stop light switch and ABSCM? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AG6**.

10AG6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10AG7**.

10AG7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

D•NEW 56 (FB1)
G SENSOR LINE

B4M0974

AH: TROUBLE CODE 56 G SENSOR LINE — OPEN OR SHORT CIRCUIT OF G SENSOR —

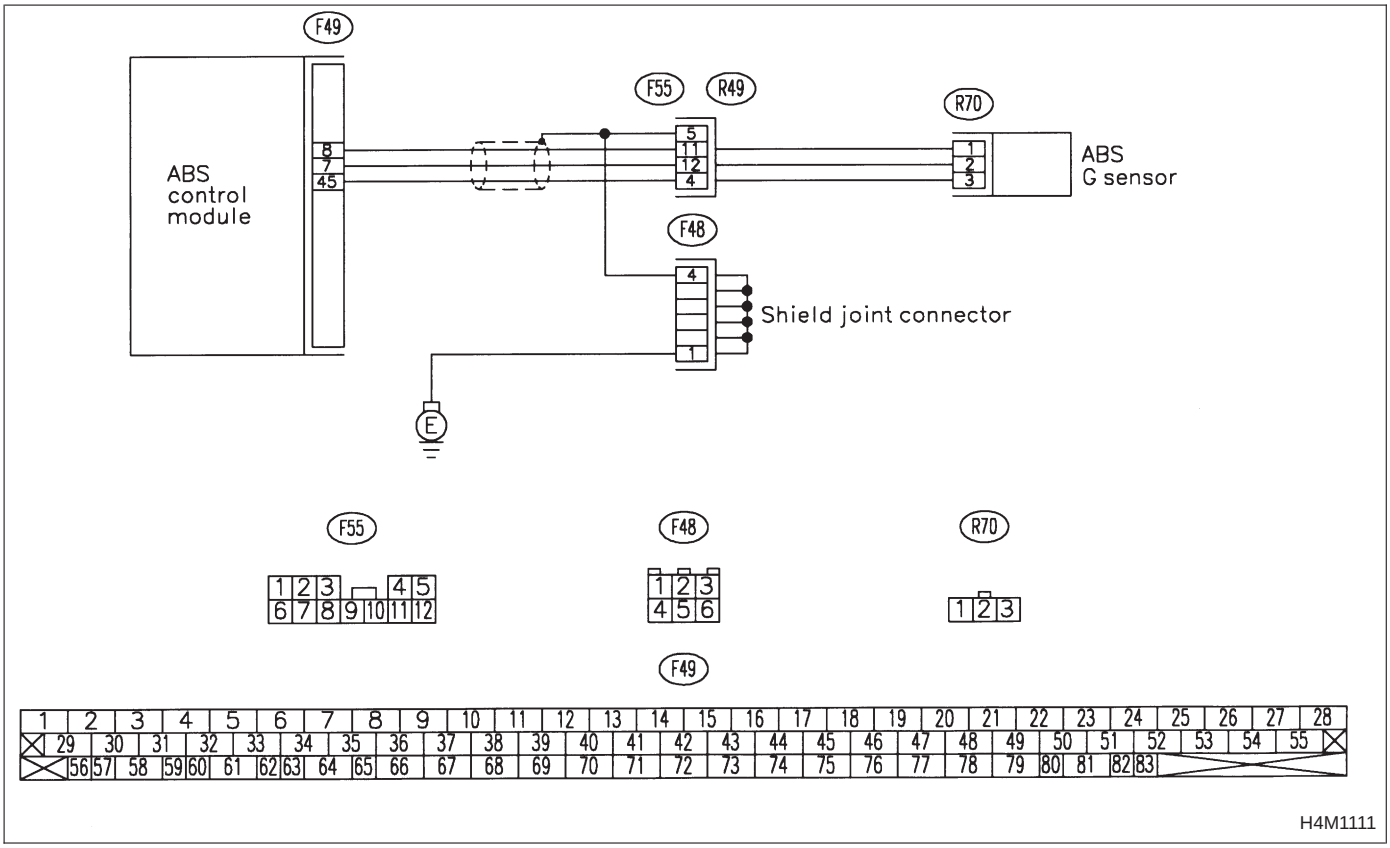
DIAGNOSIS:

- Faulty G sensor output voltage

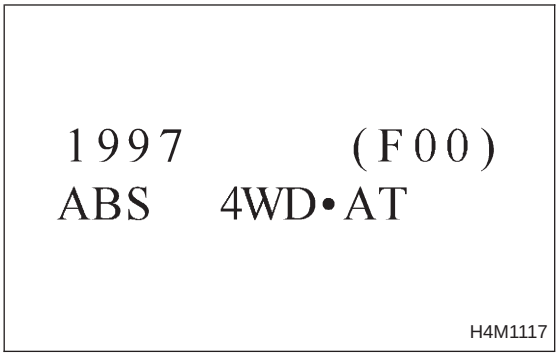
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1111

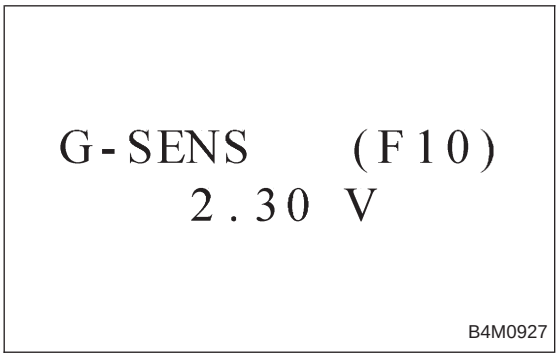


10AH1	CHECK SPECIFICATIONS OF ABSCM USING SELECT MONITOR.

1) Press [F], [0] and [0] on the select monitor.
2) Read the select monitor display.

CHECK : ***Is an ABSCM for 4WD model installed on a FWD model?***

YES : Replace ABSCM.
NO : Go to step **10AH2**.



10AH2	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

1) Press [F], [1] and [0] on the select monitor.
2) Read the select monitor display.

CHECK : ***Is the indicated reading between 2.1 and 2.5 V when the G sensor is in horizontal position?***

YES : Go to step **10AH3**.
NO : Go to step **10AH6**.

10AH3	CHECK POOR CONTACT IN CONNECTORS.

CHECK : ***Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.
NO : Go to step **10AH4**.

10AH4	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

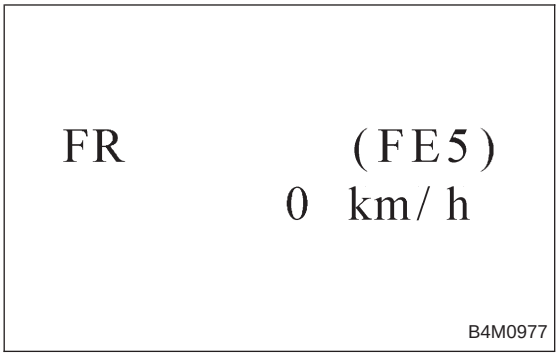
CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.
NO : Go to step **10AH5**.

10AH5	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.
NO : A temporary poor contact.



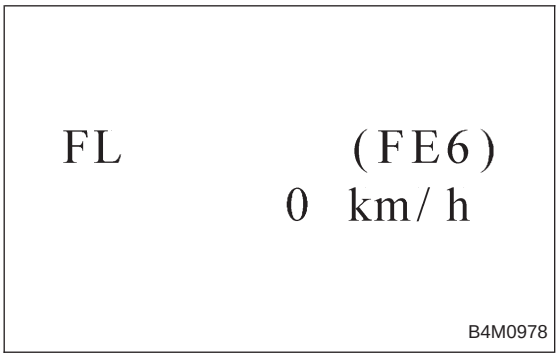
10AH6	CHECK FREEZE FRAME DATA.

1) Press [F], [E] and [5] on the select monitor.
2) Read the select monitor display.

CHECK : ***Is the reading indicated on monitor display 0 km?***

YES : Go to step **10AH7**.

NO : Go to step **10AH15**.



10AH7	CHECK FREEZE FRAME DATA.

1) Press the scroll key so that FE6 appears on the monitor display.
2) Read the select monitor display.

CHECK : ***Is the reading indicated on monitor display 0 km?***

YES : Go to step **10AH8**.

NO : Go to step **10AH15**.



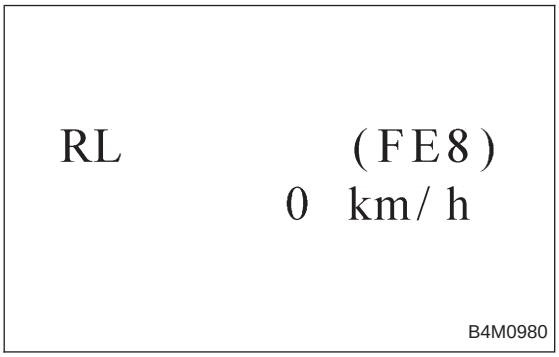
10AH8	CHECK FREEZE FRAME DATA.

1) Press the scroll key so that FE7 appears on the monitor display.
2) Read the select monitor display.

CHECK : ***Is the reading indicated on monitor display 0 km?***

YES : Go to step **10AH9**.

NO : Go to step **10AH15**.



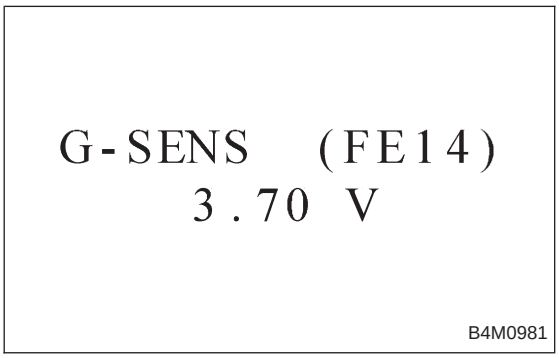
10AH9	CHECK FREEZE FRAME DATA.

1) Press the scroll key so that FE8 appears on the monitor display.
2) Read the select monitor display.

CHECK : ***Is the reading indicated on monitor display 0 km?***

YES : Go to step **10AH10**.

NO : Go to step **10AH15**.



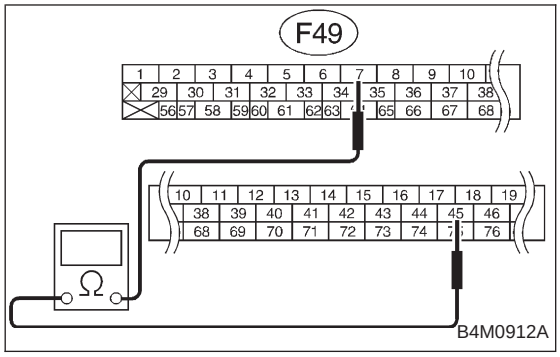
10AH10	CHECK FREEZE FRAME DATA.

1) Press the scroll key so that FE14 appears on the monitor display.
2) Read the select monitor display.

CHECK : ***Is the reading indicated on monitor display more than 3.65 V?***

YES : Go to step **10AH11**.

NO : Go to step **10AH15**.



10AH11	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK ***: Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **10AH12**.

NO : Repair harness/connector between G sensor and ABSCM.

10AH12	CHECK POOR CONTACT IN CONNECTORS.

CHECK ***: Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AH13**.

10AH13	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

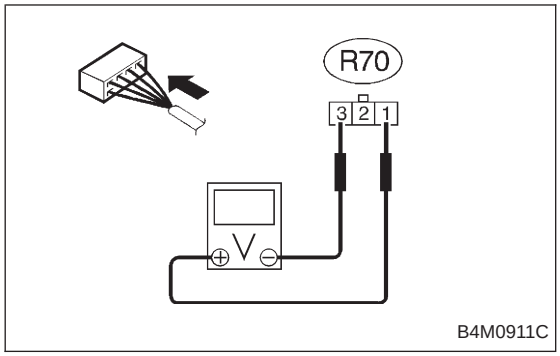
NO : Go to step **10AH14**.

10AH14	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



10AH15	CHECK INPUT VOLTAGE OF G SENSOR.

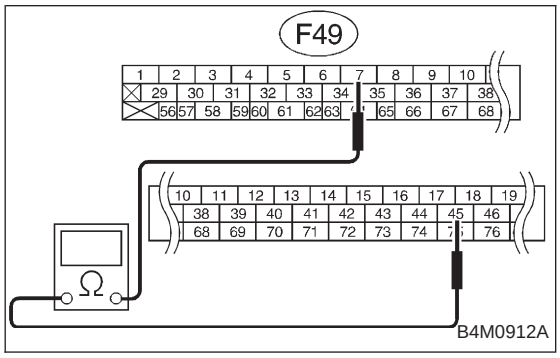
1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect G sensor from body. (Do not disconnect connector.)
4) Turn ignition switch to ON.
5) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 1 (+) — No. 3 (−):

CHECK ***: Is the voltage between 4.75 and 5.25 V?***

YES : Go to step **10AH16**.

NO : Repair harness/connector between G sensor and ABSCM.



10AH16	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

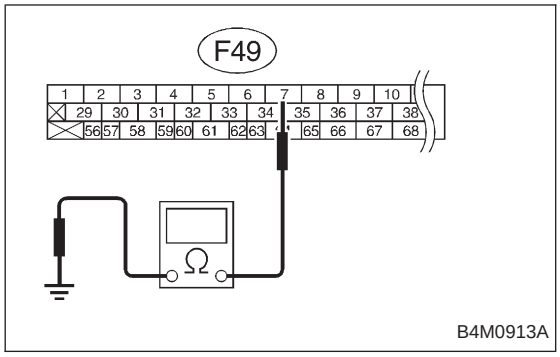
1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK ***: Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **10AH17**.

NO : Repair harness/connector between G sensor and ABSCM.



10AH17	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.

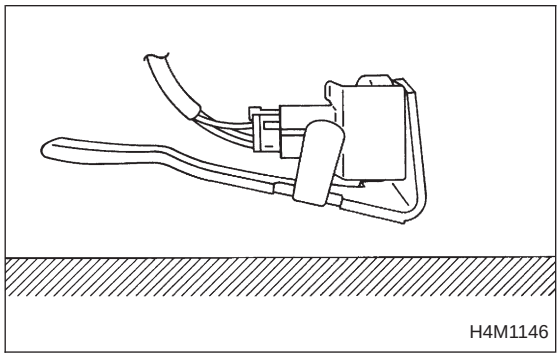
1) Disconnect connector from G sensor.
2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 — Chassis ground:

CHECK ***: Is the resistance more than 1 MΩ?***

YES : Go to step **10AH18**.

NO : Repair harness between G sensor and ABSCM.



10AH18	CHECK G SENSOR.

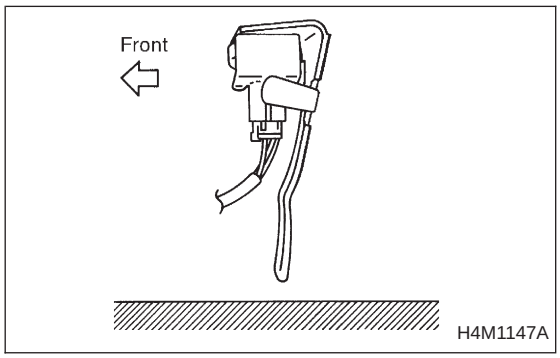
1) Connect connector to G sensor.
2) Connect connector to ABSCM.
3) Turn ignition switch to ON.
4) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?***

YES : Go to step **10AH19**.

NO : Replace G sensor.



10AH19	CHECK G SENSOR.

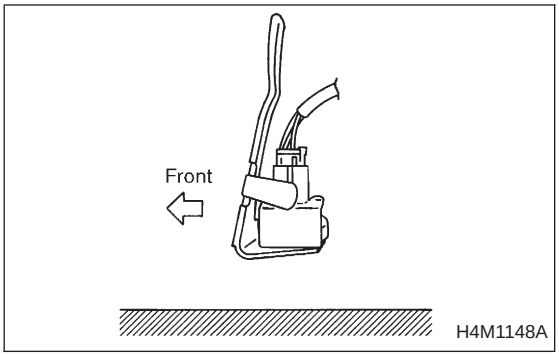
Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **10AH20**.

NO : Replace G sensor.



10AH20	CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **10AH21**.

NO : Replace G sensor.

10AH21	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK ***: Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AH22**.

10AH22	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

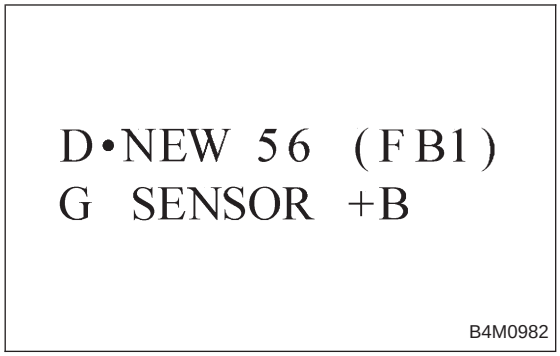
NO : Go to step **10AH23**.

10AH23	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



AI: TROUBLE CODE 56 G SENSOR +B — BATTERY SHORT OF G SENSOR —

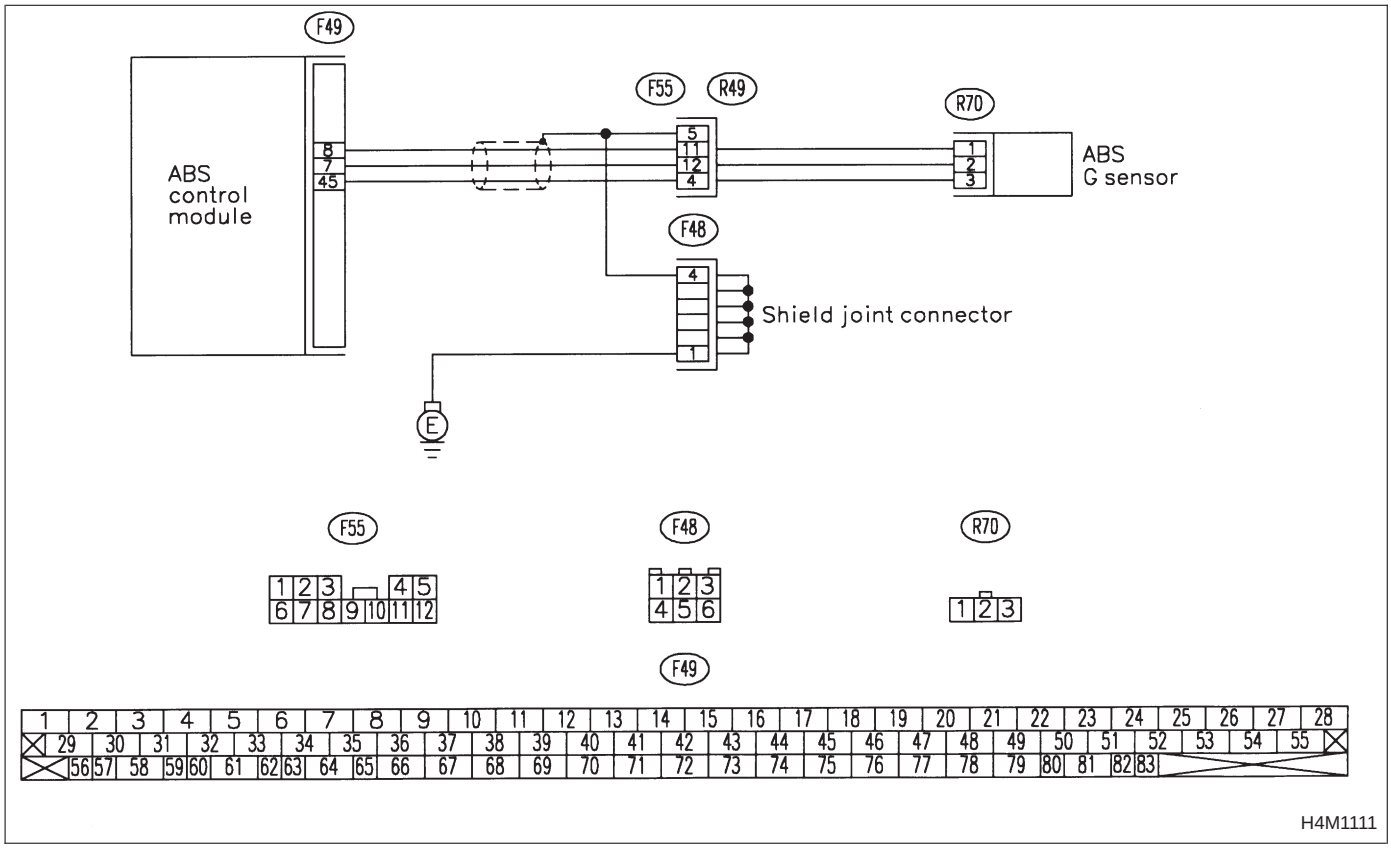
DIAGNOSIS:

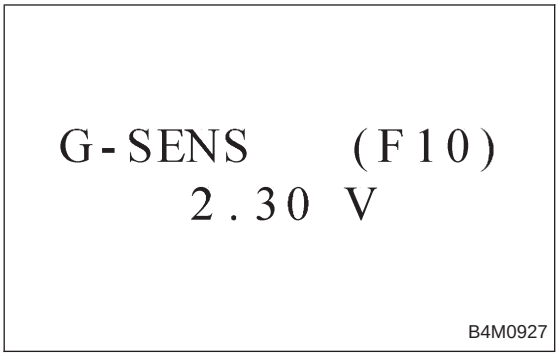
- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





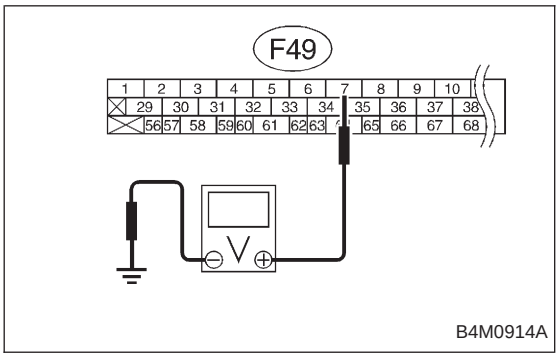
10AI1	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

1) Press [F], [1] and [0] on the select monitor.
2) Read the select monitor display.

CHECK ***: Is the indicated reading between 2.1 and 2.5 V when the G sensor is in horizontal position?***

YES : Replace ABSCM.

NO : Go to step **10AI2**.



10AI2	CHECK BATTERY SHORT OF HARNESS.

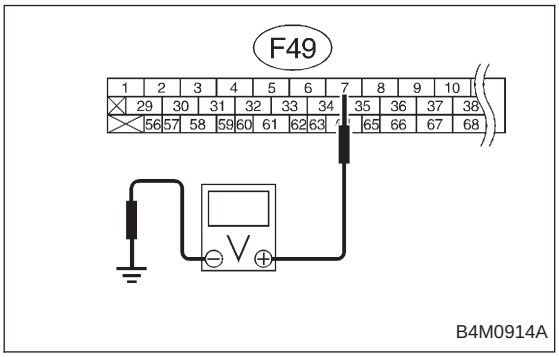
1) Turn ignition switch to OFF.
2) Remove console box.
3) Disconnect connector from G sensor.
4) Disconnect connector from ABSCM.
5) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AI3**.

NO : Repair harness between G sensor and ABSCM.



10AI3	CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.
2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (−):

CHECK ***: Is the voltage less than 1 V?***

YES : Go to step **10AI4**.

NO : Repair harness between G sensor and ABSCM.

10AI4	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10AI5**.

10AI5	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



AJ: TROUBLE CODE 56 G SENSOR Hμ — ABNORMAL G SENSOR HIGH μ OUTPUT —

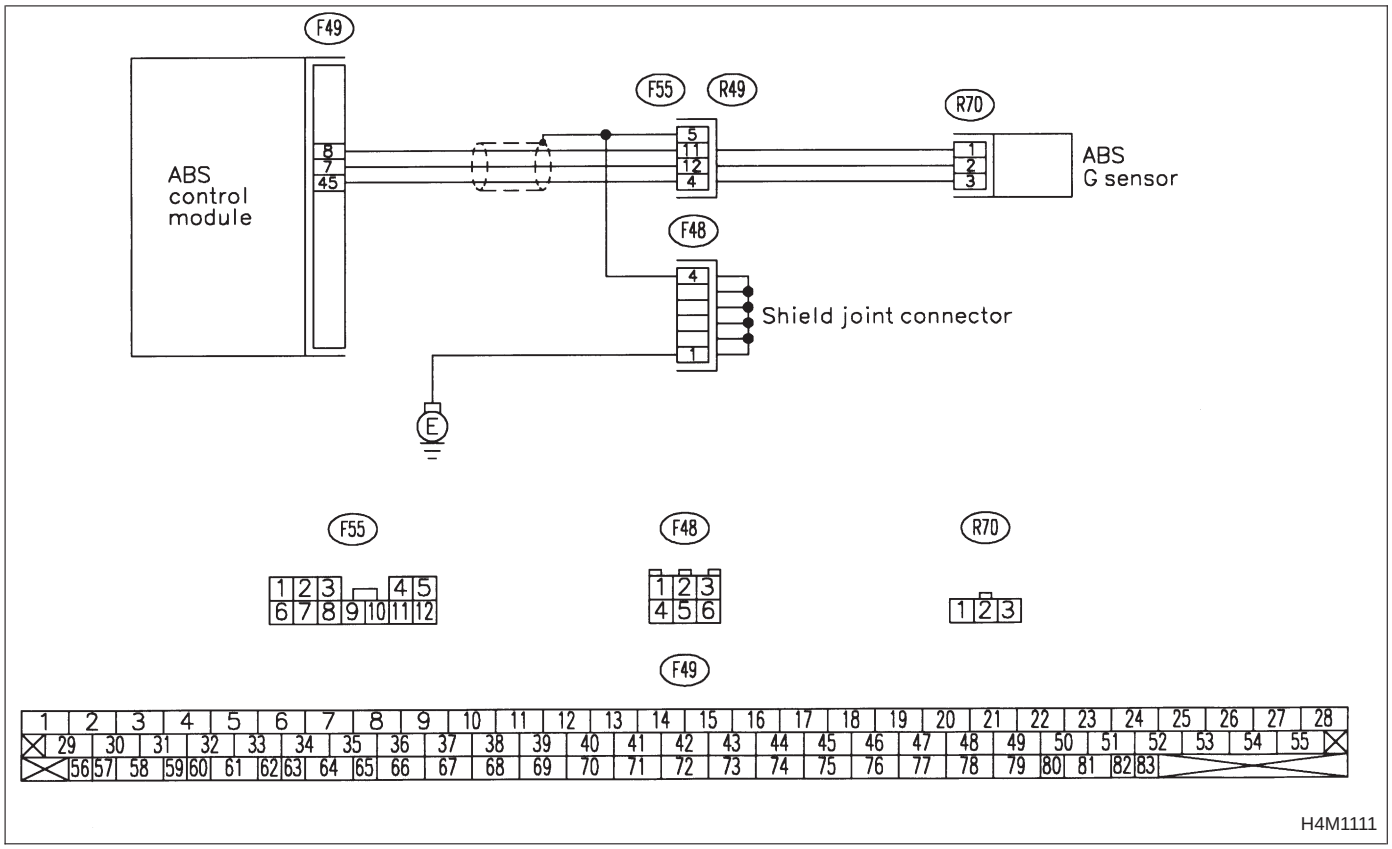
DIAGNOSIS:

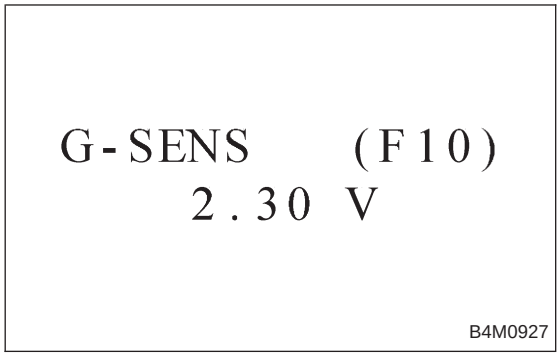
- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





10AJ1	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

1) Press [F], [1] and [0] on the select monitor.
2) Read the select monitor display.

CHECK : ***Is the indicated reading 2.3±0.2 V when the G sensor is in horizontal position?***

YES : Go to step **10AJ2**.

NO : Go to step **10AJ6**.

10AJ2	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AJ3**.

10AJ3	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

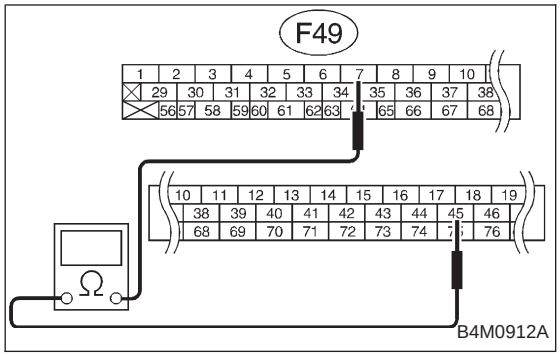
NO : Go to step **10AJ4**.

10AJ4	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



10AJ5	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

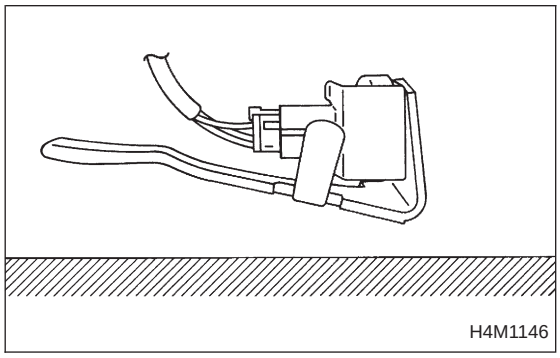
1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK ***: Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **10AJ6**.

NO : Repair harness/connector between G sensor and ABSCM.



10AJ6	CHECK G SENSOR.

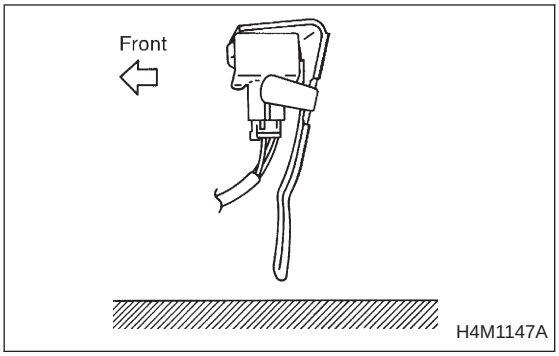
1) Remove console box.
2) Remove G sensor from vehicle.
3) Connect connector to G sensor.
4) Connect connector to ABSCM.
5) Turn ignition switch to ON.
6) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?***

YES : Go to step **10AJ7**.

NO : Replace G sensor.



10AJ7	CHECK G SENSOR.

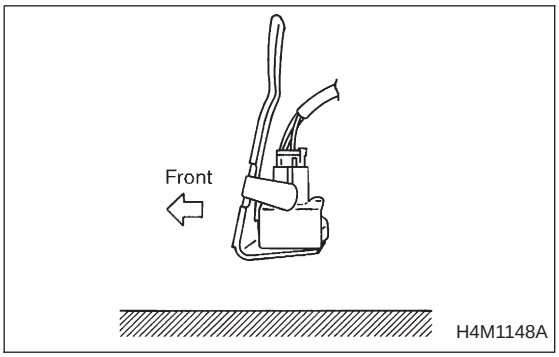
Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **10AJ8**.

NO : Replace G sensor.



10AJ8	CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **10AJ9**.

NO : Replace G sensor.

10AJ9	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

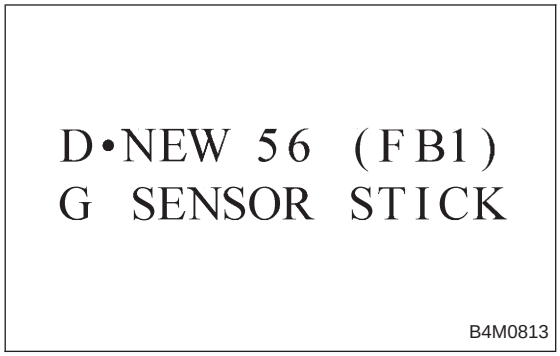
NO : Go to step **10AJ10**.

10AJ10	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



AK: TROUBLE CODE 56 G SENSOR STICK — G SENSOR OUTPUT IS STUCK —

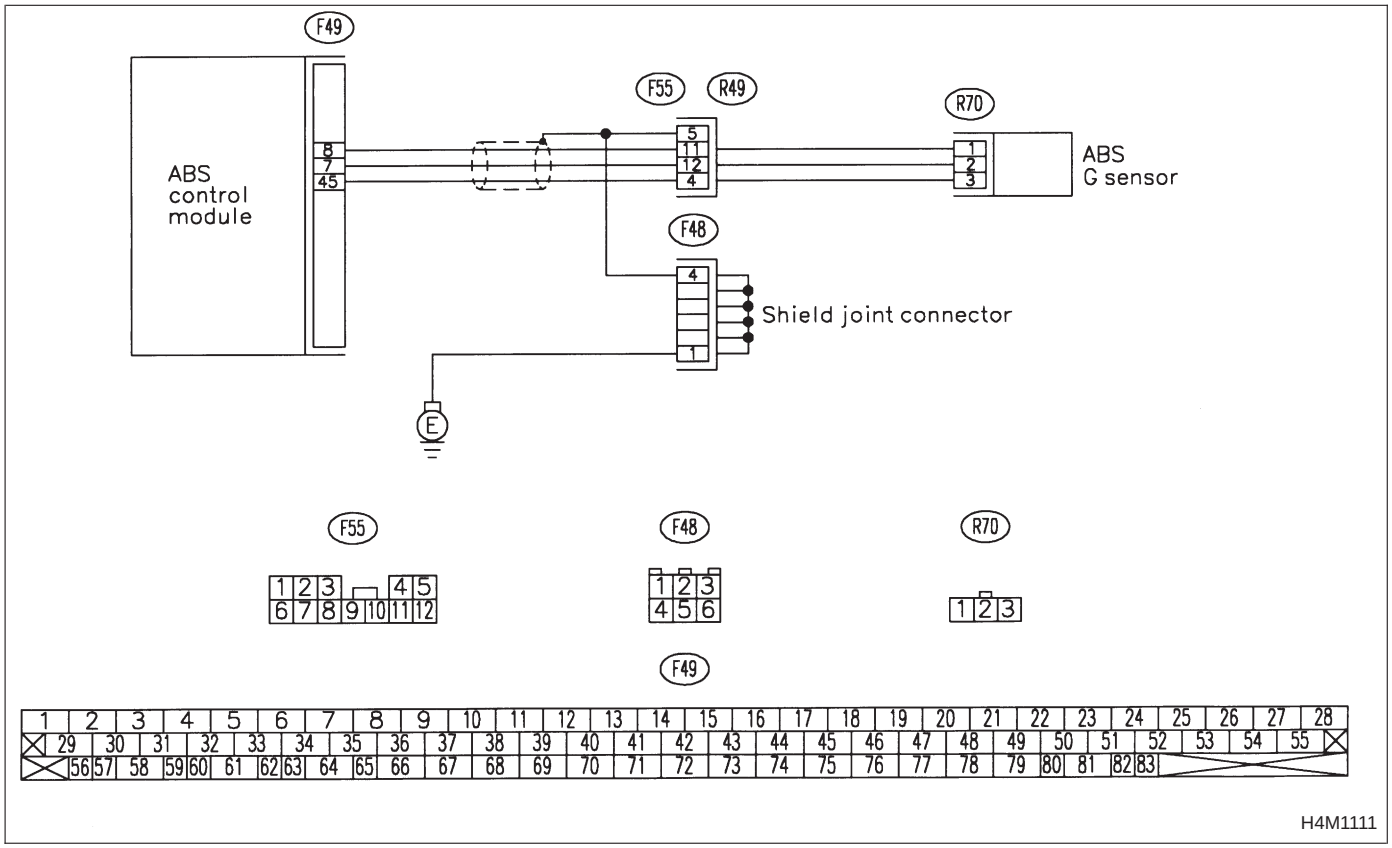
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

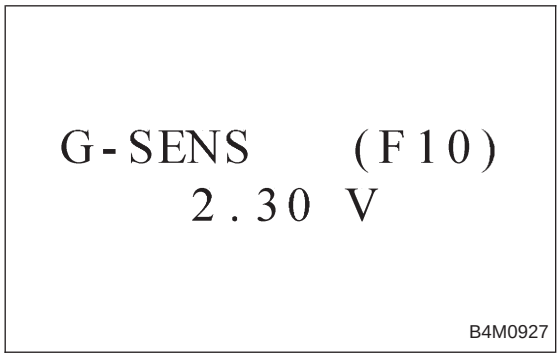


10AK1	CHECK ALL FOUR WHEELS FOR FREE TURNING.

CHECK : ***Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?***

YES : The ABS is normal. Erase the trouble code.

NO : Go to step **10AK2**.



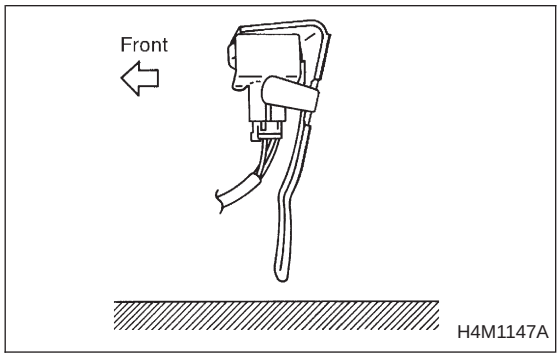
10AK2	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

1) Press [F], [1] and [0] on the select monitor.
2) Read the select monitor display.

CHECK : ***Is the indicated reading between 2.1 and 2.5 V when the vehicle is in horizontal position?***

YES : Go to step **10AK3**.

NO : Go to step **10AK8**.



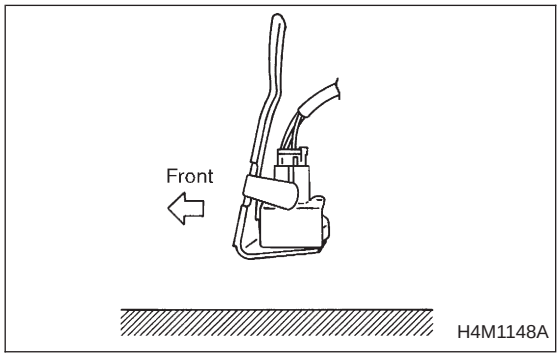
10AK3	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

1) Turn ignition switch to OFF.
2) Remove console box.
3) Remove G sensor from vehicle. (Do not disconnect connector.)
4) Turn ignition switch to ON.
5) Press [F], [1] and [0] on the select monitor.
6) Read the select monitor display.

CHECK : ***Is the indicated reading between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **10AK4**.

NO : Replace G sensor.



10AK4	CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.

Read the select monitor display.

CHECK : ***Is the indicated reading between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **10AK5**.

NO : Replace G sensor.

10AK5	CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : ***Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>***

YES : Repair connector.

NO : Go to step **10AK6**.

10AK6	CHECK ABSCM.

1) Connect all connectors.
2) Erase the memory.
3) Perform inspection mode.
4) Read out the trouble code.

CHECK : ***Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

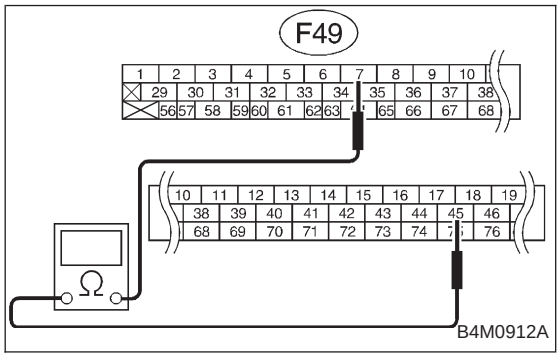
NO : Go to step **10AK7**.

10AK7	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK : ***Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.



10AK8	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.

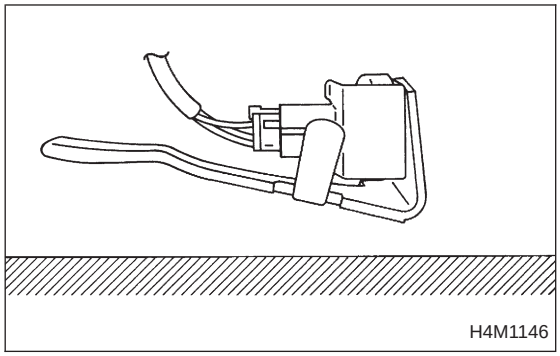
1) Turn ignition switch to OFF.
2) Disconnect connector from ABSCM.
3) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 7 — No. 45:

CHECK : ***Is the resistance between 4.3 and 4.9 kΩ?***

YES : Go to step **10AK9**.

NO : Repair harness/connector between G sensor and ABSCM.



10AK9	CHECK G SENSOR.

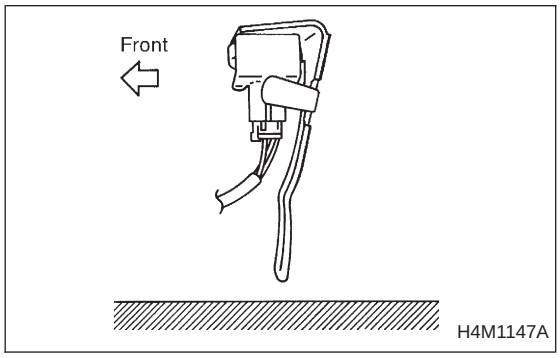
1) Remove console box.
2) Remove G sensor from vehicle.
3) Connect connector to G sensor.
4) Connect connector to ABSCM.
5) Turn ignition switch to ON.
6) Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?***

YES : Go to step **10AK10**.

NO : Replace G sensor.



10AK10	CHECK G SENSOR.

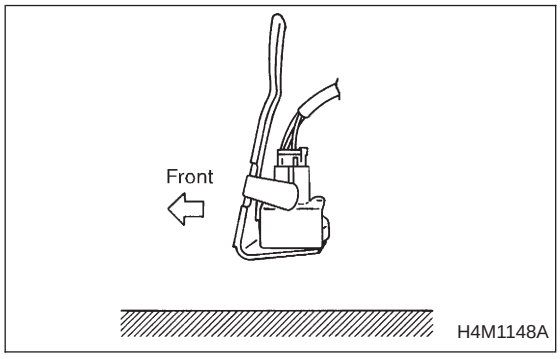
Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?***

YES : Go to step **10AK11**.

NO : Replace G sensor.



10AK11	CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal
(R70) No. 2 (+) — No. 1 (−):

CHECK ***: Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?***

YES : Go to step **10AK12**.

NO : Replace G sensor.

10AK12	CHECK ABSCM.

1) Turn ignition switch to OFF.
2) Connect all connectors.
3) Erase the memory.
4) Perform inspection mode.
5) Read out the trouble code.

CHECK ***: Is the same trouble code as in the current diagnosis still being output?***

YES : Replace ABSCM.

NO : Go to step **10AK13**.

10AK13	CHECK ANY OTHER TROUBLE CODES APPEARANCE.

CHECK ***: Are other trouble codes being output?***

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

11. General Diagnostics Table

A: SYMPTOMS AND PROBABLE CAUSES

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	● Hydraulic unit (solenoid valve) ● ABS sensor ● Brake (caliper & piston, pads) ● Wheel alignment ● Tire specifications, tire wear and air pressures ● Incorrect wiring or piping connections ● Road surface (uneven, camber)
	Vehicle spins.	● Hydraulic unit (solenoid valve) ● ABS sensor ● Brake (pads) ● Tire specifications, tire wear and air pressures ● Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	● Hydraulic unit (solenoid valve) ● Brake (pads) ● Air in brake line ● Tire specifications, tire wear and air pressures ● Incorrect wiring or piping connections
	Wheel locks.	● Hydraulic unit (solenoid valve, motor) ● ABS sensor ● Incorrect wiring or piping connections
	Brake dragging	● Hydraulic unit (solenoid valve) ● ABS sensor ● Master cylinder ● Brake (caliper & piston) ● Parking brake ● Axle & wheels ● Brake pedal play
	Long brake pedal stroke	● Air in brake line ● Brake pedal play
	Vehicle pitching	● Suspension play or fatigue (reduced damping) ● Incorrect wiring or piping connections ● Road surface (uneven)
	Unstable or uneven braking	● Hydraulic unit (solenoid valve) ● ABS sensor ● Brake (caliper & piston, pads) ● Tire specifications, tire wear and air pressures ● Incorrect wiring or piping connections ● Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	● Incorrect wiring or piping connections ● Road surface (uneven)
	Noise from hydraulic unit	● Hydraulic unit (mount bushing) ● ABS sensor ● Brake piping
	Noise from front of vehicle	● Hydraulic unit (mount bushing) ● ABS sensor ● Master cylinder ● Brake (caliper & piston, pads, rotor) ● Brake piping ● Brake booster & check valve ● Suspension play or fatigue
	Noise from rear of vehicle	● ABS sensor ● Brake (caliper & piston, pads, rotor) ● Parking brake ● Brake piping ● Suspension play or fatigue

B: CHECKING THE HYDRAULIC UNIT OPERATION

11B1	PREPARING THE BRAKE TESTER.

CHECK ***: Is the brake tester available?***

YES : CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER <Ref. to 4-4 [W12C2].>

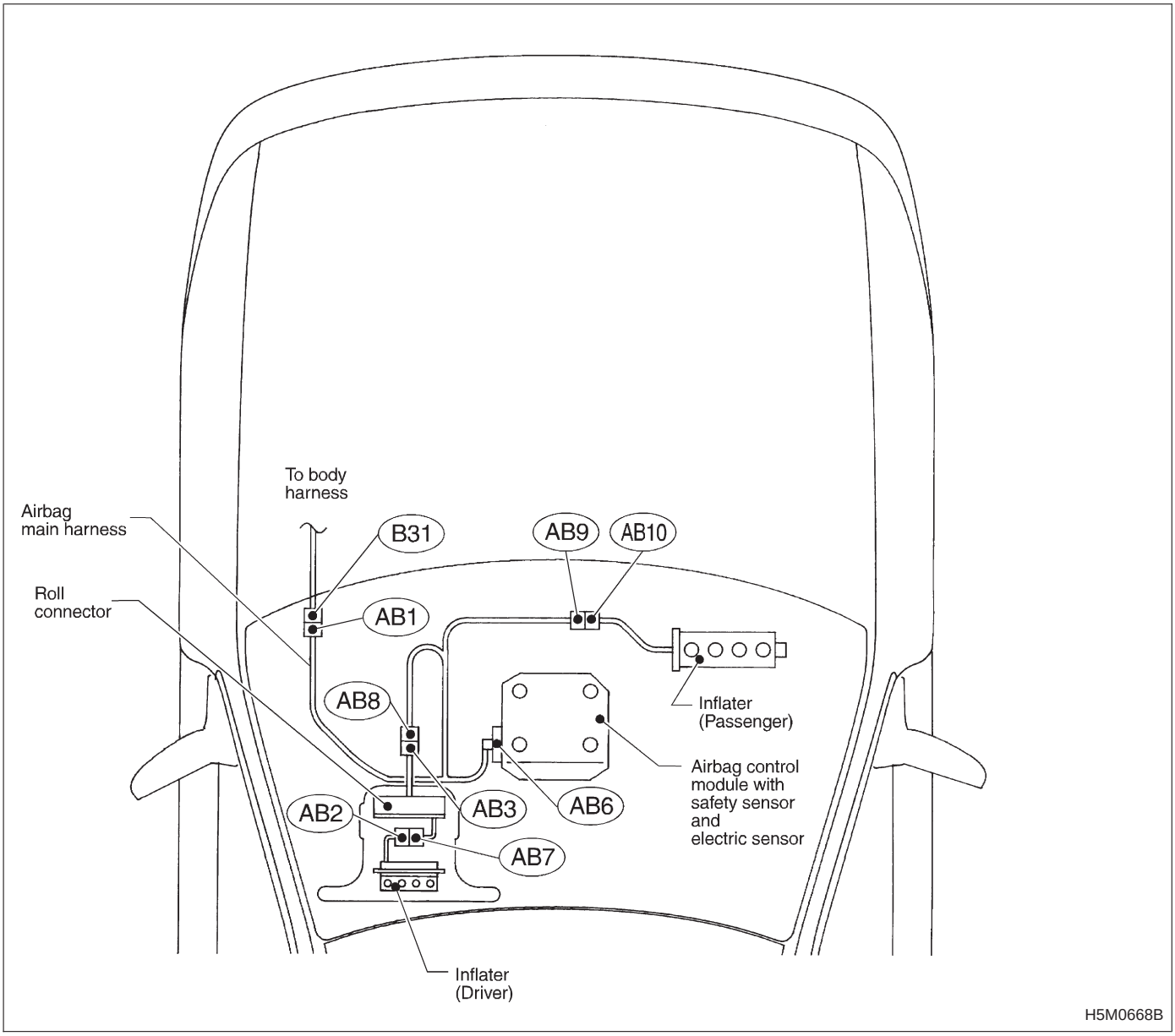
NO : CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE <Ref. to 4-4 [W12C1].>

SUPPLEMENTAL RESTRAINT SYSTEM 5-5

Page

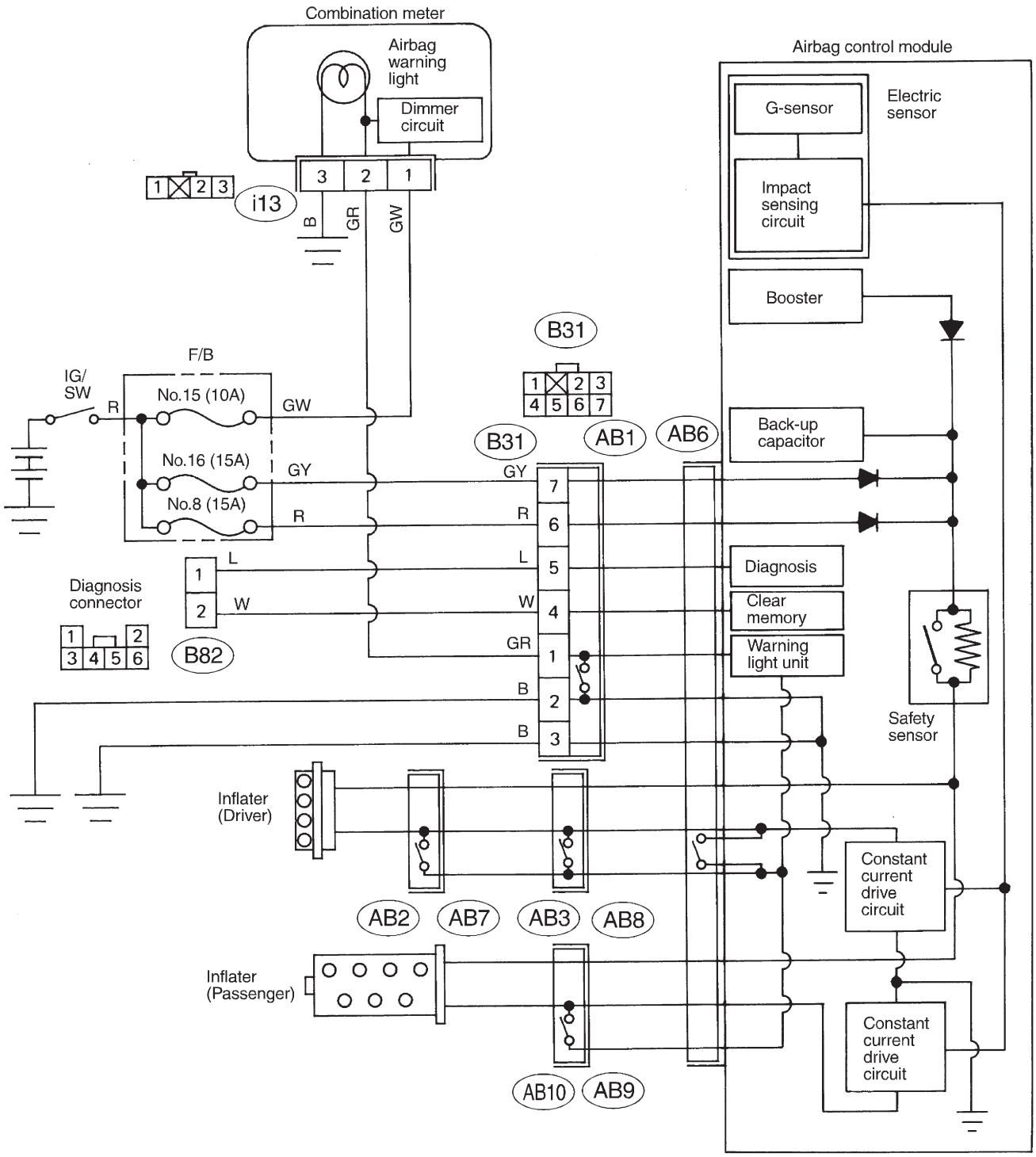
T DIAGNOSTICS 2
1. Electrical Components Location 2
2. Schematic 3
3. Tools for Diagnostics 4
4. Diagnostics Chart for On-board Diagnostic System 8
5. Diagnostics Chart with Trouble Code 14

1. Electrical Components Location



Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)
Pole	7	3	3	12	3	3	3	3
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Male	Male	Male	Female

2. Schematic



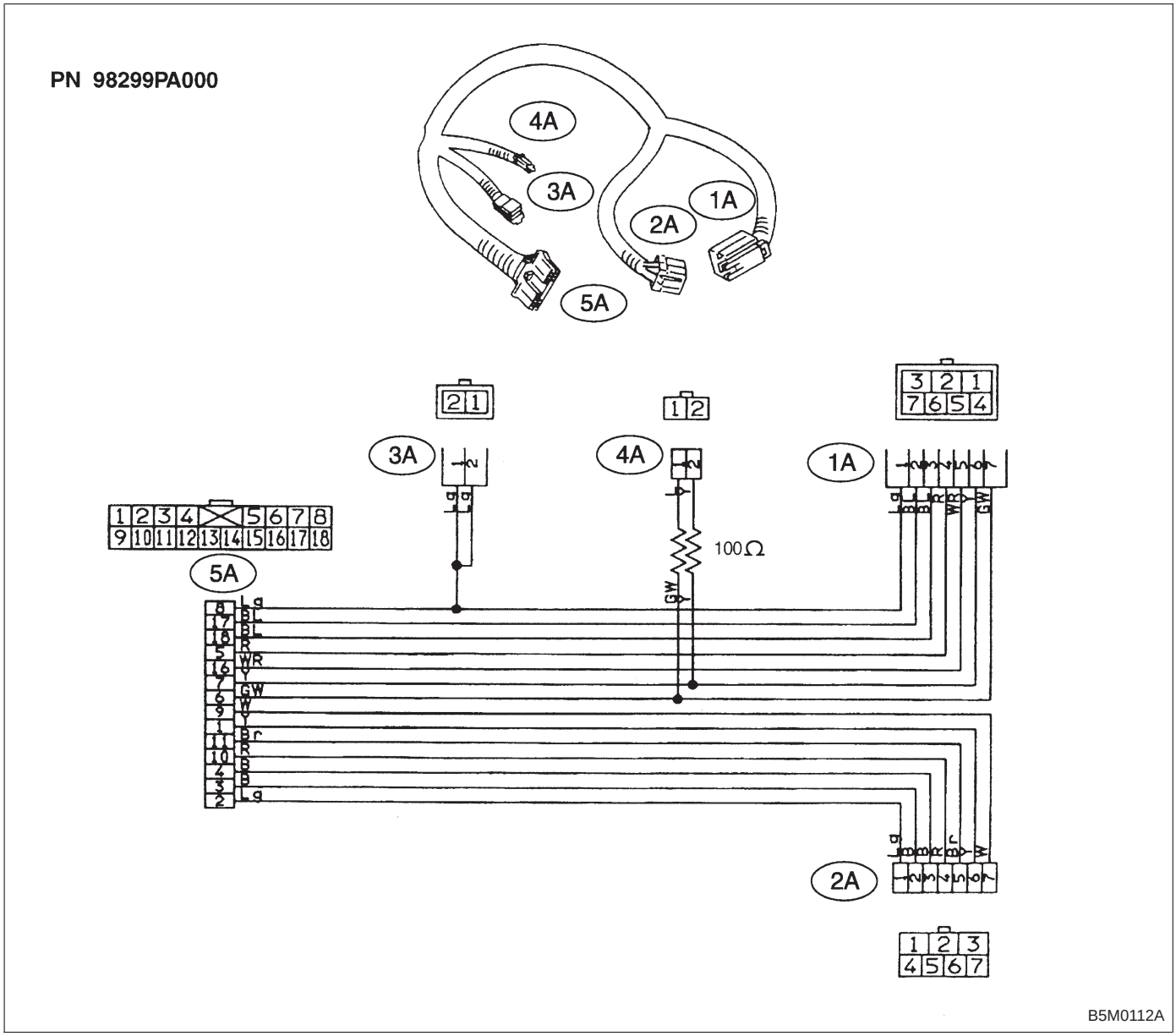
H5M0667B

3. Tools for Diagnostics

CAUTION:
Be sure to use specified test harness A, B or C when measuring voltage, resistance, etc. of AIRBAG system component parts.

