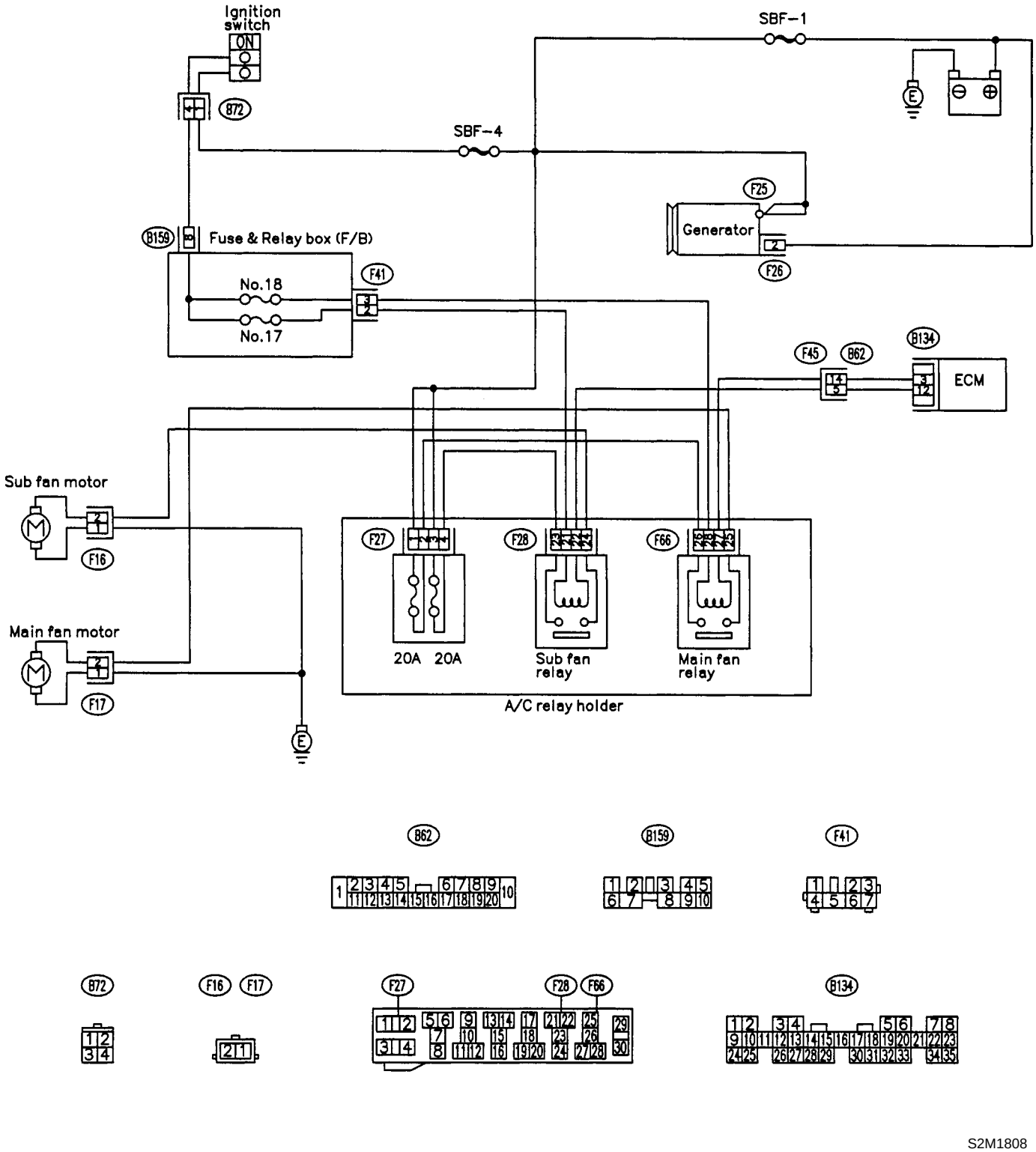
1. Wiring Diagram



S2M1808

2. Radiator Main Fan

A: OPERATION

DETECTING CONDITION:

Condition:
- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

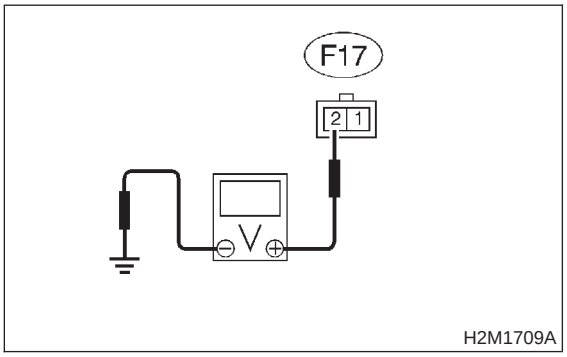
TROUBLE SYMPTOM:
- Radiator main fan does not rotate under the above conditions.

2A1 : CHECK POWER SUPPLY TO MAIN FAN MOTOR.

CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from main fan motor.
3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F).
4) Stop the engine and turn ignition switch to ON.
5) Measure voltage between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 2 (+) — Chassis ground (−):

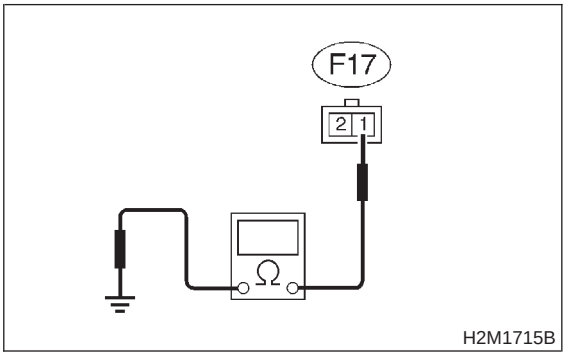


CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **2A2**.
NO : Go to step **2A5**.

2A2 : CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.

1) Turn ignition switch to OFF.
2) Measure resistance between main fan motor connector and chassis ground.

Connector & terminal
(F17) No. 1 — Chassis ground:



CHECK : ***Is the resistance less than 5 Ω?***
YES : Go to step **2A3**.
NO : Repair open circuit in harness between main fan motor connector and chassis ground.

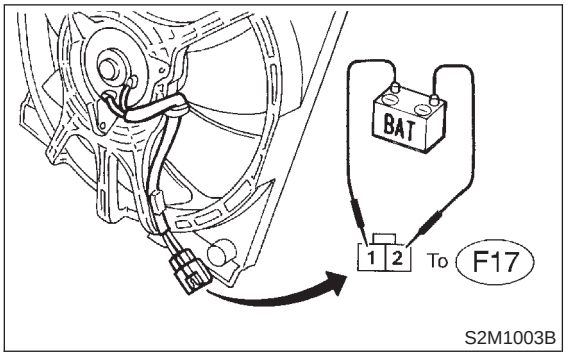
2A3 : CHECK POOR CONTACT.

Check poor contact in main fan motor connector. <Ref. to FOREWORD [W3C1].>

CHECK : ***Is there poor contact in main fan motor connector?***
YES : Repair poor contact in main fan motor connector.
NO : Go to step **2A4**.

2A4 : CHECK MAIN FAN MOTOR.

Connect battery positive (+) terminal to terminal No. 2, and negative (−) terminal to terminal No. 1 of main fan motor connector.

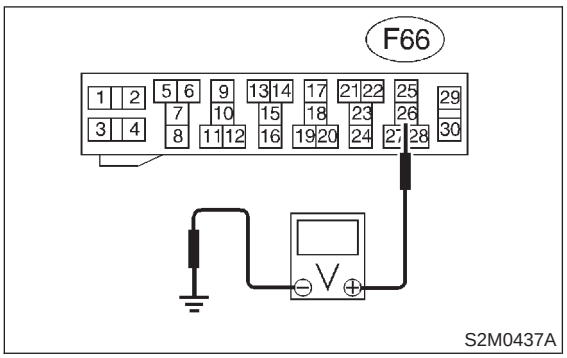


CHECK : ***Does the main fan rotate?***
YES : Repair poor contact in main fan motor connector.
NO : Replace main fan motor with a new one.

2A5 : CHECK POWER SUPPLY TO MAIN FAN RELAY.

1) Turn ignition switch to OFF.
2) Remove main fan relay from A/C relay holder.
3) Measure voltage between main fan relay terminal and chassis ground.

Connector & terminal
(F66) No. 26 (+) — Chassis ground (−):

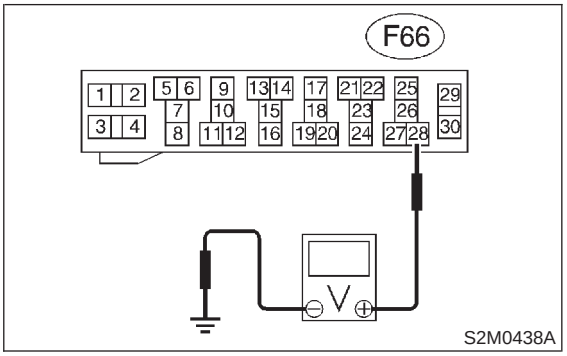


CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **2A6**.
NO : Go to step **2A7**.

2A6 : CHECK POWER SUPPLY TO MAIN FAN RELAY.

1) Turn ignition switch to ON.
2) Measure voltage between main fan relay terminal and chassis ground.

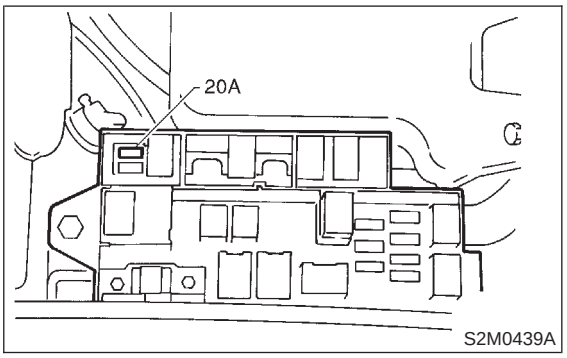
Connector & terminal
(F66) No. 28 (+) — Chassis ground (−):



CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **2A10**.
NO : Go to step **2A9**.

2A7 : CHECK 20 A FUSE.

1) Remove 20 A fuse from A/C relay holder.
2) Check condition of fuse.

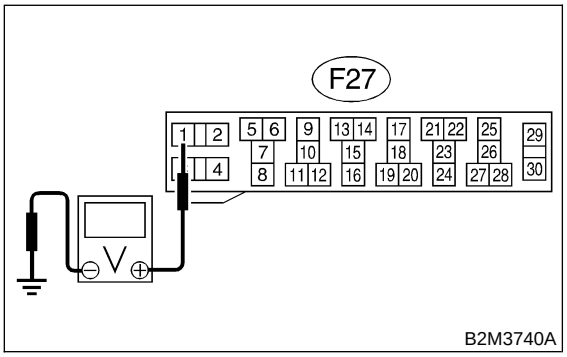


CHECK : ***Is the fuse blown-out?***
YES : Replace fuse.
NO : Go to step **2A8**.

2A8 : CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.

Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.

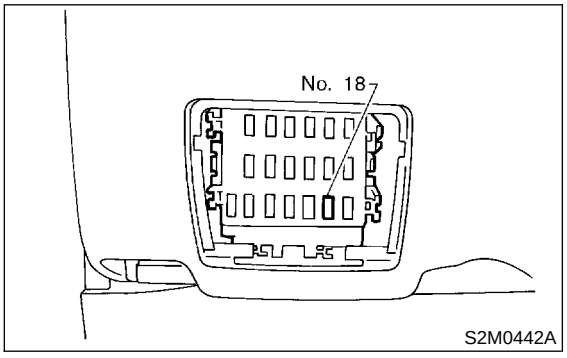
Connector & terminal
(F27) No. 1 (+) — Chassis ground (−):



CHECK : ***Is the voltage more than 10 V?***
YES : Repair open circuit in harness between 20 A fuse and main fan relay terminal.
NO : Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.

2A9 : CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 18 from joint box.
3) Check condition of fuse.

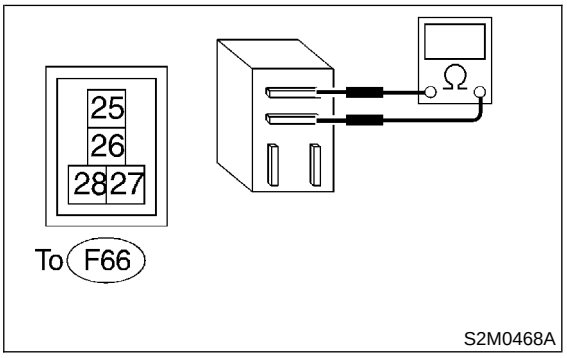


CHECK : ***Is the fuse blown-out?***
YES : Replace fuse.
NO : Repair open circuit in harness between main fan relay and ignition switch.

2A10 : CHECK MAIN FAN RELAY.

1) Turn ignition switch to OFF.
2) Measure resistance of main fan relay.

Terminal
No. 25 — No. 26:

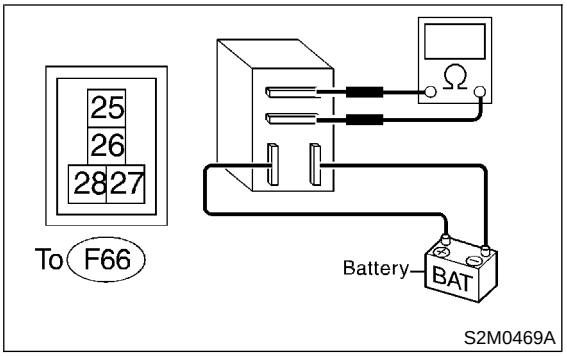


CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **2A11**.
NO : Replace main fan relay.

2A11 : CHECK MAIN FAN RELAY.

1) Connect battery to terminals No. 27 and No. 28 of main fan relay.
2) Measure resistance of main fan relay.

Terminal
No. 25 — No. 26:

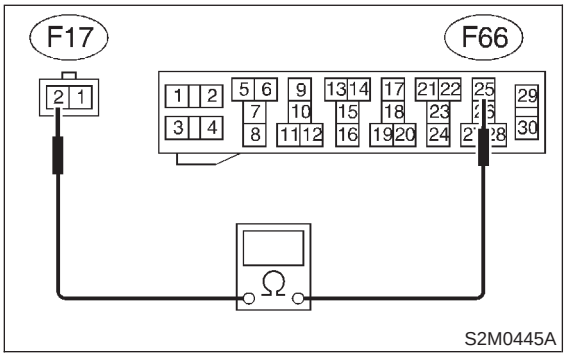


CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **2A12**.
NO : Replace main fan relay.

2A12 : CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.

Measure resistance of harness between main fan motor connector and main fan relay terminal.

Connector & terminal
(F17) No. 2 — (F66) No. 25:

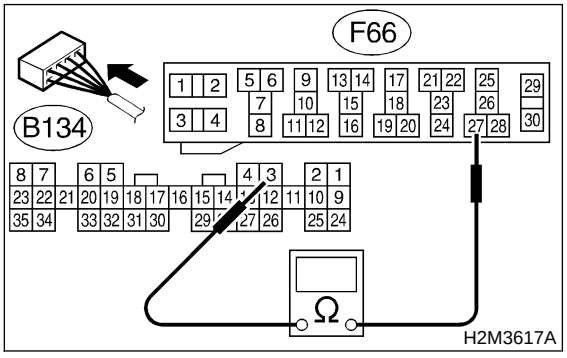


CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **2A13**.
NO : Repair open circuit in harness between main fan motor connector and main fan relay terminal.

2A13 : CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between main fan relay connector and ECM connector.

Connector & terminal
(F66) No. 27 — (B134) No. 3:



CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **2A14**.
NO : Repair open circuit in harness between main fan relay and ECM.

2A14 : CHECK POOR CONTACT.

Check poor contact in connector between main fan and ECM. <Ref. to FOREWORD [W3C1].>

CHECK : ***Is there poor contact in connector between main fan motor and ECM?***
YES : Repair poor contact connector.
NO : Contact with your Subaru distributor.

NOTE:
Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan (With A/C model only)

A: OPERATION

DETECTING CONDITION:

Condition (1):
- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):
- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

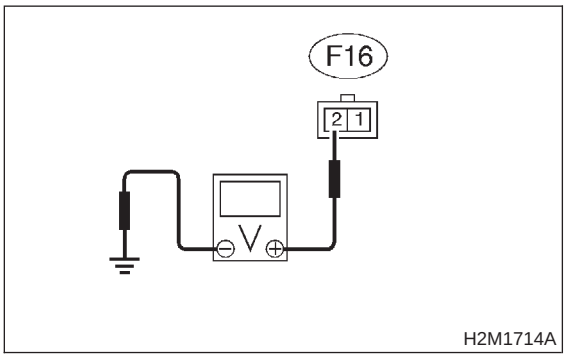
TROUBLE SYMPTOM:
- Radiator sub fan does not rotate under conditions (1) and (2) above.

3A1 : CHECK POWER SUPPLY TO SUB FAN MOTOR.

CAUTION:
Be careful not to overheat engine during repair.

1) Turn ignition switch to OFF.
2) Disconnect connector from sub fan motor and main fan motor.
3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F).
4) Stop the engine and turn ignition switch to ON.
5) Measure voltage between sub fan motor connector and chassis ground.

Connector & terminal
(F16) No. 2 (+) — Chassis ground (−):

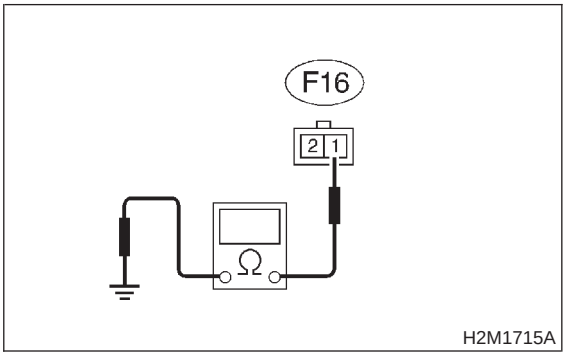


CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **3A2**.
NO : Go to step **3A5**.

3A2 : CHECK GROUND CIRCUIT OF SUB FAN MOTOR.

1) Turn ignition switch to OFF.
2) Measure resistance between sub fan motor connector and chassis ground.

Connector & terminal
(F16) No. 1 — Chassis ground:



CHECK : ***Is the resistance less than 5 Ω?***
YES : Go to step **3A3**.
NO : Repair open circuit in harness between sub fan motor connector and chassis ground.

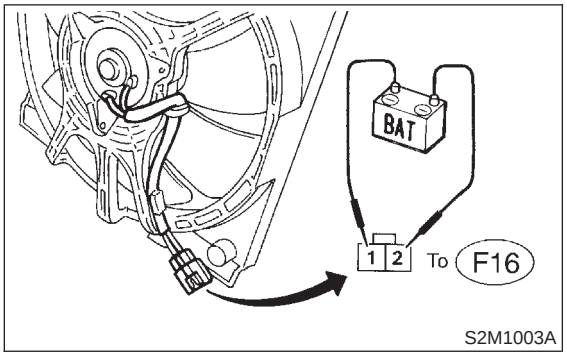
3A3 : CHECK POOR CONTACT.

Check poor contact in sub fan motor connector. <Ref. to FOREWORD [W3C1].>

CHECK : ***Is there poor contact in sub fan motor connector?***
YES : Repair poor contact in sub fan motor connector.
NO : Go to step **3A4**.

3A4 : CHECK SUB FAN MOTOR.

Connect battery positive (+) terminal to terminal No. 2, and negative (−) terminal to terminal No. 1 of sub fan motor connector.

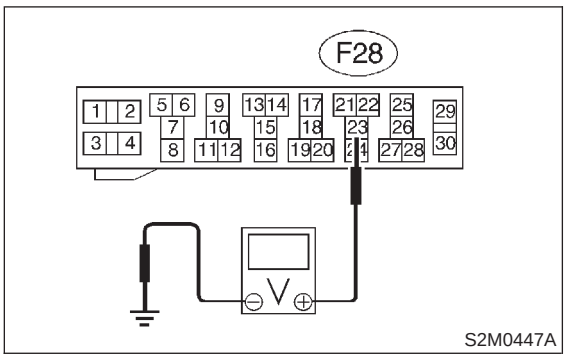


CHECK : ***Does the sub fan rotate?***
YES : Repair poor contact in sub fan motor connector.
NO : Replace sub fan motor with a new one.

3A5 : CHECK POWER SUPPLY TO SUB FAN RELAY.

1) Turn ignition switch to OFF.
2) Remove sub fan relay from A/C relay holder.
3) Measure voltage between sub fan relay terminal and chassis ground.

Connector & terminal
(F28) No. 23 (+) — Chassis ground (−):

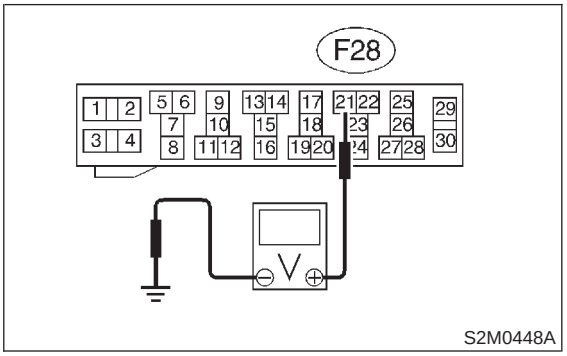


CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **3A6**.
NO : Go to step **3A7**.

3A6 : CHECK POWER SUPPLY TO SUB FAN RELAY.

1) Turn ignition switch to ON.
2) Measure voltage between sub fan relay terminal and chassis ground.

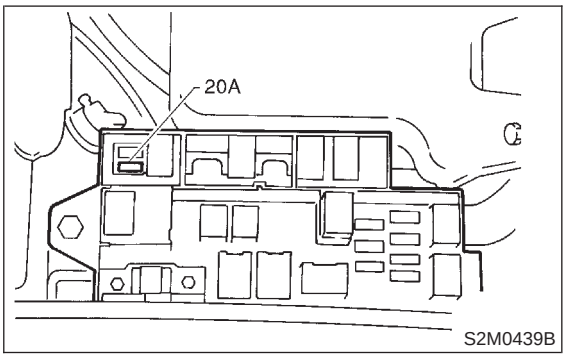
Connector & terminal
(F28) No. 21 (+) — Chassis ground (−):



CHECK : ***Is the voltage more than 10 V?***
YES : Go to step **3A10**.
NO : Go to step **3A9**.

3A7 : CHECK 20 A FUSE.

1) Remove 20 A fuse from A/C relay holder.
2) Check condition of fuse.

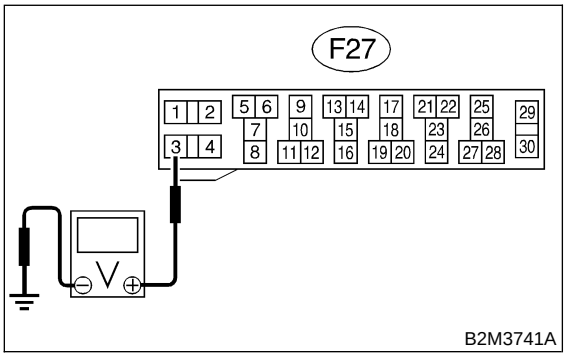


CHECK : ***Is the fuse blown-out?***
YES : Replace fuse.
NO : Go to step **3A8**.

3A8 : CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.

Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.

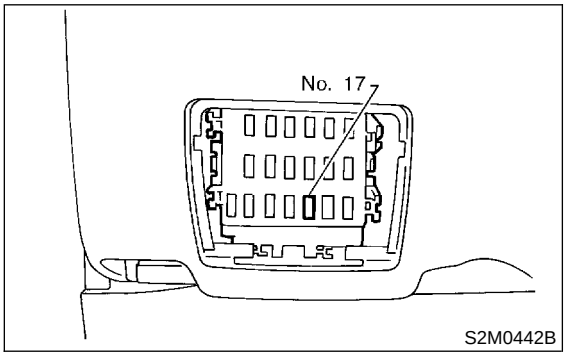
Connector & terminal
(F27) No. 3 (+) — Chassis ground (−):



CHECK : ***Is the voltage more than 10 V?***
YES : Repair open circuit in harness between 20 A fuse and sub fan relay terminal.
NO : Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.

3A9 : CHECK FUSE.

1) Turn ignition switch to OFF.
2) Remove fuse No. 17 from joint box.
3) Check condition of fuse.

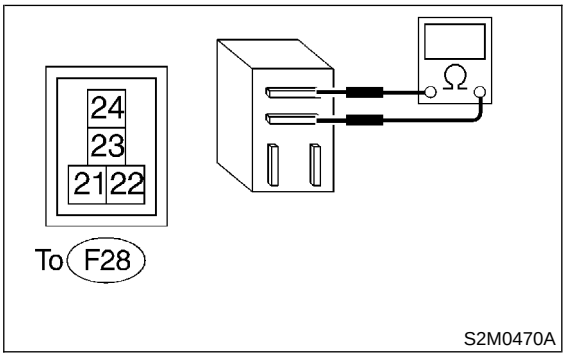


CHECK : ***Is the fuse blown-out?***
YES : Replace fuse.
NO : Repair open circuit in harness between sub fan relay and ignition switch.

3A10 : CHECK SUB FAN RELAY.

1) Turn ignition switch to OFF.
2) Measure resistance of sub fan relay.

Terminal
No. 23 — No. 24:

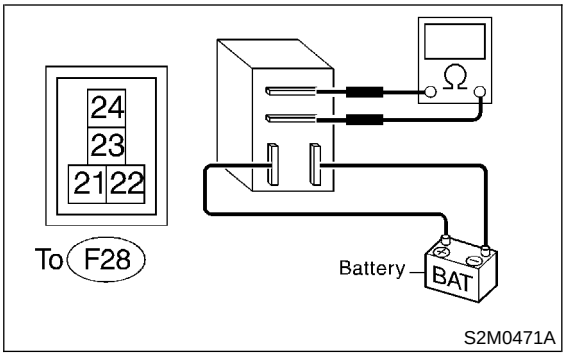


CHECK : ***Is the resistance more than 1 MΩ?***
YES : Go to step **3A11**.
NO : Replace sub fan relay.

3A11 : CHECK SUB FAN RELAY.

1) Connect battery to terminals No. 21 and No. 22 of sub fan relay.
2) Measure resistance of sub fan relay.

Terminal
No. 23 — No. 24:

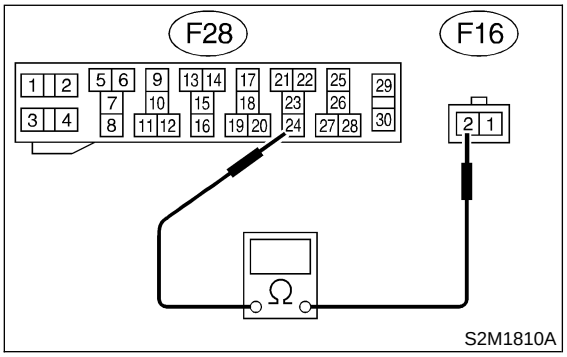


CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **3A12**.
NO : Replace sub fan relay.

3A12 : CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.

Measure resistance of harness between sub fan motor connector and sub fan relay terminal.

Connector & terminal
(F16) No. 2 — (F28) No. 24:

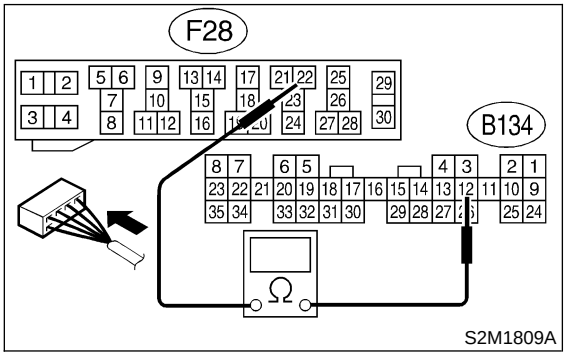


CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **3A13**.
NO : Repair open circuit in harness between sub fan motor and sub fan relay connector.

3A13 : CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.

1) Turn ignition switch to OFF.
2) Disconnect connector from ECM.
3) Measure resistance of harness between sub fan relay connector and ECM connector.

Connector & terminal
(F28) No. 22 — (B134) No. 12:



CHECK : ***Is the resistance less than 1 Ω?***
YES : Go to step **3A14**.
NO : Repair open circuit in harness between sub fan relay and ECM.

3A14 : CHECK POOR CONTACT.

Check poor contact in connnector between sub fan and ECM. <Ref. to FOREWORD [W3C1].>

CHECK : ***Is there poor contact in connector between sub fan motor and ECM?***
YES : Repair poor contact connector.
NO : Contact with your Subaru distributor.

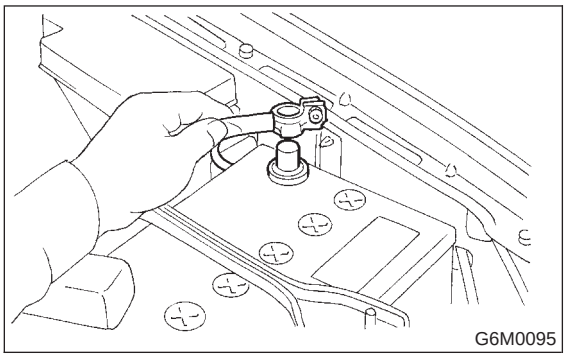
NOTE:
Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

MEMO:

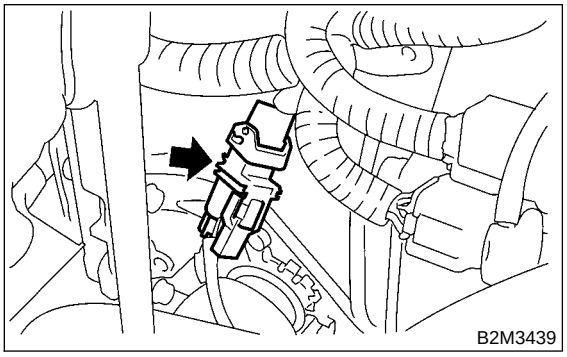
1. Front Catalytic Converter

A: REMOVAL

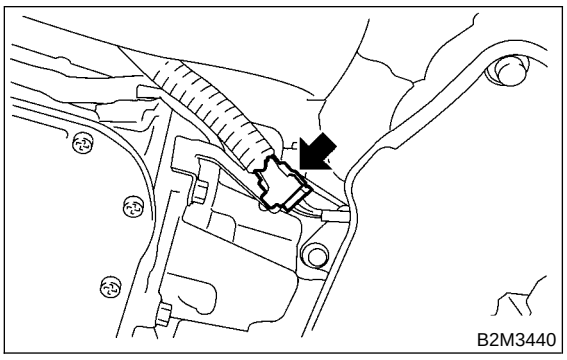
1) Disconnect battery ground cable.


G6M0095

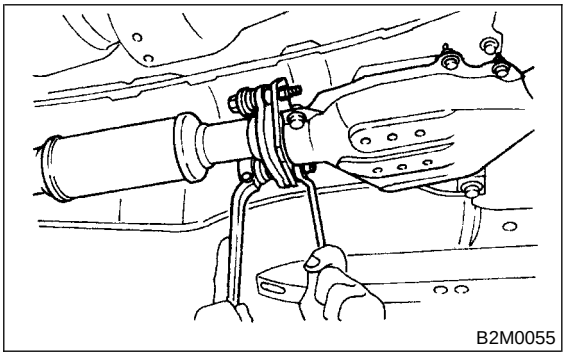
2) Disconnect front oxygen (A/F) sensor connector.


B2M3439

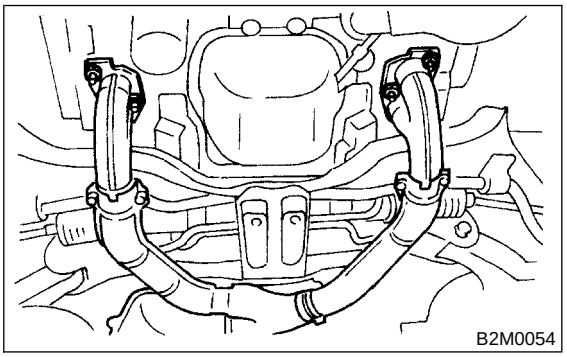
3) Lift-up the vehicle.
4) Remove under cover.
5) Disconnect rear oxygen sensor connector.


B2M3440

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

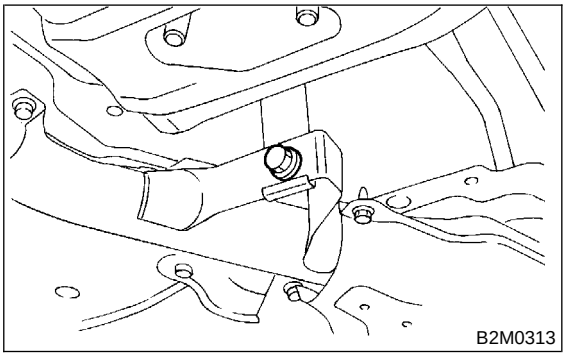

B2M0055

7) Remove front exhaust pipe from cylinder heads.


B2M0054

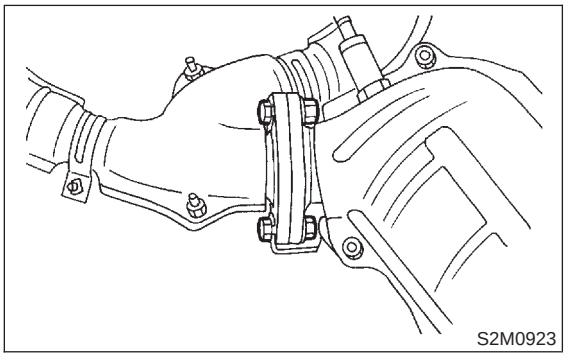
8) Remove front and rear catalytic converter assembly from hanger bracket.

CAUTION:
● Be careful not to pull down center exhaust pipe.
● After removing center exhaust pipe, do not apply excessive pulling force on rear exhaust pipe.


B2M0313

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

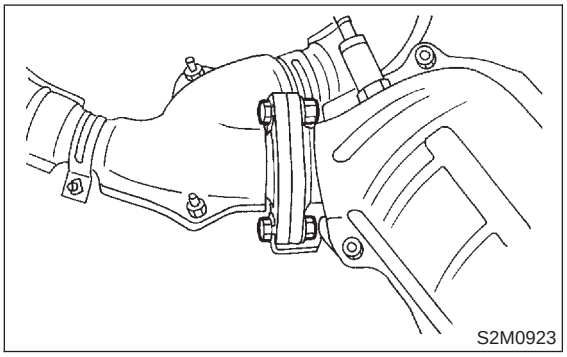
NOTE:
The rear catalytic converter is integrated with front catalytic converter. Therefore, the procedure for removing rear catalytic converter is the same as the description above.


S2M0923

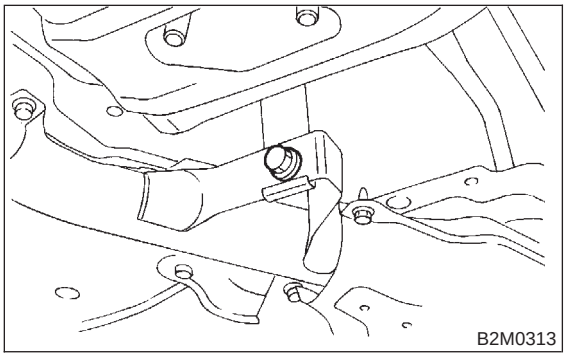
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install front and rear catalytic converter assembly to front exhaust pipe.

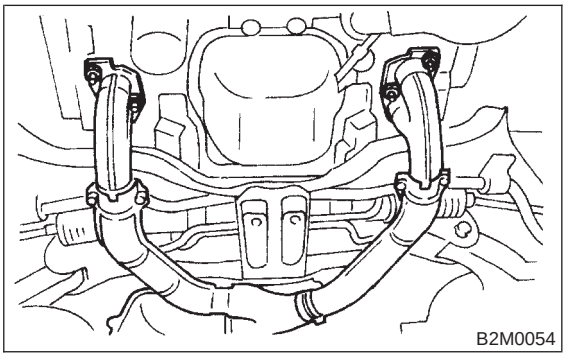

S2M0923

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


B2M0313

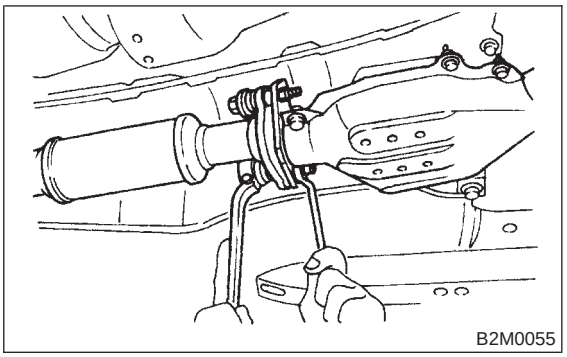
3) Install front exhaust pipe to cylinder heads.

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


B2M0054

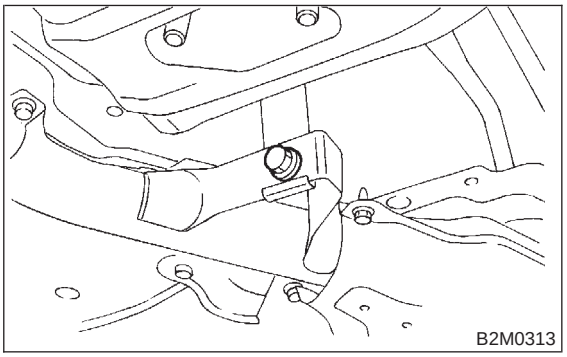
4) Install front and rear catalytic converter assembly to rear exhaust pipe.

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

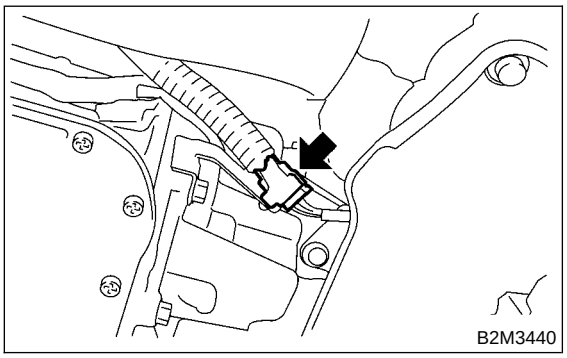

B2M0055

5) Tighten bolt which holds front and rear catalytic converter assembly to hanger bracket.

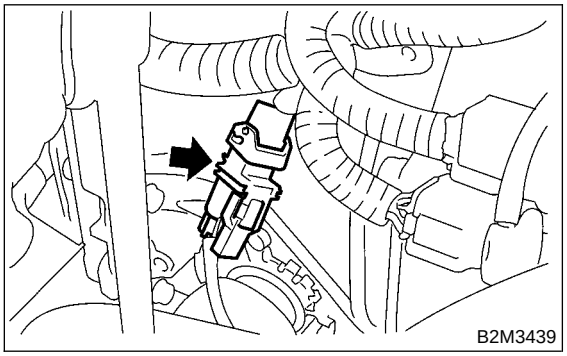
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


B2M0313

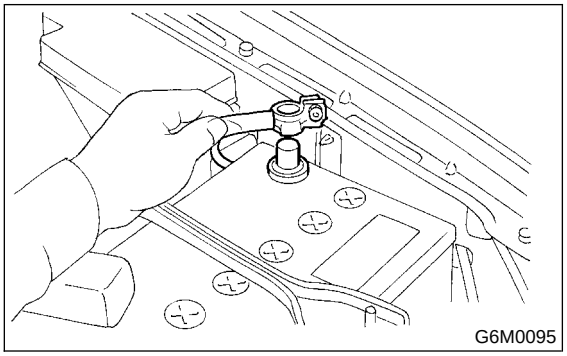
6) Connect rear oxygen sensor connector.



7) Install under cover.
8) Lower the vehicle.
9) Connect connector to front oxygen (A/F) sensor.



10) Connect battery ground cable.



2. Rear Catalytic Converter

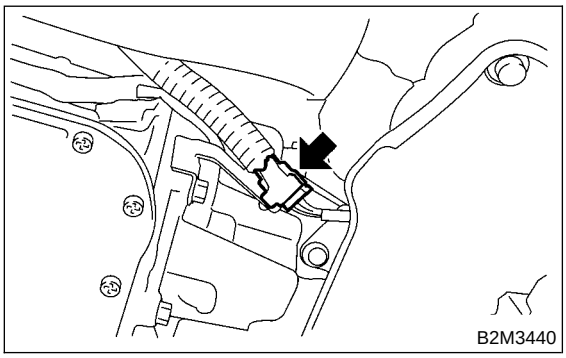
A: REMOVAL

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to 2-1 [W1A0].>

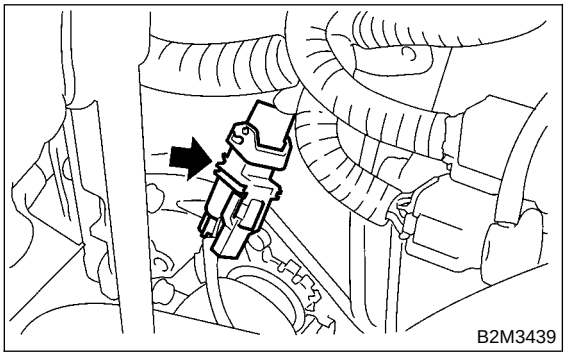
B: INSTALLATION

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to 2-1 [W1B0].>

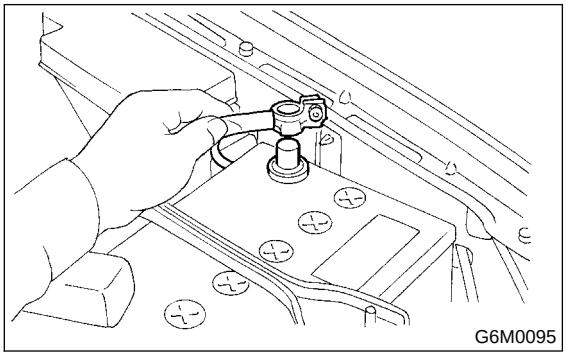
6) Connect rear oxygen sensor connector.



7) Install under cover.
8) Lower the vehicle.
9) Connect connector to front oxygen (A/F) sensor.



10) Connect battery ground cable.



2. Rear Catalytic Converter

A: REMOVAL

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to 2-1 [W1A0].>

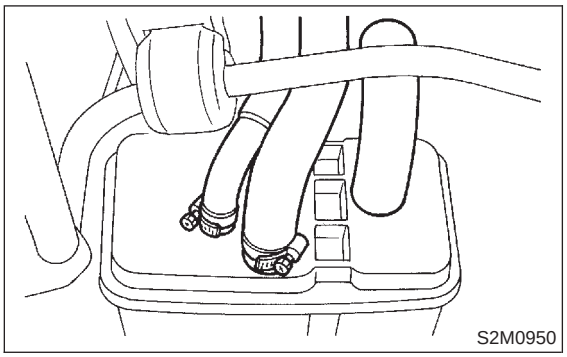
B: INSTALLATION

The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to 2-1 [W1B0].>

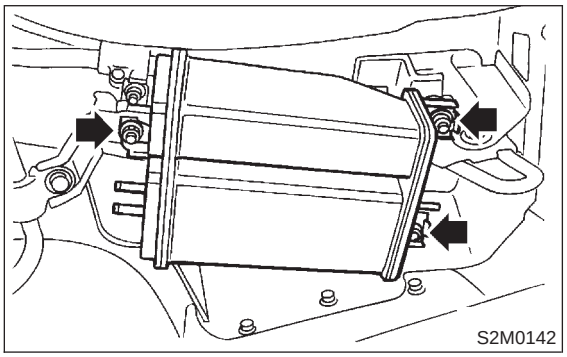
3. Canister

A: REMOVAL AND INSTALLATION

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

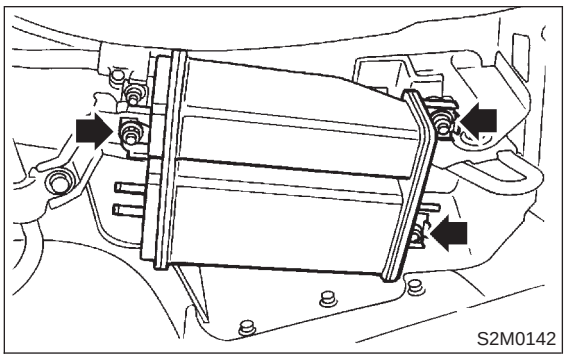


3) Remove canister from body.



4) Install in the reverse order of removal.

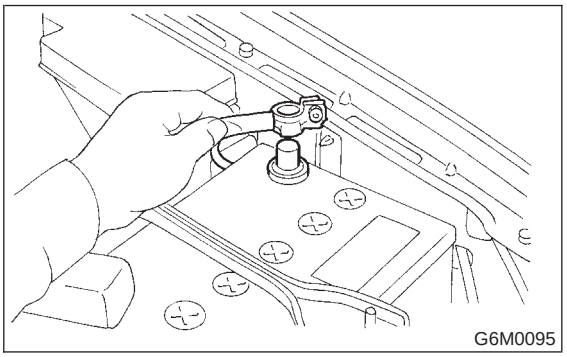
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



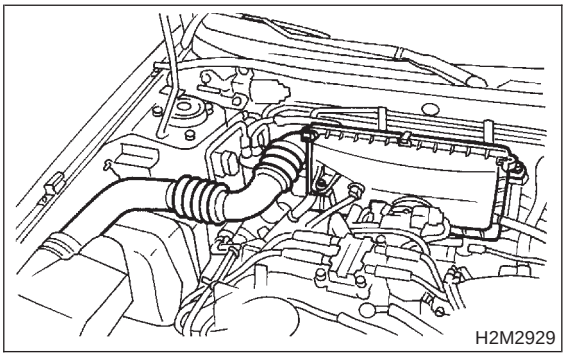
4. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

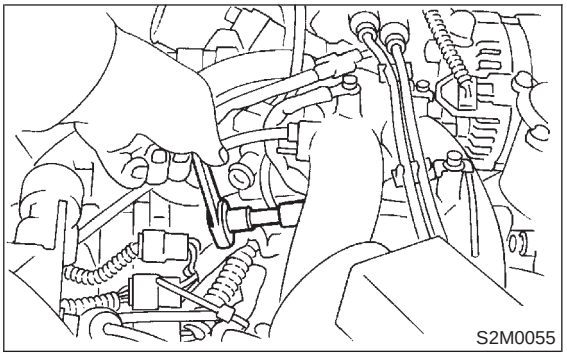
1) Disconnect battery ground cable.



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



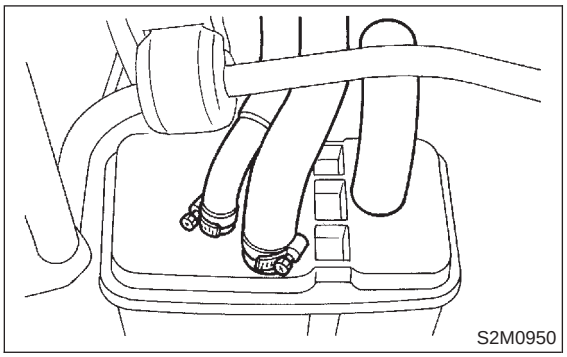
3) Remove bolt which installs purge control solenoid valve to intake manifold.



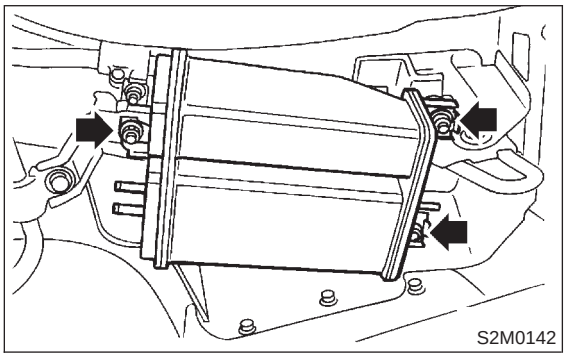
3. Canister

A: REMOVAL AND INSTALLATION

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

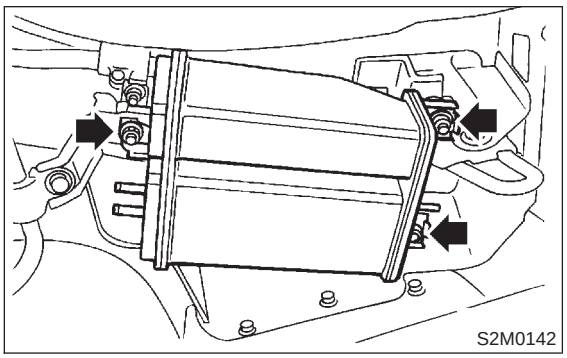


3) Remove canister from body.



4) Install in the reverse order of removal.

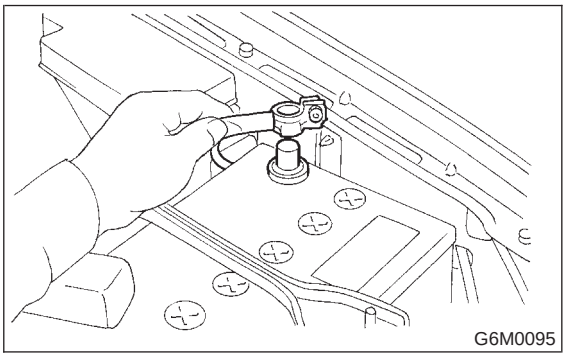
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



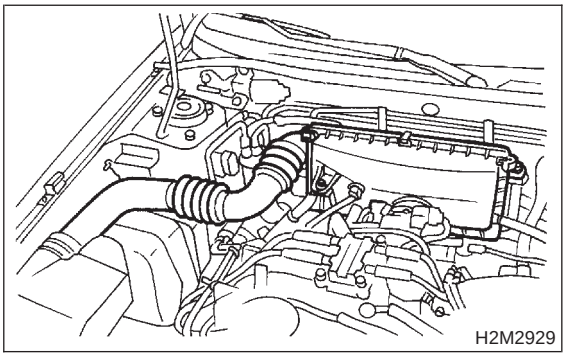
4. Purge Control Solenoid Valve

A: REMOVAL AND INSTALLATION

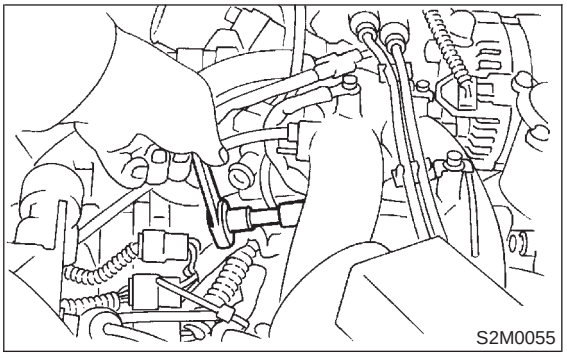
1) Disconnect battery ground cable.



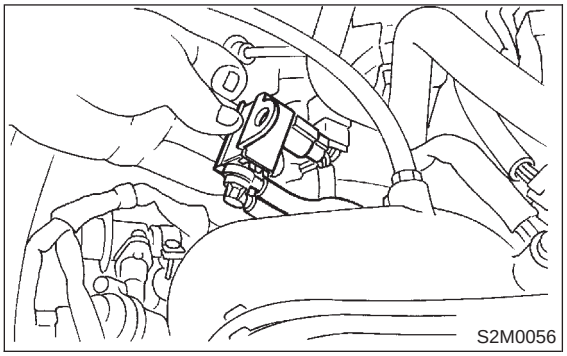
2) Remove air cleaner case and air intake duct. <Ref. to 2-7 [W1A0].>



3) Remove bolt which installs purge control solenoid valve to intake manifold.

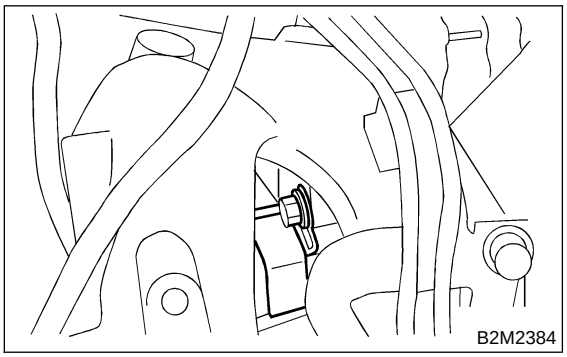


4) Take out purge control solenoid valve.
5) Disconnect connector from purge control solenoid valve.
6) Disconnect vacuum hoses from purge control solenoid valve.

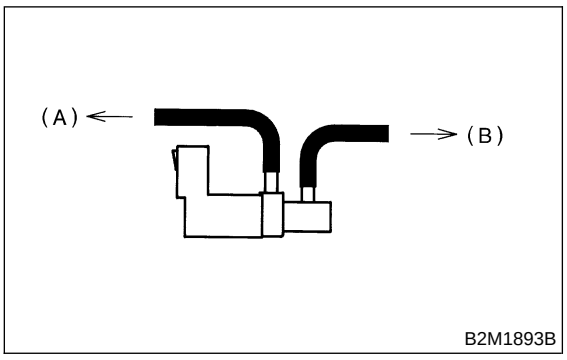

S2M0056

7) Install 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)


B2M2384

CAUTION:
Carefully connect the evaporation hoses.



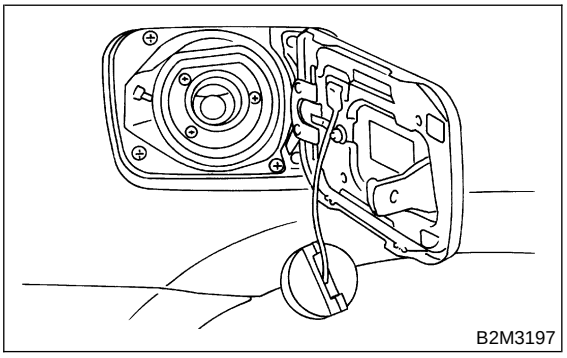
B2M1893B

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

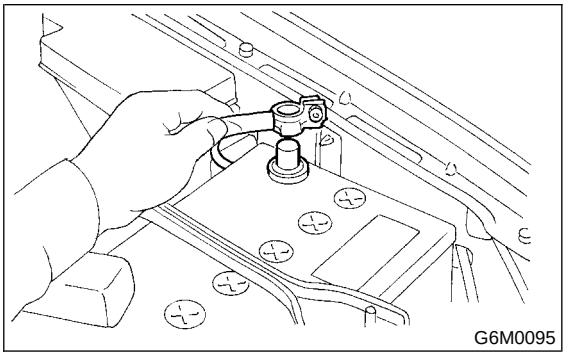
5. Fuel Temperature Sensor

A: REMOVAL

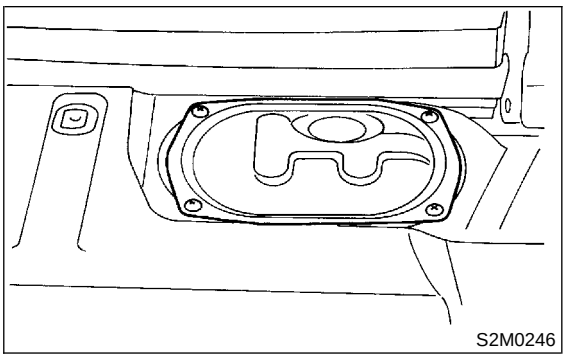
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Open fuel filler lid, and remove fuel filler cap.


B2M3197

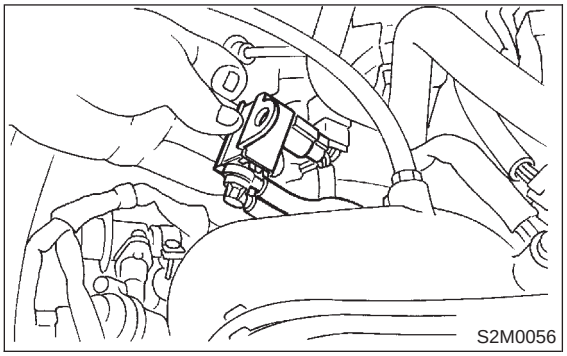
3) Disconnect battery ground cable.


G6M0095

4) Remove the floor box located just behind the rear seat.
5) Remove service hole cover.

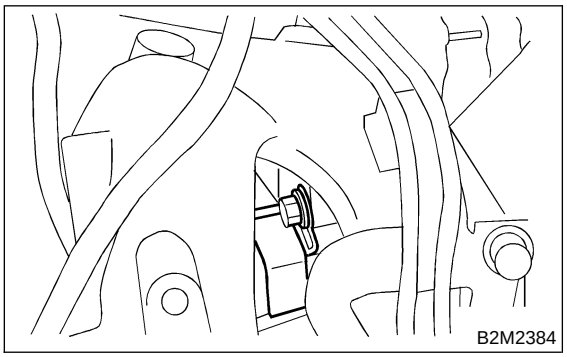

S2M0246

4) Take out purge control solenoid valve.
5) Disconnect connector from purge control solenoid valve.
6) Disconnect vacuum hoses from purge control solenoid valve.

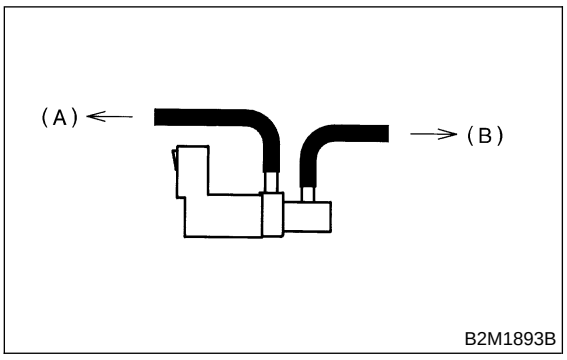

S2M0056

7) Install 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)


B2M2384

CAUTION:
Carefully connect the evaporation hoses.



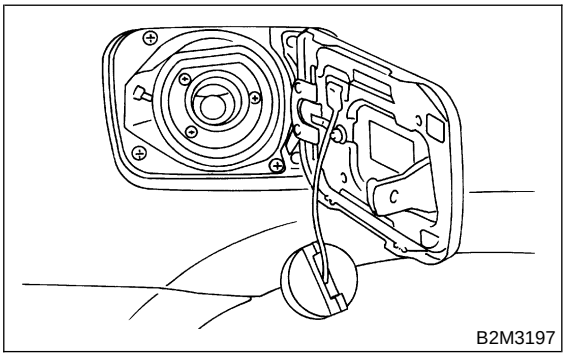
B2M1893B

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

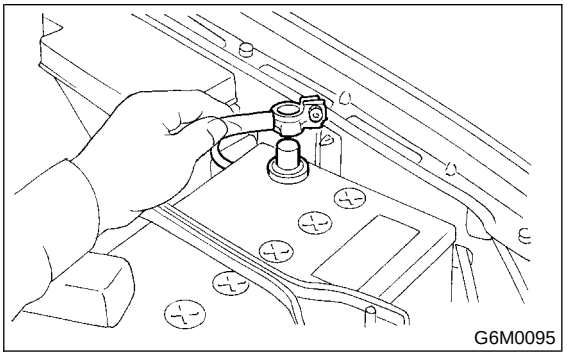
5. Fuel Temperature Sensor

A: REMOVAL

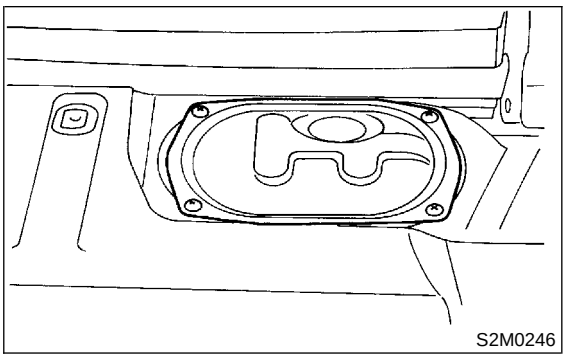
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Open fuel filler lid, and remove fuel filler cap.


B2M3197

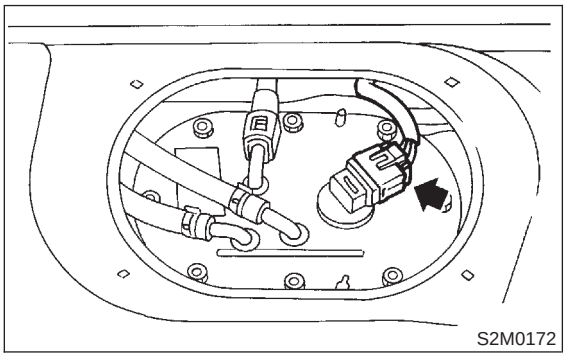
3) Disconnect battery ground cable.


G6M0095

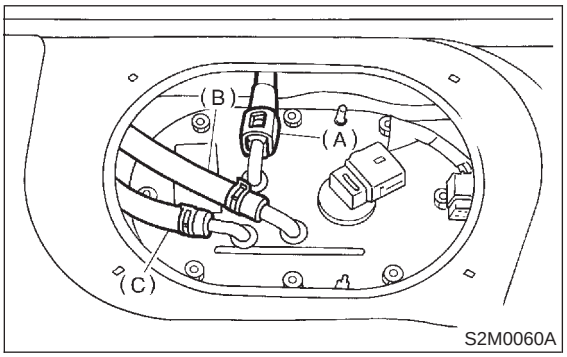
4) Remove the floor box located just behind the rear seat.
5) Remove service hole cover.


S2M0246

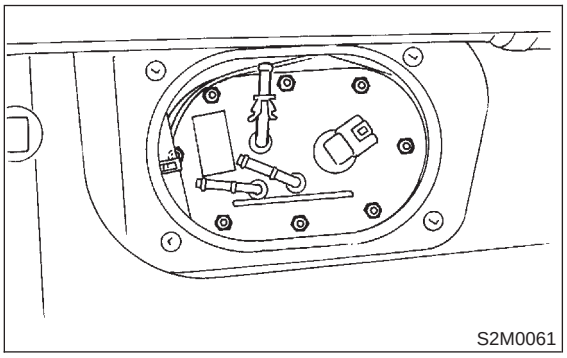
6) Disconnect connector from fuel pump.



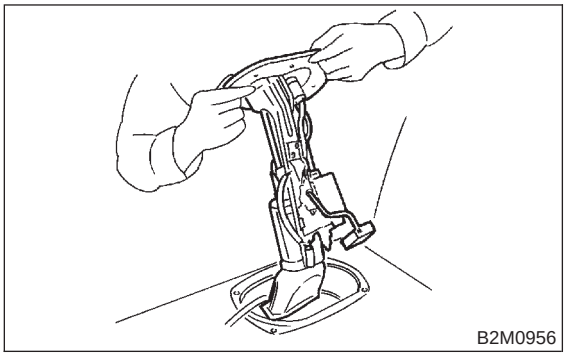
7) Move clips, and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).
8) Disconnect quick connector, and then disconnect fuel delivery hose (A). <Ref. to 2-8 [W7A0].>



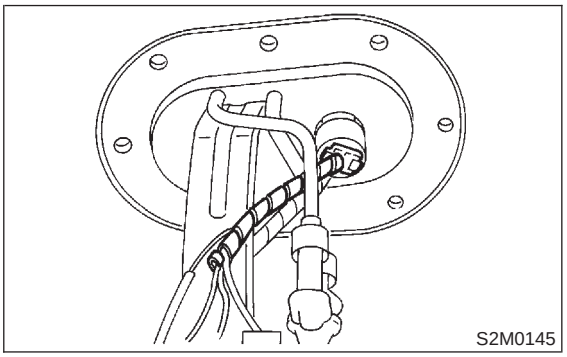
9) Remove nuts which install fuel pump assembly onto fuel tank.



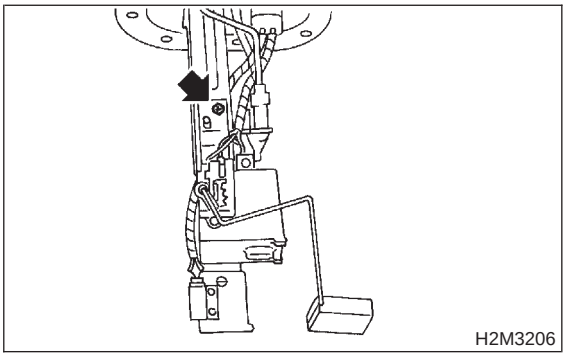
10) Take off fuel pump assembly from fuel tank.



11) Disconnect connector from fuel pump bracket.



12) Remove main fuel level sensor from fuel pump assembly. <Ref. to 2-1 [W8A0].>



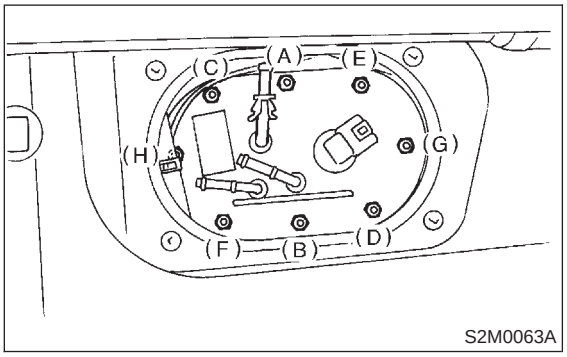
NOTE:
Fuel temperature sensor is a unit with fuel pump. If replacing it, replace as a fuel pump.

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.

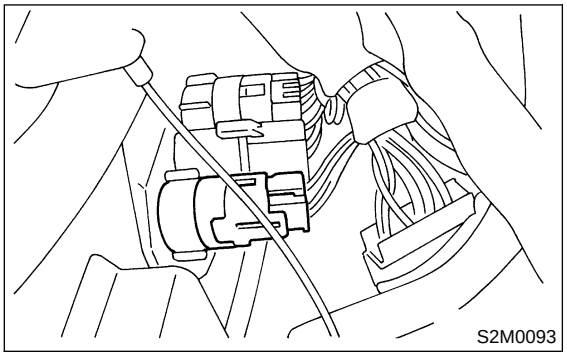
Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

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



S2M0063A

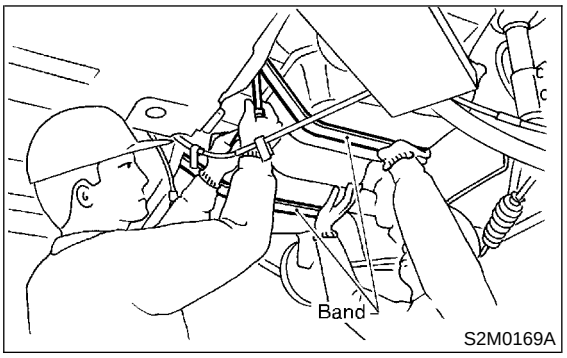
(4) Connect connector to fuel pump relay.


S2M0093

6. Fuel Tank Pressure Sensor

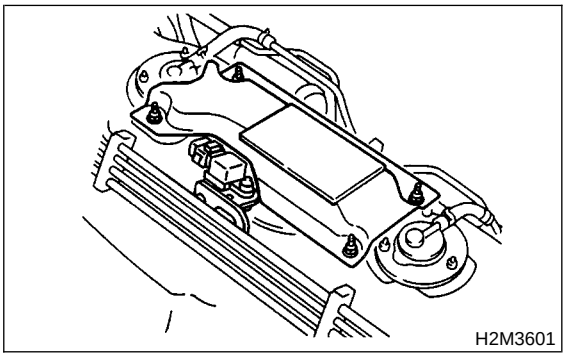
A: REMOVAL AND INSTALLATION

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

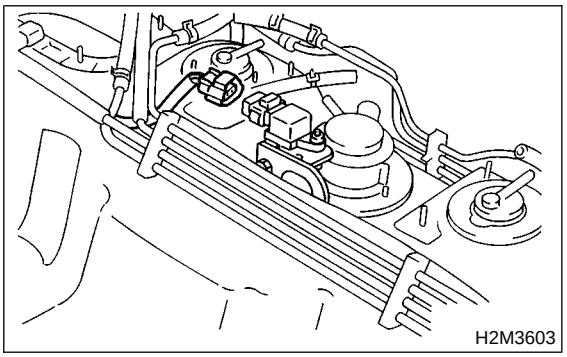


S2M0169A

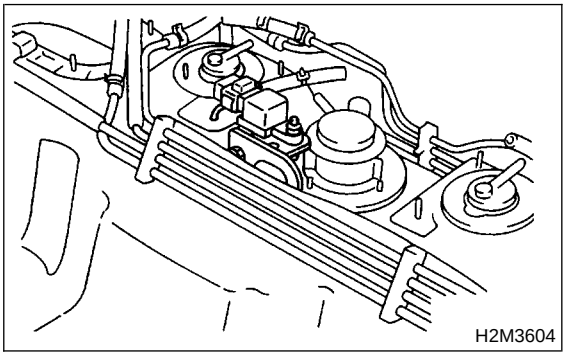
2) Remove protector cover.


H2M3601

3) Disconnect connector from fuel tank pressure sensor.


H2M3603

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

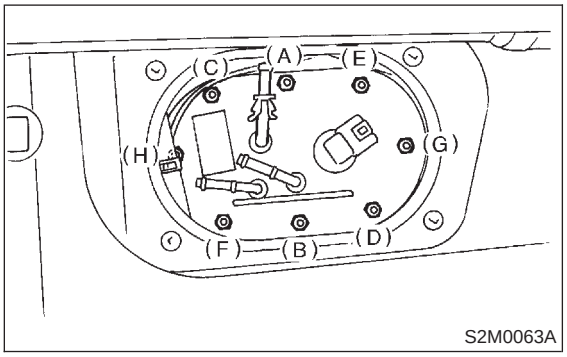

H2M3604

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.

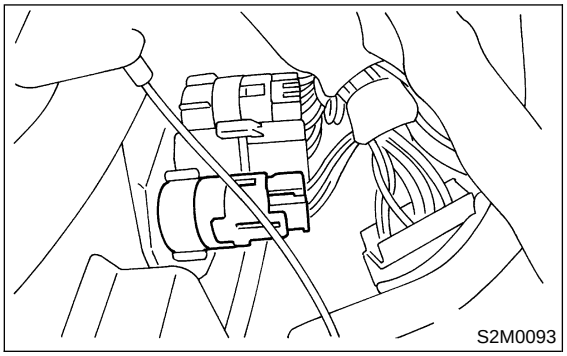
Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

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



S2M0063A

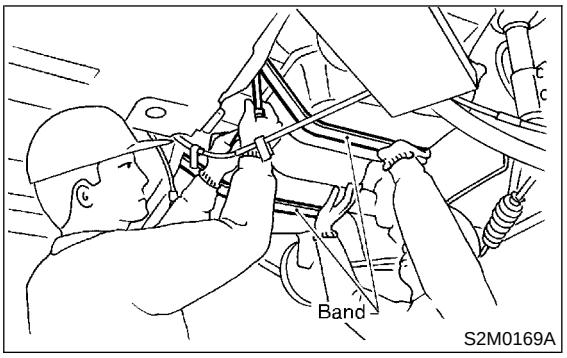
(4) Connect connector to fuel pump relay.


S2M0093

6. Fuel Tank Pressure Sensor

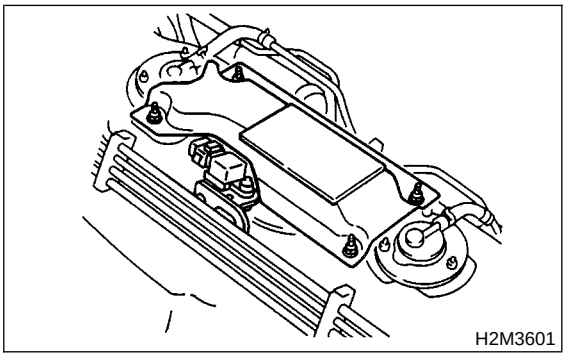
A: REMOVAL AND INSTALLATION

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

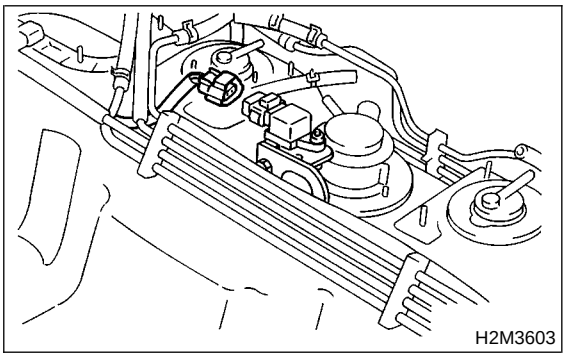


S2M0169A

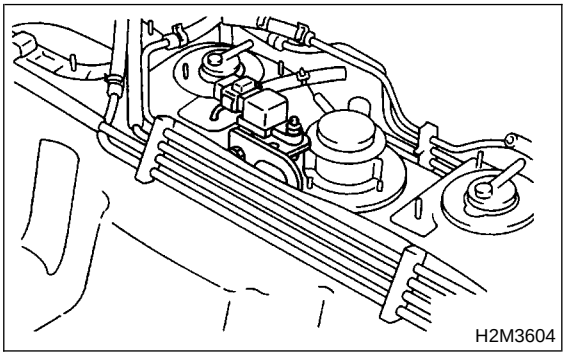
2) Remove protector cover.


H2M3601

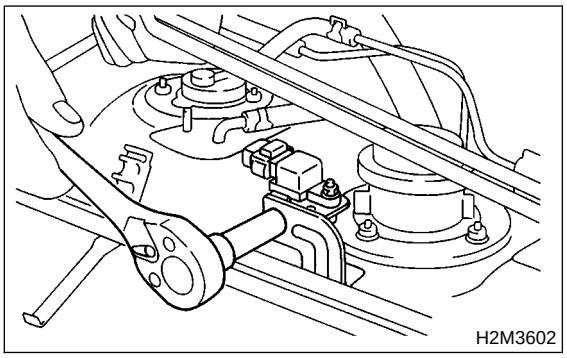
3) Disconnect connector from fuel tank pressure sensor.


H2M3603

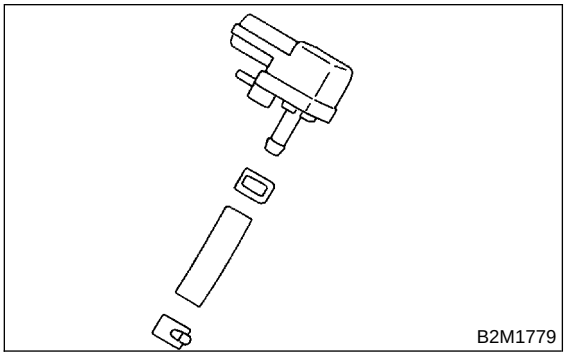
4) Release clips which hold fuel pipes onto fuel tank.


H2M3604

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

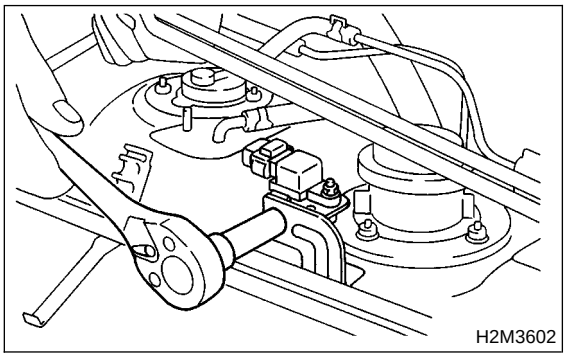

H2M3602

6) Move clip, and disconnect pressure hose from fuel tank.
7) Disconnect pressure hose from fuel tank pressure sensor.


B2M1779

8) Install in the reverse order of removal.

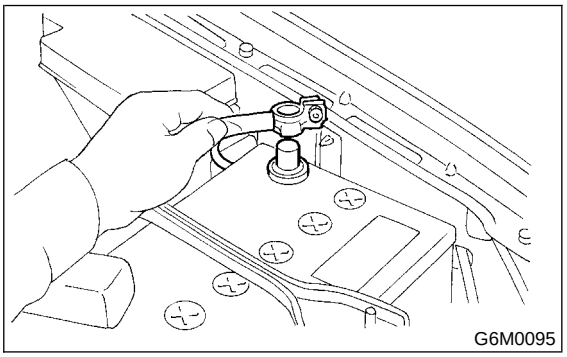
Tightening torque:
7.35±1.96 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)


H2M3602

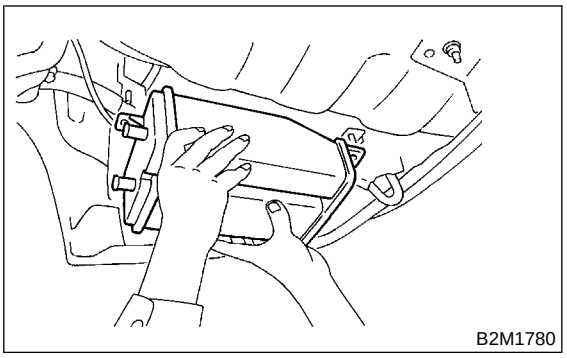
7. Pressure Control Solenoid Valve

A: REMOVAL AND INSTALLATION

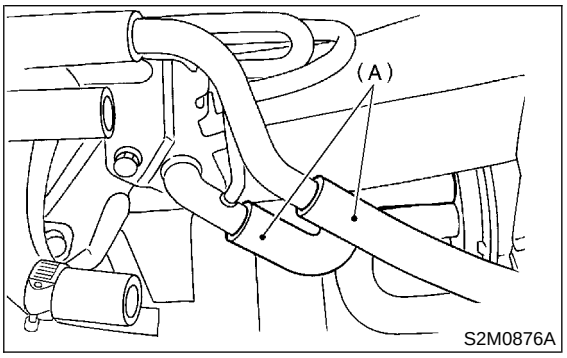
1) Disconnect battery ground cable.


G6M0095

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

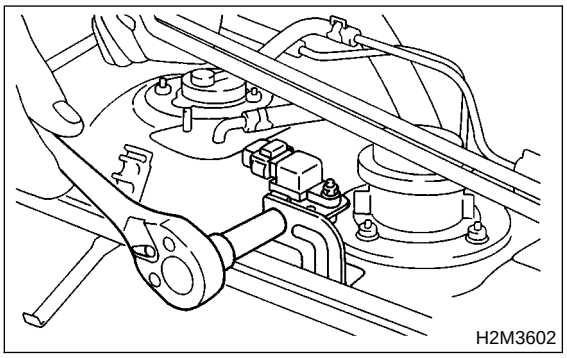

B2M1780

3) Disconnect evaporation hoses (A) from joint pipes.

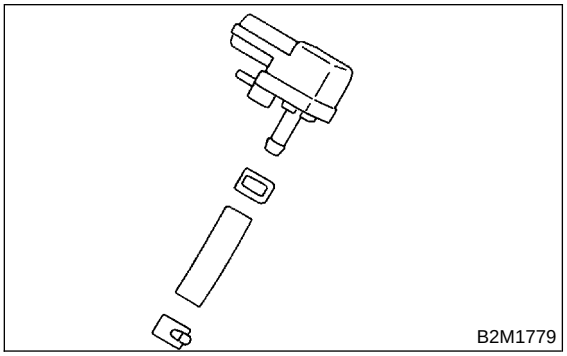


S2M0876A

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

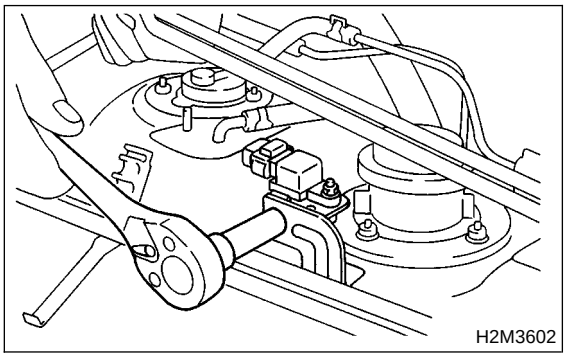

H2M3602

6) Move clip, and disconnect pressure hose from fuel tank.
7) Disconnect pressure hose from fuel tank pressure sensor.


B2M1779

8) Install in the reverse order of removal.

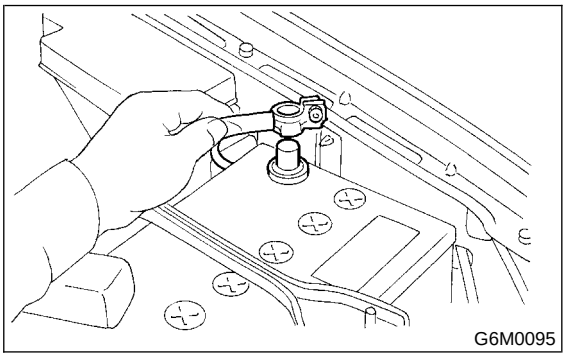
Tightening torque:
7.35±1.96 N·m (0.75±0.20 kg-m, 5.4±1.4 ft-lb)


H2M3602

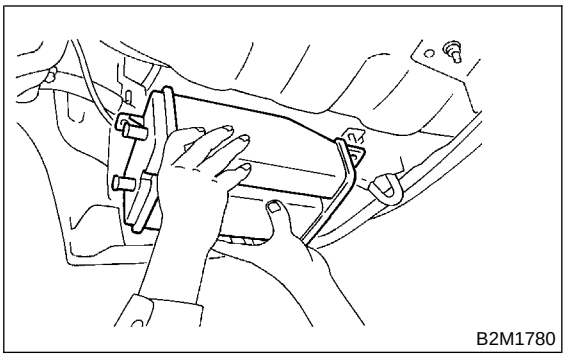
7. Pressure Control Solenoid Valve

A: REMOVAL AND INSTALLATION

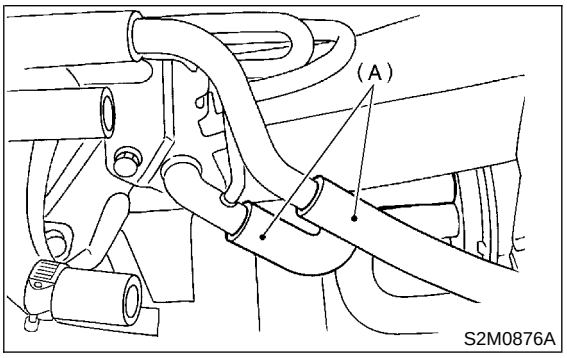
1) Disconnect battery ground cable.


G6M0095

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

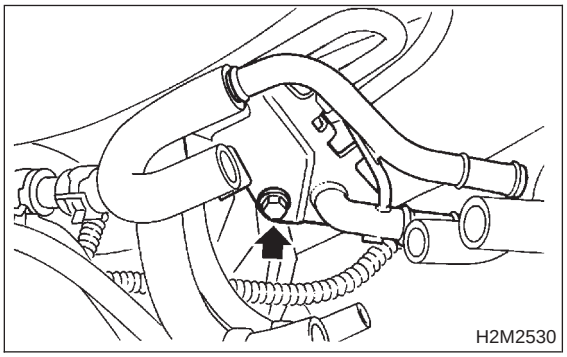

B2M1780

3) Disconnect evaporation hoses (A) from joint pipes.

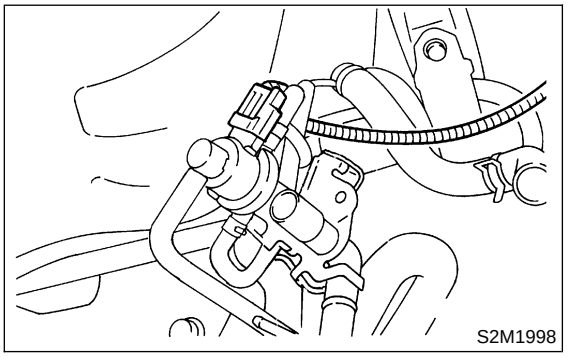


S2M0876A

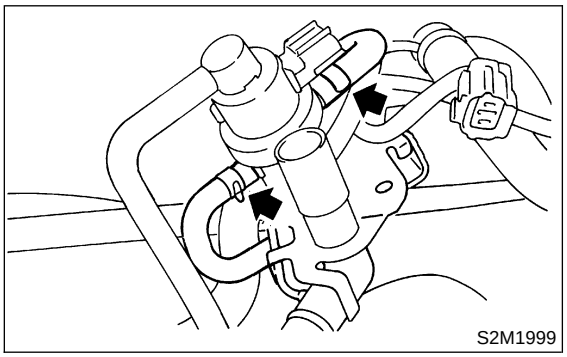
4) Remove bolt which installs pressure control solenoid valve holding bracket on body.


H2M2530

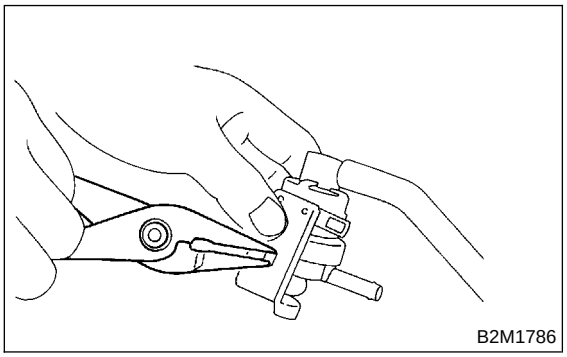
5) Disconnect connector from pressure control solenoid valve.


S2M1998

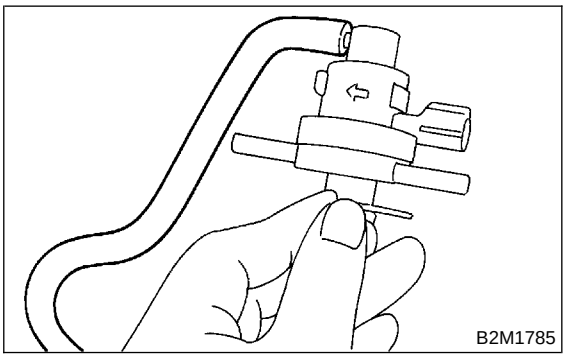
6) Disconnect two evaporation hoses from pressure control solenoid valve.
7) Remove pressure control solenoid valve with bracket.


S2M1999

8) Remove pressure control solenoid valve from bracket.

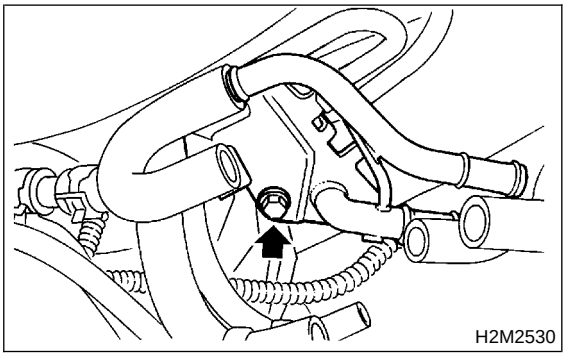

B2M1786

9) Disconnect vacuum hose from pressure control solenoid valve.


B2M1785

10) Install in the reverse order of removal.

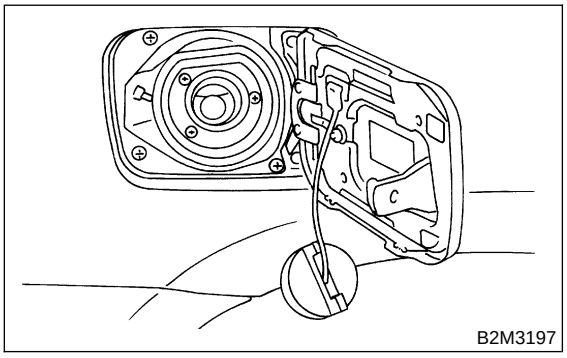
Tightening torque:
17.6±5 N·m (1.8±0.5 kg-m, 13.0±3.6 ft-lb)


H2M2530

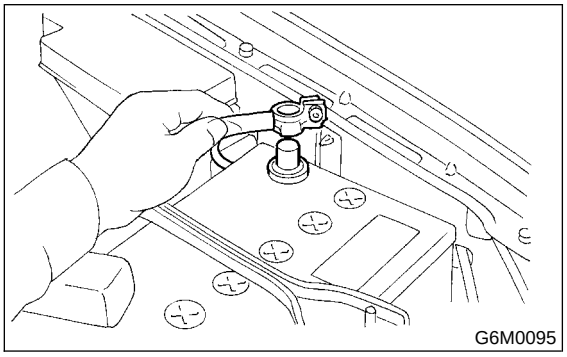
8. Main Fuel Level Sensor

A: REMOVAL

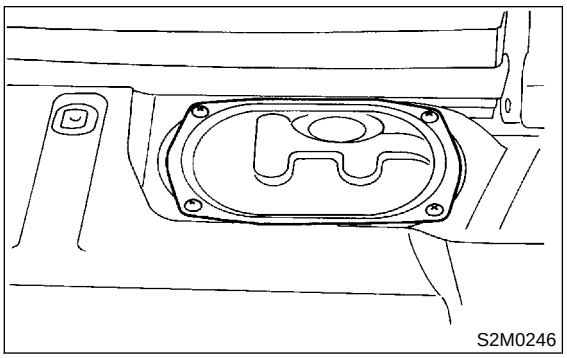
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Open fuel flap lid, and remove fuel filler cap.



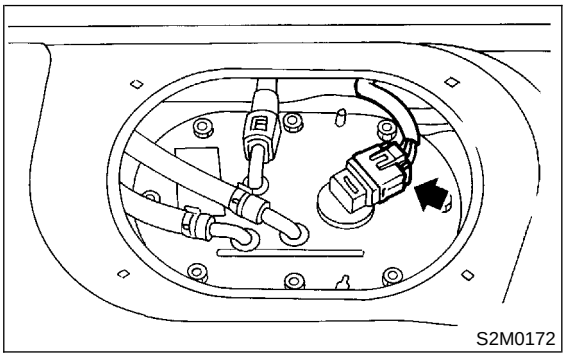
3) Disconnect battery ground cable.



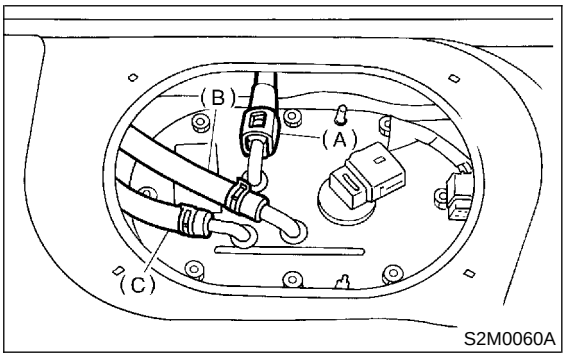
4) Remove the floor box located just behind the rear seat.
5) Remove service hole cover.



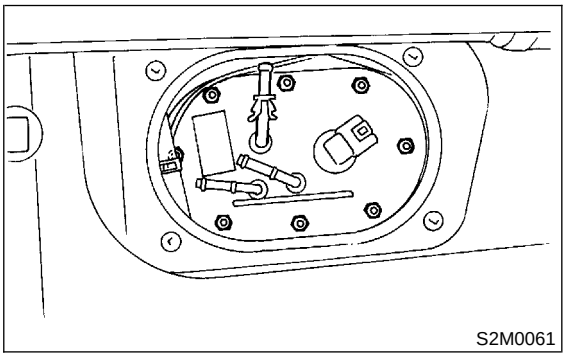
6) Disconnect connector from fuel pump.



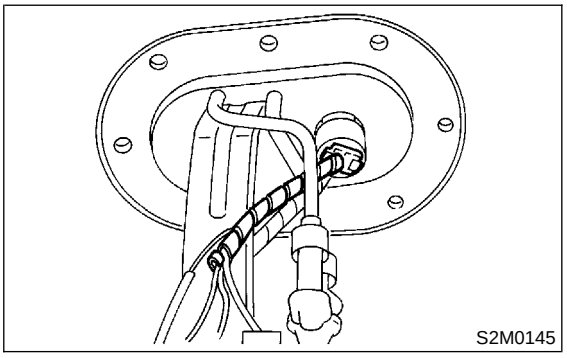
7) Move clips, and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).
8) Disconnect quick connector, and then disconnect fuel delivery hose (A). <Ref. to 2-8 [W7A0].>



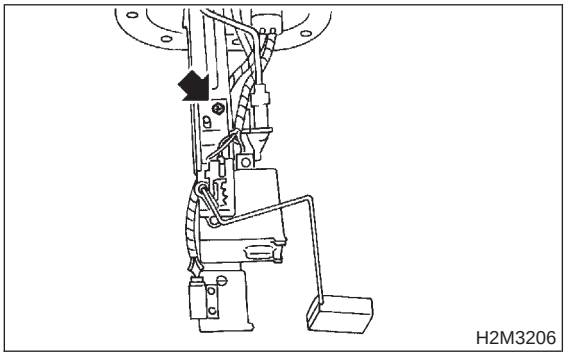
9) Remove nuts which install fuel pump assembly onto fuel tank.



10) Take off fuel pump assembly from fuel tank.
11) Disconnect connector from fuel pump bracket.



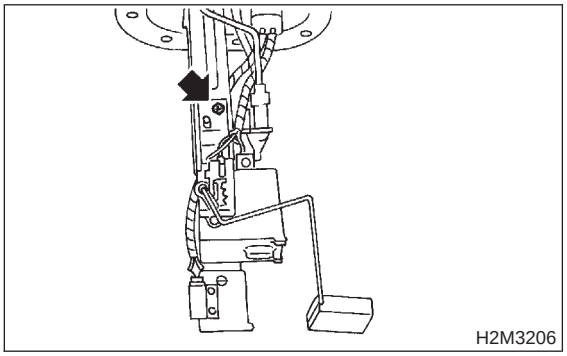
12) Remove bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

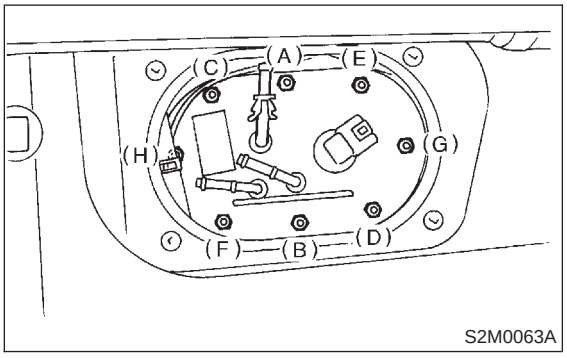
CAUTION:
Leave fuel filler cap open when tightening nuts, to prevent fuel from flowing out through fuel delivery and return pipes. Close fuel filler cap after tightening nuts.

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

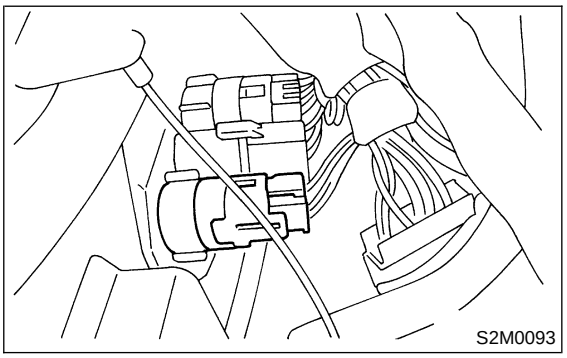


2) Always use new gaskets.
3) Ensure sealing portion is free from fuel or foreign particles before installation.
4) Tighten nuts in alphabetical sequence shown in figure to specified torque.

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



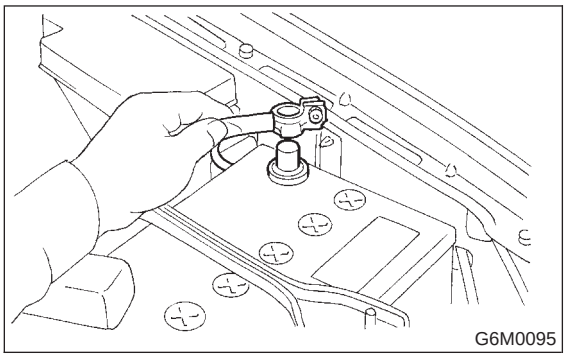
5) Connect connector to fuel pump relay.



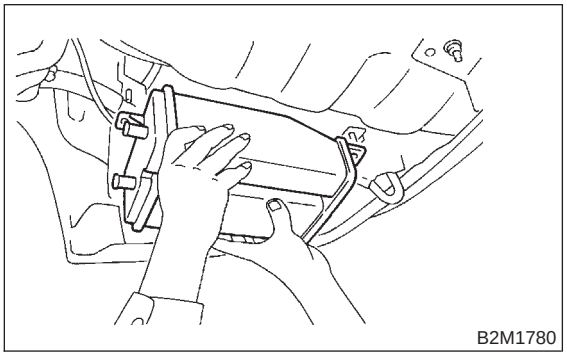
9. Drain Filter

A: REMOVAL AND INSTALLATION

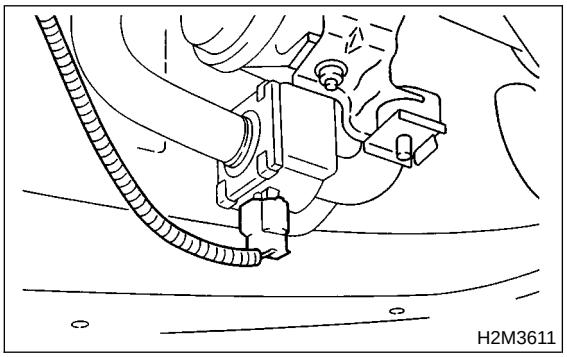
1) Disconnect battery ground cable.



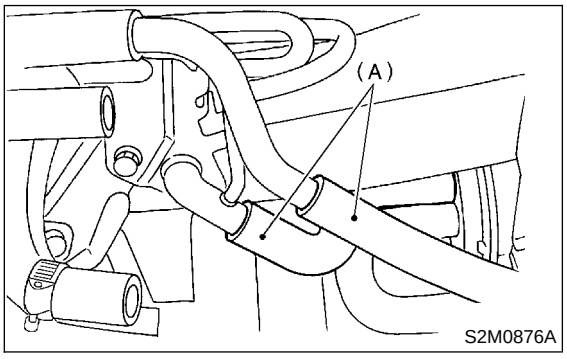
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>



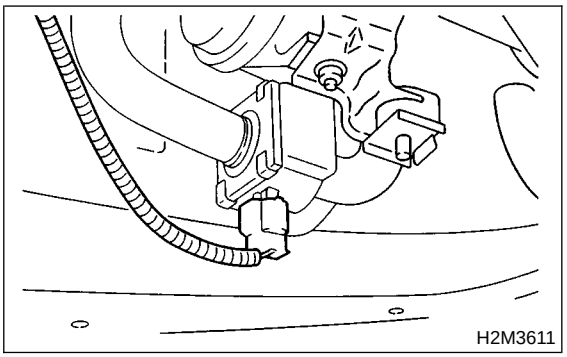
4) Disconnect connector from drain valve.



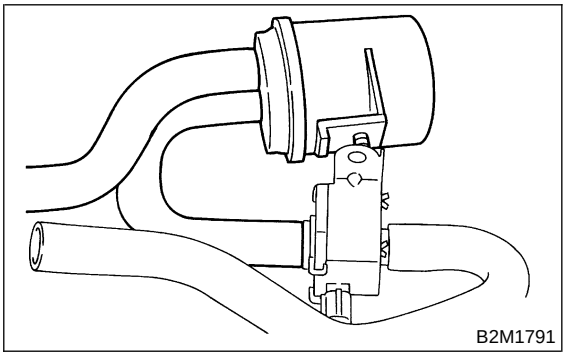
5) Disconnect evaporation hoses (A) from joint pipes.



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

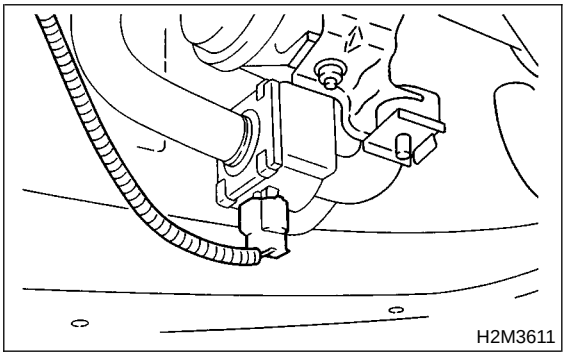


7) Disconnect evaporation hoses, and remove drain filter.



8) Install in the reverse order of removal.

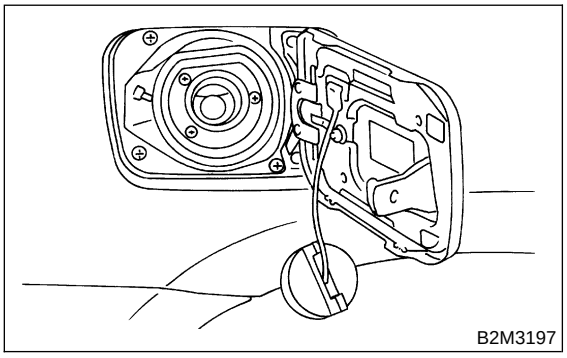
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



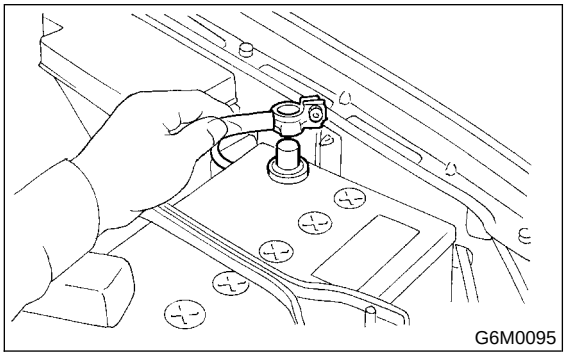
10. Fuel Sub Level Sensor

A: REMOVAL AND INSTALLATION

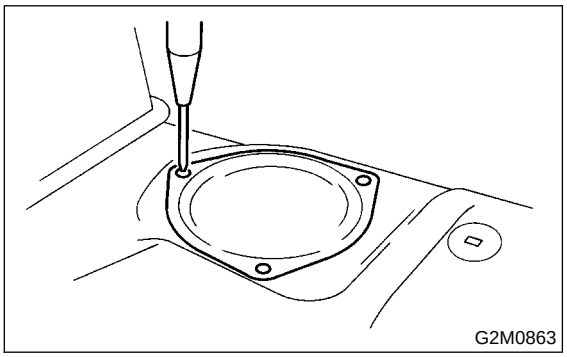
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


B2M3197

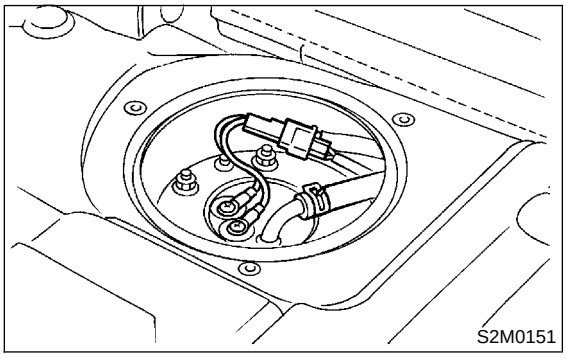
3) Disconnect battery ground cable.


G6M0095

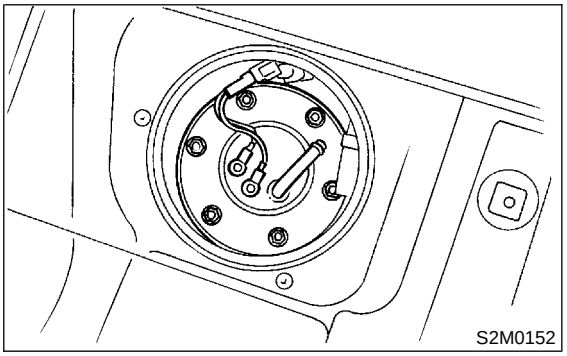
4) Remove service hole cover.


G2M0863

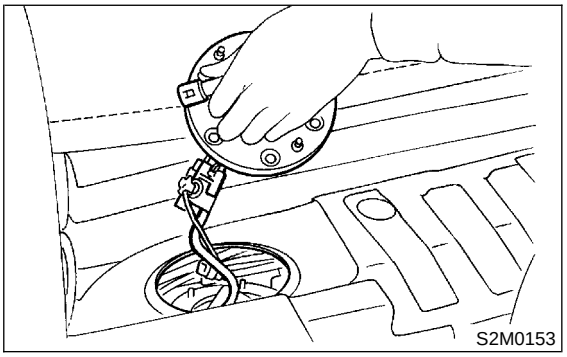
5) Disconnect connector from fuel sub level sensor, and disconnect jet pump hose.


S2M0151

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

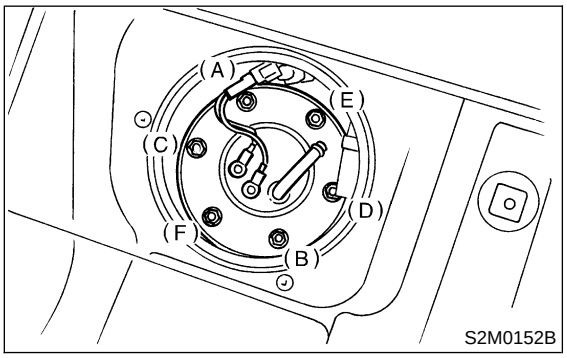

S2M0152

7) Remove fuel sub level sensor.

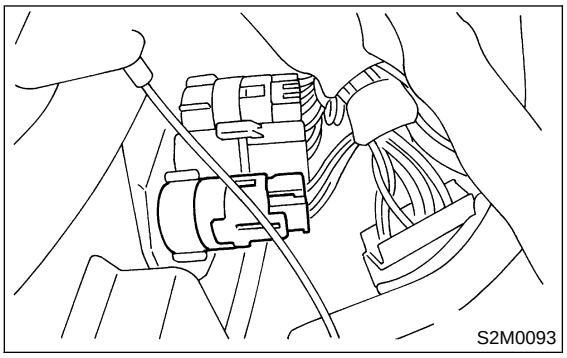

S2M0153

8) Installation is in the reverse order of removal. Do the following:
(1) Install fuel sub level sensor.

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



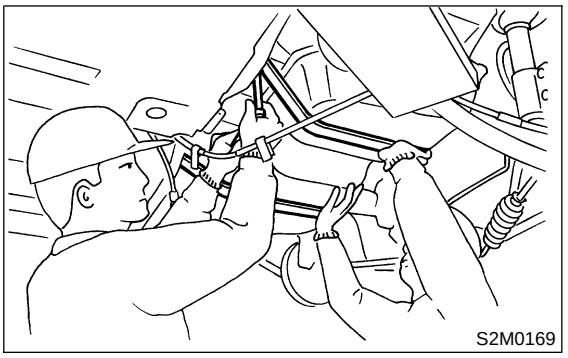
(2) Connect connector to fuel pump relay.



