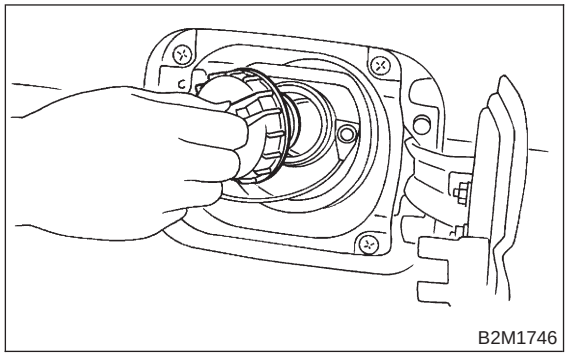
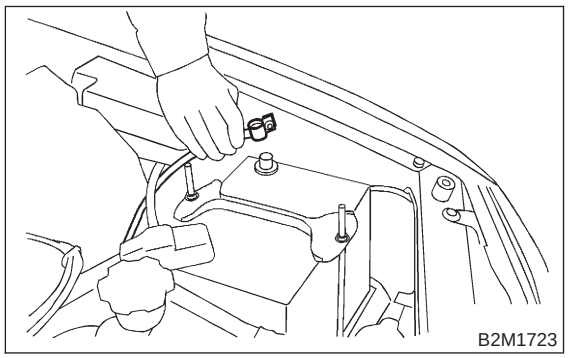
8. Fuel Temperature Sensor

A: REMOVAL

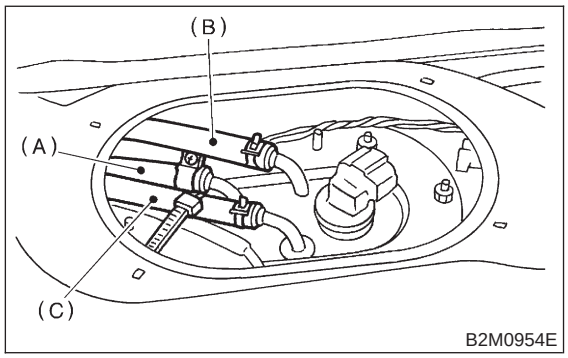
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Remove fuel filler cap.


B2M1746

3) Disconnect battery ground cable.

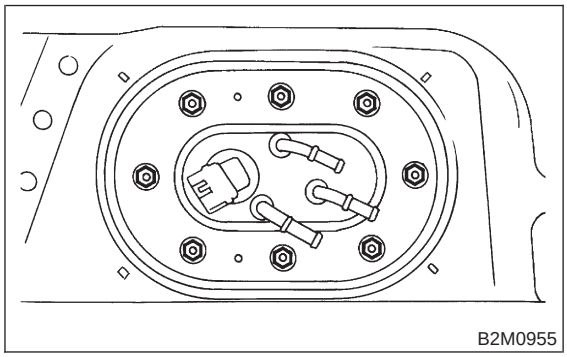

B2M1723

4) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).

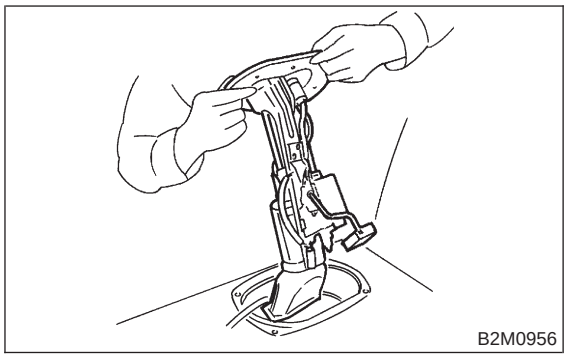


B2M0954E

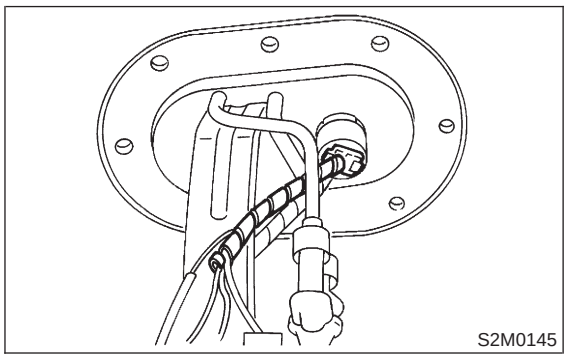
5) Remove nuts which install fuel pump assembly onto fuel tank.


B2M0955

6) Take off fuel pump assembly from fuel tank.

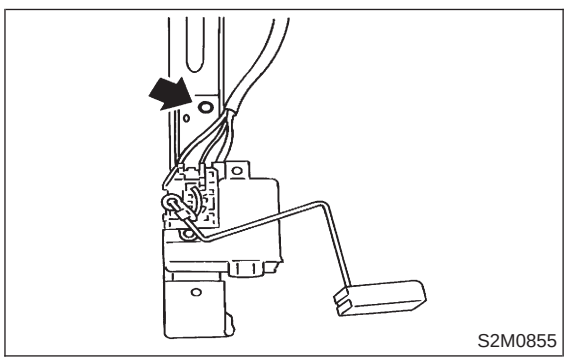

B2M0956

7) Disconnect connector from fuel pump bracket.


S2M0145

8) Remove main fuel level sensor from fuel pump assembly. <Ref. to 2-1 [W12A0].>

NOTE:
Fuel temperature sensor is a unit with fuel pump. If replacing it, replace as a fuel pump.

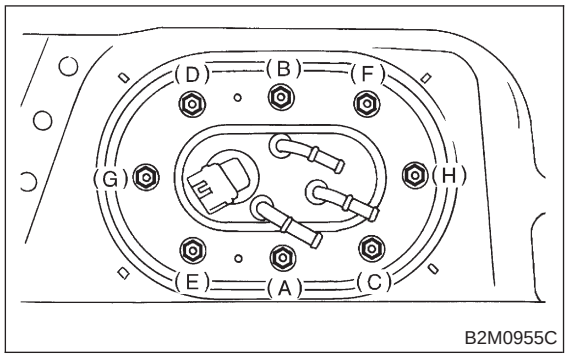

S2M0855

B: INSTALLATION

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:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

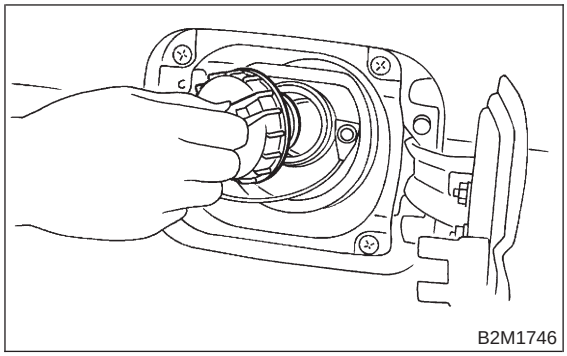
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



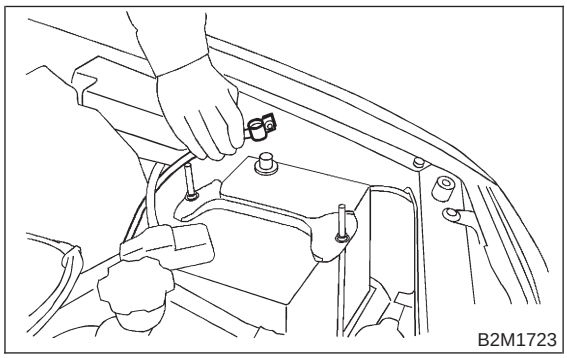
9. Fuel Tank Pressure Sensor

A: REMOVAL AND INSTALLATION

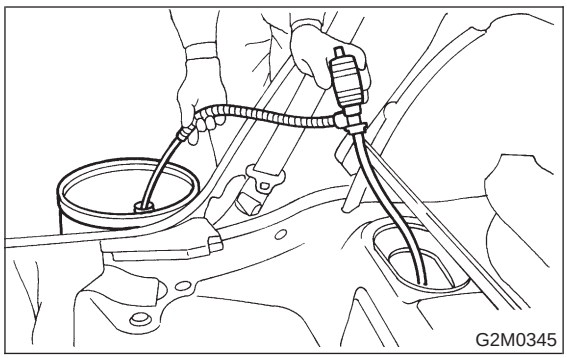
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



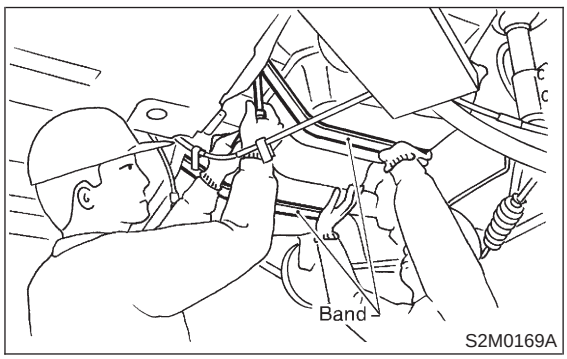
3) Disconnect battery ground cable.



4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



5) Remove fuel tank. <Ref. to 2-8 [W2A0].>

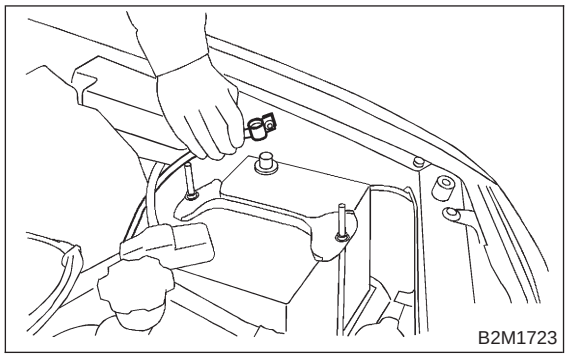


15. Engine Control Module

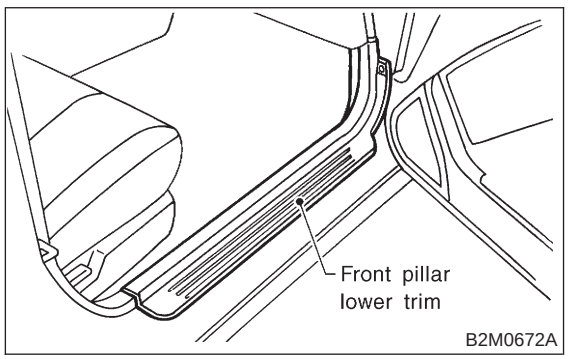
A: REMOVAL AND INSTALLATION

1. 2200 cc MODEL

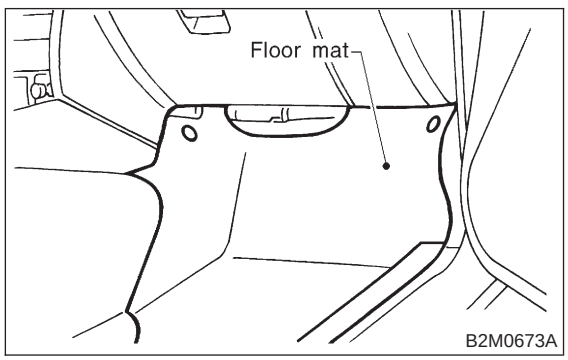
1) Disconnect battery ground cable.



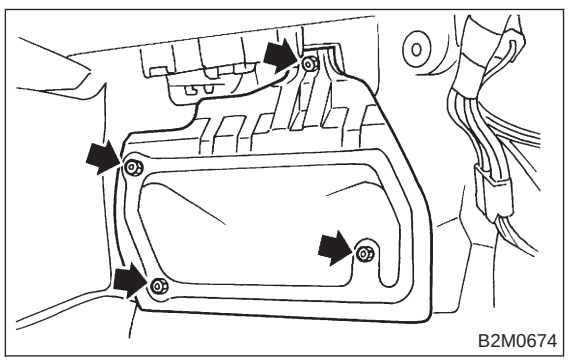
2) Remove side sill front cover.
<Ref. to 5-3 [W5A1].>



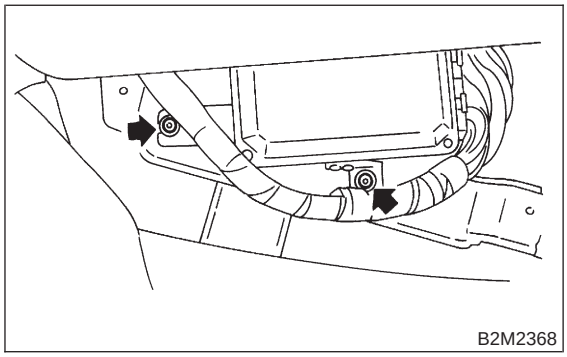
3) Detach floor mat of front passenger seat.



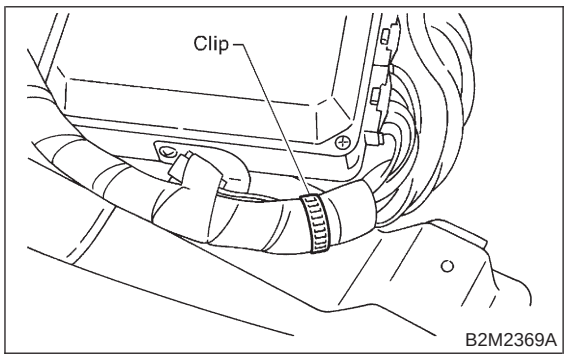
4) Remove protect cover.



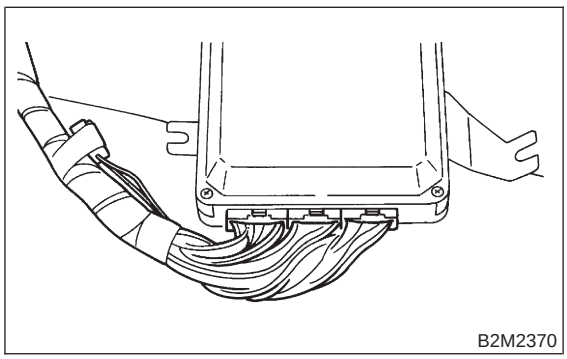
5) Remove nuts which hold ECM to bracket.



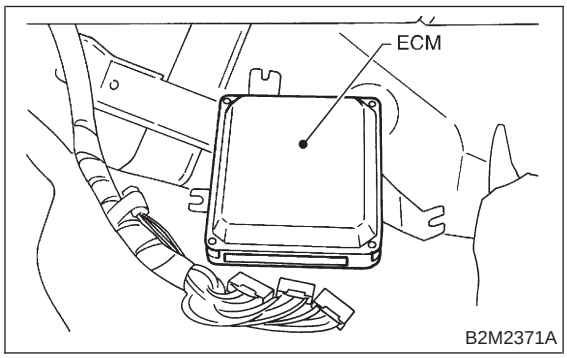
6) Remove clip from bracket.



7) Disconnect ECM connectors.



8) Take out ECM.

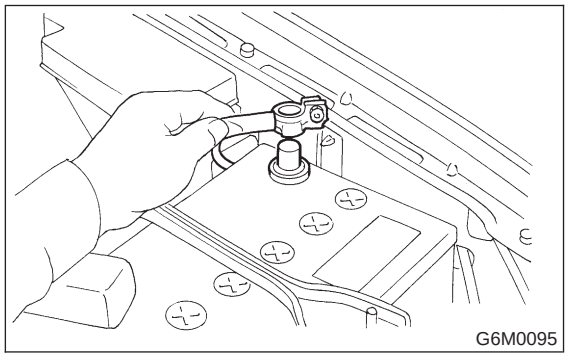


9) Installation is in the reverse order of removal.

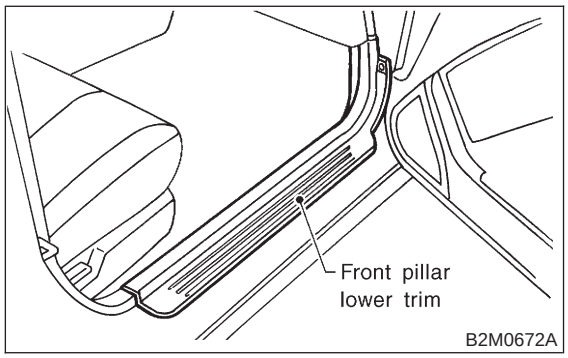
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

2. 2500 cc MODEL

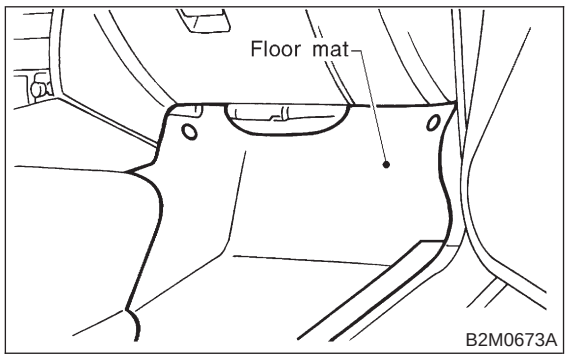
1) Disconnect battery ground cable.



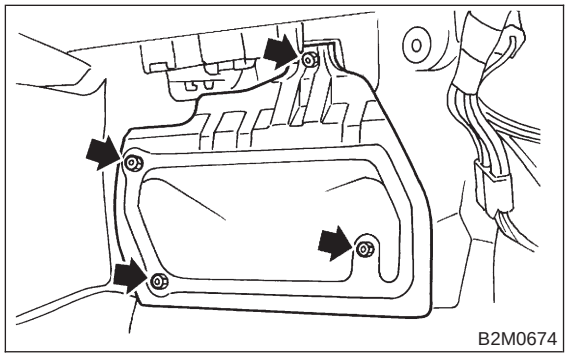
2) Remove front pillar lower trim.
<Ref. to 5-3 [W5A1].>



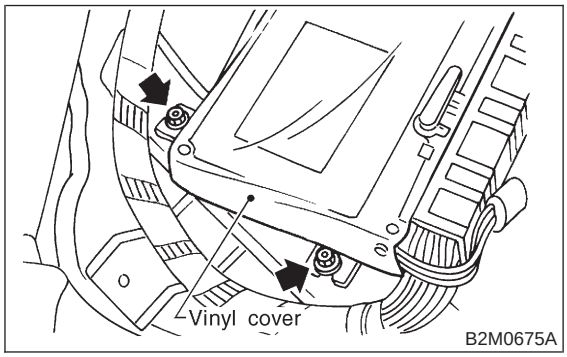
3) Detach floor mat of front passenger seat.



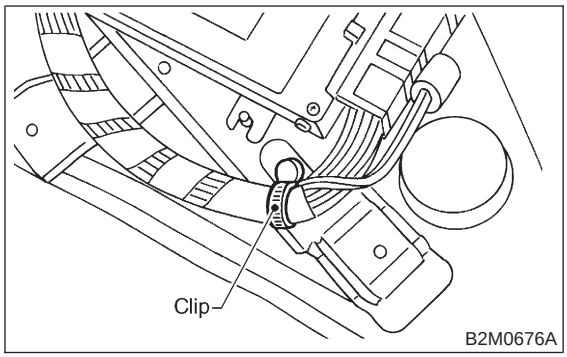
4) Remove protect cover.



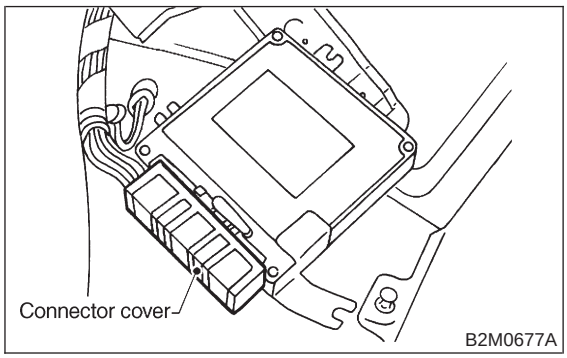
5) Remove vinyl cover and nuts which hold ECM to bracket.



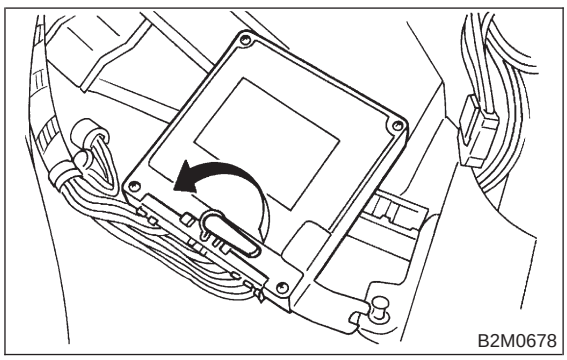
6) Remove clip from bracket.



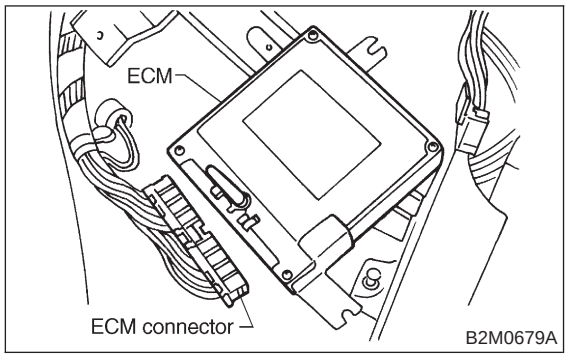
7) Remove connector cover.



8) Disconnect ECM connector.



9) Take out ECM.

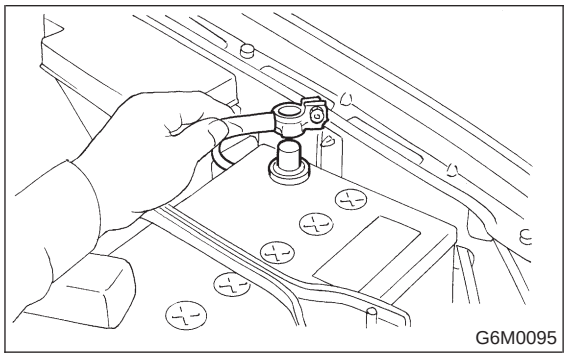


10) Installation is in the reverse order of removal.

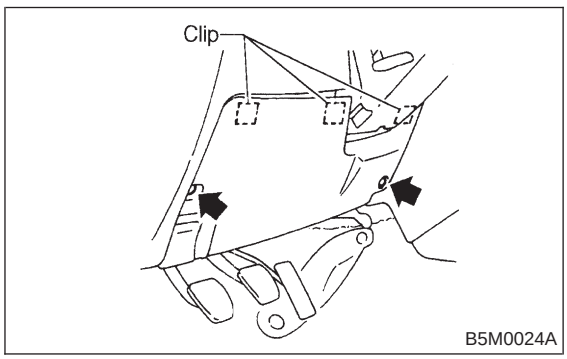
16. Main Relay

A: REMOVAL AND INSTALLATION

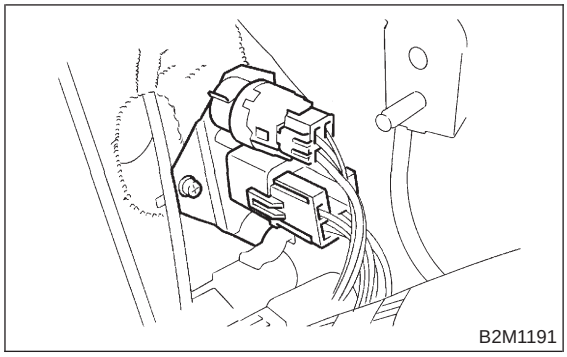
1) Disconnect battery ground cable.



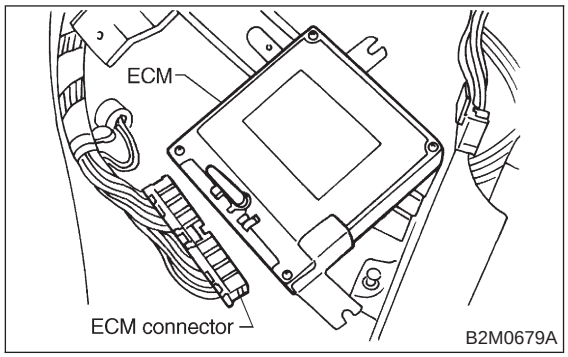
2) Remove lower cover and then disconnect connectors.



3) Lower transmission control module.
4) Remove the front pillar lower trim.
<Ref. to 5-3 [W5A1].>
5) Remove fuse box mounting nuts.
6) Lower fuse box.
7) Remove fuse box mounting bracket.
8) Remove screw which retains bracket of main relay and fuel pump relay.



9) Take out ECM.

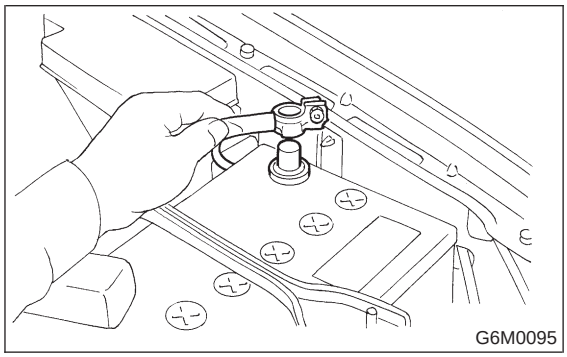


10) Installation is in the reverse order of removal.

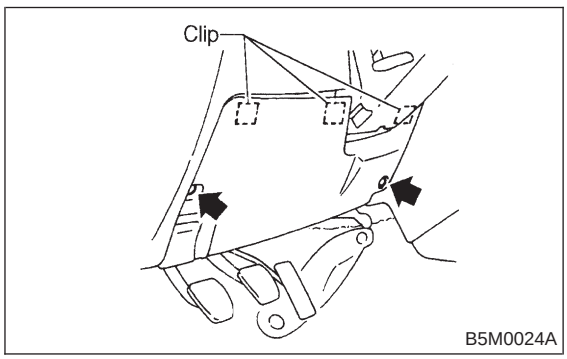
16. Main Relay

A: REMOVAL AND INSTALLATION

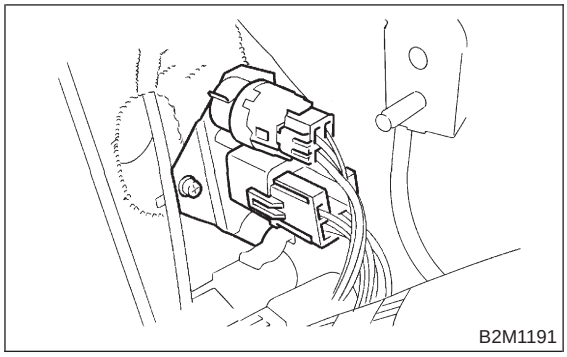
1) Disconnect battery ground cable.



2) Remove lower cover and then disconnect connectors.



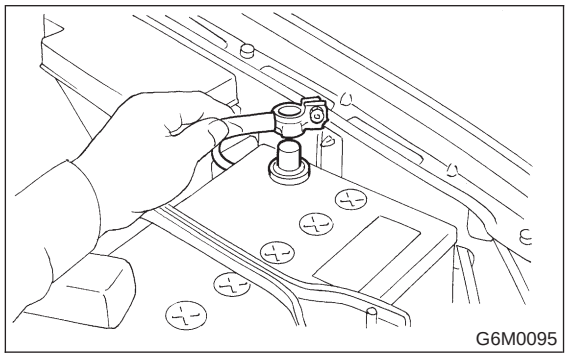
3) Lower transmission control module.
4) Remove the front pillar lower trim.
<Ref. to 5-3 [W5A1].>
5) Remove fuse box mounting nuts.
6) Lower fuse box.
7) Remove fuse box mounting bracket.
8) Remove screw which retains bracket of main relay and fuel pump relay.



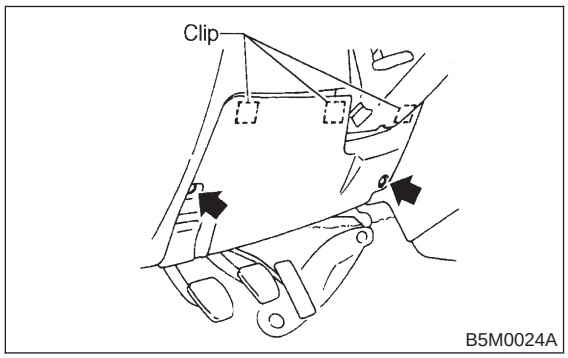
17. Fuel Pump Relay

A: REMOVAL AND INSTALLATION

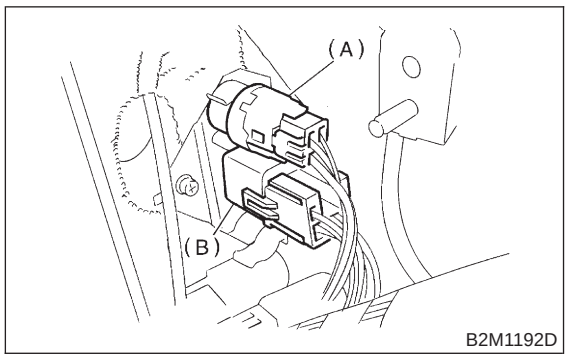
1) Disconnect battery ground cable.



2) Remove lower cover and then disconnect connectors.

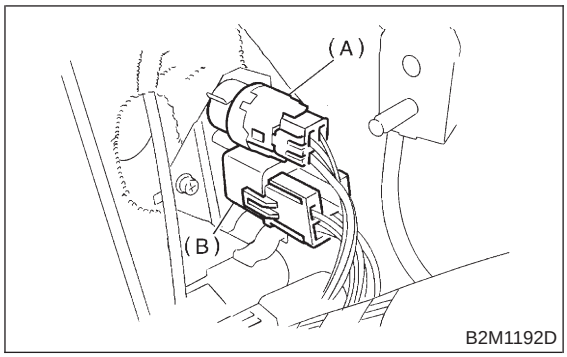


3) Lower transmission control module.
4) Remove the front pillar lower trim.
<Ref. to 5-3 [W5A1].>
5) Remove fuse box mounting nuts.
6) Lower fuse box.
7) Remove fuse box mounting bracket.
8) Remove fuel pump relay (A) from main relay and fuel pump relay mounting bracket.



(A) Fuel pump relay
(B) Main relay

9) Disconnect connector from fuel pump relay.



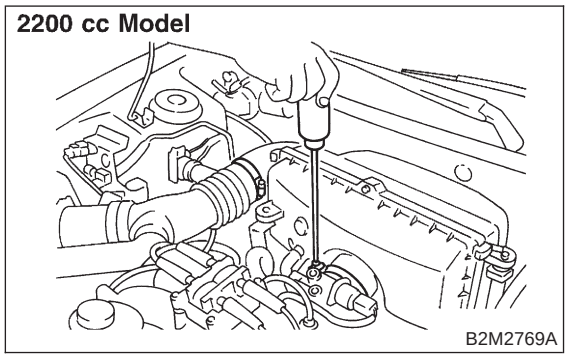
(A) Fuel pump relay
(B) Main relay

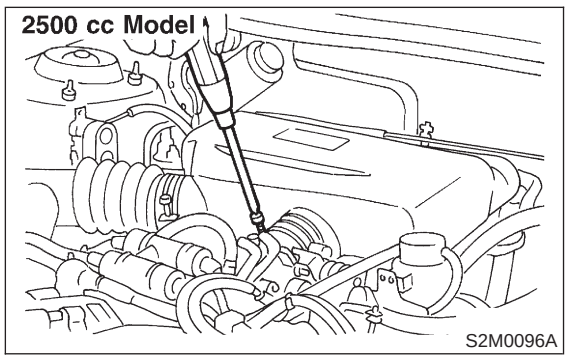
10) Installation is in the reverse order of removal.

18. Air Intake Chamber (Except 2200 cc California Spec. Vehicles)

A: REMOVAL AND INSTALLATION

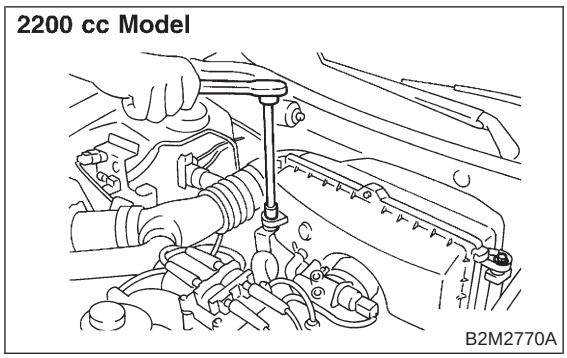
1) Loosen clamps which connect air intake chamber to throttle body and air intake duct.

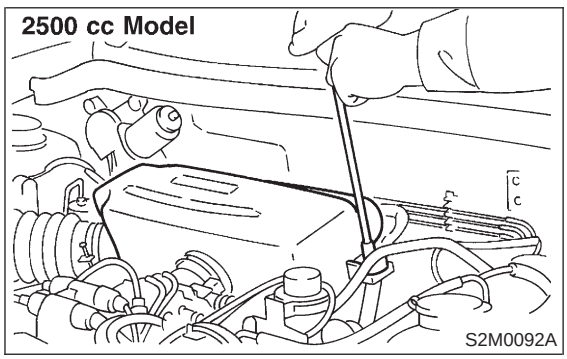




2) Disconnect air hoses from air intake chamber.

3) Remove bolts which secure air intake chamber to stays.





4) Remove air intake chamber.
5) Installation is in the reverse order of removal.

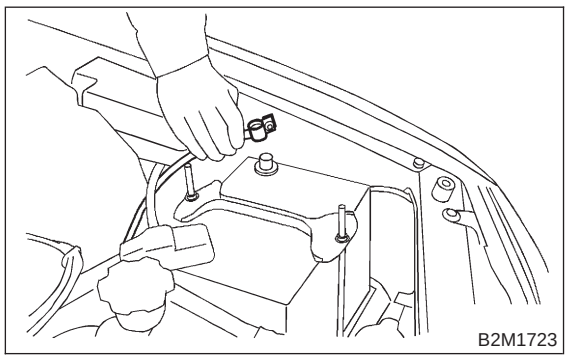
Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

19. Knock Sensor

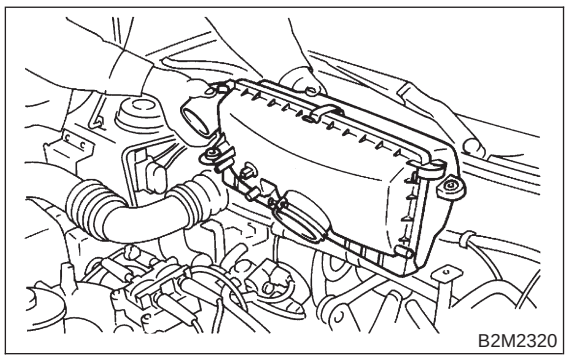
A: REMOVAL

1. 2200 cc MODEL

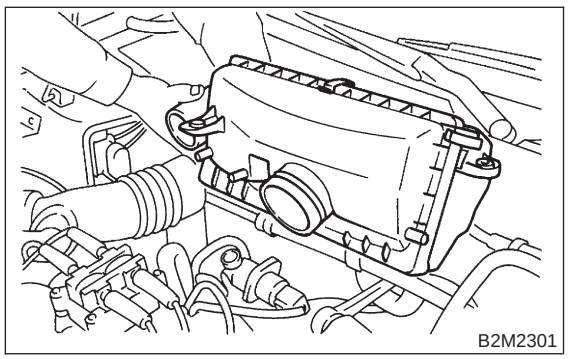
1) Disconnect battery ground cable from battery ground terminal.



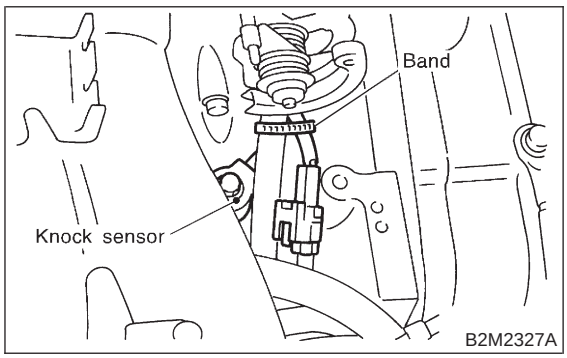
2) Remove air cleaner assembly.
(California spec. vehicles only)
<Ref. to 2-7 [W1A1].>



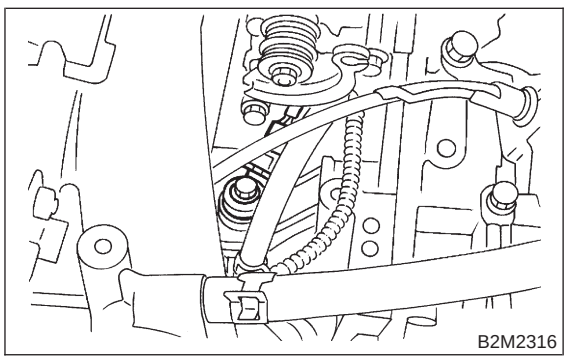
3) Remove air intake chamber.
(Except California spec. vehicles)
<Ref. to 2-7 [W18A0].>



4) Remove band which holds knock sensor harness, and disconnect connector from knock sensor.

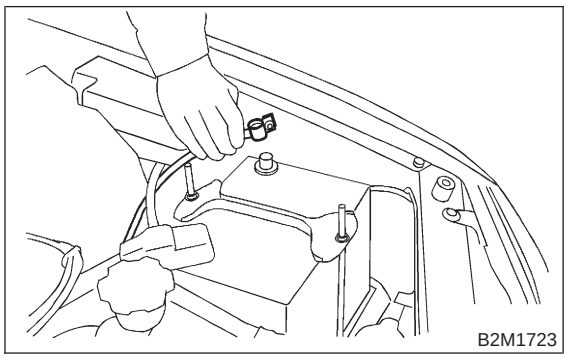


5) Remove knock sensor from cylinder block.

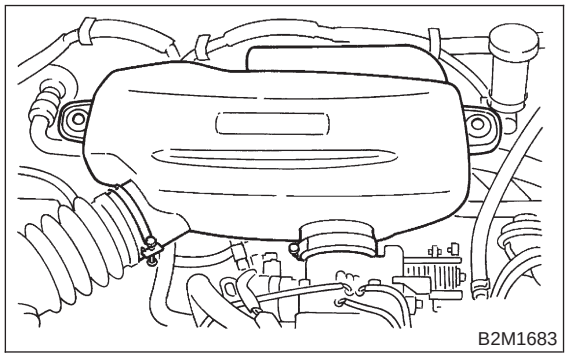


2. 2500 cc MODEL

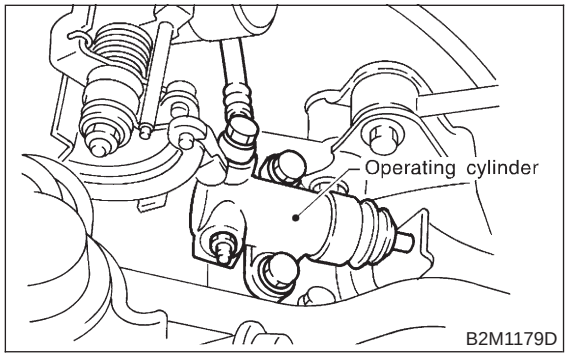
1) Disconnect battery ground cable from battery ground terminal.



2) Remove air intake chamber.
<Ref. to 2-7 [W18A0].>

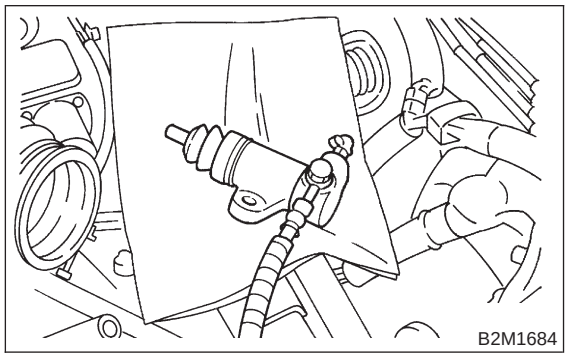

B2M1683

3) Remove operating cylinder. (MT vehicles only)
<Ref. to 2-10 [W5A0].>

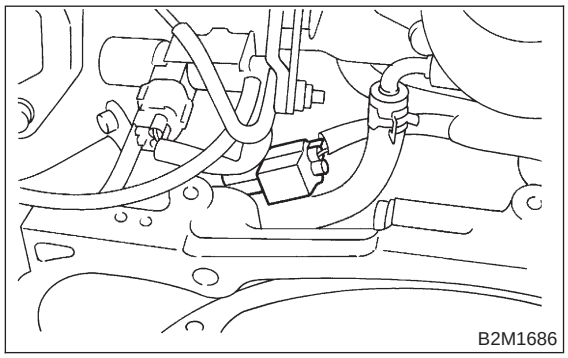


B2M1179D

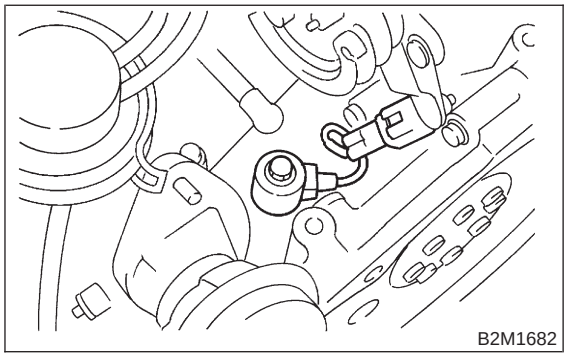
NOTE:
Place the operating cylinder where it will not interfere the work in process.


B2M1684

4) Disconnect knock sensor connector.


B2M1686

5) Remove knock sensor from cylinder block.


B2M1682

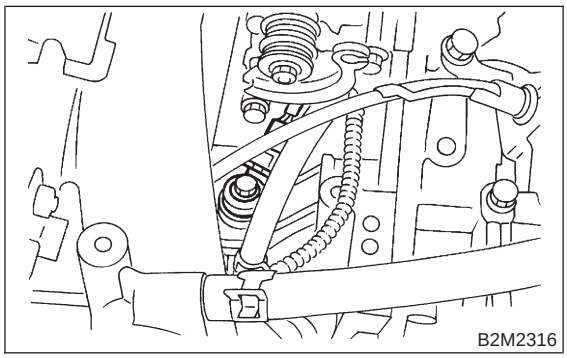
B: INSTALLATION

1. 2200 cc MODEL

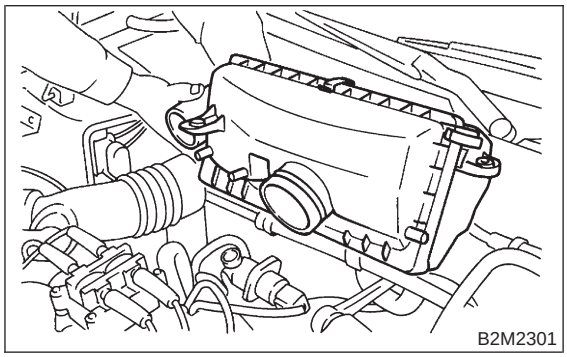
1) Install knock sensor to cylinder block.

NOTE:
The knock sensor cord which is extracted from the sensor must be positioned at a 45° angle against the rear side of the engine.

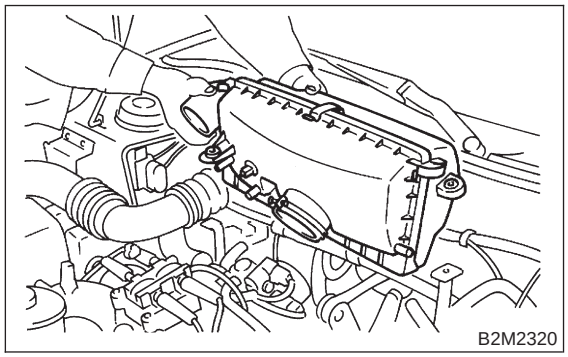
Tightening torque:
23.5±2.9 N·m (2.4±0.3 kg-m, 17.3±2.1 ft-lb)


B2M2316

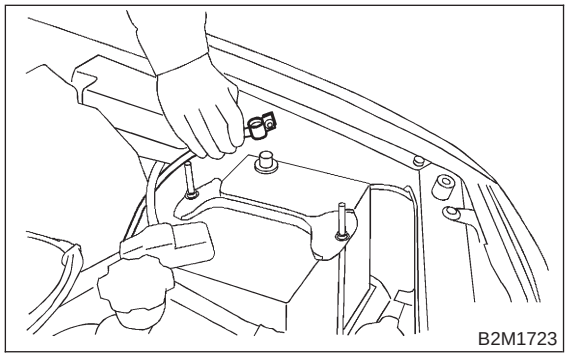
2) Connect knock sensor connector and hold knock sensor harness with band.
3) Install air intake chamber. (Except California spec. vehicles) <Ref. to 2-7 [W18A0].>


B2M2301

4) Install air cleaner assembly. (California spec. vehicles only) <Ref. to 2-7 [W1A1].>


B2M2320

5) Connect battery ground cable to battery ground terminal.

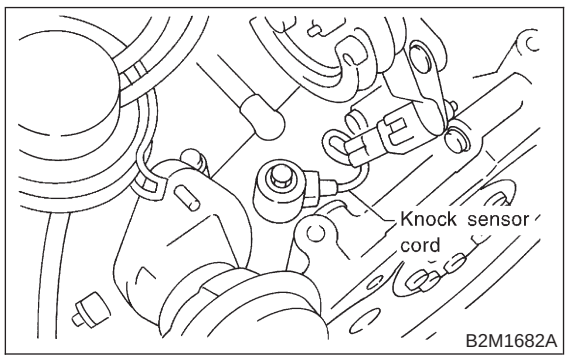

B2M1723

2. 2500 cc MODEL

1) Install knock sensor to cylinder block.

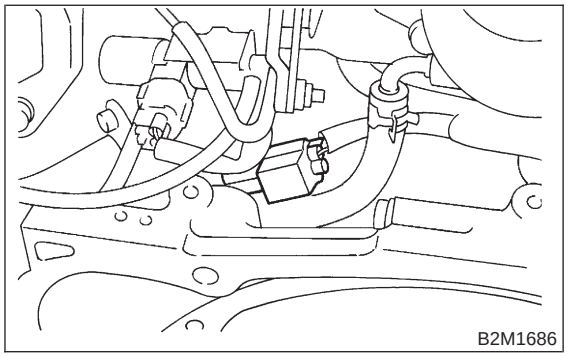
NOTE:
The knock sensor cord which is extracted from the sensor must be positioned at a 45° angle against the rear side of the engine.

Tightening torque:
23.5±2.9 N·m (2.4±0.3 kg-m, 17.3±2.1 ft-lb)

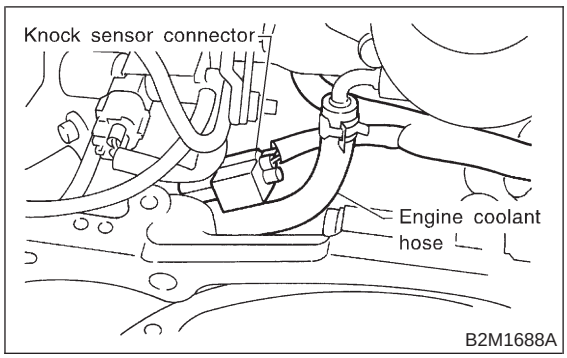


B2M1682A

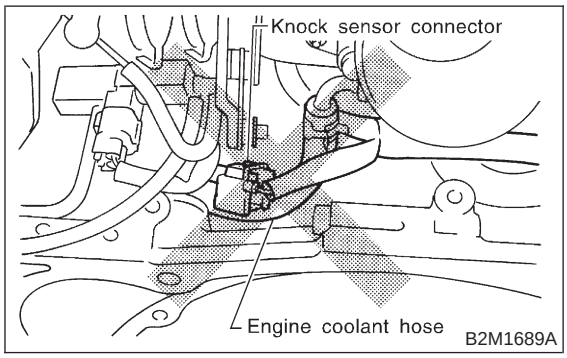
2) Connect knock sensor connector.


B2M1686

NOTE:
The knock sensor connector must be connected behind the engine coolant hose within the engine components.



B2M1688A

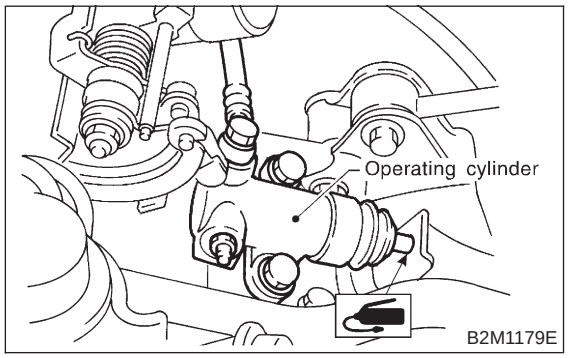


B2M1689A

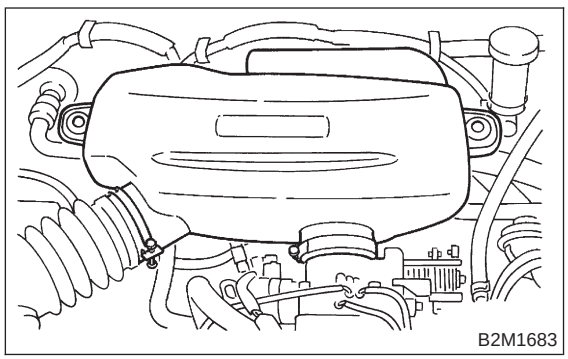
3) Install operating cylinder. (MT vehicles only)

NOTE:
Apply grease to contact point of release lever and operating cylinder rod. <Ref. to 2-10 [W5A0].>

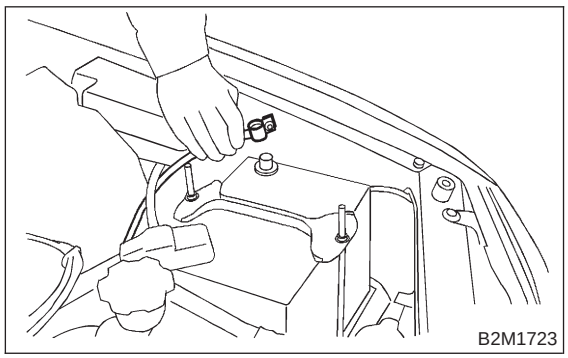
Tightening torque:
37±3 N·m (3.8±0.3 kg-m, 27.3±2.2 ft-lb)



4) Install air intake chamber. <Ref. to 2-7 [W18A0].>



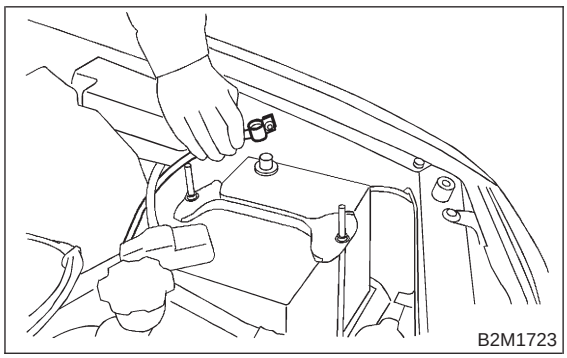
5) Connect battery ground cable to battery ground terminal.



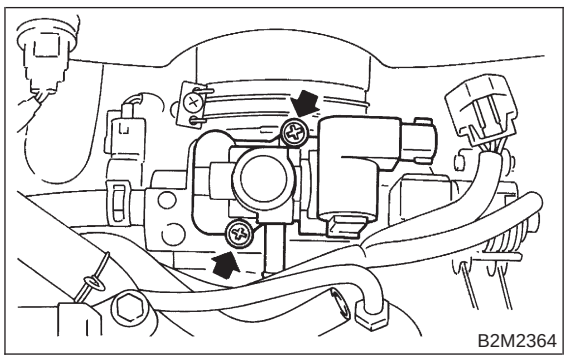
20. Intake Manifold Pressure Sensor (2200 cc California Spec. Vehicles only)

A: REMOVAL AND INSTALLATION

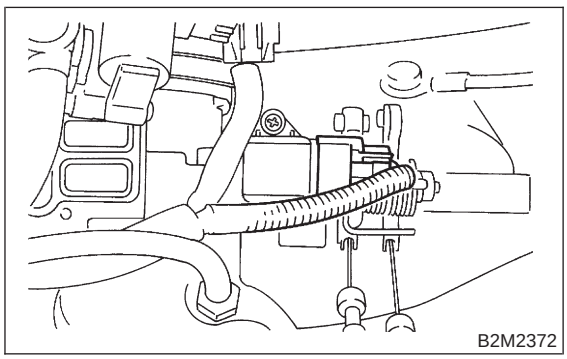
1) Disconnect battery ground cable.



2) Remove idle air control solenoid valve. <Ref. to 2-7 [W12A1].>



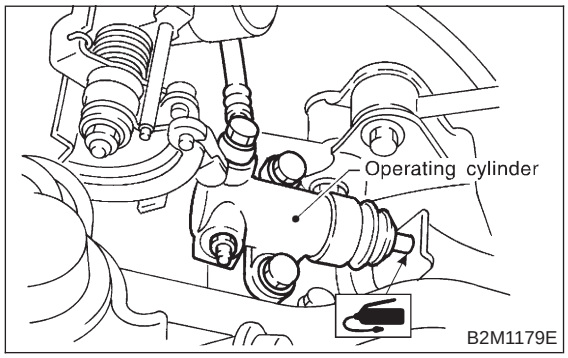
3) Disconnect connector from intake manifold pressure sensor.



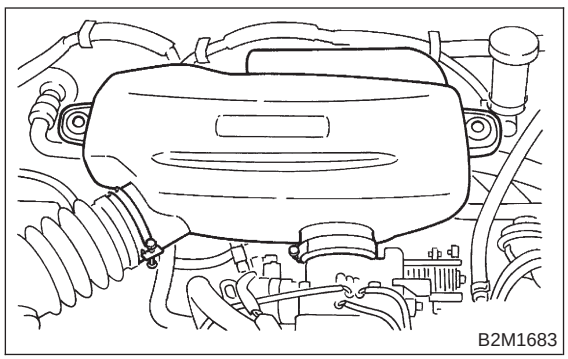
3) Install operating cylinder. (MT vehicles only)

NOTE:
Apply grease to contact point of release lever and operating cylinder rod. <Ref. to 2-10 [W5A0].>

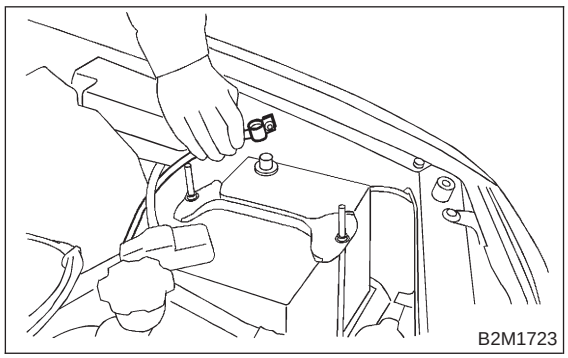
Tightening torque:
37±3 N·m (3.8±0.3 kg-m, 27.3±2.2 ft-lb)



4) Install air intake chamber. <Ref. to 2-7 [W18A0].>



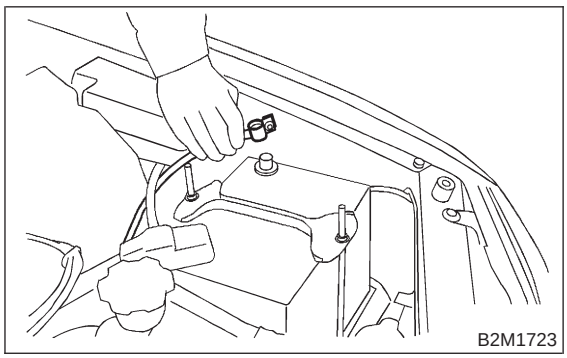
5) Connect battery ground cable to battery ground terminal.



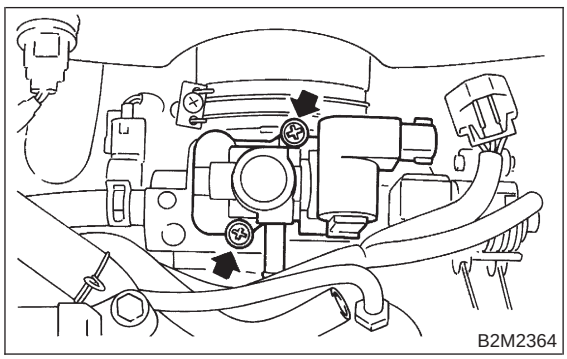
20. Intake Manifold Pressure Sensor (2200 cc California Spec. Vehicles only)

A: REMOVAL AND INSTALLATION

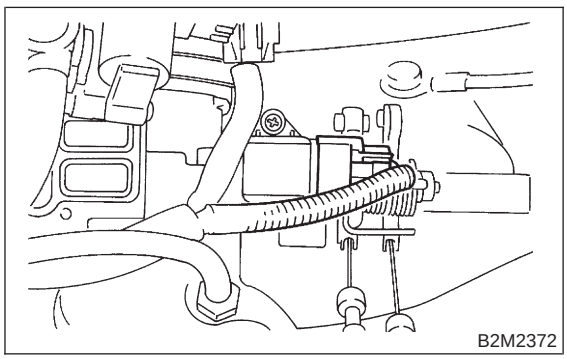
1) Disconnect battery ground cable.



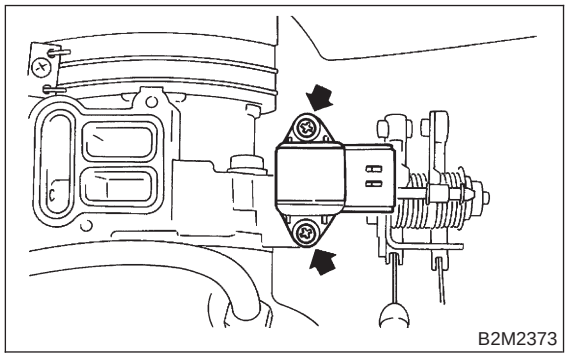
2) Remove idle air control solenoid valve. <Ref. to 2-7 [W12A1].>



3) Disconnect connector from intake manifold pressure sensor.



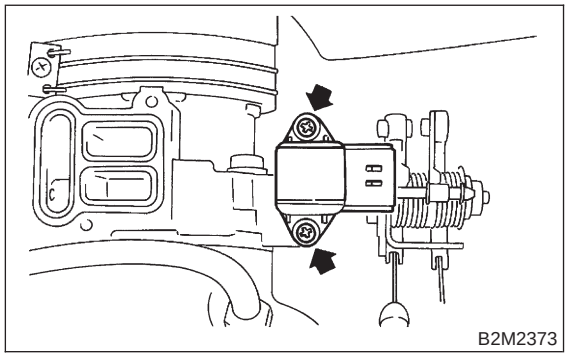
4) Remove intake manifold pressure sensor from throttle body.



5) Installation is in the reverse order of removal.

CAUTION:
Replace gaskets for intake air pressure sensor and idle air control solenoid valve with new ones.

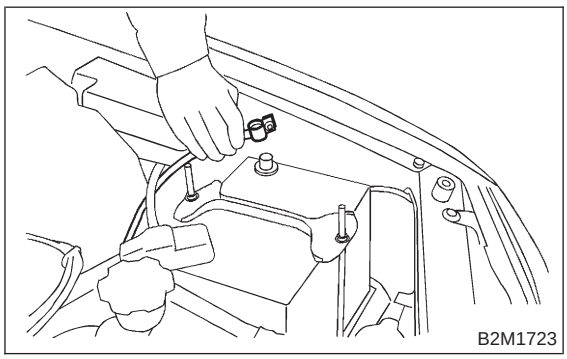
Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)



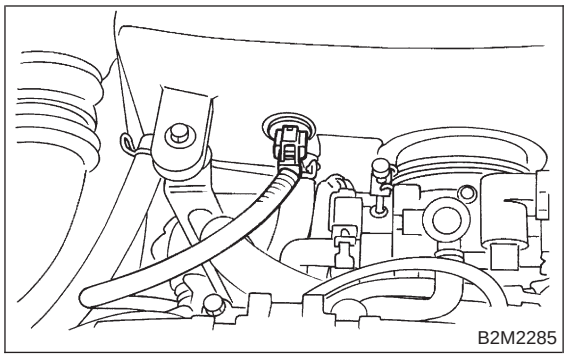
21. Intake Air Temperature Sensor (2200 cc California Spec. Vehicles only)

A: REMOVAL AND INSTALLATION

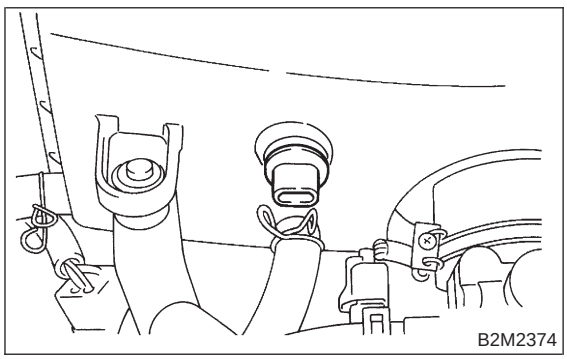
1) Disconnect battery ground cable.



2) Disconnect connector from intake air temperature sensor.

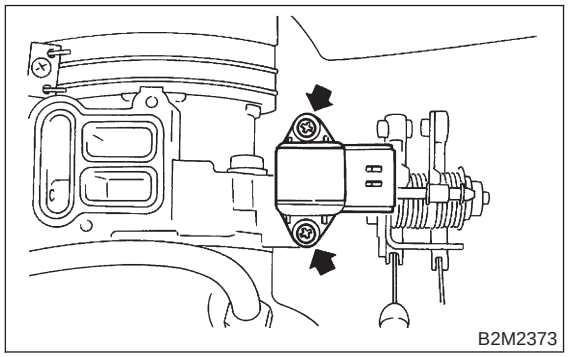


3) Remove intake air temperature sensor from air cleaner case.



4) Installation is in the reverse order of removal.

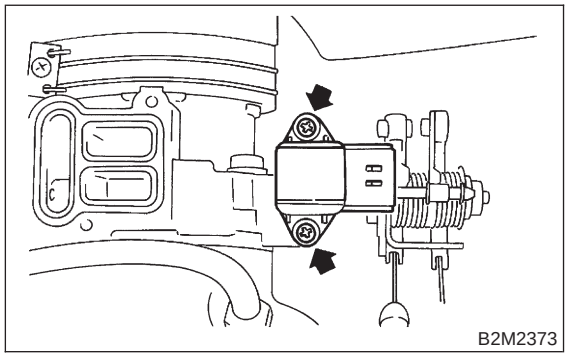
4) Remove intake manifold pressure sensor from throttle body.



5) Installation is in the reverse order of removal.

CAUTION:
Replace gaskets for intake air pressure sensor and idle air control solenoid valve with new ones.

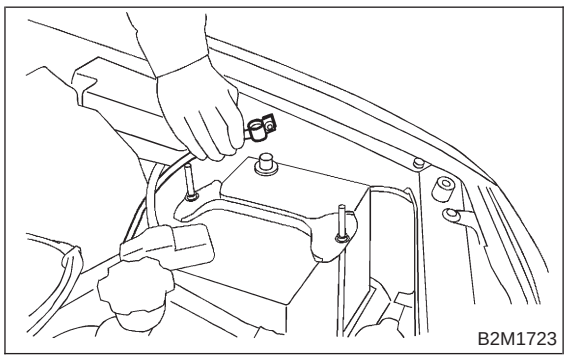
Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)



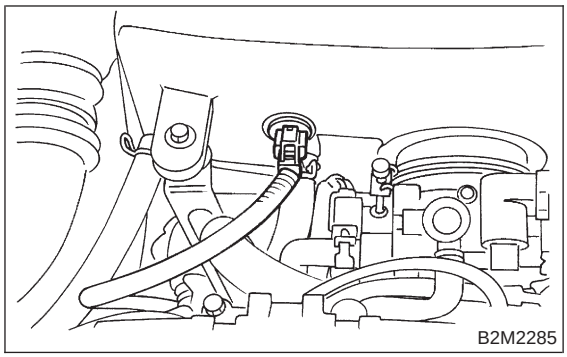
21. Intake Air Temperature Sensor (2200 cc California Spec. Vehicles only)

A: REMOVAL AND INSTALLATION

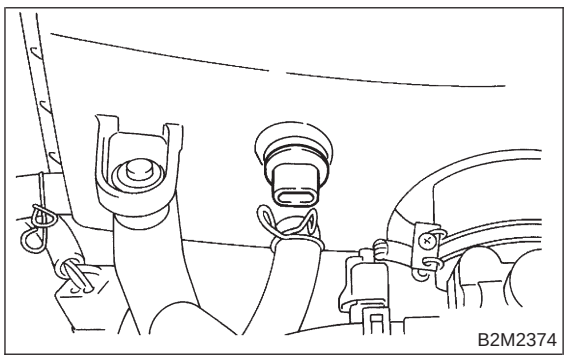
1) Disconnect battery ground cable.



2) Disconnect connector from intake air temperature sensor.



3) Remove intake air temperature sensor from air cleaner case.

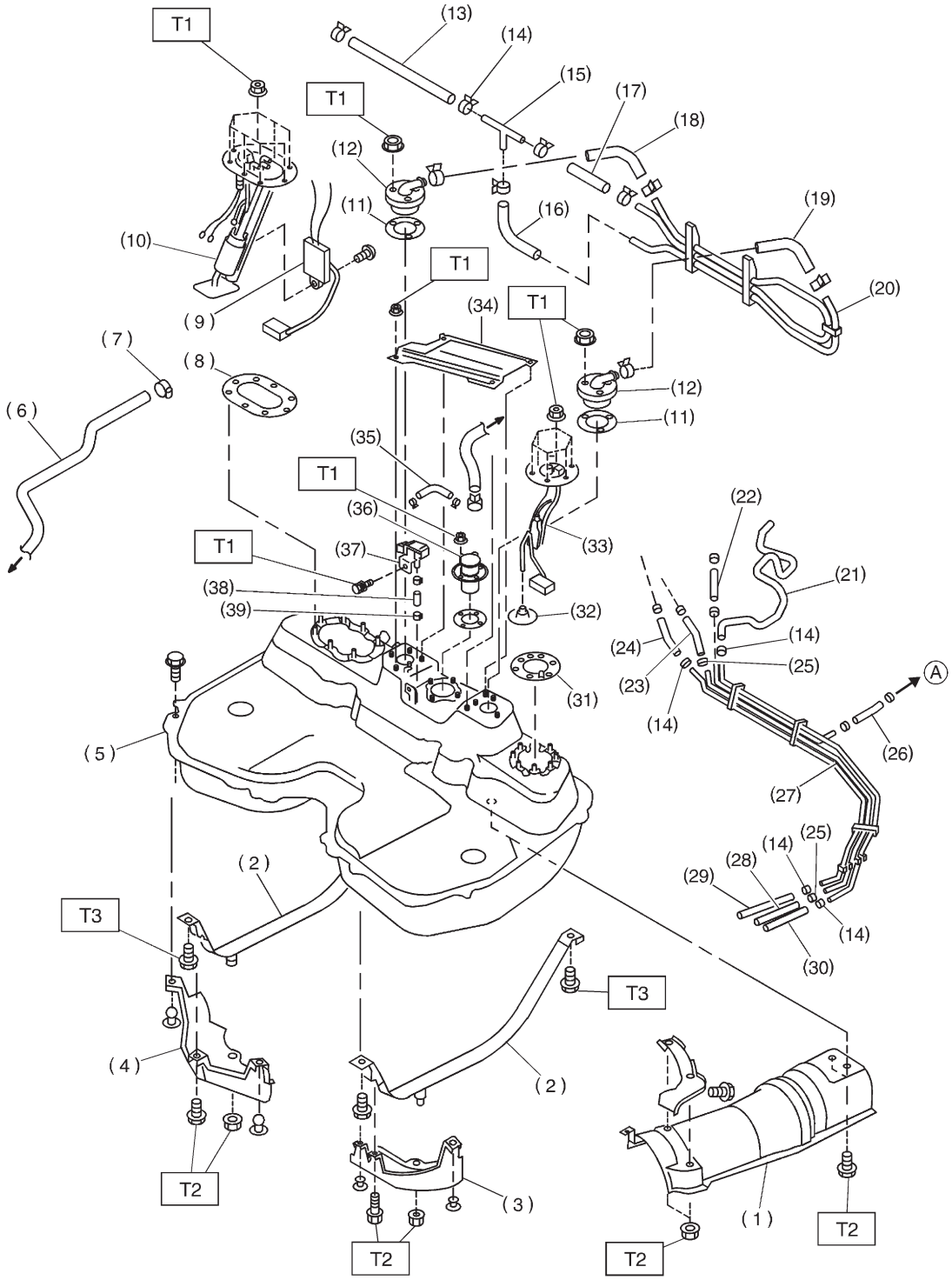


4) Installation is in the reverse order of removal.

1. Specifications

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Discharge pressure	299.1 kPa (3.05 kg/cm^2, 43.4 psi)
	Discharge flow	AWD: More than 80 ℓ (21.1 US gal, 17.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

1. Fuel Tank



B2M2379A

COMPONENT PARTS

1. Fuel Tank

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

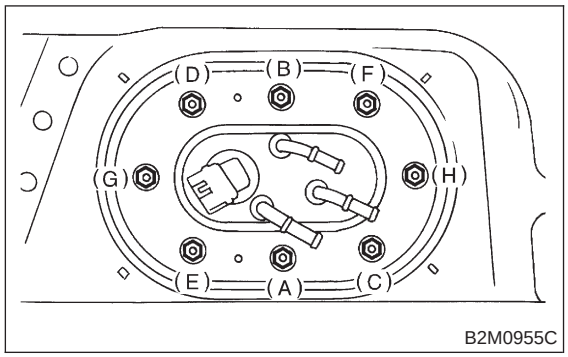
Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±1.5 (0.45±0.15, 3.3±1.1)
T2: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T3: 33±10 (3.4±1.0, 25±7)

B: INSTALLATION

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:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

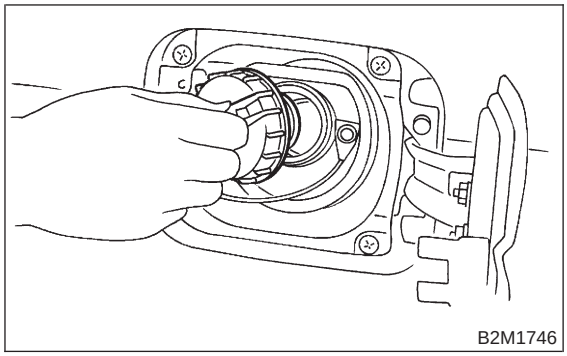
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



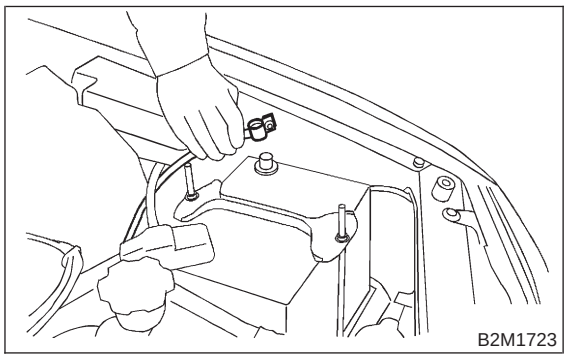
9. Fuel Tank Pressure Sensor

A: REMOVAL AND INSTALLATION

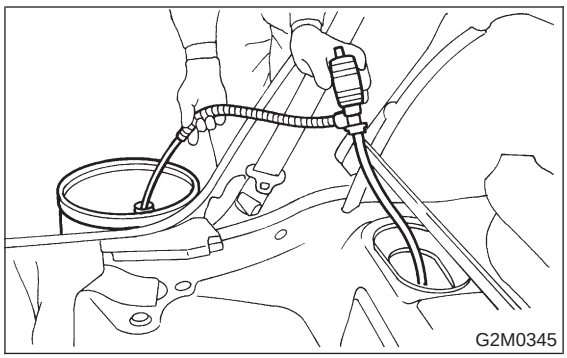
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



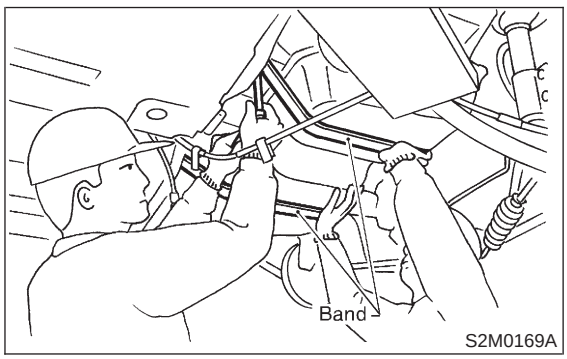
3) Disconnect battery ground cable.



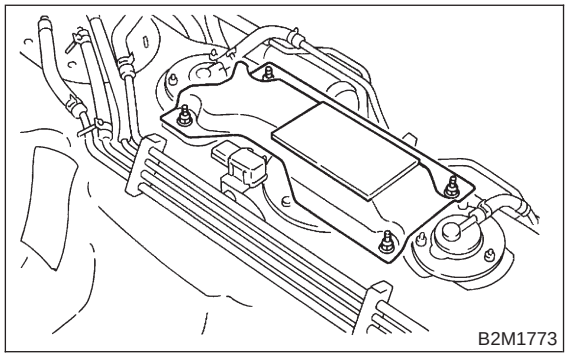
4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



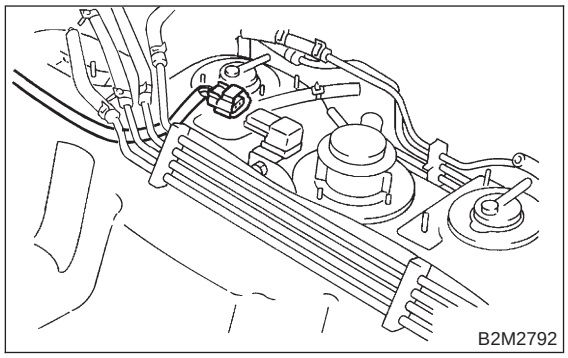
5) Remove fuel tank. <Ref. to 2-8 [W2A0].>



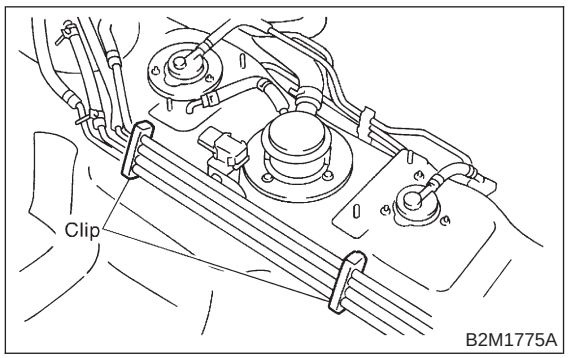
6) Remove protector cover.



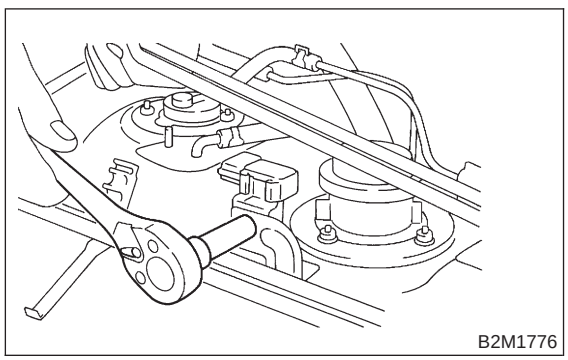
7) Disconnect connector from fuel tank pressure sensor.



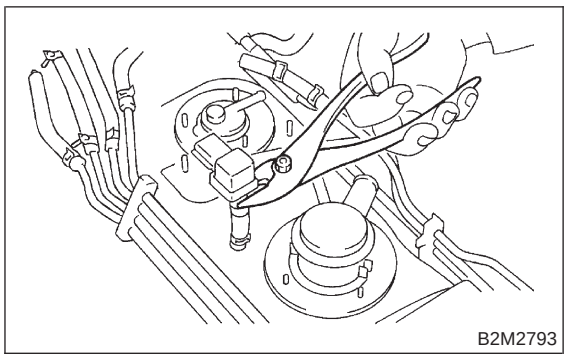
8) Release clips which hold fuel pipes onto fuel tank.



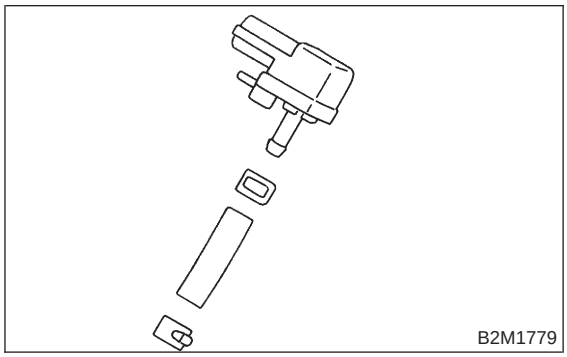
9) Move two fuel pipes to upper side, and remove bolt which install fuel tank pressure sensor to bracket.



10) Move clip, and disconnect pressure hose from fuel tank.

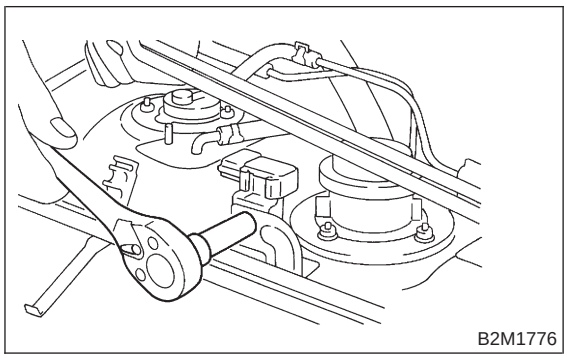


11) Disconnect pressure hose from fuel tank pressure sensor.

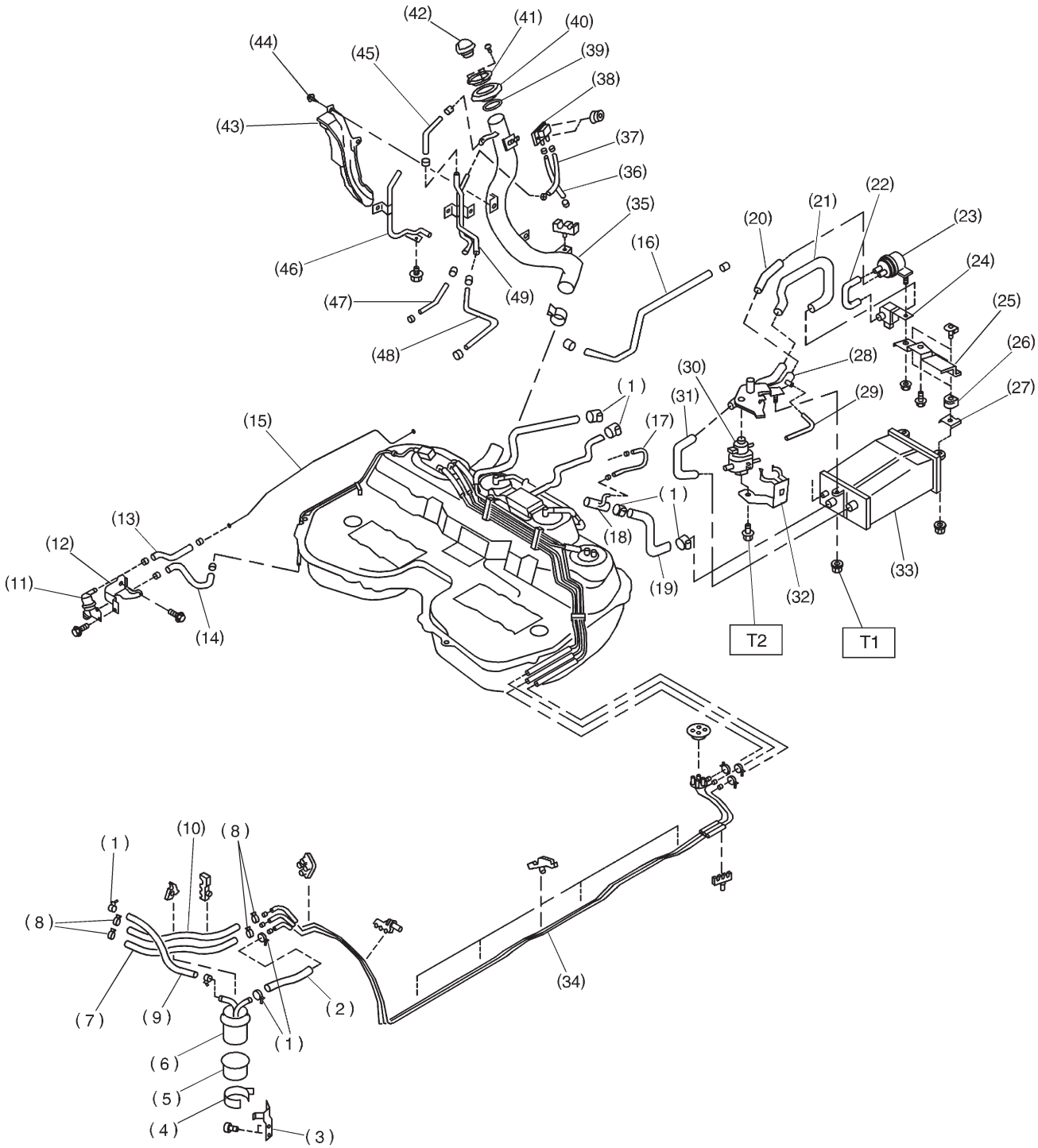


12) Installation is in the reverse order of removal.

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



2. Fuel Line



B2M2380A

COMPONENT PARTS

(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) Evaporation hose J
(17) Evaporation hose K
(18) Joint pipe
(19) Canister hose A
(20) Air filter hose A
(21) Drain valve hose
(22) Air filter hose B
(23) Air filter
(24) Drain valve
(25) Canister upper bracket
(26) Cushion rubber
(27) Canister lower bracket
(28) Canister holder
(29) Evaporation hose L
(30) Pressure control solenoid valve
(31) Canister hose B
(32) Pressure control solenoid valve holder
(33) Canister
(34) Fuel pipe ASSY
(35) Fuel filler pipe
(36) Evaporation hose M
(37) Evaporation hose N
(38) Shut valve
(39) Packing
(40) Ring A
(41) Ring B
(42) Fuel filler cap
(43) Fuel filler pipe protector
(44) Tapping screw
(45) Evaporation hose O
(46) Joint pipe
(47) Evaporation hose P
(48) Evaporation hose Q
(49) Evaporation pipe

Tightening torque: N·m (kg-m, ft-lb)
T1: 23±7 (2.3±0.7, 16.6±5.1)
T2: 25±7 (2.5±0.7, 18.1±5.1)

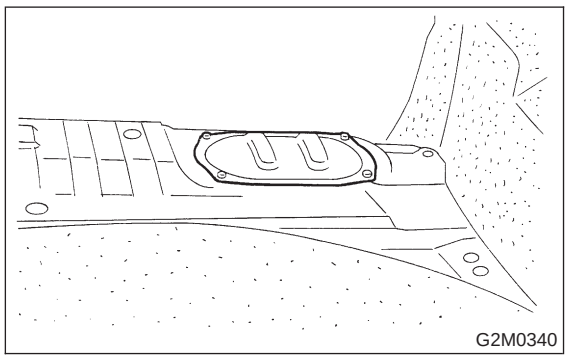
1. On-car Services

A: PRECAUTIONS

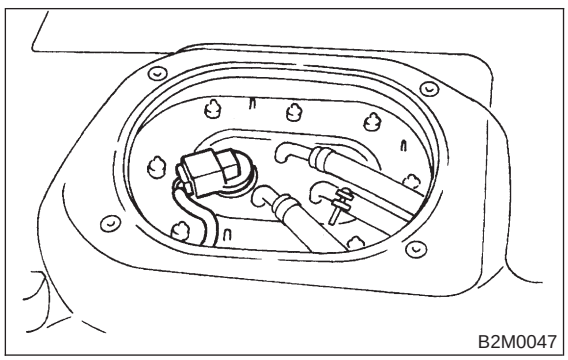
WARNING:
- **Place “No fire” signs near the working area.**
- **Disconnect ground terminal from battery.**
- **Be careful not to spill fuel on the floor.**

B: RELEASING OF FUEL PRESSURE

1) Take off floor mat.
2) Remove access hole lid.



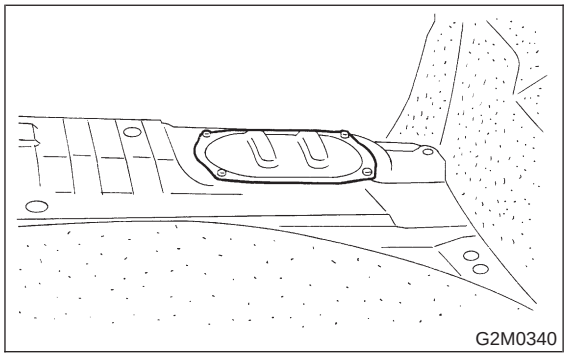
3) Disconnect connector from fuel pump.



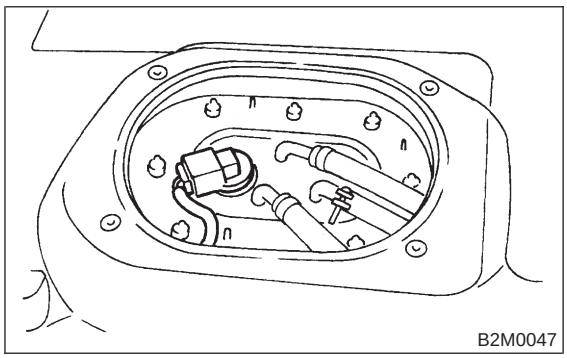
4) Start the engine, and run it until it stalls.
5) After the engine stalls, crank it for five more seconds.
6) Turn ignition switch OFF.

C: DRAINING OF FUEL

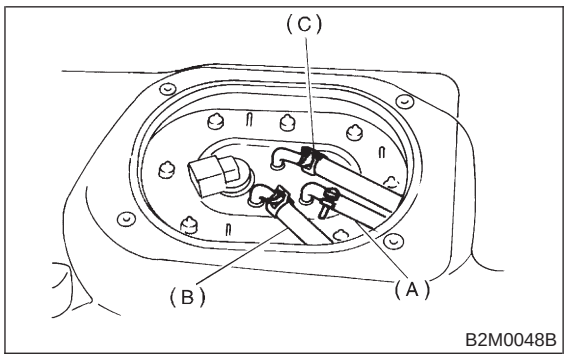
1) Remove rear seat and seat back.
2) Remove access hole lid.



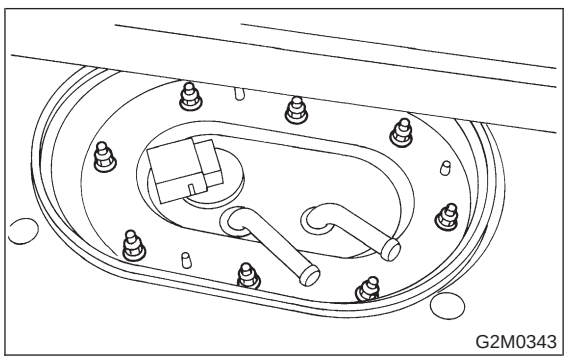
3) Disconnect connector from fuel pump.



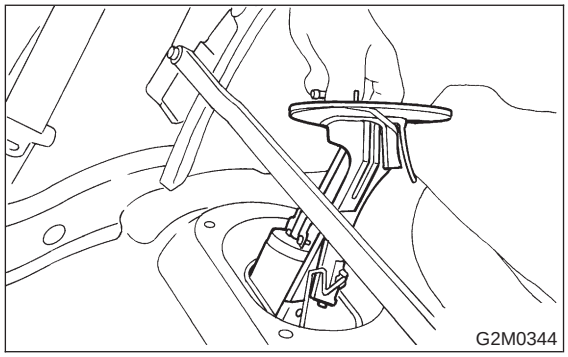
4) Release fuel pressure. <Ref. to 2-8 [W1B0].>
5) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).



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

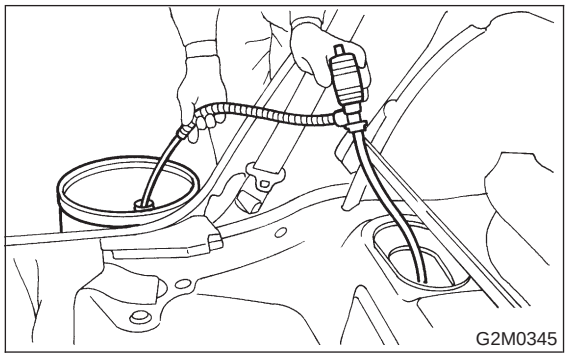


7) Take off fuel pump from fuel tank.


G2M0344

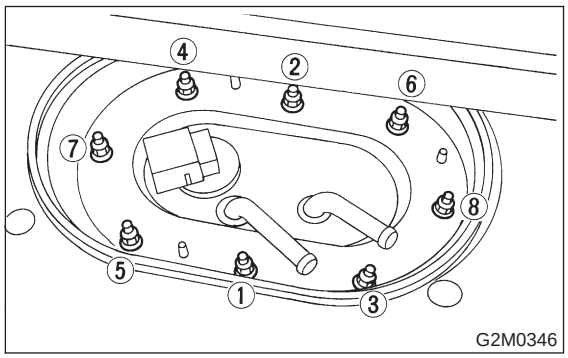
8) Drain fuel from fuel tank by using a hand pump.

WARNING:
Do not use a motor pump when draining fuel.


G2M0345

9) After draining fuel, reinstall fuel pump.
Tighten nuts in numerical sequence shown in figure to specified torque.

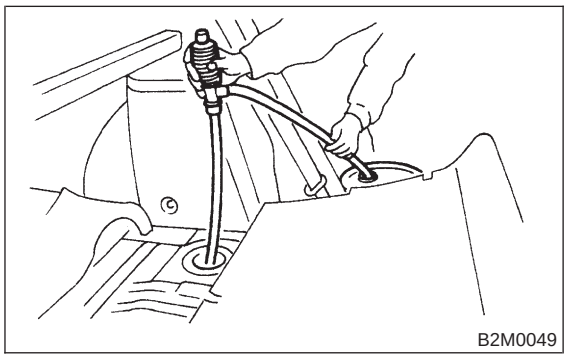
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



G2M0346

10) After removing fuel sub meter unit, drain fuel from there.

WARNING:
Do not use a motor pump when draining fuel.

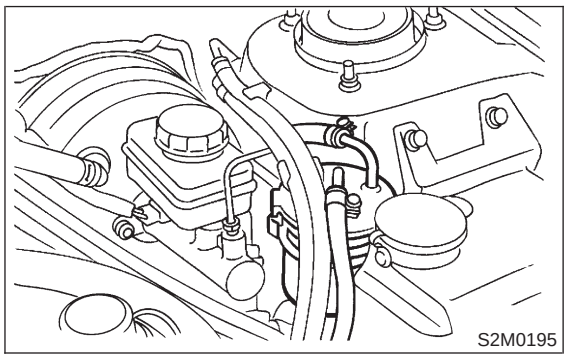

B2M0049

D: MEASUREMENT OF FUEL PRESSURE

WARNING:
Before removing fuel pressure gauge, release fuel pressure.

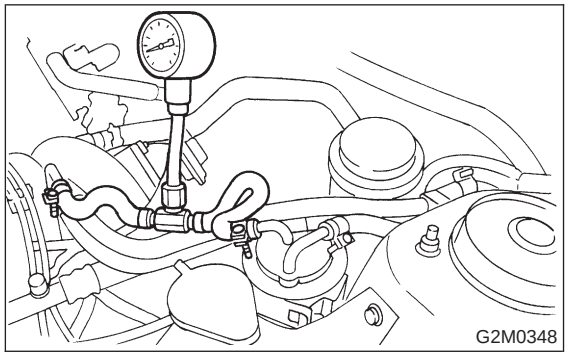
NOTE:
If out of specification as measured at step 6), check or replace pressure regulator and pressure regulator vacuum hose.

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Connect connector to fuel pump.
3) Disconnect fuel delivery hoses from fuel filter, and connect fuel pressure gauge.


S2M0195

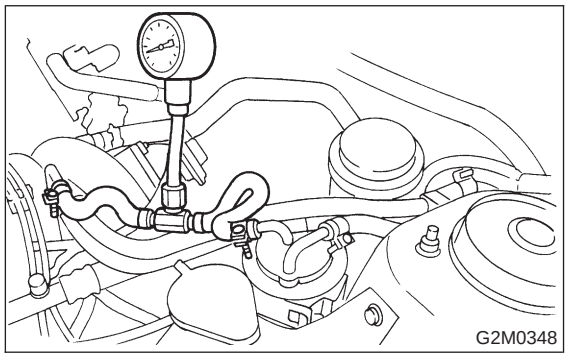
4) Start the engine.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from collector chamber.

Fuel pressure:
284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



6) After connecting pressure regulator vacuum hose, measure fuel pressure.

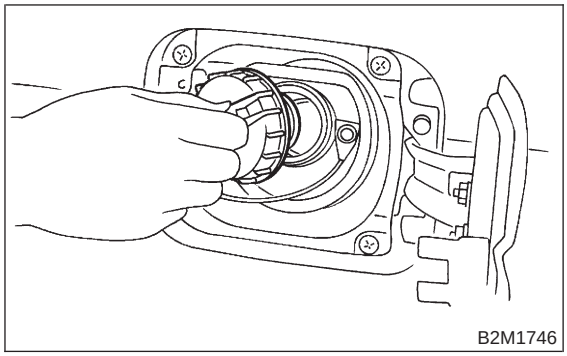
Fuel pressure:
177 — 206 kPa (1.8 — 2.1 kg/cm², 26 — 30 psi)



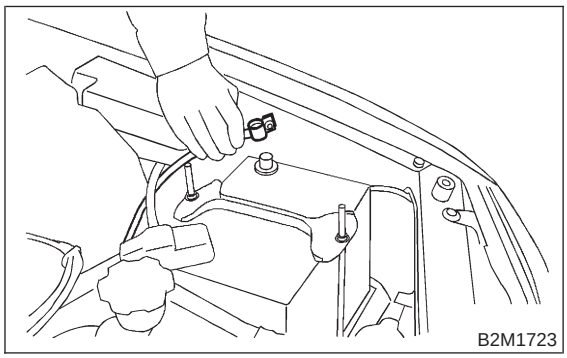
2. Fuel Tank

A: REMOVAL

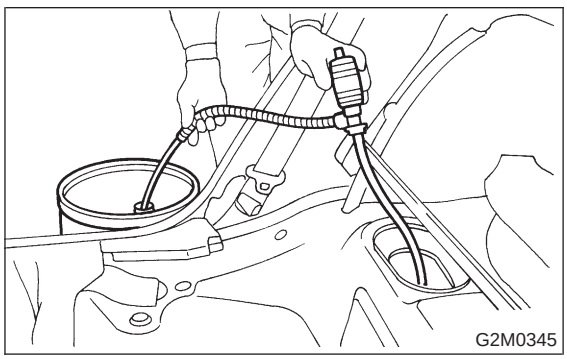
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



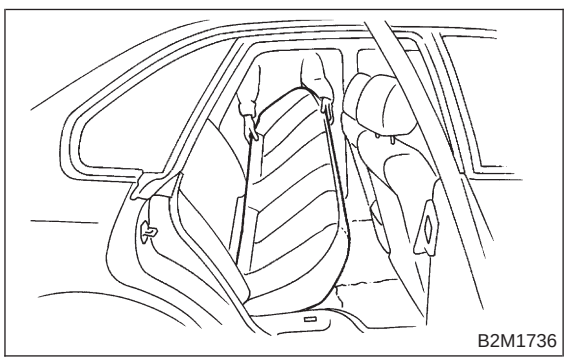
3) Disconnect battery ground cable.



4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>

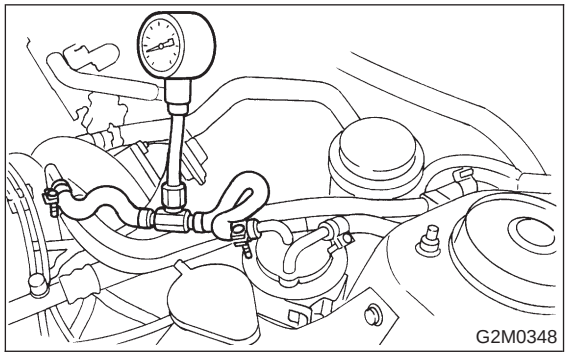


5) Remove rear seat cushion. (Sedan model) <Ref. to 5-3 [W2A1].>



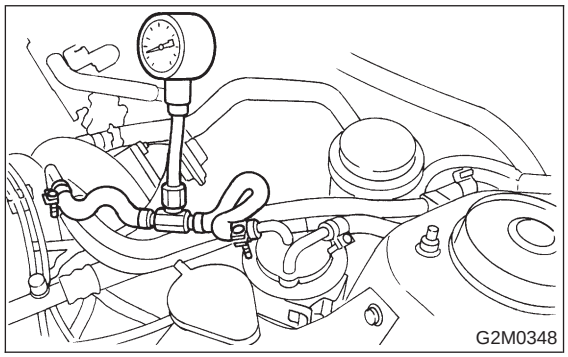
4) Start the engine.
5) Measure fuel pressure while disconnecting pressure regulator vacuum hose from collector chamber.

Fuel pressure:
284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



6) After connecting pressure regulator vacuum hose, measure fuel pressure.

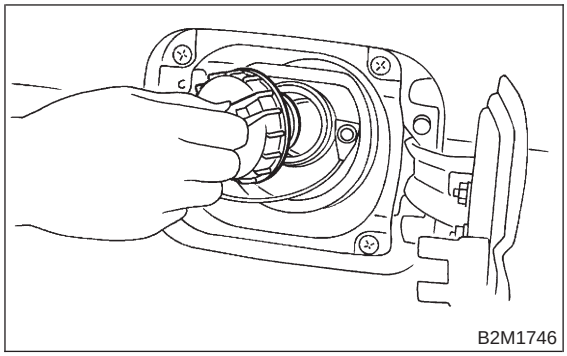
Fuel pressure:
177 — 206 kPa (1.8 — 2.1 kg/cm², 26 — 30 psi)



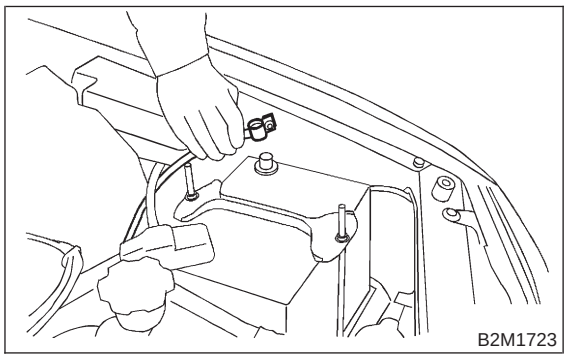
2. Fuel Tank

A: REMOVAL

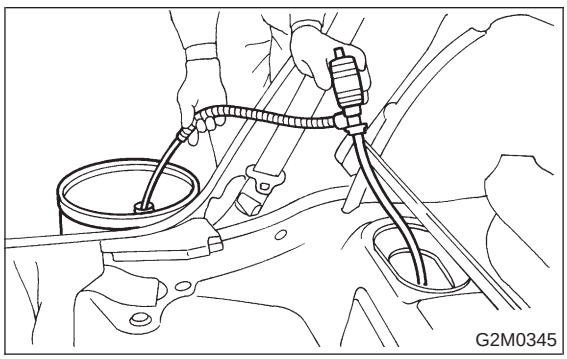
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



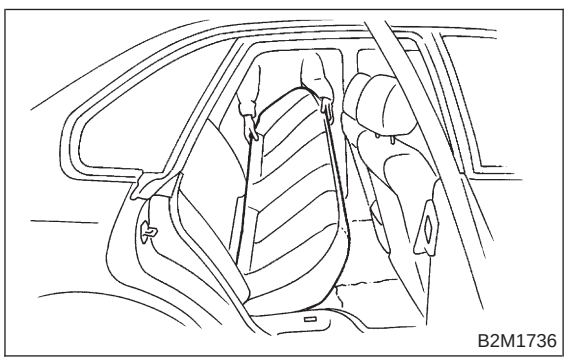
3) Disconnect battery ground cable.



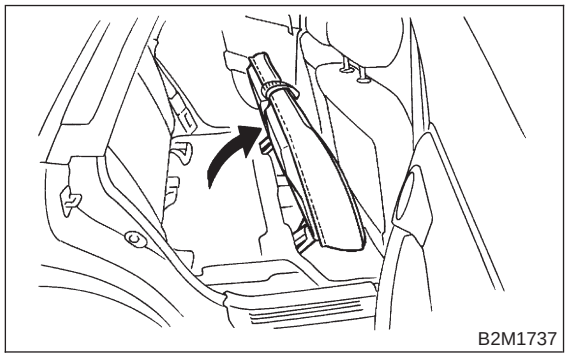
4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



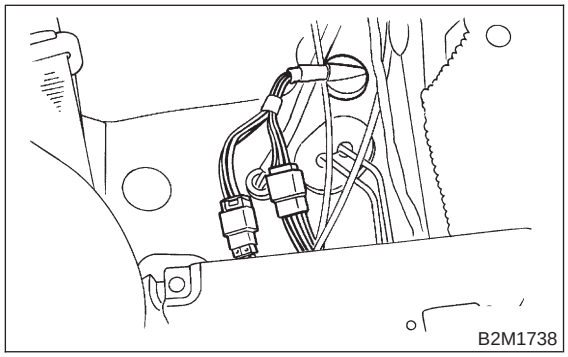
5) Remove rear seat cushion. (Sedan model) <Ref. to 5-3 [W2A1].>



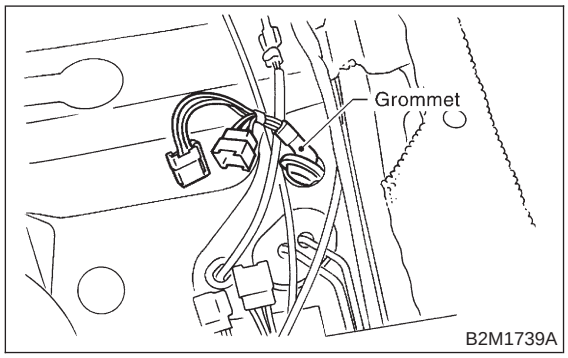
6) Move rear seat cushion forward. (Wagon model)



7) Disconnect connector of fuel tank cord from rear harness.



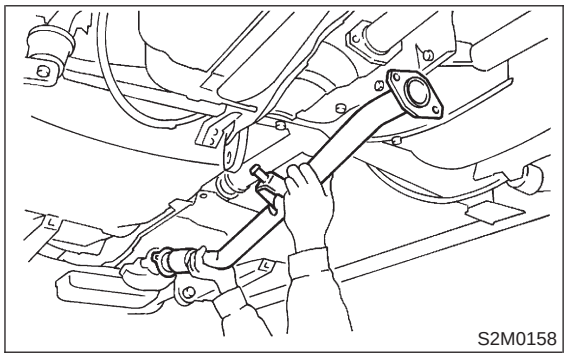
8) Push grommet which holds fuel tank cord on floor panel into under the body.



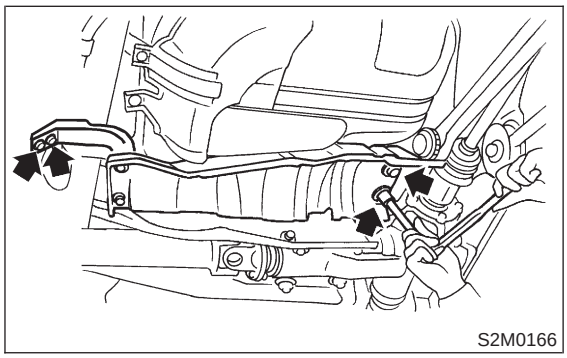
9) Lift-up the vehicle.
10) Remove rear exhaust pipe.
(1) Separate rear exhaust pipe from center exhaust pipe.
(2) Separate rear exhaust pipe from muffler.
(3) Remove bracket from rubber cushion, and remove exhaust pipe.

NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (Part No. 004301003). <Ref. to 2-9 [W3A0].>

Separate rear exhaust pipe from muffler.

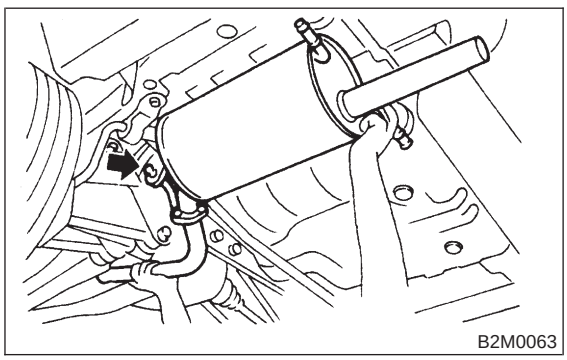


11) Remove heat sealed cover.

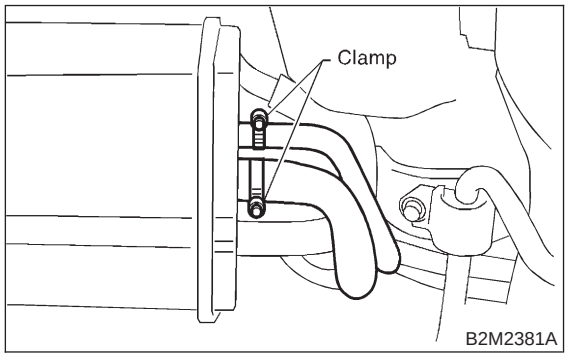


12) Remove muffler assembly.
<Ref. to 2-9 [W4A0].>

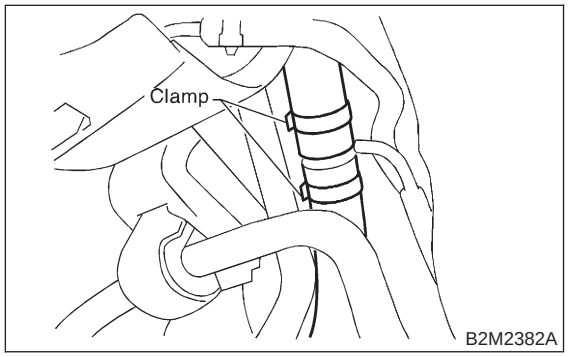
NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (Part No. 004301003).



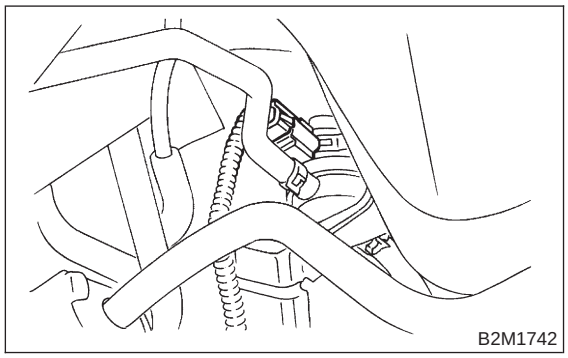
13) Loosen clamp, and disconnect evaporation hose from canister.



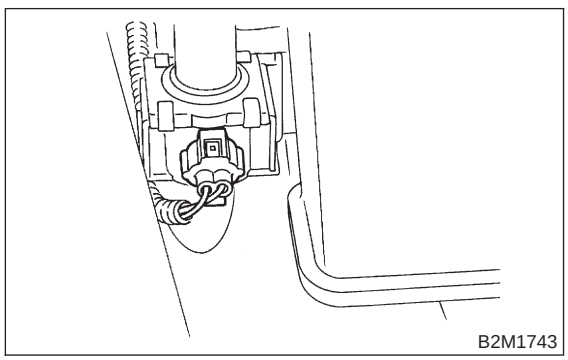
14) Loosen clamp, disconnect hose from joint pipe.



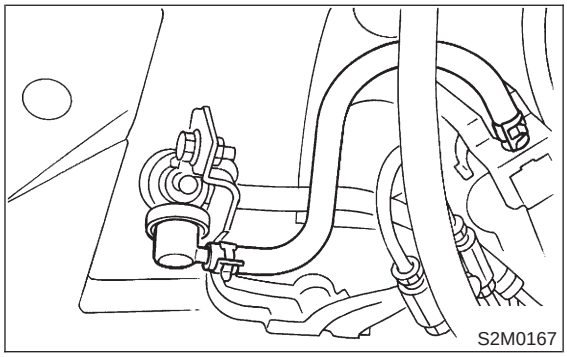
15) Disconnect connector from pressure control solenoid valve.



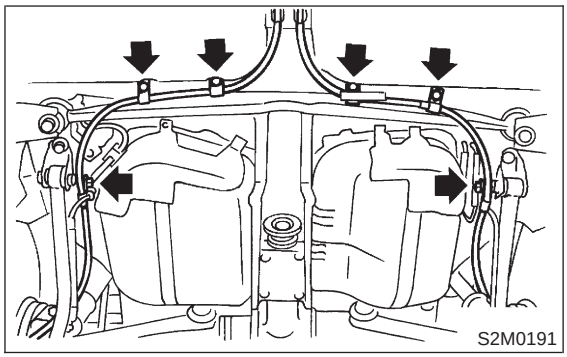
16) Disconnect connector from drain valve.



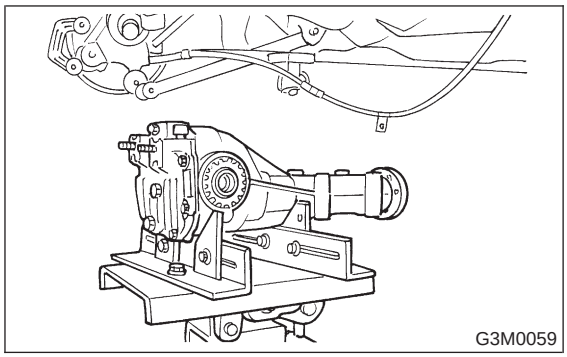
17) Disconnect hoses from roll over valve.



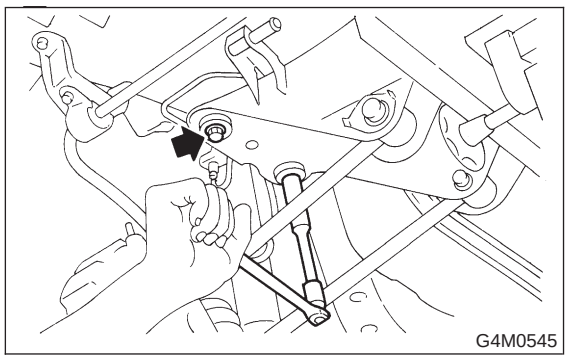
18) Remove bolts which hold parking brake cable holding bracket.



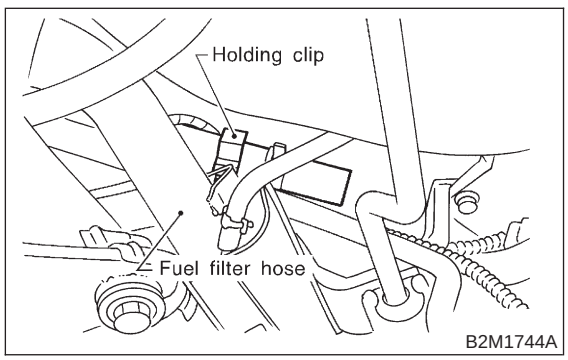
19) Remove rear differential assembly.
(1) Remove rear axle shafts from rear differential assembly.
(2) Remove rear differential front cover.
(3) Remove propeller shaft.
(4) Remove lower differential bracket.
(5) Set transmission jack under rear differential.
(6) Remove bolts which install rear differential onto rear crossmember.
<Ref. to 3-4 [W2B0].>



20) Remove rear crossmember.
<Ref. to 4-1 [W10A0].>

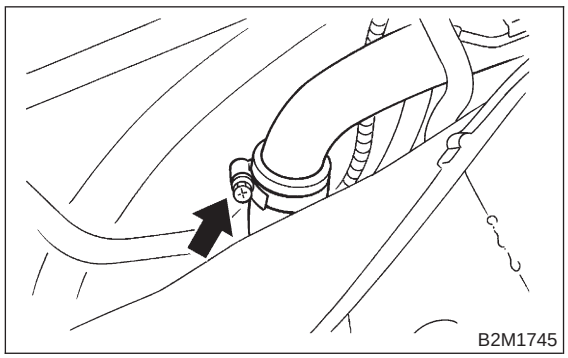

G4M0545

21) Remove two evaporation hoses from holding clip.

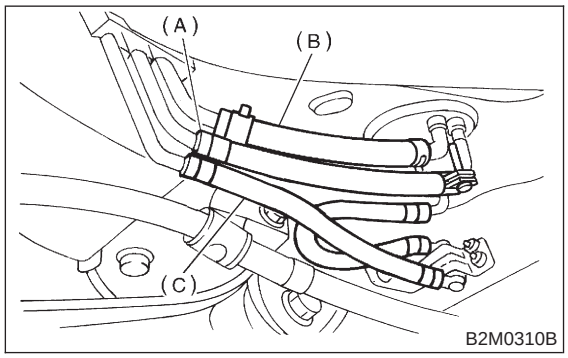


B2M1744A

22) Loosen clamp, and disconnect fuel filler hose.


B2M1745

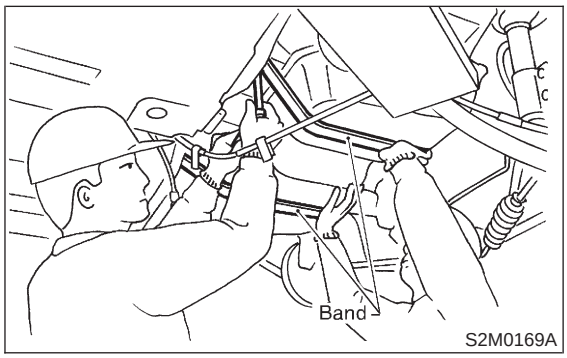
23) Loosen clamp, and then disconnect fuel delivery hose (A).
24) Move clips, and disconnect fuel return hose (B) and evaporation hose (C).



B2M0310B

25) While holding fuel tank, remove bolts from bands and dismount fuel tank.

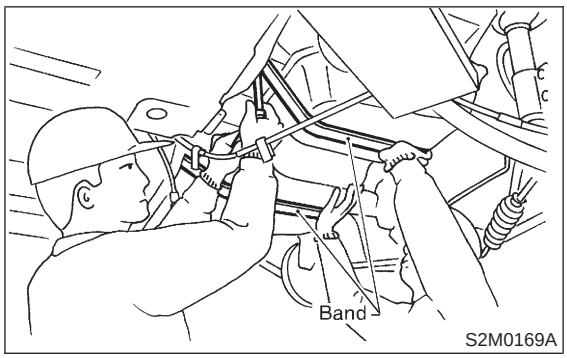
WARNING:
A helper is required to perform this work.



S2M0169A

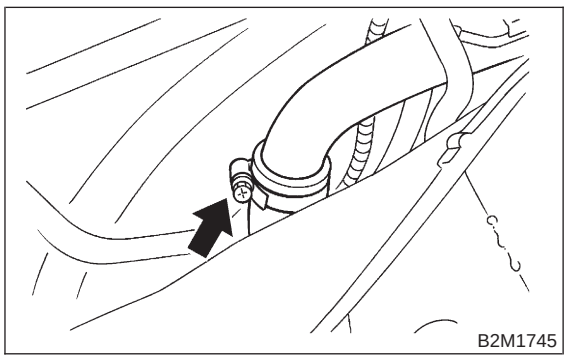
B: INSTALLATION

1) While a helper holds fuel tank, push fuel tank harness into access hole with grommet.
2) Set fuel tank, and temporary tighten bolts for installing fuel tank bands.

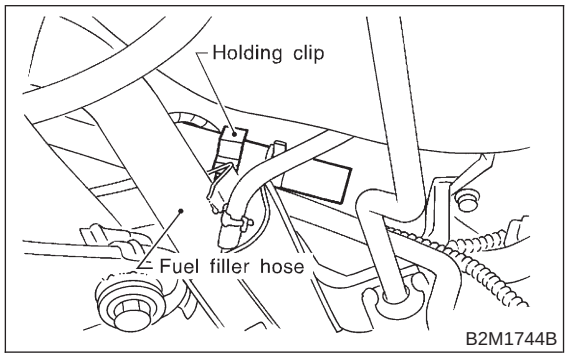


S2M0169A

3) Connect fuel filler hose, and tighten clamp.


B2M1745

4) Install two evaporation hoses to holding clip.



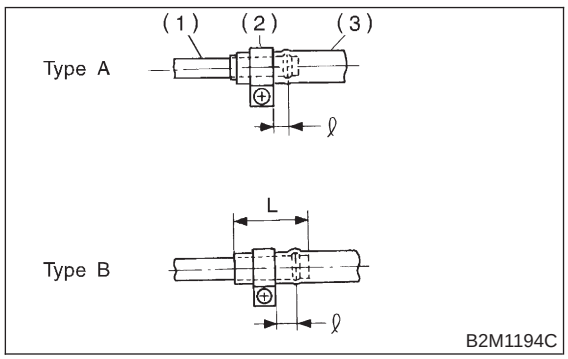
5) Install hose and hold down clips at positions indicated in Figure.

Tightening torque:
$1.0^{+0.5}/_{-0}$ N·m ($0.1^{+0.05}/_{-0}$ kg-m, $0.7^{+0.4}/_{-0}$ ft-lb)

Type A: When fitting length is specified.
Type B: When fitting length is not specified.

ℓ : 1.0 — 4.0 mm (0.039 — 0.157 in)

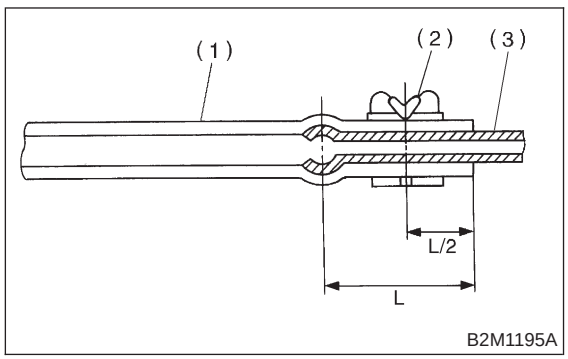
L: 20 — 25 mm (0.79 — 0.98 in)



(1) Fitting
(2) Clamp
(3) Hose

Fuel return hose:
L = 20 — 25 mm (0.79 — 0.98 in)

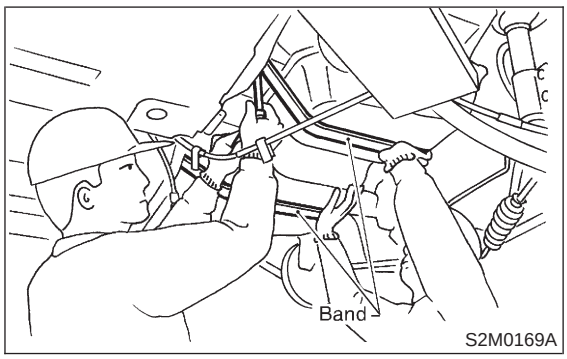
Evaporation hose:
L = 15 — 20 mm (0.59 — 0.79 in)



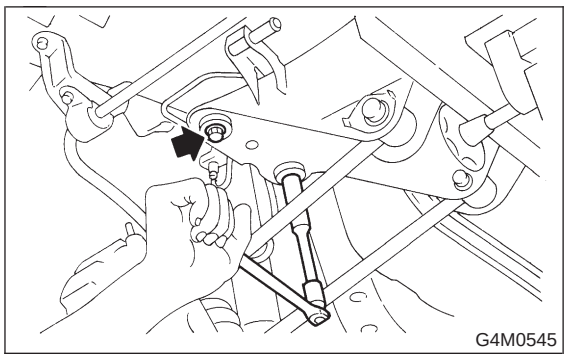
(1) Hose
(2) Clip
(3) Pipe

6) Tighten band mounting bolts.

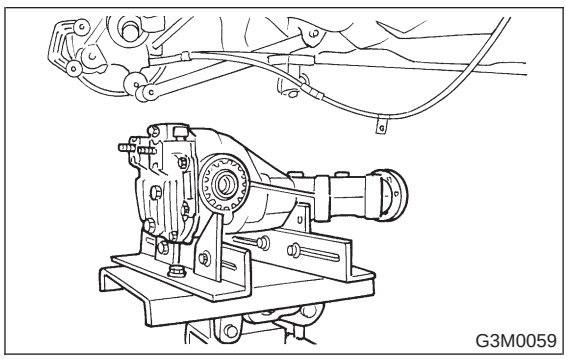
Tightening torque:
33±10 N·m (3.4±1.0 kg-m, 25±7 ft-lb)



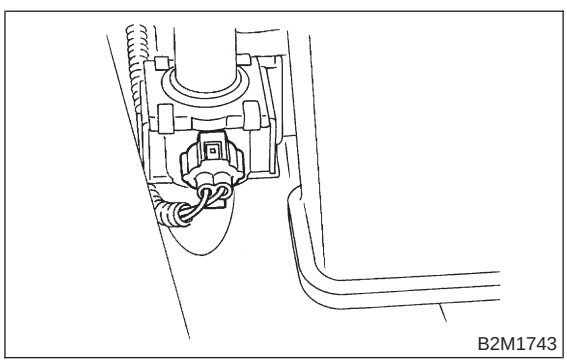
7) Install rear crossmember. <Ref. to 4-1 [W10C0].>



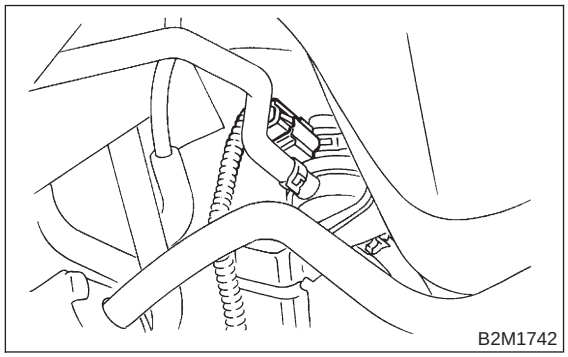
8) Install rear differential assembly. <Ref. to 3-4 [W2F0].>



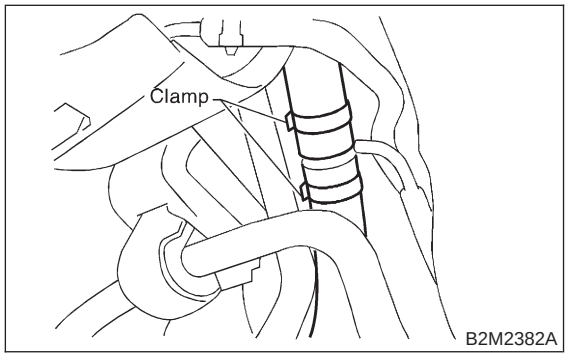
9) Connect connector to drain valve.



10) Connect connector to pressure control solenoid valve.

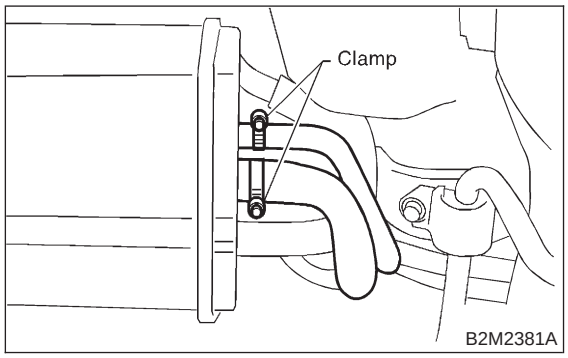

B2M1742

11) Connect hose to joint pipe, and tighten them with clamp.



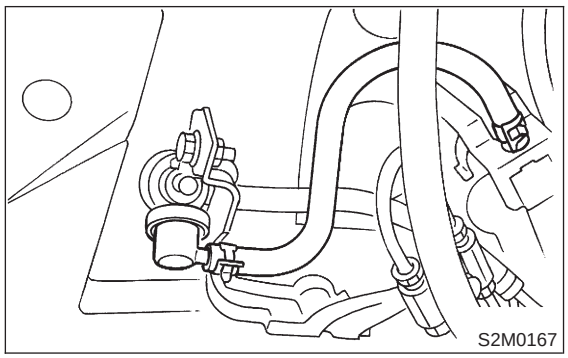
B2M2382A

12) Connect evaporation hose to canister, and tighten them with clamp.

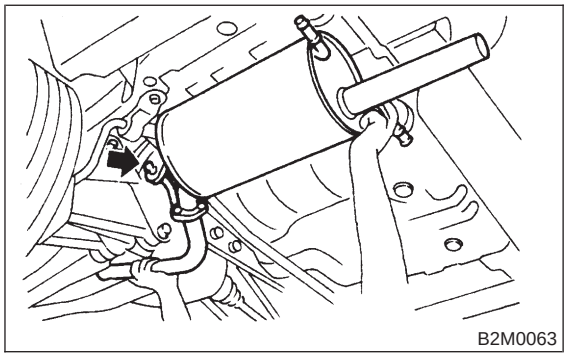


B2M2381A

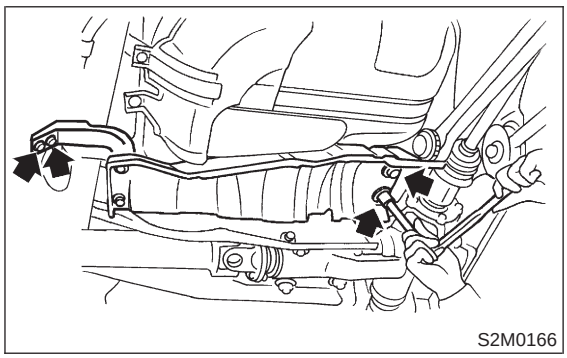
13) Connect hoses to roll over valve.


S2M0167

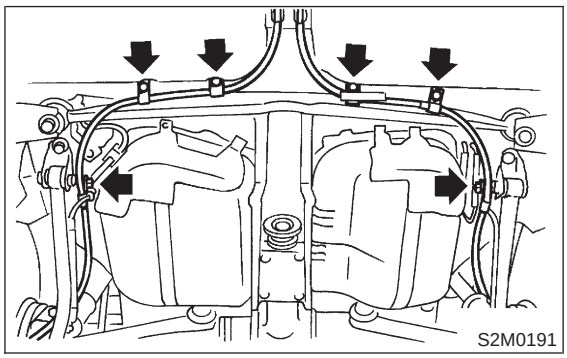
14) Install muffler assembly. <Ref. to 2-9 [W4A0].>


B2M0063

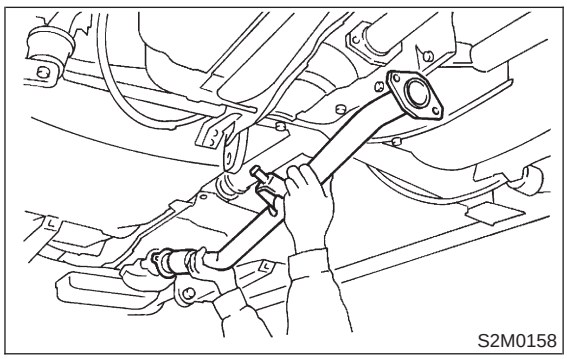
15) Install heat sealed cover.


S2M0166

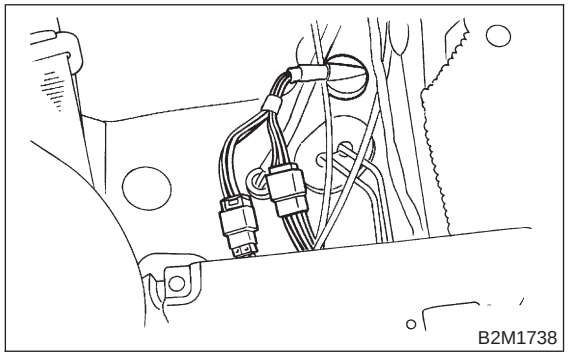
16) Install bolts which hold parking brake holding bracket.


S2M0191

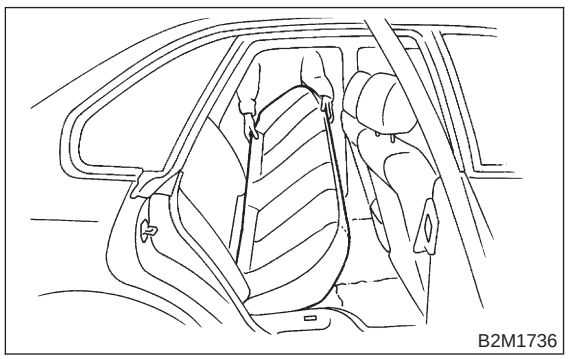
17) Install rear exhaust pipe. <Ref. to 2-9 [W3B0].>


S2M0158

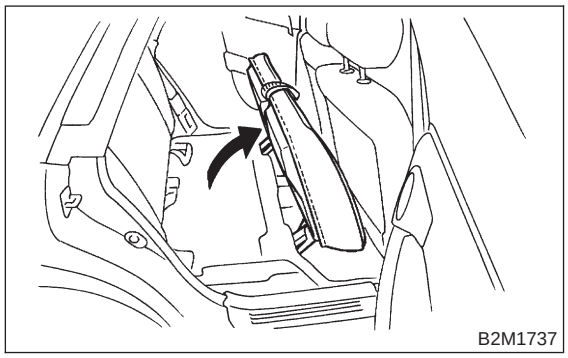
18) Lower the vehicle.
19) Connect connectors to fuel tank harness, and plug access hole with grommet.


B2M1738

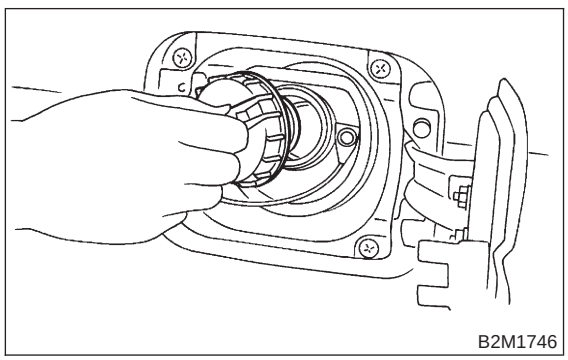
20) Install rear seat cushion. (Sedan model) <Ref. to 5-3 [W2B1].>


B2M1736

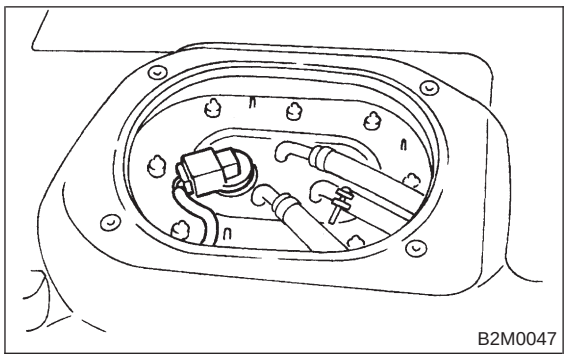
21) Set rear seat cushion. (Wagon model)


B2M1737

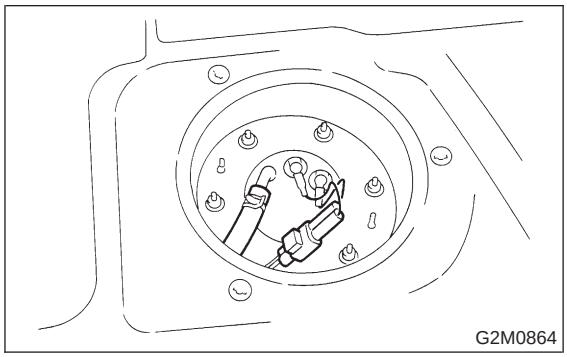
22) Install fuel filler cap.


B2M1746

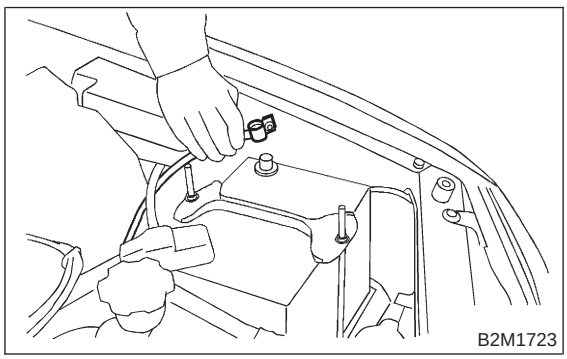
23) Install fuel pump, and connect connector and fuel hoses. <Ref. to 2-8 [W5C0].>


B2M0047

24) Install fuel sub meter unit, and connect connector and jet pump hose. <Ref. to 2-8 [W9A0].>


G2M0864

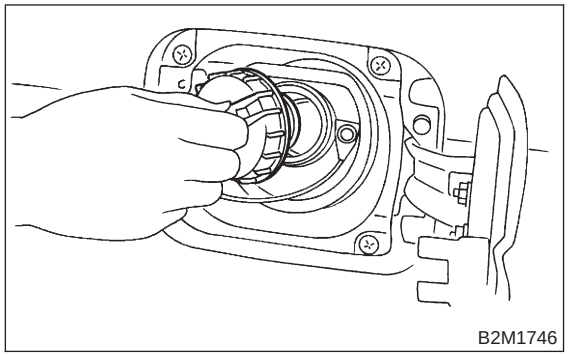
25) Connect battery ground cable.


B2M1723

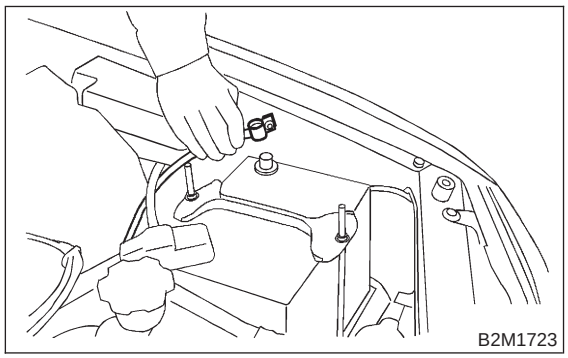
3. Fuel Filler Pipe

A: REMOVAL

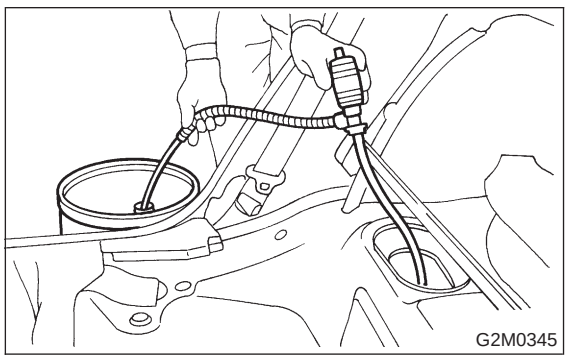
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M1746

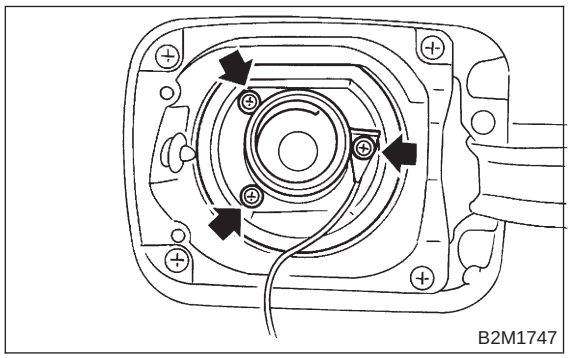
3) Disconnect battery ground cable.


B2M1723

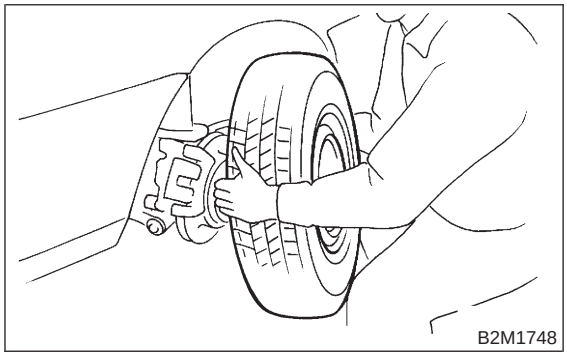
4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>


G2M0345

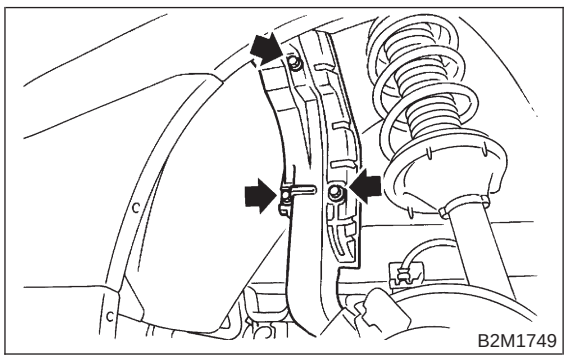
5) Remove screws which install fuel filler pipe on filler lid open.


B2M1747

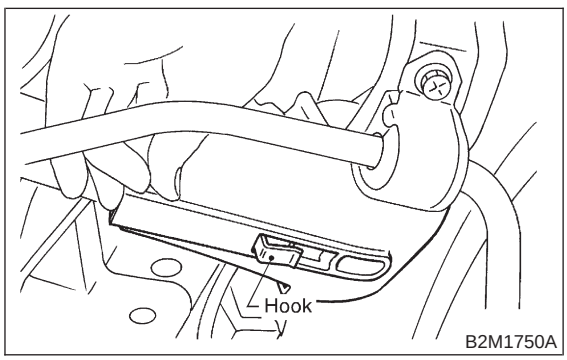
6) Remove wheel nuts of rear right side.
7) Lift-up the vehicle.
8) Remove rear right side wheel.


B2M1748

9) Remove bolts which install protector cover on body.

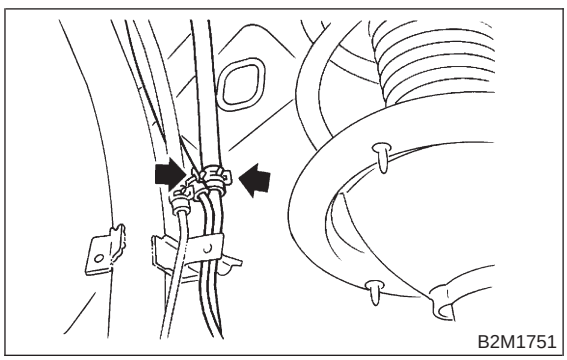

B2M1749

10) While releasing the under side of protector cover from hook, remove it.

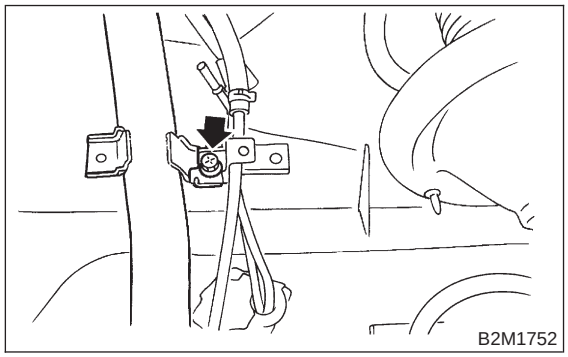


B2M1750A

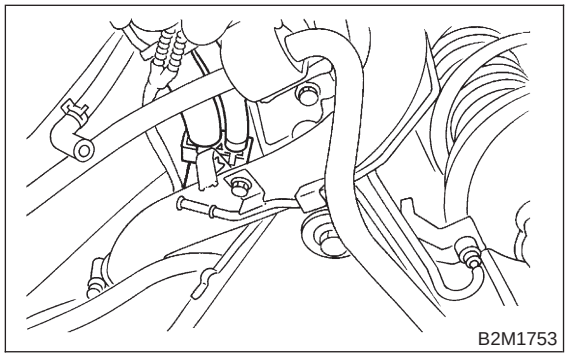
11) Disconnect evaporation hoses from pipes.


B2M1751

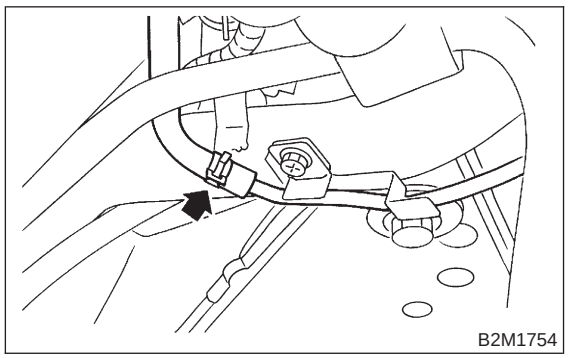
12) Remove bolts which hold fuel filler pipe bracket.



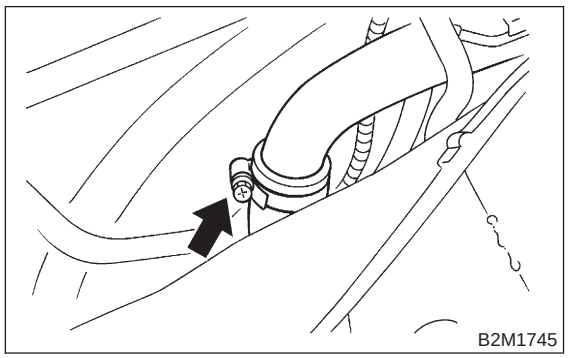
13) Lift-up the vehicle more.
14) Remove two evaporation hoses from clip.



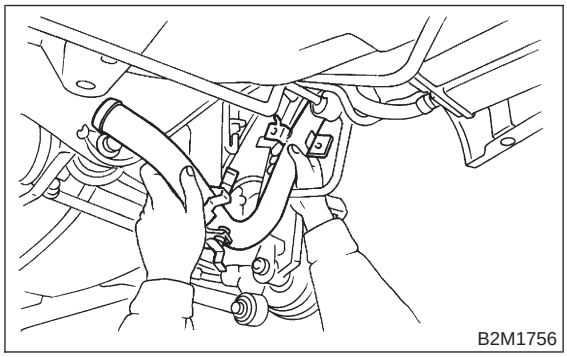
15) Disconnect evaporation hose from joint pipe.



16) Loosen clamp, and disconnect fuel filler hose from fuel filler pipe.

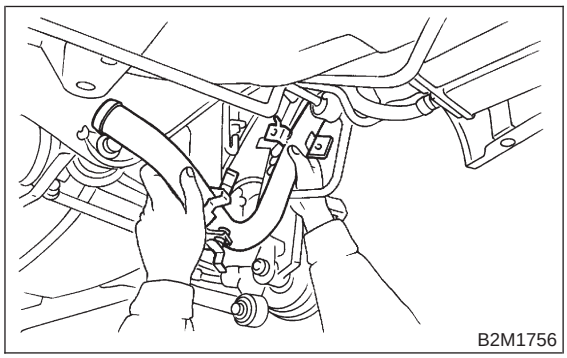


17) Remove fuel filler pipe to under side of vehicle.

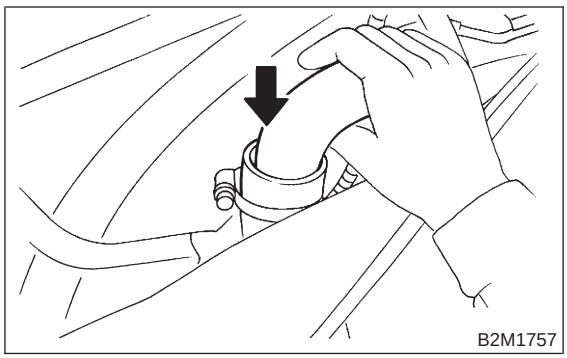


B: INSTALLATION

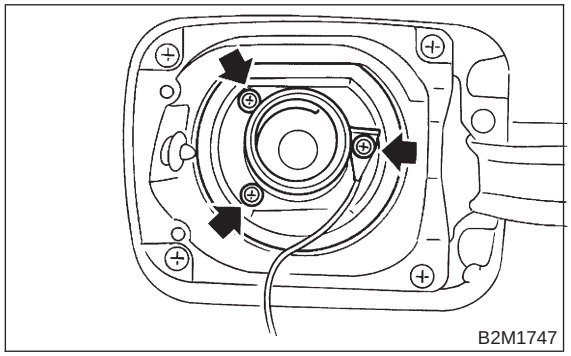
1) Set fuel filler pipe from under side of vehicle, and hold it on fuel filler flap open.



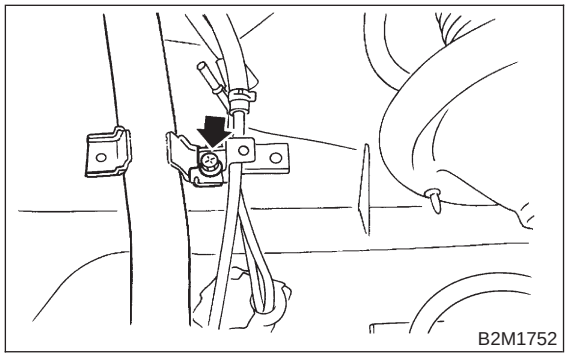
2) Connect fuel filler pipe into fuel filler hose.



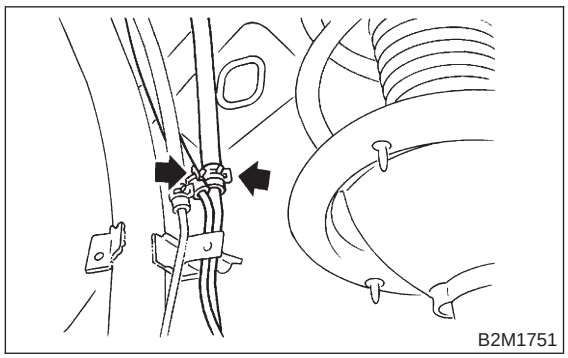
3) Lower the vehicle.
4) Temporarily tighten screws which install fuel filler pipe on filler lid open.


B2M1747

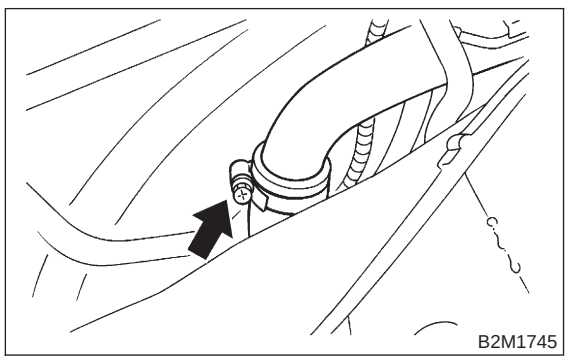
5) Tighten bolt which holds fuel filler pipe on body.


B2M1752

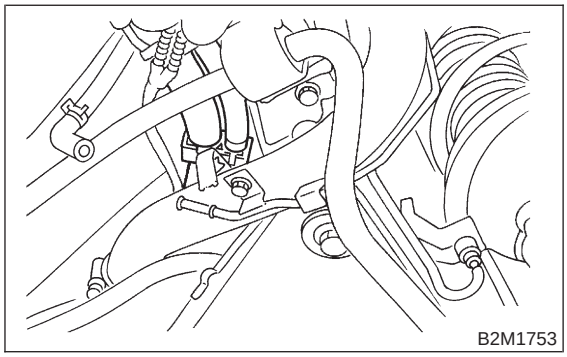
6) Connect evaporation hoses to pipes.


B2M1751

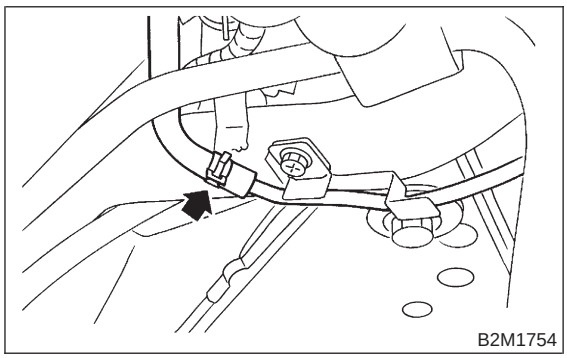
7) Lift-up the vehicle.
8) Tighten clamp bolt which holds fuel filler hose.


B2M1745

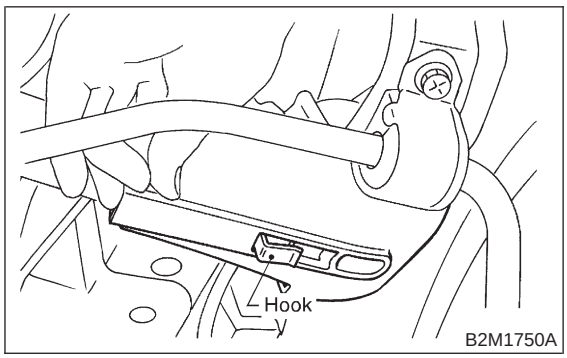
9) Install two evaporation hoses to clip.


B2M1753

10) Connect evaporation hose to joint pipe.

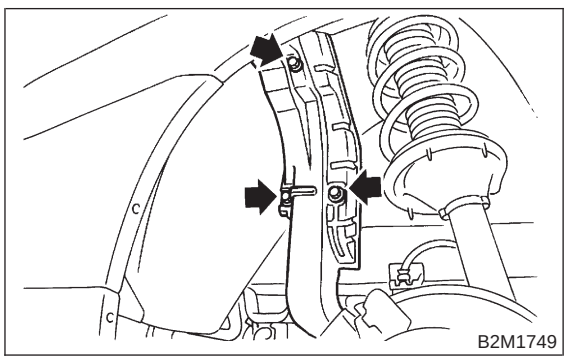

B2M1754

11) Lower the vehicle.
12) While holding the under side of protector cover on bracket, install it.

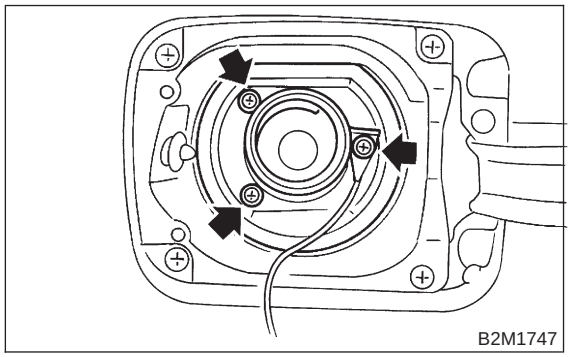


B2M1750A

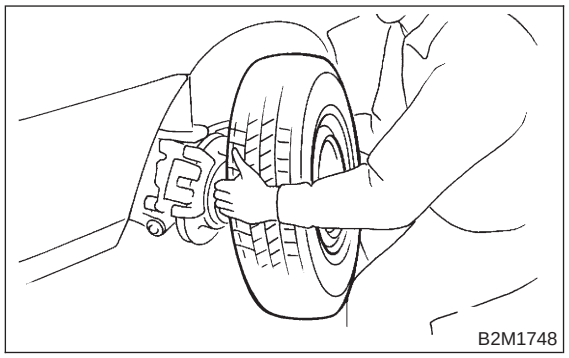
13) Tighten bolts which install protector cover on body.


B2M1749

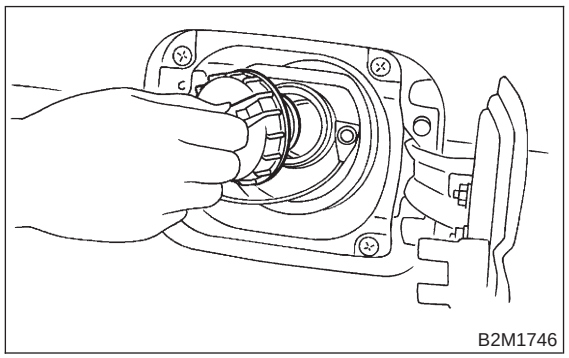
14) Tighten screws which install fuel filler pipe on filler lid open.


B2M1747

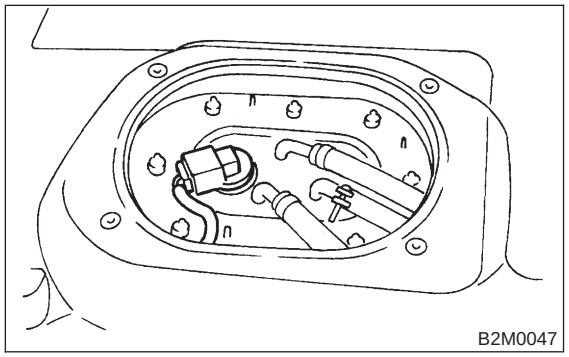
15) Install rear right wheel.


B2M1748

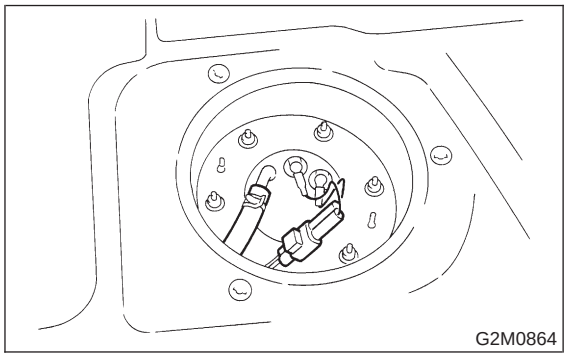
16) Install fuel filler cap.


B2M1746

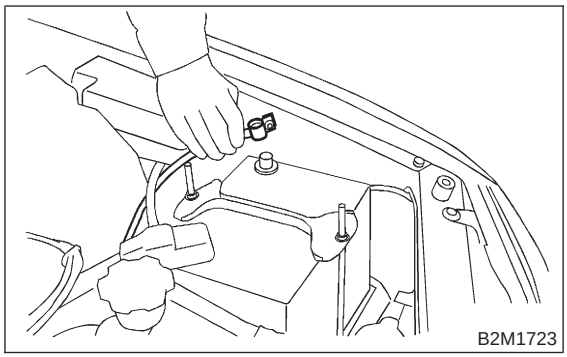
17) Install fuel pump, and connect connector and fuel hoses. <Ref. to 2-8 [W5C0].>


B2M0047

18) Install fuel sub meter unit, and connect connector and jet pump hose. <Ref. to 2-8 [W9A0].>

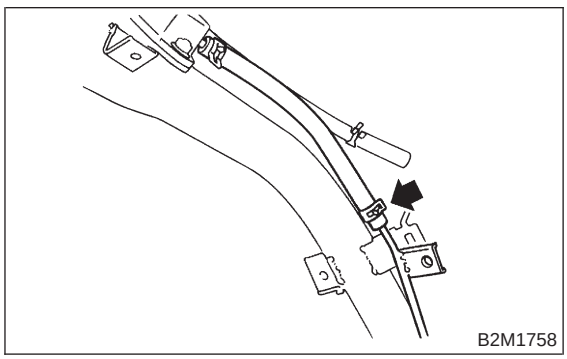

G2M0864

19) Connect battery ground terminal.

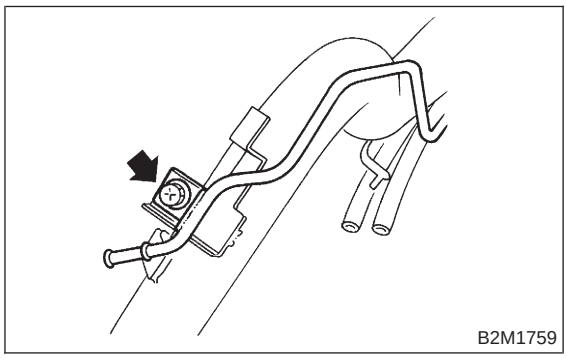

B2M1723

C: DISASSEMBLY

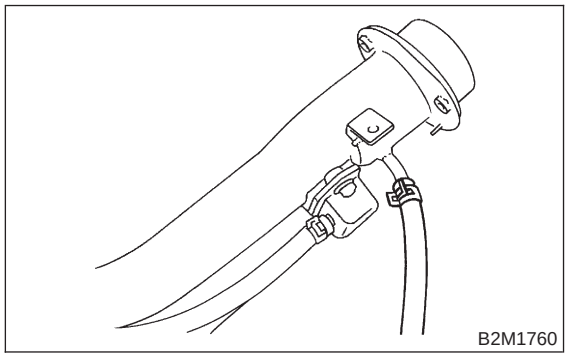
1) Move clip, and disconnect evaporation hose from joint pipe.


B2M1758

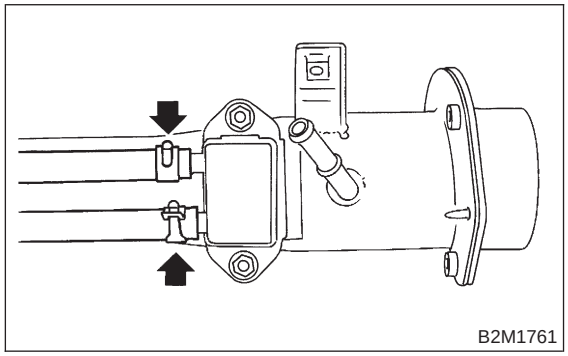
2) Remove bolt which installs joint pipe on fuel filler pipe.


B2M1759

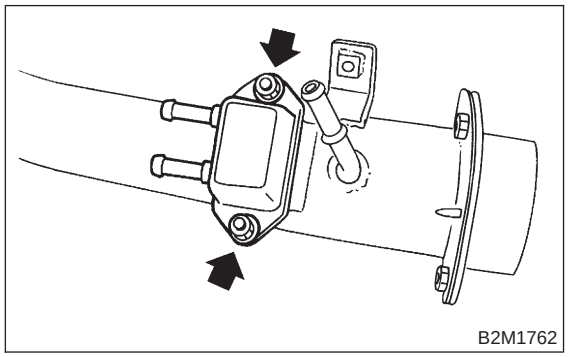
3) Disconnect evaporation hose from fuel filler pipe.



4) Disconnect evaporation hoses from shut valve.



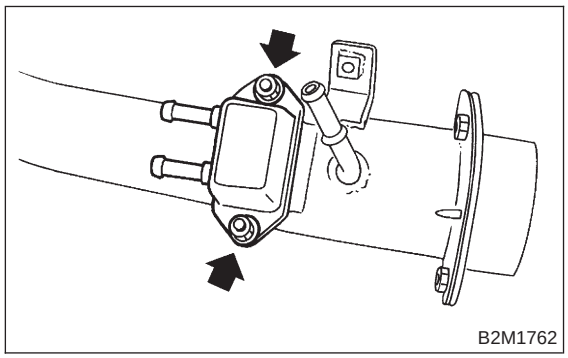
5) Remove shut valve from fuel filler pipe.



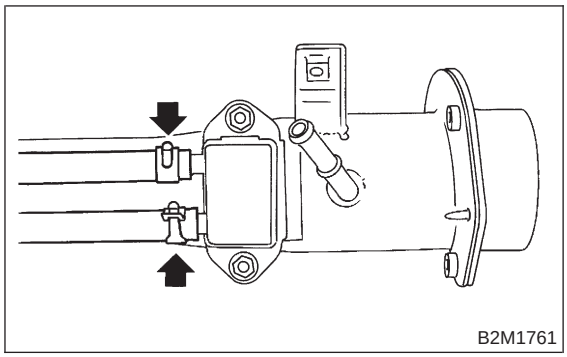
D: ASSEMBLY

1) Install shut valve on fuel filler pipe.

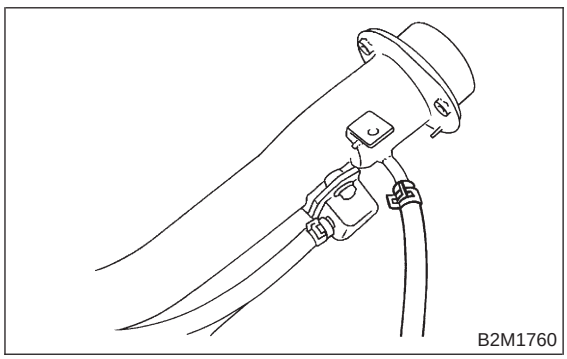
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



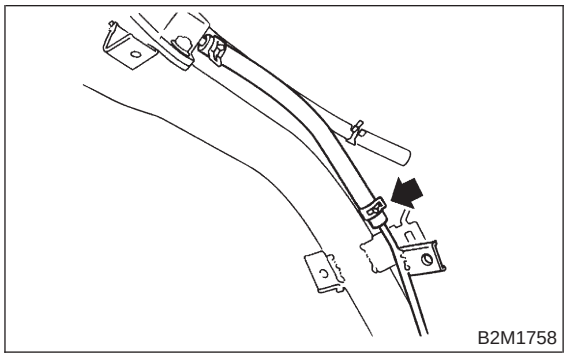
2) Connect evaporation hoses to shut valve.



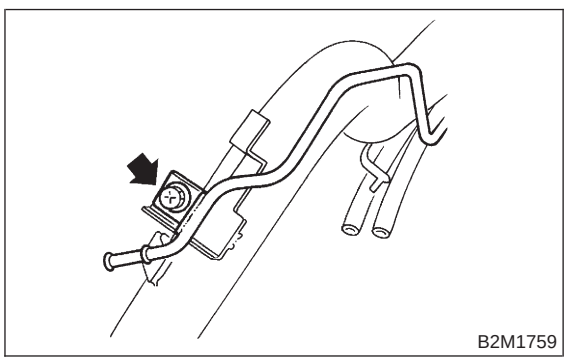
3) Connect evaporation hose to fuel filler pipe.



4) Connect evaporation hose to evaporation pipe.



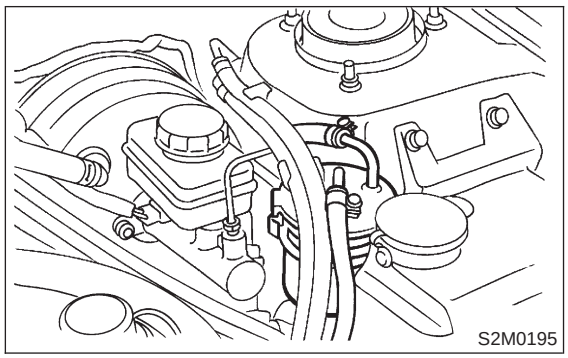
5) Install evaporation pipe to fuel filler pipe.



4. Fuel Filter

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hoses from fuel filter.



3) Remove filter from holder.

B: INSPECTION

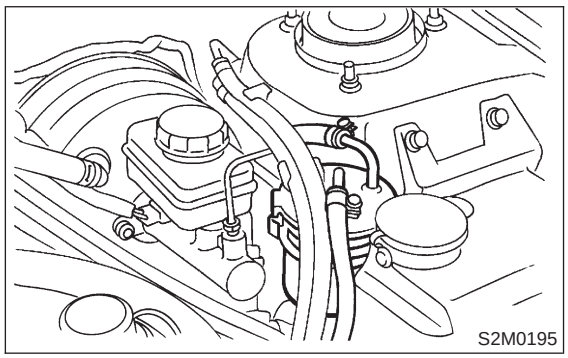
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

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.

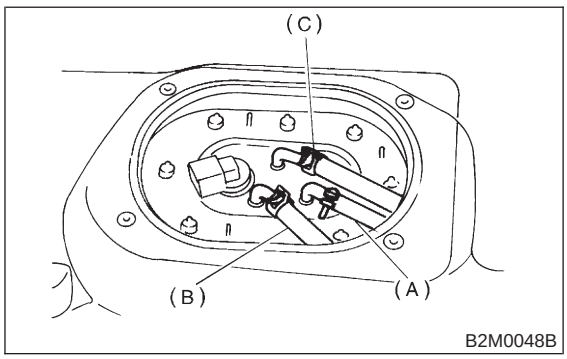
Tightening torque:
1.0 $^{+0.5}/_{-0}$ N·m (0.1$^{+0.05}/_{-0}$ kg-m, 0.7$^{+0.4}/_{-0}$ ft-lb)



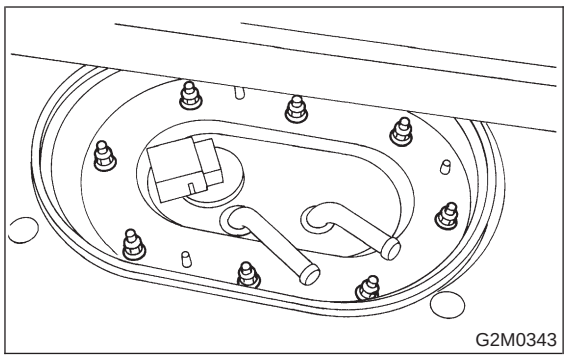
5. Fuel Pump

A: REMOVAL

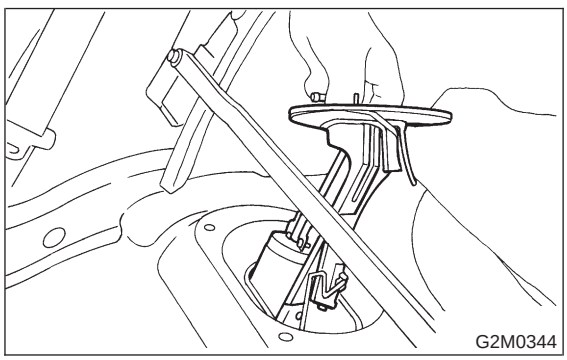
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C) (AWD model only).



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



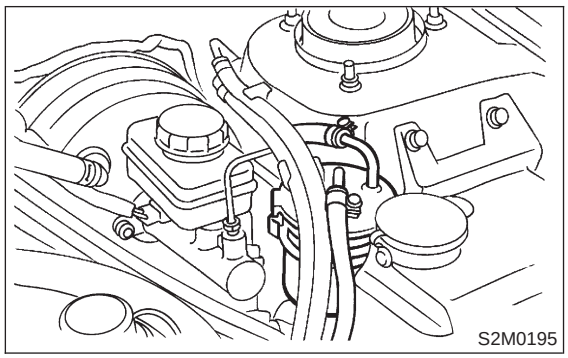
4) Take off fuel pump from fuel tank.



4. Fuel Filter

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hoses from fuel filter.



3) Remove filter from holder.

B: INSPECTION

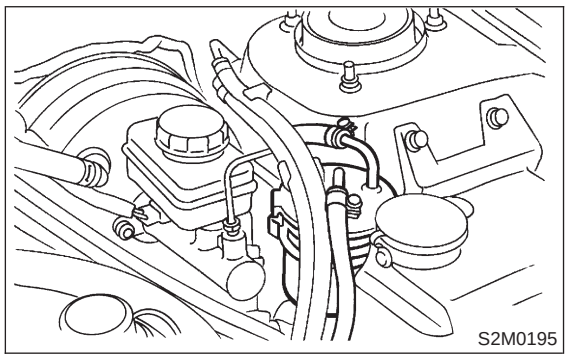
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

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.

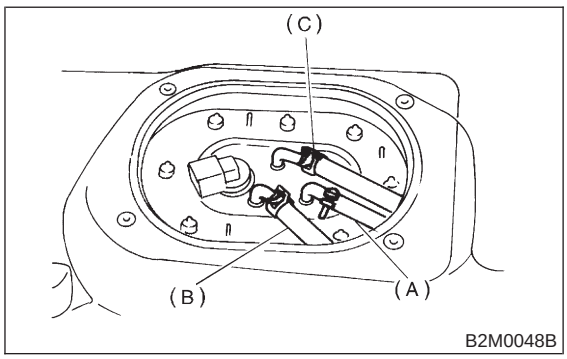
Tightening torque:
1.0 $^{+0.5}/_{-0}$ N·m (0.1$^{+0.05}/_{-0}$ kg-m, 0.7$^{+0.4}/_{-0}$ ft-lb)



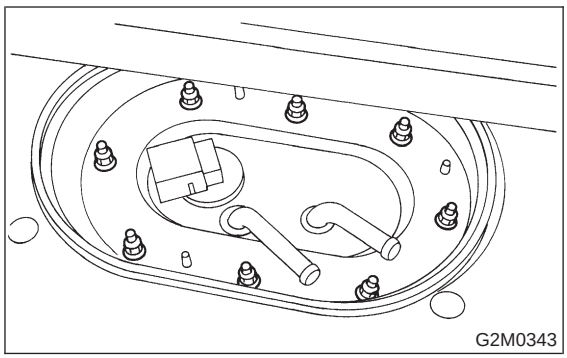
5. Fuel Pump

A: REMOVAL

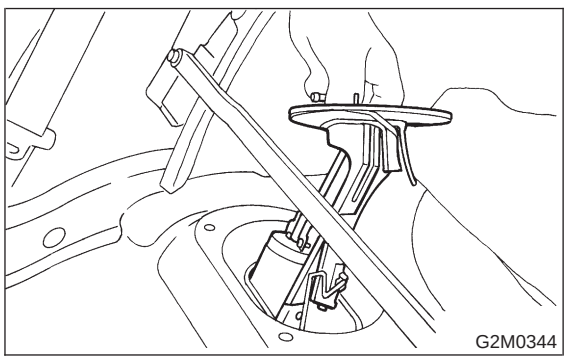
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C) (AWD model only).



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



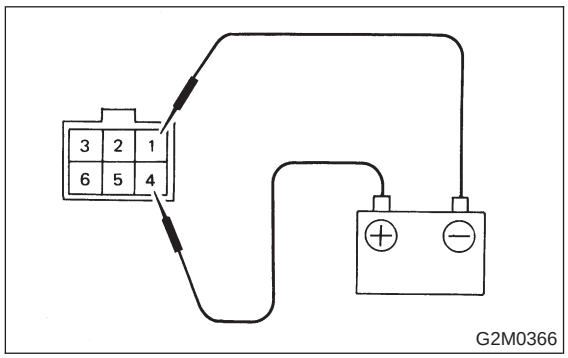
4) Take off fuel pump from fuel tank.



B: INSPECTION

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

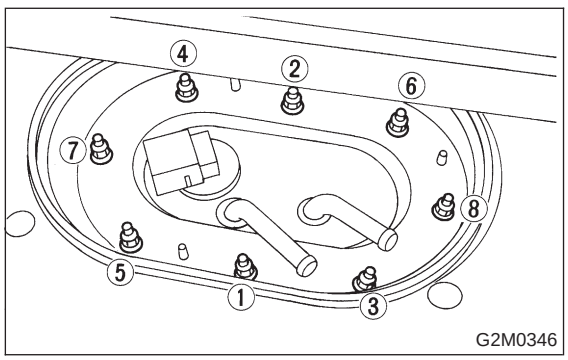
WARNING:
- **Wipe off the fuel completely.**
- **Keep battery as far apart from fuel pump as possible.**
- **Be sure to turn the battery supply ON and OFF on the battery side.**
- **Do not run fuel pump for a long time under non-load condition.**



C: INSTALLATION

Installation is in the reverse order of removal. Do 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)

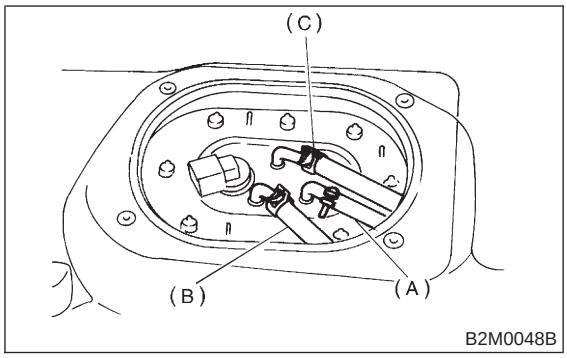


6. Fuel Meter Unit

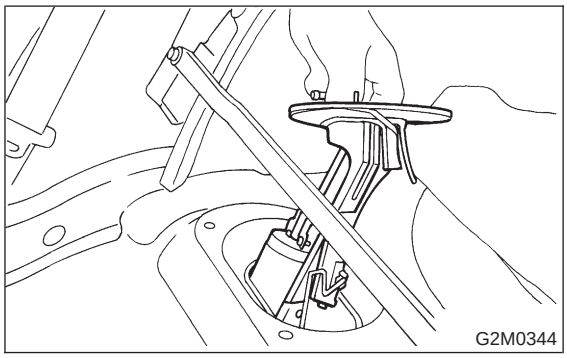
A: REMOVAL

NOTE:
Fuel meter unit is built in fuel pump assembly.

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



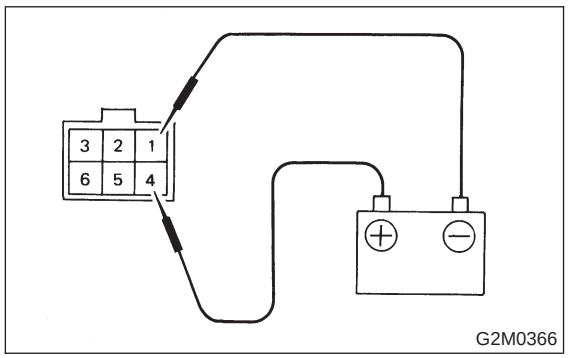
3) Remove nuts which install fuel pump assembly onto fuel tank.
4) Take off fuel pump assembly.



B: INSPECTION

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

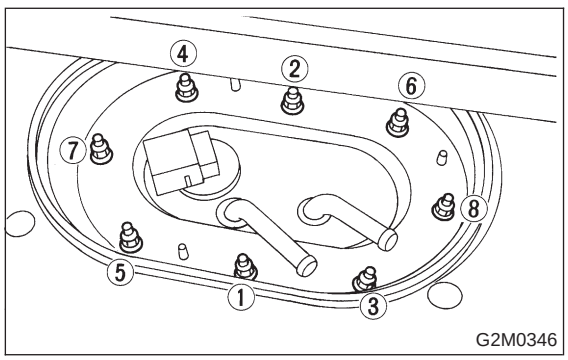
WARNING:
- **Wipe off the fuel completely.**
- **Keep battery as far apart from fuel pump as possible.**
- **Be sure to turn the battery supply ON and OFF on the battery side.**
- **Do not run fuel pump for a long time under non-load condition.**



C: INSTALLATION

Installation is in the reverse order of removal. Do 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)

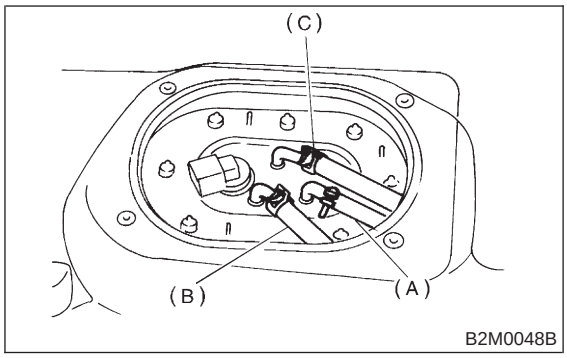


6. Fuel Meter Unit

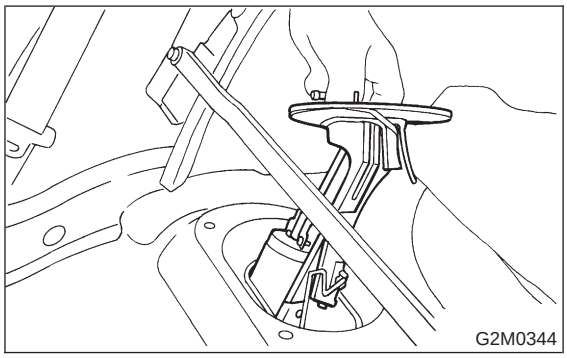
A: REMOVAL

NOTE:
Fuel meter unit is built in fuel pump assembly.

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



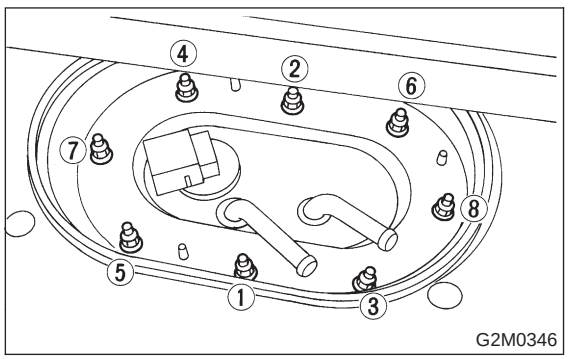
3) Remove nuts which install fuel pump assembly onto fuel tank.
4) Take off fuel pump assembly.



B: INSTALLATION

Installation is in the reverse order of removal. Do 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.

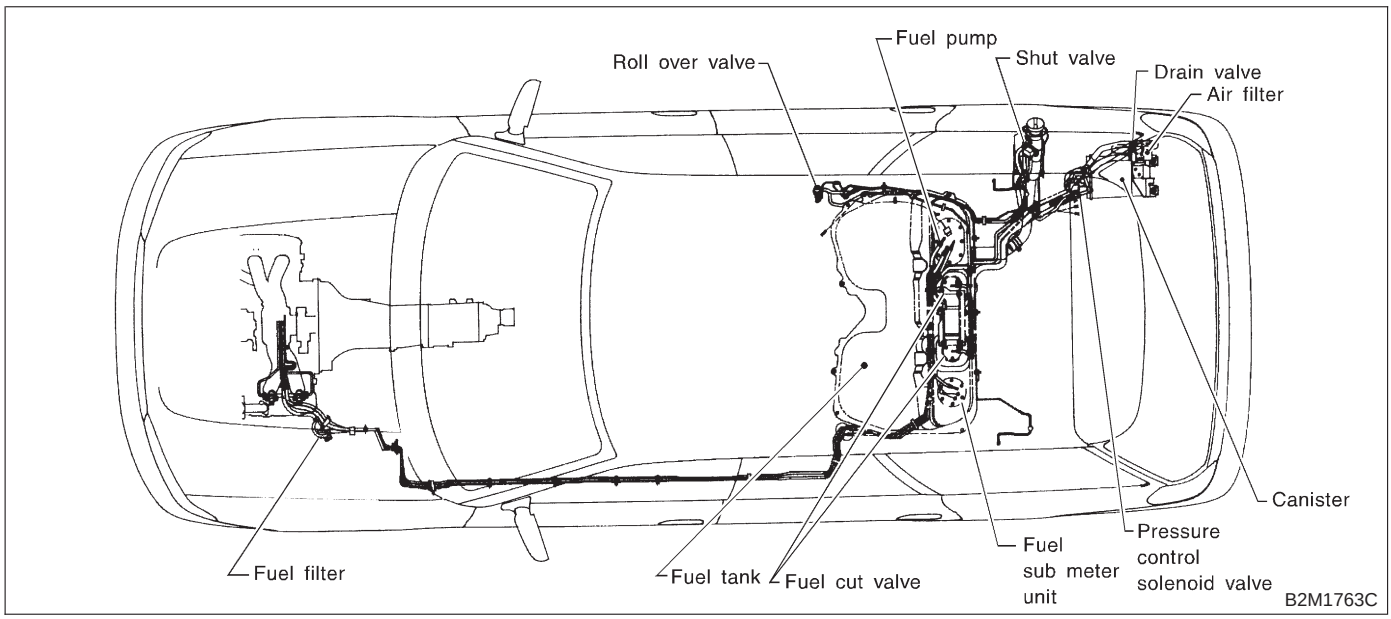
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



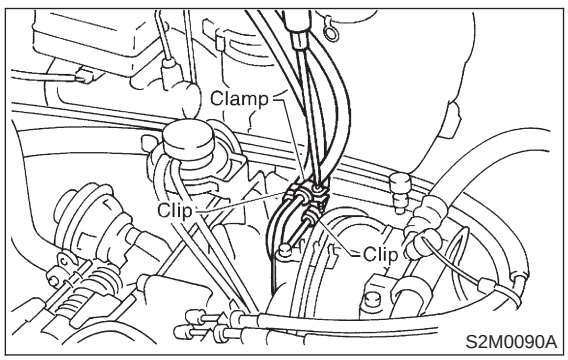
7. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Remove fuel filler cap.
3) Remove inner trim, insulator and rear seat.
4) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, and evaporation pipes and hoses.



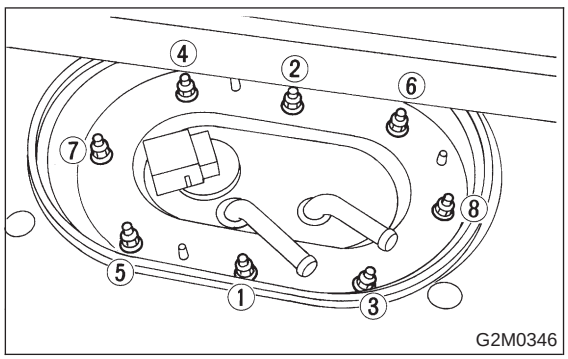
5) In engine compartment, detach fuel delivery hose, return hose and evaporation hose.



B: INSTALLATION

Installation is in the reverse order of removal. Do 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.

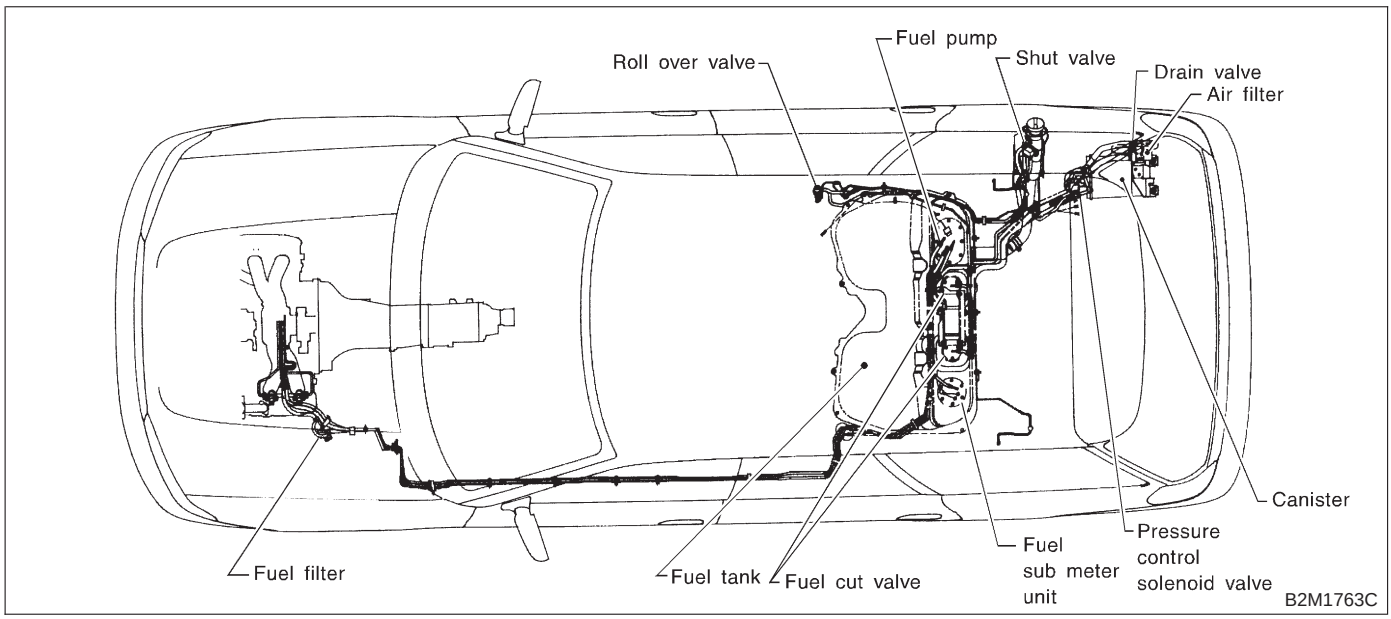
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



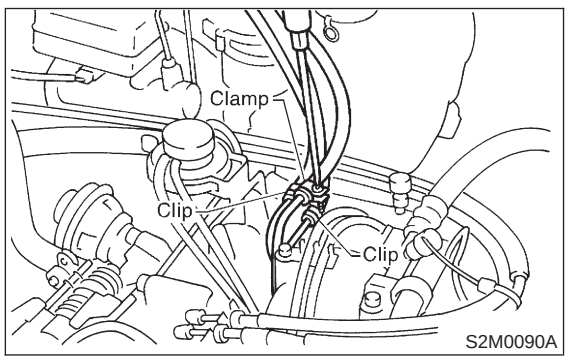
7. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Remove fuel filler cap.
3) Remove inner trim, insulator and rear seat.
4) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, and evaporation pipes and hoses.



5) In engine compartment, detach fuel delivery hose, return hose and evaporation hose.

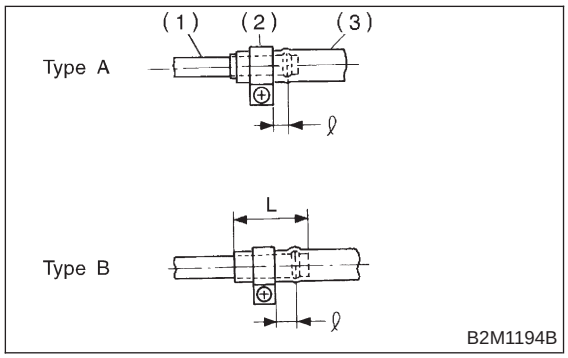


B: INSTALLATION

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.

ℓ : 1.0 — 4.0 mm (0.039 — 0.157 in)

L: 20 — 25 mm (0.79 — 0.98 in)

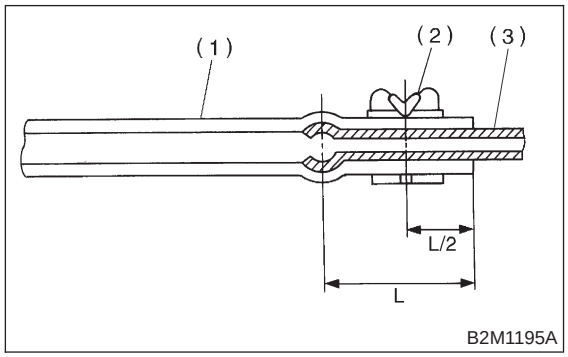


(1) Fitting
(2) Clamp
(3) Hose

2) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 15 — 20 mm (0.59 — 0.79 in)

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

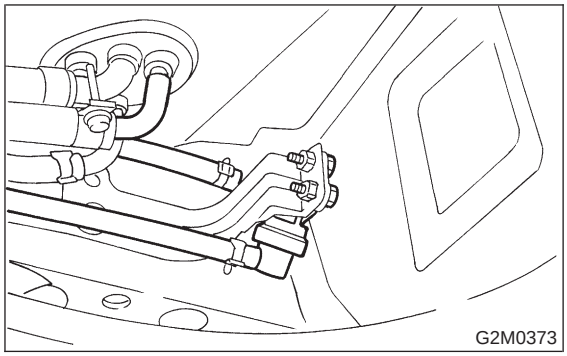


(1) Hose
(2) Clip
(3) Pipe

8. Roll Over Valve

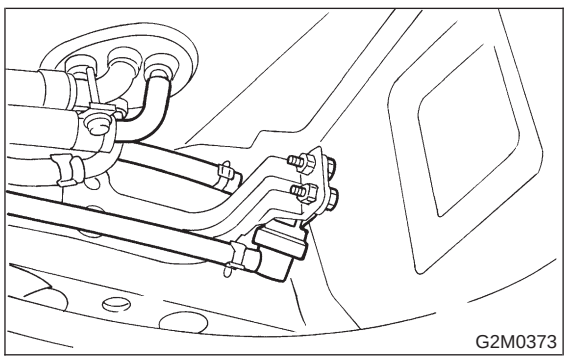
A: REMOVAL AND INSTALLATION

1) Lift-up the vehicle.
2) Remove roll over valve with bracket.



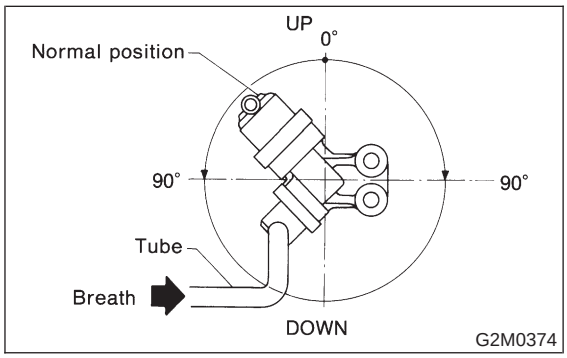
3) Disconnect hoses from roll over valve, and remove it from bracket.
4) Installation is in the reverse order of removal.

CAUTION:
- **Do not install top side of valve down.**
- **Before installing bracket on body, securely fit concave part of bracket to hole in body.**



B: INSPECTION

1) Connect hoses to roll over valve as shown in Figure.



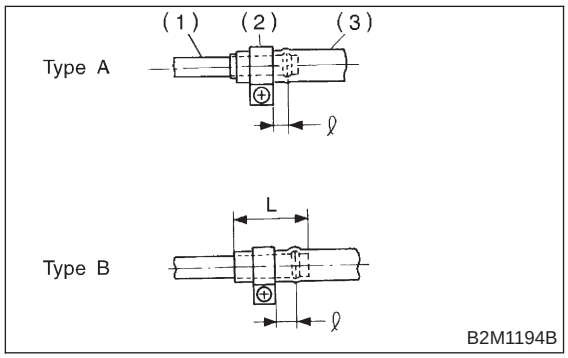
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.

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.

ℓ : 1.0 — 4.0 mm (0.039 — 0.157 in)

L: 20 — 25 mm (0.79 — 0.98 in)

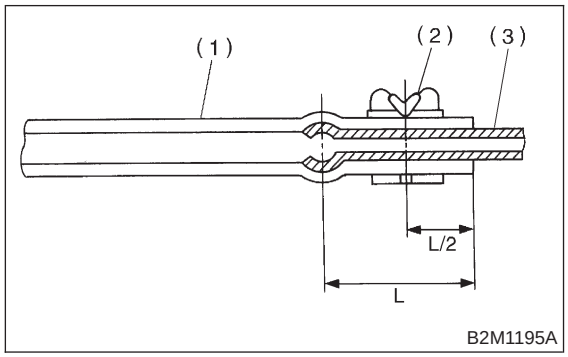


(1) Fitting
(2) Clamp
(3) Hose

2) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 15 — 20 mm (0.59 — 0.79 in)

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

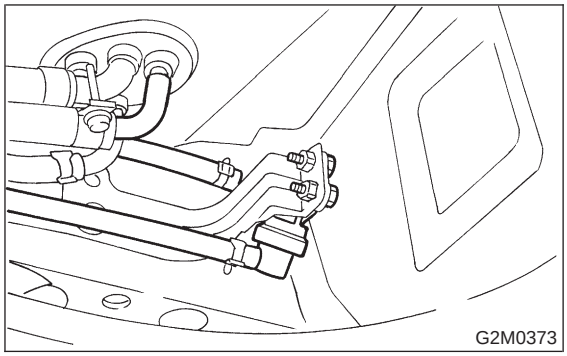


(1) Hose
(2) Clip
(3) Pipe

8. Roll Over Valve

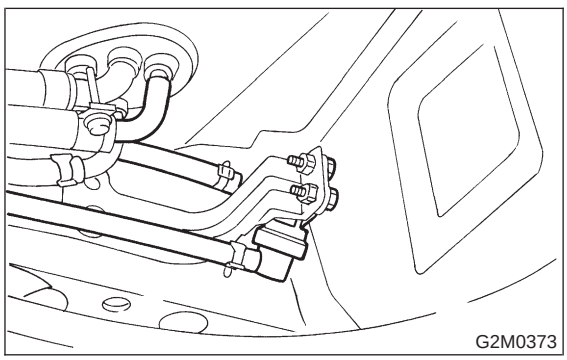
A: REMOVAL AND INSTALLATION

1) Lift-up the vehicle.
2) Remove roll over valve with bracket.



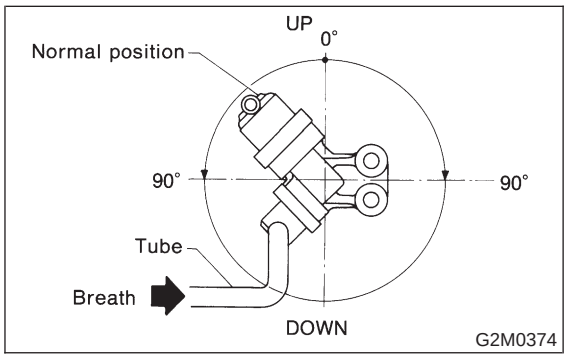
3) Disconnect hoses from roll over valve, and remove it from bracket.
4) Installation is in the reverse order of removal.

CAUTION:
- **Do not install top side of valve down.**
- **Before installing bracket on body, securely fit concave part of bracket to hole in body.**



B: INSPECTION

1) Connect hoses to roll over valve as shown in Figure.



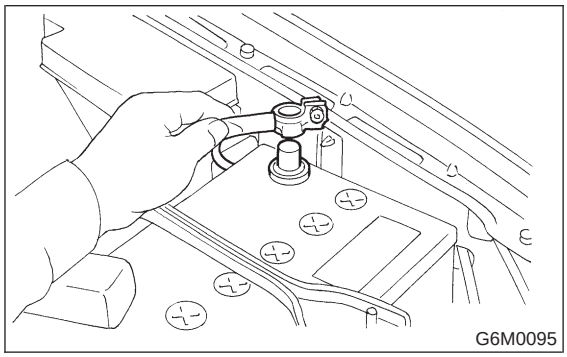
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.

3) Ensure that there is no air flow when hose is tilted greater than 90°.

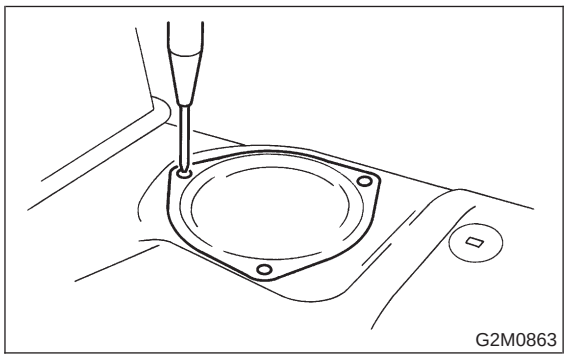
9. Fuel Sub Meter Unit

A: REMOVAL AND INSTALLATION

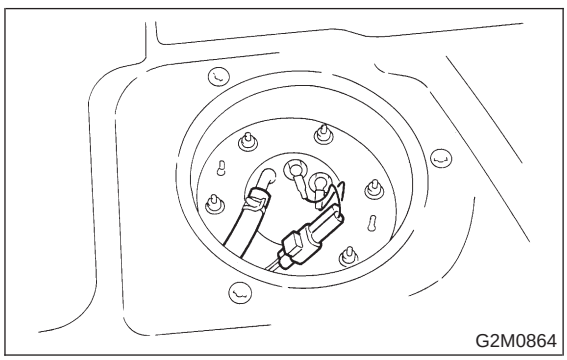
1) Disconnect battery ground cable.



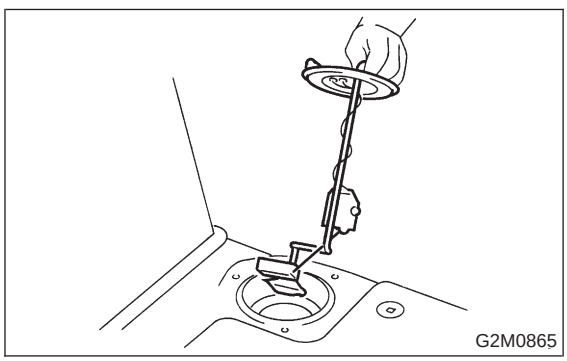
2) Remove rear seat.
3) Remove service hole cover.



4) Disconnect connector from fuel sub meter, and disconnect jet pump hose.



5) Remove fuel sub meter unit.

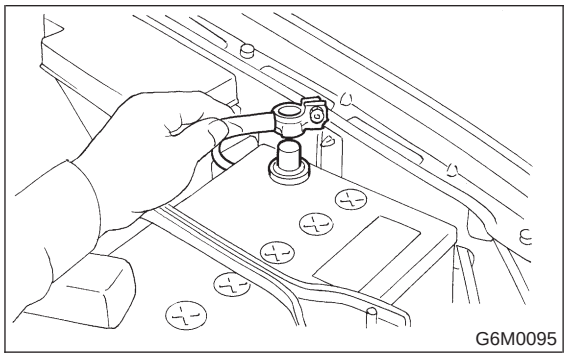


3) Ensure that there is no air flow when hose is tilted greater than 90°.

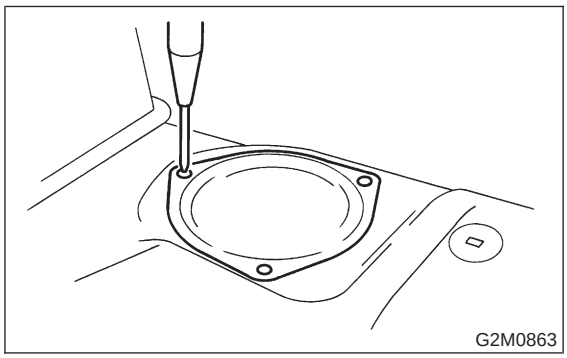
9. Fuel Sub Meter Unit

A: REMOVAL AND INSTALLATION

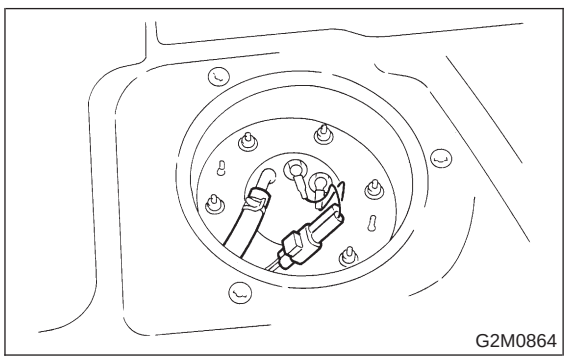
1) Disconnect battery ground cable.



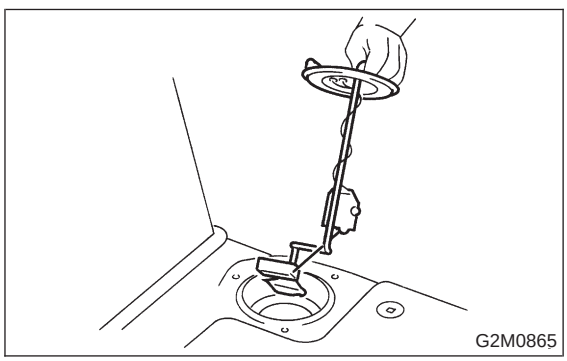
2) Remove rear seat.
3) Remove service hole cover.



4) Disconnect connector from fuel sub meter, and disconnect jet pump hose.

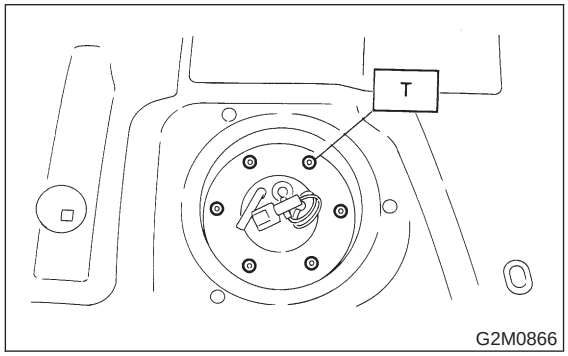


5) Remove fuel sub meter unit.



6) Installation is in the reverse order of removal.

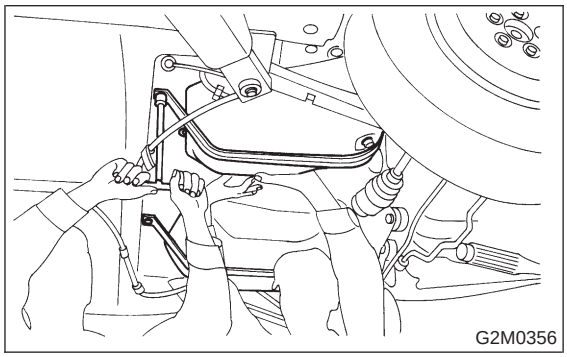
Tightening torque:
T: 4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



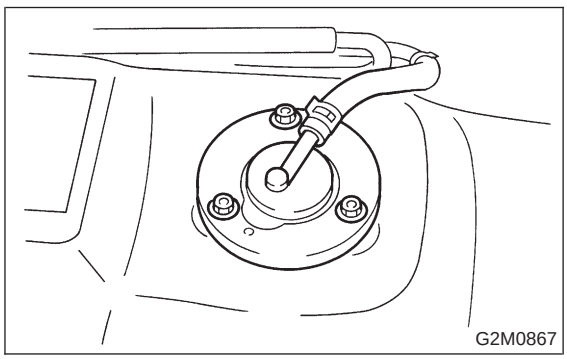
10. Fuel Cut Valve

A: REMOVAL AND INSTALLATION

1) Remove fuel tank. <Ref. to 2-8 [W2A0].>

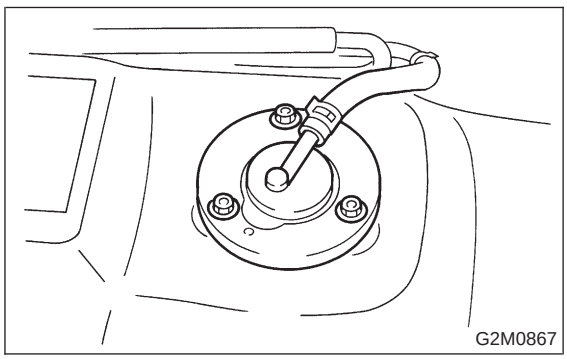


2) Disconnect evaporation hose from fuel cut valve.



3) Remove fuel cut valve.
4) Installation is in the reverse order of removal.

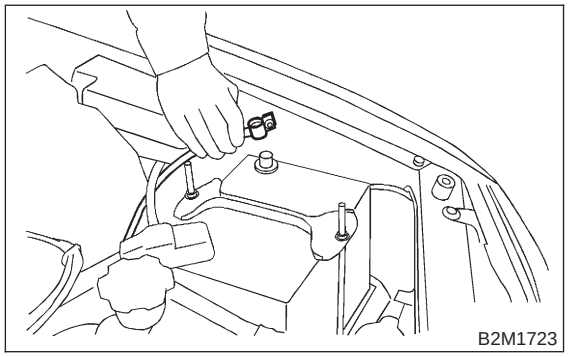
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



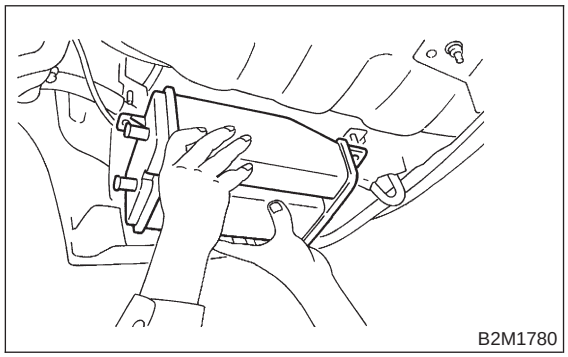
10. Pressure Control Solenoid Valve

A: REMOVAL AND INSTALLATION

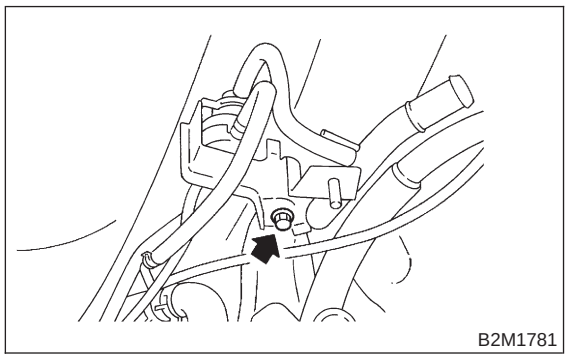
1) Disconnect battery ground cable.



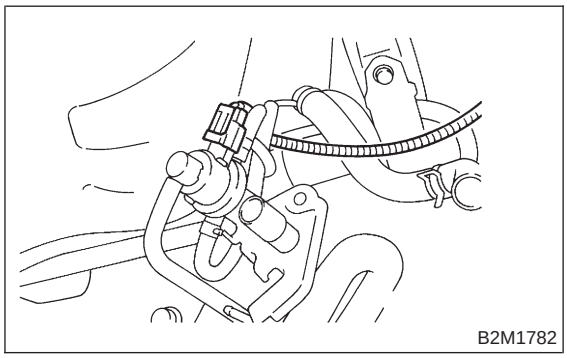
2) Remove canister. <Ref. to 2-1 [W3A0].>



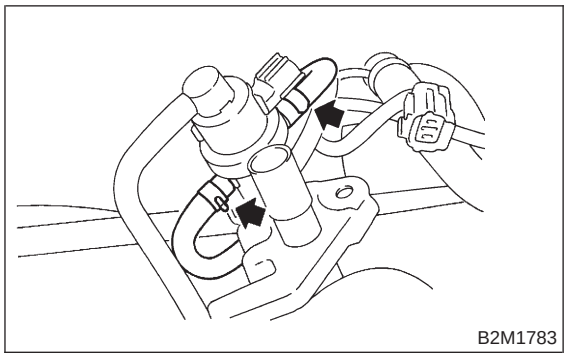
3) Remove bolt which installs pressure control solenoid valve holding bracket on body.



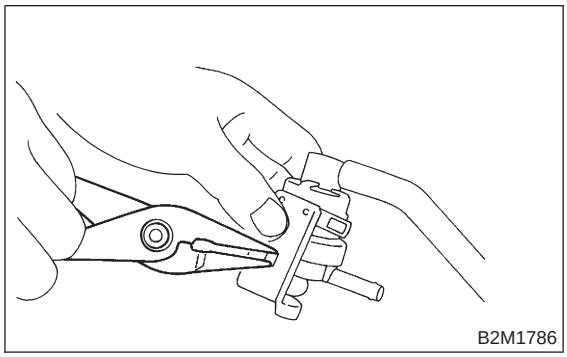
4) Disconnect connector from pressure control solenoid valve.



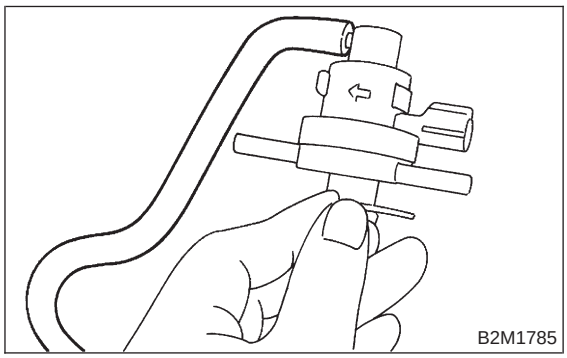
5) Disconnect two evaporation hoses from pressure control solenoid valve.
6) Remove pressure control solenoid valve with bracket.



7) Remove pressure control solenoid valve from bracket.

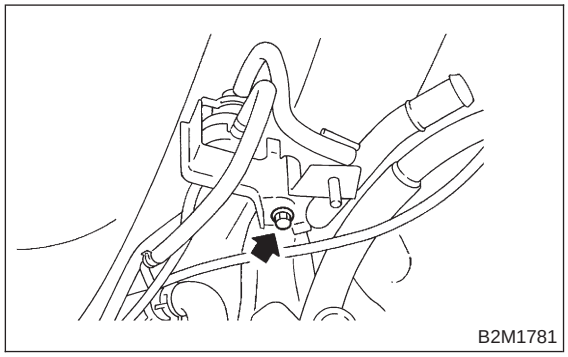


8) Disconnect vacuum hose from pressure control solenoid valve.



9) Installation is in the reverse order of removal.

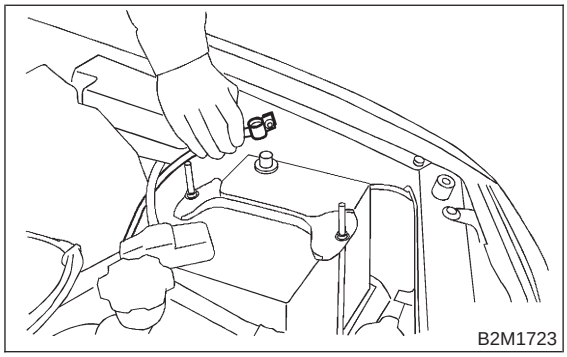
Tightening torque:
24.5±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)


B2M1781

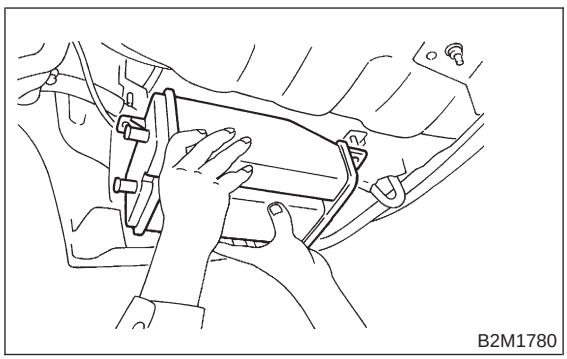
11. Vent Control Solenoid Valve (2500 cc Model)

A: REMOVAL

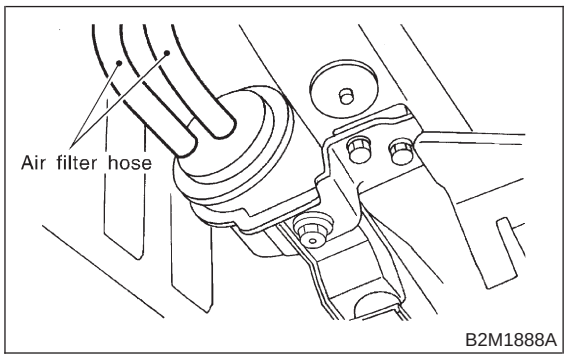
1) Disconnect battery ground cable.


B2M1723

2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>


B2M1780

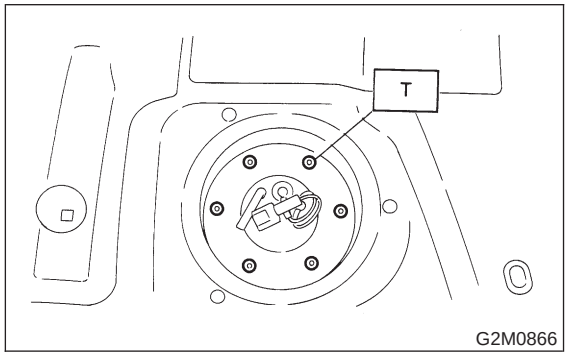
4) Disconnect two hoses from air filter.



B2M1888A

6) Installation is in the reverse order of removal.

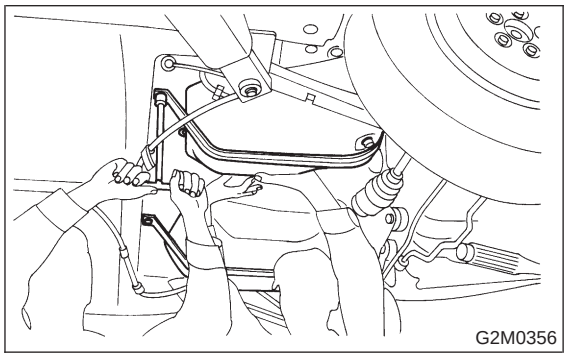
Tightening torque:
T: 4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



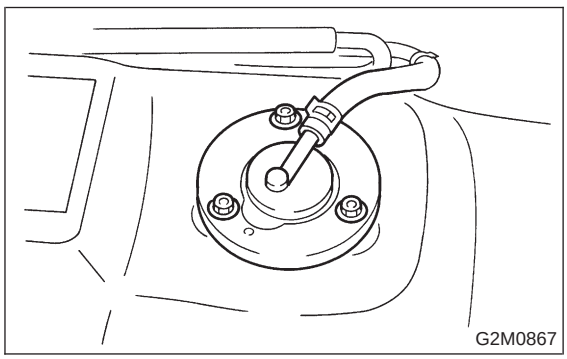
10. Fuel Cut Valve

A: REMOVAL AND INSTALLATION

1) Remove fuel tank. <Ref. to 2-8 [W2A0].>

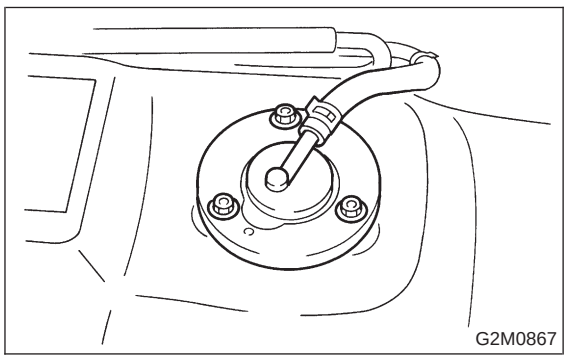


2) Disconnect evaporation hose from fuel cut valve.