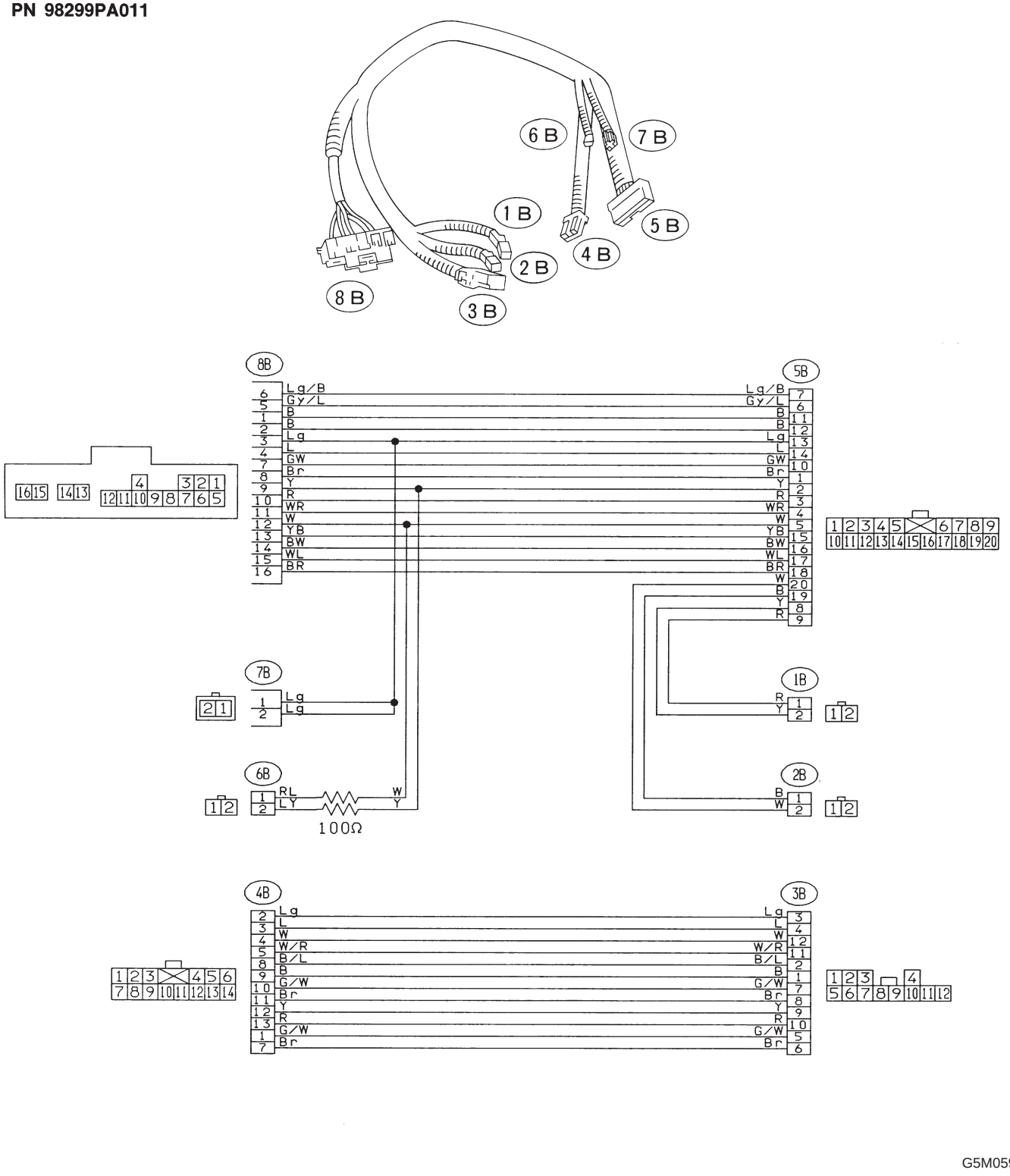
A: TEST HARNESS A

PN 98299PA000



B: TEST HARNESS B2

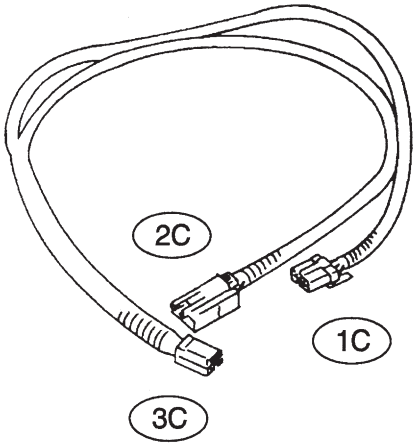
PN 98299PA011

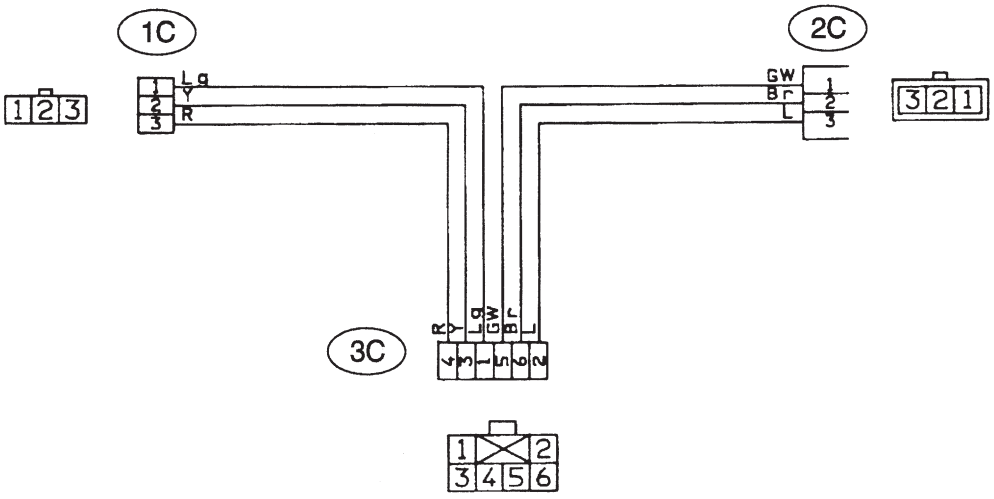


G5M0593

C: TEST HARNESS C

PN 98299PA020



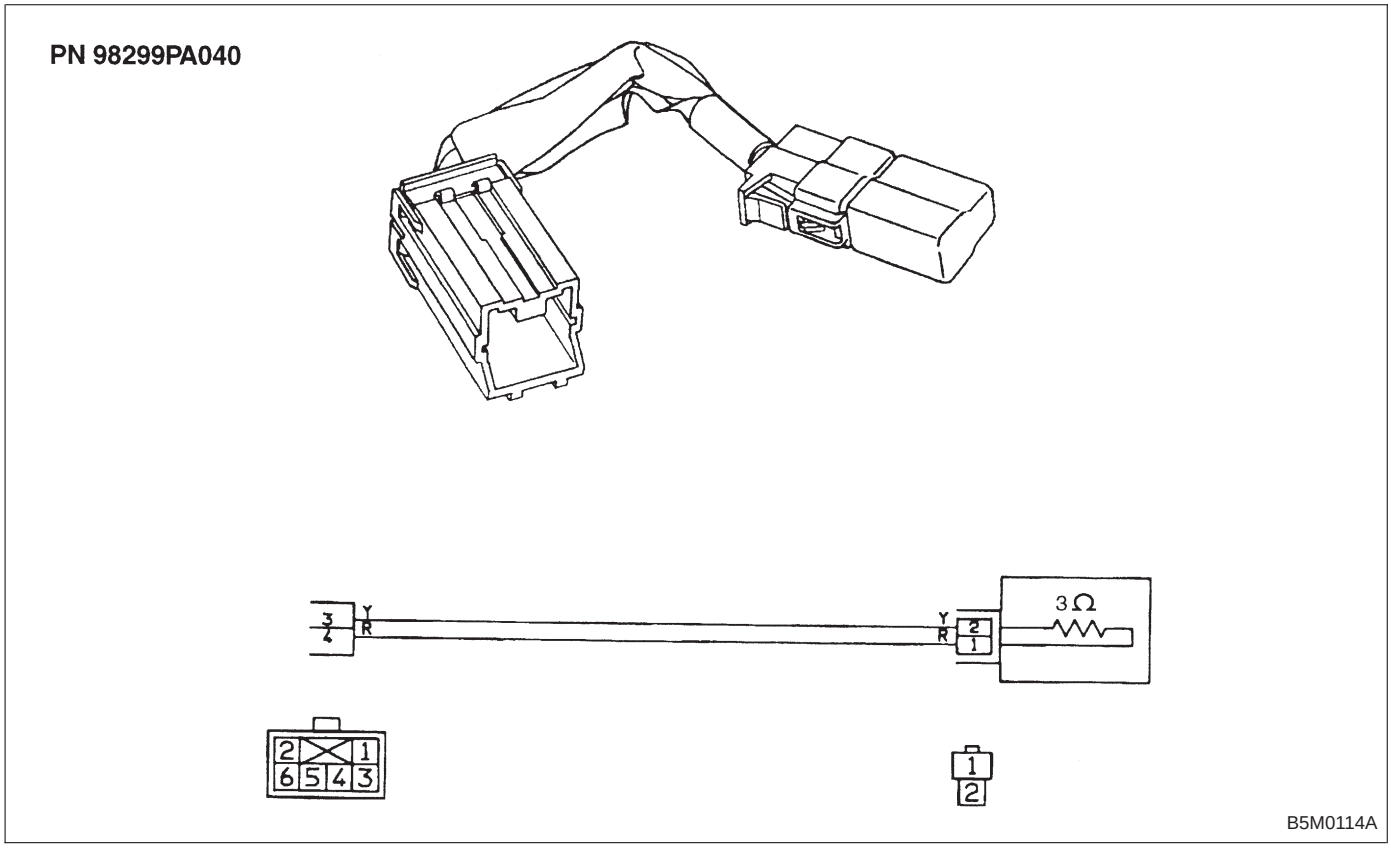


B5M0113A

D: AIRBAG RESISTOR

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.

PN 98299PA040



4. Diagnostics Chart for On-board Diagnostic System

A: BASIC DIAGNOSTICS PROCEDURE

4A1	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

1) Airbag warning light comes ON.
2) Turn ignition switch to ON (engine OFF).
3) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light stay ON after about 7 seconds or remain OFF, or come back ON after 30 seconds?***

YES : Repair and replace. <Ref. to 5-5 [T4D0].>

NO : Go to step **4A2**.

4A2	**CHECK TROUBLE CODE INDICATES.**

Perform ON-BOARD DIAGNOSTICS.
<Ref. to 5-5 [T4B0].>

CHECK : ***Does trouble code indicate? <Ref. to 5-5 [T5A0].>***

YES : Repair and replace. <Ref. to 5-5 [T5Q0].> Then go to step **4A3**.

NO : Repair and replace. <Ref. to 5-5 [T5R0].> Then go to step **4A3**.

4A3	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

1) Turn ignition switch to ON (engine OFF).
2) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light stay ON after about 7 seconds or come back ON after 30 seconds?***

YES : Repair and replace. <Ref. to 5-5 [T4D0].>

NO : Go to step **4A4**.

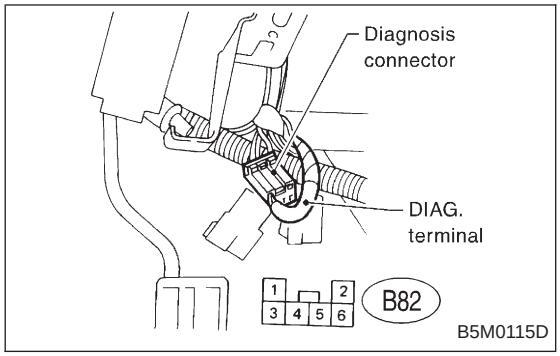
4A4	**CHECK AIRBAG WARNING LIGHT ILLUMINATES.**

Check airbag warning light illuminates.

CHECK : ***Does airbag warning light come ON for about 7 seconds, then go out and stay out?***

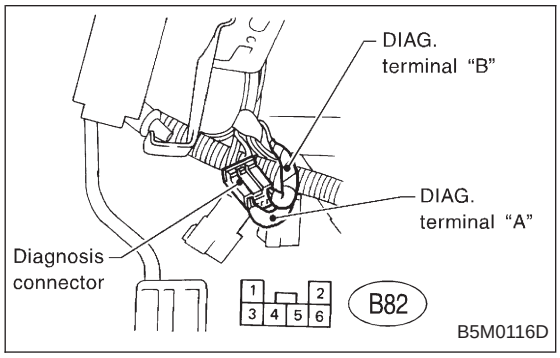
YES : Perform clear memory. <Ref. to 5-5 [T4C0].>

NO : Go to step **4A1**.



B: ON-BOARD DIAGNOSTIC

When the airbag system is in functioning condition, the airbag warning light will remain on for about 7 seconds and go out when the ignition switch is set to ON.
If there is any malfunction, the airbag warning light will either stay on or off continuously. In such cases, perform on-board diagnostic in accordance with the specified procedure to determine trouble codes.
1) Turn ignition switch ON (with engine OFF).
2) Connect DIAG. terminal to No. 1 terminal of diagnosis connector located inside lower cover.
3) Check in accordance with the trouble code indicated by the AIRBAG warning light, and record the trouble codes.
4) Turn the ignition switch “OFF” and remove the DIAG. terminal from No. 1 terminal of diagnosis connector.



C: CLEAR MEMORY

After eliminating problem as per trouble code, clear memory as follows:
1) Make sure ignition switch is ON (and engine off). Connect one DIAG. terminal “A” on diagnosis connector terminal No. 1.
While warning light is flashing, connect the other DIAG. terminal “B” on terminal No. 2 for at least three seconds.
2) After memory is cleared, normal warning light flashing rate resumes. (Warning light flashes every 0.6 seconds ON-OFF operation.) Memory cannot be cleared if any problem exists.
3) After clear memory and then DIAG. terminals “A” and “B”, extract from diagnosis connector.

D: DIAGNOSTICS PROCEDURE

4D1	CHECK TROUBLE CODE INDICATES.

1) Perform on-board diagnostic. <Ref. to 5-5 [T4B0].>
2) Check trouble code indicates.

CHECK : ***Are trouble codes 4, 12, 13, 22, 34, 41, 42, or 43 indicated? <Ref. to 5-5 [T5A2].>***

YES : Go to step **4D2**.

NO : Perform diagnostics and repair according to indicated trouble code. <Ref. to 5-5 [T5A0].> Then go to step **4D10**.

4D2	CHECK TROUBLE CODE INDICATES.

Check trouble code indicates.

CHECK : ***Are trouble codes 4, 22, 34, 42 indicated? <Ref. to 5-5 [T5A2].>***

YES : Go to step **4D3**.

NO : Go to step **4D7**.

4D3	CHECK TROUBLE CODE INDICATES.

Check trouble code indicates.

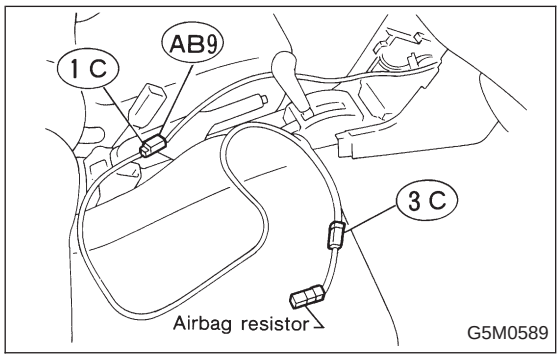
CHECK : ***Are trouble codes 12, 13, 41, 43 indicated? <Ref. to 5-5 [T5A2].>***

YES : Go to step **4D4**.

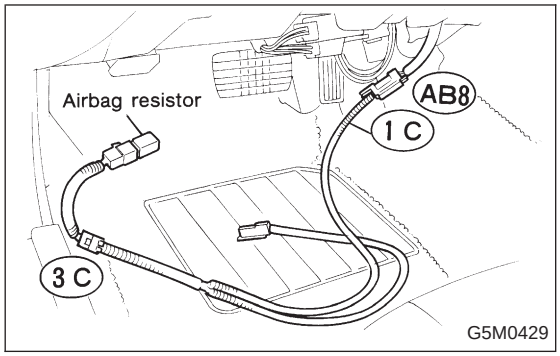
NO : Go to step **4D8**.

4D4	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Turn ignition switch to OFF. Disconnect battery ground cable, and wait 20 seconds.
2) Disconnect passenger's airbag module connector (AB9) to (AB10). <Ref. to 5-5 [W3A2].>



3) Connect test harness C connector (1C) to (AB9).
4) Connect airbag resistor to test harness C connector (3C).



5) Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
6) Connect battery ground cable and turn ignition switch to ON.
7) Check airbag warning light illuminates.

CHECK ***: Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Go to step **4D5**.

NO : Perform diagnostics and repair according to indicated trouble code. <Ref. to 5-5 [T5A0].> Then go to step **4D10**.

4D5	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Turn ignition switch to OFF. Disconnect battery ground cable, and wait 20 seconds.
2) Connect passenger's airbag module connector (AB9) to (AB10).
3) Connect battery ground cable and turn ignition switch to ON.
4) Check airbag warning light illuminates.

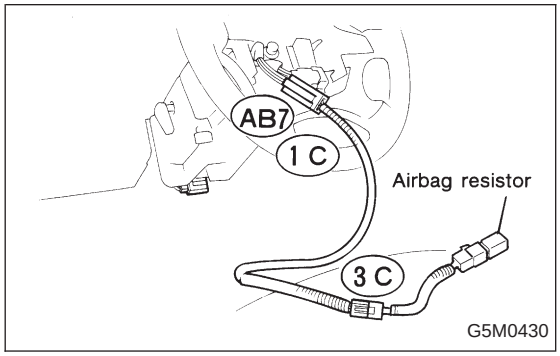
CHECK ***: Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Go to step **4D6**.

NO : Replace with a new passenger's airbag module. <Ref. to 5-5 [W3A2].> Then go to step **4D5**.

4D6	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Turn ignition switch to "OFF". Disconnect battery ground cable, and wait 20 seconds.
2) Connect connector (AB8) to (AB3).



3) Remove driver's airbag module and connect test harness C connector (1C) to (AB7). <Ref. to 5-5 [W3A1].>
4) Connect airbag resistor to test harness C connector (3C).
5) Connect battery ground cable and turn ignition switch to ON.
6) Check airbag warning light illuminates.

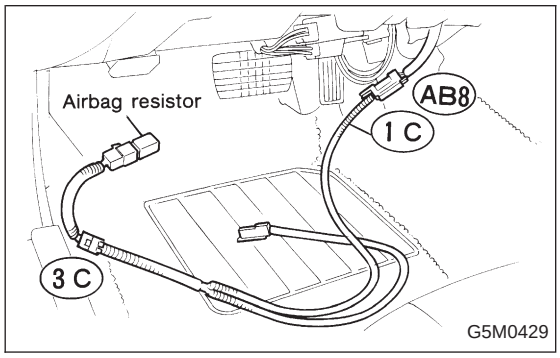
CHECK ***: Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Replace with a new driver's airbag module. <Ref. to 5-5 [W3A1].> Then go to step **4D10**.

NO : Replace with a new combination switch. <Ref. to 5-5 [W600].> and install driver's airbag module. <Ref. to 5-5 [W3A1].> Then go to step **4D9**.

4D7	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Turn ignition switch to OFF. Disconnect battery ground cable, and wait 20 seconds.



2) Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).
3) Connect battery ground cable and turn ignition switch to ON.
4) Check airbag warning light illuminates.

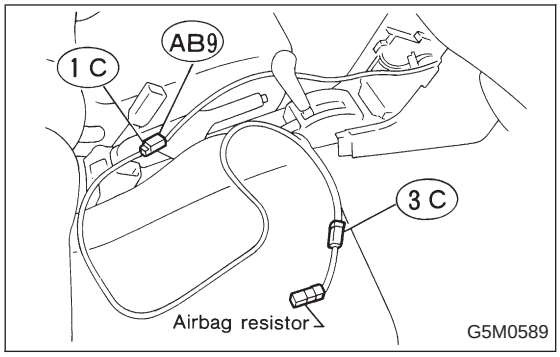
CHECK ***: Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Go to step **4D6**.

NO : Perform diagnostics and repair according to indicated trouble code. <Ref. to 5-5 [T5A0].> Then go to step **4D10**.

4D8	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Turn ignition switch to OFF. Disconnect battery ground cable, and wait 20 seconds.
2) Disconnect passenger's airbag module connector (AB9) to (AB10). <Ref. to 5-5 [W3A2].>



3) Connect test harness C connector (1C) to (AB9).
4) Connect airbag resistor to test harness C connector (3C).
5) Connect battery ground cable and turn ignition switch to ON.
6) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Replace with a new passenger's airbag module. <Ref. to 5-5 [W3A2].> Then go to step **4D10**.

NO : Perform diagnostics and repair according to indicated trouble code. <Ref. to 5-5 [T5A0].> Then go to step **4D10**.

4D9	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Connect battery ground cable and turn ignition switch to ON.
2) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Perform clear memory. <Ref. to 5-5 [T4C0].>

NO : Replace with a new driver's airbag module. <Ref. to 5-5 [W3A1].> Then go to step **4D10**.

4D10	CHECK AIRBAG WARNING LIGHT ILLUMINATES.

1) Connect battery ground cable and turn ignition switch to ON.
2) Check airbag warning light illuminates.

CHECK : ***Does airbag warning light go off after about 7 seconds and remain off for more than 30 seconds? <Ref. to 5-5 [T4D11].>***

YES : Perform clear memory. <Ref. to 5-5 [T4C0].>

NO : Then go to step **4D1**.

4D11	NOTES

● Always remember to secure the green double locks before turning the ignition switch to ON.

● In some cases the airbag warning light will go OFF after about 7 seconds but will turn ON again within 30 seconds. In this case continue diagnostics with the basic diagnostics procedures or trouble code procedures.

5. Diagnostics Chart with Trouble Code

A: TROUBLE CODES

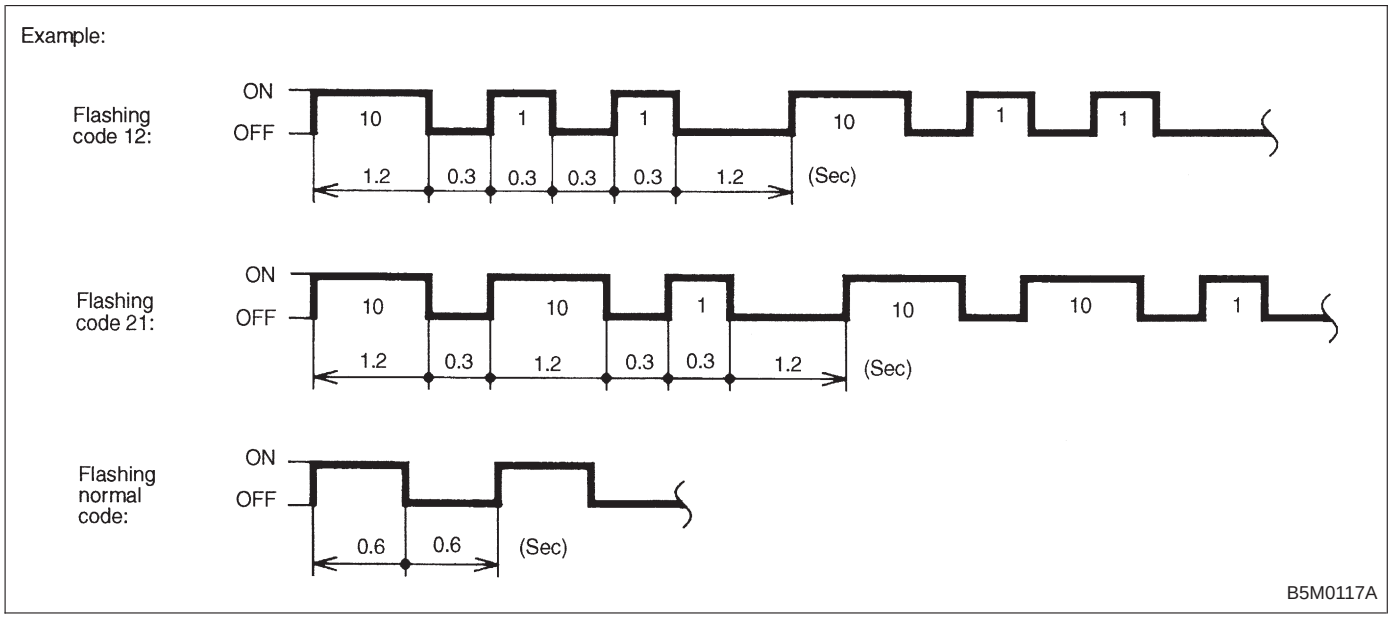
1. LIST OF TROUBLE CODES

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Ref. to
04	Provided.	1) Airbag main harness circuit is shorted. 2) Passenger's airbag module harness circuit is shorted. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5B0].>
11	Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.	<Ref. to 5-5 [T5C0].>
12	Provided.	1) Airbag main harness circuit is open. 2) Driver's airbag module harness circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5D0].>
13	Provided.	1) Airbag main harness circuit is shorted. 2) Driver's airbag module harness is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5E0].>
14	Not provided.	1) (AB9) and (AB10) are not connected properly. 2) (AB2) and (AB7) are not connected properly. 3) (AB3) and (AB8) are not connected properly. 4) (AB6) is not connected properly to airbag control module.	<Ref. to 5-5 [T5F0].>
21	Provided.	Airbag control module is faulty.	<Ref. to 5-5 [T5G0].>
22	Provided.	1) Airbag main harness circuit is open. 2) Passenger's airbag module harness circuit is open. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5H0].>
31	Not provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 16 is blown. 4) Body harness circuit is open.	<Ref. to 5-5 [T5I0].>
33	Provided.	Airbag module is inflated.	<Ref. to 5-5 [T5J0].>
34	Provided.	1) Passenger's airbag main harness circuit is shorted to power supply. 2) Passenger's airbag module harness is shorted to power supply. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5K0].>
41	Provided.	1) Driver's airbag main harness circuit is shorted to ground. 2) Driver's airbag module harness circuit is shorted to ground. 3) Roll connector circuit is shorted to ground. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5L0].>
42	Provided.	1) Passenger's airbag main harness circuit is shorted to ground. 2) Passenger's airbag module harness circuit is shorted to ground. 3) Airbag control module is faulty.	<Ref. to 5-5 [T5M0].>
43	Provided.	1) Driver's airbag main harness circuit is shorted to power supply. 2) Driver's airbag module harness is shorted to power supply. 3) Roll connector is shorted to power supply. 4) Airbag control module is faulty.	<Ref. to 5-5 [T5N0].>

Trouble code/ Contents of troubles	Memory function	Contents of diagnosis	Ref. to
Airbag warning light remains on.	Not provided.	1) Airbag warning light is faulty. 2) Airbag control module to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B31) are not connected properly.	<Ref. to 5-5 [T5O0].>
Airbag warning light remains off.	Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.	<Ref. to 5-5 [T5P0].>
Warning light indicates trouble code, then normal code. (Flashing trouble code.)	Provided.	Airbag system component parts are faulty.	<Ref. to 5-5 [T5Q0].>
Warning light indicates trouble code, then normal code. (Flashing normal code.)	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.	<Ref. to 5-5 [T5R0].>

2. HOW TO READ TROUBLE CODES

The AIRBAG warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

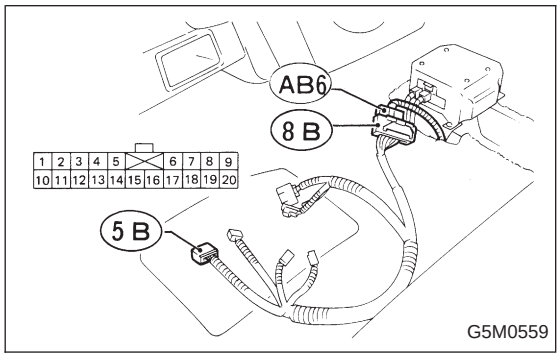


B: TROUBLE CODE 04

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness (Passenger) circuit is shorted.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5B1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

2) Measure resistance between test harness B2 connector (5B) terminal.

Connector & terminal
(5B) No. 6 — (5B) No. 7:

CHECK ***: Is resistance more than 10 kΩ?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

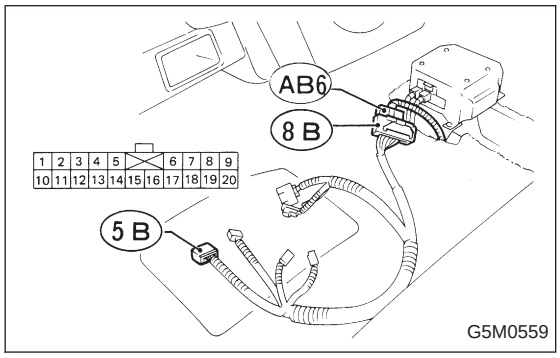
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

C: TROUBLE CODE 11

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 8 is blown.
- Body harness circuit is open.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5C1	AIRBAG CONTROL MODULE INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].> and connect it to test harness B2 connector (8B).

2) Connect battery ground cable and turn ignition switch "ON". (engine off)

3) Measure voltage across connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 2 (+) — Chassis ground (−):

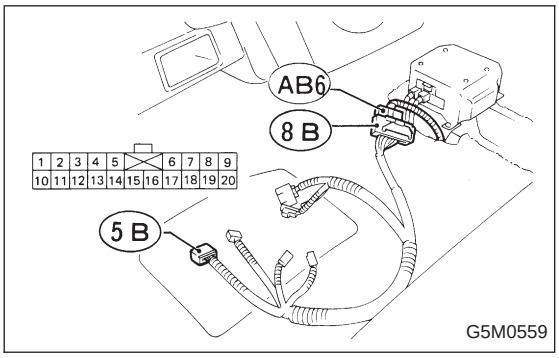
CHECK ***: Is voltage more than 10 V?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

NO : Go to step **5C2**.

5C2	AIRBAG MAIN HARNESS INSPECTION

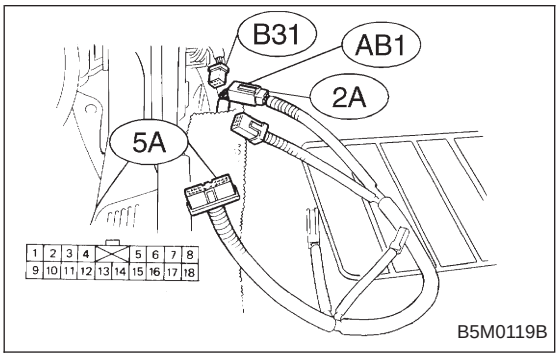
1) Go to following procedure after performing diagnostics on airbag system as per diagnosis procedure under “5C1 AIR BAG CONTROL MODULE INSPECTION” <Ref. to 5-5 [T5C1].> previously outlined.
2) Turn ignition switch “OFF”, disconnect battery ground terminal and then wait at least 20 seconds.



3) Disconnect body harness connector (B31) from connector (AB1) at front lower pillar, and connect connector (AB1) to test harness A connector (2A).
4) Measure resistance between test harness A connector (5A) terminal and test harness B2 connector (5B) terminal.

Connector & terminal
(5A) No. 1 — (5B) No. 2:

CHECK ***: Is resistance less than 10 Ω?***
YES : Go to step **5C3**.
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

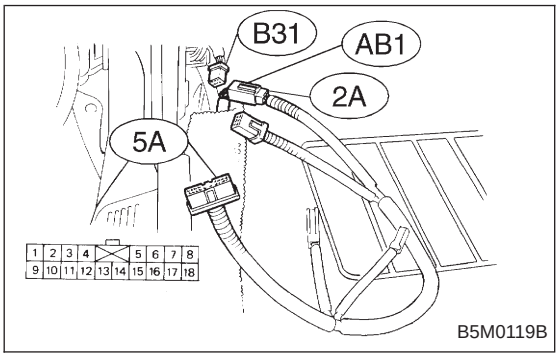


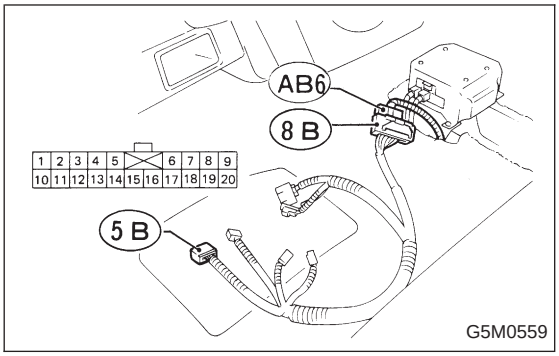
5C3	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between (5A) connector terminal and chassis ground.

Connector & terminal
(5A) No. 1 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 10 kΩ?***
YES : Go to step **5C4**.
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>





5C4	AIRBAG MAIN HARNESS INSPECTION

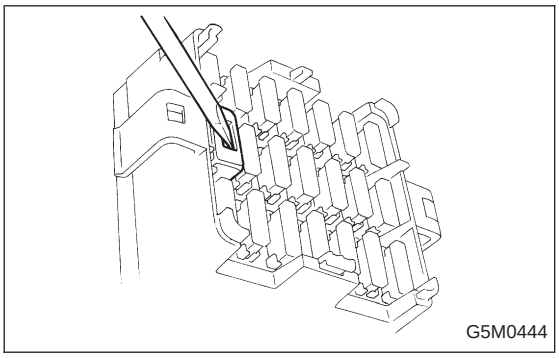
Measure resistance between (5B) connector terminal and chassis ground.

Connector & terminal
(5B) No. 2 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 10 kΩ?***

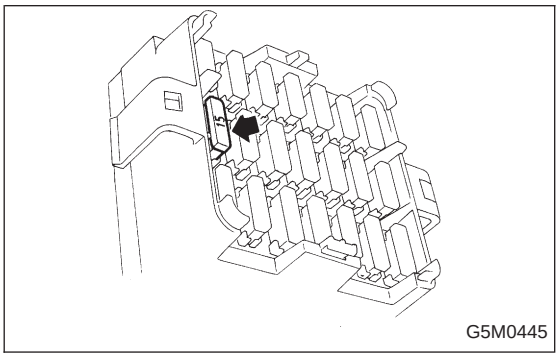
YES : Go to step **5C5**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5C5	FUSE No. 8 INSPECTION

1) Turn ignition switch “OFF”, and remove airbag fuse protector.



2) Remove and visually check fuse No. 8.

CHECK ***: Is fuse No. 8 blown?***

YES : Replace fuse No. 8 if fuse No. 8 blows again, repair body harness.

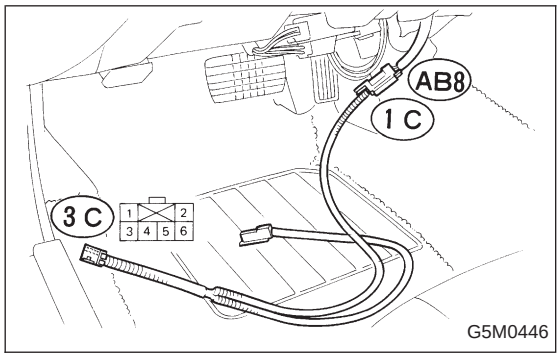
NO : Repair body harness.

D: TROUBLE CODE 12

DIAGNOSIS:

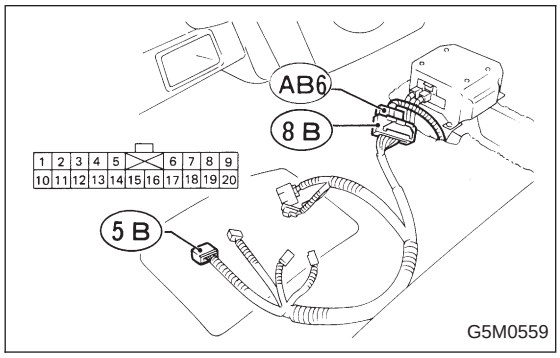
- Airbag main harness circuit is open.
- Airbag module harness (Driver) circuit is open.
- Roll connector circuit is open.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



5D1	AIRBAG MAIN HARNESS INSPECTION

1) Remove lower cover panel <Ref. to 5-4 [W1A0].>, and connect connector (AB8) below steering column to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W5A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.

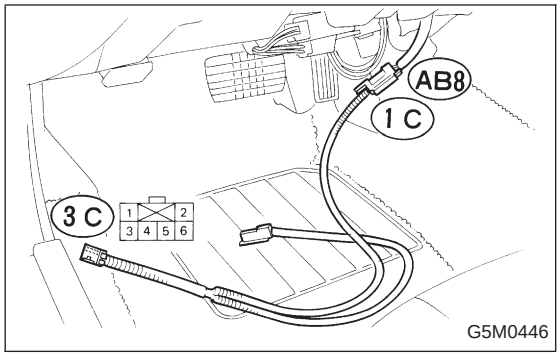
3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

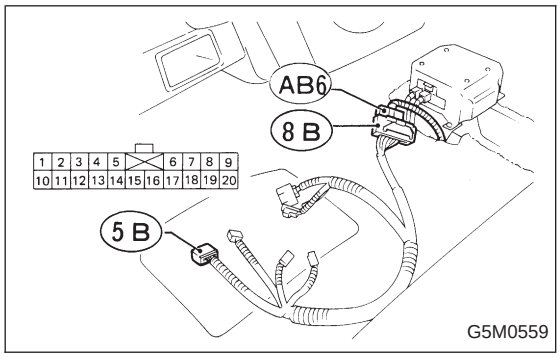
Connector & terminal
(5B) No. 14 — (3C) No. 4:

CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5D2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>





5D2	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal
(5B) No. 1 — (3C) No. 3:

CHECK ***: Is resistance less than 10 Ω?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

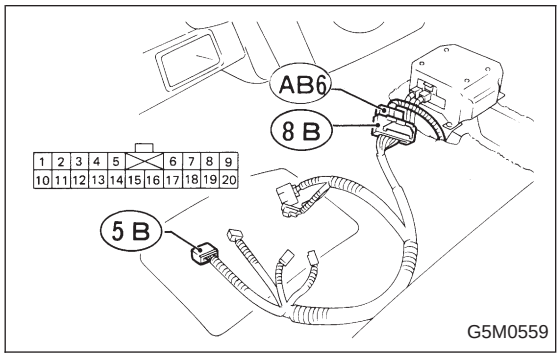
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

E: TROUBLE CODE 13

DIAGNOSIS:

- Airbag main harness circuit is shorted.
- Airbag module harness (Driver) is shorted.
- Roll connector circuit is shorted.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5E1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

2) Measure resistance between test harness B2 connector (5B) terminal.

Connector & terminal
(5B) No. 1 — (5B) No. 14:

CHECK ***: Is resistance more than 10 kΩ?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

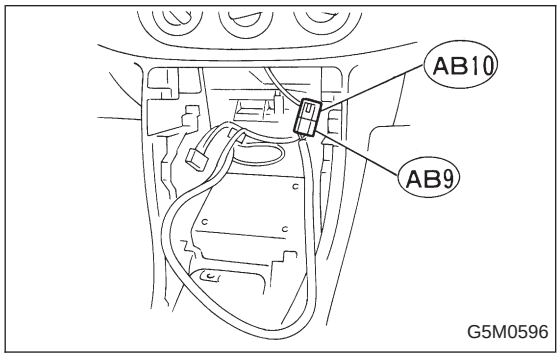
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

F: TROUBLE CODE 14

DIAGNOSIS:

- (AB9) and (AB10) are not connected properly.
- (AB2) and (AB7) are not connected properly.
- (AB3) and (AB8) are not connected properly.
- (AB6) is not connected properly to airbag control module.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



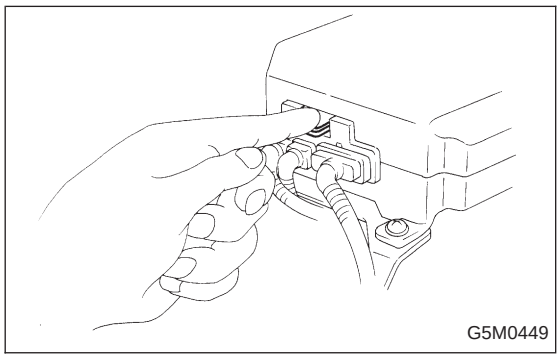
5F1	DOUBLE LOCK INSPECTION FOR CONNECTORS (AB9) AND (AB10)

1) Remove front pillar lower trim (Passenger side). <Ref. to 5-3 [W5A5].>
2) Check double lock of connectors (AB9) and (AB10).

CHECK ***: Is there poor contact in double lock of connectors (AB9) and (AB10)?***

YES : Repair poor contact in double lock of connectors (AB9) and (AB10).

NO : Go to step **5F2**.



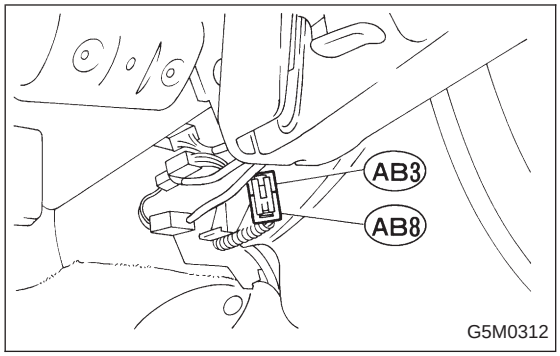
5F2	AIRBAG CONTROL MODULE DOUBLE LOCK INSPECTION AT CONNECTOR (AB6)

Check double lock of connector (AB6) connected to airbag control module. <Ref. to 5-5 [W5A0].>

CHECK ***: Is there poor contact in double lock of connector (AB6)?***

YES : Repair poor contact in double lock of connector (AB6).

NO : Go to step **5F3**.



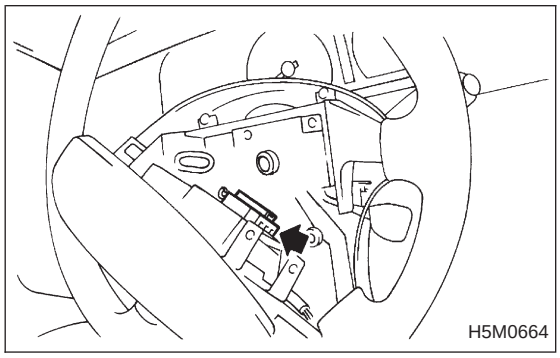
5F3	DOUBLE LOCK INSPECTION FOR CONNECTORS (AB3) AND (AB8)

1) Remove lower cover panel. <Ref. to 5-4 [W1A0].>
2) Check double lock of connectors (AB3) and (AB8) below steering column.

CHECK ***: Is there poor contact in double lock of connectors (AB3) and (AB8)?***

YES : Repair poor contact in double lock of connectors (AB3) and (AB8).

NO : Go to step **5F4**.



5F4	ROLL CONNECTOR DOUBLE LOCK INSPECTION AT CONNECTORS (AB2) AND (AB7)

Remove driver's airbag module <Ref. to 5-5 [W3A1].>, and check double lock of connectors (AB2) and (AB7) at roll connector.

CHECK ***: Is there poor contact in double lock of connectors (AB2) and (AB7)?***

YES : Repair poor contact in double lock of connectors (AB2) and (AB7).

NO : Replace airbag control module. <Ref. to 5-5 [W500].>

G: TROUBLE CODE 21

DIAGNOSIS:

- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds. <Ref. to 5-5 [W5A0].>

5G1	**CHECK IF TROUBLE CODE 21 IS INDICATED.**

Confirm flashing trouble code according to "BASIC DIAGNOSTICS PROCEDURE". <Ref. to 5-5 [T4A0].>

CHECK ***: Is airbag warning light trouble code 21 indicated?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

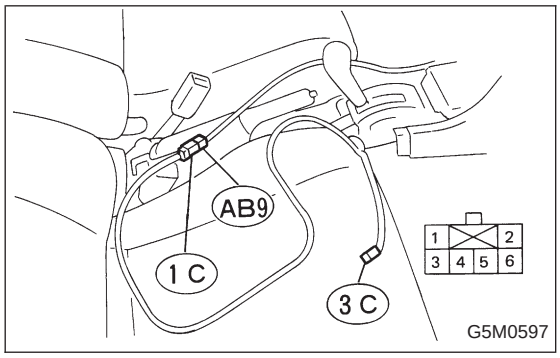
NO : Perform clear memory. <Ref. to 5-5 [T4C0].>

H: TROUBLE CODE 22

DIAGNOSIS:

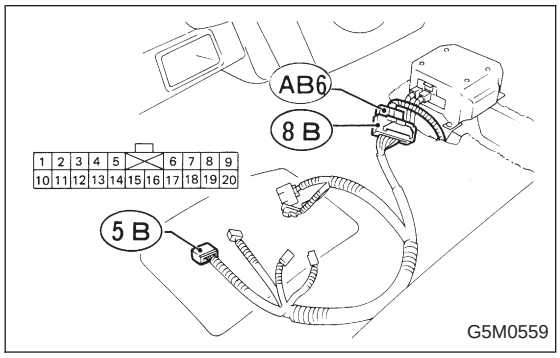
- Airbag main harness circuit is open.
- Airbag module harness (Passenger) circuit is open.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



5H1	AIRBAG MAIN HARNESS INSPECTION

1) Remove front pillar lower trim (Passenger side). <Ref. to 5-3 [W5A5].>, disconnect connector (AB9) and (AB10) and connect connector (AB9) to test harness C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W5A0].> from airbag control module, and connect it to test harness B2 connector (8B) terminal.

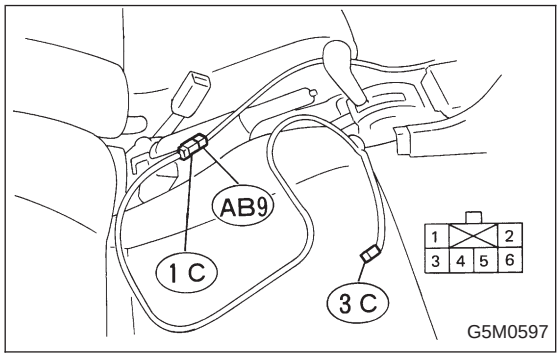
3) Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

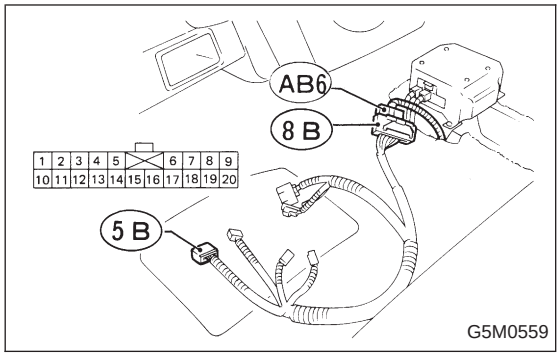
Connector & terminal
(5B) No. 6 — (3C) No. 4:

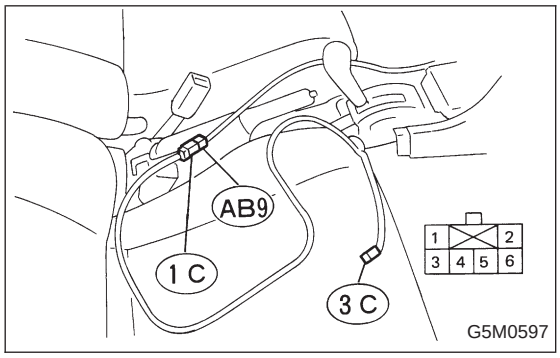
CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5H2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>







5H2	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between test harness B2 connector (5B) and test harness C connector (3C) terminals.

Connector & terminal
(5B) No. 7 — (3C) No. 3:

CHECK ***: Is resistance less than 10 Ω?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

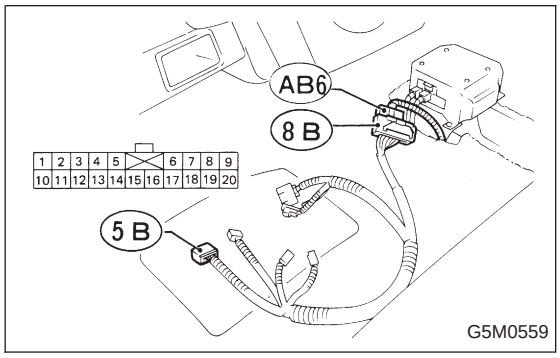
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

I: TROUBLE CODE 31

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 16 is blown.
- Body harness circuit is open.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5I1	**AIRBAG CONTROL MODULE INSPECTION**

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

2) Connect battery ground cable and turn ignition switch "ON" (engine off).

3) Measure voltage across connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 5 (+) — Chassis ground (−):

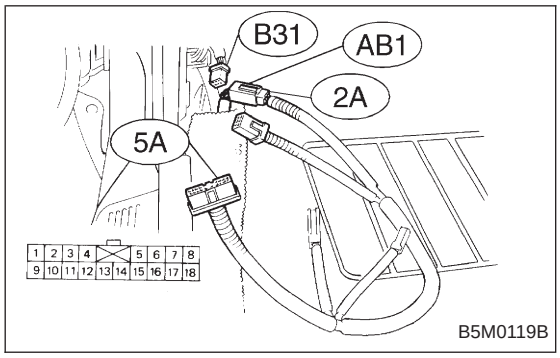
CHECK ***: Is voltage more than 10 V?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

NO : Go to step **5I2**.

5I2	AIRBAG MAIN HARNESS INSPECTION

1) Go to following procedure after performing diagnostics on airbag system as per diagnosis procedure under “5I1 AIRBAG CONTROL MODULE INSPECTION” <Ref. to 5-5 [T5I1].> previously outlined.
2) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.



3) Disconnect connector (AB1) from body harness connector (B31) at front lower pillar (driver side), and connect connector (AB1) to test harness A connector (2A).

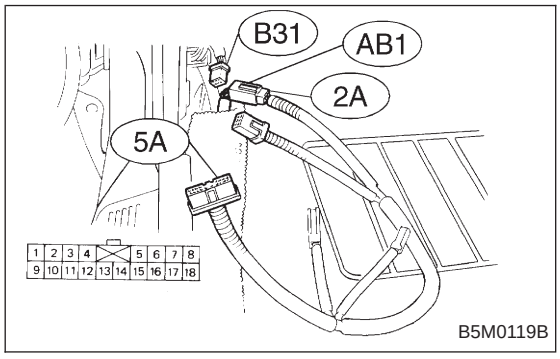
4) Measure resistance between test harness A connector (5A) and test harness B2 connector (5B) terminals.