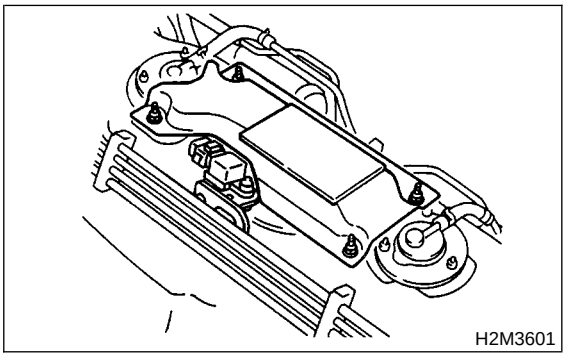
11. Vent Valve

A: REMOVAL AND INSTALLATION

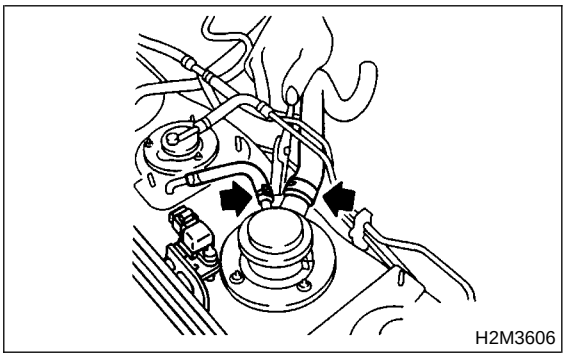
1) Remove fuel tank. <Ref. to 2-8 [W2A0].>



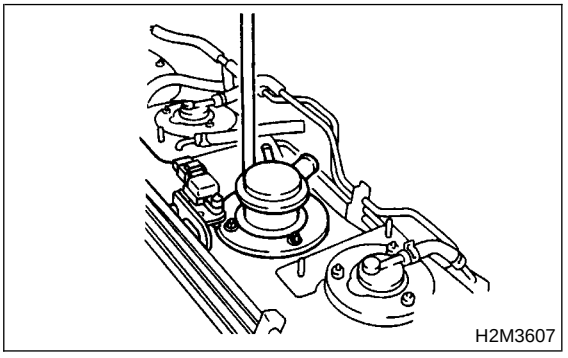
2) Remove protector cover.



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

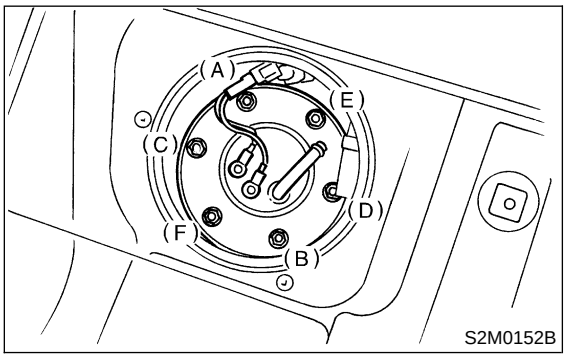


4) Remove nuts which install vent valve on fuel tank.

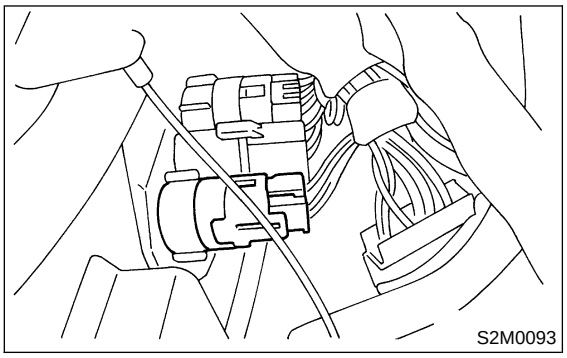


8) Installation is in the reverse order of removal. Do the following:
(1) Install fuel sub level sensor.

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



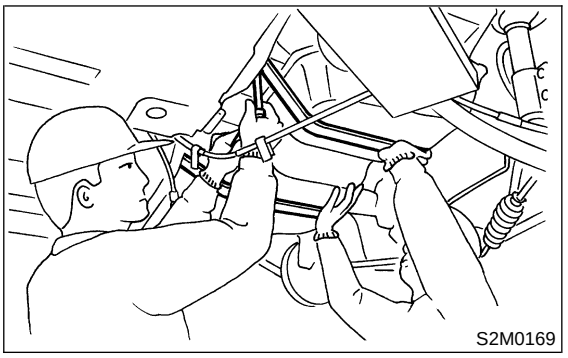
(2) Connect connector to fuel pump relay.



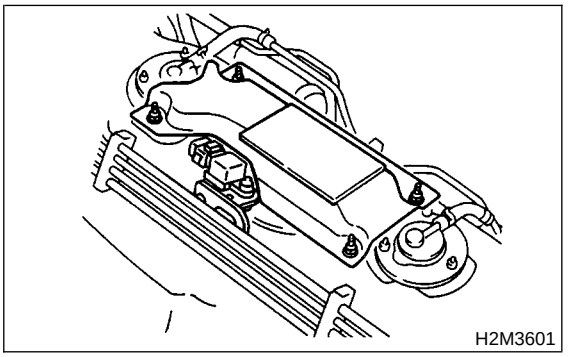
11. Vent Valve

A: REMOVAL AND INSTALLATION

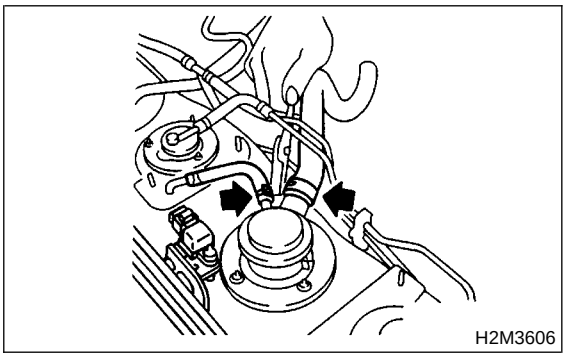
1) Remove fuel tank. <Ref. to 2-8 [W2A0].>



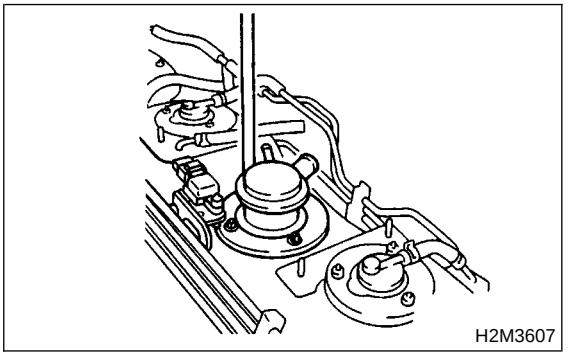
2) Remove protector cover.



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



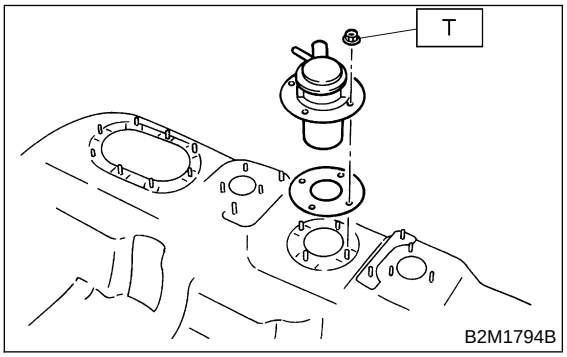
4) Remove nuts which install vent valve on fuel tank.



5) Installation is in the reverse order of removal.

CAUTION:
Replace rubber seat with a new one.

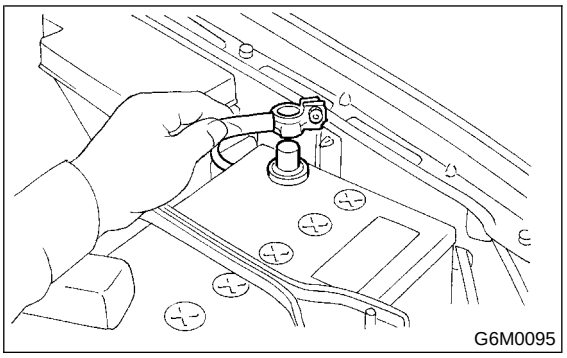
Tightening torque:
T: 4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



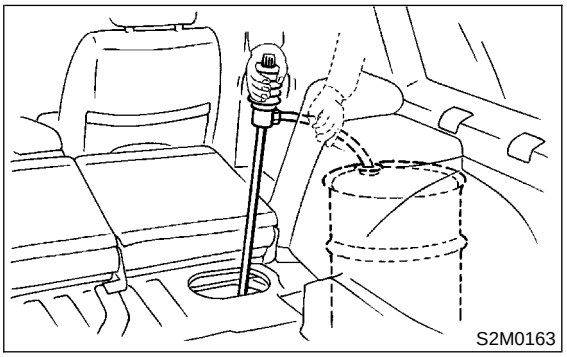
12. Shut Valve

A: REMOVAL AND INSTALLATION

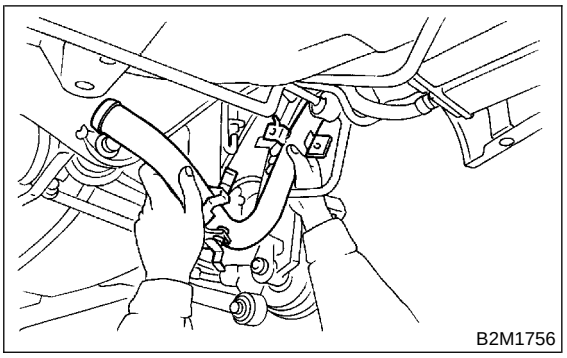
1) Disconnect battery ground cable.



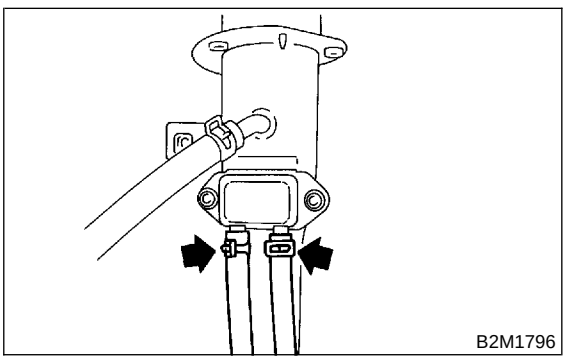
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



3) Remove fuel filler pipe. <Ref. to 2-8 [W3A1].>



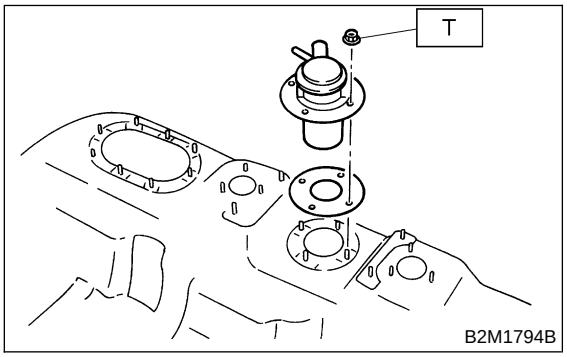
4) Disconnect evaporation hoses from shut valve.



5) Installation is in the reverse order of removal.

CAUTION:
Replace rubber seat with a new one.

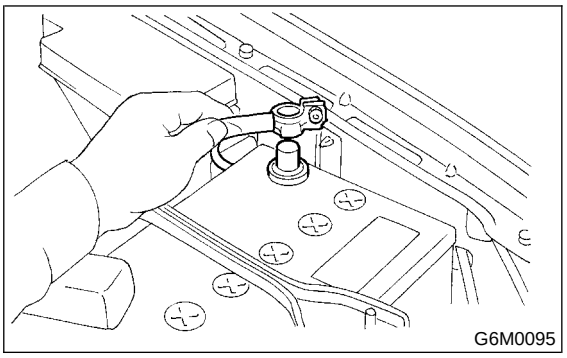
Tightening torque:
T: 4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



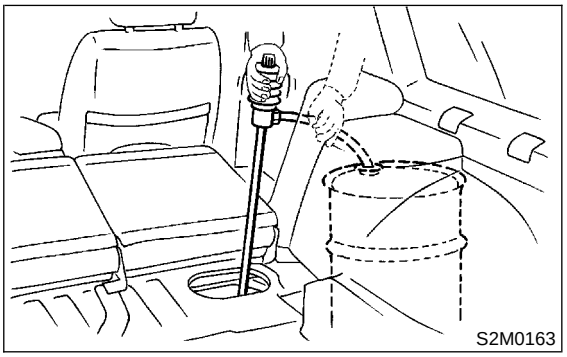
12. Shut Valve

A: REMOVAL AND INSTALLATION

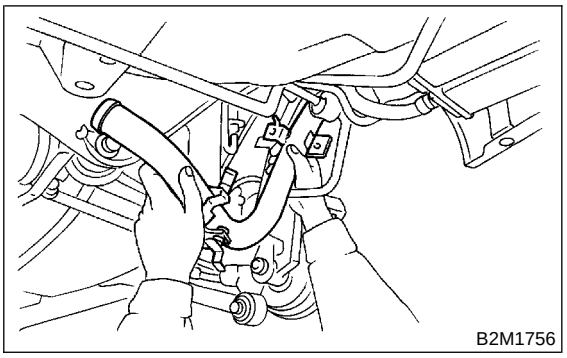
1) Disconnect battery ground cable.



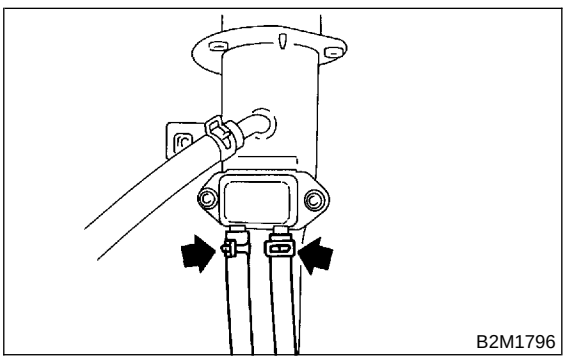
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1C0].>



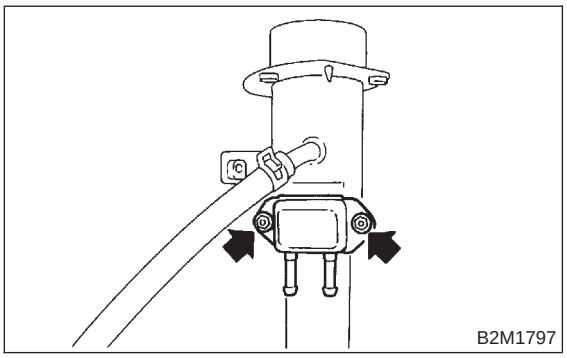
3) Remove fuel filler pipe. <Ref. to 2-8 [W3A1].>



4) Disconnect evaporation hoses from shut valve.

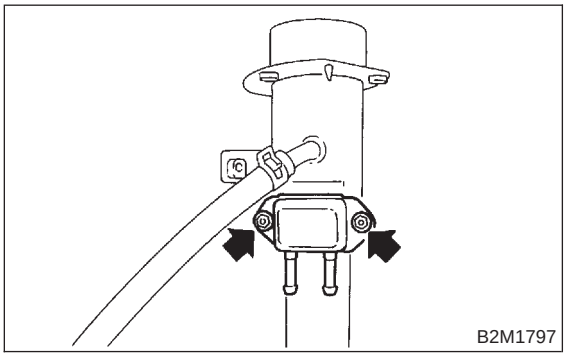


5) Remove shut valve from fuel filler pipe.



6) Install in the reverse order of removal.

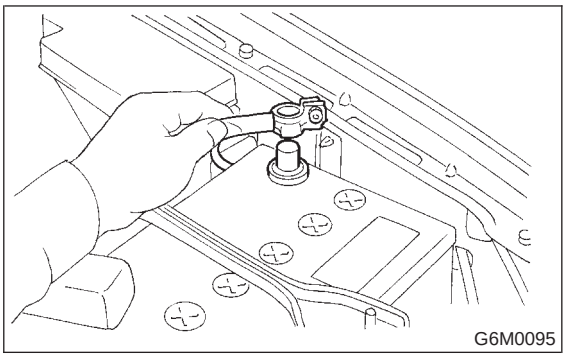
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



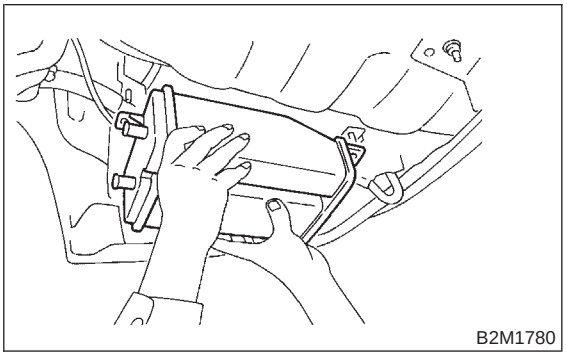
13. Drain Valve

A: REMOVAL AND INSTALLATION

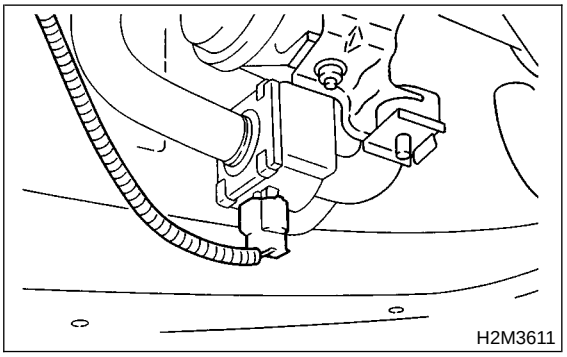
1) Disconnect battery ground cable.



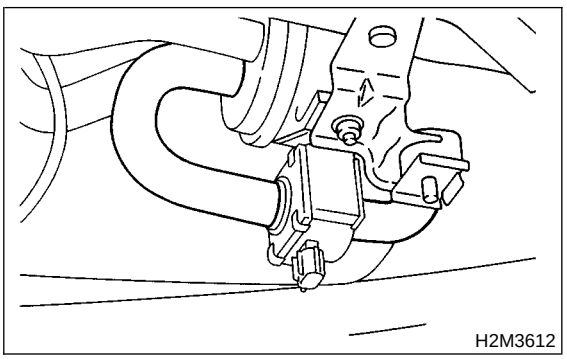
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>



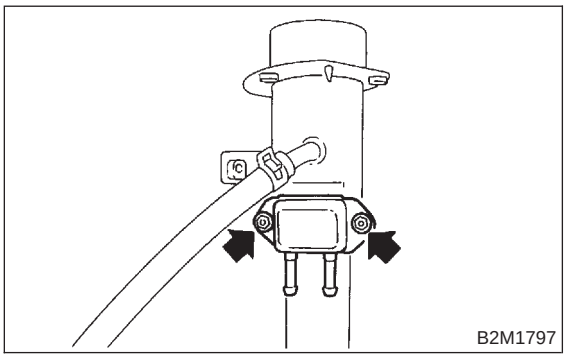
4) Disconnect connector from drain valve.



5) Disconnect evaporation hoses from drain valve.

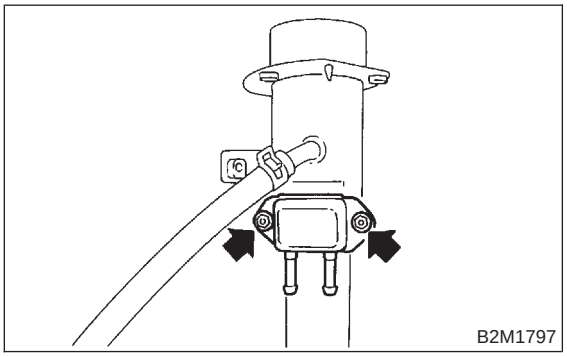


5) Remove shut valve from fuel filler pipe.



6) Install in the reverse order of removal.

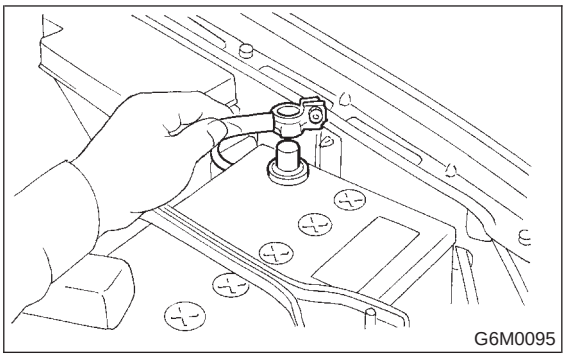
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)



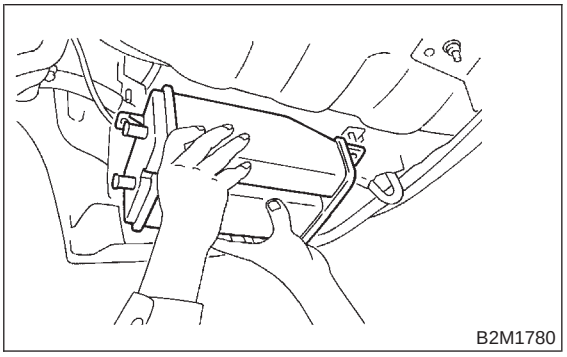
13. Drain Valve

A: REMOVAL AND INSTALLATION

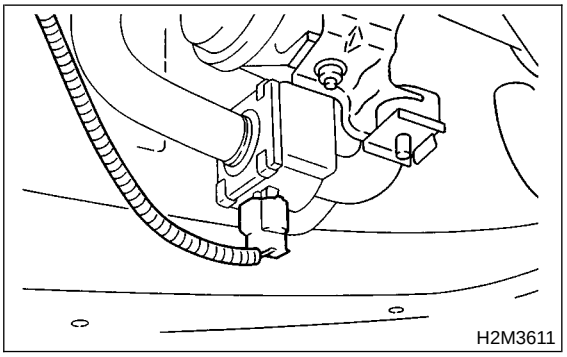
1) Disconnect battery ground cable.



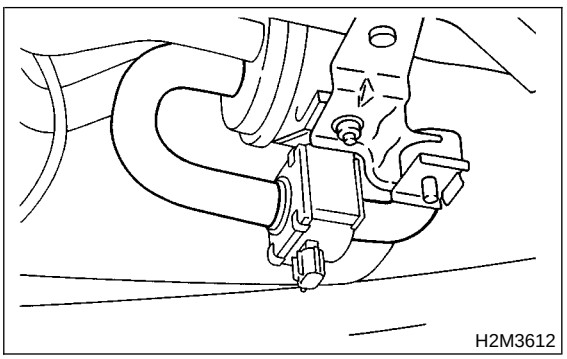
2) Lift-up the vehicle.
3) Remove canister. <Ref. to 2-1 [W3A0].>



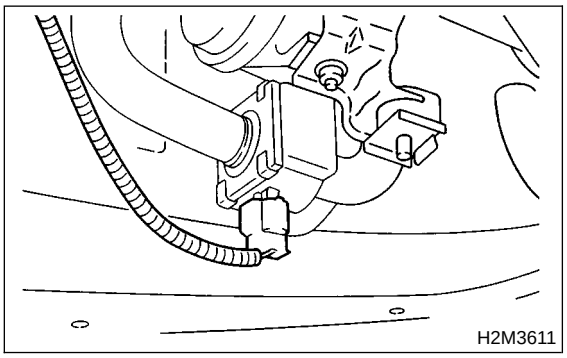
4) Disconnect connector from drain valve.



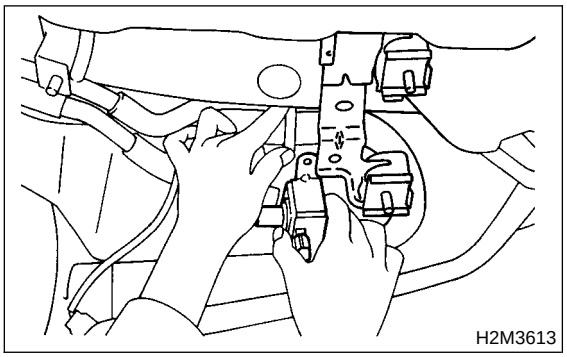
5) Disconnect evaporation hoses from drain valve.



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

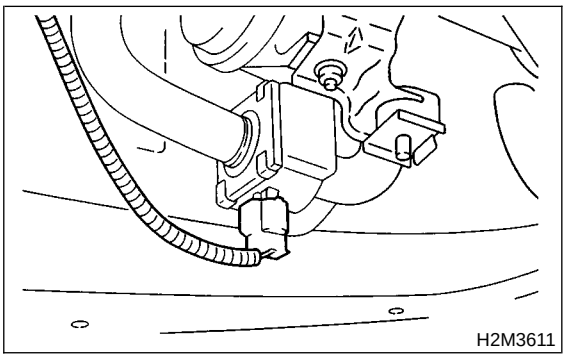


7) Move drain filter to upper side, and remove drain valve with bracket.



8) Install in the reverse order of removal.

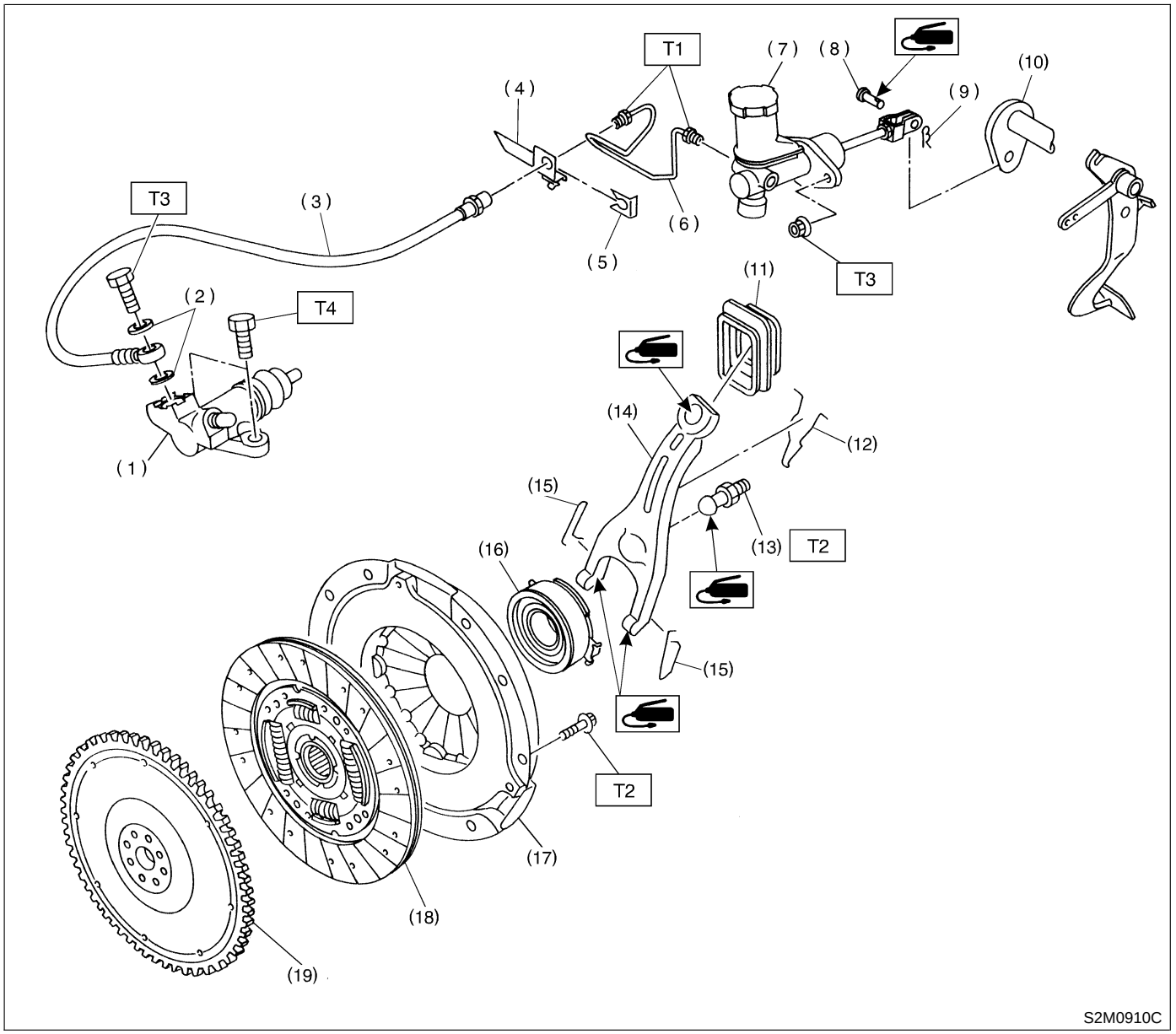
Tightening torque:
22.5±7 N·m (2.3±0.7 kg-m, 16.6±5.1 ft-lb)



1. Clutch System

			2500 cc
Clutch cover	Diaphragm set load kg (lb)		580 (1,279)
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)	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			1.6
Clutch release bearing			Grease-packed self-aligning
Clutch release lever	Stroke mm (in)		12 — 13.6 (0.472 — 0.535)
Clutch pedal	Full stroke mm (in)		130 — 135 (5.12 — 5.31)

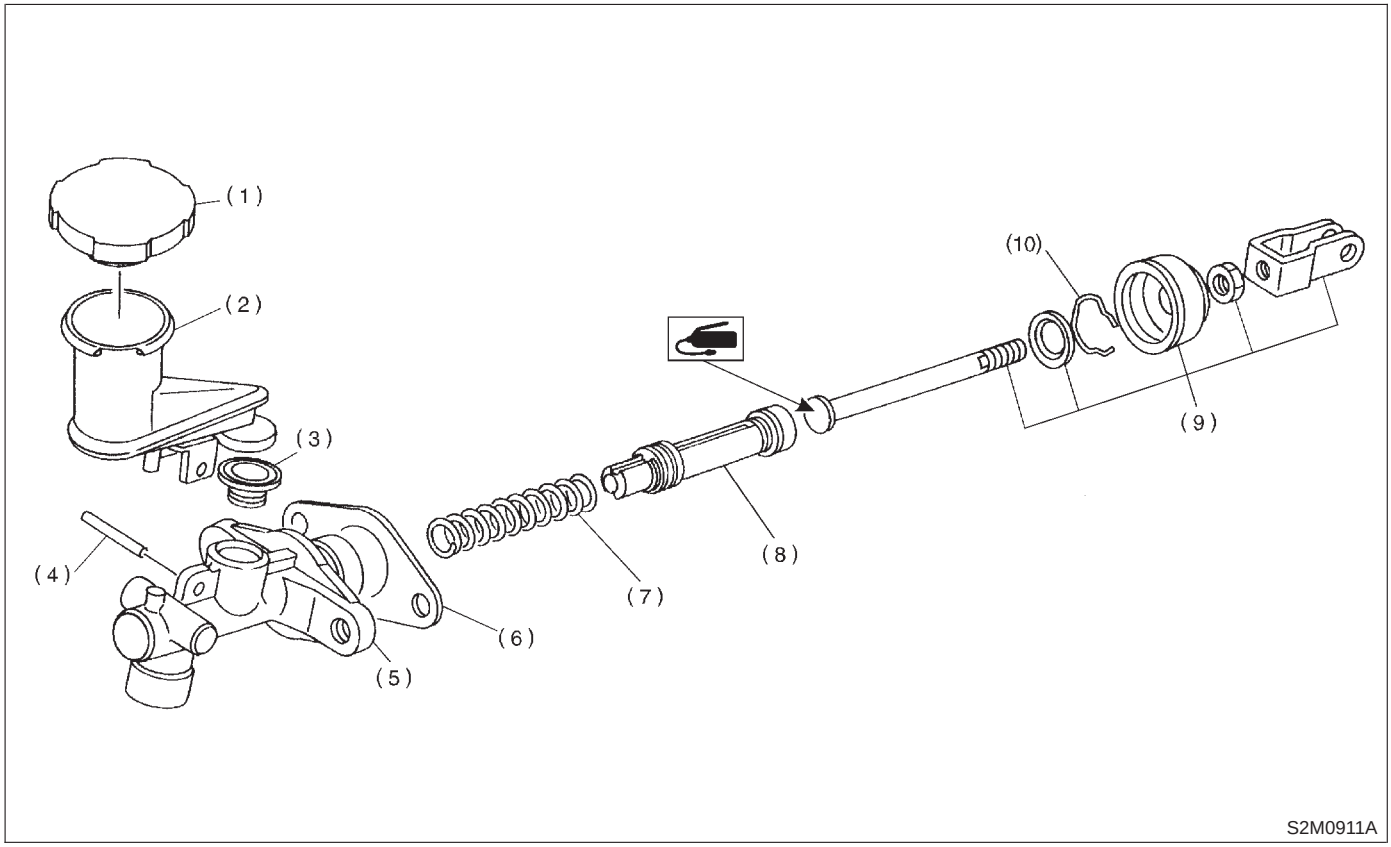
1. Clutch System



(1) Operating cylinder
(2) Washer
(3) Clutch hose
(4) Bracket
(5) Clip
(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) Clutch release lever
(15) Clip
(16) Clutch release bearing
(17) Clutch cover
(18) Clutch disc
(19) Flywheel

Tightening torque: N·m (kg-m, ft-lb)
T1: 15^{+3}_{-2} ($1.5^{+0.3}_{-0.2}$, $10.8^{+2.2}_{-1.4}$)
T2: 15.7±1.5 (1.6±0.15, 11.6±1.1)
T3: 18±3 (1.8±0.3, 13.0±2.2)
T4: 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) Seat
(7) Return spring
(8) Piston
(9) Push rod
(10) Piston stop ring

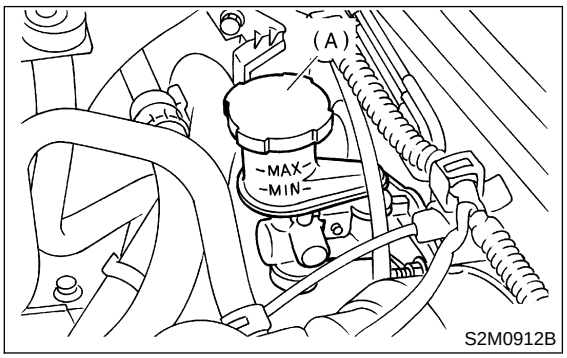
1. General

A: PRECAUTION

When servicing clutch system, pay attention to the following items.
1) Check fluid level using a scale on outside of reservoir tank. If the level is below “MIN”, add brake fluid to bring it up to “MAX”.

Recommended brake 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.



(A) Reservoir tank

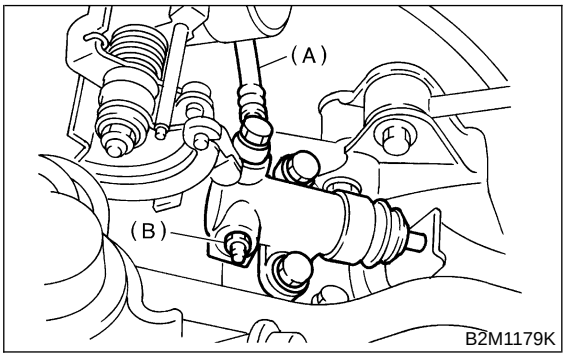
2) Make sure that brake fluid does not leak from master cylinder, operating cylinder and piping.
3) Apply grease sufficiently to the clutch release lever pinion.
4) Check for proper clutch disengagement and clutch pedal return ability.

2. On-car Service

A: ADJUSTMENT

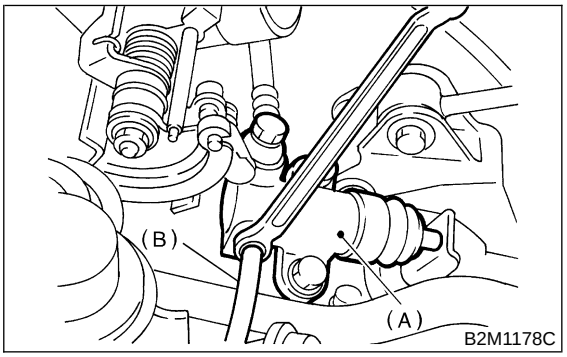
NOTE:
Bleed air from oil line with the help of a co-worker.

1) Remove air cleaner case.
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.



(A) Clutch hose
(B) Air bleeder

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.



(A) Operating cylinder
(B) Vinyl tube

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.

1. General

A: PRECAUTION

When servicing clutch system, pay attention to the following items.
1) Check fluid level using a scale on outside of reservoir tank. If the level is below “MIN”, add brake fluid to bring it up to “MAX”.

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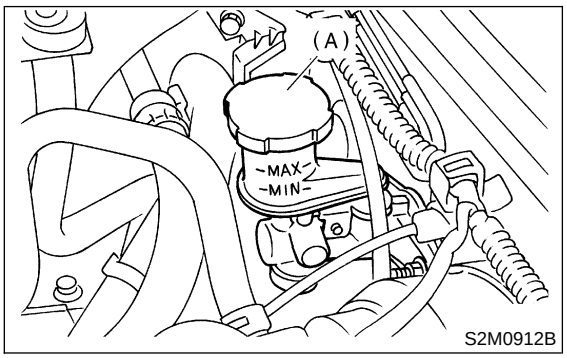

(A) Reservoir tank

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2. On-car Service

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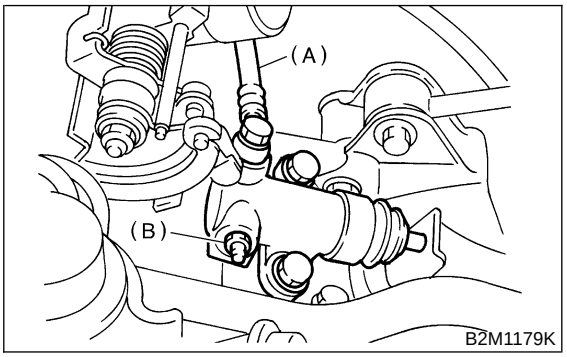

(A) Clutch hose
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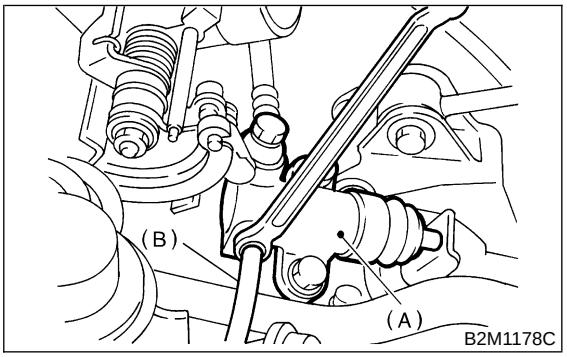


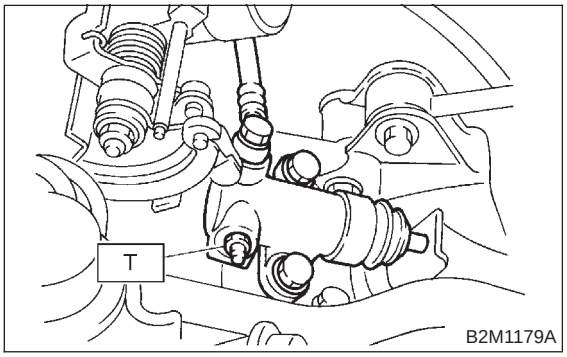
(A) Operating cylinder
(B) Vinyl tube

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: 8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 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.

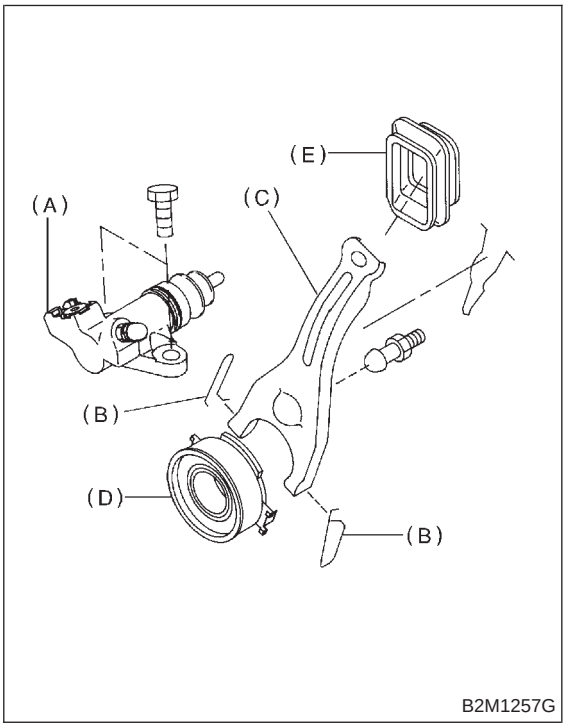
3. Clutch Release Bearing and Lever

A: REMOVAL

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 clutch release bearing.

CAUTION:
Be careful not to deform clips.

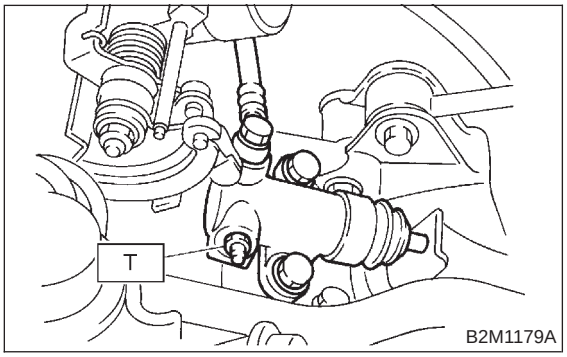
4) Remove clutch release lever sealing.



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

5) Tighten air bleeder.

Tightening torque:
T: 8±2 N·m (0.8±0.2 kg-m, 5.8±1.4 ft-lb)



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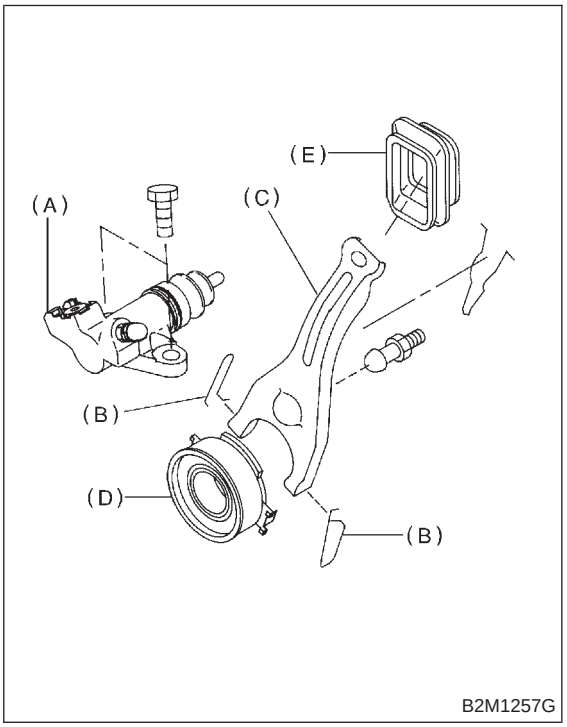
<Ref. to 2-10 [W5A0].>
3) Remove the two clips from clutch release lever and remove clutch release bearing.

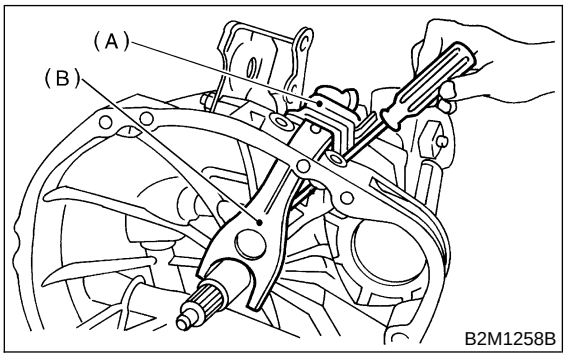
CAUTION:
Be careful not to deform clips.

4) Remove clutch release lever sealing.



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

5) Remove clutch release lever retainer spring from clutch release lever pivot with a screwdriver by accessing it through clutch housing clutch release lever hole. Then remove clutch release lever.



(A) Clutch release lever sealing
(B) Clutch release lever

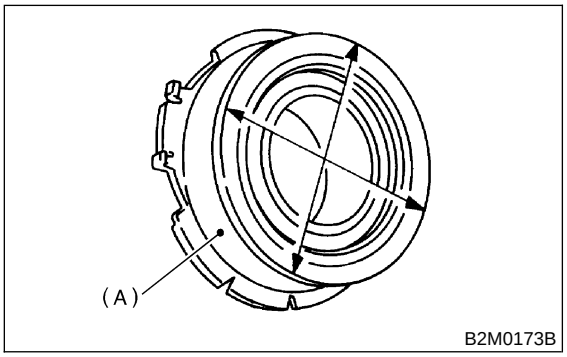
B: INSPECTION

1. CLUTCH RELEASE BEARING

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

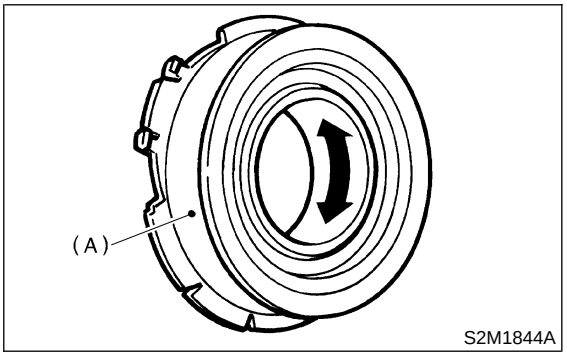
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.4 mm (0.055 in)



(A) Bearing case

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

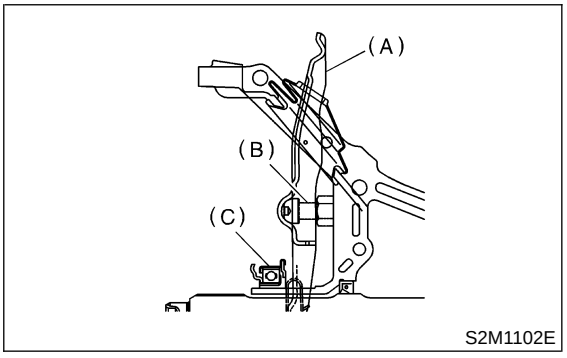


(A) Bearing case

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

2. CLUTCH RELEASE LEVER

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



(A) Clutch release lever
(B) Pivot
(C) Clutch release bearing

C: INSTALLATION

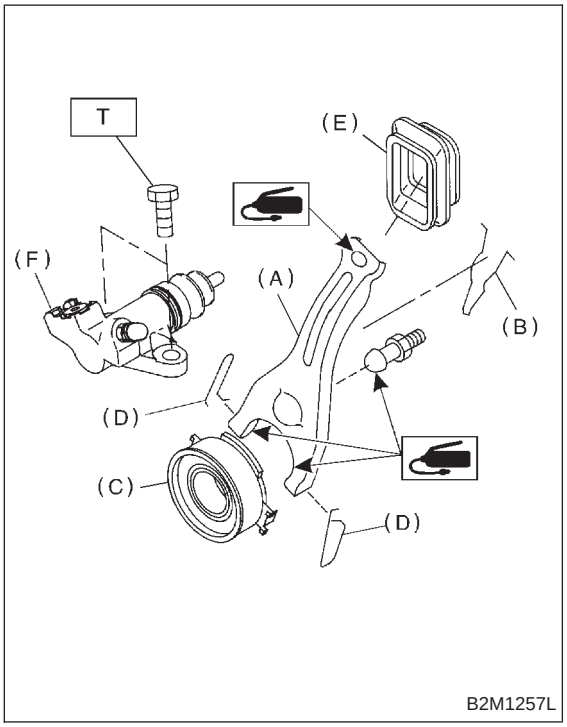
CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

1) While pushing clutch 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 clutch release lever and operating cylinder.
● Confirm that retainer spring is securely fitted by observing it through the main case hole.

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

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



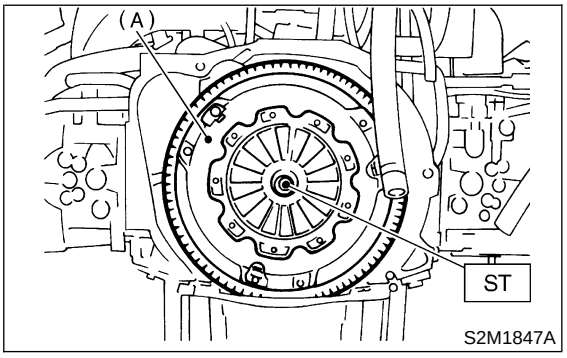
(A) Clutch release lever
(B) Retainer spring
(C) Clutch release bearing
(D) Clip
(E) Clutch release lever sealing
(F) Operating cylinder

5) After remounting engine and transmission on body.
<Ref. to 2-11 [W2C0].>
6) Bleed air from oil line with the help of a co-worker.
<Ref. to 2-10 [W2A0].>

4. Clutch Disc and Cover

A: REMOVAL

1) Install ST on flywheel.
ST 498497100 CRANKSHAFT STOPPER

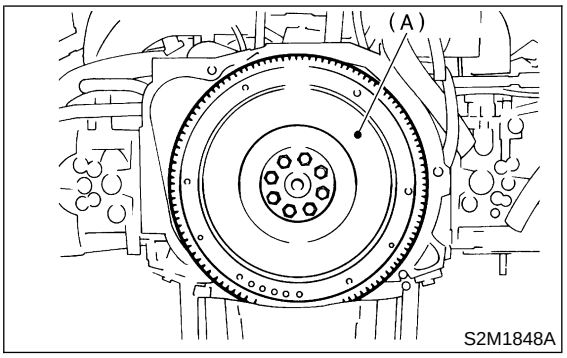


(A) Clutch cover

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.



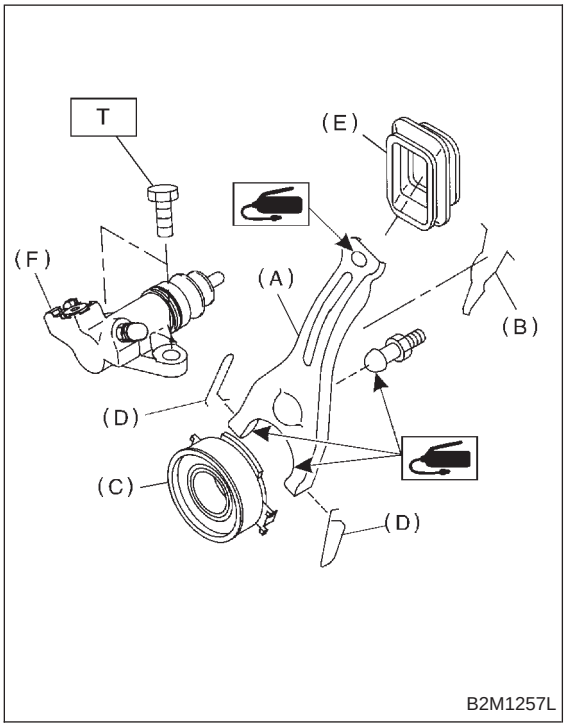
(A) Flywheel

1) While pushing clutch 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 clutch release lever and operating cylinder.
● Confirm that retainer spring is securely fitted by observing it through the main case hole.

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

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



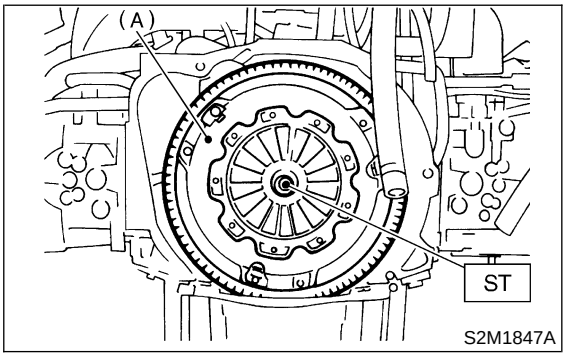
(A) Clutch release lever
(B) Retainer spring
(C) Clutch release bearing
(D) Clip
(E) Clutch release lever sealing
(F) Operating cylinder

5) After remounting engine and transmission on body.
<Ref. to 2-11 [W2C0].>
6) Bleed air from oil line with the help of a co-worker.
<Ref. to 2-10 [W2A0].>

4. Clutch Disc and Cover

A: REMOVAL

1) Install ST on flywheel.
ST 498497100 CRANKSHAFT STOPPER

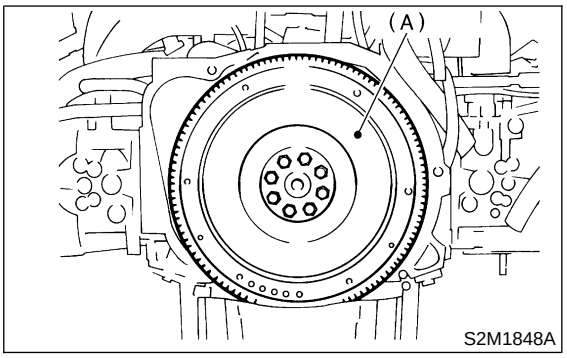


(A) Clutch cover

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.



(A) Flywheel

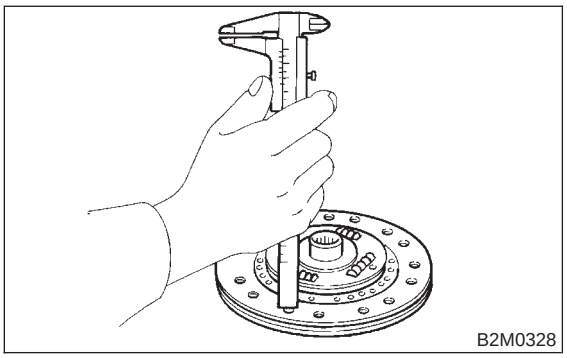
B: INSPECTION

1. CLUTCH DISC

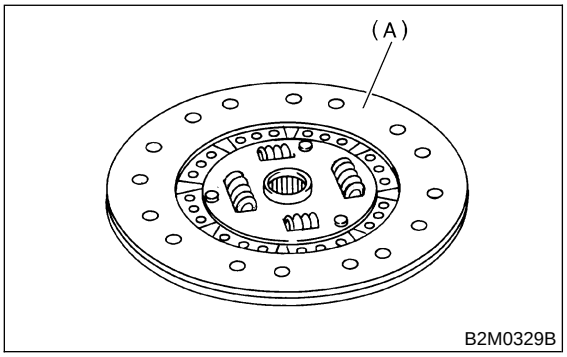
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

CAUTION:
Do not wash clutch disc with any cleaning fluid.


B2M0328

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

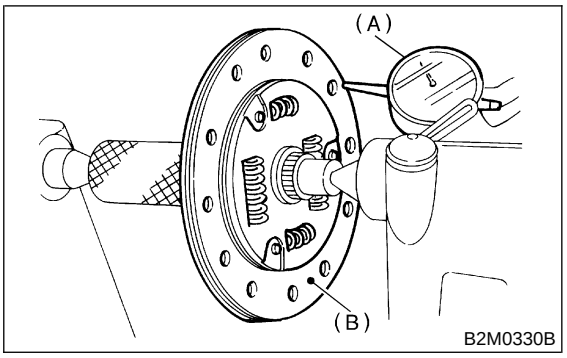


B2M0329B

(A) Facing

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

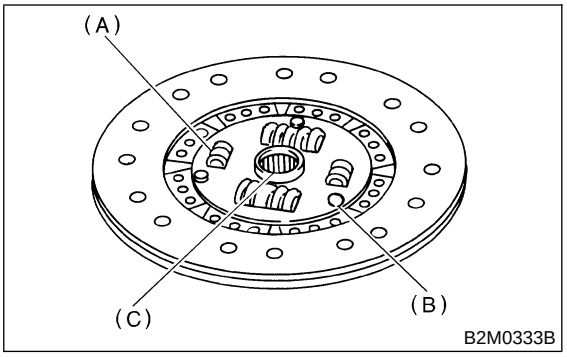
Limit for runout:
1.0 mm (0.039 in) at R = 107 mm (4.21 in)



B2M0330B

(A) Dial gauge
(B) Facing

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



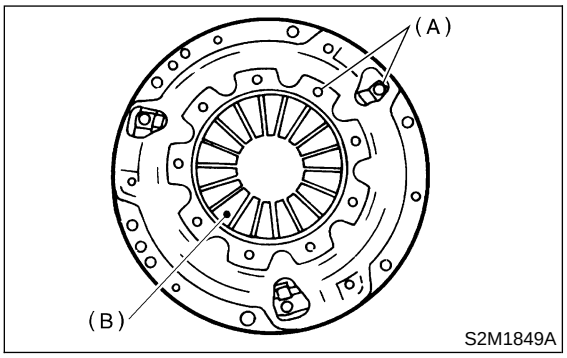
B2M0333B

(A) Torsion spring
(B) Rivet
(C) Spline

2. CLUTCH COVER

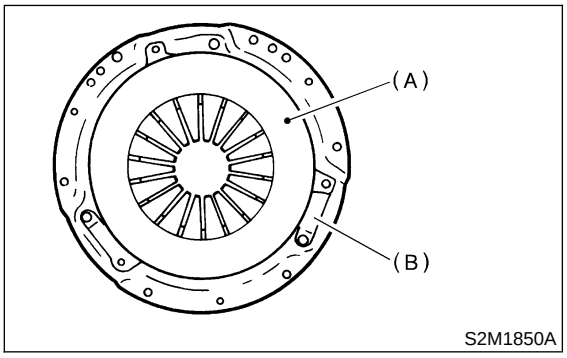
NOTE:
Visually check for the following items without disassembling, and replace or repair if defective.

1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.



(A) Thrust rivet
(B) Diaphragm spring

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

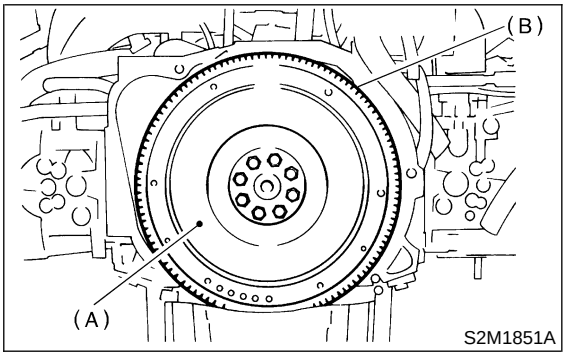


(A) Pressure plate
(B) Strap plate

3. FLYWHEEL

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

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

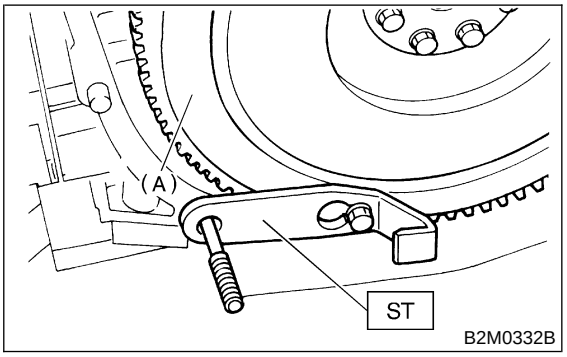


(A) Flywheel
(B) Ring gear

2) Smoothness of rotation
Rotate ball bearing applying pressure in thrust direction.
3) If noise or excessive play is noted, replace flywheel.

C: INSTALLATION

1) Install flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER

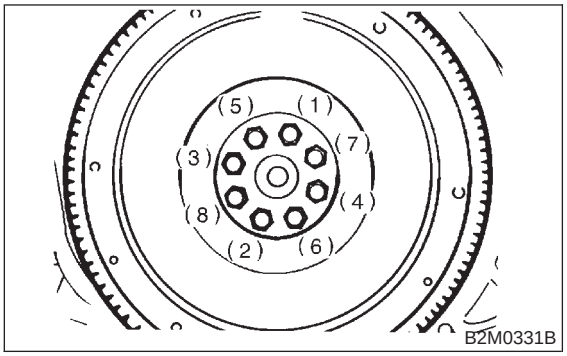


(A) Flywheel

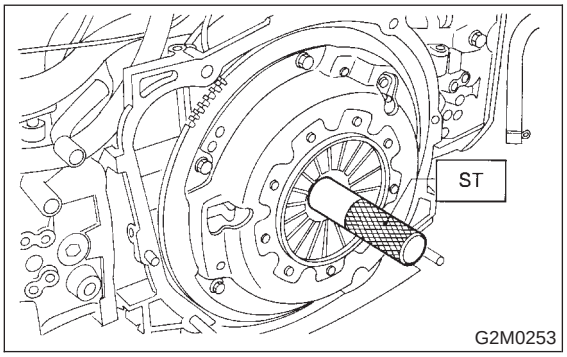
2) Tighten the flywheel attaching bolts to the specified torque.

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

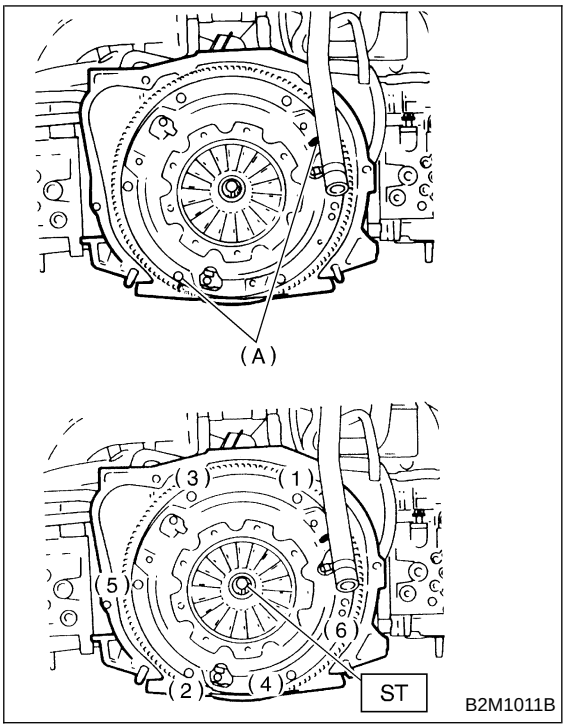


4) Install clutch cover on flywheel and tighten bolts to the specified torque.

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

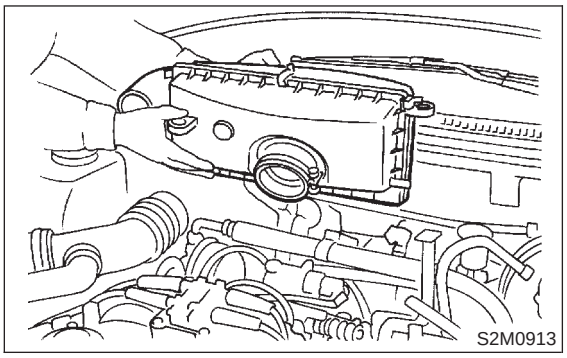


(A) “0” marks

5. Operating Cylinder

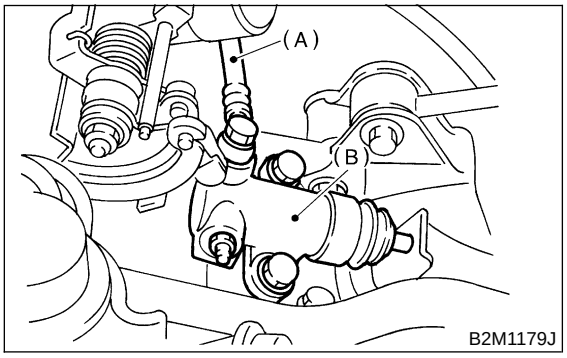
A: REMOVAL AND INSTALLATION

1) Remove air cleaner case.



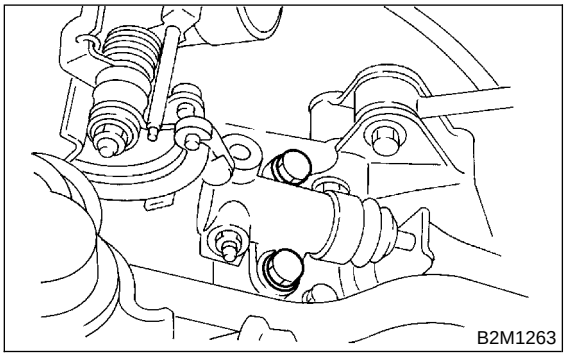
2) Remove clutch hose from operating cylinder.

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



(A) Clutch hose
(B) Operating cylinder

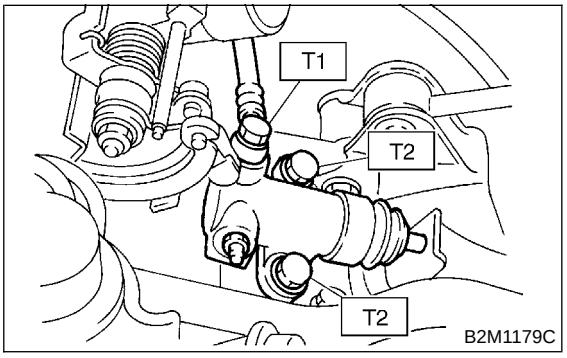
3) Remove operating cylinder from transmission.



4) Install in the reverse order of removal.

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

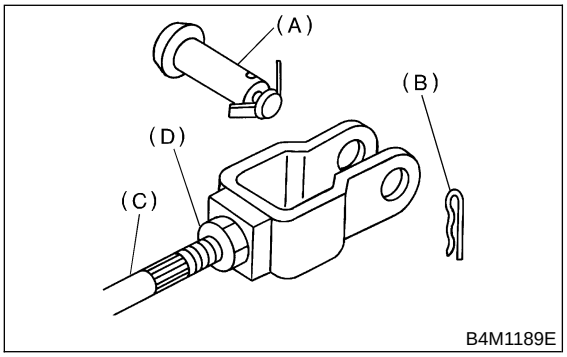


5) After bleeding air from operating cylinder, ensure that clutch operates properly.
<Ref. to 2-10 [W2A0].>

6. Master Cylinder and Reservoir Tank

A: REMOVAL

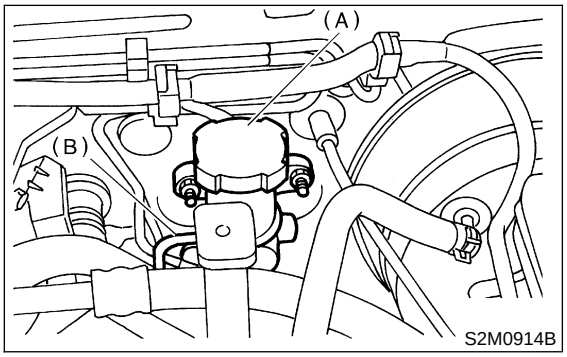
1) Thoroughly drain brake fluid from reservoir tank.
2) Remove snap pin, clevis pin and separate push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

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

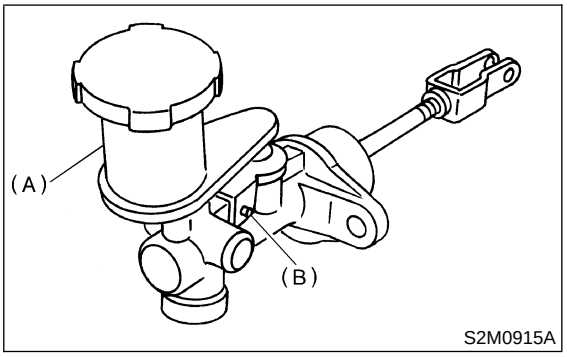
CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.



(A) Master cylinder
(B) Clutch pipe

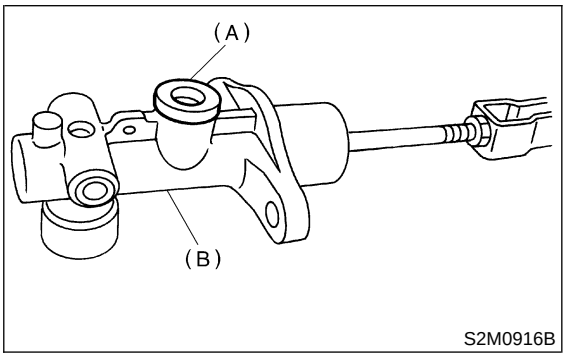
B: DISASSEMBLY

1) Remove straight pin and reservoir tank.



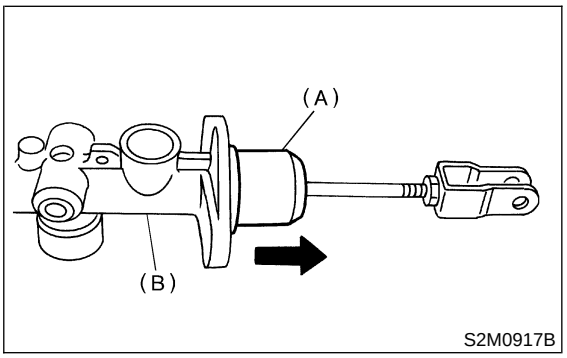
(A) Reservoir tank
(B) Straight pin

2) Remove oil sealing.



(A) Oil seal
(B) Master cylinder

3) Move the cylinder boot backward.



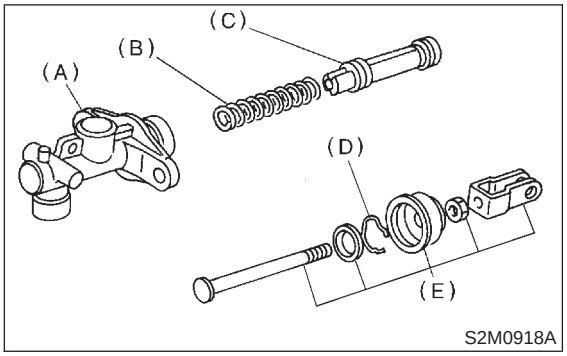
(A) Cylinder boot
(B) Master cylinder

4) Remove snap ring.

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

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.

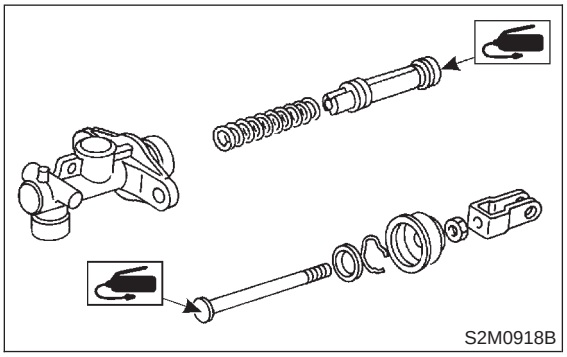


(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Snap ring
(E) Rod ASSY

D: ASSEMBLY

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

Grease:
SILICONE GREASE G40M (Part No. 004404003)



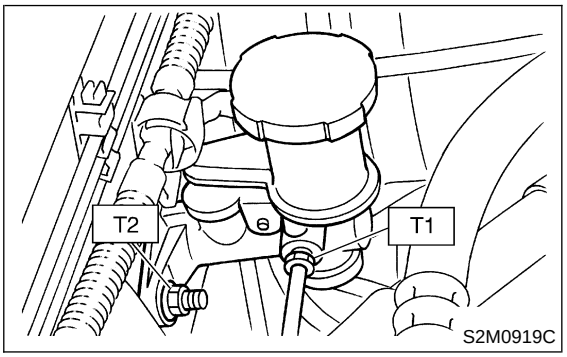
2) To assemble the master cylinder reverse the sequence of disassembly procedure.

E: INSTALLATION

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

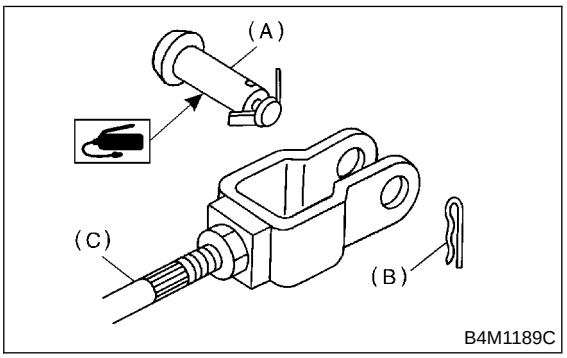
CAUTION:
Check that pipe is routed properly.

Tightening torque:
T1: 15^{+3}_{-2} N·m ($1.5^{+0.3}_{-0.2}$ kg-m, $10.8^{+2.2}_{-1.4}$ ft-lb)
T2: 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 [W2A0].>

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 reservoir 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 men 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 reservoir tank with syringe.
4) Refill reservoir tank with recommended brake fluid.

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

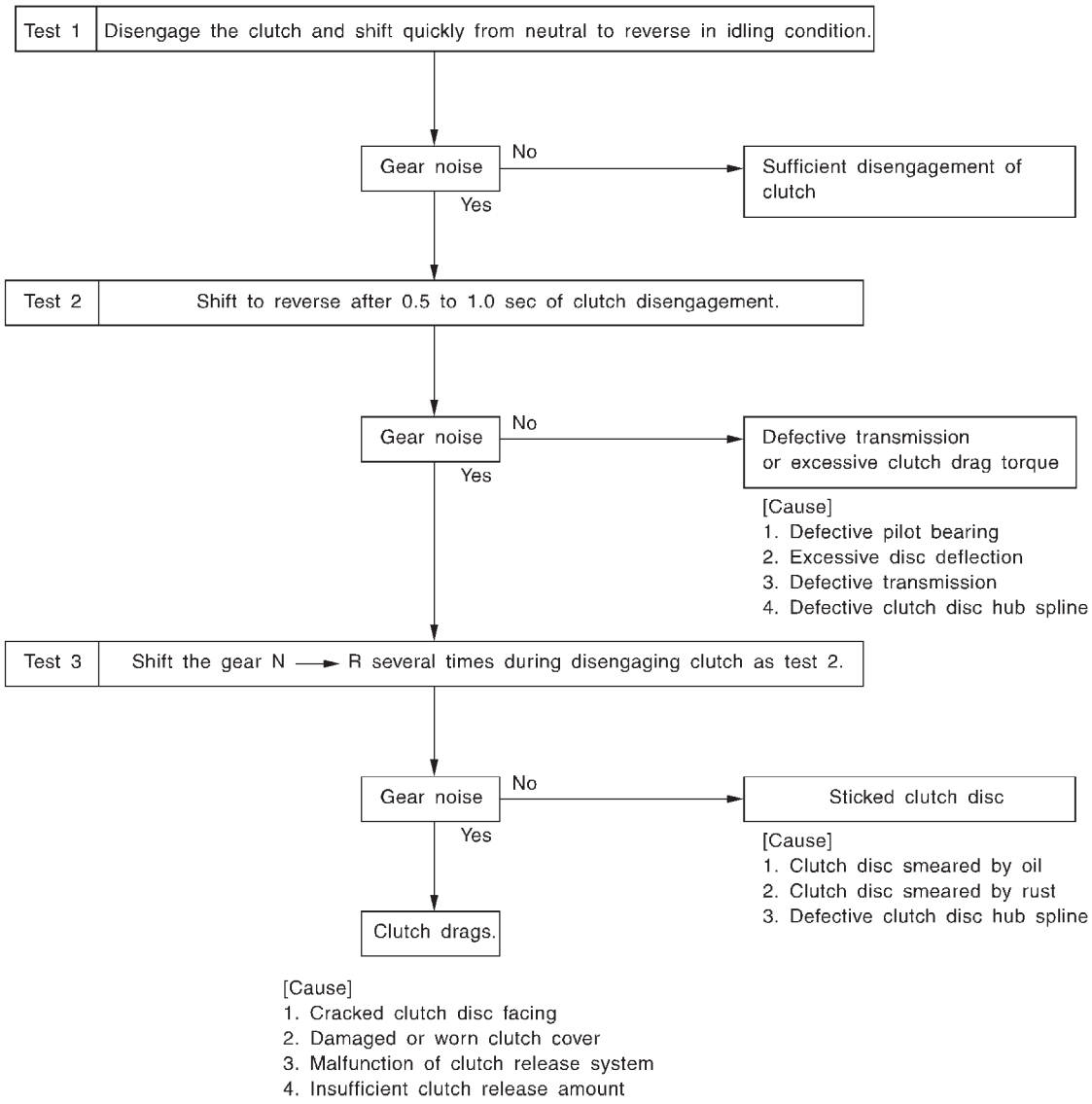
5) Bleed air from oil line with the help of a co-worker.
<Ref. to 2-10 [W2A0].>

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 speed 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) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Correct or replace.
	(e) Defective clutch release bearing holder	Correct or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. ● Method of testing: <Ref. to 2-10 [K1A0].> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace clutch disc.
	(b) Excessive deflection of clutch disc facing	Correct or replace.
	(c) Seized crankshaft pilot needle bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) 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) Adhesion of oil on the facing	Replace clutch disc.
	(b) Weak or broken torsion spring	Replace clutch disc.
	(c) Defective facing contact or excessive disc	Replace clutch disc defection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) 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 clutch release bearing	Replace clutch 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.

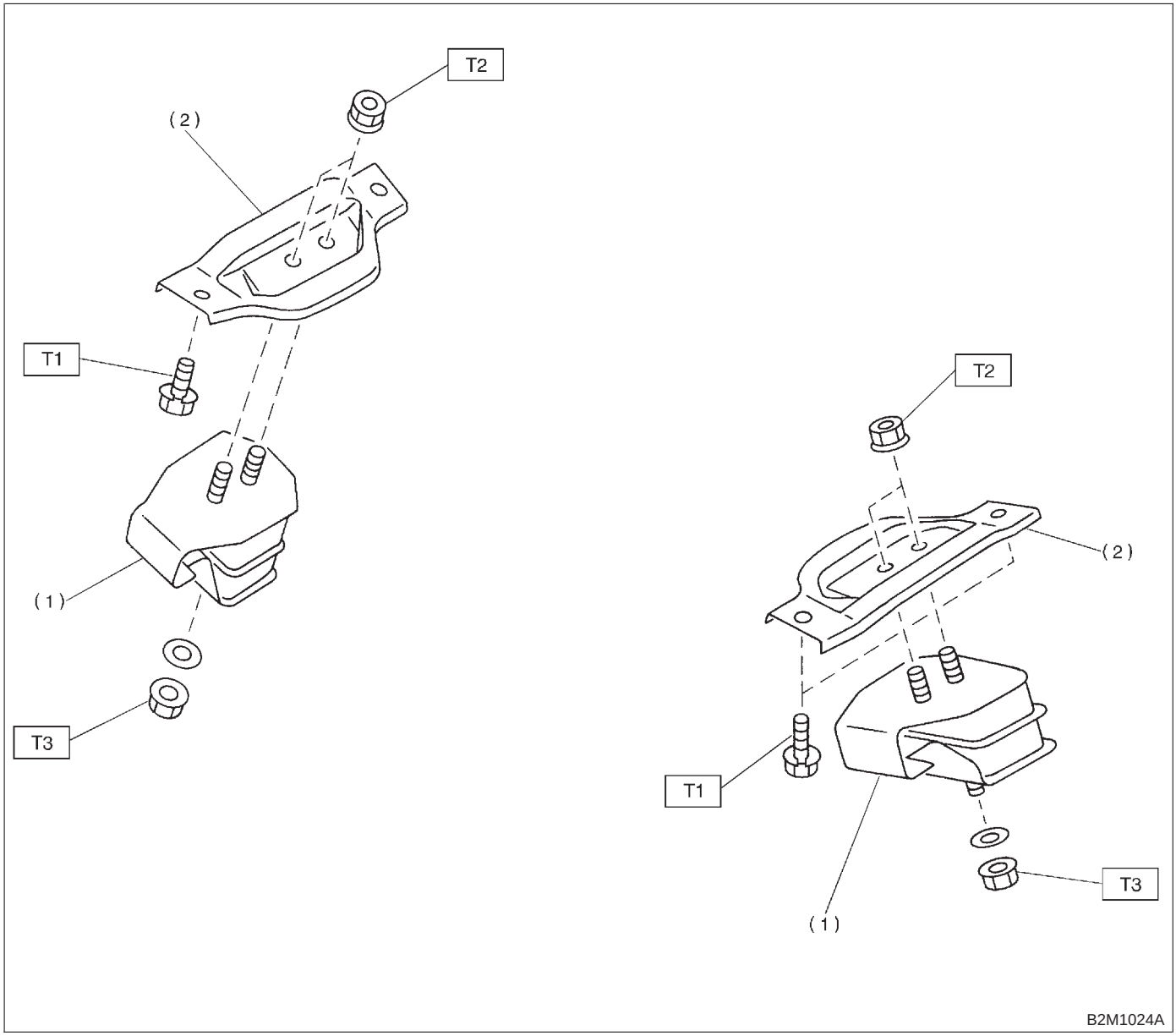
Symptom	Possible cause	Corrective
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace clutch disc.
	(b) Deteriorated cushioning spring	Replace clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace clutch disc or main shaft.
	(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



B2M1012B

1. Engine Mounting

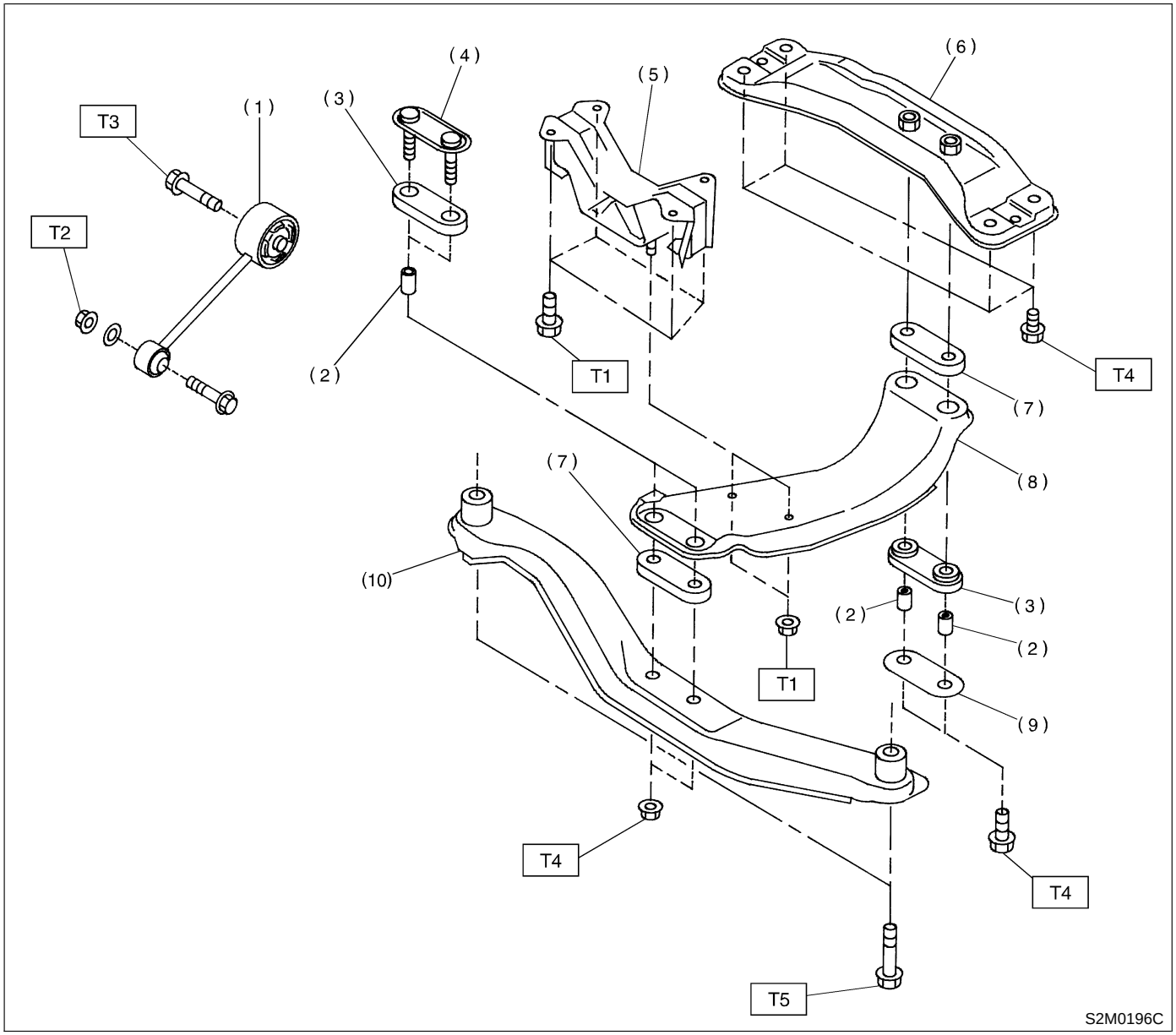


(1) Front cushion rubber
(2) Front engine mounting bracket

Tightening torque: N·m (kg-m, ft-lb)
T1: 34±5 (3.5±0.5, 25.3±3.6)
T2: 41±10 (4.2±1.0, 30±7)
T3: 83±15 (8.5±1.5, 61±11)

2. Transmission Mounting

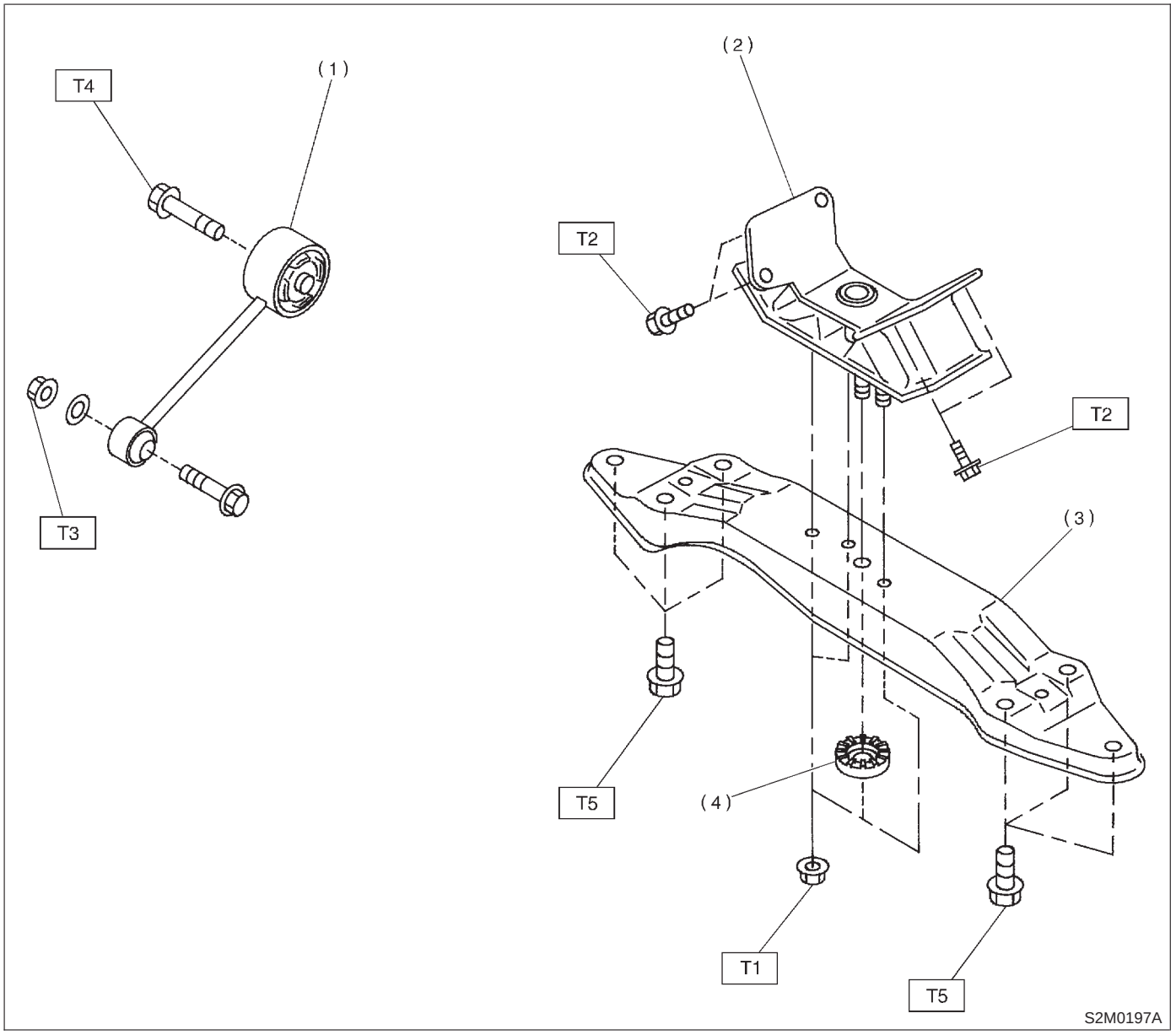
A: MT MODEL



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

Tightening torque: N·m (kg-m, ft-lb)
T1: 34±5 (3.5±0.5, 25.3±3.6)
T2: 49±5 (5.0±0.5, 36.2±3.6)
T3: 57±10 (5.8±1.0, 42±7)
T4: 69±15 (7.0±1.5, 51±11)
T5: 137±20 (14±2, 101±14)

B: AT MODEL



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

Tightening torque: N·m (kg-m, ft-lb)
T1: 34±5 (3.5±0.5, 25.3±3.6)
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)

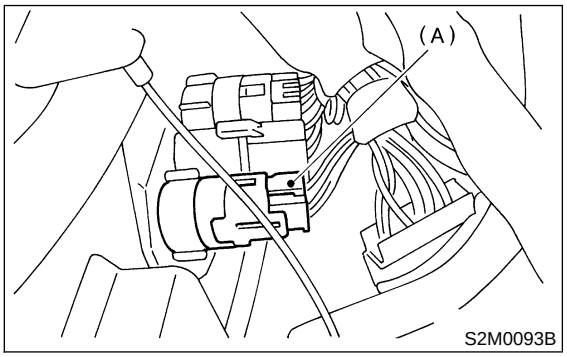
1. Engine

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 [G7B0].>

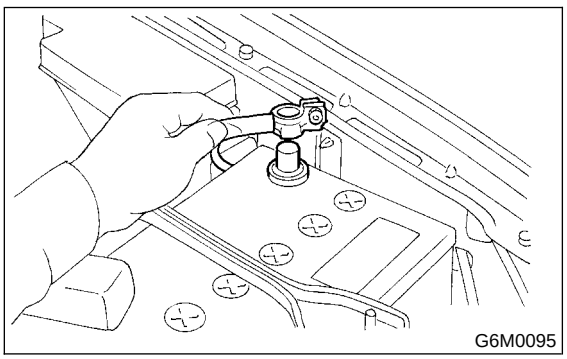
B: REMOVAL

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

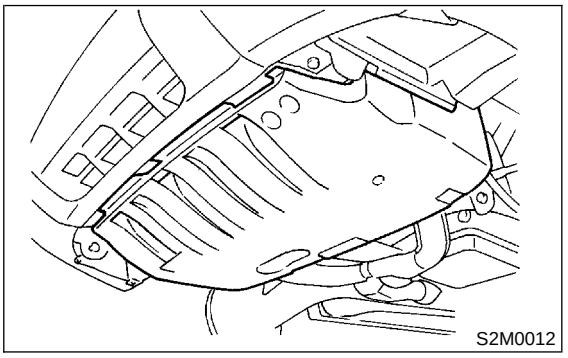


(A) Fuel pump relay connector

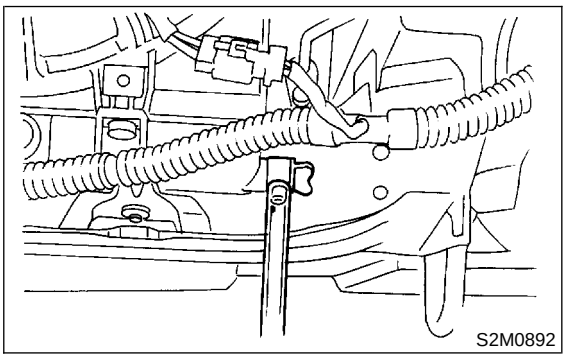
   (2) Start the engine, and run until it stalls.
   (3) After the engine stalls, crank it for five seconds more.
   (4) Turn ignition switch to “OFF”.
   (5) Remove filler cap.
4) Disconnect battery ground terminal.



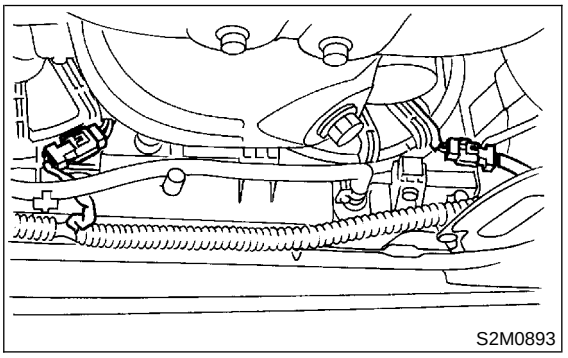
5) Remove under cover.



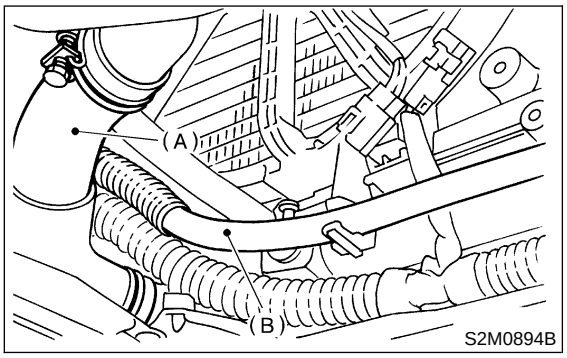
6) Drain coolant.
Set container under the vehicle, and loose drain cock from radiator.



7) Remove cooling system.
   (1) Disconnect connectors from radiator main fan and sub fan motors.

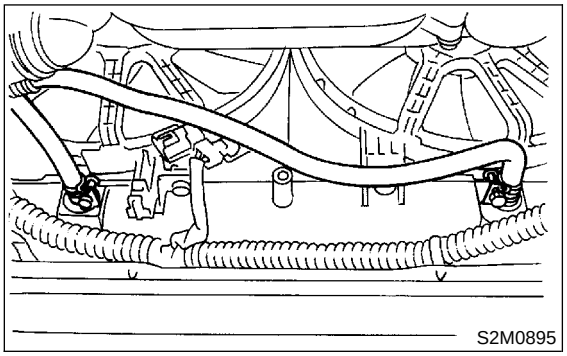


(2) Disconnect radiator outlet hose from thermostat cover, and remove ATF cooler hose from clip of radiator.

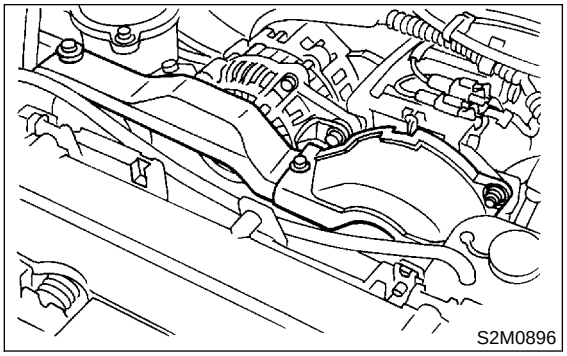


(A) Radiator outlet hose
(B) ATF cooler hose

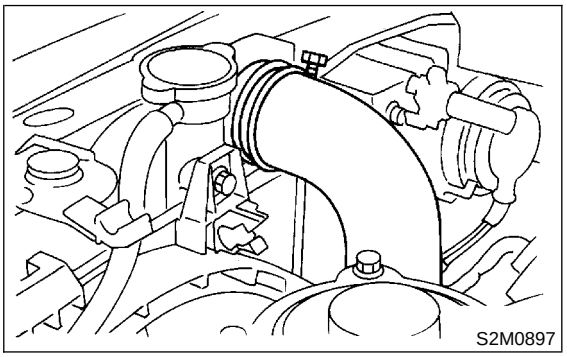
(3) Disconnect ATF cooler hoses from radiator. (AT vehicles)



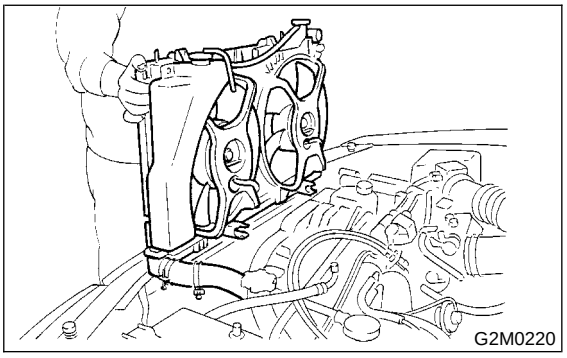
(4) Lower the vehicle.
(5) Remove V-belt covers.



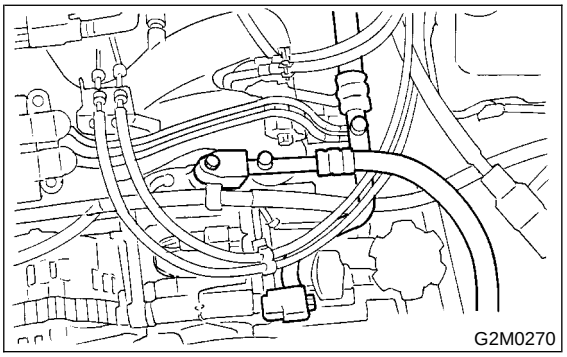
(6) Disconnect radiator inlet hose from radiator.



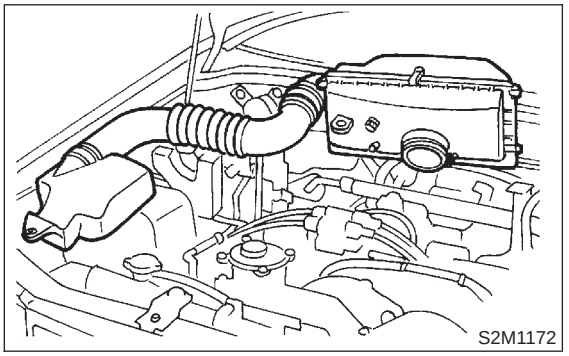
(7) Remove radiator upper bracket, and remove radiator assembly from vehicle.



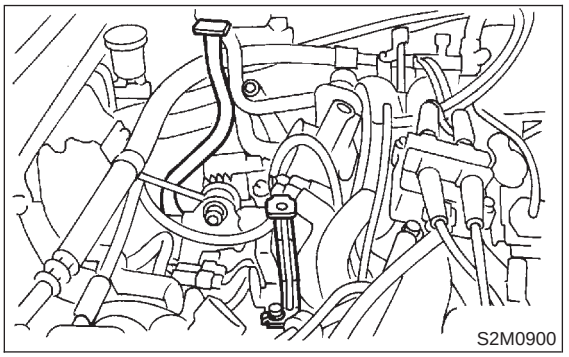
8) Collect refrigerant, and remove flexible hoses. (With A/C)
(1) Place and connect the attachment hose to the refrigerant recycle system.
(2) Collect refrigerant from A/C system.
(3) Disconnect A/C flexible hoses from A/C compressor.



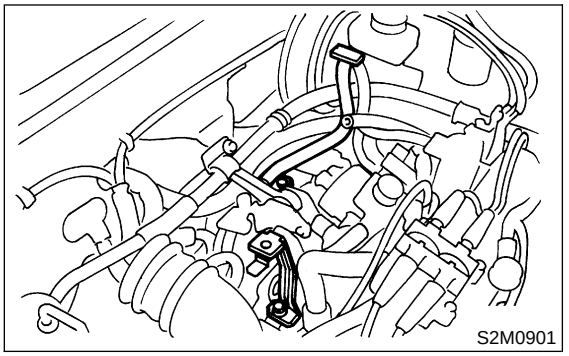
9) Remove air intake system.
Remove air intake duct with air cleaner case.


S2M1172

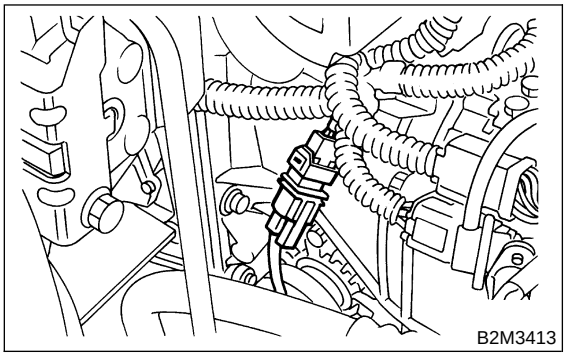
10) Remove air cleaner case stay.
- MT vehicles


S2M0900

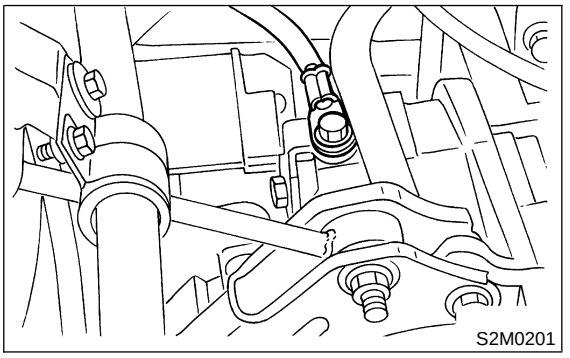
- AT vehicles


S2M0901

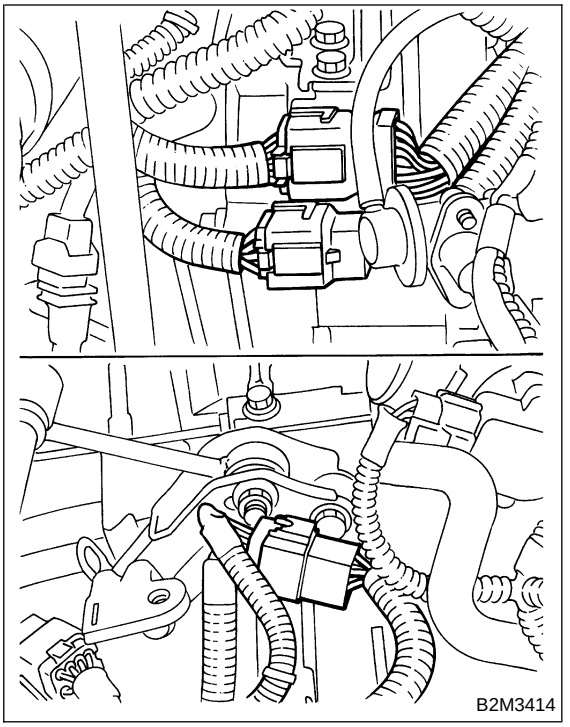
11) Disconnect the following connectors and cables.
(1) Front oxygen sensor connector


B2M3413

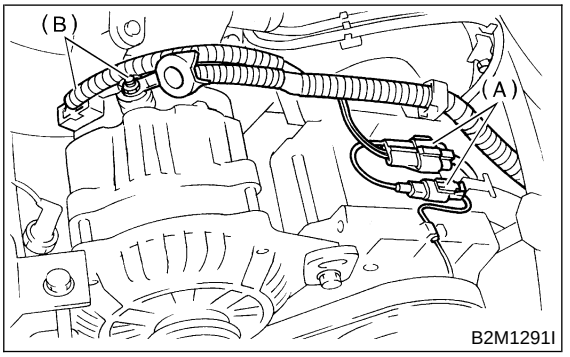
(2) Engine ground terminal


S2M0201

(3) Engine harness connector


B2M3414

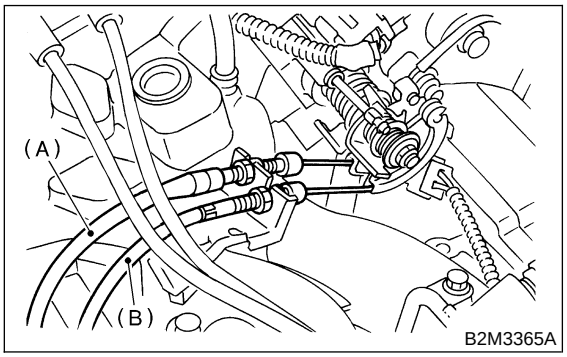
(4) Generator connector, terminal and A/C compressor connectors (With A/C)



B2M1291I

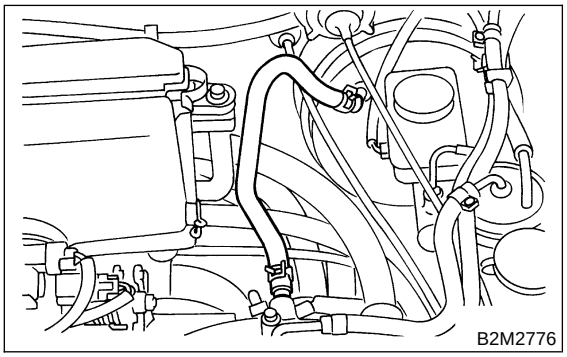
(A) A/C compressor connectors
(B) Generator connector and terminal

(5) Accelerator cable and cruise control cable

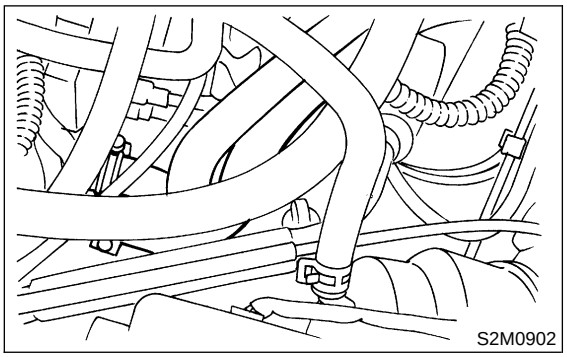


(A) Accelerator cable
(B) Cruise control cable

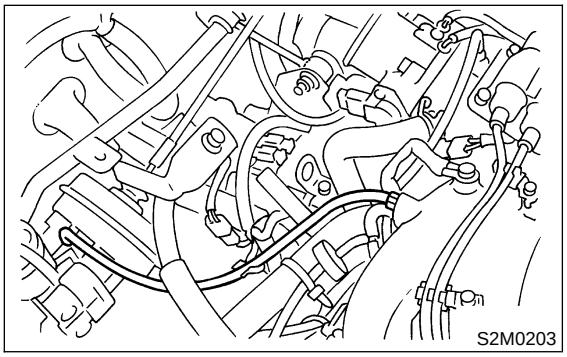
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



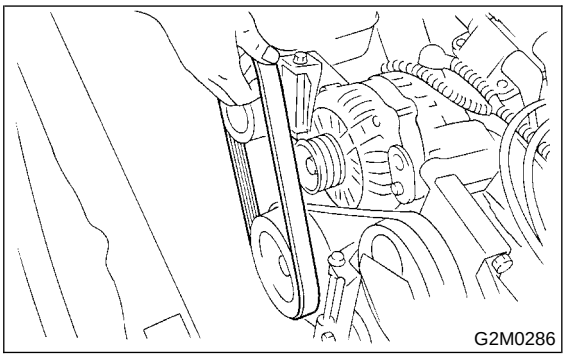
(2) Heater inlet and outlet hoses



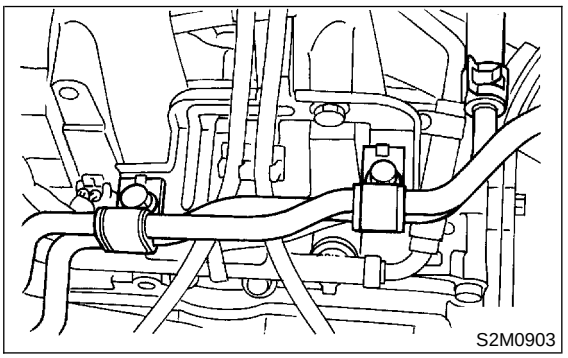
(3) Cruise control vacuum hose



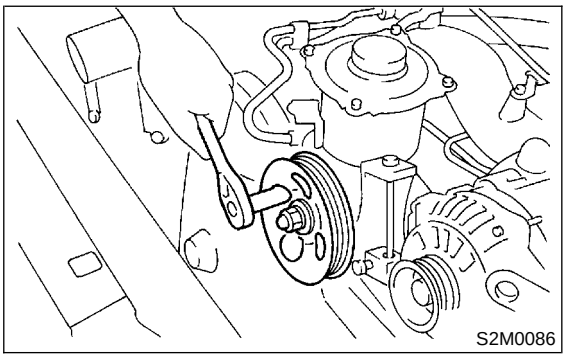
13) Remove power steering pump.
(1) Loosen lock bolt and slider bolt, and remove front side V-belt.