3) Remove fuel cut valve.
4) Installation is in the reverse order of removal.

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. 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.

1) To prevent water condensation:
- Top off the fuel tank or drain the fuel completely.
- Drain water condensation from the fuel filter.

2) Refilling the fuel tank:
Refill the fuel tank while there is still some fuel left in the tank.

3) Protecting the fuel system against freezing and water condensation:
- 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 as below.
- Affected areas

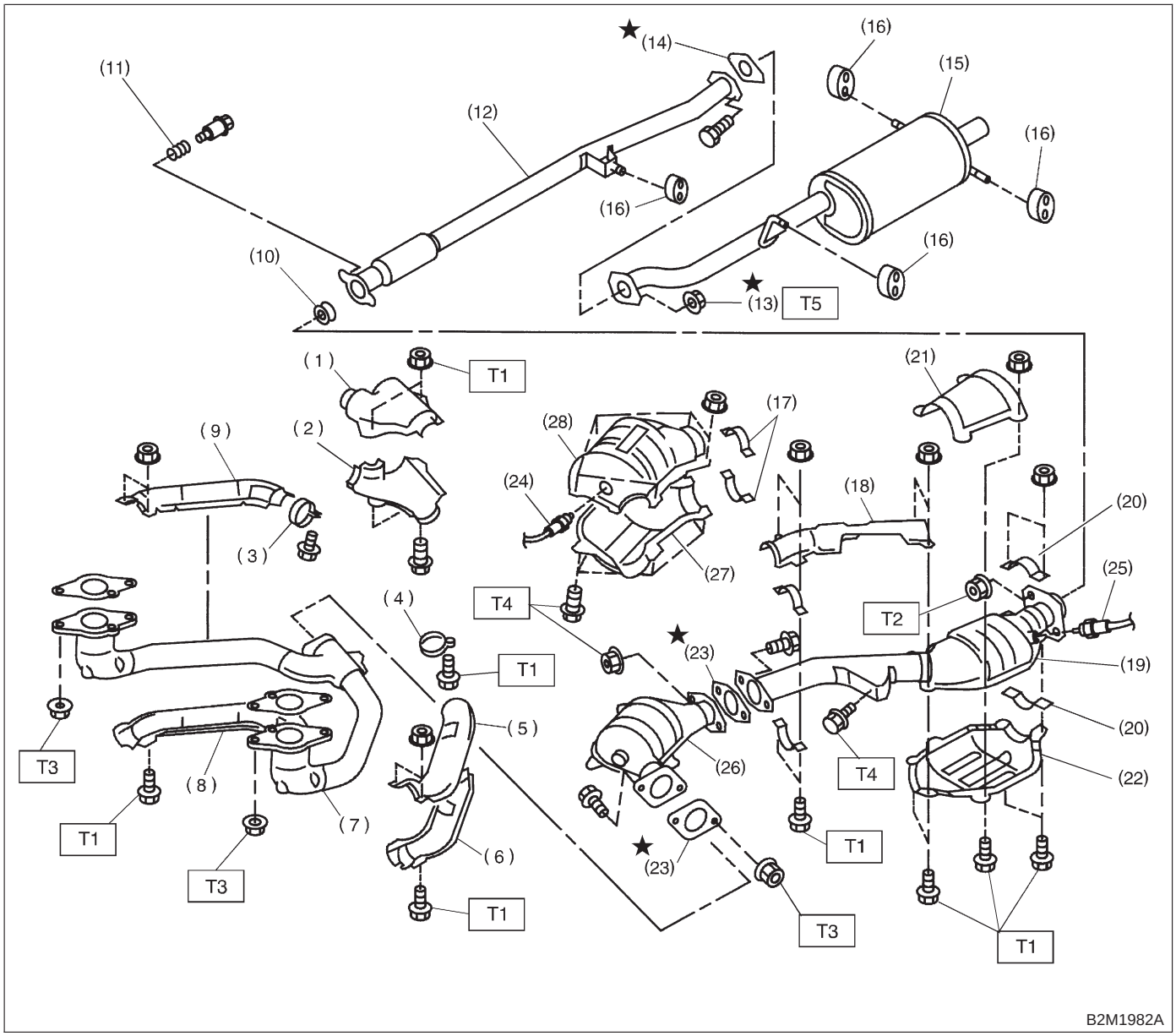
When water condensation is notched in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

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

MEMO:

1. Exhaust System

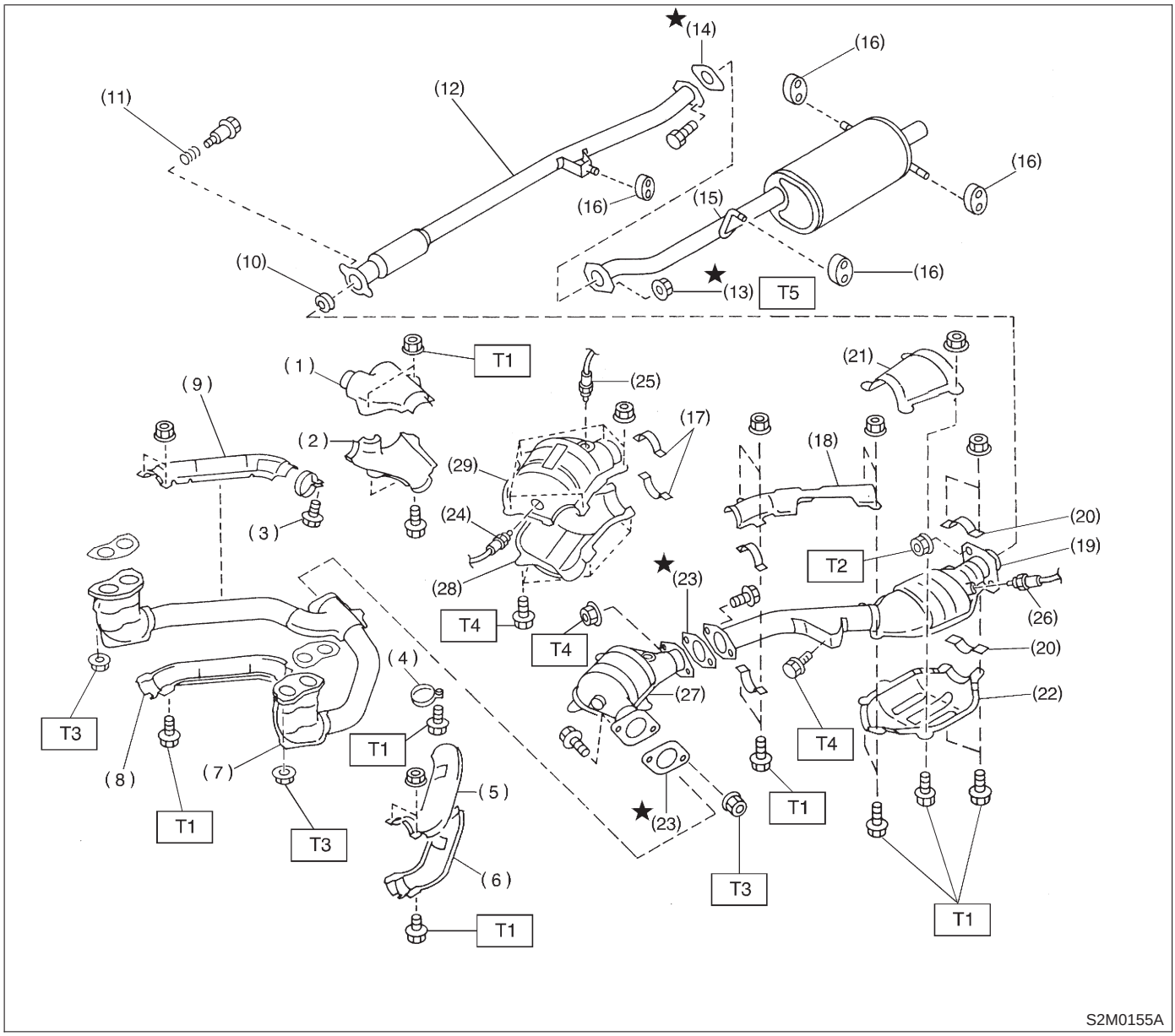
A: 2200 cc MODEL



(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) Front exhaust pipe
(8) Lower front exhaust pipe cover RHUpper front exhaust pipe cover RH
(9) Gasket
(10) Spring
(11) Rear exhaust pipe
(12) Self-locking nut
(13) Gasket
(14) Gasket
(15) Muffler
(16) Cushion rubber
(17) Clamp
(18) Upper center exhaust pipe cover
(19) Center exhaust pipe
(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) Front catalytic converterLower front catalytic converter cover
(28) Upper front catalytic converter cover

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)

B: 2500 cc MODEL



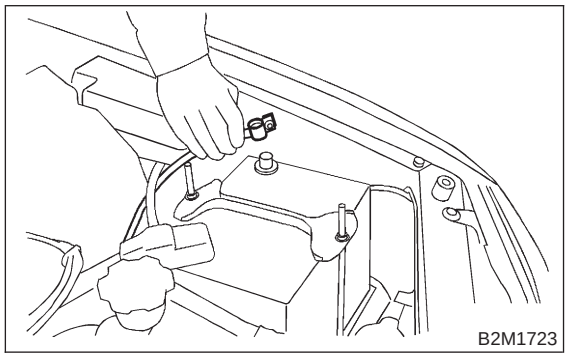
(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Band RH
(4) Band LH
(5) Upper front exhaust pipe cover LH
(6) Lower front exhaust pipe cover LH
(7) Front exhaust pipe
(8) Lower front exhaust pipe cover RH
(9) Upper front exhaust pipe cover RH
(10) Gasket
(11) Spring
(12) Rear exhaust pipe
(13) Self-locking nut
(14) Gasket
(15) Muffler
(16) Cushion rubber
(17) Clamp
(18) Upper center exhaust pipe cover
(19) Center exhaust pipe
(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 (California spec. vehicles)
(26) Rear oxygen sensor (Except California spec. vehicles)
(27) Front catalytic converter
(28) Lower front catalytic converter cover
(29) Upper front catalytic converter cover

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)

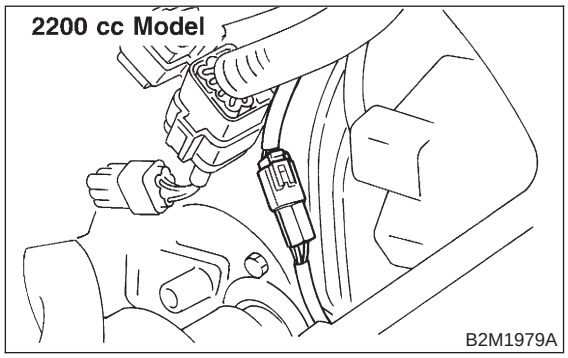
1. Front Exhaust Pipe

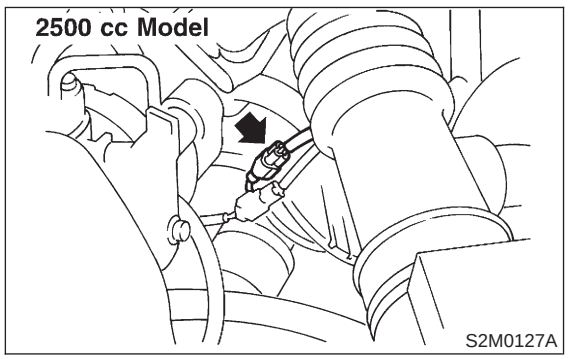
A: REMOVAL

1) Disconnect battery ground cable.

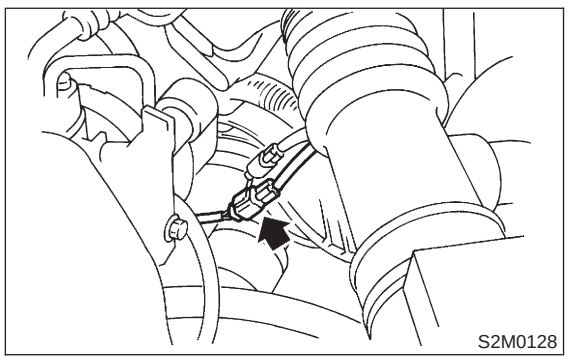


2) Disconnect front oxygen sensor connector.

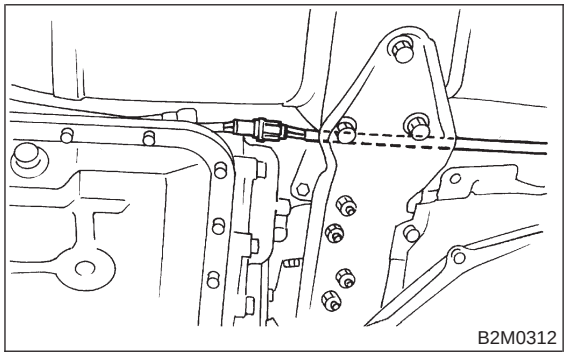




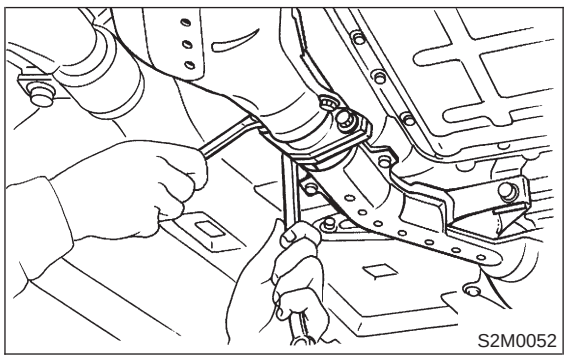
3) Disconnect rear oxygen sensor connector. (2500 cc California spec. vehicles)



4) Lift-up the vehicle.
5) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)

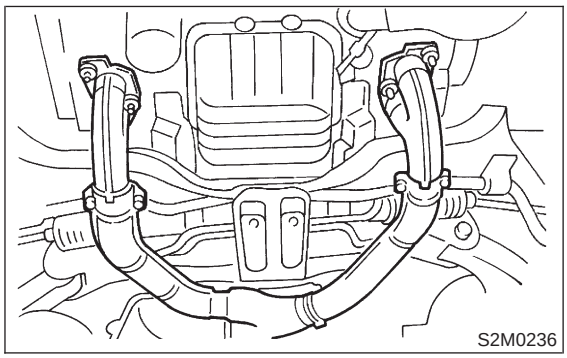


6) Separate center exhaust pipe from front exhaust pipe.

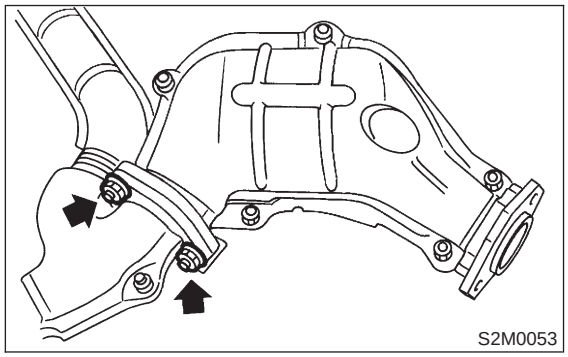


7) Remove bolts which hold front exhaust pipe onto cylinder heads.

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



8) Separate front exhaust pipe from front catalytic converter.

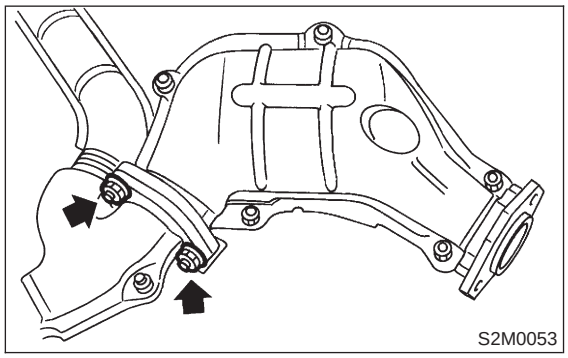

S2M0053

B: INSTALLATION

1) Install front catalytic converter to front exhaust pipe.

CAUTION:
Replace gaskets with new ones.

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

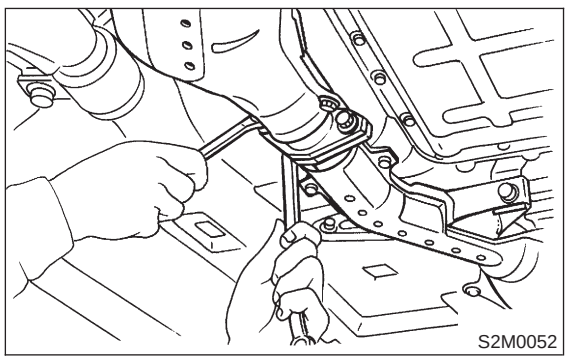

S2M0053

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

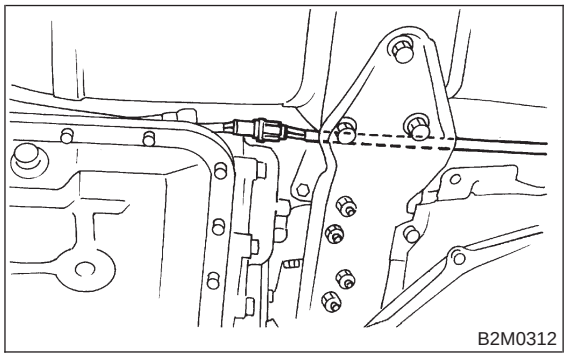
Tightening torque:
30±5 N·m (3.1±0.5 kg-m, 22.4±3.6 ft-lb)

3) Install center exhaust pipe to front exhaust pipe.

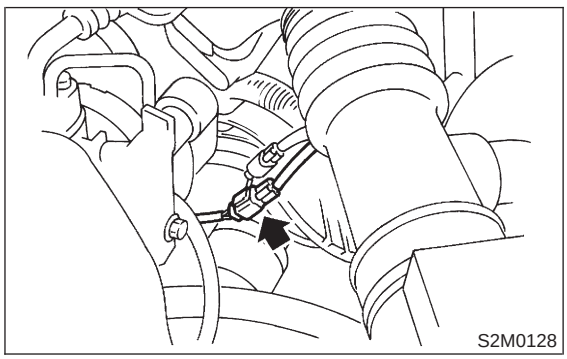
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


S2M0052

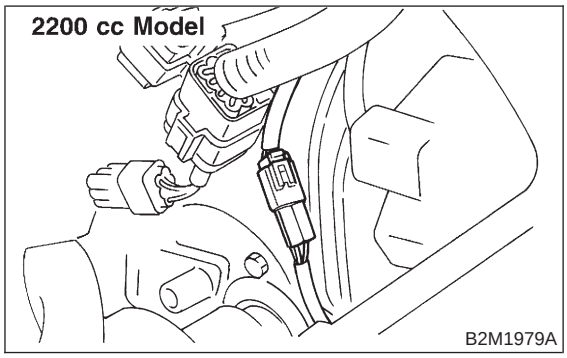
4) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)


B2M0312

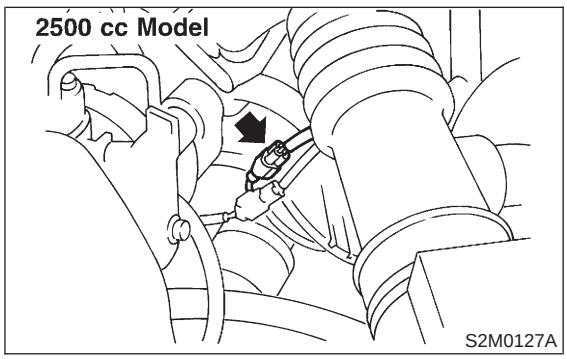
5) Lower the vehicle.
6) Connect rear oxygen sensor connector. (2500 cc California spec. vehicles)


S2M0128

7) Connect front oxygen sensor connector.

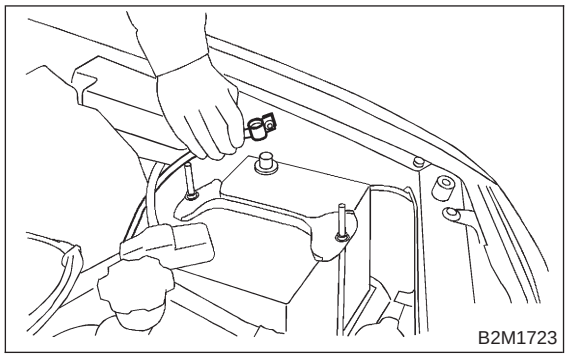


B2M1979A



S2M0127A

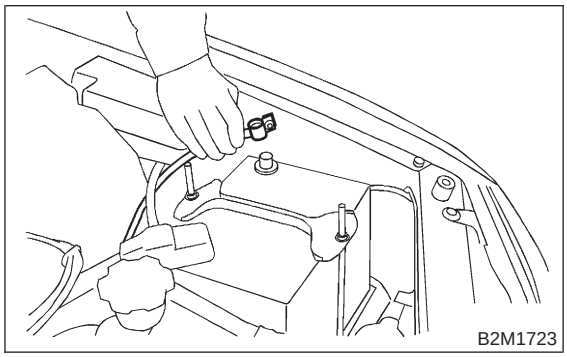
8) Connect battery ground cable.



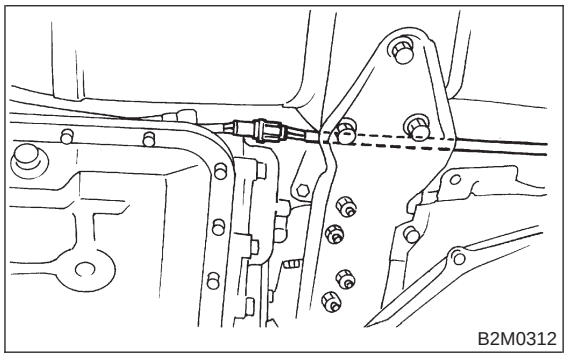
2. Center Exhaust Pipe

A: REMOVAL

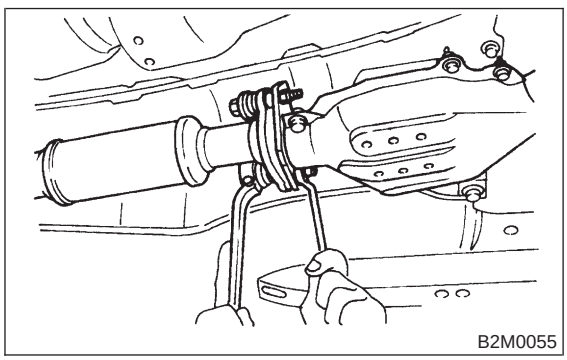
1) Disconnect battery ground cable.



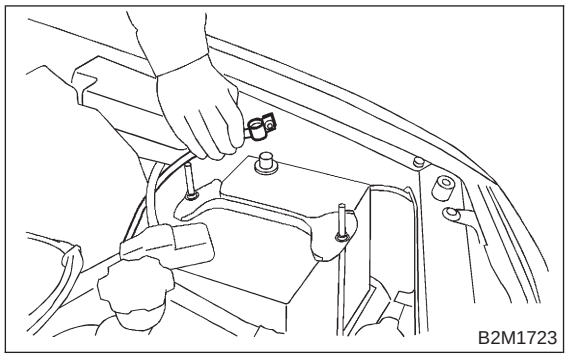
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



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



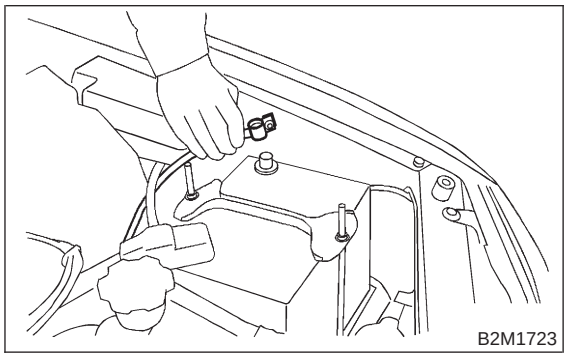
8) Connect battery ground cable.



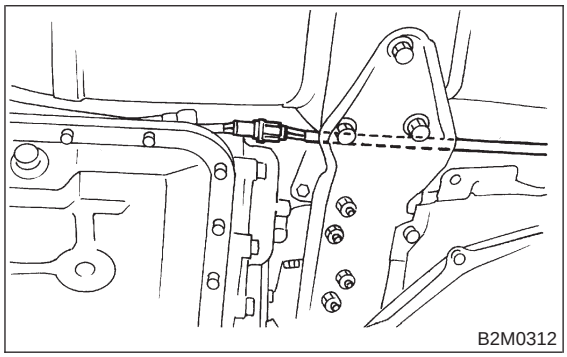
2. Center Exhaust Pipe

A: REMOVAL

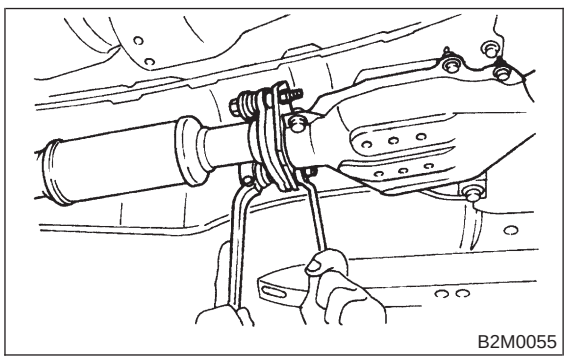
1) Disconnect battery ground cable.



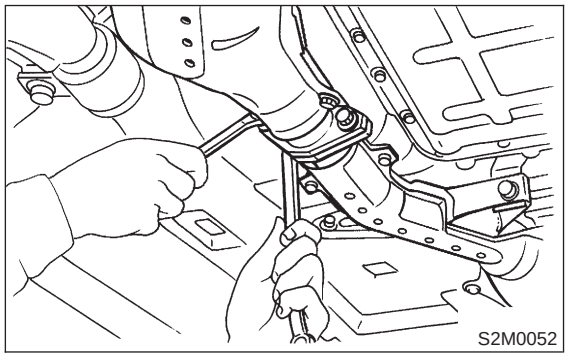
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



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



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


S2M0052

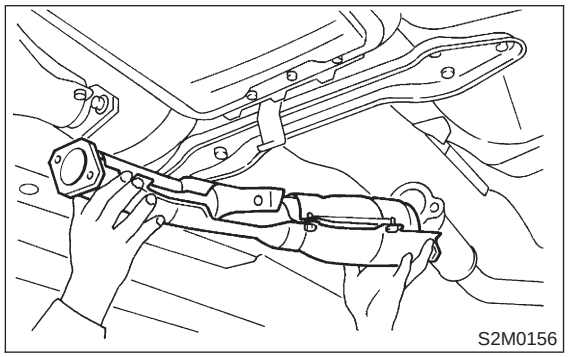
6) Remove center exhaust pipe and rear catalytic converter assembly from hanger bracket.

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.

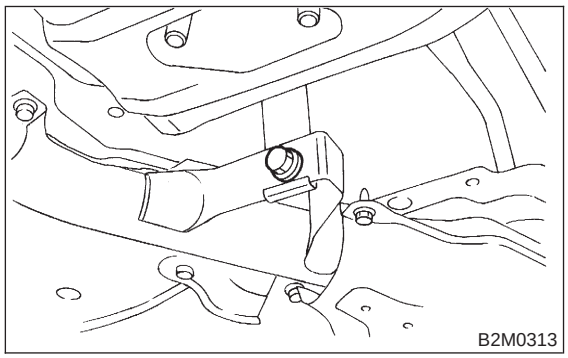
B: INSTALLATION

1)

CAUTION:
Replace gaskets with new ones. Install center exhaust pipe and rear catalytic converter assembly.

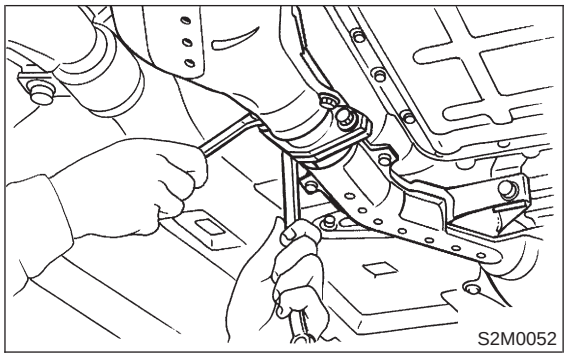

S2M0156

2) Temporarily tighten bolt which installs center exhaust pipe to hanger bracket.


B2M0313

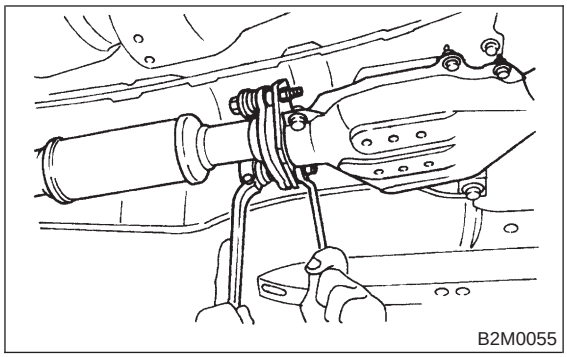
3) Install center exhaust pipe to front catalytic converter.
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)

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


S2M0052

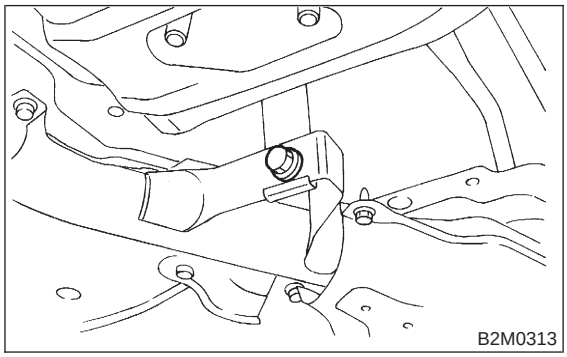
4) Install center exhaust pipe to rear exhaust pipe.

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

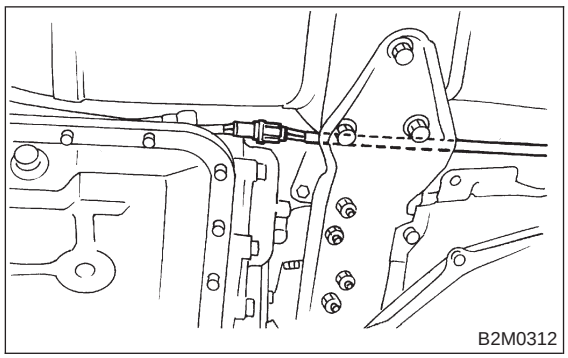

B2M0055

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

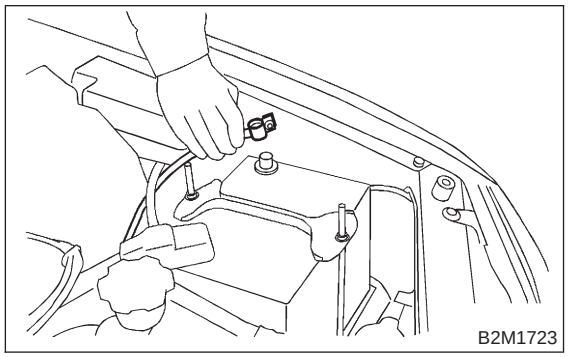
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


B2M0313

6) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)


B2M0312

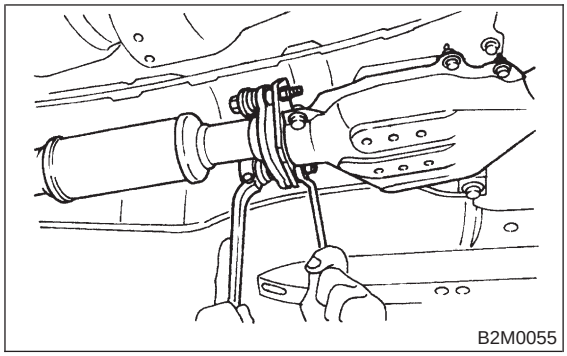
7) Lower the vehicle.
8) Connect battery ground cable.


B2M1723

3. Rear Exhaust Pipe

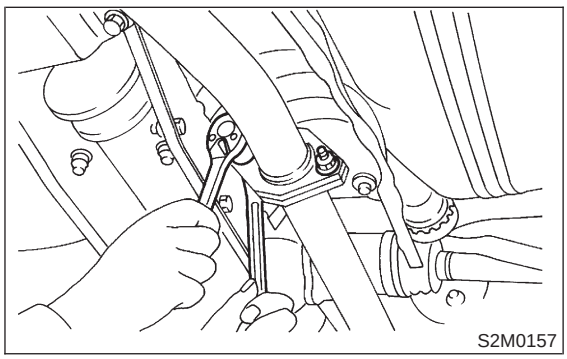
A: REMOVAL

1) Separate rear exhaust pipe from center exhaust pipe.


B2M0055

2) Separate rear exhaust pipe from muffler.

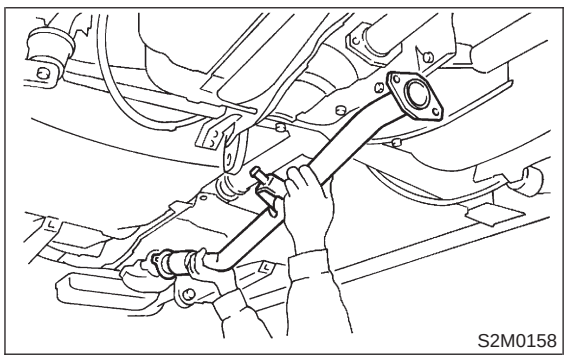
CAUTION:
Be careful not to pull down rear exhaust pipe.


S2M0157

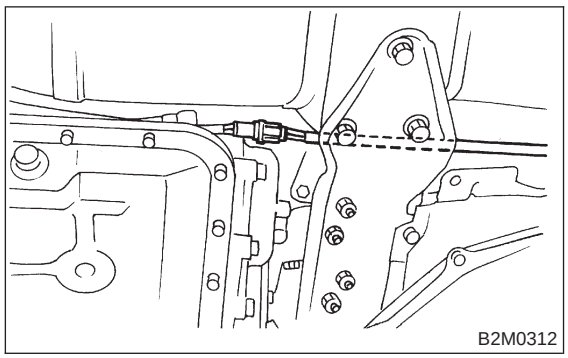
3) Remove rear exhaust pipe bracket from rubber cushion.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to pipe bracket in advance.

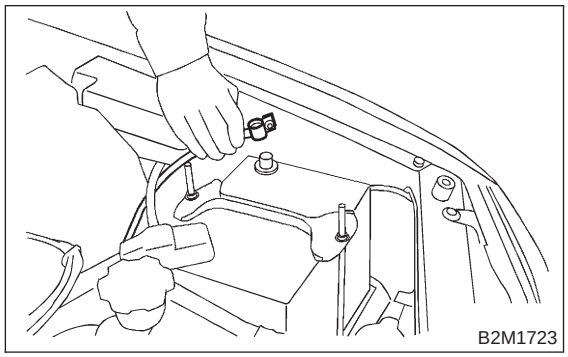
SUBARU CRC (Part No. 004301003)


S2M0158

6) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)


B2M0312

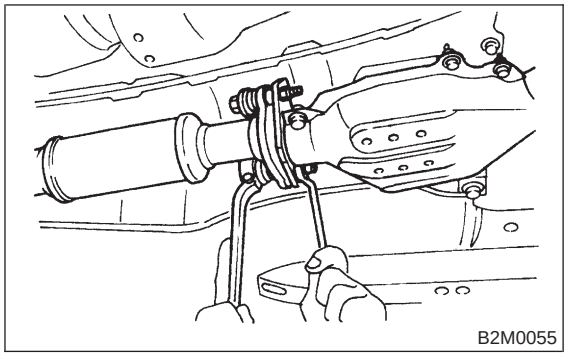
7) Lower the vehicle.
8) Connect battery ground cable.


B2M1723

3. Rear Exhaust Pipe

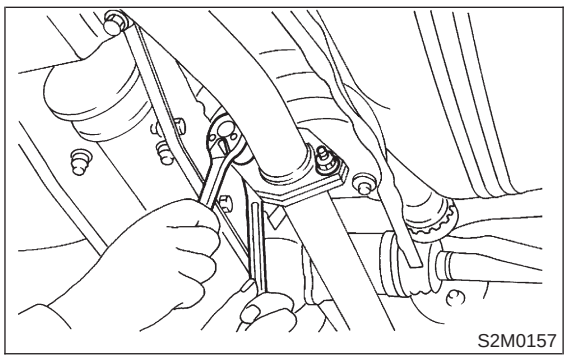
A: REMOVAL

1) Separate rear exhaust pipe from center exhaust pipe.


B2M0055

2) Separate rear exhaust pipe from muffler.

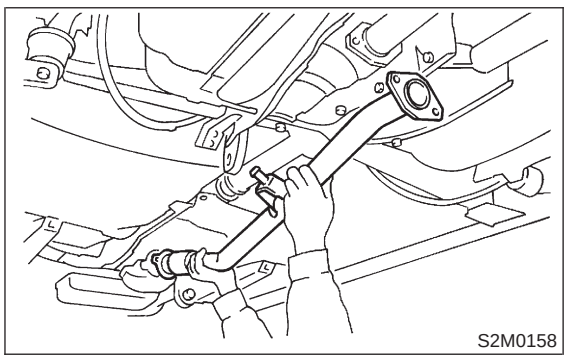
CAUTION:
Be careful not to pull down rear exhaust pipe.


S2M0157

3) Remove rear exhaust pipe bracket from rubber cushion.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to pipe bracket in advance.

SUBARU CRC (Part No. 004301003)


S2M0158

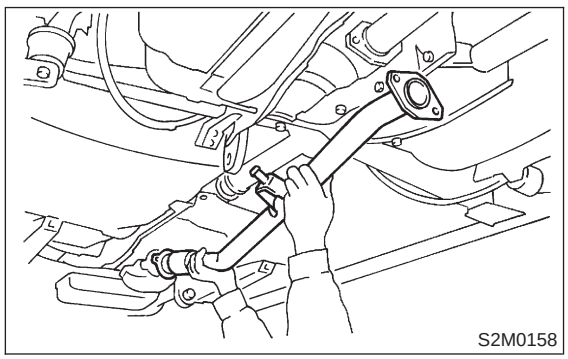
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

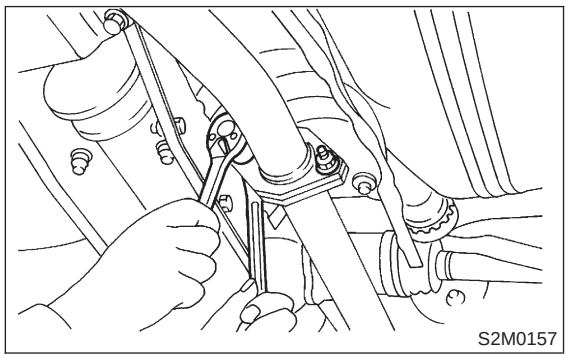
NOTE:
To facilitate installation, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)


S2M0158

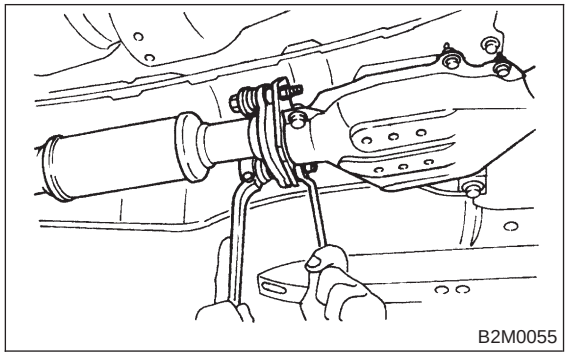
2) Install rear exhaust pipe to muffler.

Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)


S2M0157

3) Install rear exhaust pipe to center exhaust pipe.

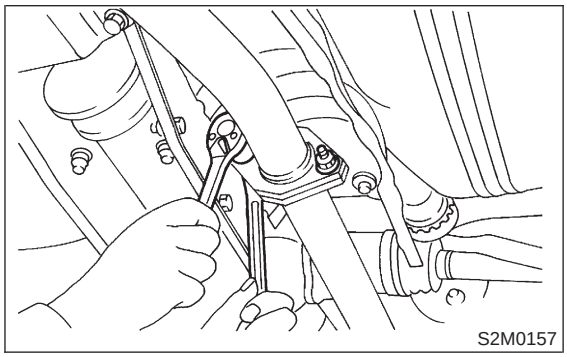
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)


B2M0055

4. Muffler

A: REMOVAL AND INSTALLATION

1) Separate muffler from rear exhaust pipe.

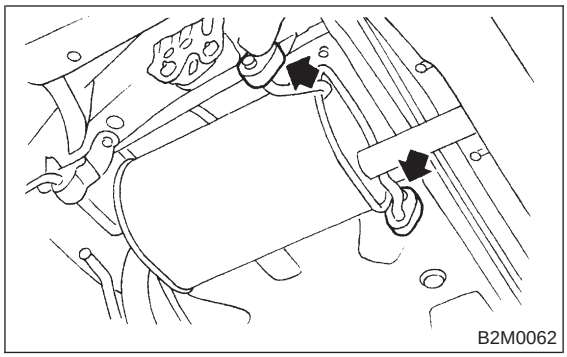

S2M0157

2) Remove left and right rubber cushions.

CAUTION:
Be careful not to pull down muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushions in advance.

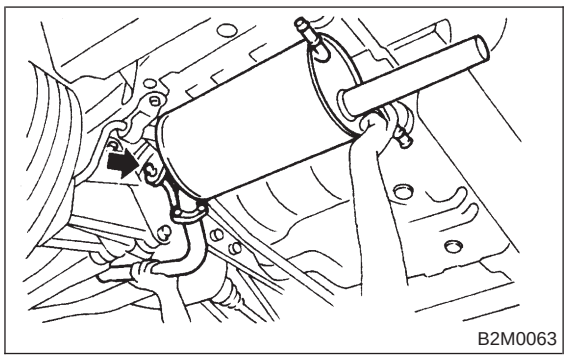
SUBARU CRC (Part No. 004301003)


B2M0062

3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)


B2M0063

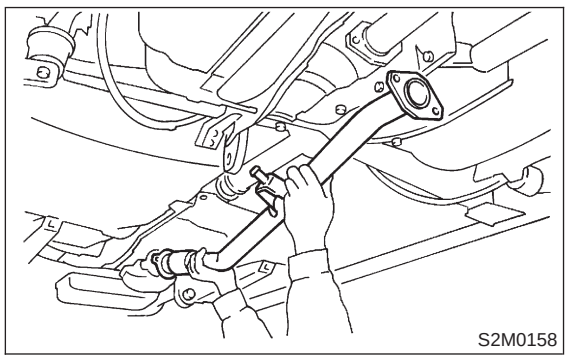
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

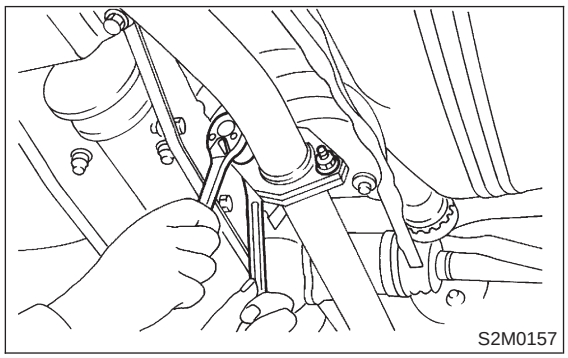
NOTE:
To facilitate installation, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)


S2M0158

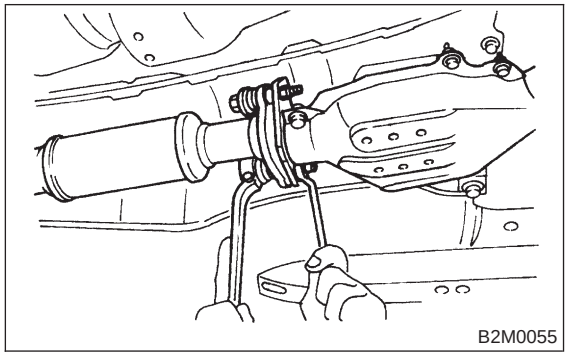
2) Install rear exhaust pipe to muffler.

Tightening torque:
48±5 N·m (4.9±0.5 kg-m, 35.4±3.6 ft-lb)


S2M0157

3) Install rear exhaust pipe to center exhaust pipe.

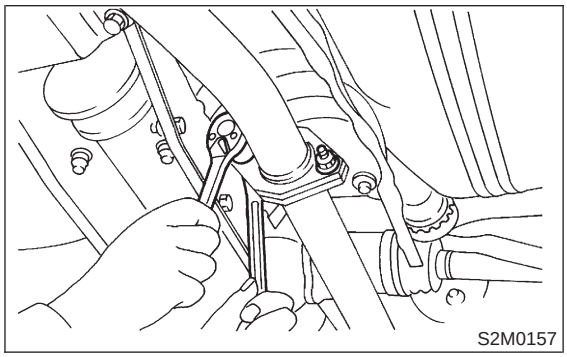
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)


B2M0055

4. Muffler

A: REMOVAL AND INSTALLATION

1) Separate muffler from rear exhaust pipe.

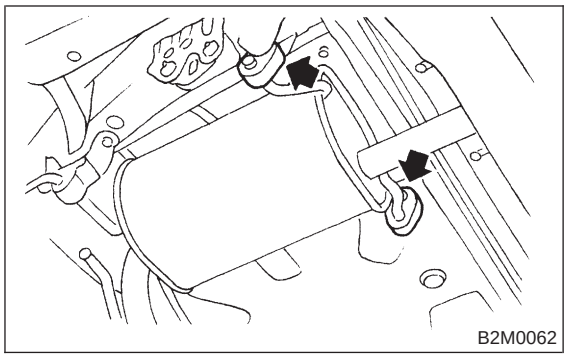

S2M0157

2) Remove left and right rubber cushions.

CAUTION:
Be careful not to pull down muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushions in advance.

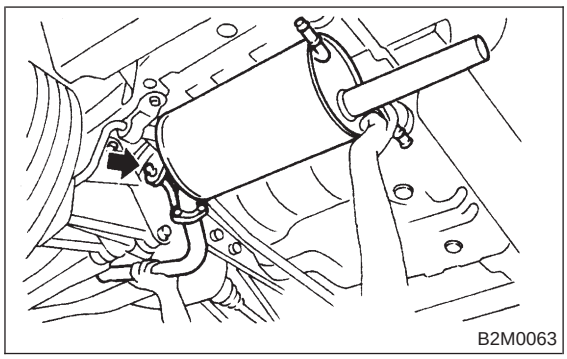
SUBARU CRC (Part No. 004301003)


B2M0062

3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

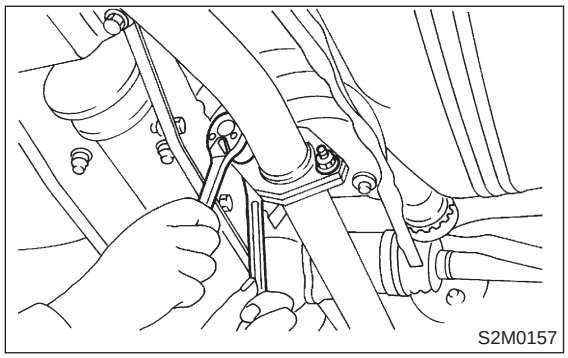
SUBARU CRC (Part No. 004301003)


B2M0063

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)



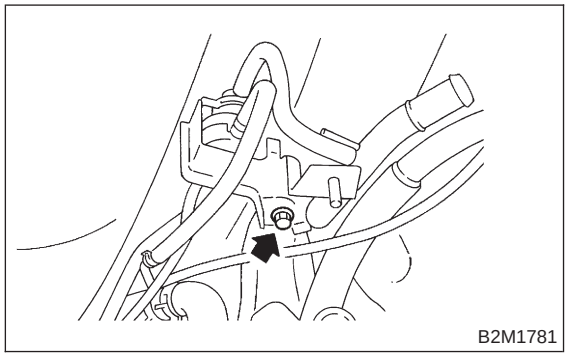
MEMO:

1. Clutch System

			2200 cc	2500 cc
Clutch cover	Diaphragm set load kg (lb)		450 (992)	550 (1,213)
Clutch disc	Facing material		Woven	
	O.D. × I.D. × thickness mm (in)		225 × 150 × 3.5 (8.86 × 5.91 × 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	1.6
Release bearing			Grease-packed self-aligning	
Release lever	Stroke mm (in)		24 — 26 (0.94 — 1.02)	
	Play at release lever center mm (in)		3 — 4 (0.12 — 0.16)	
Clutch pedal	Full stroke mm (in)		140 — 150 (5.51 — 5.91)	130 — 135 (5.12 — 5.31)

9) Installation is in the reverse order of removal.

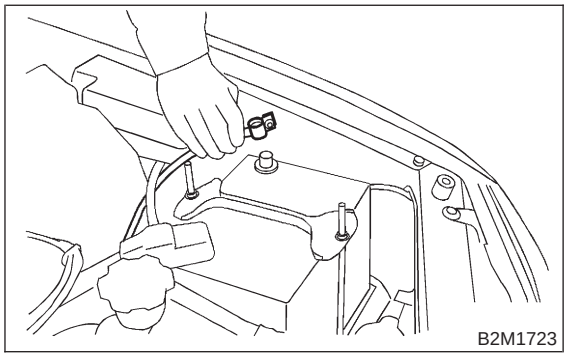
Tightening torque:
24.5±5 N·m (2.5±0.5 kg-m, 18.1±3.6 ft-lb)


B2M1781

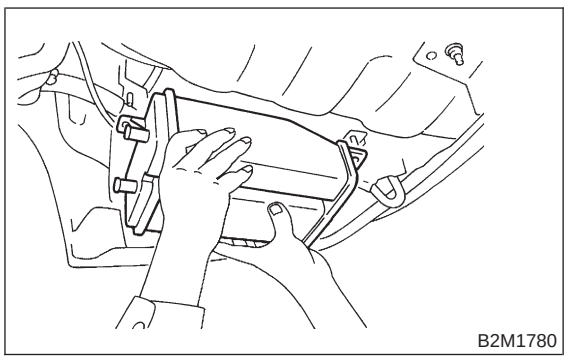
11. Vent Control Solenoid Valve (2500 cc Model)

A: REMOVAL

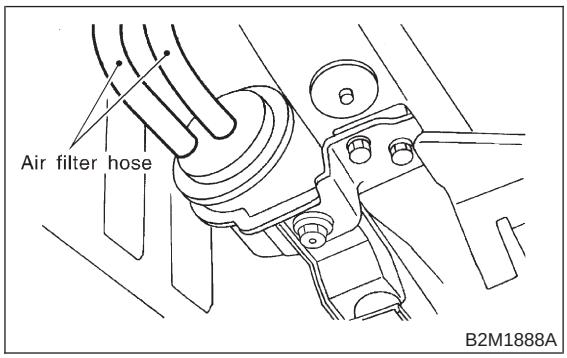
1) Disconnect battery ground cable.


B2M1723

2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>

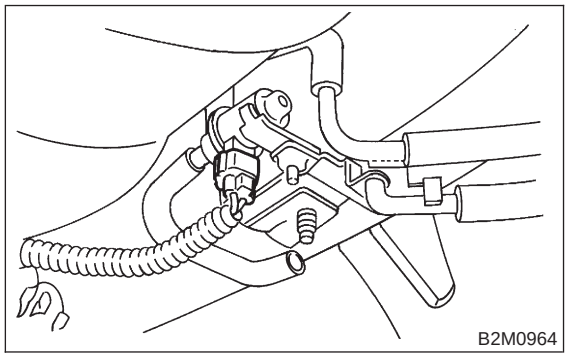

B2M1780

4) Disconnect two hoses from air filter.

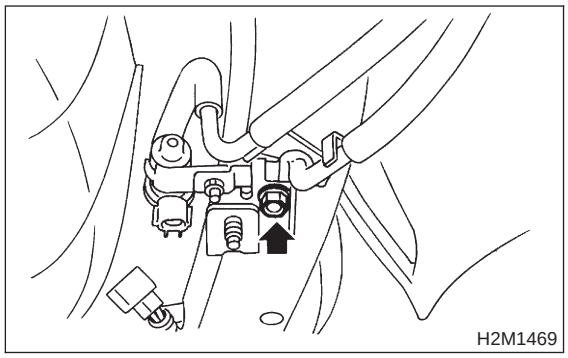


B2M1888A

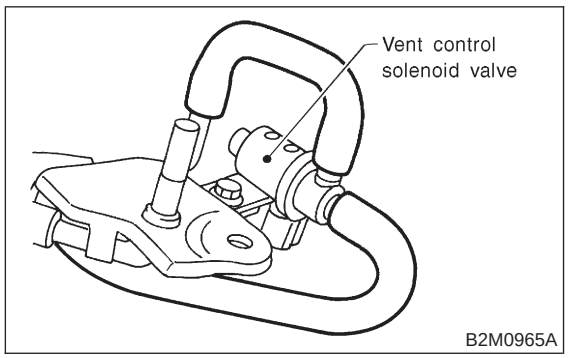
5) Disconnect connector from vent control solenoid valve.



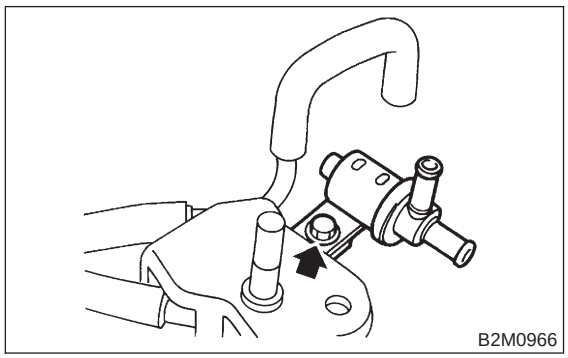
6) Remove one bolt fixing bracket on the body.



7) Remove two vacuum hoses from vent control solenoid valve.



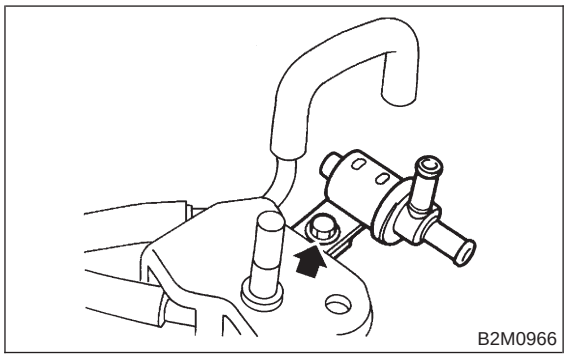
8) Remove one bolt fixing vent control solenoid valve on bracket.



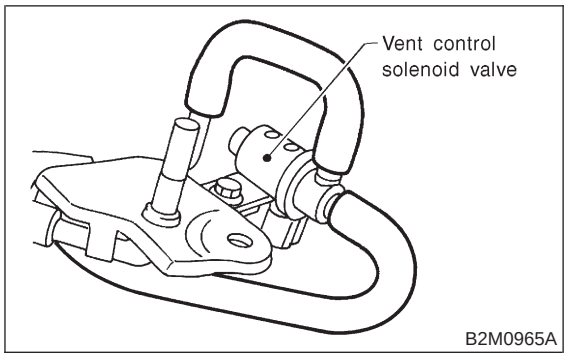
9) Remove vent control solenoid valve.

B: INSTALLATION

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

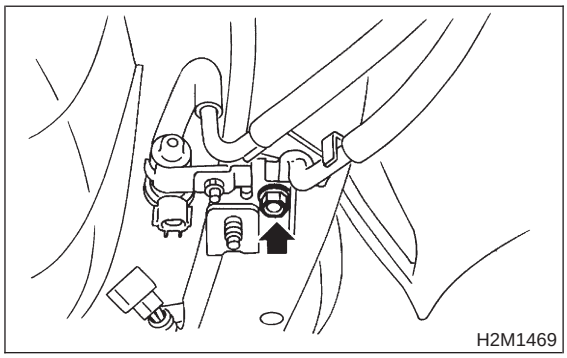


2) Install two vacuum hoses to vent control solenoid valve.

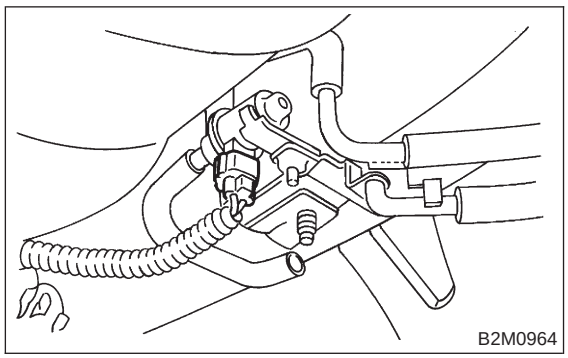


3) Install the bolt fixing bracket on the body.

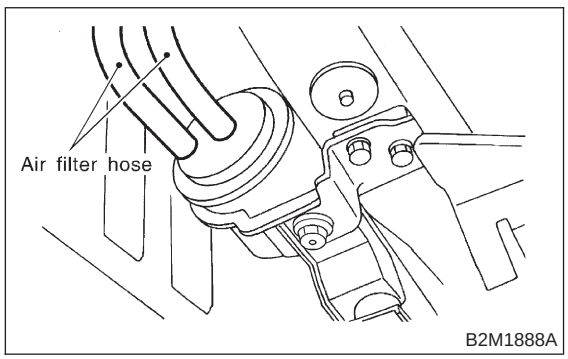
Tightening torque:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)



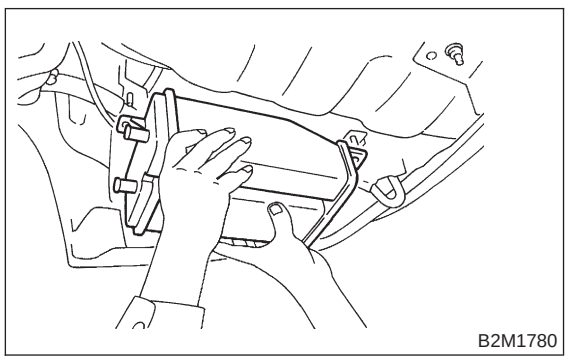
4) Connect connector to vent control solenoid valve.



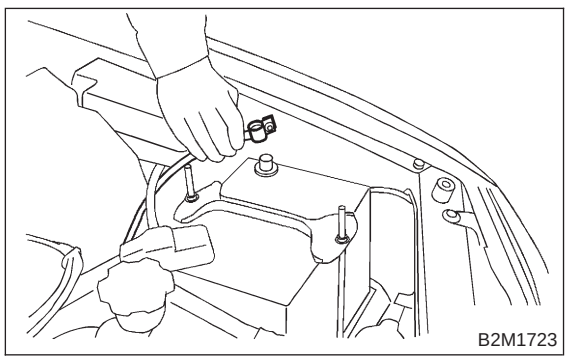
5) Connect two hoses to air filter.



6) Install canister. <Ref. to 2-1 [W3A0].>



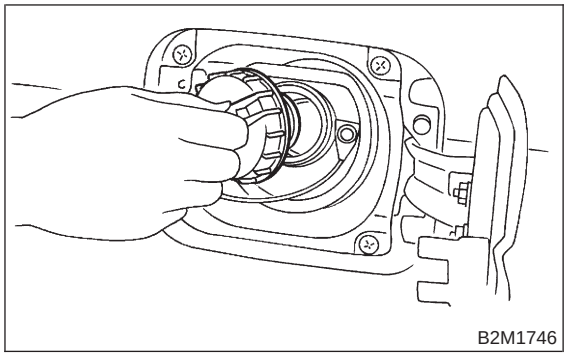
7) Lower the vehicle.
8) Connect battery ground cable.



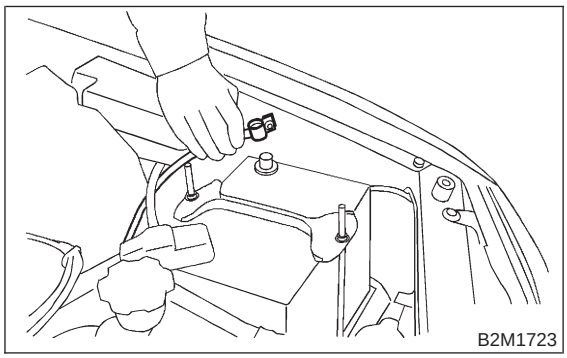
12. Main Fuel Level Sensor

A: REMOVAL

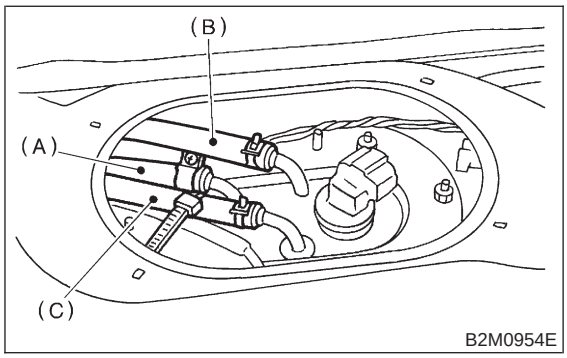
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect battery ground cable.

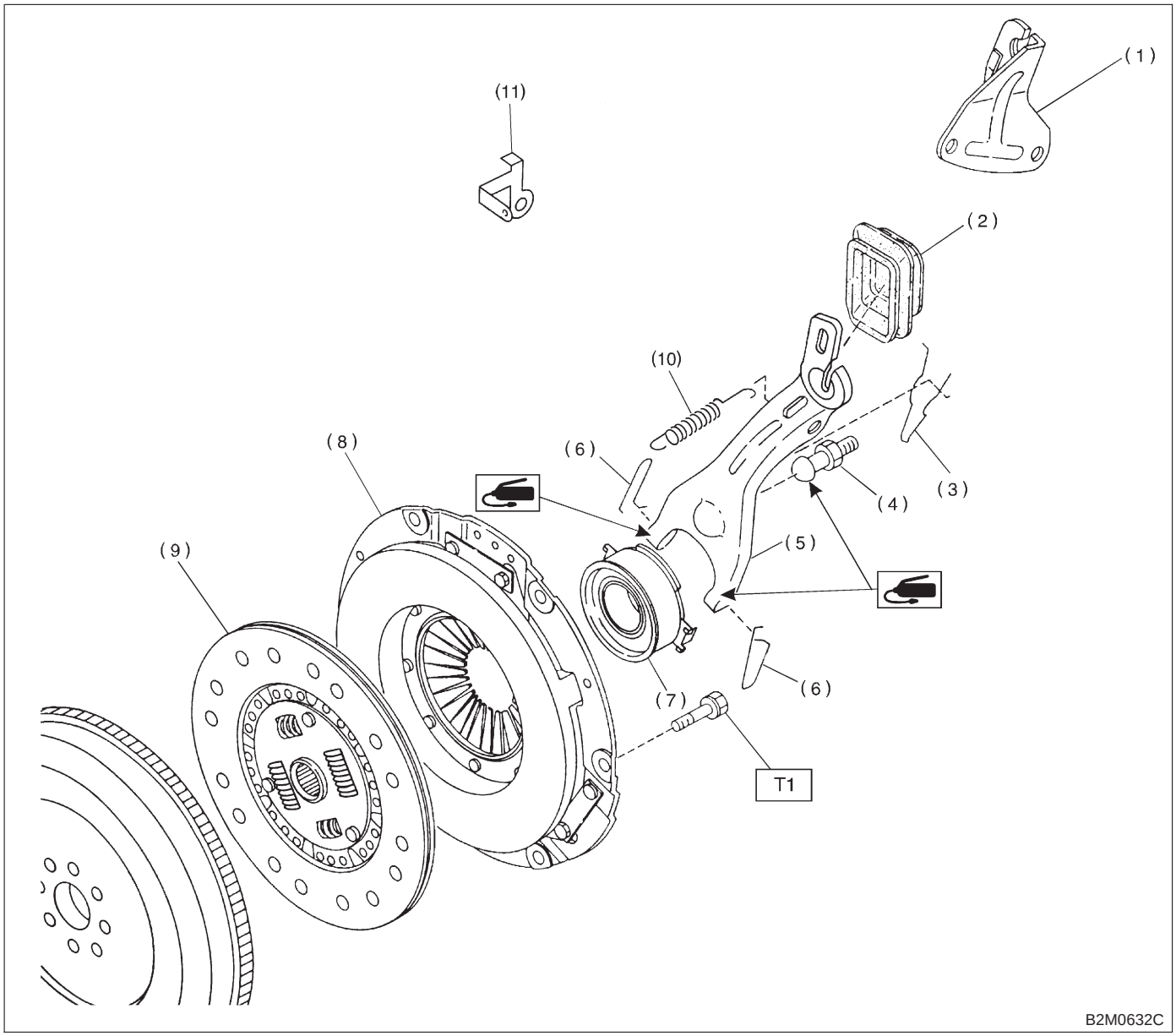


4) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).



1. Clutch System

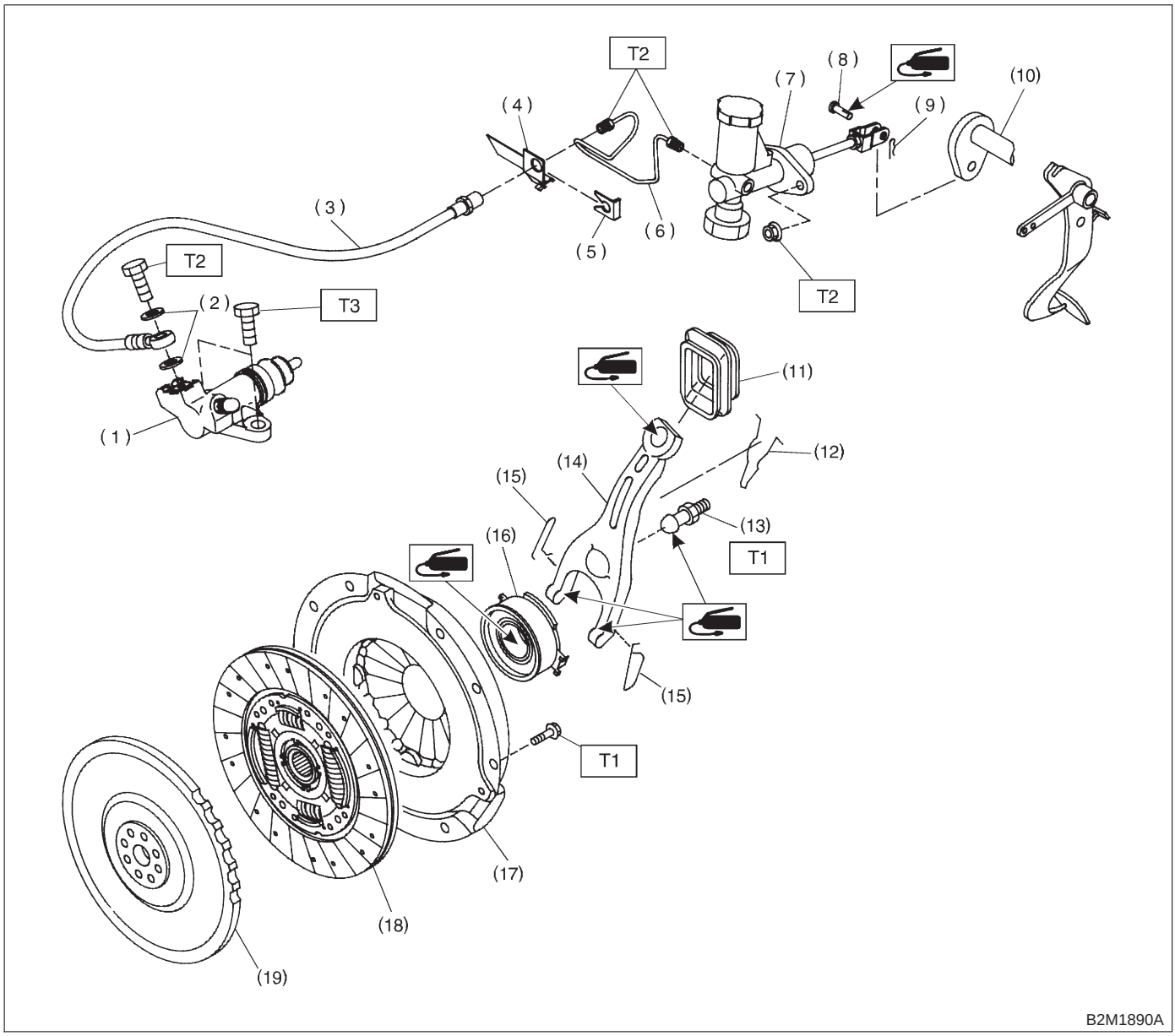
A: MECHANICAL APPLICATION TYPE



(1) Clutch cable bracket
(2) Clutch release lever sealing
(3) Retainer spring
(4) Pivot
(5) Clutch release lever
(6) Clip
(7) Clutch release bearing
(8) Clutch cover
(9) Clutch disc
(10) Return spring (Models without hill holder only)
(11) Clutch return spring bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 15.7±1.5 (1.6±0.15, 11.6±1.1)

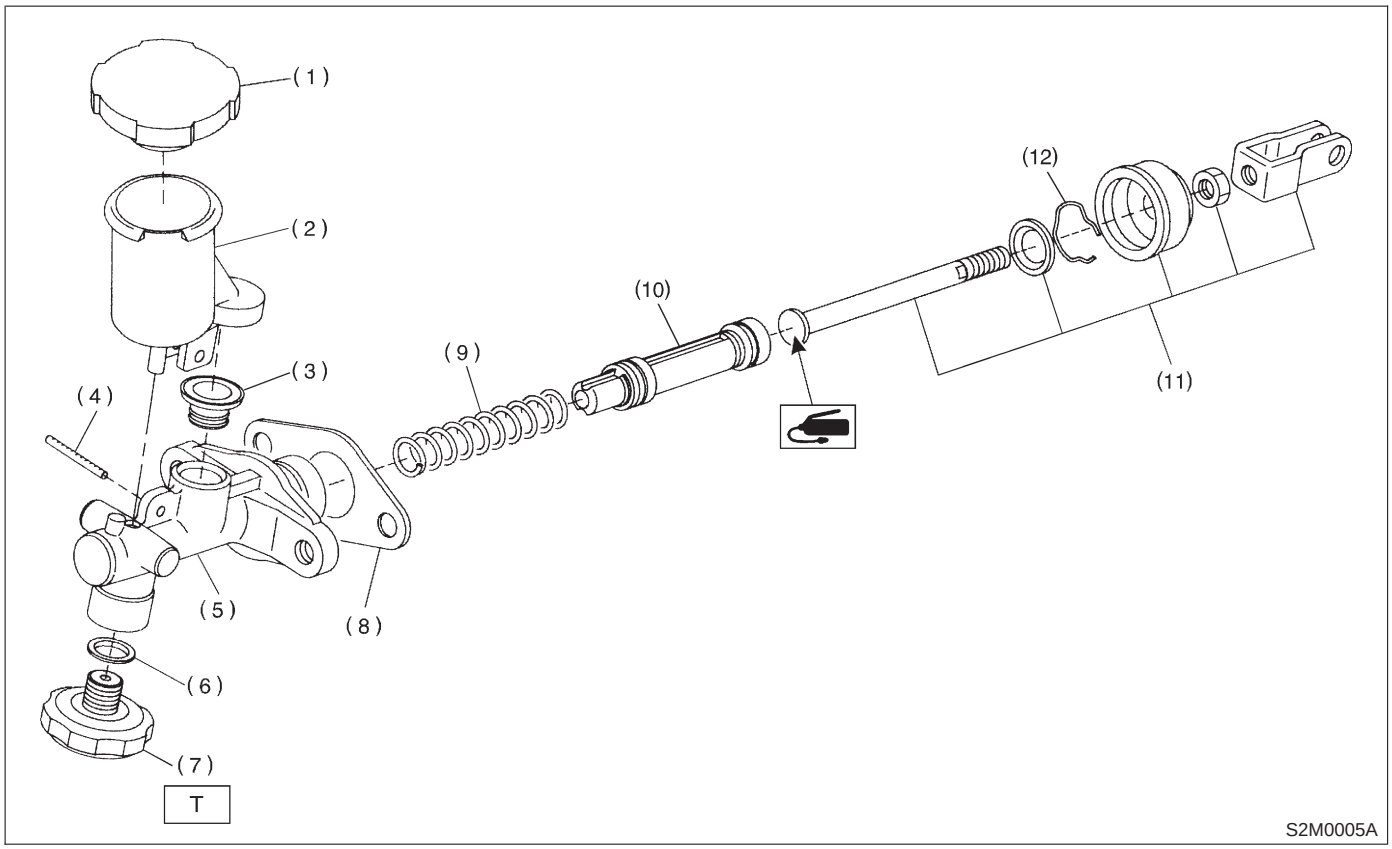
B: HYDRAULIC APPLICATION TYPE



(1) Operating cylinder
(2) Washer
(3) Clutch hose
(4) Bracket
(5) Clamp
(6) Pipe
(7) Master cylinder ASSY
(8) Clevis pin
(9) Snap pin
(10) Lever
(11) Clutch release lever sealing
(12) Retainer spring
(13) Pivot
(14) Release lever
(15) Clip
(16) Release bearing
(17) Clutch cover
(18) Clutch disc
(19) Flywheel

Tightening torque: N·m (kg-m, ft-lb)
T1: 15.7±1.5 (1.6±0.15, 11.6±1.1)
T2: 18±3 (1.8±0.3, 13.0±2.2)
T3: 37±3 (3.8±0.3, 27.5±2.2)

2. Master Cylinder and Reservoir Tank



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Washer
(7) Diaphragm spring
(8) Seat
(9) Return spring
(10) Piston
(11) Push rod
(12) Piston stop ring

Tightening torque: N·m (kg-m, ft-lb)
T: 46.6±7.4 (4.75±0.75, 34.4±5.4)

1. General

A: PRECAUTION

When servicing clutch system, pay attention to the following items.

1. MECHANICAL APPLICATION TYPE

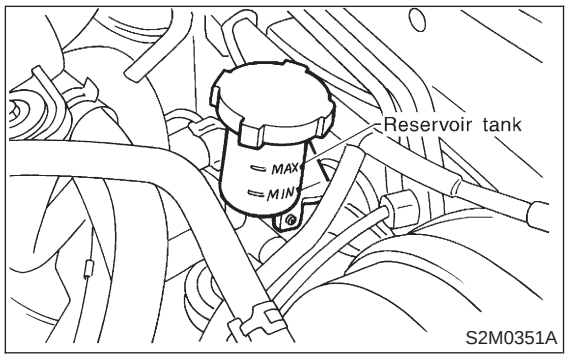
1) Check the routing of clutch cable for smoothness.
2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
3) Apply grease sufficiently to the connecting portion of clutch pedal.
4) Apply grease sufficiently to the release lever portion.
5) Position clutch 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. HYDRAULIC APPLICATION TYPE

1) Check fluid level using a scale on outside of reservoir tank. If the level is below “MIN”, add clutch fluid to bring it up to “MAX”.

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

CAUTION:
● Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.
● Use fresh DOT3 or DOT4 brake fluid when refilling fluid.



2) Make sure that brake fluid does not leak from master cylinder, operating cylinder and piping.
3) Apply grease sufficiently to the release lever pinion.
4) Check for proper clutch disengagement and clutch pedal return ability.

2. On-car Service

A: ADJUSTMENT

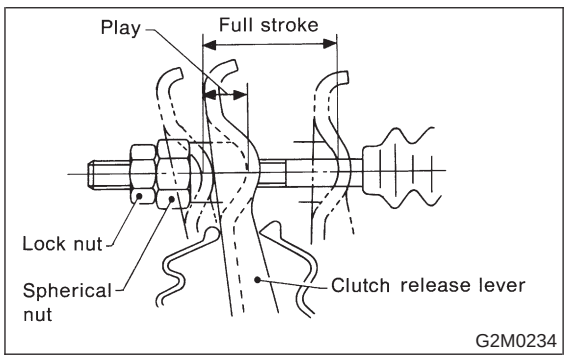
1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring from lever (Models without hill holder only).
2) Adjust spherical nut so that the play is within the specified value at the lever end (center of spherical nut).

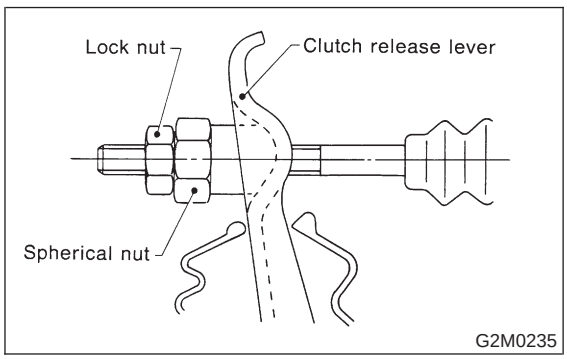
Play:
3 — 4 mm (0.12 — 0.16 in)

Full stroke:
24 — 26 mm (0.94 — 1.02 in)

CAUTION:
Take care not to twist the cable during adjustment.



3) Upon completion of adjustment, securely lock spherical nut with lock nut.



4) Install return spring on lever (Models without hill holder only).

NOTE:
Hook the long hook side of the return spring with the lever (Models without hill holder only).

1. General

A: PRECAUTION

When servicing clutch system, pay attention to the following items.

1. MECHANICAL APPLICATION TYPE

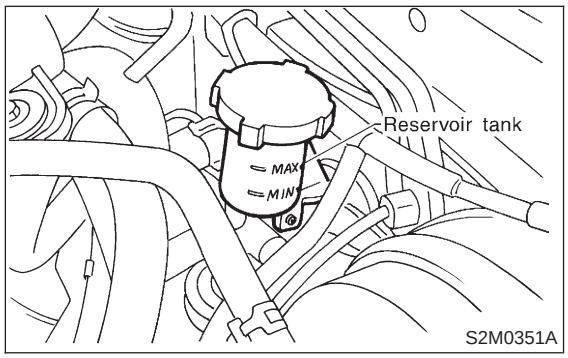
1) Check the routing of clutch cable for smoothness.
2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
3) Apply grease sufficiently to the connecting portion of clutch pedal.
4) Apply grease sufficiently to the release lever portion.
5) Position clutch 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. HYDRAULIC APPLICATION TYPE

1) Check fluid level using a scale on outside of reservoir tank. If the level is below “MIN”, add clutch fluid to bring it up to “MAX”.

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

CAUTION:
● Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.
● Use fresh DOT3 or DOT4 brake fluid when refilling fluid.



2) Make sure that brake fluid does not leak from master cylinder, operating cylinder and piping.
3) Apply grease sufficiently to the release lever pinion.
4) Check for proper clutch disengagement and clutch pedal return ability.

2. On-car Service

A: ADJUSTMENT

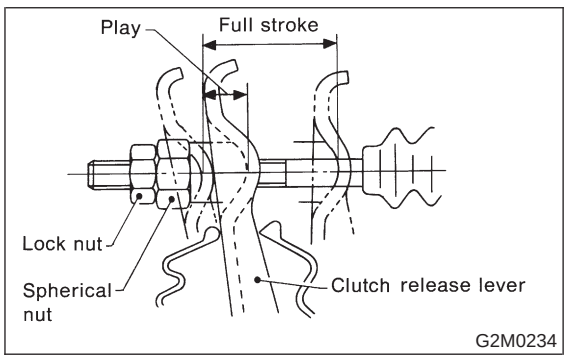
1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring from lever (Models without hill holder only).
2) Adjust spherical nut so that the play is within the specified value at the lever end (center of spherical nut).

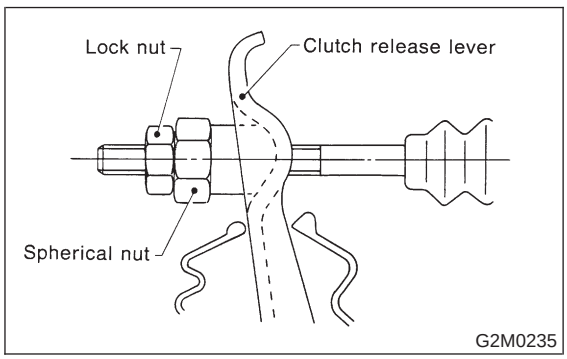
Play:
3 — 4 mm (0.12 — 0.16 in)

Full stroke:
24 — 26 mm (0.94 — 1.02 in)

CAUTION:
Take care not to twist the cable during adjustment.



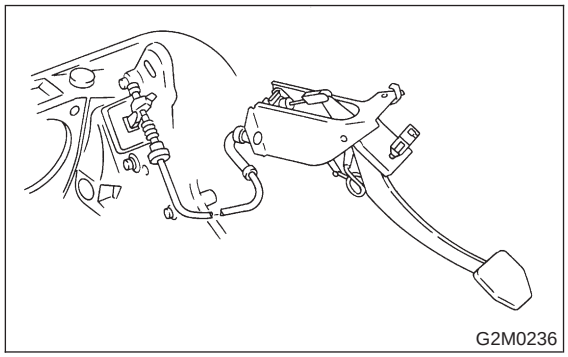
3) Upon completion of adjustment, securely lock spherical nut with lock nut.



4) Install return spring on lever (Models without hill holder only).

NOTE:
Hook the long hook side of the return spring with the lever (Models without hill holder only).

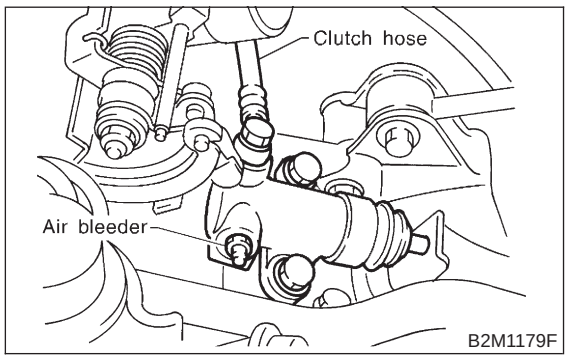
5) Depress clutch pedal to assure there is no abnormality in the clutch system.



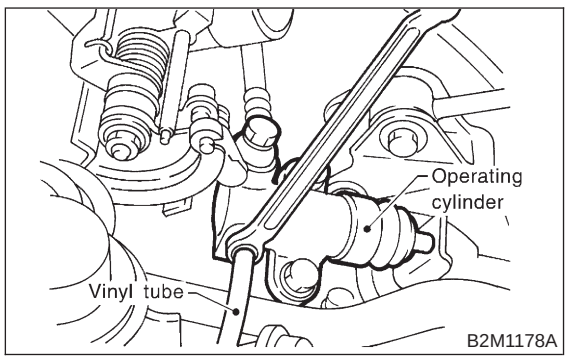
2. HYDRAULIC APPLICATION TYPE

NOTE:
Bleed air from oil line with the help of a co-worker.

1) Remove air chamber.
2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

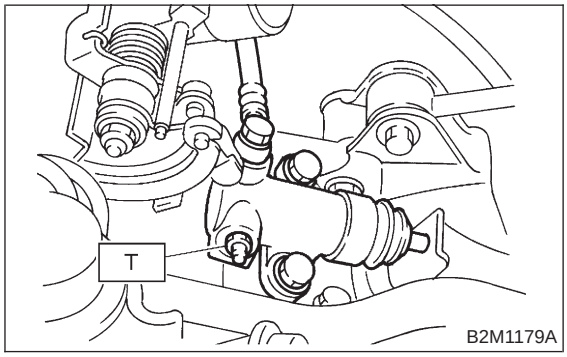


4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

5) Tighten air bleeder.

Tightening torque:
T: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)



6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
7) After bleeding air from system, ensure that clutch operates properly.

3. Release Bearing and Lever

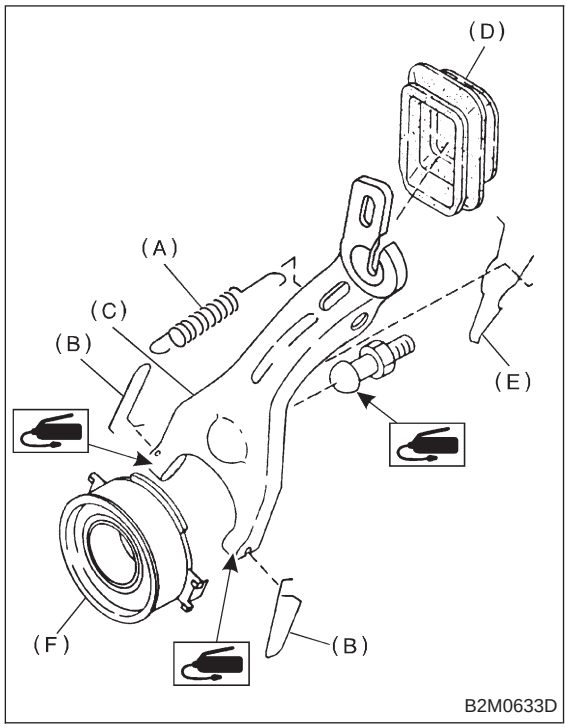
A: REMOVAL

1. MECHANICAL APPLICATION TYPE

1) Remove transmission assembly from vehicle body.
<Ref. to 2-11 [W2B0].>
2) Remove release lever return spring (Models without hill holder only).
3) Remove the two clips from clutch release lever and remove release bearing.

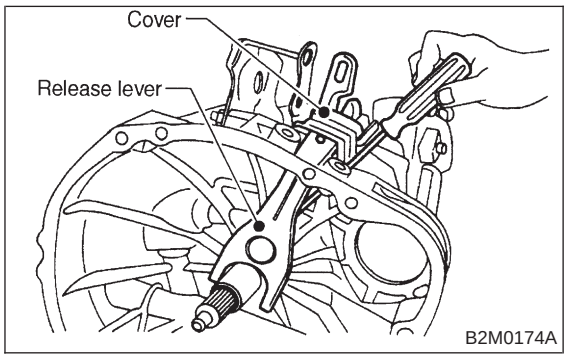
CAUTION:
Be careful not to deform clips.

4) Remove release lever seal.



(A) Release lever return spring
(B) Clip
(C) Release lever
(D) Release lever seal
(E) Retainer spring
(F) Clutch release lever

5) 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.

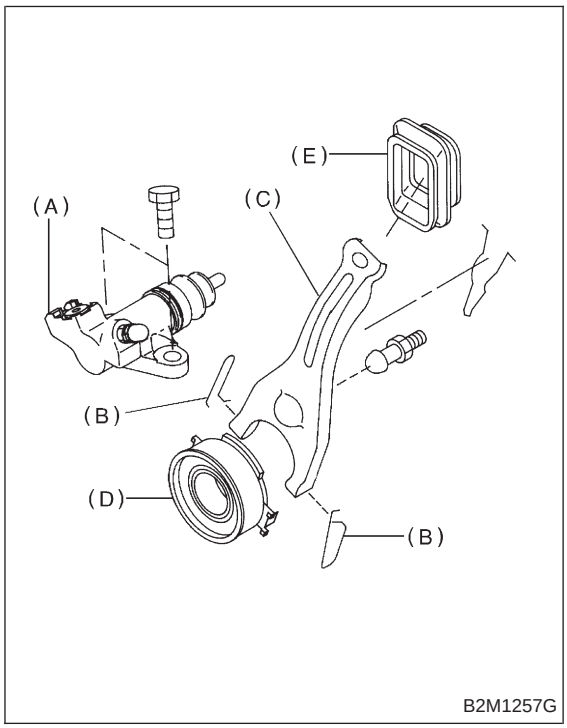


2. HYDRAULIC APPLICATION TYPE

1) Remove transmission assembly from vehicle body.
<Ref. to 2-11 [W2B0].>
2) Remove operating cylinder.
<Ref. to 2-10 [W5A0].>
3) Remove the two clips from clutch release lever and remove release bearing.

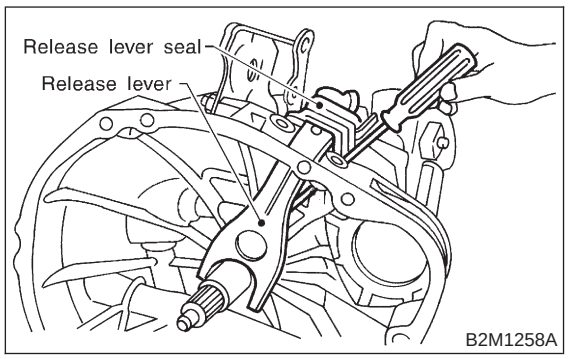
CAUTION:
Be careful not to deform clips.

4) Remove release lever seal.



(A) Operating cylinder
(B) Clip
(C) Clutch release lever
(D) Release bearing
(E) Release lever seal

5) 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.



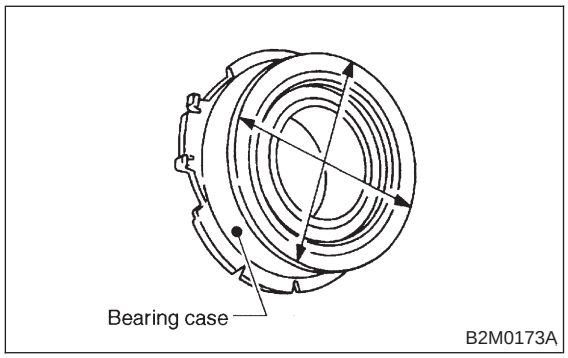
B: INSPECTION

1. RELEASE BEARING

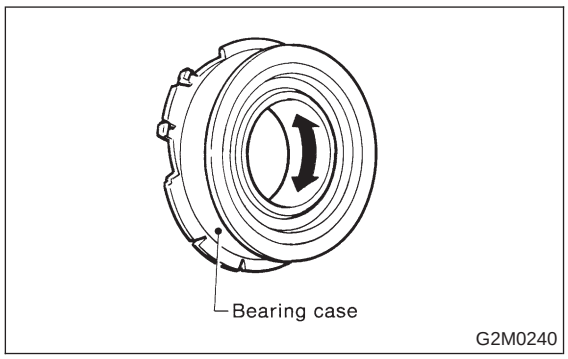
CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
FWD; Approx.
1.0 mm (0.039 in)
AWD; Approx.
1.4 mm (0.055 in)



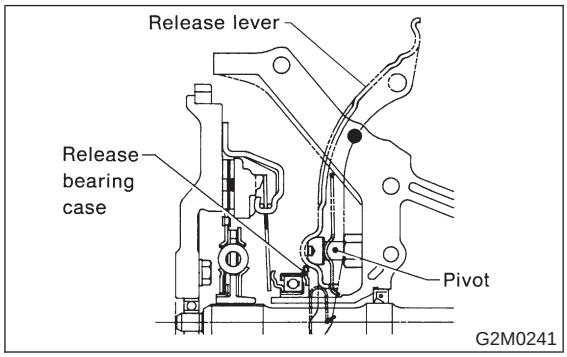
2) Check the bearing for smooth rotation by applying pressure in the thrust direction.



3) Check wear and damage of bearing case surface contacting with lever.

2. RELEASE LEVER

1) Check lever pivot portion and the point of contact with release bearing case for wear.



C: INSTALLATION

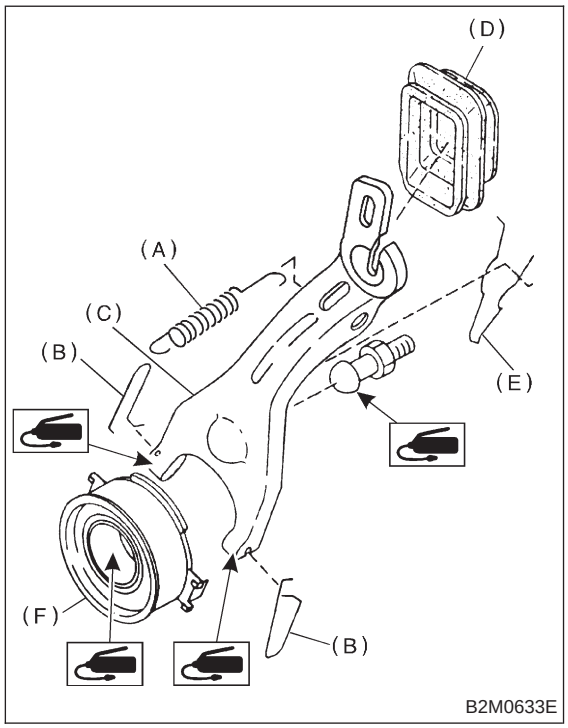
CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Inner groove of release bearing**
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

1. MECHANICAL APPLICATION TYPE

1) While pushing release lever to pivot and twisting it to both sides, fit retainer spring onto the constricted portion of pivot.

NOTE:
Confirm that retainer spring is securely fitted by observing it through the main case hole.

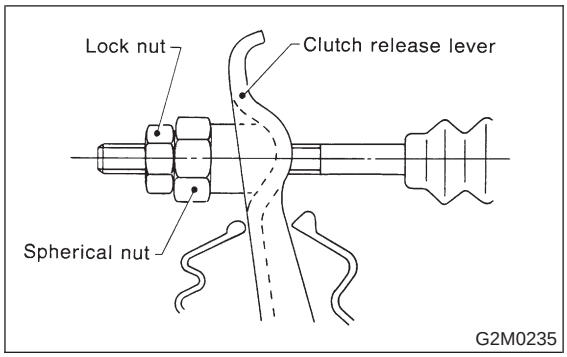
2) Install release bearing and fasten it with two clips.
3) Install release lever seal.



(A) Release lever return spring
(B) Clip
(C) Release lever
(D) Release lever seal
(E) Retainer spring
(F) Release lever bearing

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 (Models without hill holder only).

NOTE:
Hook up the return spring to right side hole of the release lever.

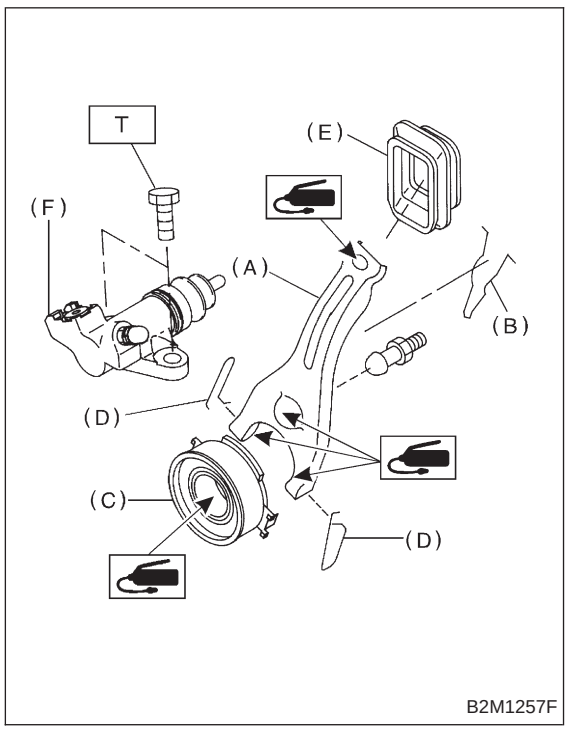
2. HYDRAULIC APPLICATION TYPE

1) While pushing release lever to pivot and twisting it to both sides, fit retainer spring onto the constricted portion of pivot.

NOTE:
● Apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.
● Confirm that retainer spring is securely fitted by observing it through the main case hole.

2) Install release bearing and fasten it with two clips.
3) Install release lever seal.
4) Install operating cylinder.

Tightening torque:
T: 37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)



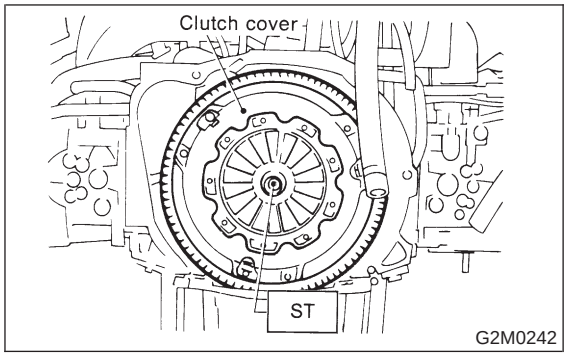
(A) Release lever
(B) Retainer spring
(C) Release bearing
(D) Clip
(E) Release lever seal
(F) Operating cylinder

5) After remounting engine and transmission on body.
<Ref. to 2-11 [W2C0].>
6) Bleed air from oil line with the help of a coworker.
<Ref. to 2-10 [W2A2].>

4. Clutch Disc and Cover

A: REMOVAL

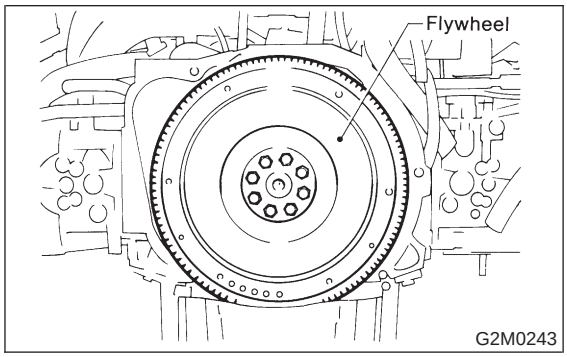
1) Install ST on flywheel.
ST 498497100C RANKSHAFT STOPPER



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.



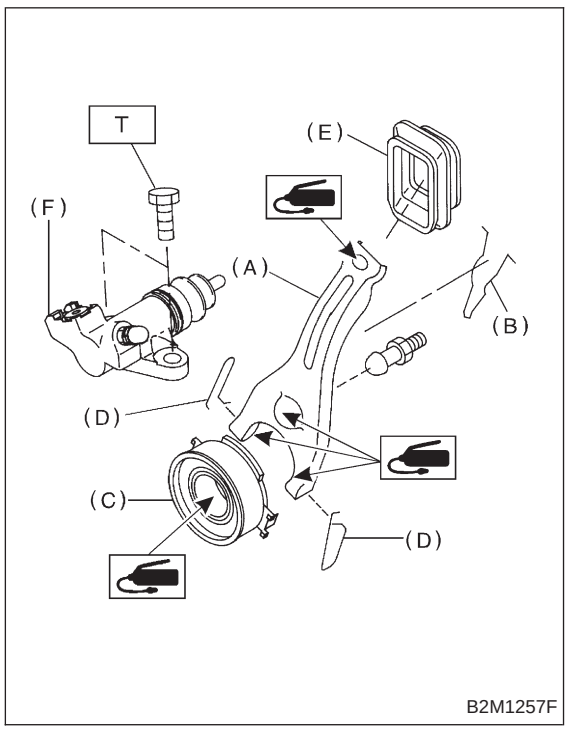
2. HYDRAULIC APPLICATION TYPE

1) While pushing release lever to pivot and twisting it to both sides, fit retainer spring onto the constricted portion of pivot.

NOTE:
● Apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.
● Confirm that retainer spring is securely fitted by observing it through the main case hole.

2) Install release bearing and fasten it with two clips.
3) Install release lever seal.
4) Install operating cylinder.

Tightening torque:
T: 37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)



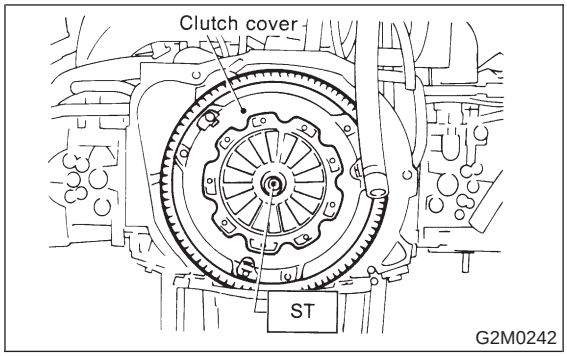
(A) Release lever
(B) Retainer spring
(C) Release bearing
(D) Clip
(E) Release lever seal
(F) Operating cylinder

5) After remounting engine and transmission on body.
<Ref. to 2-11 [W2C0].>
6) Bleed air from oil line with the help of a coworker.
<Ref. to 2-10 [W2A2].>

4. Clutch Disc and Cover

A: REMOVAL

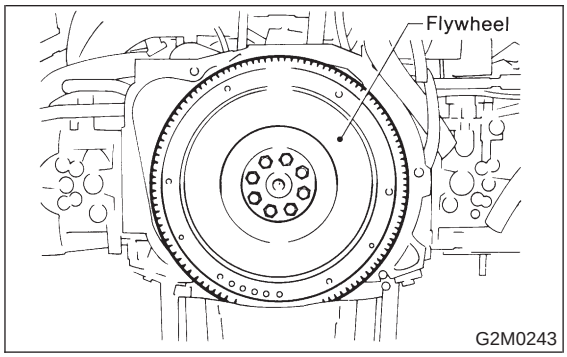
1) Install ST on flywheel.
ST 498497100C RANKSHAFT STOPPER



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.



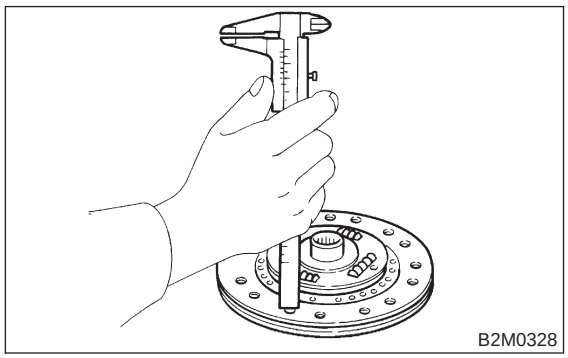
B: INSPECTION

1. CLUTCH DISC

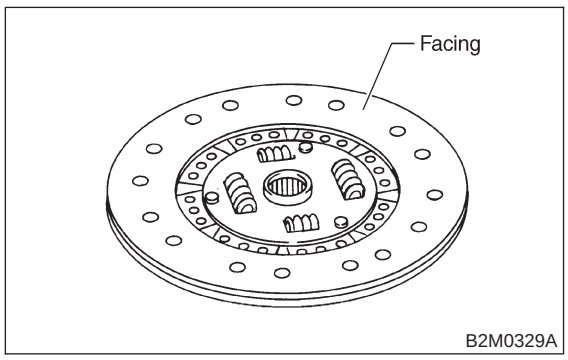
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

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.

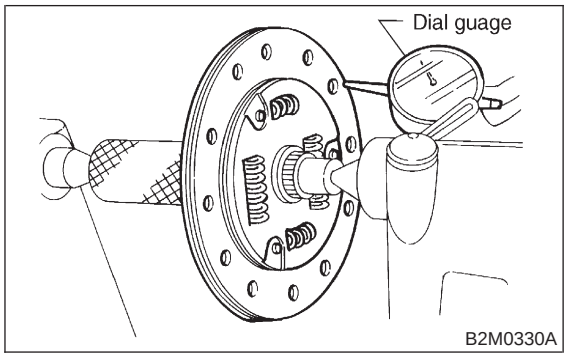


2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

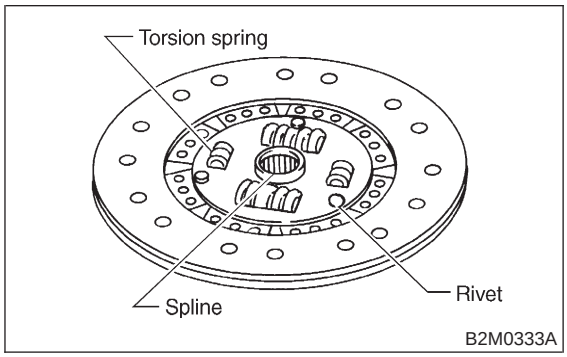


4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

Limit for deflection:
1.0 mm (0.039 in) at R = 107 mm (4.21 in)



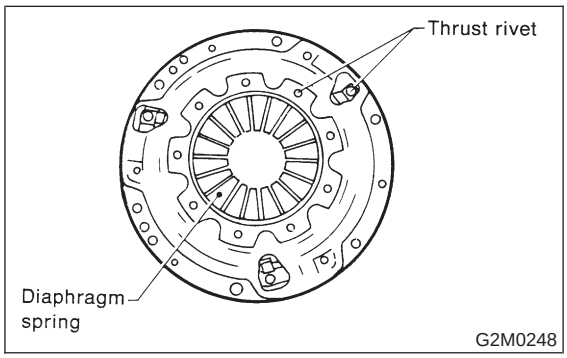
5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.



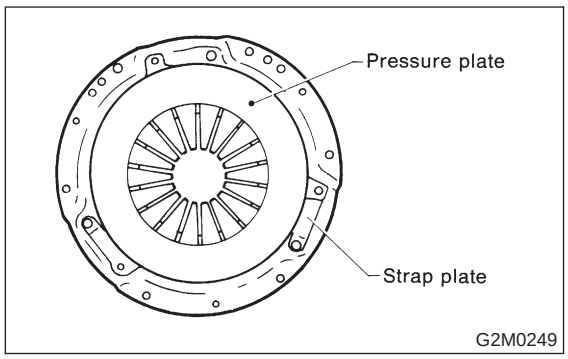
2. CLUTCH COVER

NOTE:
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.



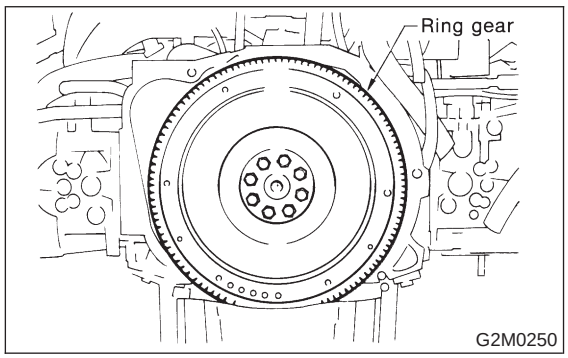
3) Damaged or worn disc contact surface of pressure plate.
4) Loose strap plate setting bolt.
5) Worn diaphragm sliding surface.



3. FLYWHEEL

CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent.

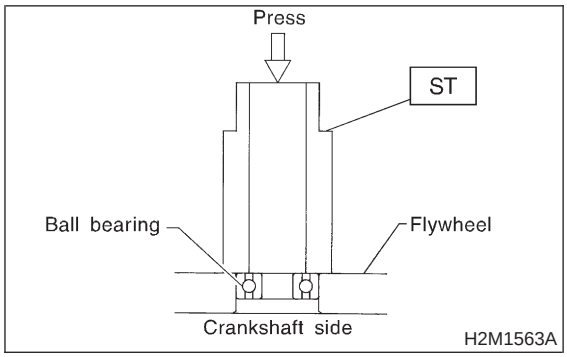
1) Damage of facing and ring gear
If defective, replace flywheel.



2) Smoothness of rotation
Rotate ball bearing applying pressure in thrust direction.

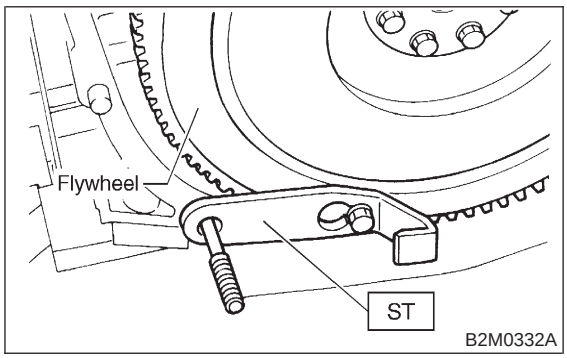
3) If noise or excessive play is noted, replace ball bearing as follows:
(1) Drive out ball bearing from flywheel.
(2) Press bearing into flywheel until bearing end surface is flush with clutch disc contact surface of flywheel. Do not press inner race.

ST 899754112 SNAP RING PRESS



C: INSTALLATION

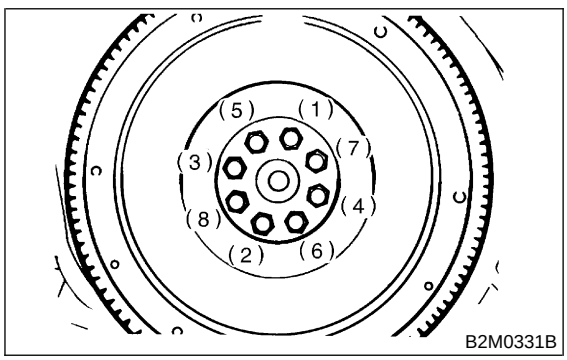
1) Install flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



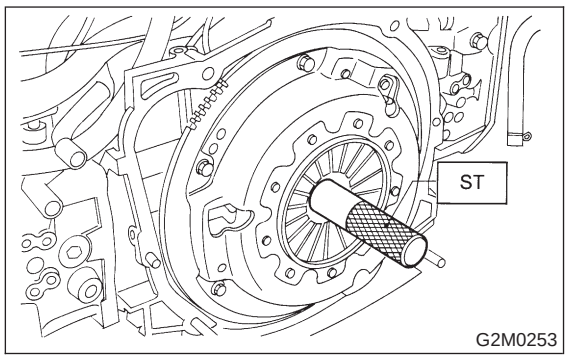
2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:
Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
72±3 N·m (7.3±0.3 kg-m, 52.8±2.2 ft-lb)



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

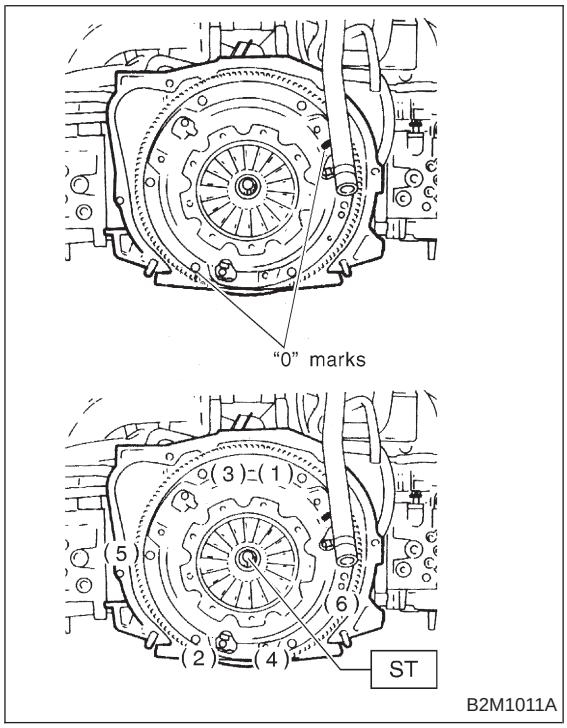


4) Install clutch cover on flywheel and tighten bolts to the specified torque.

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)

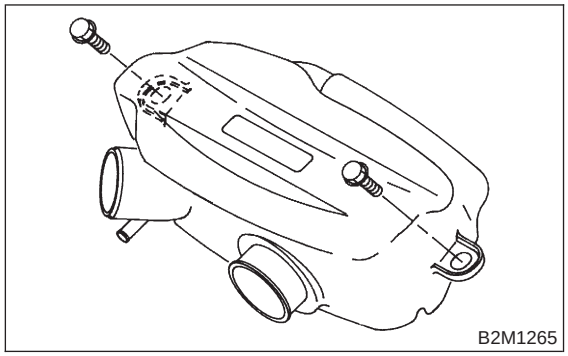
5) Remove ST.
ST 499747100 CLUTCH DISC GUIDE



5. Operating Cylinder

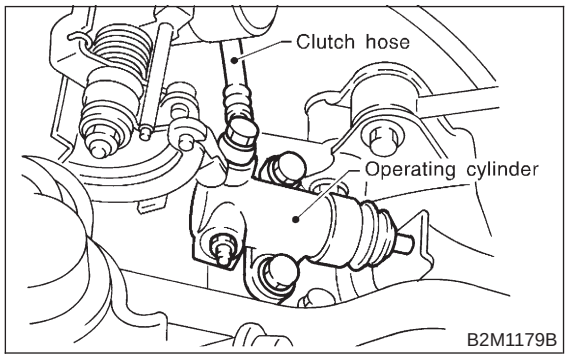
A: REMOVAL AND INSTALLATION

1) Remove air chamber.
<Ref. to 2-7 [W18A0].>

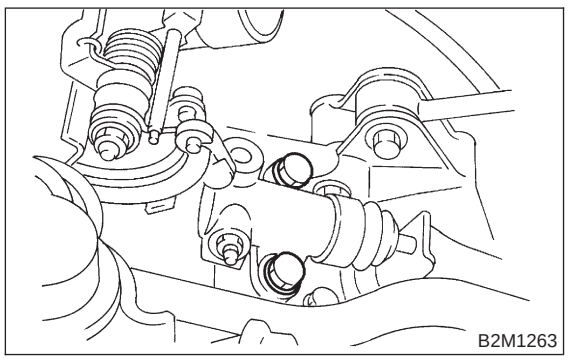


2) Remove clutch hose from operating cylinder.

CAUTION:
Cover hose joint to prevent brake fluid from flowing out.



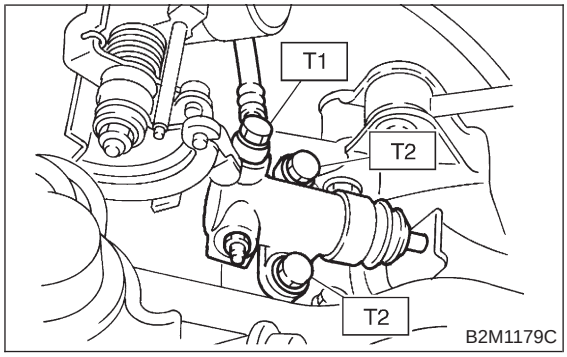
3) Remove operating cylinder from transmission.



4) Installation is in the reverse order of removal.

NOTE:
Before installing operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.

Tightening torque:
T1: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)
T2: 37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)

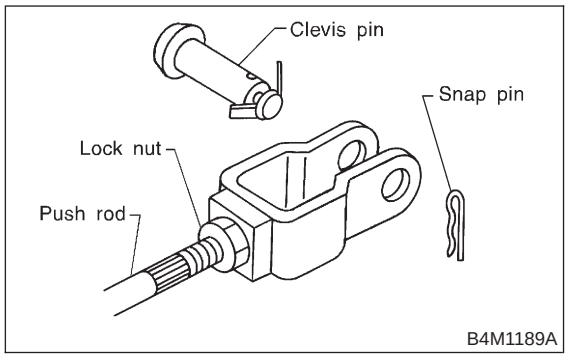


5) After bleeding air from operating cylinder, ensure that clutch operates properly.
<Ref. to 2-10 [W2A2].>

6. Master Cylinder and Reservoir Tank

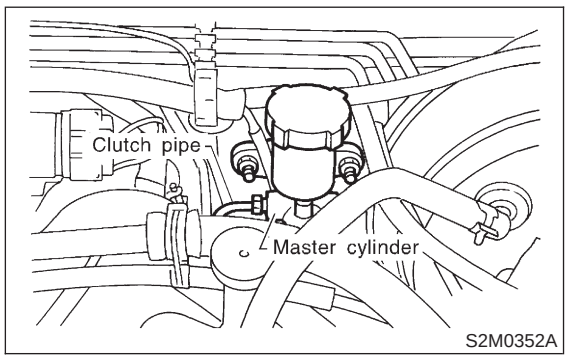
A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Remove snap pin, clevis pin and separate push rod of master cylinder from clutch pedal.



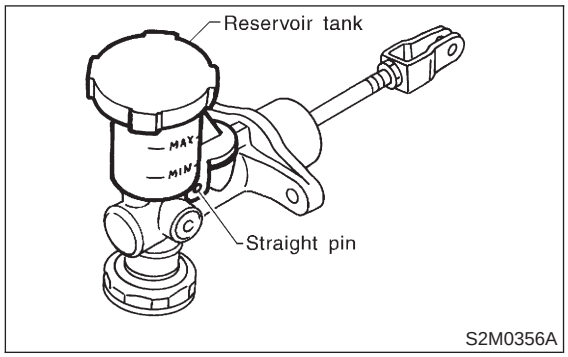
3) Remove clutch pipe from master cylinder.
4) Remove master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.

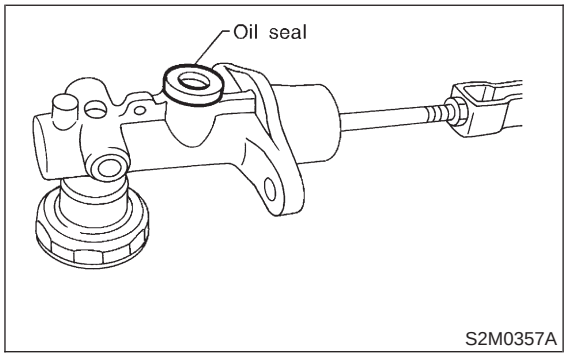


B: DISASSEMBLY

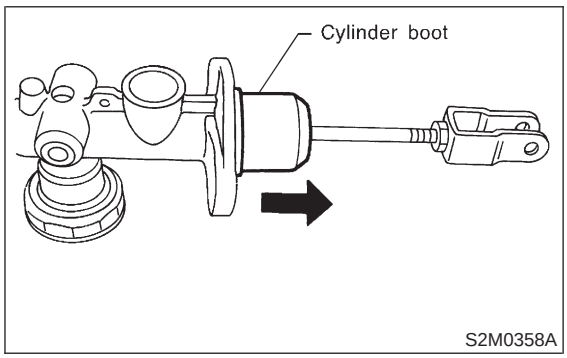
1) Remove straight pin and reservoir tank.



2) Remove oil seal.



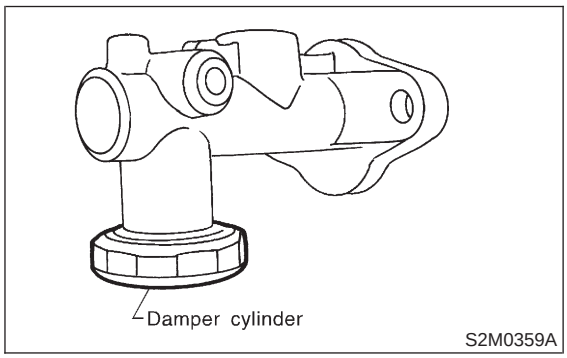
3) Move the cylinder boot backward.



4) Remove snap ring.

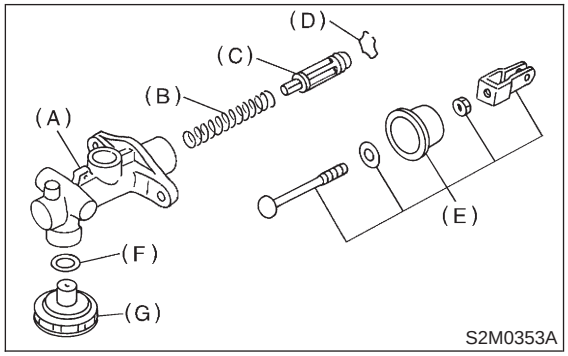
CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove damper cylinder from master cylinder body.



C: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring and gasket, replace the faulty part.



(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Snap ring
(E) Rod assy
(F) Washer
(G) Damper cylinder

D: ASSEMBLY

CAUTION:
Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

1) To assemble the master cylinder reverse the sequence of disassembly procedure.
2) Install damper cylinder washer. Install damper cylinder and tighten to the specified torque.

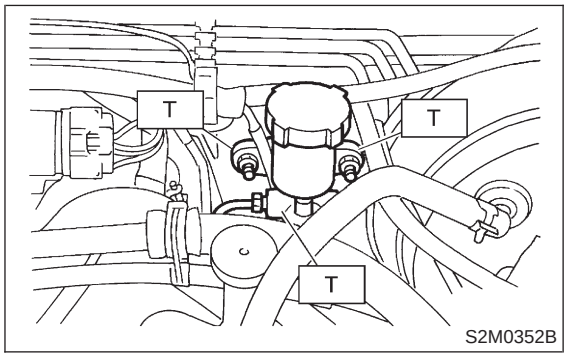
Tightening torque:
T: 46.6±7.4 N·m (4.75±0.75 kg-m, 34.4±5.4 ft-lb)

E: INSTALLATION

1) Install master cylinder to body, and install clutch pipe to master cylinder.

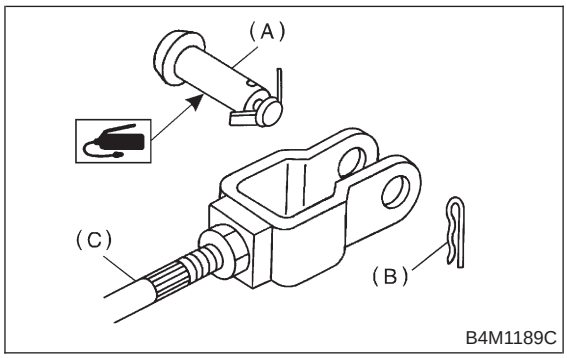
CAUTION:
Check that pipe is routed properly.

Tightening torque:
T: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)



2) Connect push rod of master cylinder to clutch pedal, and install clevis pin and snap pin.

NOTE:
Apply grease to clevis pin.



(A) Clevis pin
(B) Snap pin
(C) Push rod

3) After bleeding air from system, ensure that clutch operates properly.
<Ref. to 2-10 [W2A2].>

7. Brake Fluid

A: REPLACEMENT

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 clutch reserve tank filled with brake fluid to eliminate entry of air.
● Clutch pedal operating must be very slow.
● For convenience and safety, it is advisable to have two man working.
● The amount of brake fluid required is approximately 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch 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 reserve tank with syringe.
4) Refill reservoir tank with recommended brake fluid.

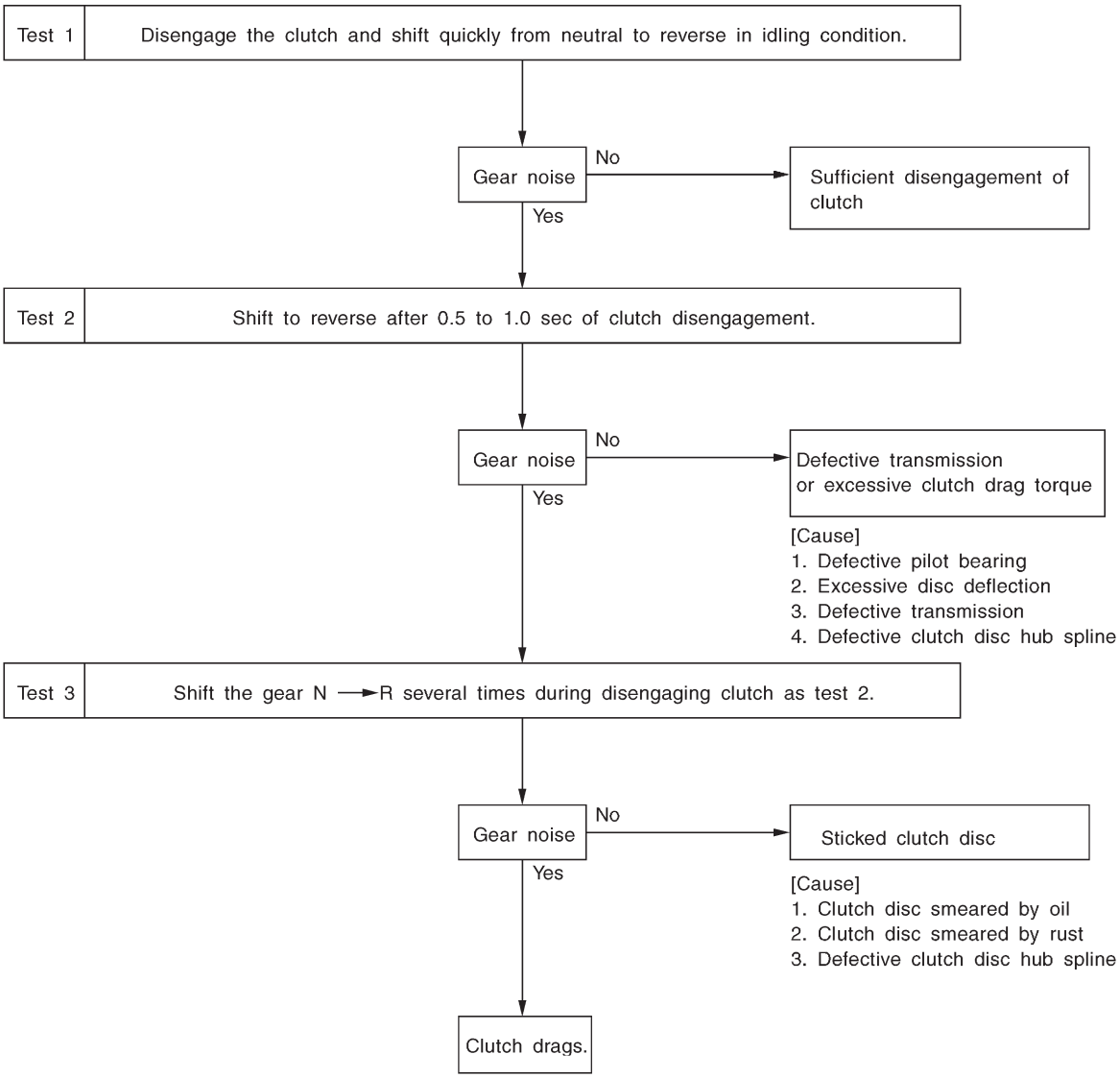
Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

5) Bleed air from oil line with the help of a co-worker.
<Ref. to 2-10 [W2A2].>

1. Clutch System

Symptom	Possible cause	Corrective
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms ● Engine revs up when shifting. ● High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. ● 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 the this sort is due to defective synchronization mechanism, carry out the test as described after. <Ref. to 2-10 [K1A0].> 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.
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



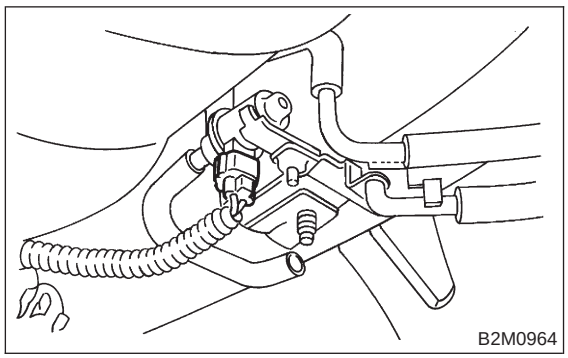
[Cause]
1. Cracked clutch disc facing
2. Damaged or worn clutch cover
3. Malfunction of clutch release system
4. Insufficient clutch release amount
5. Excessive clutch pedal play

B2M1012A

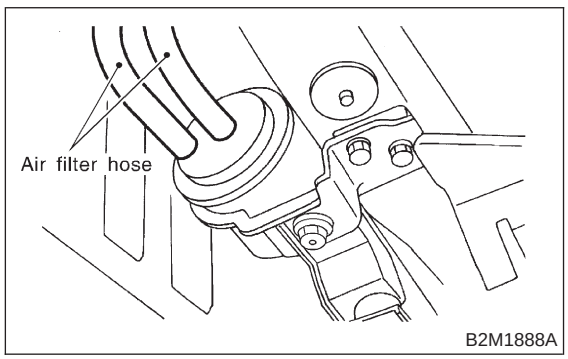
MEMO:

MEMO:

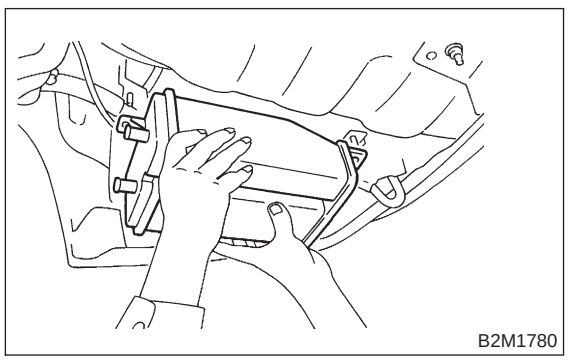
4) Connect connector to vent control solenoid valve.



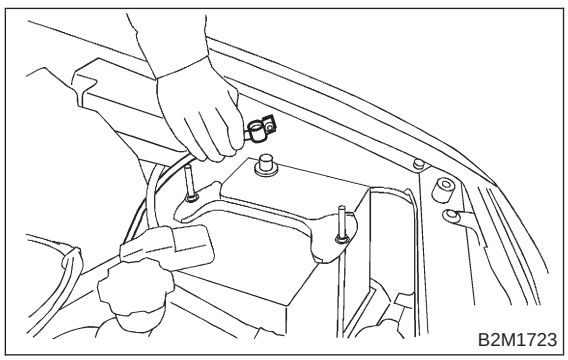
5) Connect two hoses to air filter.



6) Install canister. <Ref. to 2-1 [W3A0].>



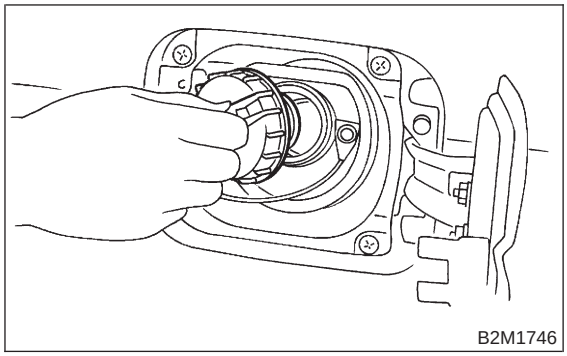
7) Lower the vehicle.
8) Connect battery ground cable.



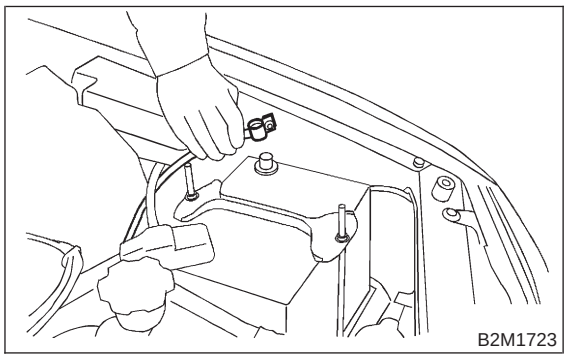
12. Main Fuel Level Sensor

A: REMOVAL

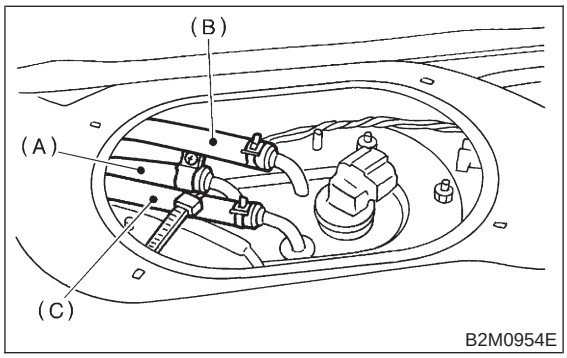
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



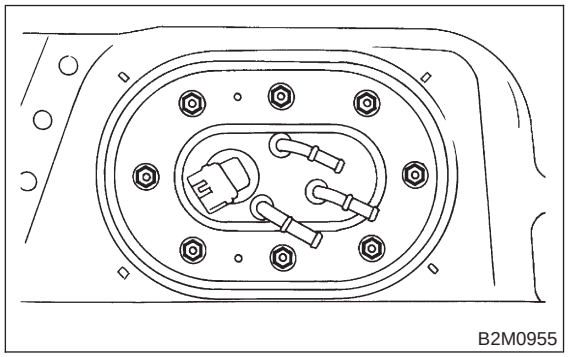
3) Disconnect battery ground cable.



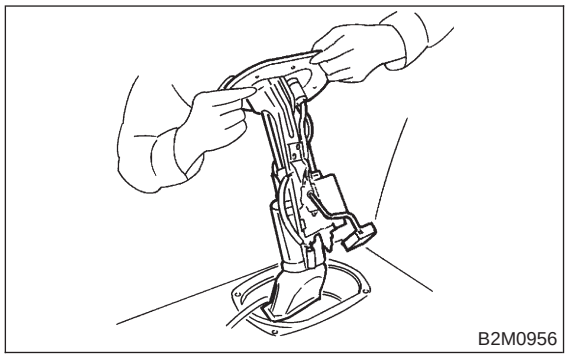
4) Disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).



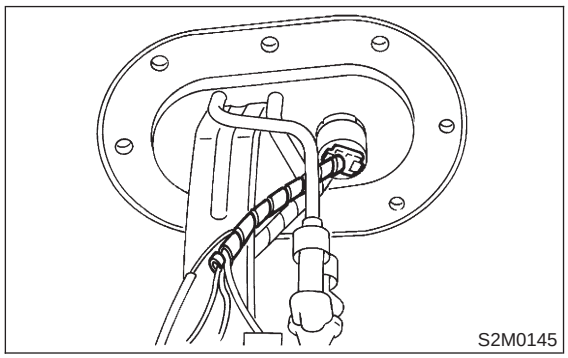
5) Remove nuts which install fuel pump assembly onto fuel tank.


B2M0955

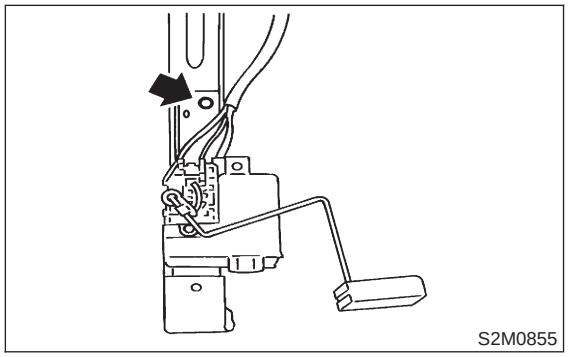
6) Take off fuel pump assembly from fuel tank.


B2M0956

7) Disconnect connector from fuel pump bracket.


S2M0145

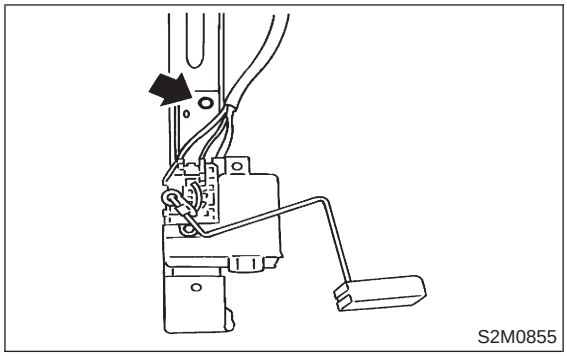
8) Remove bolt which installs fuel level sensor on mounting bracket.


S2M0855

B: INSTALLATION

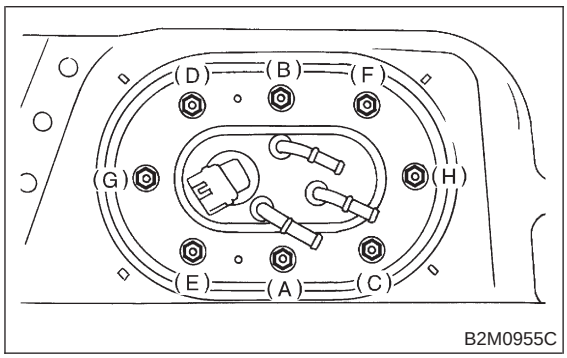
CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

Installation is in the reverse order of removal. Do the following:
(1) Install the fuel level sensor onto the mounting bracket.


S2M0855

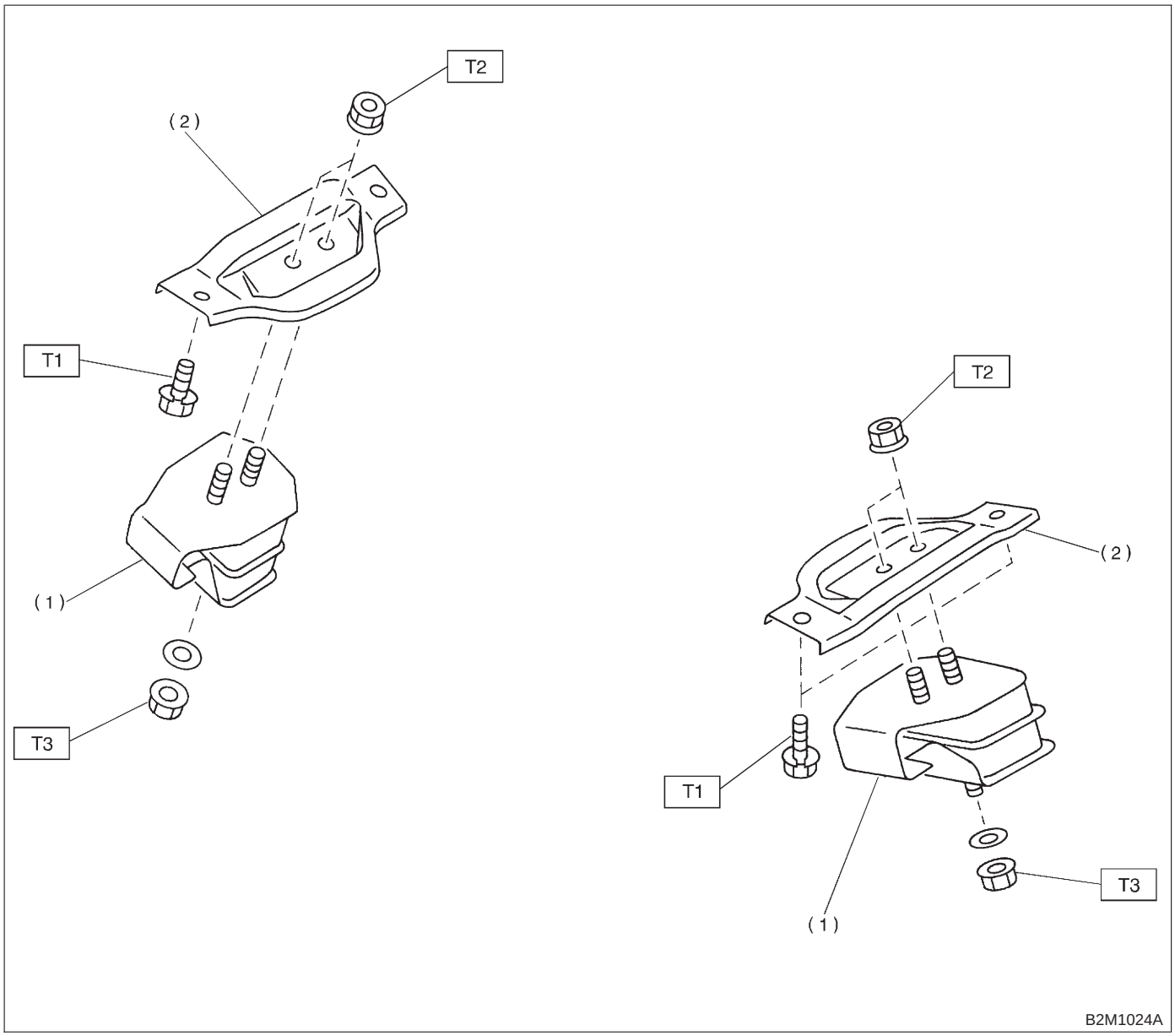
(2) Always use new gaskets.
(3) Ensure sealing portion is free from fuel or foreign particles before installation.
(4) Tighten nuts in alphabetical sequence shown in figure to specified torque

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



B2M0955C

1. Engine Mounting

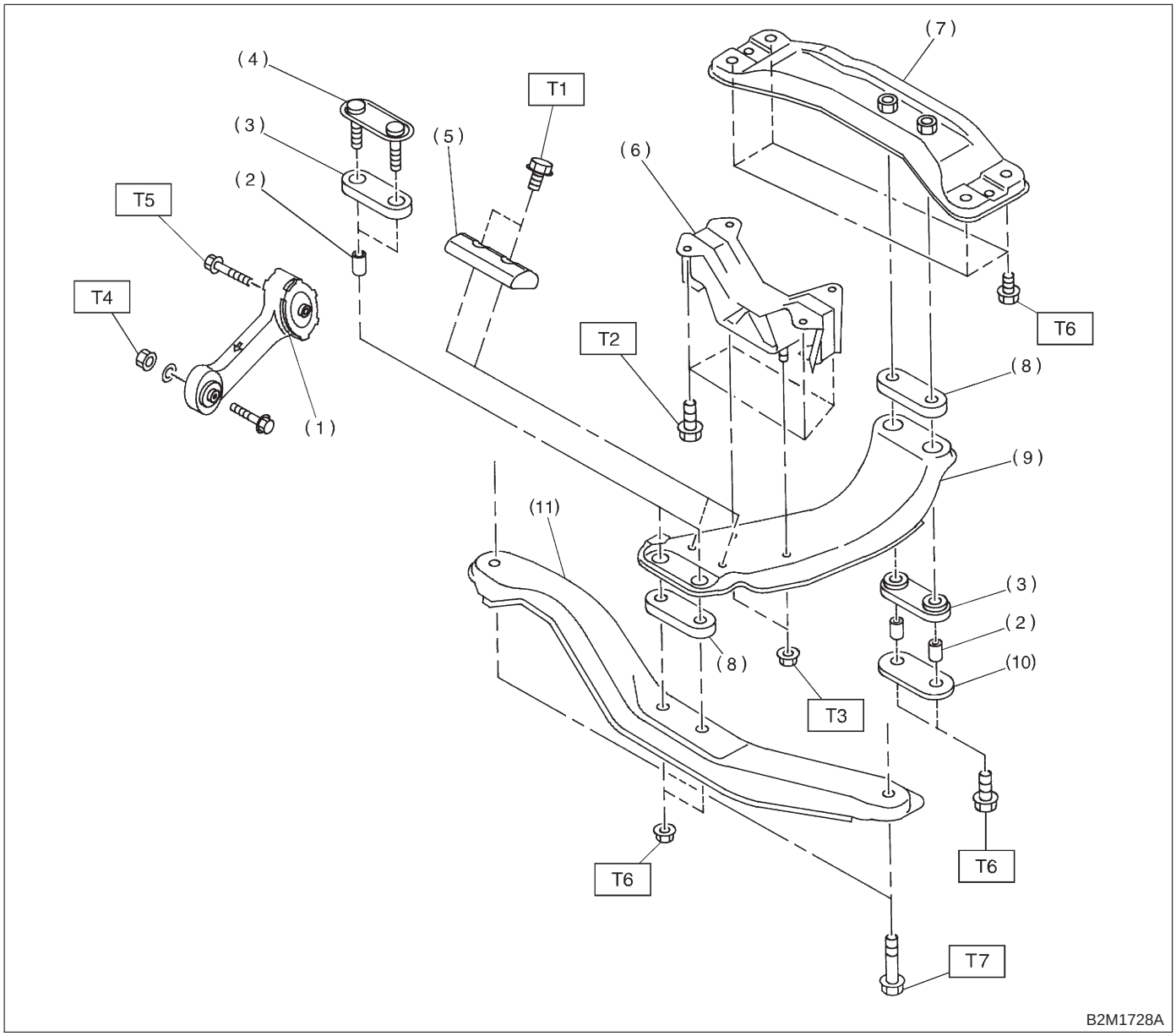


(1) Front cushion rubber
(2) Front engine mounting bracket

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: 78±15 (8.0±1.5, 58±11)

2. Transmission Mounting

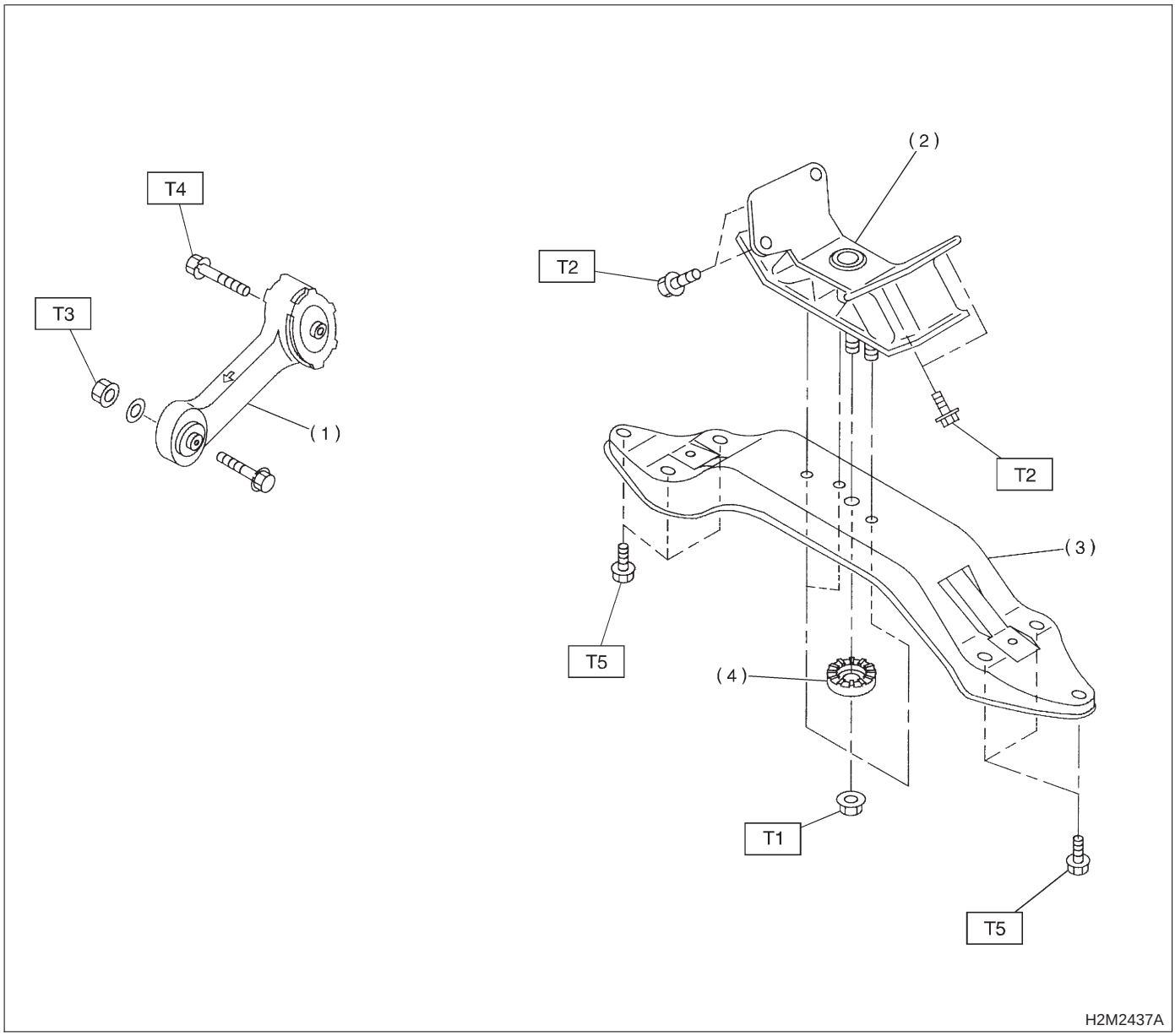
A: MT VEHICLES



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Damper (2500 cc LTD model)
(6) Rear cushion rubber
(7) Rear crossmember
(8) Cushion D
(9) Center crossmember
(10) Rear plate
(11) Front crossmember

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±5 (3.4±0.5, 24.6±3.6)
T3: 37±10 (3.8±1.0, 27±7)
T4: 49±5 (5.0±0.5, 36.2±3.6)
T5: 57±10 (5.8±1.0, 42±7)
T6: 69±15 (7.0±1.5, 51±11)
T7: 137±20 (14±2, 101±14)

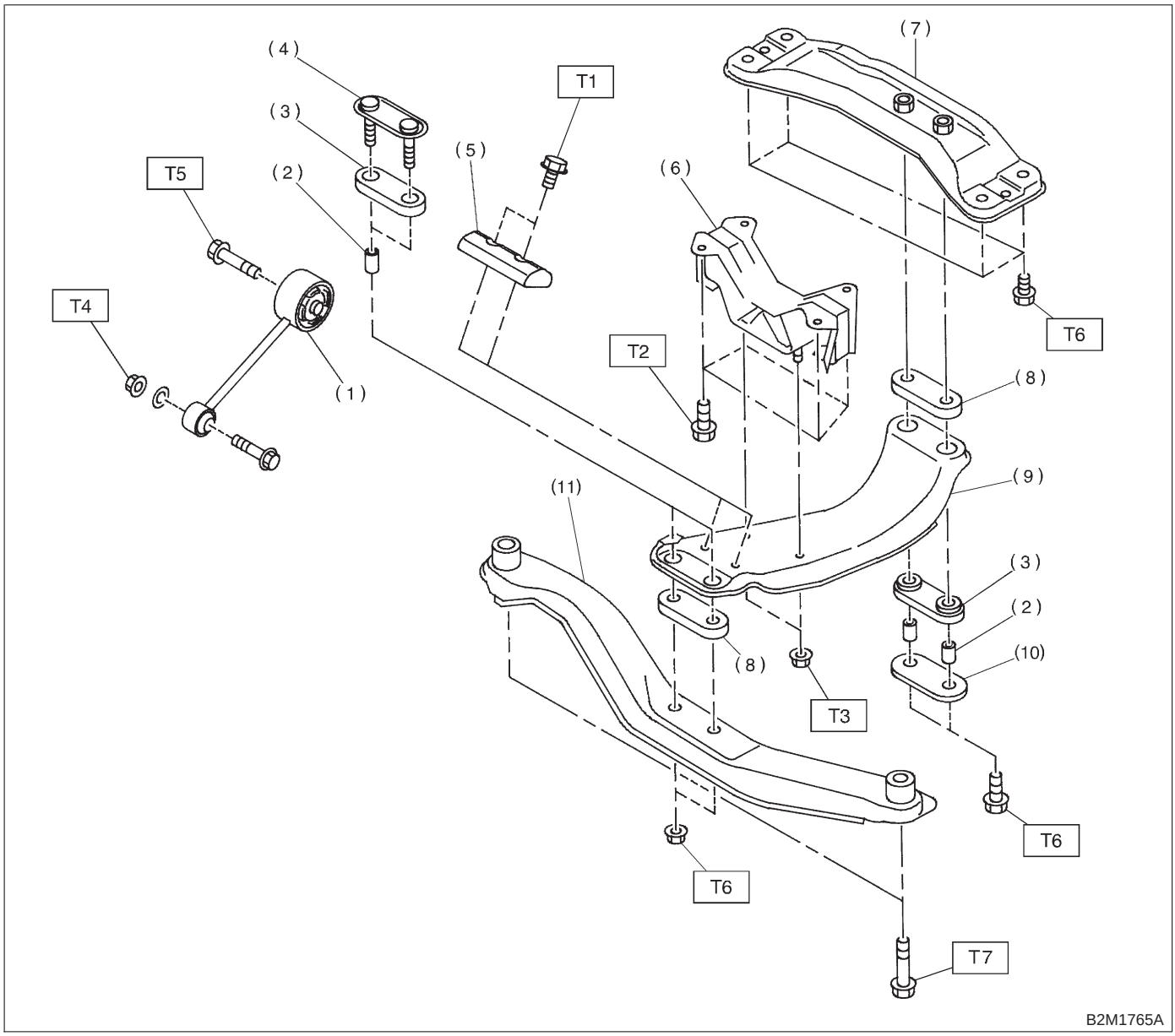
B: AT VEHICLES



(1) Pitching stopper
(2) Rear cushion rubber
(3) Crossmember
(4) Stopper

Tightening torque: N·m (kg-m, ft-lb)
T1: 37±10 (3.8±1.0, 27±7)
T2: 38±15 (3.9±1.5, 28±11)
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)

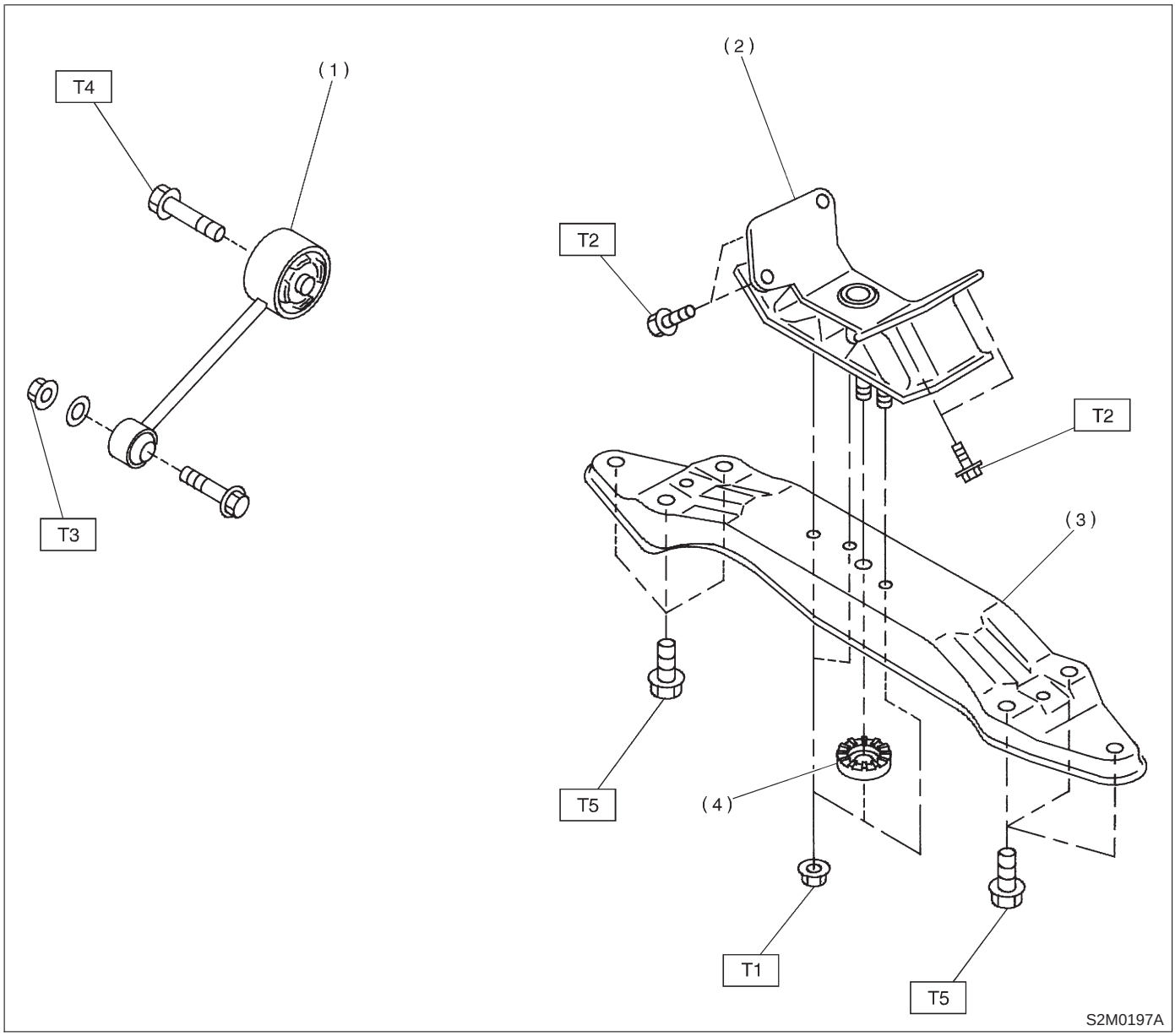
C: MT VEHICLES (OUTBACK)



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Damper (LTD model)
(6) Rear cushion rubber
(7) Rear crossmember
(8) Cushion D
(9) Center crossmember
(10) Rear plate
(11) Front crossmember

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 33±5 (3.4±0.5, 24.6±3.6)
T3: 37±10 (3.8±1.0, 27±7)
T4: 49±5 (5.0±0.5, 36.2±3.6)
T5: 57±10 (5.8±1.0, 42±7)
T6: 69±15 (7.0±1.5, 51±11)
T7: 137±20 (14±2, 101±14)

D: AT VEHICLES (OUTBACK)



(1) Pitching stopper
(2) Rear cushion rubber
(3) Crossmember
(4) Stopper

Tightening torque: N·m (kg-m, ft-lb)
T1: 37±10 (3.8±1.0, 27±7)
T2: 38±15 (3.9±1.5, 28±11)
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)

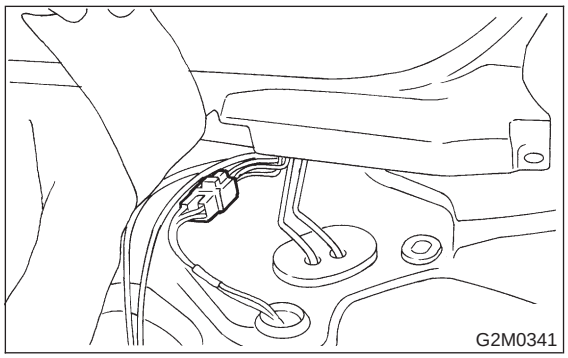
1. Engine

A: GENERAL PRECAUTION

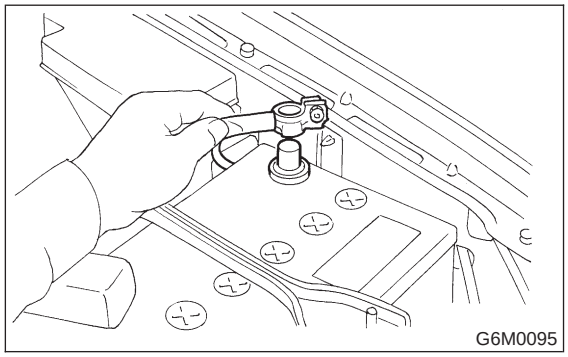
(1) Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
(2) Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
(3) Prior to starting 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 [G700].>

B: REMOVAL

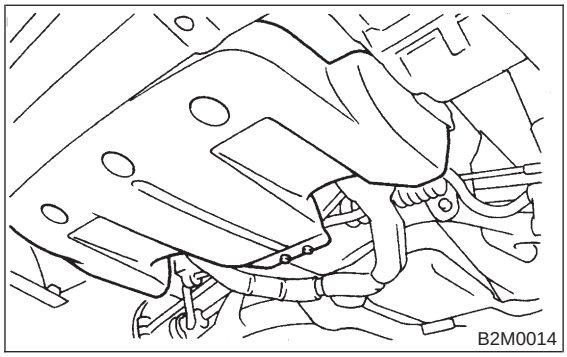
1) Set the vehicle on lift arms.
2) Open front hood and support with a stay.
3) Release fuel pressure.
   (1) Disconnect fuel tank connector.


G2M0341

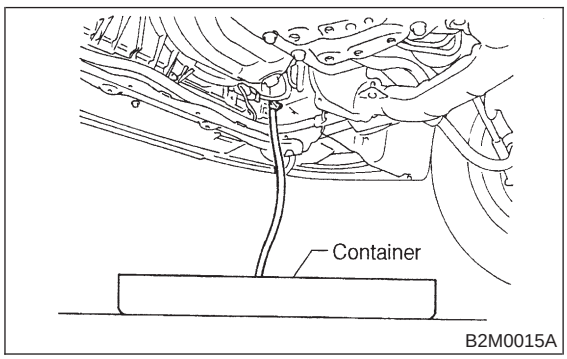
   (2) Start the engine, and run until it stalls.
   (3) After the engine stalls, crank it for five seconds more.
   (4) Turn ignition switch to “OFF”.
4) Disconnect battery cables and remove battery from vehicle.


G6M0095

5) Remove under cover

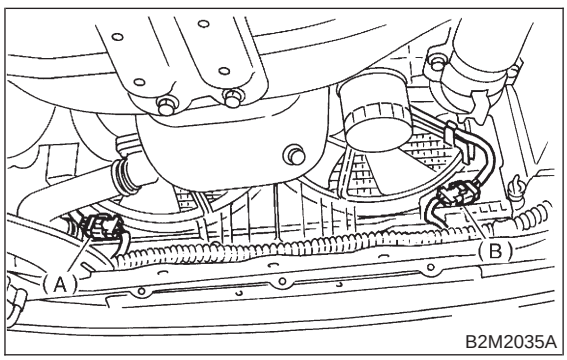

B2M0014

6) Drain coolant
Set container under the vehicle, and remove drain cock from radiator.
<Ref. to 2-5 [W1A0].>



B2M0015A

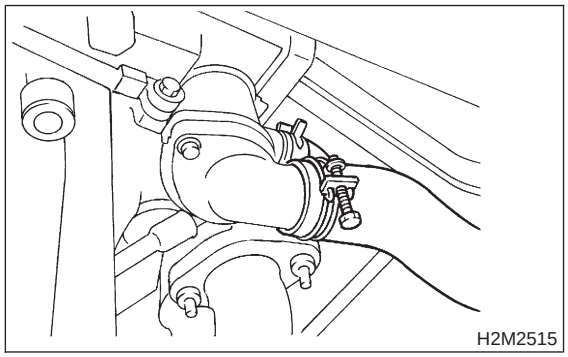
7) Remove cooling system.
   (1) Disconnect radiator fan motor connector.



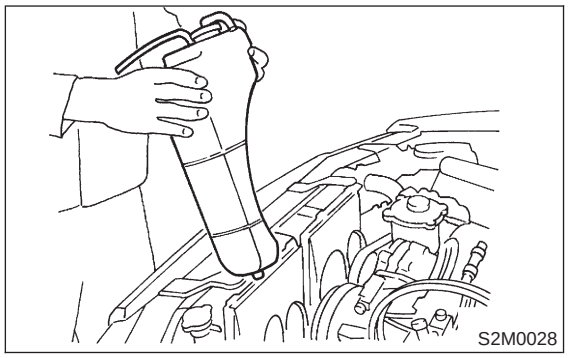
B2M2035A

(A) Main fan motor connector
(B) Sub fan motor connector

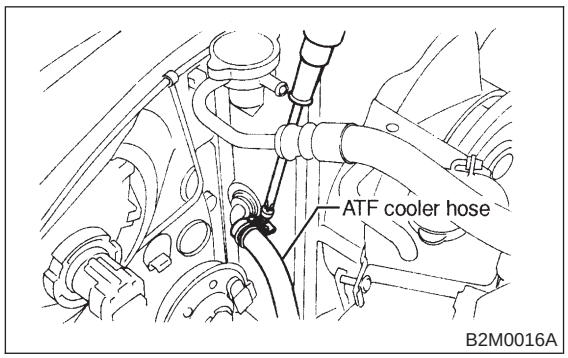
(2) Disconnect radiator outlet hose from thermostat cover.



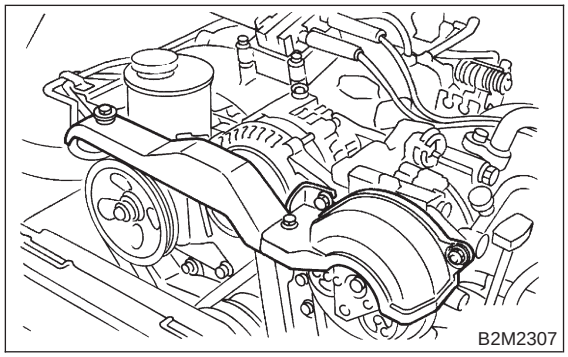
(3) Remove reservoir tank.



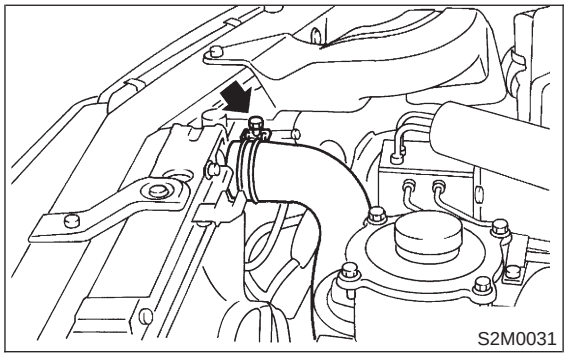
(4) Disconnect ATF cooler hoses from pipes. (AT vehicles)



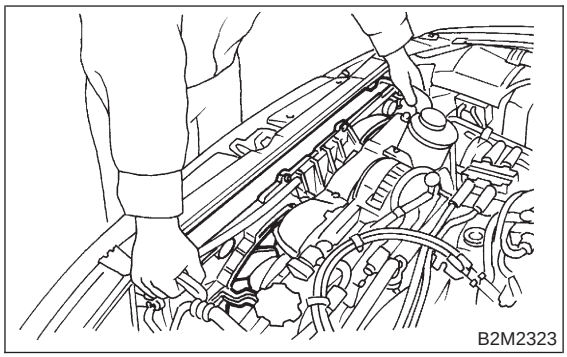
(5) Remove V-belt cover.



(6) Disconnect radiator inlet hose from radiator.



(7) Remove radiator upper bracket, and remove radiator assembly from vehicle.

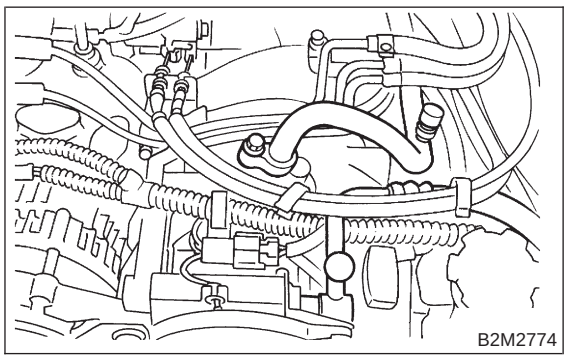


8) Collect refrigerant, and remove pressure hoses. (With A/C)

(1) Place and connect the attachment hose to the refrigerant recycle system.

(2) Collect refrigerant from A/C system.

(3) Disconnect A/C flexible hoses from A/C compressor.



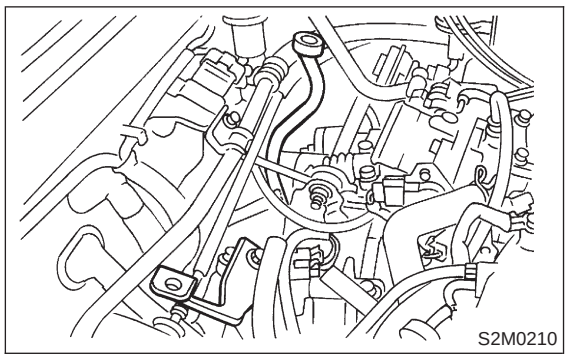
9) Remove air intake system.

(1) Disconnect connector from mass air flow sensor.

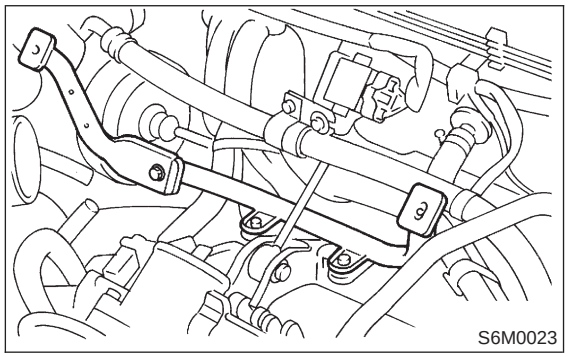
(2) Remove air intake chamber, air intake duct with air cleaner upper cover, and remove air cleaner element. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>

(3) Remove air cleaner case and duct. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].> and <Ref. to 2-7 [W18A0].>

10) Remove chamber stay.
- MT vehicles

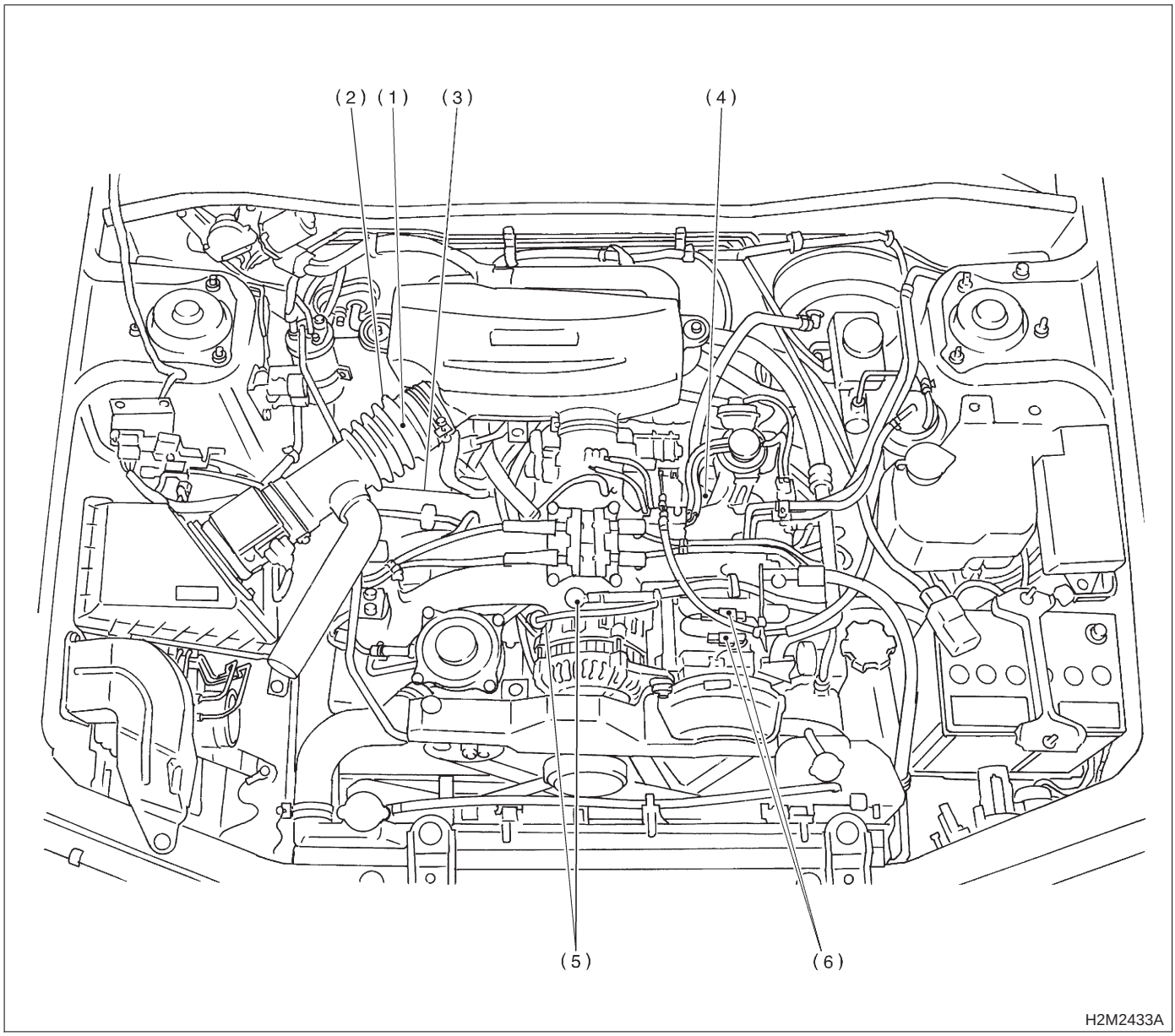


- AT vehicles

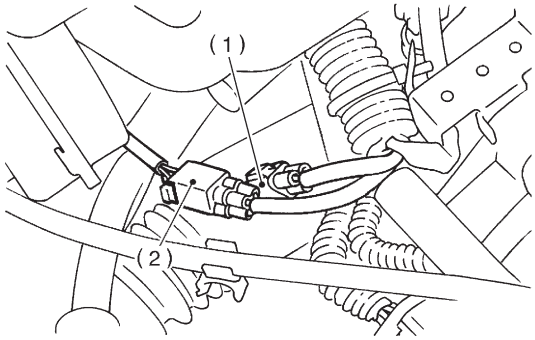


11) Disconnect connectors, cables and hoses.

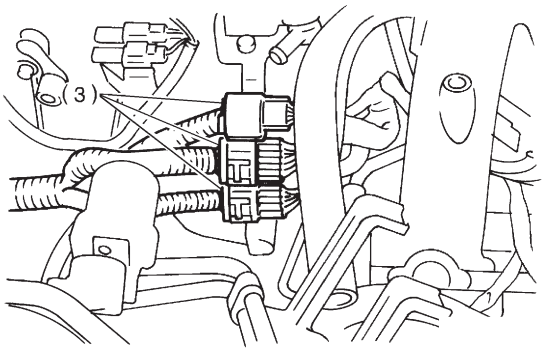
(1) Disconnect the following connectors.



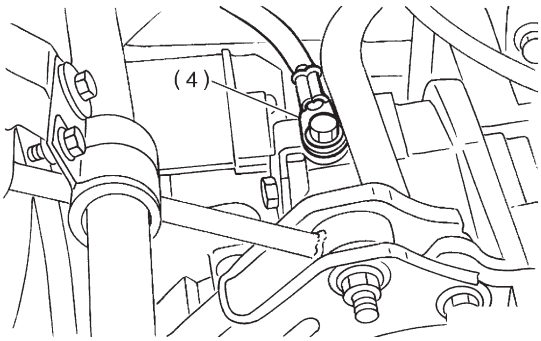
(1) Front oxygen sensor connector
(2) Rear oxygen sensor connector (California spec. vehicles)
(3) Engine harness connectors
(4) Engine ground terminal
(5) Alternator connector and terminal
(6) A/C compressor connectors (With A/C)



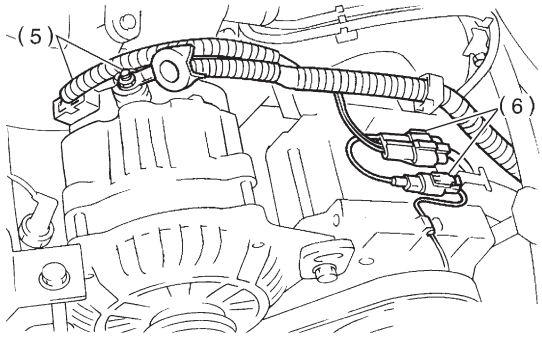
S2M0200A



B2M0019E

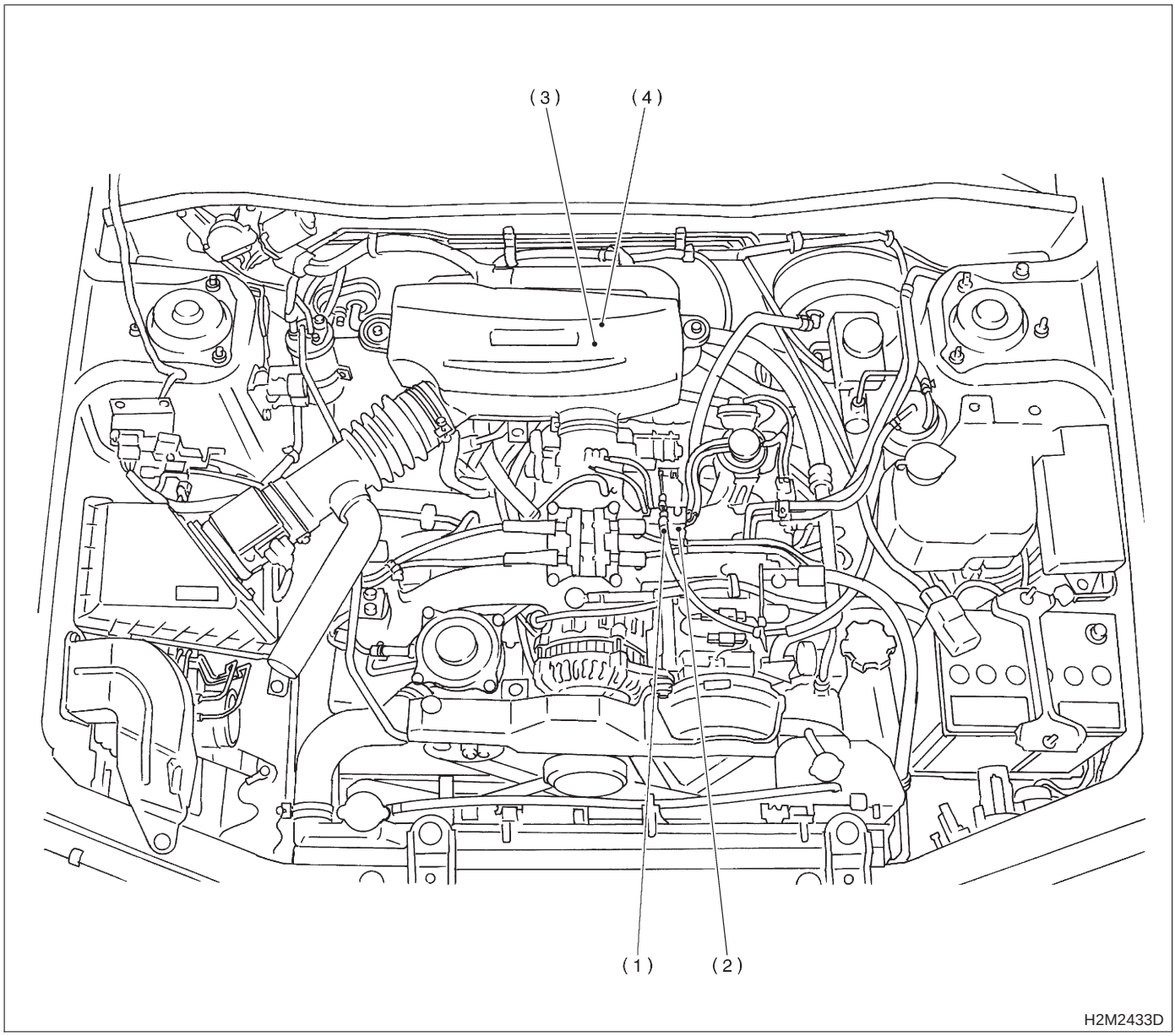


S2M0201A

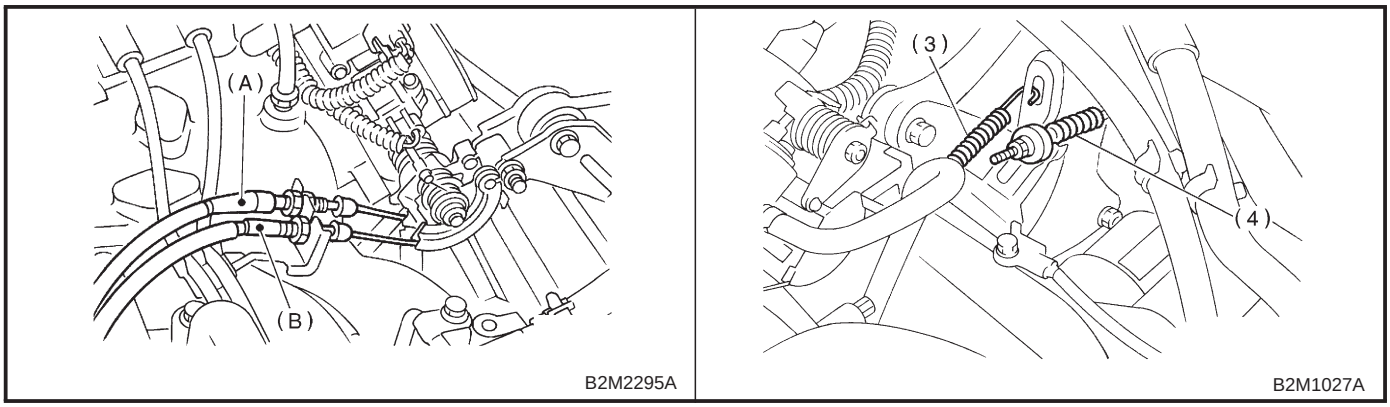


B2M1291E

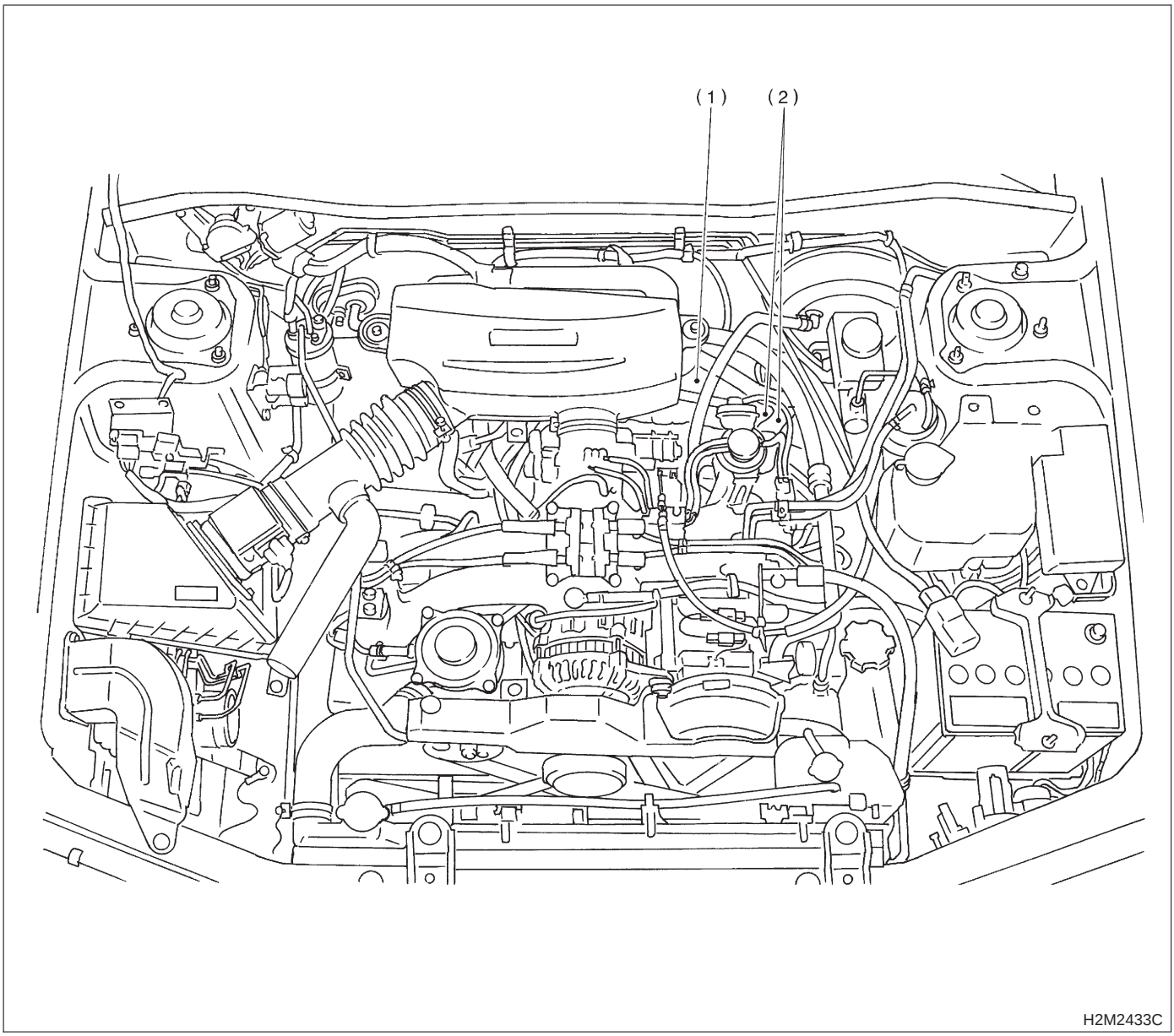
(2) Disconnect the following cables.



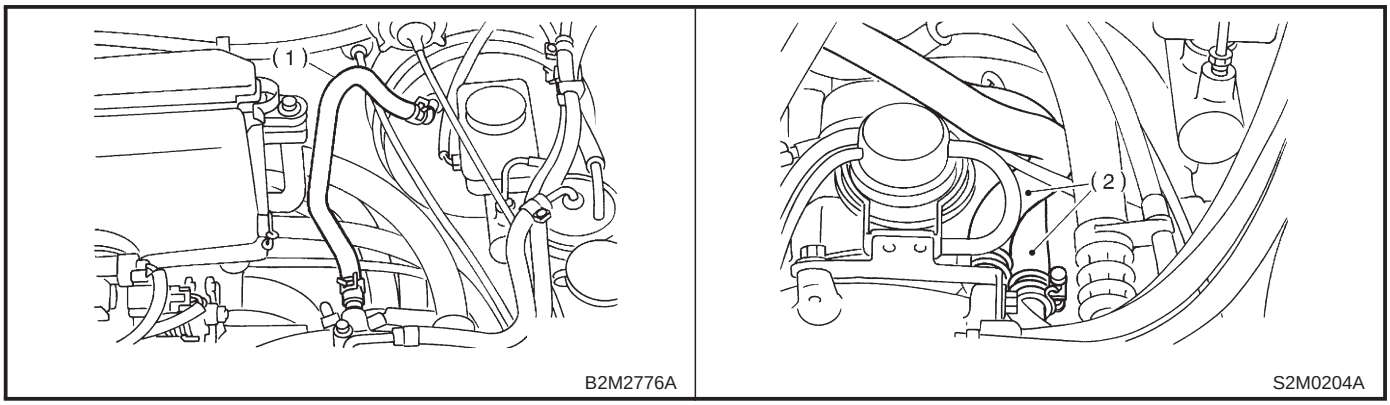
(1) Accelerator cable
(2) Cruise control cable (With cruise control vehicles)
(3) Clutch return spring (Without hill holder vehicles)
(4) Clutch cable (2200 cc MT vehicles)



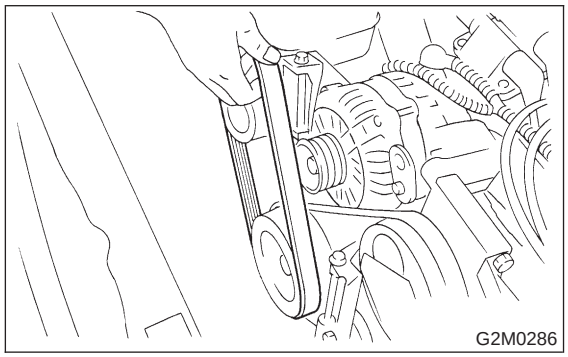
(3) Disconnect the following hoses.



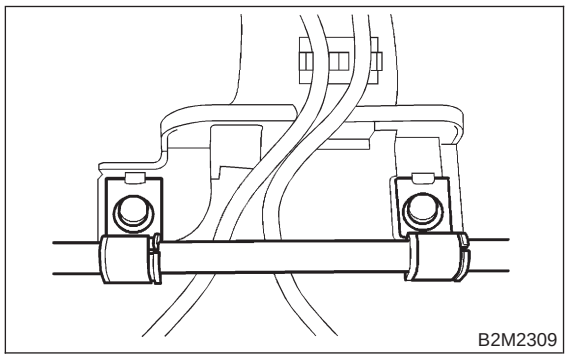
(1) Brake booster vacuum hose
(2) Heater inlet and outlet hose



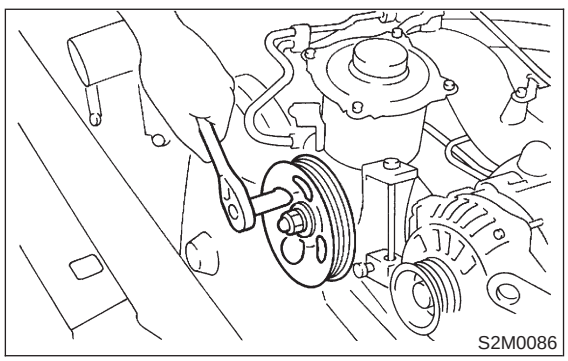
12) Remove power steering pump from bracket.
(1) Loosen lock bolt and slider bolt, and remove front side V-belt. <Ref. to 1-5 [G200].>



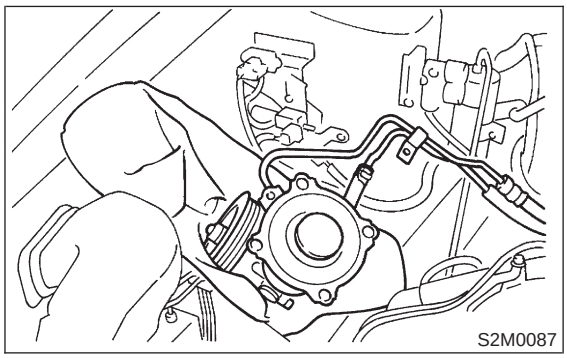
(2) Remove pipe with bracket from intake manifold.



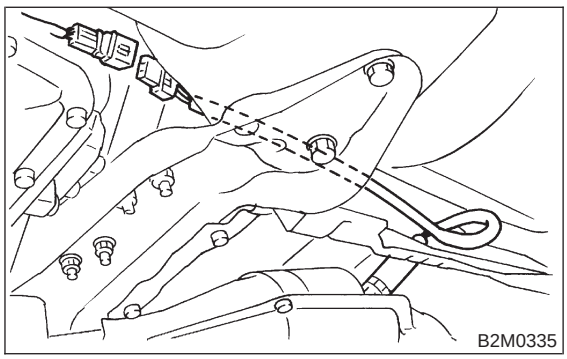
(3) Remove bolts which install power steering pump from bracket.



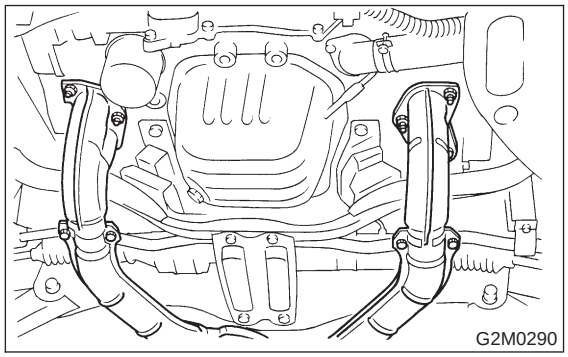
(4) Place power steering pump on the right side wheel apron.



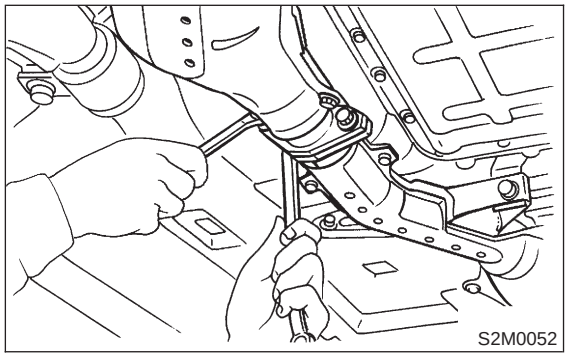
13) Remove front exhaust pipe and center exhaust pipe.
(1) Lift-up the vehicle.
(2) Disconnect connector from rear oxygen sensor. (Except 2500cc California spec. vehicles)



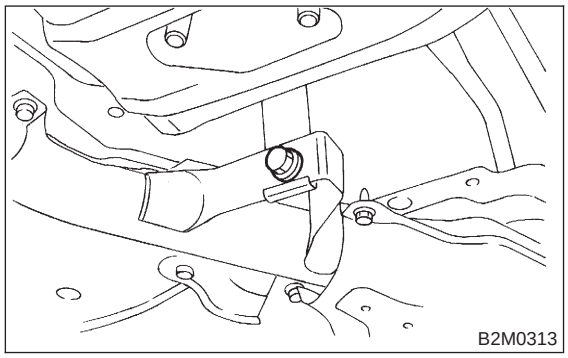
(3) Remove nuts which install front exhaust pipe onto engine.


G2M0290

(4) Separate center exhaust pipe from rear exhaust pipe.


S2M0052

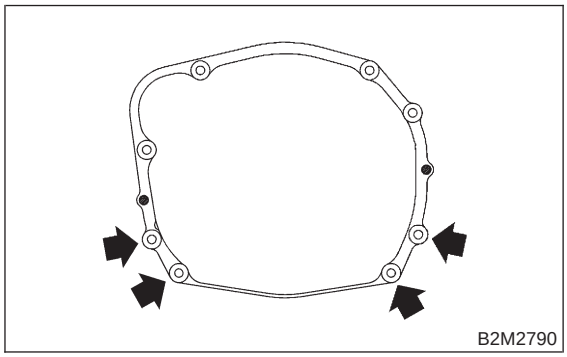
(5) Remove bolt which installs center exhaust pipe on hunger bracket.


B2M0313

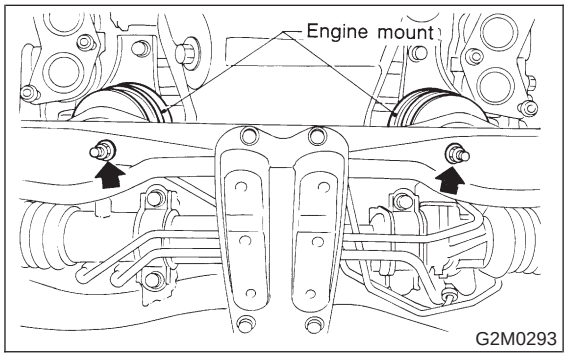
(6) Take off front and center exhaust pipes.

CAUTION:
Exhaust pipe will drop when all bolts are removed. So, hold it when removing the last bolt.

14) Remove nuts which hold lower side of transmission to engine.

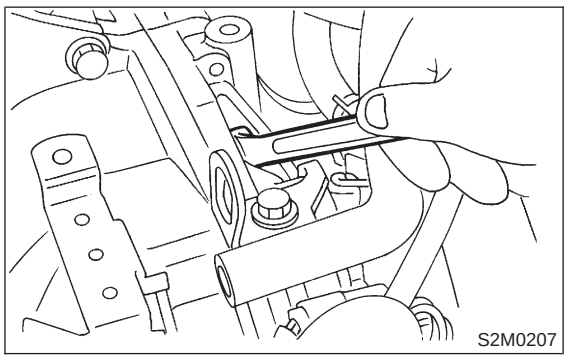

B2M2790

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



G2M0293

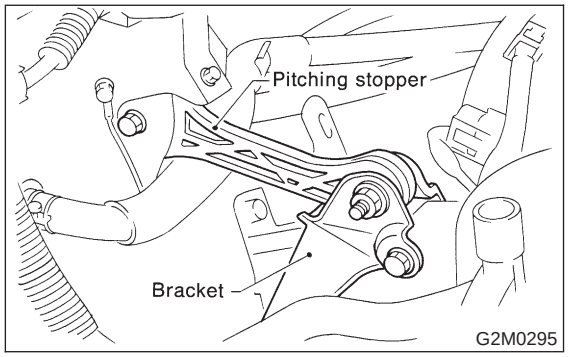
16) Separate torque converter from drive plate. (AT vehicles)
(1) Lower the vehicle.
(2) Remove service hole plug.
(3) Remove bolts which hold torque converter to drive plate.


S2M0207

(4) Remove other bolts while rotating the engine using ST.

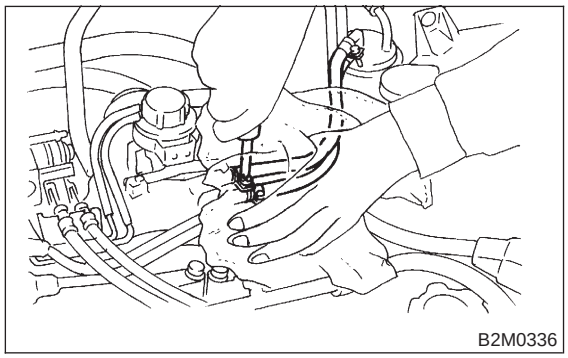
2200 cc vehicles:
ST 499977300 CRANK PULLEY WRENCH
2500 cc vehicles:
ST 499977100 CRANK PULLEY WRENCH

17) Remove pitching stopper.

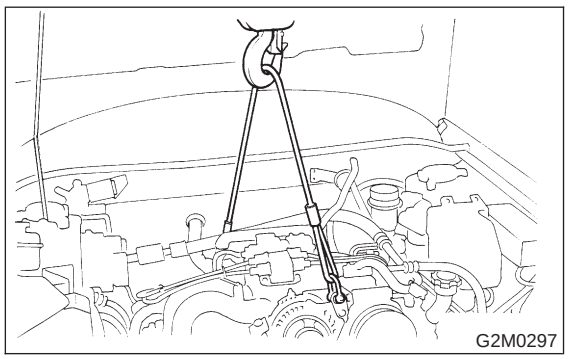


18) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:
● Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
● Catch fuel from hose into container.

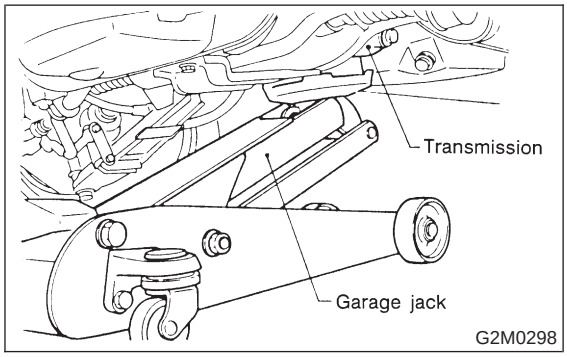


19) Support engine with a lifting device and wire ropes.

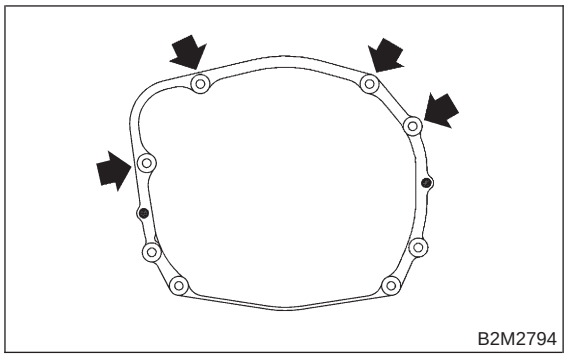


20) Support transmission with a garage jack.

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.

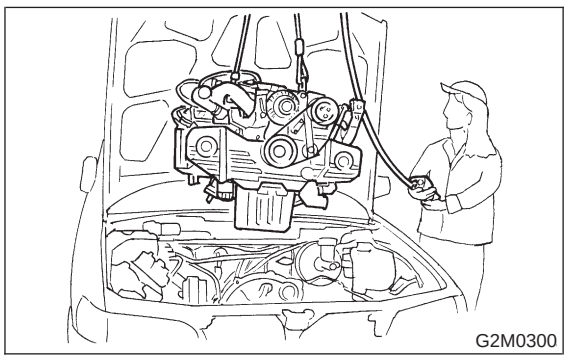


21) Remove bolts which hold upper side of transmission to engine.



22) 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.

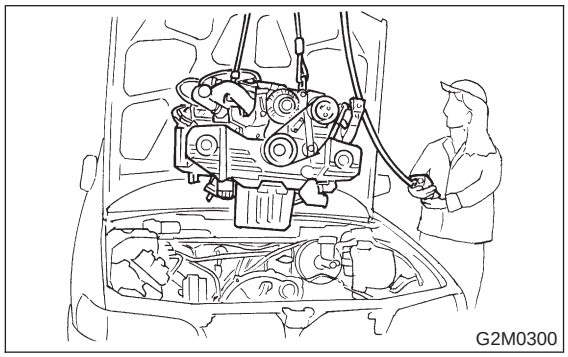
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.



C: INSTALLATION

1) Install engine onto transmission.
(1) Position engine in engine compartment and align it with transmission.

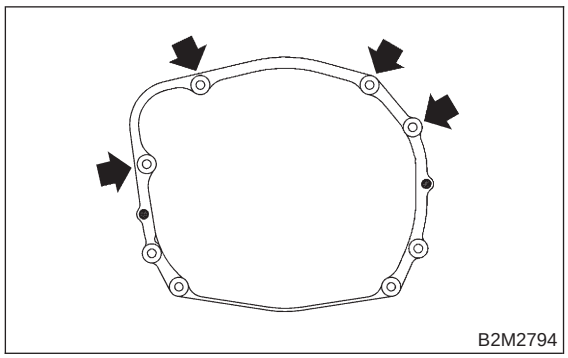
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.


G2M0300

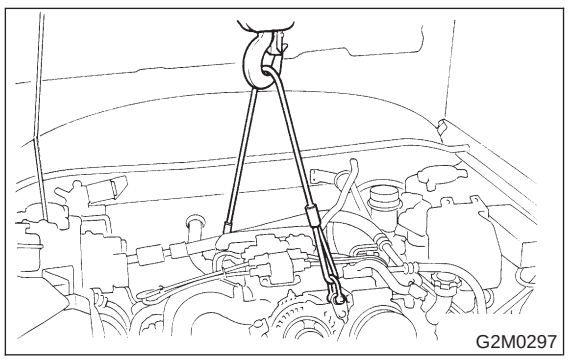
(2) Apply a small amount of grease to spline of mainshaft.

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)


B2M2794

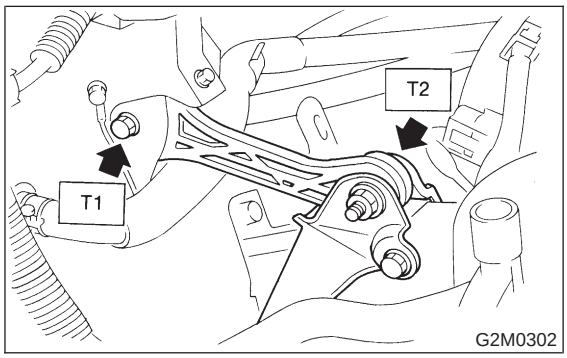
3) Remove lifting device and wire ropes.


G2M0297

4) Remove garage jack.

5) Install pitching stopper.

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



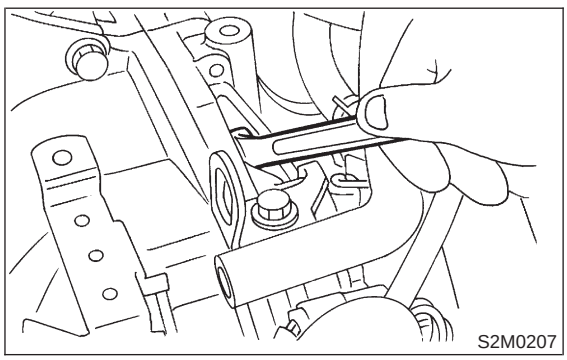
G2M0302

6) Install torque converter onto drive plate. (AT vehicles)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

2200cc vehicles:
ST 499977300 CRANK PULLEY WRENCH
2500cc vehicles:
ST 499977100 CRANK PULLEY WRENCH

CAUTION:
Be careful not to drop bolts into torque converter housing.

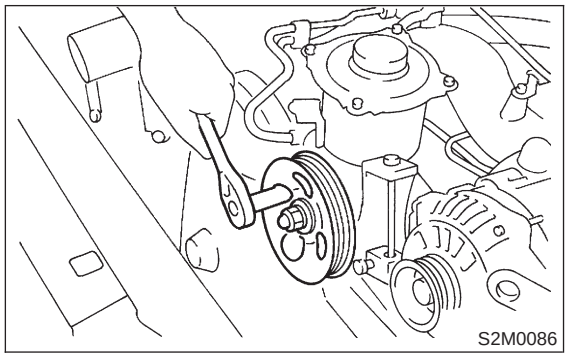
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)


S2M0207

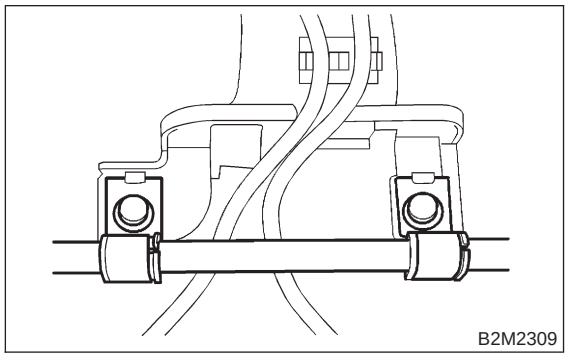
(3) Clog plug onto service hole.

7) Install canister and bracket.
(1) Install power stering pump on bracket, and tighten bolts.

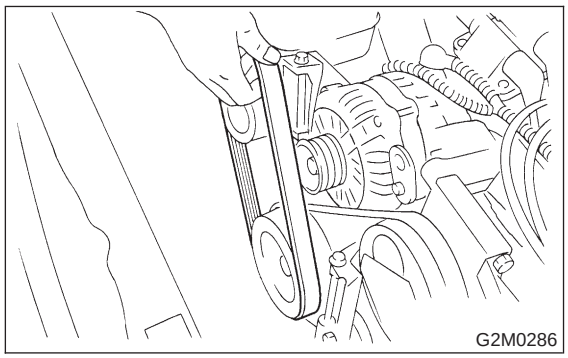
Tightening torque:
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)


S2M0086

(2) Install power steering pipe bracket on right side intake manifold, and install spark plug codes.

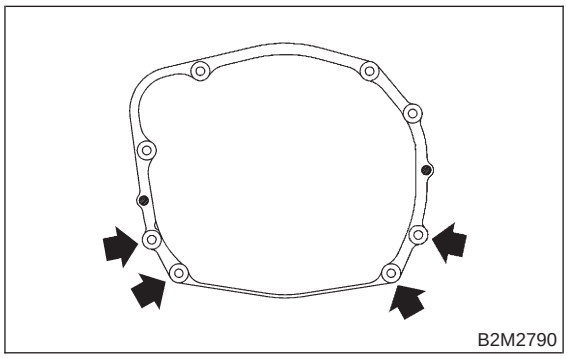

B2M2309

(3) Install front side V-belt, and adjust it. <Ref. to 1-5 [G200].>


G2M0286

8) Tighten nuts which hold lower side of transmission to engine.

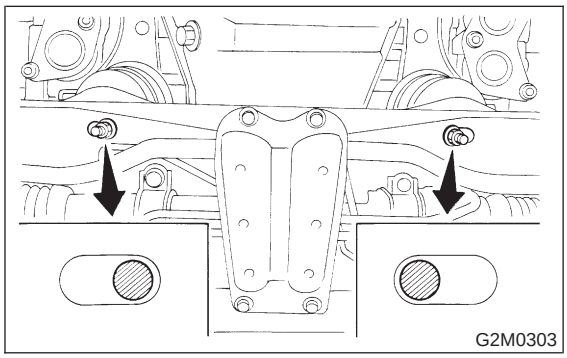
Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)


B2M2790

9) 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.

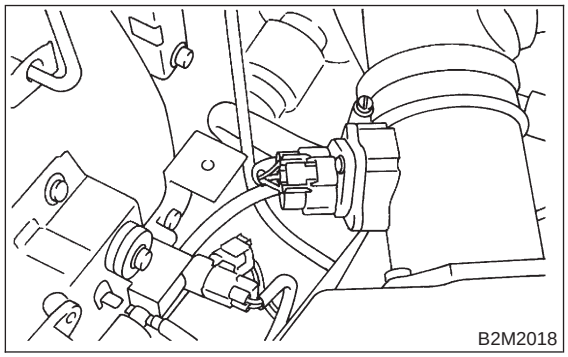

G2M0303

10) Install front exhaust pipe and center exhaust pipe. <Ref. to 2-9 [W1B0].>
11) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
12) Connect the following connectors.
(1) Engine ground terminal
(2) Engine harness connectors
(3) Front oxygen sensor connector
(4) Rear oxygen sensor connector (California spec. vehicles)
(5) Alternator connector and terminal
(6) A/C compressor connectors (With A/C)
13) Connect the following cables.
(1) Accelerator cable
(2) Cruise control cables (With cruise control)
(3) Clutch cable (2200 cc MT vehicles)

(4) Clutch return spring (Models without hill holder only)

CAUTION:
After connecting each cable, adjust them.

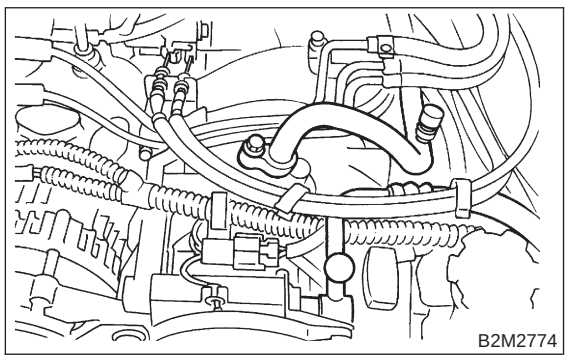
14) Install chamber stay.
15) Install air intake system.
(1) Install air cleaner element.
(2) Install air intake chamber and air intake duct with air cleaner upper cover. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>
(3) Connect connector to mass air flow sensor.


B2M2018

(4) Install air intake duct with air cleaner case. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].> and <Ref. to 2-7 [W18A0].>
16) Install A/C flexible hoses. (With A/C) <Ref. to 4-7 [W16A0].>

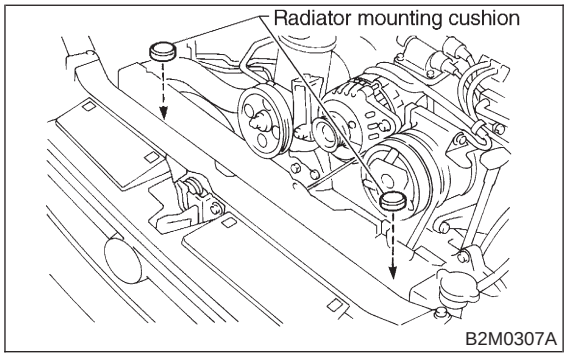
CAUTION:
Use new O-rings.

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


B2M2774

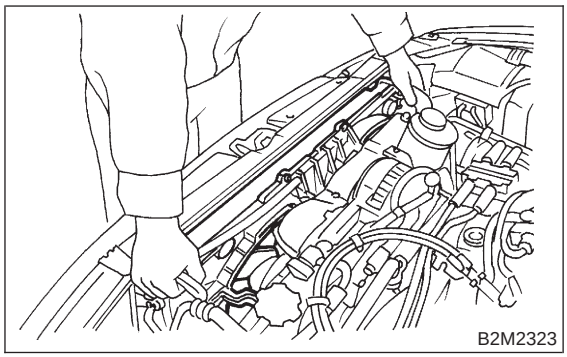
17) Install cooling system.

(1) Attach radiator mounting cushions to body.



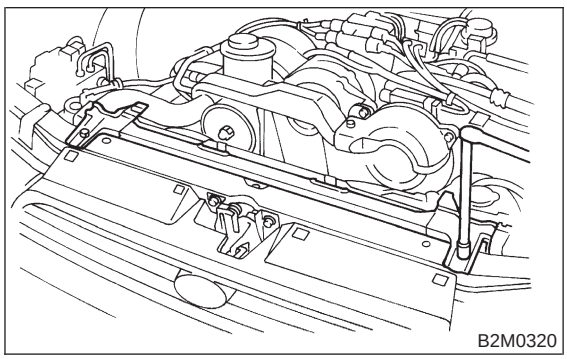
B2M0307A

(2) Install radiator while fitting radiator pins to cushions.

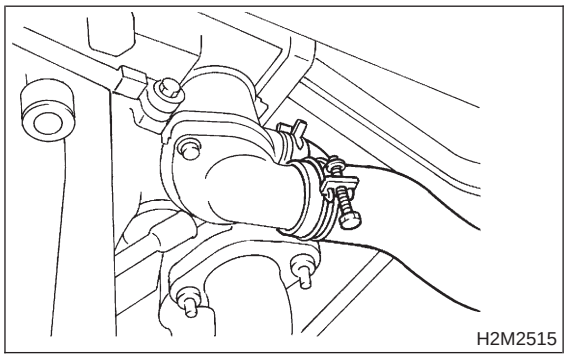

B2M2323

(3) Install radiator brackets and tighten bolts.

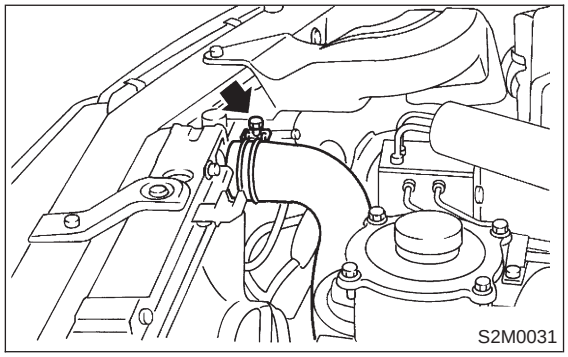
Tightening torque:
13.7±1.5 N·m (1.4±0.15 kg-m, 10.1±1.1 ft-lb)


B2M0320

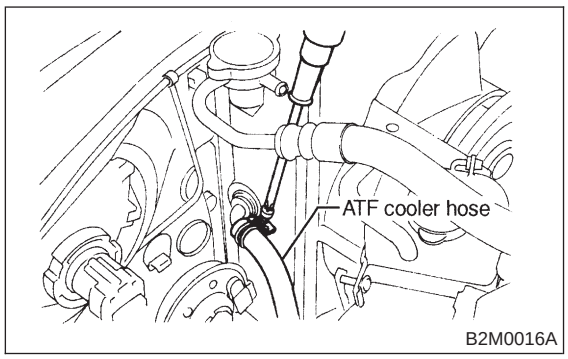
(4) Connect radiator fan motor connector.