Connector & terminal
(5A) No. 9 — (5B) No. 5:

CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5I3**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5I3	AIRBAG MAIN HARNESS INSPECTION

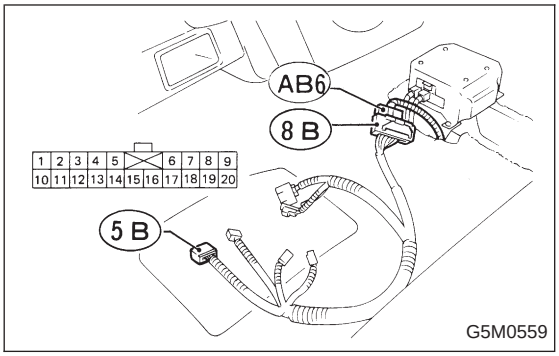
Measure resistance between each terminal of connectors (5A) and chassis ground.

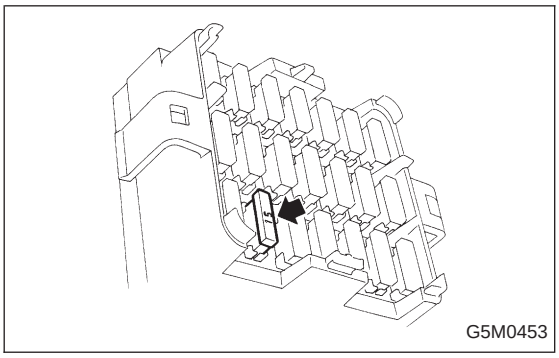
Connector & terminal
(5A) No. 9 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 10 kΩ?***

YES : Go to step **5I4**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>





5I4	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between each terminal of connectors (5B) and chassis ground.

Connector & terminal
(5B) No. 5 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 10 kΩ?***

YES : Go to step **5I5**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

5I5	FUSE No. 16 INSPECTION

Make sure ignition switch is turned “OFF”, then remove and visually check fuse No. 16.

CHECK ***: Is fuse No. 16 blown?***

YES : Replace fuse No. 16. If fuse No. 16 blows again, repair body harness.

NO : Repair body harness.

J: TROUBLE CODE 33

DIAGNOSIS:

- Airbag module is inflated.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds. <Ref. to 5-5 [W5A0].>

5J1	**CHECK IF TROUBLE CODE 33 IS INDICATED.**

Confirm flashing trouble code according to "BASIC DIAGNOSTICS PROCEDURE". <Ref. to 5-5 [T4A0].>

CHECK ***: Is airbag warning light trouble code 33 indicated?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

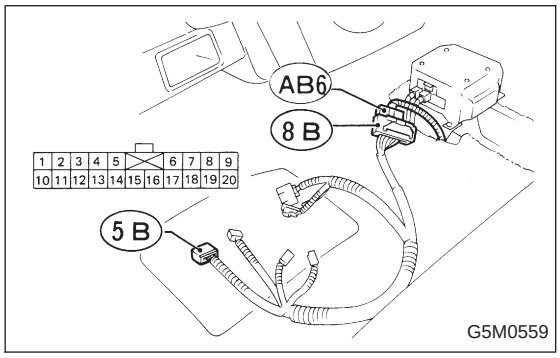
NO : Perform clear memory. <Ref. to 5-5 [T4C0].>

K: TROUBLE CODE 34

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to power supply.
- Airbag module harness (Passenger) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5K1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

2) Connect battery ground cable and turn ignition switch “ON” (engine off).

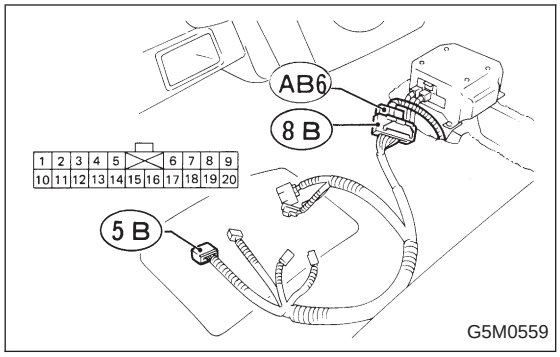
3) Measure voltage across each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 6 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 1 V?***

YES : Go to step **5K2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5K2	AIRBAG MAIN HARNESS INSPECTION

Measure voltage across each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 7 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 1 V?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

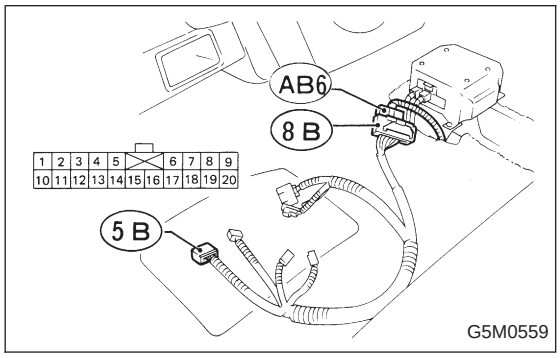
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

L: TROUBLE CODE 41

DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to ground.
- Airbag module harness (Driver) is shorted to ground.
- Roll connector circuit is shorted to ground.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5L1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

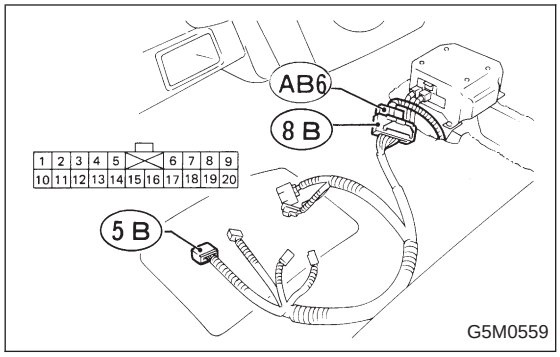
2) Measure resistance between test harness B2 connector (5B) terminals and chassis ground.

Connector & terminal
(5B) No. 1 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 200 Ω?***

YES : Go to step **5L2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5L2	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between test harness B2 connector (5B) terminals and chassis ground.

Connector & terminal
(5B) No. 14 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 200 Ω?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

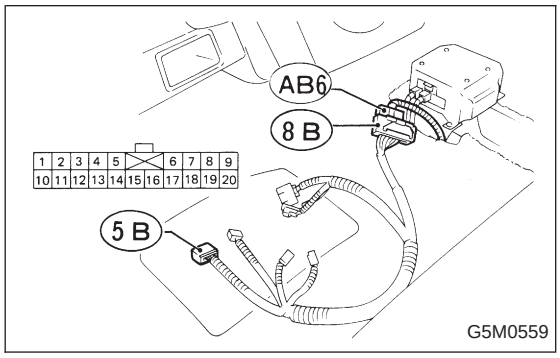
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

M: TROUBLE CODE 42

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to ground.
- Airbag module harness circuit (Passenger) is shorted to ground.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5M1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

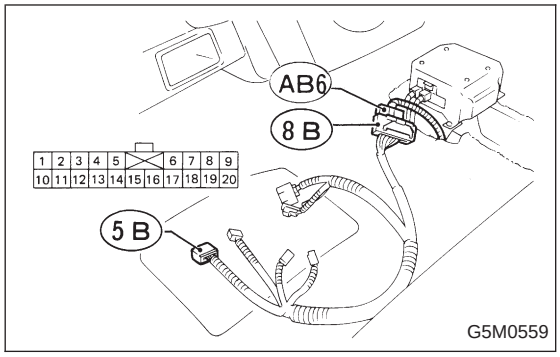
2) Measure resistance between test harness B2 connector (5B) terminals and chassis ground.

Connector & terminal
(5B) No. 6 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 200 Ω?***

YES : Go to step **5M2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5M2	AIRBAG MAIN HARNESS INSPECTION

Measure resistance between test harness B2 connector (5B) terminals and chassis ground.

Connector & terminal
(5B) No. 7 (+) — Chassis ground (−):

CHECK ***: Is resistance more than 200 Ω?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

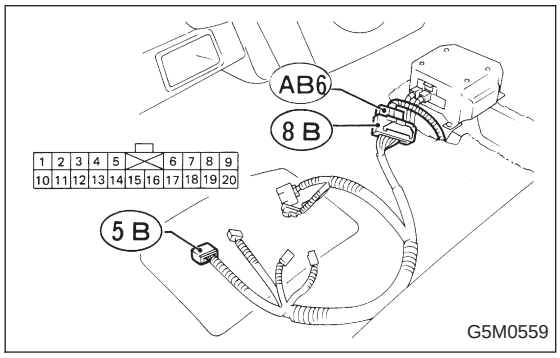
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

N: TROUBLE CODE 43

DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to power supply.
- Airbag module harness (Driver) is shorted to power supply.
- Roll connector is shorted to power supply.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8), (AB9) and (AB10).



5N1	AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

2) Connect battery ground cable and turn ignition switch "ON" (engine off).

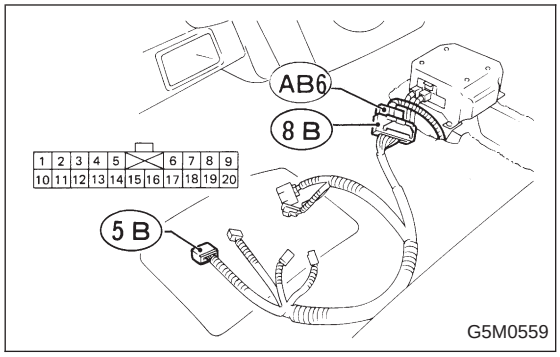
3) Measure voltage across each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 1 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 1 V?***

YES : Go to step **5N2**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5N2	AIRBAG MAIN HARNESS INSPECTION

Measure voltage across each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 14 (+) — Chassis ground (−):

CHECK ***: Is voltage less than 1 V?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

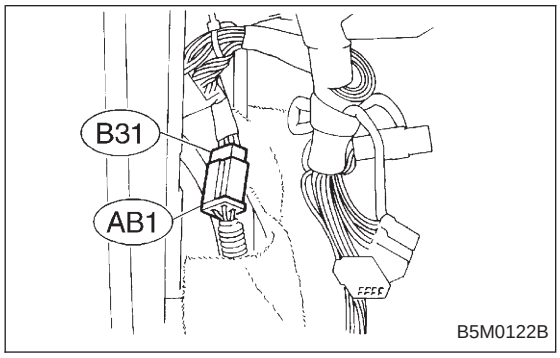
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

O: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light is faulty.
- Airbag control module to airbag warning light harness circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



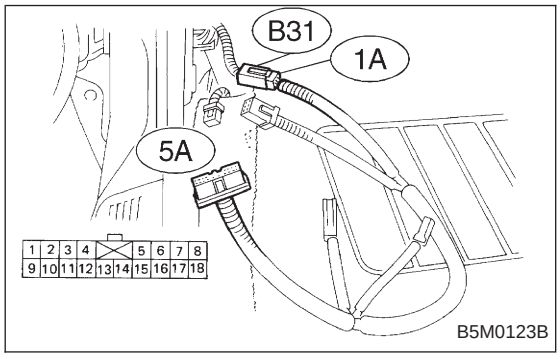
5O1	DOUBLE LOCK INSPECTION FOR CONNECTORS (AB1) AND (B31)

1) Remove front pillar lower trim (Driver side).
2) Check double lock of connectors (AB1) and (B31).

CHECK ***: Is there poor contact in double lock of connectors (AB1) and (B31)?***

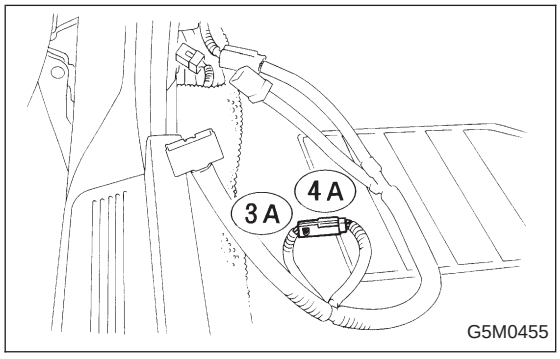
YES : Repair poor contact in double lock of connectors (AB1) and (B31).

NO : Go to step **5O2**.



5O2	INSPECTION OF AIRBAG WARNING LIGHT

1) Turn ignition switch "OFF" and connect body harness connector (B31) to test connector A connector (1A).

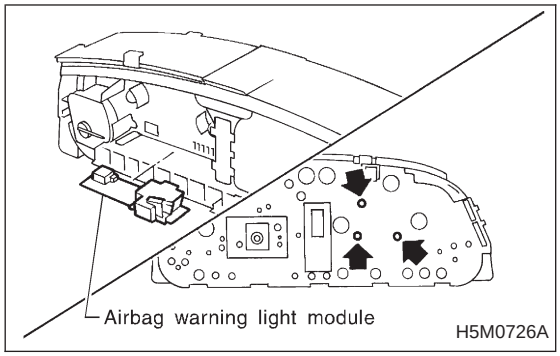


2) Connect battery ground cable and turn ignition switch "ON", (engine off) and connect connectors (3A) and (4A).

CHECK ***: Does the airbag warning light come off?***

YES : Go to step **5O4**.

NO : Go to step **5O3**.



5O3	INSPECTION OF BODY HARNESS

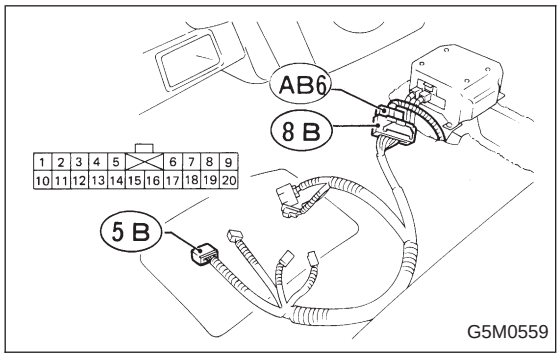
Check body harness.

CHECK ***: Is there anything unusual to body harness?***

YES : Repair body harness.

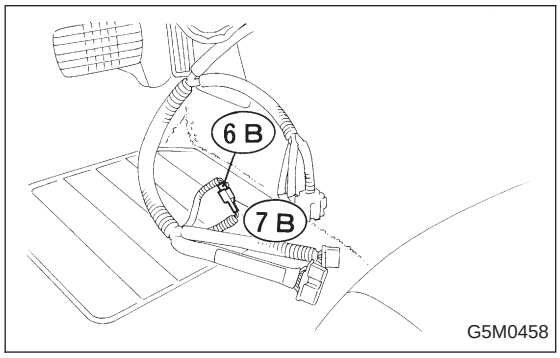
NO : Replace airbag warning light module.

NOTE:
After problem has been eliminated, disconnect connectors (3A) and (4A).



5O4	INSPECTION OF AIRBAG MAIN HARNESS

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds, and re-connect connectors (AB1) and (B31).
2) Remove instrument panel lower cover and disconnect (AB3) with (AB8), then disconnect connector (AB6) from airbag control module, <Ref. to 5-5 [W5A0].> and connect it to test harness B2 connector (8B).



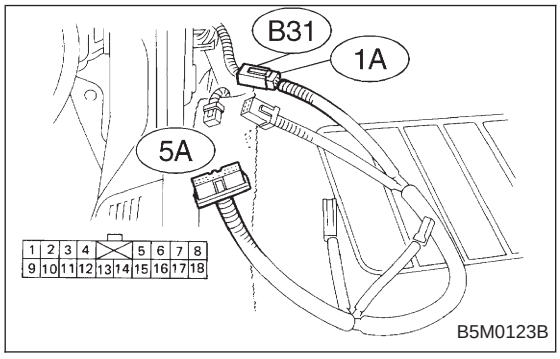
3) Connect battery ground cable and turn ignition switch “ON”, (engine off) and connect connectors (6B) and (7B).

CHECK ***: Does the airbag warning light come on?***

YES : Go to step **5O5**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

NOTE:
After problem has been eliminated, disconnect connectors (6B) and (7B).



5O5	GROUNDING CIRCUIT INSPECTION

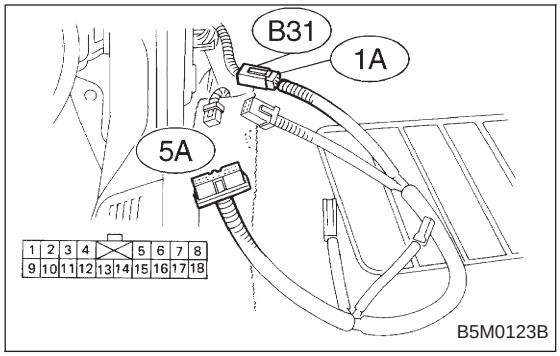
1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.
2) Disconnect connector (AB1) from body harness connector (B31), and connect connector (B31) to test harness A connector (1A).
3) Measure resistance between connector (5A) terminal and chassis ground.

Connector & terminal
(5A) No. 17 (+) — Chassis ground (−):

CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5O6**.

NO : Repair body grounding circuit.



5O6	GROUNDING CIRCUIT INSPECTION

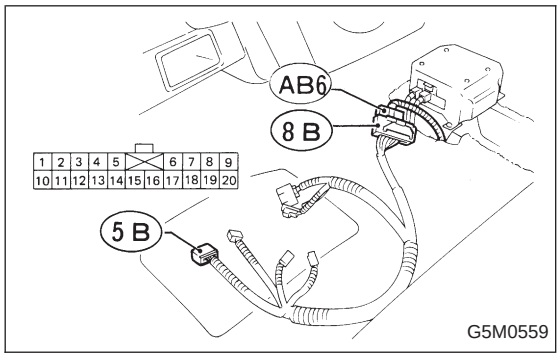
Measure resistance between connector (5A) terminal and chassis ground.

Connector & terminal
(5A) No. 18 (+) — Chassis ground (−):

CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5O7**.

NO : Repair body grounding circuit.



5O7	INSPECTION OF AIRBAG MAIN HARNESS

1) Connect connectors (AB1) and (B31). Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W5A0].>, and connect it to test harness B2 connector (8B).

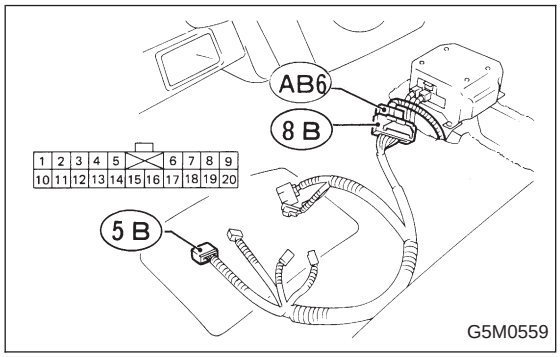
2) Measure resistance between each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 11 (+) — Chassis ground (−):

CHECK ***: Is resistance less than 10 Ω?***

YES : Go to step **5O8**.

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>



5O8	INSPECTION OF AIRBAG MAIN HARNESS

Measure resistance between each test harness B2 connector (5B) terminal and chassis ground.

Connector & terminal
(5B) No. 12 (+) — Chassis ground (−):

CHECK ***: Is resistance less than 10 Ω?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

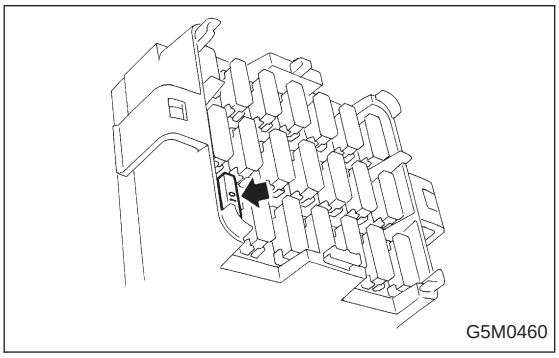
NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

P: AIRBAG WARNING LIGHT REMAINS OFF.

DIAGNOSIS:

- Fuse No. 15 is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal, and then wait at least 20 seconds.


G5M0460

5P1	FUSE No. 15 INSPECTION

Remove and visually check fuse No. 15.

CHECK ***: Is fuse No. 15 blown?***

YES : Replace fuse No. 15.
If fuse No. 15 blows again, go to step **5P2**.

NO : Go to step **5P2**.

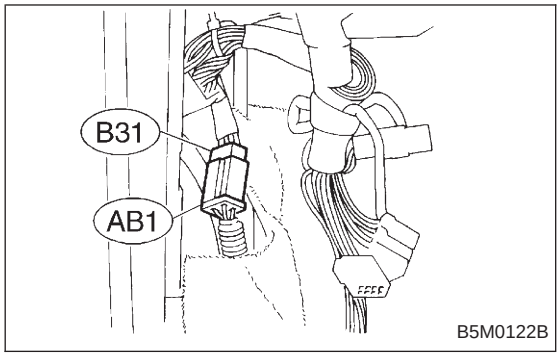
5P2	BODY HARNESS INSPECTION

Turn ignition switch "ON" (engine off) to make sure other warning lights (in combination meter) illuminate.

CHECK ***: Do all the warning lights (in combination meter) except airbag warning light come on?***

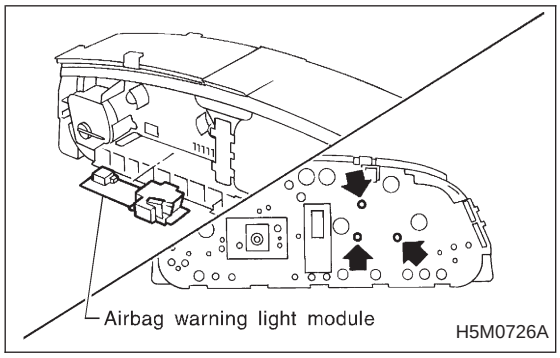
YES : Go to step **5P3**.

NO : Repair body harness.



5P3	AIRBAG WARNING LIGHT MODULE (IN COMBINATION METER) INSPECTION

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.
2) Disconnect body harness connector (B31) from connector (AB1).

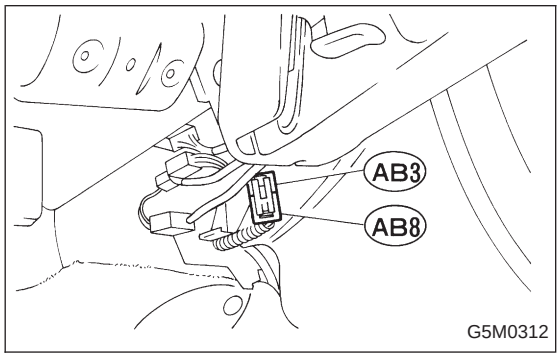


3) Connect battery ground cable and turn ignition switch “ON” (engine off) to make sure airbag warning light illuminates.

CHECK ***: Does the airbag warning light come on?***

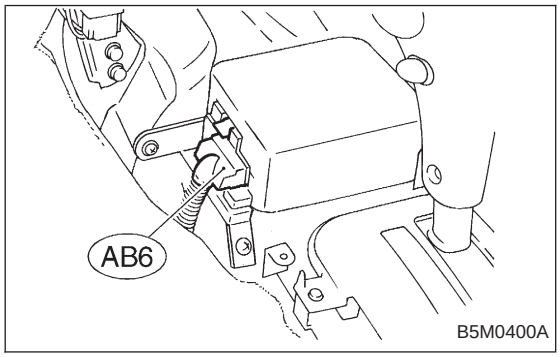
YES : Go to step **5P4**.

NO : Replace airbag warning light module.



5P4	AIRBAG MAIN HARNESS INSPECTION

1) Turn ignition switch “OFF”, disconnect battery ground cable and then wait at least 20 seconds.
2) Connect body harness connector (B31) and connector (AB1).
3) Disconnect connectors (AB3) and (AB8) below steering column. <Ref. to 5-5 [M2E2].>



4) Disconnect connector (AB6) from airbag control module. <Ref. to 5-5 [W5A0].>

5) Connect battery ground cable and turn ignition switch “ON” to make sure airbag warning light illuminates.

CHECK ***: Does the airbag warning light come on?***

YES : Replace airbag control module. <Ref. to 5-5 [W500].>

NO : Replace airbag main harness. <Ref. to 5-5 [W400].>

Q: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMAL CODE.
— FLASHING TROUBLE CODE. —

DIAGNOSIS:

- Airbag system component parts are faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch “OFF”, disconnect battery ground cable, and then wait at least 20 seconds.

5Q1	AIRBAG COMPONENT PARTS APPEARANCE INSPECTION

1) Conduct on-board diagnostic and call up trouble codes stored in memory. <Ref. to 5-5 [T4B0].>

2) Select trouble code required to check airbag component parts from those listed in table and reproduce symptom.

Trouble codes	Check parts	Refer to
04	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W400].> <5-5 [W500].>
11	● Fuse No. 8 ● Airbag main harness ● Airbag control module ● Body harness	<5-5 [T5C5].> <5-5 [W400].> <5-5 [W500].> —
12	● Roll connector ● Airbag module (Driver) ● Airbag main harness ● Airbag control module	<5-5 [W600].> <5-5 [W300].> <5-5 [W400].> <5-5 [W500].>
13	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W600].> <5-5 [W400].> <5-5 [W500].>
21	● Airbag control module	<5-5 [W500].>
22	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W400].> <5-5 [W500].>
33	● Airbag control module	<5-5 [W500].>
34	● Airbag main harness ● Airbag module (Passenger) ● Airbag control module	<5-5 [W400].> <5-5 [W300].> <5-5 [W500].>
41	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W600].> <5-5 [W400].> <5-5 [W500].>
42	● Airbag module (Passenger) ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W400].> <5-5 [W500].>
43	● Airbag module (Driver) ● Roll connector ● Airbag main harness ● Airbag control module	<5-5 [W300].> <5-5 [W600].> <5-5 [W400].> <5-5 [W500].>

3) Conduct appearance inspection on parts selected.

CHECK ***: Is there anything unusual about the appearance of airbag component parts?***

YES : Replace faulty airbag component parts.

NO : Go to step **5Q2**.

NOTE:
Also check connector terminals, wiring harness, case, etc. for damage.

5Q2	AIRBAG COMPONENT PARTS VIBRATION INSPECTION

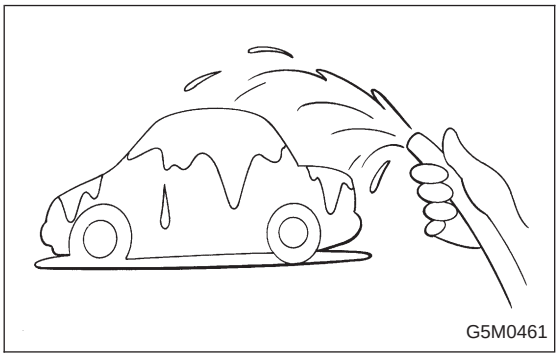
1) Gently shake check parts (to determine faults.).
2) To check airbag module or roll connector, turn and tilt steering wheel.

CAUTION:
Do not shake or vibrate airbag control module.

CHECK ***: Does the component malfunction again when shaking?***

YES : Replace faulty airbag component parts.

NO : Go to step **5Q3**.


G5M0461

5Q3	SHOWERING INSPECTION TO BODY

Spray water on vehicle body.

CAUTION:
Do not directly spray water on airbag components.

CHECK ***: Does water leak into the passenger compartment when showering vehicle?***

YES : Replace faulty airbag component parts.

NO : Perform clear memory. <Ref. to 5-5 [T4C0].>

NOTE:
Also check wiring harnesses as water may leak along them and get airbag component parts wet.

R: WARNING LIGHT INDICATES TROUBLE CODE, THEN NORMAL CODE. — FLASHING NORMAL CODE. —

DIAGNOSIS:

- Airbag connector is faulty.
- Fuse No. 16 is blown.
- Airbag main harness is faulty.
- Airbag control module is faulty.
- Body harness is faulty.

CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable, and then wait at least 20 seconds.

5R1	AIRBAG CONNECTOR APPEARANCE INSPECTION

Conduct appearance inspection on airbag connectors (AB2) through (AB8). <Ref. to 5-5 [T100].>

CHECK ***: Is there anything unusual about the appearance of connectors (AB2) through (AB8)?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R2**.

NOTE:
Check terminals, case and wiring harnesses for damage.

5R2	AIRBAG CONNECTOR VIBRATION INSPECTION

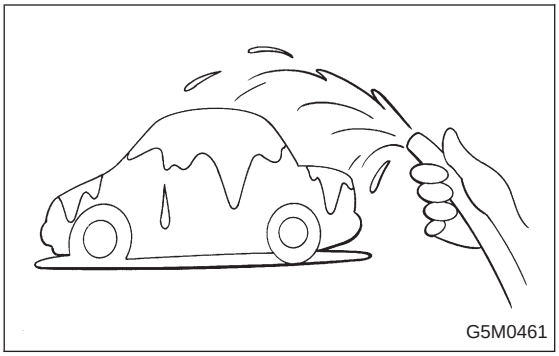
Conduct vibration inspection on airbag connectors (AB2) through (AB8). <Ref. to 5-5 [T100].>

CHECK ***: Do the connectors (AB2) through (AB8) malfunction again when shaking?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R3**.

NOTE:
Gently shake each airbag connector.



5R3	SHOWERING INSPECTION TO BODY

Spray water on vehicle body.

CAUTION:
Do not directly spray water on airbag components.

CHECK : ***Does water leak into the passenger compartment when showering vehicle?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R4**.

NOTE:
If leaks are noted, also check wiring harnesses as water may leak along them and wet airbag connectors.

5R4	FUSE No. 16, AIRBAG MAIN HARNESS, AIRBAG CONTROL MODULE, BODY HARNESS APPEARANCE INSPECTION

Conduct appearance inspection on fuse No. 16 <Ref. to 5-5 [T5I5].>, airbag main harness <Ref. to 5-5 [W400].>, airbag control module <Ref. to 5-5 [W500].> and body harness.

CHECK : ***Is there anything unusual about the appearance of fuse No. 16, airbag main harness, airbag control module or body harness?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R5**.

NOTE:
Also check connectors, terminals, wiring harness and case for damage.

5R5	FUSE No. 16, AIRBAG MAIN HARNESS, BODY HARNESS VIBRATION INSPECTION

Conduct vibration inspection on fuse No. 16, airbag main harness and body harness.

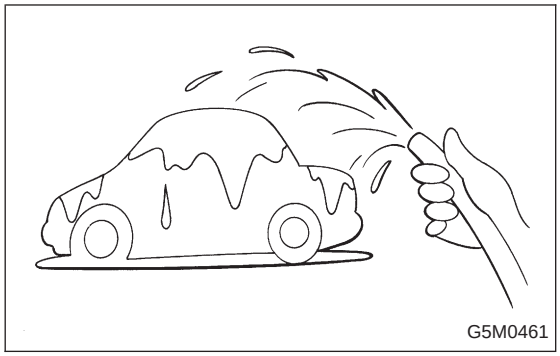
CAUTION:
Do not shake or vibrate airbag control module.

CHECK : ***Do fuse No. 16, airbag main harness or body harness malfunction again when shaking?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R6**.

NOTE:
Gently shake each part.



5R6	SHOWERING INSPECTION TO BODY

Spray water on vehicle body.

CAUTION:
Do not directly spray water on each part.

CHECK ***: Does water leak into the passenger compartment when showering vehicle?***

YES : Replace faulty airbag component parts.

NO : Go to step **5R7**.

NOTE:
If leaks are noted, check wiring harnesses as water may leak along them and get parts wet.

5R7	WARNING LIGHT ILLUMINATION CHECK

Turn ignition switch “ON” (engine off) and observe airbag warning light.

CHECK ***: Does the airbag warning light come on for about 7 seconds, then go out and stay out?***

YES : Perform clear memory. <Ref. to 5-5 [T4C0].>

NO : Go to “DIAGNOSTICS PROCEDURE”. <Ref. to 5-5 [T4D0].>

WIRING DIAGRAM SECTION

FOREWORD

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

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

FUJI HEAVY INDUSTRIES LTD.

WIRING DIAGRAM 6-3

1. Important Safety Notice

● Providing appropriate service and repair is a matter of great importance in the serviceman's safety maintenance and safe operation, function and performance which the SUBARU vehicle possesses.

● In case the replacement of parts or replenishment of consumables is required, genuine SUBARU parts whose parts numbers are designated or their equivalents must be utilized.

● It must be made well known that the safety of the serviceman and the safe operation of the vehicle would be jeopardized if he used any service parts, consumables, special tools and work procedure manuals which are not approved or designated by SUBARU.

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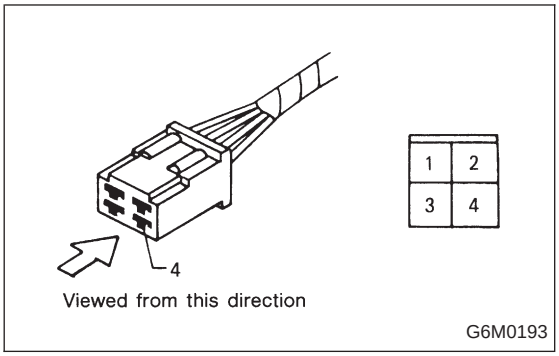
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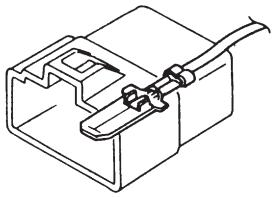
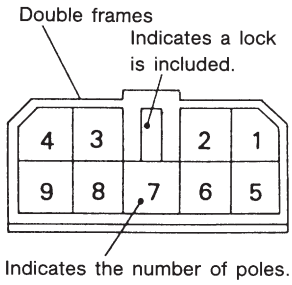
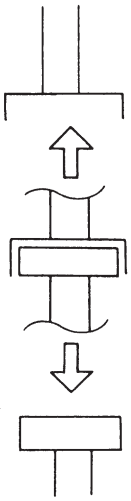
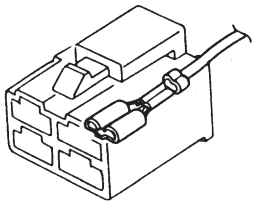
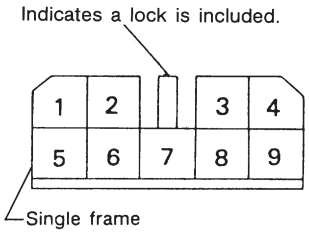


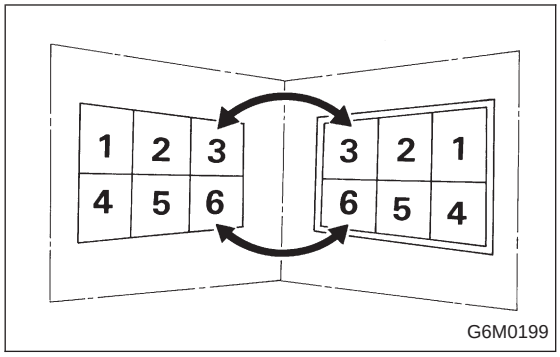
1. General Description

1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.
Sketches and codes are used in the diagrams. They should read as follows:
1) Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front, as shown in figure.

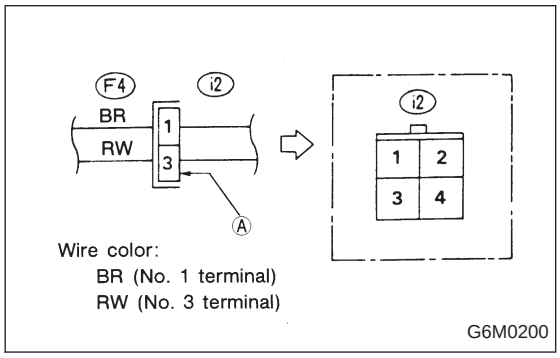
2) The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector.
In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
 G6M0194	 G6M0196	 G6M0198	Numbered in order from upper right to lower left.
 G6M0195	 G6M0197		Numbered in order from upper left to lower right.



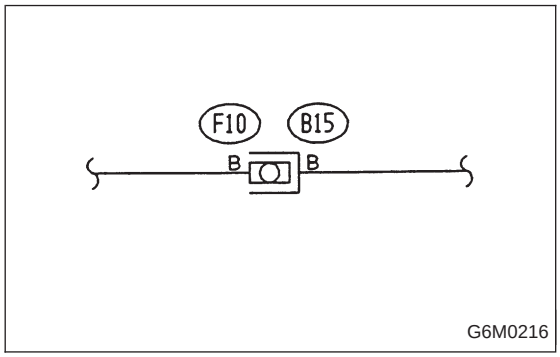
When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.

3) Electrical wiring harness
The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.

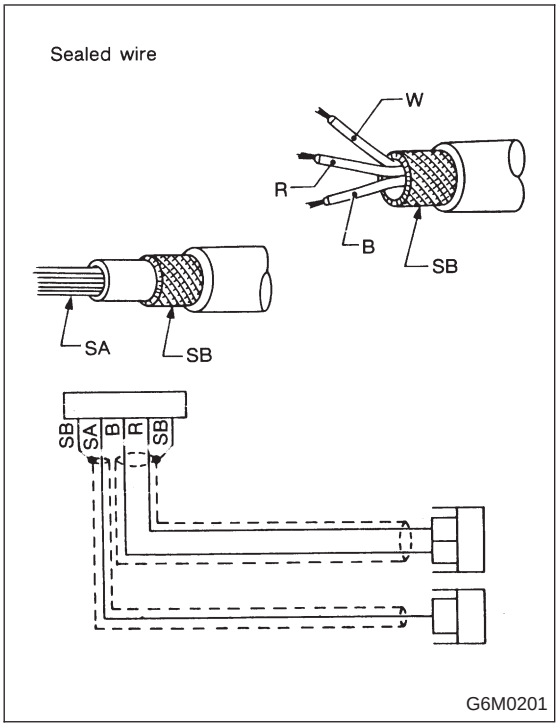


4) The sketch of each connector in the wiring diagram usually shows the “A” side of the connector. The relationship between the wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

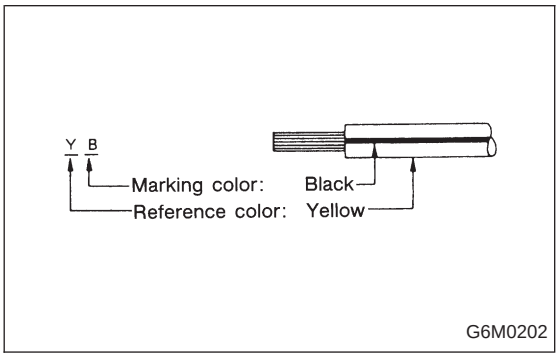


5) In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.



6) The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



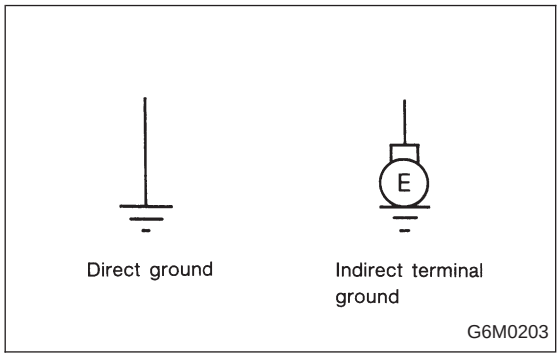
7) The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.

8) The table below lists the nominal sectional areas and allowable currents of the wires.

Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/40°C
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

CAUTION:
- **When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.**

NOTE:
- The allowable current in the above table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.



9) Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.

The ground points shown in the wiring diagram refer to the following:

(GB) Body ground

(GE) Engine ground

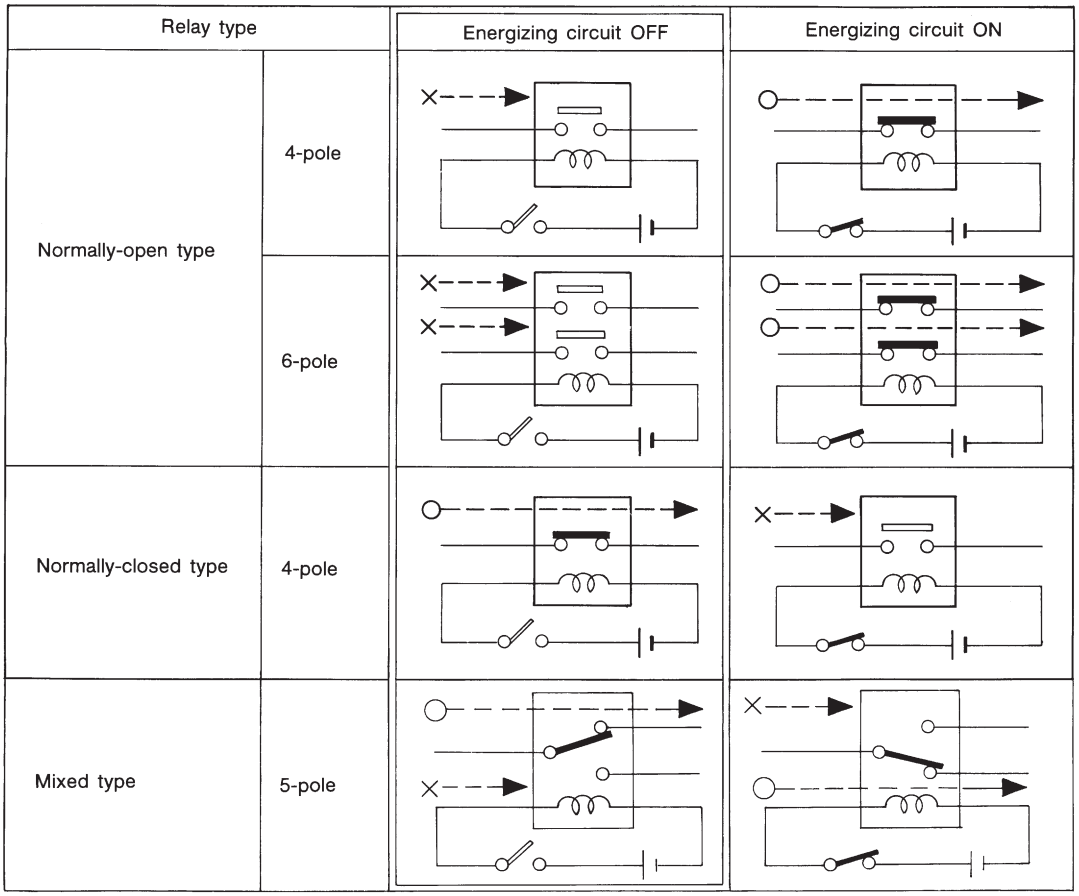
(GR) Radio ground

(GD) Rear defogger ground

All wiring harnesses are provided with a ground point which should be securely connected.

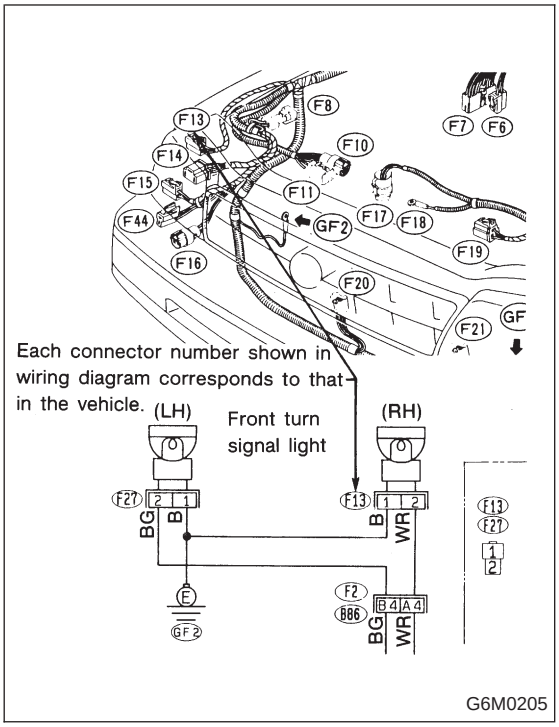
WIRING DIAGRAM

10) Relays are classified as normally-open or normally-closed.
The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when the energizing circuit is OFF.



G6M0204

Key to symbols:
◯ → : Current flows.
X → : Current does not flow.



11) Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and the type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle, as indicated in table below.

Symbol	Wiring harness and Cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear door adapter cord LH & RH
I	Instrument panel wiring harness
R	Rear wiring harness, Rear defogger cord (Ground) Fuel tank cord, Roof cord, Rear gate cord, Rear gate lock adapter cord

2. Basic Diagnostics Procedures

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

A: IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

B: PROBABLE CAUSE OF TROUBLE

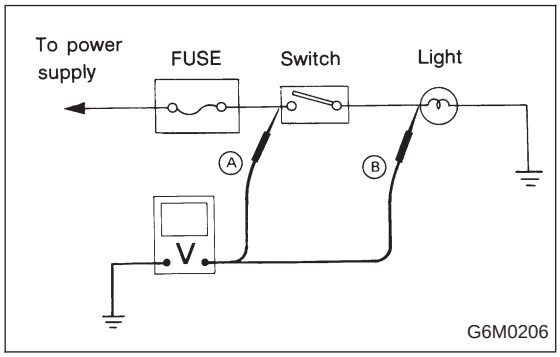
Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

C: LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

D: CONFIRMATION OF SYSTEM OPERATION

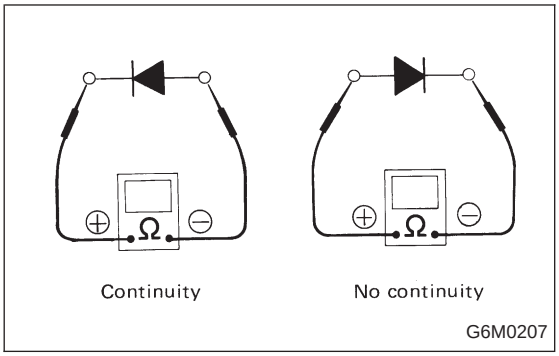
After repairing, ensure that the system operates properly.



E: INSPECTION

1. VOLTAGE MEASUREMENT

1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.
With test set-up held as it is, turn switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
4) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down the malfunction.



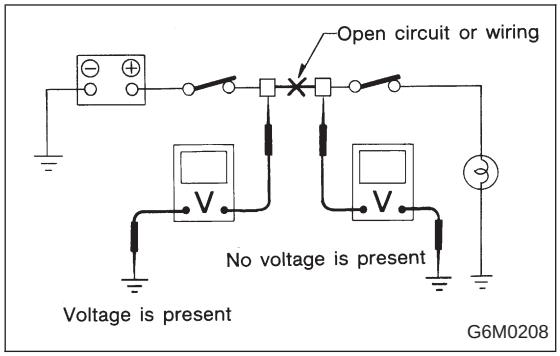
2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery terminal or connector so there is no voltage between the check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.

2) Use an ohmmeter to check for diode continuity.
When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.

3) Symbol “o—o” indicates that continuity exists between two points or terminals. For example, when a switch position is “3”, continuity exists among terminals 1, 3 and 6, as shown in table below.

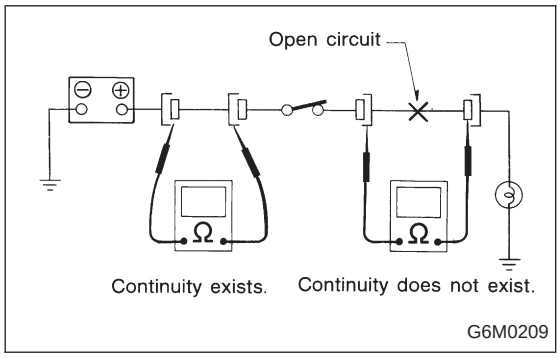
Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○



3. HOW TO DETERMINE AN OPEN CIRCUIT

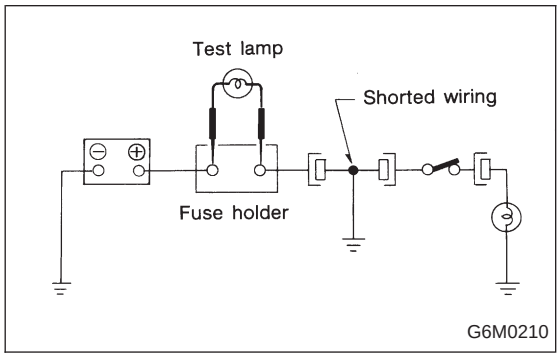
1) Voltmeter Method

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.



2) Ohmmeter method

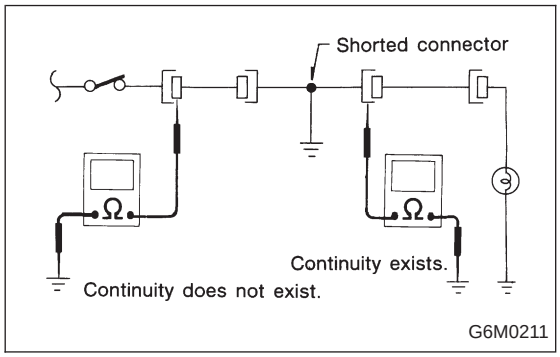
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.



4. HOW TO DETERMINE A SHORTCIRCUIT

1) Test lamp method

Connect a test lamp (rated at approximately 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from the power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and the next connector (farther from the power supply) is shorted.



2) Ohmmeter method

Disconnect all affected connectors, and check continuity between each connector and ground. When ohmmeter indicates continuity between a particular connector and ground, that connector is shorted.

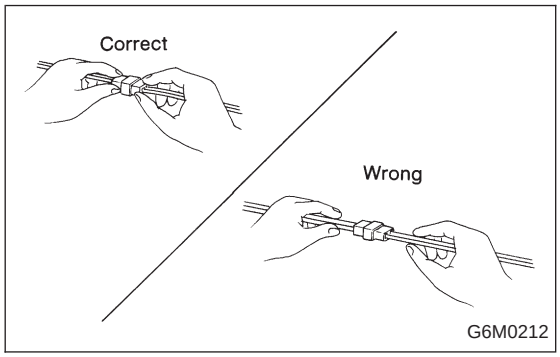
3. Working Precautions

1. PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

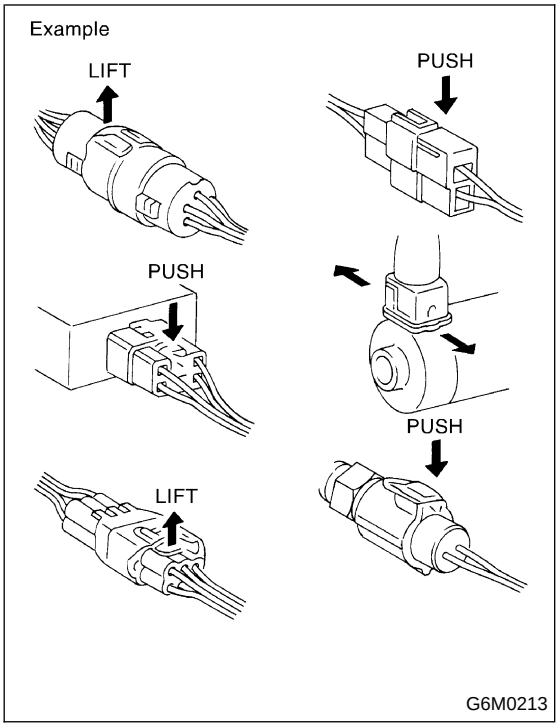
1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

2. PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

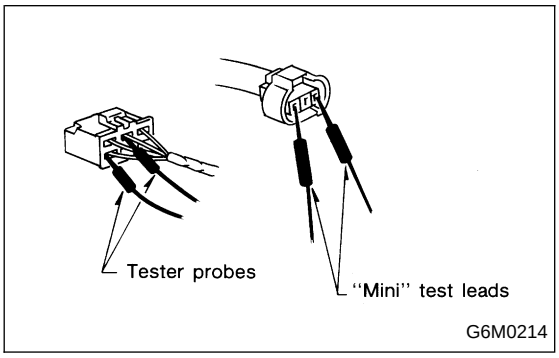
1) The battery cable must be disconnected from the battery's (−) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with the body end parts or edges and bolts or screws.
3) When installing parts, be careful not to catch them on the wiring harness.



4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.
To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use “mini” test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage the terminals.

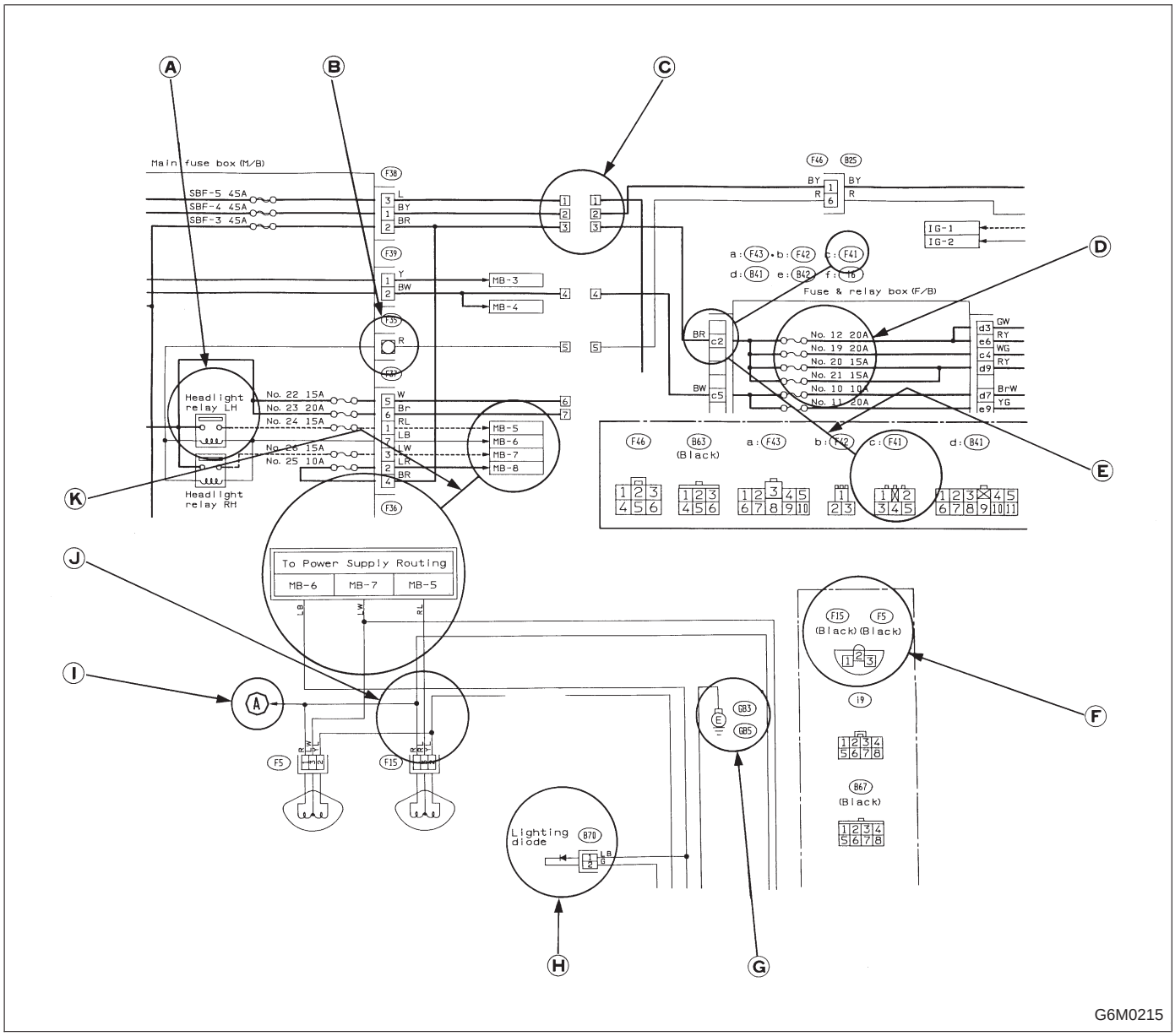
7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

ABBREVIATION LIST

Abbr.	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
+B	Battery
DN	Down
E	Ground
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
IG	Ignition
Illumi.	Illumination

Abbr.	Full name
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
OP	Optional Parts
PASS	Passing
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

4. How to Use Wiring Diagram



A: RELAY

A symbol used to indicate a relay.