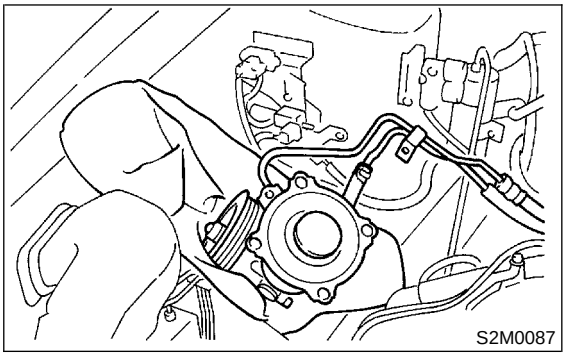
(2) Remove power steering pipe bracket.



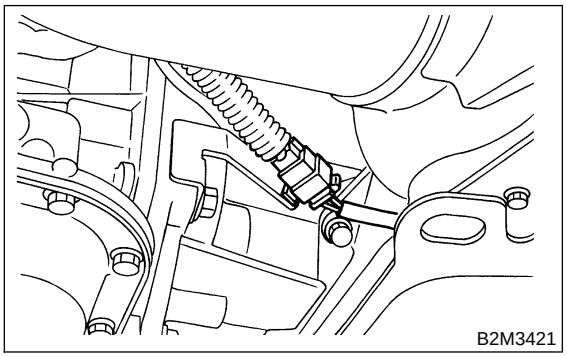
(3) Remove bolts which install power steering pump from bracket.



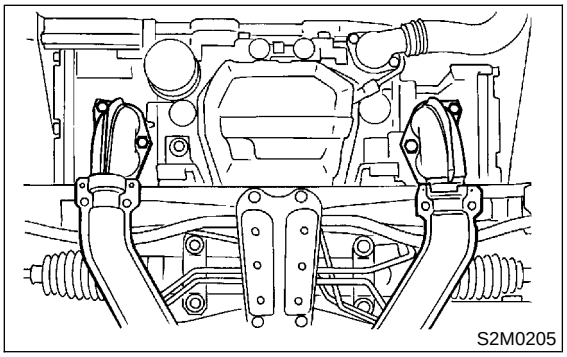
(4) Place power steering pump on the right side wheel apron.



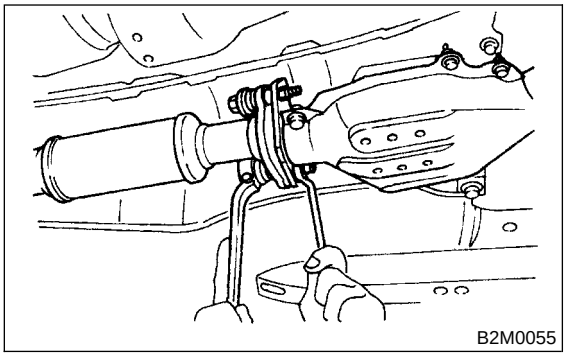
14) Remove front exhaust pipe and center exhaust pipe.
(1) Lift-up the vehicle.
(2) Disconnect connector from rear oxygen sensor.


B2M3421

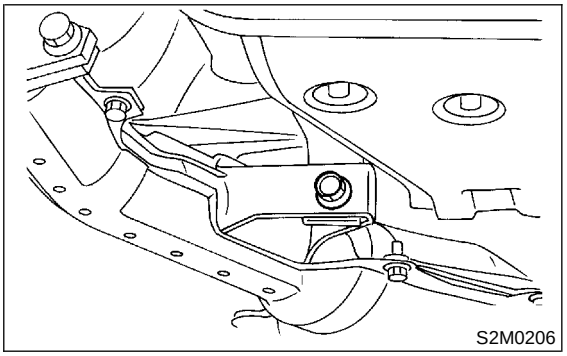
(3) Remove nuts which install front exhaust pipe onto engine.


S2M0205

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


B2M0055

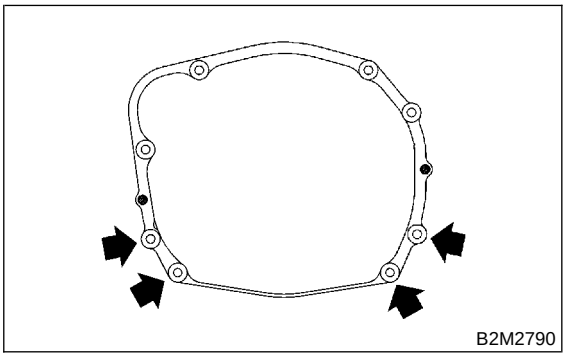
(5) Remove bolt which installs center exhaust pipe on hunger bracket.


S2M0206

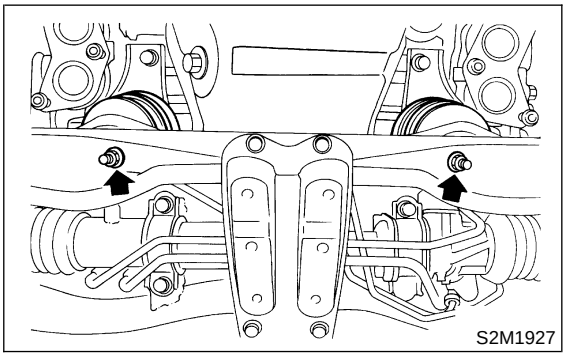
(6) Take off front and center exhaust pipes.

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

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

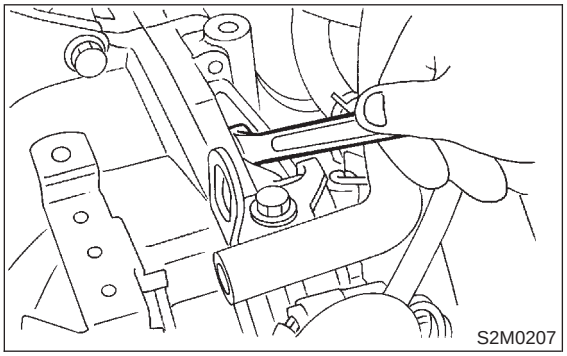

B2M2790

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


S2M1927

17) Separate torque converter from drive plate. (AT vehicles)
(1) Lower the vehicle.
(2) Remove service hole plug.

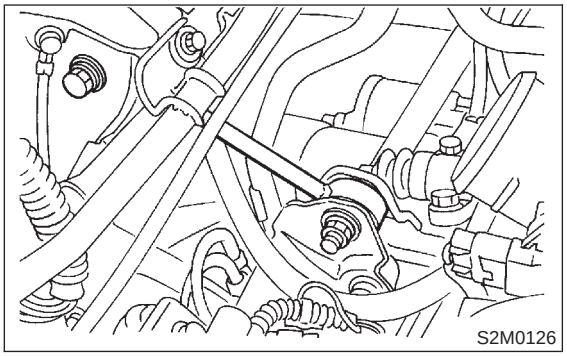
(3) Remove bolts which hold torque converter to drive plate.


S2M0207

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

ST 499977100 CRANK PULLEY WRENCH

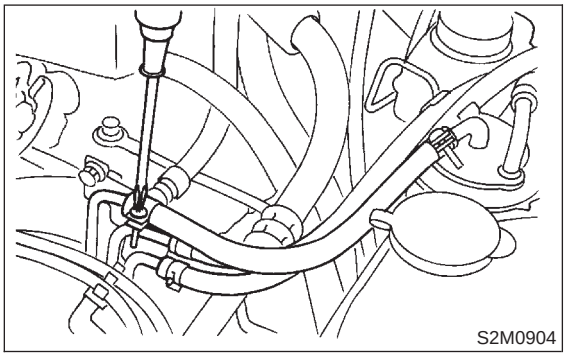
18) Remove pitching stopper.


S2M0126

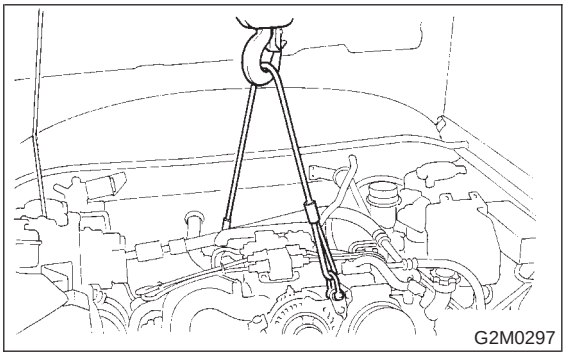
19) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:

- **Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.**
- **Catch fuel from hose into container.**


S2M0904

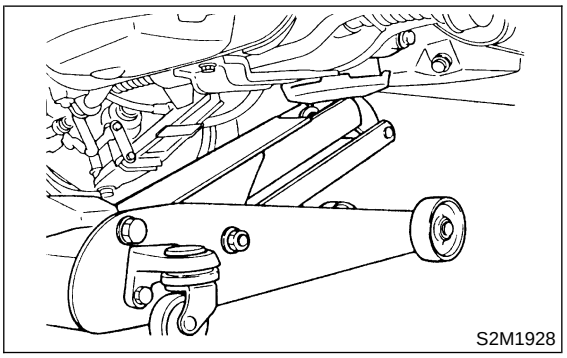
20) Support engine with a lifting device and wire ropes.


G2M0297

21) 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.

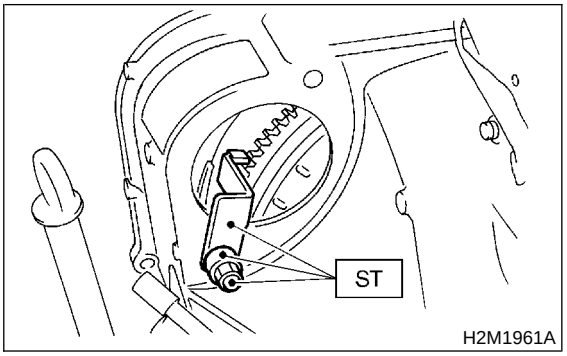

S2M1928

22) Separation of engine and transmission.

(1) Remove starter. <Ref. to 6-1 [W1A0].>

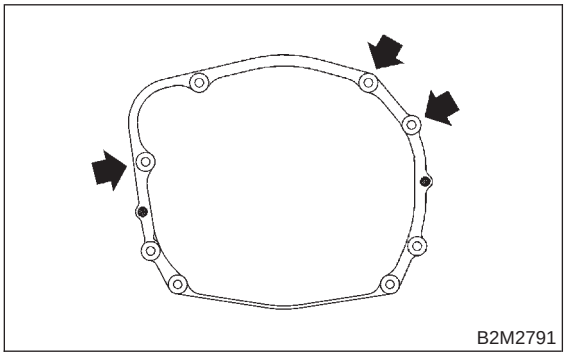
(2) Install ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



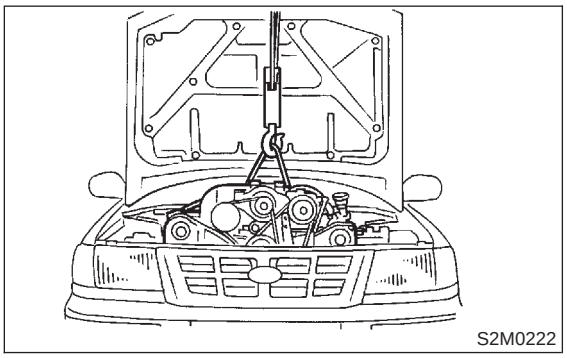
H2M1961A

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


B2M2791

23) 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.

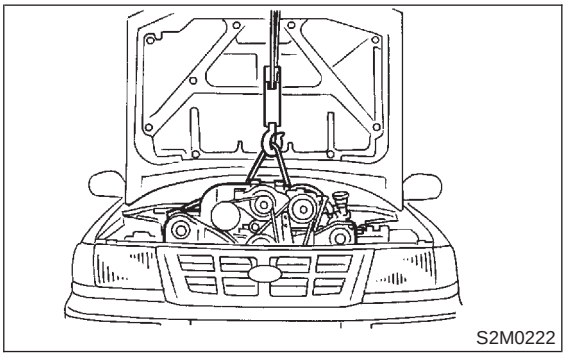
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.


S2M0222

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.

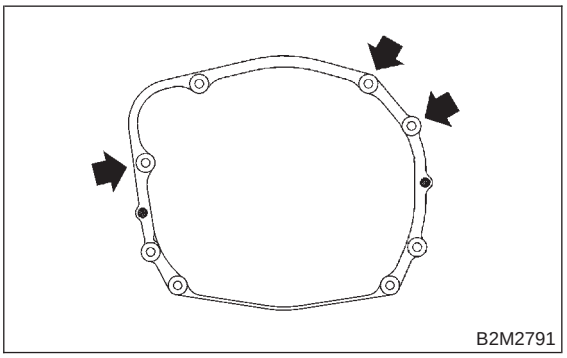

S2M0222

(2) Apply a small amount of grease to spline of mainshaft.
2) Connect engine and transmission.
(1) Remove ST from torque converter clutch case. (AT vehicles)

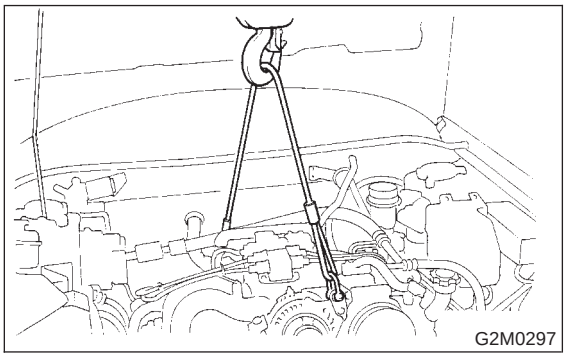
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET
(2) Install starter.
<Ref. to 6-1 [W1A0].>
(3) Tighten bolt which holds right upper side of transmission to engine.

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

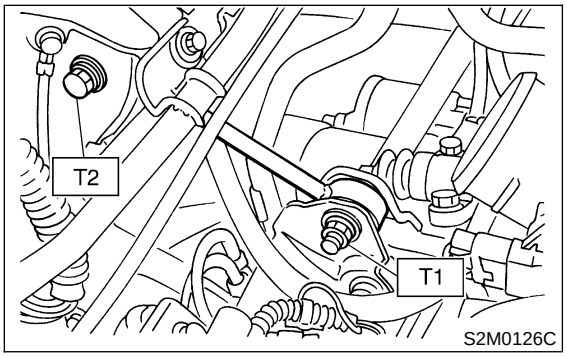

B2M2791

3) Remove lifting device and wire ropes.



4) Remove garage jack.
5) Install pitching stopper.

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

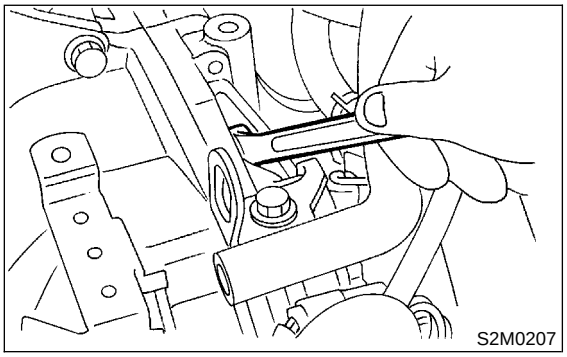


6) Install torque converter onto drive plate. (AT vehicles)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977100 CRANK PULLEY WRENCH

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

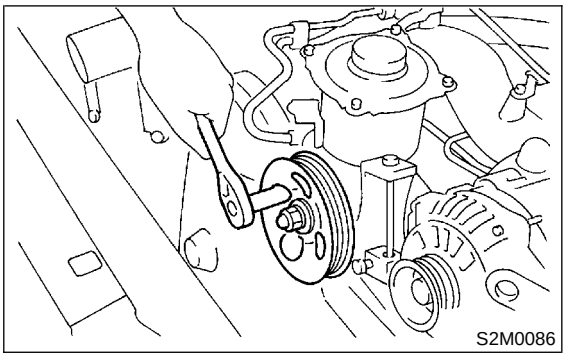
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



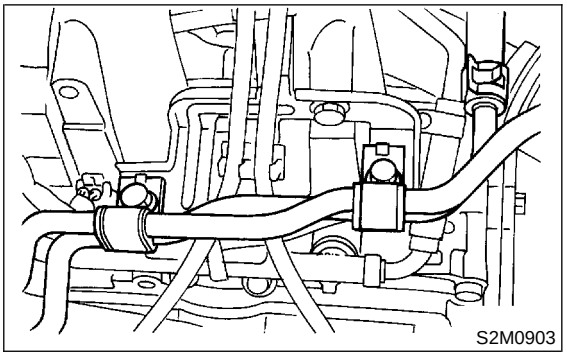
(3) Clog plug onto service hole.

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

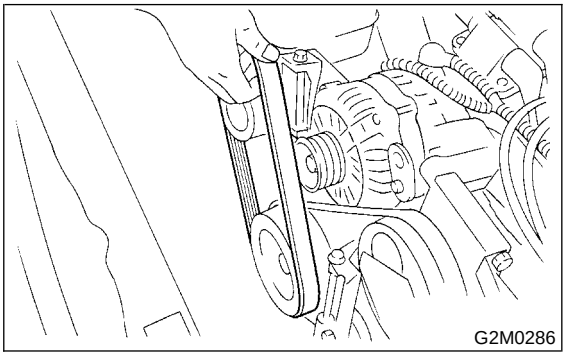
Tightening torque:
39±10 N·m (4.0±1.0 kg-m, 29±7 ft-lb)



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

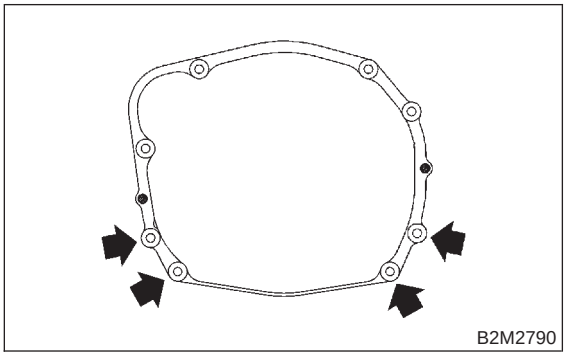


(3) Install front side V-belt, and adjust it. <Ref. to 1-5 [G200].>



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

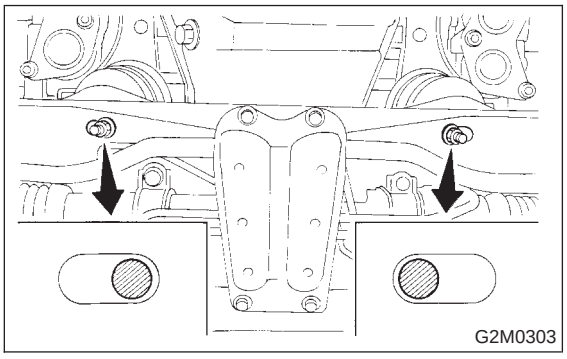
Tightening torque:
50±4 N·m (5.1±0.4 kg-m, 36.9±2.9 ft-lb)



9) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:
83±15 N·m (8.5±1.5 kg-m, 61±11 ft-lb)

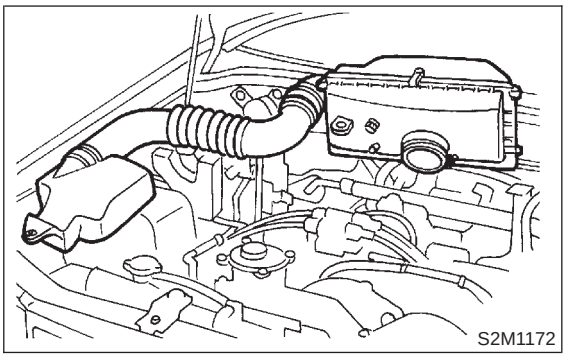
CAUTION:
Be sure to tighten front cushion rubber mounting bolts in the innermost elliptical hole in the front crossmember.



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

CAUTION:
After connecting each cable, adjust them.

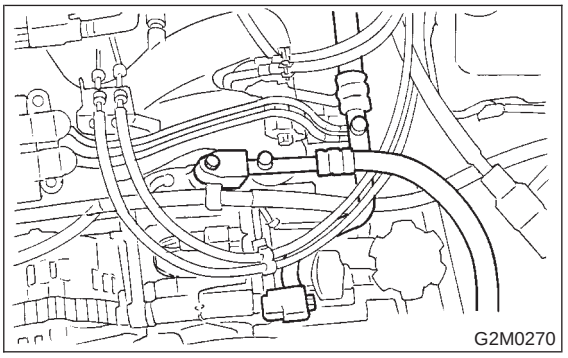
15) Install air intake system.
(1) Install air cleaner case stay.
(2) Install air intake duct with air cleaner case.



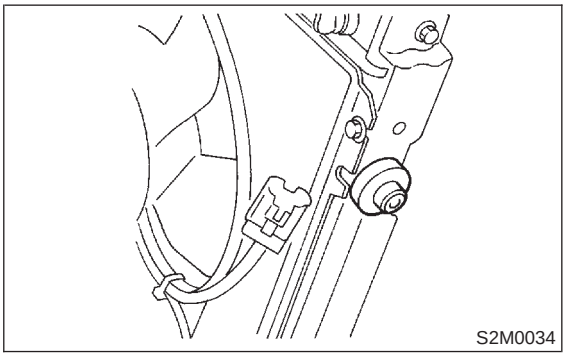
16) Install A/C flexible hoses. (With A/C)
<Ref. to 4-7 [W16A0].>

CAUTION:
Use new O-rings.

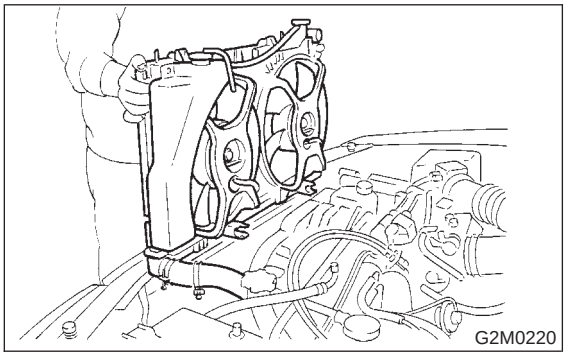
Tightening torque:
25±7 N·m (2.5±0.7 kg-m, 18.1±5.1 ft-lb)



17) Install cooling system.
(1) Attach radiator lower cushions to radiator.

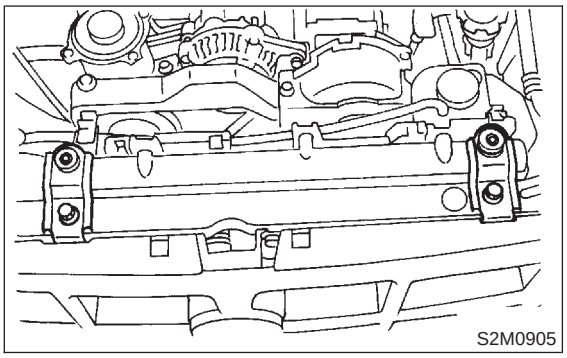


(2) Install radiator while fitting radiator pins to cushions.

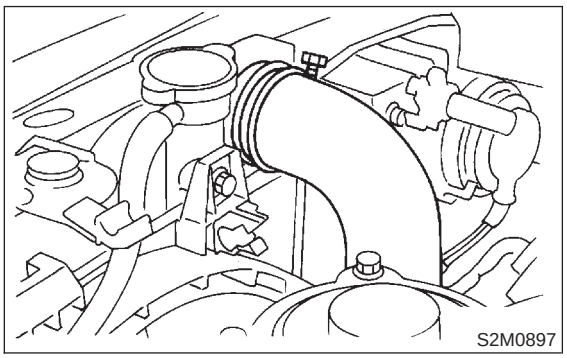


(3) Install radiator brackets and tighten bolts.

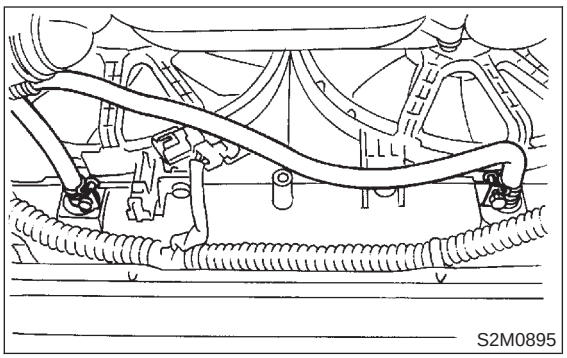
Tightening torque:
12±3 N·m (1.2±0.3 kg-m, 8.7±2.2 ft-lb)



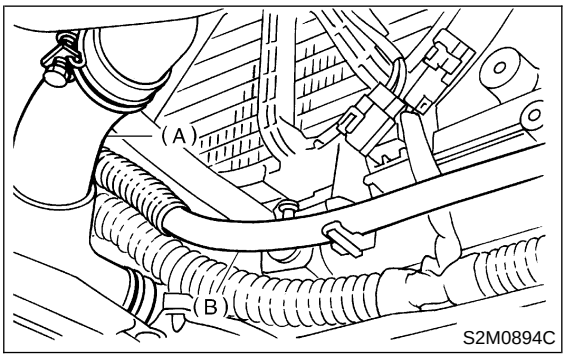
(4) Connect radiator inlet hose.



(5) Connect ATF cooler hoses. (AT vehicles)

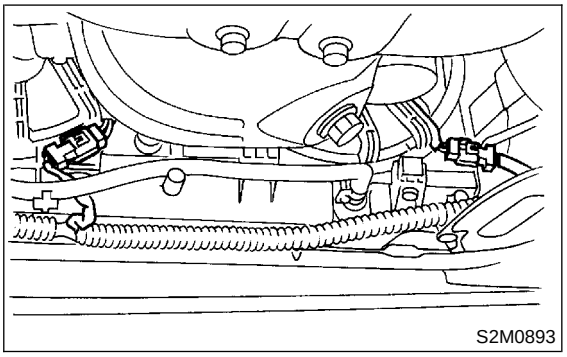


(6) Connect radiator outlet hose to thermostat cover.

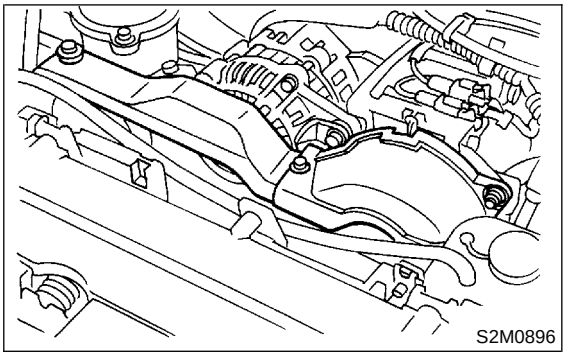


(A) Radiator outlet hose
(B) ATF cooler hose

(7) Connect radiator fan motor connector.



(8) Install V-belt covers.



18) Install battery in the vehicle, and connect terminal.
19) Fill coolant.
<Ref. to 2-5 [W9B0].>
20) Check ATF level and correct if necessary. (AT vehicles)
<Ref. to 3-2 [W1B1].>
21) Charge A/C system with refrigerant.
<Ref. to 4-7 [W7H0].>
22) Remove front hood stay, and close front hood.
23) Take off the vehicle from lift arms.

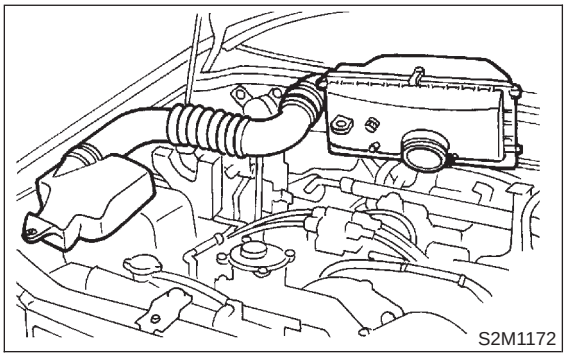
2. Transmission

A: GENERAL PRECAUTION

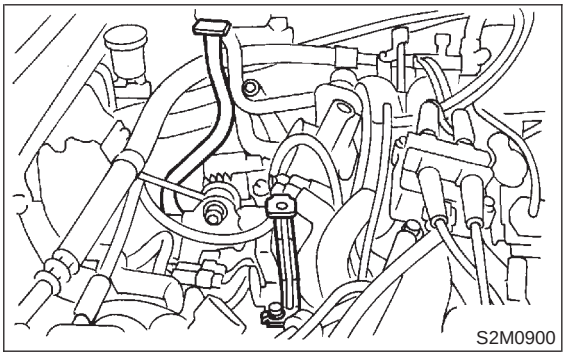
(1) Remove or install transmission in an area where chain hoists, lifting devices, etc. are available for ready use.
(2) Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
(3) Prior to 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 [G7B0].>

B: REMOVAL

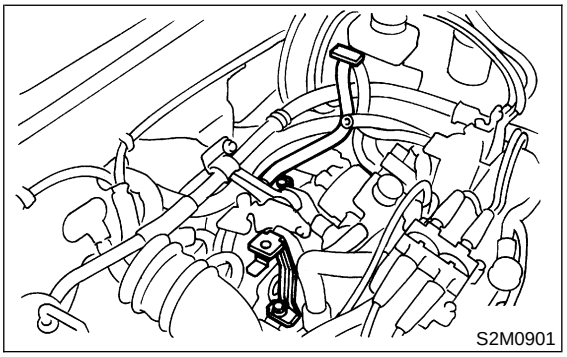
1) Open front hood fully, and support with stay.
2) Disconnect battery ground terminal.
3) Remove air intake duct and air cleaner case.


S2M1172

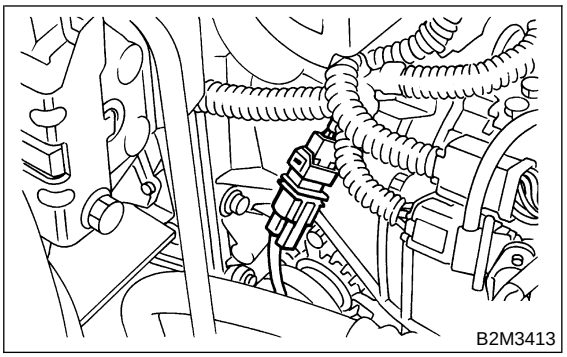
4) Remove air cleaner case stay.
- MT vehicles


S2M0900

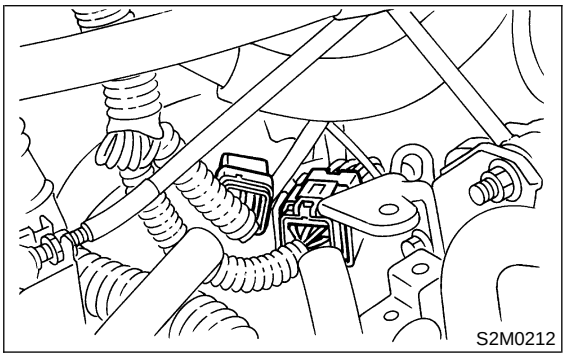
- AT vehicles


S2M0901

5) Disconnect the following connectors.
(1) Front oxygen sensor connector

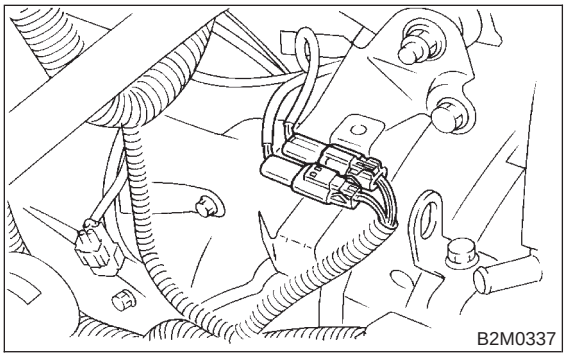

B2M3413

(2) Transmission harness connector (AT vehicles)

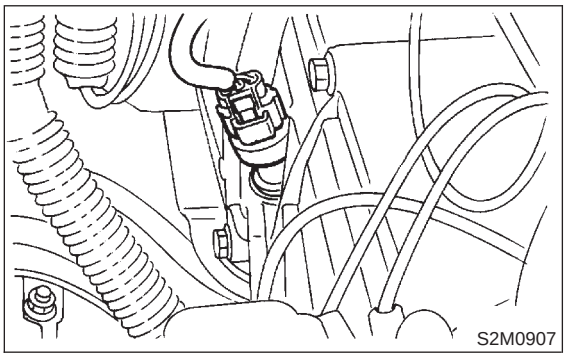

S2M0212

(3) Transmission ground terminal

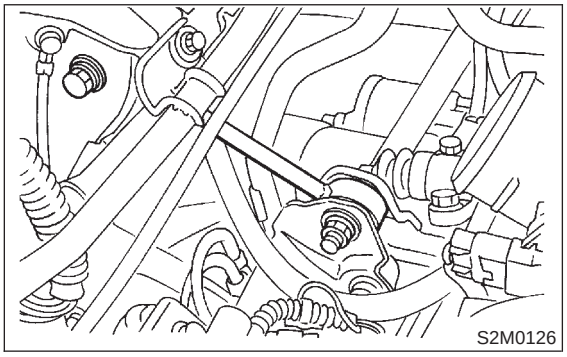
(4) Neutral position switch connector (MT vehicles)
(5) Back-up light switch connector (MT vehicles)



(6) Vehicle speed sensor (MT vehicles)



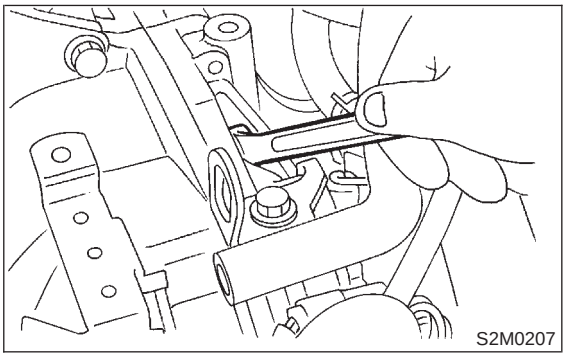
6) Disconnect connectors and terminal from starter.
7) Remove pitching stopper.



8) 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.

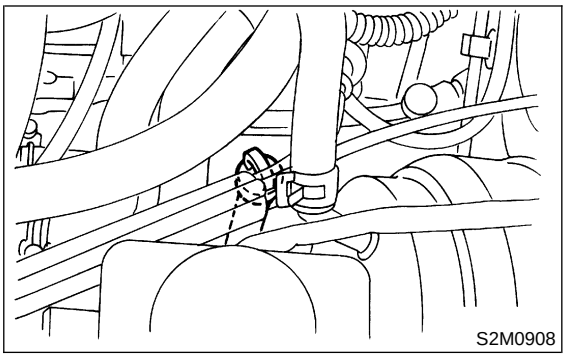
ST 499977100 CRANK PULLEY WRENCH

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

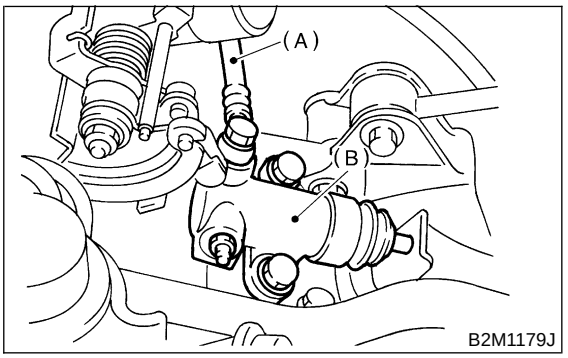


9) Remove ATF level gauge. (AT vehicles)

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



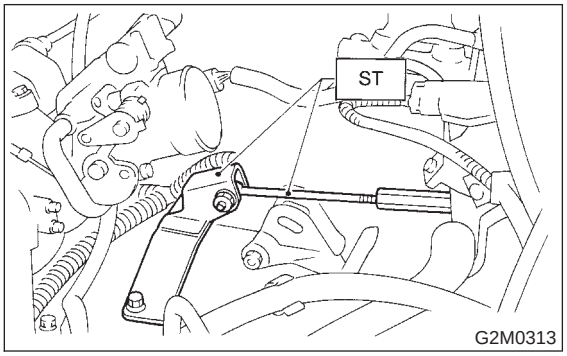
10) Remove operating cylinder. (MT vehicles)



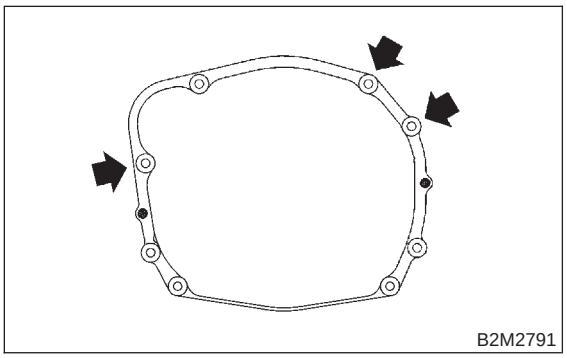
(A) Clutch hose
(B) Operating cylinder

11) Set ST.
ST 41099AA020 ENGINE SUPPORT ASSY

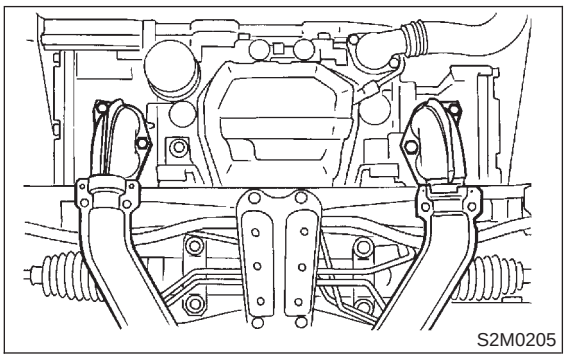
NOTE:
Also is available Part No. 927670000.



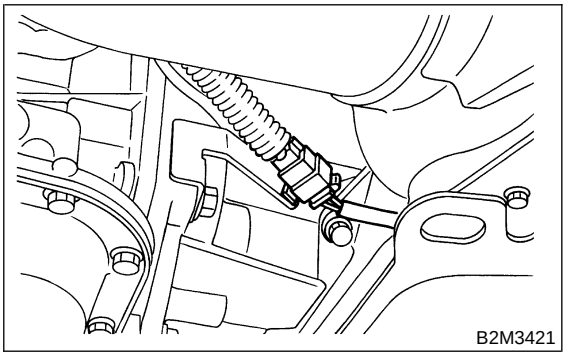
12) Remove bolt which holds right upper side of transmission to engine.



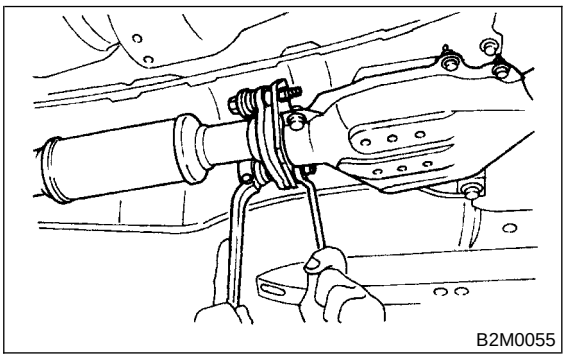
13) Remove exhaust system.
(1) Lift-up the vehicle.
(2) Remove nuts which install front exhaust pipe onto engine.



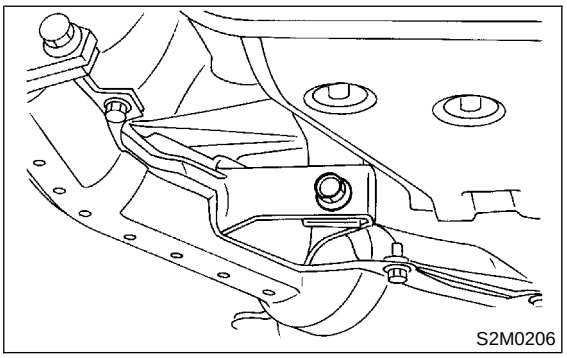
(3) Disconnect connector from rear oxygen sensor.



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



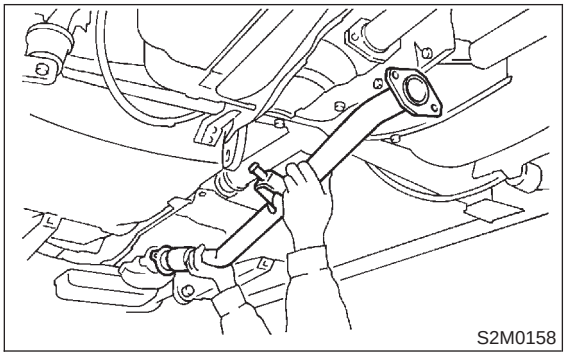
(5) Remove bolt which installs center exhaust pipe to hanger bracket.



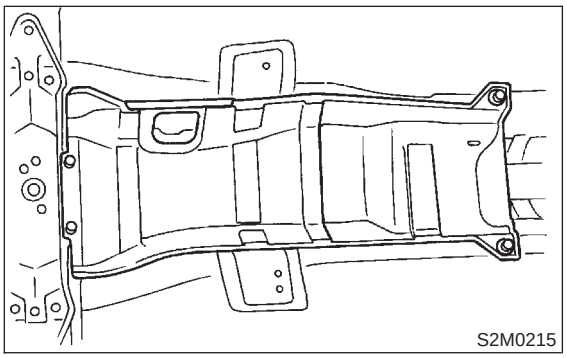
(6) Take off front and center exhaust pipes.

(7) Remove rear exhaust pipe.

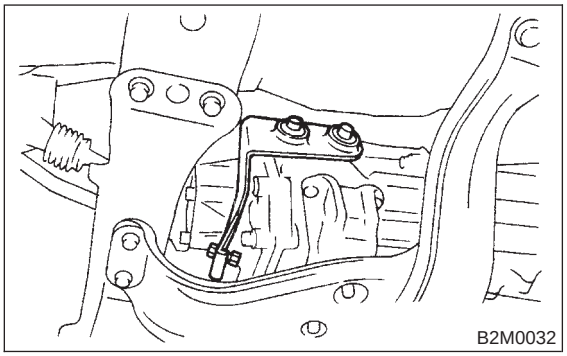
CAUTION:
When removing exhaust pipes, be careful each exhaust pipe does not drop out.


S2M0158

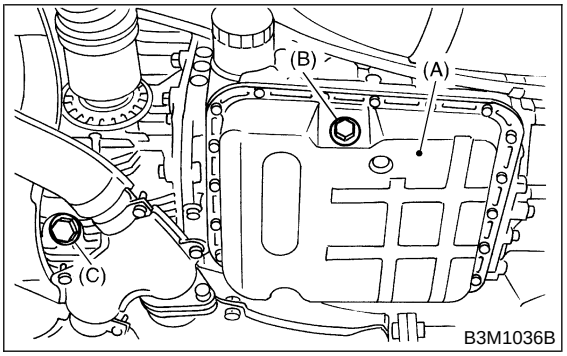
(8) Remove heat shield cover of rear exhaust pipe.


S2M0215

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


B2M0032

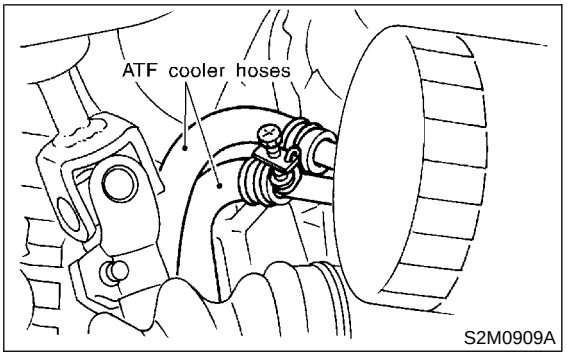
14) Drain ATF to remove ATF drain plug. (AT vehicles)



B3M1036B

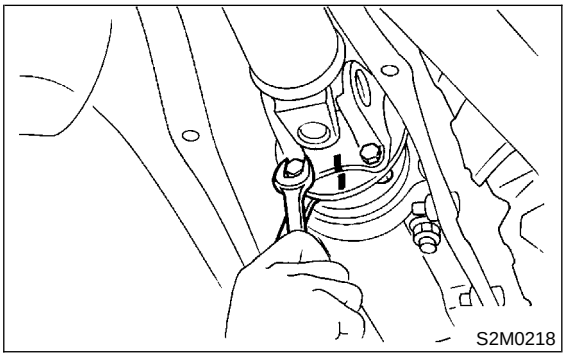
(A) Oil pan
(B) ATF drain plug
(C) Differential oil drain plug

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



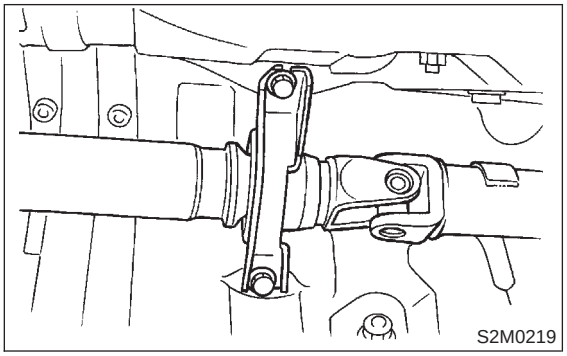
S2M0909A

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


S2M0218

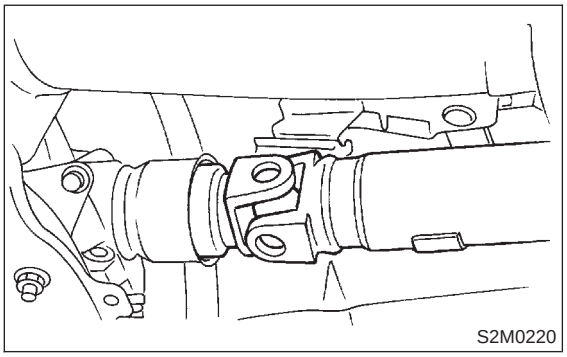
(3) Remove bolts which hold center bearing onto body.

CAUTION:
Be careful not to drop propeller shaft.


S2M0219

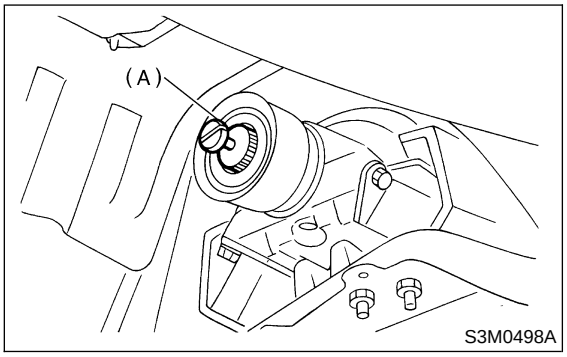
(4) Remove propeller shaft from transmission.

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

(5) Install the extension cap to transmission.

NOTE:
If extension cap is not available, place vinyl bag over opening and faster with string to prevent gear oil or ATF from leaking.

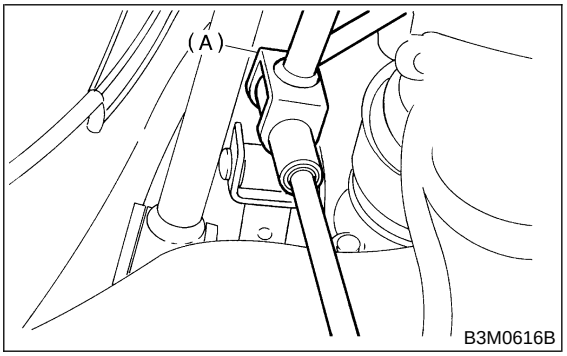


S3M0498A

(A) Extension cap

17) Remove gear shift rod and stay from transmission. (MT vehicles)

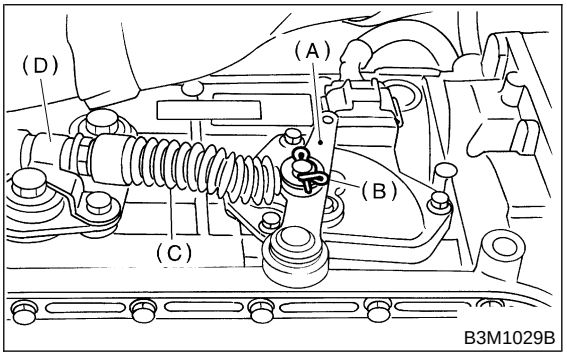
(1) Disconnect stay from transmission.
(2) Disconnect rod from transmission.



B3M0616B

(A) Joint

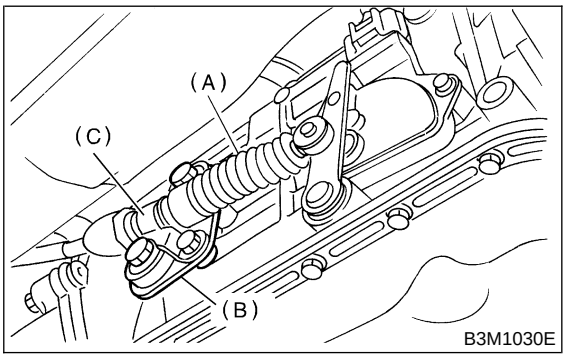
18) Remove shift select cable. (AT vehicles)
(1) Remove snap pin from range select lever.



B3M1029B

(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp

(2) Remove select cable from plate assembly.

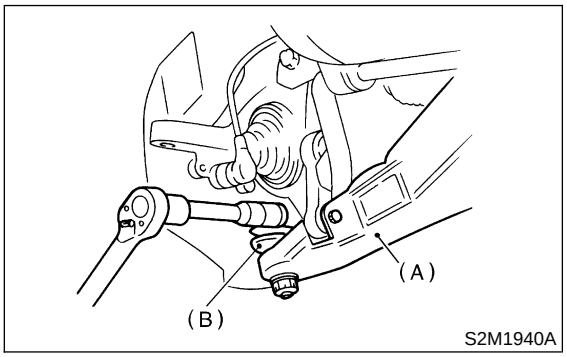


B3M1030E

(A) Select cable
(B) Plate ASSY
(C) Clamp

19) Remove front drive shafts from transmission.

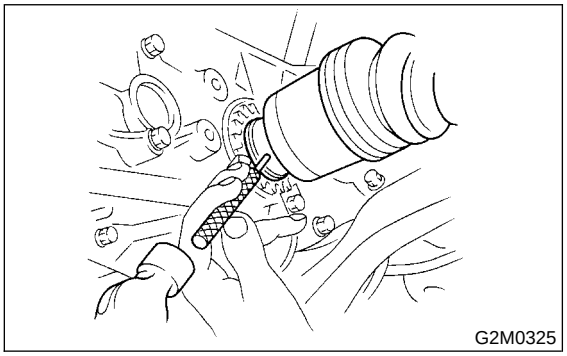
(1) Remove transverse link from housing.



(A) Transverse link
(B) Ball joint

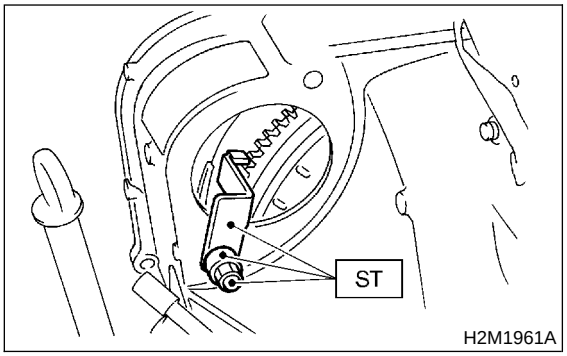
(2) Lower transverse link.
(3) Remove spring pins and separate front drive shafts from each side of the transmission.

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

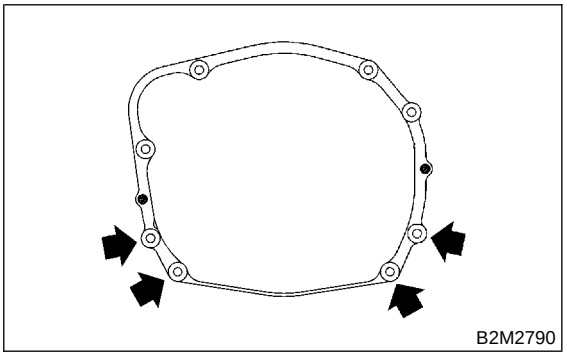


20) Remove starter.
(1) Remove bolt which installs upper side of starter.
(2) Remove nut which installs lower side of starter, and remove starter form transmission.
(3) Install ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET

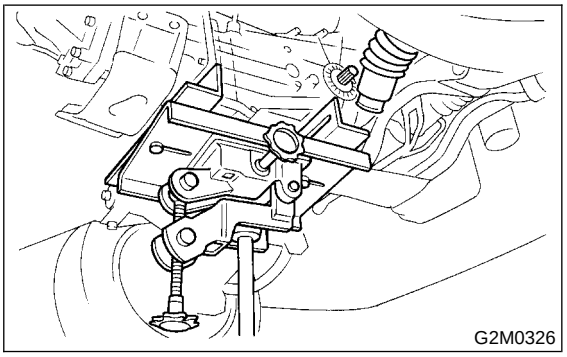


21) Remove nuts which hold lower side of transmission to engine.

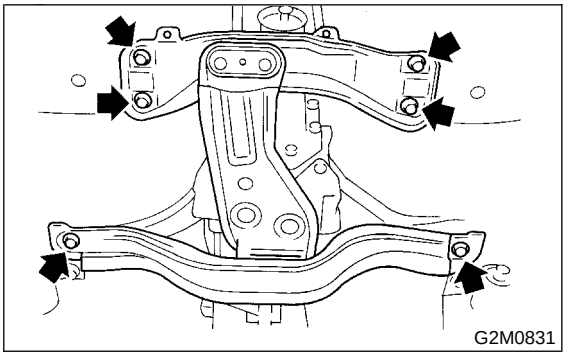


22) Place transmission jack under transmission.

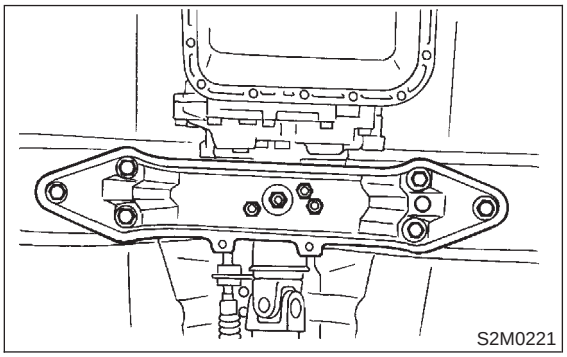
CAUTION:
● Always support transmission case with a transmission jack.
● On AT vehicles, make sure that the support plates of transmission jack don't touch the oil pan.



23) Remove transmission rear crossmember.
● MT vehicles

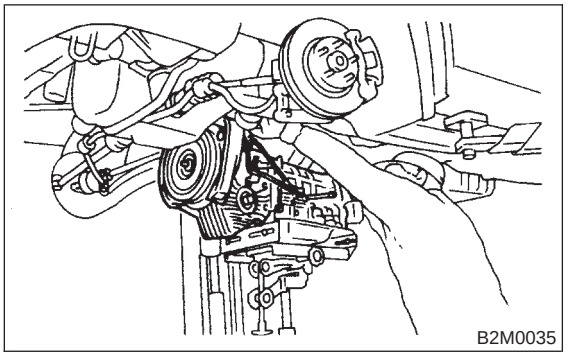


● AT vehicles



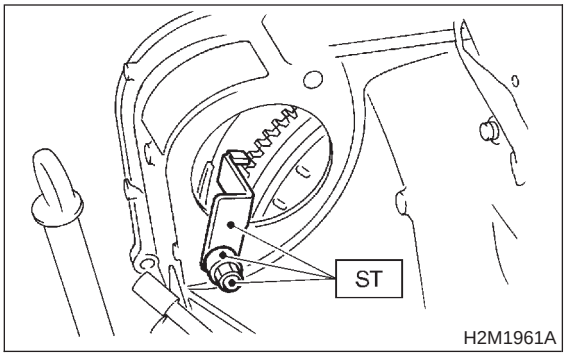
24) Remove transmission.

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)

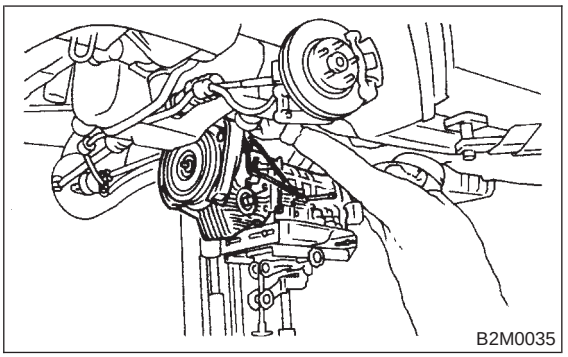


C: INSTALLATION

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.

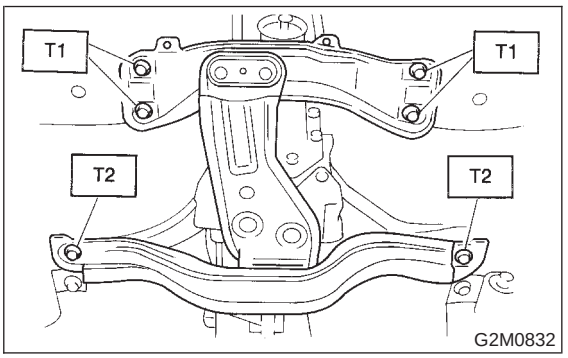


(2) Engage them at splines.

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

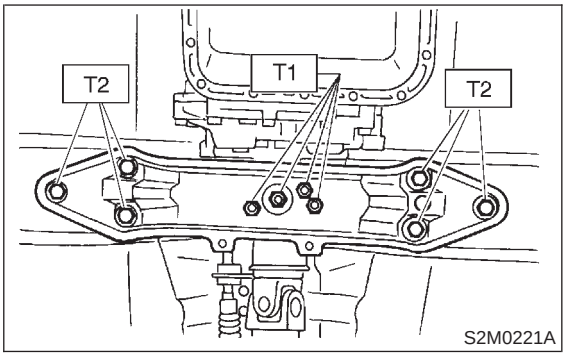
3) Install transmission rear crossmember.
● MT vehicles

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

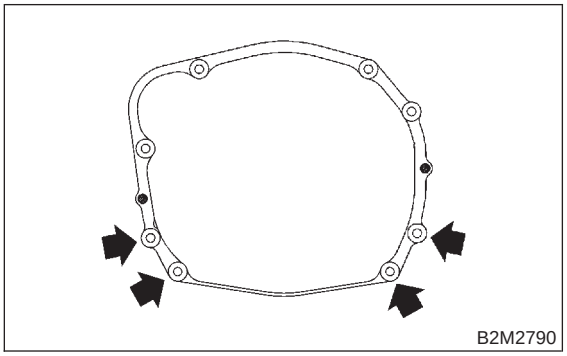
Tightening torque:
T1: 34±5 N·m (3.5±0.5 kg-m, 25.3±3.6 ft-lb)
T2: 69±15 N·m (7.0±1.5 kg-m, 51±11 ft-lb)



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)

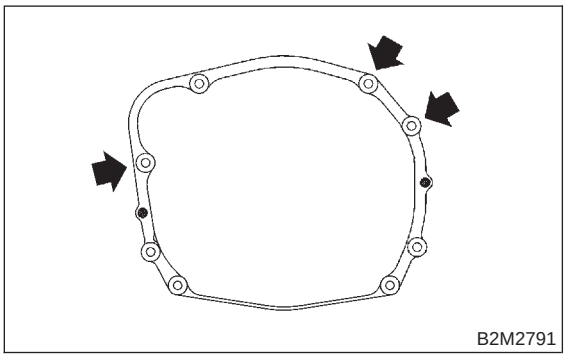


6) Connect engine and transmission.
(1) Remove ST from torque converter clutch case. (AT vehicles)

NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET
(2) Install starter.
<Ref. to 6-1 [W1A0].>
(3) Tightening bolt which holds right upper side of transmission to engine.

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

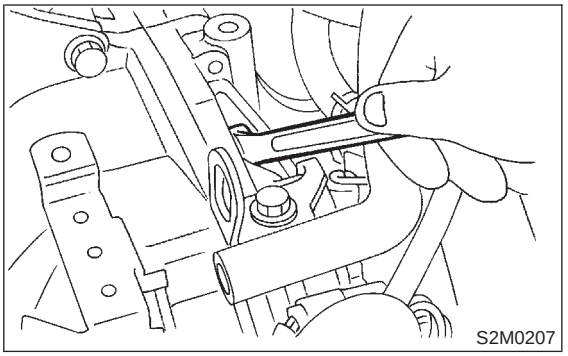


7) Install torque converter to drive plate. (AT vehicles)
(1) Tighten bolts which hold torque converter to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

ST 499977100 CRANK PULLEY WRENCH

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

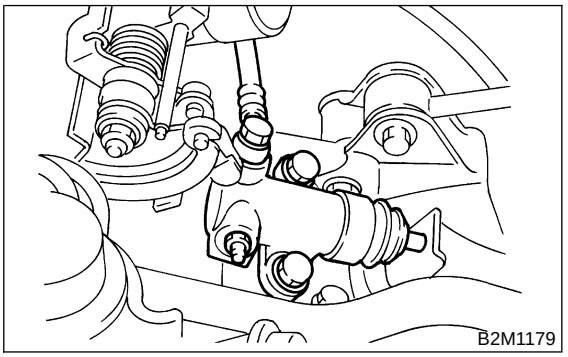
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



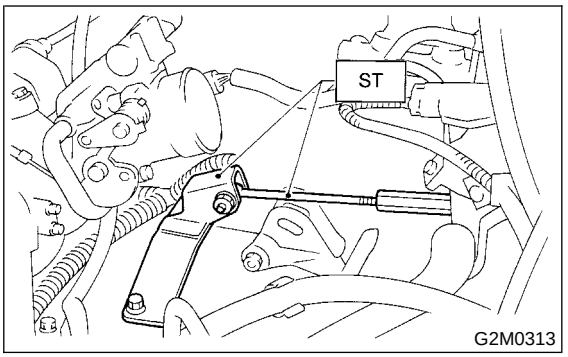
(3) Clog plug onto service hole.

8) Install operating cylinder. (MT vehicles)

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

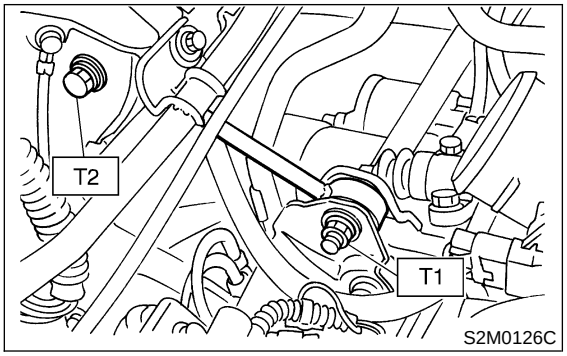


9) Remove special tools.



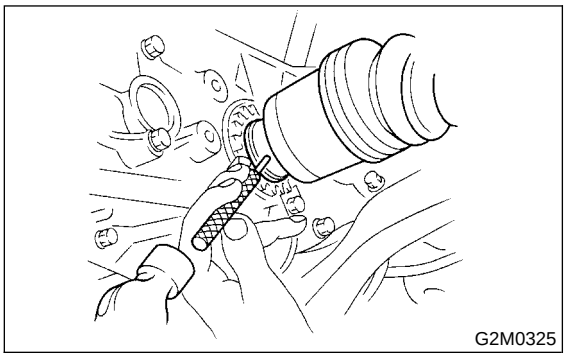
10) Install pitching stopper.

Tightening torque:
T1: 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)



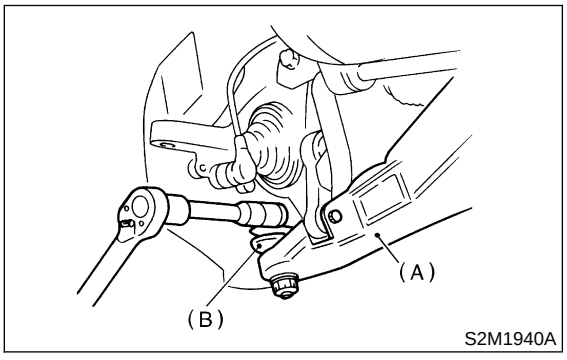
11) Install front drive shafts into transmission.
(1) Lift-up the vehicle.
(2) Install front drive shaft into transmission.
(3) Drive spring pin into chamfered hole of drive shaft.

CAUTION:
Always use a new spring pin.



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

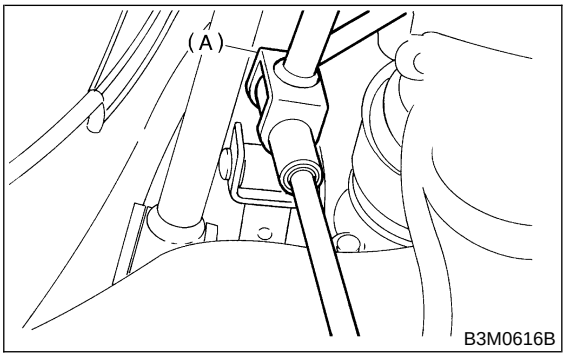
Tightening torque:
49±10 N·m (5.0±1.0 kg-m, 36±7 ft-lb)



(A) Transverse link
(B) Ball joint

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

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



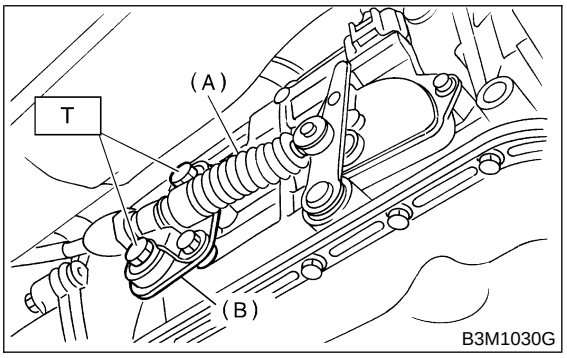
(A) Joint

(2) Install stay onto transmission.

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

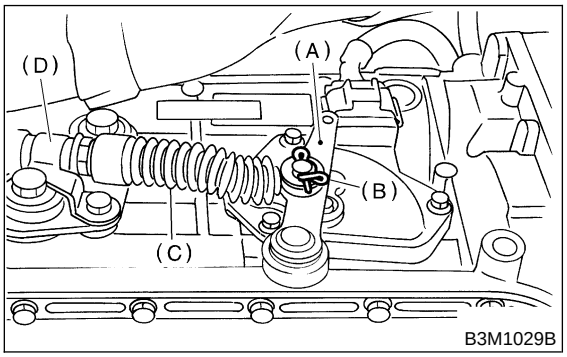
13) Install shift select cable onto select lever. (AT vehicles)
(1) Install select cable to plate assembly.

Tightening torque:
T: 33±10 N·m (3.3±1.0 kg-m, 24±7 ft-lb)



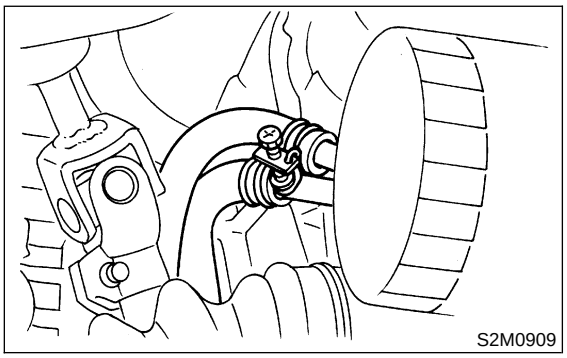
(A) Select cable
(B) Plate ASSY

(2) Install snap pin to range select lever.



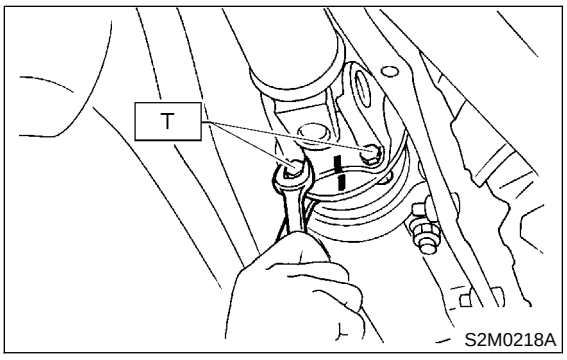
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp

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



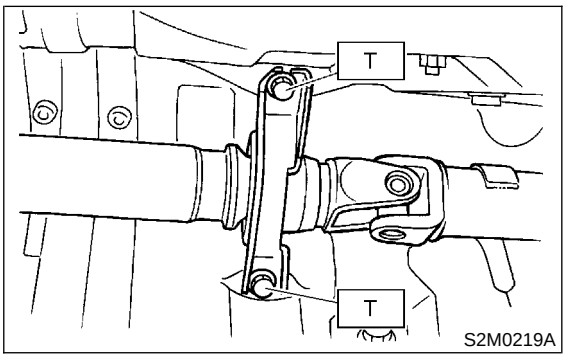
15) Install propeller shaft.
(1) Install propeller shaft into transmission.
(2) Tighten bolts which install propeller shaft onto companion flange of rear differential.

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

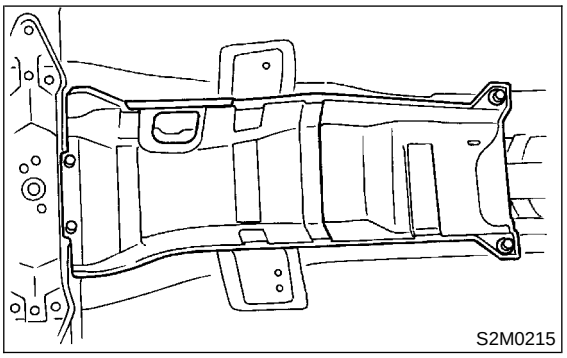


(3) Install center bearing bracket on body.

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

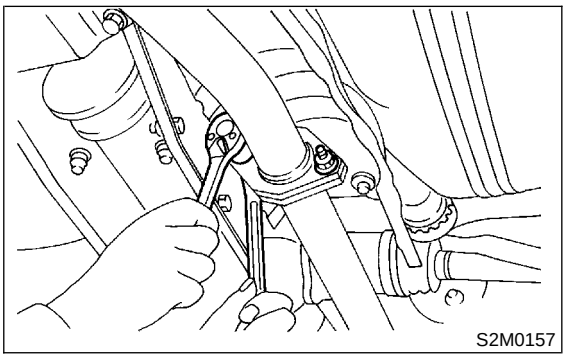


16) Install exhaust system.
(1) Install heat shield cover.

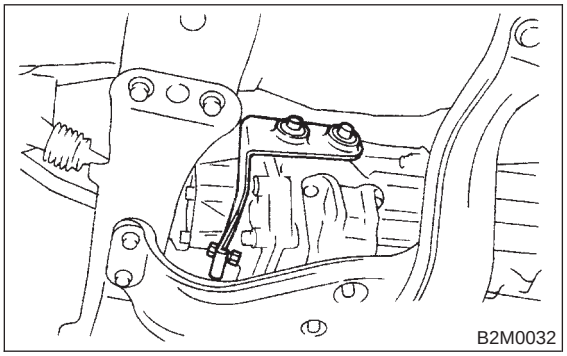


(2) Install rear exhaust pipe to muffler.

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

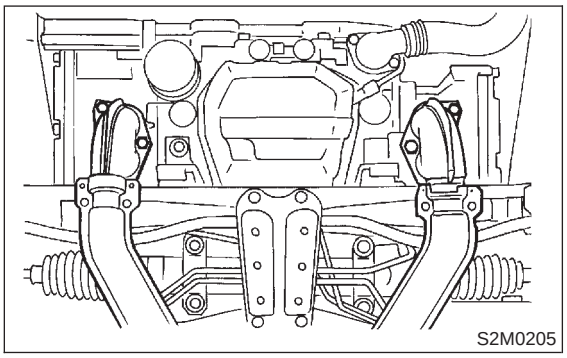


(3) Install hanger bracket on right side of transmission.


B2M0032

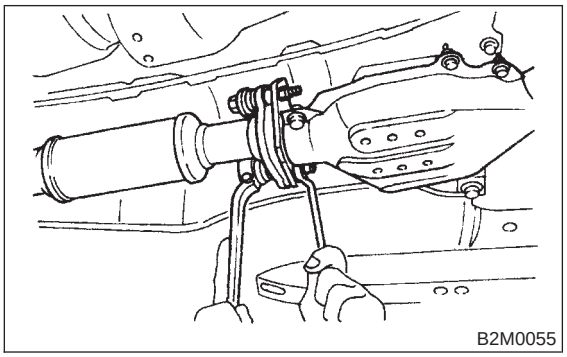
(4) Install front exhaust pipe onto engine.

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


S2M0205

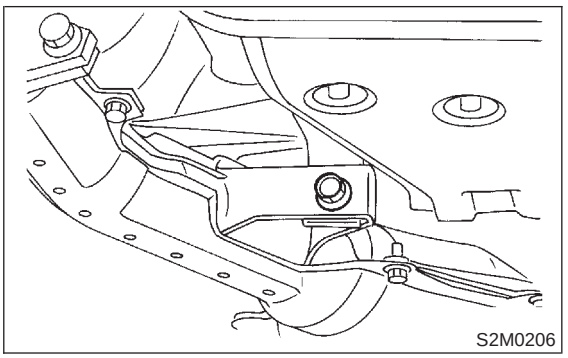
(5) Install center exhaust pipe to rear exhaust pipe.

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

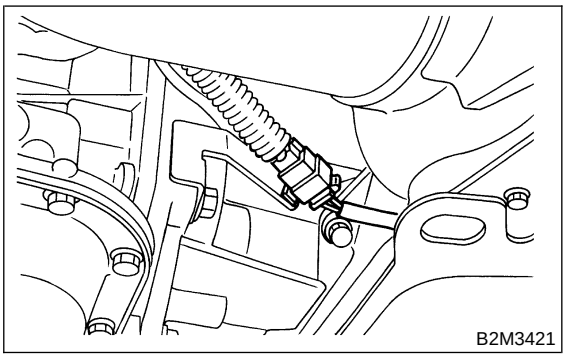

B2M0055

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

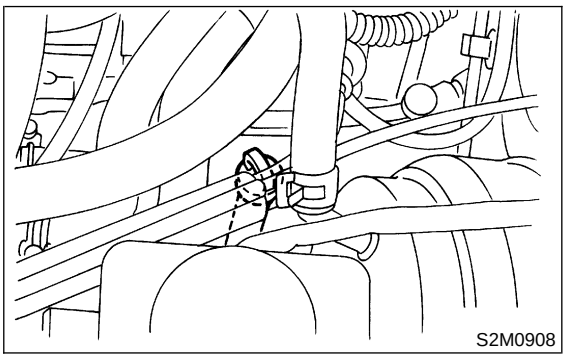
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


S2M0206

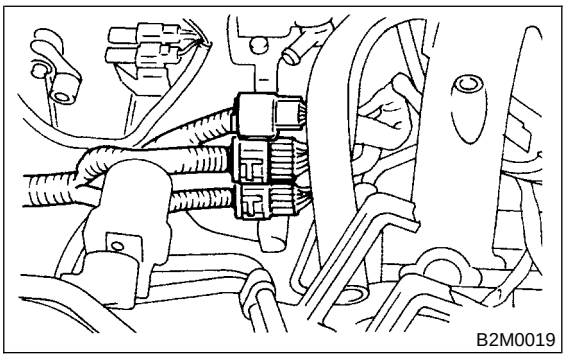
(7) Connect connector to rear oxygen sensor.


B2M3421

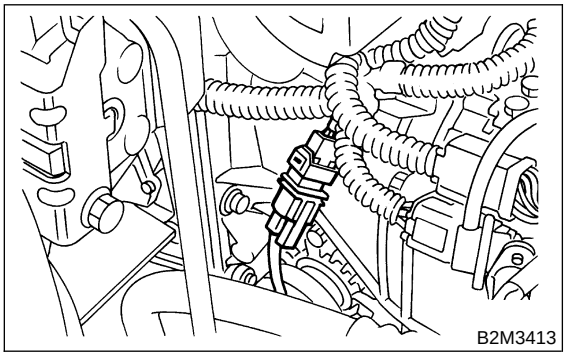
17) Install ATF level gauge. (AT vehicles)


S2M0908

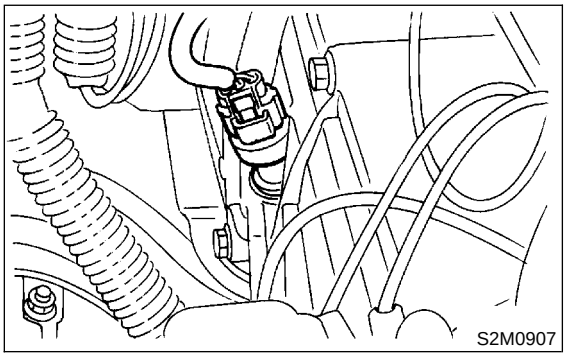
18) Connect the following connectors.
(1) Transmission harness connectors


B2M0019

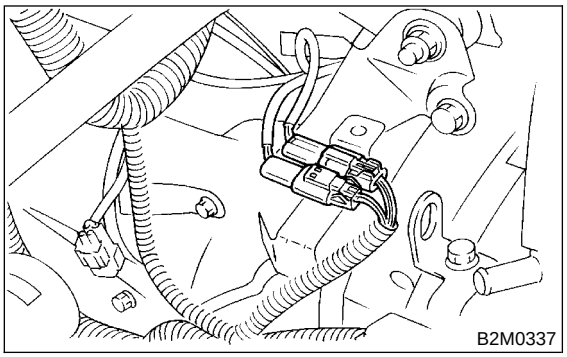
(2) Transmission ground terminal
(3) Front oxygen sensor connector


B2M3413

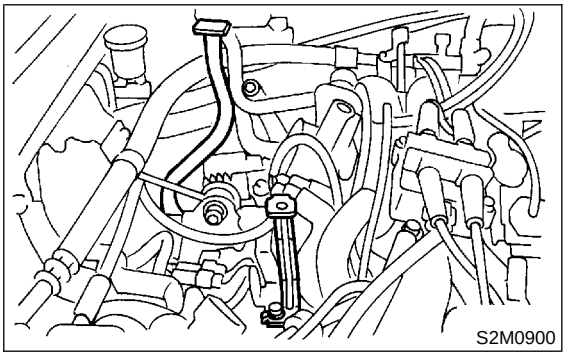
(4) Vehicle speed sensor (MT vehicles)


S2M0907

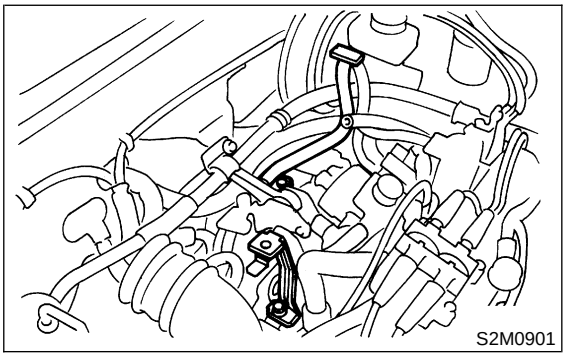
(5) Neutral position switch and back-up light switch connector (MT vehicles)


B2M0337

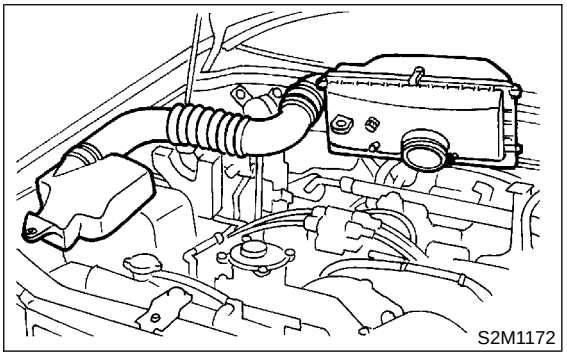
19) Install air cleaner case stay.
- MT vehicles


S2M0900

- AT vehicles


S2M0901

20) Install air intake duct and air cleaner case.


S2M1172

21) Connect battery ground terminal.
22) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. (AT vehicles)

Recommended fluid:
Dexron IIE or Dexron III type automatic transmission fluid

Fluid capacity:
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

23) Check select lever operation. (AT vehicles) <Ref. to 3-2 [T2C0].>
24) Take off vehicle from lift arms.
25) Run the vehicle until ATF temperature rises from 60 to 80°C (140 to 176°F) and check the ATF level of the “HOT” side on level gauge. (AT vehicles)

26) Check the vehicle on road tester. (AT vehicles) <Ref. to 3-2 [W7A0].>

MEMO:

1. Foreword

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

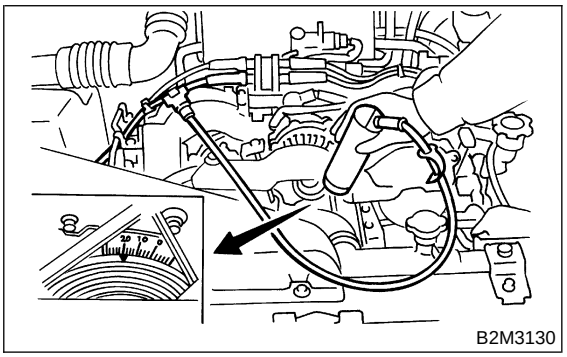
2. Ignition Timing

A: MEASUREMENT

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

1) Warm-up the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with the timing light.
3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±8°/650 (MT model)
15°±8°/700 (AT model)



If the timing is not correct, check the ignition control system.
Refer to 2-7 On-Board Diagnostics II System. <Ref. to 2-7 [T100].>

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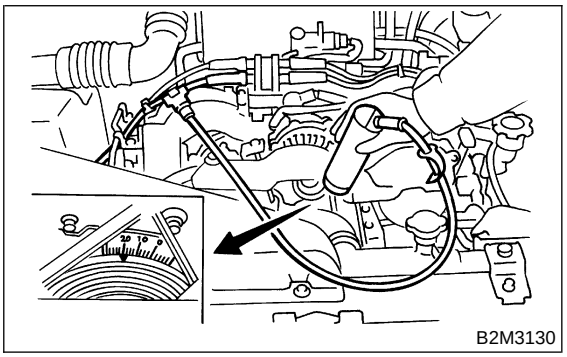
15°±8°/700 (AT model)



If the timing is not correct, check the ignition control system.
Refer to 2-7 On-Board Diagnostics II System. <Ref. to 2-7 [T100].>

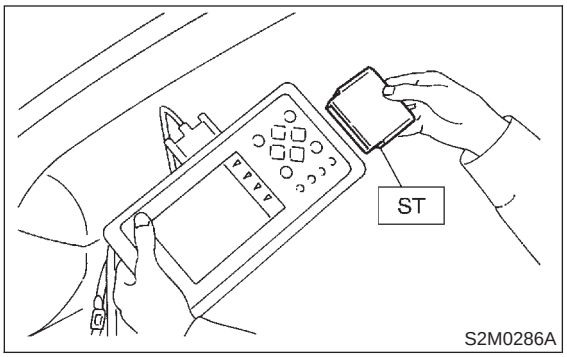
3. Engine Idle Speed

A: MEASUREMENT

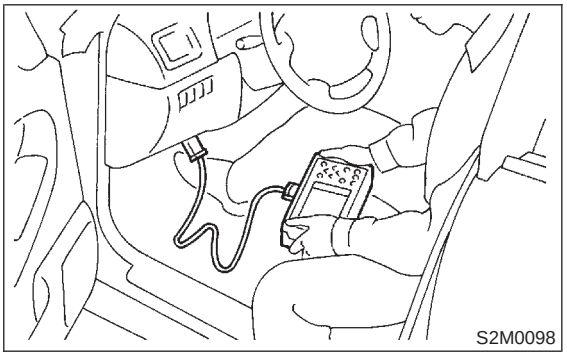
1) Before checking idle speed, check the following:
(1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
(2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) 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. <Ref. to 1-6 [G1100].>

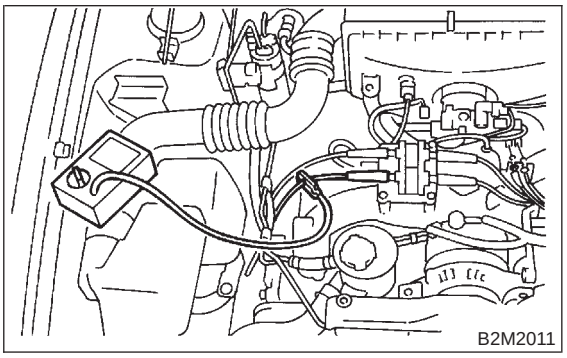


(2) Connect SUBARU SELECT MONITOR to the data link connector.
(3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
(4) Select {2. Each System Check} in Main Menu.
(5) Select {Engine Control System} in Selection Menu.
(6) Select {1. Current Data Display & Save} in EGI/EMPI Diagnosis.
(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):
650±100 rpm (MT model)
700±100 rpm (AT model)

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

Idle speed [A/C “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 [T100].>

4. Engine Compression

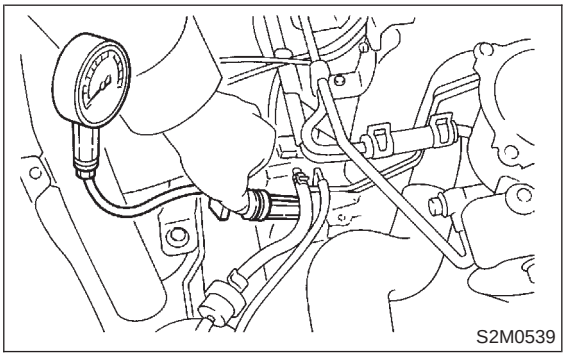
A: MEASUREMENT

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) Disconnect battery ground cable.
4) Remove all the spark plugs. <Ref. to 6-1 [W3A0].>
5) Disconnect connectors from fuel injectors.
6) Connect battery ground cable.
7) Fully open throttle valve.
8) Check the starter motor for satisfactory performance and operation.
9) 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.

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


S2M0539

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

Compression (350 rpm and fully open throttle):
Standard;
1,079 — 1,275 kPa (11.0 — 13.0 kg/cm^2, 156 — 185 psi)
Limit;
1,020 kPa (10.4 kg/cm^2, 148 psi)
Difference between cylinders;
49 kPa (0.5 kg/cm^2, 7 psi), or less

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 [T100].>

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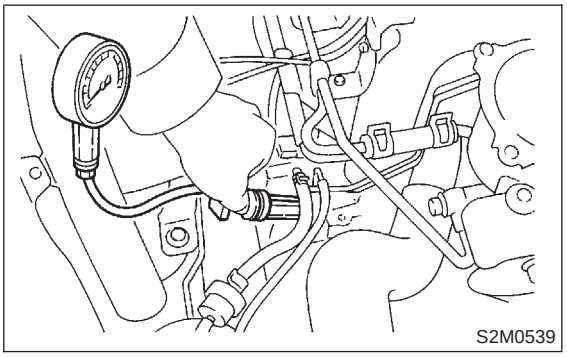
S2M0539

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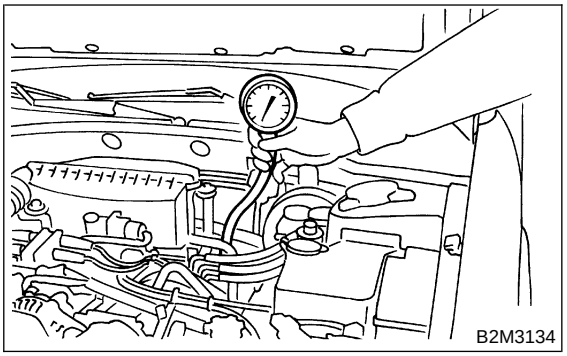
Limit;
1,020 kPa (10.4 kg/cm^2, 148 psi)
Difference between cylinders;
49 kPa (0.5 kg/cm^2, 7 psi), or less

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 intake 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)

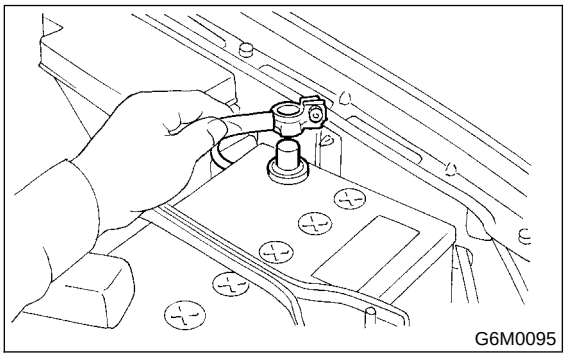

B2M3134

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

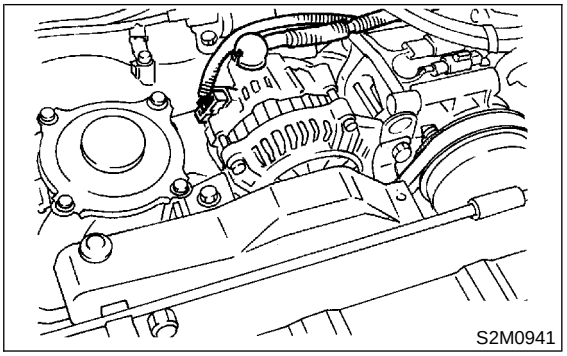
6. Engine Oil Pressure

A: MEASUREMENT

1) Disconnect battery ground cable.


G6M0095

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


S2M0941

5. Intake Manifold Vacuum

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1) Warm-up the engine.
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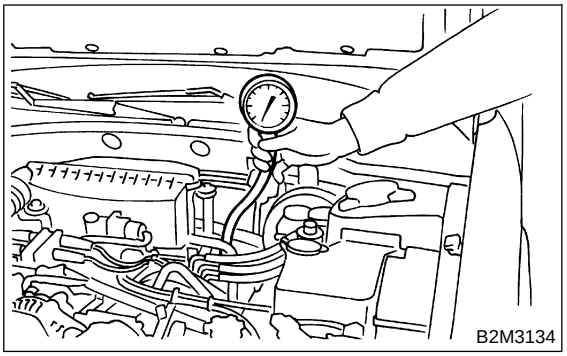
B2M3134

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
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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
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6. Engine Oil Pressure

A: MEASUREMENT

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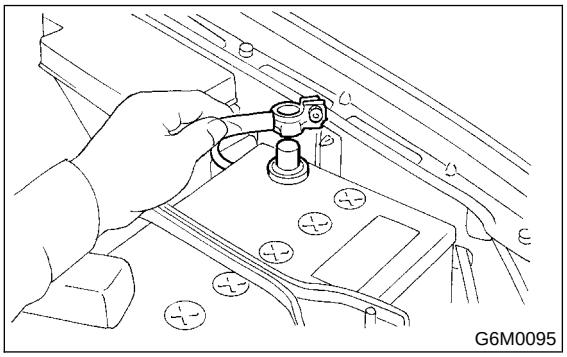
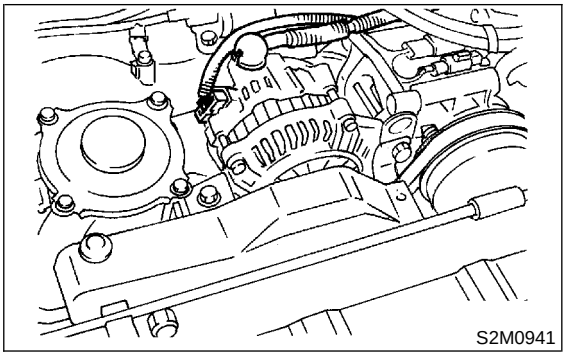
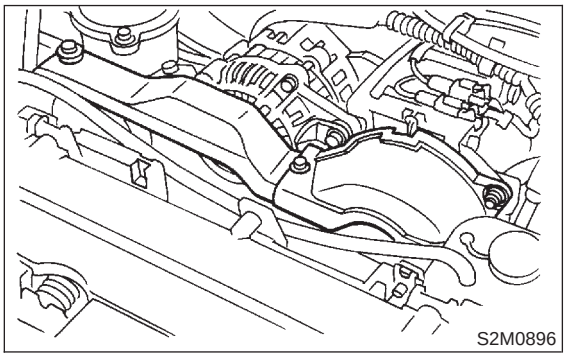

G6M0095

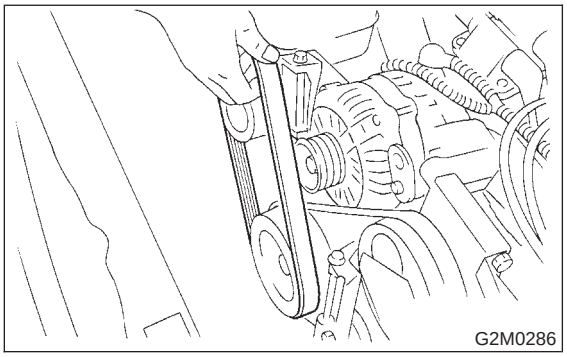
2) Remove generator from bracket.
(1) Disconnect connector and terminal from generator.


S2M0941

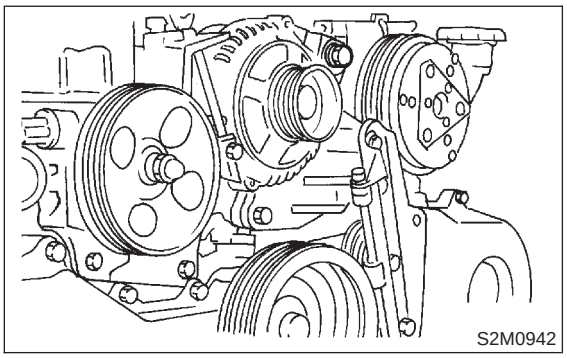
(2) Remove V-belt cover.


S2M0896

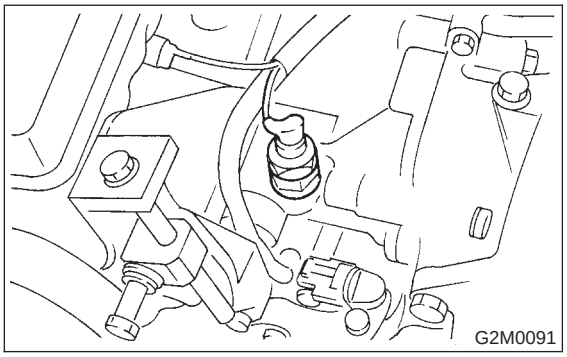
(3) Loosen lock bolt and slider bolt, and remove front side V-belt.


G2M0286

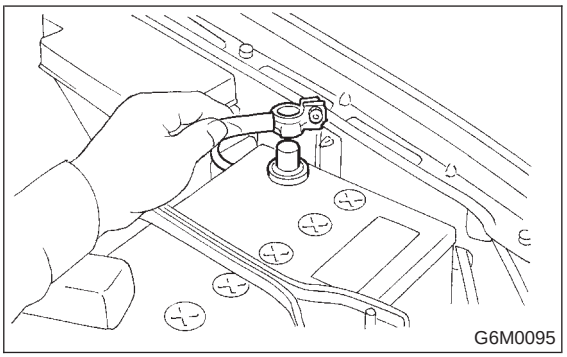
(4) Remove generator lock bolt.
(5) Remove bolt which install generator on bracket.


S2M0942

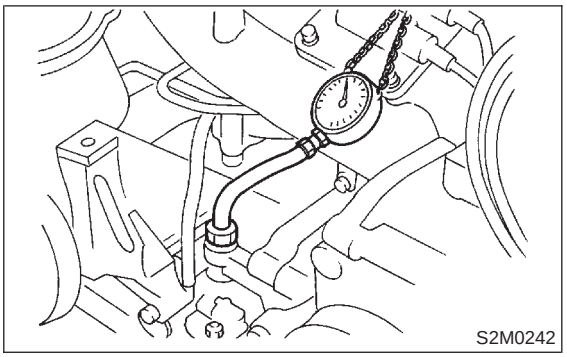
3) Disconnect connector from oil pressure switch.
4) Remove oil pressure switch from engine cylinder block. <Ref. to 2-4 [W3A0].>


G2M0091

5) Connect oil pressure gauge hose to cylinder block.
6) Connect battery ground cable.


G6M0095

7) Start the engine, and measure oil pressure.


S2M0242

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. Refer to 2-4 ENGINE LUBRICATION SYSTEM. <Ref. to 2-4 [W100].>
● If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch. Ref. to 2-4 ENGINE LUBRICATION SYSTEM. <Ref. to 2-4 [W300].>

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. <Ref. to 2-4 [W3B0].>

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. <Ref. to 1-5 [G2A0].>

7. Fuel Pressure

A: PRECAUTIONS

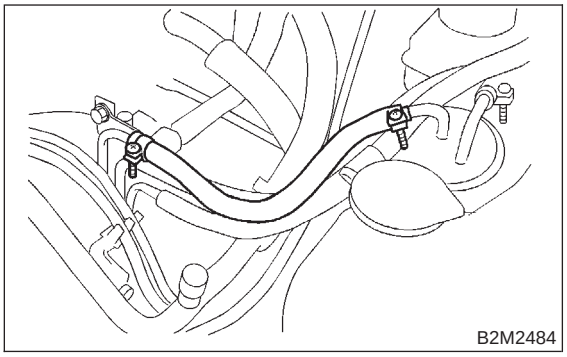
WARNING:
- **Place “No fire” signs near the working area.**
- **Disconnect ground terminal from battery.**
- **Be careful not to spill fuel on the floor.**

B: MEASUREMENT OF FUEL PRESSURE

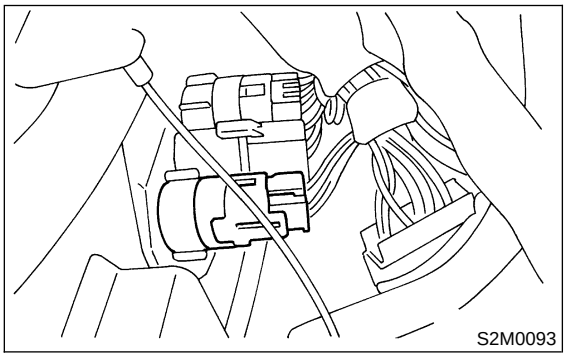
WARNING:
Before removing fuel pressure gauge, release fuel pressure.

NOTE:
If out of specification, check or replace pressure regulator and pressure regulator vacuum hose.

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Remove fuel filler cap.
3) Disconnect fuel delivery hoses from fuel filter, and connect fuel pressure gauge.


B2M2484

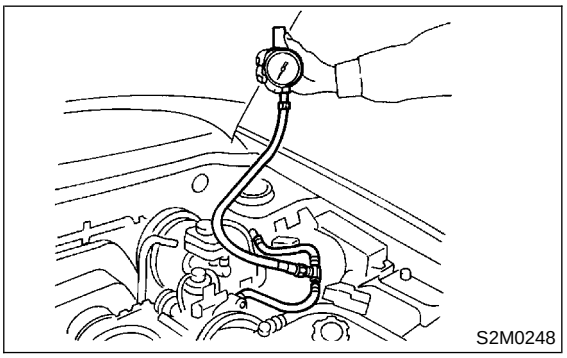
4) Connect connector to fuel pump relay.


S2M0093

5) Start the engine.

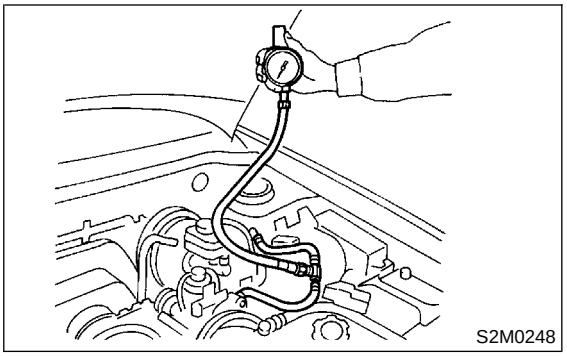
6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from collector chamber.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)


S2M0248

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

Fuel pressure:
Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)


S2M0248

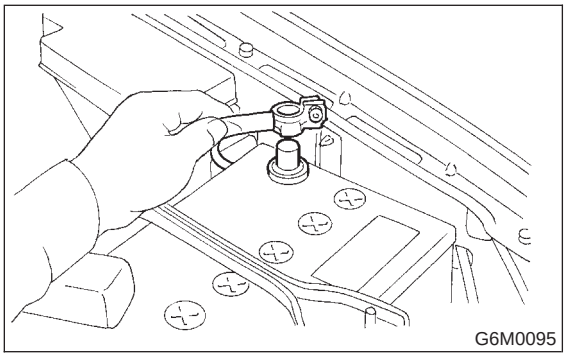
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm^2, 1.4 to 2.8 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

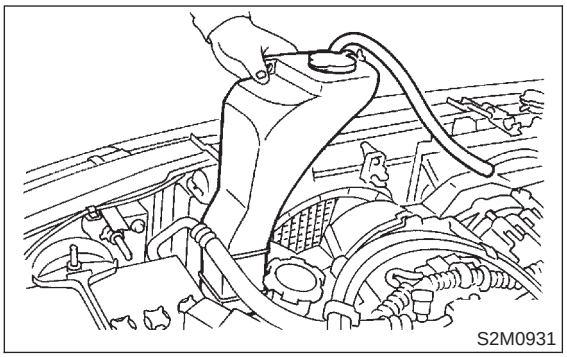
A: INSPECTION

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

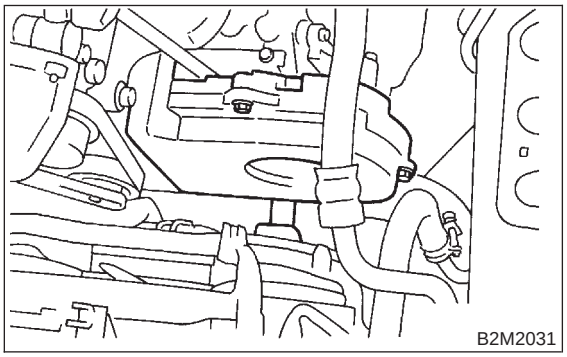
1) Set the vehicle onto the lift.
2) Disconnect battery ground cable.


G6M0095

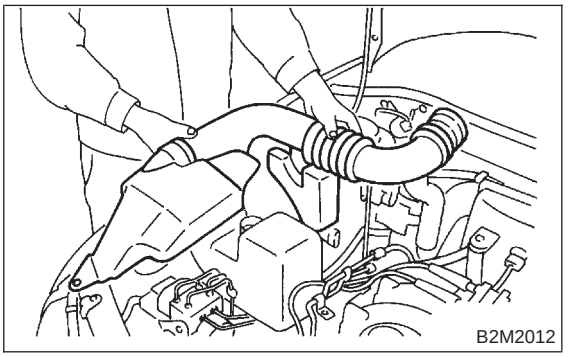
3) Remove engine coolant reservoir tank.
<Ref. to 2-5 [W8A0].>


S2M0931

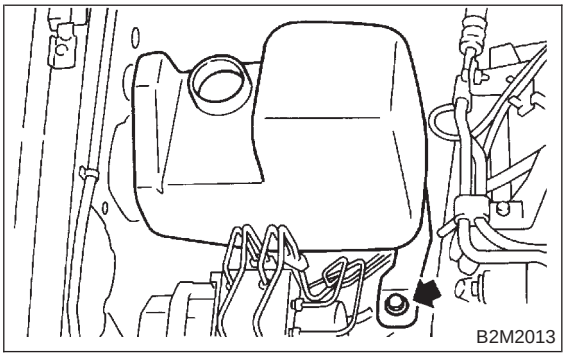
4) Remove timing belt cover (LH).


B2M2031

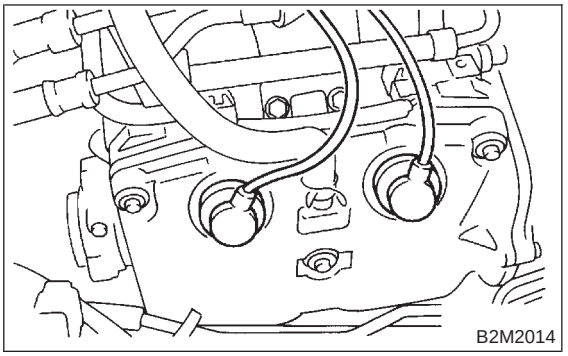
5) Remove rocker cover.
6) When inspecting #1 and #3 cylinders:
(1) Remove air intake duct as a unit.


B2M2012

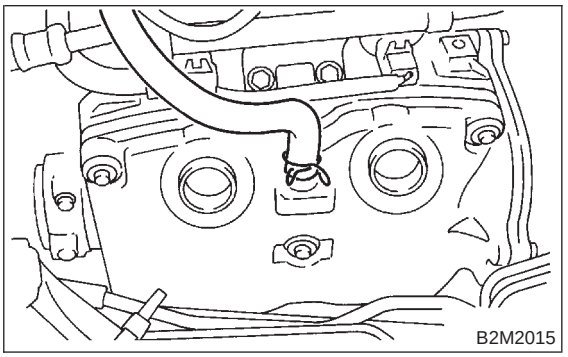
(2) Remove resonator chamber.