H2M2515

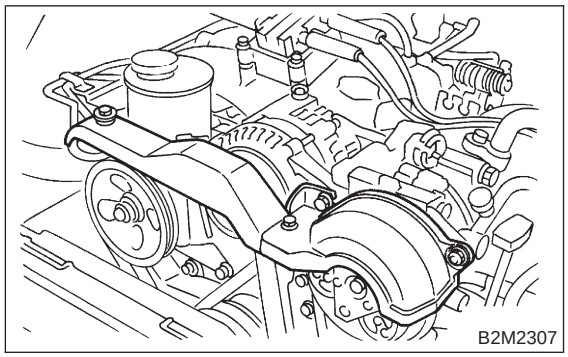
(5) Connect radiator inlet hose.



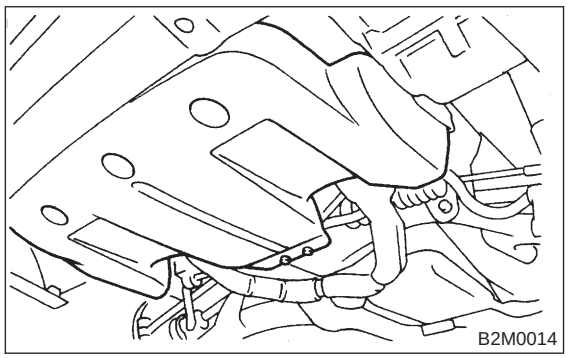
(6) Connect radiator outlet hose.
(7) Connect ATF cooler hoses. (AT vehicles)



(8) Install reservoir tank.
(9) Install V-belt cover.



18) Install under cover.



19) Install battery in the vehicle, and connect cables.
20) Fill coolant.
<Ref. to 2-5 [W1B0].>

Engine coolant capacity;
5.8 ℓ (6.1 US qt, 5.1 lmp qt)

21) Charge A/C system with refrigerant.
<Ref. to 4-7 [W700].>
22) Remove front hood stay, and close front hood.
23) Take off the vehicle from lift arms.

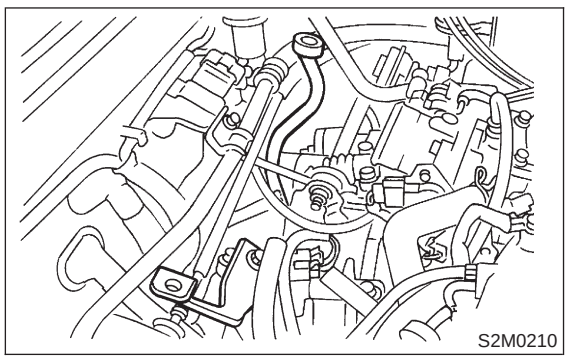
2. Transmission

A: GENERAL PRECAUTION

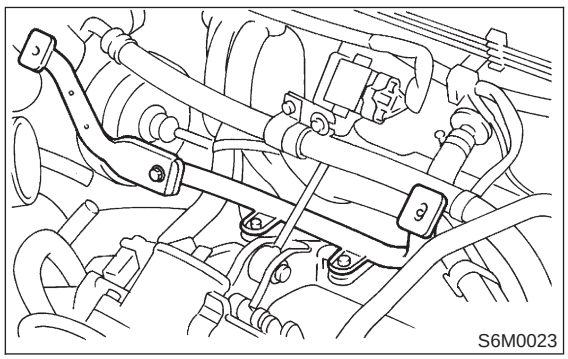
(1) Remove or install transmission in an area where chain hoists, lifting devices, etc. are available for ready use.
(2) Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
(3) Prior to 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 [G700].>

B: REMOVAL

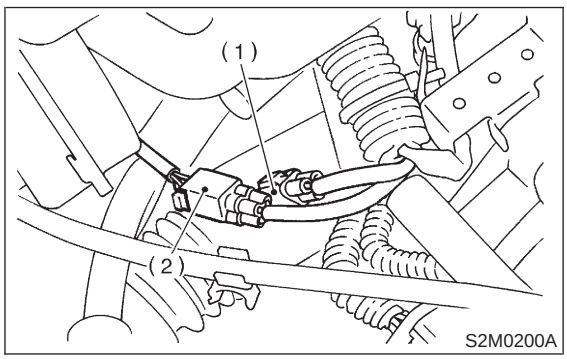
1) Open front hood fully, and support with stay.
2) Disconnect battery ground terminal.
3) Remove air intake duct and chamber. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>
4) Install air intake duct with air cleaner case. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].> and <Ref. to 2-7 [W18A0].>
5) Remove chamber stay.
- MT vehicles


S2M0210

- AT vehicles


S6M0023

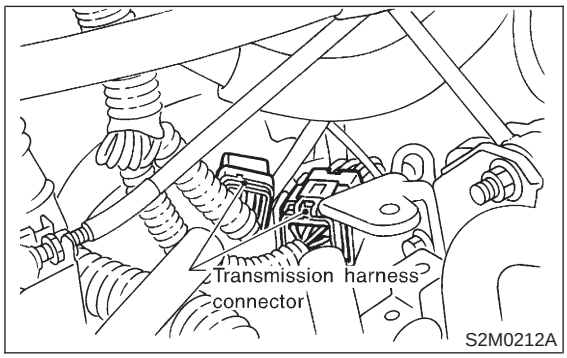
6) Disconnect the following connectors.
(1) Oxygen sensor connector



S2M0200A

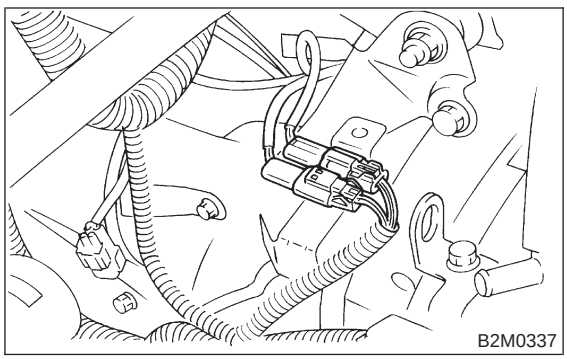
(1) Front oxygen sensor connector
(2) Rear oxygen sensor connector (California spec. vehicles)

(2) Transmission harness connector (AT vehicles)

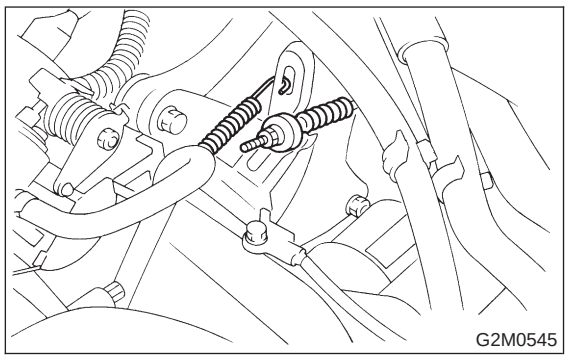


S2M0212A

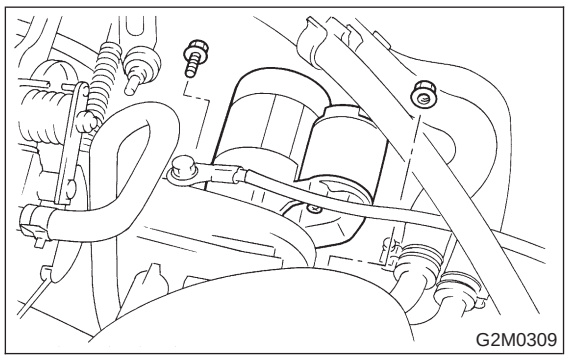
(3) Transmission ground terminal
(4) Neutral position switch connector (MT vehicles)
(5) Back-up light switch connector (MT vehicles)


B2M0337

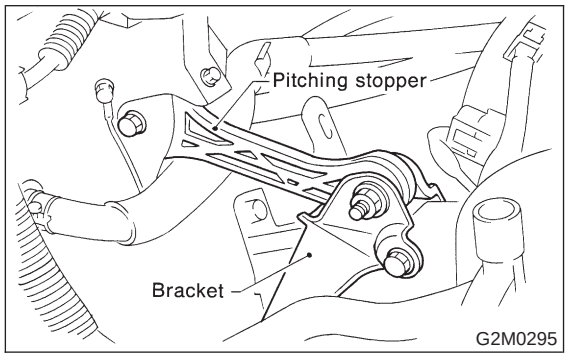
7) Disconnect the following cables.
(1) Clutch return spring (Without hill holder vehicles)
(2) Clutch cable (2200 cc MT vehicles)



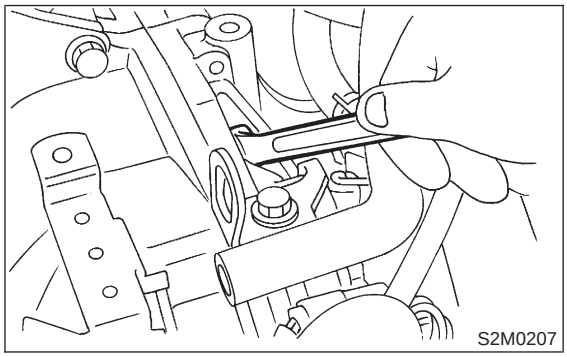
8) Remove starter.
(1) Disconnect connectors and terminal from starter.
(2) Remove bolt which installs upper side of starter.
(3) Remove nut which installs lower side of starter, and remove starter from transmission.



9) Remove pitching stopper.



10) Separate torque converter from drive plate. (AT vehicles)
(1) Remove service hole plug.
(2) Remove bolts which hold torque converter to drive plate.



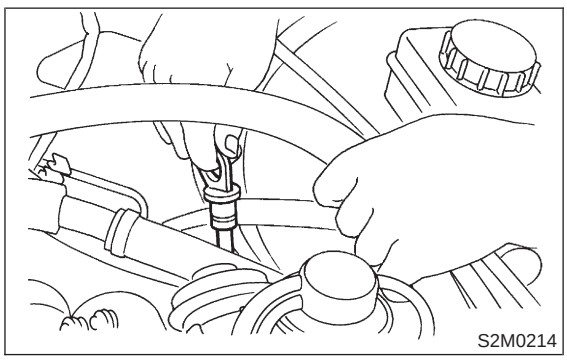
(3) While rotating the engine, remove other bolts using ST.

CAUTION:
Be careful not to drop bolts into torque converter housing.

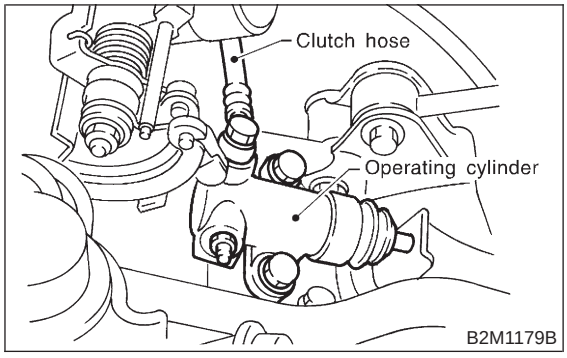
2200 cc vehicles:
ST 499977300 CRANK PULLEY WRENCH
2500 cc vehicles:
ST 499977100 CRANK PULLEY WRENCH

11) Remove ATF level gauge. (AT vehicles)

CAUTION:
Plug opening to prevent entry of foreign particles into transmission fluid.

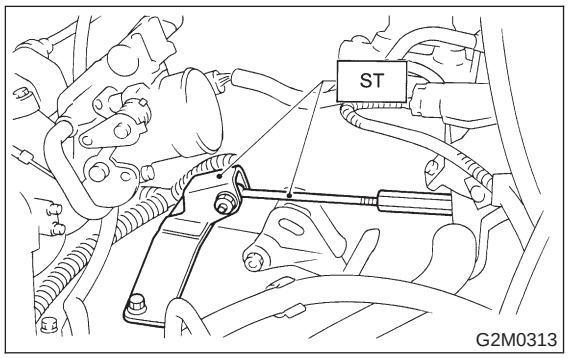


12) Remove operating cylinder. (2500 cc MT vehicles)

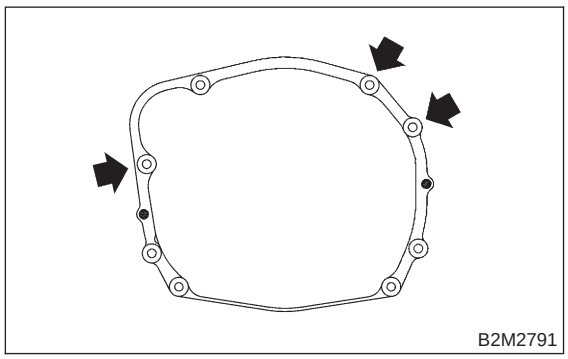


13) Set ST.
ST 41099AA020 ENGINE SUPPORT ASSY

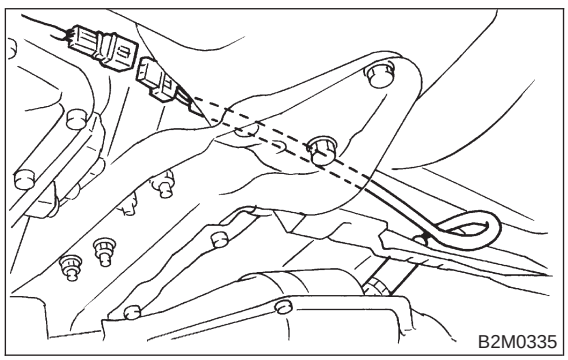
NOTE:
Also is available Part No. 927670000.



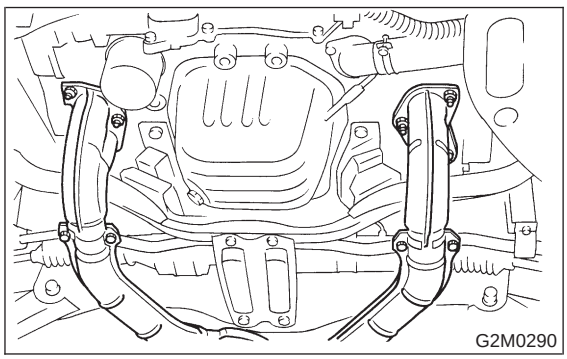
14) Remove bolt which holds right upper side of transmission to engine.



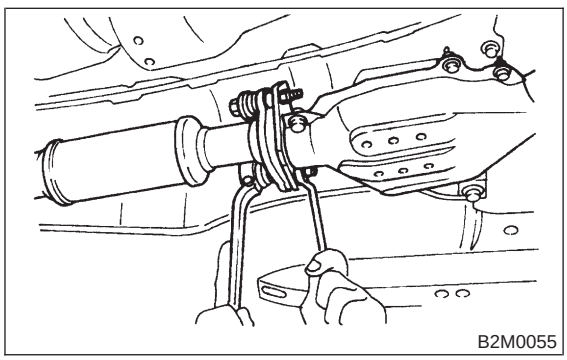
15) Remove exhaust system.
(1) Lift-up the vehicle.
(2) Remove under cover.
(3) Disconnect connector from rear oxygen sensor. (Except California spec. vehicles)



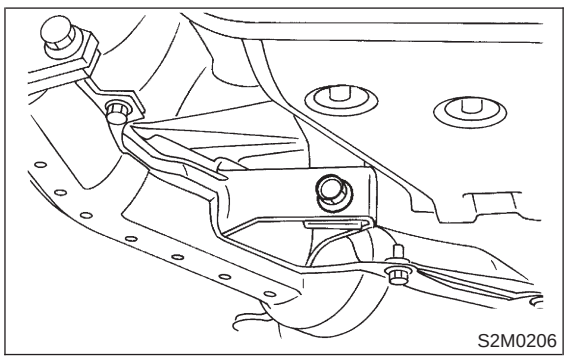
(4) Remove nuts which install front exhaust pipe onto engine.



(5) Separate rear exhaust pipe from center exhaust pipe.



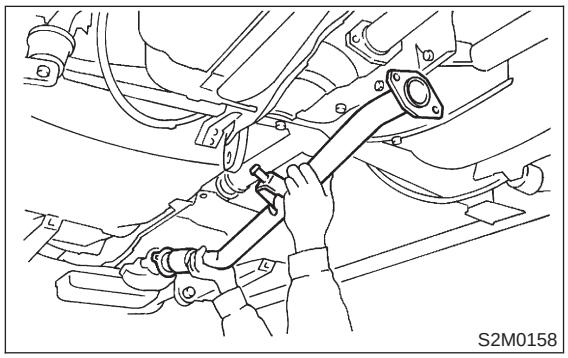
(6) Remove bolt which installs center exhaust pipe to hanger bracket.



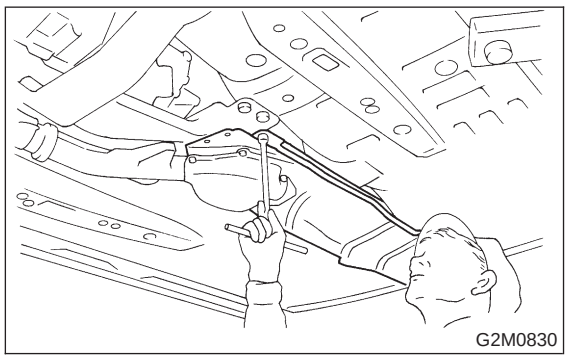
(7) Take off front and center exhaust pipes.

(8) Remove rear exhaust pipe.

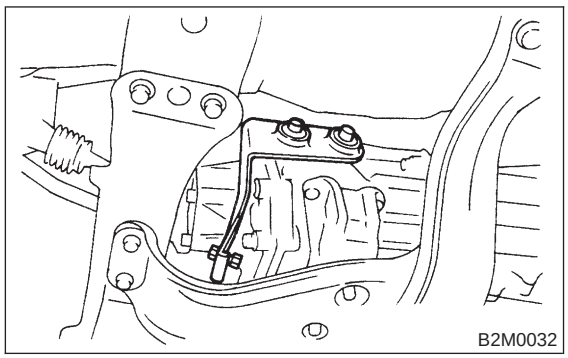
CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.


S2M0158

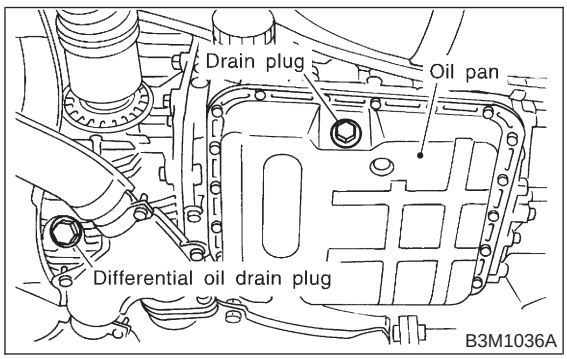
(9) Remove heat shield cover of rear exhaust pipe.


G2M0830

(10) Remove hanger bracket from right side of transmission.

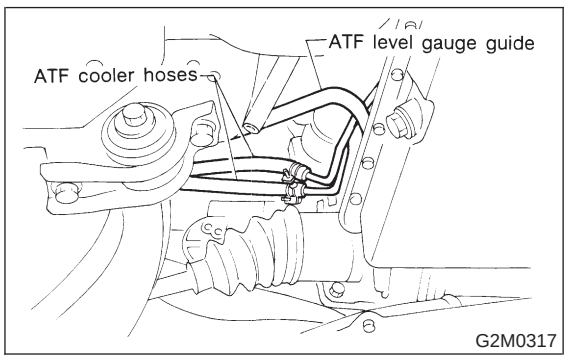

B2M0032

16) Drain ATF to remove ATF drain plug. (AT vehicles)



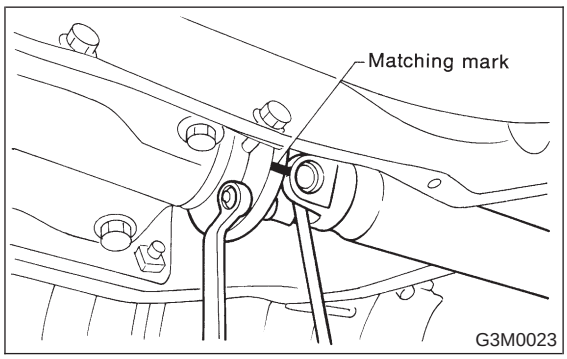
B3M1036A

17) Disconnect ATF cooler hoses from pipes of transmission side, and remove ATF level gauge guide. (AT vehicles)



G2M0317

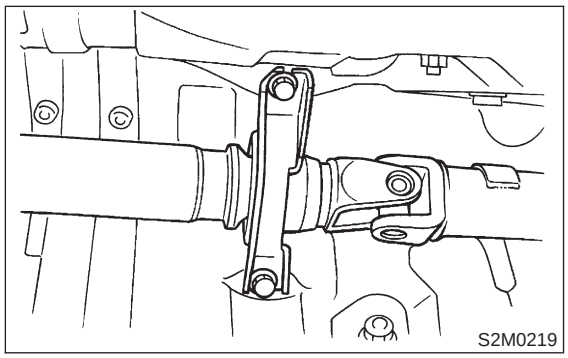
18) Remove propeller shaft.
(1) Remove front cover of rear differential mount.
(2) Separate propeller shaft from rear differential.



G3M0023

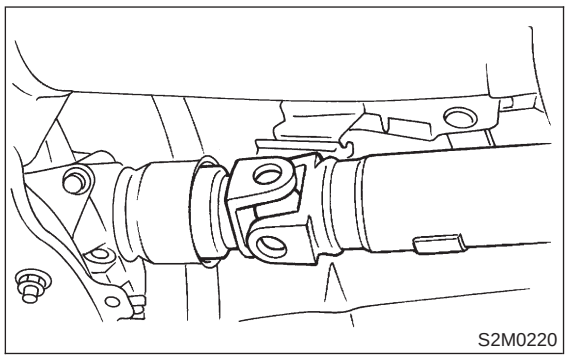
(3) Remove bolts which hold center bearing onto body.

CAUTION:
Be careful not to drop propeller shaft.

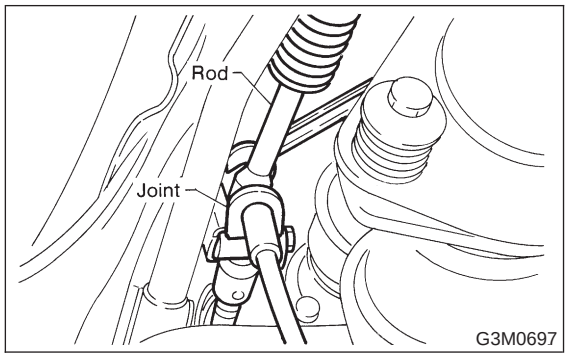

S2M0219

(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.

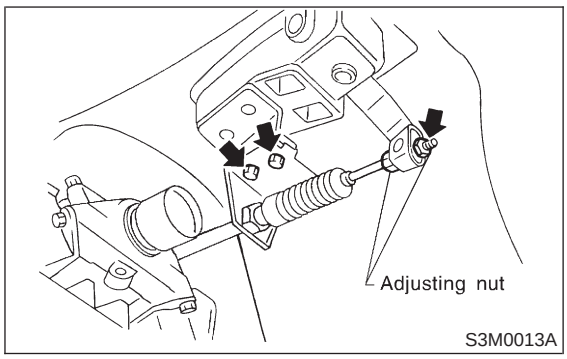

S2M0220

19) Remove gear shift rod and stay from transmission. (MT vehicles)
(1) Remove spring.
(2) Disconnect stay from transmission.
(3) Disconnect rod from transmission.



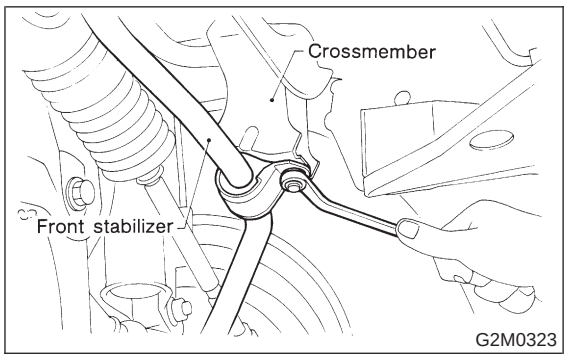
G3M0697

20) Remove shift selector cable. (AT vehicles)
(1) Disconnect shift selector cable from selector lever.
(2) Remove cable bracket from body.



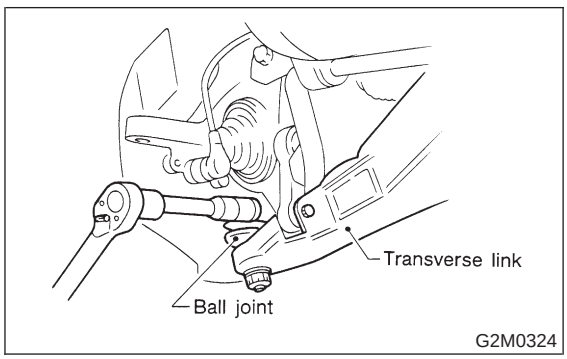
S3M0013A

21) Remove bolts which install stabilizer clamps onto crossmember.



G2M0323

22) Remove front drive shafts from transmission.
(1) Remove transverse link from housing.

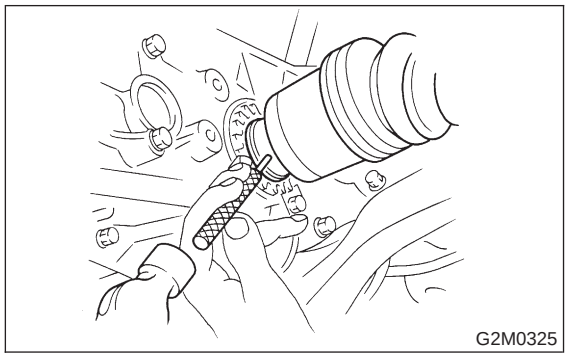


G2M0324

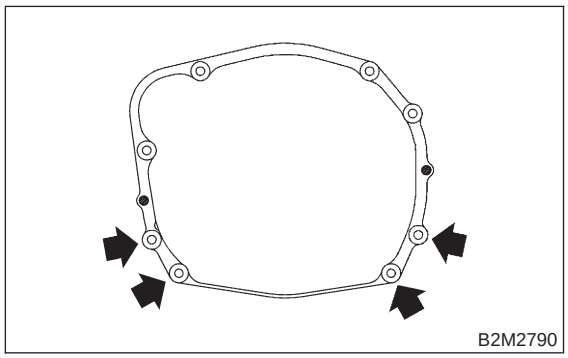
(2) Lower transverse link.

(3) Remove spring pins and separate front drive shafts from each side of the transmission.

CAUTION:
Discard removing spring pin. Replace with a new one.

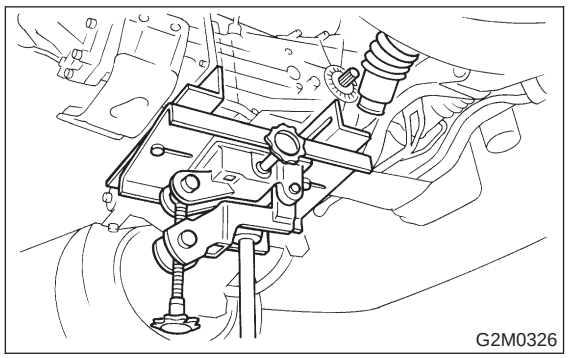

G2M0325

23) Remove nuts which hold lower side of transmission to engine.

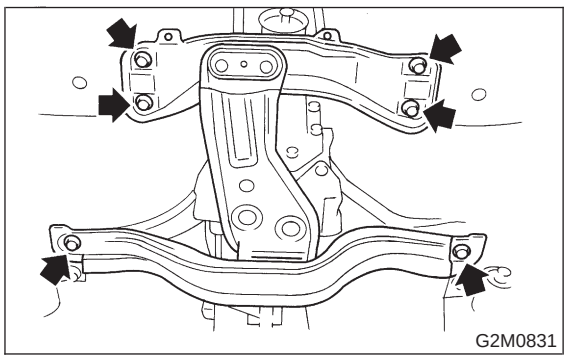

B2M2790

24) Place transmission jack under transmission.

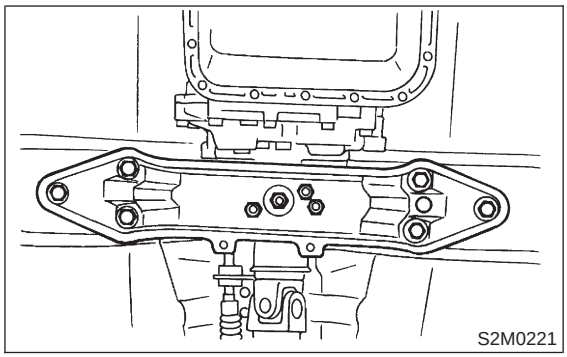
CAUTION:
● Always support transmission case with a transmission jack.
● On AT vehicles, make sure that the support plates of transmission jack don't touch the oil pan.


G2M0326

25) Remove transmission rear crossmember.
● MT vehicles

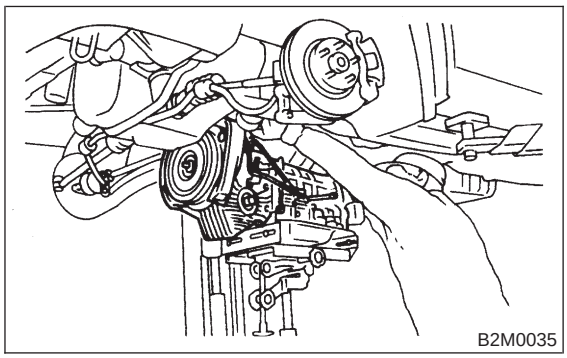

G2M0831

● AT vehicles


S2M0221

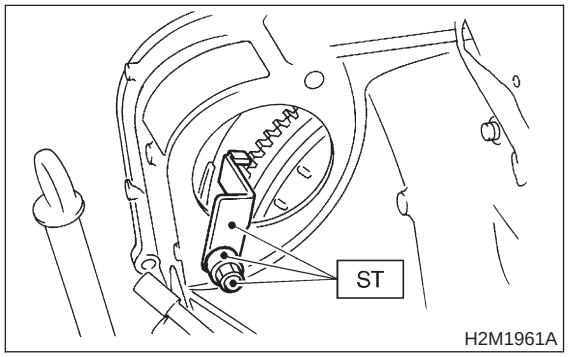
26) Remove transmission.

CAUTION:
● Move transmission jack toward rear until mainshaft is withdrawn from clutch cover. (MT vehicles)
● Move transmission and torque converter as a unit away from engine. (AT vehicles)

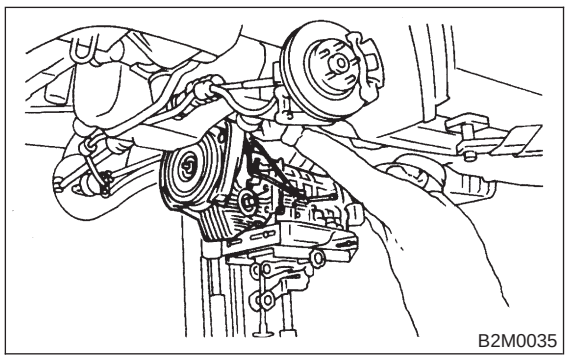

B2M0035

C: INSTALLATION

1) Install ST to torque converter clutch case. (AT vehicles)
ST 498277200 STOPPER SET



2) Install transmission to engine.
(1) Gradually raise transmission with transmission jack.



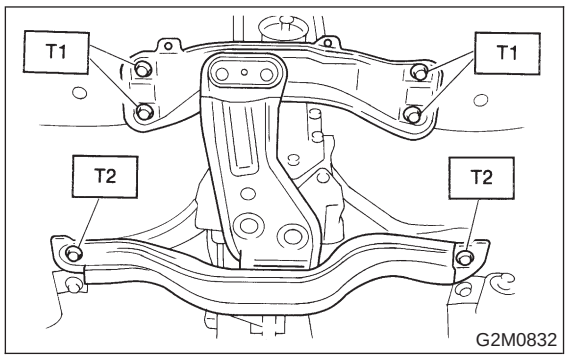
(2) Engage them at splines.

CAUTION:
Be careful not to strike mainshaft against clutch cover. (MT vehicles)

3) Install transmission rear crossmember.

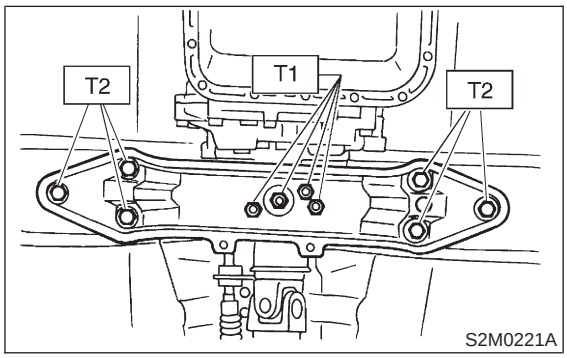
- **MT vehicles**

Tightening torque:
T1: 69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)
T2: 137±20 N·m (14±2 kg-m, 101±14 ft-lb)



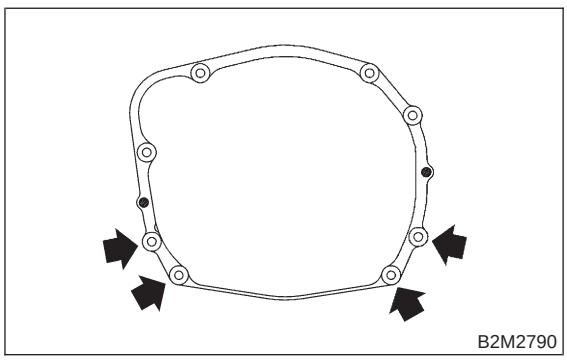
- **AT vehicles**

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)



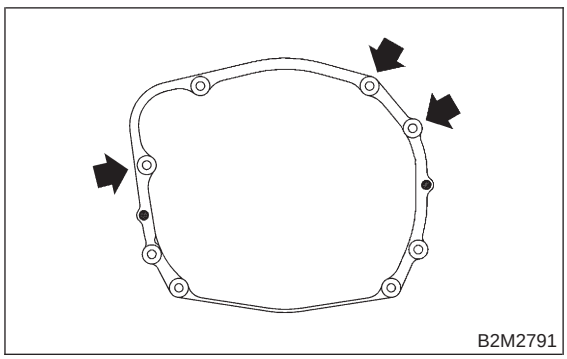
4) Take off transmission jack.
5) Tighten nuts which hold lower side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)



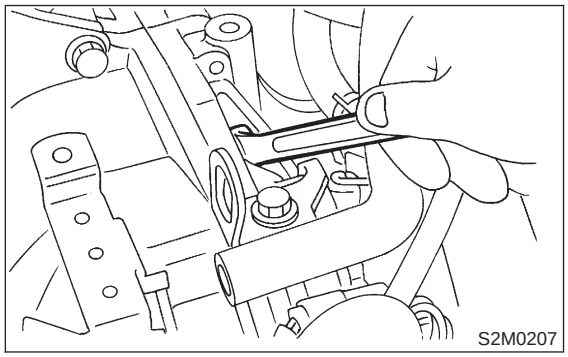
6) Tighten bolt which holds upper side of transmission to engine.

Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)



7) Install torque converter to drive plate. (AT vehicles)

(1) Tighten bolts which hold torque converter to drive plate.



(2) Tighten other bolts while rotating the engine by using ST.

2200 cc vehicles:
ST 499977300 CRANK PULLEY WRENCH
2500 cc vehicles:
ST 499977100 CRANK PULLEY WRENCH

CAUTION:
Be careful not to drop bolts into torque converter housing.

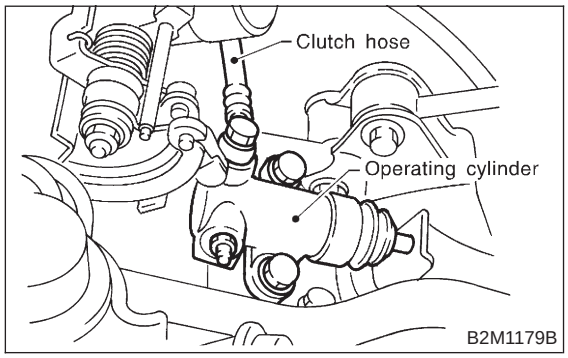
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)

(3) Clog plug onto service hole.
(4) Remove ST.

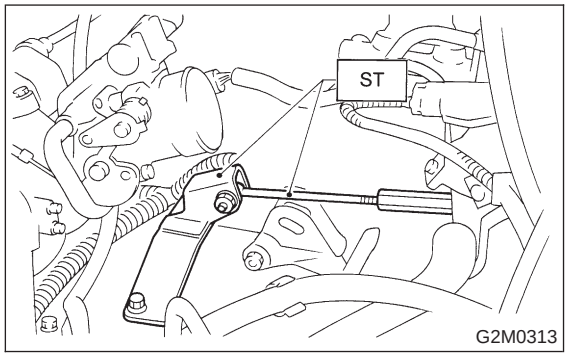
ST 498277200 STOPPER SET

8) Install operating cylinder. (2500 cc MT vehicles)

Tightening torque:
37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)

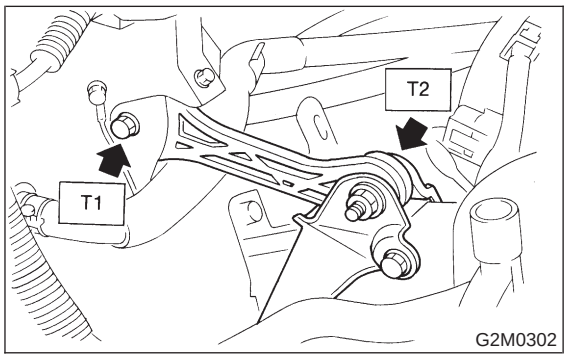


9) Remove special tools.



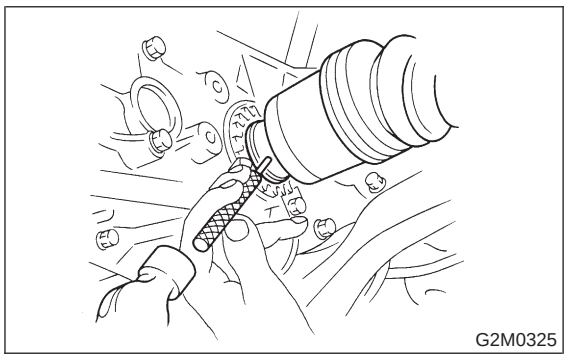
10) Install pitching stopper.

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



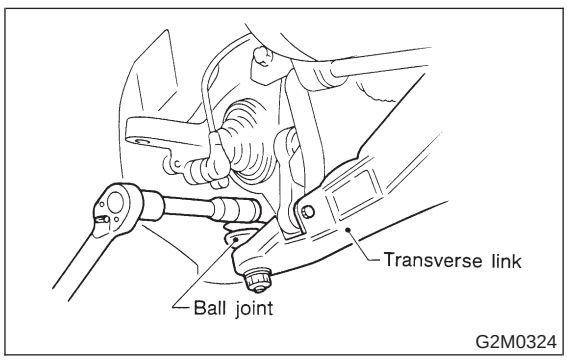
11) Install front drive shafts into transmission.
(1) Lift-up the vehicle.
(2) Install front drive shaft into transmission.
(3) Drive spring pin into chamfered hole of drive shaft.

CAUTION:
Always use a new spring pin.



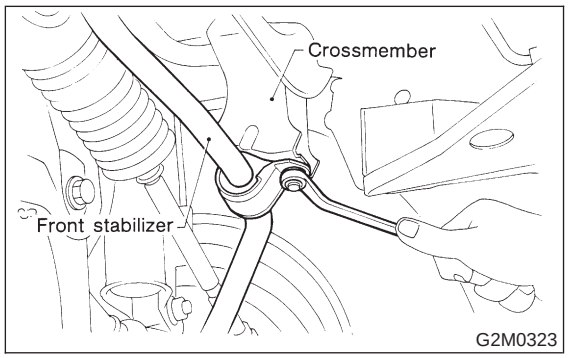
(4) Install ball joints of lower arm into knuckle arm of housing, and tighten installing bolts.

Tightening torque:
49±10 N·m (5.0±1.0 kg-m, 36±7 ft-lb)

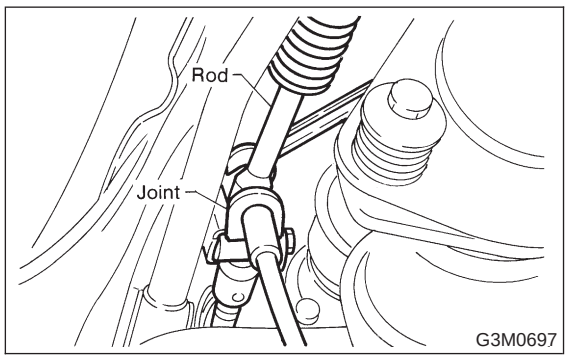


12) Install stabilizer clamps onto front crossmember.

Tightening torque:
25±4 N·m (2.5±0.4 kg-m, 18.1±2.9 ft-lb)



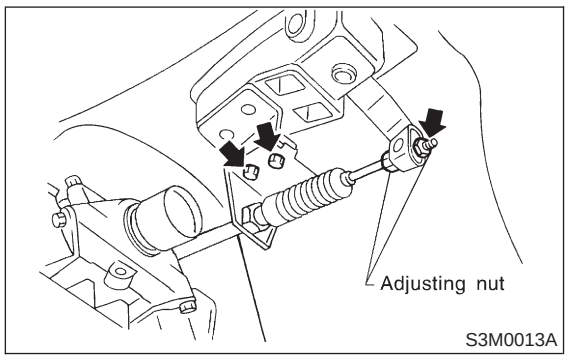
13) Install gear shift rod and stay. (MT vehicles)
(1) Install gear shift rod onto transmission.



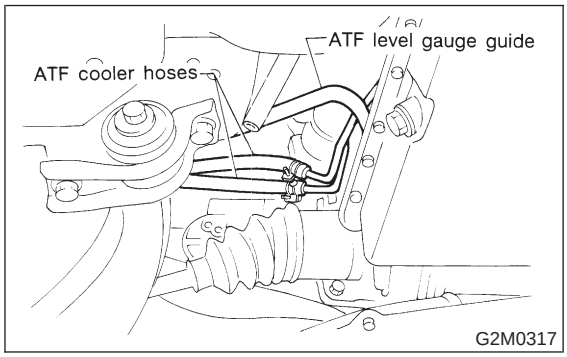
(2) Install stay onto transmission.
(3) Install spring.

14) Install shift selector cable onto selector lever. (AT vehicles)
(1) Install selector cable into selector lever.
(2) Install cable bracket onto body.

NOTE:
Tighten selector cable adjusting and lock nut after checking selector lever operation.

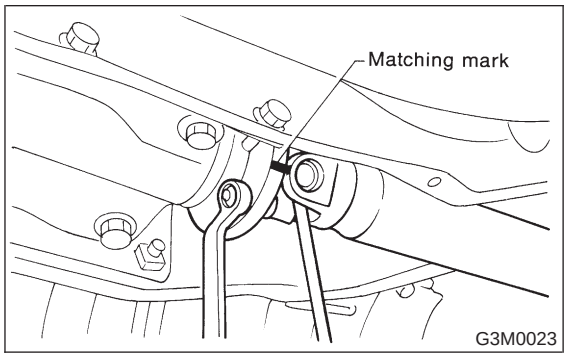


15) Install ATF level gauge guide, and ATF cooler hoses onto pipe. (AT vehicles)



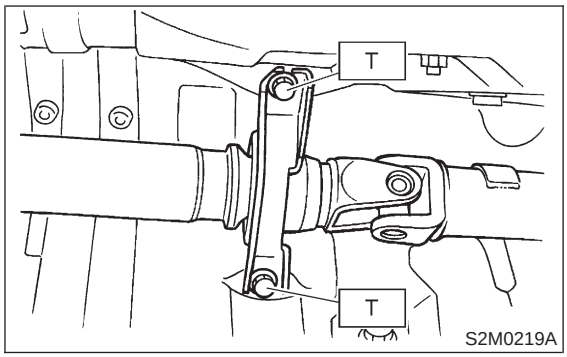
16) Install propeller shaft.
(1) Install propeller shaft into transmission.
(2) Tighten bolts which install propeller shaft onto companion flange of rear differential.

Tightening torque:
31±8 N·m (3.2±0.8 kg-m, 23.1±5.8 ft-lb)



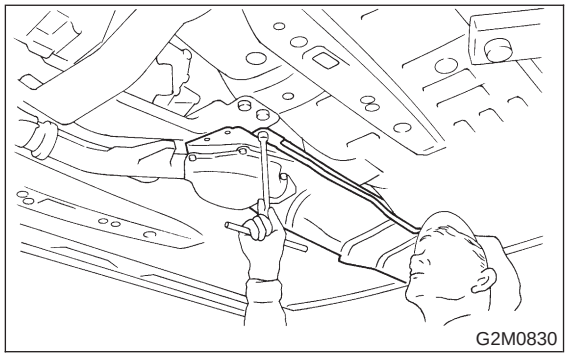
(3) Install center bearing bracket on body.

Tightening torque:
52±5 N·m (5.3±0.5 kg-m, 38.3±3.6 ft-lb)



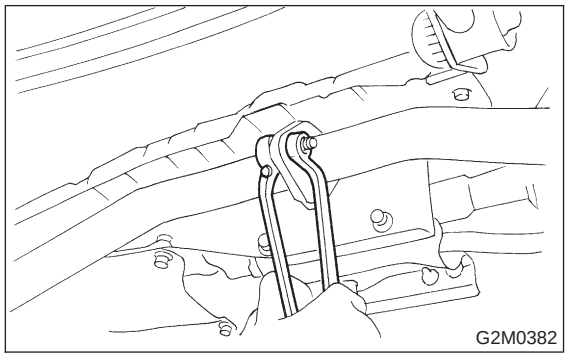
17) Install exhaust system.

(1) Install heat shield cover.

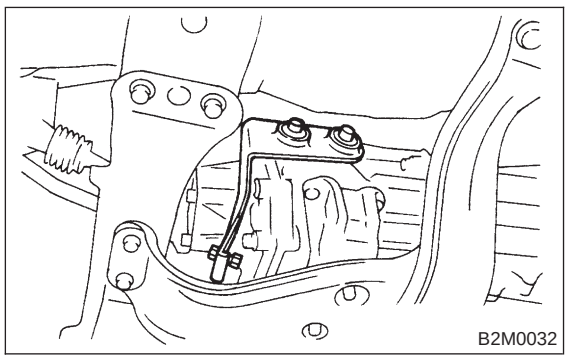


(2) Install rear exhaust pipe to muffler.

Tightening torque:
48±9 N·m (4.9±0.9 kg-m, 35.4±6.5 ft-lb)

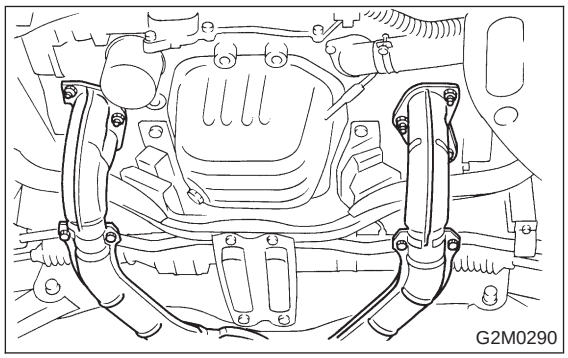


(3) Install hanger bracket on right side of transmission.



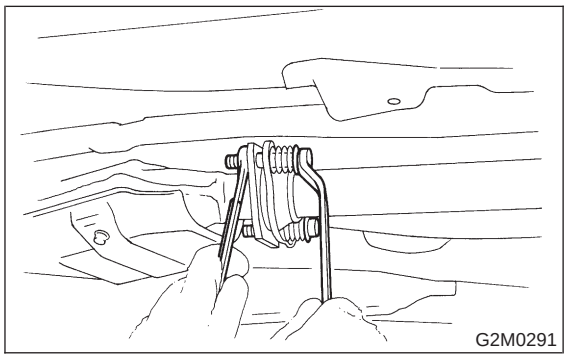
(4) Install front exhaust pipe onto engine.

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



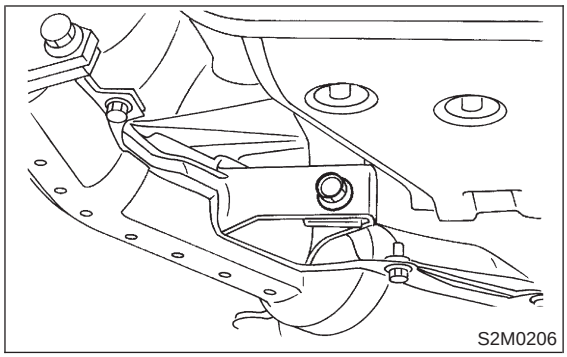
(5) Install center exhaust pipe to rear exhaust pipe.

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

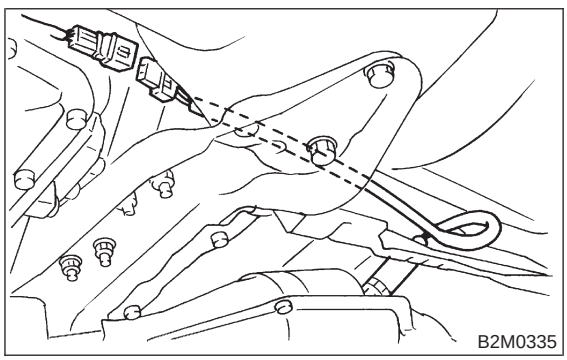


(6) Tighten bolt which installs center exhaust pipe to hanger bracket.

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

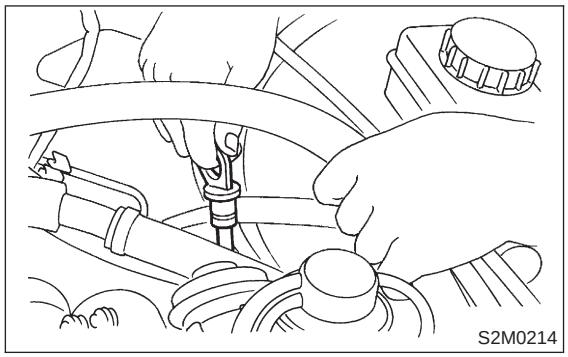


(7) Connect connector to rear oxygen sensor. (Except 2500 cc California spec. vehicles)



(8) Install under cover.

18) Install ATF level gauge. (AT vehicles)


S2M0214

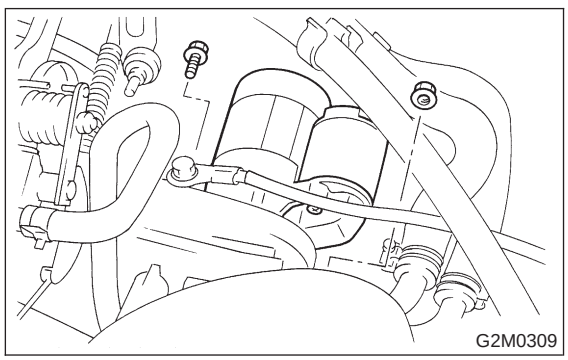
19) Connect the following connectors.
(1) Transmission harness connectors (AT vehicles)
(2) Transmission ground terminal
(3) Front oxygen sensor connector
(4) Rear oxygen sensor connector (California spec. vehicles)
(5) Neutral position switch connector (MT vehicles)
(6) Back-up light switch connector (MT vehicles)

20) Connect the following cables.
(1) Cruise control cable
(With cruise control vehicles)
(2) Clutch cable (2200 cc MT vehicles)

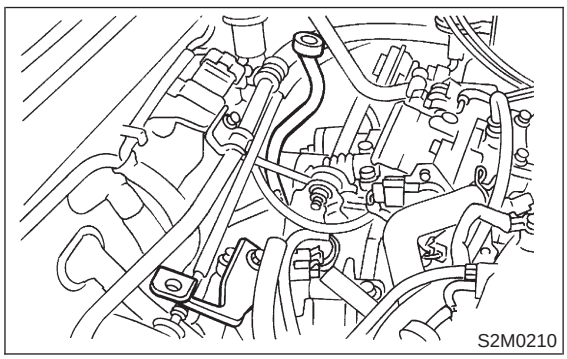
21) Install return spring.
(Without hill holder vehicles)

22) Install starter.
(1) Install starter onto transmission case, and connect connectors and terminals.
(2) Tighten bolt and nut which install starter onto transmission.

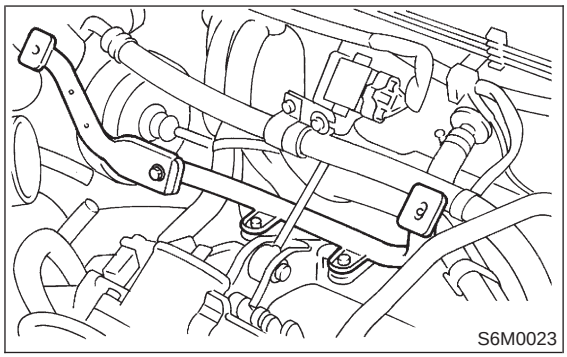
Tightening torque:
40±4 N·m (4.1±0.4 kg-m, 29.7±2.9 ft-lb)


G2M0309

23) Install chamber stay.
- MT vehicles


S2M0210

- AT vehicles


S6M0023

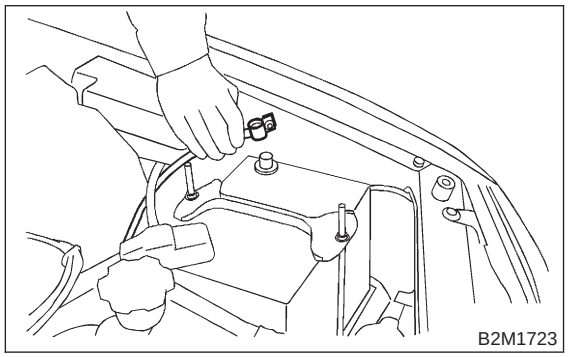
24) Install air intake duct and chamber. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>
25) Install air intake duct with air cleaner case. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].> and <Ref. to 2-7 [W18A0].>
26) Connect battery ground cable.
27) Fill ATF and differential gear oil. (AT vehicles) <Ref. to 3-2 [S1A0].>
28) Check selector lever operation. (AT vehicles) <Ref. to 3-2 [T2C0].>
29) Take off vehicle from lift arms.
30) Check the vehicle on road tester. (AT vehicles) <Ref. to 3-2 [W6A0].>

MEMO:

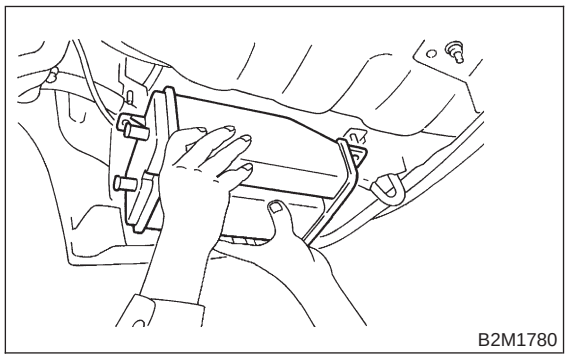
13. Air Filter

A: REMOVAL AND INSTALLATION

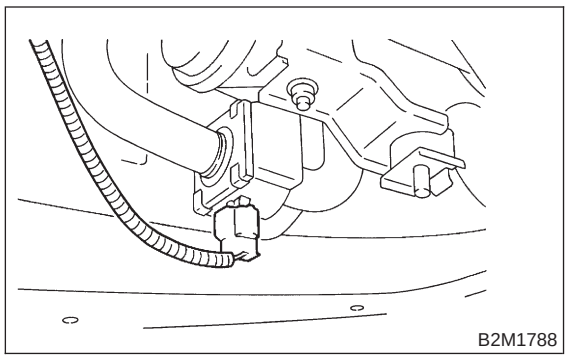
1) Disconnect battery ground cable.


B2M1723

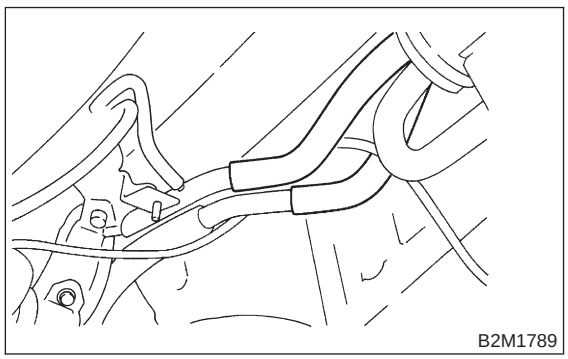
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>


B2M1780

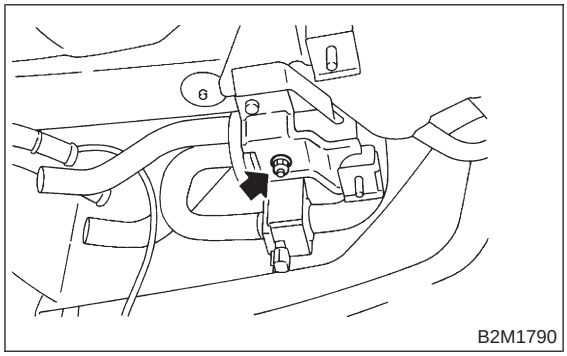
4) Disconnect connector from drain valve.


B2M1788

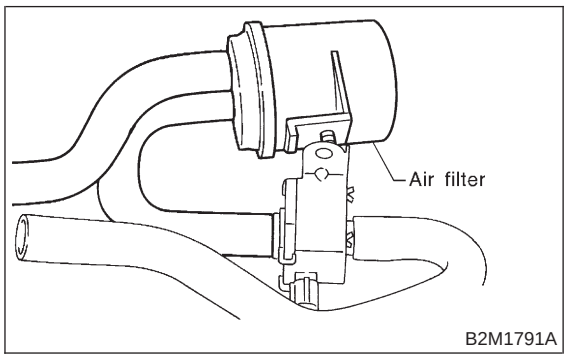
5) Disconnect evaporation hoses from joint pipes.


B2M1789

6) Remove nut which installs air filter and drain valve brackets on body, and remove them as a unit.


B2M1790

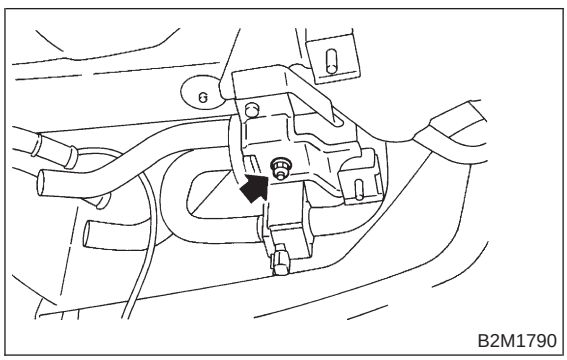
7) Disconnect evaporation hoses, and remove air filter.



B2M1791A

8) Installation is in the reverse order of removal.

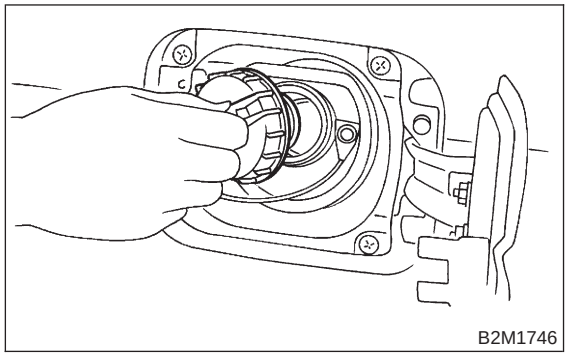
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)


B2M1790

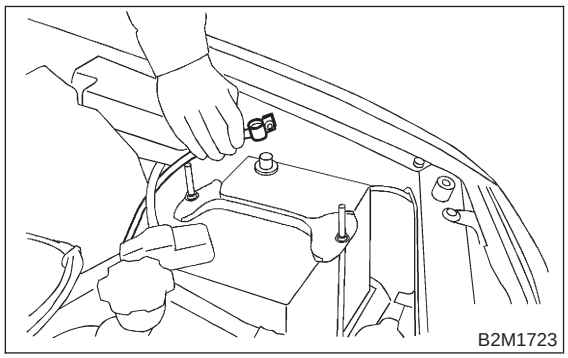
14. Sub Fuel Level Sensor

A: REMOVAL AND INSTALLATION

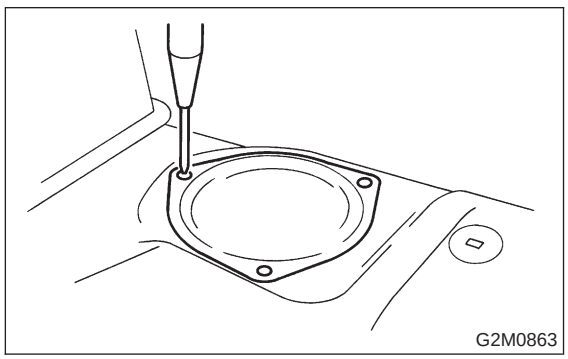
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M1746

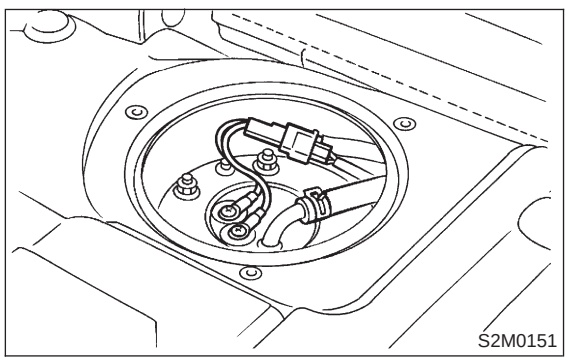
3) Disconnect battery ground cable.


B2M1723

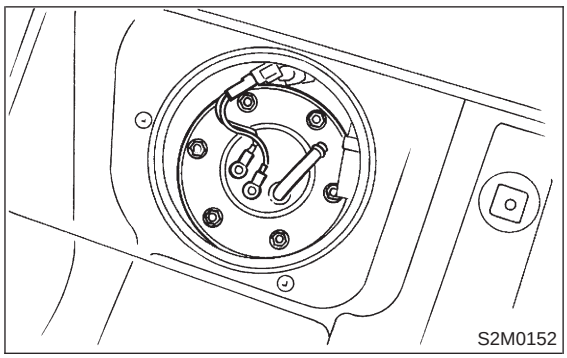
4) Remove service hole cover.


G2M0863

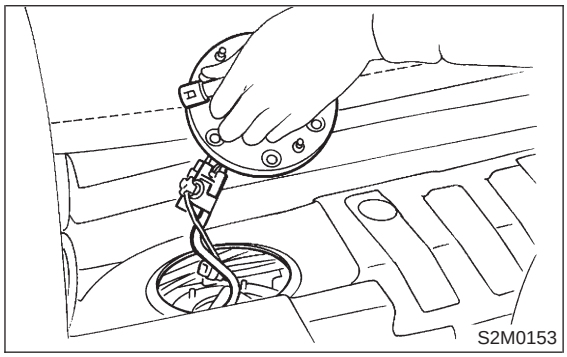
5) Disconnect connector from fuel sub meter, and disconnect jet pump hose.


S2M0151

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

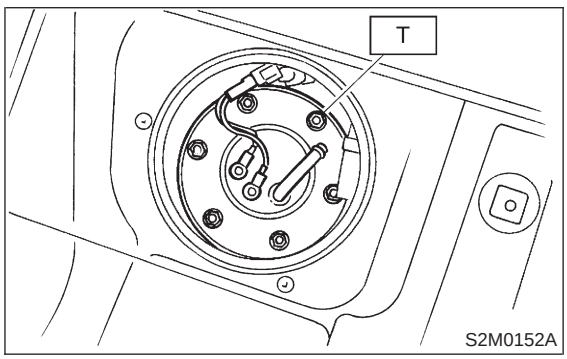

S2M0152

7) Remove sub fuel level sensor.


S2M0153

8) Installation is in the reverse order of removal.

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

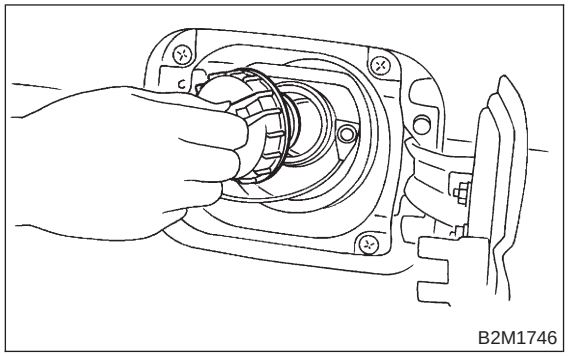


S2M0152A

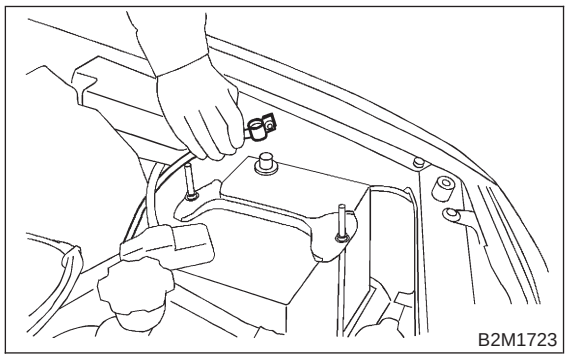
15. Vent Valve

A: REMOVAL AND INSTALLATION

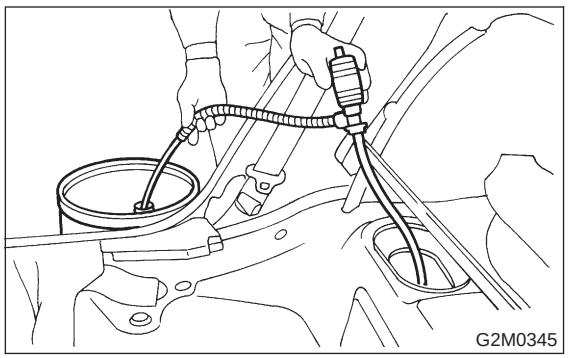
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filer cap.


B2M1746

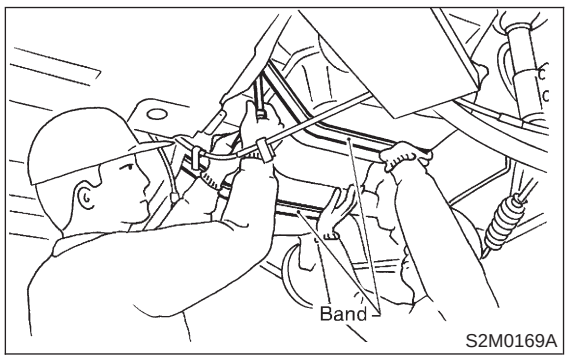
3) Disconnect battery ground cable.


B2M1723

4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>

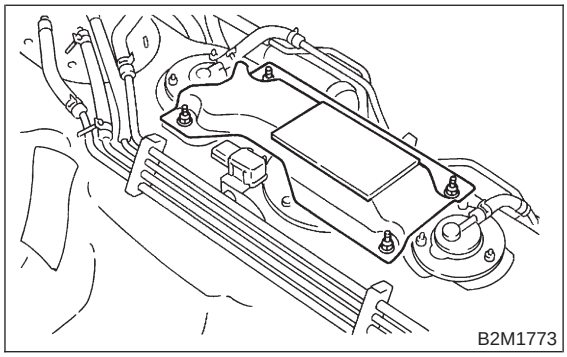

G2M0345

5) Remove fuel tank. <Ref. to 2-8 [W2A0].>

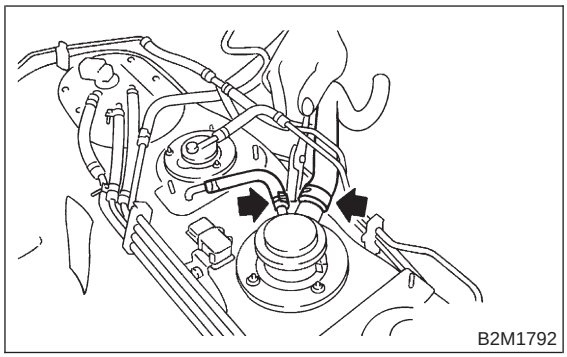


S2M0169A

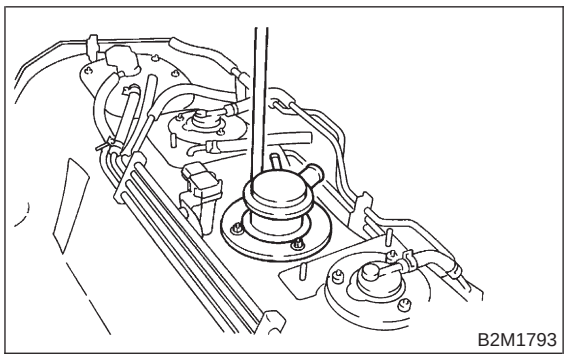
6) Remove protector cover.


B2M1773

7) Move clips, and disconnect hoses from vent valve.


B2M1792

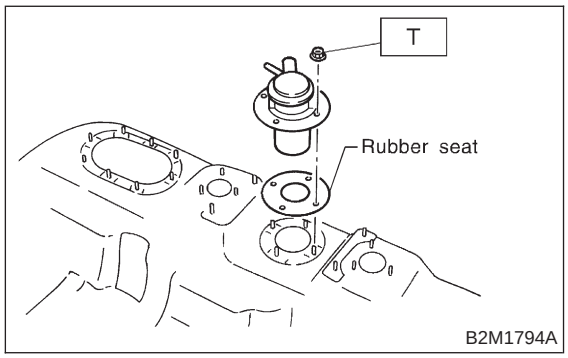
8) Remove nuts which install vent valve on fuel tank.


B2M1793

9) Installation is in the reverse order of removal.

CAUTION:
Replace rubber seat with a new one.

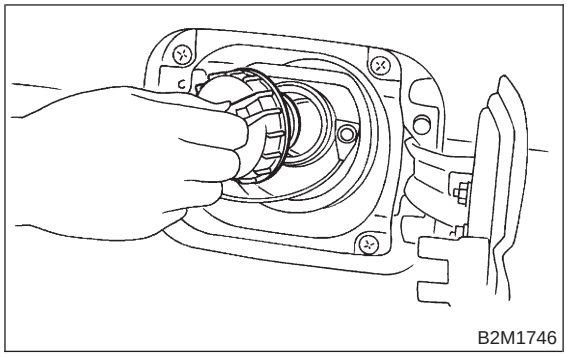
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



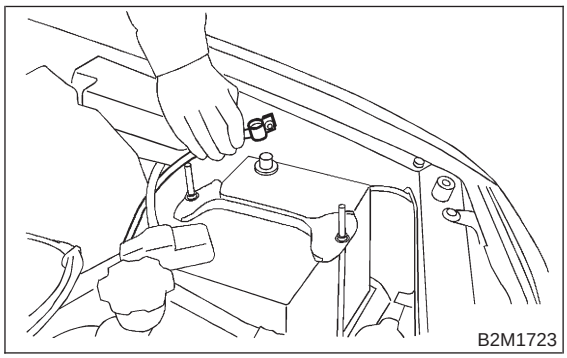
16. Shut Valve

A: REMOVAL AND INSTALLATION

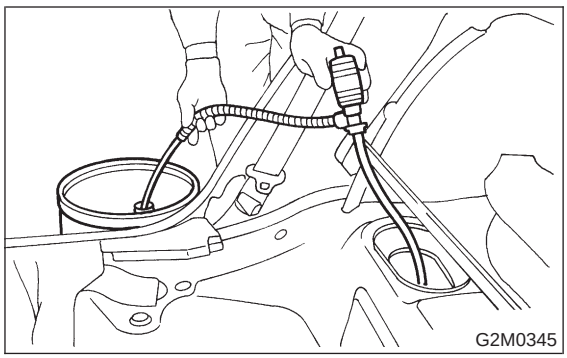
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filer cap.



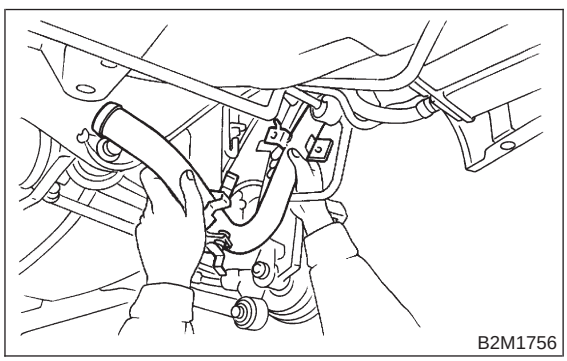
3) Disconnect battery ground cable.



4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



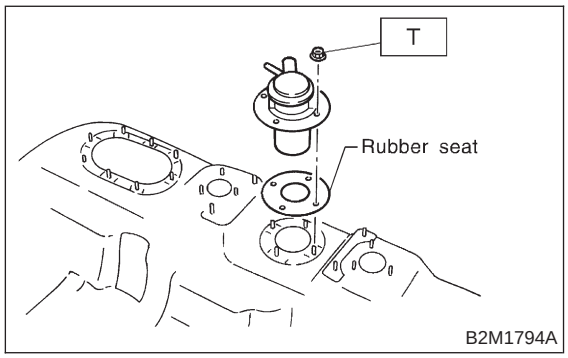
5) Remove fuel filler pipe. <Ref. to 2-8 [W3A0].>



9) Installation is in the reverse order of removal.

CAUTION:
Replace rubber seat with a new one.

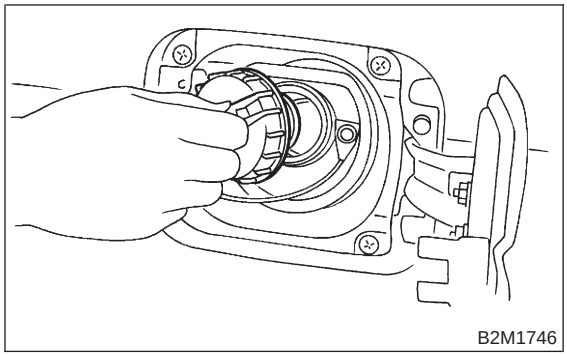
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



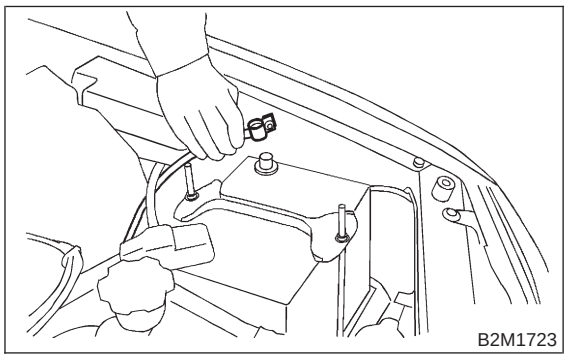
16. Shut Valve

A: REMOVAL AND INSTALLATION

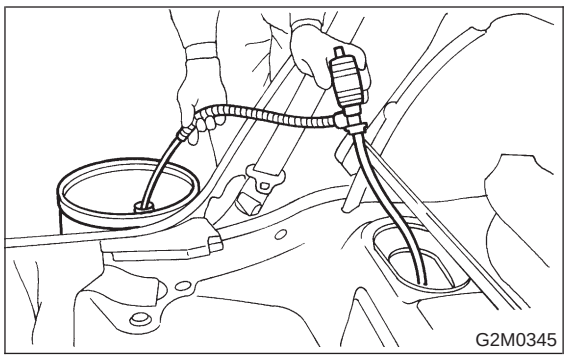
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filer cap.



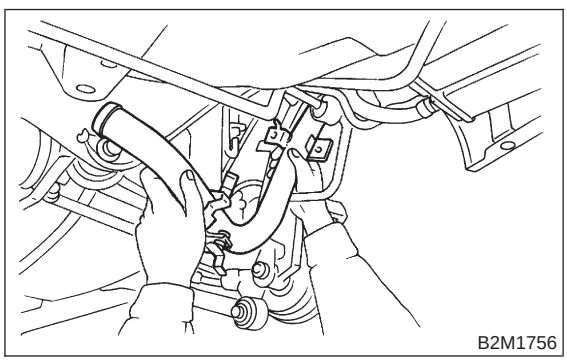
3) Disconnect battery ground cable.



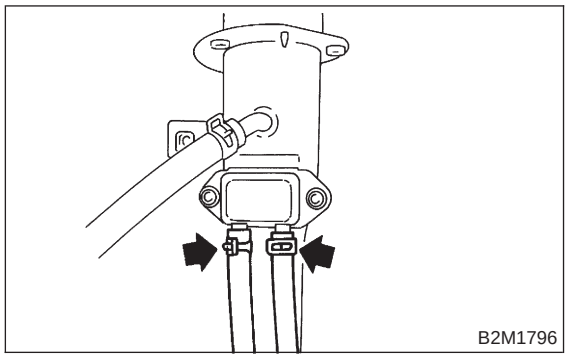
4) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



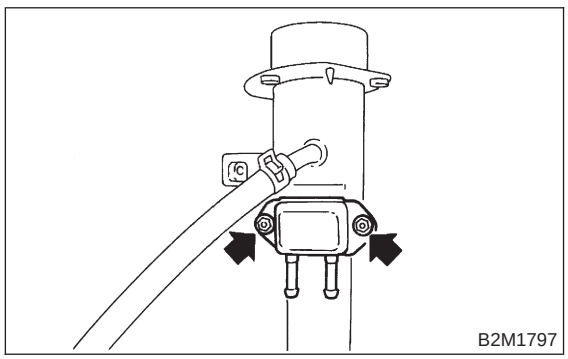
5) Remove fuel filler pipe. <Ref. to 2-8 [W3A0].>



6) Disconnect evaporation hoses from shut valve.

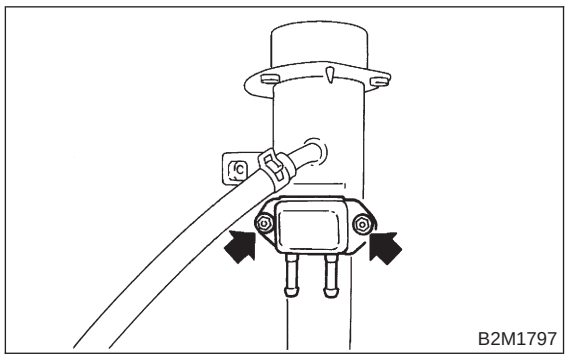


7) Remove shut valve from fuel filler pipe.



8) Installation is in the reverse order of removal.

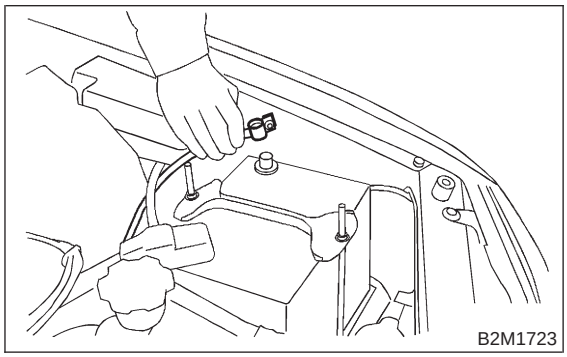
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



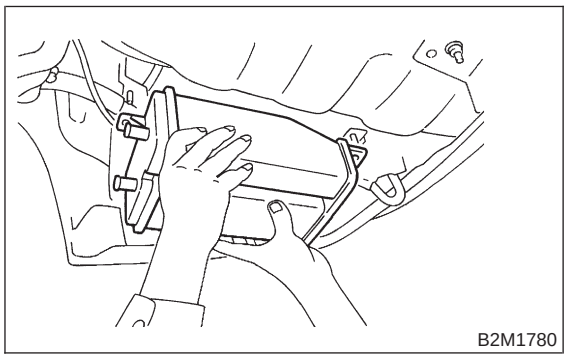
17. Drain Valve

A: REMOVAL AND INSTALLATION

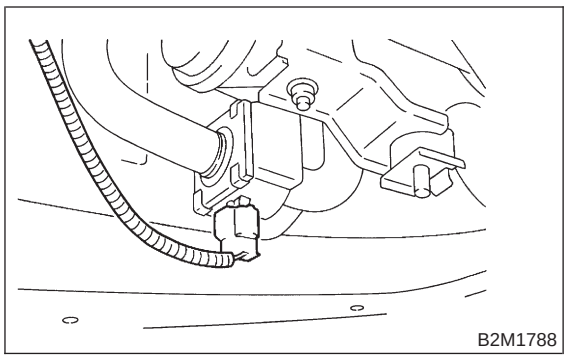
1) Disconnect battery ground cable.



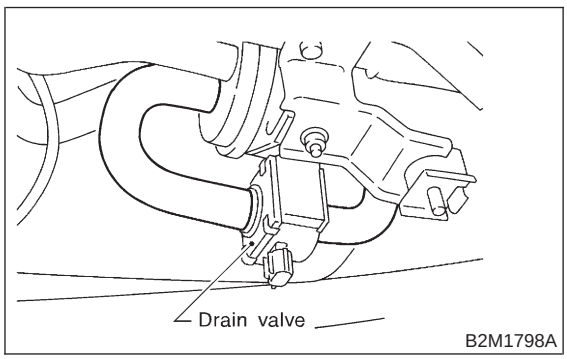
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>



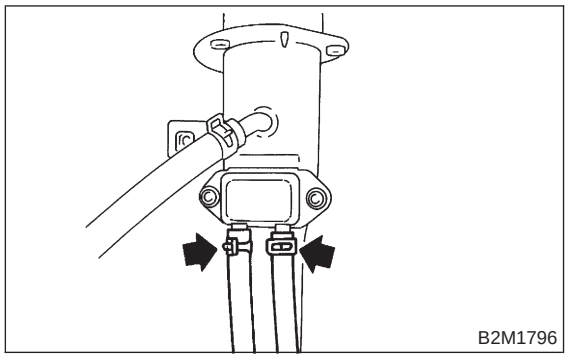
4) Disconnect connector from drain valve.



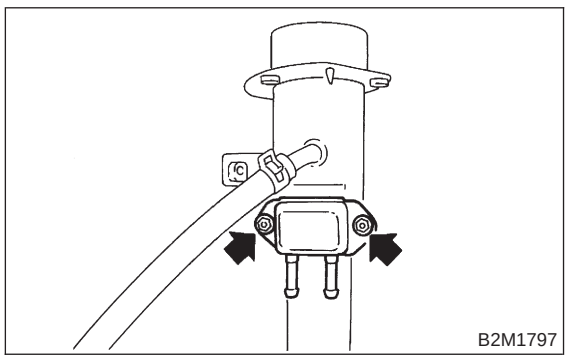
5) Disconnect evaporation hoses from drain valve.



6) Disconnect evaporation hoses from shut valve.

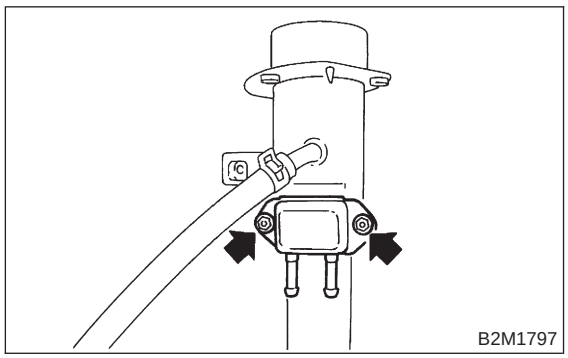


7) Remove shut valve from fuel filler pipe.



8) Installation is in the reverse order of removal.

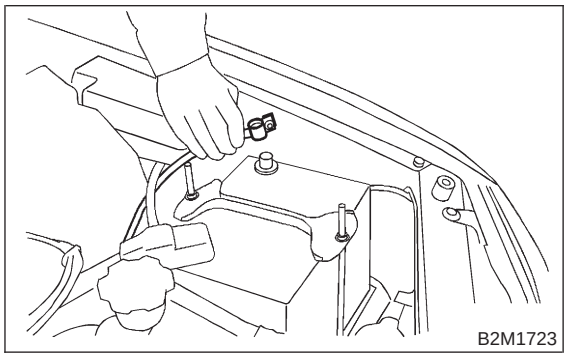
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



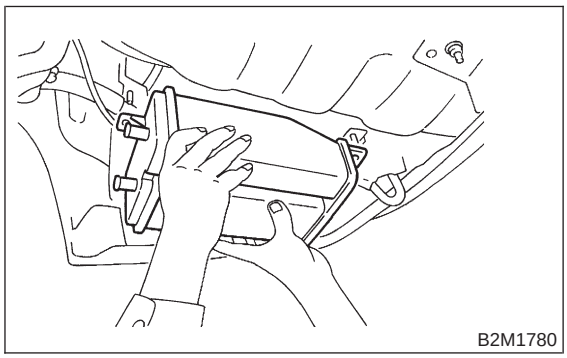
17. Drain Valve

A: REMOVAL AND INSTALLATION

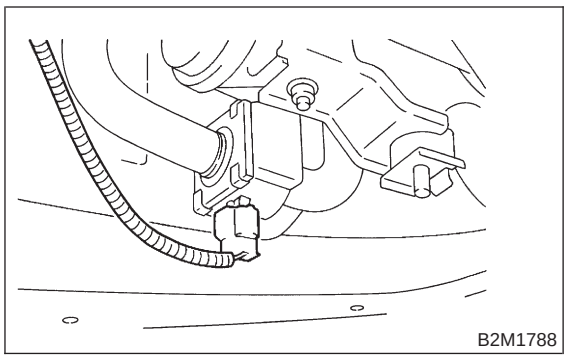
1) Disconnect battery ground cable.



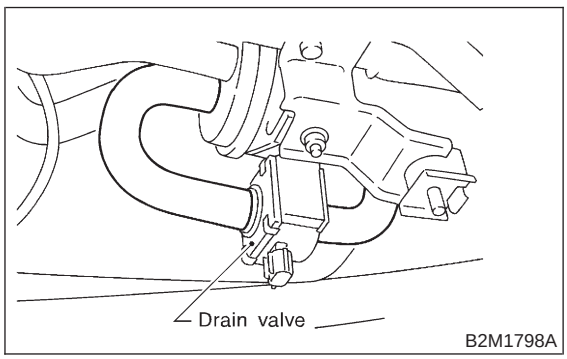
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>



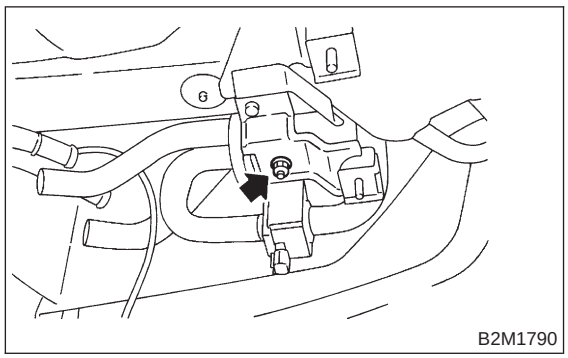
4) Disconnect connector from drain valve.



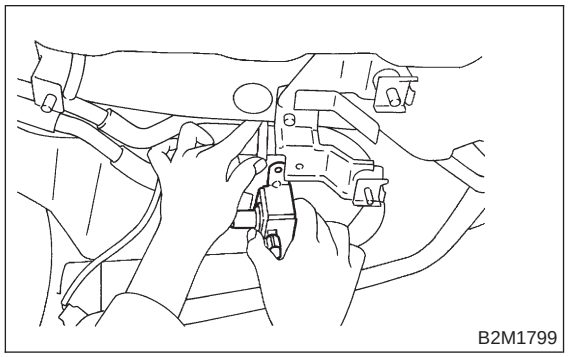
5) Disconnect evaporation hoses from drain valve.



6) Remove bolt which installs air filter and drain valve brackets on body.

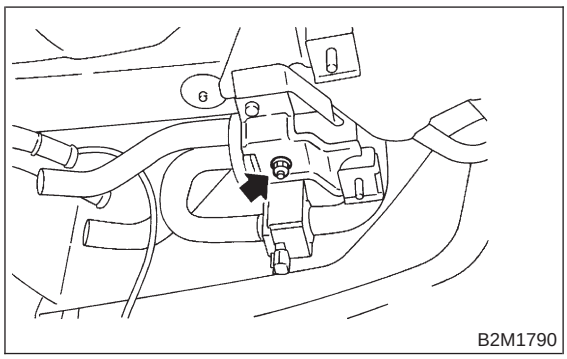


7) Move air filter to upper side, and remove drain valve with bracket.



8) Installation is in the reverse order of removal.

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



1. Foreword

A: GENERAL

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.

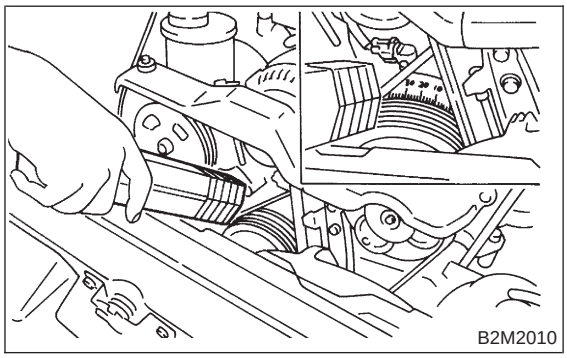
2. Ignition Timing

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.

Ignition timing [BTDC/rpm]:
2200 cc California spec. vehicles
15°±8°/700
2200 cc except California spec. vehicles
10°±8°/700 (MT model)
15°±8°/700 (AT model)
2500 cc model
15°±8°/700


B2M2010

If the timing is not correct, check the ignition control system.
<Ref. to 2-7 [T6A0].>

1. Foreword

A: GENERAL

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.

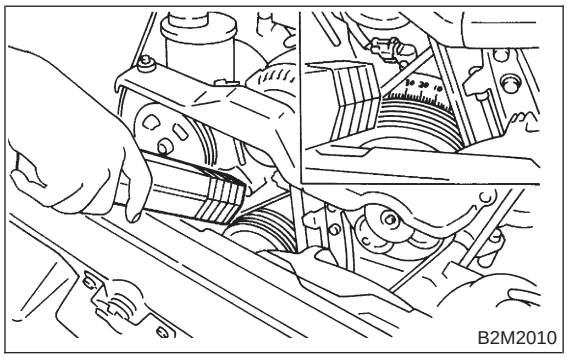
2. Ignition Timing

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.

Ignition timing [BTDC/rpm]:
2200 cc California spec. vehicles
15°±8°/700
2200 cc except California spec. vehicles
10°±8°/700 (MT model)
15°±8°/700 (AT model)
2500 cc model
15°±8°/700


B2M2010

If the timing is not correct, check the ignition control system.
<Ref. to 2-7 [T6A0].>

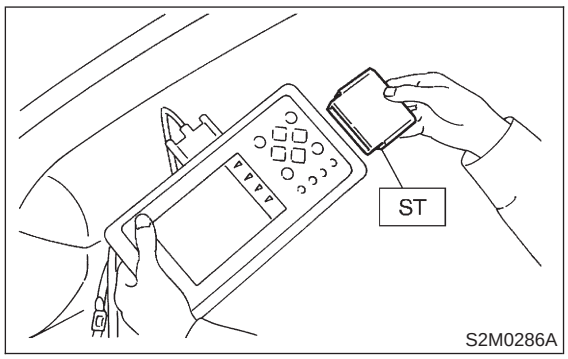
3. Engine Idle Speed

A: MEASUREMENT

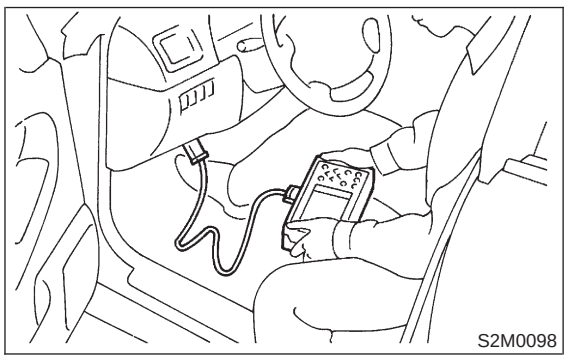
1) Before checking idle speed, check the following:
(1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
(2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR;

NOTE:
For detailed operation procedures, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

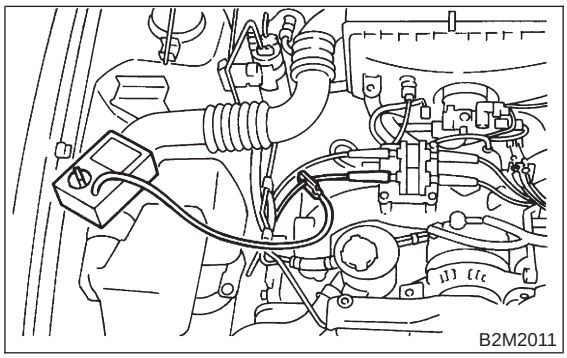
(1) Insert the cartridge to SUBARU SELECT MONITOR.
ST 24082AA090 CARTRIDGE



(2) Connect SUBARU SELECT MONITOR to the data link connector.
(3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {EGI/EMPI} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(7) Select {1.12 Data Display} in Data Display Menu.
(8) Start the engine, and read engine idle speed.



5) When using tachometer (Secondary pick-up type).
(1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
(2) Start the engine, and read engine idle speed.



NOTE:
● When using the OBD-II general scan tool, carefully read its operation manual.
● 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.

6) 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

7) Check idle speed when loaded. (Turn air conditioning switch to |P′rdquo;ON|P'ldquo; and operate compressor for at least one minute before measurement.)

Idle speed [A/C "ON", no load and gears in neutral (MT) or N or P (AT) position]:
850±50 rpm

CAUTION:
Never rotate idle adjusting screw. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "2-7 On-Board Diagnostics II System".
<Ref. to 2-7 [T6A0].>

4. Engine Compression

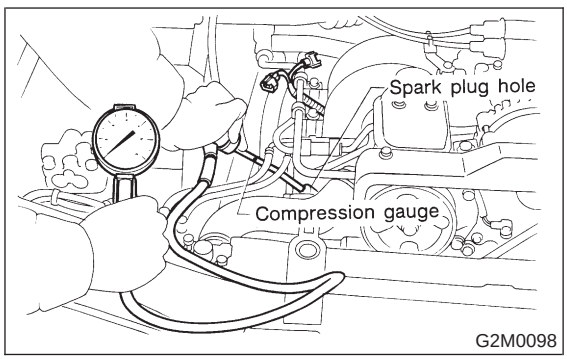
A: MEASUREMENT

1. 2200 cc MODEL

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)

CAUTION:
Never rotate idle adjusting screw. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "2-7 On-Board Diagnostics II System".
<Ref. to 2-7 [T6A0].>

4. Engine Compression

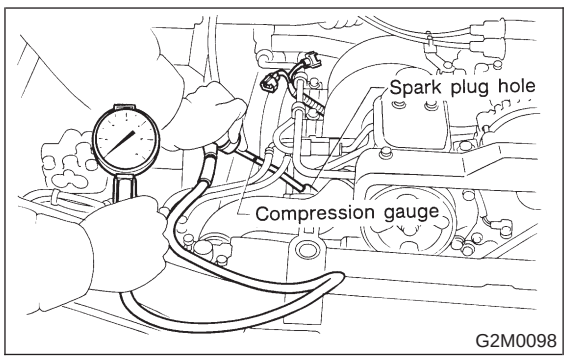
A: MEASUREMENT

1. 2200 cc MODEL

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)

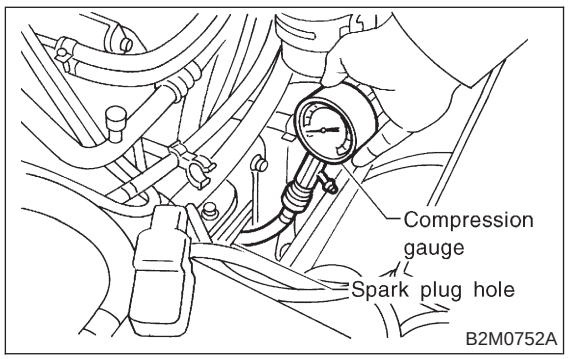
2. 2500 cc MODEL

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during 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. <Ref. to 6-1 [W3B0].>
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.



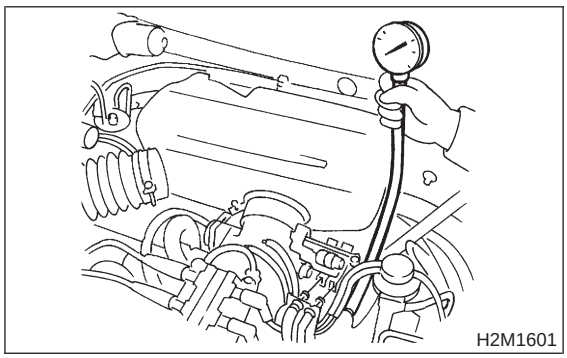
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,216 kPa (12.4 kg/cm^2, 176 psi)
Limit;
941 kPa (9.6 kg/cm^2, 137 psi)
Difference between cylinders;
49 kPa (0.5 kg/cm^2, 7 psi), or less

5. Intake Manifold Vacuum

A: MEASUREMENT

1) Warm-up the engine.
2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
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"):
Less than −60.0 kPa (−450 mmHg, −17.72 inHg)

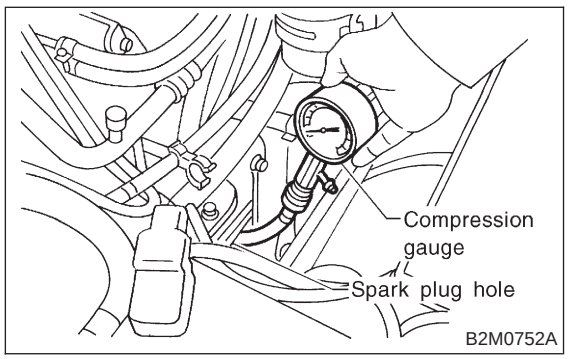
2. 2500 cc MODEL

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during 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. <Ref. to 6-1 [W3B0].>
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.



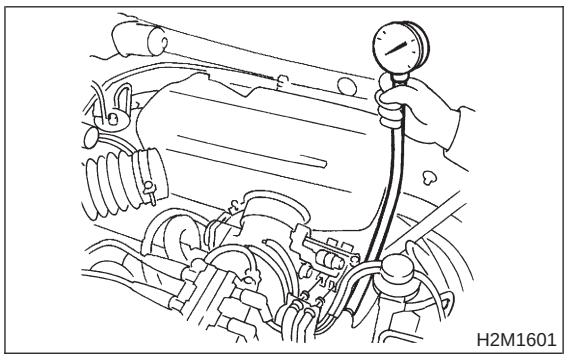
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,216 kPa (12.4 kg/cm^2, 176 psi)
Limit;
941 kPa (9.6 kg/cm^2, 137 psi)
Difference between cylinders;
49 kPa (0.5 kg/cm^2, 7 psi), or less

5. Intake Manifold Vacuum

A: MEASUREMENT

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



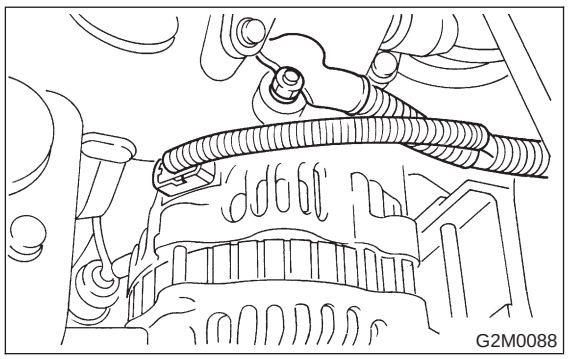
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 inHg)

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 or disconnection or 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

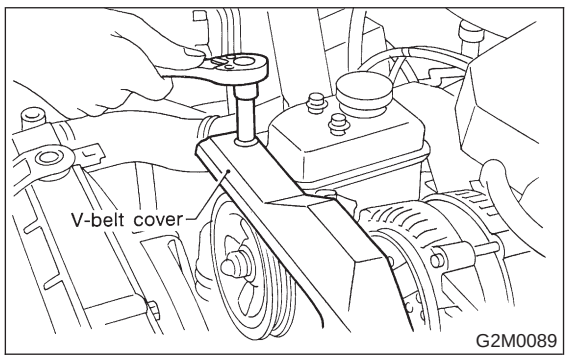
6. Engine Oil Pressure

A: MEASUREMENT

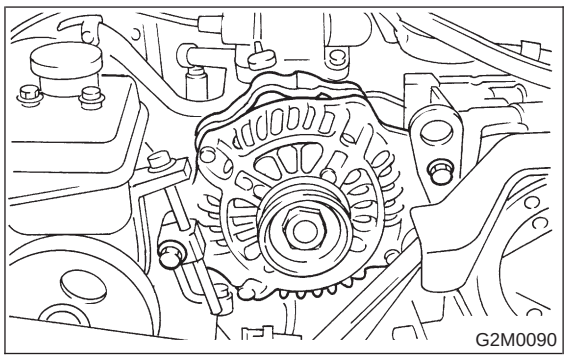
1) Disconnect battery ground cable.
2) Remove generator from bracket.
   (1) Disconnect connector and terminal from generator.



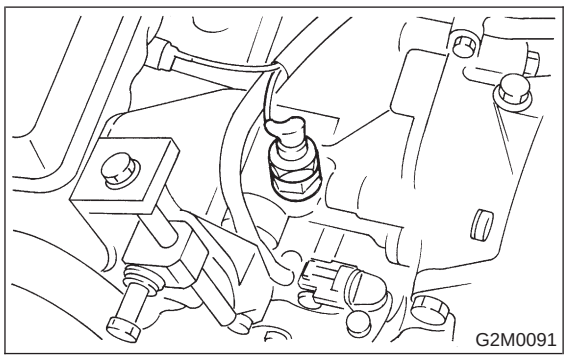
   (2) Remove V-belt cover



   (3) Loosen lock bolt and slider bolt, and remove V-belt for generator.
   (4) Remove generator lock bolt.
   (5) Remove bolt which install generator on bracket.



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



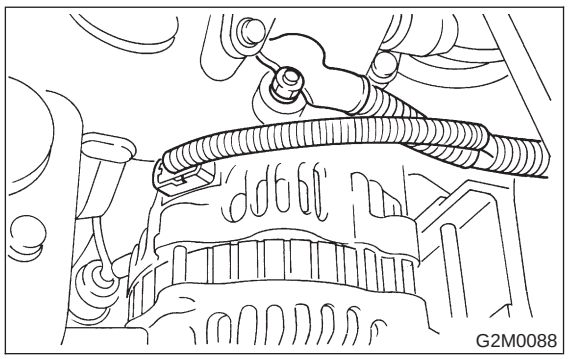
5) Connect oil pressure gauge hose to cylinder block.
6) Connect battery ground cable.
7) Start the engine, and measure oil pressure.

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 or disconnection or 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

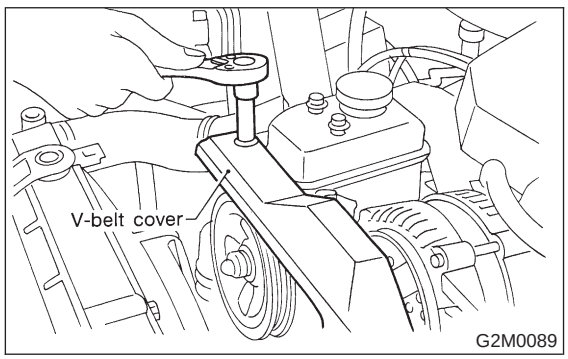
6. Engine Oil Pressure

A: MEASUREMENT

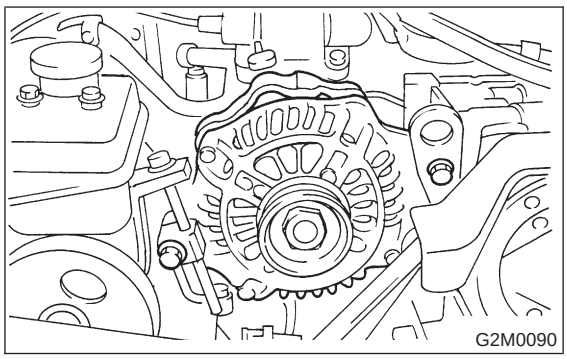
1) Disconnect battery ground cable.
2) Remove generator from bracket.
   (1) Disconnect connector and terminal from generator.



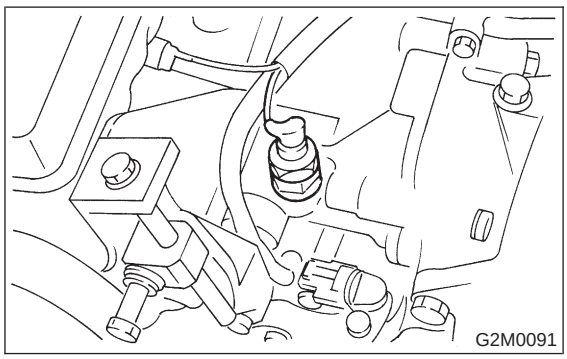
   (2) Remove V-belt cover



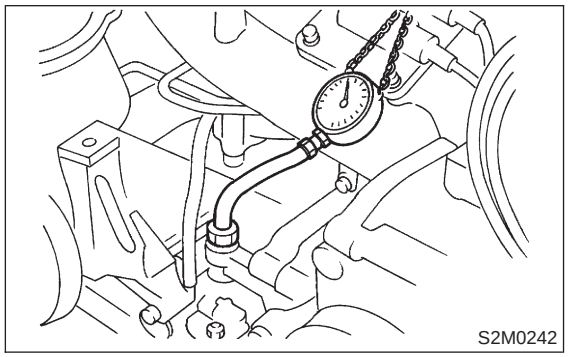
   (3) Loosen lock bolt and slider bolt, and remove V-belt for generator.
   (4) Remove generator lock bolt.
   (5) Remove bolt which install generator on bracket.



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



5) Connect oil pressure gauge hose to cylinder block.
6) Connect battery ground cable.
7) Start the engine, and measure oil pressure.



Oil pressure:
98 kPa (1.0 kg/cm^2,14 psi) or more at 800 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 [K100].>
● 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).

8) 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)

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

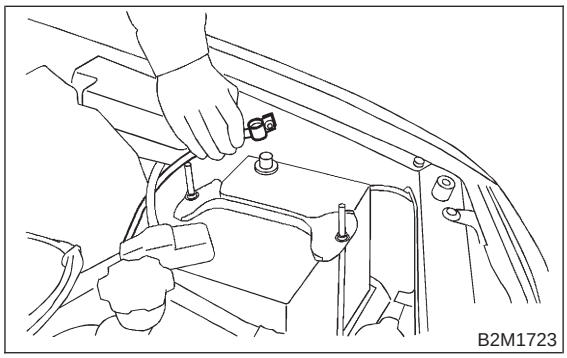
7. Valve Clearance

A: INSPECTION

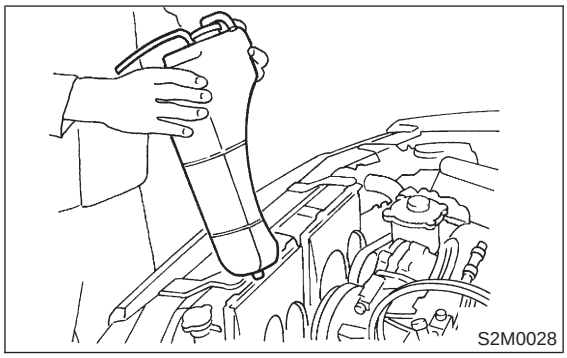
1. 2200 cc MODEL

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

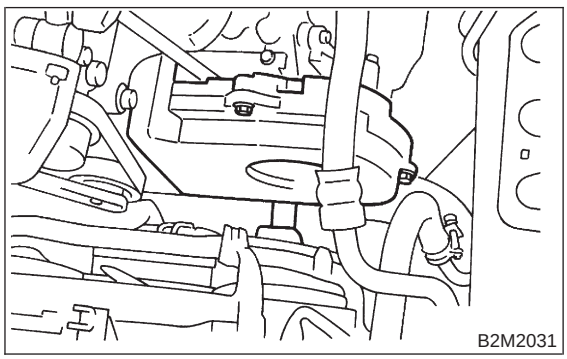
1) Set the vehicle onto the lift.
2) Disconnect battery ground cable.



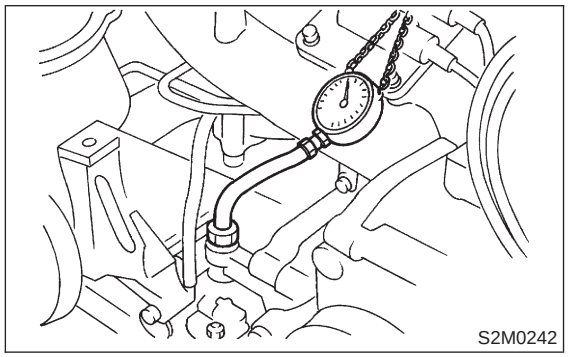
3) Remove engine coolant reservoir tank. <Ref. to 2-5 [W9A0].>



4) Remove timing belt cover (LH).



5) Remove rocker cover.
● When inspecting #1 and #3 cylinders:
  ● Low emission vehicle:



Oil pressure:
98 kPa (1.0 kg/cm^2,14 psi) or more at 800 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 [K100].>
● 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).

8) 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)

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

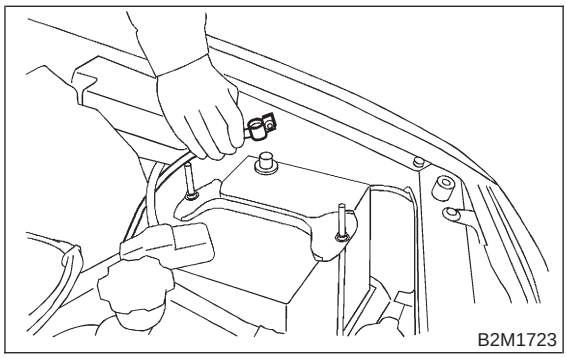
7. Valve Clearance

A: INSPECTION

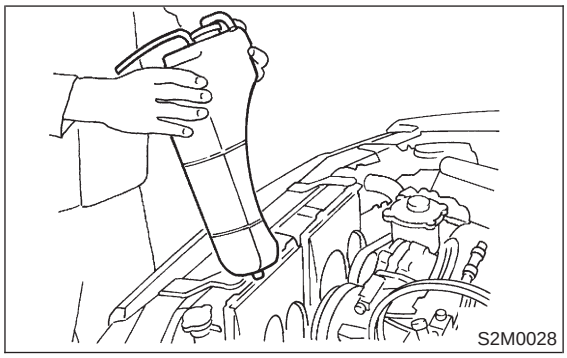
1. 2200 cc MODEL

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

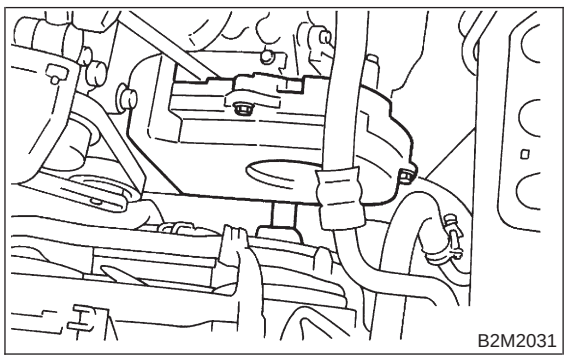
1) Set the vehicle onto the lift.
2) Disconnect battery ground cable.



3) Remove engine coolant reservoir tank. <Ref. to 2-5 [W9A0].>

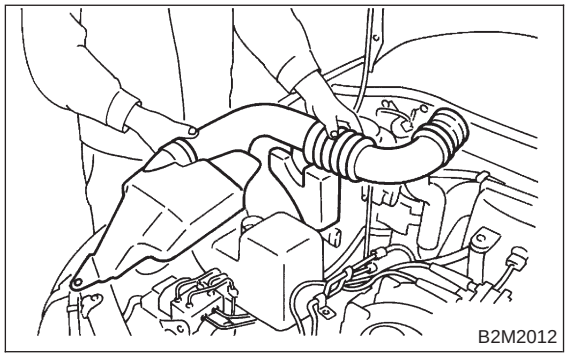


4) Remove timing belt cover (LH).

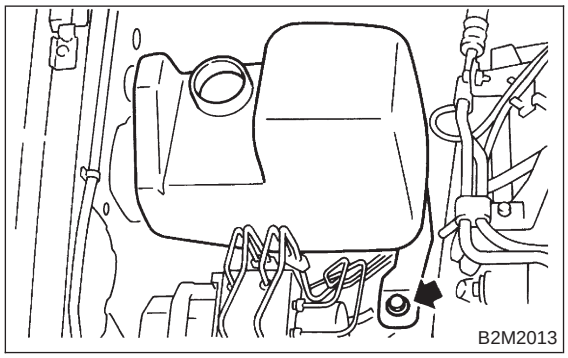


5) Remove rocker cover.
● When inspecting #1 and #3 cylinders:
  ● Low emission vehicle:

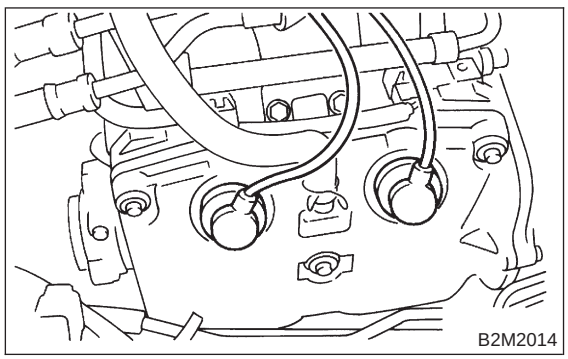
(1) Remove air intake duct A and B as a unit.



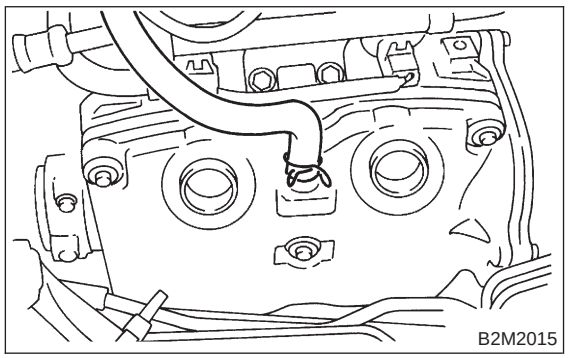
(2) Remove resonator chamber.



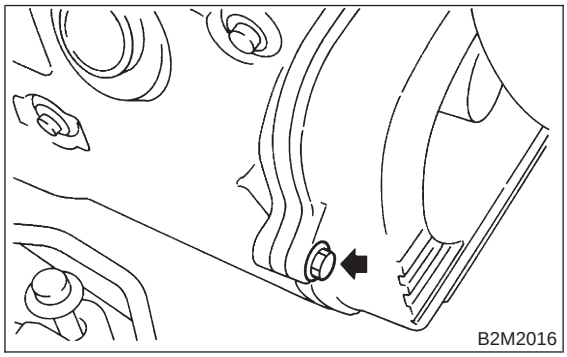
(3) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).



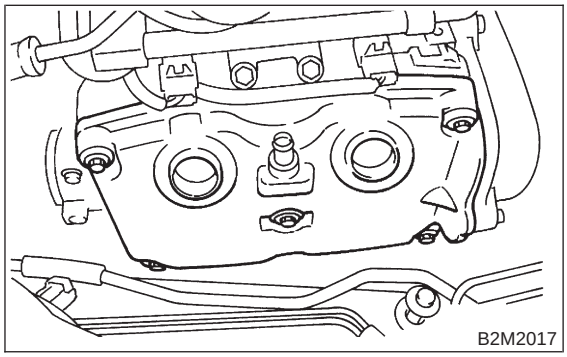
(4) Disconnect blow-by hose from rocker cover (RH).



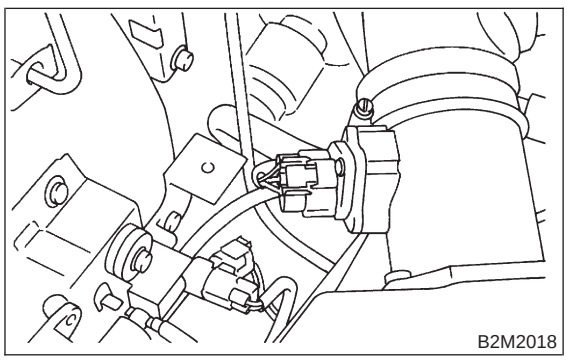
(5) Lift-up the vehicle.
(6) Remove under cover (RH).
(7) Place suitable container under the vehicle.
(8) Lower the vehicle.
(9) Remove the timing belt cover (RH) bolt.



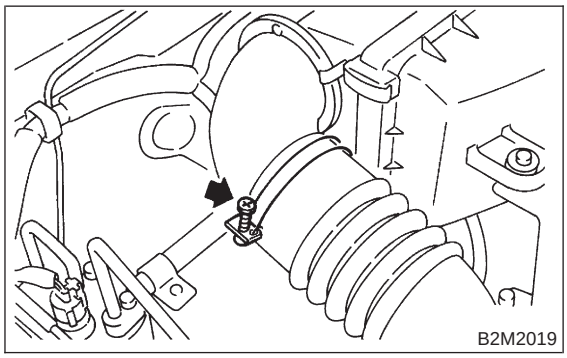
(10) Remove rocker cover bolts, then remove rocker cover (RH).



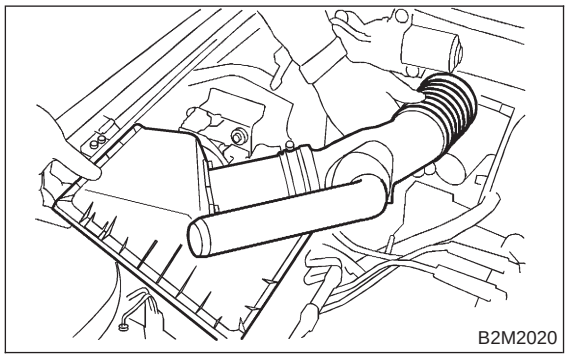
- Except low emission vehicle:
  (1) Disconnect connector from mass air flow sensor.



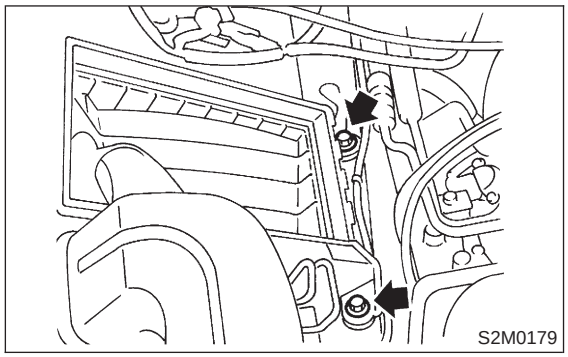
(2) Loosen clamp which connects air intake duct and air intake chamber.



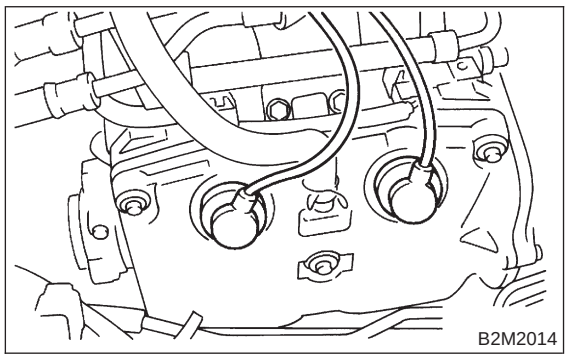
(3) Remove clips of air cleaner upper cover.
(4) Remove air intake duct and air cleaner upper cover as a unit.


B2M2020

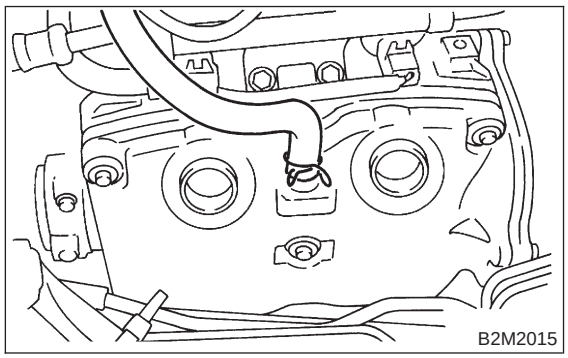
(5) Remove air cleaner element.
(6) Remive air cleaner lower case.


S2M0179

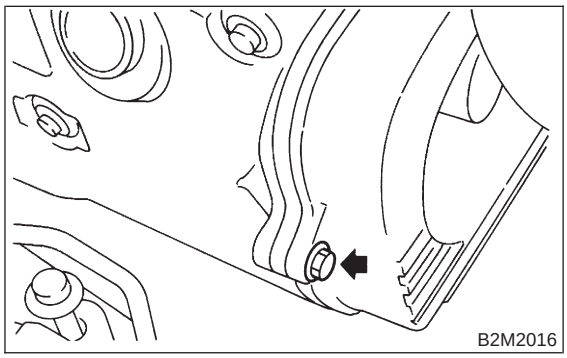
(7) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).


B2M2014

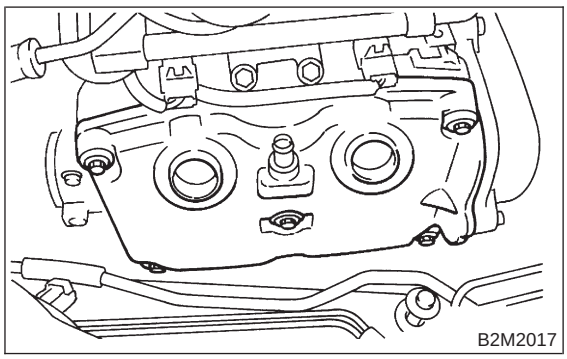
(8) Disconnect blow-by hose from rocker cover (RH).


B2M2015

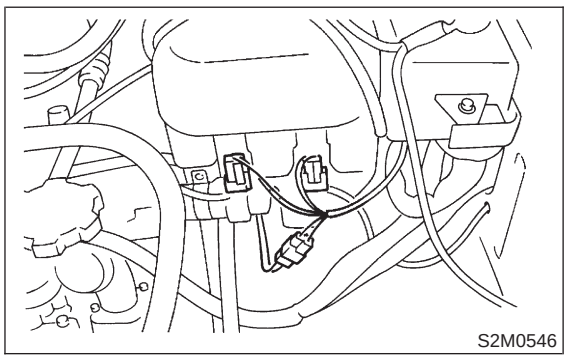
(9) Lift-up the vehicle.
(10) Remove under cover (RH).
(11) Place suitable container under the vehicle.
(12) Lower the vehicle.
(13) Remove the timing belt cover (RH) bolt.


B2M2016

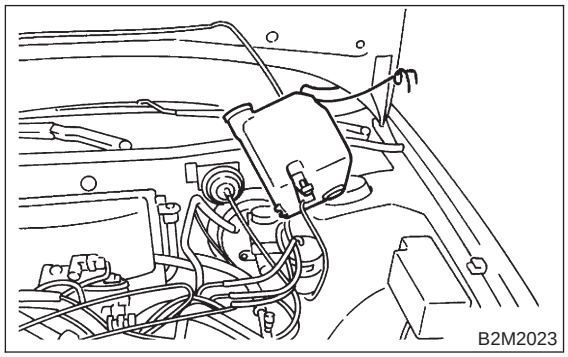
(14) Remove rocker cover bolts, then remove rocker cover (RH).


B2M2017

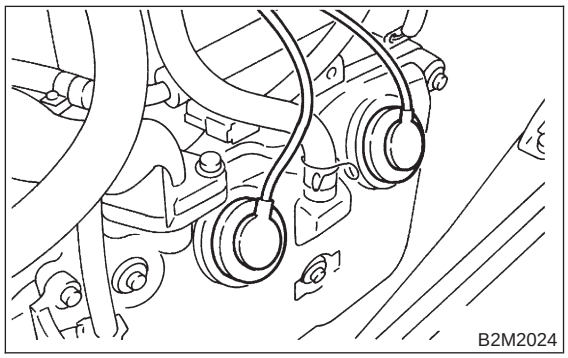
- When inspecting #2 and #4 cylinders:
  (1) Disconnect battery cables, and then remove battery and battery carrier.
  (2) Disconnect front window washer motor connector.
  (3) Disconnect rear gate glass washer motor connector. (Wagon only)


S2M0546

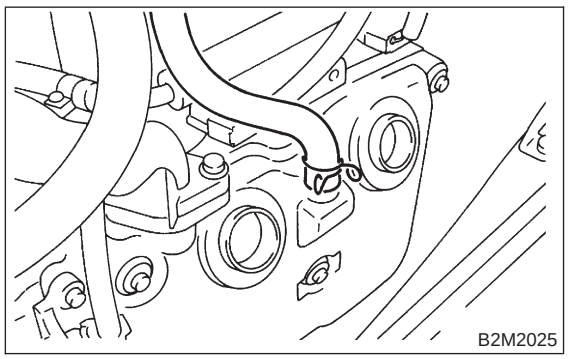
(4) Disconnect rear gate glass washer hose from washer motor, then plug connection with a suitable cap. (Wagon only)
(5) Remove the two bolts which hold washer tank, then secure the tank away from working area.


B2M2023

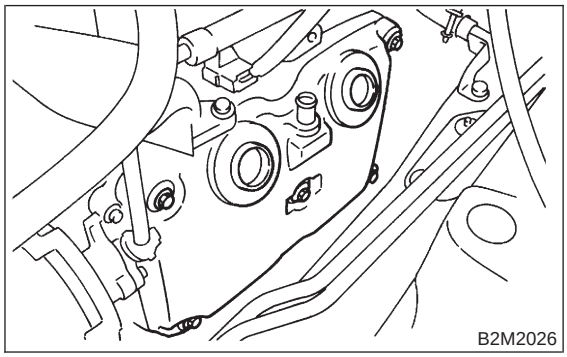
(6) Disconnect spark plug cords from spark plugs (#2 and #4 cylinders).


B2M2024

(7) Disconnect blow-by hose form rocker cover (LH).

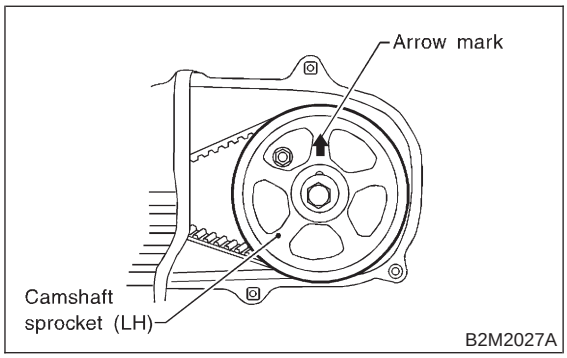

B2M2025

(8) Lift-up the vehicle.
(9) Remove under cover (LH).
(10) Place suitable container under the vehicle.
(11) Remove rocker cover bolts, then remove rocker cover (LH).


B2M2026

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

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

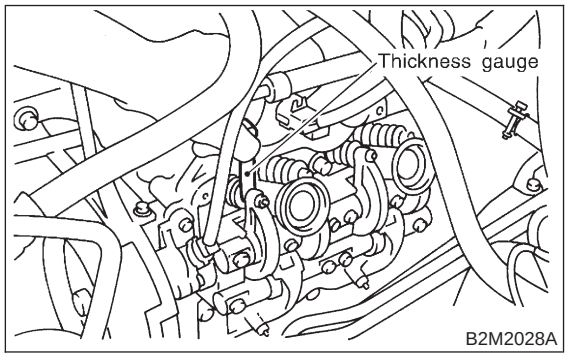


B2M2027A

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

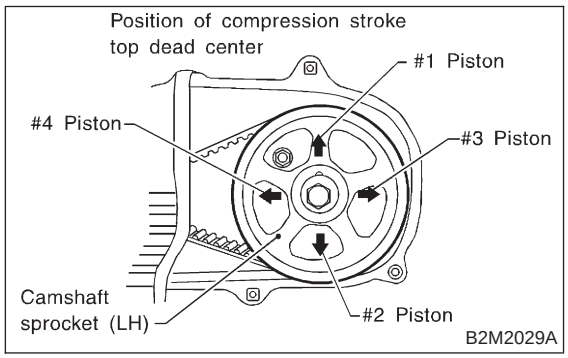
CAUTION:
● Insert the thickness gauge in at as horizontal a direction as a possible with respect to the valve stem end face.
● Measure exhaust valve clearances while lifting-up the vehicle.

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



8) If necessary, adjust the valve clearance. <Ref. to 2-2 [W7B1].>
9) 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 the compression stroke before measuring valve clearances.
● To set #3, #2 and #4 cylinder pistons to their top dead centers on the compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on left- hand camshaft sprocket facing up.

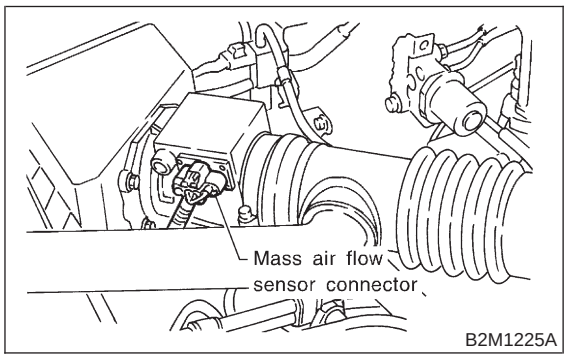


10) After inspection, install the related parts in the reverse order of removal.

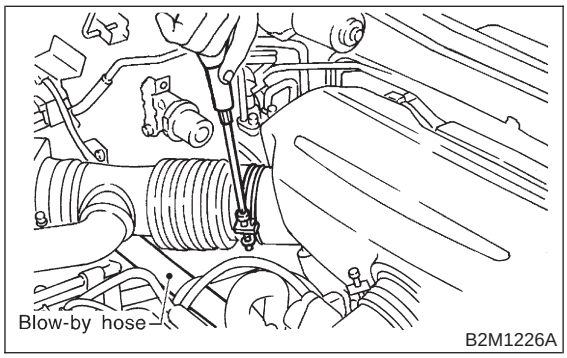
2. 2500 cc MODEL

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 canister (Taiwan spec. vehicles only).
4) Remove two bolts on the upper side which secure timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove under cover (RH).
7) Remove canister bracket (Taiwan spec. vehicles only).
8) Loosen remaining bolt on under side which secures timing belt cover (RH), then remove belt cover.
9) Lower the vehicle.
10) 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.

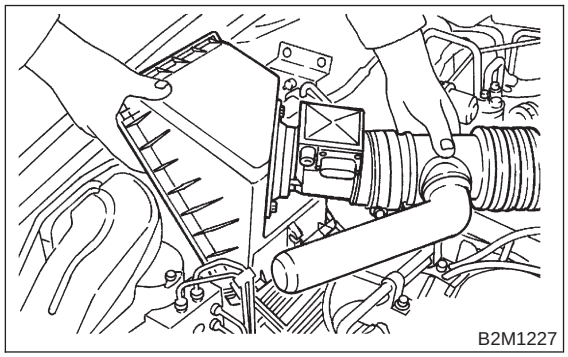


(3) Remove the two clips from air cleaner upper cover.

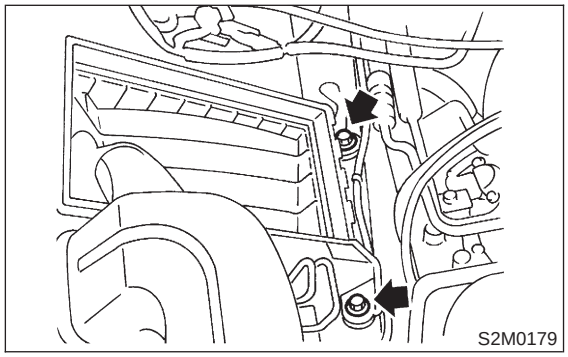
CAUTION:
Before installing air cleaner upper cover, align hole(s) with protruding portions of air cleaner lower case, then secure upper cover.

(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) Remove air cleaner lower case.

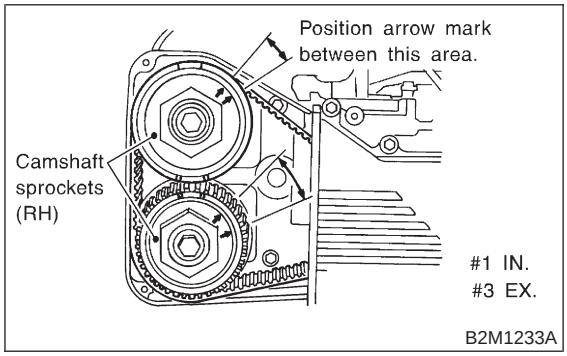


(8) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).
(9) Place suitable container under the vehicle.
(10) Disconnect PCV hose from rocker cover (RH).
(11) Remove bolts, then remove rocker cover (RH).

- When inspecting # 2 and #4 cylinders;

(1) Disconnect battery cables, and then remove battery and battery carrier.
(2) Disconnect washer motor connectors.
(3) Disconnect washer hoses from washer motors, then plug connections with suitable caps.
(4) Remove washer tank.
(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).

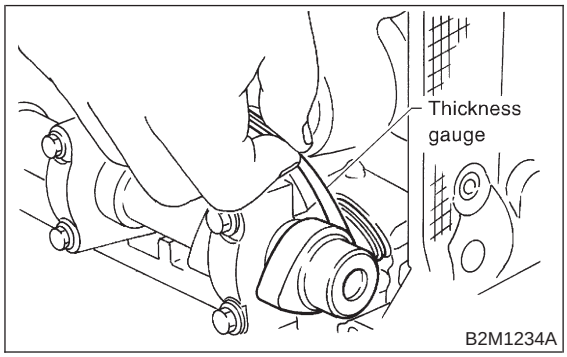
11) Turn crankshaft pulley clockwise until arrow mark on camshaft sprocket is set to position shown in figure.



12) Measure #1 cylinder intake valve and #3 cylinder exhaust valve clearances by using thickness gauge.

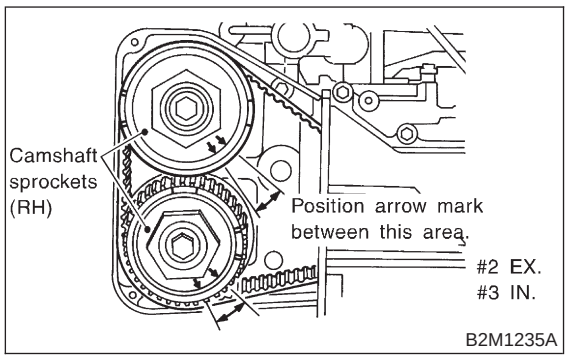
CAUTION:
- **Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.**
- **Measure exhaust valve clearances while lifting-up the vehicle.**

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

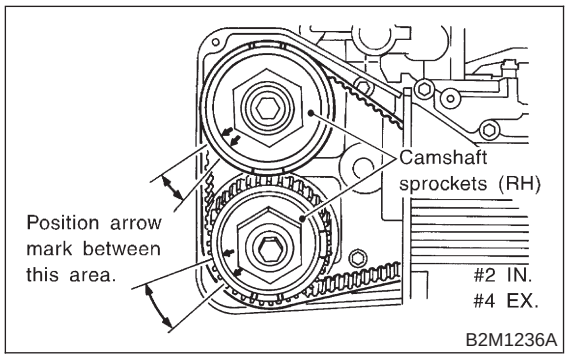


13) If necessary, adjust the valve clearance. <Ref. to 2-2 [W7B2].>
14) Further turn crankshaft pulley clockwise. Using the same procedures as in step 12) above, measure valve clearances.

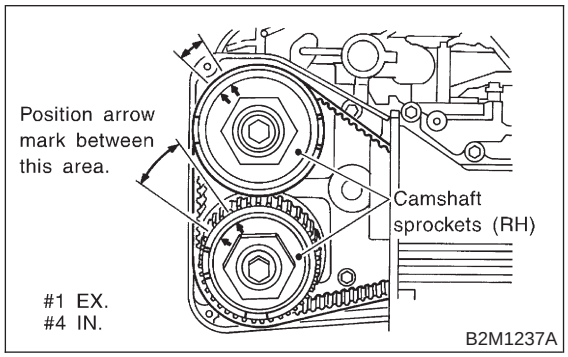
(1) Set arrow mark on camshaft sprocket to position shown in figure, and measure #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set arrow mark on camshaft sprocket to position shown in figure, and measure #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



(3) Set arrow mark on camshaft sprocket to position shown in figure, and measure #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

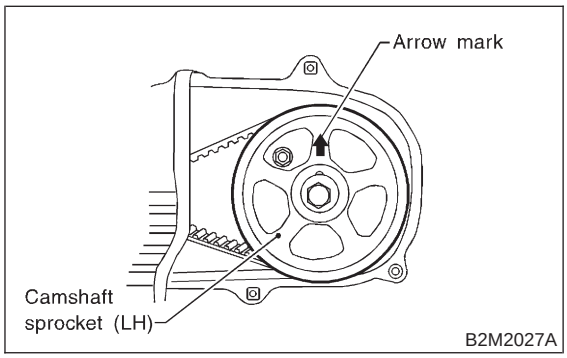
B: ADJUSTMENT

1. 2200 cc MODEL

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 (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of the compression stroke.

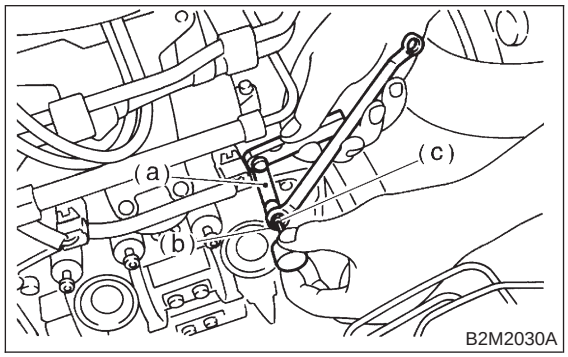


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting valve clearance, tighten valve rocker adjust screw.
(4) When specified valve clearance is obtained, tighten valve rocker nut.

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

CAUTION:
● Insert the thickness gauge in at 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)

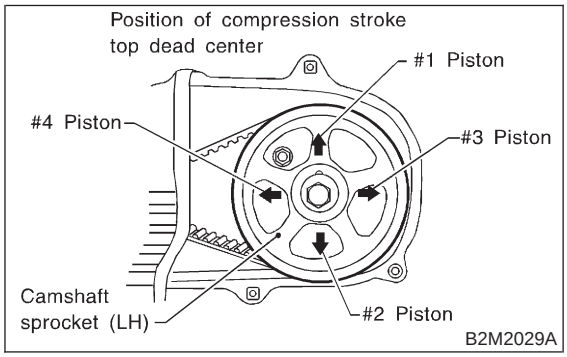


(a) Thickness gauge
(b) Valve rocker nut
(c) Valve rocker screw

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.

6) Similar to adjustment procedures used for #1 cylinder, adjust #2, #3 and #4 cylinder valve clearances.

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

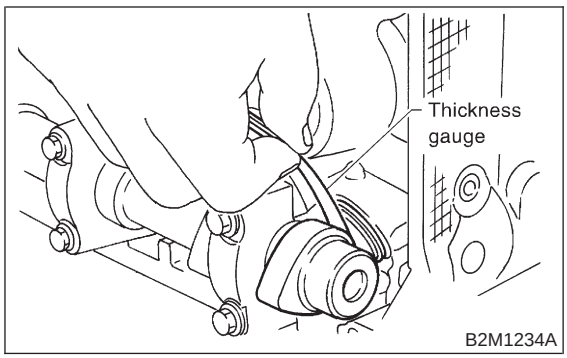


2. 2500 cc MODEL

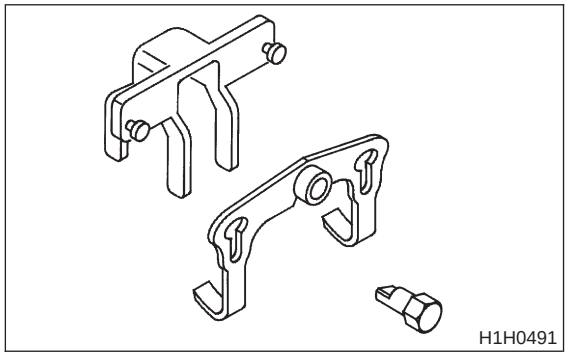
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to 2-2 [W7A2].>

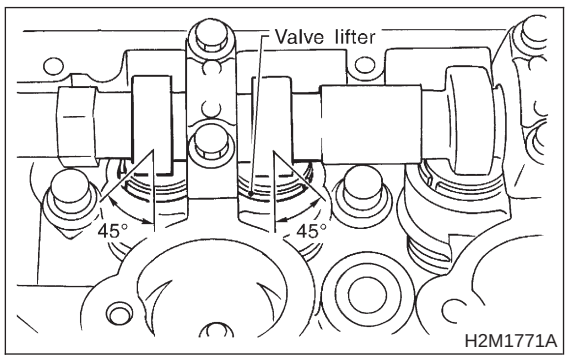
NOTE:
Record each valve clearance after it has been measured.



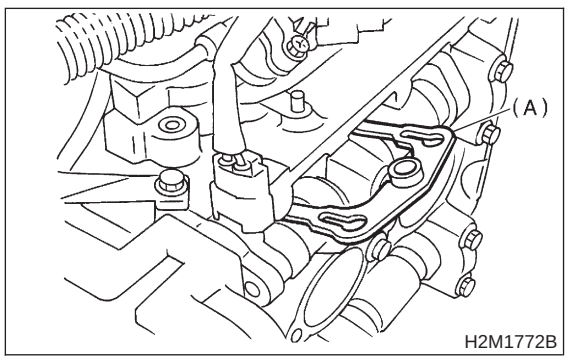
2) Remove shim of intake side.
(1) Prepare the ST.
ST 498187100 SHIM REPLACER KIT



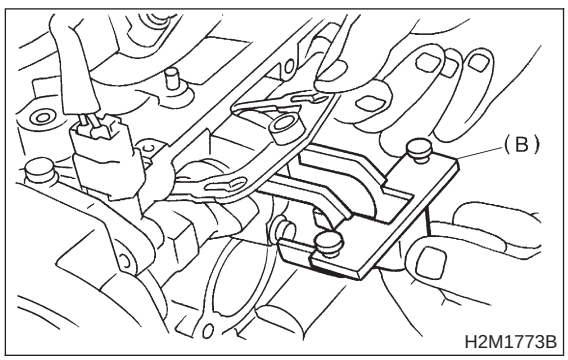
(2) Rotate the notch of the valve lifter outward by 45°.



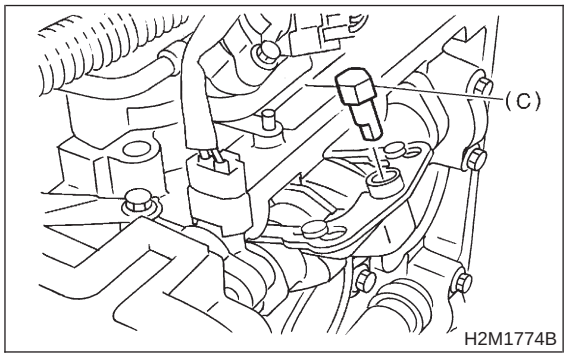
(3) Set REPLACER No. 1 (A) to intake camshaft.



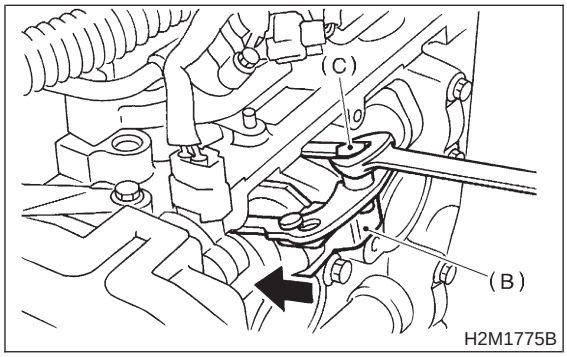
(4) Set REPLACER No. 2 (B).



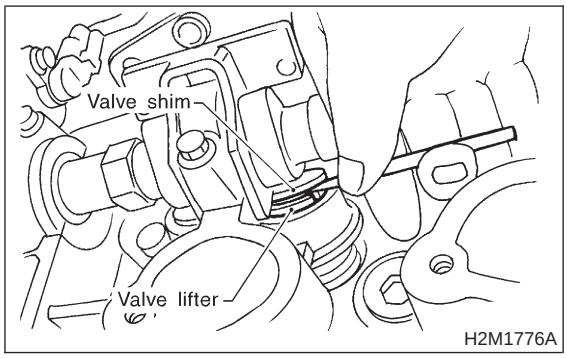
(5) Set REPLACER No. 3 (C) to hole of REPLACER No. 1.



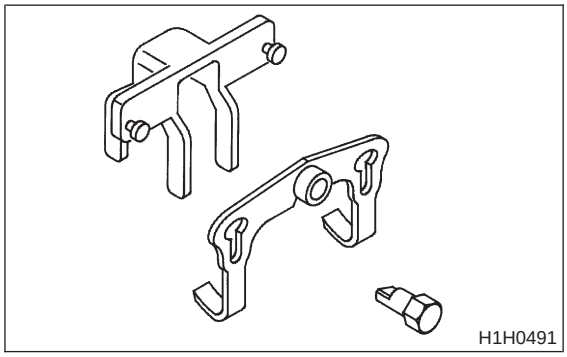
(6) Rotate REPLACER No. 3 (C) until REPLACER No. 2 (B) pushes away valve lifter.



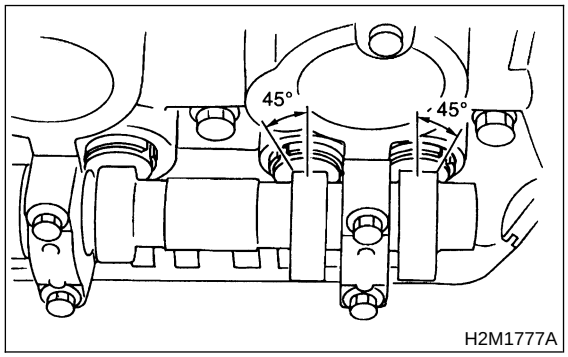
(7) Insert tweezers into the notch of the valve lifter, and take the shim out.



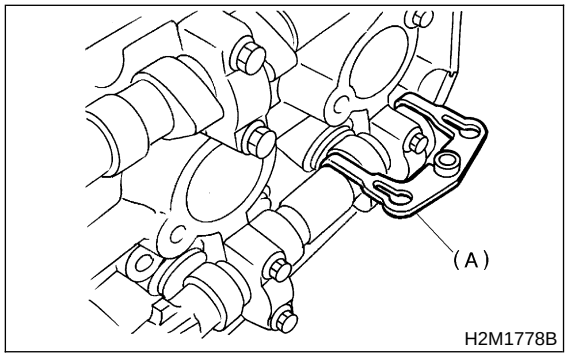
3) Remove shim of exhaust side.
(1) Prepare the ST.
ST 498187100 SHIM REPLACER KIT



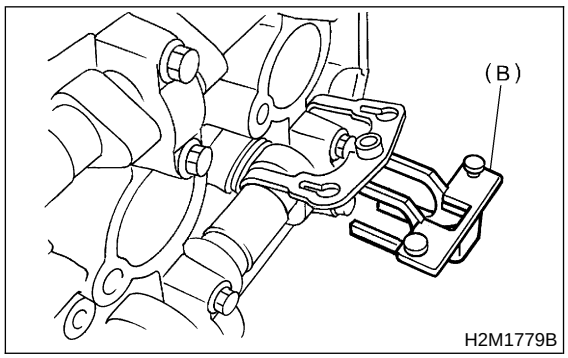
(2) Rotate the notch of the valve lifter outward by 45°.



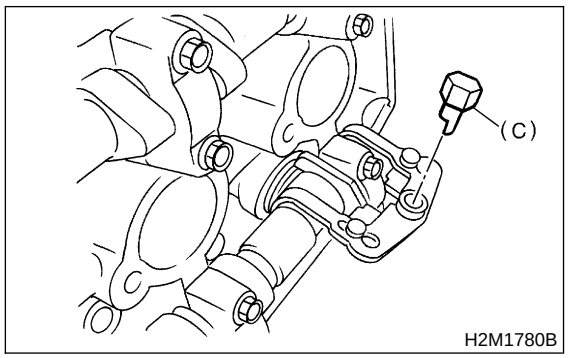
(3) Set REPLACER No. 1 (A) to exhaust camshaft.



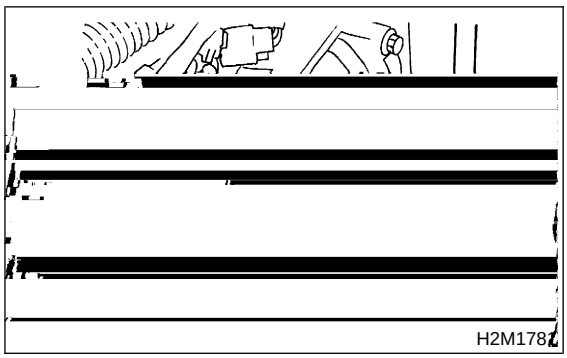
(4) Set REPLACER No. 2 (B).



(5) Set REPLACER No. 3 (C) to hole of REPLACER No. 1.

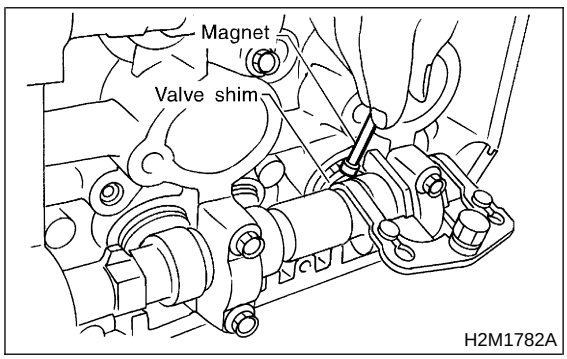


(6) Rotate REPLACER No. 3 until REPLACER No. 2 pushes away valve lifter.

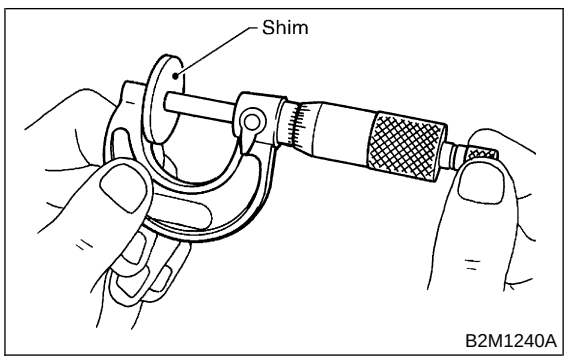


(7) Insert tweezers into the notch of the valve lifter, and take the shim out.

NOTE:
By using a magnet, the shim can be taken out without dropping it.



4) Measure thickness of shim with micrometer.



5) Select a shim of suitable thickness using measured valve clearance and shim thickness, using the following table.

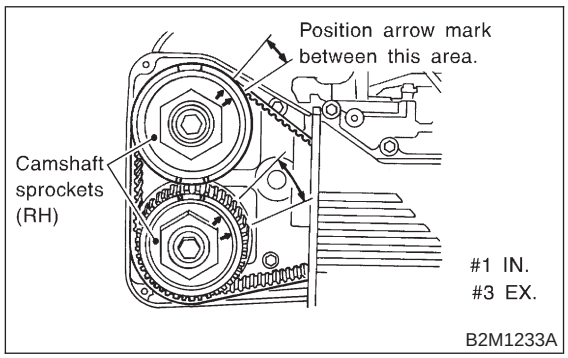
Intake valve (mm): S = (V + T) − 0.20
Exhaust valve (mm): S = (V + T) − 0.25

S: Shim thickness to be used
V: Measured valve clearance
T: Shim thickness required

Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
13218AC230	2.22 (0.0874)	13218AC480	2.52 (0.0992)
13218AE000	2.23 (0.0878)	13218AC490	2.53 (0.0996)
13218AC240	2.24 (0.0882)	13218AC500	2.54 (0.1000)
13218AE010	2.25 (0.0886)	13218AC510	2.55 (0.1004)
13218AC250	2.26 (0.0890)	13218AC520	2.56 (0.1008)
13218AE020	2.27 (0.0894)	13218AC530	2.57 (0.1012)
13218AC260	2.28 (0.0898)	13218AC540	2.58 (0.1016)
13218AE030	2.29 (0.0902)	13218AC550	2.59 (0.1020)
13218AC270	2.30 (0.0906)	13218AC560	2.60 (0.1024)
13218AE040	2.31 (0.0909)	13218AC570	2.61 (0.1028)
13218AC280	2.32 (0.0913)	13218AC580	2.62 (0.1031)
13218AC290	2.33 (0.0917)	13218AC590	2.63 (0.1035)
13218AC300	2.34 (0.0921)	13218AC600	2.64 (0.1039)
13218AC310	2.35 (0.0925)	13218AC610	2.65 (0.1043)
13218AC320	2.36 (0.0929)	13218AC620	2.66 (0.1047)
13218AC330	2.37 (0.0933)	13218AC630	2.67 (0.1051)
13218AC340	2.38 (0.0937)	13218AC640	2.68 (0.1055)
13218AC350	2.39 (0.0941)	13218AC650	2.69 (0.1059)
13218AC360	2.40 (0.0945)	13218AC660	2.70 (0.1063)
13218AC370	2.41 (0.0949)	13218AE050	2.71 (0.1067)
13218AC380	2.42 (0.0953)	13218AC670	2.72 (0.1071)
13218AC390	2.43 (0.0957)	13218AE060	2.73 (0.1075)
13218AC400	2.44 (0.0961)	13218AC680	2.74 (0.1079)
13218AC410	2.45 (0.0965)	13218AE070	2.75 (0.1083)
13218AC420	2.46 (0.0969)	13218AC690	2.76 (0.1087)
13218AC430	2.47 (0.0972)	13218AE080	2.77 (0.1091)
13218AC440	2.48 (0.0976)	13218AC700	2.78 (0.1094)
13218AC450	2.49 (0.0980)	13218AE090	2.79 (0.1098)
13218AC460	2.50 (0.0984)	13218AC710	2.80 (0.1102)
13218AC470	2.51 (0.0988)	13218AE100	2.81 (0.1106)

6) Set suitable shim selected in one step before, to valve lifter.

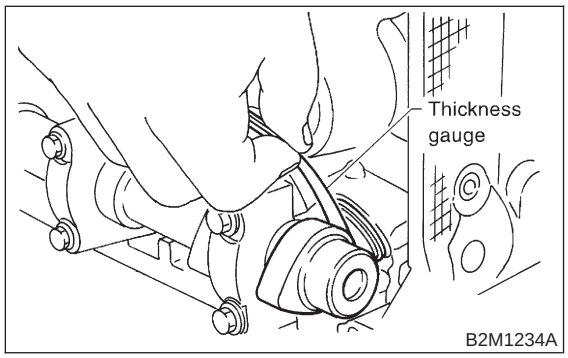
7) Turn crankshaft pulley clockwise until arrow mark on camshaft sprocket is set to position shown in figure.



8) Ensure that #1 cylinder intake valve and #3 cylinder exhaust valve are adjusted to specifications.

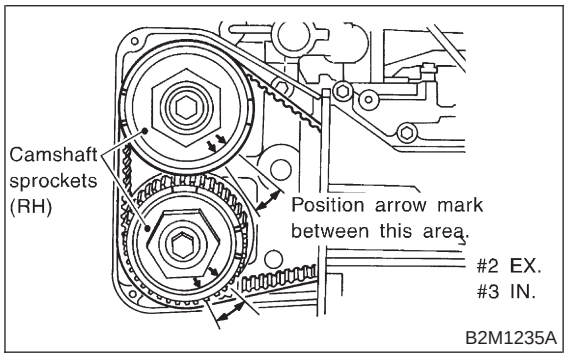
CAUTION:
● Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
● Adjust exhaust valve clearances while lifting-up the vehicle.

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

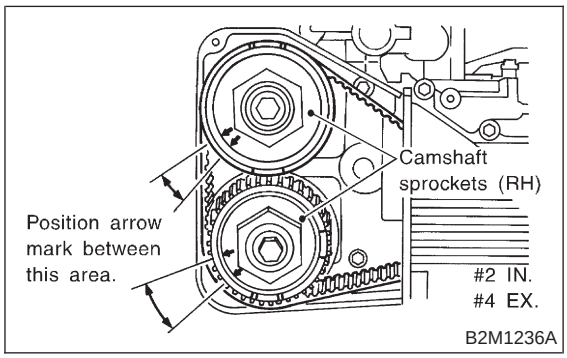


9) Turn crankshaft two complete rotations. Check again to ensure that #1 cylinder intake valve and #3 cylinder exhaust valve clearances are within specifications. If necessary, re-adjust valve clearances.
10) Further turn crankshaft pulley clockwise. Using the same procedures as in two steps before, measure valve clearances.

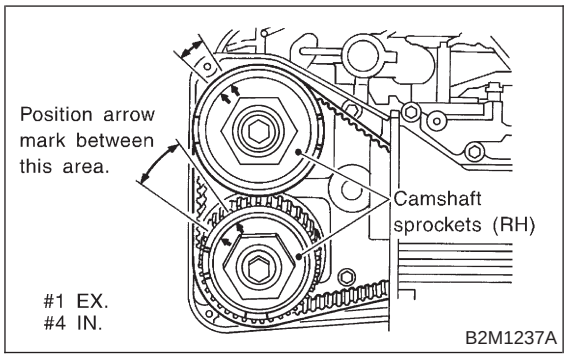
(1) Set arrow mark on camshaft sprocket to position shown in figure, and check #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set arrow mark on camshaft sprocket to position shown in figure, and check #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



(3) Set arrow mark on camshaft sprocket to position shown in figure, and check #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



1. Engine

A: SPECIFICATIONS

Engine	Model			2200 cc
	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder
	Bore × Stroke		mm (in)	96.9 × 75.0 (3.815 × 2.953)
	Displacement		cm^3 (cu in)	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		4° BTDC
		Closing		52° ABDC
	Exhaust valve timing	Opening		48° BBDC
		Closing		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) 850±50 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	14°±8°/700 (MT), 20°±8°/700 (AT)

B: SERVICE DATA

NOTE:
STD: Standard, I.D.: Inner Diameter, O.D.: Outer Diameter, OS: Oversize, US: Undersize

Belt tensioner adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm	(0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm	(0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.00 — 18.08 mm	(0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm	(0.0010 — 0.0049 in)
			Limit	0.175 mm	(0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm	(0.0079 — 0.0217 in)
			Limit	0.81 mm	(0.0319 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			0.020 mm	(0.0008 in)
	Thrust clearance		STD	0.030 — 0.090 mm	(0.0012 — 0.0035 in)
			Limit	0.11 mm	(0.0043 in)
	Cam lobe height	Intake	STD	34.00 — 38.782 mm	(1.3386 — 1.5268 in)
			Limit	33.84 mm	(1.3323 in)
		Exhaust	STD	34.00 — 39.307 mm	(1.3386 — 1.5475 in)
			Limit	33.84 mm	(1.3323 in)
	Camshaft journal O.D.			31.928 — 31.945 mm	(1.2570 — 1.2577 in)
	Camshaft journal hole I.D.			32.000 — 32.018 mm	(1.2598— 1.2605 in)
	Oil clearance		STD	0.055 — 0.090 mm	(0.0022 — 0.0035 in)
			Limit	0.118 mm	(0.0046 in)

Cylinder head	Surface warpage limit			0.05 mm	(0.0020 in)
	Surface grinding limit			0.3 mm	(0.012 in)
	Standard height			97.5 mm	(3.839 in)
Valve set	Refacing angle			90°	
	Contacting width	Intake	STD	1.0 mm	(0.039 in)
			Limit	1.7 mm	(0.067 in)
		Exhaust	STD	1.4 mm	(0.055 in)
			Limit	2.1 mm	(0.083 in)
Valve guide	Inner diameter			6.000 — 6.012 mm	(0.2362 — 0.2367 in)
	Protrusion above head	Intake		20.0 — 20.5 mm	(0.787 — 0.807 in)
		Exhaust		16.5 — 17.0 mm	(0.650 — 0.669 in)
Valve	Head edge thickness	Intake	STD	1.0 mm	(0.039 in)
			Limit	0.6 mm	(0.024 in)
		Exhaust	STD	1.2 mm	(0.047 in)
			Limit	0.6 mm	(0.024 in)
	Stem diameter		Intake	5.945 — 5.960 mm	(0.2341 — 0.2346 in)
			Exhaust	5.950 — 5.965 mm	(0.2343 — 0.2348 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	120.6 mm	(4.75 in)
			Exhaust	121.7 mm	(4.79 in)
Valve spring	Free length			54.30 mm	(2.1378 in)
	Squareness			2.5°, 2.4 mm	(0.094 in)
	Tension/spring height			214.8 — 246.2 N (21.9 — 25.1 kg, 48.3 — 55.3 lb)/45.0 mm (1.772 in) 526.6 — 581.6 N (53.7 — 59.3 kg, 118.4 — 130.8 lb)/34.7 mm (1.366 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	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	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		97.125 — 97.135 mm	(3.8238 — 3.8242 in)
		0.50 mm (0.0197 in) OS		97.375 — 97.385 mm	(3.8337 — 3.8340 in)
Piston pin	Standard clearance between piston pin and hole in piston	STD		0.004 — 0.008 mm	(0.0002 — 0.0003 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).	

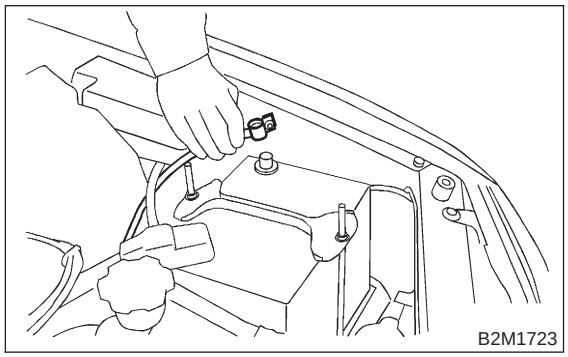
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.35 mm	(0.0079 — 0.0138 in)
			Limit	1.0 mm	(0.039 in)
		Second ring	STD	0.37 — 0.52 mm	(0.0146 — 0.0205 in)
			Limit	1.0 mm	(0.039 in)
		Oil ring	STD	0.20 — 0.50 mm	(0.0079 — 0.0197 in)
			Limit	1.0 mm	(0.039 in)
	Clearance between piston ring and piston 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	0.010 — 0.038 mm	(0.0004 — 0.0015 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)

Crank-shaft	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	59.942 — 59.958 mm	(2.3599 — 2.3605 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	59.962 — 59.978 mm	(2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm	(2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm	(2.3520 — 2.3527 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	0.045 mm	(0.0018 in)
Crank-shaft 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)

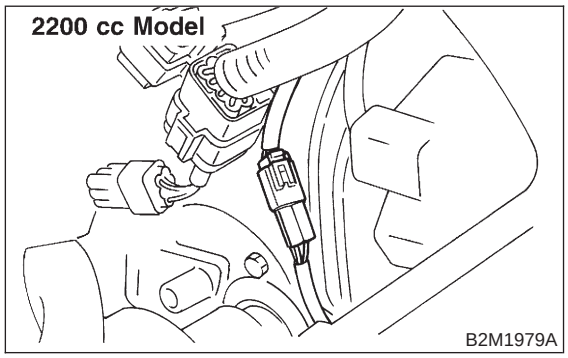
1. Front Catalytic Converter

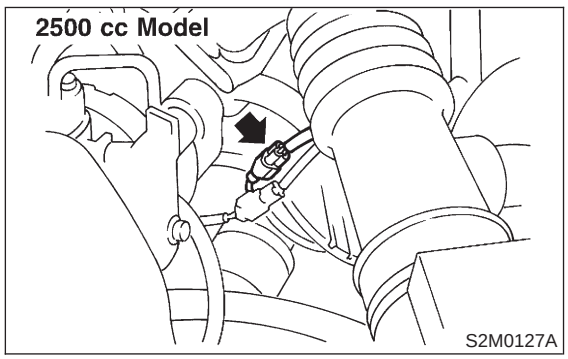
A: REMOVAL

1) Disconnect battery ground cable.

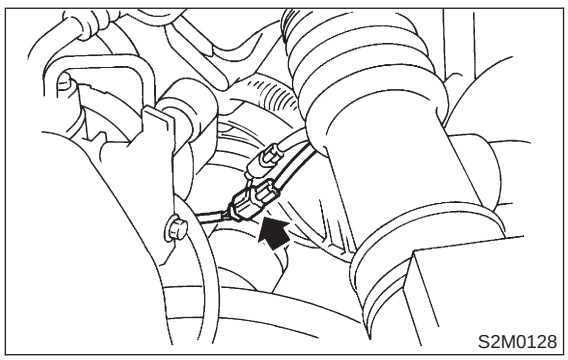


2) Disconnect front oxygen sensor connector.

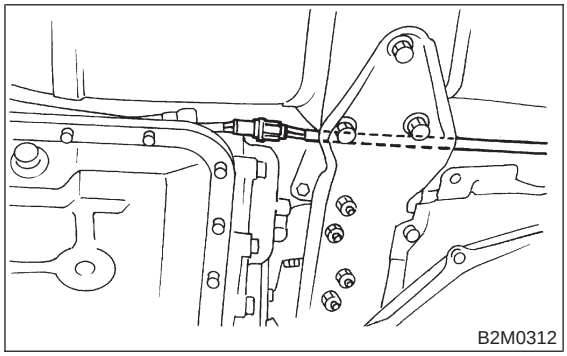




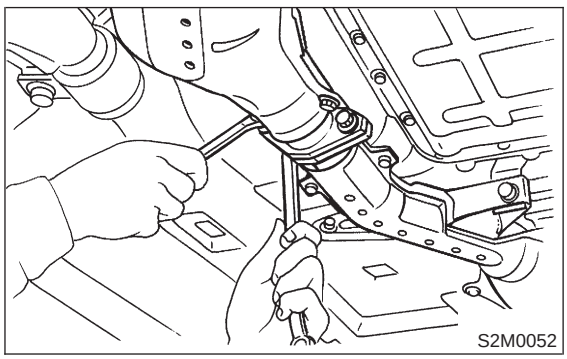
3) Disconnect rear oxygen sensor connector. (2500 cc California spec. vehicles)



4) Lift-up the vehicle.
5) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)

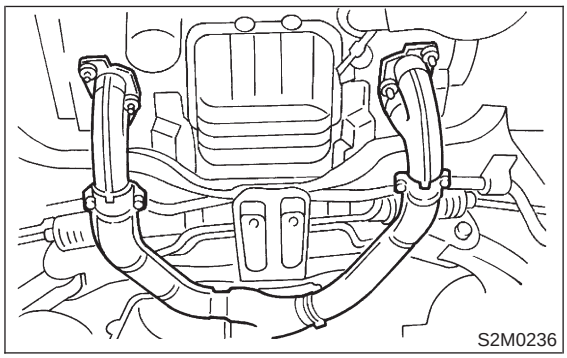


6) Separate center exhaust pipe from front catalytic converter.

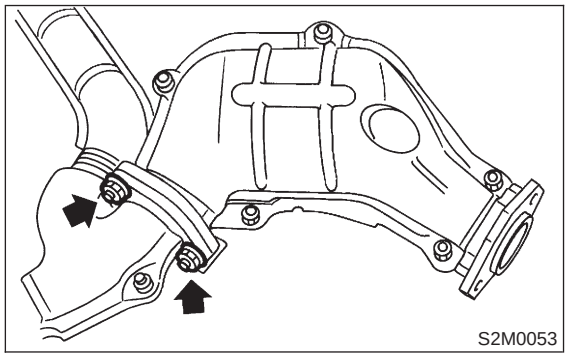


7) Remove bolts which hold front exhaust pipe onto cylinder heads.

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



8) Separate front catalytic converter from front exhaust pipe.

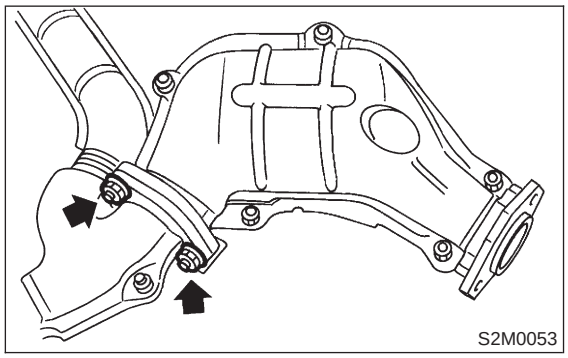

S2M0053

B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

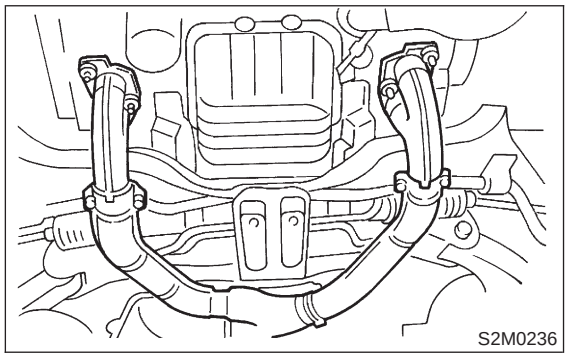
1) Install front catalytic converter to front exhaust pipe and center exhaust pipe.

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


S2M0053

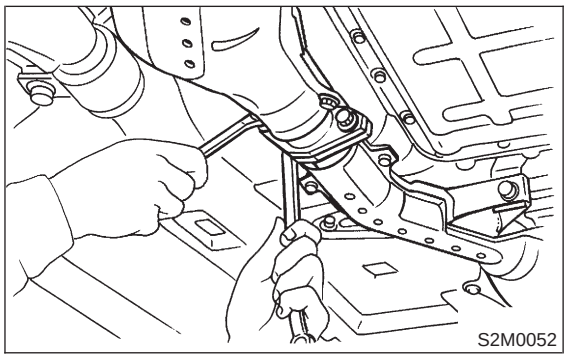
2) Tighten bolts which hold front exhaust pipe onto cylinder heads.

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

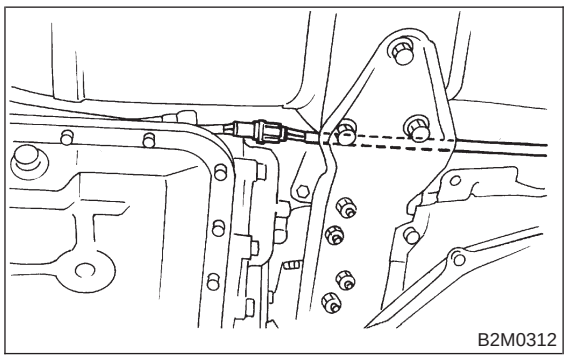

S2M0236

3) Install center exhaust pipe to front catalytic converter.

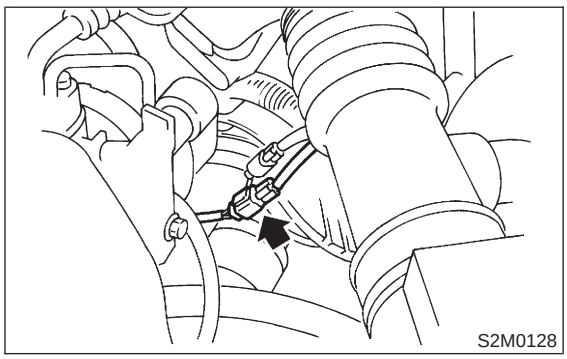
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


S2M0052

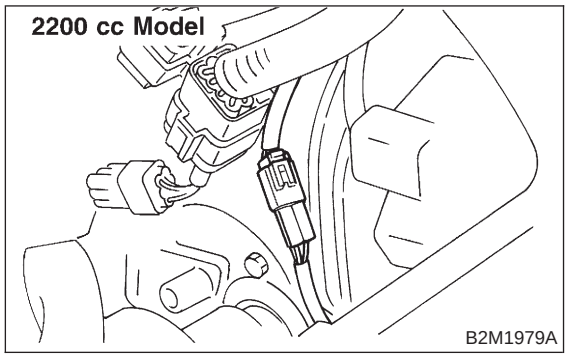
4) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)

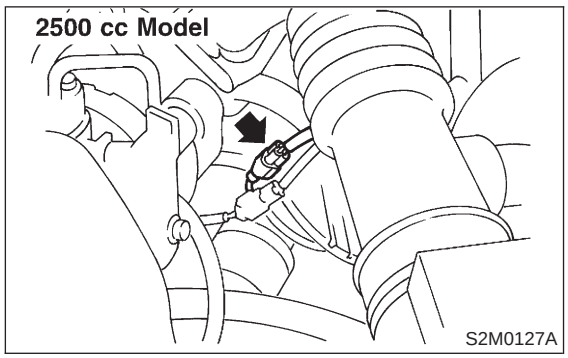

B2M0312

5) Lower the vehicle.
6) Connect rear oxygen sensor connector. (2500 cc California spec. vehicles)

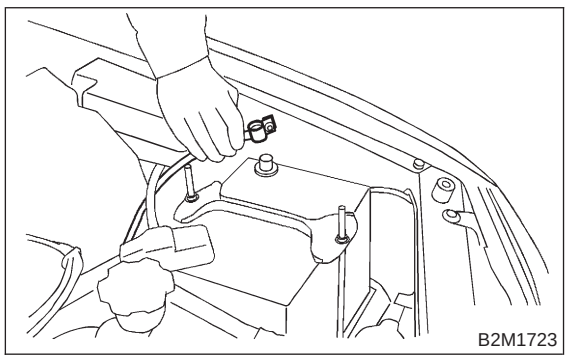

S2M0128

7) Connect front oxygen sensor connector.





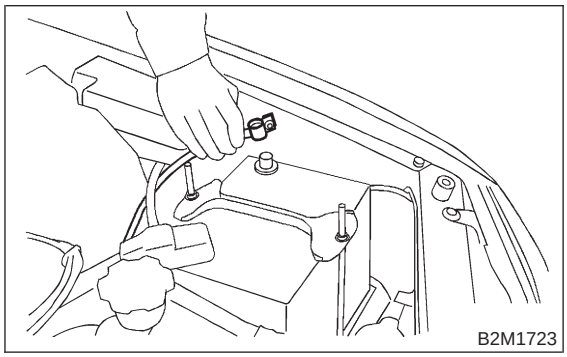
8) Connect battery ground cable.



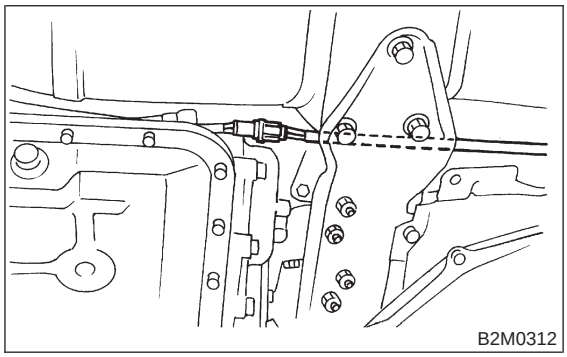
2. Rear Catalytic Converter

A: REMOVAL

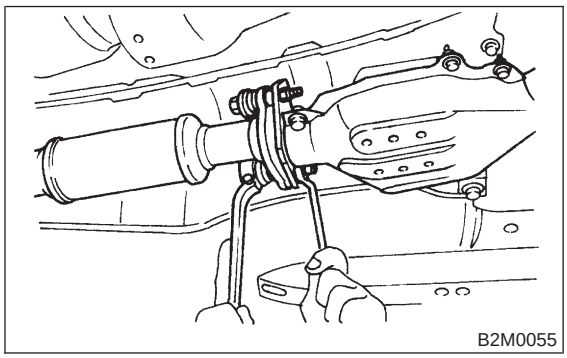
1) Disconnect battery ground cable.



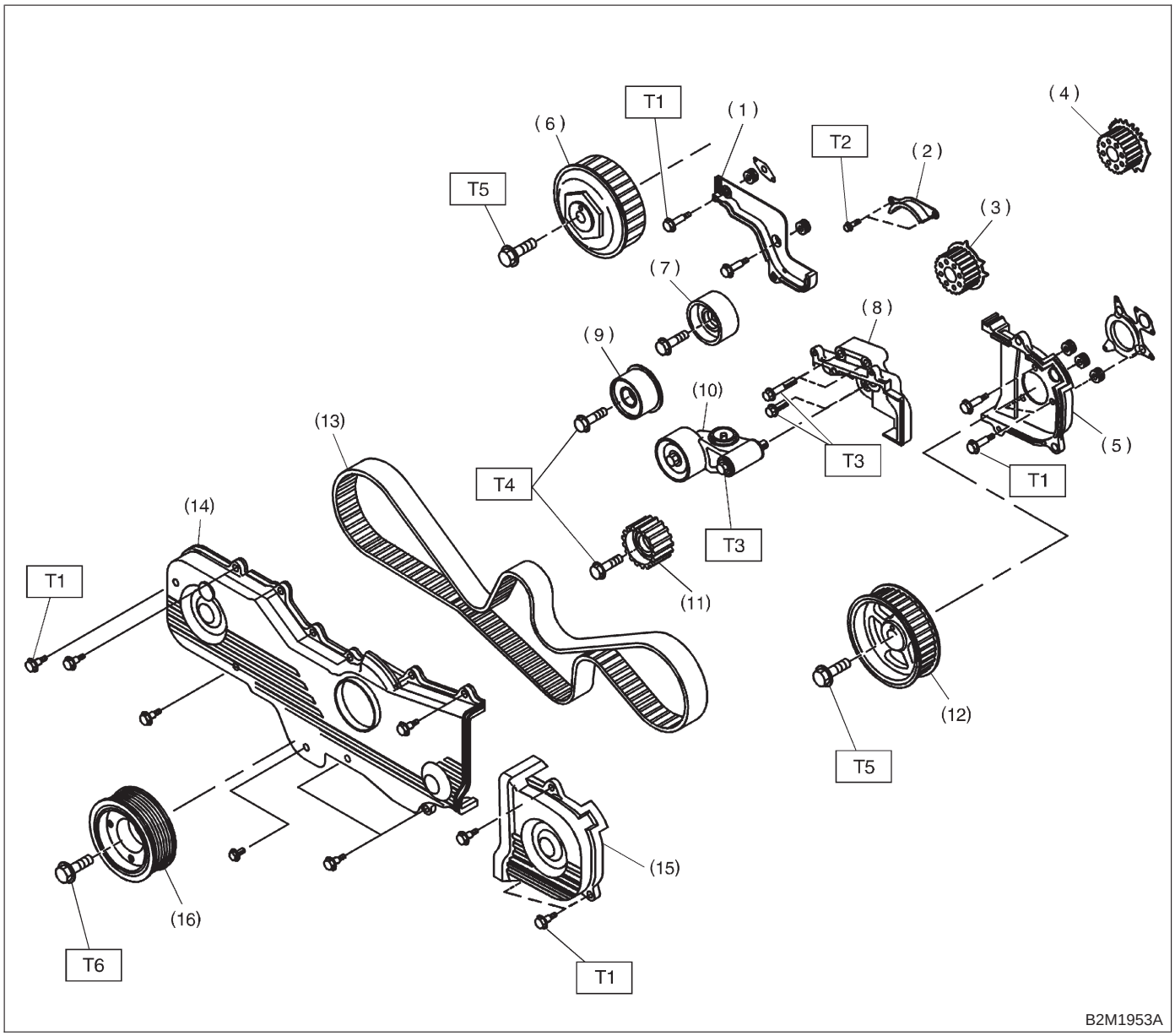
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



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



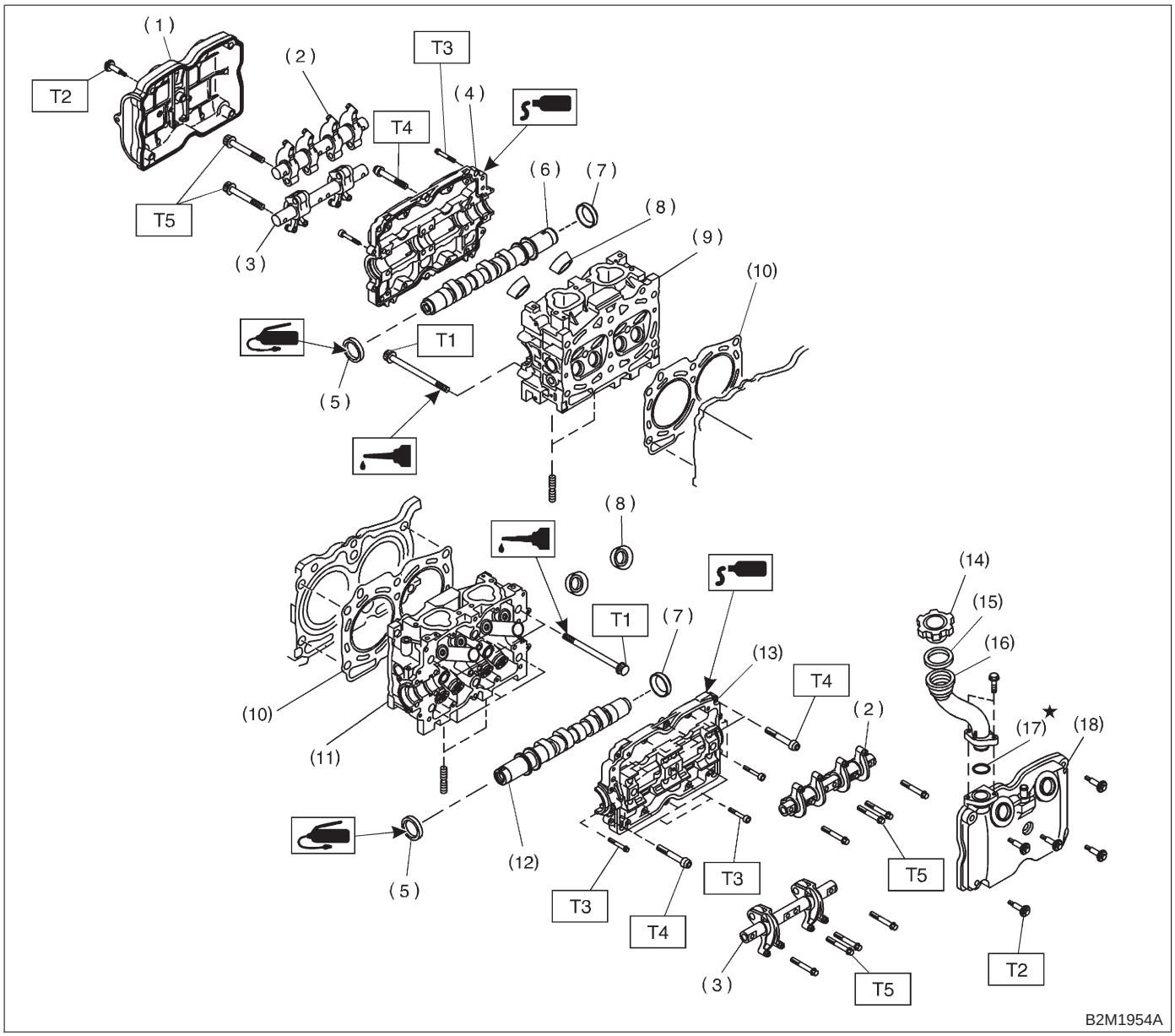
1. Timing Belt



(1) Belt cover No. 2 (RH)
(2) Timing belt guide (MT vehicles only)
(3) Crankshaft sprocket (Except California spec. vehicles)
(4) Crankshaft sprocket (California spec. vehicles)
(5) Belt cover No. 2 (LH)
(6) Camshaft sprocket No. 1
(7) Belt idler (No. 1)
(8) Tensioner bracket
(9) Belt idler (No. 2)
(10) Automatic belt tension adjuster ASSY
(11) Belt idler No. 2
(12) Camshaft sprocket No. 2
(13) Timing belt
(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: 9.8±1.0 (1.0±0.1, 7.2±0.7)
T3: 25±3 (2.5±0.3, 18.1±2.2)
T4: 39±4 (4.0±0.4, 28.9±2.9)
T5: 78±5 (8.0±0.5, 57.9±3.6)
T6: 127^{+10}_{-5} ($13.0^{+1.0}_{-0.5}$, $94^{+7.2}_{-3.6}$)

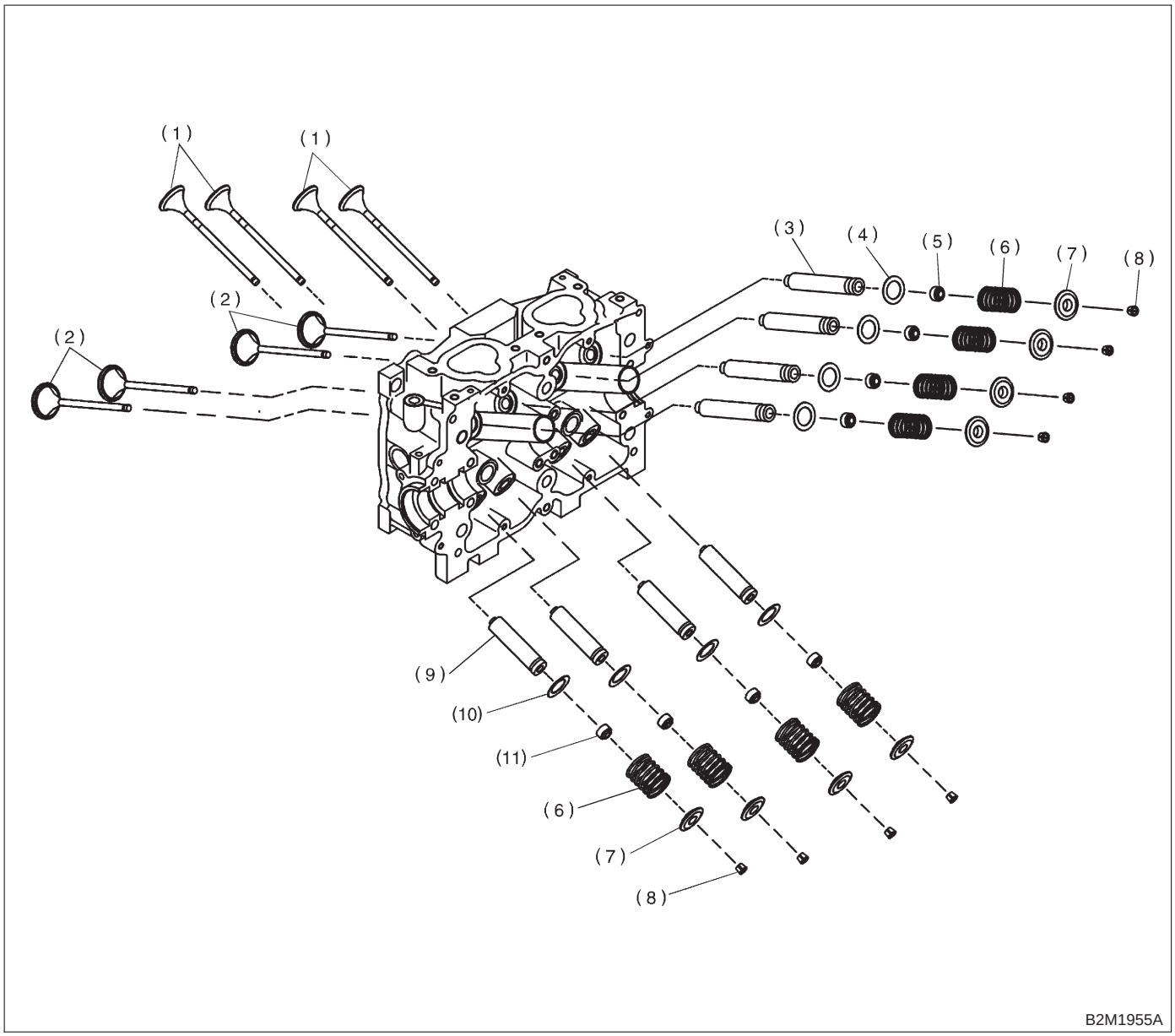
2. Cylinder Head and Camshaft



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

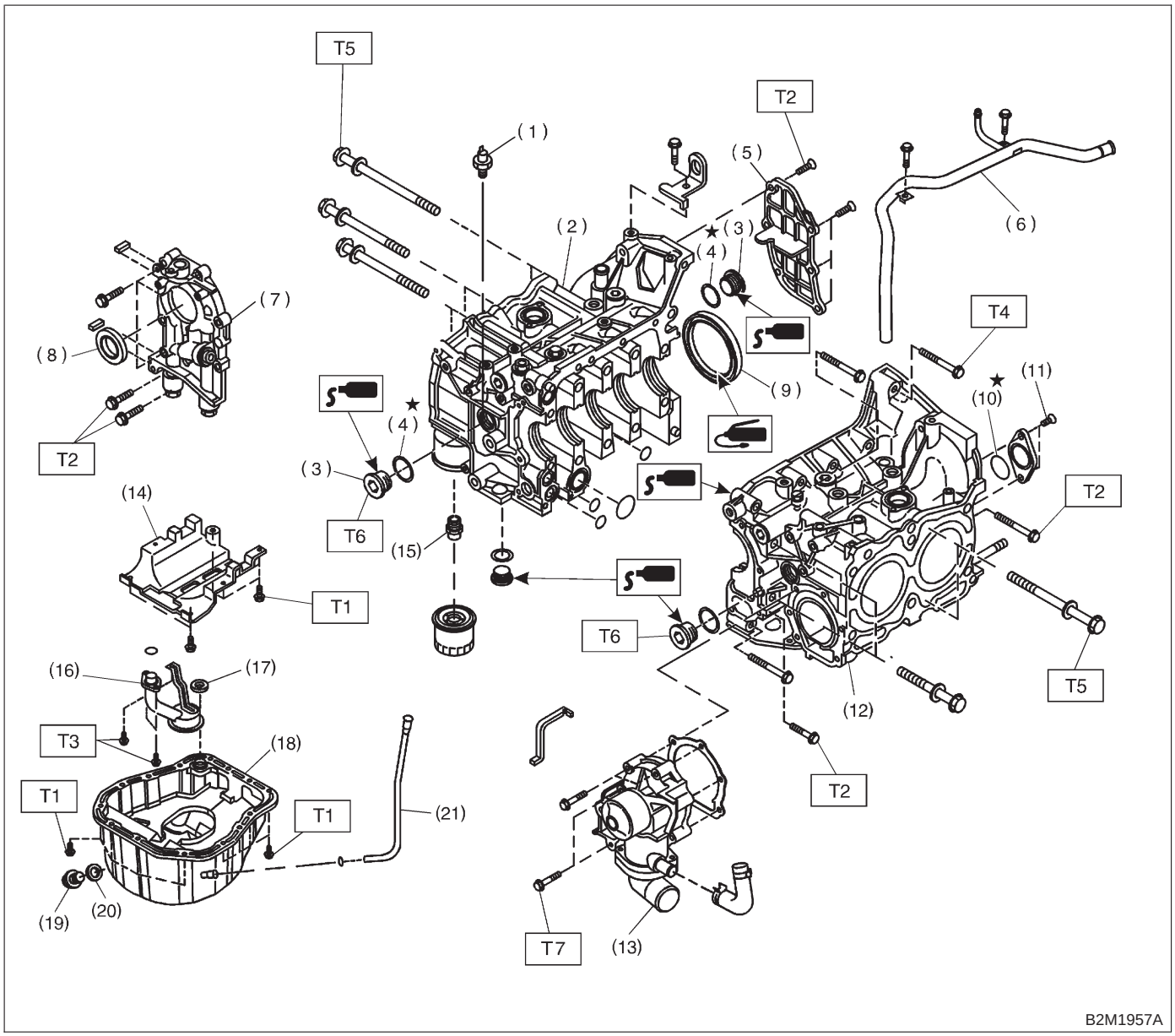
Tightening torque: N·m (kg-m, ft-lb)
T1: <Ref. to 2-3a [W6E0].>
T2: 5±1 (0.5±0.1, 3.6±0.7)
T3: 10±2 (1.0±0.2, 7.2±1.4)
T4: 18±2 (1.8±0.2, 13.0±1.4)
T5: 25±2 (2.5±0.2, 18.1±1.4)

3. Cylinder Head and Valve Assembly



(1) Exhaust valve
(2) Intake valve
(3) Intake valve guide
(4) Intake valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Exhaust valve guide
(10) Exhaust valve spring seat
(11) Exhaust valve oil seal

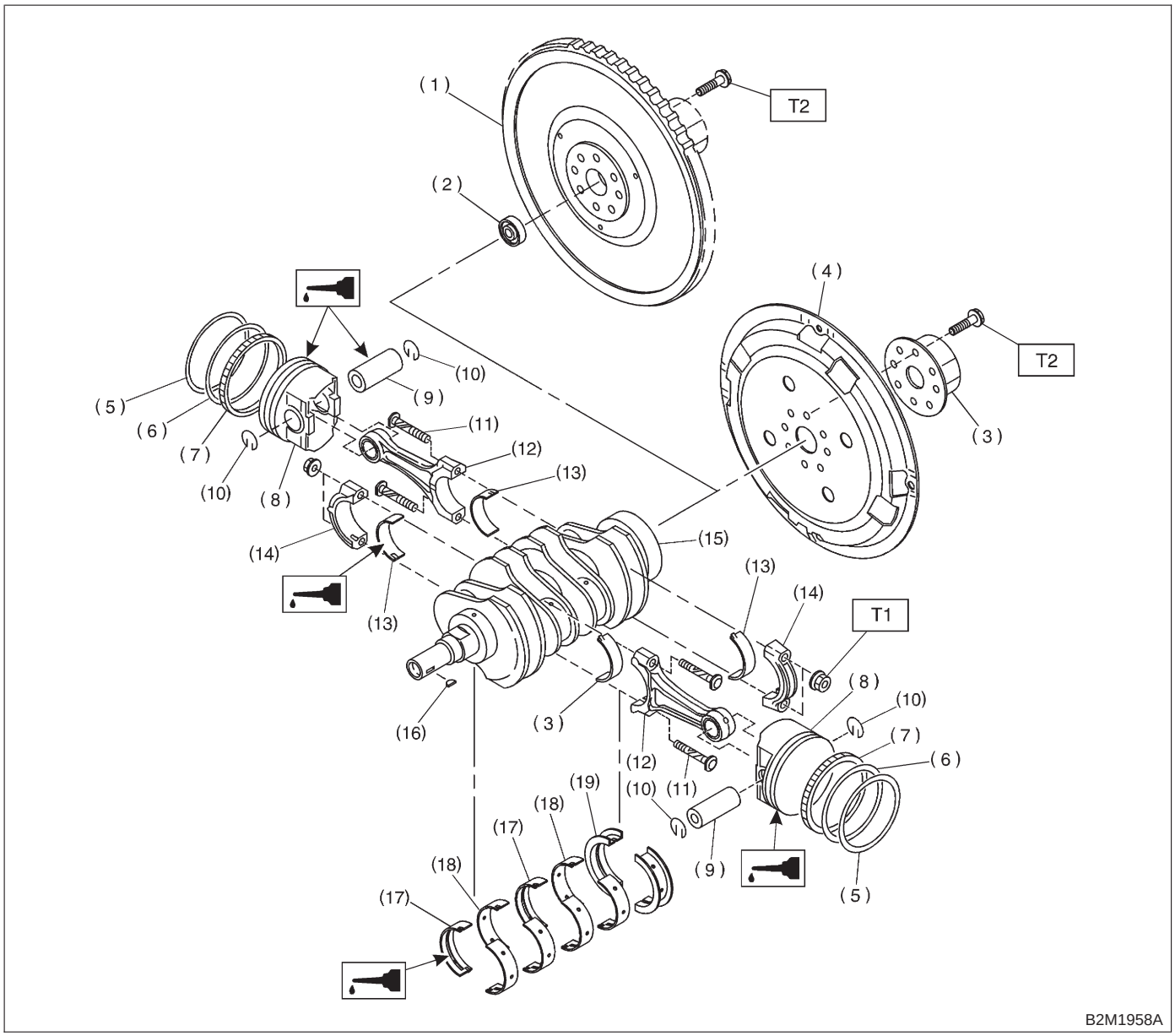
4. Cylinder Block



(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 sea
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide

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)

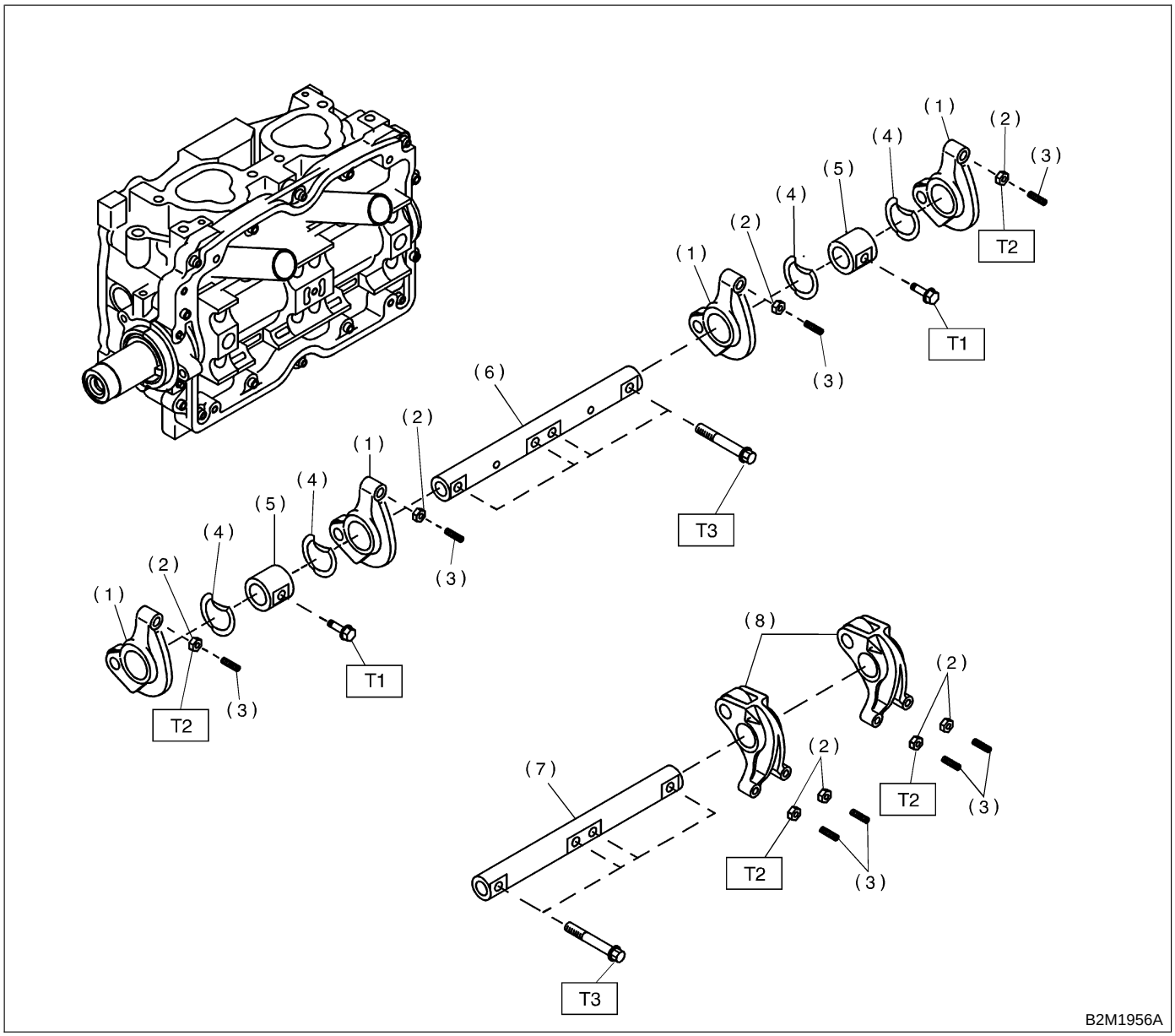
5. Crankshaft and Piston



(1) Flywheel (MT)
(2) Bell bearing (MT)
(3) Reinforcement (AT)
(4) Drive plate (AT)
(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, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

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. Valve Rocker Assembly



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

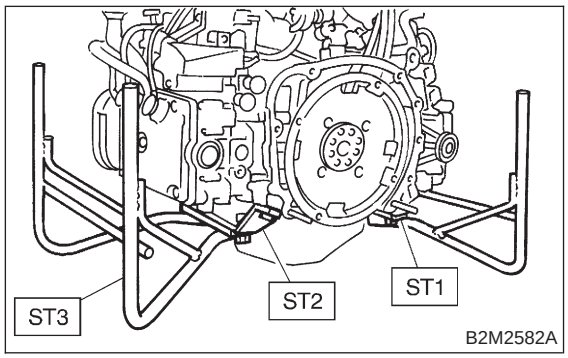
Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 10±1 (1.0±0.1, 7.2±0.7)
T3: 12±1 (1.2±0.1, 8.7±0.7)

1. General Precautions

A: 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

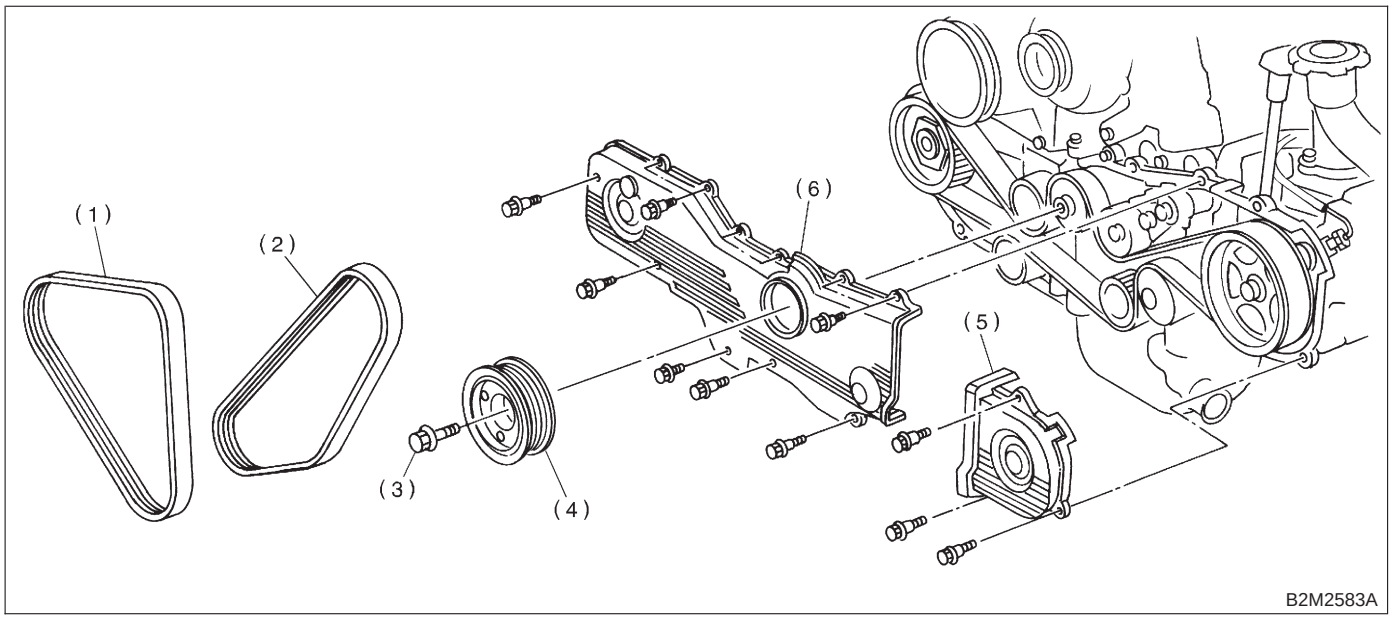


2) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
3) Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
4) Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
5) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
6) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
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

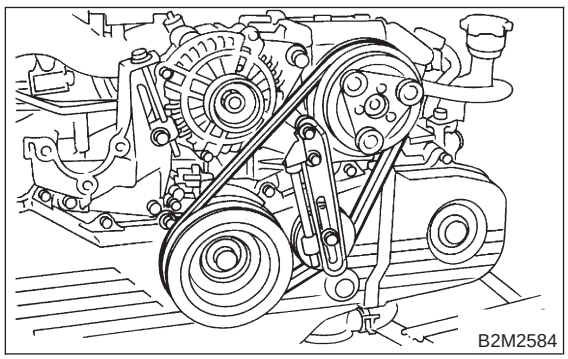
A: REMOVAL

1. CRANKSHAFT PULLEY AND BELT COVER

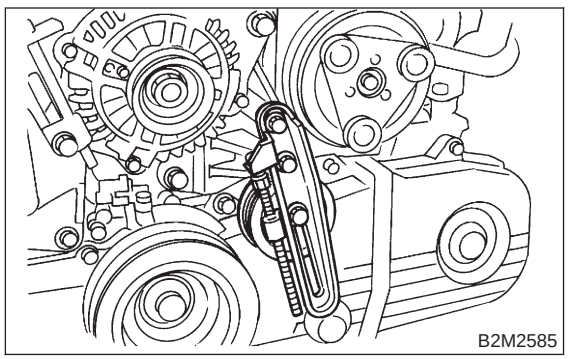


(1) Front side V-belt
(2) Rear side V-belt (With A/C model)
(3) Crankshaft pulley bolt
(4) Crankshaft Pulley
(5) Belt cover (LH)
(6) Front belt cover

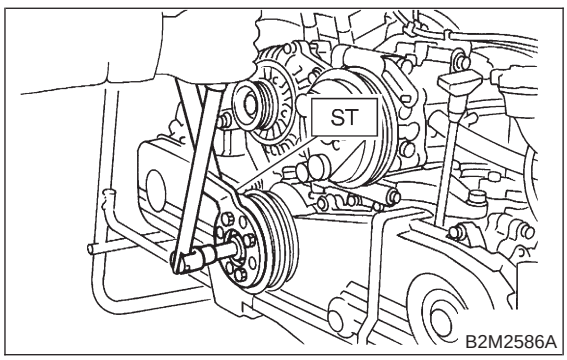
1) Remove A/C belt. (With A/C model)



2) Remove A/C belt tensioner. (With A/C model)

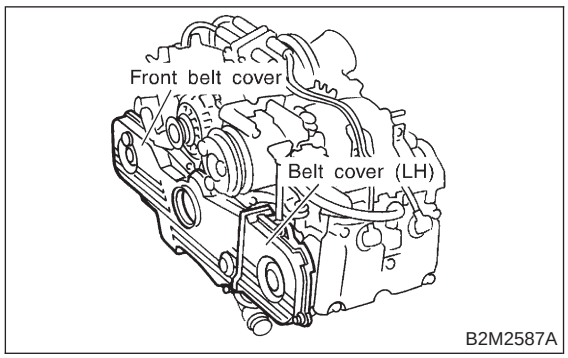


3) Remove crankshaft pulley bolt. To lock crankshaft, use ST.
ST 499977000 CRANKSHAFT PULLEY WRENCH

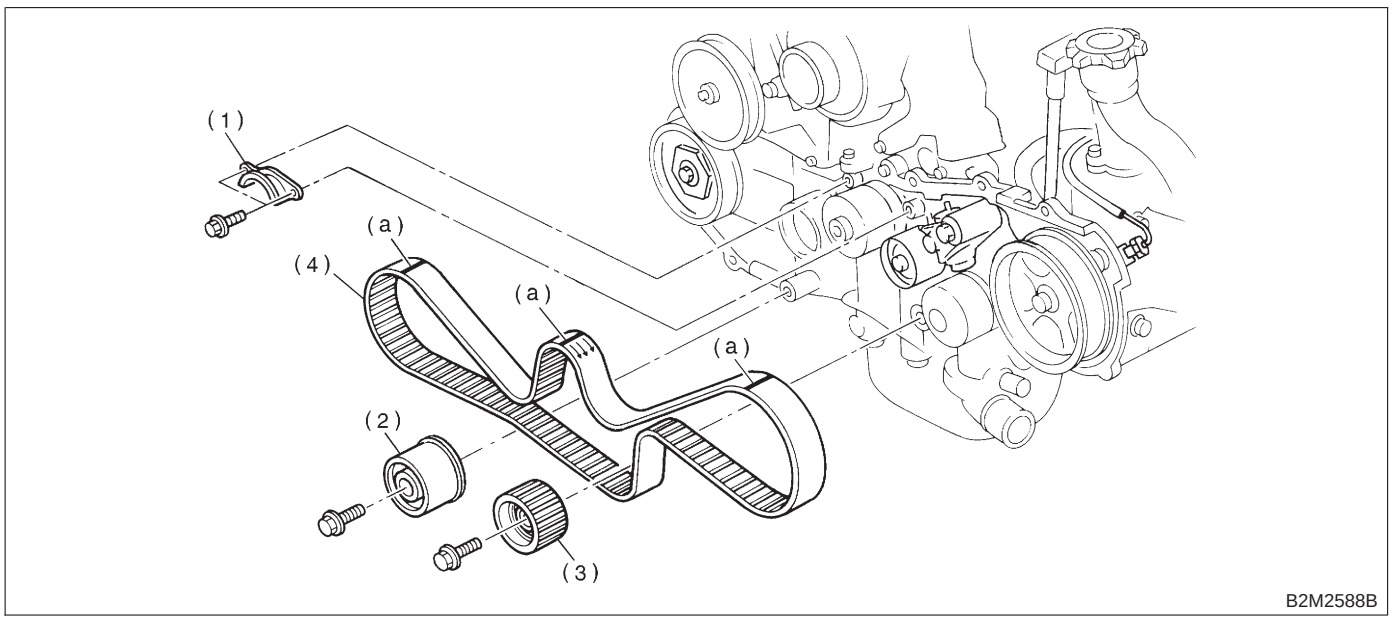


4) Remove crankshaft pulley.

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

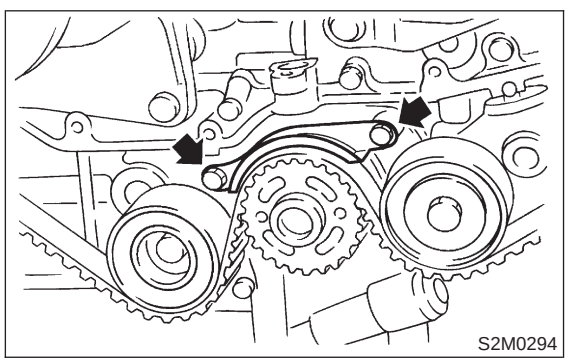


2. TIMING BELT

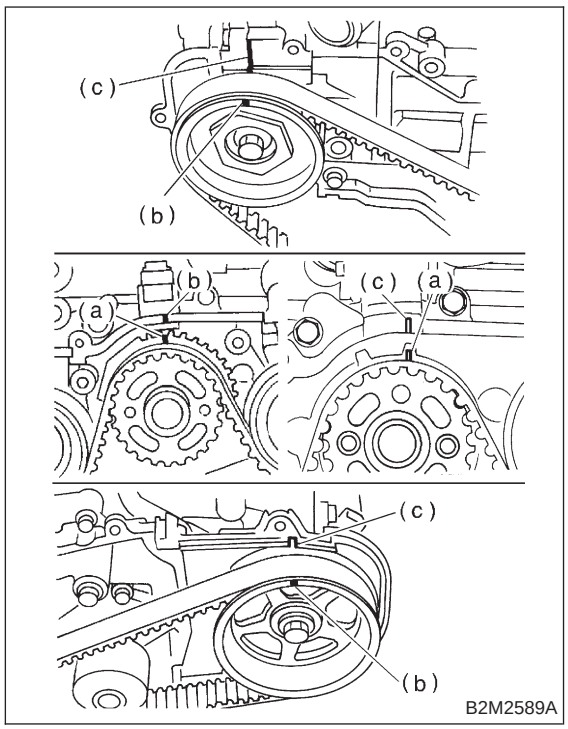


(a) Alignment mark
(1) Timing belt guide (MT vehicles only)
(2) Belt idler (No. 2)
(3) Belt idler No. 2
(4) Timing belt

1) Remove timing belt guide. (MT vehicles only)

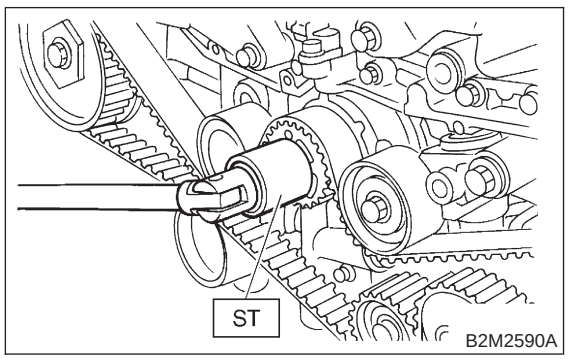


2) If alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as shown in figure:

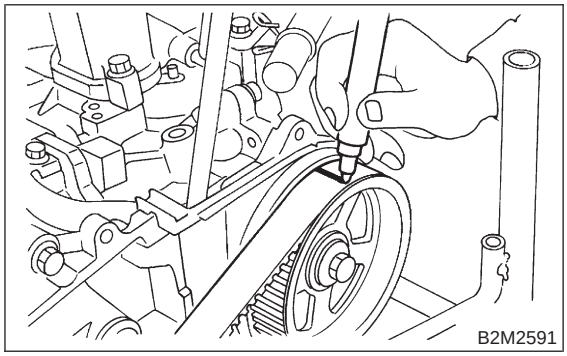


(1) Turn crankshaft using ST, and align alignment marks (c) on crankshaft sprocket, and left side camshaft sprocket with notch (c) of belt cover, and align the right side camshaft sprocket with notch (c) on the mating surface of camshaft cap and cylinder head.