B: CONNECTOR-1

The sketch of the connector indicates the one-pole types.

C: WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

D: FUSE NO. & RATING

The “FUSE No. & RATING” corresponds with that used in the fuse box (main fuse box, fuse and joint box.)

E: CONNECTOR-2

1. Each connector is indicated by a symbol.
2. Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
3. For example, terminal number “C2” refers to No. 2 terminal of connector (C:F41) shown in the connector sketch.

F: CONNECTOR SKETCH

1. Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
2. When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

G: GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

H: DIODE

A symbol is used to indicate a diode.

I: WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), as shown below, facilitates wire tracing from one page to the next.

A ↔ A, B ↔ B

J: SYMBOLS OF WIRE CONNECTION AND CROSSING

 Symbol — Refers to wires which are connected and branched at the "dot" point.

 Symbol — Refers to wires which are crossed but not connected.

K: POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.

"MB-5", "MB-6", etc., which are used as power-supply symbols throughout the text, correspond with those shown in the POWER SUPPLY ROUTING in the wiring diagram.

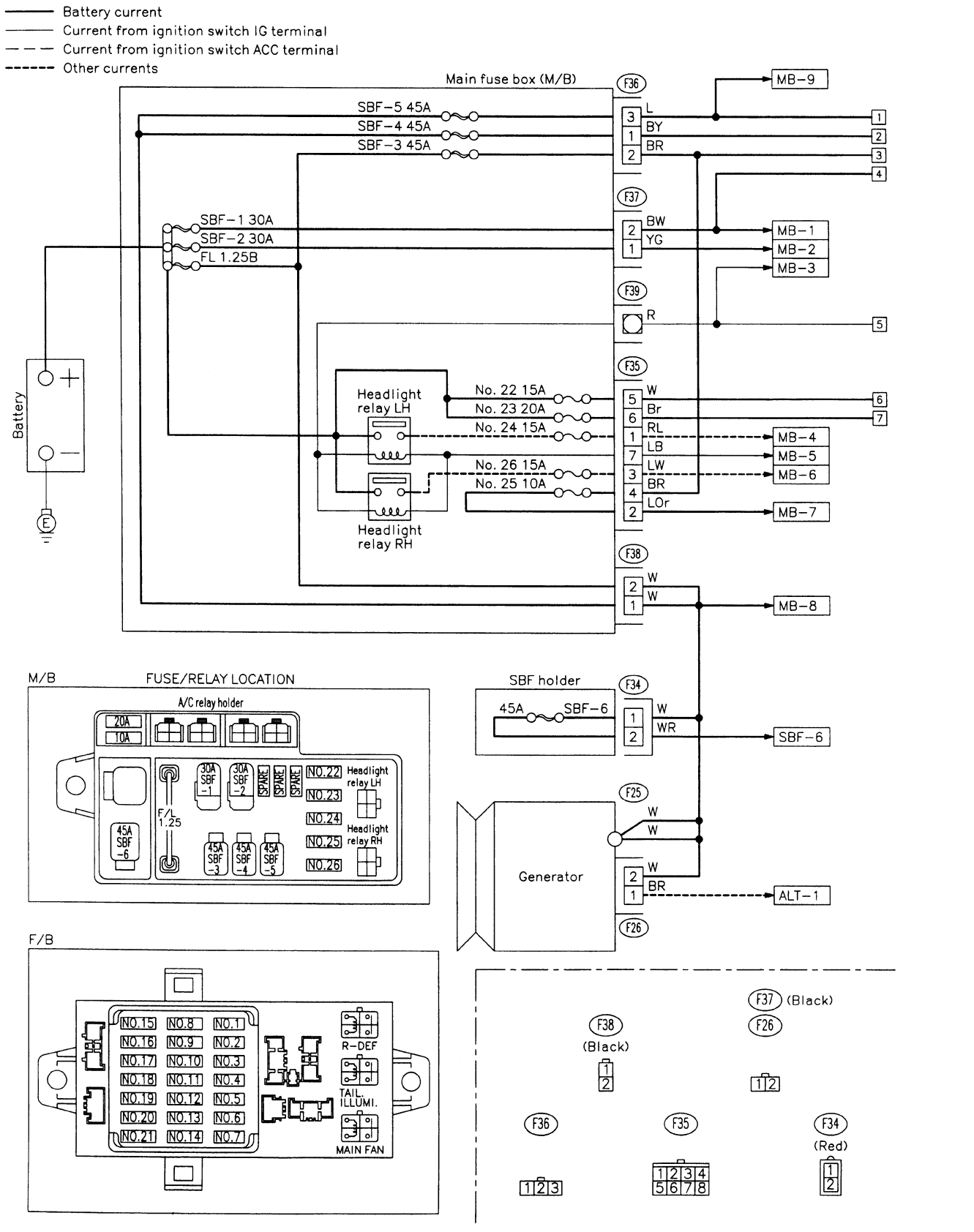
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

L: SYMBOLS AND ABBREVIATIONS

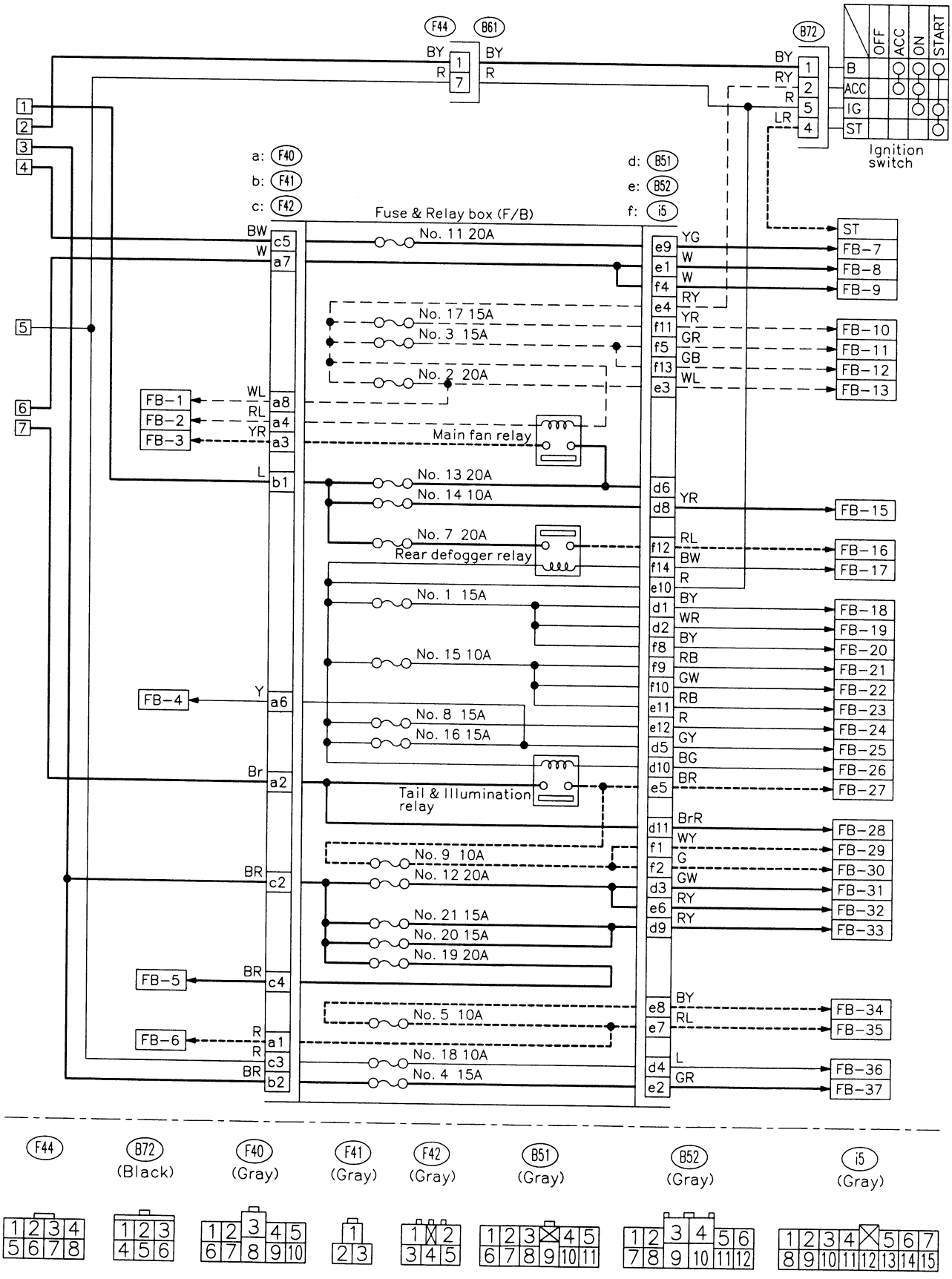
A number of symbols and abbreviations are used in each wiring diagram to easily identify parts or circuits.

5. Wiring Diagram

1. POWER SUPPLY ROUTING

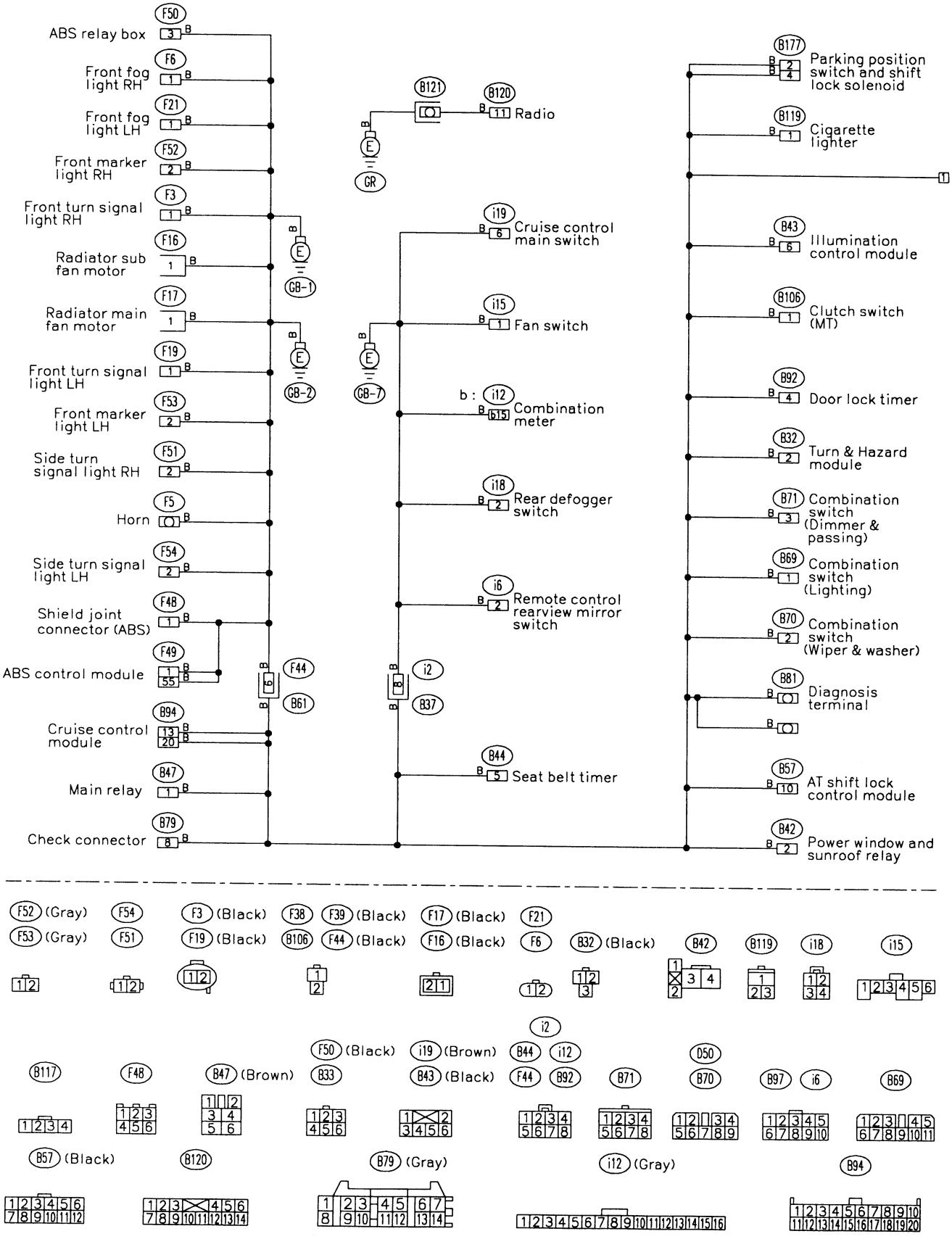


GU01-03A

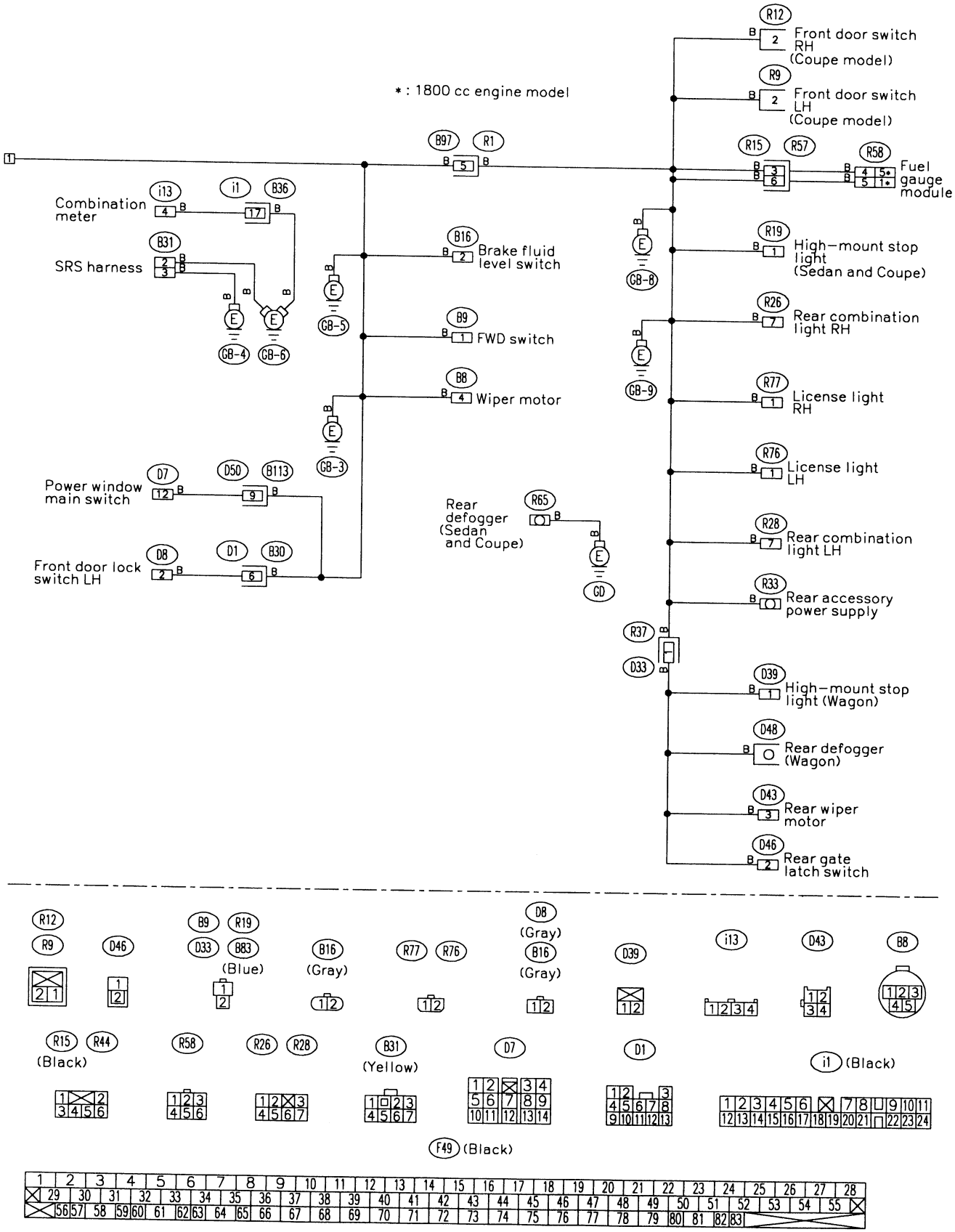

F44
B61
B72
OFF
ACC
ON
START
B
ACC
IG
ST
Ignition switch
a: F40
b: F41
c: F42
d: B51
e: B52
f: i5
Fuse & Relay box (F/B)
No. 11 20A
No. 17 15A
No. 3 15A
No. 2 20A
Main fan relay
No. 13 20A
No. 14 10A
No. 7 20A
Rear defogger relay
No. 1 15A
No. 15 10A
No. 8 15A
No. 16 15A
Tail & Illumination relay
No. 9 10A
No. 12 20A
No. 21 15A
No. 20 15A
No. 19 20A
No. 5 10A
No. 18 10A
No. 4 15A
FB-1
FB-2
FB-3
FB-4
FB-5
FB-6
FB-7
FB-8
FB-9
FB-10
FB-11
FB-12
FB-13
FB-15
FB-16
FB-17
FB-18
FB-19
FB-20
FB-21
FB-22
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-30
FB-31
FB-32
FB-33
FB-34
FB-35
FB-36
FB-37
F44
B72 (Black)
F40 (Gray)
F41 (Gray)
F42 (Gray)
B51 (Gray)
B52 (Gray)
i5 (Gray)

GU01-03B

2. GROUND DISTRIBUTION

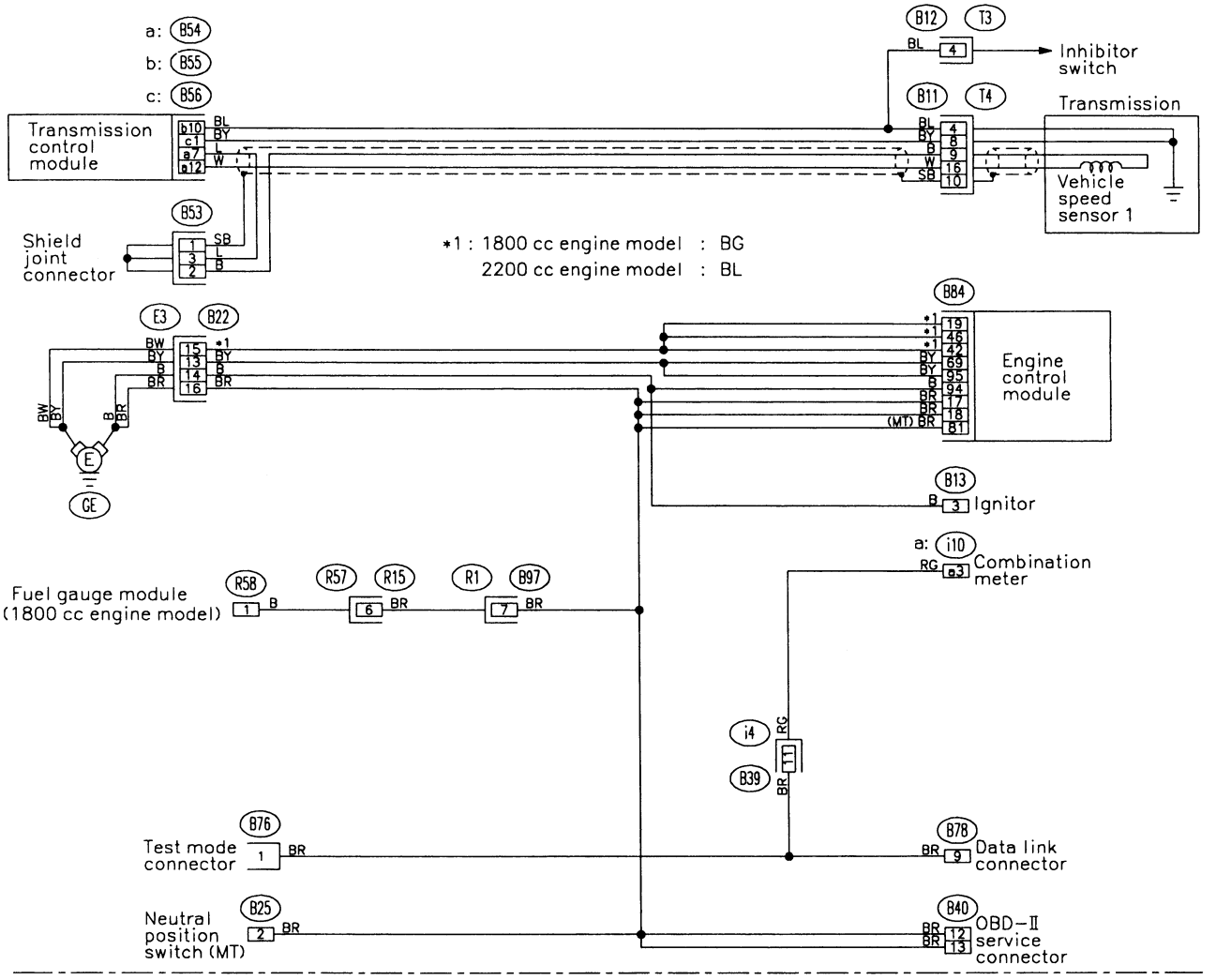


GU04-04A


*: 1800 cc engine model
Combination meter
SRS harness
Power window main switch
Front door lock switch LH
Brake fluid level switch
FWD switch
Wiper motor
Rear defogger (Sedan and Coupe)
Front door switch RH (Coupe model)
Front door switch LH (Coupe model)
Fuel gauge module
High−mount stop light (Sedan and Coupe)
Rear combination light RH
License light RH
License light LH
Rear combination light LH
Rear accessory power supply
High−mount stop light (Wagon)
Rear defogger (Wagon)
Rear wiper motor
Rear gate latch switch
(Blue)
(Gray)
(Black)
(Yellow)
F49 (Black)