B2M2013

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

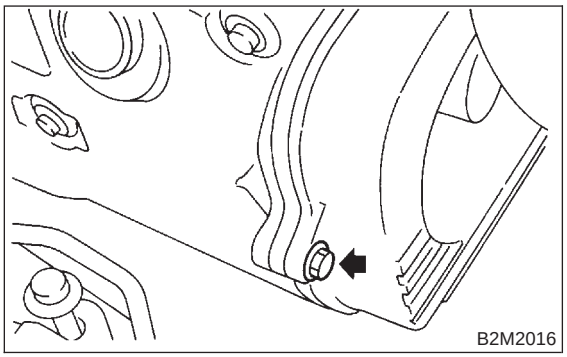

B2M2014

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

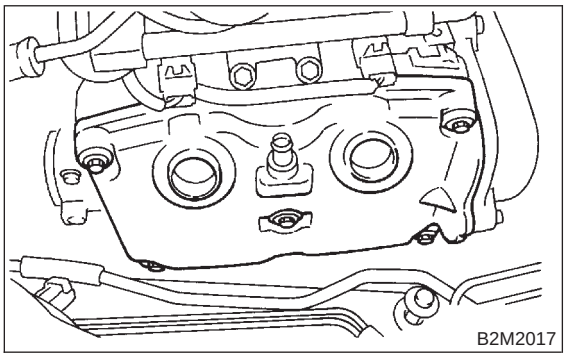

B2M2015

(5) Lift-up the vehicle.
(6) Remove under cover.

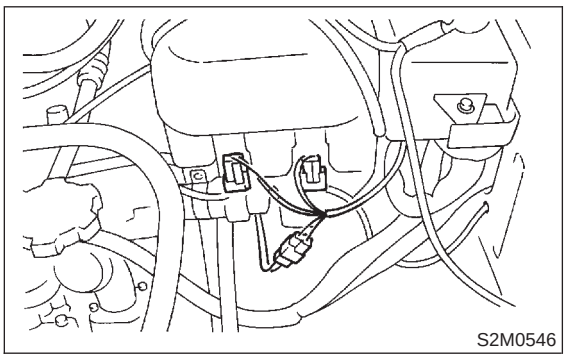
(7) Place suitable container under the vehicle.
(8) Lower the vehicle.
(9) Remove the timing belt cover (RH) bolt.


B2M2016

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

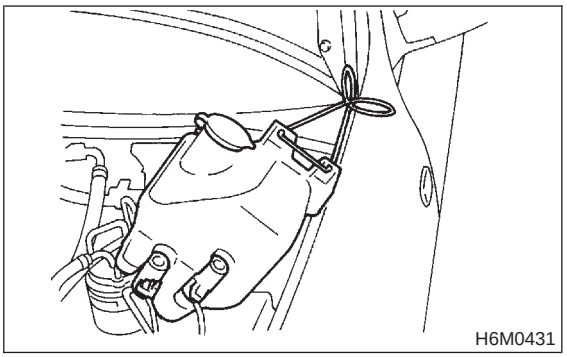

B2M2017

7) 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.

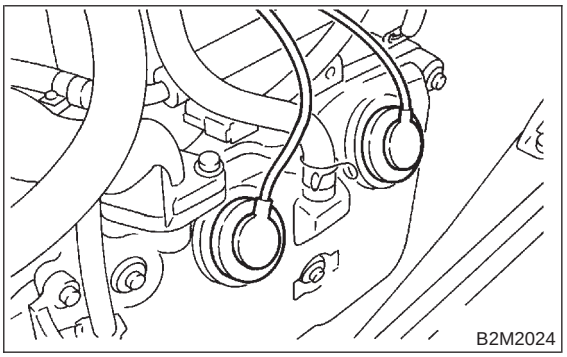

S2M0546

(4) Disconnect rear gate glass washer hose from washer motor, then plug connection with a suitable cap.

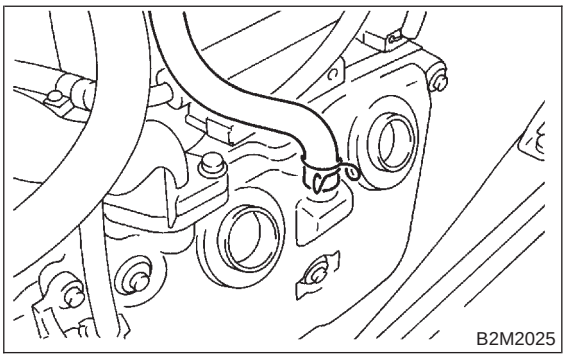
(5) Remove the two bolts which hold washer tank, then secure the tank away from working area.


H6M0431

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

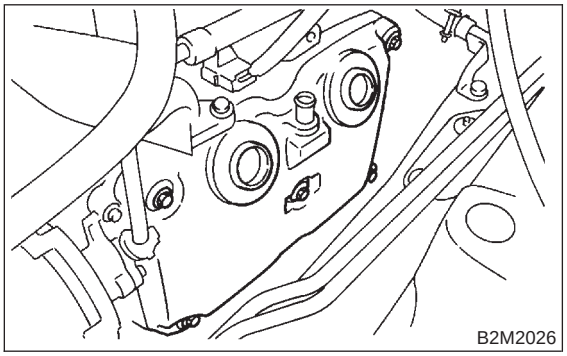

B2M2024

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


B2M2025

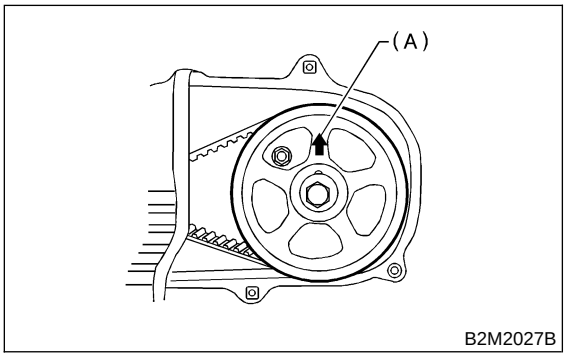
(8) Lift-up the vehicle.
(9) Remove under cover.
(10) Place suitable container under the vehicle.

(11) Remove rocker cover bolts, then remove rocker cover (LH).



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

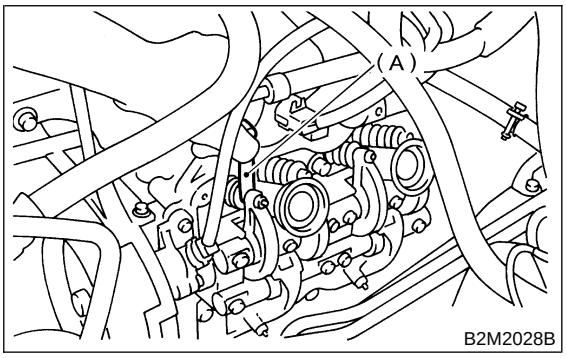
NOTE:
When arrow mark (A) on camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of the compression stroke.



9) Measure #1 cylinder valve clearance by using thickness gauge (A).

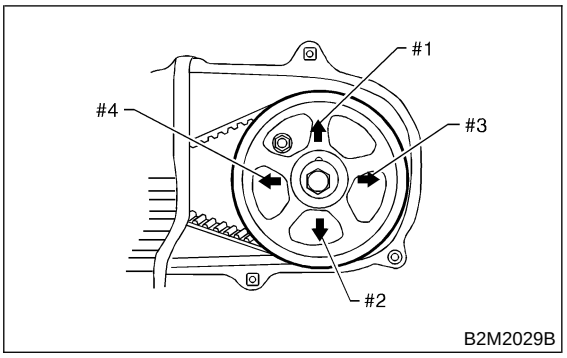
CAUTION:
● Insert the thickness gauge (A) in at as horizontal a direction as a possible with respect to the valve stem end face.
● Measure exhaust valve clearances while lifting-up the vehicle.

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



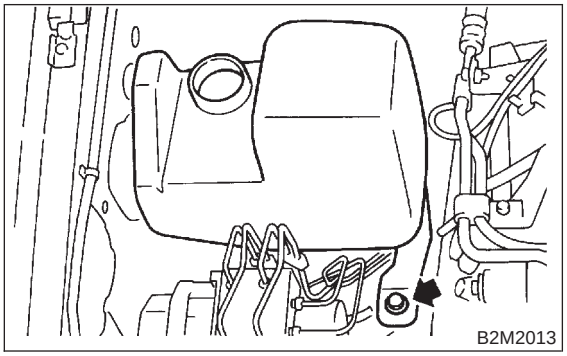
10) If necessary, adjust the valve clearance. <Ref. to 2-2 [W7B0].>
11) Similar to measurement procedures used for #1 cylinder, measure #2, #3 and #4 cylinder valve clearances.

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.



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

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

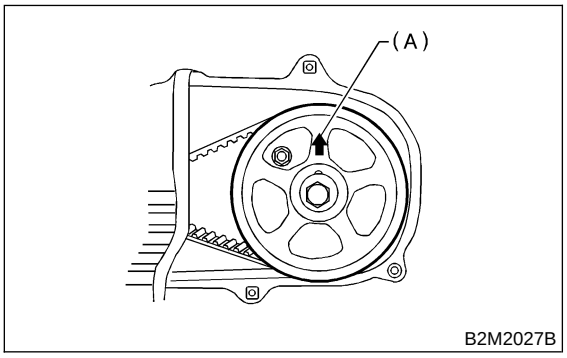

B2M2013

B: ADJUSTMENT

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

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

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



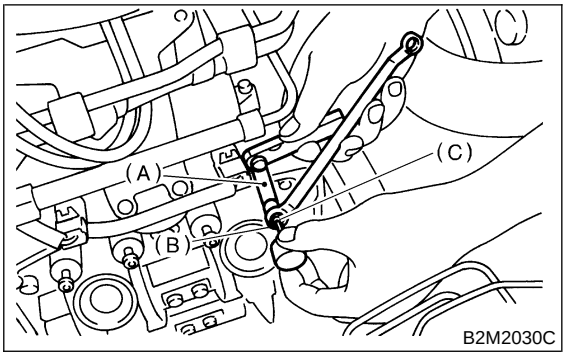
B2M2027B

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)



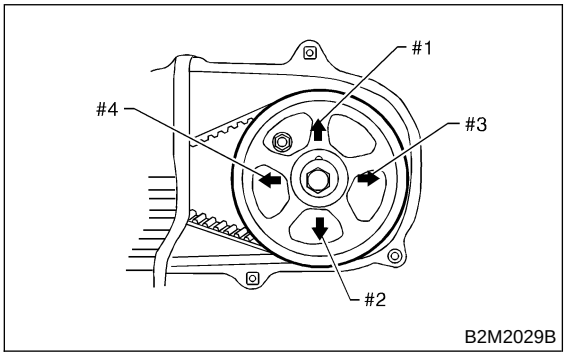
B2M2030C

(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.



1. Engine

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder
	Bore x Stroke		mm (in)	99.5 x 79.0 (3.917 x 3.110)
	Displacement		cm^3 (cu in)	2,457 (150)
	Compression ratio			10.0
	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		1° BTDC
		Closing		51° ABDC
	Exhaust valve timing	Opening		50° BBDC
		Closing		6° 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±100 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	10°±10°/700

B: SERVICE DATA

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

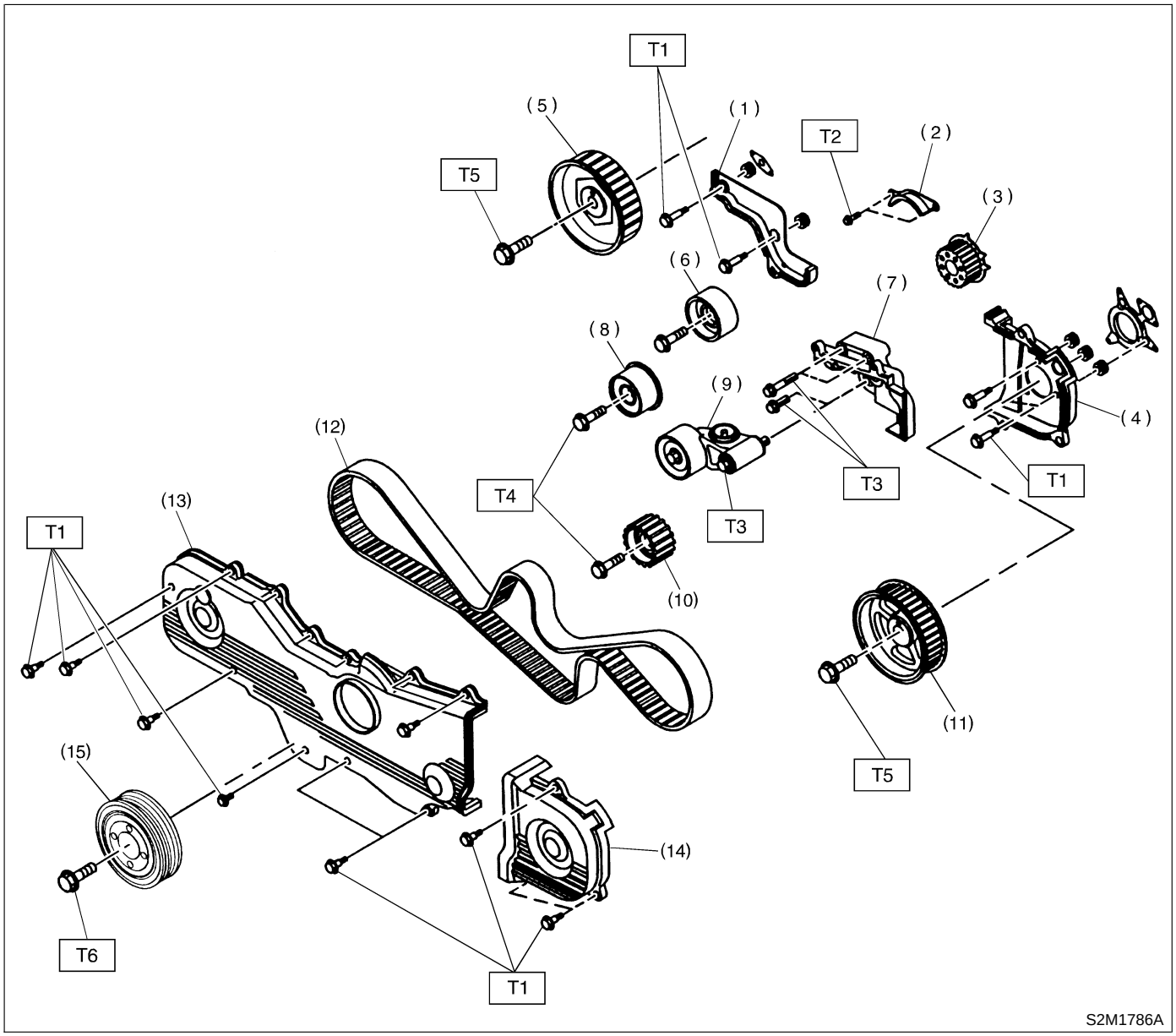
Belt tensioner adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.00 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.20 — 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	39.485 — 39.585 mm (1.5545 — 1.5585 in)
			Limit	39.385 mm (1.5506 in)
		Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
			Limit	39.157 mm (1.5416 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	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			98.3 mm (3.870 in)

Valve set	Refacing angle			90°
	Contacting width	Intake	STD	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	5.950 — 5.965 mm (0.2343 — 0.2348 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.035 — 0.062 mm (0.0014 — 0.0024 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	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	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)
	Standard inner diameter of piston pin hole			23.000 — 23.006 mm (0.9055 — 0.9057 in)
Piston pin	Outer diameter			22.994 — 23.000 mm (0.9053 — 0.9055 in)
	Standard clearance between piston pin and hole in piston			0.004 — 0.008 mm (0.0002 — 0.0003 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	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.70 mm (0.0079 — 0.0276 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 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		0.250 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, #3	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, #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		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 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)

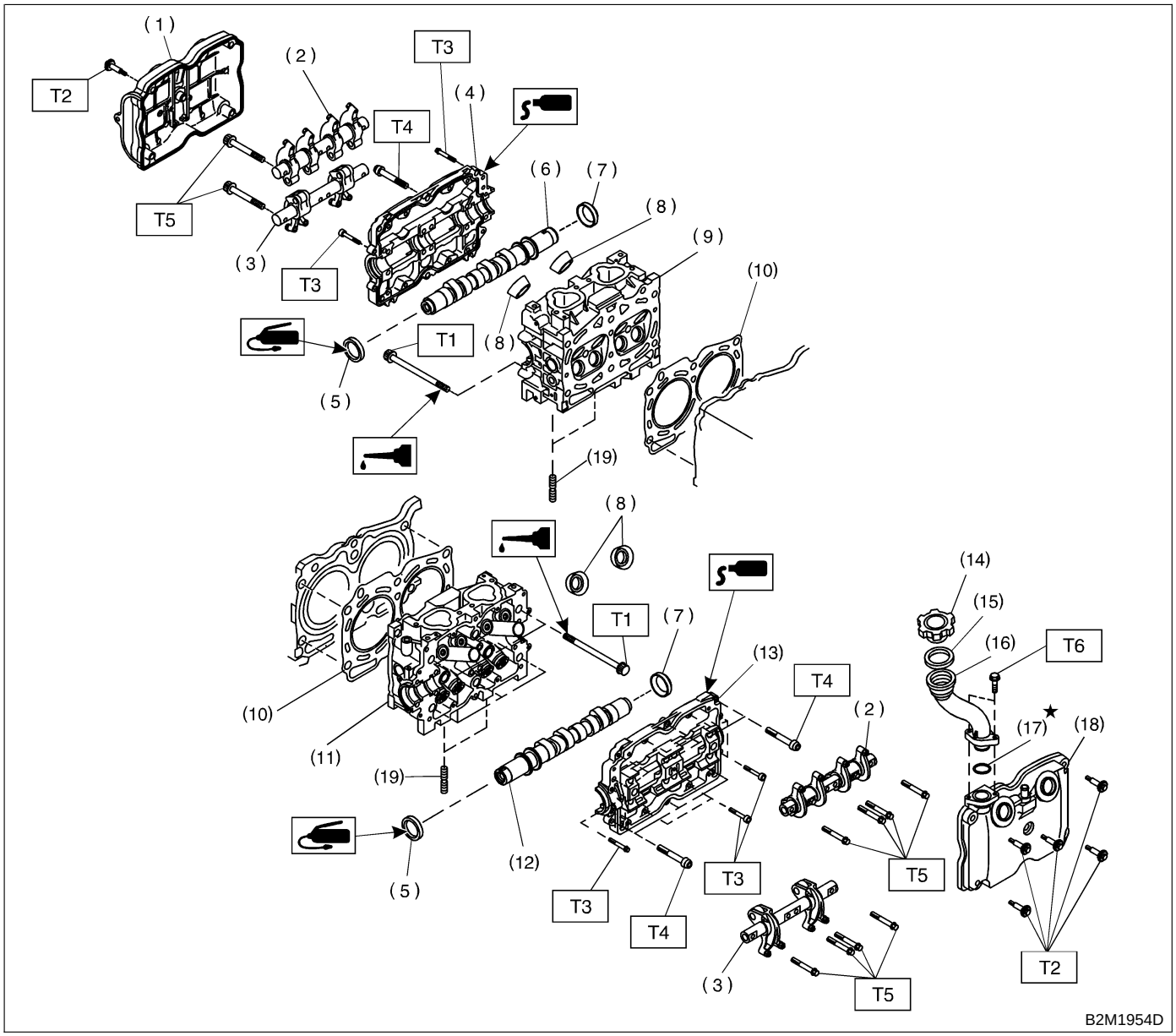
1. Timing Belt



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

Tightening torque: N·m (kg-m, ft-lb)
T1: 5±1 (0.5±0.1, 3.6±0.7)
T2: 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±5 (18.0±0.5, 130.2±3.6)

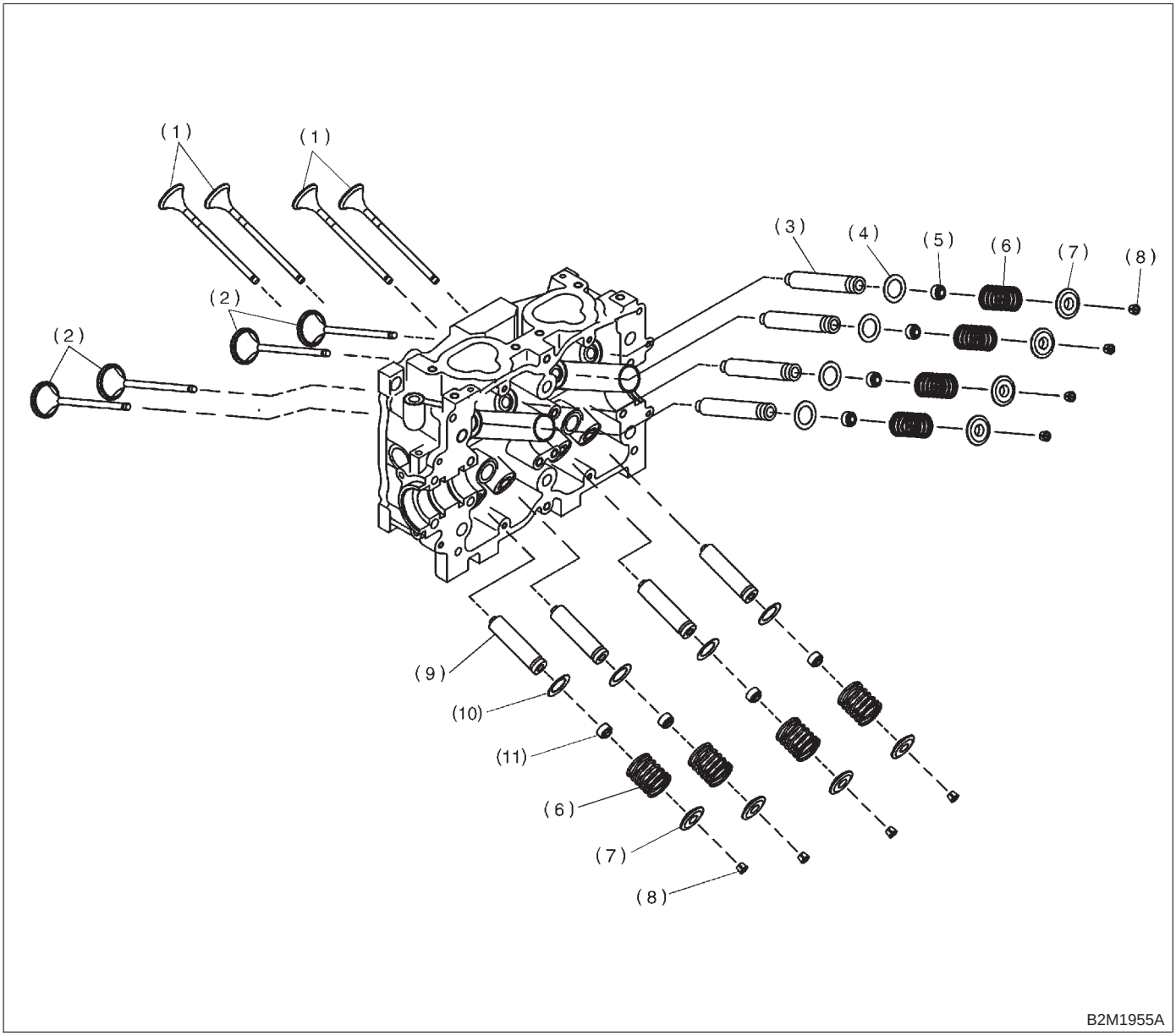
2. Cylinder Head and Camshaft



(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)
(19) Stud bolt

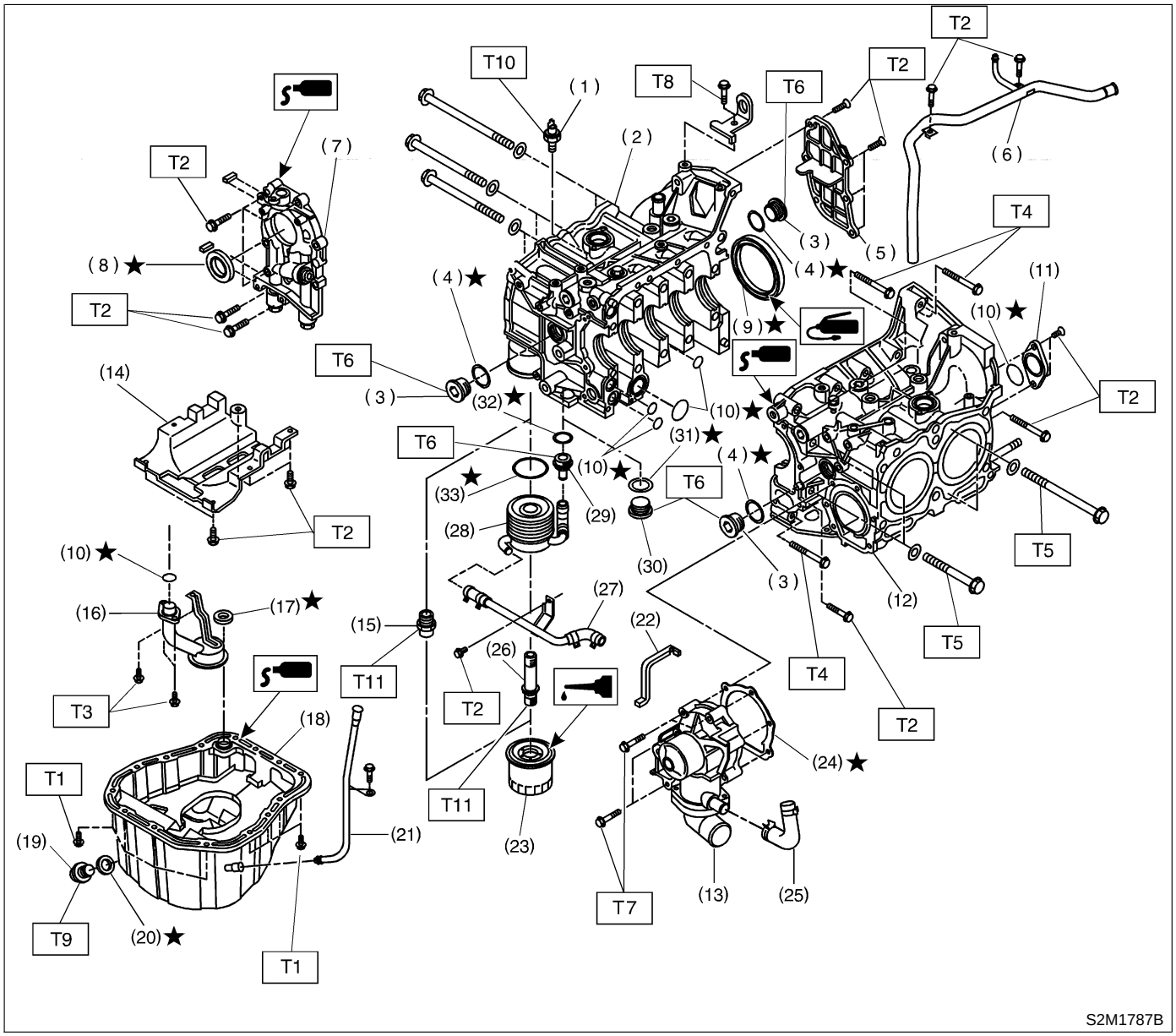
Tightening torque: N·m (kg-m, ft-lb)
T1: Refer to [W6E1].
T2: 5±1 (0.5±0.1, 3.6±0.7)
T3: 10±2 (1.0±0.2, 7.2±1.4)
T4: 18±2 (1.8±0.2, 13.0±1.4)
T5: 25±2 (2.5±0.2, 18.1±1.4)
T6: 6.4±0.5 (0.65±0.05, 4.7±0.4)

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

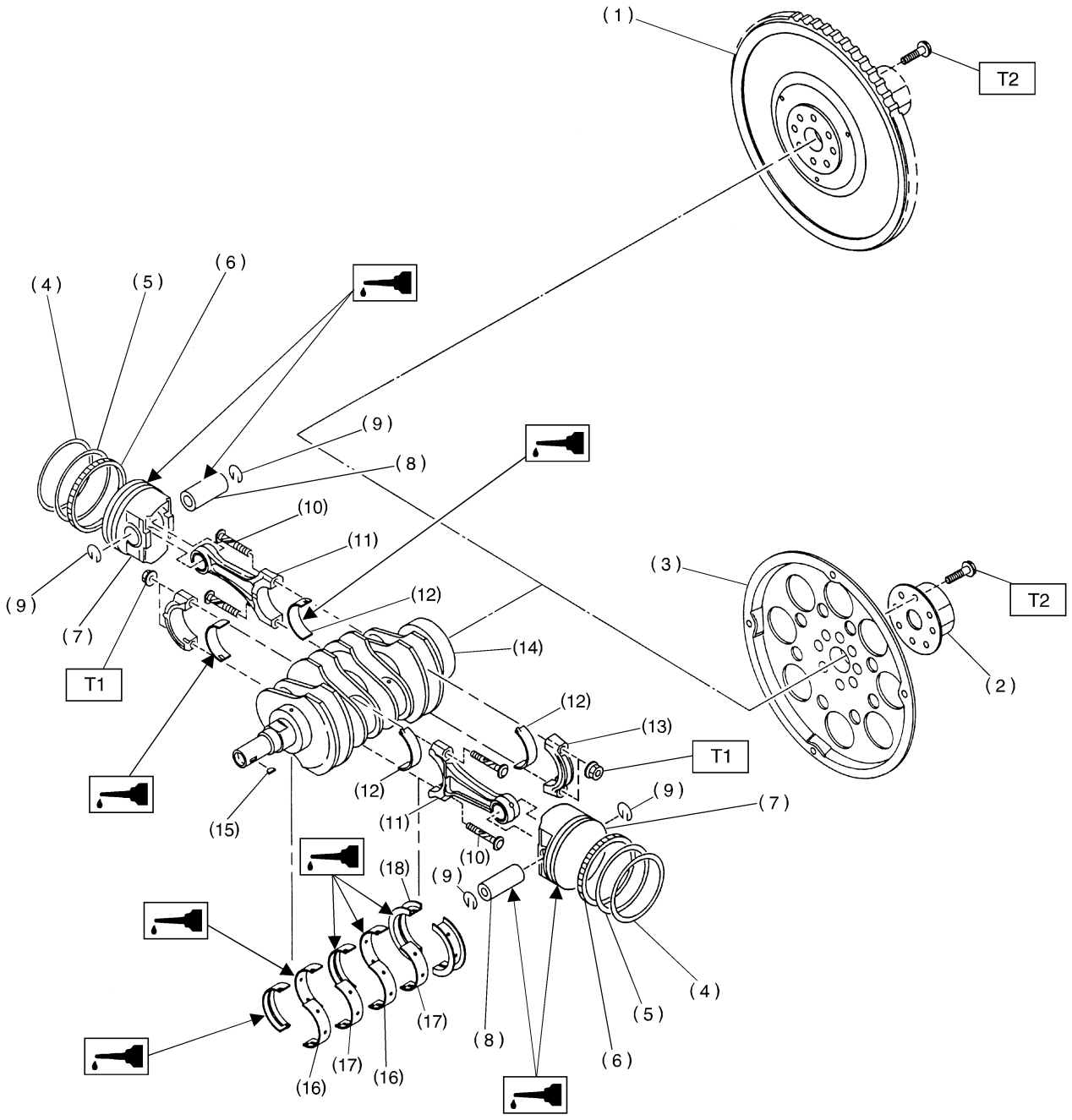
4. Cylinder Block



(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 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
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Connector (AT vehicles)
(27) Water by-pass pipe (AT vehicles)
(28) Oil cooler (AT vehicles)
(29) Nipple (AT vehicles)
(30) Plug (MT vehicles)
(31) Gasket (MT vehicles)
(32) Gasket (AT vehicles)
(33) O-ring

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)
T8: 16±1.5 (1.6±0.15, 11.6±1.1)
T9: 44 (4.5, 33)
T10: 25±3 (2.5±0.3, 18.1±2.2)
T11: 54±5 (5.5±0.5, 39.8±3.6)

5. Crankshaft and Piston

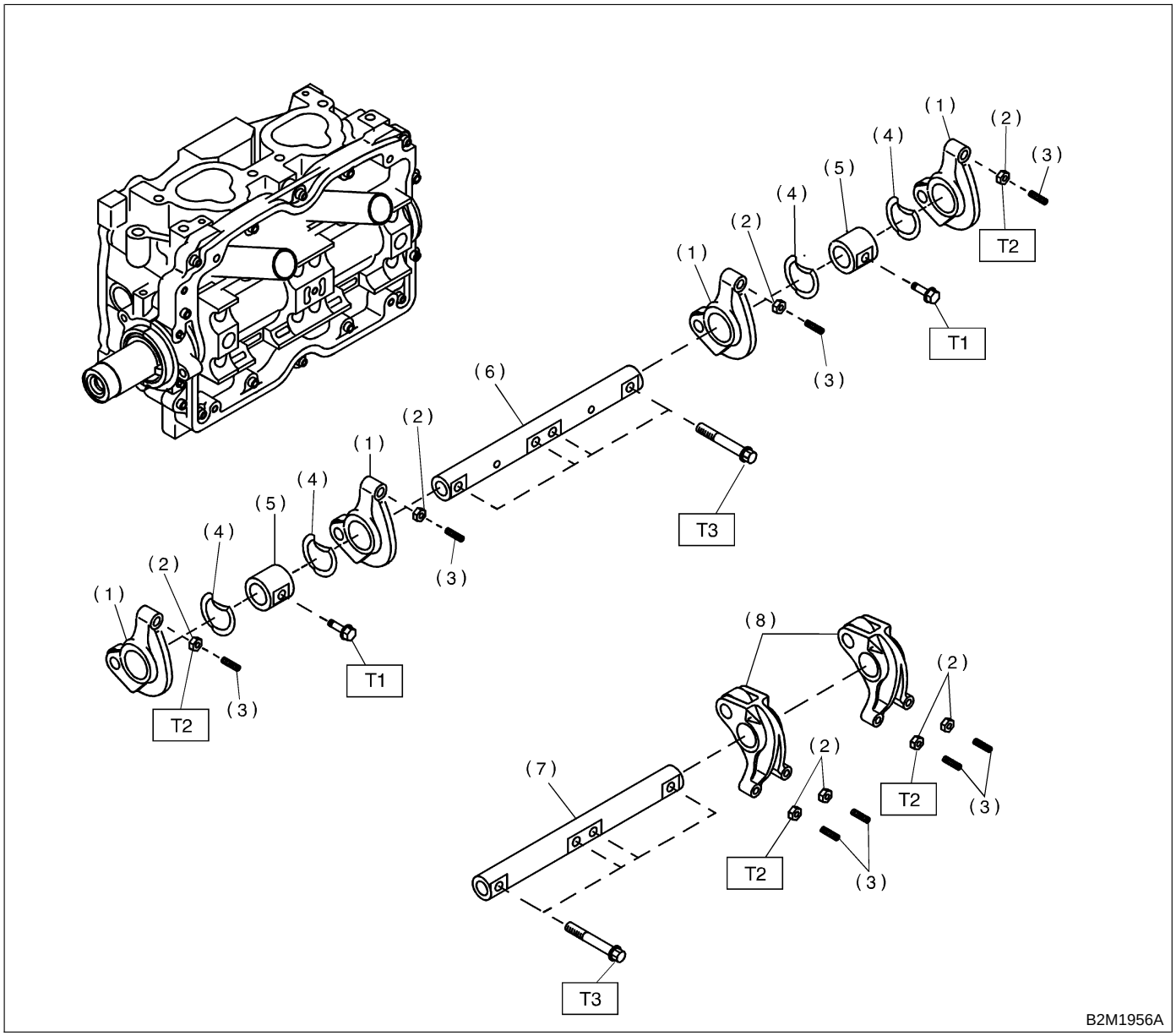


B2M3429A

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

Tightening torque: N·m (kg-m, ft-lb)
T1: 44.6±1.5 (4.55±0.15, 32.9±1.1)
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: 25±2 (2.5±0.2, 18.1±1.4)

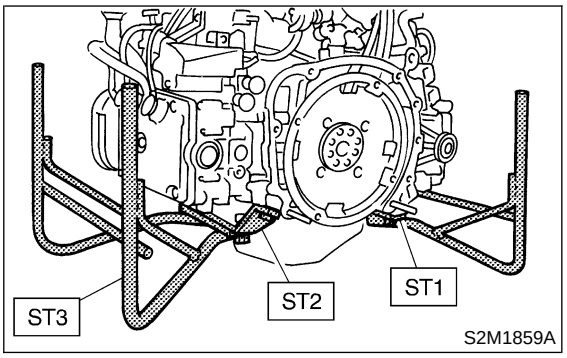
1. General Precautions

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

2. General Procedure

1) For the procedure of removing the engine from the vehicle, refer to 2-11 ENGINE AND TRANSMISSION MOUNTING SYSTEM. <Ref. to 2-11 [W2A0].> However, before going into the procedure, it is necessary to do the following.
- Before disassembling engine, place it on ST3.

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



2) It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

3) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for over hauling of the engine it-self when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

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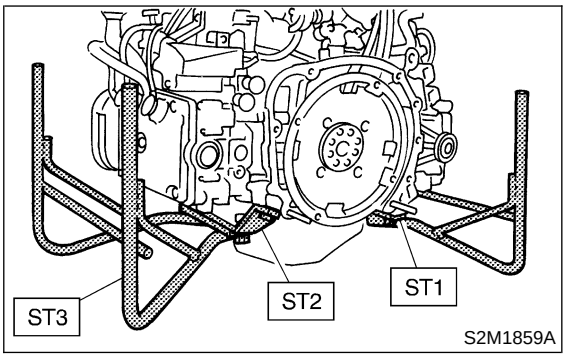

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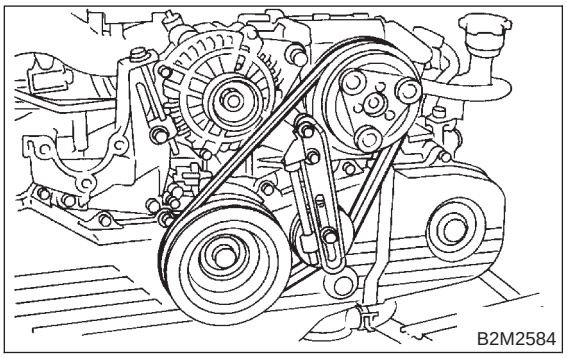
3. Timing Belt

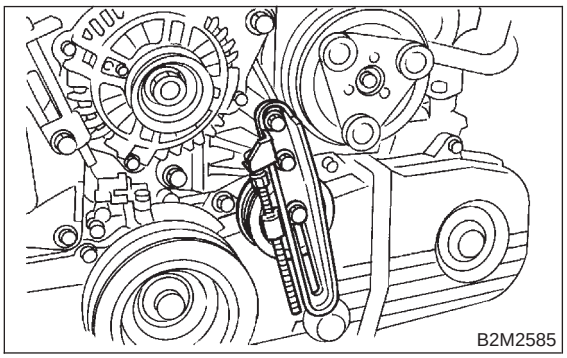
A: REMOVAL

1. CRANKSHAFT PULLEY AND BELT COVER

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

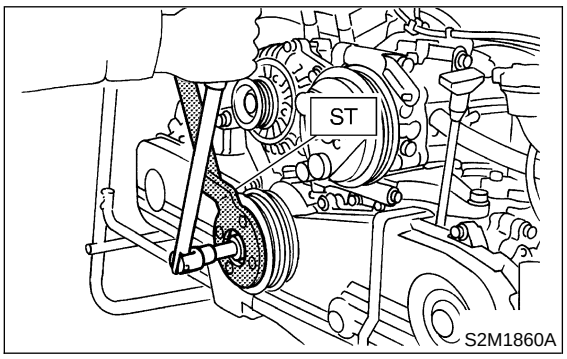


2) Remove A/C belt tensioner. (With A/C model)

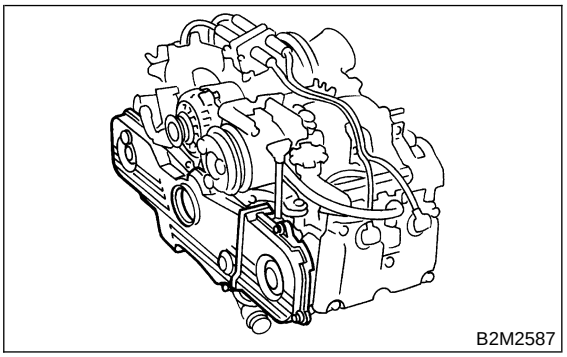


3) Remove crankshaft pulley bolt. To lock crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

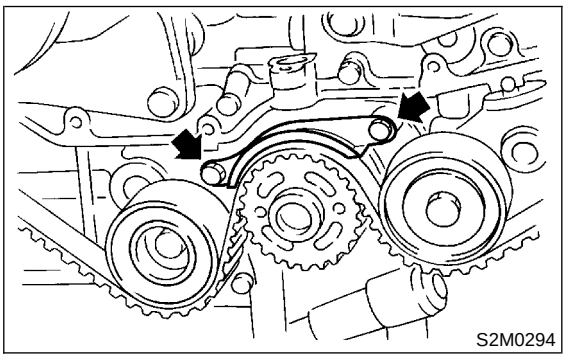


4) Remove crankshaft pulley.
5) Remove belt cover (LH).
6) Remove front belt cover.



2. TIMING BELT

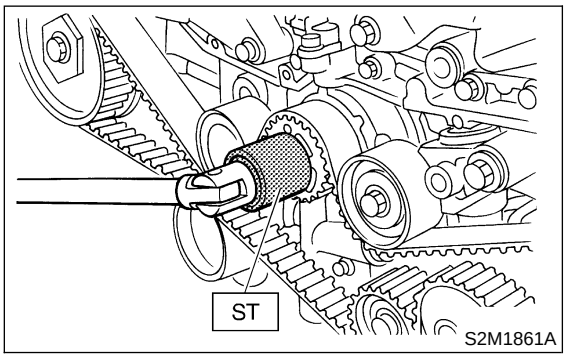
1) Remove timing belt guide. (MT vehicles only)

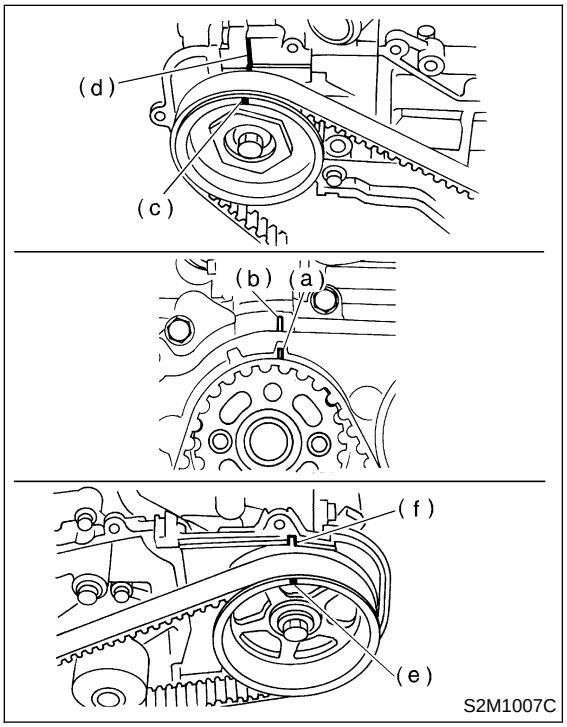


2) If alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as shown in procedures below.

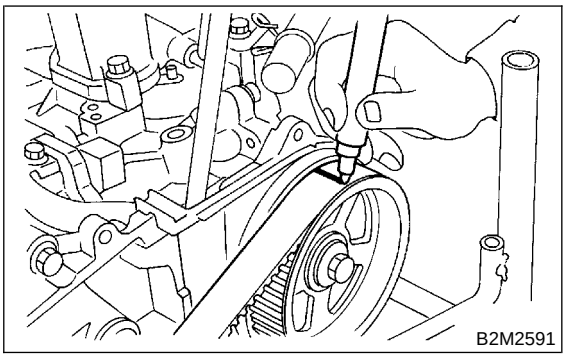
(1) Turn crankshaft using ST. Align mark (a) of sprocket to cylinder block notch (b) and ensure that right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET





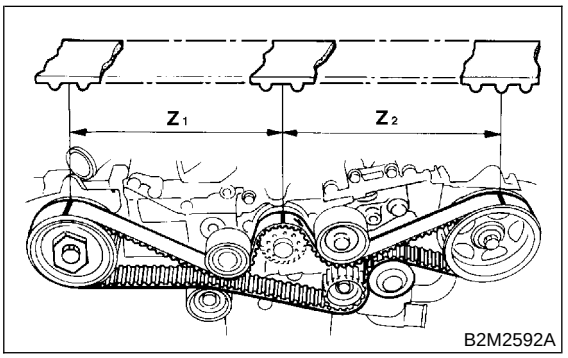
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the crank sprocket and cam sprockets.



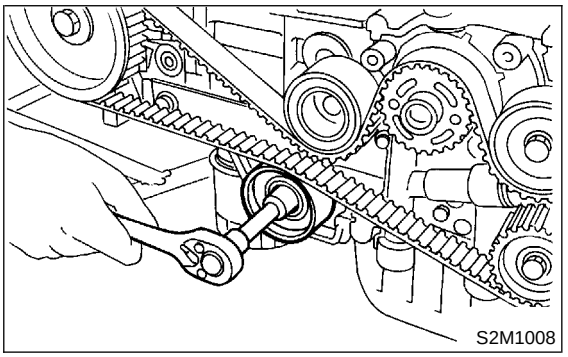
Specified data:

Z_1: 44 tooth length

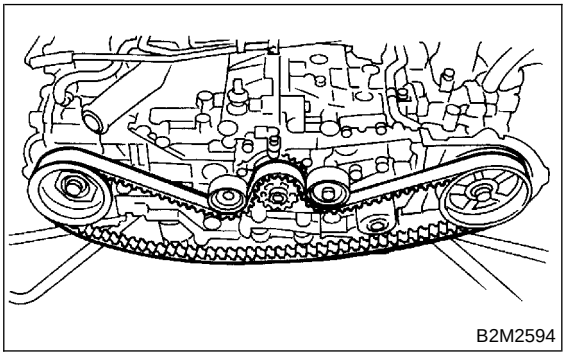
Z_2: 40.5 tooth



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

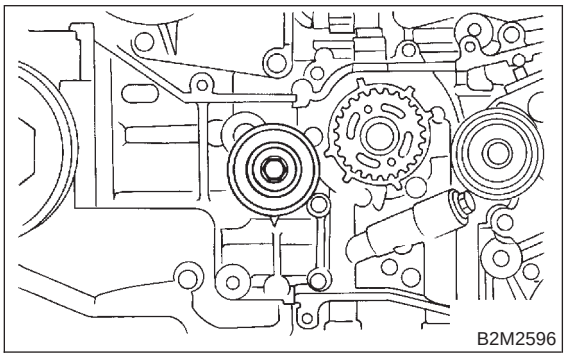


5) Remove timing belt.

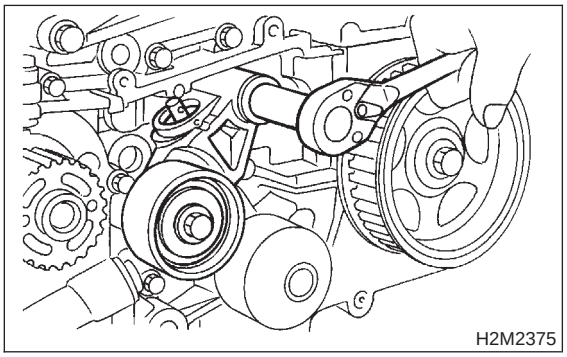


3. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove belt idler (No. 1).

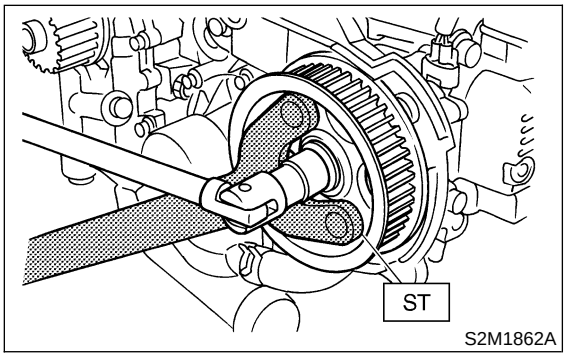

B2M2596

2) Remove automatic belt tension adjuster assembly.


H2M2375

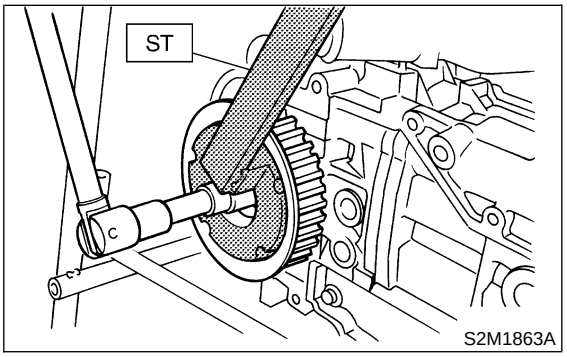
4. CAMSHAFT AND CRANKSHAFT SPROCKET

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



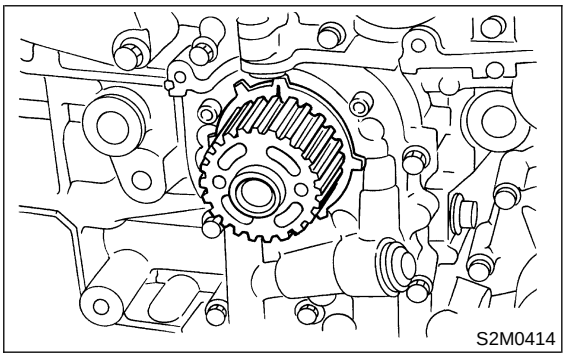
S2M1862A

3) Remove camshaft sprocket No. 1. To lock camshaft, using ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH



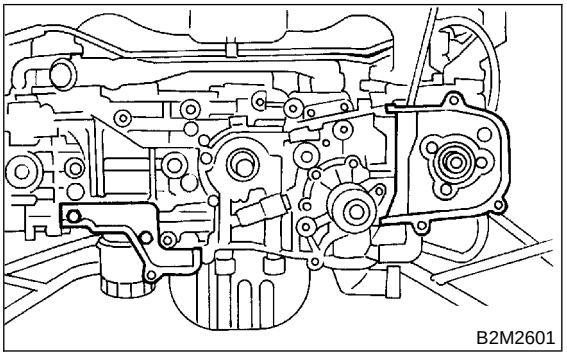
S2M1863A

4) Remove crankshaft sprocket.

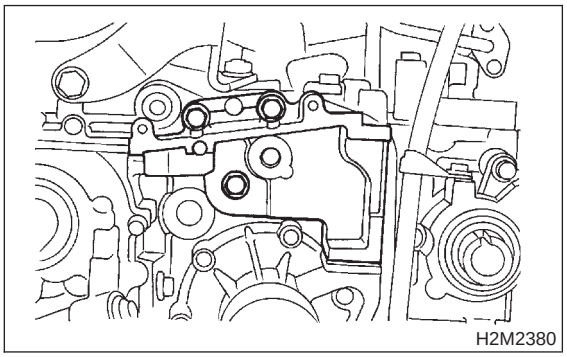

S2M0414

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

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


B2M2601

7) Remove tensioner bracket.


H2M2380

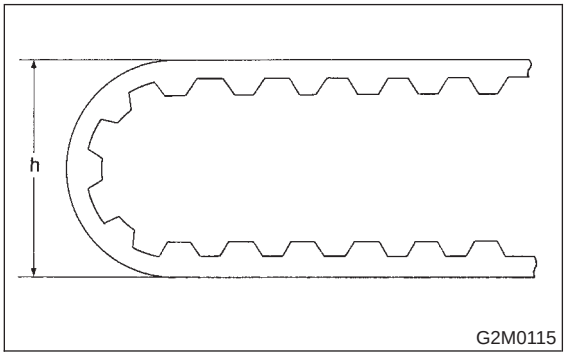
B: INSPECTION

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



G2M0115

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.

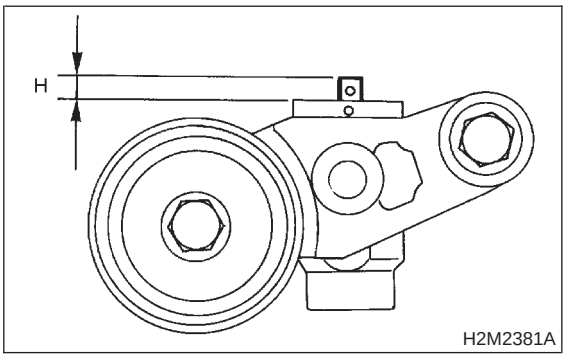
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kg, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kg, 66 lb), check it using the following procedures:

(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)



H2M2381A

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

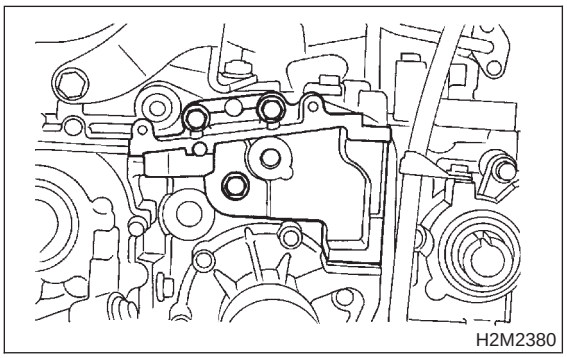
1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

C: INSTALLATION

1. CAMSHAFT AND CRANKSHAFT SPROCKET

1) Install tensioner bracket.

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

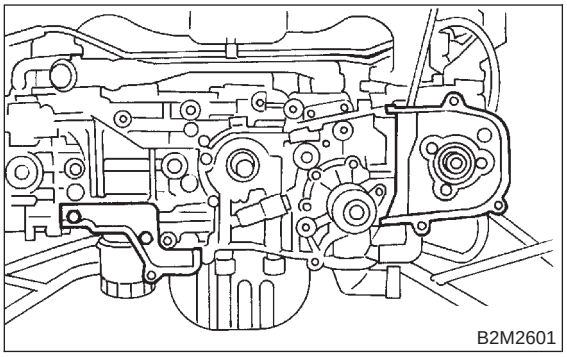

H2M2380

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

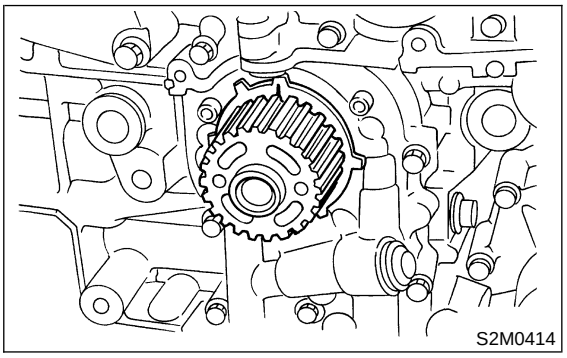
Tightening torque:
5±1 N·m (0.5±0.1 kg-m, 3.6±0.7 ft-lb)

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

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


B2M2601

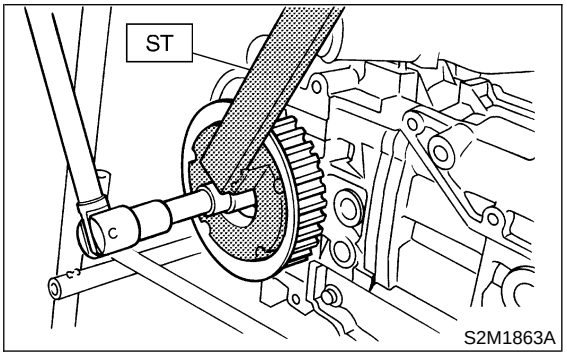
4) Install crankshaft sprocket.


S2M0414

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

Tightening torque:
78±5 N·m (8.0±0.5 kg-m, 57.9±3.6 ft-lb)

CAUTION:
Do not confuse left and right side camshaft sprockets during installation.

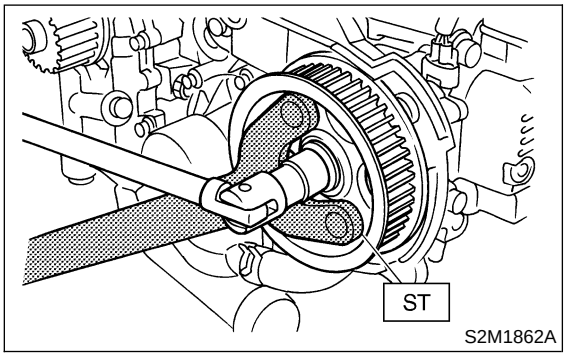


S2M1863A

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

Tightening torque:
78±5 N·m (8.0±0.5 kg-m, 57.9±3.6 ft-lb)

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.



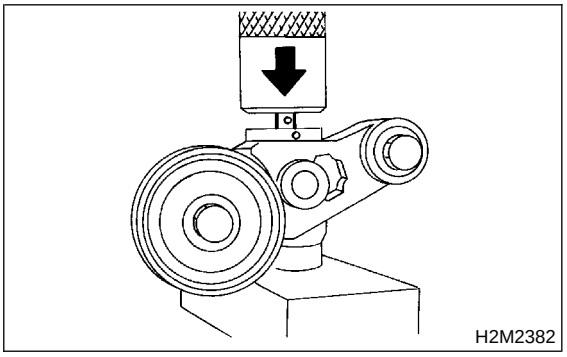
7) Install camshaft position sensor.

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

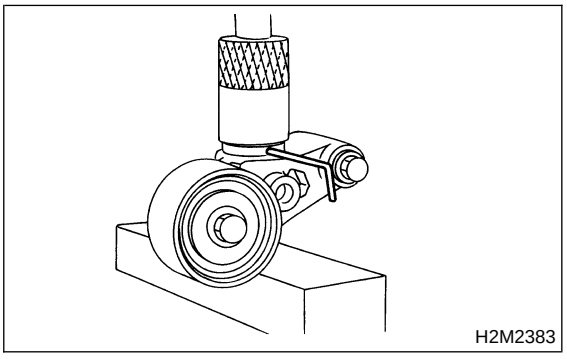
1) Preparation for installation of automatic belt tension adjuster assembly;

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.

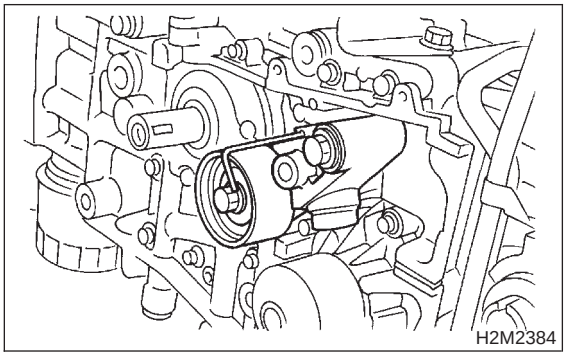


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



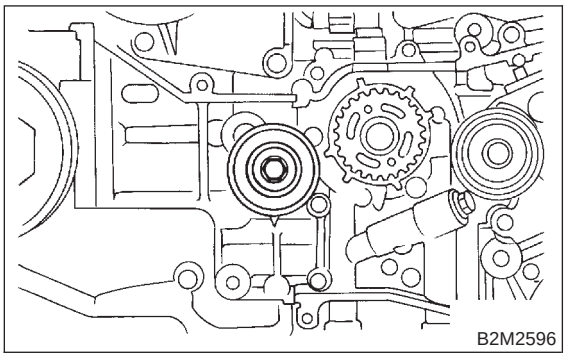
2) Install automatic belt tension adjuster assembly.

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


H2M2384

3) Install belt idler (No. 1).

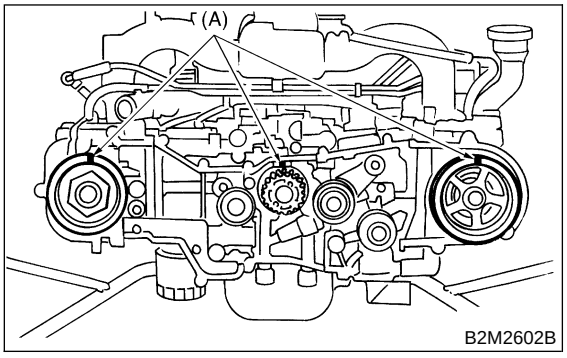
Tightening torque:
39±4 N·m (4.0±0.4 kg-m, 28.9±2.9 ft-lb)


B2M2596

3. TIMING BELT

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 (A) come to top positions.

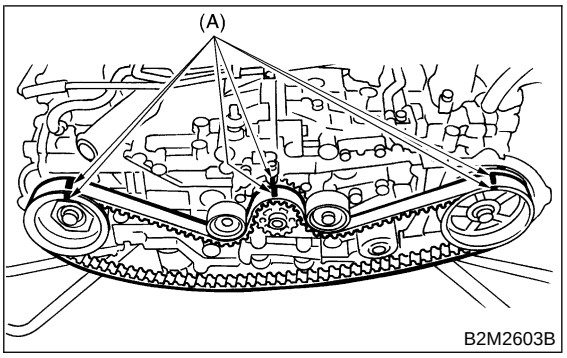
ST1 499207100 CAMSHAFT SPROCKET WRENCH
ST2 499207400 CAMSHAFT SPROCKET WRENCH



B2M2602B

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

CAUTION:
Ensure belt's rotating direction is correct.



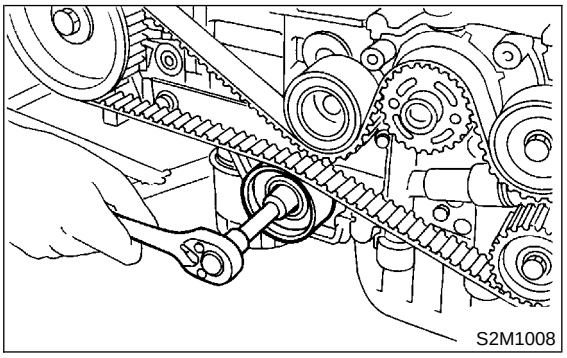
B2M2603B

2) Install belt idler No. 2.

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

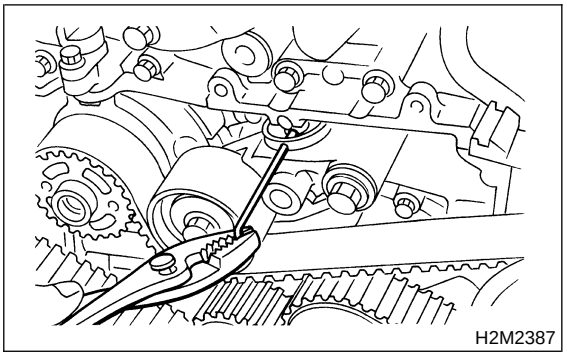
3) Install belt idler (No. 2).

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

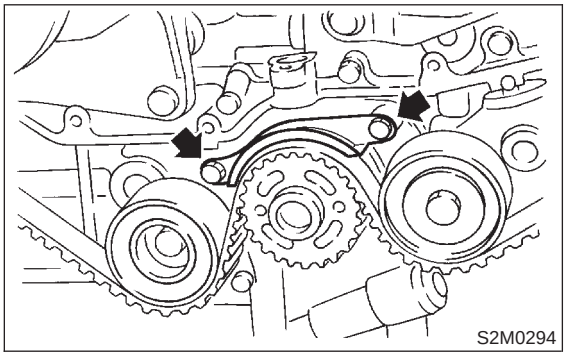

S2M1008

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.

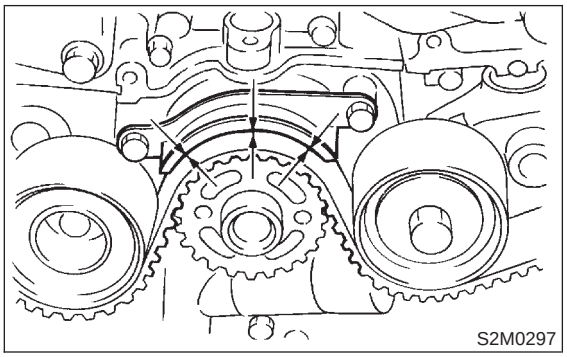

H2M2387

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


S2M0294

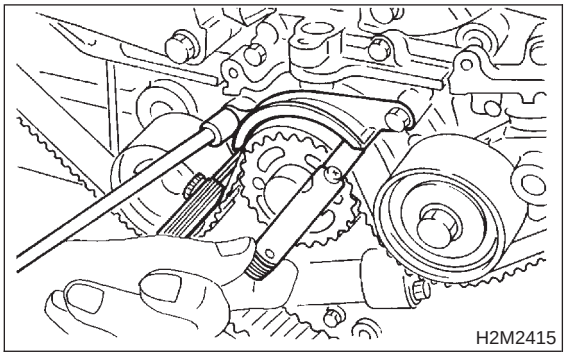
(2) Check and adjust clearance between timing belt and timing belt guide by using thickness gauge.

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


S2M0297

(3) Tighten remaining bolts.

Tightening torque:
9.8±1.0 N·m (1.0±0.1 kg-m, 7.2±0.7 ft-lb)


H2M2415

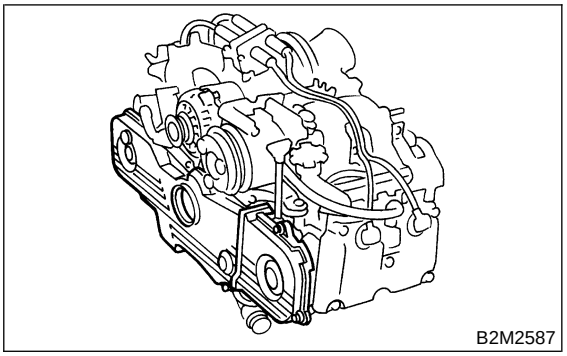
4. CRANKSHAFT PULLEY AND BELT COVER

1) Install front belt cover.

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

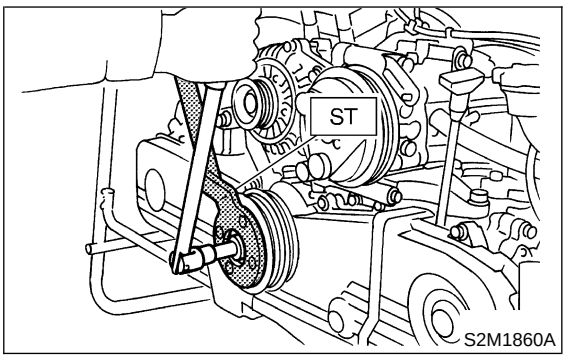
2) Install belt cover (LH).

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


B2M2587

3) Install crankshaft pulley.
4) Install pulley bolt.
To lock crankshaft, use ST.
ST 499977100 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:
177±5 N·m (18.0±0.5 kg-m, 130.2±3.6 ft-lb)



S2M1860A

5) Confirm that the tightening angle of the crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4).

CAUTION:
If the tightening angle of crankshaft pulley bolt is less than 45 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

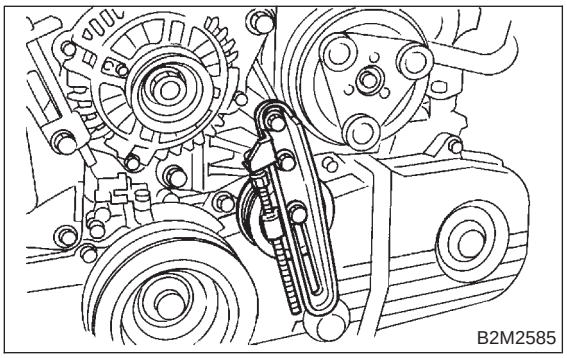
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

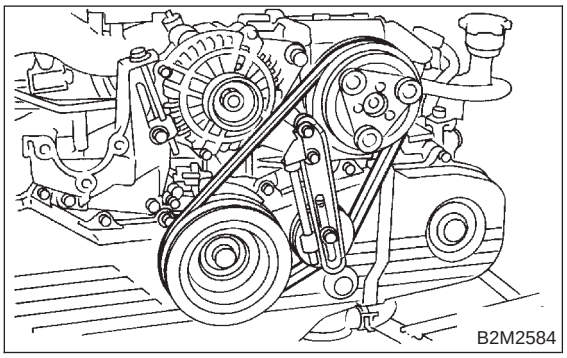
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kg-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

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)

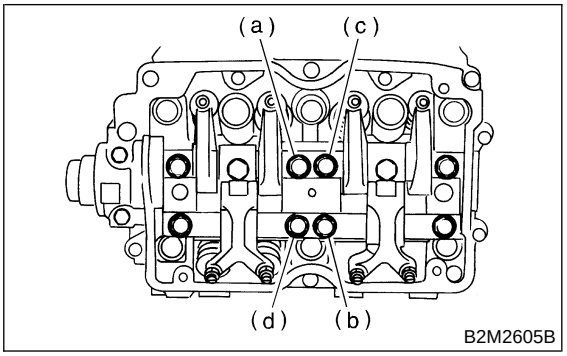

B2M2584

4. Valve Rocker Assembly

A: REMOVAL

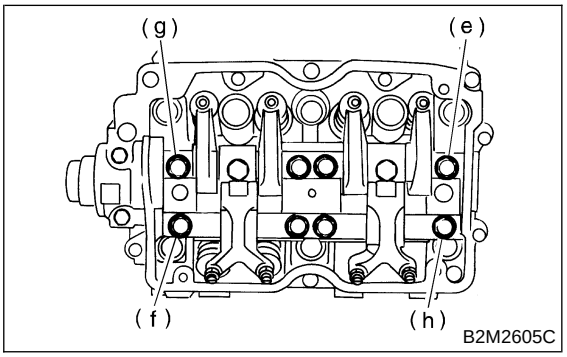
1) Disconnect PCV hose and remove rocker cover.
2) Loosen bolt which secures rocker shaft support.
3) Removal of valve rocker assembly
(1) Remove bolts (a) through (d) in alphabetical sequence.

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



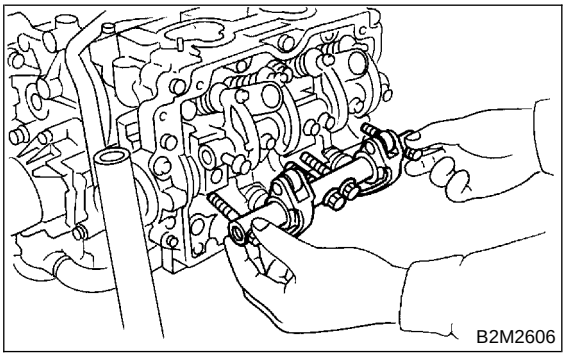
B2M2605B

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



B2M2605C

(3) Remove valve rocker assembly.


B2M2606

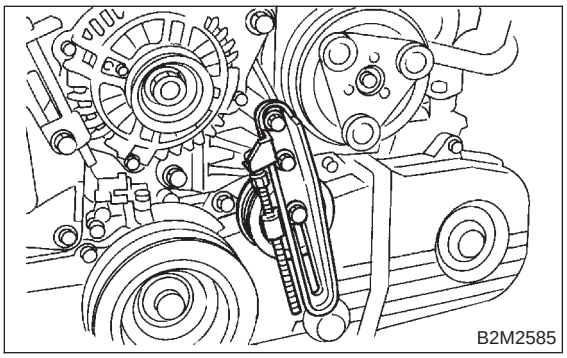
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

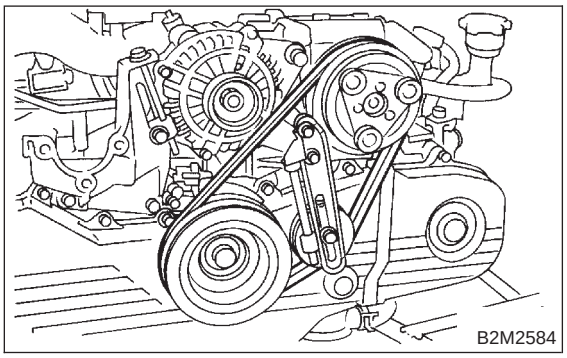
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kg-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

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)

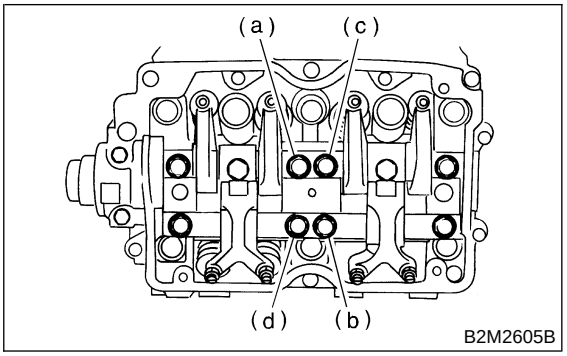

B2M2584

4. Valve Rocker Assembly

A: REMOVAL

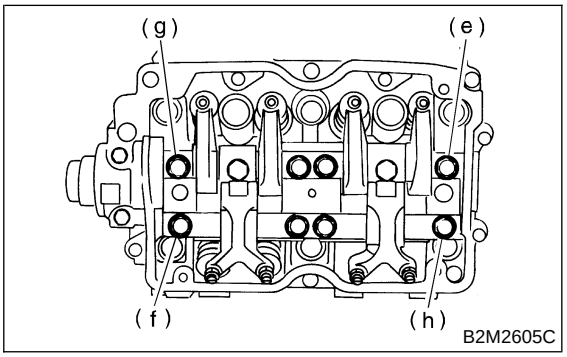
1) Disconnect PCV hose and remove rocker cover.
2) Loosen bolt which secures rocker shaft support.
3) Removal of valve rocker assembly
(1) Remove bolts (a) through (d) in alphabetical sequence.

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



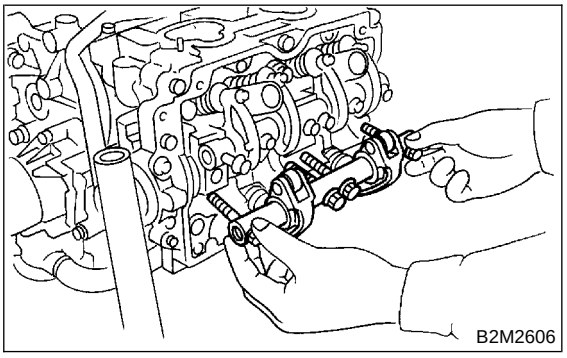
B2M2605B

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



B2M2605C

(3) Remove valve rocker assembly.


B2M2606

B: DISASSEMBLY

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.

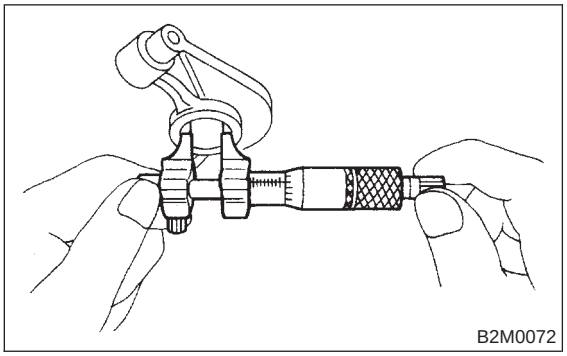
3) Remove nut and adjuster screw from valve rocker.

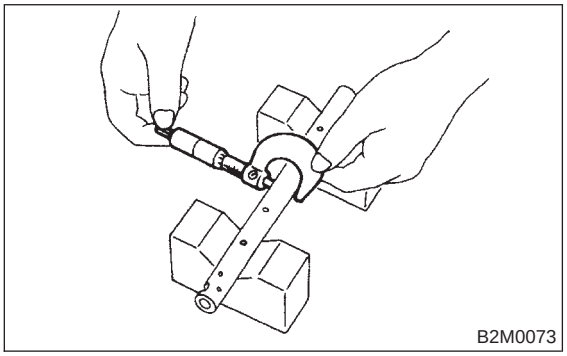
C: INSPECTION

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)


B2M0072


B2M0073

2) If oil clearance exceeds the limit, 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)

3) 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)

4) If oil clearance exceeds the limit, 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)

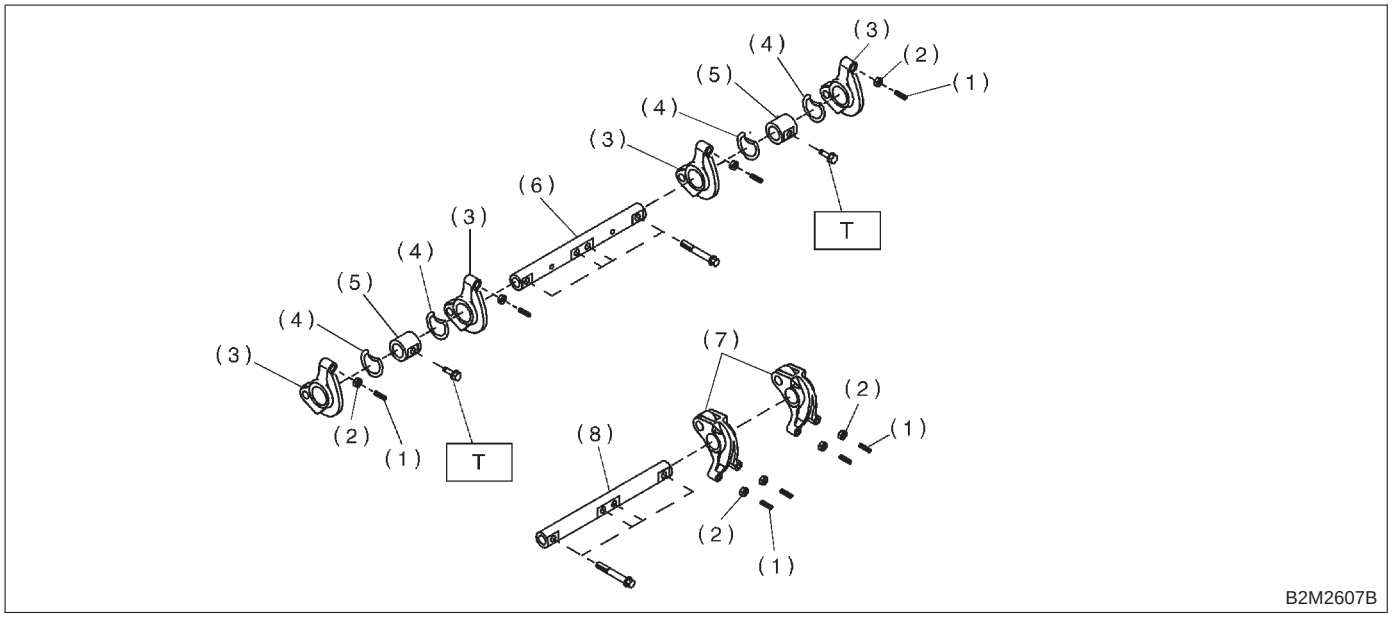
5) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.
6) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

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.

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

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.

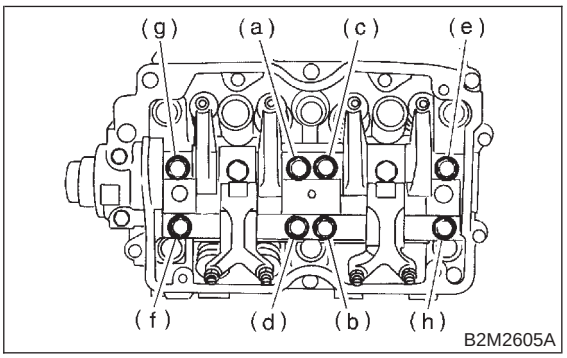
E: INSTALLATION

1) 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 [W8B1].>
3) Install rocker cover and connect PCV hose.

5. Camshaft

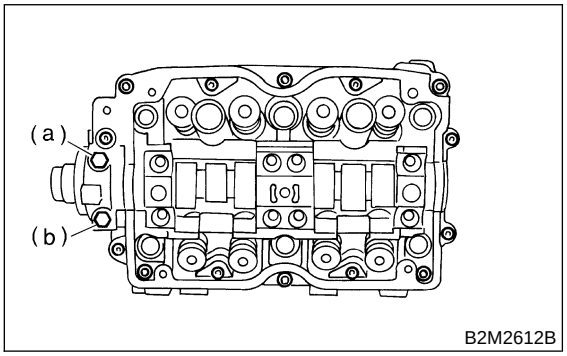
A: REMOVAL

1. RELATED PARTS

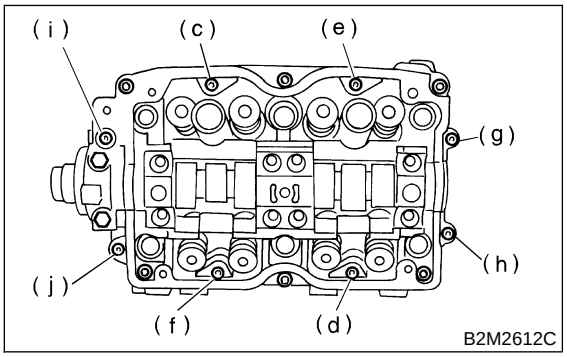
Remove camshaft sprockets, belt cover No. 2 <Ref. to 2-3 [W3A4].> and valve rocker assembly. <Ref. to 2-3 [W4A0].>

2. CAMSHAFT (LH)

1) Remove camshaft cap.
   (1) Remove bolts (a) and (b).

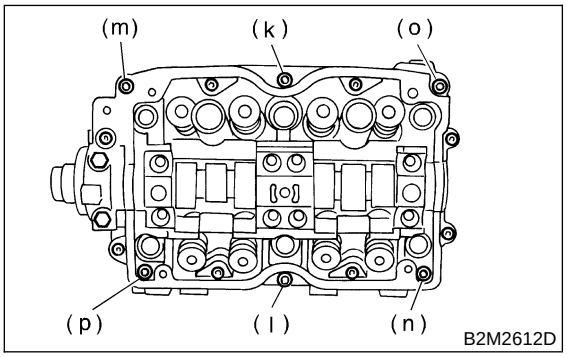


   (2) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.

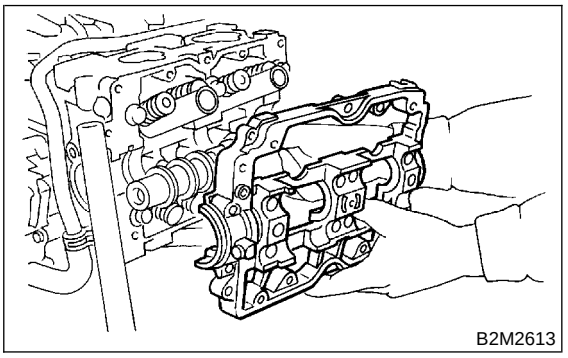


   (3) Remove bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



   (4) Remove camshaft cap.

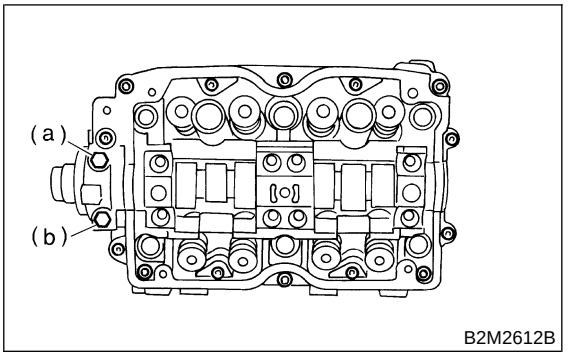


2) Remove camshaft (LH).
3) Remove oil seal.
4) Remove plug from rear side of camshaft (LH).

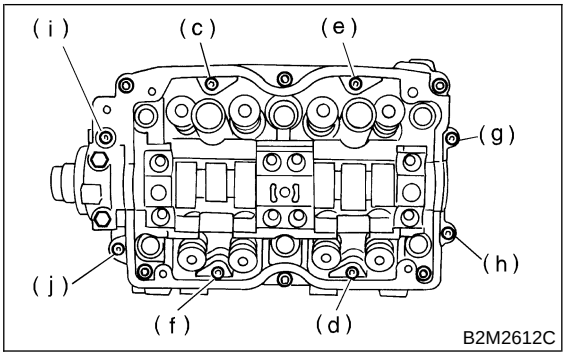
CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**

3. CAMSHAFT (RH)

1) Remove camshaft cap.
   (1) Remove bolts (a) and (b).

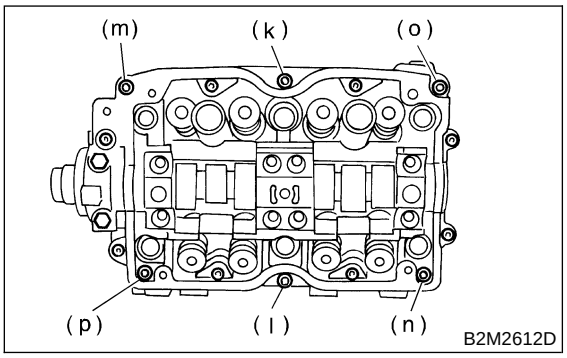


   (2) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.

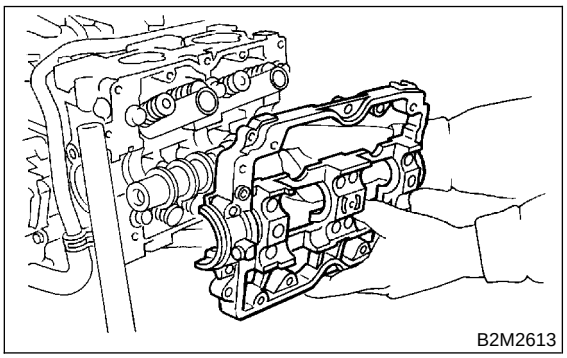


(3) Remove bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



(4) Remove camshaft cap.



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

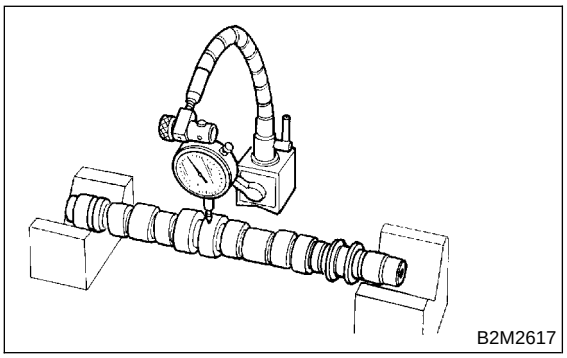
CAUTION:
- **Do not remove oil seal unless necessary.**
- **Do not scratch journal surface when removing oil seal.**

B: INSPECTION

1. CAMSHAFT

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

Limit:
0.025 mm (0.0010 in)



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

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

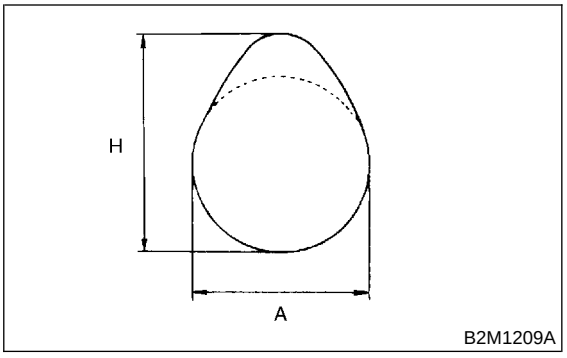
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

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		Unit: mm (in)
Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
	Limit	39.385 (1.5506)
Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
	Limit	39.157 (1.5416)

Cam base circle diameter A:
IN: 34.00 mm (1.3386 in)
EX: 34.00 mm (1.3386 in)

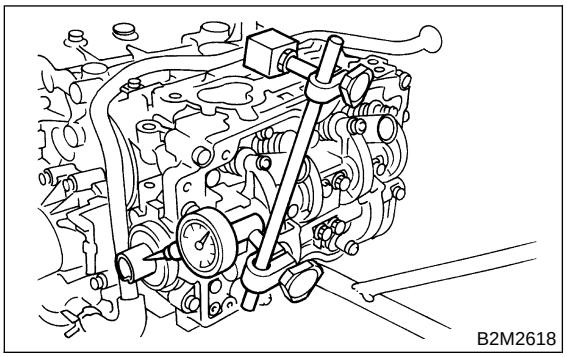


2. CAMSHAFT SUPPORT

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:
0.10 mm (0.0039 in)

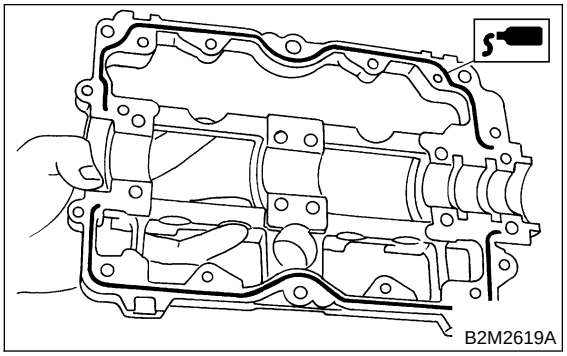


C: INSTALLATION

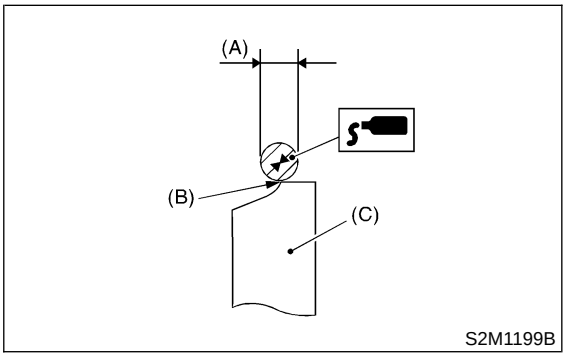
1. CAMSHAFT (LH)

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.

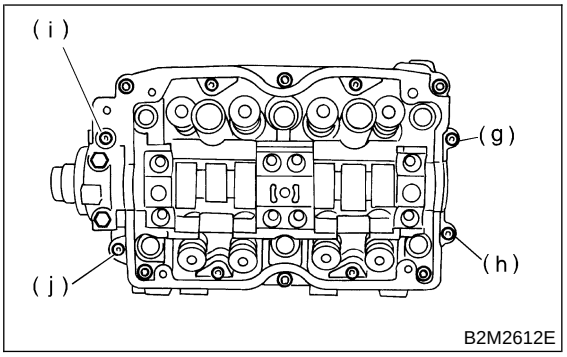
Liquid gasket:
THREE BOND 1280B



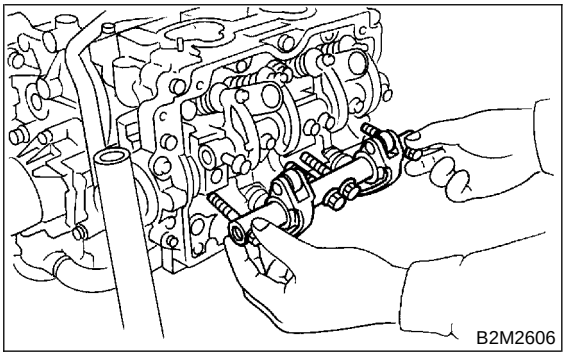
NOTE:
Apply a coat of 3 mm (0.12 in) dia. (A) liquid gasket along edge (B) of camshaft cap (C) mating surface.



(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.

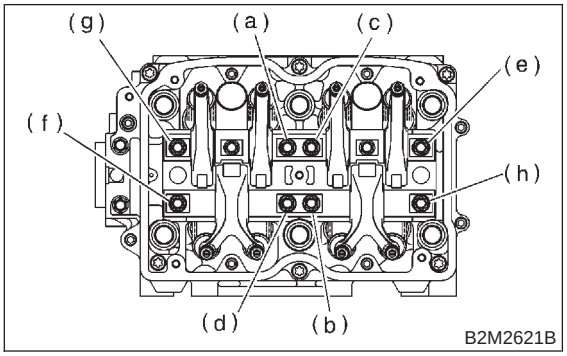


(3) Install valve rocker assembly.
<Ref. to 2-3 [W4E0].>



(4) Tighten bolts (a) through (h) in alphabetical sequence.

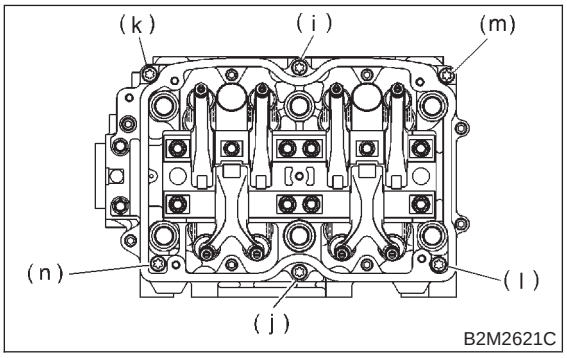
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.

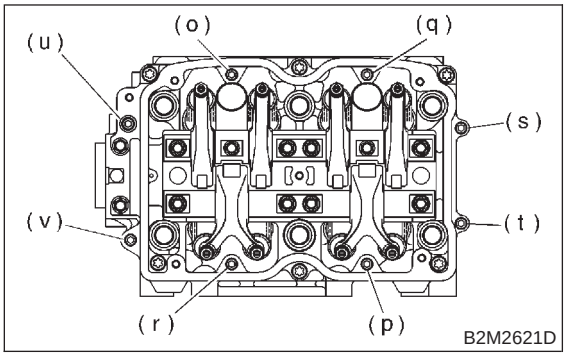
ST 499497000 TORX PLUS

Tightening torque:
18±2 N·m (1.8±0.2 kg-m, 13.0±1.4 ft-lb)



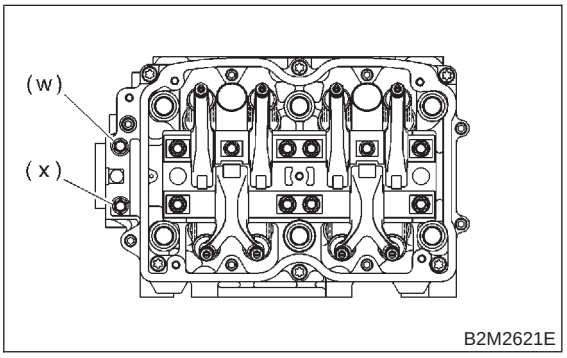
(6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



(7) Tighten bolts (w) and (x).

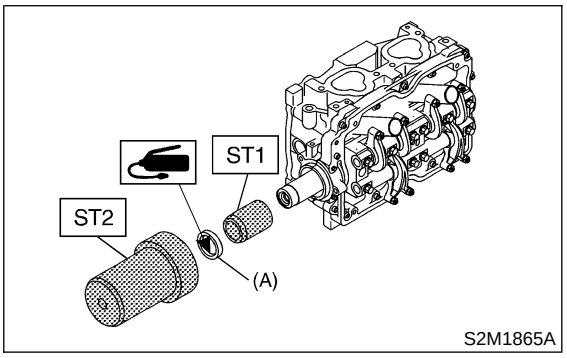
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



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



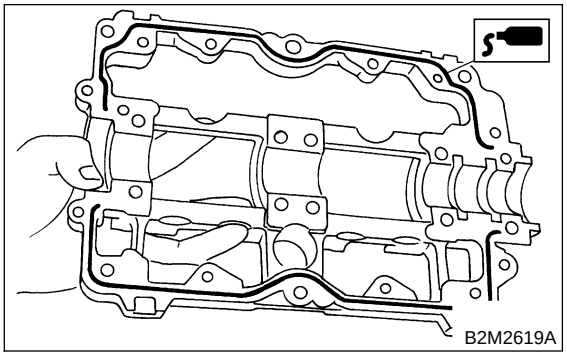
4) Install plug using ST.
ST 499587700 OIL SEAL INSTALLER
5) Install oil level gauge guide.
6) Install camshaft position sensor support.

2. CAMSHAFT (RH)

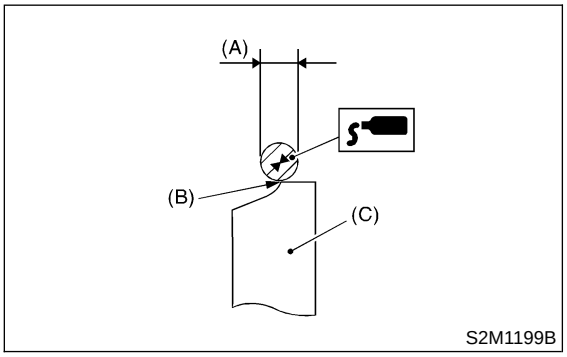
1) Apply a coat of engine oil to camshaft journals and install camshaft (RH).
2) Install camshaft cap.

(1) Apply liquid gasket on the around of camshaft cap.

Liquid gasket:
THREE BOND 1280B

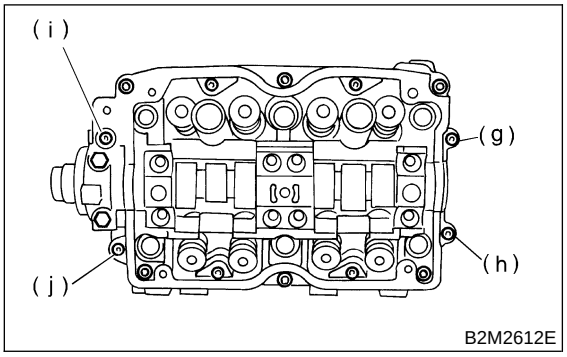

B2M2619A

NOTE:
Apply a coat of 3 mm (0.12 in) dia. (A) liquid gasket along edge (B) of camshaft cap (C) mating surface.



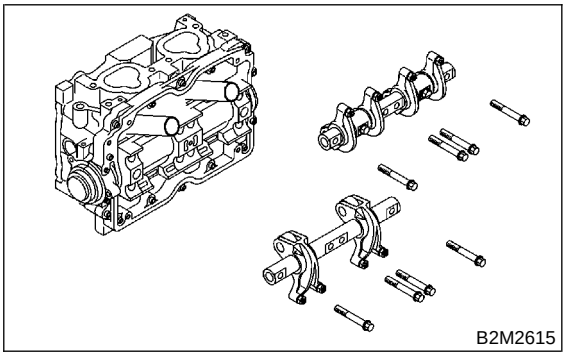
S2M1199B

(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.



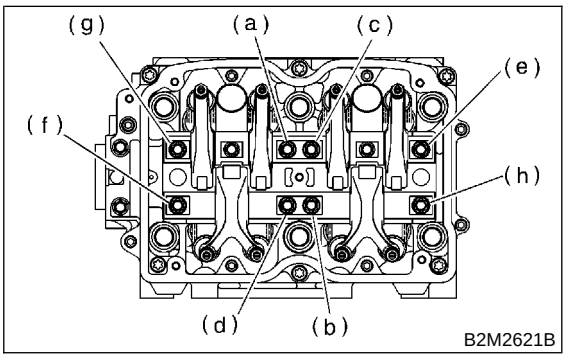
B2M2612E

(3) Install valve rocker assembly.
<Ref. to 2-3 [W4E0].>


B2M2615

(4) Tighten bolts (a) through (h) in alphabetical sequence.

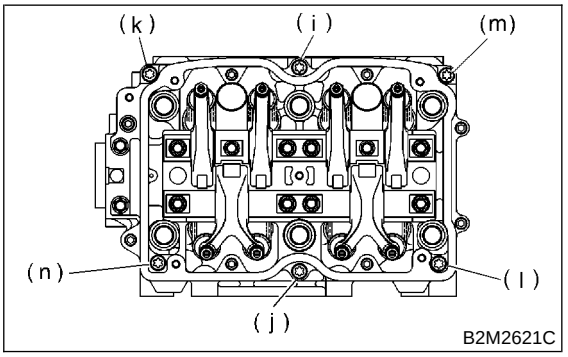
Tightening torque:
25±2 N·m (2.5±0.2 kg-m, 18.1±1.4 ft-lb)



B2M2621B

(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.
ST 499427000 TORX PLUS

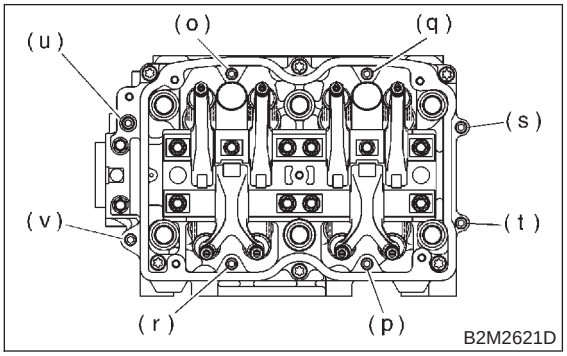
Tightening torque:
18±2 N·m (1.8±0.2 kg-m, 13.0±1.4 ft-lb)



B2M2621C

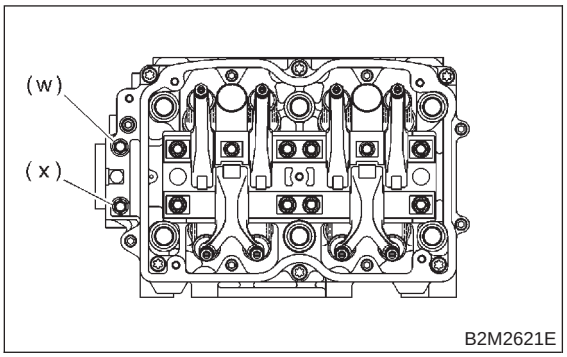
(6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



(7) Tighten bolts (w) and (x).

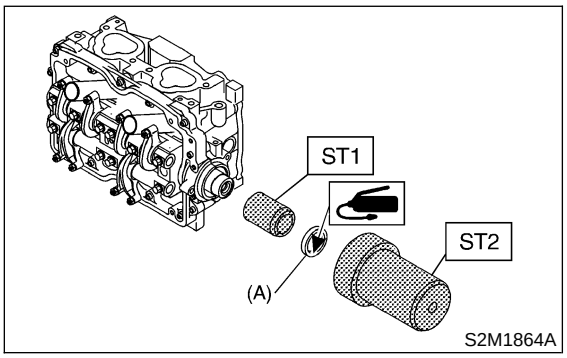
Tightening torque:
10±2 N·m (1.0±0.2 kg-m, 7.2±1.4 ft-lb)



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 499587700 OIL SEAL INSTALLER

3. RELATED PARTS

1) Adjust the valve clearance. <Ref. to 2-2 [W8B1].>
2) Install rocker cover and connect PCV hose.
3) Install timing belt. <Ref. to 2-3 [W3C0].>

6. Cylinder Head

A: REMOVAL

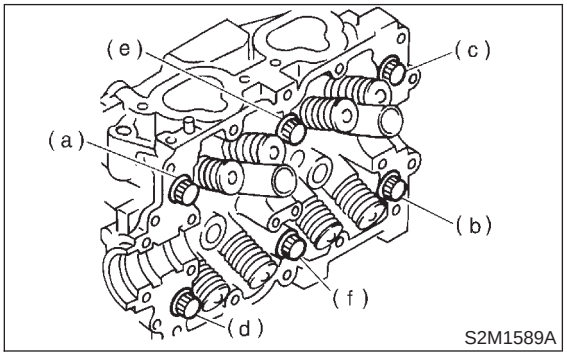
1. RELATED PARTS

1) Remove intake manifold. <Ref. to 2-7 [W3A0].>
2) Remove bolt which installs A/C compressor bracket on cylinder head. (With A/C model)
3) Remove camshafts. <Ref. to 2-3 [W5A2].>

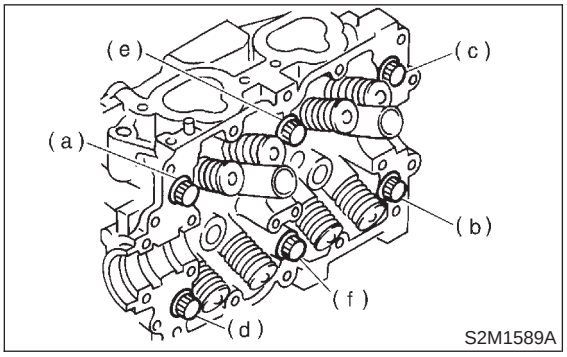
2. CYLINDER HEAD

1) Remove oil level gauge guide attaching bolt (left hand only) and oil level gauge guide.
2) 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.



3) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
4) Remove bolts (a) and (b) to remove cylinder head.



5) Remove cylinder head gasket.

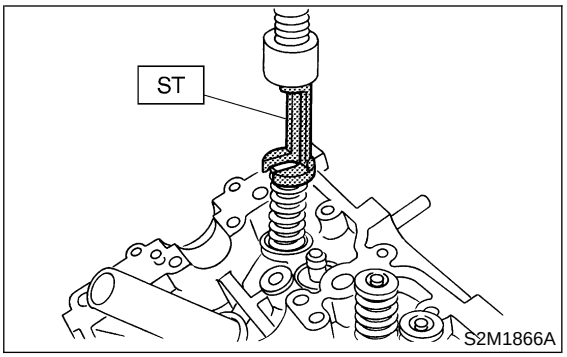
CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

6) Similarly, remove right side cylinder head.