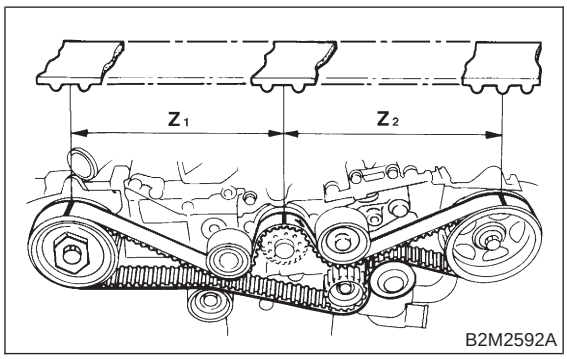
ST 499987500 CRANKSHAFT SOCKET



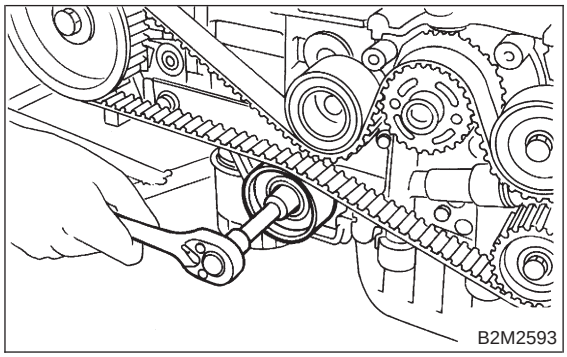
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.



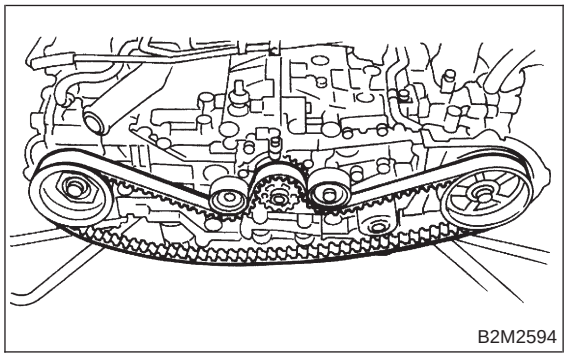
Specified data:
Z_1: 44 tooth length
Z_2: 40.5 tooth



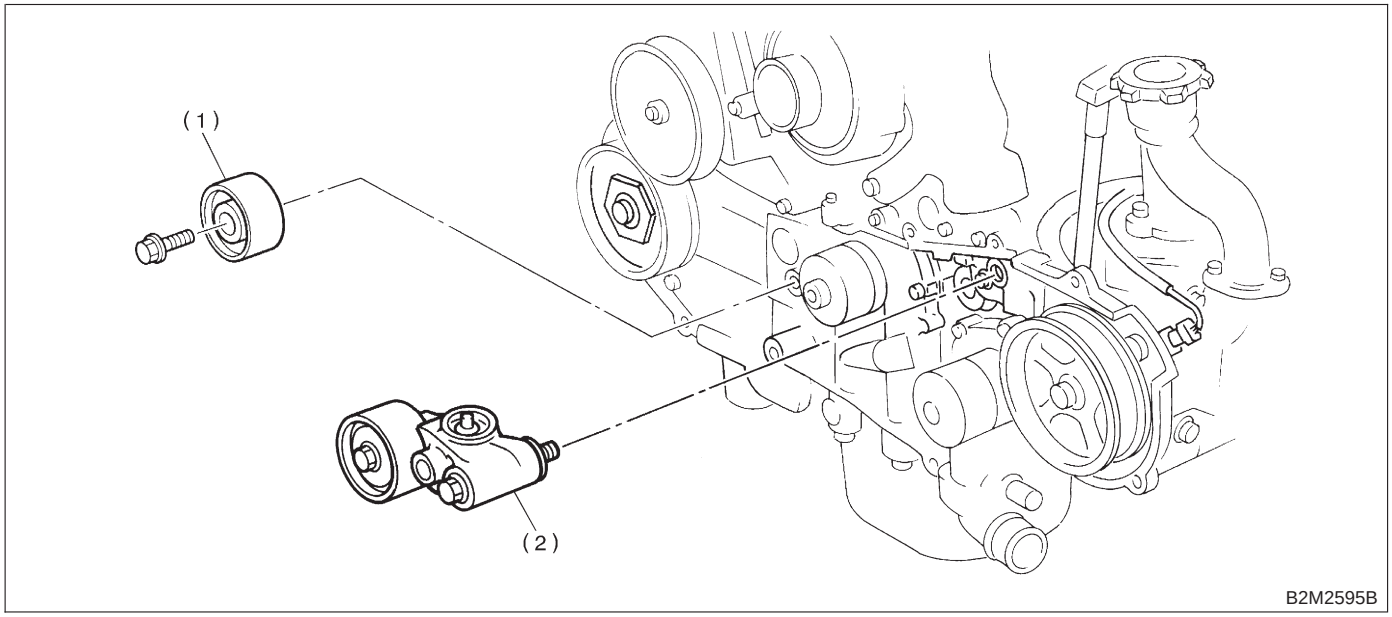
3) Remove belt idler (No. 2).
4) Remove belt idler No. 2.



5) Remove timing belt.

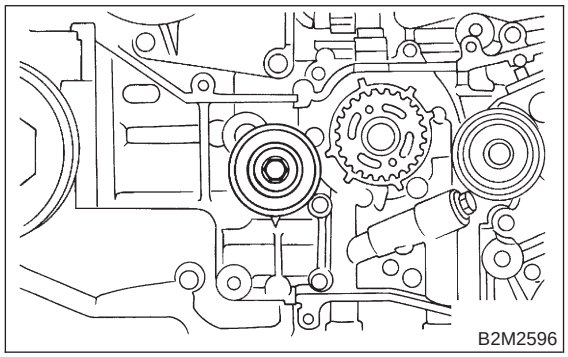


3. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

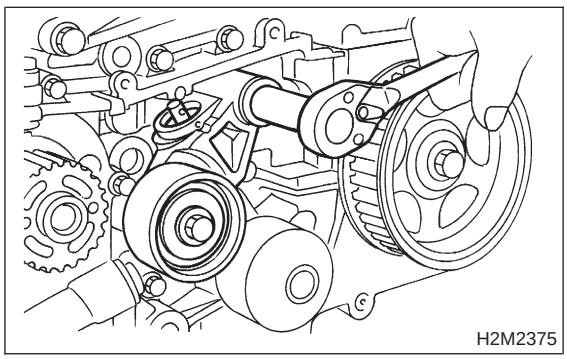


(1) Belt idler (No. 1)
(2) Automatic belt tension adjuster ASSY

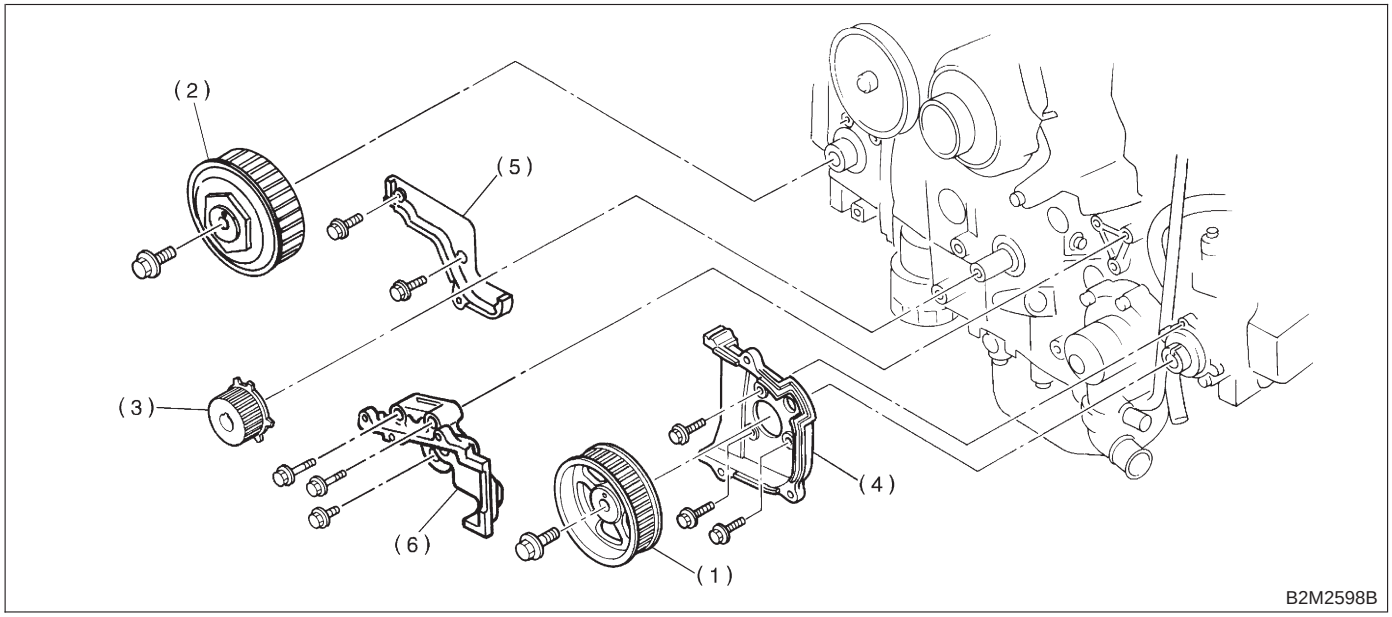
1) Remove belt idler (No. 1).



2) Remove automatic belt tension adjuster assembly.

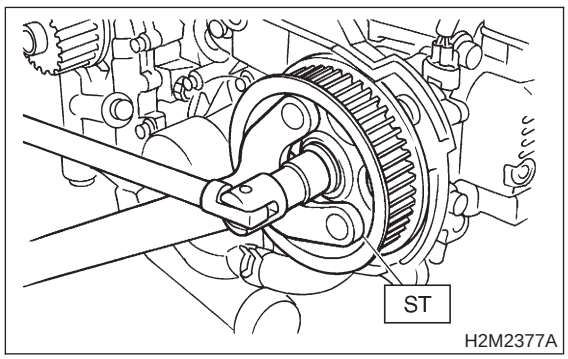


4. CAMSHAFT AND CRANKSHAFT SPROCKET

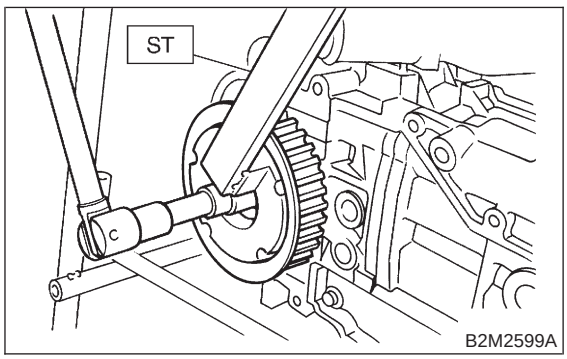


(1) Camshaft sprocket No. 2
(2) Camshaft sprocket No. 1
(3) Crankshaft sprocket (California spec. vehicles)
(4) Belt cover No. 2 (LH)
(5) Belt cover No. 2 (RH)
(6) Tensioner bracket

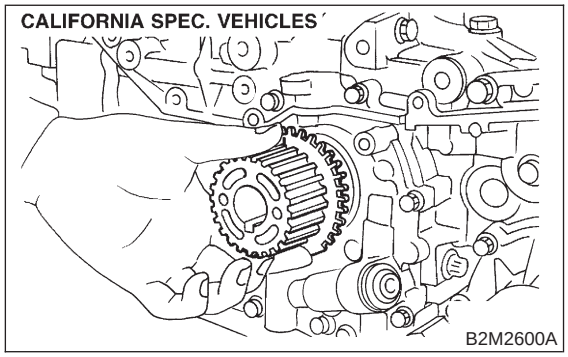
1) Remove camshaft sprocket No. 2. To lock camshaft, use ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH

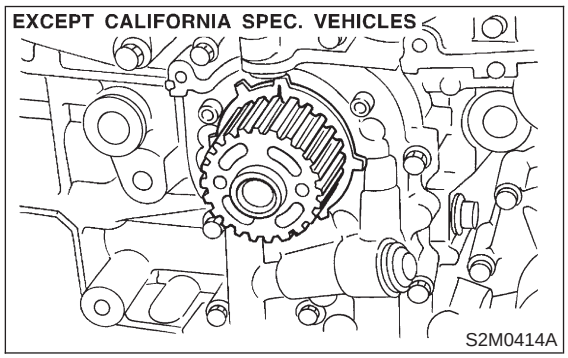


2) Remove camshaft sprocket No. 1. To lock camshaft, use ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH



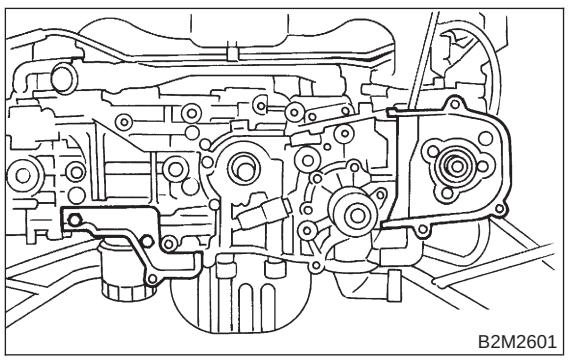
3) Remove crankshaft sprocket.



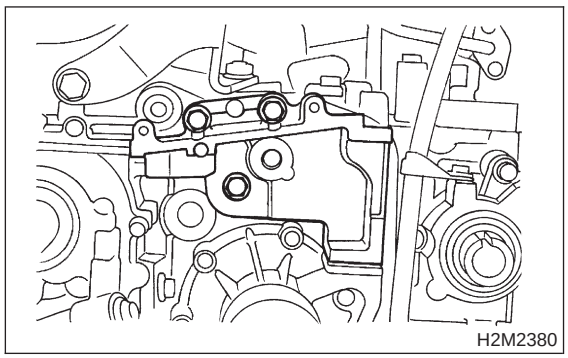


4) Remove belt cover No. 2 (LH).
5) Remove belt cover No. 2 (RH).

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



6) Remove tensioner bracket.



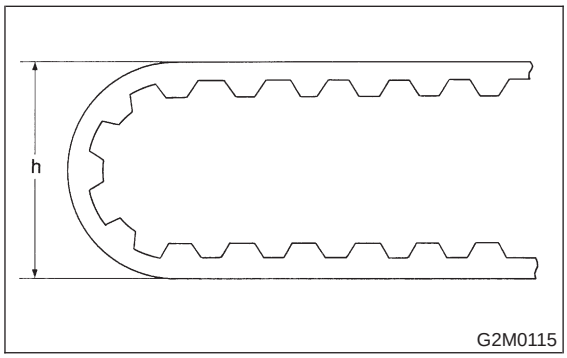
B: INSPECTION

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. 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.

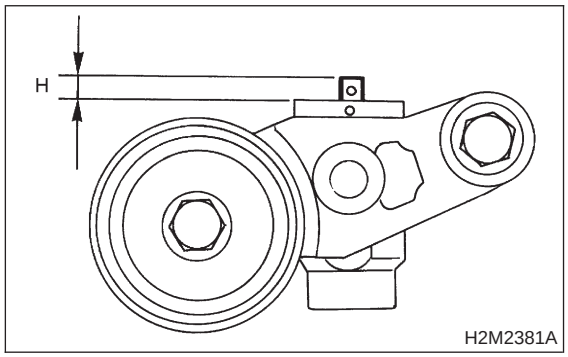
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kg, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kg, 66 lb), check it using the following procedures:
(1) Slowly press the adjuster 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
5.7±0.5 mm (0.224±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 automatic belt tension adjuster assembly if faulty.
2) Check tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check tension pulley for grease leakage.

4. BELT IDLER

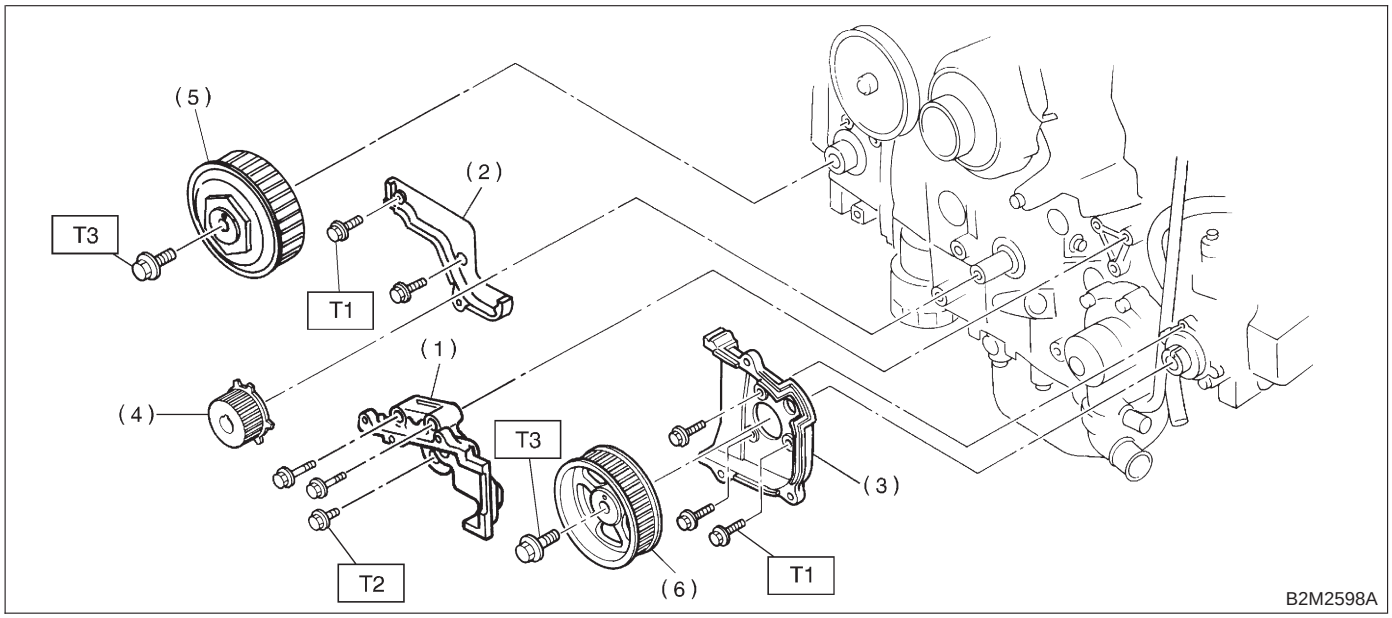
1) Check belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check belt idler for grease leakage.

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

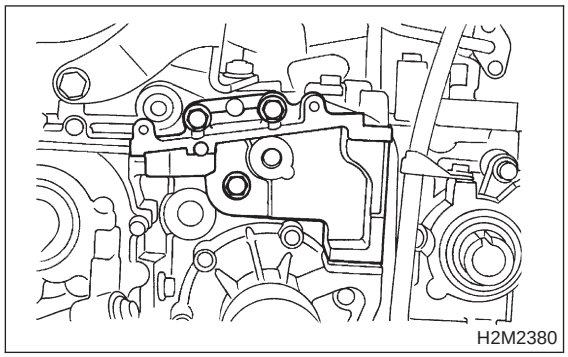
1. CAMSHAFT AND CRANKSHAFT SPROCKET



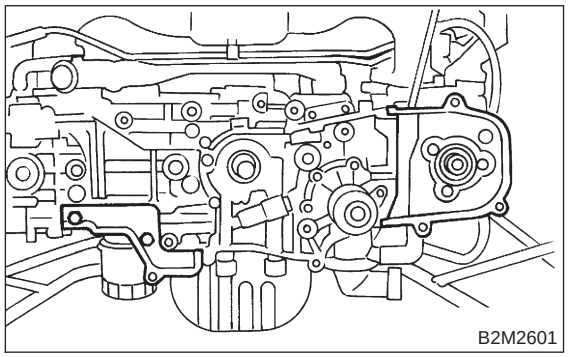
(1) Tensioner bracket
(2) Belt cover No. 2 (RH)
(3) Belt cover No. 2 (LH)
(4) Crankshaft sprocket
(5) Camshaft sprocket No. 1
(6) Camshaft sprocket No. 2

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)

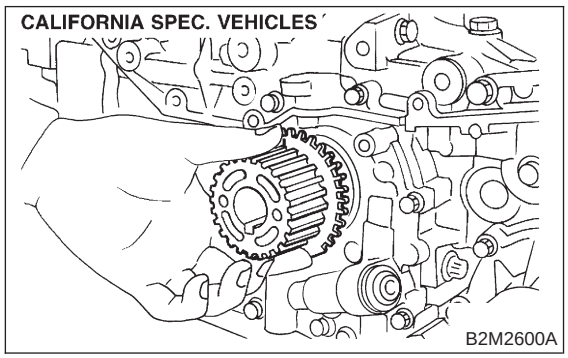
1) Install tensioner bracket.


H2M2380

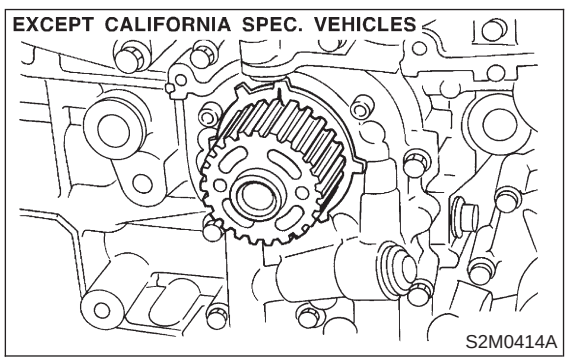
2) Install belt cover No. 2 (RH).
3) Install belt cover No. 2 (LH).


B2M2601

4) Install crankshaft sprocket.

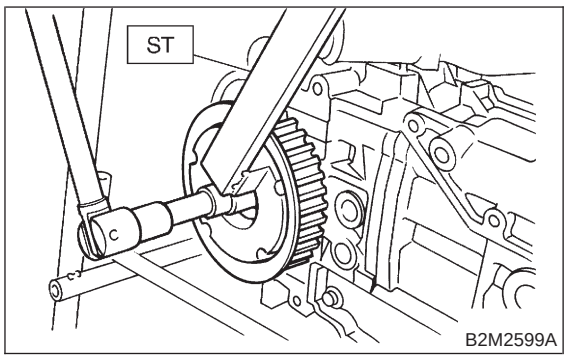


B2M2600A



S2M0414A

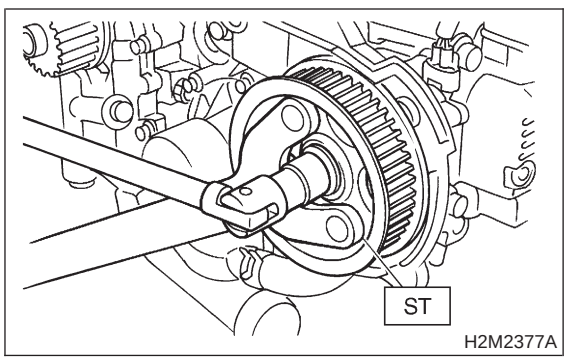
5) Install camshaft sprocket No. 1. To lock camshaft, use ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH



B2M2599A

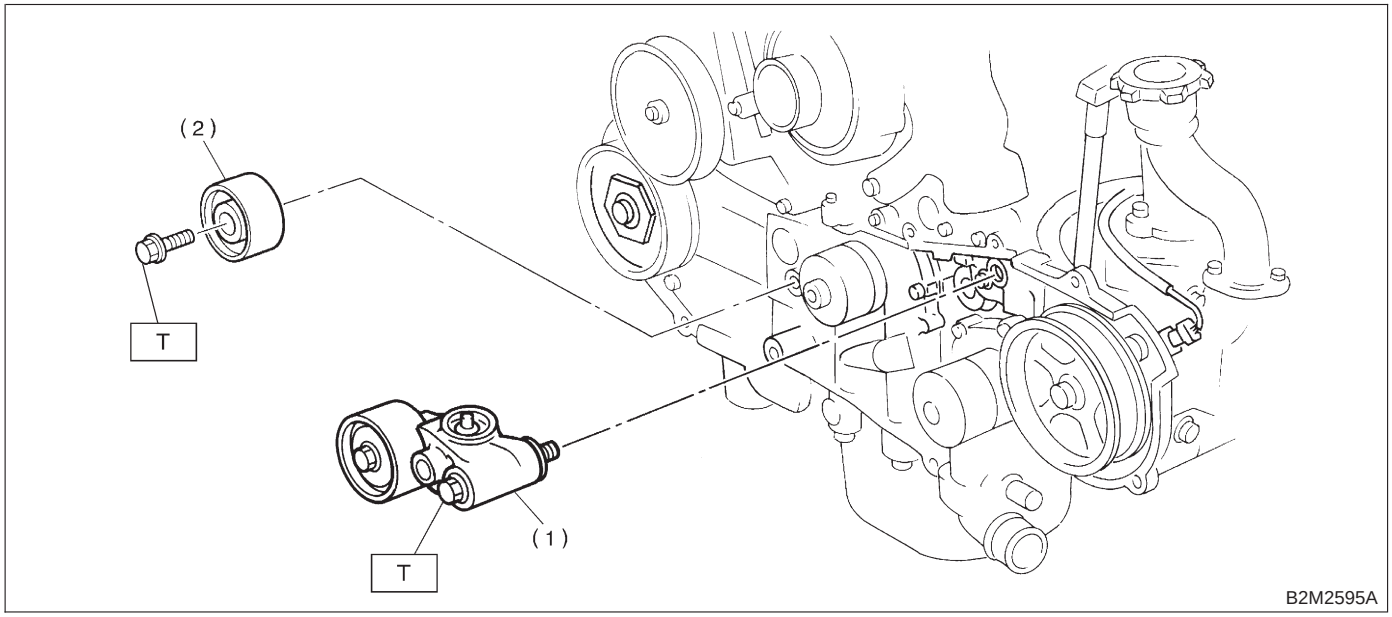
6) Install camshaft sprocket No. 2. To lock camshaft, use ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH

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.



H2M2377A

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER



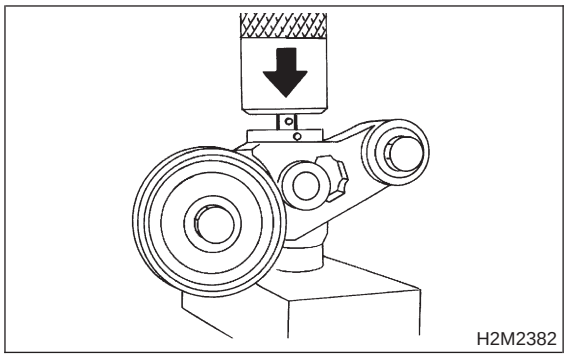
(1) Automatic belt tension adjuster ASSY
(2) Belt idler (No. 1)

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

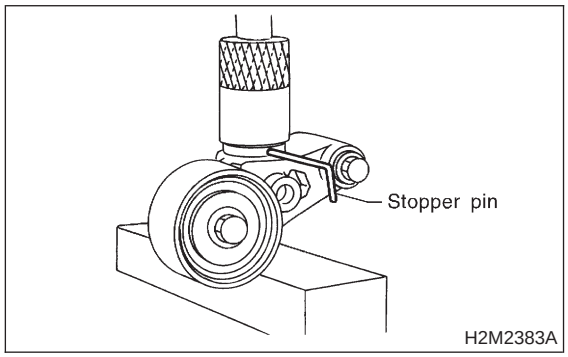
1) Preparation for installation of automatic belt tension adjuster assembly;

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.**

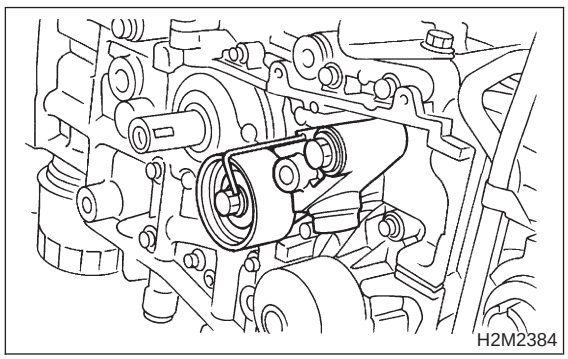
(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kg, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



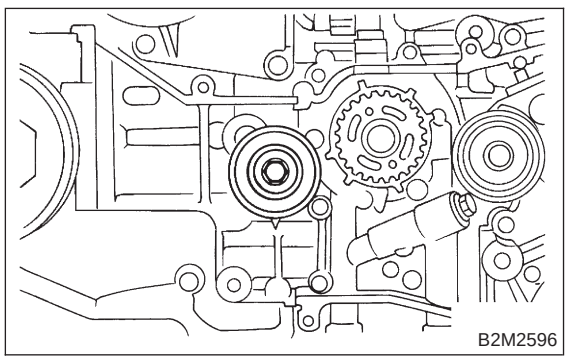
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



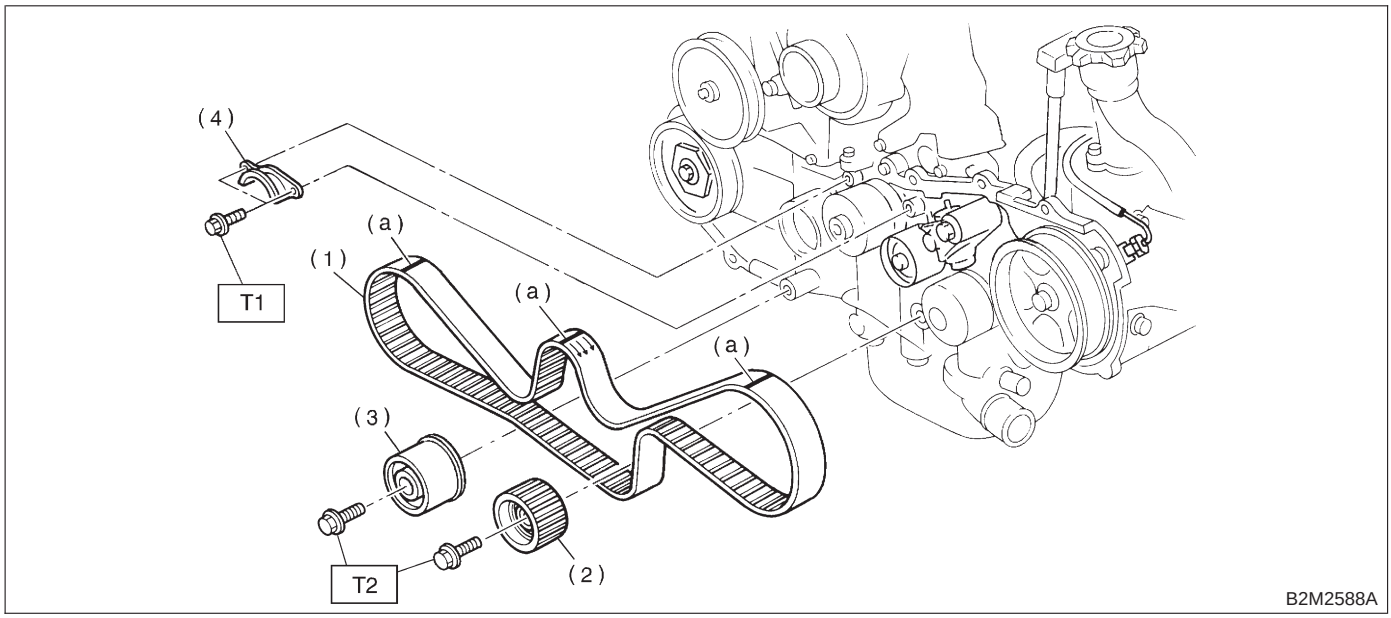
2) Install automatic belt tension adjuster assembly.



3) Install belt idler (No. 1).



3. TIMING BELT

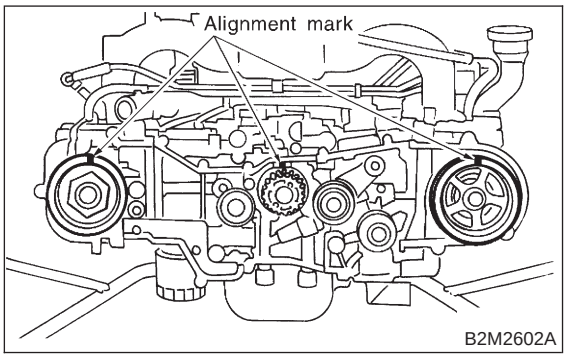


(a) Alignment mark
(1) Timing belt
(2) Belt idler No. 2
(3) Belt idler (No. 2)
(4) Timing belt guide (MT vehicles only)

Tightening torque: N·m (kg-m, ft-lb)
T1: 9.8±1.0 (1.0±0.1, 7.2±0.7)
T2: 39±4 (4.0±0.4, 28.9±2.9)

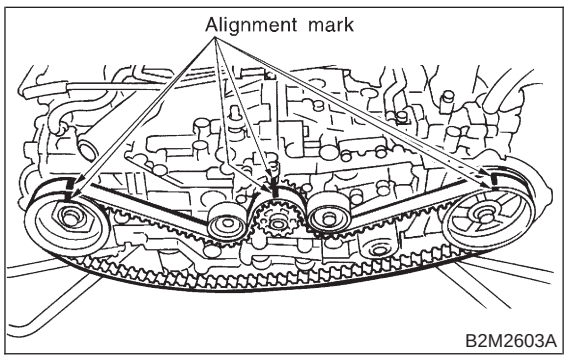
1) Installation of timing belt
(1) Turn camshaft sprocket No. 2 using ST1, and turn camshaft sprocket No. 1 using ST2 so that their alignment marks come to top positions.

ST1 499207100 CAMSHAFT SPROCKET WRENCH
ST2 499207400 CAMSHAFT SPROCKET WRENCH

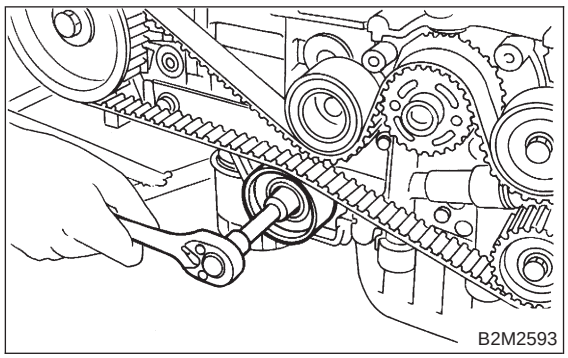


(2) While aligning alignment mark on timing belt with marks on sprockets, position timing belt properly.

CAUTION:
Ensure belt's rotating direction is correct.

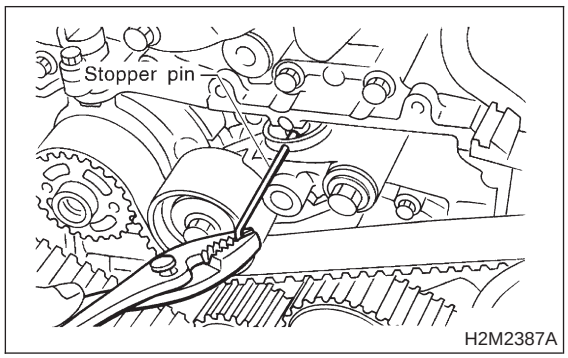


2) Install belt idler No. 2.
3) Install belt idler (No. 2).

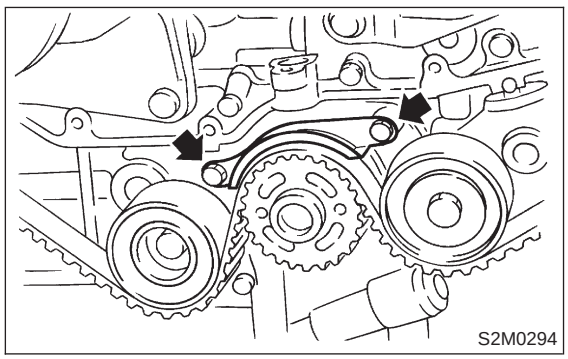


4) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from belt tensioner adjuster.

CAUTION:
After properly installing timing belt, remove rocker cover and ensure that the valve lash adjuster contains no air.

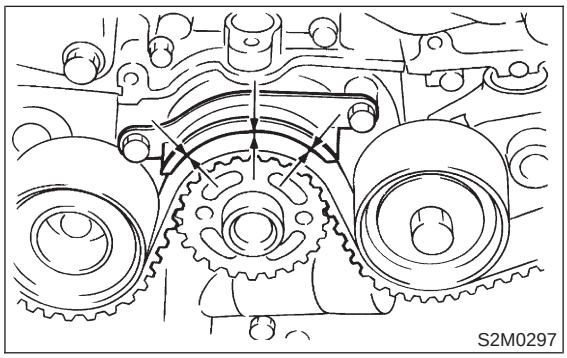


5) Install timing belt guide. (MT vehicles only)
(1) Temporarily tighten remaining bolts.

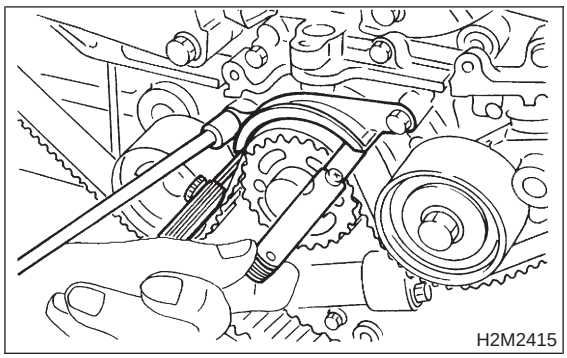


(2) Check and adjust clearance between timing belt and timing belt guide.

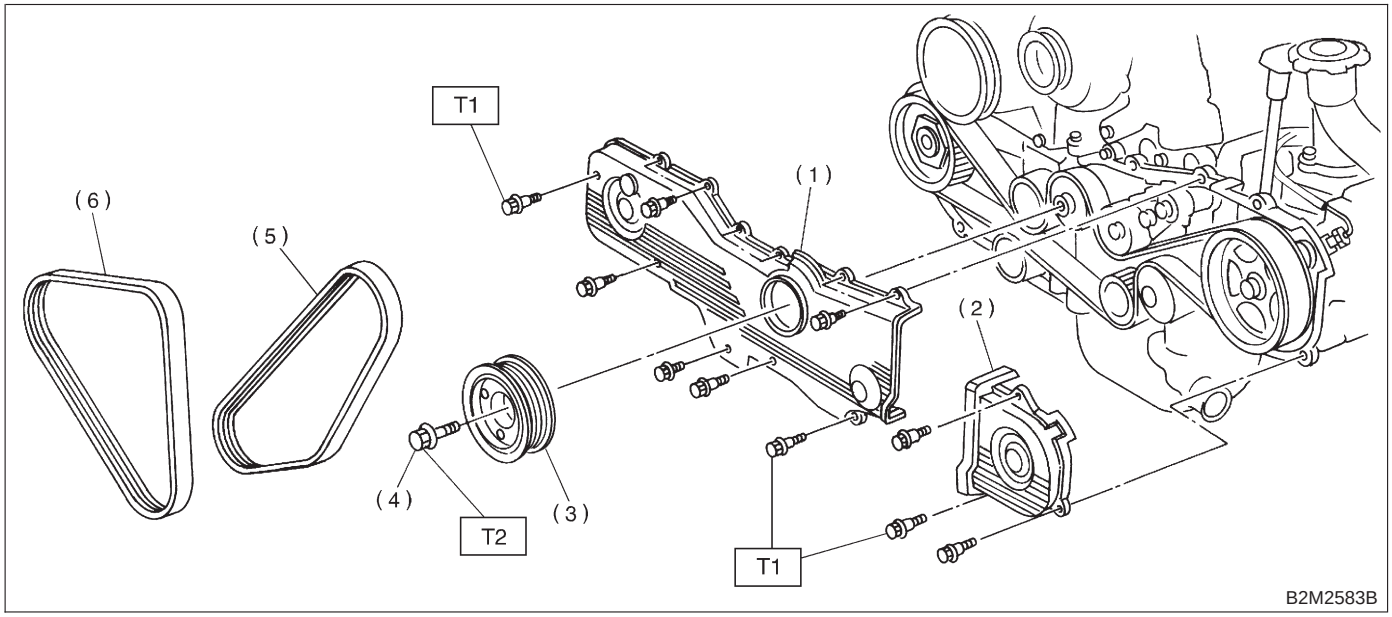
Clearance:
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten remaining bolts.



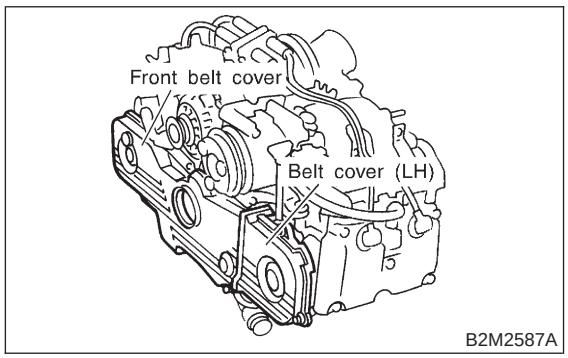
4. CRANKSHAFT PULLEY AND BELT COVER



(1) Front belt cover
(2) Belt cover (LH)
(3) Crankshaft pulley
(4) Crankshaft pulley bolt
(5) Rear side V-belt (With A/C model)
(6) Front side V-belt

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 127^{+10}_{-5} ($13.0^{+1.0}_{-0.5}$, $94^{+7.2}_{-3.6}$)

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



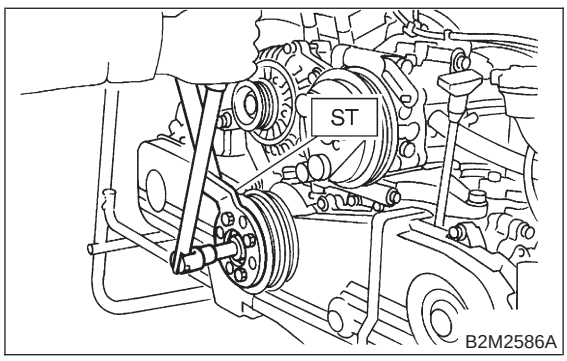
3) Install crankshaft pulley.
4) Install pulley bolt.

To lock crankshaft, use ST.

ST 499977000 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kg-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
127±5 N·m (13.0±0.5 kg-m, 94.0±3.6 ft-lb)



5) Confirm that the tightening angle of the crankshaft pulley bolt is 45 degrees or more. If not, conduct the following procedures (1) through (4).

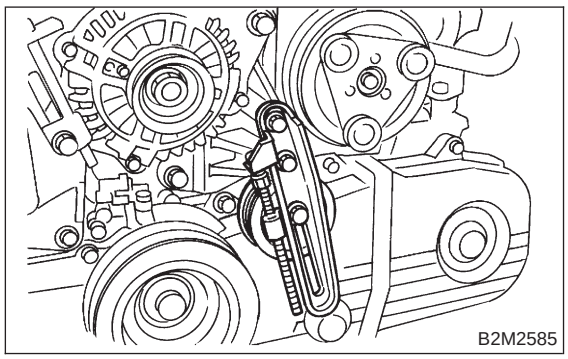
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

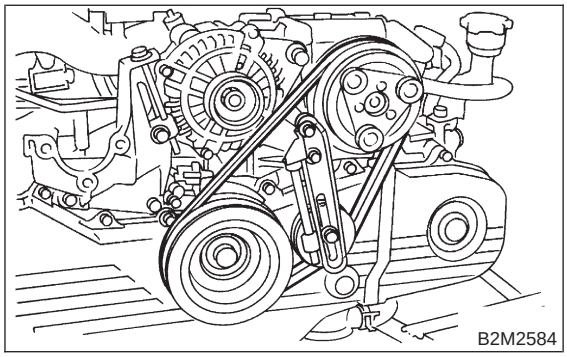
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kg-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

CAUTION:
Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

6) Install A/C belt tensioner. (With A/C model)

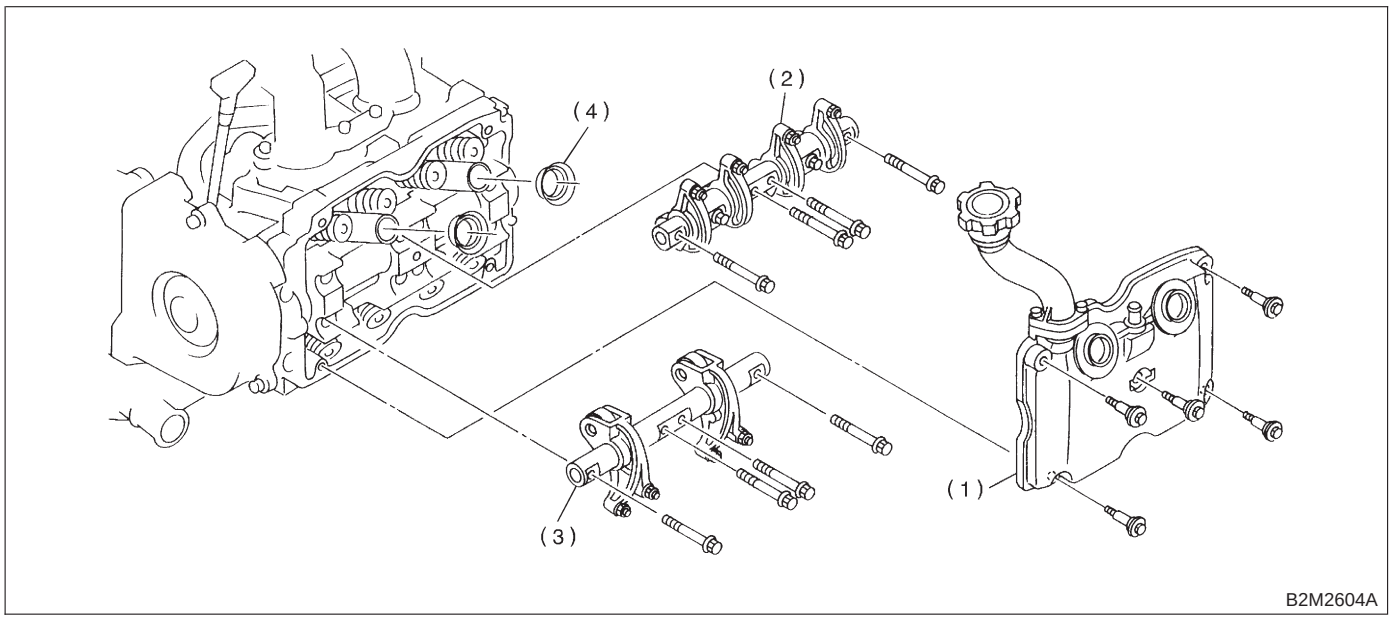

B2M2585

7) Install A/C belt. (With A/C model)


B2M2584

3. Valve Rocker Assembly

A: REMOVAL



B2M2604A

(1) Rocker cover
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Spark plug pipe gasket

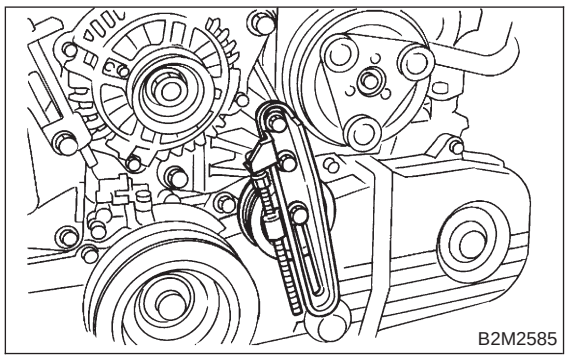
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

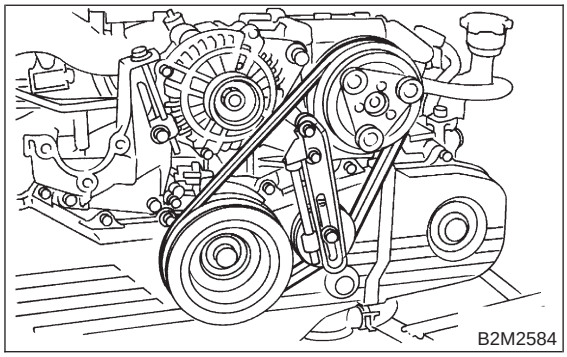
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kg-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

CAUTION:
Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

6) Install A/C belt tensioner. (With A/C model)

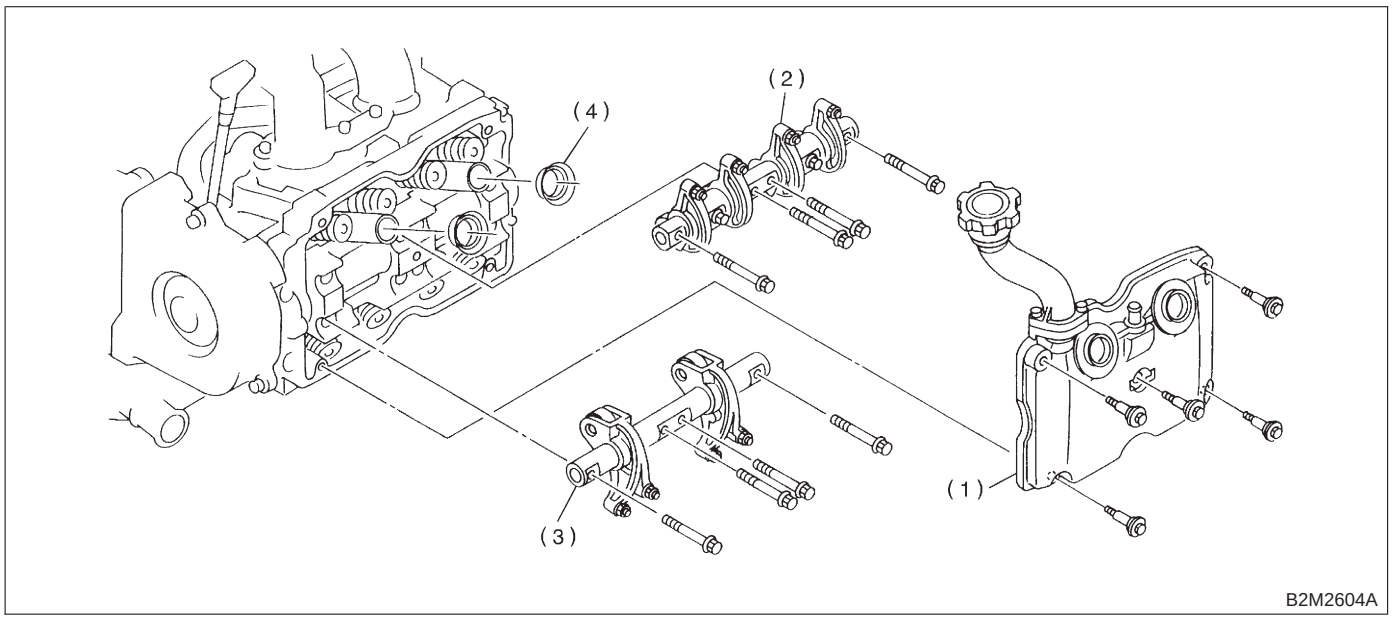

B2M2585

7) Install A/C belt. (With A/C model)


B2M2584

3. Valve Rocker Assembly

A: REMOVAL

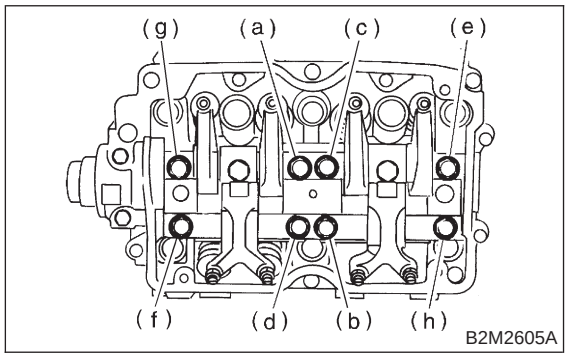


B2M2604A

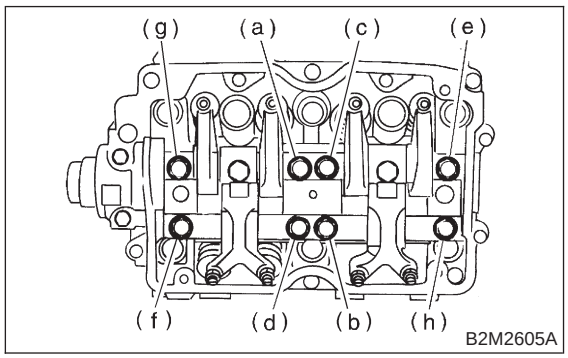
(1) Rocker cover
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Spark plug pipe gasket

1) Disconnect PCV hose and remove rocker cover.
2) Removal of valve rocker assembly
(1) Remove bolts (a) through (b) in alphabetical sequence.

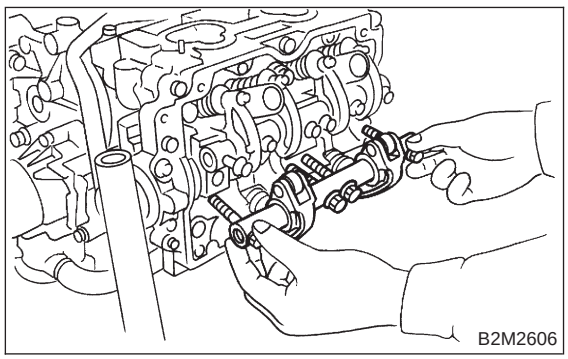
CAUTION:
Leave two or three threads of bolt (a) engaged to retain valve rocker assembly.



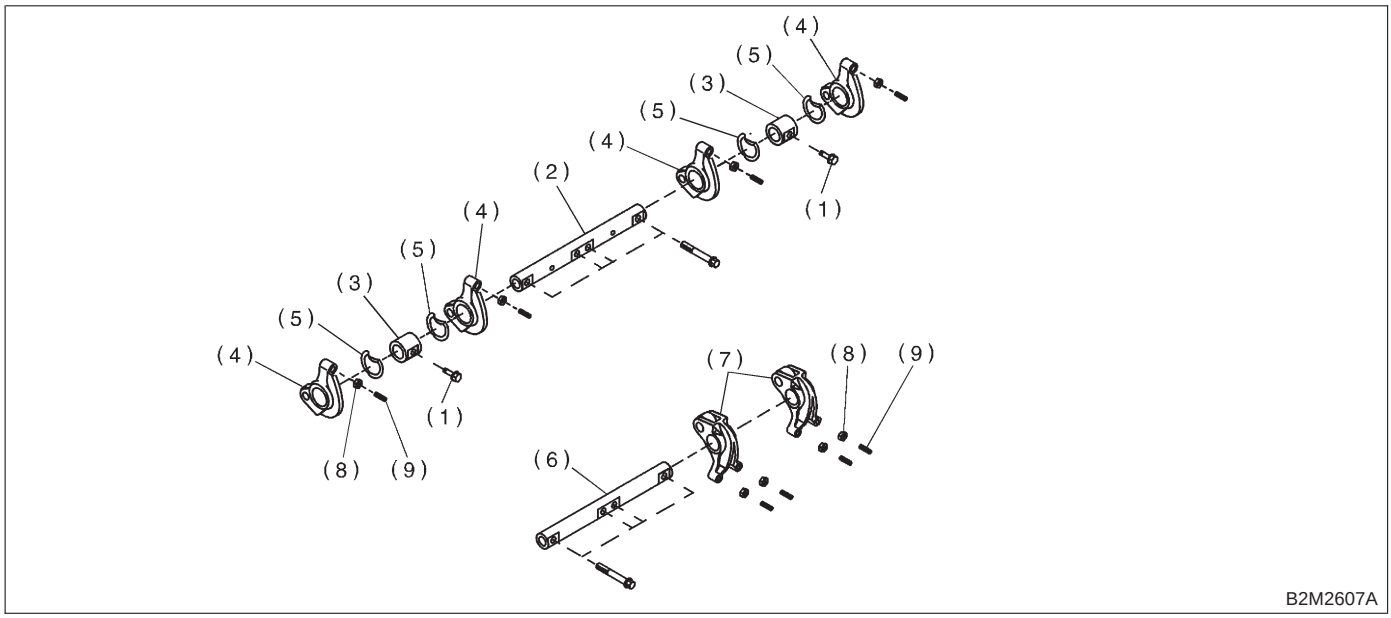
(2) Equally loosen bolts (e) through (h) all the way, being careful that knock pin is not gouged.



(3) Remove valve rocker assembly.



B: DISASSEMBLY



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

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

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

3) Remove nut and adjuster screw from valve rocker.

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).

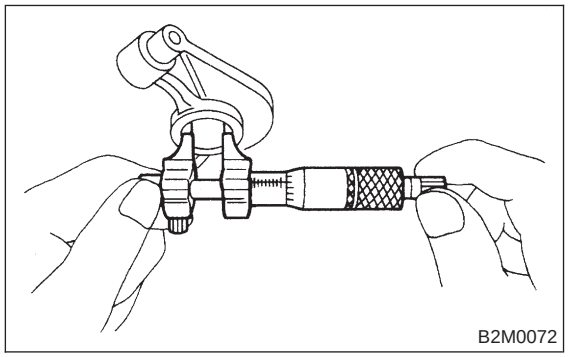
Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)

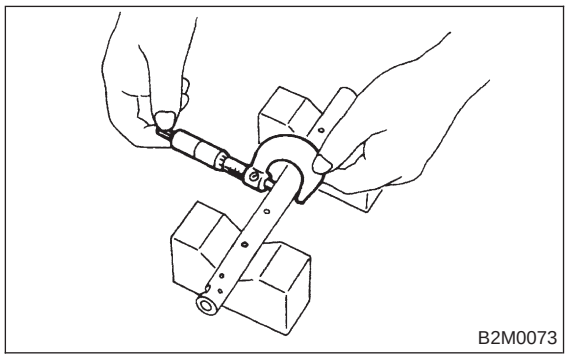
● If oil clearance exceeds specifications, replace valve rocker arm or shaft.

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)


B2M0072


B2M0073

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)

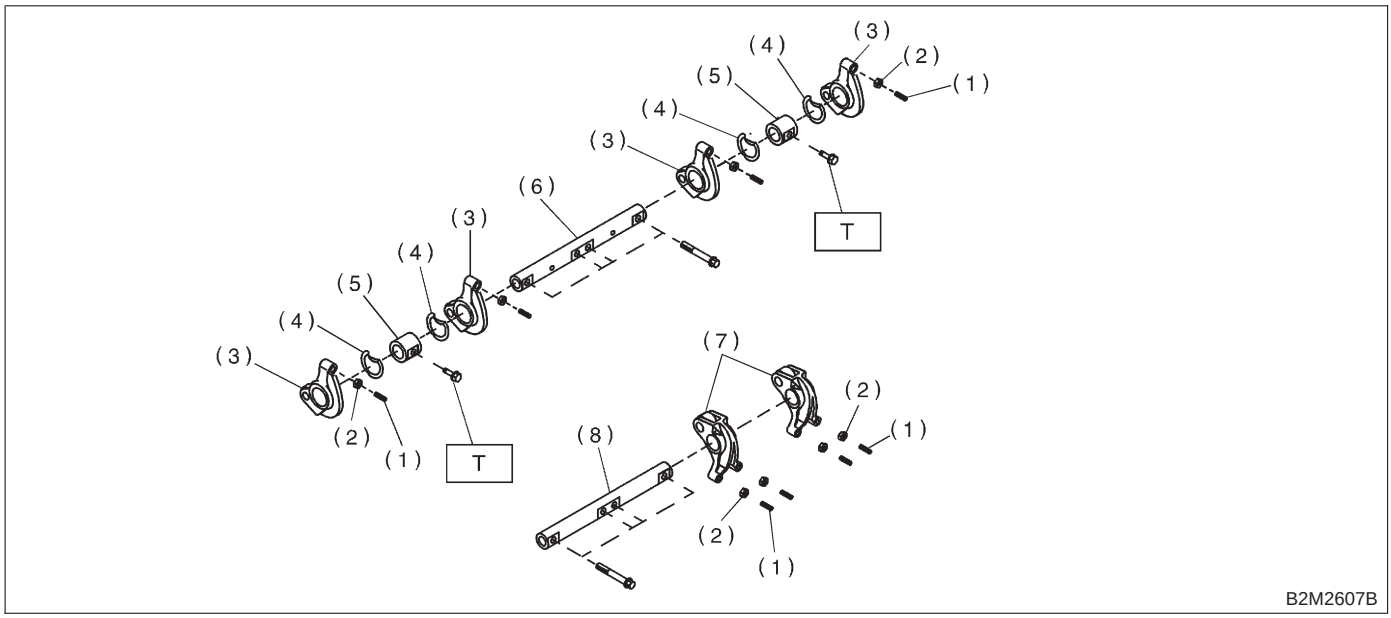
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.
4) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

2. INTAKE AND EXHAUST 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 leakage 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) Spring
(5) Rocker shaft support
(6) Intake valve rocker shaft
(7) Exhaust valve rocker arm
(8) Exhaust valve rocker shaft

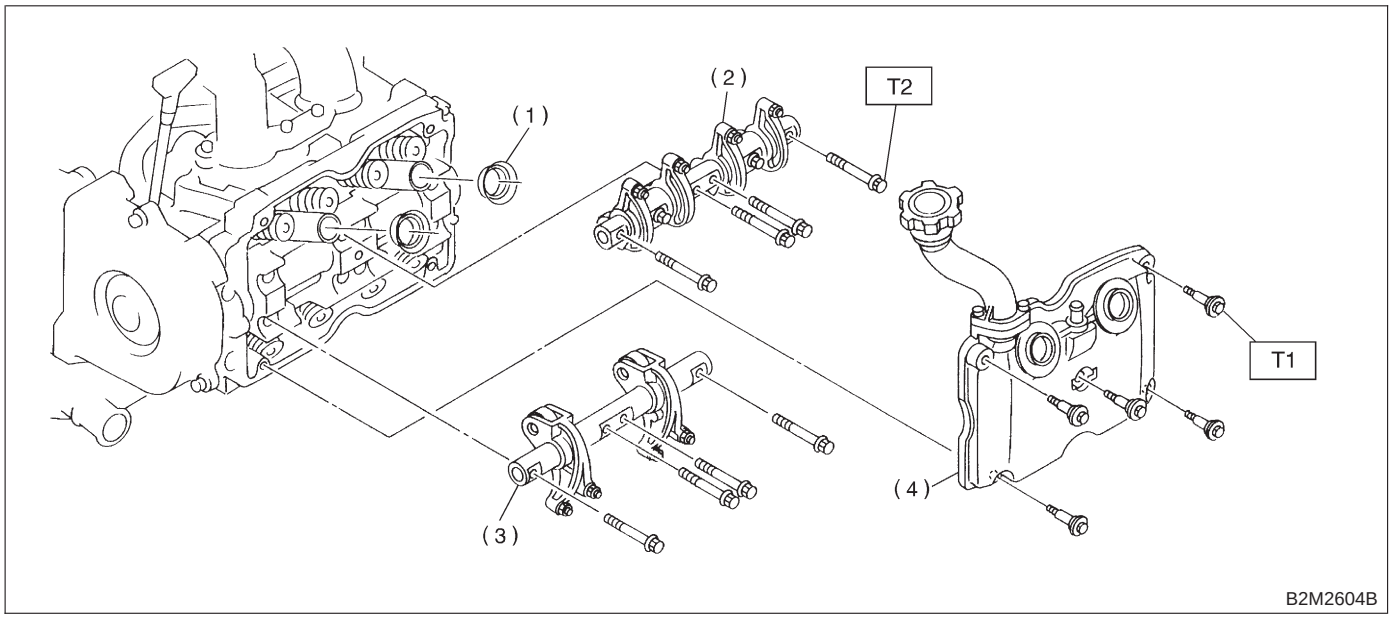
Tightening torque: N·m (kg-m, ft-lb)
T: 5±1 (0.5±0.1, 3.6±0.7)

1) Install adjuster screw and nut to valve rocker.
2) Arrange valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

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

3) Install valve rocker shaft securing bolts.

E: INSTALLATION



(1) Spark plug pipe gasket
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Rocker cover

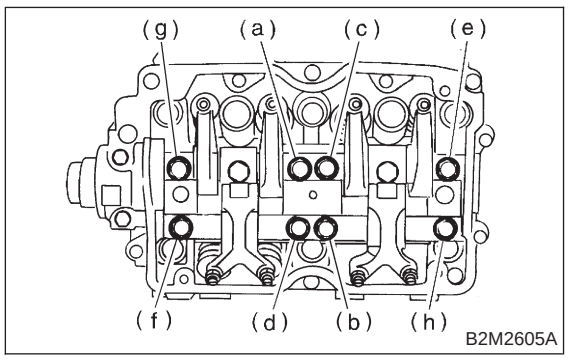
Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 25±2 (2.5±0.2, 18.1±1.4)

1) Installation of valve rocker assembly
(1) Temporarily tighten bolts (a) through (d) equally as shown in figure.

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

(2) Tighten bolts (e) through (h) to specified torque.
(3) Tighten bolts (a) through (d) to specified torque.

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



2) Adjust the valve clearances. <Ref. to 2-2 [W7B1].>
3) Install rocker cover and connect PCV hose.

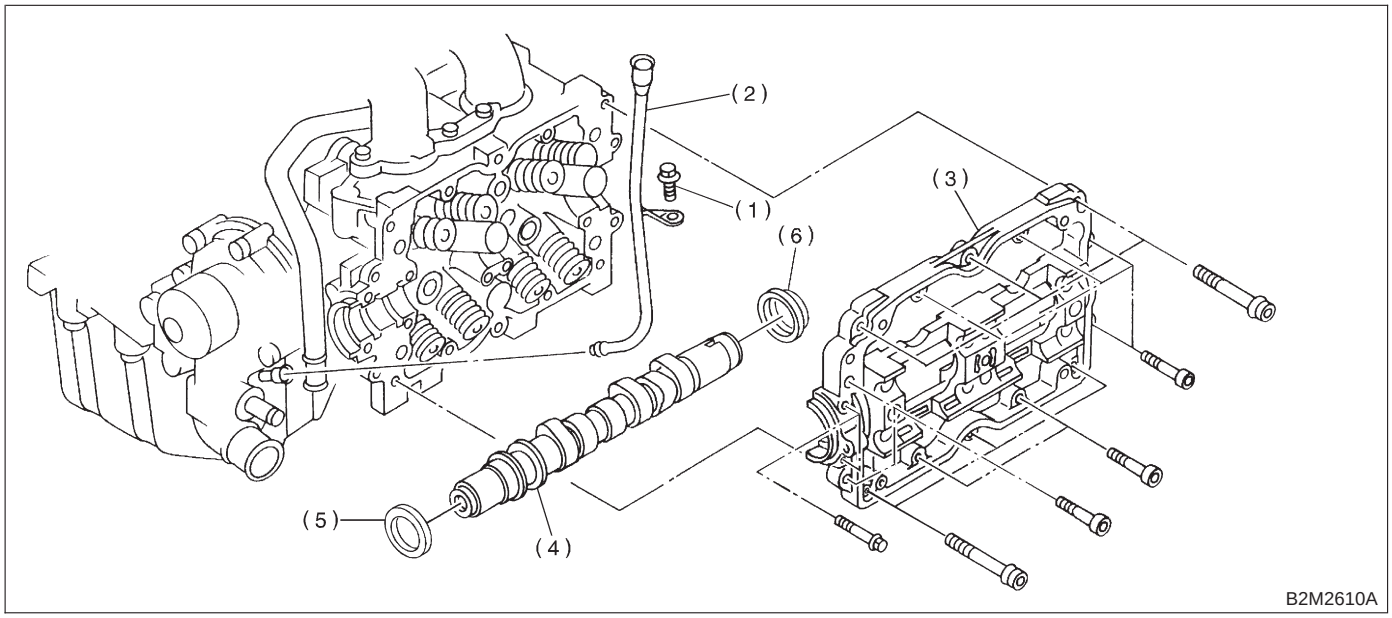
4. Camshaft

A: REMOVAL

1. RELATED PARTS

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

2. CAMSHAFT (LH)

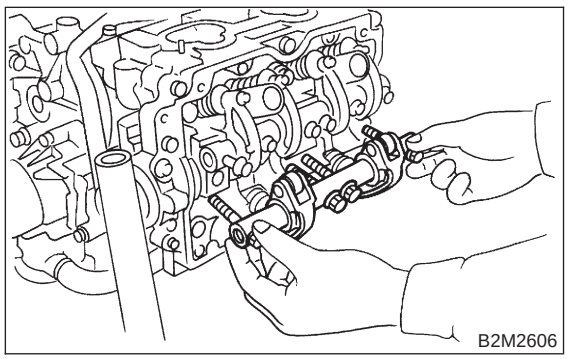


(1) Bolt
(2) Oil level gauge guide
(3) Camshaft cap
(4) Camshaft (LH)
(5) Oil seal
(6) Plug

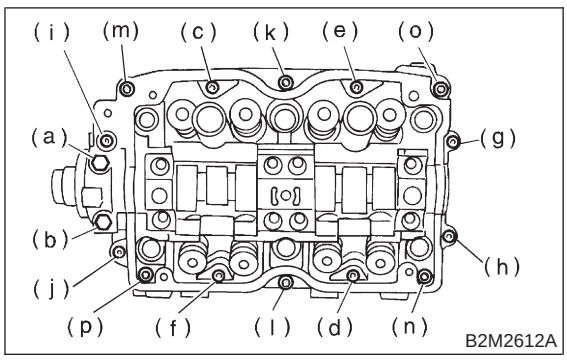
1) Remove camshaft position sensor.

CAUTION:
Do not damage the camshaft position sensor.

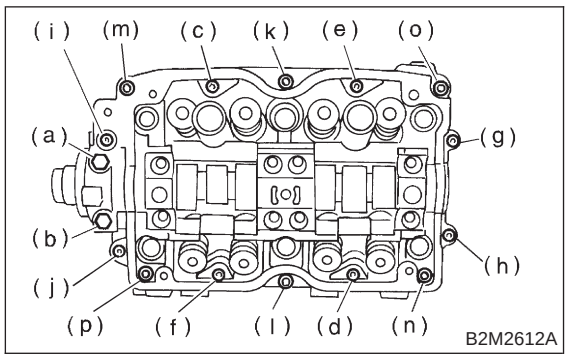
2) Remove oil level gauge guide attaching bolt.
3) Remove oil level gauge guide.
4) Remove camshaft position sensor support.
5) Remove camshaft cap.
   (1) Remove valve rocker assembly.
   <Ref. to 2-3a [W3A0].>



(2) Remove bolts (a) through (b) in alphabetical sequence.

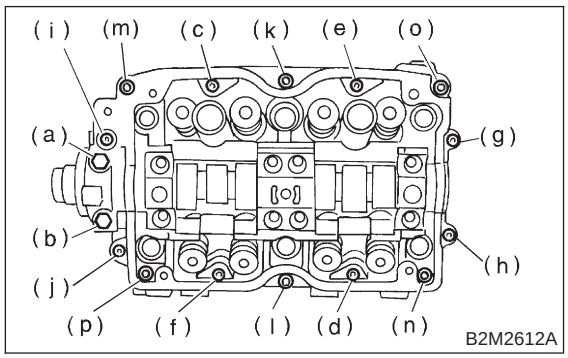


(3) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.

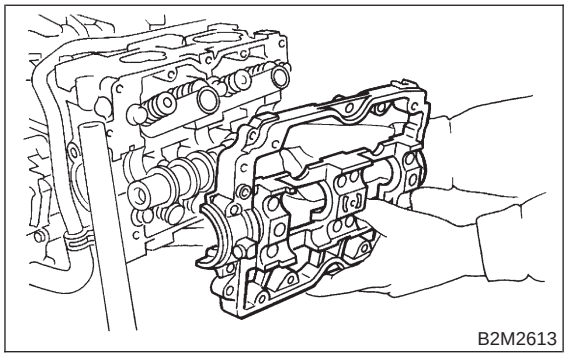


(4) Remove bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



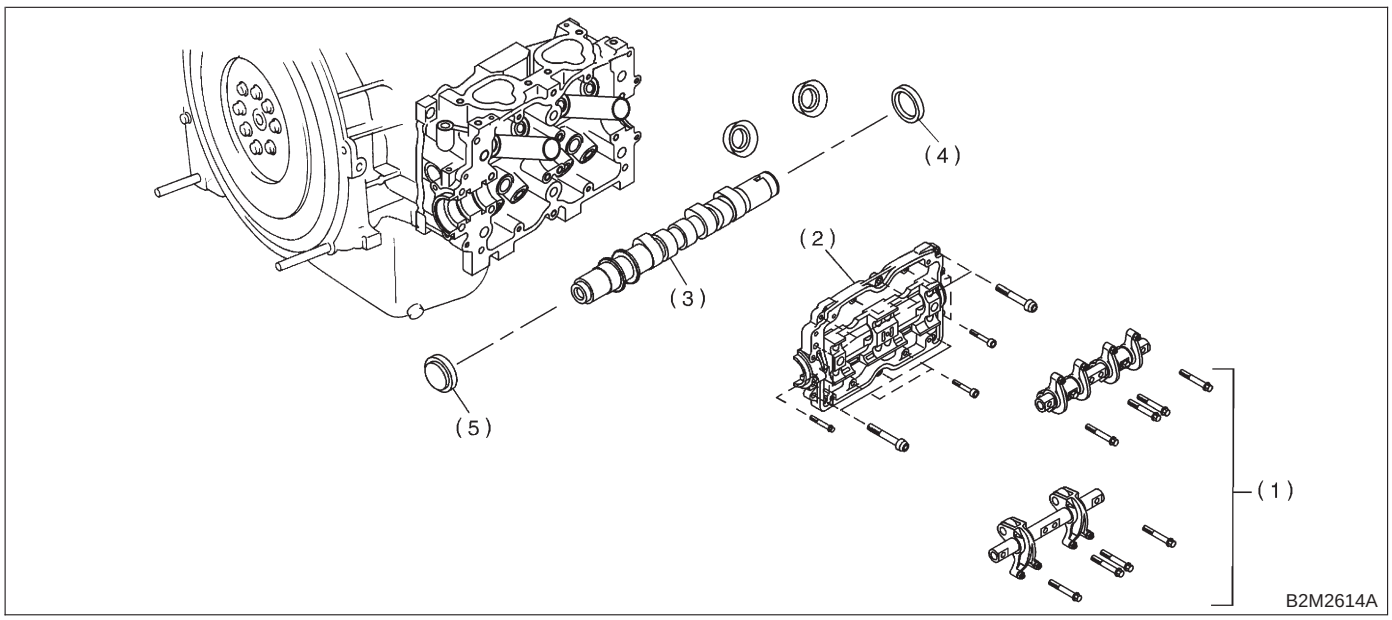
(5) Remove camshaft cap.



6) Remove camshaft (LH).
7) Remove oil seal.
8) Remove plug from rear side of camshaft (LH).

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

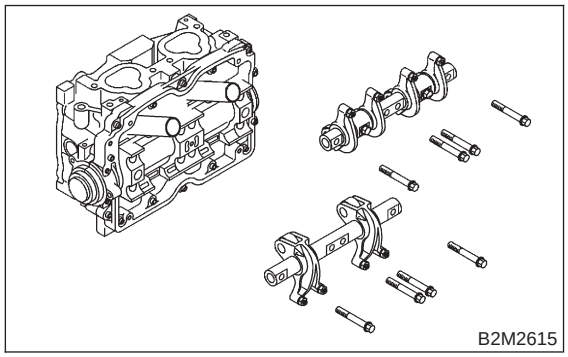
3. CAMSHAFT (RH)



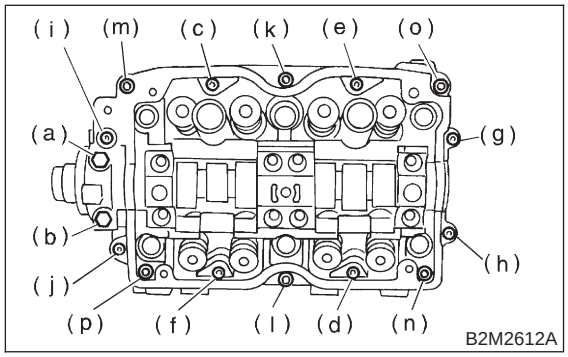
(1) Camshaft (RH)
(2) Camshaft cap
(3) Valve rocker ASSY
(4) Oil seal
(5) Plug

1) Remove camshaft cap.

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

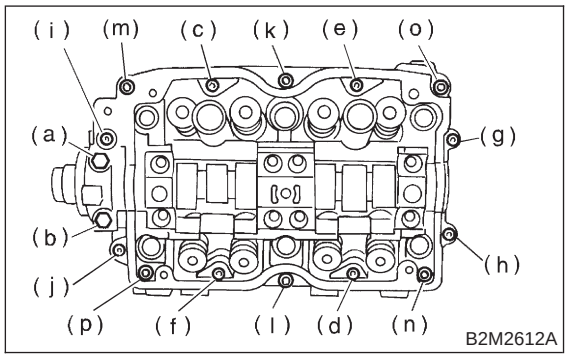

B2M2615

(2) Remove bolts (a) through (b) in alphabetical sequence.



B2M2612A

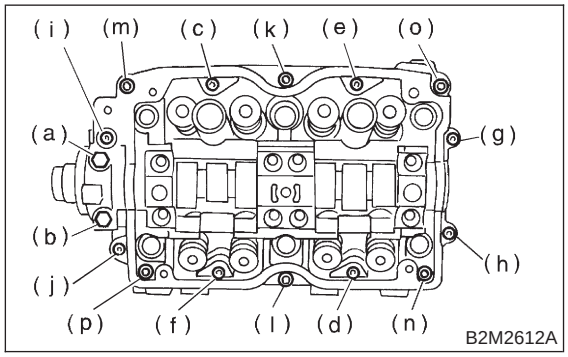
(3) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.



B2M2612A

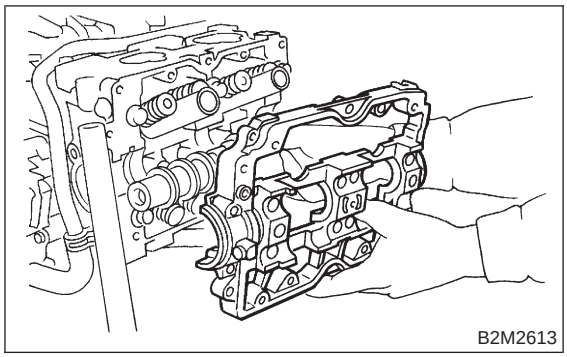
(4) Remove bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



B2M2612A

(5) Remove camshaft cap.


B2M2613

2) Remove camshaft (RH).
3) Remove oil seal.
4) Remove plug from rear side of camshaft (RH).

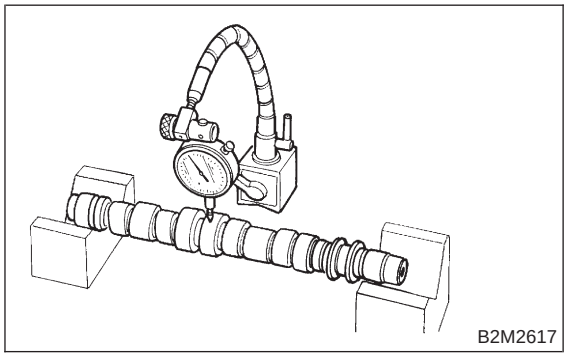
CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**

B: INSPECTION

1. CAMSHAFT

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

Limit:
0.020 mm (0.0008 in)


B2M2617

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.

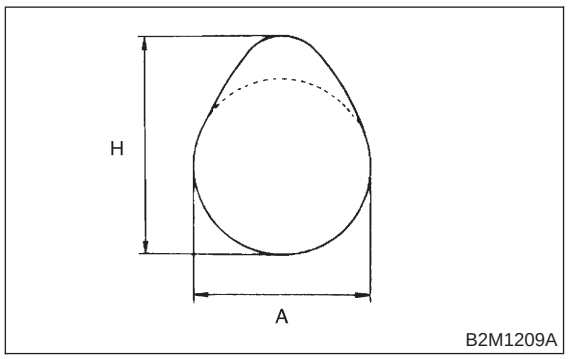
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.118 (0.0046)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

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

Item	Standard	Limit
		Unit: mm (in)
Intake	34.00 — 38.782 (1.3386 — 1.5268)	33.84 (1.3323)
Exhaust	34.00 — 39.307 (1.3386 — 1.5475)	33.84 (1.3323)

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

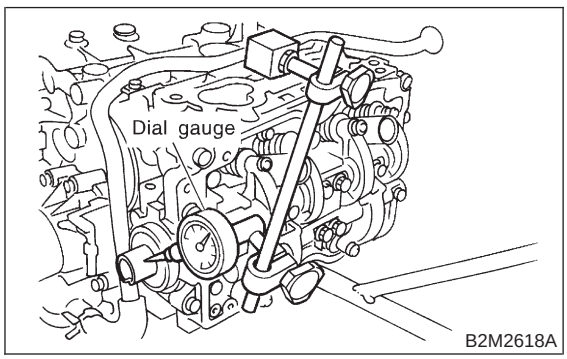


2. CAMSHAFT SUPPORT

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

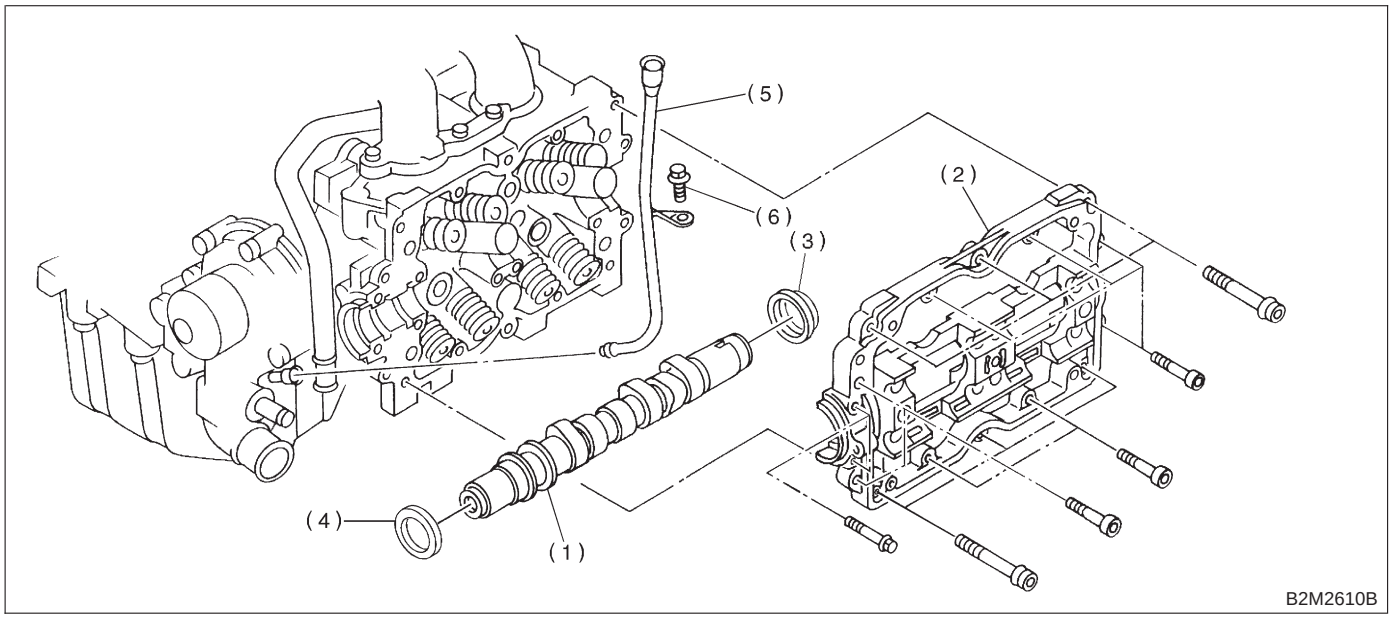
Standard:
0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:
0.11 mm (0.0043 in)



C: INSTALLATION

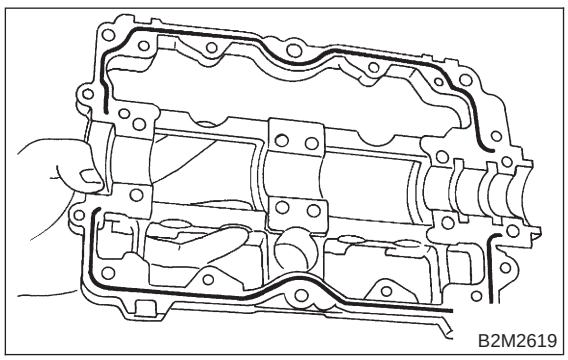
1. CAMSHAFT (LH)



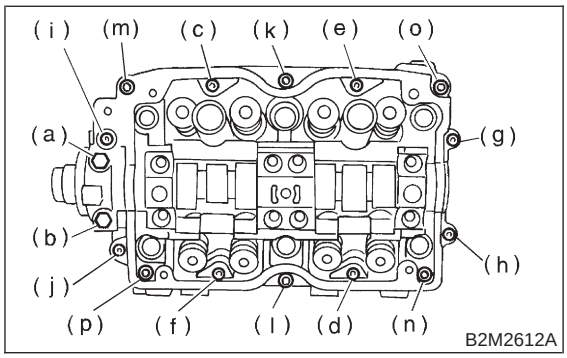
(1) Camshaft (LH)
(2) Camshaft cap
(3) Plug
(4) Oil seal
(5) Oil level gauge guide
(6) Bolt

1) Apply a coat of engine oil to camshaft journals and install camshaft (LH).
2) Install camshaft cap.
   (1) Apply liquid gasket on the around of camshaft cap.

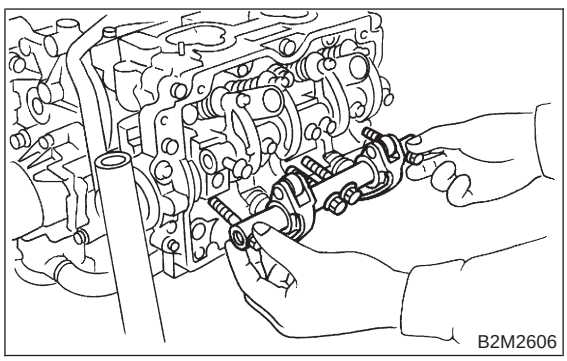
Liquid gasket:
THREE BOND 1280B (Part No. 0029431130)



(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.

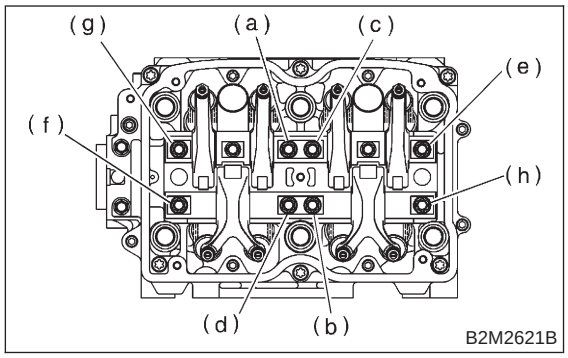


(3) Install valve rocker assembly.
<Ref. to 2-3a [W3E0].>



(4) Tighten bolts (a) through (h) in alphabetical sequence.

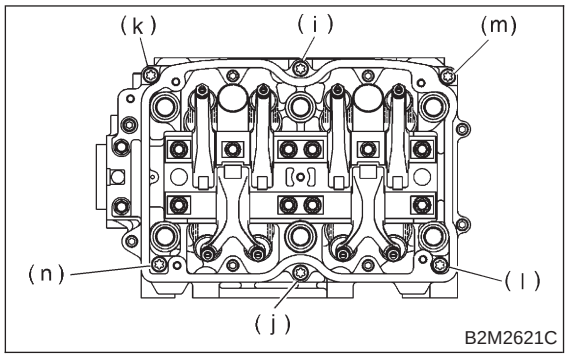
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.

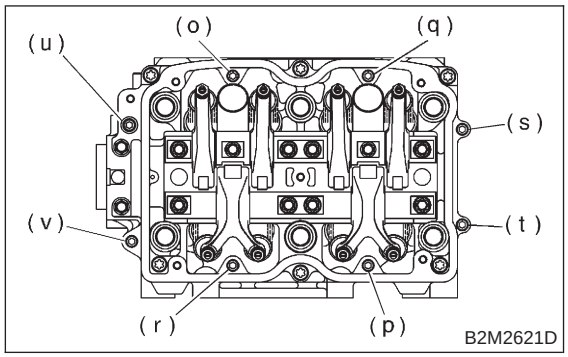
ST 499497000 TORX PLUS

Tightening torque:
18±2 N·m (1.8±0.2 kg-m, 13.0±1.4 ft-lb)



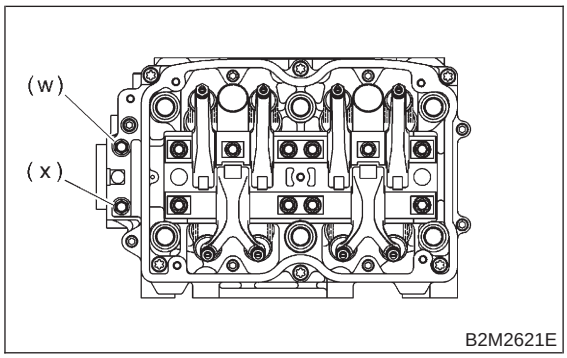
(6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



(7) Tighten bolts (w) through (x) in alphabetical sequence.

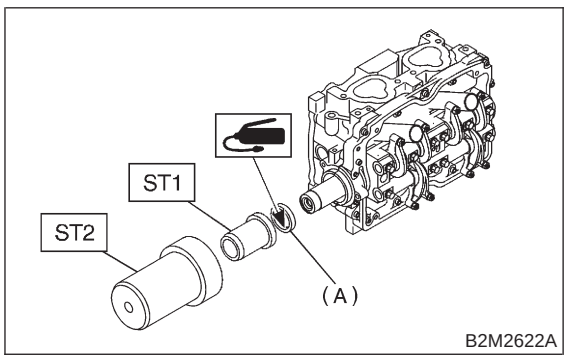
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



3) Apply a coat of grease to oil seal lips and install oil seal (A) on camshaft using ST1 and ST2.

CAUTION:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER

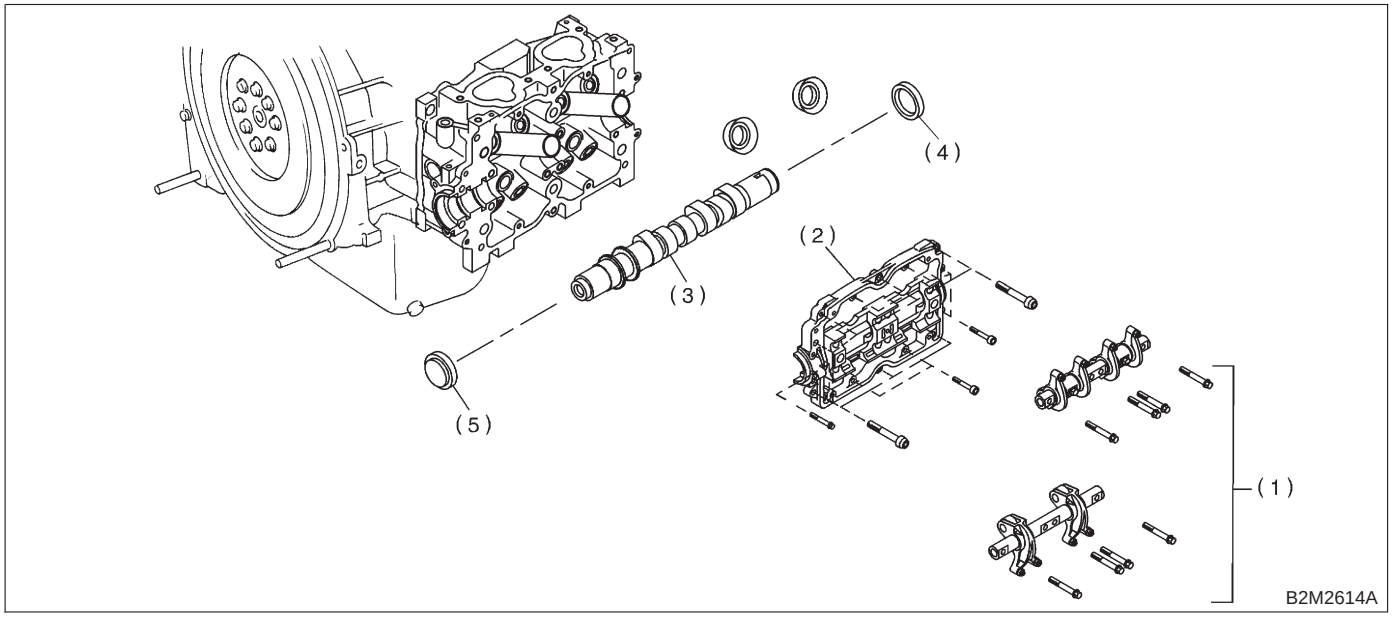


4) Install plug using ST.

ST 499587100 OIL SEAL INSTALLER

5) Install oil level gauge guide.
6) Install camshaft position sensor support.

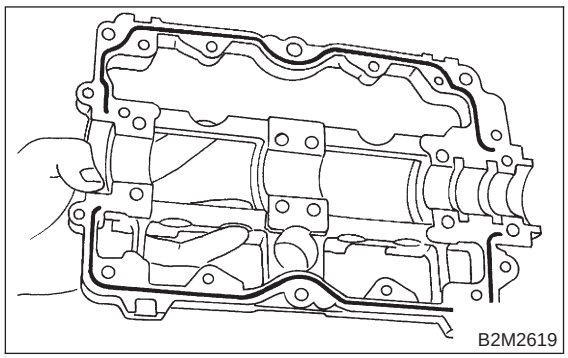
2. CAMSHAFT (RH)



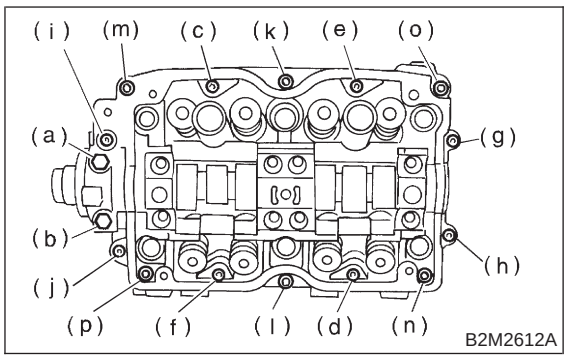
(1) Camshaft support (RH)
(2) O-ring
(3) Camshaft (RH)
(4) Oil seal
(5) Plug

1) Apply a coat of engine oil to camshaft journals and install camshaft (RH).
2) Install camshaft cap.
(1) Apply liquid gasket on the around of camshaft cap.

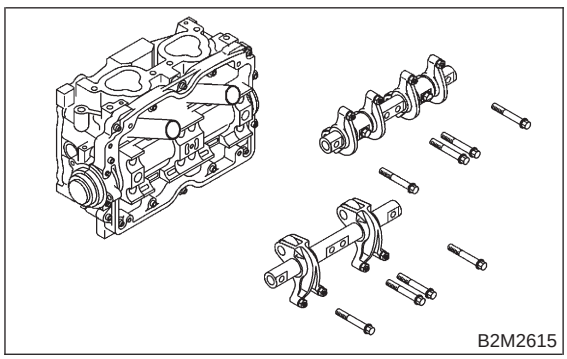
Liquid gasket:
THREE BOND 1280B (Part No. 0029431130)



(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.

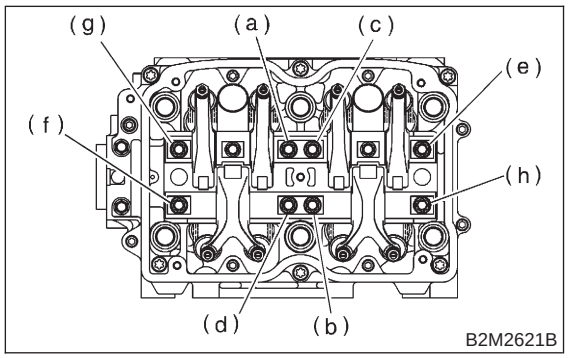


(3) Install valve rocker assembly.
<Ref. to 2-3a [W3E0].>



(4) Tighten bolts (a) through (h) in alphabetical sequence.

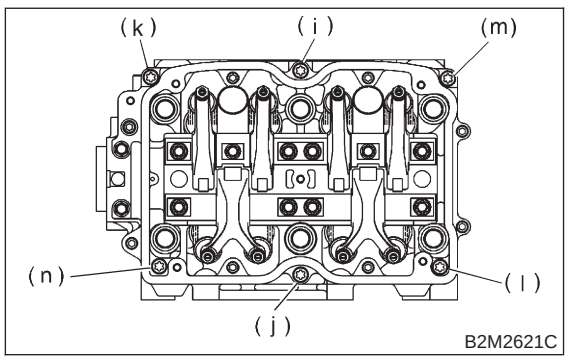
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.

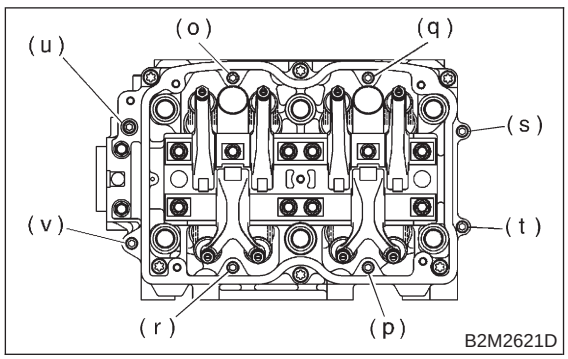
ST 499427000 TORX PLUS

Tightening torque:
18±2 N·m (1.8±0.2 kg-m, 13.0±1.4 ft-lb)



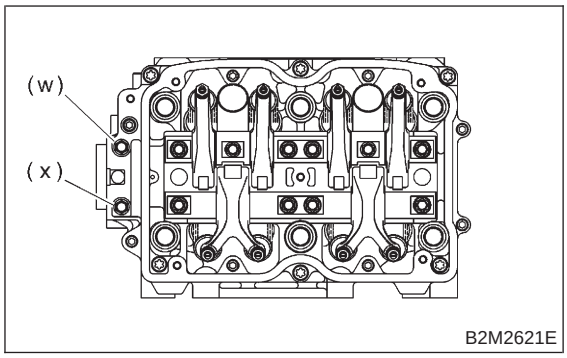
(6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



(7) Tighten bolts (o) through (p) in alphabetical sequence.

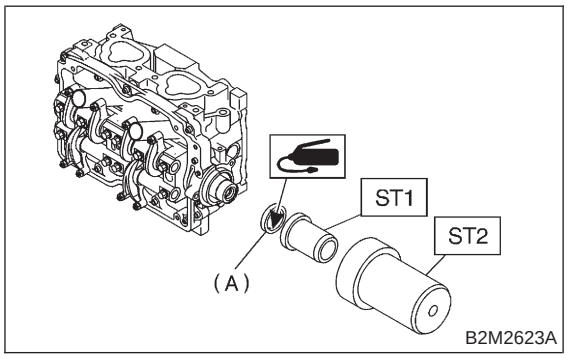
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



3) Apply a coat of grease to oil seal lips and install oil seal (A) on camshaft using ST1 and ST2.

CAUTION:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER



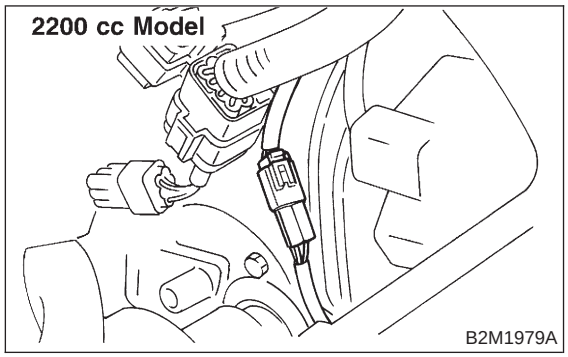
4) Install plug using ST.

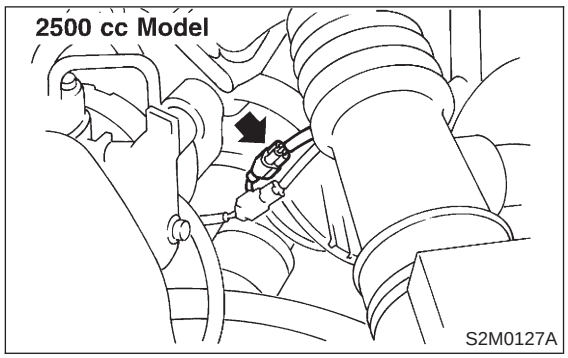
ST 499587100 OIL SEAL INSTALLER

3. RELATED PARTS

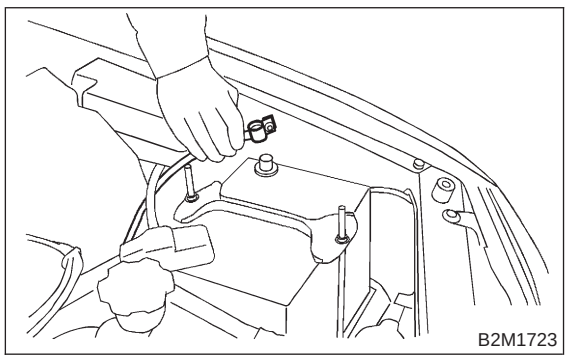
Install timing belt, camshaft sprockets and related parts.
<Ref. to 2-3a [W2C0].>

7) Connect front oxygen sensor connector.





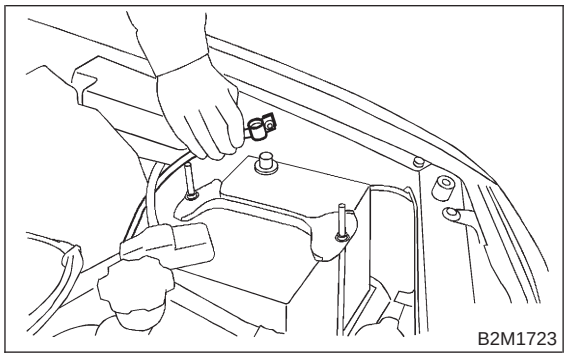
8) Connect battery ground cable.



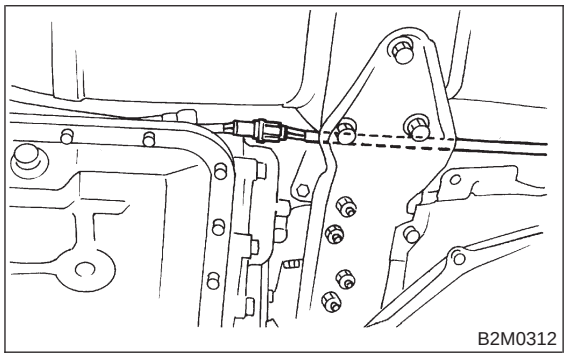
2. Rear Catalytic Converter

A: REMOVAL

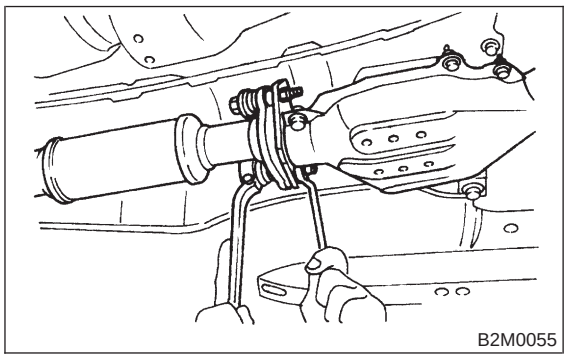
1) Disconnect battery ground cable.



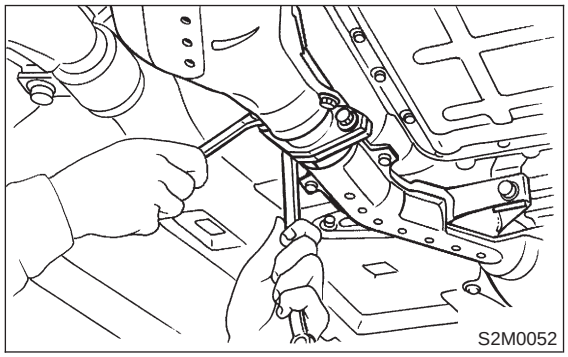
2) Lift-up the vehicle.
3) Disconnect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



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

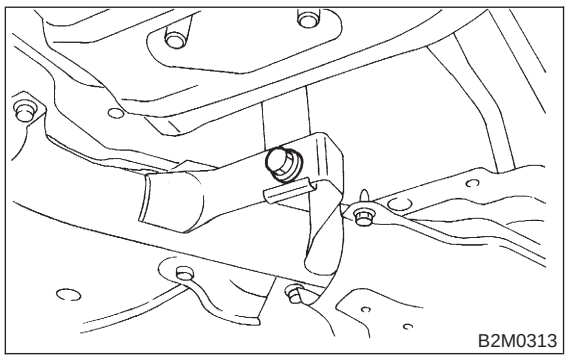


5) Separate center exhaust pipe and rear catalytic converter assembly from front catalytic converter.


S2M0052

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

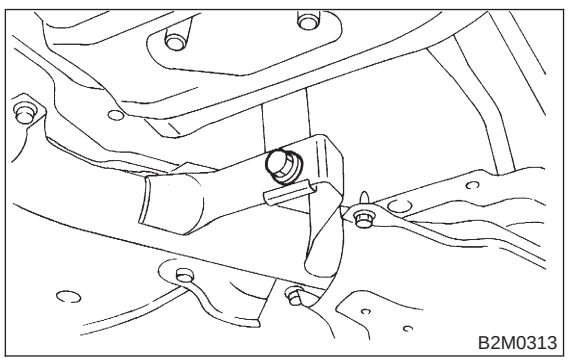
CAUTION:
● Be careful not to pull down center exhaust pipe.
● After removing center exhaust pipe, do not apply excessive pulling force on front catalytic converter and front exhaust pipe.


B2M0313

B: INSTALLATION

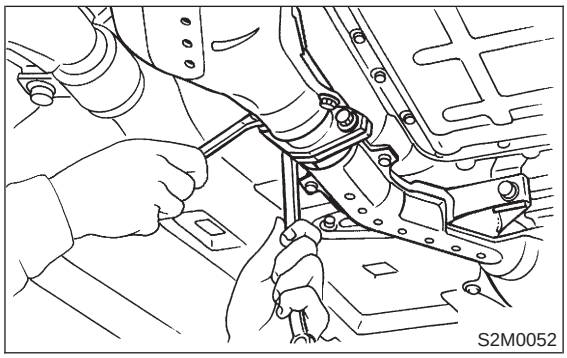
CAUTION:
Replace gaskets with new ones.

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


B2M0313

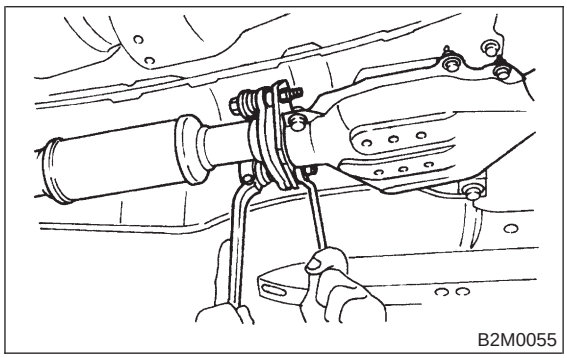
2) Install center exhaust pipe to front catalytic converter.

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


S2M0052

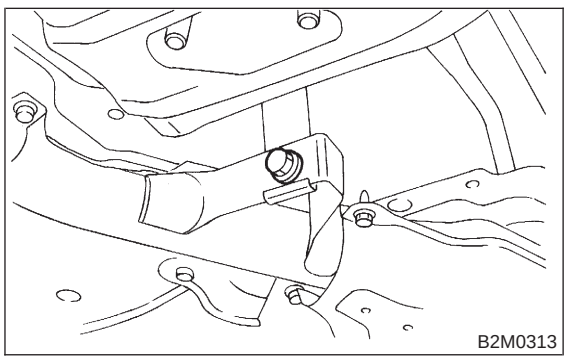
3) Install center exhaust pipe to rear exhaust pipe.

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

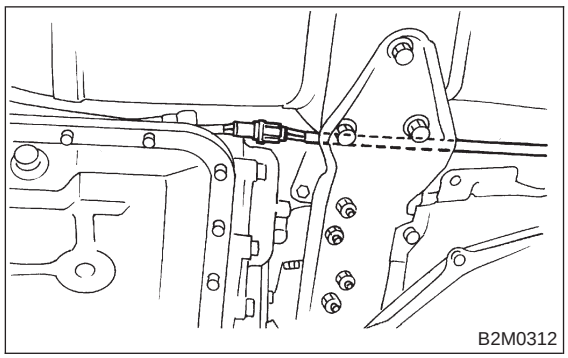

B2M0055

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

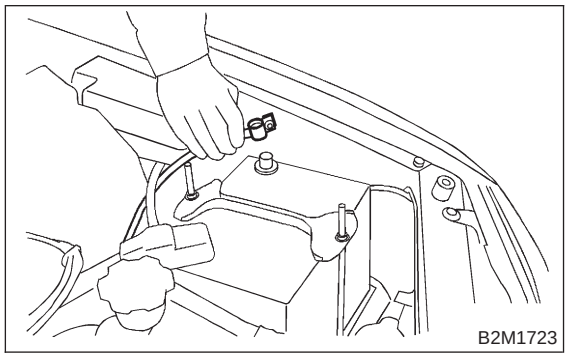
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


B2M0313

5) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



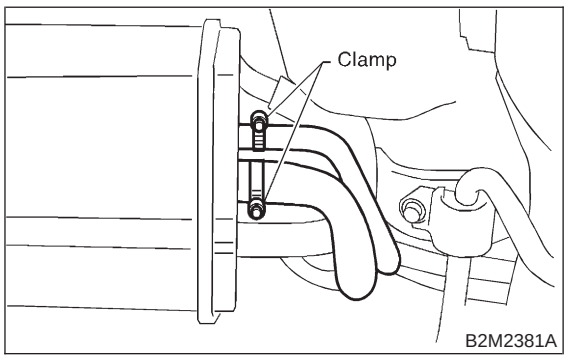
6) Lower the vehicle.
7) Connect battery ground cable.



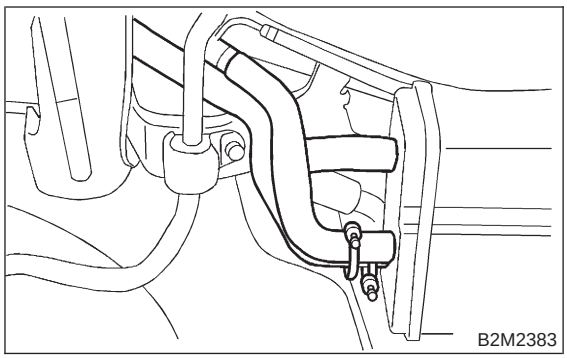
3. Canister

A: REMOVAL AND INSTALLATION

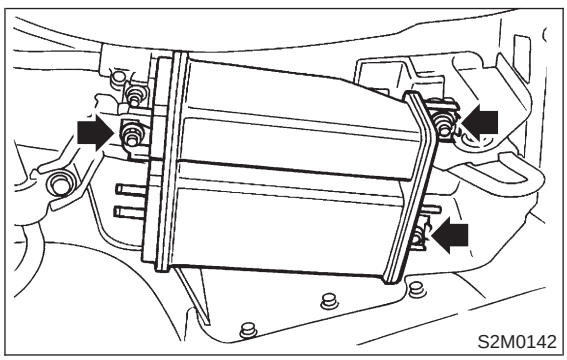
1) Lift-up the vehicle.
2) Loosen two clamps which hold two canister hoses.



3) Disconnect evaporation three hoses from canister.



4) Remove canister from body.



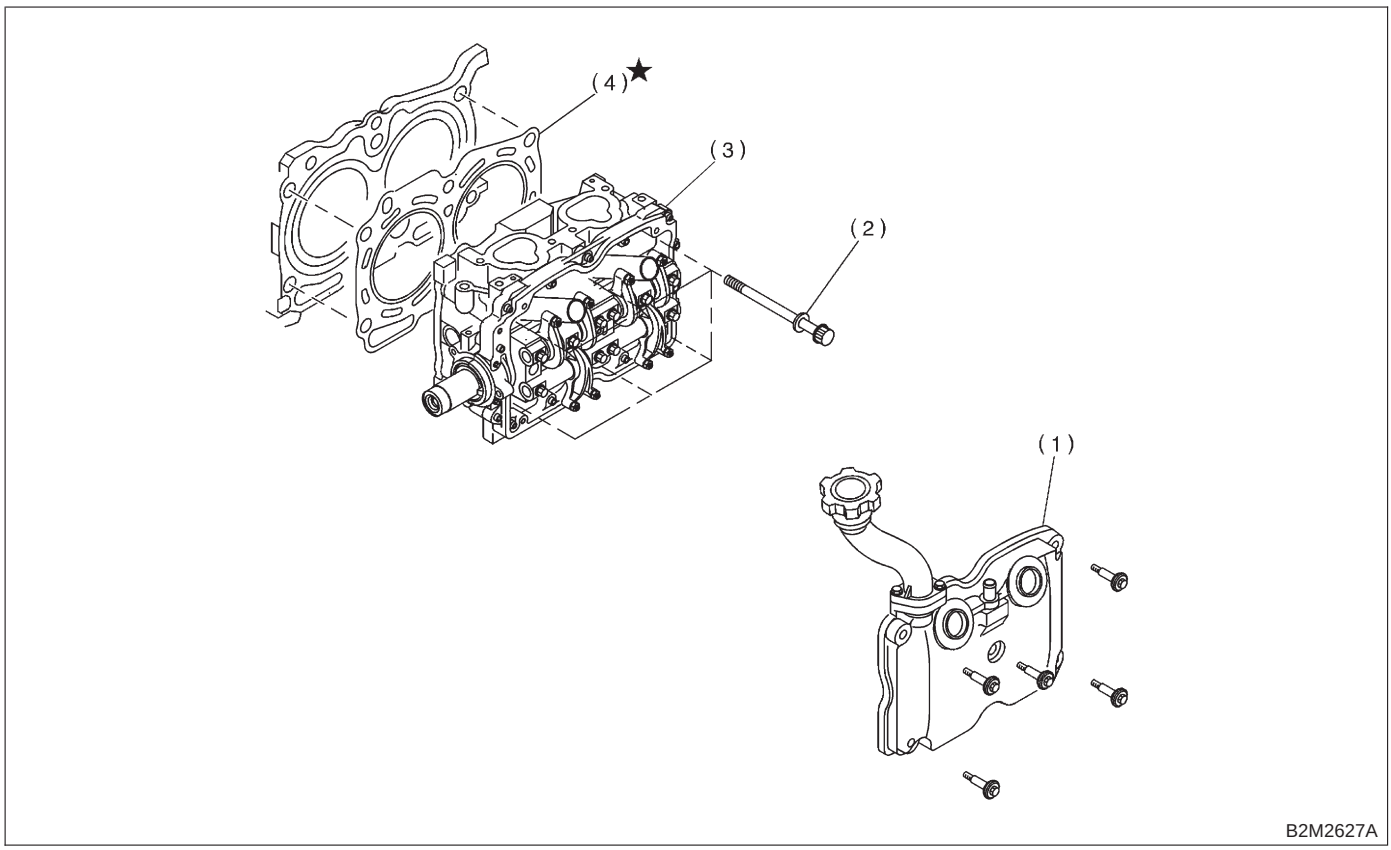
5. Cylinder Head

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(s).
4) Remove generator and bracket.
5) Remove A/C compressor and bracket. (With A/C model)
6) Disconnect spark plug cords.
7) Remove connector bracket attaching bolt.
8) Remove camshaft position sensor and camshaft position sensor support.
9) Disconnect oil pressure switch connector.
10) Disconnect blow-by hose.
11) Remove intake manifold. <Ref. to 2-7 [W4A0].>

2. CYLINDER HEAD

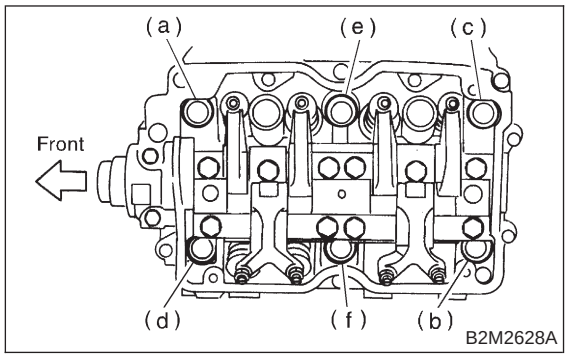


(1) Rocker cover
(2) Cylinder head bolt
(3) Cylinder head
(4) Cylinder head gasket

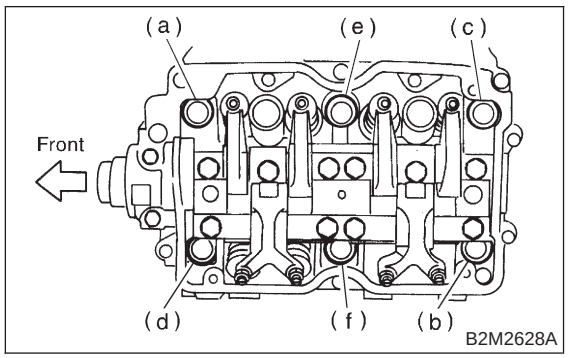
1) Remove timing belt, camshaft sprocket and related parts.
<Ref. to 2-3a [W2A0].>
2) Remove oil level gauge guide attaching bolt (left hand only) and oil level gauge guide.
3) Remove rocker cover.

4) Remove cylinder head bolts in alphabetical sequence shown in figure.

CAUTION:
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



5) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
6) Remove bolts (a) and (b) to remove cylinder head.

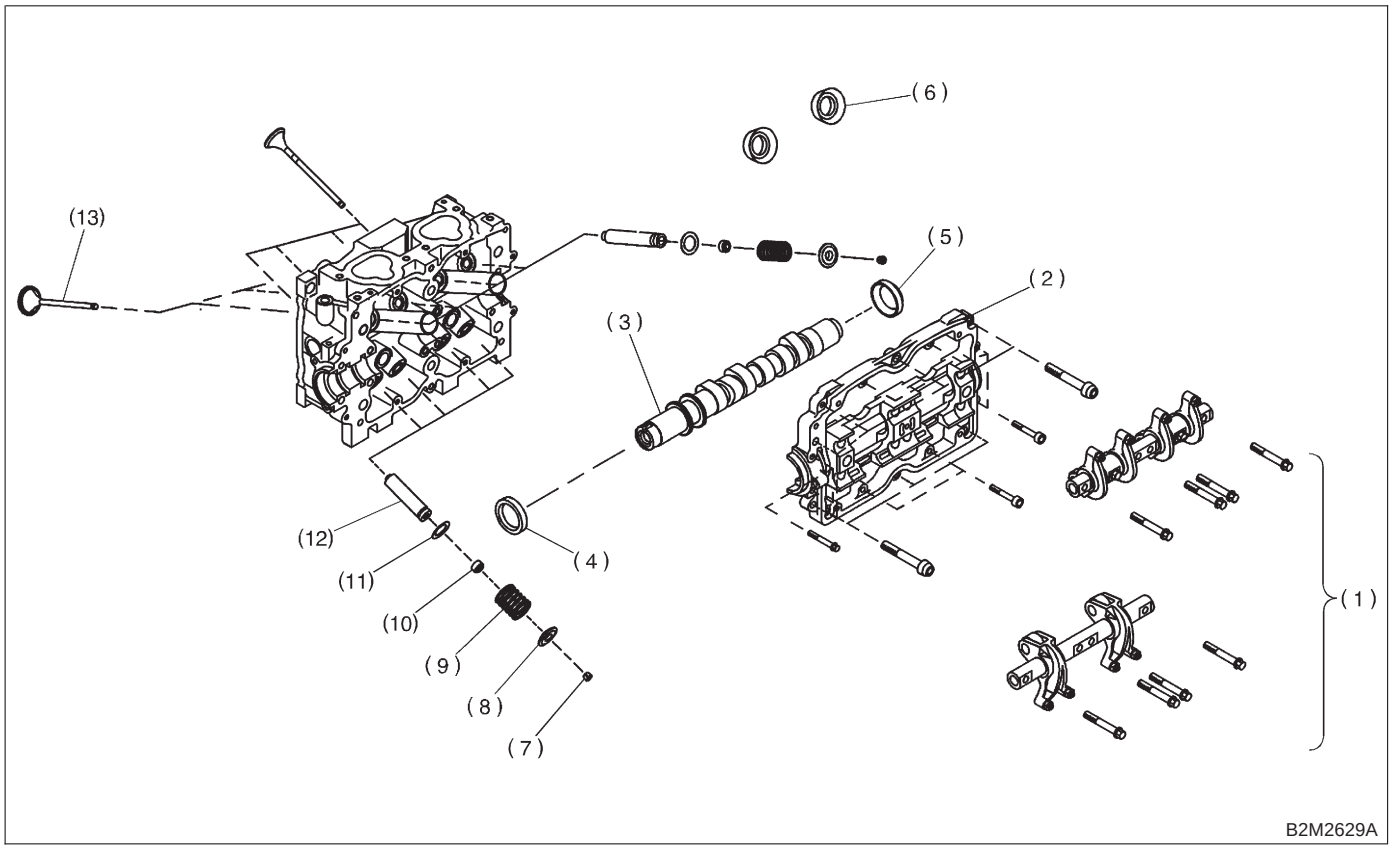


7) Remove cylinder head gasket.

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

8) Similarly, remove right side cylinder head.

B: DISASSEMBLY

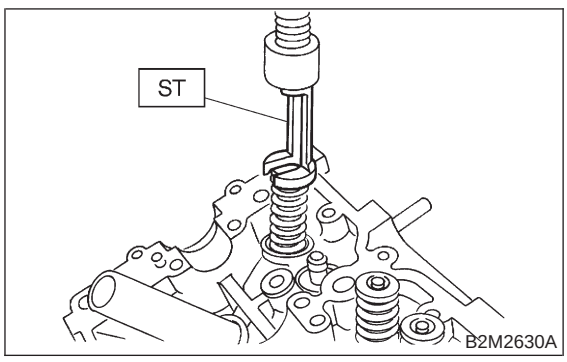


(1) Valve rocker ASSY
(2) Camshaft cap
(3) Camshaft
(4) Oil seal
(5) Plug
(6) Spark plug pipe gasket
(7) Retainer key
(8) Retainer
(9) Valve spring
(10) Oil seal
(11) Valve spring seat
(12) Valve guide
(13) Valve

1) Remove valve rocker assembly, camshaft cap and camshaft. <Ref. to 2-3a [W2A0].>
2) Remove oil seal.
3) Remove plug.
4) Place cylinder head on ST.
ST 498267800 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.**



C: INSPECTION

1. CYLINDER HEAD

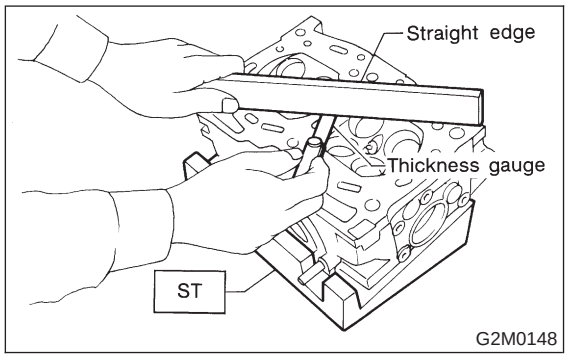
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase 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:
0.3 mm (0.012 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

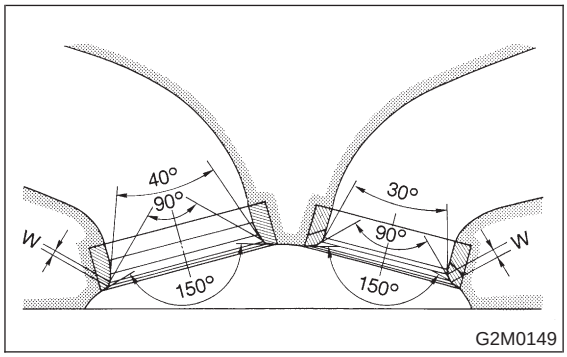
CAUTION:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

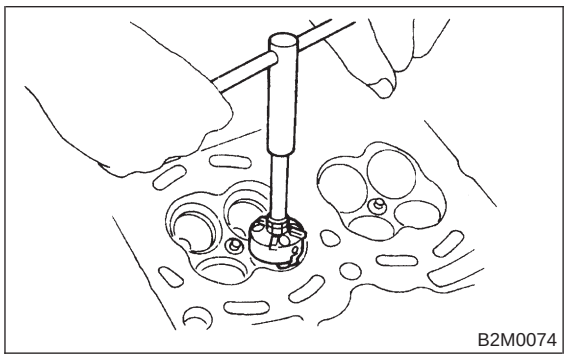


2. VALVE SEAT

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 1.0 mm (0.039 in)
Limit 1.7 mm (0.067 in)
Exhaust
Standard 1.4 mm (0.055 in)
Limit 2.1 mm (0.083 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)

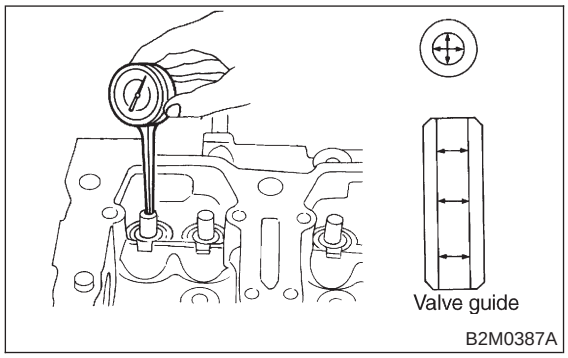
Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)



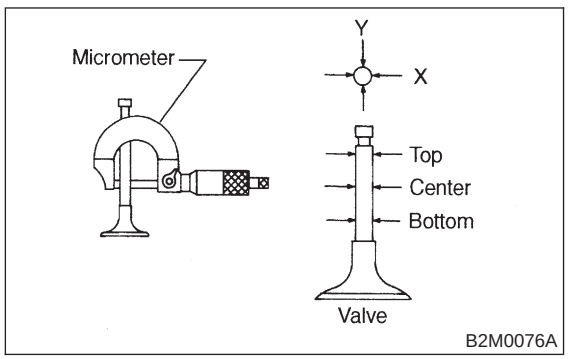
Valve stem outer diameters:

Intake

5.945 — 5.960 mm (0.2341 — 0.2346 in)

Exhaust

5.950 — 5.965 mm (0.2343 — 0.2348 in)

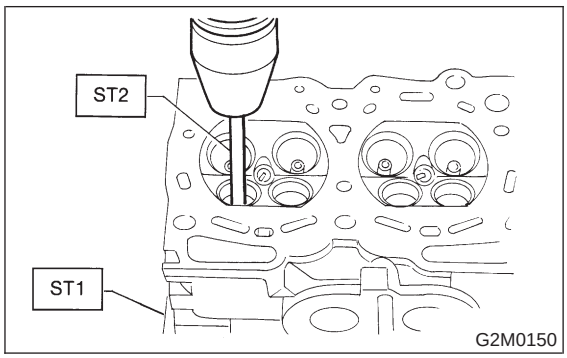


2) If the clearance between valve guide and stem exceeds the specification, replace guide as follows:

(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

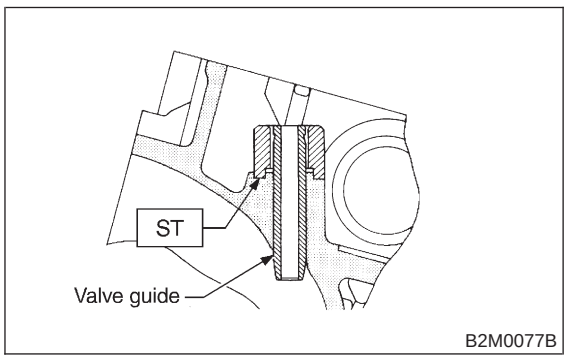
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767400 VALVE GUIDE REMOVER



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

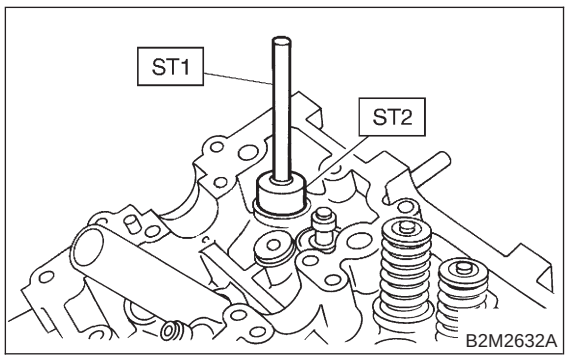
Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER



(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.

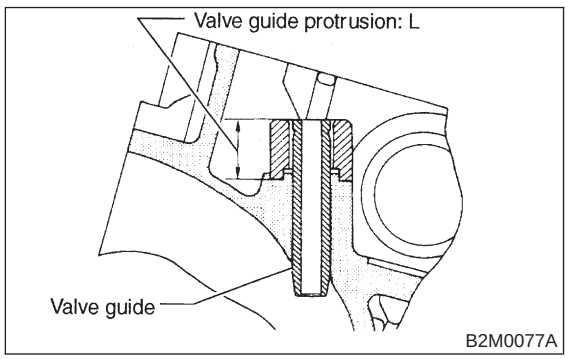
(5) Put new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767400 VALVE GUIDE REMOVER
Intake side:
ST2 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

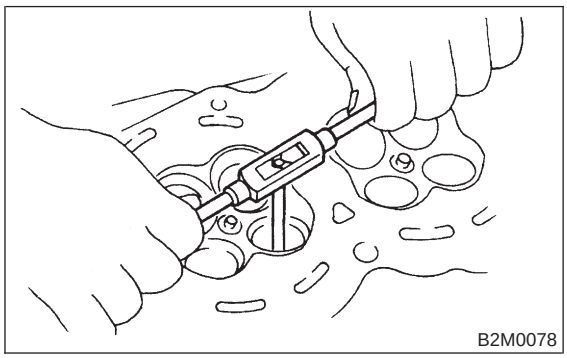
Valve guide protrusion: L
Intake
20.0 — 20.5 mm (0.787 — 0.807 in)
Exhaust
16.5 — 17.0 mm (0.650 — 0.669 in)



(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.

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.

ST 499767400 VALVE GUIDE REAMER



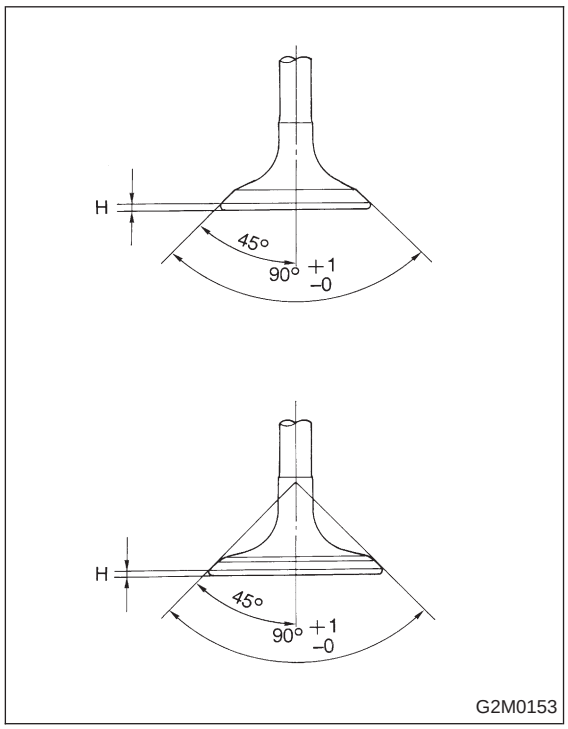
(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

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 0.6 mm (0.024 in)
Exhaust
Standard 1.2 mm (0.047 in)
Limit 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)

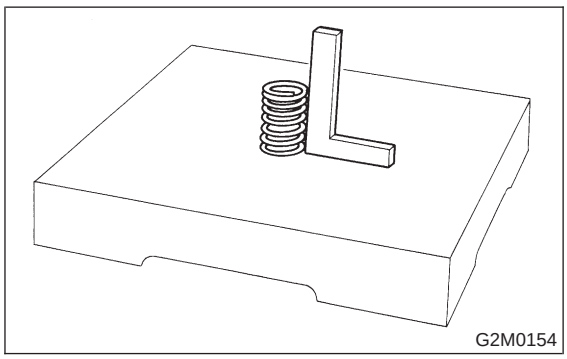


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to 2-3a [W5C2].> Install a new intake valve oil seal after lapping.

5. VALVE SPRING

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	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	214.8 — 246.2 N (21.9 — 25.1 kg, 48.3 — 55.3 lb) / 45.0 mm (1.772 in)
	526.6 — 581.6 N (53.7 — 59.3 kg, 118.4 — 130.8 lb) / 34.7 mm (1.366 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

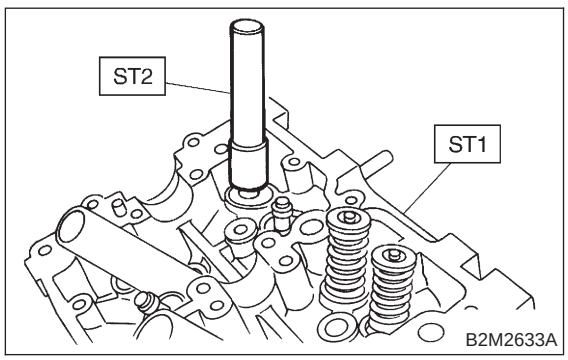
Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place cylinder head on ST1.
2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

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

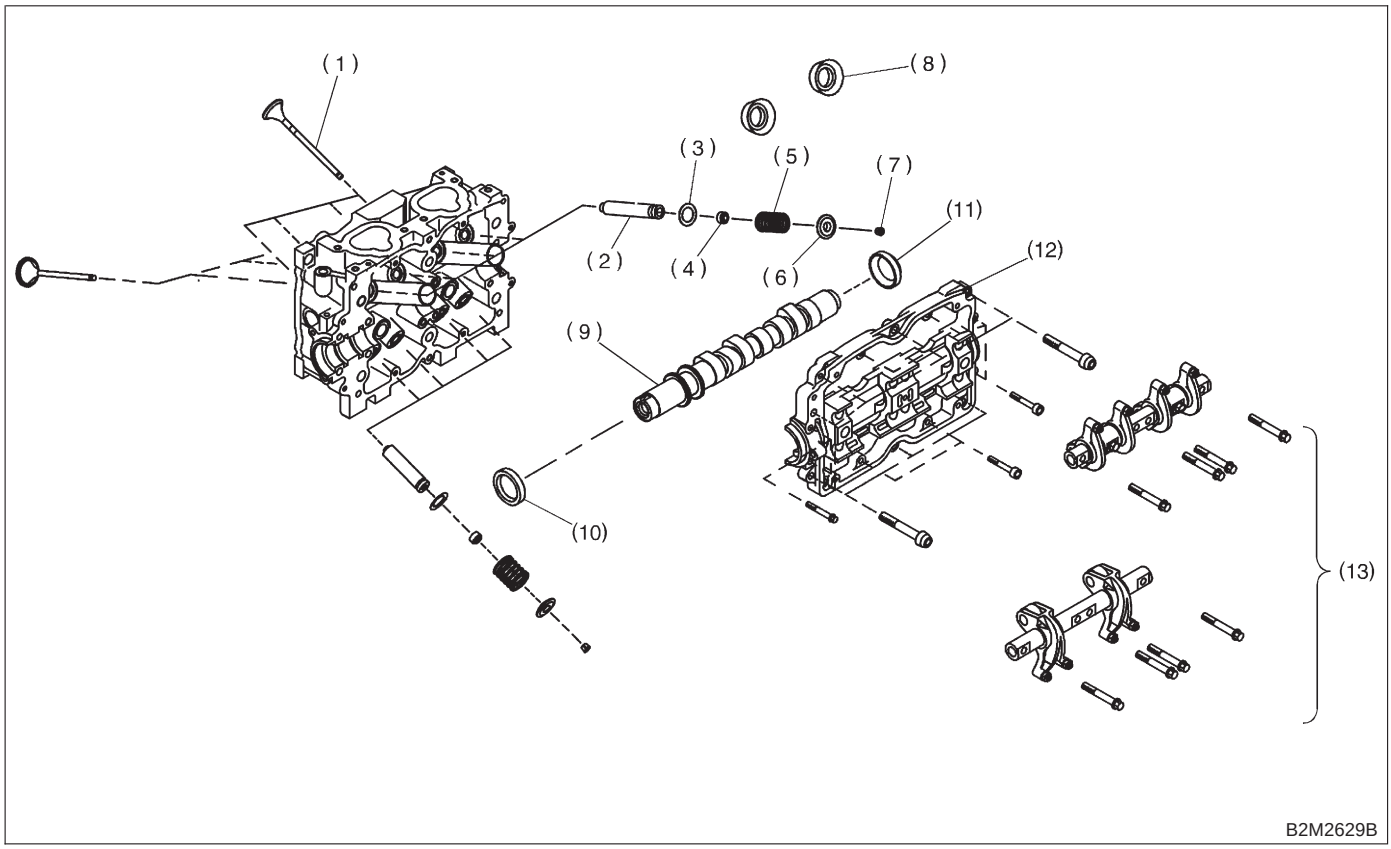
ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

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

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



D: ASSEMBLY



(1) Valve
(2) Valve guide
(3) Valve spirng seat
(4) Oil seal
(5) Valve spring
(6) Retainer
(7) Retainer key
(8) Spark plug gasket
(9) Camshaft
(10) Oil seal
(11) Plug
(12) Camshaft cap
(13) Valve rocker ASSY

1) Installation of valve spring and valve
(1) Place cylinder head on ST.

ST 498267400 CYLINDER HEAD TABLE

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

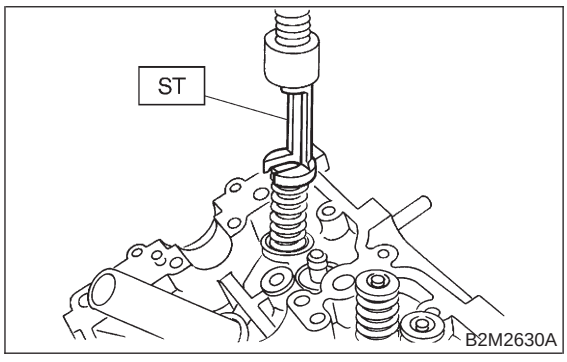
CAUTION:
When inserting valve into valve guide, use special care not to damage the oil seal lip.

(3) Install valve spring and retainer.

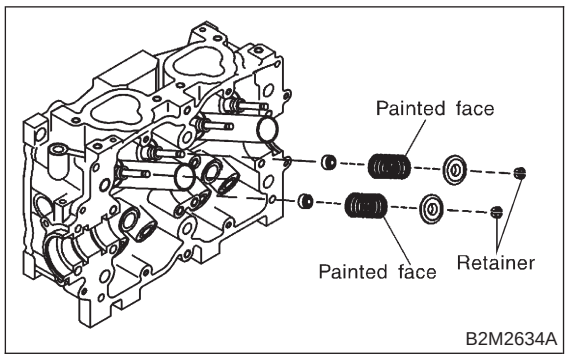
CAUTION:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(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.

2) Install plug.

3) Install camshaft, camshaft cap and valve rocker assembly.

<Ref. to 2-3a [W4C0].>

4) Install plug using ST.

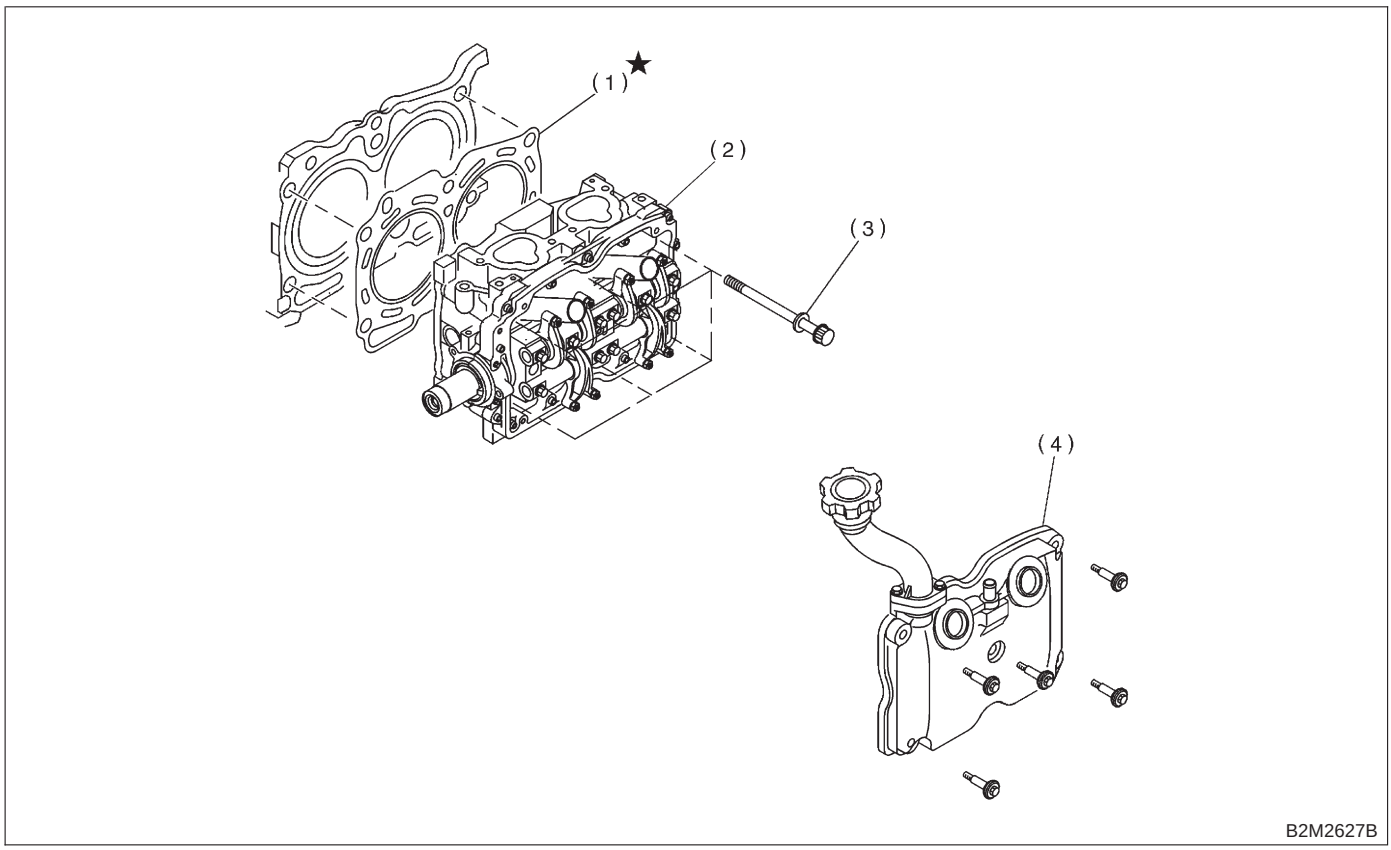
ST 499587100 OIL SEAL INSTALLER

5) Install oil seal using ST.

ST 499587500 OIL SEAL INSTALLER

E: INSTALLATION

1. CYLINDER HEAD



(1) Cylinder head gasket
(2) Cylinder head
(3) Cylinder head bolt
(4) Rocker cover

1) Install cylinder head and gaskets on cylinder block.

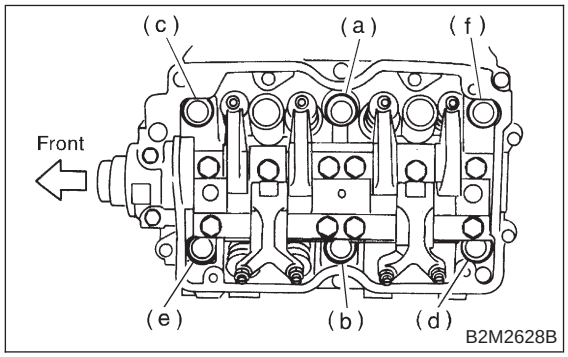
CAUTION:
Use new cylinder head gaskets.

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 (a) and (b) to 34 N·m (3.5 kg-m, 25 ft-lb).
(5) Tighten bolts (c), (d), (e) and (f) 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], do not exceed 180°.



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

2. RELATED PARTS

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

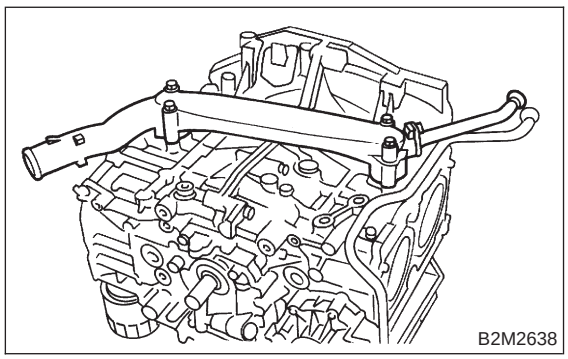
1) Install engine coolant pipe.
2) Install intake manifold. <Ref. to 2-7 [W4D0].>
3) Connect blow-by hose.
4) Connect oil pressure switch connector.
5) Install camshaft position sensor and camshaft position sensor support.
6) Install connector bracket attaching bolt.
7) Connect spark plug cords.
8) Install generator and bracket.
9) Install A/C compressor and bracket. (With A/C model)
10) Install V-belt(s).
11) Remove ENGINE STAND (ST).

6. Cylinder Block

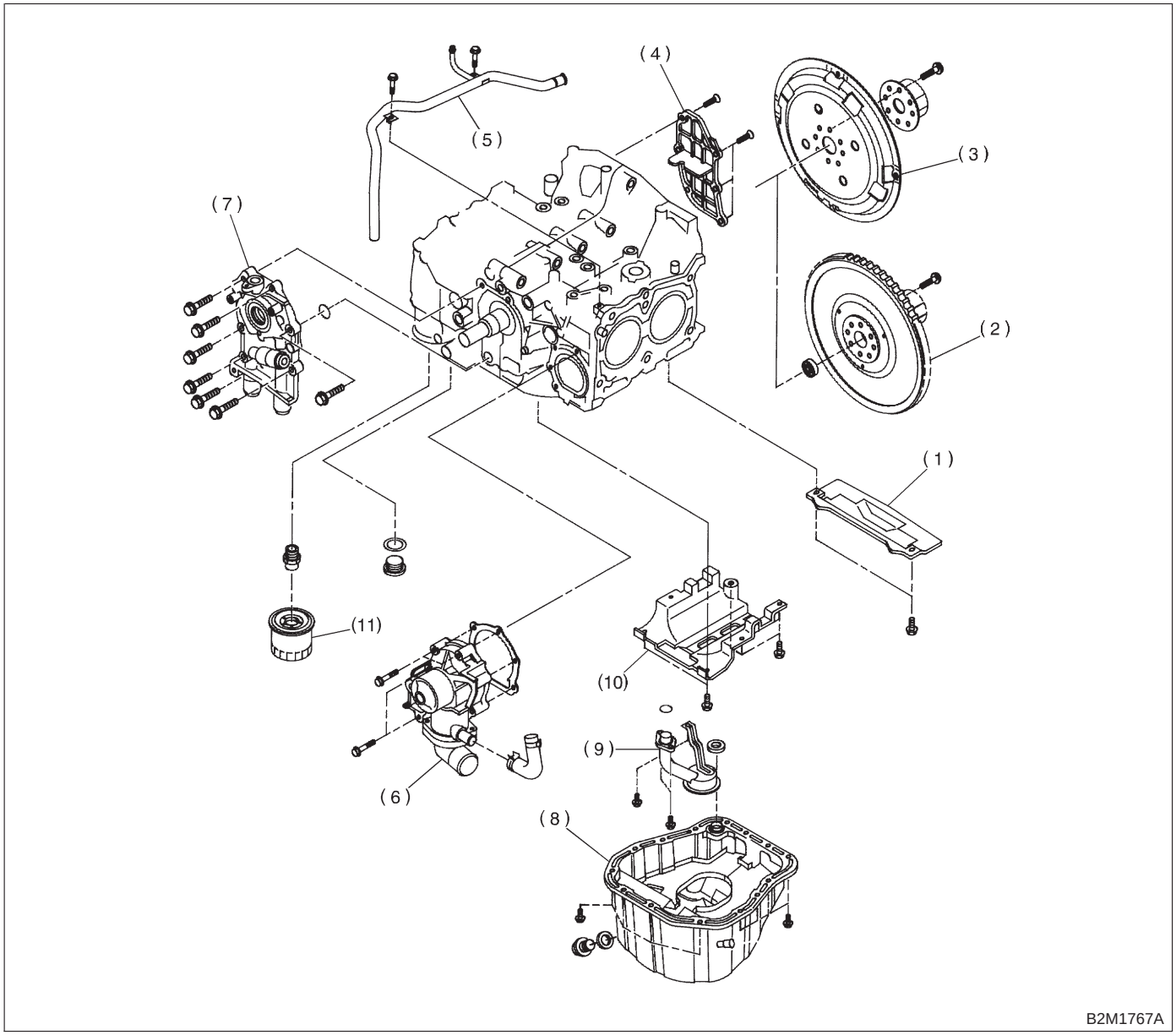
A: REMOVAL

1. RELATED PARTS

1) Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3a [W2A0].>
2) Remove cylinder heads. <Ref. to 2-3a [W5A0].>
3) Remove water pipe. <Ref. to 2-5 [W8A0].>

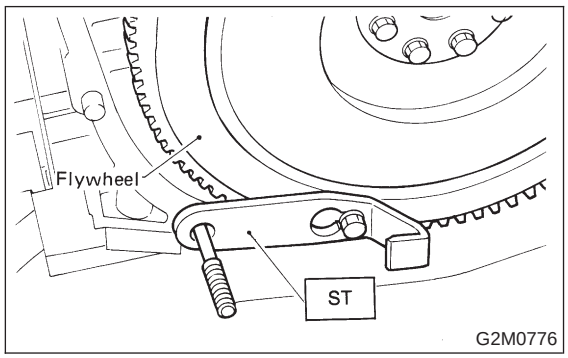


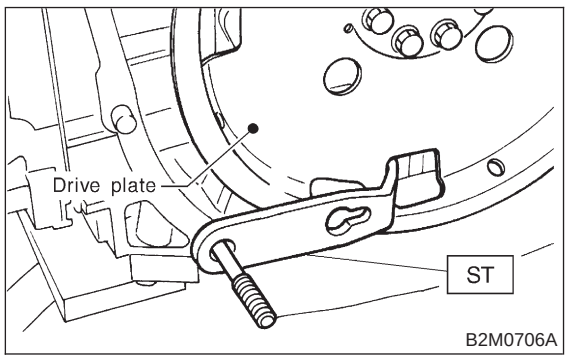
2. OIL PUMP AND WATER PUMP



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

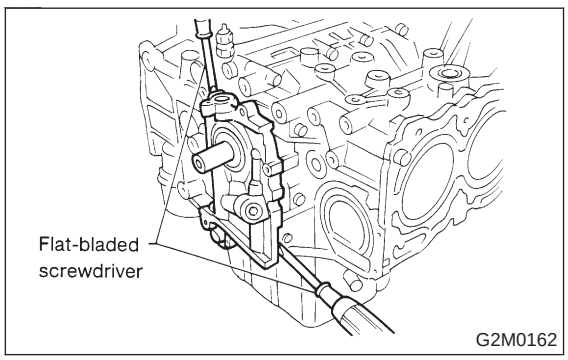
1) Remove clutch housing cover (MT vehicles only).
2) Remove flywheel (MT vehicles only) or drive plate (AT vehicles only).
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER





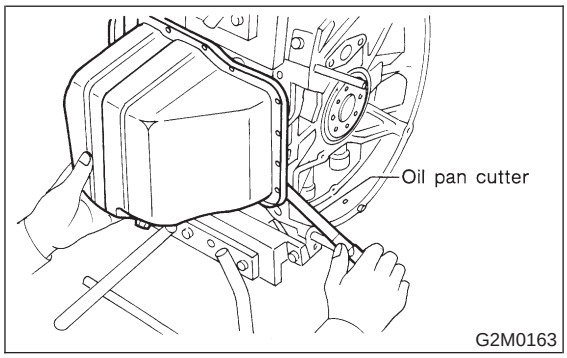
3) Remove oil separator cover.
4) Remove water by-pass pipe for heater.
5) Remove water pump.
6) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in figure when removing oil pump.

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

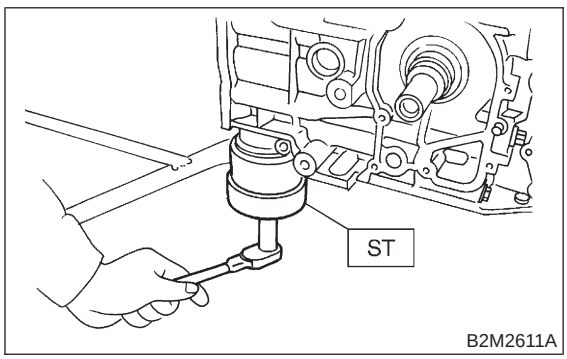


7) Removal of oil pan
(1) Turn cylinder block with #2 and #4 piston sides facing upward.
(2) Remove bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

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

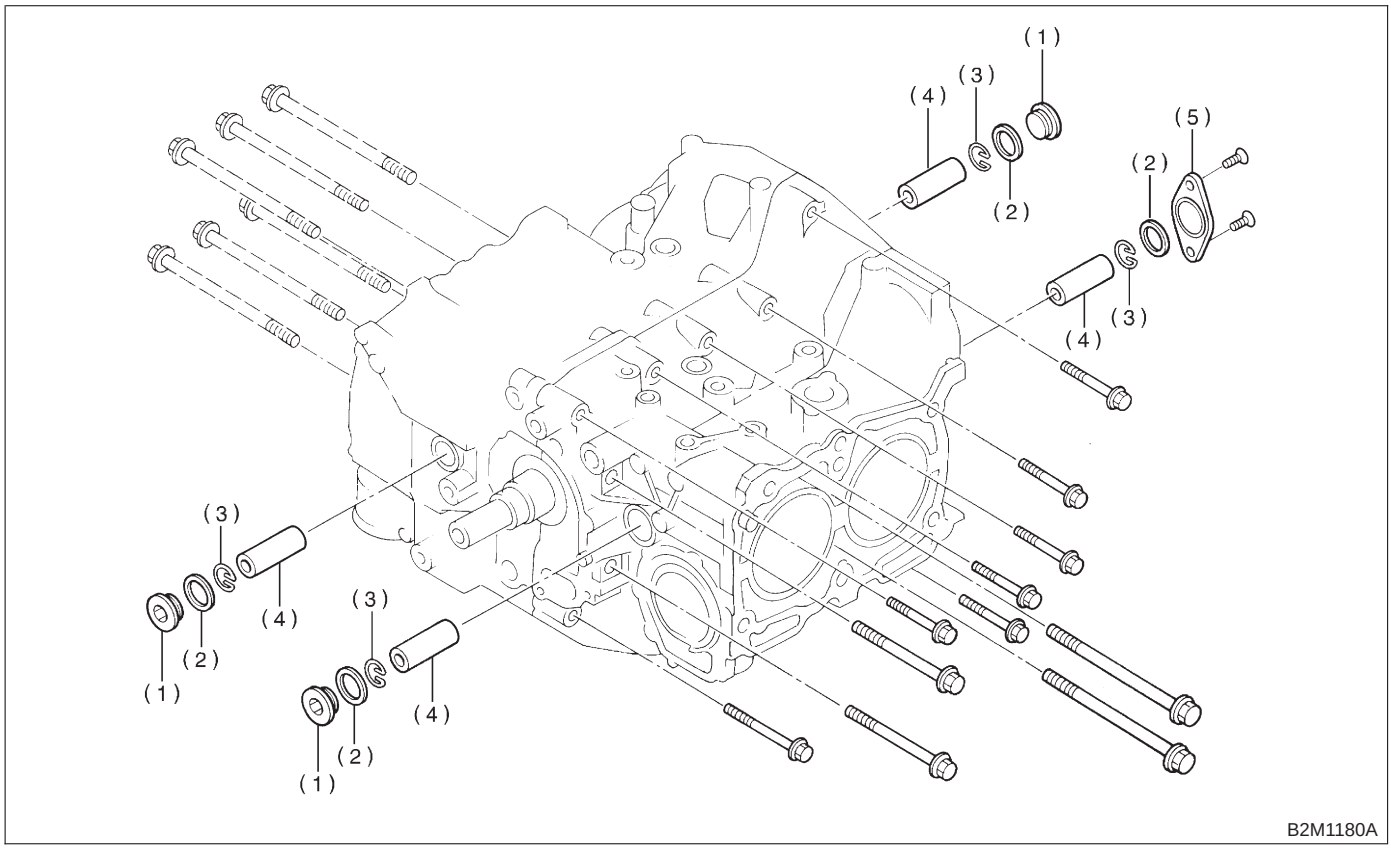


8) Remove oil strainer stay.
9) Remove oil strainer.
10) Remove baffle plate.
11) Remove oil filter using ST.
ST 498187300 OIL FILTER WRENCH



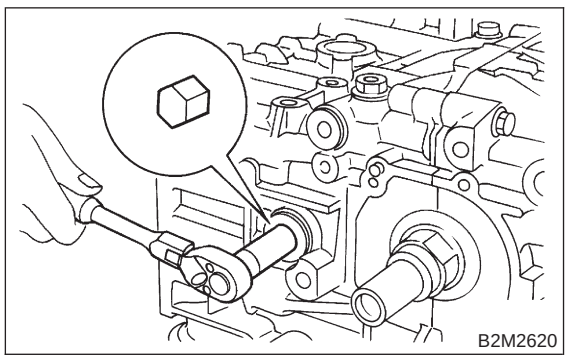
B: DISASSEMBLY

1. PISTON PIN AND CYLINDER BLOCK CONNECTING BOLT

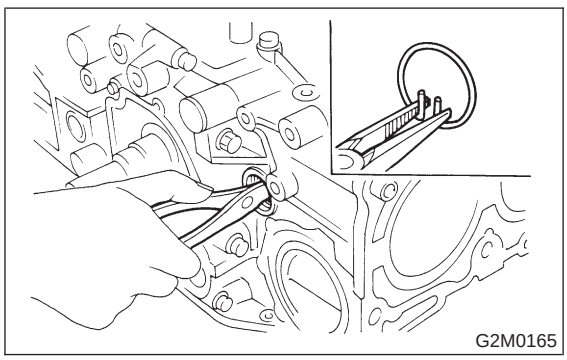


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover

1) Remove service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

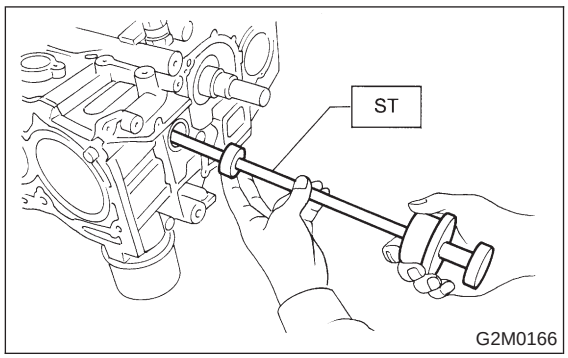


2) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders.



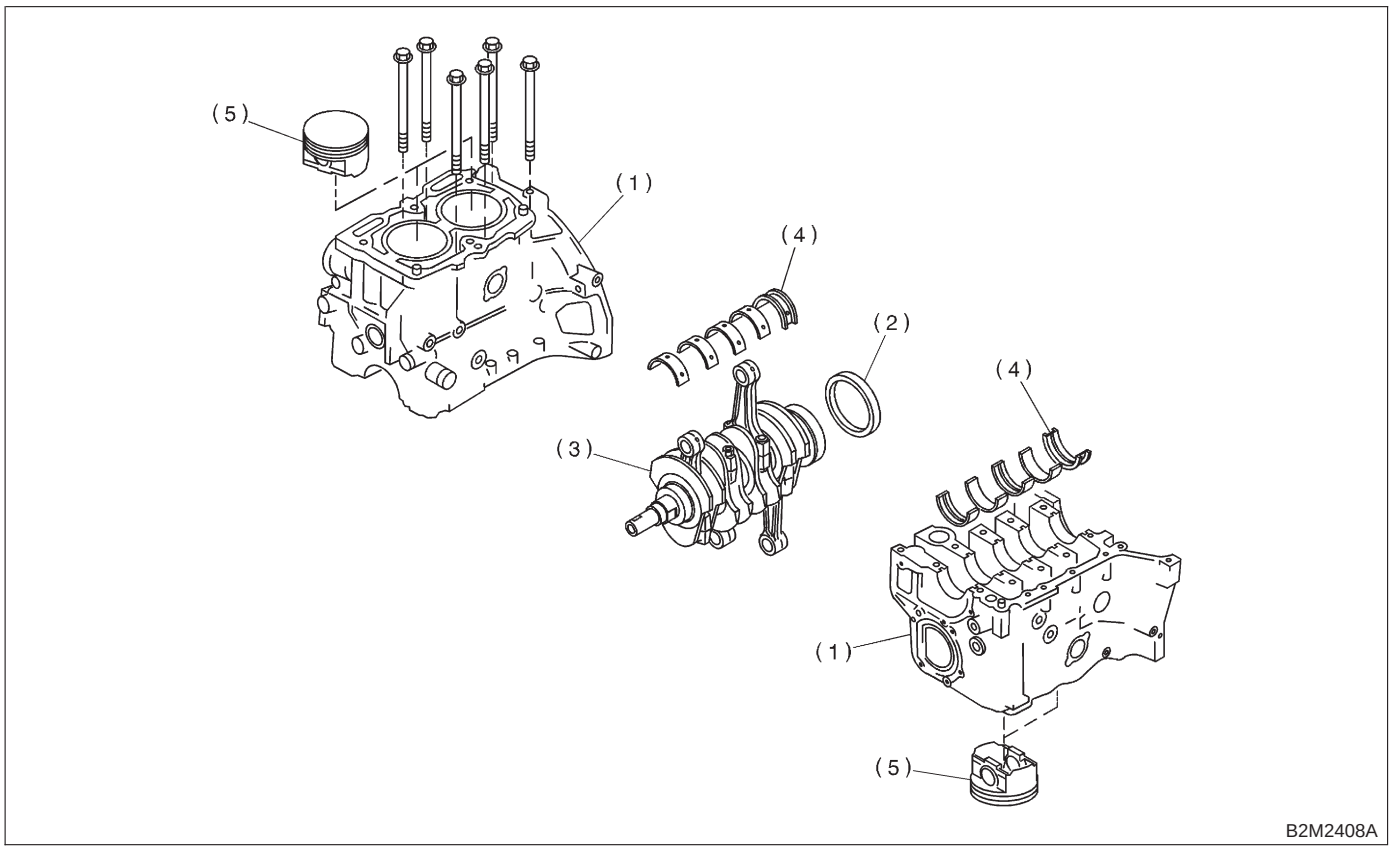
3) Draw out piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

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



4) Similarly remove piston pins from #3 and #4 pistons.
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) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) 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.

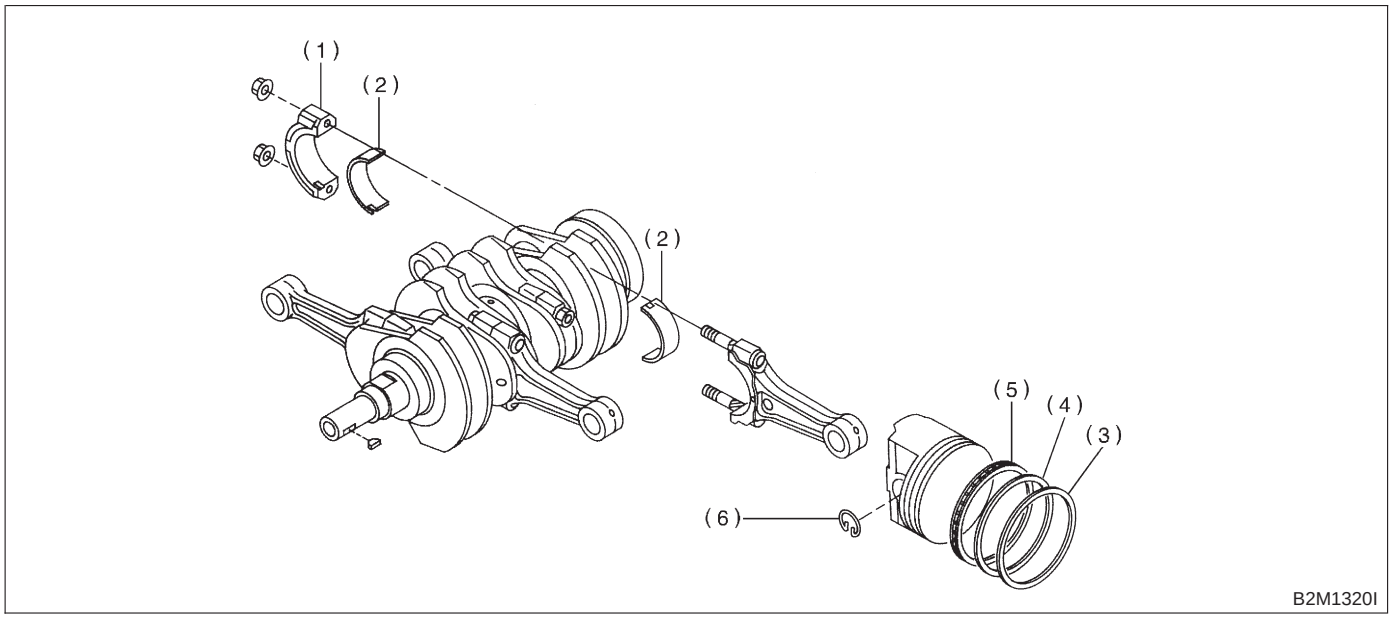
CAUTION:
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

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.

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

CAUTION:
Do not confuse combination of piston and cylinder.

C: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. 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)

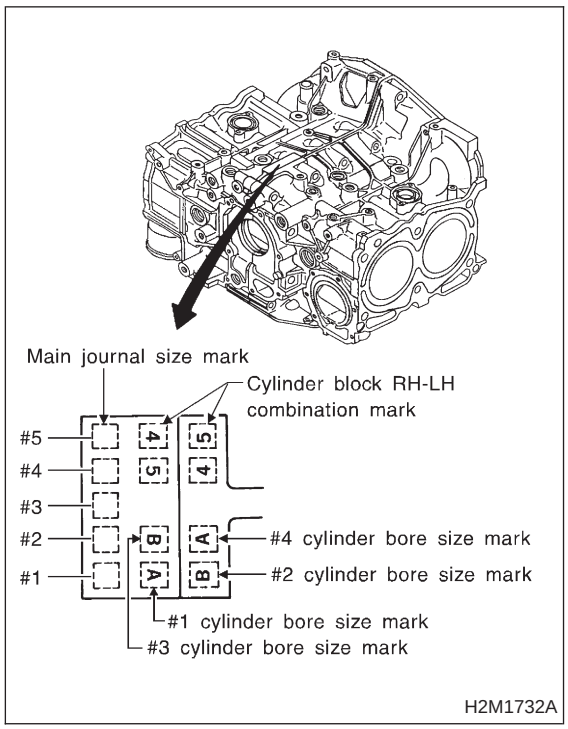
2. CYLINDER AND PISTON

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

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

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

Standard diameter:
A: 96.905 — 96.915 mm (3.8151 — 3.8155 in)
B: 96.895 — 96.905 mm (3.8148 — 3.8151 in)

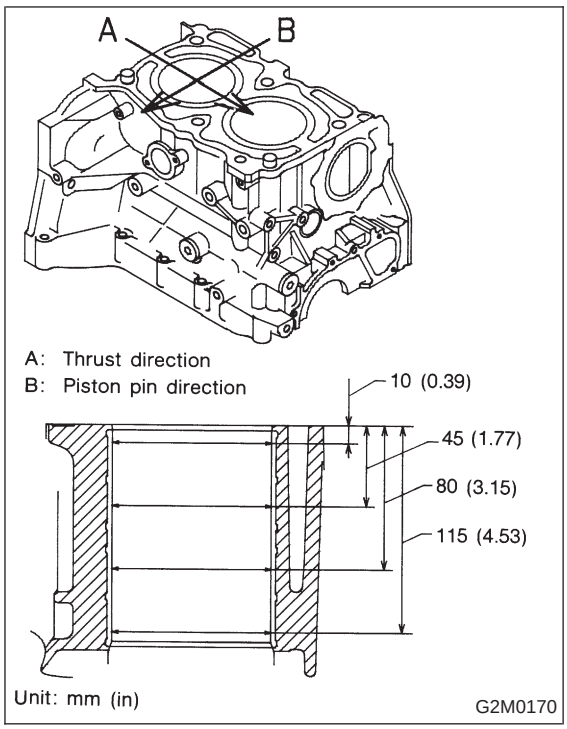


2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

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)



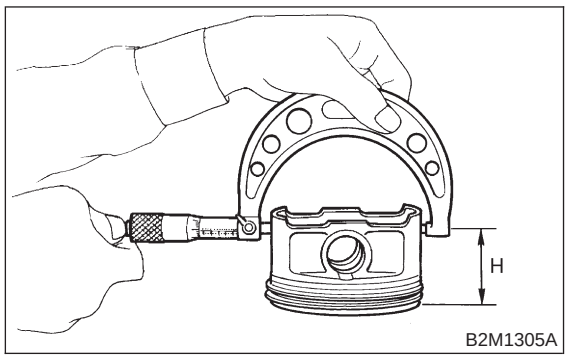
3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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:
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
97.125 — 97.135 mm (3.8238 — 3.8242 in)
0.50 mm (0.0197 in) oversize
97.375 — 97.385 mm (3.8337 — 3.8340 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.

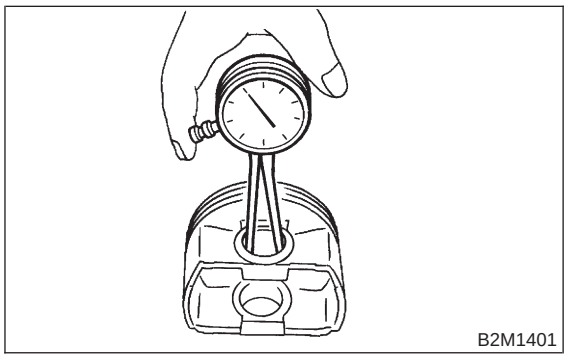
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

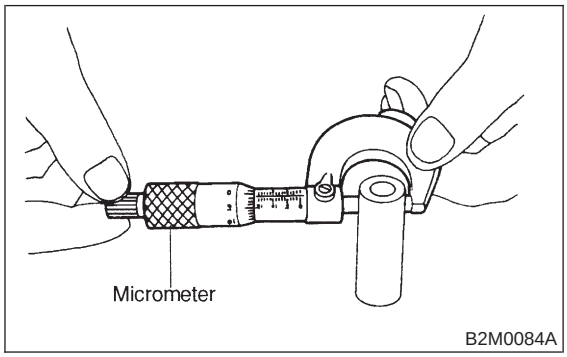
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

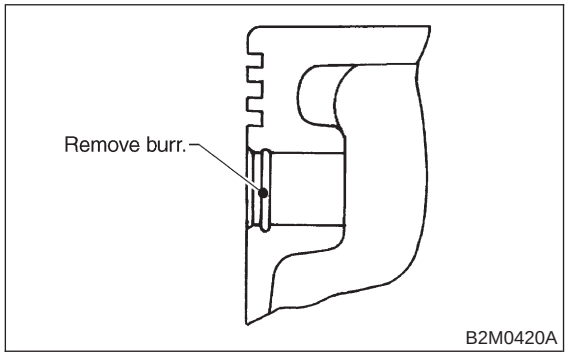
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to 2-3a [W6C2].> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
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 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)





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

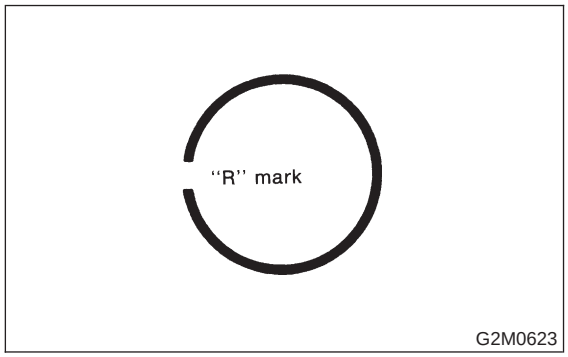


5) Check piston pin circlip for distortion, cracks and wear.

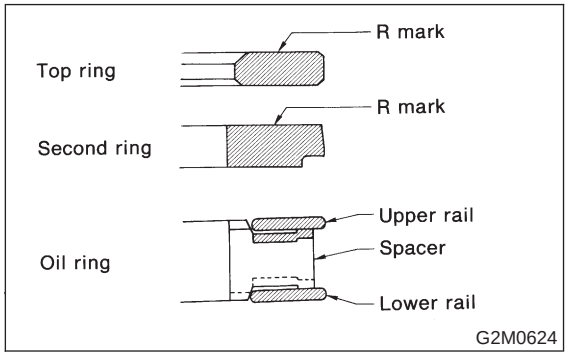
4. PISTON RING

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.

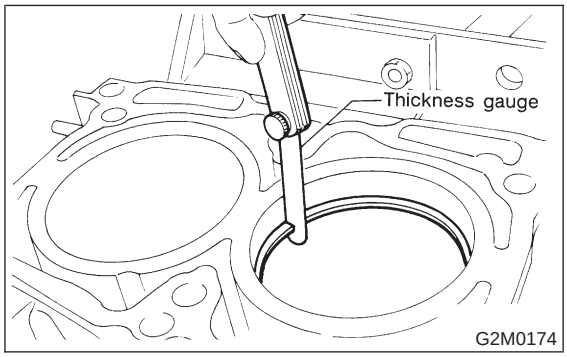


● The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



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

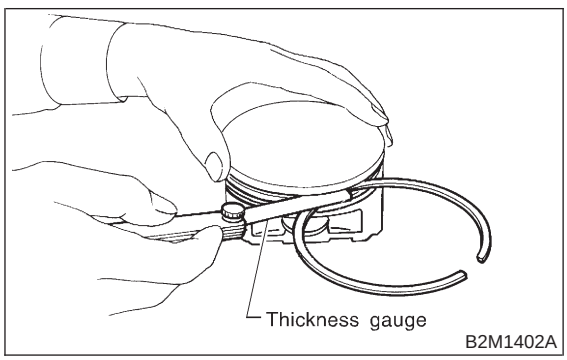
		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.0146 — 0.0205)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.0 (0.039)



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.

		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)

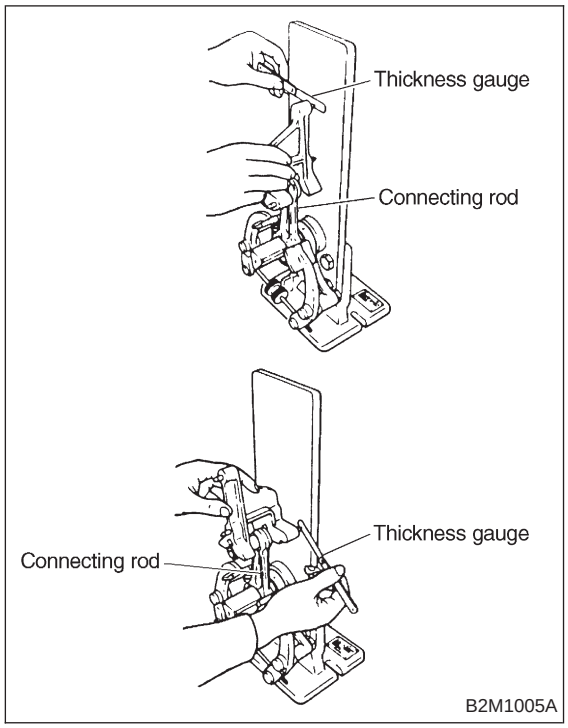


5. CONNECTING ROD

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

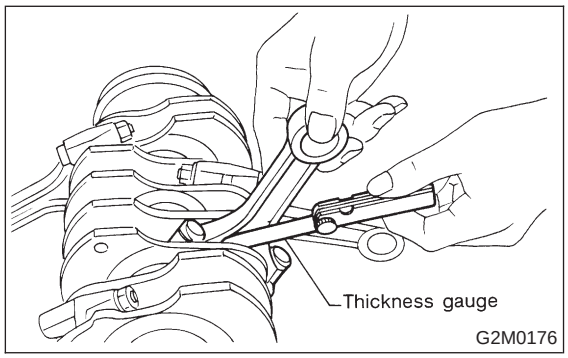
2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

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. (See the table below.)

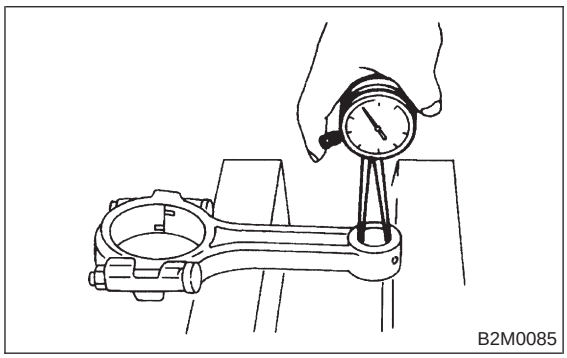
Connecting rod oil clearance:
Standard
0.010 — 0.038 mm (0.0004 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

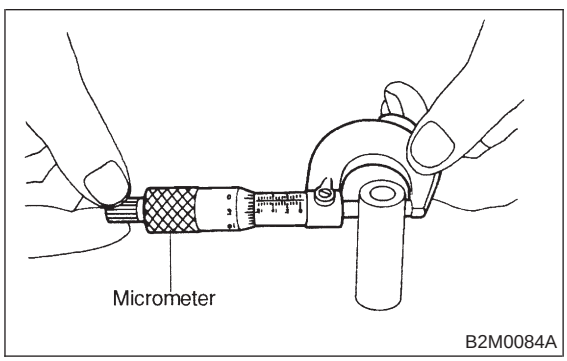
Unit: mm (in)

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)

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.

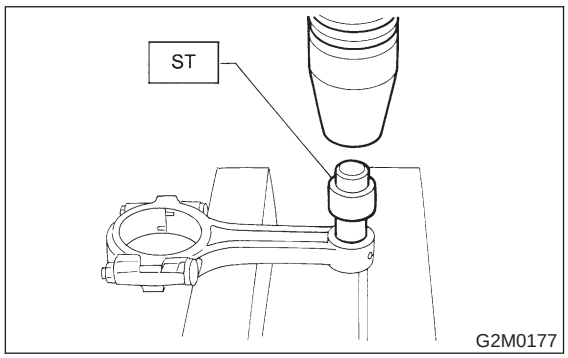
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)





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



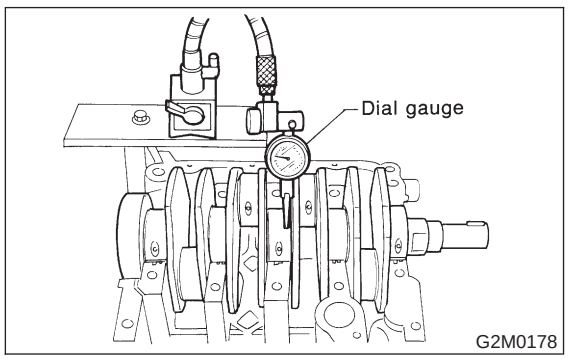
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

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.

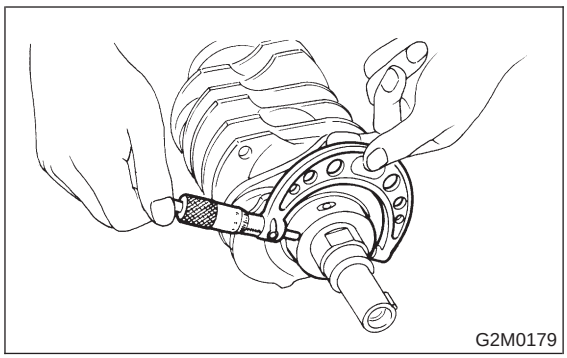
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



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
0.250 mm (0.0098 in)



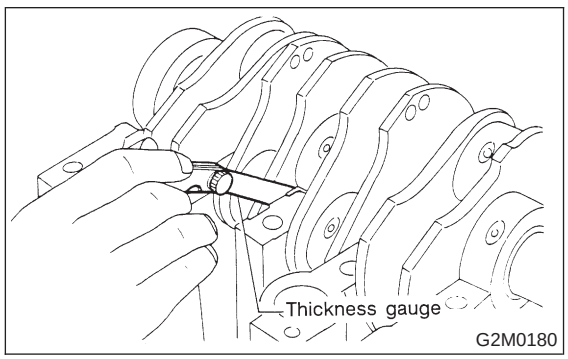
Unit: mm (in)

		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)	59.962 — 59.978 (2.3607 — 2.3613)	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.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	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)	59.742 — 59.758 (2.3520 — 2.3527)	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

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)



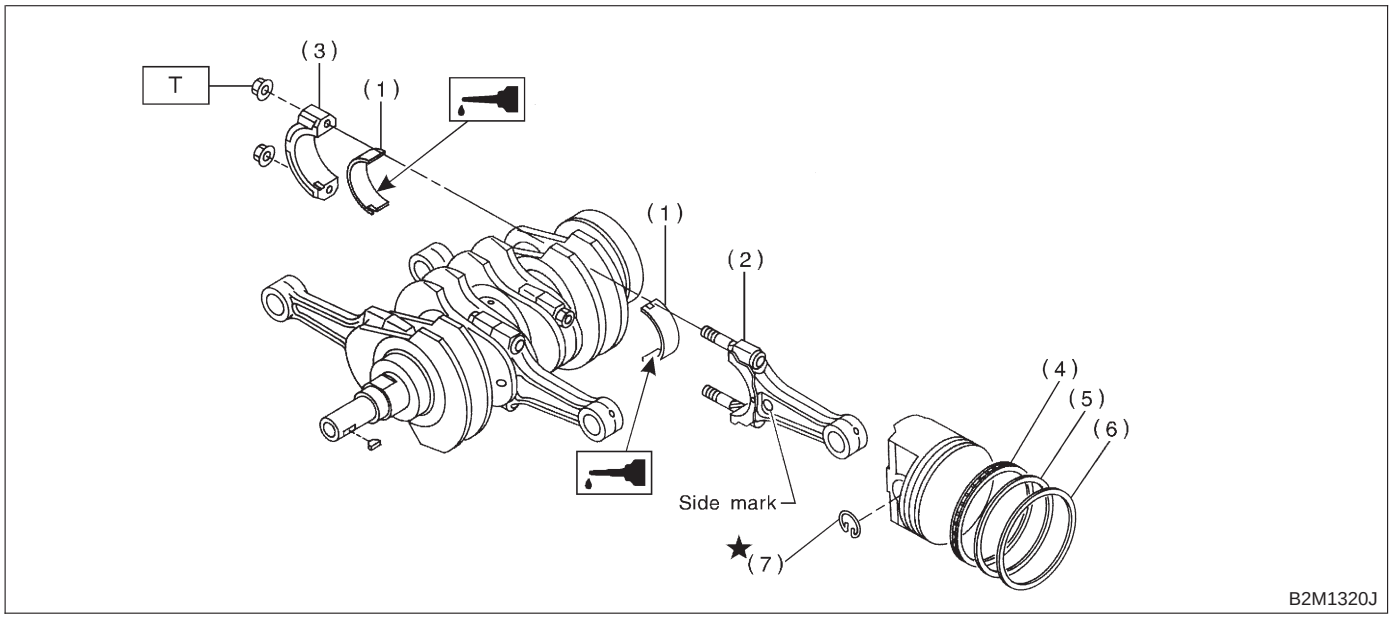
5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition 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	0.045 (0.0018)

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

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.

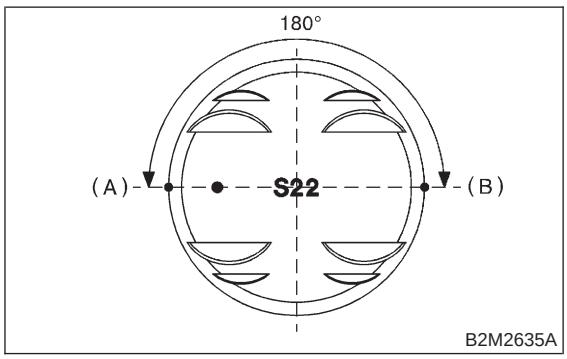
CAUTION:
Position each connecting rod with the side marked facing forward.

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.

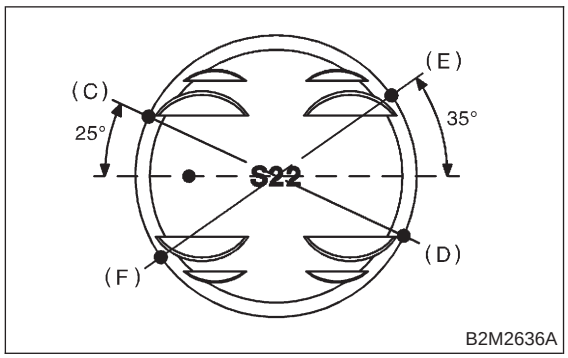
4) Installation of piston rings and oil ring
(1) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.

(2) Position the top ring gap at (A) or (B) in the figure.



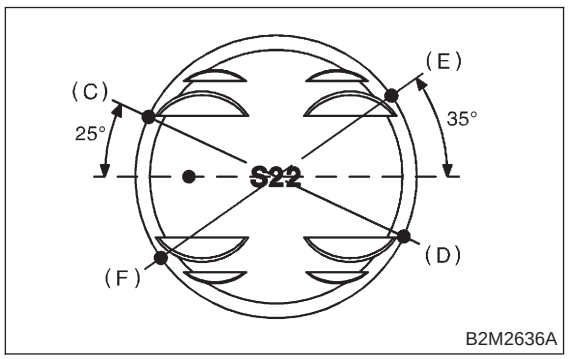
(3) Position the second ring gap at 180° on the reverse side for the top ring gap.

(4) Position the upper rail gap at (C) or (D) in the figure.



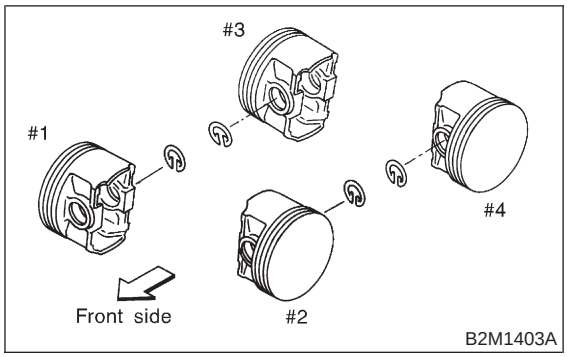
(5) Position the expander gap at 180° of the reverse side for the upper rail gap.
(6) Position the lower rail gap at (E) or (F) in the figure.

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

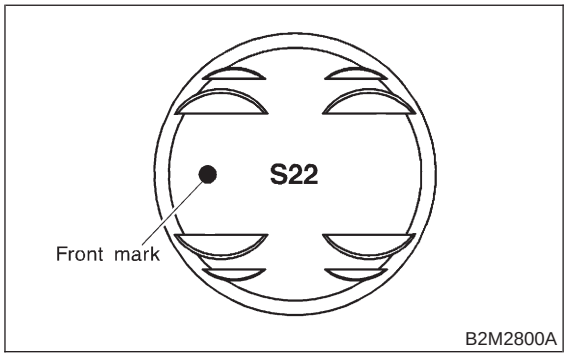


5) Install circlip.
Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

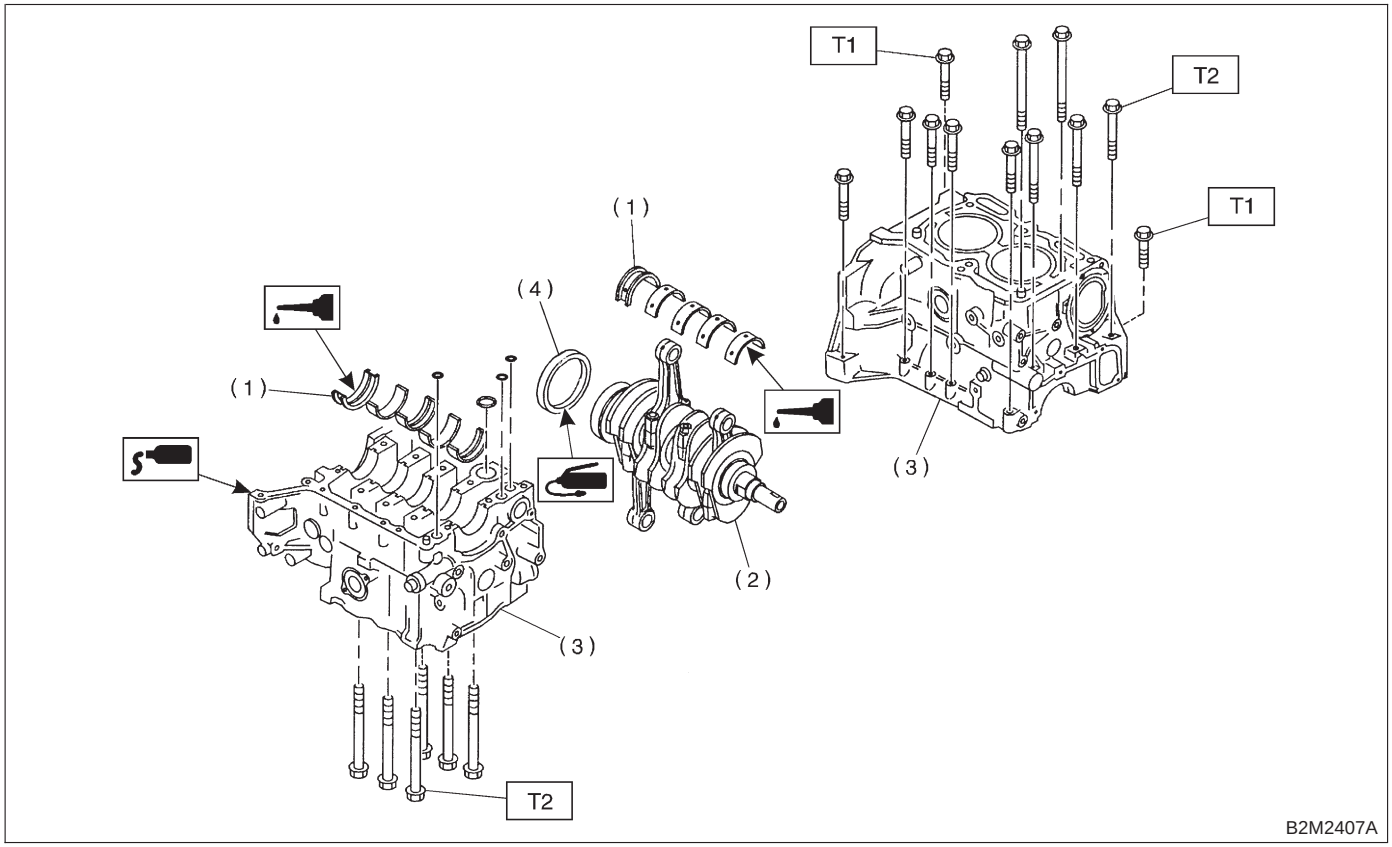
CAUTION:
Use new circlips.



CAUTION:
Piston front mark faces towards the front of the engine.



2. CYLINDER BLOCK



(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) 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

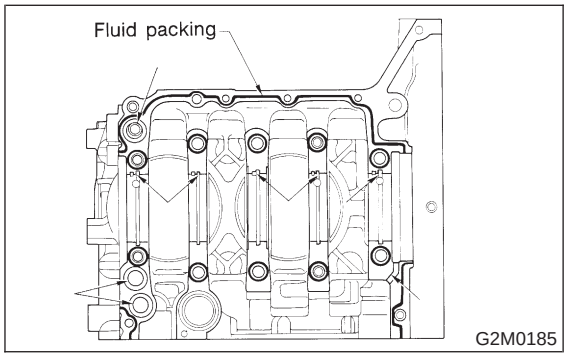
CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft on the #2 and #4 cylinder block.

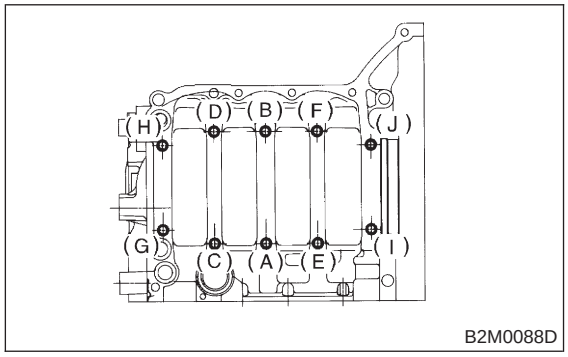
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:
THREE BOND 1215 or equivalent

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

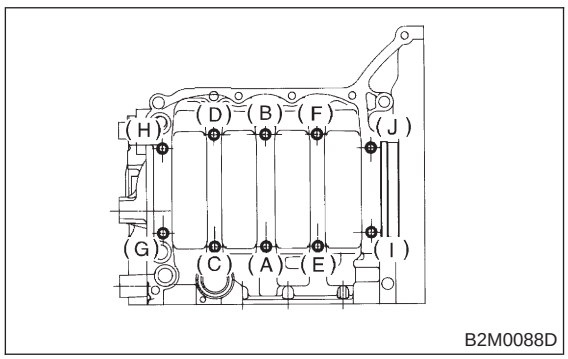


4) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure.



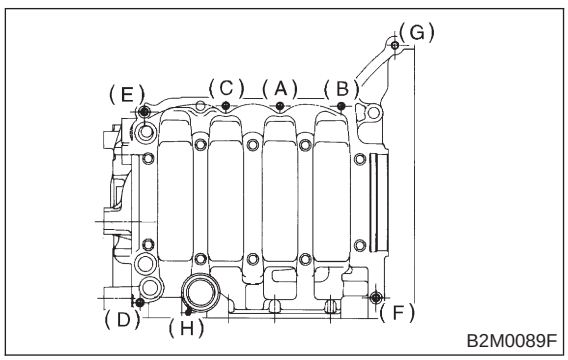
5) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence.

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

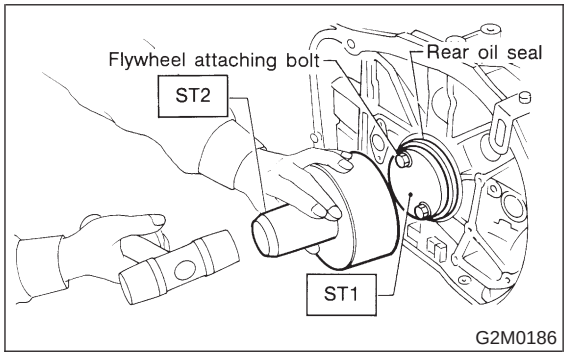


6) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

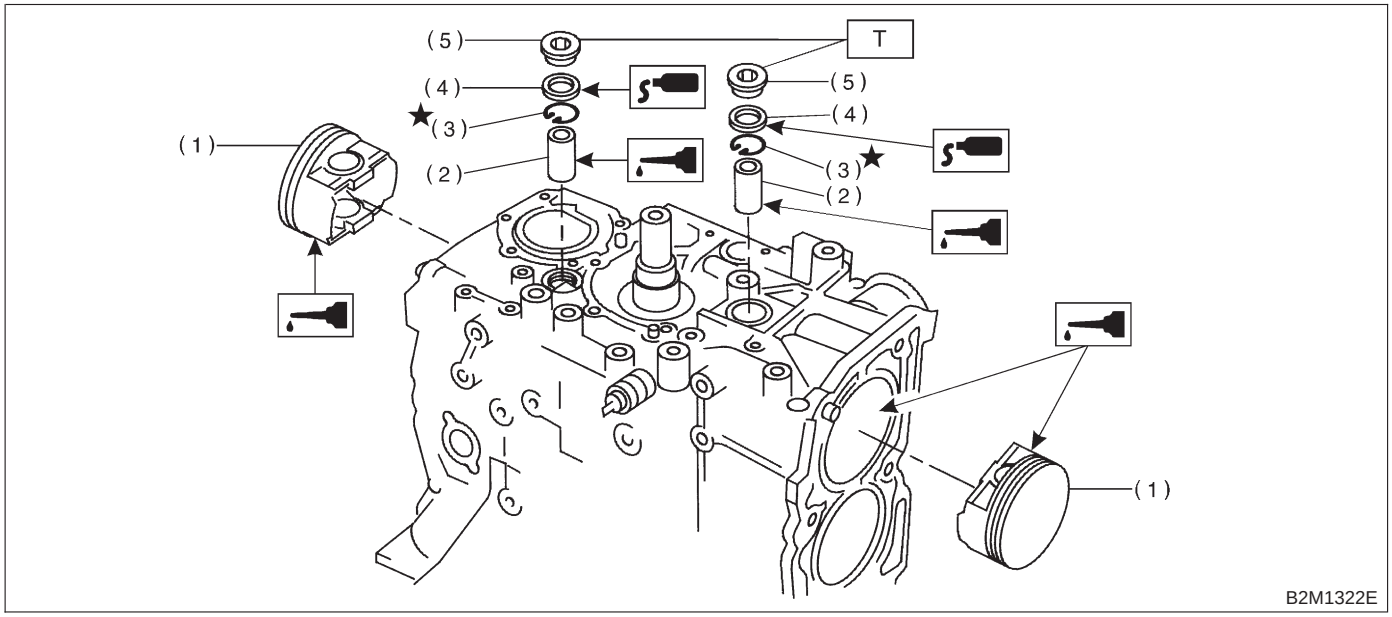
Tightening torque:
(A) — (G): 25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)
(H): 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



7) Install rear oil seal 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

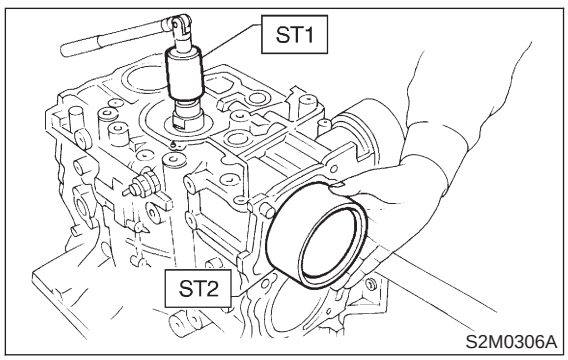
Tightening torque: N·m (kg-m, ft-lb)
T: 69±7 (7.0±0.7, 50.6±5.1)

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 using ST2.

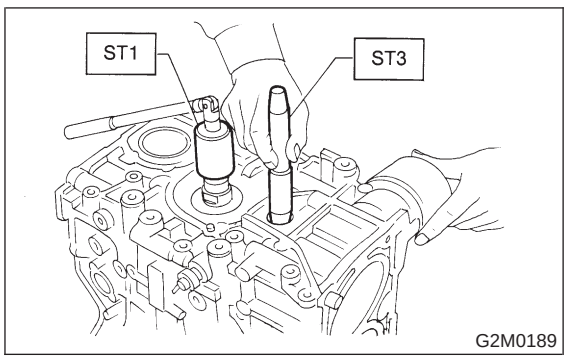
ST2 498747100 PISTON GUIDE



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.

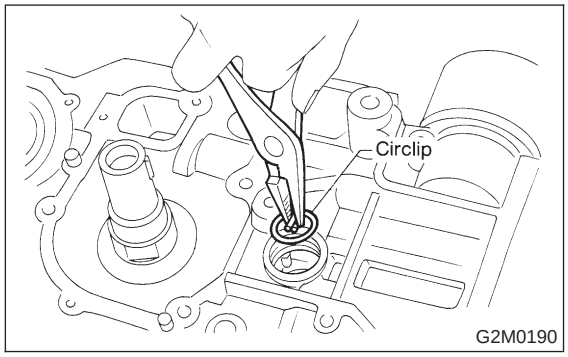
ST3 499017100 PISTON PIN GUIDE



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

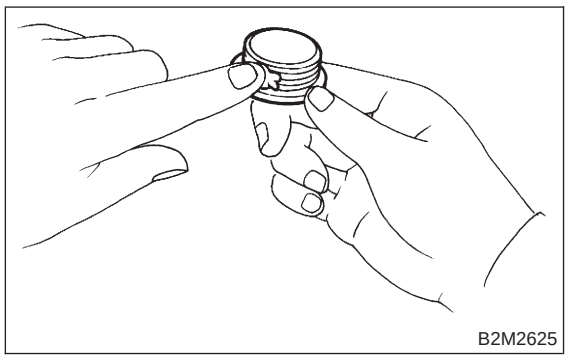
(3) Install circlip.

CAUTION:
Use new circlips.



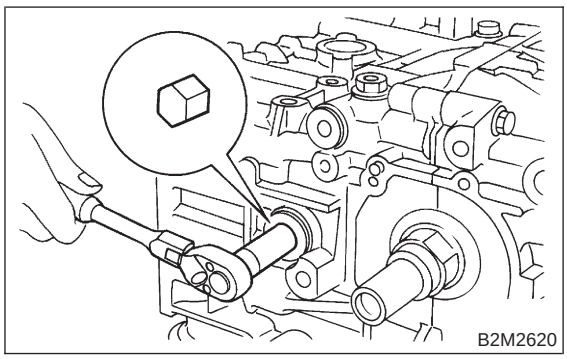
(4) Apply fluid packing around the service hole plug.

Fluid packing:
THREE BOND 1215 or equivalent

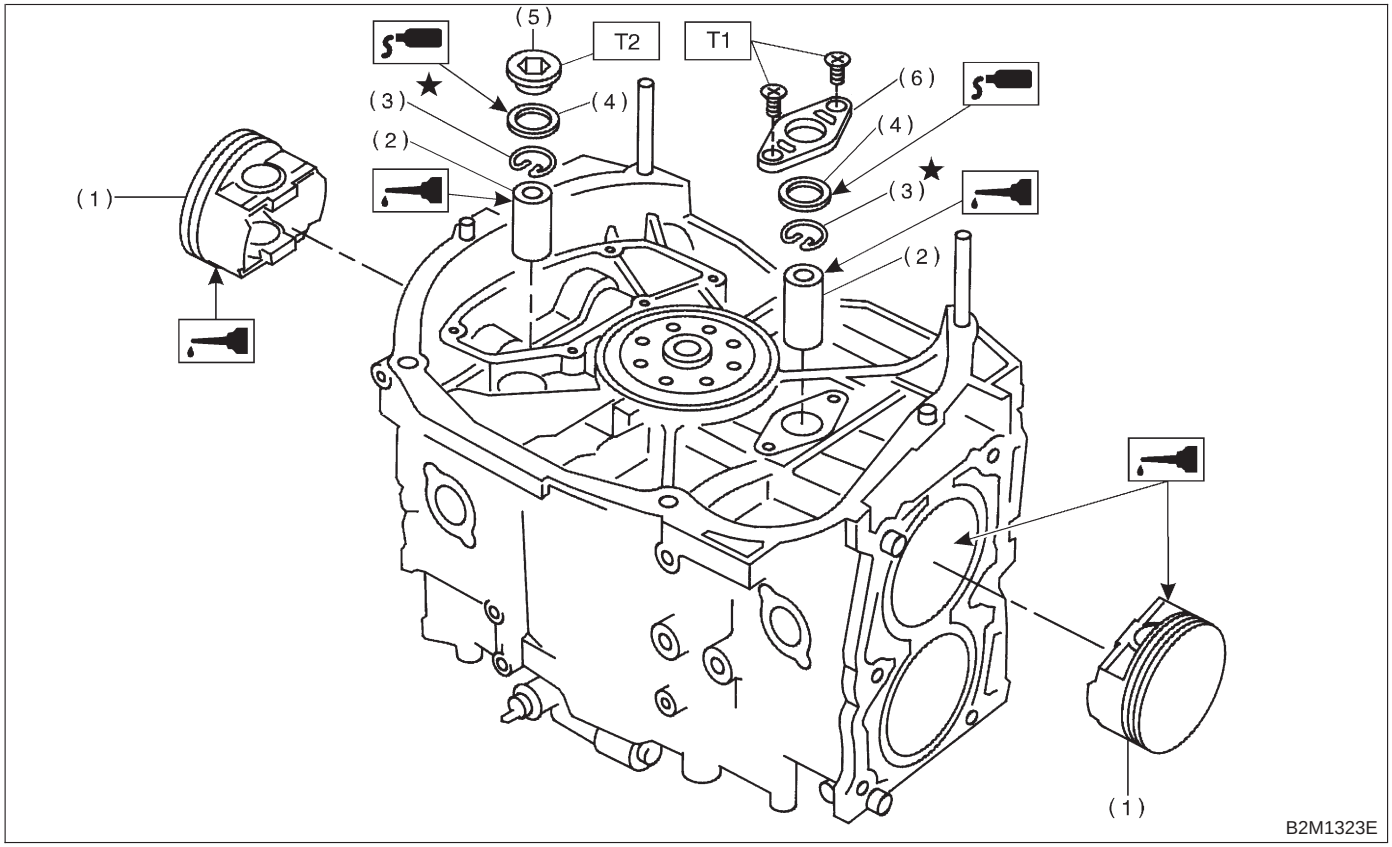


(5) Install service hole plug and gasket.

CAUTION:
Use a new gasket.



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



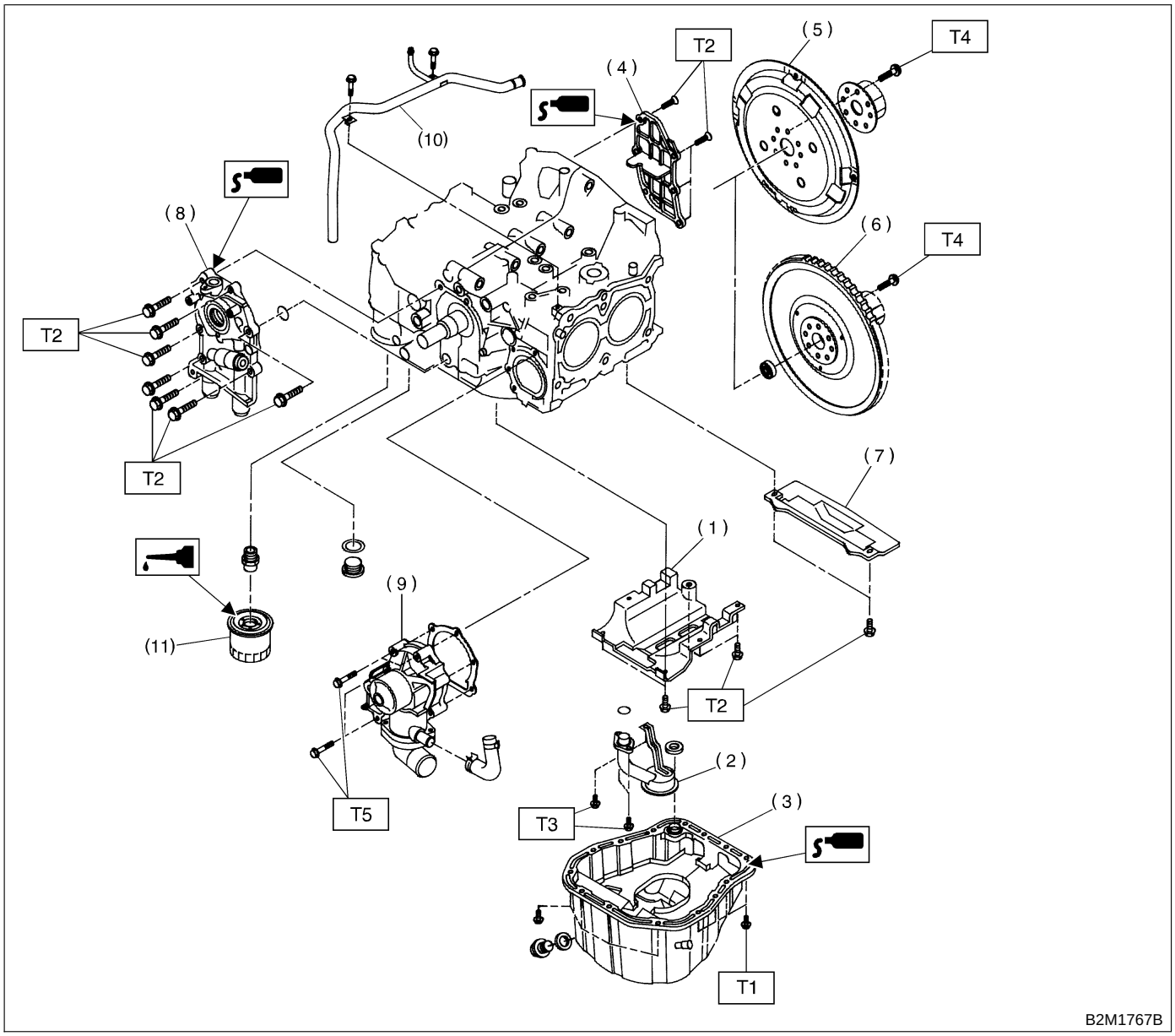
(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover

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

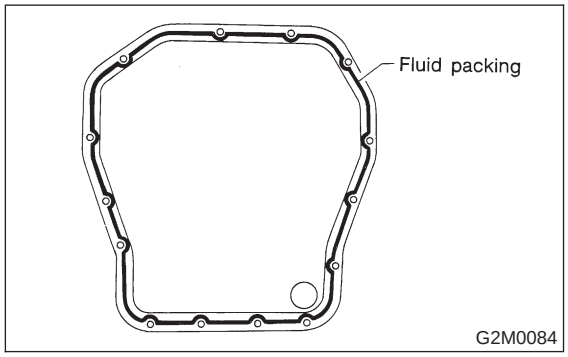


(1) Baffle plate
(2) Oil strainer
(3) Oil pan
(4) Oil separater cover
(5) Drive plate (AT vehicles only)
(6) Flywheel (MT vehicles only)
(7) Clutch housing cover (MT vehicles only)
(8) Oil pump
(9) Water pump
(10) Water by-pass pipe
(11) Oil filter

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)

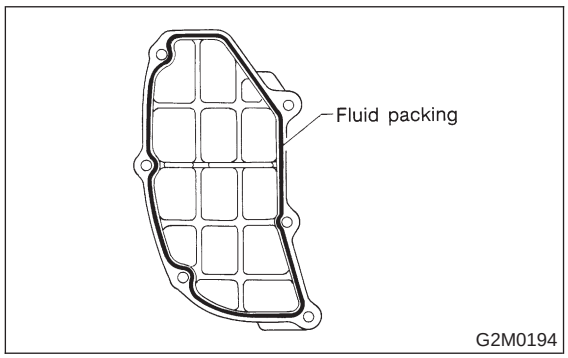
1) Install baffle plate.
2) Install oil strainer and O-ring
3) Install oil strainer stay.
4) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent

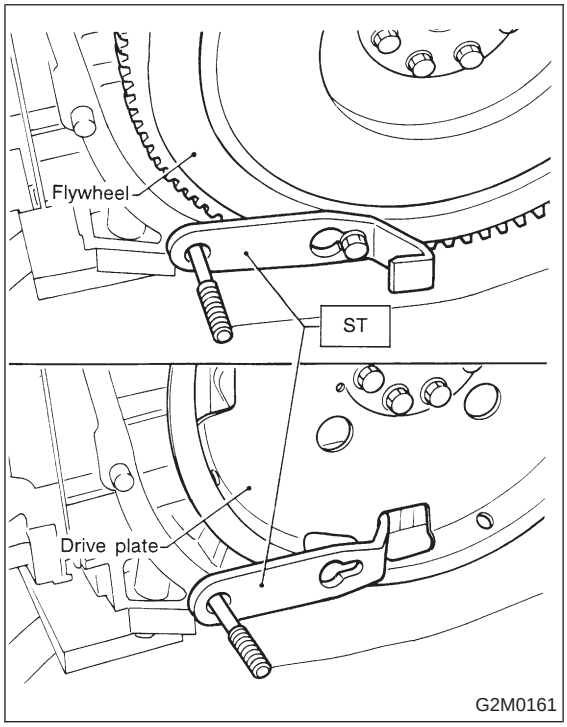


5) Apply fluid packing to matching surfaces and install oil separator cover.