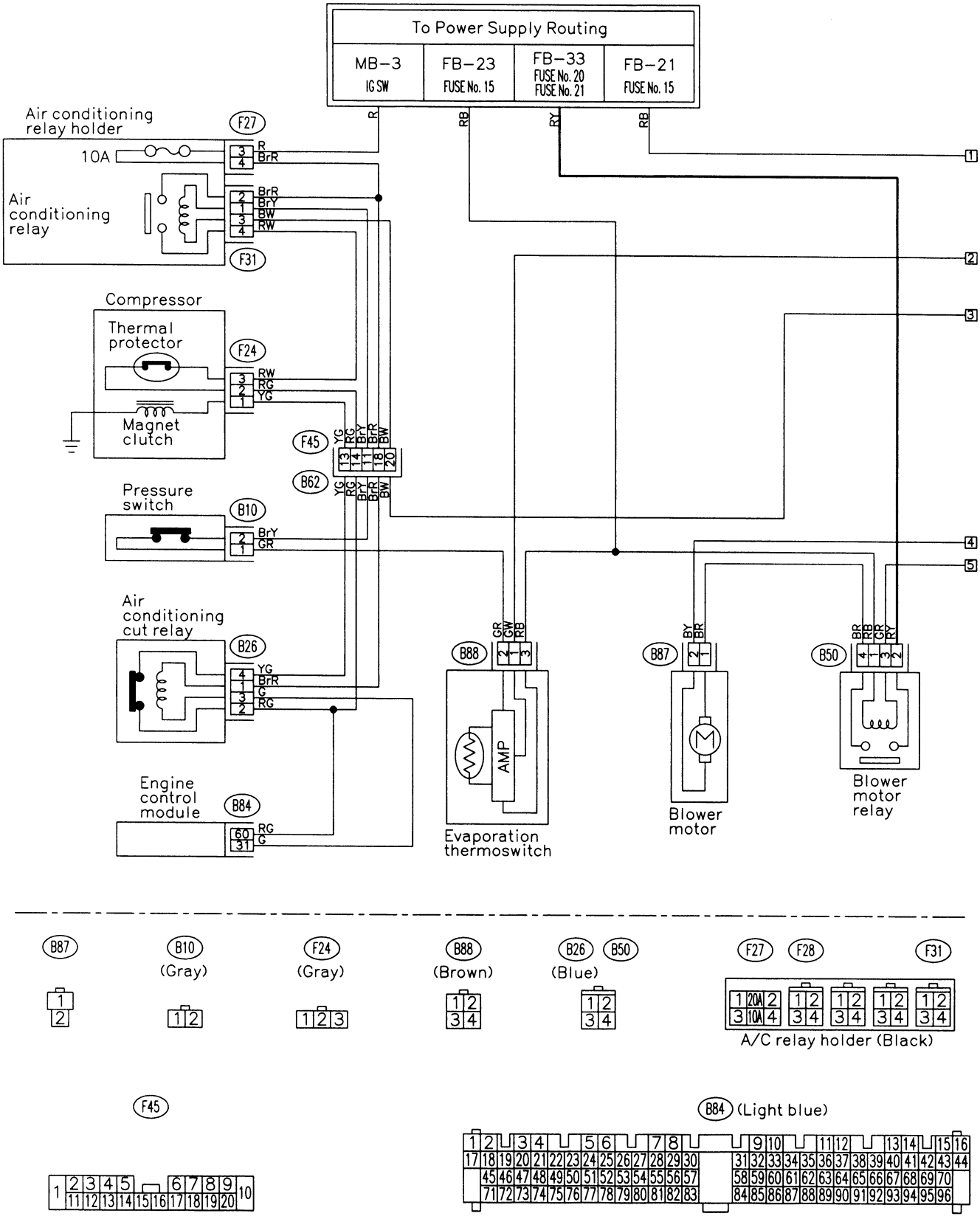
GU04-04B

WIRING DIAGRAM



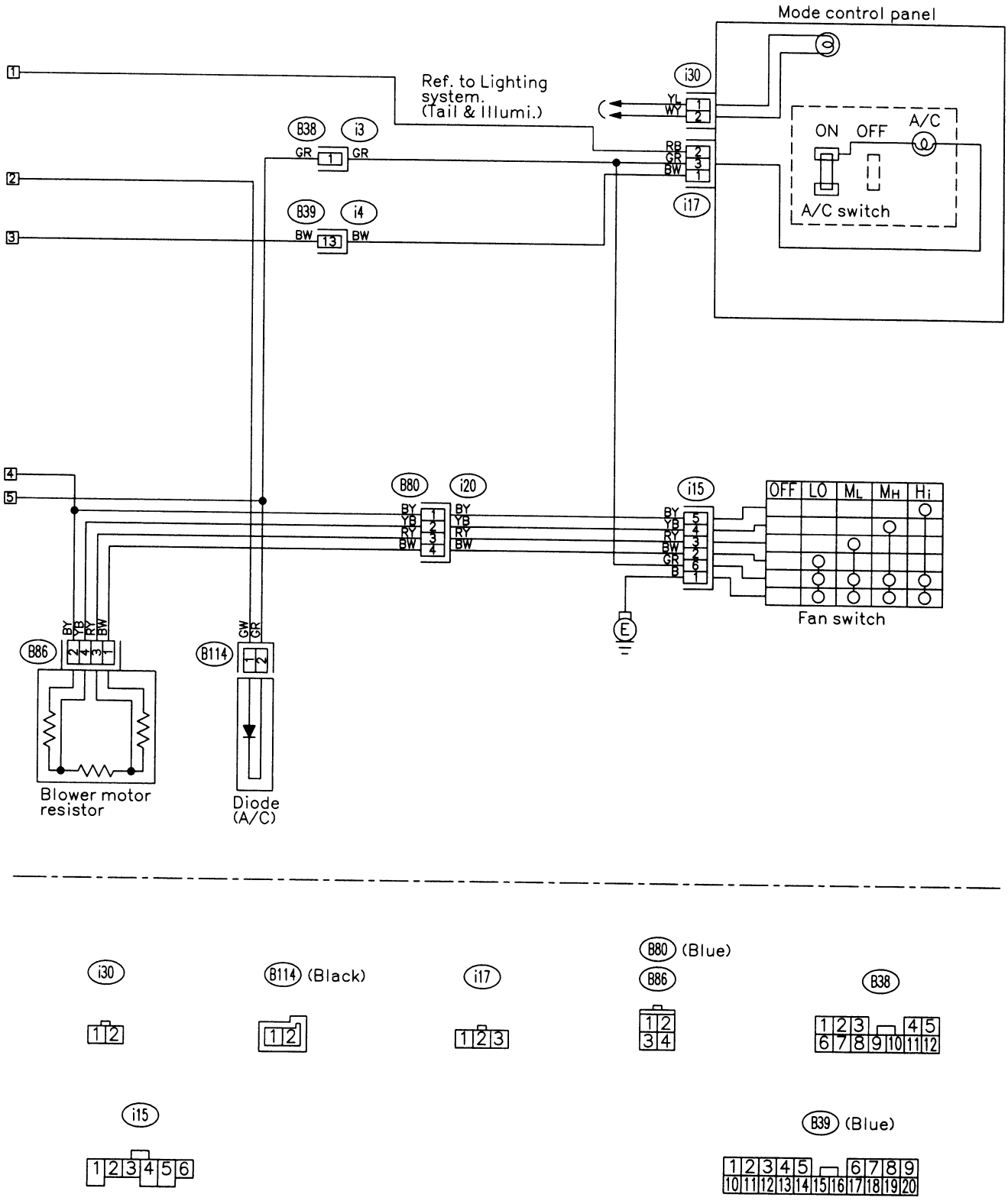
GU04-04C

3. AIR CONDITIONING SYSTEM



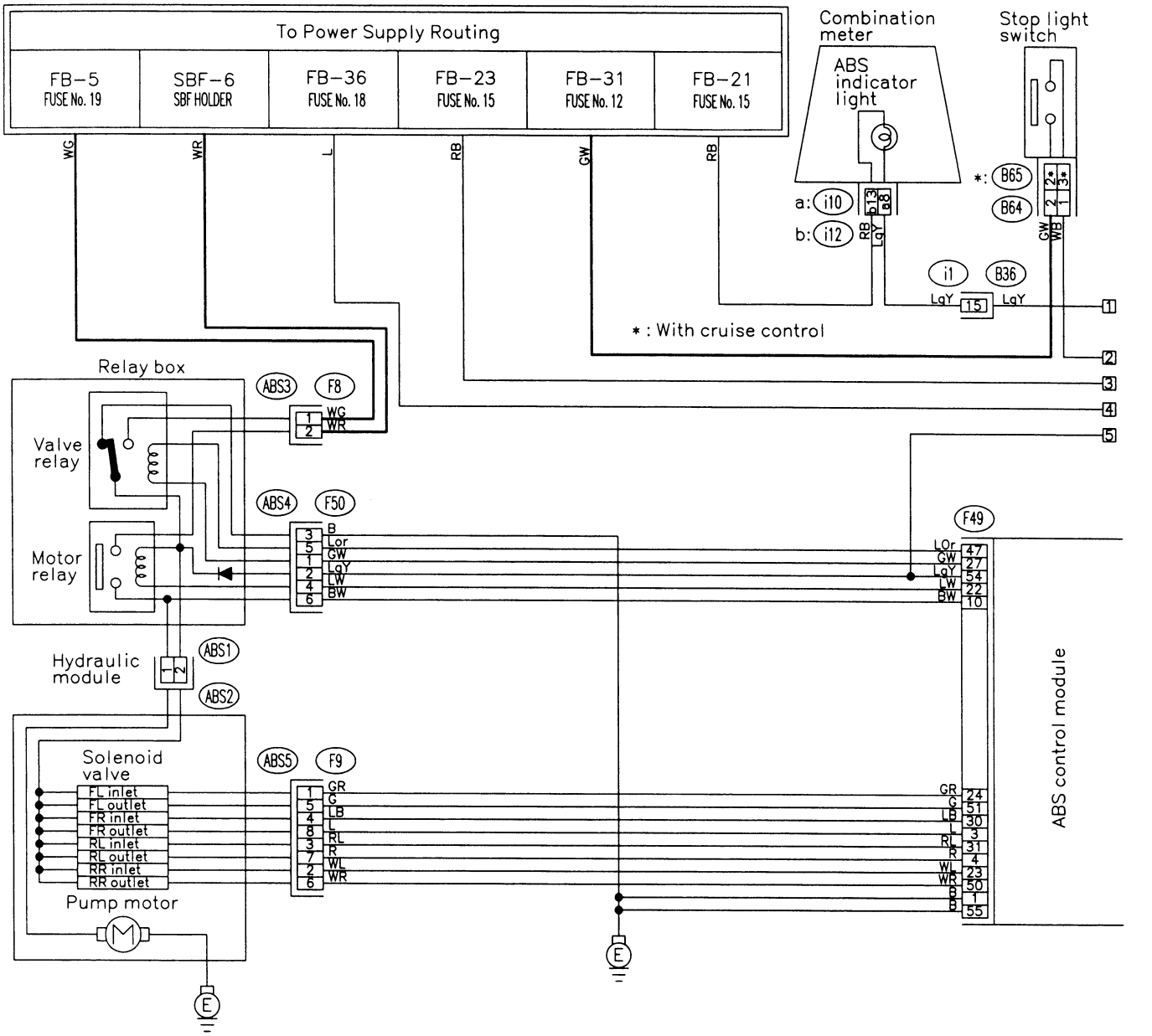
GU45-04A

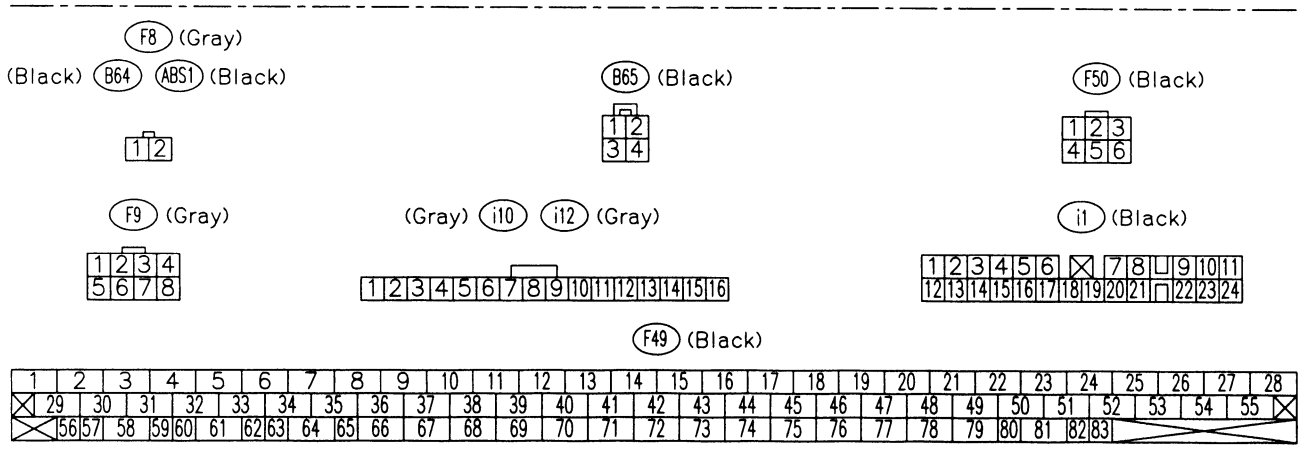
WIRING DIAGRAM



GU45-04B

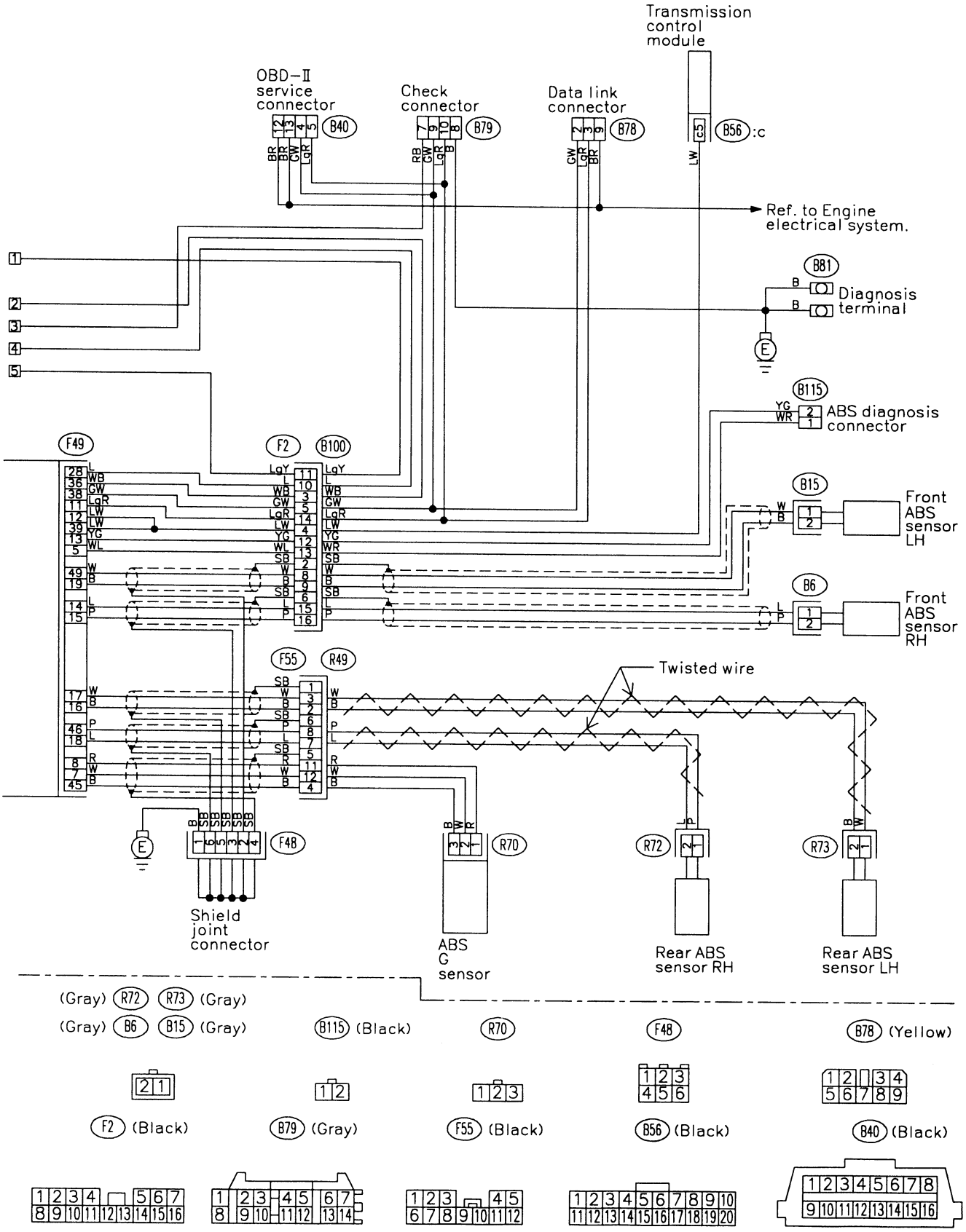
4. ANTI-LOCK BRAKE SYSTEM





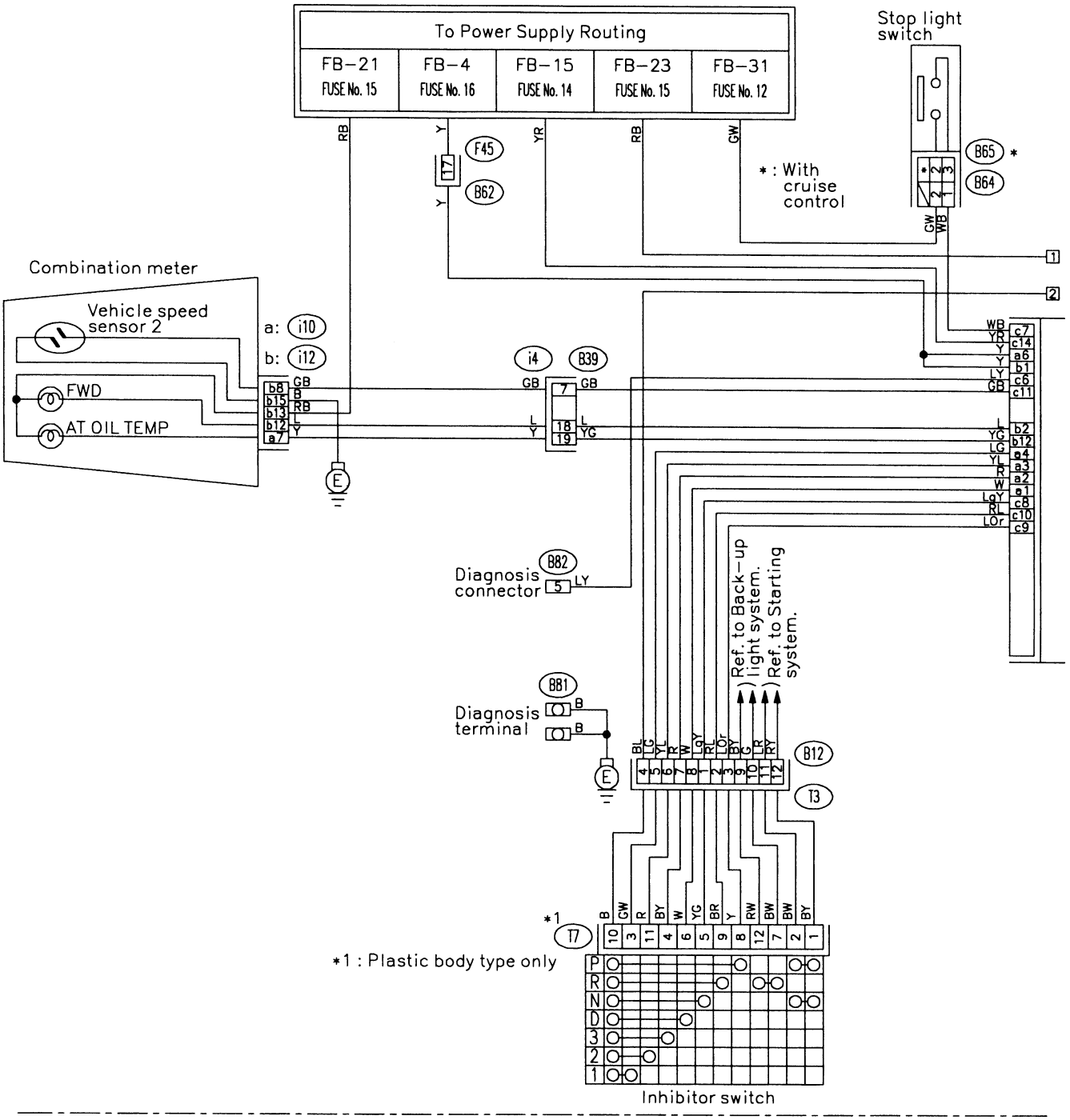
GU82-04A

WIRING DIAGRAM



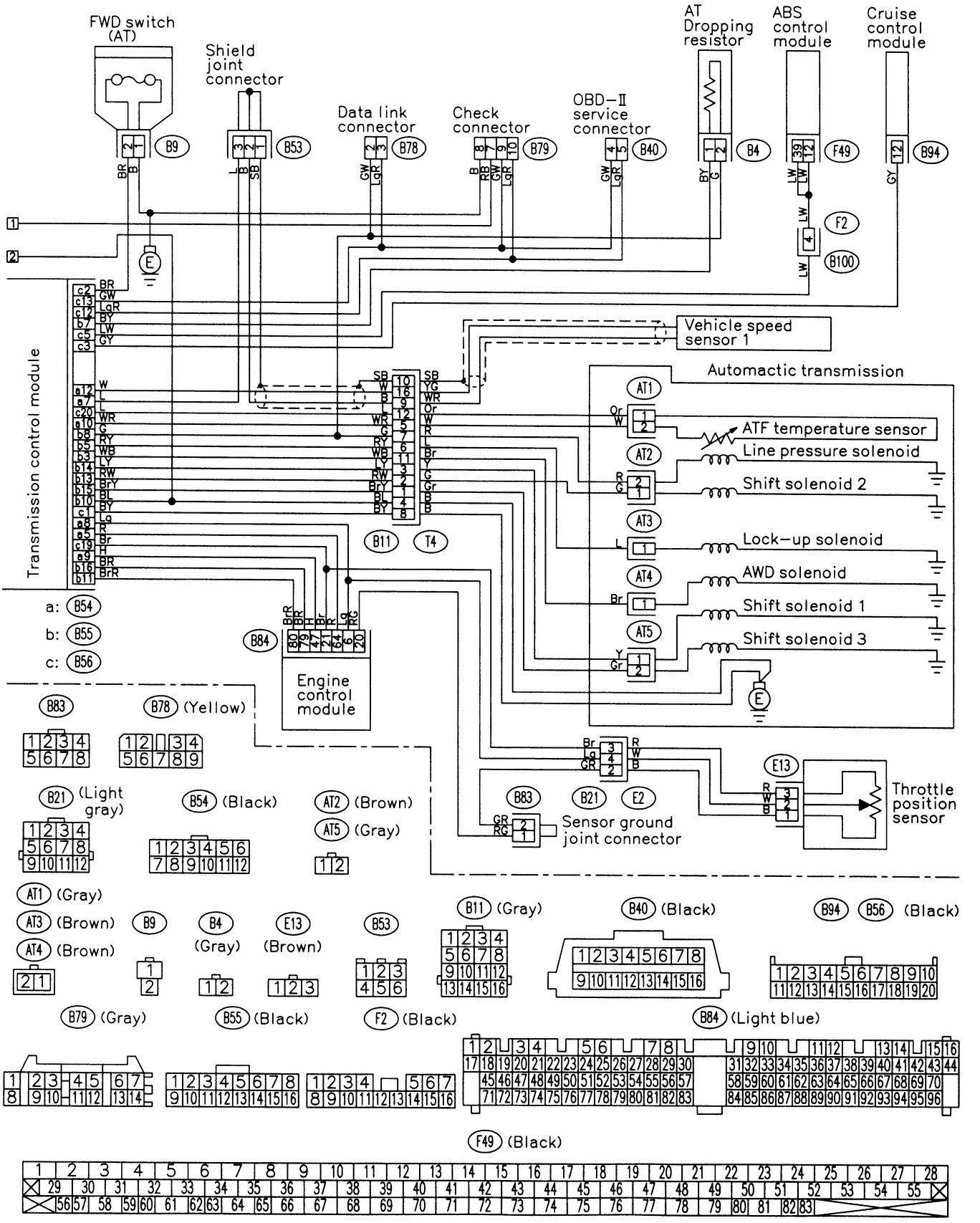
GU82-04B

5. A/T CONTROL SYSTEM



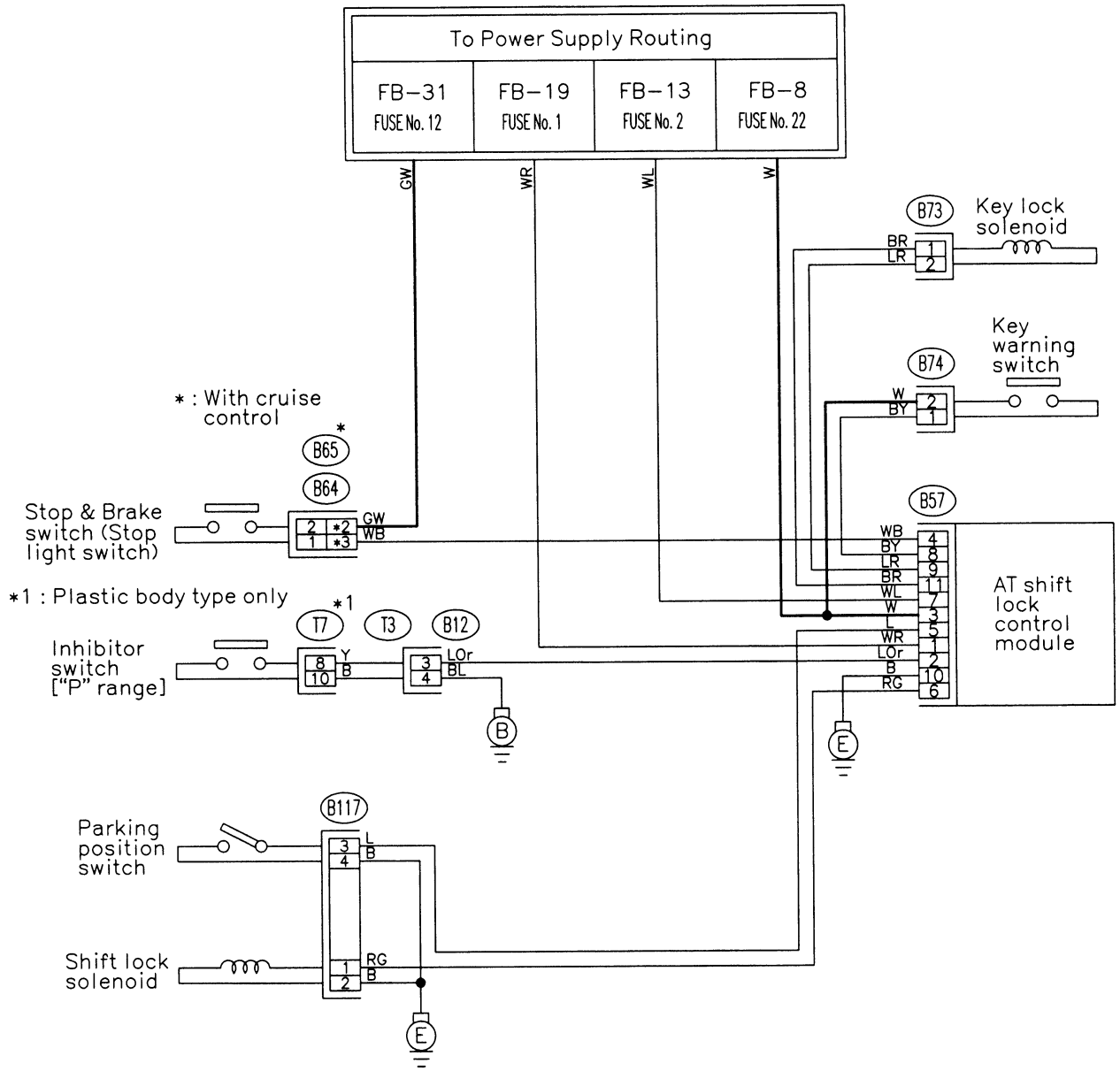
GU41-05A

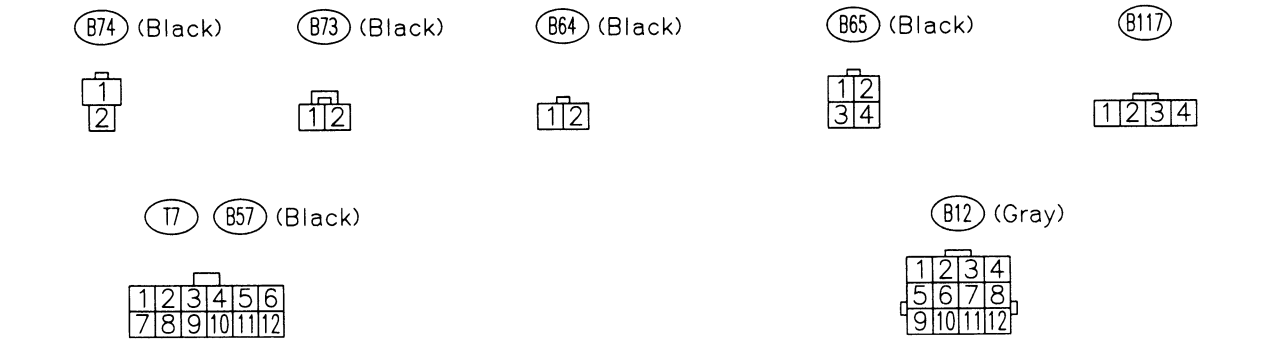
WIRING DIAGRAM



GU41-05B

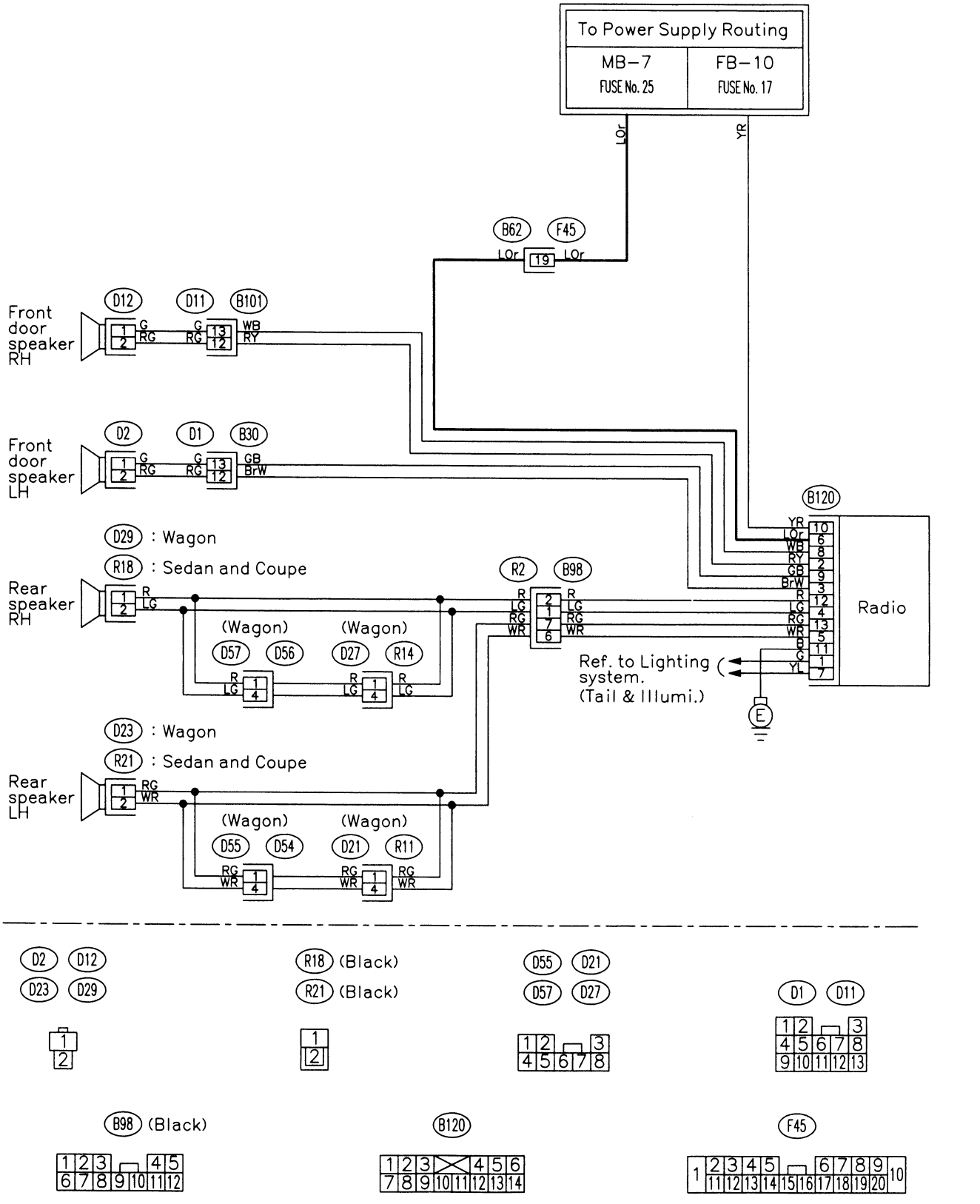
6. A/T SHIFT LOCK SYSTEM





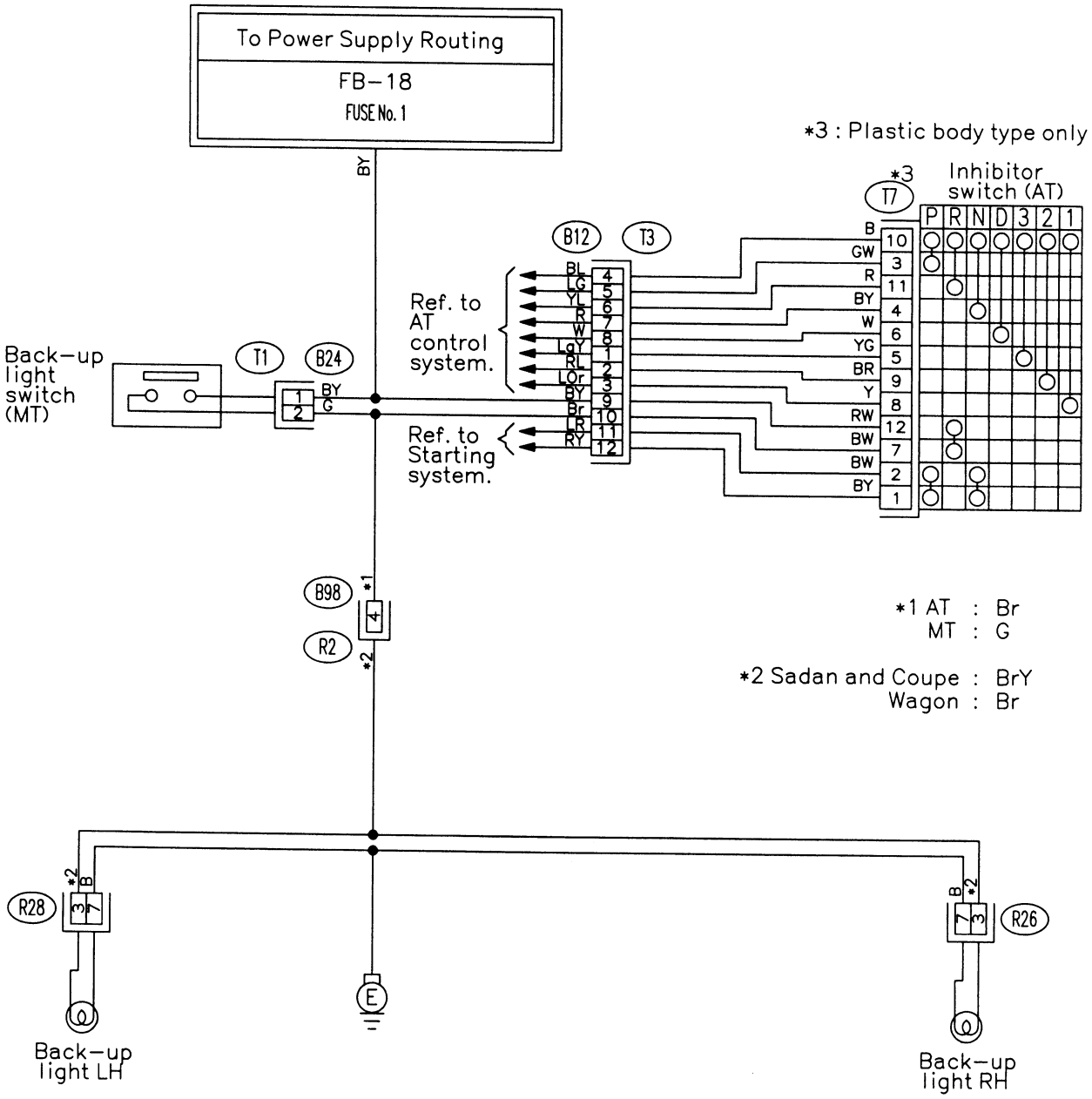
GU42-03

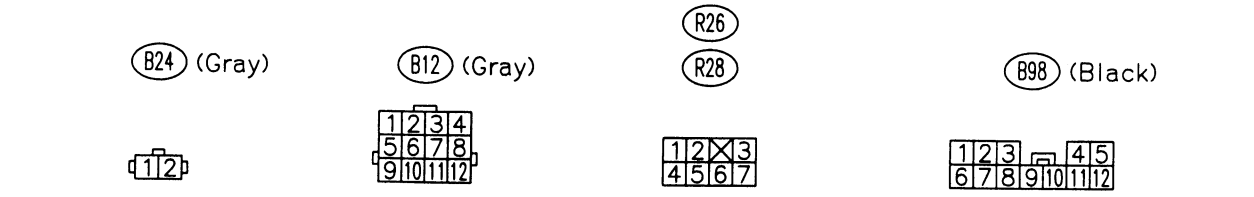
7. AUDIO SYSTEM



GU76-03

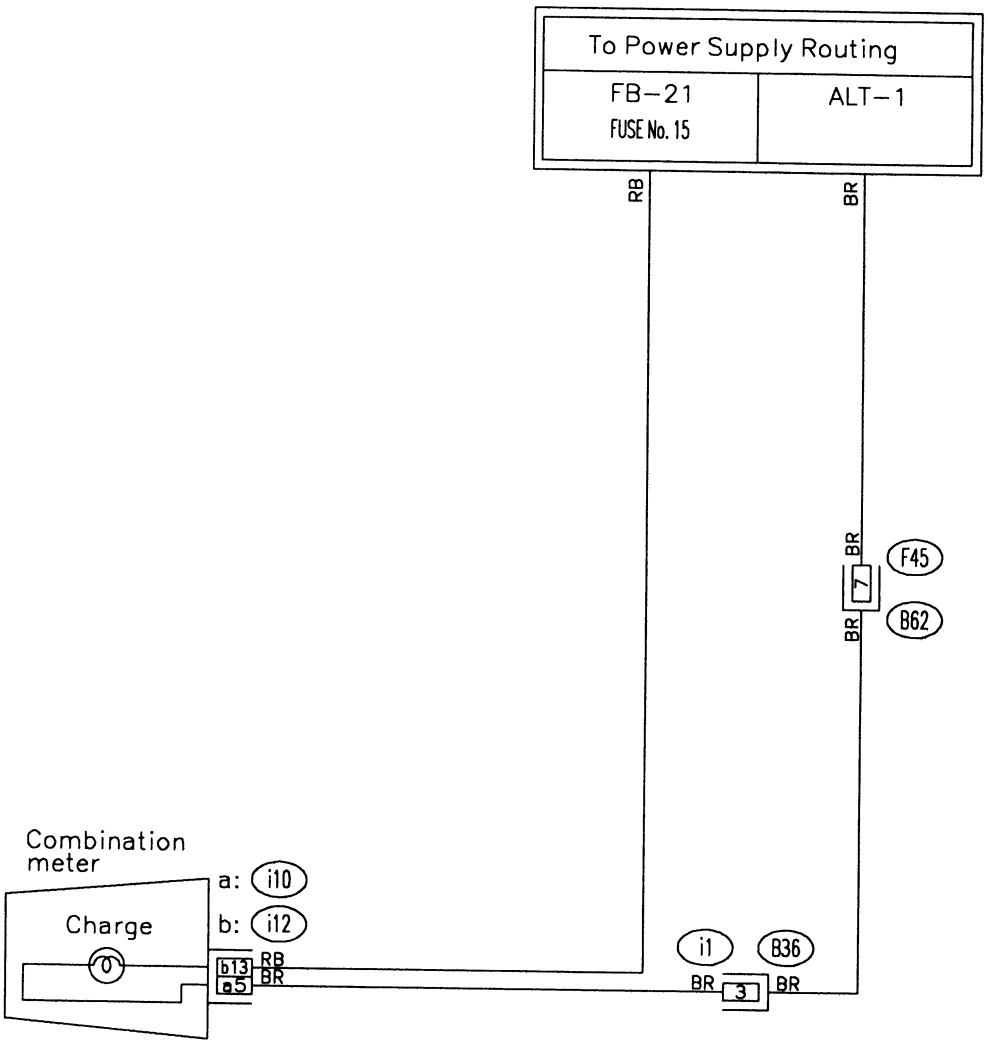
8. BACK-UP LIGHT SYSTEM

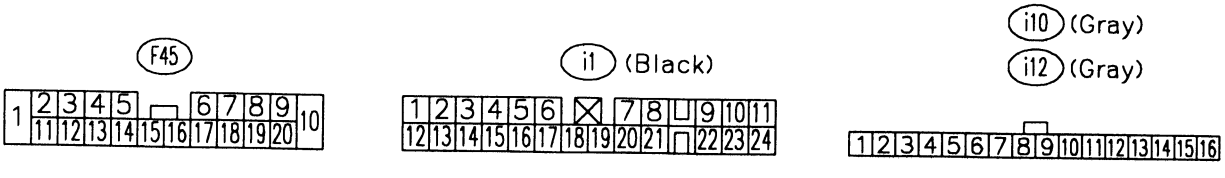




GU29-02

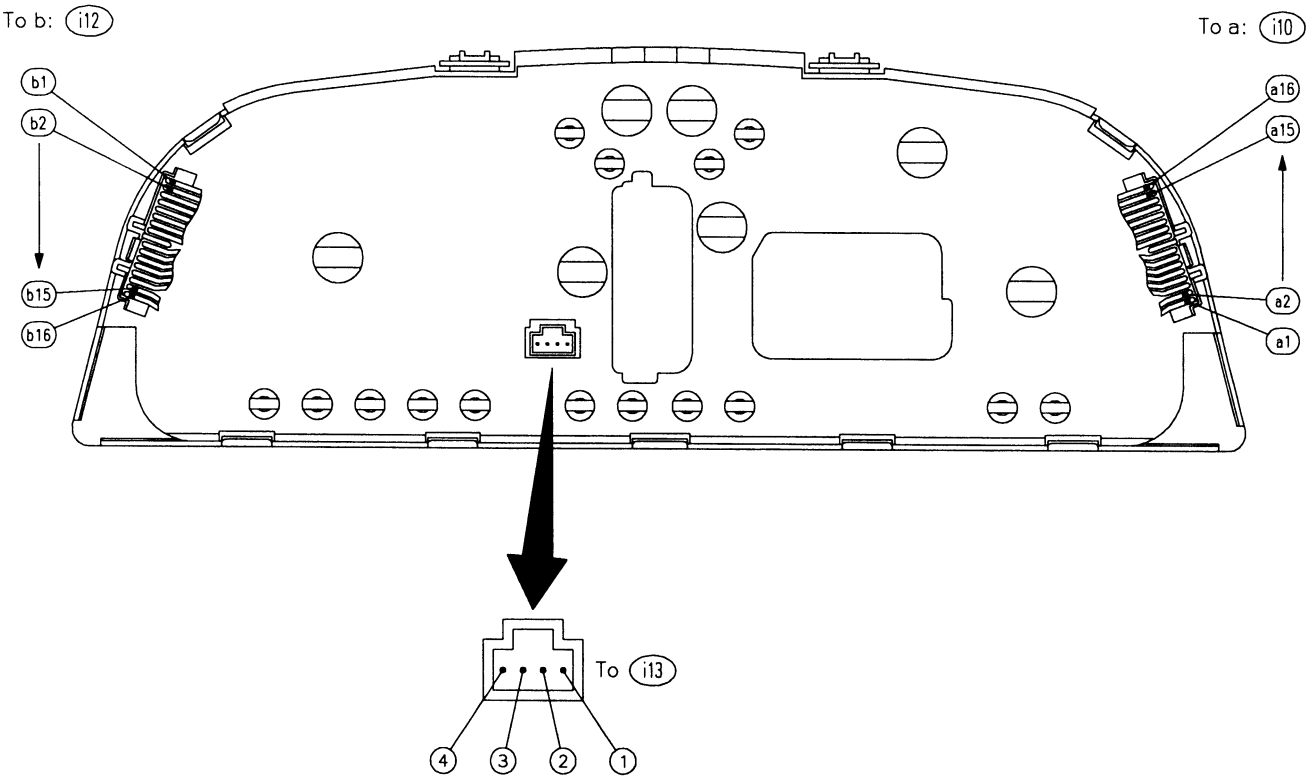
9. CHARGING SYSTEM

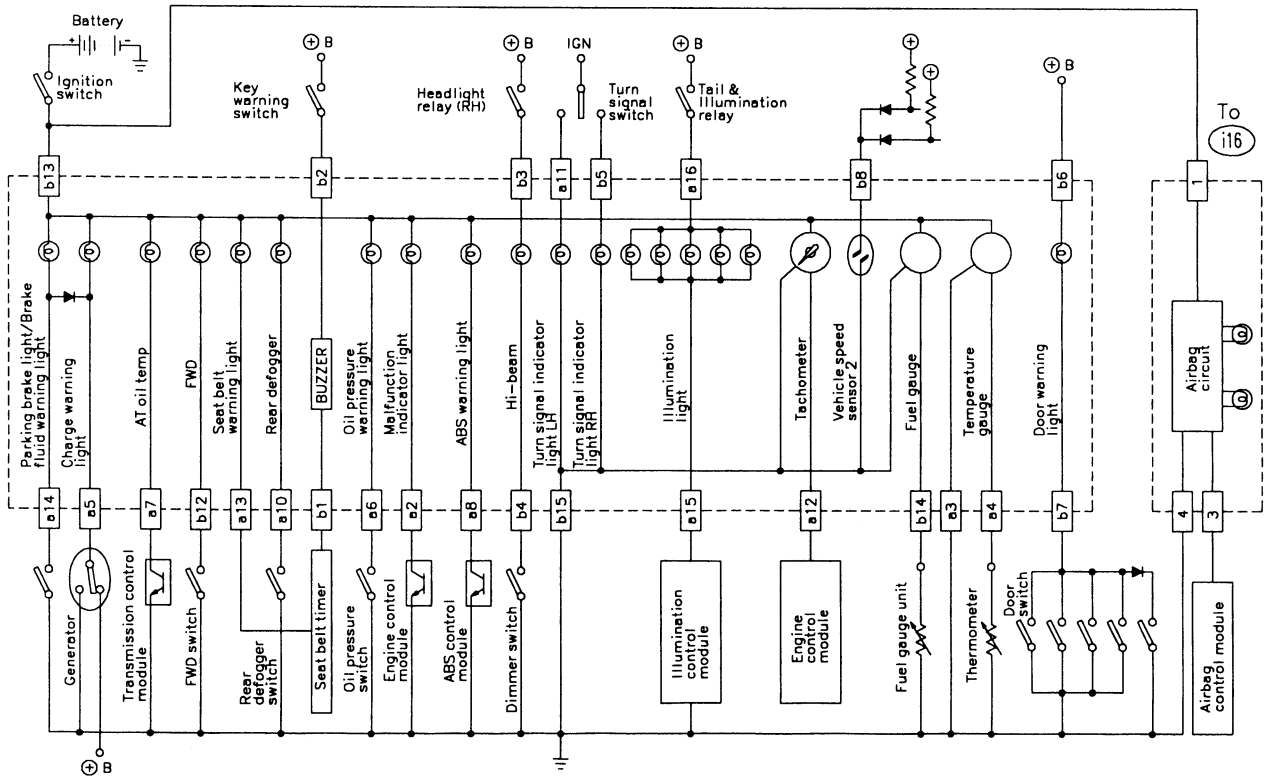




GU02-03

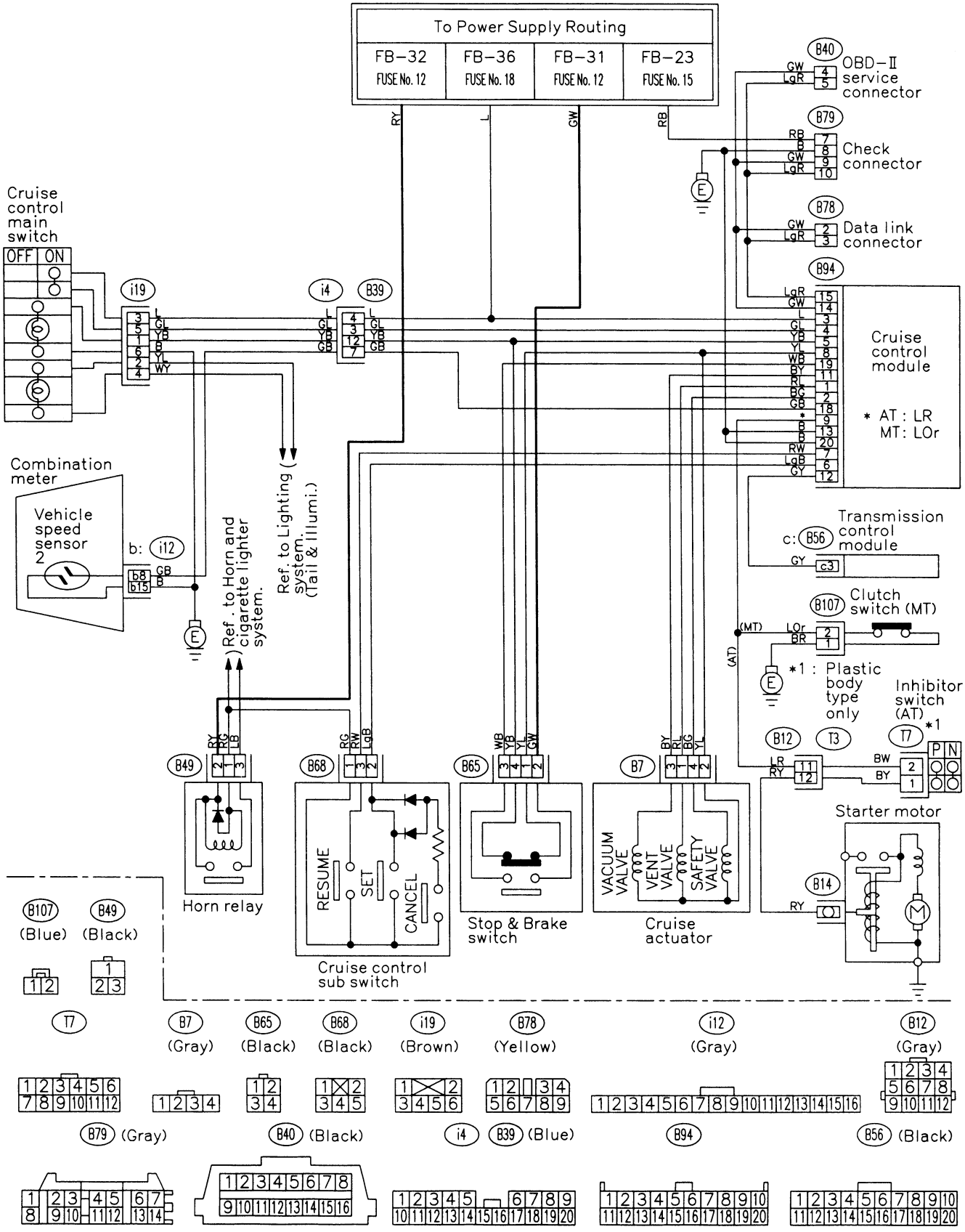
10. COMBINATION METER





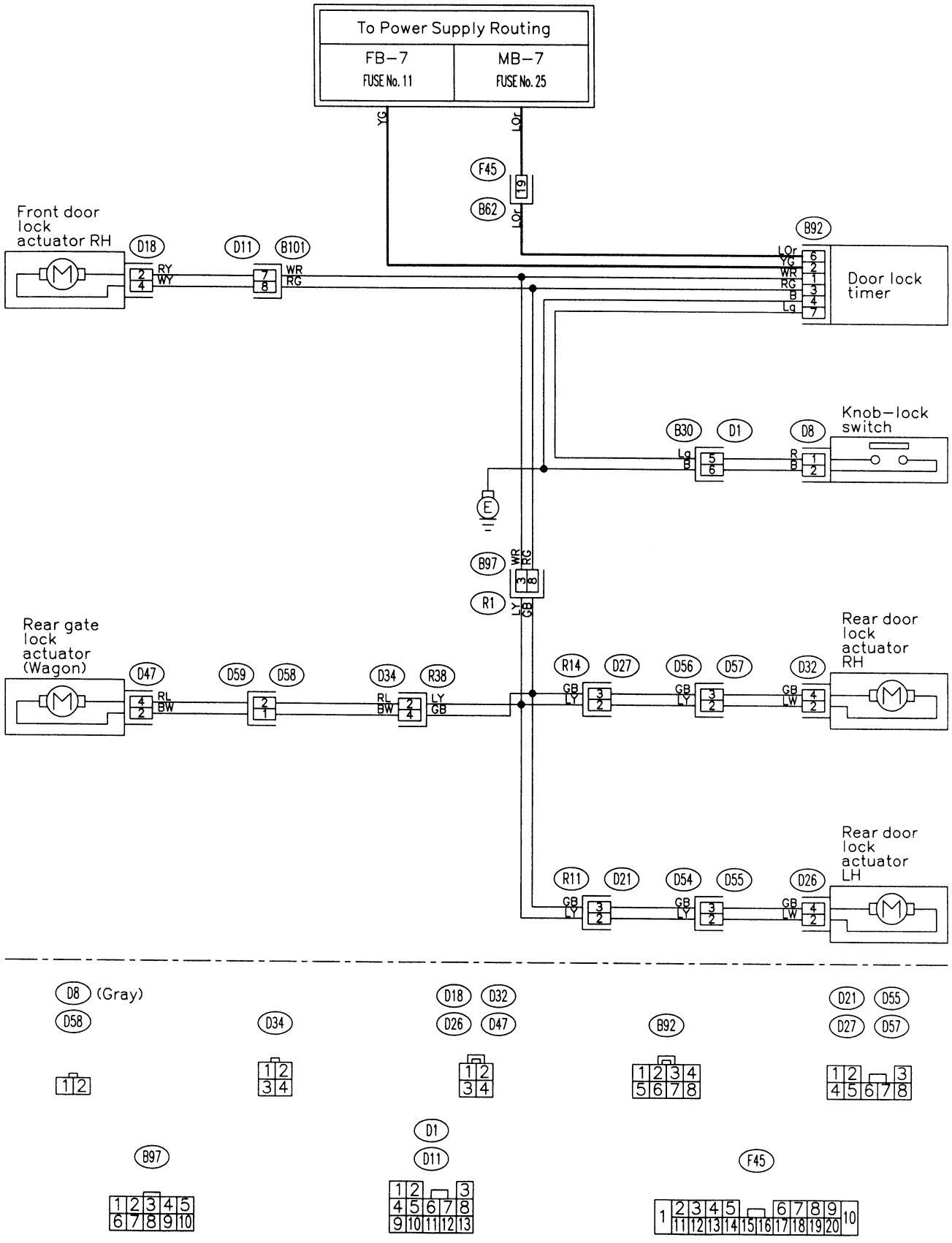
GU65-04

11. CRUISE CONTROL SYSTEM



GU71-04

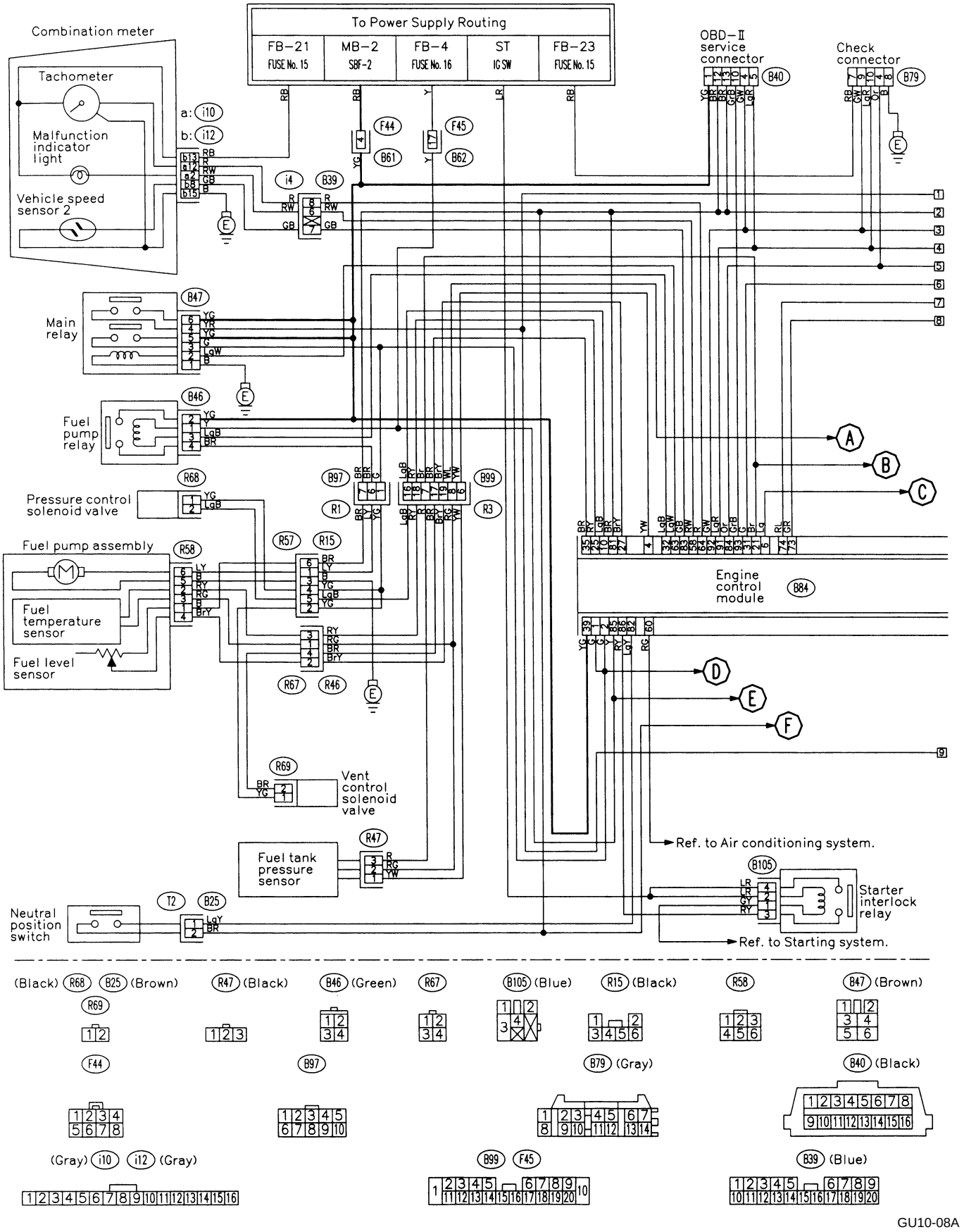
12. DOOR LOCK SYSTEM



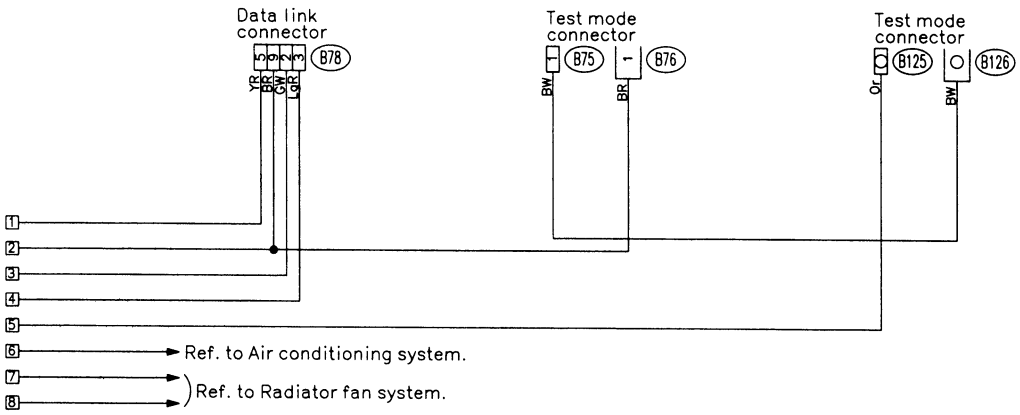
GU73-03

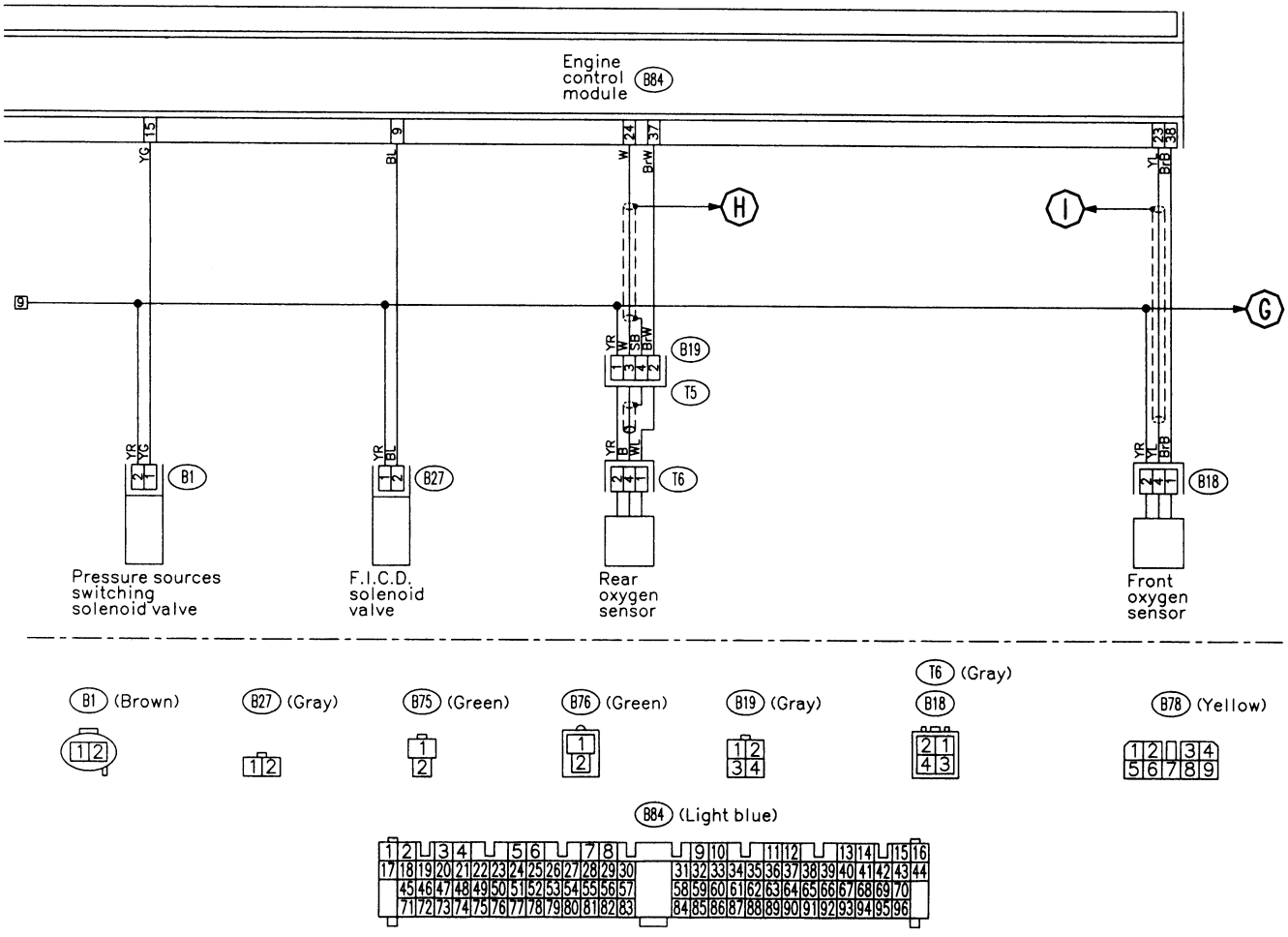
13. ENGINE ELECTRICAL SYSTEM

- **1800 cc engine model**



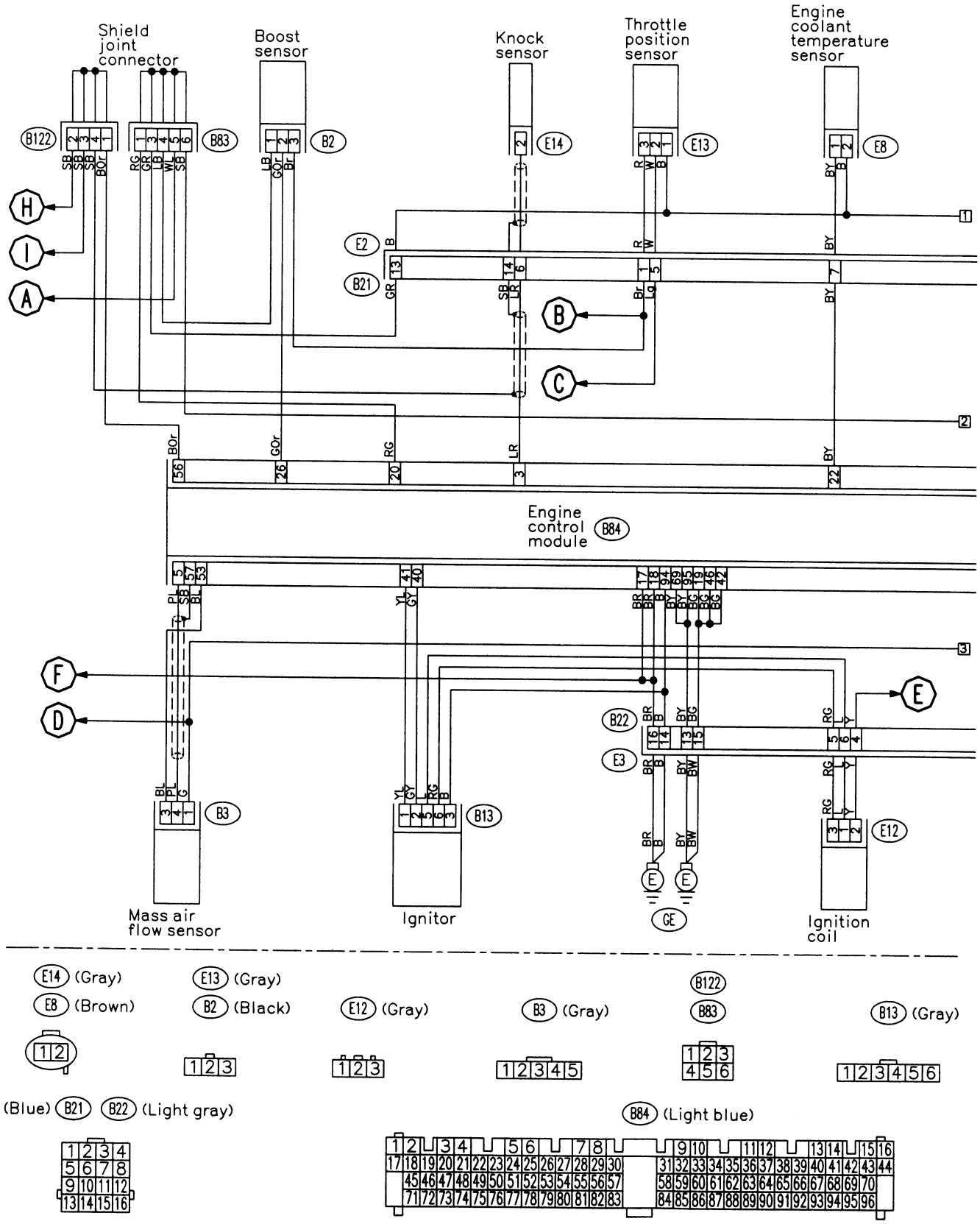
GU10-08A


Data link connector
B78
Test mode connector
B75
B76
Test mode connector
B125
B126
Ref. to Air conditioning system.
Ref. to Radiator fan system.

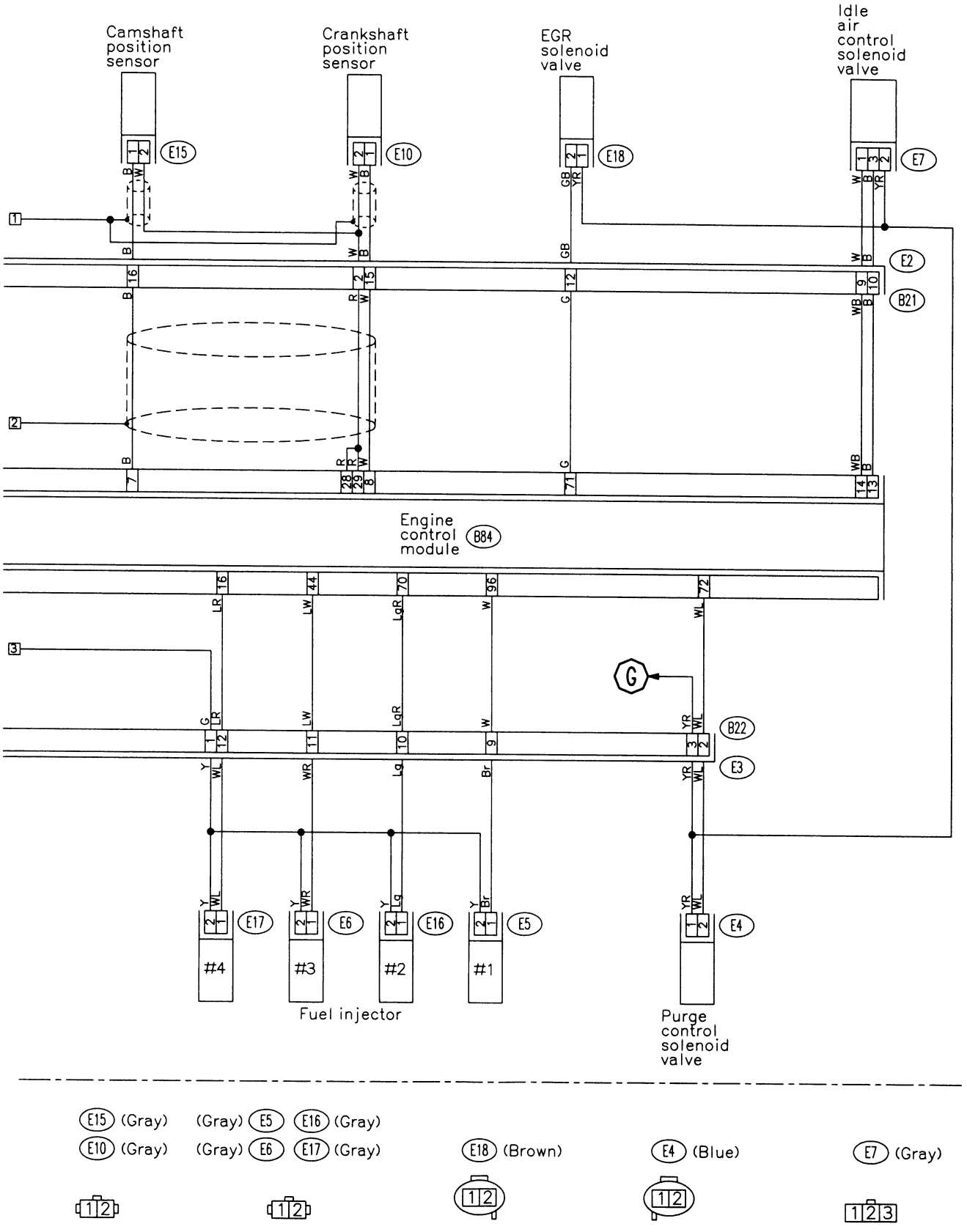

Engine control module
B84
Pressure sources switching solenoid valve
B1
F.I.C.D. solenoid valve
B27
Rear oxygen sensor
B19
T5
T6
Front oxygen sensor
B18
B1 (Brown)
B27 (Gray)
B75 (Green)
B76 (Green)
B19 (Gray)
T6 (Gray)
B18
B78 (Yellow)
B84 (Light blue)

GU10-08B

WIRING DIAGRAM



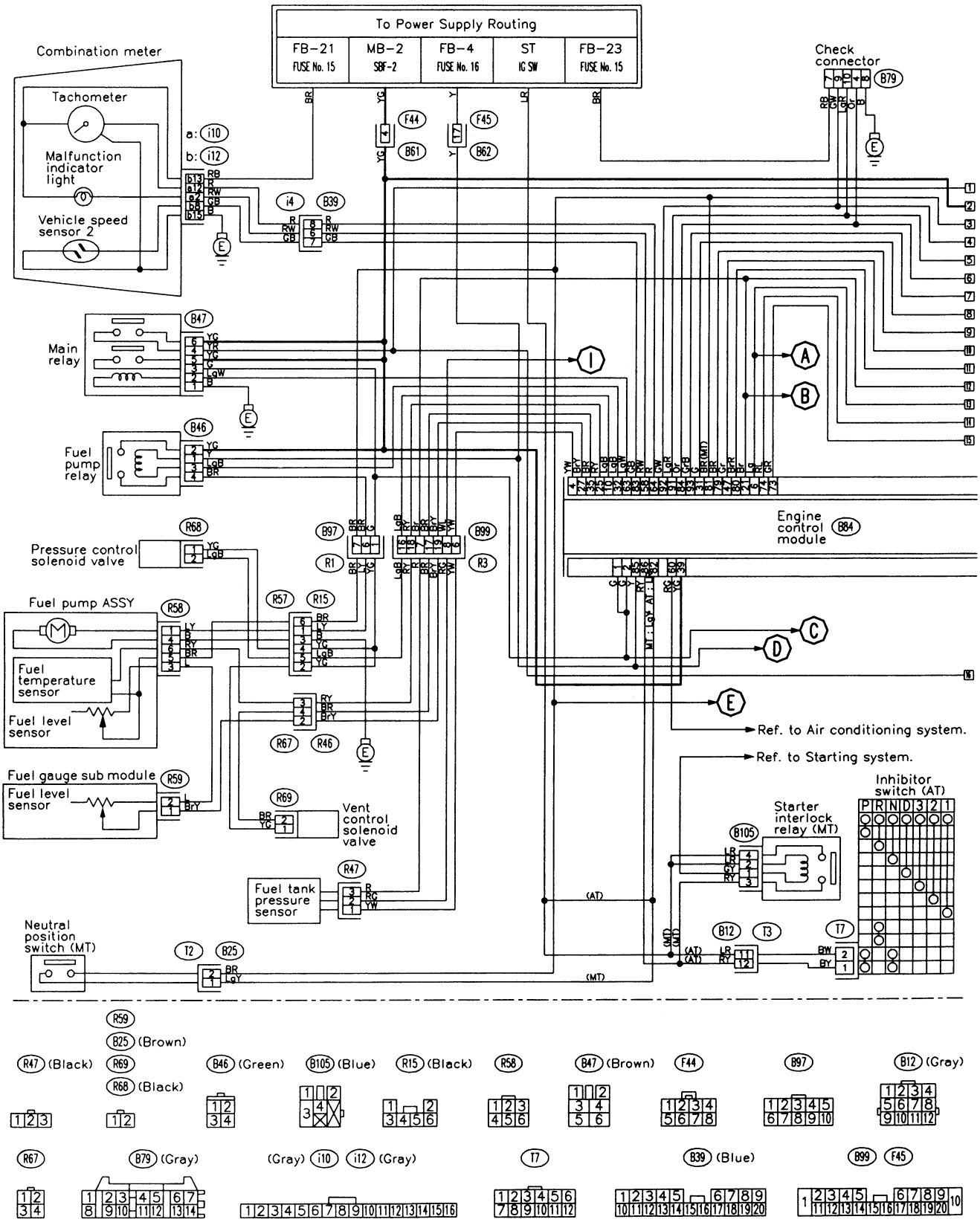
GU10-08C


Camshaft position sensor
Crankshaft position sensor
EGR solenoid valve
Idle air control solenoid valve
E15
E10
E18
E7
E2
B21
B22
E3
E17
E6
E16
E5
E4
Engine control module
B84
Fuel injector
#4
#3
#2
#1
Purge control solenoid valve
(Gray)
(Brown)
(Blue)
(Gray)

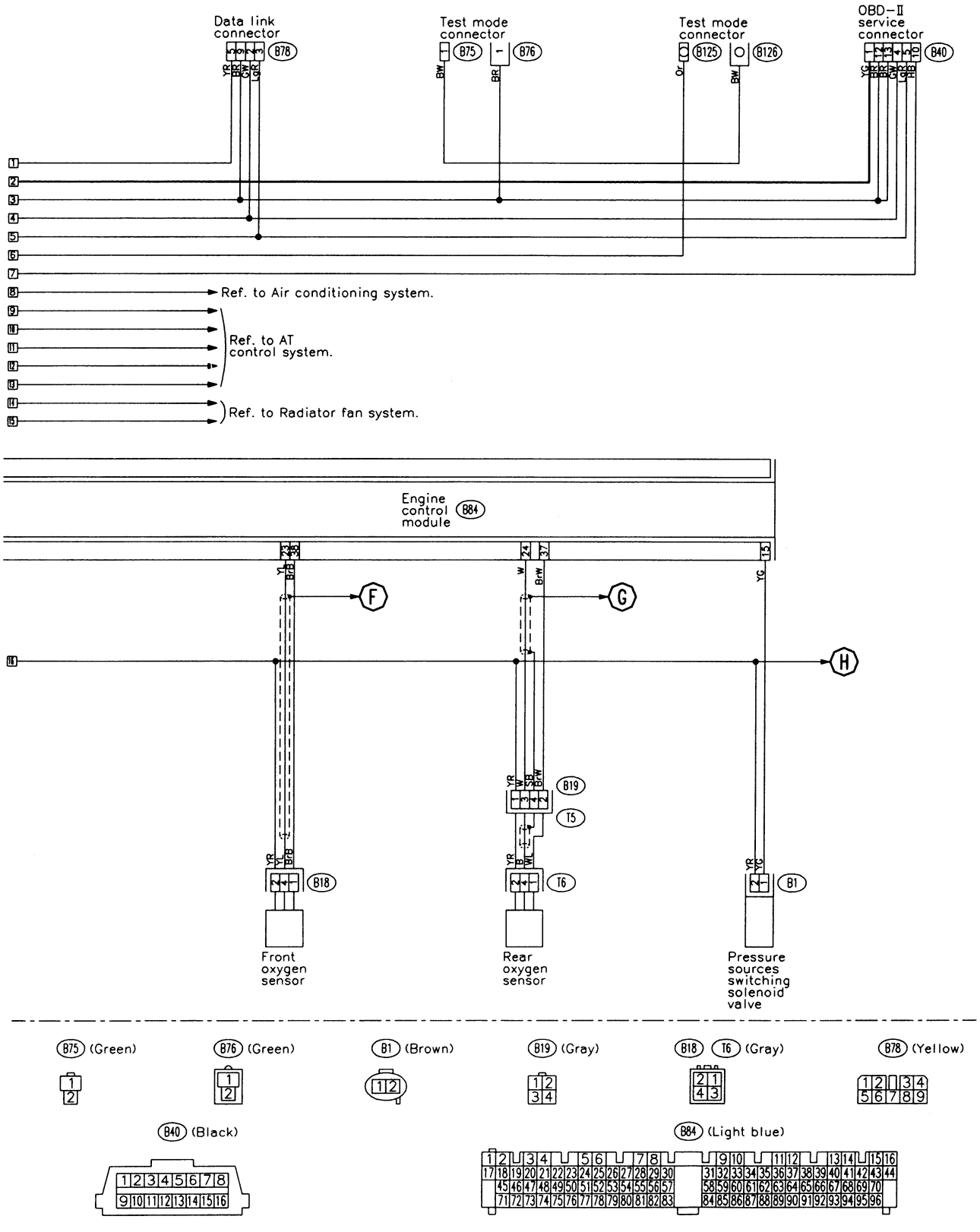
GU10-08D

13. ENGINE ELECTRICAL SYSTEM

- **2200 cc engine model**

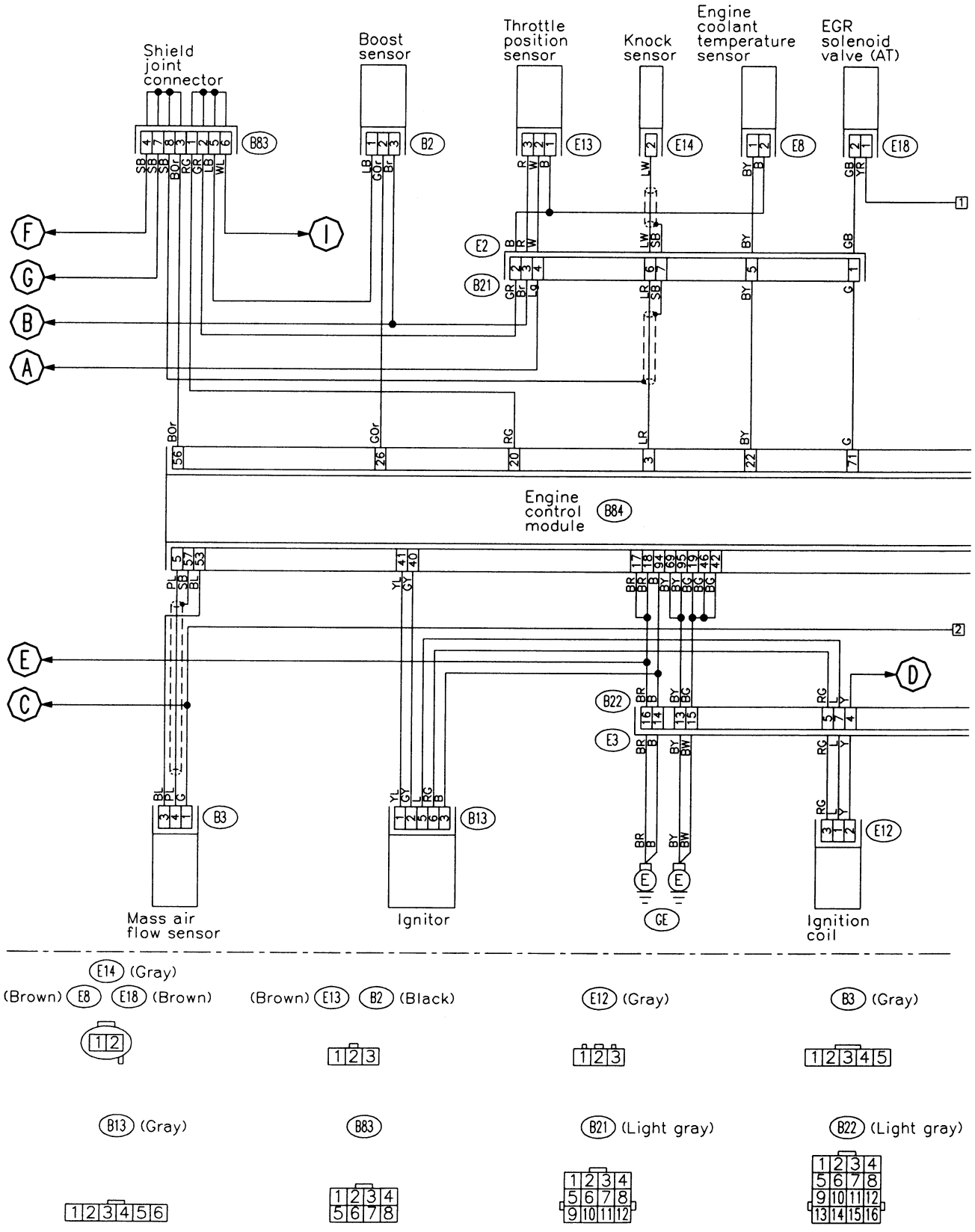


GU10-10A

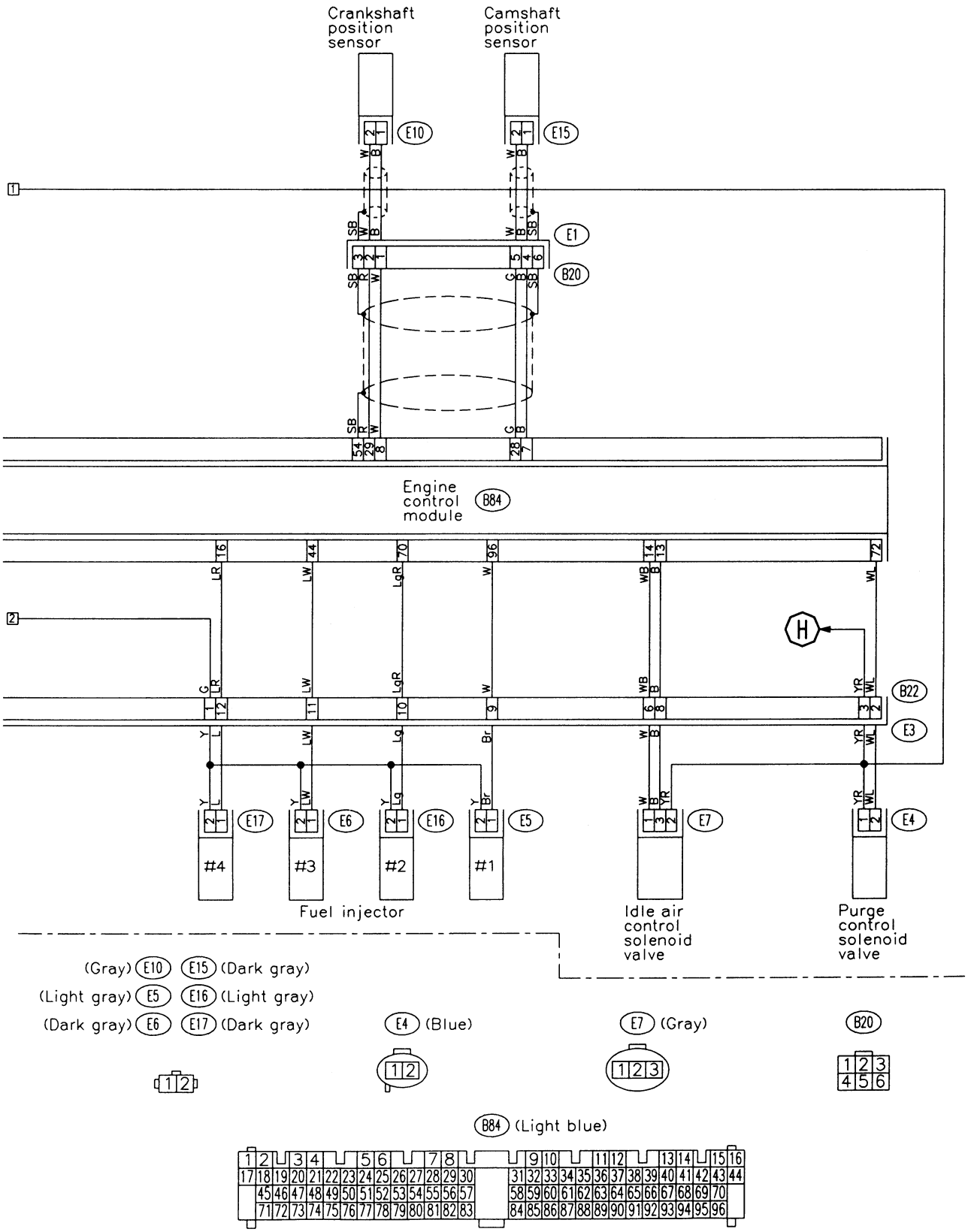

Data link connector
B78
Test mode connector
B75
B76
Test mode connector
B125
B126
OBD−II service connector
B40
Ref. to Air conditioning system.
Ref. to AT control system.
Ref. to Radiator fan system.
Engine control module
B84
F
G
H
B19
T5
T6
B18
B1
Front oxygen sensor
Rear oxygen sensor
Pressure sources switching solenoid valve
B75 (Green)
B76 (Green)
B1 (Brown)
B19 (Gray)
B18 T6 (Gray)
B78 (Yellow)
B40 (Black)
B84 (Light blue)