B: DISASSEMBLY

1) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
2) 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 AND REPLACEMENT

1. CYLINDER HEAD

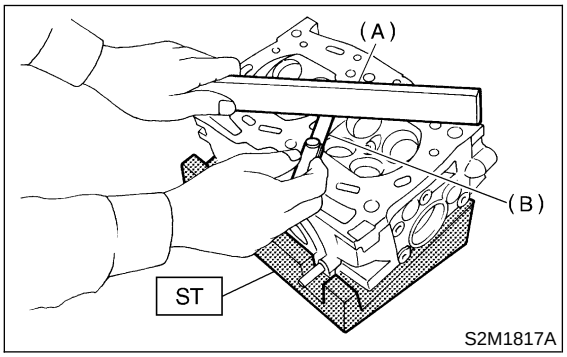
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).
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)

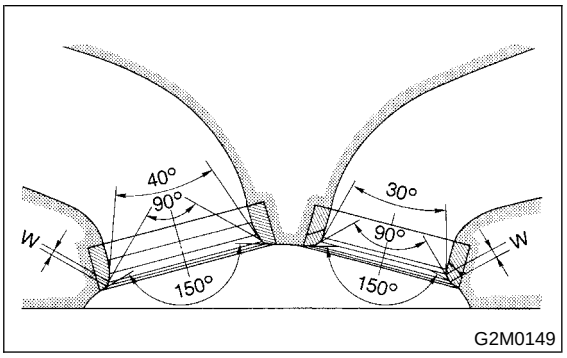
CAUTION:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

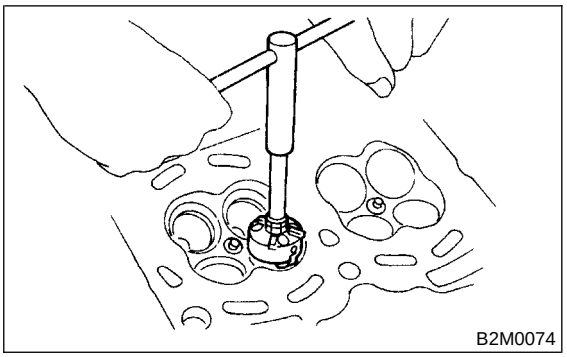


2. VALVE SEAT

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)



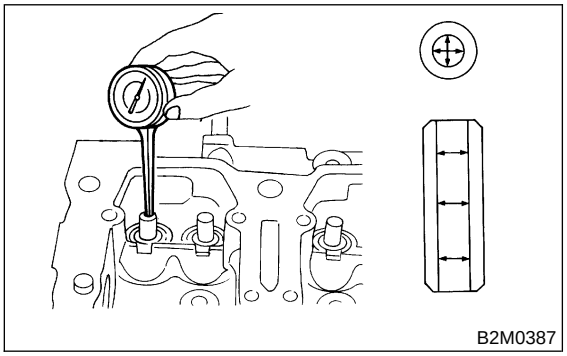


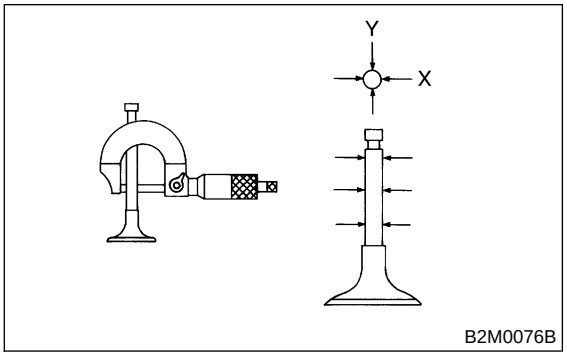
3. VALVE GUIDE

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)

NOTE:
Measure the top, center, and bottom diameters of valve and valve guide respectively to check each clearance.


B2M0387



B2M0076B

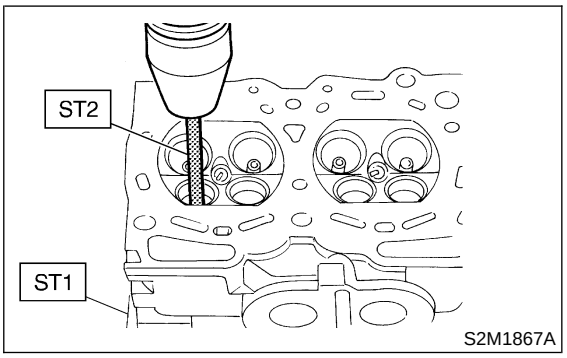
2) If the clearance between valve guide and stem exceeds the limit, replace valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

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

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

(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.

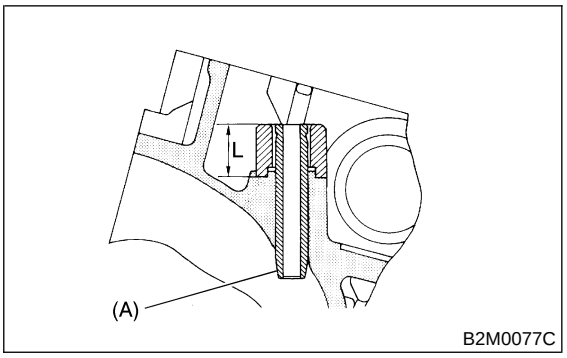
ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



S2M1867A

(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



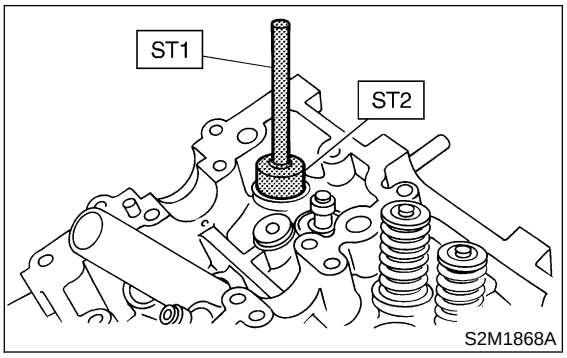
B2M0077C

(A) Valve guide

(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

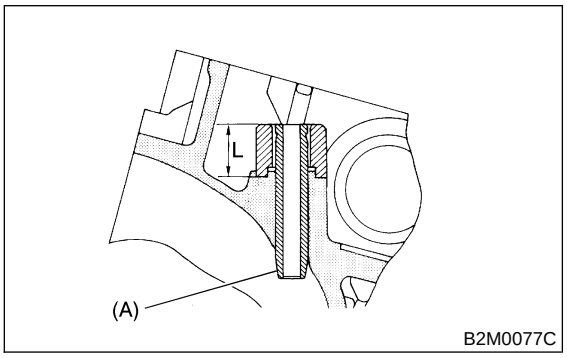
(5) Put new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
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)

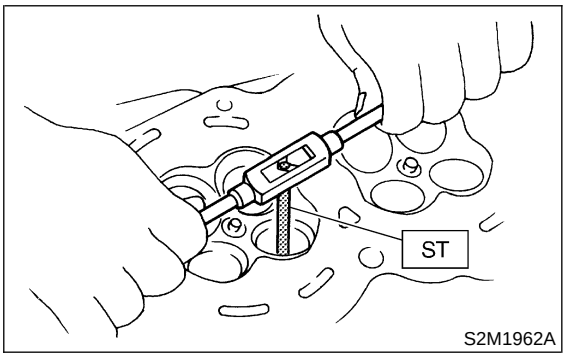


(A) Valve guide

(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



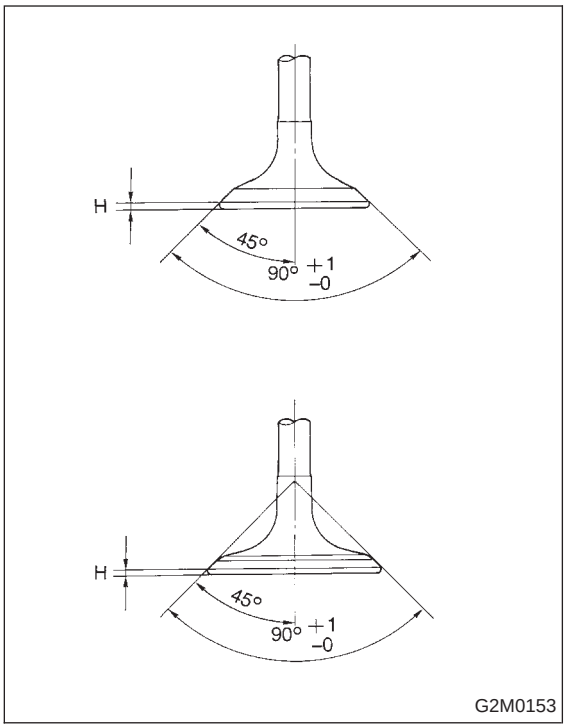
(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

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)



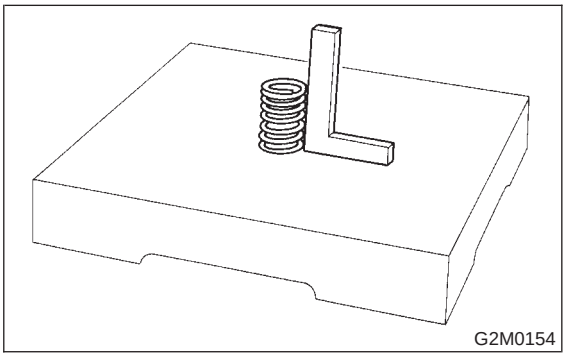
G2M0153

2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to 2-3 [W6C2].> 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)


G2M0154

6. INTAKE AND EXHAUST VALVE OIL SEAL

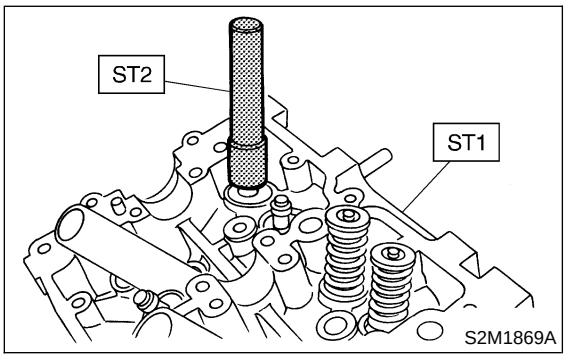
Replace oil seal with a new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.
1) Place cylinder head on ST1.
2) Press-fit oil seal to the specified 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.

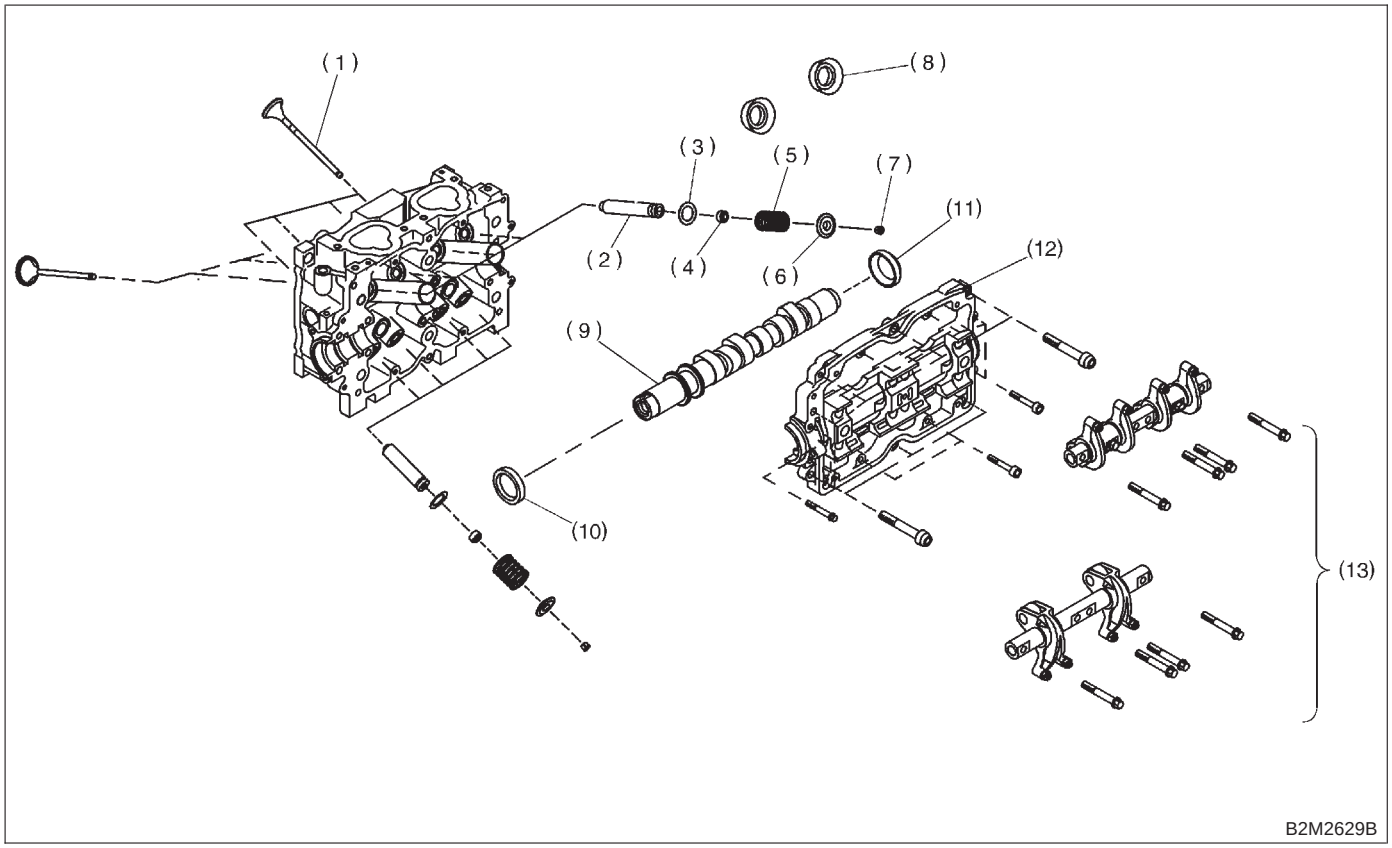
ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

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 spring 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 498267800 CYLINDER HEAD TABLE

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

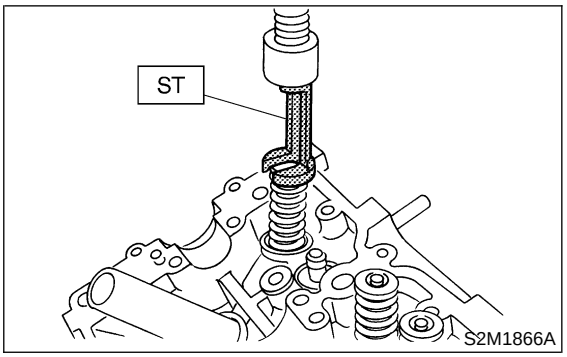
CAUTION:
When inserting valve into valve guide, use special care not to damage the oil seal lip.

(3) Install valve spring and retainer.

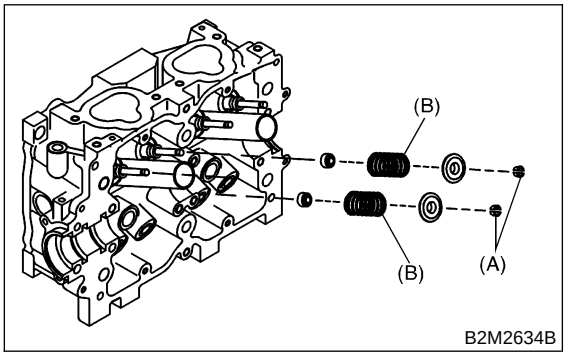
CAUTION:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



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



(A) Retainer key
(B) Painted face

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

E: INSTALLATION

1. CYLINDER HEAD

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.

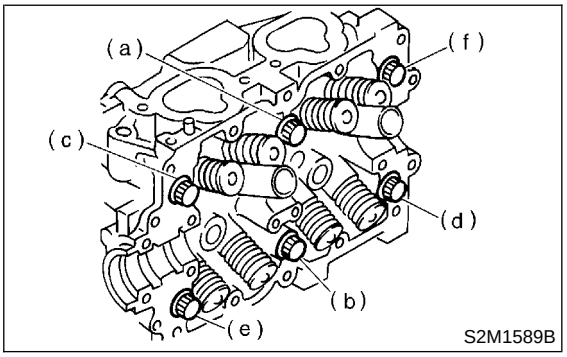
NOTE:
Bolts with pink marks on their bolts heads must be used for (c) through (f).

(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 shown in figure below.

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).

2. RELATED PARTS

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

1) Install camshafts. <Ref. to 2-3 [W5C0].>
2) Install intake manifold. <Ref. to 2-7 [W3D0].>
3) Tighten bolt which installs A/C compressor bracket on cylinder head. (With A/C model)

7. Cylinder Block

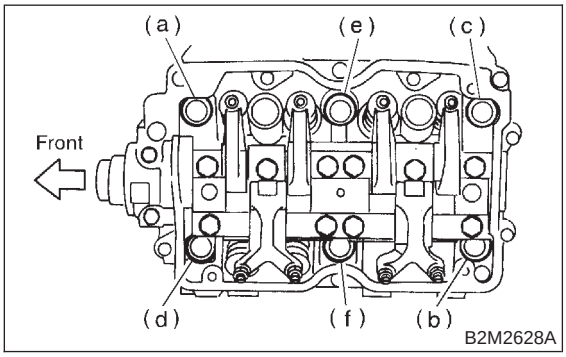
A: REMOVAL

1. RELATED PARTS

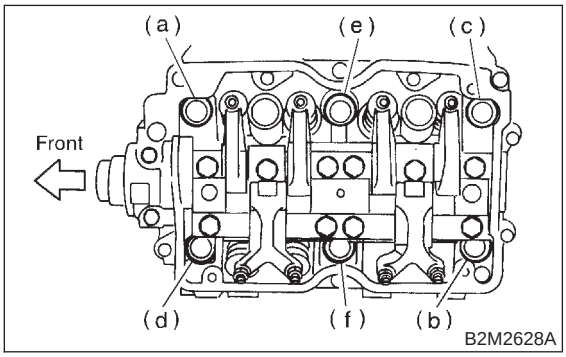
NOTE:
Before conducting this procedure drain engine oil completely if applicable.

1) Remove intake manifold. <Ref. to 2-7 [W3A0].>
2) Remove timing belt. <Ref. to 2-3 [W3A0].>
3) Remove A/C compressor bracket. (With A/C model)
4) Remove generator and A/C compressor with their brackets.
5) 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.



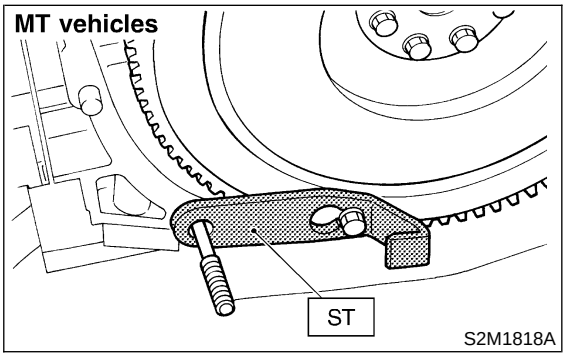
6) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
7) Remove bolts (a) and (b) to remove cylinder head.

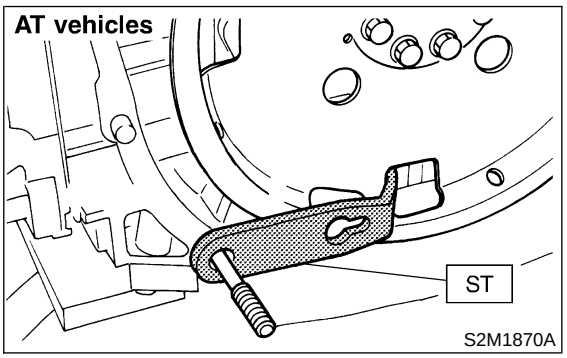


8) Remove cylinder head gasket.

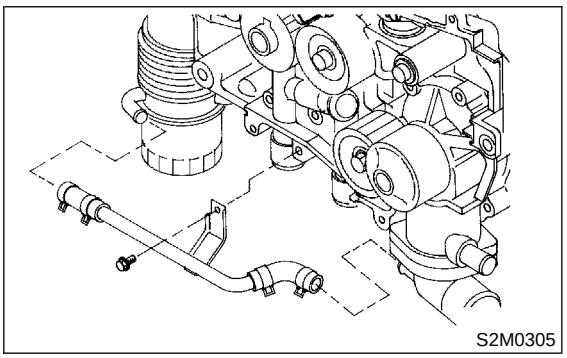
CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

9) Similarly, remove right side cylinder head.
10) Remove clutch housing cover (MT vehicles only).
11) Remove flywheel (MT vehicles only) or drive plate (AT vehicles only).
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER





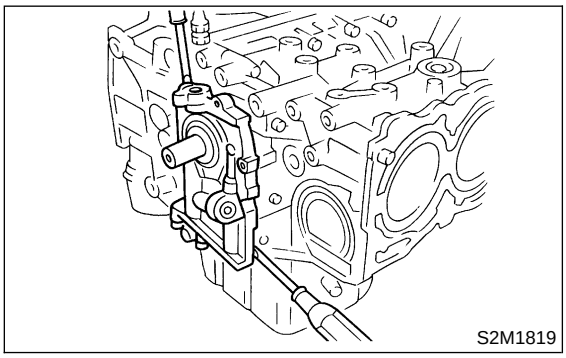
12) Remove oil separator cover.
13) Remove water by-pass pipe for heater.
14) Remove water by-pass pipe between oil cooler and water pump (AT vehicles only).



15) Remove water pump.

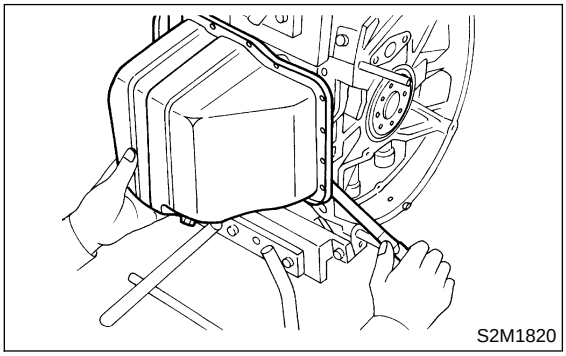
16) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in figure when removing oil pump.

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

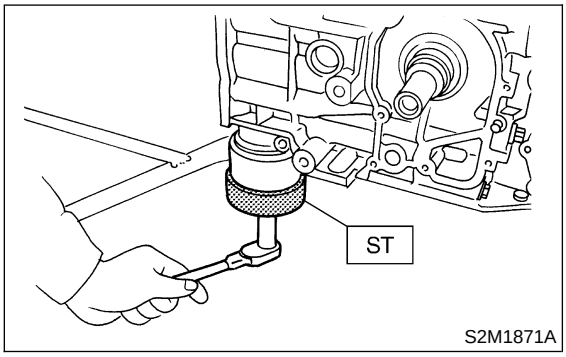

S2M1819

17) 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.

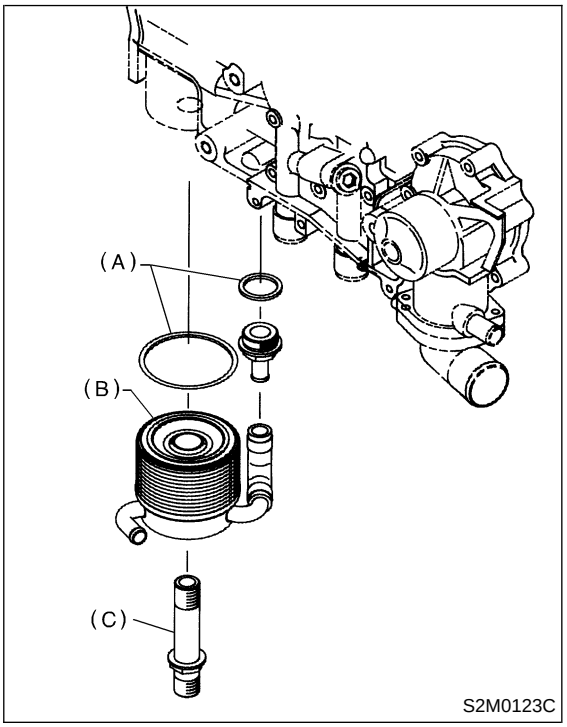

S2M1820

18) Remove oil strainer stay.
19) Remove oil strainer.
20) Remove baffle plate.
21) Remove oil filter using ST.
ST 498187000 OIL FILTER WRENCH



S2M1871A

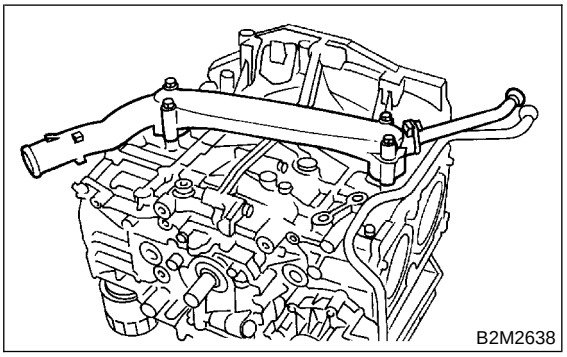
22) Remove oil cooler (AT vehicles only).



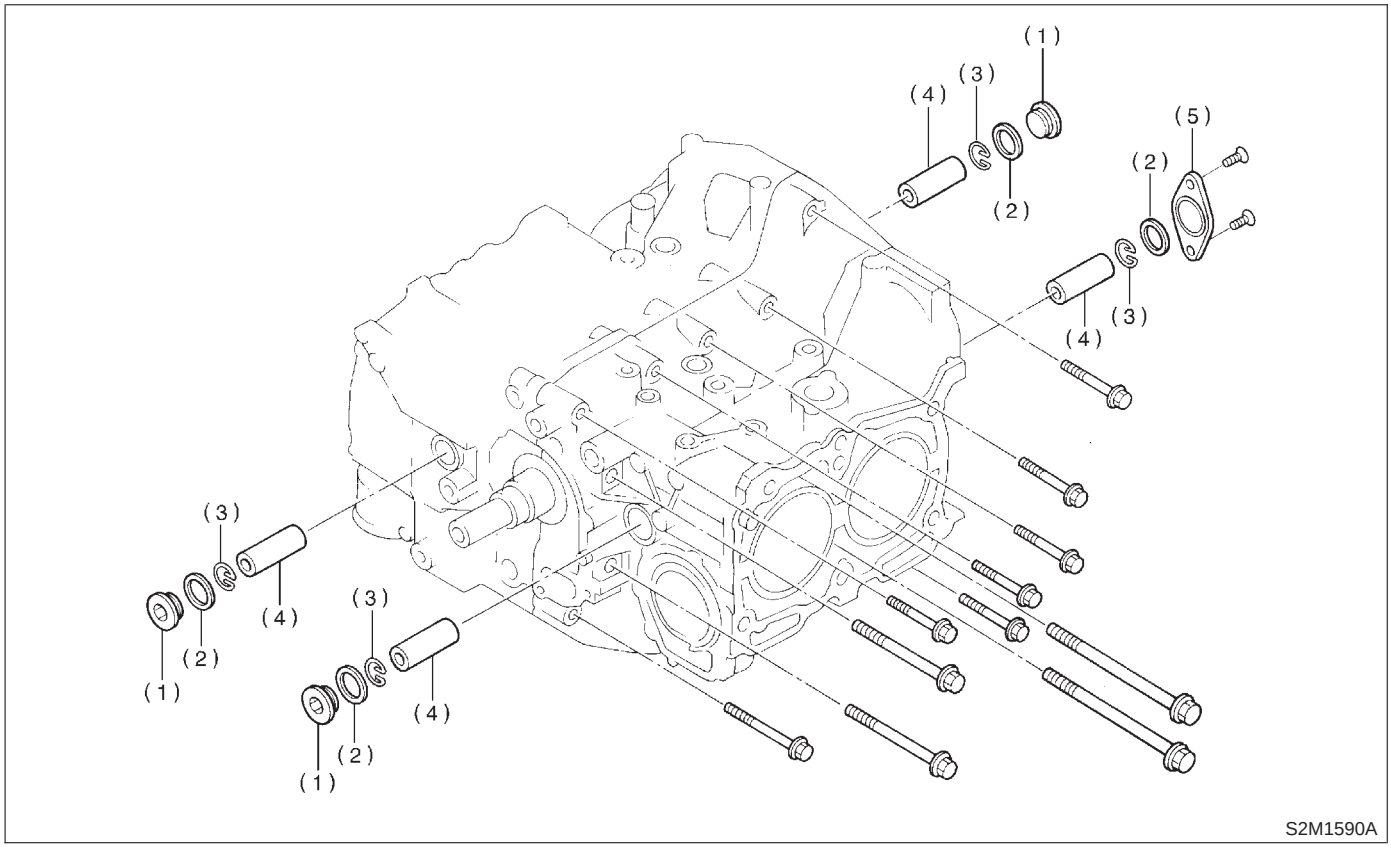
S2M0123C

(A) Gasket
(B) Oil cooler
(C) Connector

23) Remove water pipe. <Ref. to 2-5 [W7A0].>

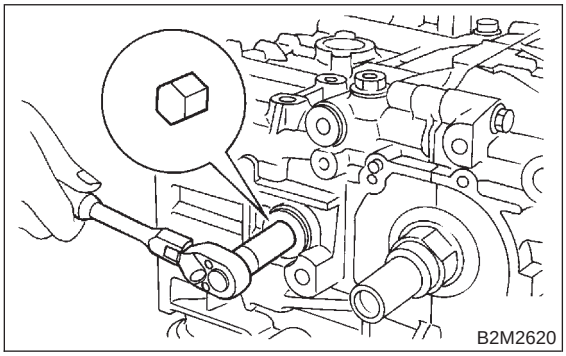

B2M2638

2. CYLINDER BLOCK

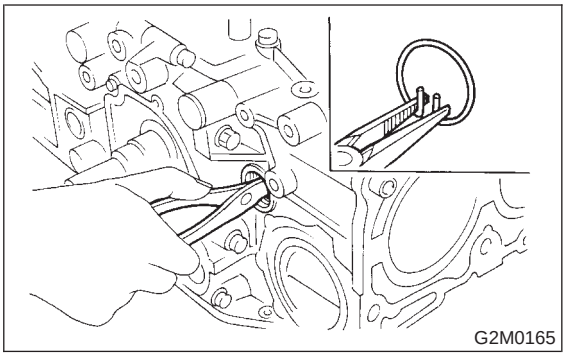


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover

1) Remove service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

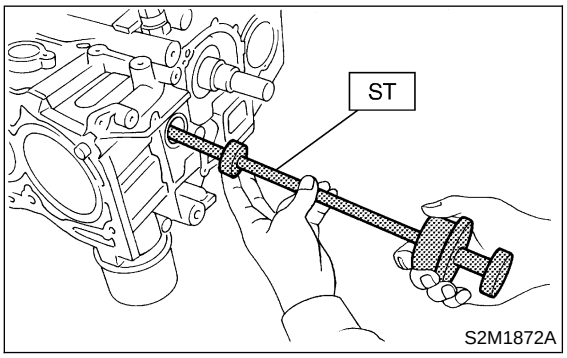


2) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders.



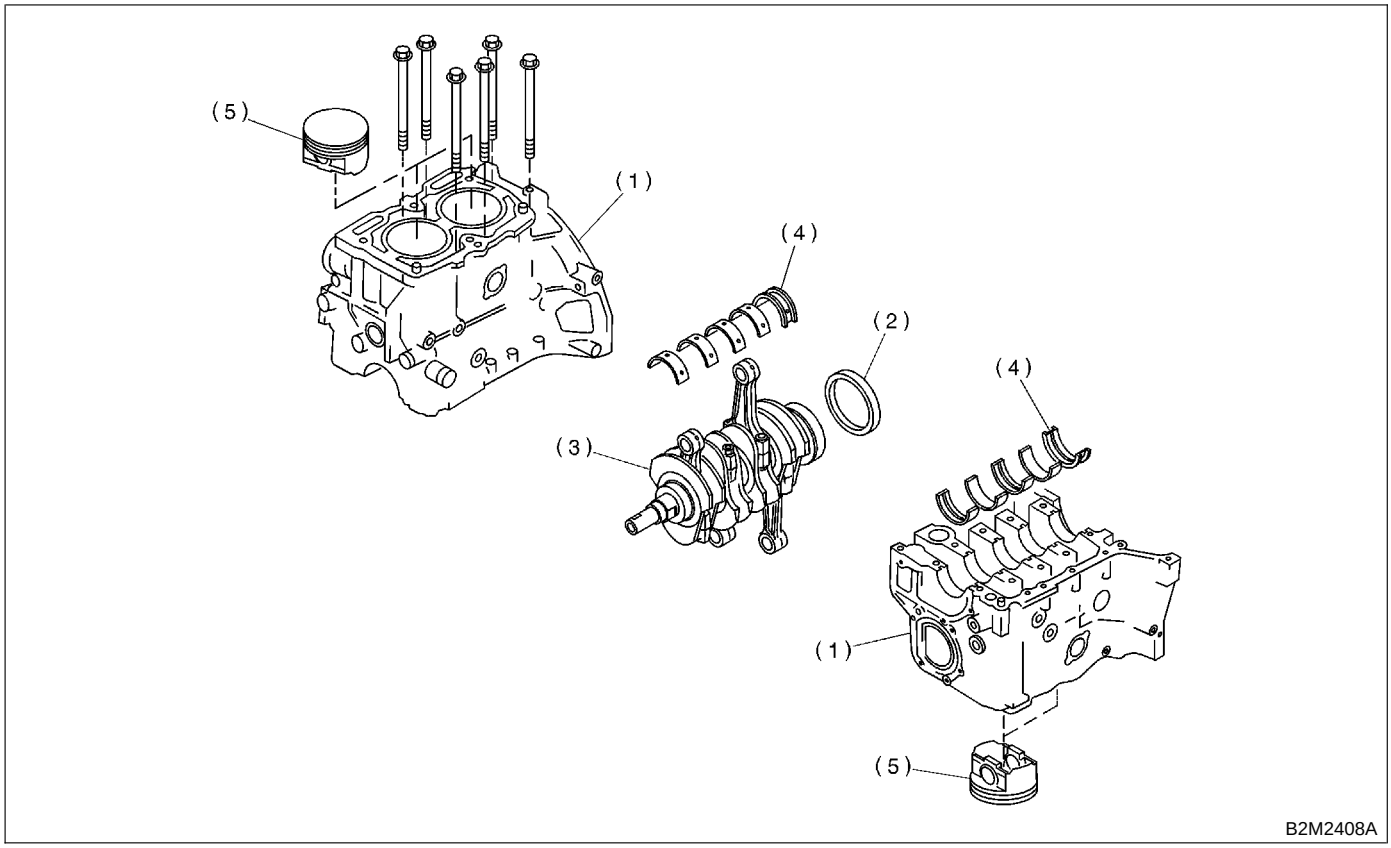
3) Draw out piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

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.
7) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.
8) 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.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

9) Remove rear oil seal.
10) Remove crankshaft together with connecting rod.
11) Remove crankshaft bearings from cylinder block using hammer handle.

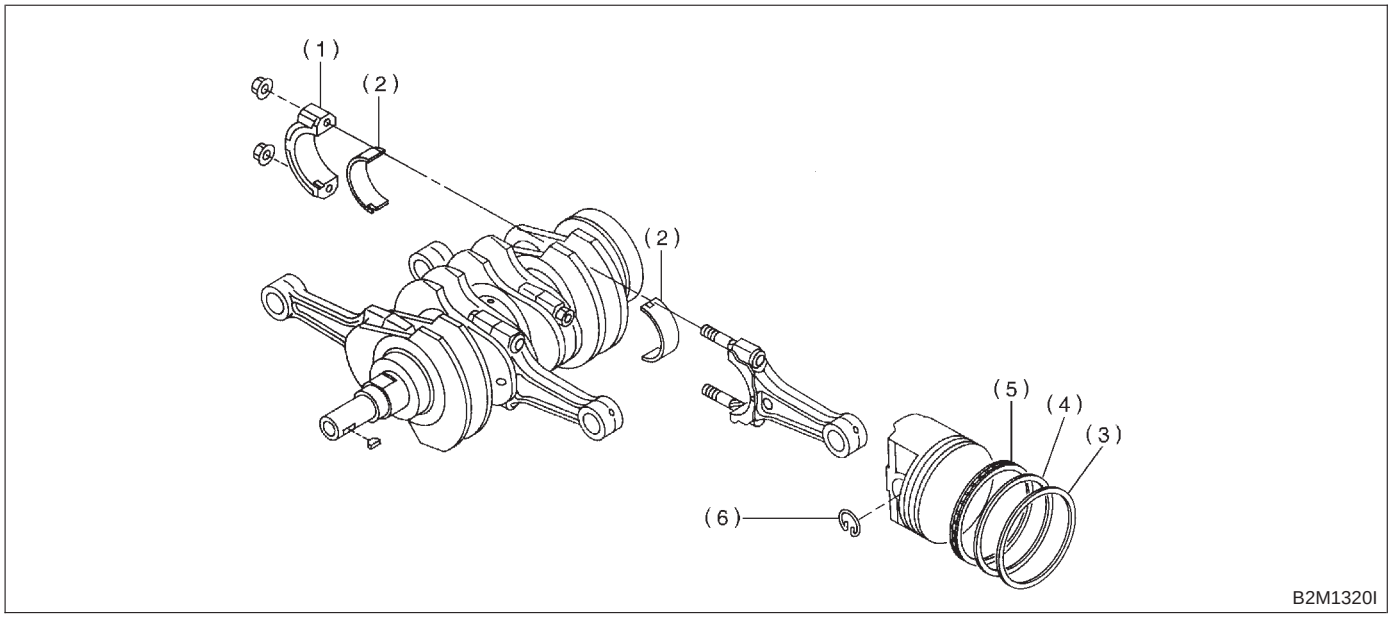
CAUTION:
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

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

CAUTION:
Do not confuse combination of piston and cylinder.

B: DISASSEMBLY

1. 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) 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)

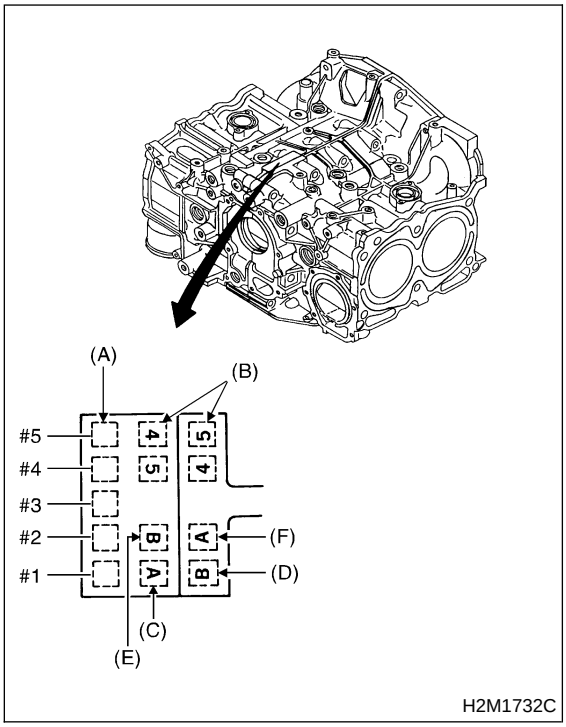
2. CYLINDER AND PISTON

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: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



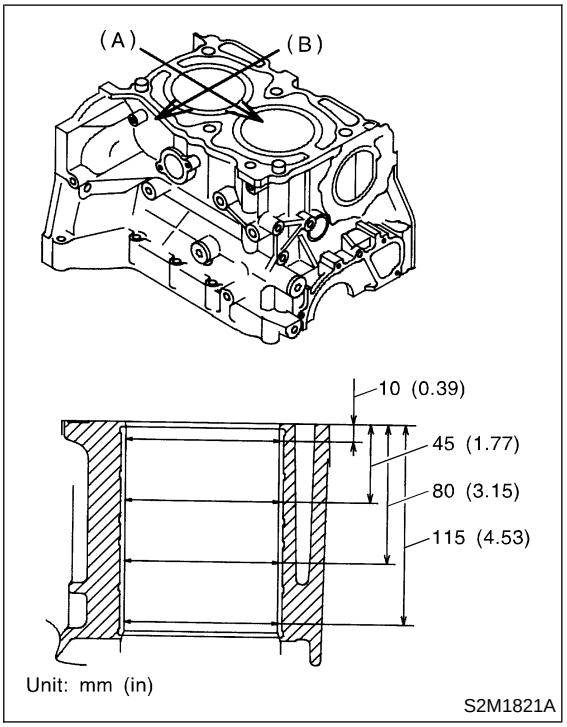
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

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)



(A) Thrust direction
(B) Piston direction

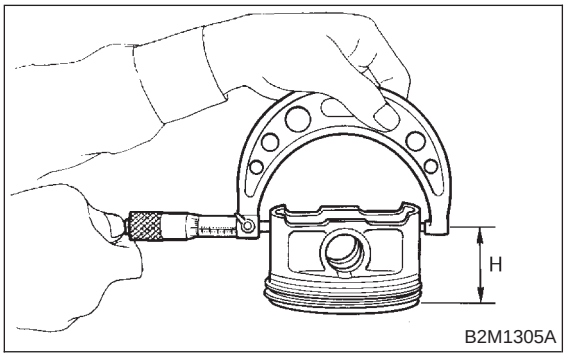
3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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:
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.

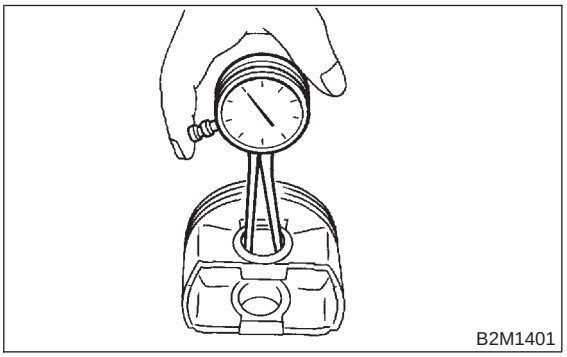
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

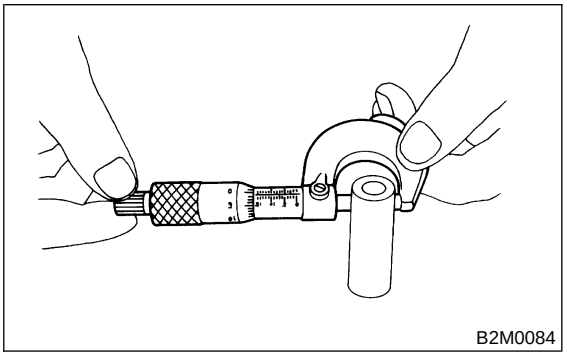
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

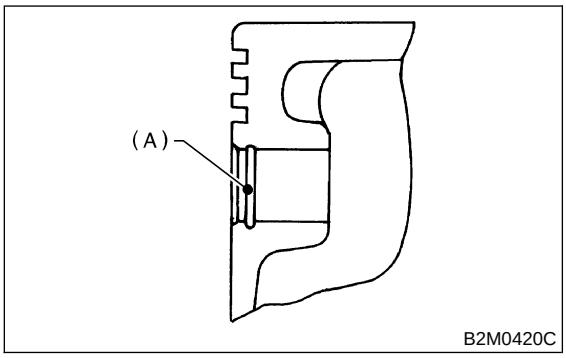
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to 2-3 [W7C2].> If any of the clearances is not to specification, replace the piston or bore the cylinder 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 (A). If necessary, remove burr from the groove so that piston pin can lightly move.

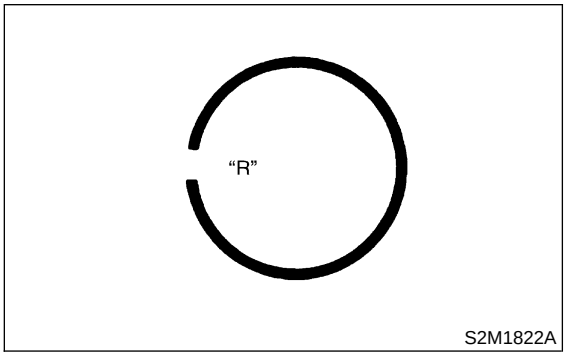


5) Check piston pin circlip for distortion, cracks and wear.

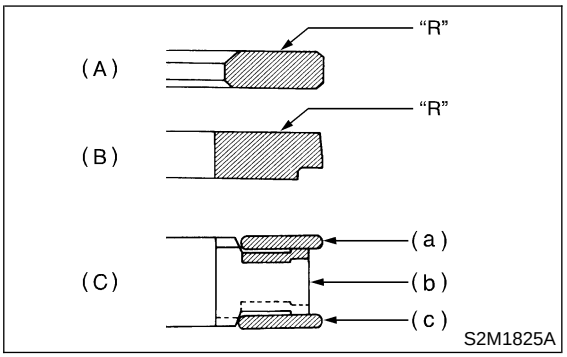
4. PISTON RING

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.

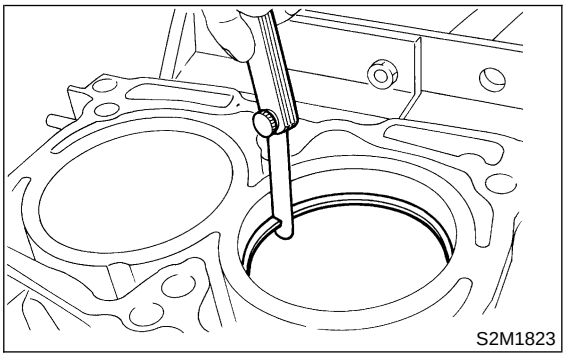


(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Spacer
(c) Lower rail

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	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.70 (0.0079 — 0.0276)	1.5 (0.059)

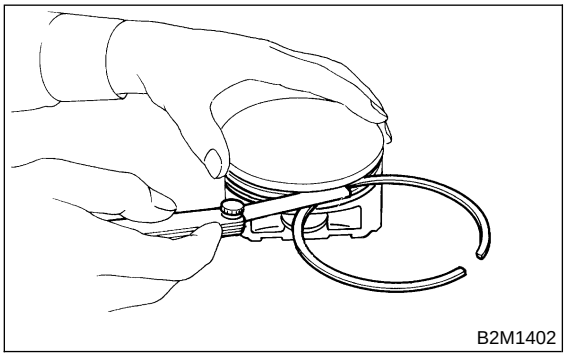


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

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

Unit: mm (in)

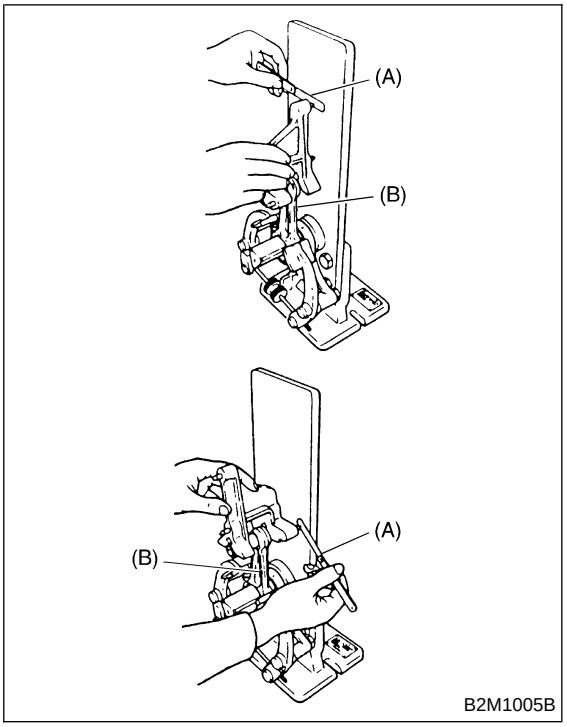
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



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.

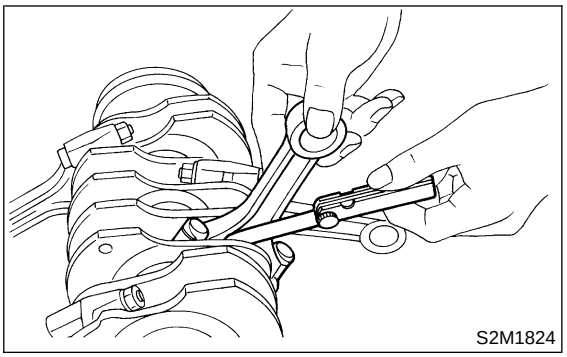
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

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.)

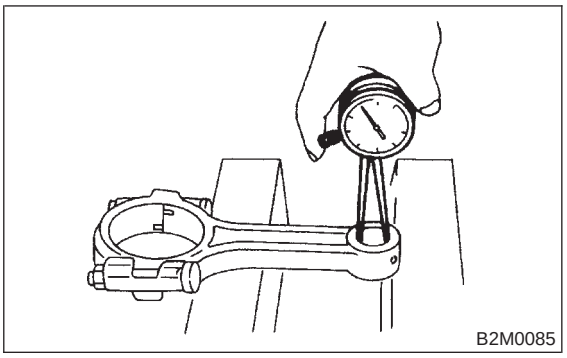
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

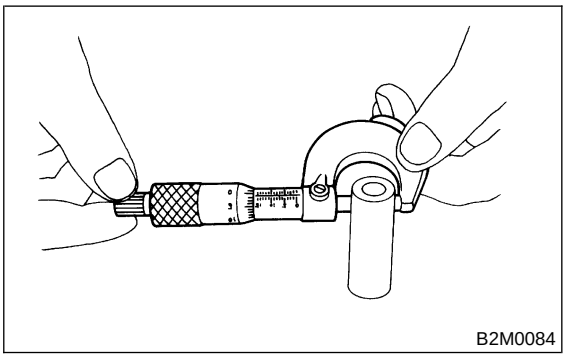
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 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.

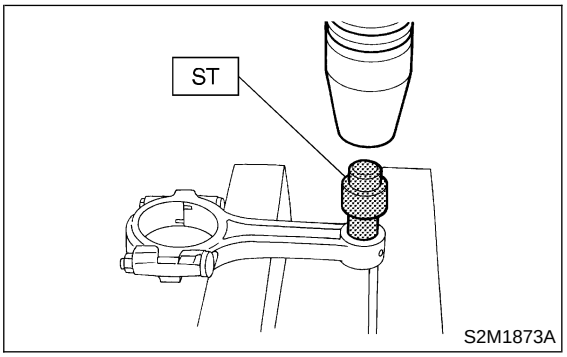
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


B2M0085


B2M0084

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



S2M1873A

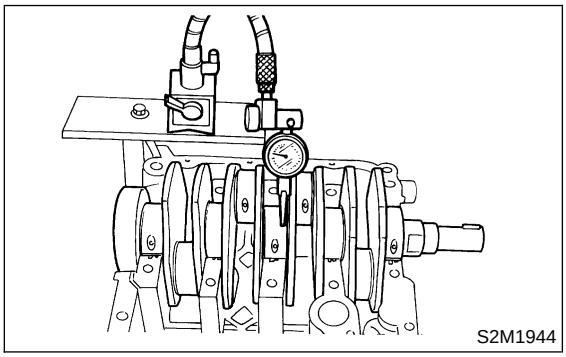
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

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.

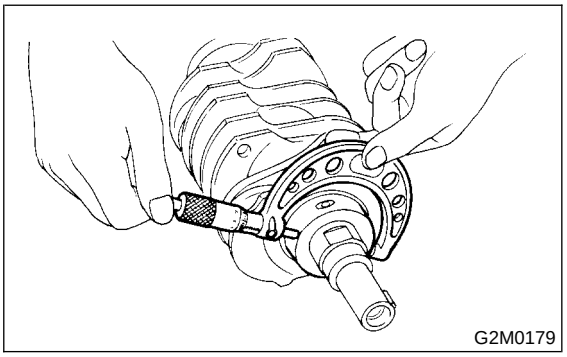
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


S2M1944

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace bearing with a suitable (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
0.250 mm (0.0098 in)


G2M0179

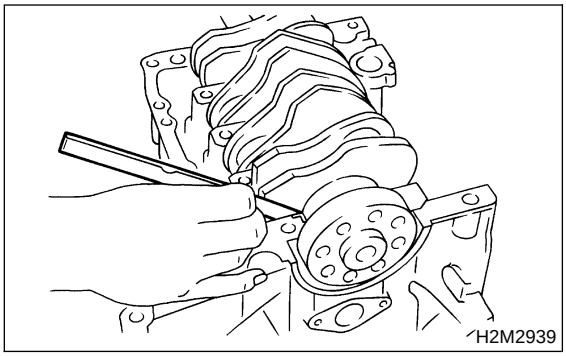
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	
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)

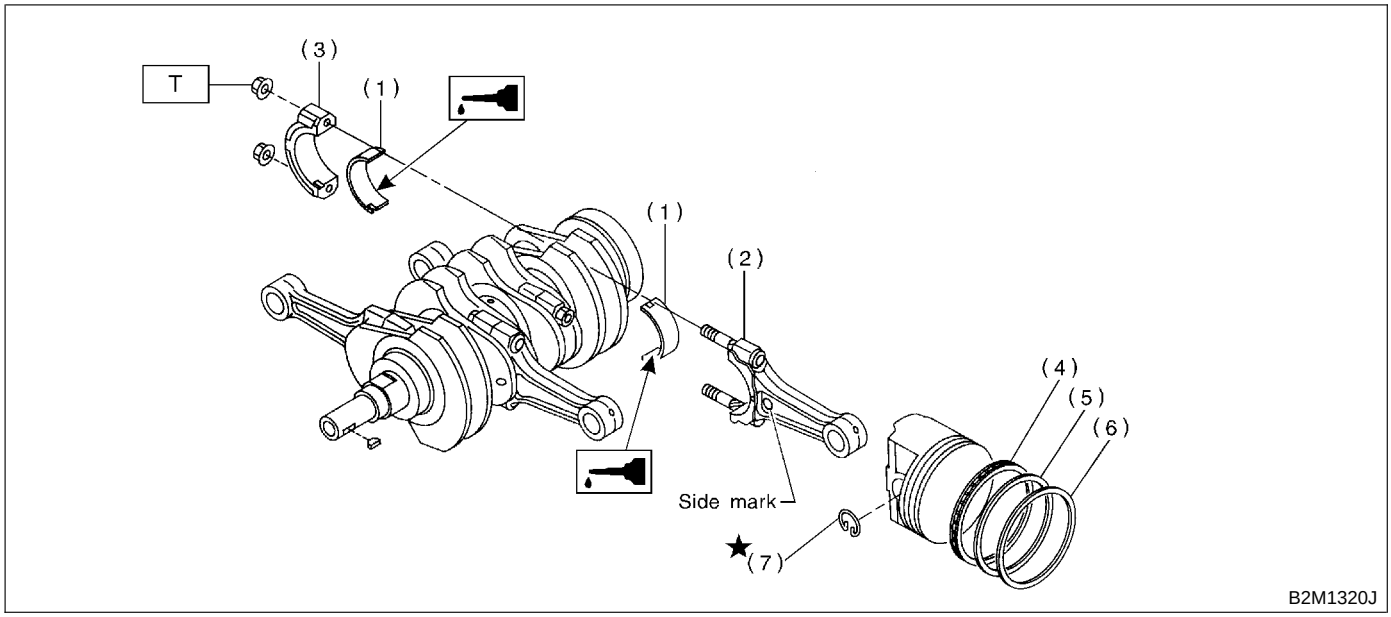


5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition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

	Unit: mm (in)
Crankshaft oil clearance	
Standard	0.010 — 0.030 (0.0004 — 0.0012)
Limit	0.040 (0.0016)

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: 44.6±1.5 (4.55±0.15, 32.9±1.1)

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

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

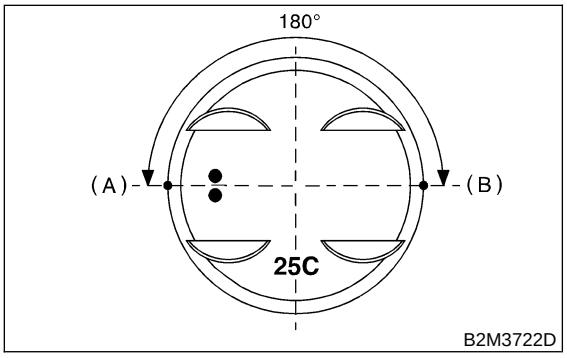
2) Install connecting rod on crankshaft.

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

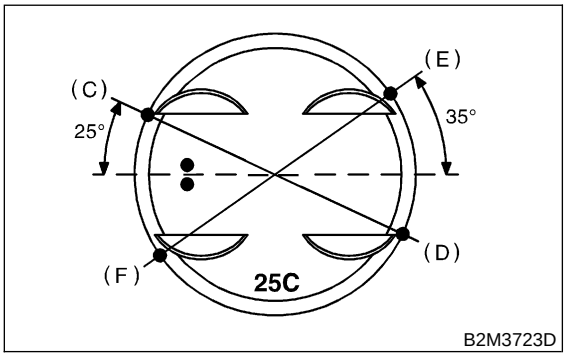
3) Install connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

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.

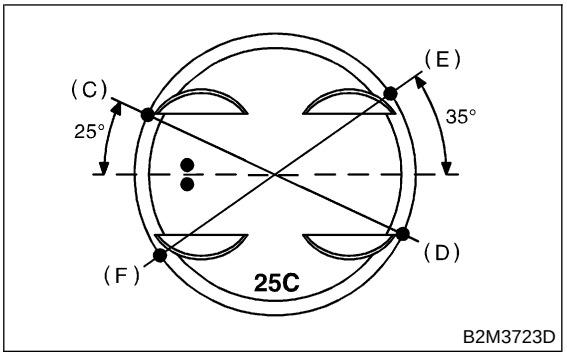


(3) Position the second ring gap at 180° on the reverse side for the top ring gap.
(4) Position the upper rail gap at (C) or (D) in the figure.



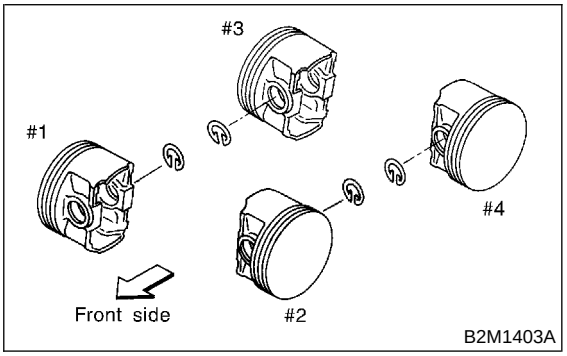
(5) Position the expander gap at 180° of the reverse side for the upper rail gap.
(6) Position the lower rail gap at (E) or (F) in the figure.

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

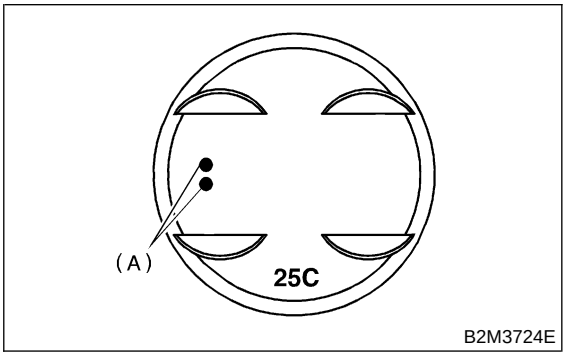


5) Install circlip.
Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

CAUTION:
Use new circlips.

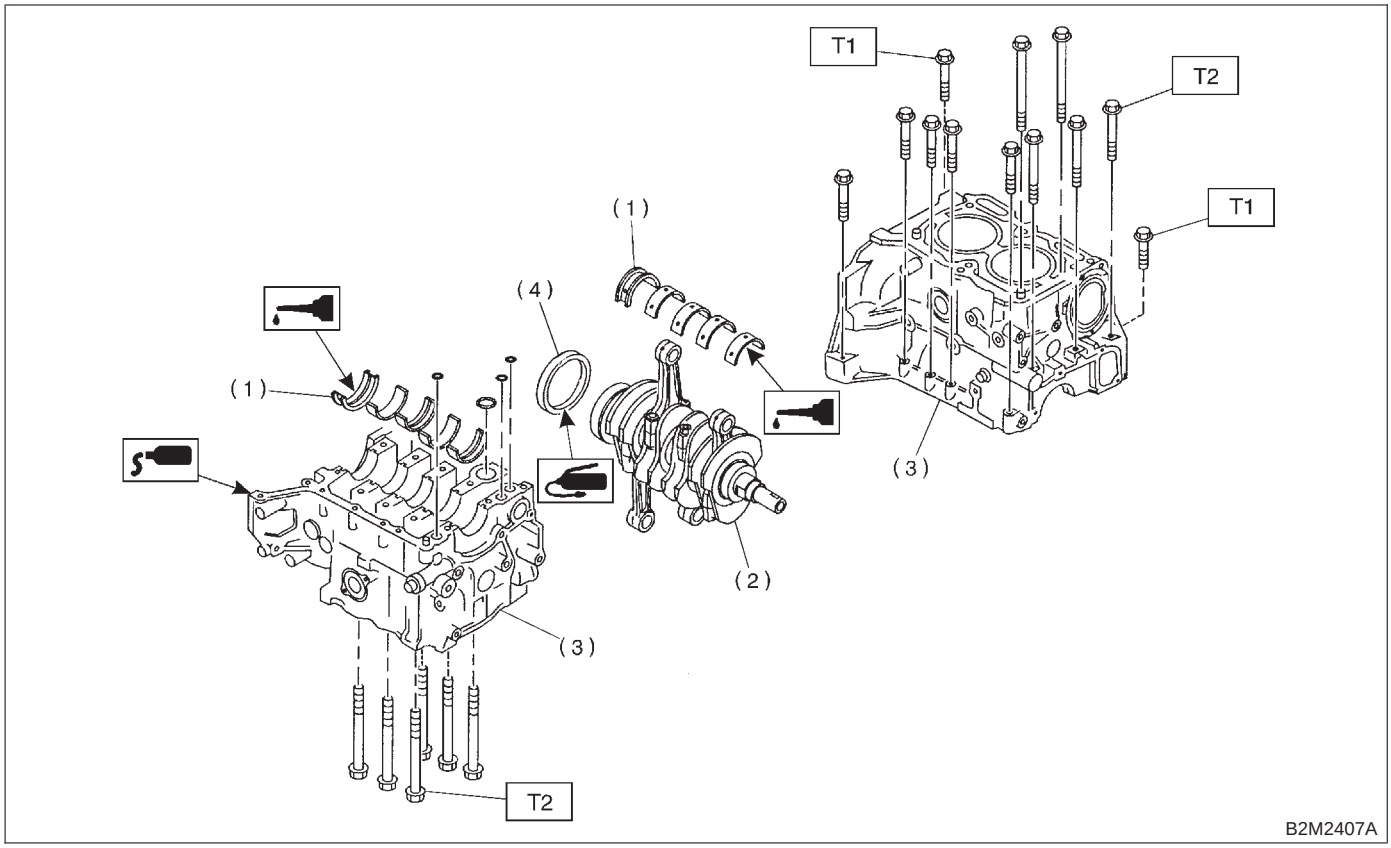


CAUTION:
Piston front mark (A) faces towards the front of the engine.



E: INSTALLATION

1. 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

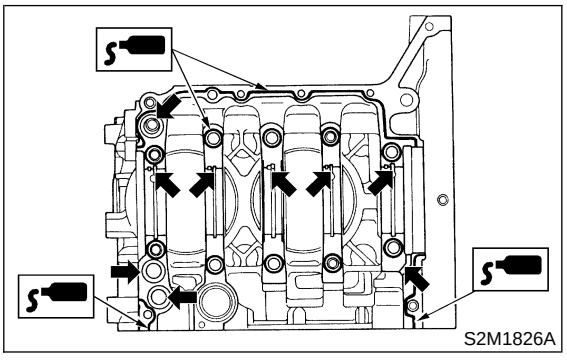
CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft on the #1 and #3 cylinder block.

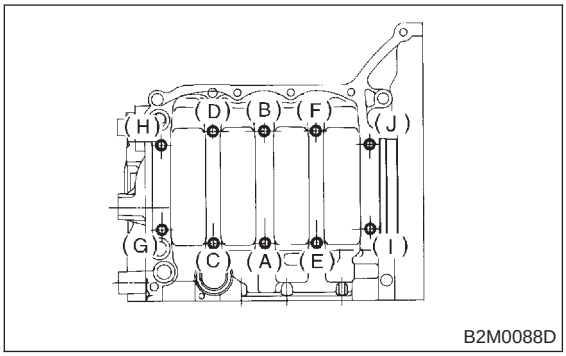
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and put #2 and #4 cylinder blocks on, and align to #1 and #3.

Fluid packing:
THREE BOND 1215 or equivalent

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

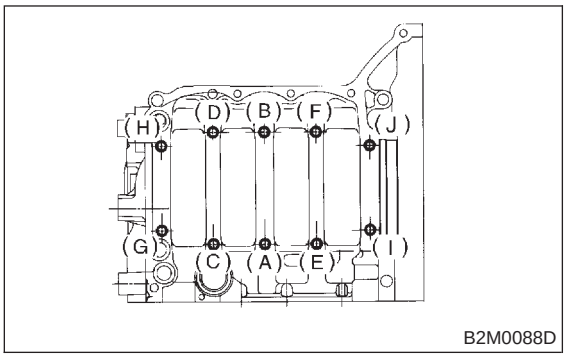


4) Temporarily tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure.



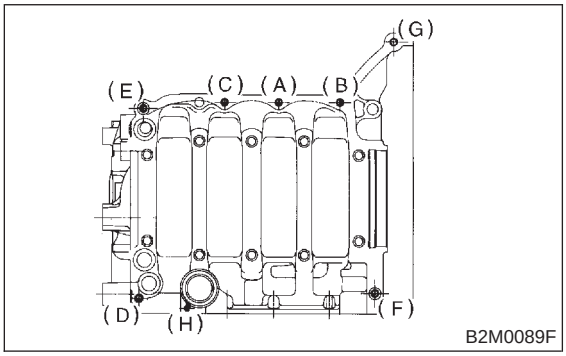
5) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence.

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

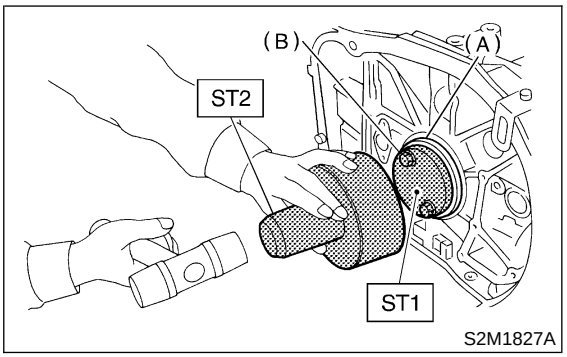


6) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

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)

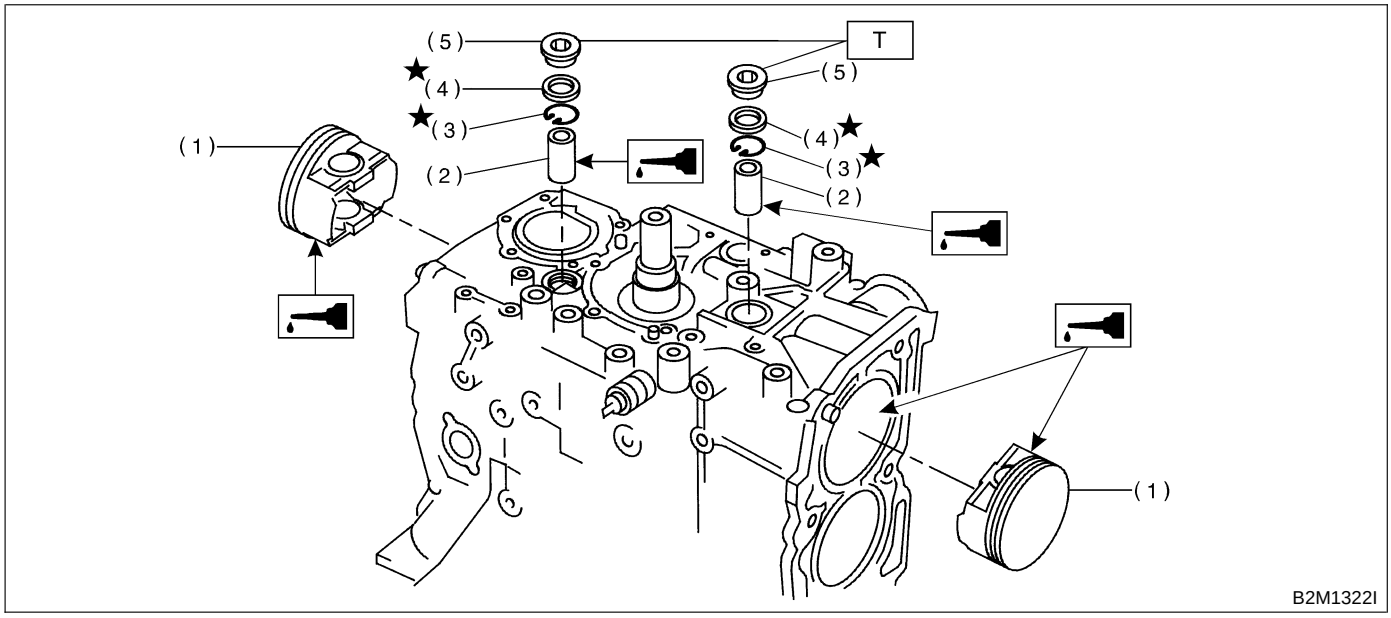


7) Install rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER



(A) Rear oil seal
(B) Flywheel attaching bolt

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



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

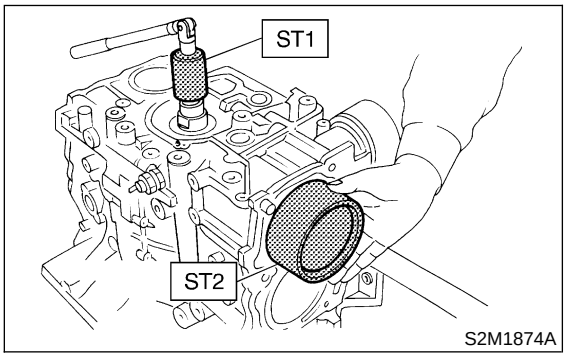
Tightening torque: N·m (kg-m, ft-lb)
T: 69±7 (7.0±0.7, 50.6±5.1)

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.

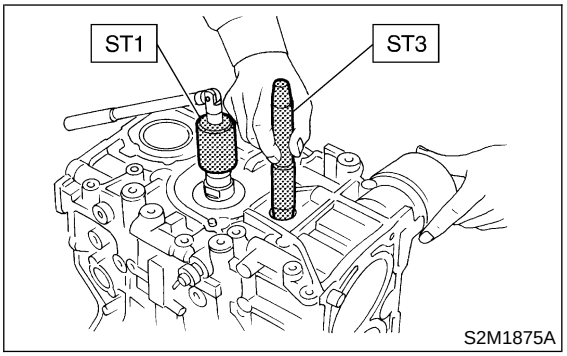
ST2 498747300 PISTON GUIDE



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.

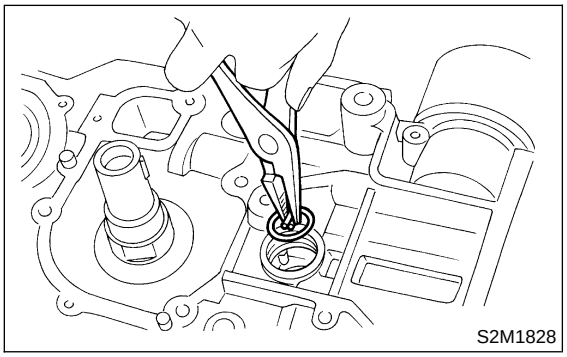
ST3 499017100 PISTON PIN GUIDE



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

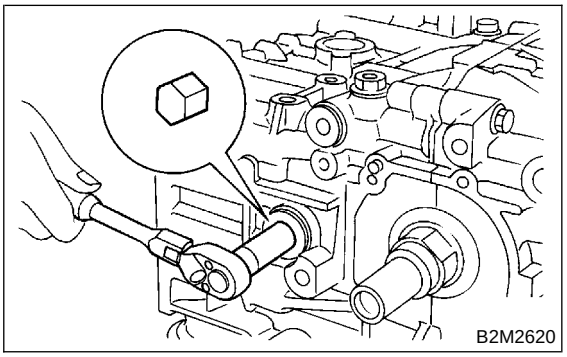
(3) Install circlip.

CAUTION:
Use new circlips.

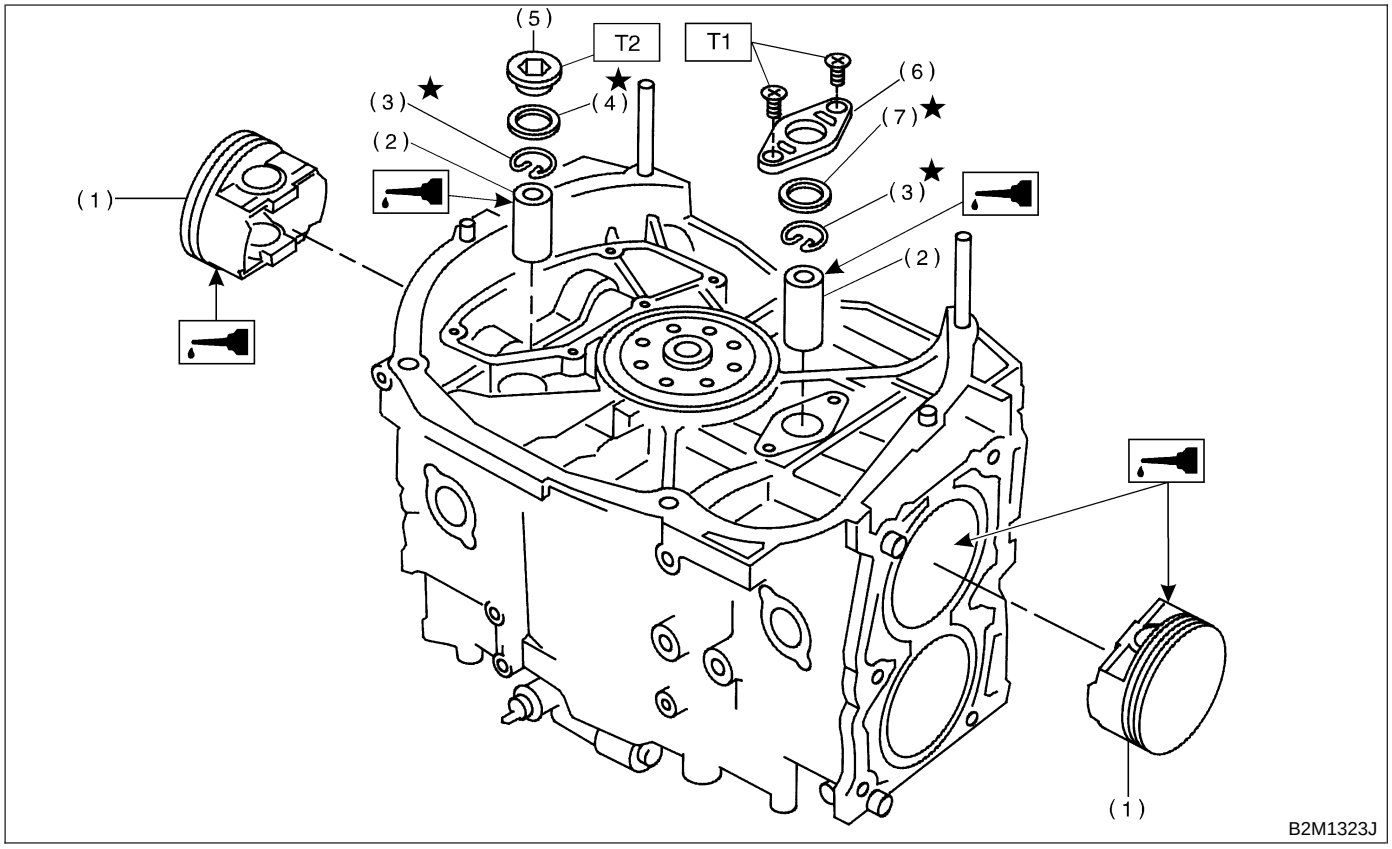


(4) Install service hole plug and gasket.

CAUTION:
Use a new gasket.



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



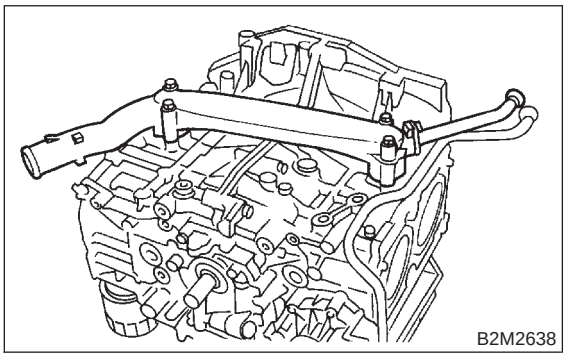
(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

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.

4. RELATED PARTS

1) Install water pipe. <Ref. to 2-5 [W7B0].>



2) Install baffle plate.

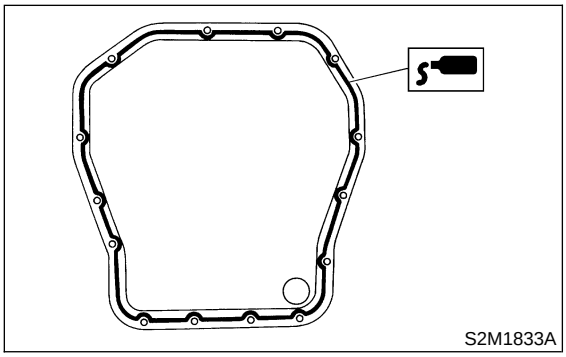
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)

3) Install oil strainer and O-ring.

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

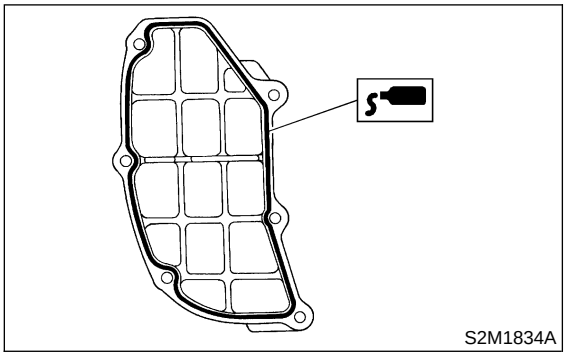
4) Install oil strainer stay.
5) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



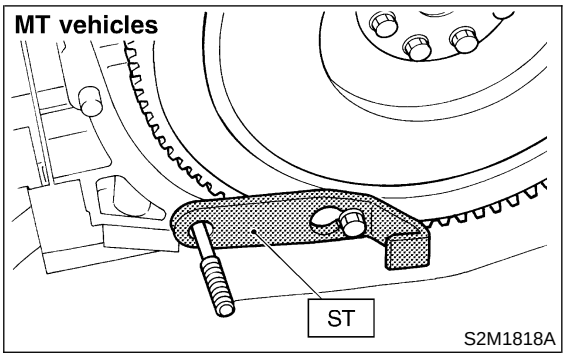
6) Apply fluid packing to matching surfaces and install oil separator cover.

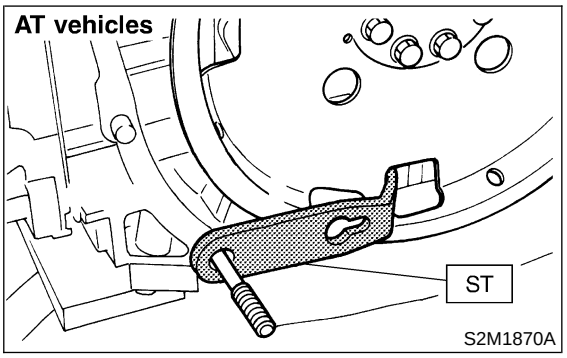
Fluid packing:
THREE BOND 1215 or equivalent



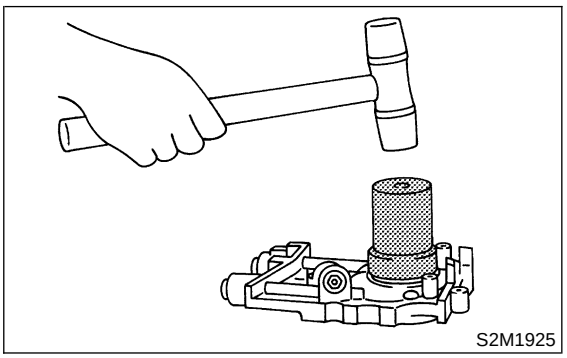
7) Install flywheel or drive plate.
To lock crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

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



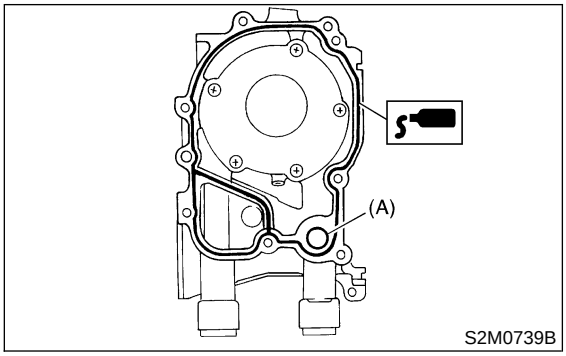


8) Install housing cover.
9) Installation of oil pump
(1) Discard front oil seal after removal. Replace with a new one using ST.
ST 499587100 OIL SEAL INSTALLER



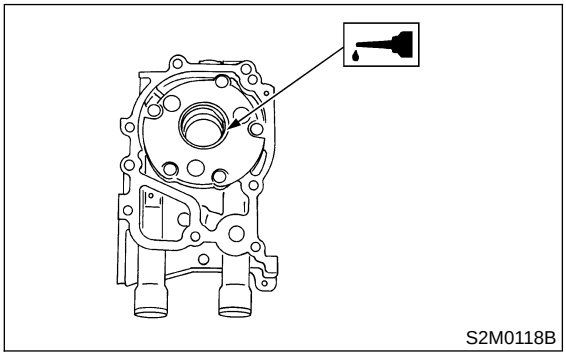
(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



(A) O-ring

(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.

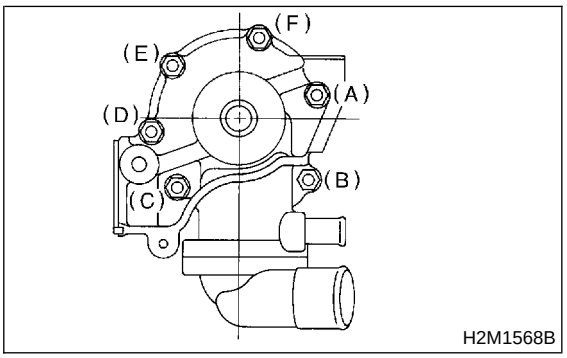
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)

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.

10) Install water pump and gasket.

Tightening torque:
First; 12±2 N·m (1.2±0.2 kg-m, 8.7±1.4 ft-lb)
Second; 12±2 N·m (1.2±0.2 kg-m, 8.7±1.4 ft-lb)

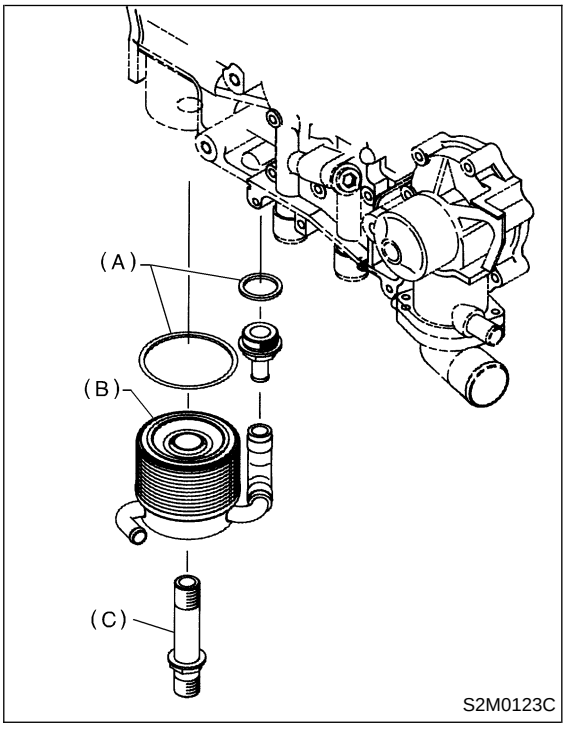
CAUTION:
● Be sure to use a new gasket.
● When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.



11) Install water by-pass pipe for heater.
12) Install oil cooler (AT vehicles only).

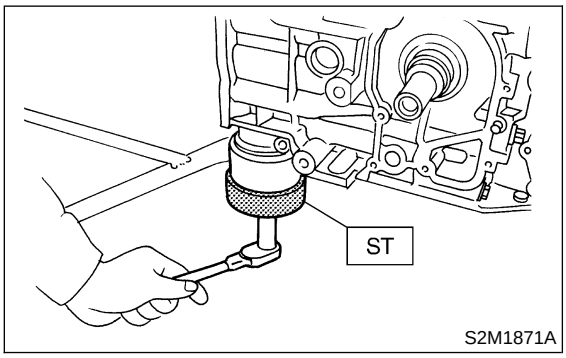
Tightening torque:
54±5 N·m (5.5±0.5 kg-m, 39.8±3.6 ft-lb)

CAUTION:
Always use a new gasket.

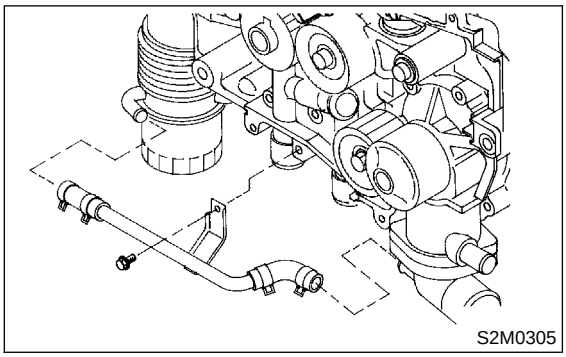


(A) Gasket
(B) Oil cooler
(C) Connector

13) Install oil filter using ST.
ST 498547000 OIL FILTER WRENCH



14) Install water by-pass pipe between oil cooler and water pump (AT vehicles only).



15) Tighten cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.

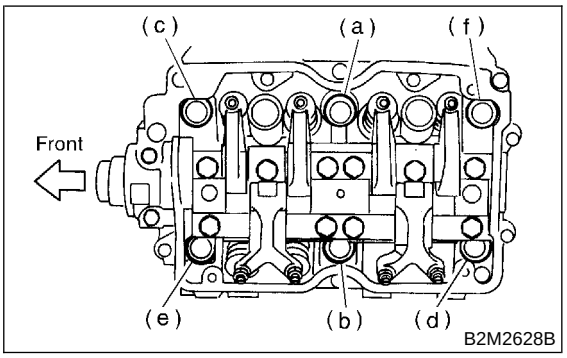
NOTE:
Bolts with pink marks on their bolt heads must be used for (c) through (f).

(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°.



16) Install oil level gauge guide and tighten attaching bolt (left side only).
17) Install timing belt, camshaft sprocket and related parts.
<Ref. to 2-3 [W3C0].>
18) Install generator and A/C compressor brackets on cylinder head.
19) Install drive belts. <Ref. to 1-5 [G2A0].>
20) Install intake manifold. <Ref. to 2-7 [W3D0].>

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 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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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 [T100].>		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

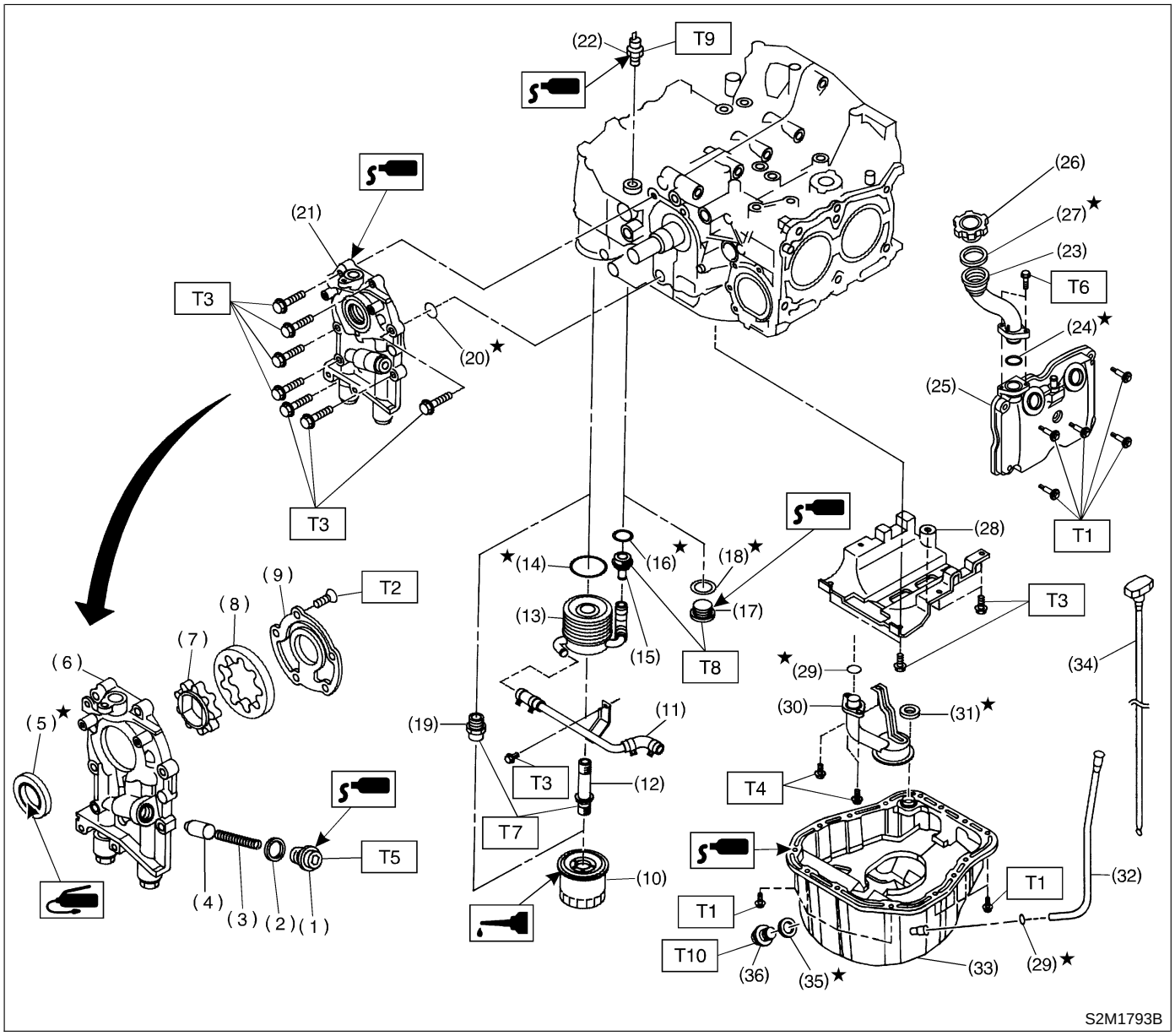
Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	● Valve mechanism is defective. ● Incorrect valve clearance ● Worn valve rocker ● Worn camshaft ● Broken valve spring
Heavy and dull clank	Oil pressure is low.	● Worn crankshaft main bearing ● Worn 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. Specifications

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)	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 x 1.5
Relief valve (on rocker shaft) operation pressure					69 kPa (0.7 kg/cm^2, 10 psi)
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure				14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure				More than 981 kPa (10 kg/cm^2, 142 psi)
Oil pan capacity					4.0 ℓ (4.2 US qt, 3.5 Imp qt)

1. Lubrication System



COMPONENT PARTS

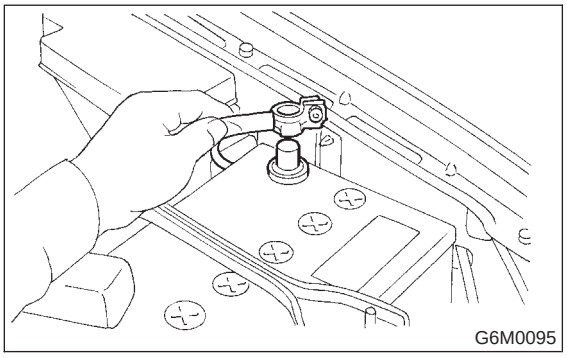
(1) Plug
(2) Washer
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler pipe and hose ASSY (AT vehicles)
(12) Connector (AT vehicles)
(13) Oil cooler (AT vehicles)
(14) Gasket (AT vehicles)
(15) Nipple (AT vehicles)
(16) Gasket (AT vehicles)
(17) Plug (MT vehicles)
(18) Gasket (MT vehicles)
(19) Oil filter connector (MT vehicles)
(20) O-ring
(21) Oil pump ASSY
(22) Oil pressure switch
(23) Oil filler duct
(24) O-ring
(25) Cylinder head cover
(26) Oil filler cap
(27) O-ring
(28) Baffle plate
(29) O-ring
(30) Oil strainer
(31) Gasket
(32) Oil level gauge guide
(33) Oil pan
(34) Oil level gauge
(35) Metal gasket
(36) 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)
T6: 6.4±0.5 (0.65±0.05, 4.7±0.4)
T7: 54±5 (5.5±0.5, 39.8±3.6)
T8: 69±7 (7.0±0.7, 50.6±5.1)
T9: 25±3 (2.5±0.3, 18.1±2.2)
T10: 44 (4.5, 33)

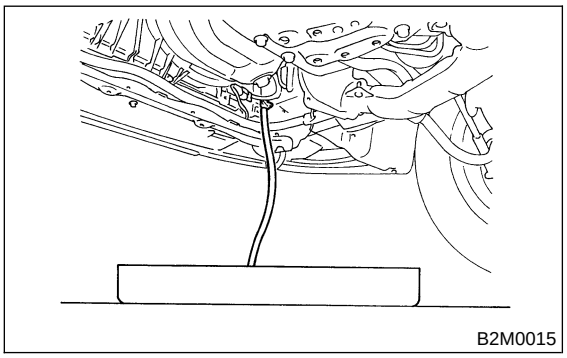
1. Oil Pump

A: REMOVAL

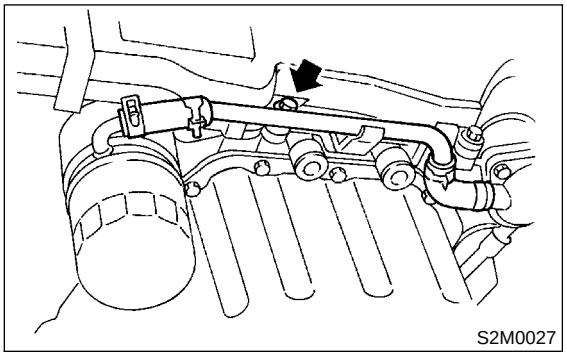
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


G6M0095

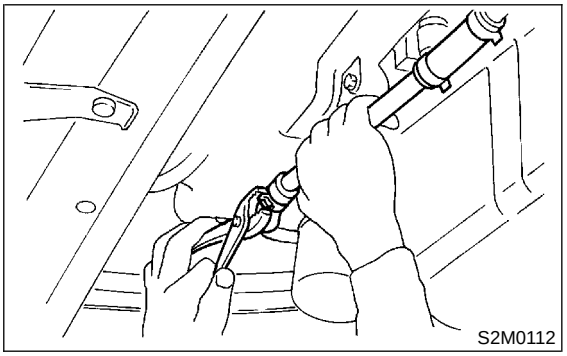
3) Lift-up the vehicle.
4) Remove under cover.
5) Drain coolant. <Ref. to 2-5 [W1A0].>


B2M0015

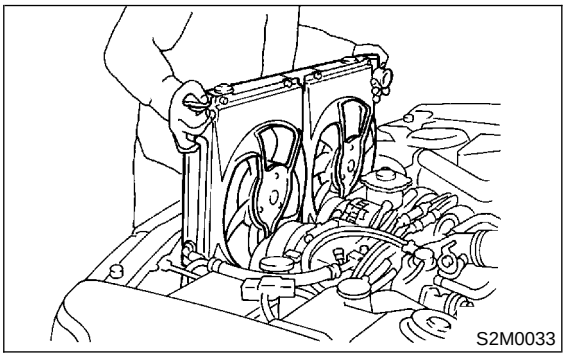
6) Remove bolts which install water pipe of oil cooler to oil pump. (AT vehicles only)


S2M0027

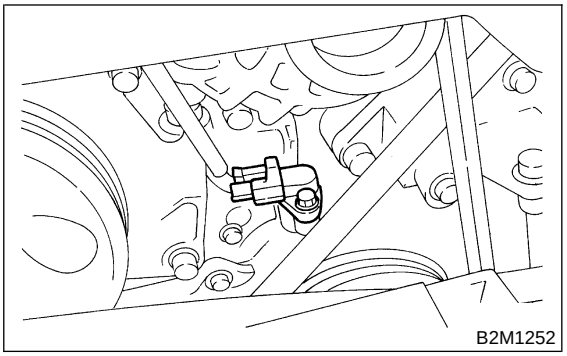
7) Remove water pipe and hoses between oil cooler and water pump. (AT vehicles only)


S2M0112

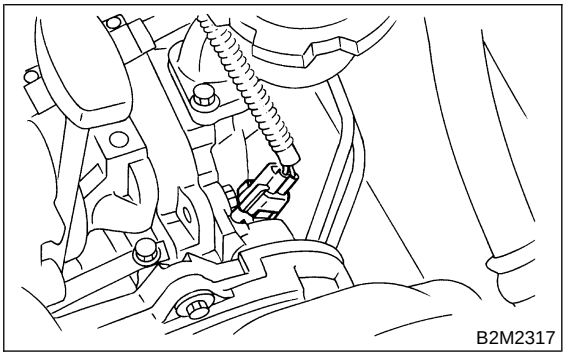
8) Lower the vehicle.
9) Remove radiator. <Ref. to 2-5 [W3A0].>


S2M0033

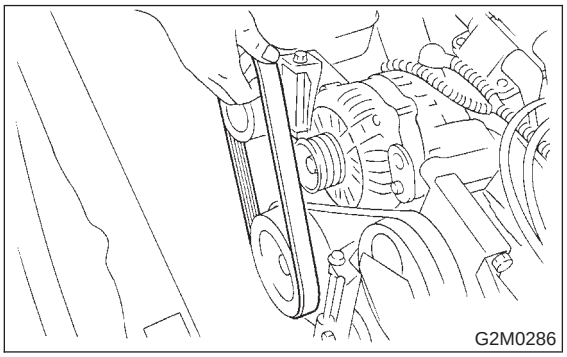
10) Remove crankshaft position sensor.


B2M1252

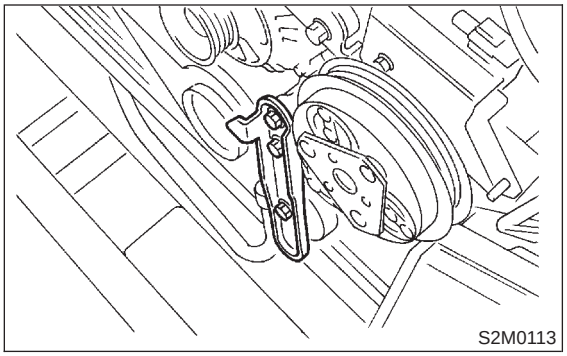
11) Remove camshaft position sensor. <Ref. to 2-7 [W10A0].>


B2M2317

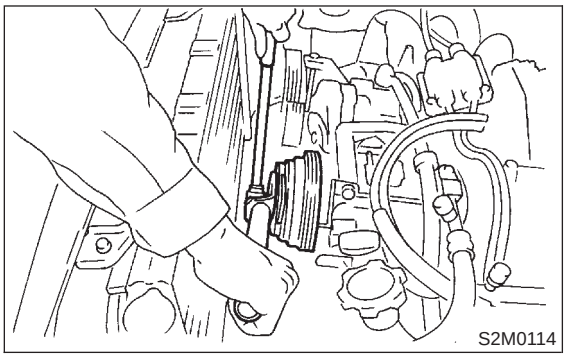
12) Remove V-belts. <Ref. to 1-5 [G2A0].>


G2M0286

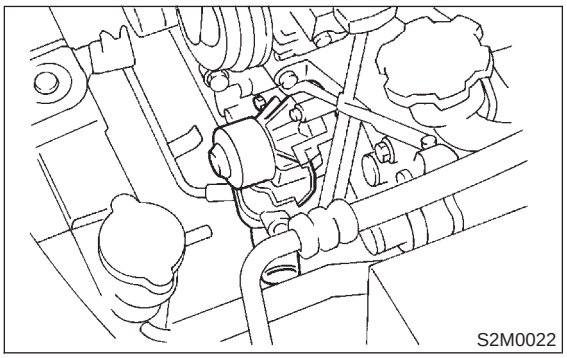
13) Remove rear side V-belt tensioner.


S2M0113

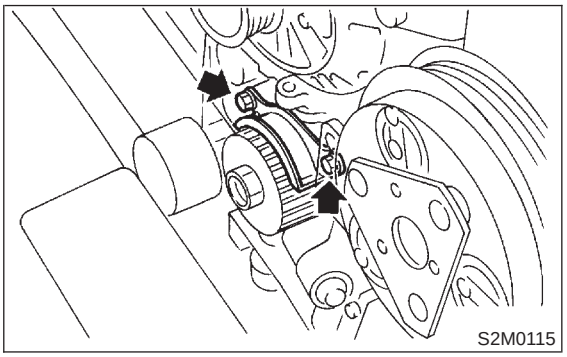
14) Remove crankshaft pulley using ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH


S2M0114

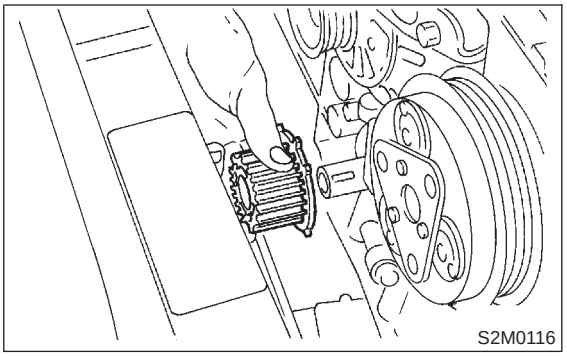
15) Remove water pump. <Ref. to 2-5 [W1A0].>


S2M0022

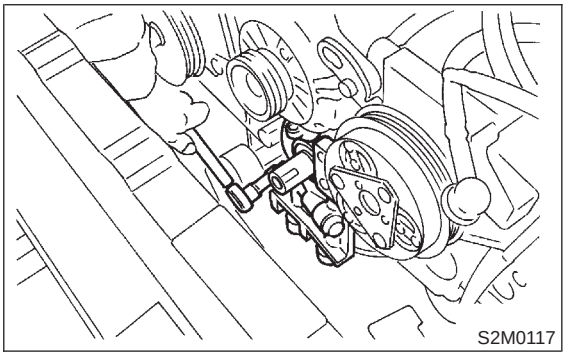
16) Remove timing belt guide. (MT vehicles only)


S2M0115

17) Remove crankshaft sprocket.

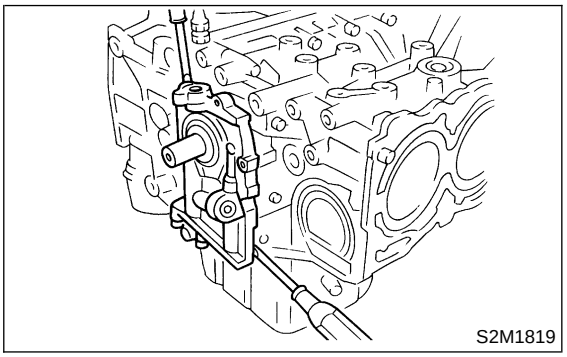

S2M0116

18) Remove bolts which install oil pump onto cylinder block.


S2M0117

19) Remove oil pump using flat bladed screwdriver.

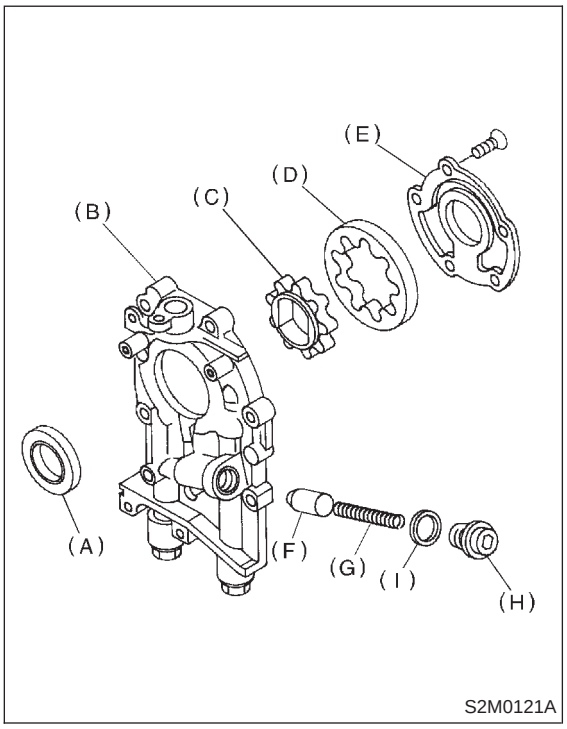
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.


S2M1819

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.



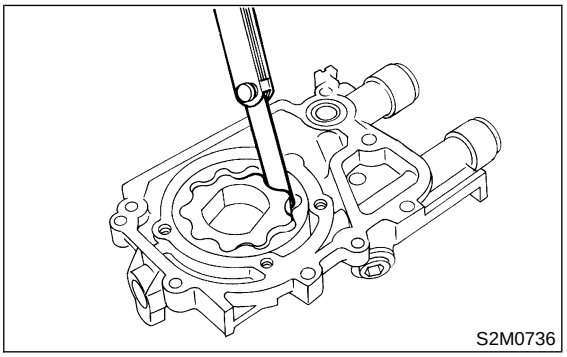
(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief spring
(H) Plug
(I) Washer

C: INSPECTION

1. TIP CLEARANCE

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

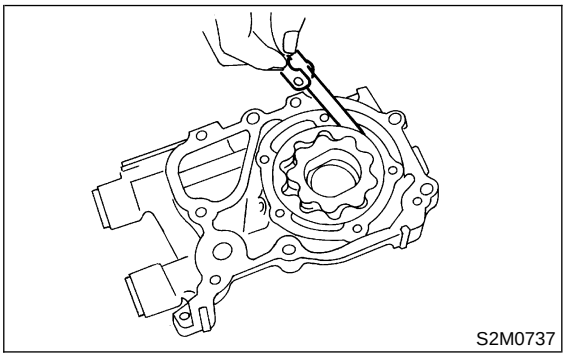
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



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.

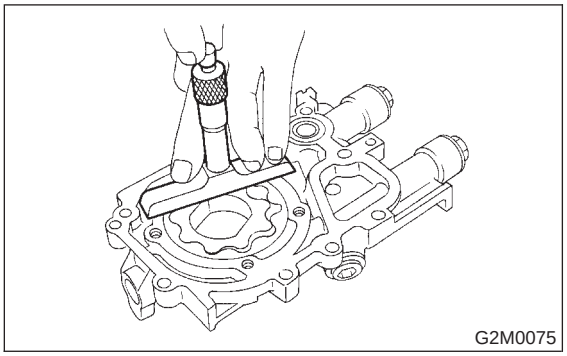
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



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.