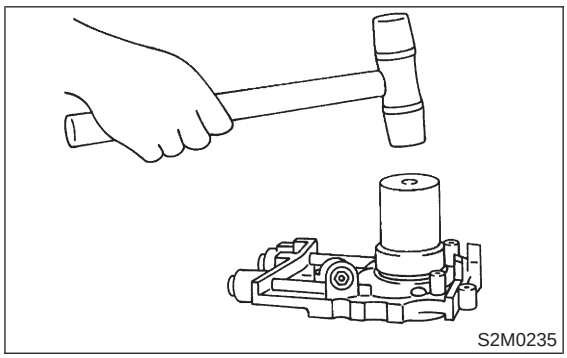
Fluid packing:
THREE BOND 1215 or equivalent



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

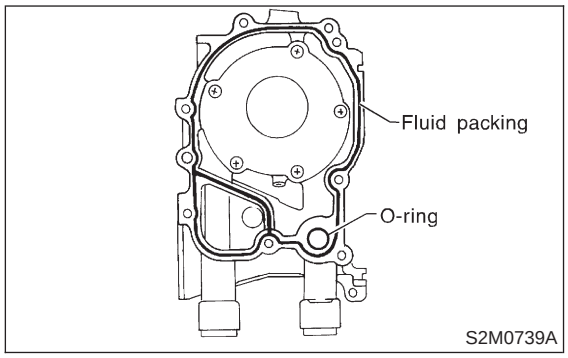


7) Install housing cover.
8) Installation of oil pump
(1) Discard front oil seal after removal. Replace with a new one using ST.
ST 499587100 OIL SEAL INSTALLER

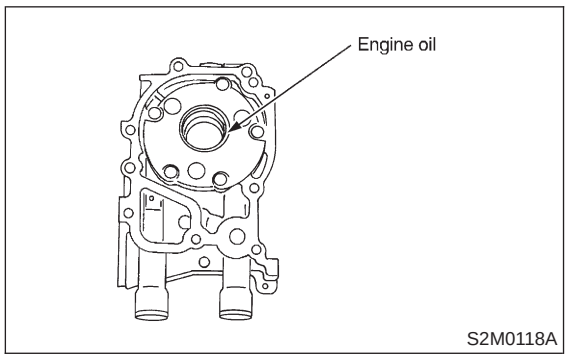


(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



(3) Apply a coat of engine oil to the inside of the oil seal.

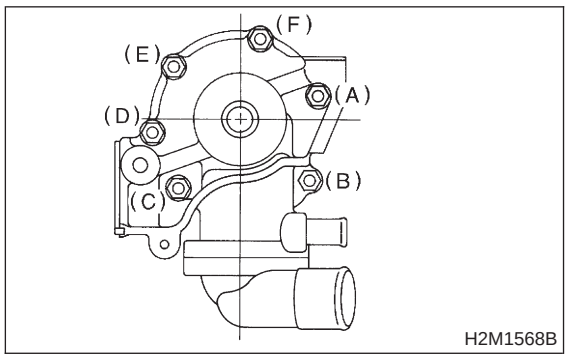


(4) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

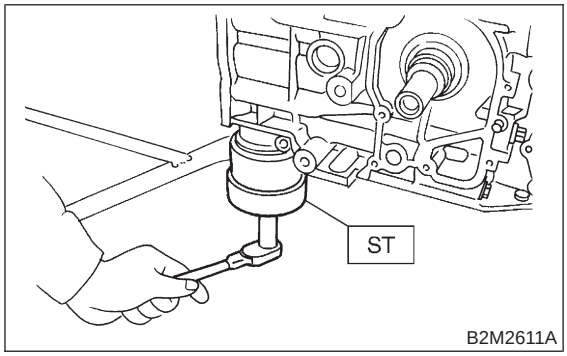
CAUTION:
● Do not forget to install O-ring and seal when installing oil pump.
● Align flat surface of oil pump's inner rotor with crankshaft before installation.

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 by-pass pipe for heater.
11) Install oil filter using ST.
ST 498187300 OIL FILTER WRENCH



2. RELATED PARTS

1) Install cylinder head, valve rocker assembly and rocker cover.
<Ref. to 2-3a [W5E0].>
2) Install timing belt and camshaft sprocket.
<Ref. to 2-3a [W2C0].>
3) Install water pipe. <Ref. to 2-5 [W8B0].>
4) Install intake manifold. <Ref. to 2-7 [W4D0].>

1. Engine Trouble in General

NOTE:
"RANK" shown in the chart refer to the possibility of reason for the trouble in order ("Very often" to "Rarely")
A — Very often
B — Sometimes
C — Rarely

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 connecton	A
		● Run-down battrey	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 [T6A0].>		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 occur.	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 [T6A0].>		A
	● Intake system	● Loosened or cracked intake uct	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 [T6A0].>		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 filter 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 [T6A0].>		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 filter 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
4. Surging	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 filter 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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Fuel injection system <Ref. to 2-7 [T6A0].>		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 [T6A0].>		A
	● Cooling system	● Overheating	B
	● Others	● Malfunction of evaporative emission control system	B
7. After burning in exhaust system	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 filter 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 [T6A0].>		A
	● Intake system	● Loosened oil filter 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 filter 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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 valve 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*)	● Unusually worn valve lifter ● Worn cam gear ● 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 engine coolant 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.

1. Engine

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, double over-head camshaft, 4-valve/cylinder
	Bore × Stroke		mm (in)	99.5 × 79.0 (3.917 × 3.110)
	Displacement		cm^3 (cu in)	2,457 (149.93)
	Compression ratio			9.5
	Compression pressure (at 200 — 300 rpm)	Standard	kPa (kg/cm^2, psi) − rpm	1,216 (12.4, 176) − 350
		Limit	kPa (kg/cm^2, psi) − rpm	941 (9.6, 137) − 350
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening		6° BTDC
		Closing		50° ABDC
	Exhaust valve timing	Opening		Front: 54° BBDC, Rear: 30° BBDC (Position in degrees)
		Closing		Front: 10° ATDC, Rear: 10° ATDC (Position in degrees)
	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) 850±50 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
Ignition timing			BTDC/rpm	15°±8°/700 rpm

B: SERVICE DATA

NOTE:
STD: Standard, I.D.: Inner Diameter, O.D.: Outer Diameter, OS: Oversize, US: Undersize

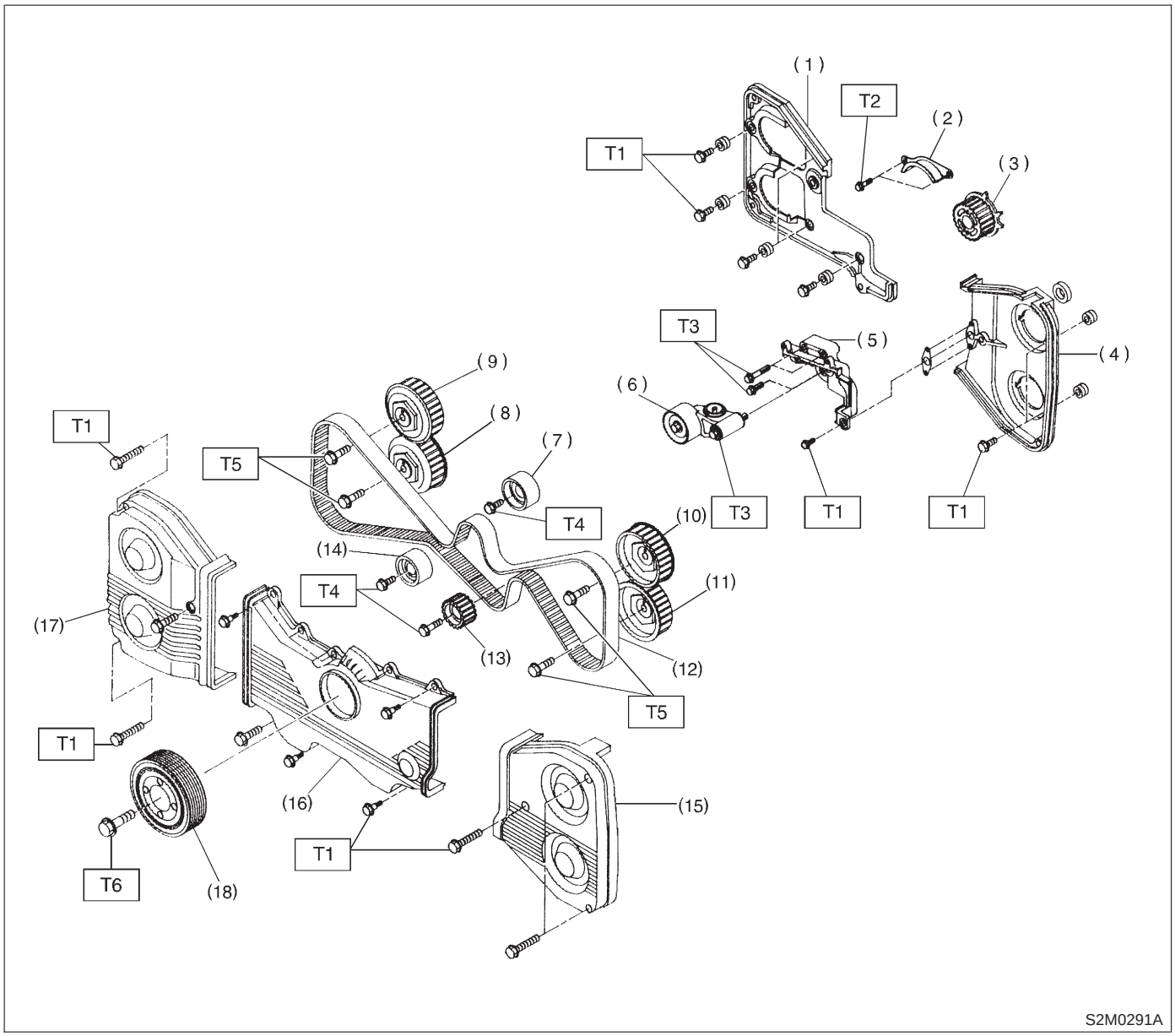
Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm	(0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm	(0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.00 — 18.08 mm	(0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm	(0.0010 — 0.0049 in)
			Limit	0.175 mm	(0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm	(0.0079 — 0.0217 in)
			Limit	0.81 mm	(0.0319 in)
Camshaft	Bend limit			0.020 mm	(0.0008 in)
	Thrust clearance		STD	0.040 — 0.080 mm	(0.0016 — 0.0031 in)
			Limit	0.10 mm	(0.0039 in)
	Cam lobe height	Intake	STD	42.20 — 42.30 mm	(1.6614 — 1.6654 in)
			Limit	42.04 mm	(1.6551 in)
		Exhaust	STD	Front: 42.50 — 42.60 mm Rear: 41.40 — 41.50 mm	(1.6732 — 1.6772 in) (1.6299 — 1.6339 in)
			Limit	Front: 42.34 mm Rear: 41.24 mm	(1.6669 in) (1.6236 in)
	Camshaft journal O.D.		Front	31.946 — 31.963 mm	(1.2577 — 1.2584 in)
			Center	27.946 — 27.963 mm	(1.1002 — 1.1009 in)
			Rear	27.946 — 27.963 mm	(1.1002 — 1.1009 in)
	Camshaft journal hole I.D.		Front	32.000 — 32.018 mm	(1.2598 — 1.2605 in)
			Center	28.000 — 28.018 mm	(1.1024 — 1.1031 in)
			Rear	28.000 — 28.018 mm	(1.1024 — 1.1031 in)
	Oil clearance		STD	0.037 — 0.072 mm	(0.0015 — 0.0028 in)
			Limit	0.10 mm	(0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm	(0.0020 in)
	Surface grinding limit			0.3 mm	(0.012 in)
	Standard height			127.5 mm	(5.02 in)
Valve seat	Refacing angle			90°	
	Contacting width	Intake	STD	1.0 mm	(0.039 in)
			Limit	1.7 mm	(0.067 in)
		Exhaust	STD	1.5 mm	(0.059 in)
			Limit	2.2 mm	(0.087 in)
Valve guide	Inner diameter			6.000 — 6.015 mm	(0.2362 — 0.2368 in)
	Protrusion above head			12.0 — 12.4 mm	(0.472 — 0.488 in)
Valve	Head edge thickness	Intake	STD	1.2 mm	(0.047 in)
			Limit	0.8 mm	(0.031 in)
		Exhaust	STD	1.5 mm	(0.059 in)
			Limit	0.8 mm	(0.031 in)
	Stem diameter		Intake	5.950 — 5.965 mm	(0.2343 — 0.2348 in)
			Exhaust	5.950 — 5.965 mm	(0.2343 — 0.2348 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	105.9 mm	(4.169 in)
			Exhaust	106.2 mm	(4.181 in)

Valve spring	Free length			48.04 mm	(1.8913 in)
	Squareness			2.5°, 2.1 mm	(0.083 in)
	Tension/spring height			146.1 — 167.7 N (14.9 — 17.1 kg, 32.9 — 37.7 lb)/42.0 mm (1.654 in) 455.0 — 523.7 N (46.4 — 53.4 kg, 102.3 — 117.7 lb)/33.4 mm (1.315 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	STD	A	99.505 — 99.515 mm	(3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm	(3.9171 — 3.9175 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	STD	A	99.485 — 99.495 mm	(3.9167 — 3.9171 in)
			B	99.475 — 99.485 mm	(3.9163 — 3.9167 in)
		0.25 mm (0.0098 in) OS		99.725 — 99.735 mm	(3.9262 — 3.9266 in)
		0.50 mm (0.0197 in) OS		99.975 — 99.985 mm	(3.9360 — 3.9364 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	0.37 — 0.52 mm	(0.0146 — 0.0205 in)
			Limit	1.0 mm	(0.039 in)
		Oil ring	STD	0.20 — 0.60 mm	(0.0079 — 0.0236 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	0.010 — 0.038 mm	(0.0004 — 0.0015 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)

Crankshaft	Bend limit			0.035 mm	(0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less	
		Grinding limit		0.25 mm	(0.0098 in)
	Crank pin 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	59.942 — 59.958 mm	(2.3599 — 2.3605 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	59.962 — 59.978 mm	(2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm	(2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm	(2.3520 — 2.3527 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	0.045 mm	(0.0018 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)

1. Timing Belt

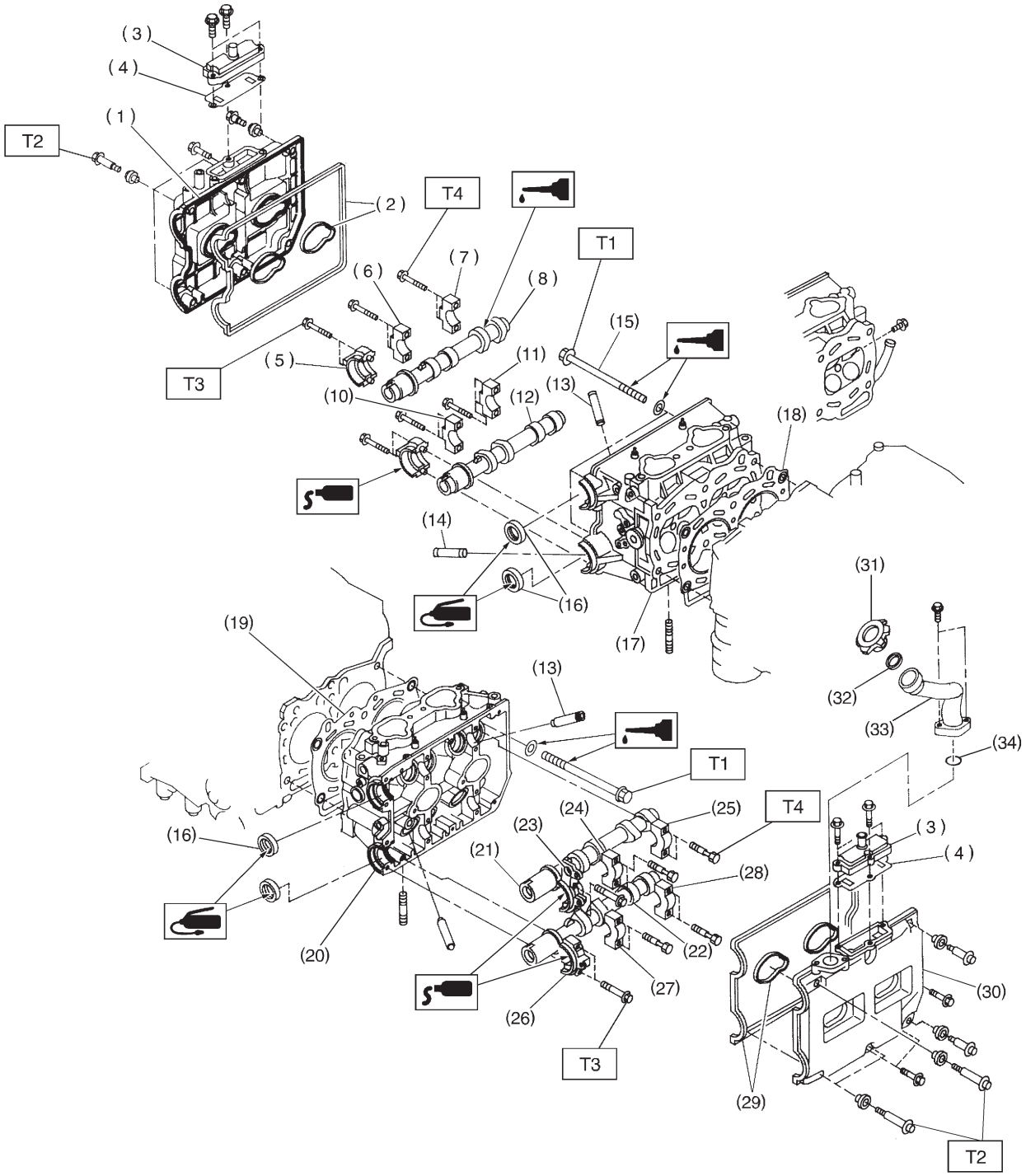


S2M0291A

(1) Right-hand belt cover No. 2
(2) Timing belt guide (MT vehicles only)
(3) Crankshaft sprocket
(4) Left-hand belt cover No. 2
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Right-hand exhaust camshaft sprocket
(9) Right-hand intake camshaft sprocket
(10) Left-hand intake camshaft sprocket
(11) Left-hand exhaust camshaft sprocket
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Left-hand belt cover
(16) Front belt cover
(17) Right-hand belt cover
(18) Crankshaft pulley

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 9.8±1.0 (1.0±0.1, 7.2±0.7)
T3: 25±3 (2.5±0.3, 18.1±2.2)
T4: 39±4 (4.0±0.4, 28.9±2.9)
T5: 78±5 (8.0±0.5, 57.9±3.6)
T6: 177±10 (18.0±1.0, 130±7)

2. Cylinder Head and Camshaft

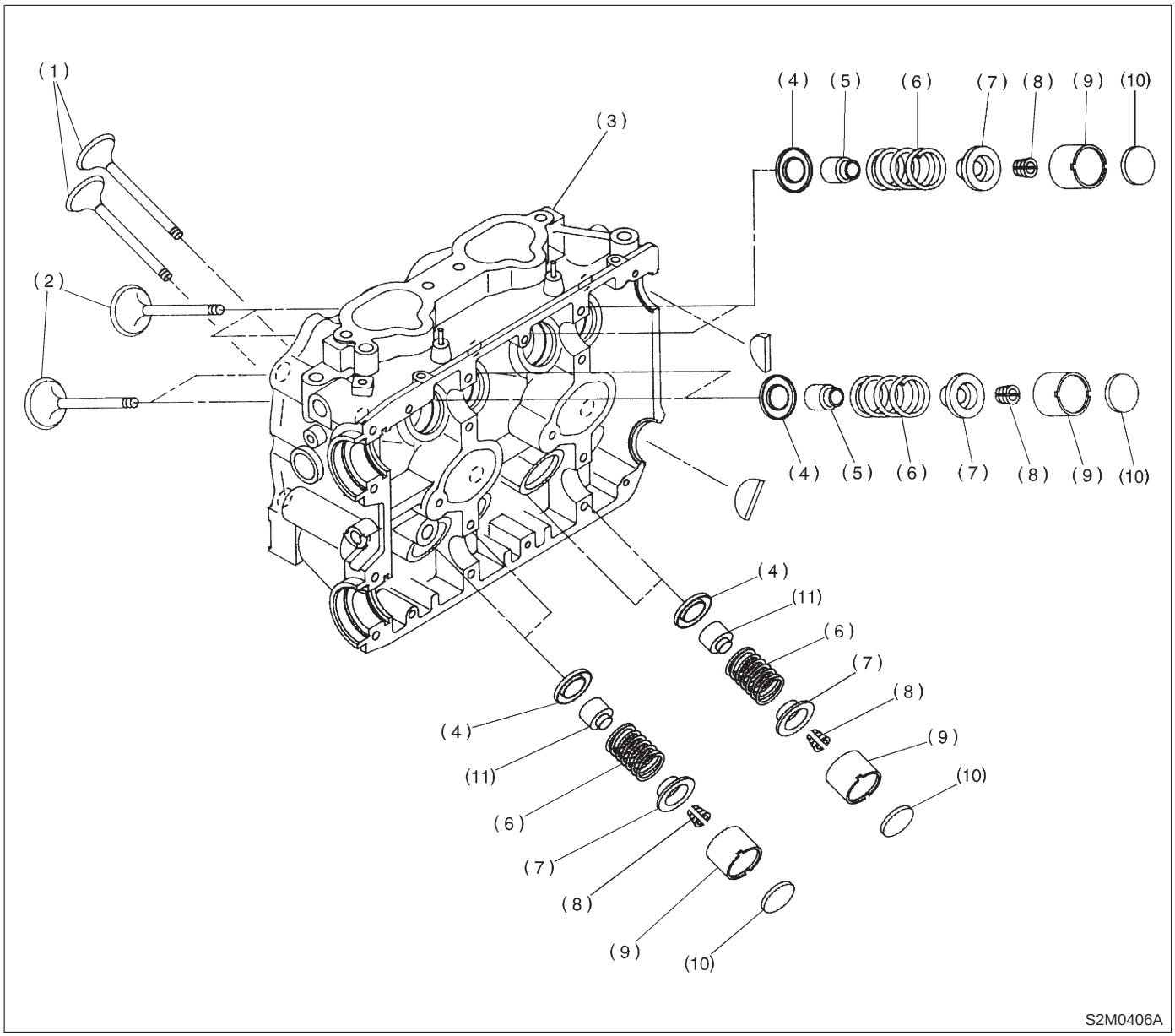


S2M0292C

(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Oil separator cover
(4) Gasket
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Intake camshaft (RH)
(9) Exhaust camshaft cap (Front RH)
(10) Exhaust camshaft cap (Center RH)
(11) Exhaust camshaft cap (Rear RH)
(12) Exhaust camshaft (RH)
(13) Intake valve guide
(14) Exhaust valve guide
(15) Cylinder head bolt
(16) Oil seal
(17) Cylinder head (RH)
(18) Cylinder head gasket (RH)
(19) Cylinder head gasket (LH)
(20) Cylinder head (LH)
(21) Intake camshaft (LH)
(22) Exhaust camshaft (LH)
(23) Intake camshaft cap (Front LH)
(24) Intake camshaft cap (Center LH)
(25) Intake camshaft cap (Rear LH)
(26) Exhaust camshaft (Front LH)
(27) Exhaust camshaft cap (Center LH)
(28) Exhaust camshaft cap (Rear LH)
(29) Rocker cover gasket (LH)
(30) Rocker cover (LH)
(31) Oil filler cap
(32) Gasket
(33) Oil filler duct
(34) O-ring

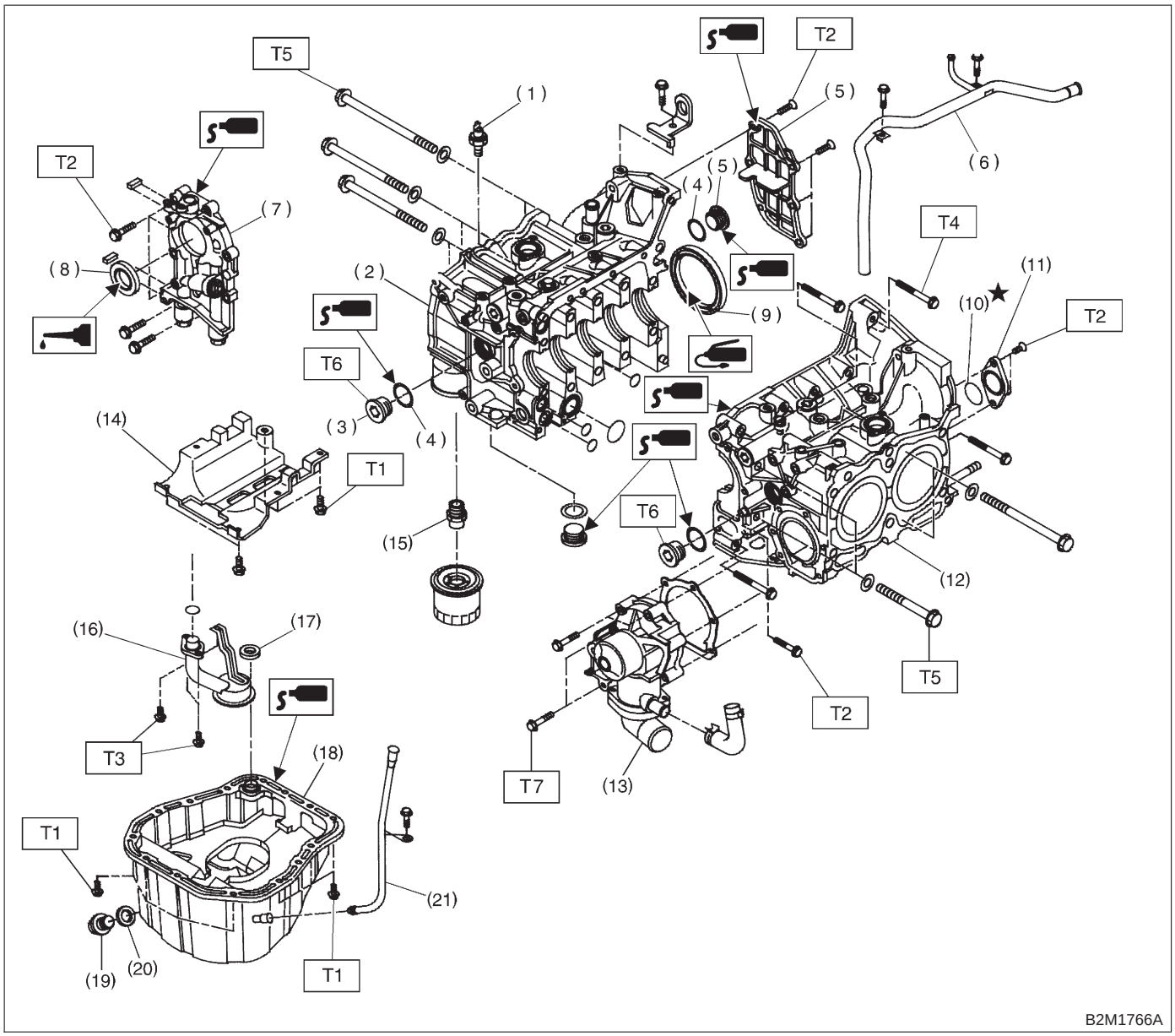
Tightening torque: N·m (kg-m, ft-lb)
T1: <Ref. to 2-3b [W4E0].>
T2: 5 (0.5, 3.6)
T3: 10±0.7 (1.0±0.07, 7.2±0.5)
T4: 20±2 (2.0±0.2, 14.0±1.4)

3. Cylinder Head and Valve Assembly



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Shim
(11) Exhaust valve oil seal

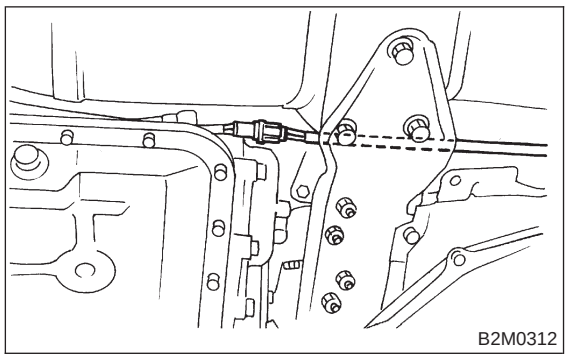
4. Cylinder Block



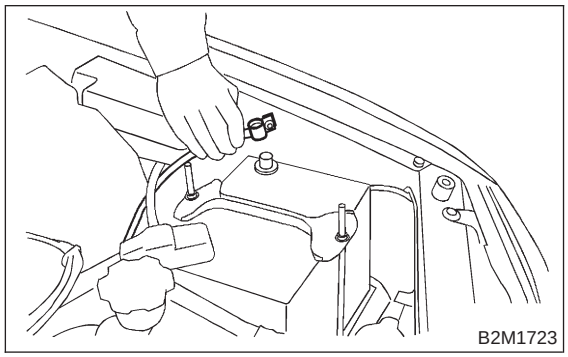
(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16)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

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) Connect rear oxygen sensor connector. (Except 2500 cc California spec. vehicles)



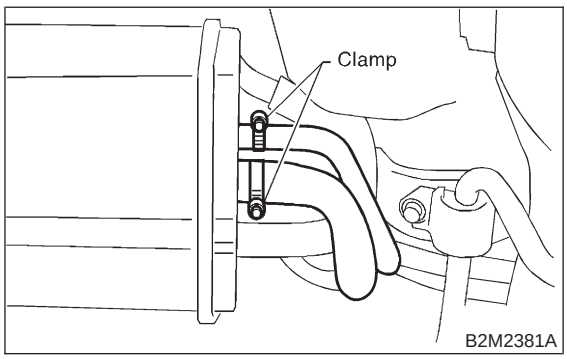
6) Lower the vehicle.
7) Connect battery ground cable.



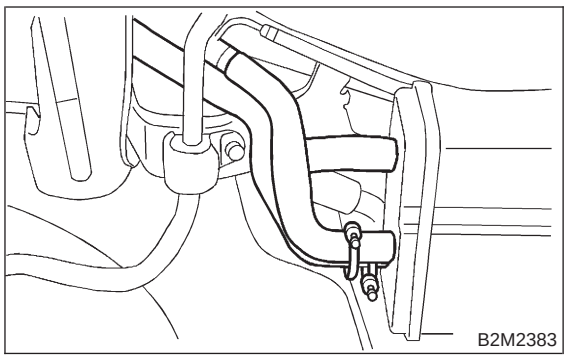
3. Canister

A: REMOVAL AND INSTALLATION

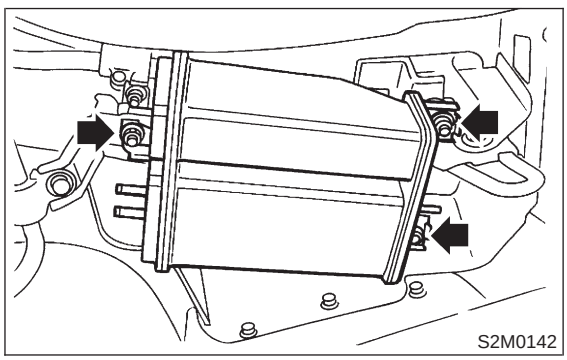
1) Lift-up the vehicle.
2) Loosen two clamps which hold two canister hoses.



3) Disconnect evaporation three hoses from canister.

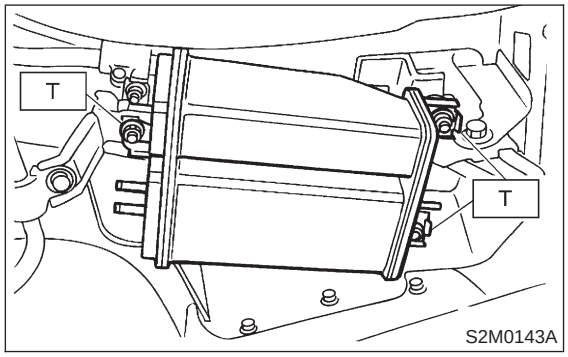


4) Remove canister from body.



5) Installation is in the reverse order of removal.

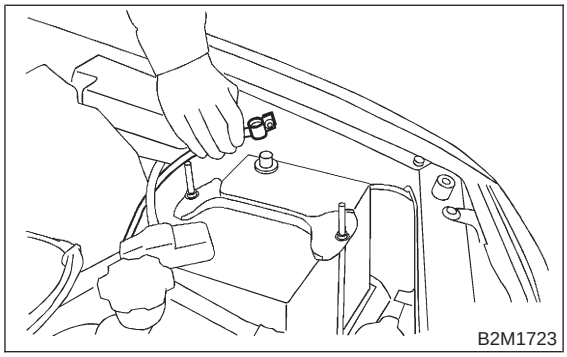
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



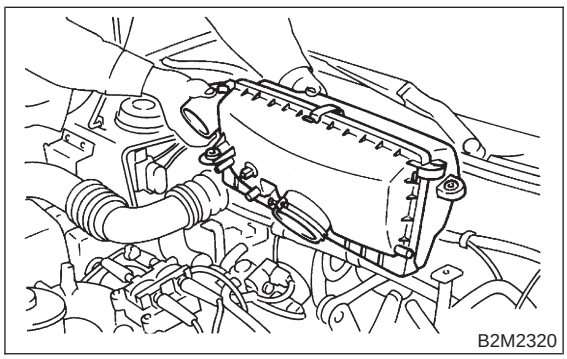
4. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

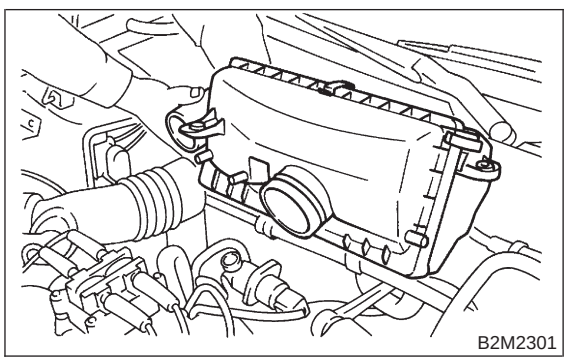
1) Disconnect battery ground cable.



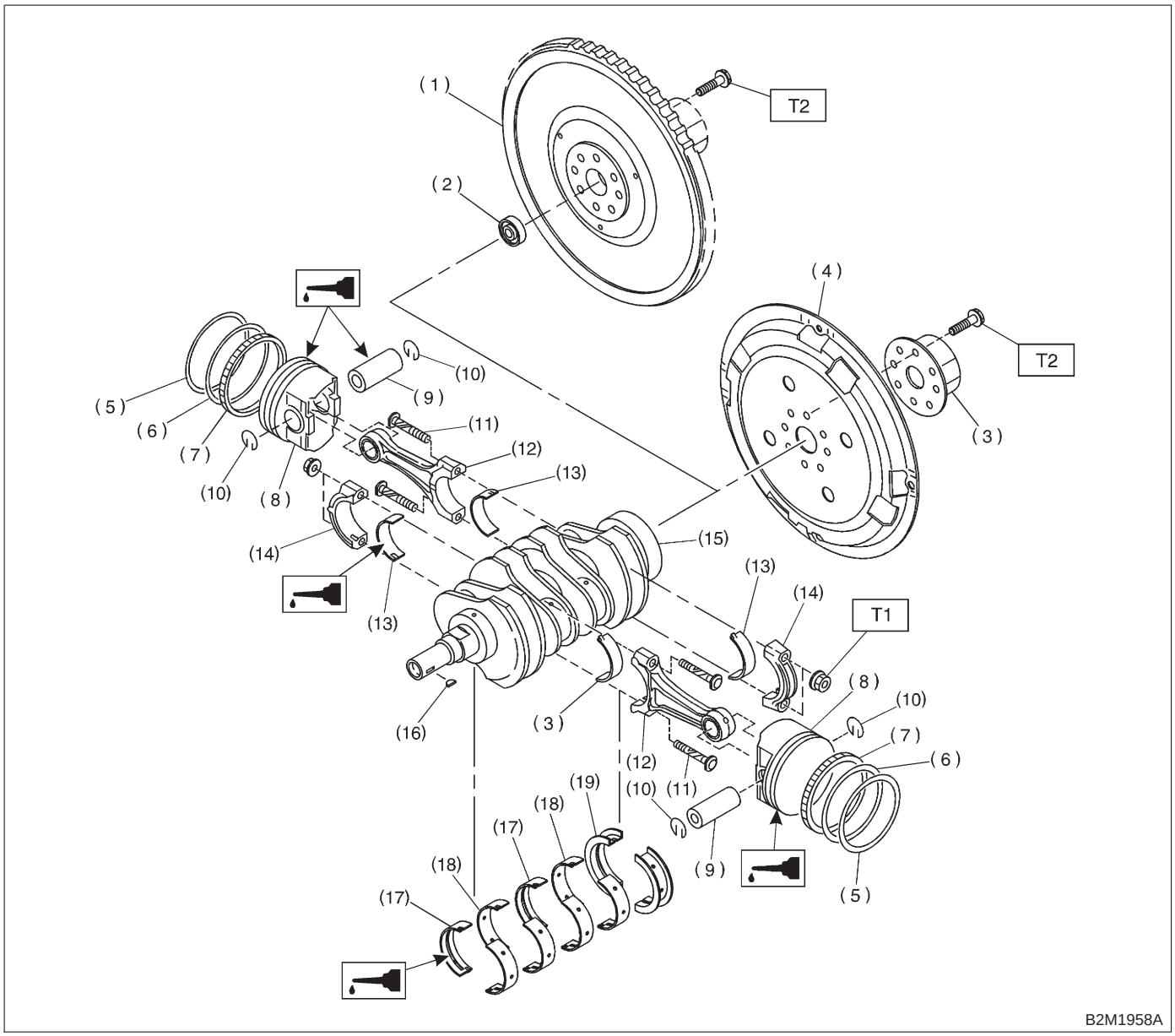
2) Remove air cleaner assembly and air intake duct (A) and (B) as a unit. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>



3) Remove air intake chamber and air intake duct as a unit. (Except 2200 cc California spec. vehicles and 2500 cc Model)
<Ref. to 2-7 [W18A0].>



5. Crankshaft and Piston



(1) Flywheel (MT vehicles only)
(2) Bell bearing (MT vehicles only)
(3) Reinforcement (AT vehicles only)
(4) Drive plate (AT vehicles only)
(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, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

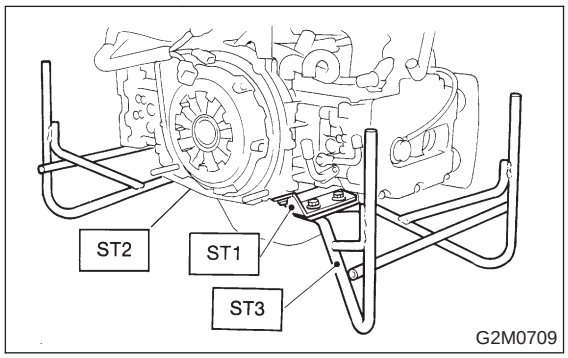
Tightening torque: N·m (kg-m, ft-lb)
T1: 44±2 (4.5±0.2, 32.5±1.4)
T2: 72±3 (7.3±0.3, 52.8±2.2)

1. Precautions

A: 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

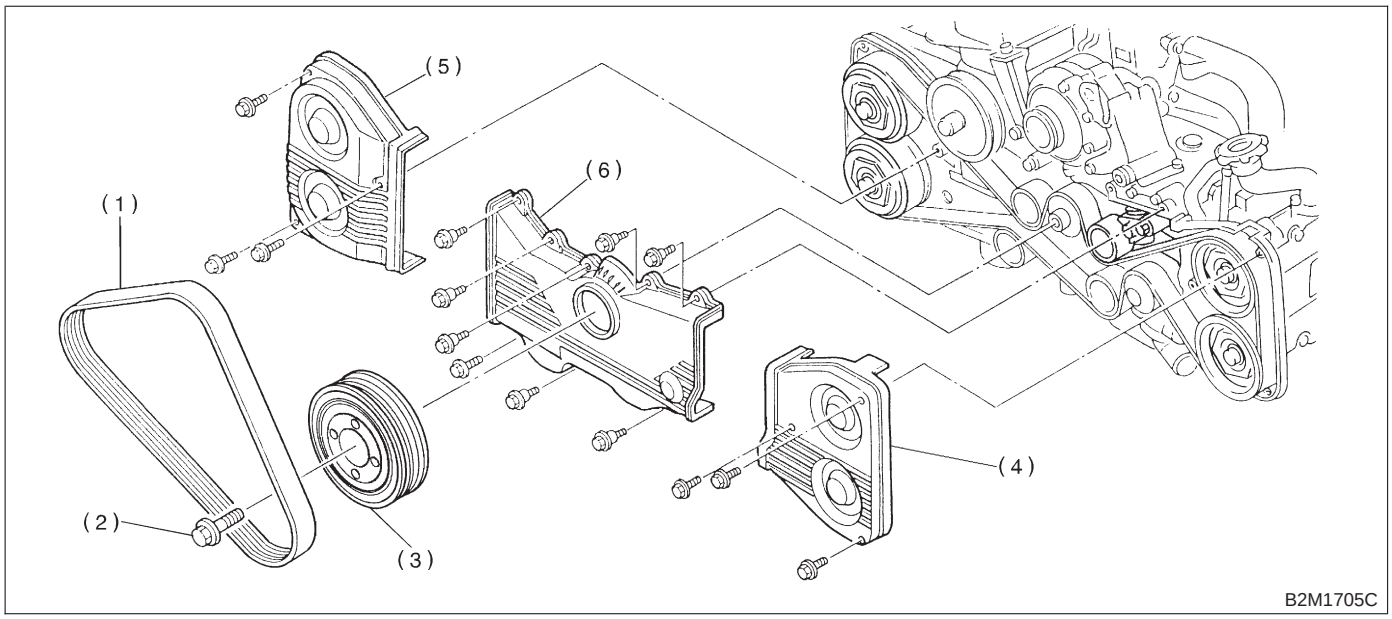


(2) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
(3) Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
(4) Be careful not to let oil, grease or coolant contact the timing 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

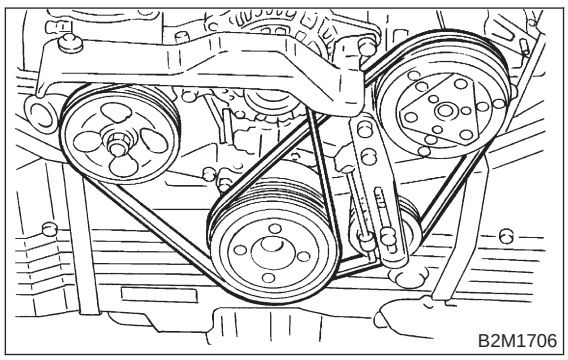
A: REMOVAL

1. CRANKSHAFT PULLEY AND BELT COVER

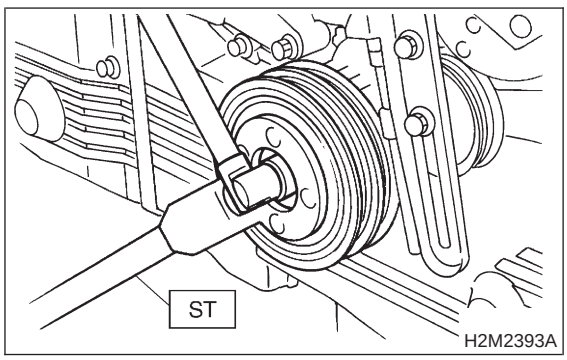


(1) V-belt
(2) Crankshaft pulley bolt
(3) Crankshaft pulley
(4) Left-hand belt cover No. 1
(5) Right-hand belt cover No. 1
(6) Front belt cover

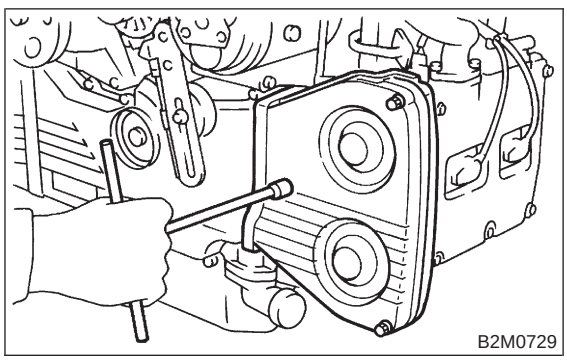
1) Remove V-belt cover, V-belt and air conditioning compressor drive belt tensioner. <Ref. to 1-5 [G2B0].>



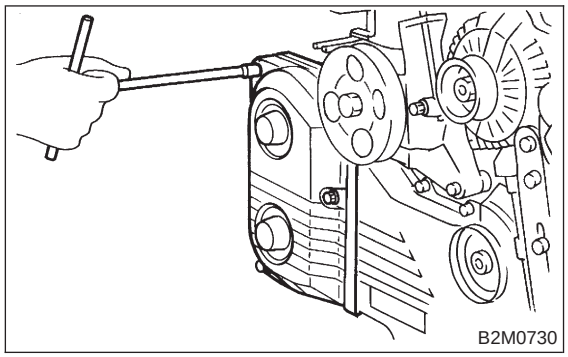
2) Remove pulley bolt. To lock crankshaft, use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH



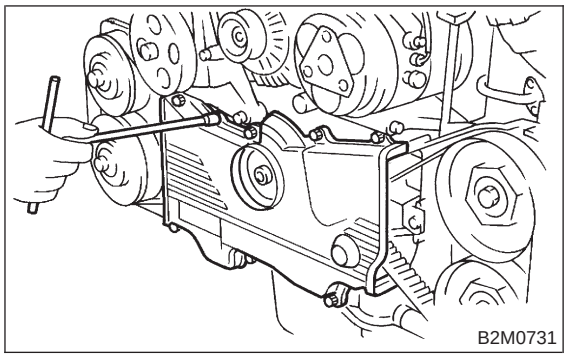
3) Remove crankshaft pulley.
4) Remove left-hand belt cover.



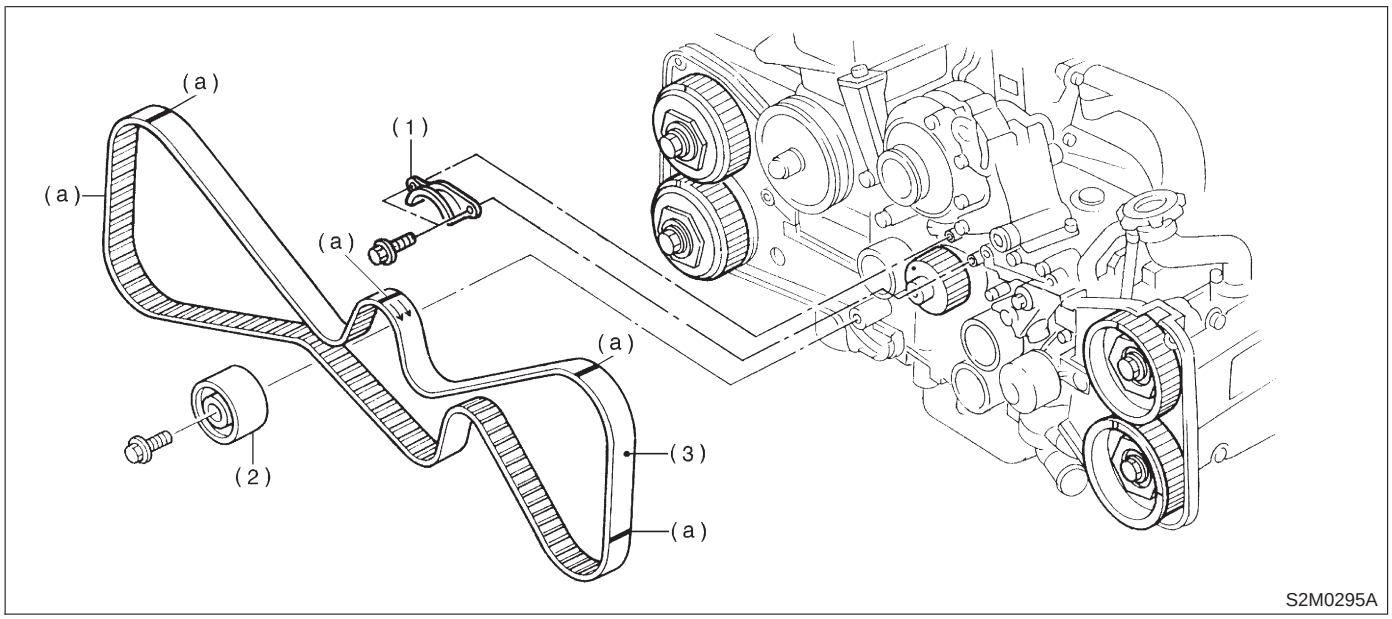
5) Remove right-hand belt cover.



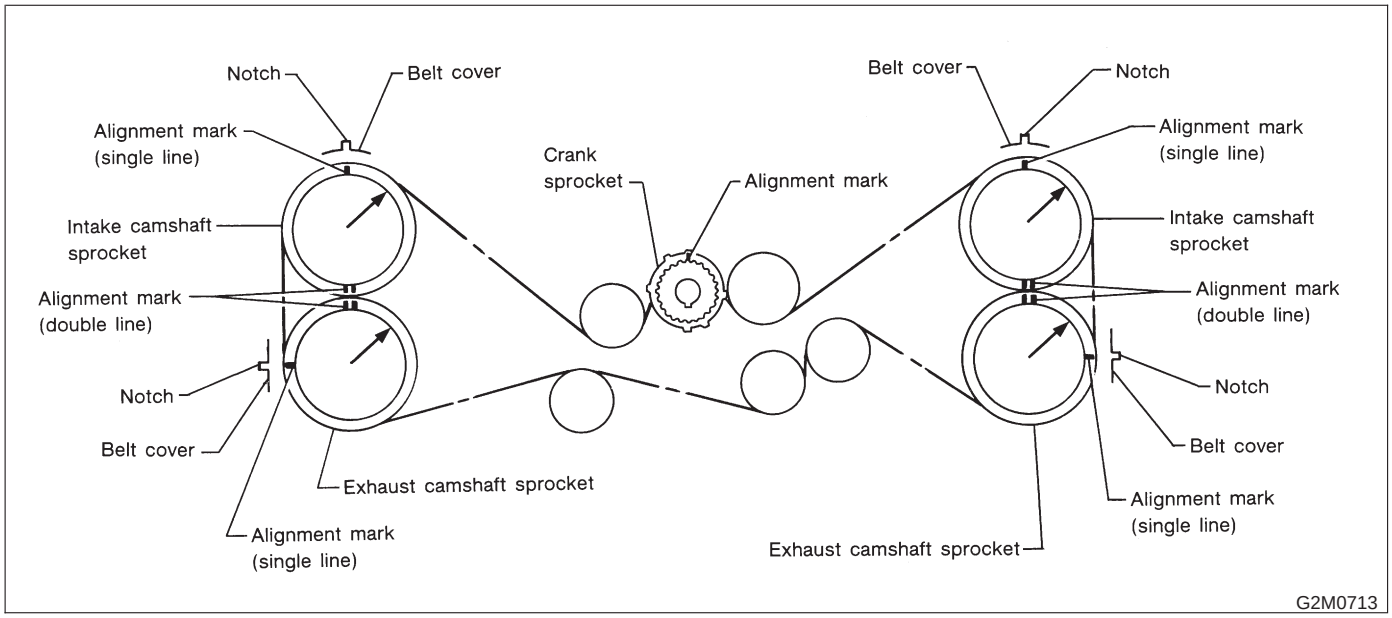
6) Remove front belt cover.



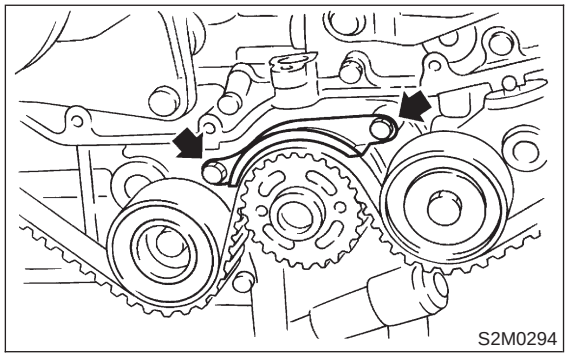
2. TIMING BELT



(1) Timing belt guide (MT vehicles only)
(2) Belt idler
(3) Timing belt
(a) Alignment marks



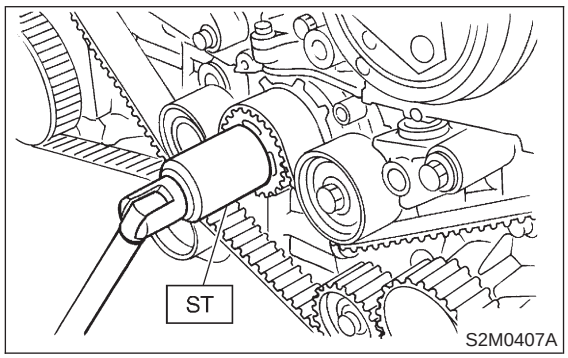
1) Remove timing belt guide. (MT vehicles only)



2) 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 using ST, and align alignment marks on crankshaft sprocket, left-hand intake camshaft sprocket, left-hand exhaust camshaft sprocket, right-hand intake camshaft sprocket and right hand exhaust camshaft sprocket with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

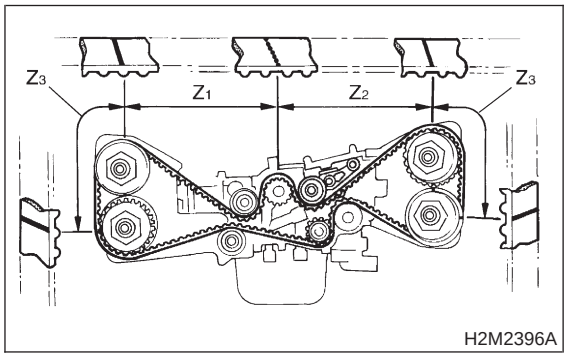


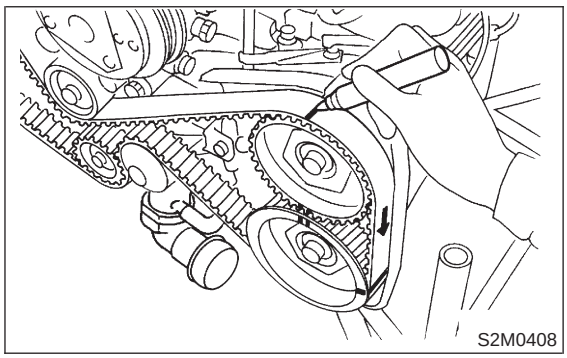
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the sprockets.

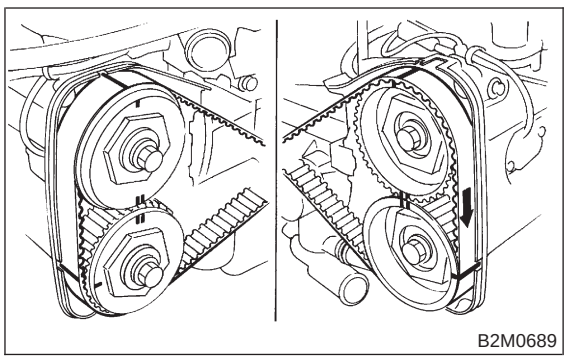
Z_1: 54.5 tooth length

Z_2: 51 tooth length

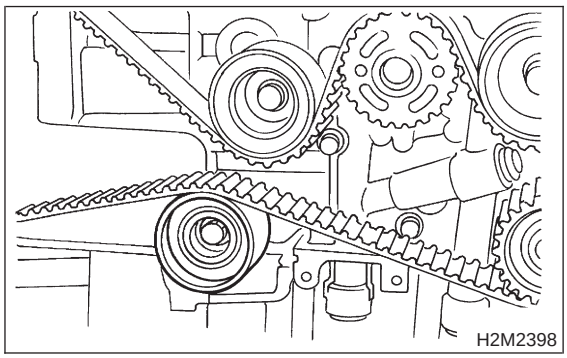
Z_3: 28 tooth length





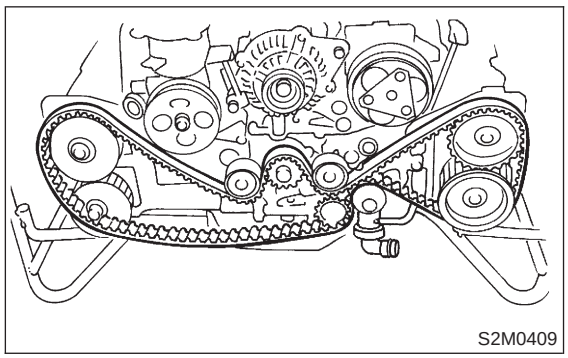


3) Remove belt idler.

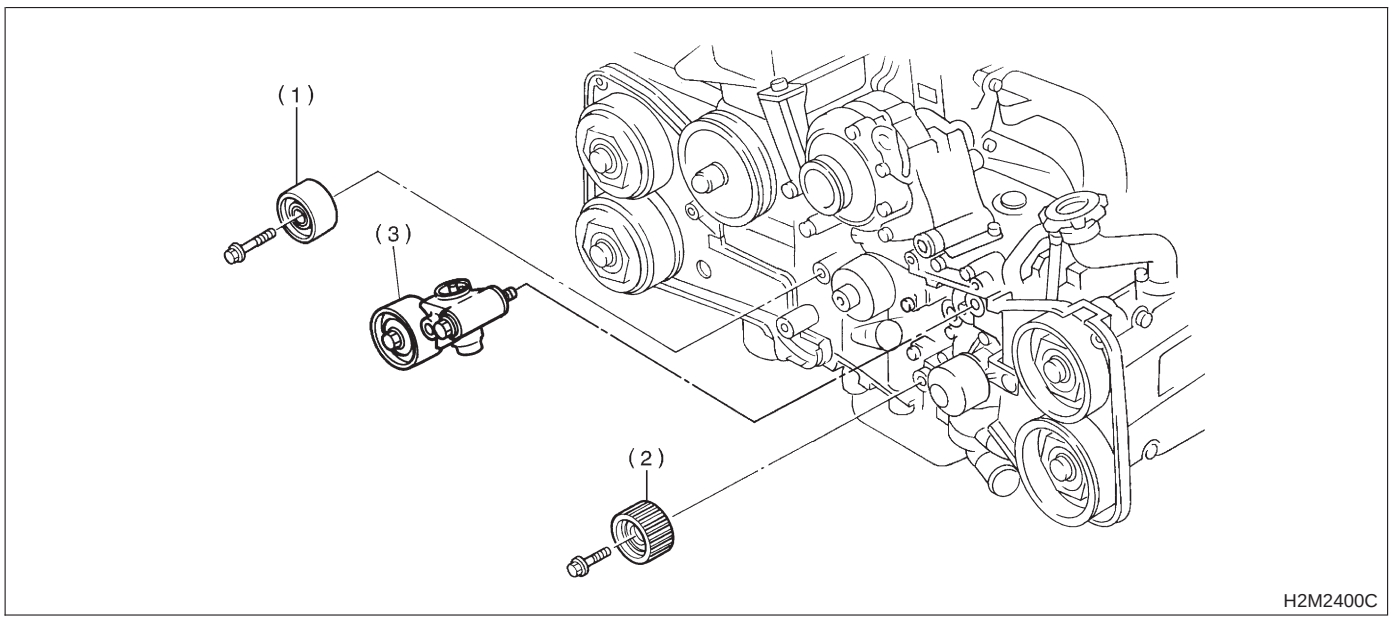


4) Remove timing belt.

CAUTION:
After timing belt has been removed, never rotate intake and exhaust, camshaft sprocket. If camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.


S2M0409

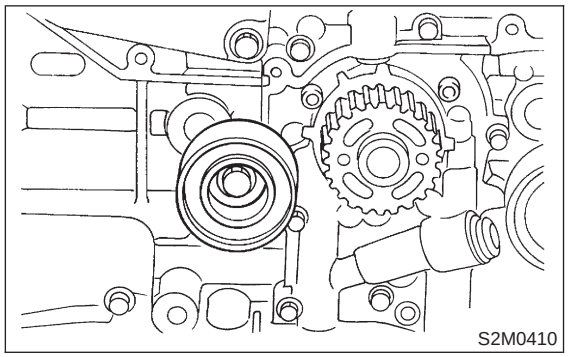
3. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY



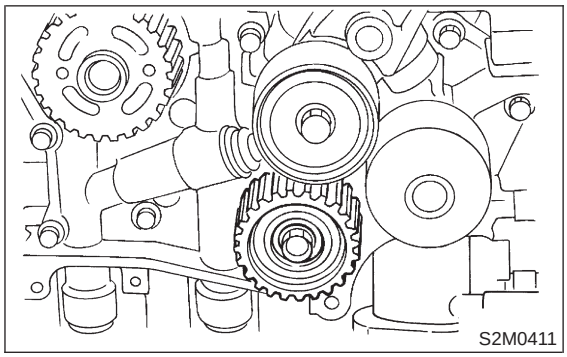
H2M2400C

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

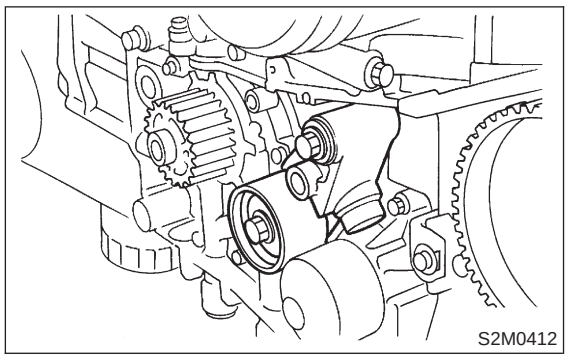
1) Remove belt idler.


S2M0410

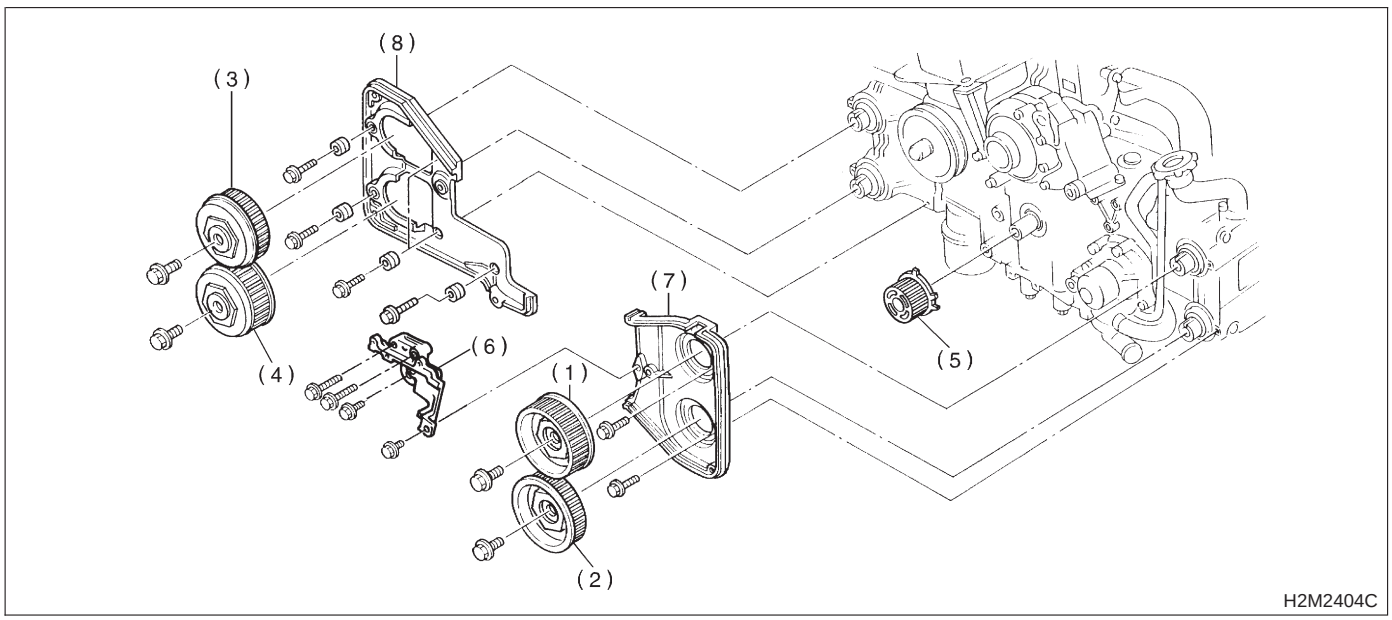
2) Remove belt idler No. 2.


S2M0411

3) Remove automatic belt tension adjuster assembly.



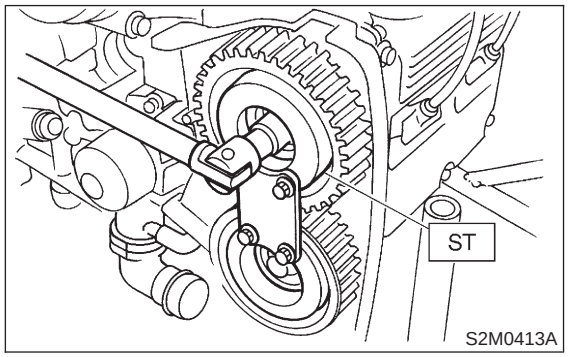
4. SPROCKET



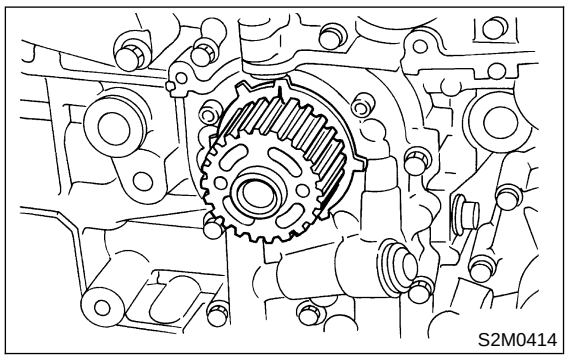
(1) Left-hand intake camshaft sprocket
(2) Left-hand exhaust camshaft sprocket
(3) Right-hand intake camshaft sprocket
(4) Right-hand exhaust camshaft sprocket
(5) Crankshaft sprocket
(6) Tensioner bracket
(7) Left-hand belt cover No. 2
(8) Right-hand belt cover No. 2

1) Remove left-hand intake camshaft sprocket.
2) Remove left-hand exhaust camshaft sprocket.
3) Remove right-hand intake camshaft sprocket.
4) Remove right-hand exhaust camshaft sprocket.

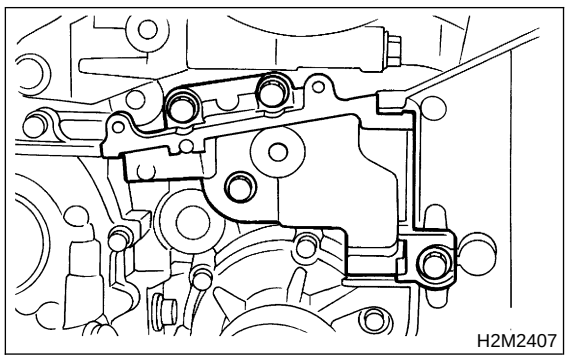
ST 499207300 CAMSHAFT SPROCKET WRENCH



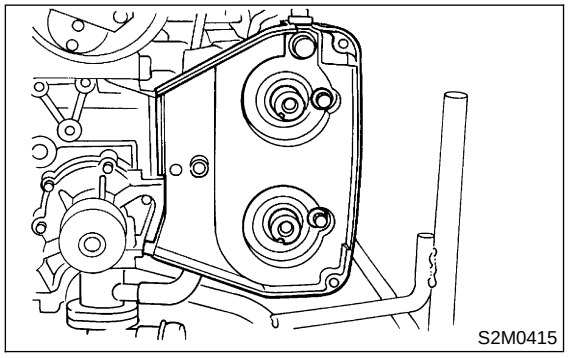
5) Remove crankshaft sprocket.



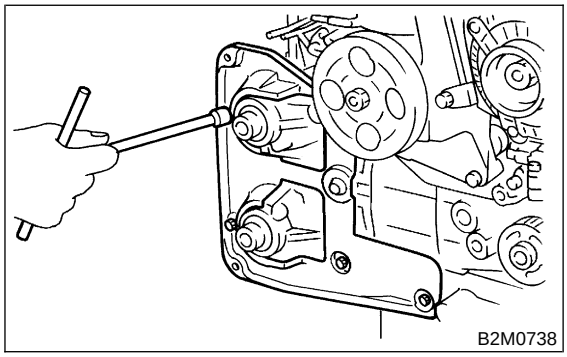
6) Remove tensioner bracket.



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



8) Remove right-hand belt cover No. 2.



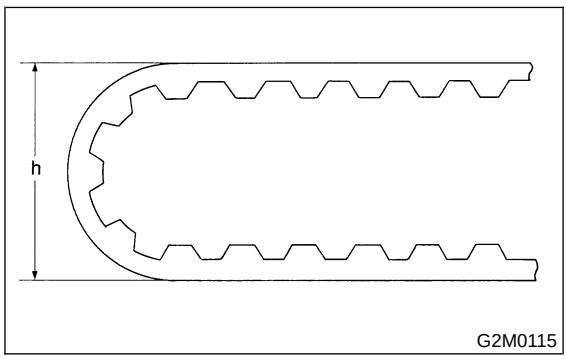
B: INSPECTION

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. AUTOMATIC BELT TENSION ADJUSTER

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

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

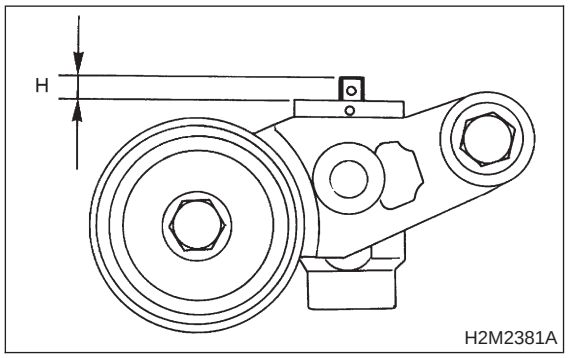
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kg, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kg, 66 lb), check it using the following procedures:

(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
5.7±0.5 mm (0.224±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

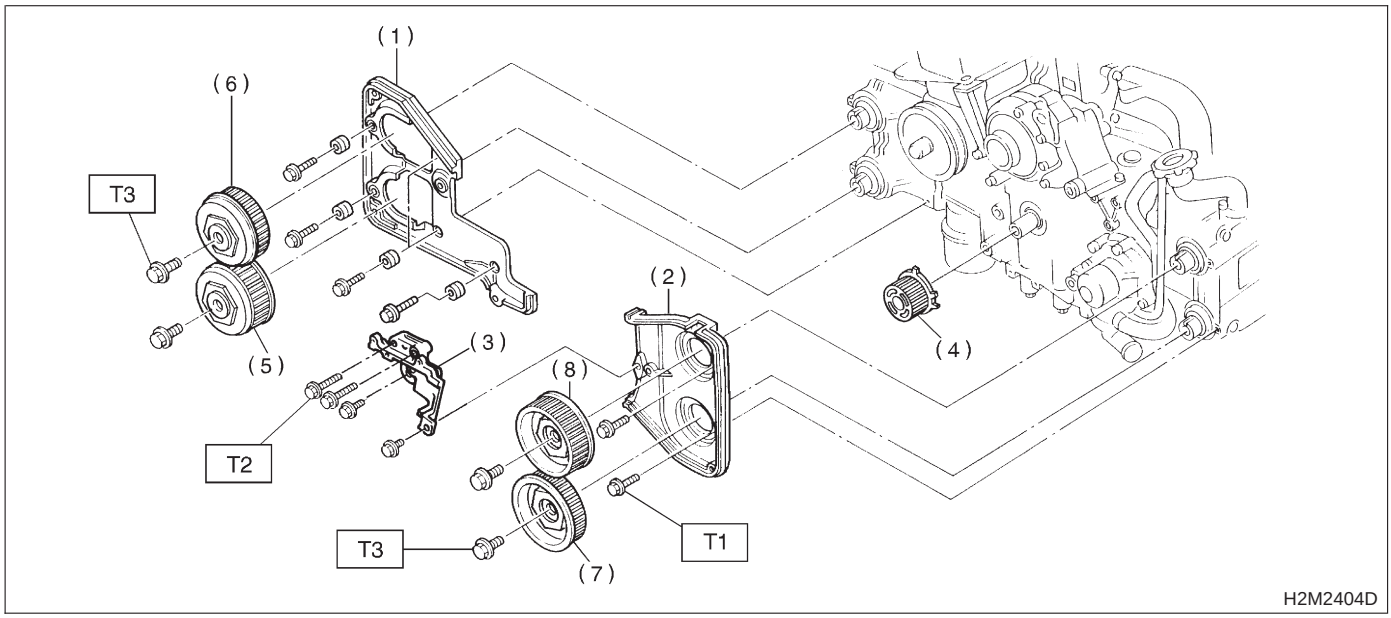
1) Check idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check idler for grease leakage.

5. 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

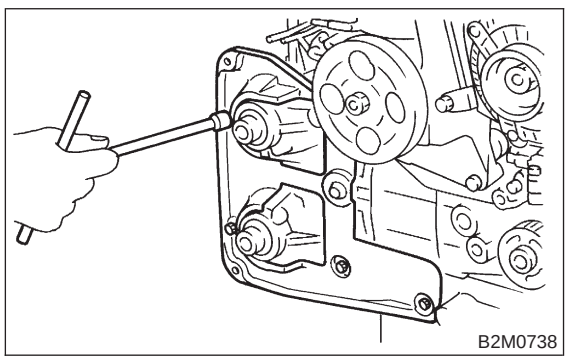
1. SPROCKET



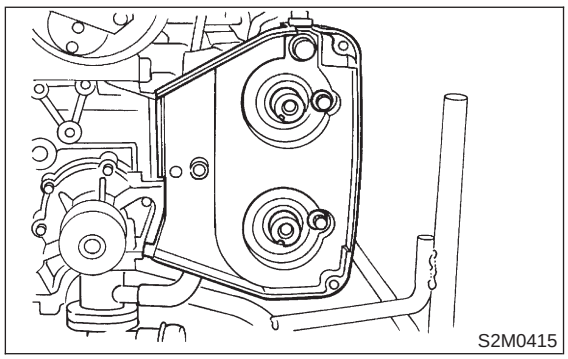
(1) Right-hand belt cover No. 2
(2) Left-hand belt cover No. 2
(3) Tensioner bracket
(4) Crankshaft sprocket
(5) Right-hand exhaust camshaft sprocket
(6) Right-hand intake camshaft sprocket
(7) Left-hand exhaust camshaft sprocket
(8) Left-hand intake camshaft sprocket

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 25±3 (2.5±0.3, 18.1±2.2)
T3: 78±5 (8.0±0.5, 57.9±3.6)

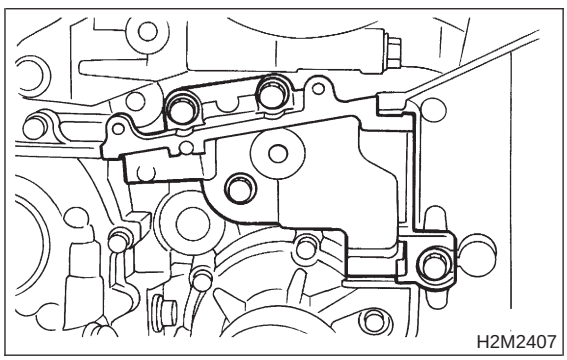
1) Install right-hand belt cover No. 2.



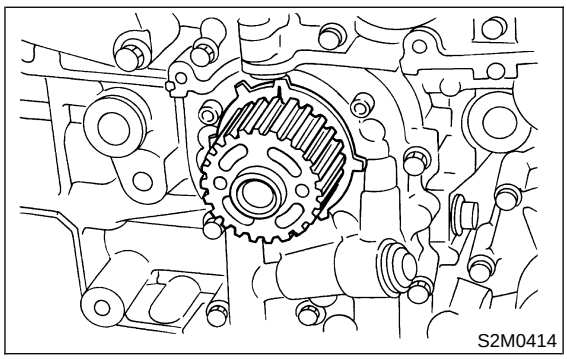
2) Install left-hand belt cover No. 2.



3) Install tensioner bracket.

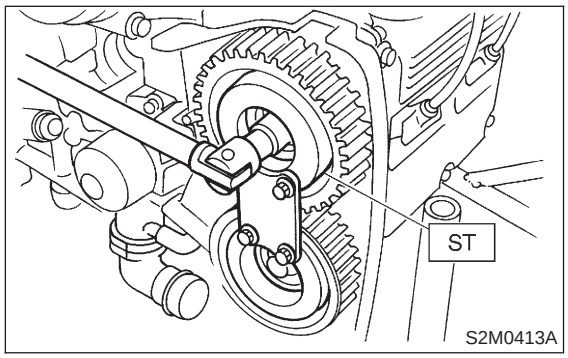


4) Install crankshaft sprocket.

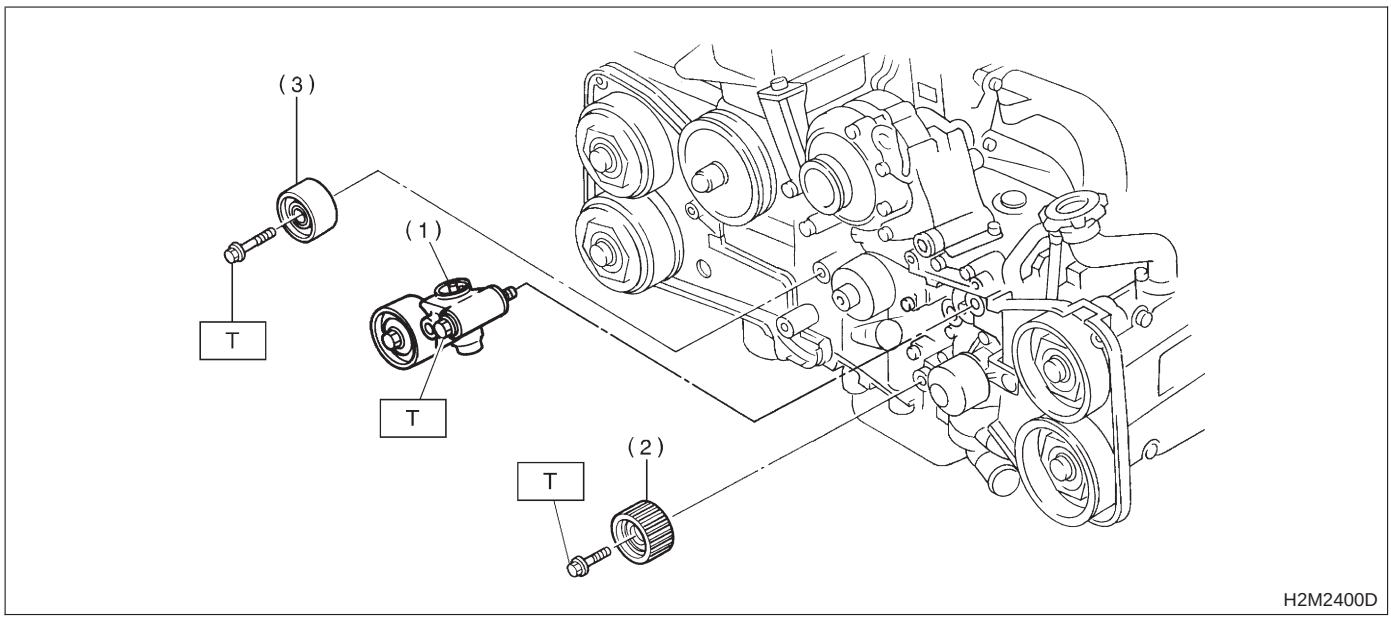


5) Install right-hand exhaust camshaft sprocket. To lock camshaft, use ST.
6) Install right-hand intake camshaft sprocket using ST.
7) Install left-hand exhaust camshaft sprocket using ST.
8) Install left-hand intake camshaft sprocket using ST.

ST 499207300 CAMSHAFT SPROCKET WRENCH



2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER



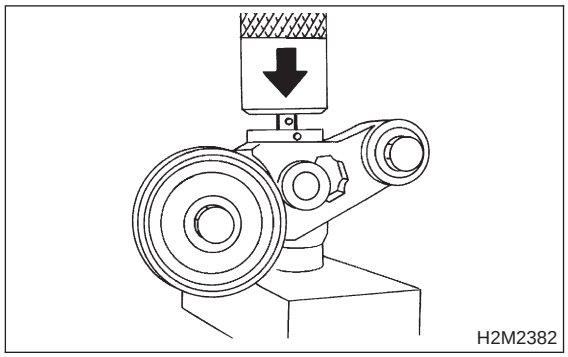
(1) Automatic belt tension adjuster ASSY
(2) Belt idler No. 2
(3) Belt idler

Tightening torque: N·m (kg-m, ft-lb)
T1: 39±4 (4.0±0.4, 28.9±2.9)

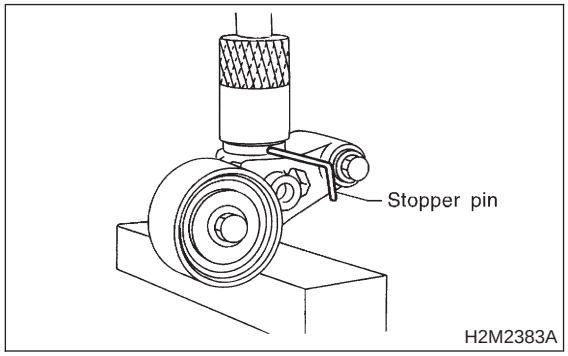
1) Preparation for installation of automatic belt tension adjuster assembly:

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.

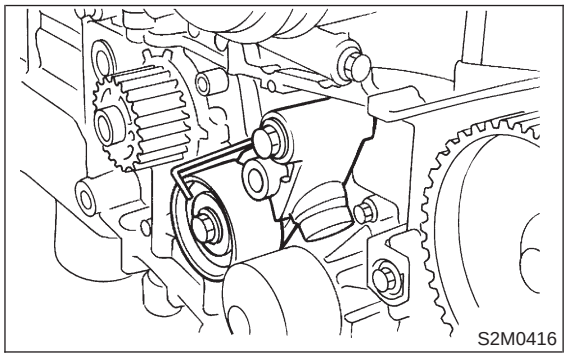

H2M2382

(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.

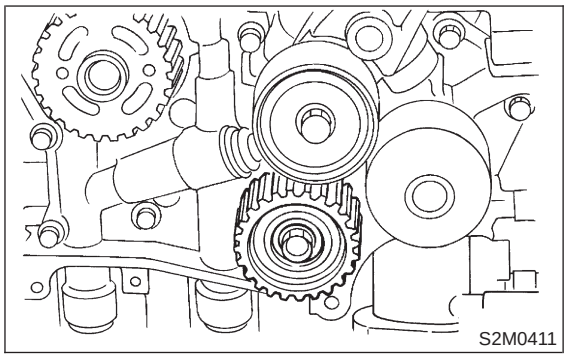


H2M2383A

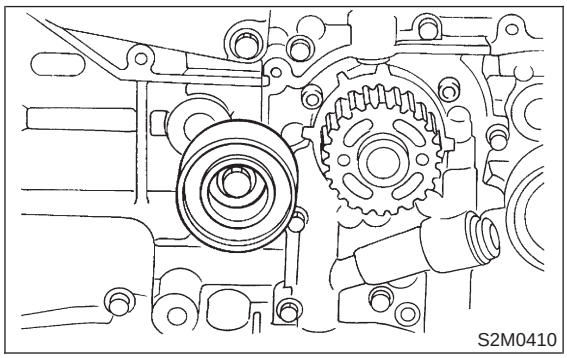
2) Install Automatic belt tension adjuster assembly.


S2M0416

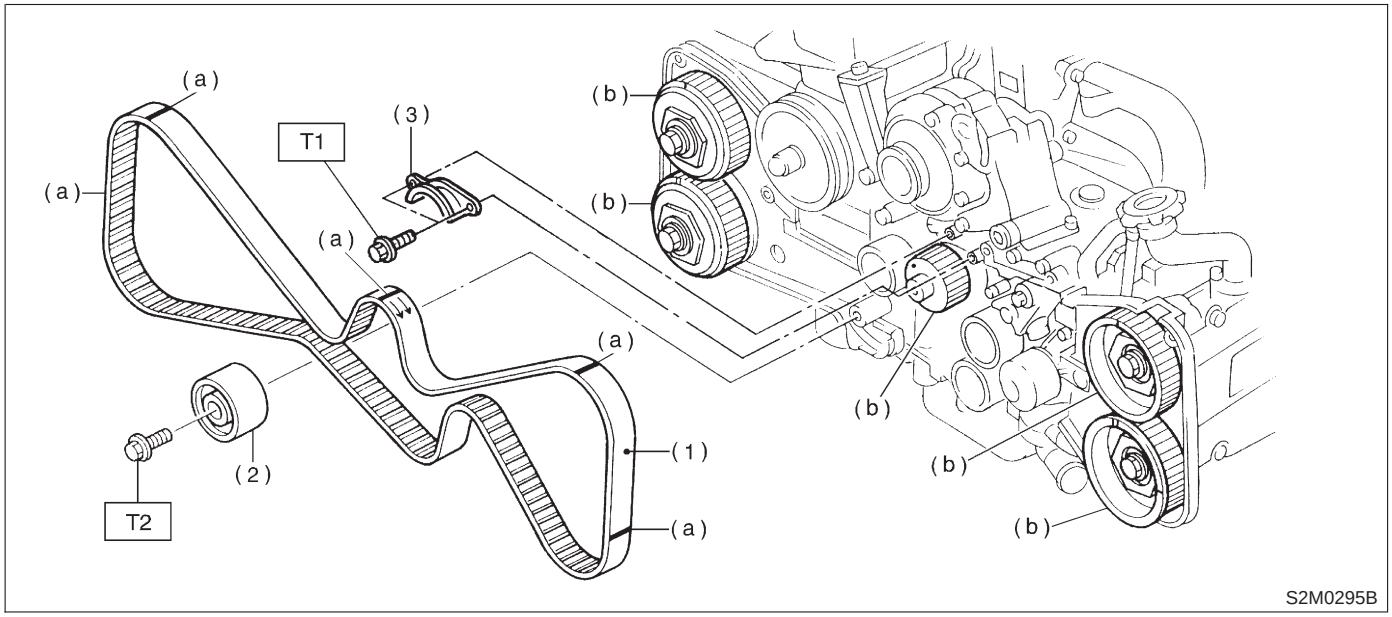
3) Install belt idler No. 2.


S2M0411

4) Install belt idler.


S2M0410

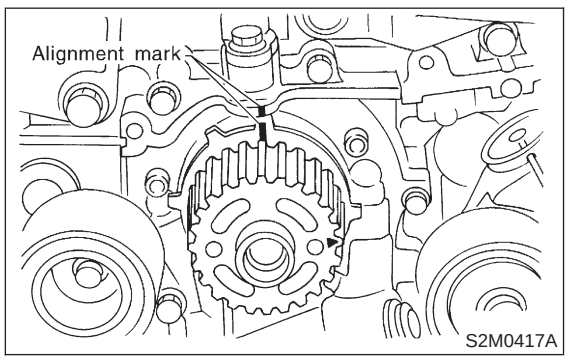
3. TIMING BELT



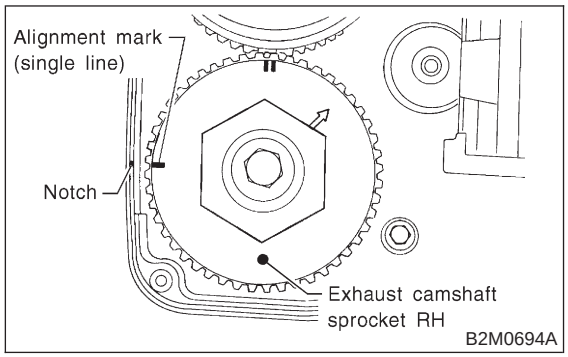
(1) Timing belt
(2) Belt idler
(3) Timing belt guide (MT vehicles only)
(a) Alignment mark (Timing belt side)
(b) Alignment mark (Sprocket side)

Tightening torque: N·m (kg-m, ft-lb)
T1: 9.8±1.0 (1.0±0.1, 7.2±0.7)
T2: 39±4 (4.0±0.4, 28.9±2.9)

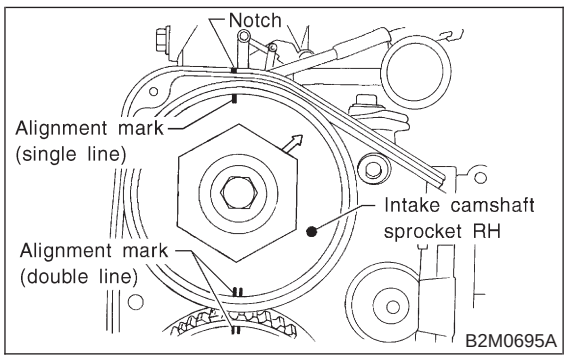
1) Crankshaft and camshaft sprocket alignment.
(1) Align mark on crankshaft sprocket with mark on the oil pump cover at cylinder block.



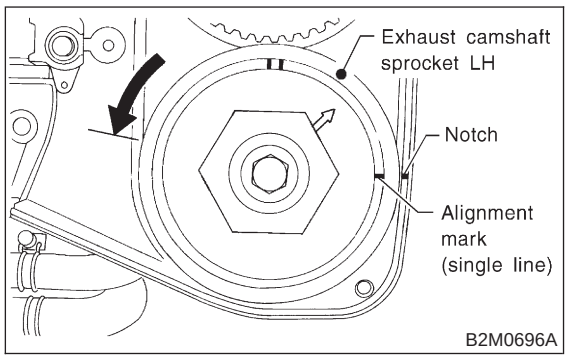
(2) Align single line mark on right-hand exhaust camshaft sprocket with notch on belt cover.



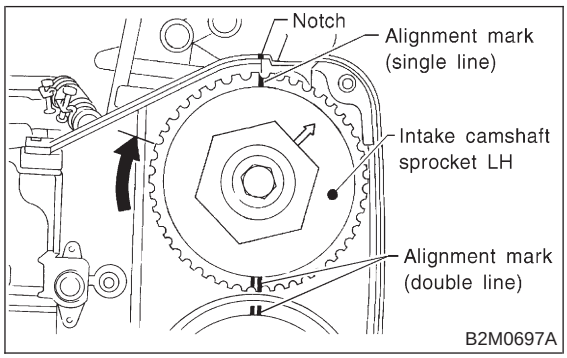
(3) Align single line mark on right-hand exhaust camshaft sprocket with notch on belt cover. (Make sure double lines on intake camshaft and exhaust camshaft sprockets are aligned.)



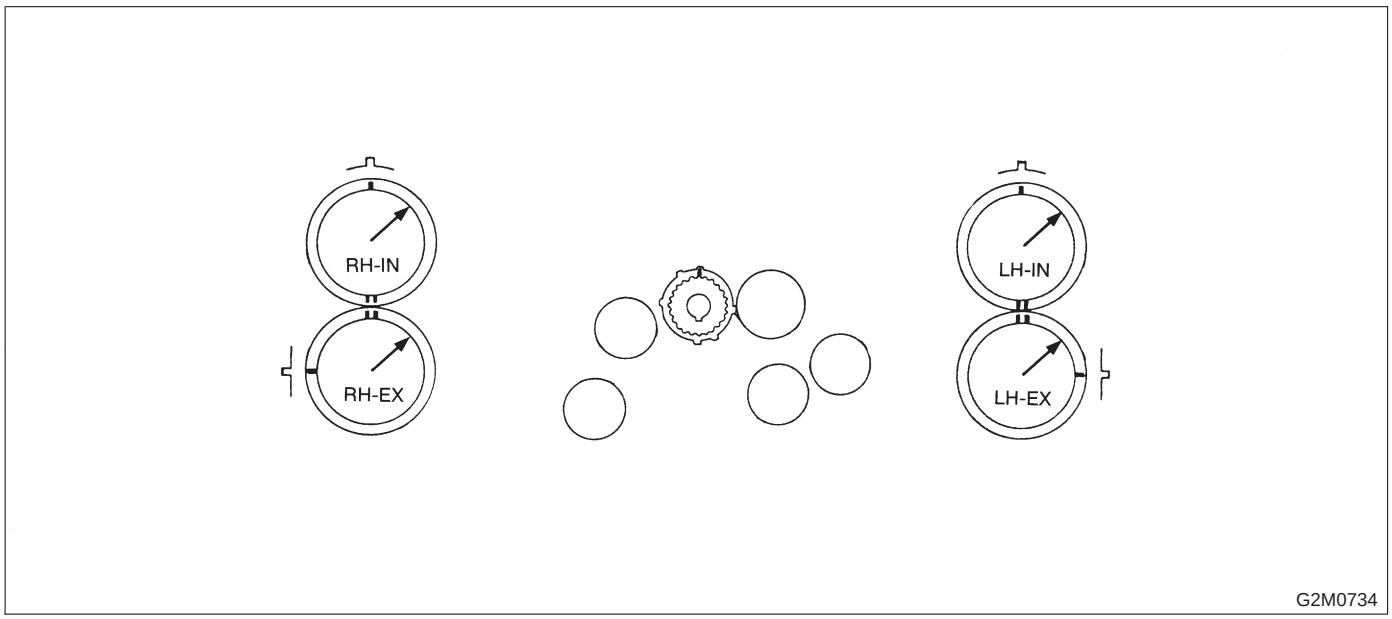
(4) Align single line mark on left-hand exhaust camshaft sprocket with notch on belt cover by turning sprocket counter-clockwise (as viewed from front of engine).



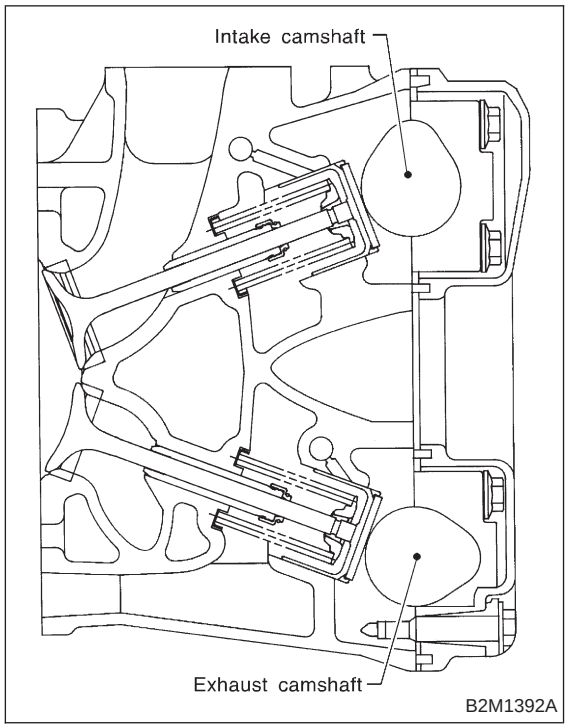
(5) Align single line mark on left-hand intake camshaft sprocket with notch on belt cover by turning sprocket clockwise (as viewed from front of engine).
Ensure double lines on intake and exhaust camshaft sprockets are aligned.



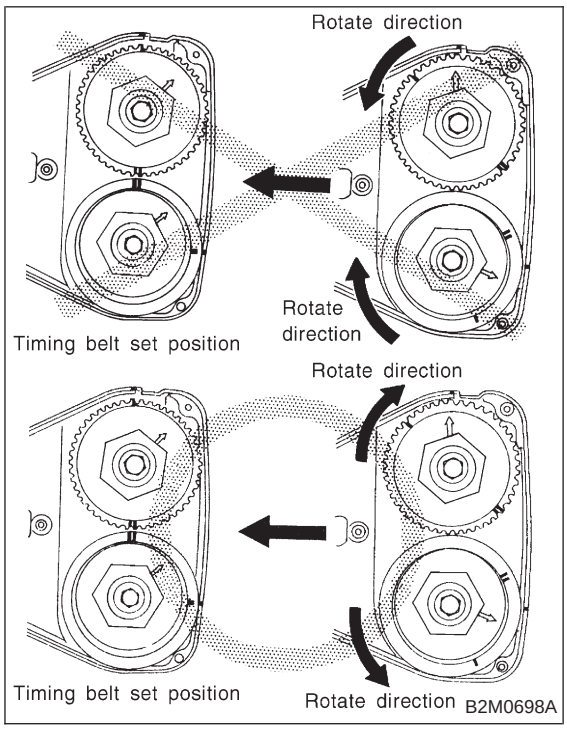
(6) Ensure camshaft and crankshaft sprockets are positioned as shown.



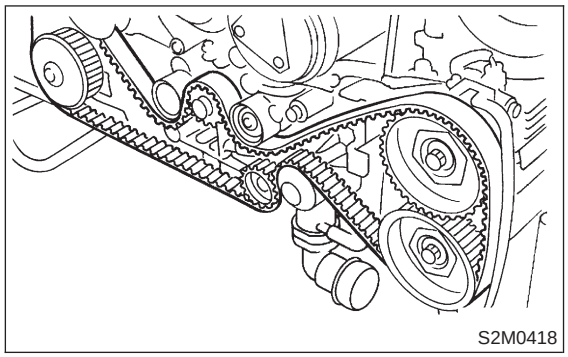
CAUTION:
● Intake and exhaust camshafts for this DOHC engine can be independently rotated with timing belts removed. As can be seen from the figure, if intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



● When timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
● When camshafts are rotated to install timing belts, #2 intake and #4 exhaust cam of left-hand camshafts are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
● Left-hand camshafts must be rotated from the "zero-lift" position to the position where timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
● Do not allow camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.

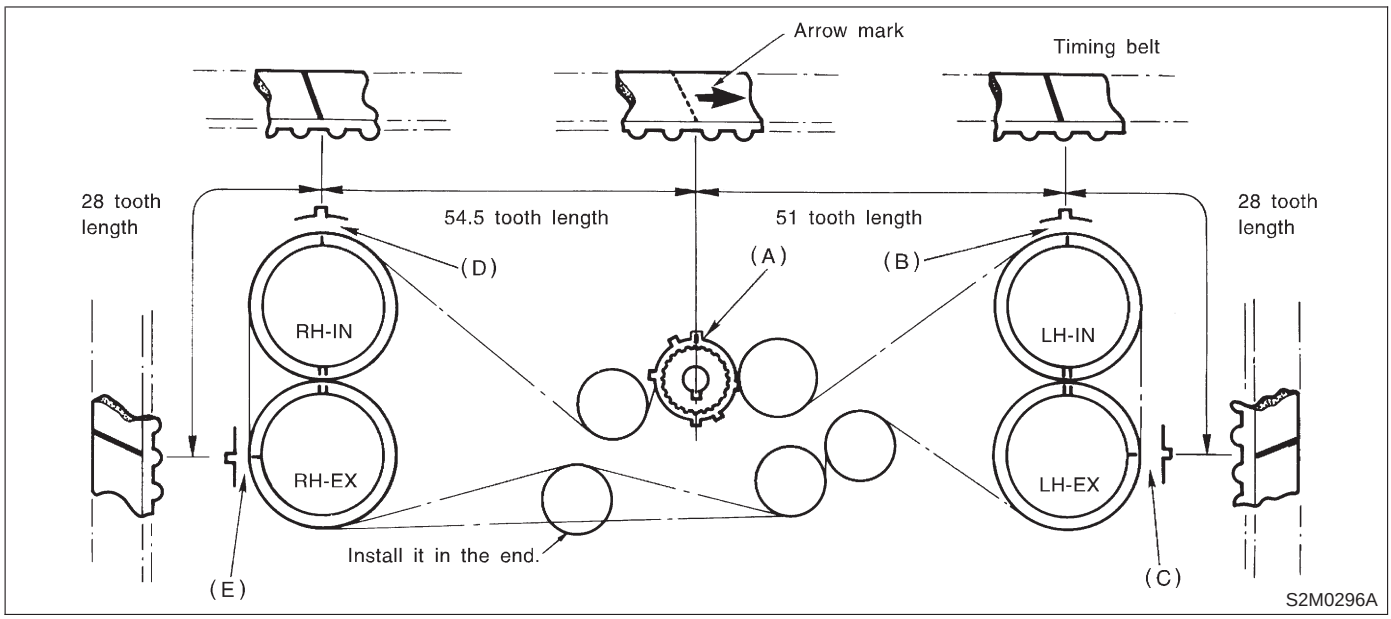


2) Installation of timing belt



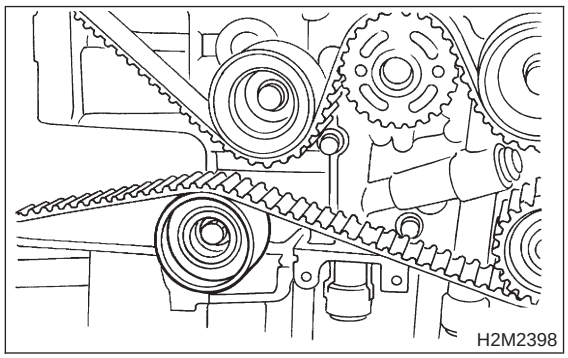
Align alignment mark on timing belt with marks on sprockets in the alphabetical order shown in figure. While aligning marks, position timing belt properly.

CAUTION:
- **Disengagement of more than three timing belt teeth may result in interference between the valve and piston.**
- **Ensure belt's rotating direction is correct.**

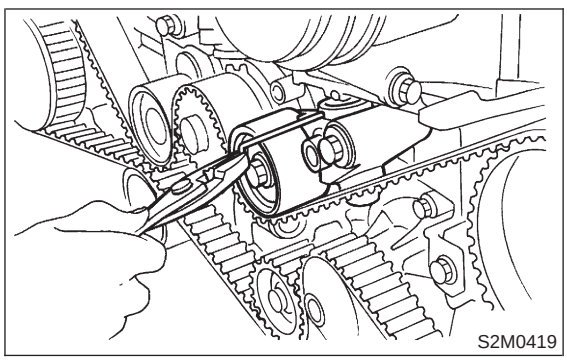


3) Install belt idler.

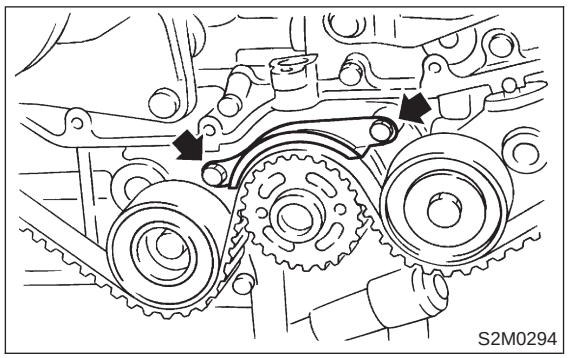
CAUTION:
Make sure that the marks on timing belt and sprockets are aligned.



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

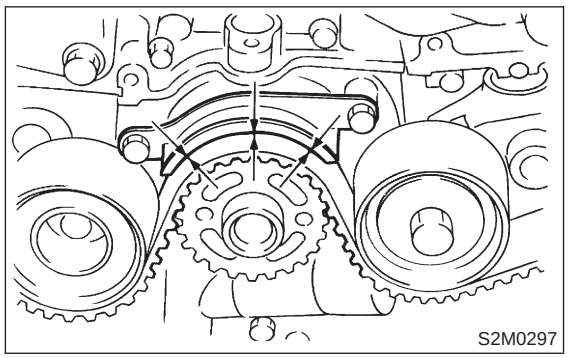


5) Install timing belt guide. (MT vehicles only)
(1) Temporarily tighten remaining bolts.

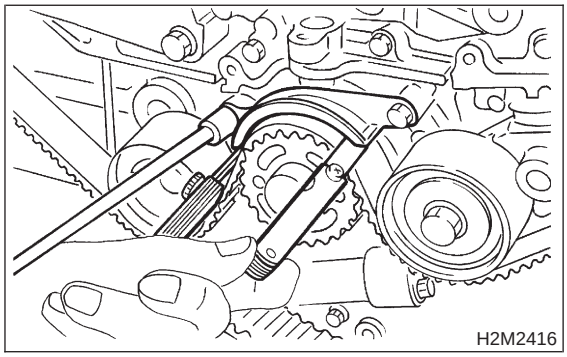

S2M0294

(2) Check and adjust clearance between timing belt and timing belt guide.

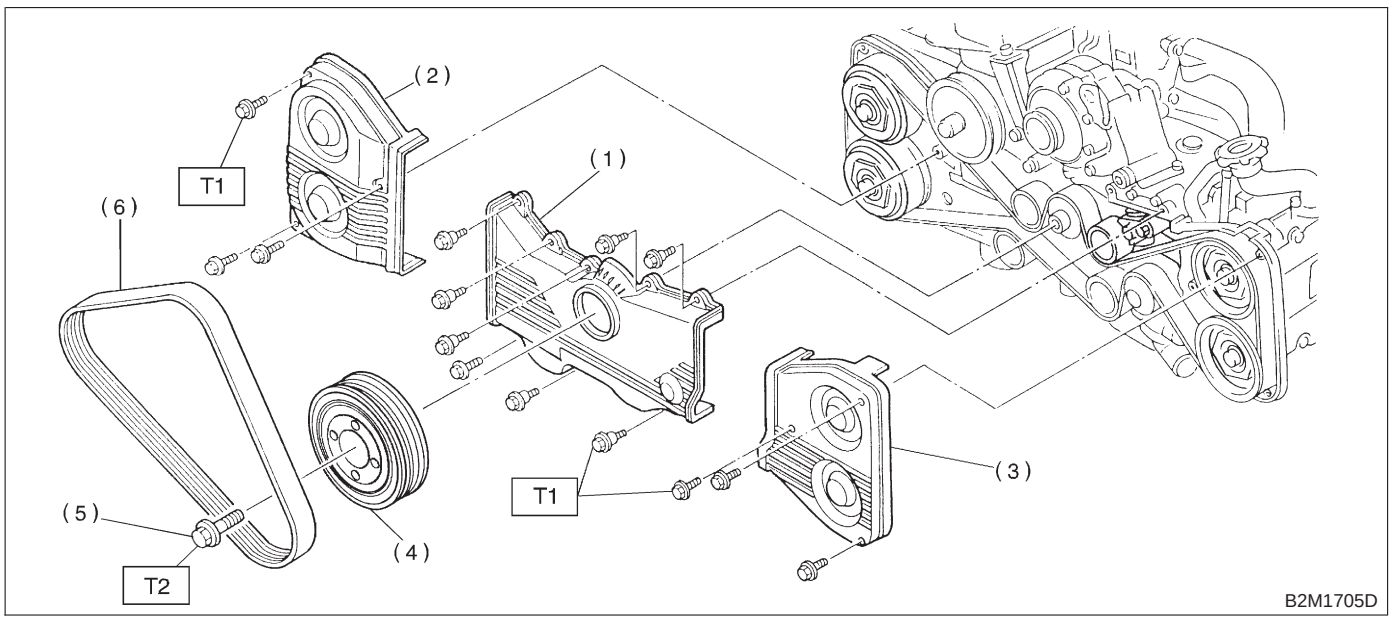
Clearance:
1.0±0.5 mm (0.039±0.020 in)


S2M0297

(3) Tighten remaining bolts.


H2M2416

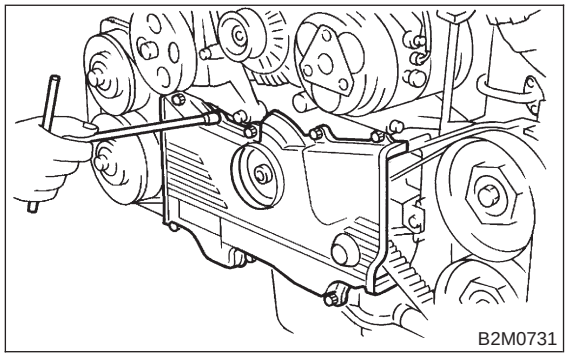
4. CRANKSHAFT PULLEY AND BELT COVER



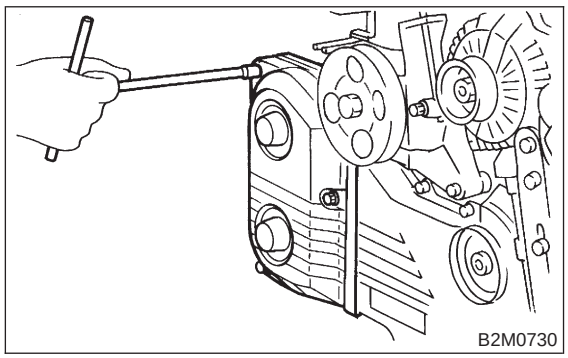
(1) Front belt cover
(2) Right-hand belt cover No. 1
(3) Left-hand belt cover No. 1
(4) Crankshft pulley
(5) Crankshaft pulley bolt

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 177±10 (18.0±1.0, 130±7)

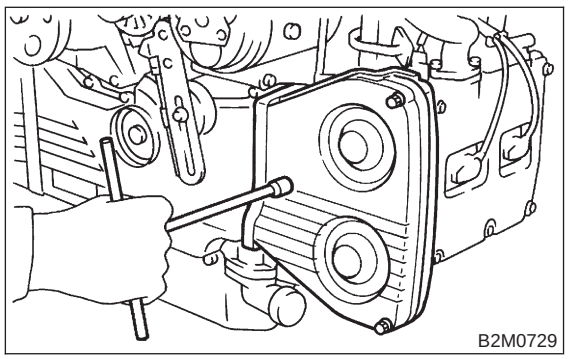
1) Install front belt cover.



2) Install right-hand belt cover.

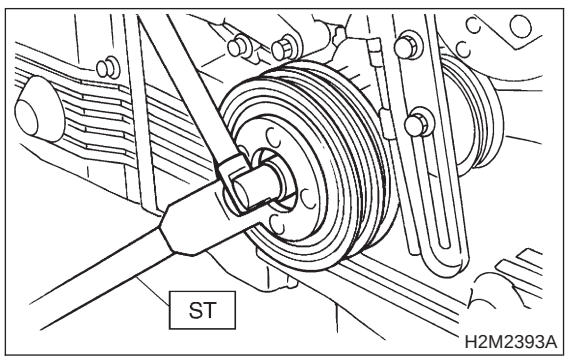


3) Install left-hand belt cover.



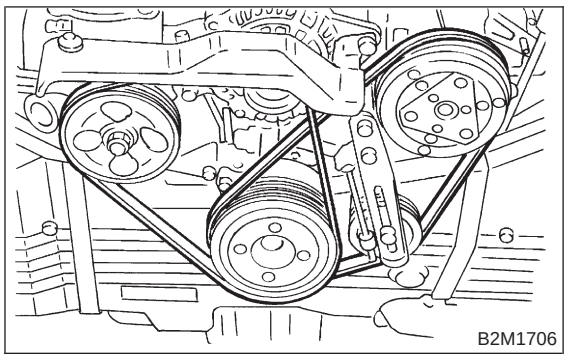
4) Install crankshaft pulley.
5) Tighten pulley bolt by using ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



6) Install V-belt, air conditioning compressor drive belt tensioner and V-belt cover. <Ref. to 1-5 [G2B0].>

CAUTION:
After installing V-belt, check and adjust V-belt tension.



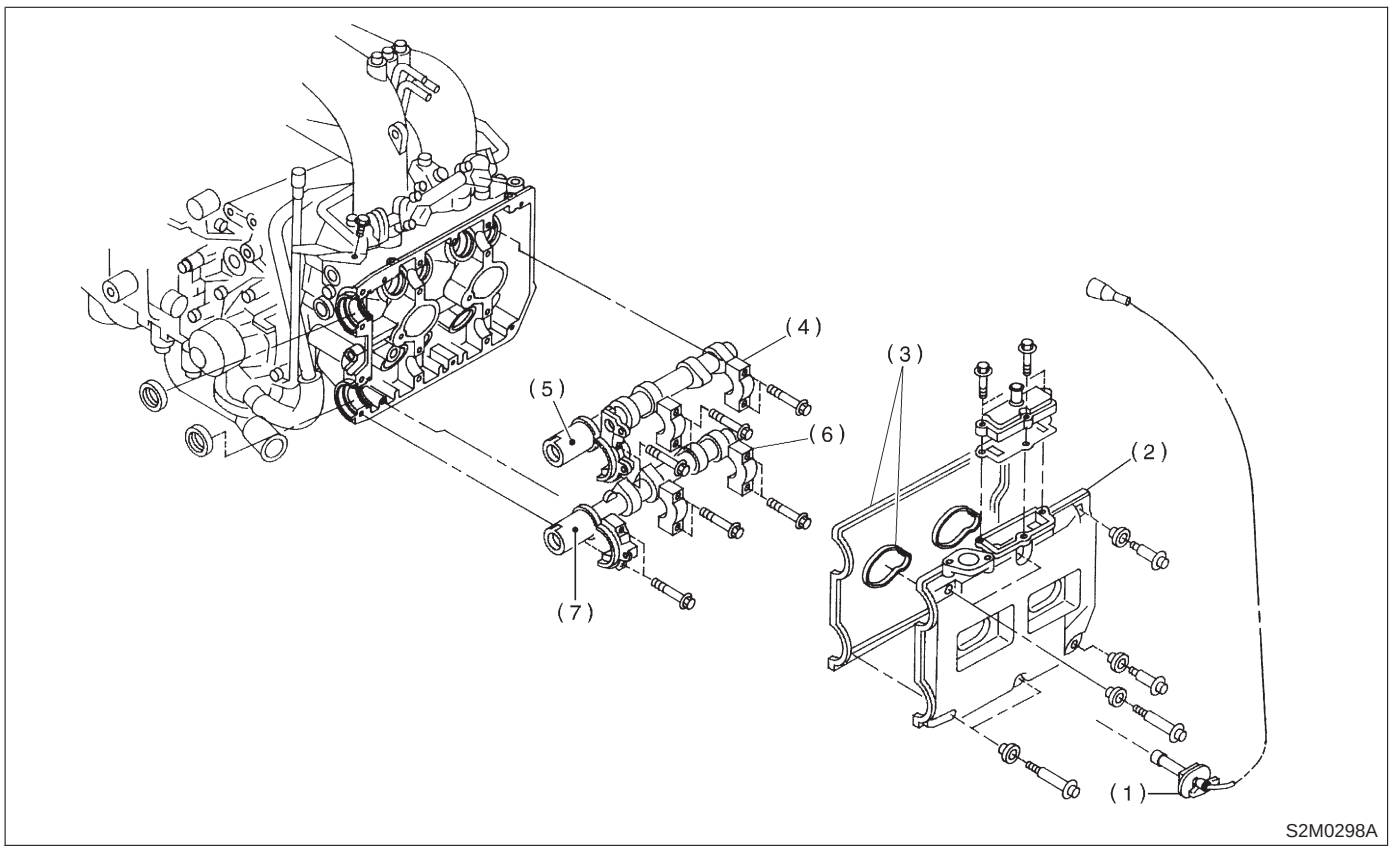
3. Camshaft

A: REMOVAL

1. RELATED PARTS

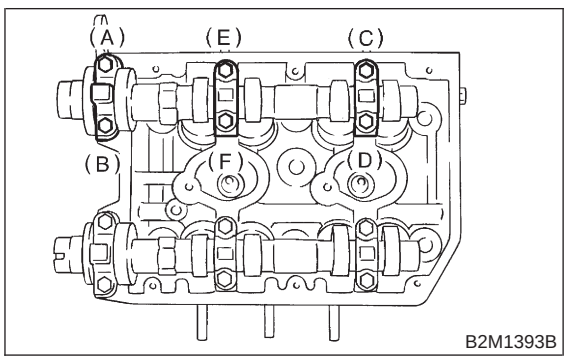
Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3b [W2A0].>

2. CAMSHAFT



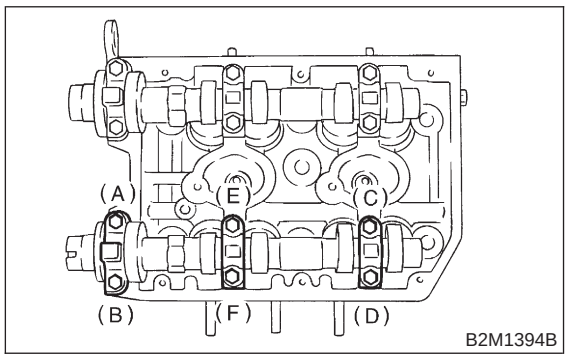
(1) Spark plug cord
(2) Rocker cover (LH)
(3) Rocker cover gasket (LH)
(4) Intake camshaft cap (LH)
(5) Intake camshaft (LH)
(6) Exhaust camshaft cap (LH)
(7) Exhaust camshaft (LH)

1) Remove camshaft position sensor (LH side only).
2) Remove spark plug cord.
3) Remove rocker cover and gasket.
4) Loosen intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in figure.



5) Remove camshaft caps and intake camshaft.

6) Loosen exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in figure.



7) Remove camshaft caps and exhaust camshaft.

CAUTION:
Arrange camshaft caps in order so that they can be installed in their original positions.

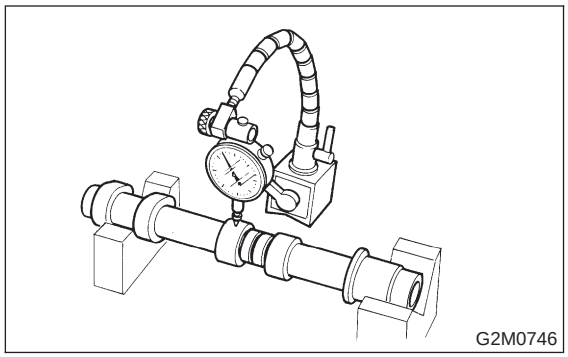
8) Similarly, remove right-hand camshafts and related parts.

B: INSPECTION

1. CAMSHAFT

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

Limit:
0.020 mm (0.0008 in)



2) Check journal for damage and wear. Replace if faulty.
3) Measure outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	31.946 — 31.963 mm (1.2577 — 1.2584 in)	27.946 — 27.963 mm (1.1002 — 1.1009 in)

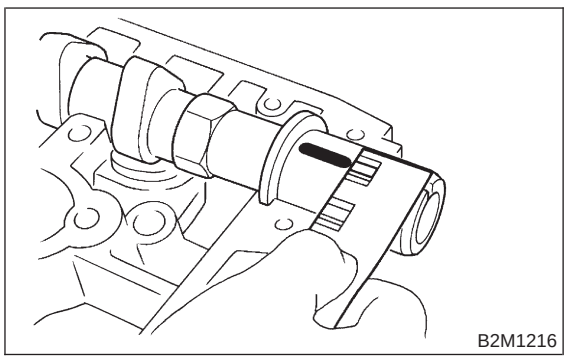
4) Measurement of the camshaft journal oil clearance
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head. (Without installing valve rocker.)
(3) Place plastigauge across each of the camshaft journals.
(4) Install the bearing caps.
<Ref. to 2-3b [W3C1].>

CAUTION:
Do not turn the camshaft.

(5) Remove the bearing caps.
(6) Measure the widest point of the plastigauge on each journal.
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard oil clearance:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

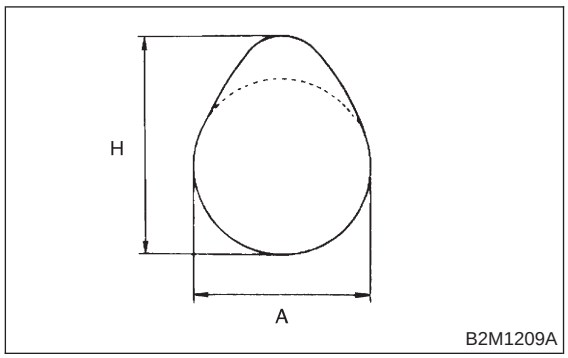
5) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Standard:
Intake:
42.20 — 42.30 mm (1.6614 — 1.6654 in)
Exhaust:
Front: 42.50 — 42.60 mm (1.6732 — 1.6772 in)
Rear: 41.40 — 41.50 mm (1.6299 — 1.6339 in)

Limit:
Intake:
42.04 mm (1.6551 in)
Exhaust:
Front: 42.34 mm (1.6669 in)
Rear: 41.24 mm (1.6236 in)

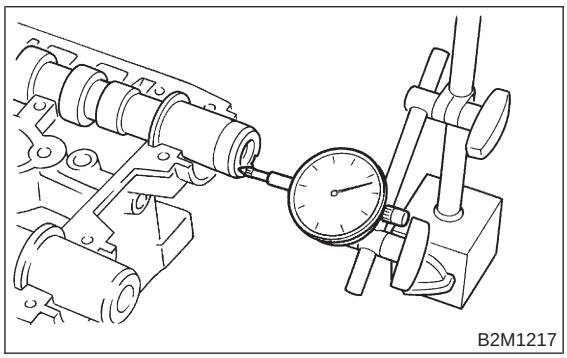
Cam base circle diameter A:
28.0 mm (1.102 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

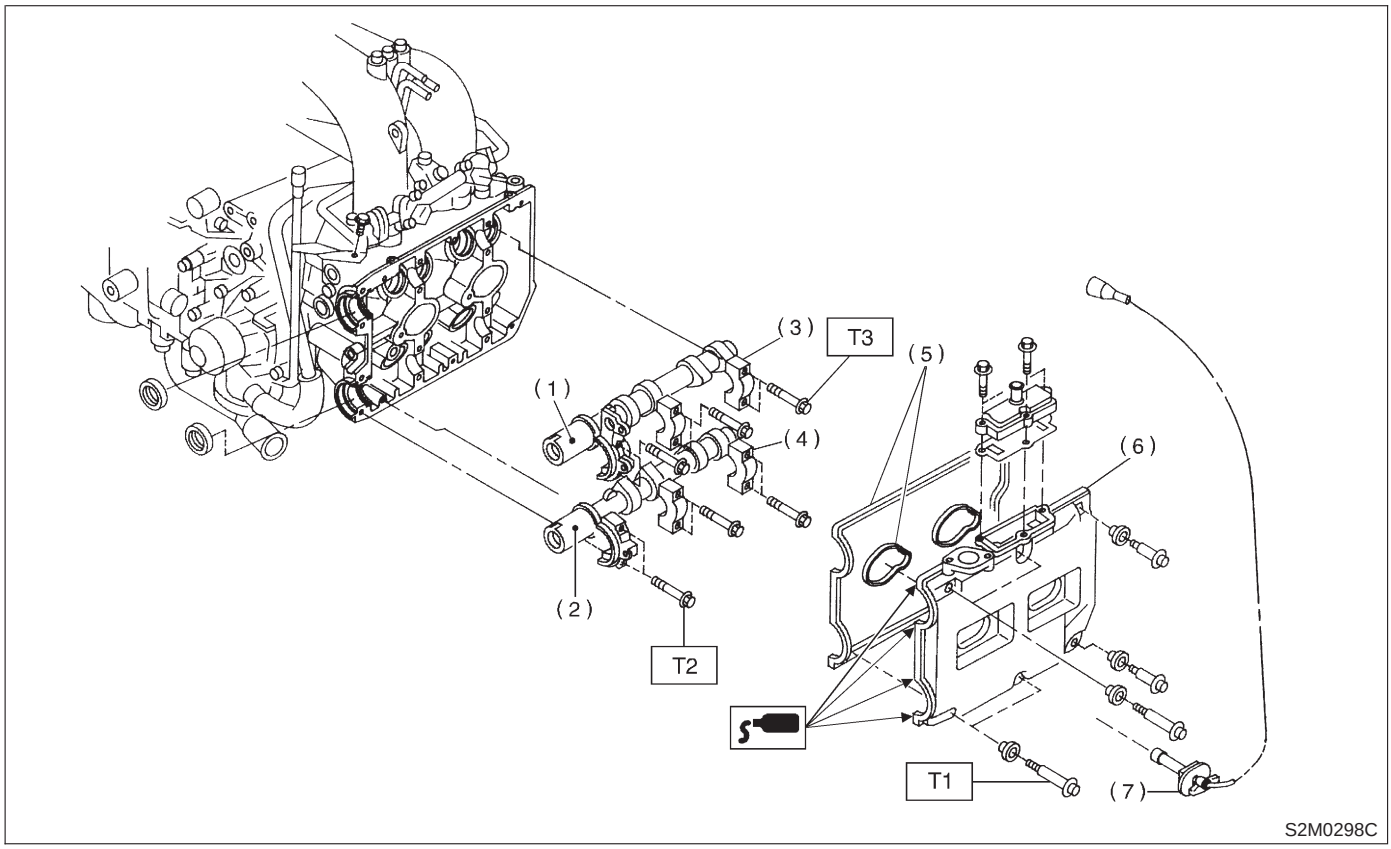
Standard:
0.040 — 0.080 mm (0.0016 — 0.0031 in)

Limit:
0.1 mm (0.004 in)



C: INSTALLATION

1. CAMSHAFT

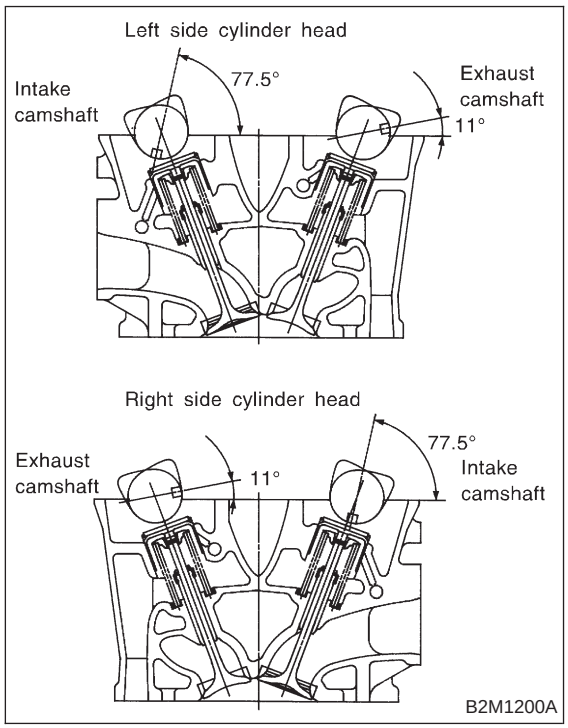


(1) Intake camshaft (LH)
(2) Exhaust camshaft (LH)
(3) Intake camshaft cap (LH)
(4) Exhaust camshaft cap (LH)
(5) Rocker cover gasket (LH)
(6) Rocker cover (LH)
(7) Spark plug cord

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 10±0.7 (1.0±0.07, 7.2±0.5)
T3: 20±2 (2.0±0.2, 14.5±1.4)

1) Camshaft installation
Apply engine oil to cylinder head at camshaft bearing location before installing camshaft. Install camshaft so that rocker arm is close to or in contact with “base circle” of cam lobe.

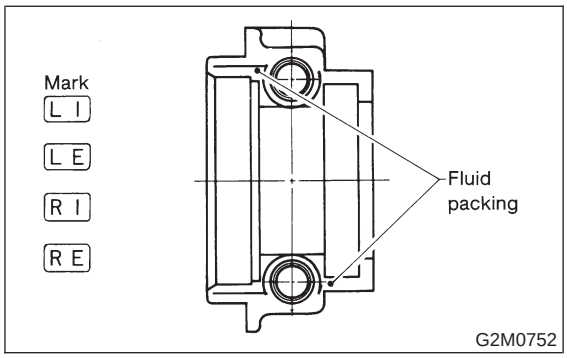
CAUTION:
● When camshafts are positioned as shown in figure, camshafts need to be rotated at a minimum to align with timing belt during installation.
● Right-hand camshaft need not be rotated when set at position shown in figure.
Left-hand intake camshaft: Rotate 80° clockwise.
Left-hand exhaust camshaft: Rotate 45° counter-clockwise.



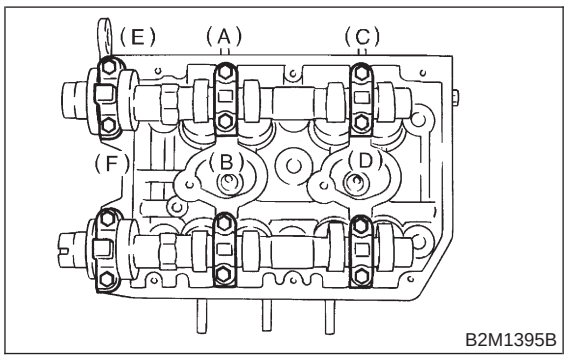
2) Camshaft cap installation
(1) Apply fluid packing sparingly to cap mating surface.

CAUTION:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

Fluid packing:
THREE BOND 1215 or equivalent



(2) Apply engine oil to cap bearing surface and install cap on camshaft as shown by identification mark.
(3) Gradually tighten cap in at least two stages in alphabetical sequence shown in figure, and then tighten to specified torque.

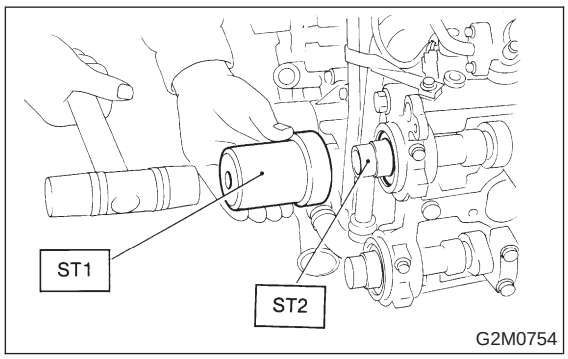


(4) Similarly, tighten cap on exhaust side.
After tightening cap, ensure camshaft rotates only slightly while holding it at “base” circle.

3) Camshaft oil seal installation
Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

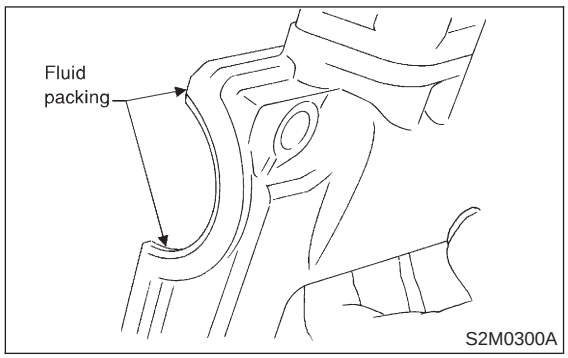
CAUTION:
Use a new oil seal.

ST1 499587100 OIL SEAL INSTALLER
ST2 499597000 OIL SEAL GUIDE



4) Rocker cover installation
(1) Install gasket on rocker cover.
Install peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to four front open edges of peripheral gasket.

Fluid packing:
THREE BOND 1215 or equivalent



(3) Install rocker cover on cylinder head. Ensure gasket is properly positioned during installation.
5) Install ignition coil.
6) Install cam angle sensor.
7) Similarly, install parts on right-hand side.

2. RELATED PARTS

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

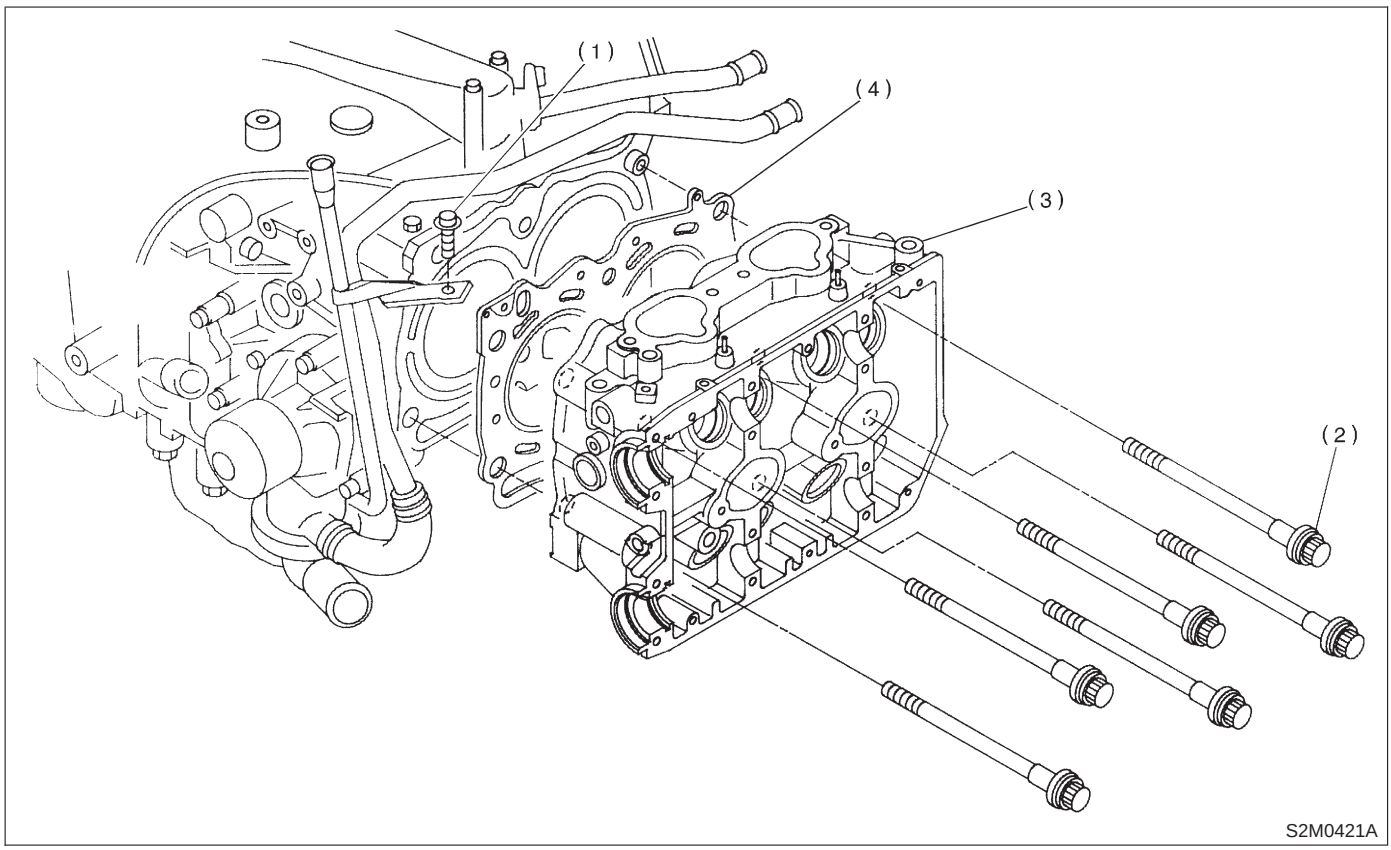
4. Cylinder Head

A: REMOVAL

1. RELATED PARTS

1) Remove V-belt.
2) Remove generator, air conditioner compressor and brackets.
3) Remove hoses and tubes from cylinder block.
4) Disconnect each connector and/or remove connector bracket.
5) Remove intake manifold assembly and gasket.
6) Remove camshaft position sensor.
7) Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3b [W2A0].>
8) Remove rocker cover, camshafts and related parts.
<Ref. to 2-3b [W3A2].>

2. CYLINDER HEAD

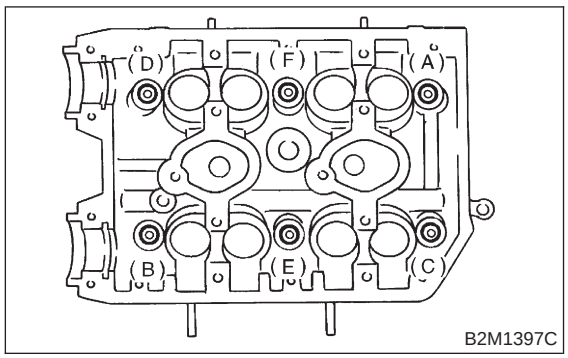


(1) Bolt
(2) Cylinder head bolt
(3) Cylinder head
(4) Cylinder head gasket

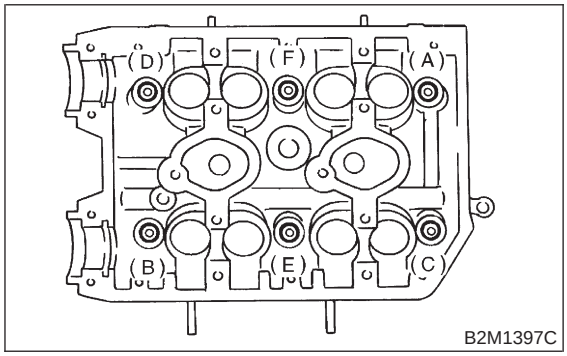
1) Remove oil level gauge guide attaching bolt (LH side only).

2) Remove cylinder head bolts in alphabetical sequence shown in figure.

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

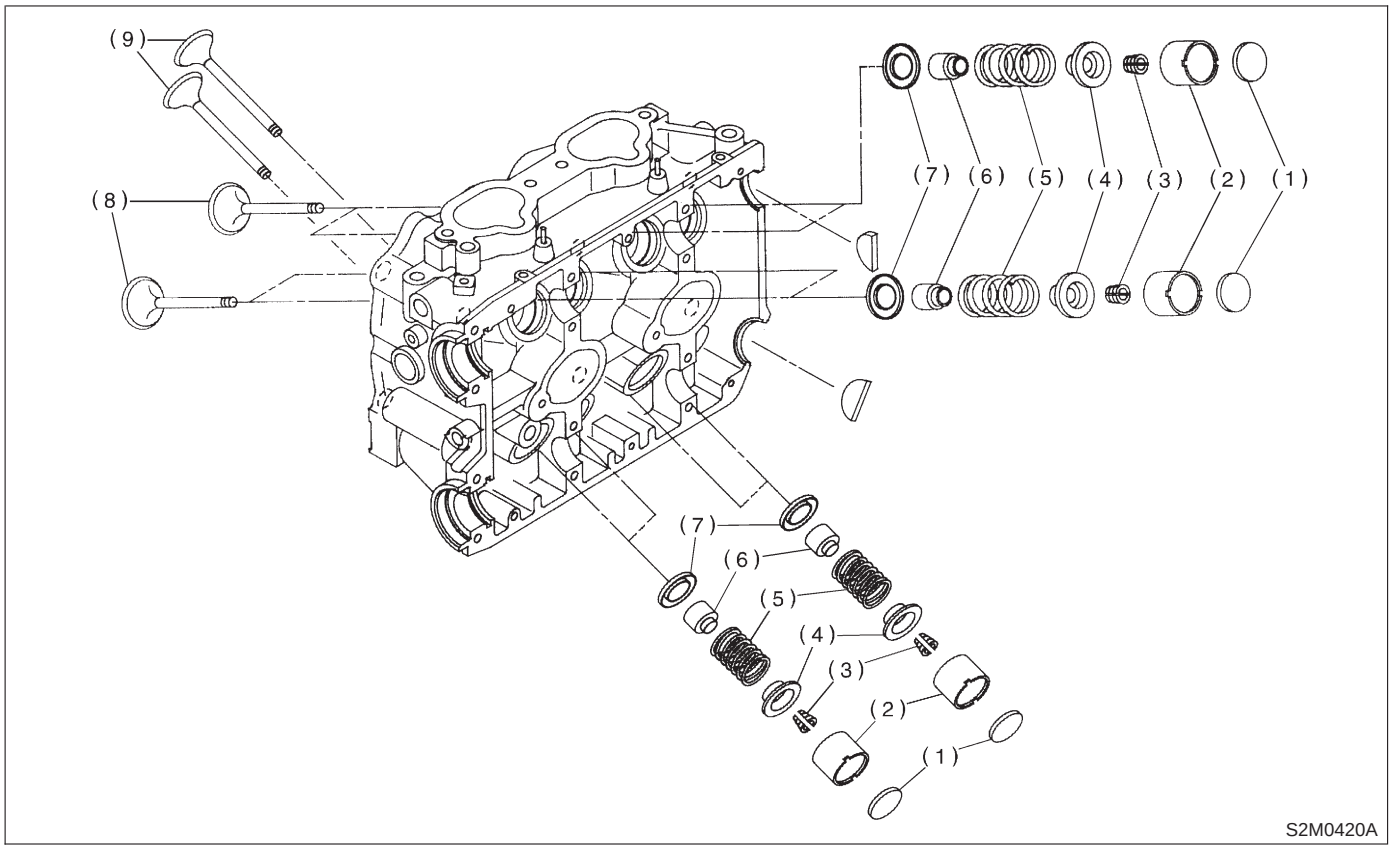


3) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
Remove bolts (A) and (D) to remove cylinder head.



4) Remove cylinder head gasket.
5) Similarly, remove right-hand cylinder head.

B: DISASSEMBLY

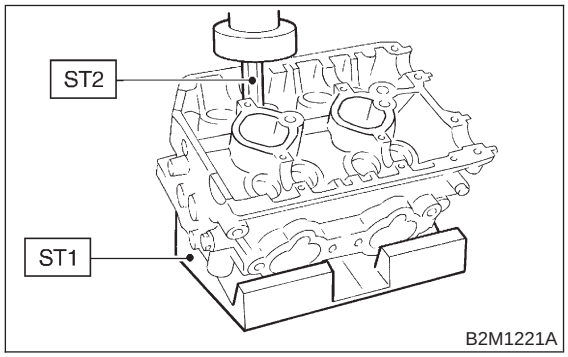


(1) Valve shim
(2) Valve lifter
(3) Valve retainer key
(4) Valve retainer
(5) Valve spring
(6) Valve oil seal
(7) Valve spring seat
(8) Intake valve
(9) Exhaust valve

1) Remove valve shims and valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

CAUTION:
● Keep removed parts in order for re-installing in their original positions.
● 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.



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 check.

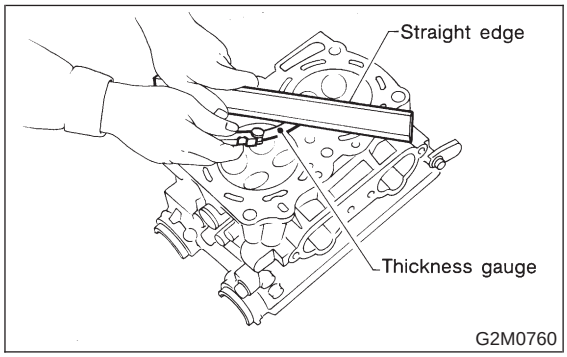
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

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



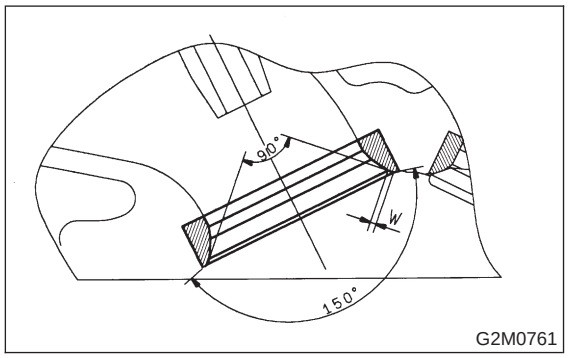
2. VALVE SEAT

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
1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)

Exhaust
Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 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 diameter:
6.000 — 6.015 mm (0.2362 — 0.2368 in)

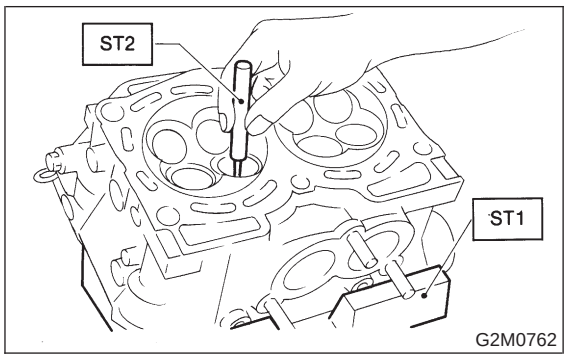
Valve stem outer diameter:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.950 — 5.965 mm (0.2343 — 0.2348 in)

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.

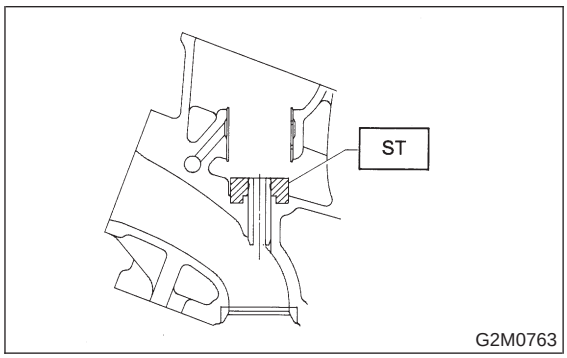
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



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

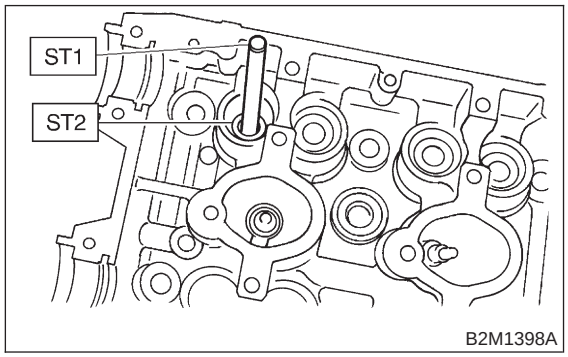
ST 498267700 VALVE GUIDE ADJUSTER



(4) Before installing new 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 498267700 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
12.0 — 12.4 mm (0.472 — 0.488 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

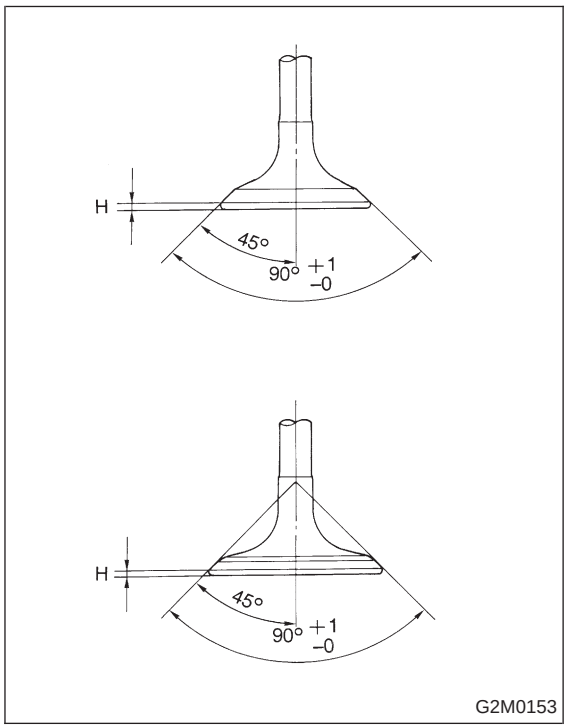
1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:

Intake
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)

Exhaust
Standard
1.5 mm (0.059 in)
Limit
0.8 mm (0.031 in))

Valve overall length:
Intake
105.9 mm (4.169 in)
Exhaust
106.2 mm (4.181 in)

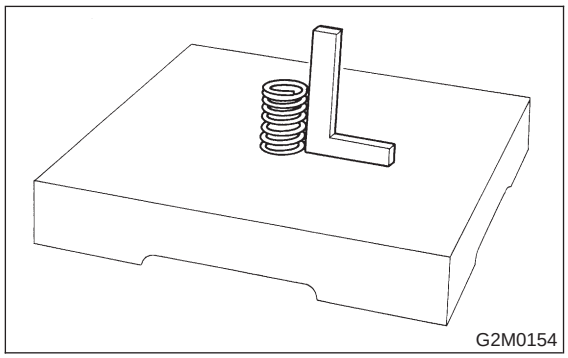


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented in the table.
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.

	Valve spring
Free length	39.8 mm (1.567 in)
Tension/spring height	228.5 — 261.8 N (23.3 — 26.7 kg, 51.4 — 58.9 lb)/31.0 mm (1.220 in)
	462.9 — 531.5 N (47.2 — 54.2 kg, 104.1 — 119.5 lb)/23.2 mm (0.913 in)
Squareness	2.5°, 1.7 mm (0.067 in)


G2M0154

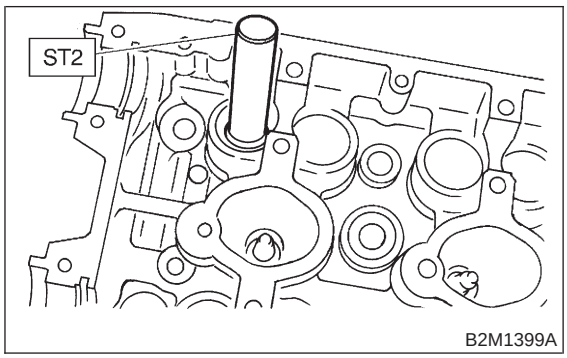
6. INTAKE AND EXHAUST VALVE OIL SEAL

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 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

CAUTION:
● Apply engine oil to oil seal before force-fitting.
● 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]

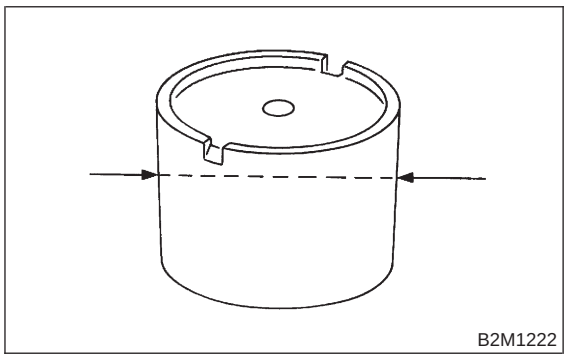


B2M1399A

7. VALVE LIFTER

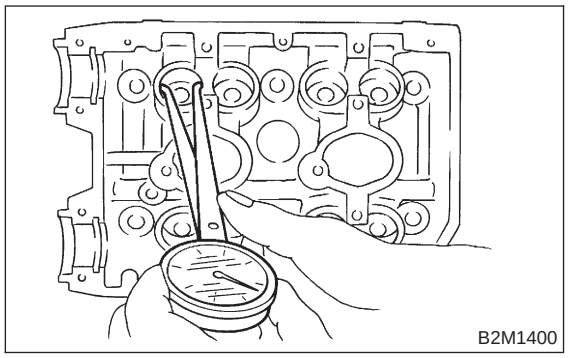
1) Check valve lifter visually.
2) Measure outer diameter of valve lifter.

Outer diameter:
32.959 — 32.975 mm (1.2976 — 1.2982 in)


B2M1222

3) Measure inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
32.994 — 33.016 mm (1.2990 — 1.2998 in)

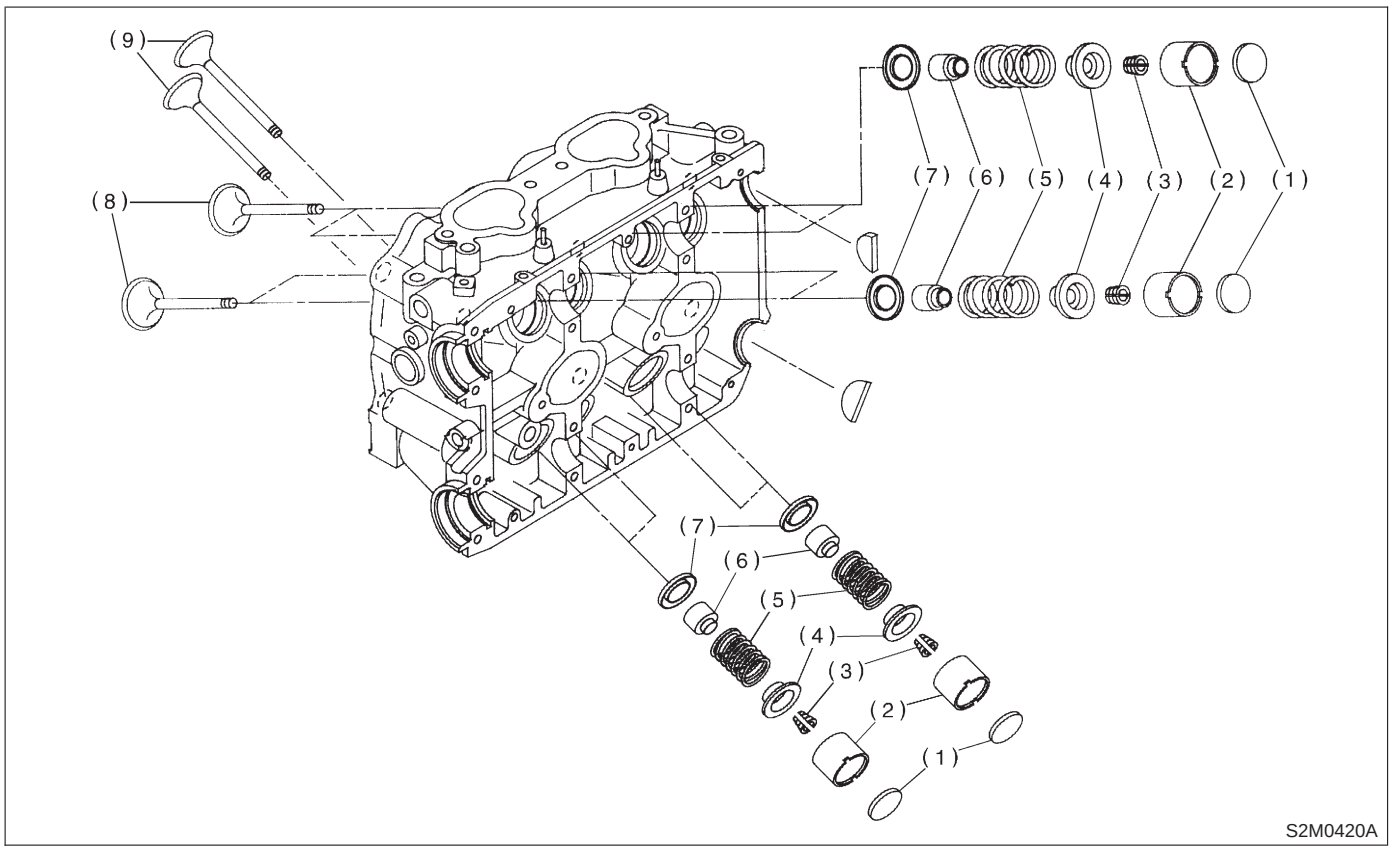


CAUTION:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

D: ASSEMBLY



(1) Valve shim
(2) Valve lifter
(3) Valve retainer key
(4) Valve retainer
(5) Valve spring
(6) Valve oil seal
(7) Valve spring seat
(8) Intake valve
(9) Exhaust valve

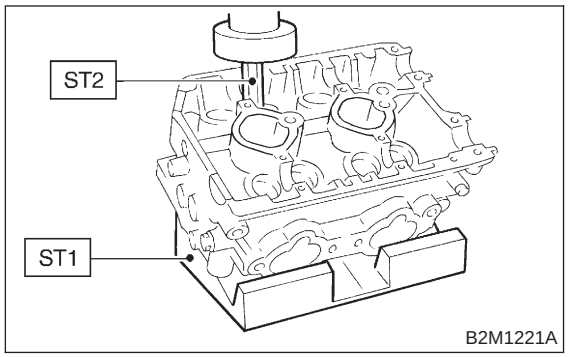
1) Installation of valve spring and valve
   (1) Coat stem of each valve with engine oil and insert valve into valve guide.

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

   (2) Set cylinder head on ST1.
   (3) Install valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

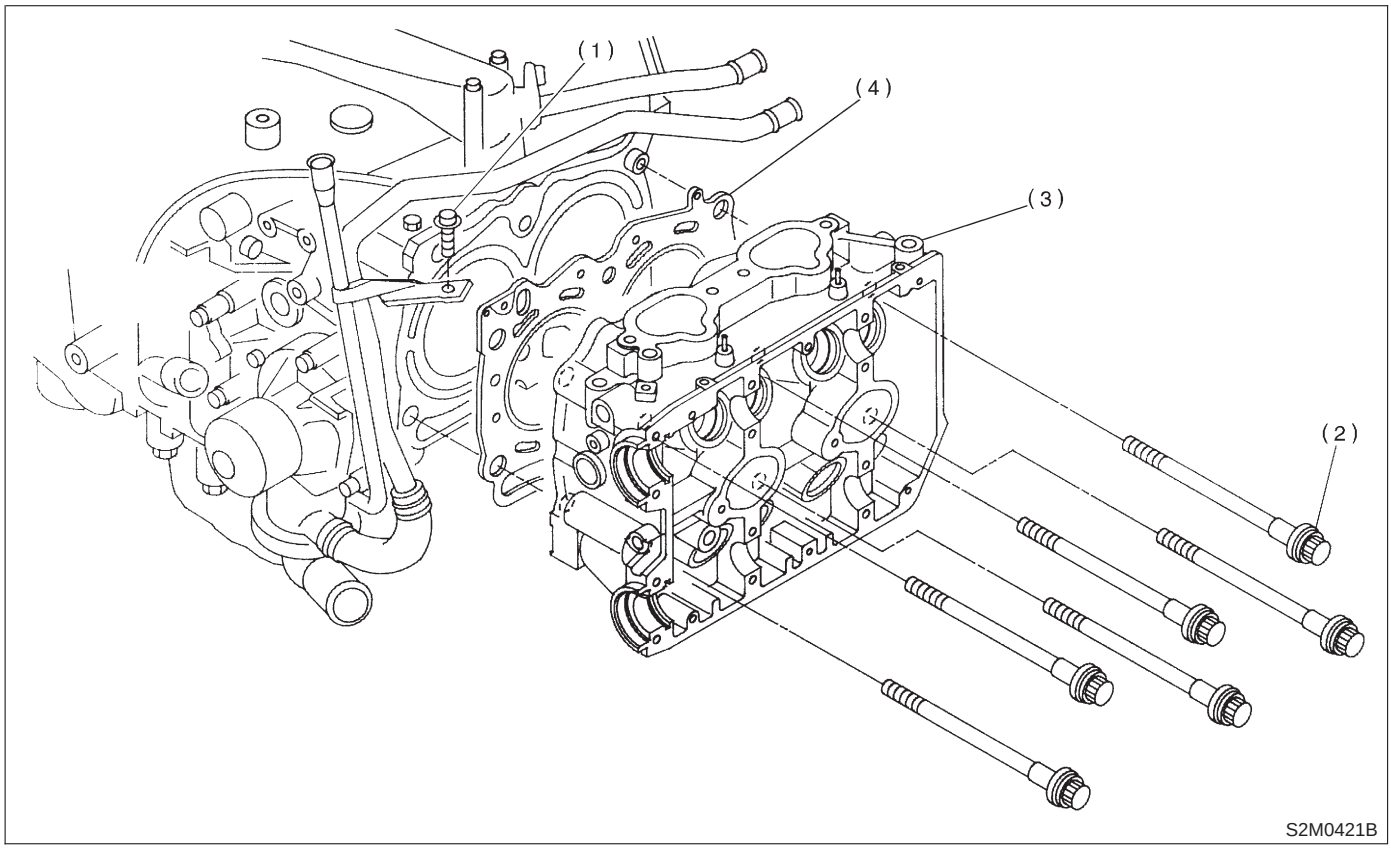
CAUTION:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.



   (4) Compress valve spring and fit valve spring retainer key.
   (5) After installing, tap valve spring retainers lightly with wooden hammer for better seating.
2) Install valve lifter and valve shim.

E: INSTALLATION

1. CYLINDER HEAD

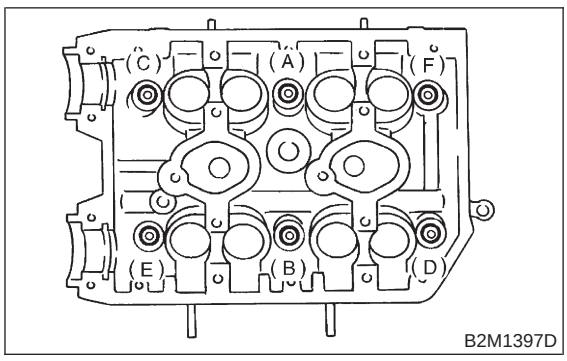


(1) Bolt
(2) Cylinder head bolt
(3) Cylinder head
(4) Cylinder head gasket

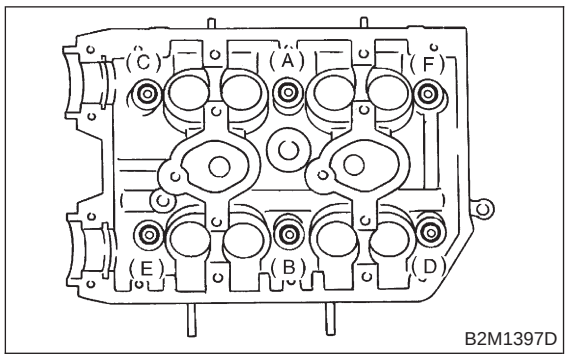
1) Install cylinder head and gaskets on cylinder block.

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 (A) and (B) to 34 N·m (3.5 kg-m, 25 ft-lb).



(5) Tighten bolts (C), (D), (E) and (F) 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°.

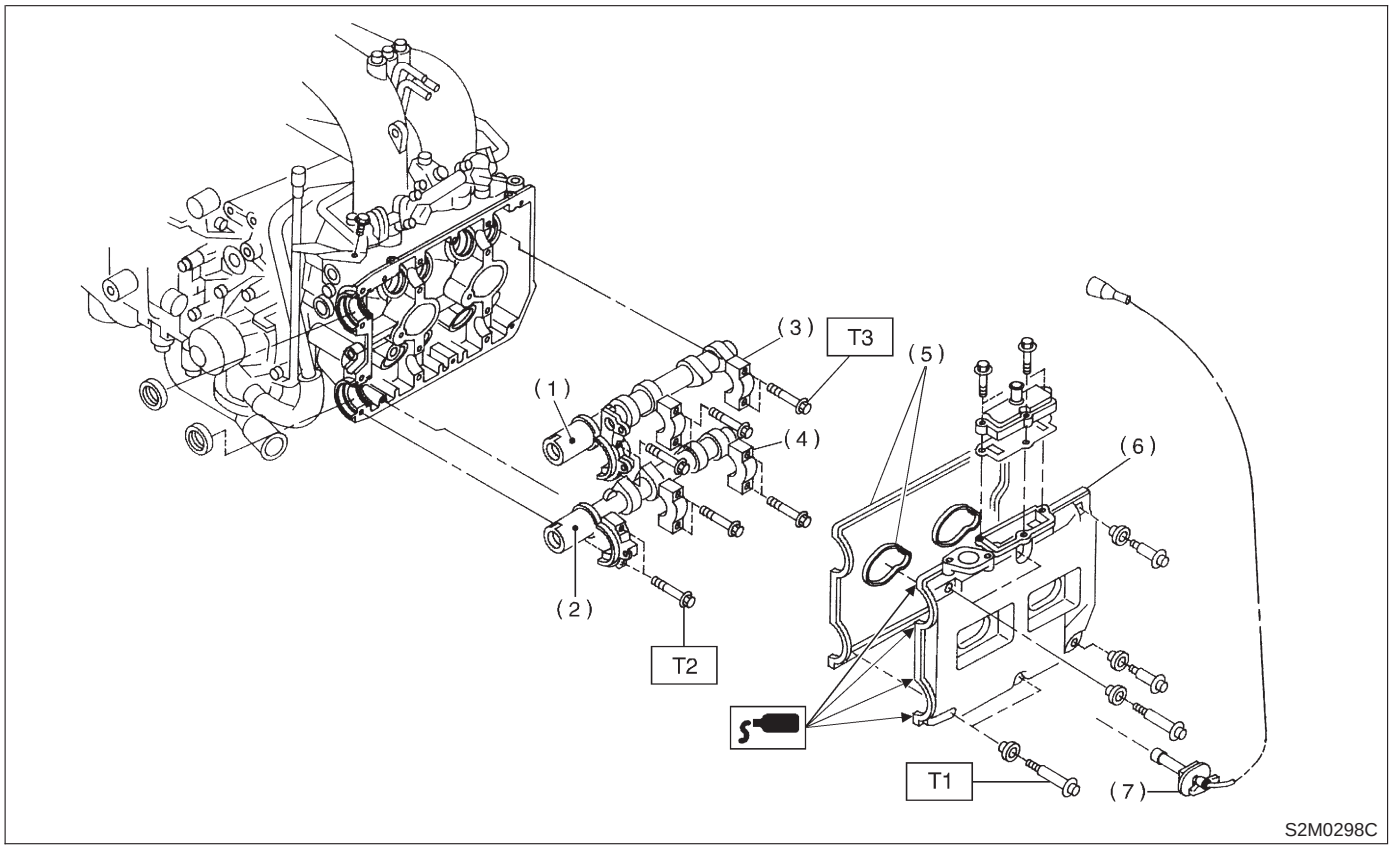
(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

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

3) Install oil level gauge guide attaching bolt (LH side only).

2. RELATED PARTS

1) Install camshafts, rocker cover and related parts.
<Ref. to 2-3b [W3C1].>

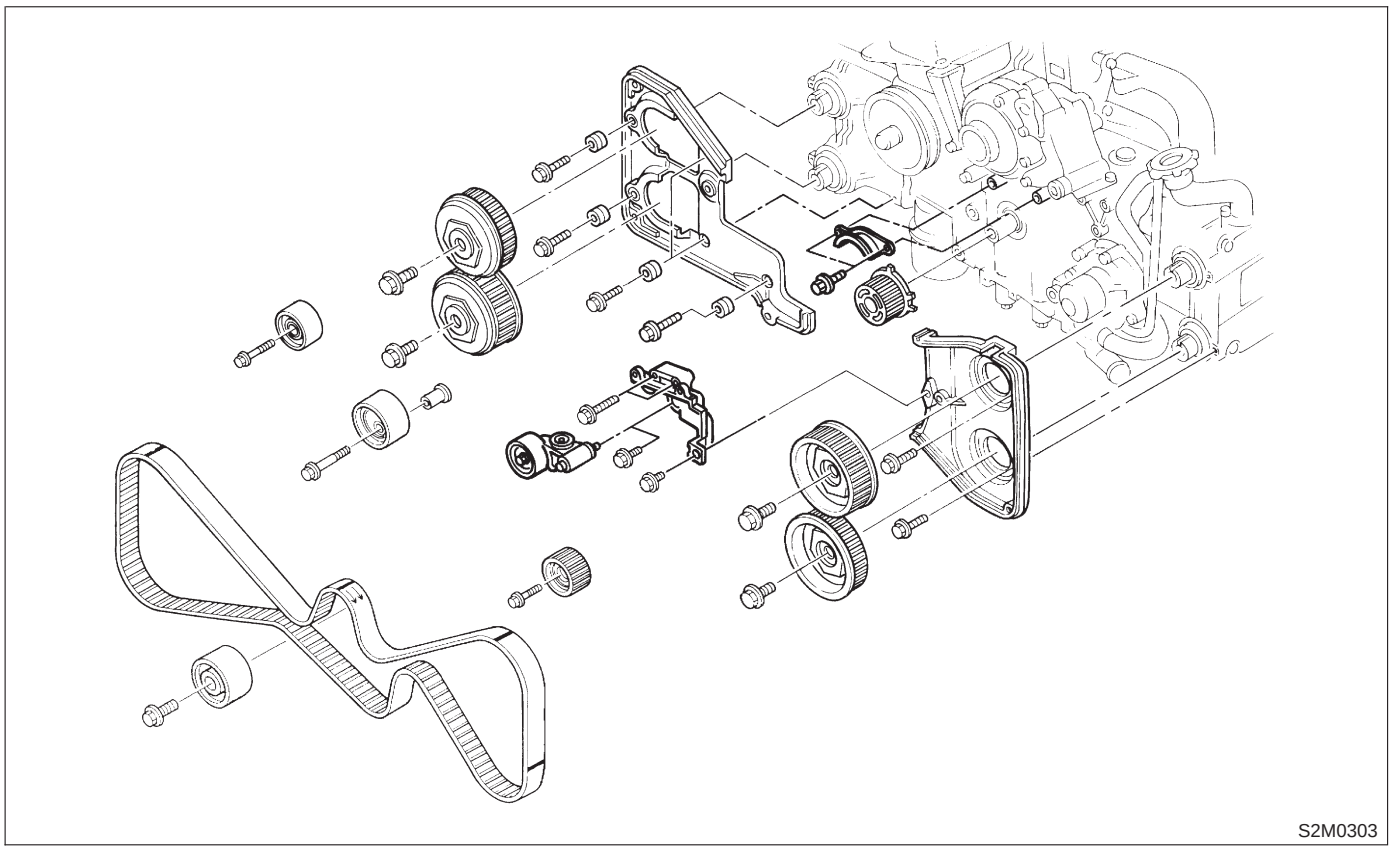


(1) Intake camshaft (LH)
(2) Exhaust camshaft (LH)
(3) Intake camshaft cap (LH)
(4) Exhasut camshaft cap (LH)
(5) Rocker cover gasket (LH)
(6) Rocker cover (LH)
(7) Spark plug cord

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 10±0.7 (1.0±0.07, 7.2±0.5)
T3: 20±2 (2.0±0.2, 14.5±1.4)

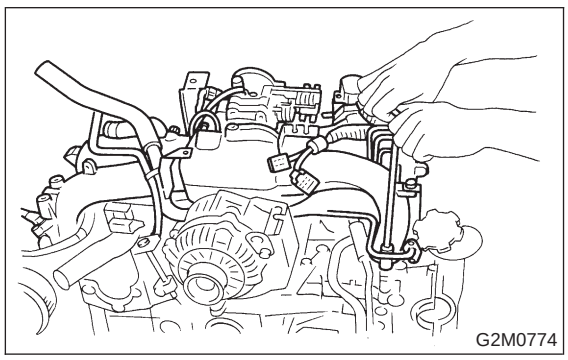
2) Similarly, install parts on right-hand side.

3) Install camshaft sprockets, timing belt and related parts.
<Ref. to 2-3b [W2C1].>


S2M0303

4) Install intake manifold.

CAUTION:
Use new gaskets.


G2M0774

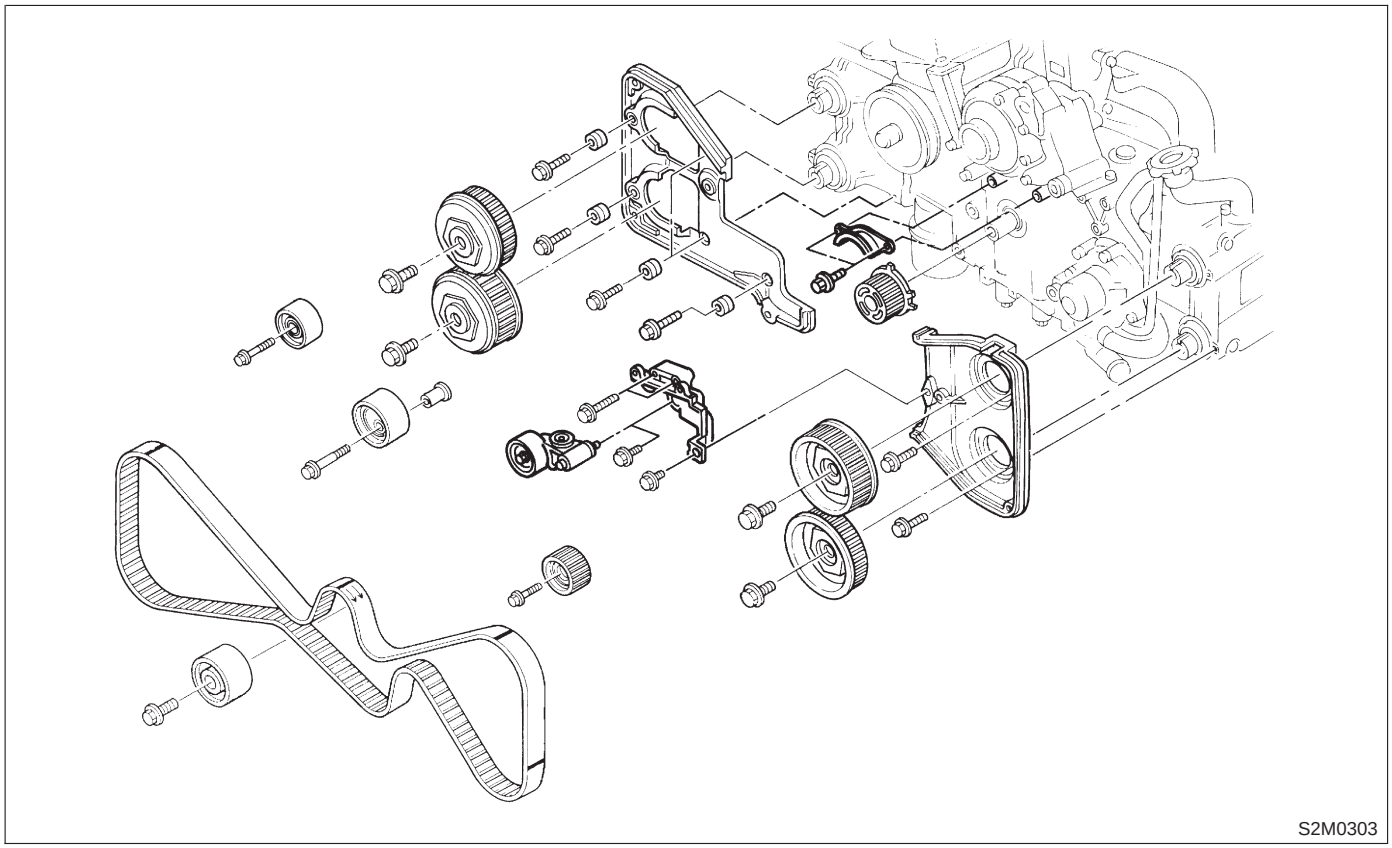
5) Install camshaft position sensor. Use dry compressed air to remove foreign particles before installing sensor.
6) Connect each connector and/or install connector bracket.
7) Connect hoses and tubes to cylinder block.
8) Install brackets, generator and air conditioner compressor.
9) Install V-belt.

5. Cylinder Block

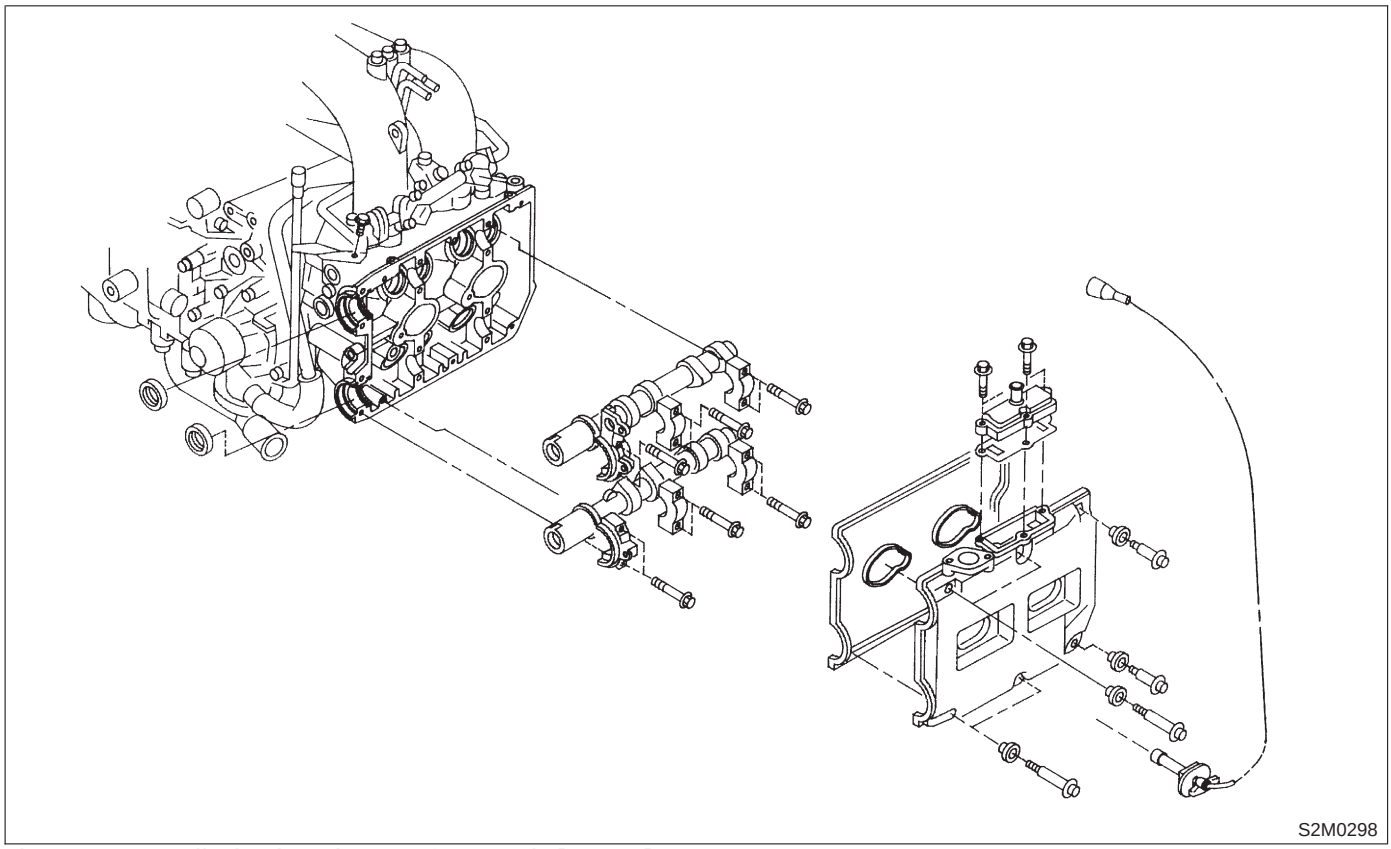
A: REMOVAL

1. RELATED PARTS

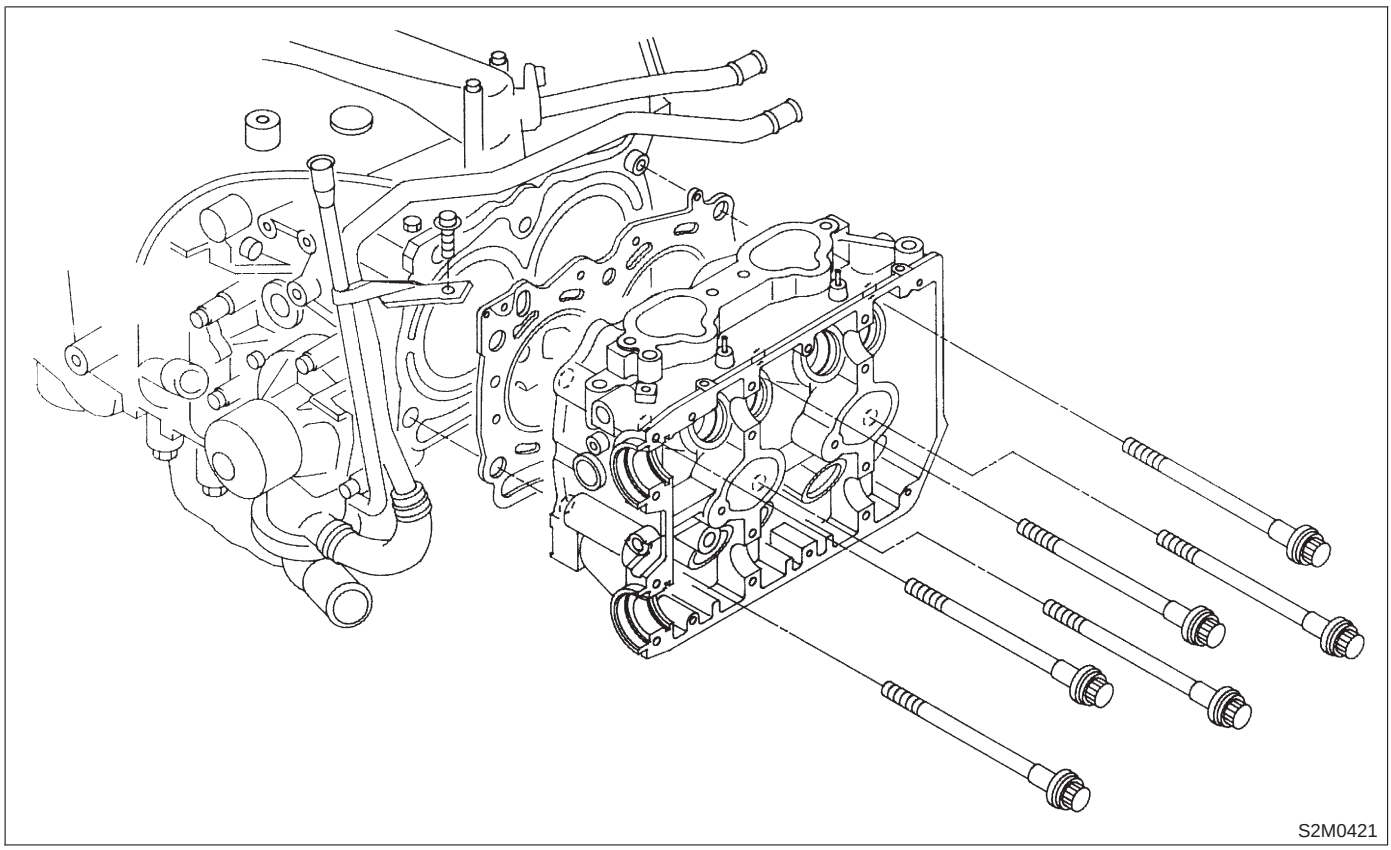
1) Remove timing belt, camshaft sprockets and related parts.
<Ref. to 2-3b [W2A0].>


S2M0303

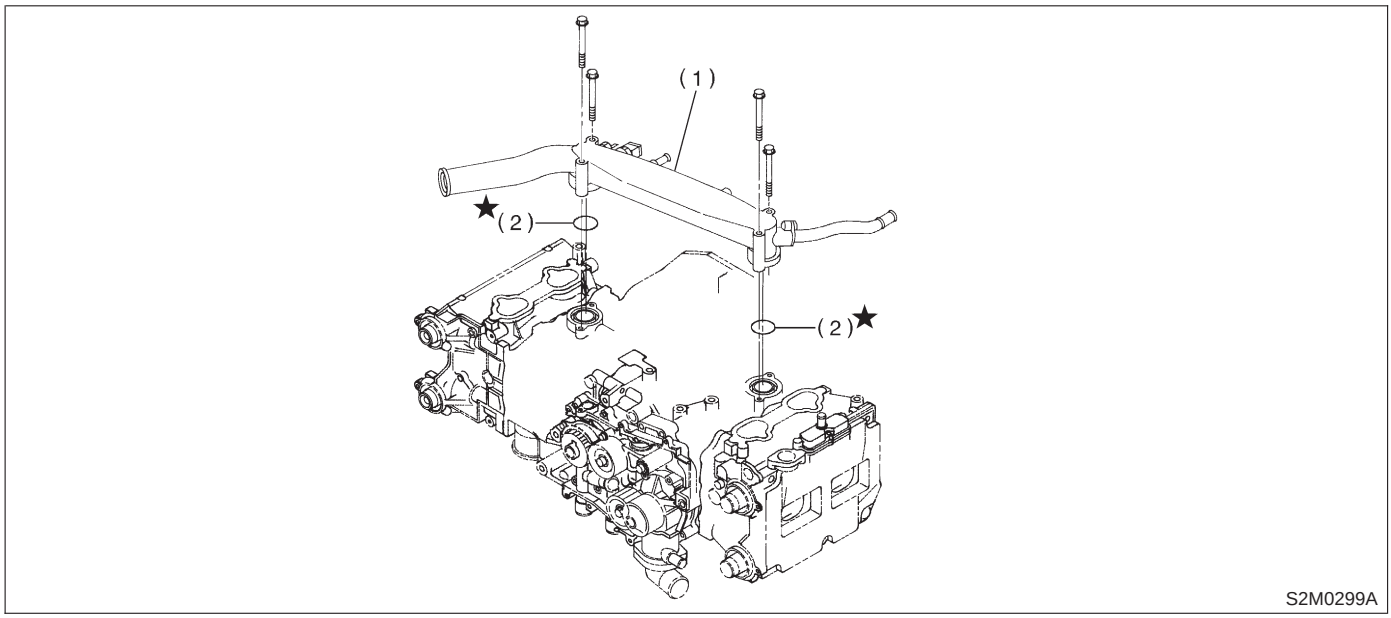
2) Remove rocker cover, camshafts and related parts. <Ref. to 2-3b [W3A0].>


S2M0298

3) Remove cylinder heads. <Ref. to 2-3b [W4A0].>

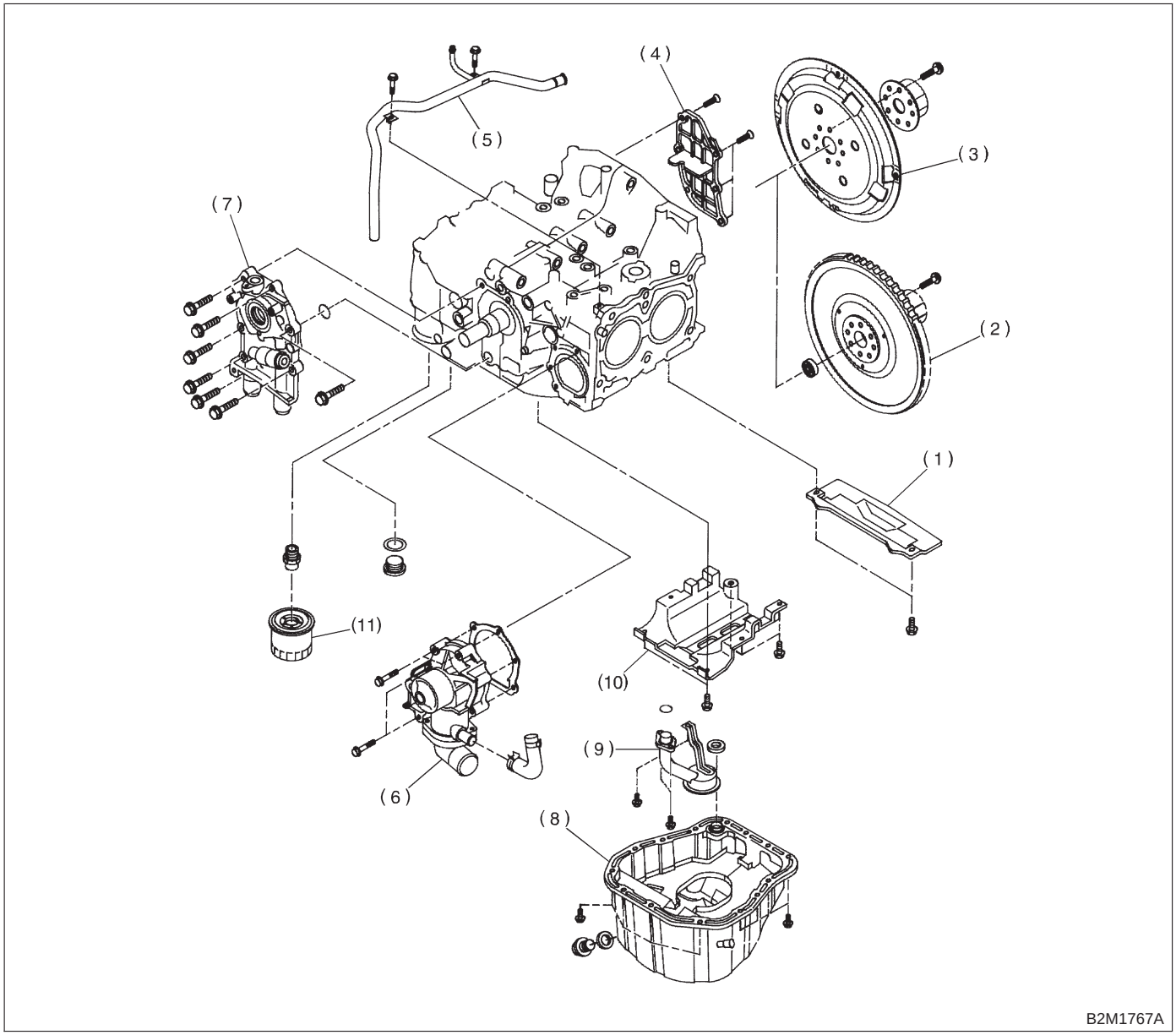

S2M0421

4) Remove water pipe. <Ref. to 2-5 [W8A0].>



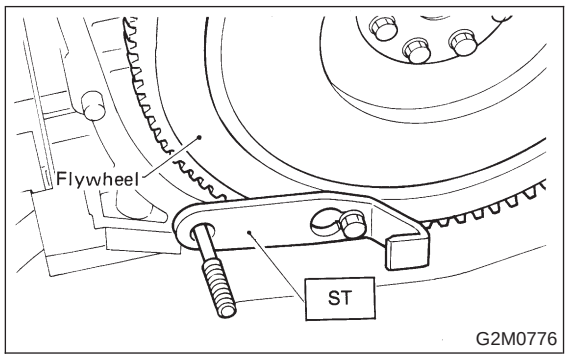
(1) Water pipe
(2) O-ring

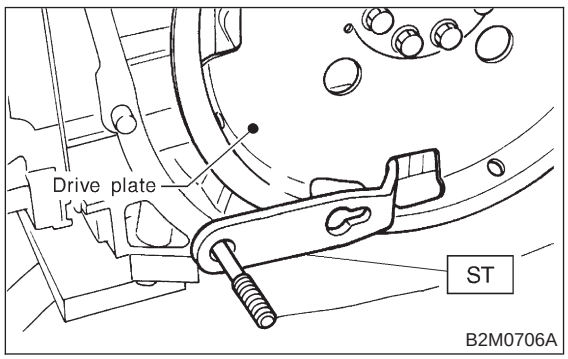
2. OIL PUMP AND WATER PUMP



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

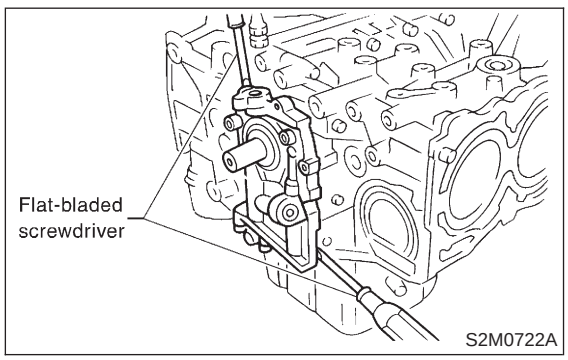
1) Remove clutch housing cover (MT vehicles only).
2) Remove flywheel (MT vehicles only) or drive plate (AT vehicles only).
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER





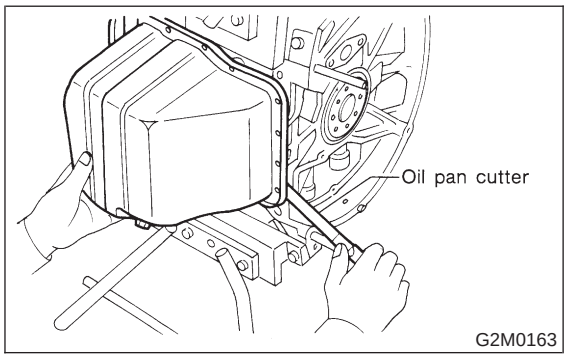
3) Remove oil separator cover.
4) Remove water by-pass pipe for heater.
5) Remove water pump.
6) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in figure when removing oil pump.

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.

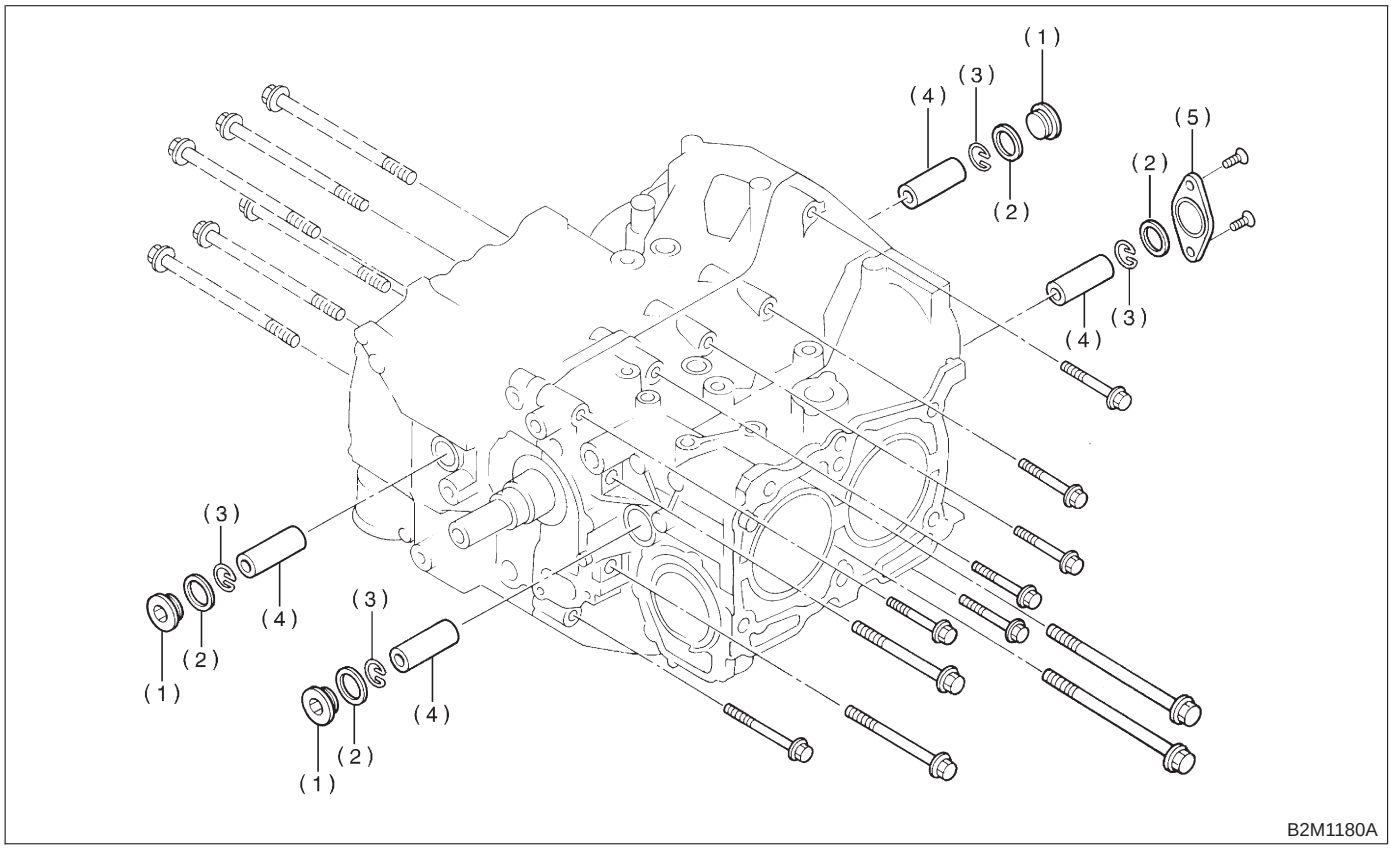
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



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

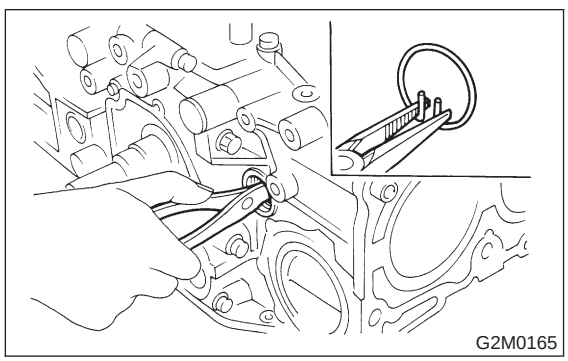
B: DISASSEMBLY

1. PISTON PIN AND CYLINDER BLOCK CONNECTING BOLT



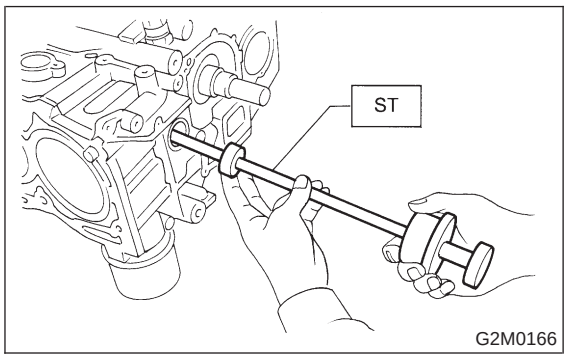
(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover

1) Remove service hole cover and service hole plugs using hexagon wrench (14 mm).
2) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders.



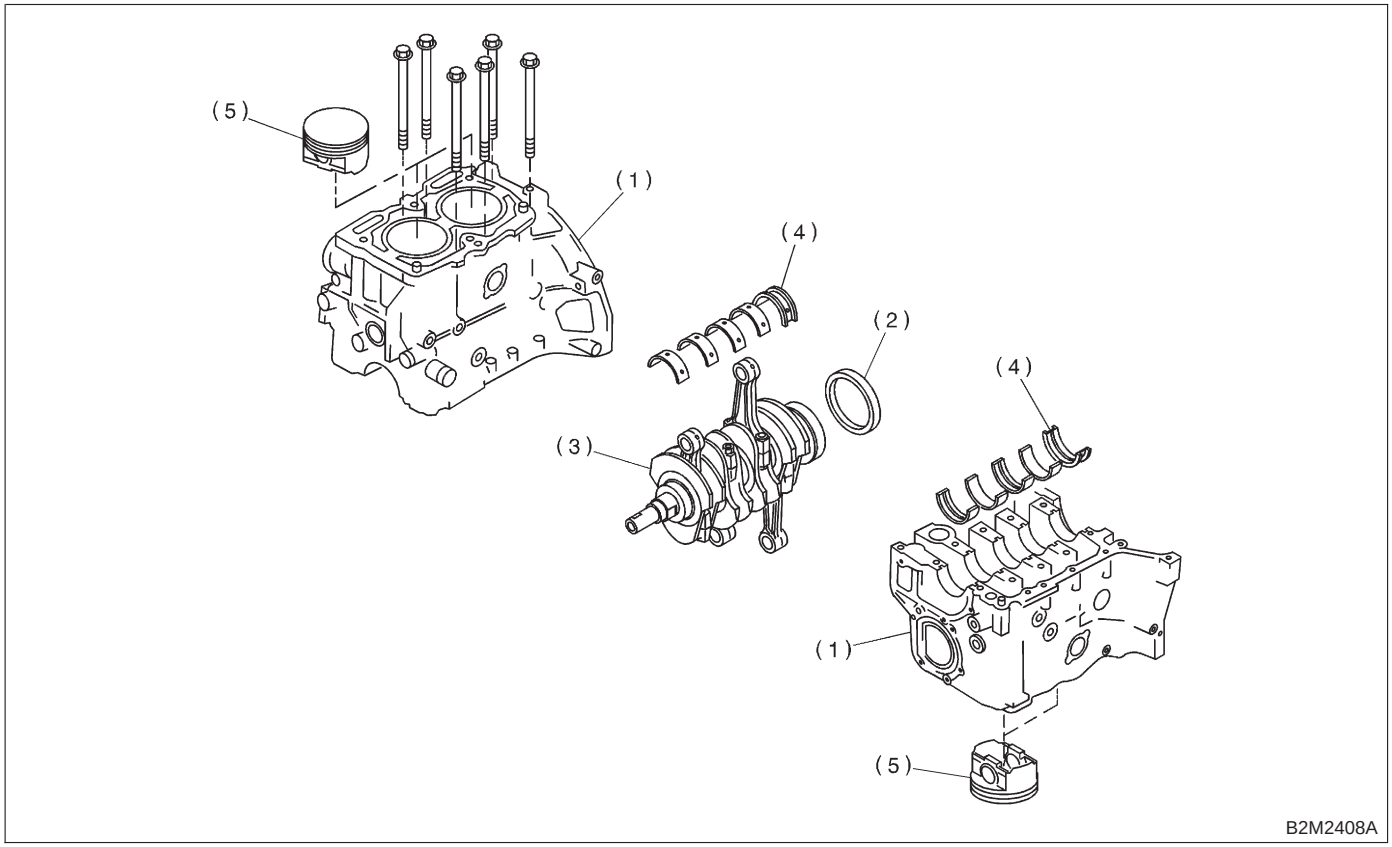
3) Draw out piston pin from #1 and #2 pistons by using ST.
ST 499097700 PISTON PIN REMOVER

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



4) Similarly remove piston pins from #3 and #4 pistons.
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) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) 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.

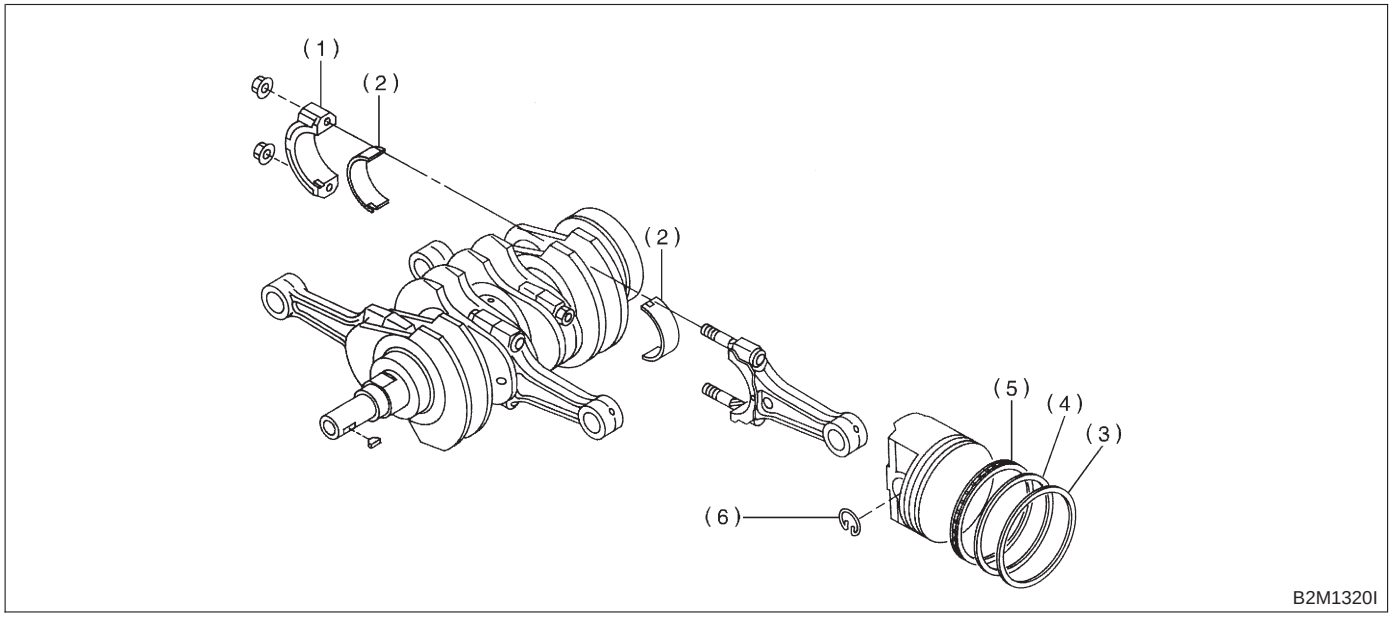
3) Remove rear oil seal.
4) Remove crankshaft together with connecting rod.
5) Remove crankshaft bearings from cylinder block using hammer handle.

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 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)

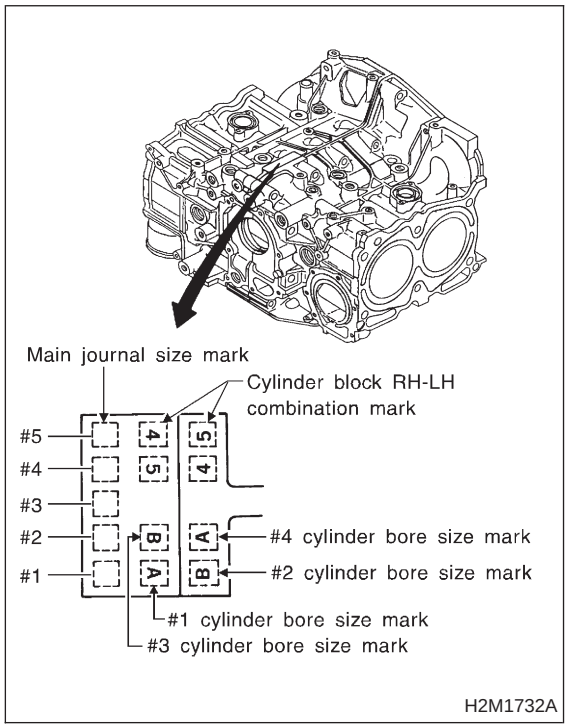
Standard height of cylinder block:
201.0 mm (7.91 in)

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 guide line in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

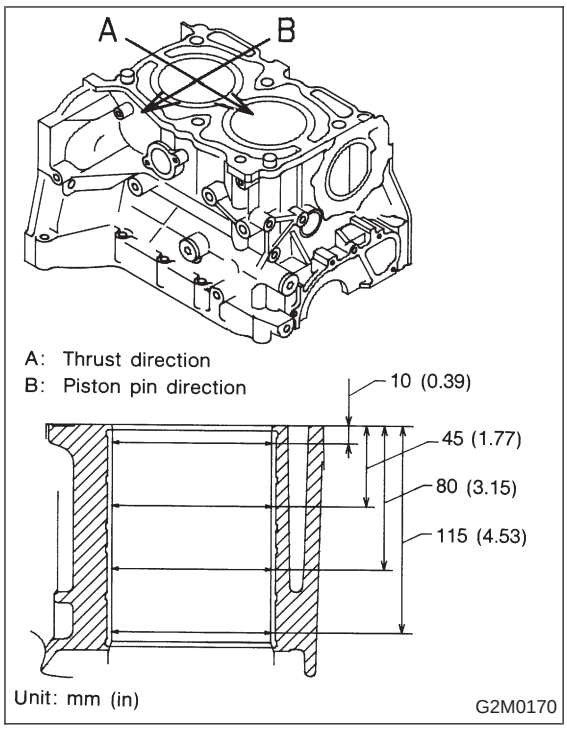


2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in figure, using a cylinder bore gauge.

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)



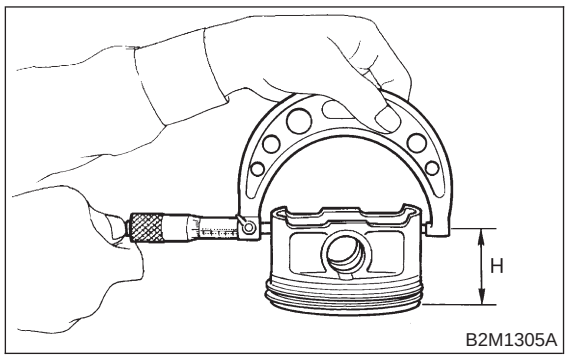
3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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

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

Piston grade point H:
37.0 mm (1.457 in)

Piston outer diameter:
Standard
A: 99.485 — 99.495 mm (3.9167 — 3.9171 in)
B: 99.475 — 99.485 mm (3.9163 — 3.9167 in)
0.25 mm (0.0098 in) oversize
99.725 — 99.735 mm (3.9262 — 3.9266 in)
0.50 mm (0.0197 in) oversize
99.975 — 99.985 mm (3.9360 — 3.9364 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.

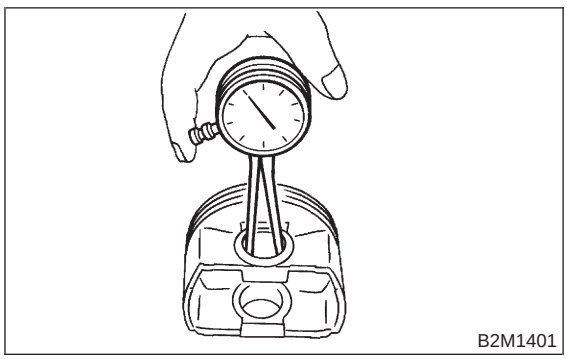
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

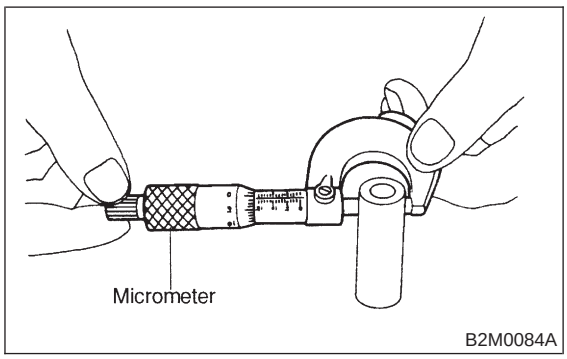
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

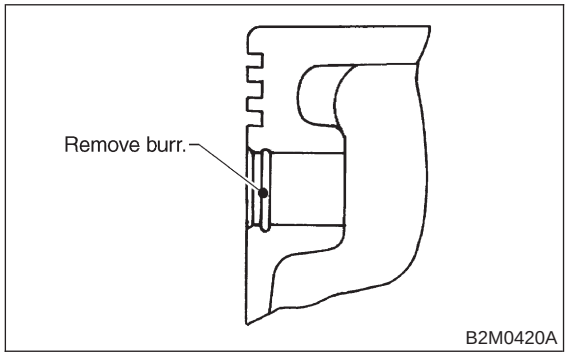
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder.
<Ref. to 2-3b [W5C2].>
If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
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)





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

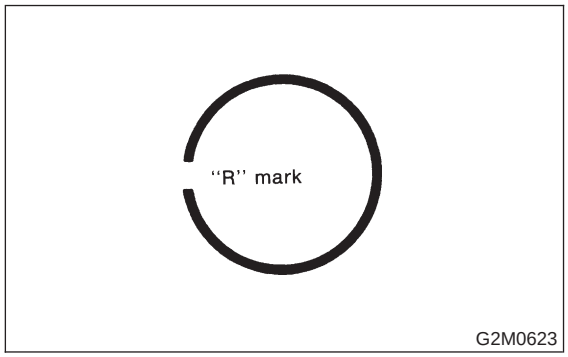


5) Check piston pin circlip for distortion, cracks and wear.

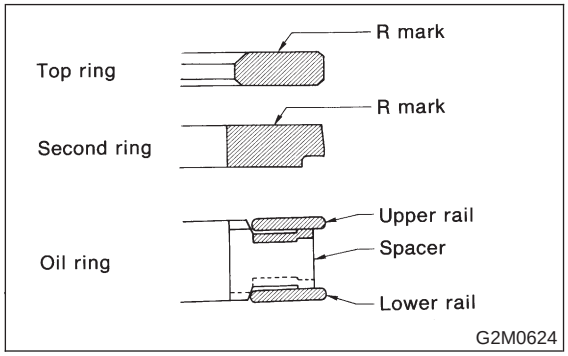
4. PISTON RING

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.

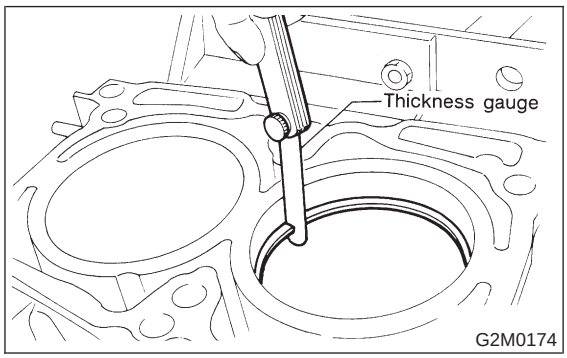


● The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.



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

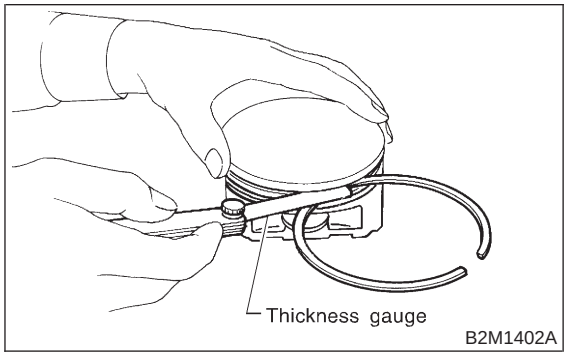
		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.0146 — 0.0205)	1.0 (0.039)
	Oil ring rail	0.20 — 0.60 (0.0079 — 0.0236)	1.5 (0.059)



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.

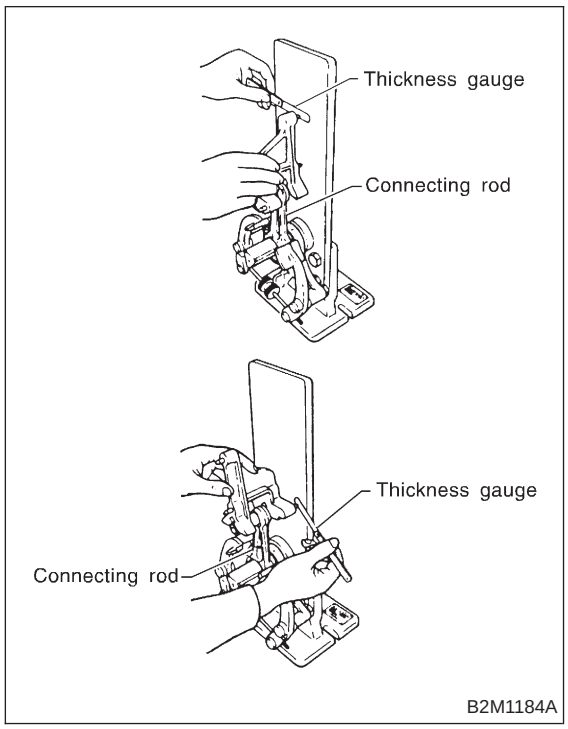
		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 —0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 —0.0028)	0.15 (0.0059)



5. CONNECTING ROD

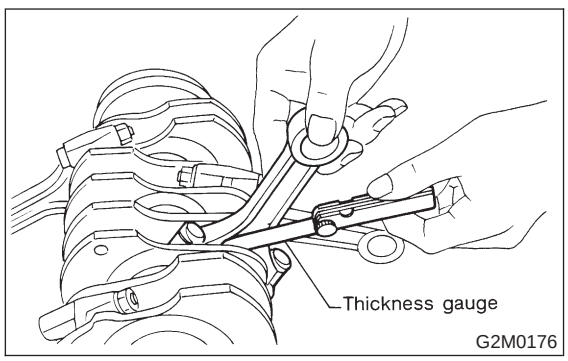
1) Replace connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

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. (See the table.)

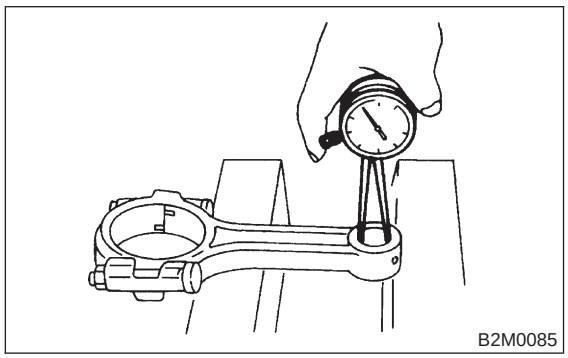
Connecting rod oil clearance:
Standard
0.010 — 0.038 mm (0.0004 — 0.0015 in)
Limit
0.05 mm (0.0020 in)

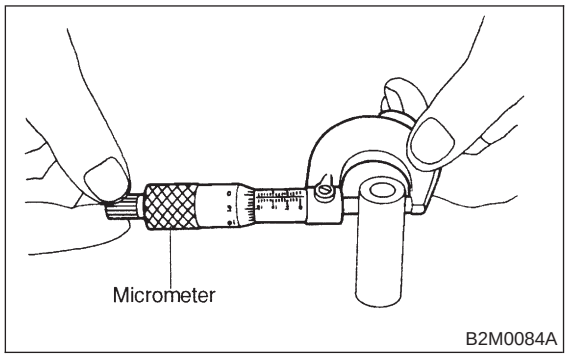
Unit: mm (in)

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)

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)

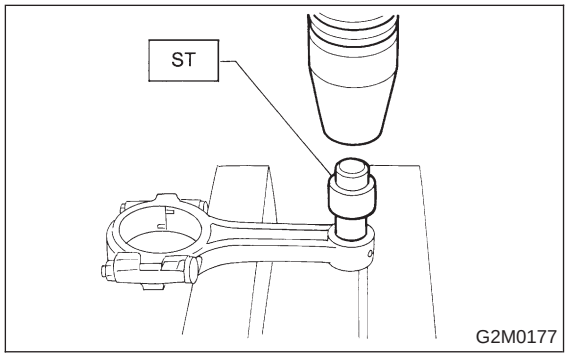

B2M0085



B2M0084A

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



G2M0177

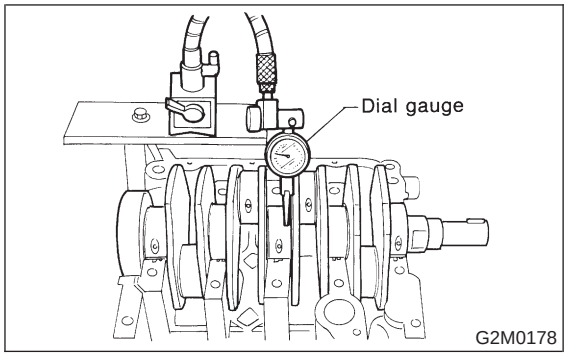
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

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.

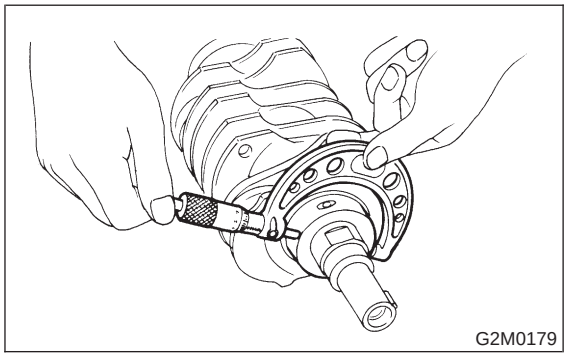
Crankshaft bend limit:
0.035 mm (0.0014 in)



G2M0178

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
0.020 mm (0.0008 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.25 mm (0.0098 in)


G2M0179

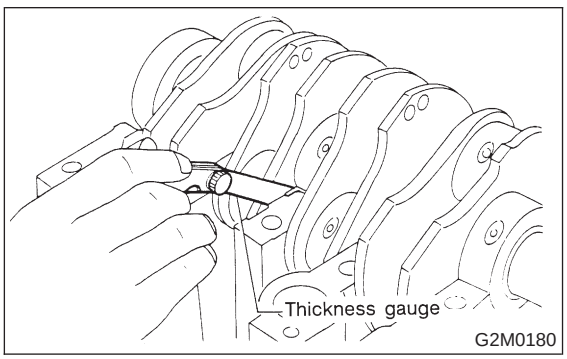
Unit: mm (in)

		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)	59.962 — 59.978 (2.3607 — 2.3613)	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.	59.942— 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	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)	59.742 — 59.758 (2.3520 — 2.3527)	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

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)



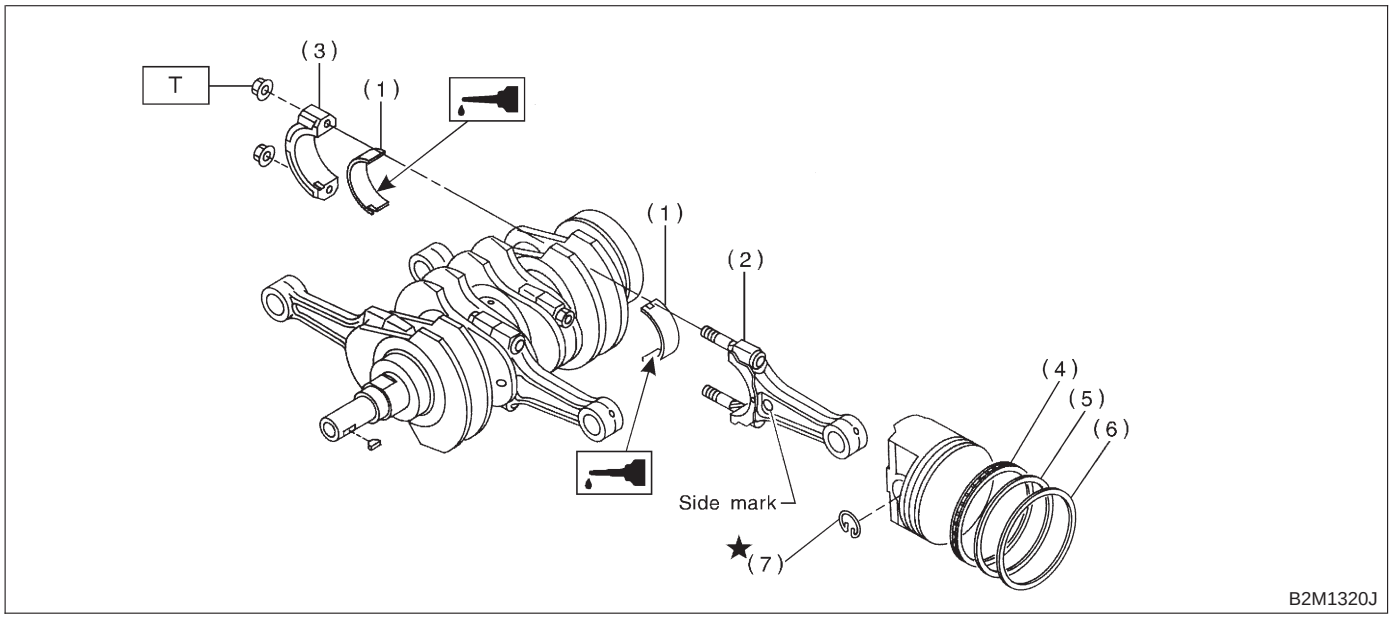
5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition 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	0.045 (0.0018)

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

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.

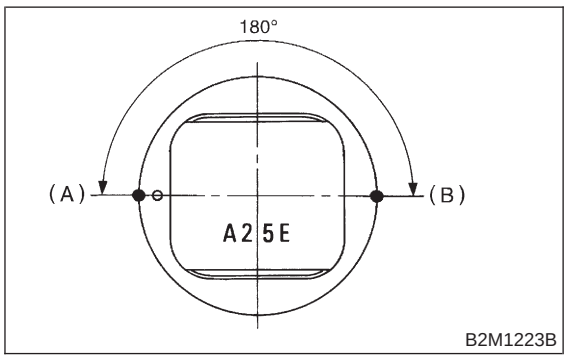
CAUTION:
Position each connecting rod with the side marked facing forward.

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.

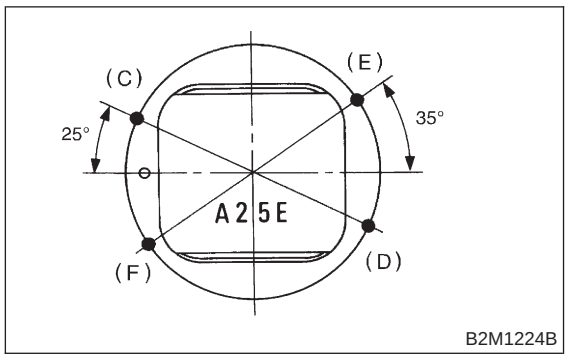
4) Installation of piston rings and oil ring
(1) Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.

(2) Position the top ring gap at (A) or (B) in the figure.



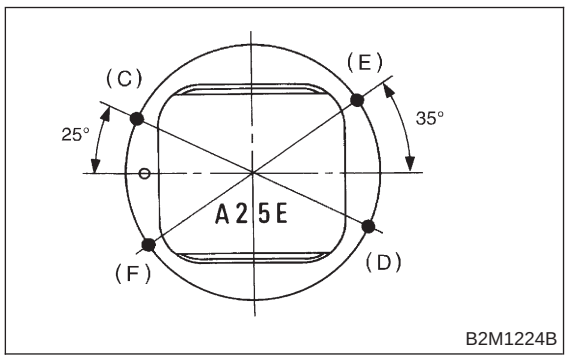
(3) Position the second ring gap at 180° on the reverse side for the top ring gap.

(4) Position the upper rail gap at (C) or (D) in the figure.



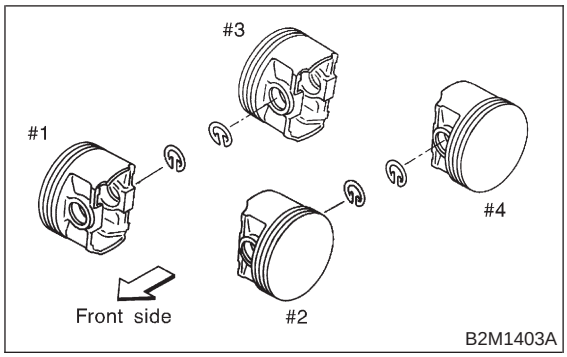
(5) Position the expander gap at 180° of the reverse side for the upper rail gap.
(6) Position the lower rail gap at (E) or (F) in the figure.

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

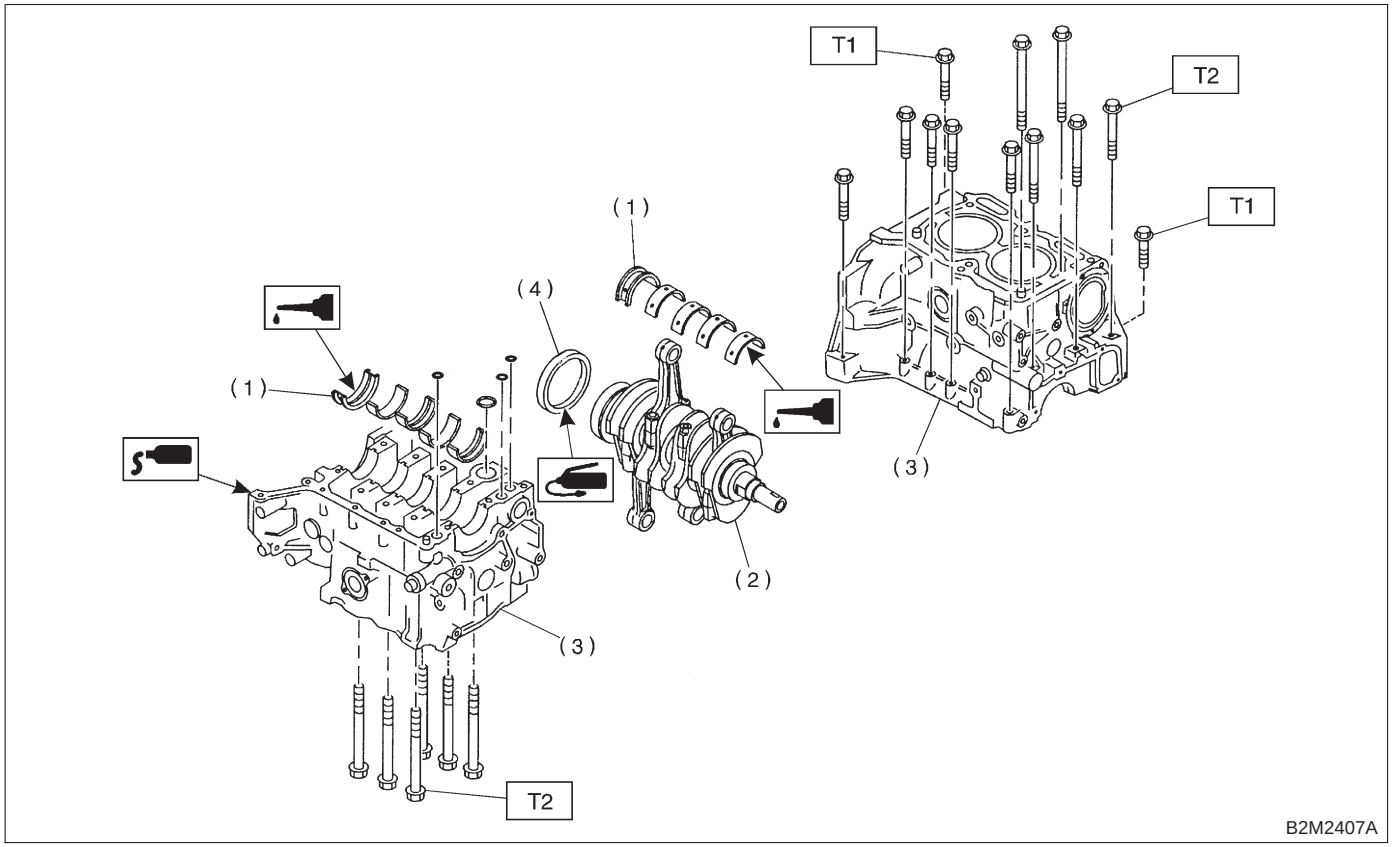


5) Install circlip.
Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

CAUTION:
Use new circlips.



2. CYLINDER BLOCK



(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) 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

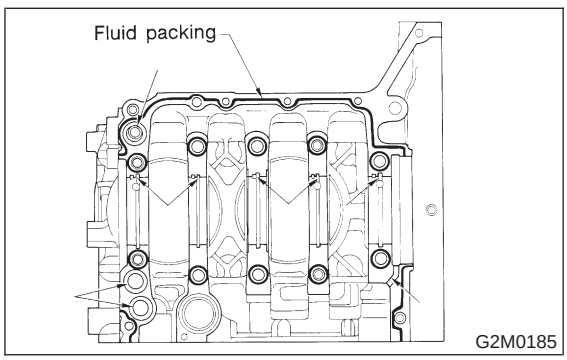
CAUTION:
Remove oil the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft on the #2 and #4 cylinder block.

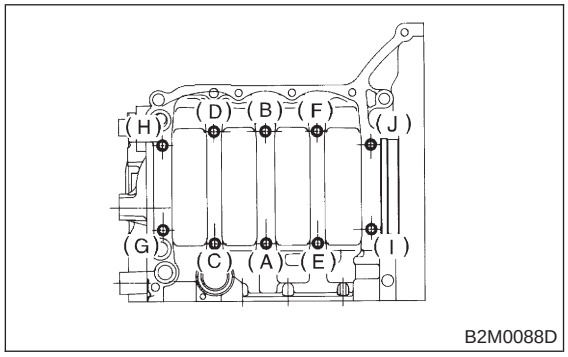
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:
THREE BOND 1215 or equivalent

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

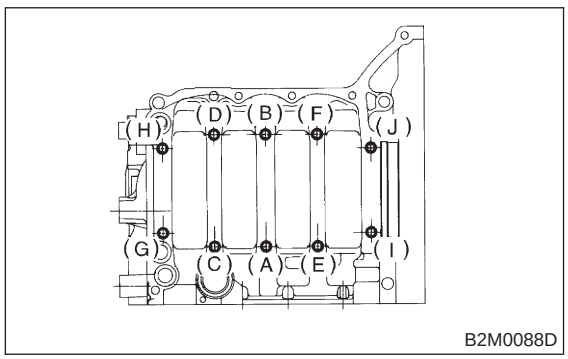


4) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure.



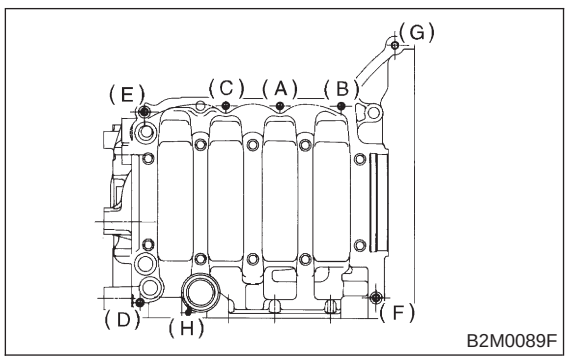
5) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence.

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

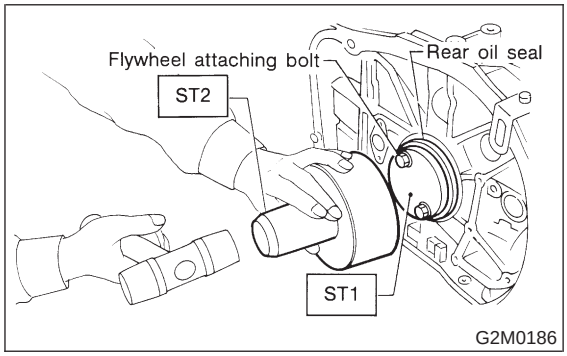


6) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

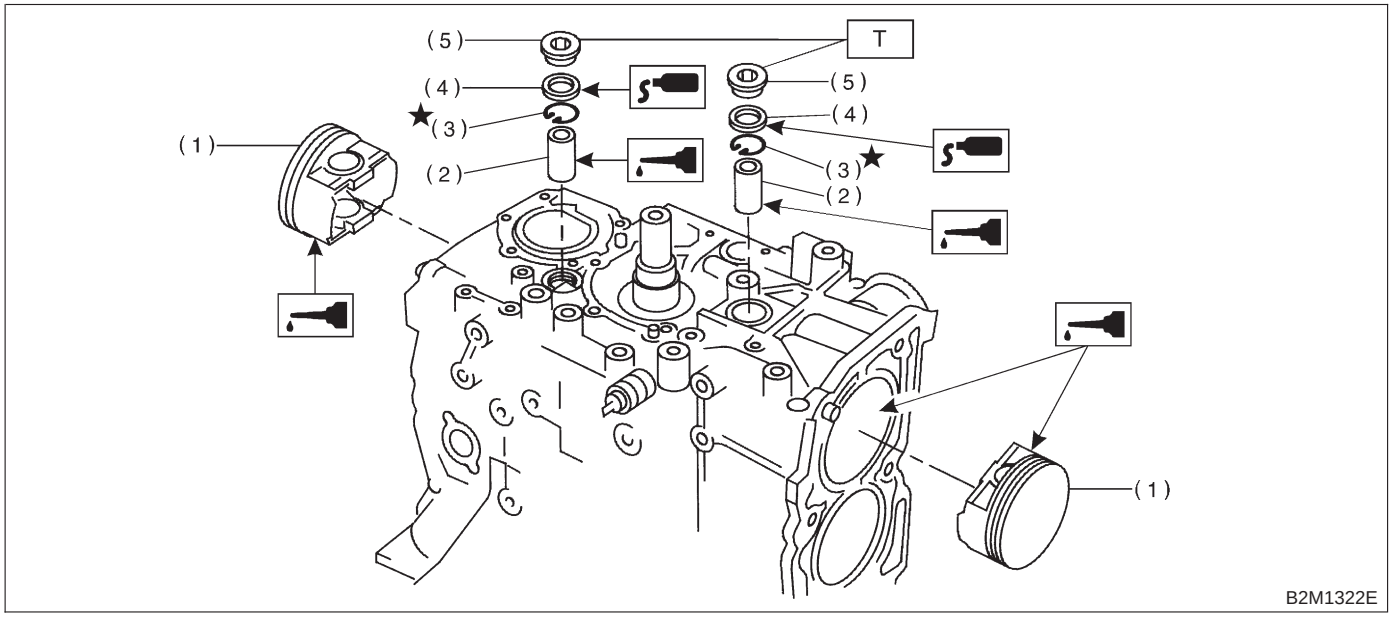
Tightening torque:
(A) — (G): 25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)
(H): 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



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

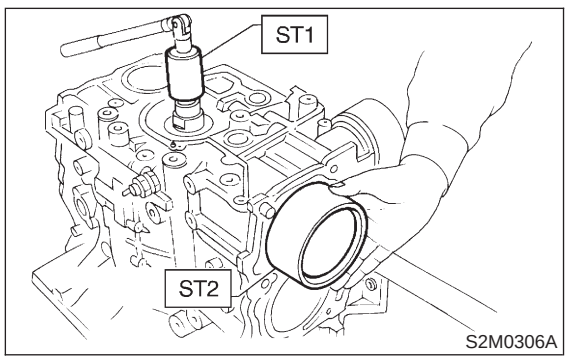
Tightening torque: N·m (kg-m, ft-lb)
T: 69±7 (7.0±0.7, 50.6±5.1)

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.

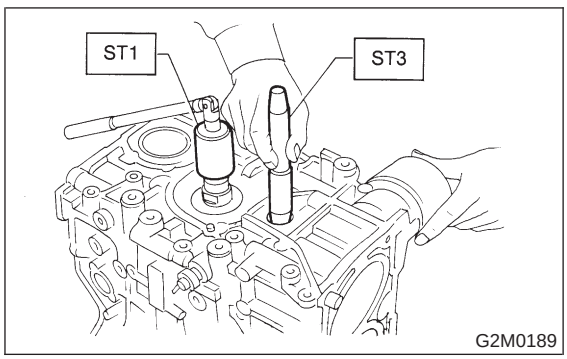
ST2 498747300 PISTON GUIDE



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.

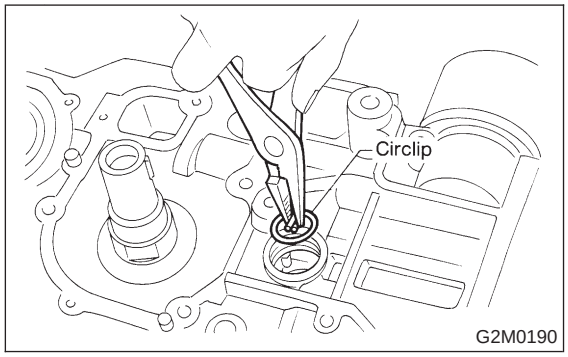
ST3 499017100 PISTON PIN GUIDE



(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.

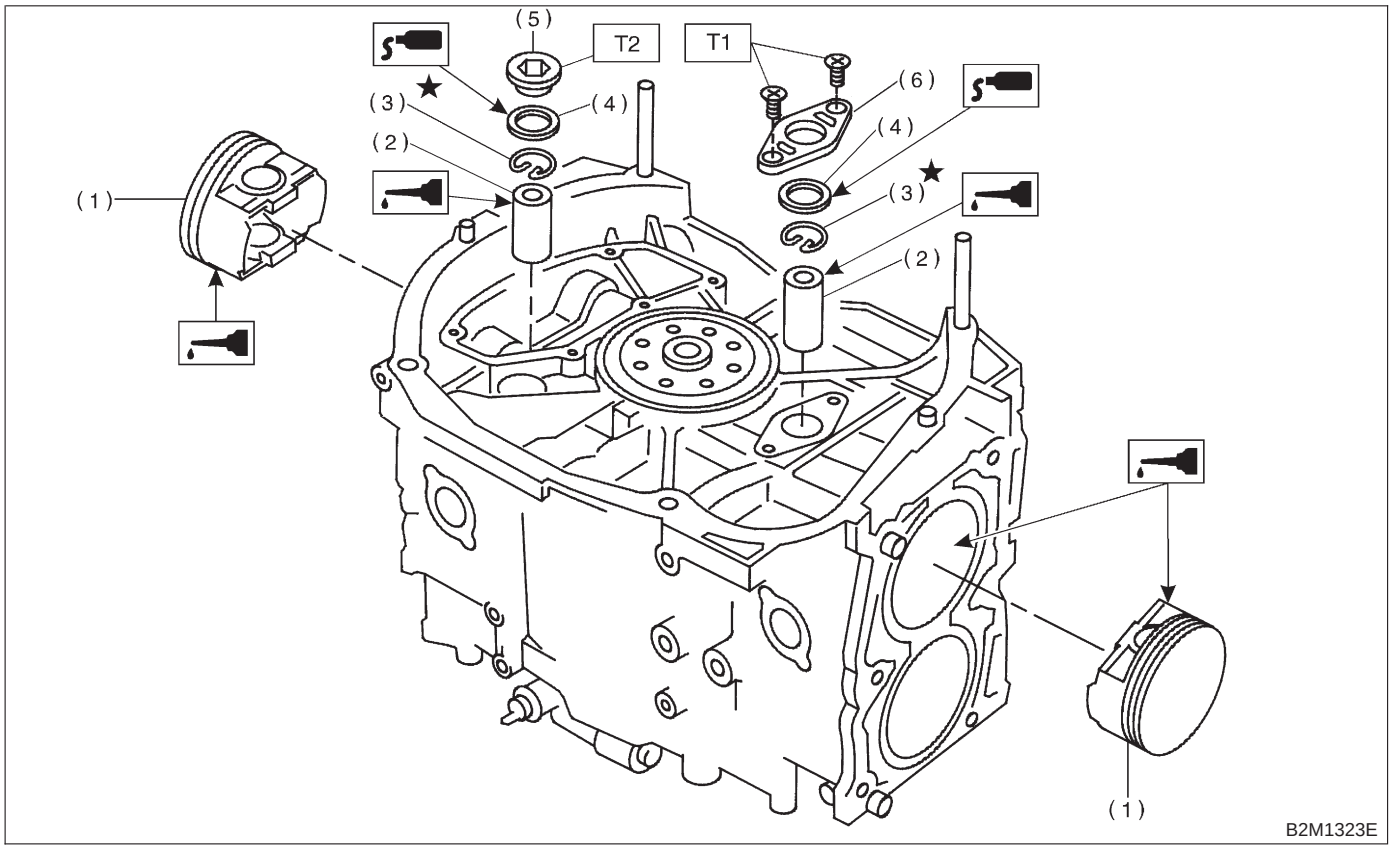


(4) Install service hole plug and gasket.

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)



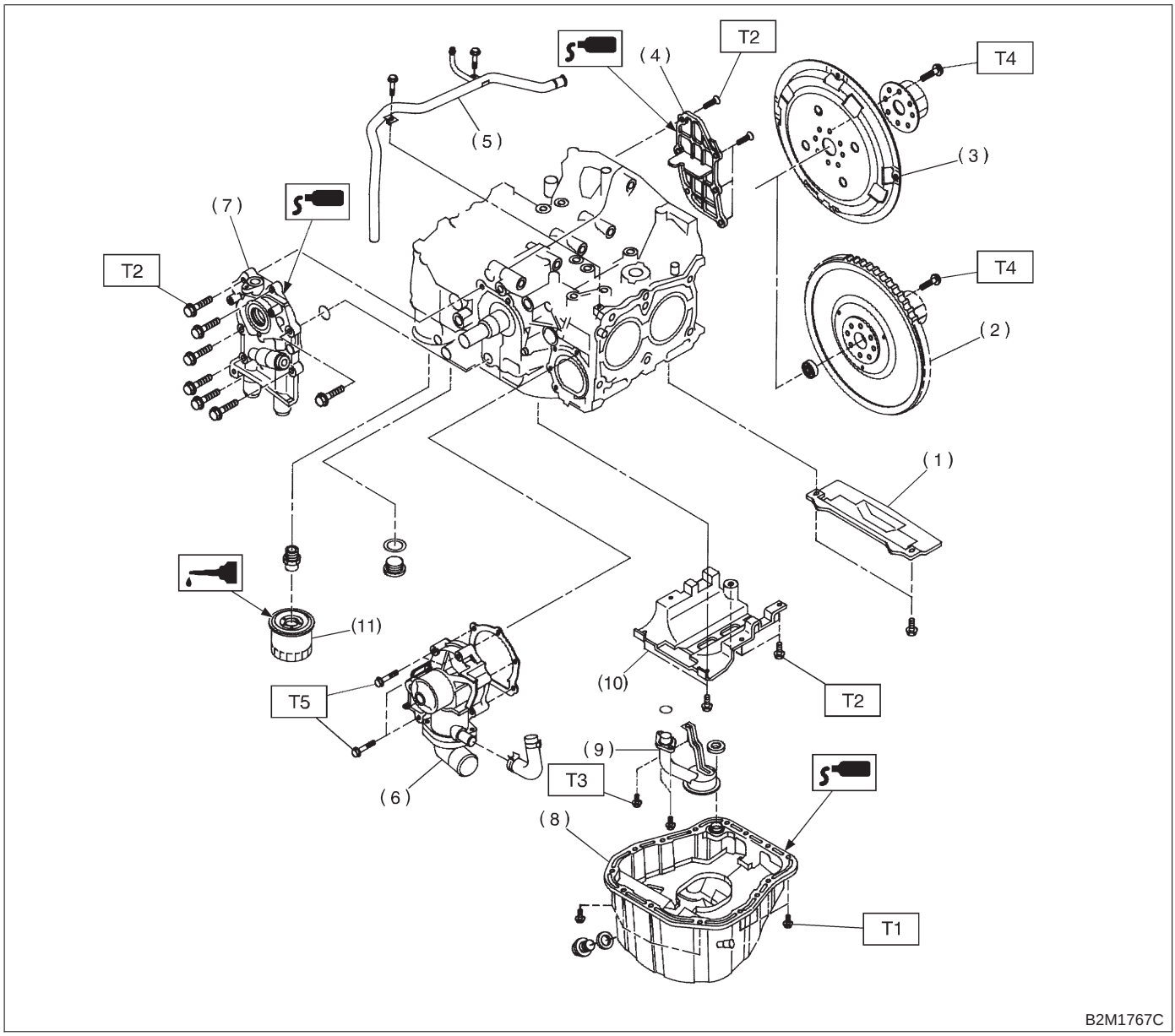
(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover

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

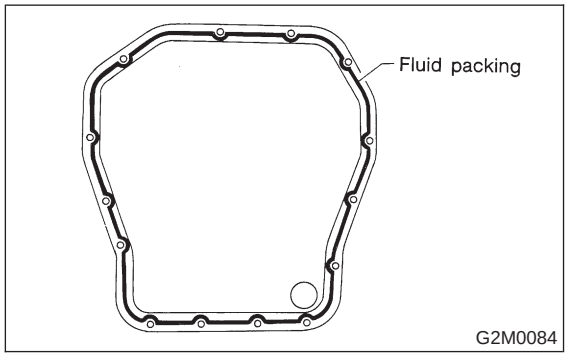


(1) Baffle plate
(2) Oil strainer
(3) Oil pan
(4) Oil separator cover
(5) Drive plate (AT vehicles only)
(6) Flywheel (MT vehicles only)
(7) Clutch housing cover (MT vehicles only)
(8) Oil pump
(9) Water pump
(10) Water by-pass pipe
(11) Oil filter

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)

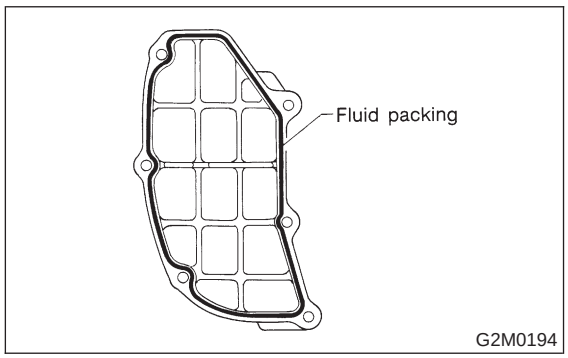
1) Install baffle plate.
2) Install oil strainer and O-ring.
3) Install oil strainer stay.
4) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent

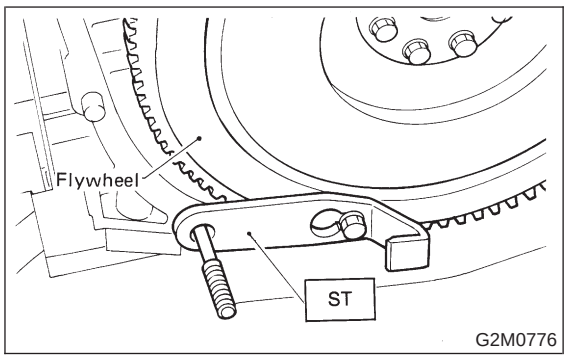


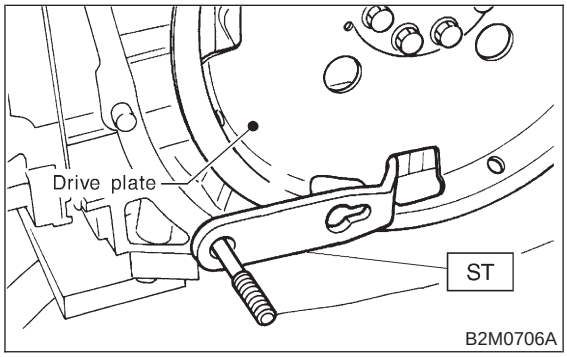
5) Apply fluid packing to matching surfaces and install oil separator cover.

Fluid packing:
THREE BOND 1215 or equivalent

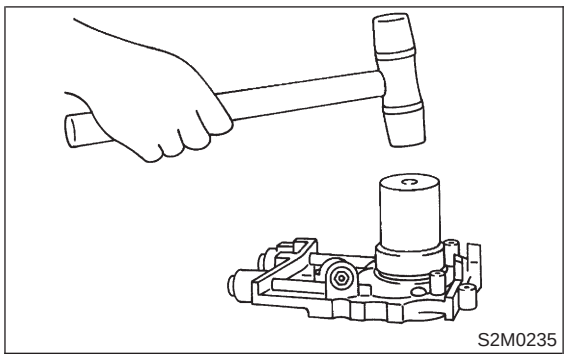


6) Install flywheel (MT vehicles only) or drive plate (AT vehicles only).
To lock crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER



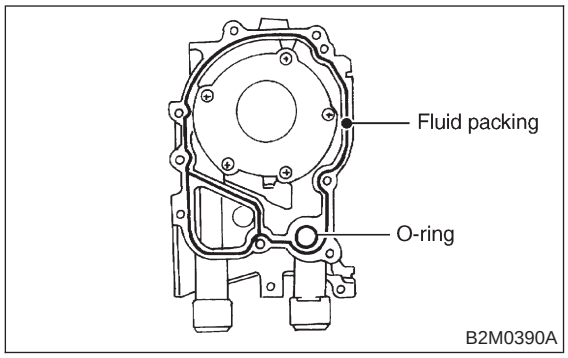


7) Install clutch housing cover. (MT vehicles only)
8) Installation of oil pump
(1) Discard front oil seal after removal. Replace with a new one by using ST.
ST 499587100 OIL SEAL INSTALLER



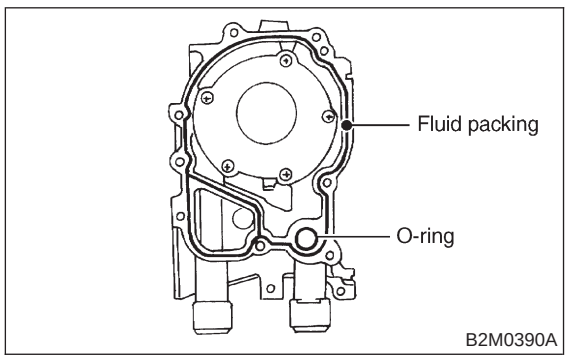
(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



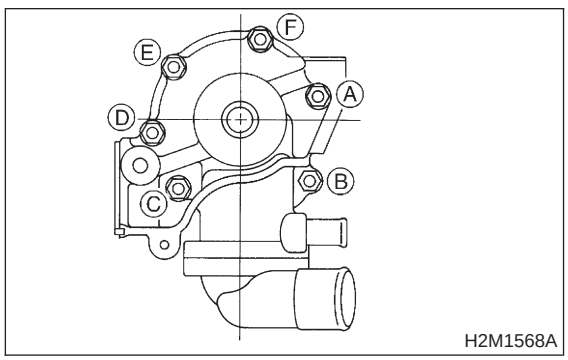
(3) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

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.

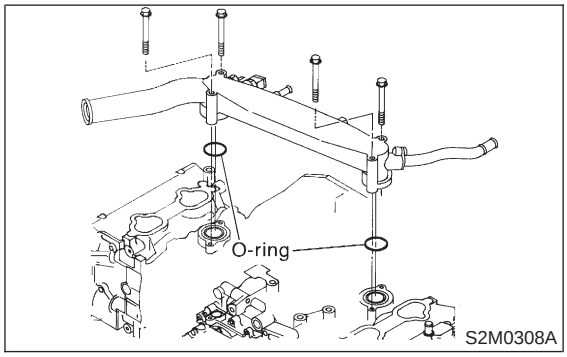


10) Install water by-pass pipe for heater.
11) Install oil filter.

2. RELATED PARTS

1) Install water pipe. <Ref. to 2-5 [W7B0].>

CAUTION:
Always use a new O-ring.



2) Install cylinder heads.
<Ref. to 2-3b [W4E0].>
3) Install camshafts, rocker cover and related parts.
<Ref. to 2-3b [W3C0].>
4) Install camshaft sprockets, timing belt and related parts.
<Ref. to 2-3b [W2C0].>

1. Engine Trouble in General

NOTE:
A, B and C shown in the RANK of table refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”).

A : Very often
B : Sometimes
C : Rarely

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 [T6A0].>		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 [T6A0].>		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 [T6A0].>		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 [T6A0].>		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 [T6A0].>		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
4. Surging	● Fuel injection system <Ref. to 2-7 [T6A0].>		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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 [T6A0].>		A
	● Cooling system	● Overheating	B
	● Others	● Accelerator cable out of adjustment	B
7. After burning in exhaust system	● Fuel injection system <Ref. to 2-7 [T6A0].>		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 [T6A0].>		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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	● Fuel injection system <Ref. to 2-7 [T6A0].>		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

If noise still exists, conduct diagnostics procedures in accordance with the following table.

CAUTION:
Do not disconnect spark plug cord while engine is running.

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	Valve mechanism is defective. ● Incorrect valve clearance ● 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*)	● Unusually worn valve lifter ● 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 engine coolant 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 and INSPECTION MODE after connecting fuel injector connector. <Ref. to 2-7 [T6A0].>

1. Specifications

A: 2200 cc MODEL

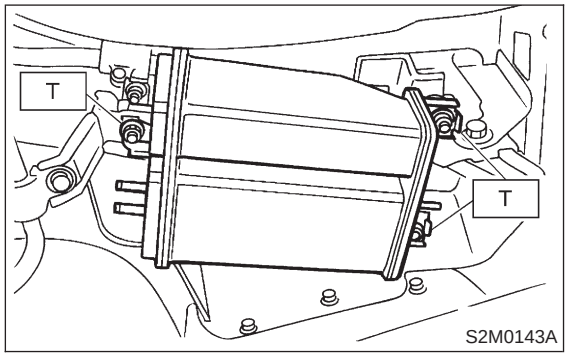
Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter × thickness				78 × 9 mm (3.07 × 0.35 in)
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				LIMIT	0.18 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)	700 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				157 kPa (1.6 kg/cm^2, 23 psi)
	Outer diameter × width				80 × 70 mm (3.15 × 2.76 in)
	Oil filter to engine thread size				M 20 × 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 pan capacity					4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: 2500 cc MODEL

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter × thickness				78 × 10 mm (3.07 × 0.39 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	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
		5,000 rpm	Discharge	- pressure	294 kPa (3.0 kg/cm^2, 43 psi) or more
				- quantity	47.0 ℓ (12.4 US gal, 10.3 Imp gal)/min.
	Relief valve operation pressure				588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type				Full-flow filter type
	Filtration area				1,000 cm^2 (155 sq in)
	By-pass valve opening pressure				157 kPa (1.6 kg/cm^2, 23 psi)
	Outer diameter × width				80 × 70 mm (3.15 × 2.76 in)
	Oil filter to engine thread size				M 20 × 1.5
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 pan capacity					4.5 ℓ (4.8 US qt, 4.0 Imp qt)

5) Installation is in the reverse order of removal.

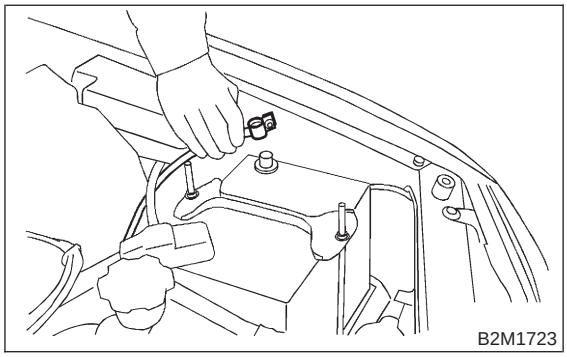
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



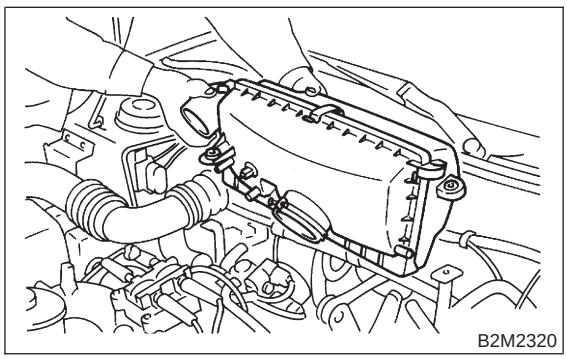
4. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

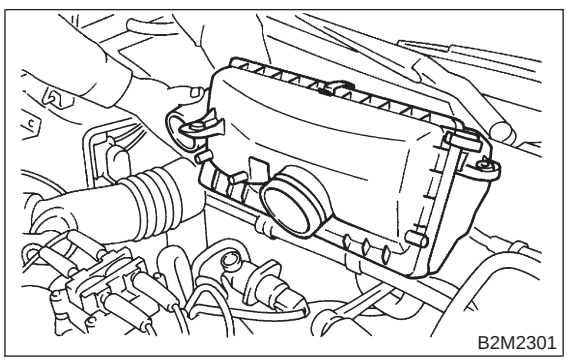
1) Disconnect battery ground cable.

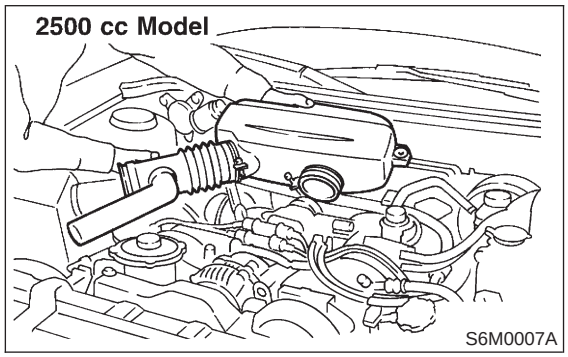


2) Remove air cleaner assembly and air intake duct (A) and (B) as a unit. (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A0].>

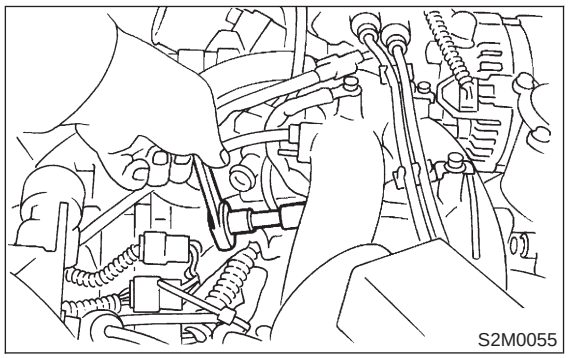


3) Remove air intake chamber and air intake duct as a unit. (Except 2200 cc California spec. vehicles and 2500 cc Model)
<Ref. to 2-7 [W18A0].>

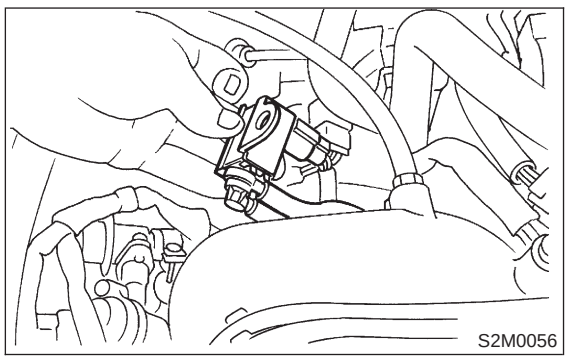




4) Remove bolt which installs purge control solenoid valve to intake manifold.

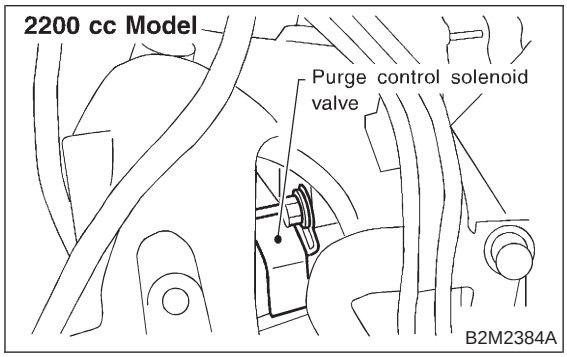


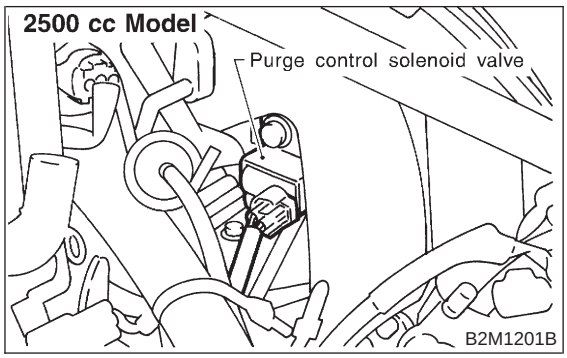
5) Take out purge control solenoid valve.
6) Disconnect connector from purge control solenoid valve.
7) Disconnect vacuum hoses from purge control solenoid valve.



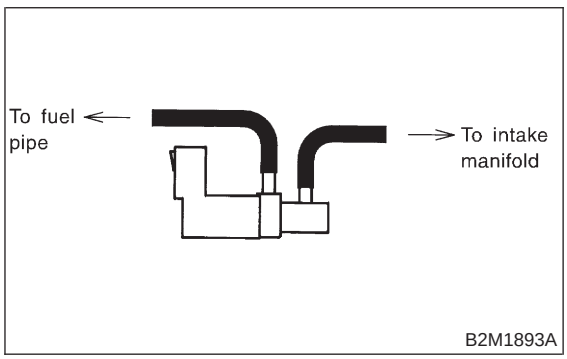
8) Installation is in the reverse order of removal.

Tightening torque:
15.7±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)



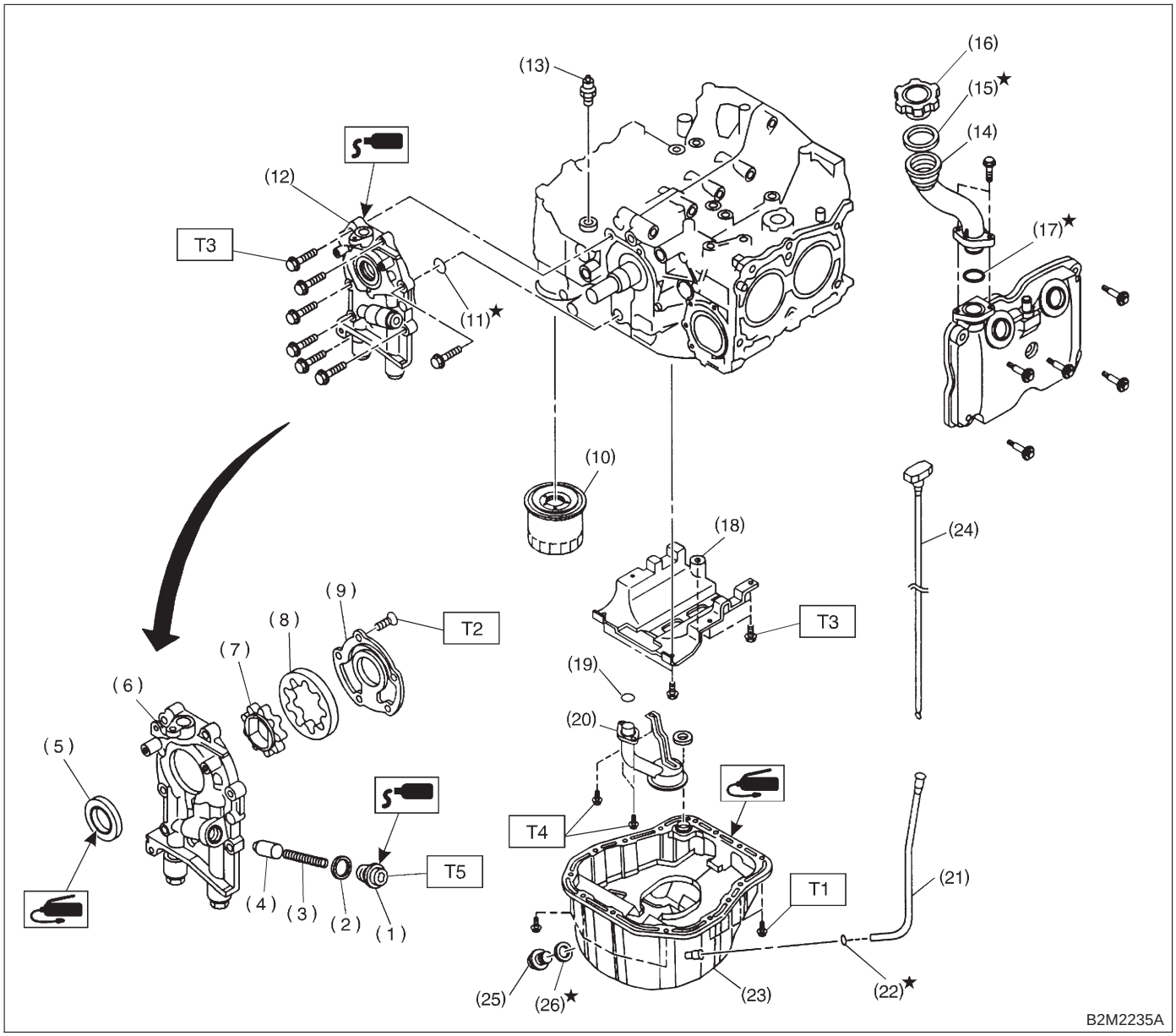


CAUTION:
Carefully connect the evaporation hoses.



1. Lubrication System

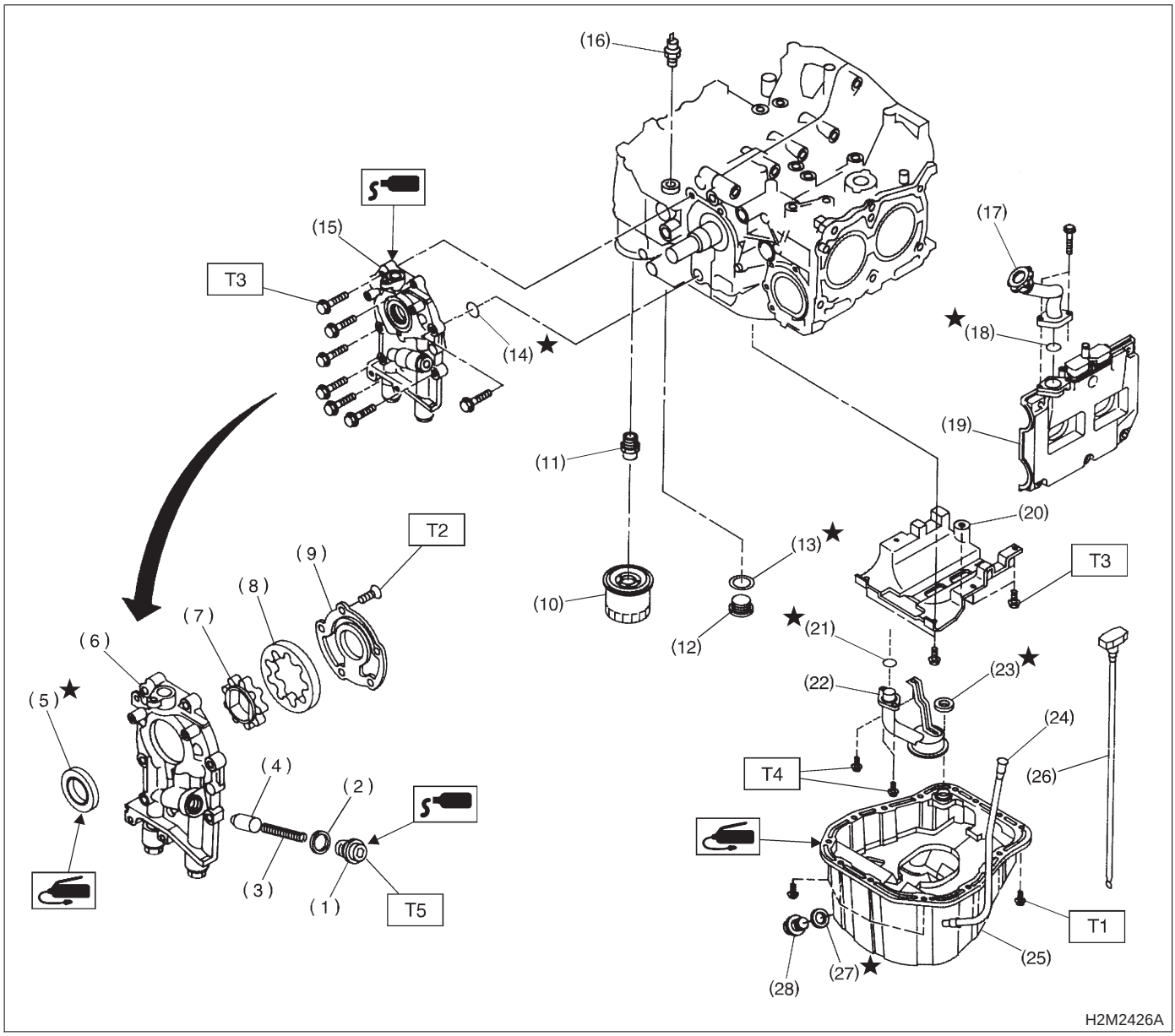
A: 2200 cc MODEL



(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) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5^{+1}_{-0} ($0.5^{+0.1}_{-0}$, $3.6^{+0.7}_{-0}$)
T3: 6.4 (0.65, 4.7)
T4: 9.8 (1.0, 7.0)
T5: 44.1±3.4 (4.5±0.35, 32.5±2.5)

B: 2500 cc MODEL



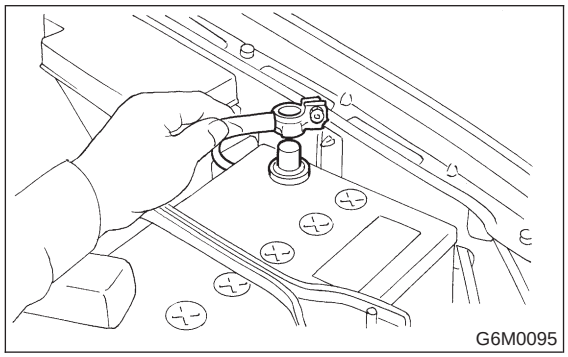
(1) Plug
(2) Washer
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Plug
(12) Gasket
(13) Oil filter connector
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Cylinder head cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: $5^{+1}/_{-0}$($0.5^{+0.1}/_{-0}$, $3.6^{+0.7}/_{-0}$)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.0)
T5: 44.1±3.4 (4.5±0.35, 32.5±2.5)

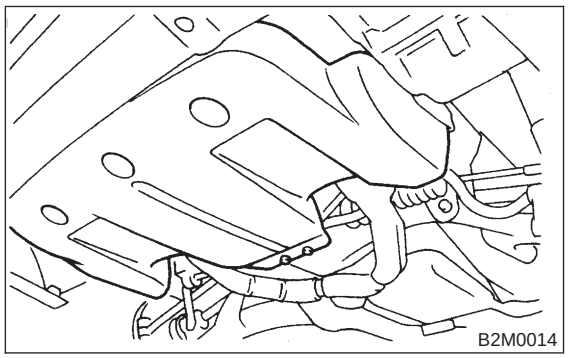
1. Oil Pump

A: REMOVAL

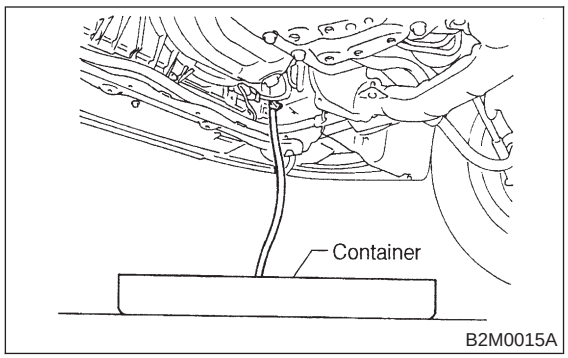
1) Disconnect battery ground cable.



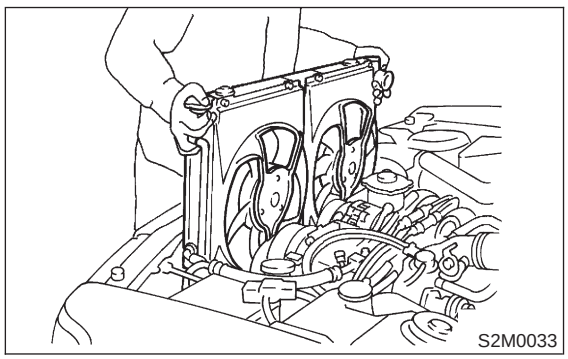
2) Lift-up the vehicle.
3) Remove under cover.



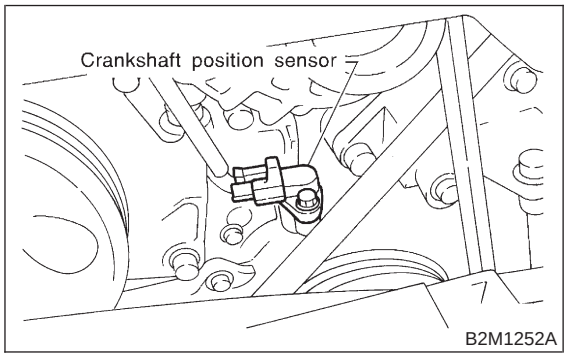
4) Drain coolant. <Ref. to 2-5 [W1A0].>



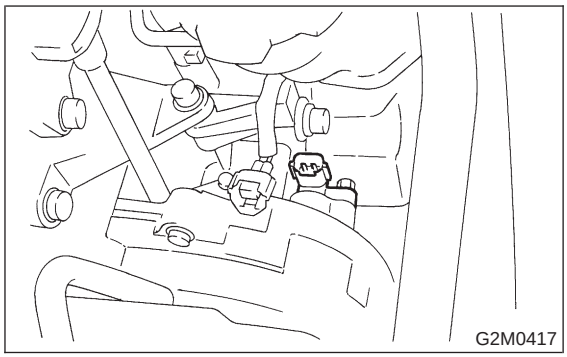
5) Remove radiator. <Ref. to 2-5 [W4A0].>



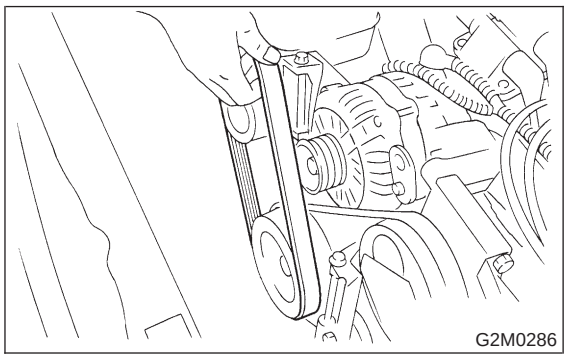
6) Lower the vehicle.
7) Remove crankshaft position sensor.



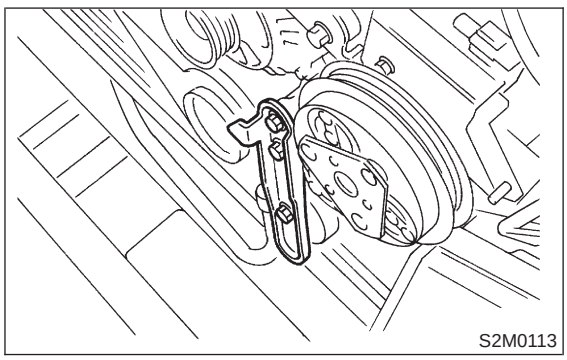
8) Remove camshaft position sensor.



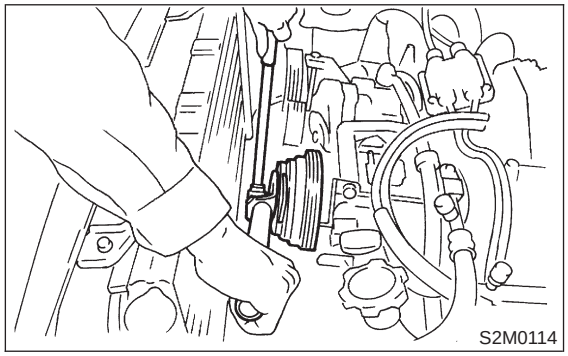
9) Remove V-belts. <Ref. to 1-5 [G2A0].>



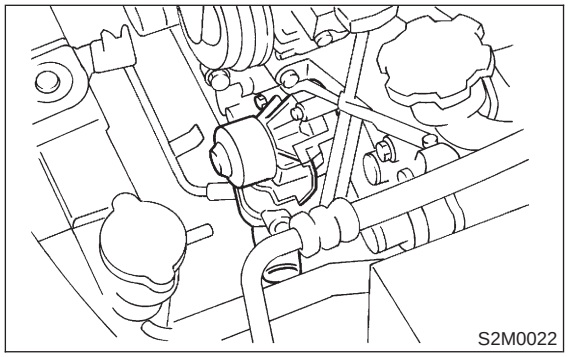
10) Remove rear side V-belt tensioner.



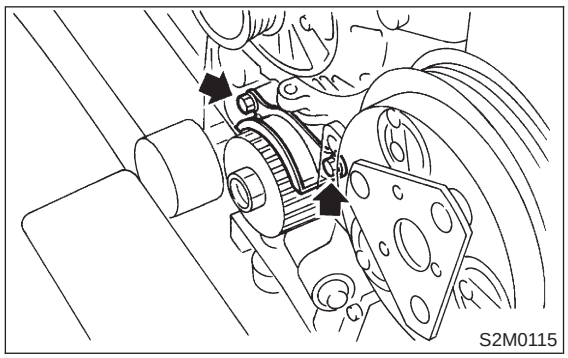
11) Remove crankshaft pulley by using ST.
ST 49997700 CRANKSHAFT PULLEY WRENCH



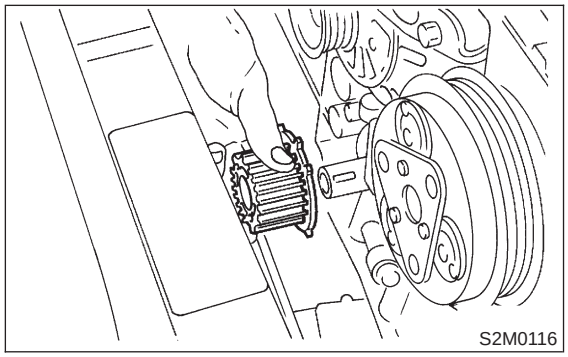
12) Remove water pump. <Ref. to 2-5 [W2A0].>



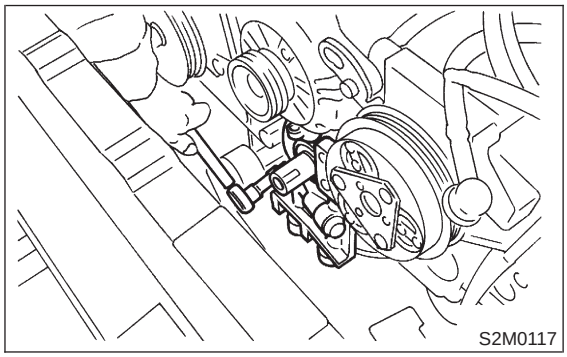
13) Remove timing belt guide. (MT vehicles only)



14) Remove crankshaft sprocket.

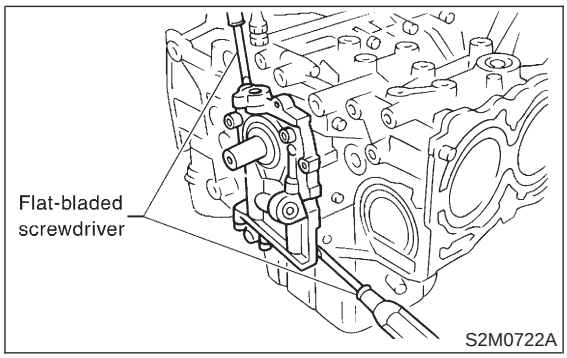


15) Remove bolts which install oil pump onto cylinder block.



16) Remove oil pump by using flat bladed screwdriver.

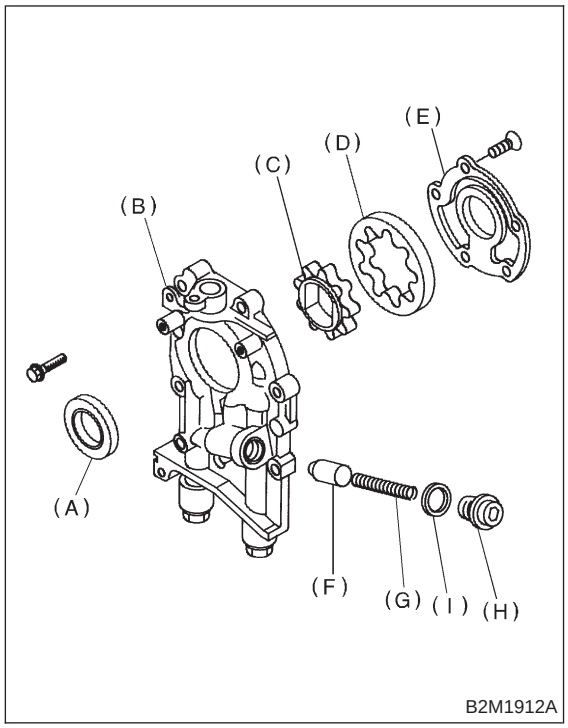
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.



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.



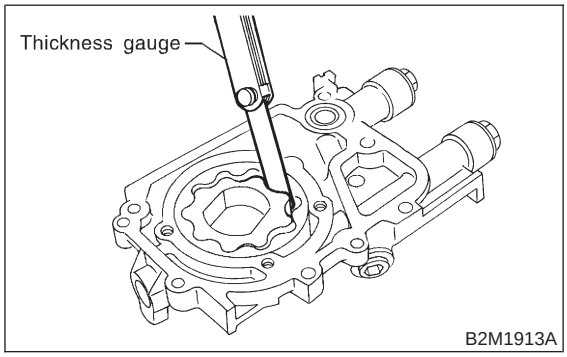
(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief spring
(H) Plug
(I) Washer

C: INSPECTION

1. TIP CLEARANCE

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

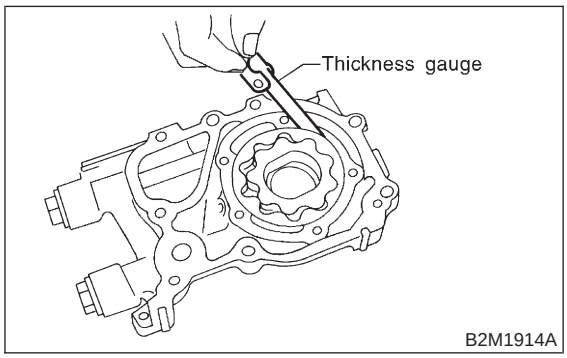
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



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.

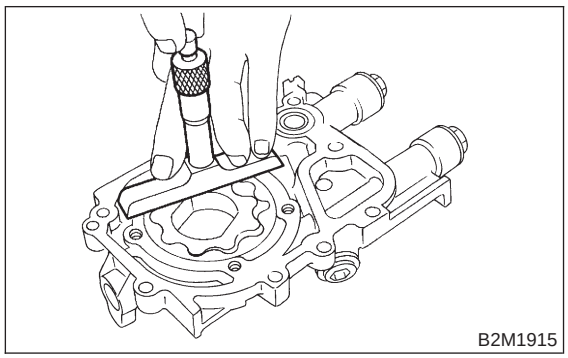
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



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.

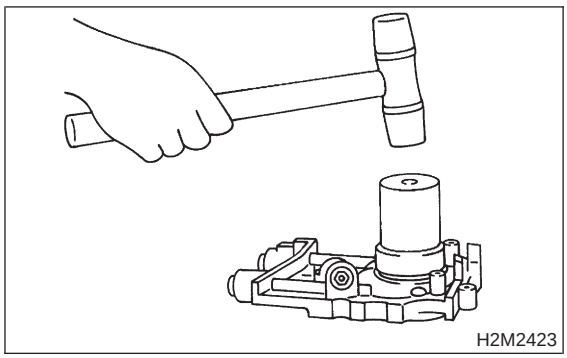
6. OIL SEAL

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

D: ASSEMBLY

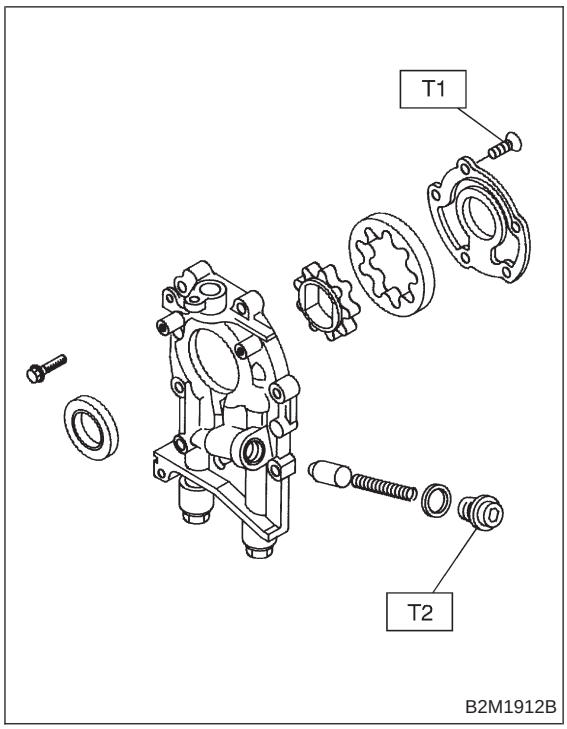
1) Install front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

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.

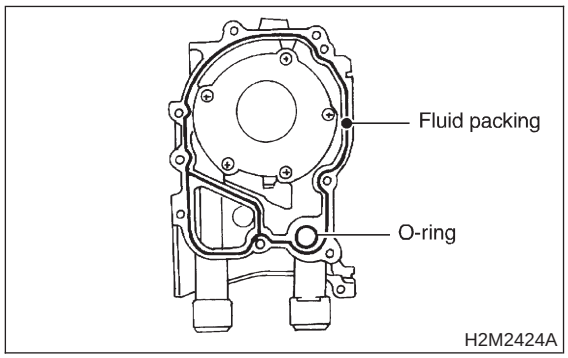
Tightening torque:
T1: 5 — 6 N·m (0.5 — 0.6 kg-m, 3.6 — 4.3 ft-lb)
T2: 40.7 — 47.6 N·m (4.15 — 4.85 kg-m, 30.0 — 35.1 ft-lb)



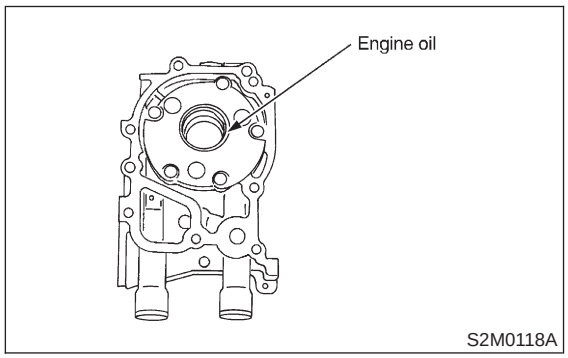
E: INSTALLATION

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) Apply a coat of engine oil to the inside of the oil seal.

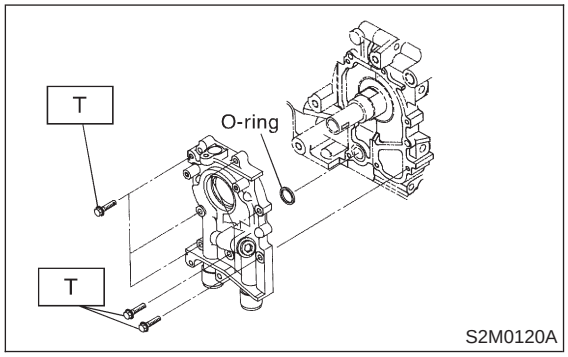


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install oil pump.

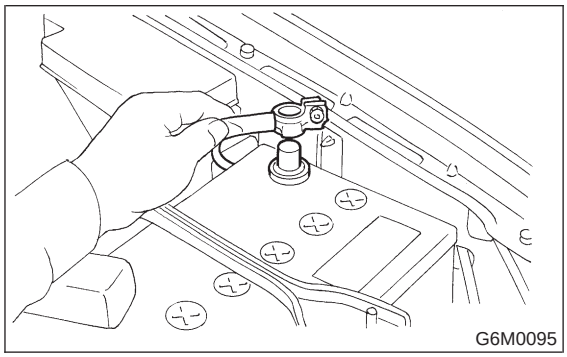
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



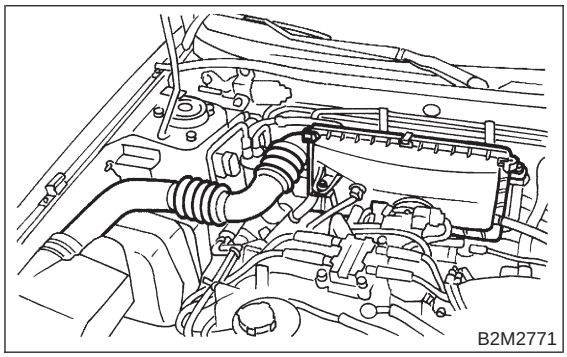
2. Oil Pan and Oil Strainer

A: REMOVAL

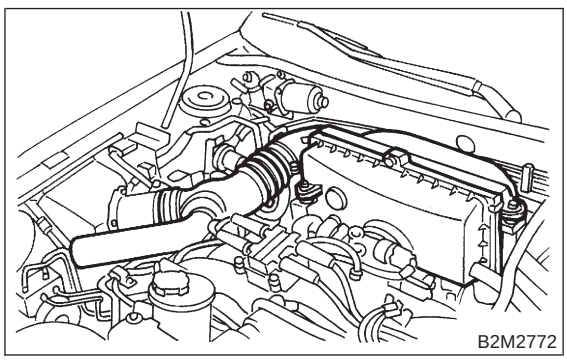
1) Disconnect battery ground cable.



2) Remove front wheels.
3) Remove air intake duct and air cleaner assembly. (2200 cc California spec. vehicles)



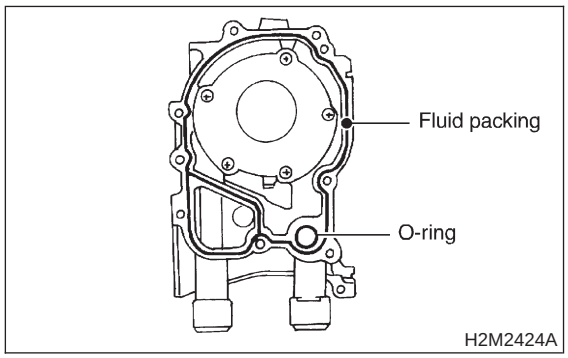
4) Remove air intake duct and air intake chamber. (Except 2200 cc California spec. vehicles)



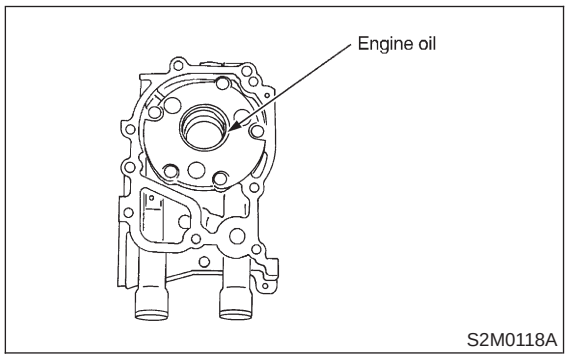
E: INSTALLATION

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) Apply a coat of engine oil to the inside of the oil seal.

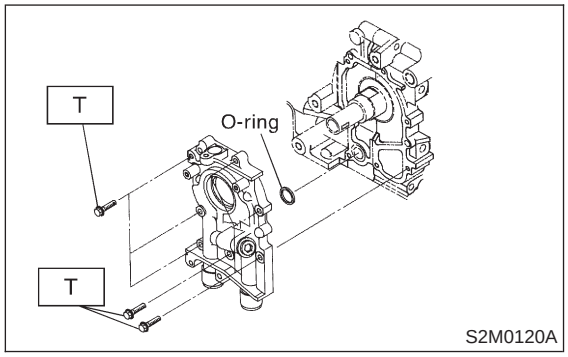


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install oil pump.

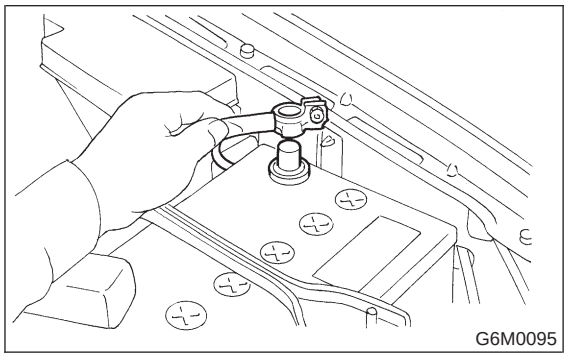
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



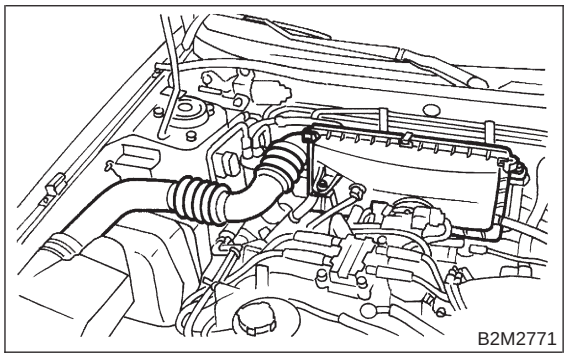
2. Oil Pan and Oil Strainer

A: REMOVAL

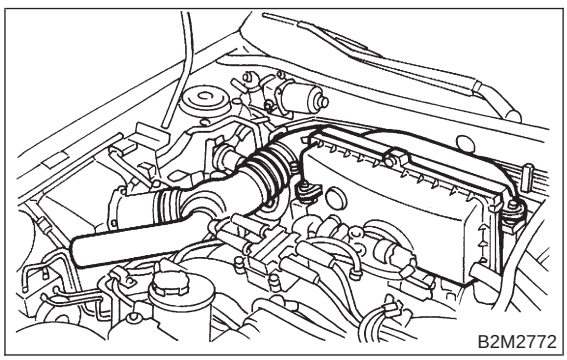
1) Disconnect battery ground cable.



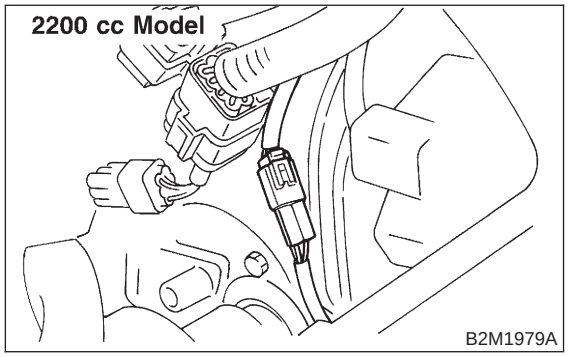
2) Remove front wheels.
3) Remove air intake duct and air cleaner assembly. (2200 cc California spec. vehicles)

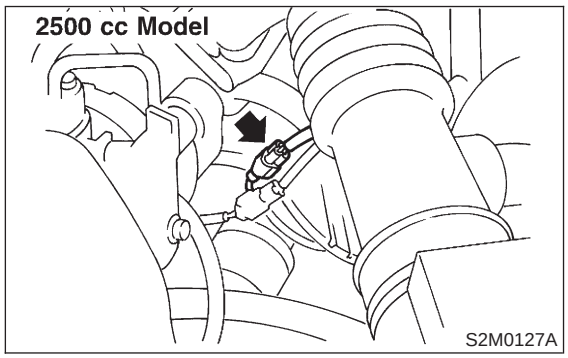


4) Remove air intake duct and air intake chamber. (Except 2200 cc California spec. vehicles)

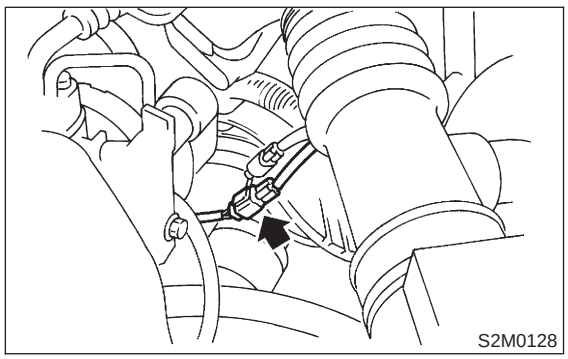


5) Disconnect front oxygen sensor connector.

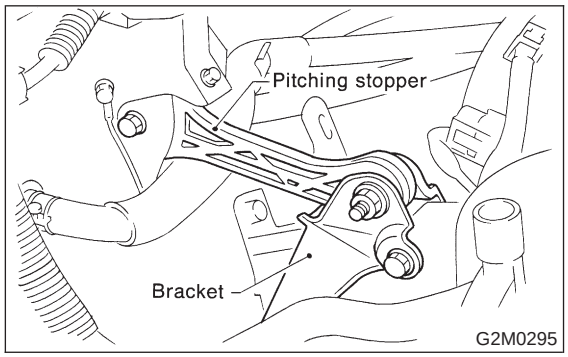




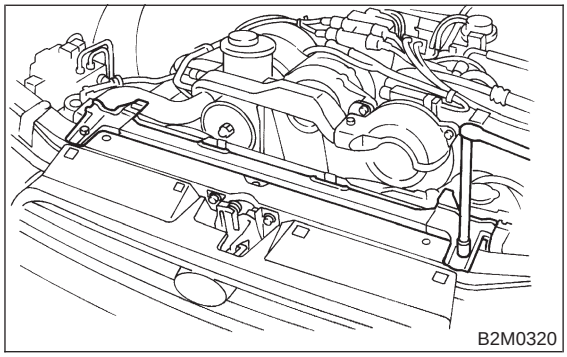
6) Disconnect rear oxygen sensor connector. (2500 cc California spec. vehicles)



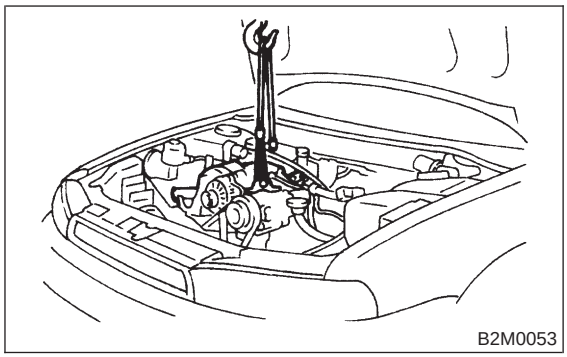
7) Remove pitching stopper.



8) Remove radiator upper bracket.



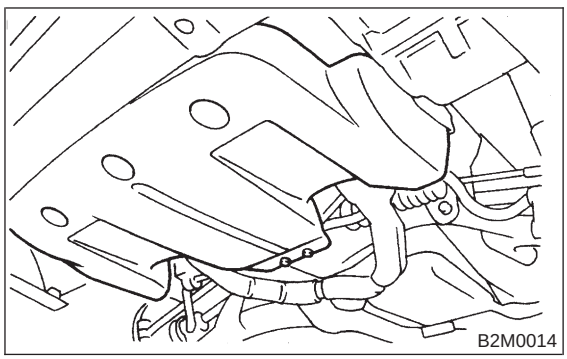
9) Support engine with a lifting device and wire ropes.



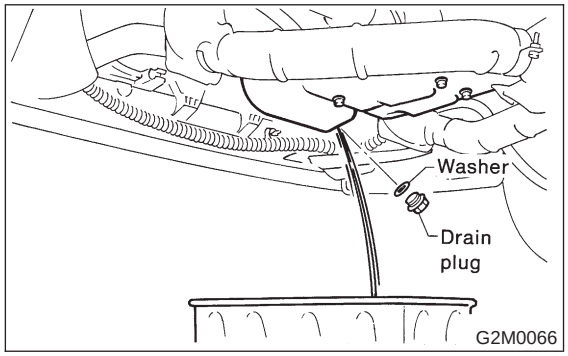
10) Lift-up the vehicle.

CAUTION:
At this time, raise up wire ropes.

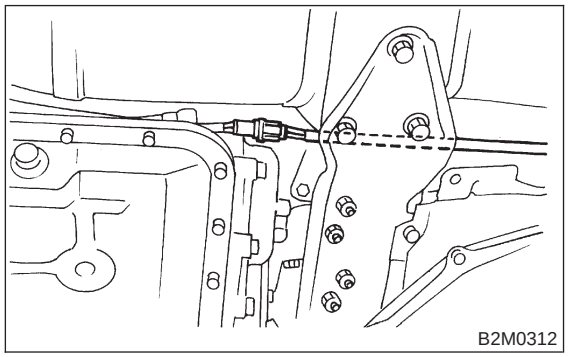
11) Remove under cover.



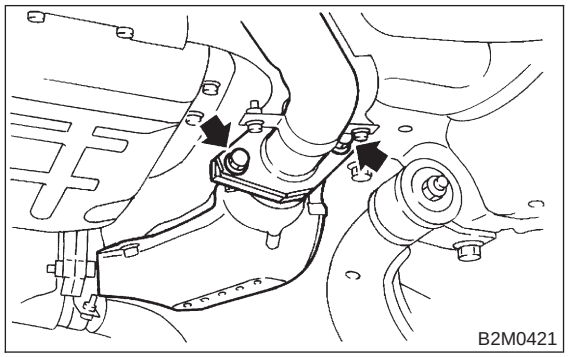
12) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



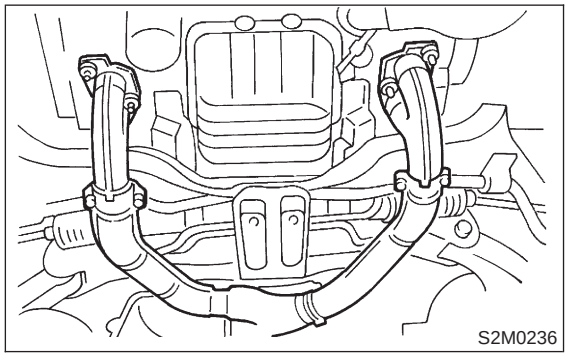
13) Disconnect connector from rear oxygen sensor. (Except 2500 cc California spec. vehicles)



14) Remove front exhaust pipe.
(1) Separate front catalytic converter from center exhaust pipe.

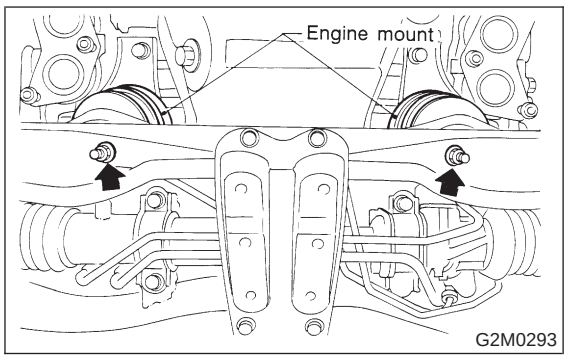


(2) Remove front exhaust pipe from engine.

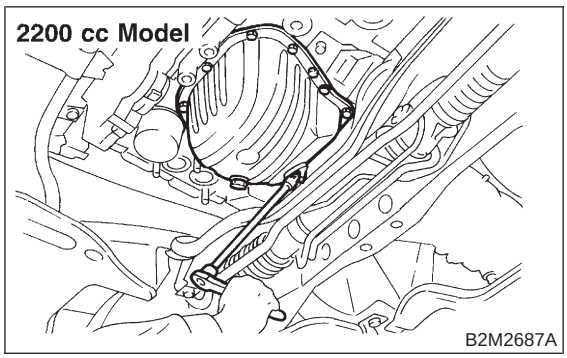


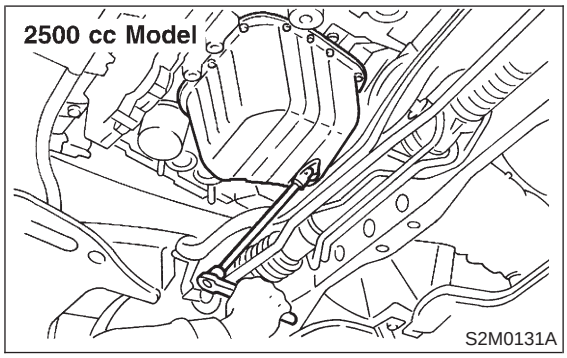
(3) Remove bolt which installs front exhaust pipe on bracket.

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



16) Remove bolts which install oil pan on cylinder block while raising up engine.

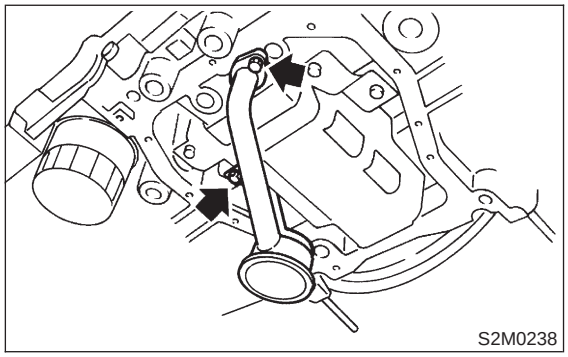




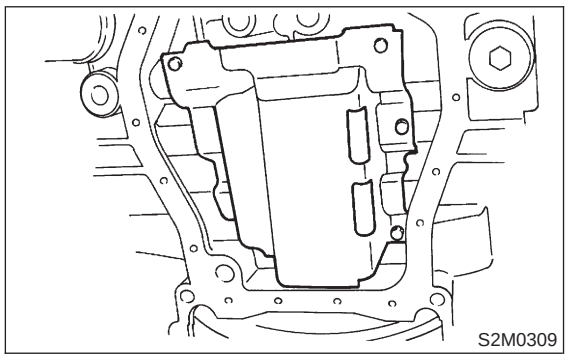
17) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

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

18) Remove oil strainer.



19) Remove baffle plate.



B: INSPECTION

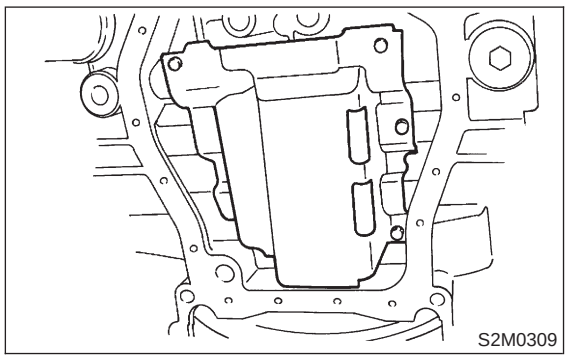
By visual check make sure oil pan, oil strainer and baffle plate are not damaged.

C: INSTALLATION

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

1) Install baffle plate.

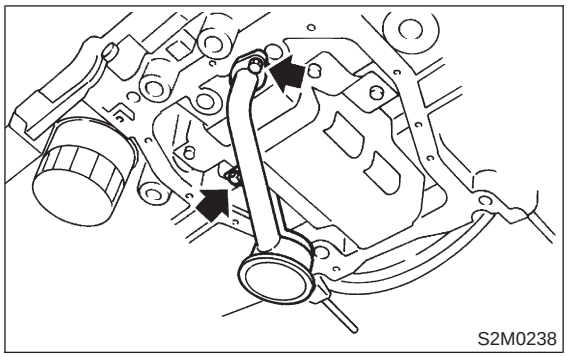
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



2) Install oil strainer onto baffle plate.

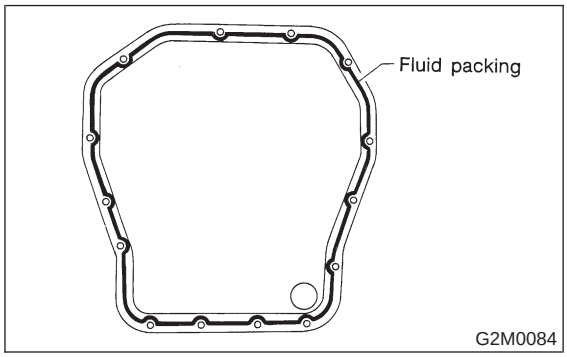
CAUTION:
Replace O-ring with a new one.

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



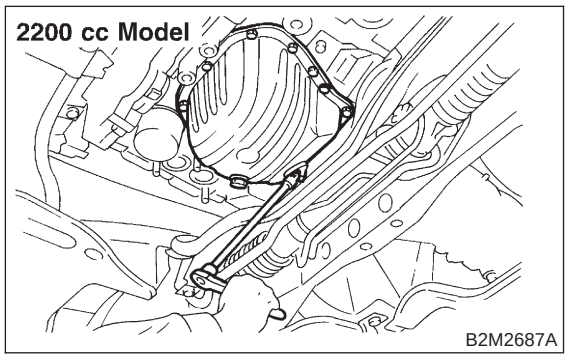
3) Apply fluid packing to mating surfaces and install oil pan.

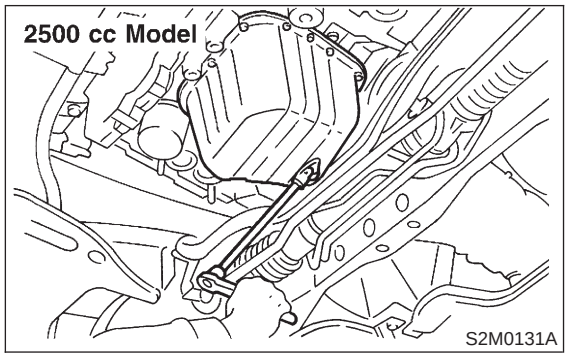
Fluid packing:
THREE BOND 1215 or equivalent



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

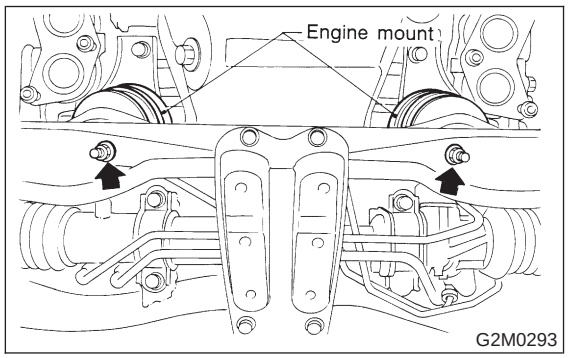
Tightening torque:
5 N·m (0.5 kg-m, 3.6 ft-lb)





5) Lower engine onto front crossmember.
6) 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)

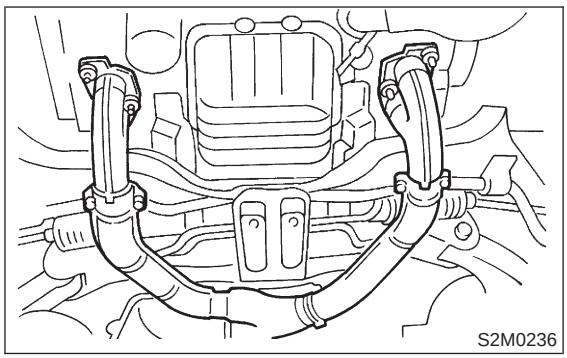


7) Install front exhaust pipe.

CAUTION:
Always use the new gaskets.

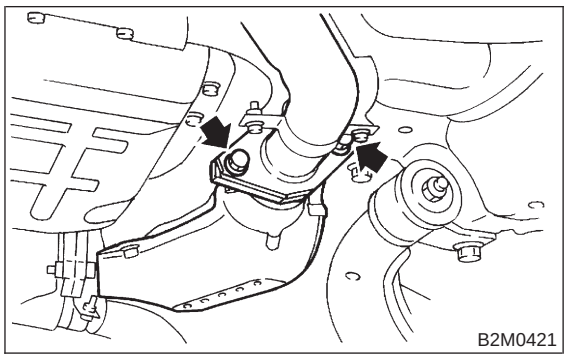
(1) Place front exhaust pipe on bracket.
(2) Tighten nuts which install front exhaust pipe on engine.

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



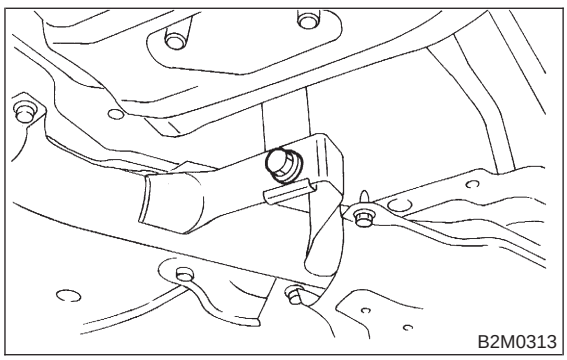
(3) Tighten nuts which install front catalytic converter to center exhaust pipe.

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

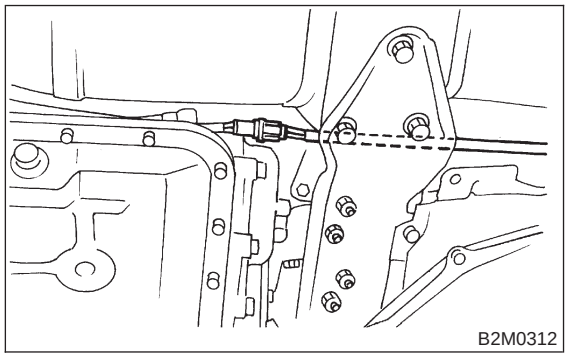


(4) Tighten bolt which installs front exhaust pipe on bracket.

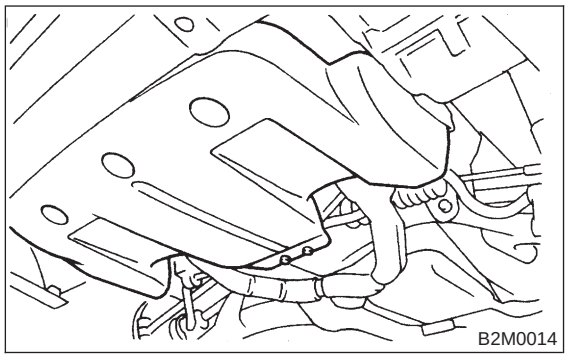
Tightening torque:
24±3 N·m (2.4±0.3 kg-m, 17.4±2.2 ft-lb)



8) Connect connector to rear oxygen sensor. (Except 2500 cc California spec. vehicles)



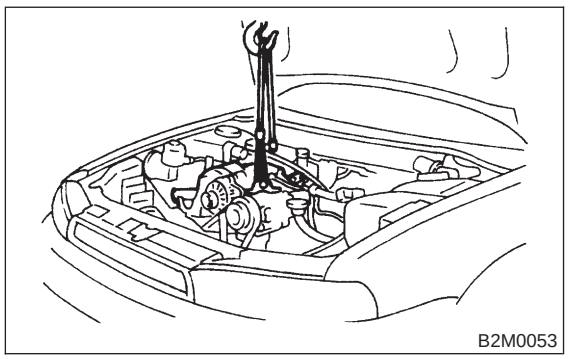
9) Install under cover.



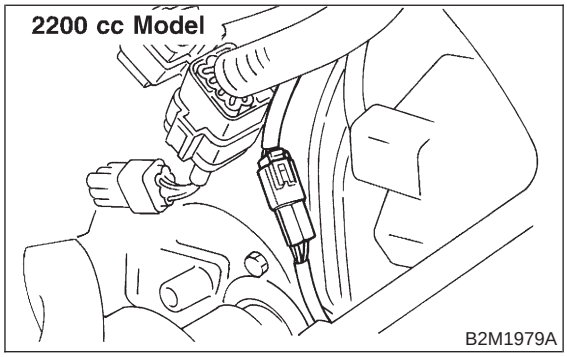
10) Lower the vehicle.

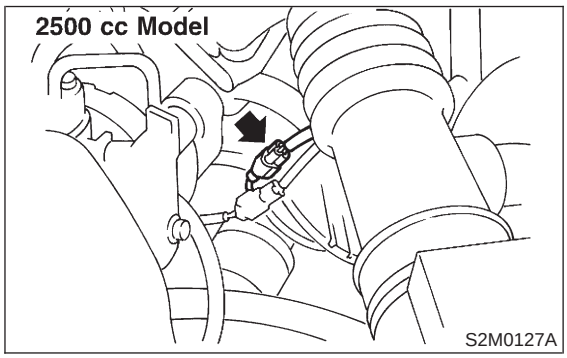
CAUTION:
At this time, lower lifting device and release steel cables.

11) Remove lifting device and steel cables.

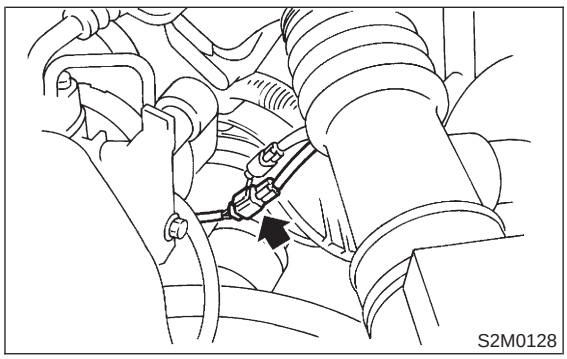


12) Connect connector to front oxygen sensor.



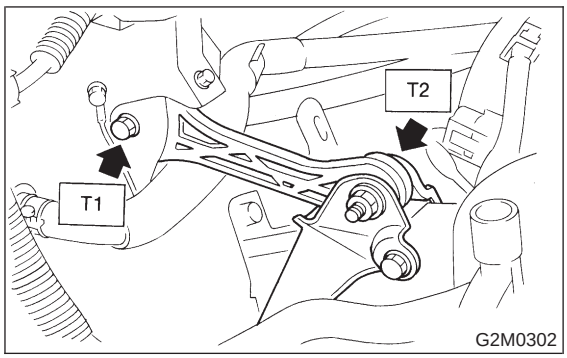


13) Connect connector to rear oxygen sensor. (2500 cc California spec. vehicles)



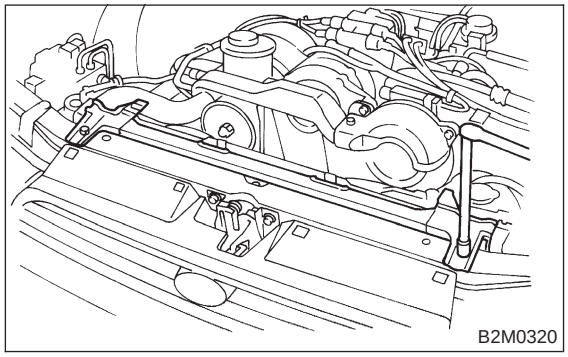
14) Install pitching stopper.

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)

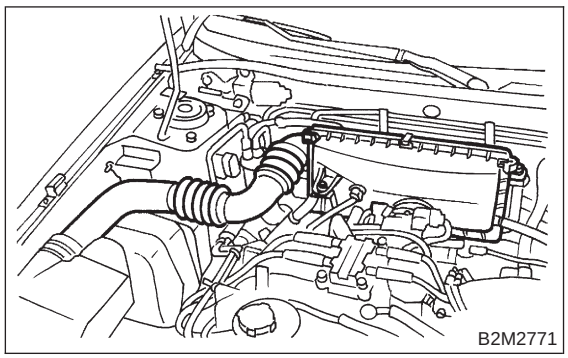


15) Install radiator upper brackets.

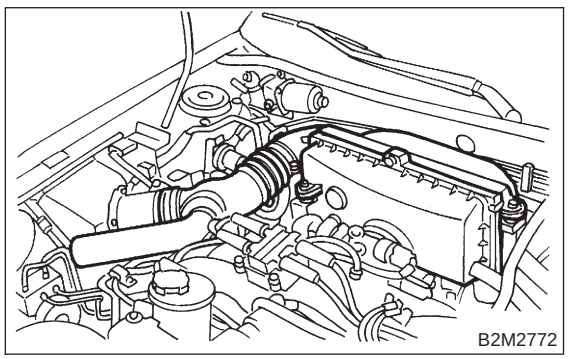
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13±4 ft-lb)


B2M0320

16) Install air intake duct and air cleaner assembly. (2200 cc California spec. vehicles)


B2M2771

17) Install air intake duct and air intake chamber. (Except 2200 cc California spec. vehicles)


B2M2772

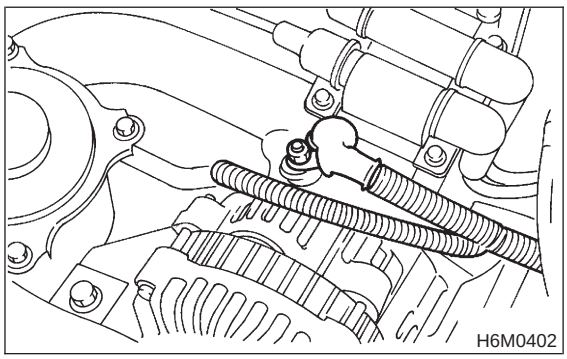
18) Fill engine oil through filler pipe up to upper point of level gauge. <Ref. to 1-5 [G4A0].>

Engine oil capacity:
2200 cc ; Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
2200 cc ; Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)
2500 cc ; Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
2500 cc ; Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

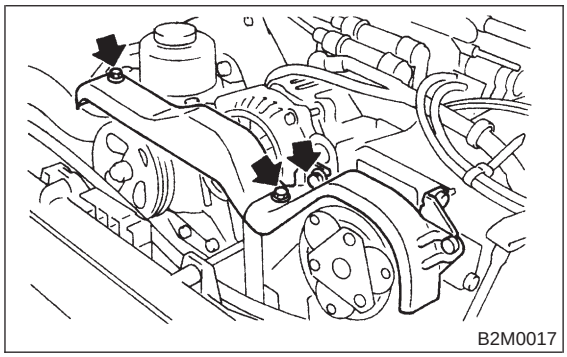
3. Oil Pressure Switch

A: REMOVAL

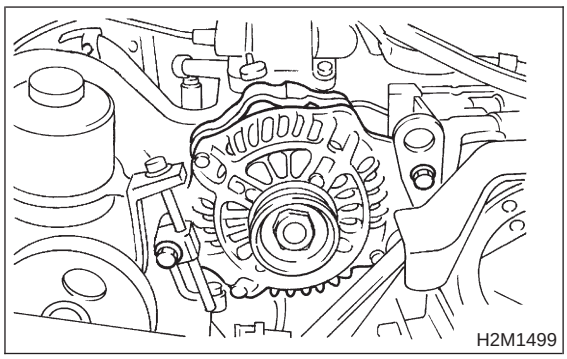
1) Remove alternator from bracket.
(1) Disconnect connector and terminal from generator.


H6M0402

(2) Remove V-belt cover.

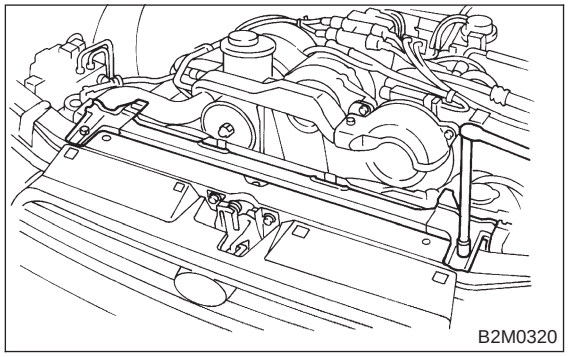

B2M0017

(3) Loosen lock bolt and slider bolt, and remove front side V-belt.
(4) Remove bolts which install generator on bracket.

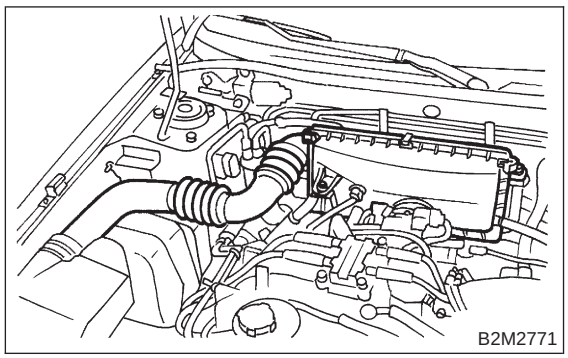

H2M1499

15) Install radiator upper brackets.

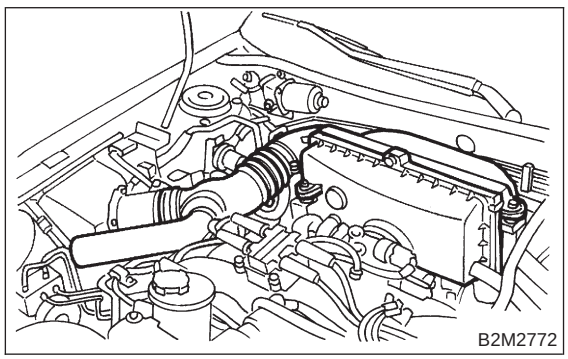
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13±4 ft-lb)


B2M0320

16) Install air intake duct and air cleaner assembly. (2200 cc California spec. vehicles)


B2M2771

17) Install air intake duct and air intake chamber. (Except 2200 cc California spec. vehicles)


B2M2772

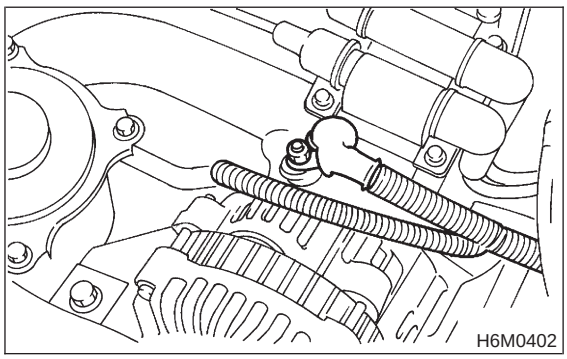
18) Fill engine oil through filler pipe up to upper point of level gauge. <Ref. to 1-5 [G4A0].>

Engine oil capacity:
2200 cc ; Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
2200 cc ; Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)
2500 cc ; Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
2500 cc ; Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

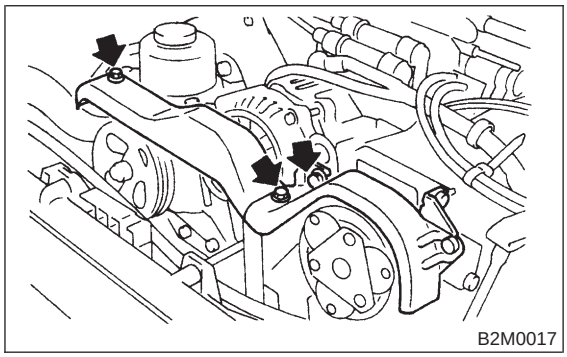
3. Oil Pressure Switch

A: REMOVAL

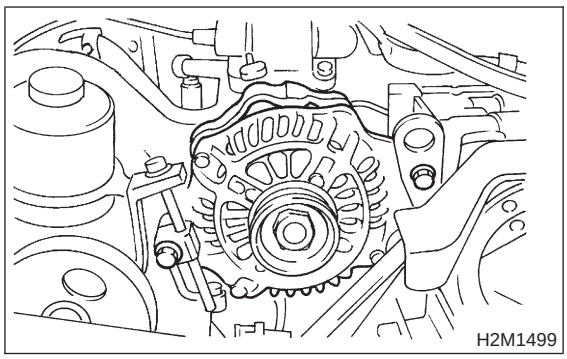
1) Remove alternator from bracket.
(1) Disconnect connector and terminal from generator.


H6M0402

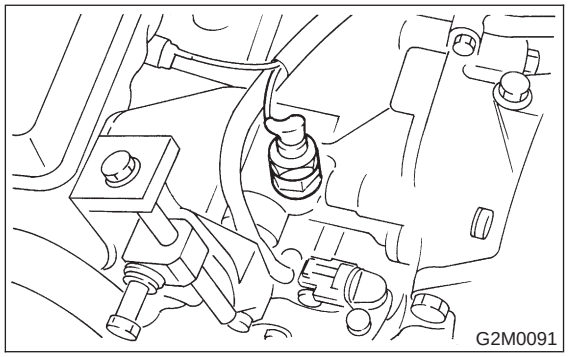
(2) Remove V-belt cover.


B2M0017

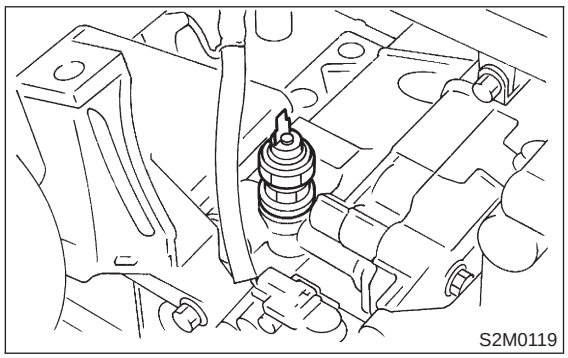
(3) Loosen lock bolt and slider bolt, and remove front side V-belt.
(4) Remove bolts which install generator on bracket.


H2M1499

2) Disconnect terminal from oil pressure switch.



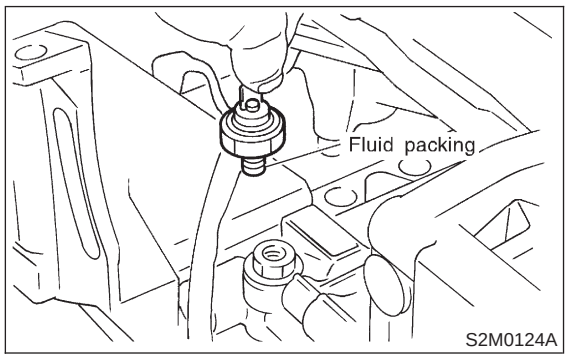
3) Remove oil pressure switch.



B: INSTALLATION

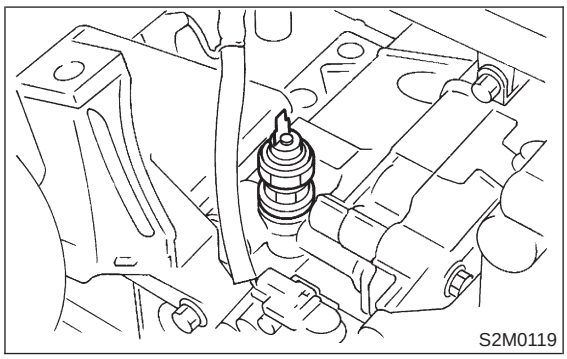
1) Apply fluid packing to oil pressure switch threads before installation.

Fluid packing:
THREE BOND 1215 or equivalent

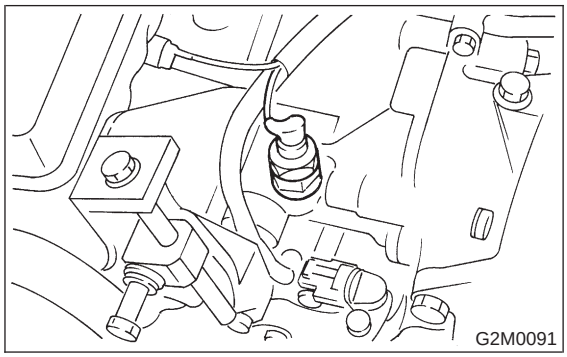


2) Install oil pressure switch onto engine block.

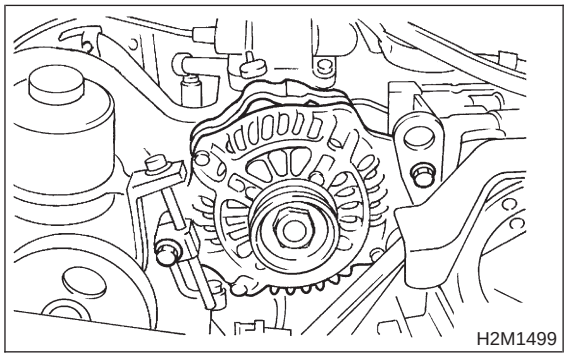
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



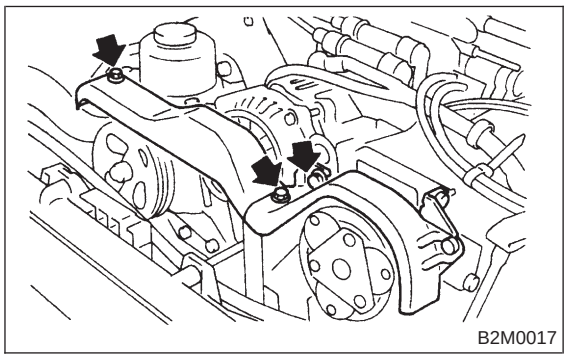
3) Connect terminal of oil pressure switch.



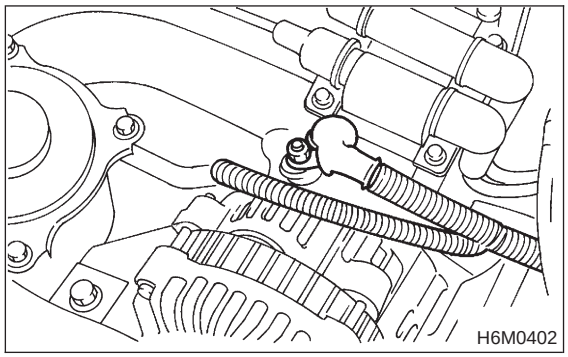
4) Install generator on bracket and temporarily tighten installing bolts.



5) Install front side V-belt and adjust it. <Ref. to 1-5 [G2A0].>
6) Install V-belt cover.



7) 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)

MEMO:

1. Specifications

A: 2200 cc MODEL

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 6.1 (6.4, 5.4)
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		120 W
	Fan diameter × Blade		320 mm (12.60 in) × 5
Radiator	Type		Cross flow, pressure type
	Core dimensions		670 × 361 × 16 mm (26.38 × 14.21 × 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)

B: 2500 cc MODEL

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 6.1 (6.4, 5.4)
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		120 W (main fan) 140 W (sub fan)
	Fan diameter × Blade		340 mm (13.39 in) × 5 (main fan) 280 mm (11.02 in) × 4 (sub fan)
Radiator	Type		Cross flow, pressure type
	Core dimensions		670 × 361 × 16 mm (26.38 × 14.21 × 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	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)

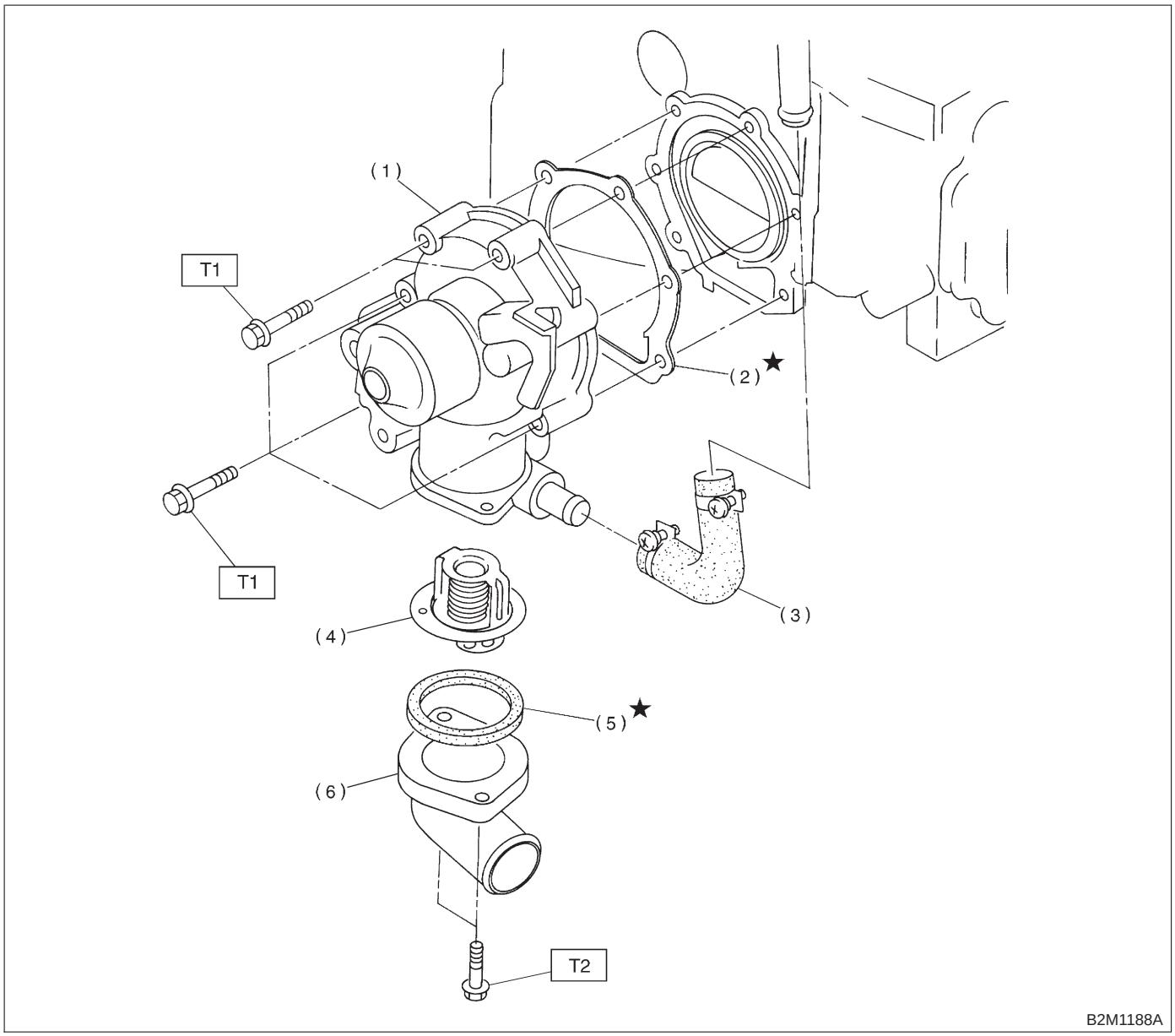
B: 2500 cc MODEL

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 6.1 (6.4, 5.4)
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		120 W (main fan) 140 W (sub fan)
	Fan diameter × Blade		340 mm (13.39 in) × 5 (main fan) 280 mm (11.02 in) × 4 (sub fan)
Radiator	Type		Cross flow, pressure type
	Core dimensions		670 × 361 × 16 mm (26.38 × 14.21 × 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	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)

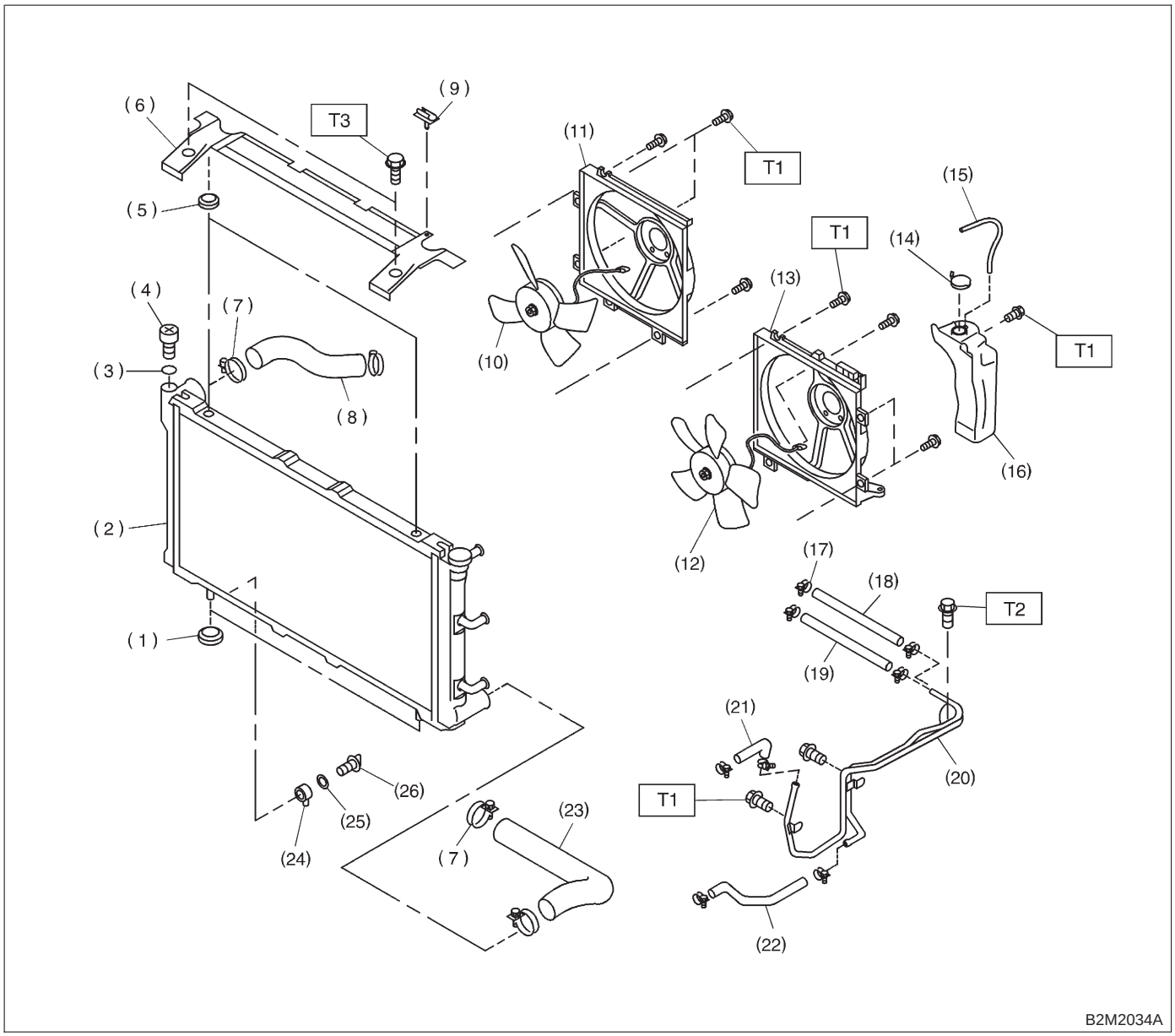
1. Water Pump



(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



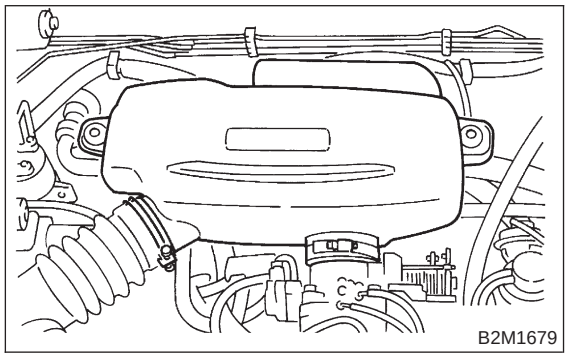
(1) Radiator lower cushion
(2) Radiator
(3) O-ring
(4) Air vent plug
(5) Radiator upper cushion
(6) Radiator upper bracket
(7) Clamp
(8) Radiator inlet hose
(9) Support
(10) Radiator sub fan ASSY
(11) Sub fan shroud
(12) Radiator main fan ASSY
(13) Main fan shroud
(14) Engine coolant reservoir tank cap
(15) Over flow hose
(16) Engine coolant reservoir tank
(17) ATF hose clamp (AT vehicles only)
(18) ATF inlet hose A (AT vehicles only)
(19) ATF outlet hose A (AT vehicles only)
(20) ATF pipe (AT vehicles only)
(21) ATF inlet hose B (AT vehicles only)
(22) ATF outlet hose B (AT vehicles only)
(23) Radiator outlet hose
(24) Radiator drain pipe
(25) Gasket
(26) Radiator drain plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.20, 5.4±1.4)
T2: 12±3 (1.2±0.3, 8.7±2.2)
T3: 18±5 (1.8±0.5, 13.0±3.6)

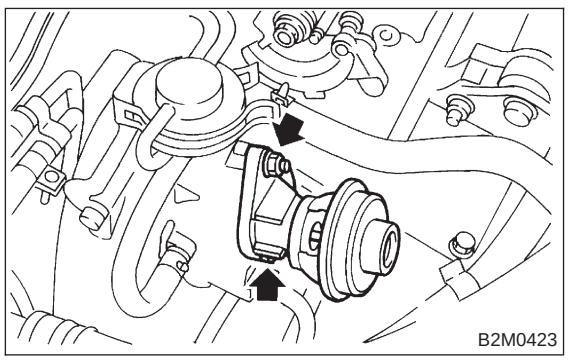
5. EGR Valve (2500 cc Model)

A: REMOVAL AND INSTALLATION

1) Remove air intake chamber.



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



4) Installation is in the reverse order of removal.

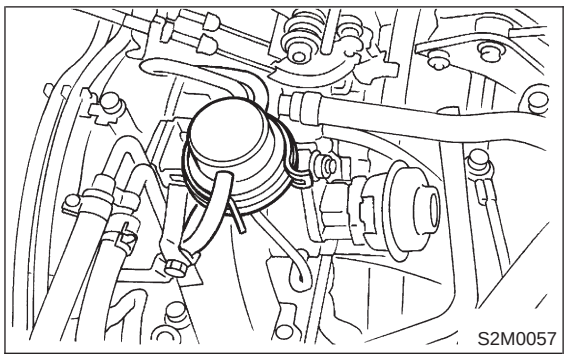
CAUTION:
Replace gasket with a new one.

Tightening torque:
18.6±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)

6. Back-Pressure Transducer (BPT) (2500 cc Model)

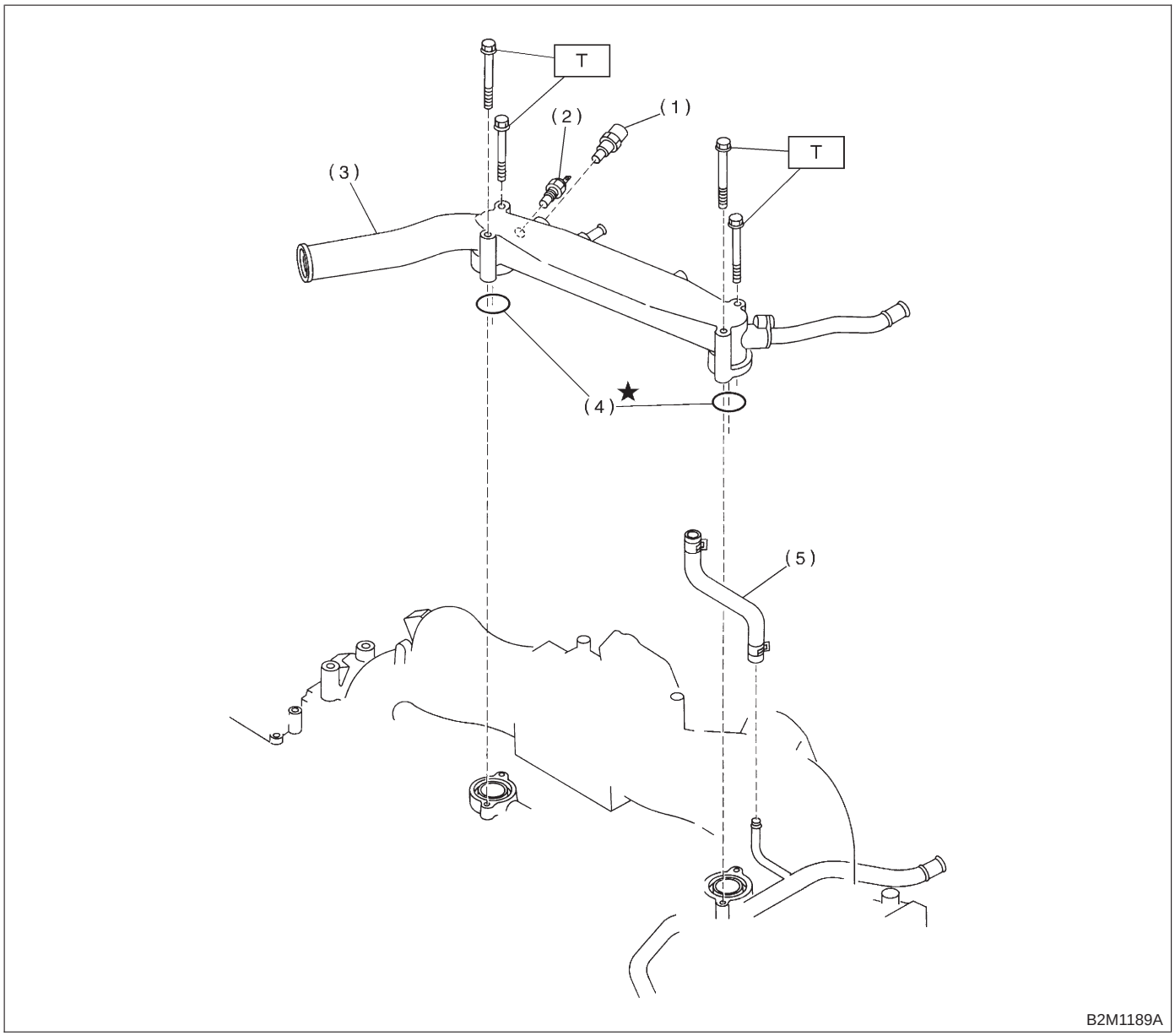
A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hoses from BPT.
2) Remove BPT from bracket.



3) Installation is in the reverse order of removal.

3. Water Pipe



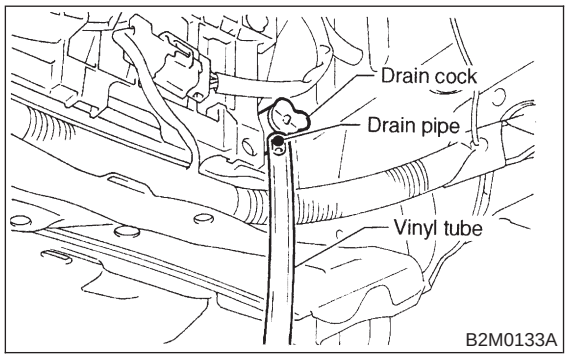
(1) Engine coolant temperature sensor
(2) Engine coolant temperature gauge
(3) Water pipe
(4) O-ring
(5) By-pass hose

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

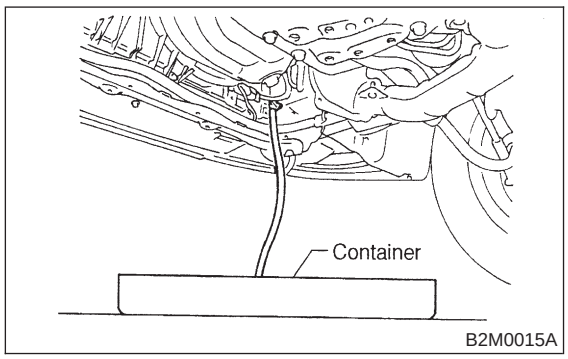
A: DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Fit vinyl tube to drain pipe.



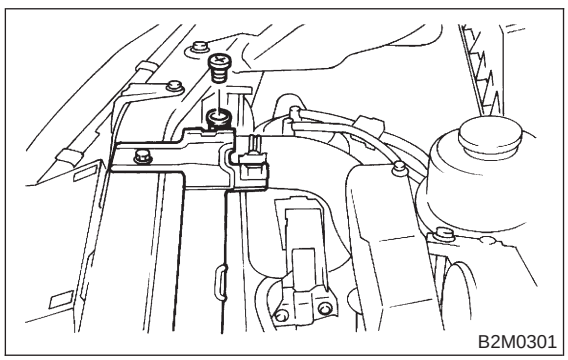
3) Loosen drain cock to drain engine coolant into container.

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

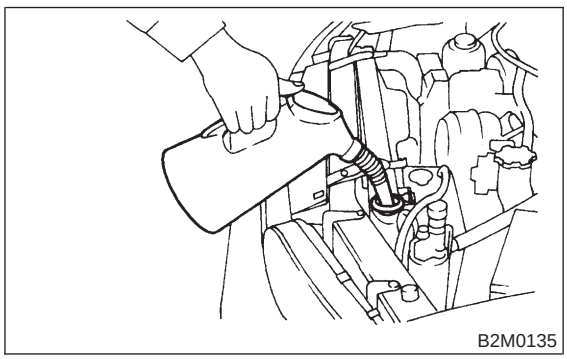


B: FILLING OF ENGINE COOLANT

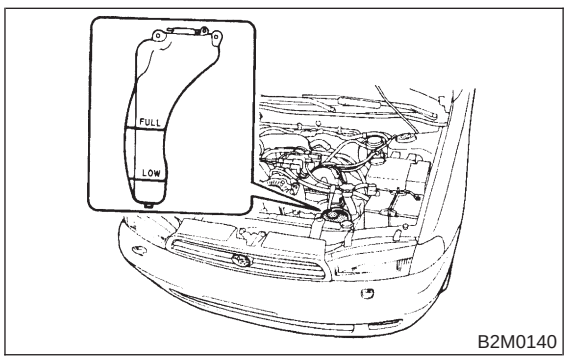
1) Remove air vent plug from radiator.



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



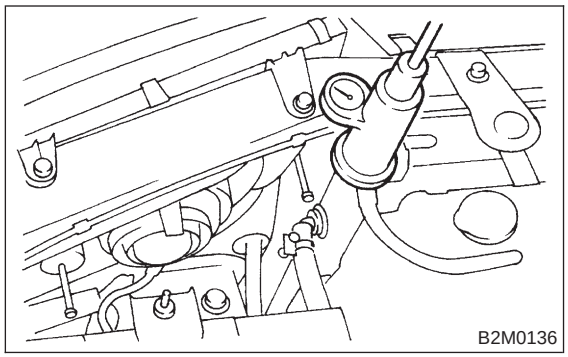
3) Fill engine coolant into reservoir tank up to upper level.



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

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.

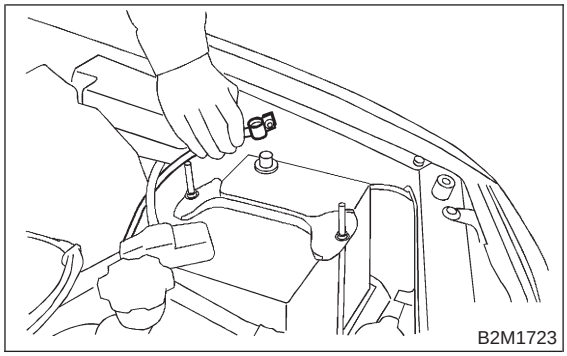
CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

2. Water Pump

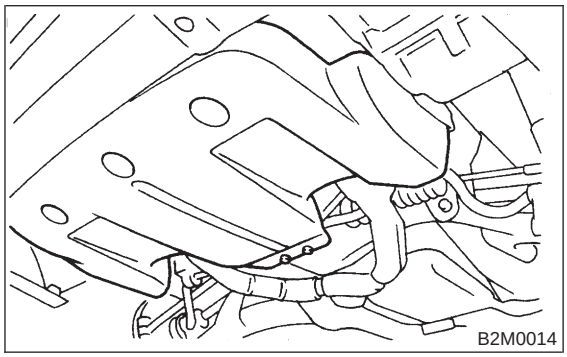
A: REMOVAL AND INSTALLATION

1. 2200 cc MODEL

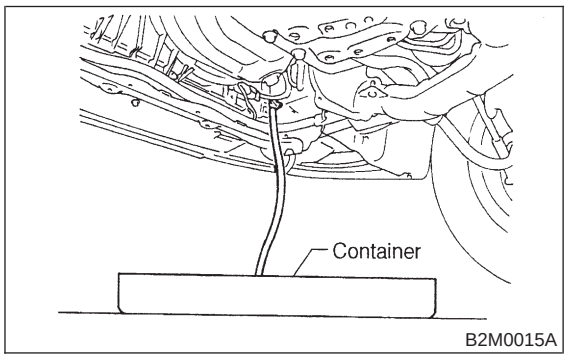
1) Disconnect ground cable from battery.



2) Lift-up the vehicle.
3) Remove under cover.

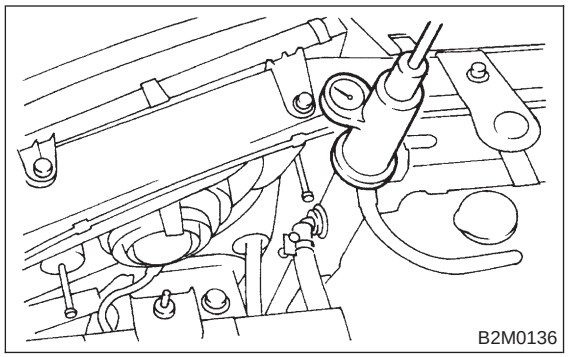


4) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>



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.

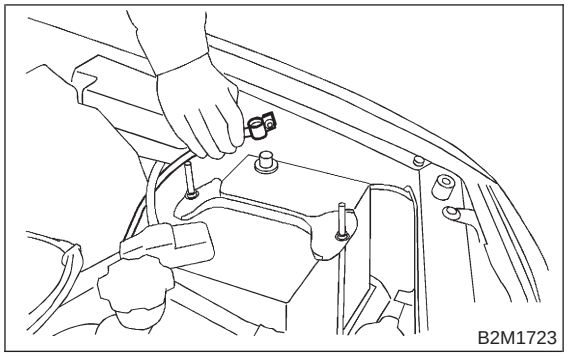
CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

2. Water Pump

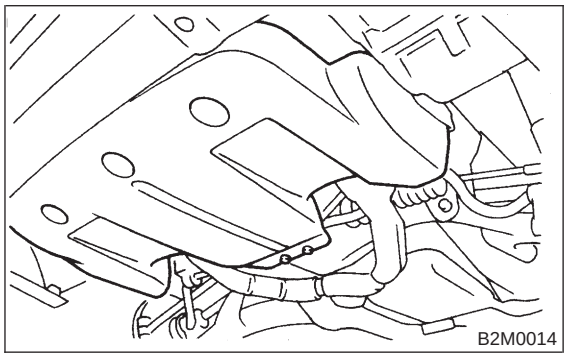
A: REMOVAL AND INSTALLATION

1. 2200 cc MODEL

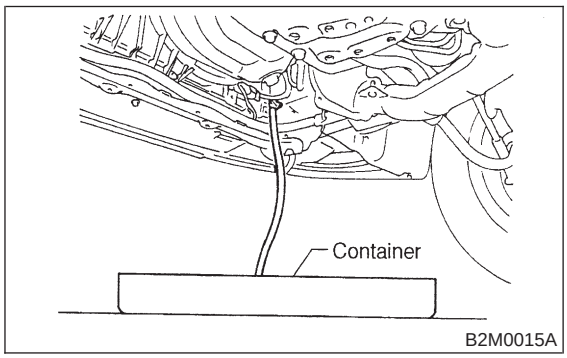
1) Disconnect ground cable from battery.



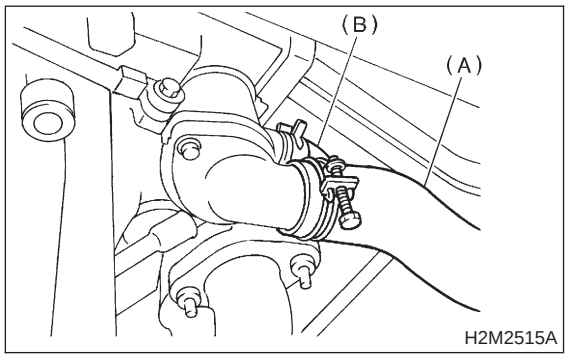
2) Lift-up the vehicle.
3) Remove under cover.



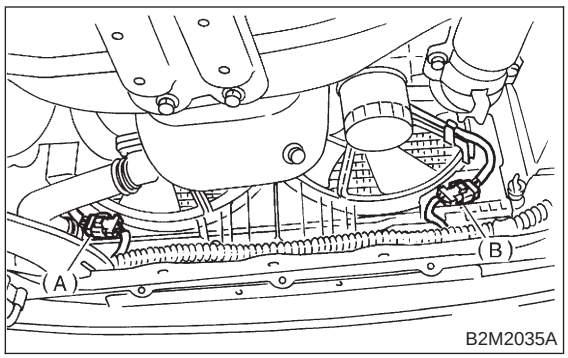
4) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>



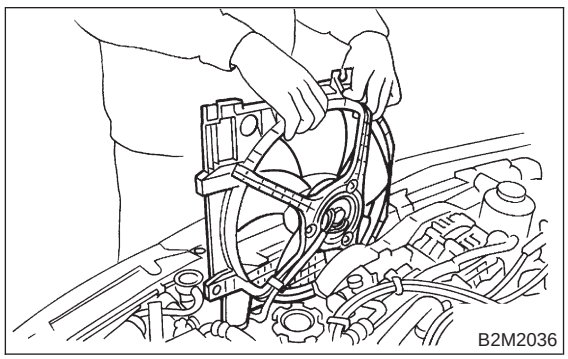
5) Disconnect radiator outlet hose (A) and heater by-pass hose (B) from water pump.



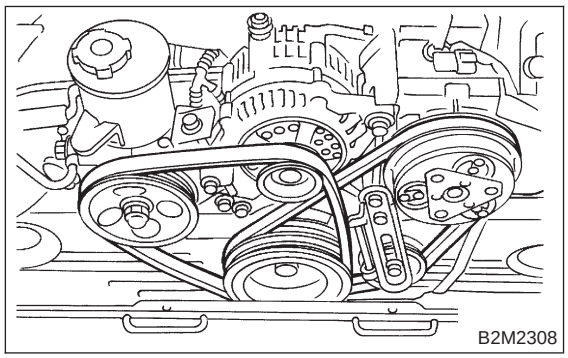
6) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.



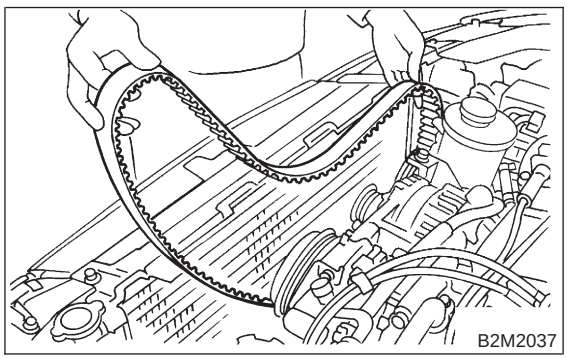
7) Lower the vehicles.
8) Remove radiator main fan <Ref. to 2-5 [W6A0].> and sub fan motor assembly <Ref. to 2-5 [W7A0].>.



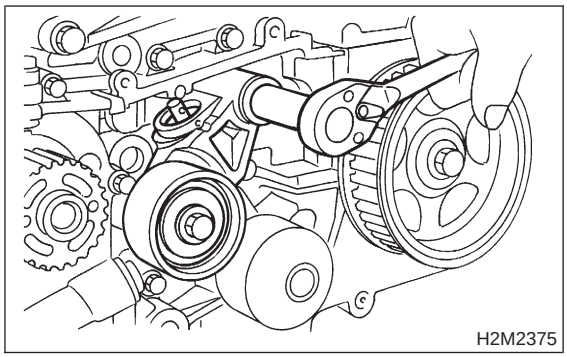
9) Remove V-belts.
<Ref. to 1-5 [G2B0].>



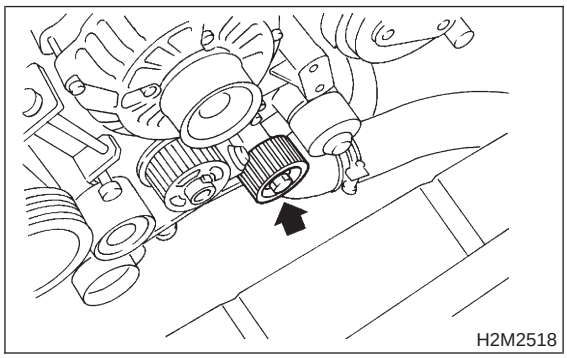
10) Remove timing belt.
<Ref. to 2-3a [W2A0].>



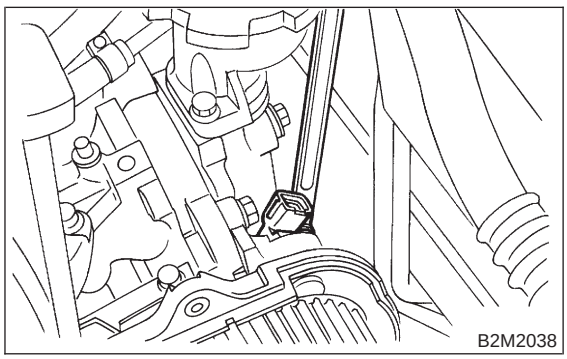
11) Remove automatic belt tension adjuster.



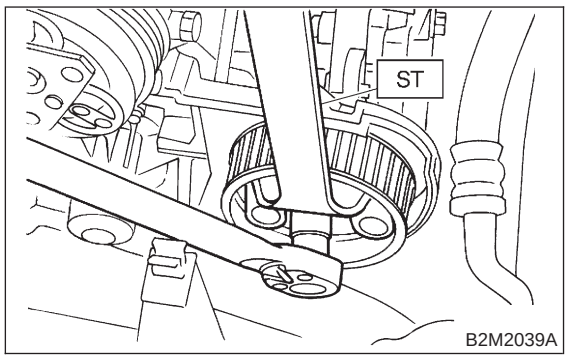
12) Remove belt idler No. 2.



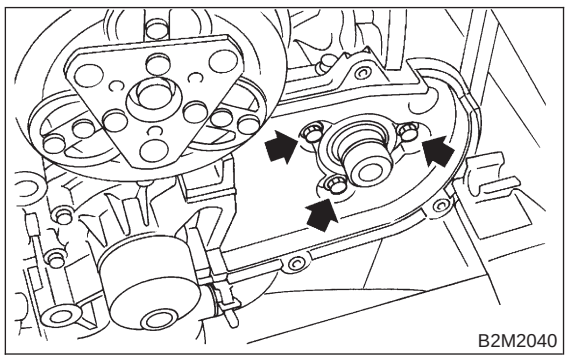
13) Remove camshaft position sensor.
<Ref. to 2-7 [W10A0].>



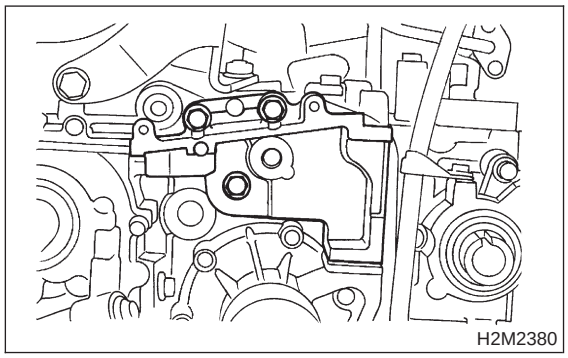
14) Remove left-hand camshaft sprocket by using ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH



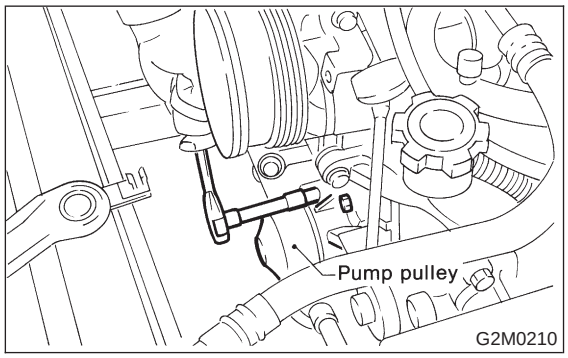
15) Remove left-hand belt cover No. 2.



16) Remove tensioner bracket.



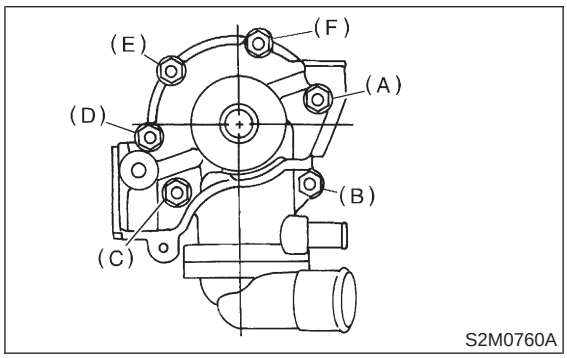
17) Remove tensioner bracket.
18) Disconnect heater hose from water pump.
19) Remove water pump.



20) Installation is in the reverse order of removal.

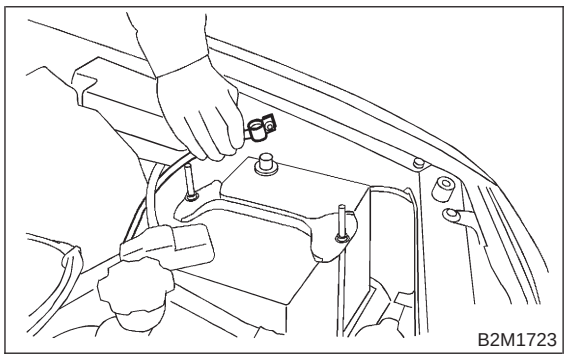
CAUTION:
- **Replace gasket with a new one.**
- **When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.**

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

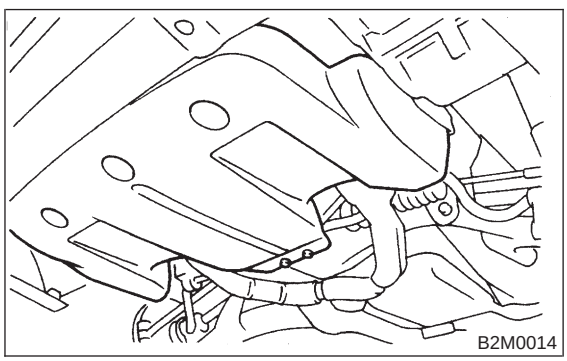


2. 2500 cc MODEL

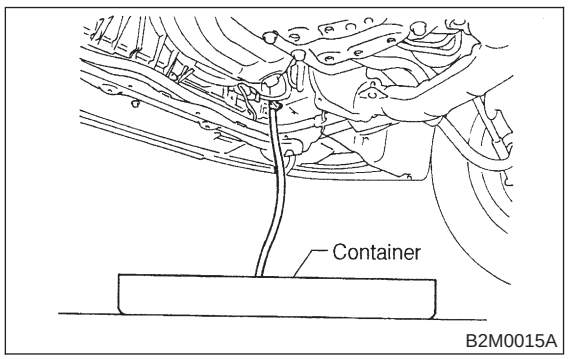
1) Disconnect ground cable from the battery.



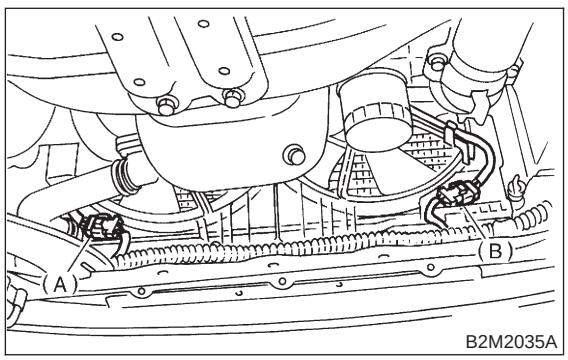
2) Lift-up the vehicle.
3) Remove under cover.



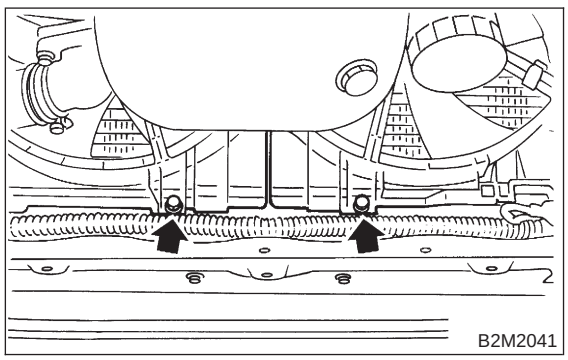
4) Drain engine coolant completely.
<Ref. to 2-5 [W1A0].>



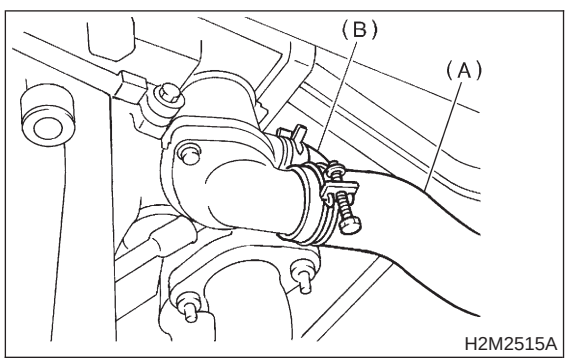
5) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.



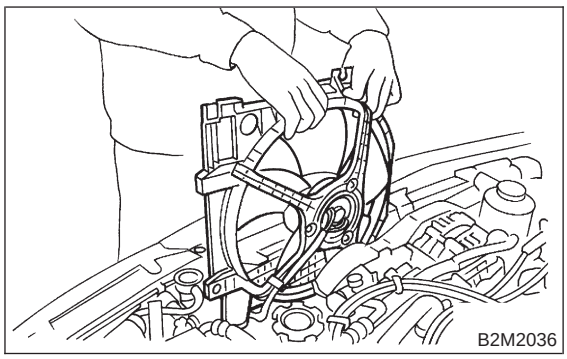
6) Loosen bolts which hold lower side of radiator main fan and sub fan shrouds.



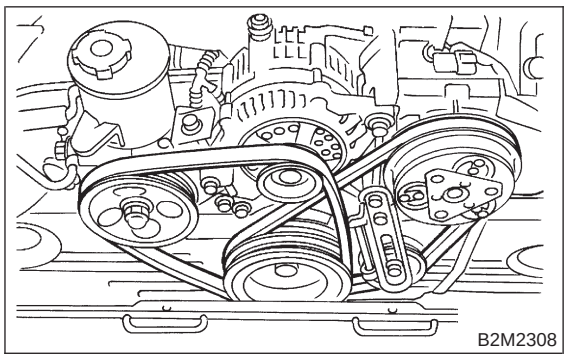
7) Disconnect radiator outlet hose (A) and heater by-pass hose (B) from water pump.



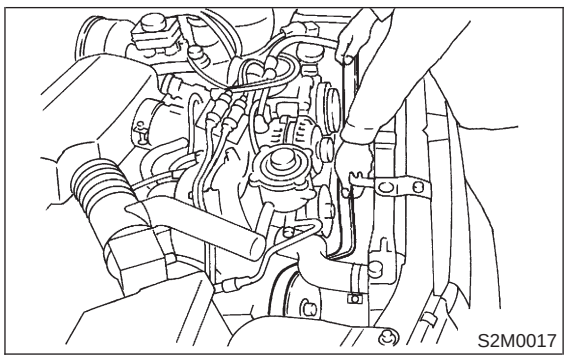
8) Lower the vehicle.
9) Remove radiator main fan <Ref. to 2-5 [W6A0].> and sub fan assemblies <Ref. to 2-5 [W7A0].>.



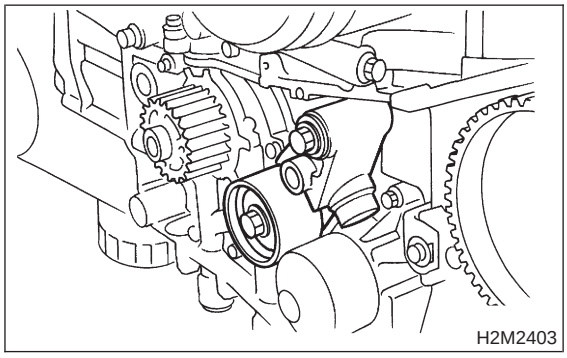
10) Remove V-belts.
<Ref. to 1-5 [G2B0].>



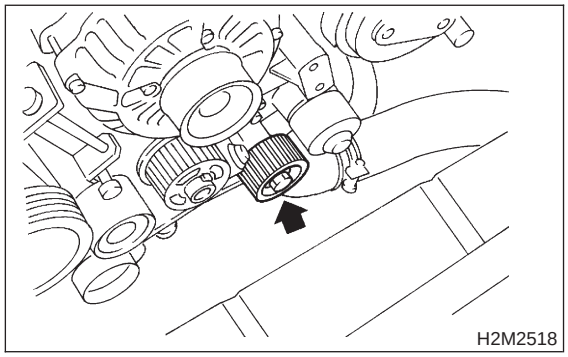
11) Remove timing belt.
<Ref. to 2-3b [W2A0].>



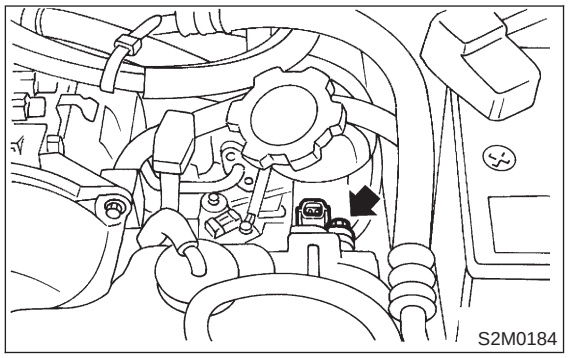
12) Remove automatic belt tension adjuster.



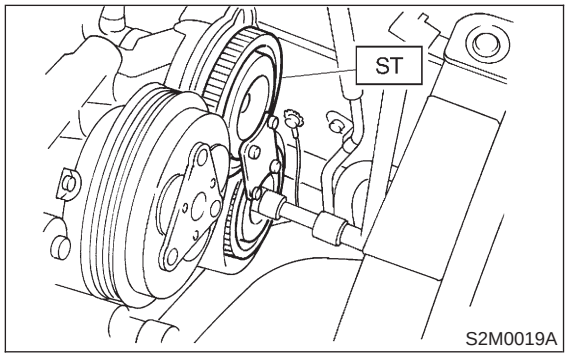
13) Remove belt idler No. 2.



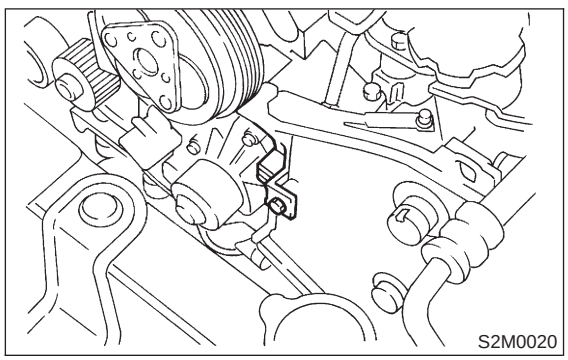
14) Remove camshaft position sensor.
<Ref. to 2-7 [W10A0].>



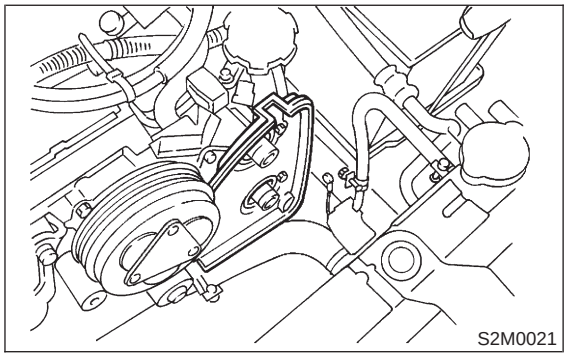
15) Remove left-hand camshaft sprockets by using ST.
ST 499207300 CAMSHAFT SPROCKET WRENCH



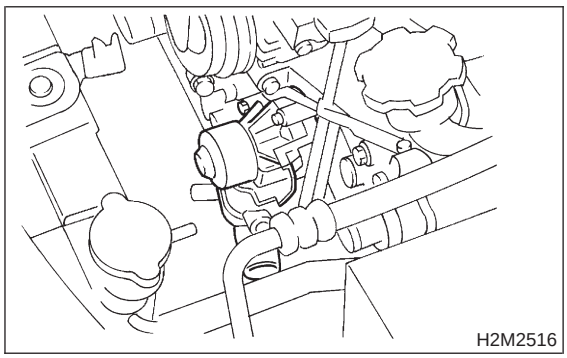
16) Remove tensioner bracket.



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



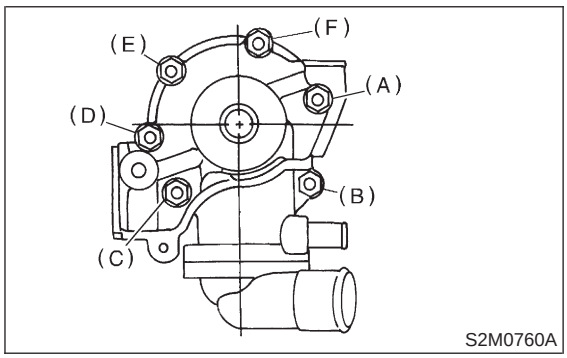
18) Remove water pump.



19) 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 alphabetical 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)

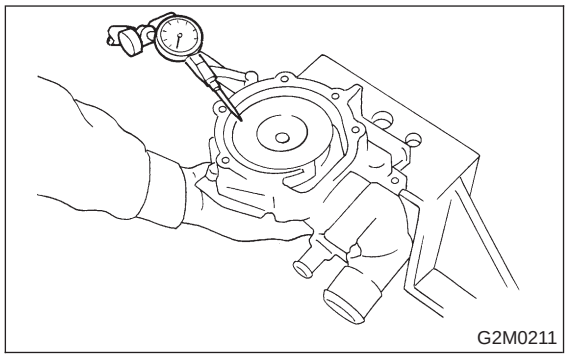


B: INSPECTION

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

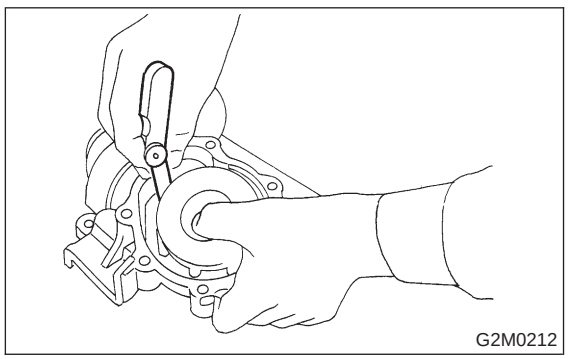
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

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



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)

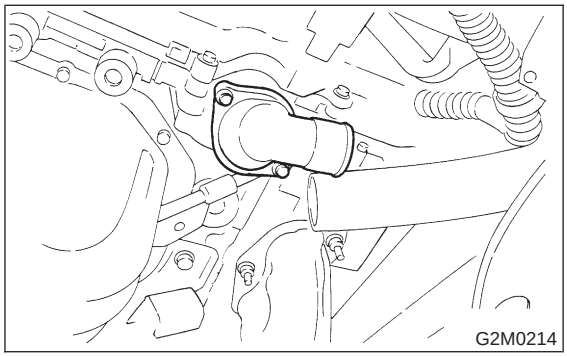


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

3. Thermostat

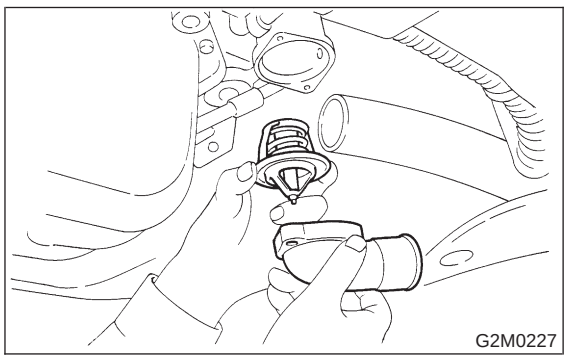
A: REMOVAL AND INSTALLATION

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.



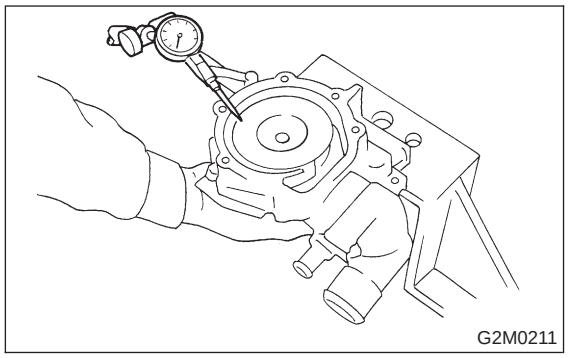
4) Install the thermostat in the intake manifold, and install the thermostat cover together with a gasket.

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.



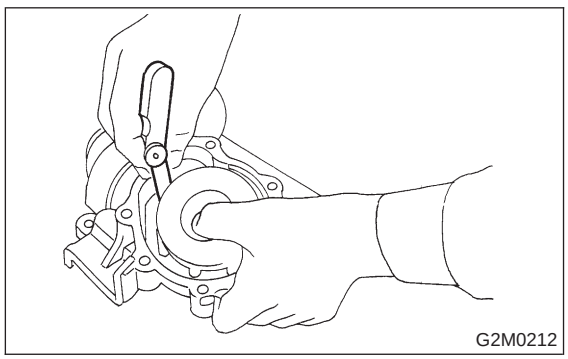
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

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



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)

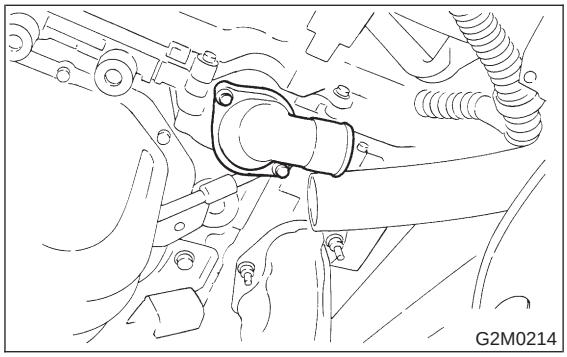


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

3. Thermostat

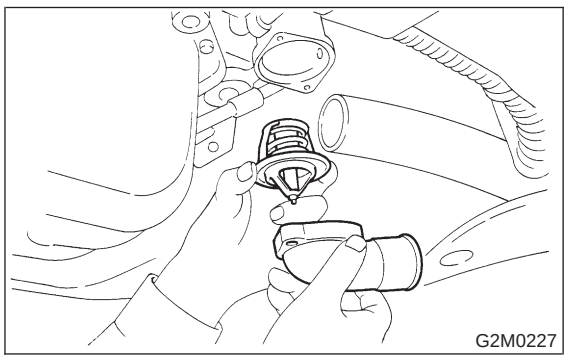
A: REMOVAL AND INSTALLATION

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.



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.

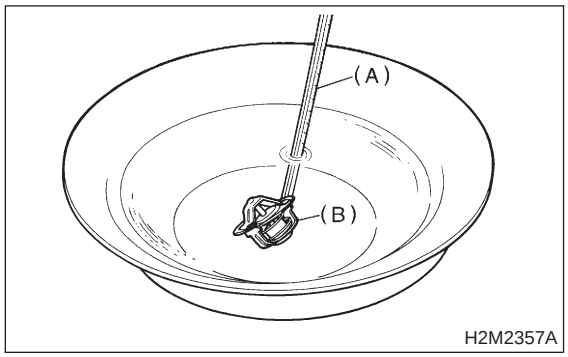


B: INSPECTION

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)

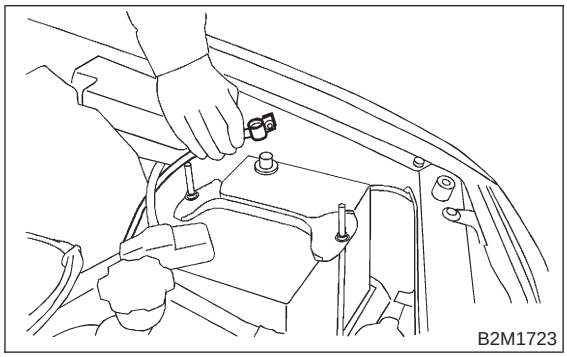


(A) Thermometer
(B) Thermostat

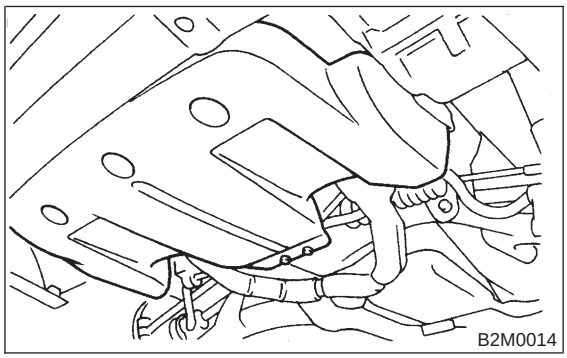
4. Radiator

A: REMOVAL

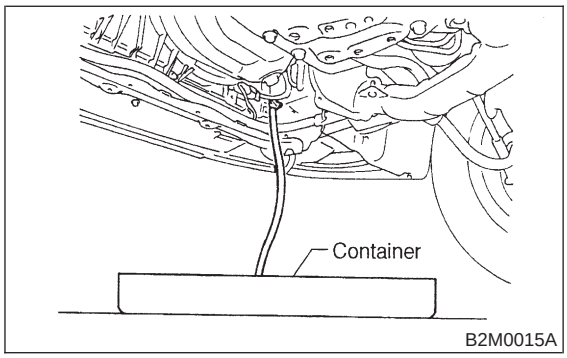
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.



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

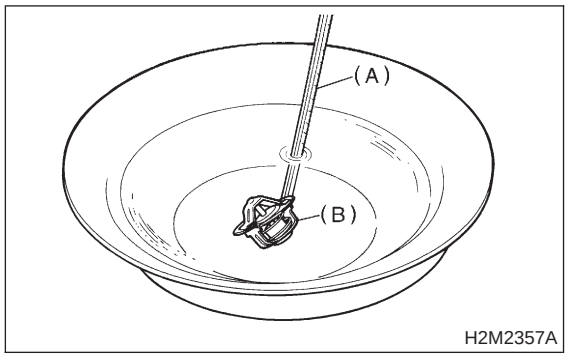


B: INSPECTION

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)

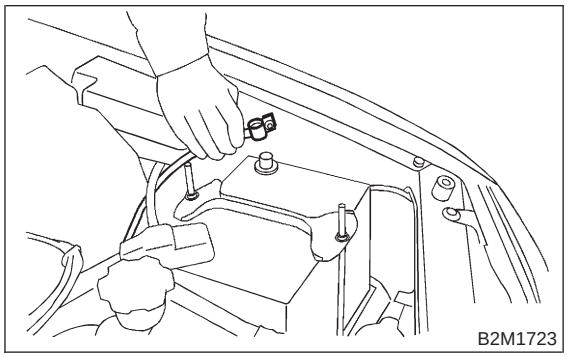


(A) Thermometer
(B) Thermostat

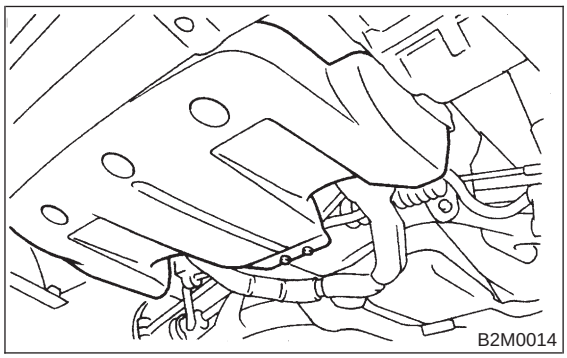
4. Radiator

A: REMOVAL

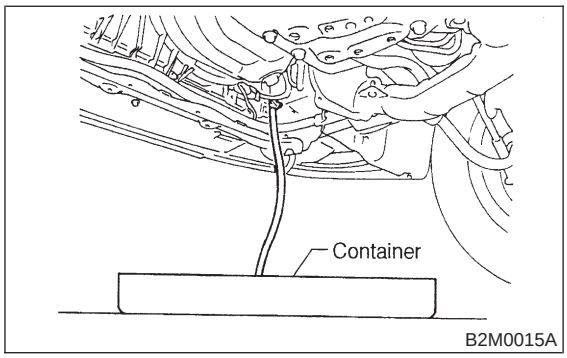
1) Disconnect battery ground cable.



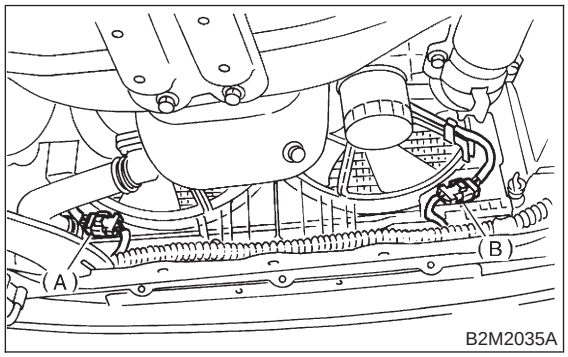
2) Lift-up the vehicle.
3) Remove under cover.



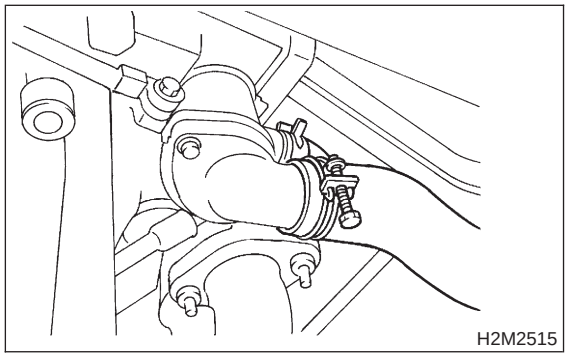
4) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>



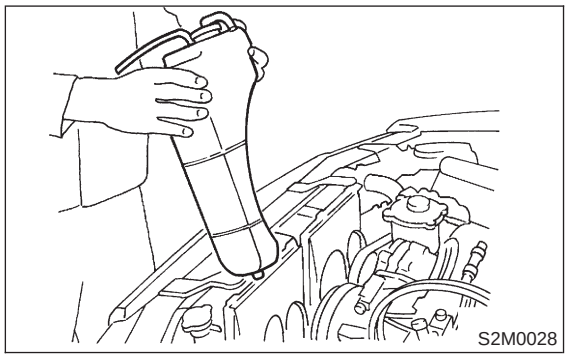
5) Disconnect connectors of radiator main fan (A) and sub fan (B) motors.



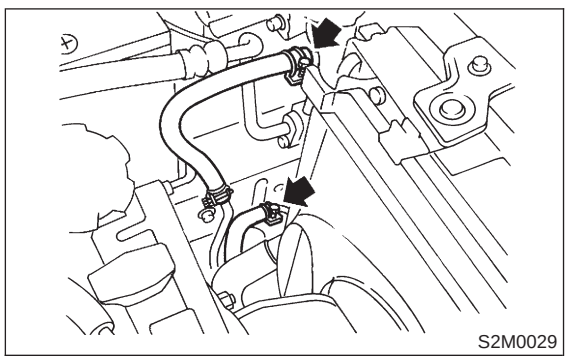
6) Disconnect radiator outlet hose from thermostat cover.



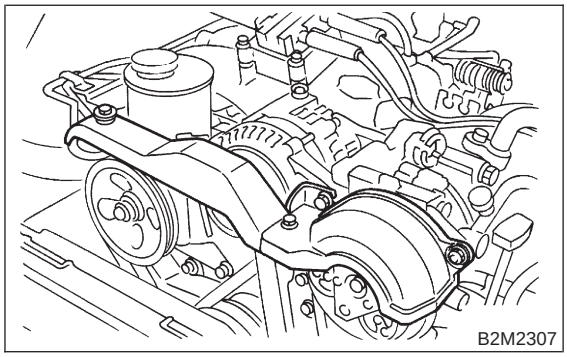
7) Lower the vehicle.
8) Remove reservoir tank.



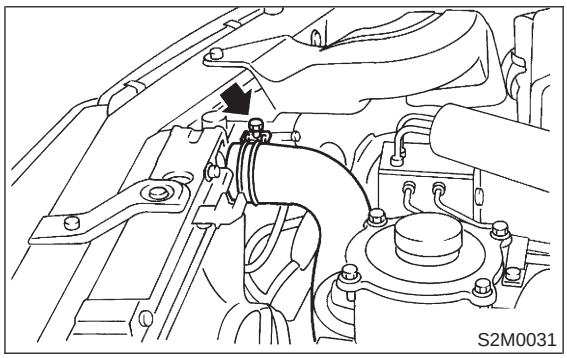
9) Disconnect ATF cooler hoses from radiator. (AT vehicles only)



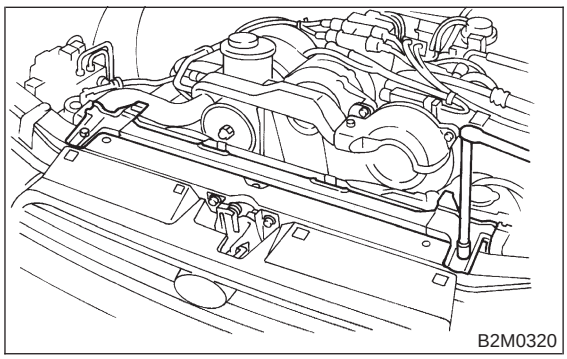
10) Remove V-belt covers.



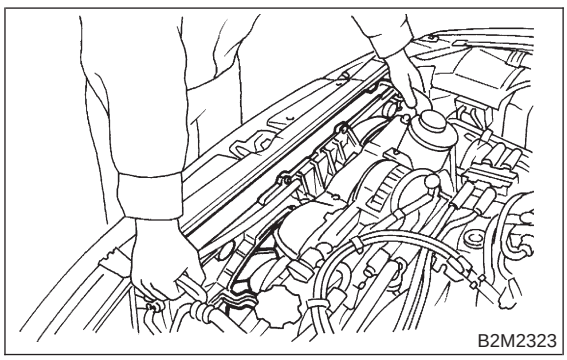
11) Disconnect radiator inlet hose from radiator.



12) Remove radiator upper brackets.

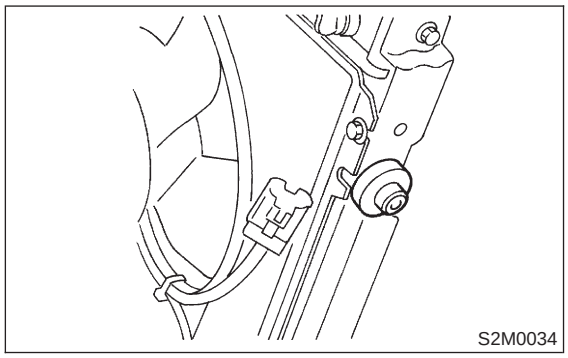


13) While slightly lifting radiator, slide it to left.
14) Lift radiator up and away from vehicle.



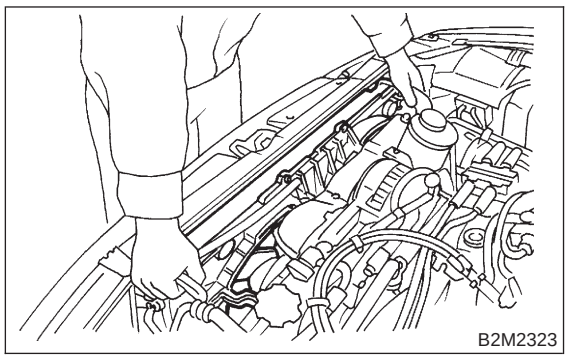
B: INSTALLATION

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


S2M0034

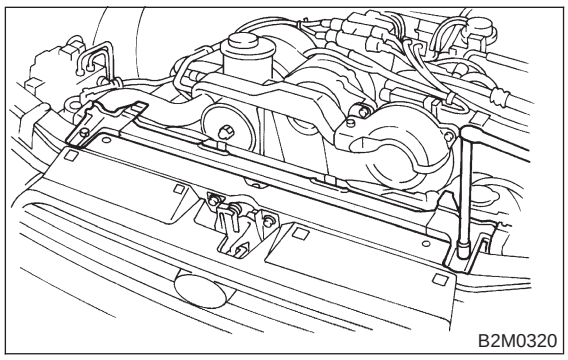
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit cushion on lower side of radiator into holes on body side.

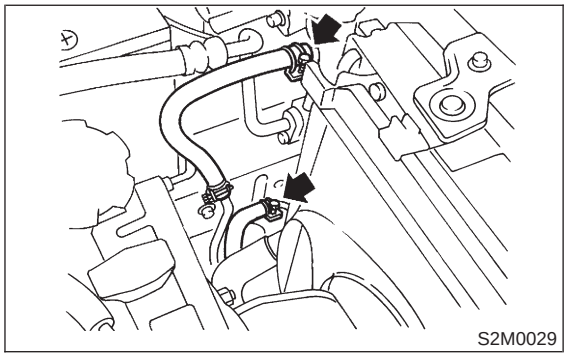

B2M2323

3) Install radiator brackets and tighten bolts.

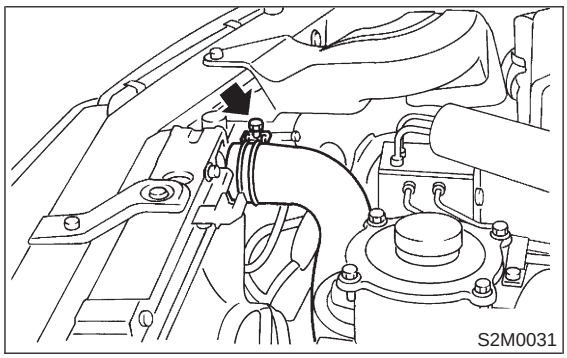
Tightening torque:
18±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)


B2M0320

4) Connect ATF cooler hoses. (AT vehicles only)

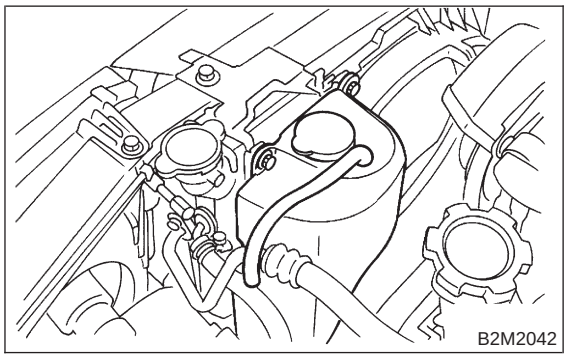

S2M0029

5) Connect radiator inlet hose.

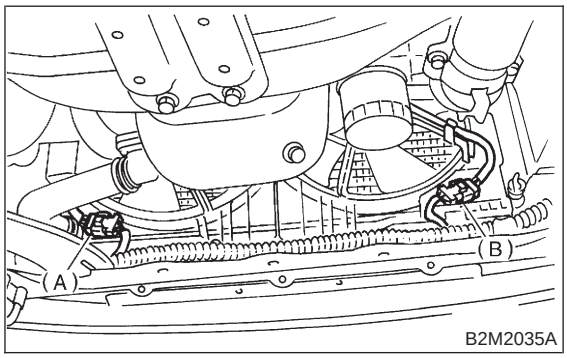

S2M0031

6) Install reservoir tank.

Tightening torque:
7.4±2.0 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)

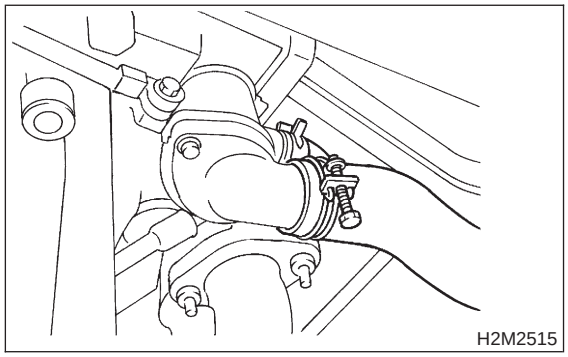

B2M2042

7) Lift-up the vehicle.
8) Connect connectors to radiator main fan (A) and sub fan (B) motors.

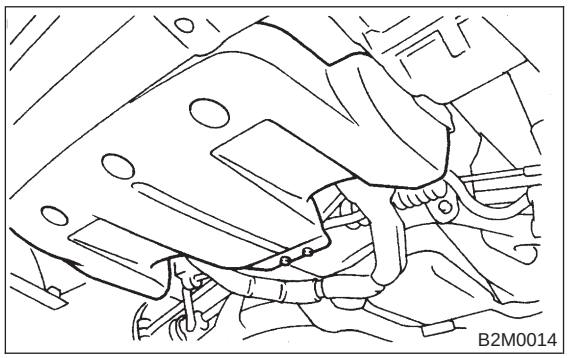


B2M2035A

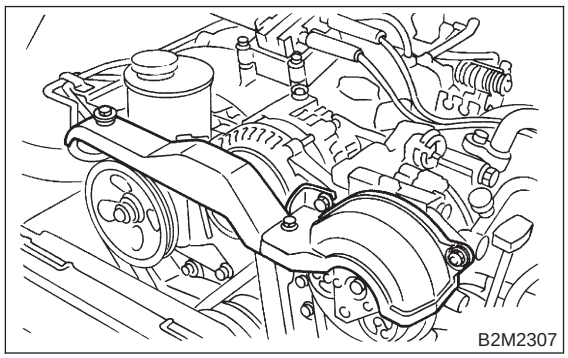
9) Connect radiator outlet hose.


H2M2515

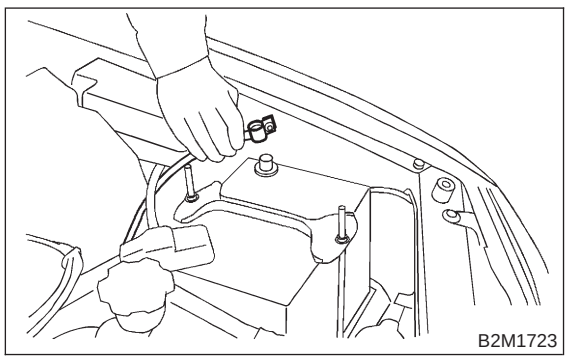
10) Install under cover.


B2M0014

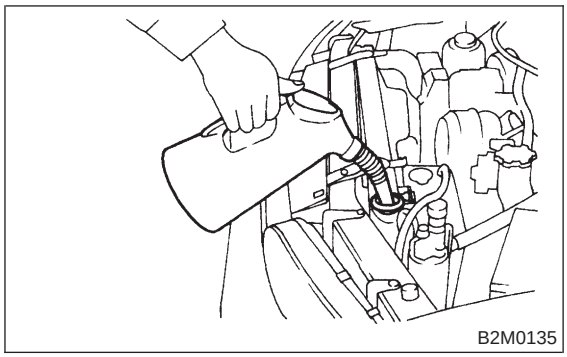
11) Lower the vehicle.
12) Install V-belt covers.


B2M2307

13) Connect battery ground cable.


B2M1723

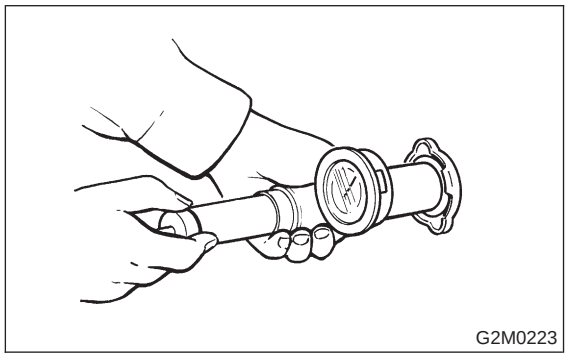
14) Fill coolant. <Ref. to 2-5 [W1B0].>


B2M0135

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)

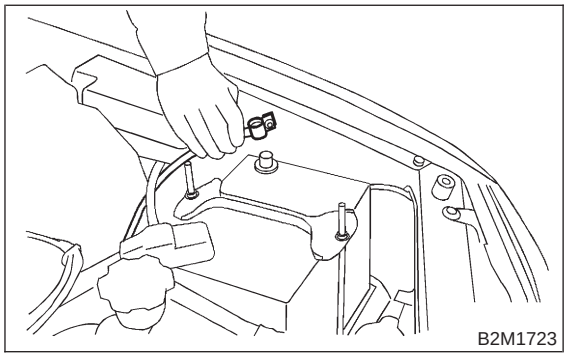
Service limit pressure:
69 kPa (0.7 kg/cm^2, 10 psi)

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

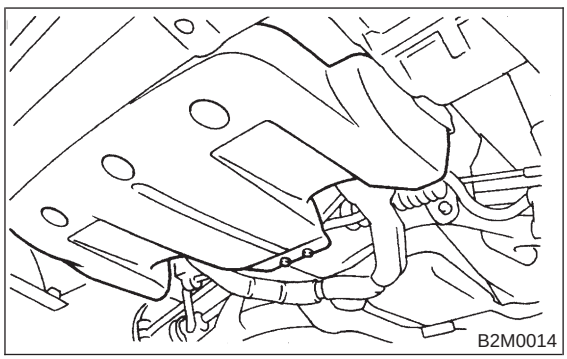
6. Radiator Main Fan and Fan Motor

A: REMOVAL AND INSTALLATION

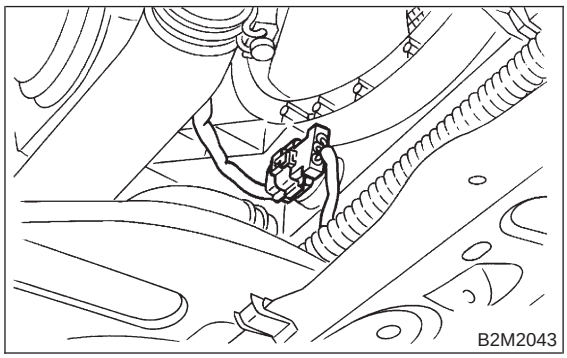
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.



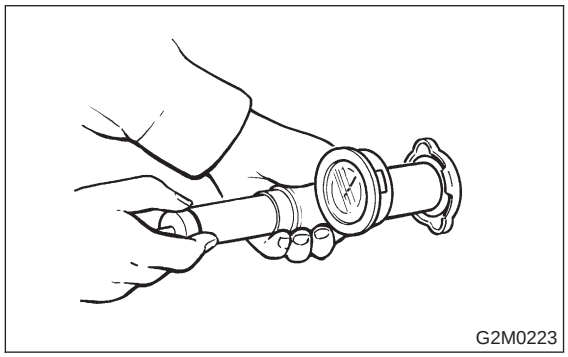
4) Disconnect connector of main fan motor.



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)

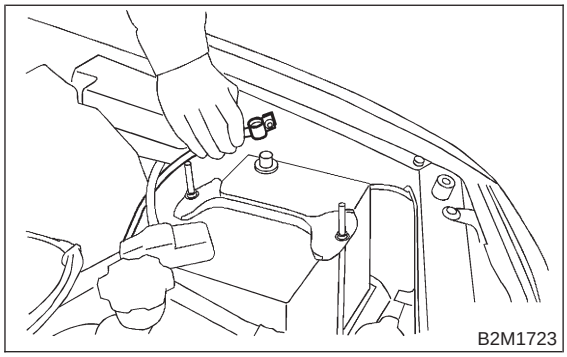
Service limit pressure:
69 kPa (0.7 kg/cm^2, 10 psi)

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

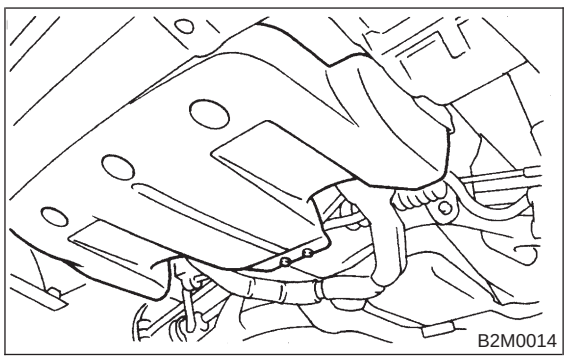
6. Radiator Main Fan and Fan Motor

A: REMOVAL AND INSTALLATION

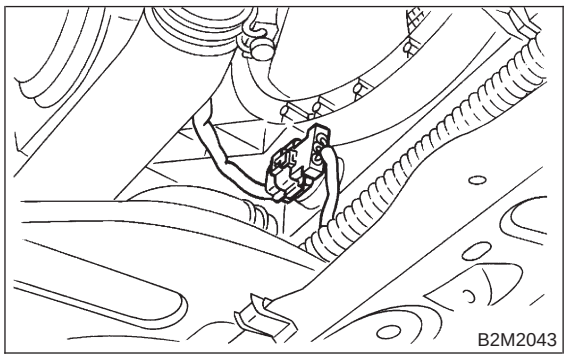
1) Disconnect battery ground cable.



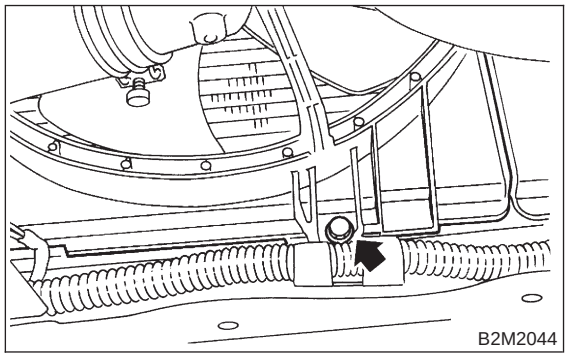
2) Lift-up the vehicle.
3) Remove under cover.



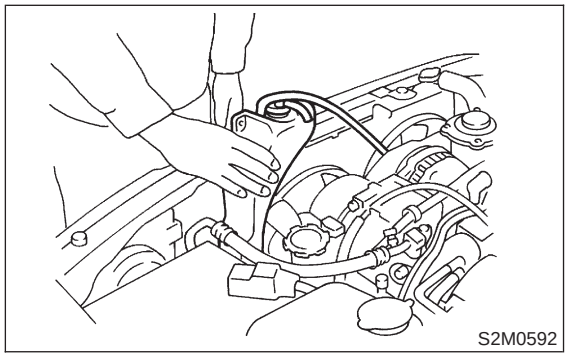
4) Disconnect connector of main fan motor.



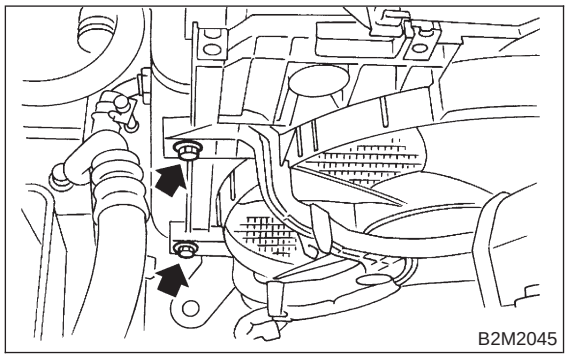
5) Remove bolt which installs the under side of radiator main fan shroud onto radiator.


B2M2044

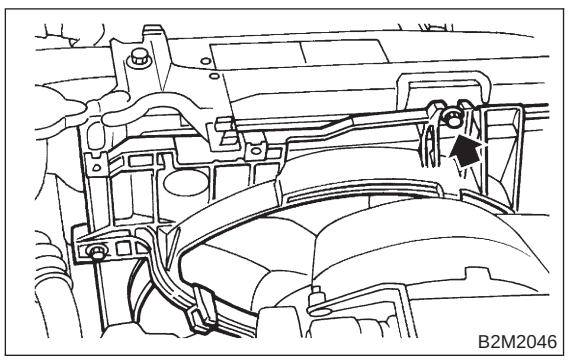
6) Lower the vehicle.
7) Remove reservoir tank. <Ref. to 2-5 [W9A0].>


S2M0592

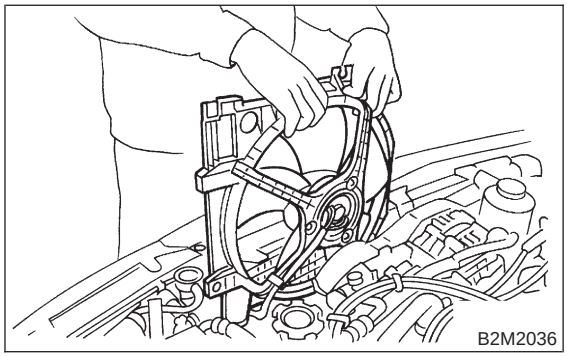
8) Remove bolts which install the left side of radiator main fan shroud onto radiator.


B2M2045

9) Remove bolt holding shroud to radiator upper side.

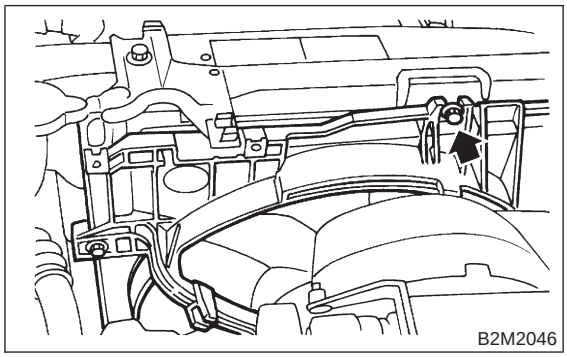

B2M2046

10) Remove radiator main fan motor assembly.


B2M2036

11) Installation is in the reverse order of removal.

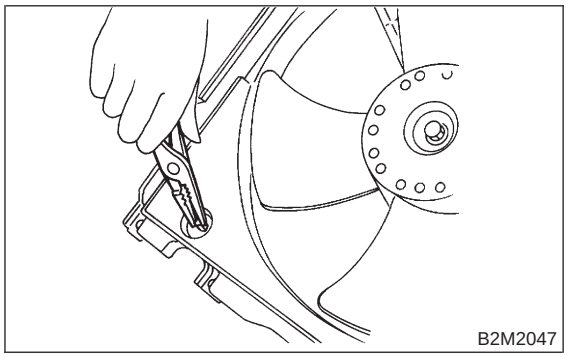
Tightening torque:
7.4±2.0 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)


B2M2046

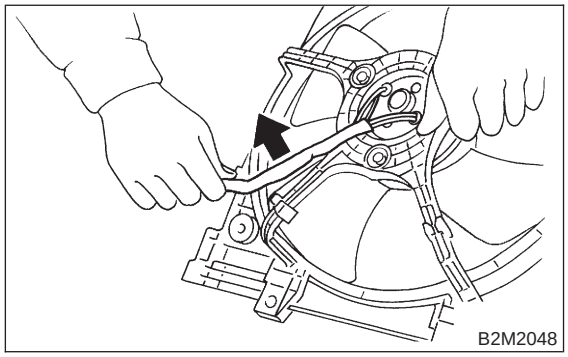
B: DISASSEMBLY AND ASSEMBLY

1. 2200 cc MODEL

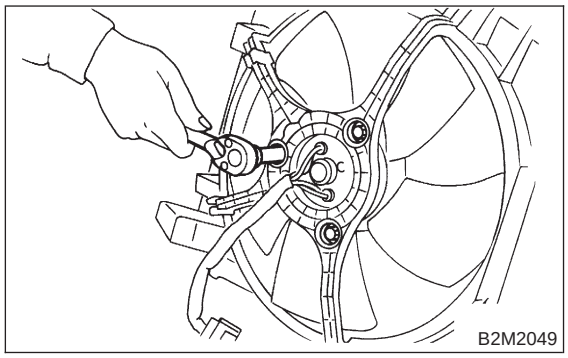
1) Remove clip which holds motor harness onto shroud.


B2M2047

2) Release harness from shroud.

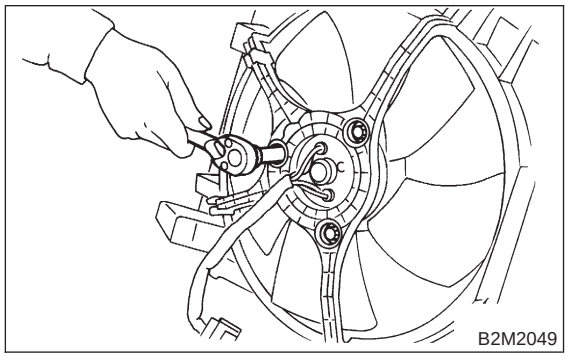


3) Remove bolts which install fan motor onto shroud.



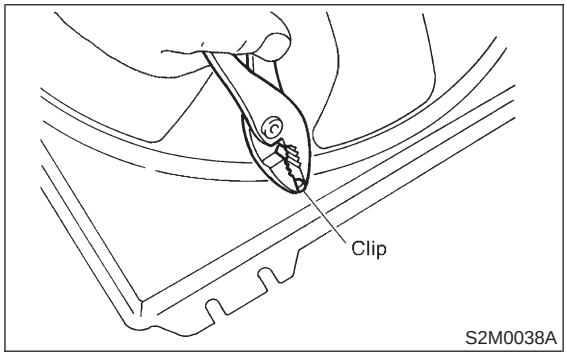
4) Assembly is in the reverse order of disassembly.

Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)

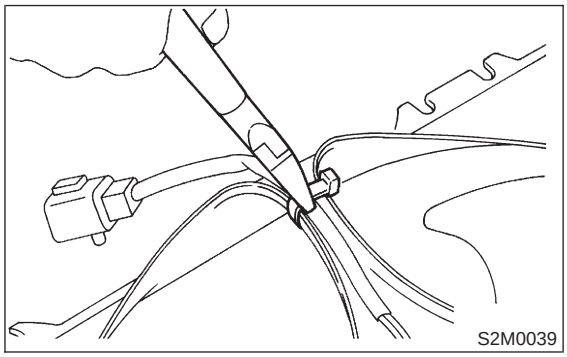


2. 2500 cc MODEL

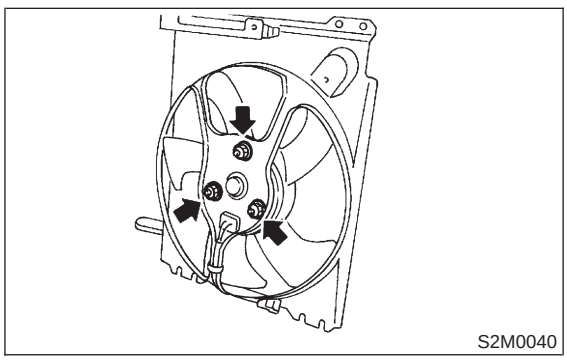
1) Remove clip which holds motor harness onto shroud.



2) Cut band which holds motor harness on shroud.

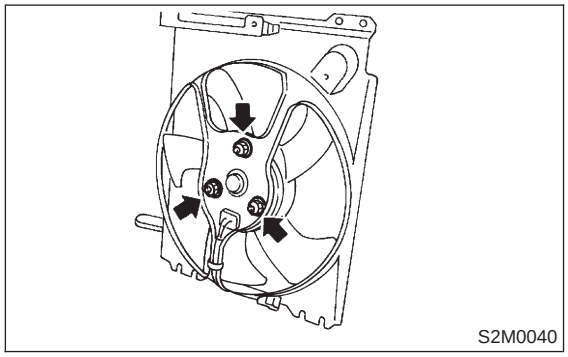


3) Remove bolts which install fan motor onto shroud.



4) Installation is in the reverse order of removal.

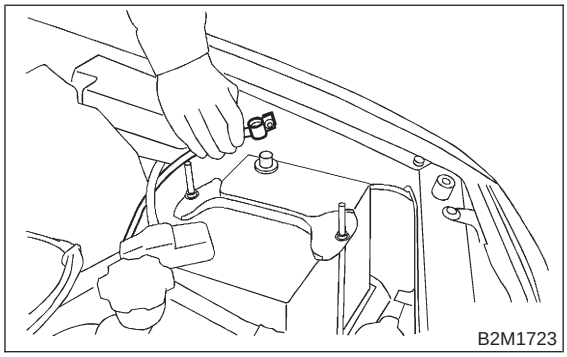
Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)


S2M0040

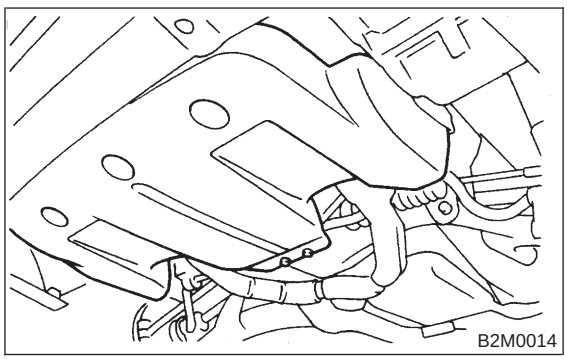
7. Radiator Sub Fan and Fan Motor

A: REMOVAL AND INSTALLATION

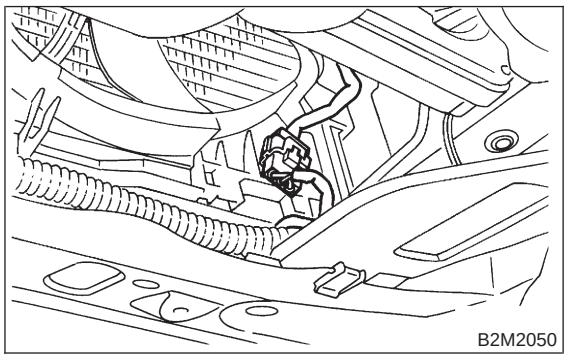
1) Disconnect battery ground cable.


B2M1723

2) Lift-up the vehicle.
3) Remove under cover.

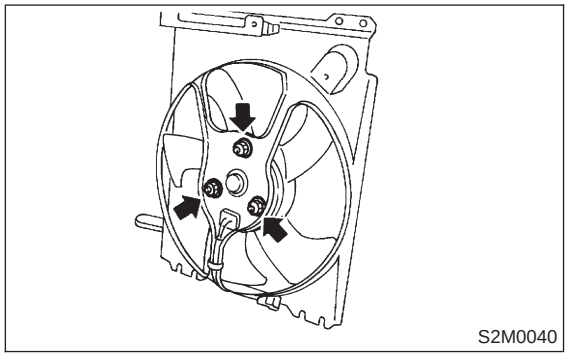

B2M0014

4) Disconnect connector of sub fan motor.


B2M2050

4) Installation is in the reverse order of removal.

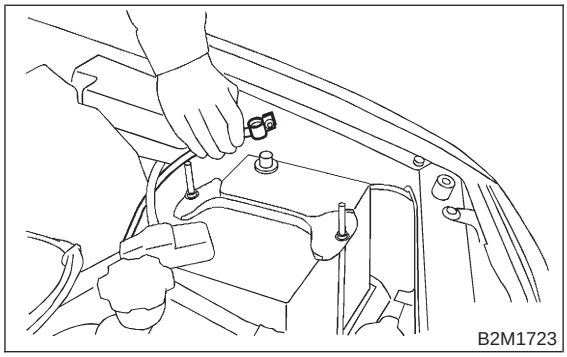
Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)


S2M0040

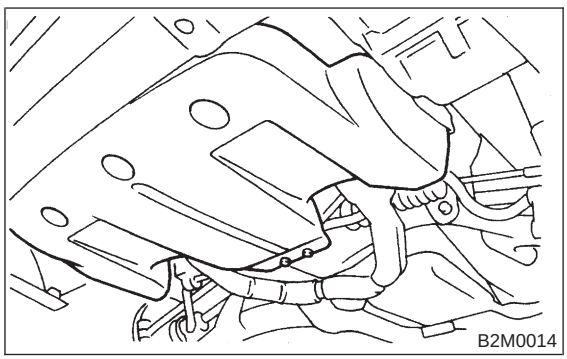
7. Radiator Sub Fan and Fan Motor

A: REMOVAL AND INSTALLATION

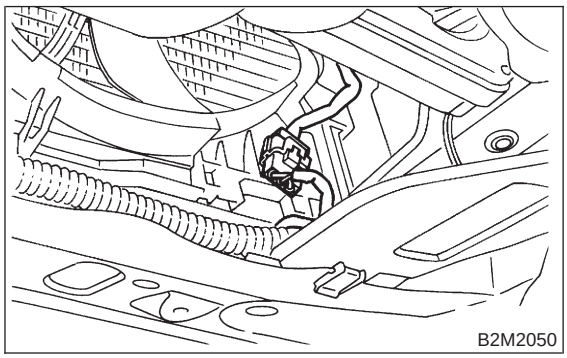
1) Disconnect battery ground cable.


B2M1723

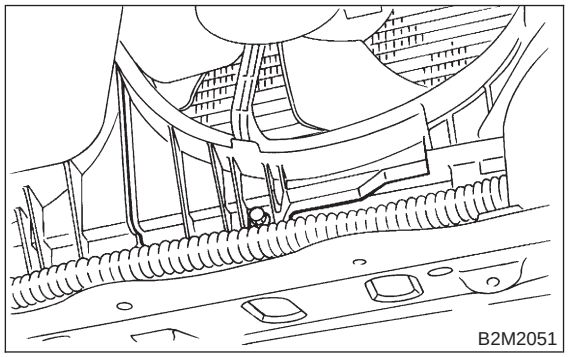
2) Lift-up the vehicle.
3) Remove under cover.


B2M0014

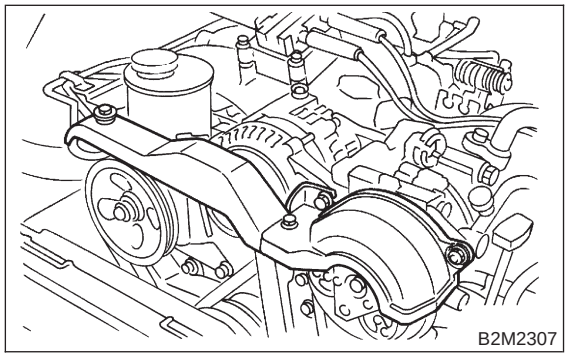
4) Disconnect connector of sub fan motor.


B2M2050

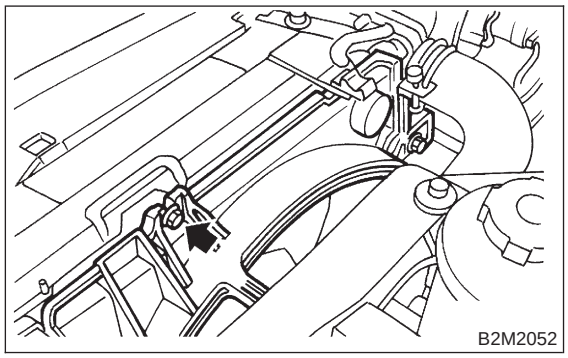
5) Remove bolt which installs the under side of radiator sub fan shroud onto radiator.



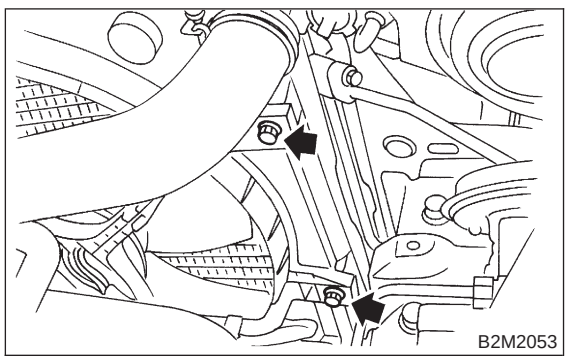
6) Lower the vehicle.
7) Remove V-belt covers.



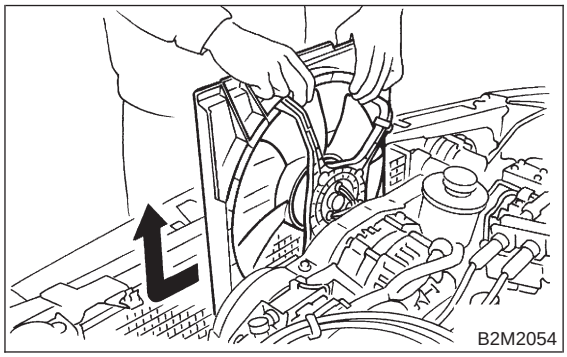
8) Remove two bolts holding shroud to radiator upper side.



9) Remove bolts which install the right side of radiator sub fan shroud onto radiator.

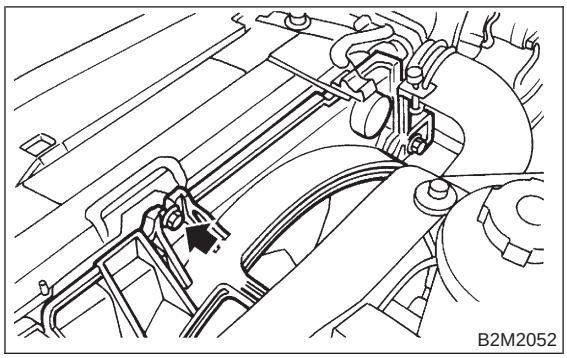


10) Move radiator sub fan motor assembly to left side, and remove it.



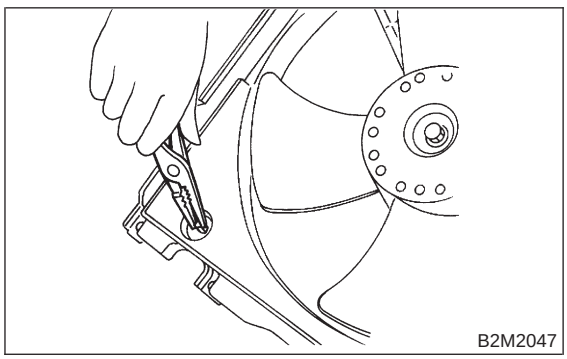
11) Installation is in the reverse order of removal.

Tightening torque:
7.4±2.0 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)

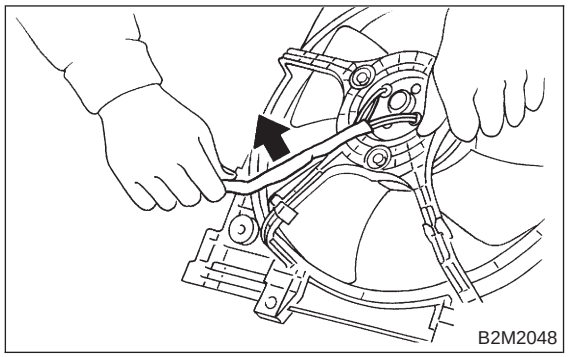


B: DISASSEMBLY AND ASSEMBLY

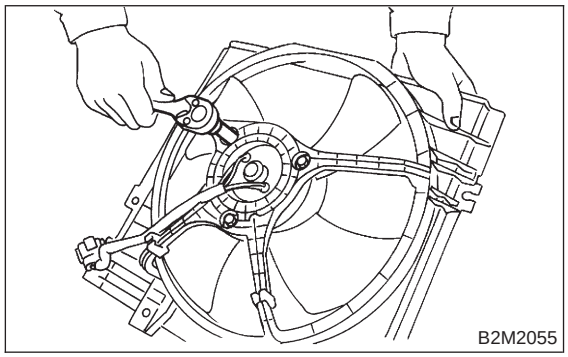
1) Remove clip which holds motor harness onto shroud.



2) Release motor harness from shroud.

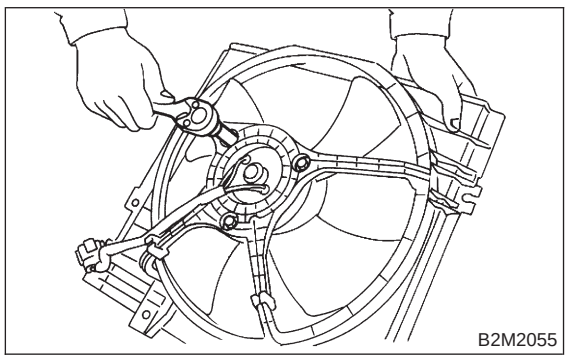


3) Remove bolts which install fan motor onto shroud.



4) Assembly is in the reverse order of disassembly.

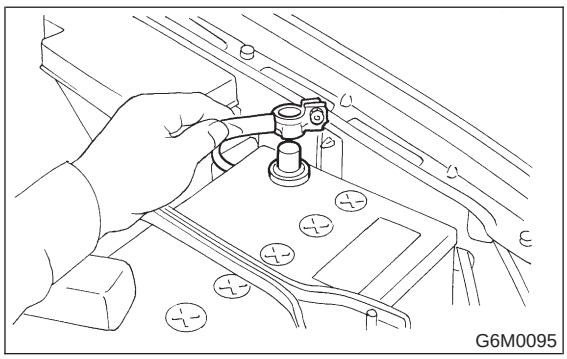
Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)



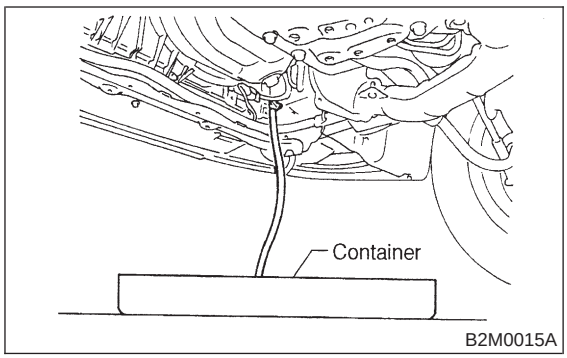
8. Water Pipe

A: REMOVAL

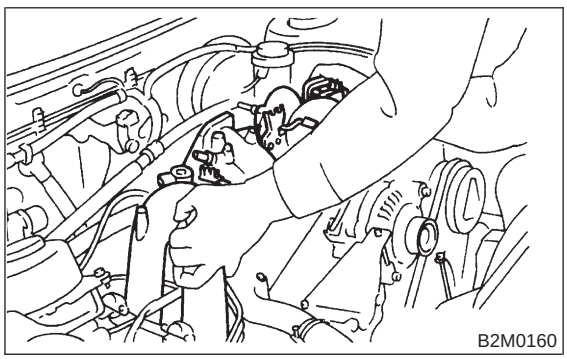
1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Disconnect ground cable from the battery.



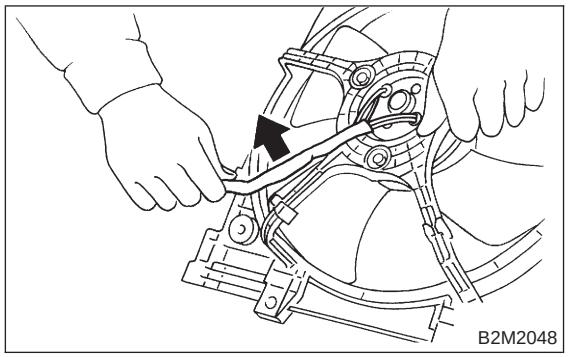
3) Drain engine coolant completely.
<Ref. to 2-5 [W1A0].>



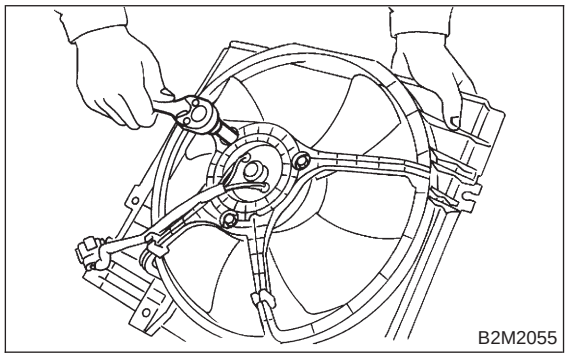
4) Remove intake manifold.
<Ref. to 2-7 [W4A0].>



2) Release motor harness from shroud.

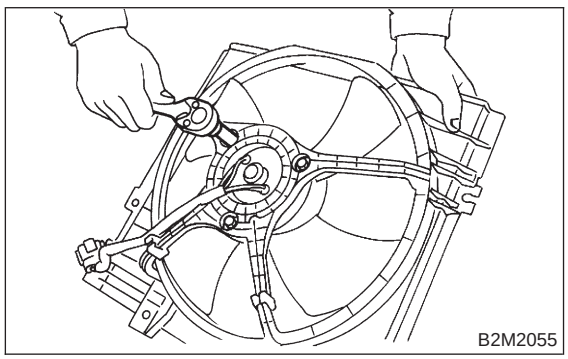


3) Remove bolts which install fan motor onto shroud.



4) Assembly is in the reverse order of disassembly.

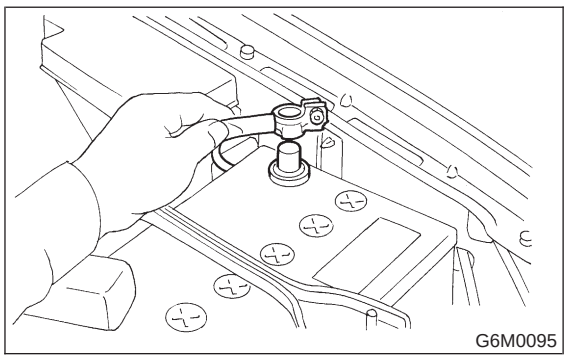
Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)



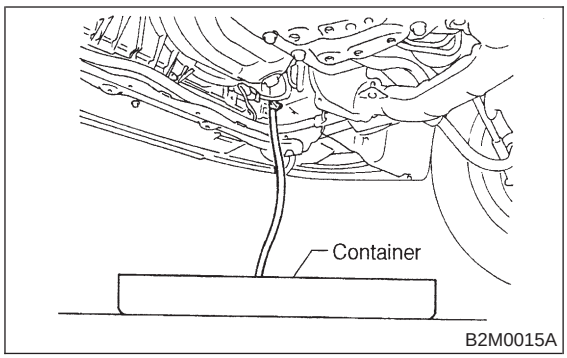
8. Water Pipe

A: REMOVAL

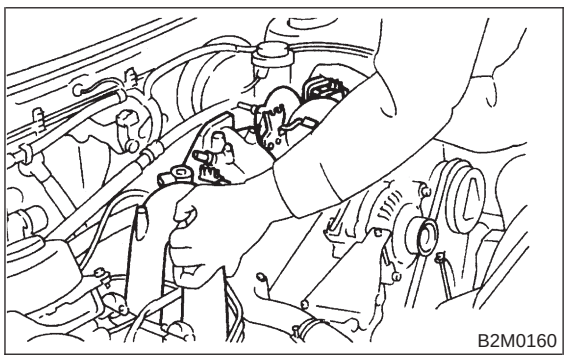
1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Disconnect ground cable from the battery.



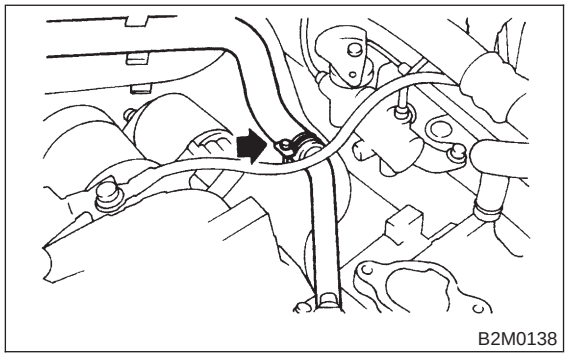
3) Drain engine coolant completely.
<Ref. to 2-5 [W1A0].>



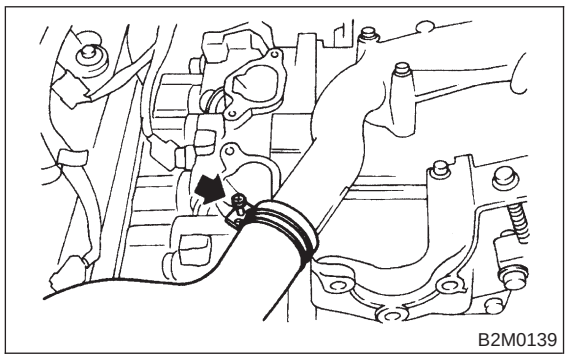
4) Remove intake manifold.
<Ref. to 2-7 [W4A0].>



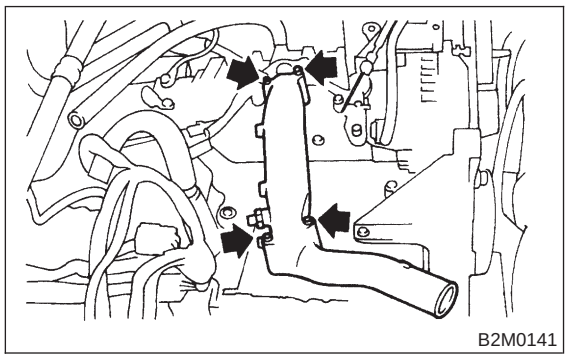
5) Disconnect heater inlet hose.


B2M0138

6) Disconnect radiator inlet hose from water pipe.


B2M0139

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

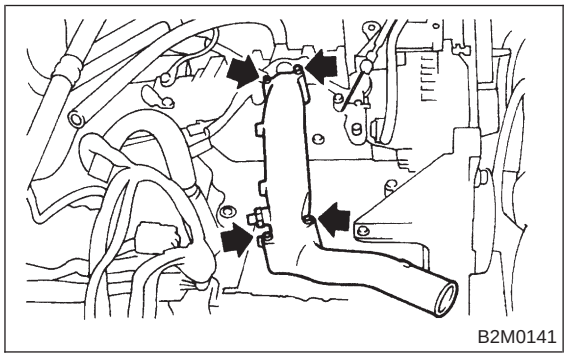

B2M0141

B: INSTALLATION

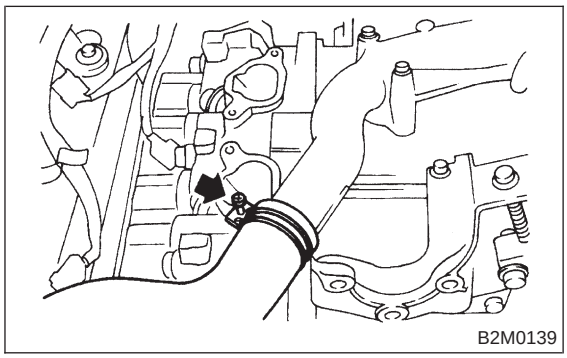
1) Install water pipe on cylinder block.

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

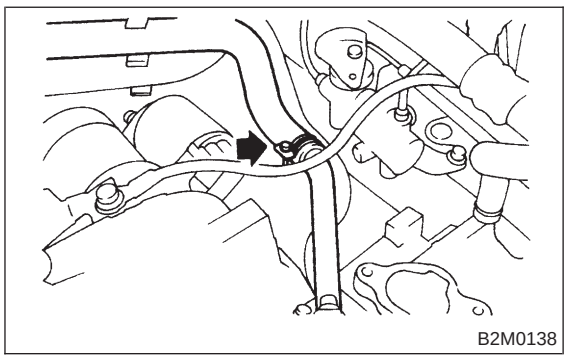
CAUTION:
Use a new O-ring.


B2M0141

2) Connect radiator inlet hose.


B2M0139

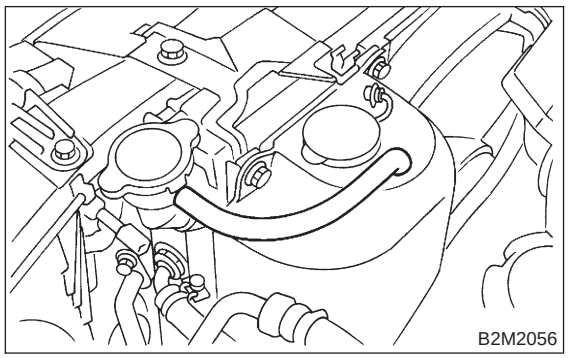
3) Connect heater inlet hose.


B2M0138

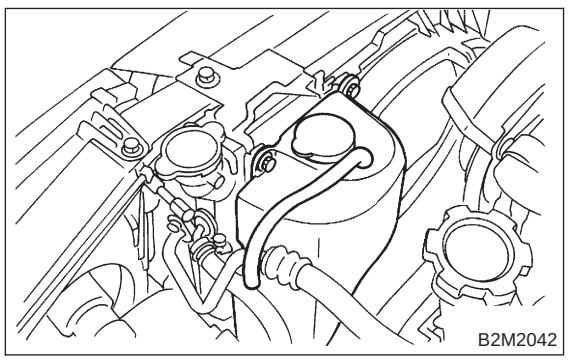
9. Reservoir Tank

A: REMOVAL AND INSTALLATION

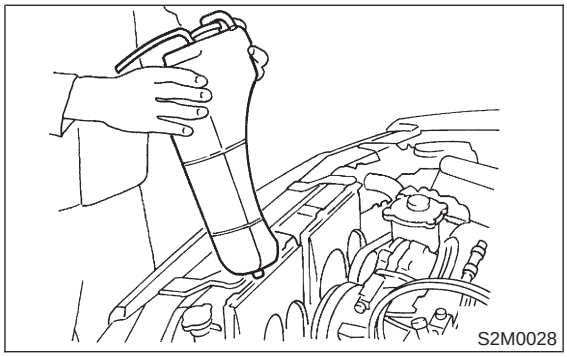
1) Disconnect over flow hose from radiator filler neck position.



2) Remove bolts which install reservoir tank onto radiator main fan shroud.

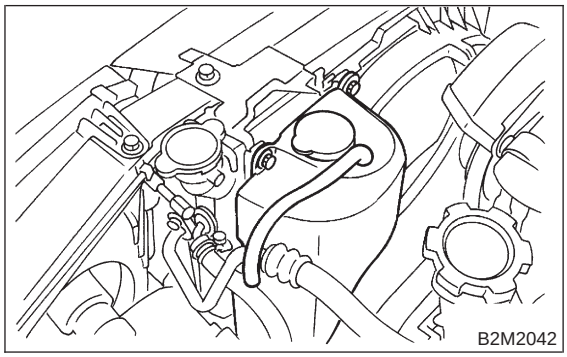


3) Remove reservoir tank.



4) Installation is in the reverse order of removal.

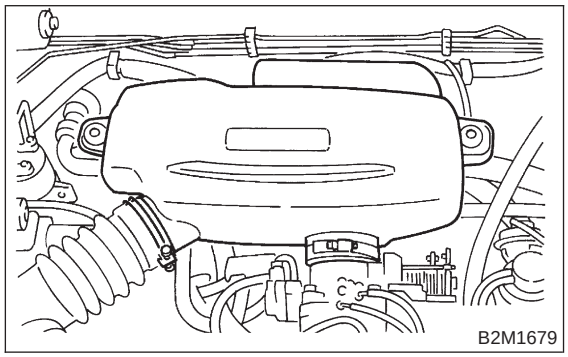
Tightening torque:
7.4±2.0 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)



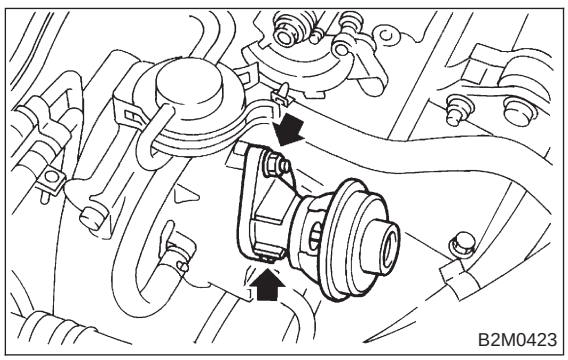
5. EGR Valve (2500 cc Model)

A: REMOVAL AND INSTALLATION

1) Remove air intake chamber.



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



4) Installation is in the reverse order of removal.

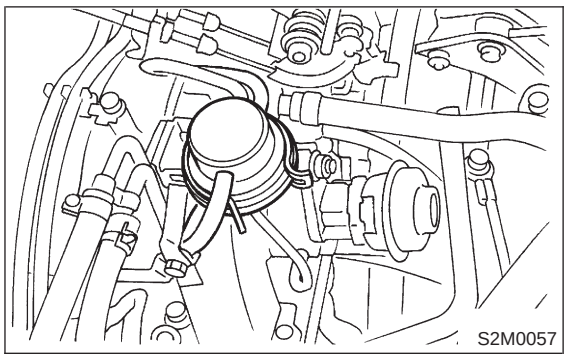
CAUTION:
Replace gasket with a new one.

Tightening torque:
18.6±1.5 N·m (1.9±0.15 kg-m, 13.7±1.1 ft-lb)

6. Back-Pressure Transducer (BPT) (2500 cc Model)

A: REMOVAL AND INSTALLATION

1) Disconnect vacuum hoses from BPT.
2) Remove BPT from bracket.



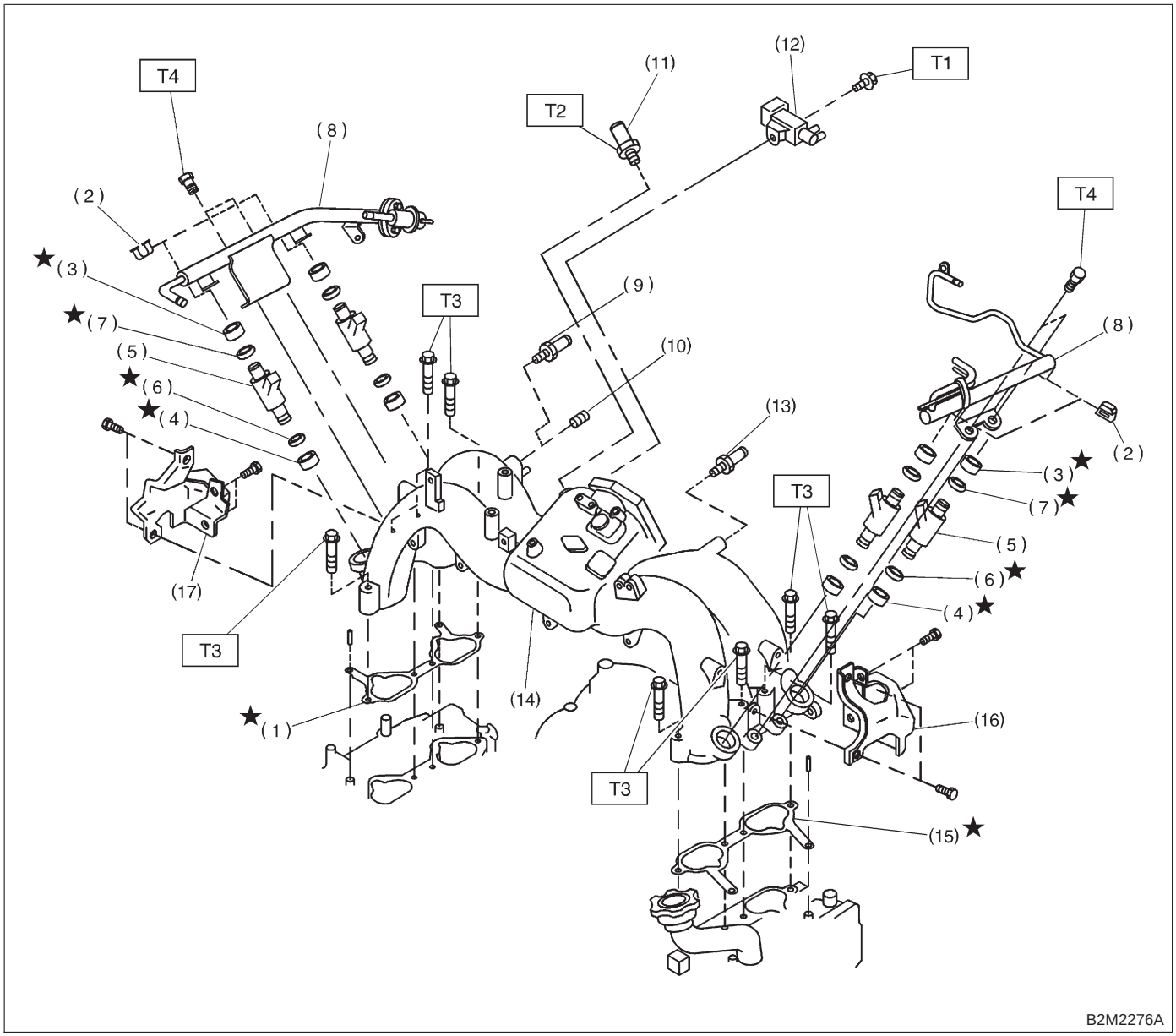
3) Installation is in the reverse order of removal.

1. Engine Cooling System Trouble in General

Trouble		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 [T9D0].> On-Board Diagnostics II System
	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 [T600].> On-Board Diagnostics II System
	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 crank-case	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.

1. Intake Manifold

A: 2200 cc CALIFORNIA SPEC. VEHICLES

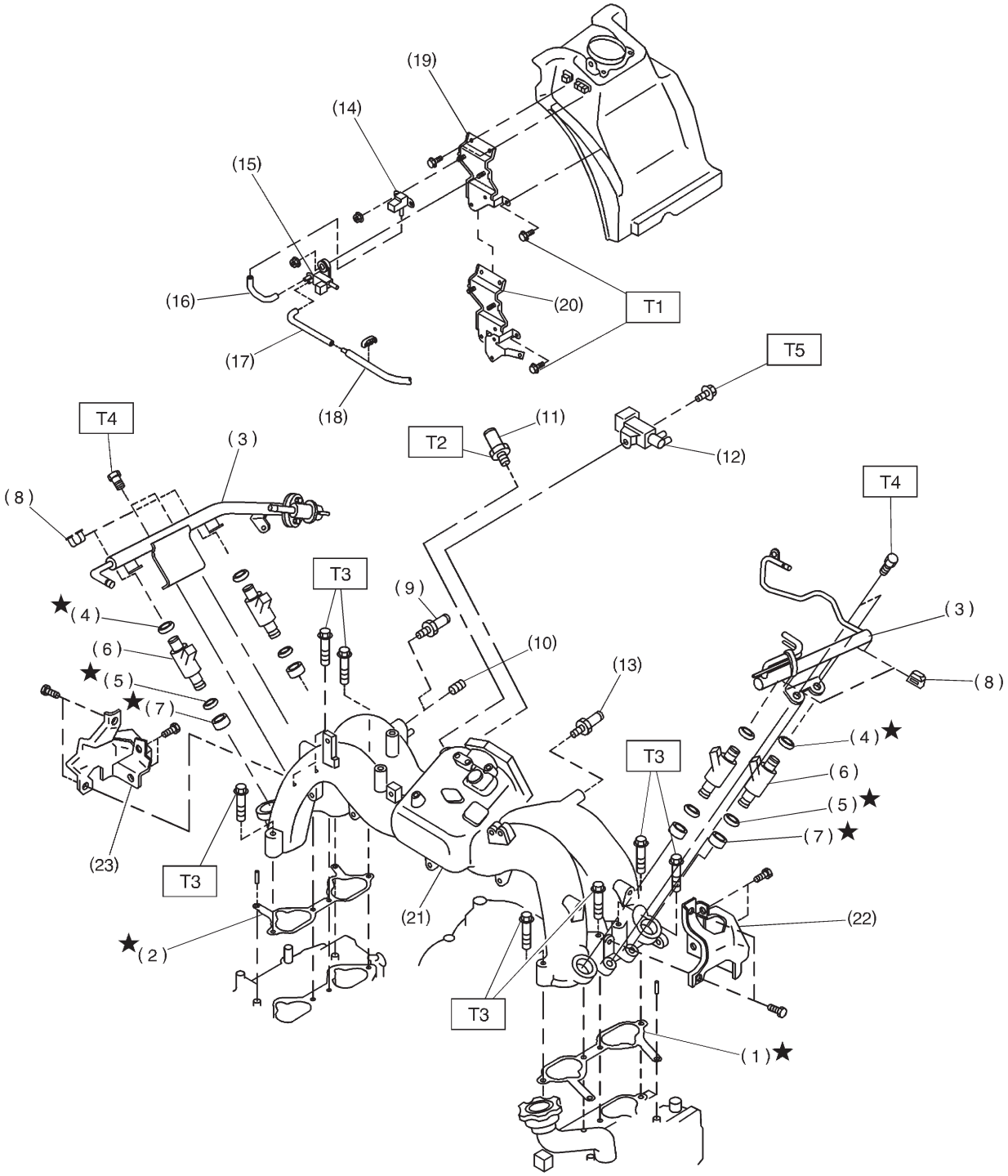


(1) Intake manifold gasket RH
(2) Fuel injector cap
(3) Insulator A
(4) Insulator B
(5) Fuel injector
(6) O-ring B
(7) O-ring A
(8) Fuel pipe
(9) Nipple (AT vehicles)
(10) Plug
(11) PCV valve
(12) Purge control solenoid valve
(13) Nipple
(14) Intake manifold
(15) Intake manifold gasket LH
(16) Fuel pipe protector LH (LHD model)
(17) Fuel pipe protector RH (RHD model)

Tightening torque: N·m (kg-m, ft-lb)
T1: 16±1.5 (1.6±0.15, 11.6±1.1)
T2: 23±3 (2.3±0.3, 16.6±2.2)
T3: 25±2 (2.5±0.2, 18.1±1.4)
T4: 3.4±0.5 (0.35±0.05, 2.5±0.4)

MEMO:

B: 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

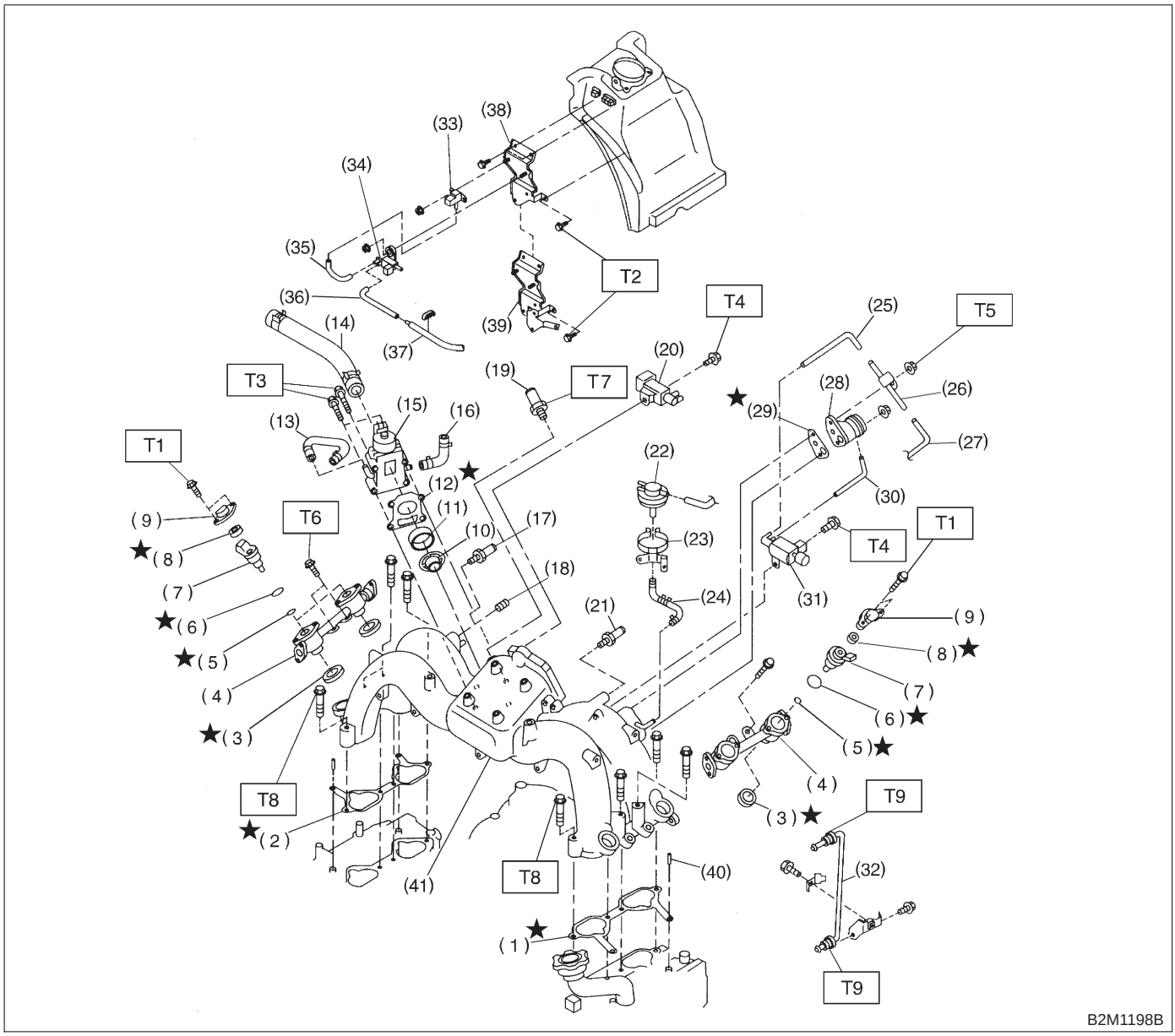


B2M2277A

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

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.9±0.5 (0.5±0.05, 3.6±0.4)
T2: 23±3 (2.3±0.3, 16.6±2.2)
T3: 25±2 (2.5±0.2, 18.1±1.4)
T4: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T5: 15.7±1.5 (1.6±0.15, 11.6±1.1)

C: 2500 cc MODEL

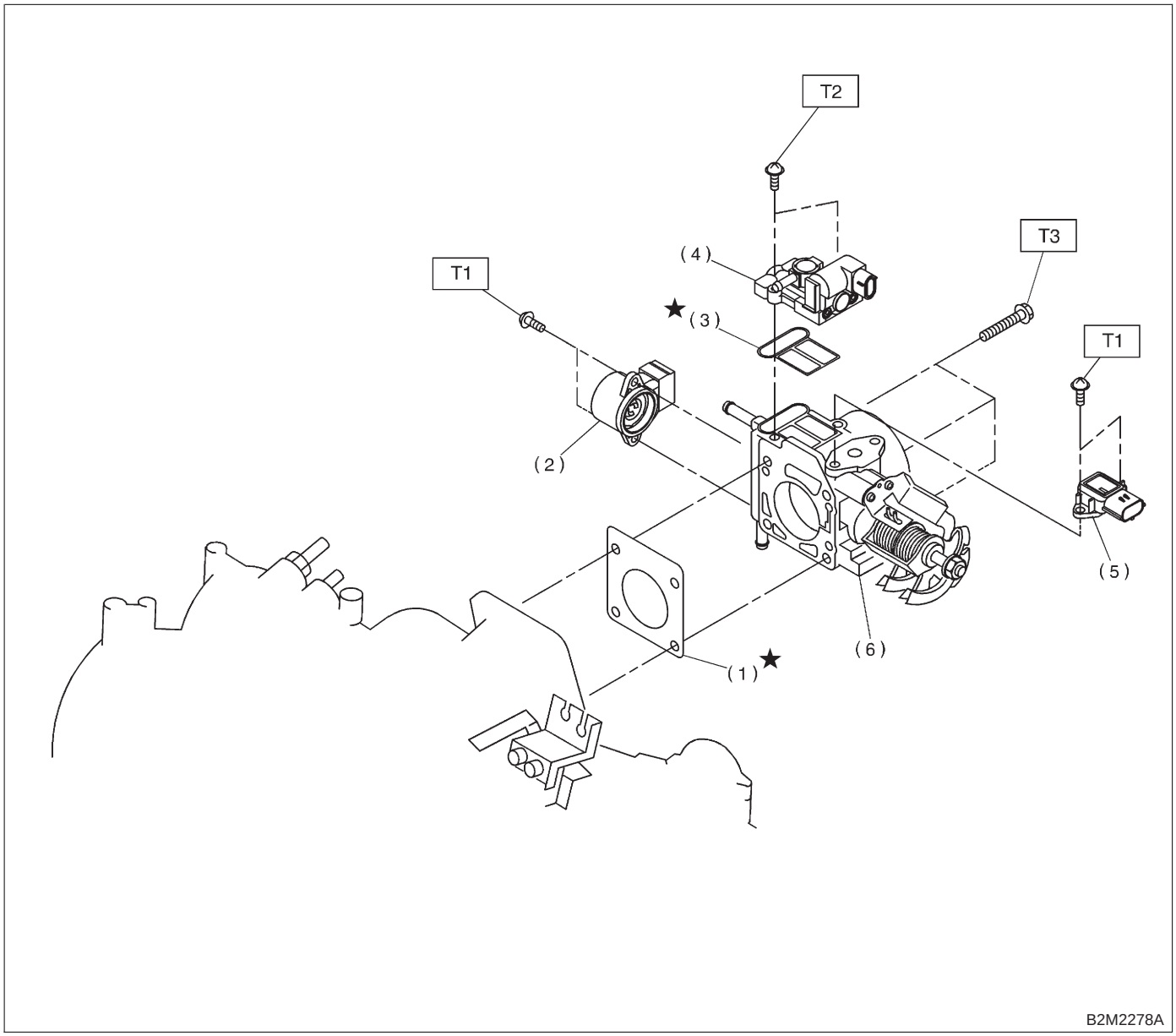


(1) Intake manifold gasket LH
(2) Intake manifold gasket RH
(3) Fuel injector pipe insulator
(4) Fuel injector pipe
(5) O-ring A
(6) O-ring B
(7) Fuel injector
(8) Insulator
(9) Fuel injector cap
(10) Plate
(11) Sealing
(12) Gasket
(13) Engine coolant hose B
(14) Air by-pass hose
(15) Idle air control 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
(23) BPT holder bracket
(24) Back pressure hose
(25) EGR vacuum hose A
(26) EGR vacuum pipe
(27) EGR vacuum hose C
(28) EGR valve
(29) Gasket
(30) EGR vacuum hose B
(31) EGR solenoid valve
(32) EGR pipe
(33) Pressure sensor
(34) Pressure sources switching solenoid valve
(35) Vacuum hose A
(36) Vacuum hose B
(37) Vacuum hose C
(38) Bracket (Except Canada spec. vehicles)
(39) Bracket (For Canada spec. vehicles)
(40) Collar
(41) 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

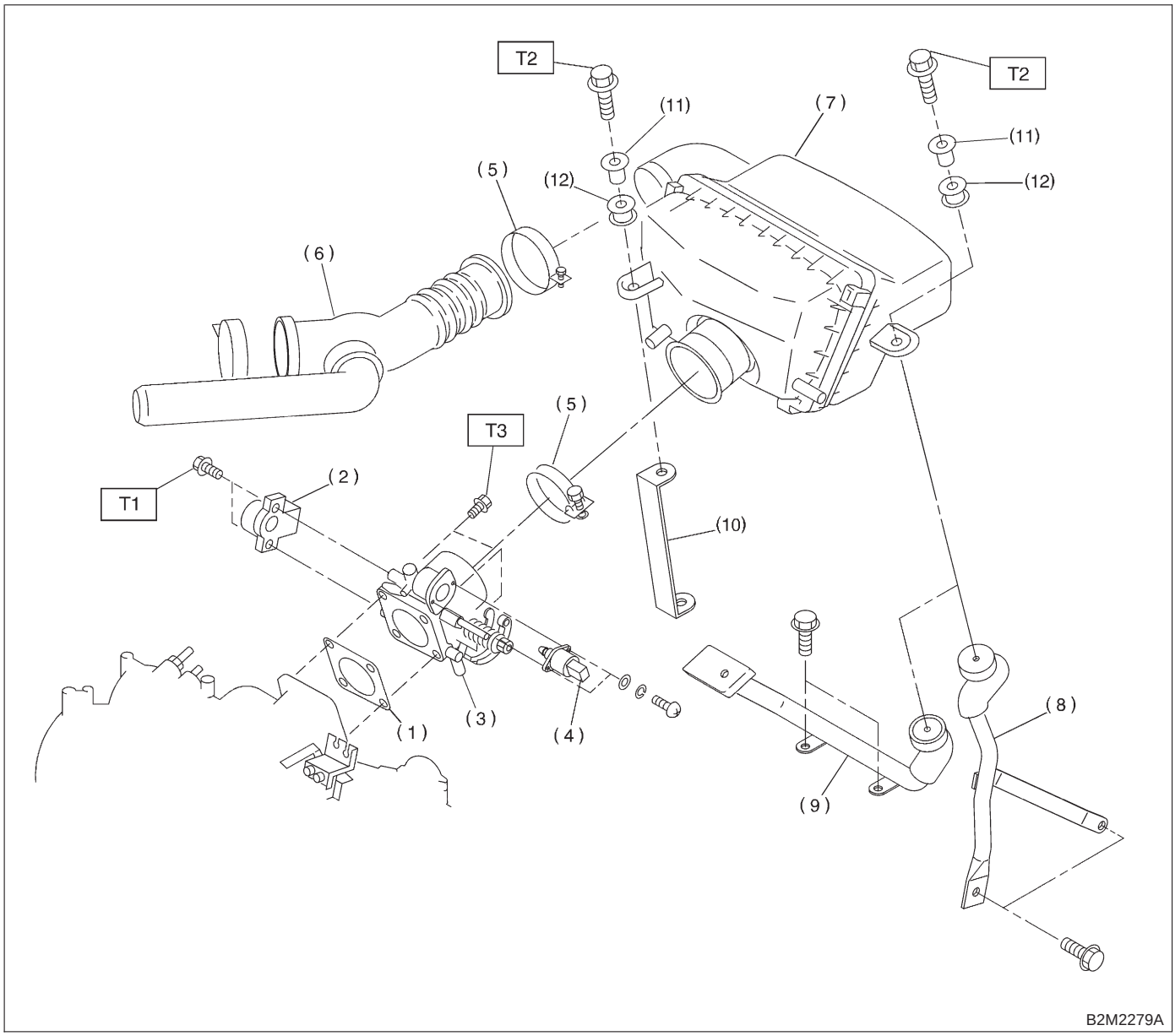
A: 2200 cc CALIFORNIA SPEC. VEHICLES



(1) Gasket
(2) Throttle position sensor
(3) Gasket
(4) Idle air control solenoid valve
(5) Intake manifold pressure sensor
(6) Throttle body

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

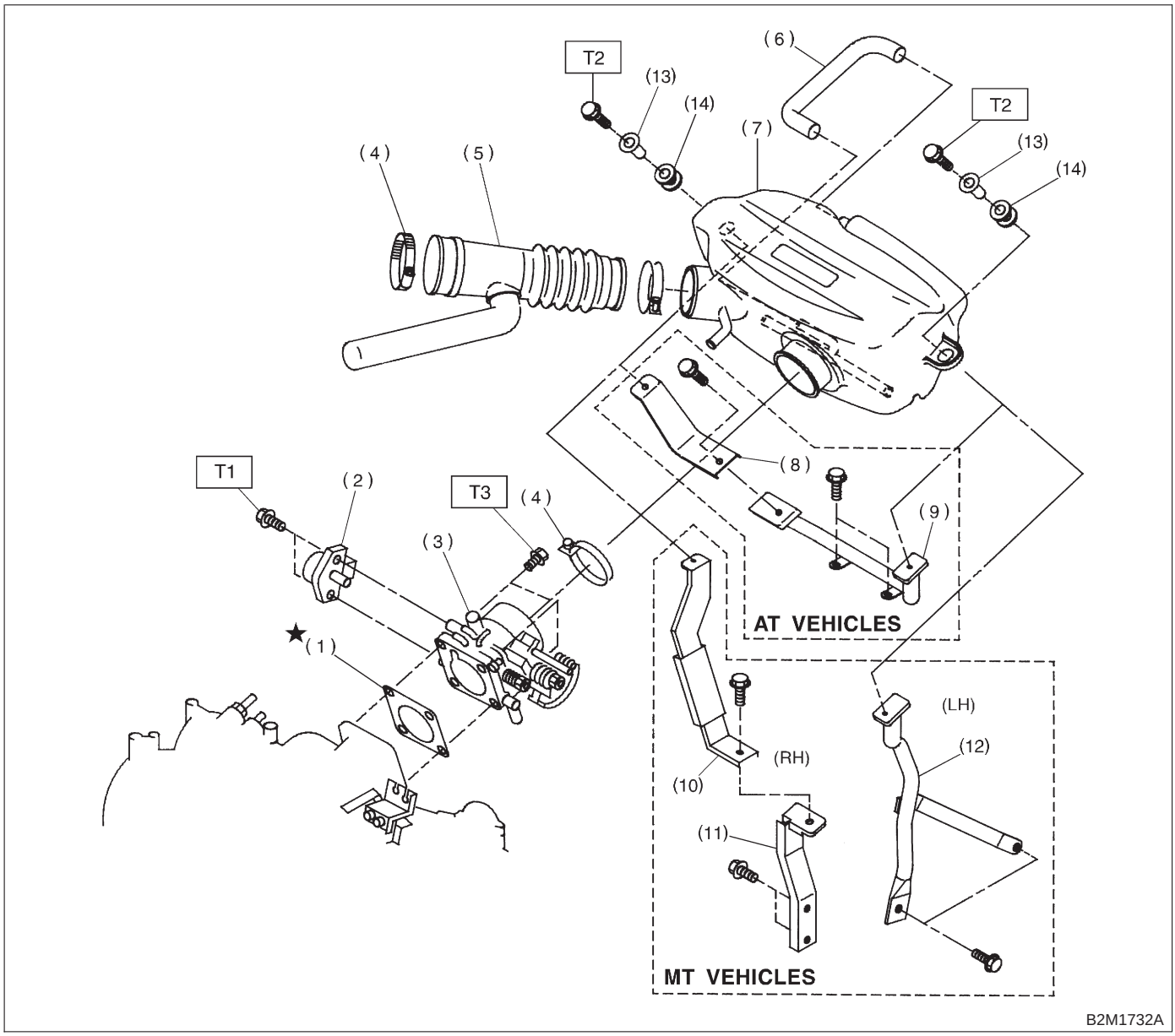
B: 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES



(1) Gasket
(2) Throttle position sensor
(3) Throttle body
(4) Idle air control solenoid valve
(5) Clamp
(6) Air intake duct
(7) Air intake chamber
(8) Stay LH (MT vehicles)
(9) Stay LH (AT vehicles)
(10) Stay RH
(11) Spacer
(12) 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)

C: 2500 cc MODEL

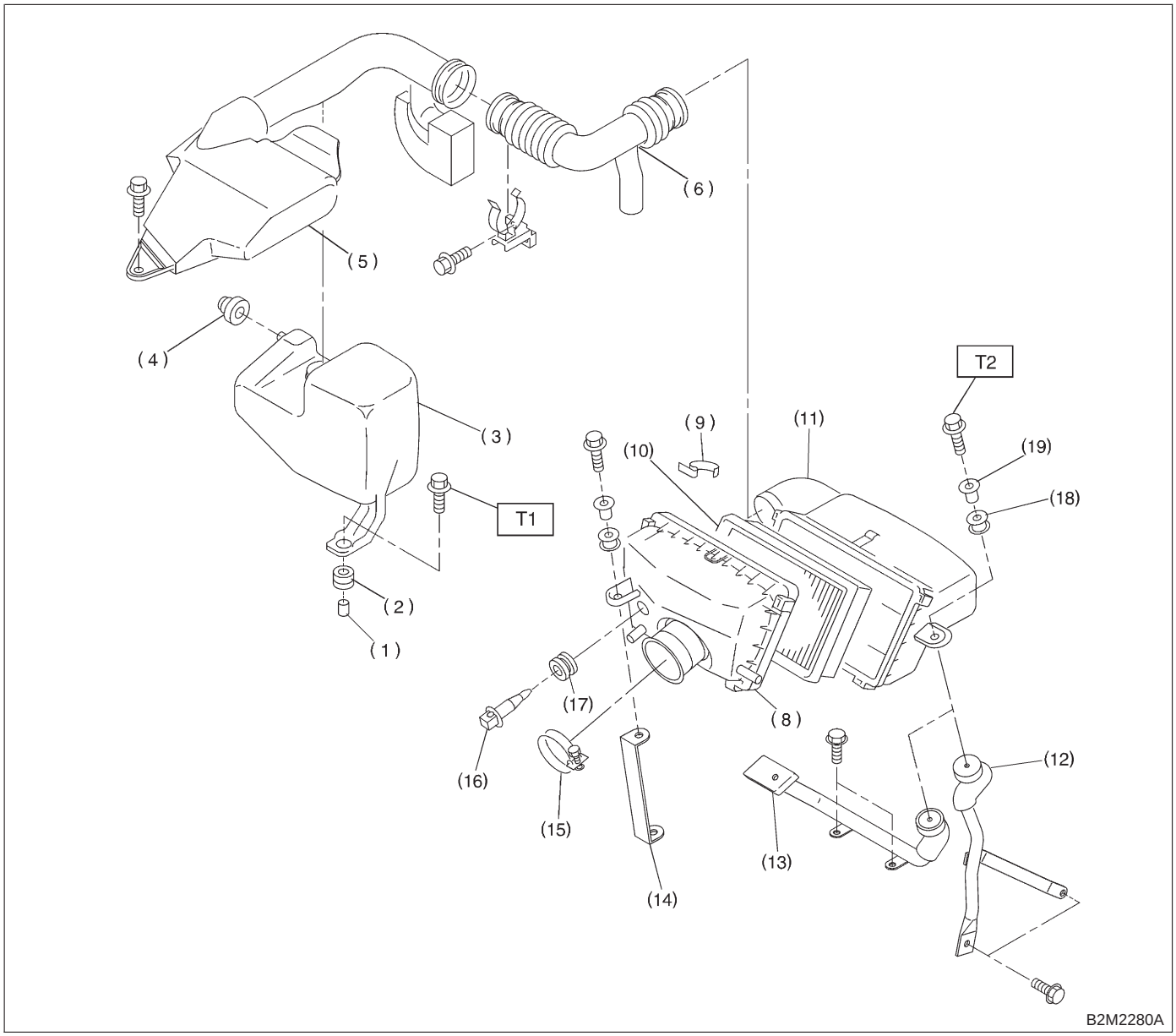


(1) Gasket
(2) Throttle position sensor
(3) Throttle body
(4) Clamp
(5) Air intake duct
(6) By-pass hose
(7) Air intake chamber
(8) Stay A (AT vehicles)
(9) Stay B (AT vehicles)
(10) Stay C (MT vehicles)
(11) Stay D (MT vehicles)
(12) Spacer
(13) Bush

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

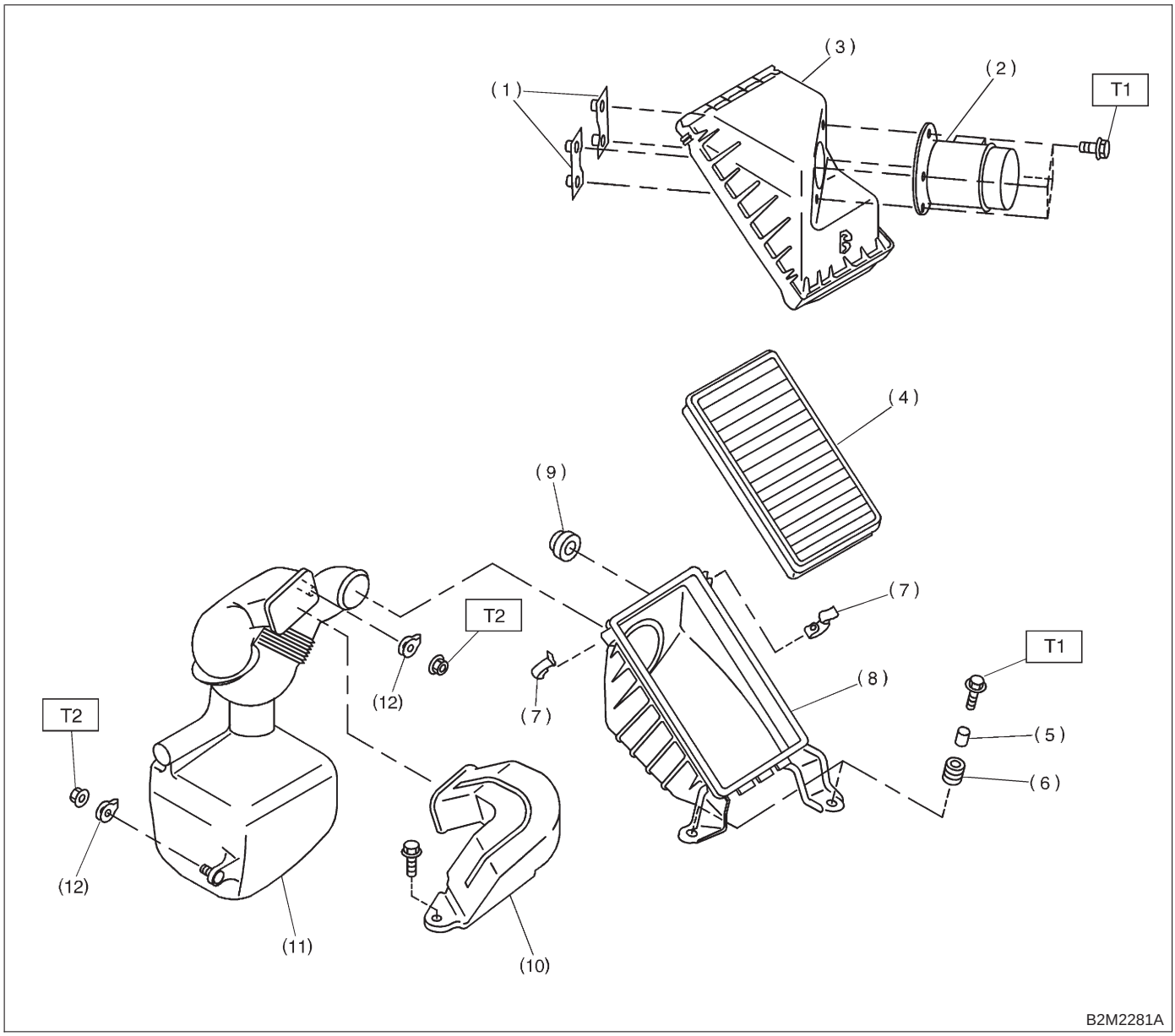
A: 2200 cc CALIFORNIA SPEC. VEHICLES



(1) Spacer
(2) Bush
(3) Air chamber
(4) Cushion rubber
(5) Air intake duct A
(6) Air intake duct B
(7) Holder
(8) Air cleaner case A
(9) Clip
(10) Air cleaner element
(11) Air cleaner case B
(12) Air cleaner case stay LH (MT vehicles)
(13) Air cleaner case stay LH (AT vehicles)
(14) Air cleaner case stay RH
(15) Clamp
(16) Intake air temperature sensor
(17) Rubber holder
(18) Bush
(19) Spacer

Tightening torque: N·m (kg-m, ft-lb)
T1: 7.4±2.0 (0.75±0.2, 5.4±1.4)
T2: 4.9±0.5 (0.5±0.05, 3.6±0.4)

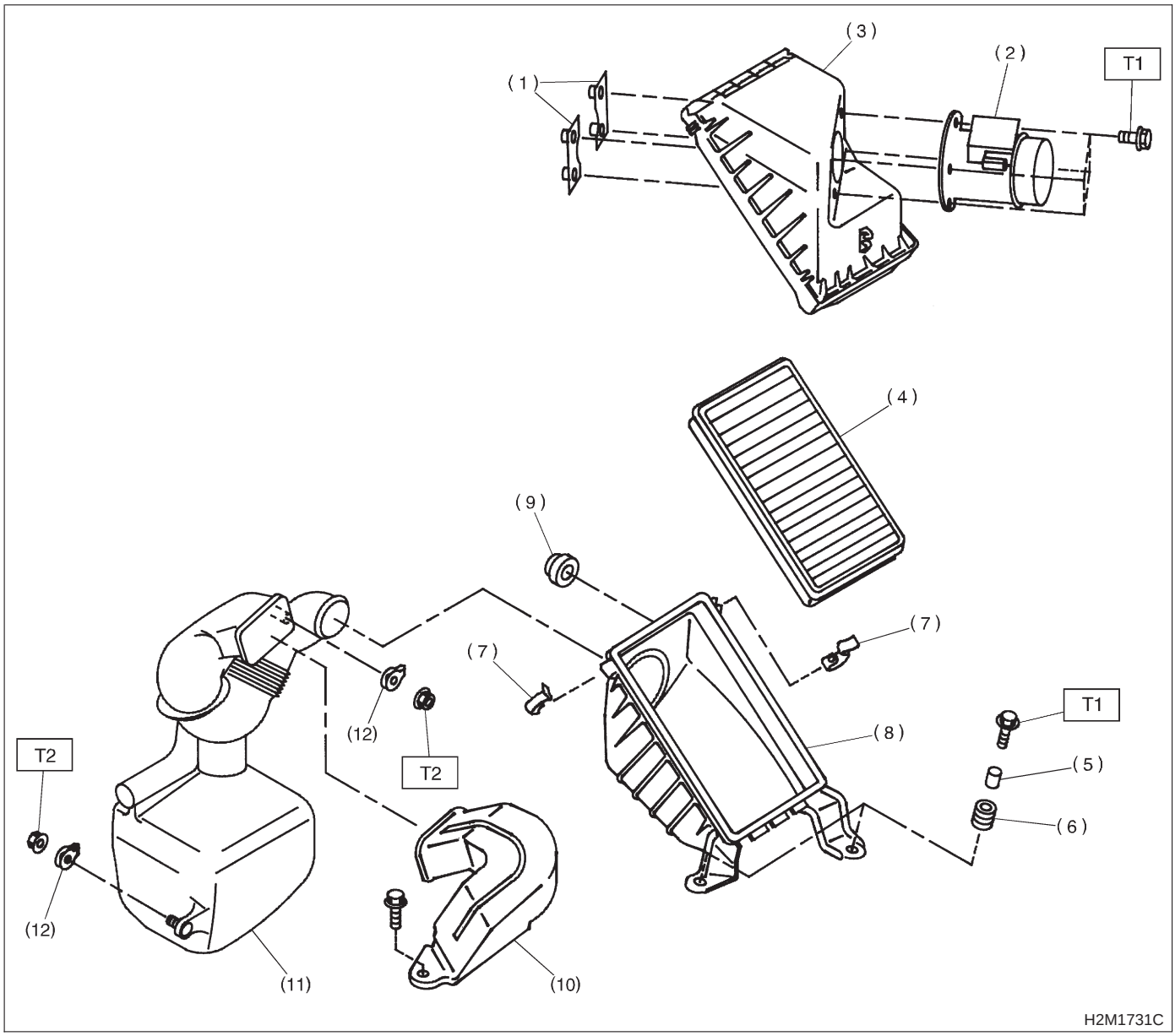
B: 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES



(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)

C: 2500 cc MODEL

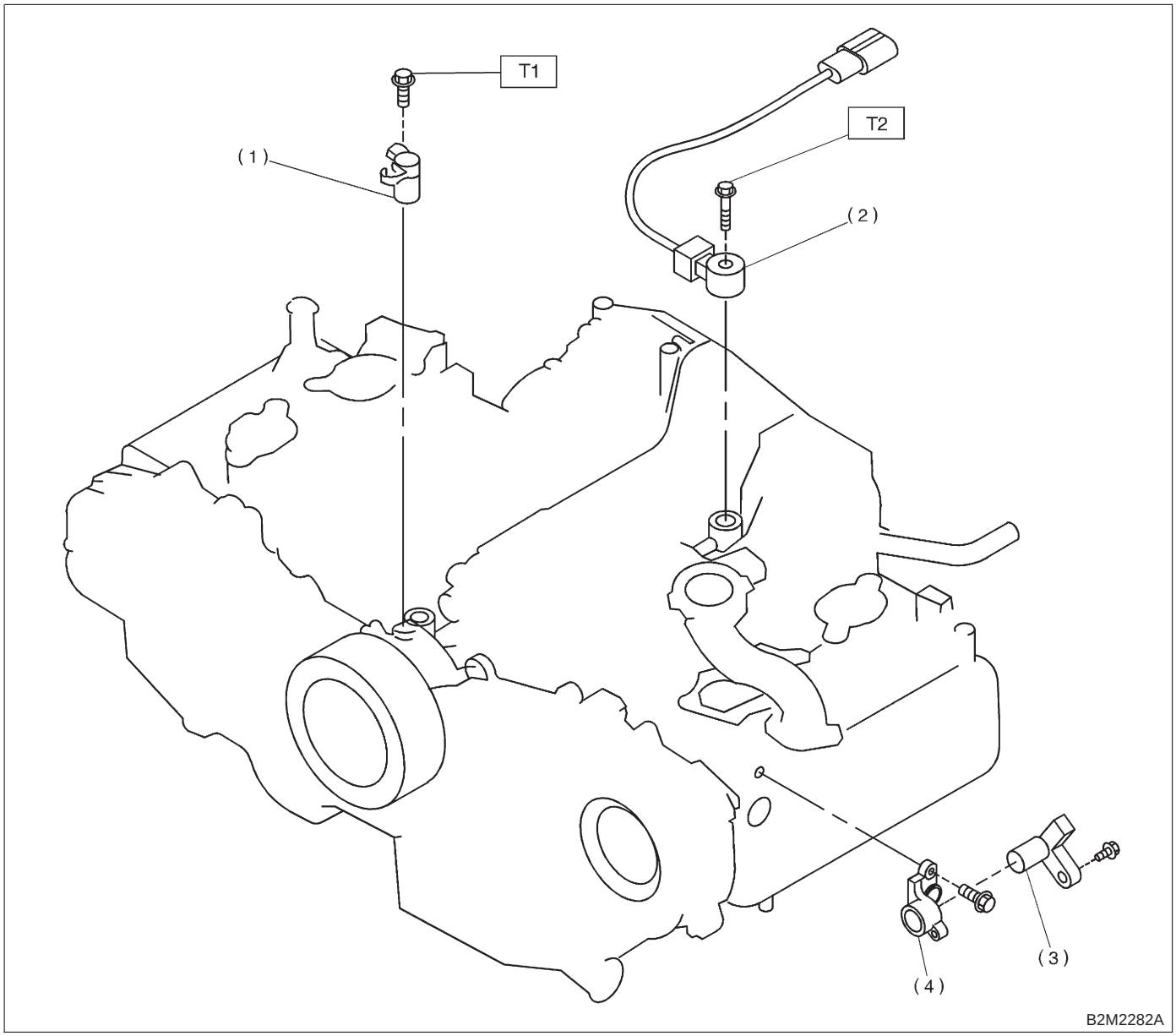


(1) Mass air flow sensor bracket
(2) Mass air flow sensor ASSY
(3) Air cleaner upper cover
(4) Air cleaner element
(5) Spacer
(6) Bush
(7) Clip
(8) Air cleaner case
(9) Cushion rubber
(10) Air intake duct
(11) Resonator chamber ASSY
(12) Clip

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)

4. Crankshaft Position, Camshaft Position and Knock Sensors

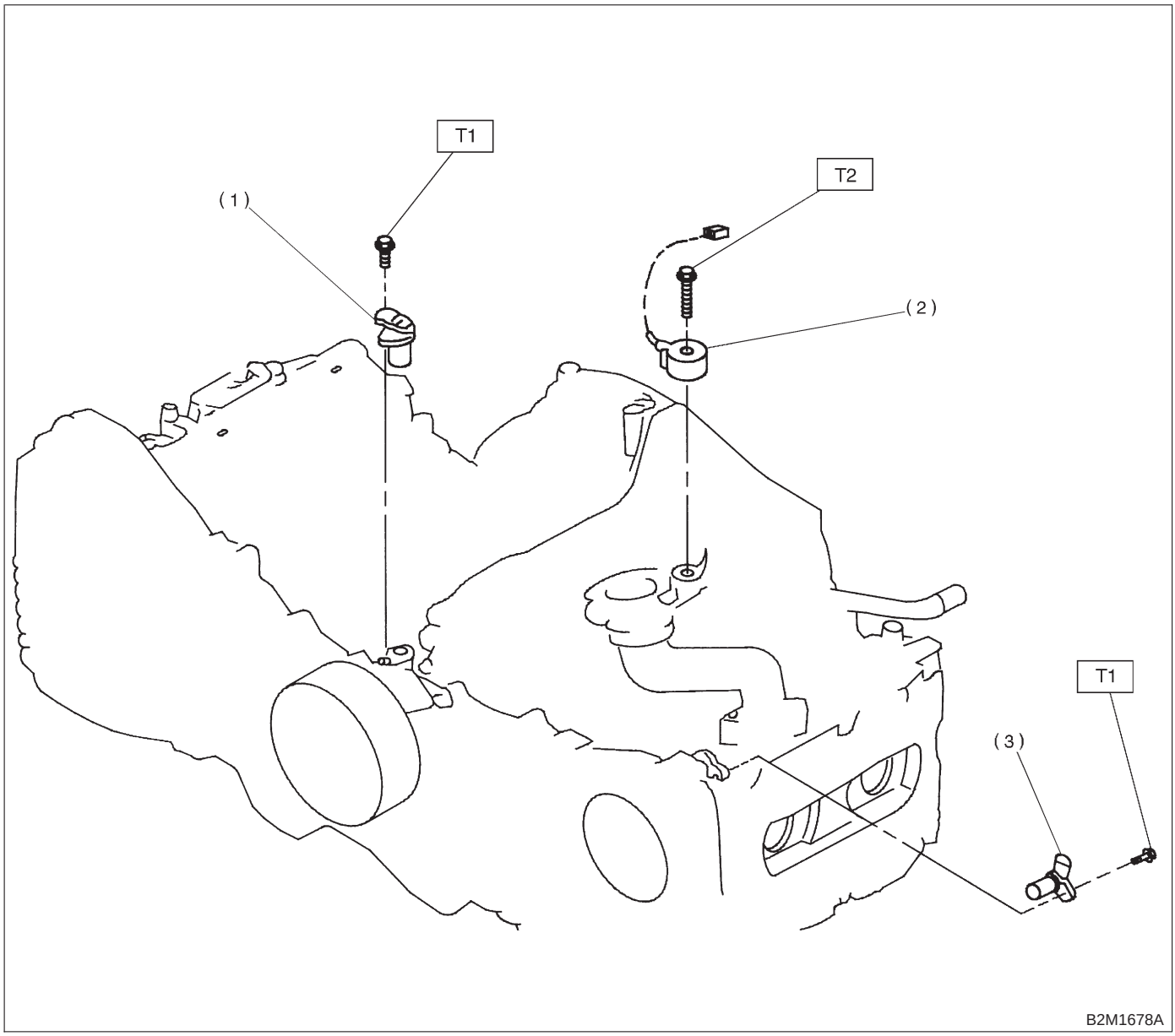
A: 2200 cc MODEL



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

Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T2: 23.5±2.9 (2.4±0.3, 17.3±2.1)

B: 2500 cc MODEL



(1) Crankangle position sensor
(2) Knock sensor
(3) Camshaft position sensor

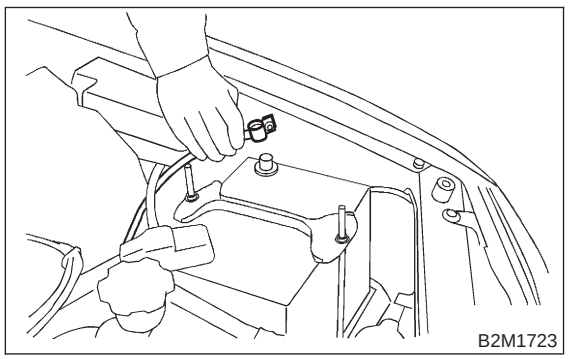
Tightening torque: N·m (kg-m, ft-lb)
T1: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T2: 23.5±2.9 (2.4±0.3, 17.3±2.1)

1. Air Cleaner and Air Intake Duct

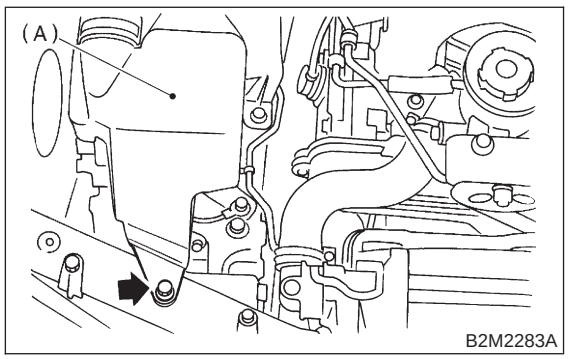
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

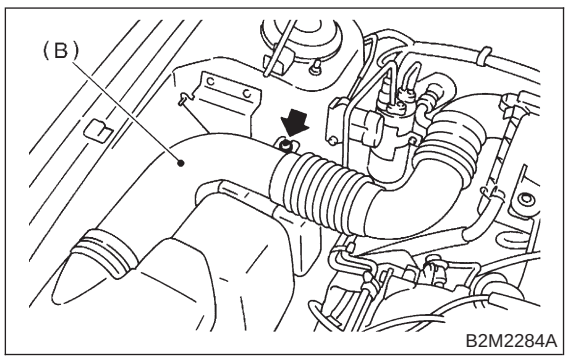
1) Disconnect battery ground cable.



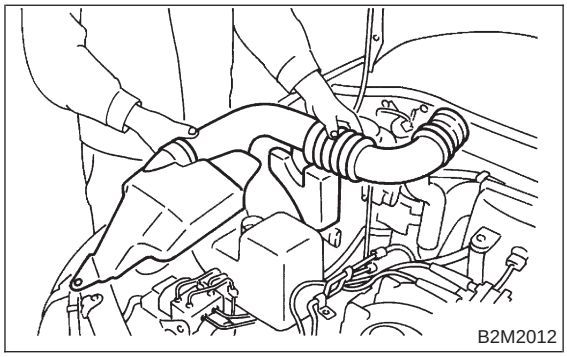
2) Remove bolt which installs air intake duct (A) on the front side of body.



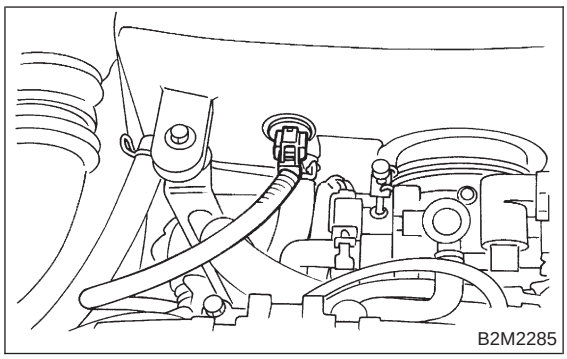
3) Remove bolt which installs air intake duct (B) on body.



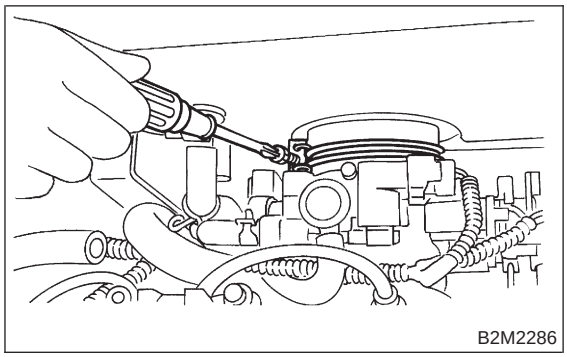
4) Remove air intake duct (A) and (B) as a unit.



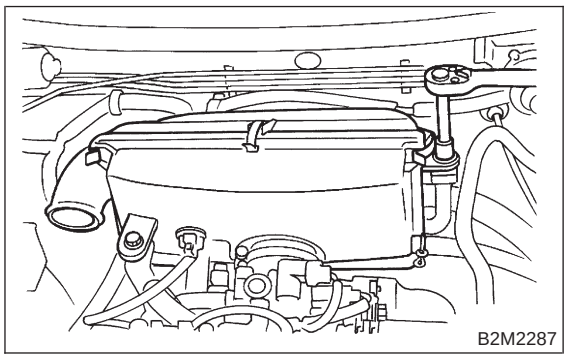
5) Disconnect connector from intake air temperature sensor.



6) Loosen clamp which connects air cleaner case to throttle body.



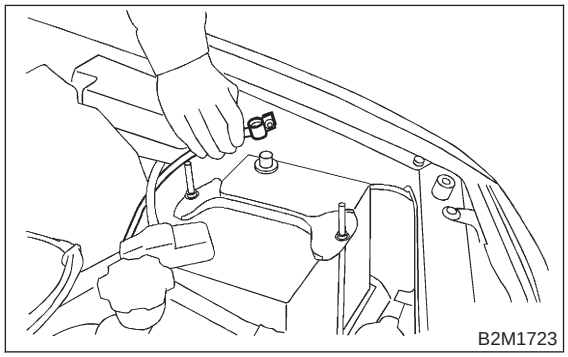
7) Disconnect hoses from air cleaner case.
8) Remove bolts which install air cleaner case to stays.
9) Remove air cleaner assembly.



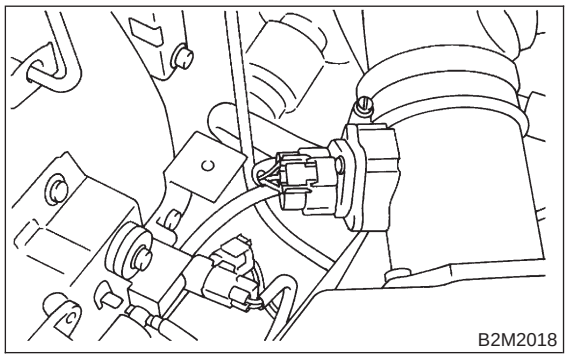
10) Installation is in the reverse order of removal.

2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

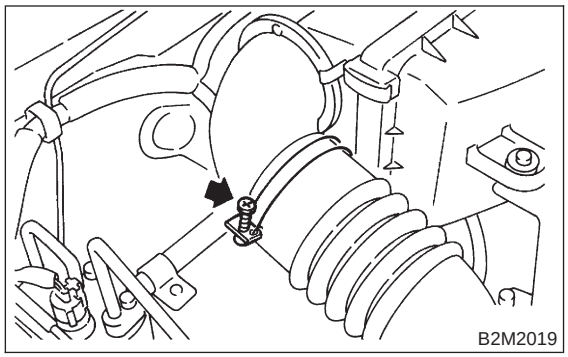
1) Disconnect battery ground cable.


B2M1723

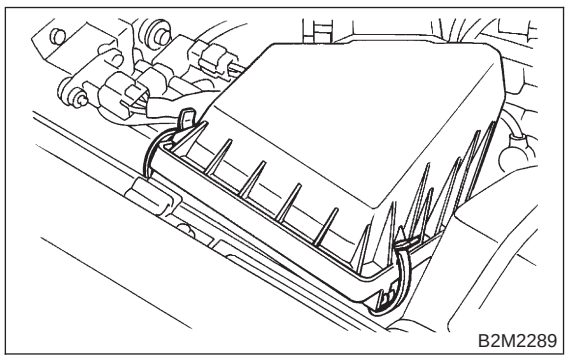
2) Disconnect connector from mass air flow sensor.


B2M2018

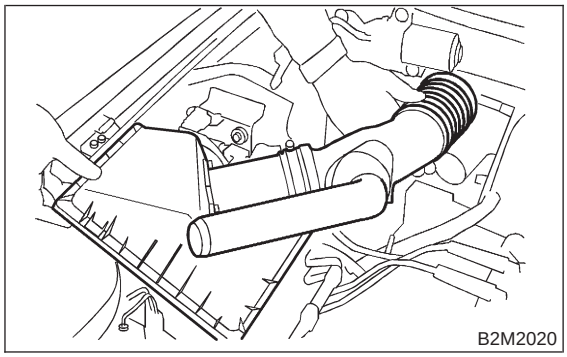
3) Loosen clamp which connects air intake duct to air intake chamber.


B2M2019

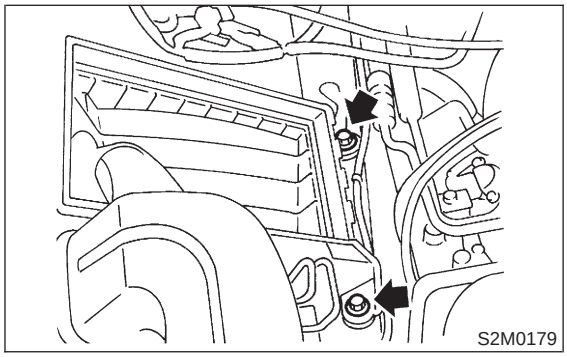
4) Remove two clips of air cleaner upper cover.


B2M2289

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

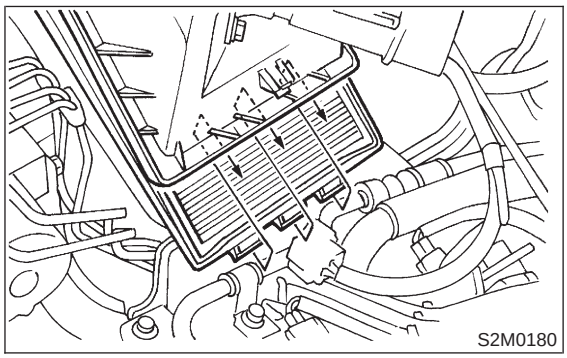

B2M2020

6) Remove air cleaner element.
7) Remove air cleaner lower case.


S2M0179

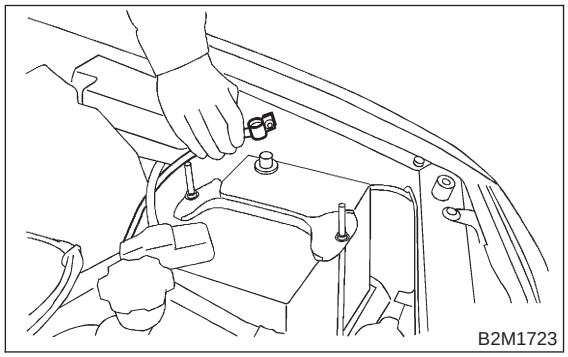
8) Installation is in the reverse order of removal.

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

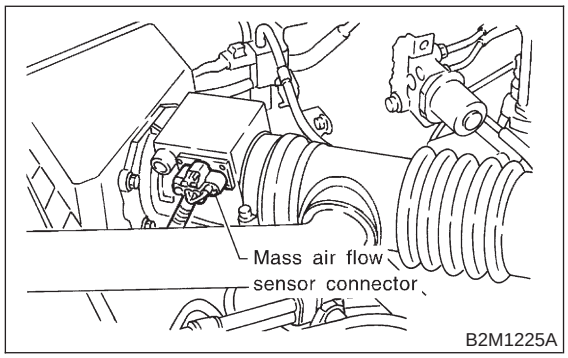

S2M0180

3. 2500 cc MODEL

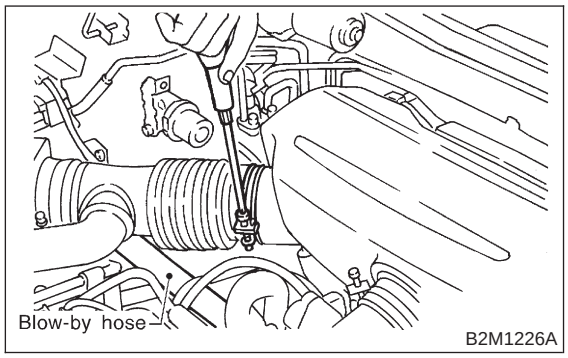
1) Disconnect battery ground cable.



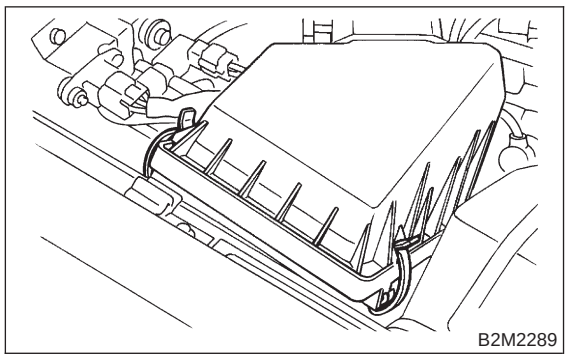
2) Disconnect connector from mass air flow sensor.



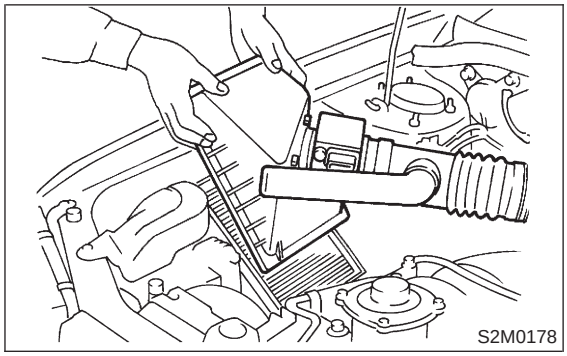
3) Loosen clamp which connects air intake duct to air intake chamber.



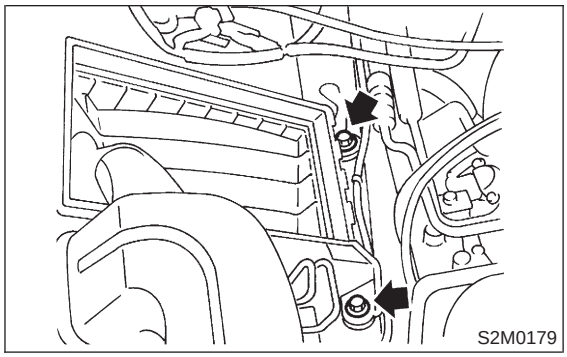
4) Remove two clips of air cleaner upper cover.
5) Disconnect blow-by hose from air intake duct.



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

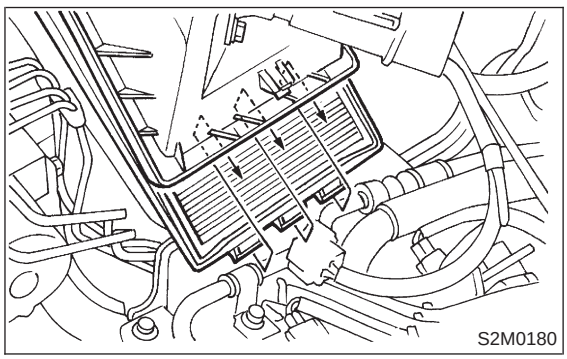


7) Remove air cleaner element.
8) Remove air cleaner lower case.



9) 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.

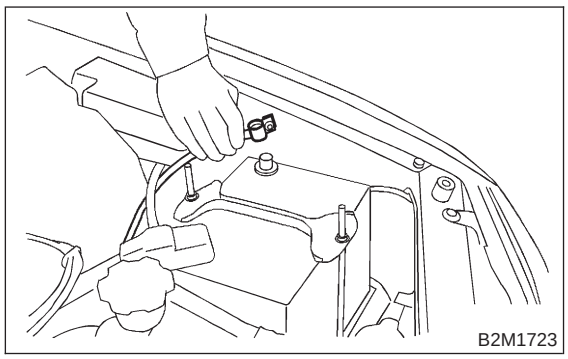


2. Mass Air Flow Sensor (Except 2200 cc California Spec. Vehicles)

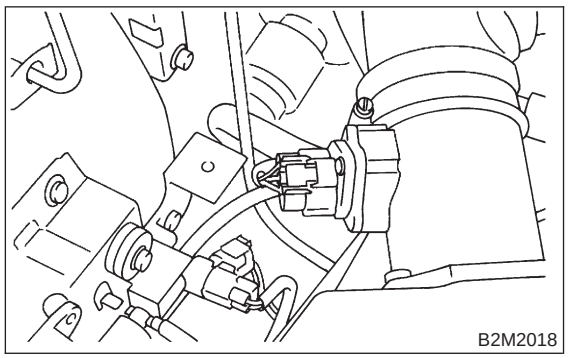
A: REMOVAL AND INSTALLATION

1. 2200 cc MODEL

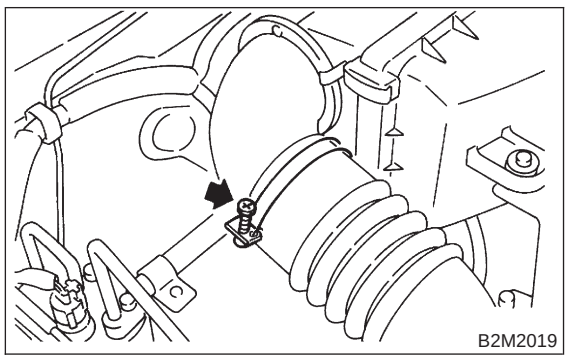
1) Disconnect battery ground cable.


B2M1723

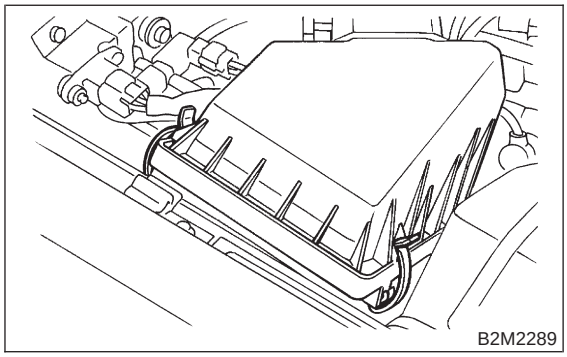
2) Disconnect connector from mass air flow sensor.


B2M2018

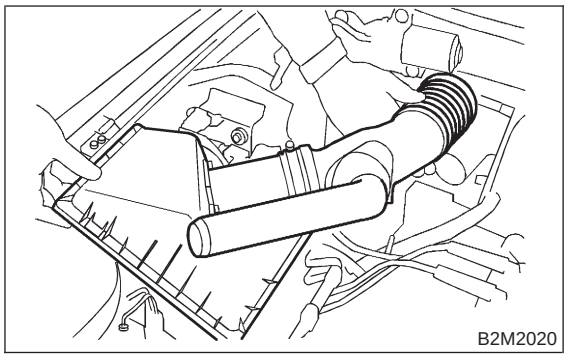
3) Loosen clamp which connects air intake duct to air intake chamber.


B2M2019

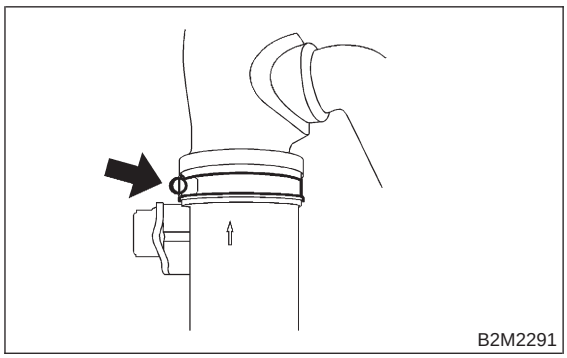
4) Remove two clips of air cleaner upper cover.


B2M2289

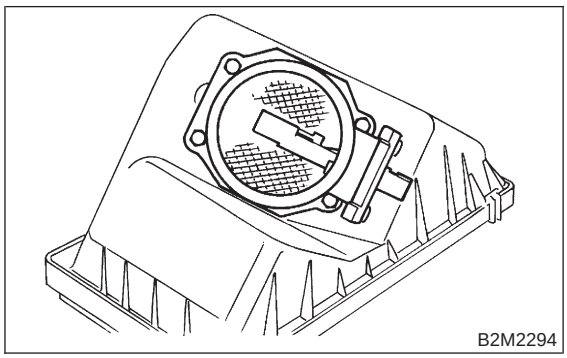
5) Remove air intake duct and air cleaner upper cover as a unit.


B2M2020

6) Loosen clamp which connects air intake duct to mass air flow sensor.


B2M2291

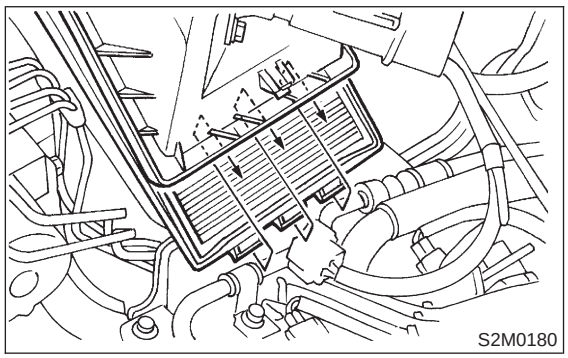
7) Remove mass air flow sensor from air cleaner upper cover.


B2M2294

8) Installation is in the reverse order of removal.

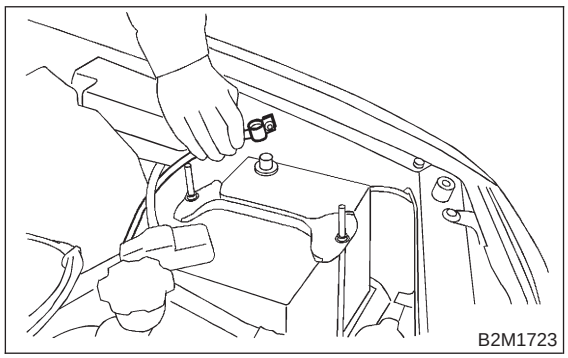
Tightening torque:
7.4±2.0 N·m (0.75±0.2 kg-m, 5.4±1.4 ft-lb)

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

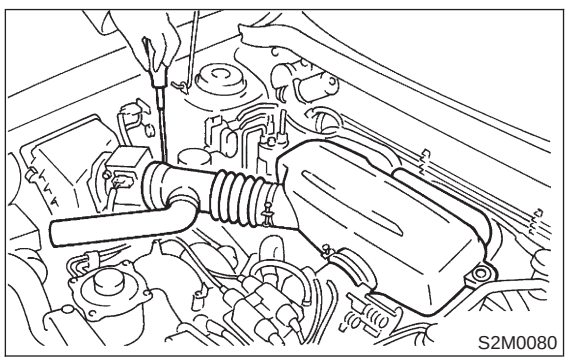

S2M0180

2. 2500 cc MODEL

1) Disconnect battery ground cable.

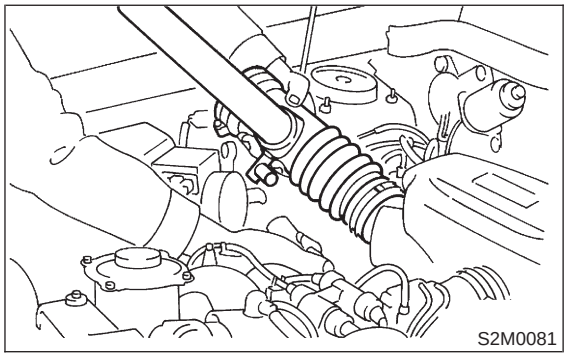

B2M1723

2) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.

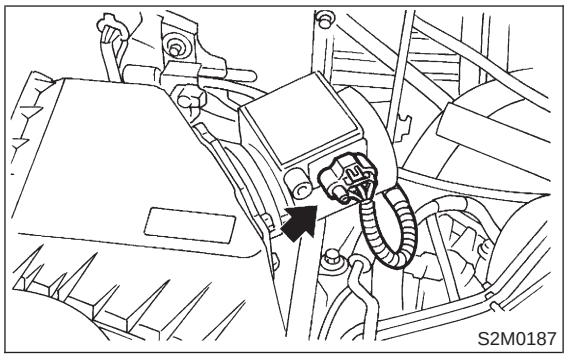

S2M0080

3) Disconnect blow-by hose from air intake duct.

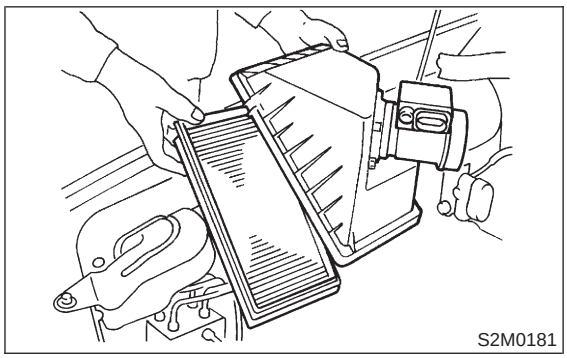
4) Remove air intake duct.


S2M0081

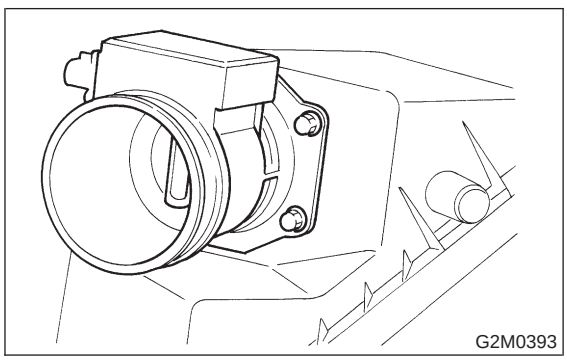
5) Disconnect connector from mass air flow sensor.


S2M0187

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


S2M0181

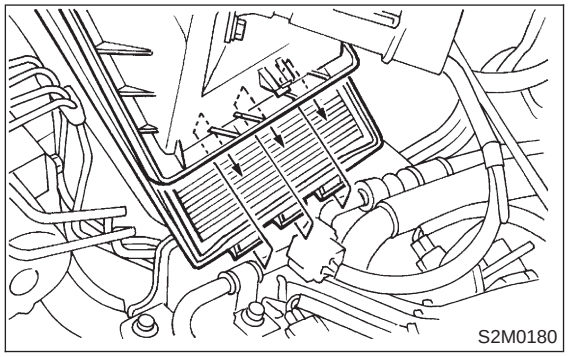
7) Remove mass air flow sensor from air cleaner upper cover.


G2M0393

8) 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.

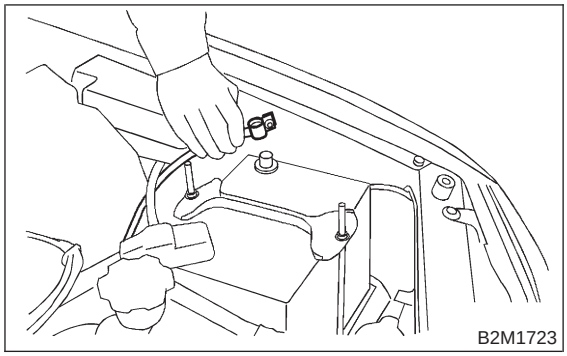

S2M0180

3. Throttle Body

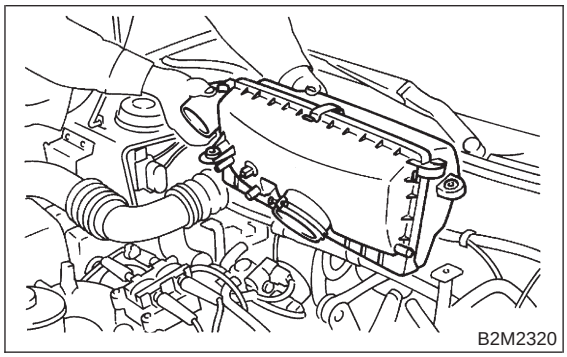
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

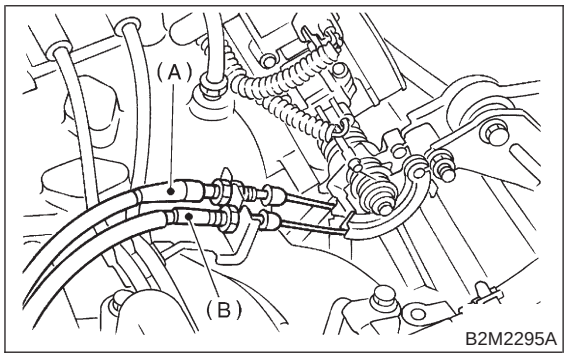
1) Disconnect battery ground cable.


B2M1723

2) Remove air cleaner assembly. <Ref. to 2-7 [W1A0].>


B2M2320

3) Disconnect accelerator cable (A).
4) Disconnect cruise control cable (B). (With cruise control model)

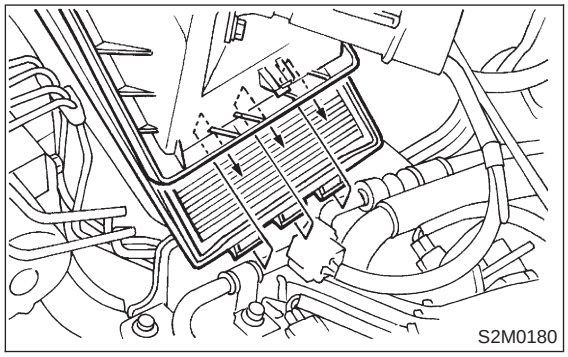


B2M2295A

8) 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.

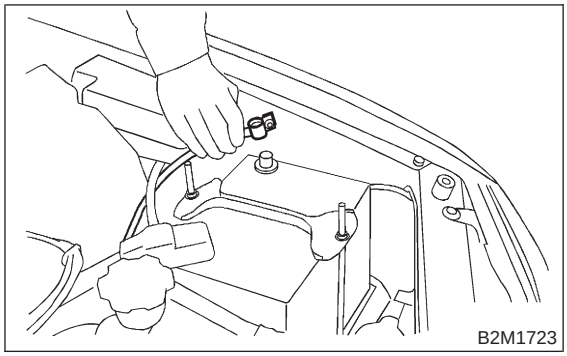

S2M0180

3. Throttle Body

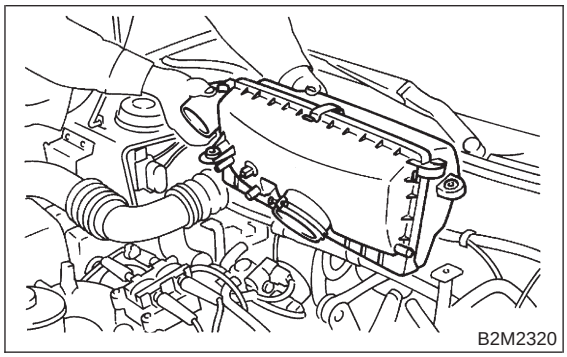
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

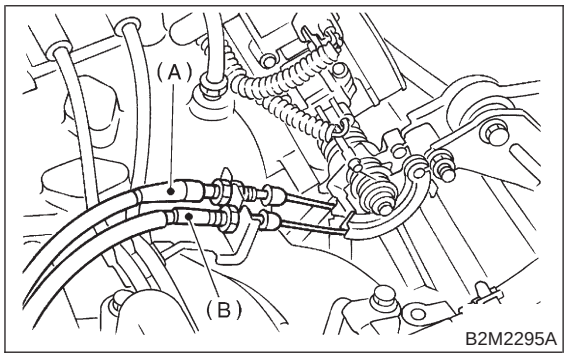
1) Disconnect battery ground cable.


B2M1723

2) Remove air cleaner assembly. <Ref. to 2-7 [W1A0].>

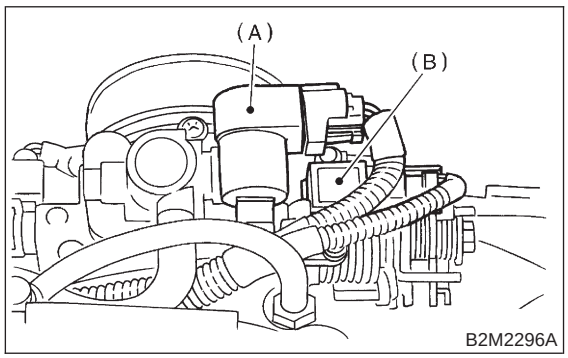

B2M2320

3) Disconnect accelerator cable (A).
4) Disconnect cruise control cable (B). (With cruise control model)



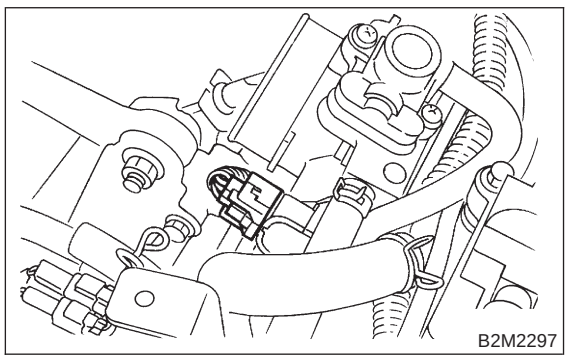
B2M2295A

5) Disconnect connectors from idle air control solenoid valve (A) and intake manifold pressure sensor (B).

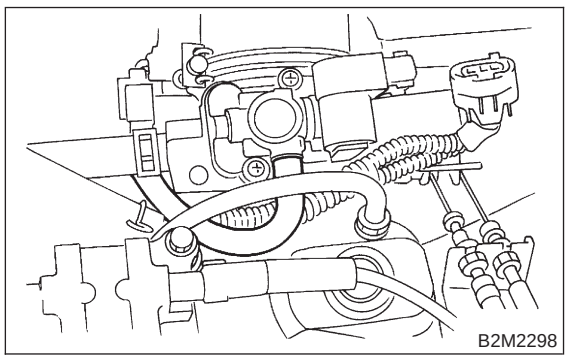


(A) Idle air control solenoid valve
(B) Intake manifold pressure sensor

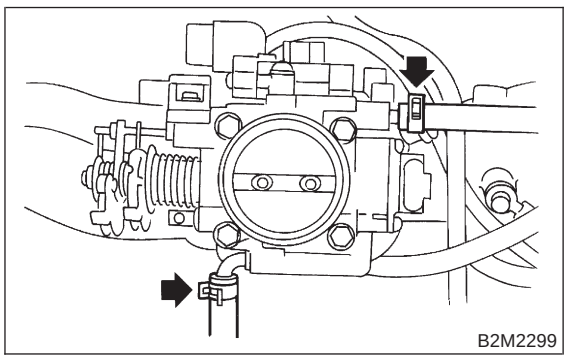
6) Disconnect connector from throttle position sensor.



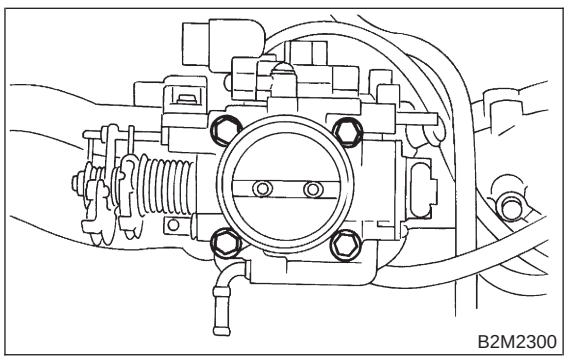
7) Disconnect air by-pass hose from idle air control solenoid valve.



8) Disconnect engine coolant hoses from throttle body.



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



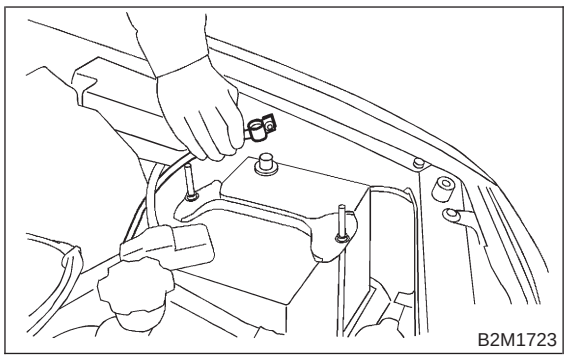
10) Installation is in the reverse order of removal.

CAUTION:
Always use a new gasket.

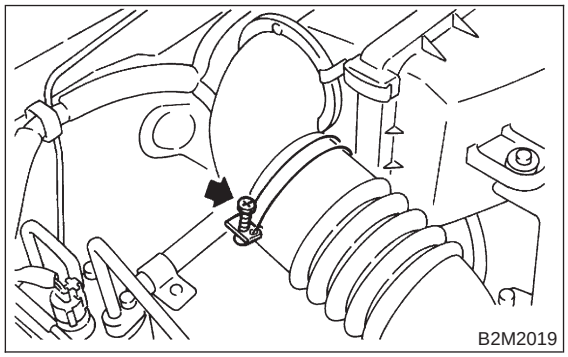
Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air cleaner case:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

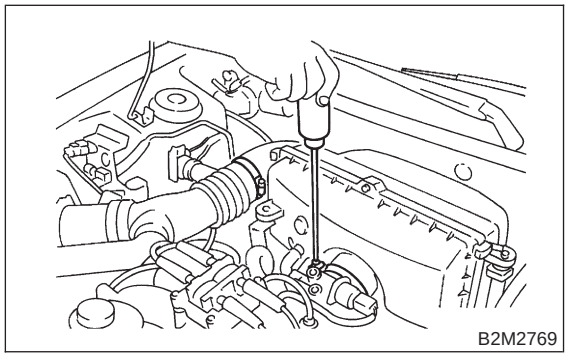
1) Disconnect battery ground cable.



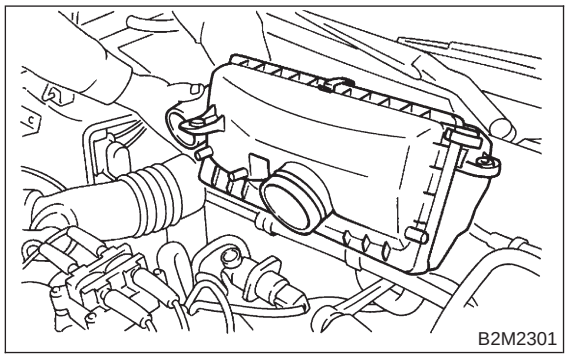
2) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.


B2M2019

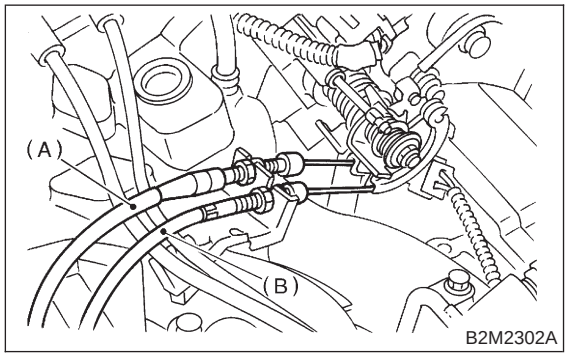
3) Loosen clamp which connects air intake chamber to throttle body.


B2M2769

4) Disconnect blow-by hose and air hoses, and remove air intake chamber.

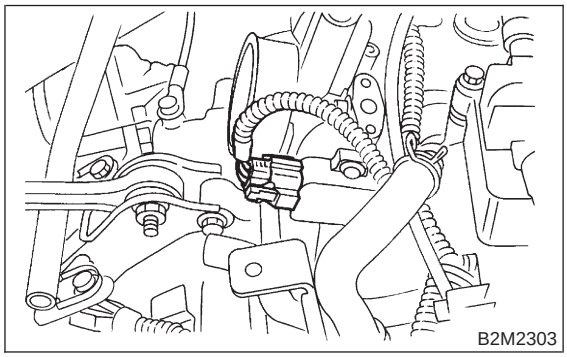

B2M2301

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

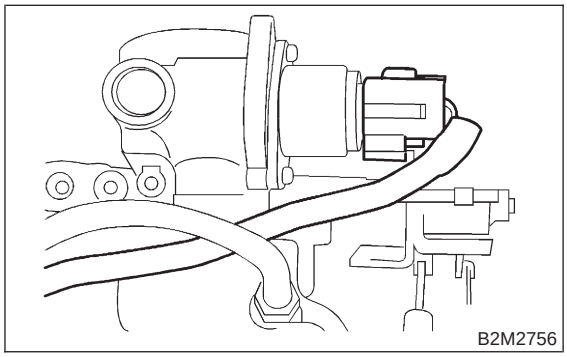


B2M2302A

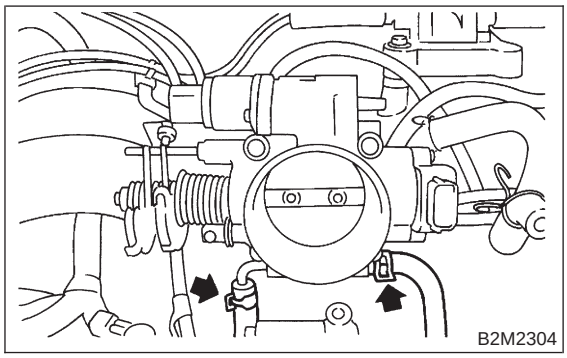
7) Disconnect connector from throttle position sensor.


B2M2303

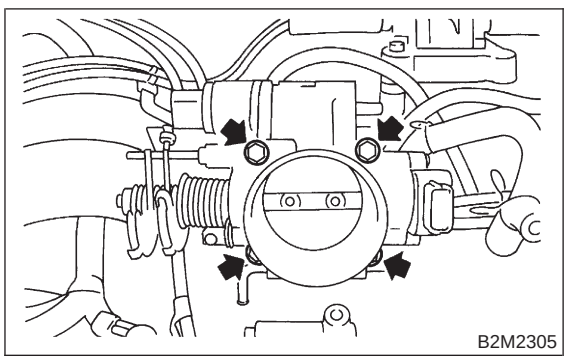
8) Disconnect connector from idle air control solenoid valve.


B2M2756

9) Disconnect engine coolant hoses from throttle body.


B2M2304

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


B2M2305

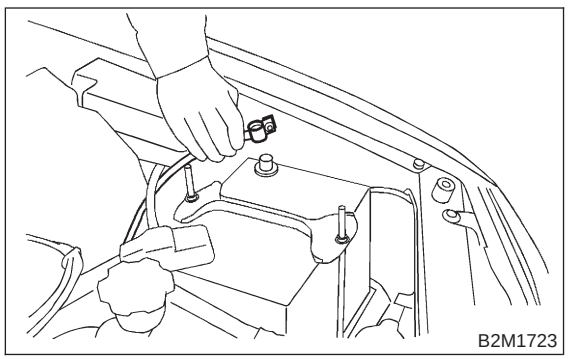
11) Installation is in the reverse order of removal.

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.**

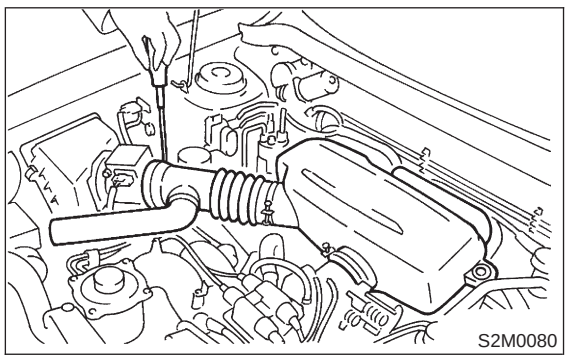
Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air intake chamber:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

3. 2500 cc MODEL

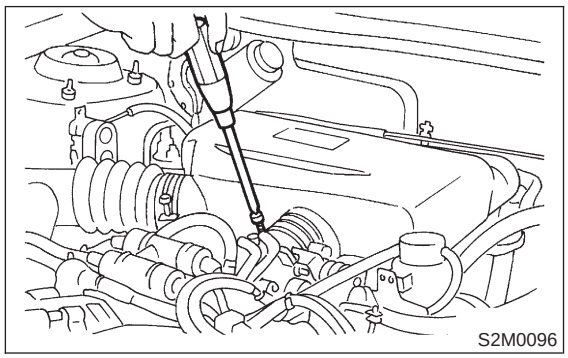
1) Disconnect battery ground cable.


B2M1723

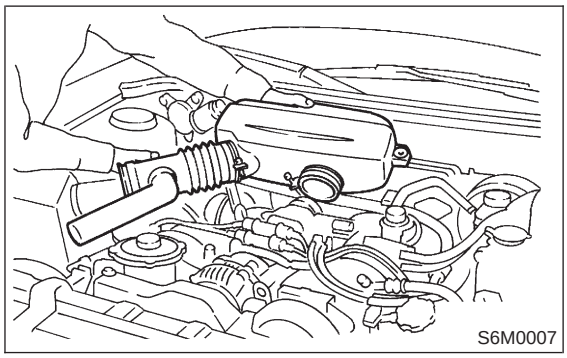
2) Loosen clamps which connect air intake duct to air intake chamber and mass air flow sensor.


S2M0080

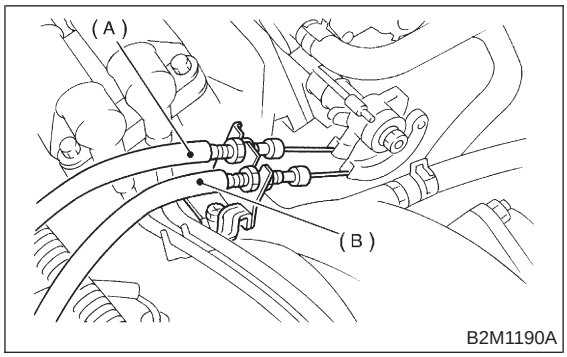
3) Loosen clamp which connects air intake chamber to throttle body.


S2M0096

4) Disconnect blow-by hose and air hoses, and remove air intake chamber and air intake duct as a unit.

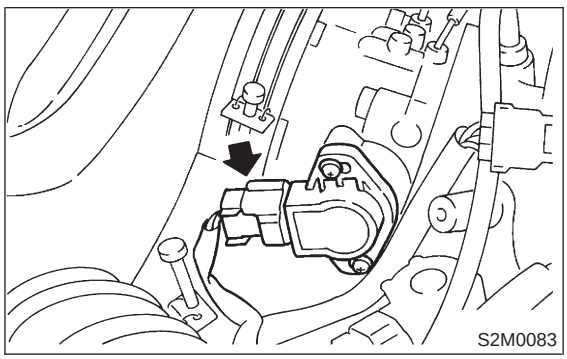

S6M0007

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

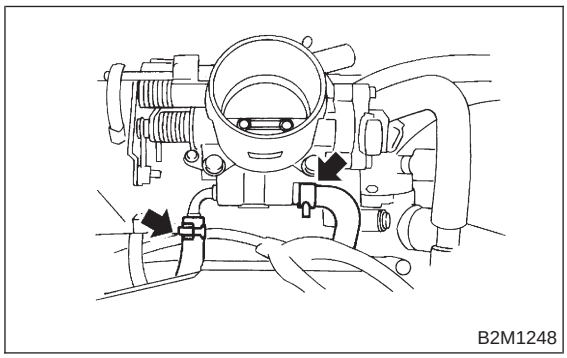


B2M1190A

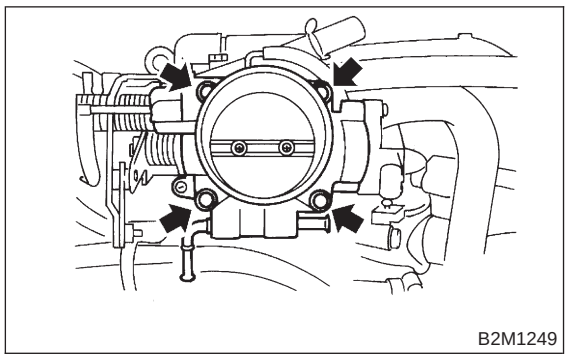
7) Disconnect connector from throttle position sensor.


S2M0083

8) Disconnect engine coolant hoses from throttle body.


B2M1248

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



10) 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.**

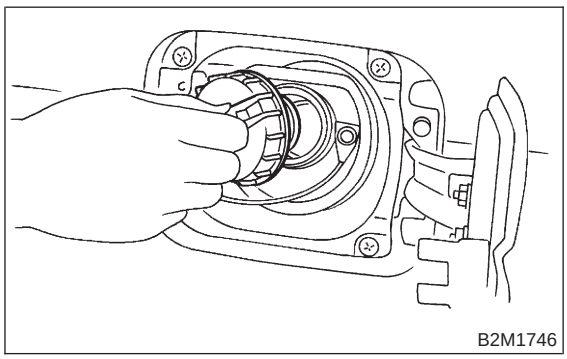
Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air intake chamber:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

4. Intake Manifold

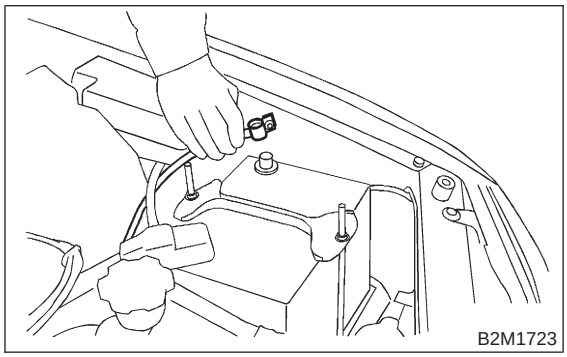
A: REMOVAL

1. 2200 cc CALIFORNIA SPEC. VEHICLES

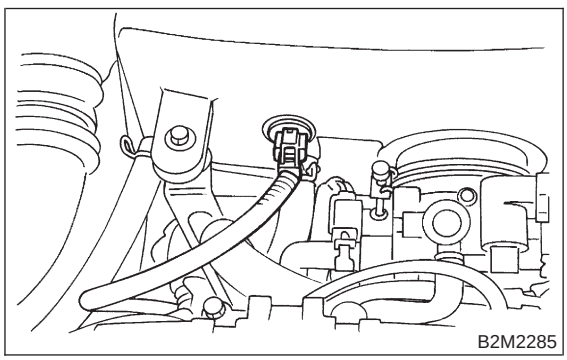
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



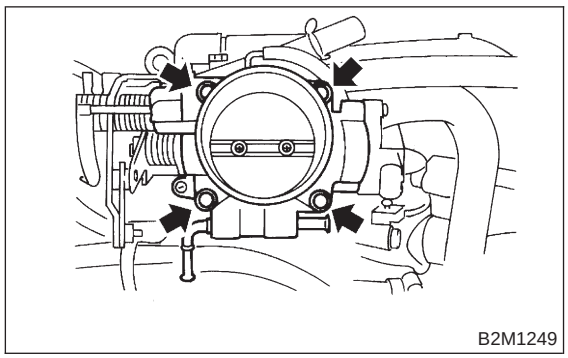
3) Disconnect battery ground cable.



4) Disconnect connector from intake air temperature sensor.



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



10) 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.**

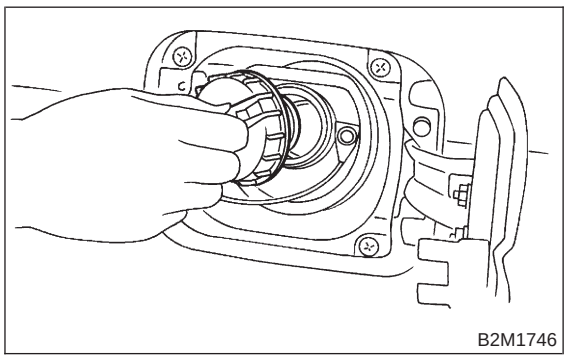
Tightening torque:
Throttle body:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)
Air intake chamber:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)

4. Intake Manifold

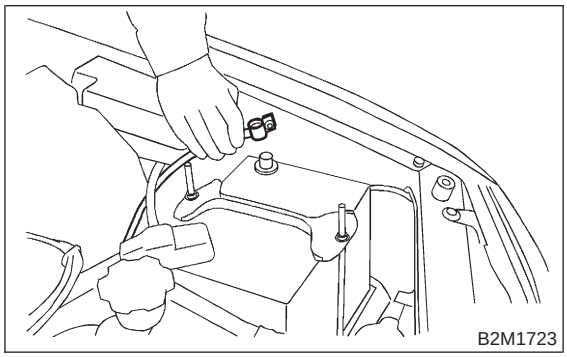
A: REMOVAL

1. 2200 cc CALIFORNIA SPEC. VEHICLES

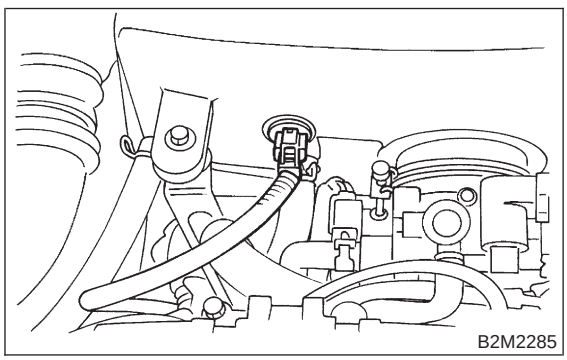
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



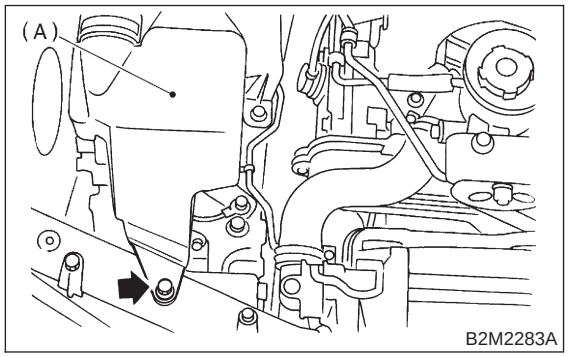
3) Disconnect battery ground cable.



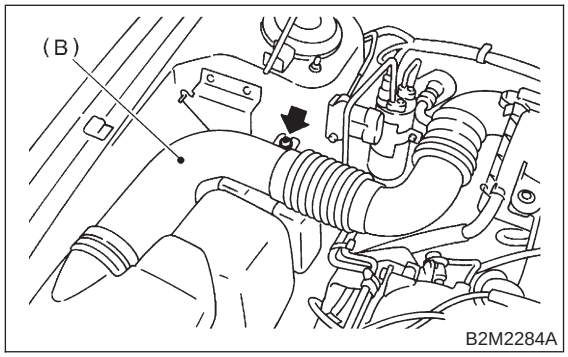
4) Disconnect connector from intake air temperature sensor.



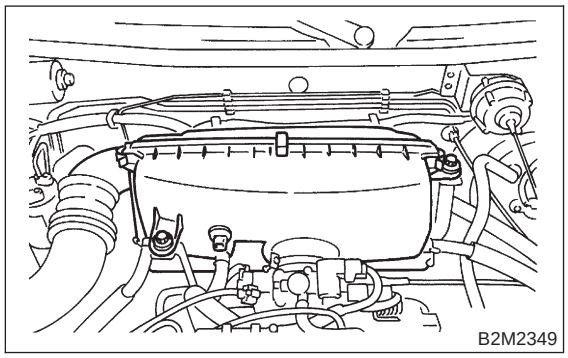
5) Remove bolt which installs air intake duct (A) on the front of body.



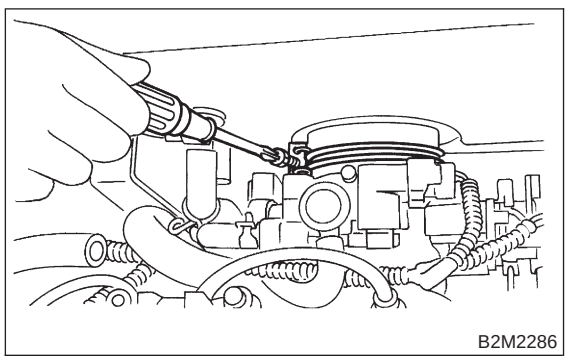
6) Remove bolt which installs air intake duct (B) on body.



7) Remove bolts which install air cleaner case on stays.

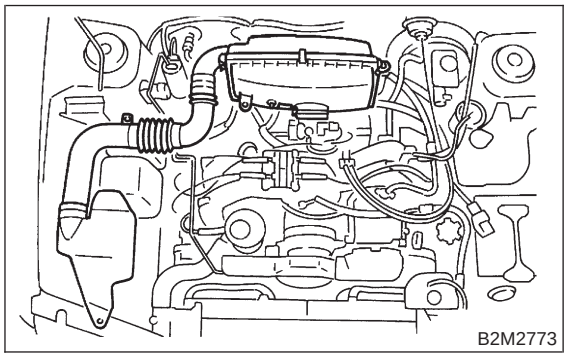


8) Loosen clamp which connects air intake chamber to throttle body.

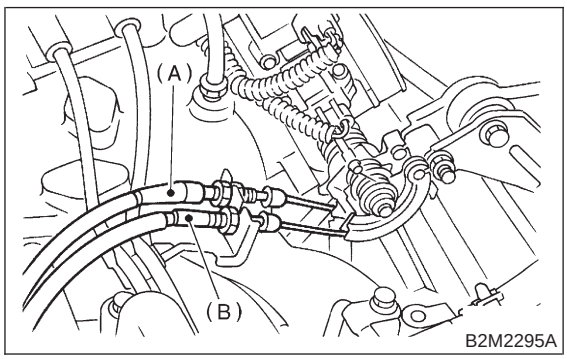


9) Disconnect blow-by hose from air cleaner case.

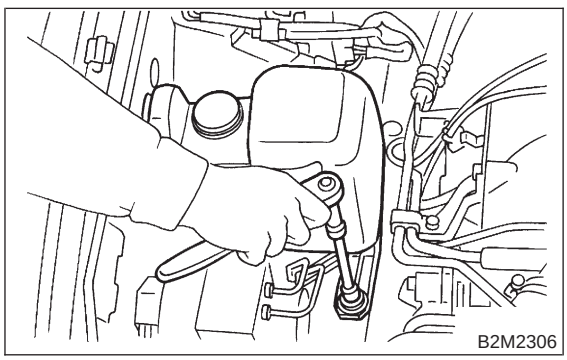
10) Remove air intake duct (A), (B) and air cleaner assembly as a unit.



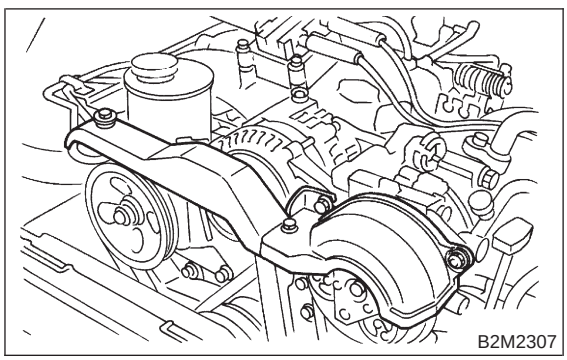
11) Disconnect accelerator cable (A).
12) Disconnect cruise control cable (B). (With cruise control model)



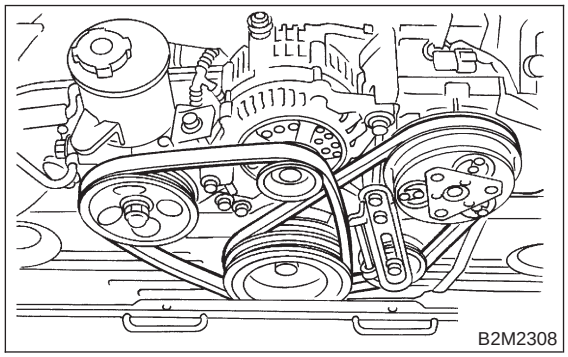
13) Remove power steering pump from bracket.
(1) Remove resonator chamber.



(2) Remove V-belt covers.

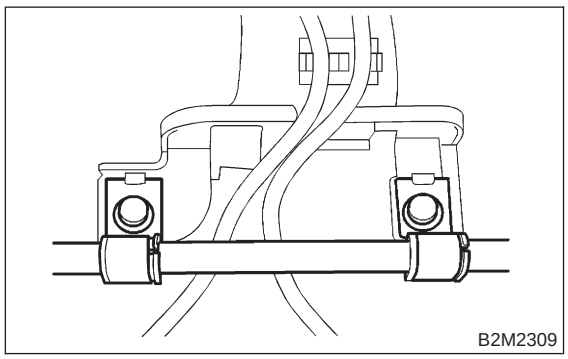


(3) Loosen lock bolt and slider bolt, and remove power steering pump drive V-belt.

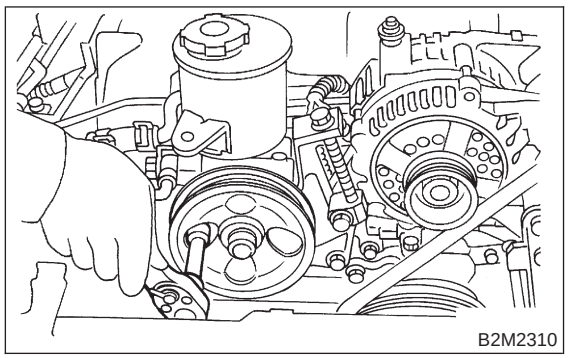

B2M2308

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

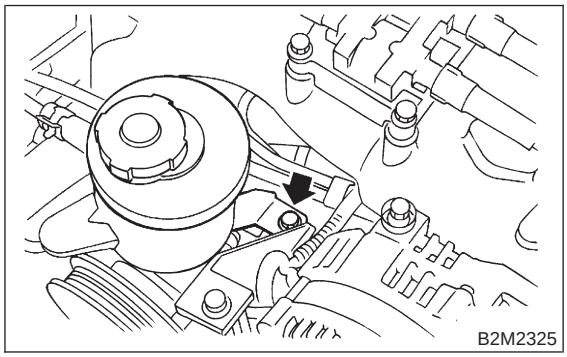
NOTE:
Do not disconnect power steering hose.


B2M2309

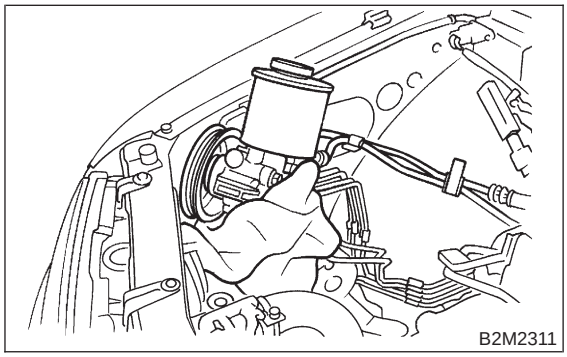
(5) Remove bolts which install power steering pump to bracket.


B2M2310

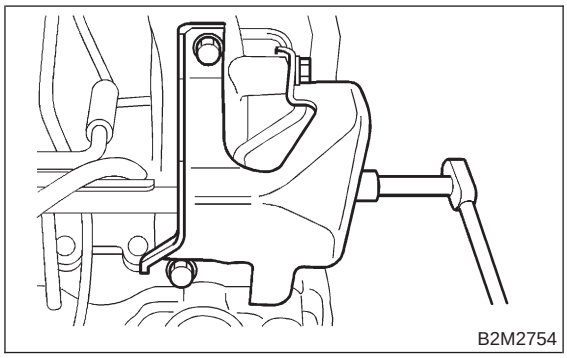
(6) Remove bolt which holds power steering fluid tank bracket onto cylinder block.


B2M2325

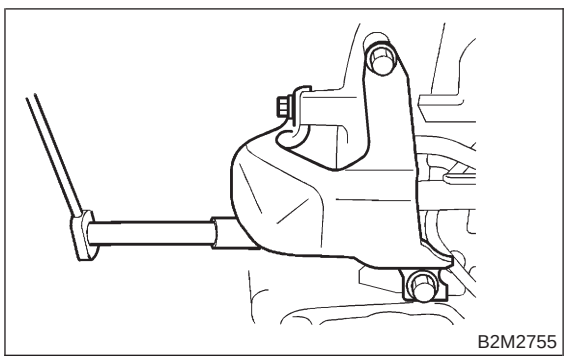
(7) Place power steering pump on the right side wheel apron.


B2M2311

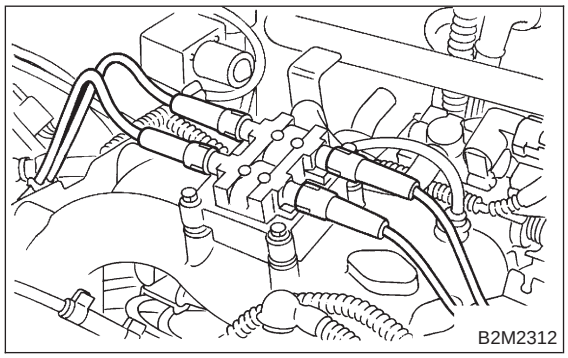
14) Remove fuel pipe protector LH. (LHD model only)


B2M2754

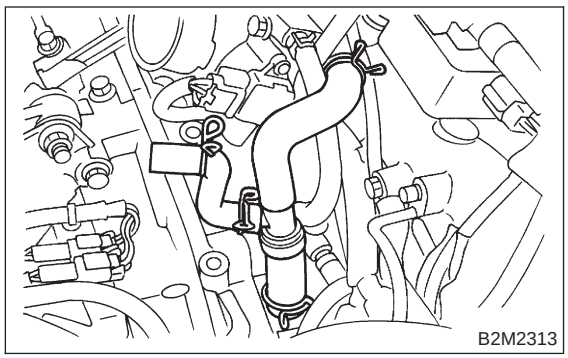
15) Remove fuel pipe protector RH. (RHD model only)


B2M2755

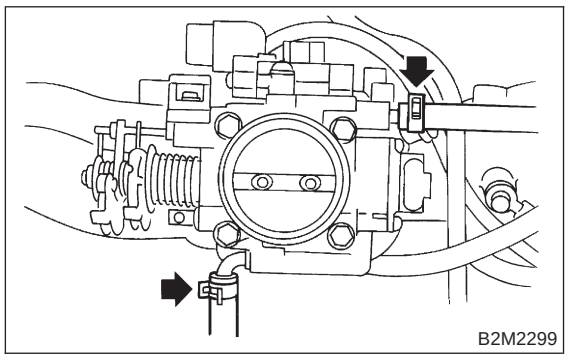
16) Disconnect spark plug cords from ignition coil and ignitor assembly.



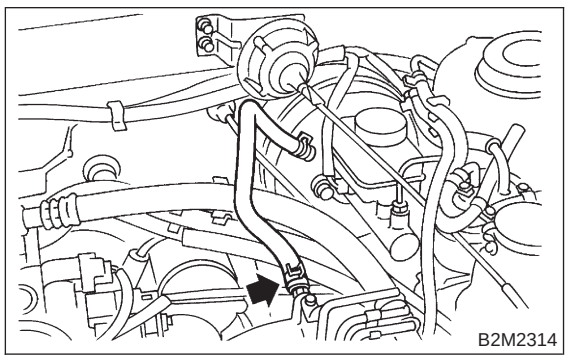
17) Disconnect PCV hose assembly from intake manifold.



18) Disconnect engine coolant hoses from throttle body.

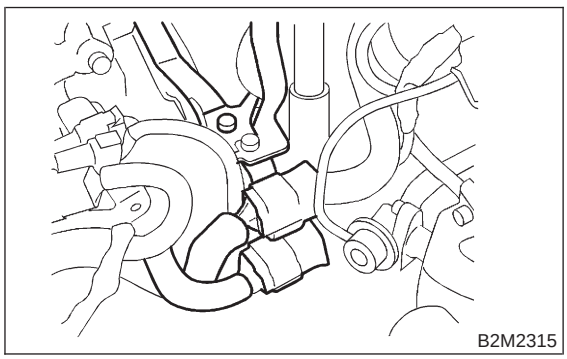


19) Disconnect brake booster hose.

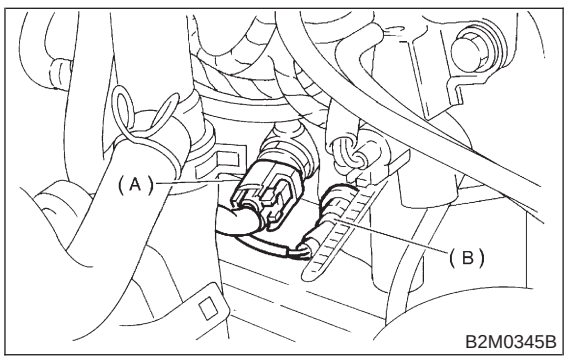


20) Remove air cleaner case stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.

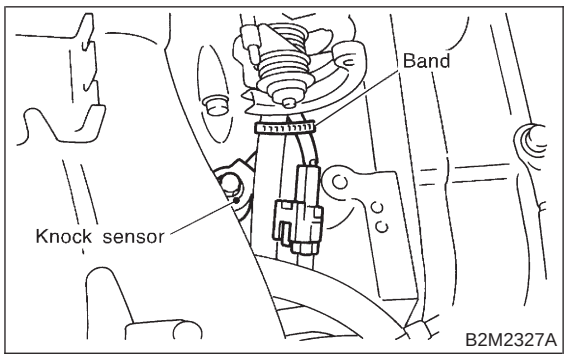
21) Pull out engine harness connector from bracket.



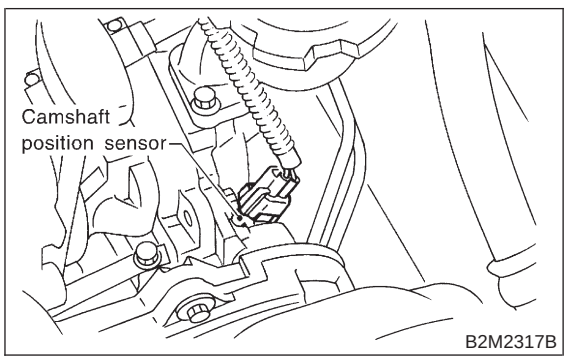
22) Disconnect connectors from engine coolant temperature sensor (A) and thermometer (B).



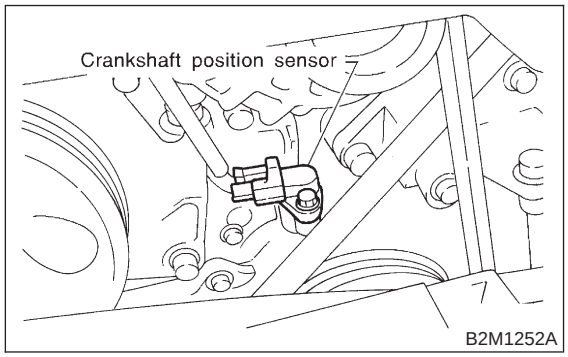
23) Disconnect knock sensor connector.



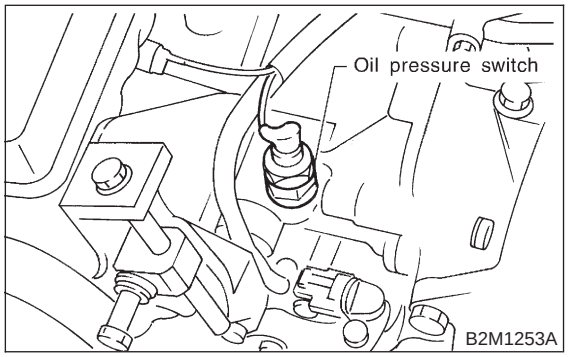
24) Disconnect connector from camshaft position sensor.



25) Disconnect connector from crankshaft position sensor.

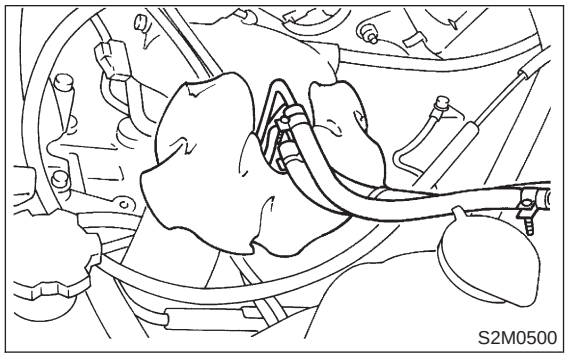


26) Disconnect connector from oil pressure switch.

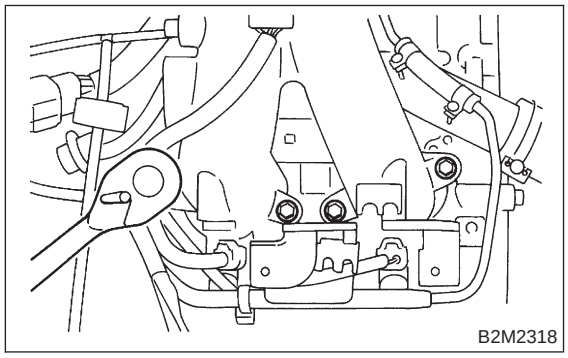


27) Disconnect fuel hoses from fuel pipes.

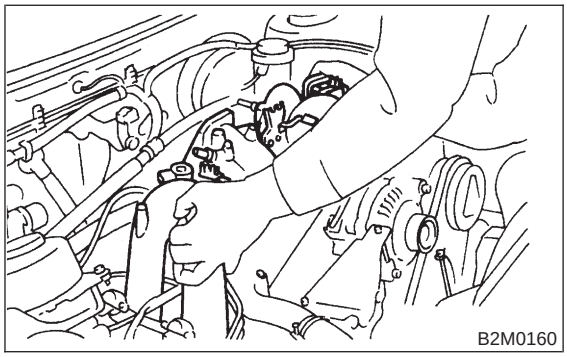
WARNING:
Catch fuel from hoses in a container.



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

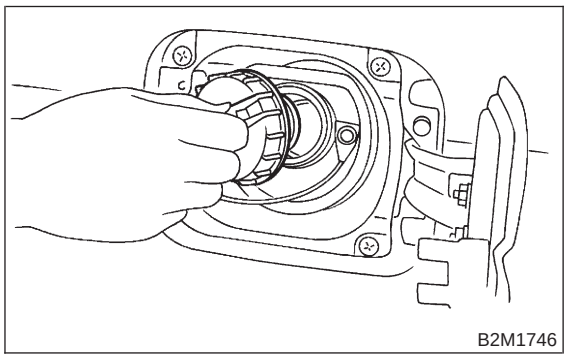


29) Remove intake manifold.

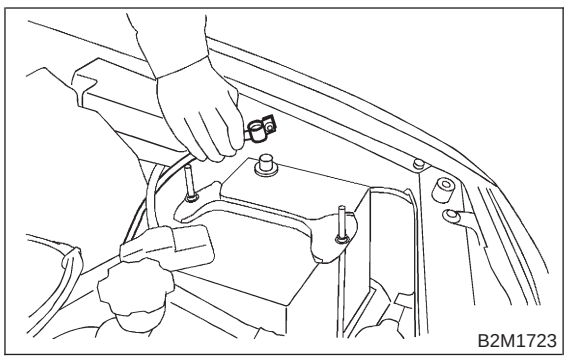


2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

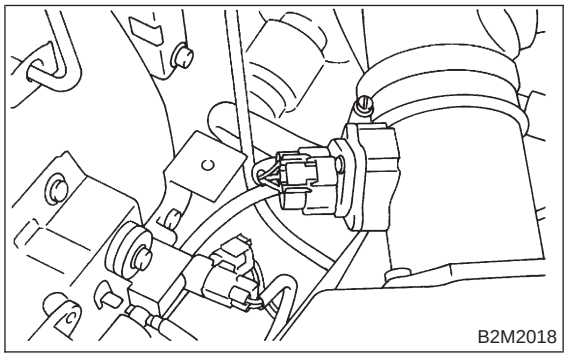
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



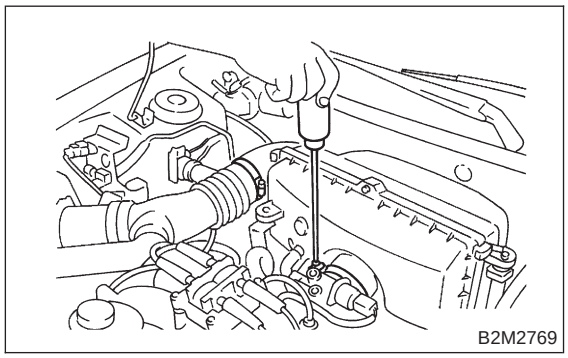
3) Disconnect battery ground cable.



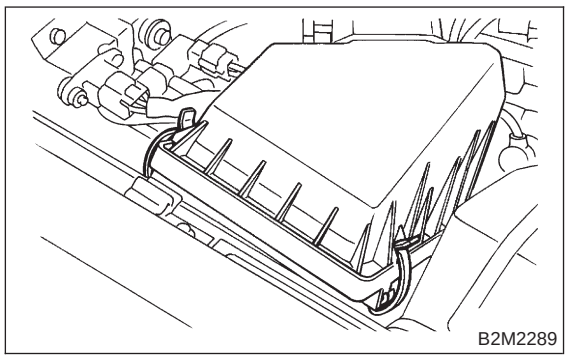
4) Disconnect connector from mass air flow sensor.



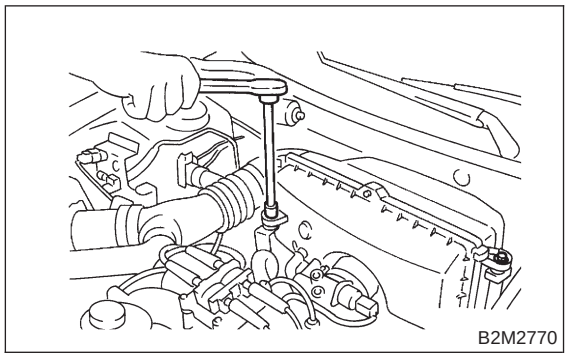
5) Loosen clamp which connects air intake chamber to throttle body.


B2M2769

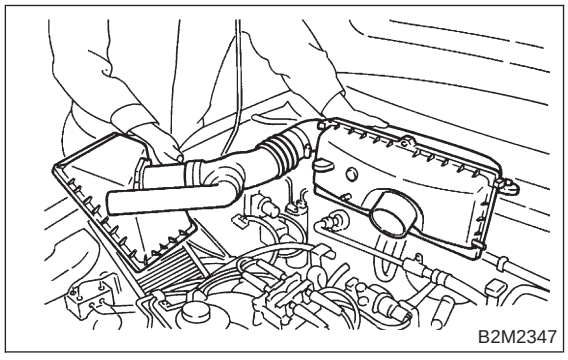
6) Remove two clips of air cleaner upper cover.


B2M2289

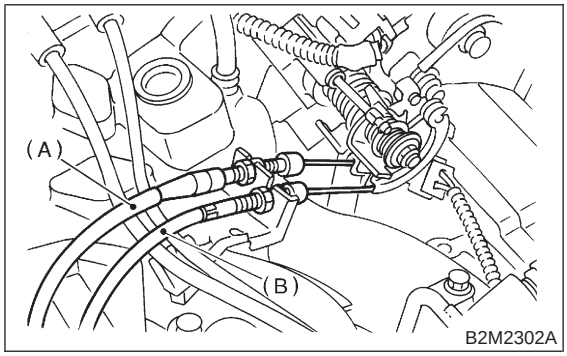
7) Remove bolts which install air intake chamber on stays.


B2M2770

8) Disconnect blow-by hose from air intake chamber.
9) Remove air intake duct, air cleaner upper cover and air intake chamber as a unit.
10) Remove air cleaner element.

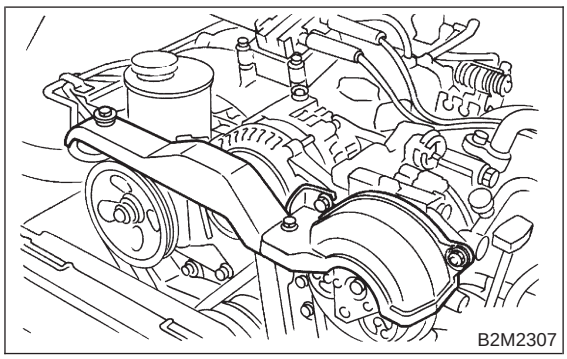

B2M2347

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

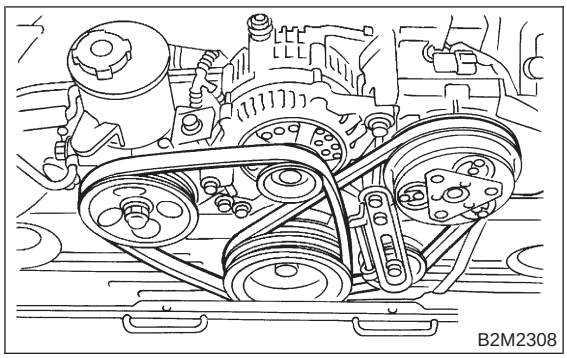


B2M2302A

13) Disconnect vacuum hoses from pressure sources switching solenoid valve.
14) Remove power steering pump from bracket.
(1) Remove V-belt cover.

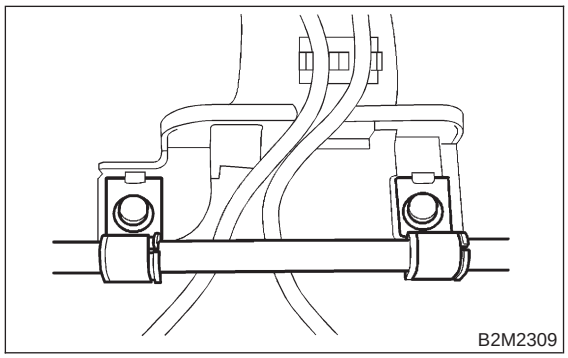

B2M2307

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

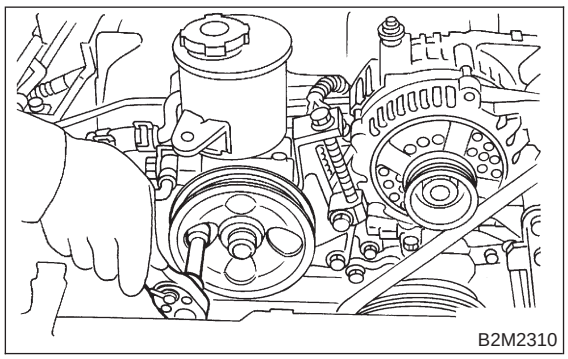

B2M2308

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

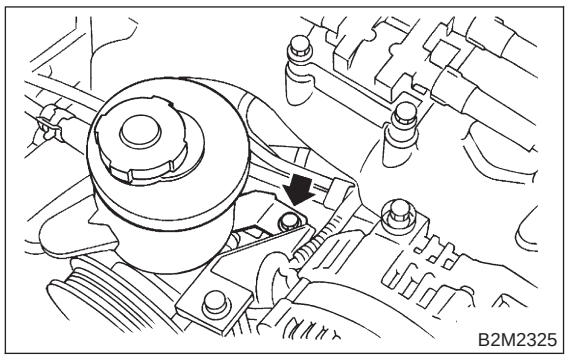
NOTE:
Do not disconnect power steering hose.


B2M2309

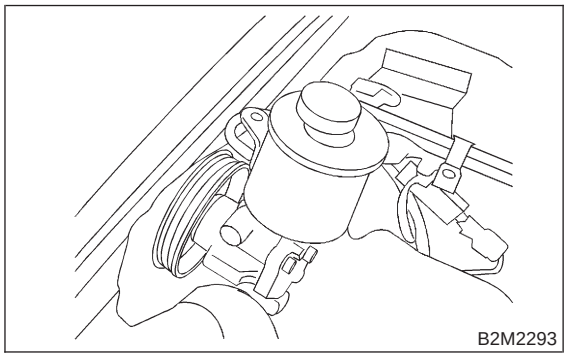
(4) Remove bolts which install power steering pump to bracket.


B2M2310

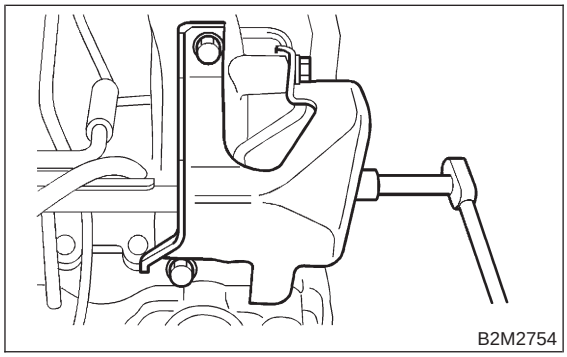
(5) Remove bolt which holds power steering fluid tank bracket onto cylinder block.


B2M2325

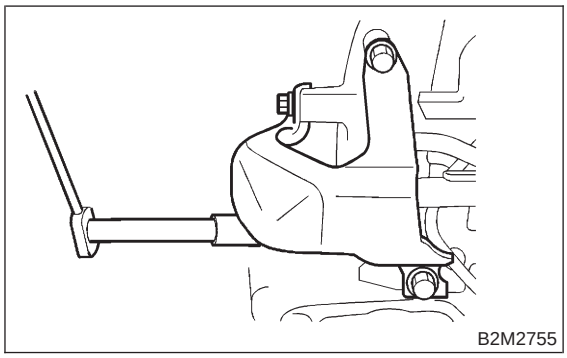
(6) Place power steering pump on the right side wheel apron.


B2M2293

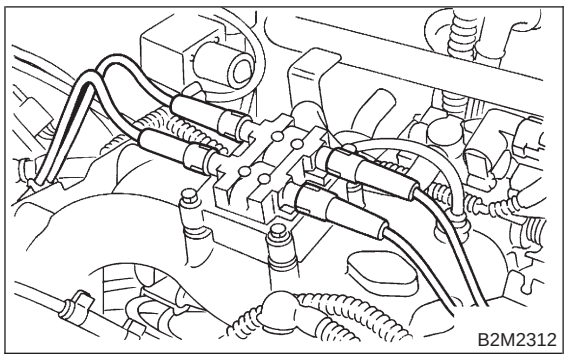
15) Remove fuel pipe protector LH. (LHD model only)


B2M2754

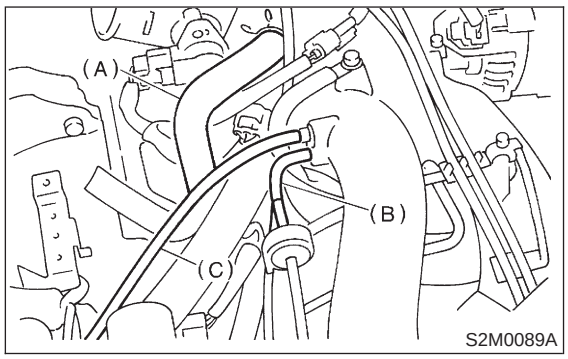
16) Remove fuel pipe protector RH. (RHD model only)


B2M2755

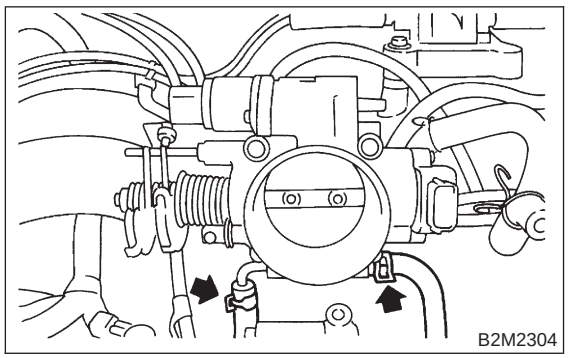
17) Disconnect spark plug cords from ignition coil and ignitor assembly.


B2M2312

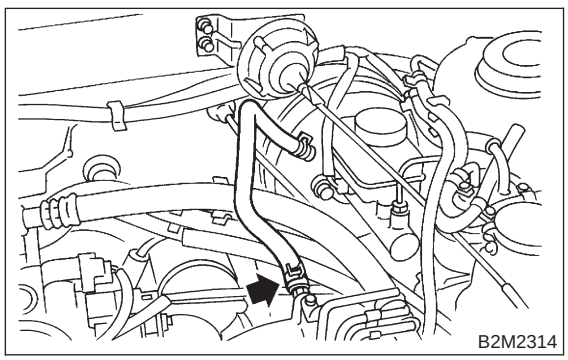
18) Disconnect PCV hose (A) and pressure regulator vacuum hose (B) from intake manifold.
19) Disconnect vacuum hose (C) to cruise control diaphragm. (With cruise control models)



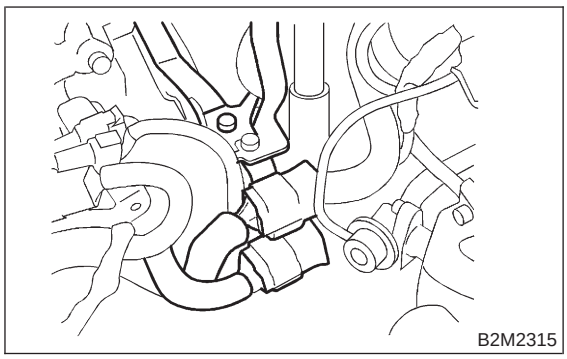
20) Disconnect engine coolant hose from throttle body.



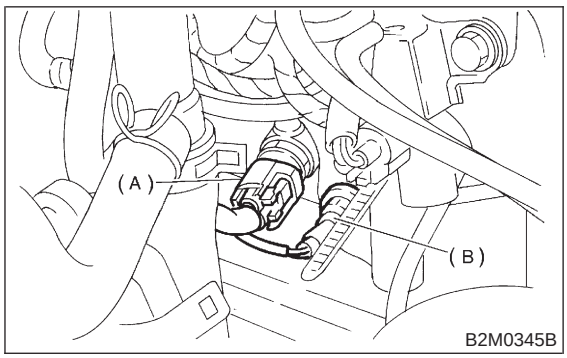
21) Disconnect brake booster hose.



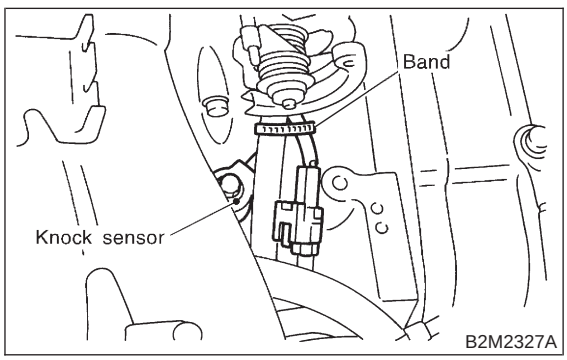
22) Remove air intake chamber stay RH, engine harness bracket from transmission housing, and disconnect engine harness connectors from bulkhead harness connectors.



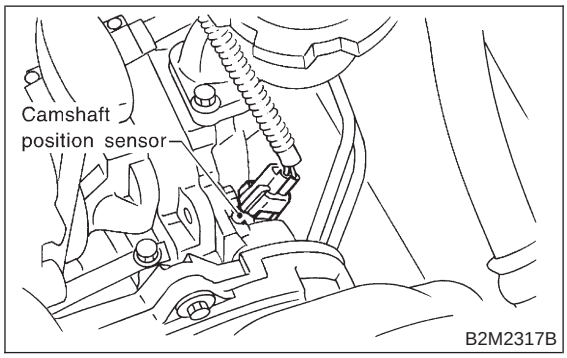
23) Disconnect connectors from engine coolant temperature sensor (A) and thermometer (B).



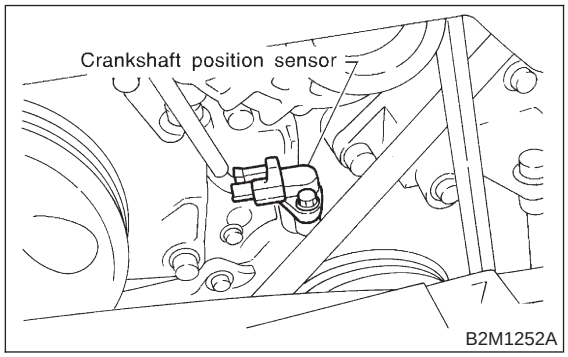
24) Disconnect knock sensor connector.



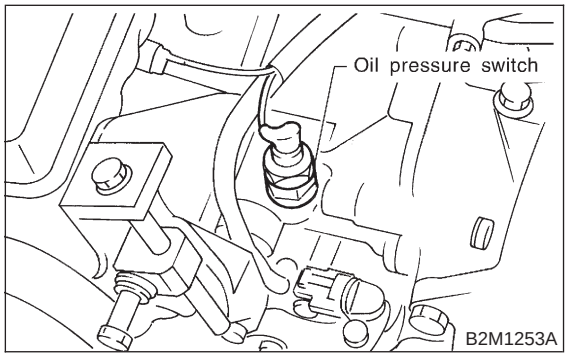
25) Disconnect connector from camshaft position sensor.



26) Disconnect connector from crankshaft position sensor.

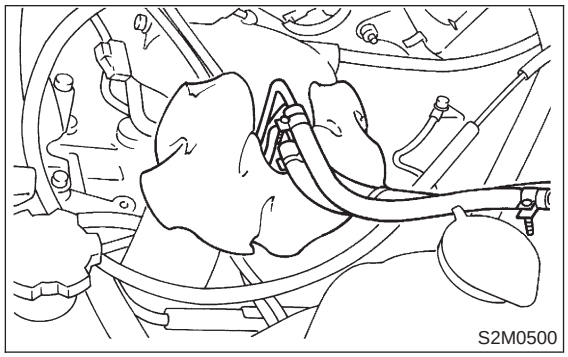


27) Disconnect connector from oil pressure switch.

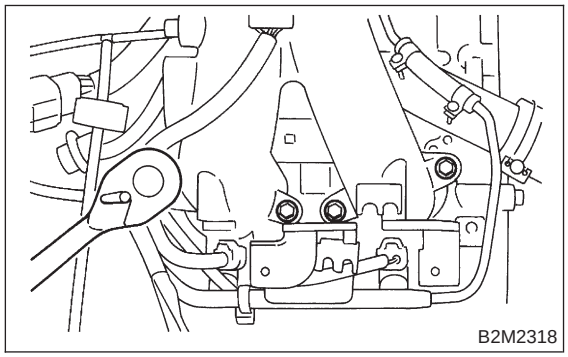


28) Disconnect fuel hoses from fuel pipes.

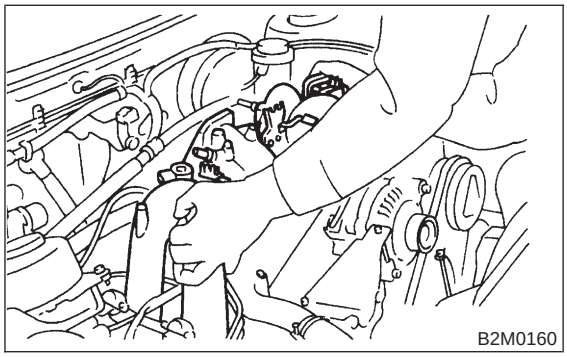
WARNING:
Catch fuel from hoses in a container.



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

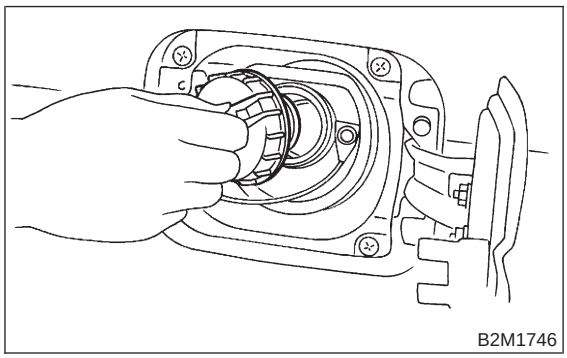


30) Remove intake manifold.

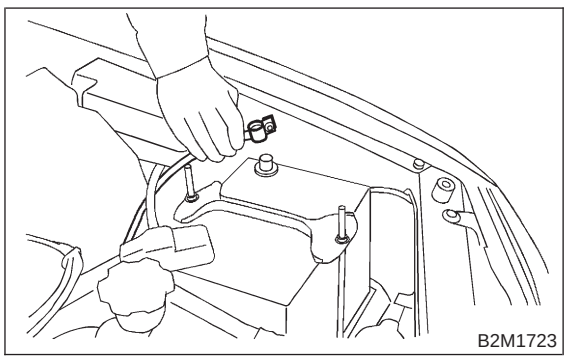


3. 2500 cc MODEL

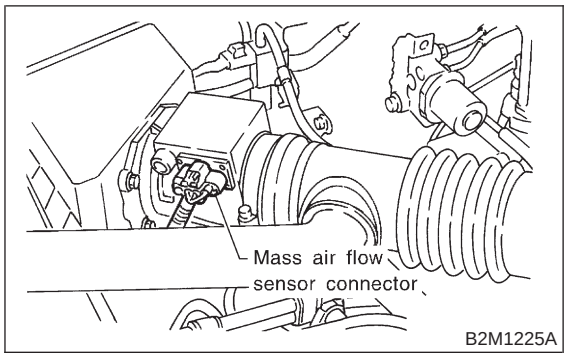
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



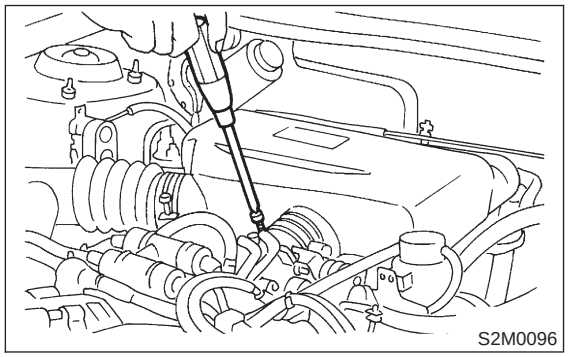
3) Disconnect battery ground cable.



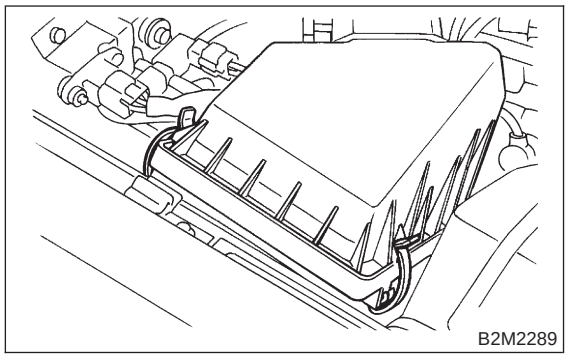
4) Disconnect connector from mass air flow sensor.



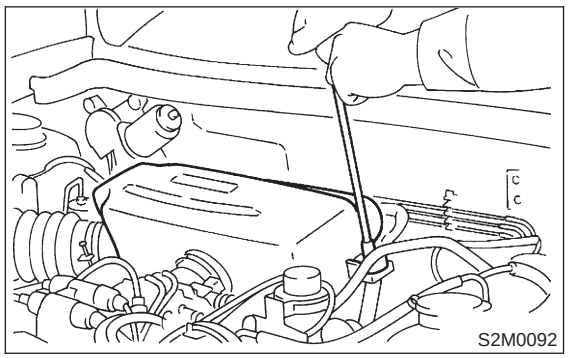
5) Loosen clamp which connects air intake chamber to throttle body.


S2M0096

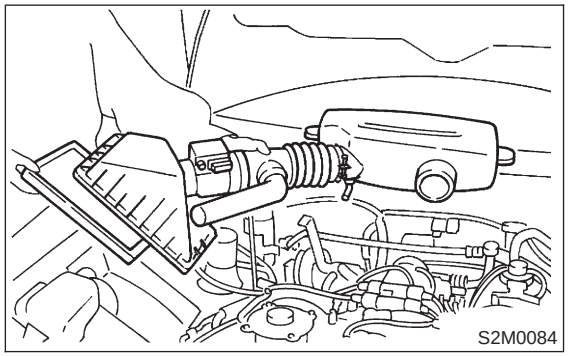
6) Remove two clips of air cleaner upper cover.


B2M2289

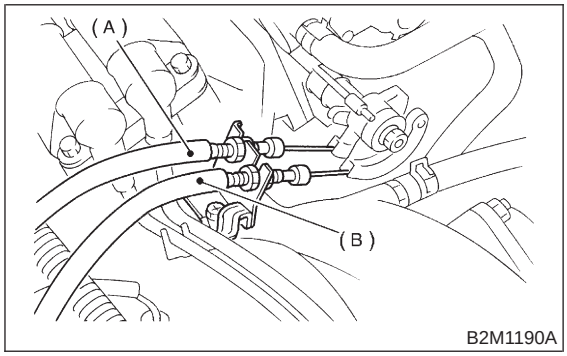
7) Remove bolts which install air intake chamber on stays.


S2M0092

8) Disconnect blow-by hose from air intake duct.
9) Remove air intake duct, air cleaner upper cover and air intake chamber as a unit.
10) Remove air cleaner element.

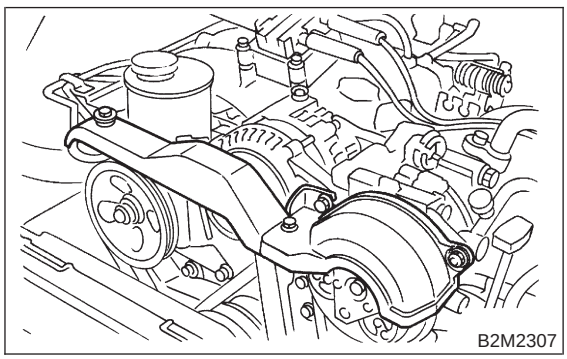

S2M0084

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

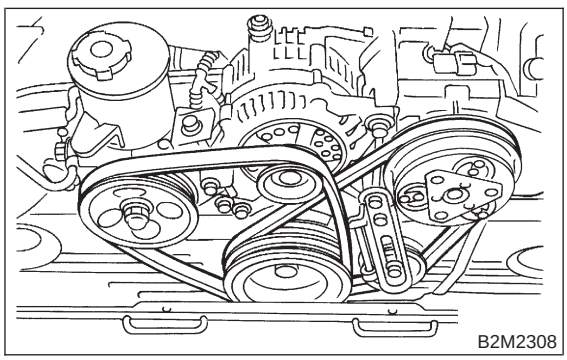


B2M1190A

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

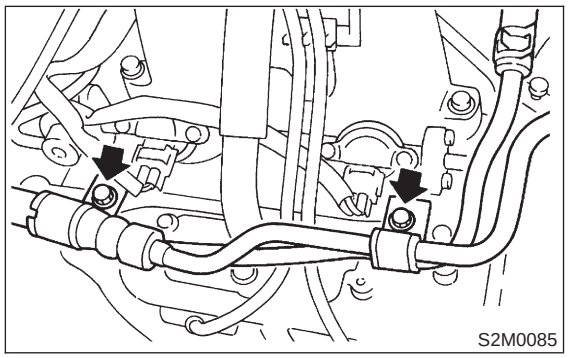

B2M2307

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

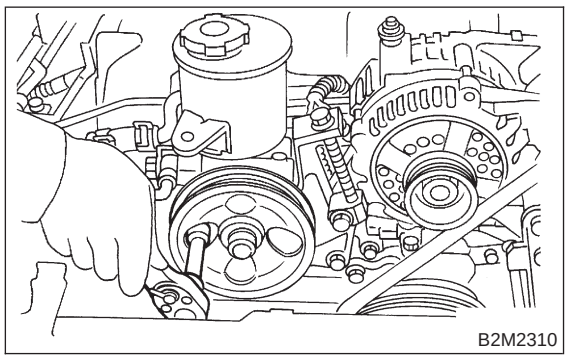

B2M2308

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

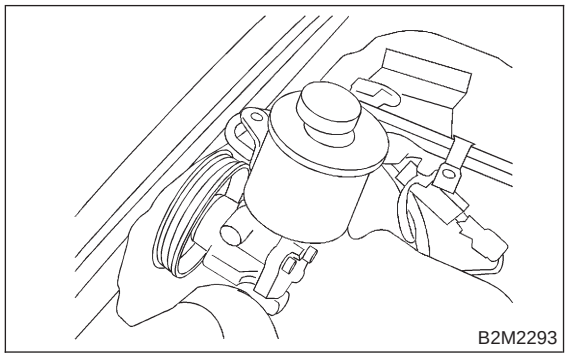
NOTE:
Do not disconnect power steering hose.


S2M0085

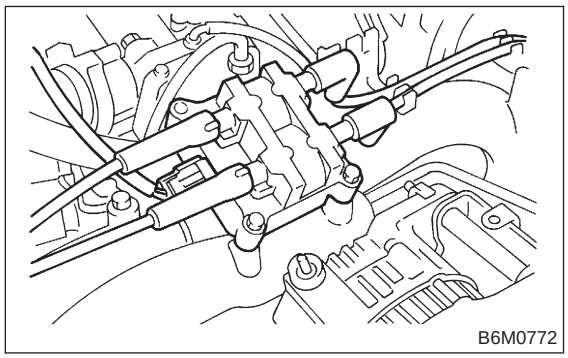
(4) Remove bolts which install power steering pump to bracket.


B2M2310

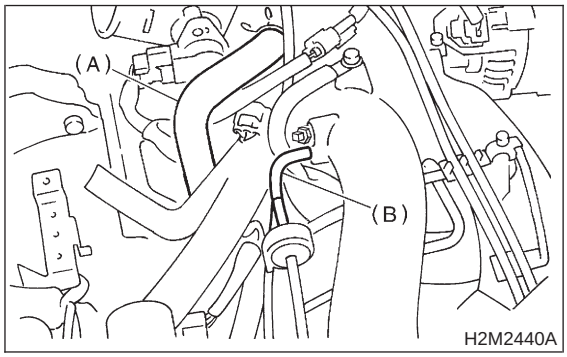
(5) Place power steering pump on the right side wheel apron.


B2M2293

14) Disconnect spark plug cords from ignition coil.

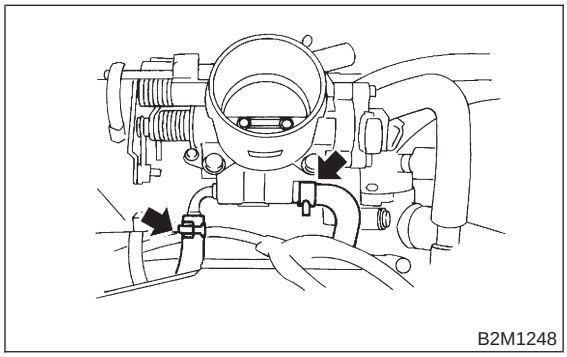

B6M0772

15) Disconnect PCV hose (A) and vacuum hose (B) from intake manifold.

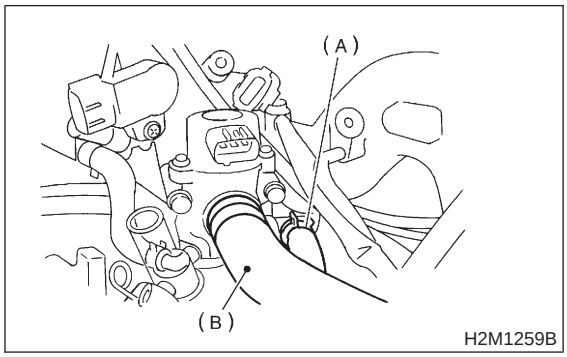


H2M2440A

16) Disconnect engine coolant hose from throttle body.

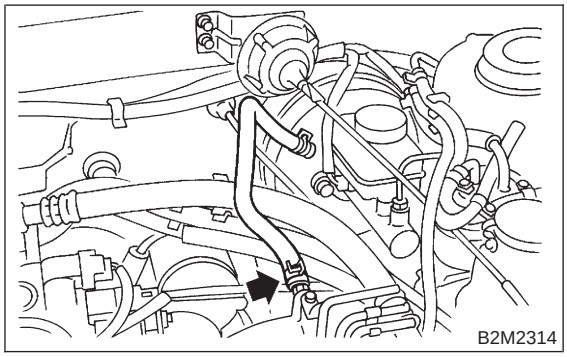

B2M1248

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

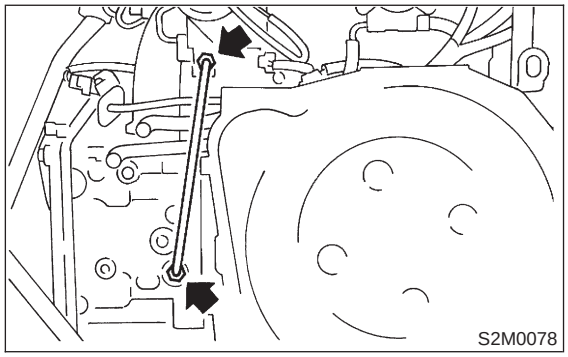


H2M1259B

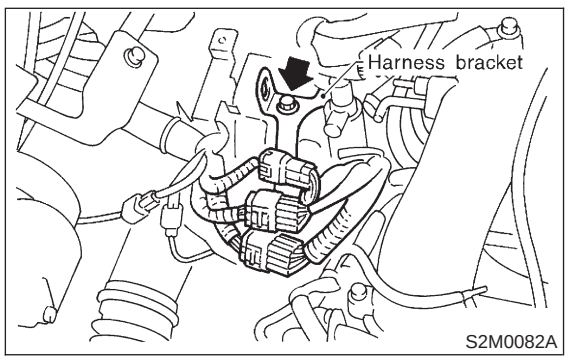
19) Disconnect brake booster hose.


B2M2314

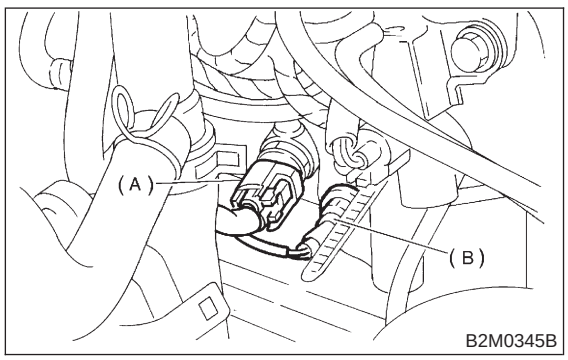
20) Remove EGR pipe.



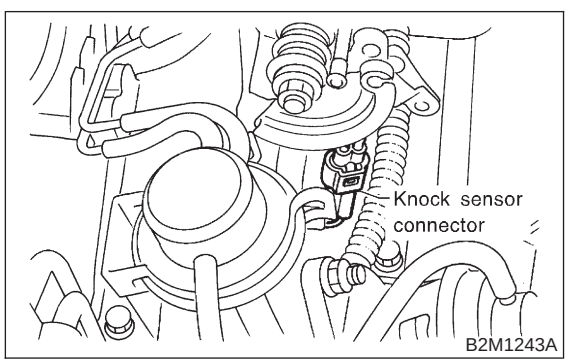
21) Remove engine harness bracket from transmission housing, and disconnect engine harness connectors from bulkhead harness connectors.



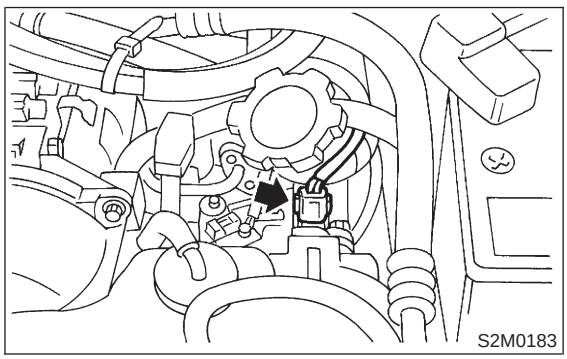
22) Disconnect connectors from engine coolant temperature sensor (A) and thermometer (B).



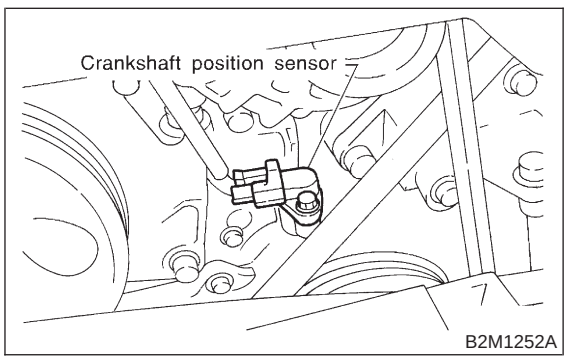
23) Disconnect knock sensor connector.



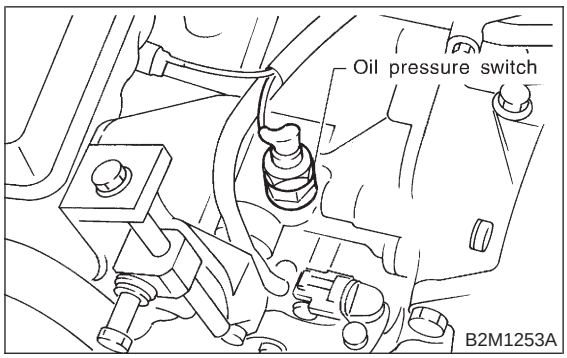
24) Disconnect connector from camshaft position sensor.



25) Disconnect connector from crankshaft position sensor.

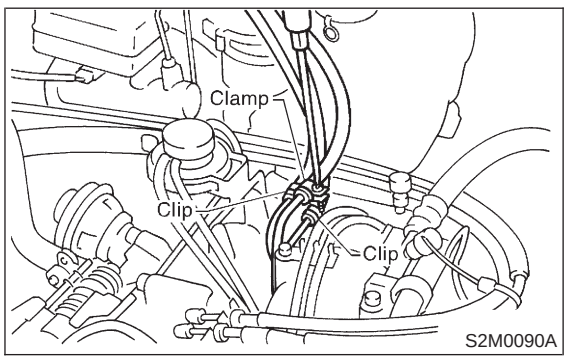


26) Disconnect connector from oil pressure switch

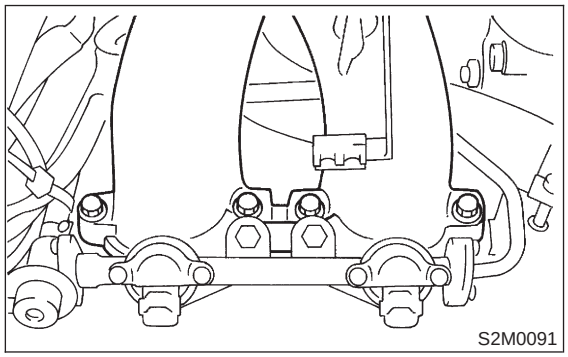


27) Disconnect fuel hoses from fuel pipes.

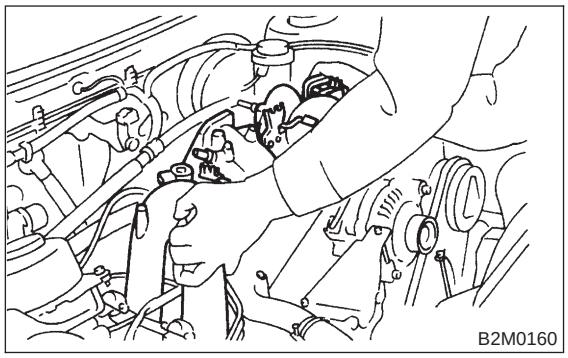
WARNING:
Catch fuel from hoses in a container.



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


S2M0091

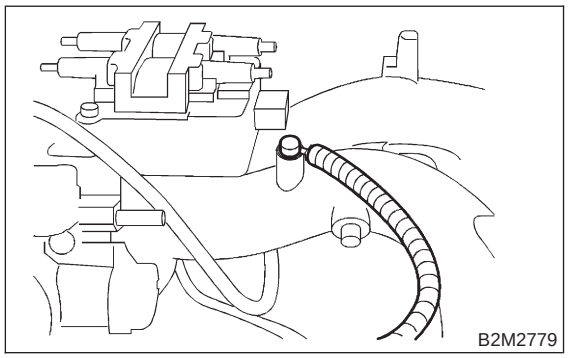
29) Remove intake manifold.


B2M0160

B: DISASSEMBLY

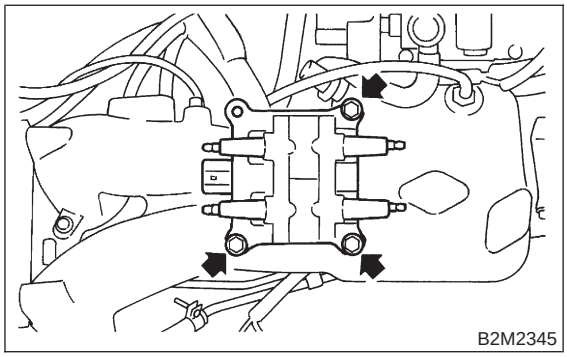
1. 2200 cc CALIFORNIA SPEC. VEHICLES

1) Disconnect engine ground terminal from intake manifold.

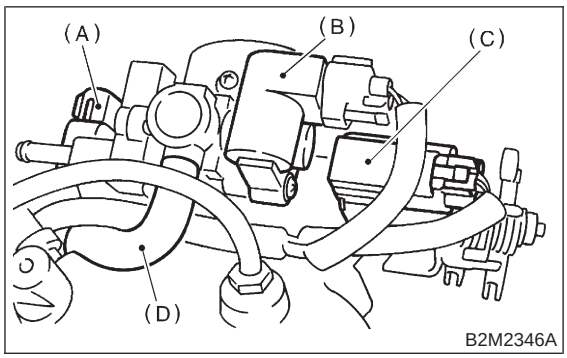

B2M2779

2) Disconnect connector from ignition coil and ignitor assembly.

3) Remove ignition coil and ignitor assembly.

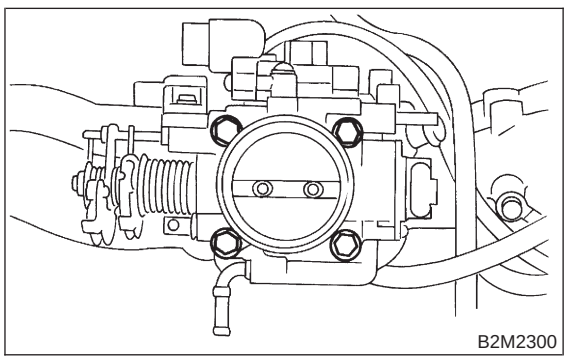

B2M2345

4) Disconnect connectors from throttle position sensor (A), idle air control solenoid valve (B) and intake manifold pressure sensor (C).
5) Disconnect air by-pass hose (D) from idle air control solenoid valve.



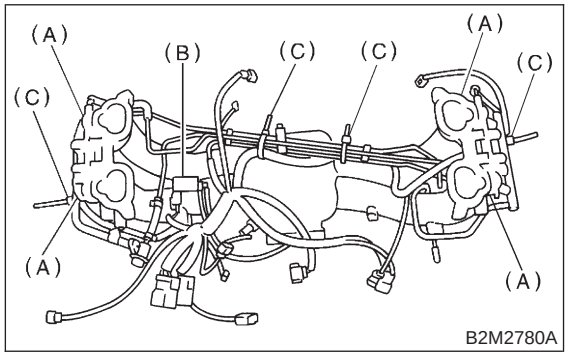
B2M2346A

6) Remove throttle body.


B2M2300

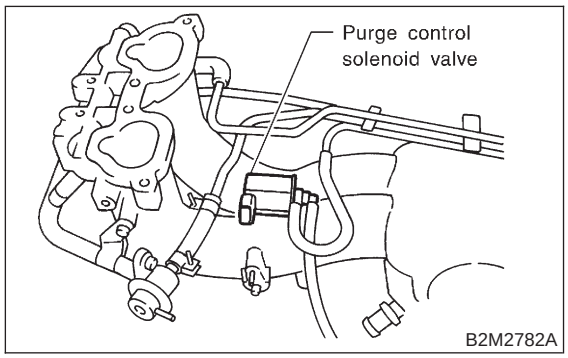
7) Disconnect connectors from fuel injectors, and purge control solenoid valve.

8) Remove harness bands which hold engine harness onto intake manifold.
9) Remove engine harness from intake manifold.

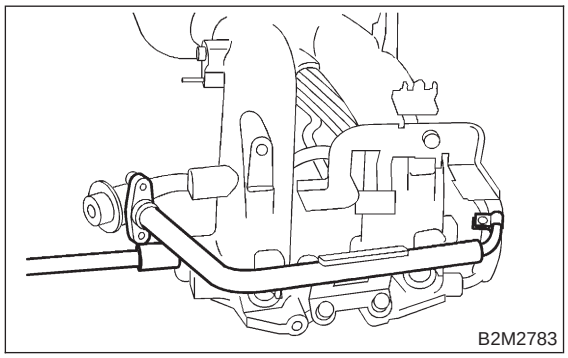


(A) Fuel injector
(B) Purge control solenoid valve
(C) Harness band

10) Remove purge control solenoid valve.

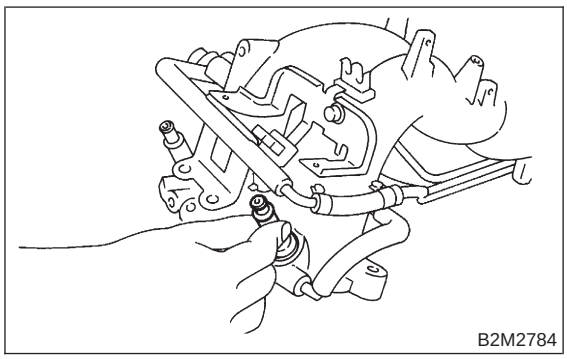


11) Remove bolts which install injector pipe on intake manifold.

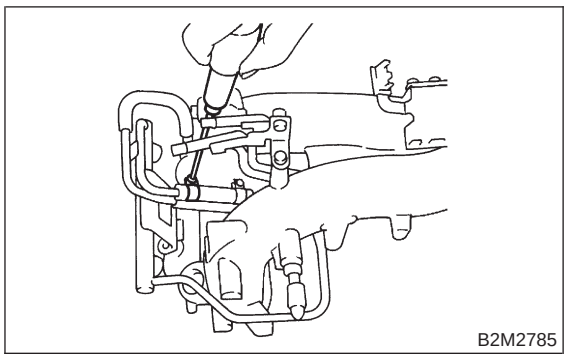


12) Remove fuel injectors.

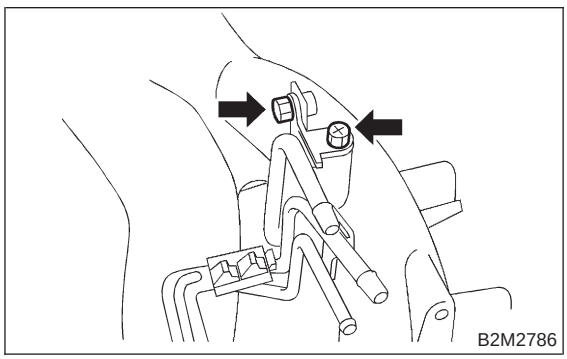
CAUTION:
Replace o-rings and insulators with new ones.



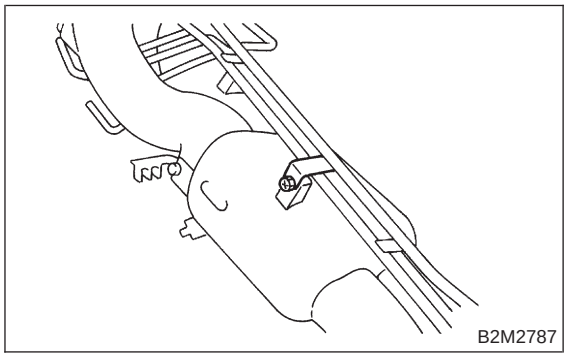
13) Loosen clamp which holds front left side fuel hose to injector pipe.



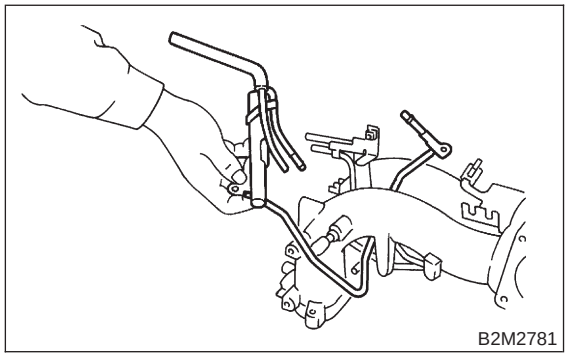
14) Remove bolts which hold fuel pipes on the left side of intake manifold.



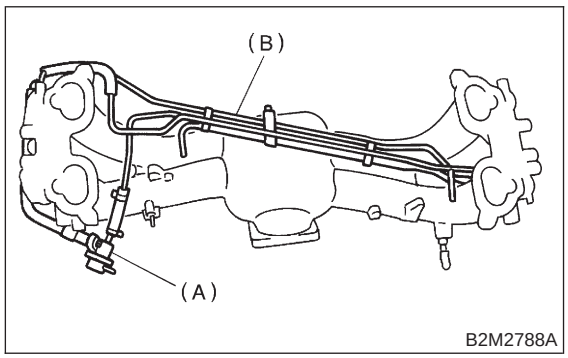
15) Remove two bolts which install fuel pipes on intake manifold.



16) Remove fuel injector pipe.



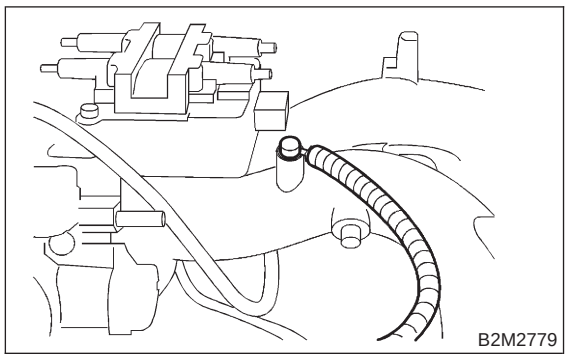
17) Remove fuel pipes, etc. from intake manifold.



(A) Pressure regulator
(B) Fuel pipe ASSY

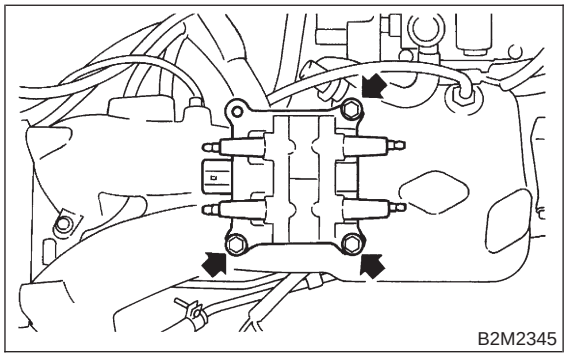
2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

1) Remove engine ground terminal from intake manifold.

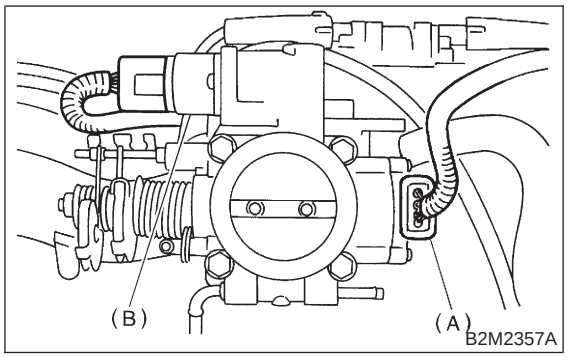


2) Disconnect connector from ignition coil and ignitor assembly.

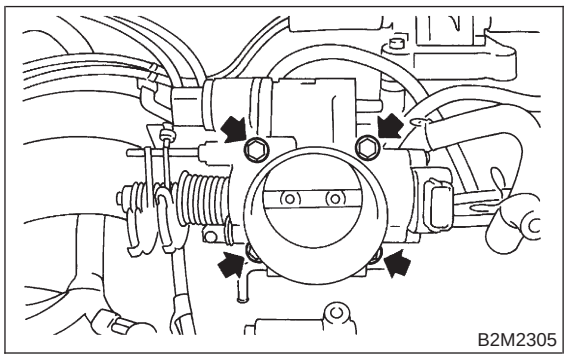
3) Remove ignition coil and ignitor assembly.



4) Disconnect connectors from throttle position sensor (A) and idle air control solenoid valve (B).

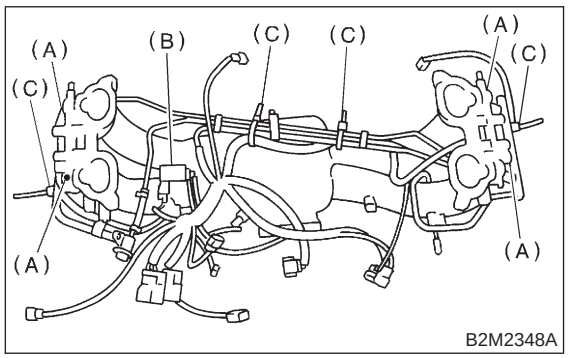


5) Remove throttle body.



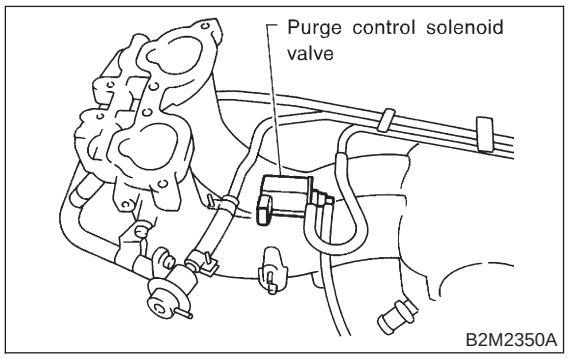
6) Disconnect connectors from fuel injectors, and purge control solenoid valve.

7) Remove harness bands which hold engine harness onto intake manifold.
8) Remove engine harness from intake manifold.

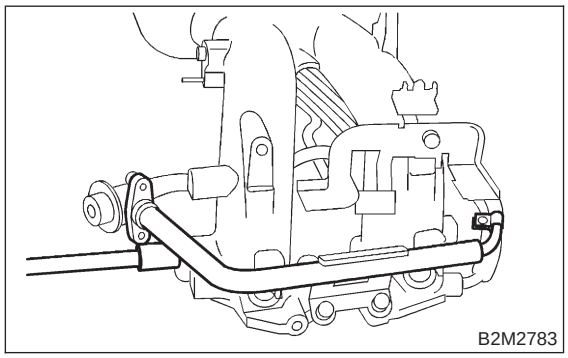


(A) Fuel injector
(B) Purge control solenoid valve
(C) Harness band

9) Remove purge control solenoid valve.

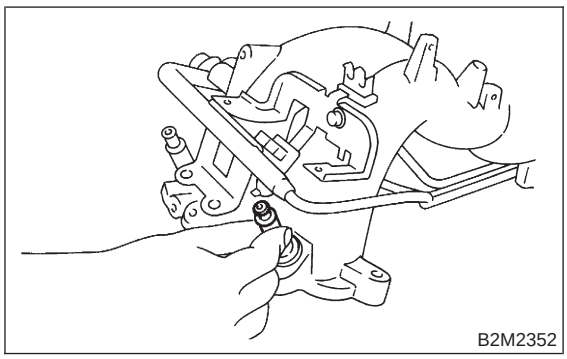


10) Remove bolts which install injector pipe on intake manifold.

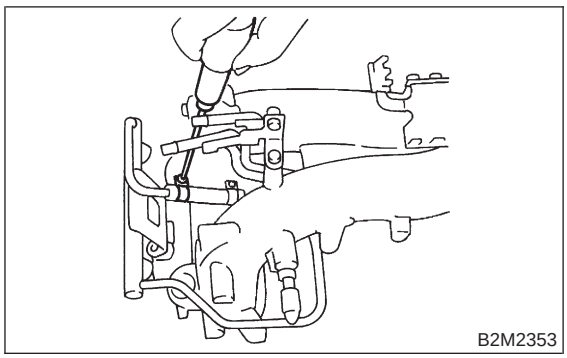


11) Remove fuel injectors.

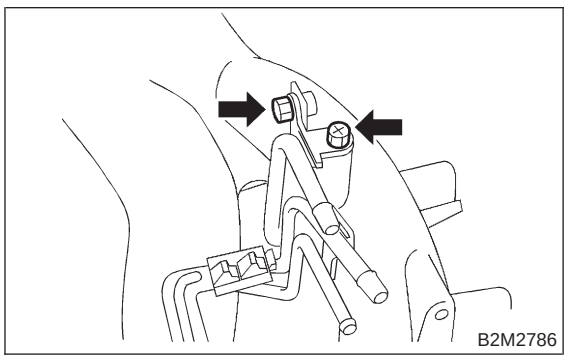
CAUTION:
Replace o-rings and insulators with new ones.



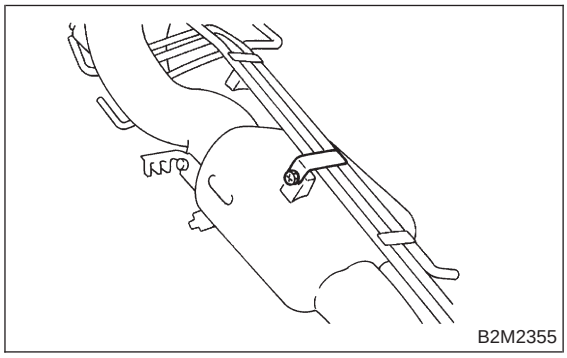
12) Loosen clamp which holds front left side fuel hose to injector pipe.



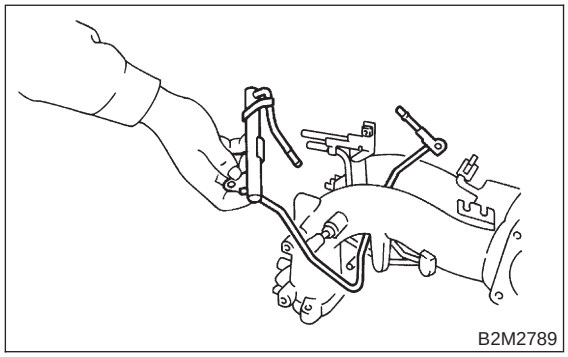
13) Remove bolts which hold fuel pipes on the left side of intake manifold.



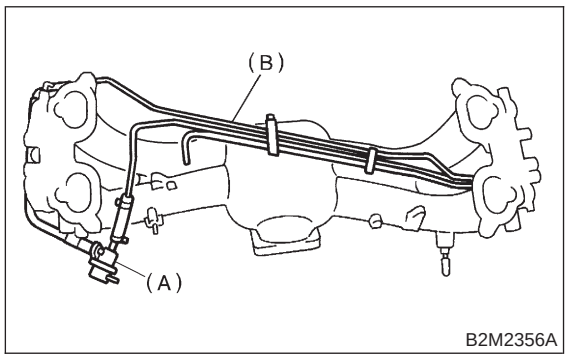
14) Remove two bolts which install fuel pipes on intake manifold.



15) Remove fuel injector pipe.



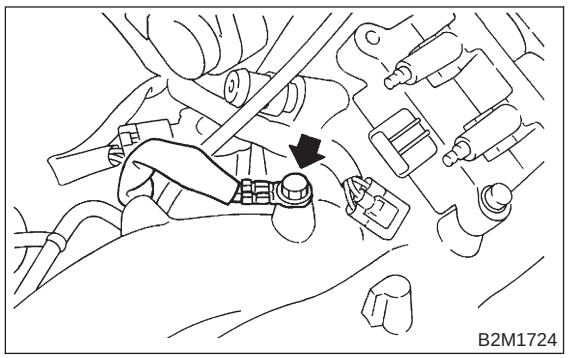
16) Remove fuel pipes, etc. from intake manifold.



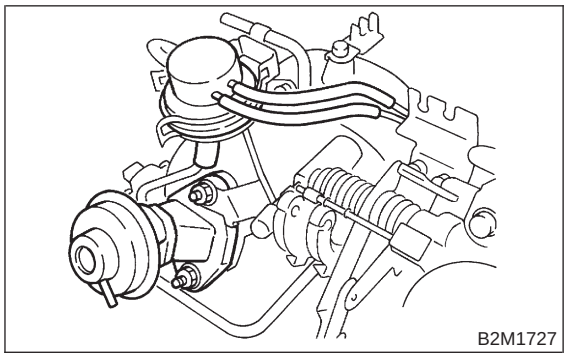
(A) Pressure regulator
(B) Fuel pipe ASSY

3. 2500 cc MODEL

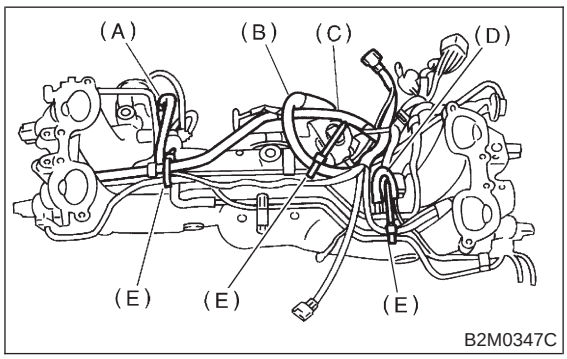
1) Disconnect engine ground terminal from intake manifold.



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

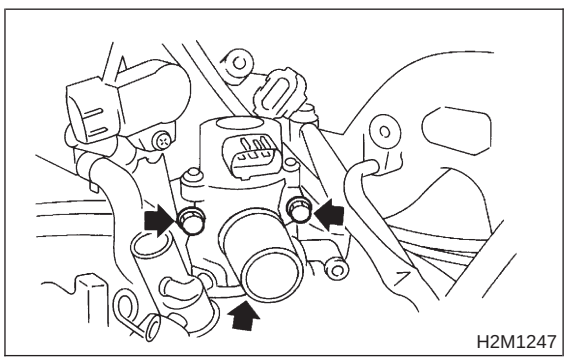


7) Disconnect connectors from throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve.

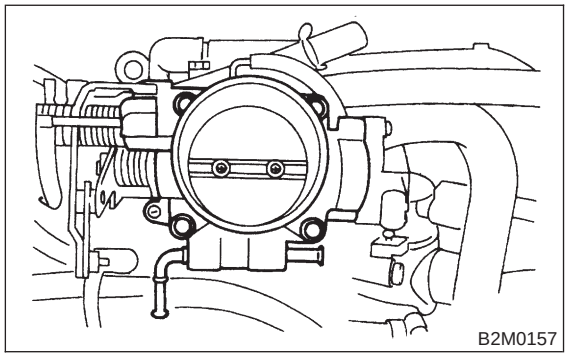


(A) EGR solenoid valve
(B) Throttle position sensor
(C) Idle air control solenoid valve
(D) Purge control solenoid valve
(E) Harness band

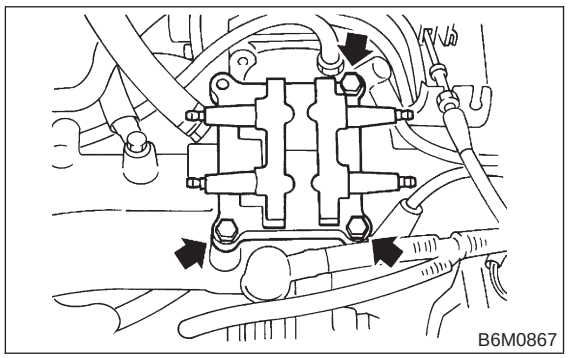
8) Remove engine harness from intake manifold.
9) Remove idle air control solenoid valve from intake manifold.



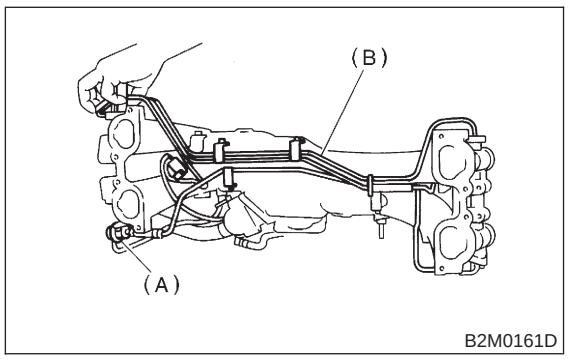
10) Remove throttle body from intake manifold.



11) Remove ignition coil.

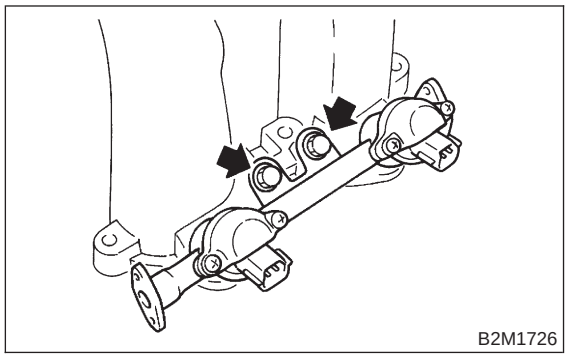


12) Remove fuel pipes, etc. from intake manifold.



(A) Pressure regulator
(B) Fuel pipe ASSY

13) Remove fuel injector pipes.

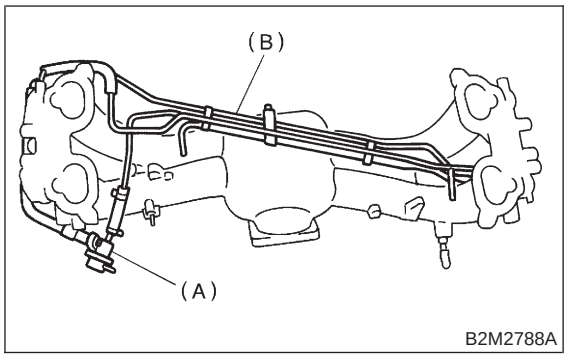


14) Remove EGR solenoid valve and purge control solenoid valve.

C: ASSEMBLY

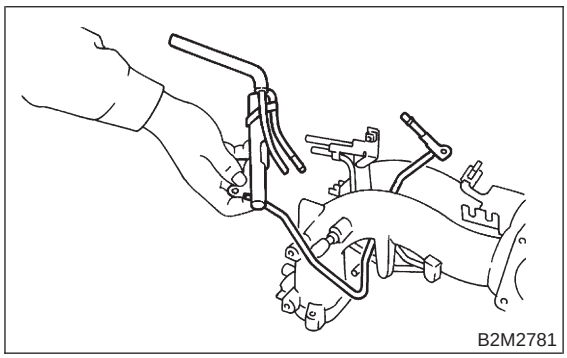
1. 2200 cc CALIFORNIA SPEC. VEHICLES

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

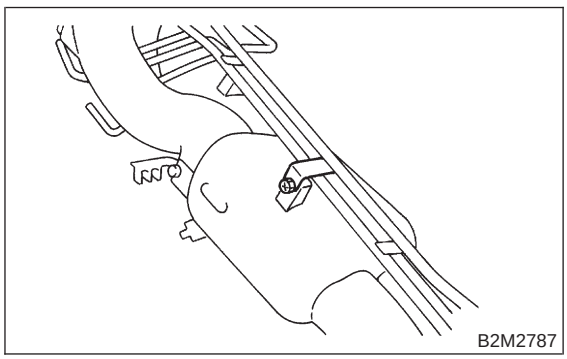


(A) Pressure regulator
(B) Fuel pipe ASSY

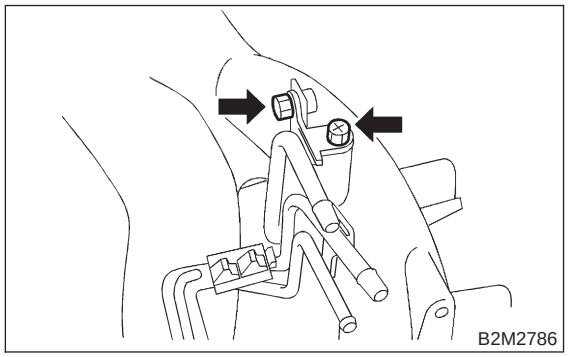
2) Install fuel injector pipe.



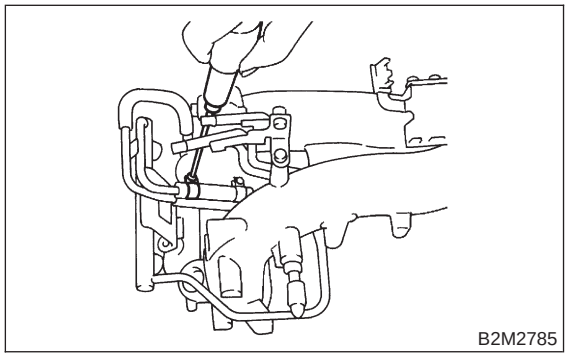
3) Tighten two bolts which install fuel pipes on intake manifold.



4) Tighten two bolts which install fuel pipes on the left side of intake manifold.

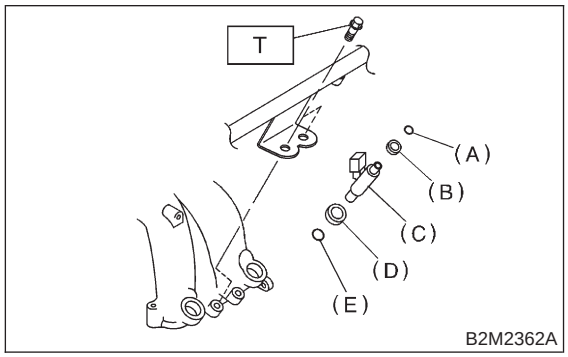


5) Connect left side fuel hose to injector pipe, and tighten clamp screw.



6) Install fuel injectors.

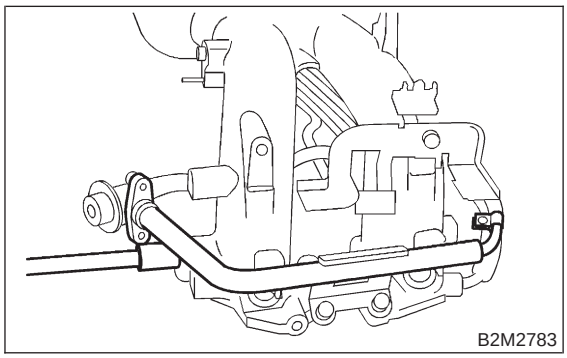
CAUTION:
Always use new o-rings and insulators.



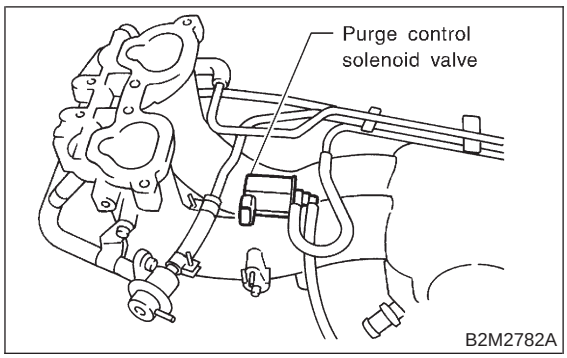
(A) O-ring A
(B) Insulator A
(C) Fuel injector
(D) Insulator B
(E) O-ring B

7) Tighten bolts which install injector pipe on intake manifold.

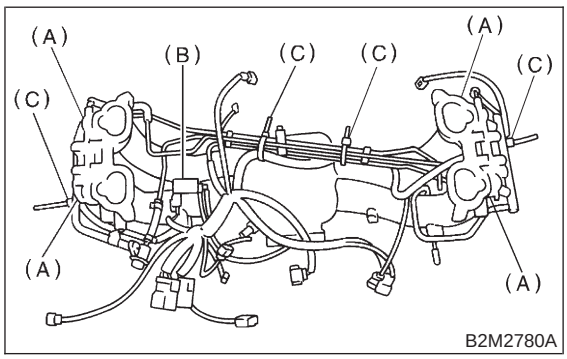
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)



8) Install purge control solenoid valve.



9) Install engine harness onto intake manifold.
10) Connect connectors to fuel injectors and purge control solenoid valve.
11) Hold engine harness by harness bands.

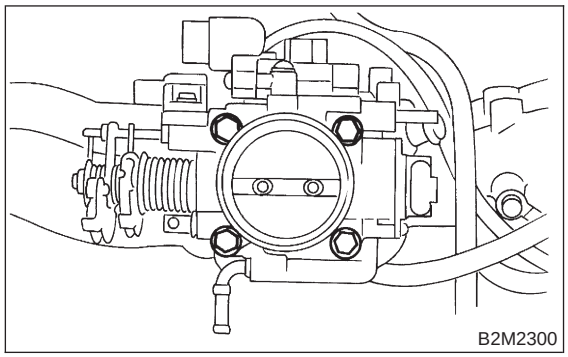


(A) Fuel injector
(B) Purge control solenoid valve
(C) Harness band

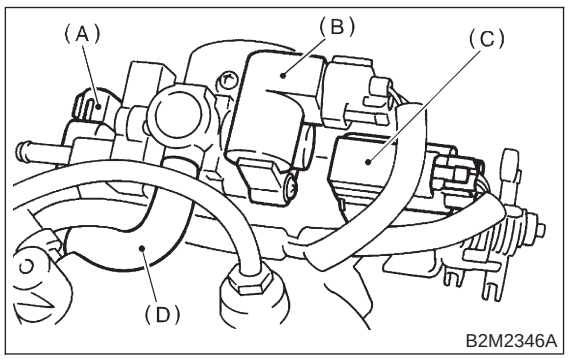
12) Assemble throttle body to intake manifold.

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)

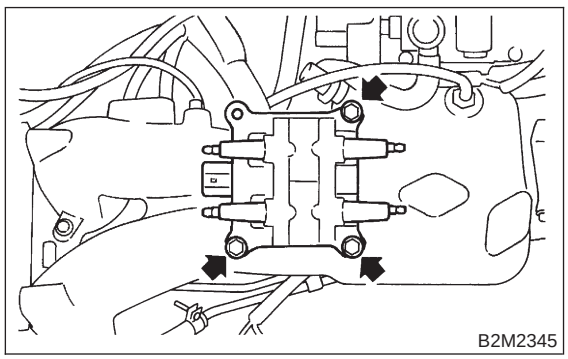

B2M2300

13) Connect connectors to throttle position sensor (A), idle air control solenoid valve (B) and intake manifold pressure sensor (C).
14) Connect air by-pass hose (D) to idle air control solenoid valve.



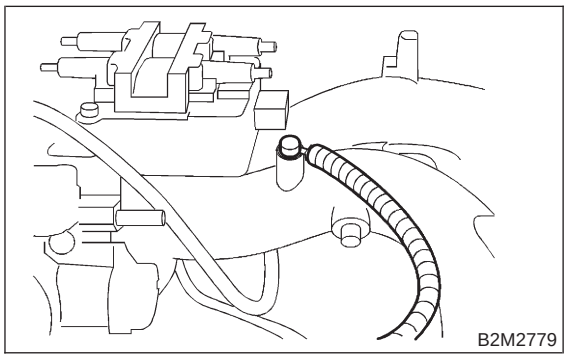
B2M2346A

15) Install ignition coil and ignitor assembly.
16) Connect connector to ignition coil and ignitor assembly.


B2M2345

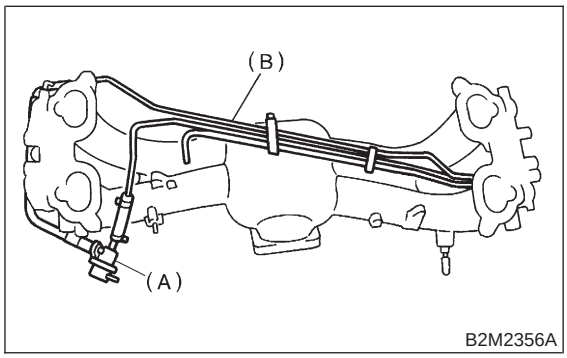
17) Install engine ground terminal to intake manifold.

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


B2M2779

2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

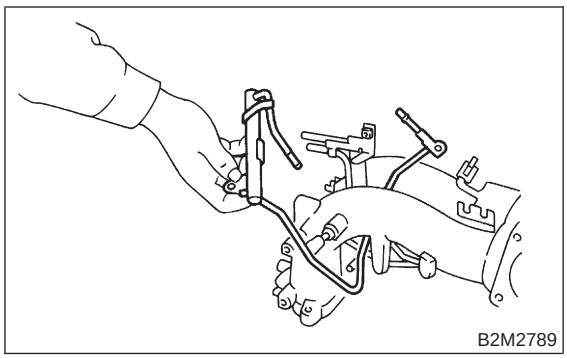
1) Assemble fuel pipes, etc. to intake manifold.



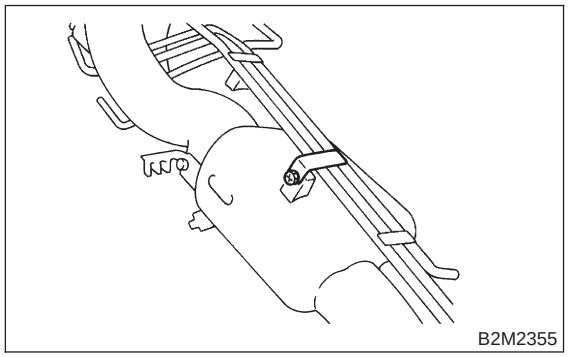
B2M2356A

(A) Pressure regulator
(B) Fuel pipe ASSY

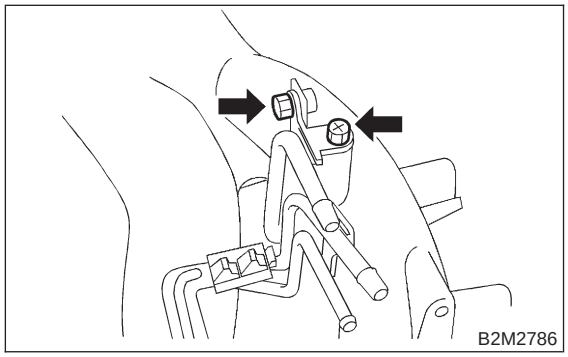
2) Install fuel injector pipe.


B2M2789

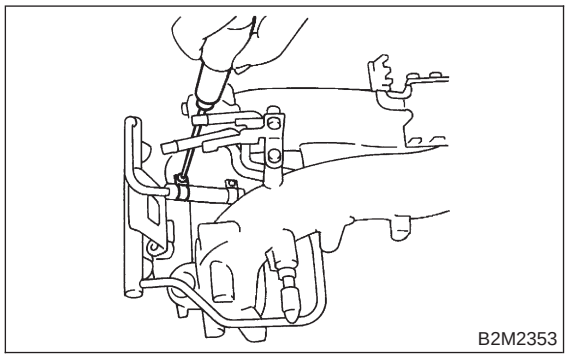
3) Tighten two bolts which install fuel pipes on intake manifold.



4) Tighten two bolts which install fuel pipes on the left side of intake manifold.

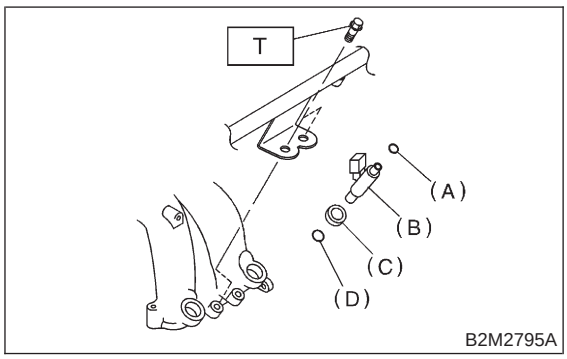


5) Connect left side fuel hose to injector pipe, and tighten clamp screw.



6) Install fuel injectors.

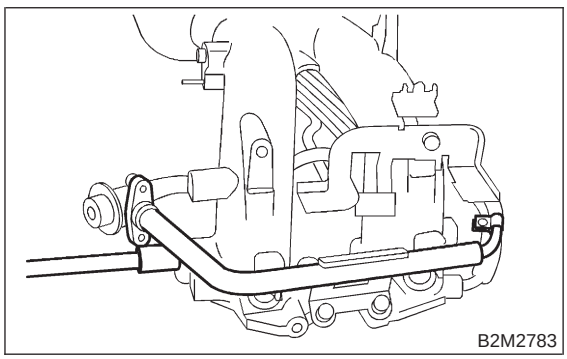
CAUTION:
Always use new o-rings and insulators.



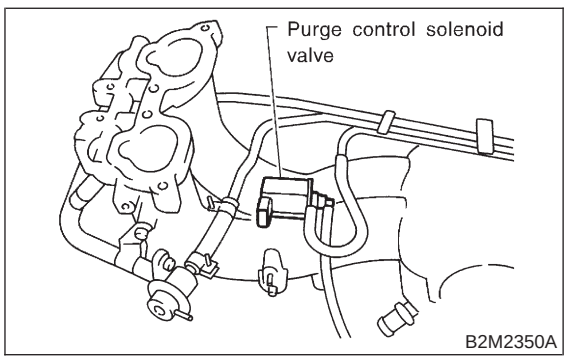
(A) O-ring A
(B) Fuel injector
(C) Insulator
(D) O-ring B

7) Tighten bolts which install injector pipe on intake manifold.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

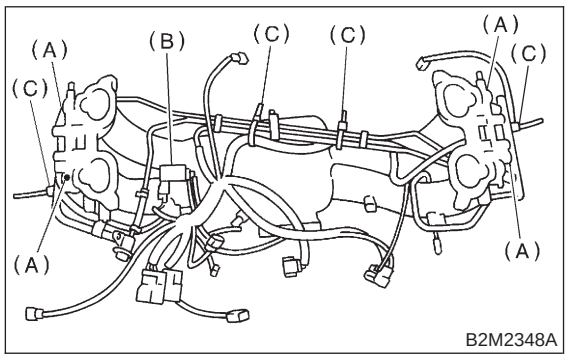


8) Install purge control solenoid valve.



9) Install engine harness onto intake manifold.

10) Connect connectors to fuel injectors and purge control solenoid valve.
11) Hold engine harness by harness bands.

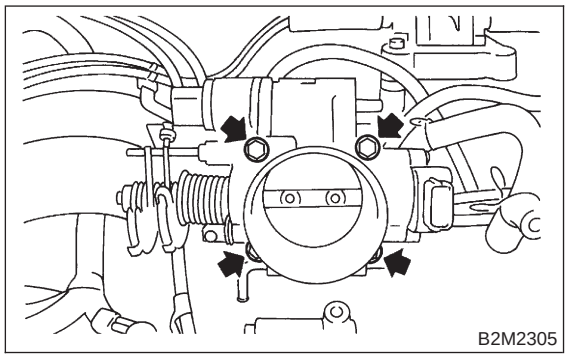


(A) Fuel injector
(B) Purge control solenoid valve
(C) Harness band

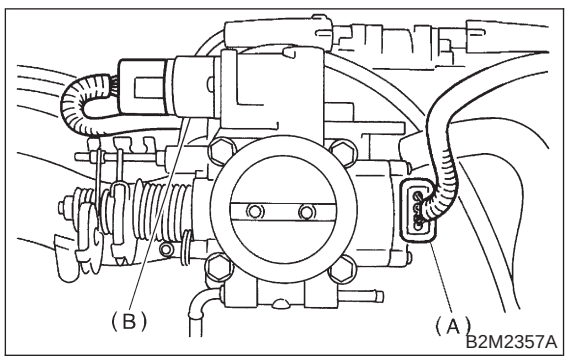
12) Assemble throttle body to intake manifold.

CAUTION:
Replace gasket with a new one.

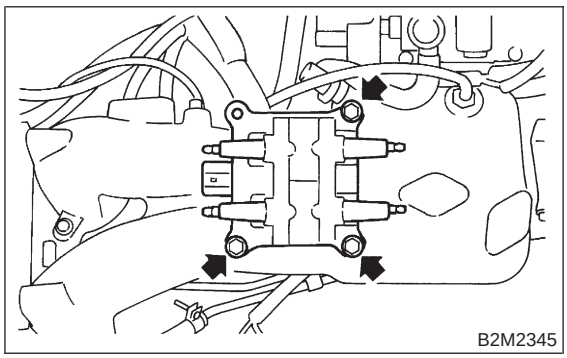
Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)



13) Connect connectors to throttle position sensor (A) and idle air control solenoid valve (B).

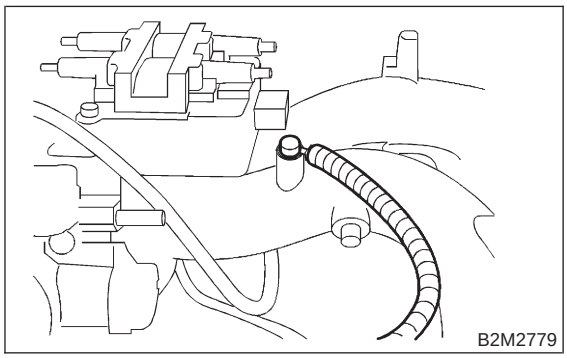


14) Install ignition coil and ignitor assembly.
15) Connect connector to ignition coil and ignitor assembly.



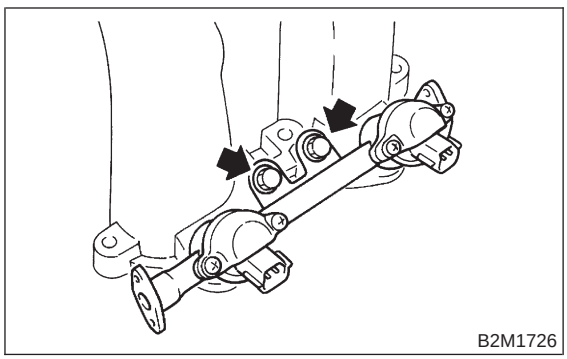
16) Install engine ground terminal to intake manifold.

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

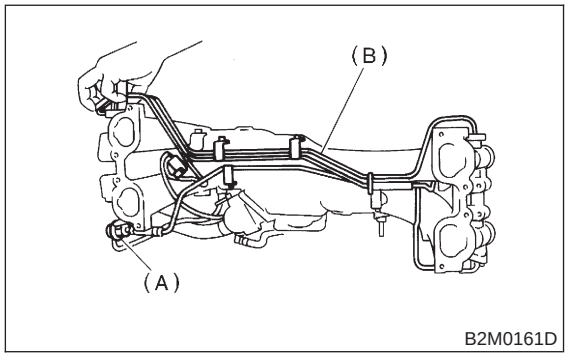


3. 2500 cc MODEL

1) Install EGR solenoid valve and purge control solenoid valve.
2) Install fuel injector pipes.

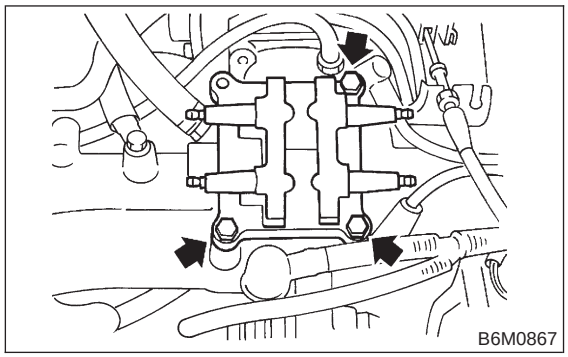


3) Assemble fuel pipes, etc. to intake manifold.



(A) Pressure regulator
(B) Fuel pipe ASSY

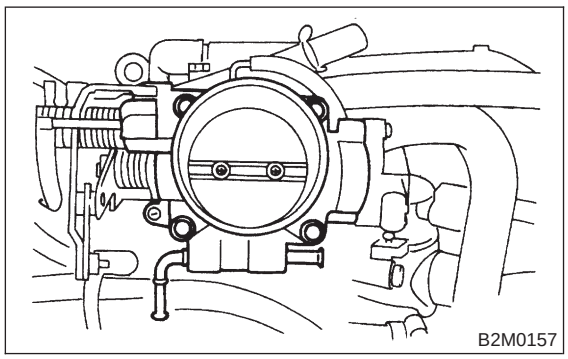
4) Install ignition coil.



5) Assemble throttle body to intake manifold.

CAUTION:
Replace gasket with a new one.

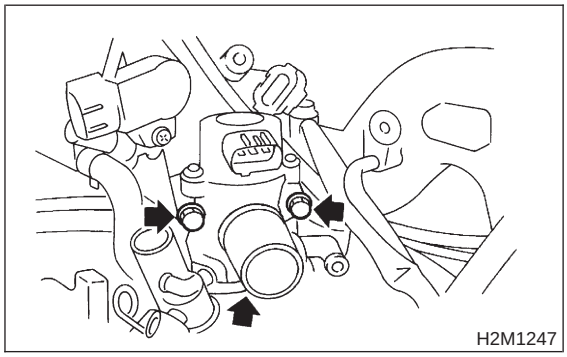
Tightening torque:
22±2 N·m (2.2±0.2 kg-m, 15.9±1.4 ft-lb)



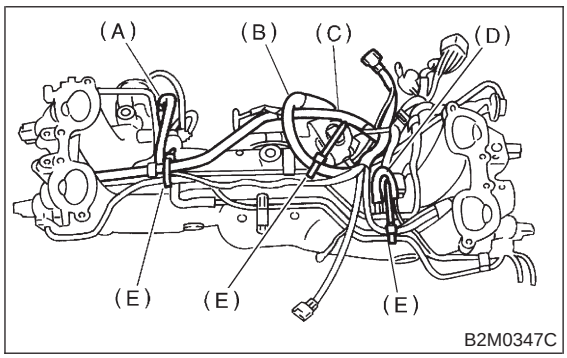
6) Install idle air control solenoid valve to intake manifold.

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)



7) Install engine harness onto intake manifold.
8) Connect connectors to throttle position sensor, ignition coil, fuel injectors, idle air control solenoid valve, purge control solenoid valve and EGR solenoid valve.



(A) EGR solenoid valve
(B) Throttle position sensor
(C) Idle air control solenoid valve
(D) Purge control solenoid valve
(E) Harness band

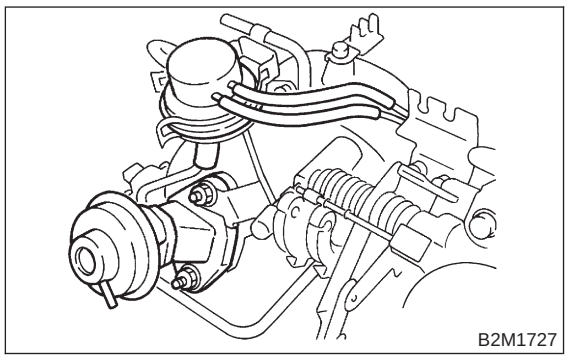
9) Install EGR valve.

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)

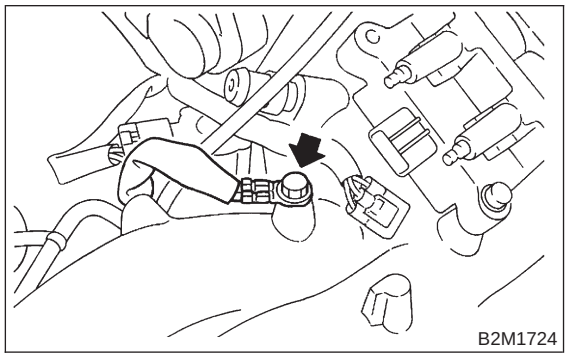
10) Install BPT with BPT holder bracket.

11) Connect BPT hoses from EGR solenoid valve and intake manifold.
12) Connect back pressure hose from pipe.
13) Connect EGR vacuum hose from EGR valve.



14) 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)



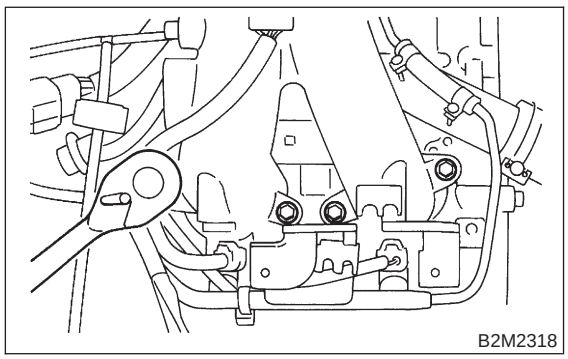
D: INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

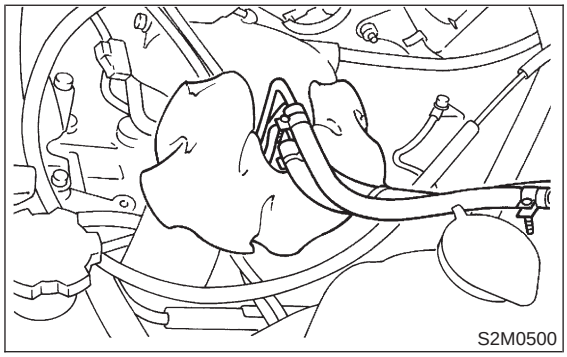
1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

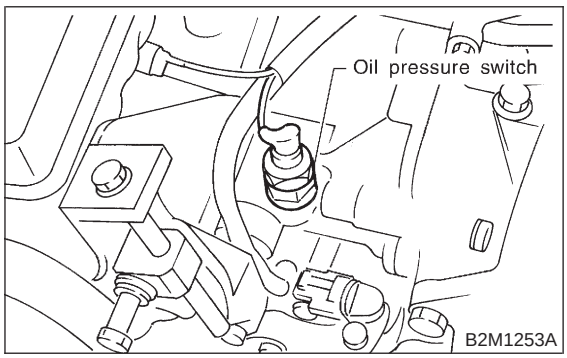
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



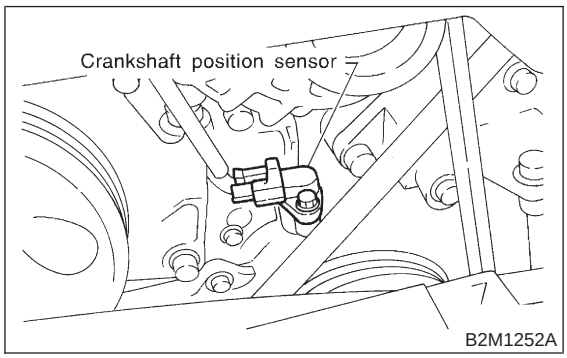
2) Connect fuel hoses.



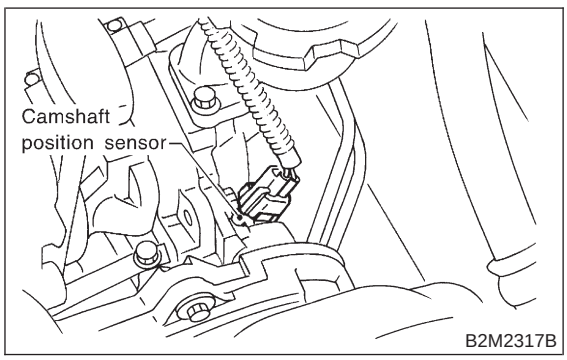
3) Connect connector to oil pressure switch.



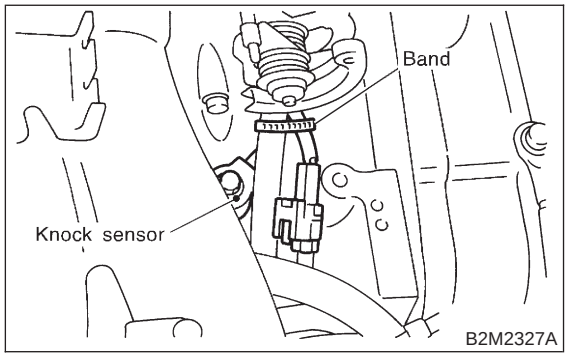
4) Connect connector to crankshaft position sensor.



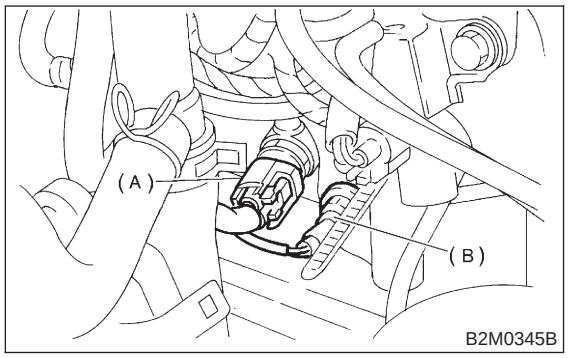
5) Connect connector to camshaft position sensor.



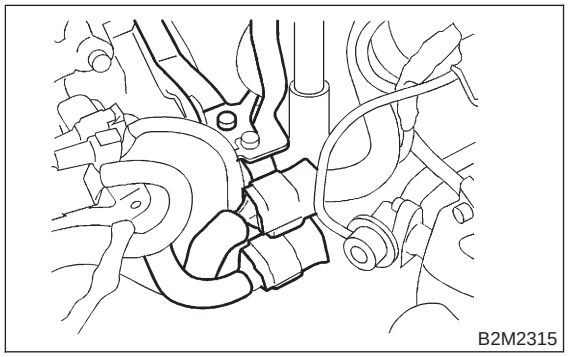
6) Connect knock sensor connector.



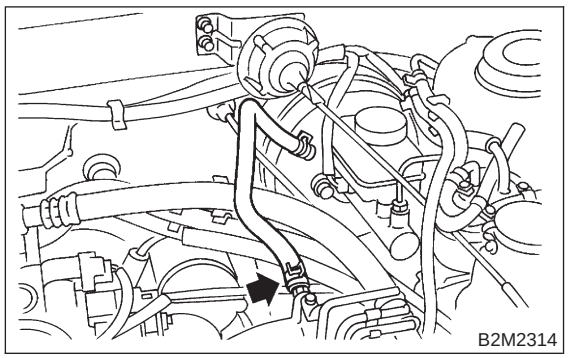
7) Connect connectors to engine coolant temperature sensor (A) and thermometer (B).



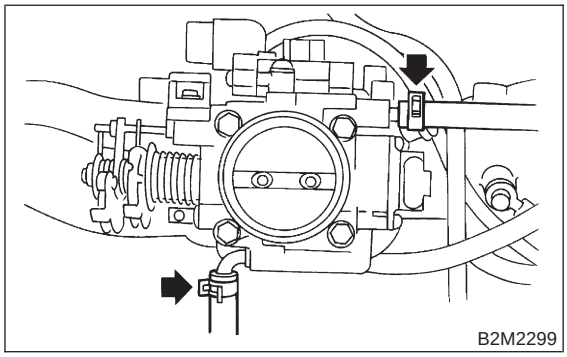
8) Hold engine harness connector onto bracket.
9) Install air cleaner case stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



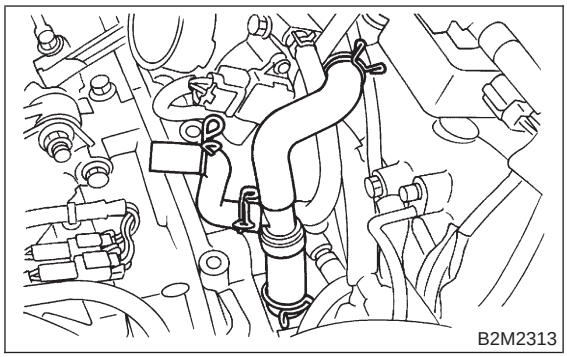
10) Connect brake booster hose.



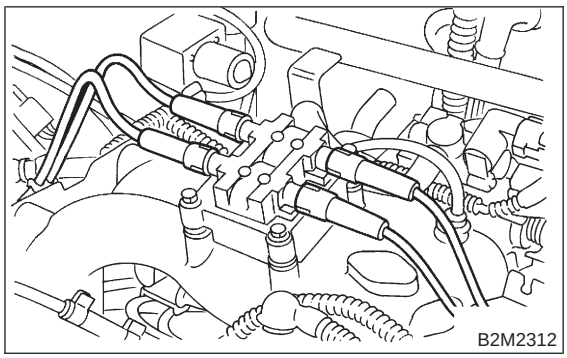
11) Connect engine coolant hose to throttle body.



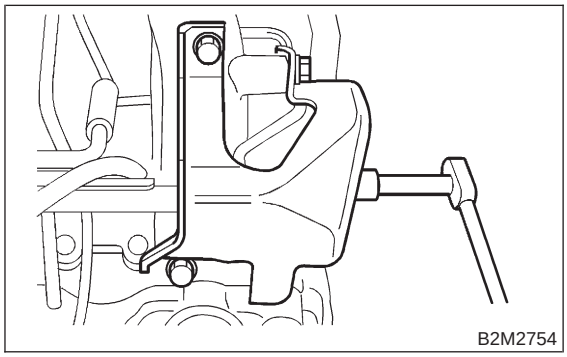
12) Connect PCV hose (A) and pressure regulator vacuum hose (B) to intake manifold.



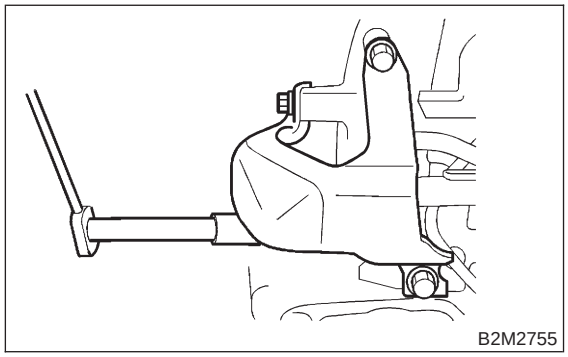
13) Connect spark plug cords to ignition coil and ignitor assembly.



14) Install fuel protector LH. (LHD model only)

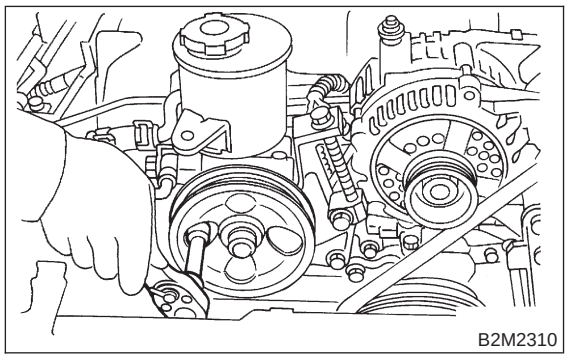


15) Install fuel protector RH. (RHD model only)

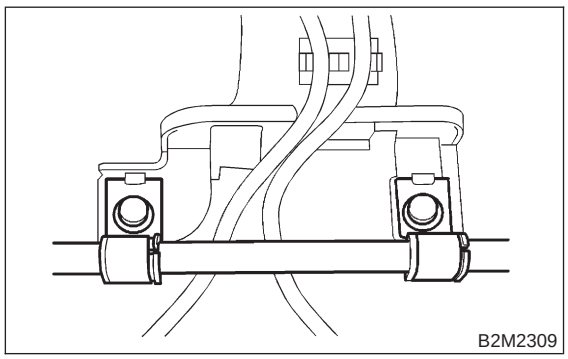

B2M2755

16) Install power steering pump on bracket.
(1) Tighten bolts which install power steering pump on bracket.

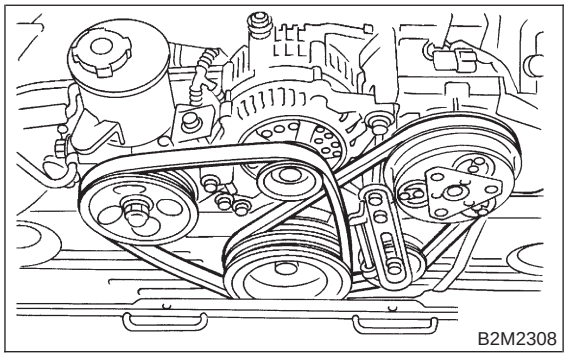
Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)


B2M2310

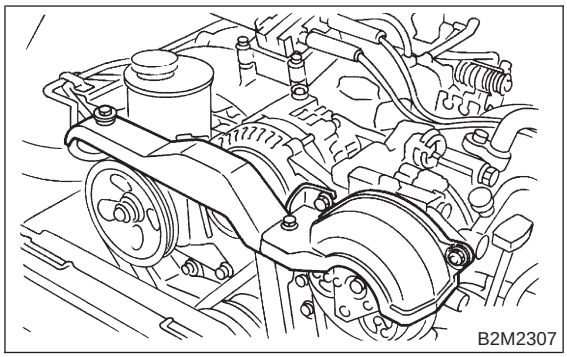
(2) Install power steering pipe brackets on the right side of intake manifold.


B2M2309

(3) Install power steering pump drive V-belt.

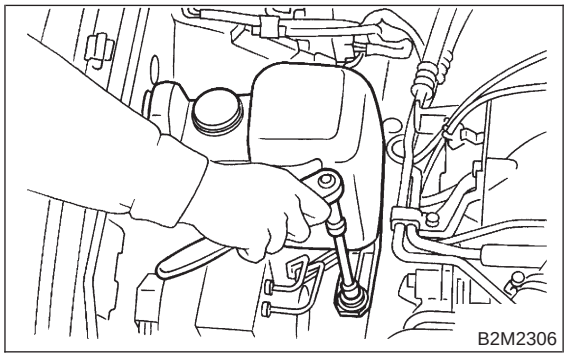

B2M2308

(4) Adjust V-belt. <Ref. to 1-5 [G2B0].>
(5) Install V-belt covers.

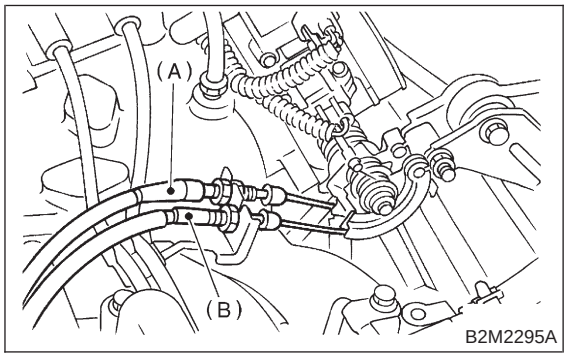

B2M2307

(6) Install resonator chamber.

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

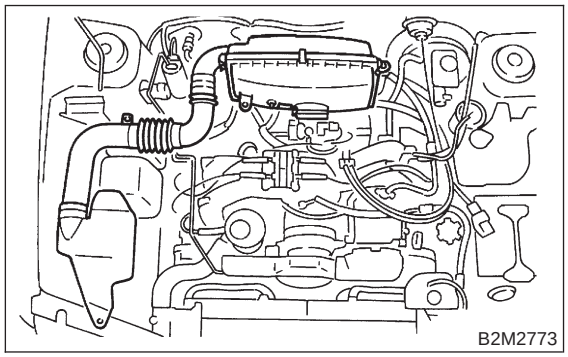

B2M2306

17) Connect accelerator cable (A).
18) Connect cruise control cable (B). (With cruise control models)



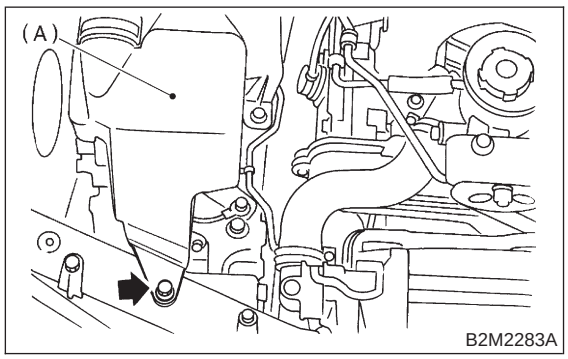
B2M2295A

19) Install air cleaner case and air intake duct as a unit.



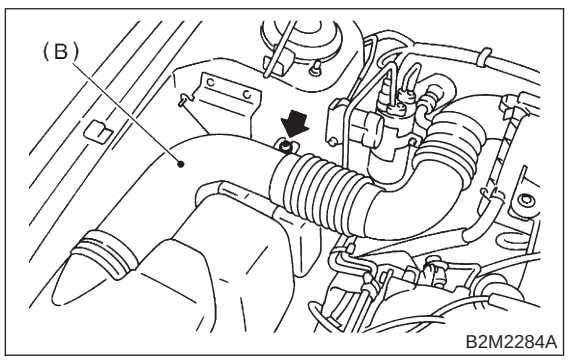
20) Tighten bolt which installs air intake duct (A) on the front side of body.

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



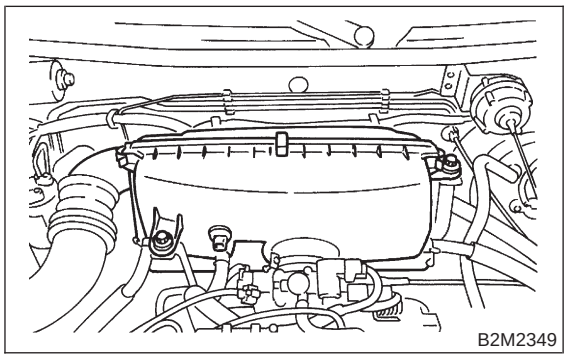
21) Tighten bolt which installs air intake duct (B) on body.

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

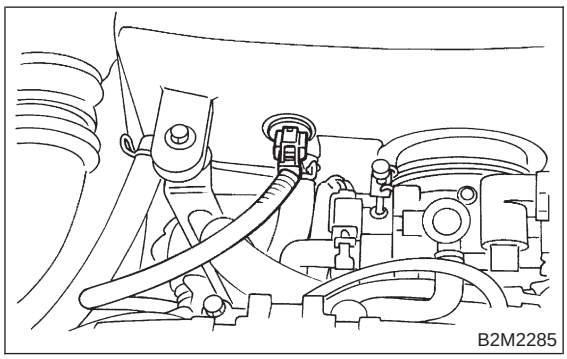


22) Tighten bolts which install air cleaner case to stays.

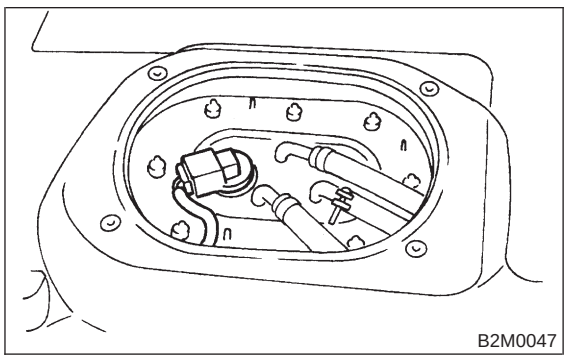
Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)



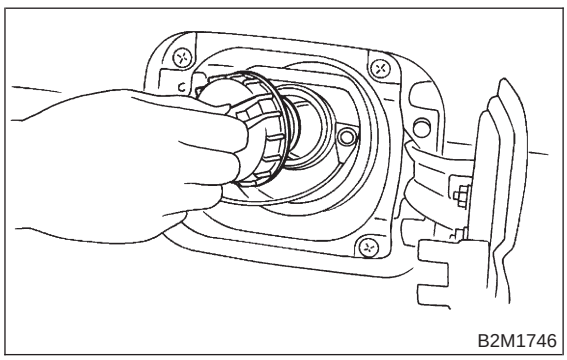
23) Connect connector to intake air temperature sensor.



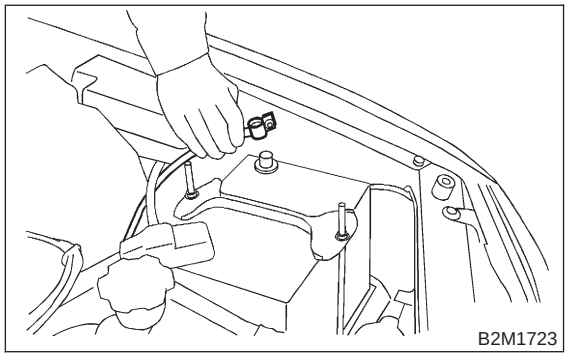
24) Connect connector to fuel pump.



25) Install fuel filler cap.



26) Connect battery ground cable.

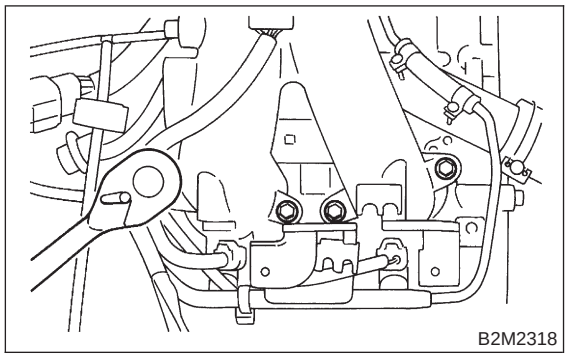


2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

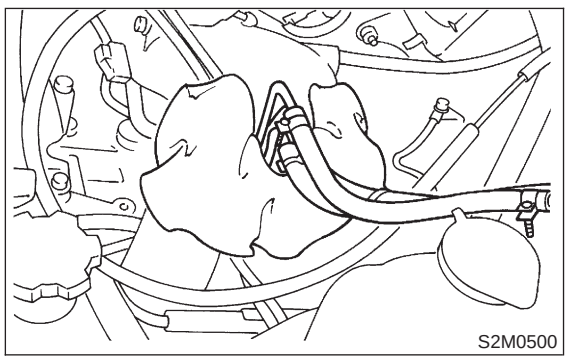
1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

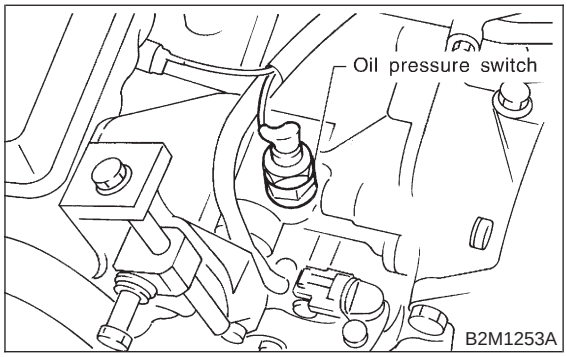
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



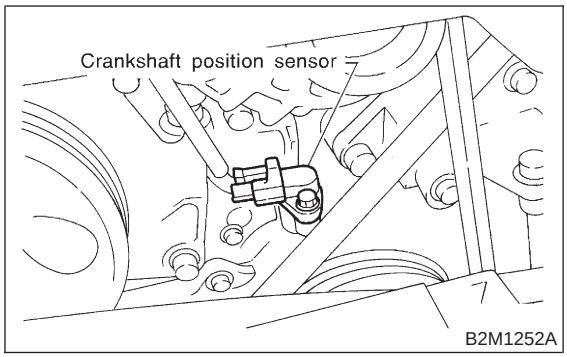
2) Connect fuel hoses.



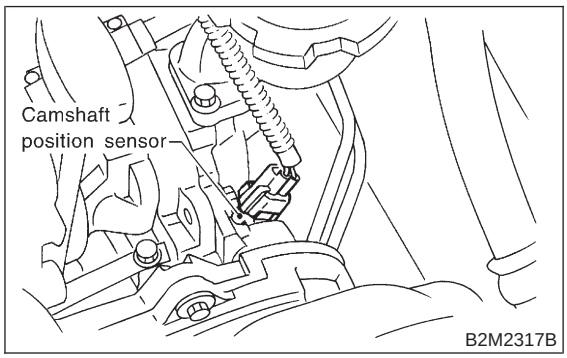
3) Connect connector to oil pressure switch.



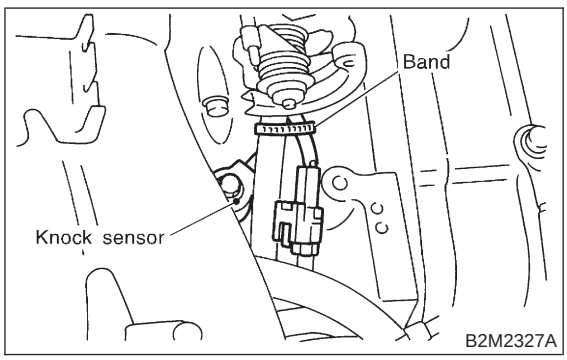
4) Connect connector to crankshaft position sensor.



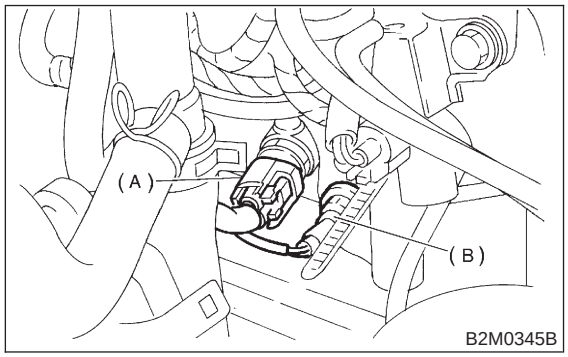
5) Connect connector to camshaft position sensor.



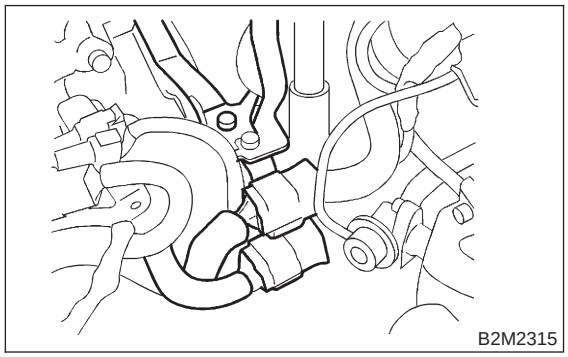
6) Connect knock sensor connector.



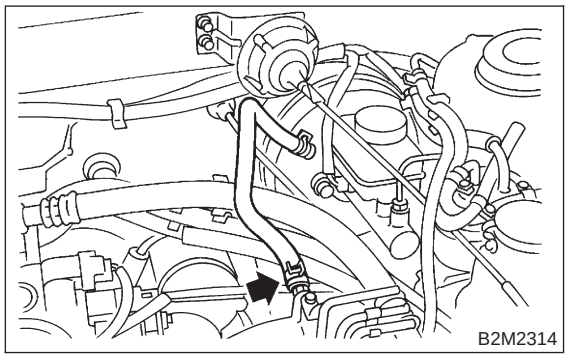
7) Connect connectors to engine coolant temperature sensor (A) and thermometer (B).



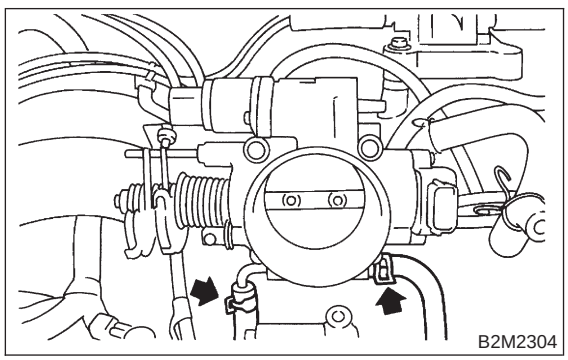
8) Install air intake chamber stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



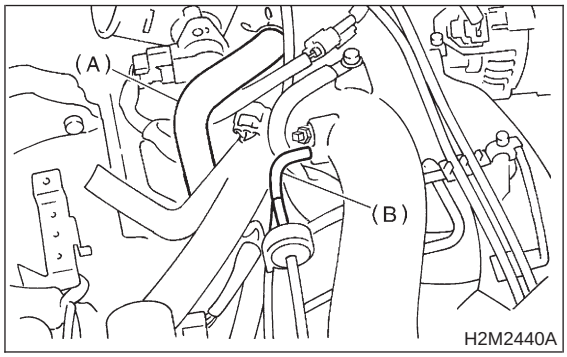
9) Connect brake booster hose.



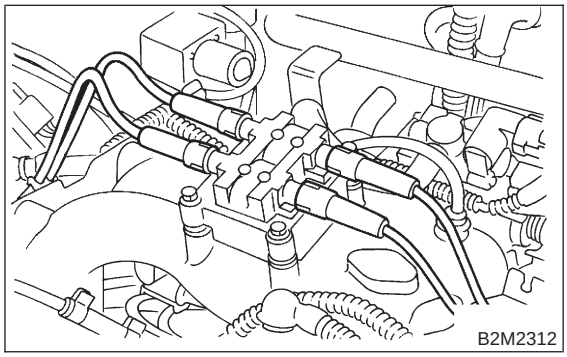
10) Connect engine coolant hose to throttle body.



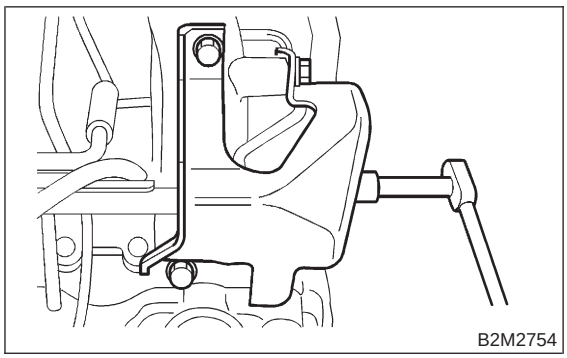
11) Connect PCV hose (A) and vacuum hose (B) to intake manifold.



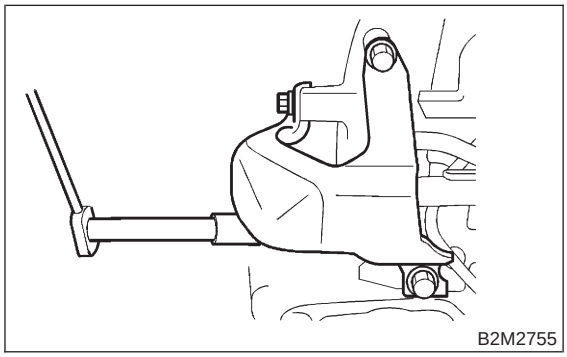
12) Connect spark plug cords to ignition coil and ignitor assembly.



13) Install fuel pipe protector LH. (LHD model)



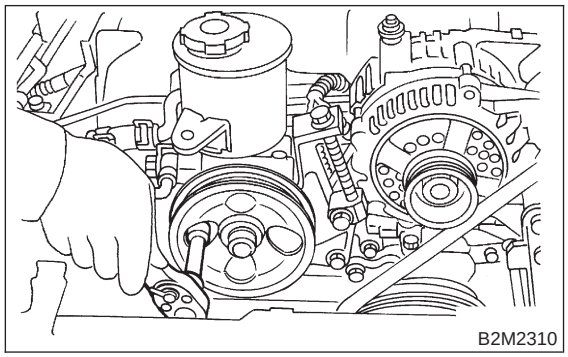
14) Install fuel pipe protector RH. (RHD model)



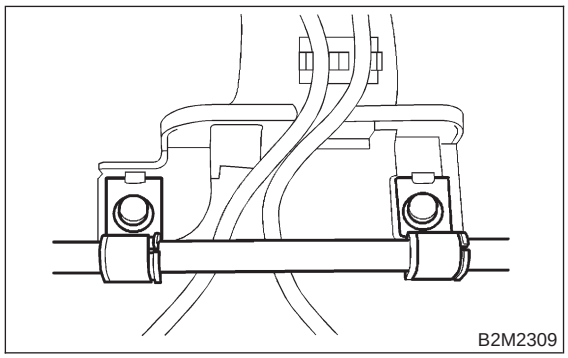
15) Install power steering pump on bracket.

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

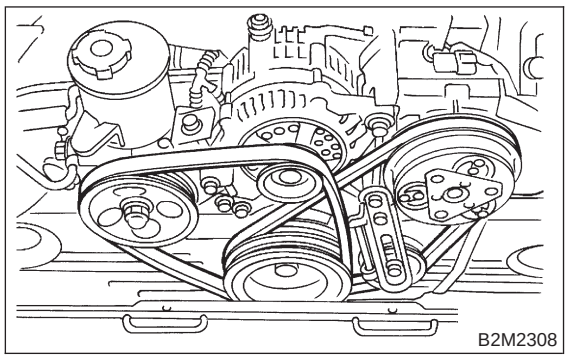
Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)


B2M2310

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

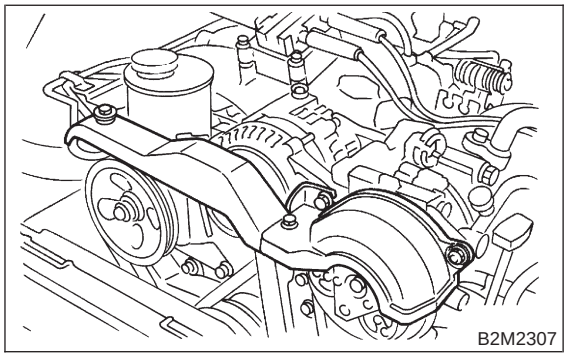

B2M2309

(3) Install power steering pump drive V-belt.

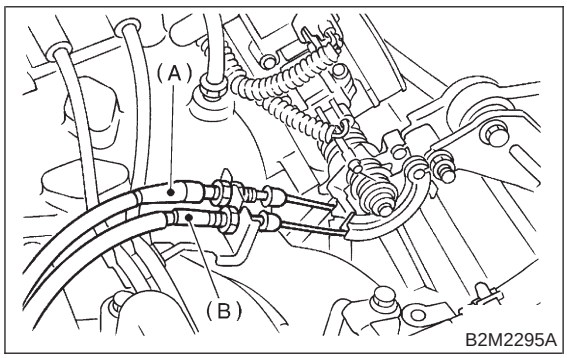

B2M2308

(4) Adjust V-belt. <Ref. to 1-5 [G2B0].>

(5) Install V-belt covers.


B2M2307

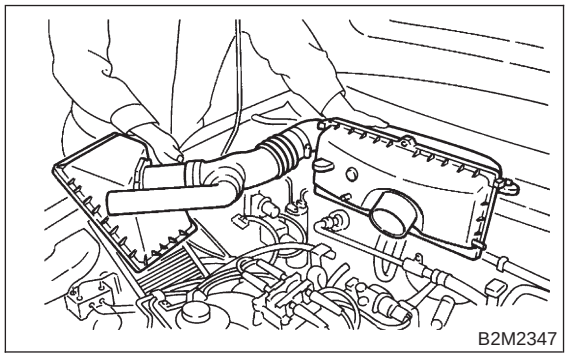
16) Connect accelerator cable.



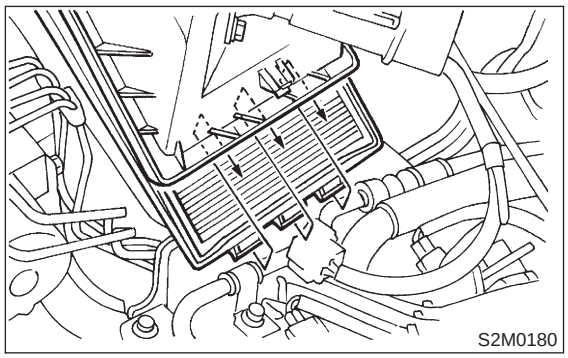
B2M2295A

17) Install air cleaner element.

18) Install air cleaner upper cover, air intake duct and air intake chamber as a unit.

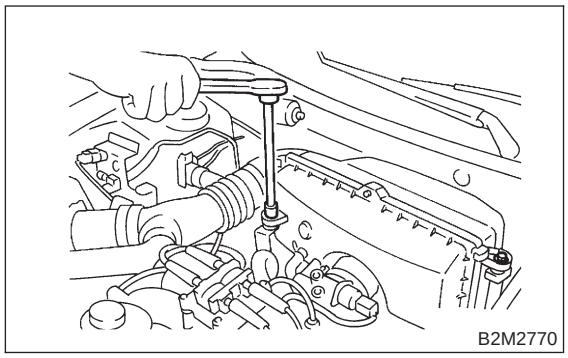

B2M2347

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

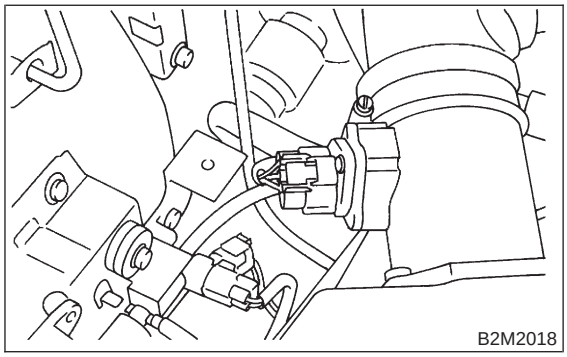

S2M0180

19) Tighten bolts which install air intake chamber to stays.

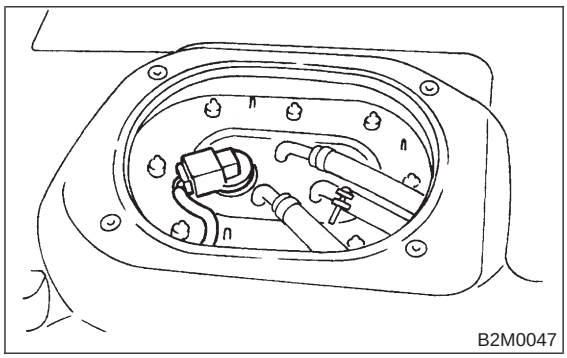
Tightening torque:
4.9±0.5 N·m (0.5±0.05 kg-m, 3.6±0.4 ft-lb)


B2M2770

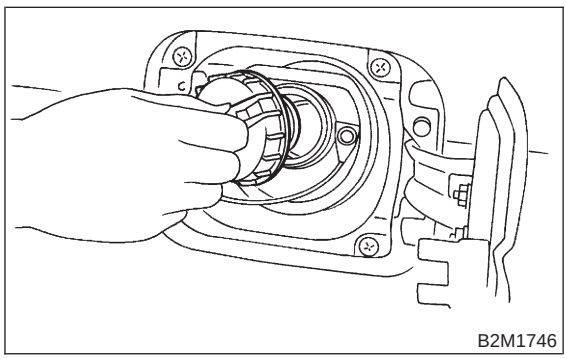
20) Connect connector to mass air flow sensor.


B2M2018

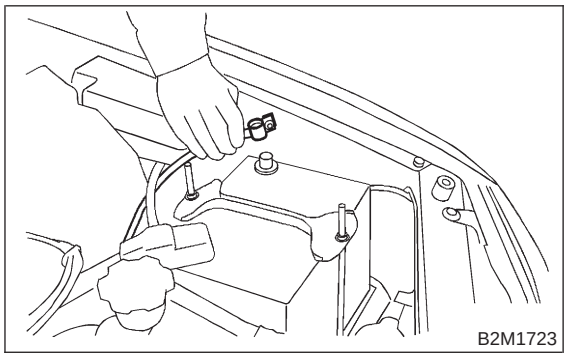
21) Connect connector to fuel pump.


B2M0047

22) Install fuel filler cap.


B2M1746

23) Connect battery ground cable.

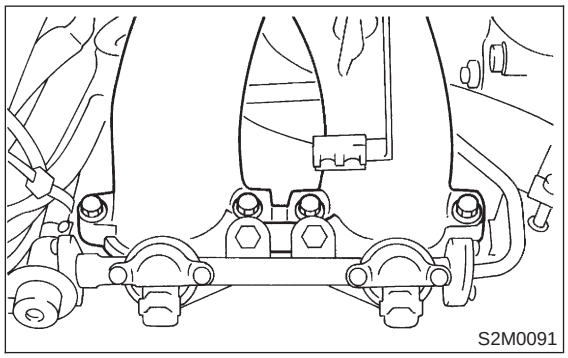

B2M1723

3. 2500 cc MODEL

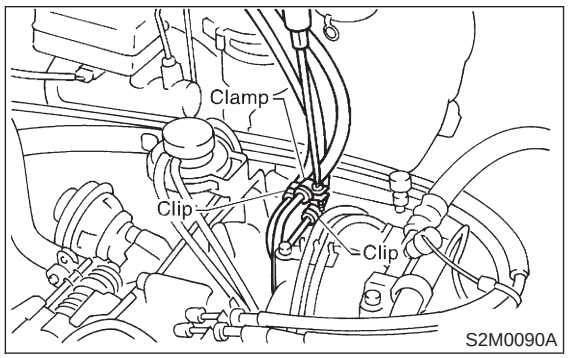
1) Install intake manifold onto cylinder heads.

CAUTION:
Always use new gaskets.

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

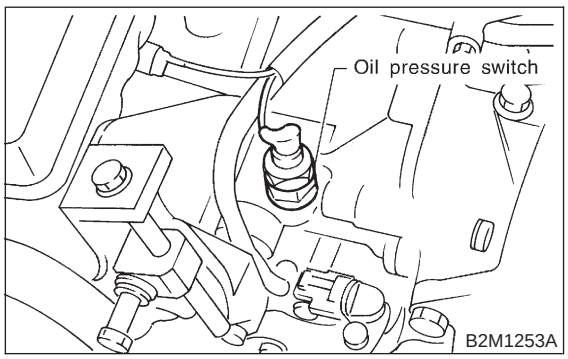

S2M0091

2) Connect fuel hoses.



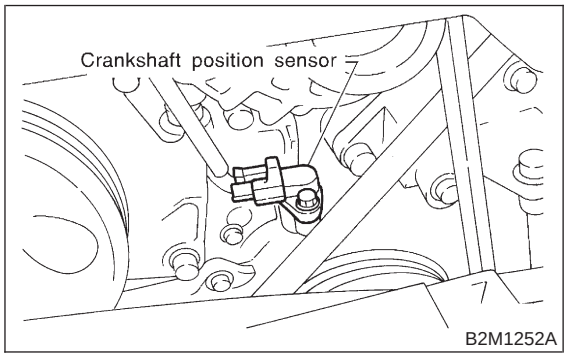
S2M0090A

3) Connect connector to oil pressure switch.



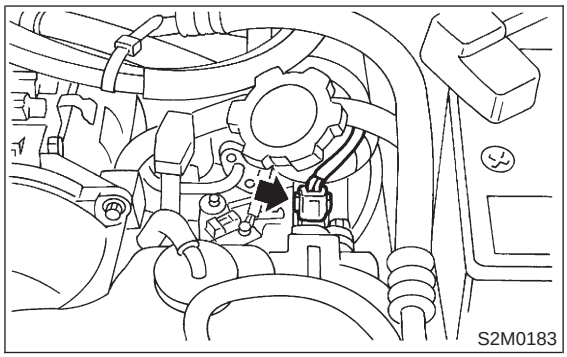
B2M1253A

4) Connect connector to crankshaft position sensor.

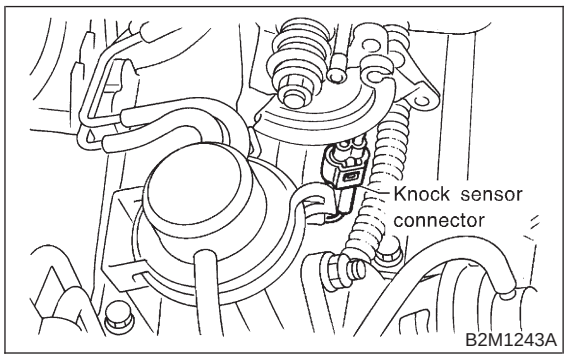


B2M1252A

5) Connect connector to camshaft position sensor.

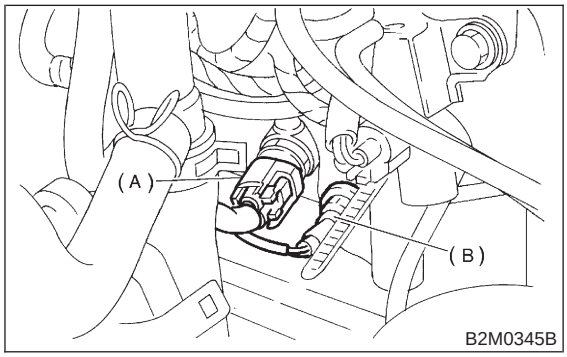

S2M0183

6) Connect knock sensor connector.



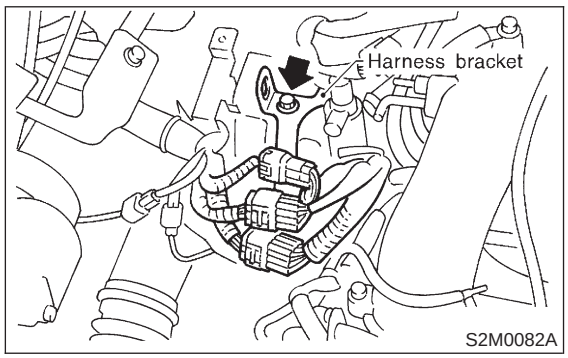
B2M1243A

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



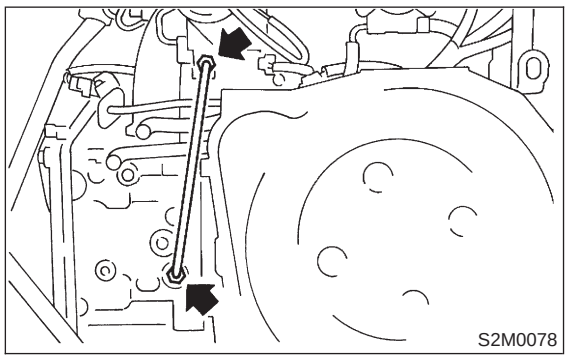
B2M0345B

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

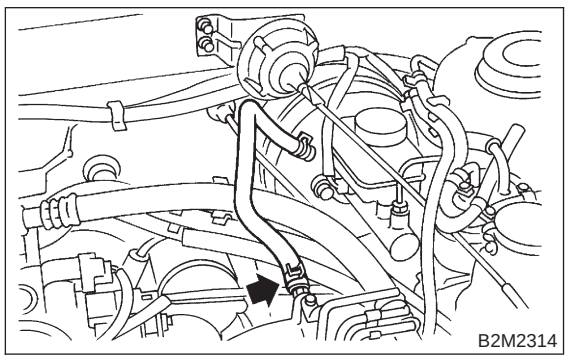


9) Install EGR pipe.

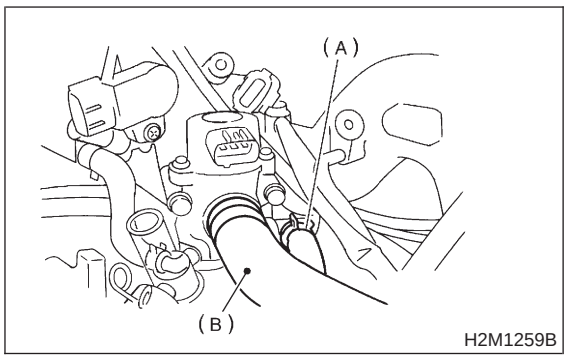
Tightening torque:
34±2 N·m (3.5±0.2 kg-m, 25.3±1.4 ft-lb)



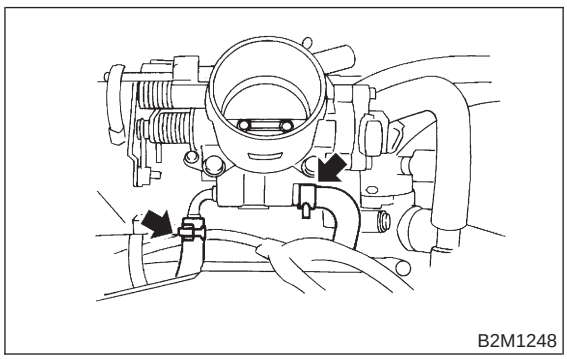
10) Connect brake booster hose.



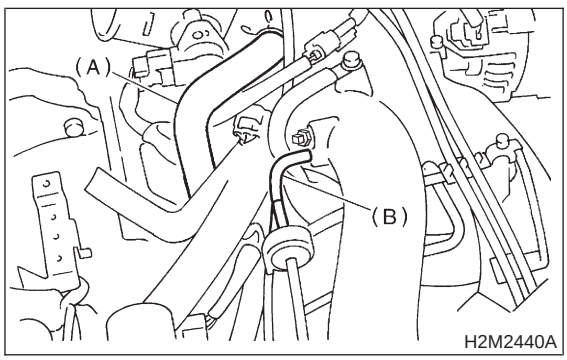
11) Connect engine coolant hose (A) to idle air control solenoid valve.
12) Connect air by-pass hose (B) to idle air control solenoid valve.



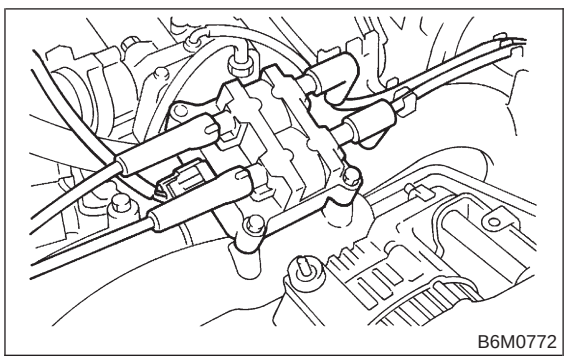
13) Connect engine coolant hose to throttle body.



14) Connect PCV hose (A) and vacuum hose (B) to intake manifold.



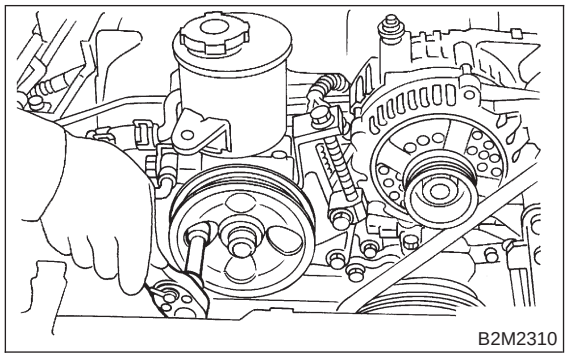
15) Connect spark plug cords to ignition coil.



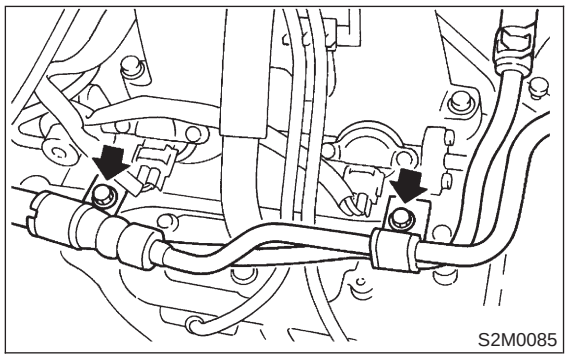
16) Install power steering pump on bracket.

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

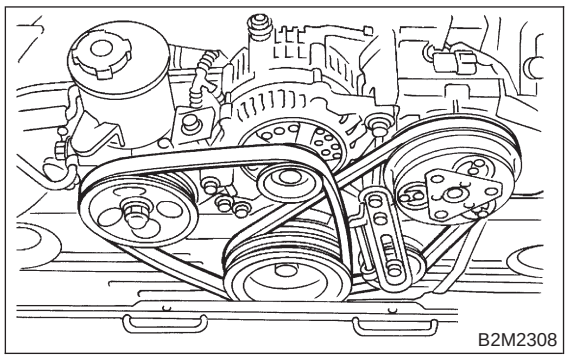
Tightening torque:
20.1±2.5 N·m (2.05±0.25 kg-m, 14.8±1.8 ft-lb)


B2M2310

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

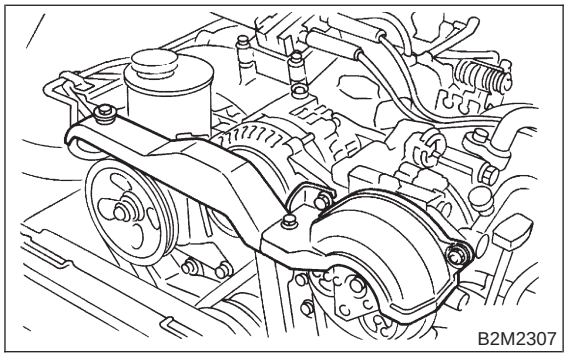

S2M0085

(3) Install power steering pump drive V-belt.

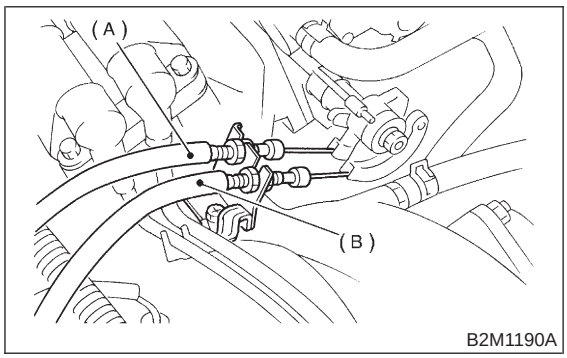

B2M2308

(4) Adjust V-belt. <Ref. to 1-5 [G2B0].>

(5) Install V-belt covers.

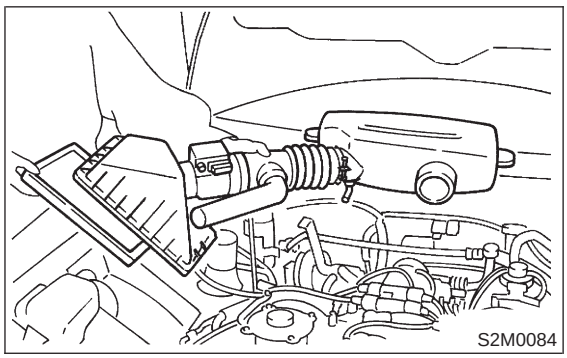

B2M2307

17) Connect accelerator cable.

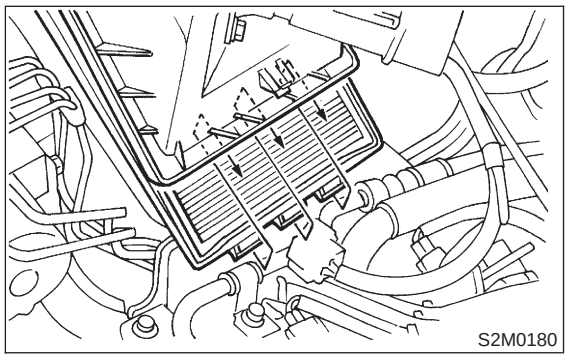


B2M1190A

18) Install air cleaner element.
19) Install air cleaner upper cover, air intake duct and air intake chamber as a unit.

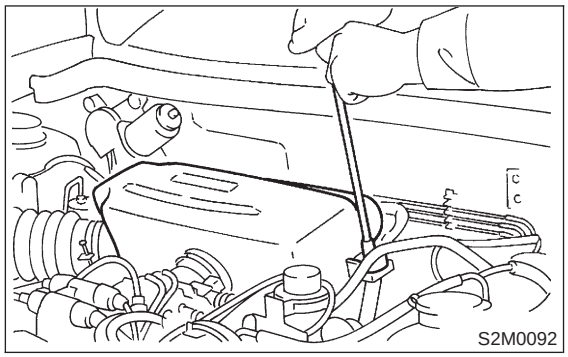

S2M0084

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

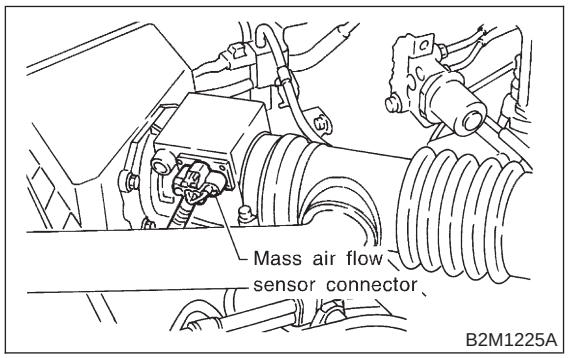

S2M0180

20) Tighten bolts which install air intake chamber to stays.

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

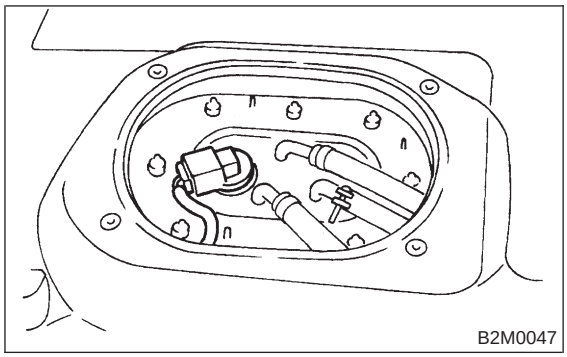

S2M0092

21) Connect connector to mass air flow sensor.

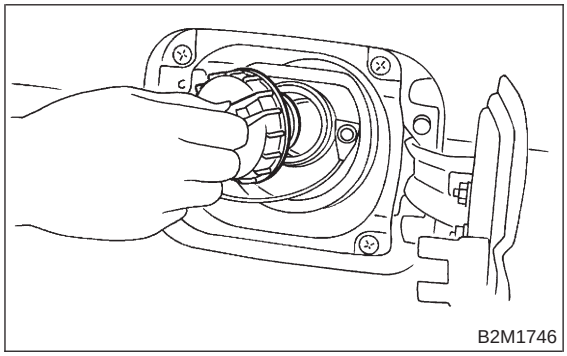


B2M1225A

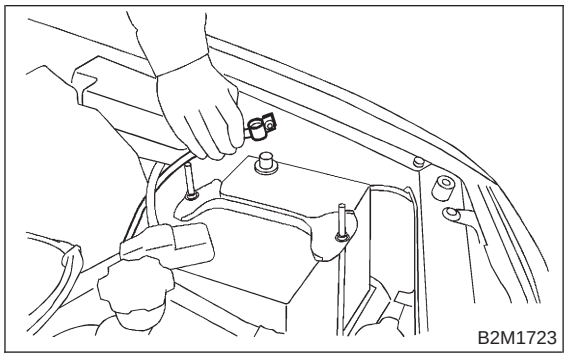
22) Connect connector to fuel pump.


B2M0047

23) Install fuel filler cap.


B2M1746

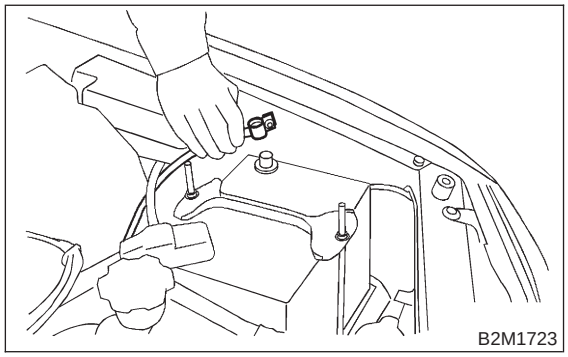
24) Connect battery ground cable.


B2M1723

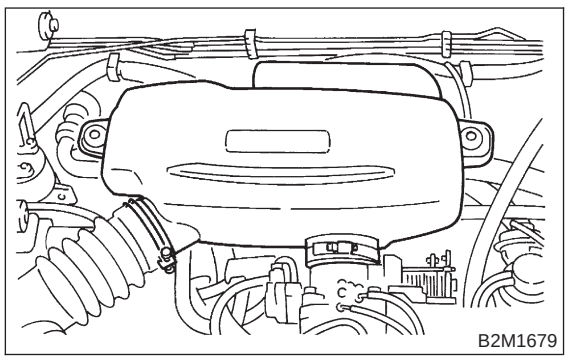
7. EGR Solenoid Valve (2500 cc Model)

A: REMOVAL AND INSTALLATION

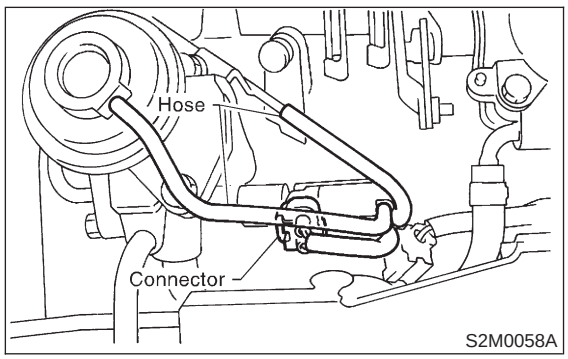
1) Disconnect battery ground cable.



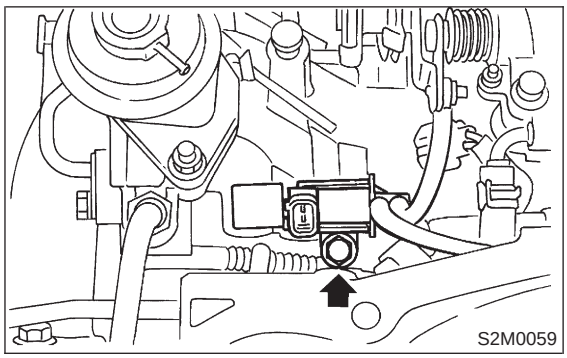
2) Remove air intake chamber. <Ref. to 2-7 [W18A0].>



3) Disconnect vacuum hoses from EGR solenoid valve.
4) Disconnect connector from EGR solenoid valve.



5) Remove bolt which installs EGR solenoid valve onto intake manifold.



6) Installation is in the reverse order of removal.

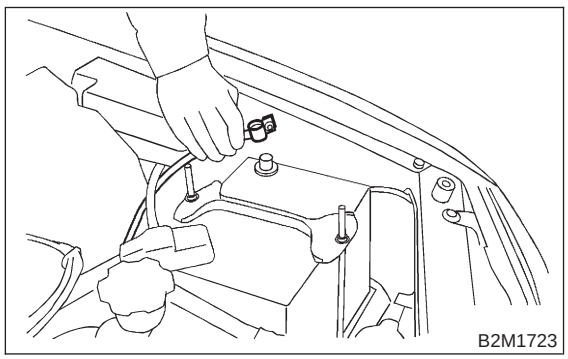
Tightening torque:
15.7±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)

5. Engine Coolant Temperature Sensor

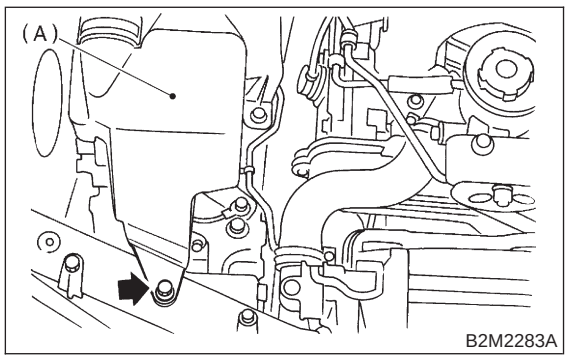
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

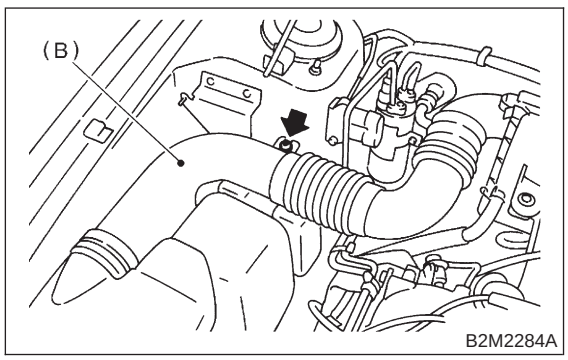
1) Disconnect battery ground cable.



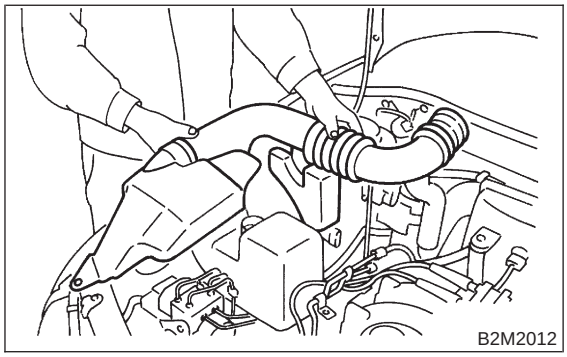
2) Remove bolt which installs air intake duct (A) on the front side of body.



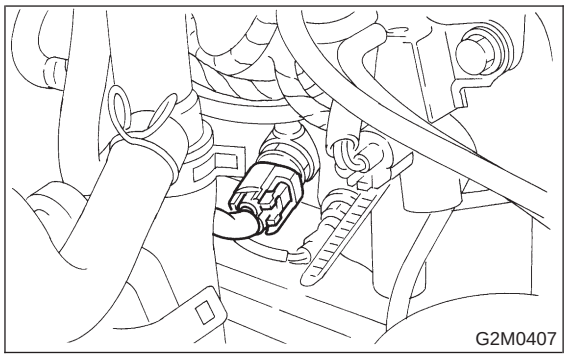
3) Remove bolt which installs air intake duct (B) on body.



4) Remove air intake duct (A) and (B) as a unit.

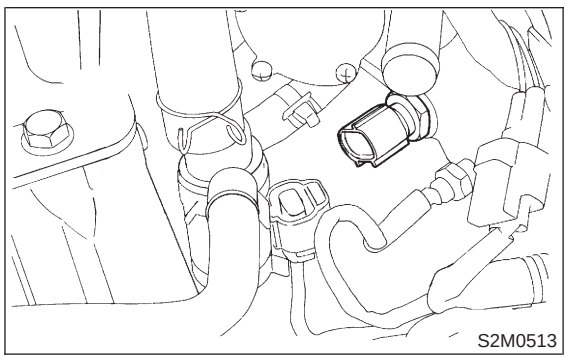


5) Disconnect connector from engine coolant temperature sensor.



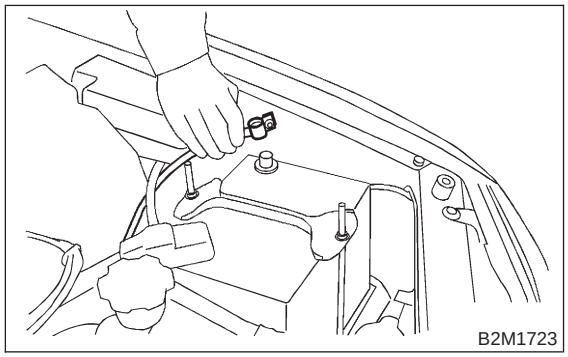
6) Remove engine coolant temperature sensor.
7) Installation is in the reverse order of removal.

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

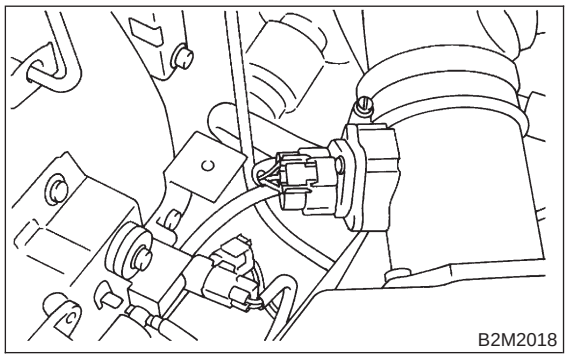


2. EXCEPT 2200 cc CALIFORNIA SPEC. VEHICLES

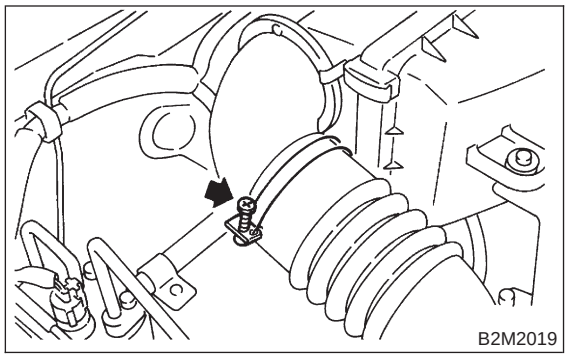
1) Disconnect battery ground cable.


B2M1723

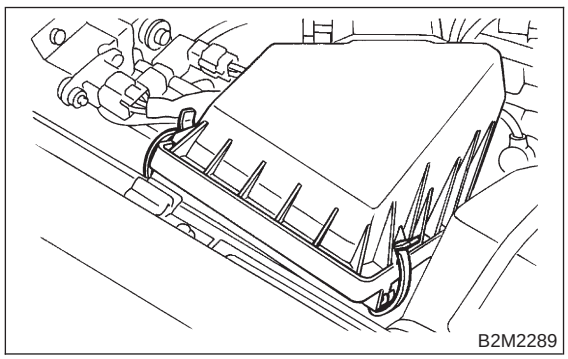
2) Disconnect connector from mass air flow sensor.


B2M2018

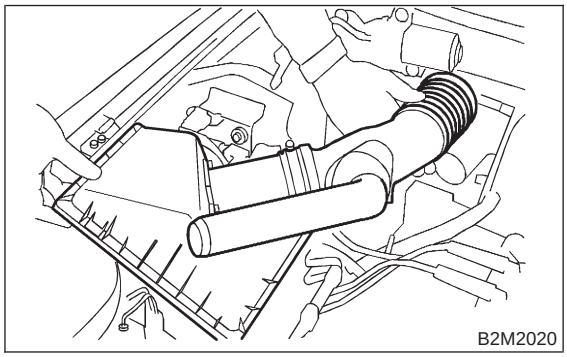
3) Loosen clamp which connects air intake duct to air intake chamber.


B2M2019

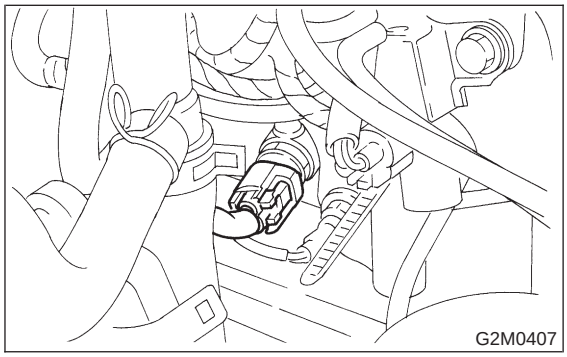
4) Remove two clips of air cleaner upper cover.


B2M2289

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

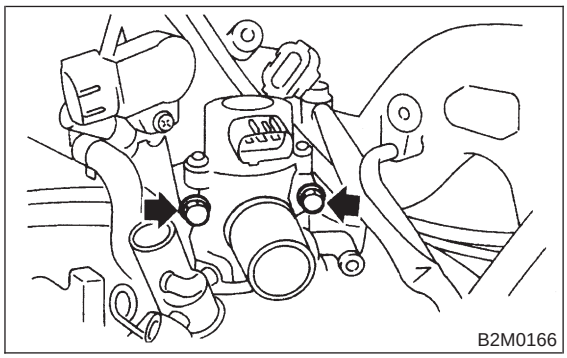

B2M2020

6) Disconnect connector from engine coolant temperature sensor.


G2M0407

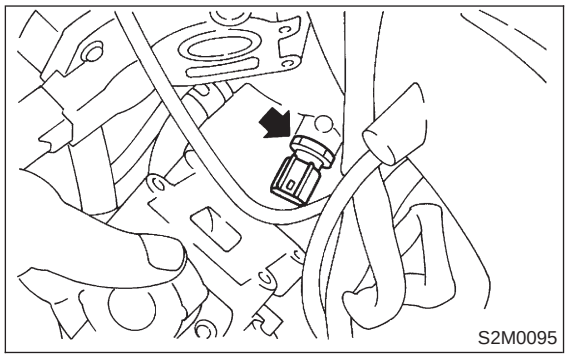
7) Remove bolts which install idle air control solenoid valve, and move it aside. (2500 cc model only) <Ref. to 2-7 [W12A0].>

NOTE:
At this time, do not disconnect engine coolant hoses from idle air control solenoid valve.


B2M0166

8) Remove engine coolant temperature sensor.
9) Installation is in the reverse order of removal.

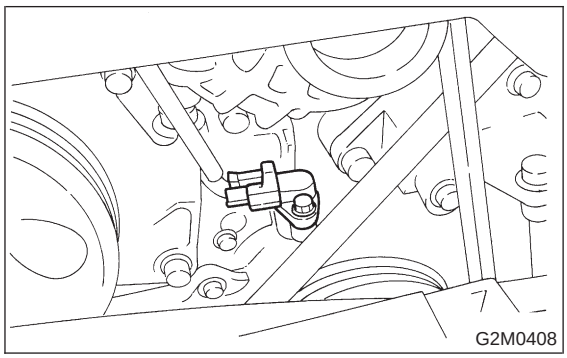
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



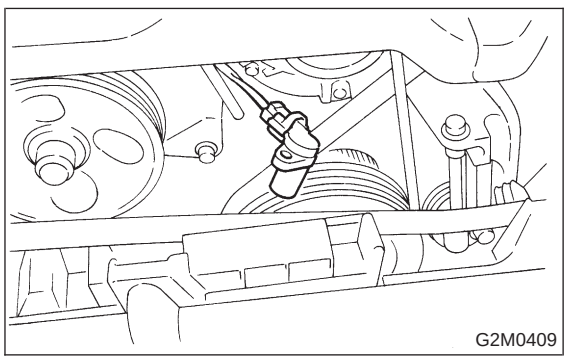
6. Crankshaft Position Sensor

A: REMOVAL AND INSTALLATION

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

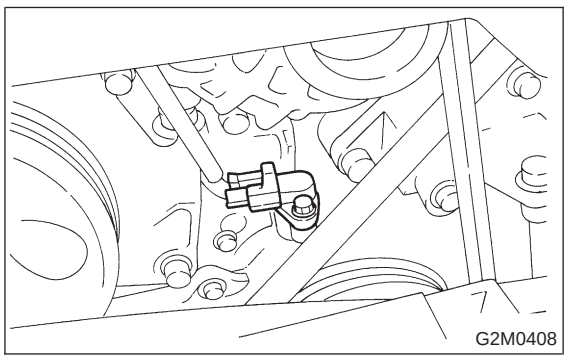


2) Remove crankshaft position sensor, and disconnect connector from it.



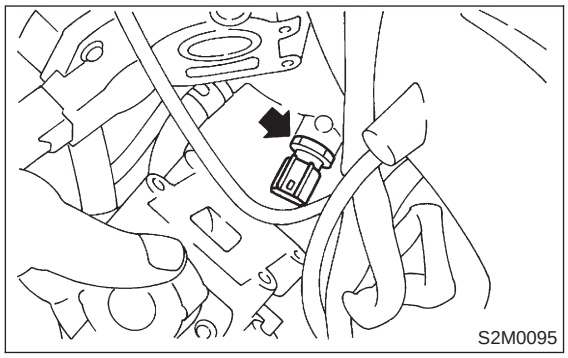
3) Installation is in the reverse order of removal.

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



8) Remove engine coolant temperature sensor.
9) Installation is in the reverse order of removal.

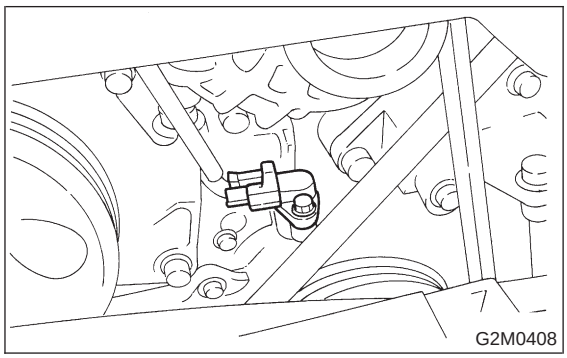
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)



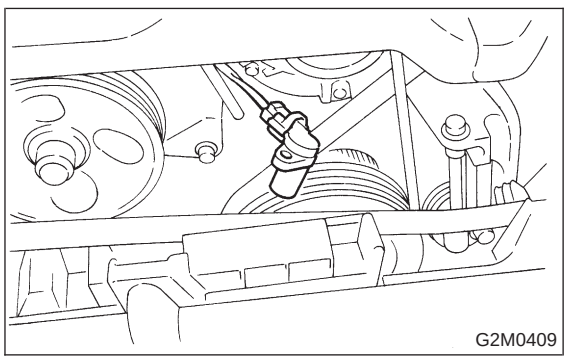
6. Crankshaft Position Sensor

A: REMOVAL AND INSTALLATION

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

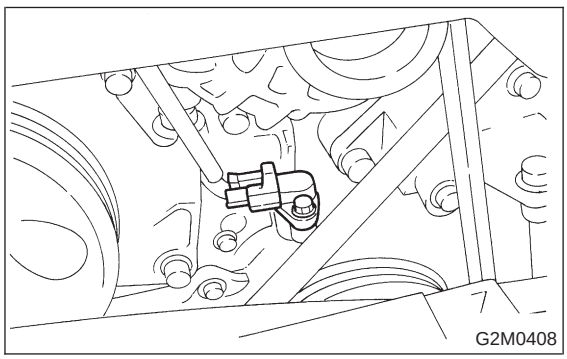


2) Remove crankshaft position sensor, and disconnect connector from it.



3) Installation is in the reverse order of removal.

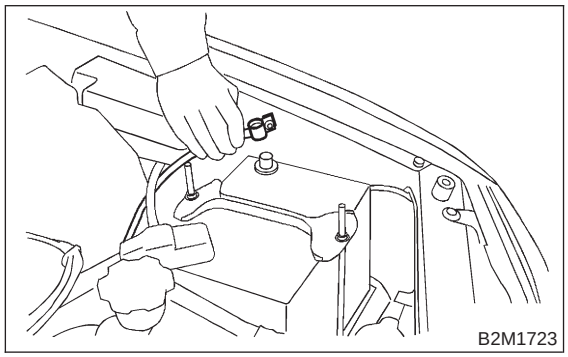
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



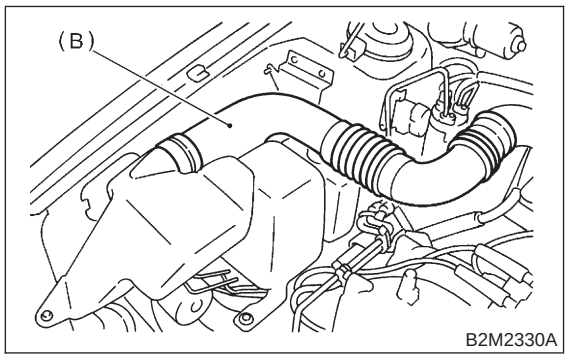
7. Front Oxygen (A/F) Sensor

A: REMOVAL

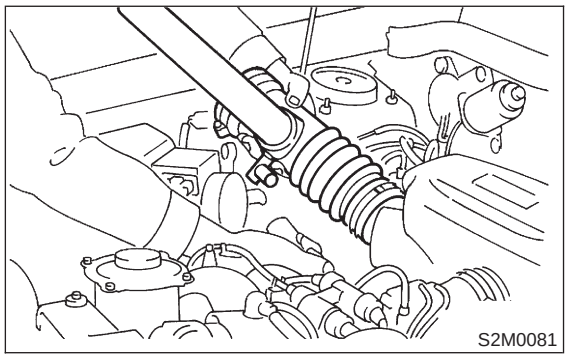
1) Disconnect battery ground cable.



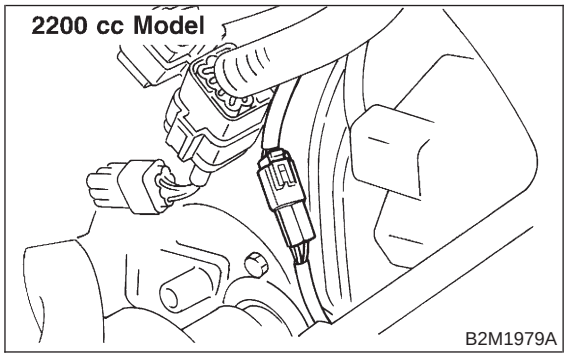
2) Disconnect air intake duct (B). (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A1].>

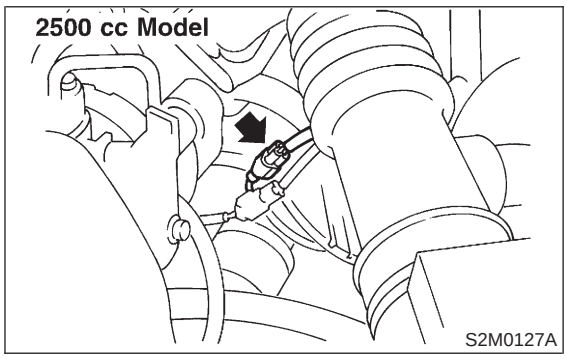


3) Remove air intake duct. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A2].>



4) Disconnect connector from front oxygen sensor.



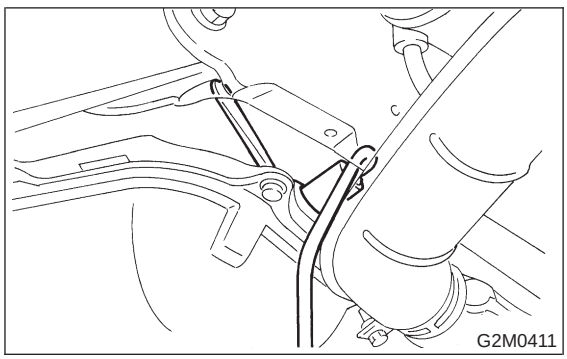


5) Lift-up the vehicle.
6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

7) Remove front oxygen (A/F) sensor.

CAUTION:
When removing, do not force front oxygen (A/F) sensor in an unnatural way especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.

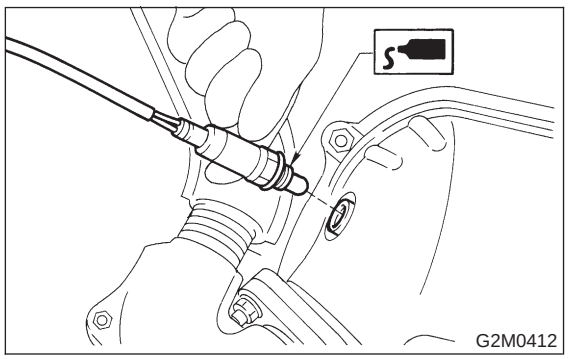


B: INSTALLATION

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

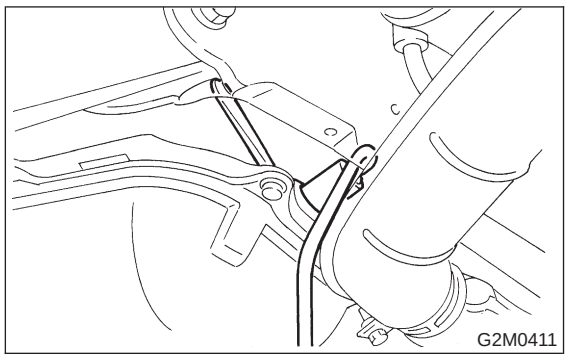
Anti-seize compound:
SS-30 by JET LUBE

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

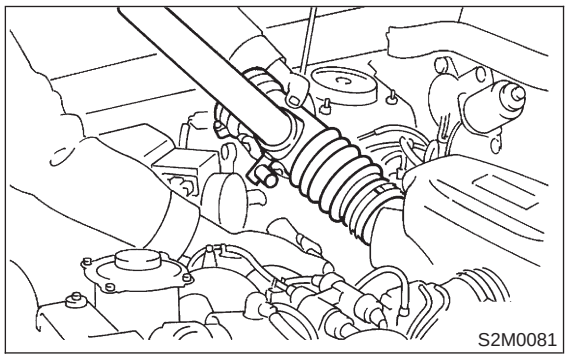


2) Install front oxygen (A/F) sensor.

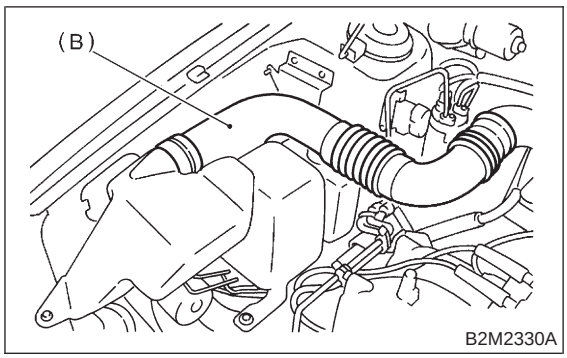
Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)



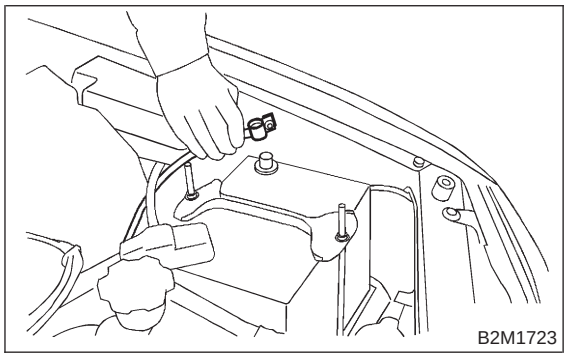
3) Lower the vehicle.
4) Connect connector to front oxygen (A/F) sensor.
5) Install air intake duct. (Except 2200 cc California spec. vehicles) <Ref. to 2-7 [W1A2].>



6) Install air intake duct (B). (2200 cc California spec. vehicles) <Ref. to 2-7 [W1A1].>



7) Connect battery ground cable.

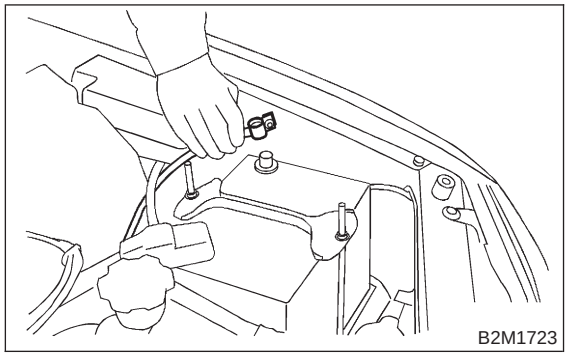


8. Rear Oxygen Sensor

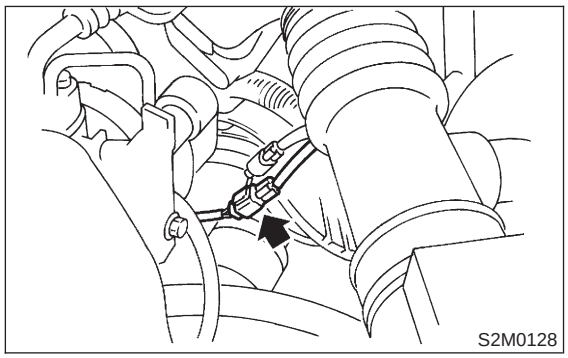
A: REMOVAL

1. 2200 cc CALIFORNIA SPEC. VEHICLES

1) Disconnect battery ground cable.



2) Disconnect connector from rear oxygen sensor.

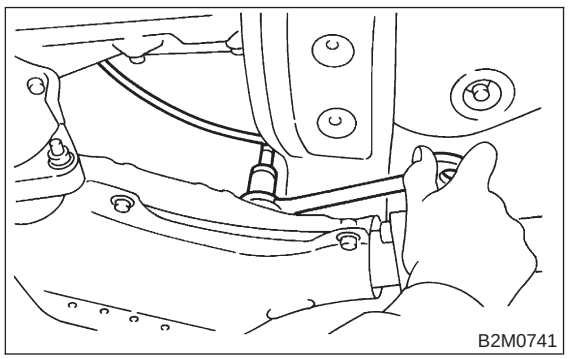


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

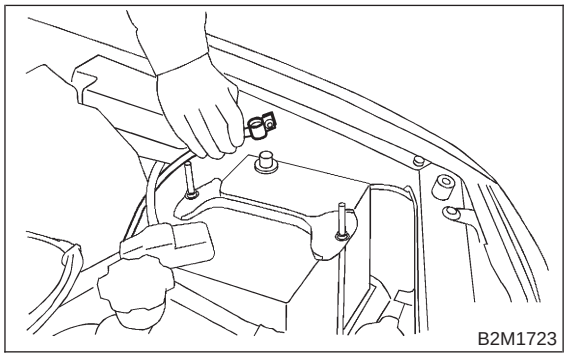
5) Remove rear oxygen sensor.

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

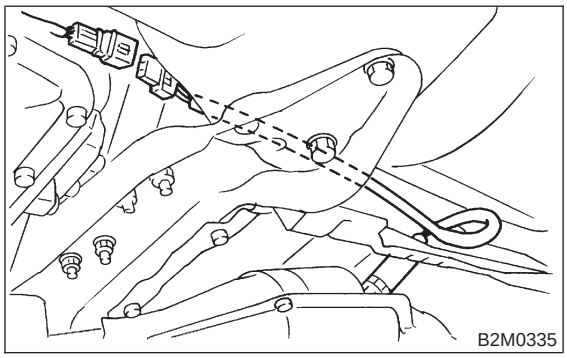


2. EXCEPT 2200 cc CALIFORNIA SPEC. VEHICLES

1) Disconnect battery ground cable.



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

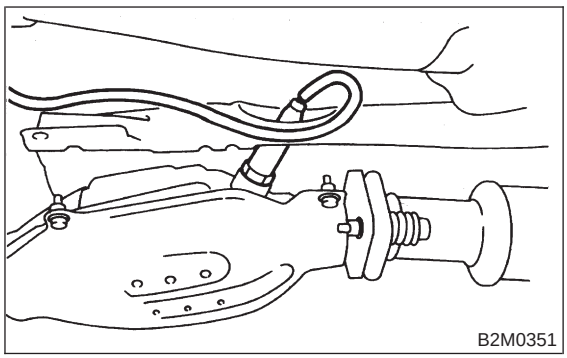


4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove rear oxygen sensor.

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



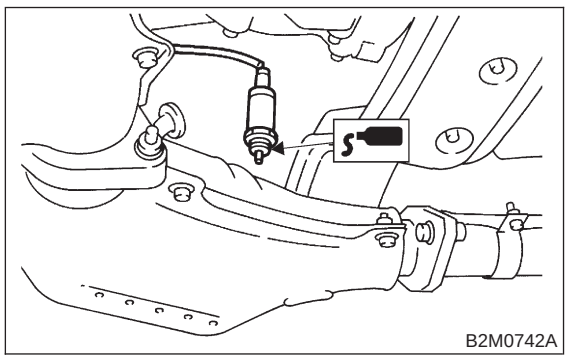
B: INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

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

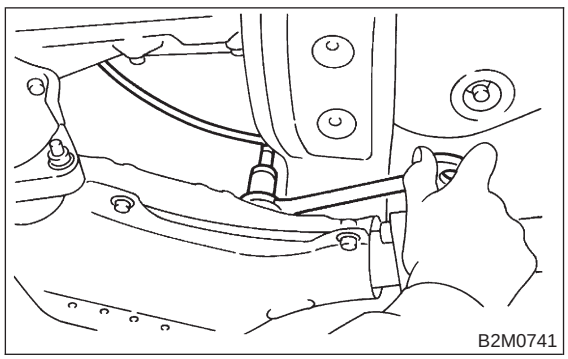
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:
SS-30 by JET LUBE

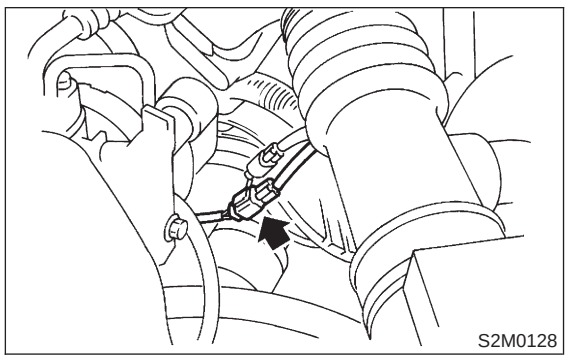


2) Install rear oxygen sensor.

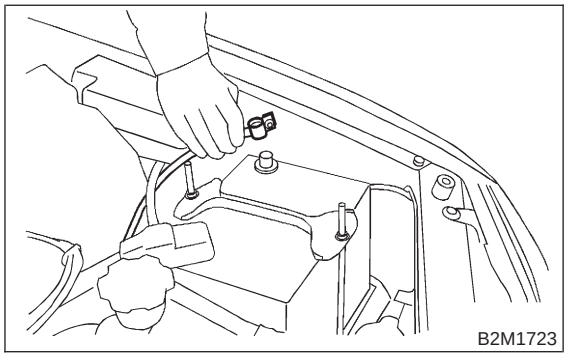
Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)



3) Lower the vehicle.
4) Connect connector to rear oxygen sensor.



5) Connect battery ground cable.

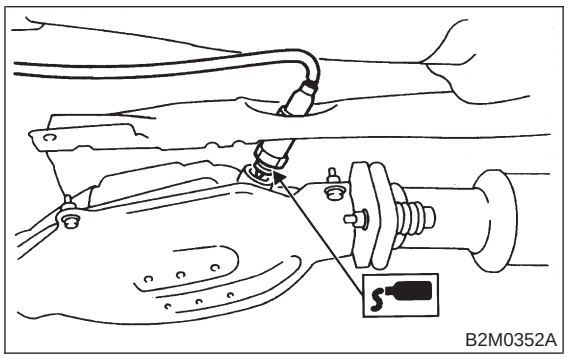


2. EXCEPT 2200 cc CALIFORNIA SPEC. VEHICLES

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

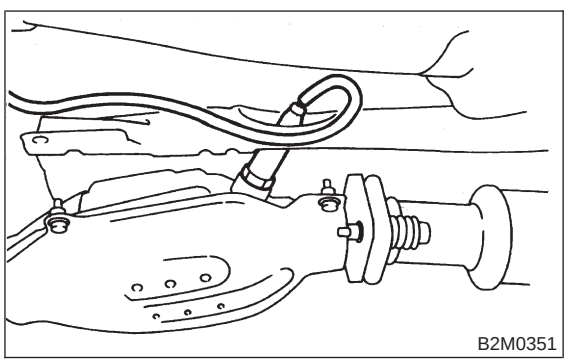
Anti-seize compound:
SS-30 by JET LUBE

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

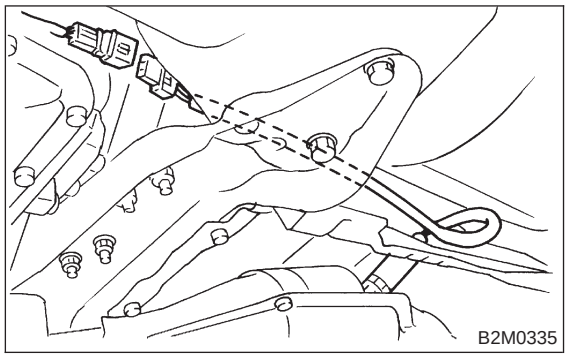


2) Install rear oxygen sensor.

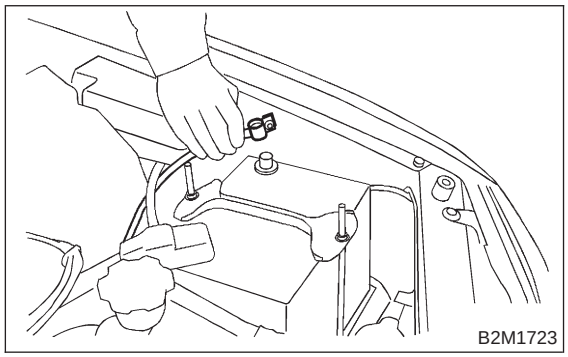
Tightening torque:
21±3 N·m (2.1±0.3 kg-m, 15.2±2.2 ft-lb)



3) Connect connector to rear oxygen sensor.



4) Lower the vehicle.
5) Connect battery ground cable.

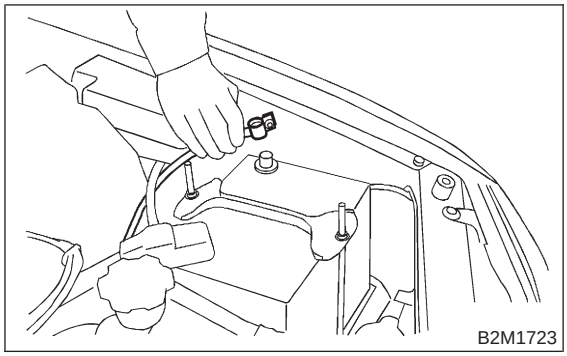


9. Throttle Position Sensor

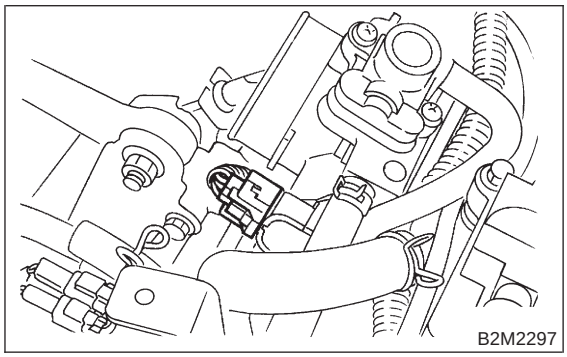
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

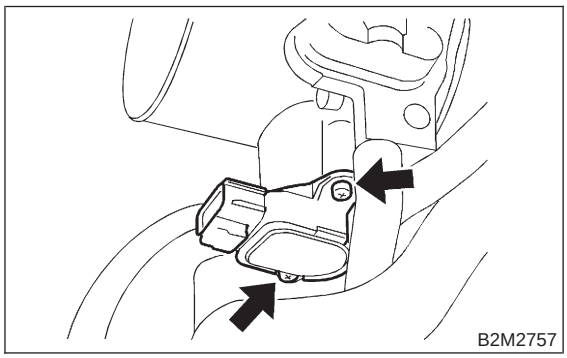
1) Disconnect battery ground cable.



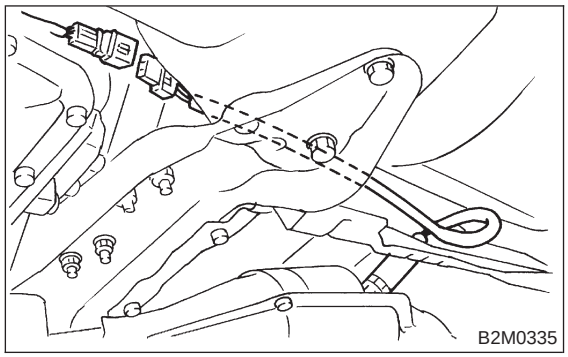
2) Disconnect connector from throttle position sensor.



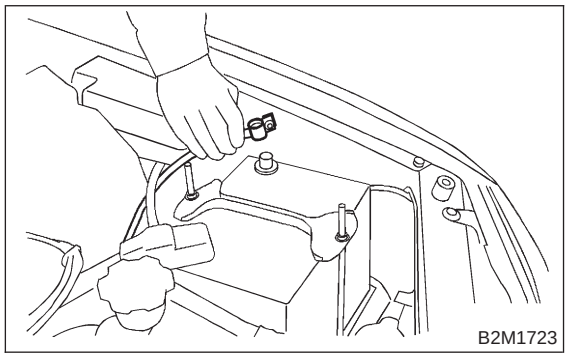
3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.



3) Connect connector to rear oxygen sensor.



4) Lower the vehicle.
5) Connect battery ground cable.

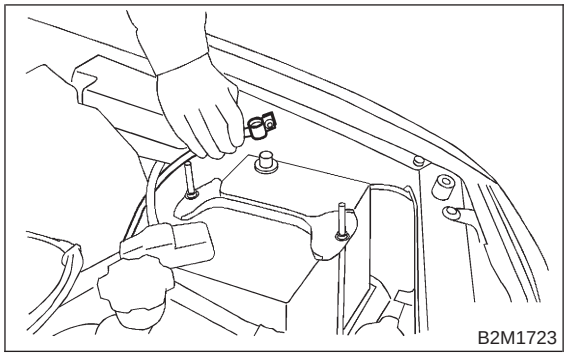


9. Throttle Position Sensor

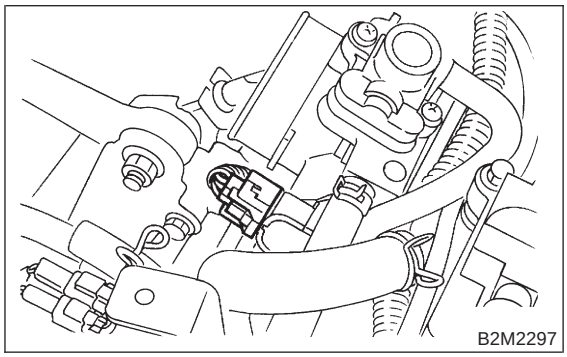
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

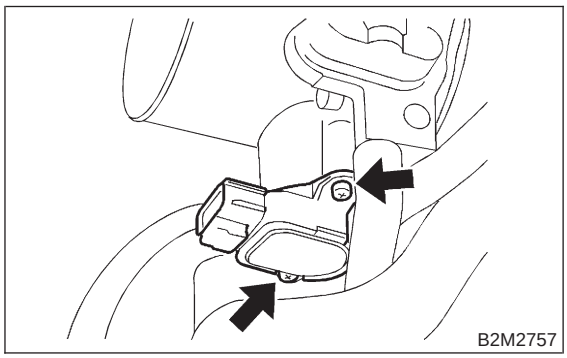
1) Disconnect battery ground cable.



2) Disconnect connector from throttle position sensor.



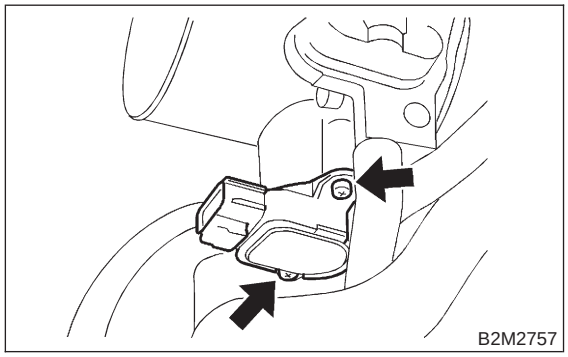
3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.



4) Installation is in the reverse order of removal.

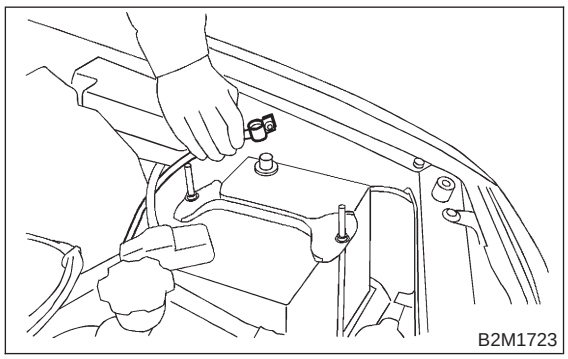
CAUTION:
When installing throttle position sensor, adjust the position to match with the specified data.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

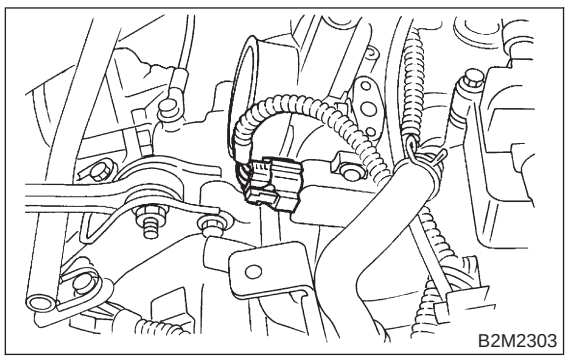

B2M2757

2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

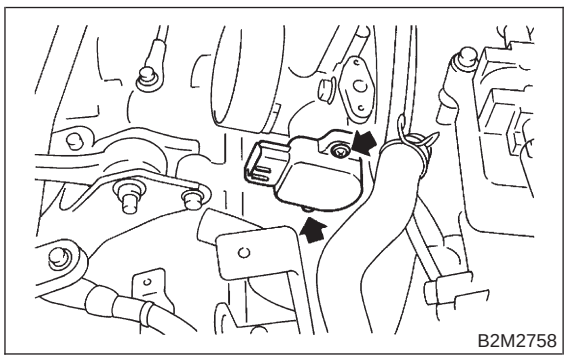
1) Disconnect battery ground cable.


B2M1723

2) Disconnect connector from throttle position sensor.


B2M2303

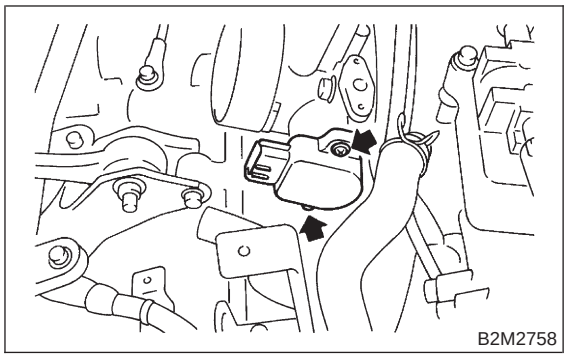
3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.


B2M2758

4) Installation is in the reverse order of removal.

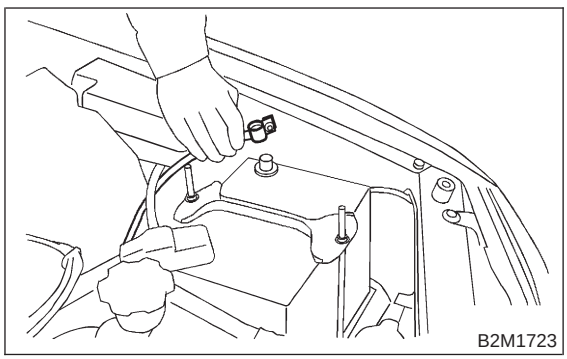
CAUTION:
When installing throttle position sensor, adjust the position to match with the specified data.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

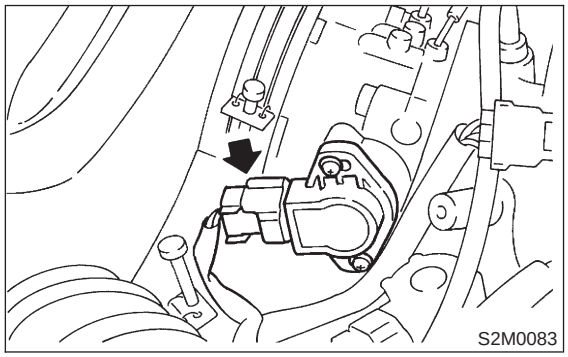

B2M2758

3. 2500 cc MODEL

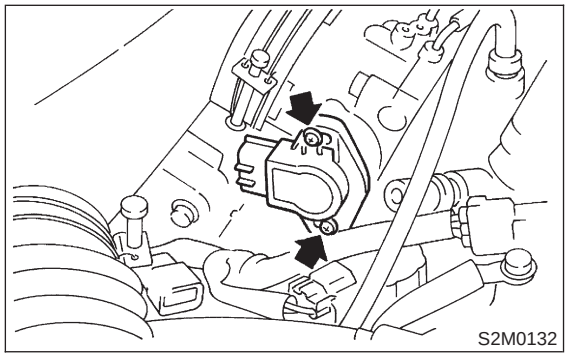
1) Disconnect battery ground cable.


B2M1723

2) Disconnect connector from throttle position sensor.


S2M0083

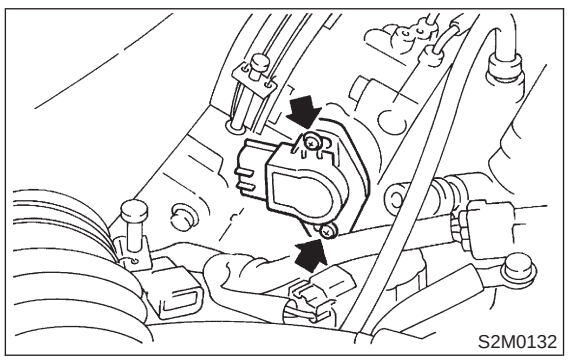
3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.


S2M0132

4) Installation is in the reverse order of removal.

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

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

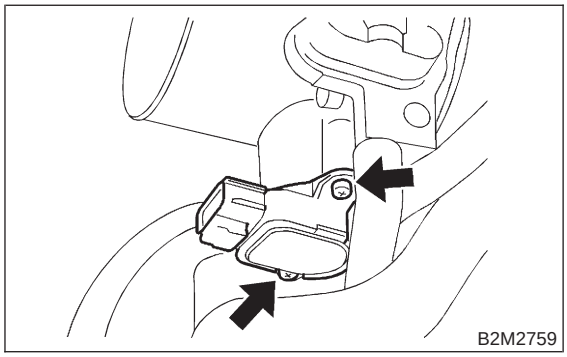

S2M0132

B: ADJUSTMENT

1. 2200 cc CALIFORNIA SPEC. VEHICLES

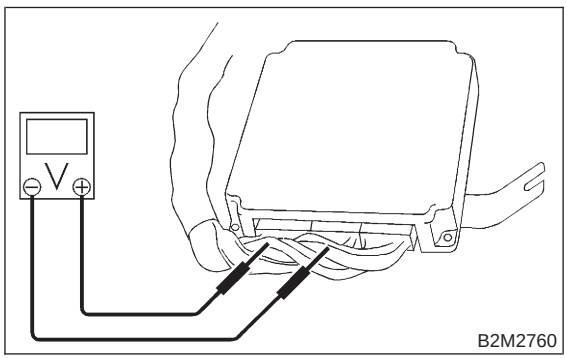
1) Turn ignition switch to OFF.

2) Loosen throttle position sensor holding screws.


B2M2759

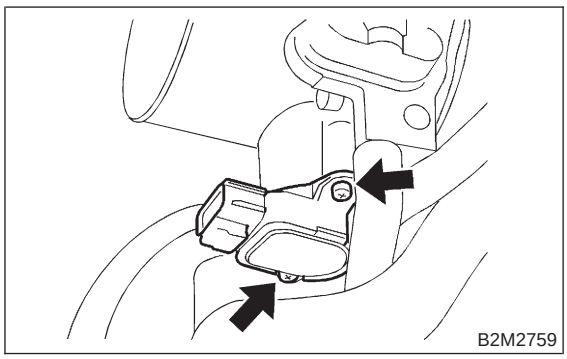
3) When using voltage meter;
(1) Take out ECM.
(2) Turn ignition switch to ON.
(3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage
(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V
[Fully closed.]


B2M2760

(4) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

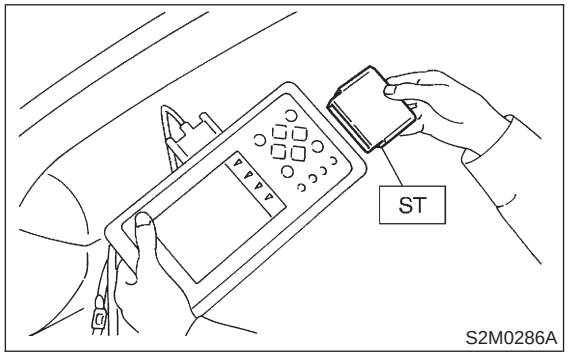

B2M2759

4) When using Subaru Select Monitor;

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

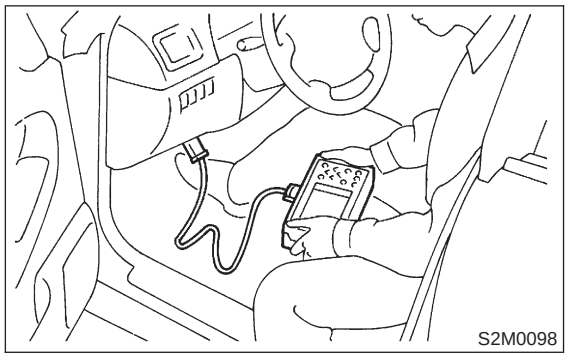
(1) Insert the cartridge to Subaru Select Monitor.

ST 24082AA090 CARTRIDGE



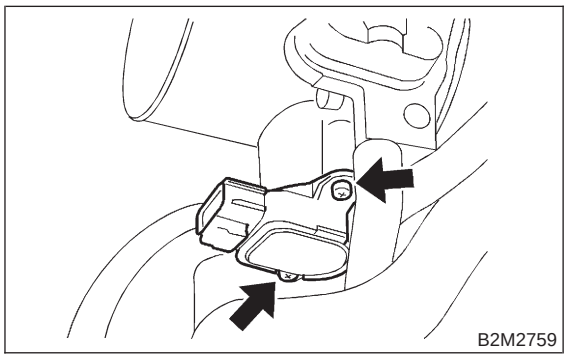
(2) Connect Subaru Select Monitor to the data link connector.
(3) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {EGI/EMPI} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(7) Select {1.12 Data Display} in Data Display Menu.
(8) Adjust throttle position sensor to the proper position to match with the following specifications.

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



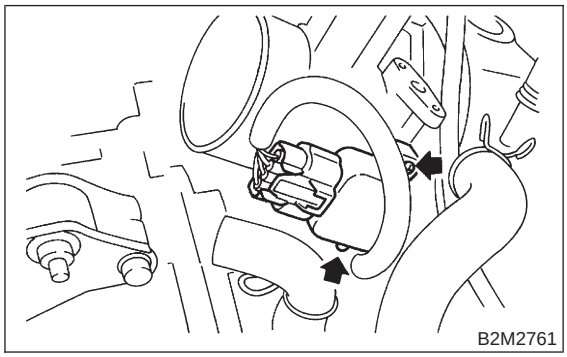
(9) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)



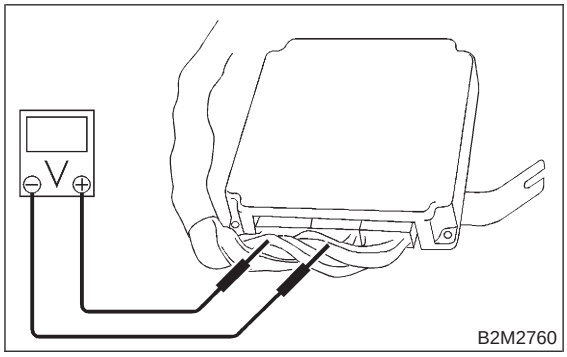
2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

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



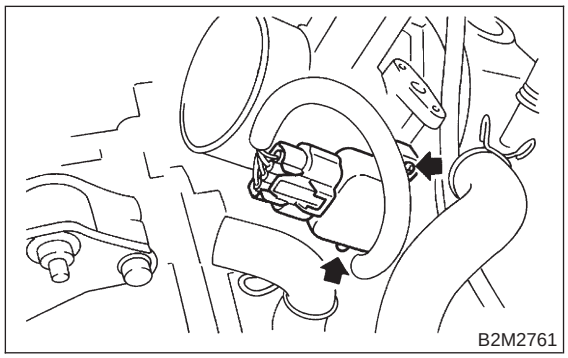
3) When using voltage meter;
(1) Take out ECM.
(2) Turn ignition switch to ON.
(3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage
(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V
[Fully closed.]



(4) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

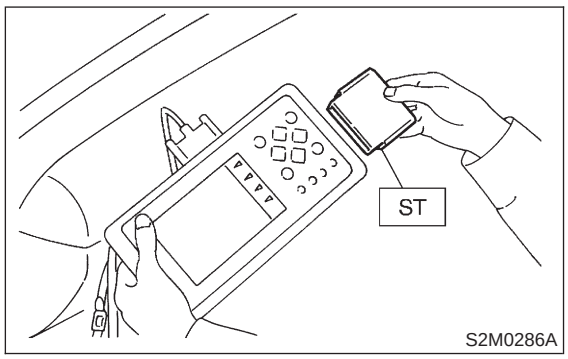


4) When using Subaru Select Monitor;

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

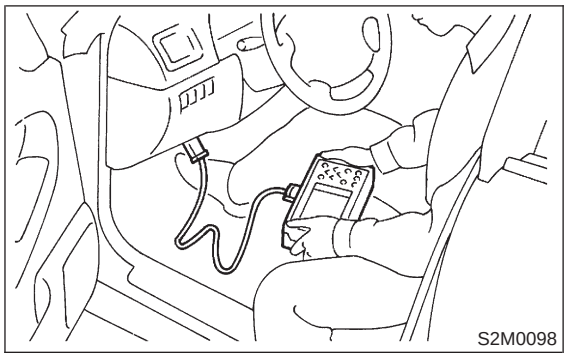
(1) Insert the cartridge to Subaru Select Monitor.

ST 24082AA090 CARTRIDGE



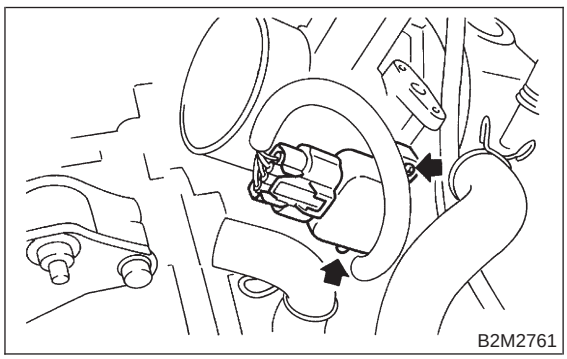
(2) Connect Subaru Select Monitor to the data link connector.
(3) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {EGI/EMPI} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(7) Select {1.12 Data Display} in Data Display Menu.
(8) Adjust throttle position sensor to the proper position to match with the following specifications.

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



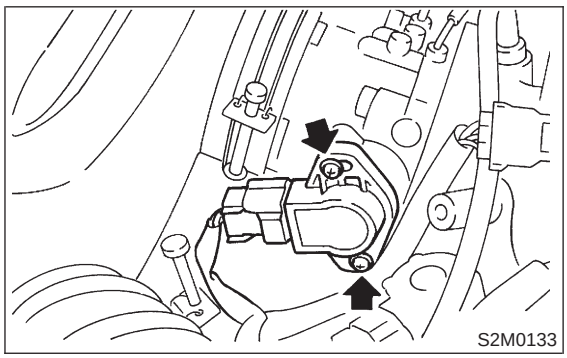
(9) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)



3. 2500 cc MODEL

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

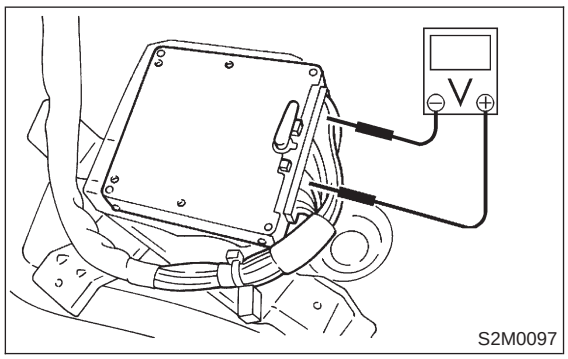


3) When using voltage meter;
(1) Take out ECM.
(2) Turn ignition switch to ON.

(3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

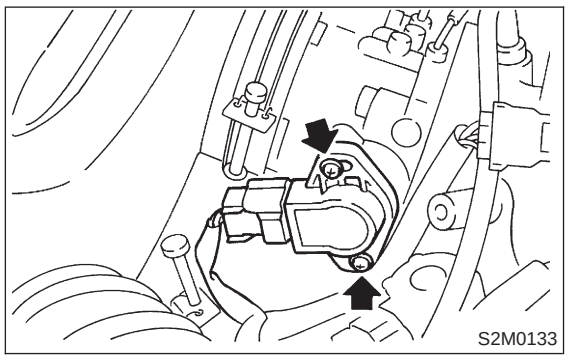
Connector & terminal /
(B84) No. 6 — (B84) No. 20

Specified voltage /
0.45 — 0.55 V [Fully closed.]



(4) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

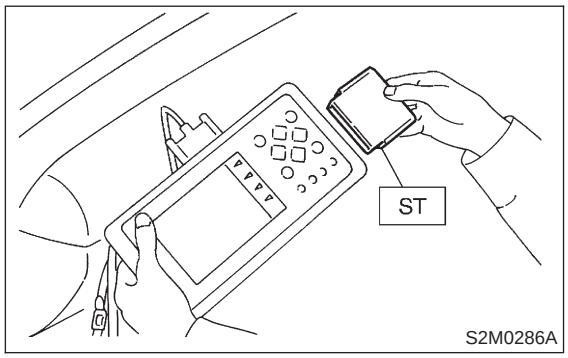


4) When using Subaru Select Monitor;

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

(1) Insert the cartridge to Subaru Select Monitor.

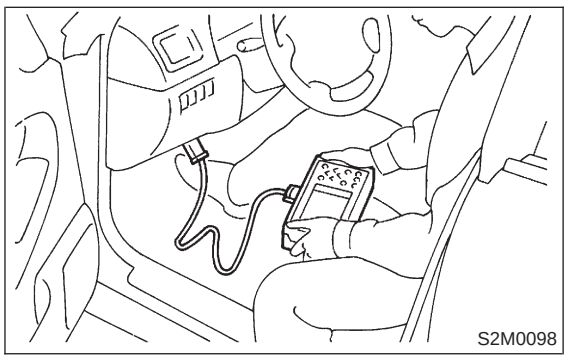
ST 24082AA090 CARTRIDGE



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

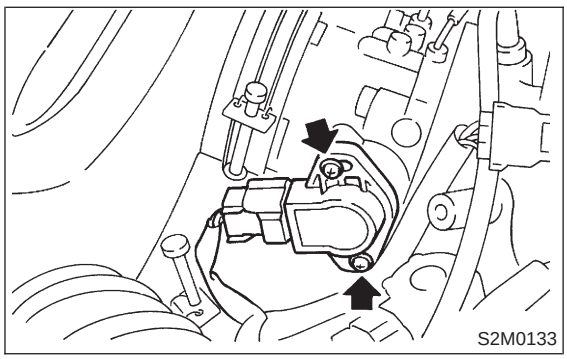
(3) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {EGI/EMPI} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(7) Select {1.12 Data Display} in Data Display Menu.
(8) Adjust throttle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

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



(9) Tighten throttle position sensor holding screws.

Tightening torque:
2.2±0.2 N·m (0.22±0.02 kg-m, 1.6±0.1 ft-lb)

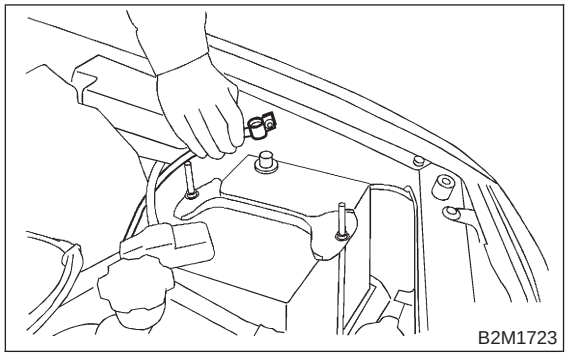


10. Camshaft Position Sensor

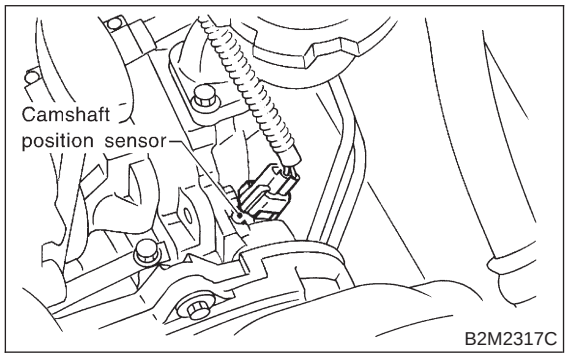
A: REMOVAL AND INSTALLATION

1. 2200 cc MODEL

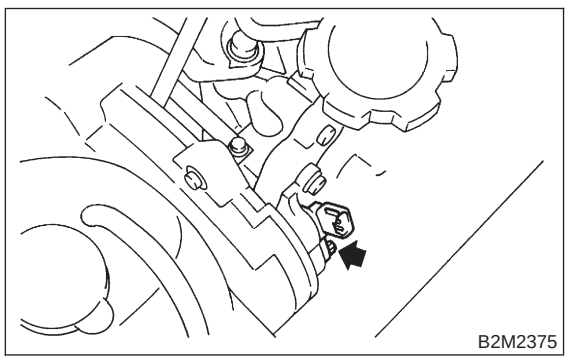
1) Disconnect battery ground cable.



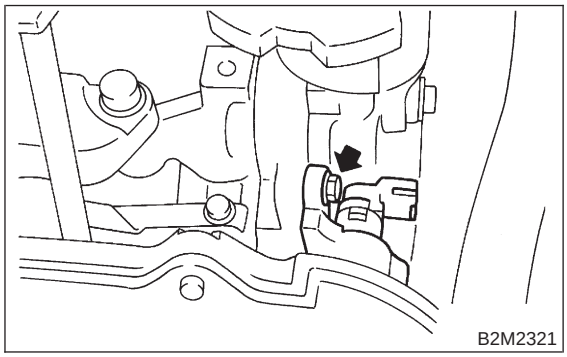
2) Disconnect connector from camshaft position sensor.



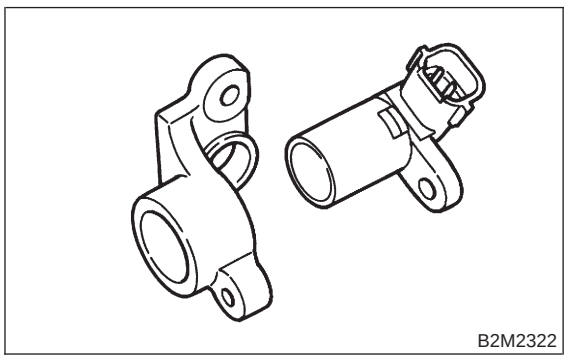
3) Remove bolt which installs camshaft position sensor to camshaft position sensor support.



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



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

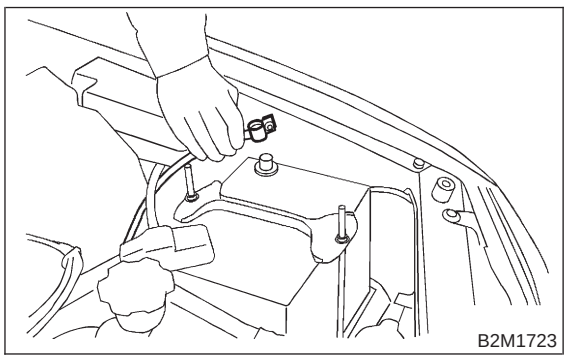


7) Installation is in the reverse order of removal.

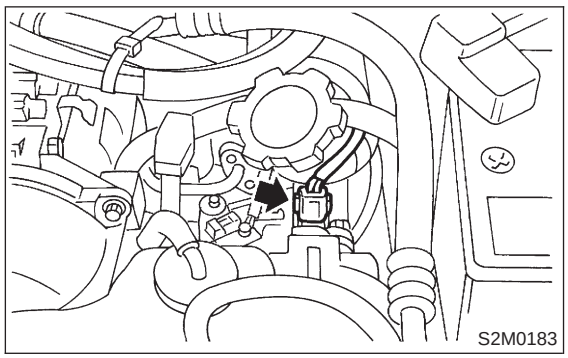
Tightening torque:
Camshaft position sensor support;
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)
Camshaft position sensor;
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

2. 2500 cc MODEL

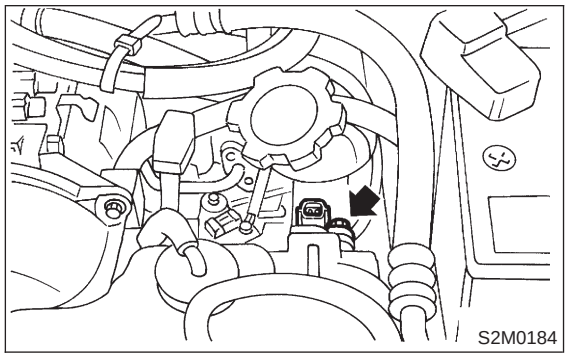
1) Disconnect battery ground cable.



2) Disconnect connector from camshaft position sensor.



3) Remove camshaft position sensor from camshaft support LH.



4) Installation is in the reverse order of removal.

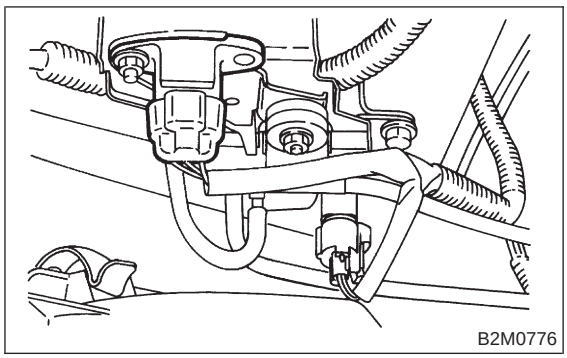
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

11. Pressure Sensor (AT model)

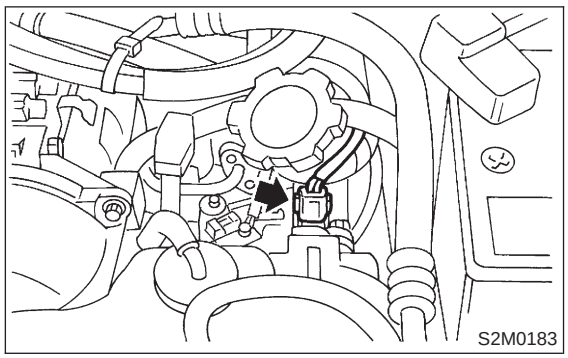
A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sensor.
2) Disconnect hose from pressure sensor.
3) Remove pressure sensor from bracket.
4) Installation is in the reverse order of removal.

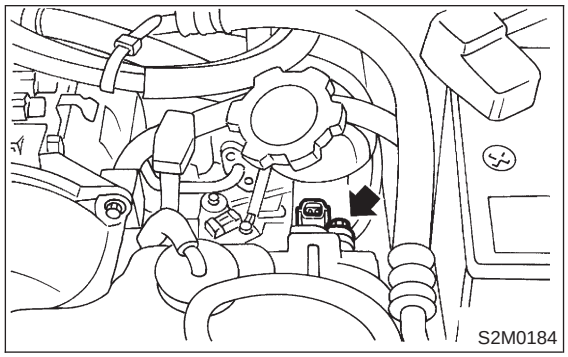
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)



2) Disconnect connector from camshaft position sensor.



3) Remove camshaft position sensor from camshaft support LH.



4) Installation is in the reverse order of removal.

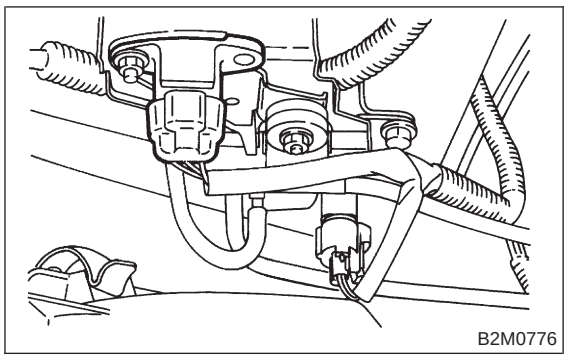
Tightening torque:
6.4±0.5 N·m (0.65±0.05 kg-m, 4.7±0.4 ft-lb)

11. Pressure Sensor (AT model)

A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sensor.
2) Disconnect hose from pressure sensor.
3) Remove pressure sensor from bracket.
4) 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)

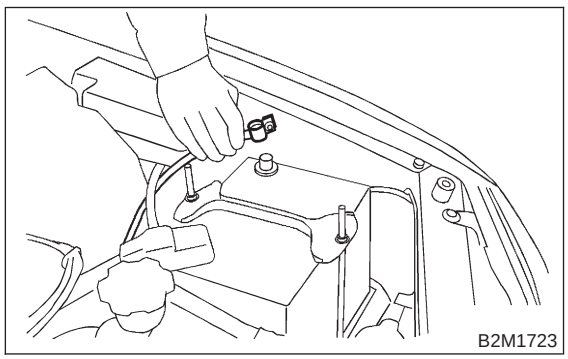


12. Idle Air Control Solenoid Valve

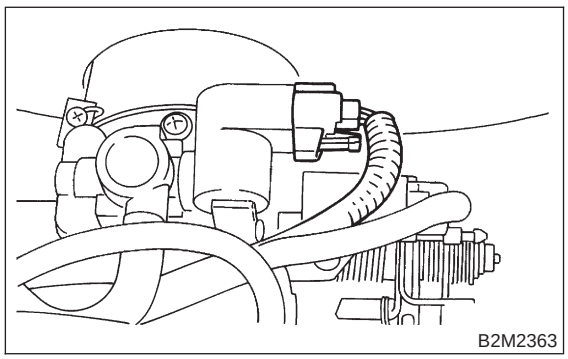
A: REMOVAL AND INSTALLATION

1. 2200 cc CALIFORNIA SPEC. VEHICLES

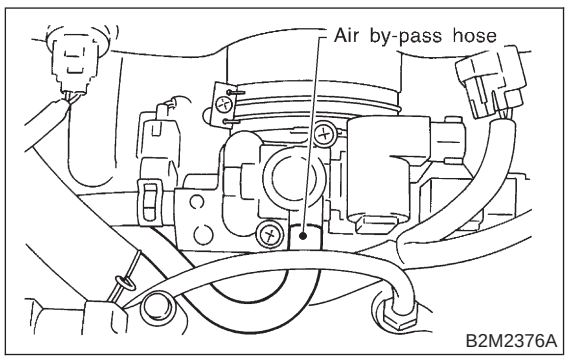
1) Disconnect battery ground cable.



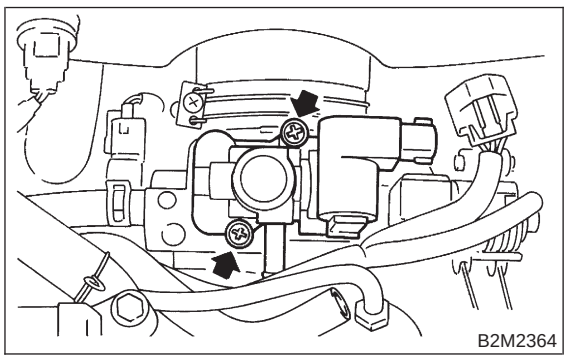
2) Disconnect connector from idle air control solenoid valve.



3) Disconnect air by-pass hose from idle air control solenoid valve.



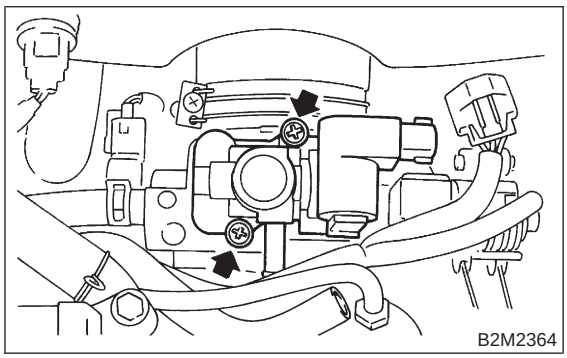
4) Remove idle air control solenoid valve from throttle body.



5) Installation is in the reverse order of removal.

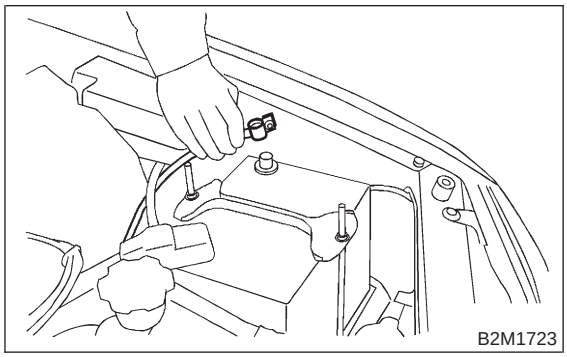
CAUTION:
Replace gasket with a new one.

Tightening torque:
6.0±0.8 N·m (0.61±0.08 kg-m, 4.4±0.6 ft-lb)

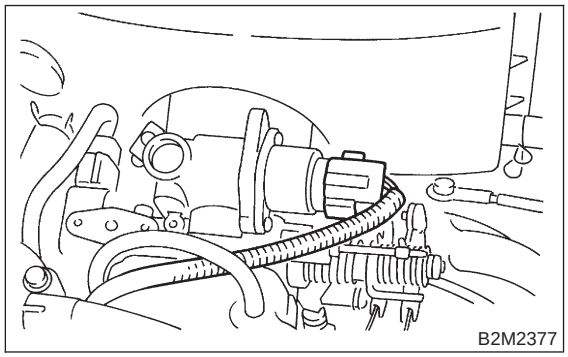


2. 2200 cc EXCEPT CALIFORNIA SPEC. VEHICLES

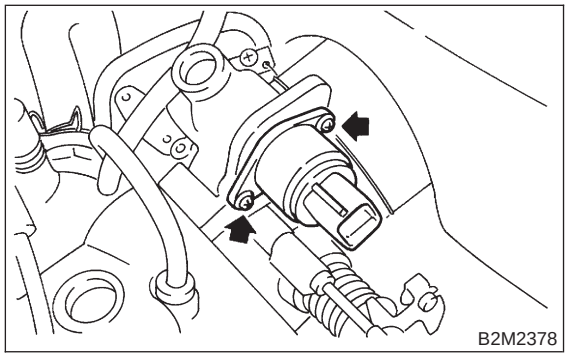
1) Disconnect battery ground cable.



2) Disconnect connector from idle air control solenoid valve.


B2M2377

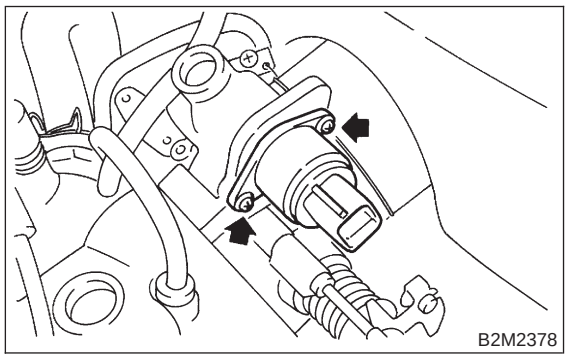
3) Remove idle air control solenoid valve from throttle body.


B2M2378

4) Installation is in the reverse order of removal.

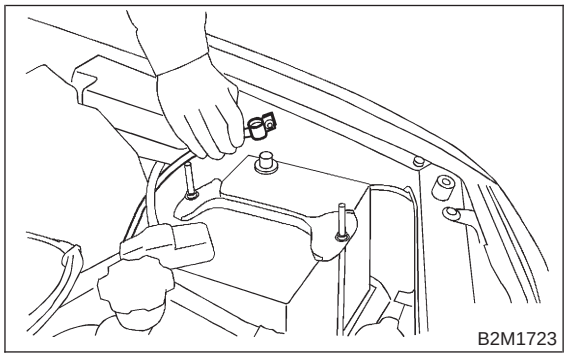
CAUTION:
Replace gasket with a new one.

Tightening torque:
6.0±0.8 N·m (0.61±0.08 kg-m, 4.4±0.6 ft-lb)

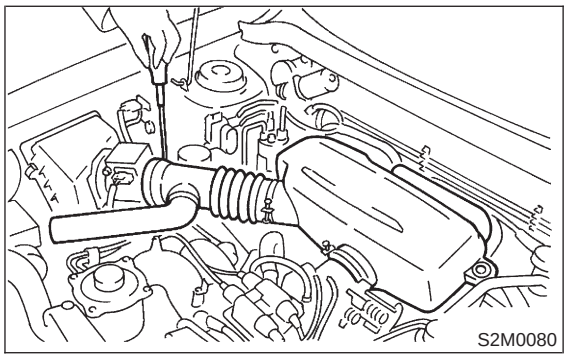

B2M2378

3. 2500 cc MODEL

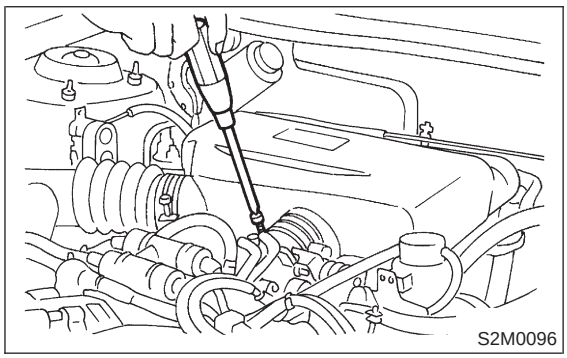
1) Disconnect battery ground cable.


B2M1723

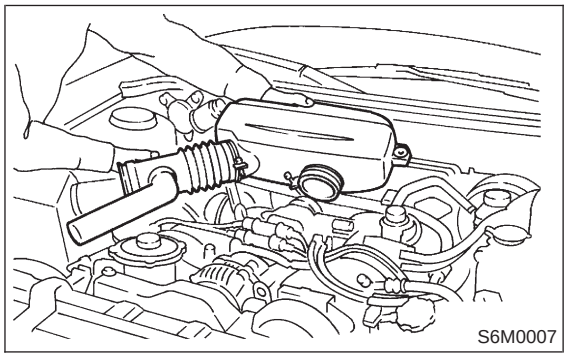
2) Loosen clamp which connects air intake duct to mass air flow sensor.


S2M0080

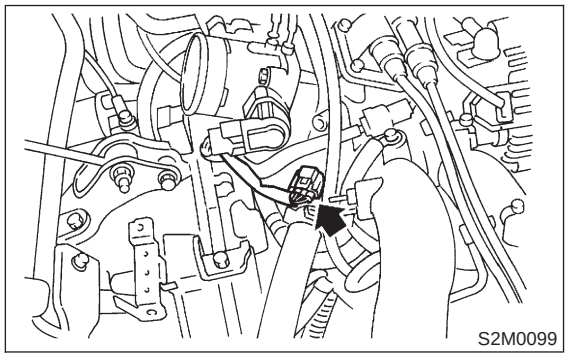
3) Loosen clamp which connects air intake chamber to throttle body.


S2M0096

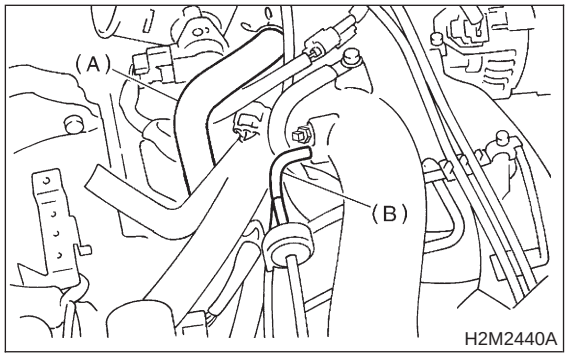
4) Disconnect blow-by hose and air hose, and remove air intake chamber and air intake duct as a unit.


S6M0007

5) Disconnect connector from idle air control solenoid valve.

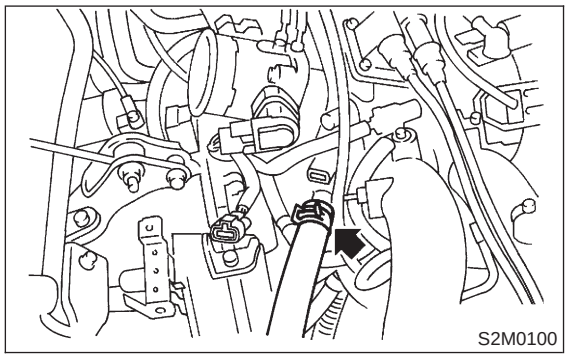

S2M0099

6) Disconnect PCV hose (A) and pressure regulator vacuum hose (B).

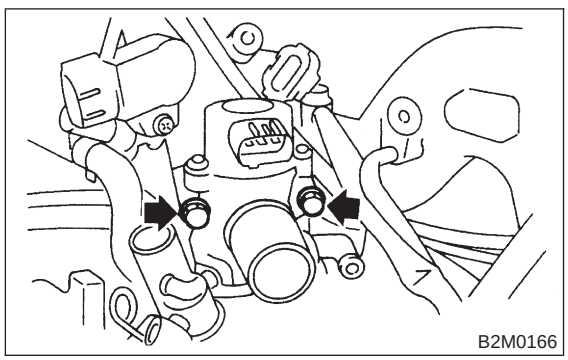


H2M2440A

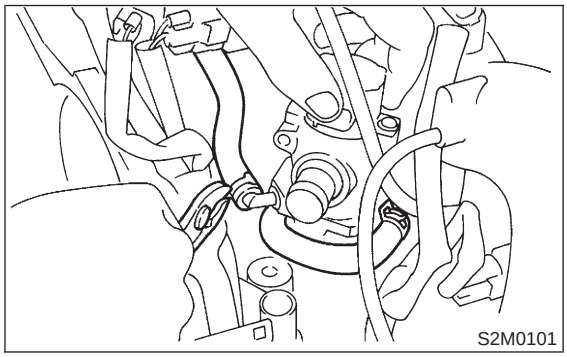
7) Disconnect air by-pass hose from idle air control solenoid valve.


S2M0100

8) Remove bolts which install idle air control solenoid valve to throttle body.


B2M0166

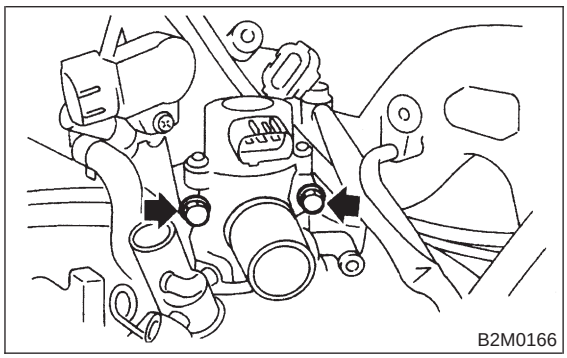
9) Disconnect engine coolant hoses from idle air control solenoid valve, and take them off.


S2M0101

10) Installation is in the reverse order of removal.

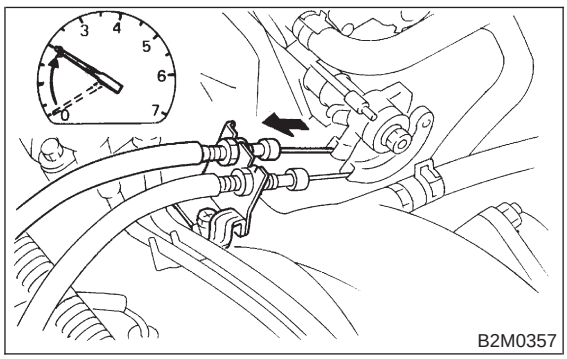
CAUTION:
Replace gasket with a new one.

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


B2M0166

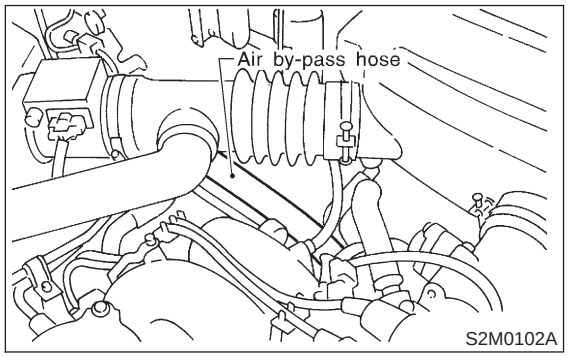
B: CLEANING (2500 cc MODEL ONLY)

1) Start and warm-up the engine until radiator fan operates.
2) Hold throttle valve to keep the engine speed at 2,000 rpm.



B2M0357

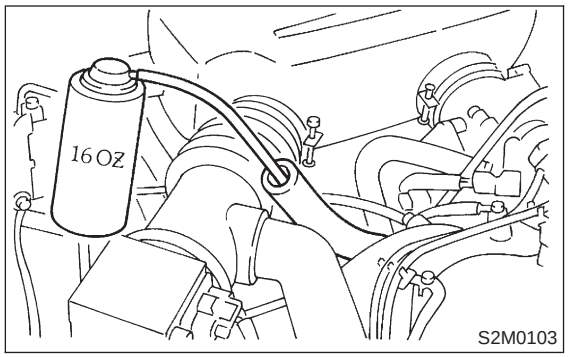
3) Disconnect air by-pass hose from air intake duct.



4) Slowly pour one can (16 oz) of cleaner into by-pass air hole.

Cleaner:

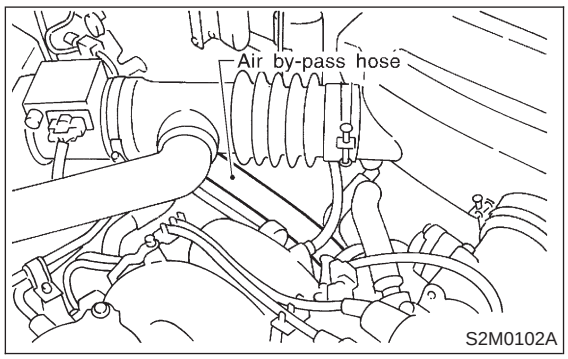
Part No. 1050002 GM Top Engine Cleaner
Part No. X66-A AC Delco Carburetor Tune-up Conditioner



5) Leave the engine running for five minutes.

NOTE:
Let white smoke come out from muffler until the cleaner is used up.

6) Stop the engine.
7) Release the throttle valve.
8) Connect air by-pass hose to air intake duct.

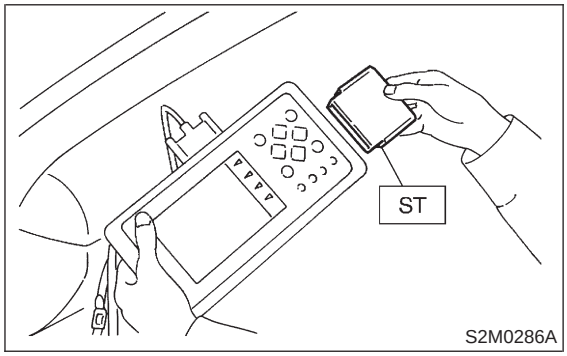


9) Check duty ratio of idle air control solenoid valve using Subaru Select Monitor.

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

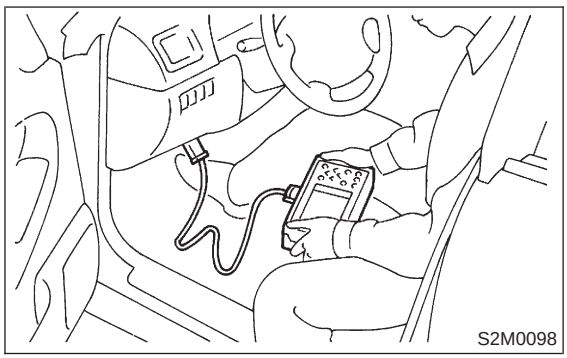
(1) Insert the cartridge to Subaru Select Monitor.

ST 24082AA090 CARTRIDGE



(2) Connect Subaru Select Monitor to the data link connector.
(3) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {EGI/EMPI} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(7) Select {1.12 Data Display} in Data Display Menu.
(8) Adjust throttle position sensor to the proper position to match with the following specification.

ISC valve duty ratio: 25 — 40%

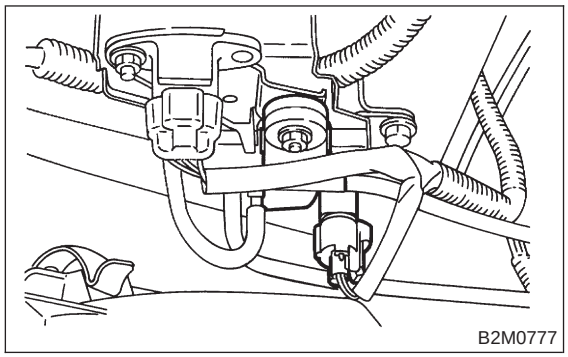


13. Pressure Sources Switching Solenoid Valve (AT model)

A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sources switching solenoid valve.
2) Disconnect hoses from pressure sources switching solenoid valve.
3) Remove pressure sources switching solenoid valve from bracket.
4) 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)

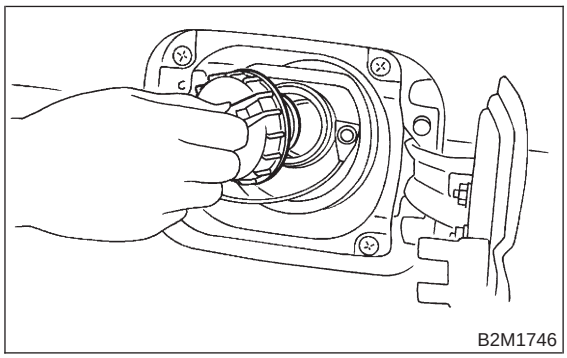

B2M0777

14. Fuel Injector

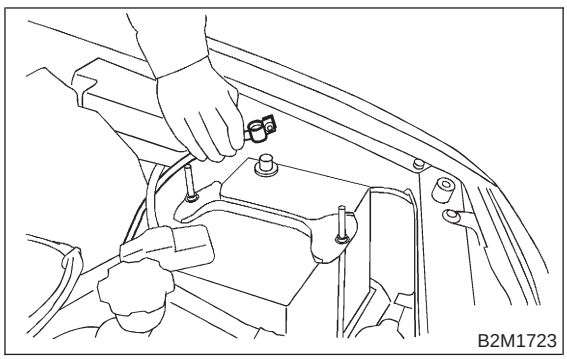
A: REMOVAL AND INSTALLATION

1. RH SIDE OF 2200 cc MODEL

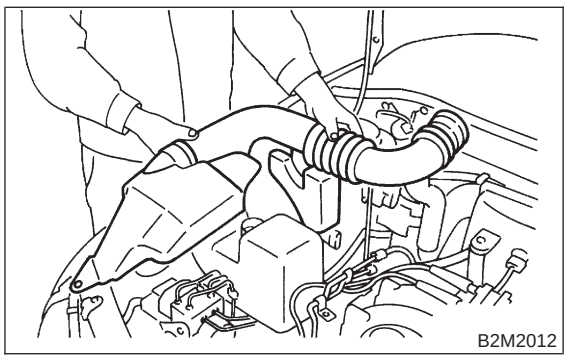
1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M1746

3) Disconnect battery ground cable.


B2M1723

4) Remove component parts of air intake system on California spec. vehicles.
(1) Remove air intake duct (A) and (B) as a unit.

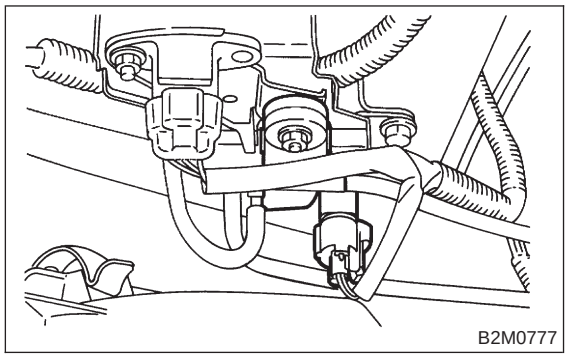

B2M2012

13. Pressure Sources Switching Solenoid Valve (AT model)

A: REMOVAL AND INSTALLATION

1) Disconnect connector from pressure sources switching solenoid valve.
2) Disconnect hoses from pressure sources switching solenoid valve.
3) Remove pressure sources switching solenoid valve from bracket.
4) 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)

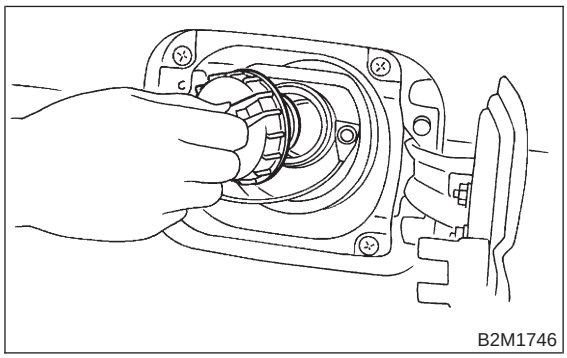

B2M0777

14. Fuel Injector

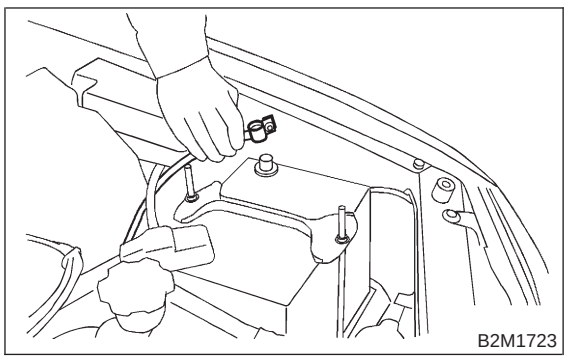
A: REMOVAL AND INSTALLATION

1. RH SIDE OF 2200 cc MODEL

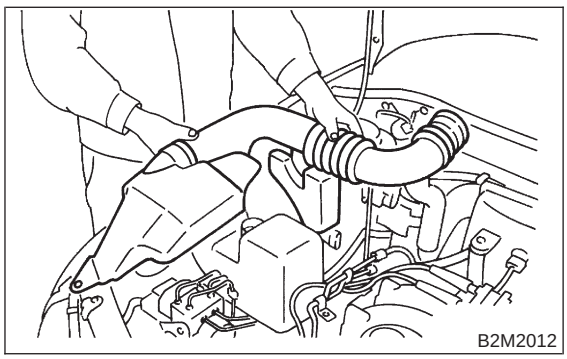
1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M1746

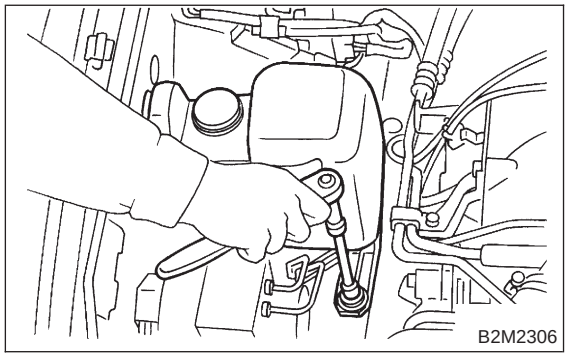
3) Disconnect battery ground cable.


B2M1723

4) Remove component parts of air intake system on California spec. vehicles.
(1) Remove air intake duct (A) and (B) as a unit.

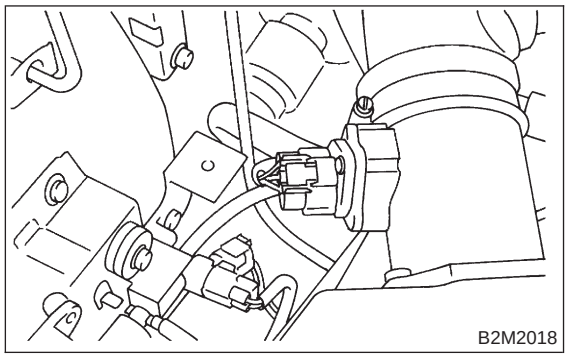

B2M2012

(2) Remove resonator chamber.

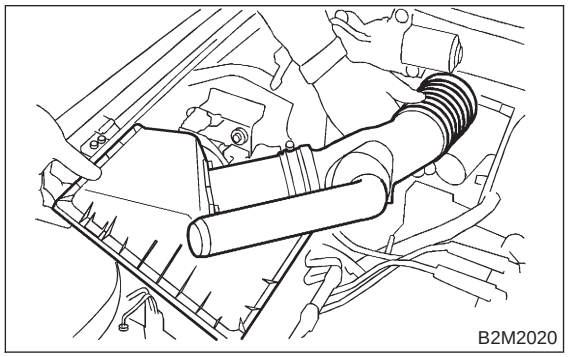


5) Remove component parts of air intake system. (Except California spec. vehicles)

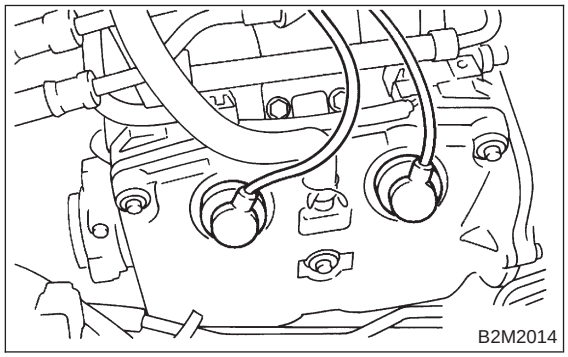
(1) Disconnect connector from mass air flow sensor.



(2) Remove air intake duct and air cleaner upper cover as a unit, and remove air cleaner element. <Ref. to 2-7 [W1A0].>

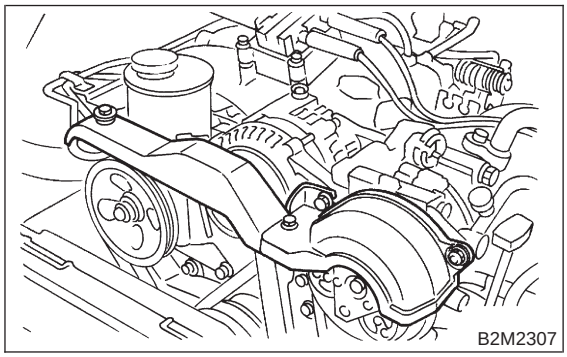


6) Remove spark plug cords from spark plugs (#1 and #3 cylinders).

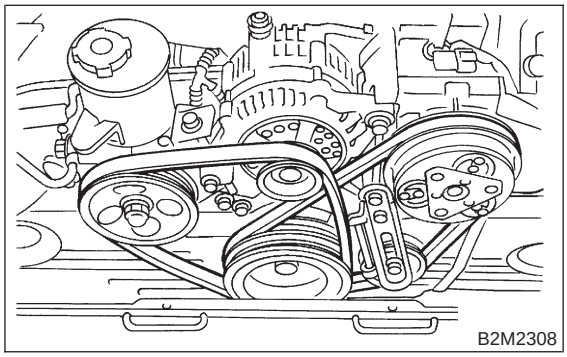


7) Remove power steering pump from bracket.

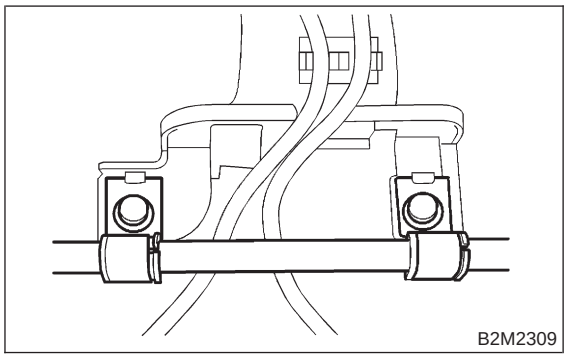
(1) Remove V-belt covers.



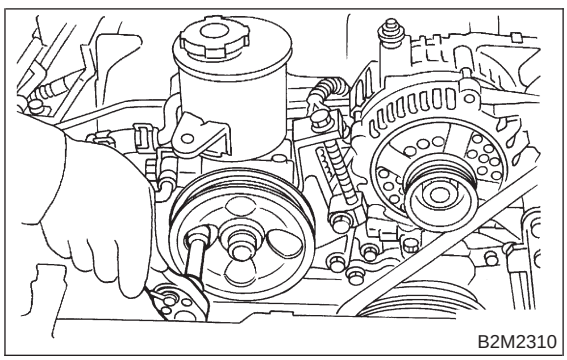
(2) Loosen lock bolt and slider bolt, and remove power steering pump drive V-belt.



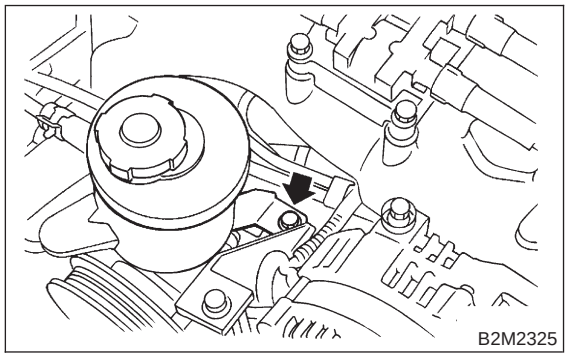
(3) Remove bolts which secure power steering pipe brackets to intake manifold.



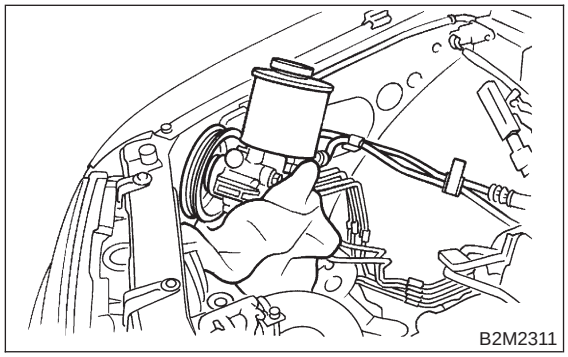
(4) Remove bolts which install power steering pump to bracket.



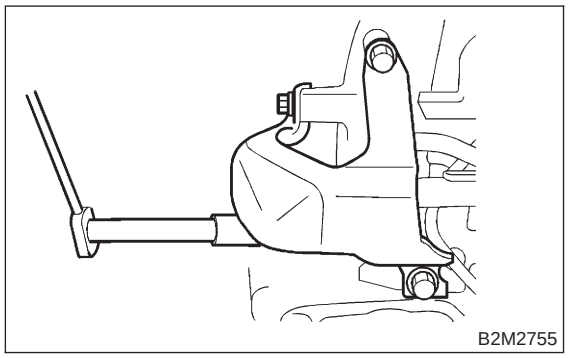
(5) Remove bolt which installs power steering stiffener onto cylinder block.


B2M2325

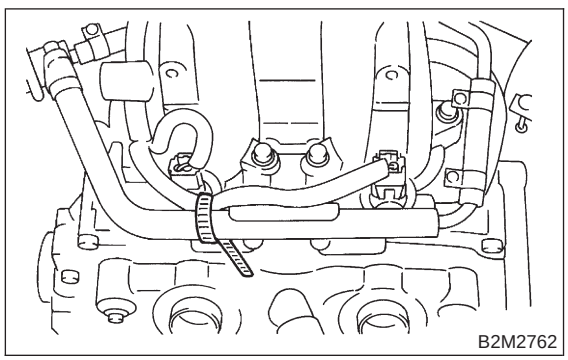
(6) Place power steering pump on the right side wheel apron.


B2M2311

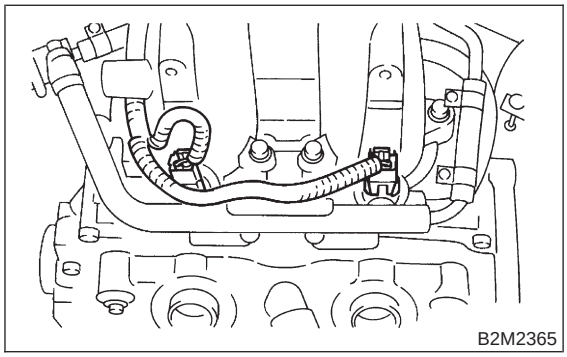
8) Remove fuel pipe protector RH. (RHD model only)


B2M2755

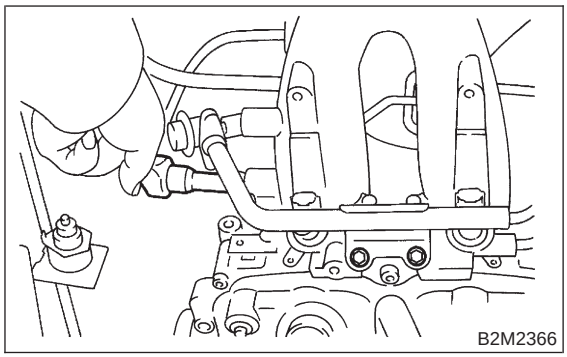
9) Remove band which holds engine harness to fuel injector pipe.


B2M2762

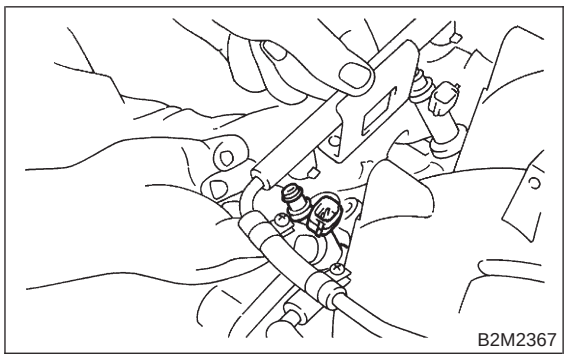
10) Disconnect connector from fuel injector.


B2M2365

11) Remove bolts which install injector pipe to intake manifold.


B2M2366

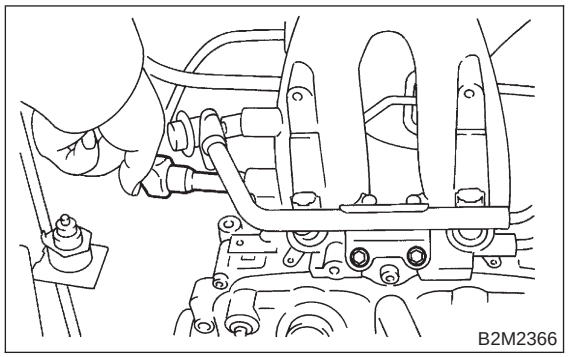
12) Pull up injector pipe, and remove fuel injector from intake manifold.


B2M2367

13) Installation is in the reverse order of removal.

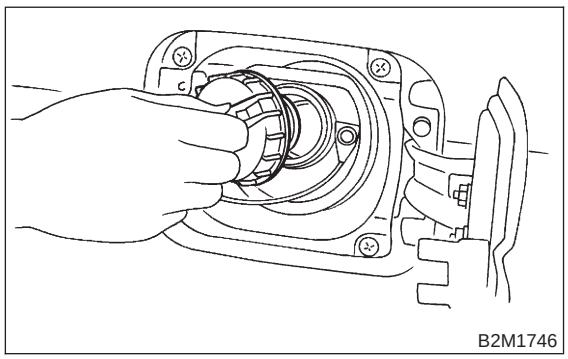
CAUTION:
Replace O-rings with new ones.

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

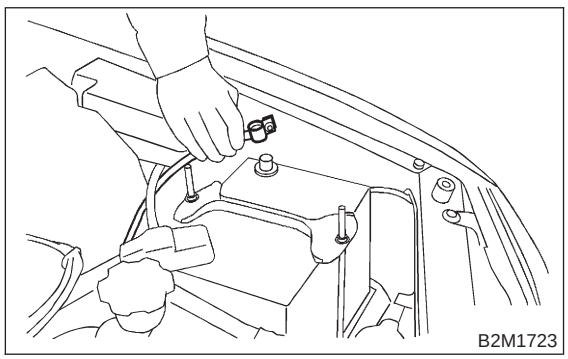

B2M2366

2. LH SIDE OF 2200 cc MODEL

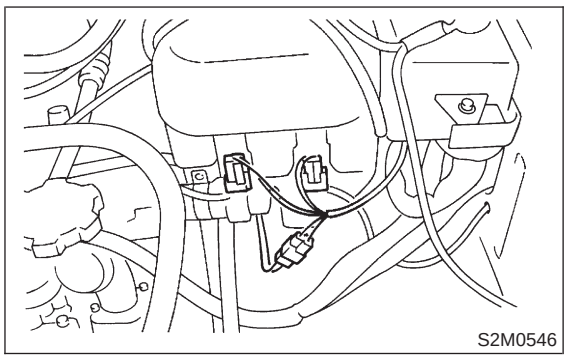
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M1746

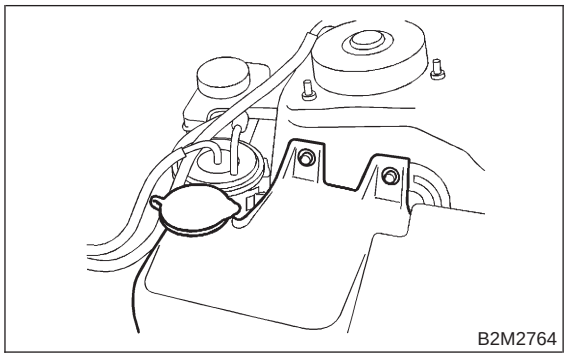
3) Disconnect battery ground cable.


B2M1723

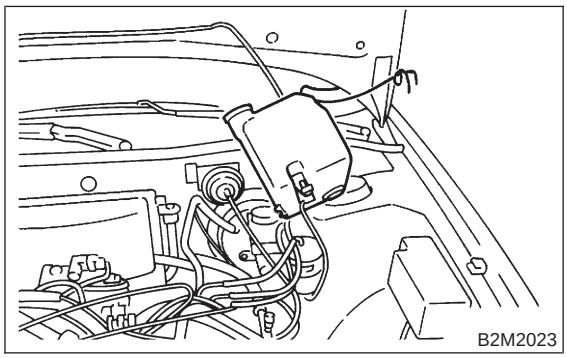
4) Disconnect connector from front window washer motor.
5) Disconnect connector from rear gate glass washer motor. (Wagon only)


S2M0546

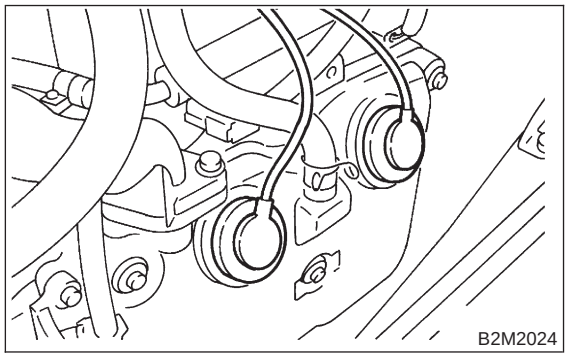
6) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
7) Remove two bolts which install washer tank on body.


B2M2764

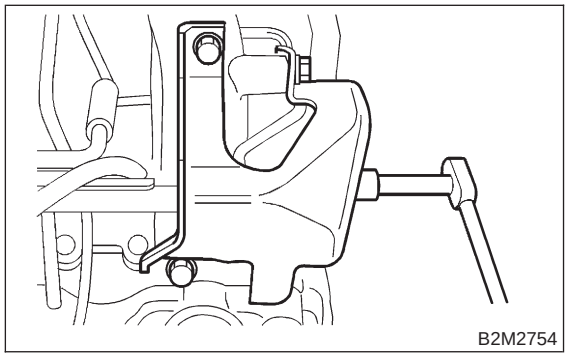
8) Move washer tank, and secure it away from working area.


B2M2023

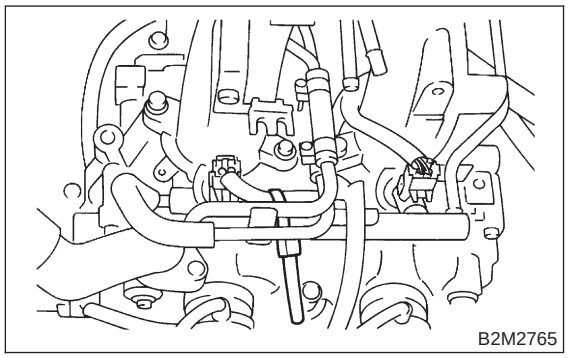
9) Remove spark plug cords from spark plugs (#1 and #3 cylinders).



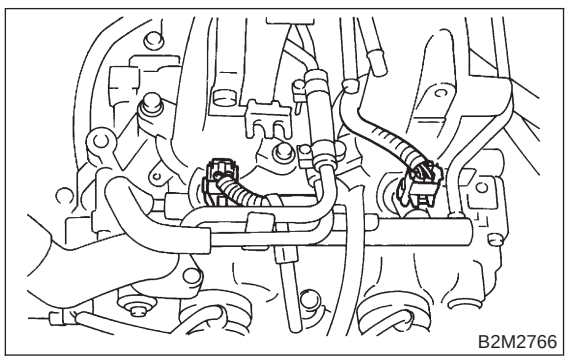
10) Remove fuel pipe protector LH. (LHD model only)



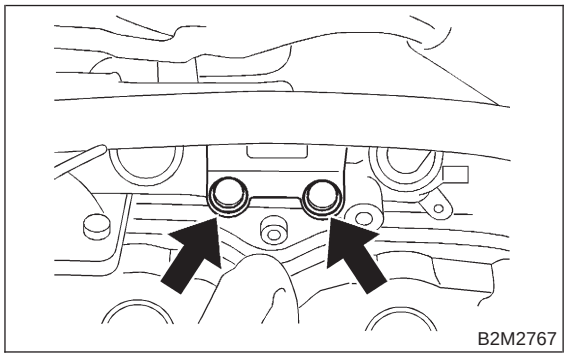
11) Remove band which holds engine harness to fuel injector pipe.



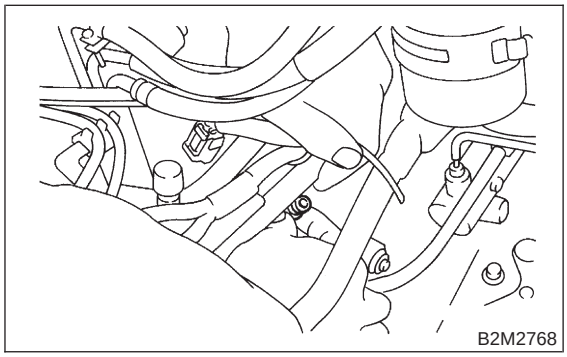
12) Disconnect connector from fuel injector.



13) Remove bolts which install injector pipe to intake manifold.



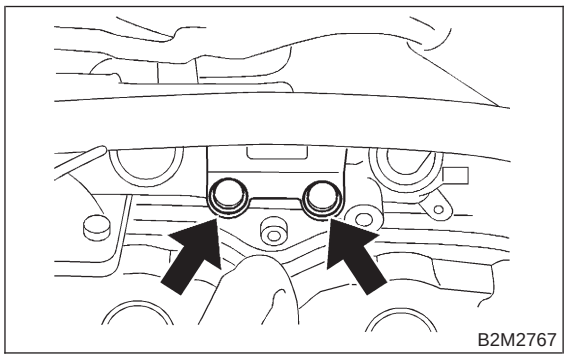
14) Pull up injector pipe, and remove fuel injector from intake manifold.



15) Installation is in the reverse order of removal.

CAUTION:
Replace O-rings with new ones.

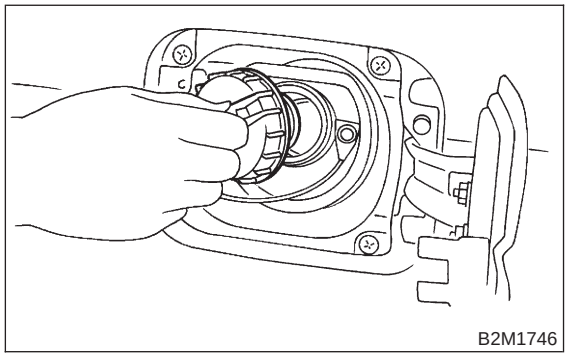
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)



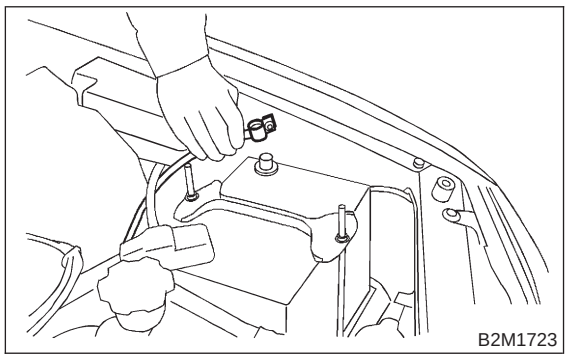
3. 2500 cc MODEL

1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>

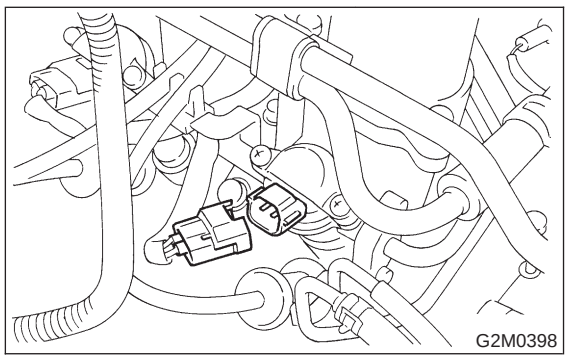
2) Open fuel flap lid, and remove fuel filler cap.



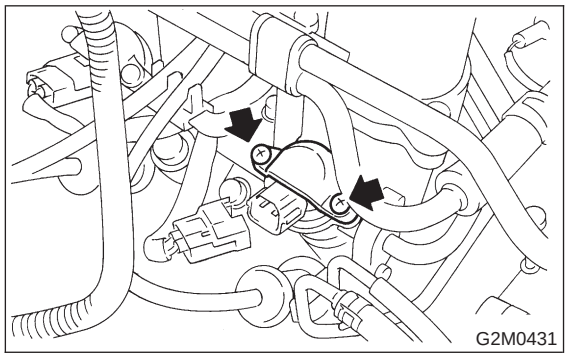
3) Disconnect battery ground cable.



4) Disconnect connector from fuel injector.



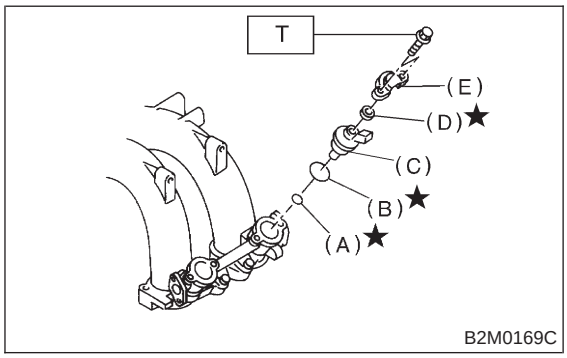
5) Remove fuel injector from fuel pipe assembly.



6) 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)



(A) O-ring B
(B) O-ring A
(C) Fuel injector
(D) Insulator
(E) Fuel injector cup
★: Replacement part