GU10-10B

WIRING DIAGRAM

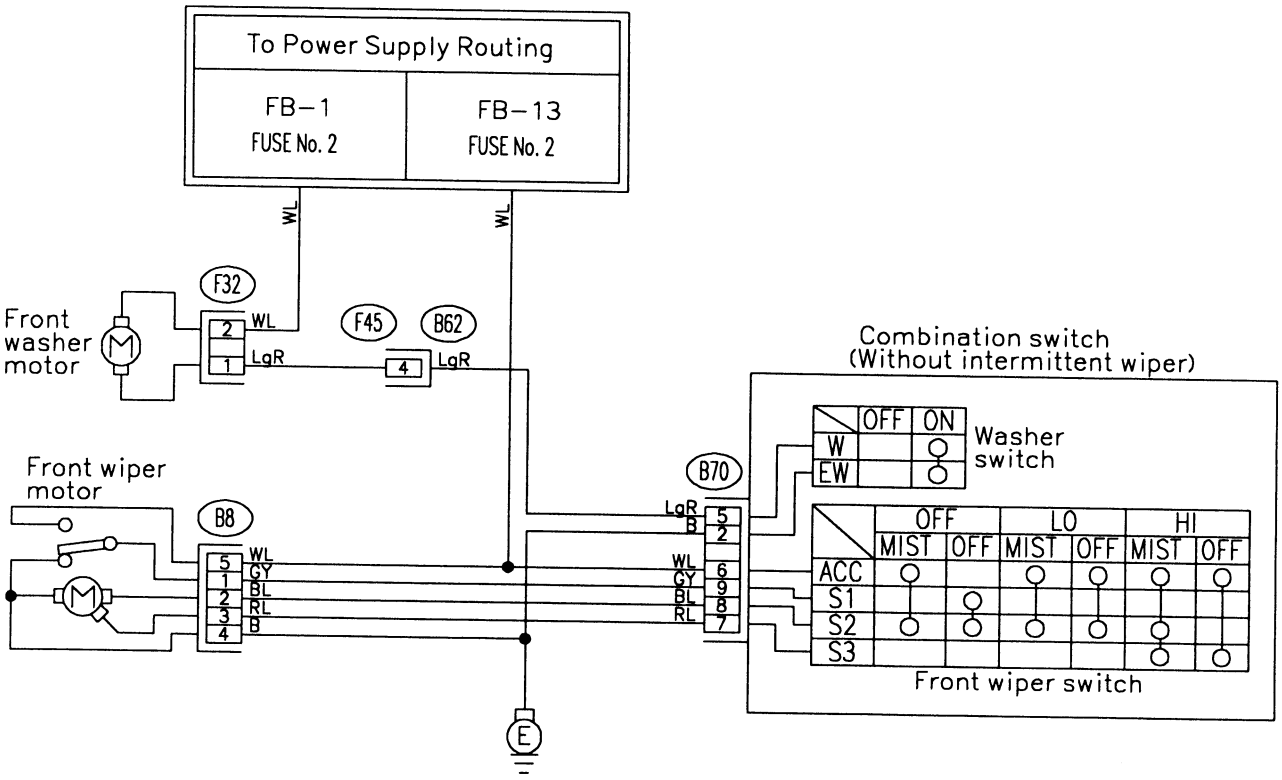


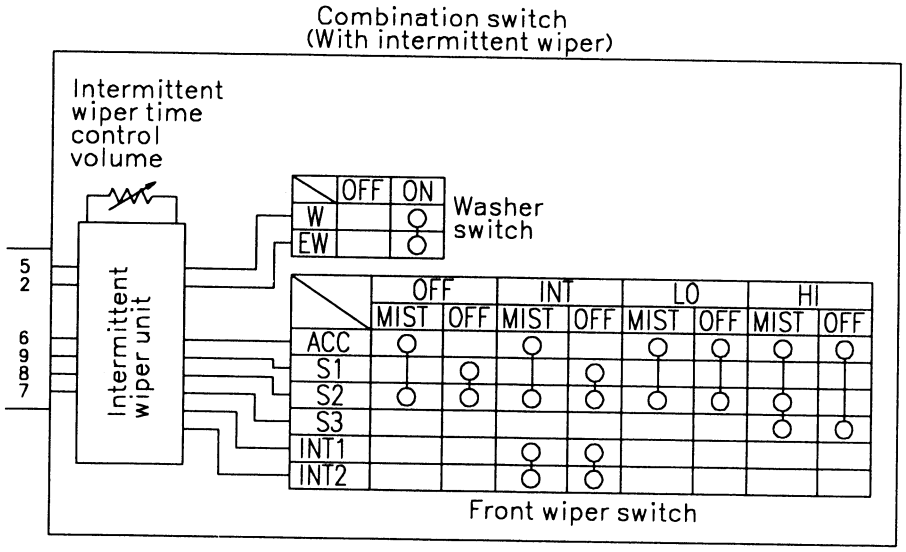
GU10-10C

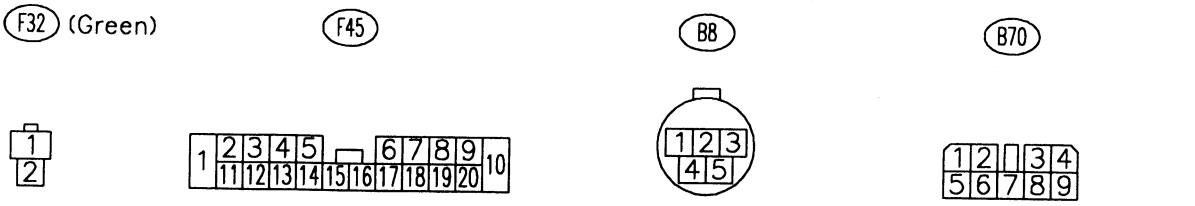

Crankshaft position sensor
Camshaft position sensor
E10
E15
E1
B20
Engine control module
B84
B22
E3
E17
E6
E16
E5
E7
E4
#4
#3
#2
#1
Fuel injector
Idle air control solenoid valve
Purge control solenoid valve
(Gray) E10 E15 (Dark gray)
(Light gray) E5 E16 (Light gray)
(Dark gray) E6 E17 (Dark gray)
E4 (Blue)
E7 (Gray)
B20
B84 (Light blue)

GU10-10D

14. FRONT WIPER AND WASHER SYSTEM

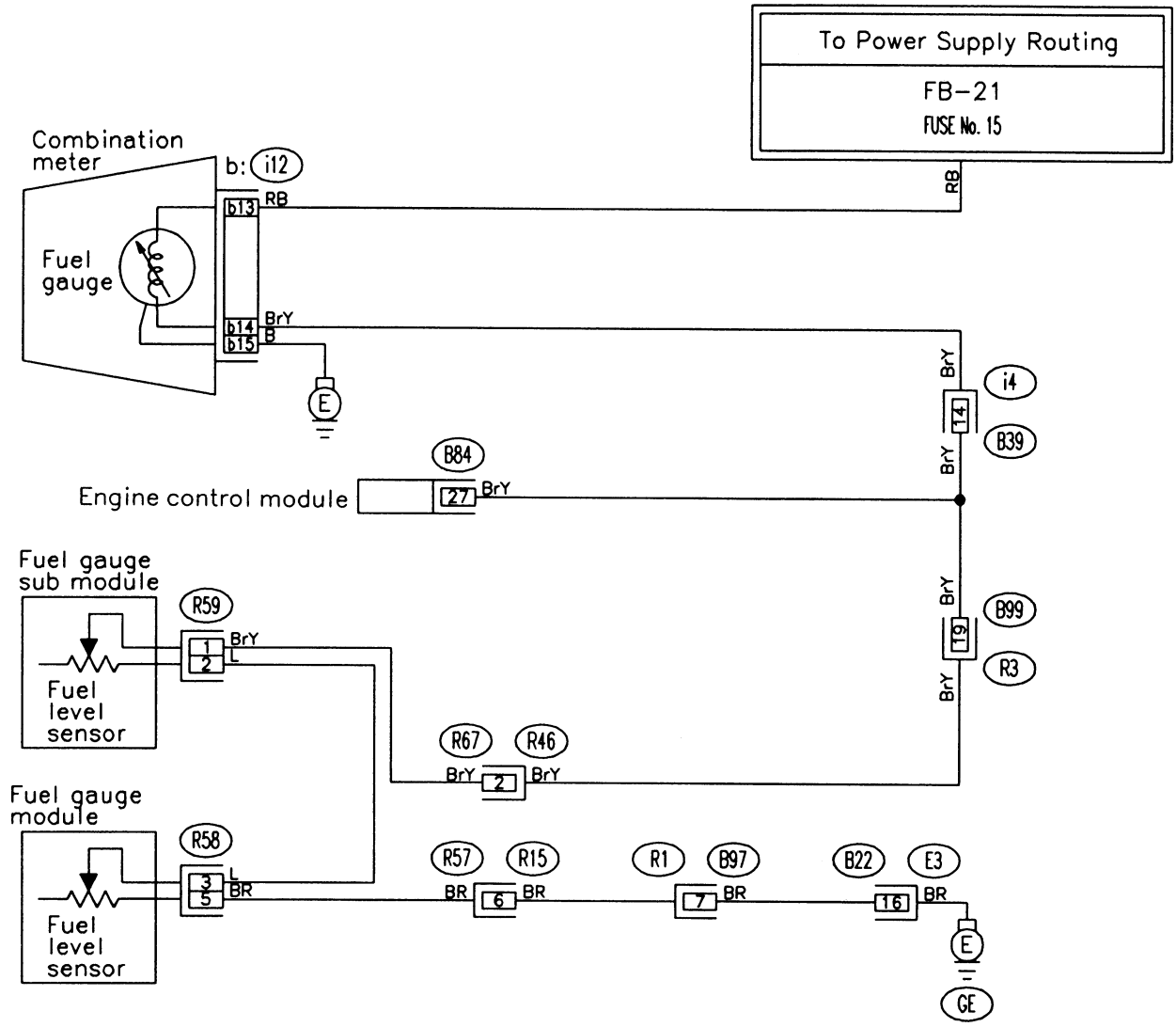


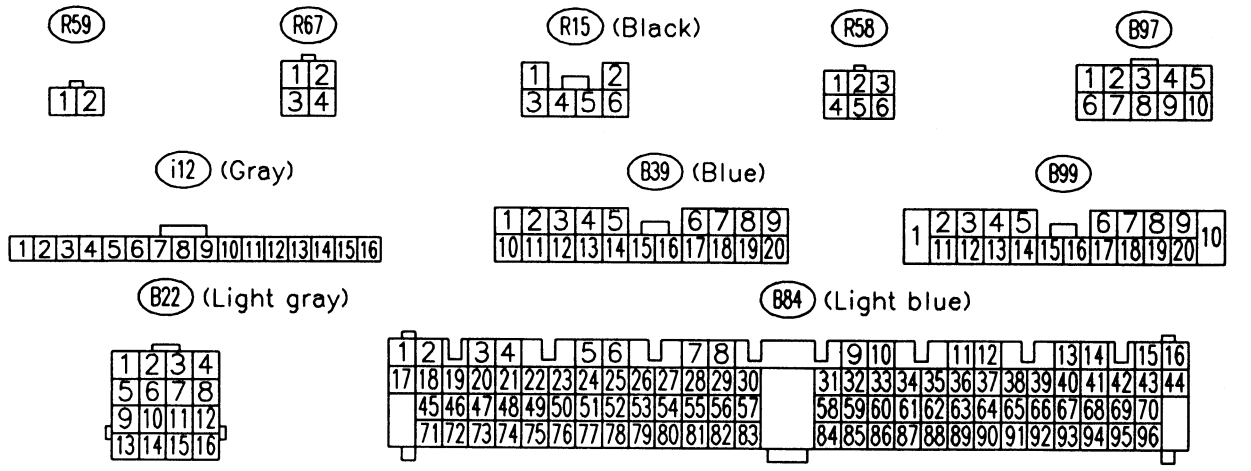




GU50-02

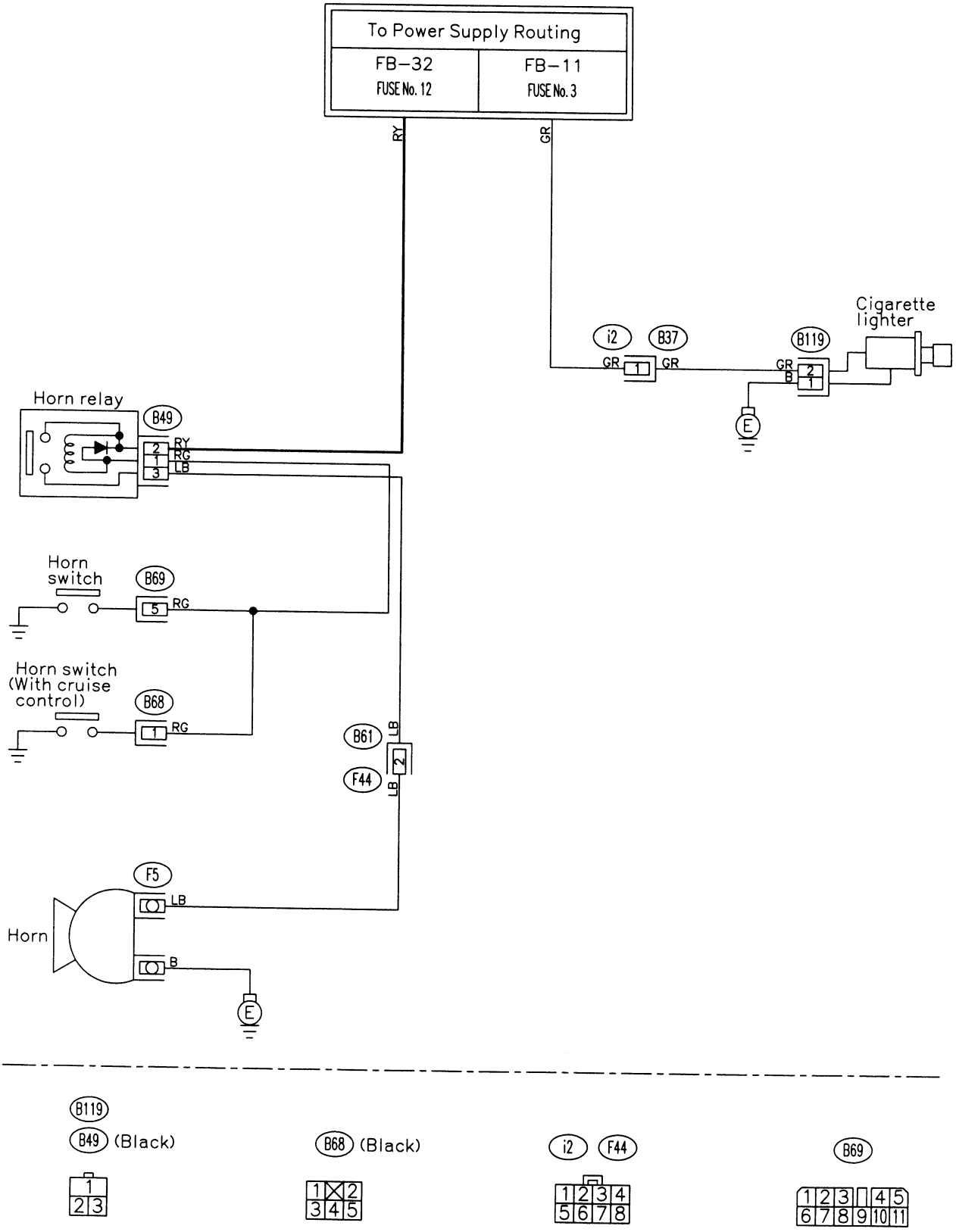
15. FUEL GAUGE SYSTEM





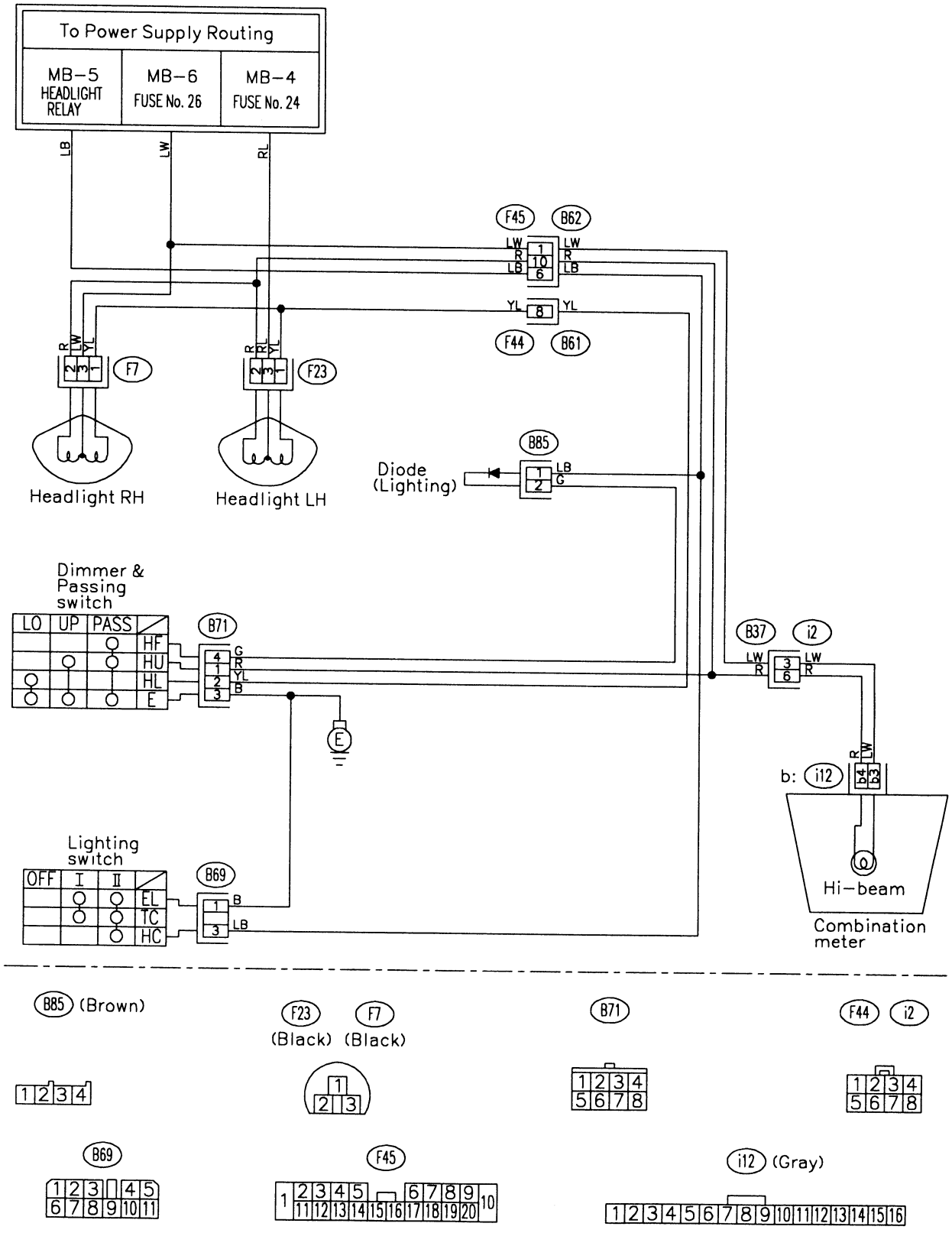
GU61-05

16. HORN AND CIGARETTE LIGHTER SYSTEM



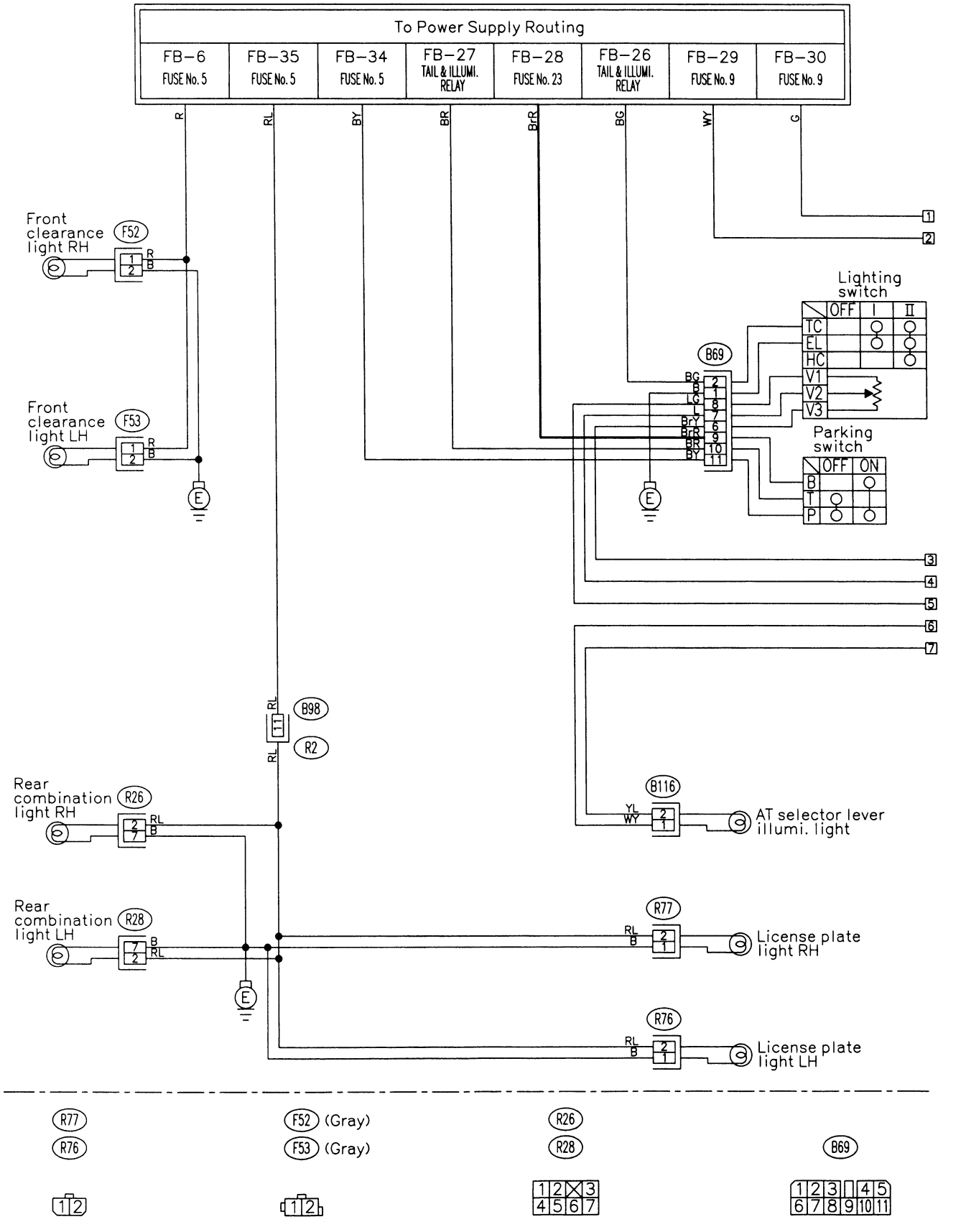
GU74-03

17. LIGHTING (HEADLIGHT) SYSTEM

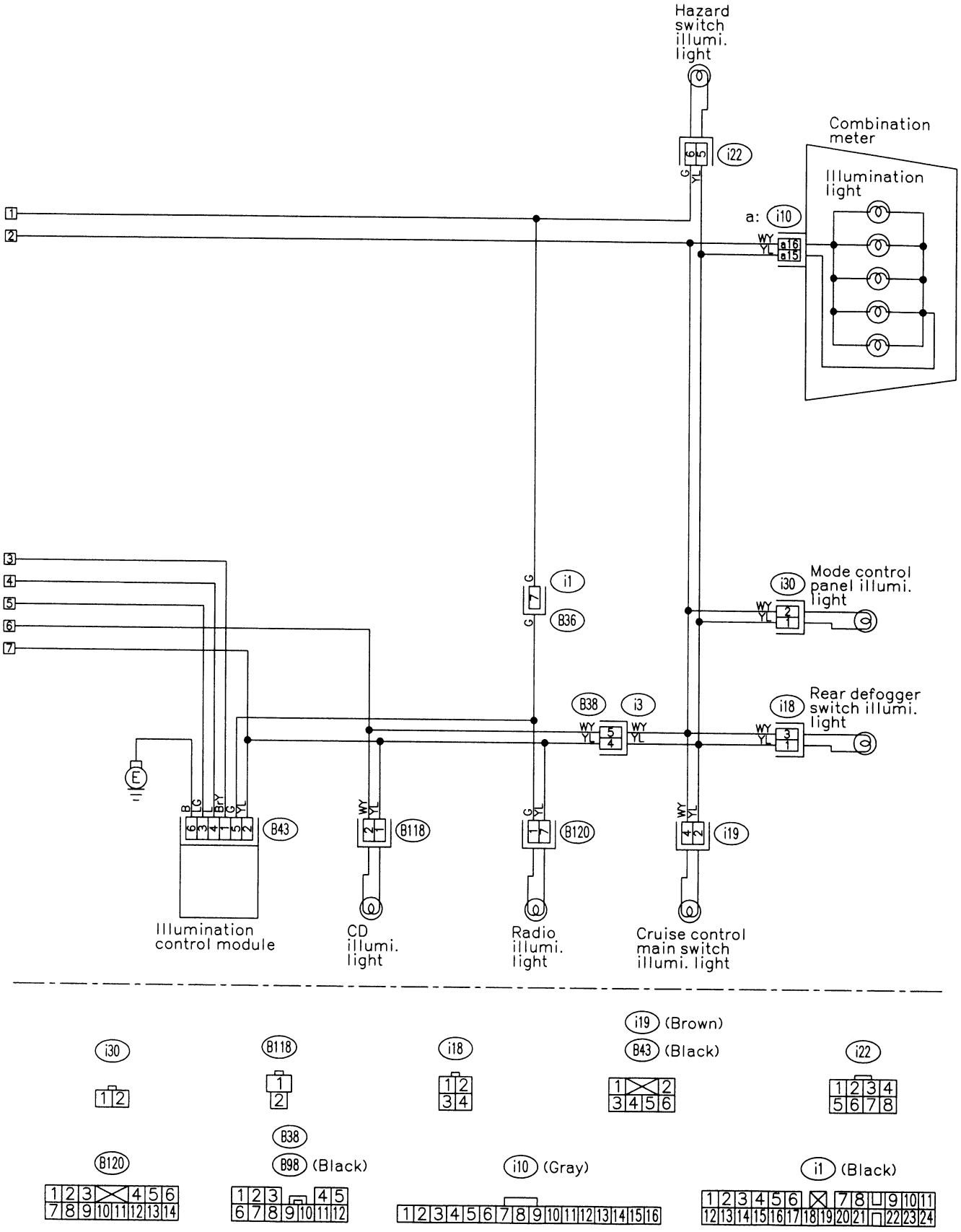


GU20-03

18. LIGHTING
(TAIL LIGHT·ILLUMINATION LIGHT·ETC.) SYSTEM

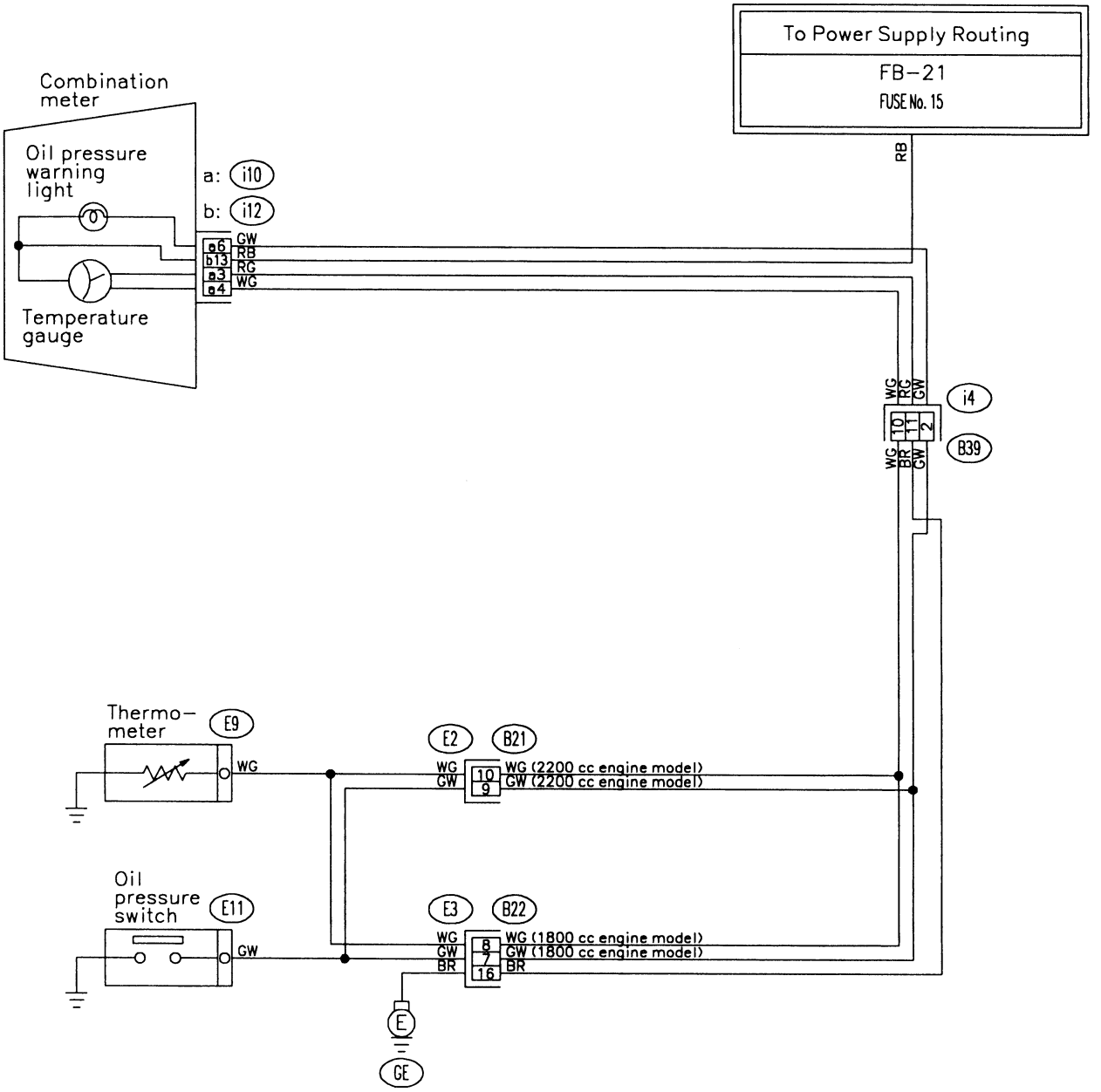


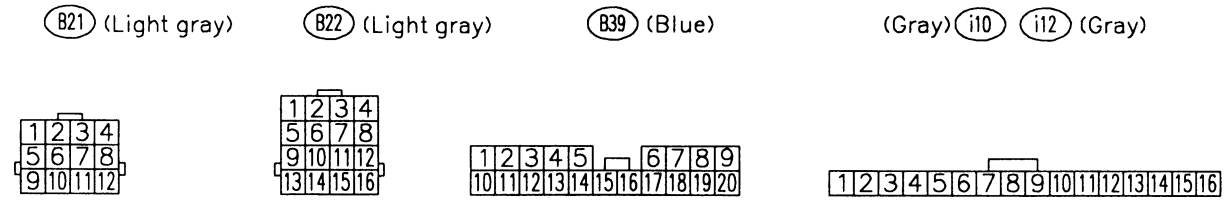
GU21-03A


Hazard switch illumi. light
Combination meter
Illumination light
a: i10
i22
i1
B36
i30
Mode control panel illumi. light
B38
i3
i18
Rear defogger switch illumi. light
B43
B118
B120
i19
Illumination control module
CD illumi. light
Radio illumi. light
Cruise control main switch illumi. light
i19 (Brown)
B43 (Black)
B38
B98 (Black)
i10 (Gray)
i1 (Black)

GU21-03B

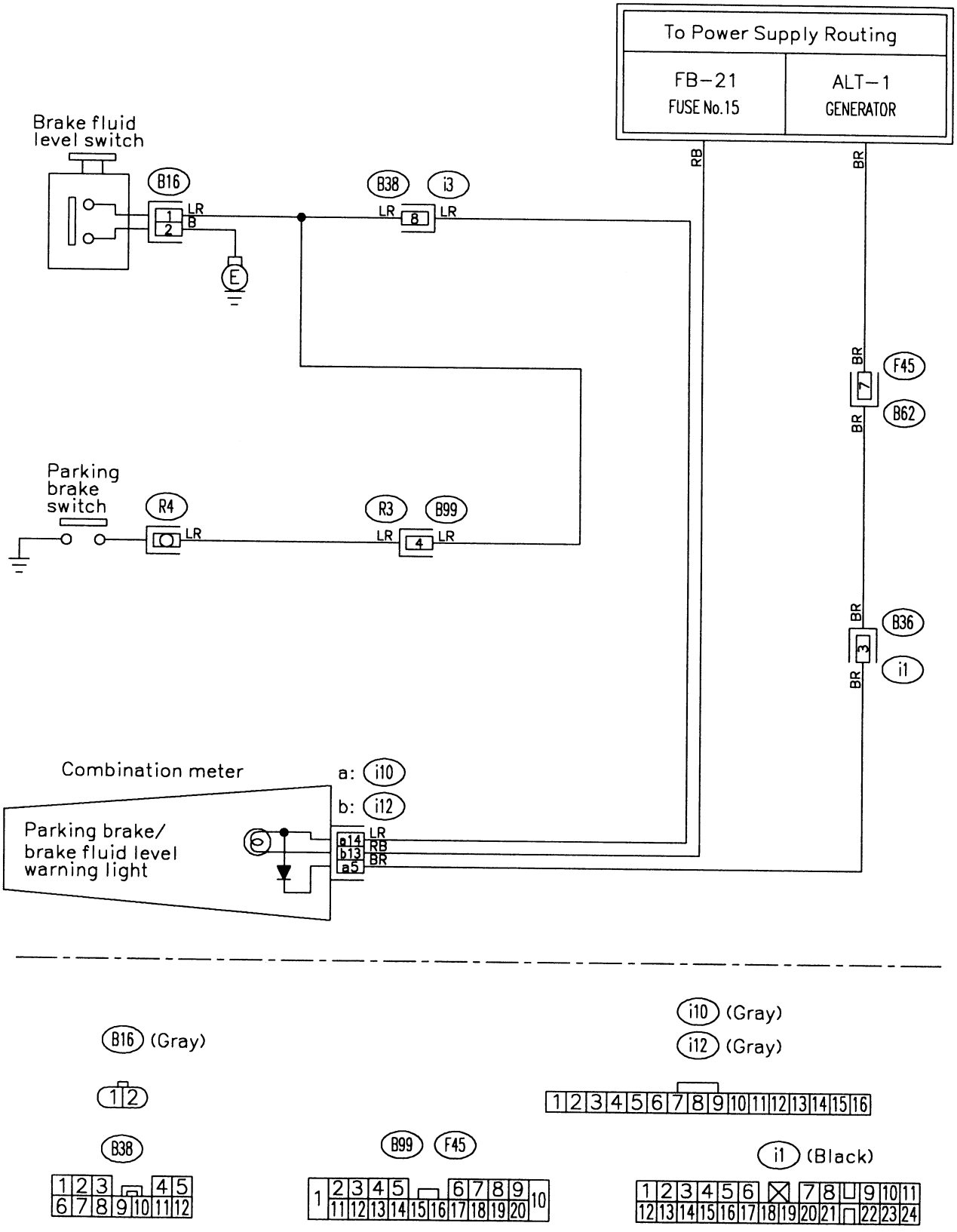
19. OIL PRESSURE AND TEMPERATURE GAUGE SYSTEM





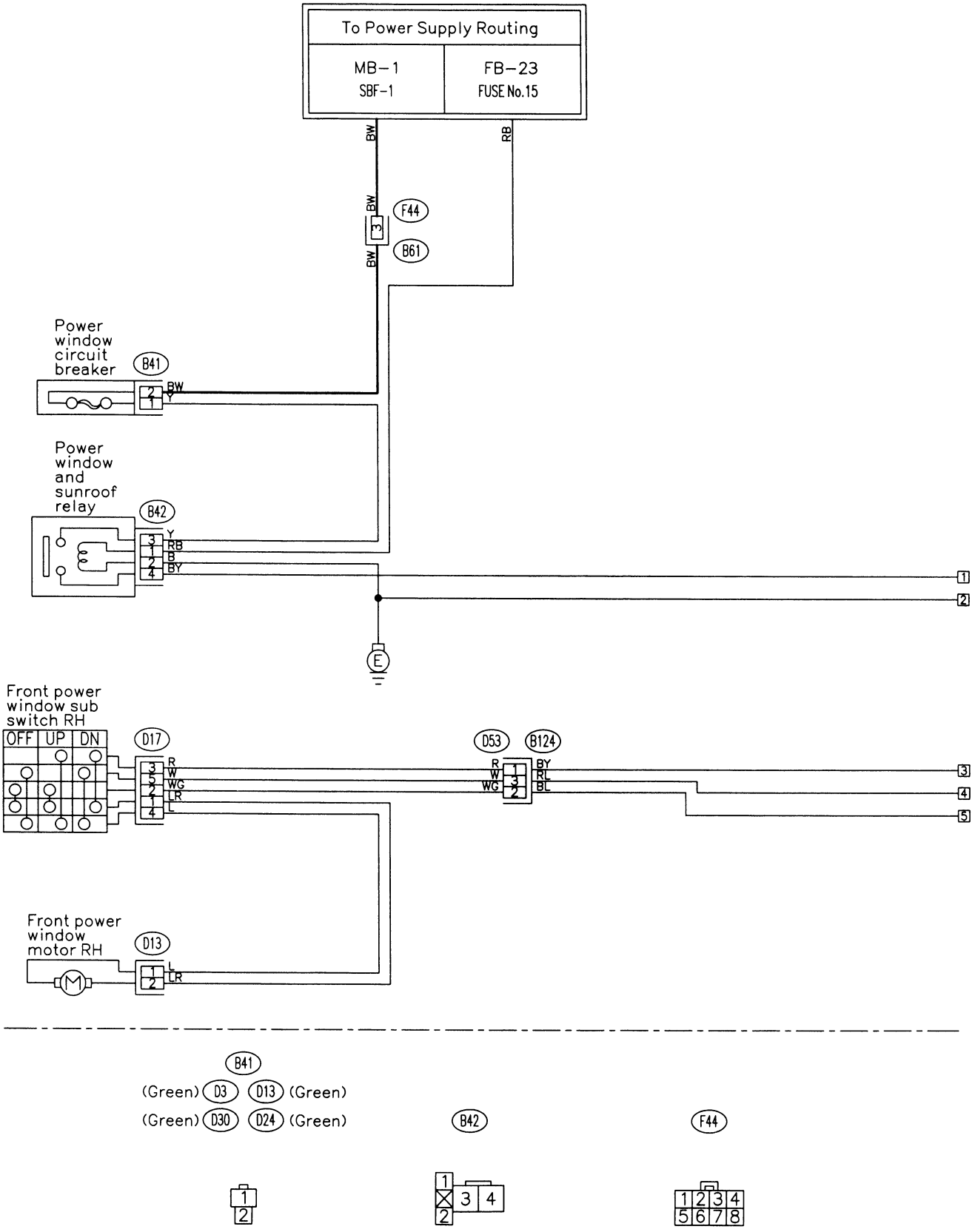
GU66-04

20. PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

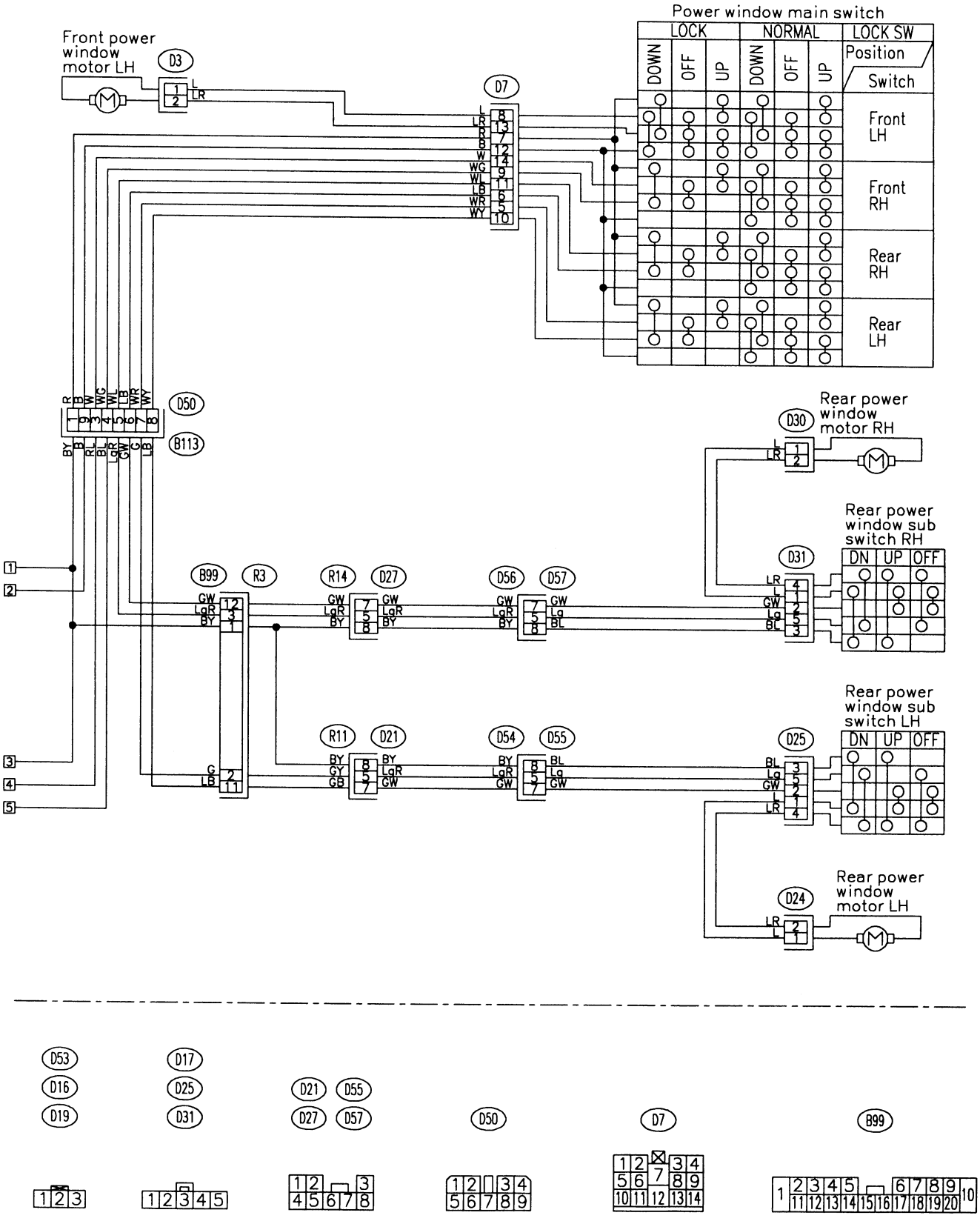


GU60-03

21. POWER WINDOW SYSTEM



GU70-02A

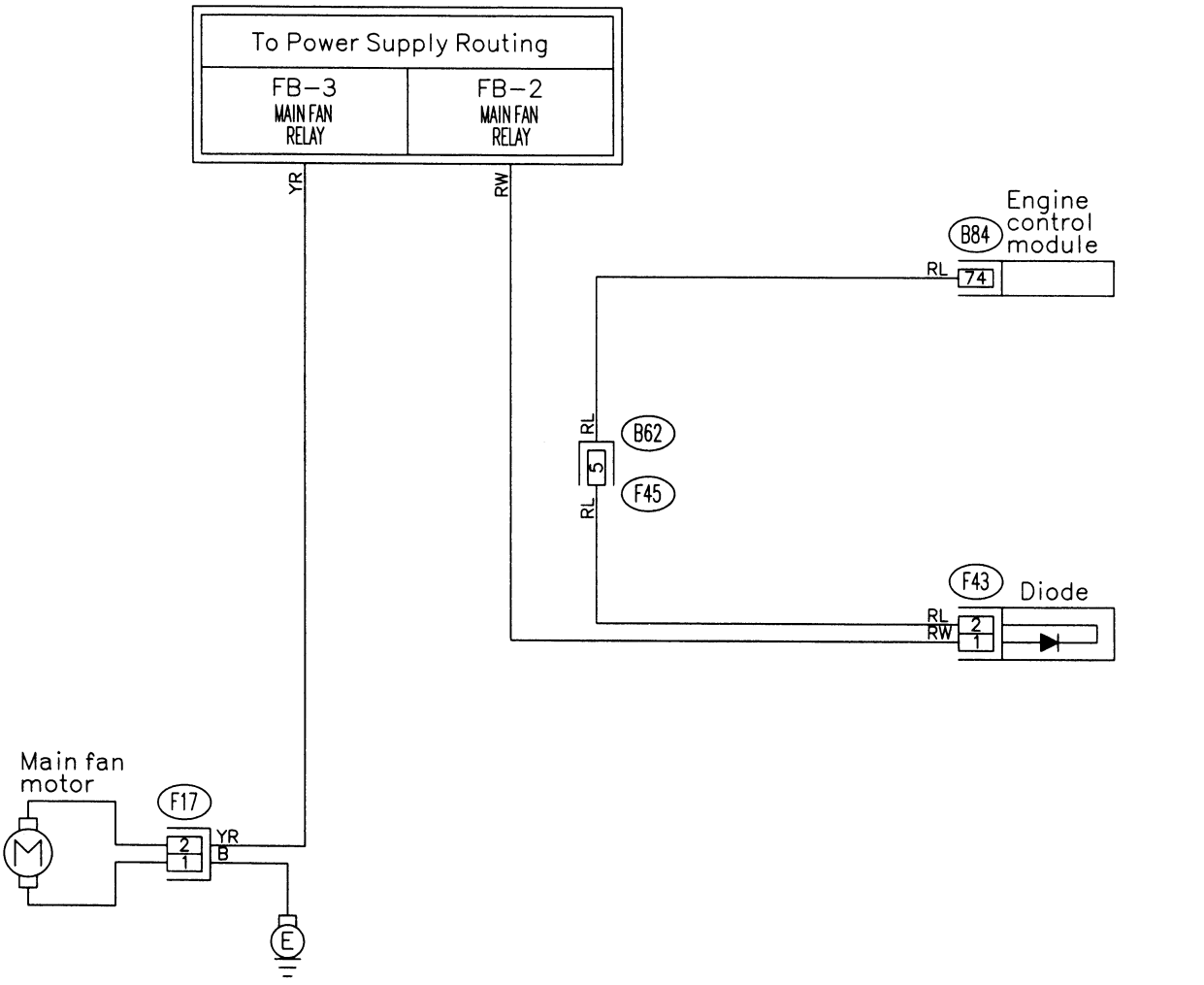

Power window main switch
LOCK
NORMAL
LOCK SW
DOWN
OFF
UP
Position
Switch
Front LH
Front RH
Rear RH
Rear LH
Front power window motor LH
Rear power window motor RH
Rear power window sub switch RH
Rear power window sub switch LH
Rear power window motor LH
DN
UP
OFF
D3
D7
D50
B113
D30
D31
D25
D24
B99
R3
R14
D27
D56
D57
R11
D21
D54
D55

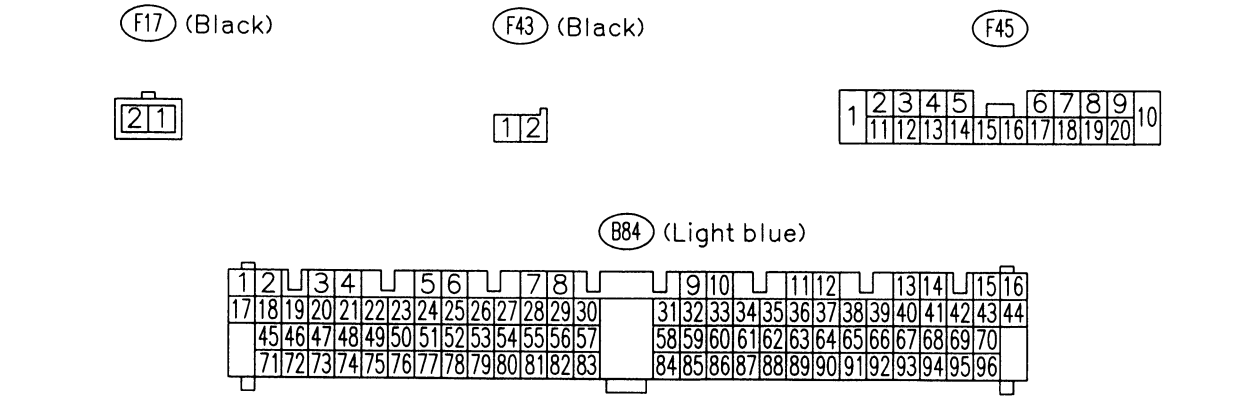
D53
D16
D19
D17
D25
D31
D21
D55
D27
D57
D50
D7
B99