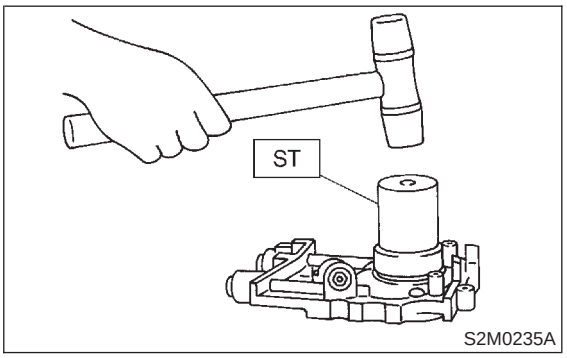
6. OIL SEAL

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

D: ASSEMBLY

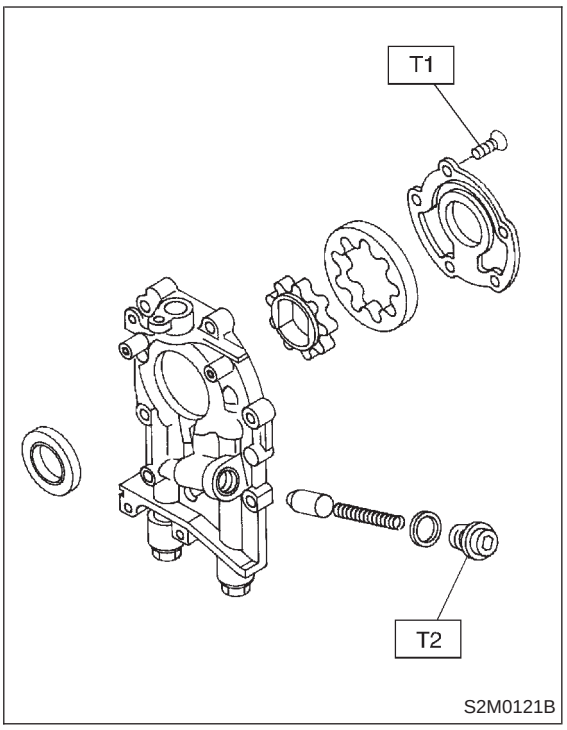
1) Install front oil seal using ST.
ST 499587100 OIL SEAL INSTALLER

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 — 47.5 N·m (4.15 — 4.84 kg-m, 30.0 — 35.0 ft-lb)

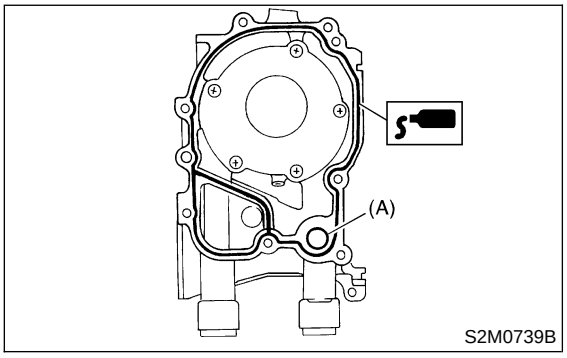


E: INSTALLATION

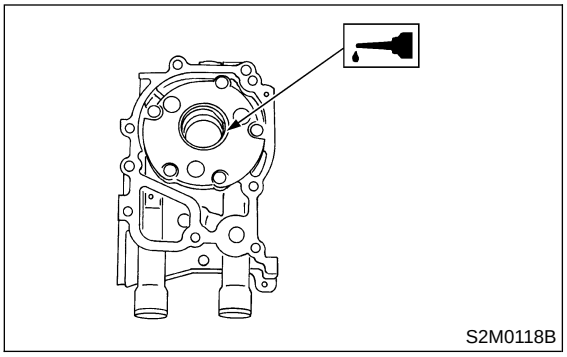
Install in the reverse order of removal.
Observe the following:
1) Apply fluid packing to matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent

2) Replace O-ring (A) with a new one.



3) Apply a coat of engine oil to the inside of the oil seal.

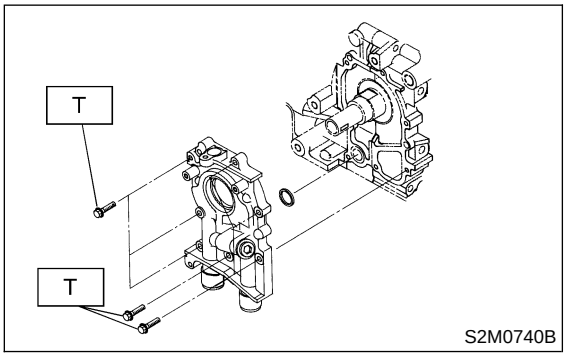


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install oil pump.

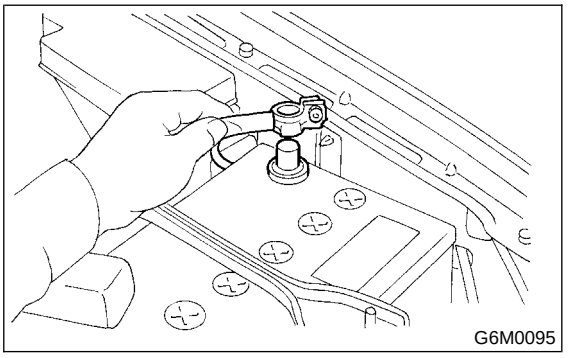
Tightening torque:
T: 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



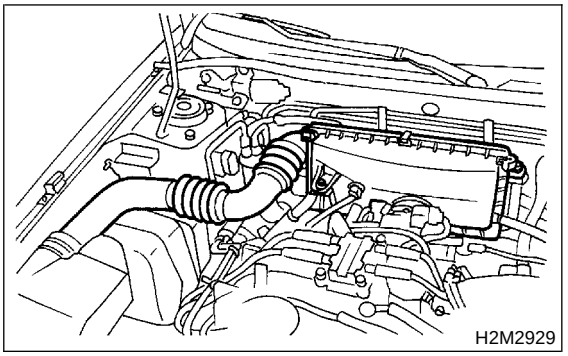
2. Oil Pan and Oil Strainer

A: REMOVAL

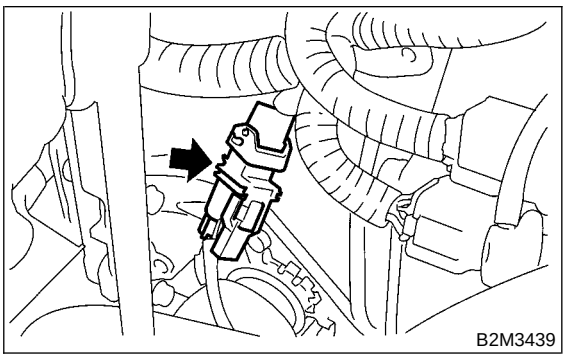
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



3) Remove air intake duct and air cleaner assembly. <Ref. to 2-7 [W1A0].>



4) Disconnect front oxygen (A/F) sensor connector.

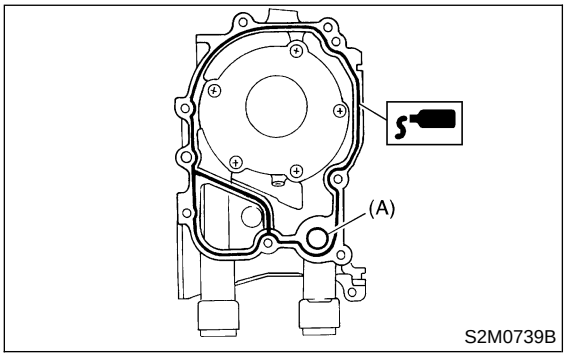


E: INSTALLATION

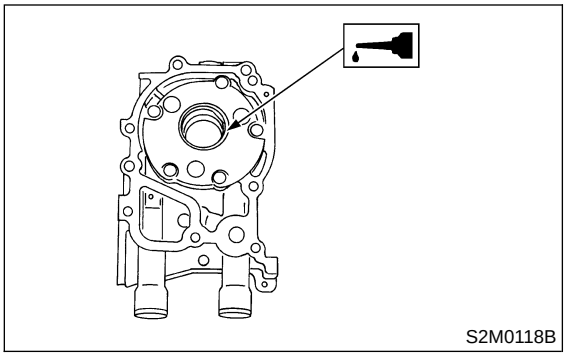
Install in the reverse order of removal.
Observe the following:
1) Apply fluid packing to matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent

2) Replace O-ring (A) with a new one.



3) Apply a coat of engine oil to the inside of the oil seal.

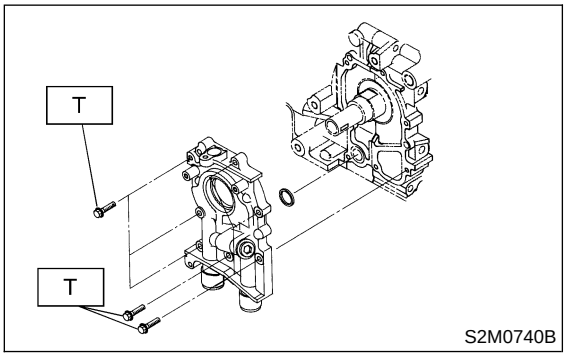


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install oil pump.

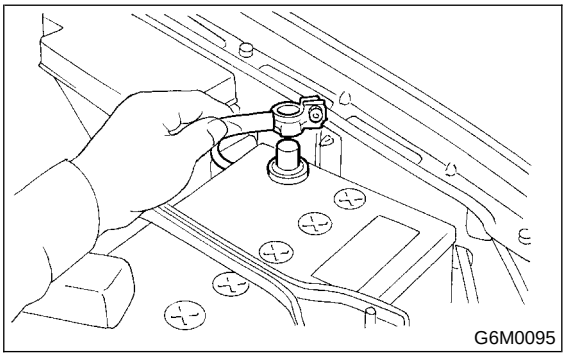
Tightening torque:
T: 6.4 N·m (0.65 kg-m, 4.7 ft-lb)



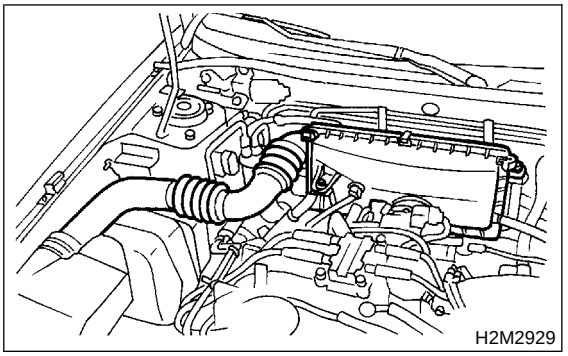
2. Oil Pan and Oil Strainer

A: REMOVAL

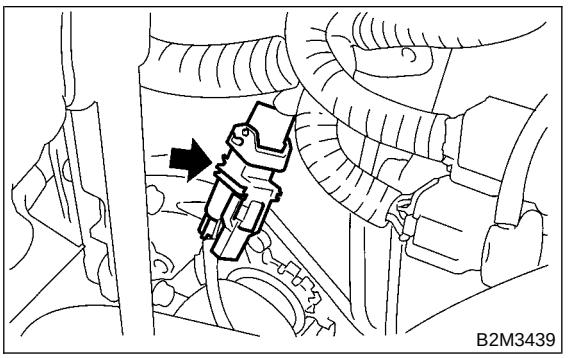
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



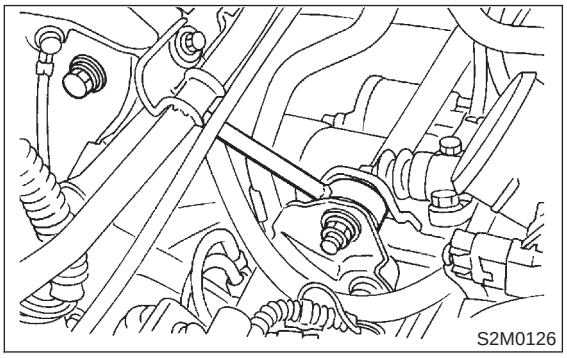
3) Remove air intake duct and air cleaner assembly. <Ref. to 2-7 [W1A0].>



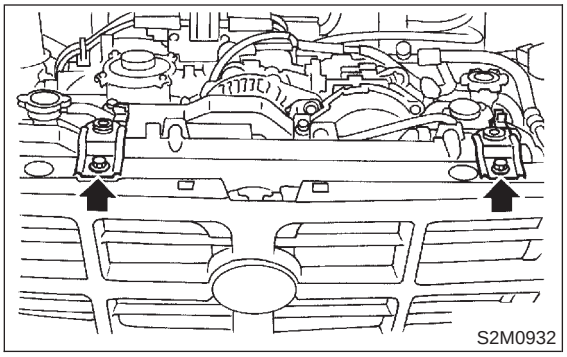
4) Disconnect front oxygen (A/F) sensor connector.



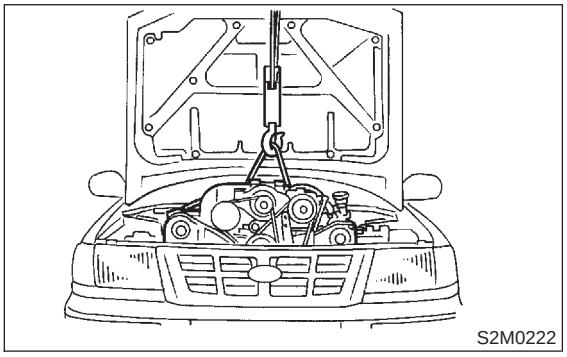
5) Remove pitching stopper.


S2M0126

6) Remove radiator upper bracket.


S2M0932

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

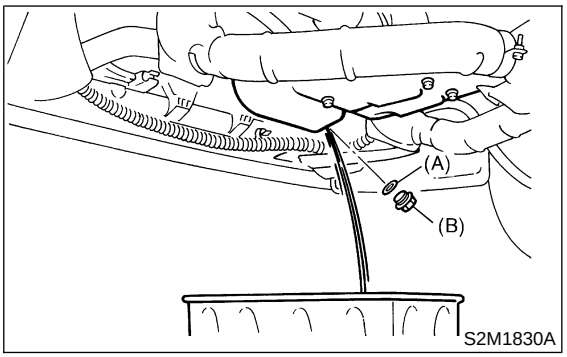

S2M0222

8) Lift-up the vehicle.

CAUTION:
At this time, raise up wire ropes.

9) Remove under cover.

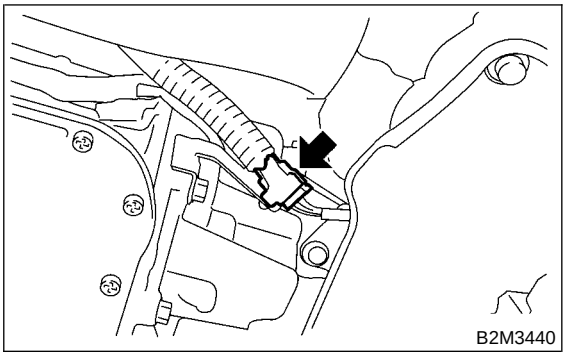
10) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



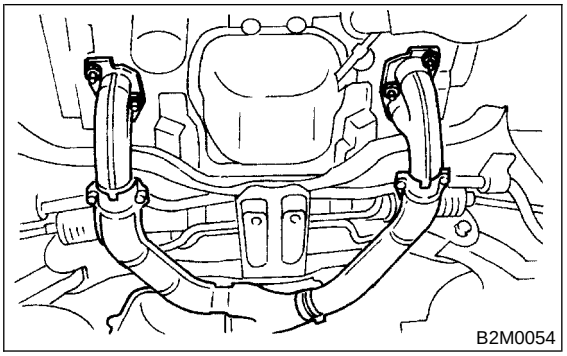
S2M1830A

(A) Washer
(B) Drain plug

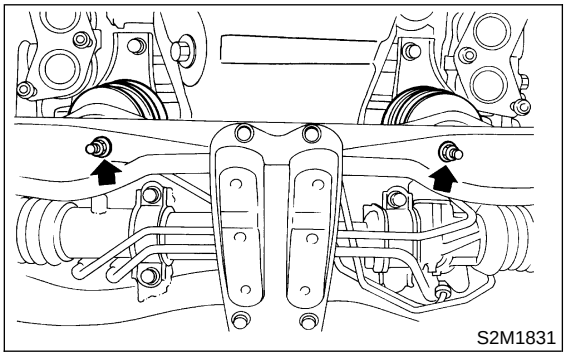
11) Disconnect connector from rear oxygen sensor.


B2M3440

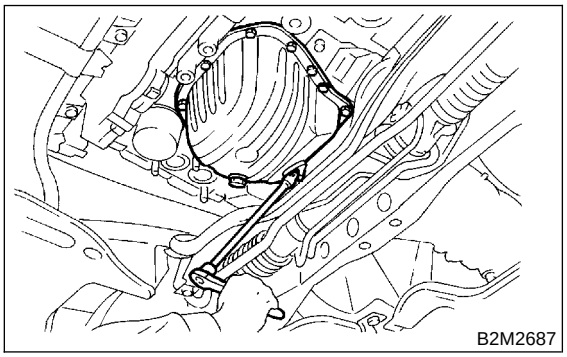
12) Remove front and center exhaust pipe assembly. <Ref. to 2-9 [W1A0].>


B2M0054

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



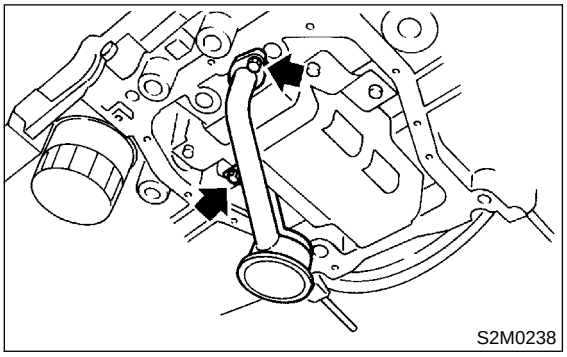
14) Remove bolts which install oil pan on cylinder block while raising up engine.



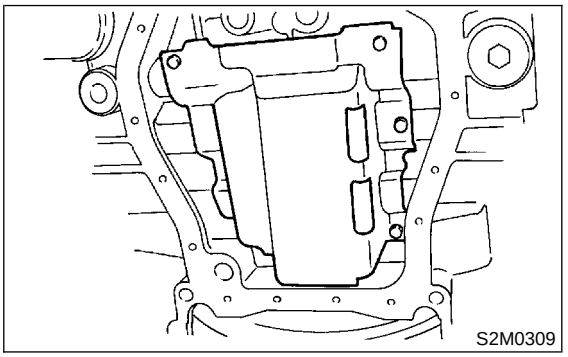
15) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

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

16) Remove oil strainer.



17) Remove baffle plate.



B: INSPECTION

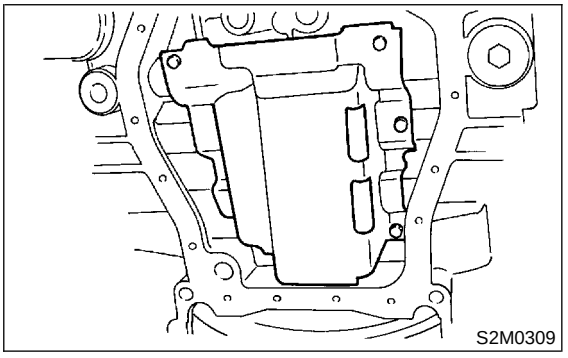
By visual check make sure oil pan, oil strainer and baffle plate are not damaged.

C: INSTALLATION

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

1) Install baffle plate.

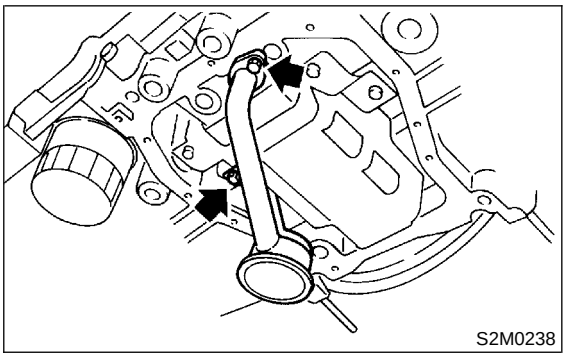
Tightening torque:
6.4 N·m (0.65 kg-m, 4.7 ft-lb)



2) Install oil strainer onto baffle plate.

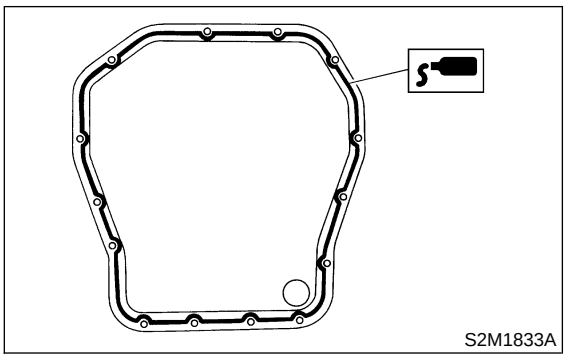
CAUTION:
Replace O-ring with a new one.

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



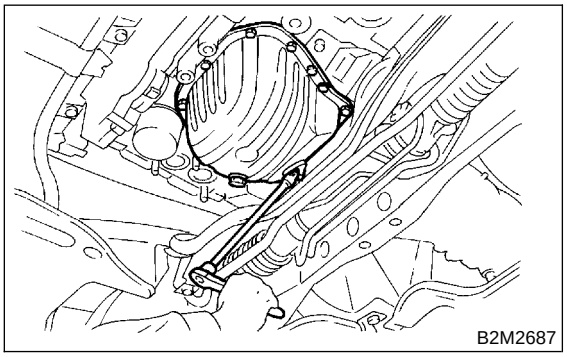
3) Apply fluid packing to mating surfaces and install oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



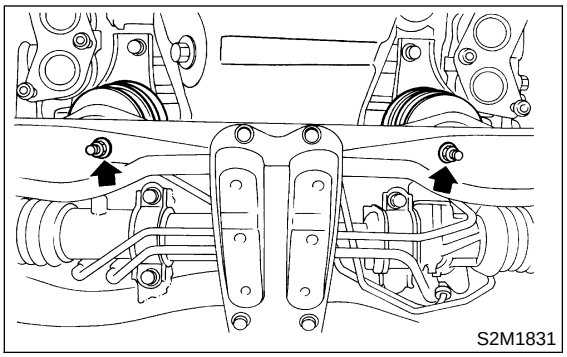
4) Tighten bolts which install oil pan onto engine block.

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



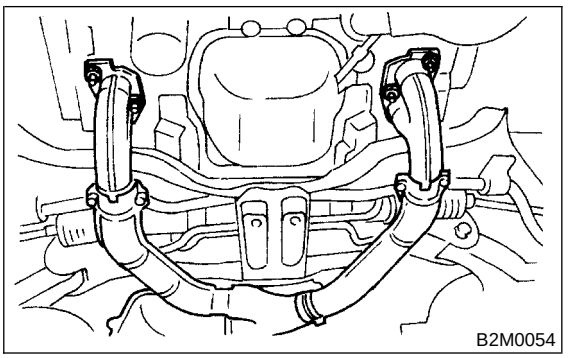
5) Lower engine onto front crossmember.
6) Tighten nuts which install front cushion rubber onto front crossmember.

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

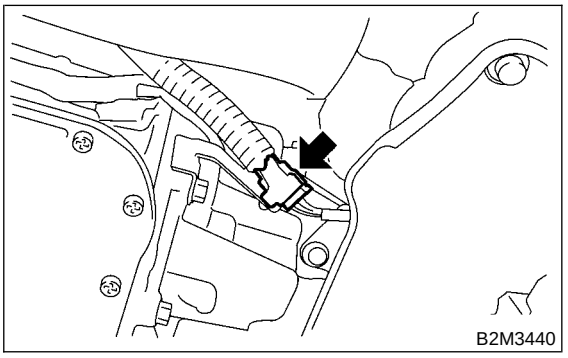


7) Install front and center exhaust pipe assembly. <Ref. to 2-9 [W1A0].>

CAUTION:
Always use new gaskets.



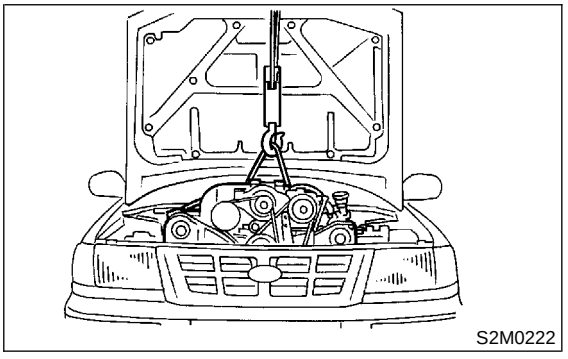
8) Connect connector to rear oxygen sensor.



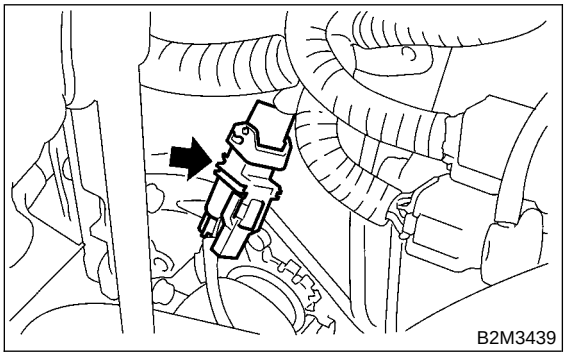
9) Install under cover.
10) Lower the vehicle.

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

11) Remove lifting device and steel cables.

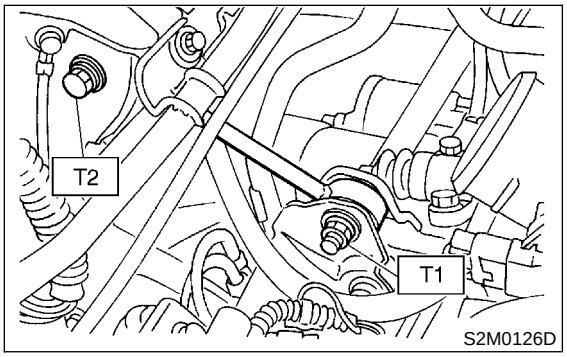


12) Connect connector to front oxygen (A/F) sensor.



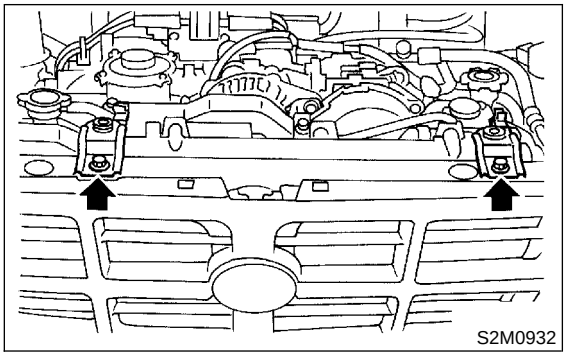
13) Install pitching stopper.

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

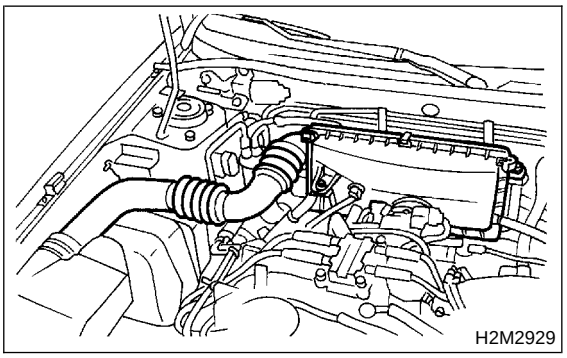


14) Install radiator upper brackets.

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



15) Install air intake duct and air cleaner assembly. <Ref. to 2-7 [W1A0].>

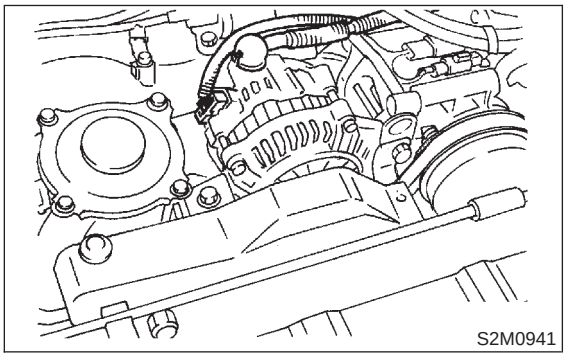


16) Fill engine oil through filler pipe up to upper point of level gauge. <Ref. to 1-5 [G4A0].>

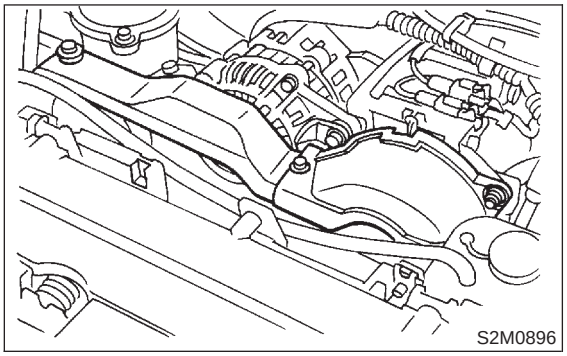
3. Oil Pressure Switch

A: REMOVAL

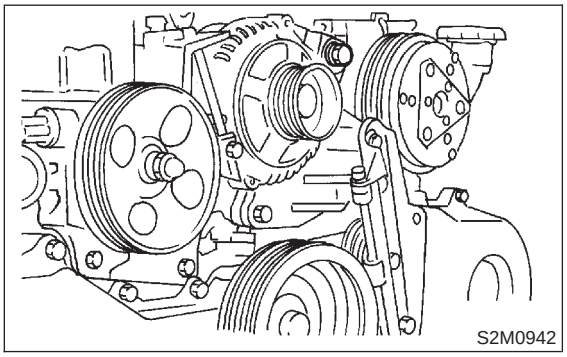
1) Remove alternator from bracket.
(1) Disconnect connector and terminal from generator.


S2M0941

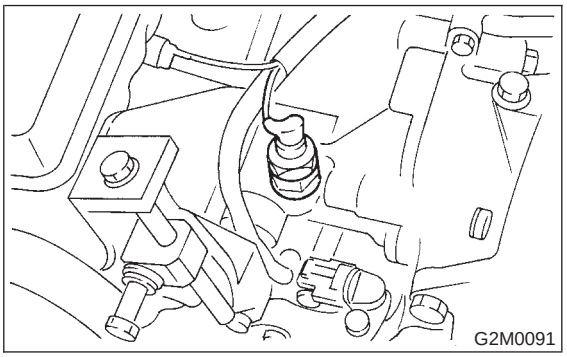
(2) Remove V-belt cover.


S2M0896

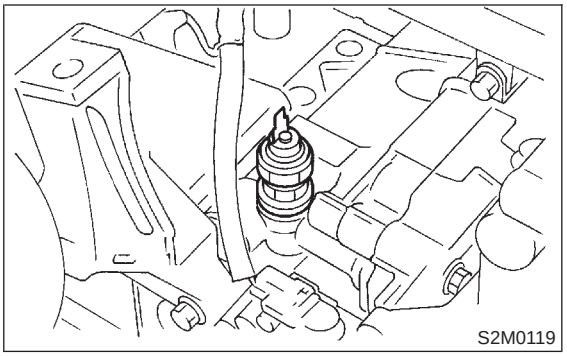
(3) Loosen lock bolt and slider bolt, and remove front side V-belt.
(4) Remove bolts which install generator on bracket.


S2M0942

2) Disconnect terminal from oil pressure switch.


G2M0091

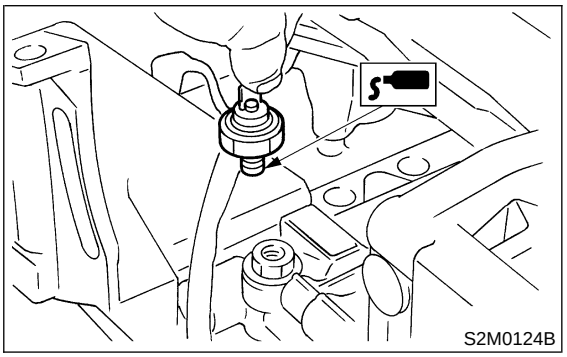
3) Remove oil pressure switch.


S2M0119

B: INSTALLATION

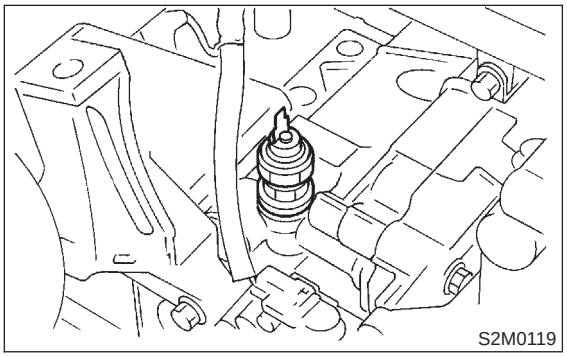
1) Apply fluid packing to oil pressure switch threads before installation.

Fluid packing:
THREE BOND 1215 or equivalent

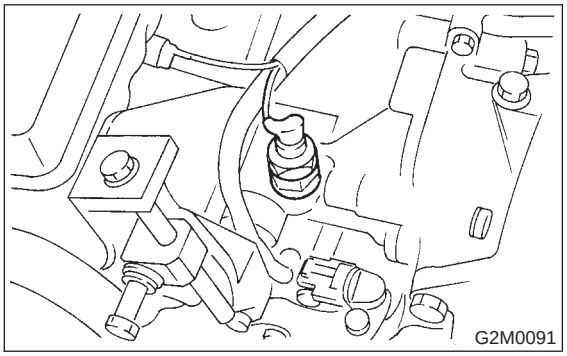

S2M0124B

2) Install oil pressure switch onto engine block.

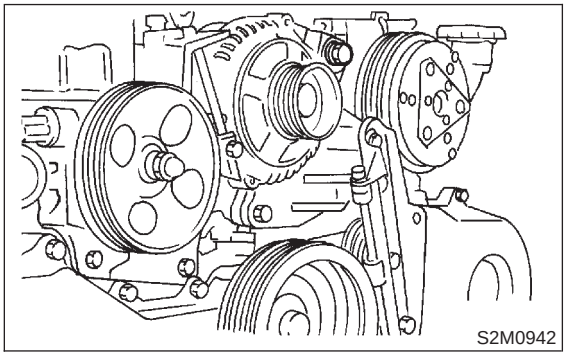
Tightening torque:
25±3 N·m (2.5±0.3 kg-m, 18.1±2.2 ft-lb)


S2M0119

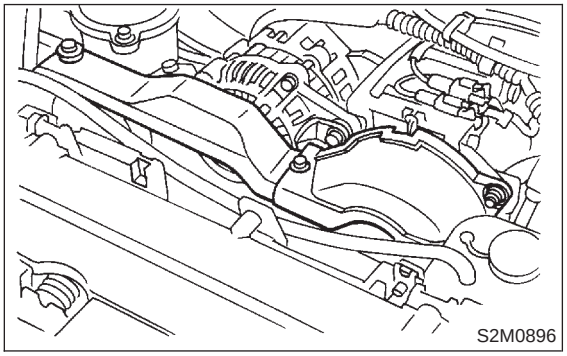
3) Connect terminal of oil pressure switch.


G2M0091

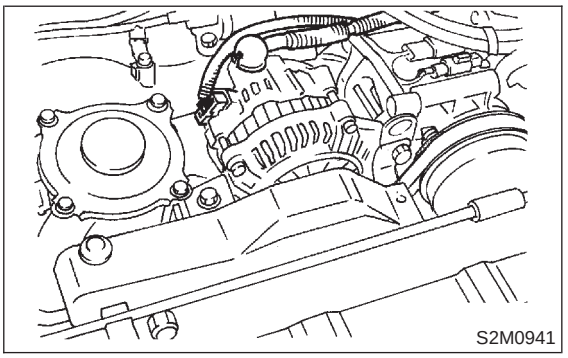
4) Install generator on bracket and temporary tighten installing bolts.


S2M0942

5) Install front side V-belt and adjust it. <Ref. to 1-5 [G2A0].>
6) Install V-belt cover.


S2M0896

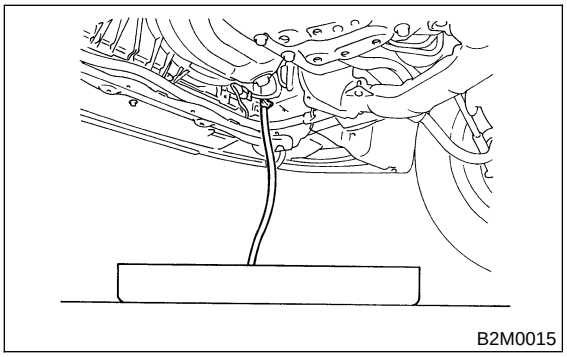
7) Connect connector and terminal to generator.


S2M0941

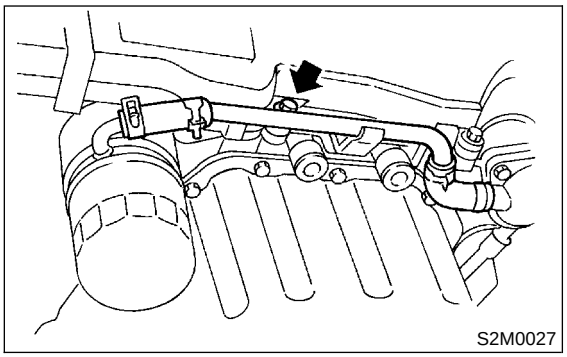
4. Oil Cooler (AT Vehicles Only)

A: REMOVAL

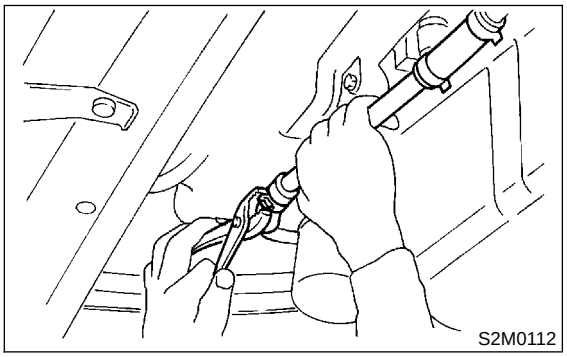
1) Lift-up the vehicle.
2) Remove under cover.
3) Drain engine coolant completely. <Ref. to 2-2 [W8A0].>


B2M0015

4) Remove bolt which installs water pipe to engine.

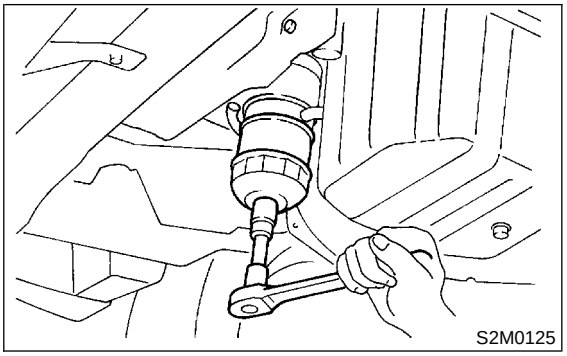

S2M0027

5) Disconnect water hose from oil cooler.

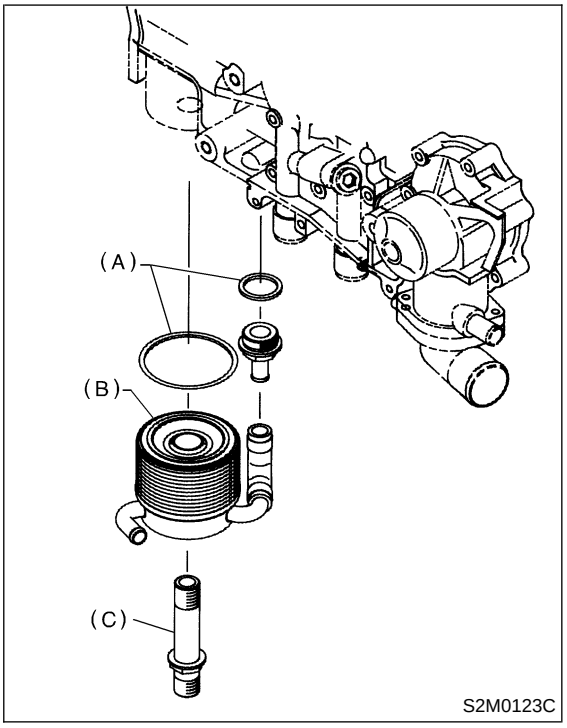

S2M0112

6) Remove oil filter using ST.
ST 498547000 OIL FILTER WRENCH

NOTE:
Set container under the vehicle.


S2M0125

7) Remove connector and remove oil cooler.



S2M0123C

(A) Gasket
(B) Oil cooler
(C) Connector

B: INSPECTION

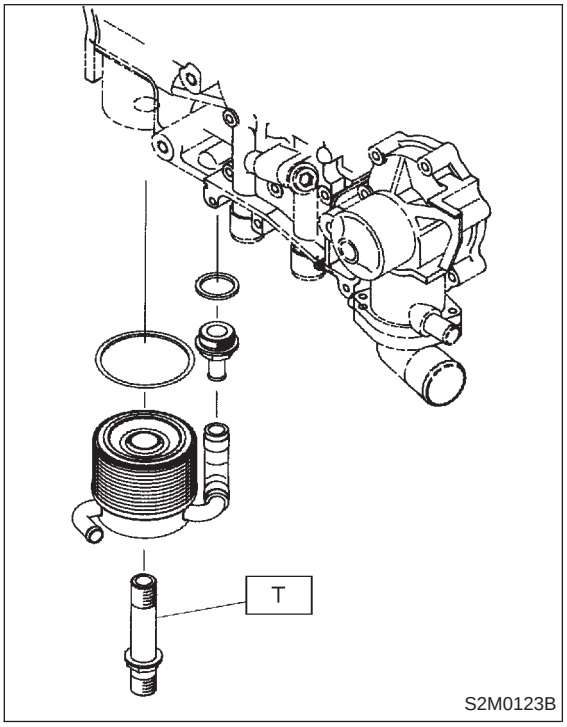
1) Check that coolant passages are not clogged using air blow method.
2) Check mating surfaces of cylinder block, O-ring groove and oil filter for damage.

C: INSTALLATION

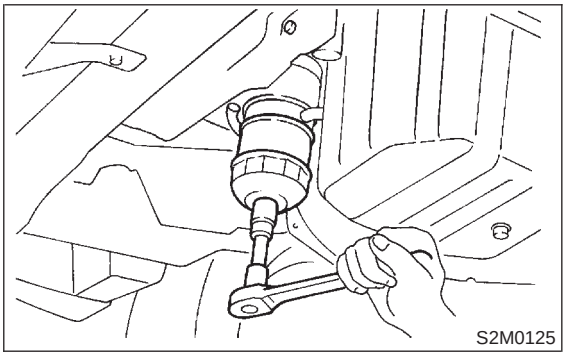
1) Install oil cooler on cylinder block with connector pipe.

Tightening torque:
T: 54±5 N·m (5.5±0.5 kg-m, 39.8±3.6 ft-lb)

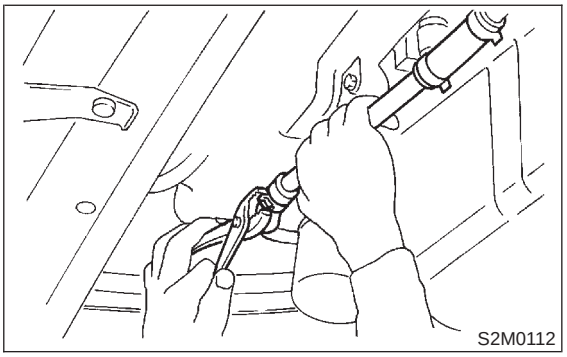
CAUTION:
Always use a new O-ring.



2) Install oil filter using ST.
ST 498547000 OIL FILTER WRENCH



3) Install water hose to oil cooler.



4) Check the amount of engine oil. If necessary, fill engine oil. <Ref. to 1-5 [G4A0].>
5) Fill engine coolant. <Ref. to 2-5 [W9B0].>

1. Engine Lubrication System Trouble in General

NOTE:
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).

1. Specifications

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			MT: Approx. 6.0 (6.3, 5.3) AT: Approx. 6.2 (6.6, 5.5)
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		70 W (main fan) 70 W (sub fan)
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions		691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.45 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. Specifications

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			MT: Approx. 6.0 (6.3, 5.3) AT: Approx. 6.2 (6.6, 5.5)
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)
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	Starts to open		76 — 80°C (169 — 176°F)
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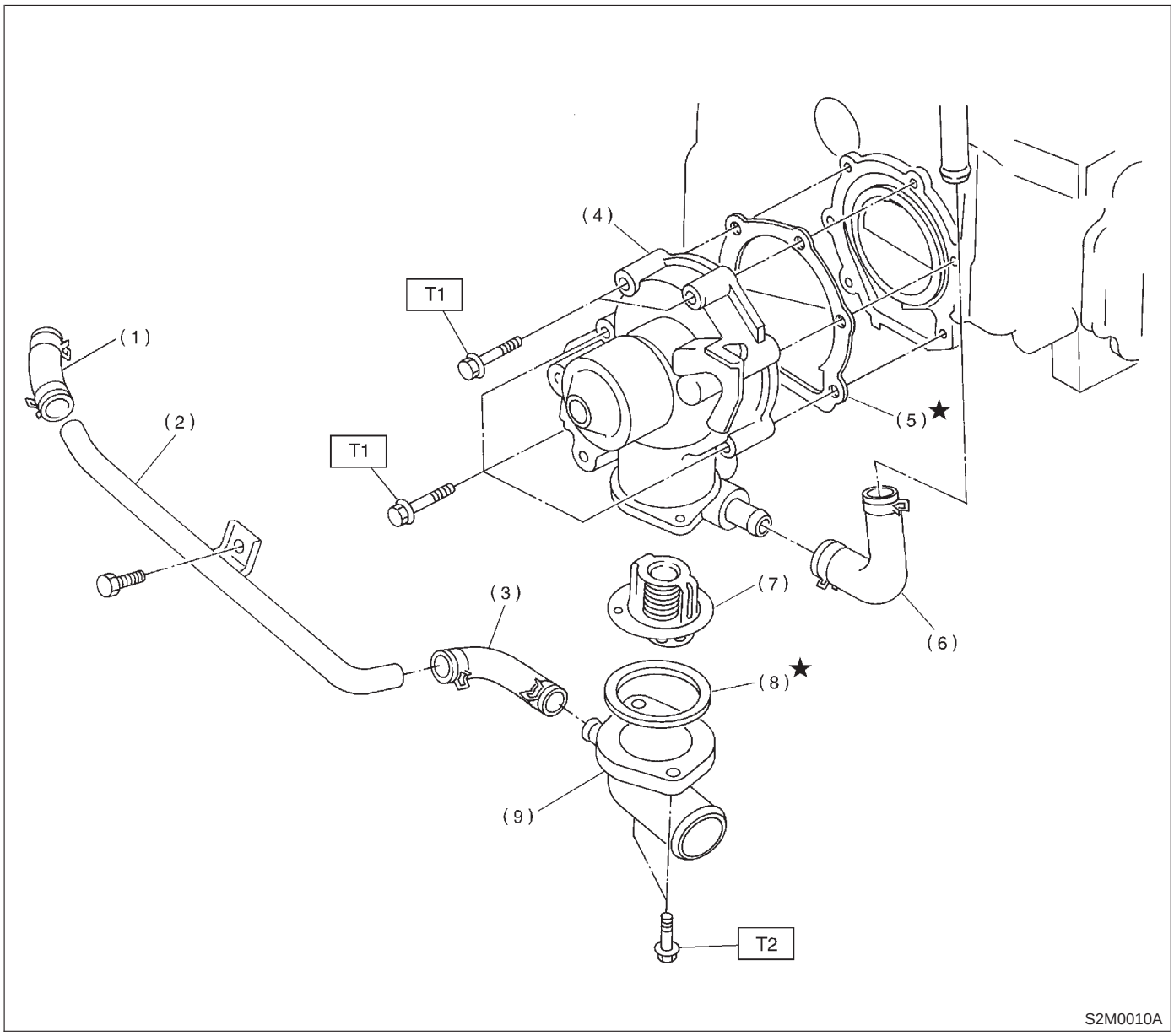
Radiator	Type		Down flow, pressure type
	Core dimensions		691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.45 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)

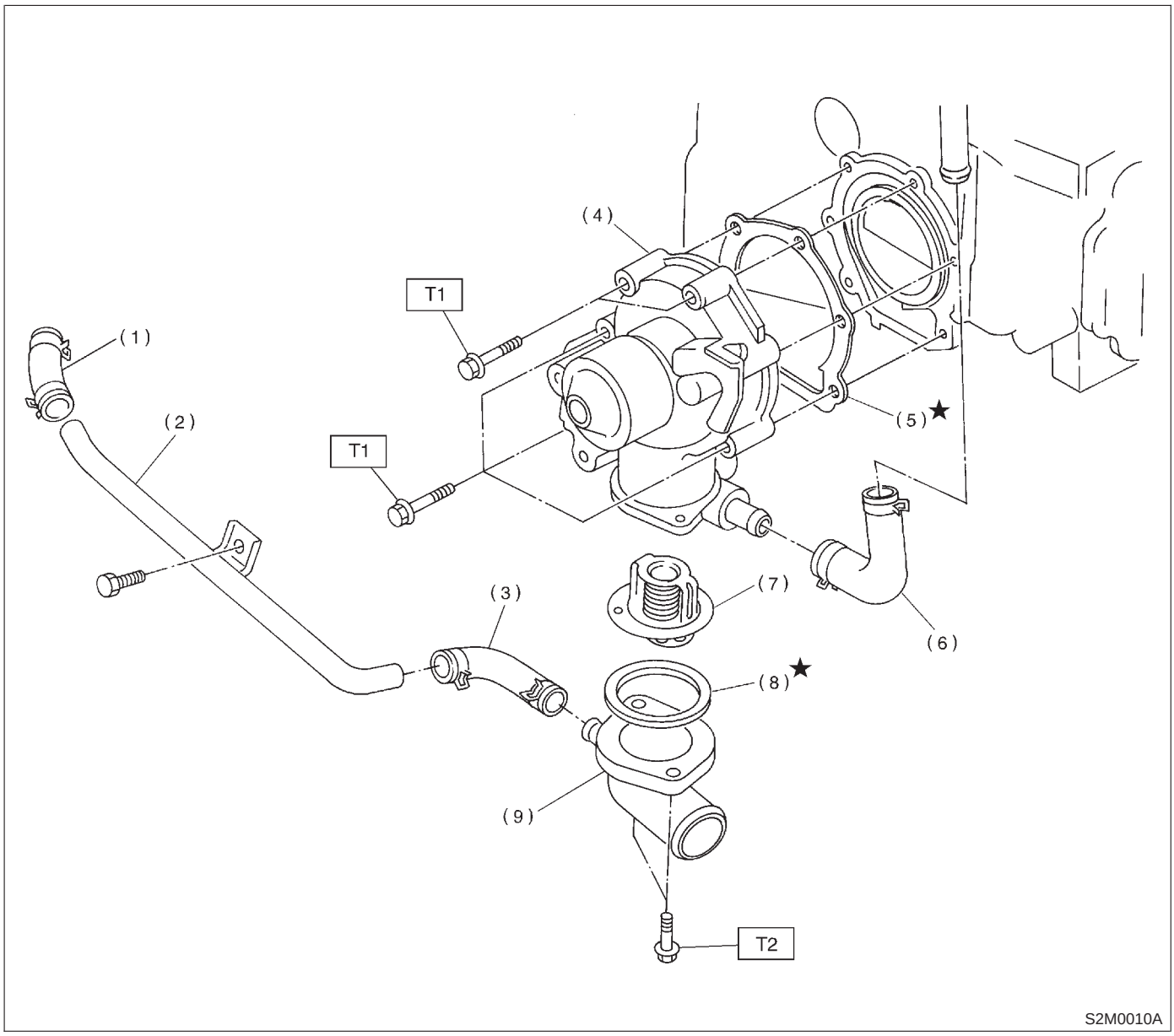
1. Water Pump



(1) Water by-pass hose A (AT vehicles)
(2) Water by-pass pipe (AT vehicles)
(3) Water by-pass hose B (AT vehicles)
(4) Water pump ASSY
(5) Gasket
(6) Heater hose
(7) Thermostat
(8) Gasket
(9) Thermostat cover

Tightening torque: N·m (kg-m, ft-lb)
T1:
First:
12±2 (1.2±0.2, 8.7±1.4)
Second:
12±2 (1.2±0.2, 8.7±1.4)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)

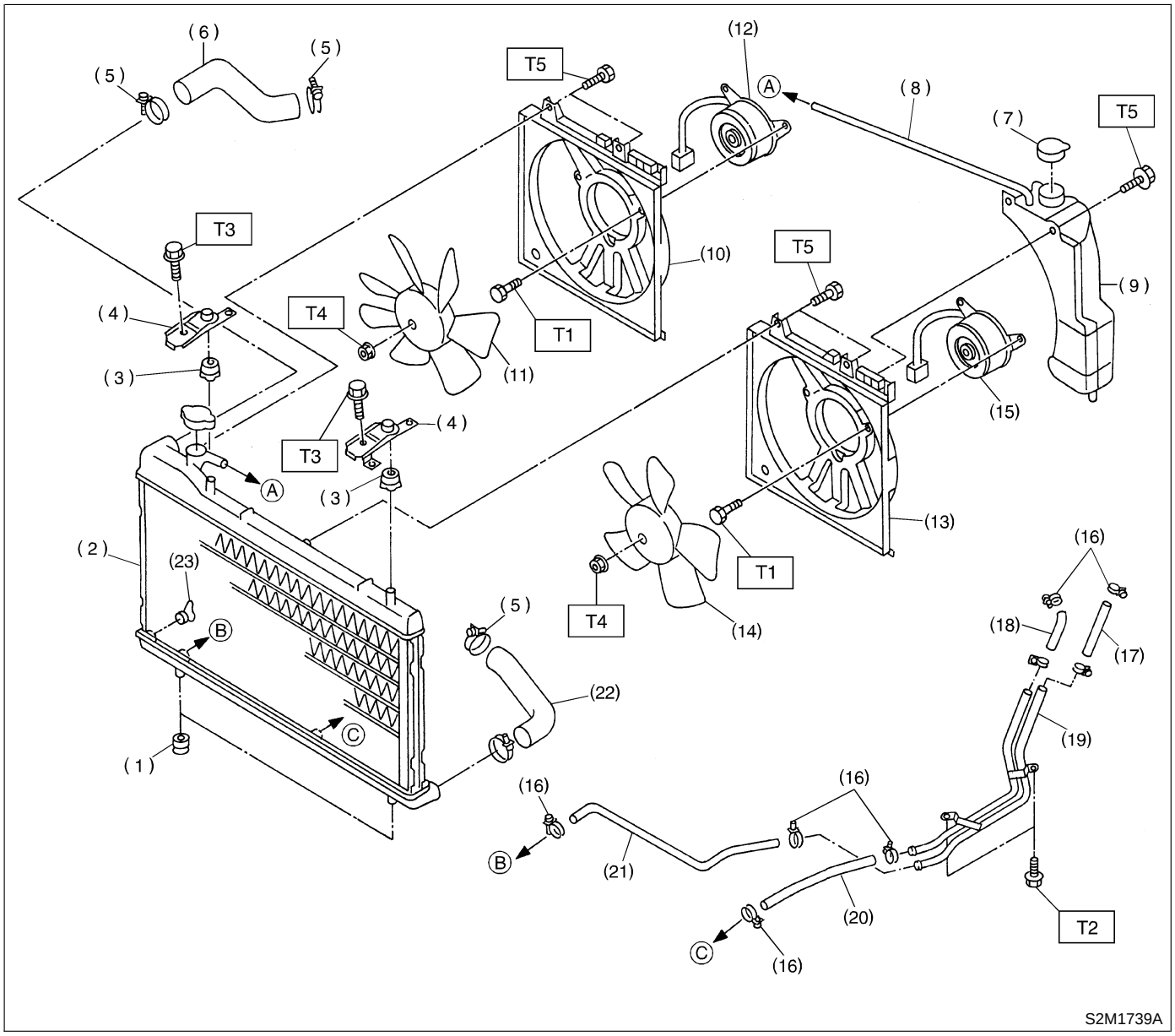
1. Water Pump



(1) Water by-pass hose A (AT vehicles)
(2) Water by-pass pipe (AT vehicles)
(3) Water by-pass hose B (AT vehicles)
(4) Water pump ASSY
(5) Gasket
(6) Heater hose
(7) Thermostat
(8) Gasket
(9) Thermostat cover

Tightening torque: N·m (kg-m, ft-lb)
T1:
First:
12±2 (1.2±0.2, 8.7±1.4)
Second:
12±2 (1.2±0.2, 8.7±1.4)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)

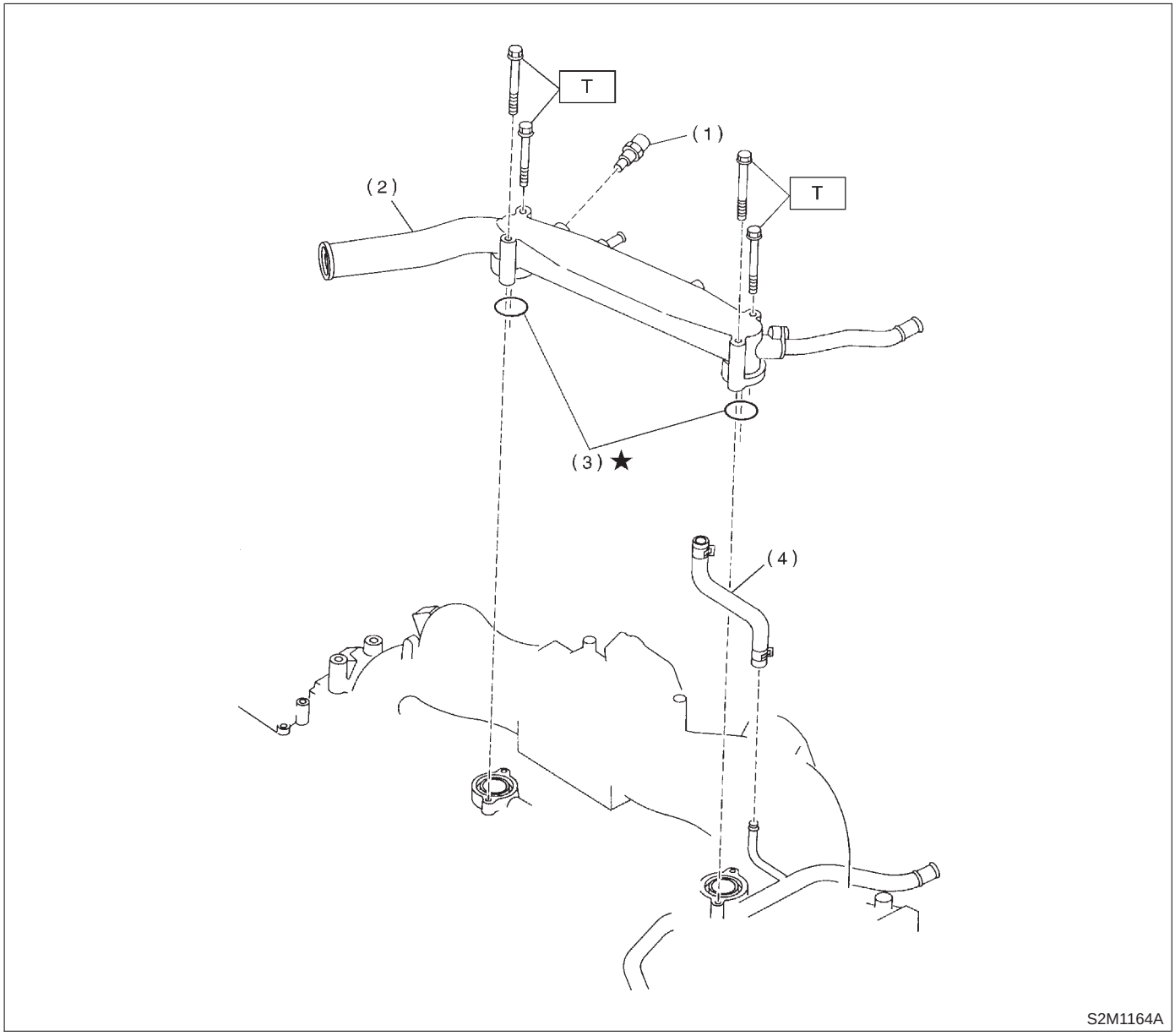
2. Radiator and Radiator Fan



(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Over flow hose
(9) Engine coolant reservoir tank
(10) Sub fan shroud
(11) Radiator sub fan
(12) Radiator sub fan motor
(13) Main fan shroud
(14) Radiator main fan
(15) Radiator main fan motor
(16) ATF hose clamp (AT vehicles only)
(17) ATF inlet hose A (AT vehicles only)
(18) ATF outlet hose A (AT vehicles only)
(19) ATF pipe (AT vehicles only)
(20) ATF outlet hose B (AT vehicles only)
(21) ATF inlet hose B (AT vehicles only)
(22) Radiator outlet hose
(23) Radiator drain plug

Tightening torque: N·m (kg-m, ft-lb)
T1: 4.4±0.5 (0.45±0.05, 3.3±0.4)
T2: 12±3 (1.2±0.3, 8.7±2.2)
T3: 18±5 (1.8±0.5, 13.0±3.6)
T4: 3.4±0.5 (0.35±0.05, 2.5±0.4)
T5: 4.9±1.5 (0.50±0.15, 3.6±1.1)

3. Water Pipe



S2M1164A

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

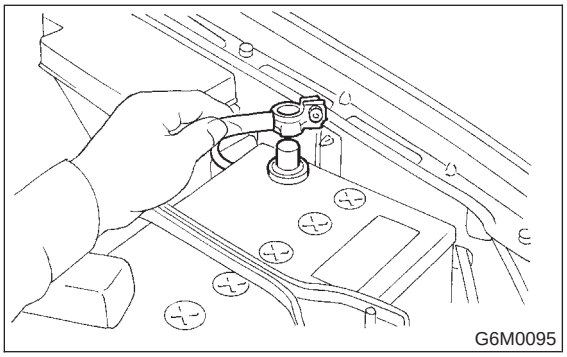
Tightening torque: N·m (kg-m, ft-lb)
T: 6.4±0.5 (0.65±0.05, 4.7±0.4)

1. Water Pump

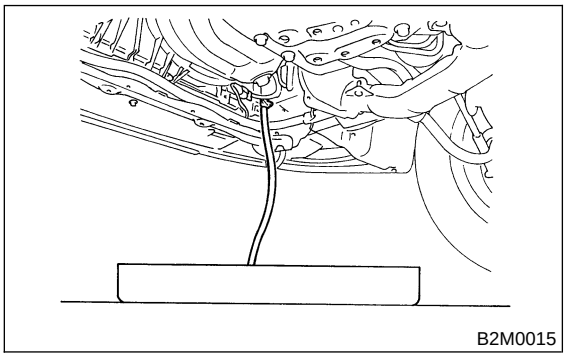
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

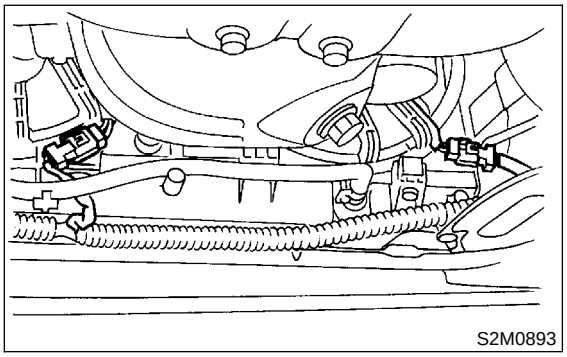
1) Set the vehicle on the lift.
2) Disconnect ground cable from the battery.


G6M0095

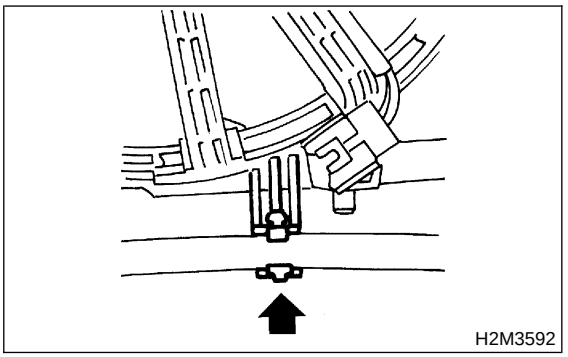
3) Lift-up the vehicle.
4) Remove under cover.
5) Drain engine coolant completely.
<Ref. to 2-5 [W9A0].>


B2M0015

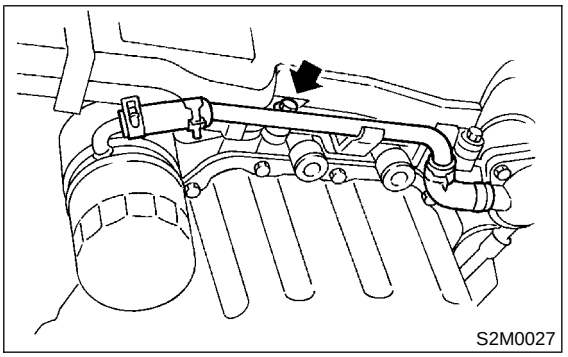
6) Disconnect connectors from radiator main fan and sub fan motors.


S2M0893

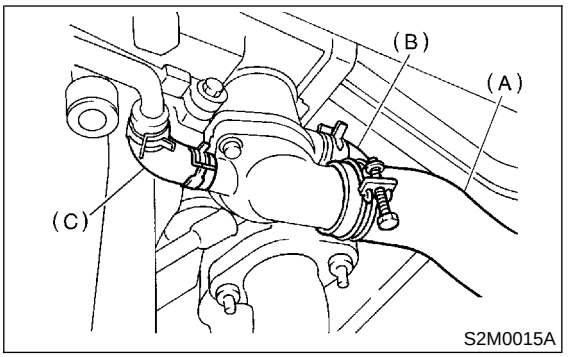
7) Detach ATF cooler hose attached to a clip under the radiator main fan shroud. (AT vehicles only)


H2M3592

8) Remove bolt which installs water by-pass pipe of oil cooler onto oil pump. (AT vehicles only)


S2M0027

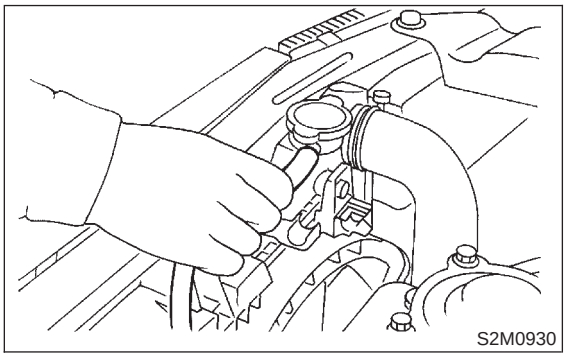
9) Disconnect radiator outlet hose (A) and heater hose (B) from water pump.
10) Disconnect water by-pass hose (C). (AT vehicles only)



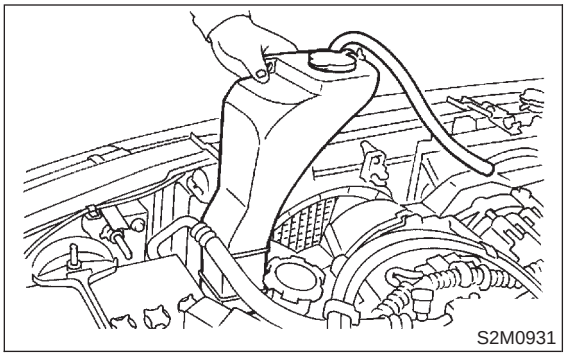
S2M0015A

11) Lower the vehicle.

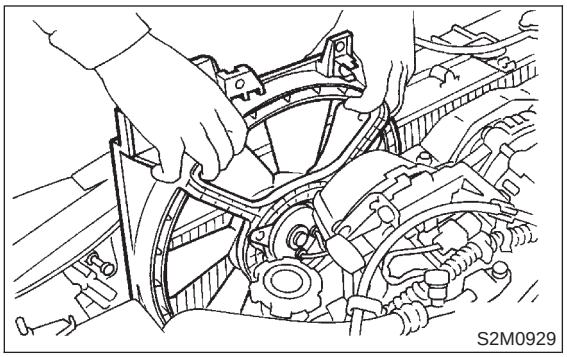
12) Disconnect over flow hose.


S2M0930

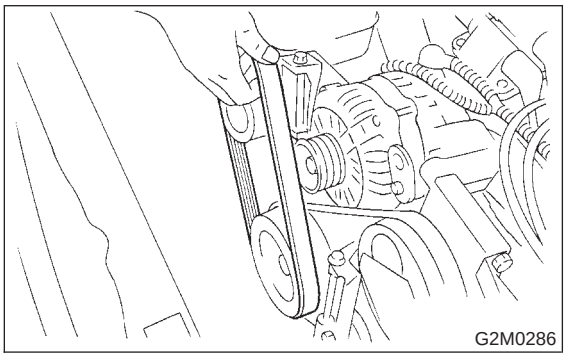
13) Remove reservoir tank.


S2M0931

14) Remove radiator main fan and sub fan assemblies. <Ref. to 2-5 [W5A0].> and <Ref. to 2-5 [W6A0].>

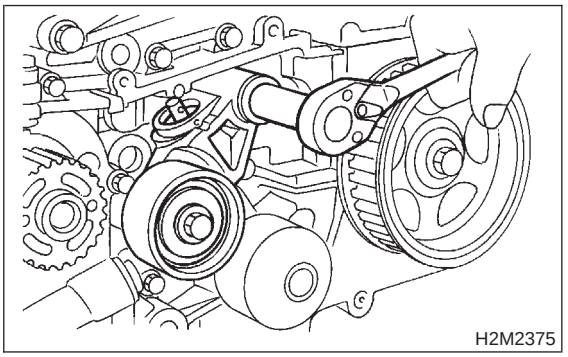

S2M0929

15) Remove V-belts.
<Ref. to 1-5 [G2B0].>

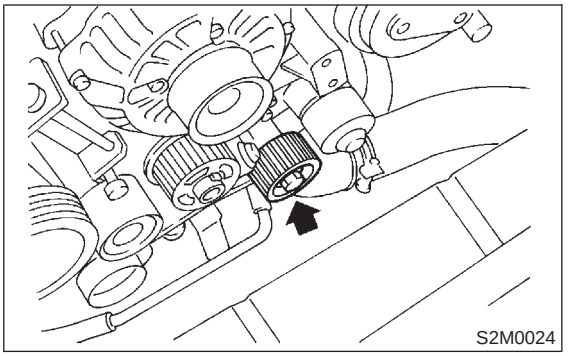

G2M0286

16) Remove timing belt.
<Ref. to 2-3 [W3A0].>

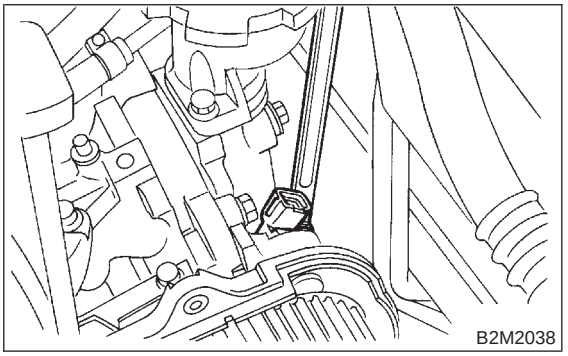
17) Remove automatic belt tension adjuster.


H2M2375

18) Remove belt idler No. 2.

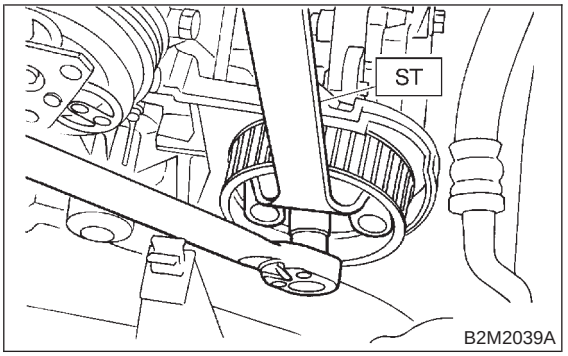

S2M0024

19) Remove camshaft position sensor.
<Ref. to 2-7 [W6A0].>


B2M2038

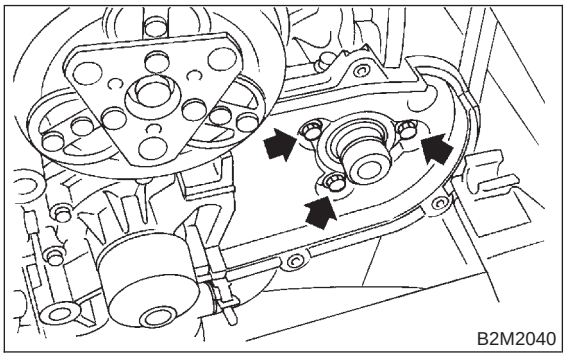
20) Remove left-hand camshaft sprocket by using ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

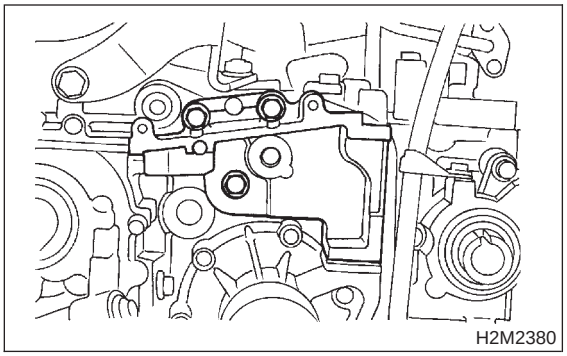


B2M2039A

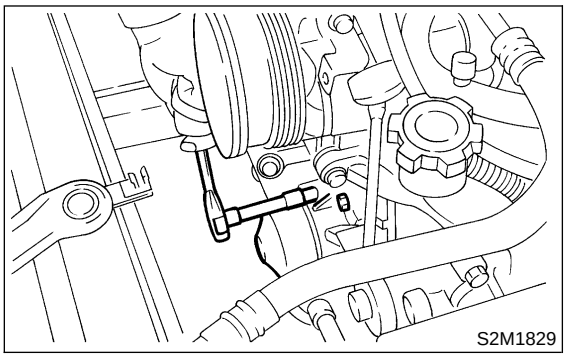
21) Remove left-hand belt cover No. 2.


B2M2040

22) Remove tensioner bracket.


H2M2380

23) Remove tensioner bracket.
24) Disconnect heater hose from water pump.
25) Remove water pump.

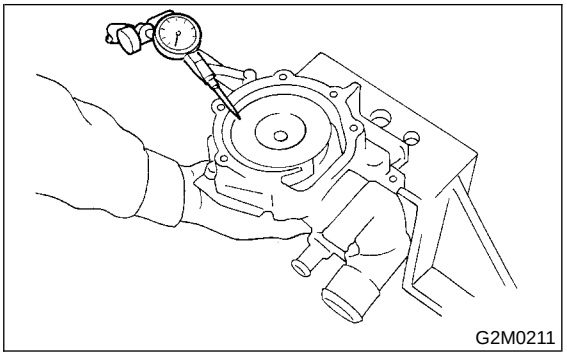

S2M1829

B: INSPECTION

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

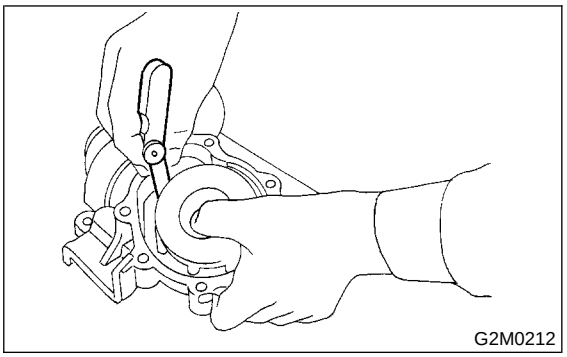
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

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


G2M0211

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)


G2M0212

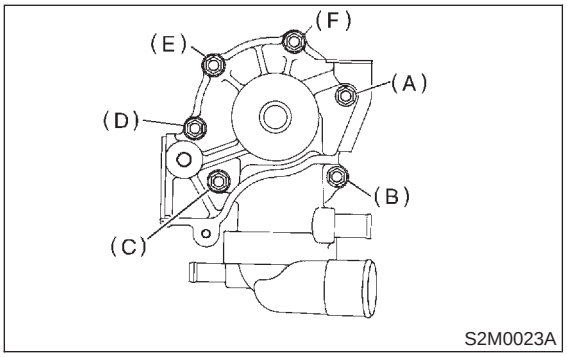
5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

C: INSTALLATION

1) Install water pump onto left-hand cylinder head.

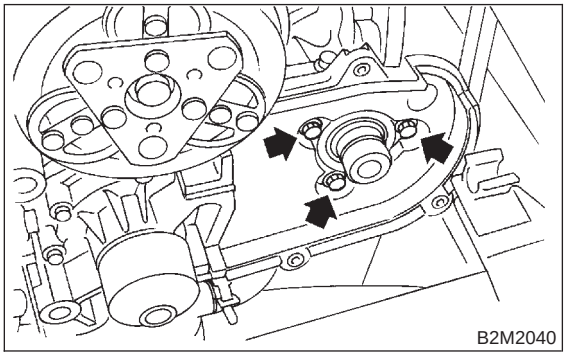
CAUTION:
- **Replace gasket with a new one.**
- **When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.**

Tightening torque:
First:
12±2 N·m (1.2±0.2 kg-m, 8.7±1.4 ft-lb)
Second:
12±2 N·m (1.2±0.2 kg-m, 8.7±1.4 ft-lb)



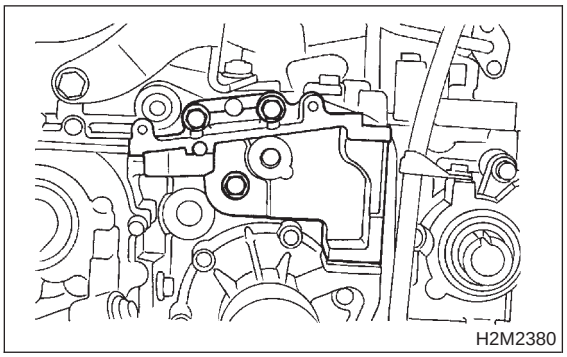
2) Install left-hand belt cover No. 2.

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



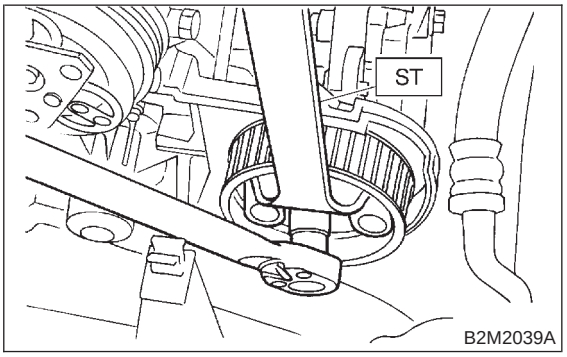
3) Install tensioner bracket.

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

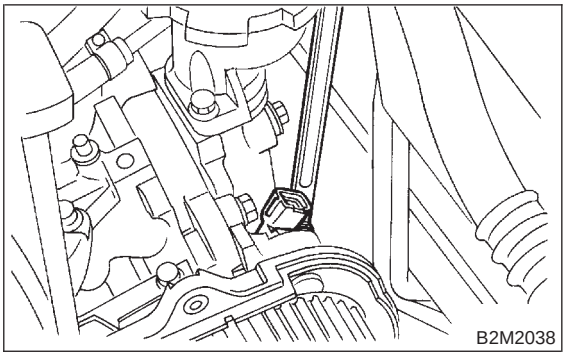


4) Install left-hand camshaft sprockets by using ST.
ST 4992707100 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78±5 N·m (8.0±0.5 kg-m, 57.9±3.6 ft-lb)

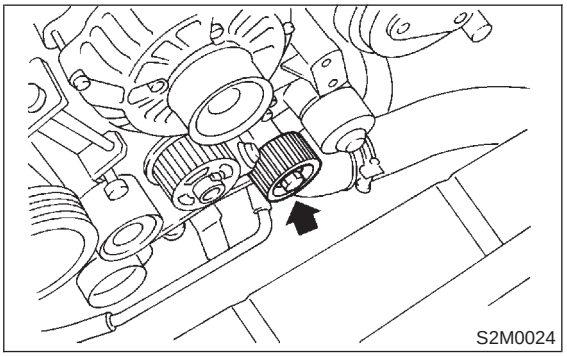


5) Install camshaft position sensor. <Ref. to 2-7 [W6A0].>

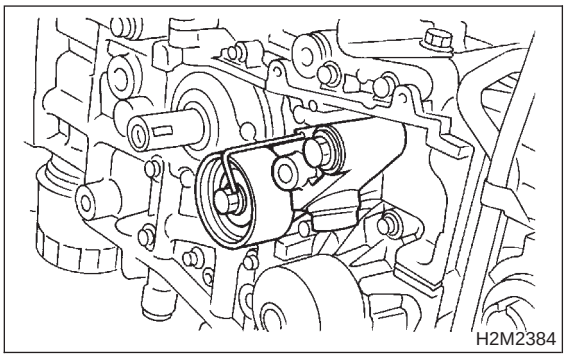


6) Install belt idler No. 2.

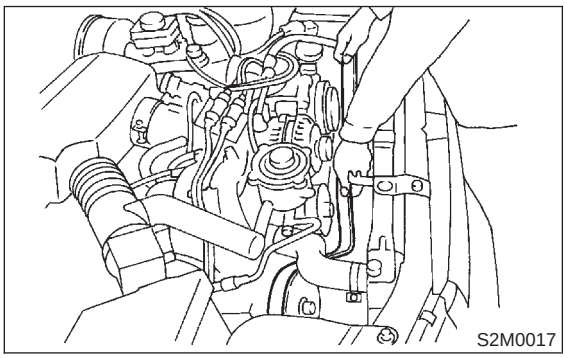
Tightening torque:
39±4 N·m (4.0±0.4 kg-m, 28.9±2.9 ft-lb)



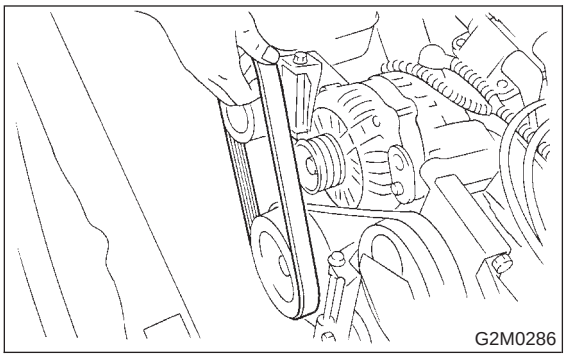
7) Install automatic belt tension adjuster which tension rod is holded with pin. <Ref. to 2-3 [W3C2].>


H2M2384

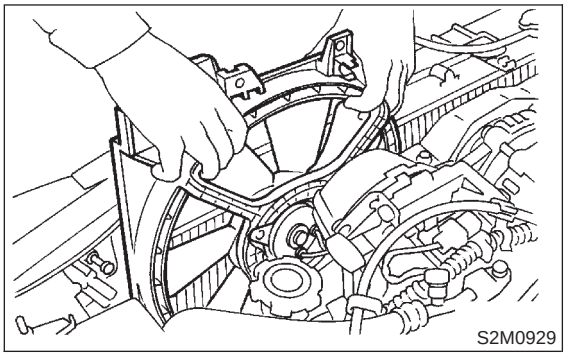
8) Install timing belt. <Ref. to 2-3 [W2C0].>


S2M0017

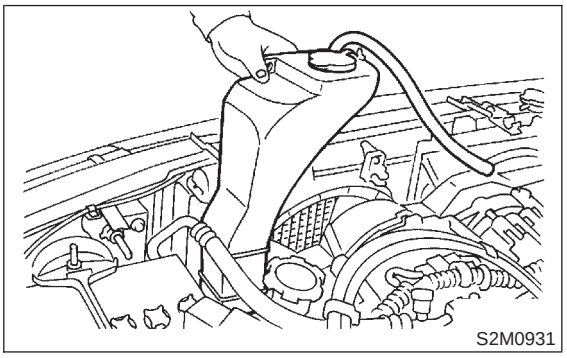
9) Install V-belts. <Ref. to 1-5 [G2B0].>


G2M0286

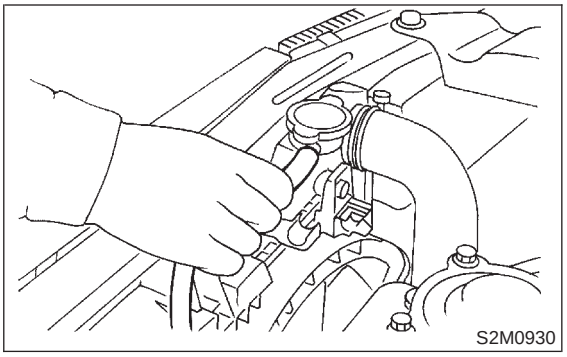
10) Install radiator main fan and sub fan motor assemblies. <Ref. to 2-5 [W5A0].> and <Ref. to 2-5 [W6A0].>


S2M0929

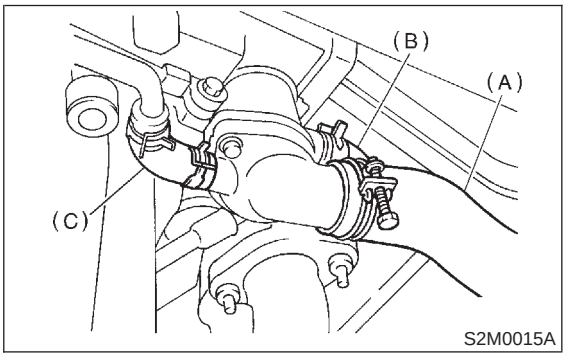
11) Install reservoir tank.


S2M0931

12) Connect over flow hose.

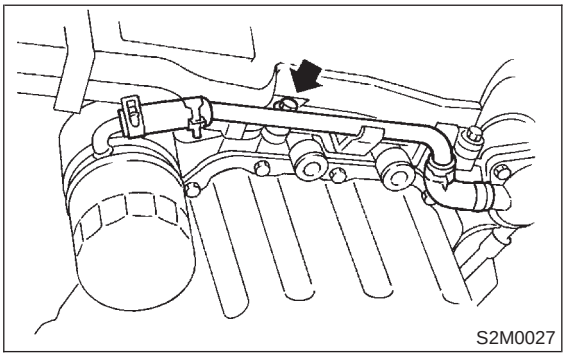

S2M0930

13) Lift-up the vehicle.
14) Connect radiator outlet hose (A) and heater hose (B) to water pump.
15) Connect water by-pass hose (C). (AT vehicles only)

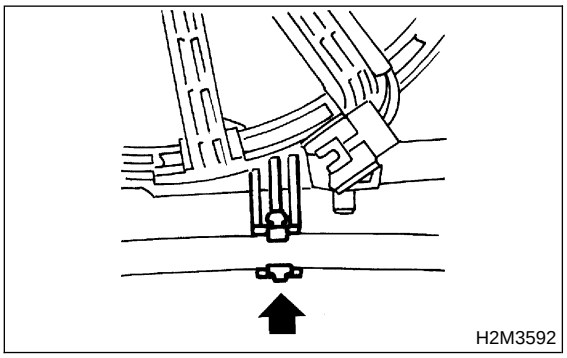


S2M0015A

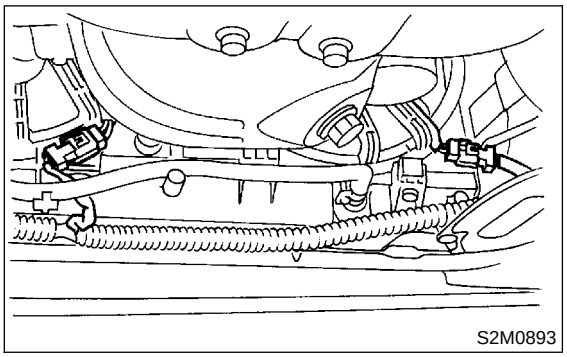
16) Install bolt which installs water by-pass pipe onto oil pump. (AT vehicles only)


S2M0027

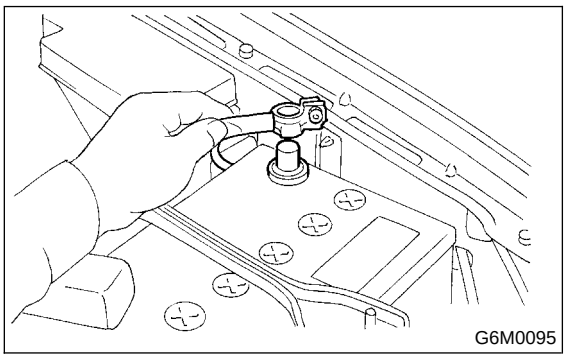
17) Attach ATF cooler hose to a clip under the radiator main fan shroud. (AT vehicles only)



18) Connect connectors to radiator main fan and sub fan motors.



19) Install under cover.
20) Lower the vehicle.
21) Connect battery ground cable.



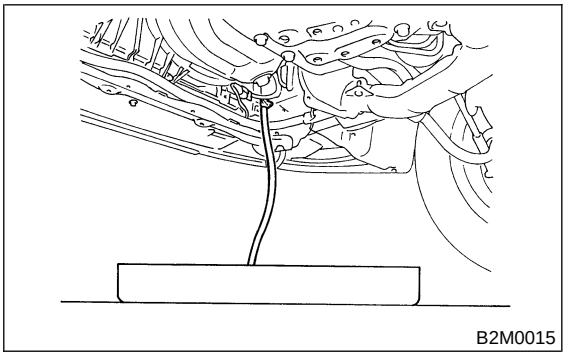
22) Fill coolant. <Ref. to 2-5 [W9B0].>

2. Thermostat

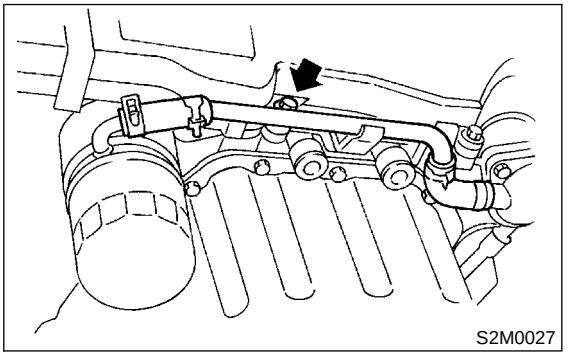
A: REMOVAL AND INSTALLATION

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

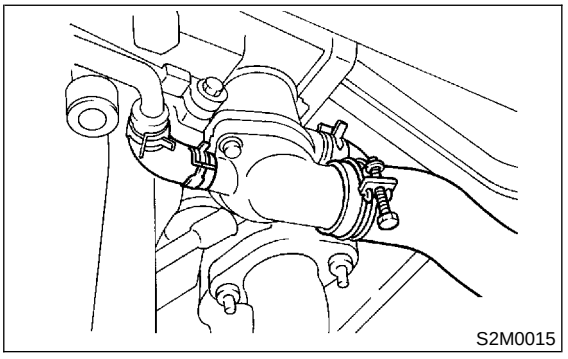
1) Lift-up the vehicle.
2) Remove under cover.
3) Drain engine coolant completely. <Ref. to 2-5 [W9A0].>



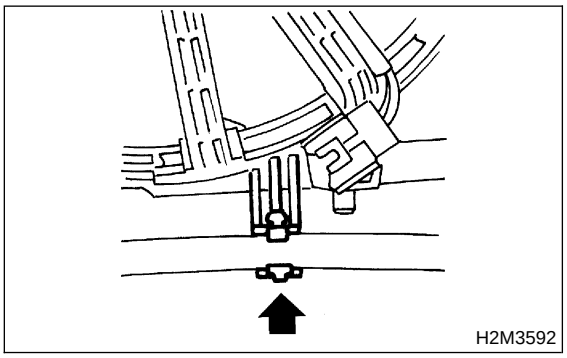
4) Remove bolt which installs water by-pass pipe of oil cooler onto oil pump. (AT vehicles only)



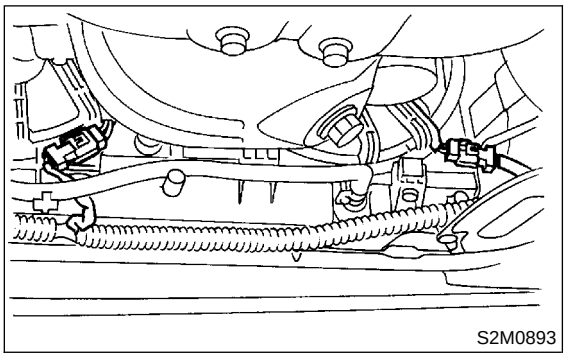
5) Disconnect radiator outlet hose and water by-pass hose B (AT vehicles) from thermostat cover.



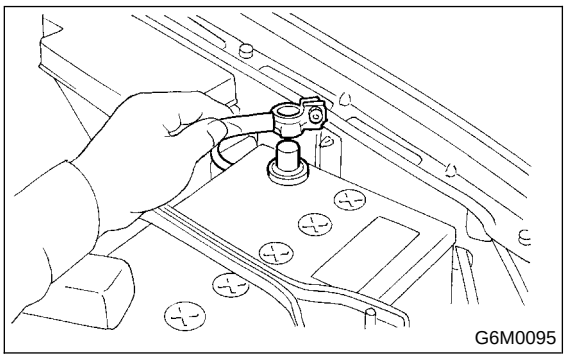
17) Attach ATF cooler hose to a clip under the radiator main fan shroud. (AT vehicles only)



18) Connect connectors to radiator main fan and sub fan motors.



19) Install under cover.
20) Lower the vehicle.
21) Connect battery ground cable.



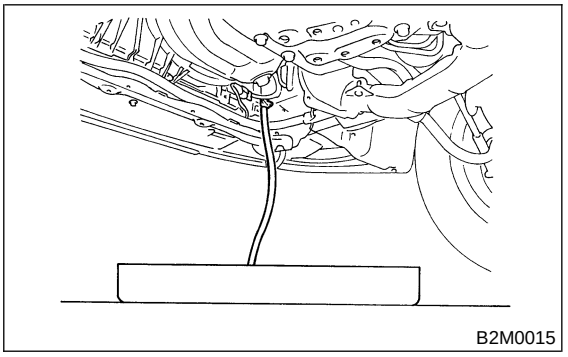
22) Fill coolant. <Ref. to 2-5 [W9B0].>

2. Thermostat

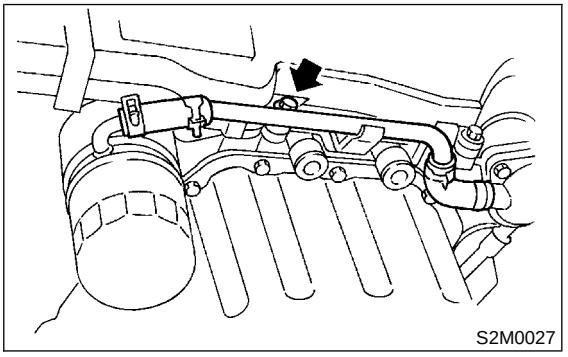
A: REMOVAL AND INSTALLATION

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

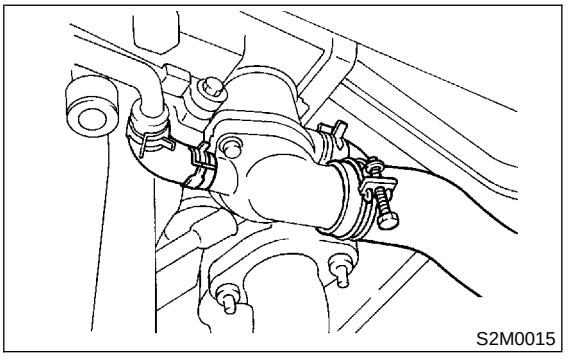
1) Lift-up the vehicle.
2) Remove under cover.
3) Drain engine coolant completely. <Ref. to 2-5 [W9A0].>



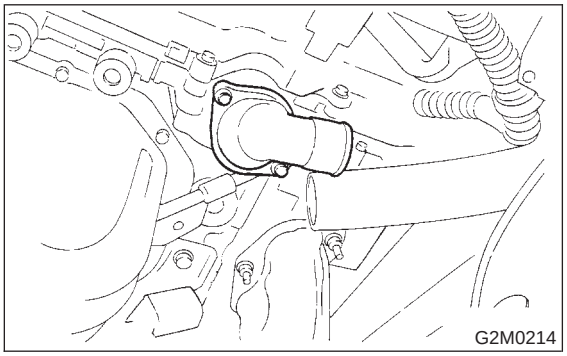
4) Remove bolt which installs water by-pass pipe of oil cooler onto oil pump. (AT vehicles only)



5) Disconnect radiator outlet hose and water by-pass hose B (AT vehicles) from thermostat cover.



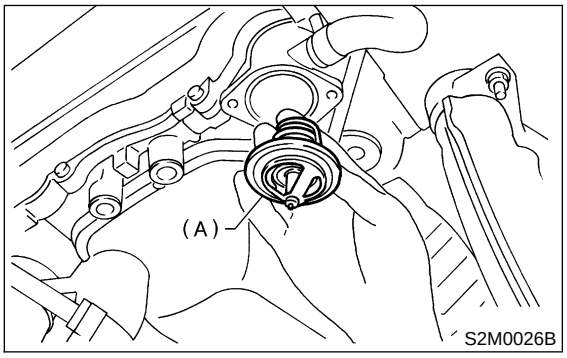
6) Remove thermostat cover and gasket, and pull out the thermostat.



7) Install the thermostat in the water pump, 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 facing to front side.**
- **At this time, set the jiggle pin (A) of thermostat for front side.**

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



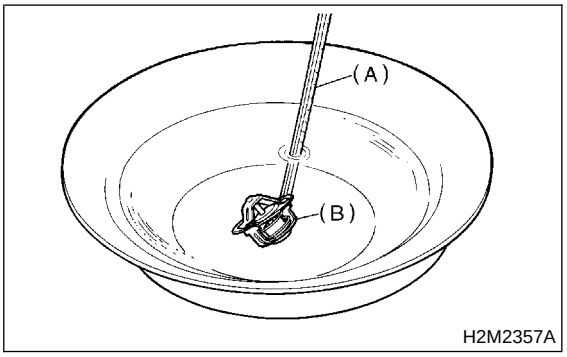
8) Fill coolant. <Ref. to 2-5 [W9B0].>

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)



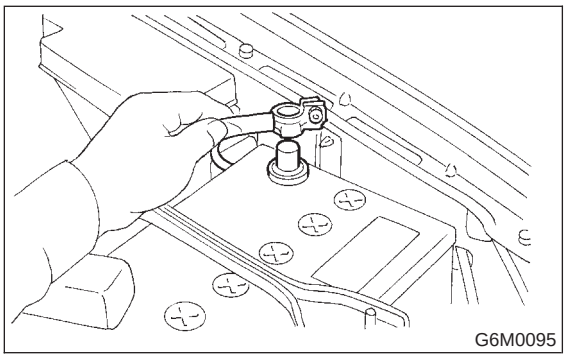
(A) Thermometer
(B) Thermostat

3. Radiator

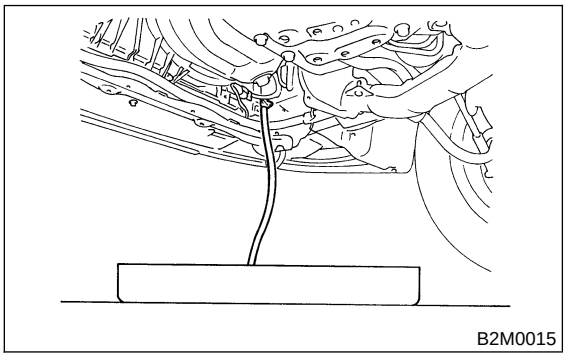
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

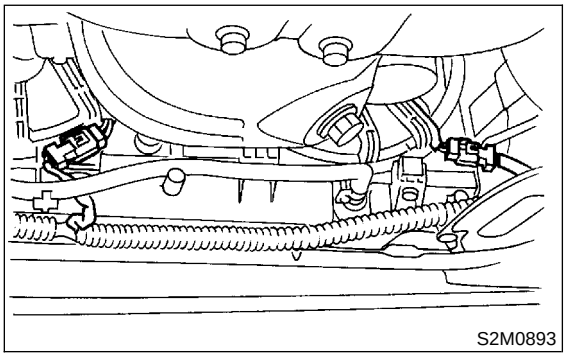
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


G6M0095

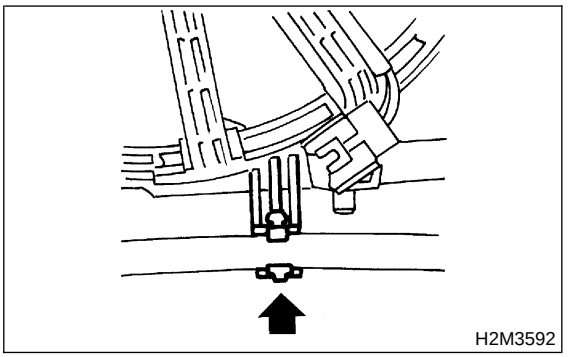
3) Lift-up the vehicle.
4) Remove under cover.
5) Drain engine coolant completely. <Ref. to 2-5 [W9A0].>


B2M0015

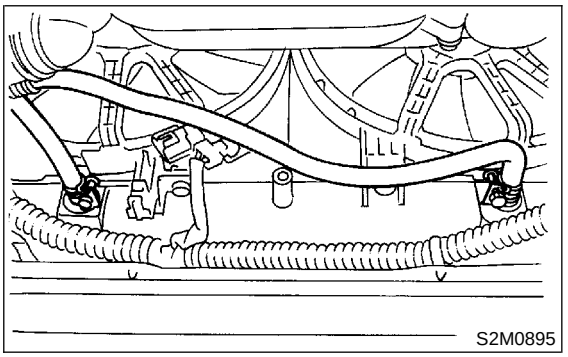
6) Disconnect connectors of radiator main fan and sub fan motor.


S2M0893

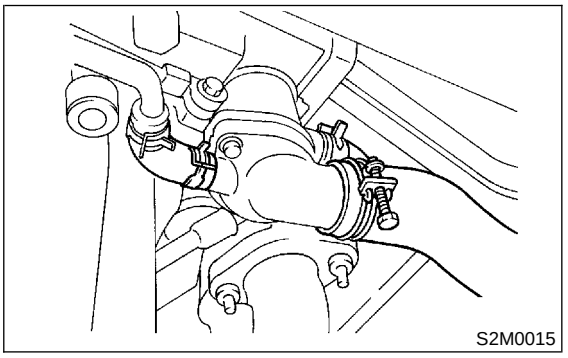
7) Detach ATF cooler hose attached to a clip under the radiator main fan shroud. (AT vehicles only)


H2M3592

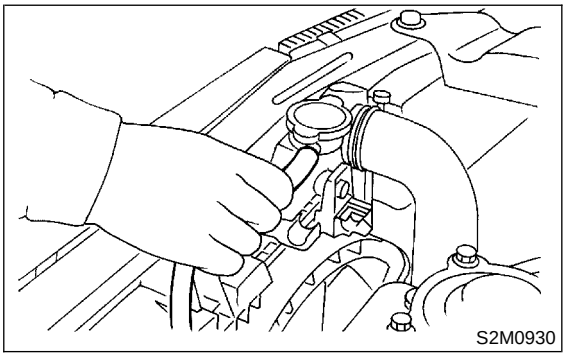
8) Disconnect ATF cooler hoses from radiator. (AT vehicles only)


S2M0895

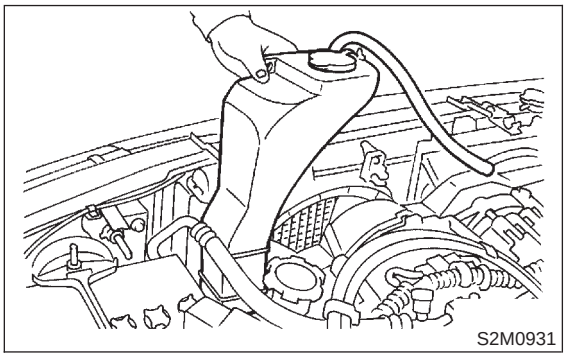
9) Disconnect radiator outlet hose from thermostat cover.


S2M0015

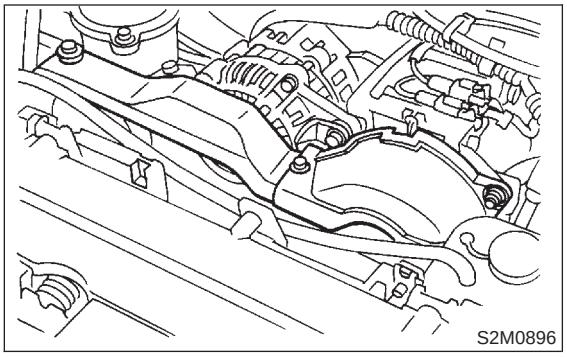
10) Lower the vehicle.
11) Disconnect over flow hose.


S2M0930

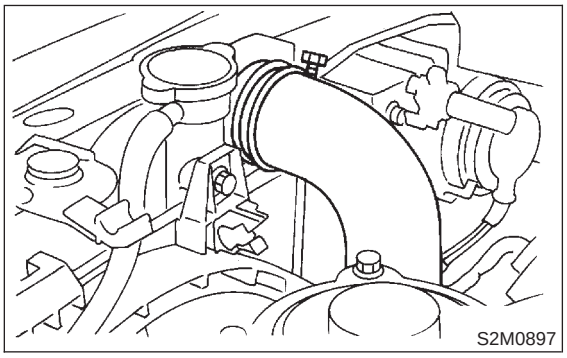
12) Remove reservoir tank.


S2M0931

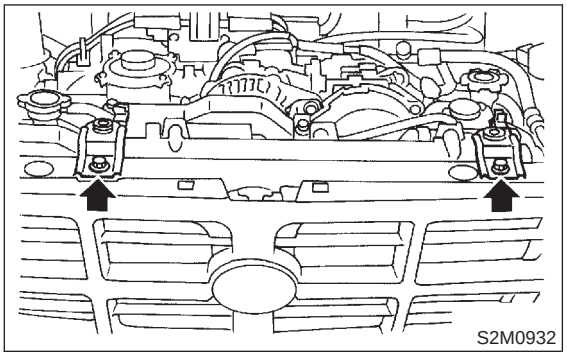
13) Remove V-belt covers.


S2M0896

14) Disconnect radiator inlet hose from radiator.

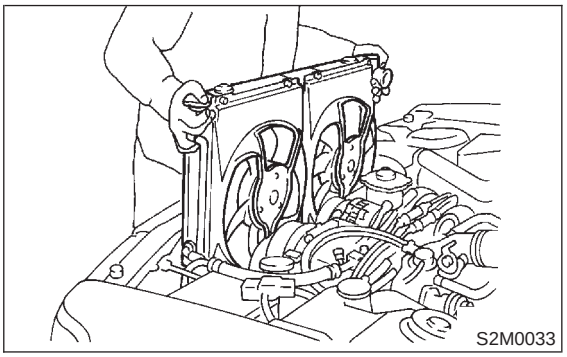

S2M0897

15) Remove radiator upper brackets.


S2M0932

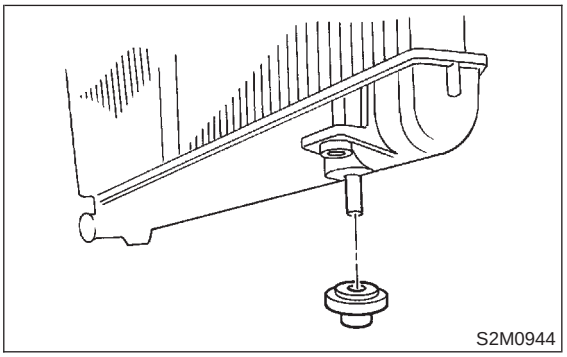
16) While slightly lifting radiator, slide it to left.

17) Lift radiator up and away from vehicle.


S2M0033

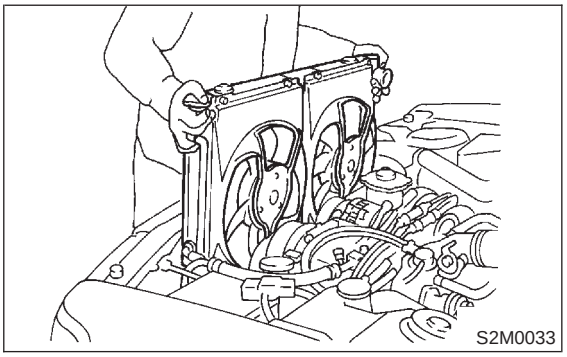
B: INSTALLATION

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


S2M0944

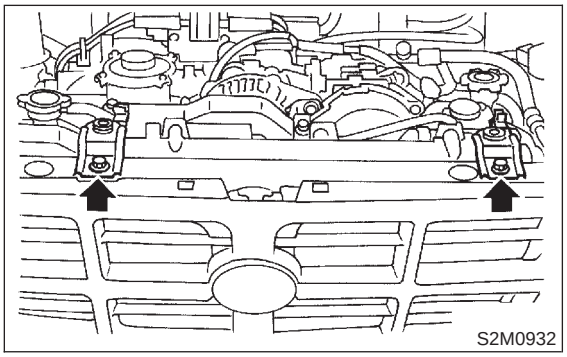
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit cushion on lower side of radiator into holes on body side.

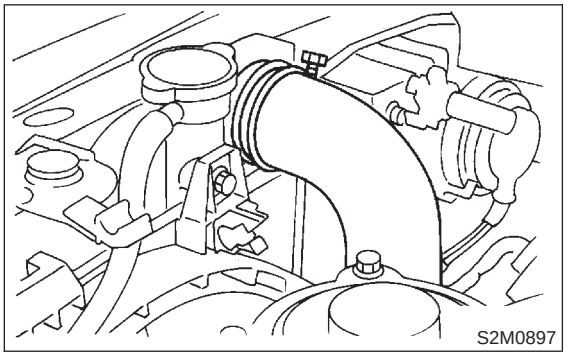

S2M0033

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)

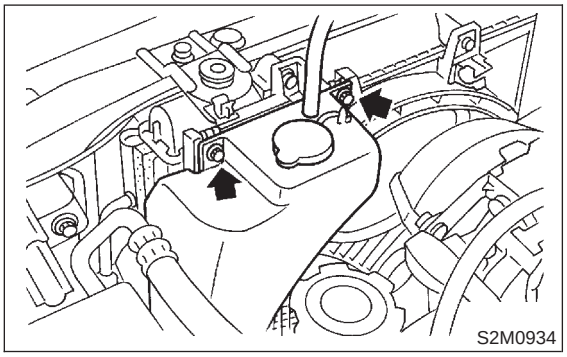

S2M0932

4) Connect radiator inlet hose.


S2M0897

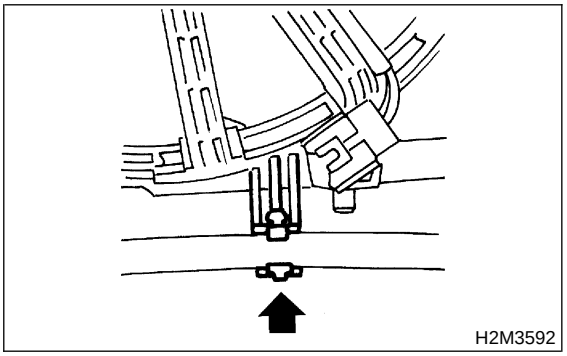
5) Install reservoir tank.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

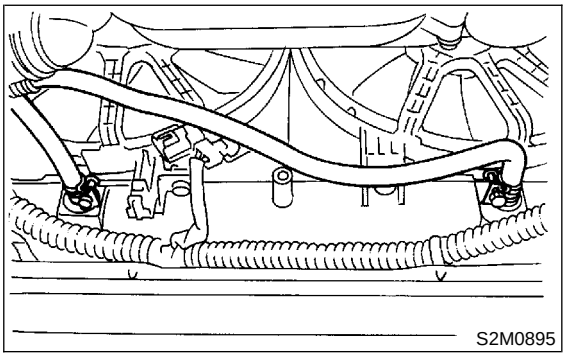

S2M0934

6) Lift-up the vehicle.

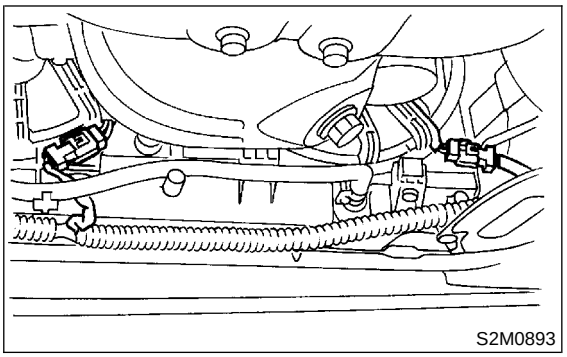
7) Attach ATF cooler hose to a clip under the radiator main fan shroud. (AT vehicles only)


H2M3592

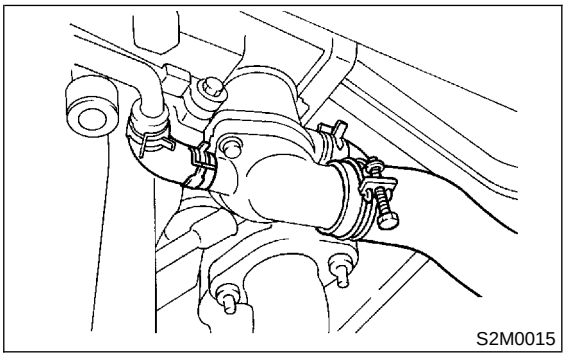
8) Connect ATF cooler hoses. (AT vehicles only)


S2M0895

9) Connect connectors to radiator main fan motor and sub fan motor.

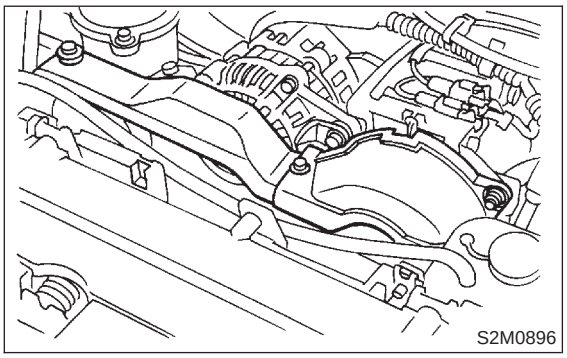

S2M0893

10) Connect radiator outlet hose.

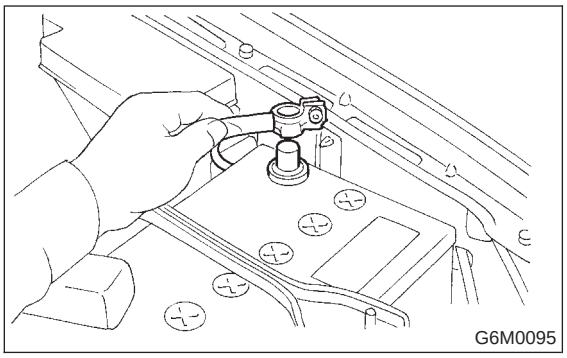

S2M0015

11) Install under cover.
12) Lower the vehicle.

13) Install V-belt covers.


S2M0896

14) Connect battery ground cable.

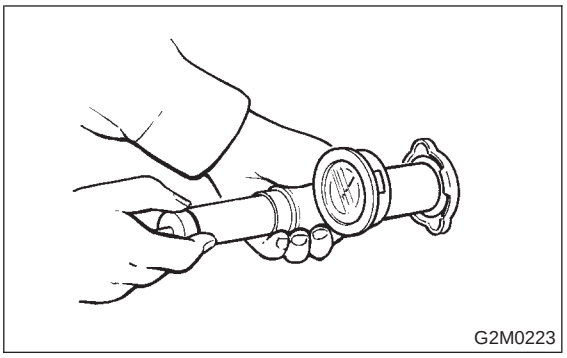

G6M0095

15) Fill coolant. <Ref. to 2-2 [W9B0].>

4. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.


G2M0223

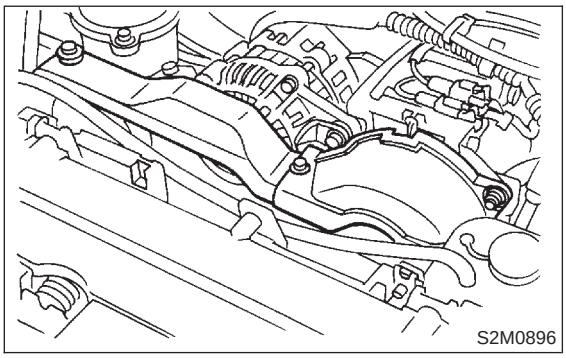
2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

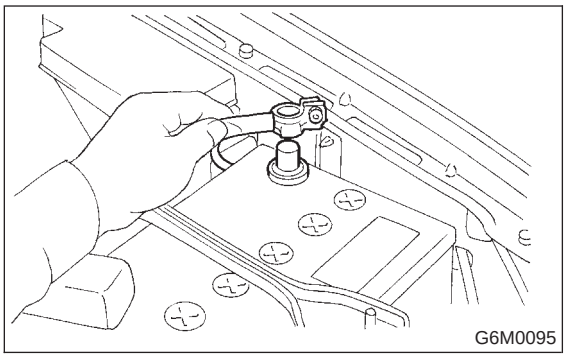
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

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

13) Install V-belt covers.


S2M0896

14) Connect battery ground cable.

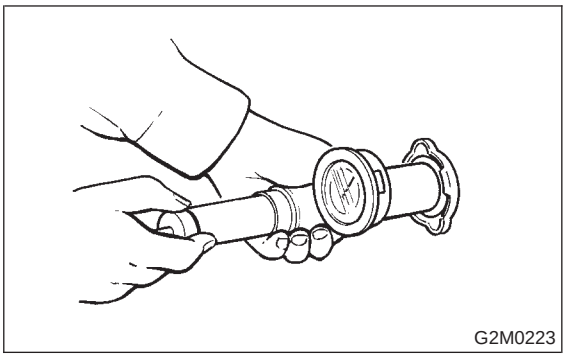

G6M0095

15) Fill coolant. <Ref. to 2-2 [W9B0].>

4. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.


G2M0223

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:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

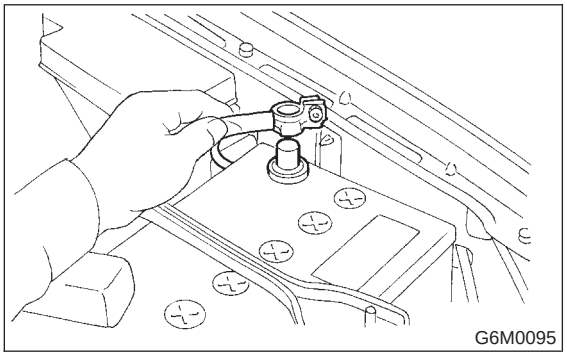
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

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

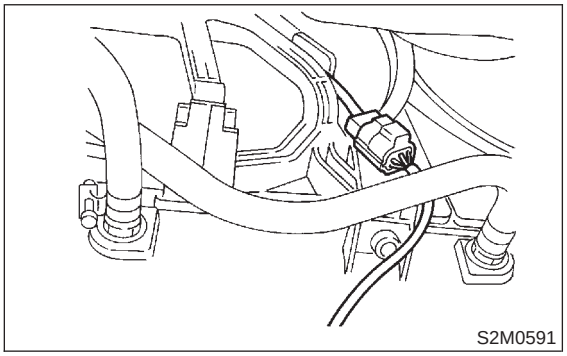
5. Radiator Main Fan and Fan Motor

A: REMOVAL AND INSTALLATION

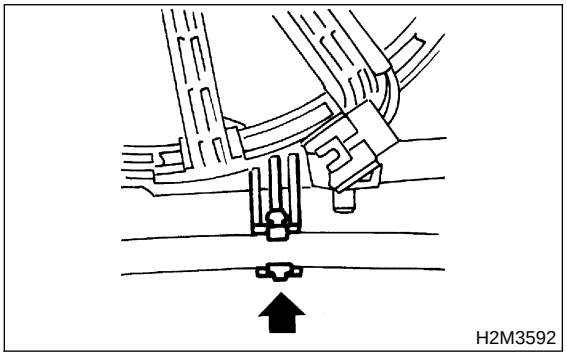
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


G6M0095

3) Lift-up the vehicle.
4) Remove under cover.
5) Disconnect connector of main fan motor.

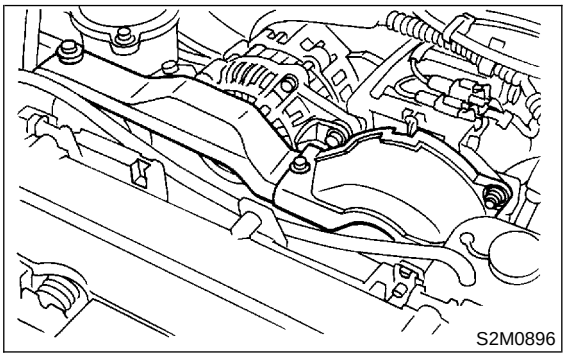

S2M0591

6) Detach ATF cooler hose attached to a clip under the radiator main fan shroud. (AT vehicles only)

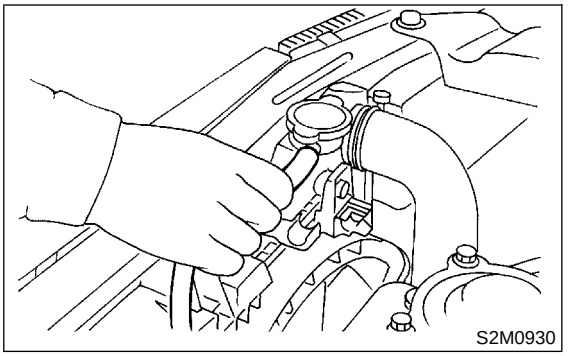

H2M3592

7) Lower the vehicle.

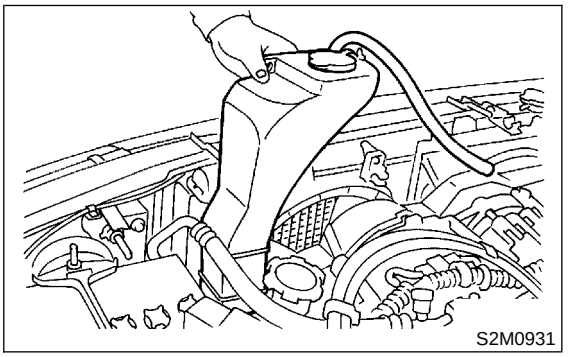
8) Remove V-belt covers.


S2M0896

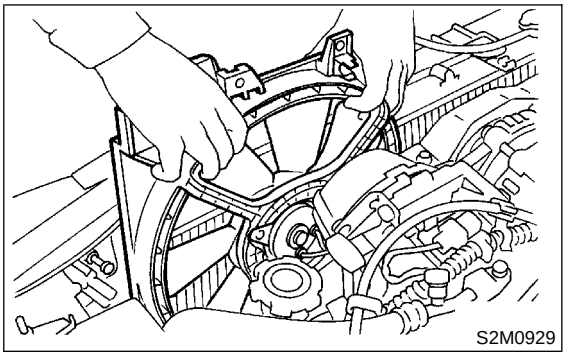
9) Disconnect over flow hose.


S2M0930

10) Remove reservoir tank.


S2M0931

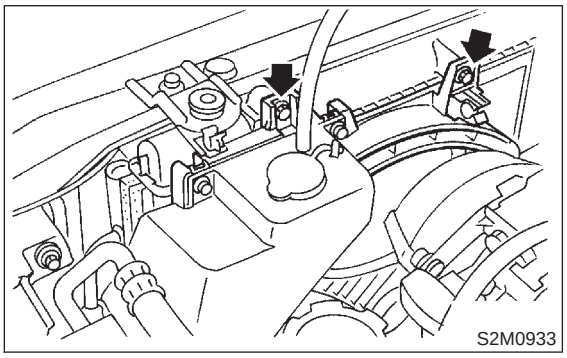
11) Remove radiator main fan motor assembly.


S2M0929

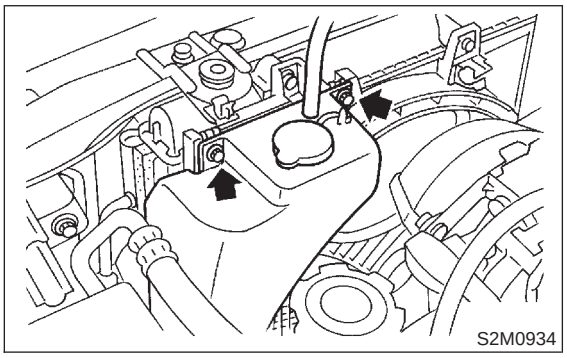
12) Install in the reverse order of removal.

NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it. <Ref. to 2-5 [W6A0].>

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

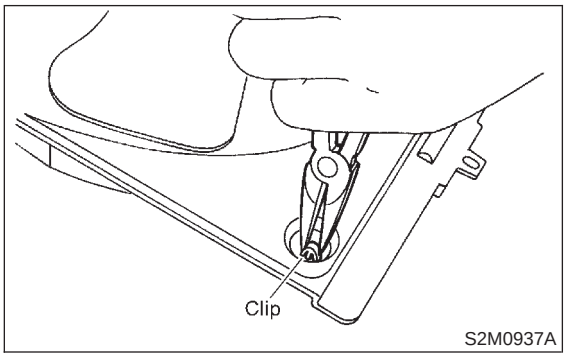

S2M0933

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)


S2M0934

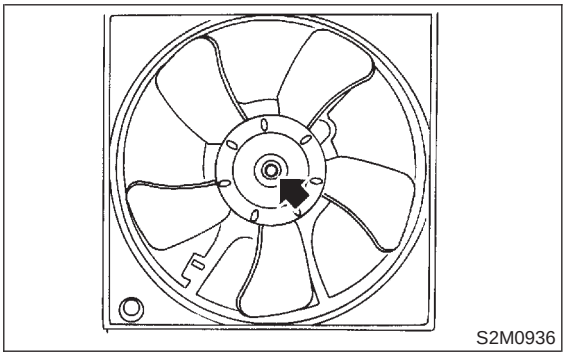
B: DISASSEMBLY AND ASSEMBLY

1) Remove clip which holds motor connector onto shroud.

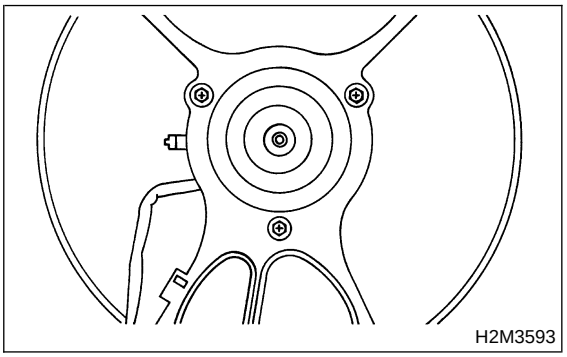


S2M0937A

2) Remove nut which holds fan itself onto fan motor and shroud assembly.

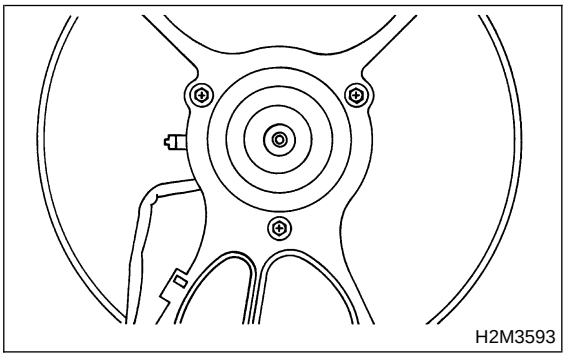

S2M0936

3) Remove bolts which install fan motor onto shroud.

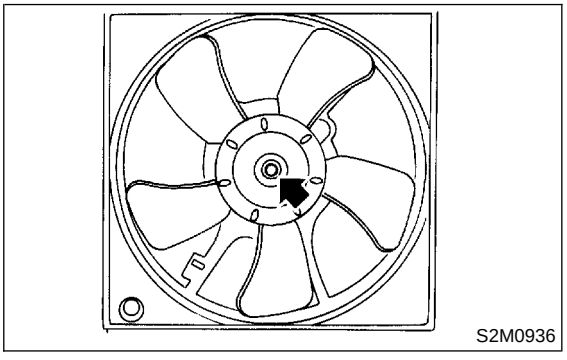

H2M3593

4) Install 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)


H2M3593

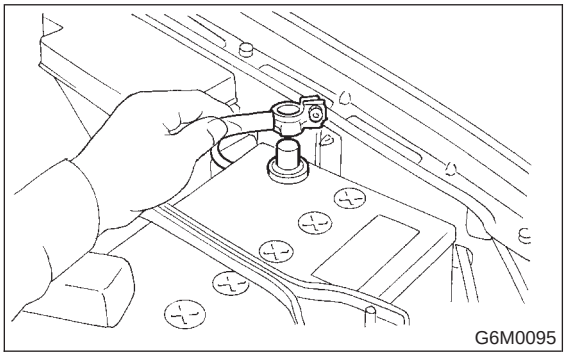
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)


S2M0936

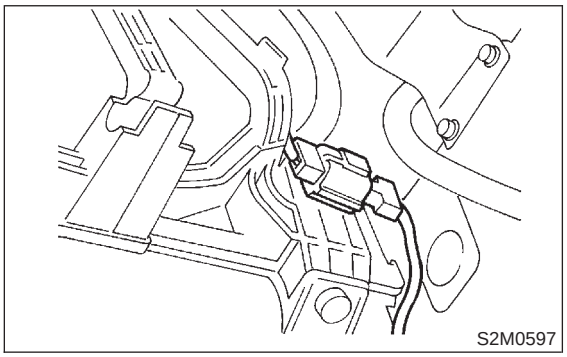
6. Radiator Sub Fan and Fan Motor

A: REMOVAL AND INSTALLATION

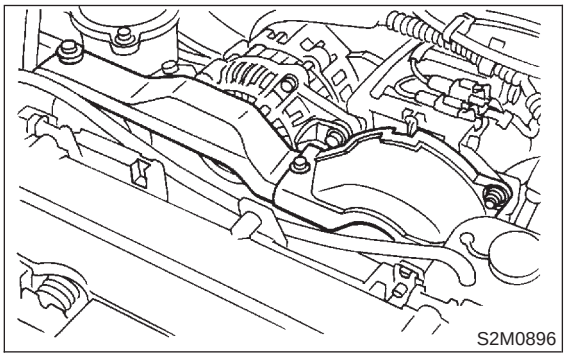
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


G6M0095

3) Lift-up the vehicle.
4) Remove under cover.
5) Disconnect connector of sub fan motor.

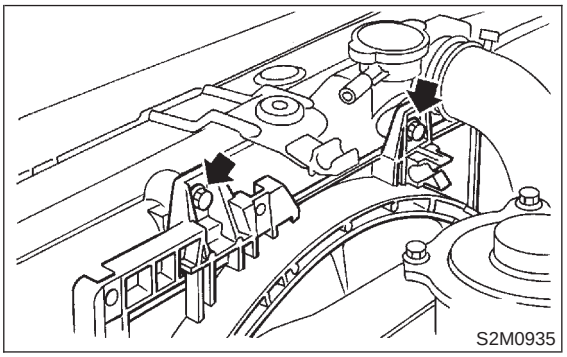

S2M0597

6) Lower the vehicle.
7) Remove V-belt covers.


S2M0896

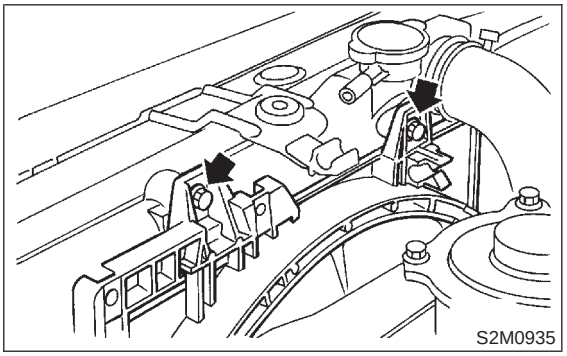
8) Remove bolts which hold sub fan shroud to radiator.

9) Remove radiator sub fan motor assembly.


S2M0935

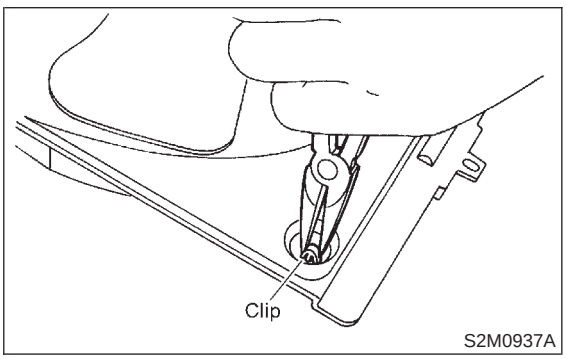
10) Install in the reverse order of removal.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)


S2M0935

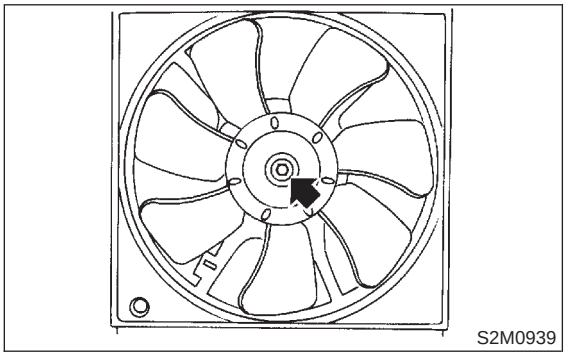
B: DISASSEMBLY AND ASSEMBLY

1) Remove clip which holds motor harness onto shroud.

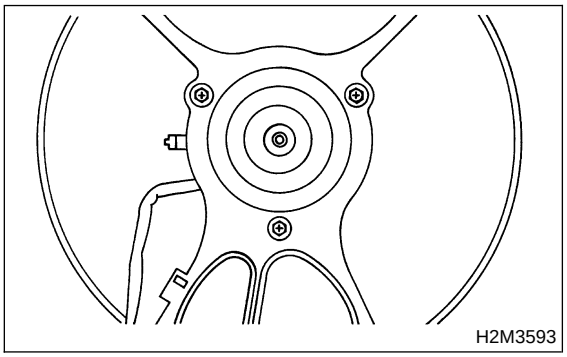


S2M0937A

2) Remove nut which holds fan itself onto fan motor and shroud assembly.

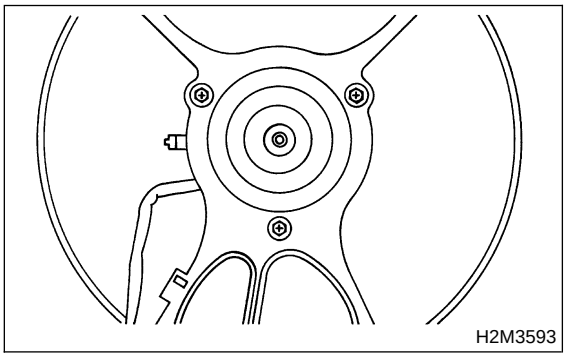

S2M0939

3) Remove bolts which install fan motor onto shroud.

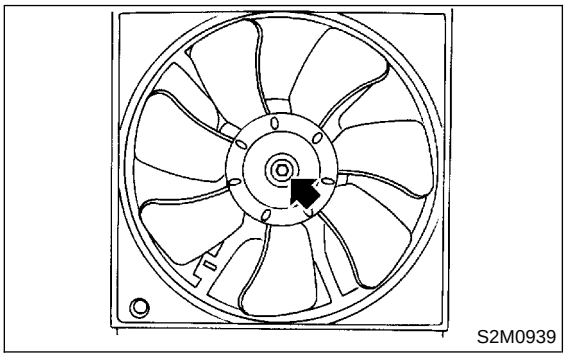

H2M3593

4) Install 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)


H2M3593

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

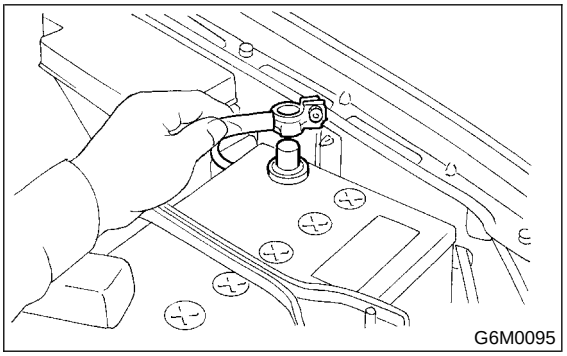

S2M0939

7. Water Pipe

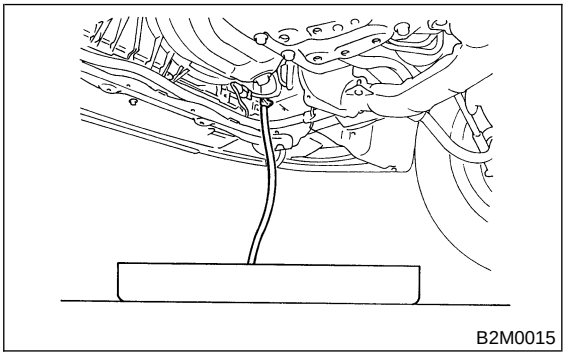
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

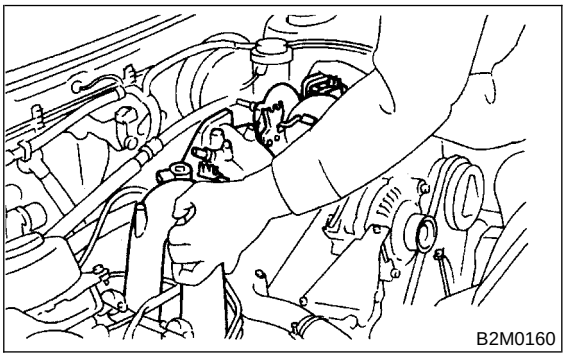
1) Set the vehicle on the lift.
2) Release fuel pressure.
<Ref. to 2-8 [W1A0].>
3) Disconnect ground cable from the battery.


G6M0095

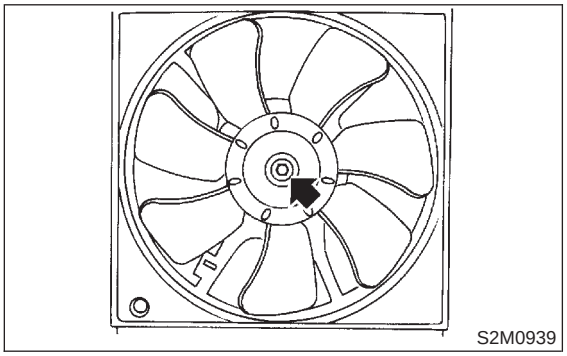
4) Drain engine coolant completely.
<Ref. to 2-5 [W9A0].>


B2M0015

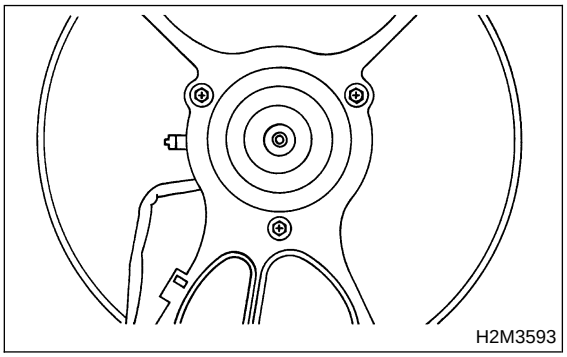
5) Lower the vehicle.
6) Remove intake manifold.
<Ref. to 2-7 [W3A0].>


B2M0160

2) Remove nut which holds fan itself onto fan motor and shroud assembly.

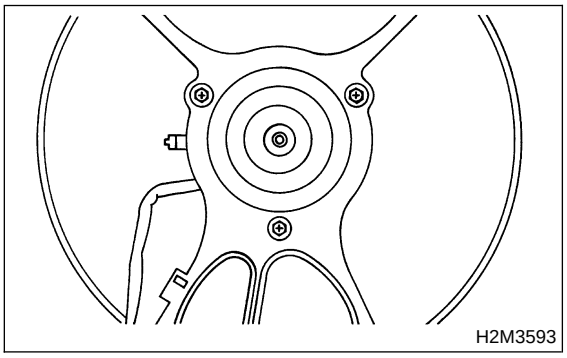

S2M0939

3) Remove bolts which install fan motor onto shroud.

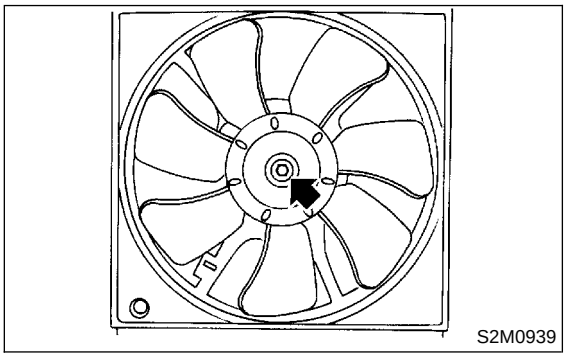

H2M3593

4) Install 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)


H2M3593

Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)

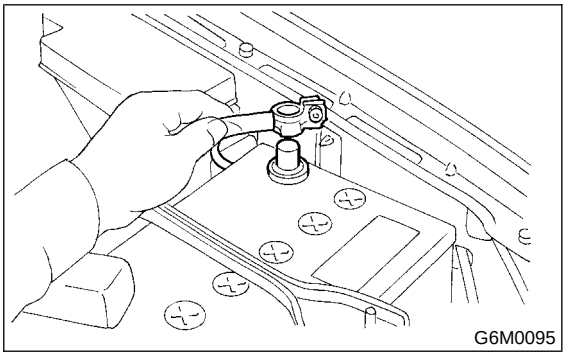

S2M0939

7. Water Pipe

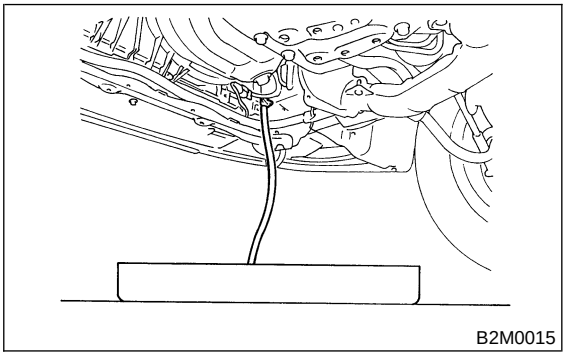
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

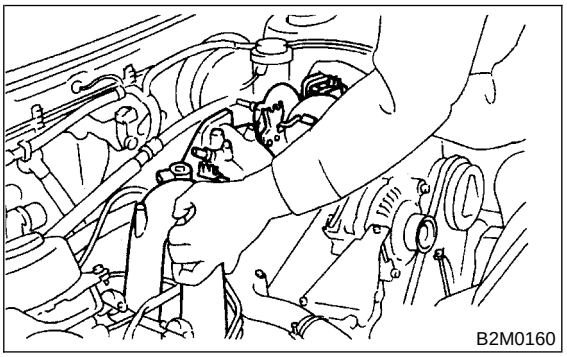
1) Set the vehicle on the lift.
2) Release fuel pressure.
<Ref. to 2-8 [W1A0].>
3) Disconnect ground cable from the battery.


G6M0095

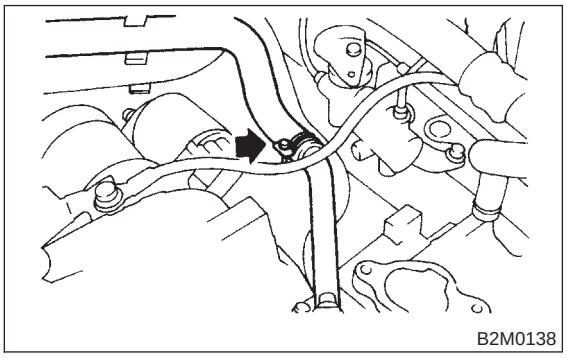
4) Drain engine coolant completely.
<Ref. to 2-5 [W9A0].>


B2M0015

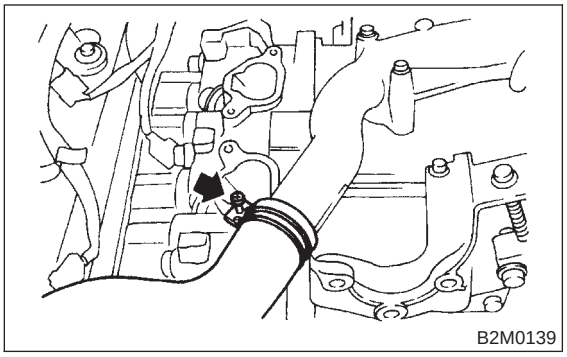
5) Lower the vehicle.
6) Remove intake manifold.
<Ref. to 2-7 [W3A0].>


B2M0160

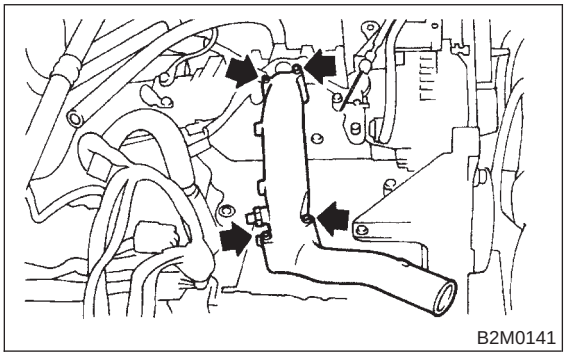
7) Disconnect heater inlet hose.



8) Disconnect radiator inlet hose from water pipe.



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

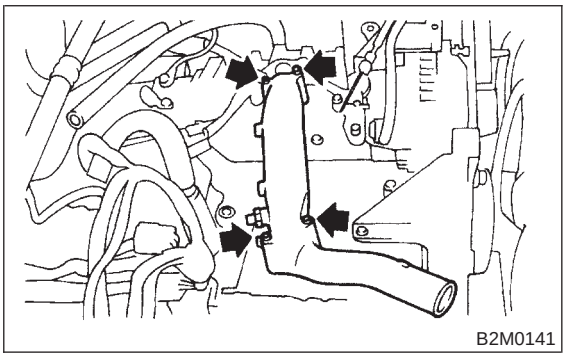


B: INSTALLATION

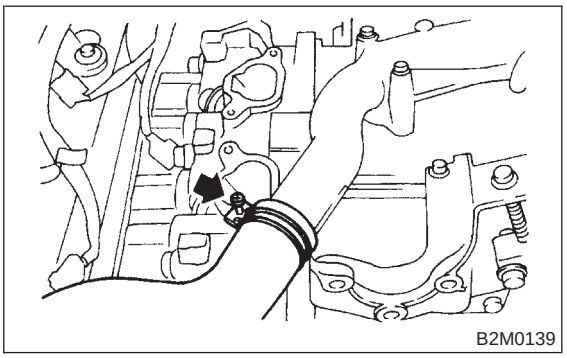
1) Install water pipe on cylinder block.

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

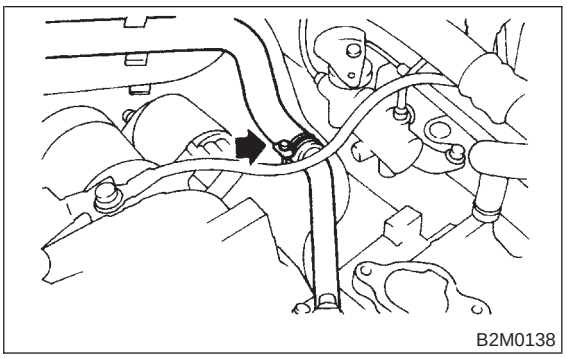
CAUTION:
Use a new O-ring.



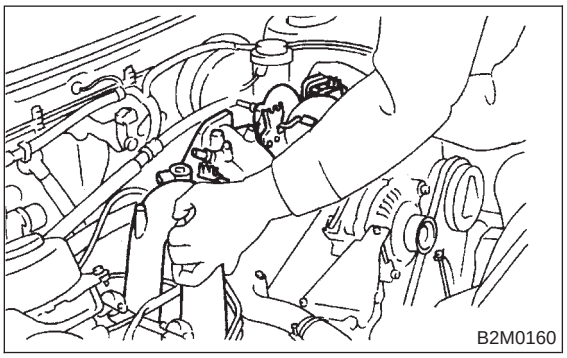
2) Connect radiator inlet hose.



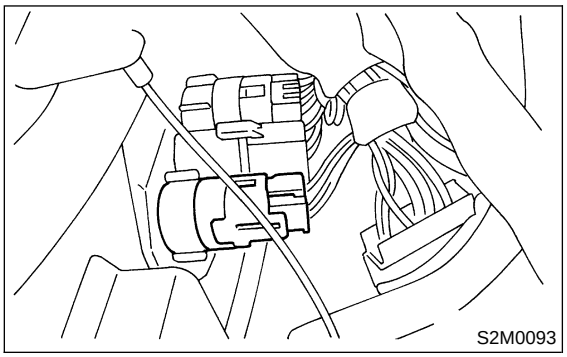
3) Connect heater inlet hose.



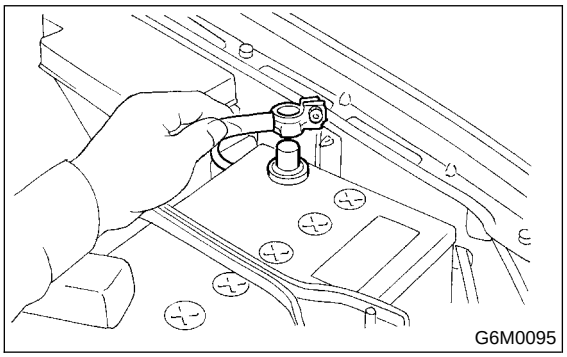
4) Install intake manifold.
<Ref. to 2-7 [W3D0].>



5) Connect connector to fuel pump relay.



6) Connect ground cable to battery.

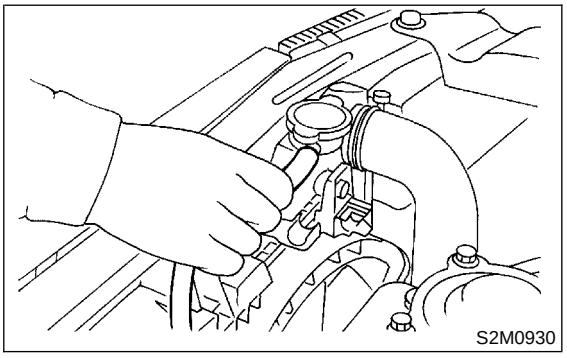


7) Lift-up the vehicle.
8) Install under cover.
9) Lower the vehicle.
10) Fill coolant.
<Ref. to 2-5 [W9B0].>

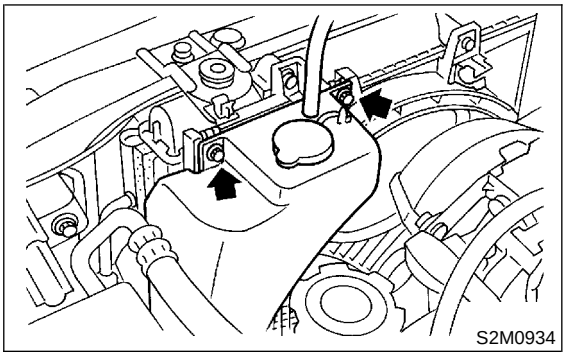
8. Reservoir Tank

A: REMOVAL AND INSTALLATION

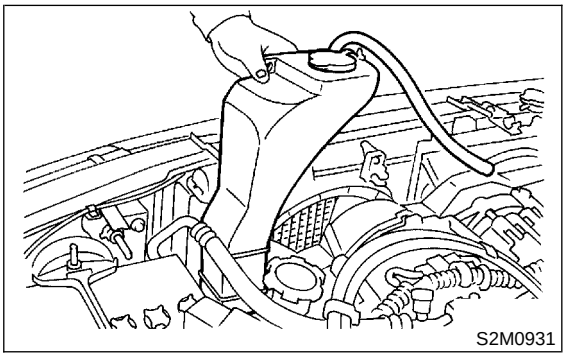
1) Disconnect over flow hose from radiator filler neck position.



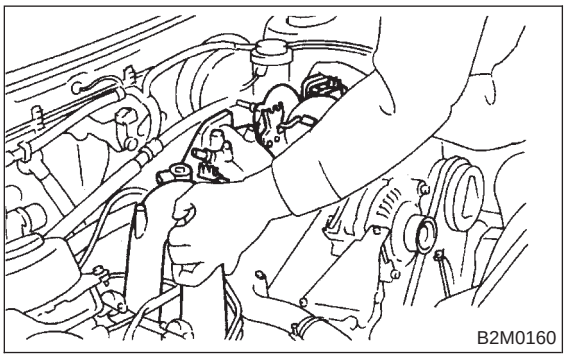
2) Remove bolts which install reservoir tank onto radiator main fan shroud.



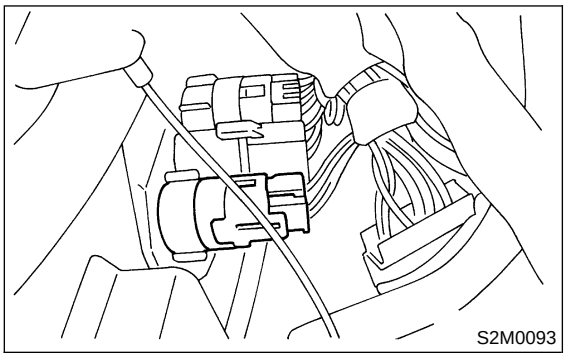
3) Remove reservoir tank.



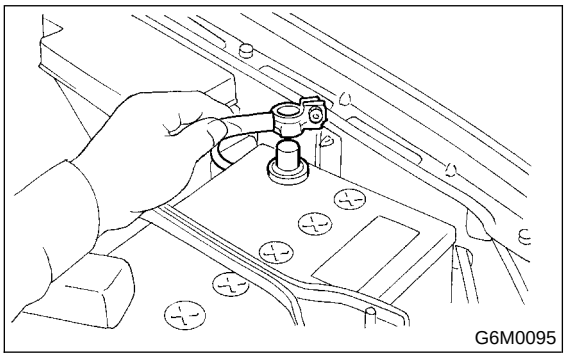
4) Install intake manifold.
<Ref. to 2-7 [W3D0].>



5) Connect connector to fuel pump relay.



6) Connect ground cable to battery.

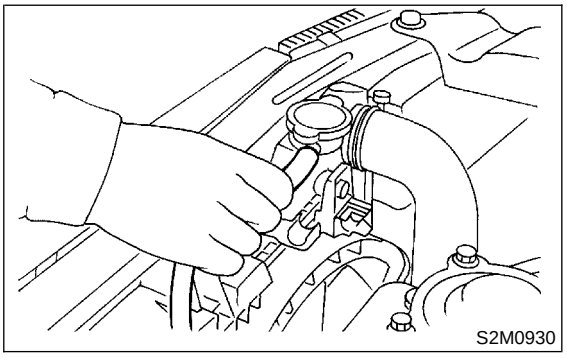


7) Lift-up the vehicle.
8) Install under cover.
9) Lower the vehicle.
10) Fill coolant.
<Ref. to 2-5 [W9B0].>

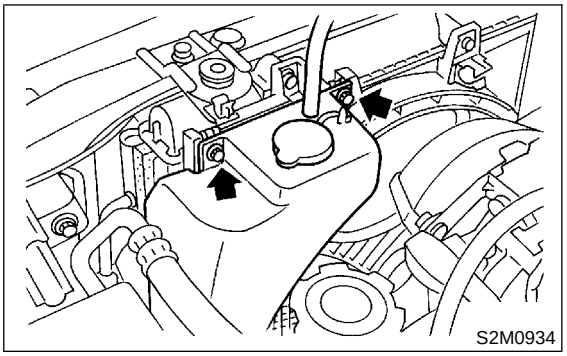
8. Reservoir Tank

A: REMOVAL AND INSTALLATION

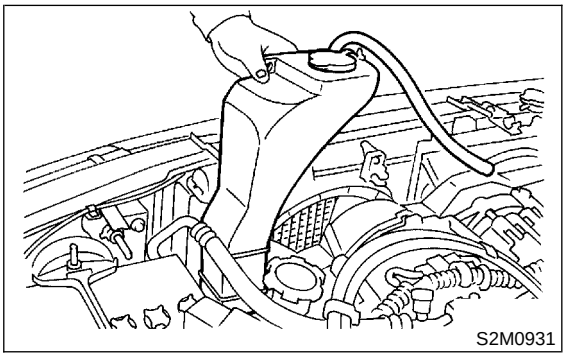
1) Disconnect over flow hose from radiator filler neck position.



2) Remove bolts which install reservoir tank onto radiator main fan shroud.

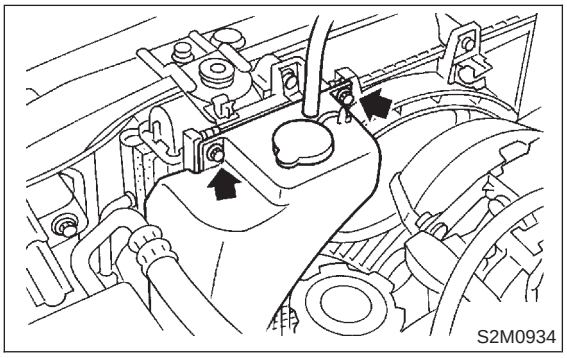


3) Remove reservoir tank.



4) Install in the reverse order of removal.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

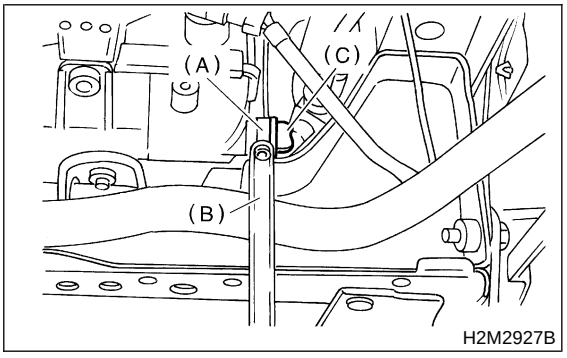

S2M0934

9. Engine Coolant

A: DRAINING OF ENGINE COOLANT

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

1) Lift-up the vehicle.
2) Remove under cover.
3) Fit vinyl tube to drain pipe.

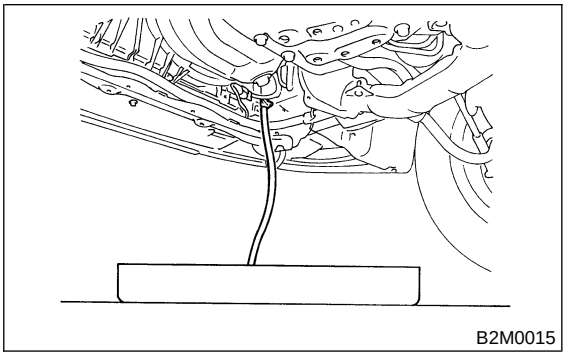


H2M2927B

(A) Drain pipe
(B) Vinyl tube
(C) Drain cock

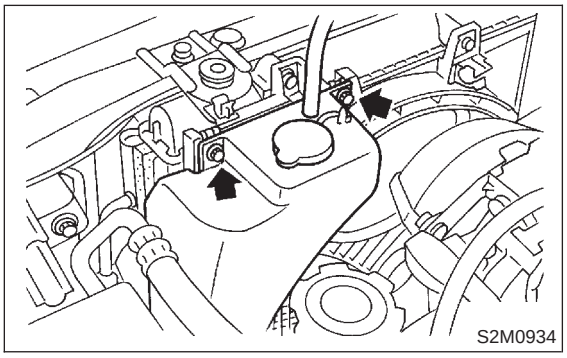
4) Loosen drain cock to drain engine coolant into container.

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


B2M0015

4) Install in the reverse order of removal.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

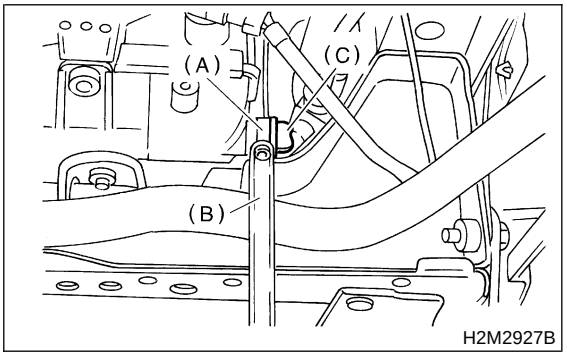

S2M0934

9. Engine Coolant

A: DRAINING OF ENGINE COOLANT

WARNING:
The radiator is pressurized. Wait until engine cools down before working on the radiator.

1) Lift-up the vehicle.
2) Remove under cover.
3) Fit vinyl tube to drain pipe.

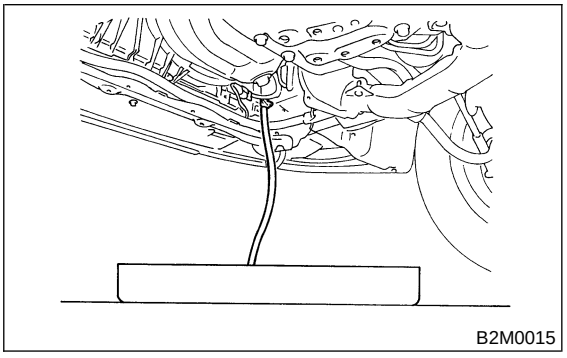


H2M2927B

(A) Drain pipe
(B) Vinyl tube
(C) Drain cock

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

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


B2M0015

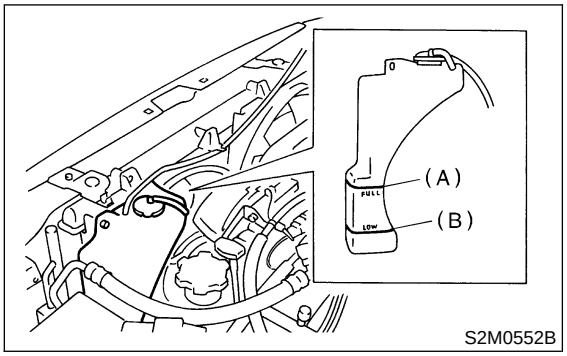
B: FILLING OF ENGINE COOLANT

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

Coolant capacity (fill up to "FULL" level):
MT model;
Approx. 6.0 ℓ (6.3 US qt, 5.3 Imp qt)
AT model;
Approx. 6.2 ℓ (6.6 US qt, 5.5 Imp qt)

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

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

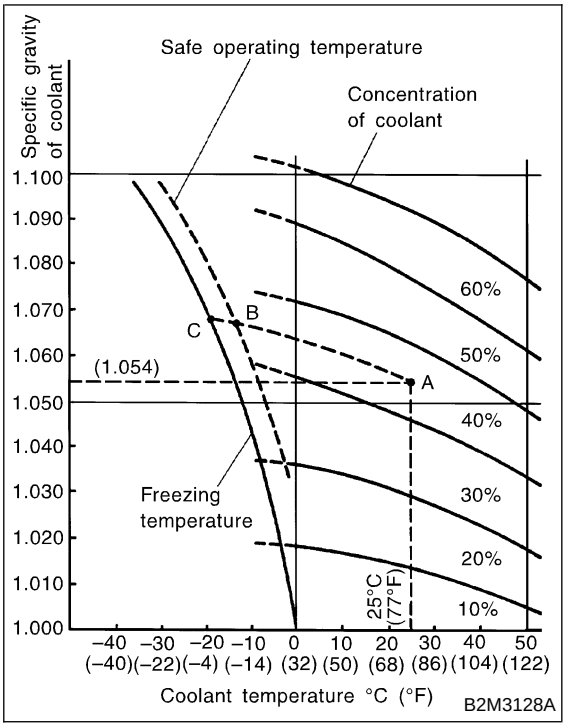


(A) Full level
(B) Low level

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

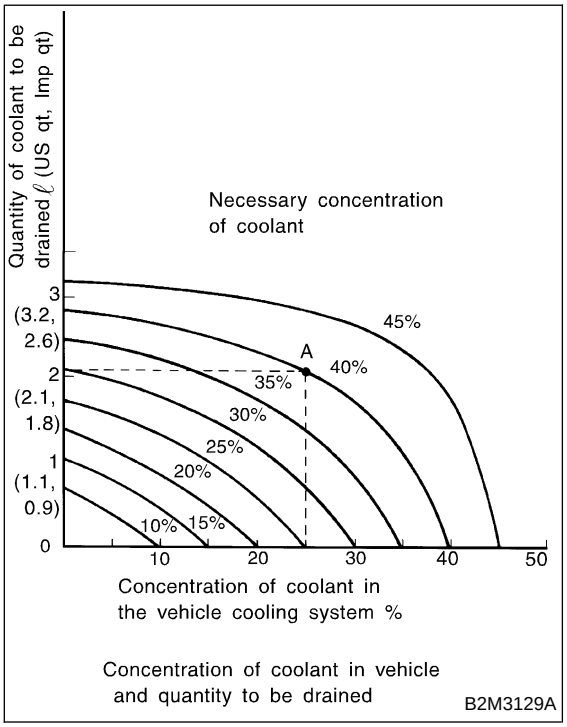
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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



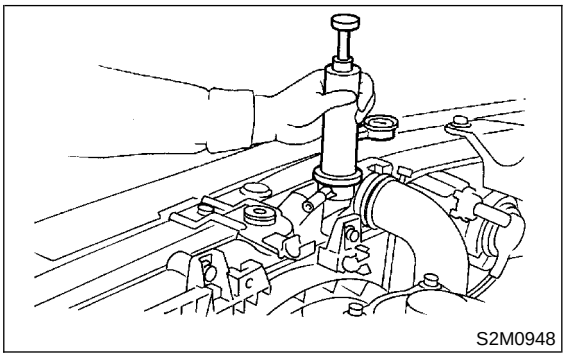
2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

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



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.**

1. Engine Cooling System Trouble in General

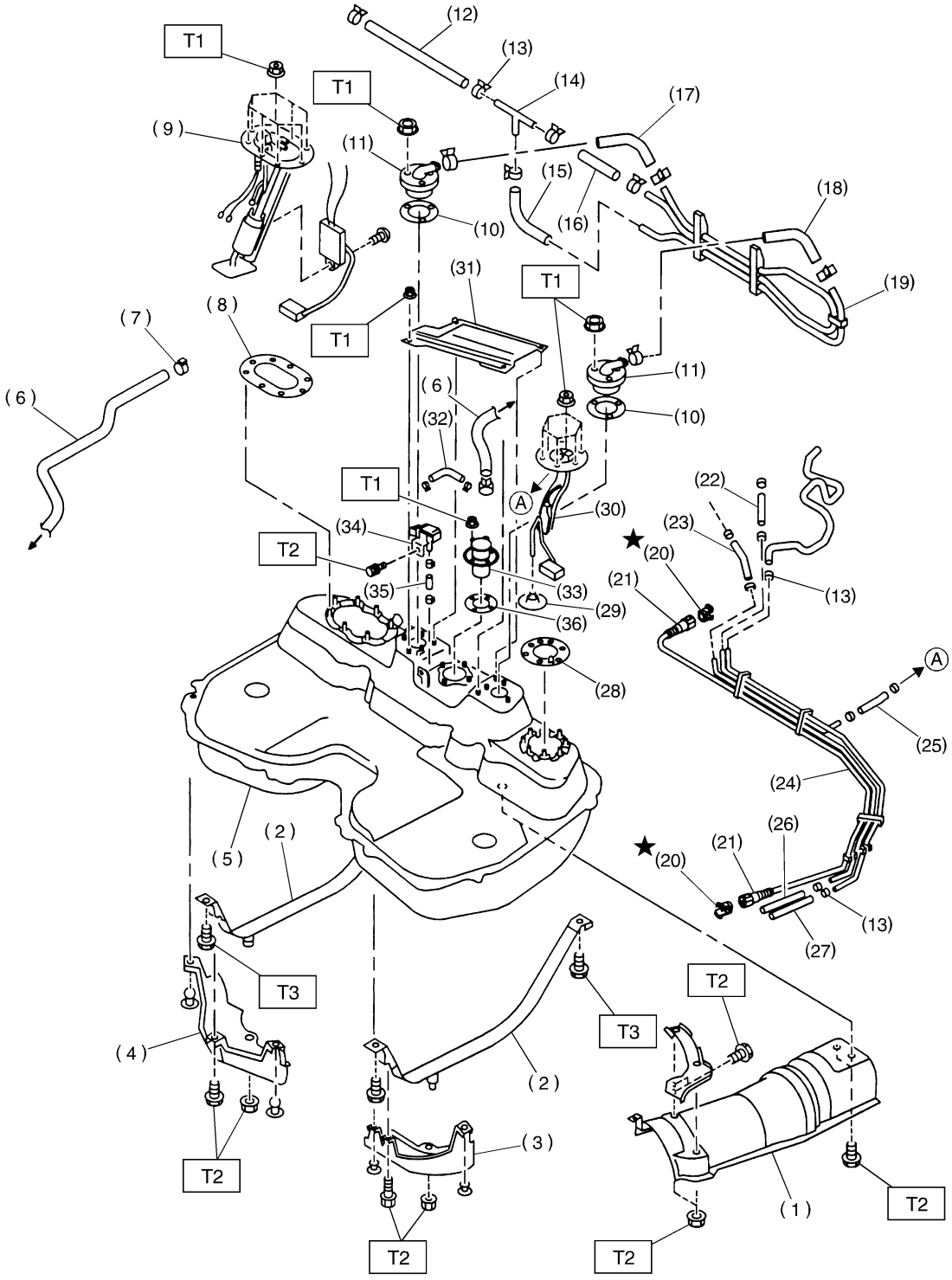
Trouble		Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to 2-7 [T100].> 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 [T100].> 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. Fuel System

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	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

1. Fuel Tank

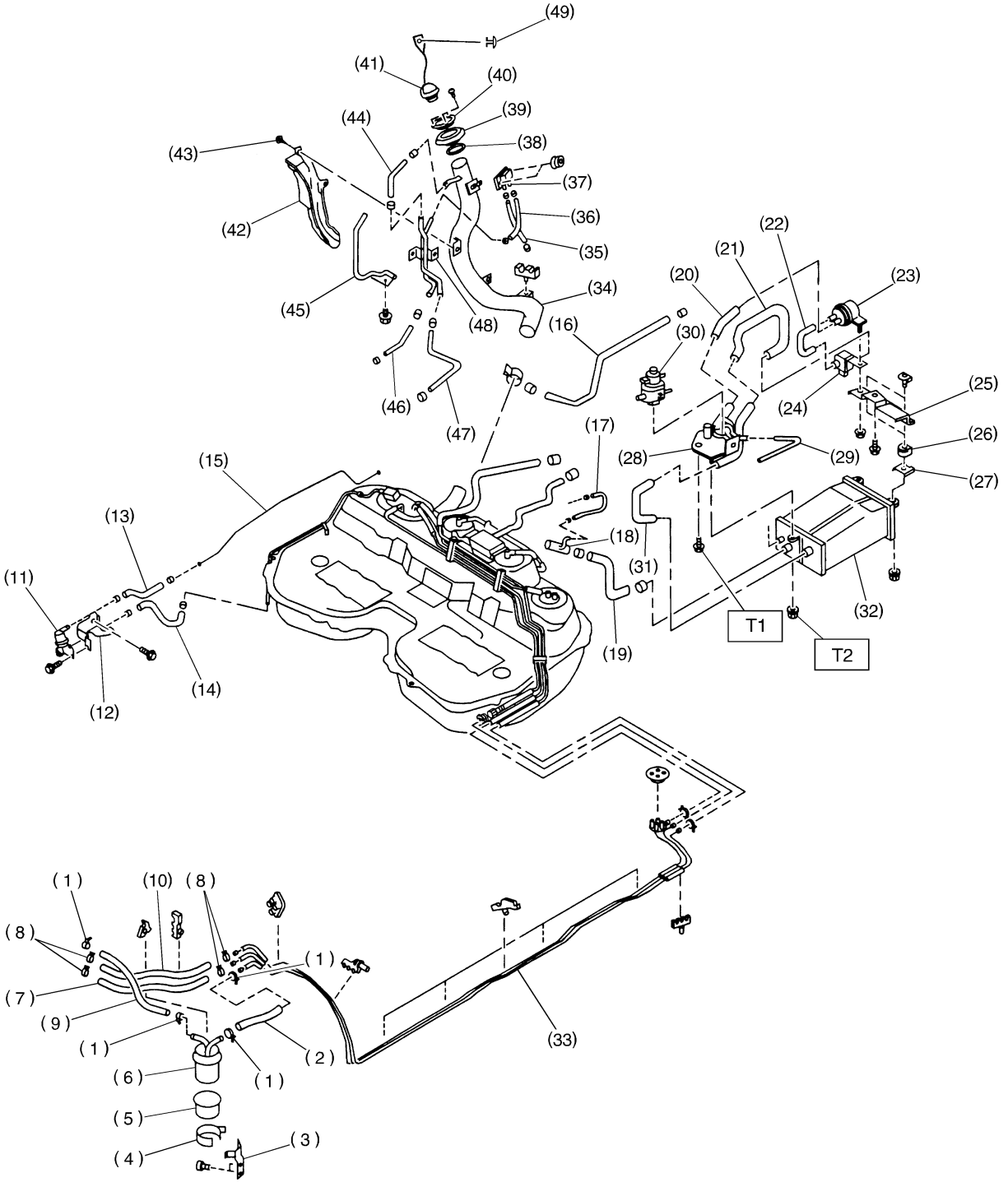


S2M2001A

(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) Fuel pump ASSY
(10) Fuel cut valve gasket
(11) Fuel cut valve
(12) Evaporation hose A
(13) Clip
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation hose B
(17) Evaporation hose D
(18) Evaporation hose E
(19) Evaporation pipe ASSY
(20) Retainer
(21) Quick connector
(22) Jet pump hose A
(23) Fuel return hose A
(24) Fuel pipe ASSY
(25) Jet pump hose B
(26) Fuel return hose B
(27) Evaporation hose F
(28) Fuel sub level sensor gasket
(29) Jet pump filter
(30) Fuel sub level sensor
(31) Protector cover
(32) Vent valve hose
(33) Vent valve
(34) Fuel tank pressure sensor
(35) Fuel tank pressure sensor hose
(36) 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)

2. Fuel Line



S2M2002A

(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) Drain 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) Canister
(33) Fuel pipe ASSY
(34) Fuel filler pipe
(35) Evaporation hose M
(36) Evaporation hose N
(37) Shut valve
(38) Packing
(39) Ring A
(40) Ring B
(41) Fuel filler cap
(42) Fuel filler pipe protector
(43) Tapping screw
(44) Evaporation hose O
(45) Joint pipe
(46) Evaporation hose P
(47) Evaporation hose Q
(48) Evaporation pipe
(49) Clip

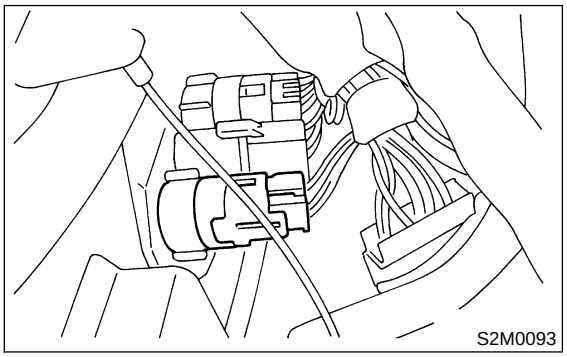
Tightening torque: N·m (kg-m, ft-lb)
T1: 17.7±5 (1.8±0.5, 13.0±3.6)
T2: 23±7 (2.3±0.7, 16.6±5.1)

1. Fuel Tank

A: RELEASING OF FUEL PRESSURE

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

1) Disconnect connector from fuel pump relay.

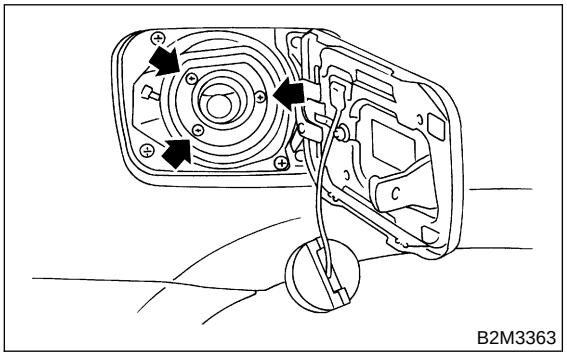

S2M0093

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

B: DRAINING OF FUEL

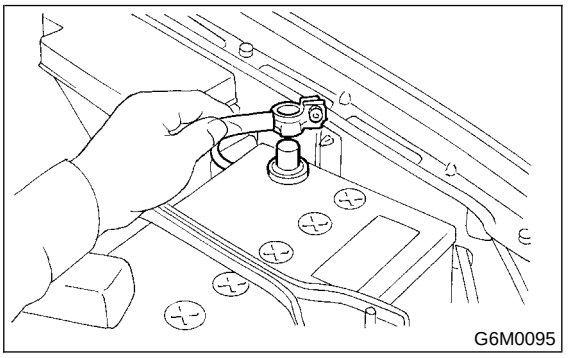
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Open fuel flap lid, and remove fuel filler cap.

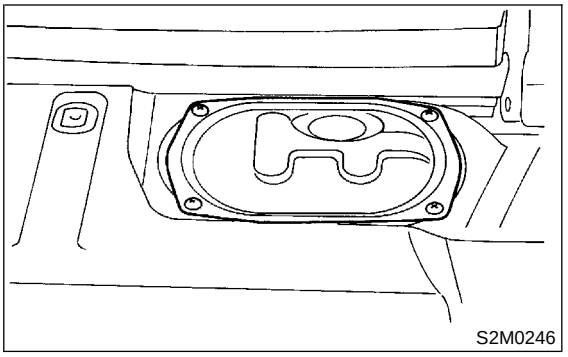


B2M3363

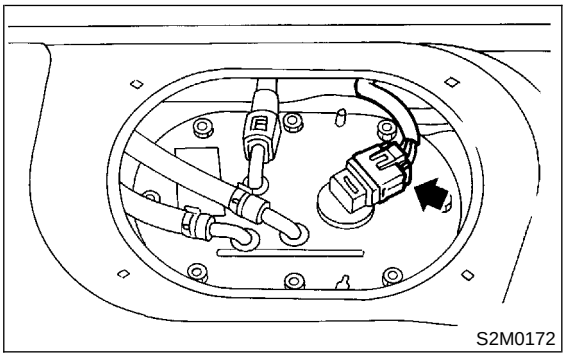
3) Disconnect battery ground cable.


G6M0095

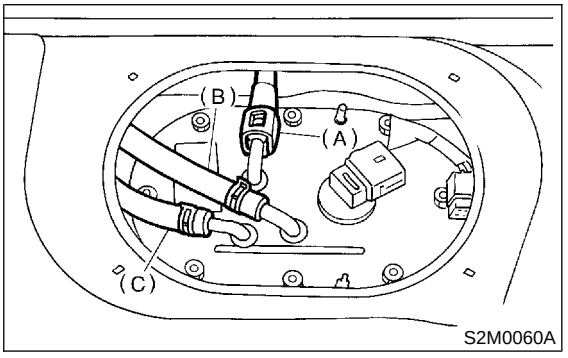
4) Remove access hole lid.


S2M0246

5) Disconnect connector from fuel pump.

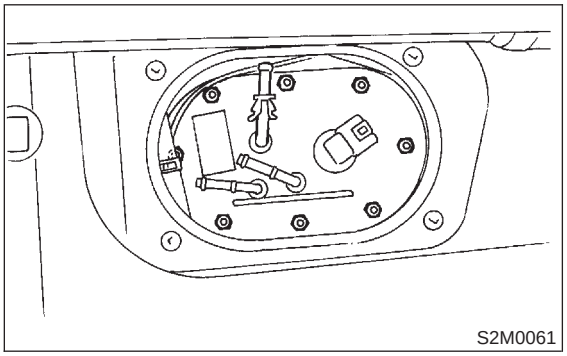

S2M0172

6) Disconnect quick connector, and then disconnect fuel delivery hose (A). <Ref. to 2-8 [W9A0].>
7) Move clips, and then disconnect fuel return hose (B) and jet pump hose (C).



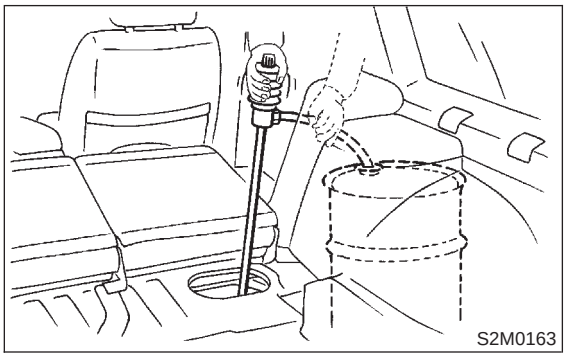
S2M0060A

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

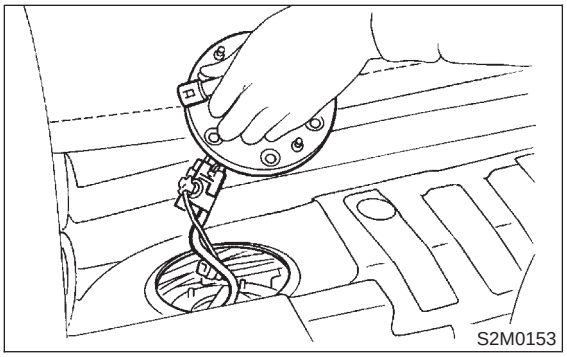

S2M0061

9) Take off fuel pump from fuel tank.
10) Drain fuel from fuel tank by using a hand pump.

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

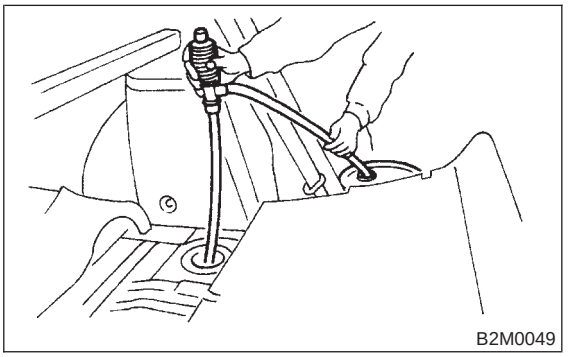

S2M0163

11) Remove fuel sub level sensor. <Ref. to 2-8 [W5A0].>


S2M0153

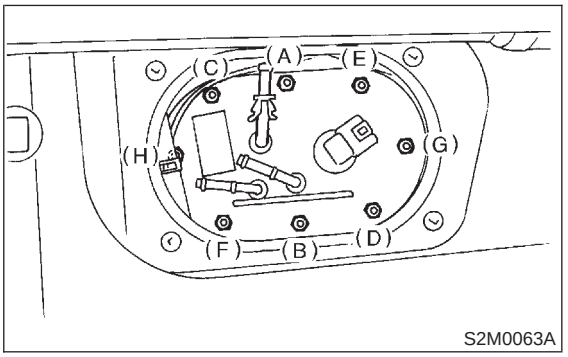
12) Drain fuel from there.

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

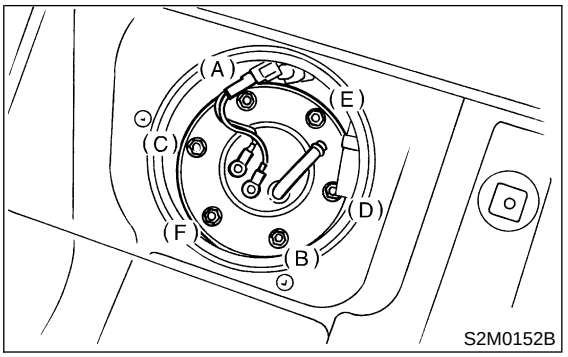

B2M0049

13) After draining fuel, reinstall fuel pump and fuel sub level sensor.
Tighten nuts of fuel pump 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)



S2M0063A



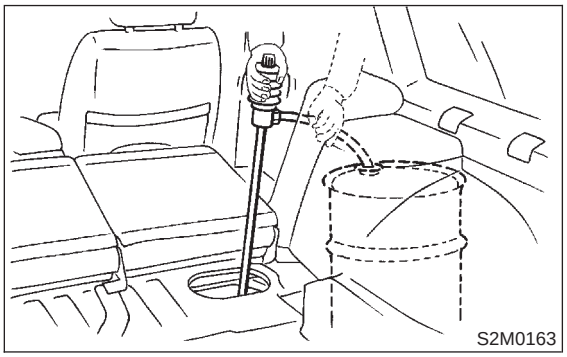
S2M0152B

C: REMOVAL

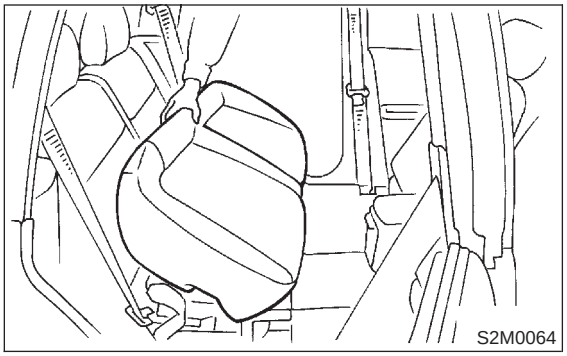
WARNING:
● Place "NO FIRE" signs near the working area.
● Be careful not to spill fuel on the floor.

1) Set the vehicle on the lift.

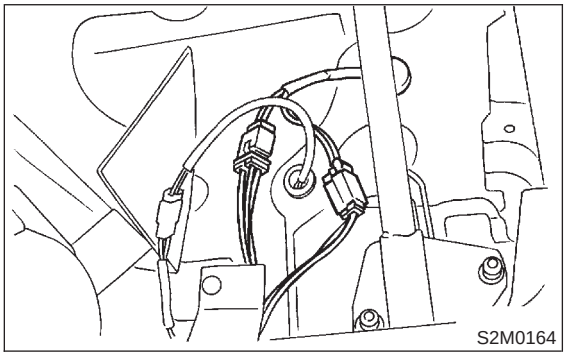
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1B0].>


S2M0163

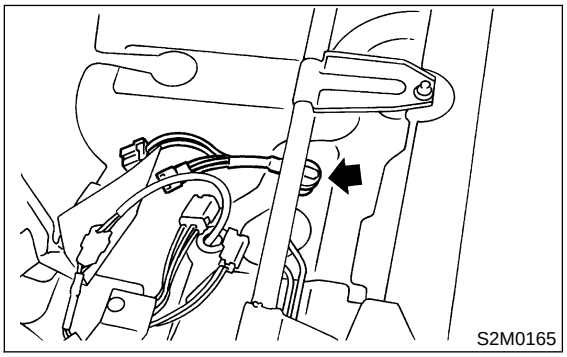
3) Remove rear seat cushion and turn up cover.


S2M0064

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


S2M0164

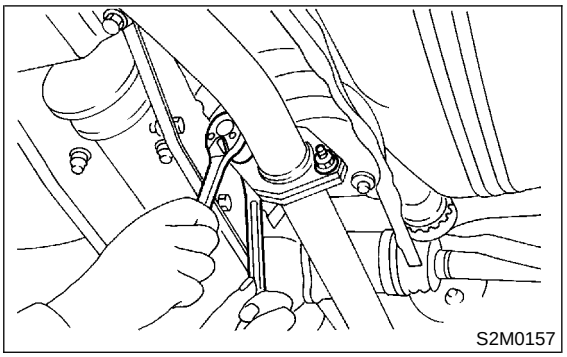
5) Push grommet which holds fuel tank cord on floor panel into the body side.


S2M0165

6) Lift-up the vehicle.

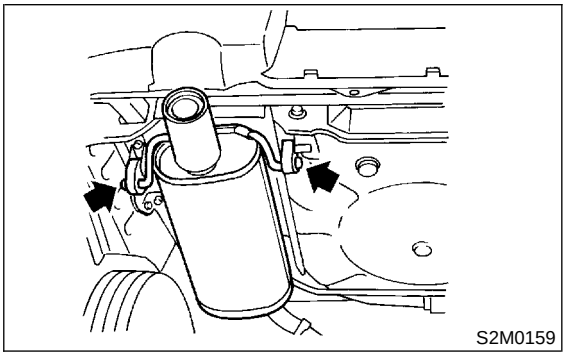
7) Remove rear exhaust pipe. <Ref. to 2-9 [W2A0].>

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

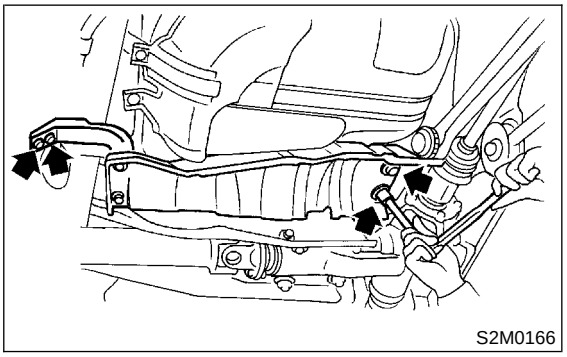

S2M0157

8) Remove muffler assembly.
<Ref. to 2-9 [W3A0].>

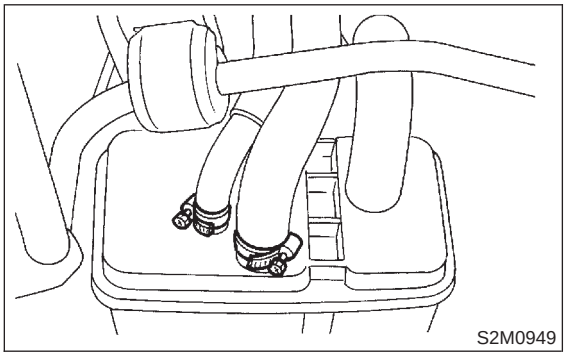
NOTE:
To facilitate the removal of parts, apply a coat of SUBARU CRC5-56 (Part No. 004301003).


S2M0159

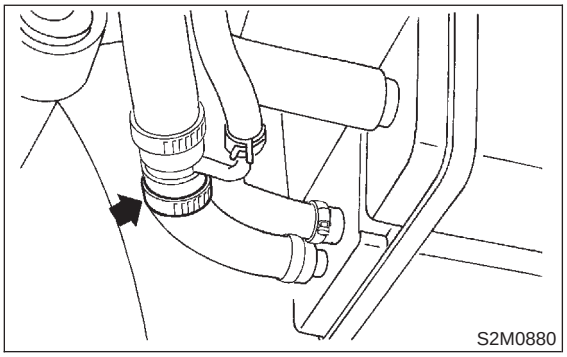
9) Remove heat sealed cover.


S2M0166

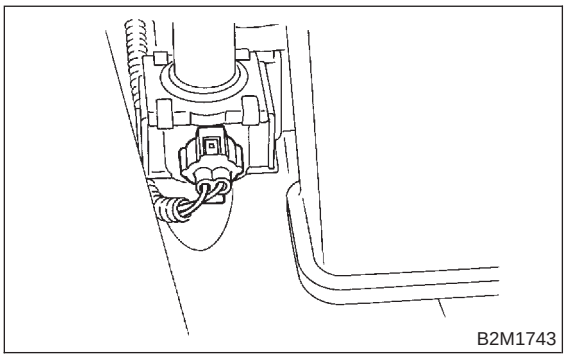
10) Move clamp, and disconnect evaporation hose from canister.


S2M0949

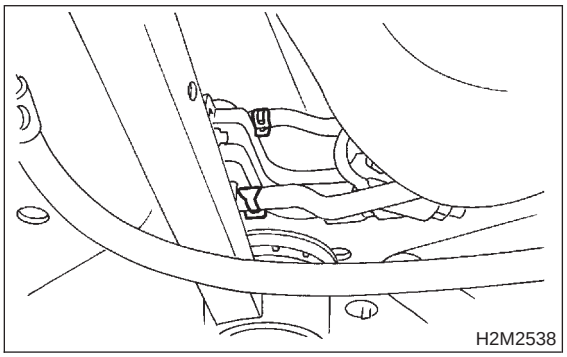
11) Disconnect hose from joint pipe.


S2M0880

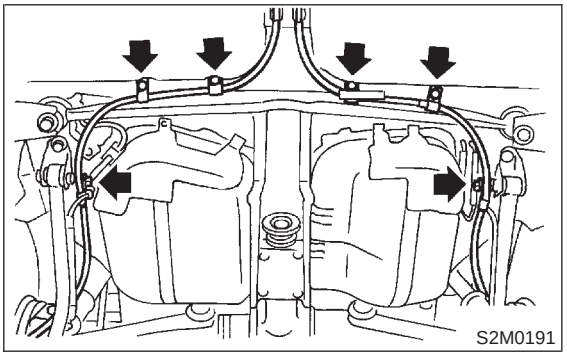
12) Disconnect connector from pressure control solenoid valve.
13) Disconnect connector from drain valve.


B2M1743

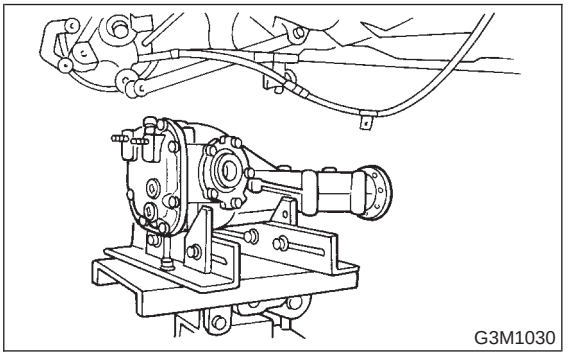
14) Disconnect hoses from roll over valve.


H2M2538

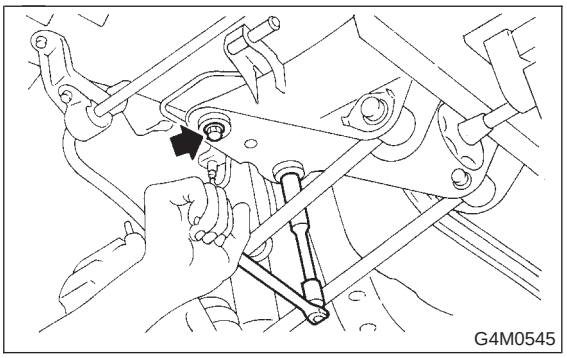
15) Remove bolts which hold parking brake cable holding bracket.


S2M0191

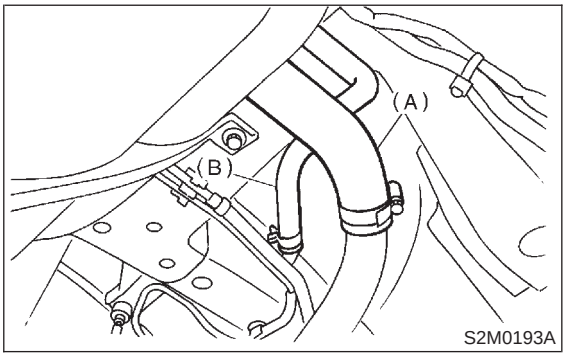
16) Remove rear differential assembly.
<Ref. to 3-4 [W2B0].>


G3M1030

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

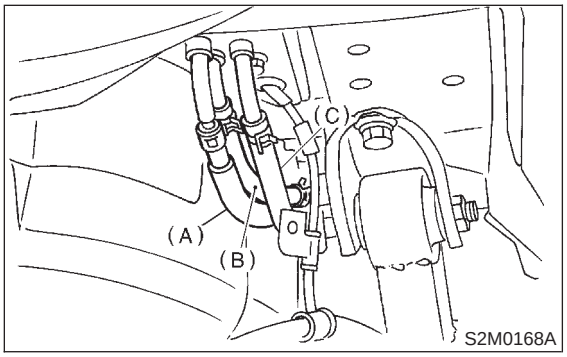

G4M0545

18) Loosen clamp, and disconnect fuel filler hose (A) and air vent hose (B) from fuel filler pipe and air vent pipe.



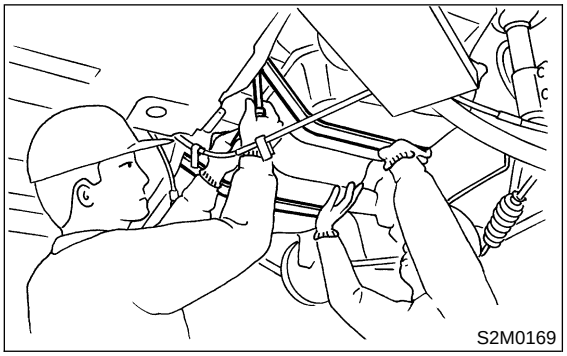
S2M0193A

19) Move clips, and disconnect fuel return hose (B) and evaporation hose (C).
20) Disconnect quick connector, and then disconnect fuel delivery hose (A).



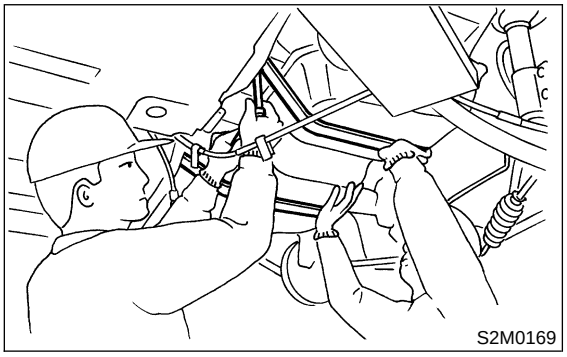
21) While holding fuel tank, remove bolts from bands and dismount fuel tank.

WARNING:
A helper is required to perform this work.



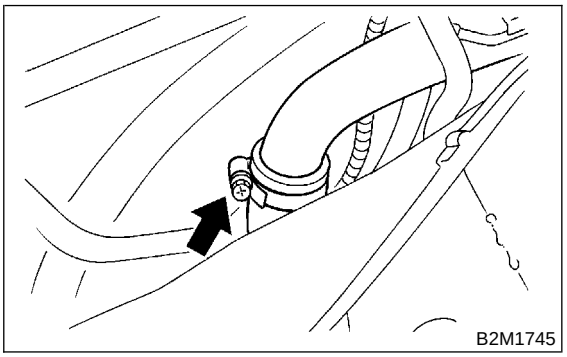
D: INSTALLATION

1) While a helper holds fuel tank, push fuel tank harness into access hole with grommet.



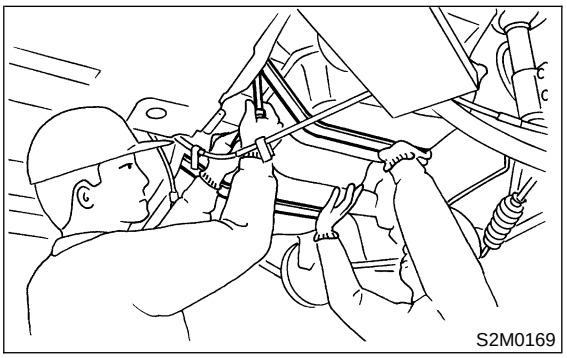
2) Set fuel tank, and temporary tighten bolts in order to install fuel tank bands.

3) Connect fuel filler hose, and tighten clamp.

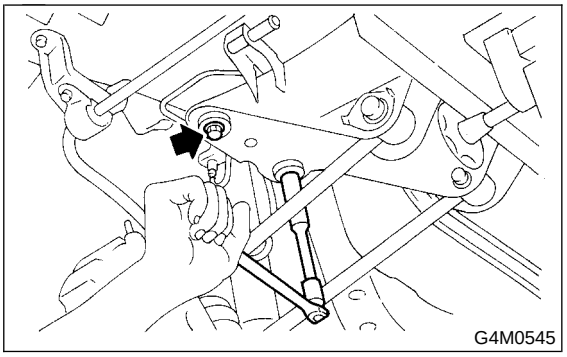


4) Connect fuel hoses, and hold then with clips and quick connector. <Ref. to 2-8 [W9A0].>
5) Tighten band mounting bolts.

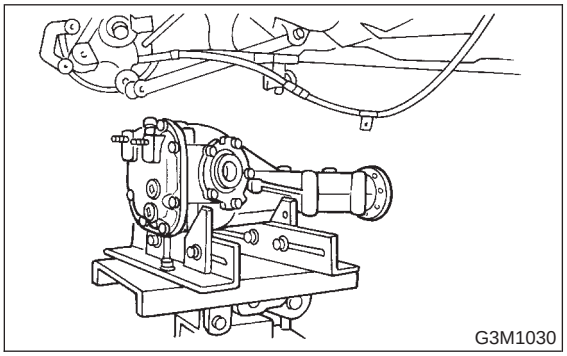
Tightening torque:
33±10 N·m (3.4±1.0 kg-m, 25±7 ft-lb)



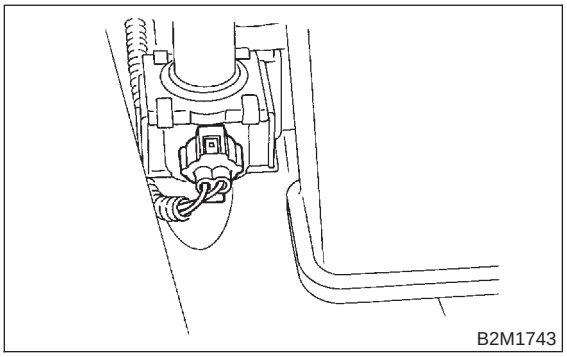
6) Install rear crossmember. <Ref. to 4-1 [W10C0].>



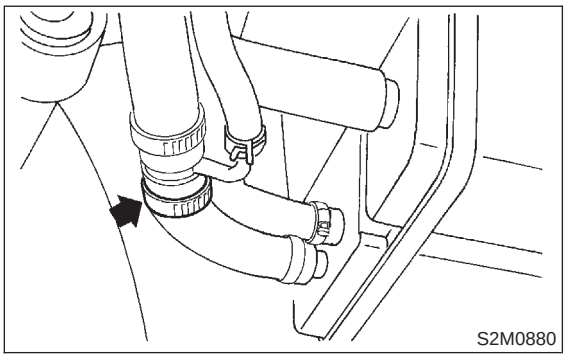
7) Install rear differential assembly. <Ref. to 3-4 [W2F0].>


G3M1030

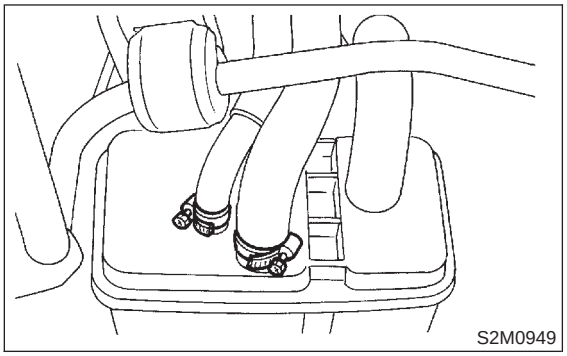
8) Connect connector to drain valve.


B2M1743

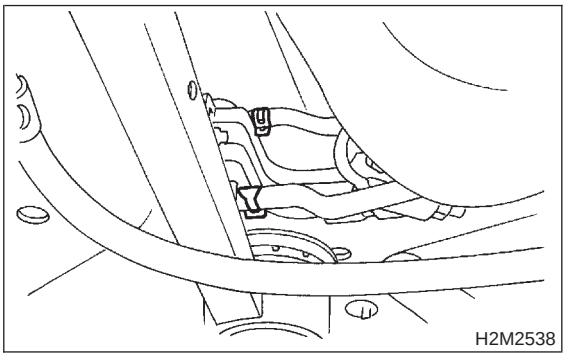
9) Connect connector to pressure control solenoid valve.
10) Connect hose to joint pipe.


S2M0880

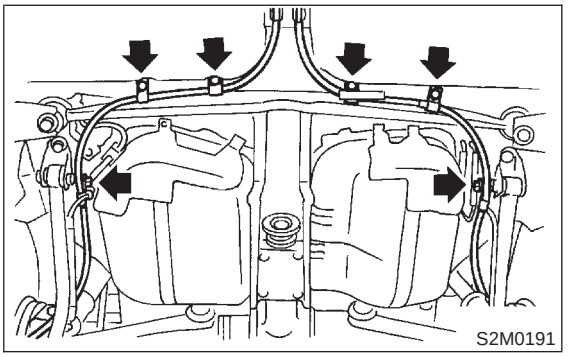
11) Connect evaporation hose to canister, and hold them with clamp.


S2M0949

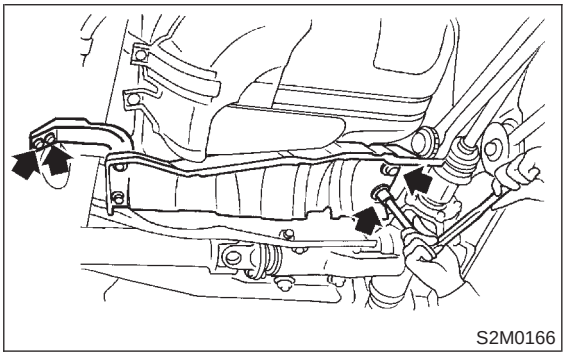
12) Connect hoses to roll over valve.


H2M2538

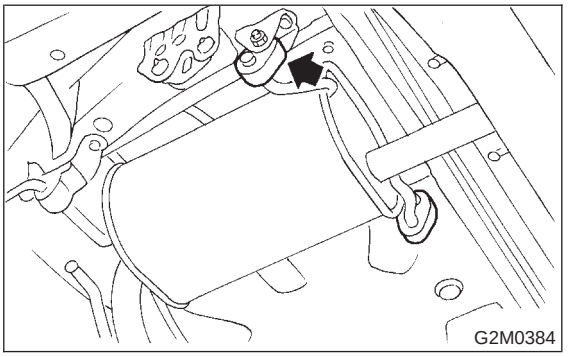
13) Install bolts which hold parking brake holding bracket.


S2M0191

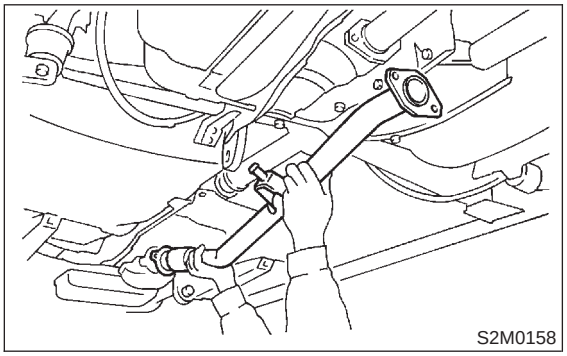
14) Install heat sealed cover.


S2M0166

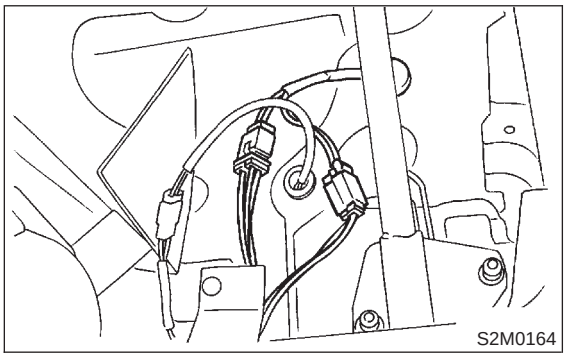
15) Install muffler assembly. <Ref. to 2-9 [W3A0].>


G2M0384

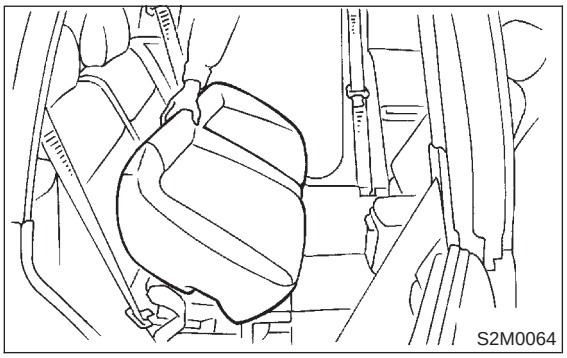
16) Install rear exhaust pipe. <Ref. to 2-9 [W2B0].>


S2M0158

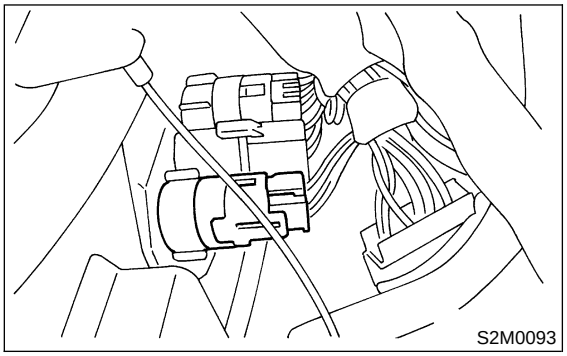
17) Lower the vehicle.
18) Connect connectors to fuel tank harness, and plug access hole with grommet.


S2M0164

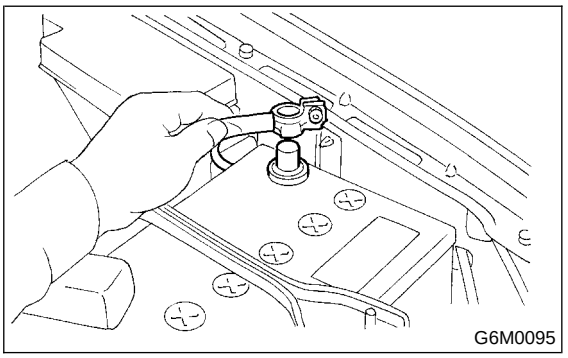
19) Install rear seat cushion.


S2M0064

20) Install fuel filler cap.
21) Connect connector to fuel pump relay.


S2M0093

22) Connect battery ground cable.

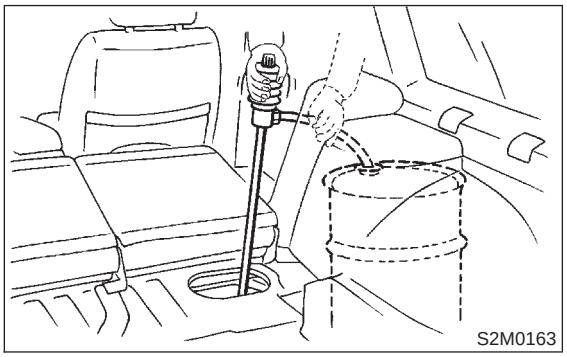

G6M0095

2. Fuel Filler Pipe

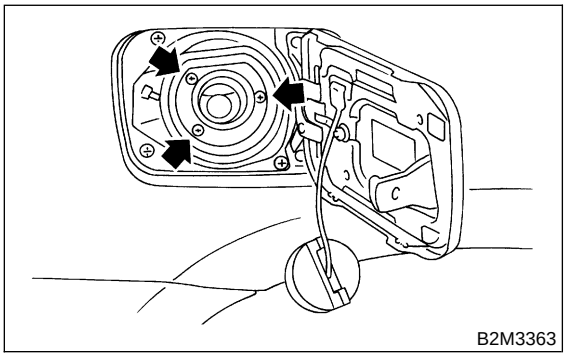
A: REMOVAL

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

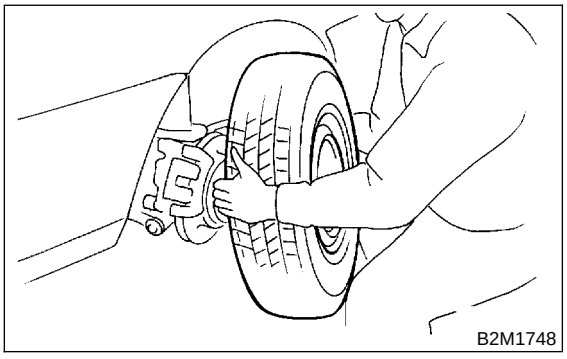
1) Set the vehicle on the lift.
2) Drain fuel from fuel tank. <Ref. to 2-8 [W1B0].>


S2M0163

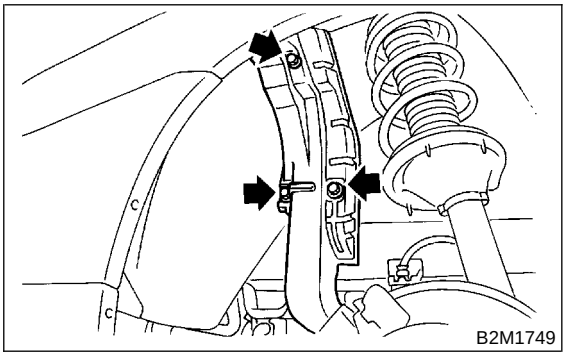
3) Remove screws which install fuel filler pipe on filler lid open.