GU70-02B

22. RADIATOR FAN SYSTEM

- **Without A/C**

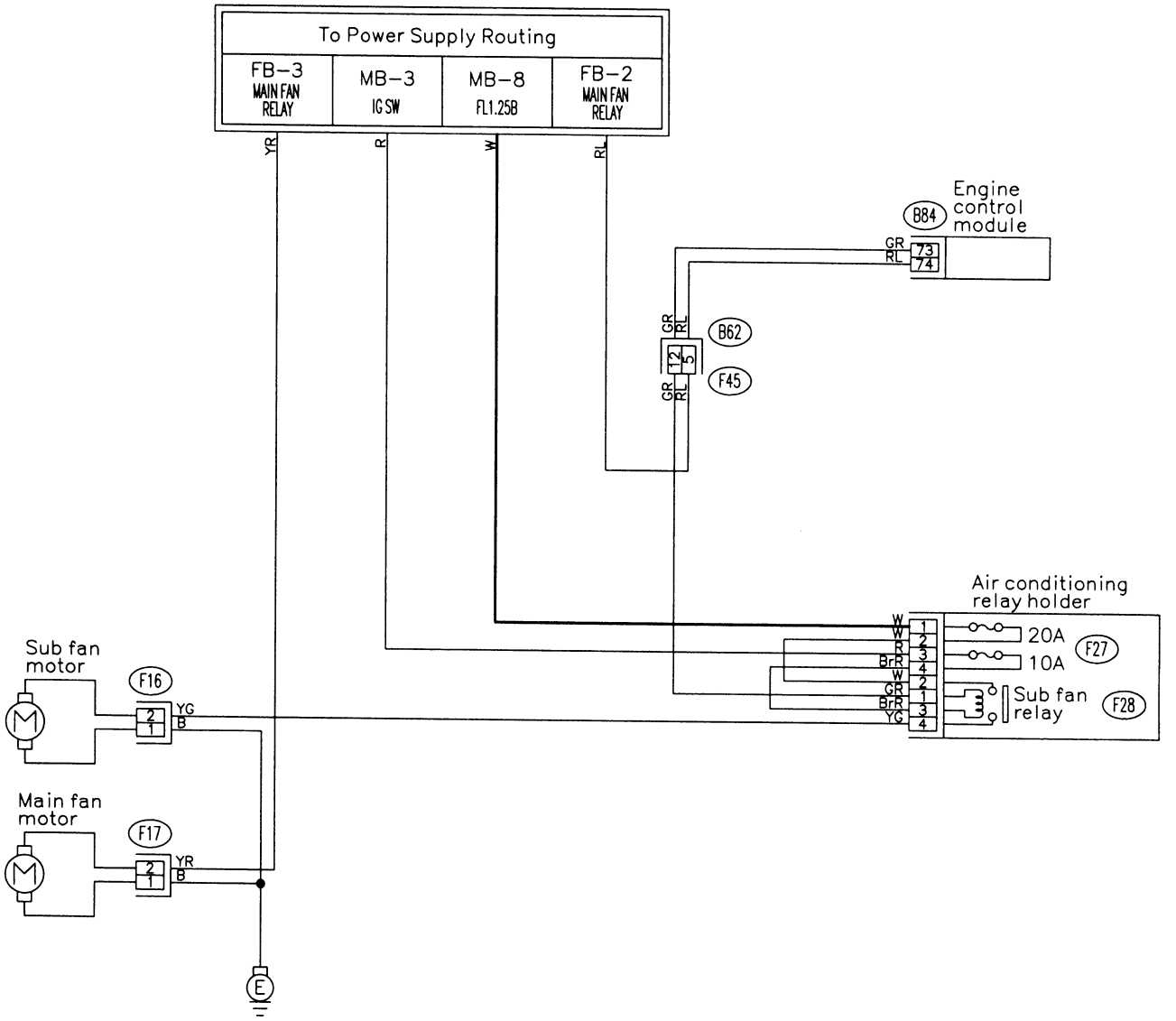


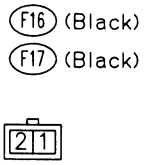


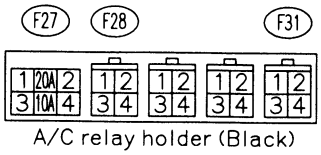
GU14-08

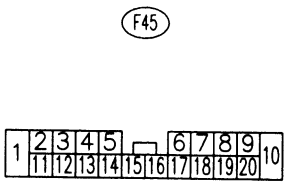
22. RADIATOR FAN SYSTEM

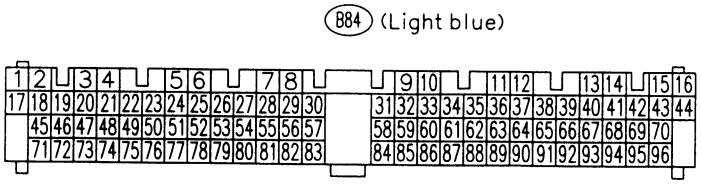
- **With A/C**





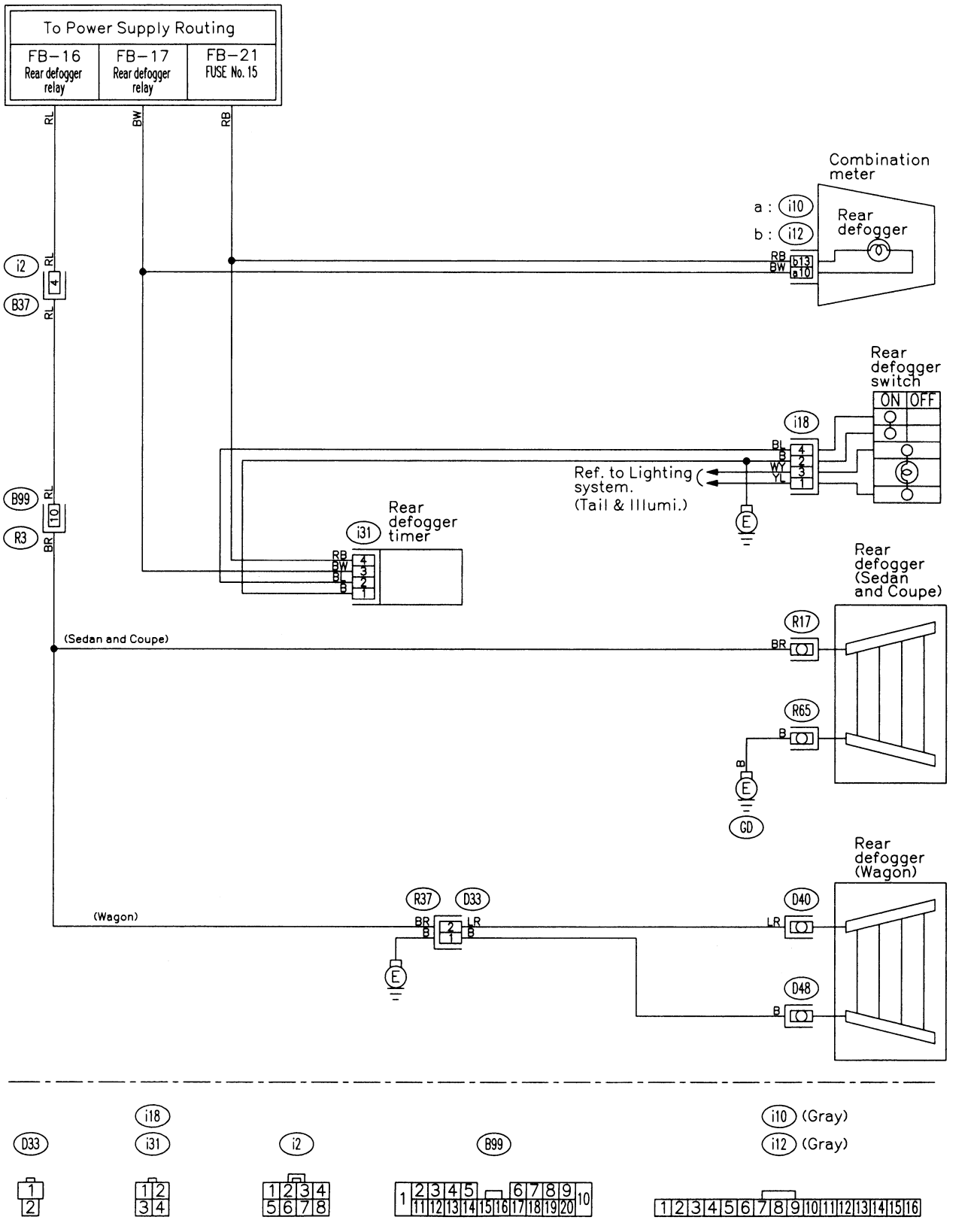






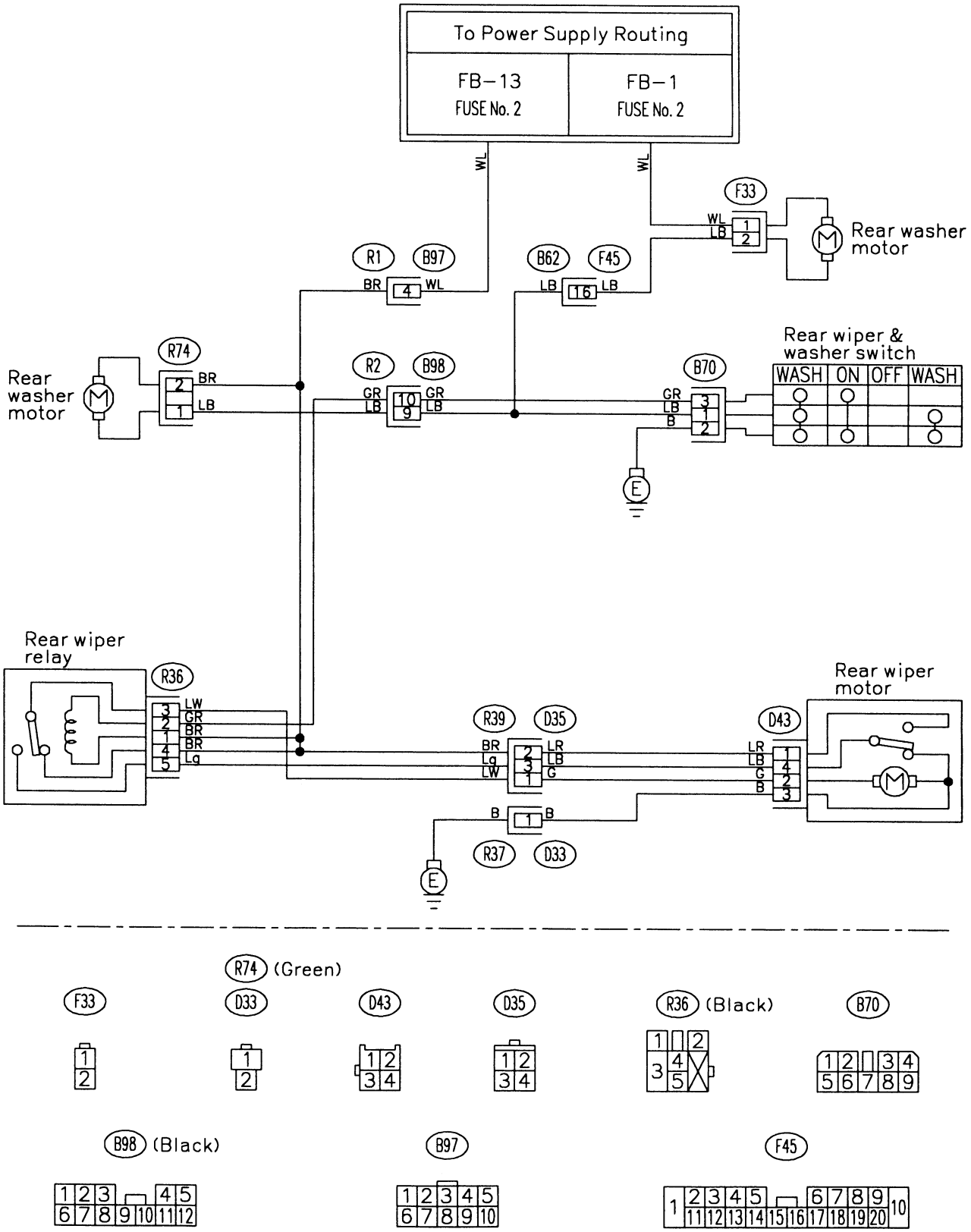
GU14-07

23. REAR WINDOW DEFOGGER SYSTEM



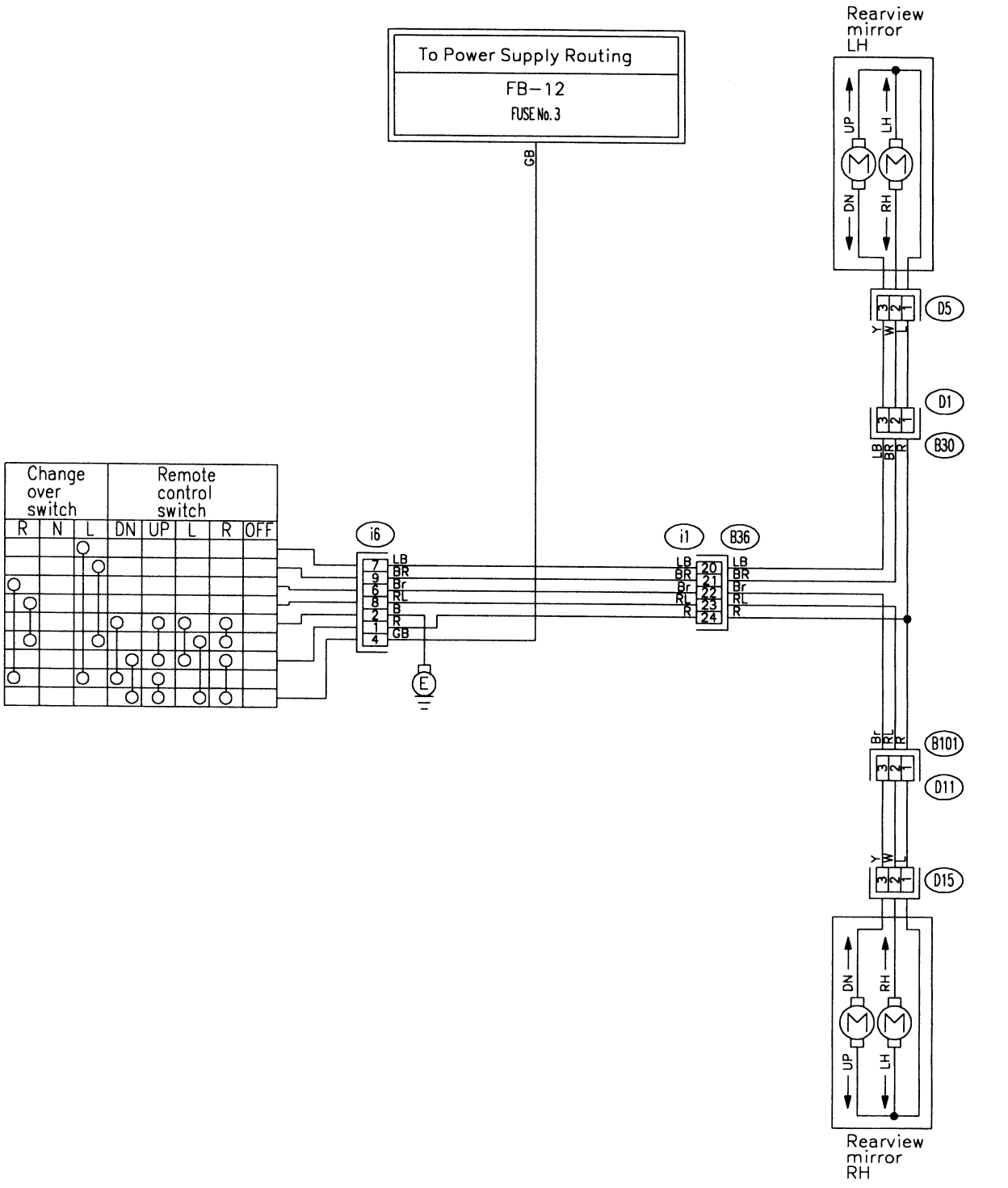
GU52-04

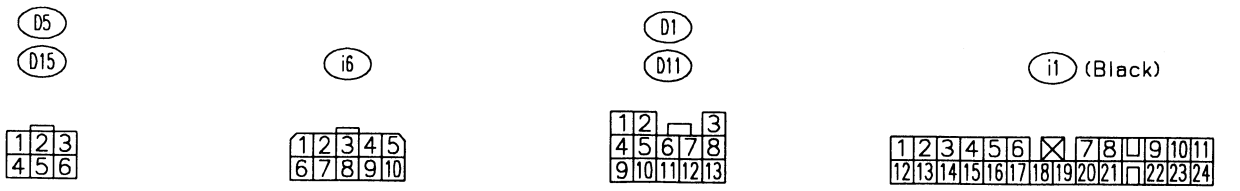
24. REAR WIPER AND WASHER SYSTEM



GU51-03

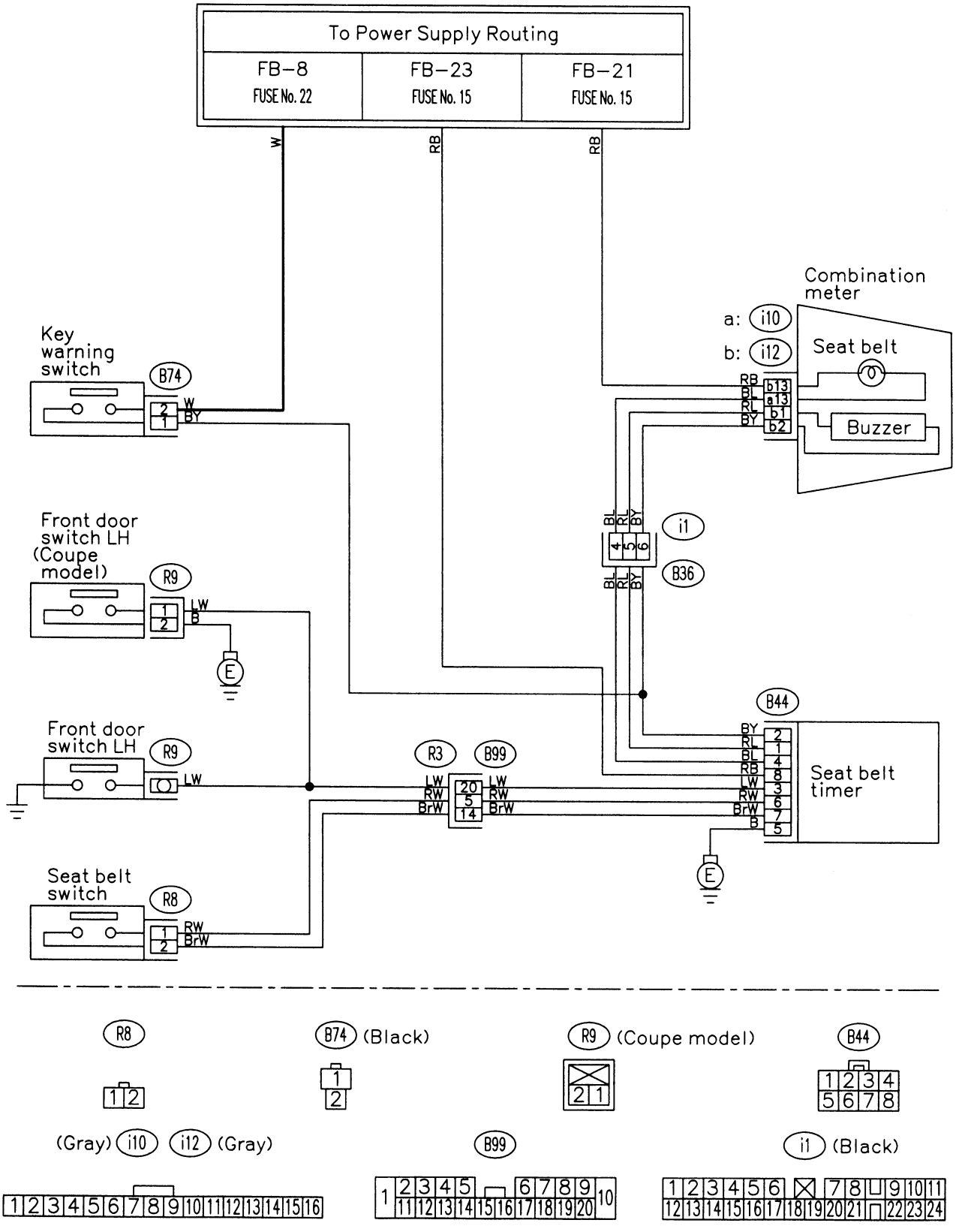
25. REMOTE CONTROL REARVIEW MIRROR SYSTEM





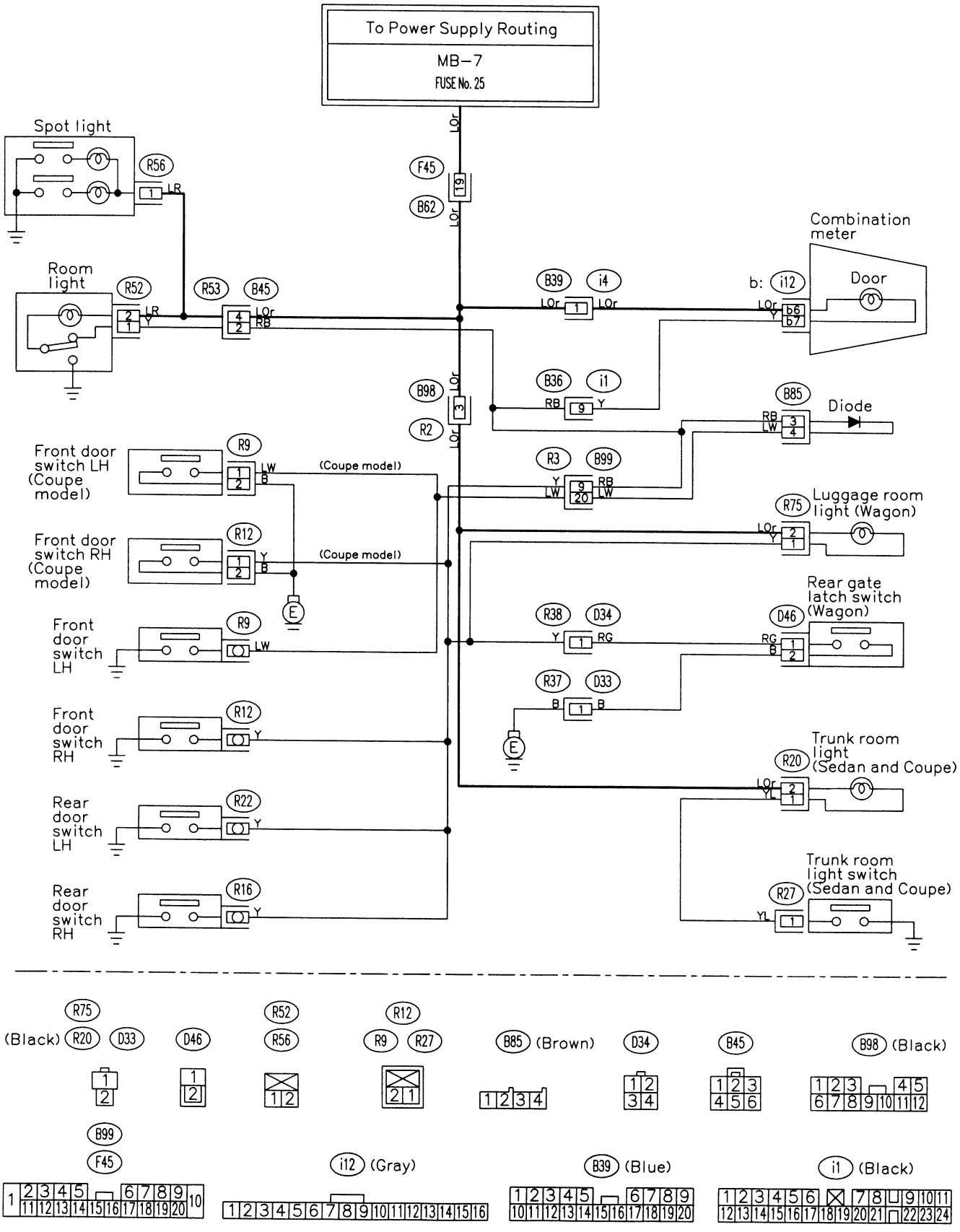
GU79-02

26. SEAT BELT WARNING AND KEY WARNING SYSTEM



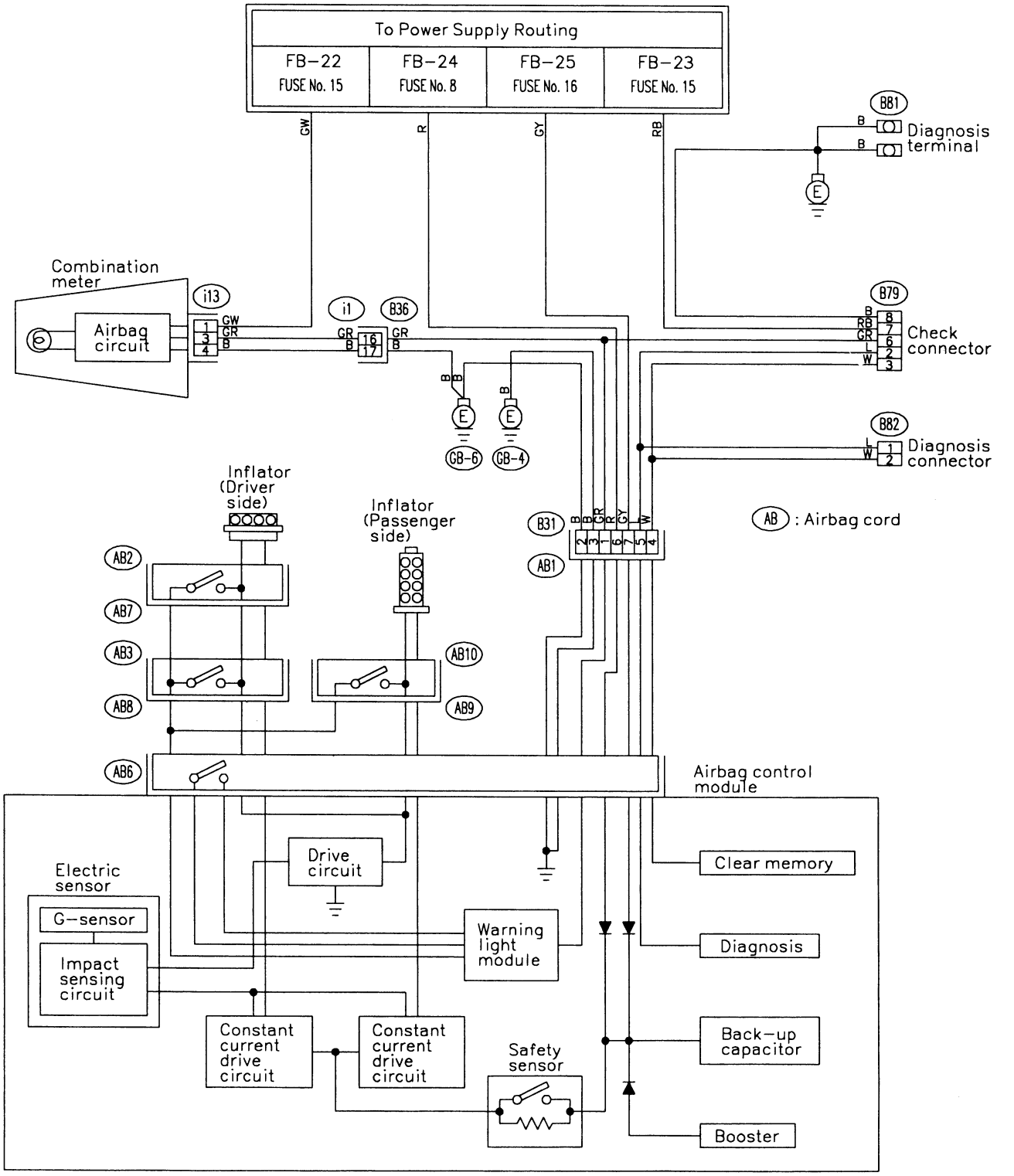
GU87-03

27. SPOT LIGHT, ROOM LIGHT, LUGGAGE AND TRUNK ROOM LIGHT SYSTEM



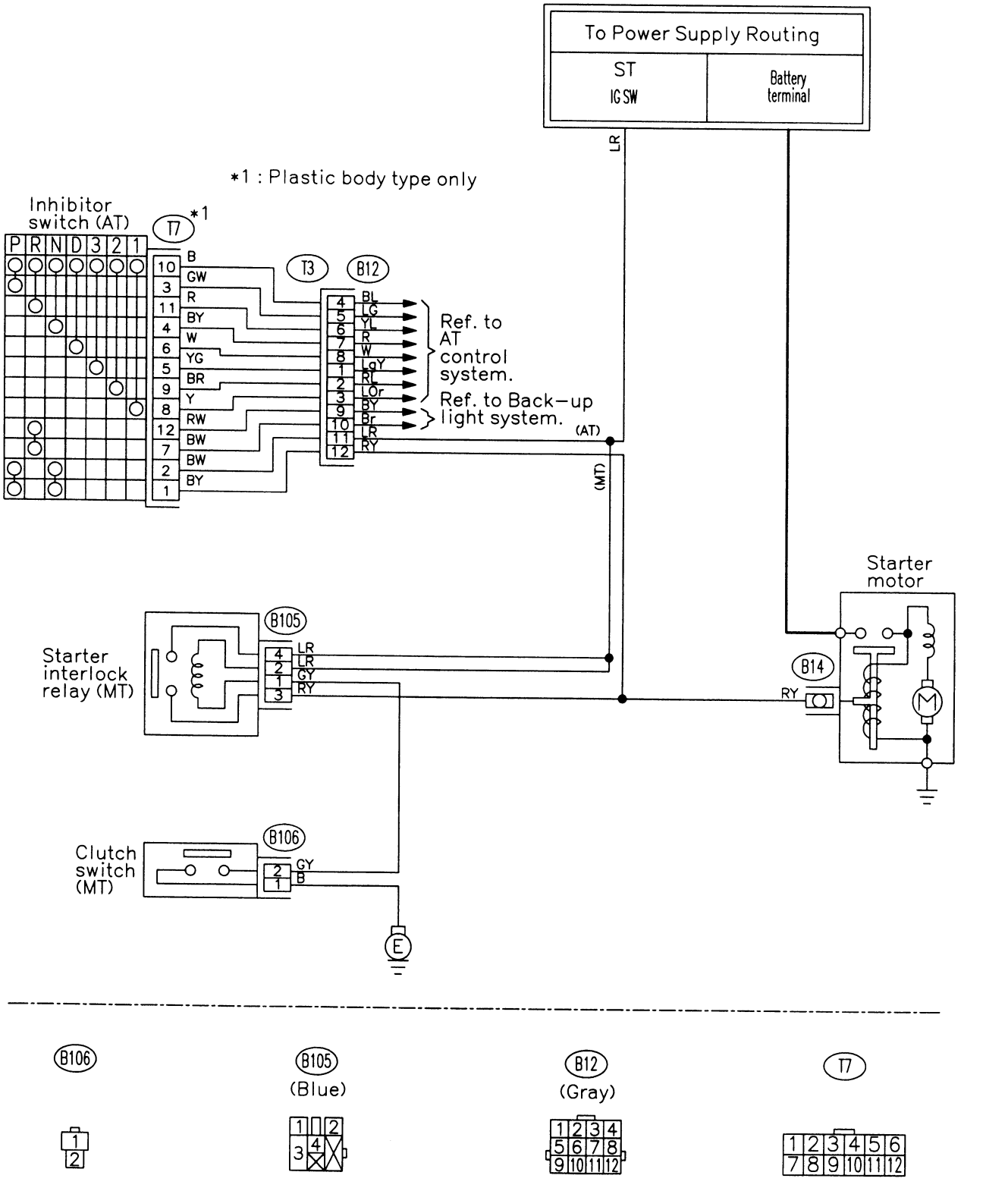
GU24-03

28. SRS (AIRBAG SYSTEM)



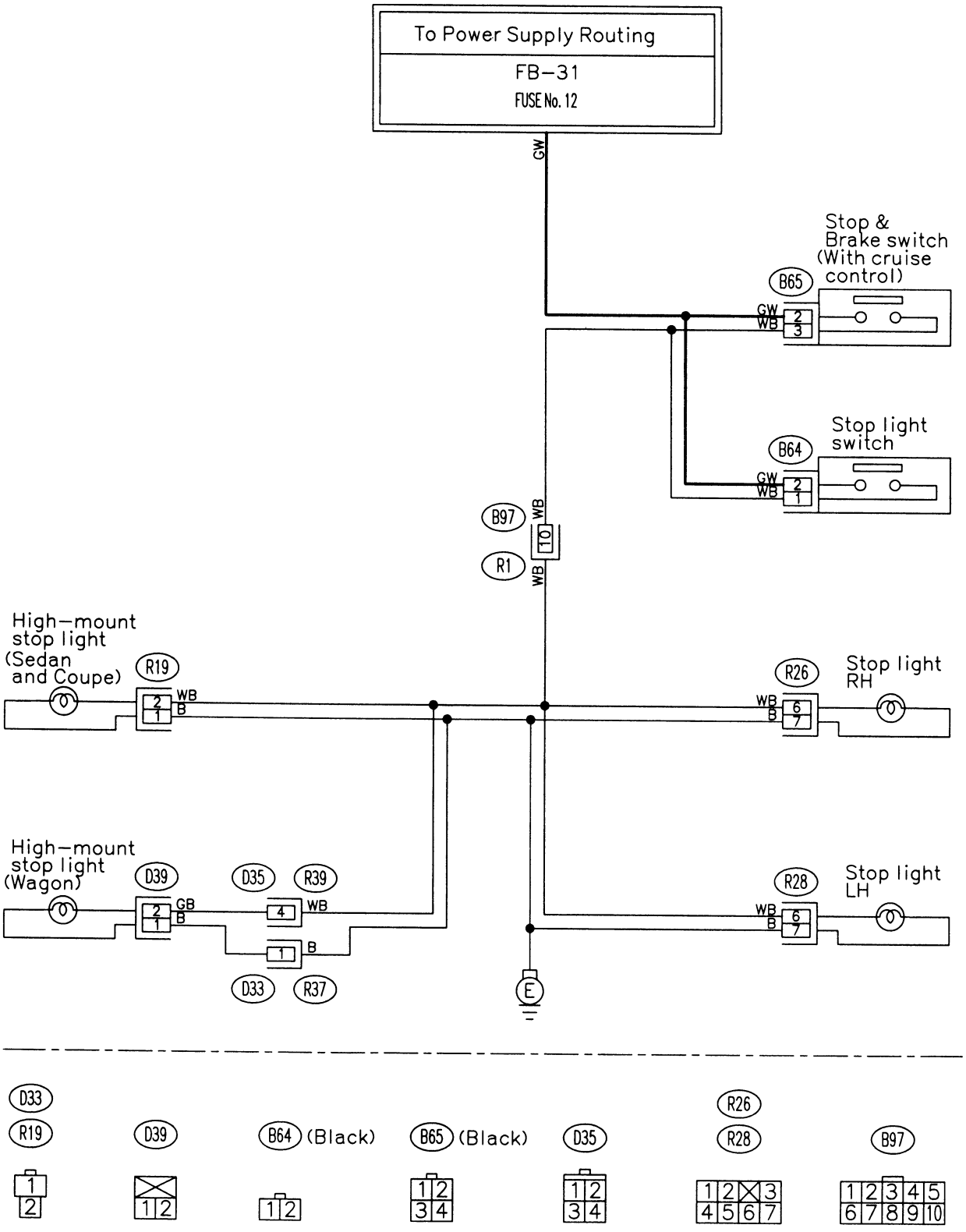
GU86-04

29. STARTING SYSTEM



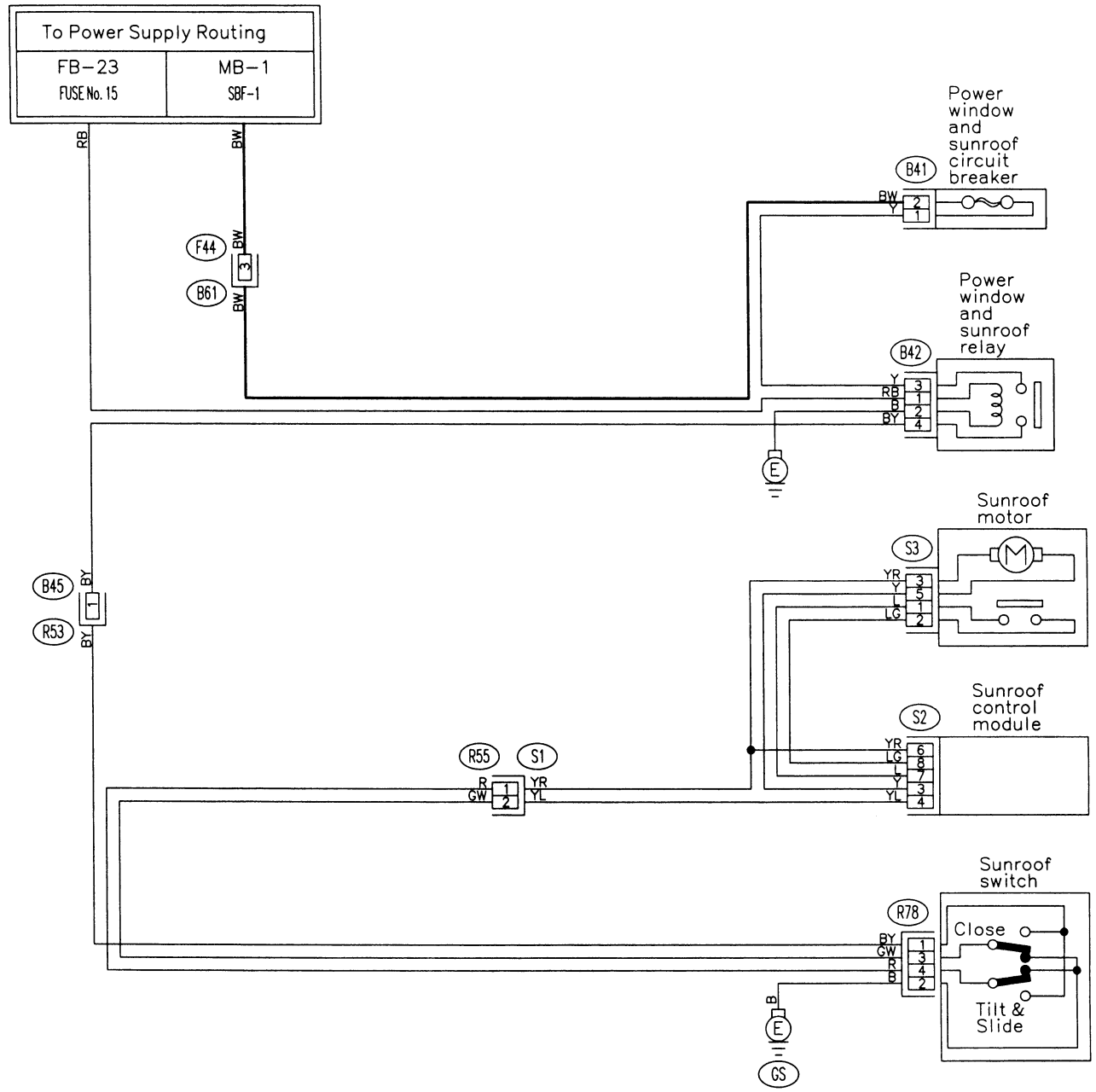
GU03-02

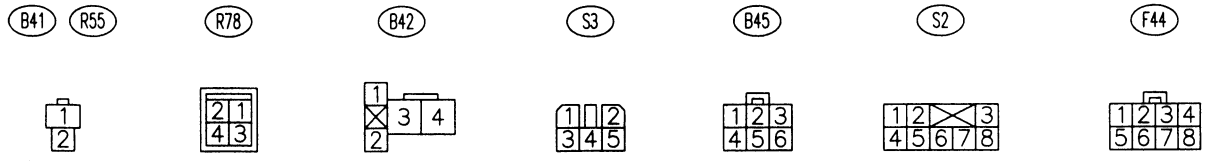
30. STOP LIGHT SYSTEM



GU25-03

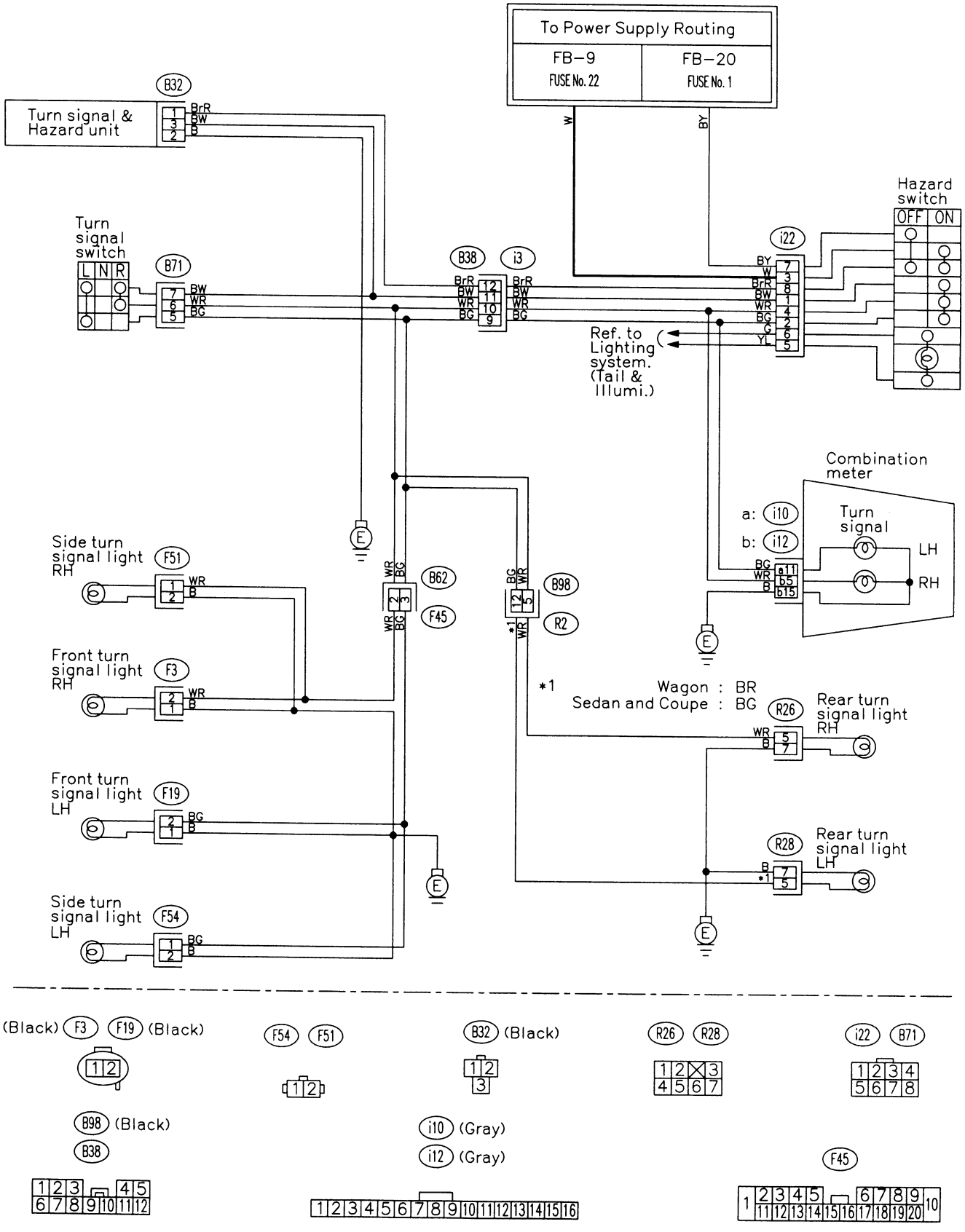
31. SUNROOF SYSTEM





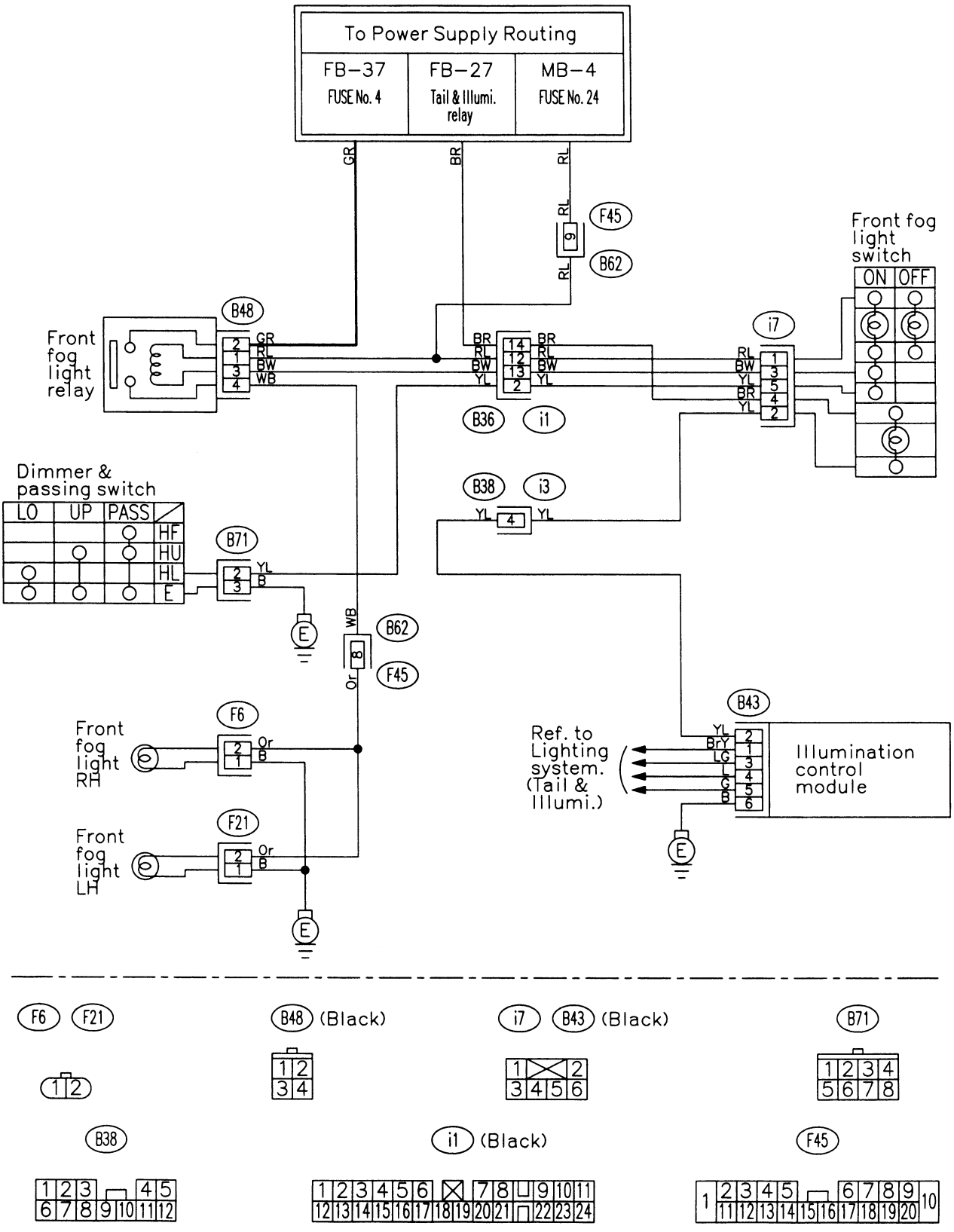
GU75-02

32. TURN SIGNAL AND HAZARD SYSTEM



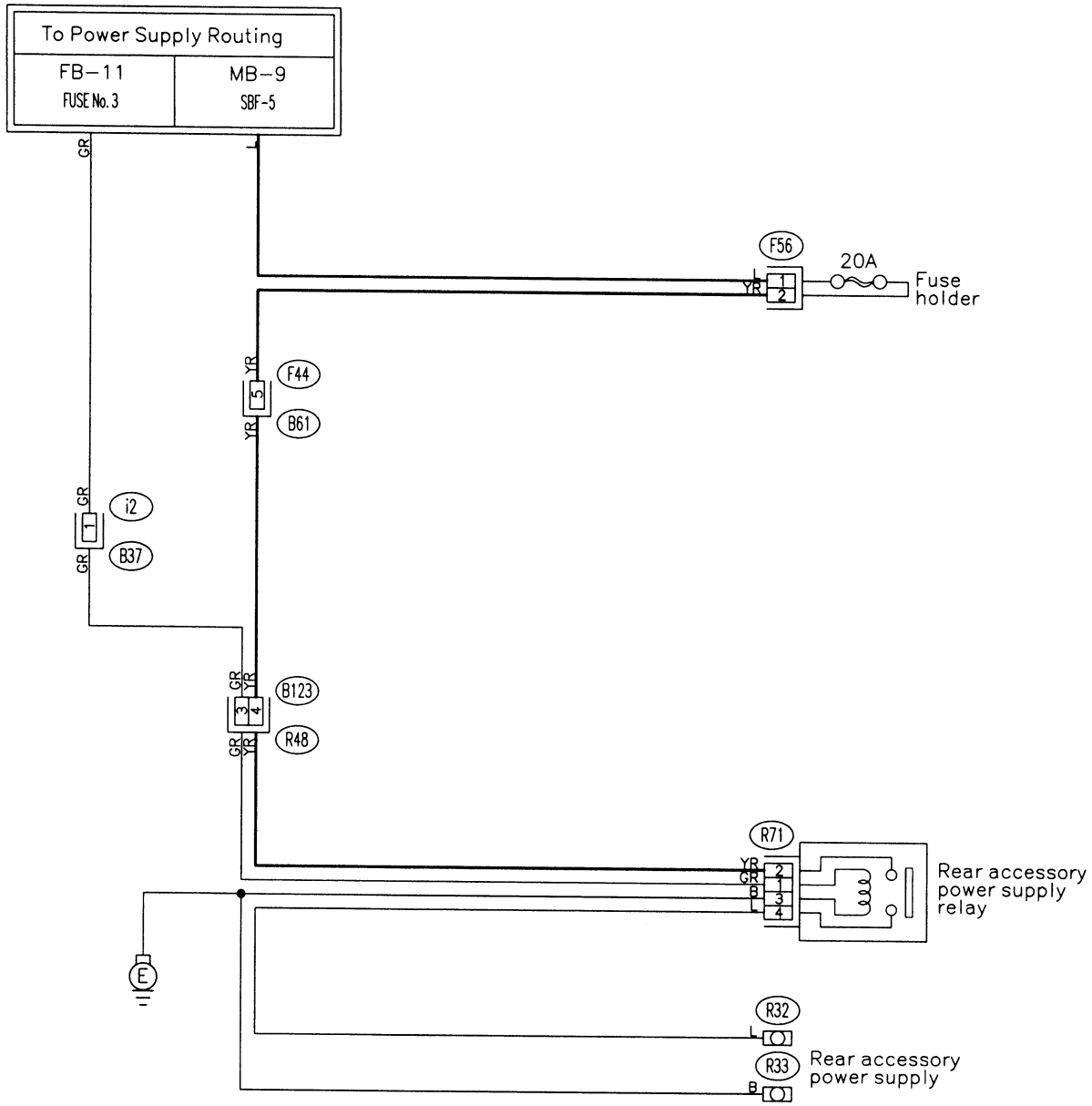
GU26-02

33. FRONT FOG LIGHT SYSTEM



GU22-02

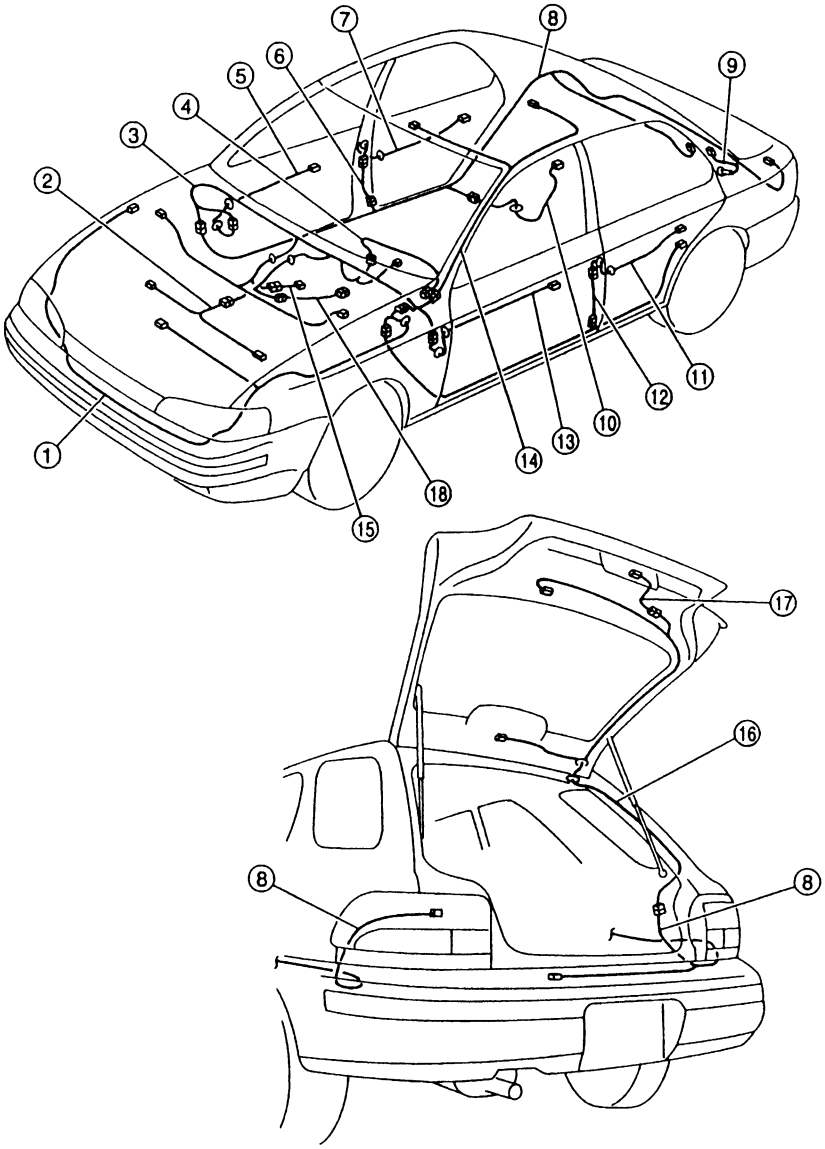
34. REAR ACCESSORY POWER SUPPLY SYSTEM





GU90-01

6. Electrical Wiring Harness and Ground Point

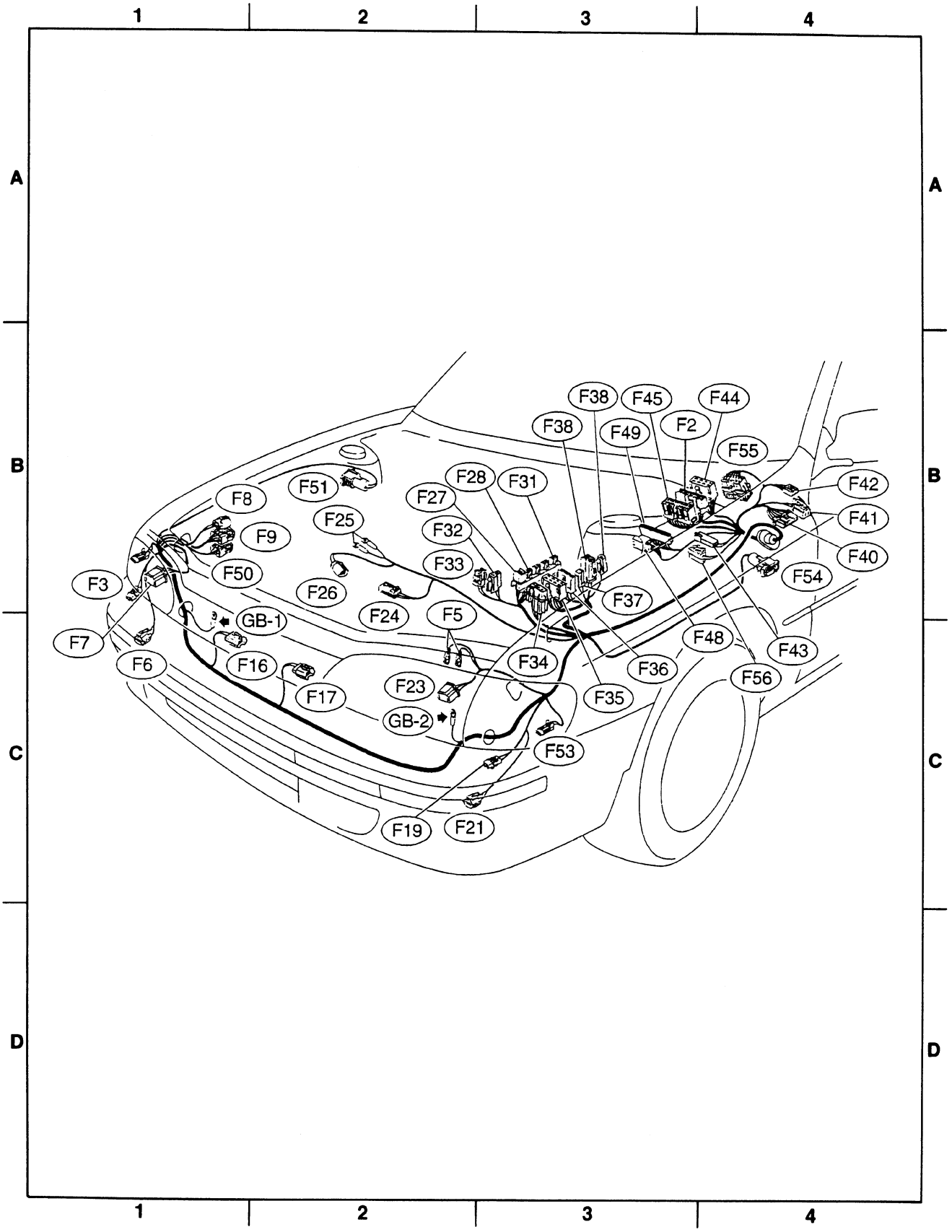


① Front wiring harness
② Engine wiring harness
③ Bulkhead wiring harness
④ Instrument panel wiring harness
⑤ Front door cord RH
⑥ Rear door adapter cord RH
⑦ Rear door cord RH
⑧ Rear wiring harness
⑨ Rear defogger cord (Ground)
⑩ Fuel tank cord
⑪ Rear door cord LH
⑫ Rear door adapter cord LH
⑬ Front door cord LH
⑭ Roof cord
⑮ Transmission cord
⑯ Rear gate cord
⑰ Rear gate lock adapter cord
⑱ Rear oxygen sensor cord

Connector			Connecting to	
No.	Pole	Color	No.	Name
F2	16	Black	B100	Bulkhead wiring harness
F3	2	Black		Front turn signal light RH
F5	1 x 2	★		Horn
F6	2	★		Front fog light RH
F7	3	Black		Headlight RH
F8	2	Gray		Hydraulic module (ABS)
F9	8	Gray		
F16	2	Black		Sub fan motor
F17	2	Black		Radiator main fan motor
F19	2	Black		Front turn signal light LH
F21	2	★		Front fog light LH
F23	3	Black		Headlight LH
F24	3	Gray		A/C compressor
F25	1 x 2	★		Generator
F26	2	★		
F27	4	Black		A/C fuse (Relay holder)
F28	4	Black		A/C sub fan relay (Relay holder)
F31	4	Black		A/C relay (Relay holder)
F32	2	Green		Front washer motor
F33	2	★		Rear washer motor
F34	2	Red		SBF holder
F35	8	★		M/B
F36	3	★		
F37	2	Black		
F38	2	Black		
F39	1	Brown		
F40	10	Gray		F/B
F41	3	Gray		
F42	5	Gray		
F43	2	Black		A/C diode
F44	8	★	B61	Bulkhead wiring harness
F45	20	★	B62	
F48	6	★		Shield joint connector (ABS)
F49	83	Black		ABS control module
F50	6	Black		ABS relay box
F51	2	★		Side turn signal light RH
F52	2	Gray		Front marker light RH
F53	2	Gray		Front marker light LH
F54	2	★		Side turn signal light LH
F55	12	Black	R49	Rear wiring harness (ABS)
F56	2	Black		Fuse holder

★: Non-colored

1. FRONT WIRING HARNESS AND GROUND POINT

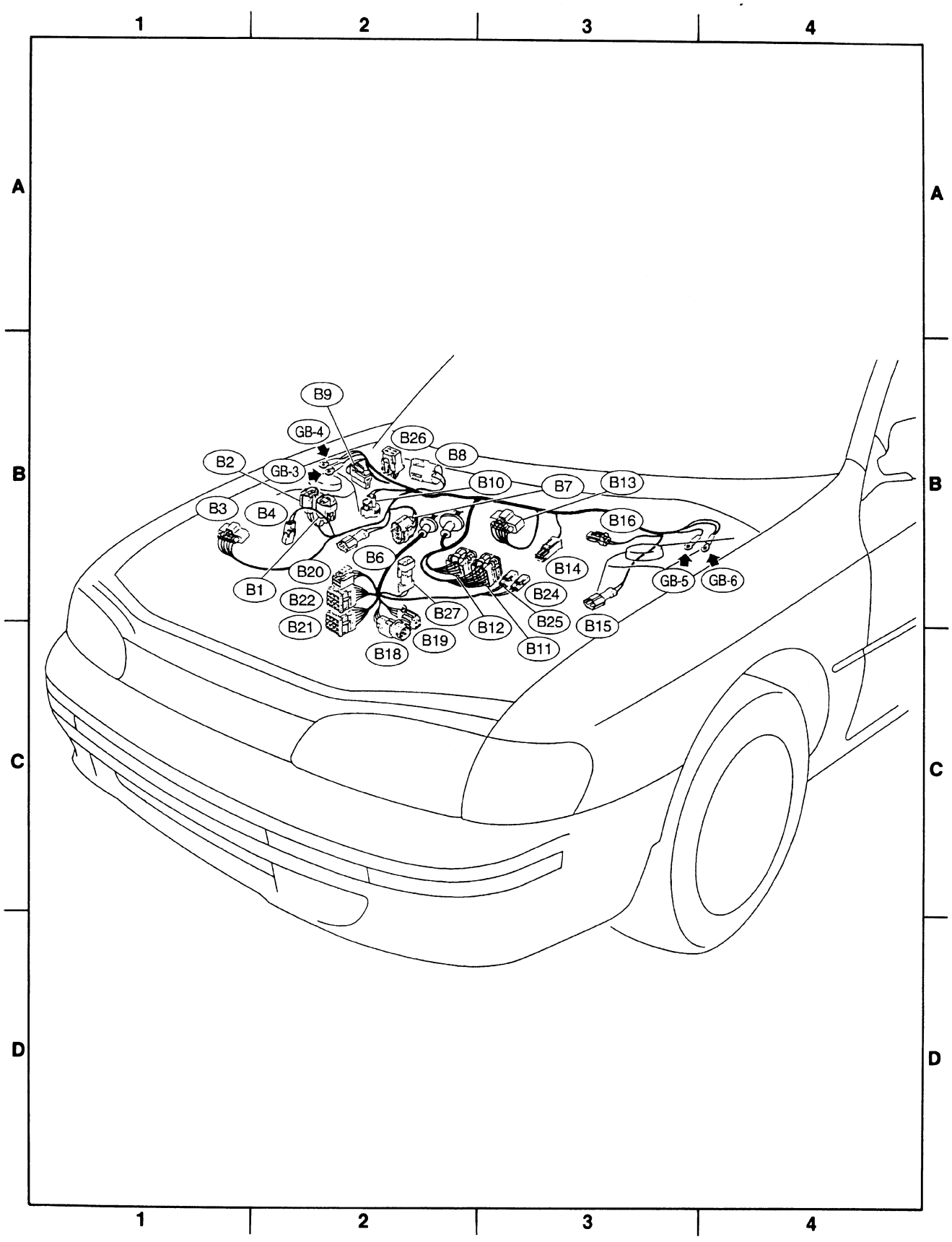


H6M0405

Connector			Connecting to	
No.	Pole	Color	No.	Name
B1	2	Blown		Pressure source switching solenoid
B2	3	Black		Pressure sensor
B3	5	Gray		Mass air flow sensor
B4	2	Gray		AT dropping resistor
B6	2	Gray		ABS front sensor RH
B7	4	Gray		Cruise control actuator
B8	5	★		Front wiper motor
B9	2	★		FWD switch (AT)
B10	2	Gray		A/C pressure switch
B11	16	Gray	T4	Transmission (AT)
B12	12	Gray	T3	
B13	6	Gray		Ignitor
B14	1	Black		Starter (Magnet)
B15	2	Gray		ABS front sensor LH
B16	2	Gray		Brake fluid level switch
B18	4	★		Front oxygen sensor
B19	4	Gray	T5	Rear oxygen sensor cord
B20	6	★	E1	Engine wiring harness (2200 cc engine model)
B21	12	Light gray	E2	Engine wiring harness (2200 cc engine model)
	16	Blue	E2	Engine wiring harness (1800 cc engine model)
B22	16	Light gray	E3	Engine wiring harness
B24	2	Gray	T1	Back-up light switch (MT)
B25	2	Brown	T2	Neutral position switch (MT)
B26	4	Blue		A/C cut relay
B27	2	Gray		FICD solenoid (1800 cc engine model)

★: Non-colored

2. BULKHEAD WIRING HARNESS AND GROUND POINT (IN ENGINE ROOM)



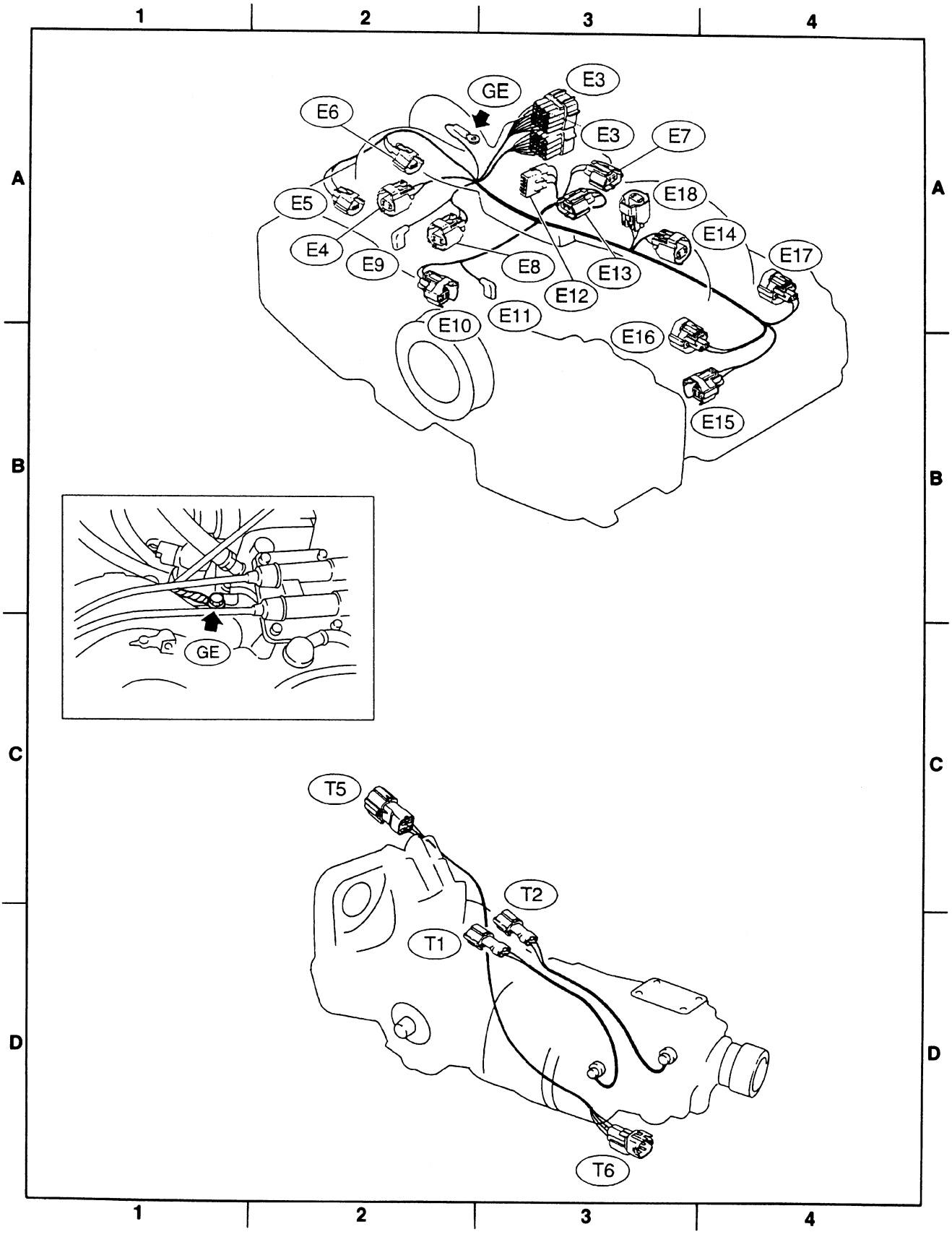
H6M0406

Connector			Connecting to	
No.	Pole	Color	No.	Name
E2	16	Blue	B21	Bulkhead wiring harness
E3	16	Gray	B22	
E4	2	Black		Purge control solenoid valve
E5	2	Gray		Injector #1
E6	2	Gray		Injector #3
E7	3	Gray		Idle air control solenoid
E8	2	Brown		Engine coolant temperature sensor
E9	1	★		Thermometer
E10	2	Gray		Crankshaft position sensor
E11	1	★		Oil pressure switch
E12	3	Gray		Ignition coil
E13	3	Gray		Throttle position sensor
E14	2	Gray		Knock sensor
E15	2	Gray		Camshaft position sensor
E16	2	Gray		Injector #2
E17	2	Gray		Injector #4
E18	2	Brown		EGR solenoid valve

Connector			Connecting to	
No.	Pole	Color	No.	Name
T1	2	Gray	B24	Bulkhead wiring harness (Back-up light switch)
T2	2	Brown	B25	Bulkhead wiring harness (Neutral position switch)
T5	4	Gray	B19	Bulkhead wiring harness
T6	4	Gray		Rear oxygen sensor

★: Non-colored

3. ENGINE WIRING HARNESS · TRANSMISSION CORD AND GROUND POINT (1800 cc engine model)



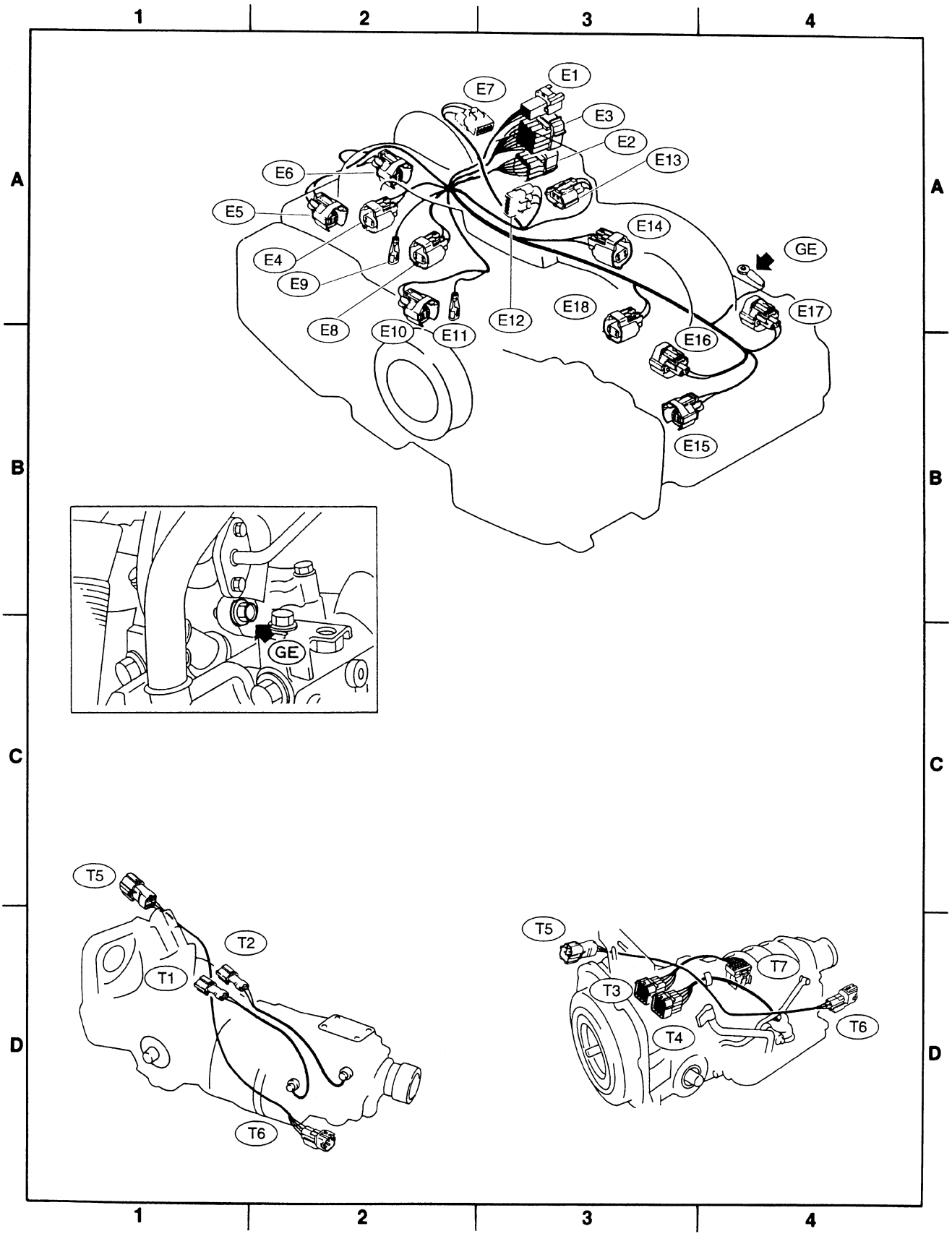
EPA0061

Connector			Connecting to	
No.	Pole	Color	No.	Name
E1	6	★	B20	Bulkhead wiring harness
E2	12	Light gray	B21	
E3	16	Light gray	B22	
E4	2	Blue		Purge control solenoid valve
E5	2	Light gray		Injector #1
E6	2	Dark gray		Injector #3
E7	3	Gray		Idle air control solenoid valve
E8	2	Brown		Engine coolant temperature sensor
E9	1	★		Thermometer
E10	2	Gray		Crankshaft position sensor
E11	1	★		Oil pressure switch
E12	3	Gray		Ignition coil
E13	3	Brown		Throttle position sensor
E14	2	Gray		Knock sensor
E15	2	Dark gray		Camshaft position sensor
E16	2	Light gray		Injector #2
E17	2	Dark gray		Injector #4
E18	2	Brown		EGR solenoid (AT)

Connector			Connecting to	
No.	Pole	Color	No.	Name
T1	2	Gray	B24	Bulkhead wiring harness (MT)
T2	2	Brown	B25	
T3	12	Gray	B12	Bulkhead wiring harness (AT)
T4	16	Gray	B11	
T5	4	Gray	B19	Bulkhead wiring harness
T6	4	Gray		Rear oxygen sensor
T7	12	★		Inhibitor switch (AT)

★: Non-colored

3. ENGINE WIRING HARNESS, TRANSMISSION CORD AND GROUND POINT (2200 cc engine model)



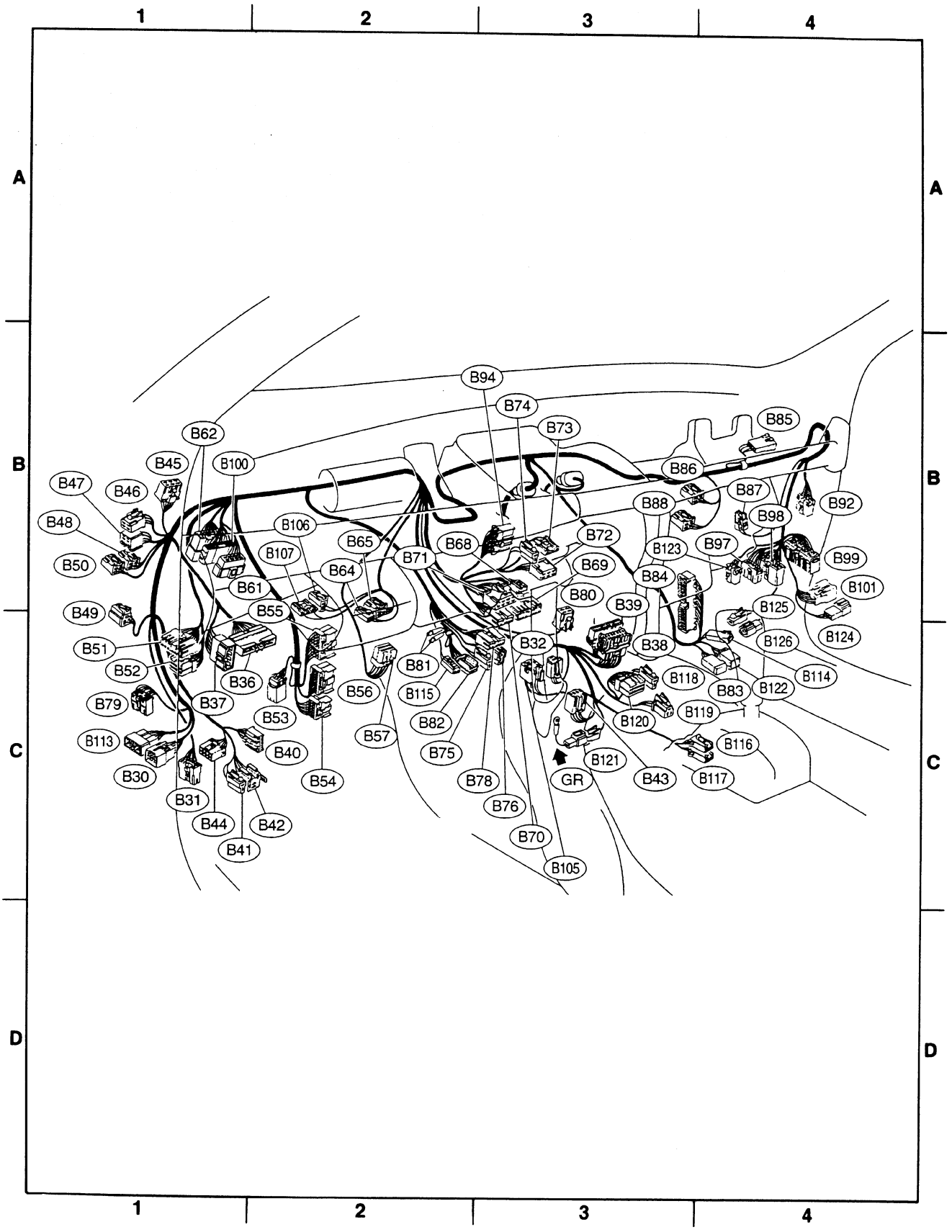
EPA0062

Connector			Connecting to	
No.	Pole	Color	No.	Name
B30	13	★	D1	Front door cord LH
B31	7	Yellow	AB1	SRS (Airbag) harness
B32	3	Black		Turn & hazard module
B36	24	Black	i1	Instrument panel wiring harness
B37	8	★	i2	
B38	12	★	i3	
B39	20	Blue	i4	
B40	16	Black		OBD-II service connector
B41	2	★		Power window circuit breaker
B42	4	★		Power window and sunroof relay
B43	6	Black		Illumination control module
B44	8	★		Seat belt timer
B45	6	★	R53	Roof cord
B46	4	Green		Fuel pump relay
B47	6	Brown		Main relay
B48	4	Black		Front fog light relay
B49	3	Black		Horn relay
B50	4	★		Blower relay
B51	11	Gray		F/B
B52	12	Gray		
B53	6	★		Shield joint connector (AT)
B54	12	Black		Transmission control module
B55	16	Black		
B56	20	Black		
B57	12	Black		Shift lock control module
B61	8	★	F44	Front wiring harness
B62	20	★	F45	
B64	2	Black		Stop light switch
B65	4	Black		Stop & brake switch (With cruise control)
B68	5	Black		Cruise control sub switch
B69	11	★		Combination switch
B70	9	★		
B71	8	★		
B72	6	Black		Ignition switch
B73	2	Black		Key lock solenoid (AT)
B74	2	Black		Key warning switch
B75	2	Green	B76	Test mode connector
B76	2	Green	B75	
B78	9	Yellow		Data link connector

Connector			Connecting to	
No.	Pole	Color	No.	Name
B79	14	Gray		Check connector
B80	4	Blue	i20	Instrument panel wiring harness
B81	1 x 2	★		Diagnosis terminal (Ground)
B82	6	Black		Diagnosis connector
B83	6	★		Shield joint connector (E/G) (1800 cc engine model)
	8	★		Shield joint connector (E/G) (2200 cc engine model)
B84	96	Light blue		Engine control module
B85	4	Brown		Diode (Lighting)
B86	4	★		Blower motor resistor
B87	2	★		Blower motor
B88	4	Brown		Evaporator thermoswitch
B92	8	★		Door lock timer
B94	20	★		Cruise control module
B97	10	★	R1	Rear wiring harness
B98	12	Black	R2	
B99	20	★	R3	
B100	16	Black	F2	Front wiring harness (With ABS model)
B101	13	★	D11	Front door cord RH
B105	4	Blue		Starter interlock relay (MT)
B106	2	★		Clutch switch (MT)
B107	2	Blue		Clutch switch (Cruise control)
B113	9	★	D50	Front door cord LH
B114	2	Black		Diode (A/C)
B115	2	Black		Check connector (ABS)
B116	4	Black		Select level illumination light (AT)
B117	4	★		Parking position switch & shift lock solenoid (AT)
B118	2	★		CD player illumination light
B119	3	★		Cigarette lighter
B120	14	★		Radio
B121	1	Black		Ground (Radio)
B122	6	★		Sensor ground joint connector
B123	4	★	R48	Rear wiring harness
B124	3	★		Front door cord RH
B125	1	Green	B126	Test mode connector
B126	1	Green	B125	

★: Non-colored

4. BULKHEAD WIRING HARNESS (IN COMPARTMENT)

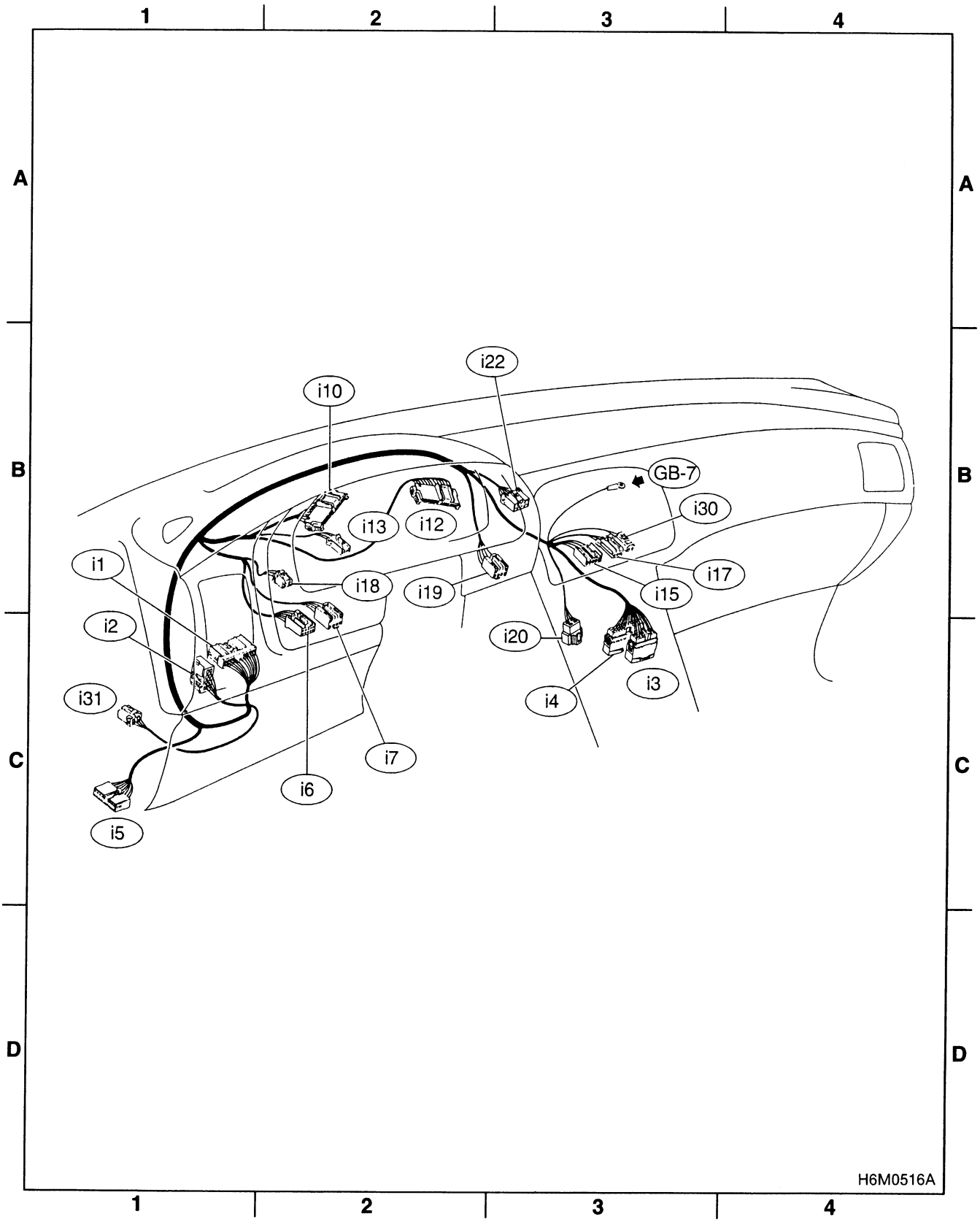


H6M0408

Connector			Connecting to	
No.	Pole	Color	No.	Name
i1	24	Black	B36	Bulkhead wiring harness
i2	8	★	B37	
i3	12	★	B38	
i4	20	Blue	B39	
i5	15	Gray		F/B
i6	10	★		Remote control rearview mirror switch
i7	6	★		Front fog light switch
i10	16	Gray		Combination meter
i12	16	Gray		
i13	4	★		Combination meter (Airbag warning)
i15	6	★		Fan switch
i17	3	★		Mode control panel
i18	4	★		Rear defogger switch
i19	6	Brown		Cruise control main switch
i20	4	Blue	B80	Bulkhead wiring harness
i22	8	★		Hazard switch
i30	2	★		Mode control panel illumination light
i31	4	★		Rear window deffogger timer

★: Non-colored

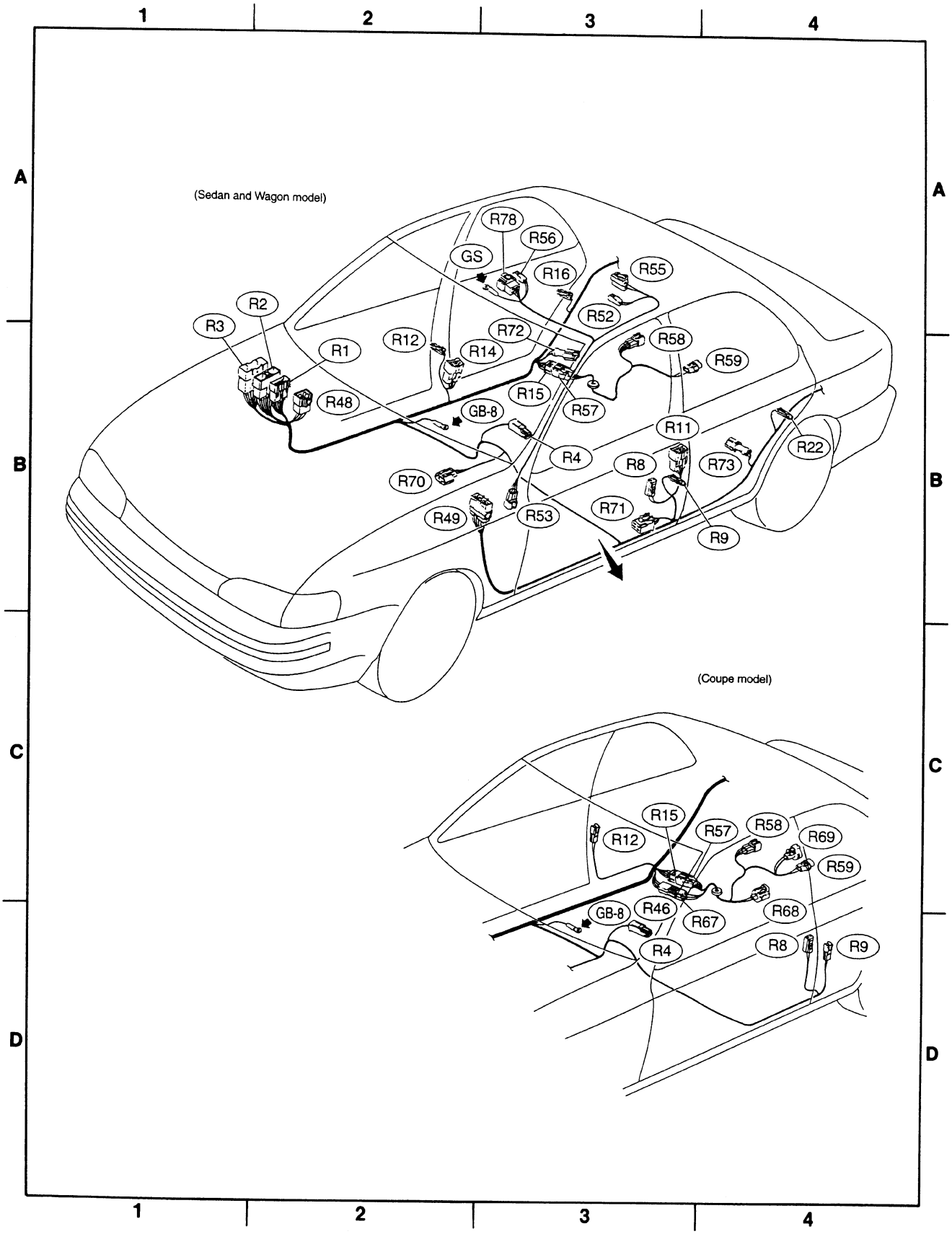
5. INSTRUMENT PANEL WIRING HARNESS AND GROUND POINT



Connector			Connecting to	
No.	Pole	Color	No.	Name
R1	10	★	B97	Bulkhead wiring harness
R2	12	Black	B98	
R3	20	★	B99	
R4	1	Black		Parking brake switch
R8	2	★		Seat belt switch
R9	1	Brown		Front door switch LH (Sedan and Wagon model)
	2	★		Front door switch LH (Coupe model)
R11	8	★	D21	Rear door adapter cord LH
R12	1	Brown		Front door switch RH (Sedan and Wagon model)
	2	★		Front door switch RH (Coupe model)
R14	8	★	D27	Rear door adapter cord RH
R15	6	Black	R57	Fuel tank cord
R16	1	Brown		Rear door switch RH
R22	1	Brown		Rear door switch LH
R46	4	★	R67	Fuel tank cord (1800 cc engine model)
R48	4	★	B123	Bulkhead wiring harness (Wagon model)
R49	12	Black	F55	Front wiring harness (With ABS model)
R52	2	★		Room light
R53	6	★	B45	Bulkhead wiring harness
R55	2	★		Sunroof control module and sunroof motor
R56	2	★		Spot light
R57	6	Black	R15	Rear wiring harness
R58	6	★		Fuel gauge module & fuel pump assembly
R59	2	★		Fuel gauge sub module
R67	4	★	R46	Rear wiring harness
R68	2	Black		Pressure control solenoid valve
R69	2	★		Vent control solenoid valve
R70	3	★		ABS G sensor
R71	4	Red		Rear accessory power supply relay
R72	2	Gray		Rear ABS sensor RH
R73	2	Gray		Rear ABS sensor LH

★: Non-colored

6. REAR WIRING HARNESS AND GROUND POINT

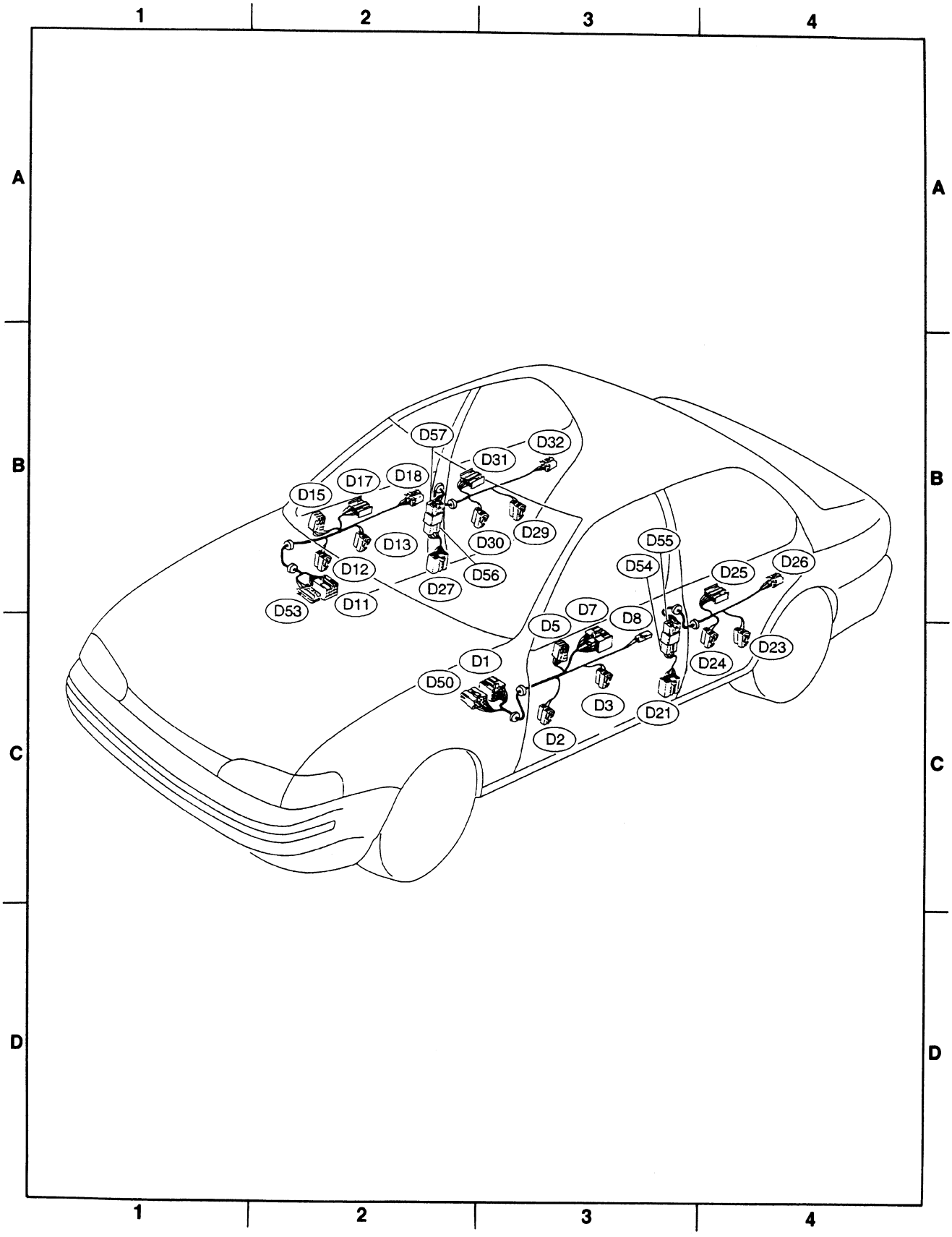


H6M0410

Connector			Connecting to	
No.	Pole	Color	No.	Name
D1	13	★	B30	Bulkhead wiring harness
D2	2	★		Front speaker LH
D3	2	Green		Front power window motor LH
D5	6	★		Remote control rearview mirror LH
D7	14	★		Power window main switch
D8	2	Gray		Front door lock switch LH
D11	13	★	B101	Bulkhead wiring harness
D12	2	★		Front speaker RH
D13	2	Green		Front power window motor RH
D15	6	★		Remote control rearview mirror RH
D17	5	★		Front power window sub switch RH
D18	4	★		Front door lock actuator RH
D21	8	★	R11	Rear wiring harness
D23	2	★		Rear door speaker LH
D24	2	Green		Rear power window motor LH
D25	5	★		Rear power window sub switch LH
D26	4	★		Rear door lock actuator LH
D27	8	★	R14	Rear wiring harness
D29	2	★		Rear door speaker RH
D30	2	Green		Rear power window motor RH
D31	5	★		Rear power window sub switch RH
D32	4	★		Rear door lock actuator RH
D50	9	★	B113	Bulkhead wiring harness
D53	3	★	B124	Bulkhead wiring harness
D54	8	★	D55	Rear door cord LH
D55	8	★	D54	Rear door adapter cord LH
D56	8	★	D57	Rear door cord RH
D57	8	★	D56	Rear door adapter cord RH

★: Non-colored

7. DOOR CORD

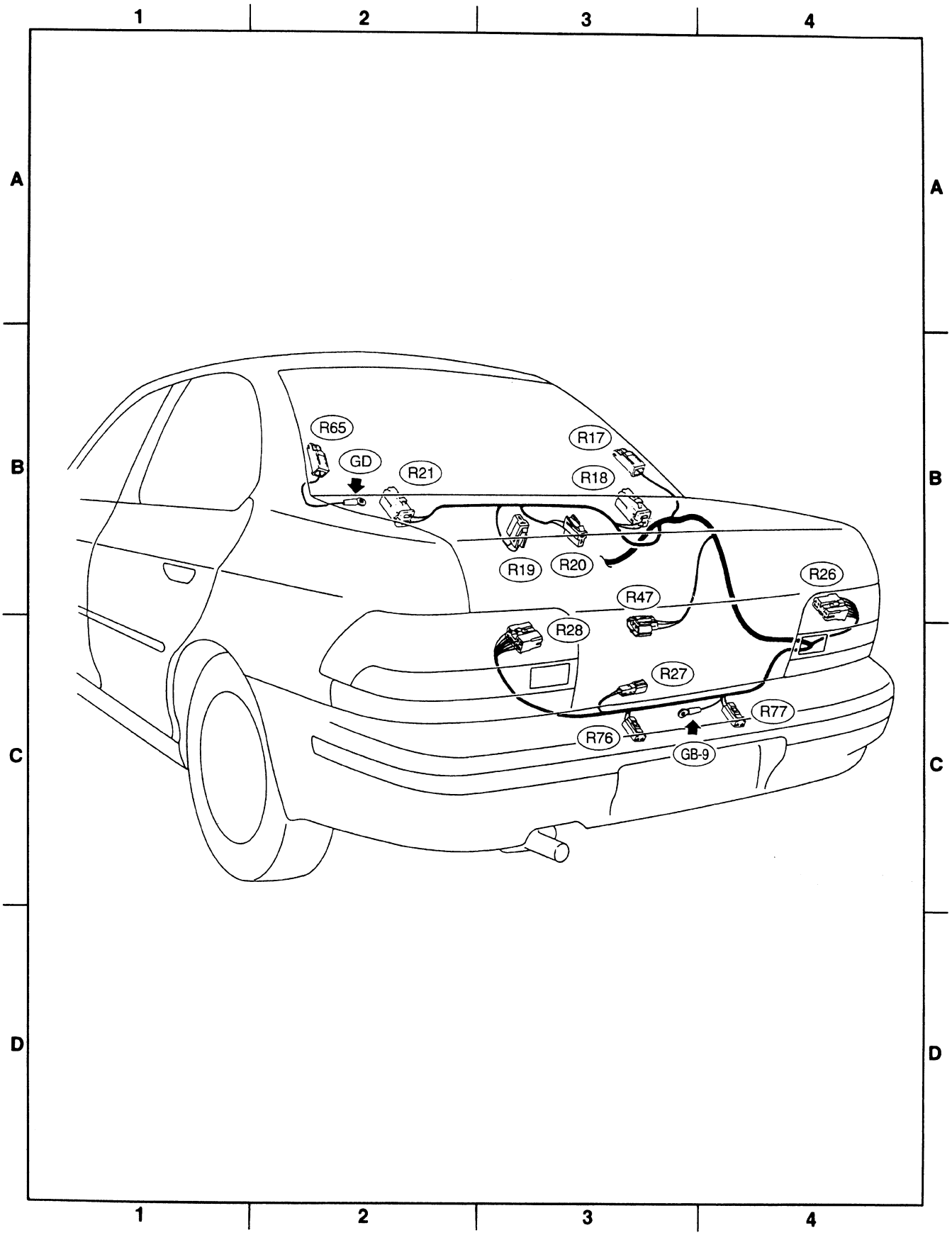


H6M0411

Connector			Connecting to	
No.	Pole	Color	No.	Name
R17	1	Black		Rear defogger (Power)
R18	2	Black		Rear speaker RH
R19	2	★		High-mount stop light
R20	2	Black		Trunk room light
R21	2	Black		Rear speaker LH
R26	7	★		Rear combination light RH
R27	2	★		Trunk room light switch
R28	7	★		Rear combination light LH
R47	3	Black		Fuel tank pressure sensor (1800 cc engine model)
R65	1	Black		Rear defogger (Ground)
R76	2	★		License plate light LH
R77	2	★		License plate light RH

★: Non-colored

8. REAR END WIRING HARNESS AND GROUND POINT OF SEDAN AND COUPE



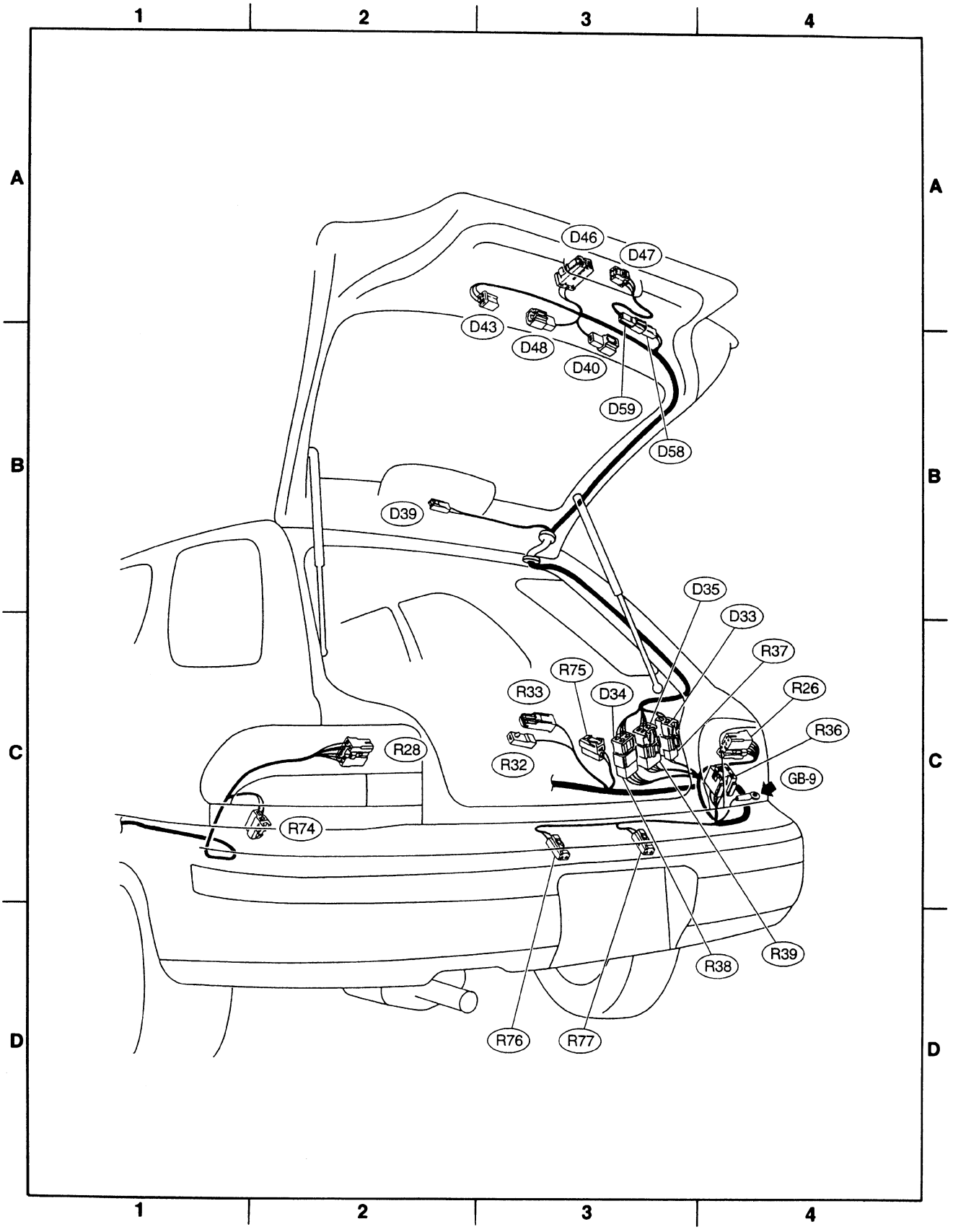
H6M0412

Connector			Connecting to	
No.	Pole	Color	No.	Name
R26	7	★		Rear combination light RH
R28	7	★		Rear combination light LH
R32	1	★		Rear accessory power supply (Power)
R33	1	Black		Rear accessory power supply (Ground)
R36	5	Black		Rear wiper relay
R37	2	★	D33	Rear gate cord
R38	4	★	D34	
R39	4	★	D35	
R74	2	Green		Rear washer motor
R75	2	★		Luggage room light
R76	2	★		License plate light LH
R77	2	★		License plate light RH

Connector			Connecting to	
No.	Pole	Color	No.	Name
D33	2	★	R37	Rear wiring harness
D34	4	★	R38	
D35	4	★	R39	
D39	2	★		High-mount stop light
D40	1	★		Rear defogger (Power)
D43	4	★		Rear wiper motor
D46	2	★		Rear gate latch switch
D47	4	★		Rear gate lock actuator
D48	1	★		Rear defogger (Ground)
D58	2	★	D59	Rear gate lock adapter cord
D59	2	★	D58	Rear gate cord

★: Non-colored

9. REAR END WIRING HARNESS AND GROUND POINT OF WAGON



H6M0413