B2M3363

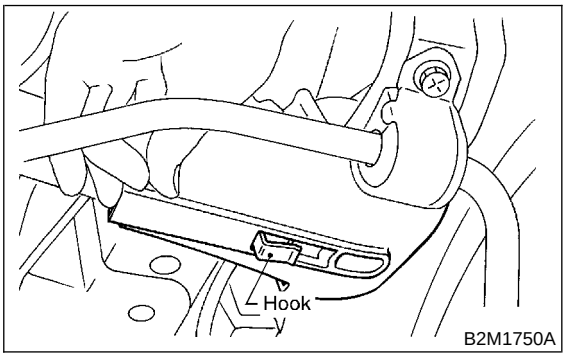
4) Remove wheel nuts of rear right side.
5) Lift-up the vehicle.
6) Remove rear right side wheel.


B2M1748

7) Remove bolts which install protector cover on body.

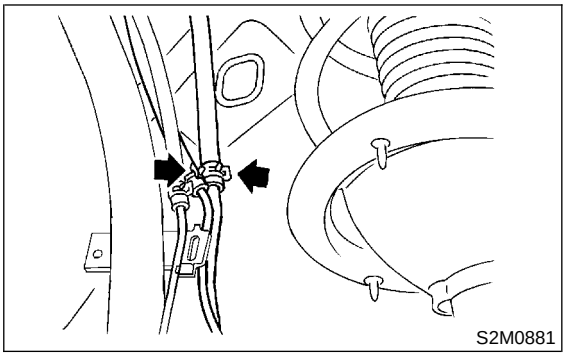

B2M1749

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

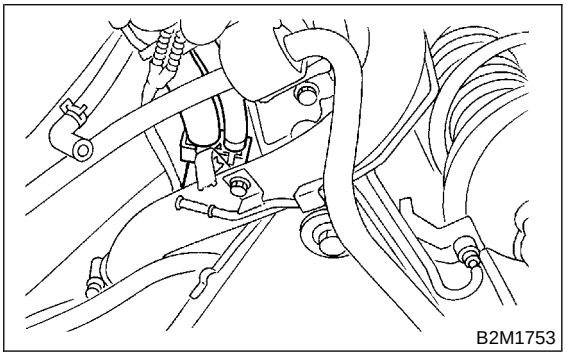


B2M1750A

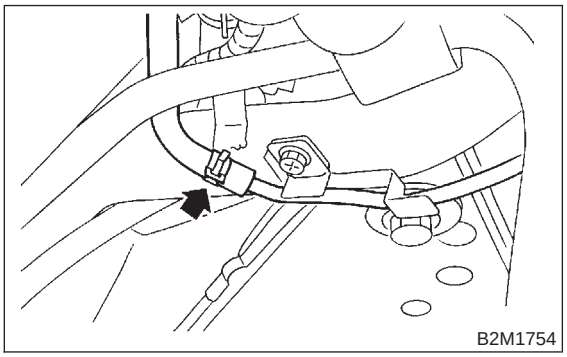
9) Disconnect evaporation hoses from pipes.


S2M0881

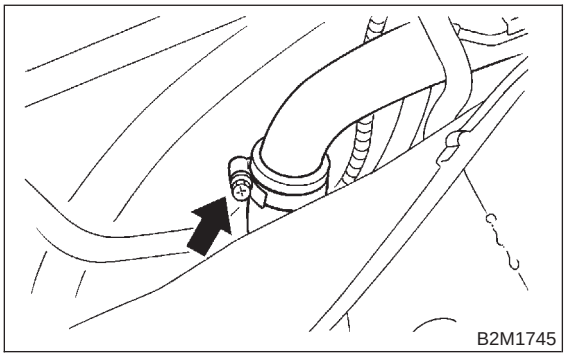
10) Lift-up the vehicle more.
11) Remove the two evaporation hoses from clip.


B2M1753

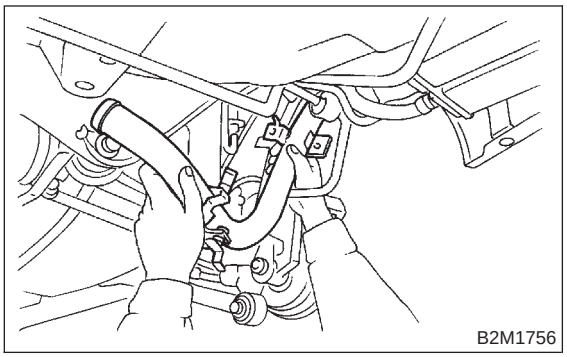
12) Disconnect evaporation hose from joint pipe.



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

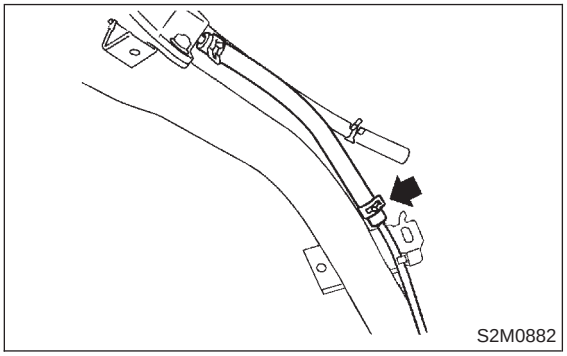


14) Remove fuel filler pipe to under side of vehicle.

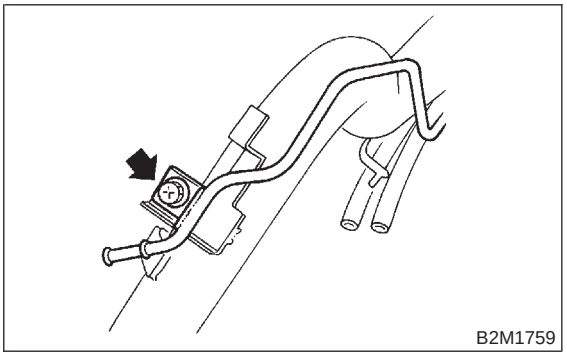


B: DISASSEMBLY

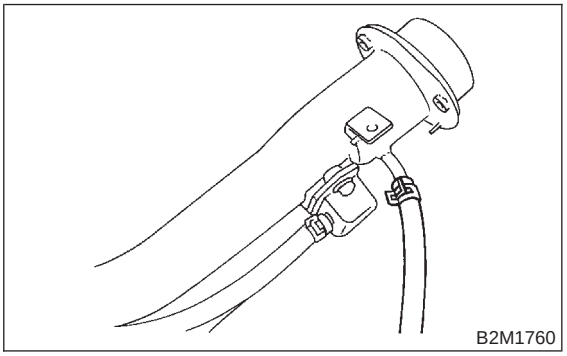
1) Move clip, and disconnect evaporation hose from joint pipe.



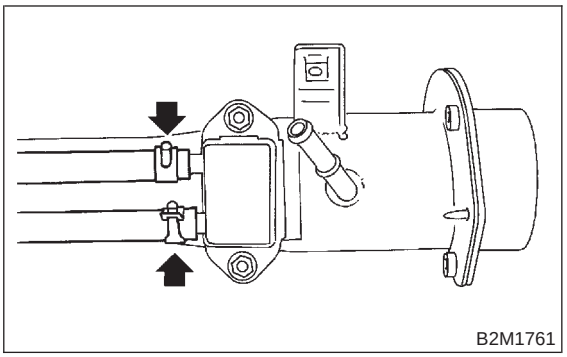
2) Remove bolt which installs joint pipe on fuel filler pipe.



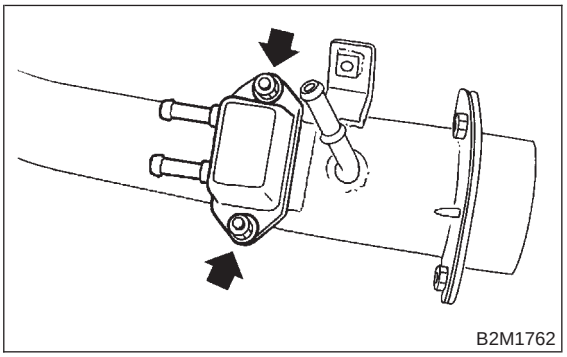
3) Disconnect evaporation hose from fuel filler pipe.



4) Disconnect evaporation hoses from shut valve.



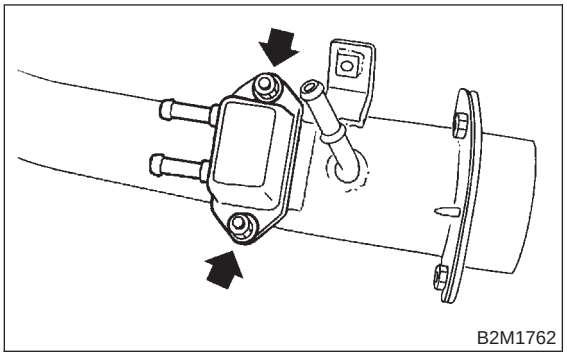
5) Remove shut valve from fuel filler pipe.



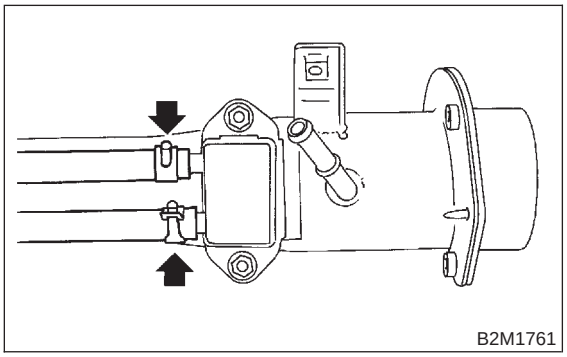
C: ASSEMBLY

1) Install shut valve on fuel filler pipe.

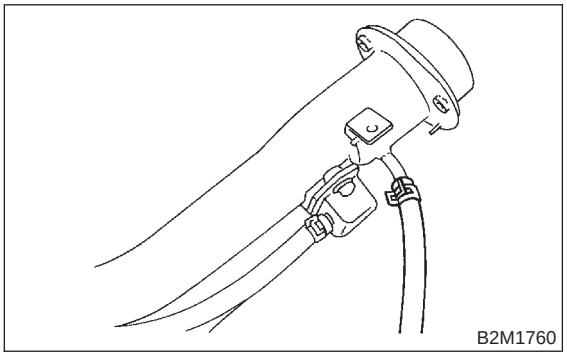
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)


B2M1762

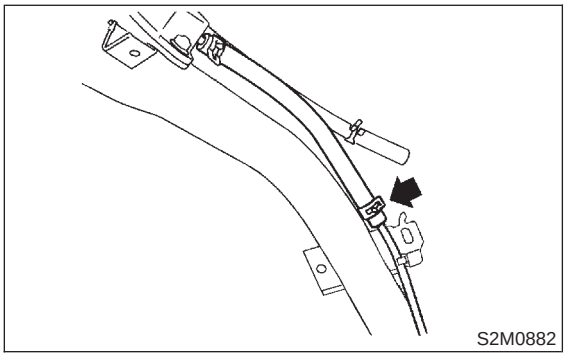
2) Connect evaporation hoses to shut valve.


B2M1761

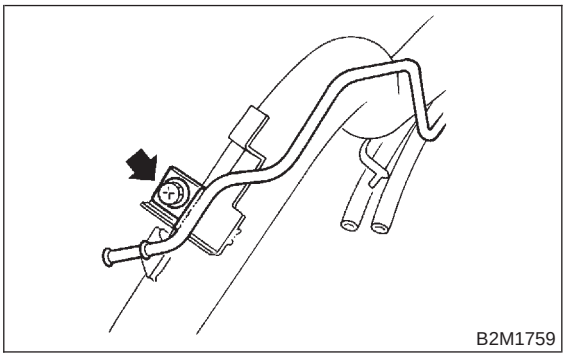
3) Connect evaporation hose to fuel filler pipe.


B2M1760

4) Connect evaporation hose to evaporation pipe.

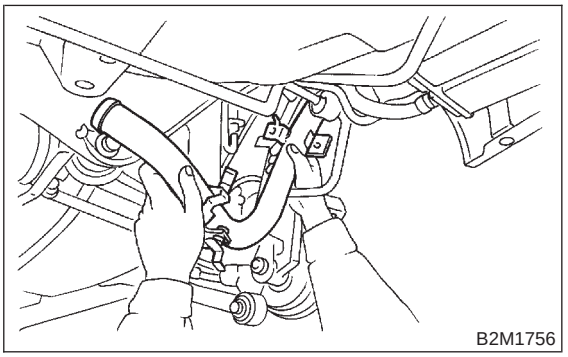

S2M0882

5) Install evaporation pipe to fuel filler pipe.

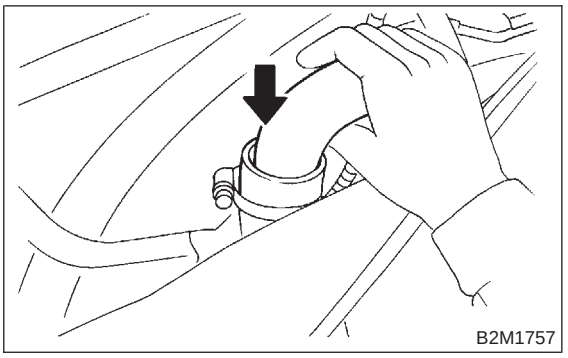

B2M1759

D: INSTALLATION

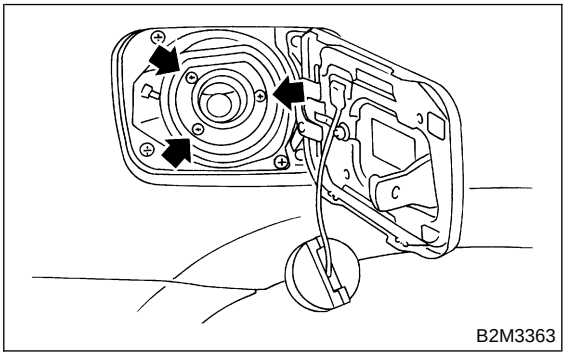
1) Set fuel filler pipe from under side of vehicle, and hold it on fuel filler flap open.


B2M1756

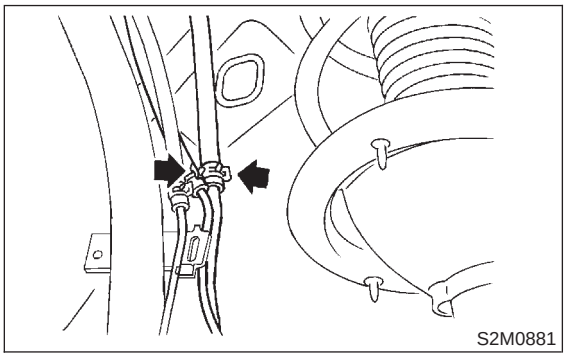
2) Connect fuel filler pipe into fuel filler hose.


B2M1757

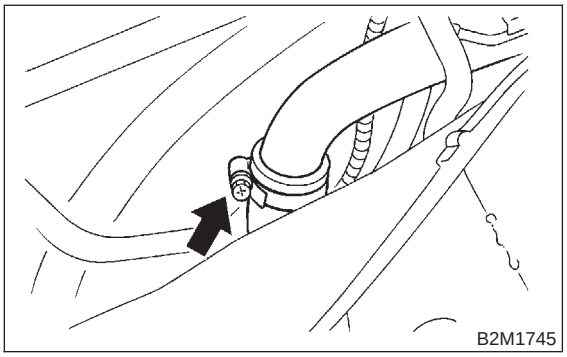
3) Lower the vehicle.
4) Temporarily tighten screws which install fuel filler pipe on filler lid open.


B2M3363

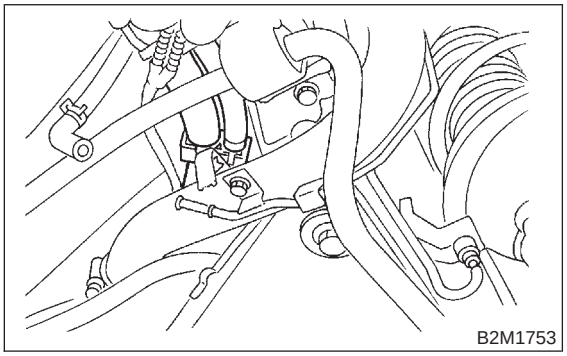
5) Connect evaporation hoses to pipes.



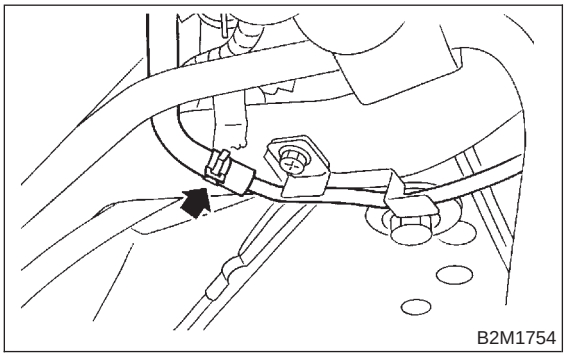
6) Lift-up the vehicle.
7) Tighten clamp bolt which holds fuel filler hose.



8) Install the two evaporation hoses to clip.

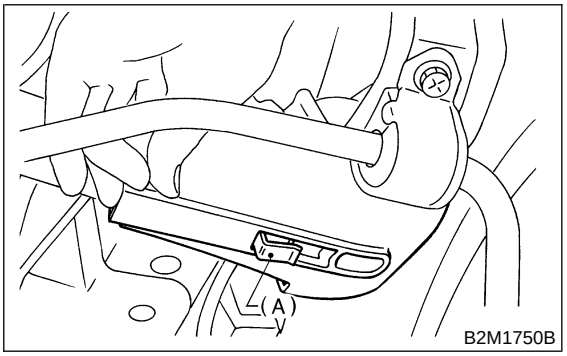


9) Connect evaporation hose to joint pipe.



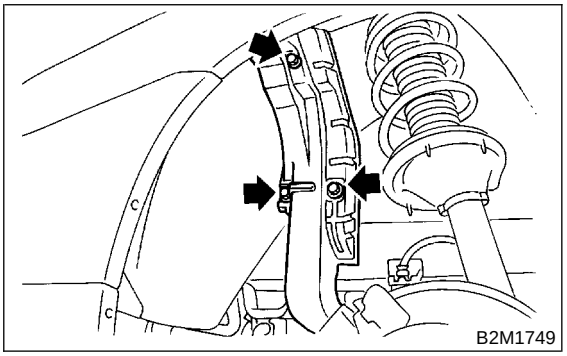
10) Lower the vehicle.

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

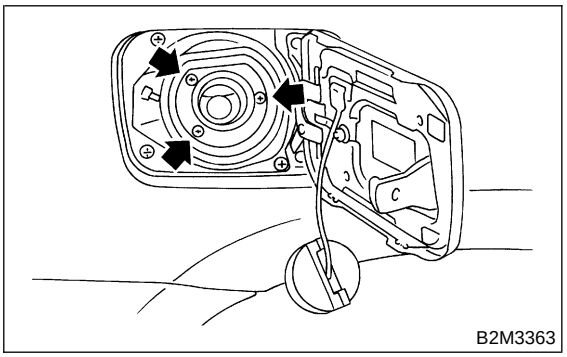


(A) Hook

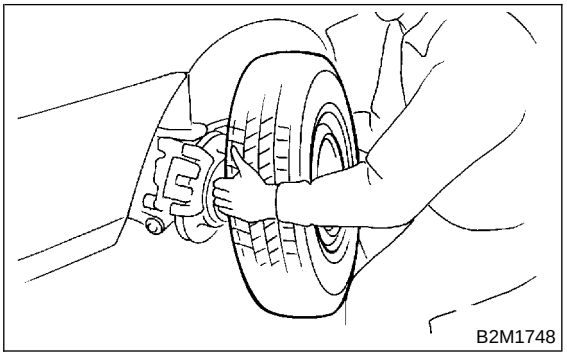
12) Tighten bolts which install protector cover on body.



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

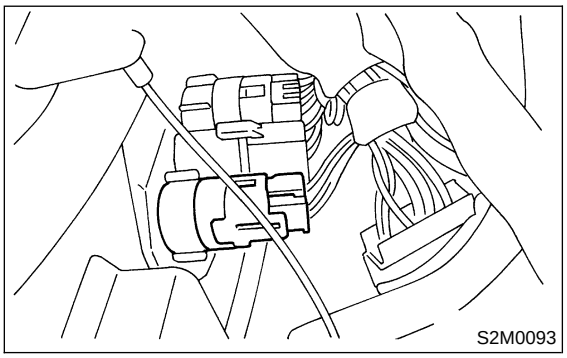


14) Install rear right wheel.

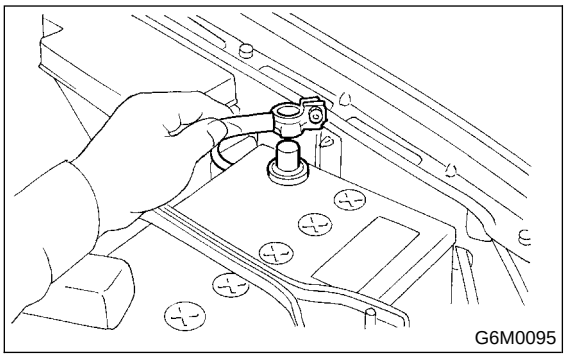


15) Install fuel filler cap.

16) Connect connector to fuel pump relay.



17) Connect battery ground terminal.

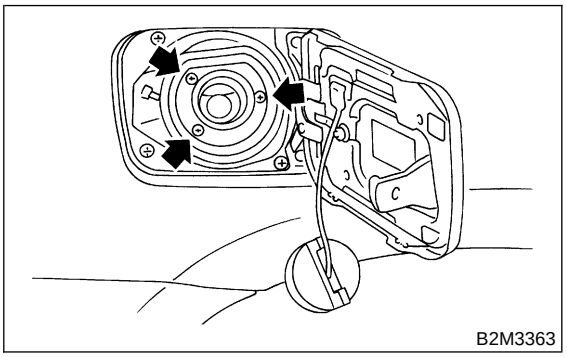


3. Fuel Pump

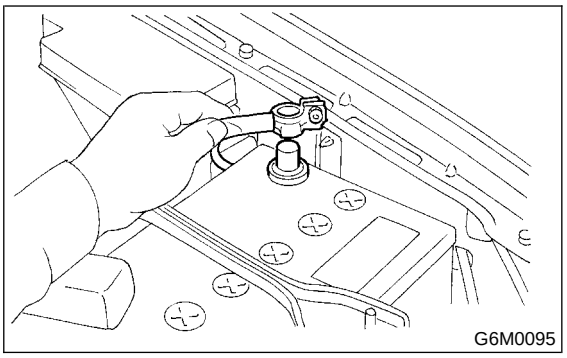
A: REMOVAL

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

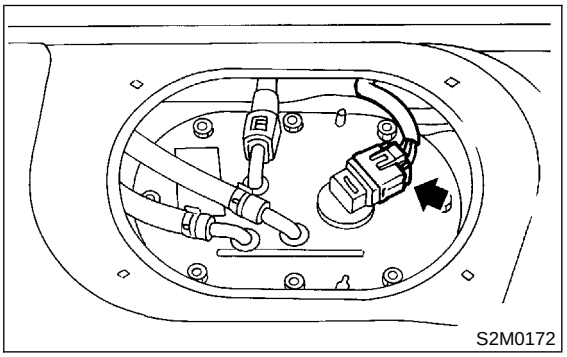
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect battery ground cable.

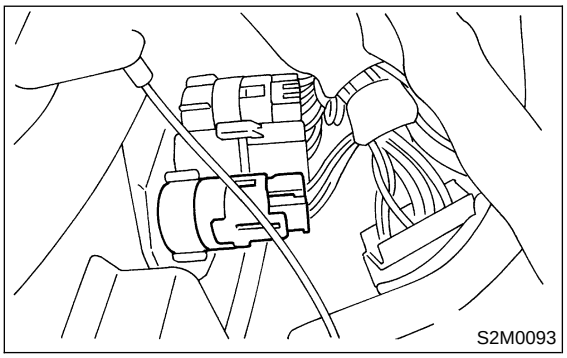


4) Disconnect connector from fuel pump.

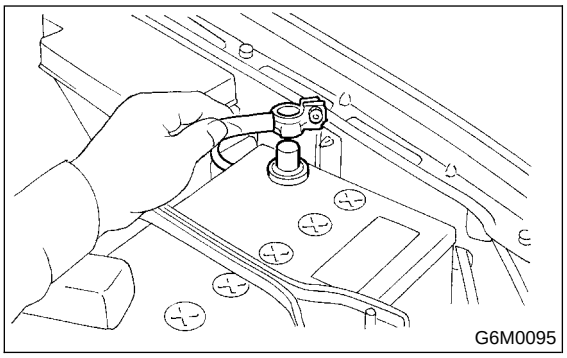


5) Move clips, and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).

16) Connect connector to fuel pump relay.



17) Connect battery ground terminal.

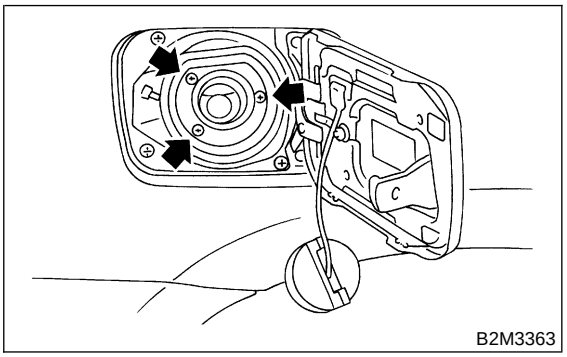


3. Fuel Pump

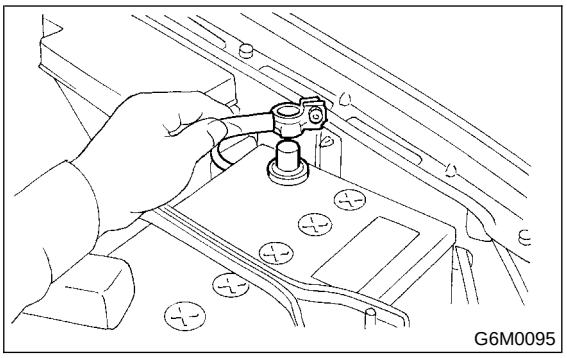
A: REMOVAL

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

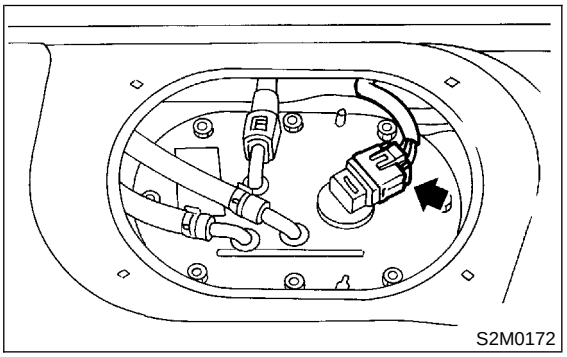
1) Release fuel pressure. <Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.



3) Disconnect battery ground cable.

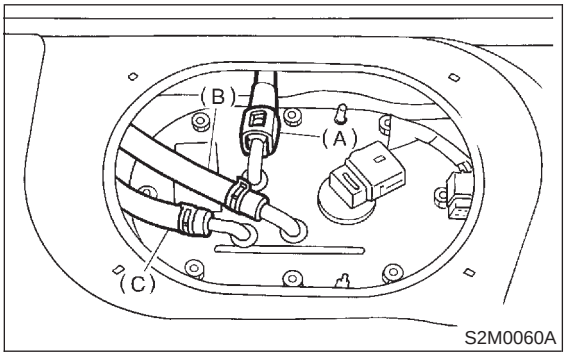


4) Disconnect connector from fuel pump.

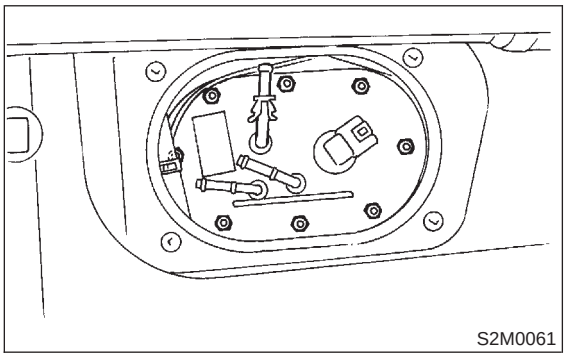


5) Move clips, and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose (C).

6) Disconnect quick connector, and then disconnect fuel delivery hose (A). <Ref. to 2-8 [W7A0].>



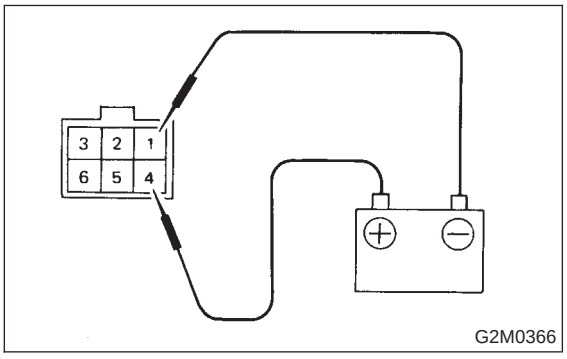
7) Remove nuts which install fuel pump assembly onto fuel tank.
8) Take off fuel pump from fuel tank.



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.**
- **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.**

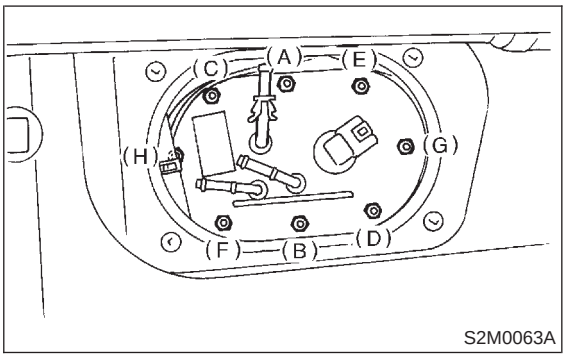


C: INSTALLATION

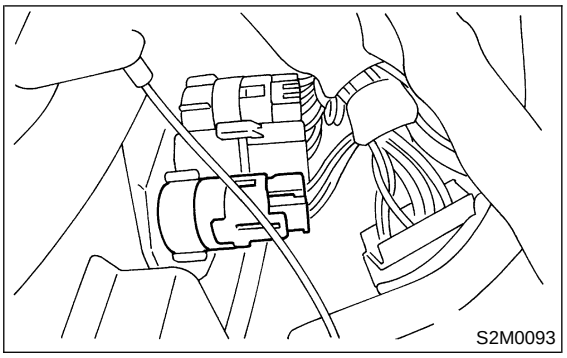
Install in the reverse order of removal. Do the following:

(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)



(4) Connect connector to fuel pump relay.



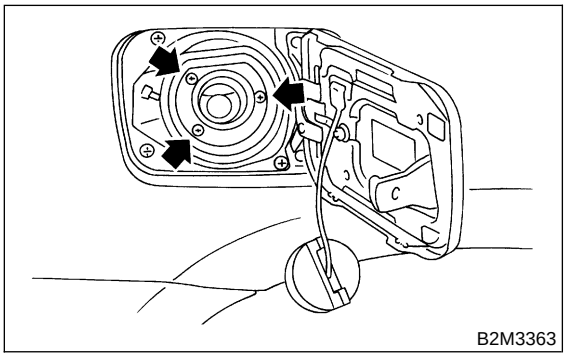
4. Fuel Level Sensor

A: REMOVAL

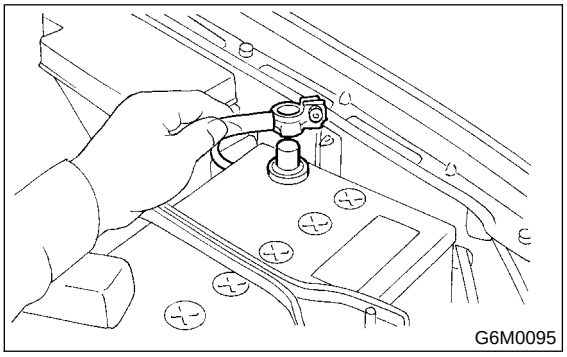
WARNING:
● Place “NO FIRE” signs near the working area.
● Be careful not to spill fuel on the floor.

NOTE:
Fuel level sensor is built in fuel pump assembly.

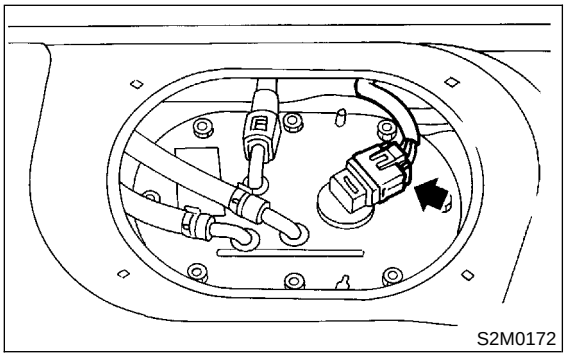
1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Open fuel flap lid, and remove fuel filler cap.



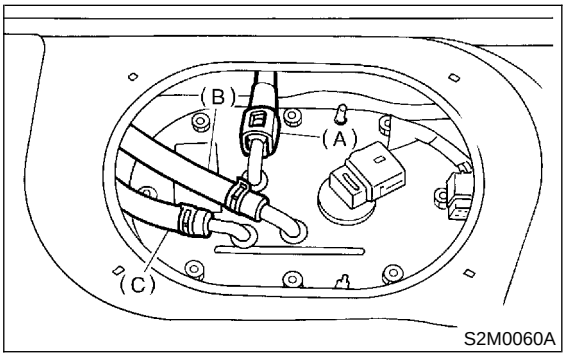
3) Disconnect battery ground cable.



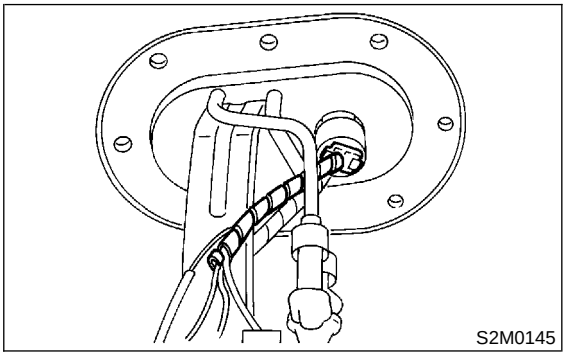
4) Disconnect connector from fuel pump.



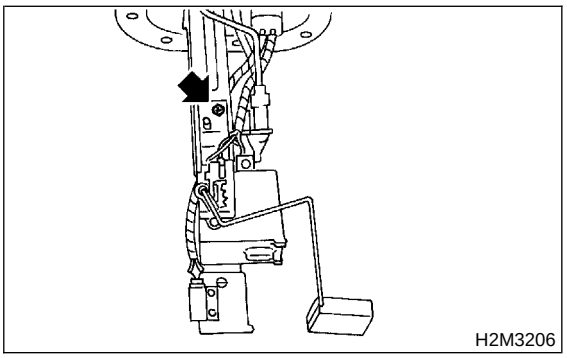
5) Move clips, and then disconnect fuel return hose (B) and jet pump hose (C).
6) Disconnect quick connector, and then disconnect fuel delivery hose (A). <Ref. to 2-8 [W9A0].>



7) Remove nuts which install fuel pump assembly onto fuel tank.
8) Take off fuel pump assembly.
9) Disconnect connector from fuel pump bracket.

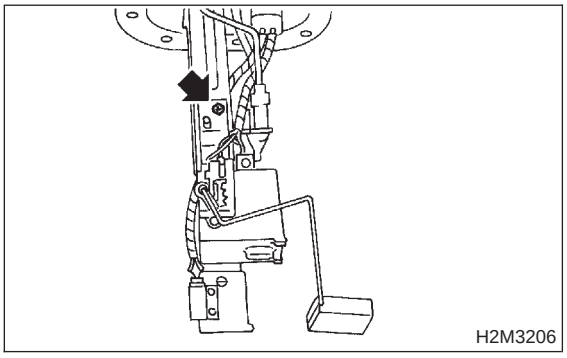


10) Remove bolt which installs fuel level sensor on mounting bracket.



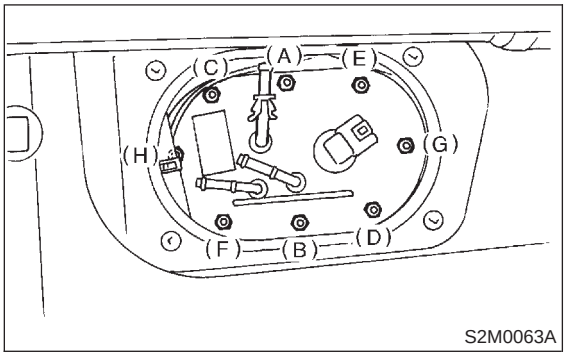
B: INSTALLATION

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

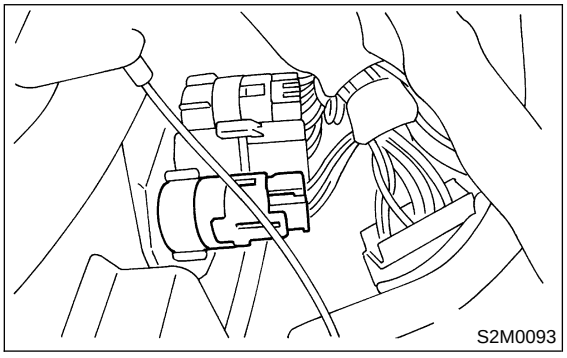


(2) Always use new gaskets.
(3) Ensure sealing portion is free from fuel or foreign particles before installation.
(4) Tighten nuts in alphabetical sequence shown in Figure to specified torque.

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



(5) Connect connector to fuel pump relay.

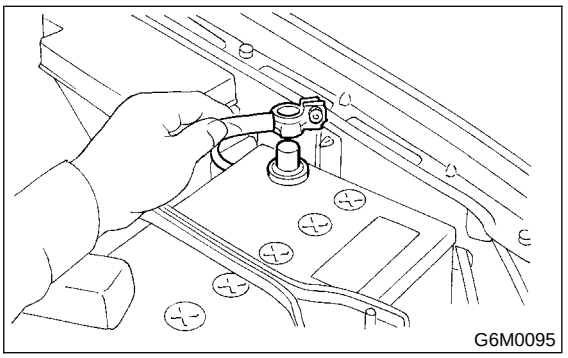


5. Fuel Sub Level Sensor

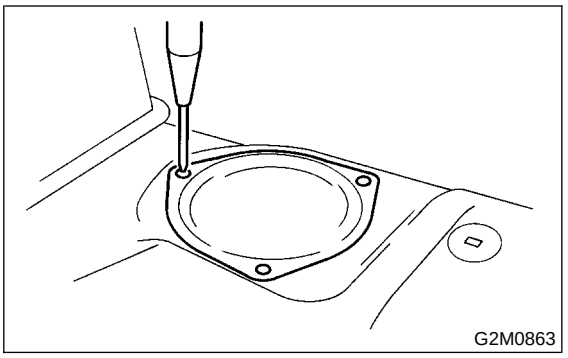
A: REMOVAL AND INSTALLATION

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

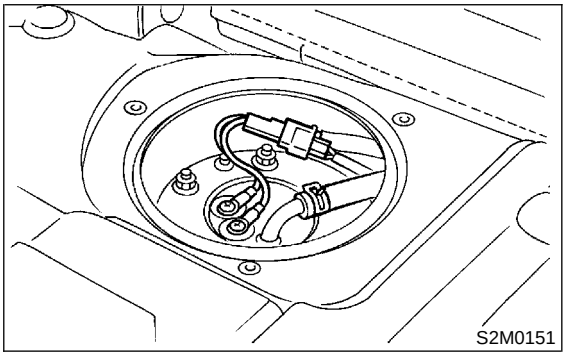
1) Disconnect battery ground cable.



2) Remove fuel filler cap.
3) Remove service hole cover.

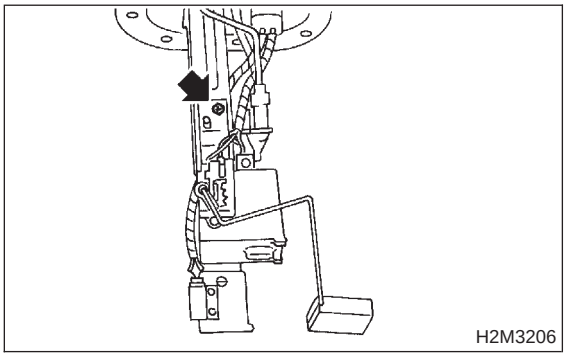


4) Disconnect connector from fuel sub level sensor, and disconnect jet pump hose.



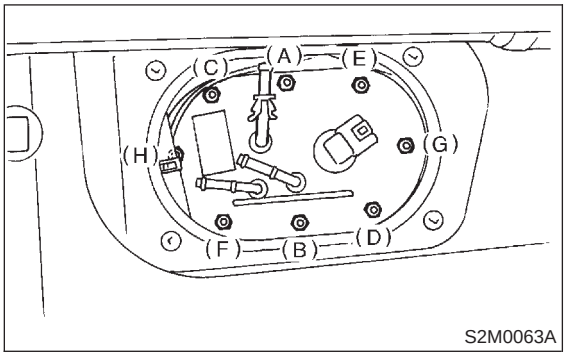
B: INSTALLATION

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

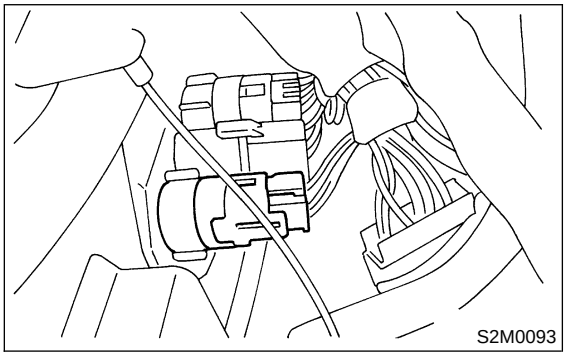


(2) Always use new gaskets.
(3) Ensure sealing portion is free from fuel or foreign particles before installation.
(4) Tighten nuts in alphabetical sequence shown in Figure to specified torque.

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



(5) Connect connector to fuel pump relay.

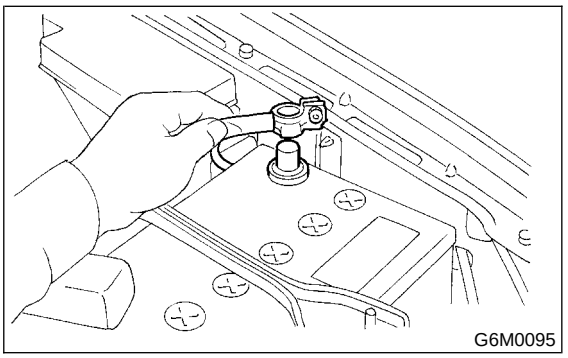


5. Fuel Sub Level Sensor

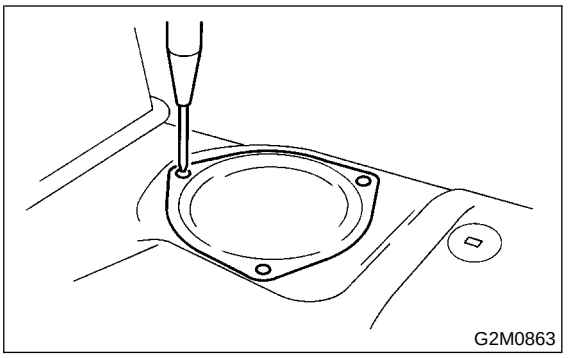
A: REMOVAL AND INSTALLATION

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

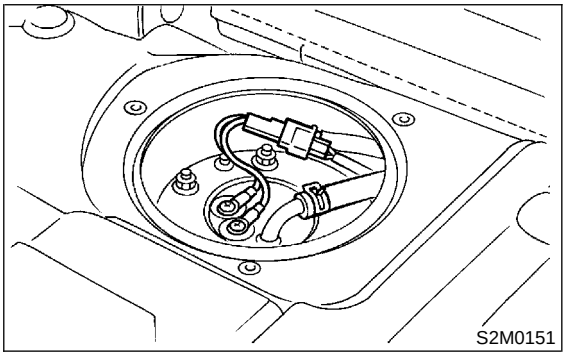
1) Disconnect battery ground cable.



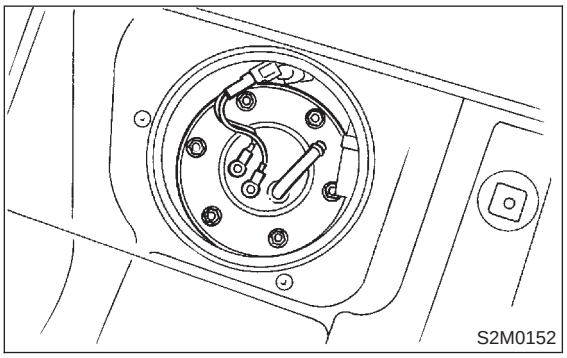
2) Remove fuel filler cap.
3) Remove service hole cover.



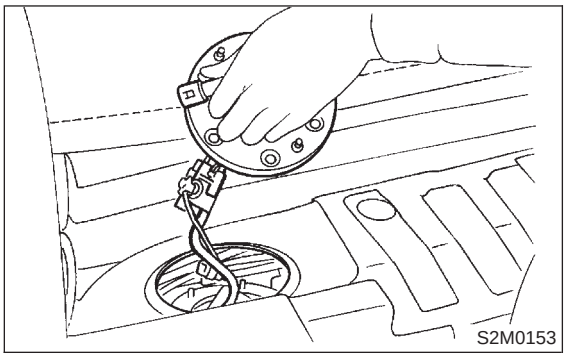
4) Disconnect connector from fuel sub level sensor, and disconnect jet pump hose.



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

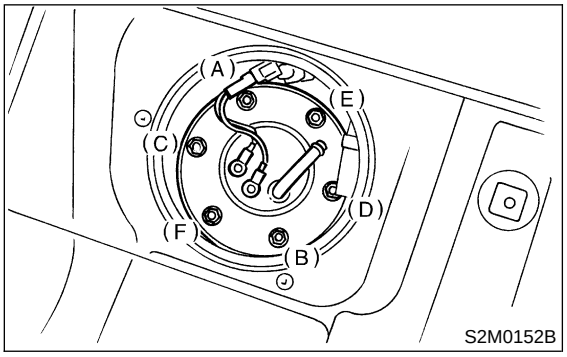


6) Remove fuel sub level sensor.



7) Install 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)

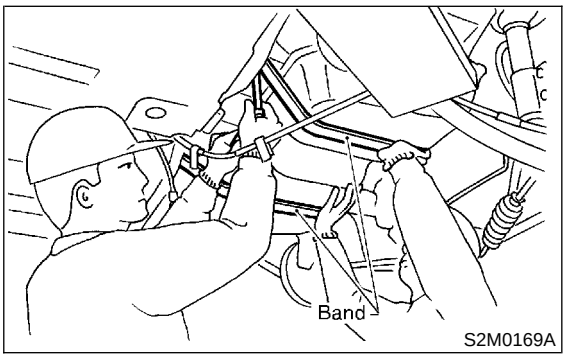


6. Fuel Cut Valve

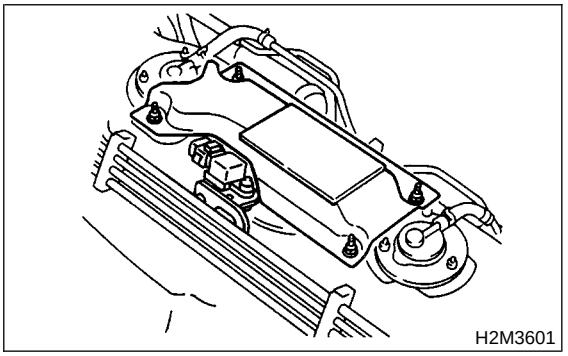
A: REMOVAL AND INSTALLATION

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

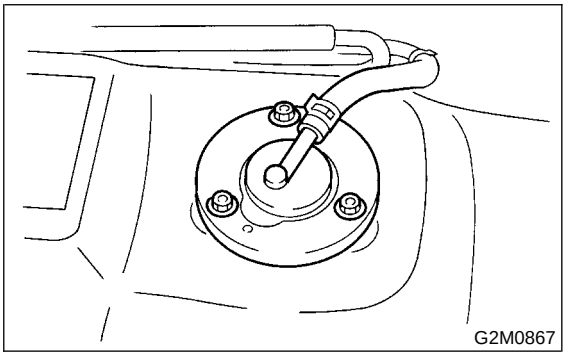
1) Remove fuel tank. <Ref. to 2-8 [W1C0].>



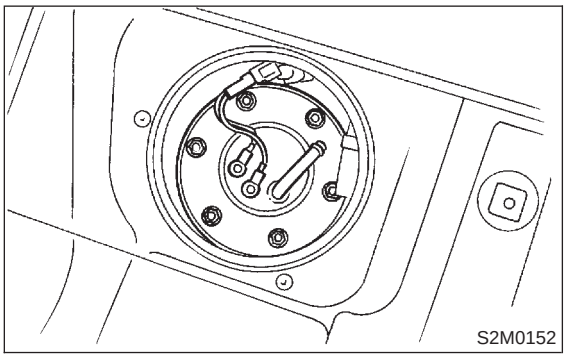
2) Remove protect cover.



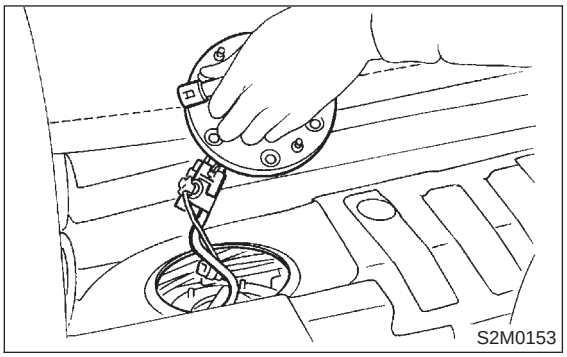
3) Disconnect evaporation hose from fuel cut valve.
4) Remove fuel cut valve.



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

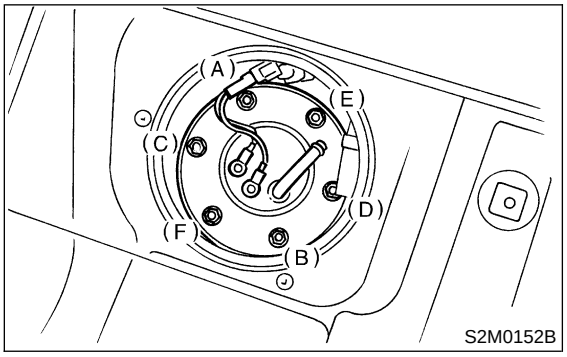


6) Remove fuel sub level sensor.



7) Install 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)

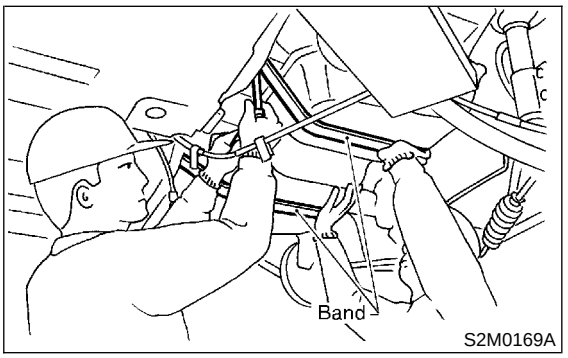


6. Fuel Cut Valve

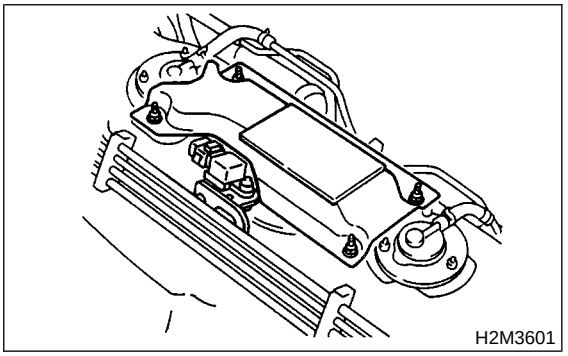
A: REMOVAL AND INSTALLATION

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

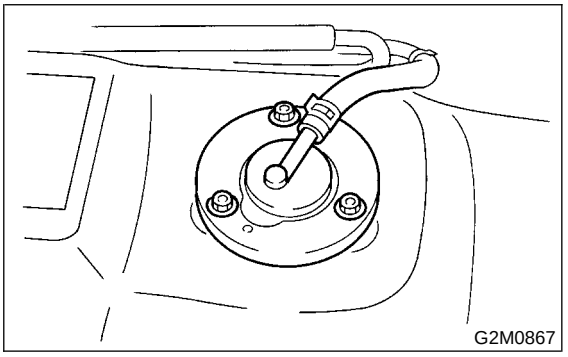
1) Remove fuel tank. <Ref. to 2-8 [W1C0].>



2) Remove protect cover.

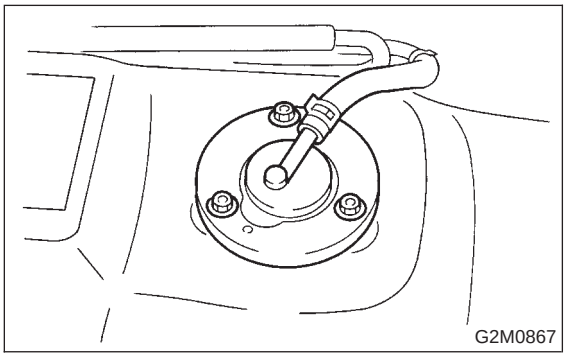


3) Disconnect evaporation hose from fuel cut valve.
4) Remove fuel cut valve.



5) Install in the reverse order of removal.

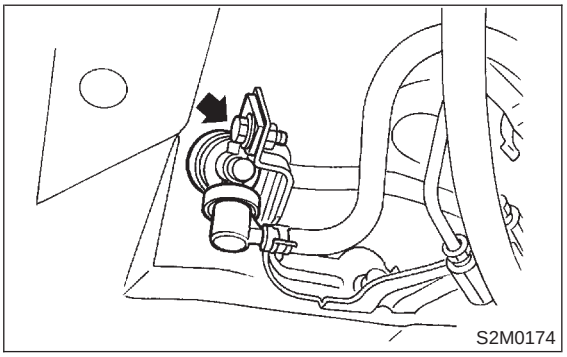
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)


G2M0867

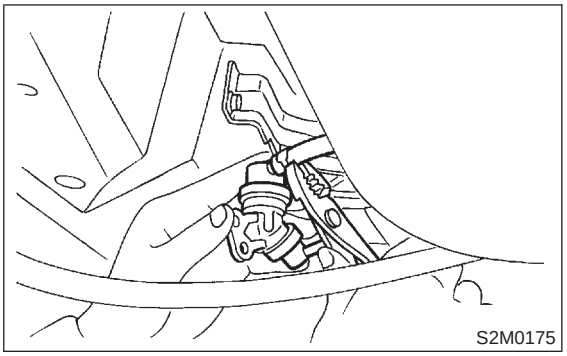
7. Roll Over Valve

A: REMOVAL AND INSTALLATION

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

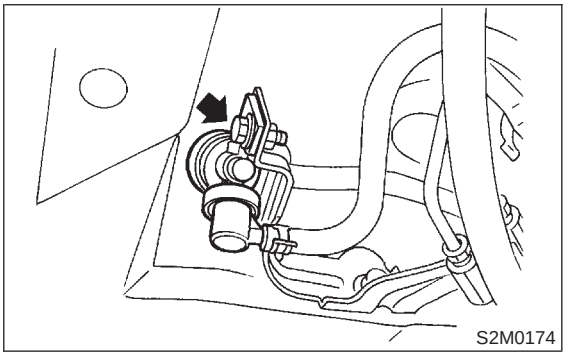

S2M0174

3) Disconnect hoses from roll over valve, and remove it from bracket.


S2M0175

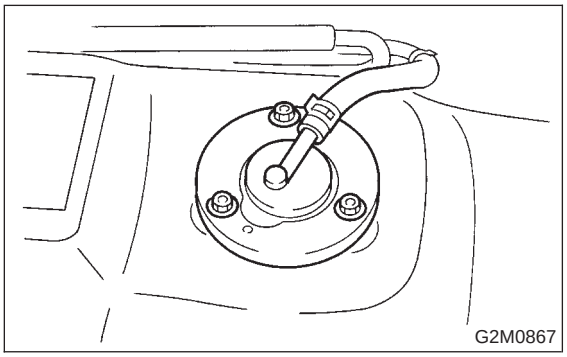
4) Install in the reverse order of removal.

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


S2M0174

5) Install in the reverse order of removal.

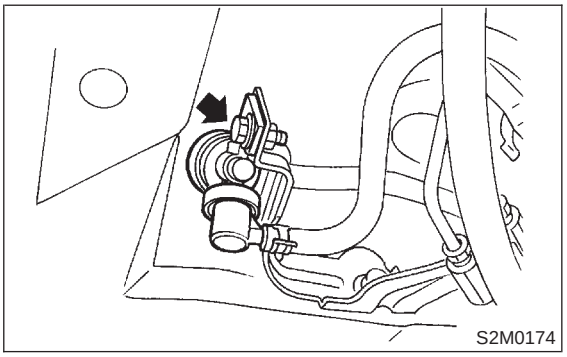
Tightening torque:
4.4±1.5 N·m (0.45±0.15 kg-m, 3.3±1.1 ft-lb)


G2M0867

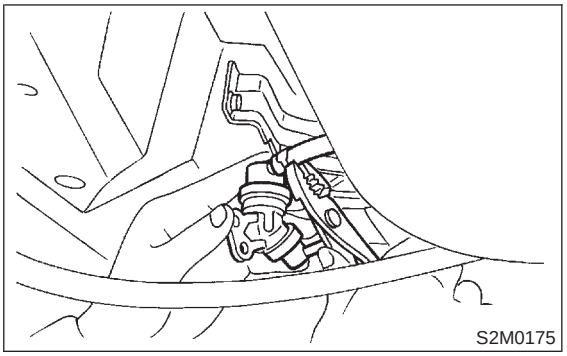
7. Roll Over Valve

A: REMOVAL AND INSTALLATION

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

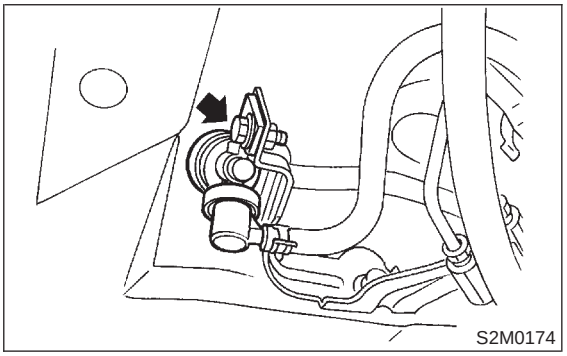

S2M0174

3) Disconnect hoses from roll over valve, and remove it from bracket.


S2M0175

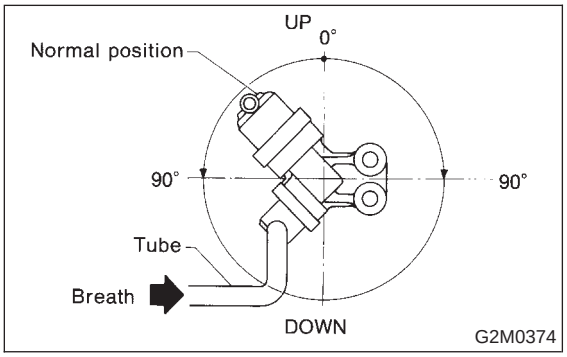
4) Install in the reverse order of removal.

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


S2M0174

B: INSPECTION

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



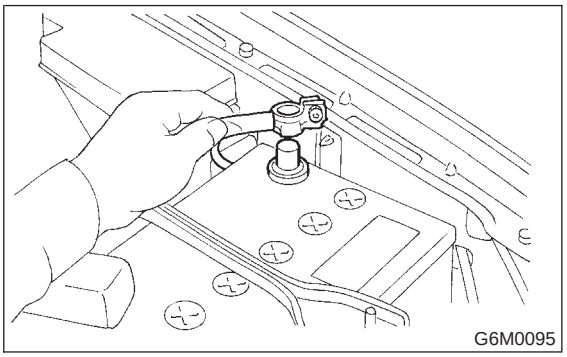
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.
3) Ensure that there is no air flow when hose is tilted greater than 90°.

8. Fuel Filter

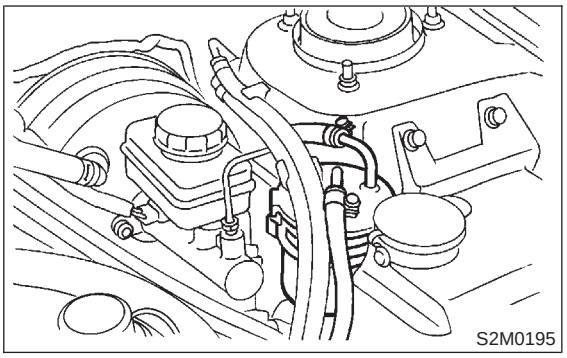
A: REMOVAL

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

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect battery ground cable.



3) Disconnect fuel delivery hoses from fuel filter.



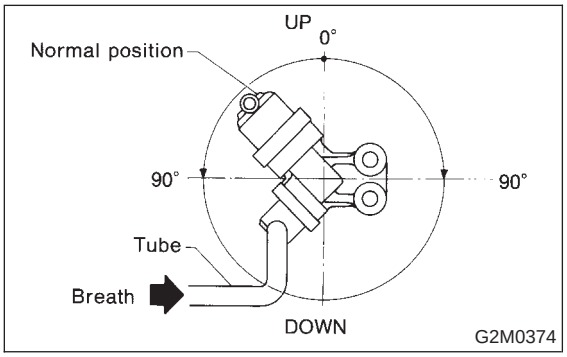
4) Remove filter from holder.

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.

B: INSPECTION

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



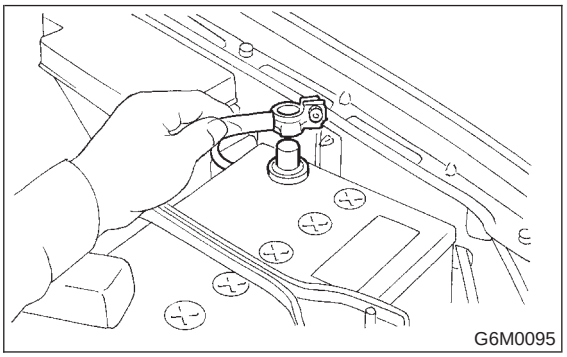
2) While blowing through open end of hose, tilt valve at least 90° left and right from normal position.
3) Ensure that there is no air flow when hose is tilted greater than 90°.

8. Fuel Filter

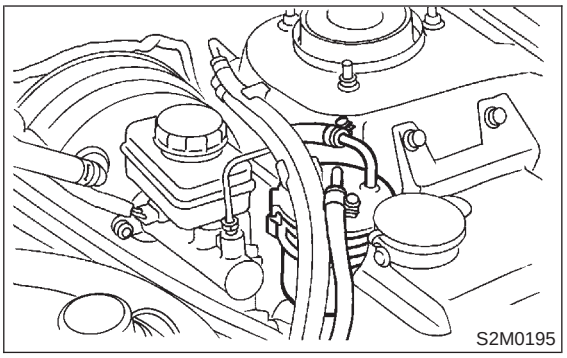
A: REMOVAL

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

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
2) Disconnect battery ground cable.



3) Disconnect fuel delivery hoses from fuel filter.



4) Remove filter from holder.

B: INSPECTION

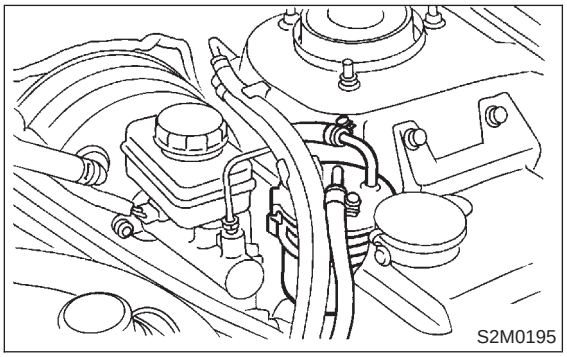
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

C: INSTALLATION

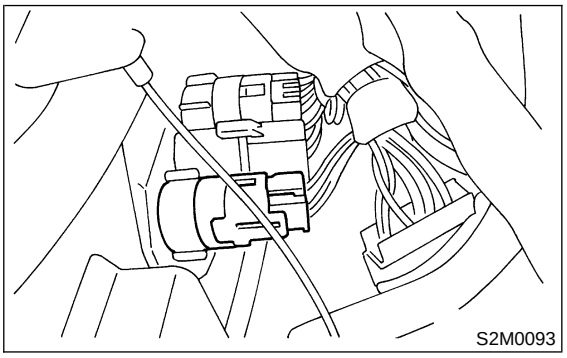
CAUTION:
● If fuel hoses are damaged at the connecting portion, replace it with a new one.
● If clamps are badly damaged, replace with new ones.

1) Install 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)


S2M0195

3) Connect connector to fuel pump relay.

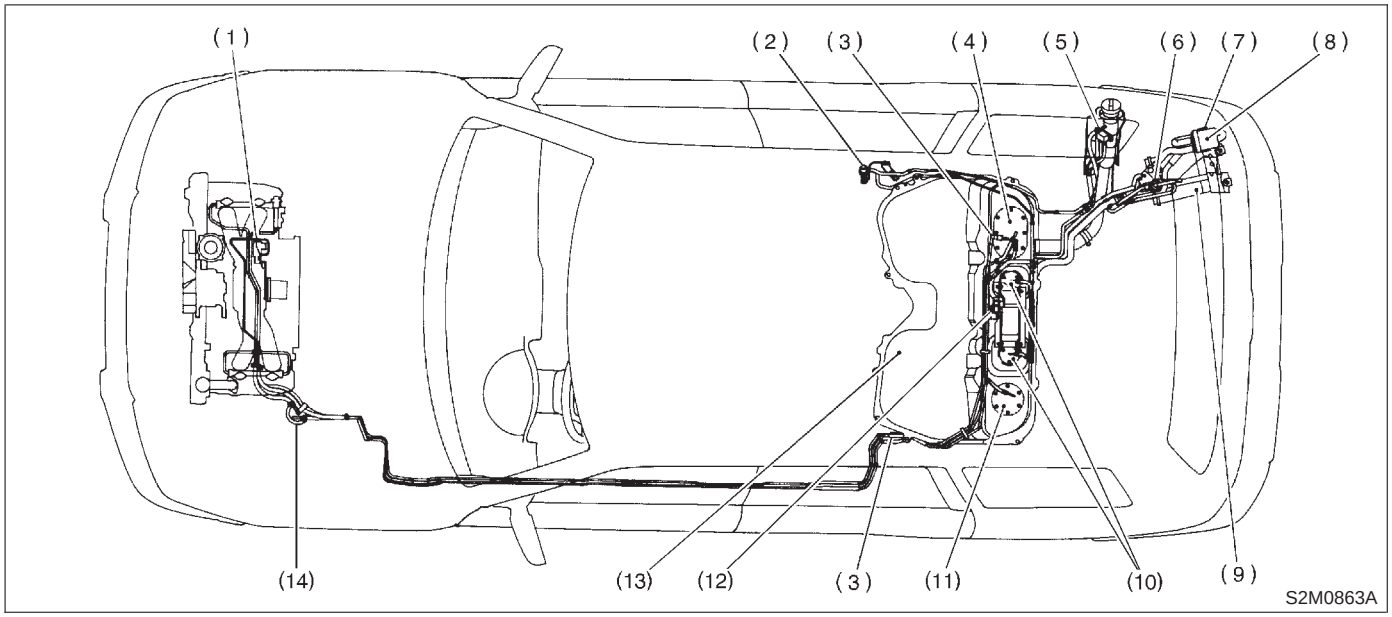

S2M0093

9. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

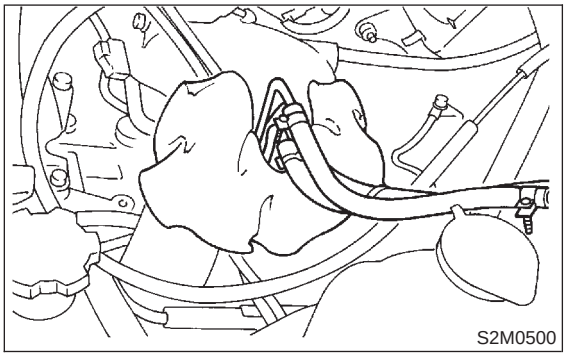
WARNING:
● Place “NO FIRE” signs near the working area.
● Be careful not to spill fuel on the floor.

1) Release fuel pressure. <Ref. to 2-8 [W1A0].>
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.



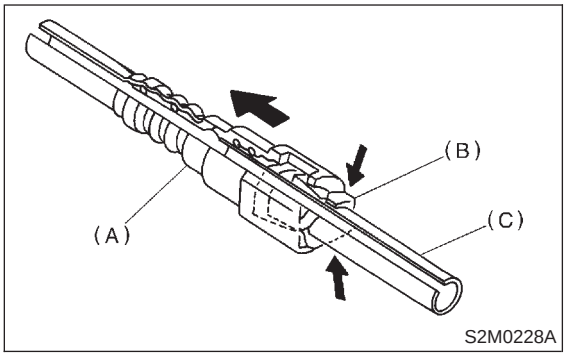
(1) Purge control solenoid valve
(2) Roll over valve
(3) Quick connector
(4) Fuel pump
(5) Shut valve
(6) Pressure control solenoid valve
(7) Drain valve
(8) Drain filter
(9) Canister
(10) Fuel cut valve
(11) Fuel sub level sensor
(12) Fuel tank pressure sensor
(13) Fuel tank
(14) Fuel filter

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



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

CAUTION:
Replace retainer with new ones.

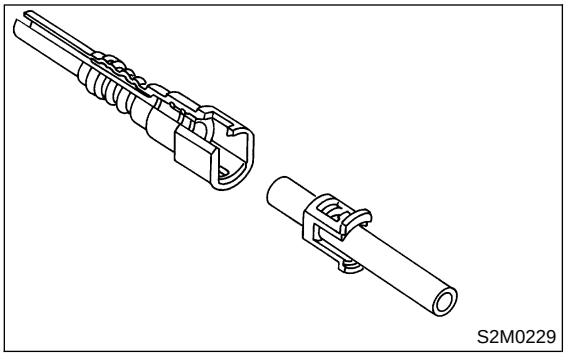


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

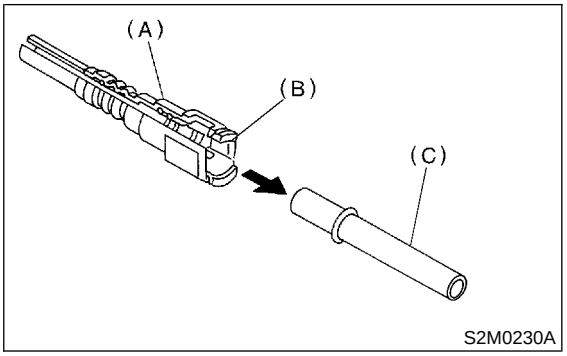
Install in the reverse order of removal.
1) Connect quick connector on fuel delivery line.

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



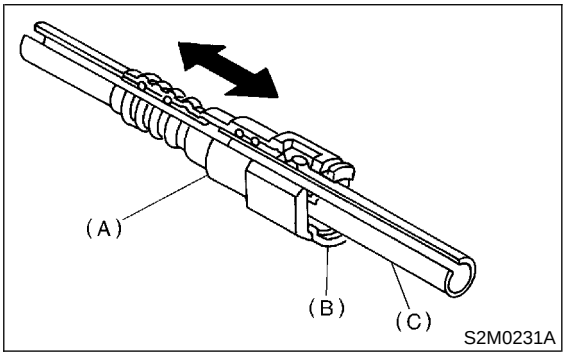
(1) Set new retainer (B) to connector (A).
(2) Push pipe into connector completely.

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



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

CAUTION:
- **Pull the connector to ensure it is connected securely.**
- **Ensure the two retainer pawls are engaged in their mating positions in the connector.**
- **Be sure to inspect hoses and their connections for any leakage of fuel.**

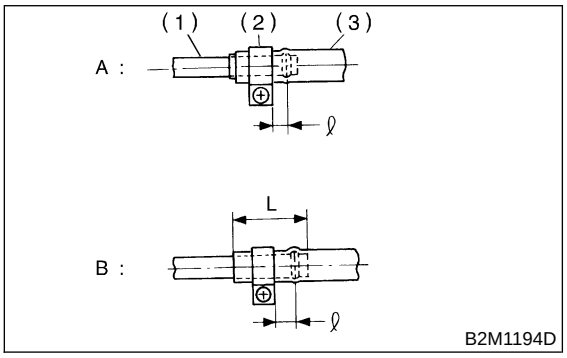


(A) Connector
(B) Retainer
(C) Pipe

2) Connect fuel delivery hose to pipe in engine compartment with an overlap of 20 to 25 mm (0.79 to 0.98 in).
A: When fitting length is specified.
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)



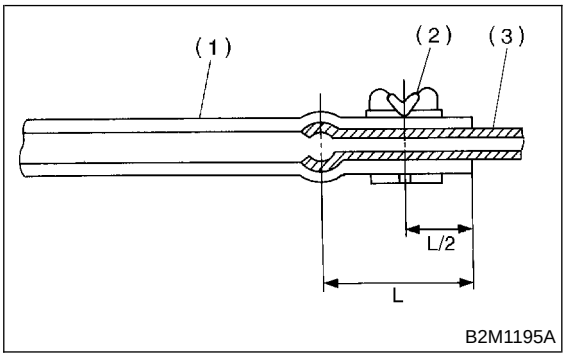
(1) Fitting
(2) Clamp
(3) Hose

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

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

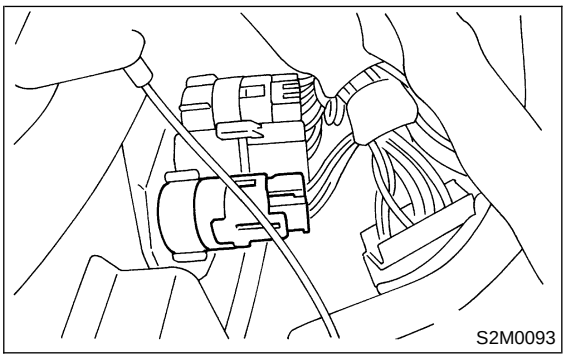
Fuel evaporation hose:
L = 15 — 20 mm (0.59 — 0.79 in)

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



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

4) Connect connector to fuel pump relay.



1. Fuel System Trouble in General

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

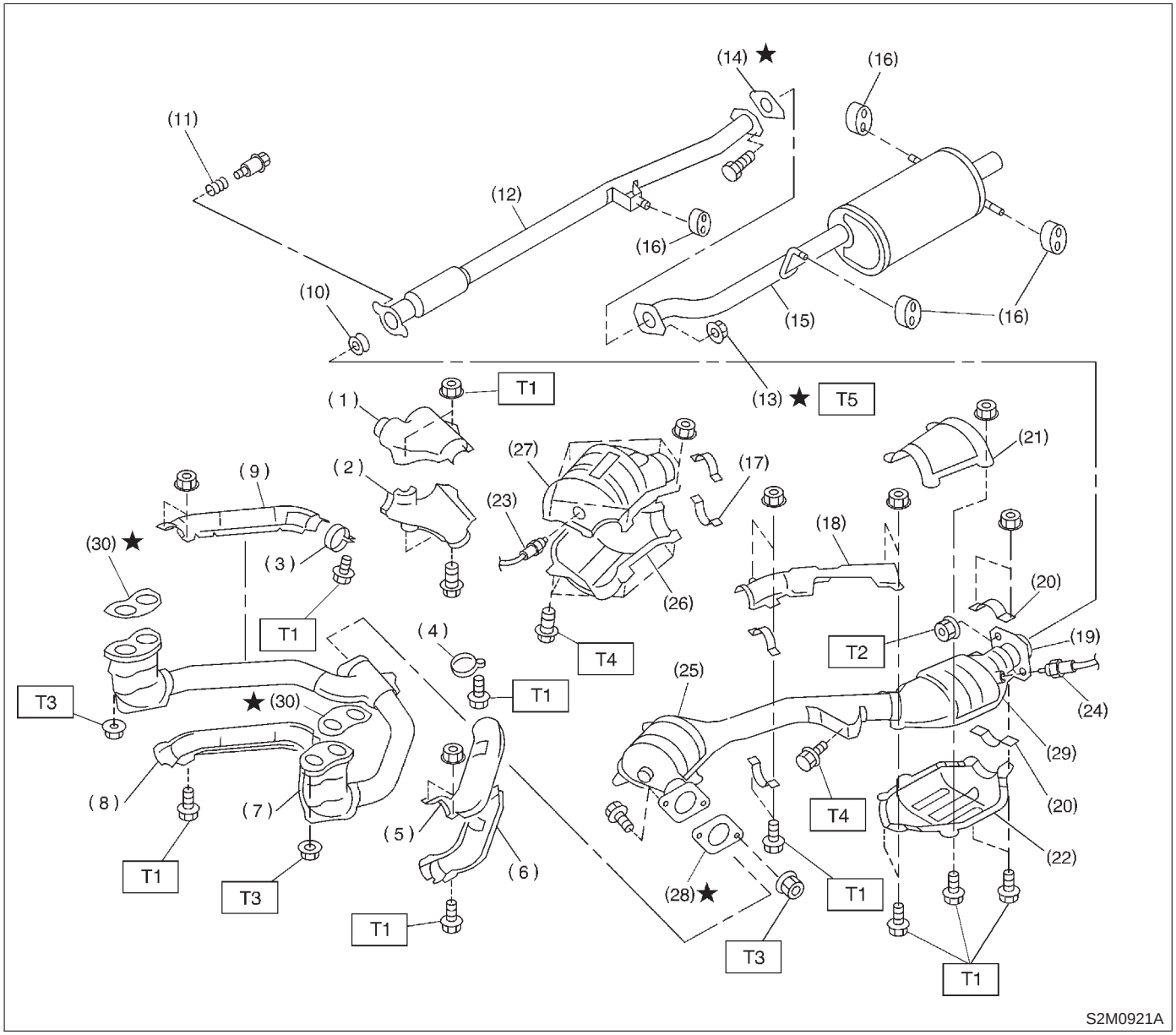
NOTE:
When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.
(1) To prevent water condensation:
- Top off the fuel tank or drain the fuel completely.
- Drain water condensation from the fuel filter.

(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 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.

1. Exhaust System



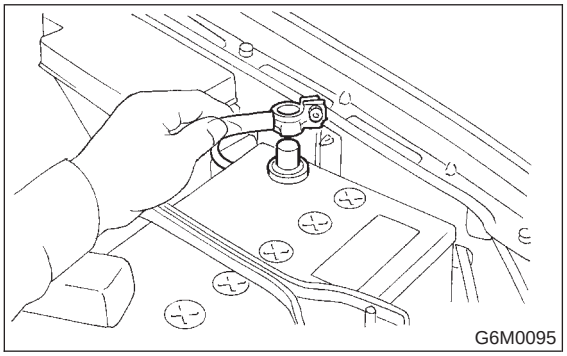
(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Band RH
(4) Band LH
(5) Upper front exhaust pipe cover LH
(6) Lower front exhaust pipe cover LH
(7) Front exhaust pipe
(8) Lower front exhaust pipe cover RH
(9) Upper front exhaust pipe cover RH
(10) Gasket
(11) Spring
(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) Front oxygen (A/F) sensor
(24) Rear oxygen sensor
(25) Front catalytic converter
(26) Lower front catalytic converter cover
(27) Upper front catalytic converter cover
(28) Gasket
(29) Rear catalytic converter
(30) Gasket

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)

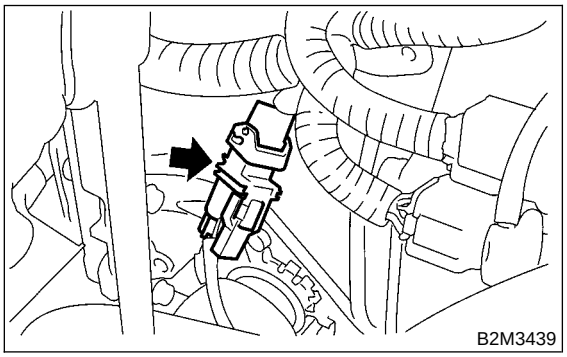
1. Front and Center Exhaust Pipe Assembly

A: REMOVAL

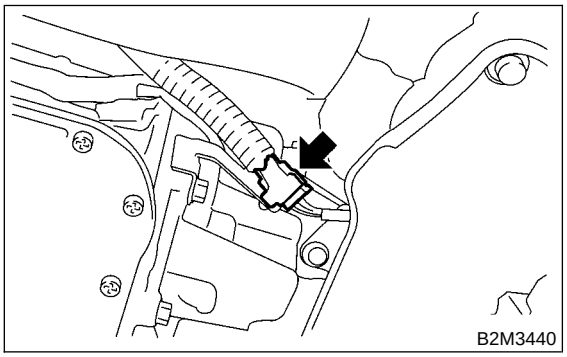
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


G6M0095

3) Disconnect front oxygen (A/F) sensor connector.

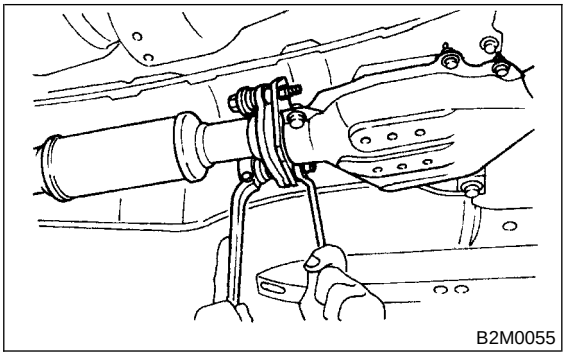

B2M3439

4) Lift-up the vehicle.
5) Remove under cover.
6) Disconnect rear oxygen sensor connector.


B2M3440

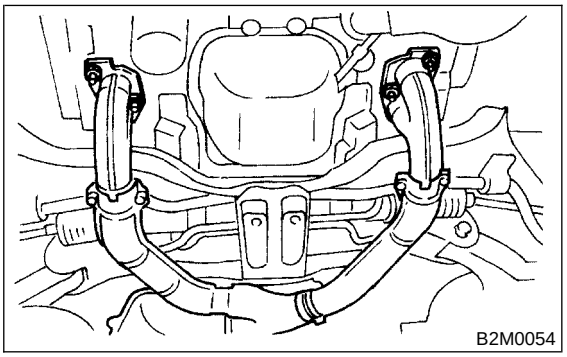
7) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.

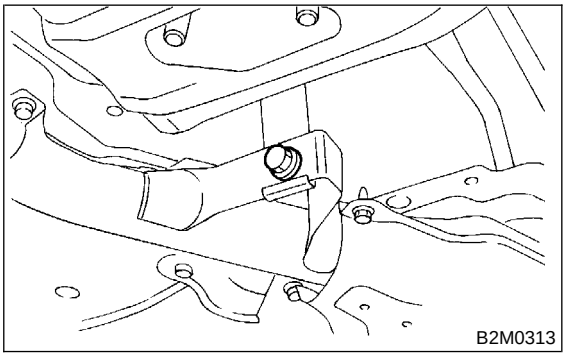

B2M0055

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

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


B2M0054

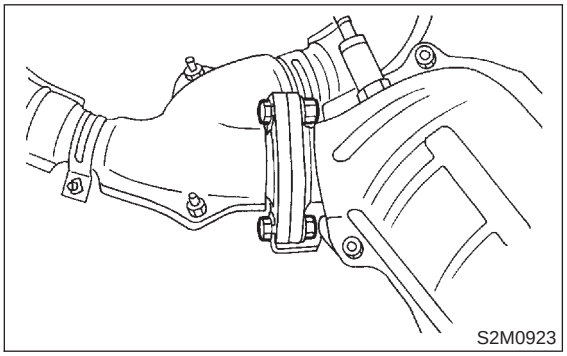
9) Remove bolt which installs front and center exhaust pipe assembly to hanger bracket.


B2M0313

10) Remove front and center exhaust pipe assembly from the vehicle.

CAUTION:
- **Be careful not to let front and center exhaust pipe assembly fall off when removing as it is quite heavy.**
- **After removing front and center exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.**

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

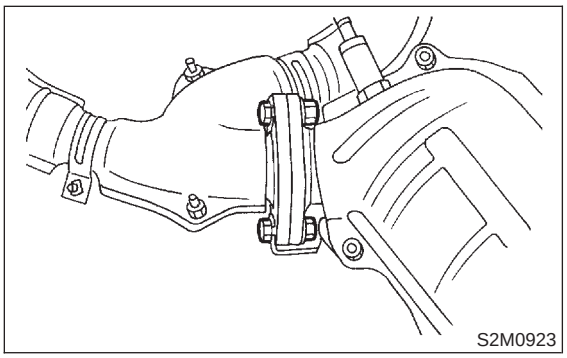

S2M0923

B: INSTALLATION

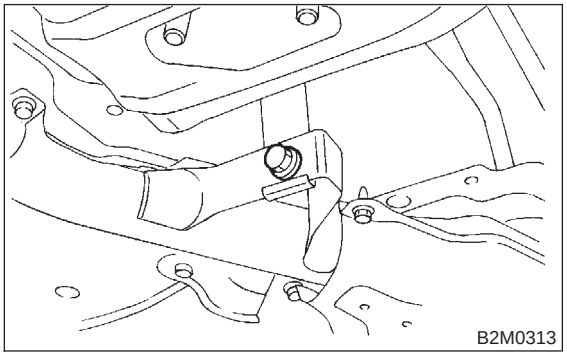
1) Install front exhaust pipe to front catalytic converter and center exhaust pipe assembly.

CAUTION:
Replace gaskets with new ones.

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

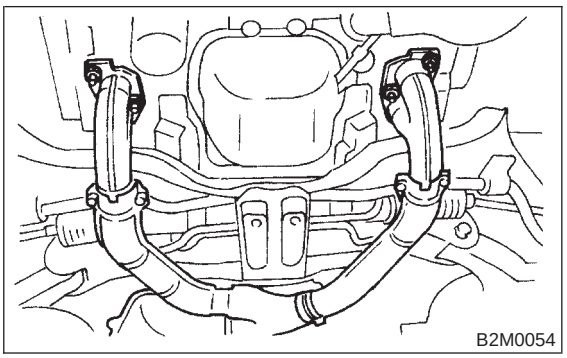

S2M0923

2) Install front and center exhaust pipe assembly to the vehicle.
3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.


B2M0313

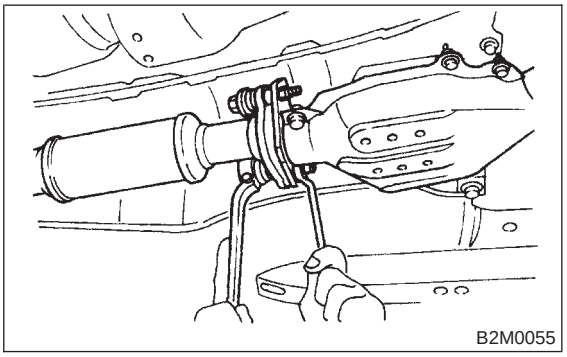
4) Tighten bolts which hold front exhaust pipe onto cylinder heads.

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


B2M0054

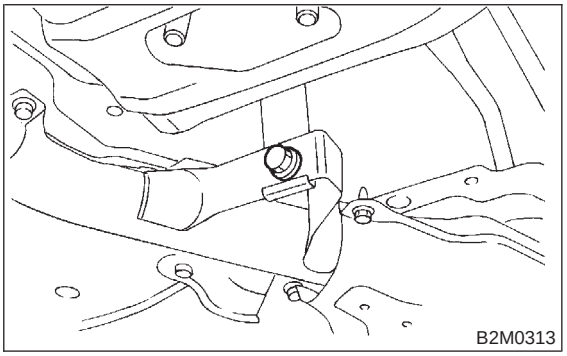
5) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

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

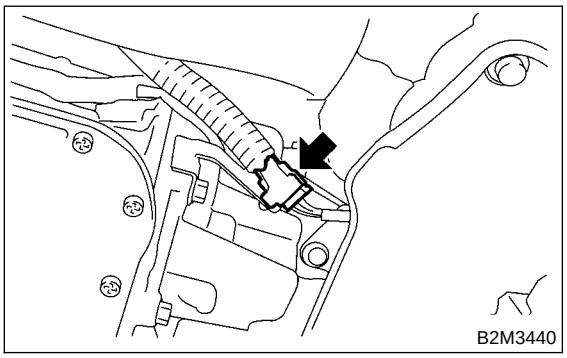

B2M0055

6) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

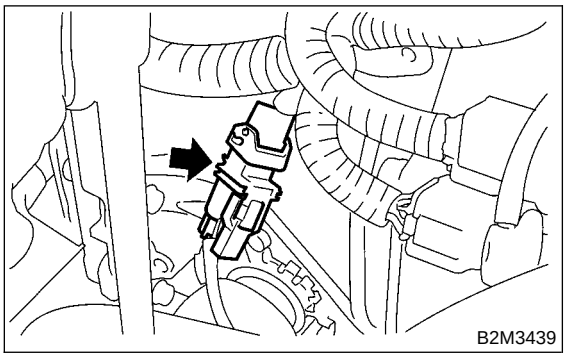
Tightening torque:
35±5 N·m (3.6±0.5 kg-m, 26.0±3.6 ft-lb)


B2M0313

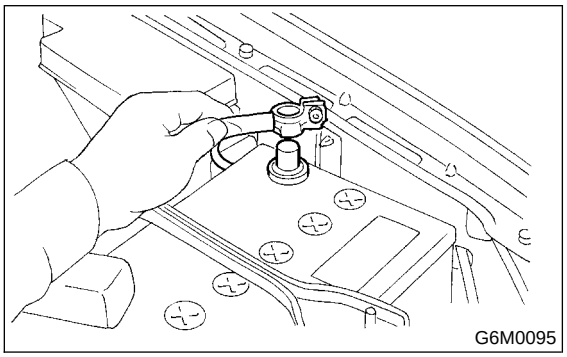
7) Connect rear oxygen sensor connector.



8) Install under cover.
9) Lower the vehicle.
10) Connect front oxygen (A/F) sensor connector.



11) Connect battery ground cable.

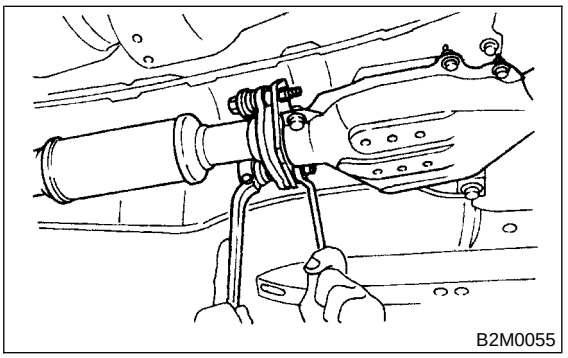


2. Rear Exhaust Pipe

A: REMOVAL

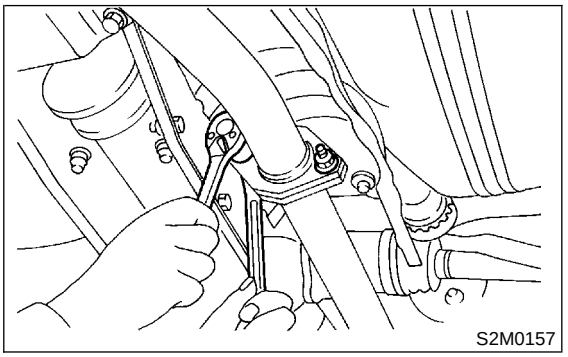
1) Lift-up the vehicle.
2) Separate rear exhaust pipe from center exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.



3) Separate rear exhaust pipe from muffler.

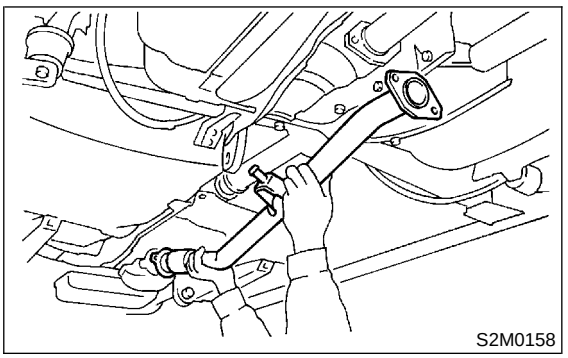
CAUTION:
Be careful not to pull down rear exhaust pipe.



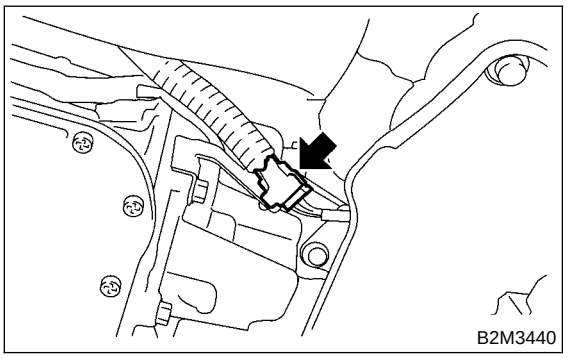
4) Remove rear exhaust pipe bracket from rubber cushion.

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

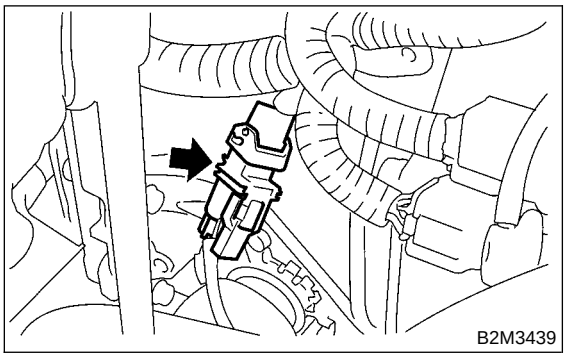
SUBARU CRC (Part No. 004301003)



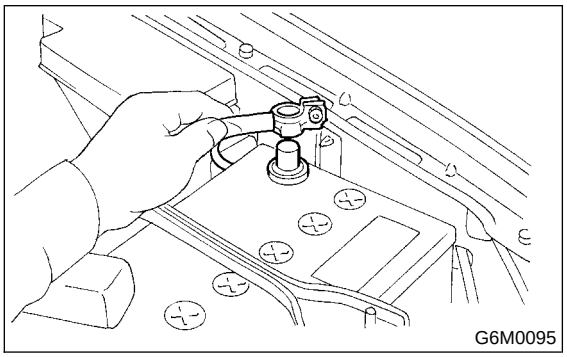
7) Connect rear oxygen sensor connector.



8) Install under cover.
9) Lower the vehicle.
10) Connect front oxygen (A/F) sensor connector.



11) Connect battery ground cable.

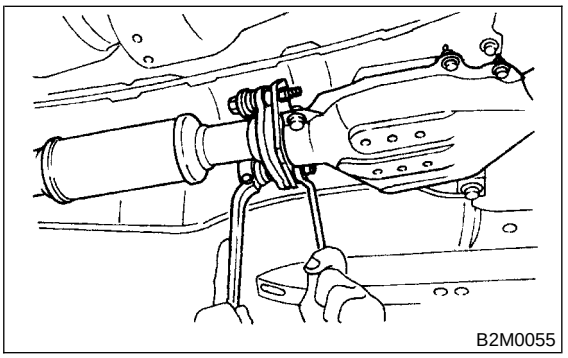


2. Rear Exhaust Pipe

A: REMOVAL

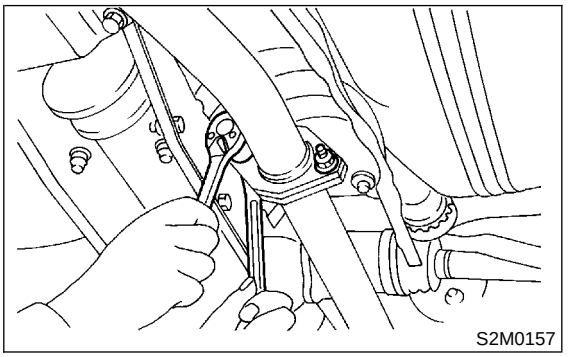
1) Lift-up the vehicle.
2) Separate rear exhaust pipe from center exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.



3) Separate rear exhaust pipe from muffler.

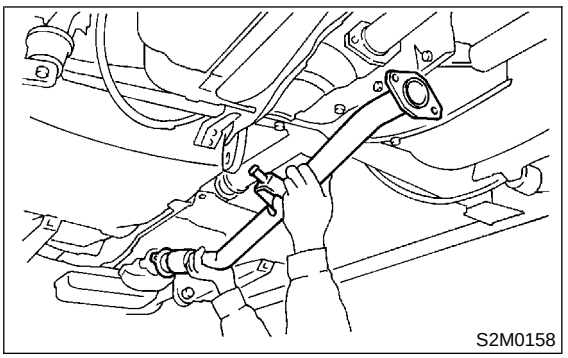
CAUTION:
Be careful not to pull down rear exhaust pipe.



4) 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)



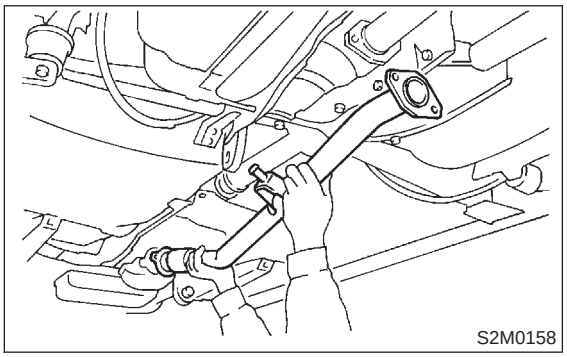
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

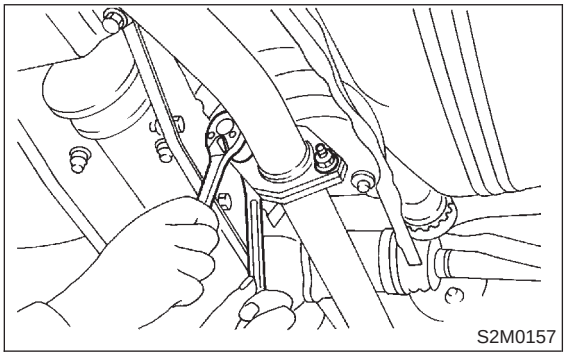
NOTE:
To facilitate installation, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)


S2M0158

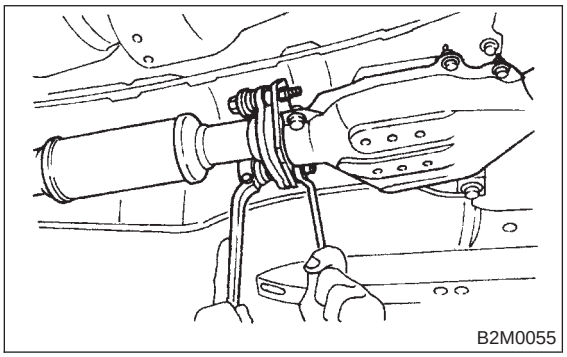
2) Install rear exhaust pipe to muffler.

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)

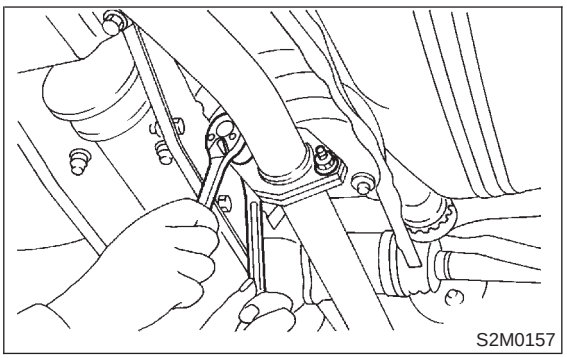

B2M0055

3. Muffler

A: REMOVAL AND INSTALLATION

WARNING:
Be careful, exhaust pipe is hot.

1) Lift-up the vehicle.
2) Separate muffler from rear exhaust pipe.

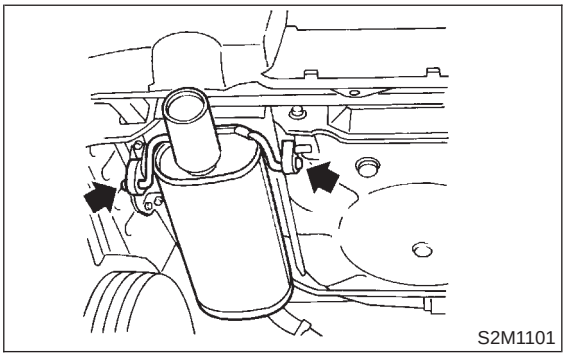

S2M0157

3) 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)


S2M1101

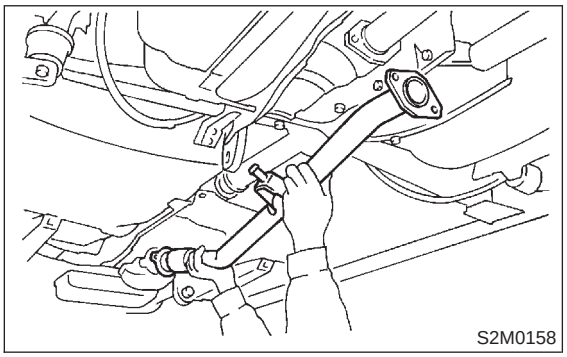
B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

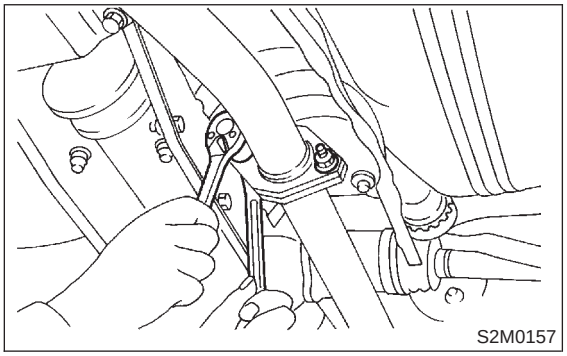
NOTE:
To facilitate installation, apply a coat of SUBARU CRC or equivalent to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)


S2M0158

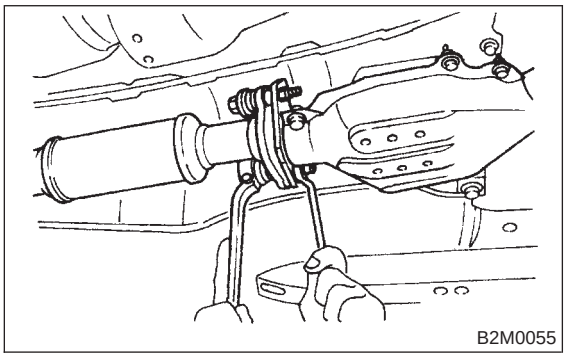
2) Install rear exhaust pipe to muffler.

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)

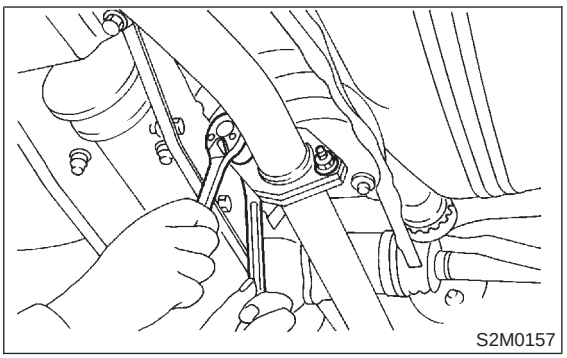

B2M0055

3. Muffler

A: REMOVAL AND INSTALLATION

WARNING:
Be careful, exhaust pipe is hot.

1) Lift-up the vehicle.
2) Separate muffler from rear exhaust pipe.

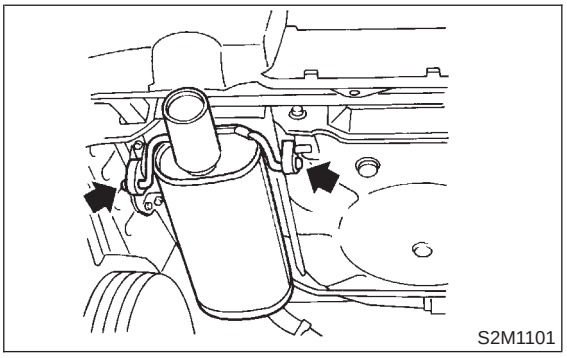

S2M0157

3) 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.

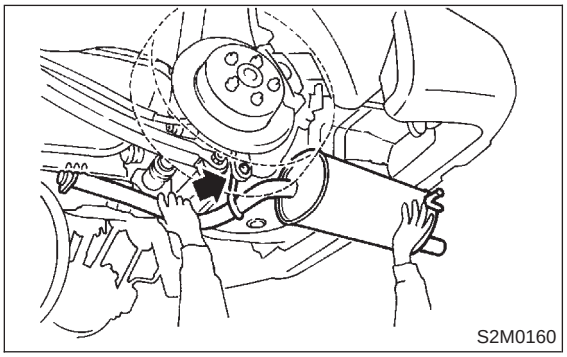
SUBARU CRC (Part No. 004301003)


S2M1101

4) 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.

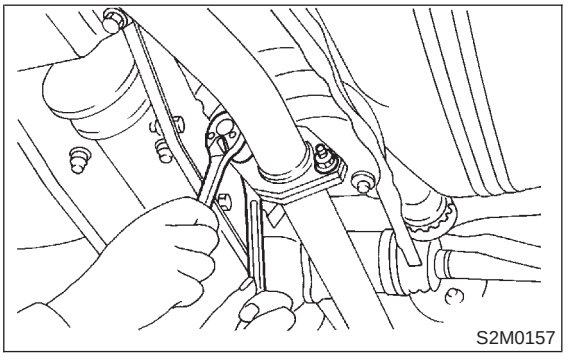
SUBARU CRC (Part No. 004301003)


S2M0160

5) Install 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)


S2M0157

MEMO: