ENGINE1 SECTION

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

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

FUJI HEAVY INDUSTRIES LTD.

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

FUEL INJECTION (FUEL SYSTEMS)

FU(SOHC)

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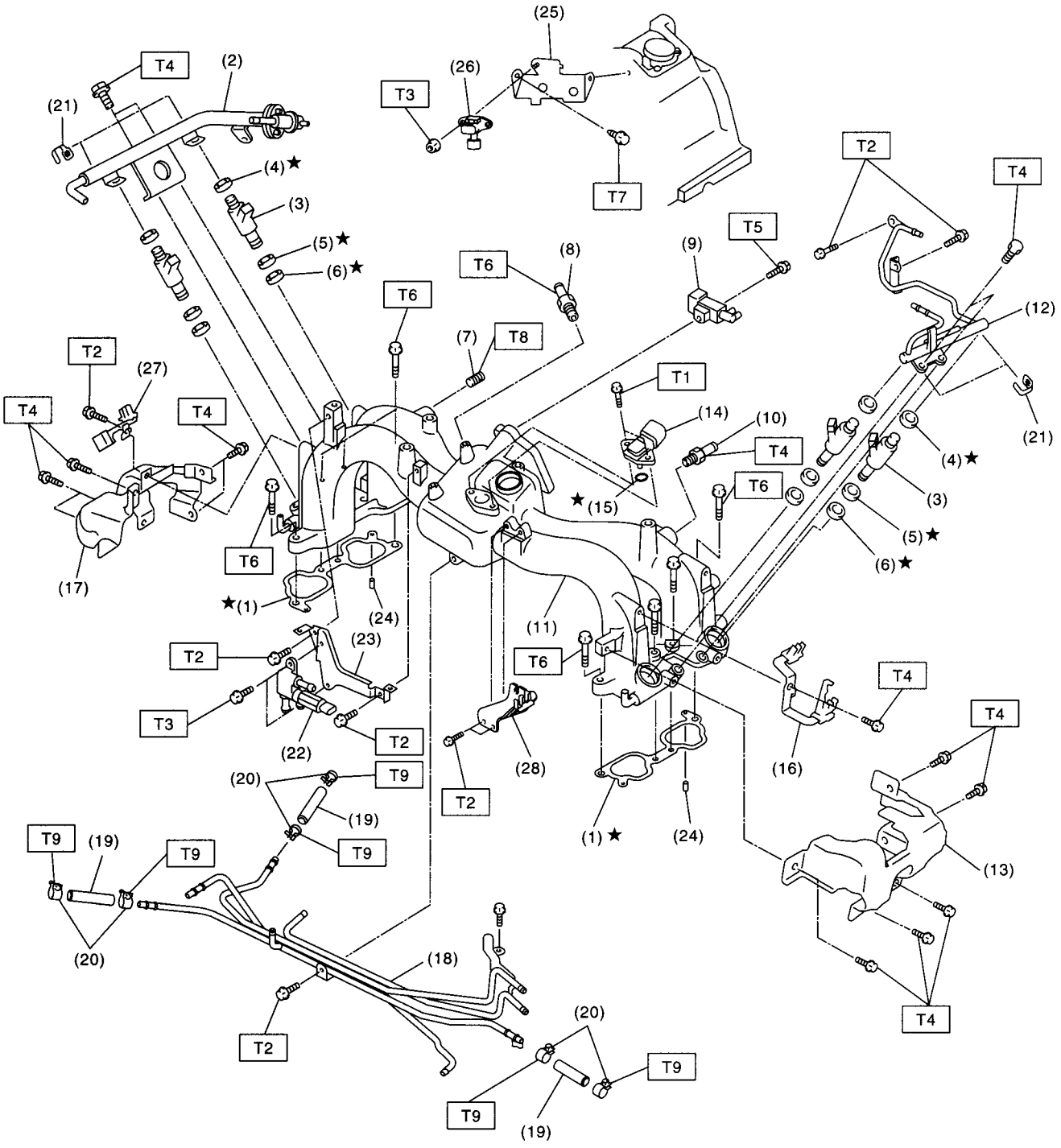
1. General Description

A: SPECIFICATIONS

Model		
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 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

B: COMPONENT

1. INTAKE MANIFOLD

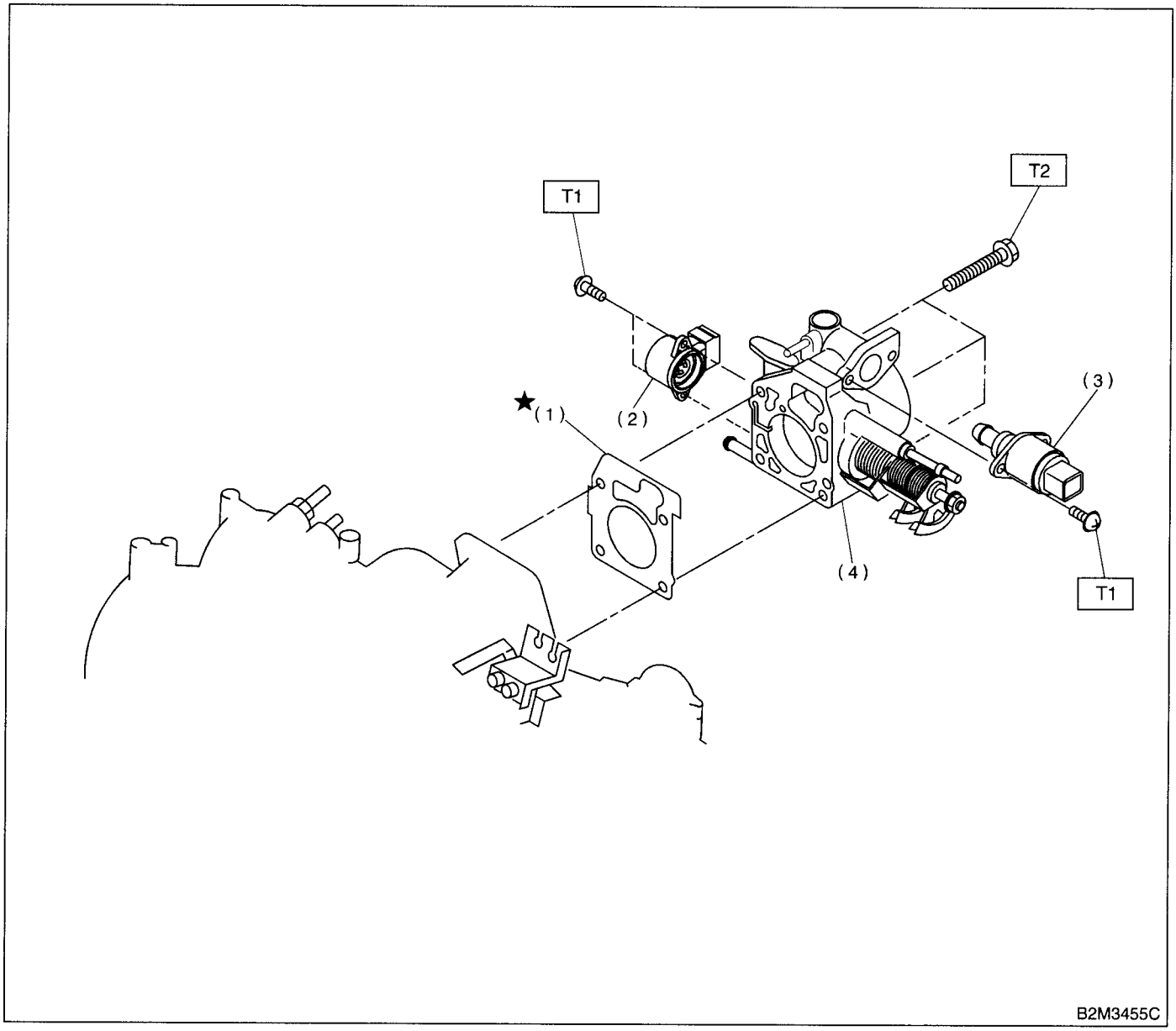


EN1172

(1) Intake manifold gasket
(2) Fuel injector pipe RH
(3) Fuel injector
(4) O-ring
(5) O-ring
(6) O-ring
(7) Plug
(8) PCV valve
(9) Purge control solenoid valve
(10) Nipple
(11) Intake manifold
(12) Fuel injector pipe LH
(13) Fuel pipe protector LH
(14) Intake air temperature and pressure sensor
(15) O-ring
(16) Plug cord holder LH
(17) Fuel pipe protector RH
(18) Fuel pipe ASSY
(19) Fuel hose
(20) Clip
(21) Clip
(22) Air assist injector solenoid valve
(23) Air assist injector solenoid valve bracket
(24) Guide pin
(25) Atmospheric pressure sensor bracket
(26) Atmospheric pressure sensor
(27) Plug cord holder RH
(28) Accelerator cable bracket

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*3.4 (0.35, 2.5)*
T2:	*4.9 (0.5, 3.6)*
T3:	*6.4 (0.65, 4.7)*
T4:	*19 (1.9, 13.7)*
T5:	*16 (1.6, 11.8)*
T6:	*25 (2.5, 18.1)*
T7:	*7.35 (0.75, 5.42)*
T8:	*17 (1.7, 12.5)*
T9:	*1.5 (0.15, 1.1)*

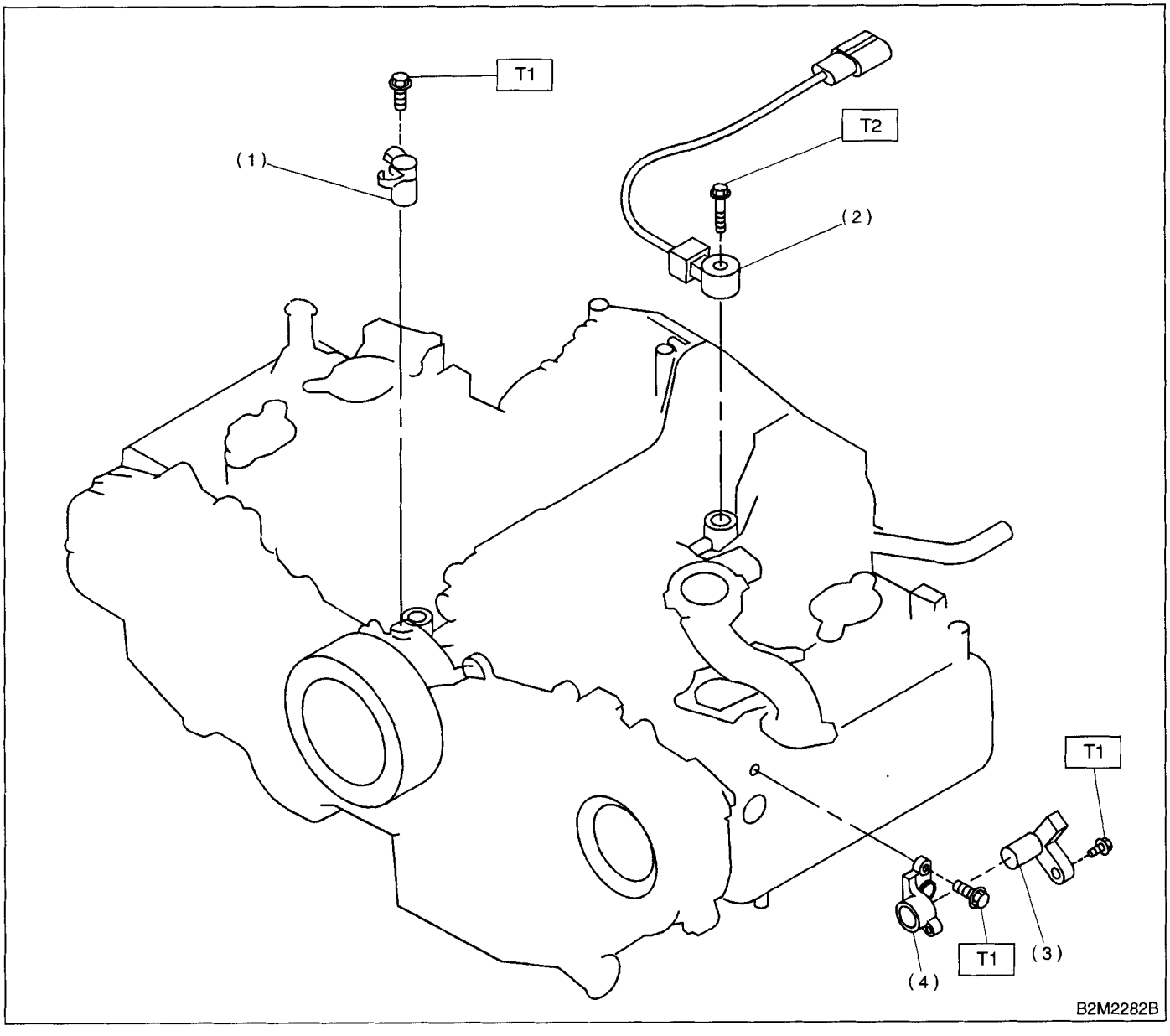
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Throttle body

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

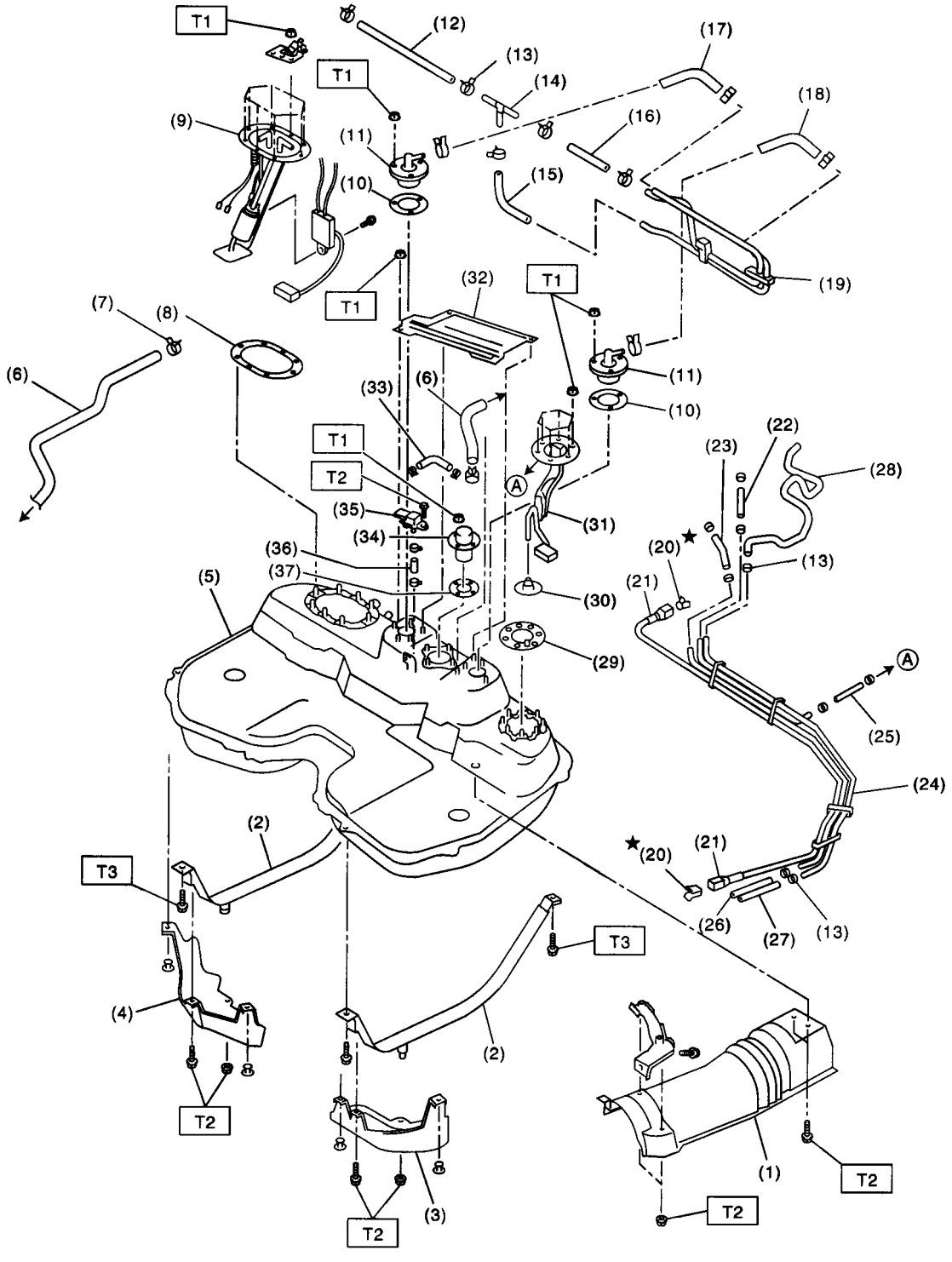
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



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

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

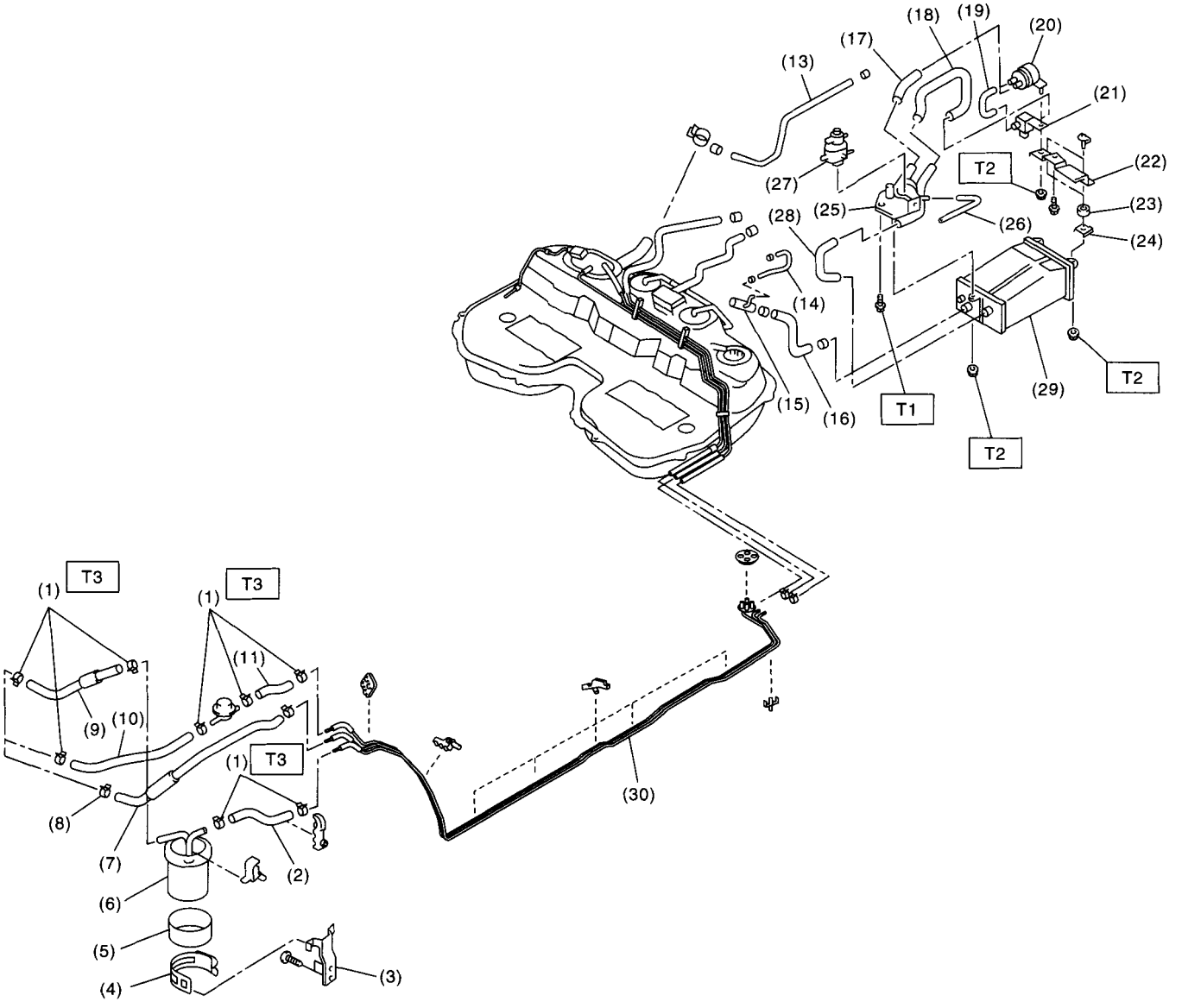
4. FUEL TANK


T1
(12)
(13)
(14)
(17)
(18)
(9)
(11)
(16)
(10)
(15)
(19)
(32)
(7)
(8)
(6)
(33)
(22)
(23)
(28)
T2
(35)
(34)
(31)
(36)
(37)
(20)
(13)
(5)
(21)
(30)
(29)
(25)
(24)
(2)
T3
(26)
(27)
(4)
(1)
(3)
EN1119

(1) Heat shield 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) Evaporation hose G
(29) Fuel sub level sensor gasket
(30) Jet pump filter
(31) Fuel sub level sensor
(32) Protector cover
(33) Vent valve hose
(34) Vent valve
(35) Fuel tank pressure sensor
(36) Fuel tank pressure sensor hose
(37) Vent valve gasket

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

5. FUEL LINE

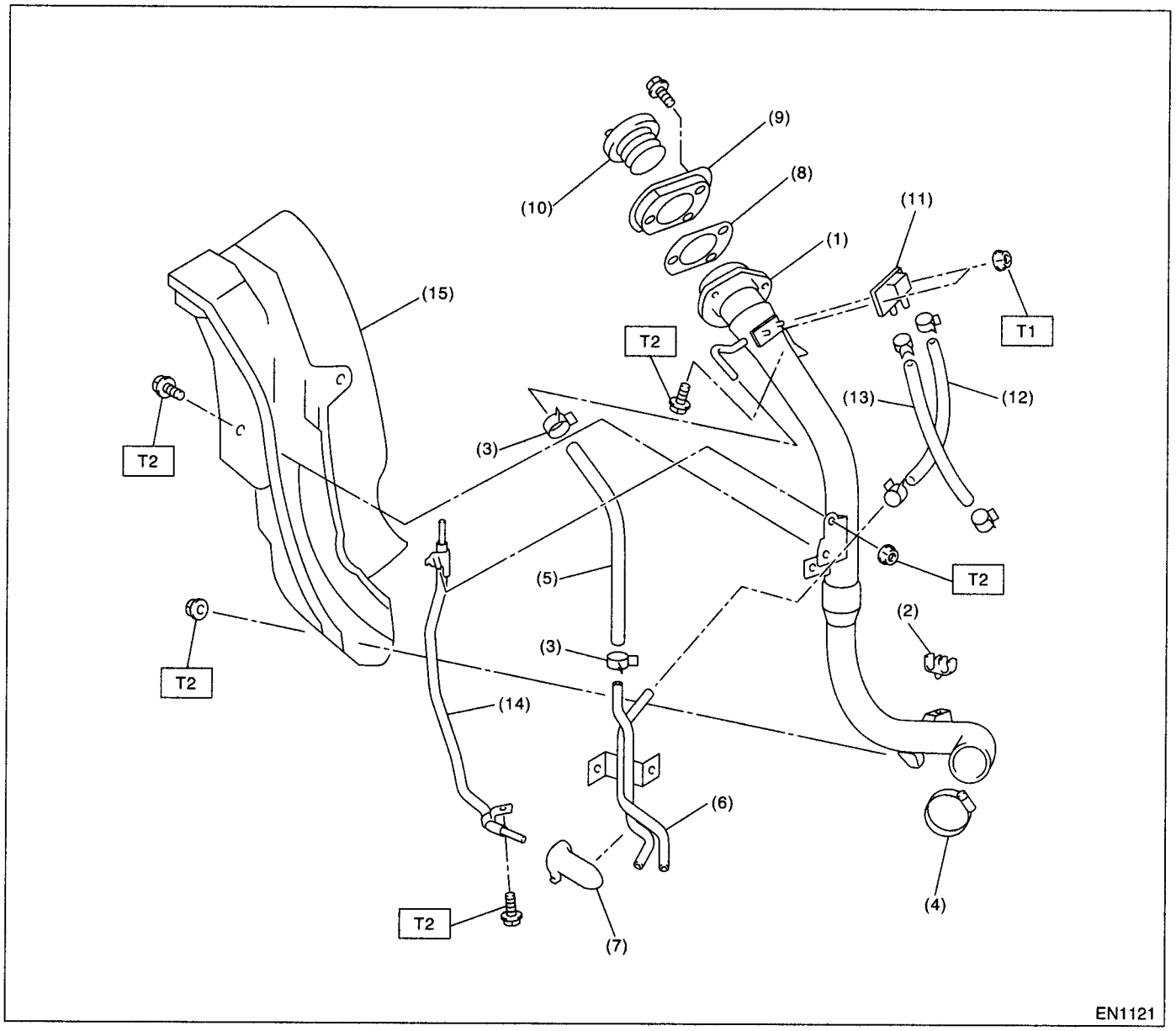


EN1120

(1) Clip
(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 A
(11) Fuel return hose B
(12) Fuel damper
(13) Evaporation hose J
(14) Evaporation hose K
(15) Joint pipe
(16) Canister hose A
(17) Air filter hose A
(18) Drain valve hose
(19) Air filter hose B
(20) Drain filter
(21) Drain valve
(22) Canister upper bracket
(23) Cushion rubber
(24) Canister lower bracket
(25) Canister holder
(26) Evaporation hose L
(27) Pressure control solenoid valve
(28) Canister hose B
(29) Canister
(30) Fuel pipe ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)
T3: 1.25 (0.13, 0.94)

6. FUEL FILLER PIPE



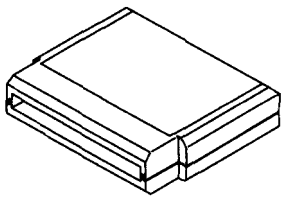
(1) Fuel filter pipe ASSY
(2) Evaporation hose holder
(3) Clamp
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe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

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

C: CAUTION

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

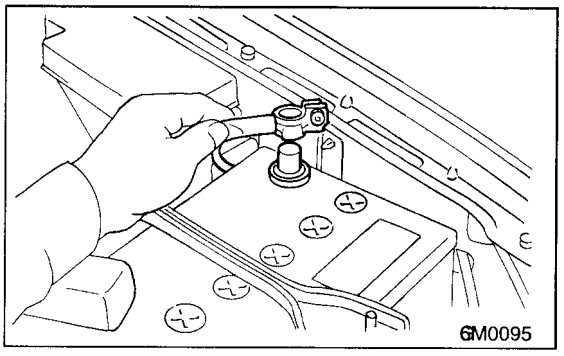
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

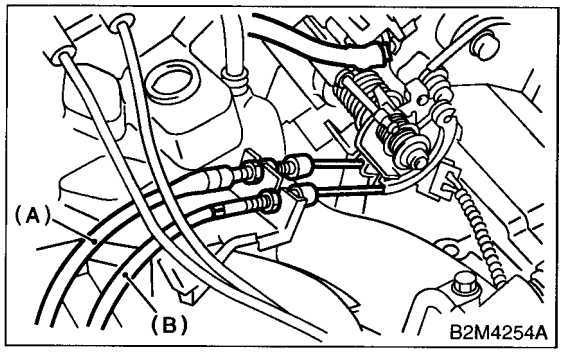
2. Throttle Body

A: REMOVAL

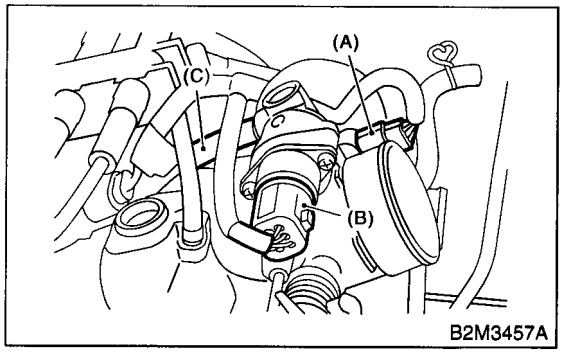
1) Disconnect the battery ground cable.



2) Remove the air cleaner case.<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the accelerator cable (A).
4) Disconnect the cruise control cable (B). (With cruise control model)

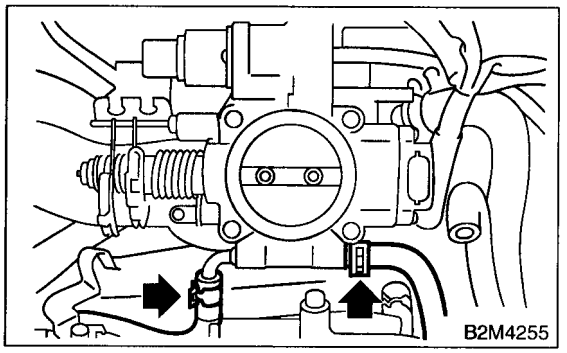


5) Disconnect the connectors from the idle air control solenoid valve and throttle position sensor.
6) Disconnect the air by-pass hose from the throttle body.



(A) Throttle position sensor
(B) Idle air control solenoid valve
(C) Air by-pass hose from air assist injector solenoid valve

7) Disconnect the engine coolant hoses from the throttle body.



8) Remove the bolts which install throttle body to the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

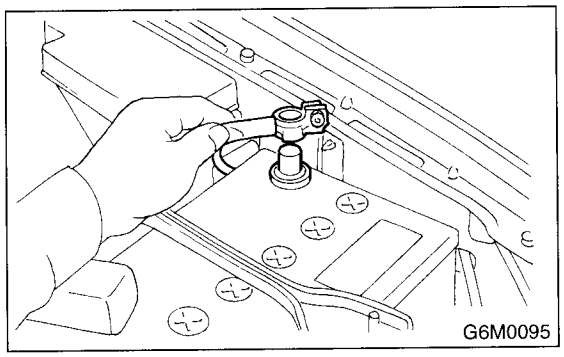
NOTE:
Always use a new gasket.

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

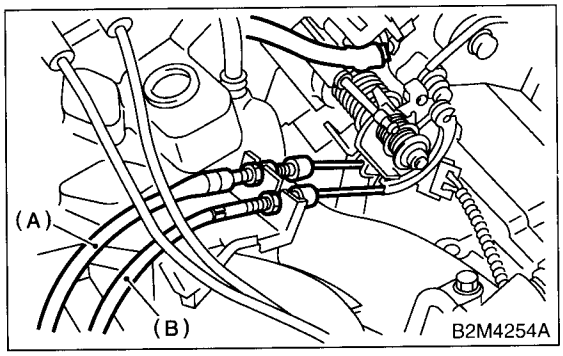
3. Intake Manifold

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the battery ground cable.

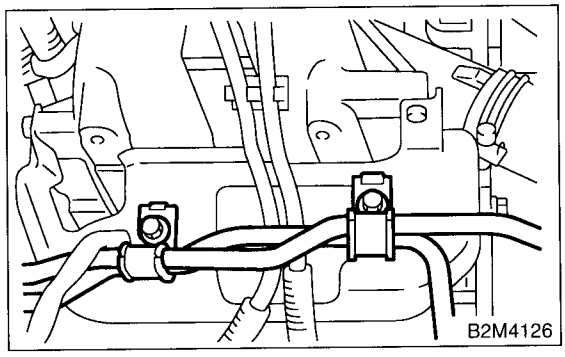


4) Remove the air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Disconnect the accelerator cable (A).
6) Disconnect the cruise control cable (B). (With cruise control model)

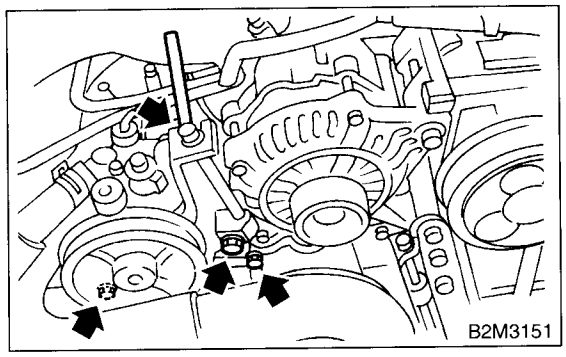


7) Remove the power steering pump.
(1) Remove the resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
(2) Remove the front side V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
(3) Remove the bolts which hold power steering pipes onto the intake manifold protector.

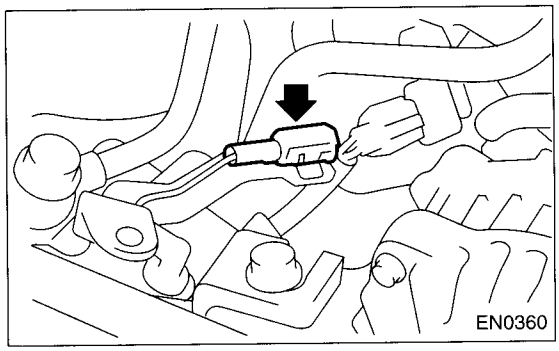
NOTE:
Do not disconnect the power steering hose.



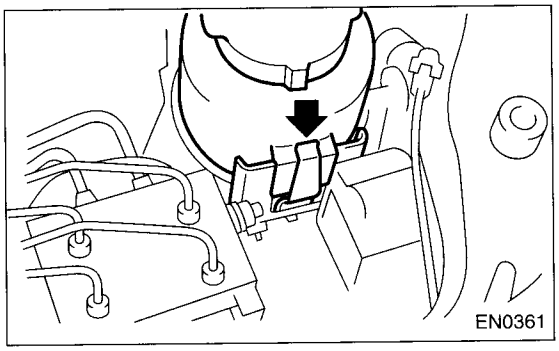
(4) Remove the bolts which install power steering pump bracket.



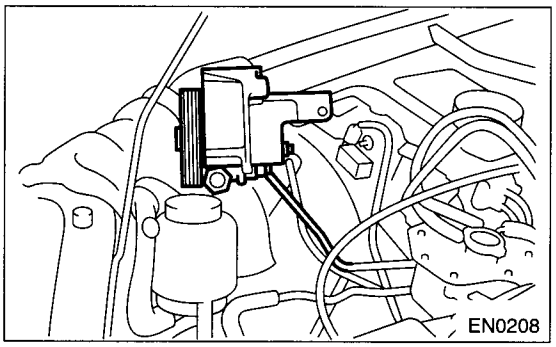
(5) Disconnect the connector from the power steering pump switch.



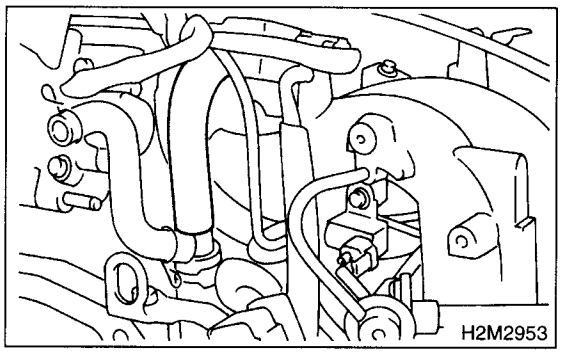
(6) Remove the power steering tank from the bracket by pulling it upwards.



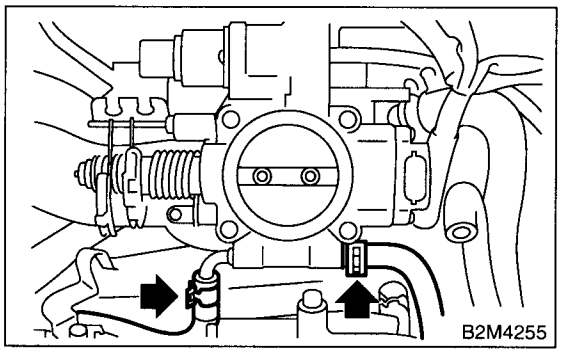
(7) Place the power steering pump on the right side wheel apron.



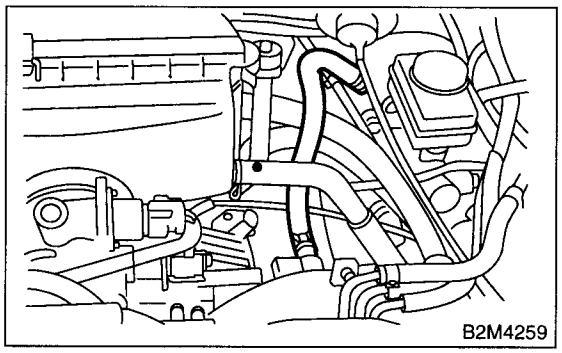
8) Disconnect the spark plug cords from the spark plugs.
9) Disconnect the PCV hose from the intake manifold.



10) Disconnect the engine coolant hose from the throttle body.



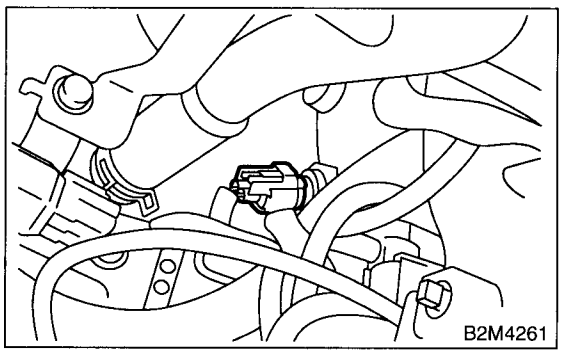
11) Disconnect the brake booster hose.



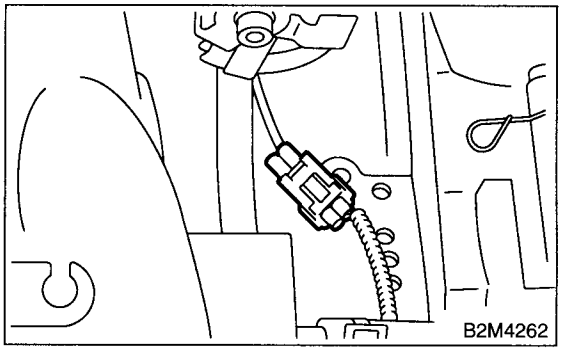
12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from the bulkhead harness connectors.



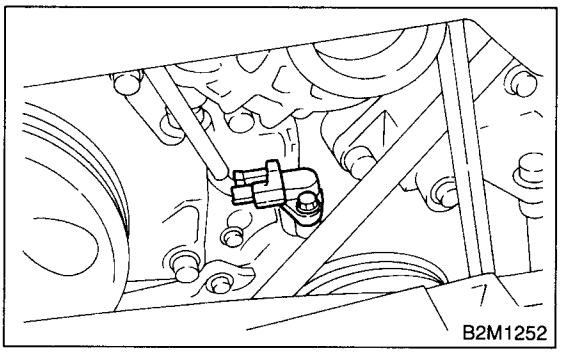
13) Disconnect the connectors from the engine coolant temperature sensor.



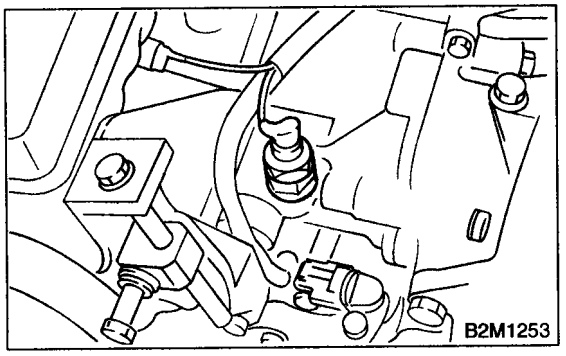
14) Disconnect the knock sensor connector.



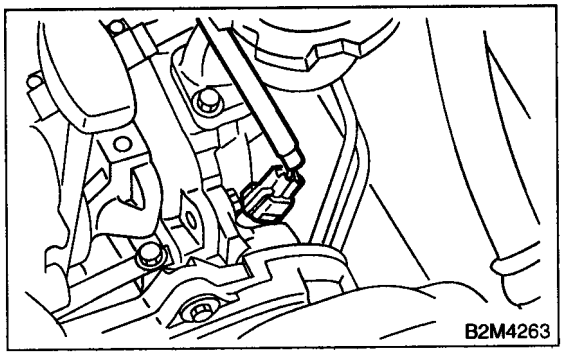
15) Disconnect the connector from the crankshaft position sensor.



16) Disconnect the connector from the oil pressure switch.

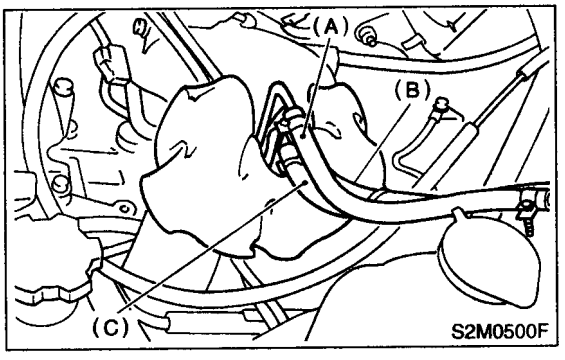


17) Disconnect the connector from the camshaft position sensor.



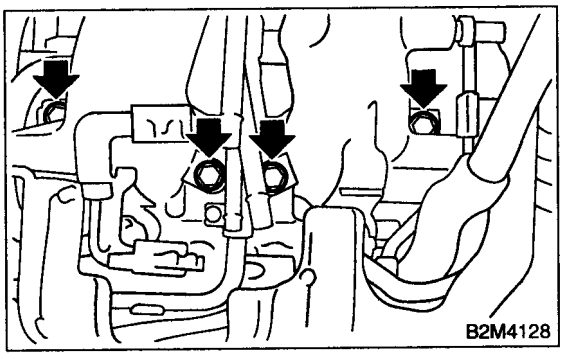
18) Disconnect the fuel hoses from the fuel pipes.

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

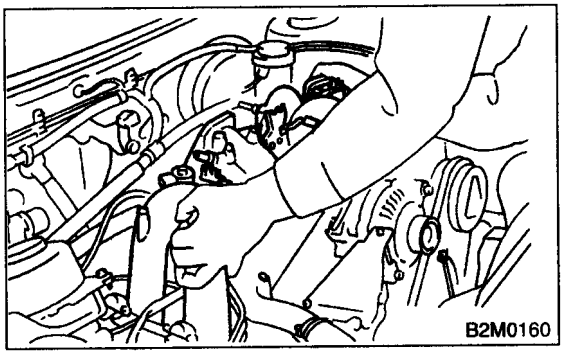


(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

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



20) Remove the intake manifold.

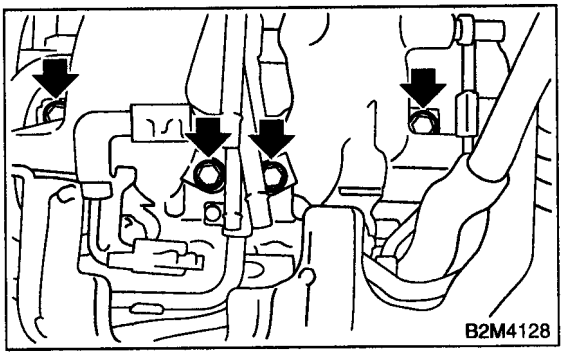


B: INSTALLATION

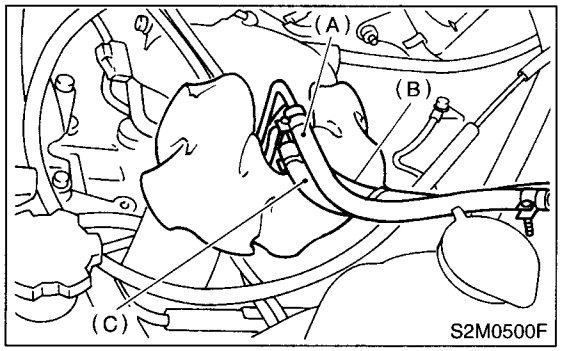
1) Install the intake manifold onto the cylinder heads.

NOTE:
Always use new gaskets.

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

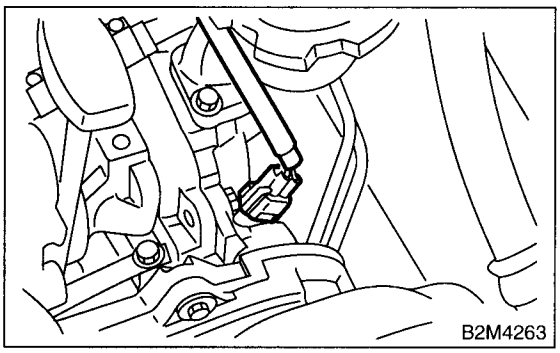


2) Connect the fuel hoses.

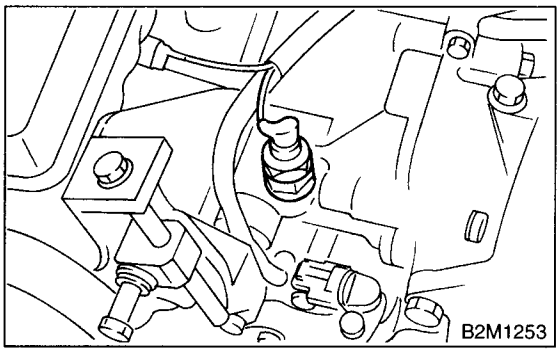


(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

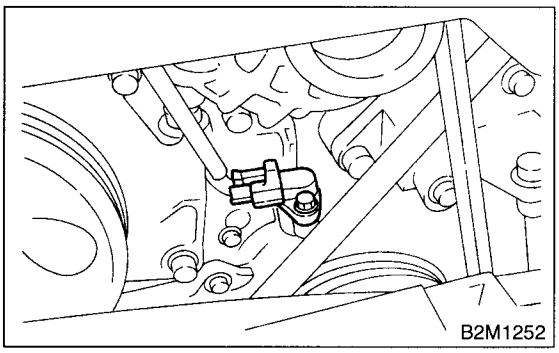
3) Connect the connector to the camshaft position sensor.



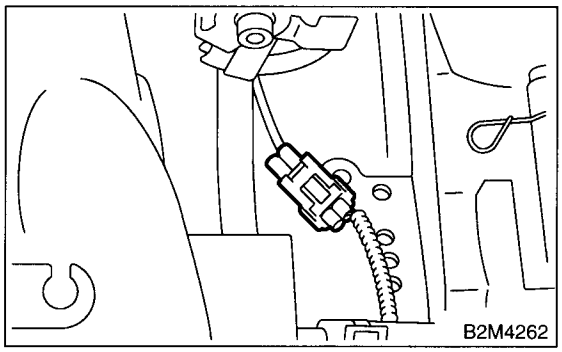
4) Connect the connector to the oil pressure switch.



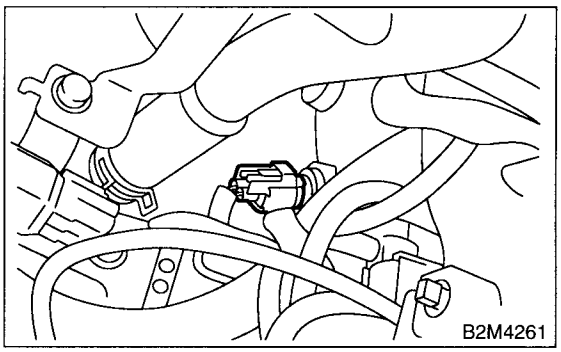
5) Connect the connector to the crankshaft position sensor.



6) Connect the knock sensor connector.



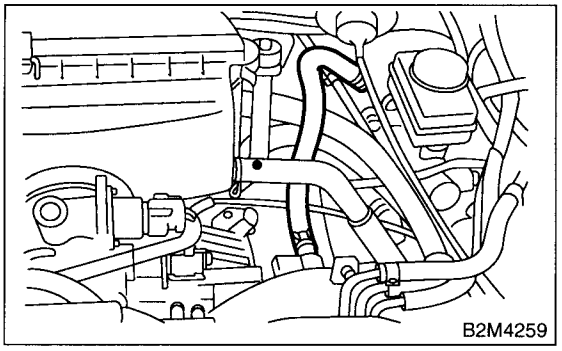
7) Connect the connectors to the engine coolant temperature sensor.



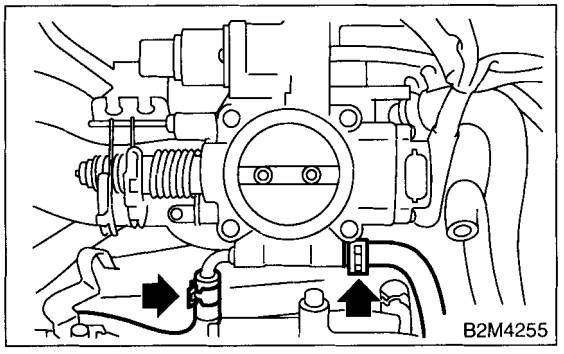
8) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to the bulkhead connectors.



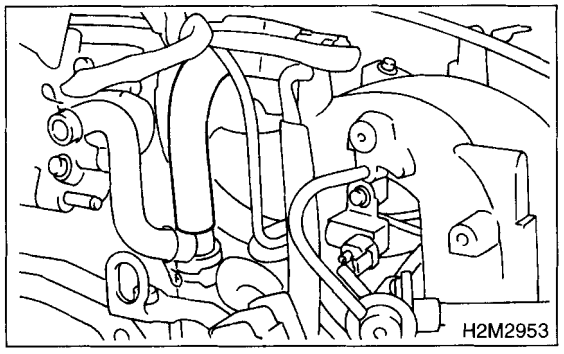
9) Connect the brake booster hose.



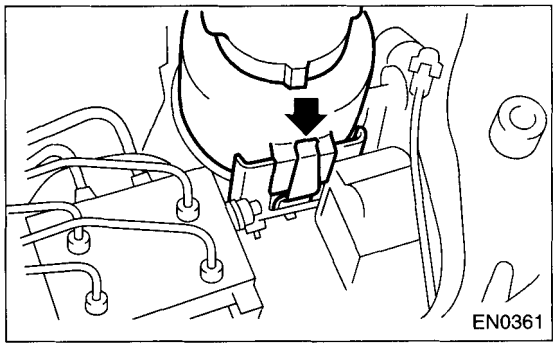
10) Connect the engine coolant hose to the throttle body.



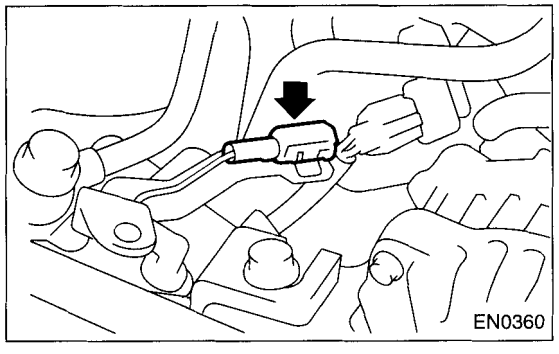
11) Connect the PCV hose to the intake manifold.



12) Connect the spark plug cords to the spark plugs.
13) Install the power steering pump.
(1) Install the power steering tank on the bracket.

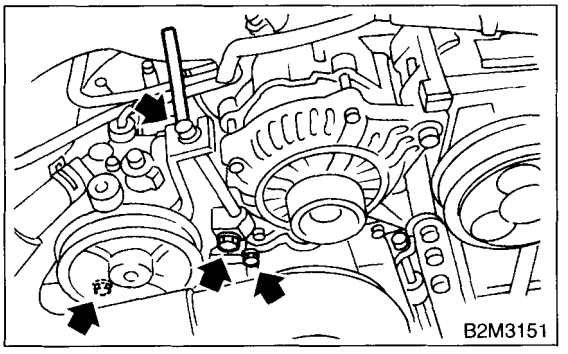


(2) Connect the connector to the power steering pump switch.

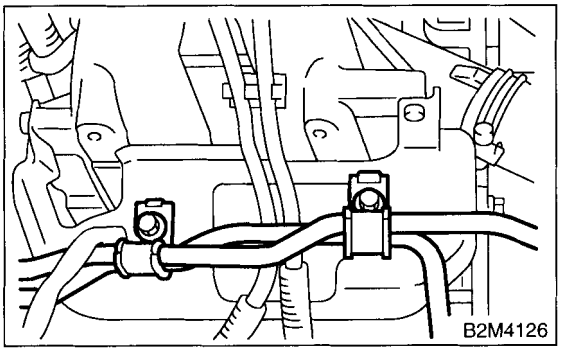


(3) Tighten the bolts which install power steering pump bracket.

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

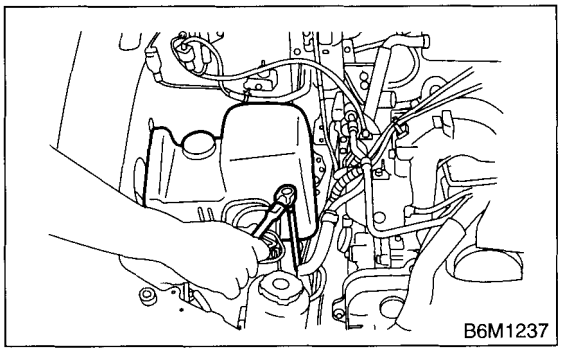


(4) Install the power steering pipes onto the right side intake manifold protector.



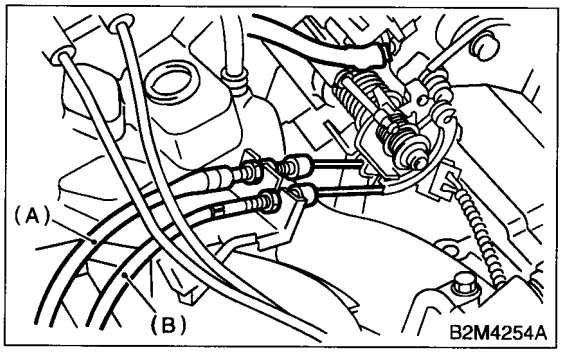
(5) Install the front side V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

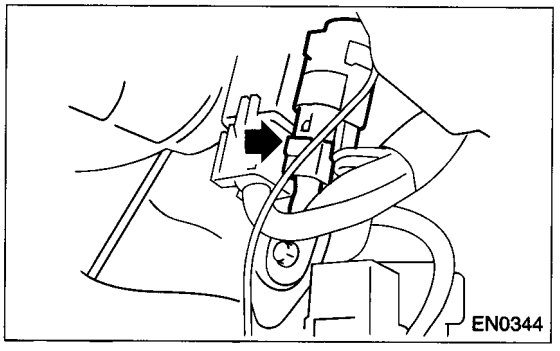


14) Connect the accelerator cable (A).

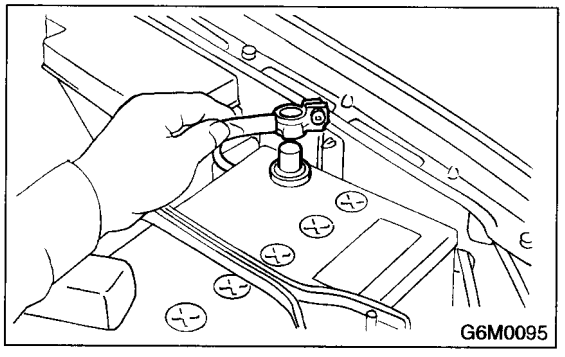
15) Connect the cruise control cable (B). (With cruise control models)



16) Install the air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
17) Connect the connector to the fuel pump relay.

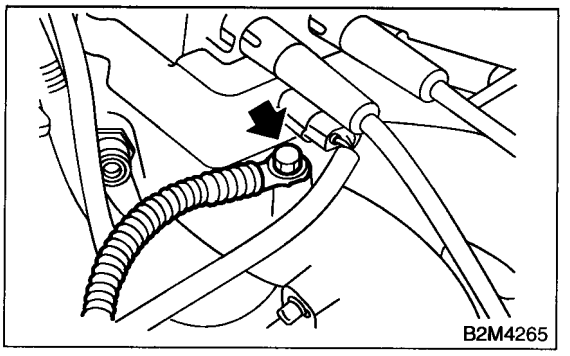


18) Connect the battery ground cable.

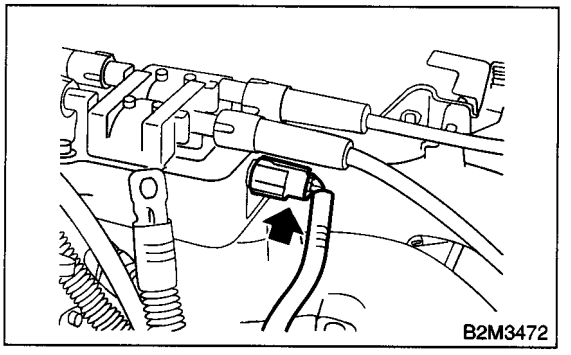


C: DISASSEMBLY

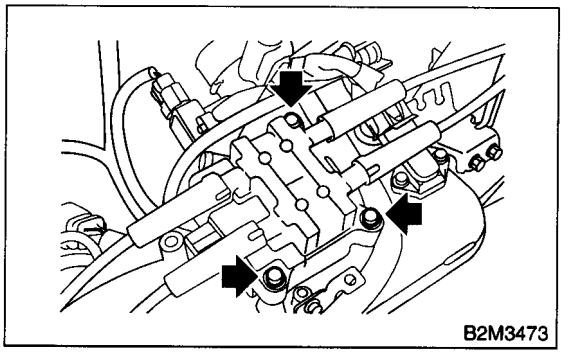
1) Disconnect the engine ground terminal from the intake manifold.



2) Disconnect the connector from the ignition coil and ignitor assembly.

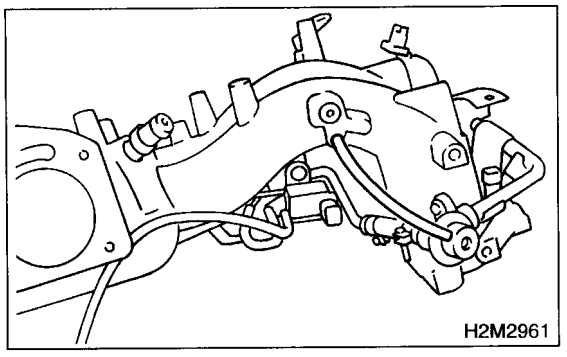


3) Remove the ignition coil and ignitor assembly.

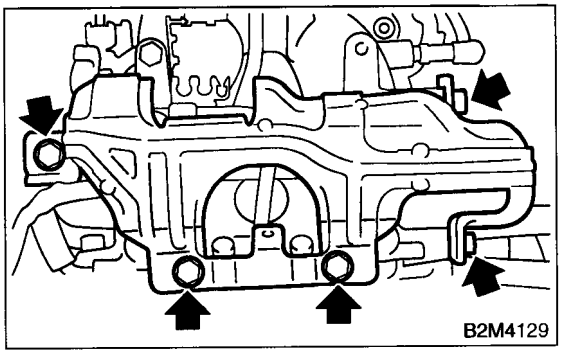


4) Remove the intake air temperature and pressure sensor from the intake manifold.<Ref. to FU(SOHC)-34, REMOVAL, Intake Air Temperature and Pressure Sensor.>
5) Remove the throttle body.<Ref. to FU(SOHC)-14, REMOVAL, Throttle Body.>
6) Remove the air assist injector solenoid valve from the intake manifold.<Ref. to FU(SOHC)-37, REMOVAL, Air Assist Injector Solenoid Valve.>

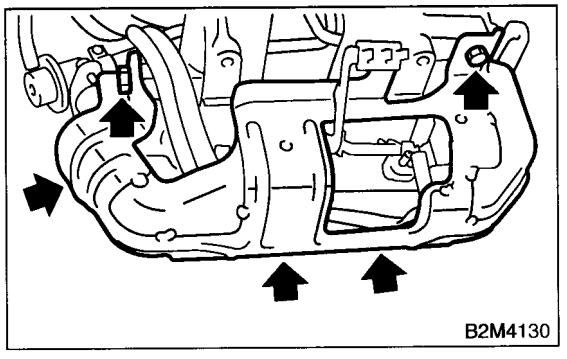
7) Disconnect the pressure regulator vacuum hose from the intake manifold.



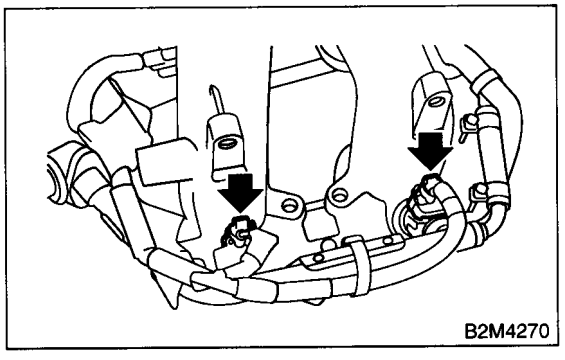
8) Remove the fuel pipe protector LH.



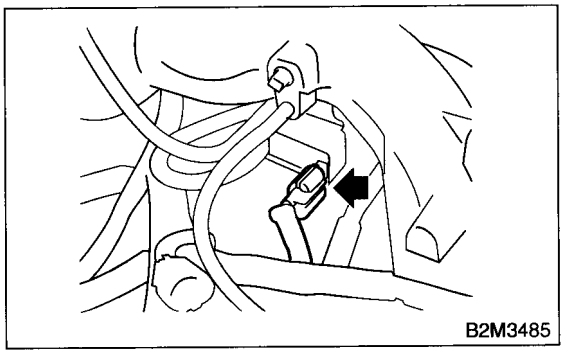
9) Remove the fuel pipe protector RH.



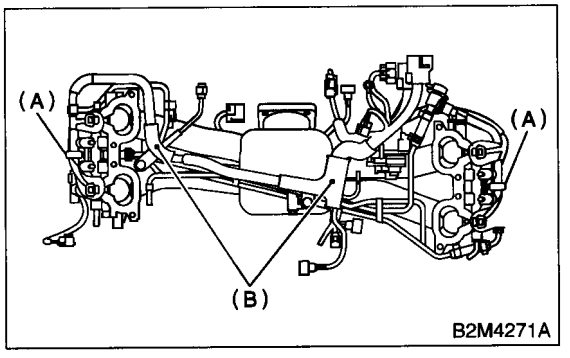
10) Disconnect the connectors from the fuel injectors.



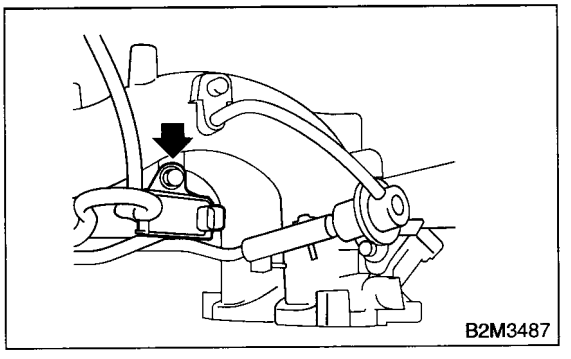
11) Disconnect the connector from the purge control solenoid valve.



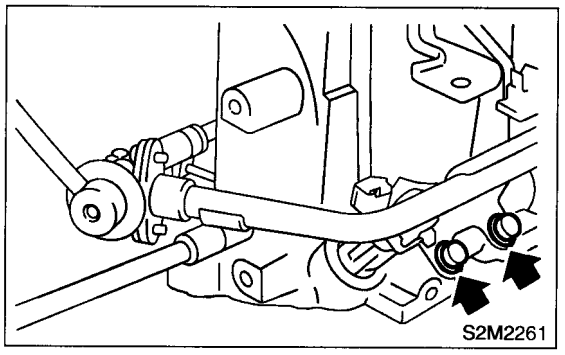
12) Disconnect the air by-pass hose from the purge control solenoid valve.
13) Remove the harness bands (A) and harness bracket (B) which hold engine harness onto the intake manifold.



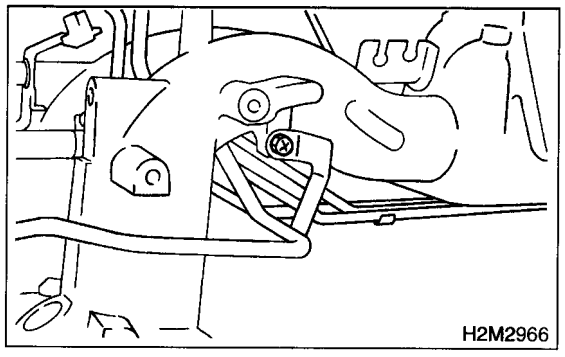
14) Remove the engine harness from the intake manifold.
15) Remove the purge control solenoid valve.



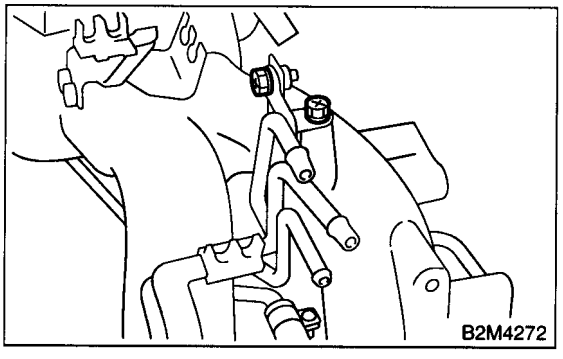
16) Remove the bolt which installs injector pipe on the intake manifold as shown in figure.



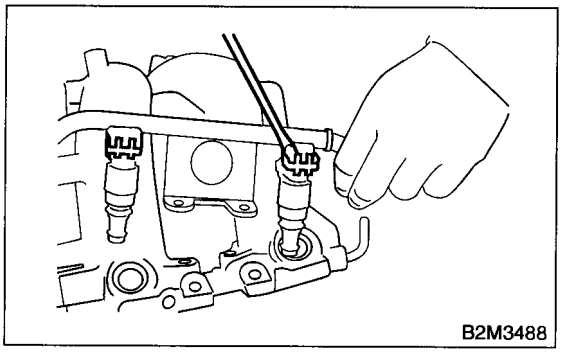
17) Remove the bolt which installs injector pipe on the intake manifold.



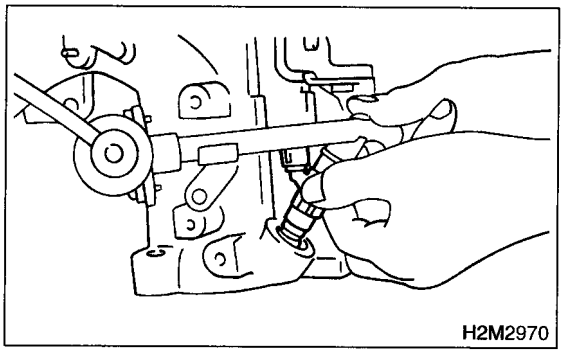
18) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



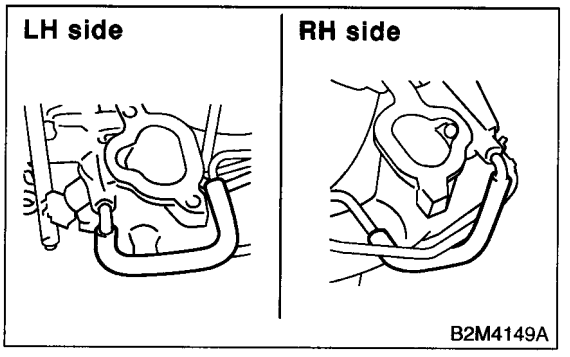
19) Remove the fuel injectors.
(1) Remove the fuel injector securing clip.



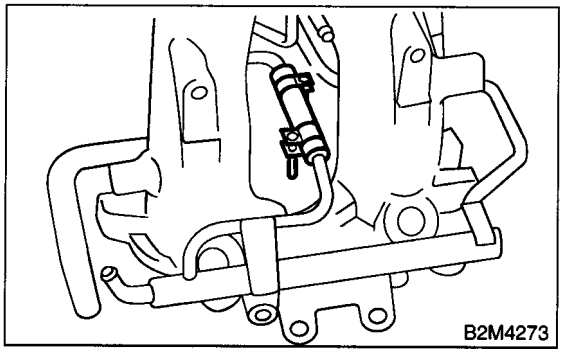
(2) Remove the fuel injector while lifting up the fuel injector pipe.



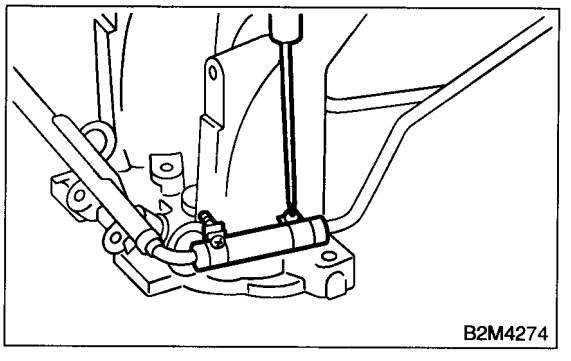
20) Disconnect the air by-pass hoses from the intake manifold.



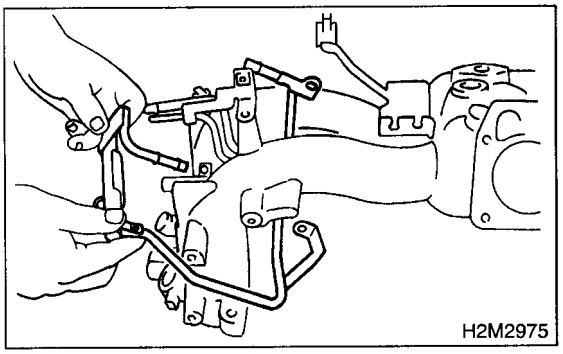
21) Loosen the clamp which holds the front left side fuel hose to the injector pipe and remove the pipe.



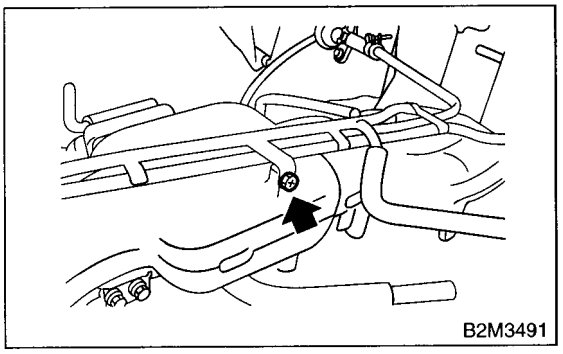
22) Loosen the clamp which holds the front right side fuel hose to the injector pipe and remove the pipe.



23) Remove the fuel injector pipe.



24) Remove the bolt which installs the fuel pipes on the intake manifold.

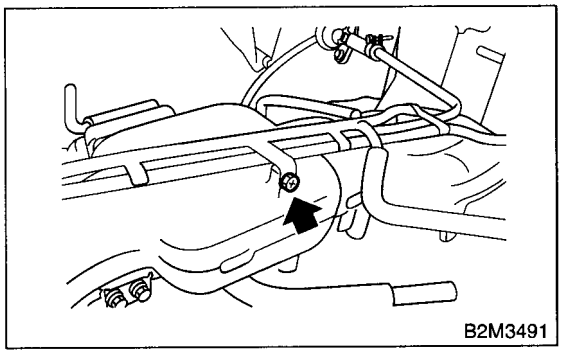


25) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

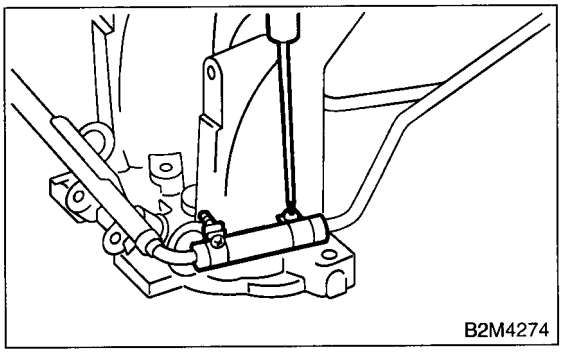
D: ASSEMBLY

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

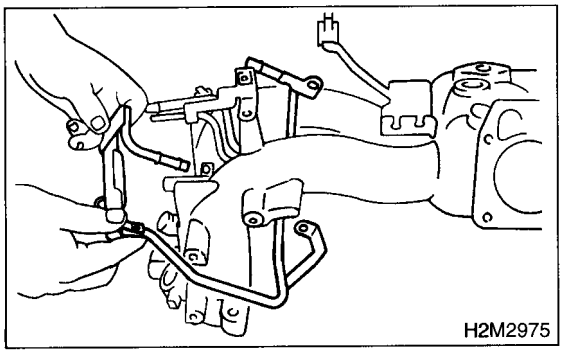
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



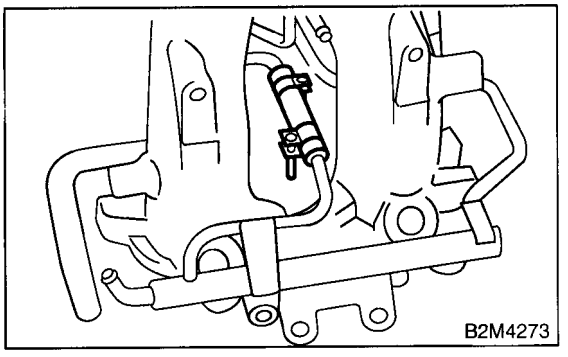
3) Connect the right side fuel hose to the injector pipe, and tighten the clamp screw.



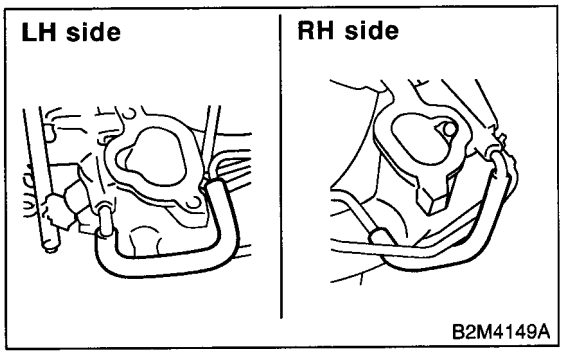
4) Install the fuel injector pipe.



5) Connect the left side fuel hose to the injector pipe, and tighten the clamp screw.

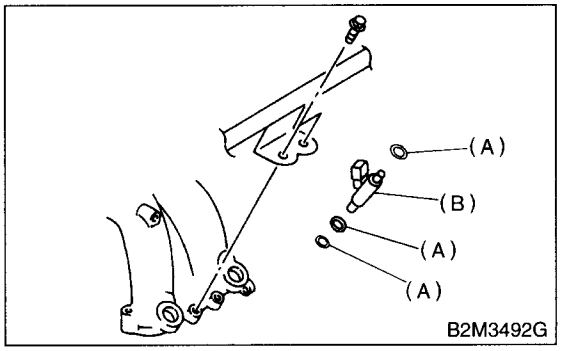


6) Connect the air assist hoses.



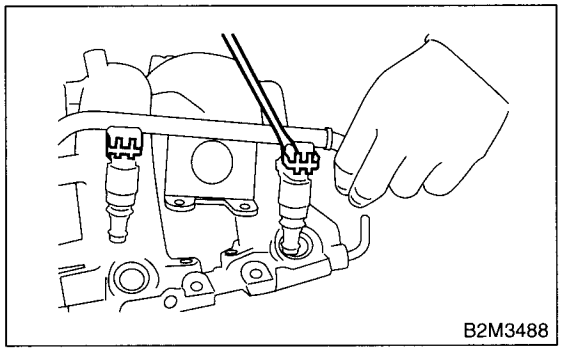
7) Install the fuel injectors.

NOTE:
Always use new o-rings.



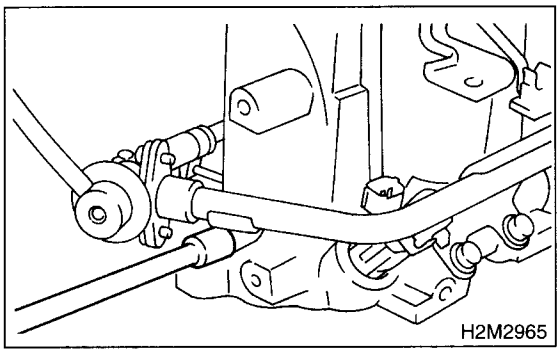
(A) O-ring
(B) Fuel injector

NOTE:
Do not forget to install the fuel injector securing clip.

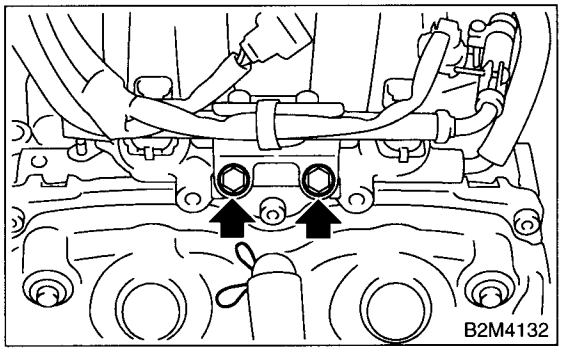


8) Tighten the bolt which installs the injector pipe on the intake manifold.

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

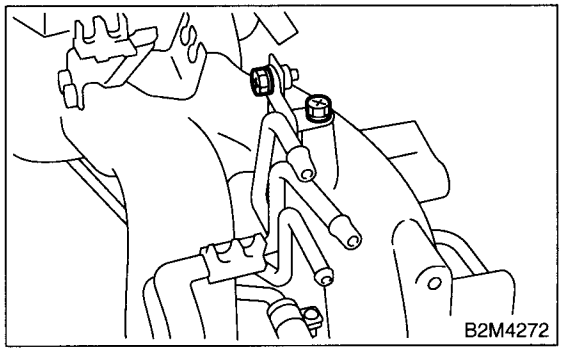


Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



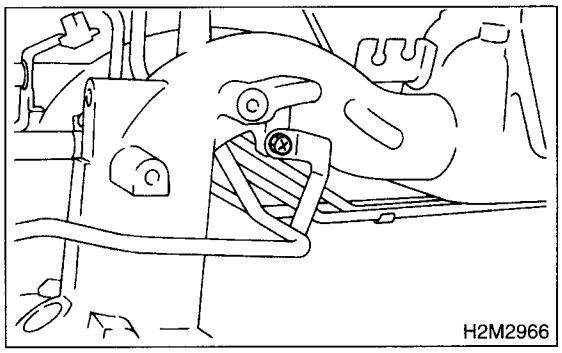
9) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

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



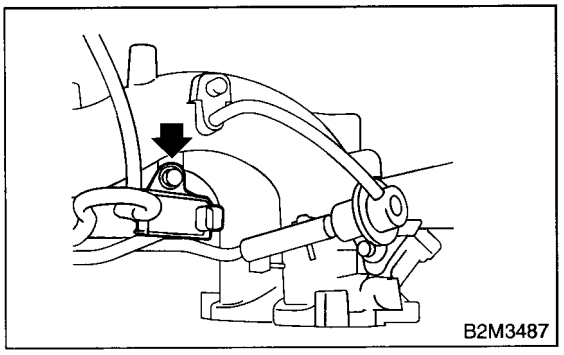
10) Tighten the bolt which install the injector pipe on the intake manifold.

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



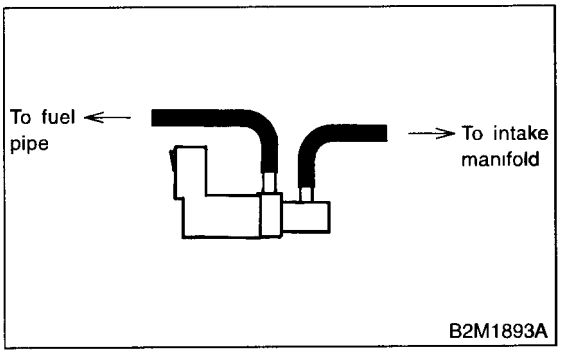
11) Install the purge control solenoid valve.

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



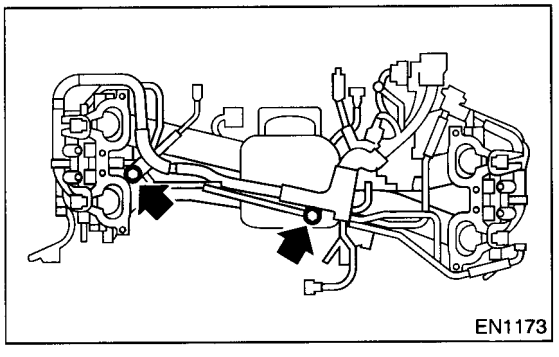
12) Connect the hoses to the purge control solenoid valve.

CAUTION:
Carefully connect the evaporation hoses.



13) Install the engine harness onto the intake manifold.
14) Connect the connectors to the fuel injectors and purge control solenoid valve.
15) Hold the engine harness by harness band (A) and harness bracket (B).

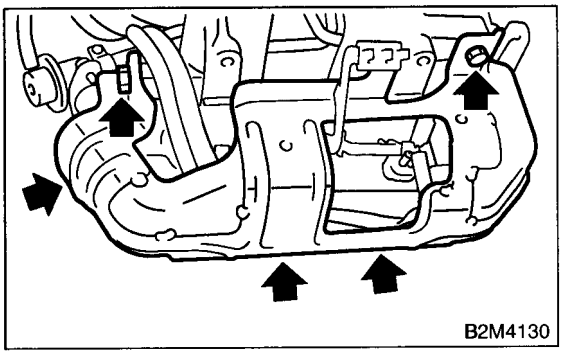
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



NOTE:
Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

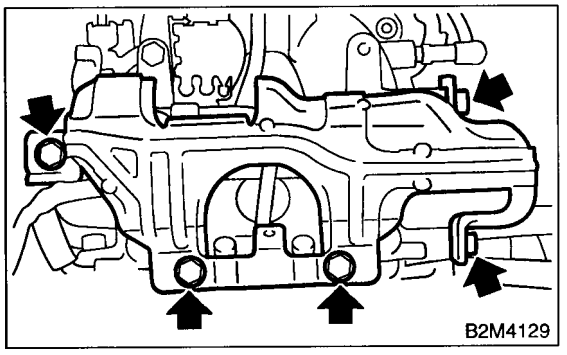
16) Install the fuel pipe protector RH.

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

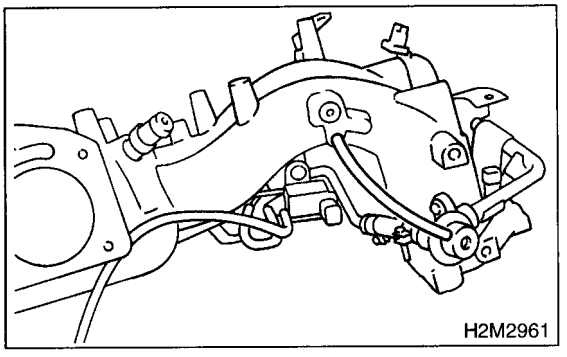


17) Install the fuel pipe protector LH.

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

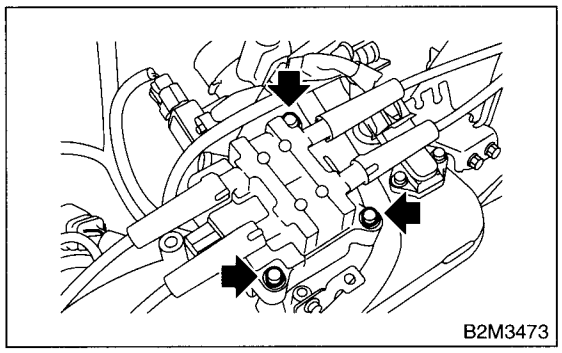


18) Connect the pressure regulator vacuum hose to the intake manifold.



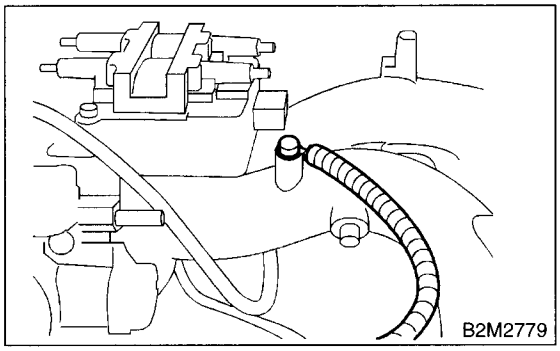
19) Install the air assist injector solenoid valve to the bracket.<Ref. to FU(SOHC)-37, INSTALLATION, Air Assist Injector Solenoid Valve.>
20) Install the throttle body to the intake manifold.<Ref. to FU(SOHC)-14, INSTALLATION, Throttle Body.>
21) Install the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, INSTALLATION, Intake Air Temperature and Pressure Sensor.>
22) Connect the connector to the intake air temperature and pressure sensor.

23) Install the ignition coil and ignitor assembly.



24) Connect the connector to the ignition coil and ignitor assembly.
25) Install the engine ground terminal to the intake manifold.

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



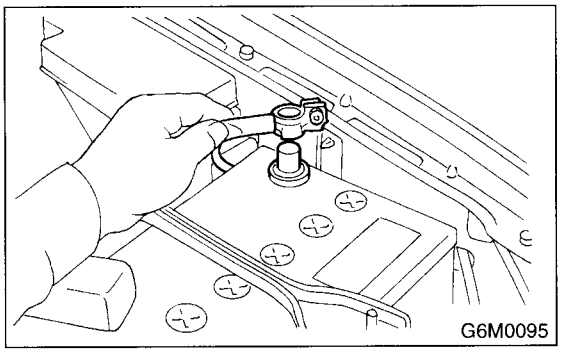
E: INSPECTION

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

4. Engine Coolant Temperature Sensor

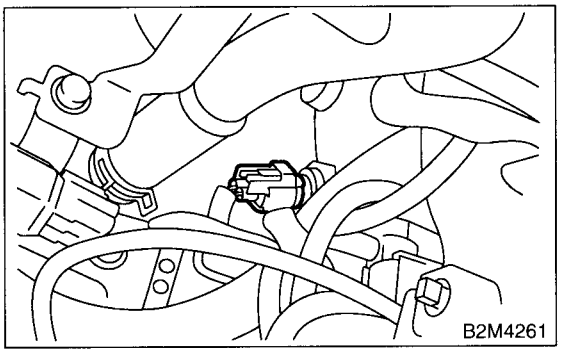
A: REMOVAL

1) Disconnect the battery ground cable.



2) Remove the air intake duct and air cleaner assembly. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>

3) Disconnect the connector from the engine coolant temperature sensor.

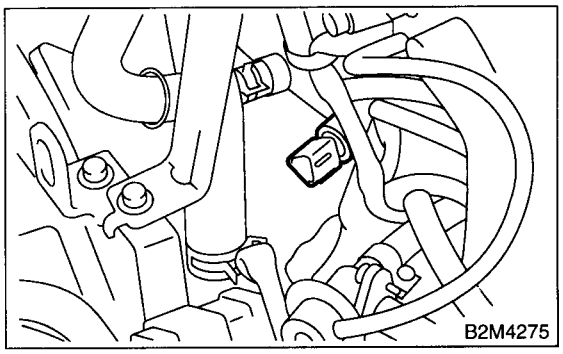


4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

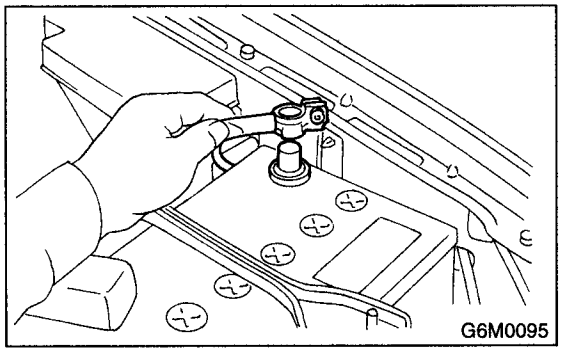
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



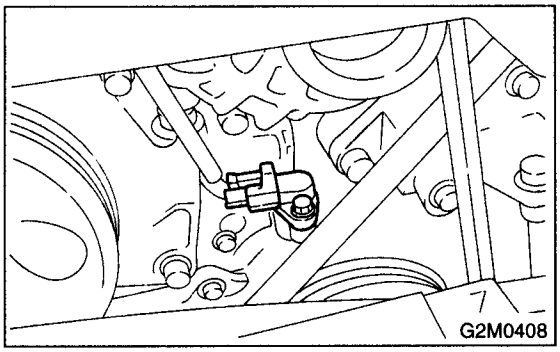
5. Crankshaft Position Sensor

A: REMOVAL

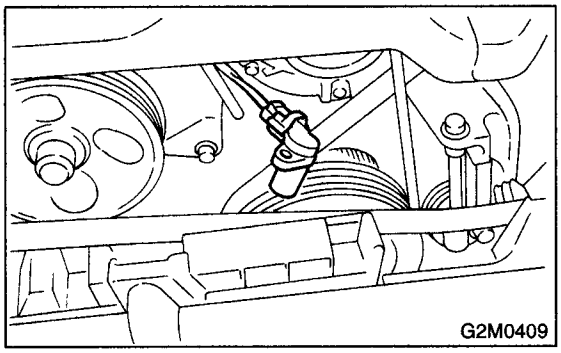
1) Disconnect the battery ground cable.



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



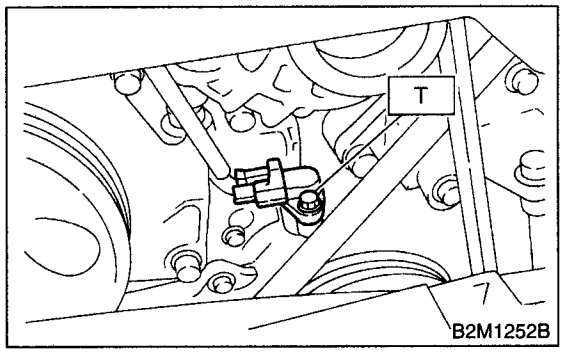
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

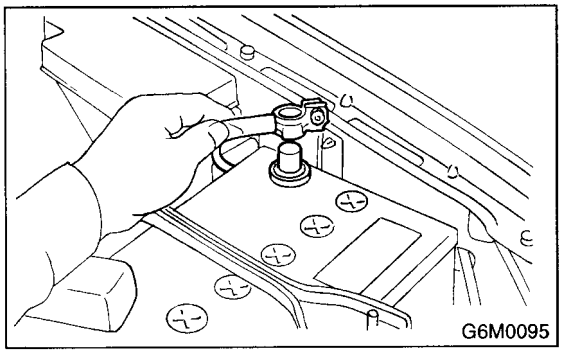
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



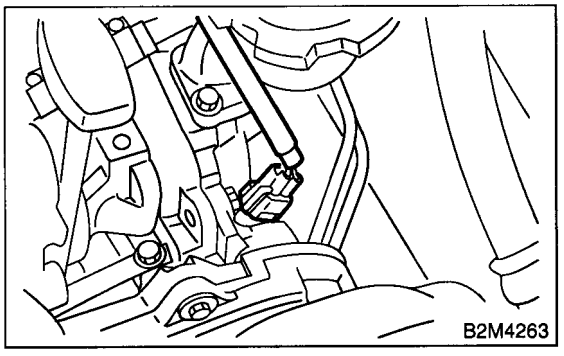
6. Camshaft Position Sensor

A: REMOVAL

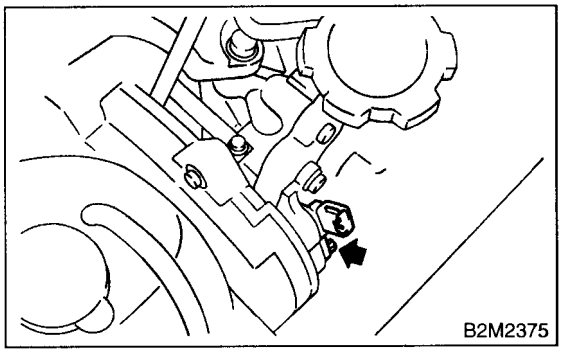
1) Disconnect the battery ground cable.



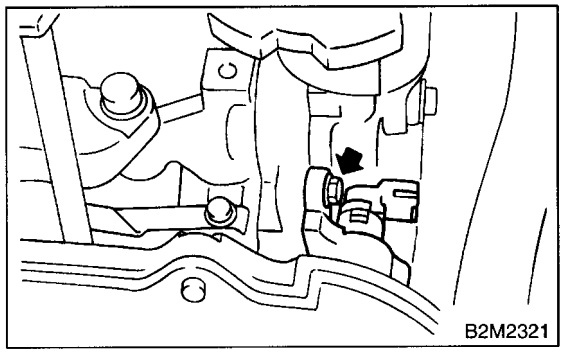
2) Disconnect the connector from the camshaft position sensor.



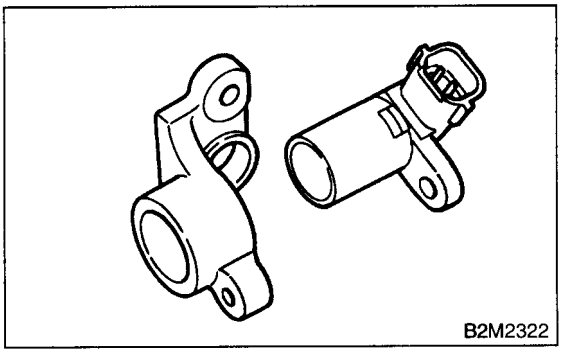
3) Remove the bolt which installs camshaft position sensor to the camshaft position sensor support.



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



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



B: INSTALLATION

Install in the reverse order of removal.

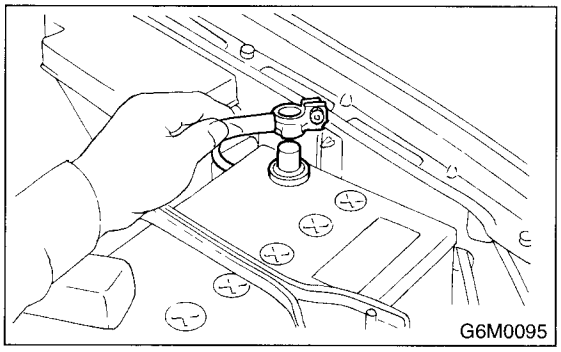
Tightening torque:

- ***Camshaft position sensor support; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***
- ***Camshaft position sensor; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***

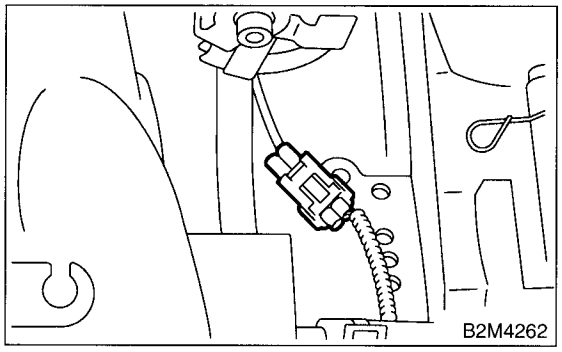
7. Knock Sensor

A: REMOVAL

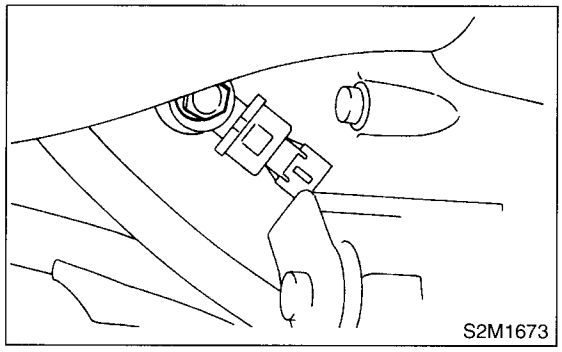
1) Disconnect the battery ground cable from the battery ground terminal.



2) Remove the air cleaner case.<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

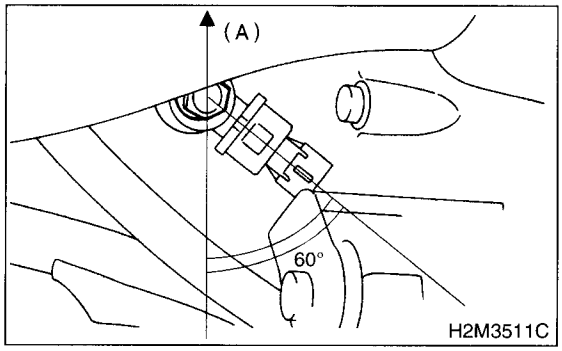


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

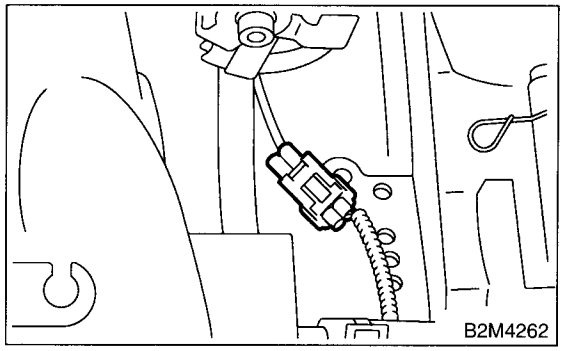
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

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

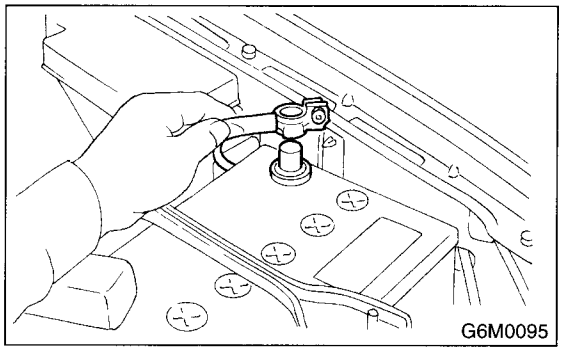


(A) Front side

2) Connect the knock sensor connector.



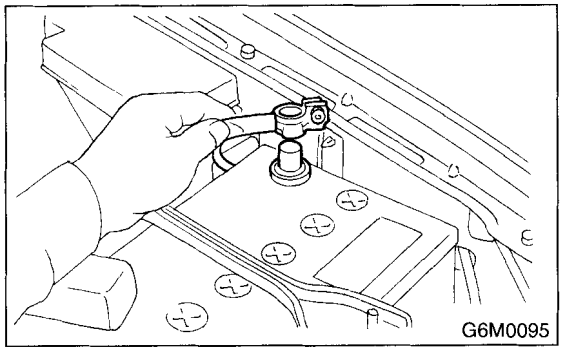
3) Install the air cleaner case.
<Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
4) Connect the battery ground cable.



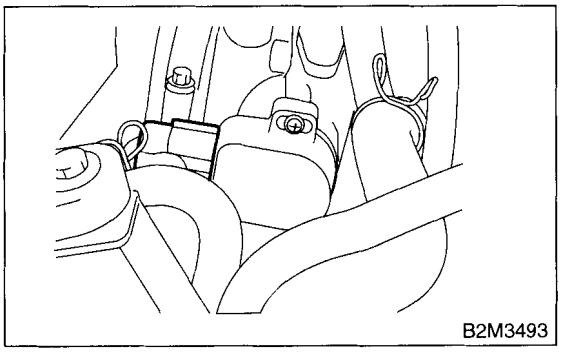
8. Throttle Position Sensor

A: REMOVAL

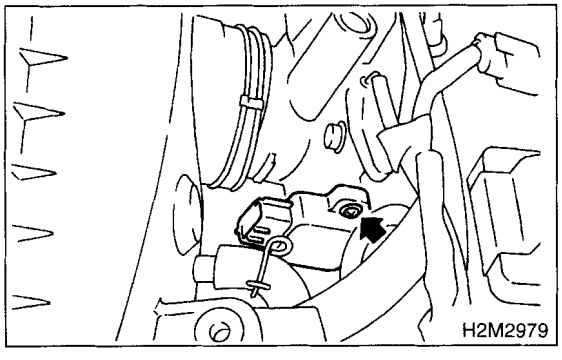
1) Disconnect the battery ground cable.



2) Disconnect the connector from the throttle position sensor.



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

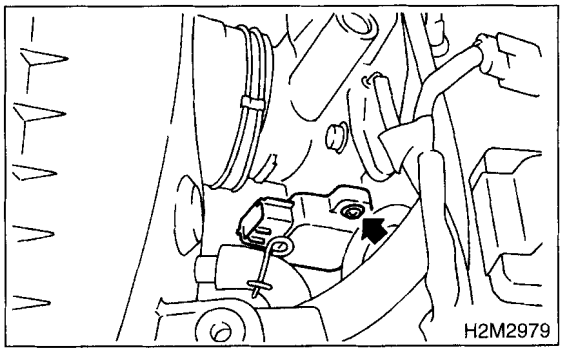


B: INSTALLATION

Install in the reverse order of removal.

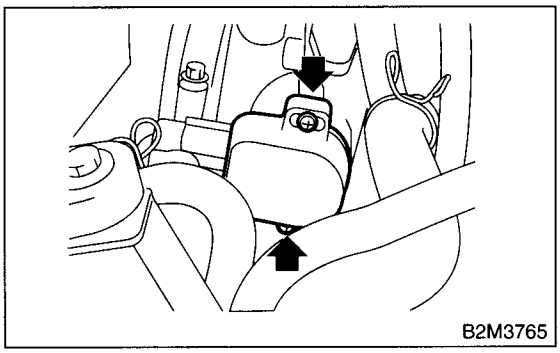
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

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



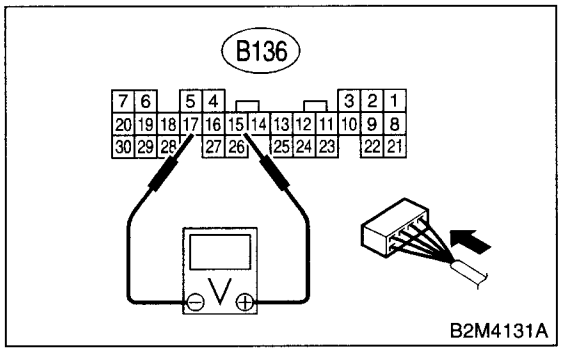
C: ADJUSTMENT

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



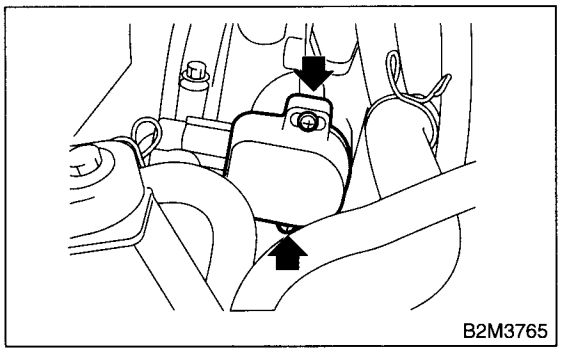
3) When using voltage meter;
   (1) Take out the ECM.
   (2) Turn the ignition switch to ON.
   (3) Adjust the throttle position sensor to the proper position to allow the voltage signal to the ECM to be in specification.

Connector & terminal / Specified voltage
(B136) No. 15 — (B136) No. 17 / 0.45 — 0.55 V
[Fully closed.]

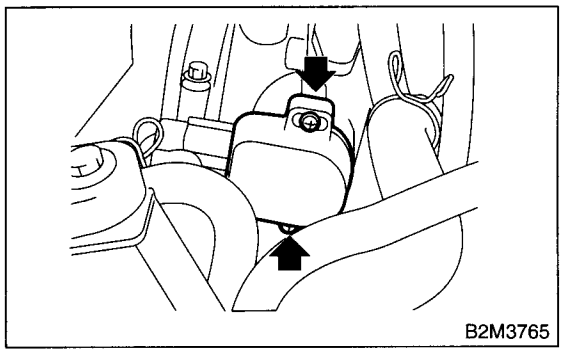


(4) Tighten the throttle position sensor holding screws.

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

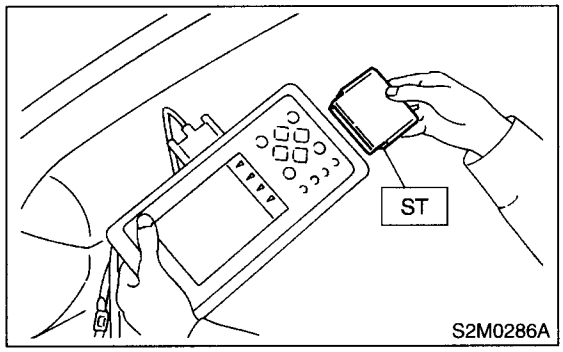


4) When using Subaru Select Monitor;
   (1) Turn the ignition switch to OFF.
   (2) Loosen the throttle position sensor holding screws.

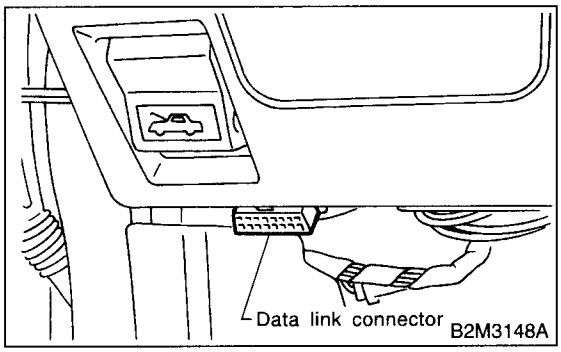


NOTE:
For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

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



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



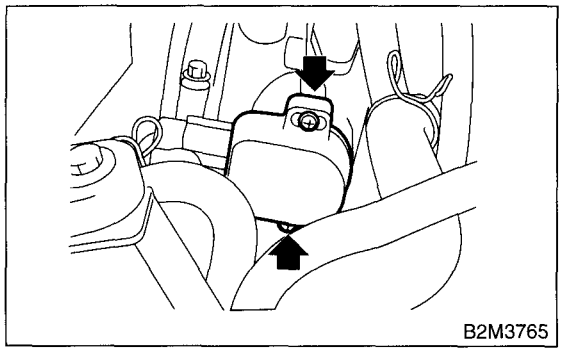
5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
6) Select the {2. Each System Check} in Main Menu.
7) Select the {Engine Control System} in Selection Menu.
8) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
9) Select the {1.12 Data Display} in Data Display Menu.

10) Adjust the throttle position sensor to the proper position to match with the following specifications.

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

11) Tighten the throttle position sensor holding screws.

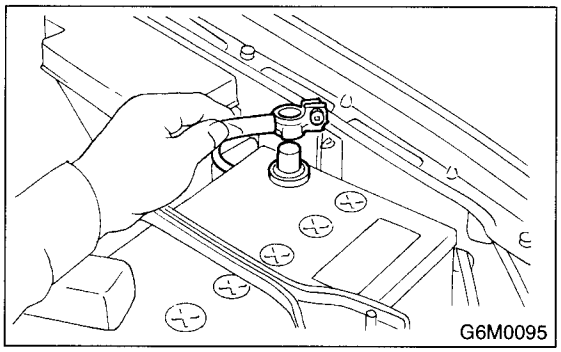
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



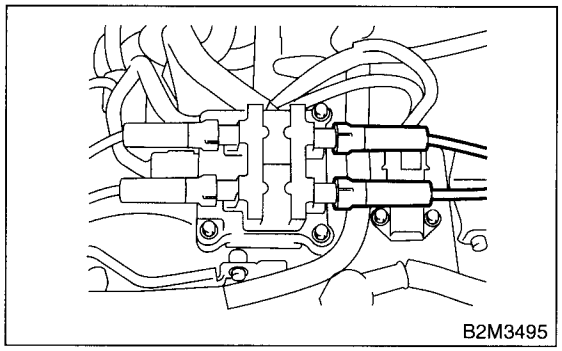
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

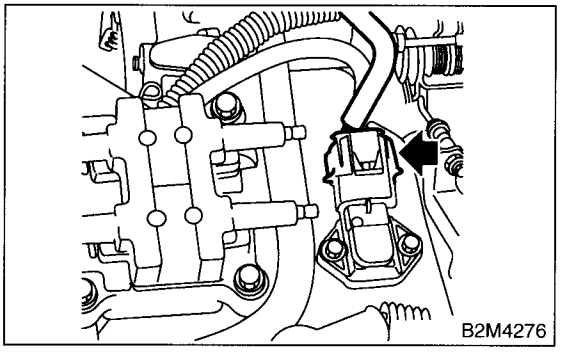
1) Disconnect the battery ground cable.



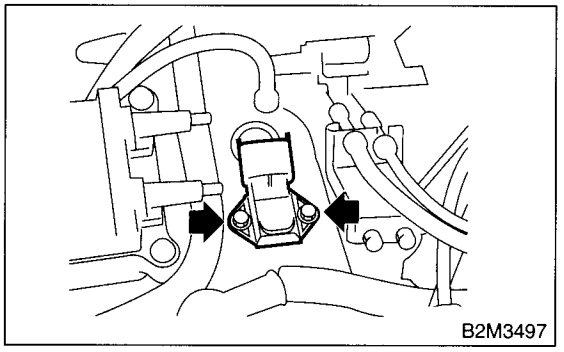
2) Disconnect the spark plug cord from the ignition coil and ignitor assembly.



3) Disconnect the connector from the intake air temperature and pressure sensor.



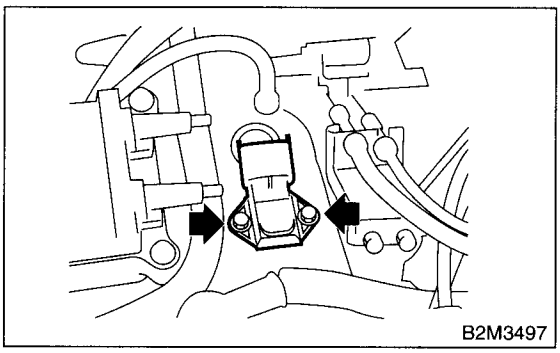
4) Remove the intake air temperature and pressure sensor.



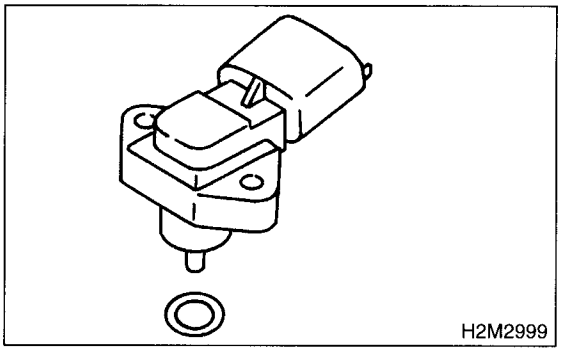
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



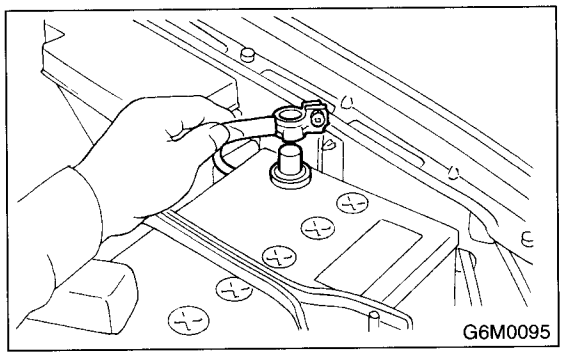
NOTE:
Replace O-ring with new one.



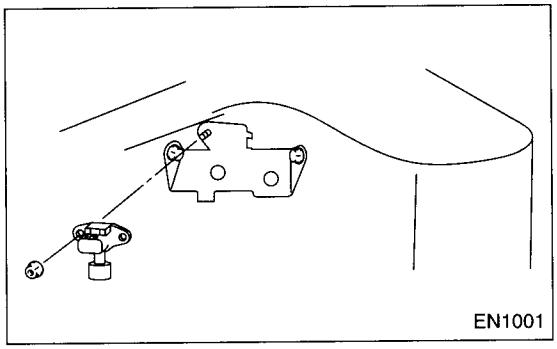
10. Atmospheric Pressure Sensor

A: REMOVAL

1) Disconnect the battery ground cable.



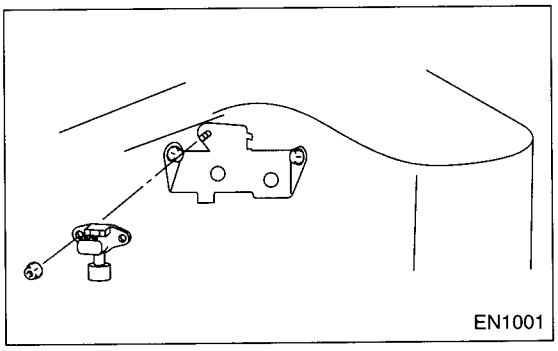
2) Disconnect the connector from the atmospheric pressure sensor.
3) Remove the atmospheric pressure sensor from the bracket.



B: INSTALLATION

Install in the reverse order of removal.

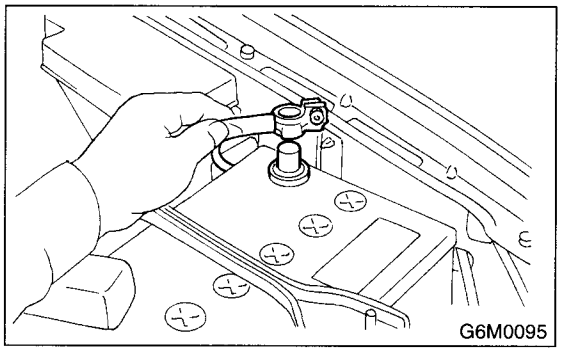
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



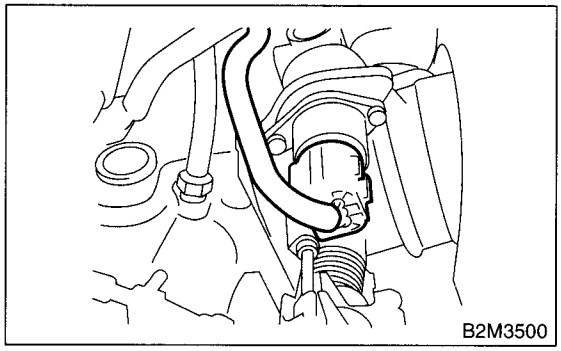
11.Idle Air Control Solenoid Valve

A: REMOVAL

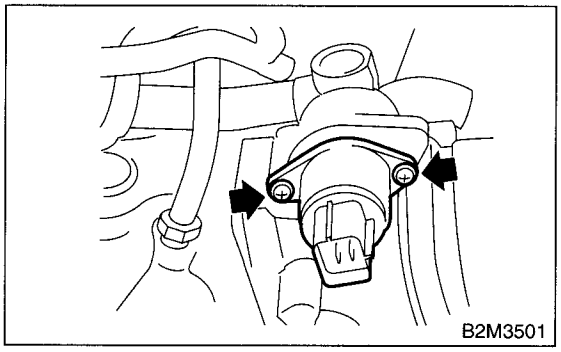
1) Disconnect the battery ground cable.



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



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

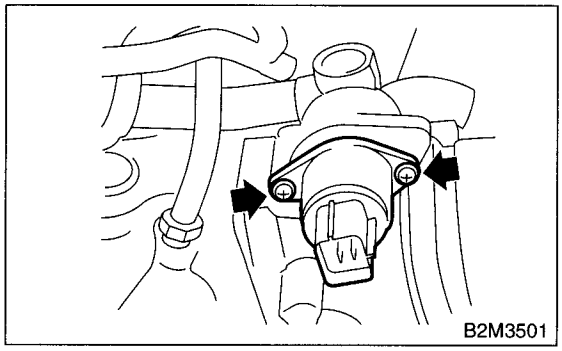


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gasket.

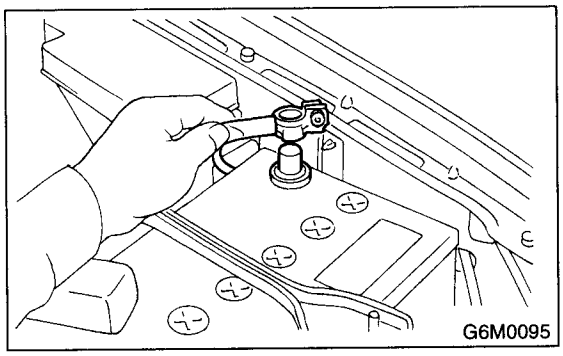
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



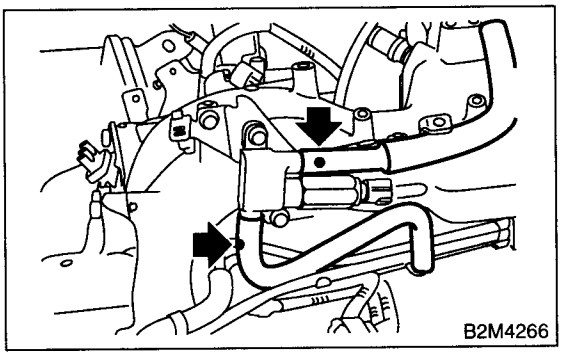
12. Air Assist Injector Solenoid Valve

A: REMOVAL

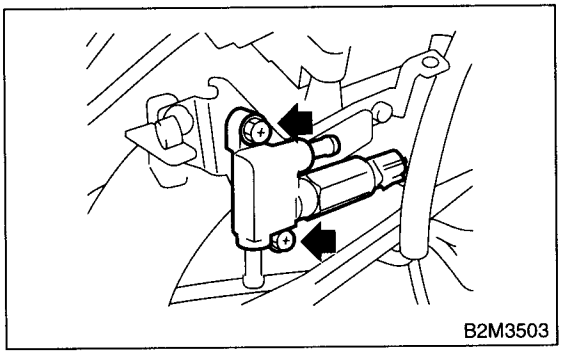
1) Disconnect the battery ground cable.



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



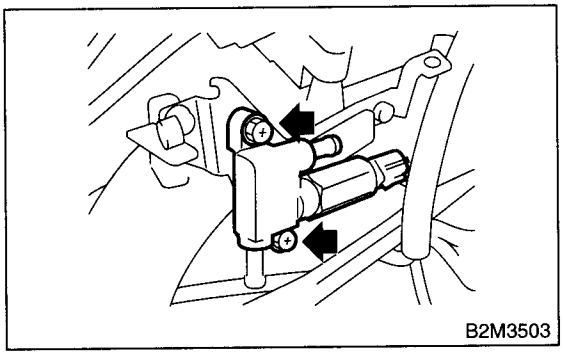
3) Remove the air assist injector solenoid valve from the intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

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

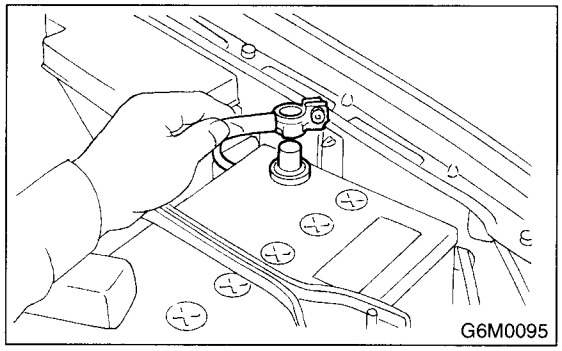


13.Fuel Injector

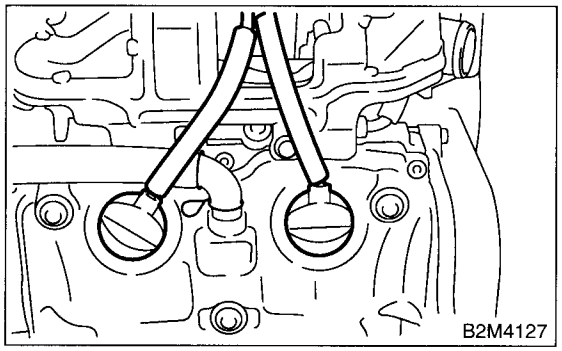
A: REMOVAL

1. RH SIDE

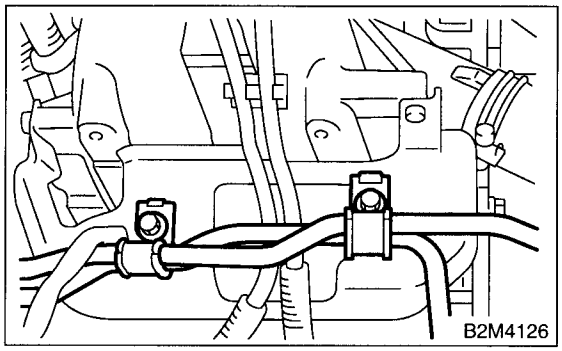
1) Release the fuel pressure.
<Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the battery ground cable.



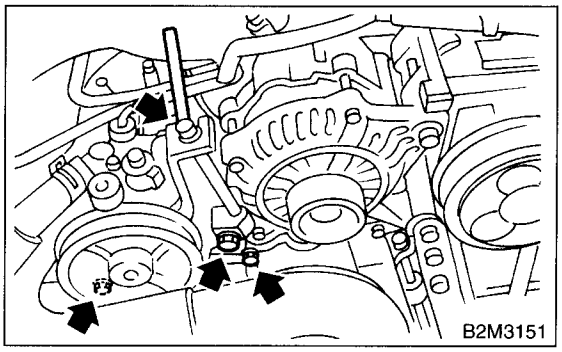
4) Remove the resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
5) Remove the spark plug cords from the spark plugs (#1 and #3 cylinders).



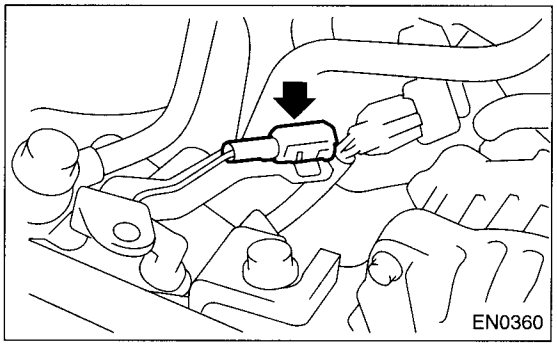
6) Remove the power steering pump and tank from the brackets.
(1) Remove the front side V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
(2) Remove the bolts which hold the power steering pipes onto the intake manifold protector.



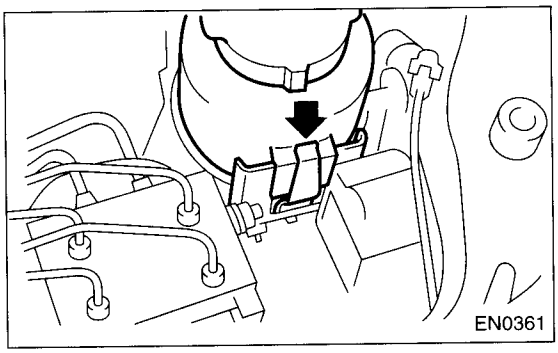
(3) Remove the bolts which install the power steering pump to the bracket.



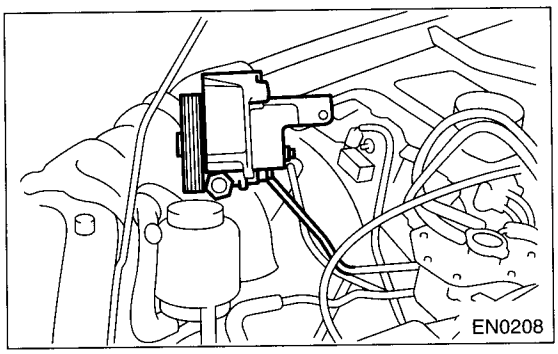
(4) Disconnect the connector from the power steering pump switch.



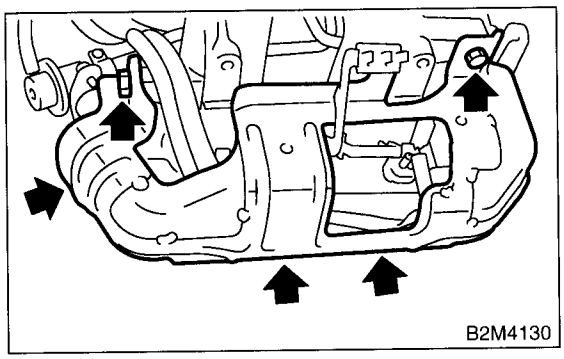
(5) Remove the power steering tank from the bracket by pulling it upwards.



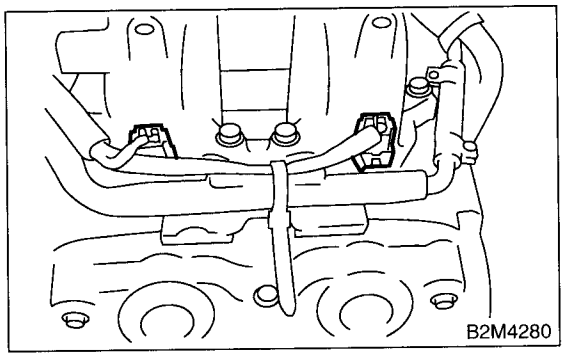
(6) Place the power steering pump and tank on the right side wheel apron.



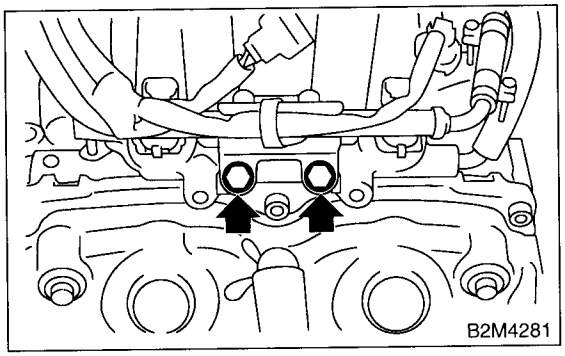
7) Remove the fuel pipe protector RH.

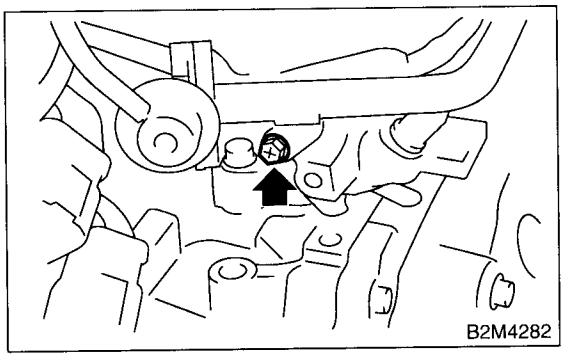


8) Disconnect the connector from fuel injector.



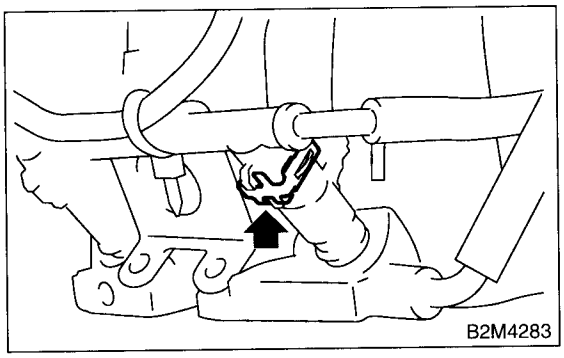
9) Remove the bolt which holds the injector pipe to the intake manifold.



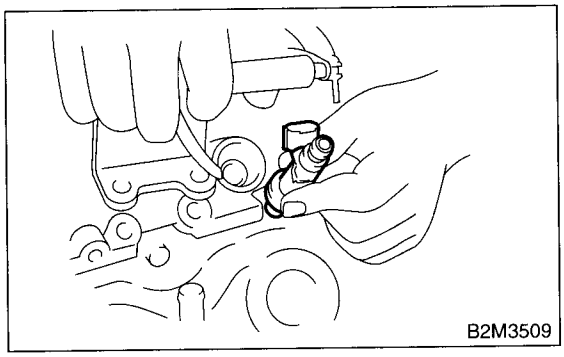


10) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.

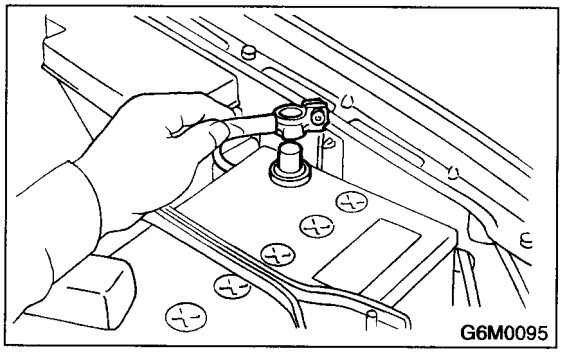


(2) Remove the fuel injector while lifting up the fuel injector pipe.

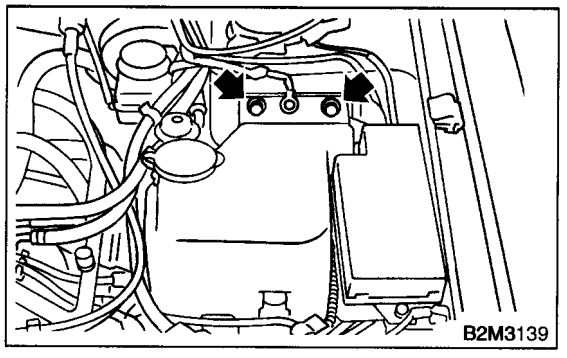


2. LH SIDE

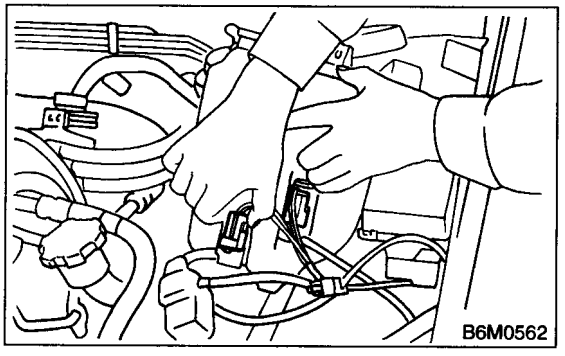
1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the battery ground cable.


G6M0095

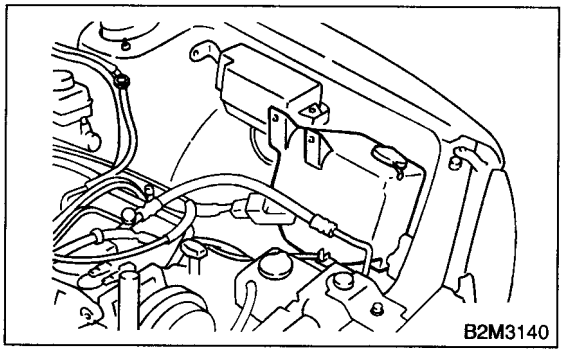
4) Remove the two bolts which install the washer tank on the body.


B2M3139

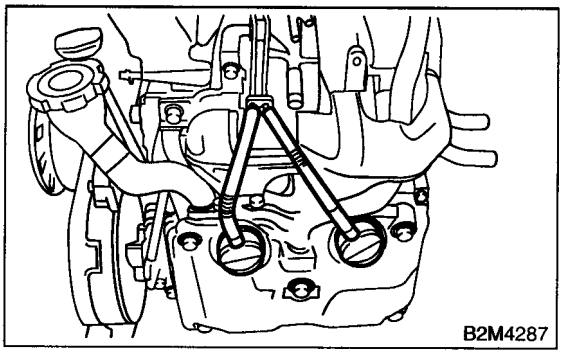
5) Disconnect the connector from the front window washer motor.
6) Disconnect the connector from the rear gate glass washer motor.


B6M0562

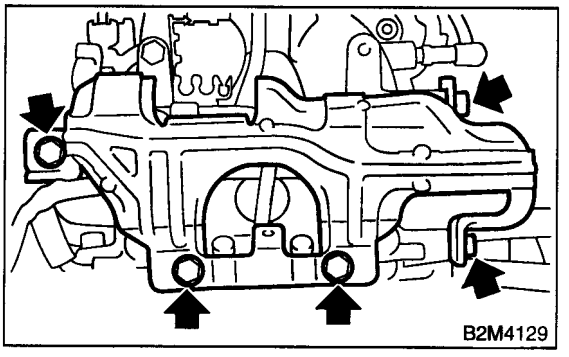
7) Disconnect the rear window glass washer hose from the washer motor, then plug the connection with a suitable cap.
8) Move the washer tank, and secure it away from the working area.


B2M3140

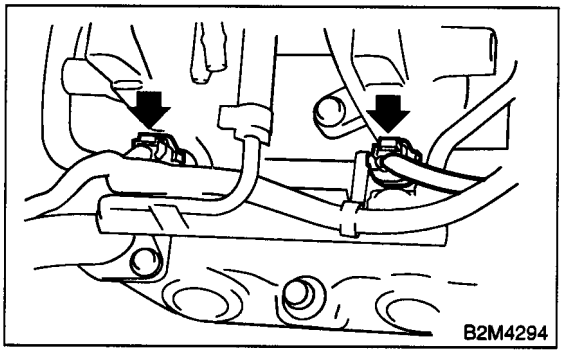
9) Remove the spark plug cords from the spark plugs (#2 and #4 cylinders).


B2M4287

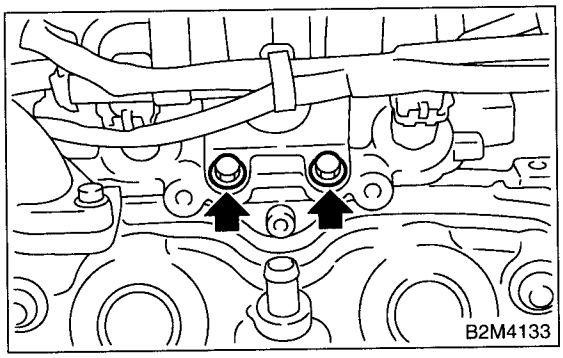
10) Remove the fuel pipe protector LH.

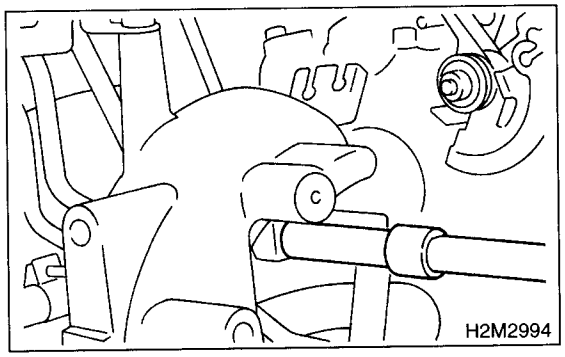

B2M4129

11) Disconnect the connector from the fuel injector.

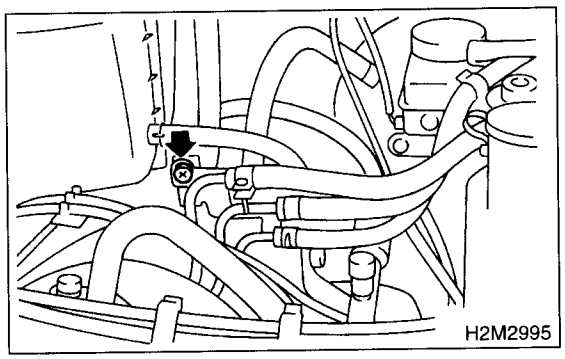

B2M4294

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



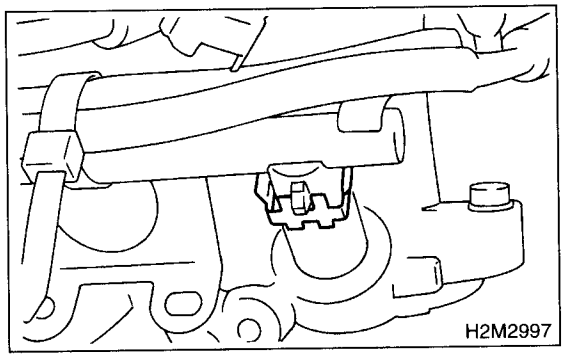


13) Remove the bolt which holds the fuel pipe on the left side intake manifold.

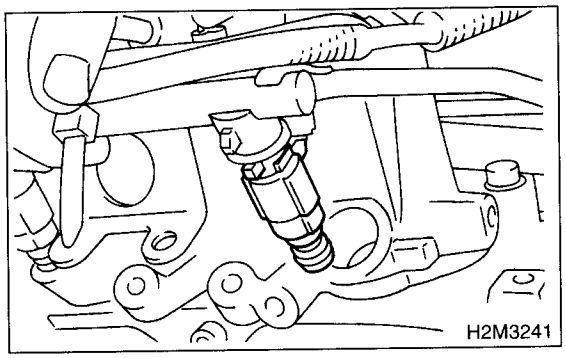


14) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.



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

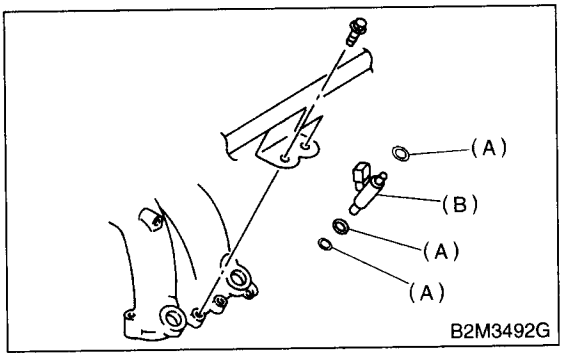


B: INSTALLATION

1. RH SIDE

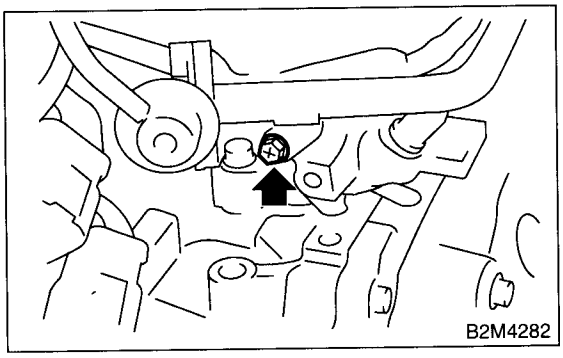
Install in the reverse order of removal.

CAUTION:
Replace O-rings with new ones.

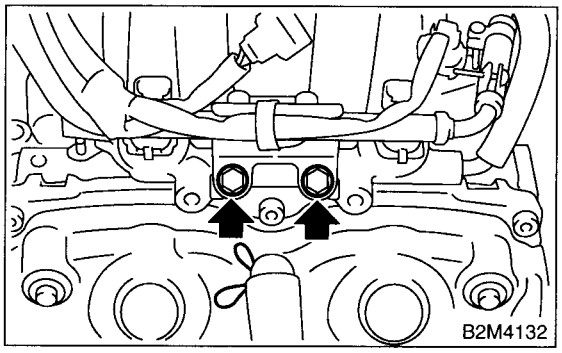


(A) O-ring
(B) Fuel injector

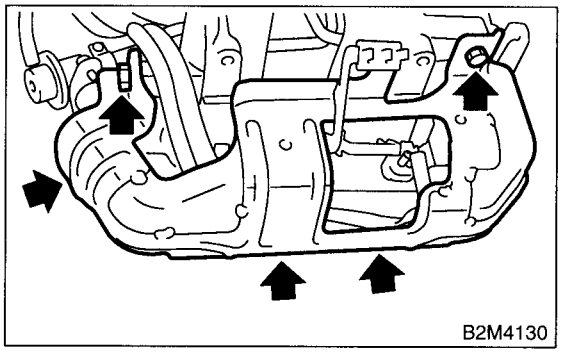
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



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



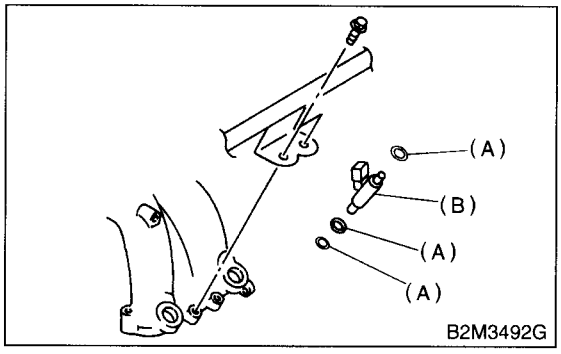
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



2. LH SIDE

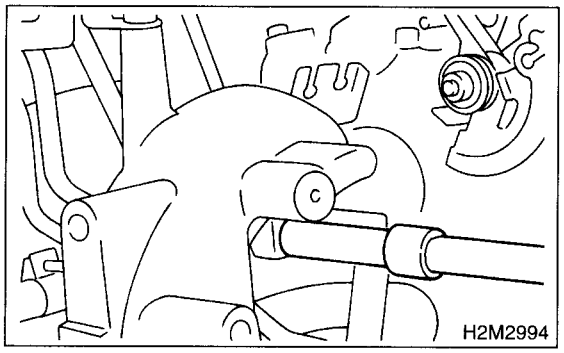
Install in the reverse order of removal.

CAUTION:
Replace O-rings with new ones.

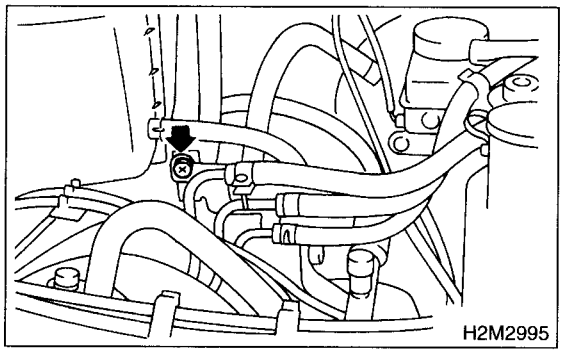


(A) O-ring
(B) Fuel injector

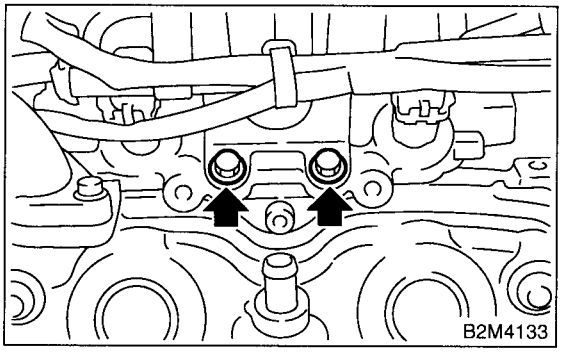
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



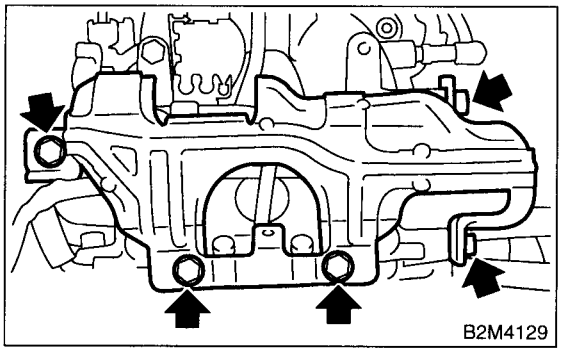
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



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



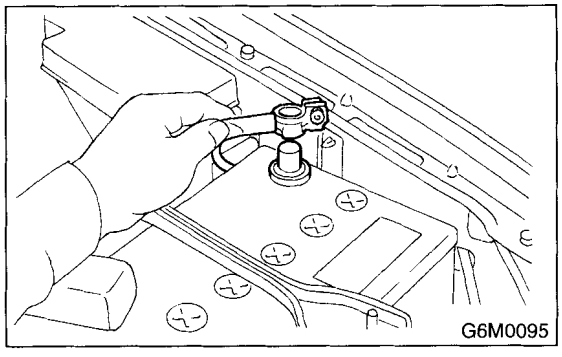
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



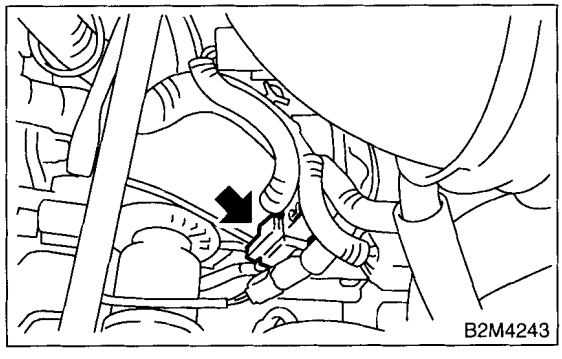
14.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the battery ground cable.



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

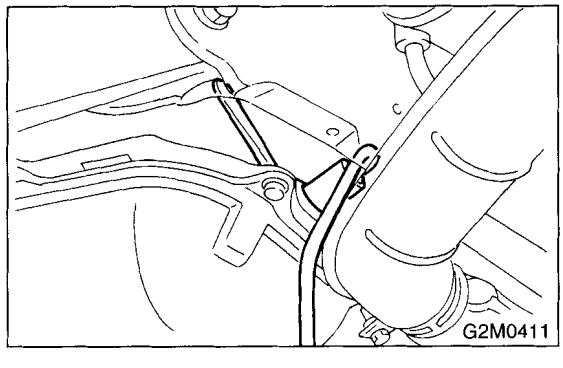


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

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

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

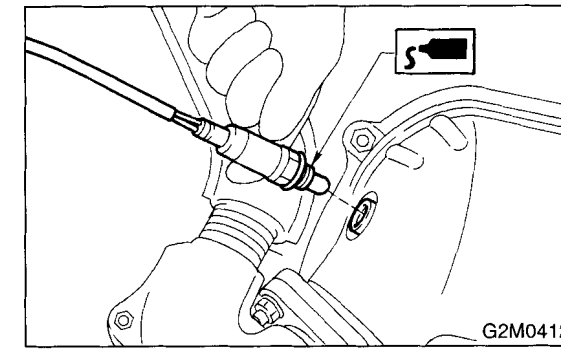


B: INSTALLATION

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

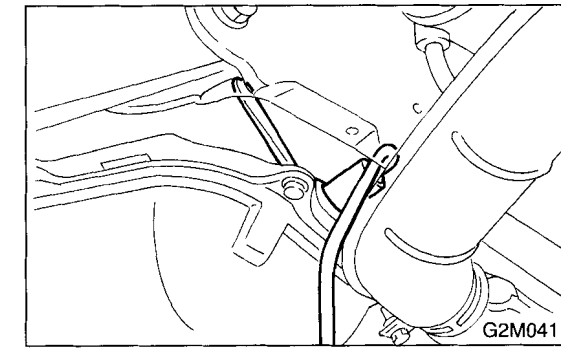
Anti-seize compound:
SS-30 by JET LUBE

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

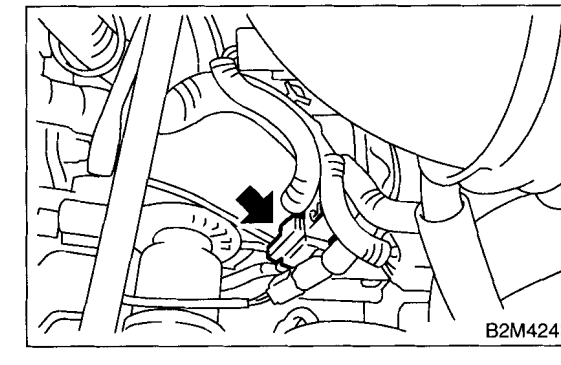


2) Install the front oxygen (A/F) sensor.

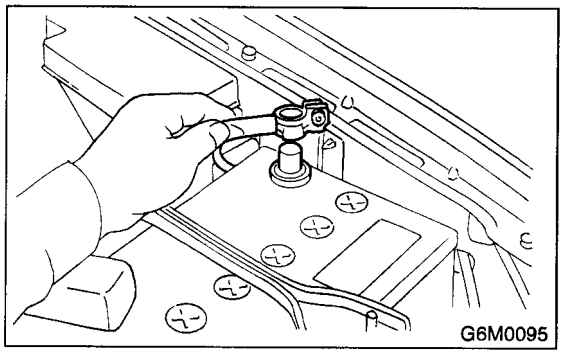
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect the connector of front oxygen (A/F) sensor.



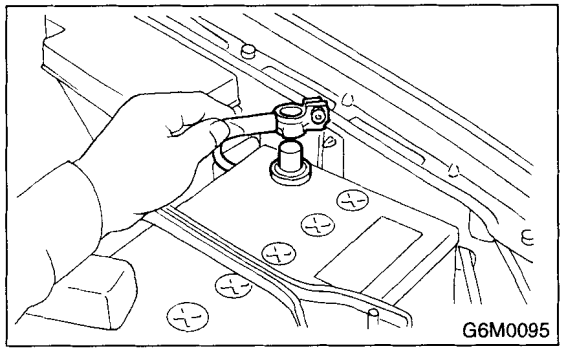
5) Connect the battery ground cable.



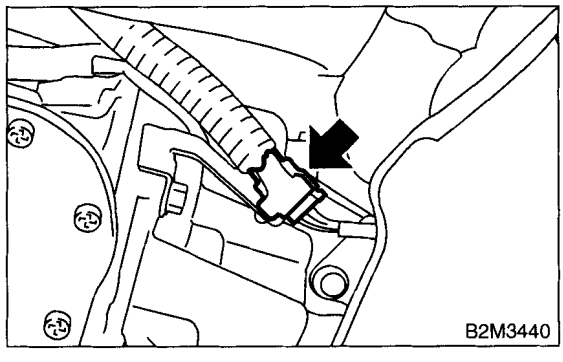
15.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the battery ground cable.



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

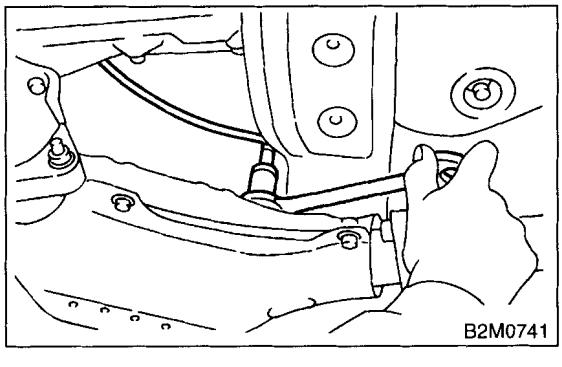


4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the rear oxygen sensor.

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

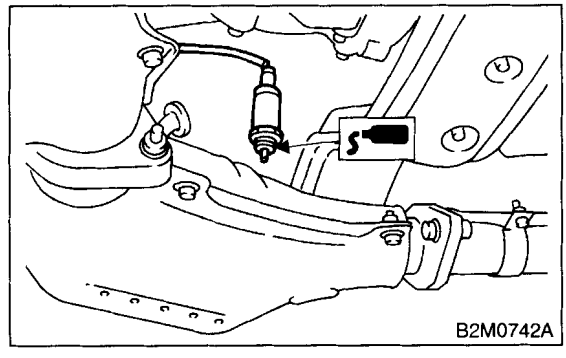


B: INSTALLATION

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

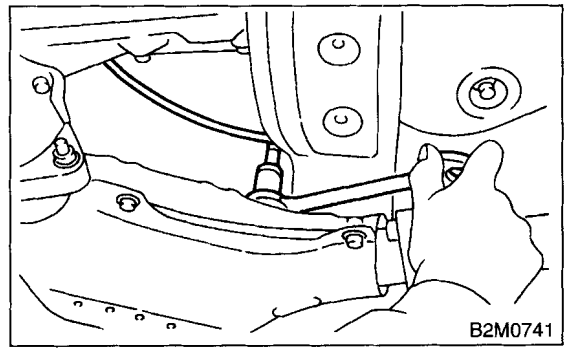
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:
SS-30 by JET LUBE

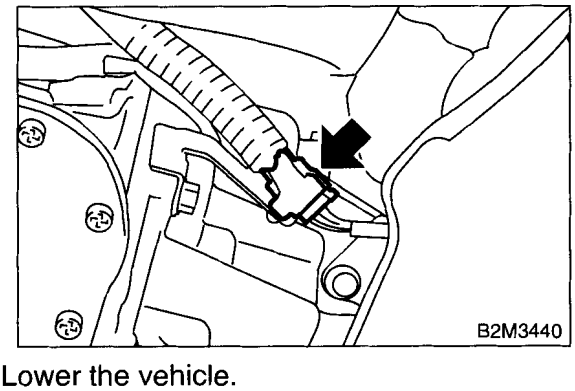


2) Install the rear oxygen sensor.

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

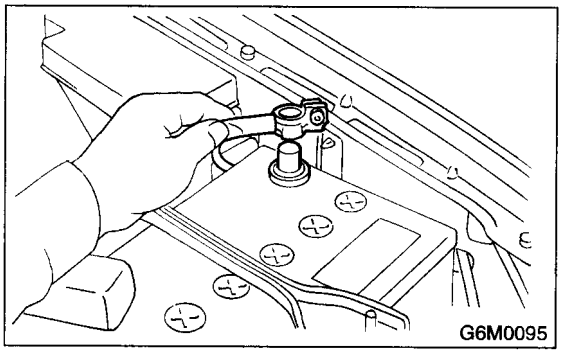


3) Connect the connector to the rear oxygen sensor.



4) Lower the vehicle.

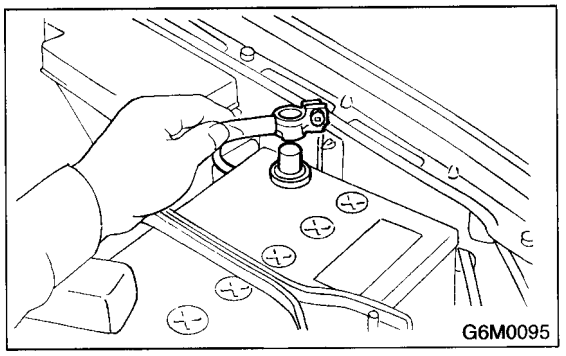
5) Connect the battery ground cable.



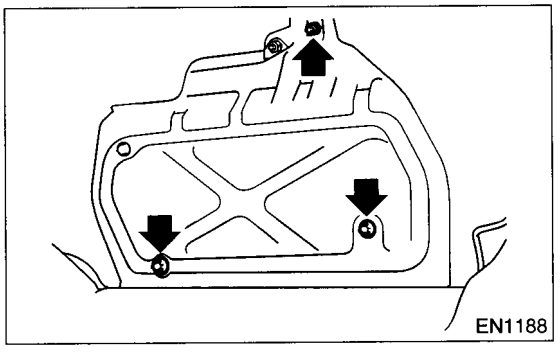
16.Engine Control Module

A: REMOVAL

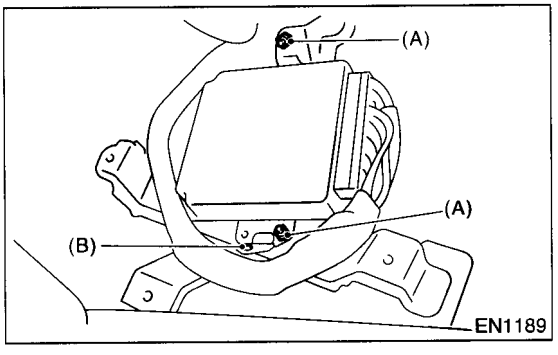
1) Disconnect the battery ground cable.



2) Remove the lower inner trim of passenger side. <Ref. to EI-46, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of front passenger seat.
4) Remove the protect cover.



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



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

B: INSTALLATION

Install in the reverse order of removal.

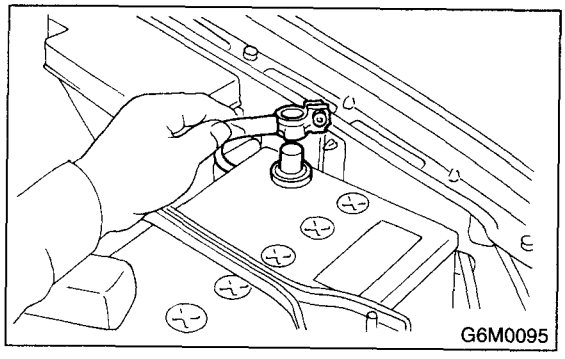
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

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

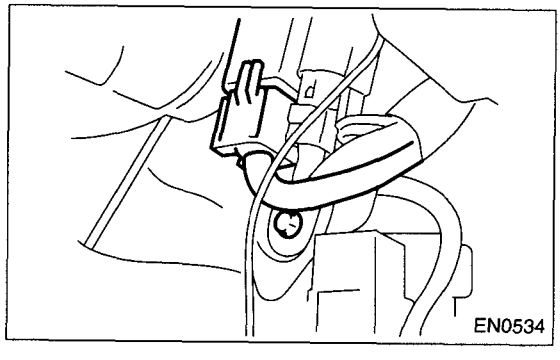
17.Main Relay

A: REMOVAL

1) Disconnect the battery ground cable.



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



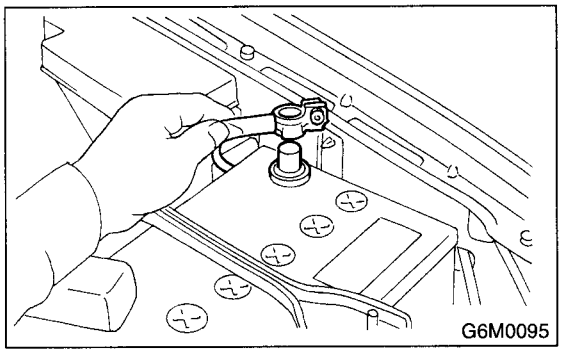
B: INSTALLATION

Install in the reverse order of removal.

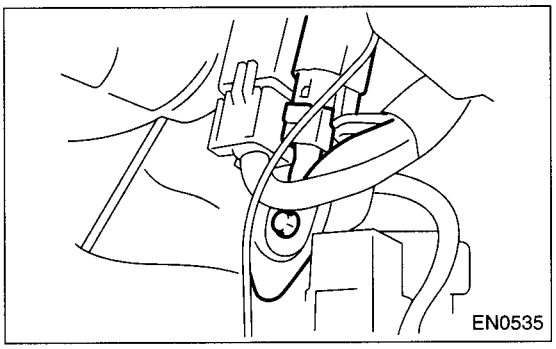
18.Fuel Pump Relay

A: REMOVAL

1) Disconnect the battery ground cable.



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



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

B: INSTALLATION

Install in the reverse order of removal.

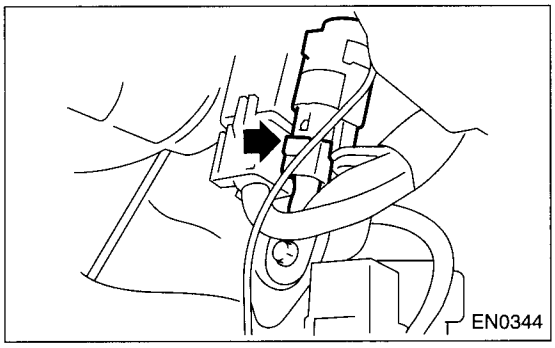
19.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

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

1) Disconnect the connector from the fuel pump relay.

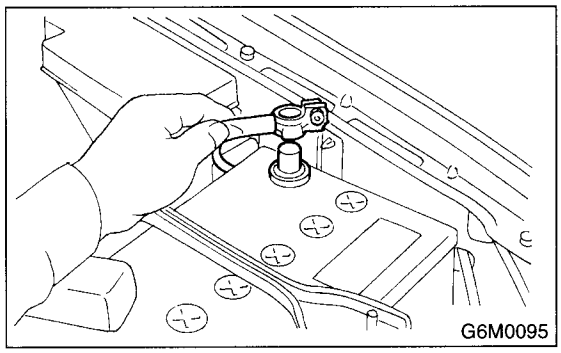


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

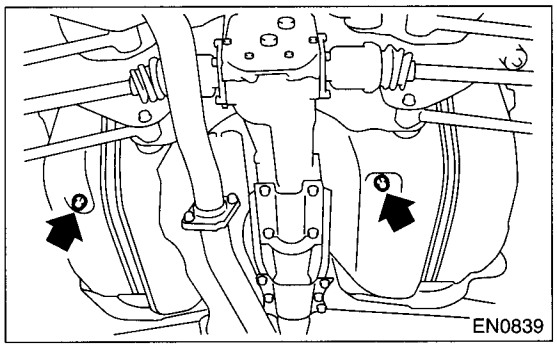
2. DRAINING FUEL

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) Disconnect the battery ground cable.

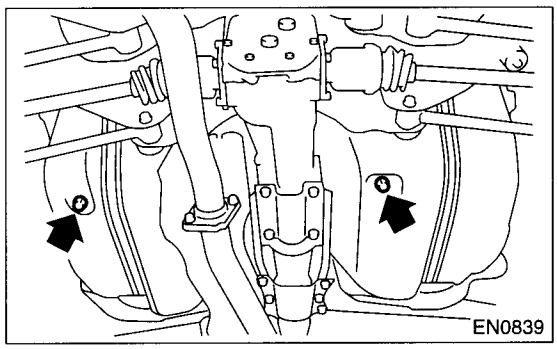


3) Lift-up the vehicle.
4) Drain the fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from the fuel tank.



5) Tighten the fuel drain plug.

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

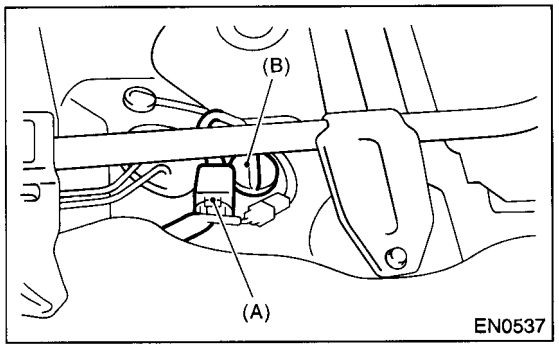


20.Fuel Tank

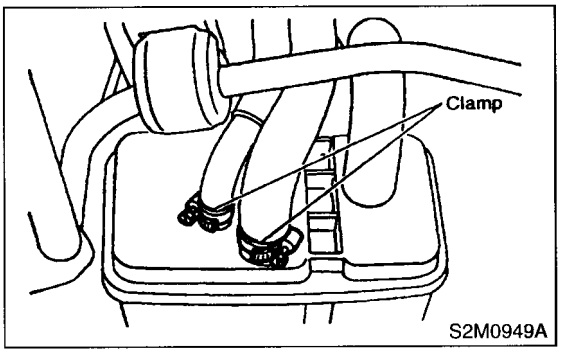
A: REMOVAL

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

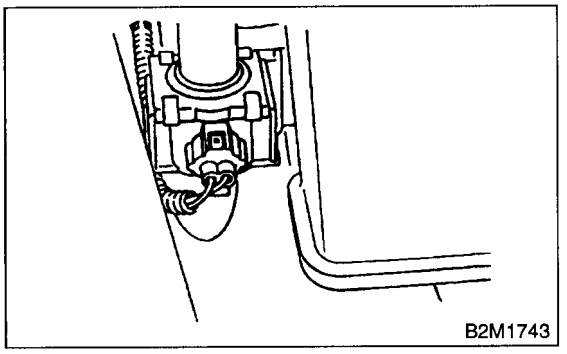
1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, Fuel.>
3) Drain the fuel from the fuel tank. <Ref. to FU(SOHC)-50, DRAINING FUEL, OPERATION, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cond on the floor panel into under the body.



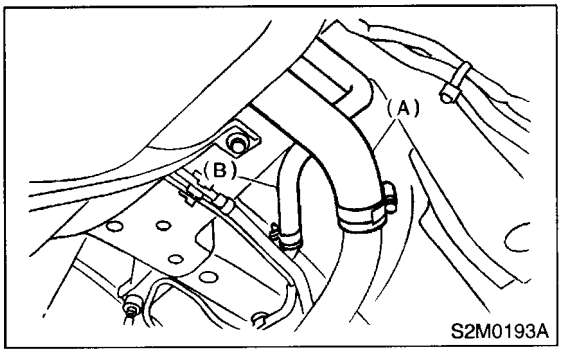
7) Remove the rear crossmember. <Ref. to RS-19, REMOVAL, Rear Crossmember.>
8) Move the clamp, and disconnect the evaporation hose from the canister.



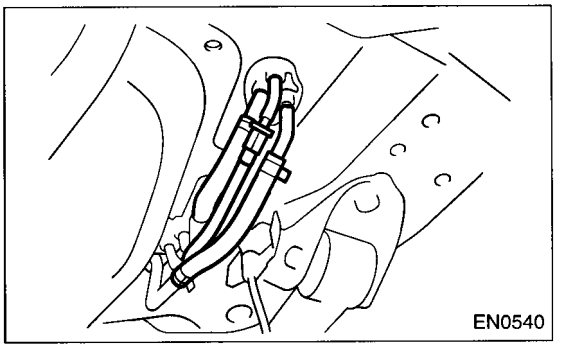
9) Disconnect the connector from the pressure control solenoid valve.
10) Disconnect the connector from the drain valve.



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

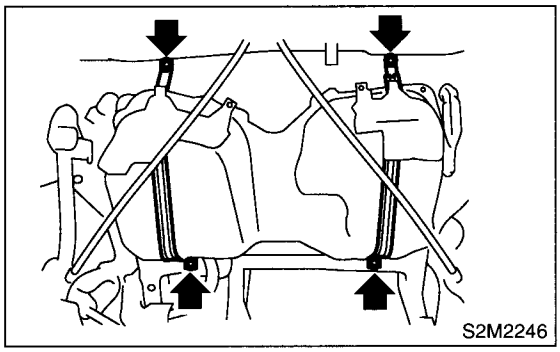


12) Move the clips, and disconnect the quick connector. <Ref. to FU(SOHC)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
13) Disconnect the fuel hoses.



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

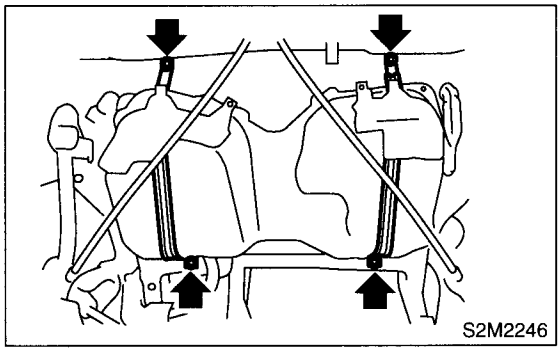
WARNING:
A helper is required to perform this work.



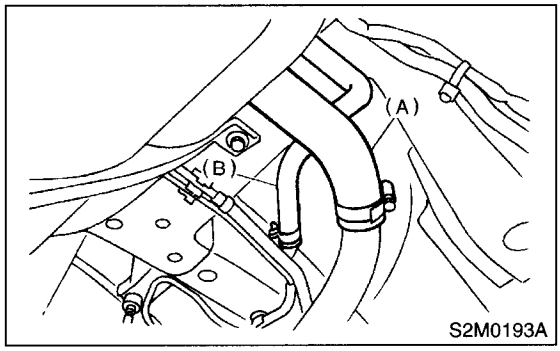
B: INSTALLATION

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

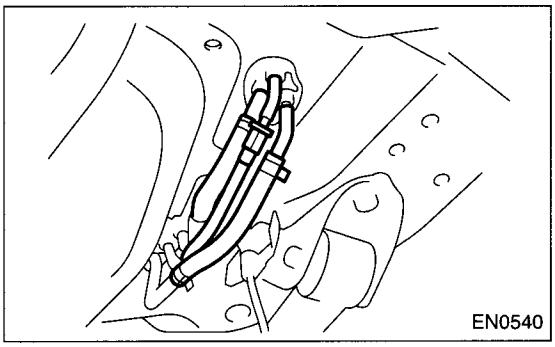
WARNING:
A helper is required to perform this work.



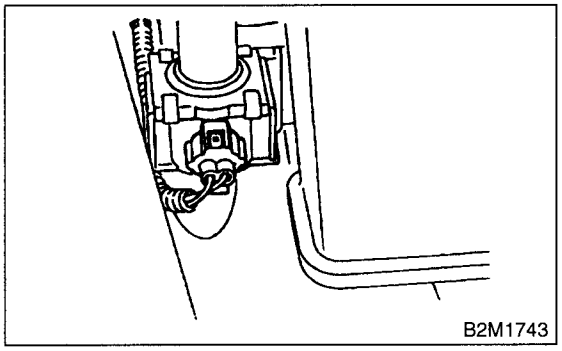
3) Connect the fuel filler hose (A) and air vent hose (B).



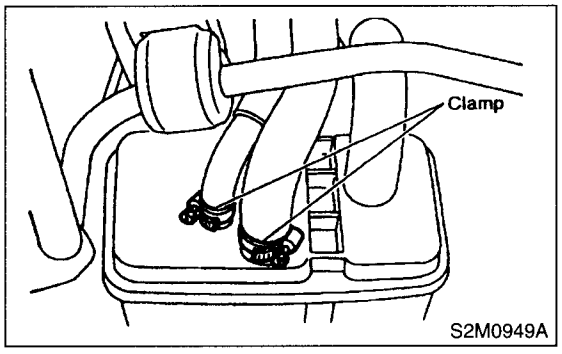
4) Connect the fuel hoses, and hold then with clips and quick connector. <Ref. to FU(SOHC)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



5) Connect the connector to the drain valve.

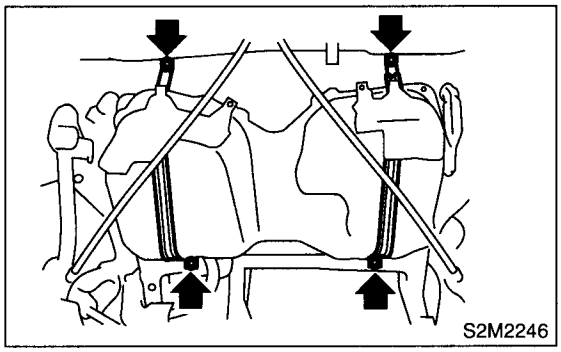


6) Connect the connector to the pressure control solenoid valve.
7) Connect the evaporation hose to the canister, and hold them clamp.

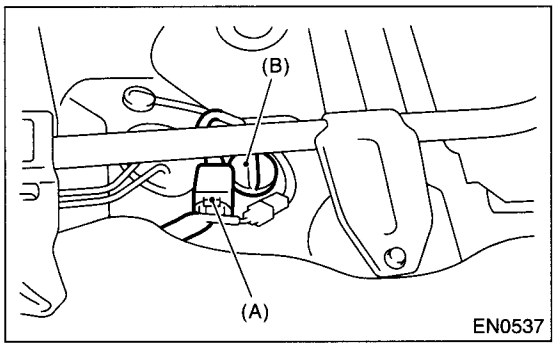


8) Tighten the band mounting bolts.

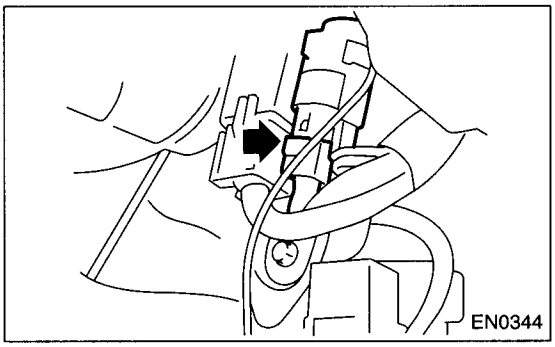
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



9) Install the rear crossmember. <Ref. to RS-19, INSTALLATION, Rear Crossmember.>
10) Connect the connectors to the fuel tank cord and plug the service hole with gromment.



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



C: INSPECTION

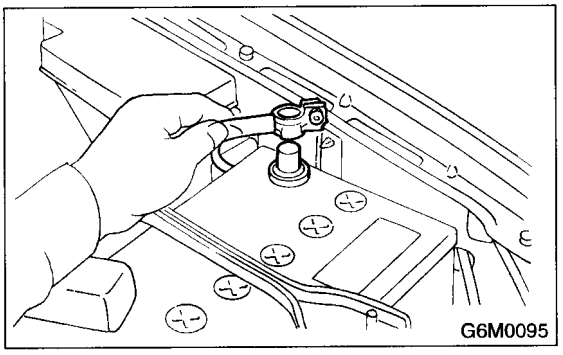
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

21.Fuel Filler Pipe

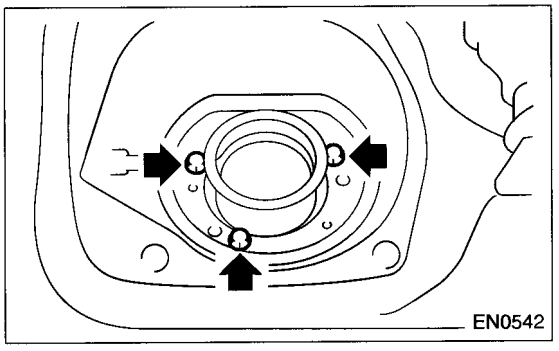
A: REMOVAL

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

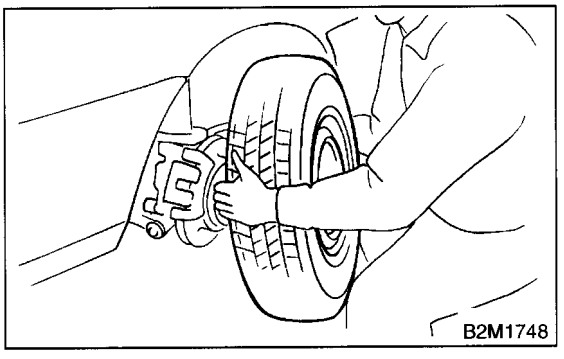
1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the filler cap.
3) Disconnect the battery ground cable.



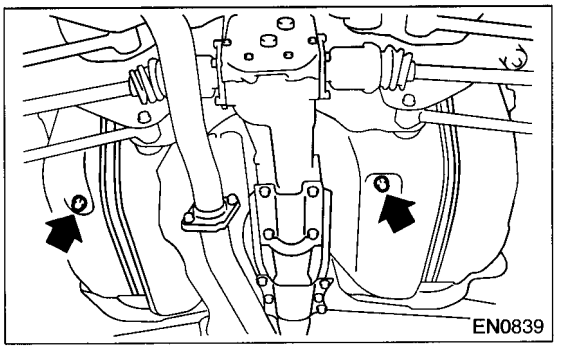
4) Remove the screws holding packing in place.



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

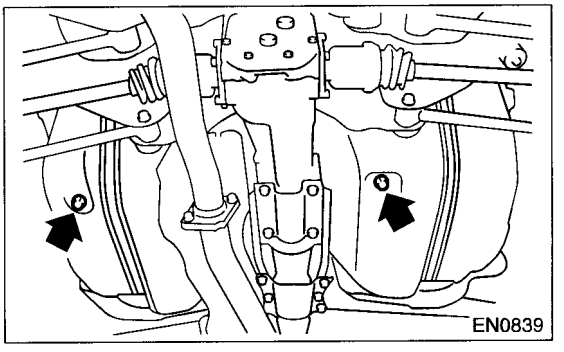


8) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.

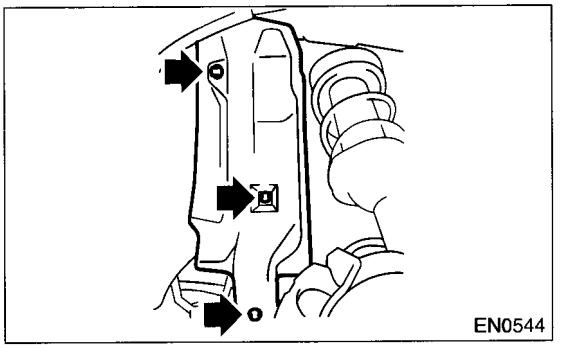


9) Tighten the fuel drain plug and then install the front right side tank cover.

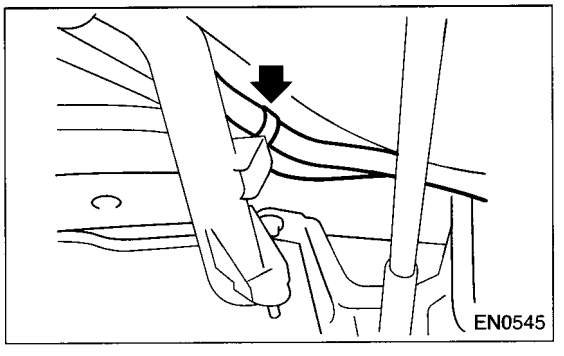
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



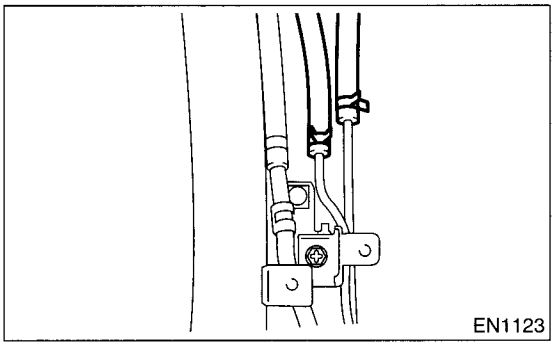
10) Remove the fuel filler pipe protector.



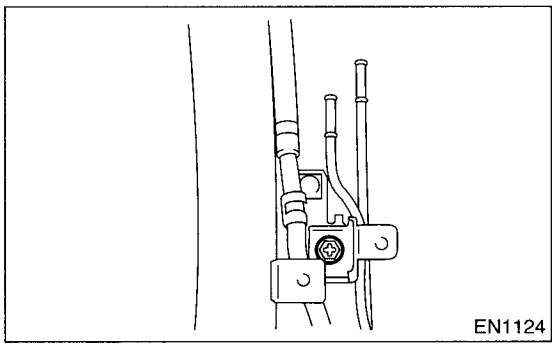
11) Separate the evaporation hoses from the clip of fuel filler pipe.



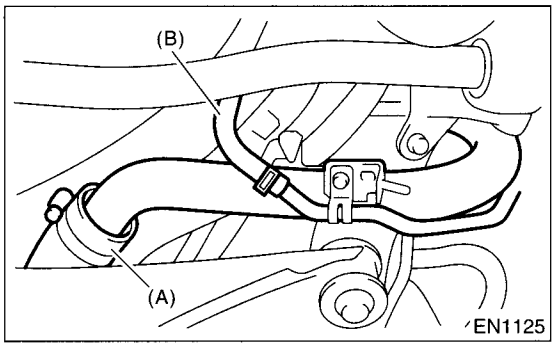
12) Disconnect the evaporation hoses from the pipes.



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

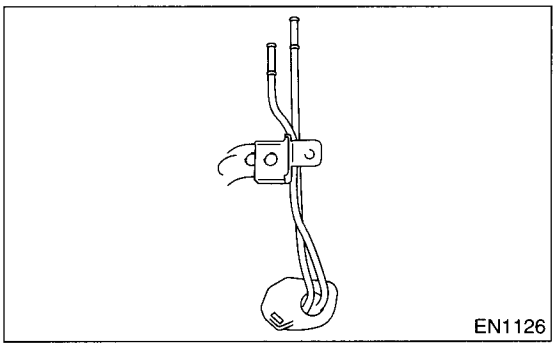


14) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.
15) Move the clip and separate the evaporation hose (B).



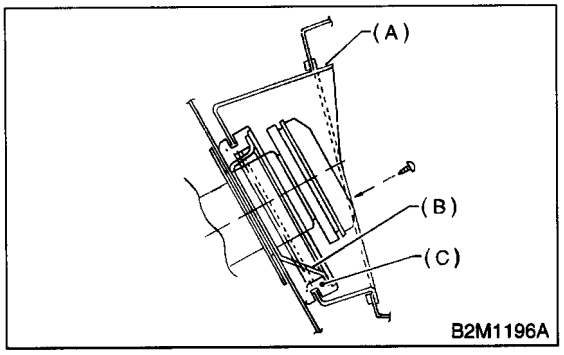
16) Remove the fuel filler pipe to under side of the vehicle.

17) Remove the evaporation pipe together with clip from the body.



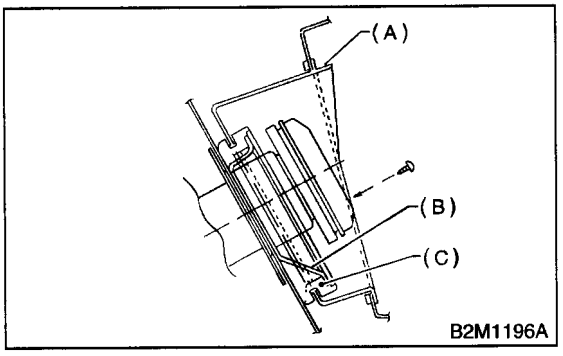
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.

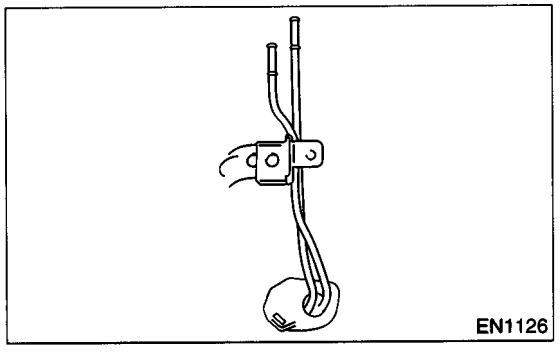


3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

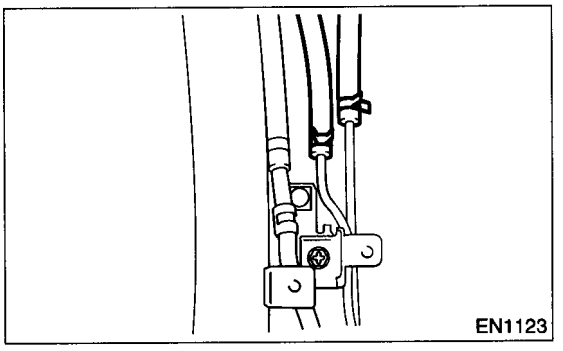
NOTE:
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.

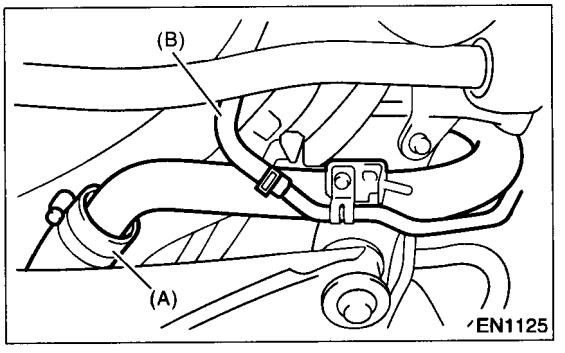


5) Connect the evaporation hose to the pipe.



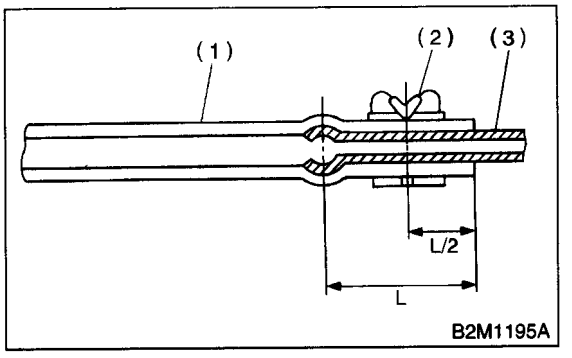
6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

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



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

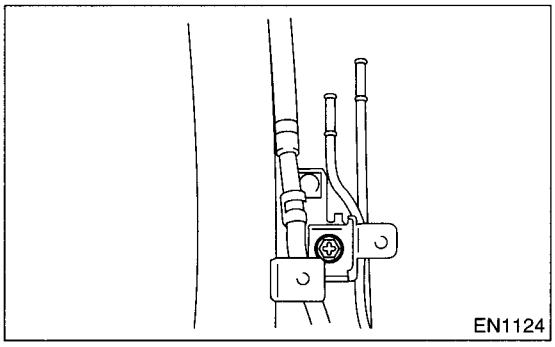
L = 27.5±2.5 mm (1.083±0.098 in)



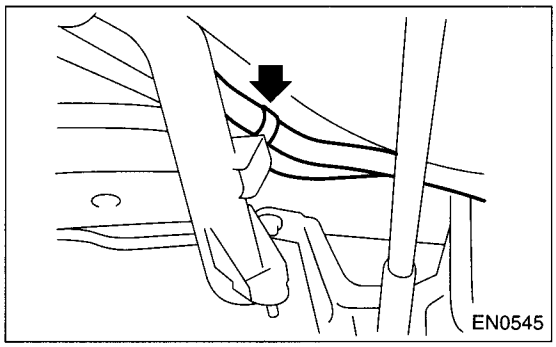
(1) Hose
(2) Clip
(3) Pipe

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

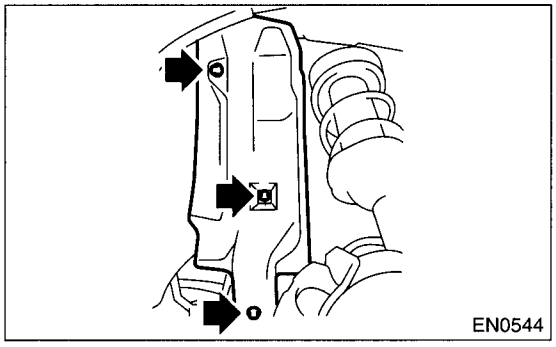
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



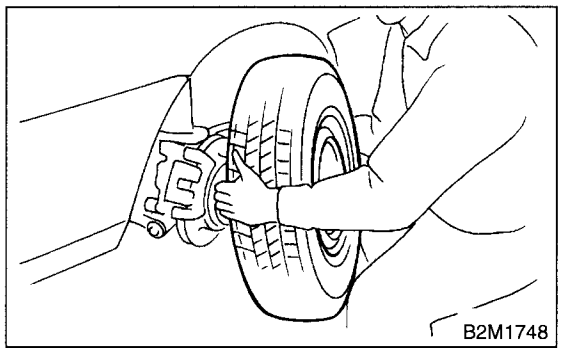
9) Tighten the bolts which hold the evaporation hoses onto the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.

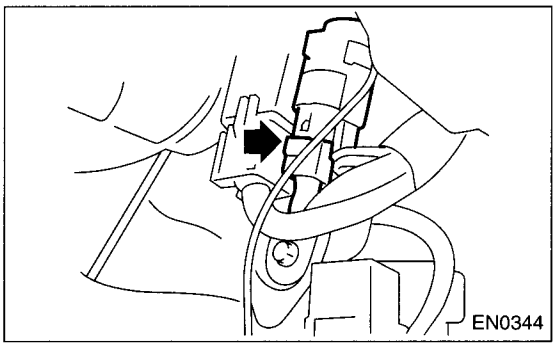


11) Install the rear right wheel.

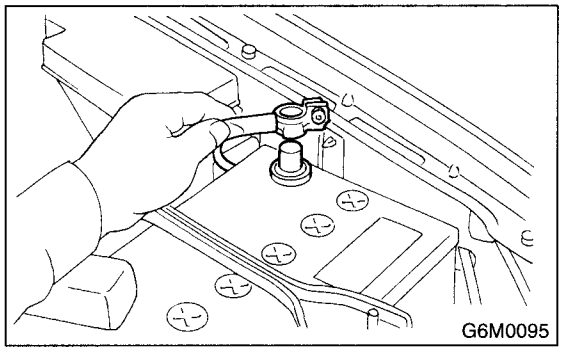


12) Lower the vehicle.
13) Tighten the wheel nuts.

14) Connect the connector to the fuel pump relay.

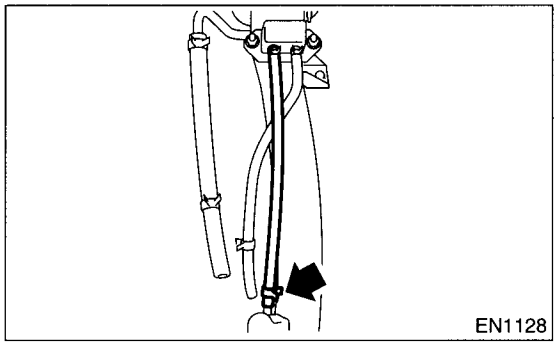


15) Connect the battery ground terminal.

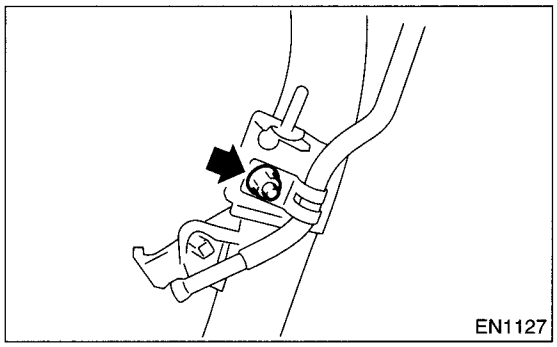


C: DISASSEMBLY

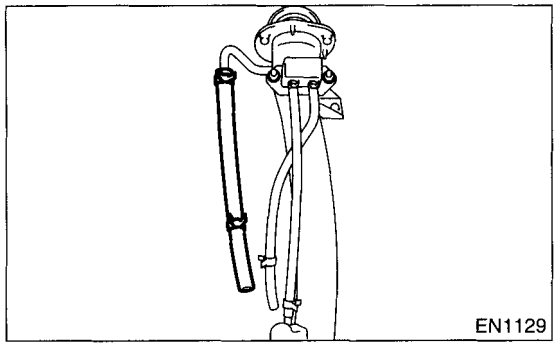
1) Move the clip, and disconnect the evaporation hose from the joint pipe.



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



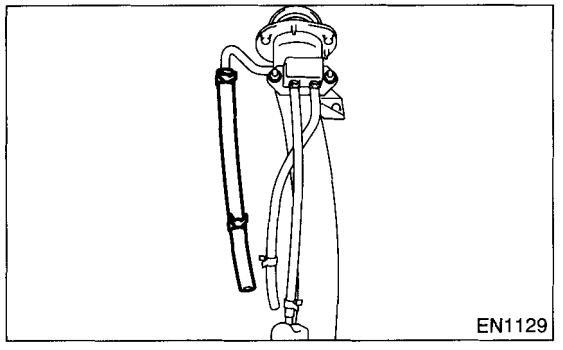
3) Disconnect the evaporation hose from the fuel filler pipe.



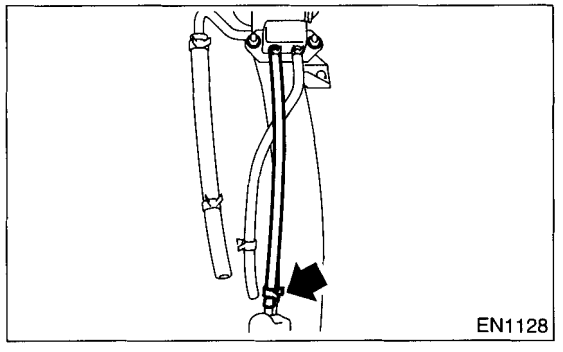
4) Remove the shut valve from the fuel filler pipe.<Ref. to EC(DOHC TURBO)-16, REMOVAL, Shut Valve.>

D: ASSEMBLY

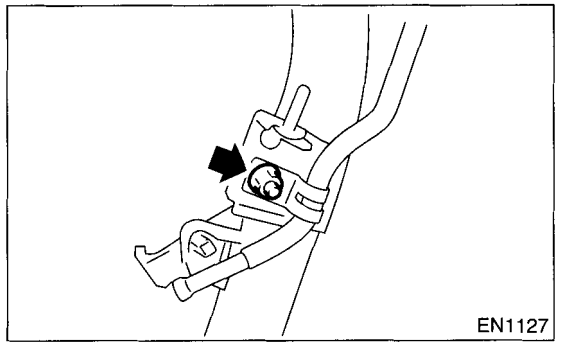
1) Install the shut valve on the fuel filler pipe.<Ref. to EC(DOHC TURBO)-16, INSTALLATION, Shut Valve.>
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



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



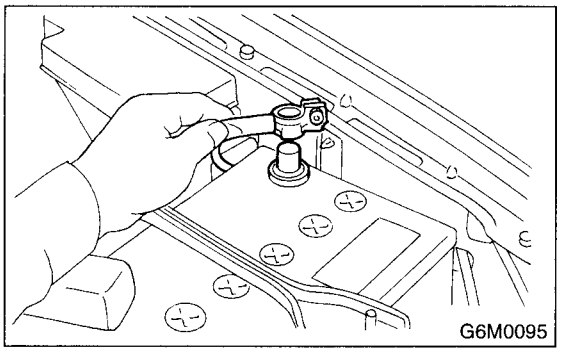
22.Fuel Pump

A: REMOVAL

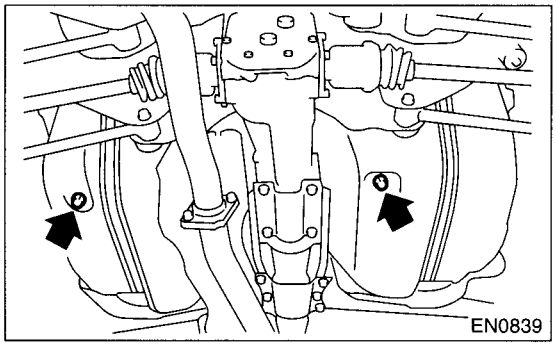
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the battery ground cable.

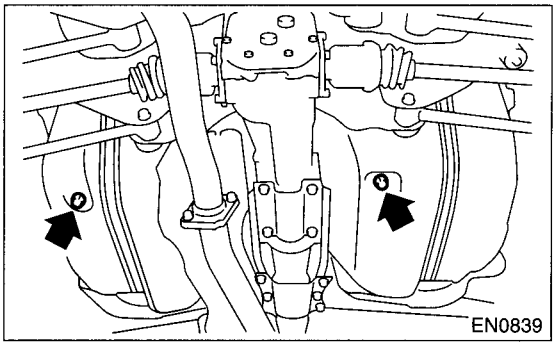

G6M0095

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

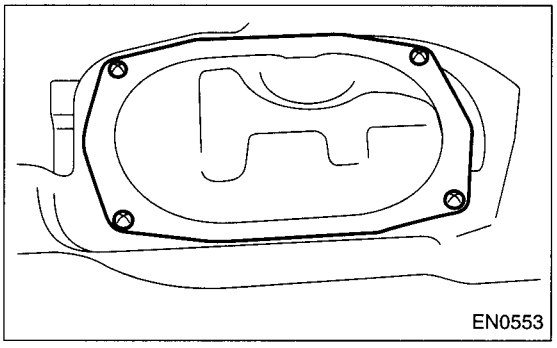

EN0839

6) Tighten the fuel drain plug.

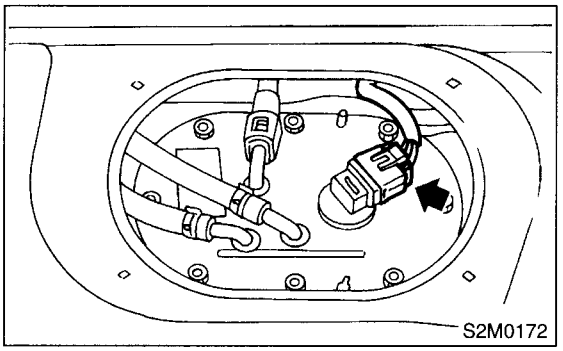
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


EN0839

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

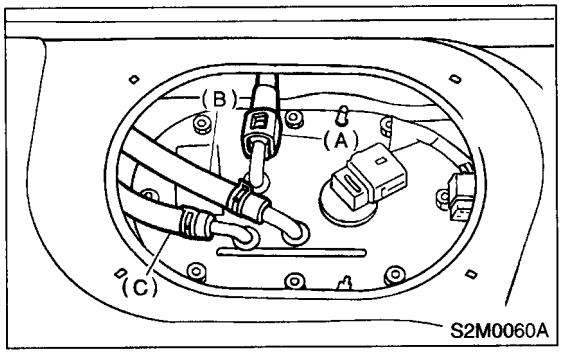

EN0553

9) Disconnect the connector from the fuel pump.

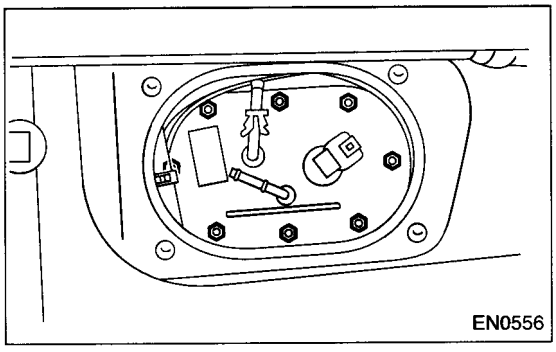

S2M0172

10) Disconnect the quick connector and then disconnect the fuel delivery hose (A). <Ref. to FU(SOHC)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

11) Move the clip and then disconnect the fuel return hose (B) and jet pump hose (C).



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

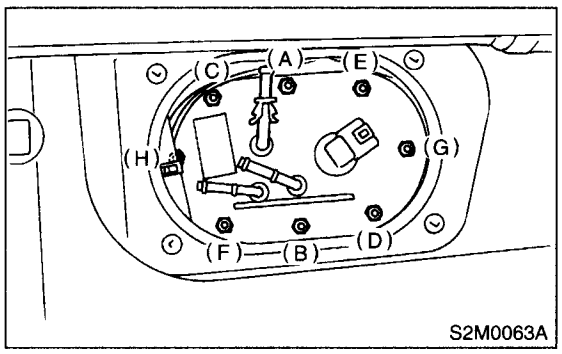


13) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

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

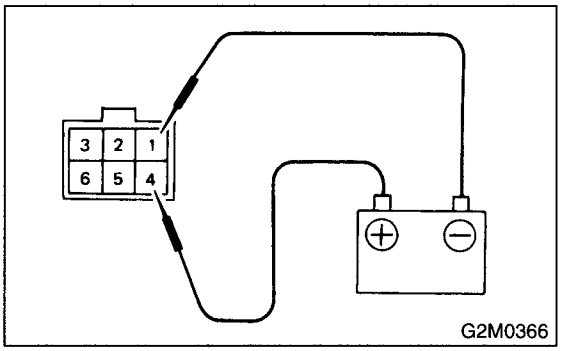
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

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

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



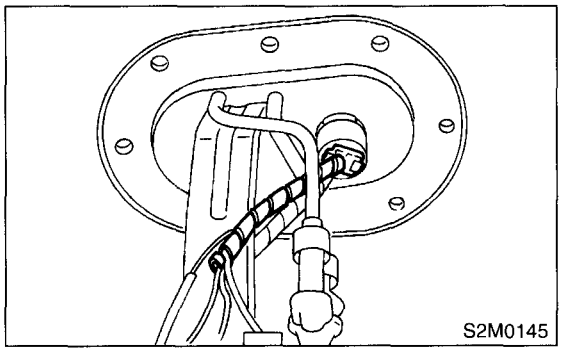
23.Fuel Level Sensor

A: REMOVAL

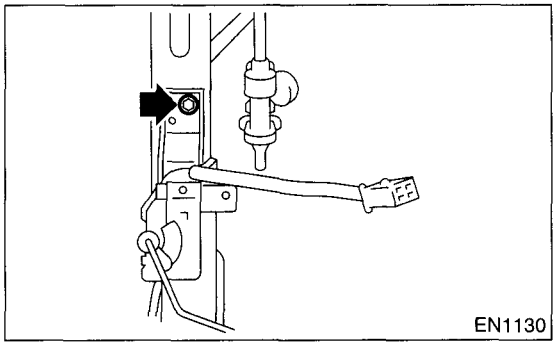
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(SOHC)-59, REMOVAL, Fuel Pump.>
2) Disconnect the connector from the fuel pump bracket.



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



B: INSTALLATION

Install in the reverse order of removal.

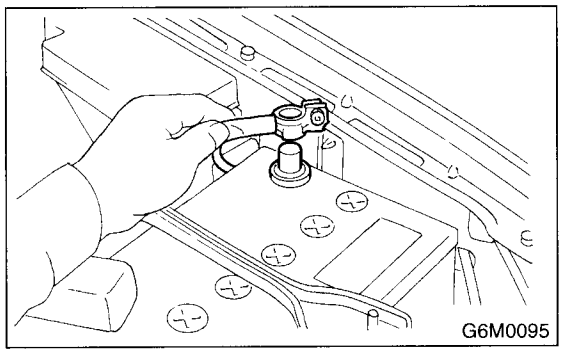
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

24. Fuel Sub Level Sensor

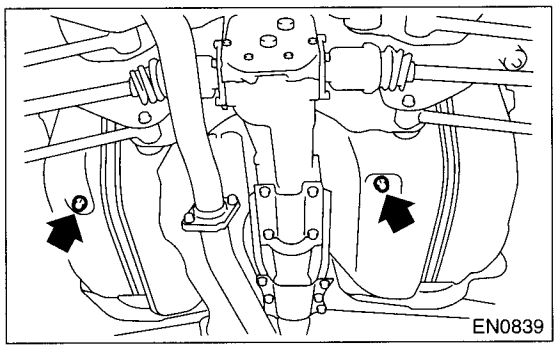
A: REMOVAL

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

1) Disconnect the battery ground cable.

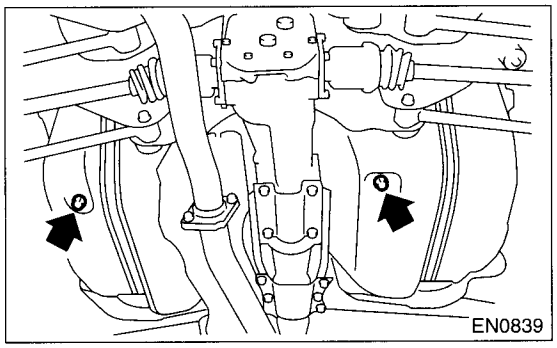


2) Lift-up the vehicle.
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.

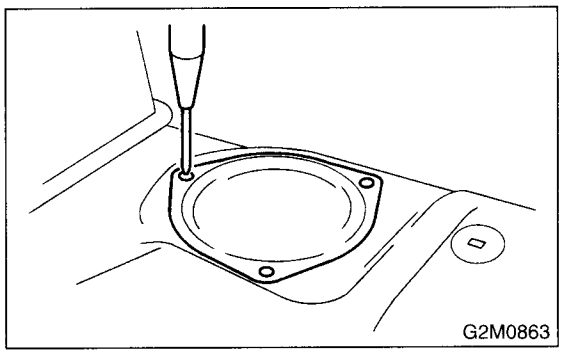


4) Tighten the fuel drain plug.

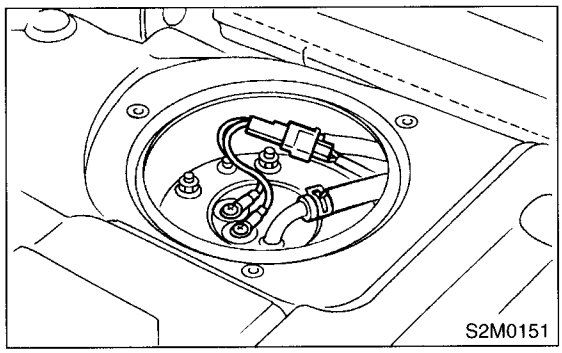
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



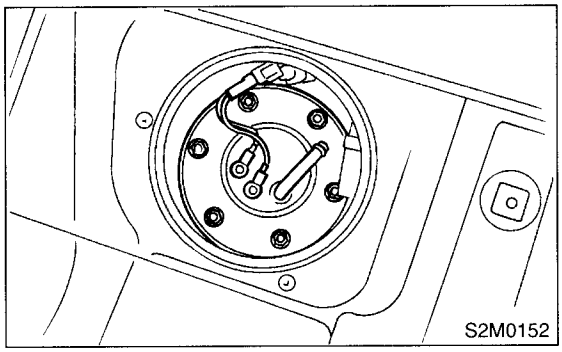
5) Remove the rear seat.
6) Remove the service hole cover.



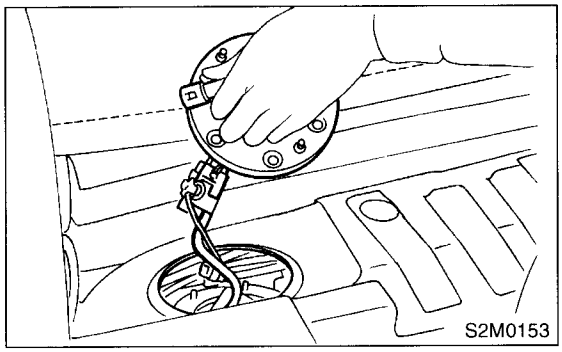
7) Disconnect the connector from the fuel sub meter.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub meter unit on the fuel tank.



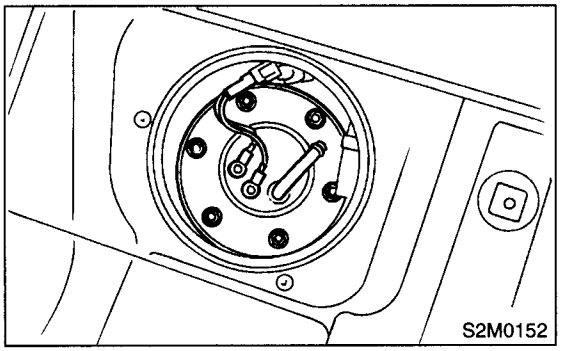
10) Remove the fuel sub meter unit.



B: INSTALLATION

Install in the reverse order of removal.

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

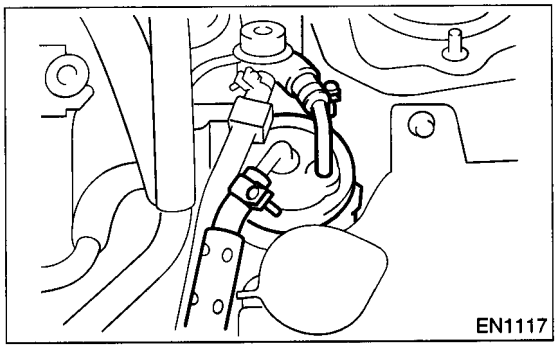


25.Fuel Filter

A: REMOVAL

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

1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the fuel delivery hoses from the fuel filter.

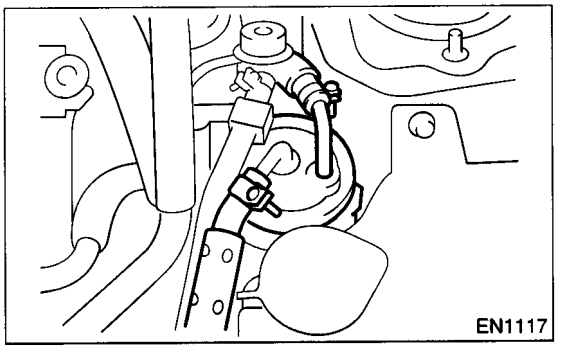


3) Remove the filter from the holder.

B: INSTALLATION

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

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



C: INSPECTION

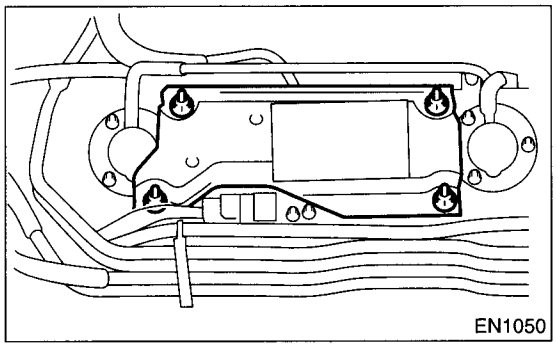
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if the replacement interval has been reached, replace it.
3) If the water is found in it, shake and expel the water from the inlet port.
4) If fuel hoses are damaged at the connecting portion, replace it with a new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

26.Fuel Cut Valve

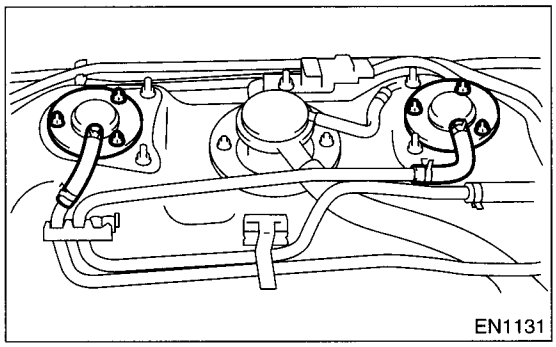
A: REMOVAL

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

1) Remove the fuel tank. <Ref. to FU(SOHC)-51, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



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

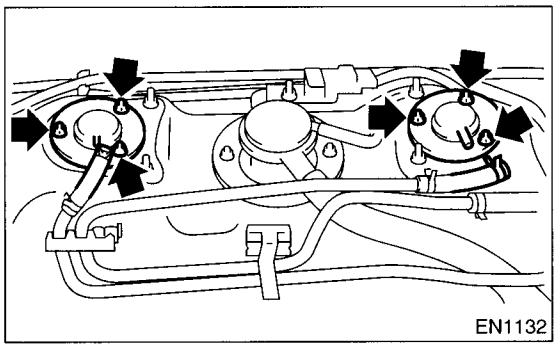


4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

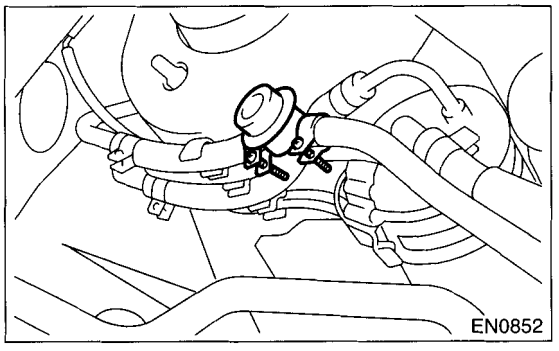
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



27.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from the fuel return line.



B: INSTALLATION

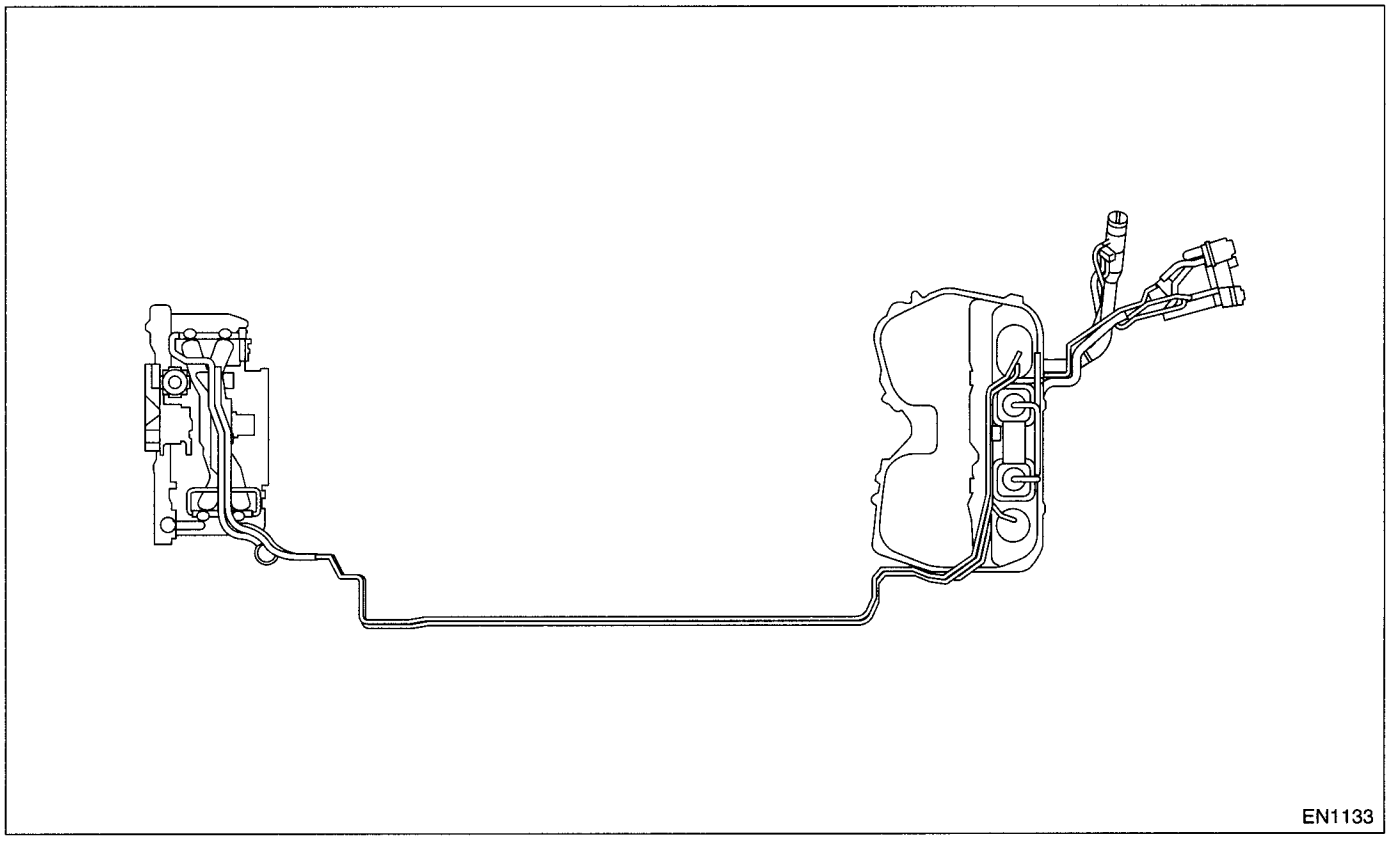
Install in the reverse order of removal.

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

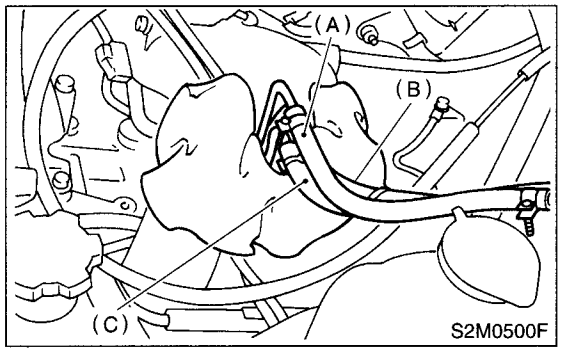
28. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-55, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



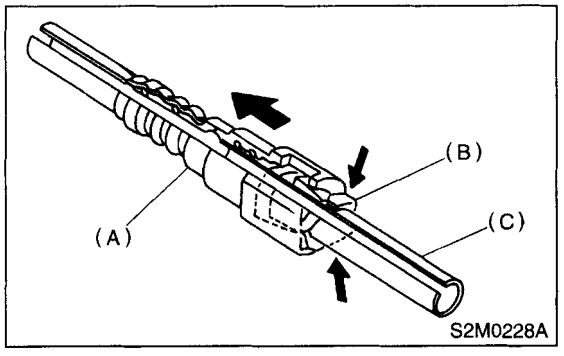
6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.
7) Lift-up the vehicle.



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

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

CAUTION:
Replace retainer with new ones.

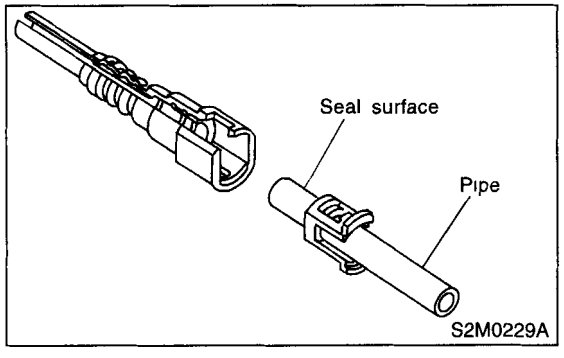


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

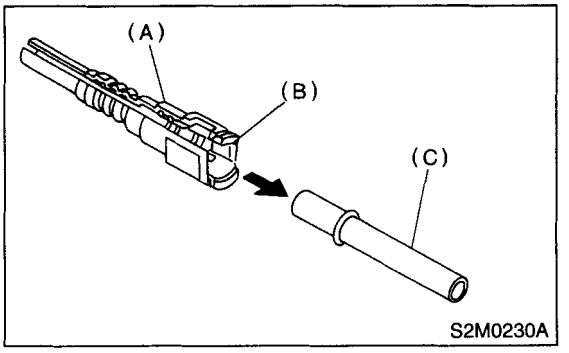
1) Connect the quick connector on fuel delivery line.

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.**



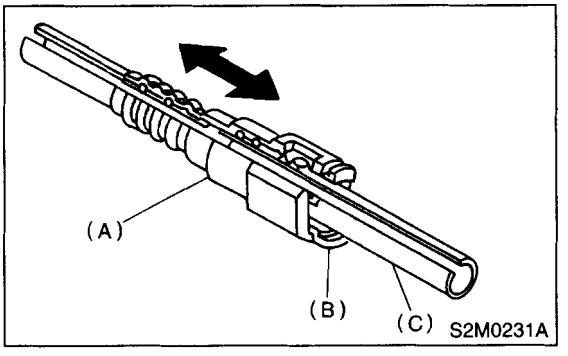
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

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.**

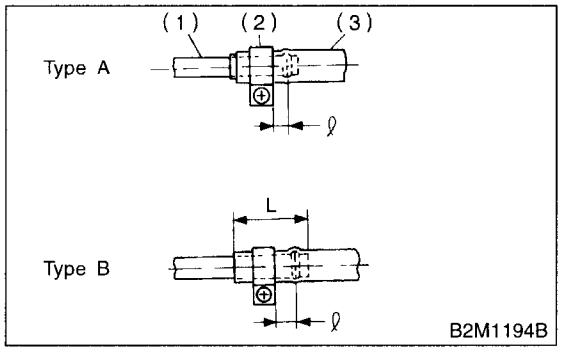


(A) Connector
(B) Retainer
(C) Pipe

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

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)



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

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

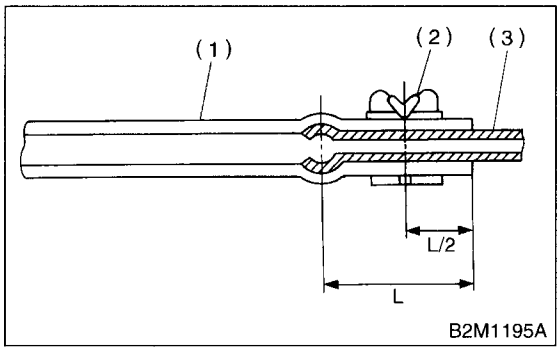
Fuel return hose:

L = 22.5±2.5 mm (0.885±0.098 in)

Fuel evaporation hose:

L = 17.5±2.5 mm (0.689±0.098 in)

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



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

C: INSPECTION

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

29.Fuel System Trouble in General

A: INSPECTION

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)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

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

To prevent water condensation.

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

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

• Refilling the fuel tank.

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

• Protecting the fuel system against freezing and water condensation.

(3) 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 the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(4) Affected areas

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

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

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

		Page
1.	General Description	2
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3.	Rear Catalytic Converter	4
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5.	Purge Control Solenoid Valve	6
6.	Main Fuel Level Sensor	7
7.	Fuel Temperature Sensor	8
8.	Sub Fuel Level Sensor	9
9.	Fuel Tank Pressure Sensor	10
10.	Pressure Control Solenoid Valve	11
11.	Drain Filter	13
12.	Vent Valve	14
13.	Shut Valve	15
14.	Drain Valve	16

1. General Description

A: CAUTION

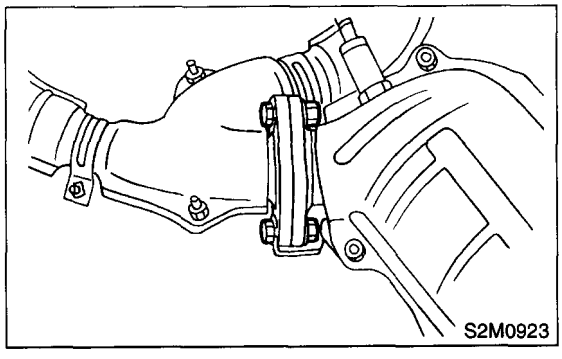
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation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

2. Front Catalytic Converter

A: REMOVAL

1) Remove the front exhaust pipe and center exhaust pipe. <Ref. to EX(SOHC)-8, Removal, Center Exhaust Pipe.>
2) Separate the front catalytic converter from front exhaust pipe.

NOTE:
The front catalytic converter is integrated with rear catalytic converter.

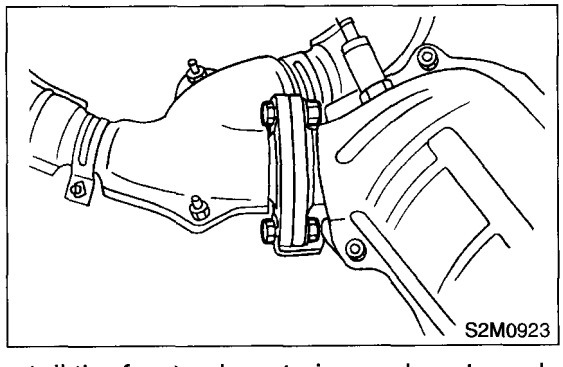


B: INSTALLATION

CAUTION:
Replace gaskets with new ones.

1) Install the front catalytic converter to front exhaust pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



2) Install the front exhaust pipe and center exhaust pipe. <Ref. to EX(SOHC)-8, Installation, Center Exhaust Pipe.>

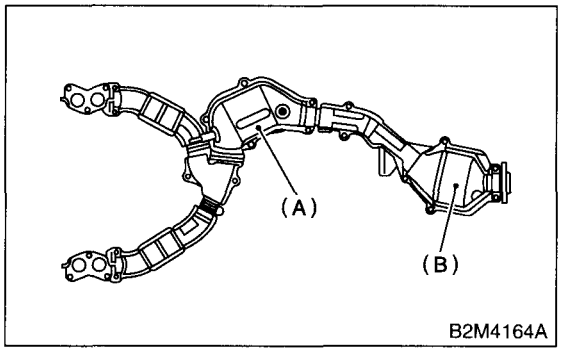
C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

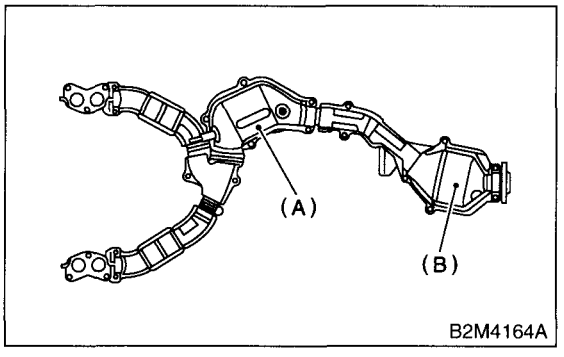
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as those for the front catalytic converter. <Ref. to EC(SOHC)-3, REMOVAL, Front Catalytic Converter.>



(A) Front catalytic converter
(B) Rear catalytic converter

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 those for the front catalytic converter. <Ref. to EC(SOHC)-3, INSTALLATION, Front Catalytic Converter.>



(A) Front catalytic converter
(B) Rear catalytic converter

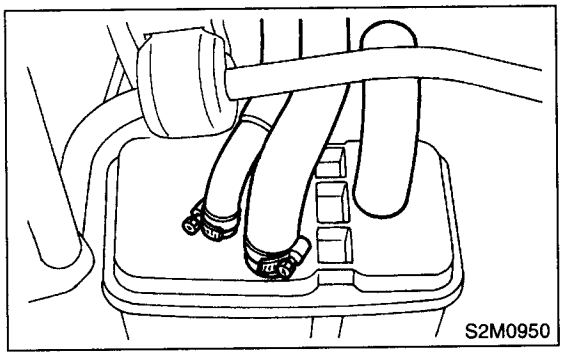
C: INSPECTION

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

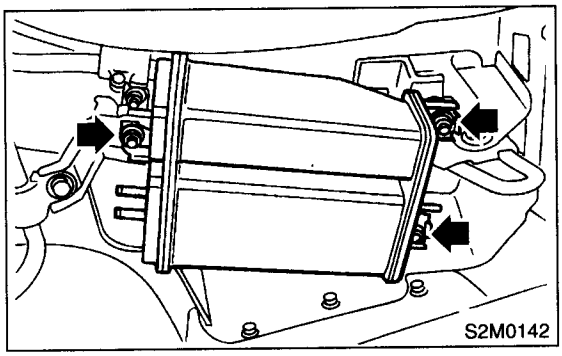
4. Canister

A: REMOVAL

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



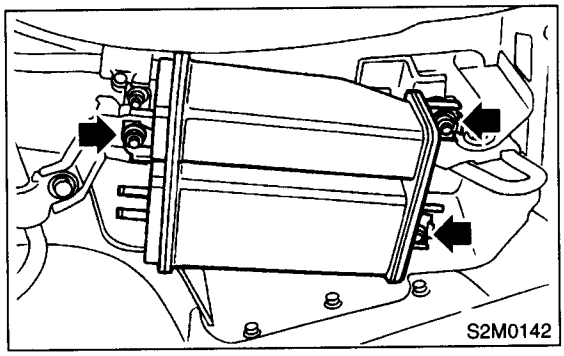
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

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



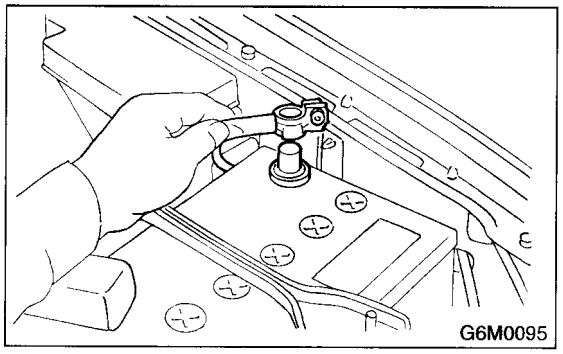
C: INSPECTION

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

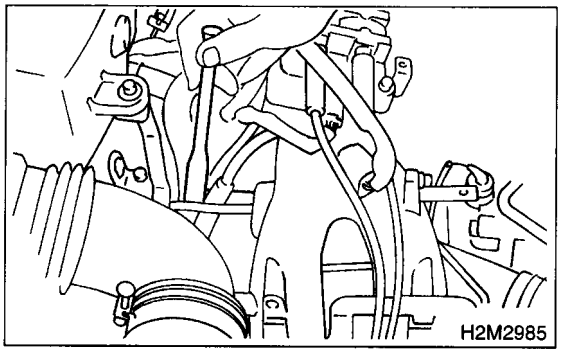
5. Purge Control Solenoid Valve

A: REMOVAL

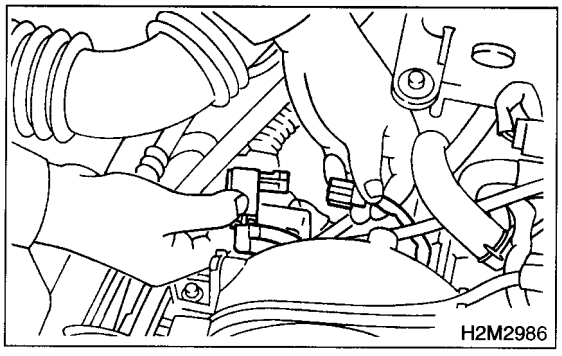
1) Disconnect the ground terminal from battery.



2) Remove the bolt which installs purge control solenoid valve onto intake manifold.



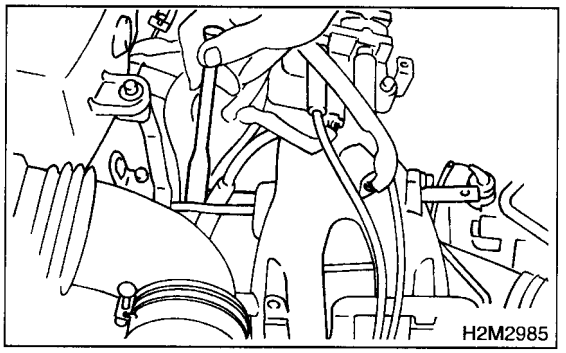
3) Take out purge control solenoid valve through the bottom of the intake manifold.
4) Disconnect the connector and hoses from purge control solenoid valve.



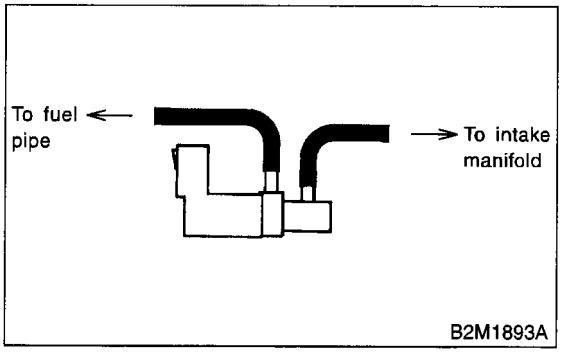
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:
Carefully connect the evaporation hoses.



C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to "FU" section. <Ref. to FU(SOHC)-62, REMOVAL, Fuel Level Sensor.>

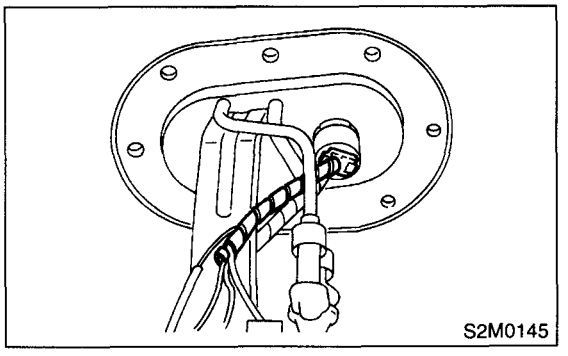
B: INSTALLATION

For work procedures, refer to "FU" section. <Ref. to FU(SOHC)-62, INSTALLATION, Fuel Level Sensor.>

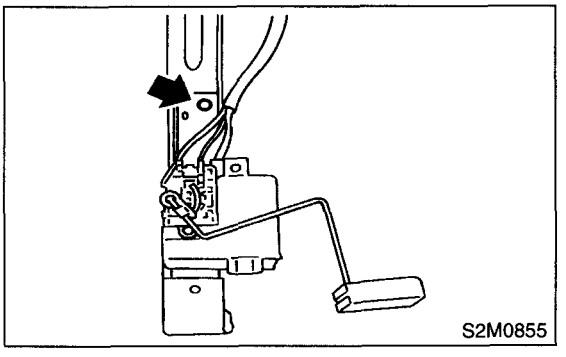
7. Fuel Temperature Sensor

A: REMOVAL

1) Remove the fuel pump assembly. <Ref. to FU(SOHC)-59, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the main fuel level sensor from fuel pump assembly. <Ref. to FU(SOHC)-62, REMOVAL, Fuel Level Sensor.>



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

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
Spark may occur and ignite if fuel is nearby.

8. Sub Fuel Level Sensor

A: REMOVAL

For work procedures, refer to <Ref. to FU(SOHC)-63, REMOVAL, Fuel Sub Level Sensor.>

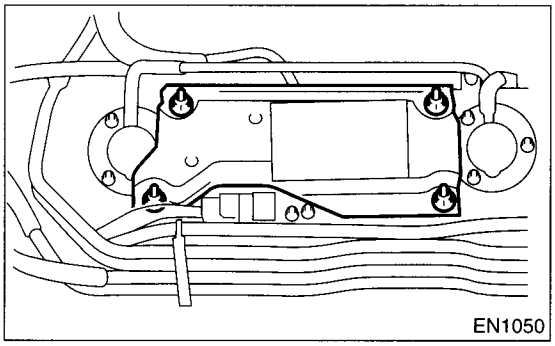
B: INSTALLATION

For work procedures, refer to <Ref. to FU(SOHC)-64, INSTALLATION, Fuel Sub Level Sensor.>

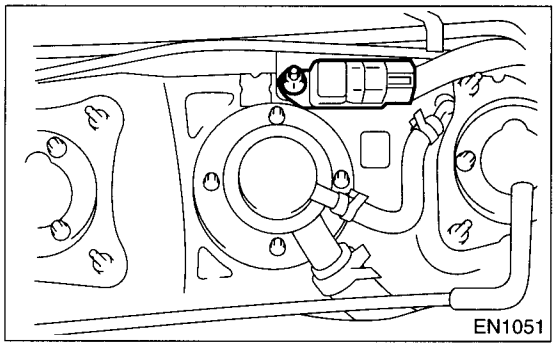
9. Fuel Tank Pressure Sensor

A: REMOVAL

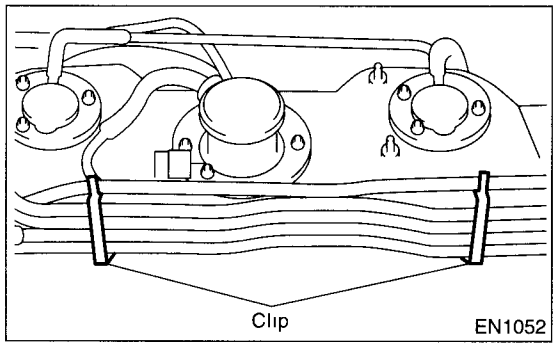
1) Remove the fuel tank. <Ref. to FU(SOHC)-51, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



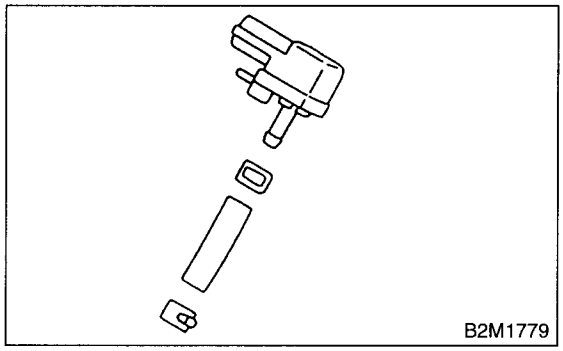
3) Disconnect the connector from fuel tank pressure sensor.



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



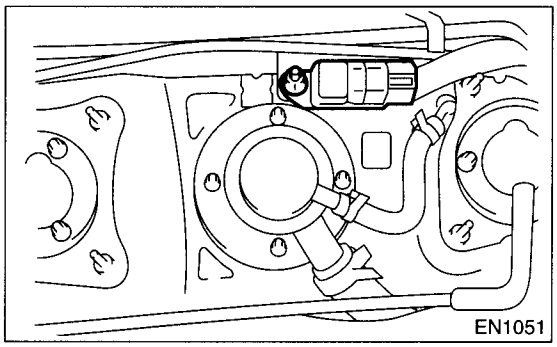
5) Remove the clip, and disconnect pressure hose from fuel tank.
6) Disconnect the pressure hose from fuel tank pressure sensor.



B: INSTALLATION

Install in the reverse order of removal.

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



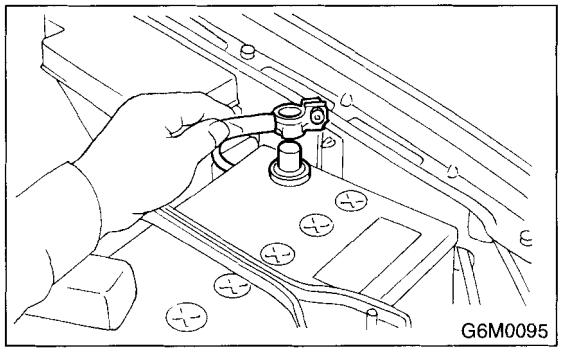
C: INSPECTION

Make sure the hoses are not cracked or loose.

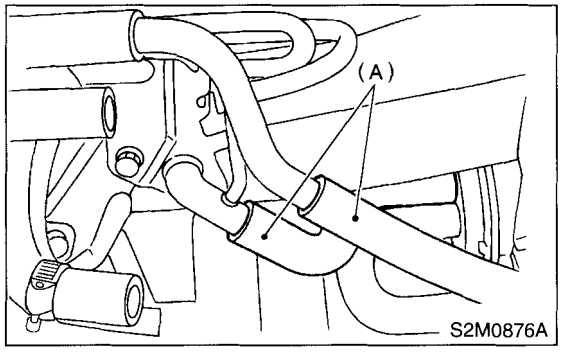
10.Pressure Control Solenoid Valve

A: REMOVAL

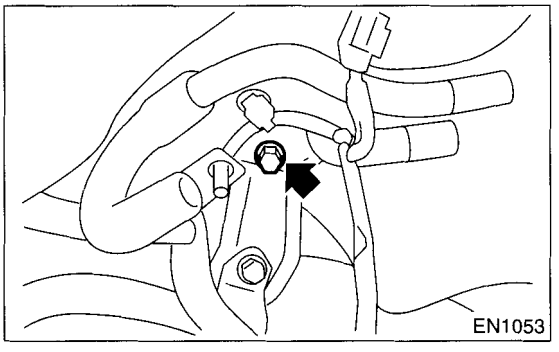
1) Disconnect the ground terminal from battery.



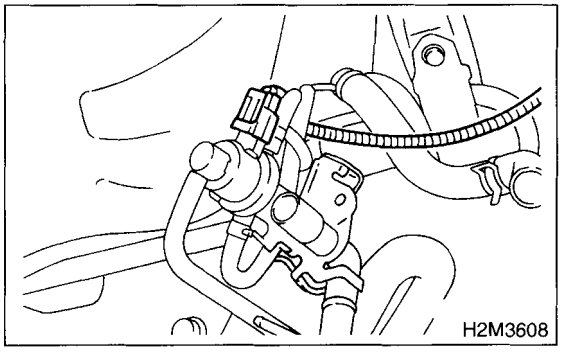
2) Remove the canister. <Ref. to EC(SOHC)-5, REMOVAL, Canister.>
3) Disconnect the evaporation hoses (A) from joint pipes.



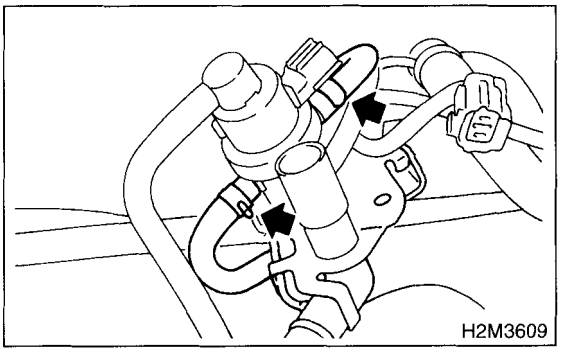
4) Remove the bolt which installs pressure control solenoid valve holding bracket on body.



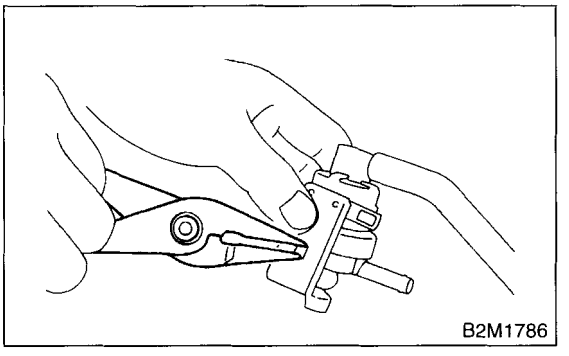
5) Disconnect the connector from pressure control solenoid valve.



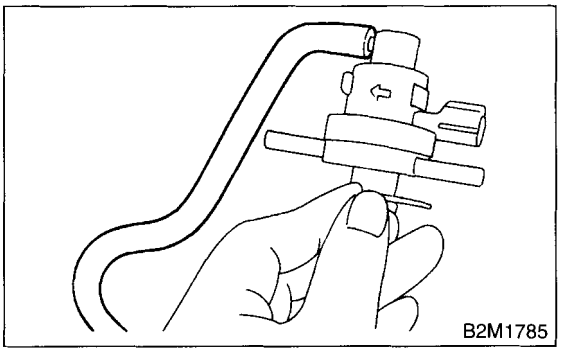
6) Disconnect the two evaporation hoses from pressure control solenoid valve.
7) Remove the pressure control solenoid valve with bracket.



8) Remove the pressure control solenoid valve from bracket.



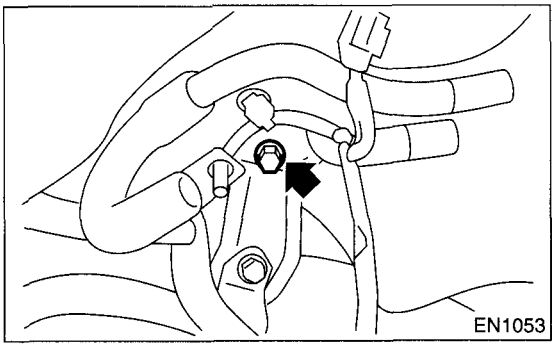
9) Disconnect the vacuum hose from pressure control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

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



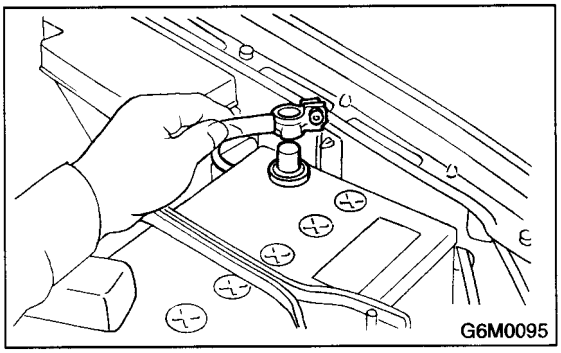
C: INSPECTION

Make sure the hoses are not cracked or loose.

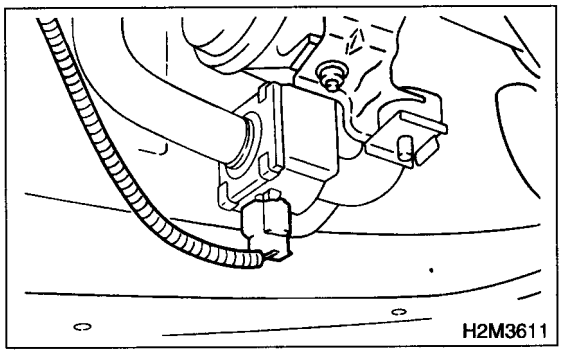
11.Drain Filter

A: REMOVAL

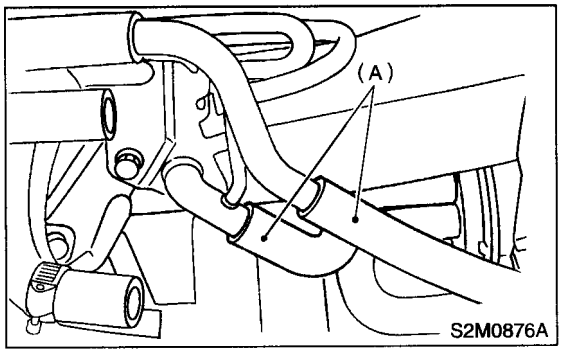
1) Disconnect the ground terminal from battery.



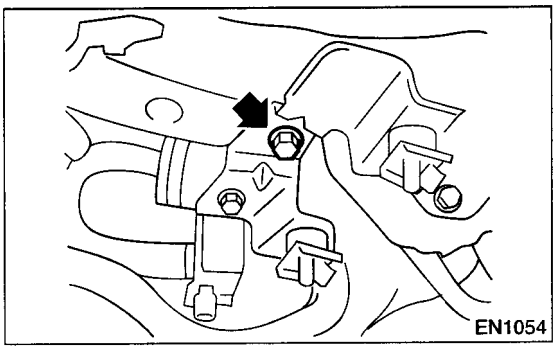
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(SOHC)-5, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



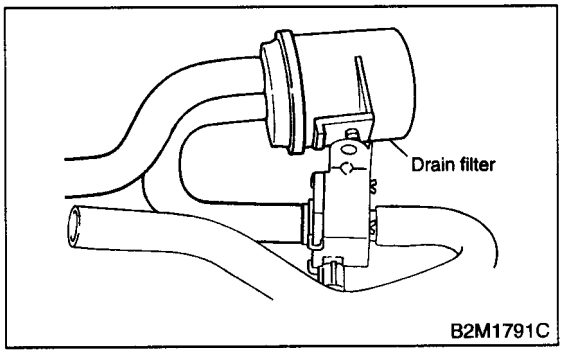
5) Disconnect the evaporation hoses (A) from joint pipes.



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



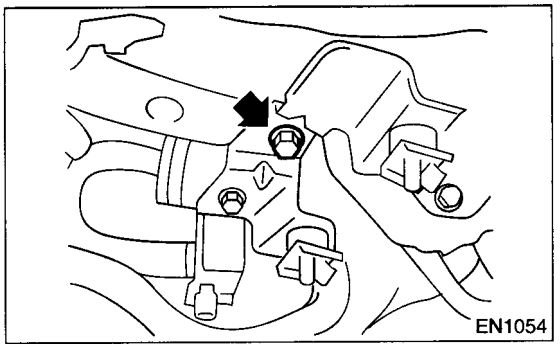
7) Disconnect the evaporation hoses, and remove the drain filter.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.35 kgf-m, 17.0 ft-lb)



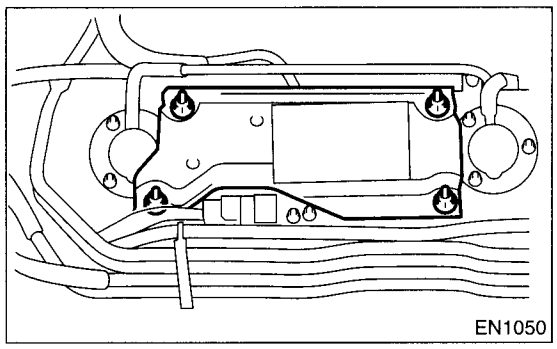
C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

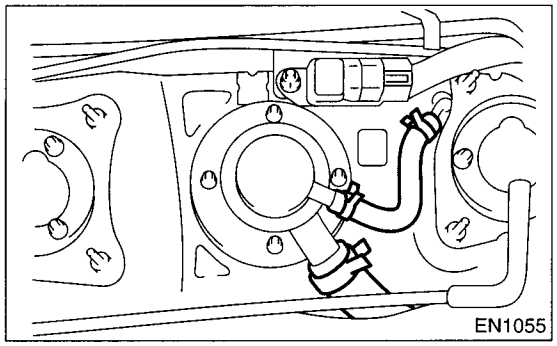
12.Vent Valve

A: REMOVAL

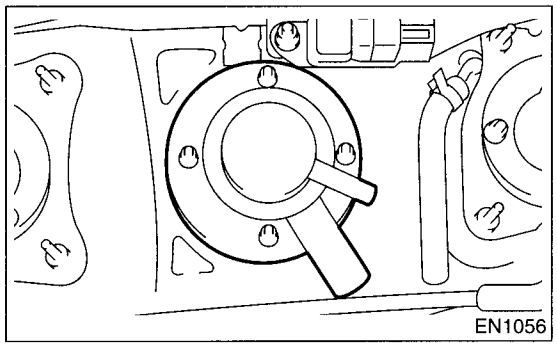
1) Remove the fuel tank. <Ref. to FU(SOHC)-51, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



3) Remove the clips, and disconnect the hoses from vent valve.



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

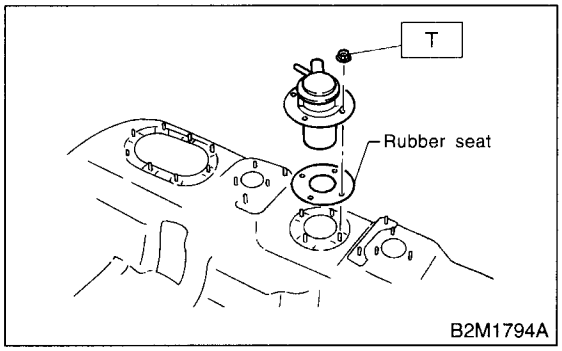


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Replace the rubber seat with a new one.

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



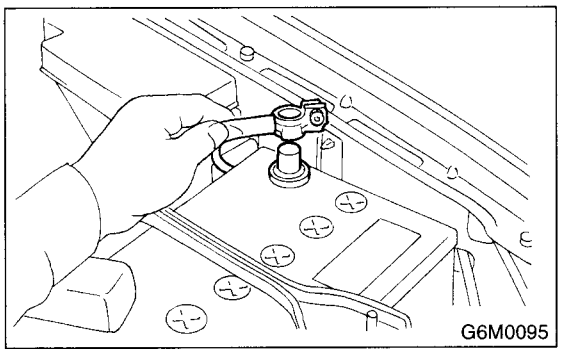
C: INSPECTION

Make sure the hoses are not cracked or loose.

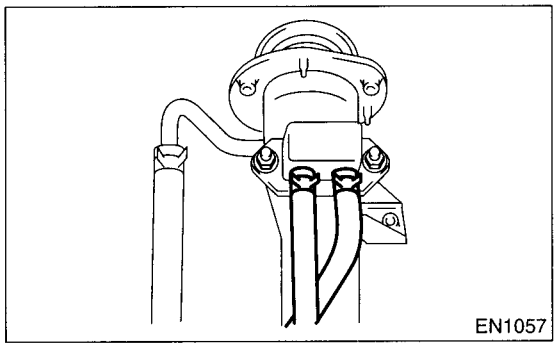
13.Shut Valve

A: REMOVAL

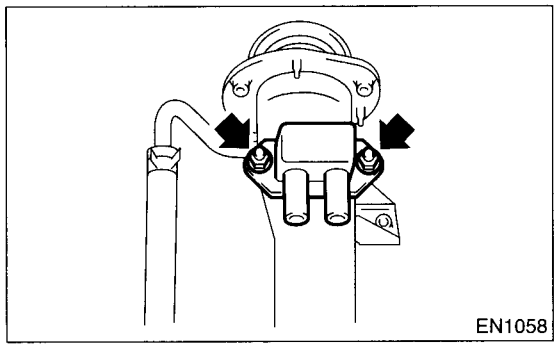
1) Disconnect the ground terminal from battery.



2) Drain fuel from the fuel tank. <Ref. to FU(SOHC)-51, REMOVAL, Fuel Tank.>
3) Remove the fuel filler pipe. <Ref. to FU(SOHC)-54, REMOVAL, Fuel Filler Pipe.>
4) Disconnect the evaporation hoses from shut valve.



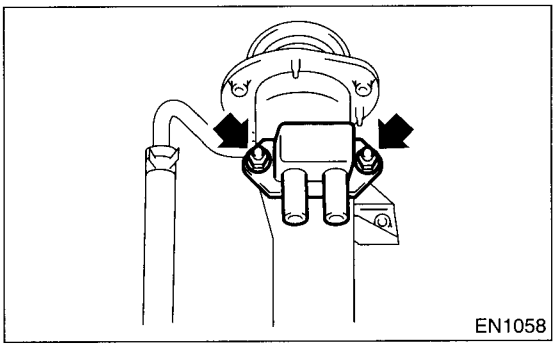
5) Remove the shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



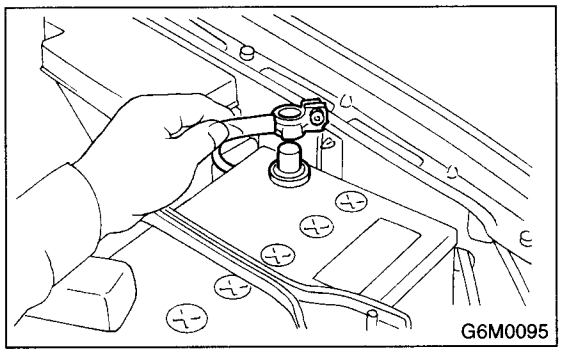
C: INSPECTION

Make sure the hoses are not cracked or loose.

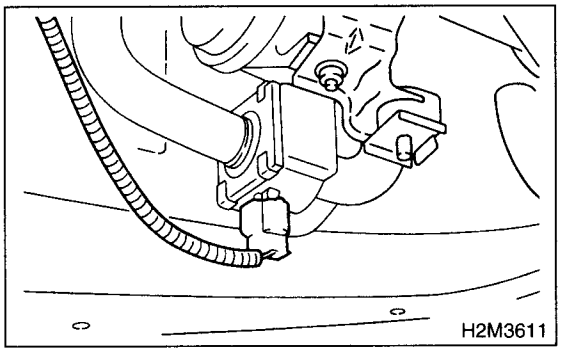
14.Drain Valve

A: REMOVAL

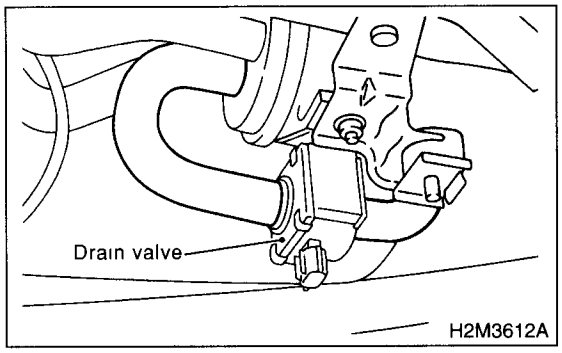
1) Disconnect the ground terminal from battery.



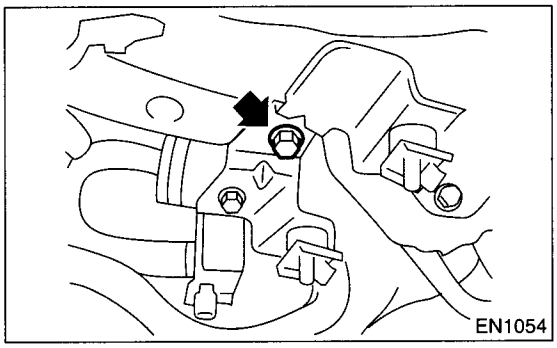
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(SOHC)-5, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



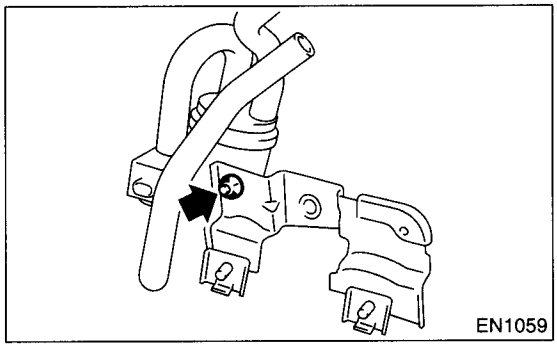
5) Disconnect the evaporation hoses from drain valve.



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



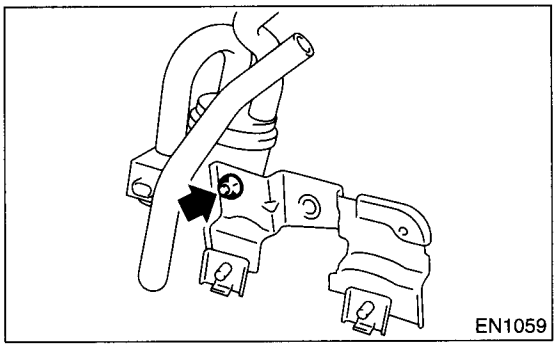
7) Remove the drain valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.35 kgf-m, 17.0 ft-lb)



C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

INTAKE (INDUCTION)

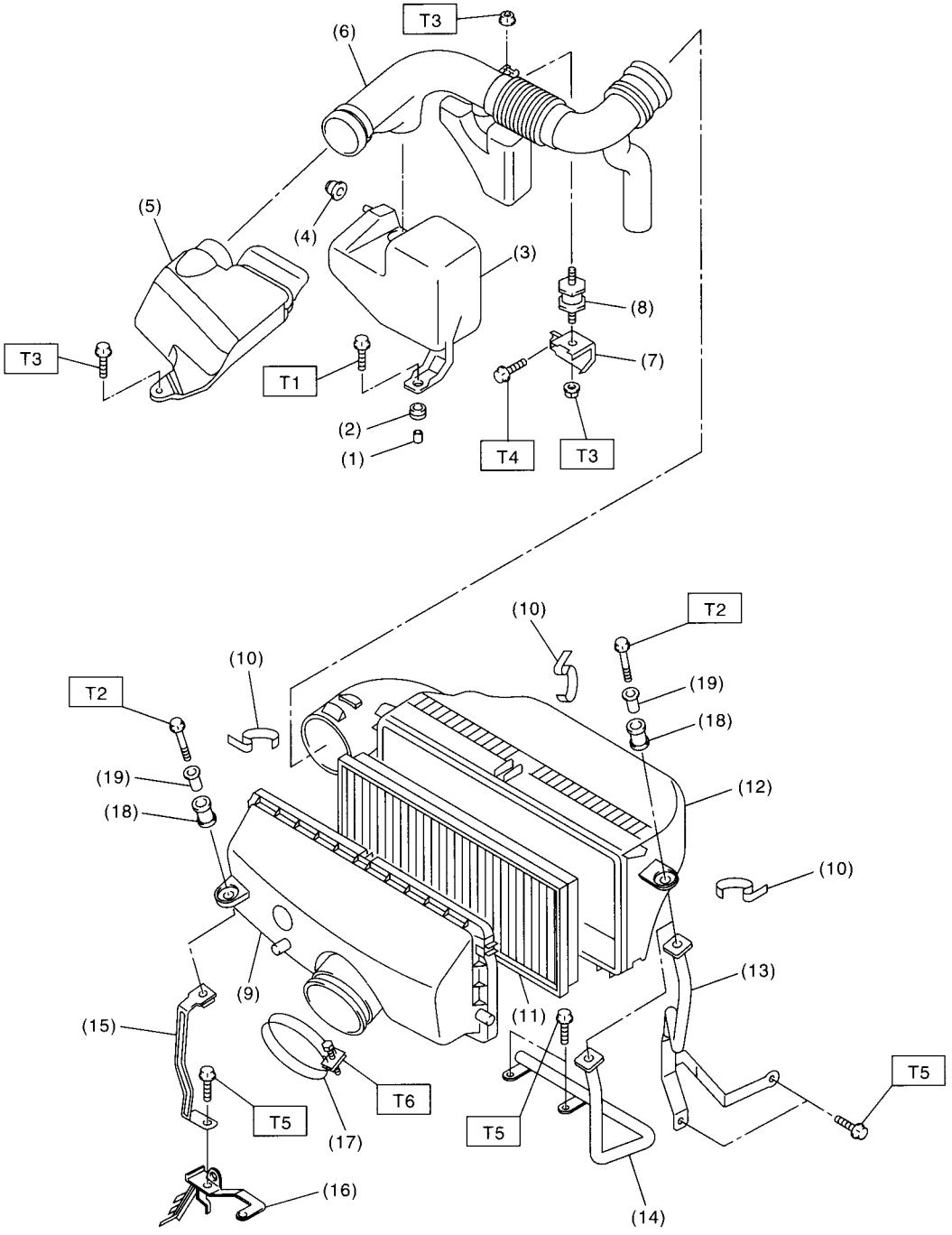
IN(SOHC)

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2. Air Cleaner 5
3. Air Cleaner Case 6
4. Air Intake Duct 7
5. Resonator Chamber 8

1. General Description

A: COMPONENT



EN0057

(1) Spacer
(2) Bush
(3) Resonator chamber
(4) Cushion rubber
(5) Air intake duct A
(6) Air intake duct B
(7) Bracket
(8) Cushion
(9) Air cleaner case A
(10) Clip
(11) Air cleaner element
(12) Air cleaner case B
(13) Air cleaner case stay LH (MT vehicles)
(14) Air cleaner case stay LH (AT vehicles)
(15) Air cleaner case stay RH
(16) Engine harness bracket
(17) Clamp
(18) Bush
(19) Spacer

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*33 (3.4, 24.4)*
T2:	*6.4 (0.65, 4.7)*
T3:	*7.5 (0.76, 5.5)*
T4:	*6 (0.6, 4.4)*
T5:	*16 (1.6, 11.6)*
T6:	*3 (0.3, 2.2)*

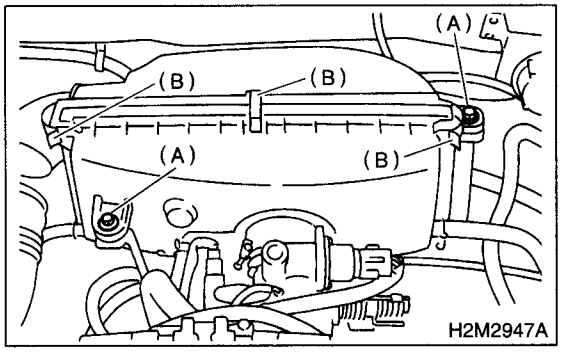
B: CAUTION

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

2. Air Cleaner

A: REMOVAL

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



3) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

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

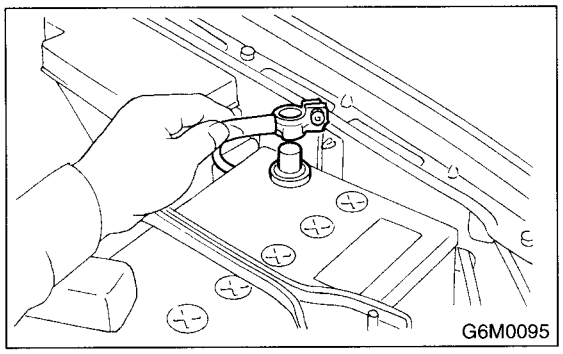
C: INSPECTION

Replace if excessively damaged or dirty.

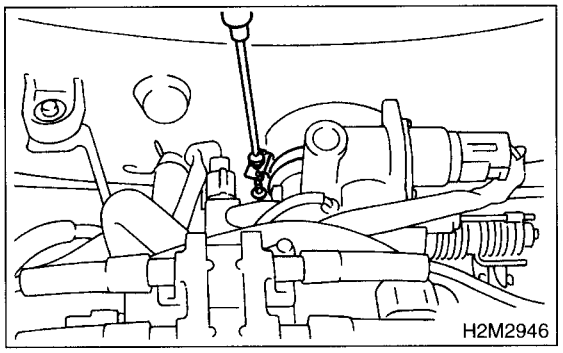
3. Air Cleaner Case

A: REMOVAL

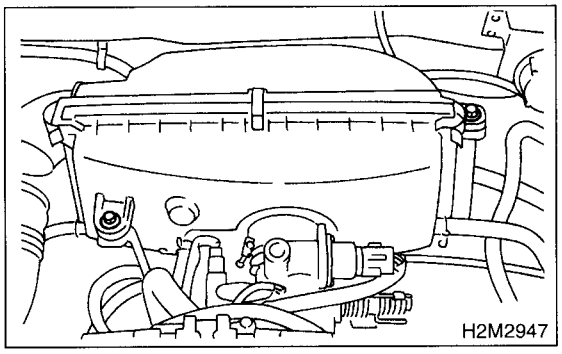
1) Disconnect the battery ground cable.



2) Loosen the clamp which connects air cleaner case to throttle body.



3) Disconnect the hoses and intake duct from air cleaner case.
4) Remove the bolts which install air cleaner case to stays.



5) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

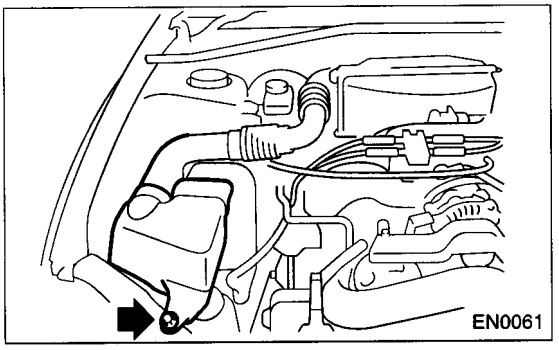
C: INSPECTION

Inspect for cracks and loose connections.

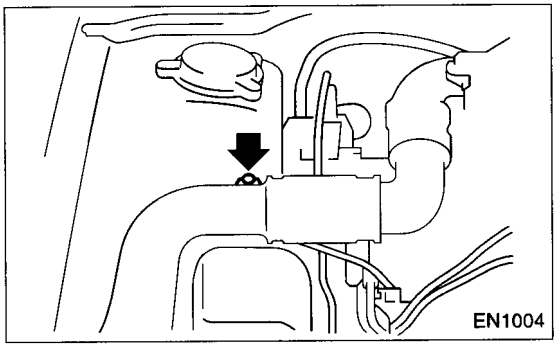
4. Air Intake Duct

A: REMOVAL

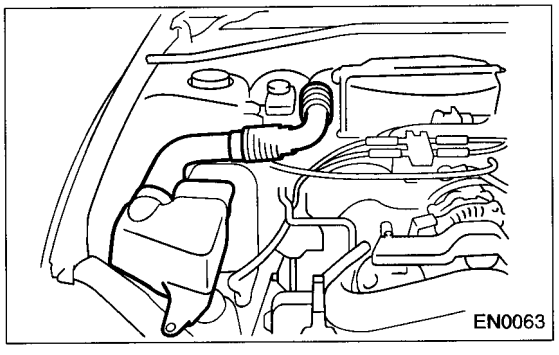
1) Remove the bolts which install air intake duct (A) on the front side of body.



2) Remove the bolt which installs air intake duct (B) on body.



3) Remove the air intake ducts as a unit.



B: INSTALLATION

Install in the reverse order of removal.

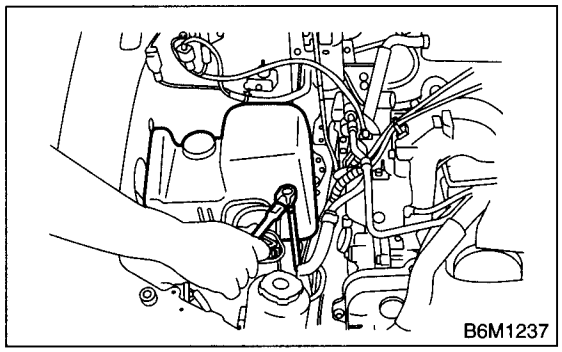
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

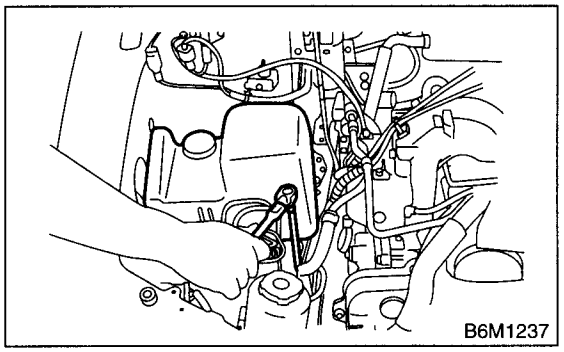
1) Remove the air intake duct. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.>
2) Remove the resonator chamber.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.4 ft-lb)



C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME(SOHC)

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1. General Description

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 (kgf/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	MT: 650±100 (No load) AT: 700±100 (No load) 850±100 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	MT: 10°±8°/650 AT: 15°±8°/700

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)

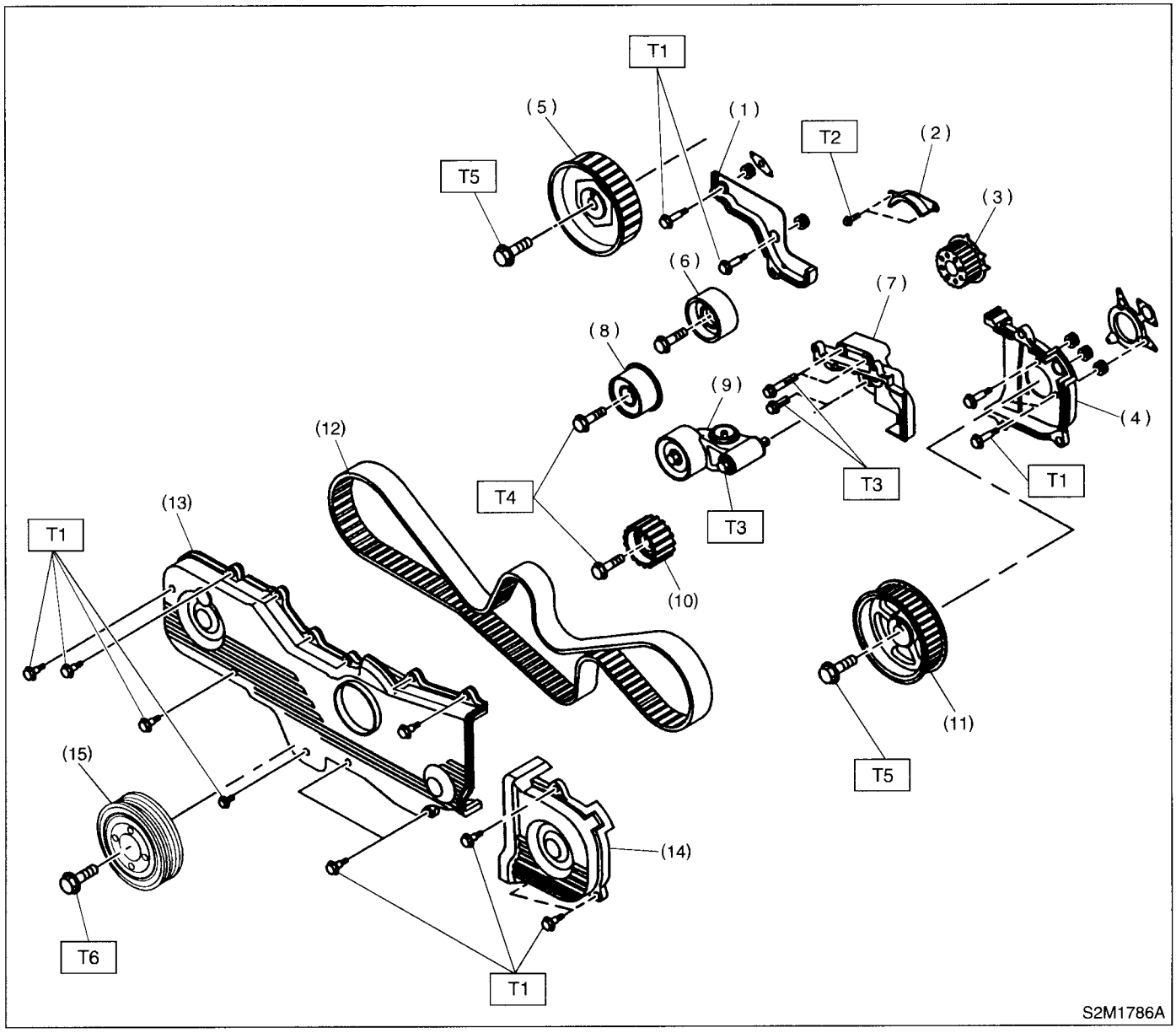
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			98.3 mm (3.870 in)
Valve set	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.4 mm (0.055 in)
			Limit	2.1 mm (0.083 in)
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 kgf, 48.3 — 55.3 lb)/ 45.0 mm (1.772 in) 526.6 — 581.6 N (53.7 — 59.3 kgf, 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)

B: COMPONENT

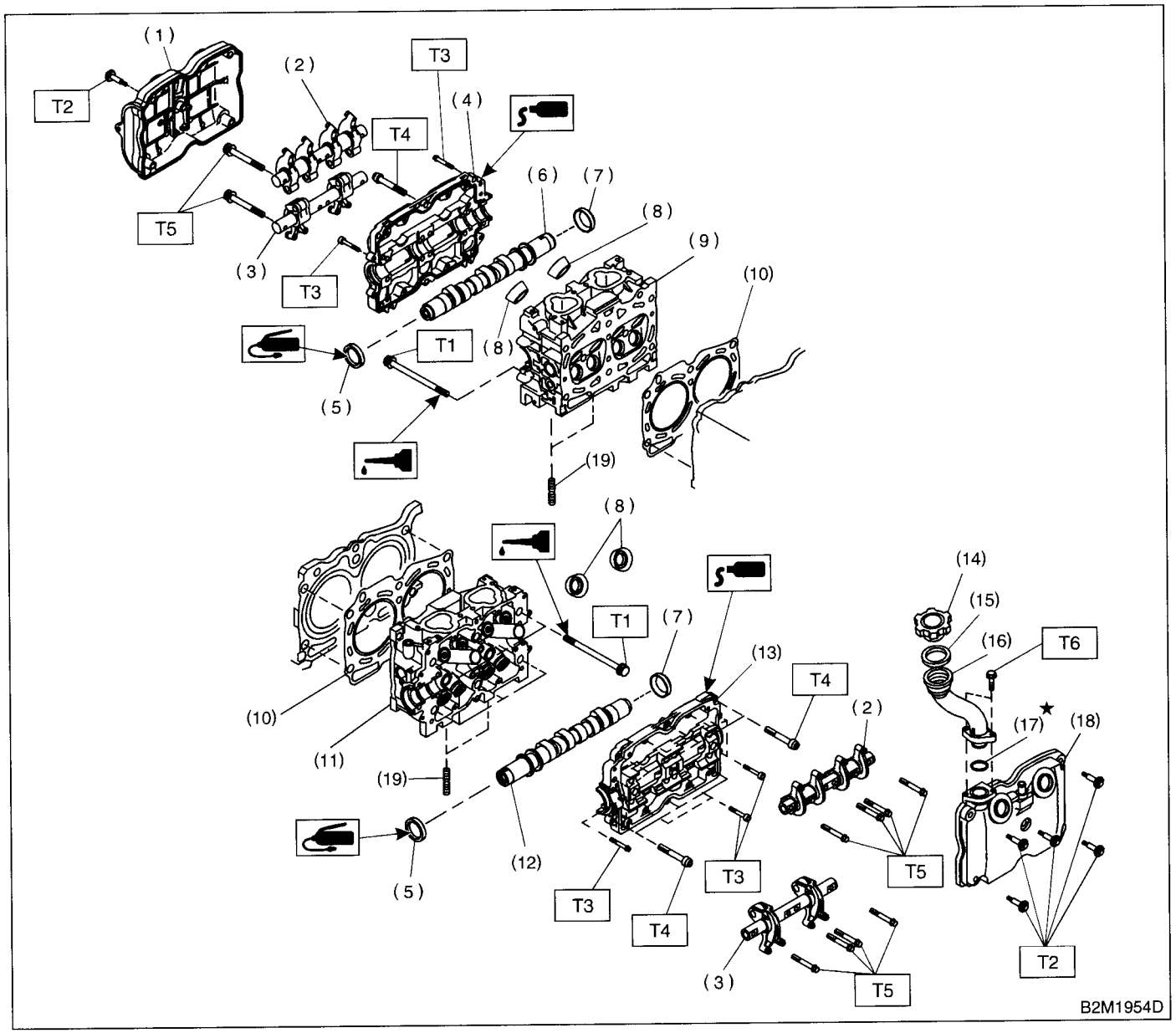
1. TIMING BELT



(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 (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 9.8 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>

2. CYLINDER HEAD AND CAMSHAFT



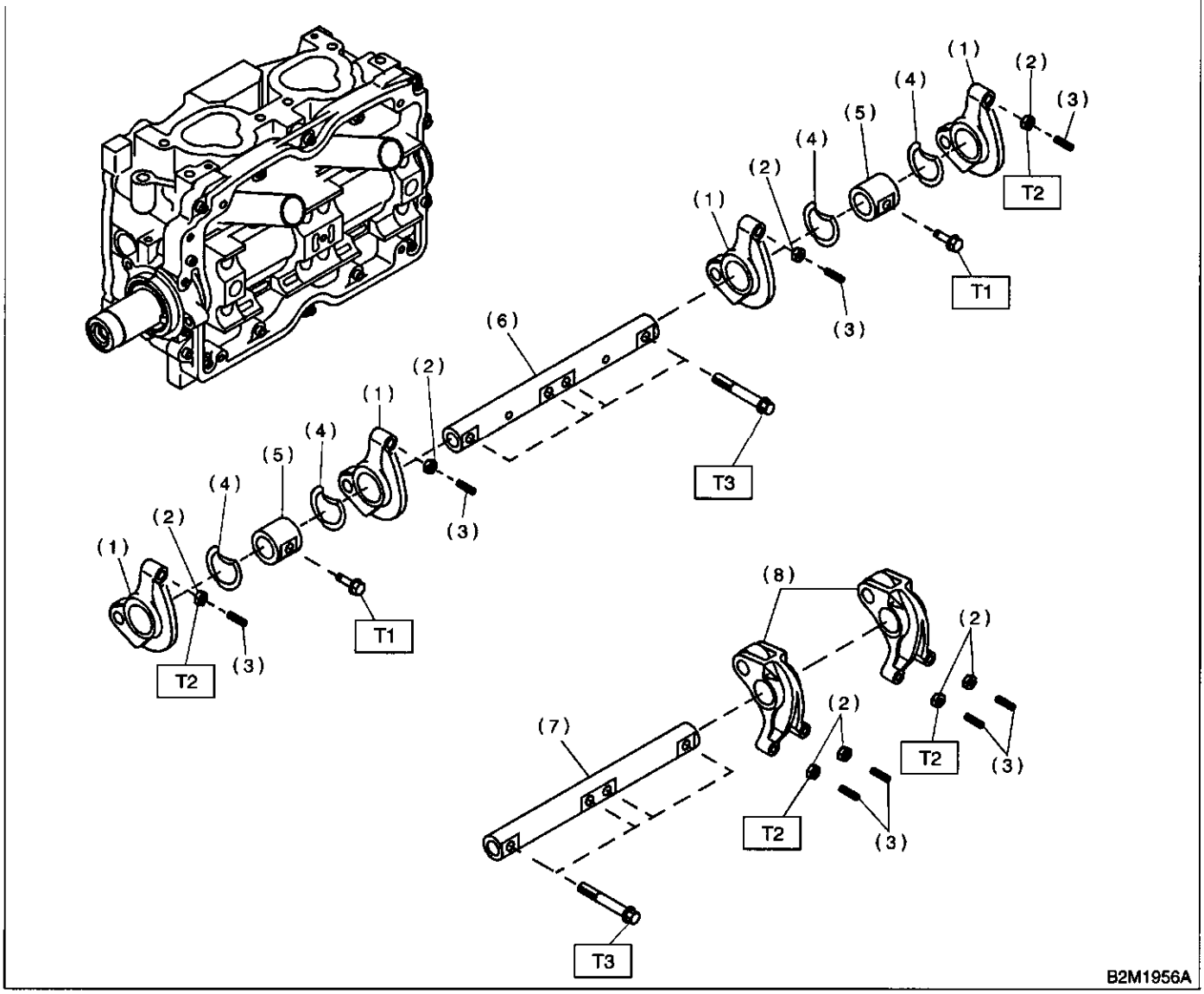
(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler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

Tightening torque: N·m (kgf-m, ft-lb)

T1: ***<Ref. to ME(SOHC)-61, INSTALLATION, Cylinder Head Assembly.>***

T2: ***5 (0.5, 3.6)***
T3: ***10 (1.0, 7.2)***
T4: ***18 (1.8, 13.0)***
T5: ***25 (2.5, 18.1)***
T6: ***6.4 (0.65, 4.7)***

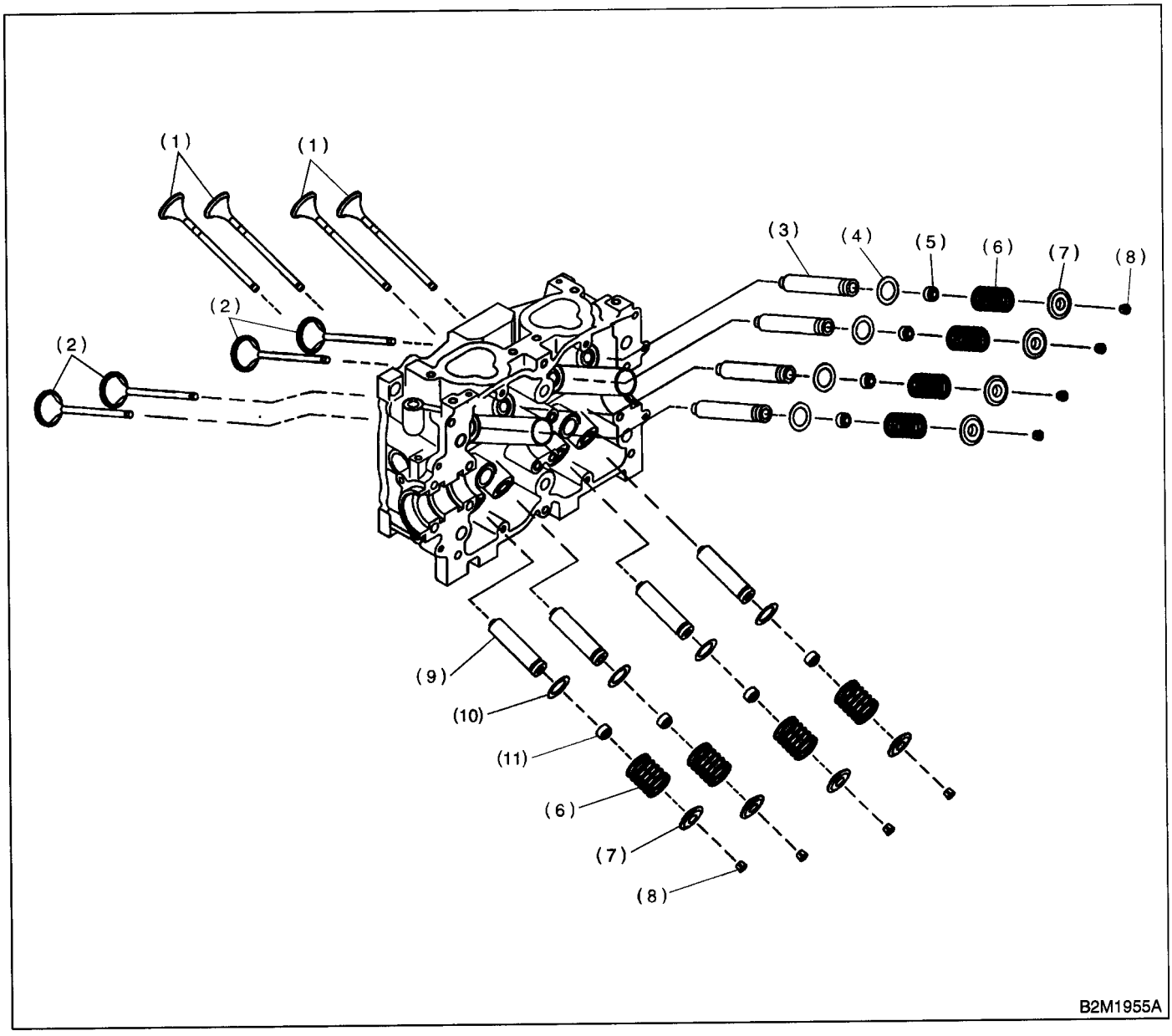
3. VALVE ROCKER ASSEMBLY



(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

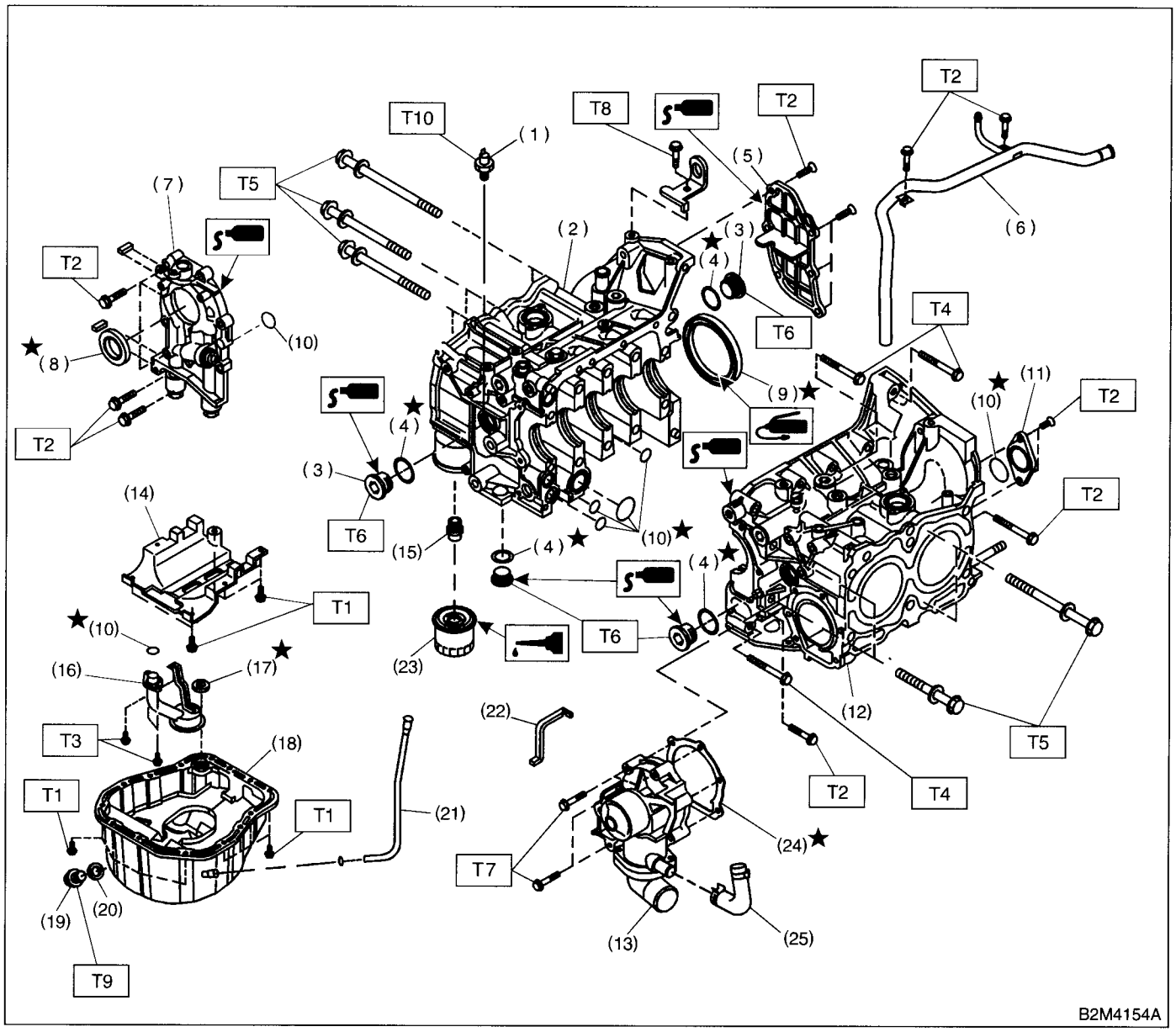
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)

4. 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

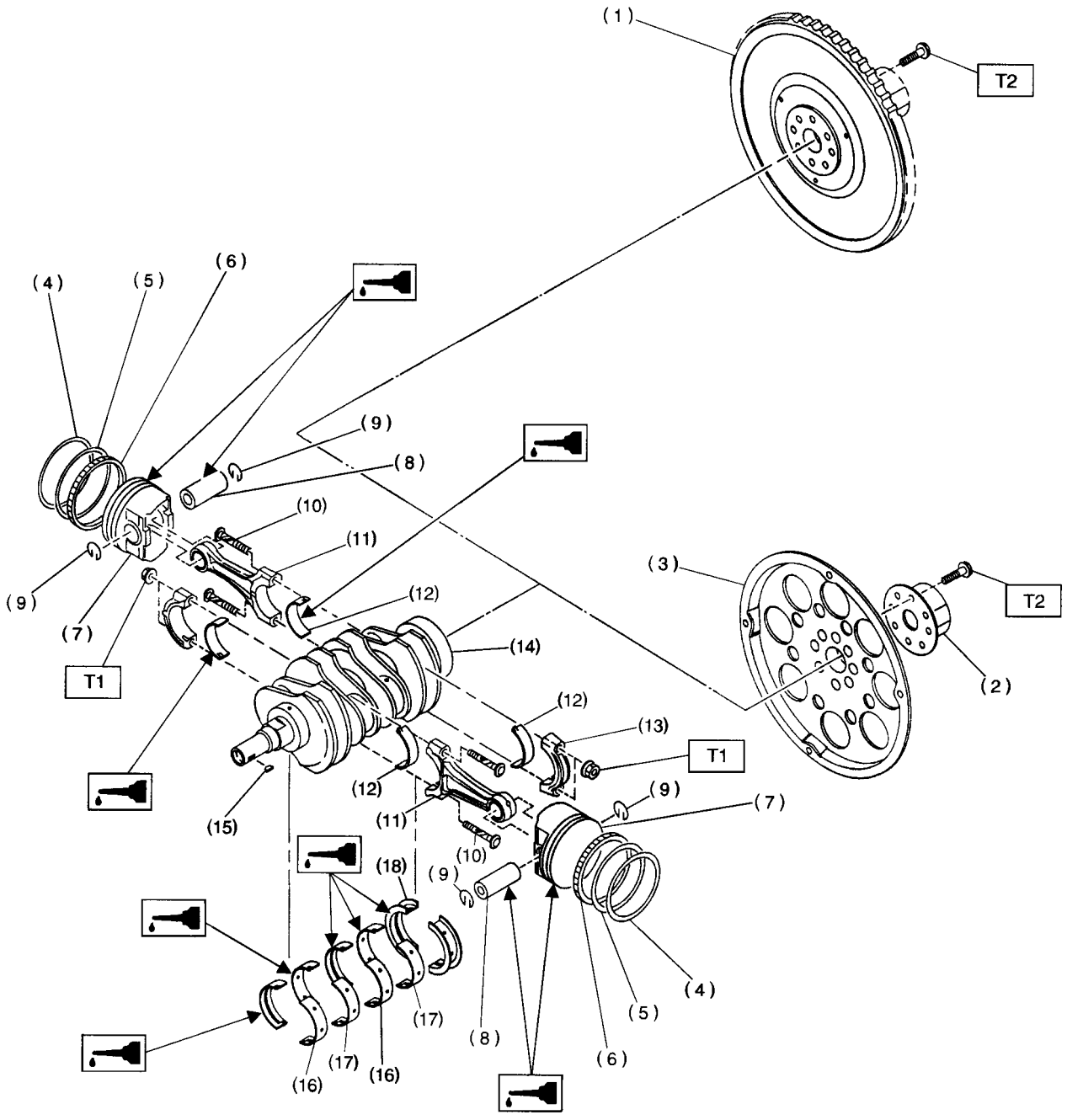
5. CYLINDER BLOCK



(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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 25 (2.5, 18.1)
T5: 47 (4.8, 34.7)
T6: 69 (7.0, 50.6)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)

6. CRANKSHAFT AND PISTON

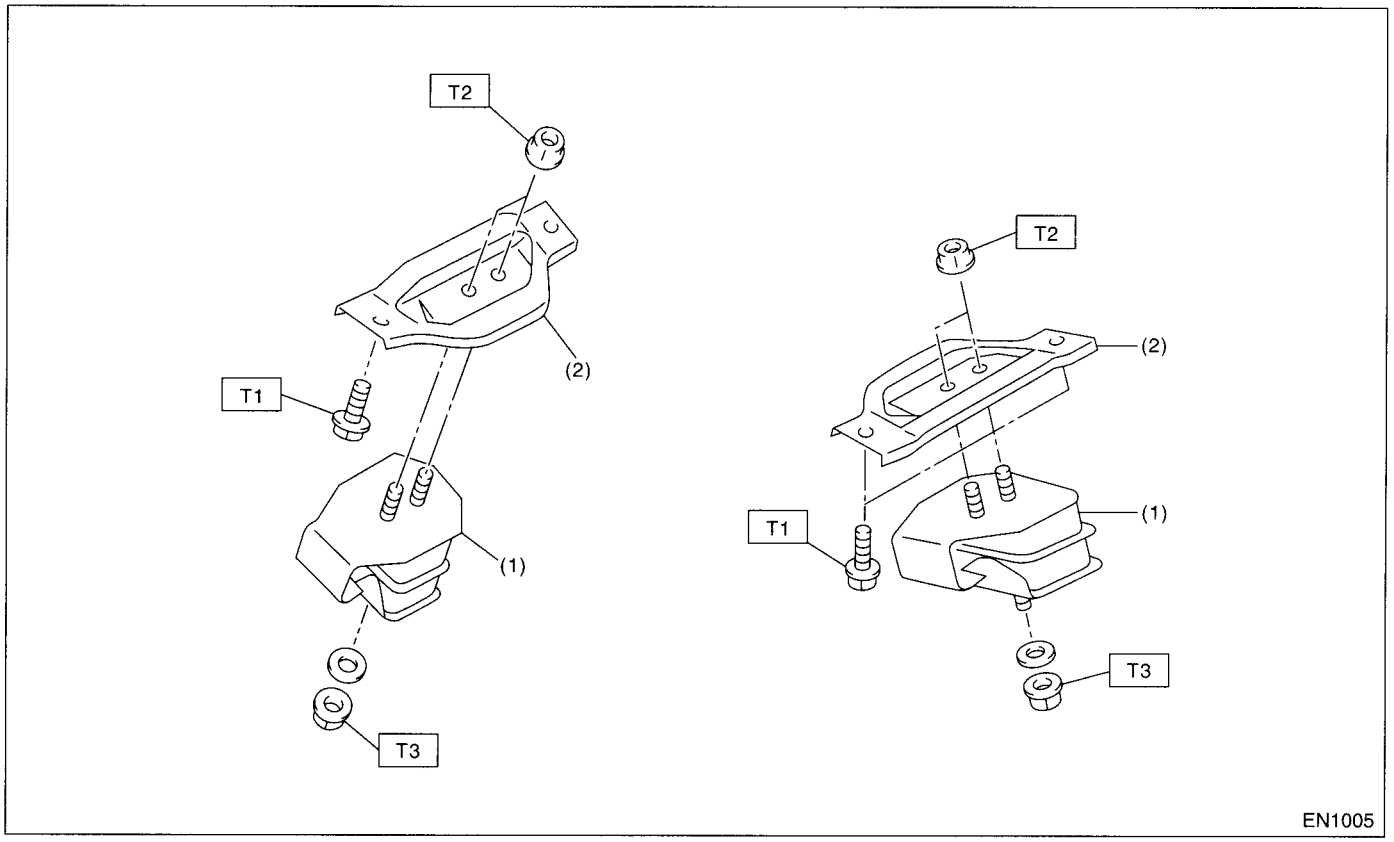


B2M3429A

(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 (kgf-m, ft-lb)	
T1:	*44.6 (4.55, 32.9)*
T2:	*72 (7.3, 52.8)*

7. ENGINE MOUNTING



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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- 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.

• Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.

• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

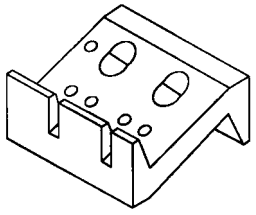
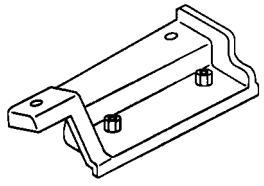
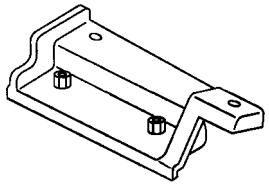
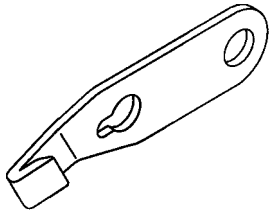
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3850	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 B2M3851	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 B2M3852	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 B2M3853	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

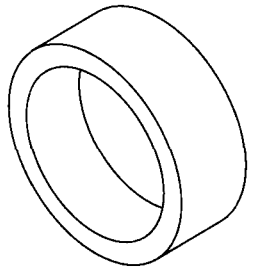
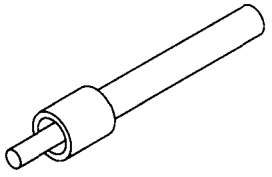
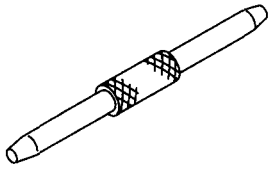
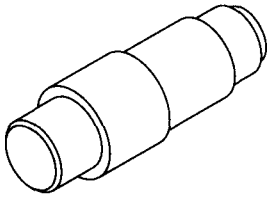
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3854	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2500 cc engine.
 B2M3855	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 B2M3856	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 B2M3857	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

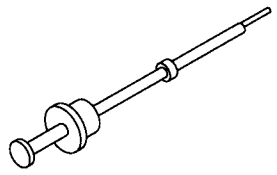
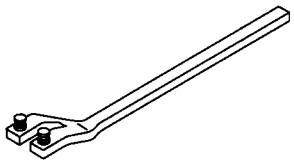
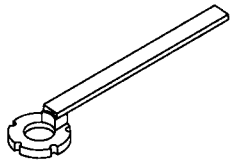
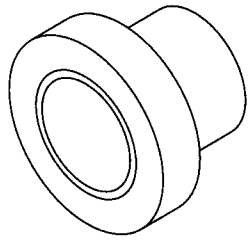
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3858	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 B2M3859	499207100	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (LH side)
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)
 B2M3860	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.

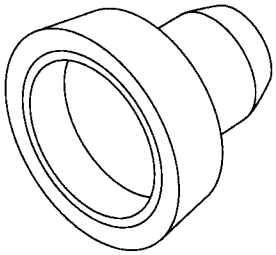
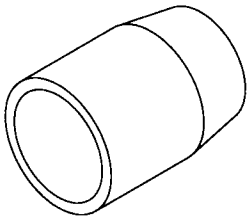
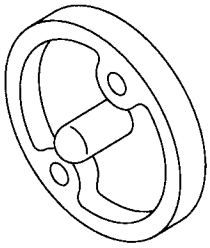
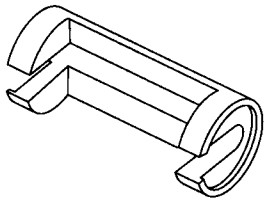
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3861	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 B2M3862	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587100).
 B2M3863	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 B2M3864	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

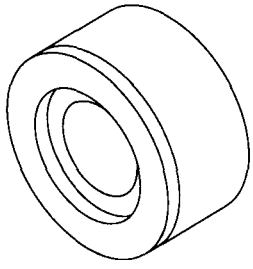
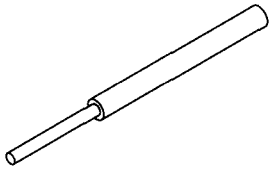
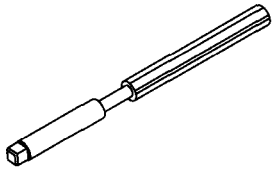
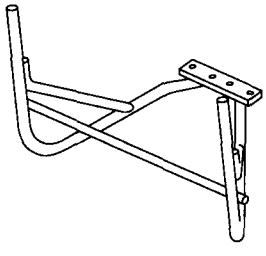
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3865	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 B2M3867	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 B2M3868	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 B2M3869	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

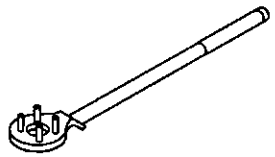
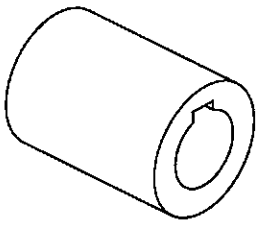
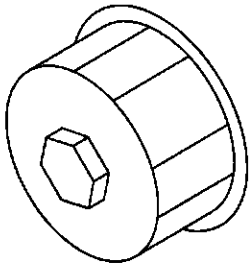
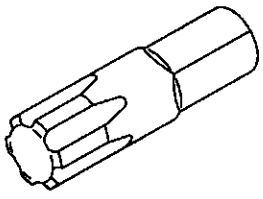
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3870	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 B2M3871	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter
 B2M3873	499497000	TORX PLUS	Used for removing and installing camshaft cap

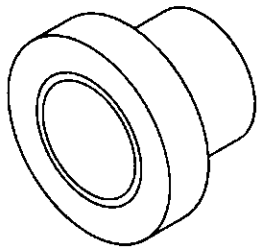
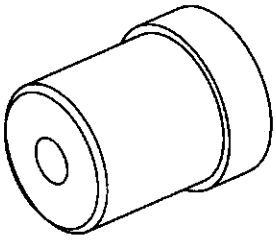
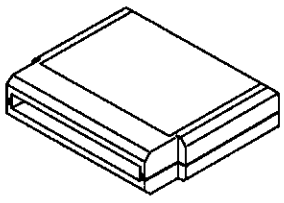
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3874	499587500	OIL SEAL INSTALLER	Used for installing front camshaft oil seal.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 B2M2043	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 B2M3876	24082AA150 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing Light	Used for measuring ignition timing.

E: PROCEDURE

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.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

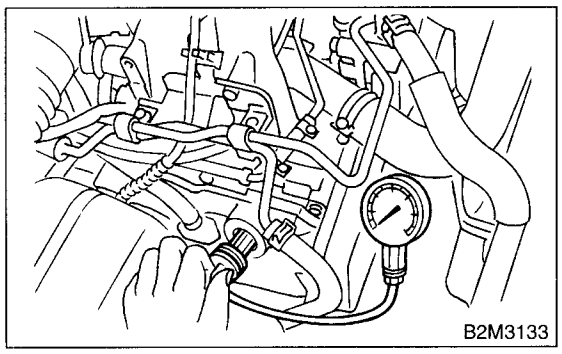
A: INSPECTION

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

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(SOHC)-4, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against the spark plug hole.

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

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



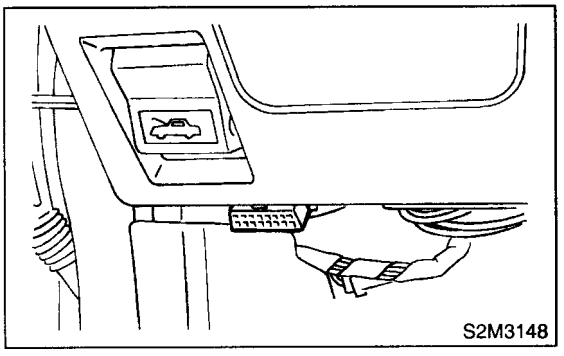
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

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

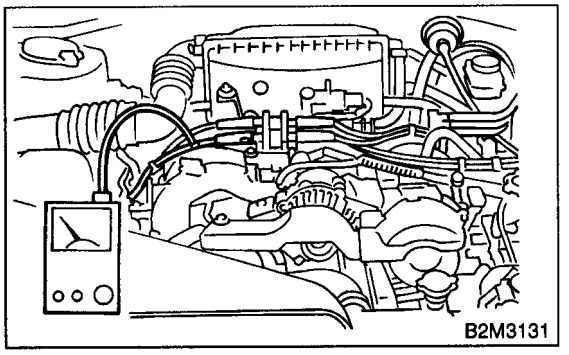
3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:
   (1) Ensure the 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 the malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) When using the SUBARU SELECT MONITOR: <Ref. to ME(SOHC)-15, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to the SUBARU SELECT MONITOR.
   (2) Connect the SUBARU SELECT MONITOR to the data link connector.


S2M3148

   (3) Turn the 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 Engine Control System Diagnosis.
   (7) Select {1.12 Data Display} in Data Display Menu.
   (8) Start the engine, and read engine idle speed.
5) When using the 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.


B2M3131

NOTE:
- When using the 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 the 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):
MT vehicle: 650±100 rpm
AT vehicle: 700±100 rpm

7) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the 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±100 rpm

CAUTION:
Never rotate the idle adjusting screw. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>

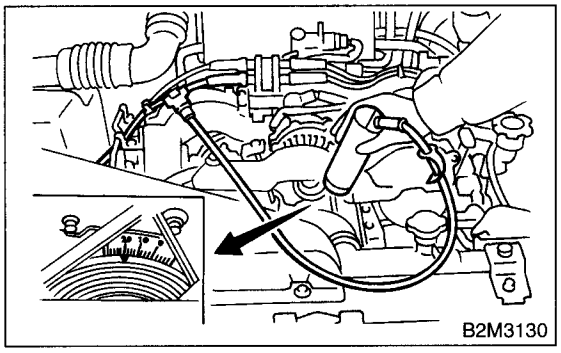
4. Ignition Timing

A: INSPECTION

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]:
MT vehicle: 10°±8°/650
AT vehicle: 15°±8°/700

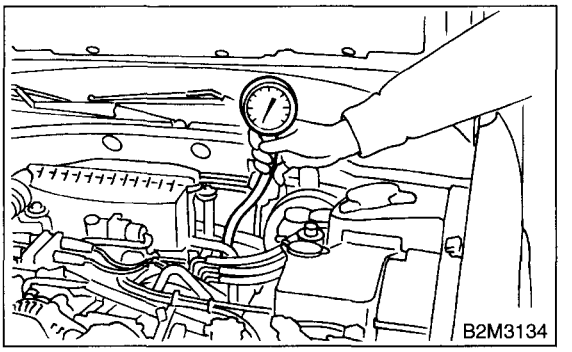


If the timing is not correct, check the ignition control system.
Refer to Engine Control System. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
3) Keep the engine at the idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



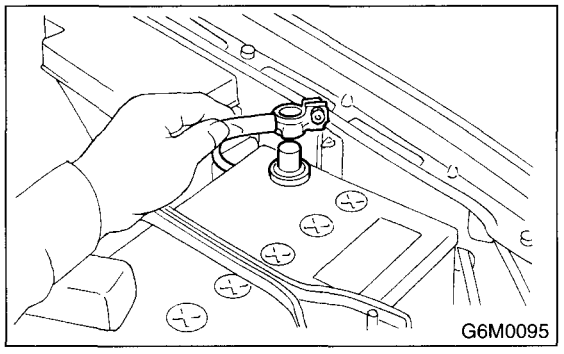
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 in-Hg)

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

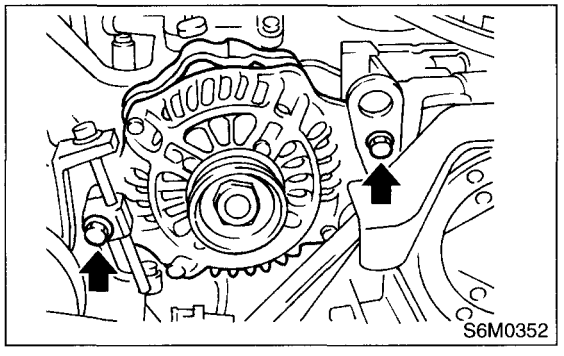
6. Engine Oil Pressure

A: INSPECTION

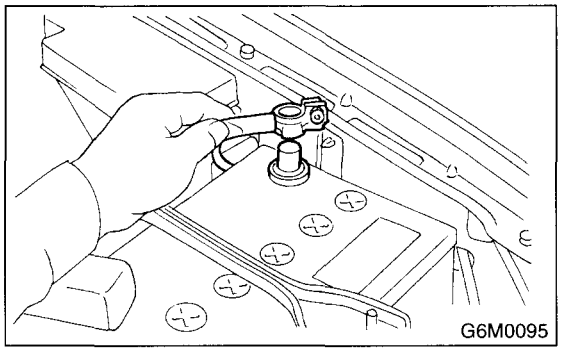
1) Disconnect the ground terminal from battery.



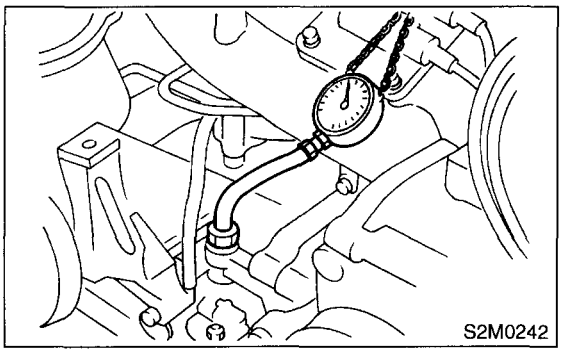
2) Remove the generator from bracket.
   (1) Loosen the lock bolt and slider bolt, and remove the front side V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
   (2) Remove the generator lock bolt.
   (3) Remove the bolt which installs the generator on bracket.



3) Disconnect the connector from oil pressure switch.
4) Remove the oil pressure switch from engine cylinder block. <Ref. to LU-22, REMOVAL, Oil Pressure Switch.>
5) Connect the oil pressure gauge hose to cylinder block.
6) Connect the battery ground terminal to battery.



7) Start the engine, and measure oil pressure.



Oil pressure:
98 kPa (1.0 kgf/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU-28, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU-28, INSPECTION, Engine Lubrication System Trouble in General.>

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

8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU-23, INSTALLATION, Oil Pressure Switch.>

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

9) Install the generator and V-belt in the reverse order of removal, and adjust the V-belt deflection. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

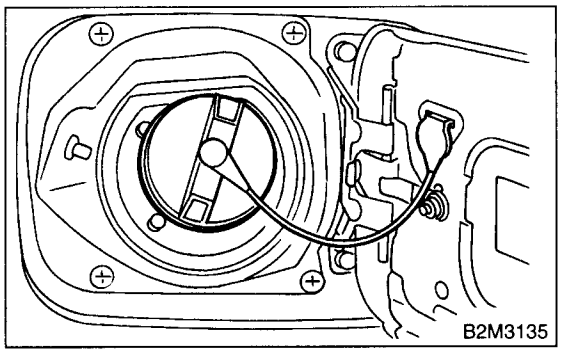
7. Fuel Pressure

A: INSPECTION

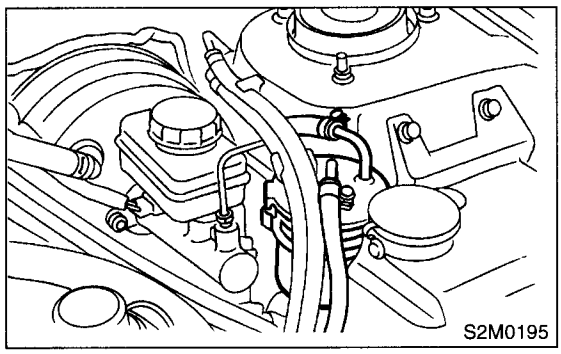
WARNING:
Before removing the fuel pressure gauge, release the fuel pressure.

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

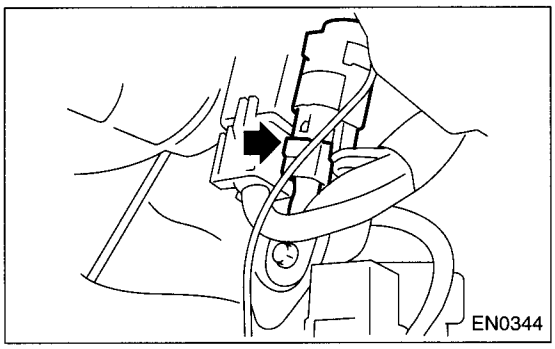
1) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.


B2M3135

3) Disconnect the fuel delivery hoses from fuel filter, and connect the fuel pressure gauge.

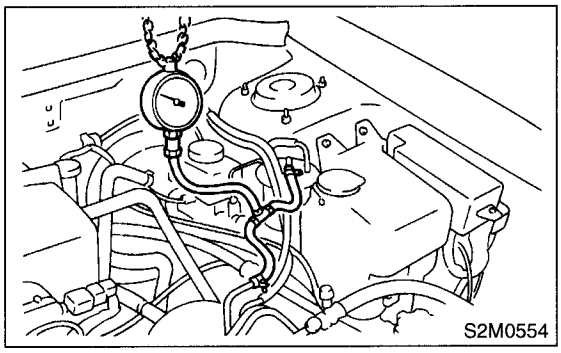

S2M0195

4) Connect the connector of fuel pump relay.


EN0344

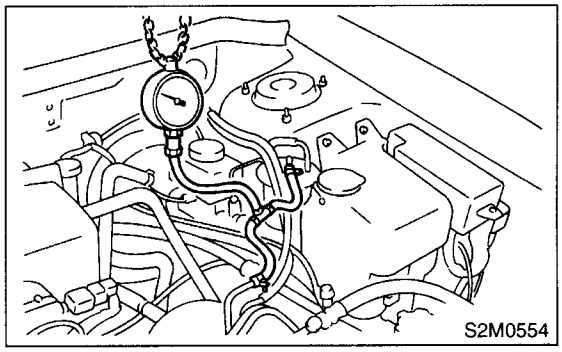
5) Start the engine.
6) Measure fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

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


S2M0554

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

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


S2M0554

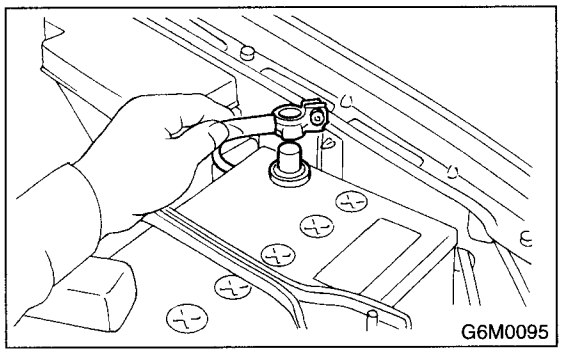
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

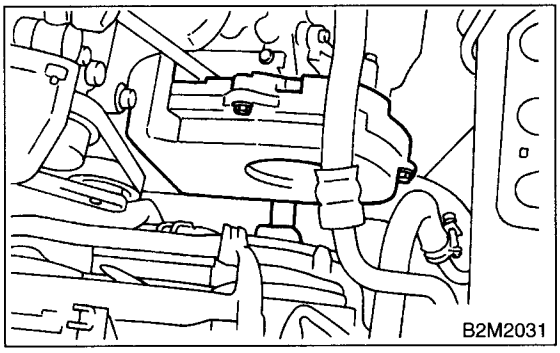
A: INSPECTION

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

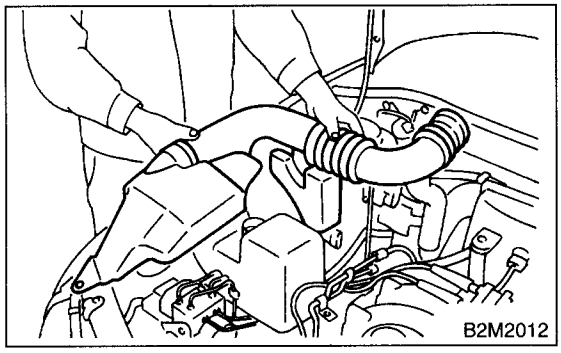
1) Set the vehicle onto the lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the ground terminal from battery.



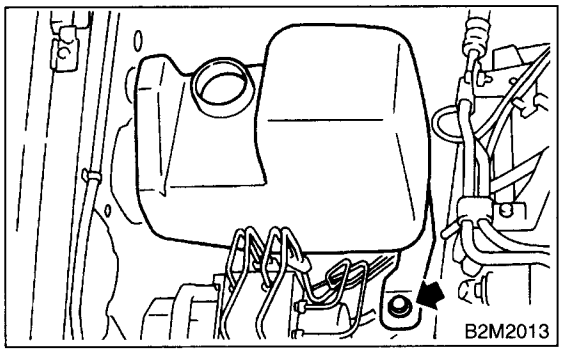
5) Lower the vehicle.
6) Remove the timing belt cover (LH).



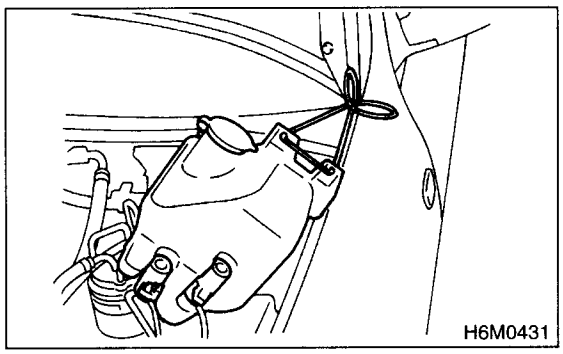
7) When inspecting #1 and #3 cylinders:
   (1) Remove the air intake duct as a unit.



   (2) Rmove the resonator chamber.



   (3) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(SOHC)-4, RH SIDE, REMOVAL, Spark Plug.>
   (4) Disconnect the PCV hose from rocker cover (RH).
   (5) Remove the bolts, then remove the rocker cover (RH).
8) When inspecting #2 and #4 cylinders:
   (1) Remove the battery and battery carrier.
   (2) Disconnect the window washer motor connectors.
   (3) Remove the two bolts which hold washer tank, then secure the tank away from working area.

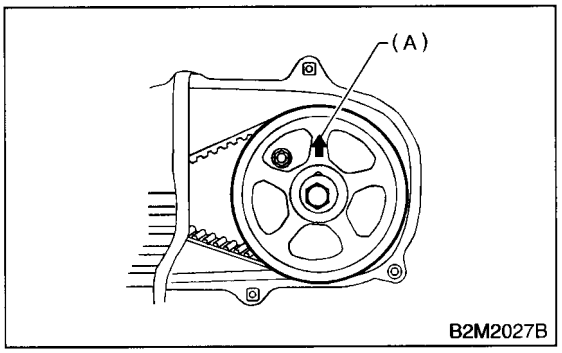


   (4) Disconnect the spark plug cords from spark plugs (LH Side) <Ref. to IG(SOHC)-4, LH SIDE, REMOVAL, Spark Plug.>
   (5) Disconnect the PCV hose from rocker cover (LH).
   (6) Remove the bolts, then remove the rocker cover (LH).

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

ST 499977100 CRANKSHAFT PULLEY WRENCH

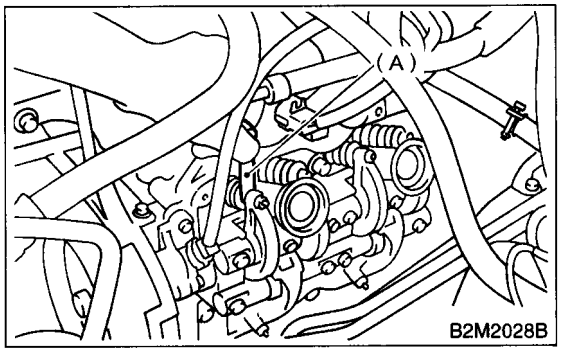
NOTE:
When the arrow mark (A) on camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



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

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

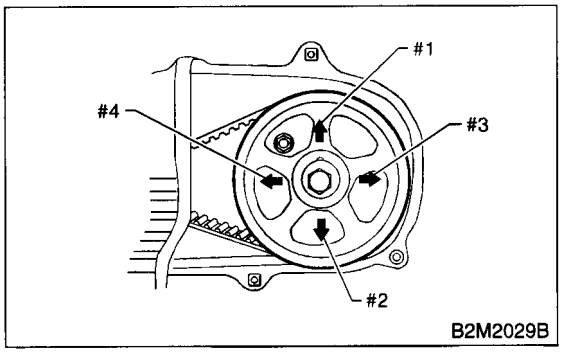
Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



11) If necessary, adjust the valve clearance. <Ref. to ME(SOHC)-31, ADJUSTMENT, Valve Clearance.>

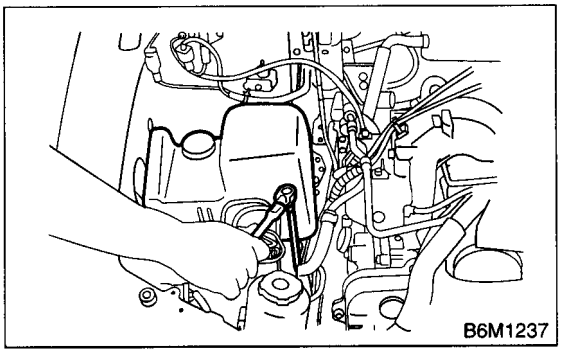
12) Similar to measurement procedures used for #1 cylinder, measure #2, #3 and #4 cylinder valve clearances.

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



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

Tightening torque:
Resonator chamber;
33 N·m (3.4 kgf-m, 24 ft-lb)



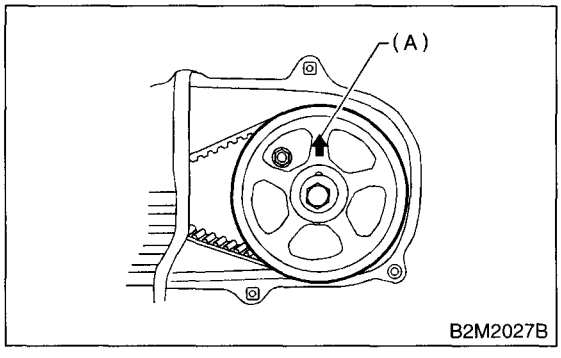
B: ADJUSTMENT

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 the crankshaft pulley clockwise using ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

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

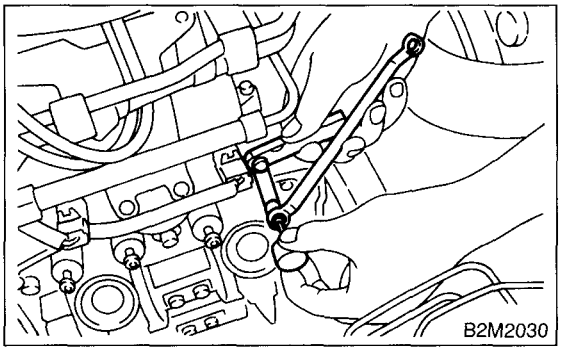


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting the valve clearance, tighten the valve rocker adjust screw.
(4) When the specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

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

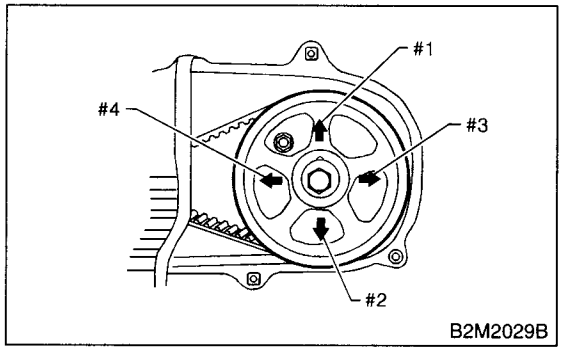
Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



3) Ensure the valve clearances are within specifications.
4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to top dead center on compression stroke.
5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.

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

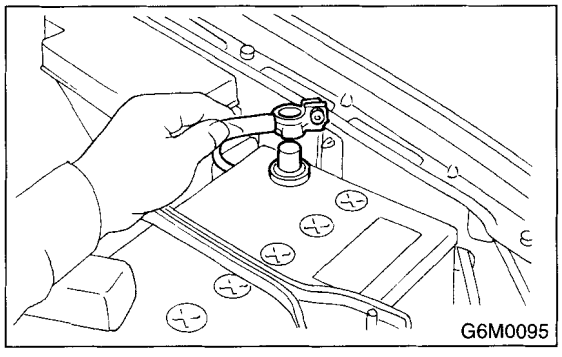
NOTE:
- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
- To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark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



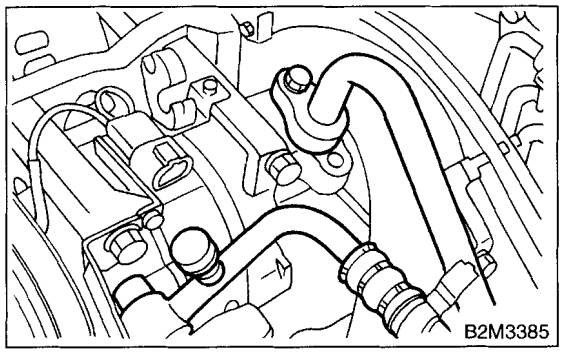
9. Engine Assembly

A: REMOVAL

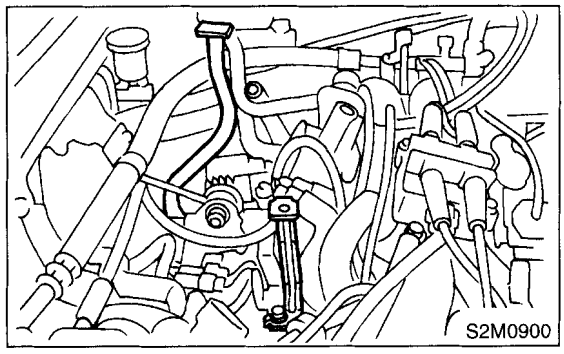
1) Set the vehicle on lift arms.
2) Open the front hood fully and support with stay.
3) Release the fuel pressure. <Ref. to FU(SOHC)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove the filler cap.
5) Disconnect the battery ground terminal.



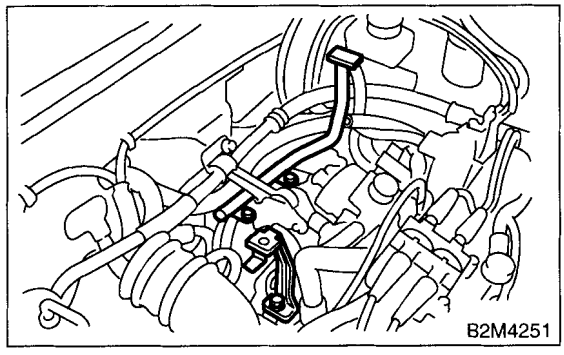
6) Remove the air intake duct and air cleaner case. <Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
7) Remove the under cover.
8) Remove the radiator from vehicle. <Ref. to CO-37, REMOVAL, Radiator.>
9) Remove ATF cooler pipe from cylinder head. <Ref. to AT-47, REMOVAL, ATF Cooler Pipe and Hose.>
10) Collect refrigerant, and remove the pressure hoses. (With A/C)
   (1) Place and connect the attachment hose to the refrigerant recycle system.
   (2) Collect the refrigerant from A/C system.
   (3) Disconnect the A/C pressure hoses from A/C compressor.



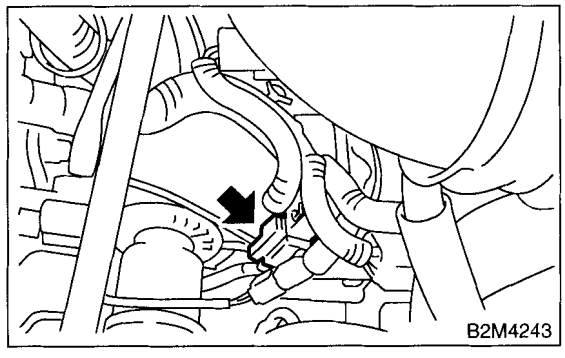
11) Remove the air cleaner case stay.
- **MT model**



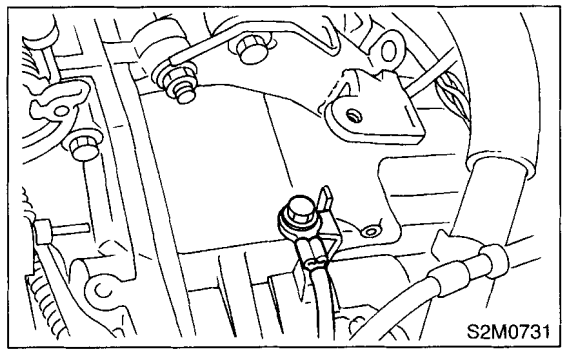
- **AT model**



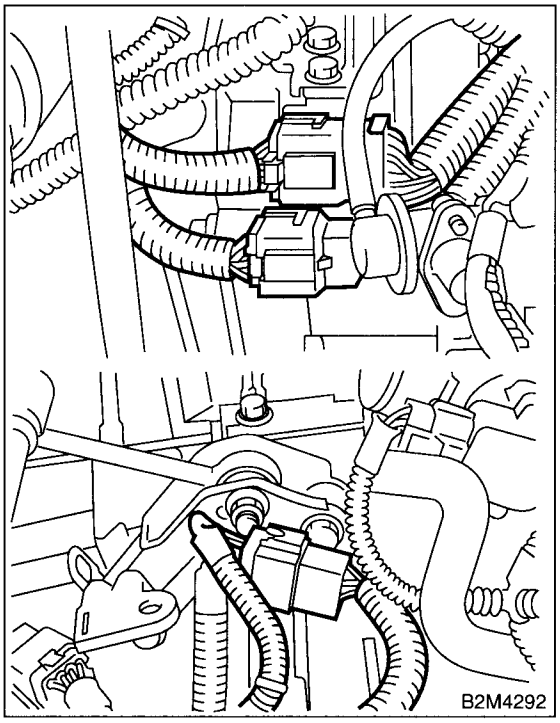
12) Disconnect the following connectors and cables.
   (1) Front oxygen (A/F) sensor connector



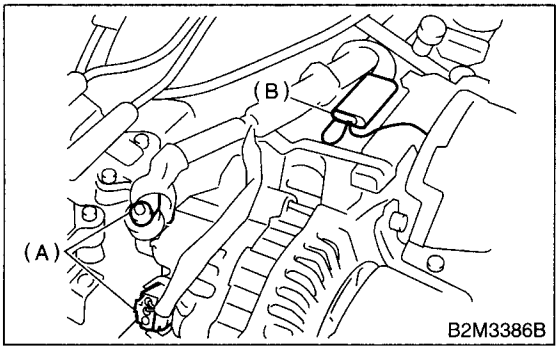
   (2) Engine ground terminal



(3) Engine harness connectors

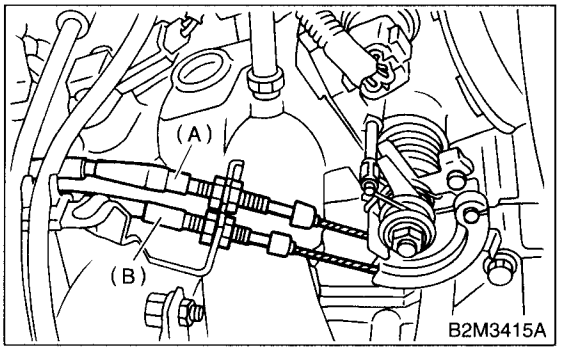


(4) Generator connector, terminal and A/C compressor connector



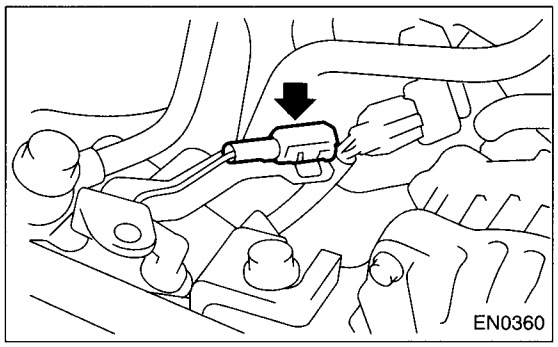
(A) Generator connector and terminal
(B) A/C compressor connector

(5) Accelerator cable and cruise control cable

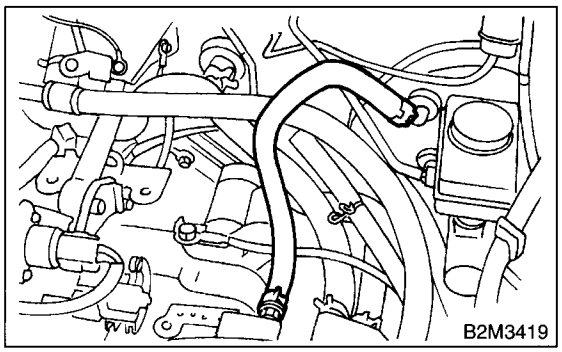


(A) Accelerator cable
(B) Cruise control cable

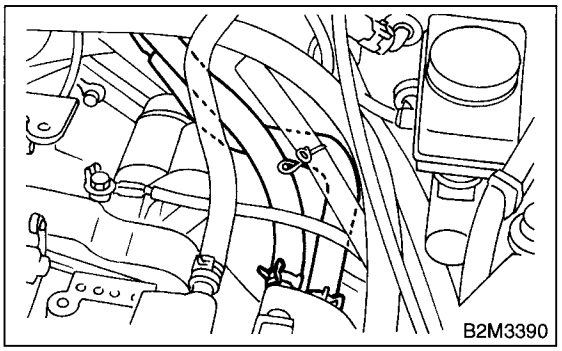
(6) Pressure switch



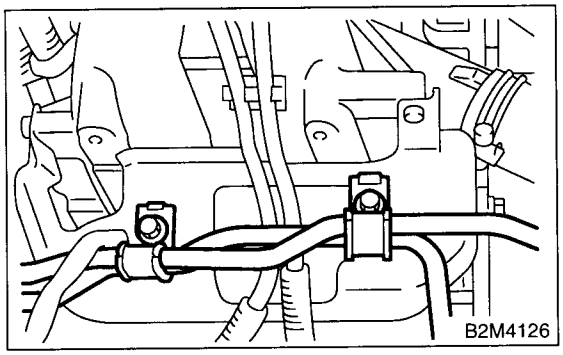
13) Disconnect the following hoses.
(1) Brake booster vacuum hose



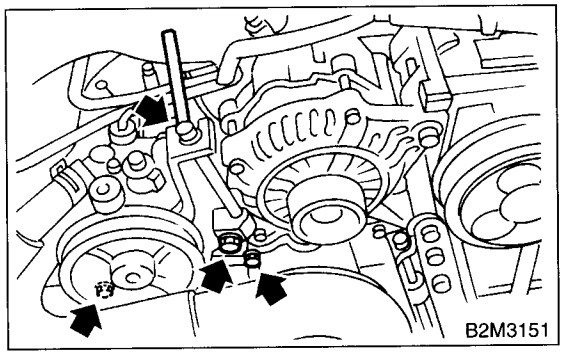
(2) Heater inlet outlet hose



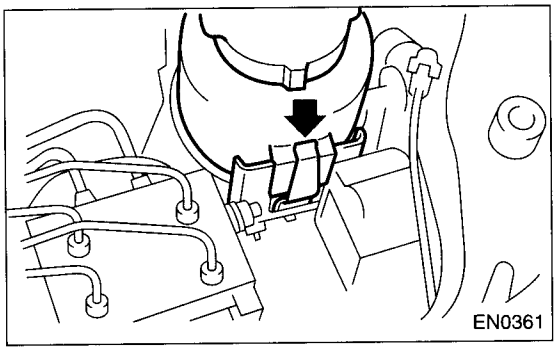
14) Remove the power steering pump from bracket.
(1) Remove the resonator chamber.
(2) Loosen the lock bolt and slider bolt, and remove the front side V-belt.<Ref. to ME(SOHC)-43, FRONT SIDE BELT, REMOVAL, V-belt.>
(3) Remove the pipe with bracket.


B2M4126

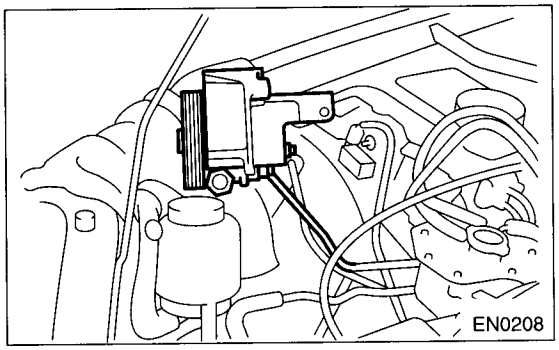
(4) Remove the bolts which install the power steering pump bracket.


B2M3151

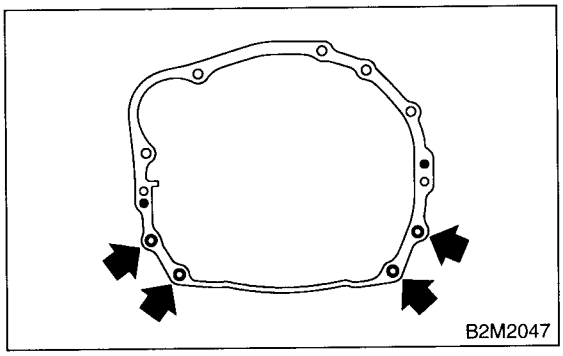
(5) Remove the power steering tank from the bracket by pulling it upward.


EN0361

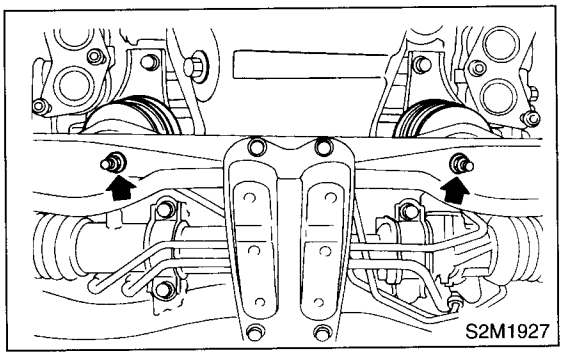
(6) Place the power steering pump on the right side wheel apron.


EN0208

15) Remove the front and center exhaust pipe.
<Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
16) Remove the nuts which hold lower side of transmission to engine.

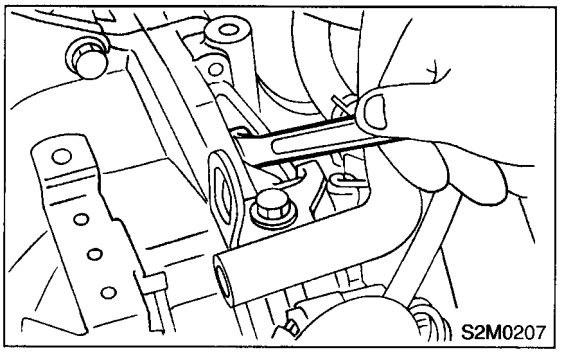

B2M2047

17) Remove the nuts which install the front cushion rubber onto front crossmember.

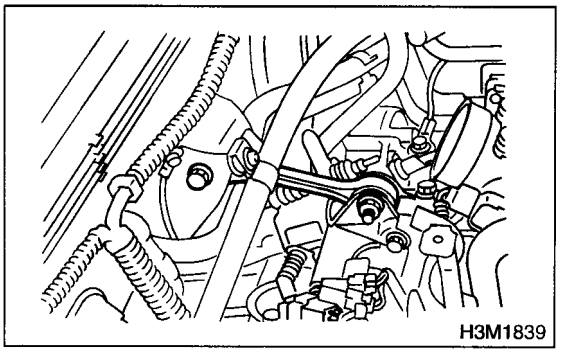

S2M1927

18) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove the other bolts while rotating the engine using ST.

ST 499977100 CRANK PULLEY WRENCH

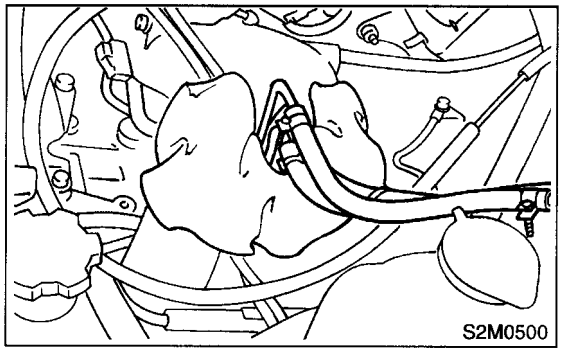


19) Remove the pitching stopper.

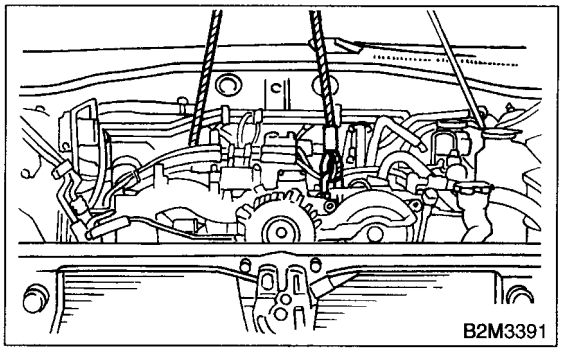


20) Disconnect the fuel delivery hose, return hose and evaporation hose.

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

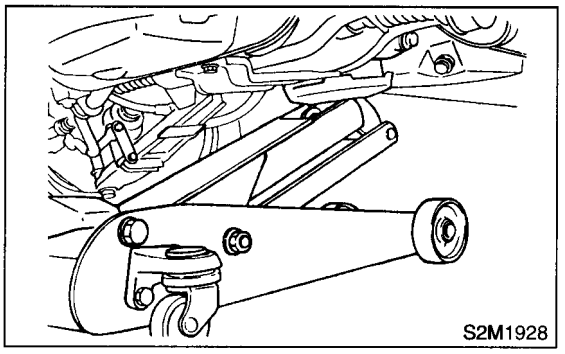


21) Support the engine with a lifting device and wire ropes.

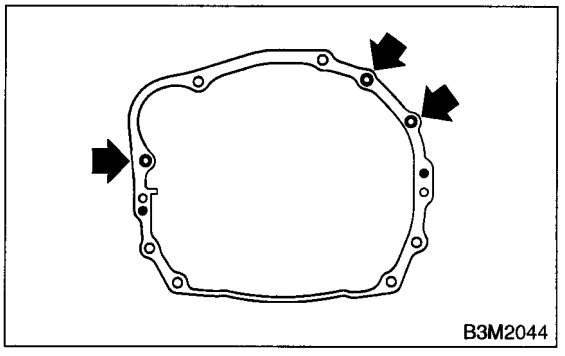


22) Support the transmission with a garage jack.

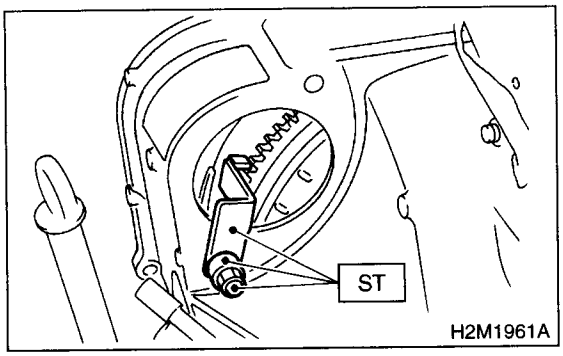
CAUTION:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



23) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.

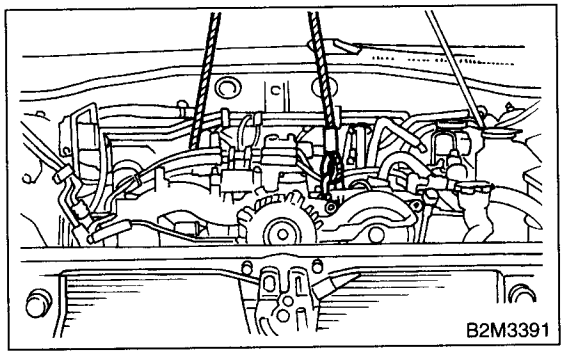


24) Install the ST to torque converter clutch case. (AT model)
ST 498277200 STOPPER SET



25) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

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



26) Remove the front cushion rubbers.

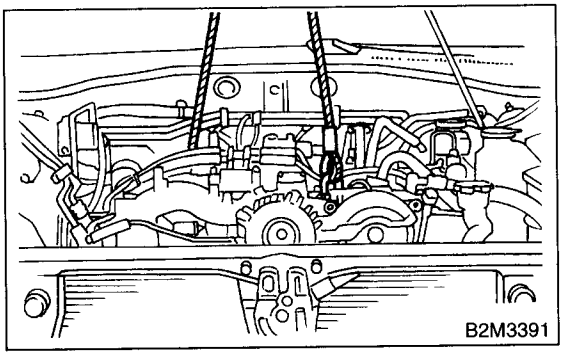
B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

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

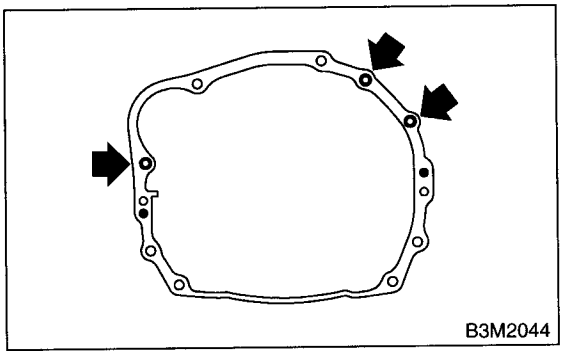
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



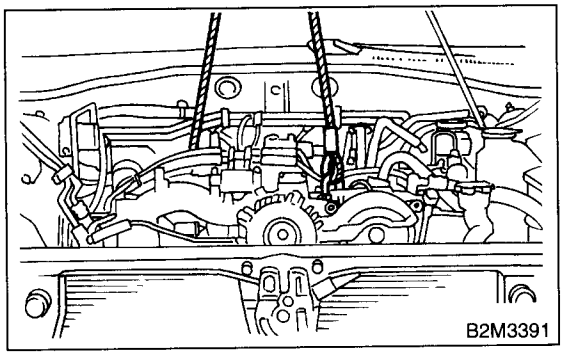
(2) Apply a small amount of grease to spline of main shaft. (MT model)

3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



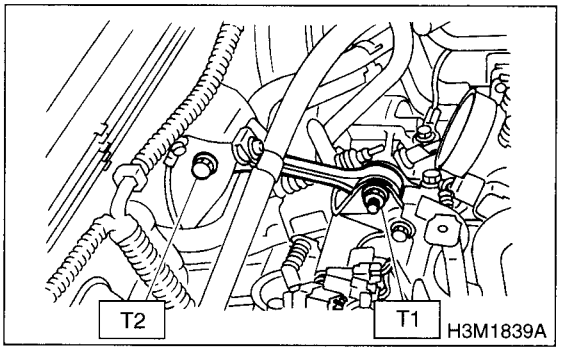
4) Remove the lifting device and wire ropes.



5) Remove the garage jack.

6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



7) Remove the ST from torque converter clutch case. (AT model)

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

ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC-7, INSTALLATION, Starter.>

9) Install the torque converter clutch onto drive plate. (AT model)

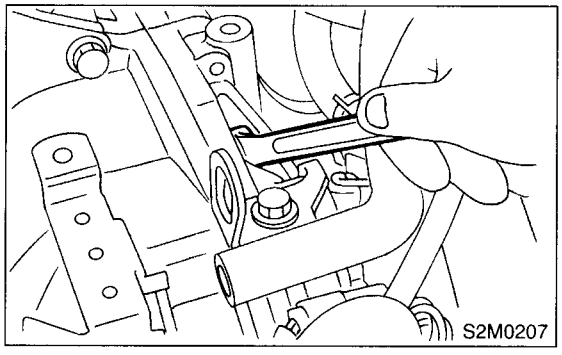
(1) Tighten the bolts which hold torque converter clutch to drive plate.

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

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

ST 499977100 CRANK PULLEY WRENCH

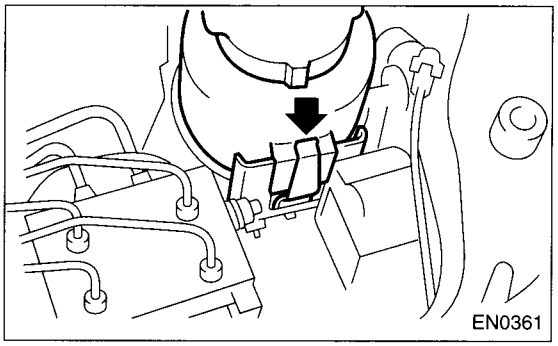
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Clog the service hole with plug.

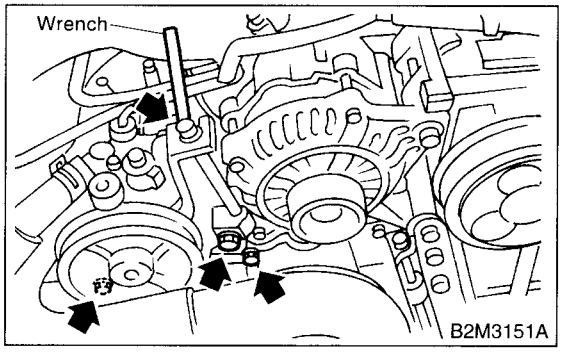
10) Install the power steering pump on bracket.

(1) Install the power steering tank on bracket.

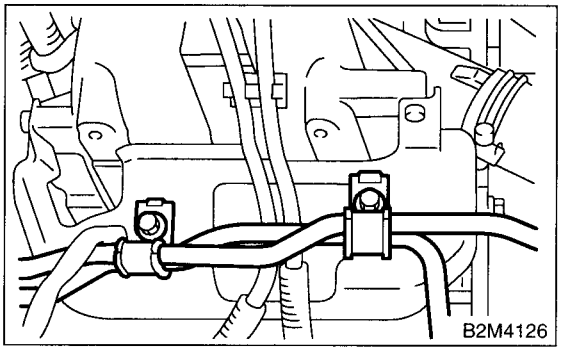


(2) Install the power steering pump on bracket, and tighten the bolts.

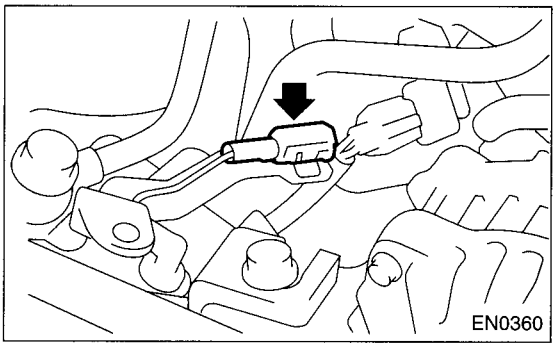
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten the bolt which installs the power steering pump bracket, and install the spark plug codes.

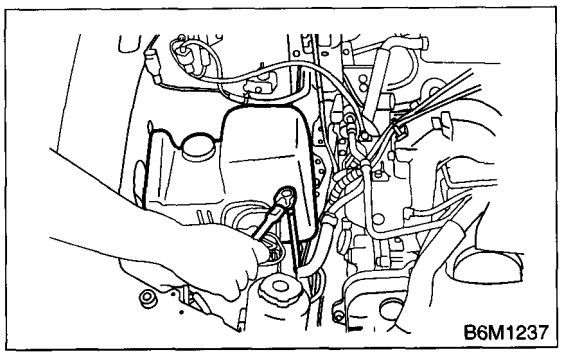


(4) Connect the power steering switch connector.



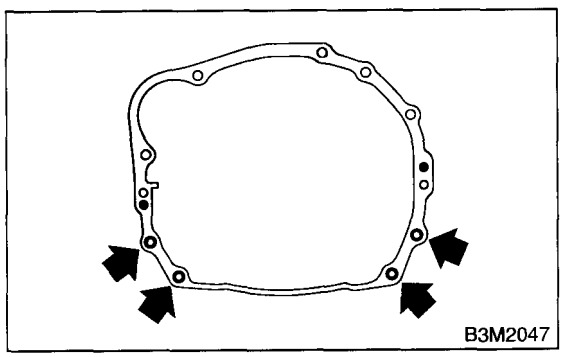
(5) Install the front side V-belt, and adjust it. <Ref. to ME(SOHC)-43, FRONT SIDE BELT, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



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

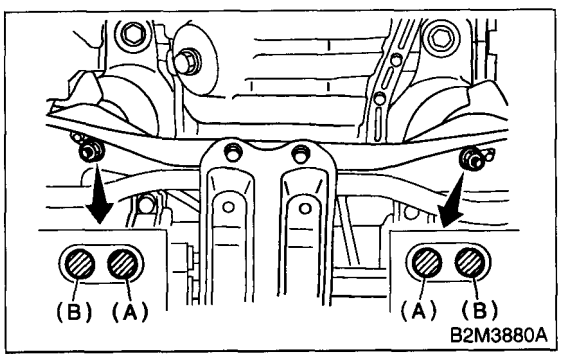
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

CAUTION:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install the front and center exhaust pipe. <Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>
14) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors:
(1) Engine ground terminals

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
(5) Power steering pressure switch
16) Connect the following cables:
(1) Accelerator cable
(2) Cruise control cables (With cruise control)

CAUTION:
After connecting each cable, adjust them.

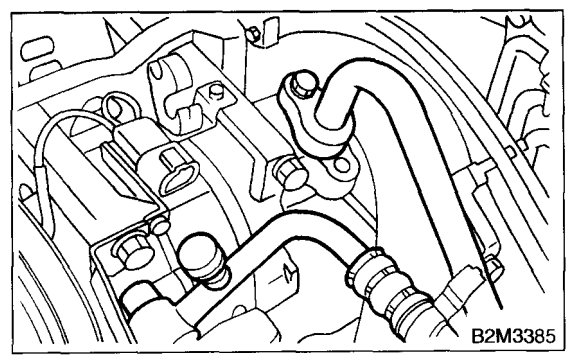
17) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

18) Install the A/C pressure hoses. <Ref. to AC-30, INSTALLATION, Hose and Tube.>

CAUTION:
Use new O-rings.

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



19) Install the radiator to vehicle. <Ref. to CO-41, INSTALLATION, Radiator.>
20) Install the ATF cooler pipe. <Ref. to AT-49, INSTALLATION, ATF Cooler Pipe and Hose.>.
21) Install the under cover.
22) Install the battery in the vehicle, and connect cables.

23) Fill coolant.
<Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
24) Check the ATF level and correct if necessary. (AT model)
<Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>
25) Charge the A/C system with refrigerant.
<Ref. to AC-17, OPERATION, Refrigerant Charging Procedure.>
26) Install the air intake duct and air cleaner case.
<Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.>
27) Remove the front hood stay, and close the front hood.
28) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(SOHC)-33, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

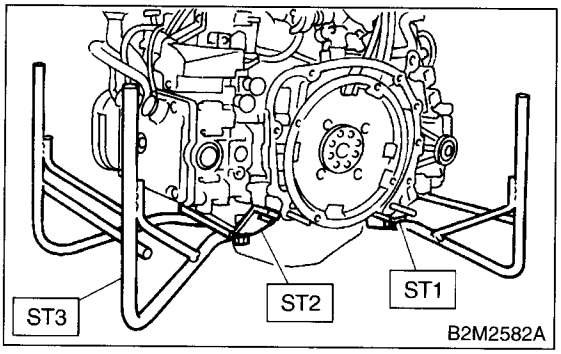
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from the body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself 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.

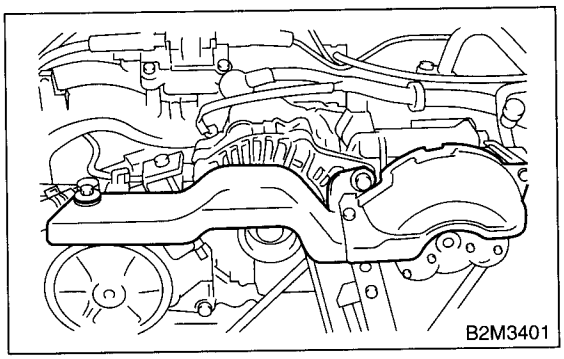
12.V-belt

A: REMOVAL

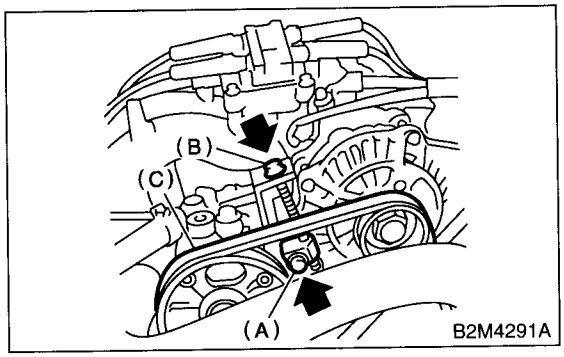
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to the body.

1) Remove the V-belt cover.

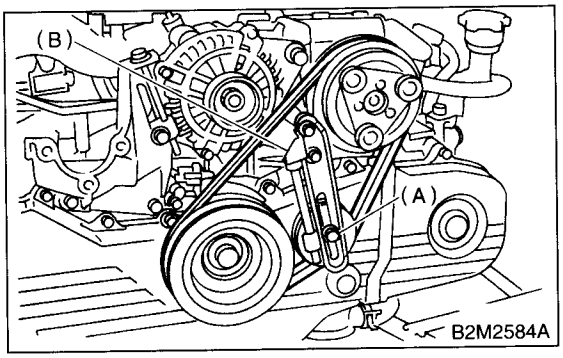


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

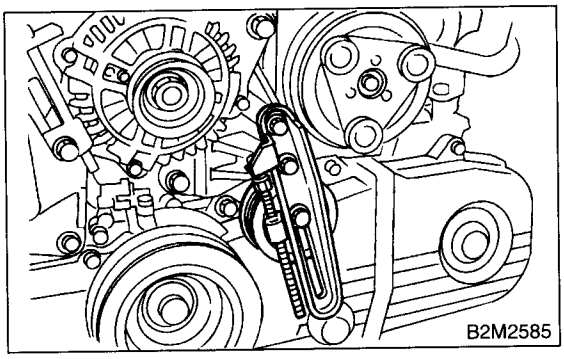


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



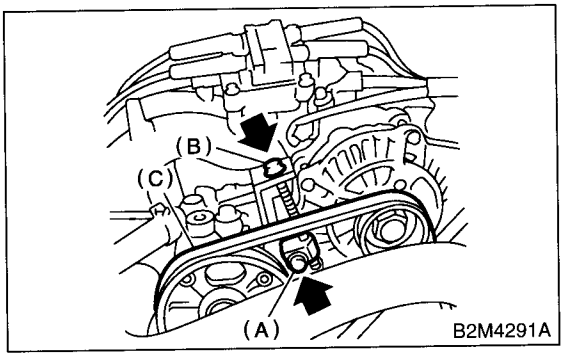
B: INSTALLATION

1. FRONT SIDE BELT

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

1) Install a belt, and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(SOHC)-44, INSPECTION, V-belt.>
2) Tighten the lock bolt (A)
3) Tighten the slider bolt (B).

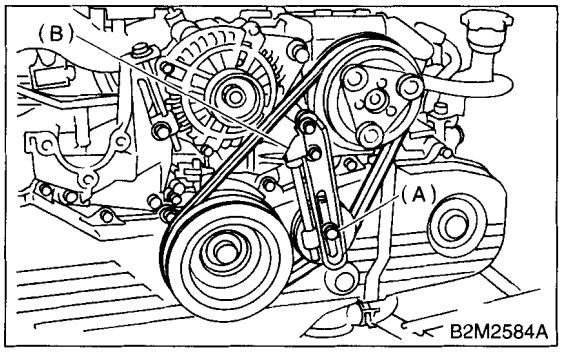
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)



2. REAR SIDE BELT

1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(SOHC)-44, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

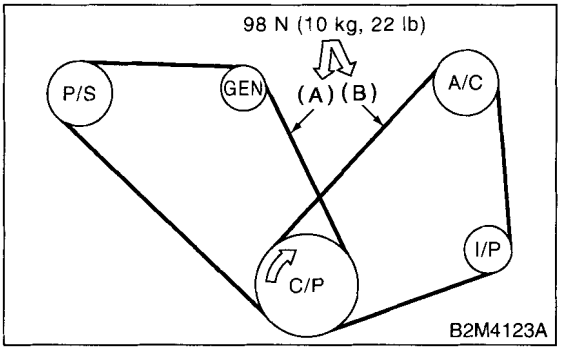
Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: With Air conditioner***

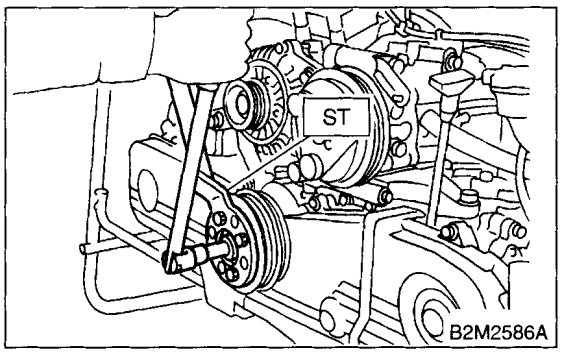


C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock crankshaft, use ST.
ST 499977100
CRANKSHAFT PULLEY WRENCH

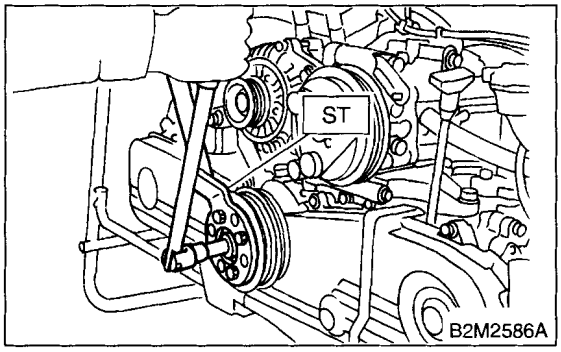


3) Remove the crankshaft pulley.

B: INSTALLATION

1) Install the crankshaft pulley.
2) Install the pulley bolt.
To lock the 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 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
177 N·m (18 kgf-m, 130.2 ft-lb)



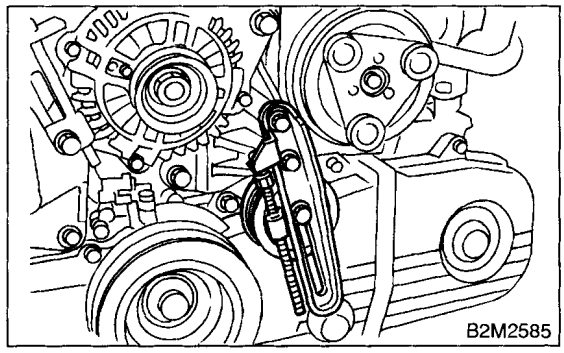
3) Confirm that the tightening angle of the crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4):
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

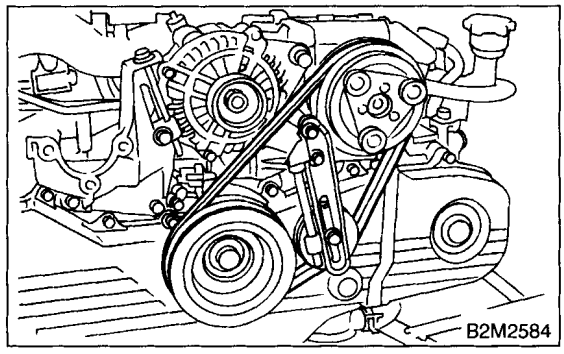
(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

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

4) Install the A/C belt tensioner.



5) Install the A/C belt.



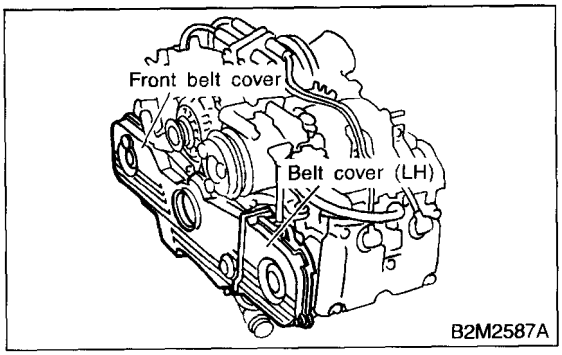
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(SOHC)-44, INSPECTION, V-belt.>

14.Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover (LH).
4) Remove the front belt cover.



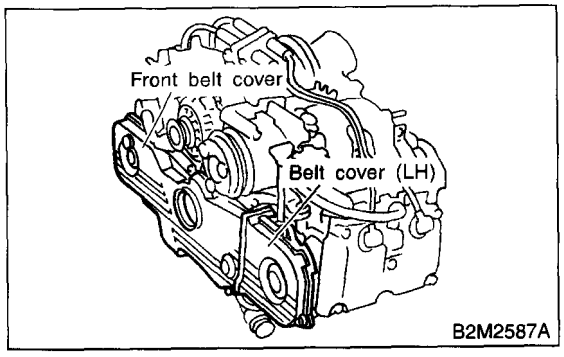
B: INSTALLATION

1) Install the front belt cover.

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

2) Install the belt cover (LH).

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



3) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
4) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

C: INSPECTION

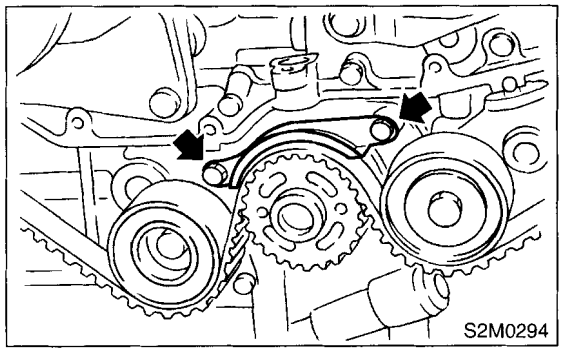
Make sure the cover is not damaged.

15.Timing Belt Assembly

A: REMOVAL

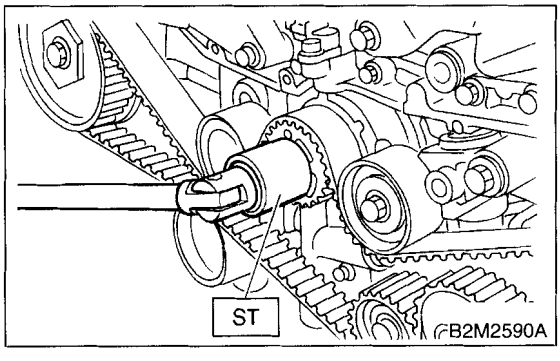
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt guide. (MT vehicle only)

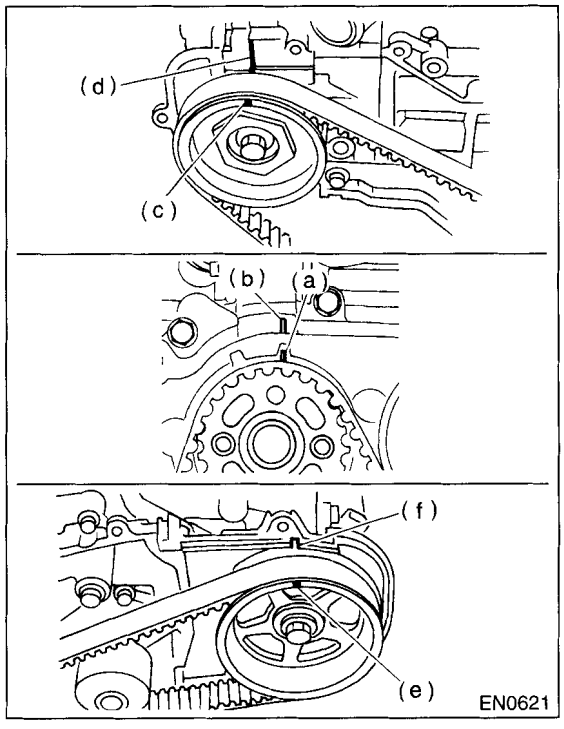

S2M0294

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

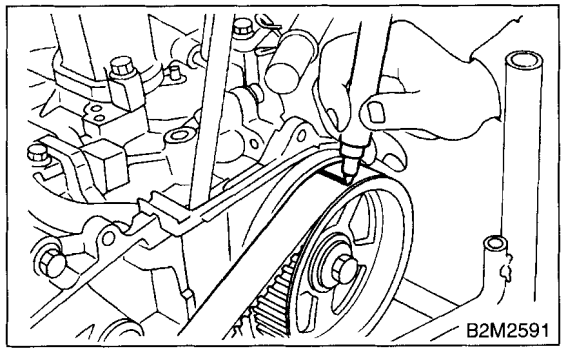


B2M2590A

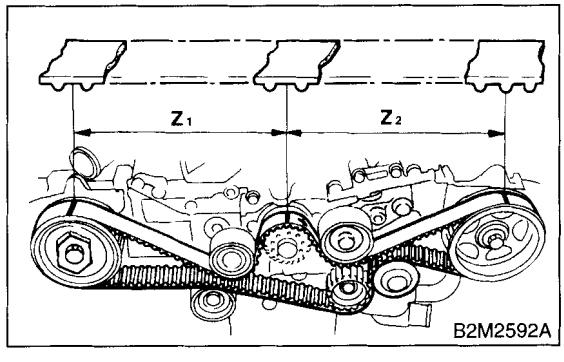


EN0621

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


B2M2591

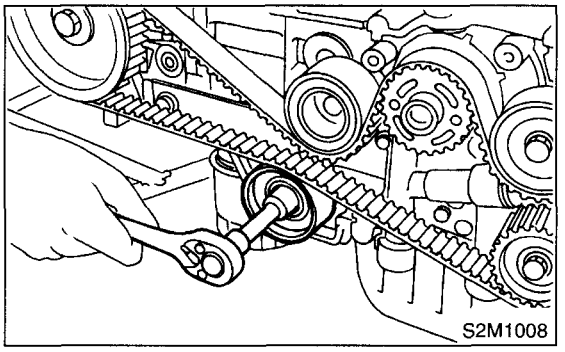
Specified data:
Z_1: 44 tooth length
Z_2: 40.5 tooth length



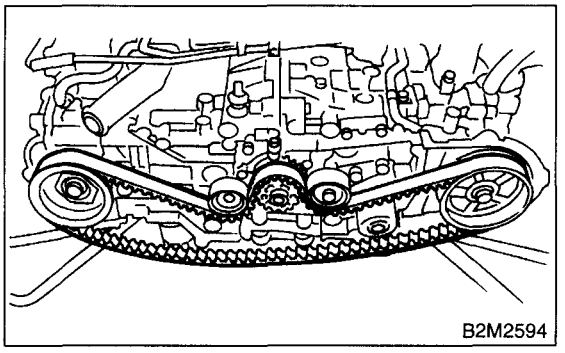
B2M2592A

6) Remove the belt idler (No. 2).

7) Remove the belt idler No. 2.

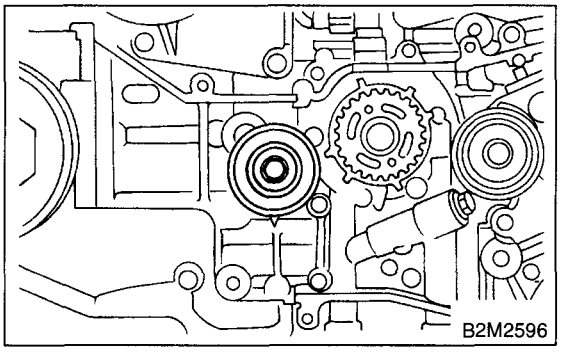


8) Remove the timing belt.

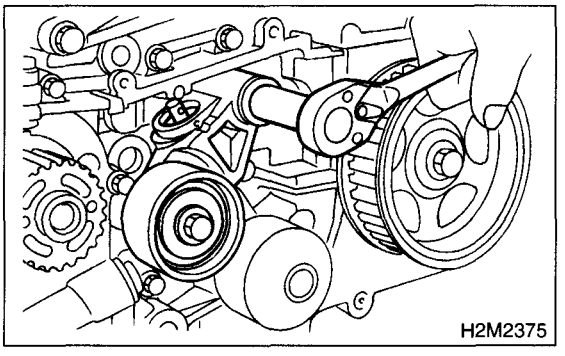


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



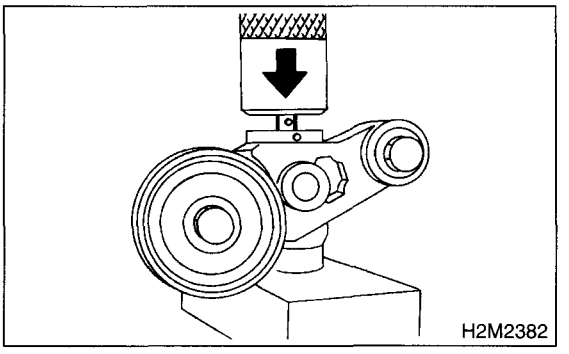
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

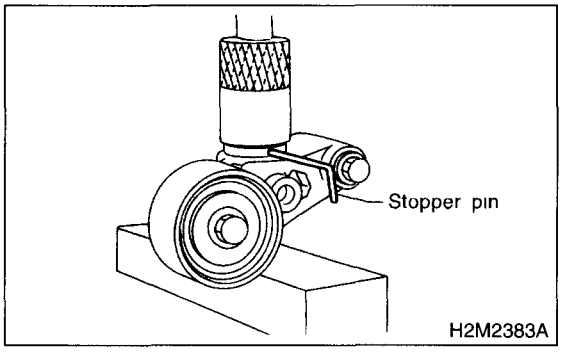
1) Preparation for installation of automatic belt tension adjuster assembly:

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 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 kgf, 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 the 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 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

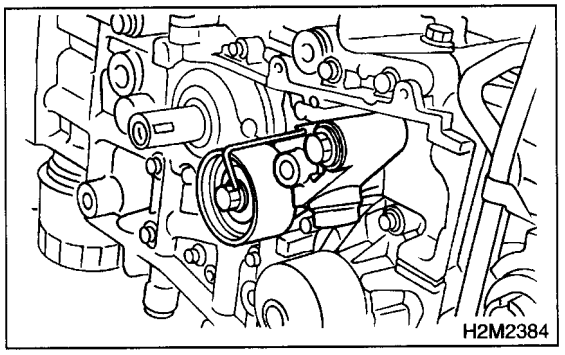


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



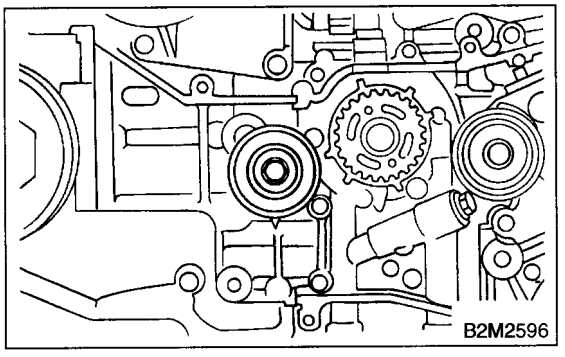
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



3) Install the belt idler (No. 1).

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



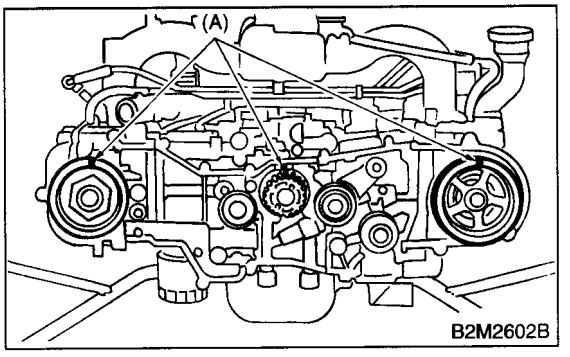
2. TIMING BELT

1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(SOHC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt:

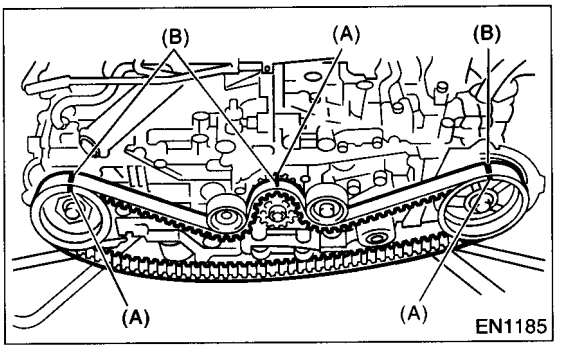
(1) Turn the camshaft sprocket No. 2 using ST1, and turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1	499207100	CAMSHAFT SPROCKET WRENCH
ST2	499207400	CAMSHAFT SPROCKET WRENCH



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

CAUTION:
Ensure the belt's rotating direction is correct.

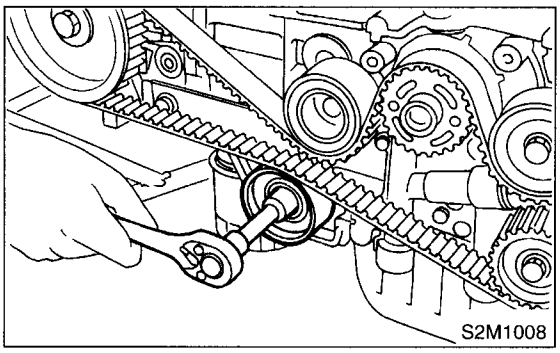


3) Install the belt idler No. 2.

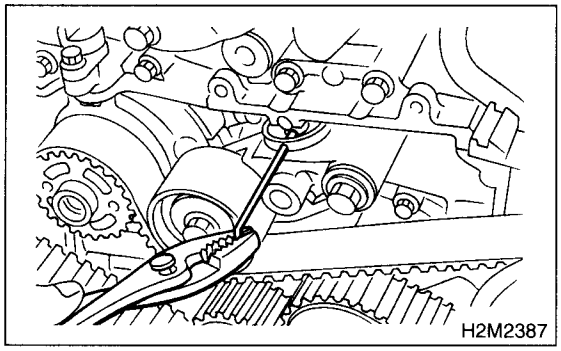
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

4) Install the belt idler (No. 2).

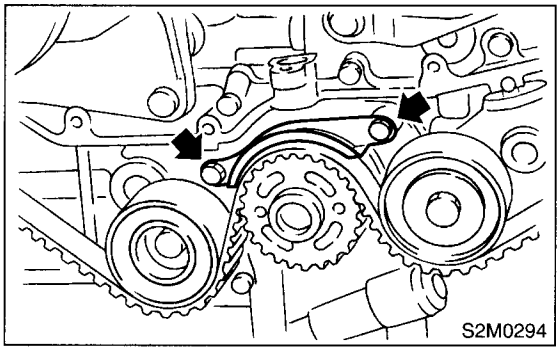
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



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

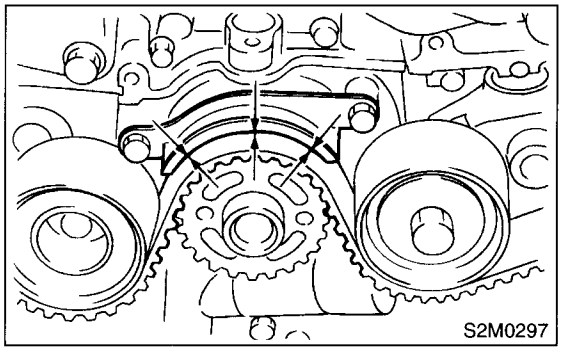


6) Install the timing belt guide. (MT vehicles only)
(1) Temporarily tighten the remaining bolts.



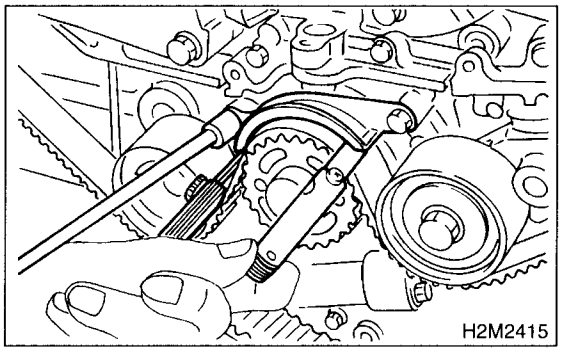
(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

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



(3) Tighten the remaining bolts.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)



7) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

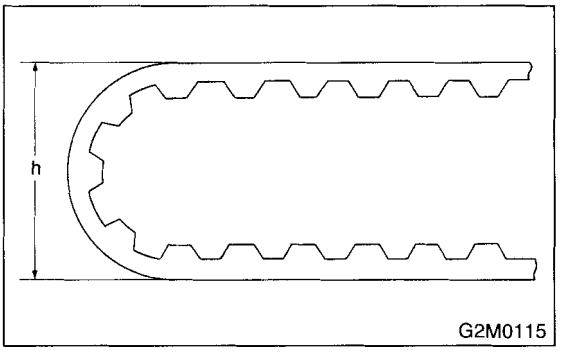
C: INSPECTION

1. TIMING BELT

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

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

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



2. AUTOMATIC BELT TENSION ADJUSTER

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

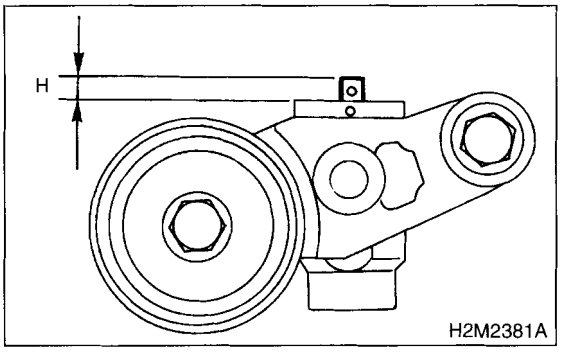
CAUTION:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 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 kgf, 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 kgf, 66 lb) to it. Check the 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 the 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 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

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

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

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

4. BELT IDLER

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

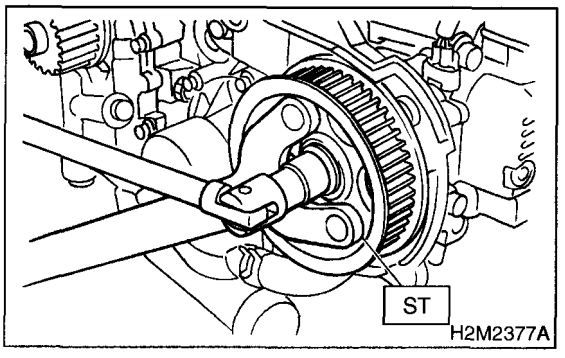
16.Camshaft Sprocket

A: REMOVAL

1. REMOVAL

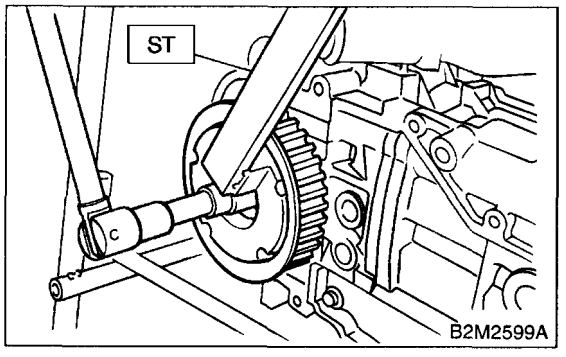
1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(SOHC)-29, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH



7) Remove the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



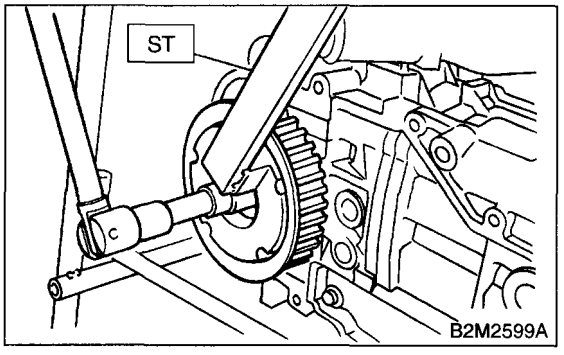
B: INSTALLATION

1) Install the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

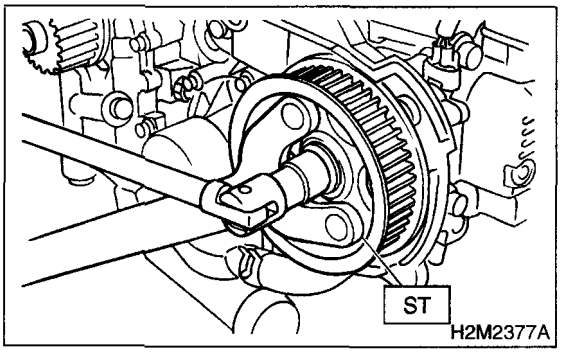
CAUTION:
Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



2) Install the camshaft sprocket No. 2. To lock the camshaft, use ST.

ST 499207100 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



3) Install the camshaft position sensor. <Ref. to FU(SOHC)-29, INSTALLATION, Camshaft Position Sensor.>
4) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
5) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
6) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
7) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

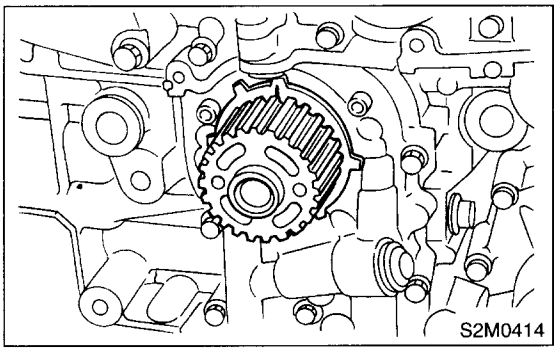
C: INSPECTION

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

17.Crankshaft Sprocket

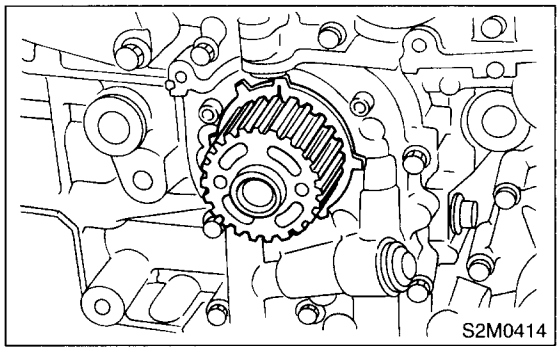
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-52, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(SOHC)-52, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
4) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

C: INSPECTION

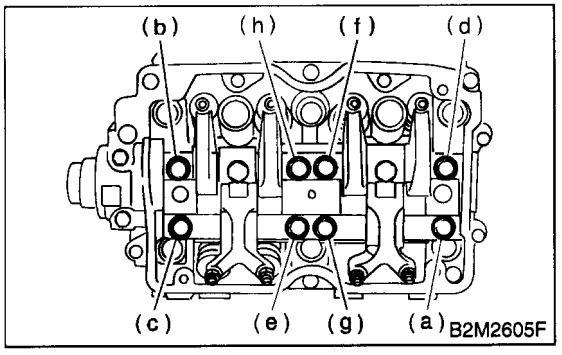
1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

18.Valve Rocker Assembly

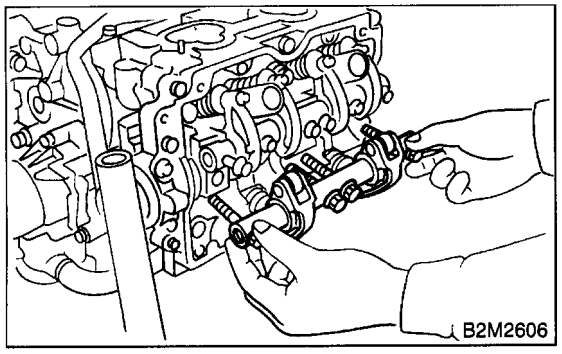
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-52, REMOVAL, Camshaft Sprocket.>
6) Disconnect the PCV hose and remove the rocker cover.
7) Removal of valve rocker assembly:
   (1) Remove the bolts (a) through (h) in alphabetical sequence.

CAUTION:
Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



   (2) Remove the valve rocker assembly.



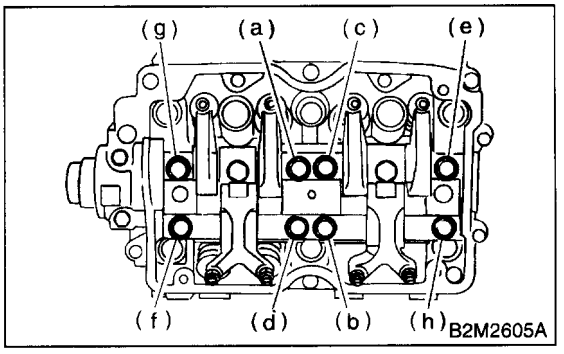
B: INSTALLATION

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

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

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

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



2) Adjust the valve clearances. <Ref. to ME(SOHC)-31, ADJUSTMENT, Valve Clearance.>
3) Install the rocker cover and connect PCV hose.
4) Install the camshaft sprocket. <Ref. to ME(SOHC)-52, INSTALLATION, Camshaft Sprocket.>
5) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
6) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
7) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
8) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

C: DISASSEMBLY

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

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

3) Remove the nut and adjuster screw from valve rocker.

D: ASSEMBLY

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

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

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

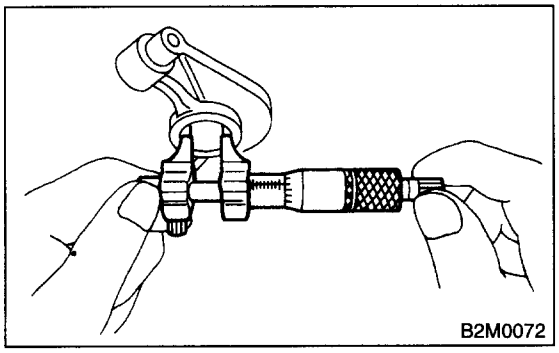
3) Install the valve rocker shaft securing bolts.

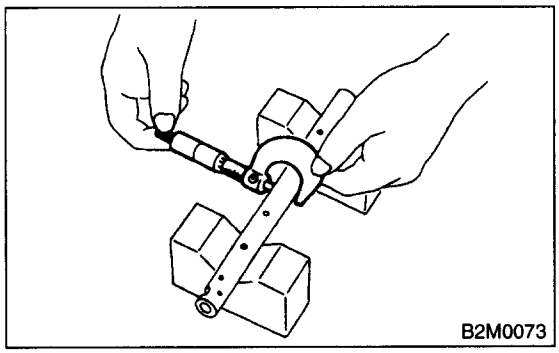
E: INSPECTION

1. VALVE ROCKER ARM

1) Measure the 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 the oil clearance exceeds the limit, replace the 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 the 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 the oil clearance exceeds the limit, replace the 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 the cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
6) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.

2. INTAKE AND EXHAUST VALVE ROCKER SHAFT

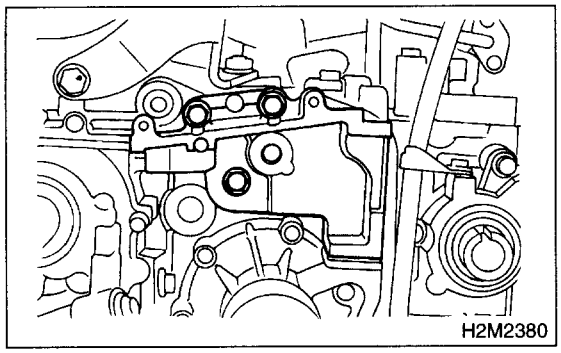
Visually check the oil relief valve of shaft end for any of the following abnormalities:
- Breaks in check ball body
- Foreign particles caught in valve spring
- Oil leakage at check ball

CAUTION:
Repair or replace the valve rocker shaft as necessary.

19.Camshaft

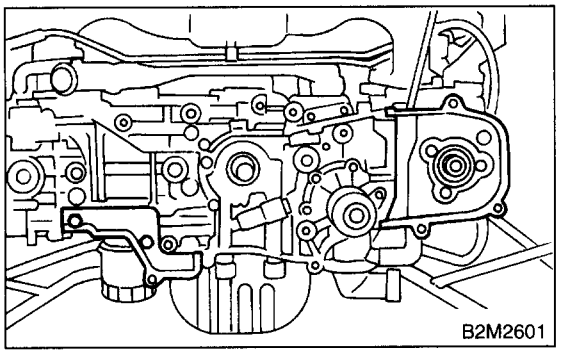
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-52, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(SOHC)-54, REMOVAL, Crankshaft Sprocket.>
7) Remove the belt cover No. 2 (RH).
8) Remove the tensioner bracket.

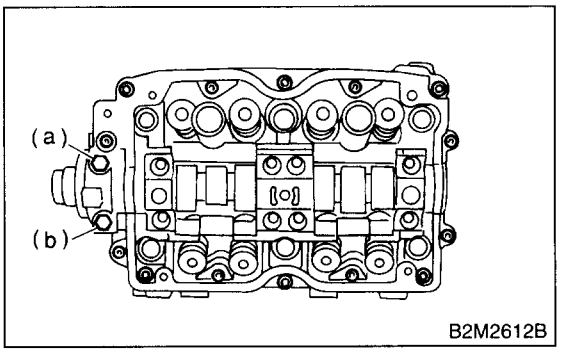

H2M2380

9) Remove the belt cover No. 2 (LH).

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

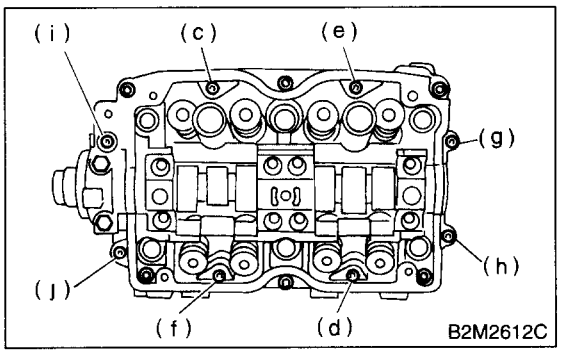

B2M2601

10) Remove the camshaft position sensor support. (LH side only)
11) Remove the oil level gauge guide. (LH side only)
12) Remove the valve rocker assembly. <Ref. to ME(SOHC)-55, REMOVAL, Valve Rocker Assembly.>
13) Remove the camshaft cap.
(1) Remove the bolts (a) through (b) in alphabetical sequence.



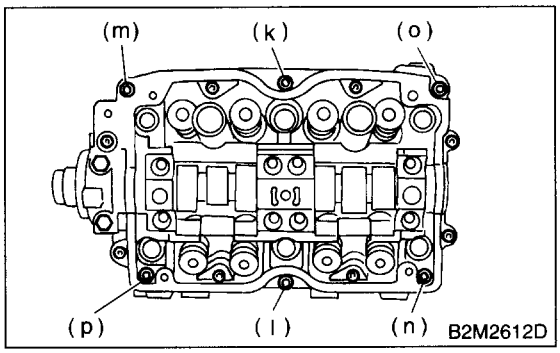
B2M2612B

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



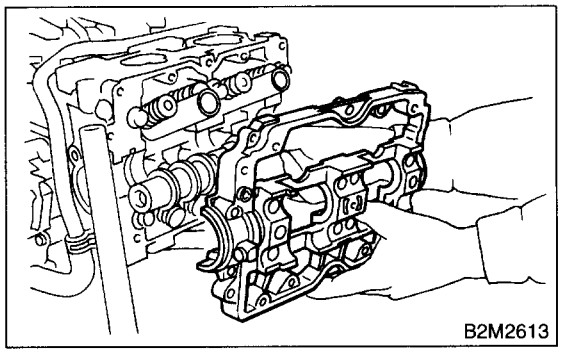
B2M2612C

(3) Remove the bolts (k) through (p) in alphabetical sequence using ST.
ST 499497000 TORX PLUS



B2M2612D

(4) Remove the camshaft cap.


B2M2613

14) Remove the camshaft.
15) Remove the oil seal.

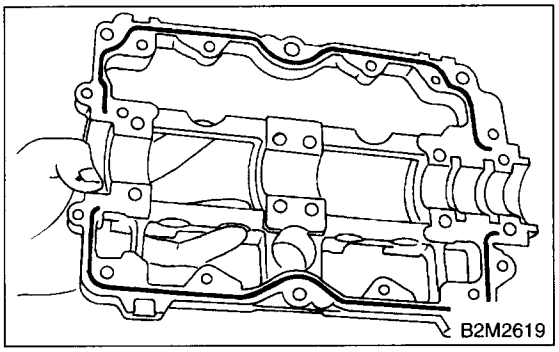
16) Remove the plug from rear side of camshaft.

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

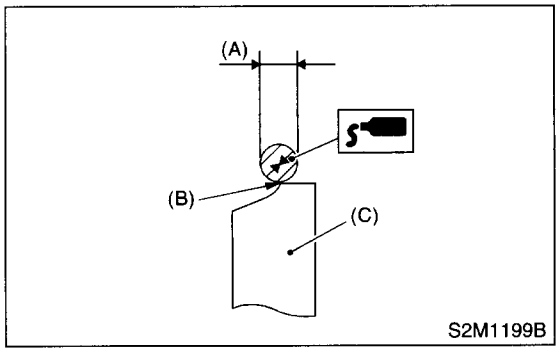
B: INSTALLATION

1) Apply a coat of engine oil to camshaft journals and install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket on the periphery of camshaft cap.

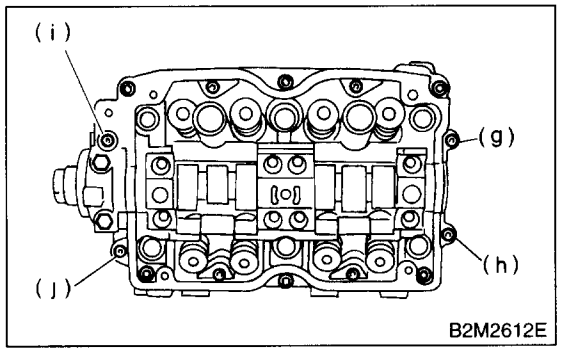
Liquid gasket:
THREE BOND 1280B
P/N K0877YA018



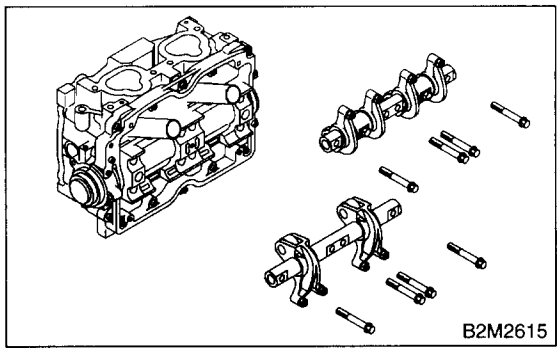
NOTE:
Apply a coat of 3 mm (0.12 in) dia. (A): liquid gasket along edge (B) of camshaft cap (C) mating surface.



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

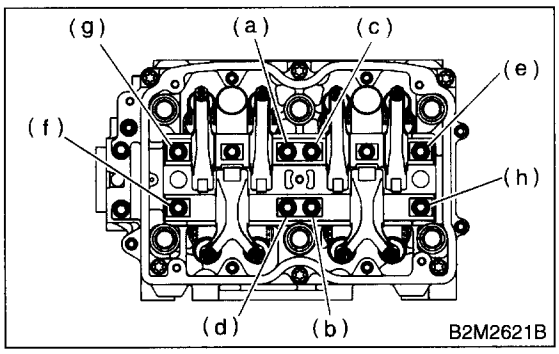


(3) Install the valve rocker assembly.



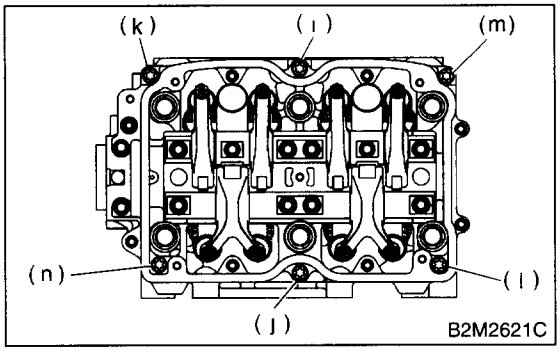
(4) Tighten the bolts (a) through (h) in alphabetical sequence.

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



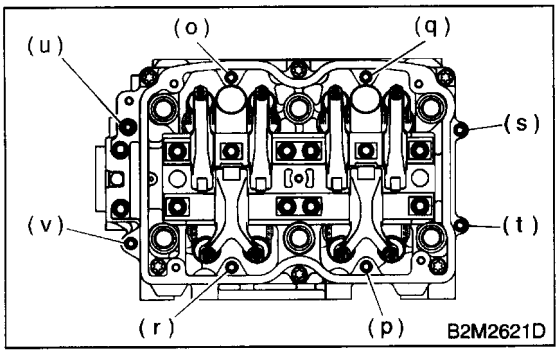
(5) Tighten the TORX bolts (i) through (n) in alphabetical sequence using ST.
ST 499427000 TORX PLUS

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



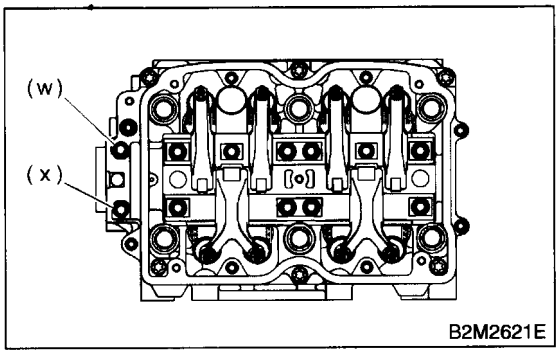
(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

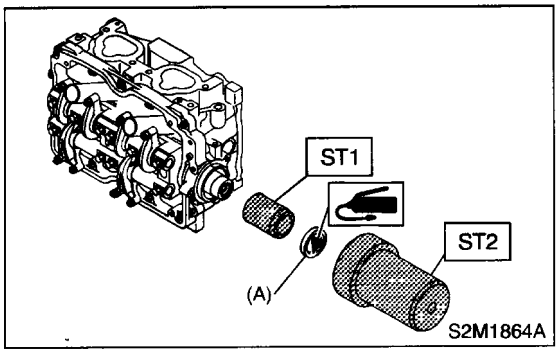
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Apply a coat of grease to oil seal lips and install the 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

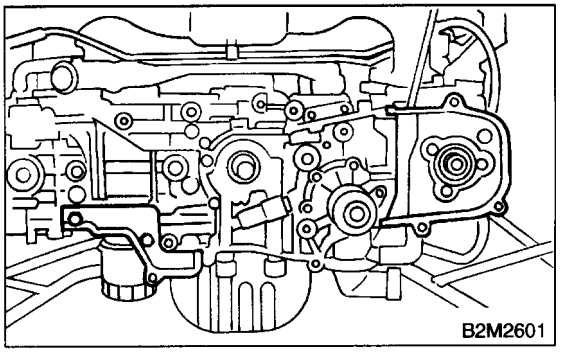


4) Install the plug using ST.
ST 499587700 OIL SEAL INSTALLER
5) Adjust the valve clearance. <Ref. to ME(SOHC)-31, ADJUSTMENT, Valve Clearance.>
6) Install the rocker cover and connect PCV hose.
7) Install the oil level gauge guide. (LH side only)
8) Install the camshaft position sensor support. (LH side only)
9) Install the belt cover No. 2 (RH).

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

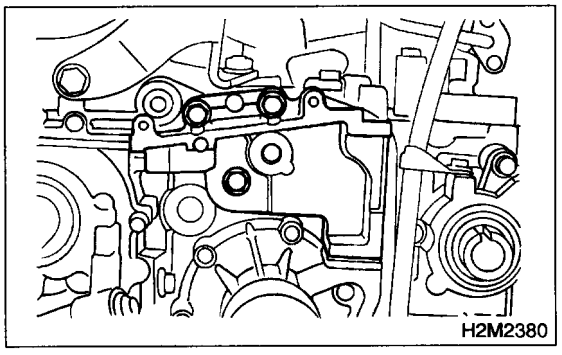
10) Install the belt cover No. 2 (LH).

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



11) Install the tensioner bracket.

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



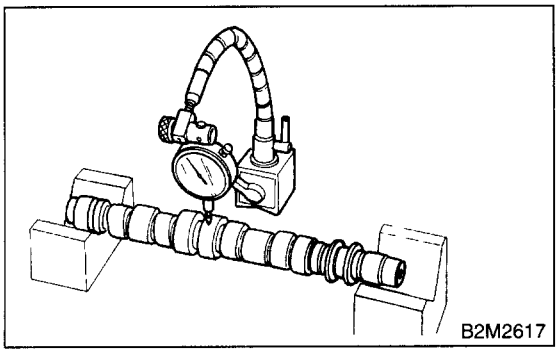
12) Install the crankshaft sprocket. <Ref. to ME(SOHC)-54, INSTALLATION, Crankshaft Sprocket.>
13) Install the camshaft sprocket. <Ref. to ME(SOHC)-52, INSTALLATION, Camshaft Sprocket.>
14) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
15) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
16) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
17) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

C: INSPECTION

1. CAMSHAFT

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

Limit:
0.025 mm (0.0010 in)



2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between the two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

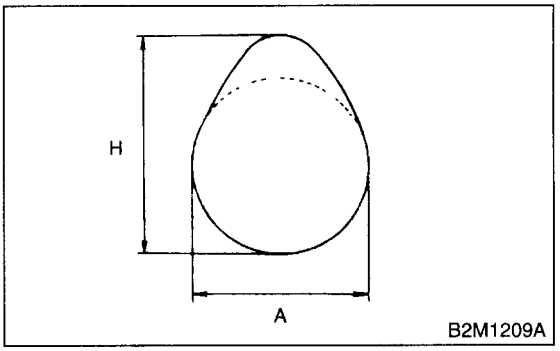
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition; remove the 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)

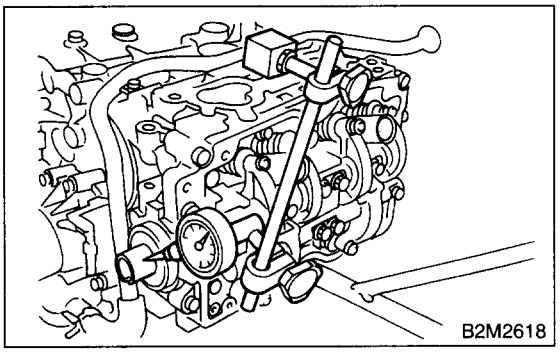


2. CAMSHAFT SUPPORT

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

Standard:
0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:
0.10 mm (0.0039 in)

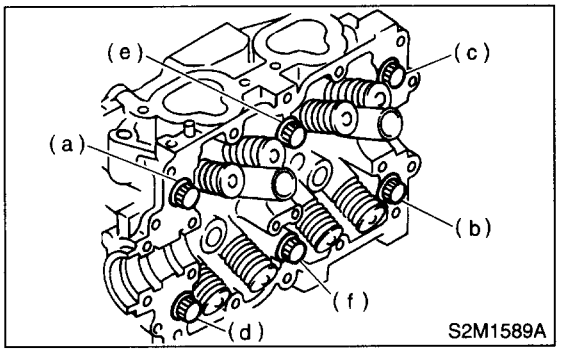


20.Cylinder Head Assembly

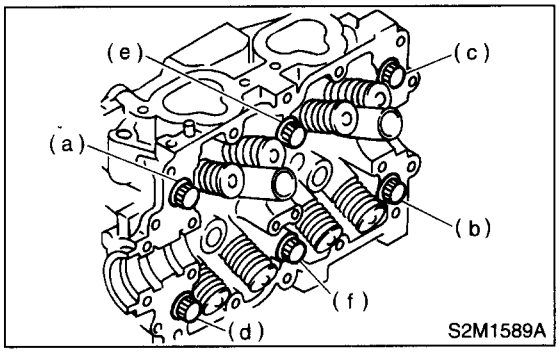
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
3) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(SOHC)-52, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(SOHC)-15, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the valve rocker assembly. <Ref. to ME(SOHC)-55, REMOVAL, Valve Rocker Assembly.>
9) Remove the camshaft. <Ref. to ME(SOHC)-57, REMOVAL, Camshaft.>
10) Remove the cylinder head bolts in alphabetical sequence shown in figure.

CAUTION:
Leave bolts (a) and (c) engaged by three or four threads to prevent the cylinder head from falling.



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



13) Remove the cylinder head gasket.

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

14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

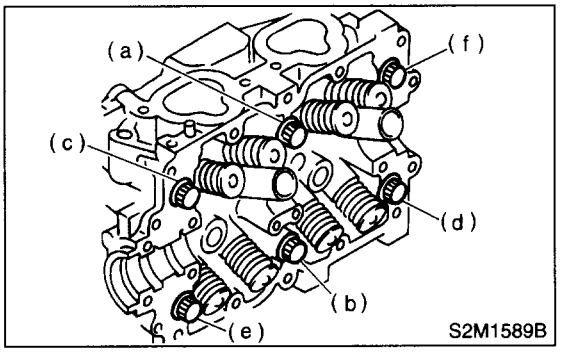
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten the bolts more than 90°.

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

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



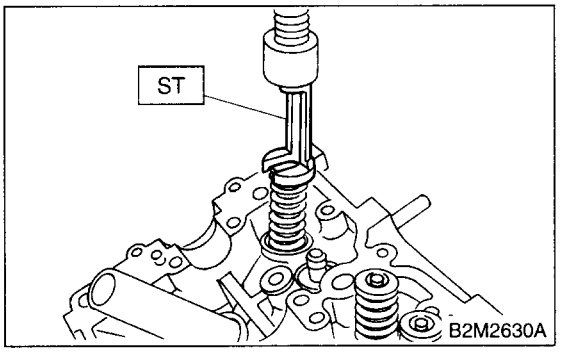
3) Install the camshaft. <Ref. to ME(SOHC)-58, INSTALLATION, Camshaft.>
4) Install the valve rocker assembly. <Ref. to ME(SOHC)-55, INSTALLATION, Valve Rocker Assembly.>
5) Install the A/C compressor bracket on cylinder head.

6) Install the intake manifold. <Ref. to FU(SOHC)-17, INSTALLATION, Intake Manifold.>
7) Install the camshaft sprocket. <Ref. to ME(SOHC)-52, INSTALLATION, Camshaft Sprocket.>
8) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
9) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
10) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
11) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

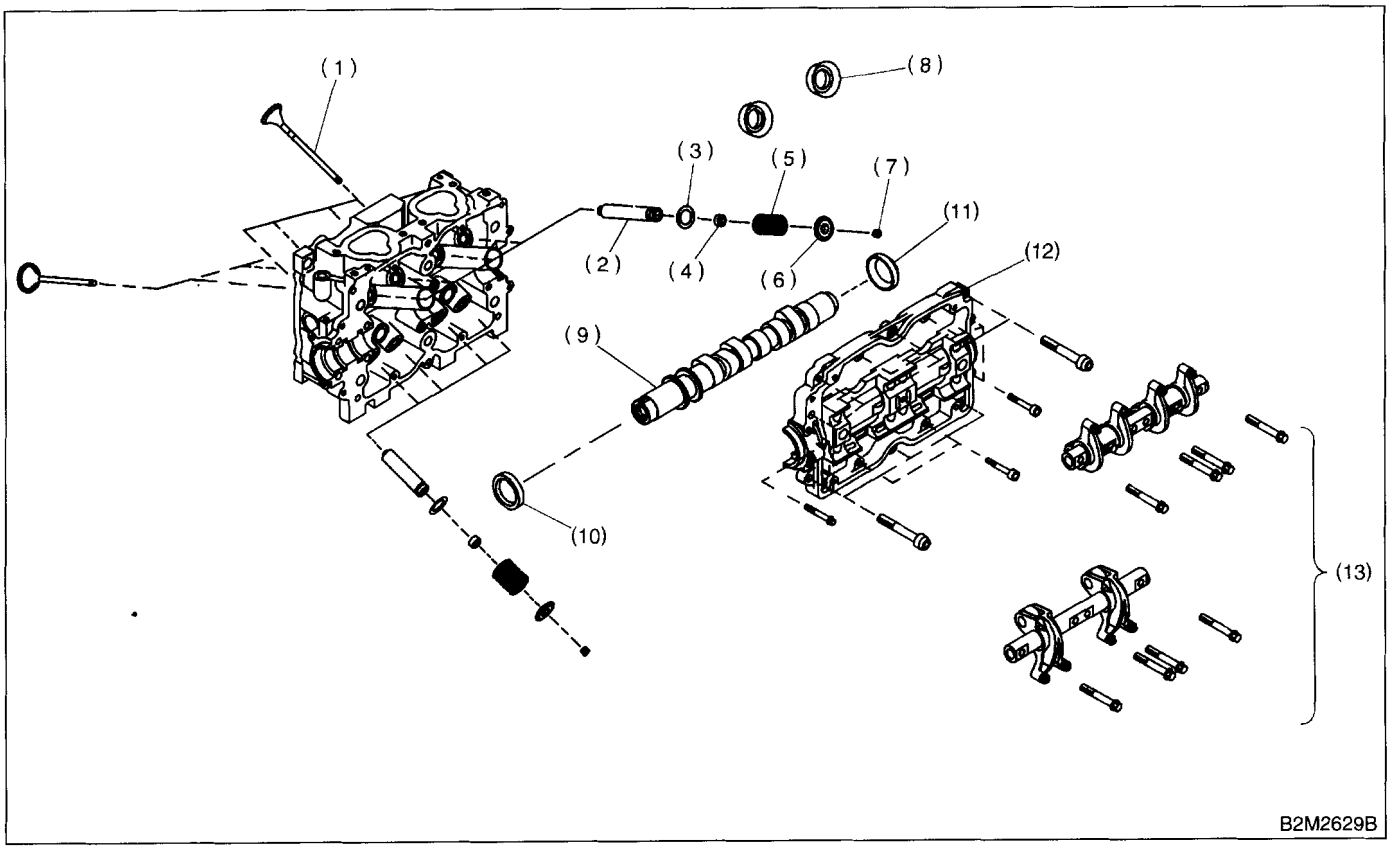
C: DISASSEMBLY

1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
2) Set the ST on valve spring. Compress the 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.**



D: ASSEMBLY



(1)	Valve	(6)	Retainer	(11)	Plug
(2)	Valve guide	(7)	Retainer key	(12)	Camshaft cap
(3)	Valve spring seat	(8)	Spark plug gasket	(13)	Valve rocker ASSY
(4)	Oil seal	(9)	Camshaft		
(5)	Valve spring	(10)	Oil seal		

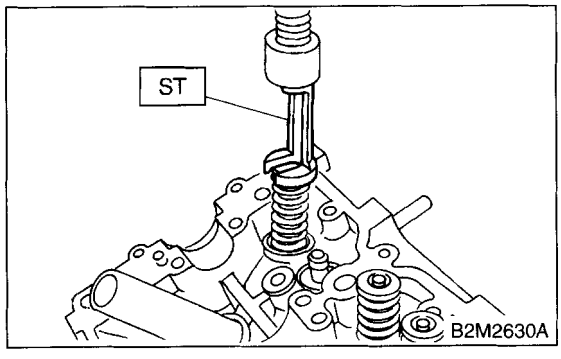
1) Installation of valve spring and valve:
(1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
(2) Coat the stem of each valve with engine oil and insert the valve into valve guide.

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

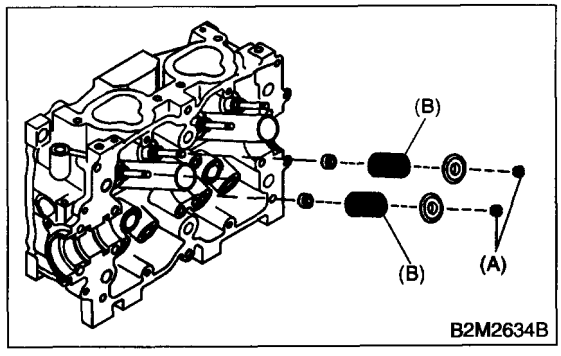
(3) Install the valve spring and retainer.

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

(4) Set the ST on valve spring.
ST 499718000 VALVE SPRING REMOVER



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



(A) Retainer key
(B) Painted face

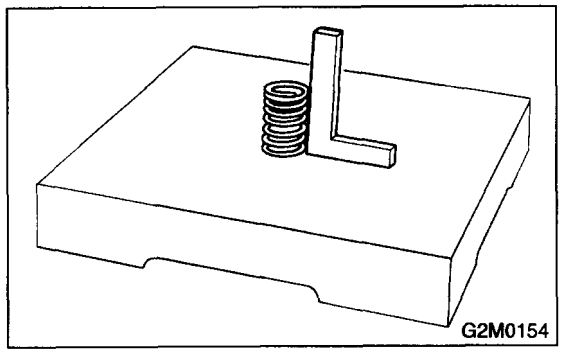
(6) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

E: INSPECTION

1. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the 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 kgf, 48.3 — 55.3 lb)/ 45.0 mm (1.772 in)
	526.6 — 581.6 N (53.7 — 59.3 kgf, 118.4 — 130.8 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

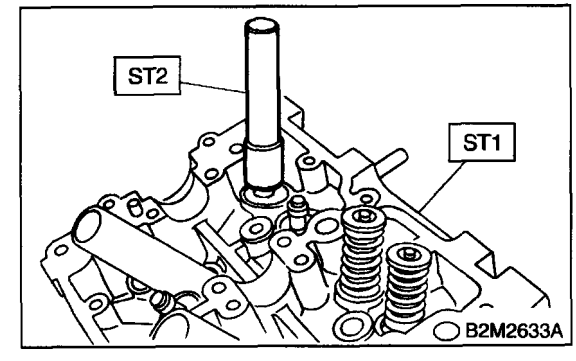
Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove the oil seal from valve.
1) Place the cylinder head on ST1.
2) Press-fit the oil seal to the specified dimension indicated in the figure using ST2.

CAUTION:
• Apply engine oil to oil seal before press-fitting.
• When press-fitting the oil seal, do not use a hammer or strike in.
• Differentiate between the 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]



F: ADJUSTMENT

1. CYLINDER HEAD

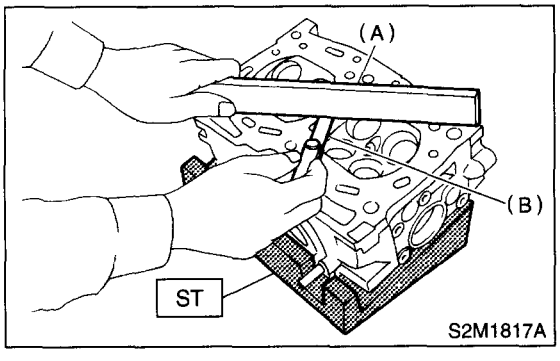
1) Make sure that no crack or other damage do not exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure the gasket installing surface shows no trace of gas and water leaks.
2) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure 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:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

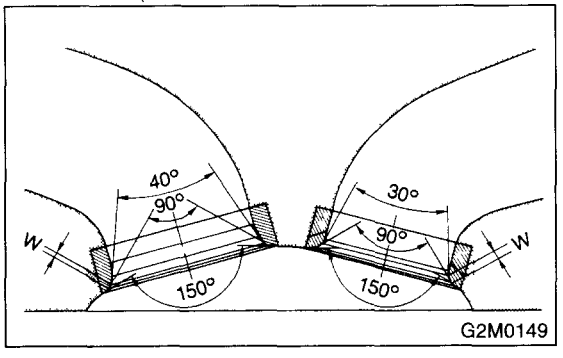
CAUTION:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

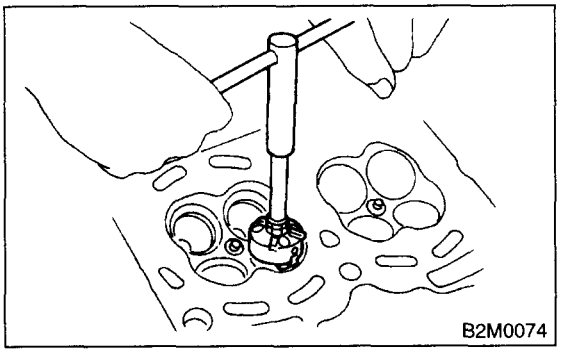


2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a 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)

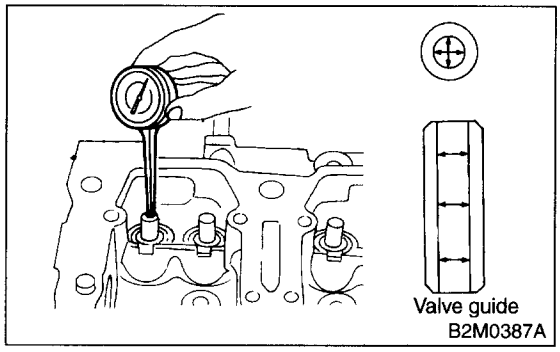


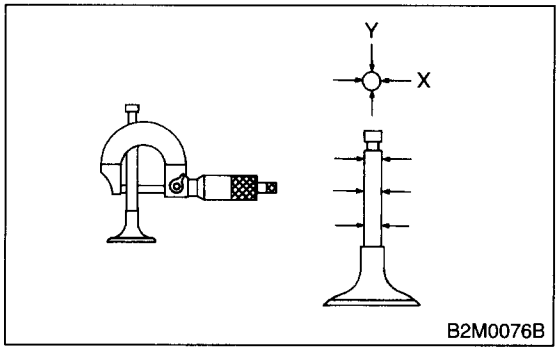


3. VALVE GUIDE

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)





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

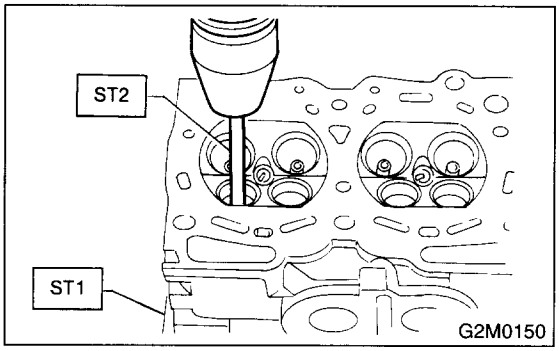
Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

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 the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

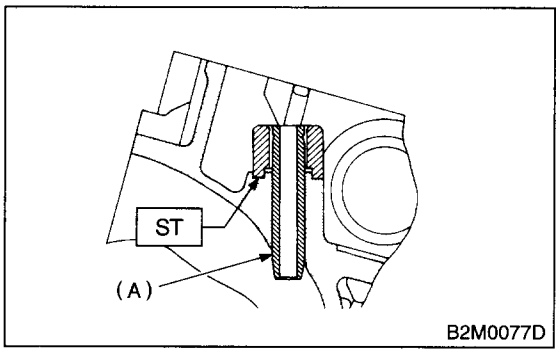
(2) Insert ST2 into the valve guide and press it down to remove the valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



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

Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER

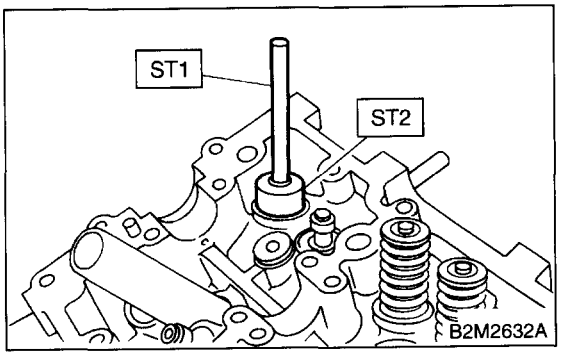


(A) Valve guide

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

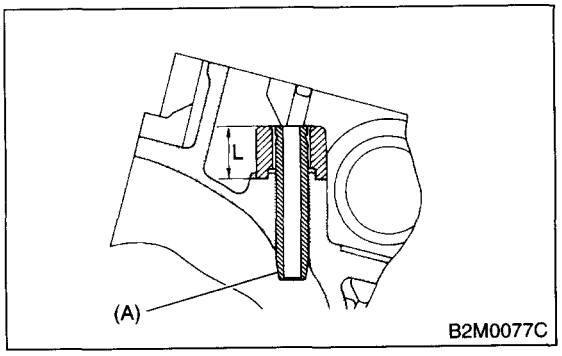
(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

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)

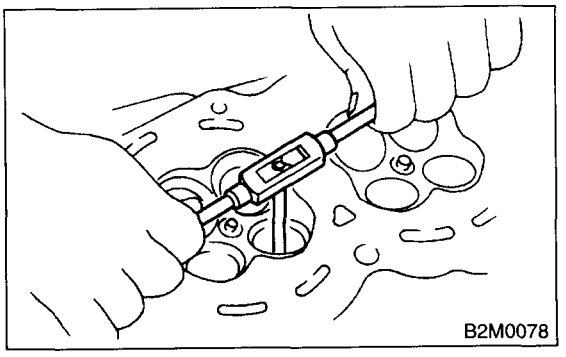


(A) Valve guide

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the 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 chip, use a new reamer or remedy the reamer.**

ST 499767400 VALVE GUIDE REAMER



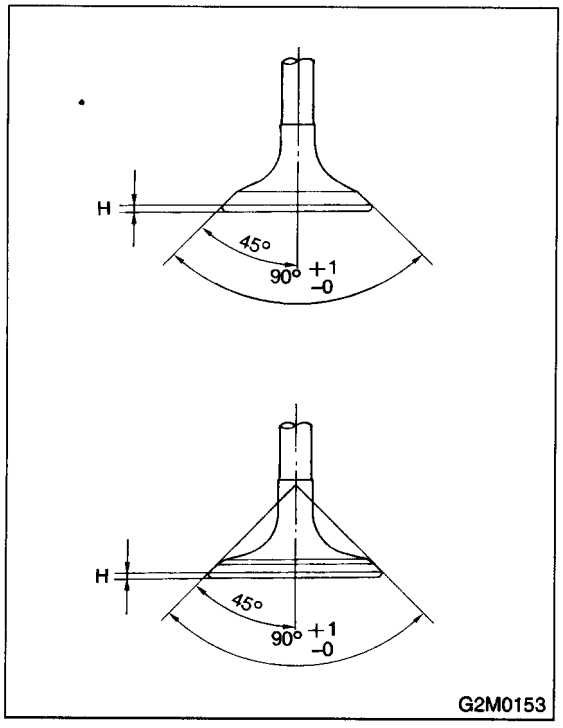
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

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

H:
Intake
Standard 1.0 mm (0.039 in)
Limit 0.6 mm (0.024 in)
Exhaust
Standard 1.2 mm (0.047 in)
Limit 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(SOHC)-65, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

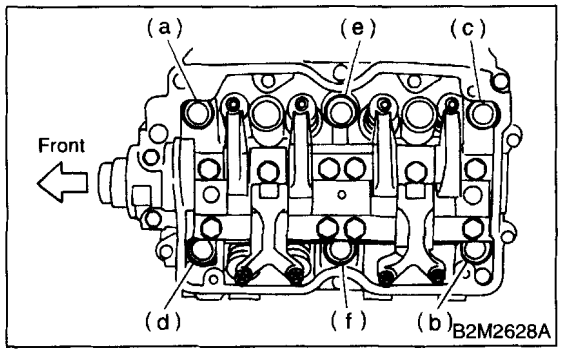
21.Cylinder Block

A: REMOVAL

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

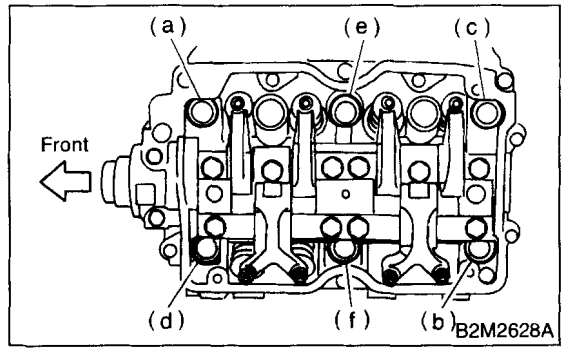
1) Remove the intake manifold. <Ref. to FU(SOHC)-15, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(SOHC)-45, REMOVAL, Crankshaft Pulley.>
4) Remove the belt cover. <Ref. to ME(SOHC)-46, REMOVAL, Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(SOHC)-47, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(SOHC)-52, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(SOHC)-54, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the rocker cover.
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

CAUTION:
Leave bolts (a) and (b) engaged by three or four threads to prevent the cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

12) Remove the bolts (a) and (b) to remove the cylinder head.

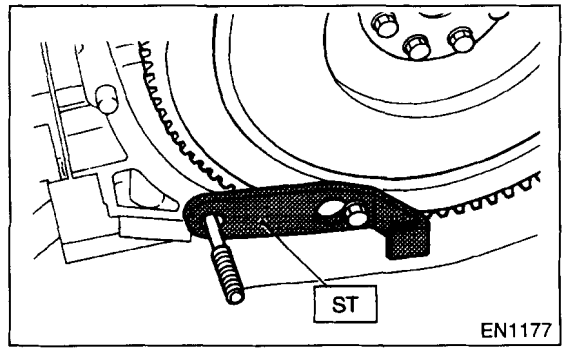


13) Remove the cylinder head gasket.

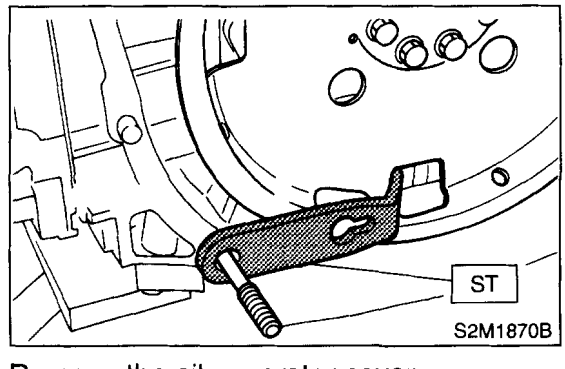
CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

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

- **MT MODEL**



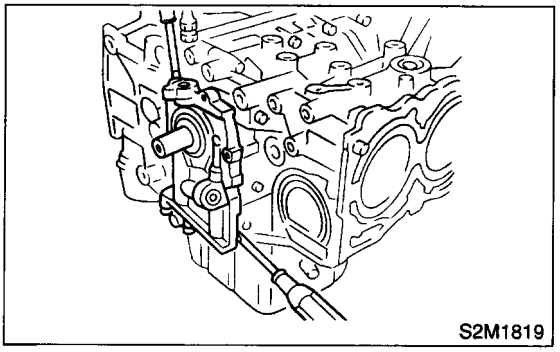
- **AT MODEL**



17) Remove the oil separator cover.
18) Remove the water by-pass pipe for heater.
19) Remove the water pump.

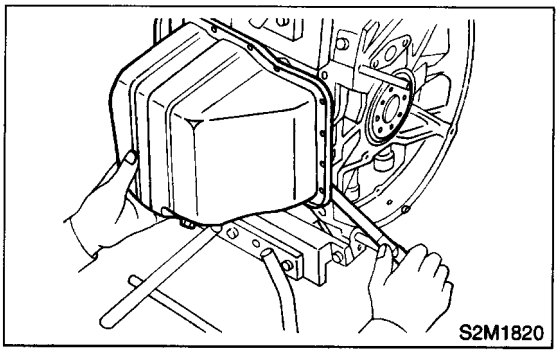
20) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

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

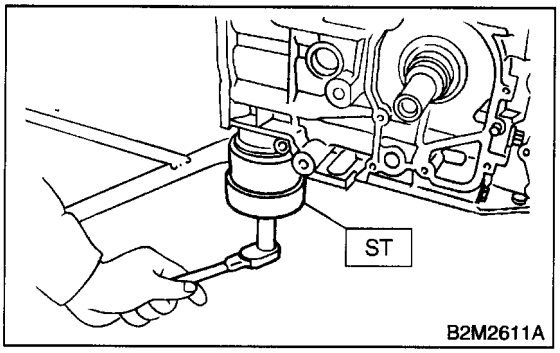

S2M1819

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

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

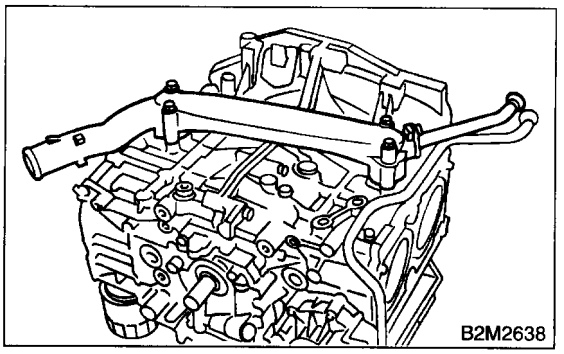

S2M1820

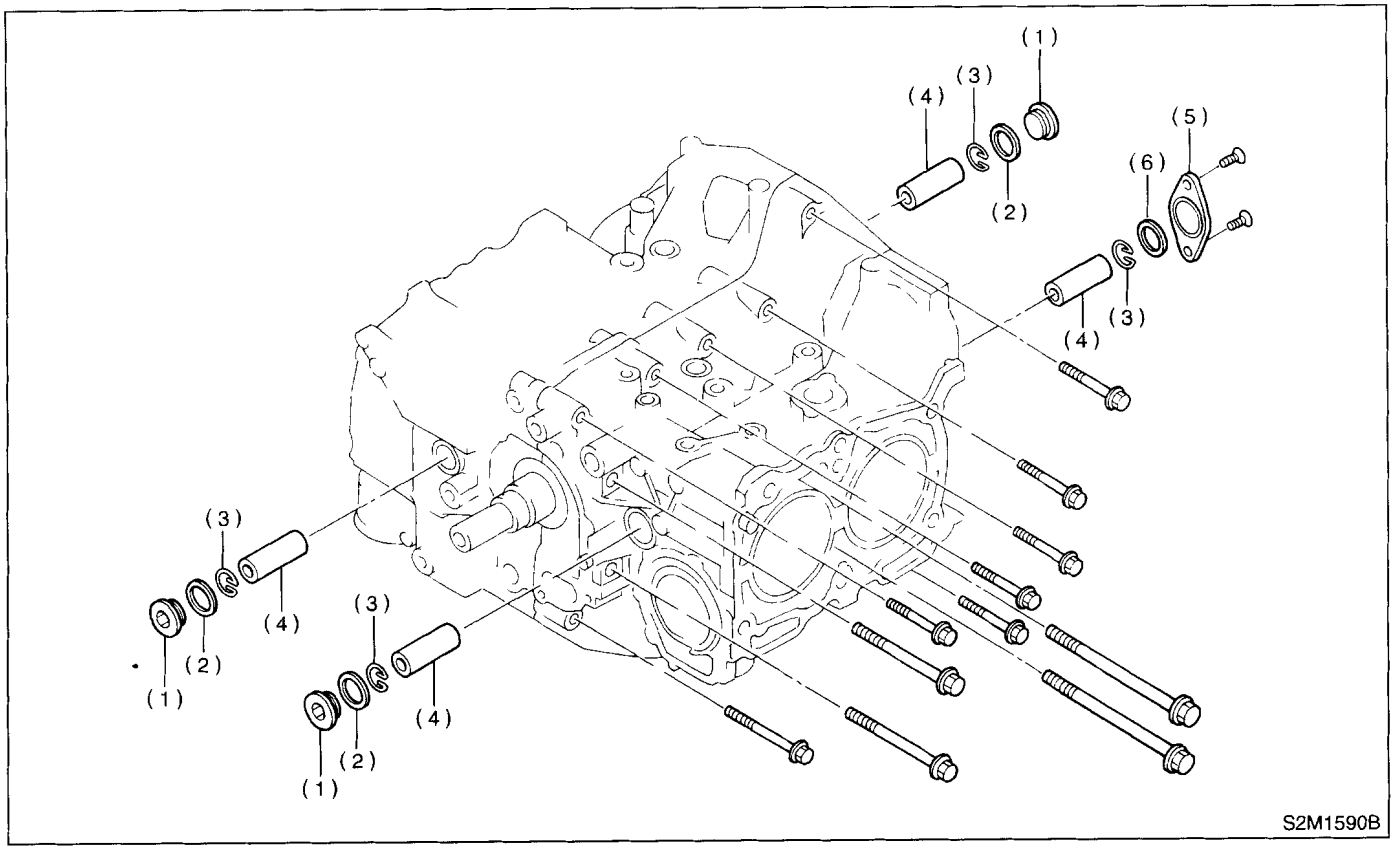
22) Remove the oil strainer stay.
23) Remove the oil strainer.
24) Remove the baffle plate.
25) Remove the oil filter using ST.
ST 498547000 OIL FILTER WRENCH



B2M2611A

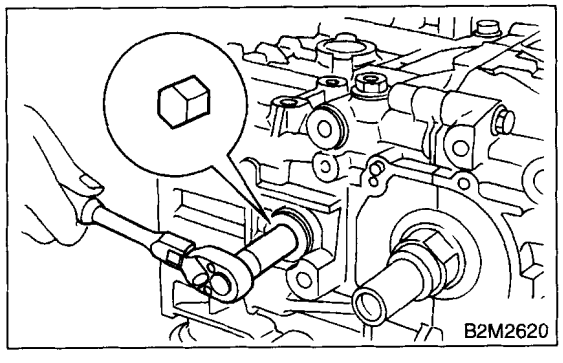
26) Remove the water pipe.


B2M2638

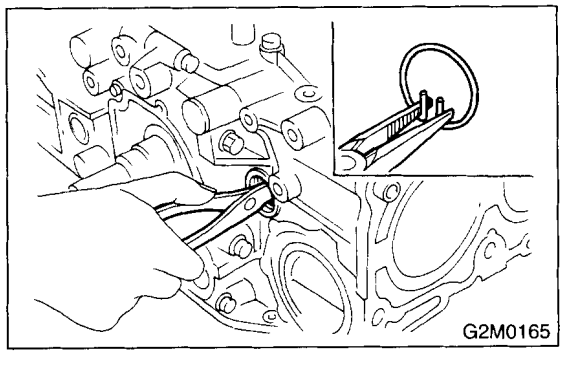


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

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

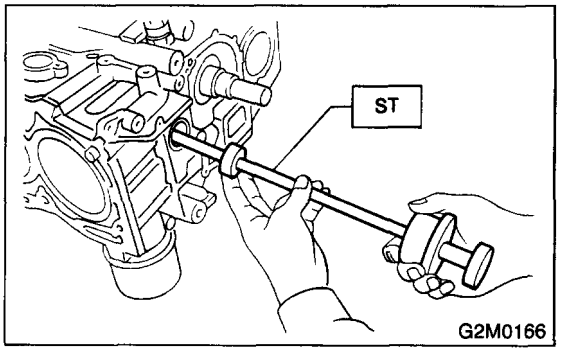


28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston circlip through service hole of #1 and #2 cylinders.



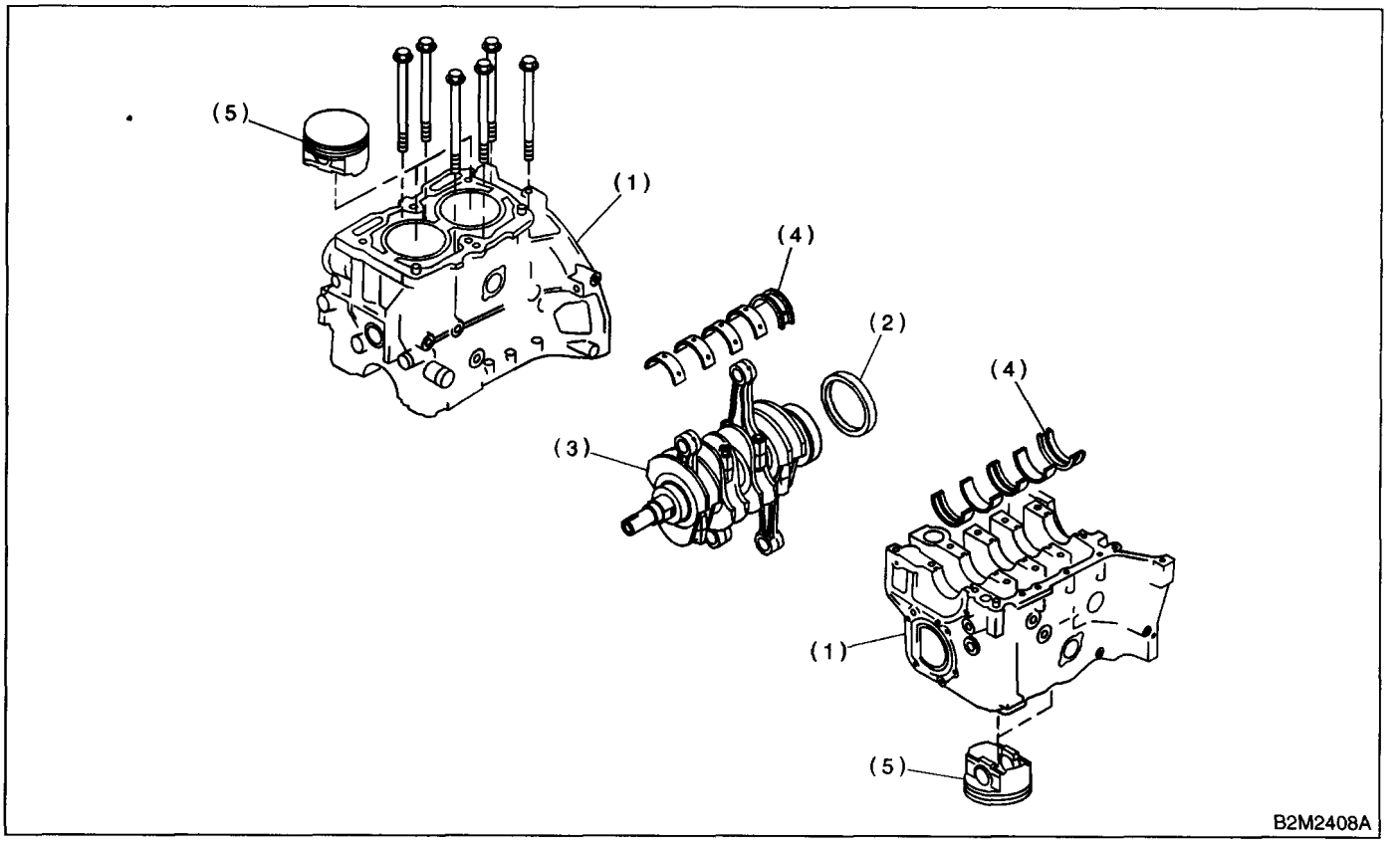
29) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

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



30) Similarly remove the piston pins from #3 and #4 pistons.
31) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
34) Separate the left-hand and right-hand cylinder blocks.

CAUTION:
When separating the 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

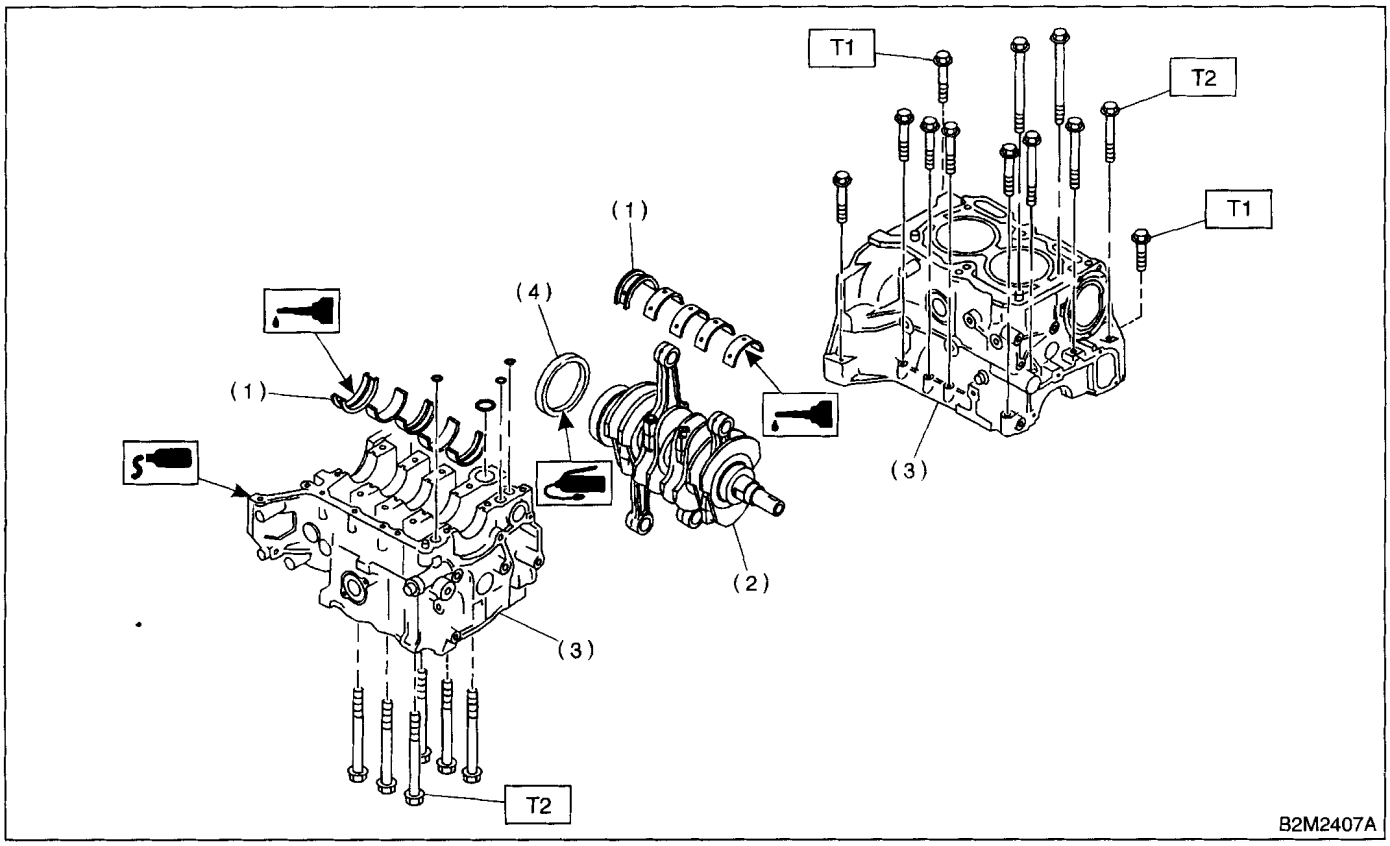
35) Remove the rear oil seal.
36) Remove the crankshaft together with connecting rod.
37) Remove the crankshaft bearings from cylinder block using a hammer handle.

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

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

CAUTION:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 47 (4.8, 34.7)

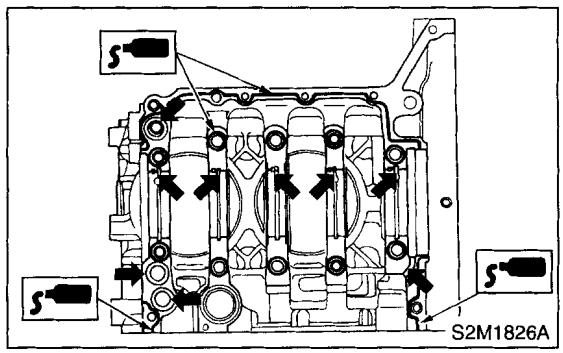
CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position the crankshaft on the #2 and #4 cylinder block.

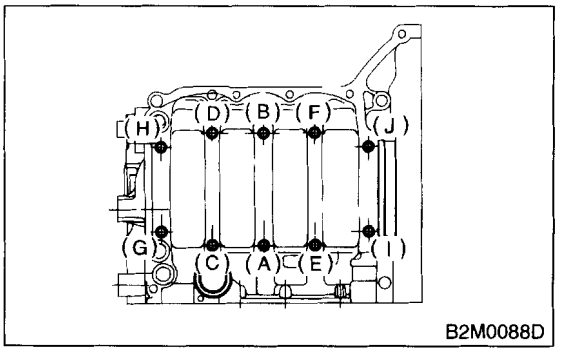
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:
THREE BOND 1215 or equivalent

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

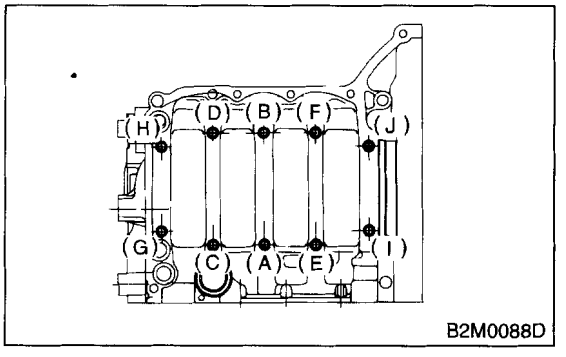


3) Temporarily tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.



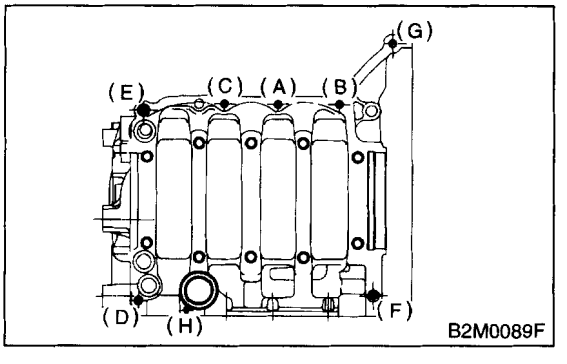
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence.

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)

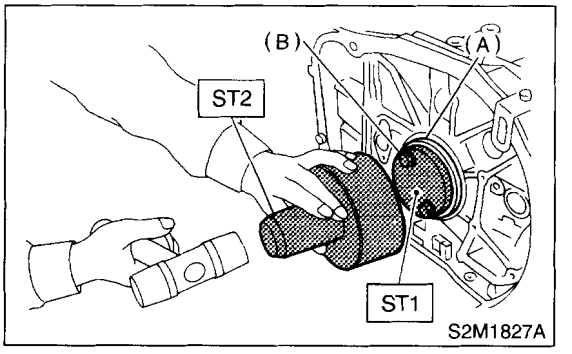


5) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

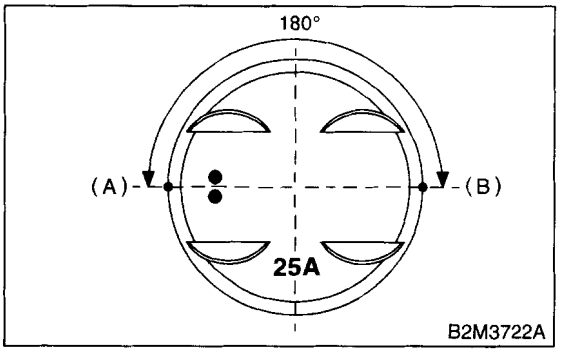


6) Install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

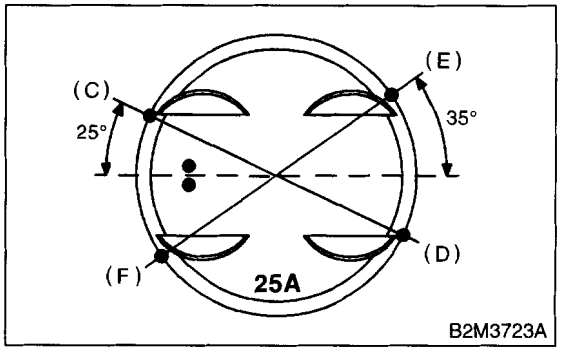


(A) Rear oil seal
(B) Flywheel attaching bolt

7) Position the top ring gap at (A) or (B) in the figure.



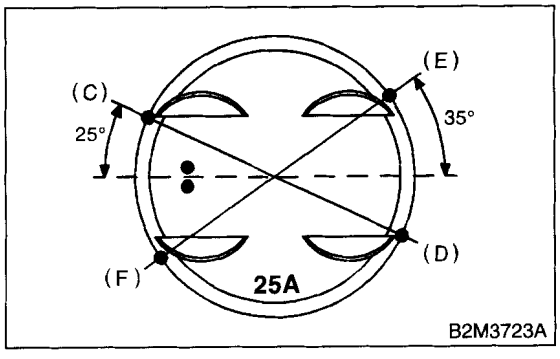
8) Position the second ring gap at 180° on the reverse side for the top ring gap.
9) Position the upper rail gap at (C) or (D) in the figure.



10) Position the expander gap at 180° of the reverse side for the upper rail gap.

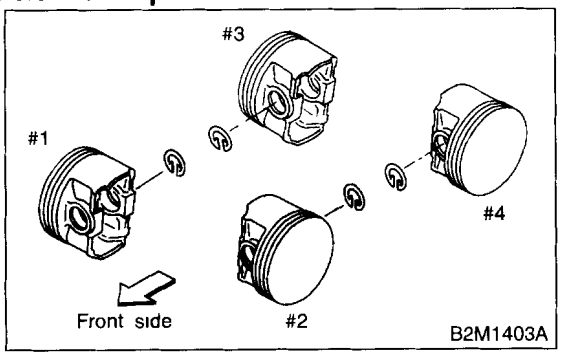
11) Position the lower rail gap at (E) or (F) in the figure.

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

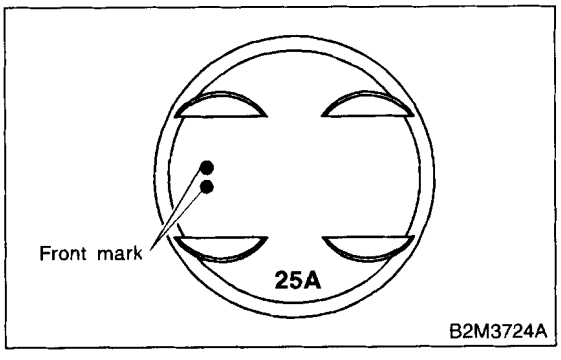


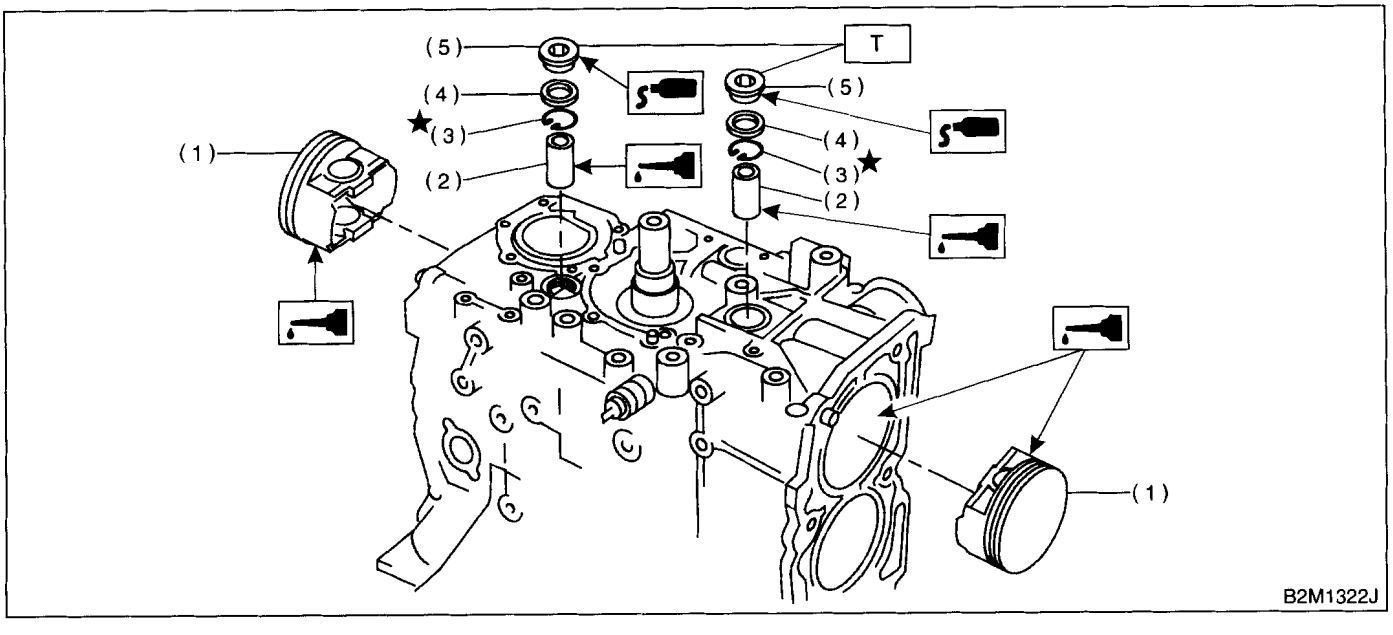
12) Installing the circlip:
Install the circlips in piston holes located opposite of service-holes in cylinder block, when positioning all pistons in the corresponding cylinders.

CAUTION:
Use new circlips.



CAUTION:
Piston front mark faces towards the front of the engine.





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

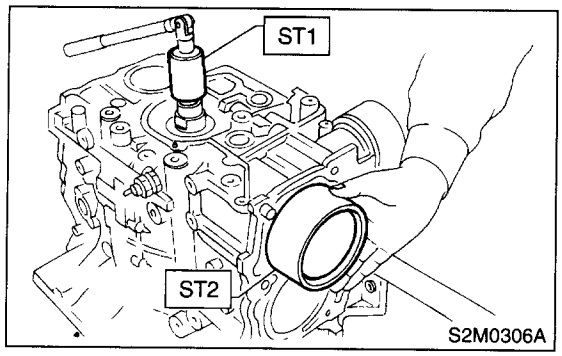
Tightening torque: N·m (kgf-m, ft-lb)
T: 69 (7.0, 50.6)

13) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using ST1, turn the 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 the pistons and cylinders and insert pistons in their cylinders using ST2.

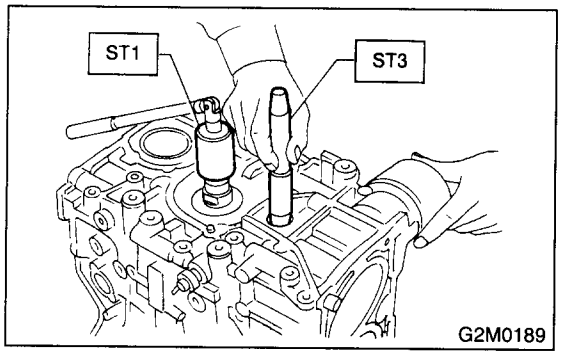
ST2 498747300 PISTON GUIDE



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

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

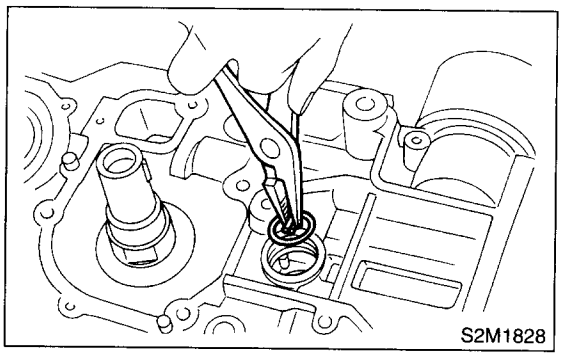
ST3 499017100 PISTON PIN GUIDE



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

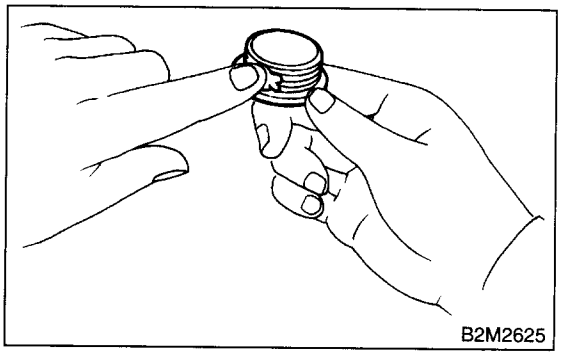
(3) Install the circlip.

CAUTION:
Use new circlips.



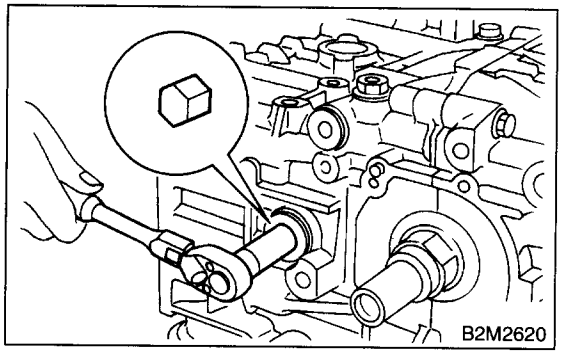
(4) Apply fluid packing around the service hole plug.

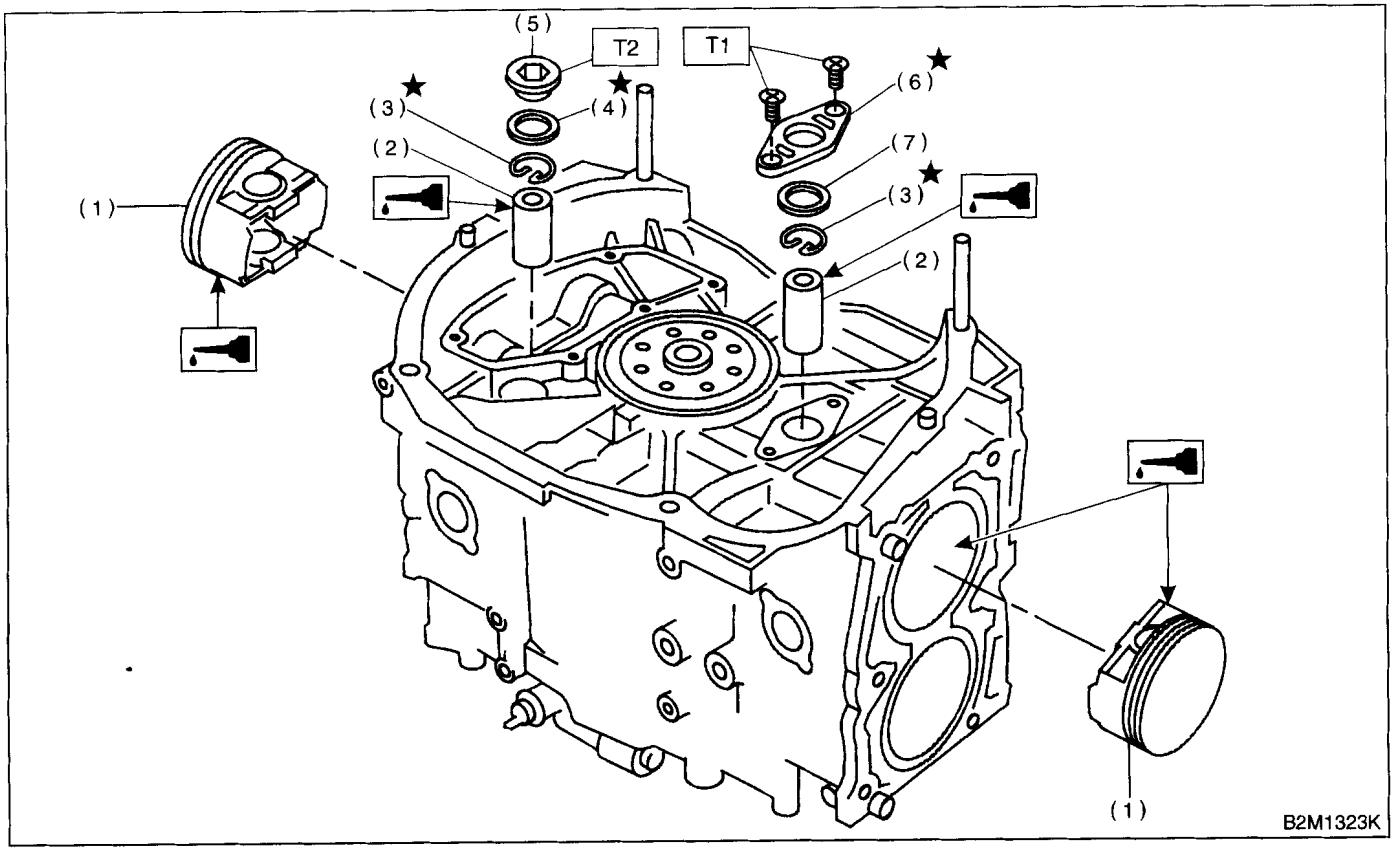
Fluid packing:
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

CAUTION:
Use a new gasket.



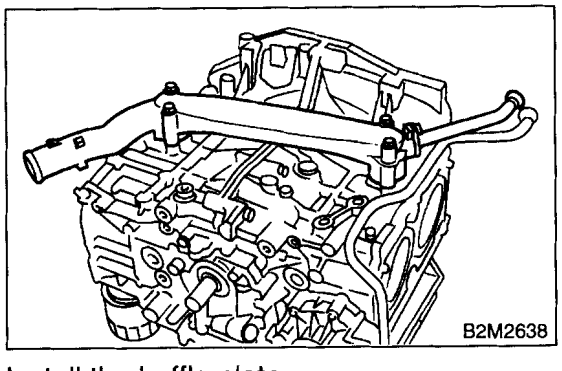


(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 69 (7.0, 50.6)

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

15) Install the water pipe.



16) Install the baffle plate.

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

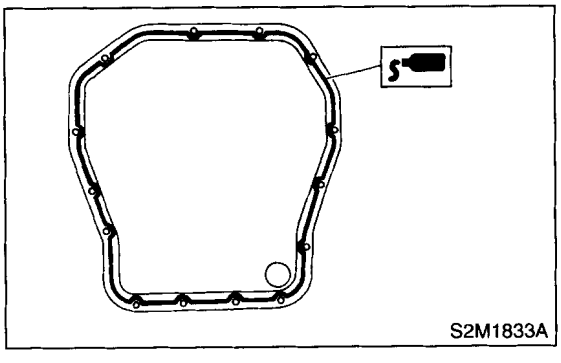
17) Install the oil strainer and O-ring

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

18) Install the oil strainer stay.

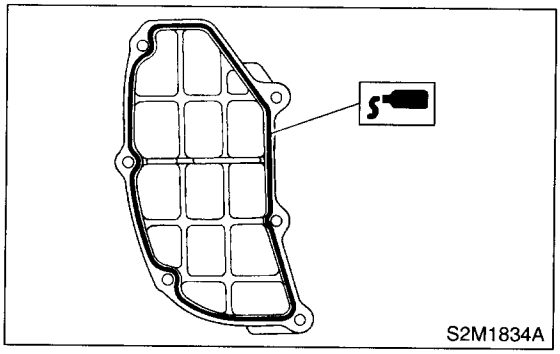
19) Apply fluid packing to matching surfaces and install the oil pan.

Fluid packing:
THREE BOND 1215 or equivalent



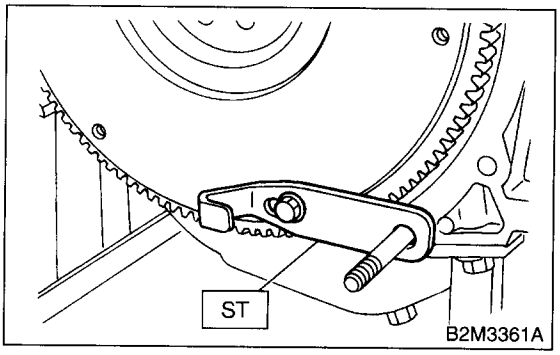
20) Apply fluid packing to matching surfaces and install the oil separator cover.

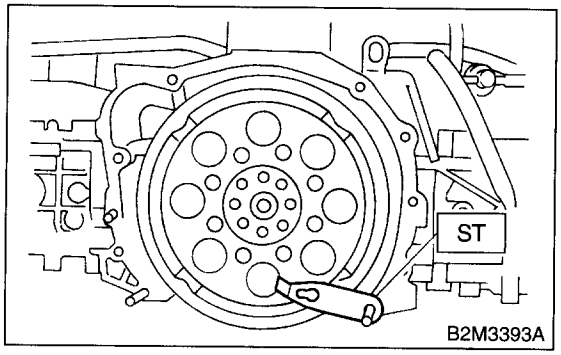
Fluid packing:
THREE BOND 1215 or equivalent



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

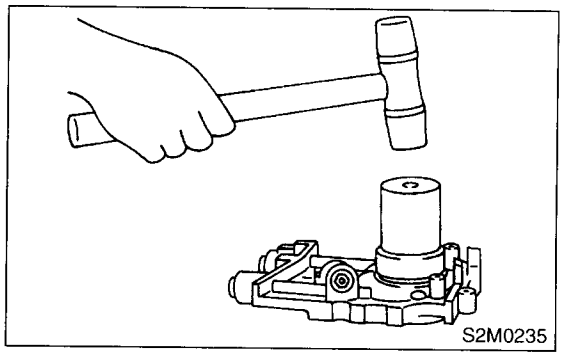
Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)





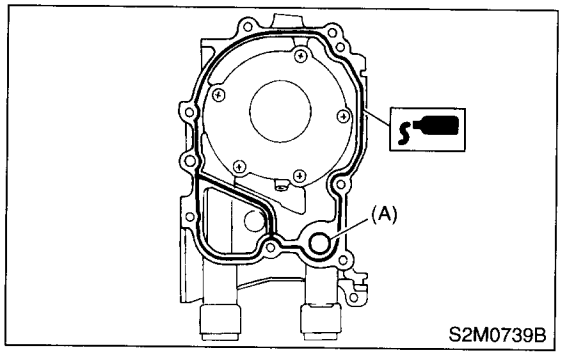
22) Install the housing cover.

23) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using ST.
ST 499587100 OIL SEAL INSTALLER



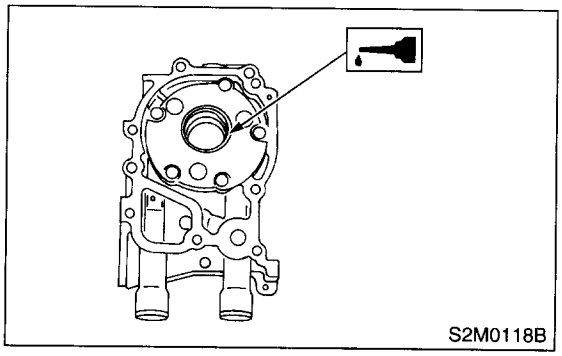
(2) Apply fluid packing to the matching surface of oil pump.

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 the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

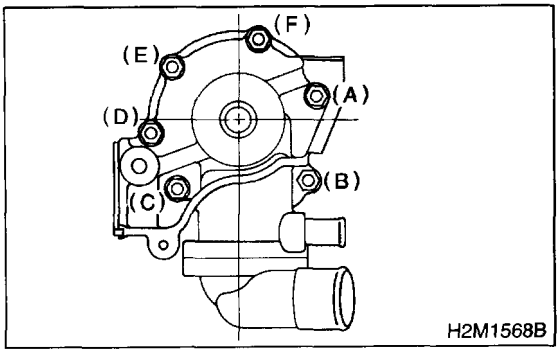
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

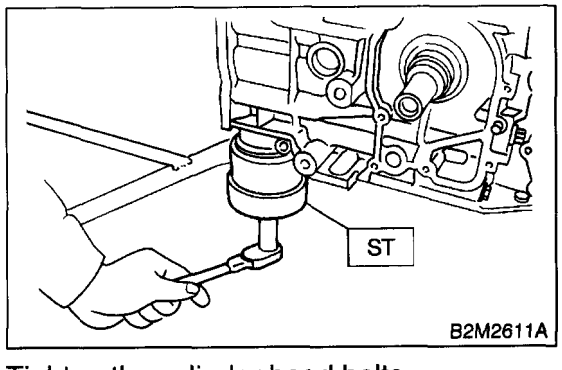
24) Install the water pump and gasket.

Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

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



25) Install the water by-pass pipe for heater.
26) Install the oil filter using ST.
ST 498547000 OIL FILTER WRENCH

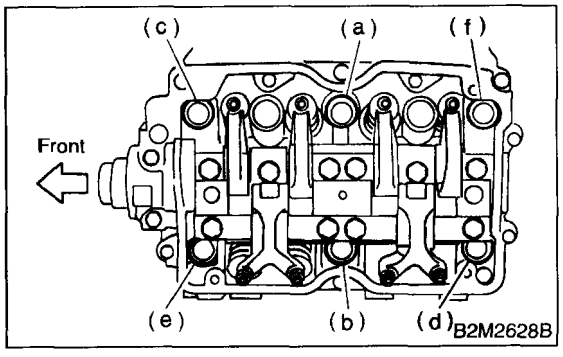


27) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten the bolts more than 90°.

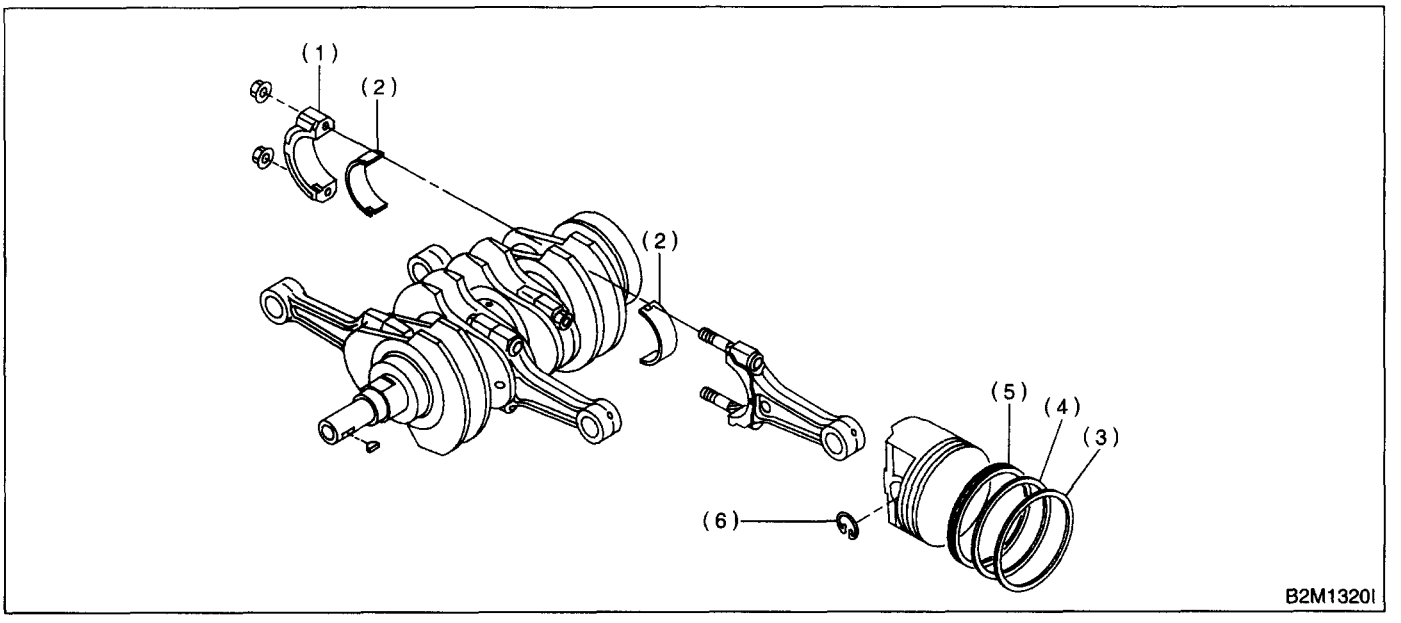
(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

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



28) Install the oil level gauge guide and tighten the attaching bolt (left side only).
29) Install the rocker cover.
30) Install the crankshaft sprocket. <Ref. to ME(SOHC)-54, INSTALLATION, Crankshaft Sprocket.>
31) Install the camshaft sprocket. <Ref. to ME(SOHC)-52, INSTALLATION, Camshaft Sprocket.>
32) Install the timing belt assembly. <Ref. to ME(SOHC)-48, INSTALLATION, Timing Belt Assembly.>
33) Install the belt cover. <Ref. to ME(SOHC)-46, INSTALLATION, Belt Cover.>
34) Install the crankshaft pulley. <Ref. to ME(SOHC)-45, INSTALLATION, Crankshaft Pulley.>
35) Install the generator and A/C compressor brackets on cylinder head.
36) Install the intake manifold. <Ref. to FU(SOHC)-17, INSTALLATION, Intake Manifold.>
37) Install the V-belt. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

C: DISASSEMBLY



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

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

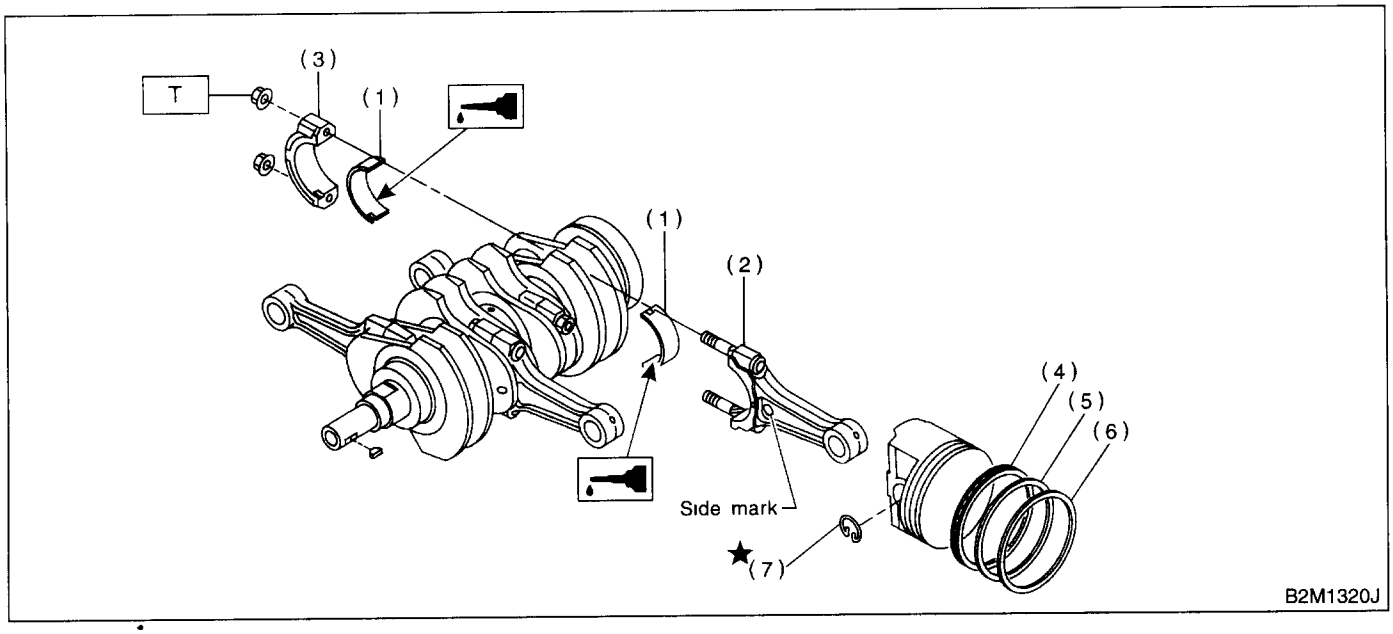
CAUTION:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

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

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

5) Remove the circlip.

D: ASSEMBLY



(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 (kgf-m, ft-lb)
T: 44.6 (4.55, 32.9)

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

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

2) Install the connecting rod on crankshaft.

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

3) Install the 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) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the 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)

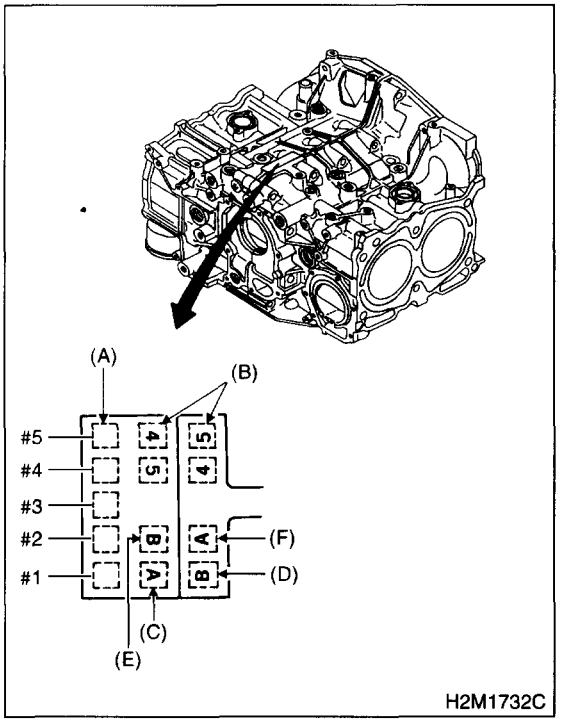
2. CYLINDER AND PISTON

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

CAUTION:
Measurement should be performed at a temperature of 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 — 99.515 mm (3.9171 — 3.9175 in)



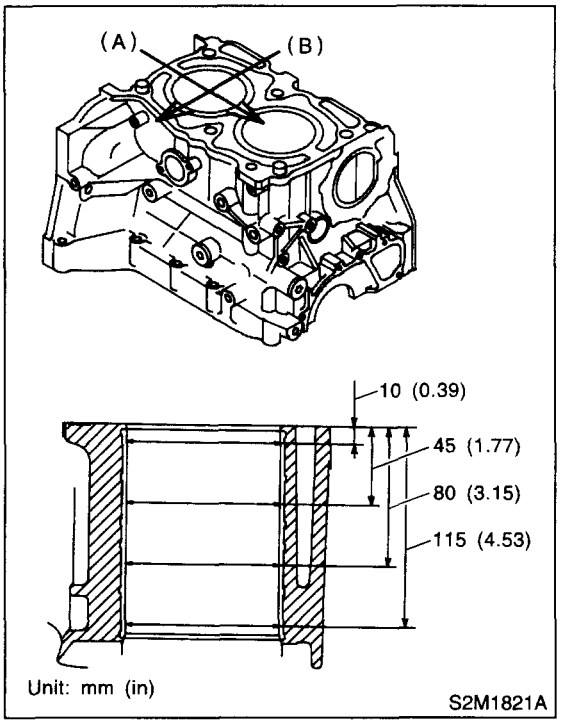
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

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 of 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) Piston pin direction
(B) Thrust direction

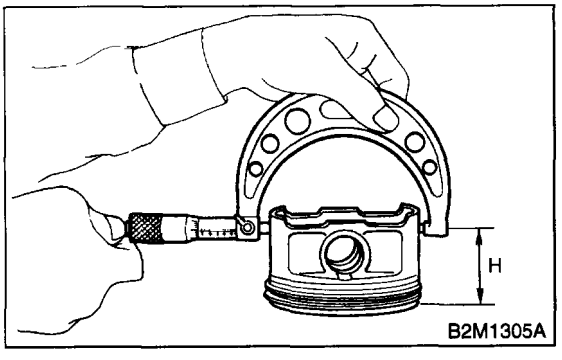
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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.

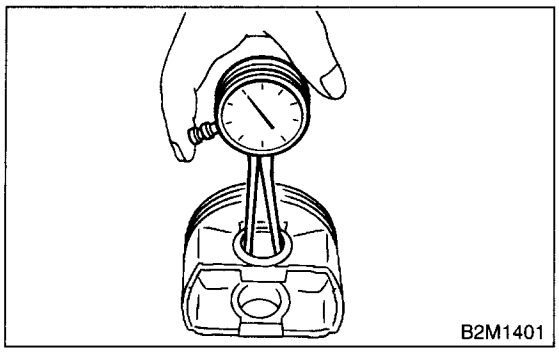
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

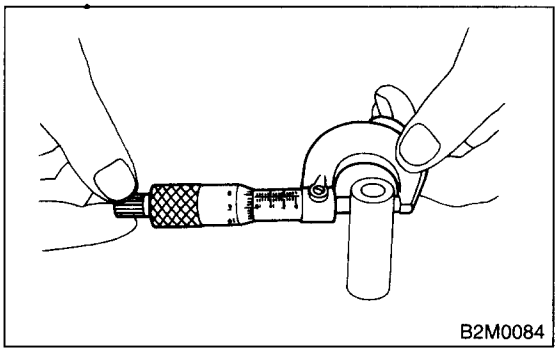
3. PISTON AND PISTON PIN

1) Check the 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 ME(SOHC)-82, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

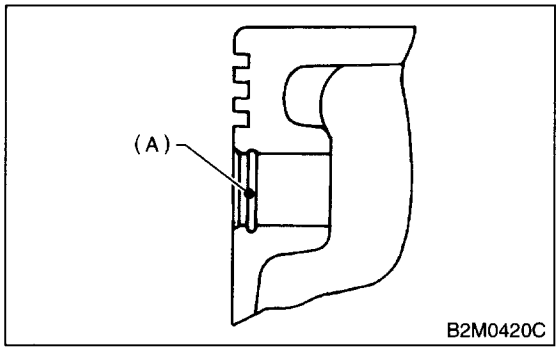
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

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)


B2M1401


B2M0084

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



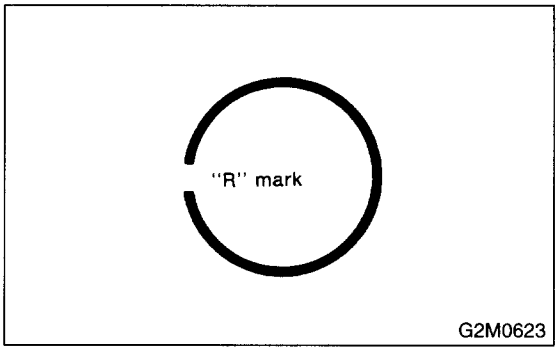
B2M0420C

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

4. PISTON RING

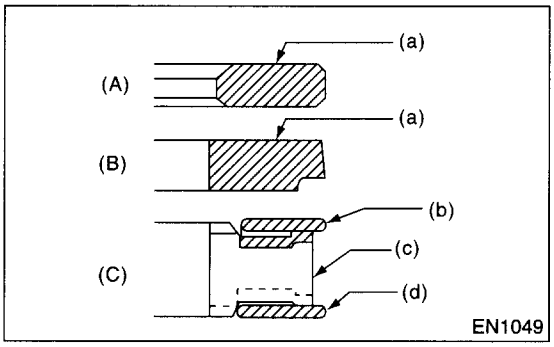
1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:
• "R" is marked on the end of the top and second rings. When installing the rings to the piston, face these marks upward.



G2M0623

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



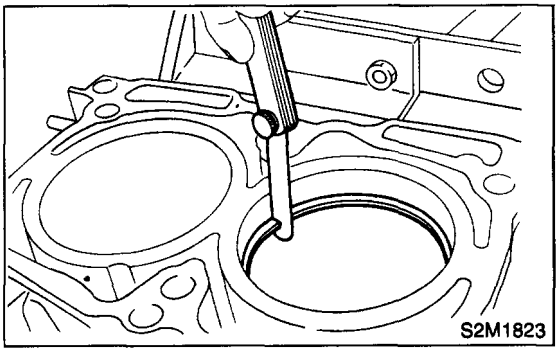
EN1049

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

2) Squarely place the 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)

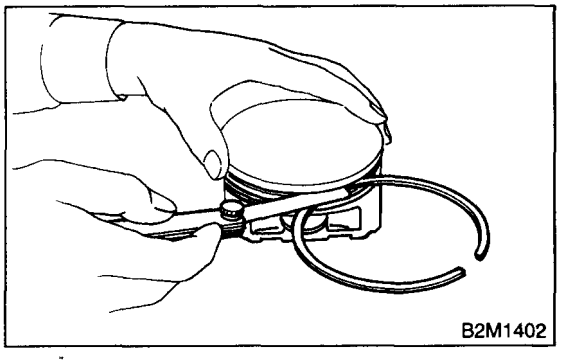

S2M1823

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)

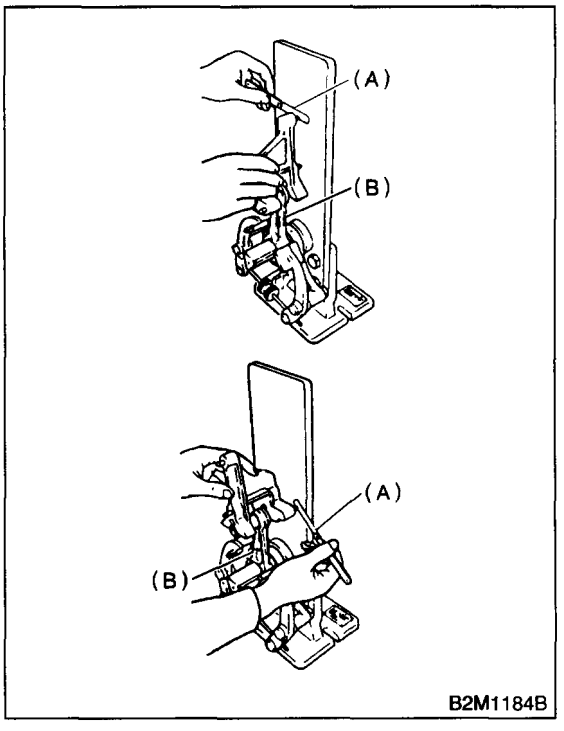
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


B2M1402

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the 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)

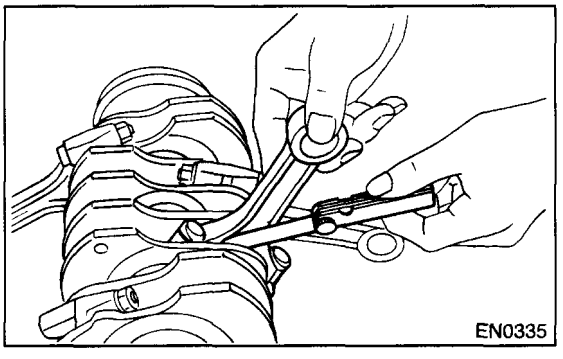


B2M1184B

(A) Thickness gauge
(B) Connecting rod

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


EN0335

4) Inspect the 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.)

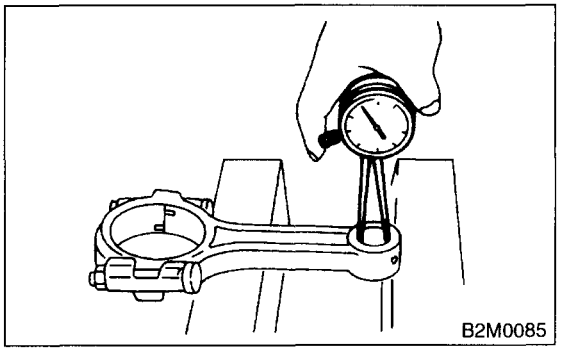
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.05 mm (0.0020 in)

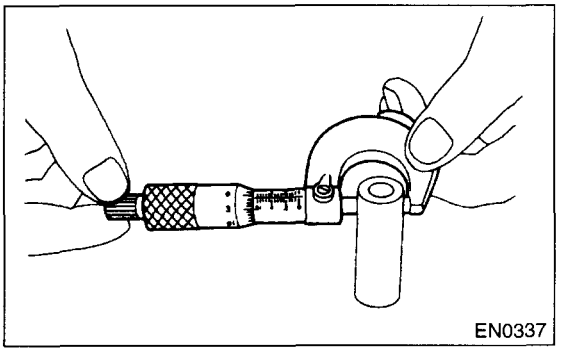
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0599)	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 the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

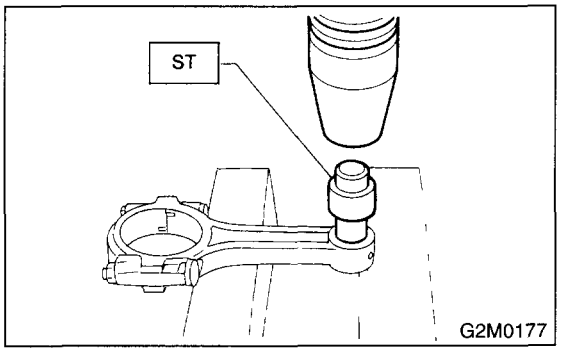
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


B2M0085


EN0337

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

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



G2M0177

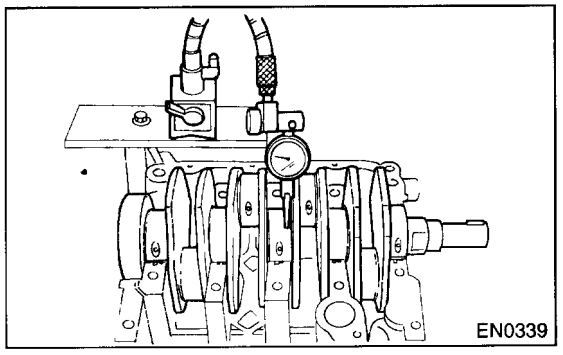
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the 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.

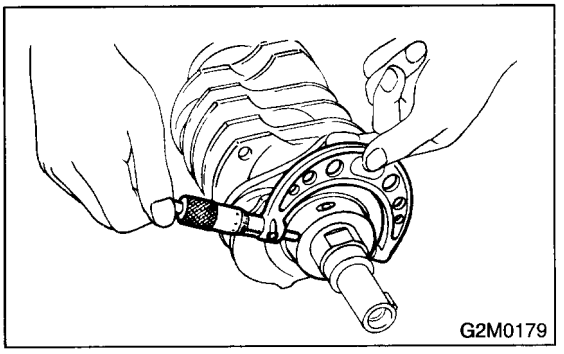
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


EN0339

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding the 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

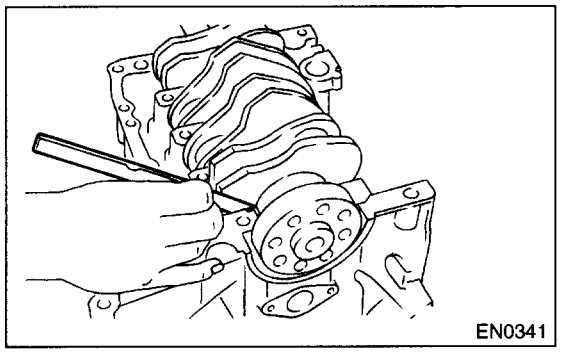
Unit: mm (in)

		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 the 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 the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

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

22.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refers 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
	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3) Initial combustion occur.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		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
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		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

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

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

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		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)	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure >		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure >		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	• Engine control system <Ref to EN(SOHC)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter o-ring	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	• Engine control system <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.>		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

23.Engine Noise

A: INSPECTION

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 water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*
When disconnecting the 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 EN(SOHC)-43, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

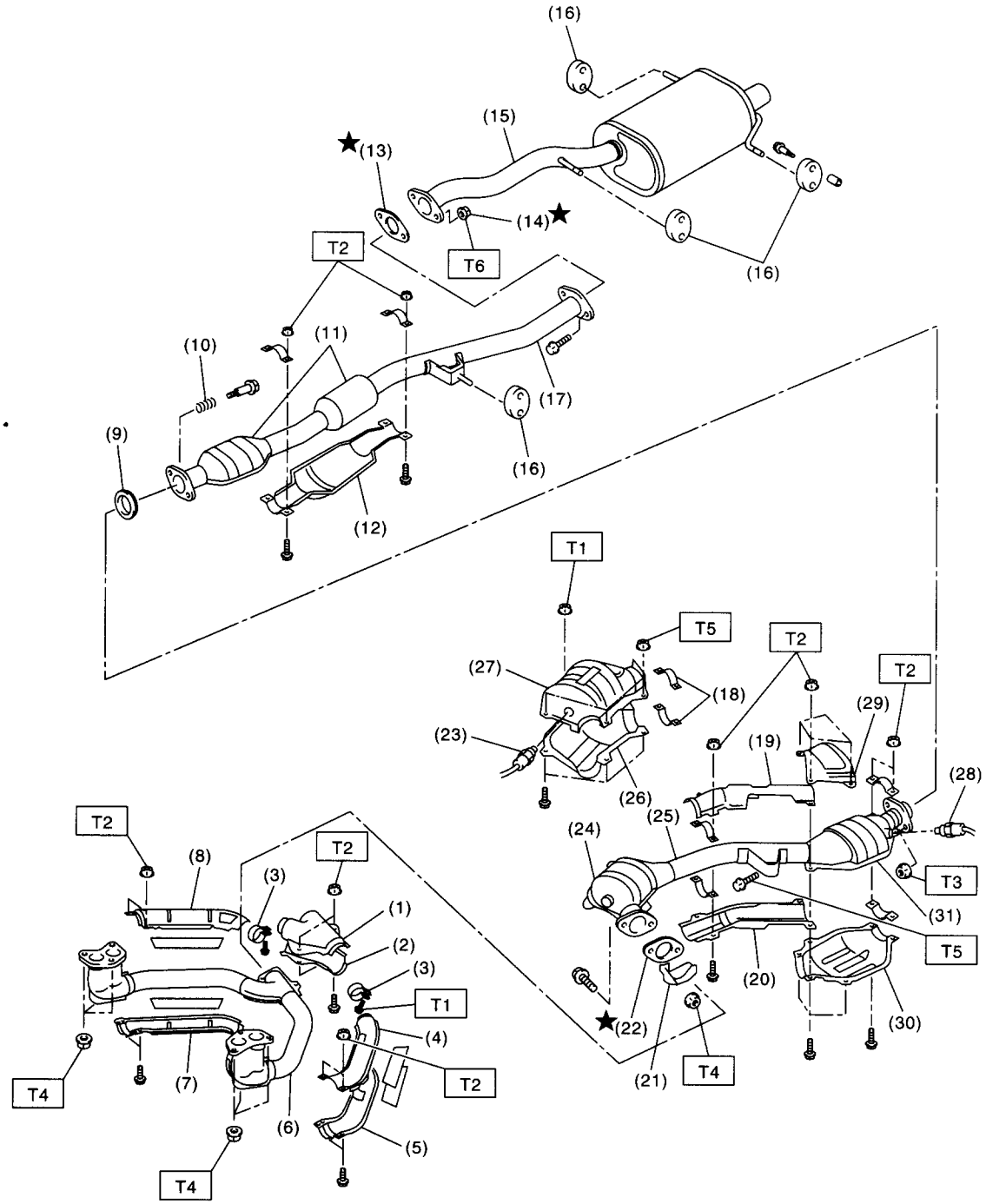
EX(SOHC)

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3. Center Exhaust Pipe 8
4. Rear Exhaust Pipe 9
5. Muffler 11

1. General Description

A: COMPONENT



EN1048

(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Clamp
(4) Upper front exhaust pipe cover LH
(5) Lower front exhaust pipe cover LH
(6) Front exhaust pipe
(7) Lower front exhaust pipe cover RH
(8) Upper front exhaust pipe cover RH
(9) Gasket
(10) Spring
(11) Chamber
(12) Rear exhaust pipe cover
(13) Gasket
(14) Self-locking nut
(15) Muffler
(16) Cushion rubber
(17) Rear exhaust pipe
(18) Clamp
(19) Upper center exhaust pipe cover
(20) Lower center exhaust pipe cover
(21) Protector
(22) Gasket
(23) Front oxygen (A/F) sensor
(24) Front catalytic converter
(25) Center exhaust pipe
(26) Lower front catalytic converter cover
(27) Upper front catalytic converter cover
(28) Rear oxygen sensor
(29) Upper rear catalytic converter cover
(30) Lower rear catalytic converter cover
(31) Rear catalytic converter

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 30 (3.1, 22.4)
T5: 35 (3.6, 26.0)
T6: 48 (4.9, 35.4)

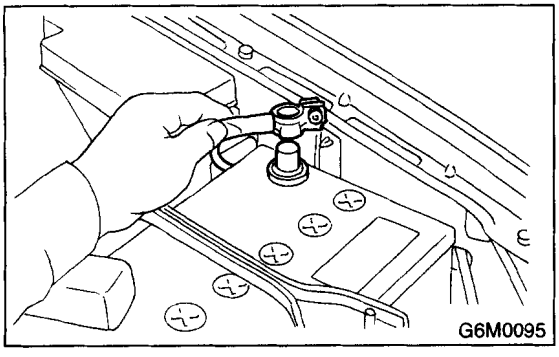
B: CAUTION

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

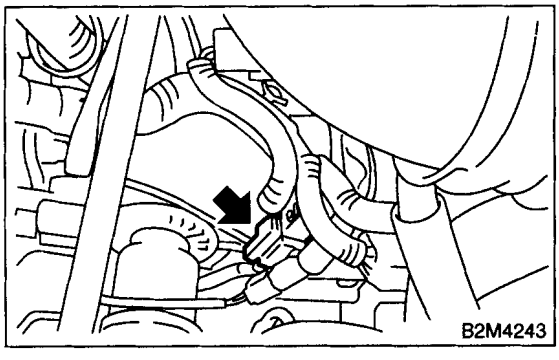
2. Front Exhaust Pipe

A: REMOVAL

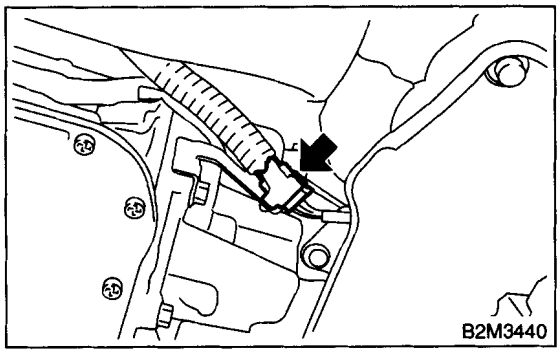
1) Disconnect the battery ground cable.



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



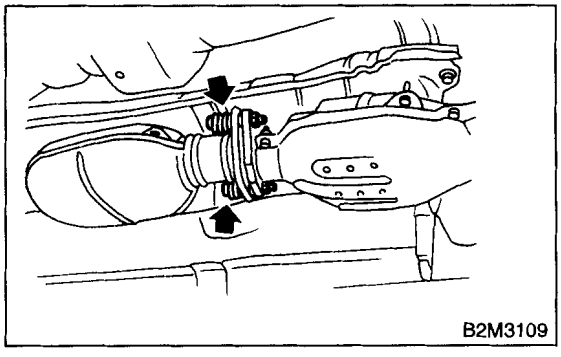
3) Disconnect the rear oxygen sensor connector.



4) Lift-up the vehicle.

5) Separate the front and center exhaust pipe assembly from rear exhaust pipe.

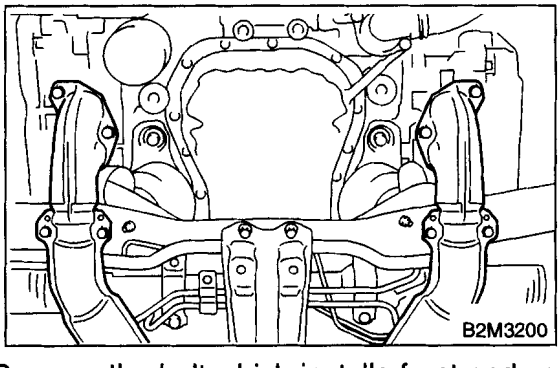
WARNING:
Be careful, the exhaust pipe is hot.



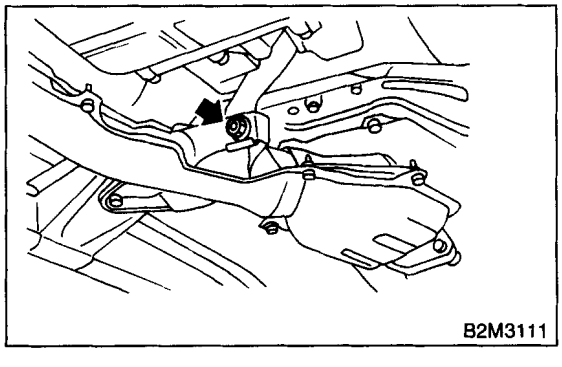
6) Remove the under cover.

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

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



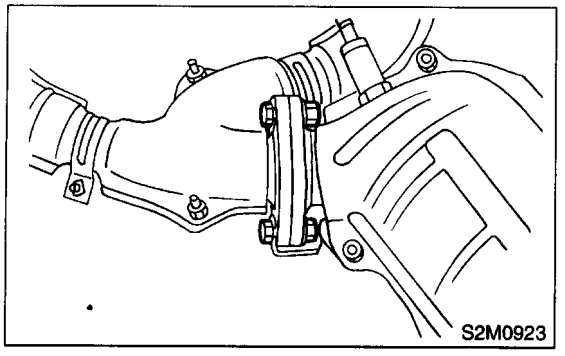
8) Remove the bolt which installs front and center exhaust pipe assembly to hanger bracket.



9) Remove the front and center exhaust pipe assembly from the vehicle.

CAUTION:
- **Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.**
- **After removing the front and center exhaust assembly, do not apply excessive pulling force on the rear exhaust pipe.**

10) Separate the front exhaust pipe from center exhaust pipe.

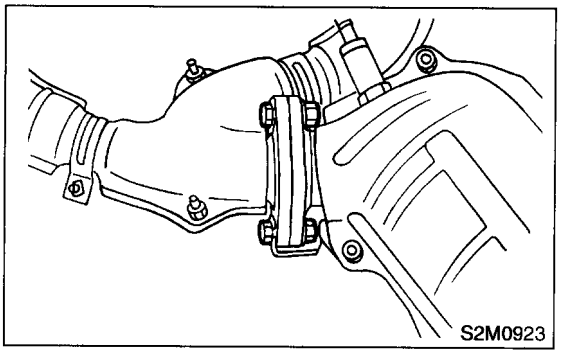


B: INSTALLATION

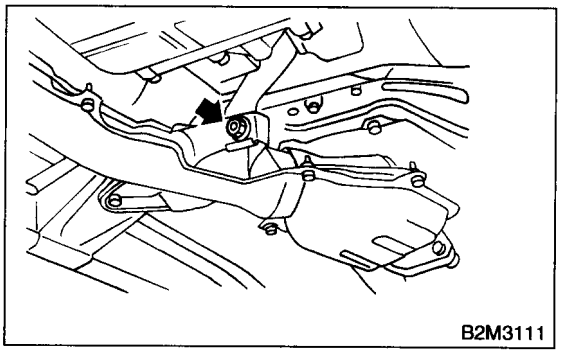
1) Install the front exhaust pipe to center exhaust pipe.

NOTE:
Replace the gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

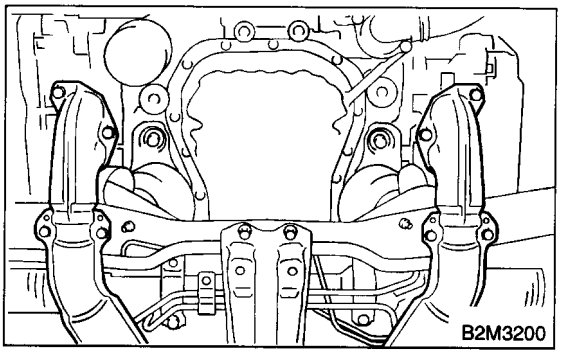


2) Install the front and center exhaust pipe assembly to the vehicle.
3) Temporarily tighten the bolt which installs front and center exhaust pipe assembly to hanger bracket.



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

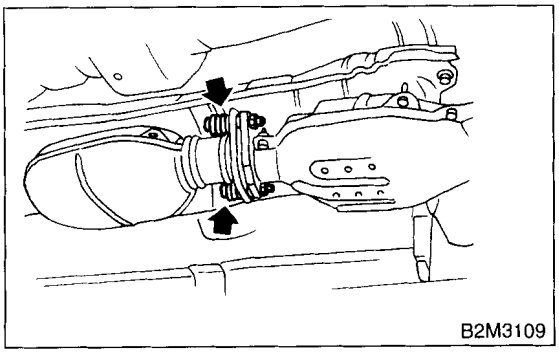
Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



5) Install the under cover.

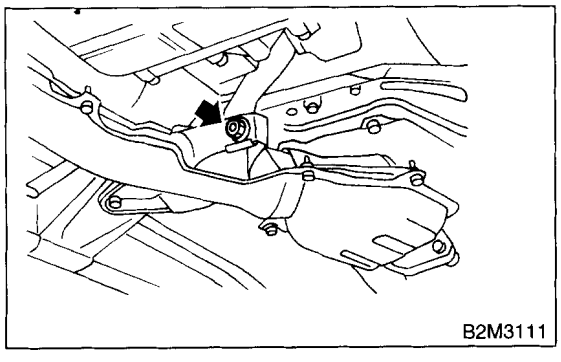
6) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

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

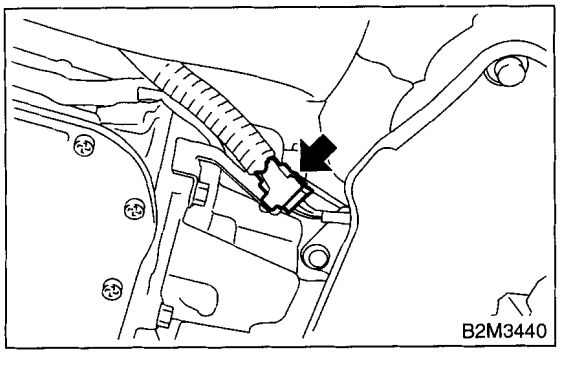

B2M3109

7) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

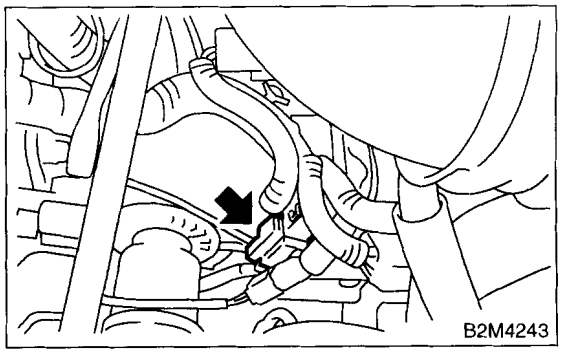
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)


B2M3111

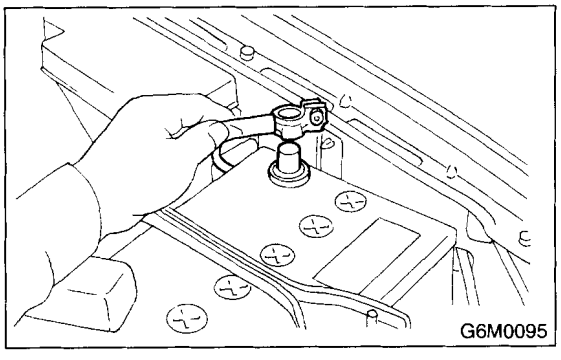
8) Lower the vehicle.
9) Connect the rear oxygen sensor connector.


B2M3440

10) Connect the front oxygen (A/F) sensor connector.


B2M4243

11) Connect the battery ground cable.


G6M0095

C: INSPECTION

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

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

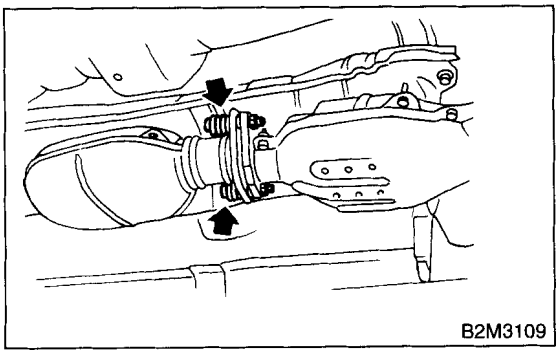
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Rear Exhaust Pipe

A: REMOVAL

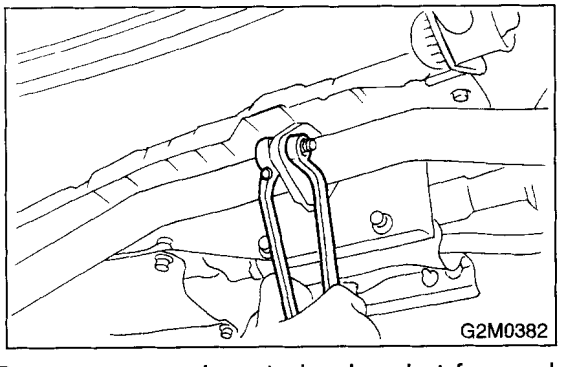
1) Lift-up the vehicle.
2) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



3) Separate the rear exhaust pipe from muffler.

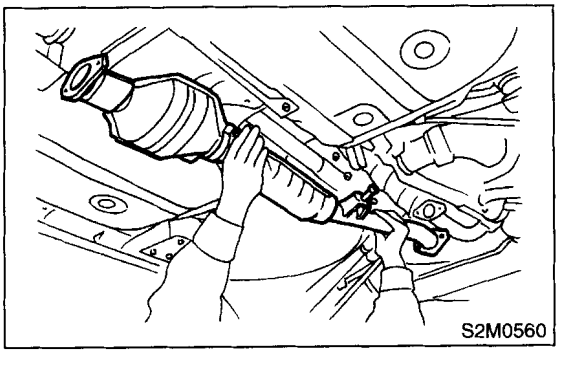
CAUTION:
Be careful not to pull down rear the exhaust pipe.



4) Remove rear exhaust pipe bracket from rubber cushion.

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

SUBARU CRC (Part No. 004301003)



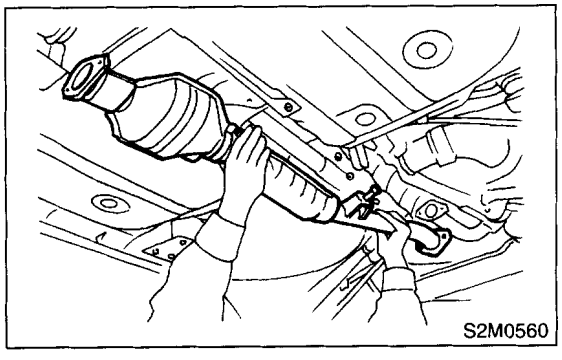
B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Install rear exhaust pipe bracket to rubber cushion.

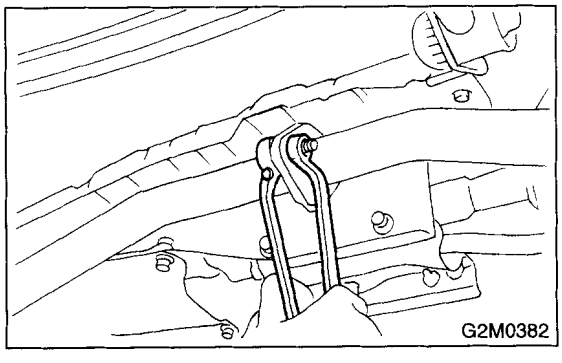
NOTE:
To facilitate installation, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)



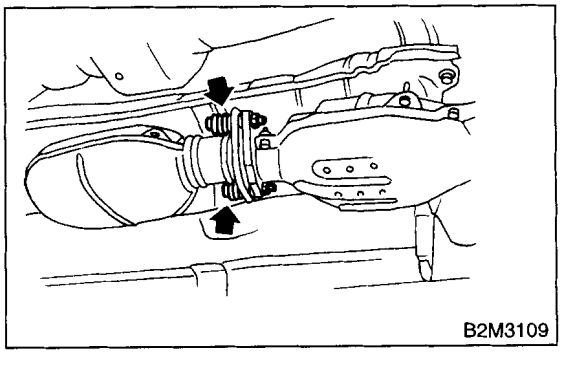
2) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



3) Install the rear exhaust pipe to center exhaust pipe.

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



C: INSPECTION

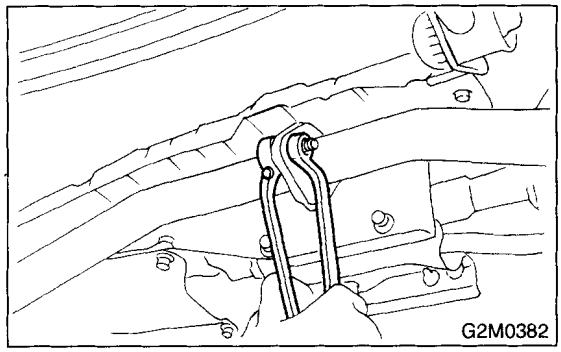
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

5. Muffler

A: REMOVAL

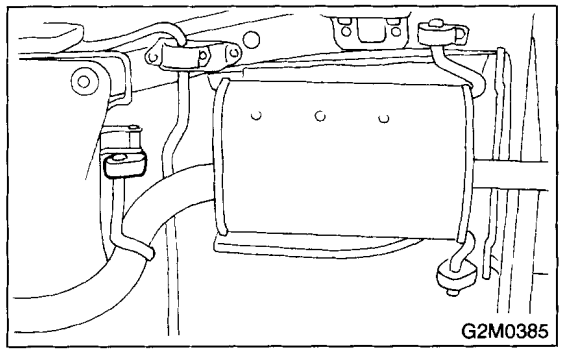
1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



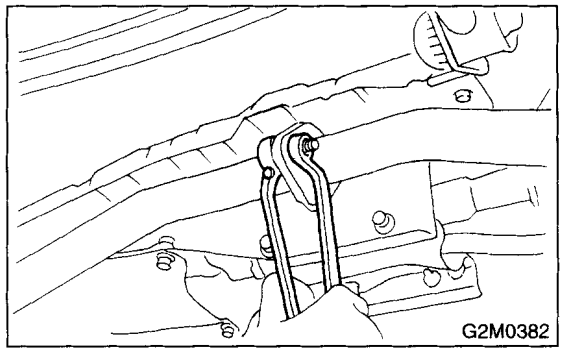
3) Remove the front, left and right rubber cushion, and detach muffler assembly.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO

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11.	Reservoir Tank	50
12.	Coolant Filler Tank	51
13.	Engine Cooling System Trouble in General	52

1. General Description

A: SPECIFICATIONS

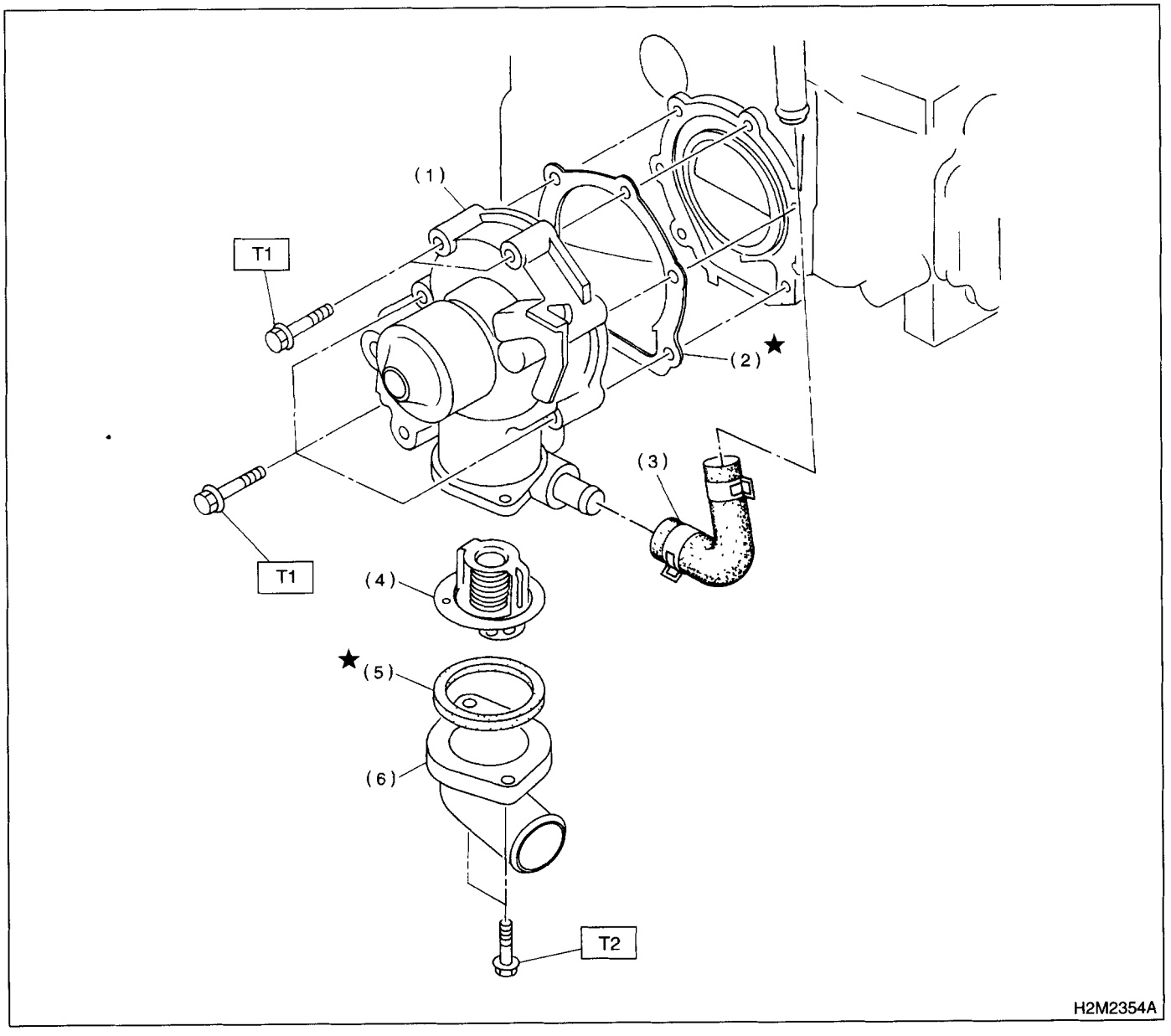
Model			Non-turbo	Turbo
Cooling system			Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity ℓ (US qt, Imp qt)			MT: Approx. 7 (7.4, 6.2) AT: Approx. 6.9 (7.29, 6.07)	MT: Approx. 7.7 (8.14, 6.78) AT: Approx. 7.6 (8.03, 6.69)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed—total engine coolant head	700 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)	
	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)	
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	Main fan	70 W	120 W
		Sub fan	70 W	120 W
	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		*1 691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)	*2 691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 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		0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

*1: Non-turbo model and turbo AT model
*2: Turbo MT model

B: COMPONENT

1. WATER PUMP

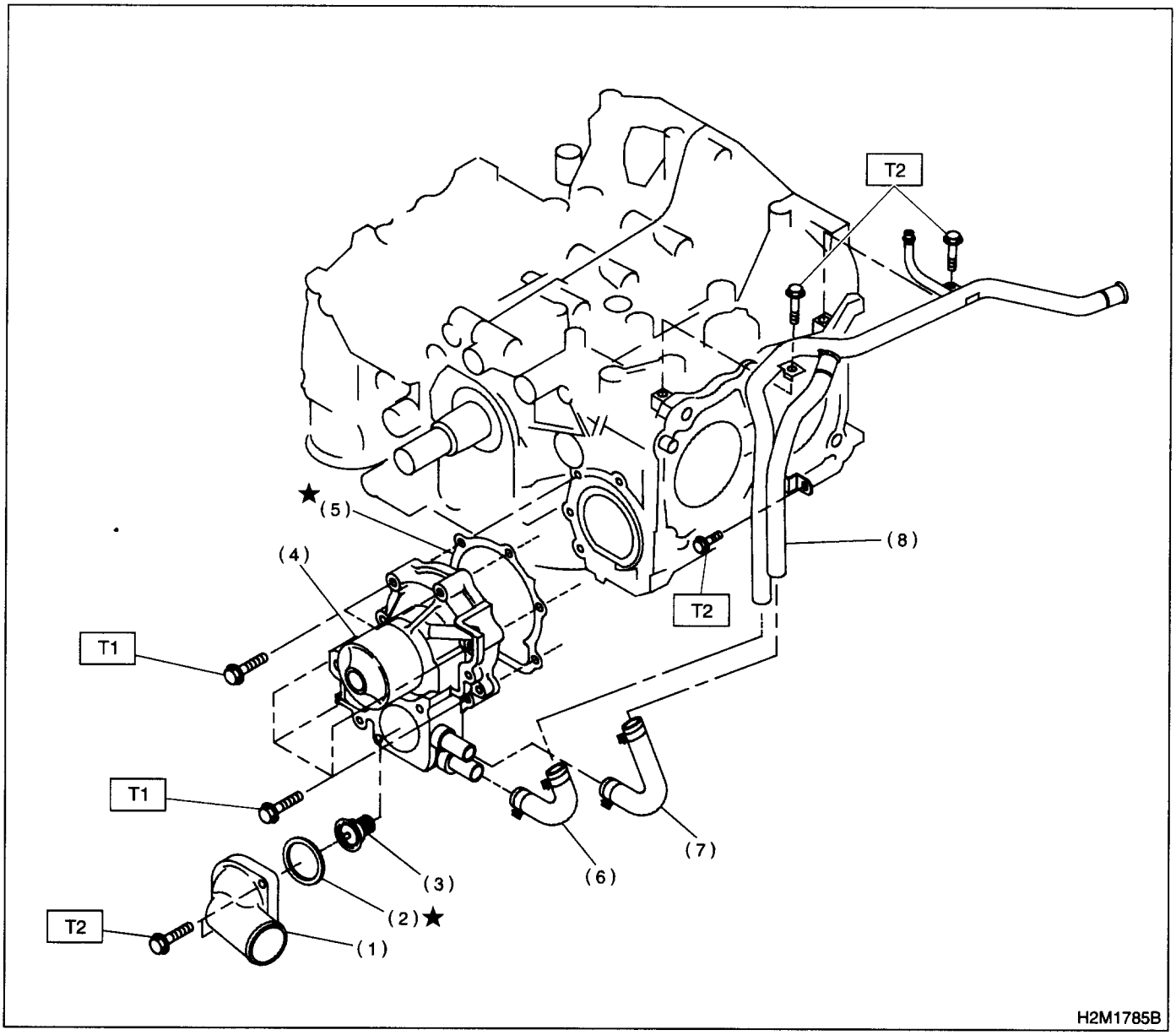
• NON-TURBO MODEL



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.4 (0.65, 4.7)

• TURBO MODEL

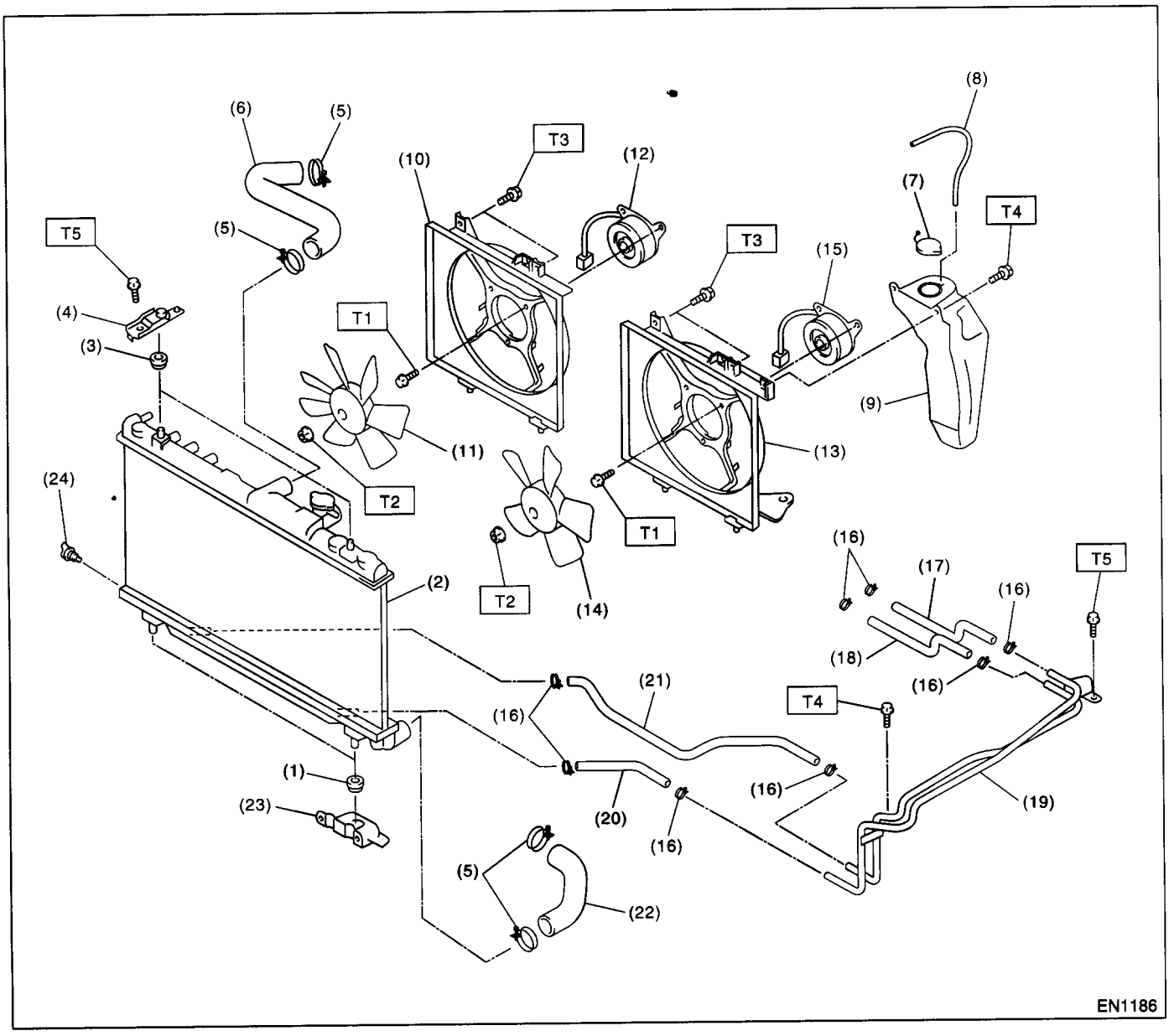


(1) Thermostat case
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Header by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.4 (0.65, 4.7)

2. RADIATOR AND RADIATOR FAN

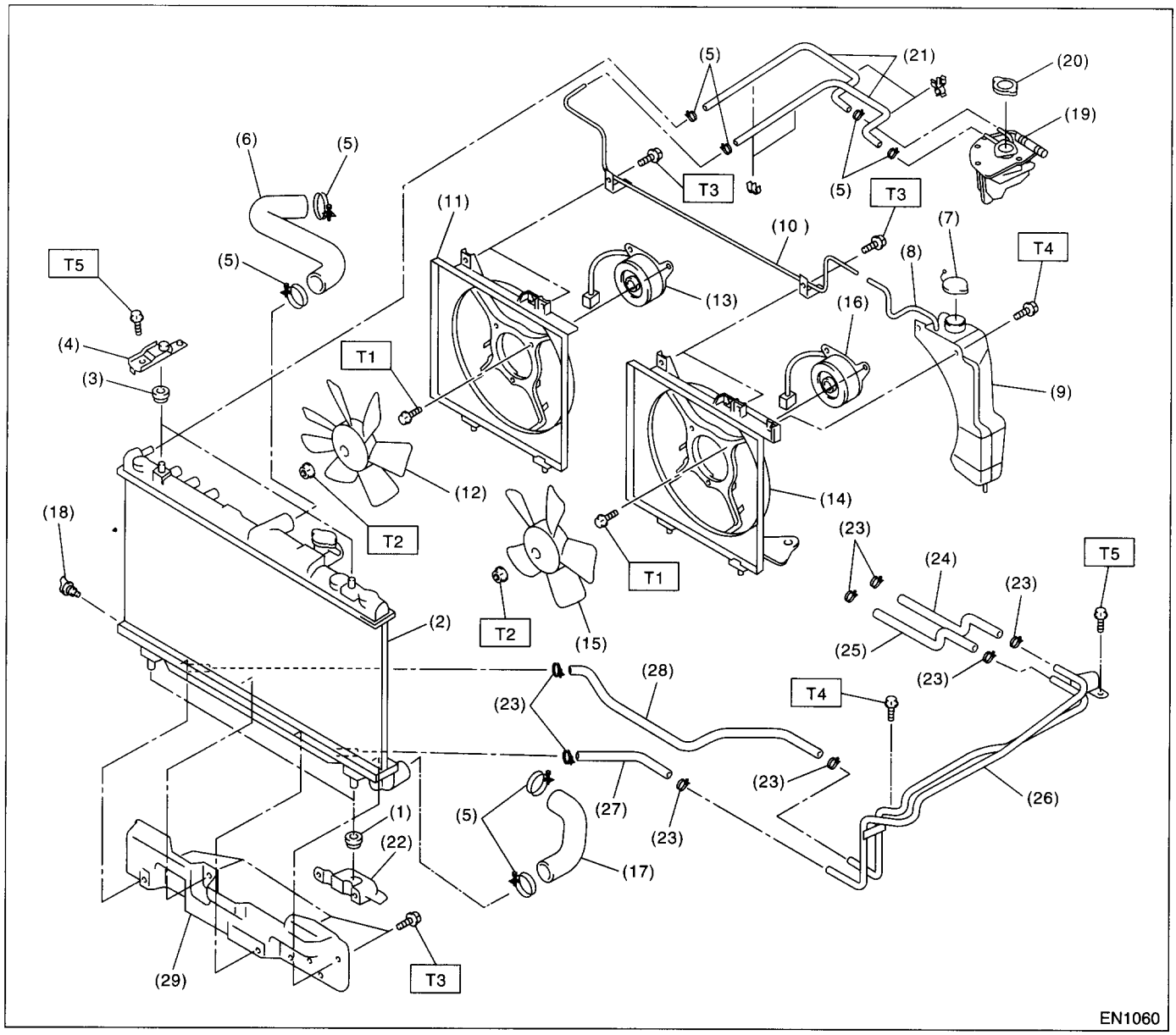
• NON-TURBO MODEL



(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) Sub fan motor
(13) Main fan shroud
(14) Radiator main fan
(15) 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 inlet hose B (AT vehicles only)
(21) ATF outlet hose B (AT vehicles only)
(22) Radiator outlet hose
(23) Radiator lower bracket
(24) Radiator drain plug

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*3.4 (0.35, 2.5)*
T2:	*4.5 (0.46, 3.3)*
T3:	*5.0 (0.51, 3.7)*
T4:	*7.5 (0.76, 5.5)*
T5:	*12 (1.2, 8.7)*

• TURBO MODEL



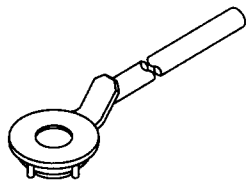
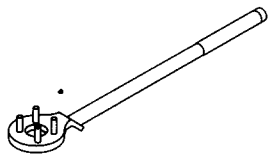
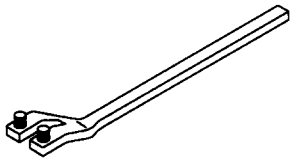
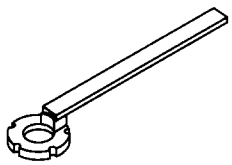
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Over flow hose
(9) Engine coolant reservoir tank
(10) Over flow pipe
(11) Sub fan shroud
(12) Radiator sub fan
(13) Radiator sub fan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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.4 (0.35, 2.5)
T2: 4.5 (0.46, 3.3)
T3: 5.0 (0.51, 3.7)
T4: 7.5 (0.76, 5.5)
T5: 12 (1.2, 8.7)

C: CAUTION

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

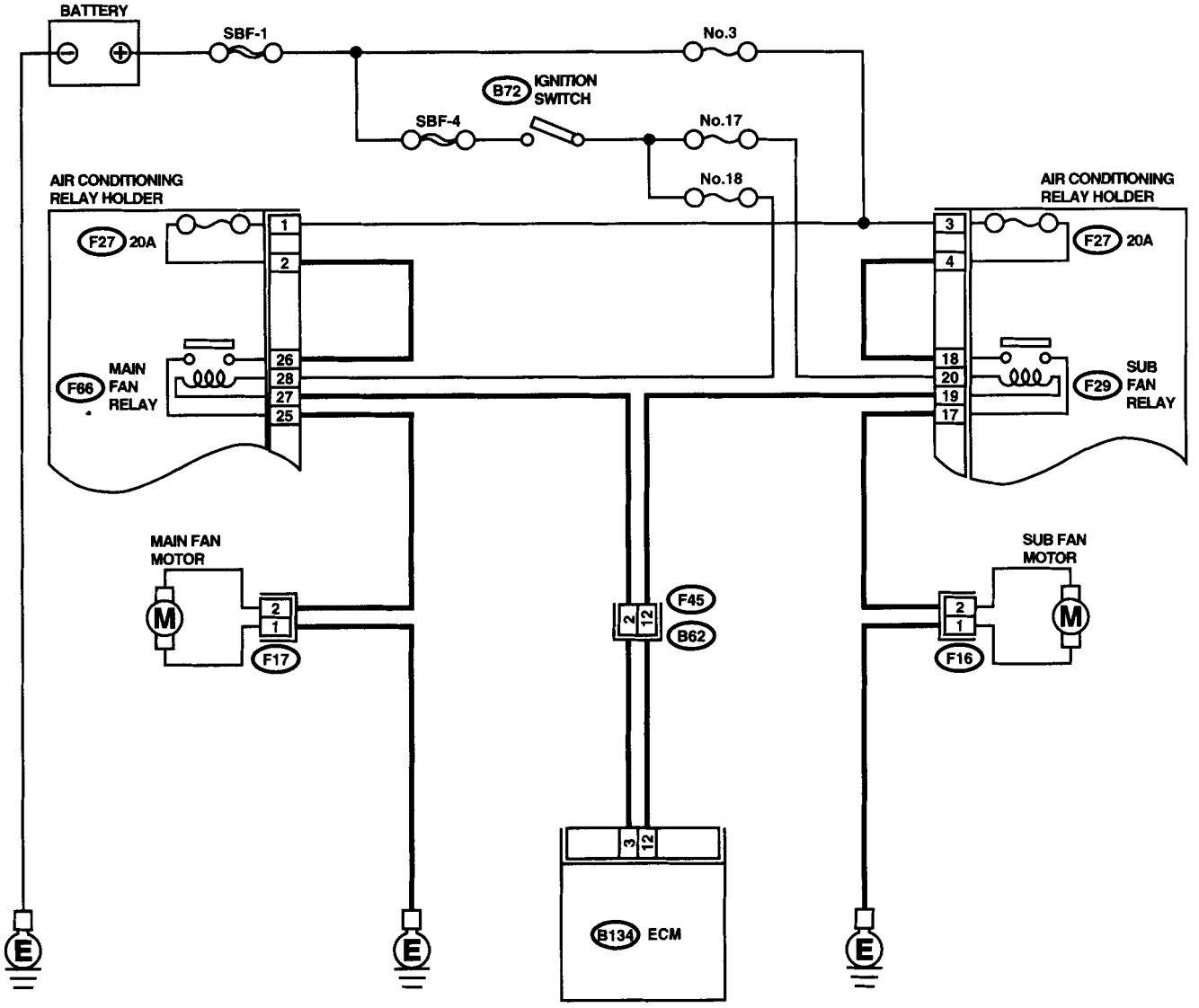
D: PREPARATION TOOL

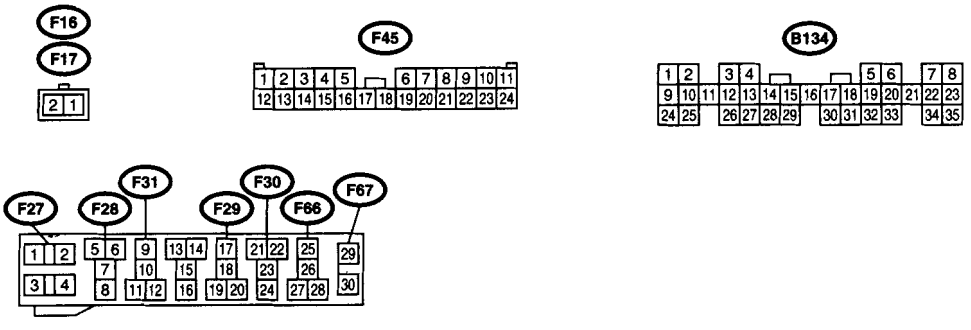
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (Turbo model)
 B2M3870	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (Non-turbo model)
 B2M3859	499207100	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Non-turbo LH side only)
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

2. Radiator Main Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

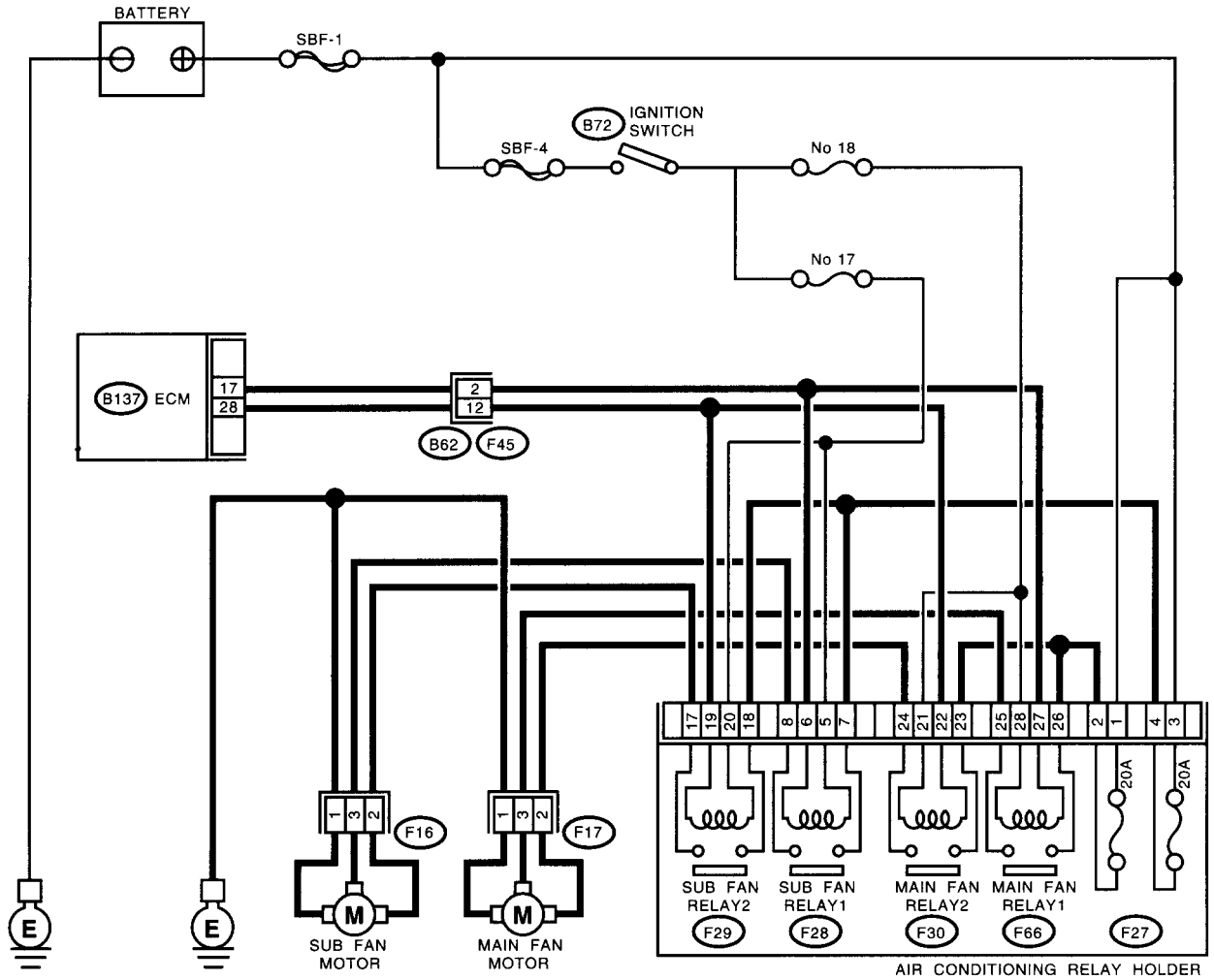


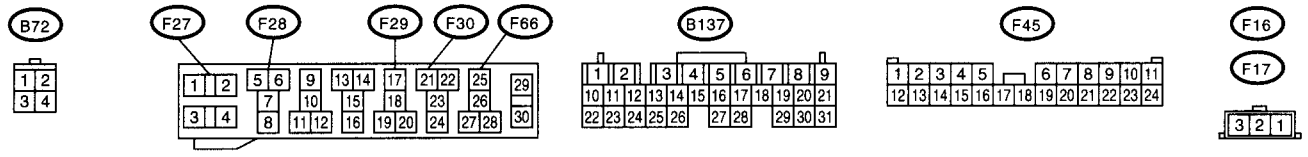


EN1061

RADIATOR MAIN FAN SYSTEM

2. TURBO MODEL





EN1062

B: INSPECTION

1. NON-TURBO MODEL

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.

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from the 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 the ignition switch to ON. 5)Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between main fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **4.**
4	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and the negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
5	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay from A/C relay holder. 3)Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **7.**
6	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1)Turn the ignition switch to ON. 2)Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Go to step **9.**
7	**CHECK 20 A FUSE.** 1)Remove 20 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **8.**

RADIATOR MAIN FAN SYSTEM

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
10	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay. 3)Measure the resistance of main fan relay. ***Terminal*** ***No. 26 — No. 25:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the main fan relay.
11	**CHECK MAIN FAN RELAY.** 1)Connect the battery to terminals No. 27 and No. 28 of main fan relay. 2)Measure the resistance of main fan relay. ***Terminal*** ***No. 26 — No. 25:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the main fan relay.
12	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay terminal. ***Connector & terminal*** ***(F17) No. 2 — (F66) No. 25:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.
13	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between main fan relay connector and ECM connector. ***Connector & terminal*** ***(F66) No. 27 — (B134) No. 3:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair the open circuit in harness between main fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

NOTE:
Inspection by SOA service is required, because probable cause is deterioration of multiple parts.

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
  (1) Engine coolant temperature is above 90°C (194°F)
  (2) A/C is ON

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR.** 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the main radiator fan rotate?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR.** 1)Turn the A/C switch ON at condition of step 1.	Does the main radiator fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step **17.**
3	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from main fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **7.**
4	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit in harness between main fan motor connector and chassis ground.
5	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **6.**
6	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 3, and the negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
7	**CHECK POWER SUPPLY TO MAIN FAN RELAY1.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1 from A/C relay holder. 3)Measure the voltage between main fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Go to step **9.**

RADIATOR MAIN FAN SYSTEM

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO MAIN FAN RELAY1.** 1)Turn the ignition switch to ON. 2)Measure the voltage between main fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **12.**	Go to step **11.**
9	**CHECK 20 A FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
11	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
12	**CHECK MAIN FAN RELAY1.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1. 3)Measure the resistance of main fan relay1. ***Terminal*** ***No. 26 — No. 25:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Replace the main fan relay1.
13	**CHECK MAIN FAN RELAY.** 1)Connect the battery to terminals No. 27 and No. 28 of main fan relay1. 2)Measure the resistance of main fan relay1. ***Terminal*** ***No. 26 — No. 25:***	Is the resistance less than 1 Ω?	Go to step **14.**	Replace the main fan relay1.
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY1 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay1 terminal. ***Connector & terminal*** ***(F17) No. 3 — (F66) No. 25:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between main fan motor connector and main fan relay1 terminal.
15	**CHECK HARNESS BETWEEN MAIN FAN RELAY1 AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between main fan relay1 connector and ECM connector. ***Connector & terminal*** ***(F66) No. 27 — (B137) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between main fan relay1 and ECM.
16	**CHECK POOR CONTACT.** · Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

	Step	Check	Yes	No
17	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from main fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Turn the A/C switch ON. 5)Measure the voltage while A/C compressor is rotating. 6)Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **18.**	Go to step **20.**
18	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **19.**
19	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
20	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2 from A/C relay holder. 3)Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F30) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1)Turn the ignition switch to ON. 2)Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F30) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **25.**	Go to step **24.**
22	**CHECK 20 A FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
24	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.

RADIATOR MAIN FAN SYSTEM

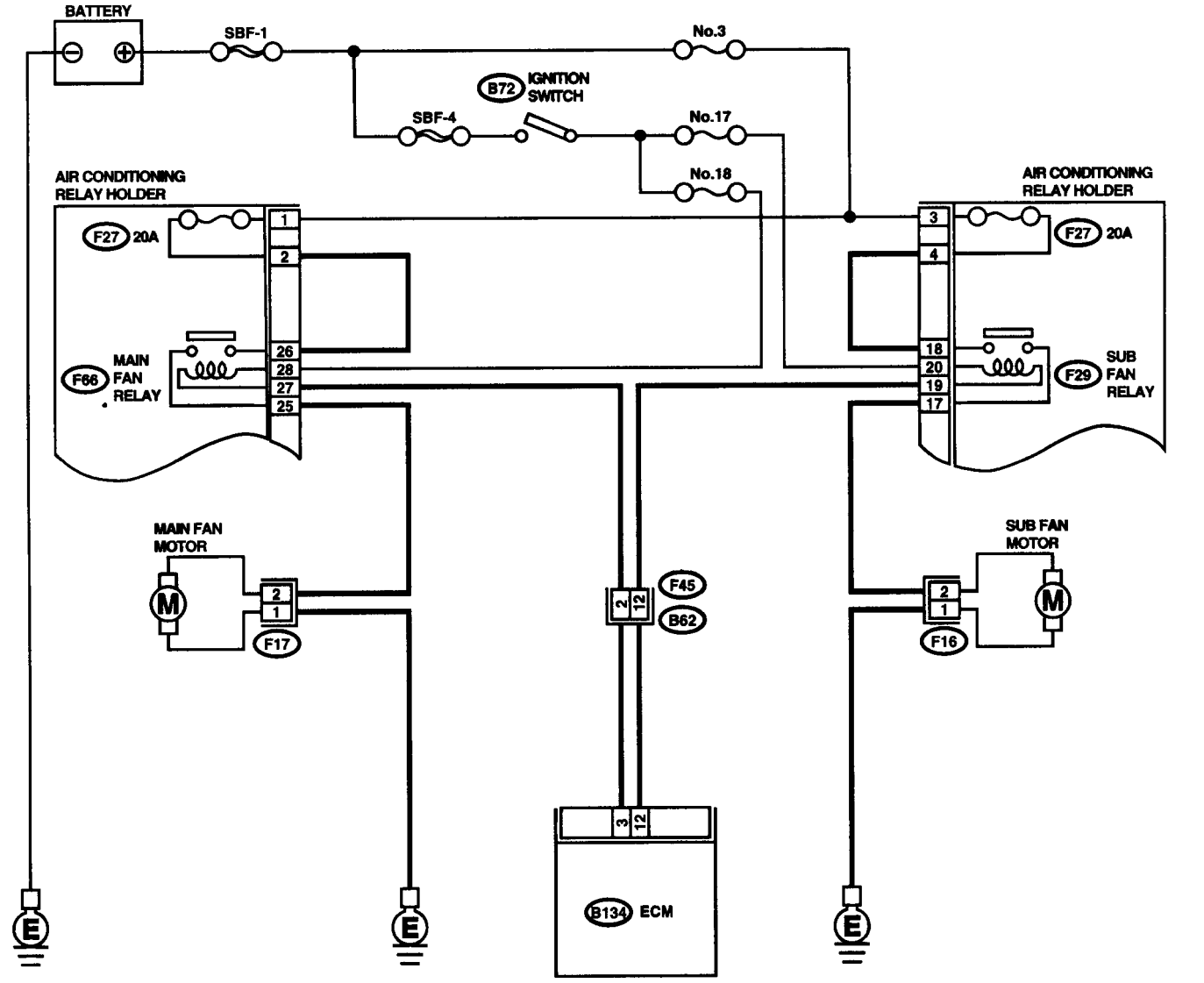
	Step	Check	Yes	No
25	**CHECK MAIN FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2. 3)Measure the resistance of main fan relay2. ***Terminal*** ***No. 23 — No. 24:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the main fan relay2.
26	**CHECK MAIN FAN RELAY2.** 1)Connect the battery to terminals No. 21 and No. 22 of main fan relay1. 2)Measure the resistance of main fan relay2. ***Terminal*** ***No. 23 — No. 24:***	Is the resistance less than 1 Ω?	Go to step **27.**	Replace the main fan relay2.
27	**CHECK HARNESS BETWEEN MAIN FAN RELAY2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay2 terminal. ***Connector & terminal*** ***(F17) No. 2 — (F30) No. 24:***	Is the resistance less than 1 Ω?	Go to step **28.**	Repair the open circuit in harness between main fan motor connector and main fan relay2 terminal.
28	**CHECK HARNESS BETWEEN MAIN FAN RELAY2 AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between main fan relay2 connector and ECM connector. ***Connector & terminal*** ***(F30) No. 22 — (B134) No. 28:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit in harness between main fan relay2 and ECM.
29	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

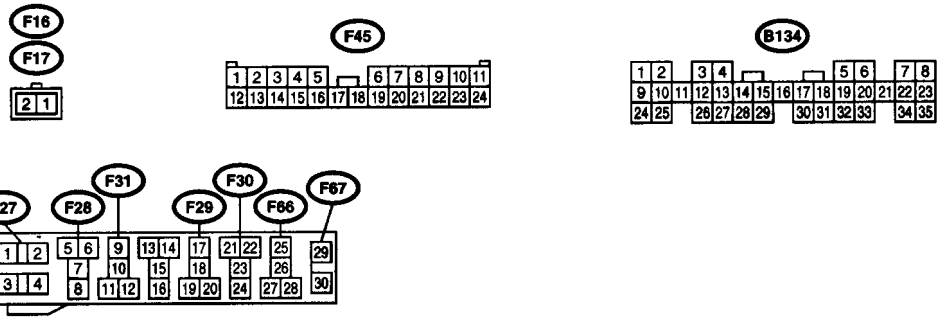
NOTE:
Inspection by SOA service is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC

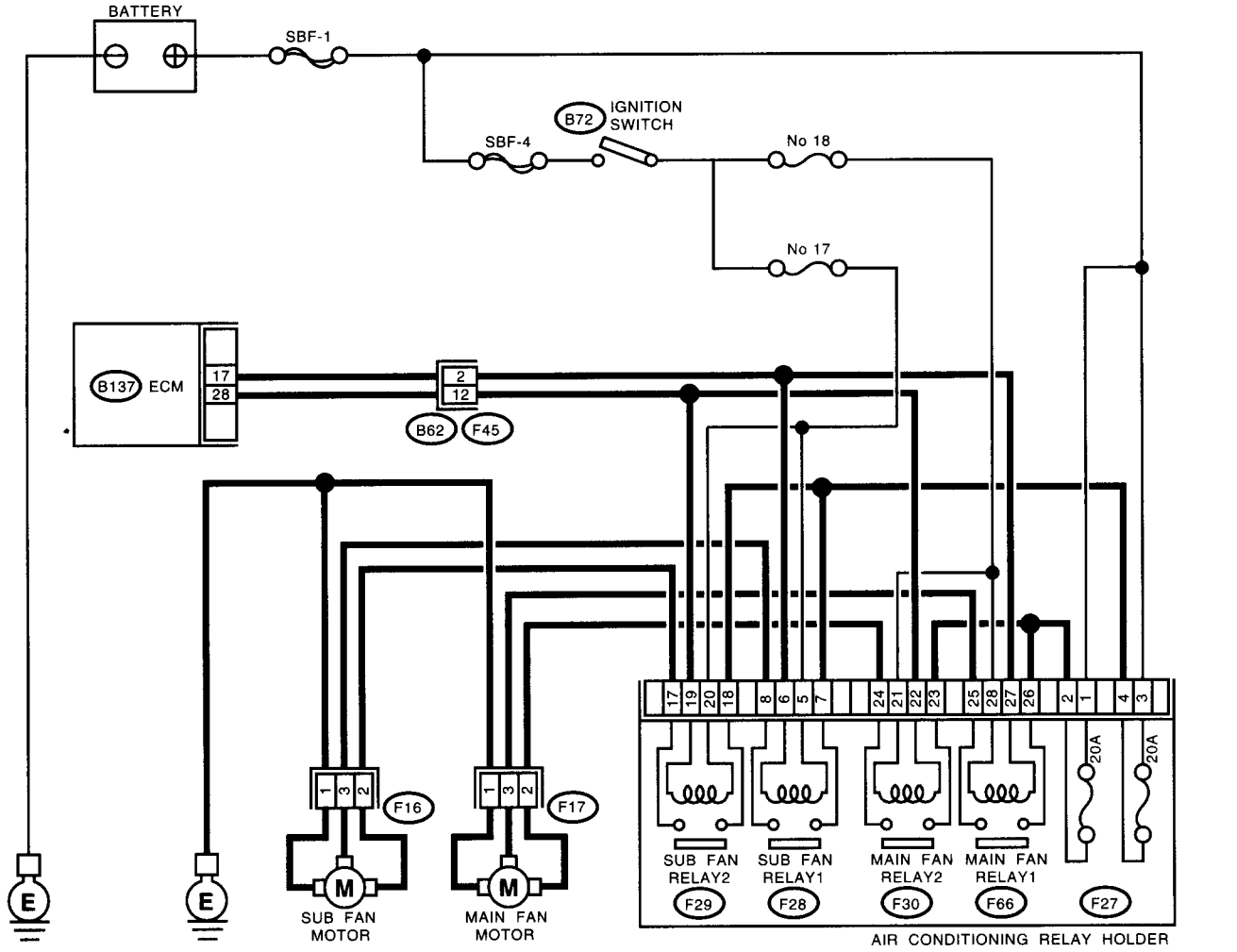
1. NON-TURBO MODEL

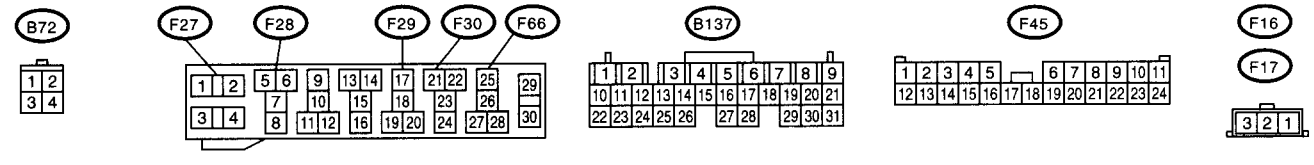




EN1061

2. TURBO MODEL





EN1062

B: INSPECTION

1. NON-TURBO MODEL

NOTE:
System for A/C equipped vehicles only.

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.

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from the 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 the ignition switch to ON. 5)Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between sub fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **4.**
4	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
5	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay from A/C relay holder. 3)Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 18 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **7.**
6	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1)Turn the ignition switch to ON. 2)Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Go to step **9.**

RADIATOR SUB FAN SYSTEM

	Step	Check	Yes	No
7	**CHECK 20 A FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **8.**
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
10	**CHECK SUB FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of sub fan relay. ***Terminal*** ***No. 17 — No. 18:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the sub fan relay.
11	**CHECK SUB FAN RELAY.** 1)Connect the battery to terminals No. 20 and No. 19 of sub fan relay. 2)Measure the resistance of sub fan relay. ***Terminal*** ***No. 17 — No. 18:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the sub fan relay.
12	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. ***Connector & terminal*** ***(F16) No. 2 — (F28) No. 17:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between sub fan motor and sub fan relay connector.
13	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F28) No. 19 — (B134) No. 12:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair the open circuit in harness between sub fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connnector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

NOTE:
Inspection by SOA service is required, because probable cause is deterioration of multiple parts.

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
  (1) Engine coolant temperature is above 90°C (194°F)
  (2) A/C is ON

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR.** 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the radiator sub fan rotate?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR.** 1)Turn the A/C switch ON at condition of step 1.	Does the radiator sub fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step **17.**
3	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from sub fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Stop the engine and turn the ignition switch to ON. 5)Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **7.**
4	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit in harness between sub fan motor connector and chassis ground.
5	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **6.**
6	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 3, and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
7	**CHECK POWER SUPPLY TO SUB FAN RELAY1.** 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay1 from A/C relay holder. 3)Measure the voltage between sub fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Go to step **9.**

RADIATOR SUB FAN SYSTEM

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO SUB FAN RELAY1.** 1)Turn the ignition switch to ON. 2)Measure the voltage between sub fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **12.**	Go to step **11.**
9	**CHECK 20 A FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.
11	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay1 and ignition switch.
12	**CHECK SUB FAN RELAY1.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1. 3)Measure the resistance of sub fan relay1. ***Terminal*** ***No. 7 — No. 8:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Replace the sub fan relay1.
13	**CHECK SUB FAN RELAY1.** 1)Connect the battery to terminals No. 6 and No. 5 of sub fan relay1. 2)Measure the resistance of sub fan relay. ***Terminal*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **14.**	Replace the sub fan relay1.
14	**CHECK HARNESS BETWEEN SUB FAN RELAY1 TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay1 terminal. ***Connector & terminal*** ***(F16) No. 3 — (F28) No. 8:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between sub fan motor connector and sub fan relay1 terminal.
15	**CHECK HARNESS BETWEEN SUB FAN RELAY1 AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between sub fan relay1 connector and ECM connector. ***Connector & terminal*** ***(F28) No. 6 — (B137) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between sub fan relay1 and ECM.
16	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

	Step	Check	Yes	No
17	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from sub fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Turn the A/C switch ON. 5)Measure the voltage while A/C compressor is rotating. 6)Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **18.**	Go to step **20.**
18	**CHECK POOR CONTACT.** Check the poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **19.**
19	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
20	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay2 from A/C relay holder. 3)Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F29) No. 18 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1)Turn the ignition switch to ON. 2)Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F29) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **23.**	Go to step **24.**
22	**CHECK 20 A FUSE.** 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.
24	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.

RADIATOR SUB FAN SYSTEM

	Step	Check	Yes	No
25	**CHECK SUB FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay2. 3)Measure the resistance of sub fan relay2. ***Terminal*** ***No. 18 — No. 17:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the sub fan relay2.
26	**CHECK MAIN FAN RELAY2.** 1)Connect the battery to terminals No. 19 and No. 20 of sub fan relay2. 2)Measure the resistance of sub fan relay2. ***Terminal*** ***No. 18 — No. 17:***	Is the resistance less than 1 Ω?	Go to step **27.**	Replace the sub fan relay2.
27	**CHECK HARNESS BETWEEN SUB FAN RELAY2 TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay2 terminal. ***Connector & terminal*** ***(F16) No. 2 — (F29) No. 17:***	Is the resistance less than 1 Ω?	Go to step **28.**	Repair the open circuit in harness between sub fan motor connector and sub fan relay2 terminal.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY2 AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between sub fan relay2 connector and ECM connector. ***Connector & terminal*** ***(F29) No. 19 — (B137) No. 28:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit in harness between sub fan relay2 and ECM.
29	**CHECK POOR CONTACT.** Check the poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

NOTE:
Inspection by SOA service is required, because probable cause is deterioration of multiple parts.

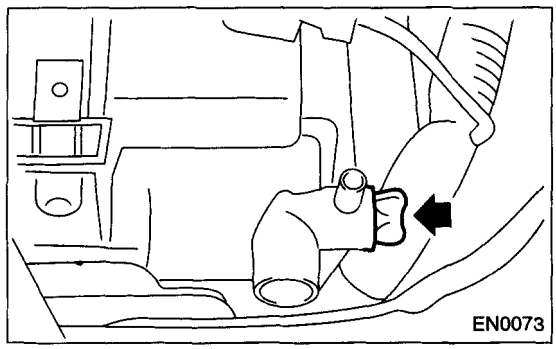
4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain cock to drain engine coolant into container.

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



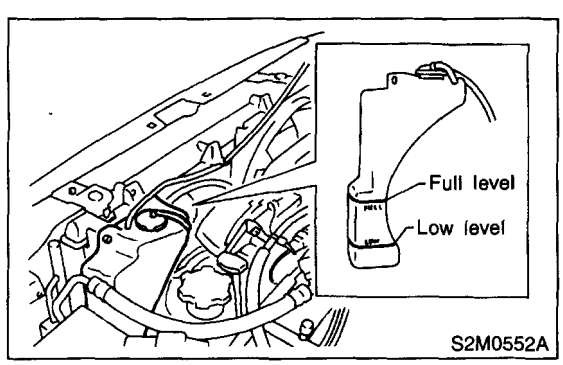
2. FILLING OF ENGINE COOLANT

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

Coolant capacity (fill up to "FULL" level):
Non-turbo AT model
Approx. 6.9 ℓ (7.29 US qt, 6.07 Imp qt)
Non-turbo MT model
Approx. 7 ℓ (7.4 US qt, 6.2 Imp qt)
Turbo AT model
Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)
Turbo MT model
Approx. 7.7 ℓ (8.14 US qt, 6.78 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 the upper level.

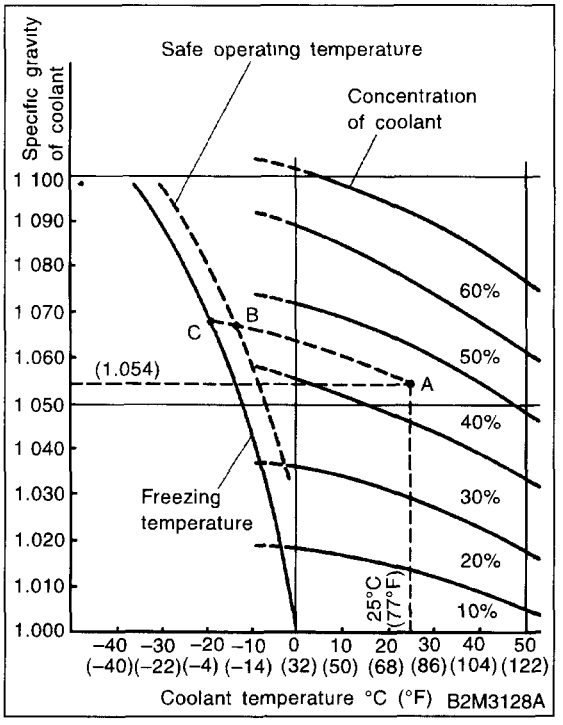


3) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
4) If the engine coolant level drops in radiator, add the engine coolant to filler neck position.
5) If the engine coolant level drops from upper level of reservoir tank, add the engine coolant to the upper level.
6) Attach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

B: INSPECTION

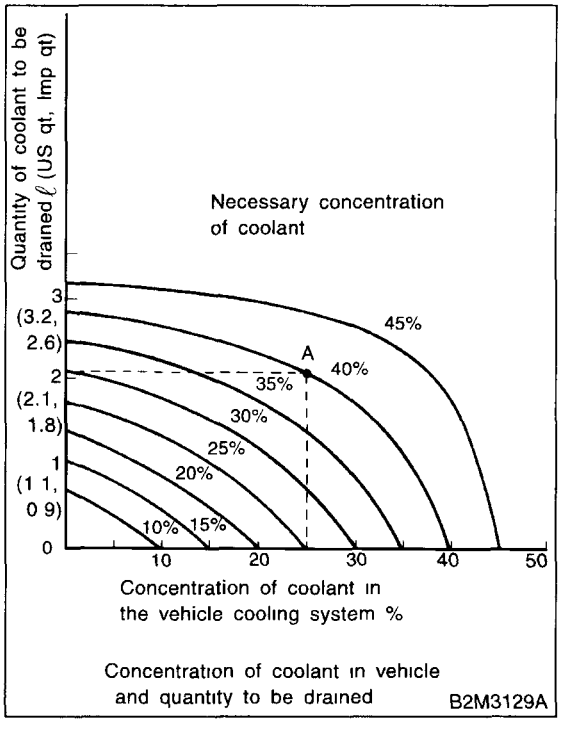
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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 from 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.

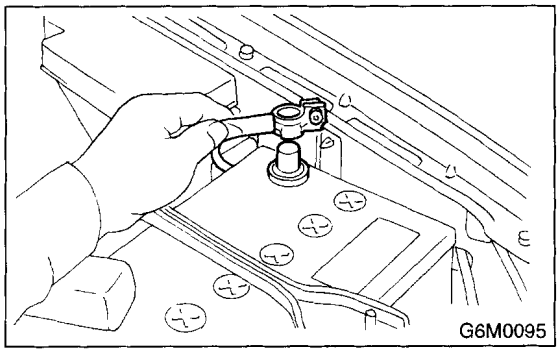


5. Water Pump

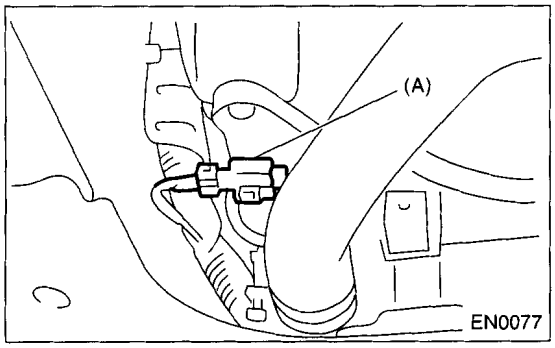
A: REMOVAL

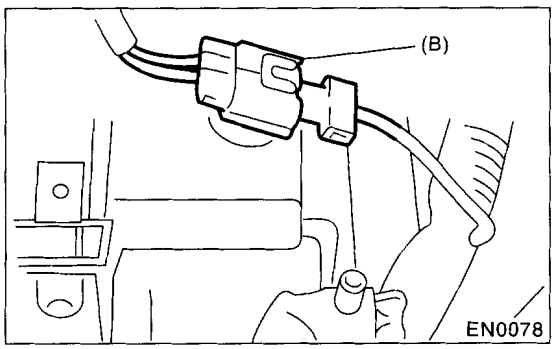
1. NON-TURBO MODEL

1) Disconnect the ground cable from the battery.

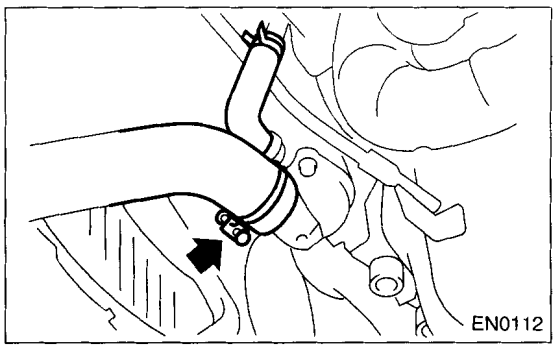


2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely.
<Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the connectors from the radiator main fan (A) and sub fan (B) motors.

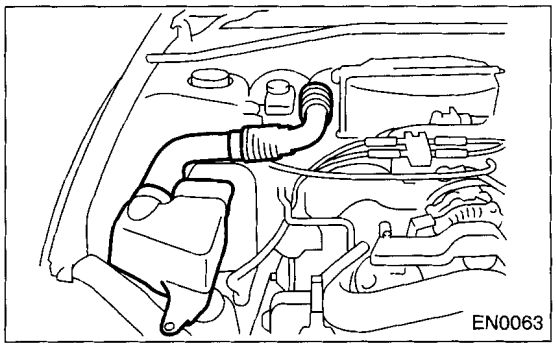




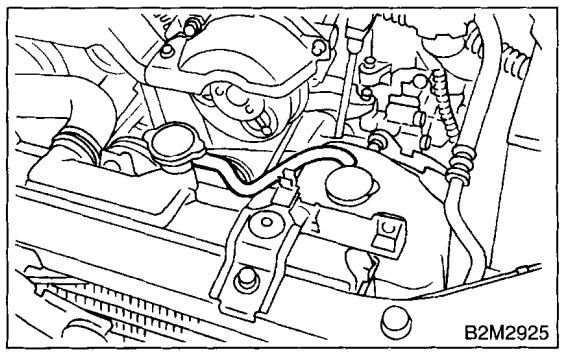
6) Disconnect the radiator outlet hose and heater hose from the water pump.



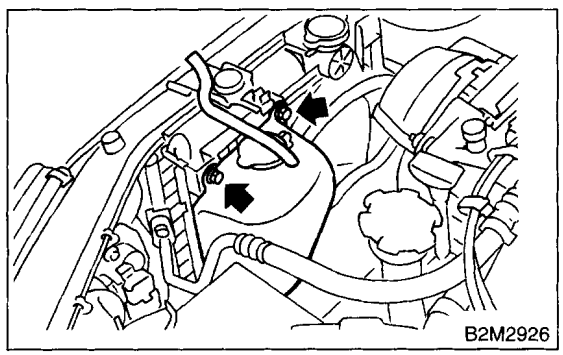
7) Lower the vehicle.
8) Remove the air intake duct.



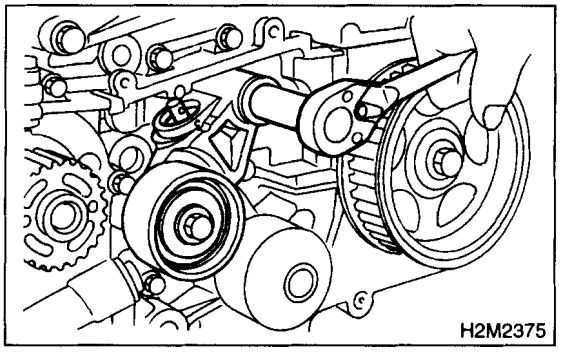
9) Disconnect the over flow hose.



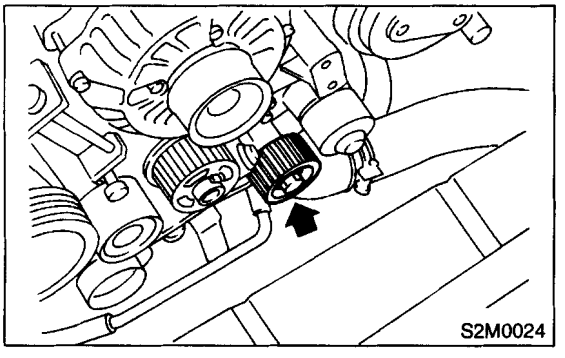
10) Remove the reservoir tank.



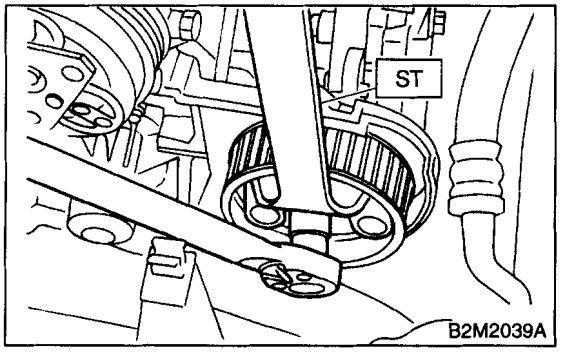
11) Remove the radiator main fan and sub fan assemblies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>
12) Remove V-belts.
<Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
13) Remove the timing belt.
<Ref. to ME(SOHC)-47, TIMING BELT, REMOVAL, Timing Belt Assembly.>
14) Remove the automatic belt tension adjuster.


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15) Remove the belt idler No. 2.

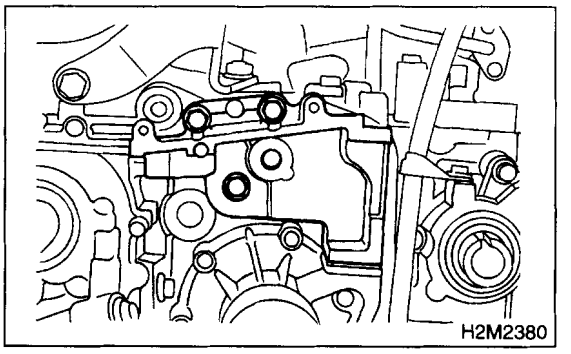

S2M0024

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

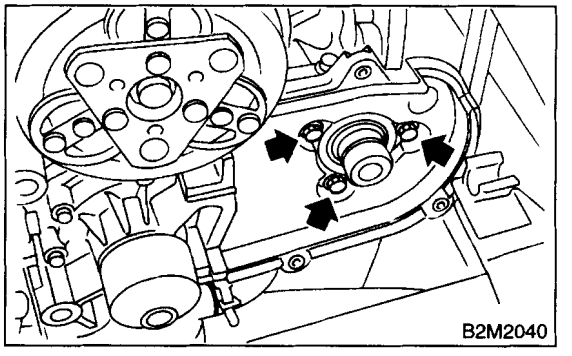


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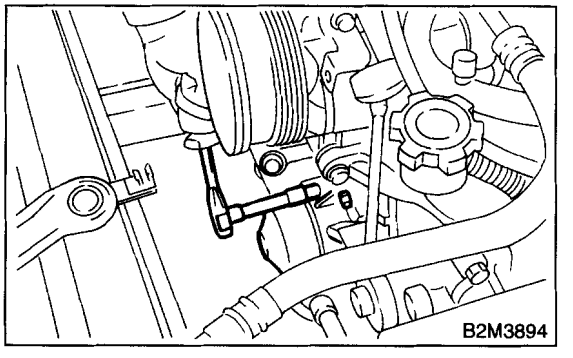
17) Remove the tensioner bracket.


H2M2380

18) Remove the left-hand belt cover No. 2.


B2M2040

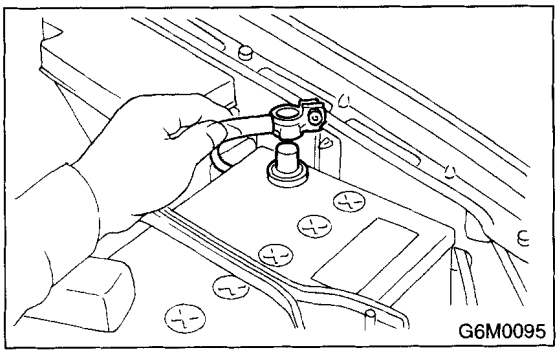
19) Disconnect the heater hose from the water pump.
20) Remove the water pump.


B2M3894

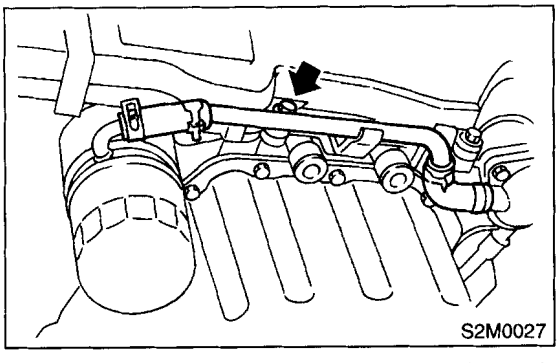
2. TURBO MODEL

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

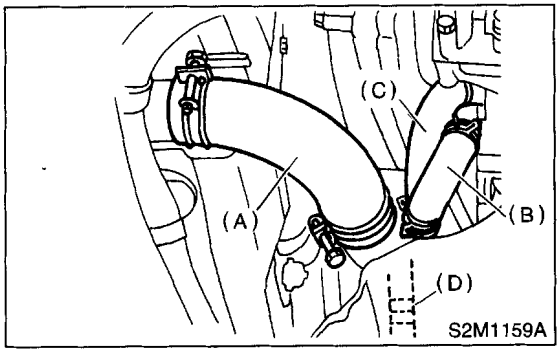
1) Set the vehicle on the lift.
2) Disconnect the ground cable from the battery.



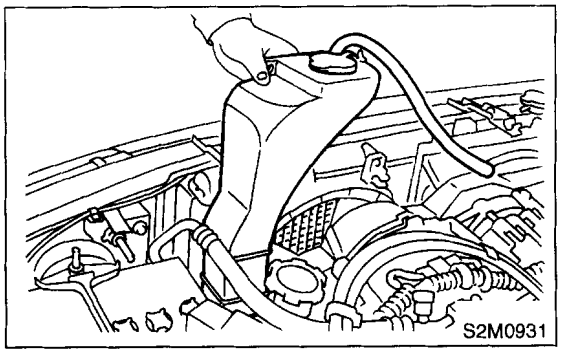
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Remove the radiator under cover.
7) Disconnect the connectors from the radiator main fan and sub fan motors.
8) Remove the bolt which installs water by-pass pipe of oil cooler onto oil pump.



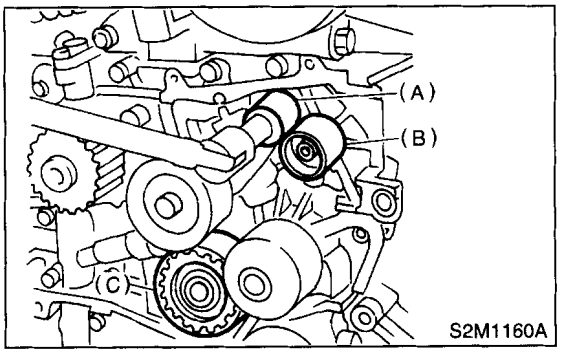
9) Disconnect the radiator outlet hose (A) and heater hose (B) from the water pump.
10) Disconnect the water by-pass hose (C) and oil cooler hose (D).



11) Lower the vehicle.
12) Disconnect the over flow hose.
13) Remove the reservoir tank.

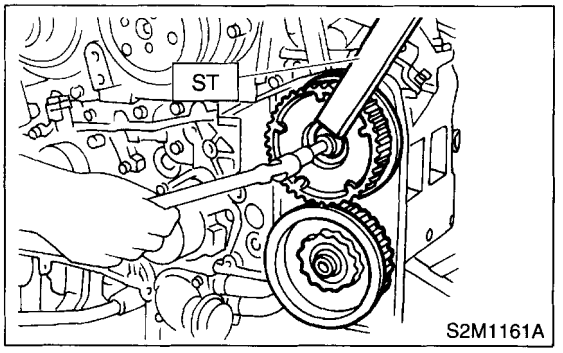


14) Remove the radiator main fan and sub fan assem-blies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>
15) Remove the V-belts. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
16) Remove the timing belt. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
17) Remove the automatic belt tension adjuster (A).
18) Remove the belt idler (B).
19) Remove the belt idler No. 2 (C).

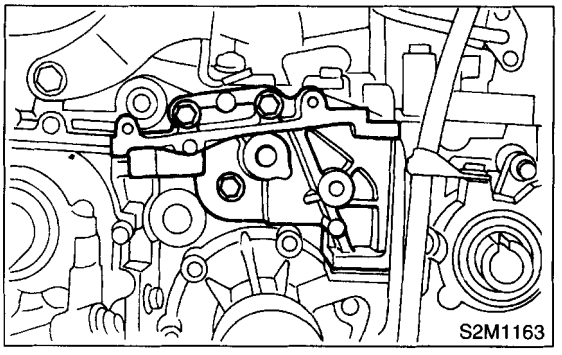


20) Remove the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, REMOVAL, Camshaft Position Sensor.>

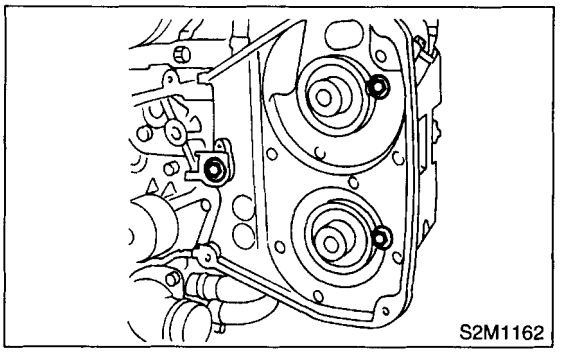
21) Remove the left-hand camshaft sprockets by using ST.
ST 499207400 CAMSHAFT SPROCKET WRENCH



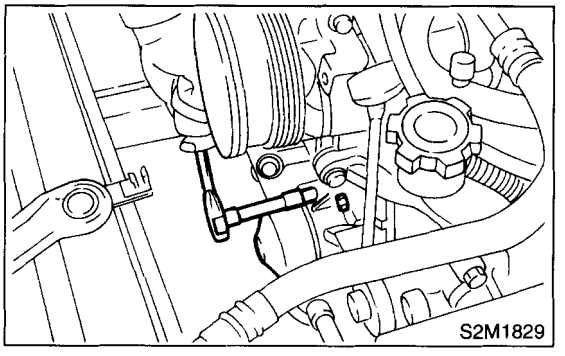
22) Remove the tensioner bracket.



23) Remove the left-hand belt cover No. 2.



24) Disconnect the heater hose from the water pump.
25) Remove the water pump.



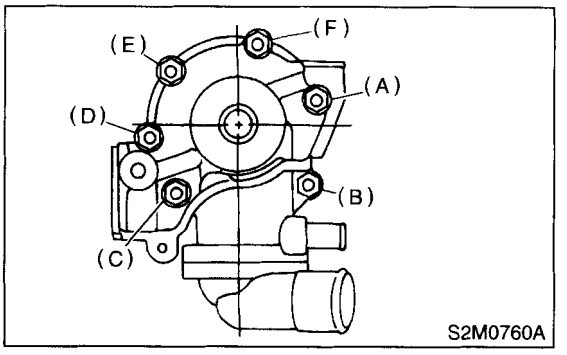
B: INSTALLATION

1. NON-TURBO MODEL

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

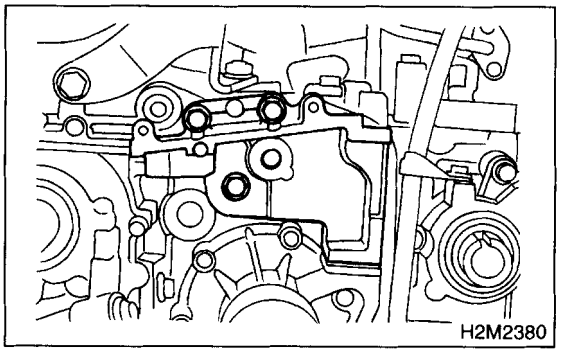
CAUTION:
- **Replace gasket with a new one.**
- **When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.**

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



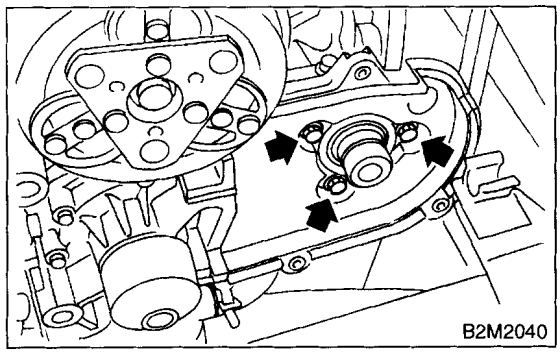
2) Install the tensioner bracket.

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



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

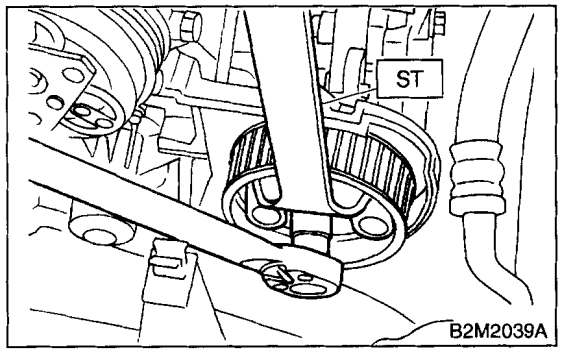
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the left-hand camshaft sprockets by using ST.

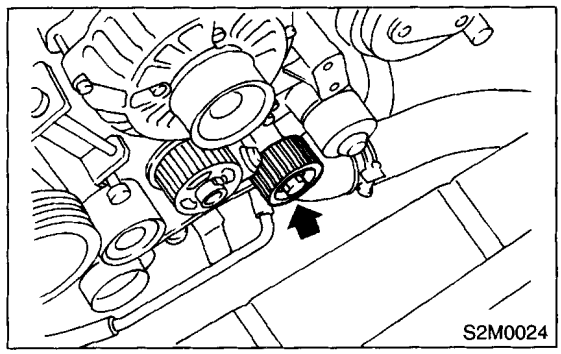
ST 4992707100 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



5) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



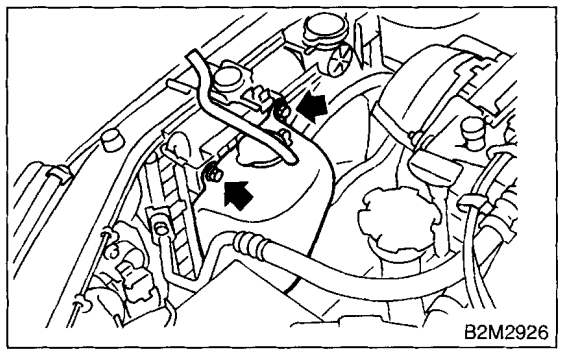
6) Install the automatic belt tension adjuster which tension rod is holded with pin. <Ref. to ME(SOHC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

7) Install the timing belt. <Ref. to ME(SOHC)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

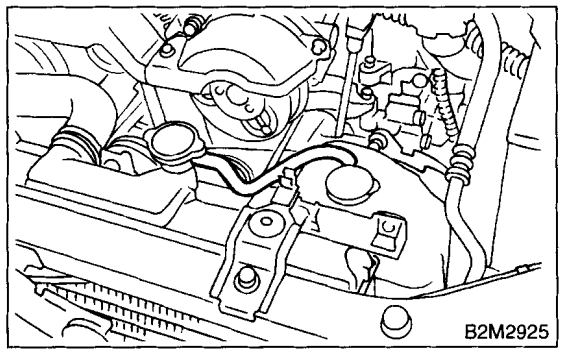
8) Install V-belts. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

9) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>

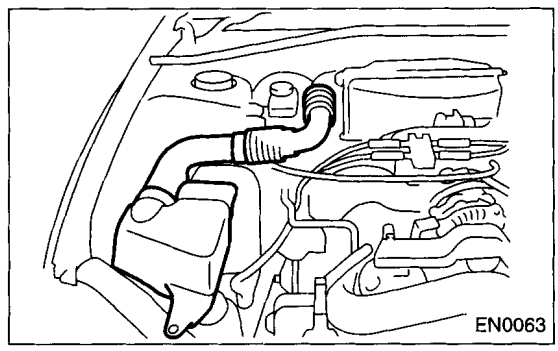
10) Install the reservoir tank.



11) Connect the over flow hose.

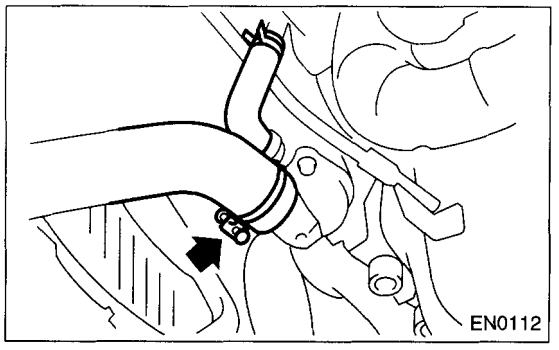


12) Install the air intake duct.

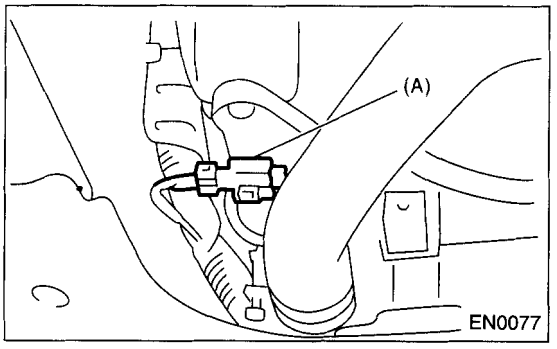


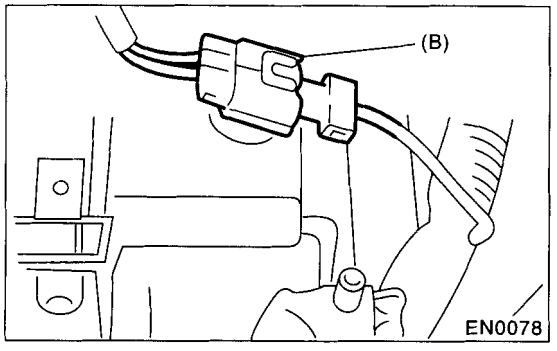
13) Lift-up the vehicle.

14) Connect the radiator outlet hose and heater hose to the water pump.

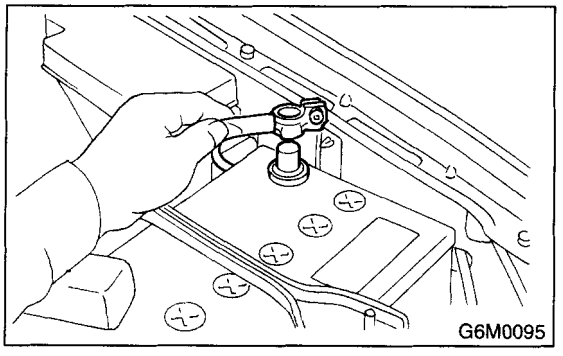


15) Connect the connectors to radiator main fan (A) and sub fan (B) motors.





16) Install the under cover.
17) Lower the vehicle.
18) Connect the battery ground cable.



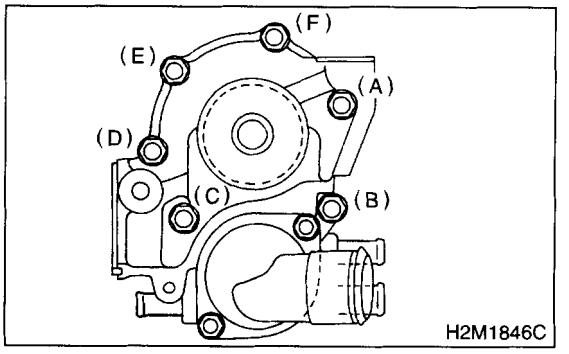
19) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

2. TURBO MODEL

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

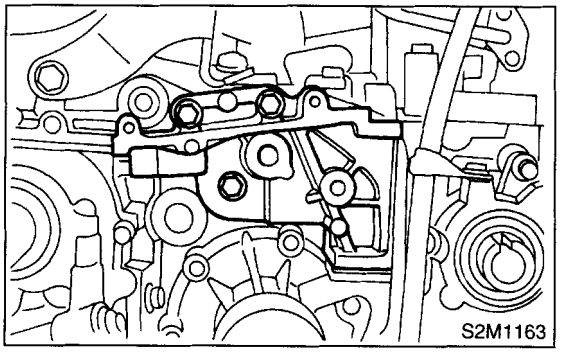
CAUTION:
- **Replace gasket with a new one.**
- **When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.**

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



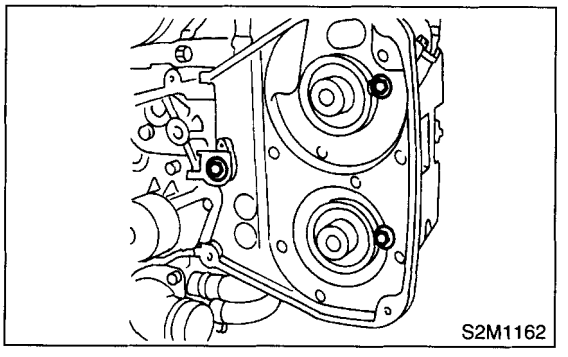
2) Install the tensioner bracket.

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



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

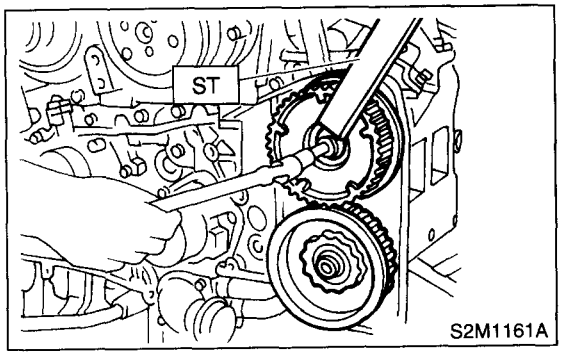
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the left-hand camshaft sprockets by using ST.

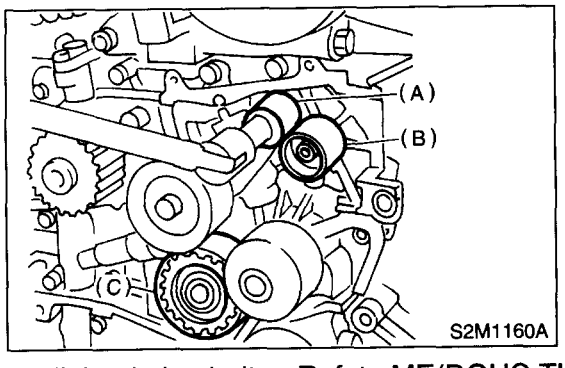
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
98 N·m (10.0 kgf-m, 72.4 ft-lb)

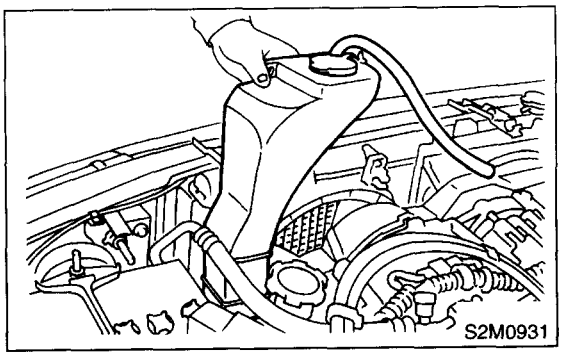


5) Install the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, INSTALLATION, Camshaft Position Sensor.>
6) Install the belt idler No. 2 (C).
7) Install the belt idler (B).
8) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(DOHC TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

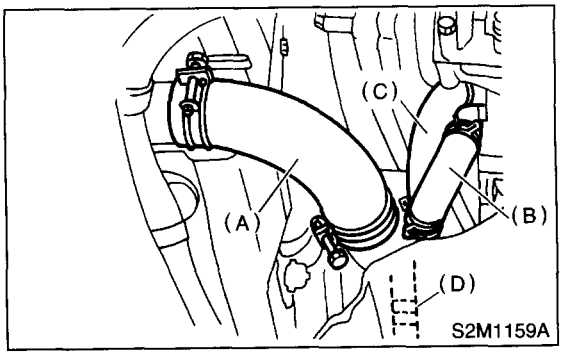
Tightening torque:
39.4 N·m (4.0 kgf-m, 28.9 ft-lb)



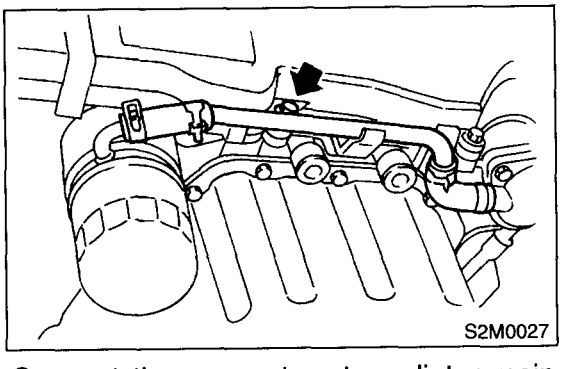
9) Install the timing belt. <Ref. to ME(DOHC TURBO)-51, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
10) Install the V-belts. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>
11) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>
12) Install the reservoir tank.



13) Connect the over flow hose.
14) Lift-up the vehicle.
15) Connect the radiator outlet hose (A) and heater hose (B) to the water pump.
16) Connect the water by-pass hose (C) and oil cooler hose (D).

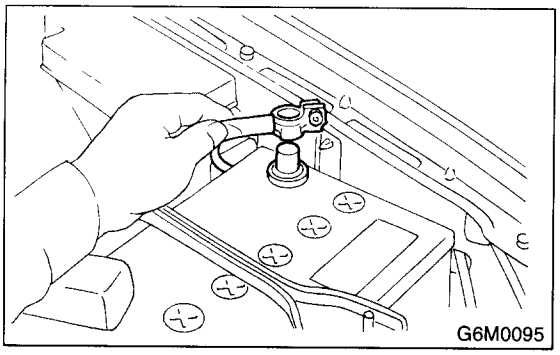


17) Install the bolt which installs water by-pass pipe onto the oil pump.



18) Connect the connectors to radiator main fan and sub fan motors.
19) Install the radiator under cover.
20) Install the under cover.
21) Lower the vehicle.

22) Connect the battery ground cable.

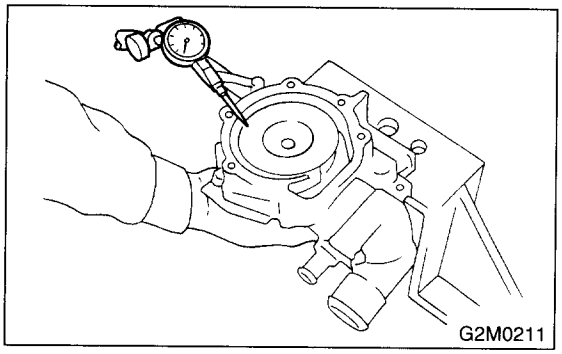


23) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

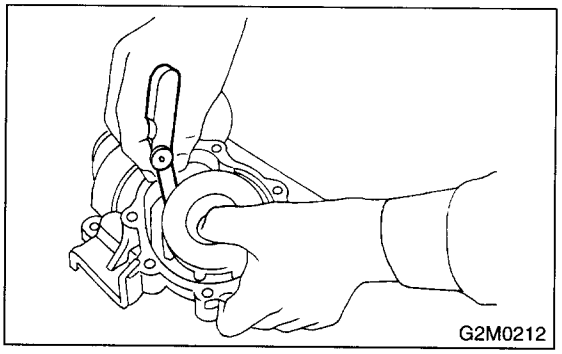
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

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



4) Check the clearance between impeller and pump case.

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

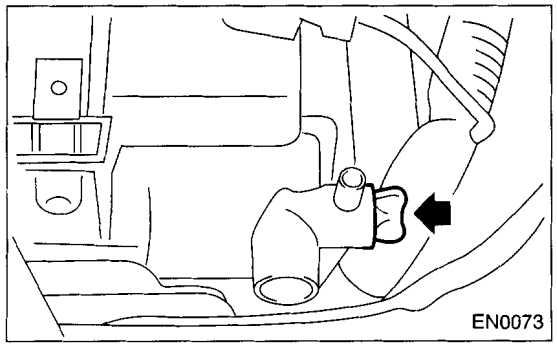


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

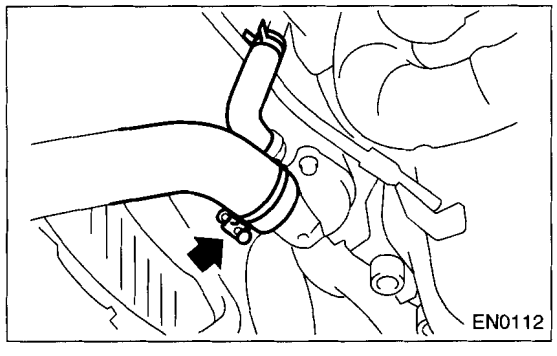
6. Thermostat

A: REMOVAL

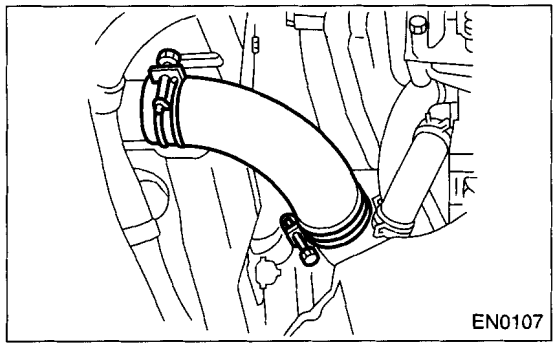
1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



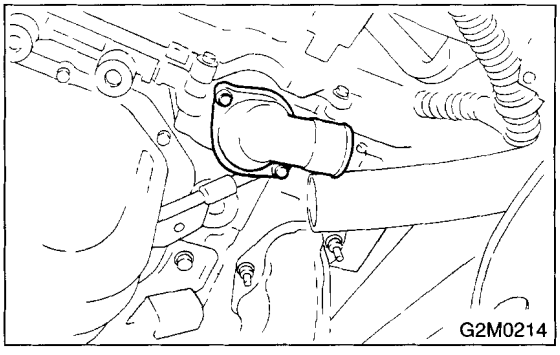
4) Disconnect the radiator outlet hose from the thermostat cover.
- Non-Turbo model



5) Disconnect the radiator outlet hose.
- Turbo model



6) Remove the thermostat cover and gasket, and pull out the thermostat.

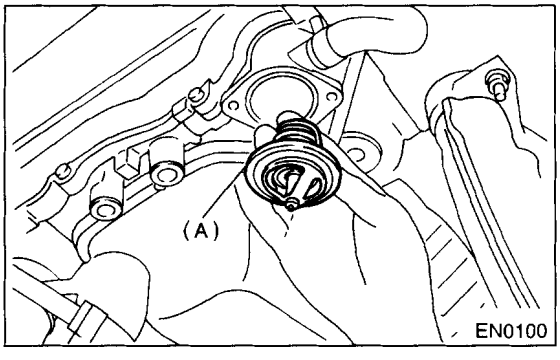


B: INSTALLATION

1) 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 (A) facing to front side.**
- **At this time, set the jiggle pin of thermostat for front side.**

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



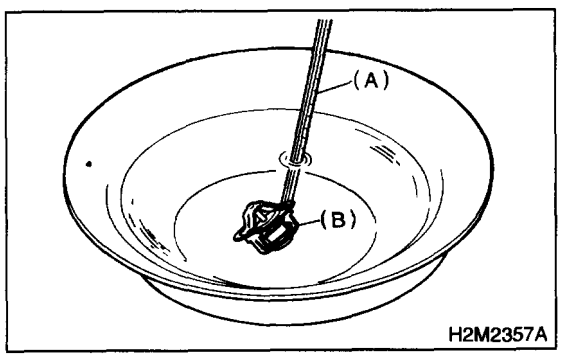
2) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: 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 — 80°C (169 — 176°F)

Fully opens:
91°C (196°F)



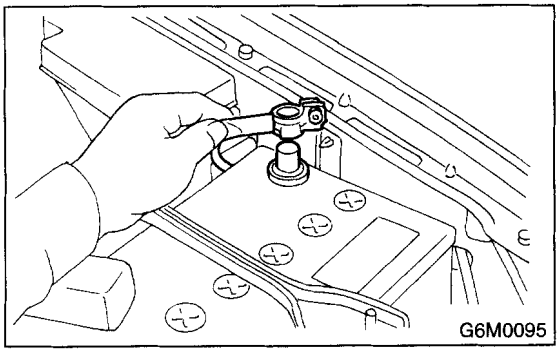
(A) Thermometer
(B) Thermostat

7. Radiator

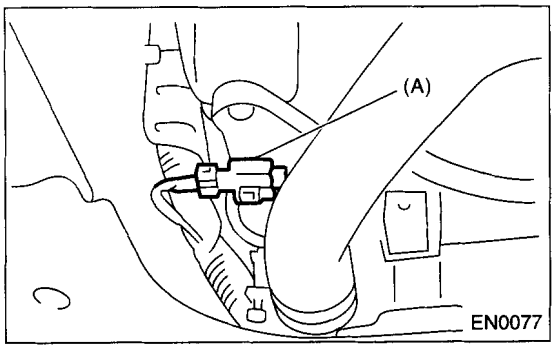
A: REMOVAL

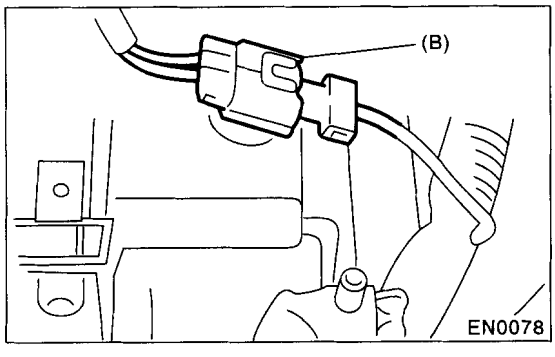
1. NON-TURBO MODEL

1) Disconnect the battery ground cable.



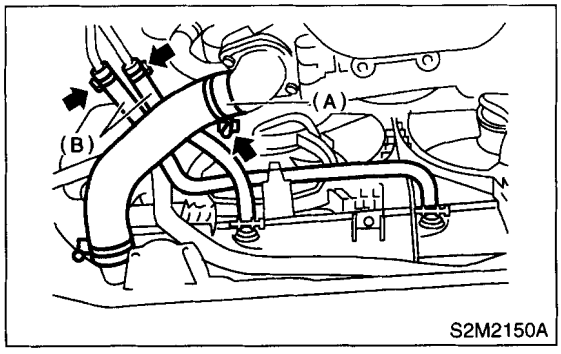
2) Lift-up the vehicle.
3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connectors of radiator main fan (A) and sub fan (B) motor.



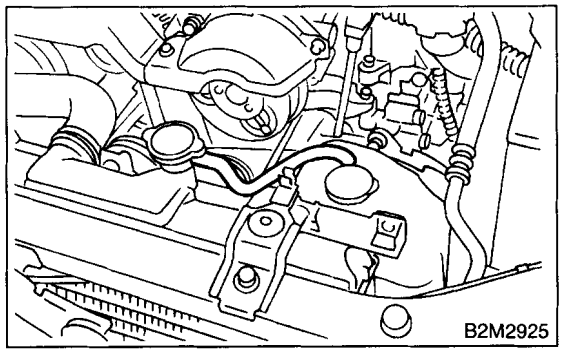


5) Disconnect the radiator outlet hose (A) from thermostat cover.

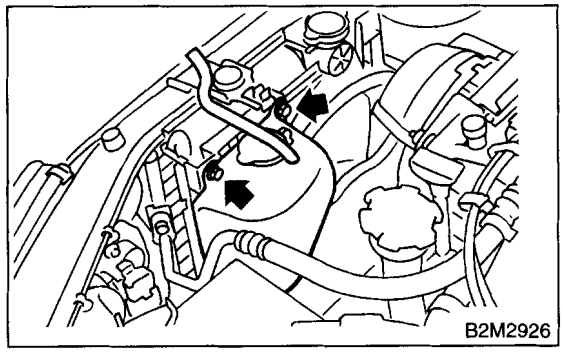
6) Disconnect the ATF cooler hoses (B) from the radiator. (AT vehicles only)



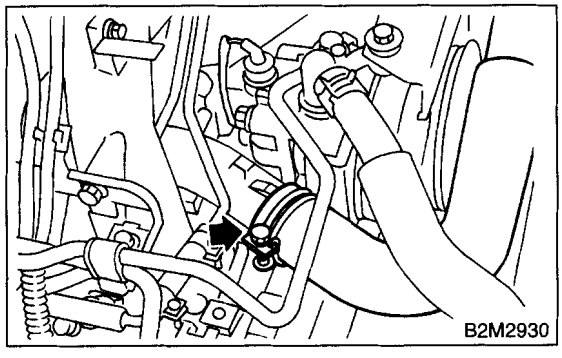
7) Lower the vehicle.
8) Disconnect the over flow hose.



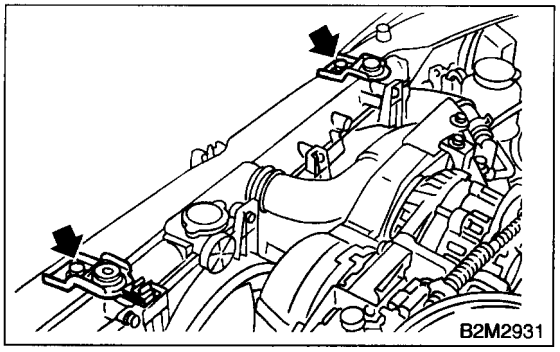
9) Remove the reservoir tank.



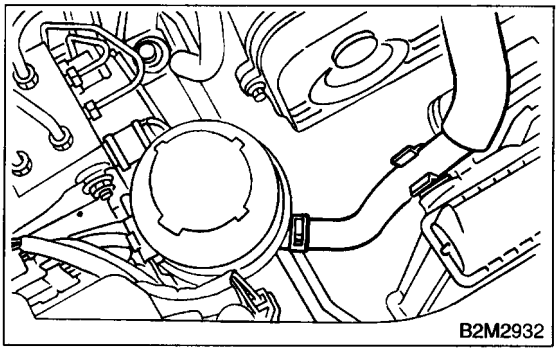
10) Disconnect the radiator inlet hose from the engine.



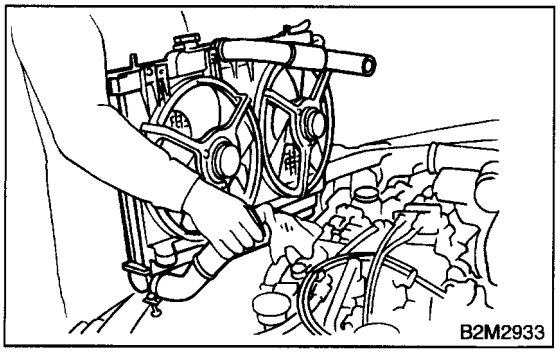
11) Remove the radiator upper brackets.



12) Detach the power steering hose from the the clip on the radiator.



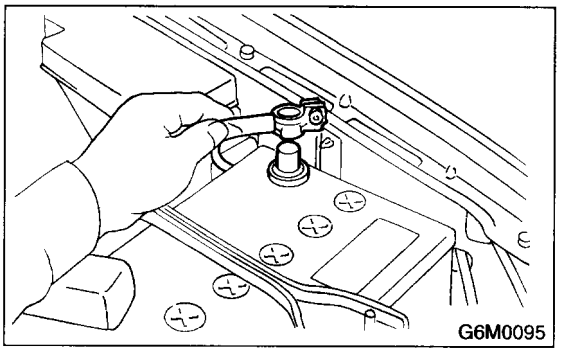
13) While slightly lifting radiator, slide it to left.
14) Lift the radiator up and away from the vehicle.



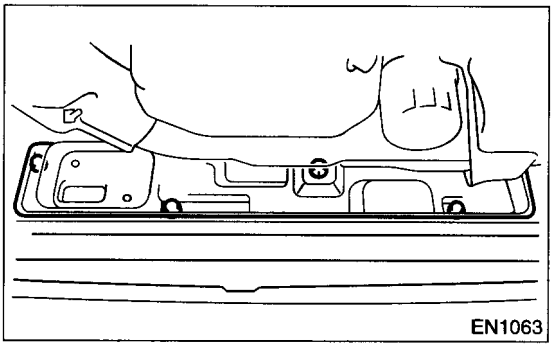
2. TURBO MODEL

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

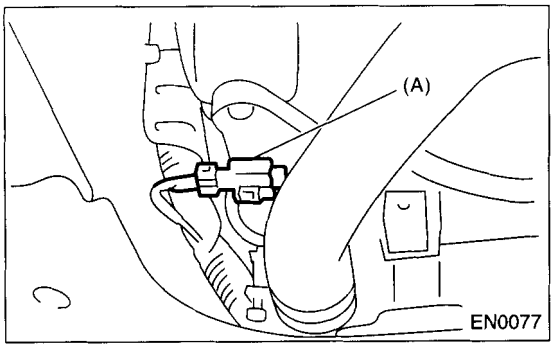
1) Set the vehicle on the lift.
2) Disconnect the battery ground cable.

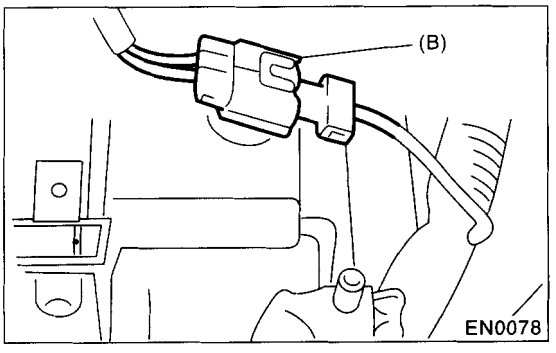


3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Remove the radiator under cover. (AT vehicles only)

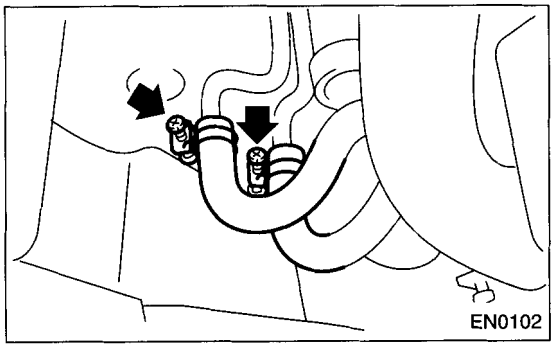


7) Disconnect the connectors of radiator main fan (A) and sub fan motor (B).

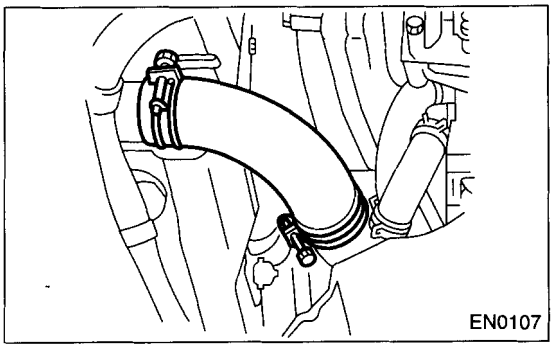




8) Disconnect the ATF cooler hoses from the radiator. (AT vehicles only)

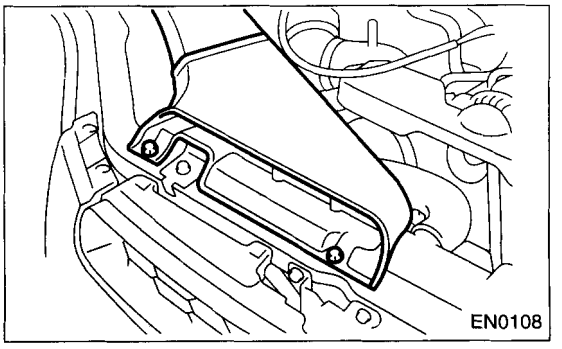


9) Disconnect the radiator outlet hose from the thermostat cover.

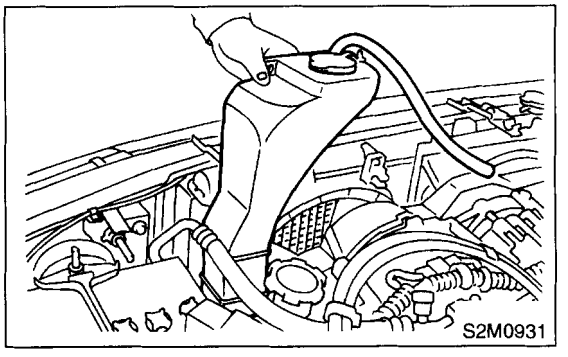


10) Lower the vehicle.

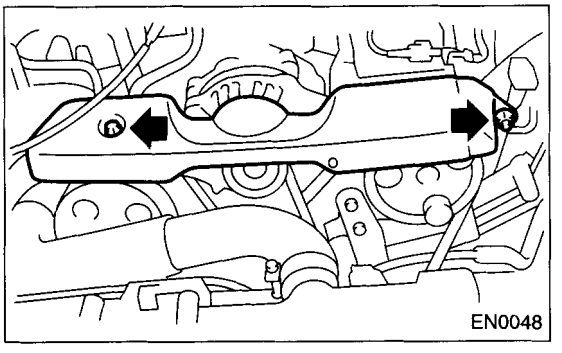
11) Remove the air intake duct.



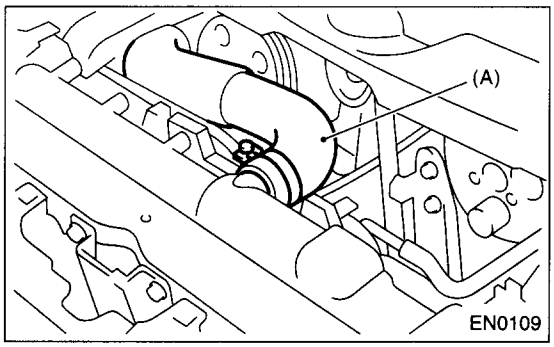
12) Disconnect the over flow hose.
13) Remove the reservoir tank.

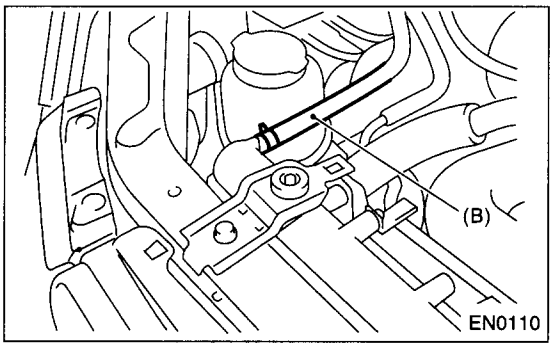


14) Remove the V-belt covers.

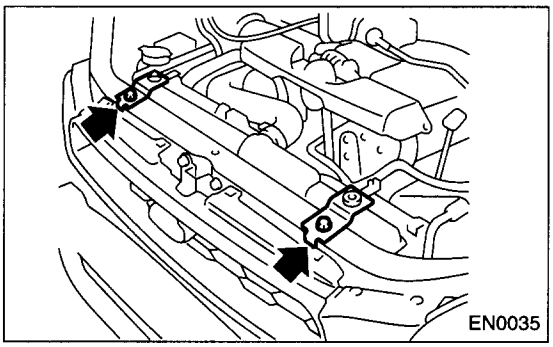


15) Disconnect the radiator inlet hose (A) and coolant filler tank hose (B) from the radiator.





16) Remove the radiator upper brackets.

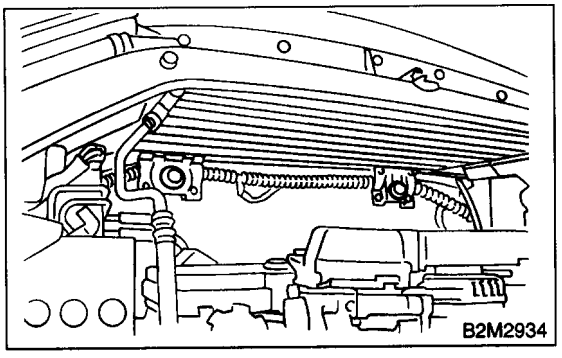


17) While slightly lifting radiator, slide it to left.
18) Lift the radiator up and away from the vehicle.

B: INSTALLATION

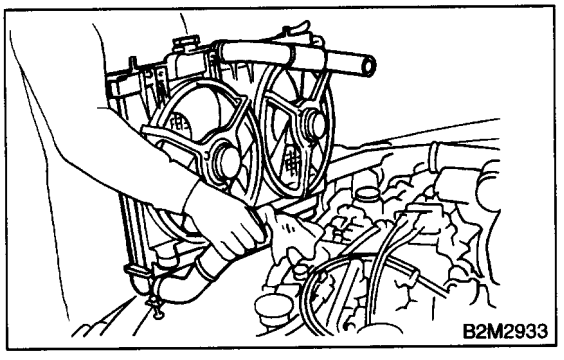
1. NON-TURBO MODEL

1) Attach the radiator mounting cushions to holes on the vehicle.



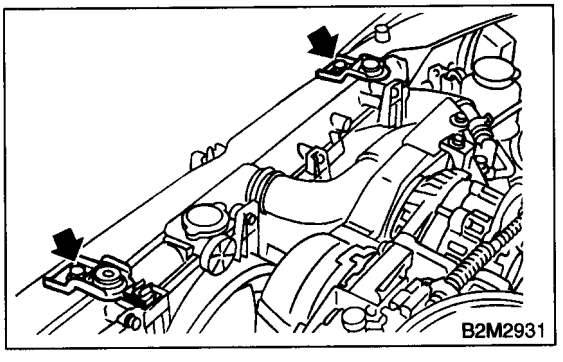
2) Install the radiator while fitting radiator pins to cushions.

NOTE:
Fit pins on lower side of radiator into cushions on body side.

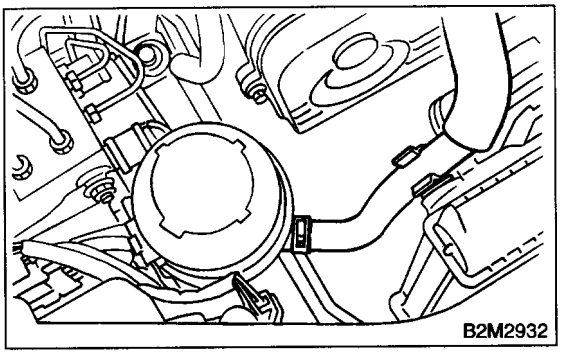


3) Install the radiator brackets and tighten the bolts.

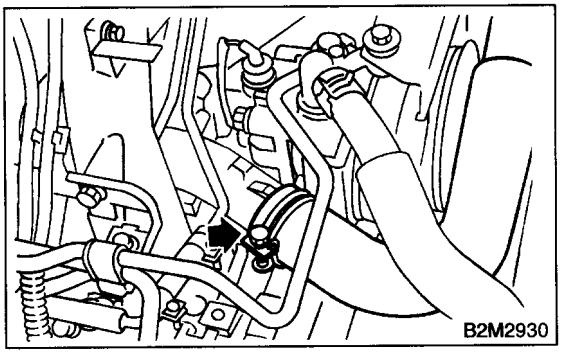
Tightening torque:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



4) Attach the power steering hose to the radiator.

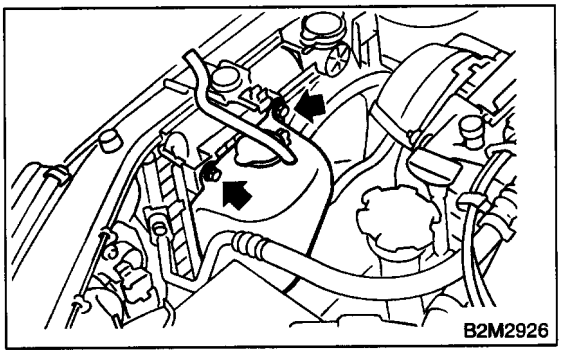


5) Connect the radiator inlet hose.

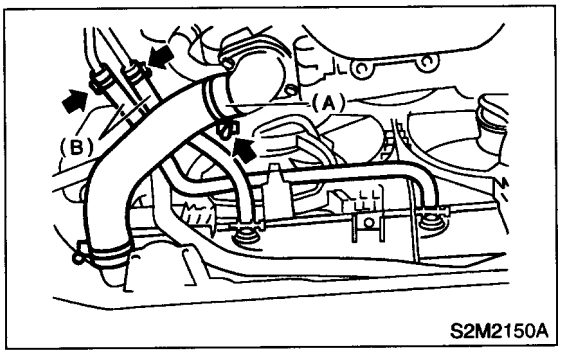


6) Install the reservoir tank.

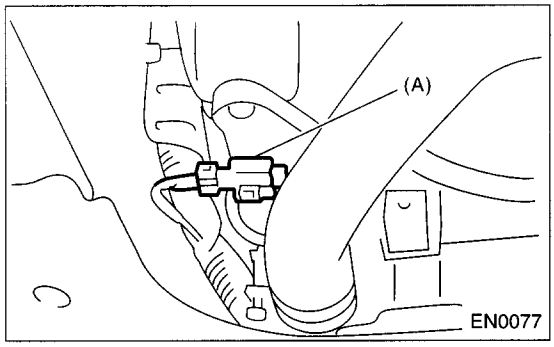
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

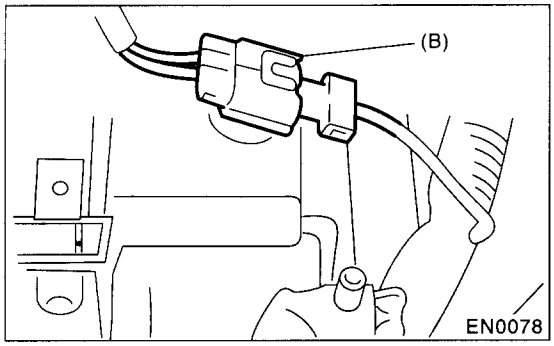


7) Lift-up the vehicle.
8) Connect the radiator outlet hose (A).
9) Connect the ATF cooler hoses (B). (AT vehicles only)

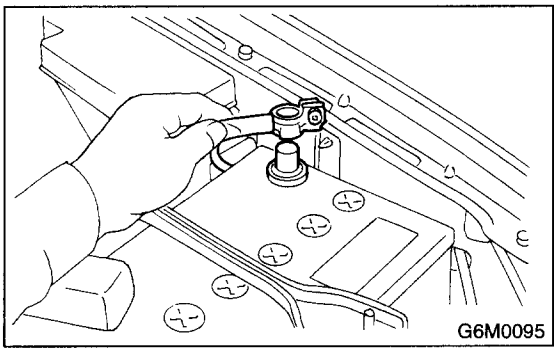


10) Connect the connectors to the radiator main fan motor (A) and sub fan motor (B).





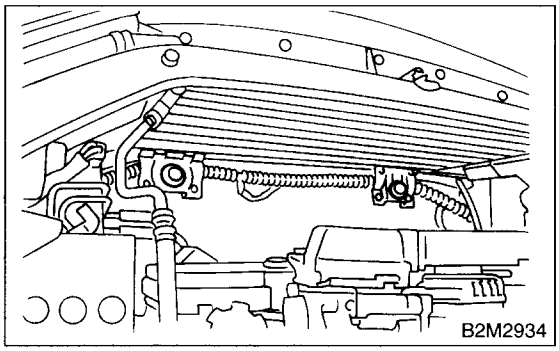
11) Install the under cover.
12) Lower the vehicle.
13) Connect the battery ground cable.



14) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
15) Check ATF level. <Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>

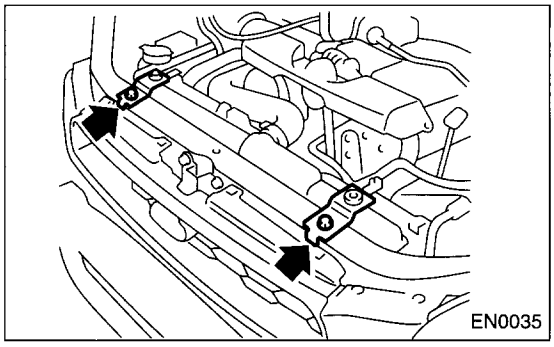
2. TURBO MODEL

1) Attach the radiator mounting cushions to holes on the vehicle.

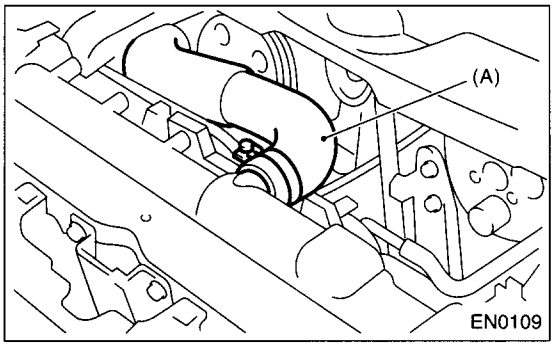


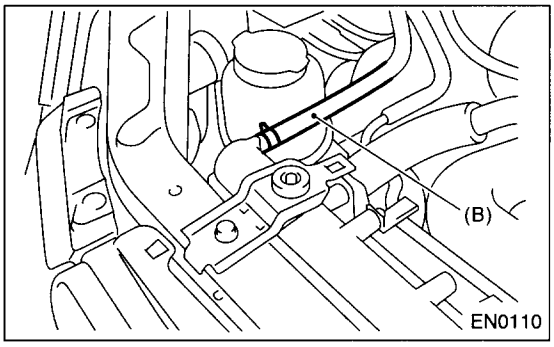
2) Install the radiator brackets and tighten bolts.

Tightening torque:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



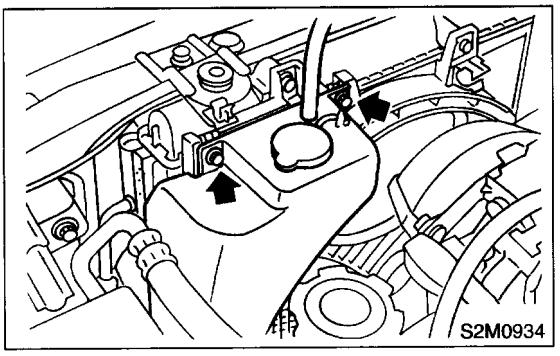
3) Connect the radiator inlet hose (A) and coolant filler tank hose (B).



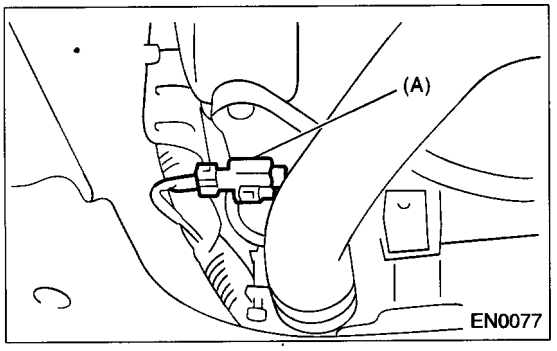


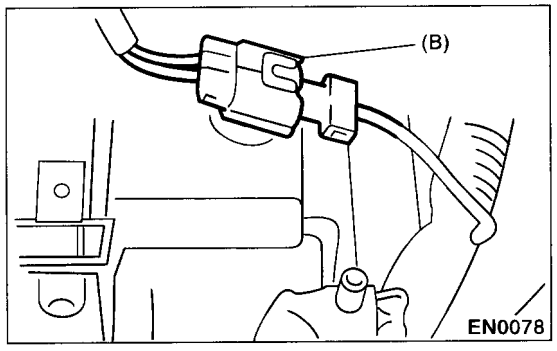
4) Install the reservoir tank.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

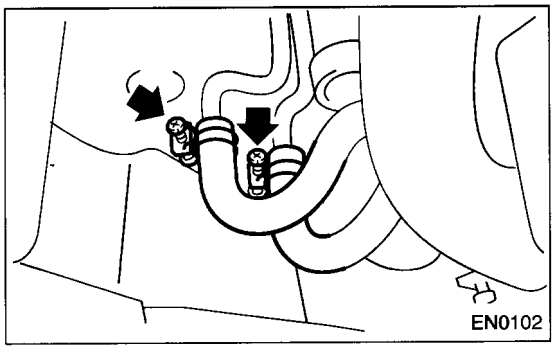


5) Connect the over flow hose.
6) Lift-up the vehicle.
7) Connect the connectors to the radiator main fan motor(A) and sub fan motor(B).

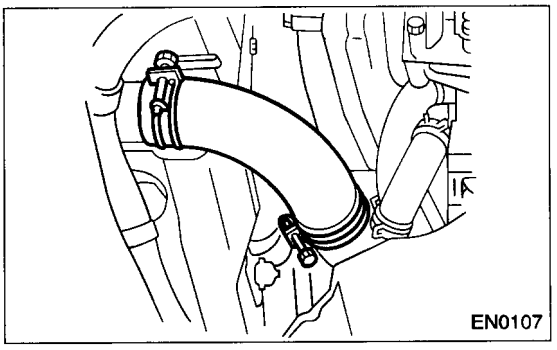




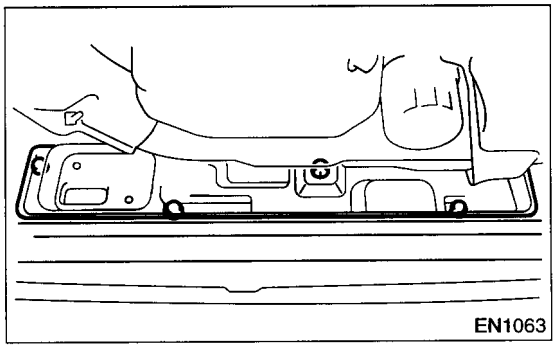
8) Connect the ATF cooler hoses. (AT vehicles only)



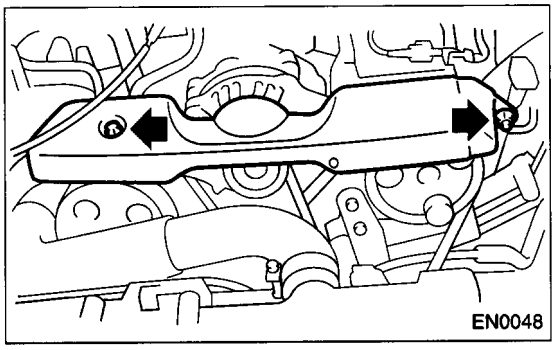
9) Connect the radiator outlet hose.



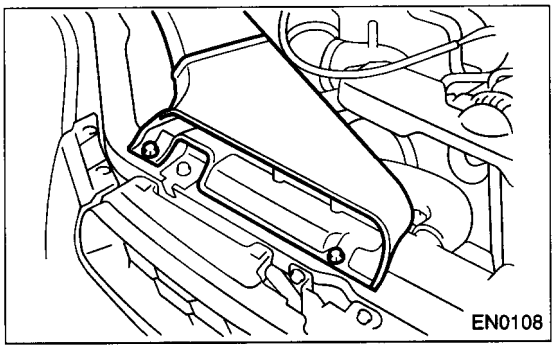
10) Install the radiator under cover. (AT vehicle only)



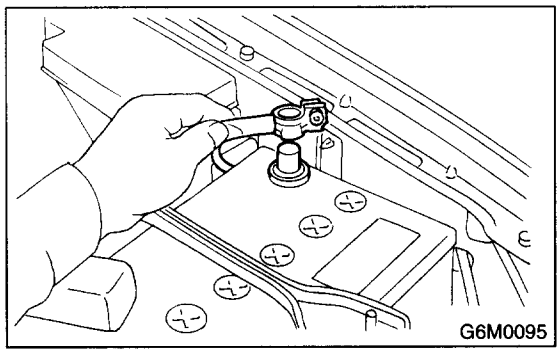
11) Install the under cover.
12) Lower the vehicle.
13) Install the V-belt covers.



14) Install the air intake duct.



15) Connect the battery ground cable.

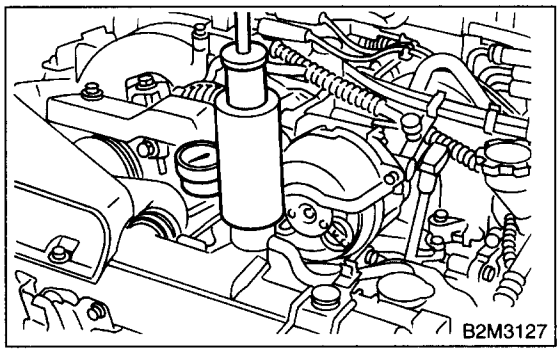


16) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

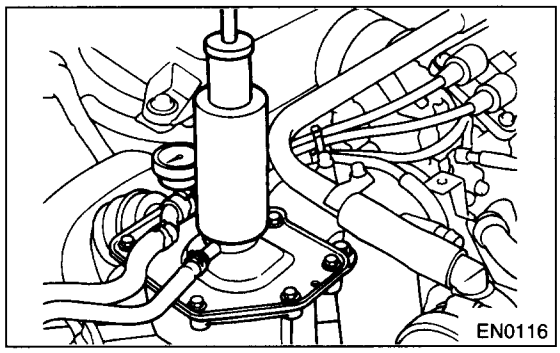
C: INSPECTION

1) Remove the radiator cap, top off radiator, and attach tester to the radiator in place of cap.

- Non-Turbo model



- Turbo model



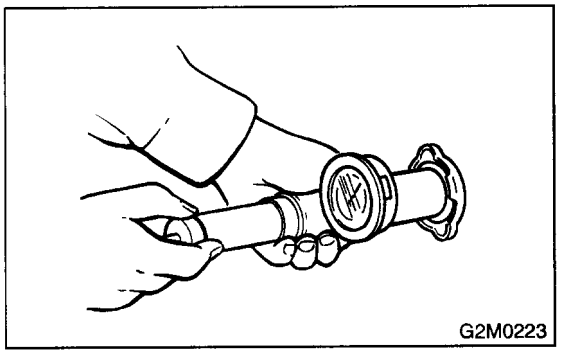
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to the radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

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.**

8. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to the tester.



2) Increase pressure until the 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)

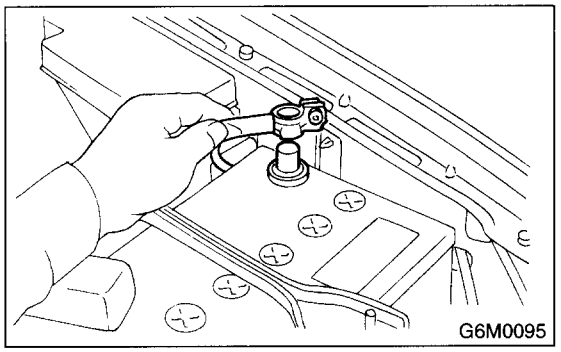
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

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

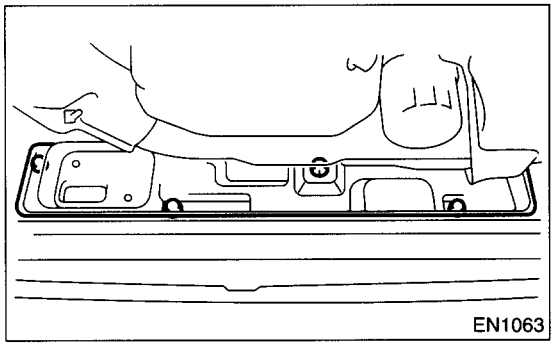
9. Radiator Main Fan and Fan Motor

A: REMOVAL

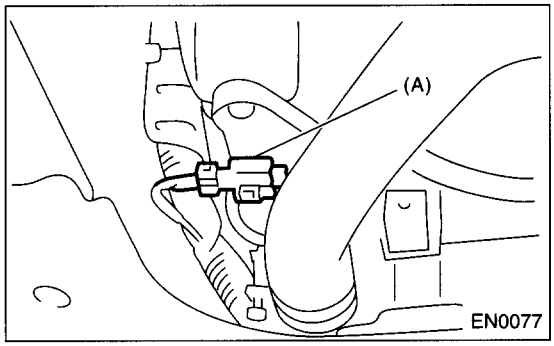
1) Disconnect the battery ground cable.



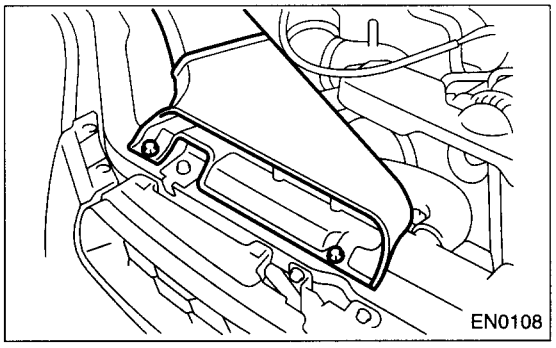
2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the radiator under cover. (AT vehicle only)



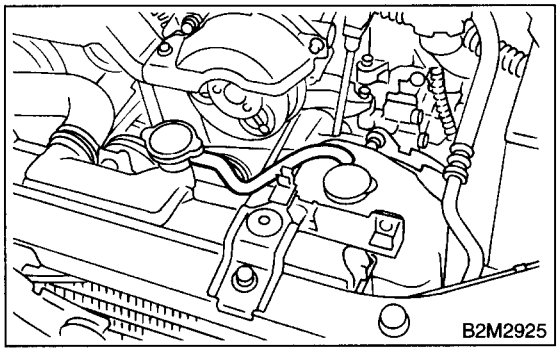
5) Disconnect the connector of main fan motor (A).



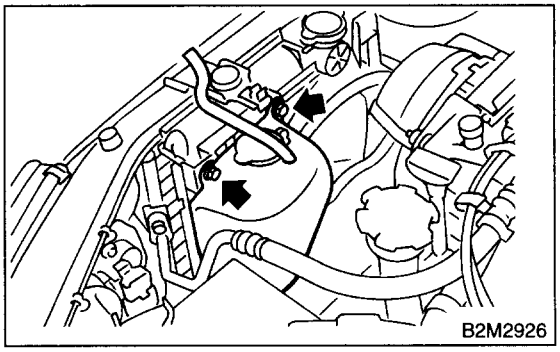
6) Lower the vehicle.
7) Remove the air intake duct. (Turbo model)



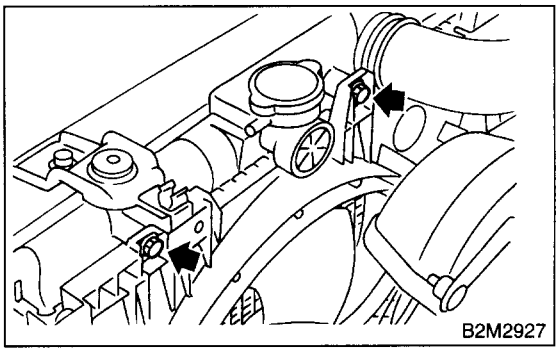
8) Disconnect the over flow hose.



9) Remove the over flow pipe. (Turbo model)
10) Remove the reservoir tank.



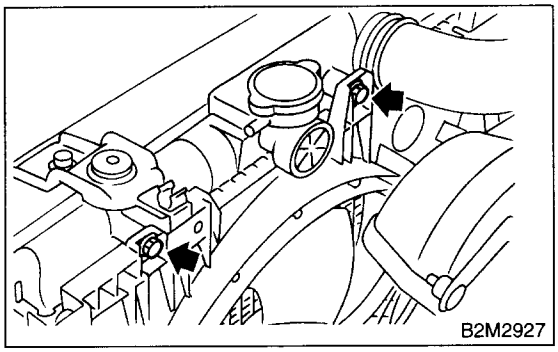
11) Remove the radiator main fan motor assembly.



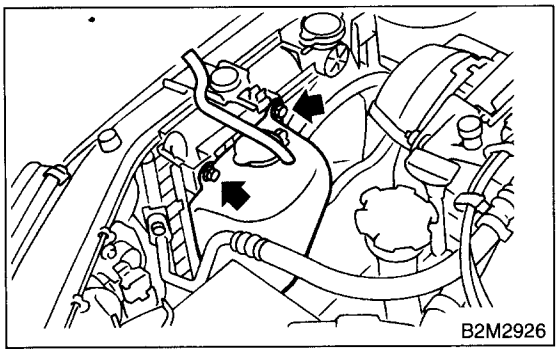
B: INSTALLATION

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.

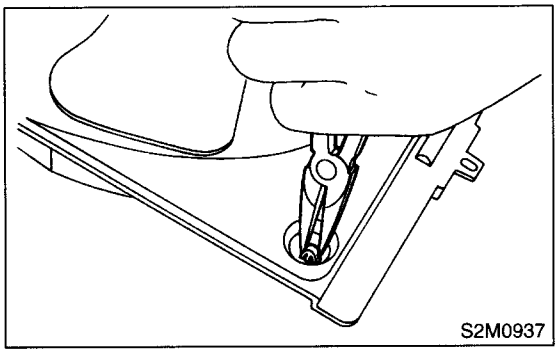


Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

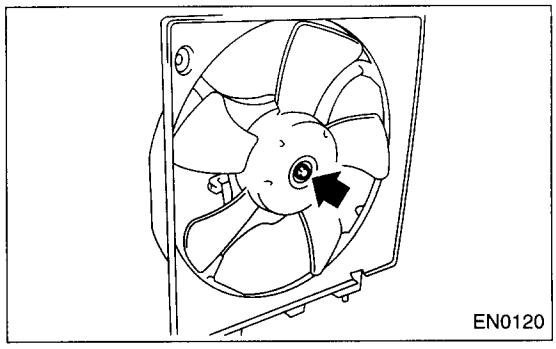


C: DISASSEMBLY

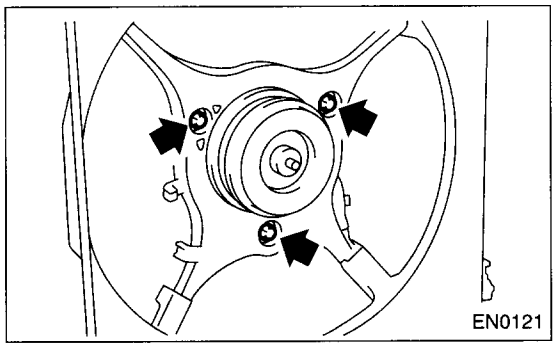
1) Remove the clip which holds motor connector onto the shroud.



2) Remove the nut which holds fan itself onto the fan motor and shroud assembly.



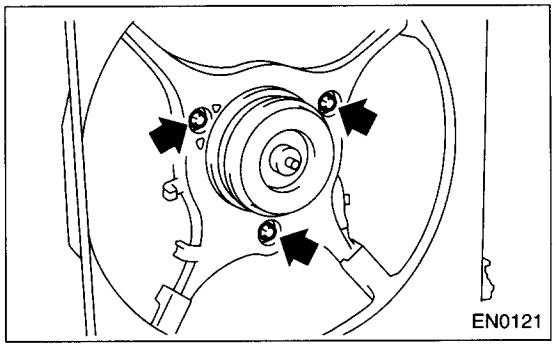
3) Remove the bolts which install fan motor onto the shroud.



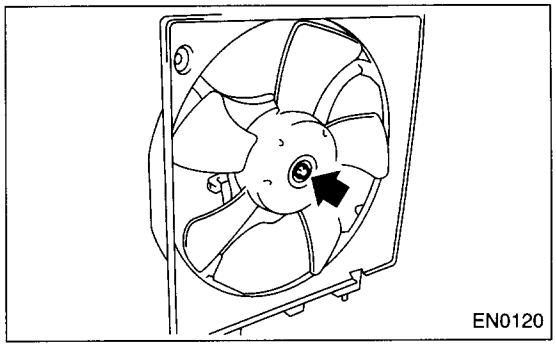
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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



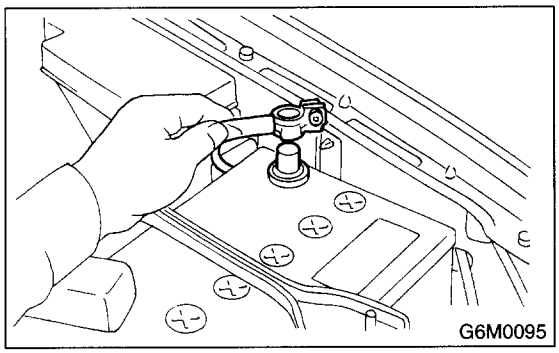
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



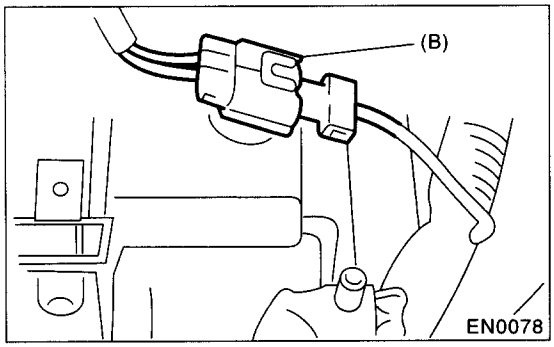
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

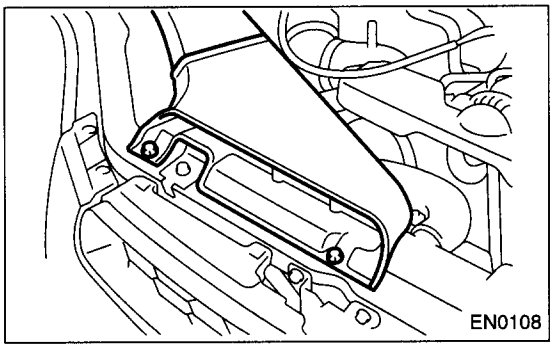
1) Disconnect the battery ground cable.



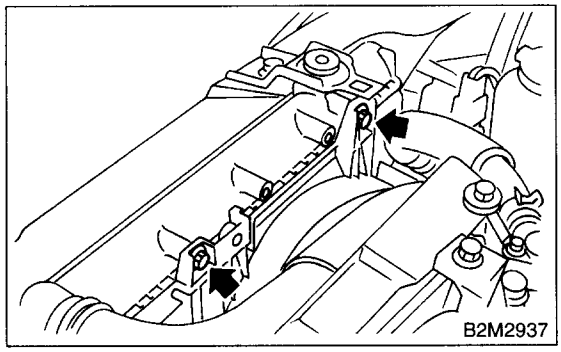
2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the radiator under cover.
5) Disconnect the connector of sub fan motor.



6) Lower the vehicle.
7) Remove the air intake duct. (Turbo model)



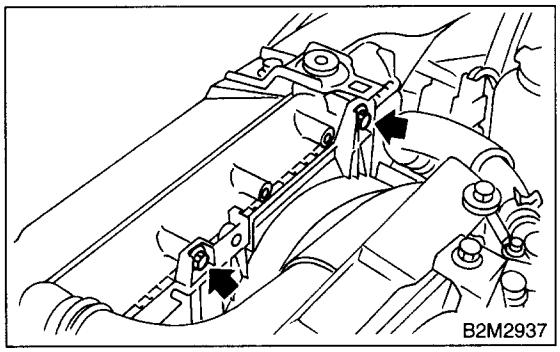
8) Remove the bolts which hold sub fan shroud to the radiator.
9) Remove the over flow pipe. (Turbo model)
10) Remove the radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

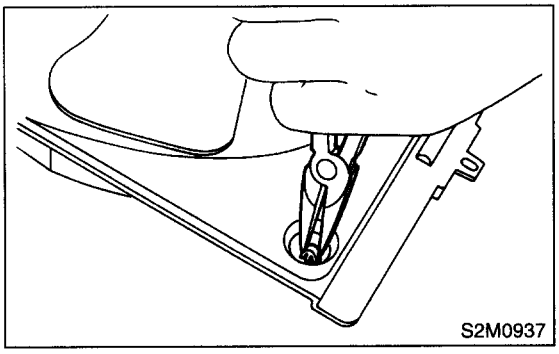
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

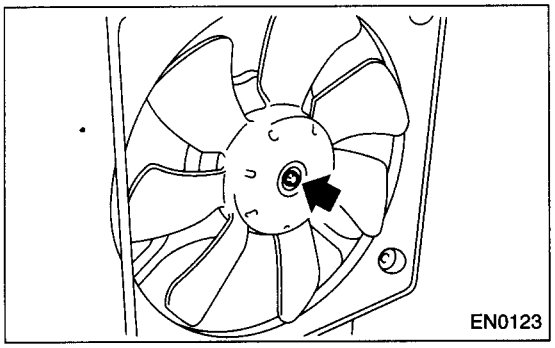


C: DISASSEMBLY

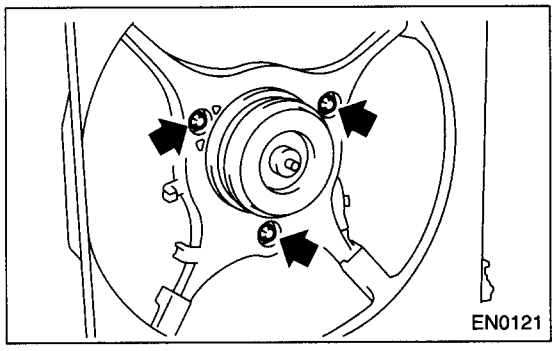
1) Remove the clip which holds motor harness onto the shroud.



2) Remove the nut which holds fan itself onto the fan motor and shroud assembly.



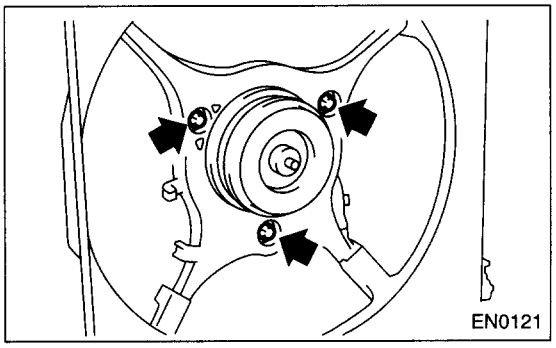
3) Remove the bolts which install fan motor onto the shroud.



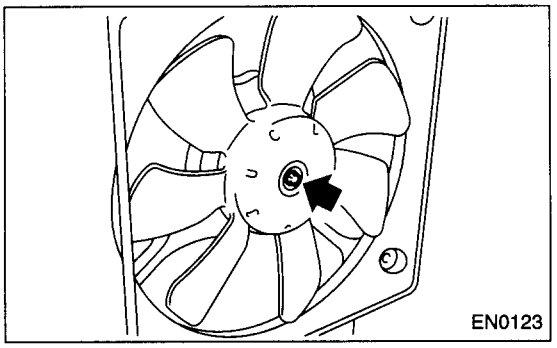
D: ASSEMBLY

Assemble in the reverse order of disasssembly.

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



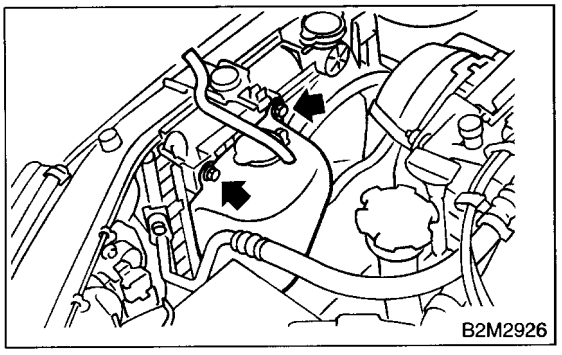
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



11.Reservoir Tank

A: REMOVAL

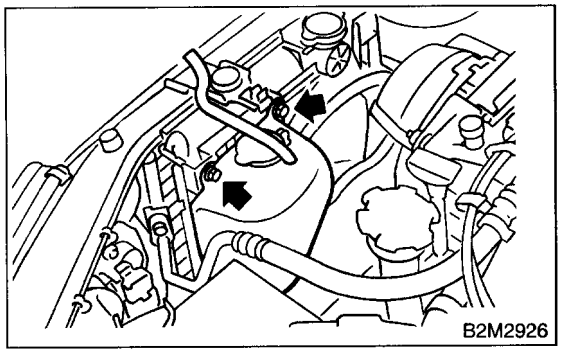
1) Disconnect the over flow hose from the radiator filler neck position.
2) Remove the bolts which install reservoir tank onto the radiator main fan shroud.
3) Remove the reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

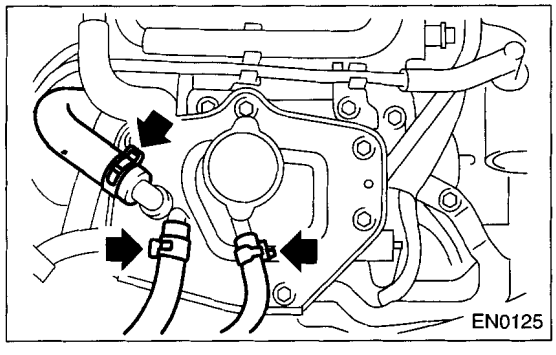
Make sure the engine coolant level is between full and low.

12.Coolant Filler Tank

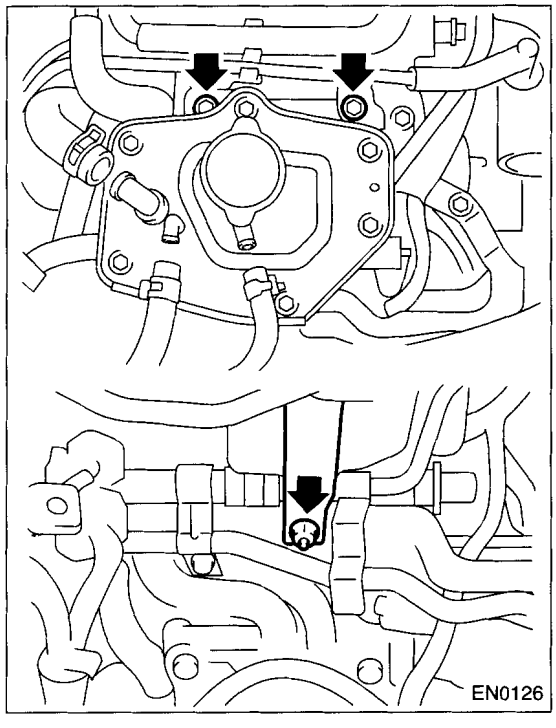
A: REMOVAL

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

1) Drain the coolant about 3.0 (3.2 US qt, 2.6 Imp qt). <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from the coolant filler tank.



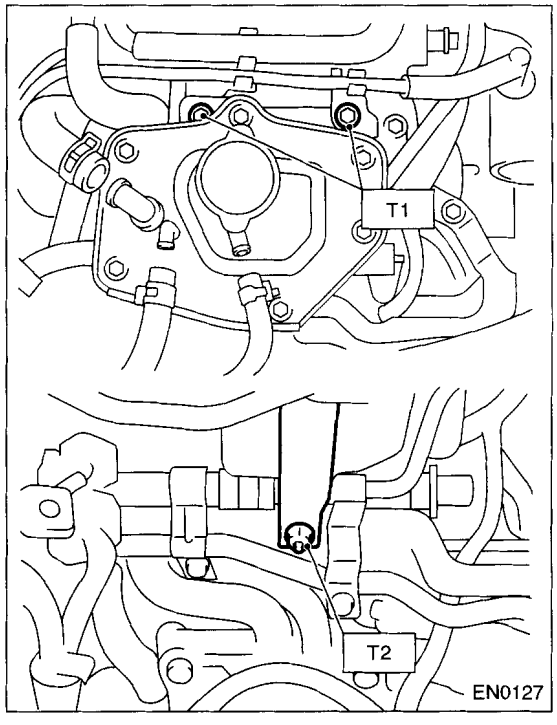
5) Remove the bolts and nut which install coolant filler tank.
6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
7) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



2) Fill engine coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

13.Engine Cooling System Trouble in General

A: INSPECTION

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

LUBRICATION

LU

		Page
1.	General Description	2
2.	Oil Pressure System	7
3.	Engine Oil	10
4.	Oil Pump	12
5.	Oil Pan and Strainer	17
6.	Oil Pressure Switch	22
7.	Engine Oil Cooler	25
8.	Engine Oil Filter	27
9.	Engine Lubrication System Trouble in General	28

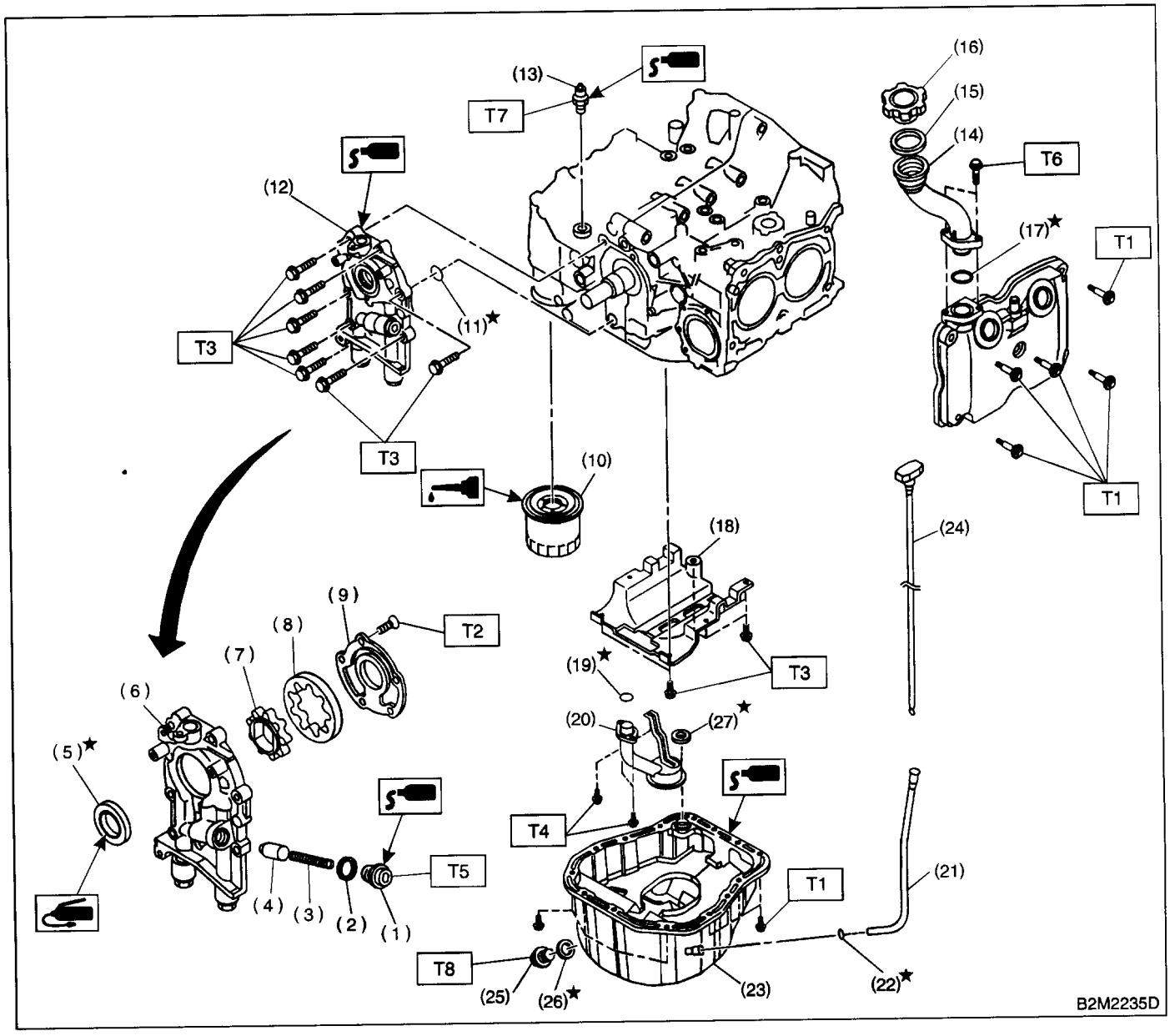
1. General Description

A: SPECIFICATIONS

Model					Non-Turbo	Turbo
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)	78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)	
				LIMIT	0.18 mm (0.0071 in)	
	Side clearance between inner rotor and pump case			STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)	
				LIMIT	0.12 mm (0.0047 in)	
	Case clearance between outer rotor and pump case			STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)	
				LIMIT	0.20 mm (0.0079 in)	
	Capacity at 80°C (176°F)	700 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm^2, 14 psi)	
				- quantity	4.2 ℓ (4.4 US qt, 3.7 Imp qt)/min.	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)	
				- quantity	42.0 ℓ (11.10 US gal, 9.24 Imp gal)/min.	47.0 ℓ (12.41 US gal, 10.33 Imp gal)/min.
	Relief valve operation pressure				490 kPa (5.0 kg/cm^2, 71 psi)	588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type				Full-flow filter type	
	Filtration area				1,000 cm^2 (155 sq in)	
	By-pass valve opening pressure				157 kPa (1.6 kg/cm^2, 23 psi)	
	Outer diameter × width				80 × 70 mm (3.15 × 2.76 in)	
	Oil filter to engine thread size				M 20 × 1.5	
Relief valve (on rocker shaft) operation pressure					69 kPa (0.7kg/cm^2, 10 psi)	
Oil pressure switch	Type				Immersed contact point type	
	Working voltage — wattage				12 V — 3.4 W or less	
	Warning light activation pressure				14.7 kPa (0.15 kg/cm^2, 2.1 psi)	
	Proof pressure				More than 981 kPa (10 kg/cm^2, 142 psi)	
Oil capacity (at replacement)					4.0 ℓ (4.2 US qt, 3.5 Imp qt)	4.5 ℓ (4.8 US qt, 4.0 Imp qt)

B: COMPONENT

1. NON-TURBO MODEL

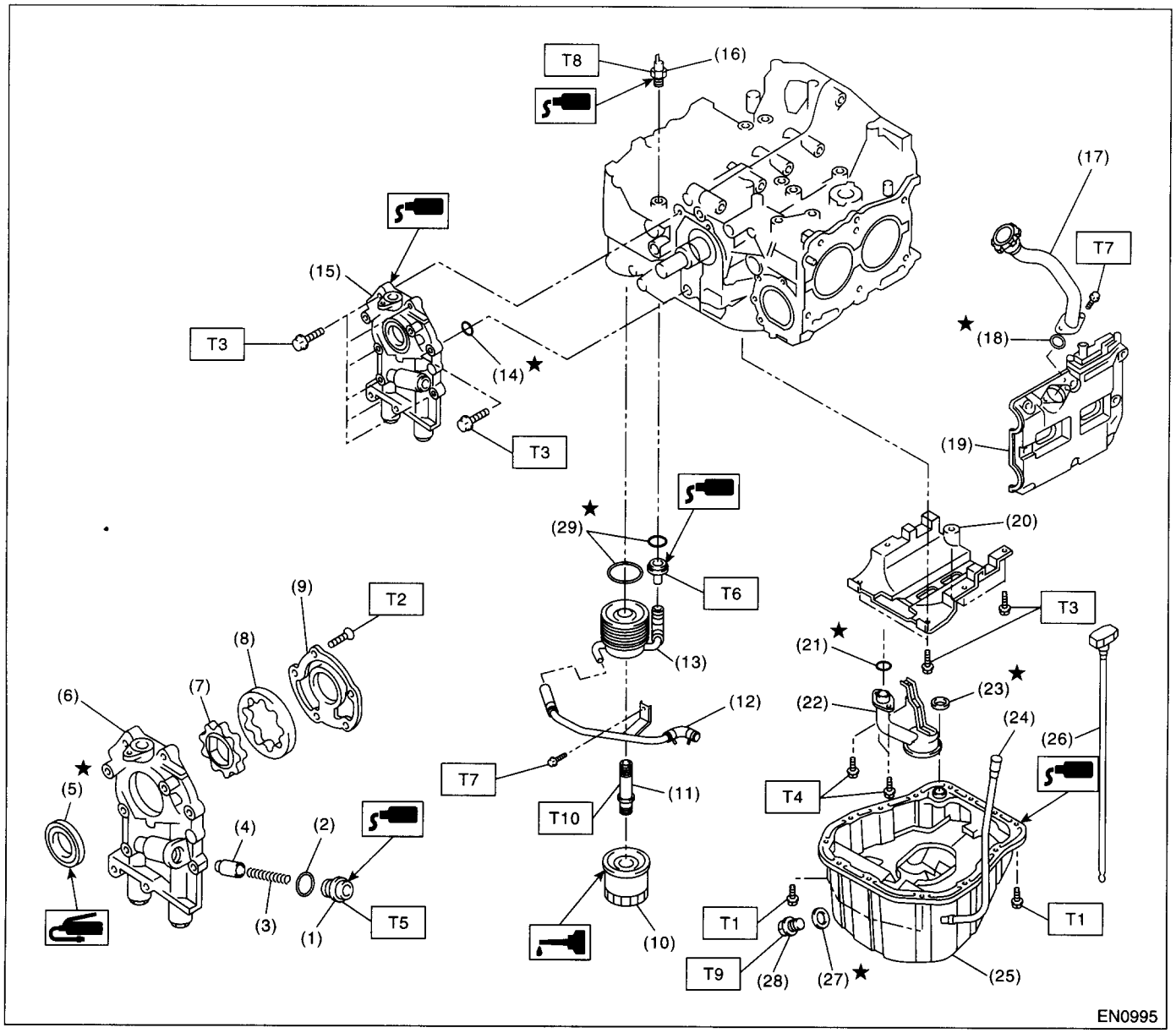


(1) Plug
(2) Washer
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket
(27) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 5 (0.5, 3.6)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.2)
T5: 44.1 (4.5, 32.5)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 33)

2. TURBO MODEL



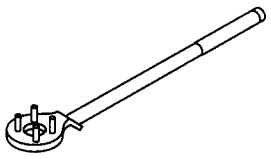
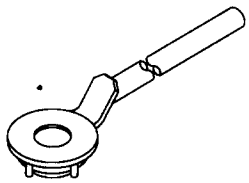
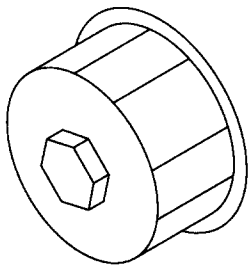
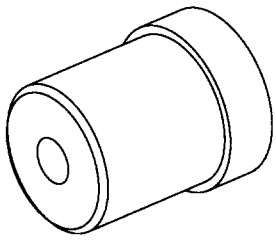
(1) Plug
(2) Washer
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Connector
(12) Water by-pass pipe
(13) Oil cooler
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Cylinder head cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 5 (0.5, 3.6)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.0)
T5: 44.1 (4.5, 32.5)
T6: 69 (7.0, 4.7)
T7: 6.4 (0.65, 50.6)
T8: 25 (2.5, 18.1)
T9: 44 (4.5, 33)
T10: 54 (5.5, 40)

C: CAUTION

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

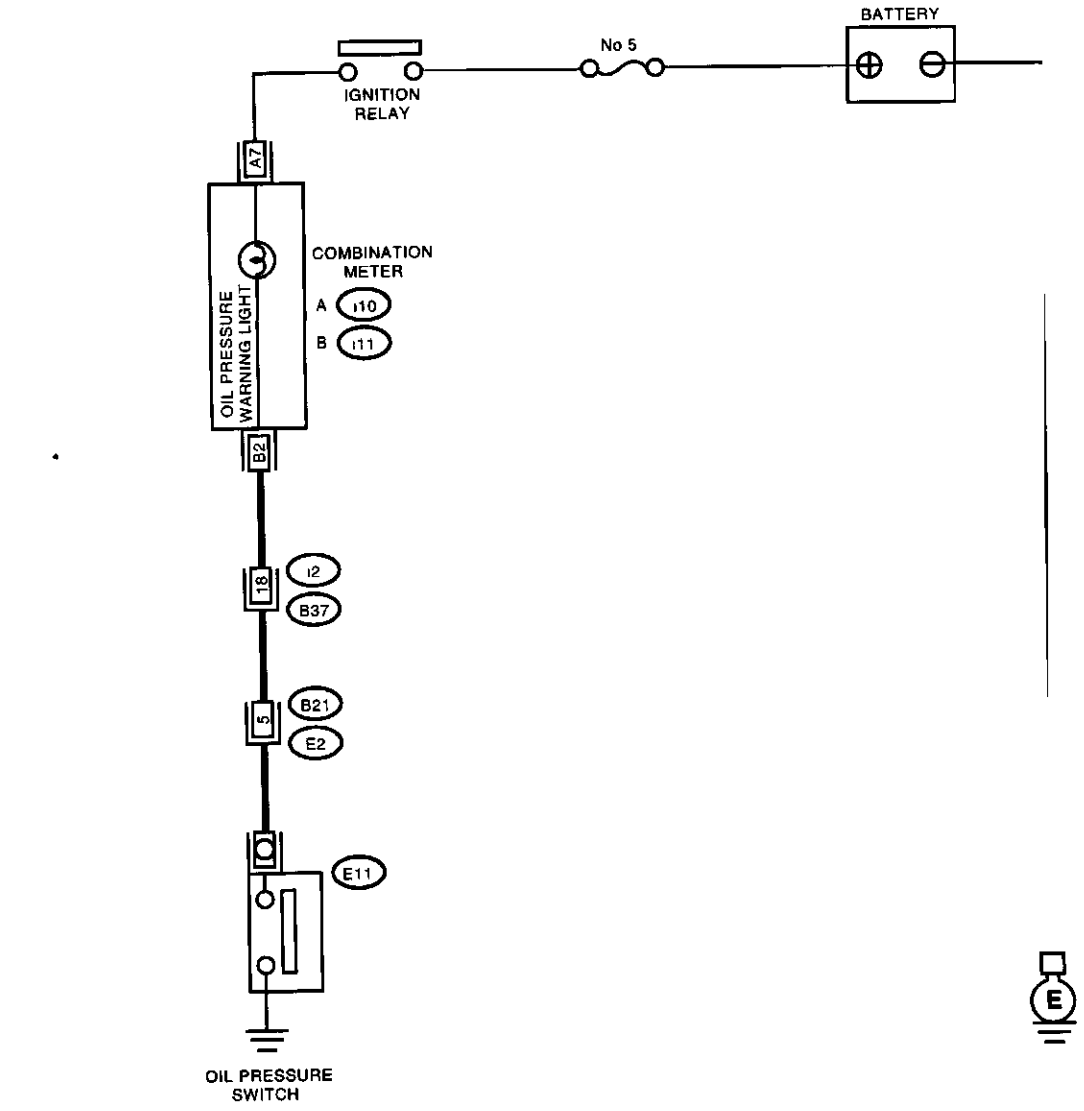
D: PREPARATION TOOL

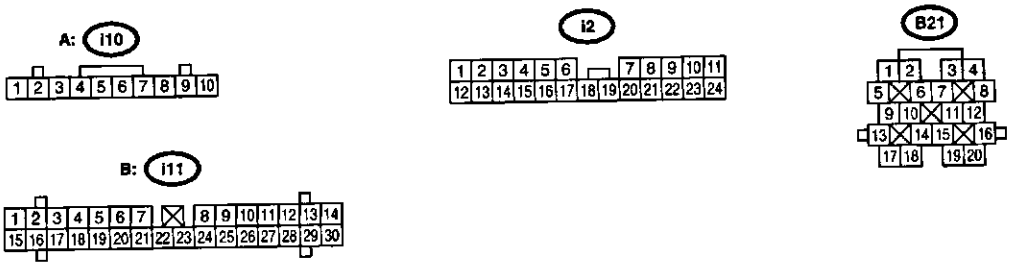
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3870	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (Non-Turbo model)
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (Turbo model)
 B2M3872	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 B2M3875	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

2. Oil Pressure System

A: SCHEMATIC

1. NON-TURBO MODEL

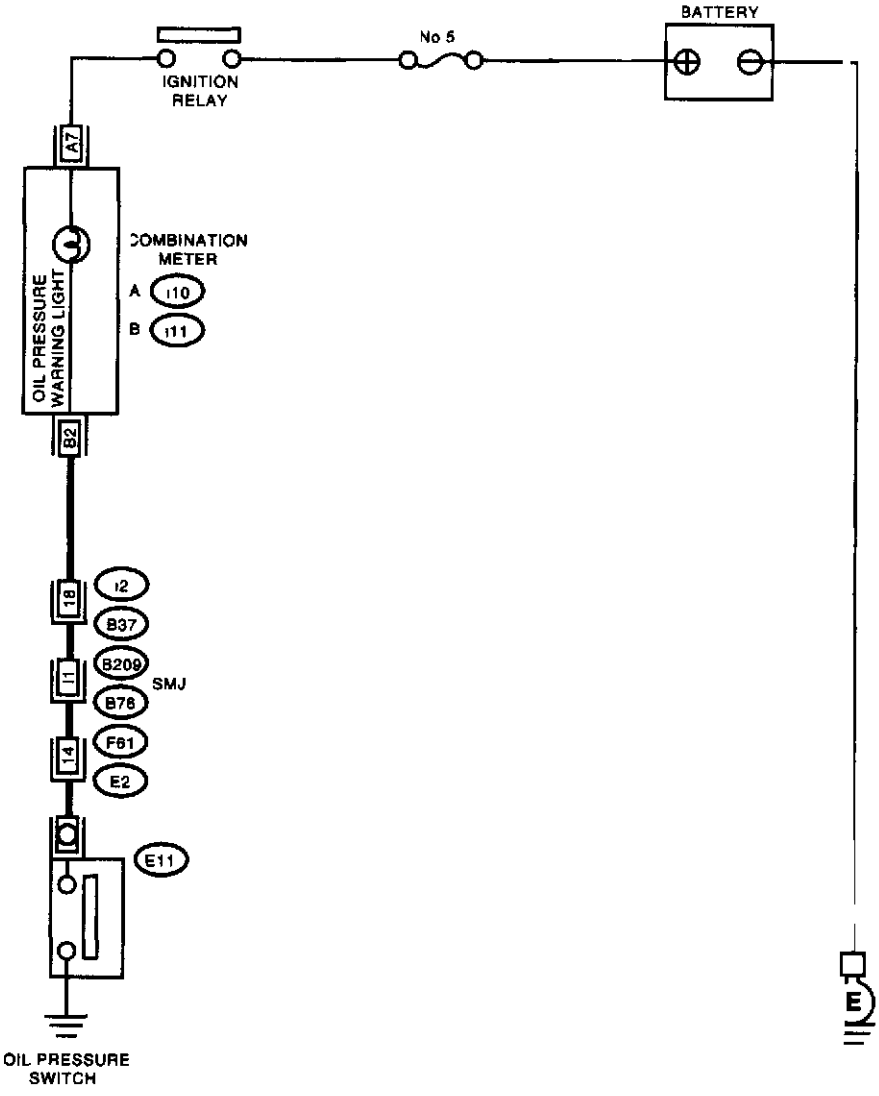


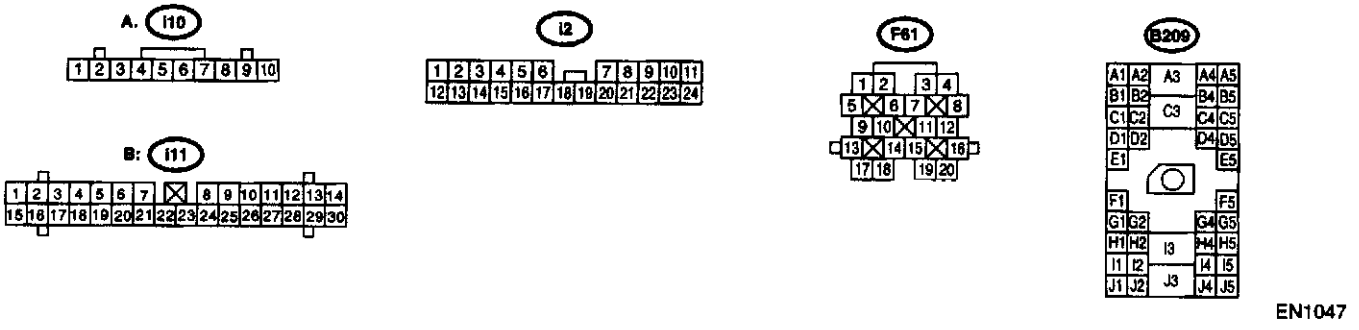


EN1046

OIL PRESSURE SYSTEM

2. TURBO MODEL





EN1047

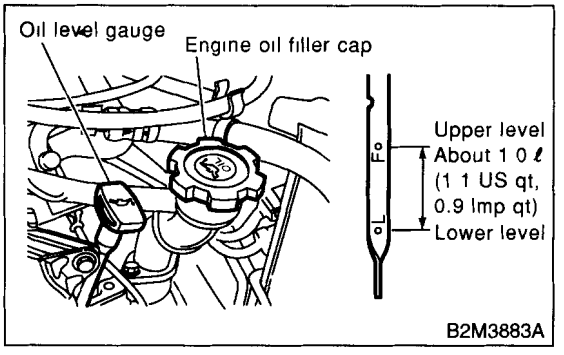
B: INSPECTION

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1)Turn the ignition switch to ON. (engine OFF) 2)Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from the oil pressure switch. 3)Turn the ignition switch ON. 4)Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 — Chassis ground:***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Measure the resistance of the combination meter. ***Terminal*** ***No. A7 — No. B2:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

3. Engine Oil

A: INSPECTION

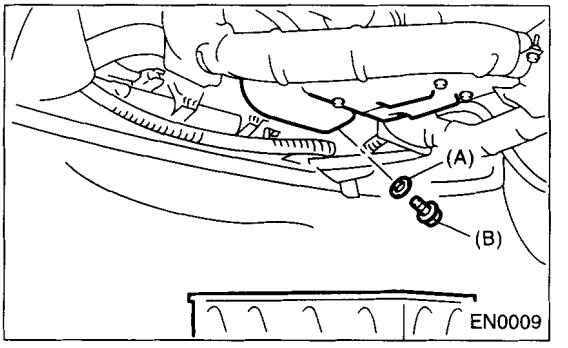
1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and properly orientated.
4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.



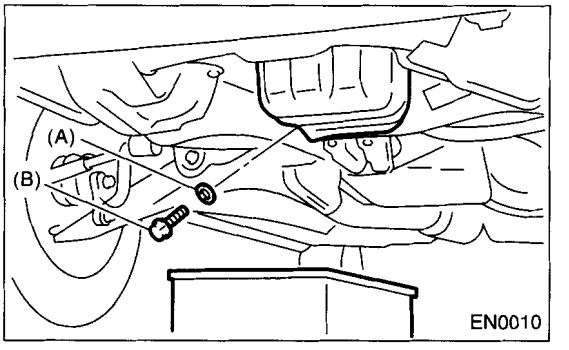
B: REPLACEMENT

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

- Non-Turbo model

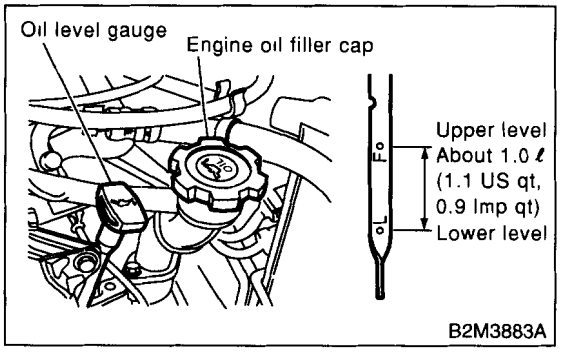


- Turbo model



(A) Gasket
(B) Drain plug

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

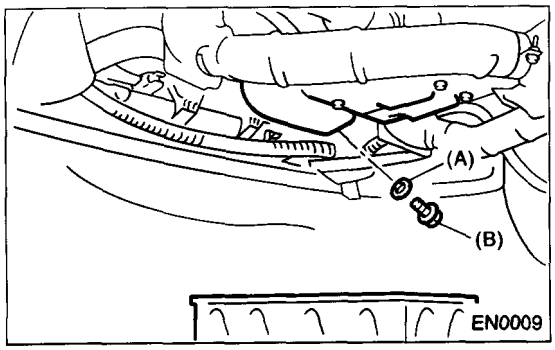


3) Replace the drain plug gasket.

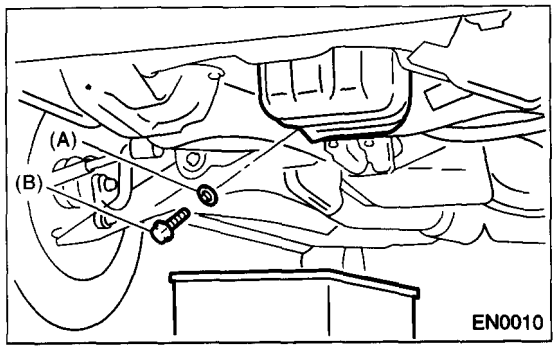
4) Tighten the engine oil drain plug after draining engine oil.

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

- Non-Turbo model



- Turbo model



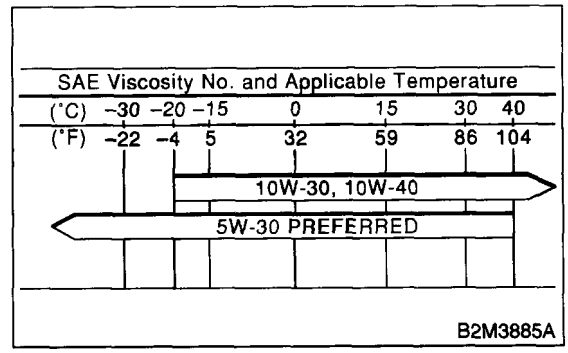
(A) Gasket
(B) Drain plug

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

Recommended oil:
API classification
SJ or SH with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SJ or SH grade, you may use SG grade.)

Engine oil capacity: (Non-Turbo model)
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)

Engine oil capacity: (Turbo model)
Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

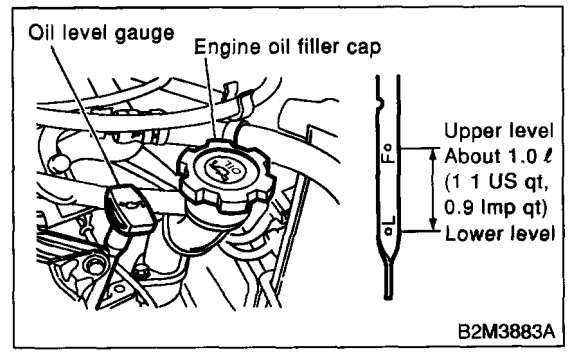


The proper viscosity helps the vehicle to get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

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

NOTE:
If the vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

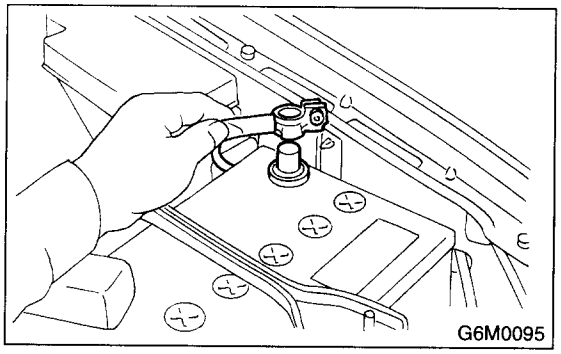
6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.
8) After the engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.



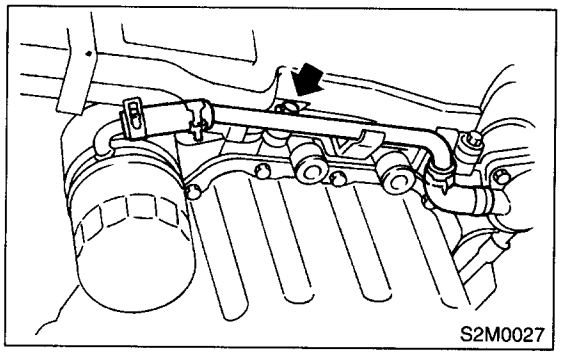
4. Oil Pump

A: REMOVAL

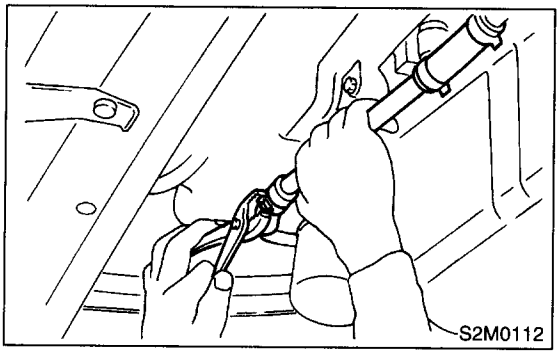
1) Disconnect the battery ground cable.


G6M0095

2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install water pipe of oil cooler to oil pump. (Turbo model)

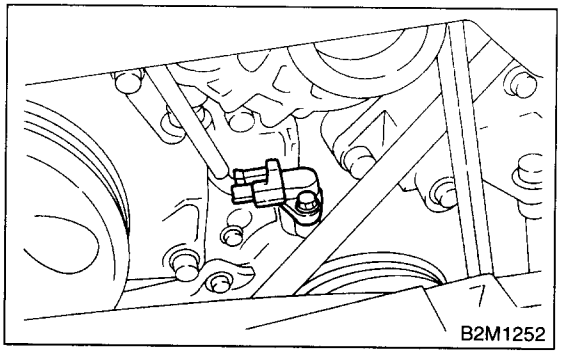

S2M0027

5) Remove the water pipe and hoses between oil cooler and water pump. (Turbo model)

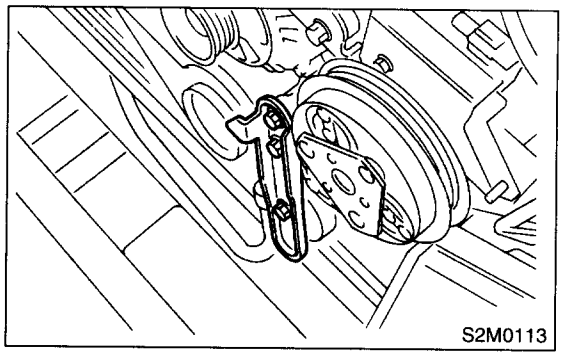

S2M0112

6) Remove the radiator. <Ref. to CO-37, REMOVAL, Radiator.>

7) Remove the crankshaft position sensor.

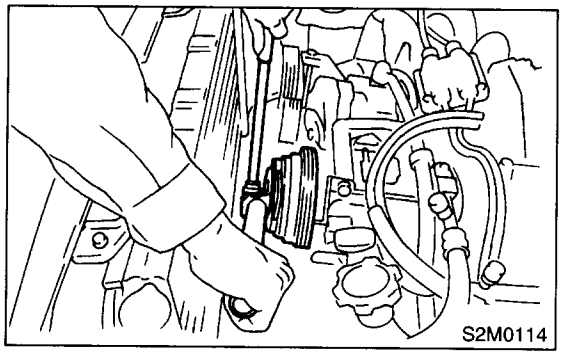

B2M1252

8) Remove the V-belts. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.

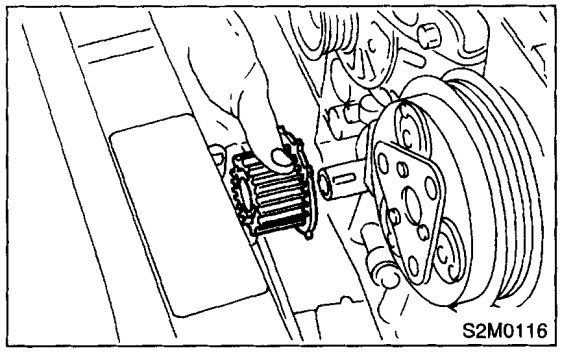

S2M0113

10) Remove the crankshaft pulley by using ST.

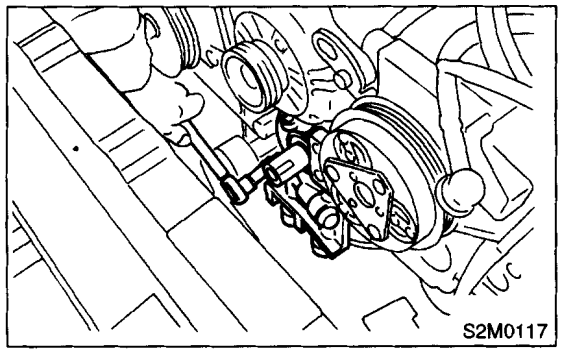
ST	499977300	CRANKSHAFT PULLEY WRENCH (Turbo model)
ST	499977100	CRANKSHAFT PULLEY WRENCH (Non-Turbo model)


S2M0114

11) Remove the water pump. <Ref. to CO-27, REMOVAL, Water Pump.>
12) Remove the crankshaft sprocket.

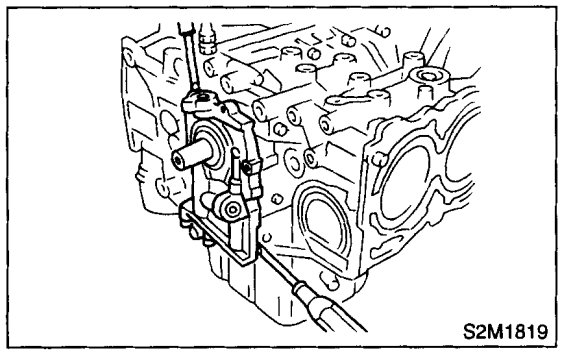

S2M0116

13) Remove the bolts which install oil pump onto cylinder block.


S2M0117

14) Remove the oil pump by using flat bladed screwdriver.

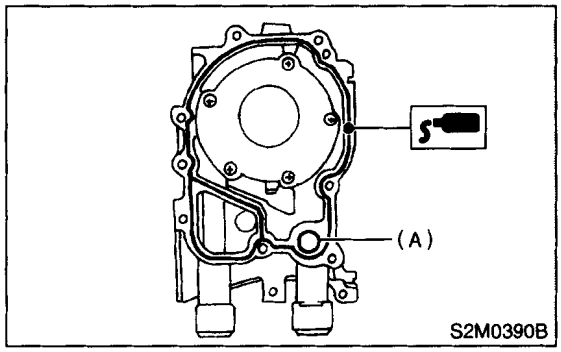
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.


S2M1819

B: INSTALLATION

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

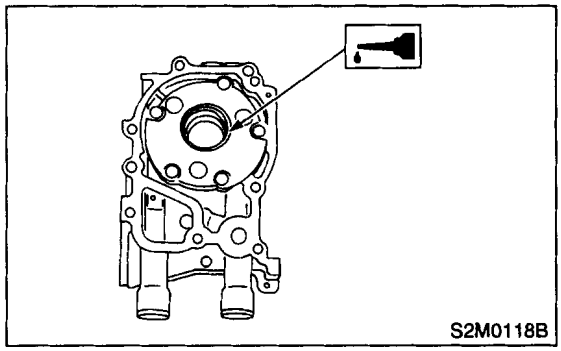
Fluid packing:
THREE BOND 1215 or equivalent



S2M0390B

(A) O-ring

2) Replace the O-ring with a new one.
3) Apply a coat of engine oil to the inside of the oil seal.

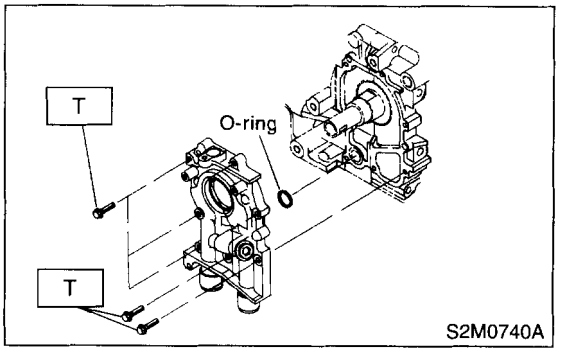

S2M0118B

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 the oil pump.

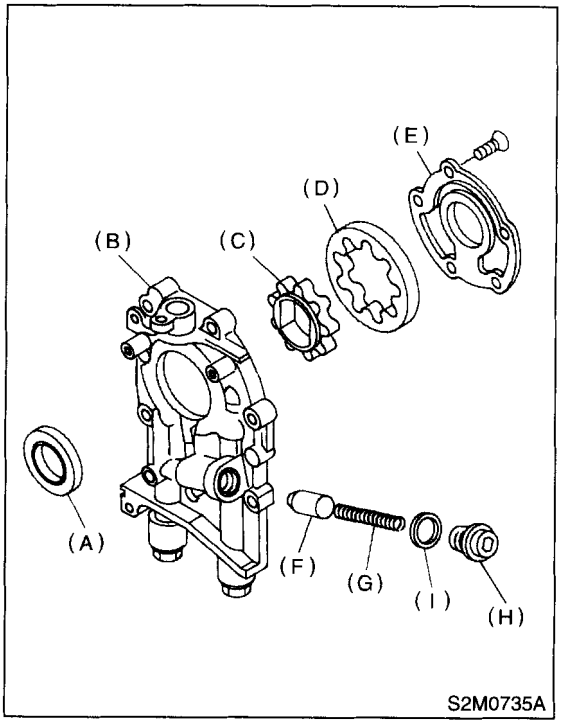
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure oil pump cover and then 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 the relief valve, loosen plug when removing the oil pump from cylinder block.

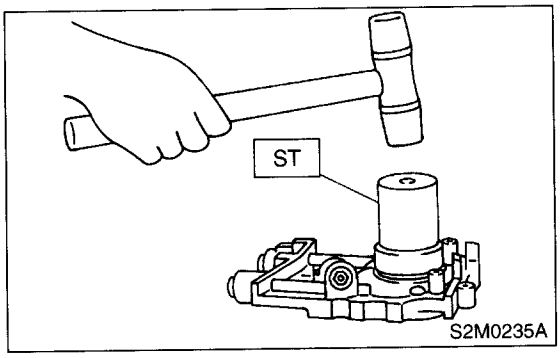


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Washer

D: ASSEMBLY

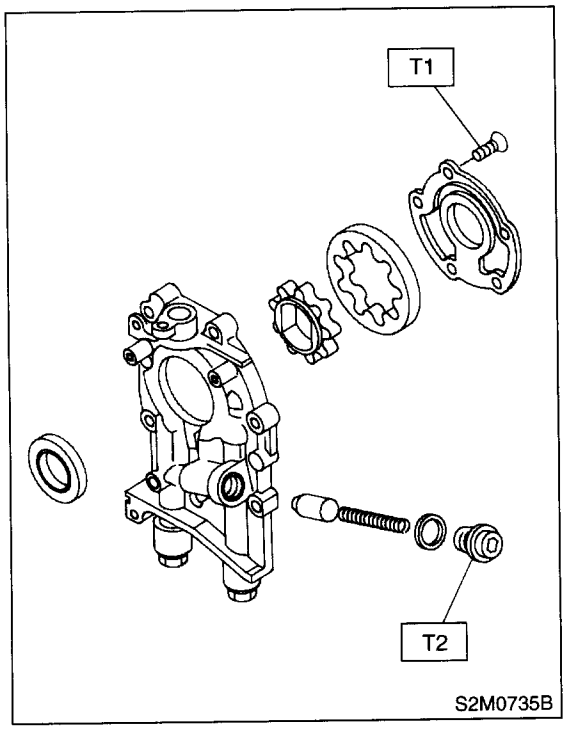
1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

CAUTION:
Use a new oil seal.



2) Apply a coat of engine oil to inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve and relief valve spring.
5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

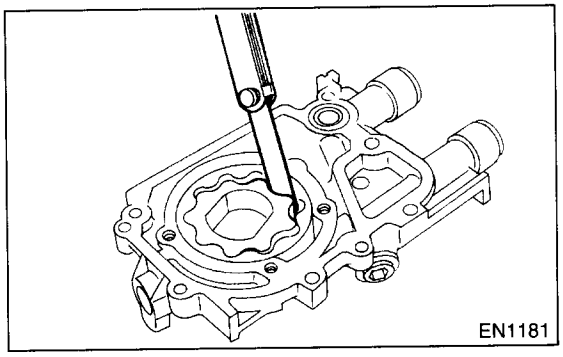


E: INSPECTION

1. TIP CLEARANCE

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

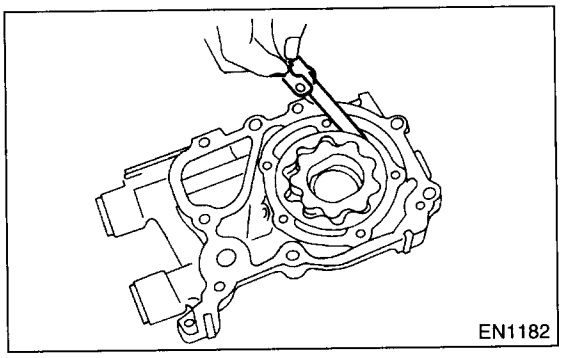
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



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.

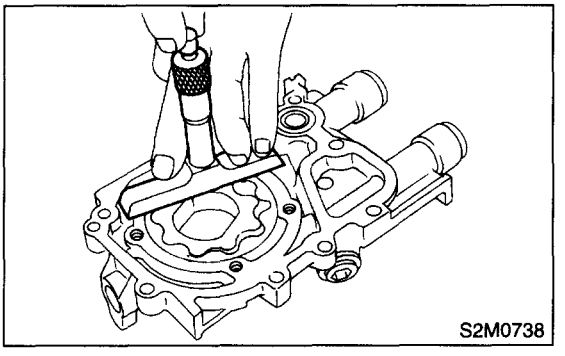
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the 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
0.12 mm (0.0047 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.

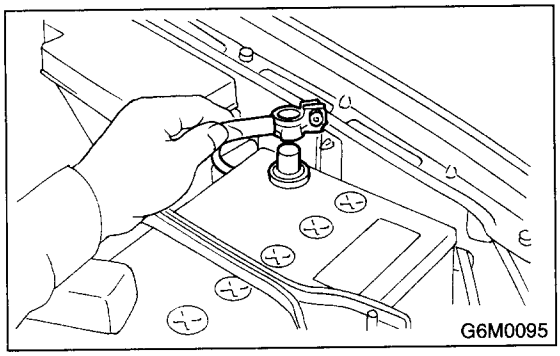
6. OIL SEAL

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

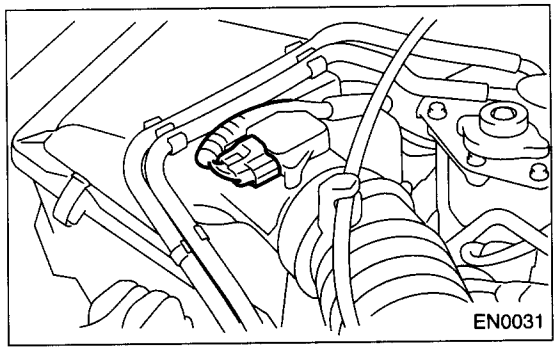
5. Oil Pan and Strainer

A: REMOVAL

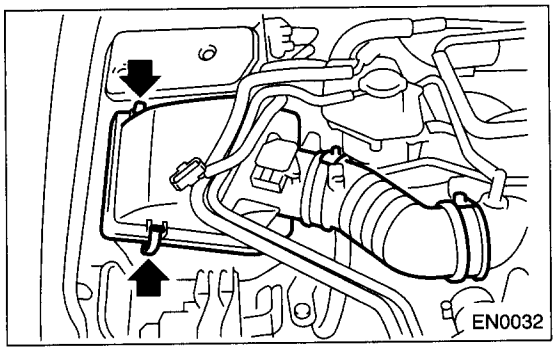
1) Set the vehicle on lift arms.
2) Remove the front wheels.
3) Disconnect the battery ground cable.



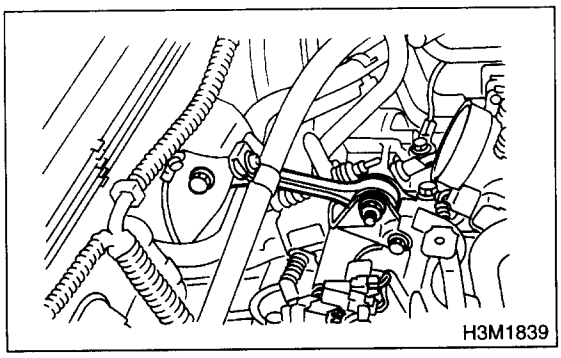
4) Remove the air intake duct and air cleaner case. (Non-Turbo model)
<Ref. to IN(SOHC)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(SOHC)-6, REMOVAL, Air Cleaner Case.>
5) Disconnect the connector from mass air flow sensor. (Turbo model)



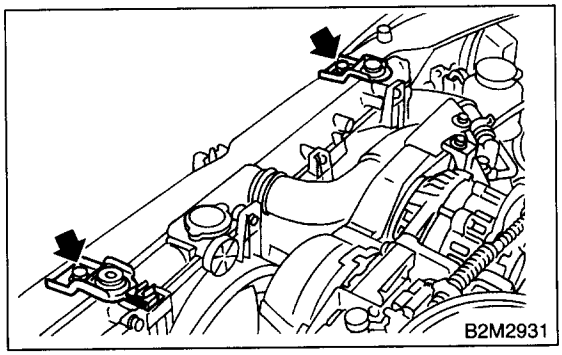
6) Remove the air intake boot and air cleaner upper cover. (Turbo model)



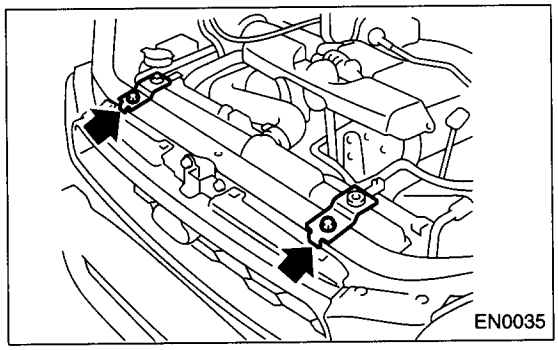
7) Remove the intercooler (Turbo model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



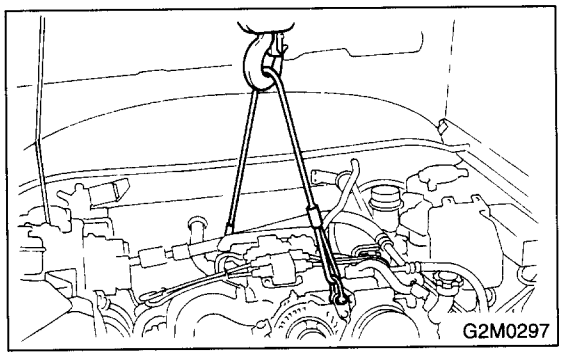
9) Remove the radiator upper brackets.
- Non-Turbo model



- Turbo model



10) Support the engine with a lifting device and wire ropes.

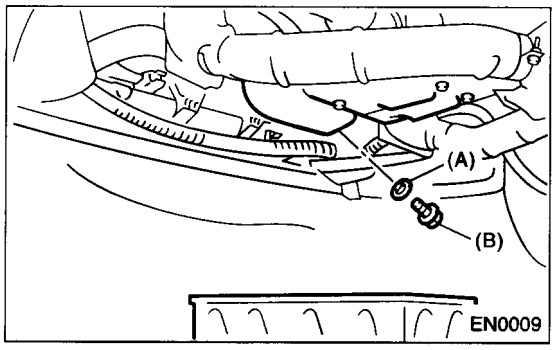


11) Lift-up the vehicle.

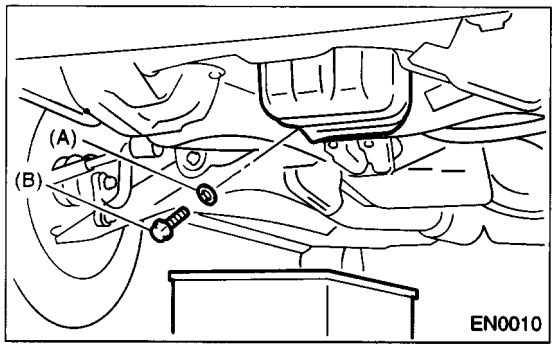
CAUTION:
At this time, raise up wire ropes.

OIL PAN AND STRAINER

12) Remove the under cover.
13) Drain the engine oil.
Set a container under the vehicle, and remove drain plug from oil pan.
- Non-Turbo model

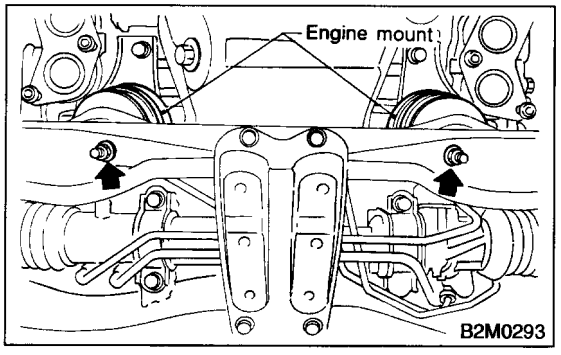


- Turbo model



(A) Gasket
(B) Drain plug

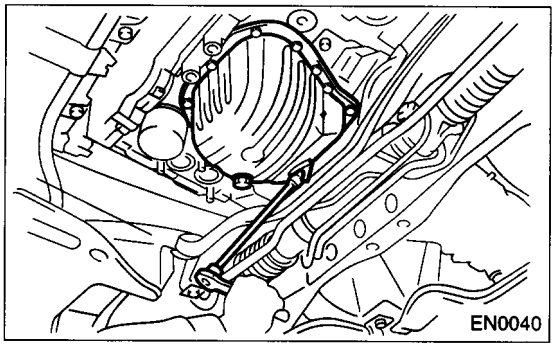
14) Remove the front and center exhaust pipes. (Non-Turbo model) <Ref. to EX(SOHC)-5, REMOVAL, Front Exhaust Pipe.>
15) Remove the nuts which install front cushion rubber onto front crossmember.



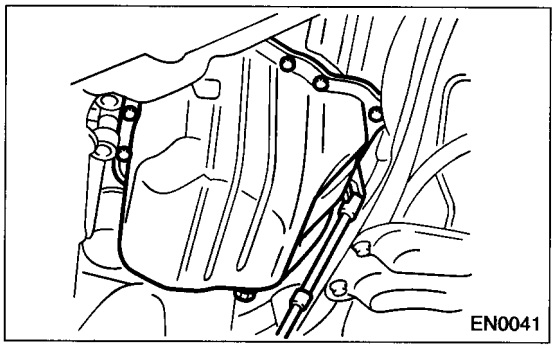
16) Remove the bolts which install oil pan on cylinder block while raising up engine.
17) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

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

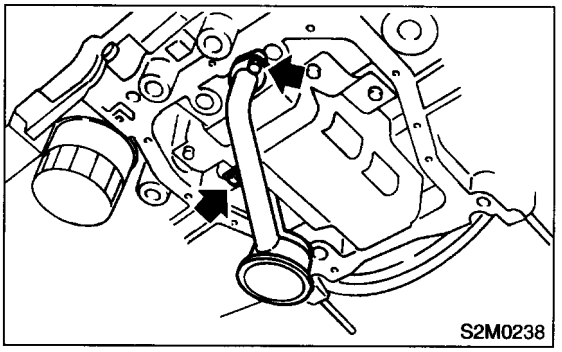
- Non-Turbo model



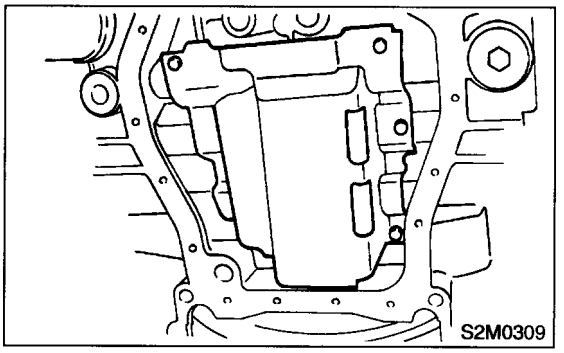
- Turbo model



18) Remove the oil strainer.



19) Remove the baffle plate.

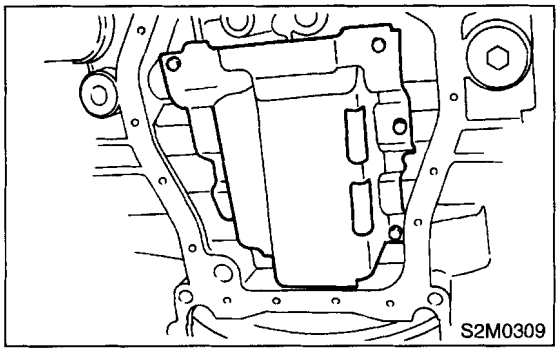


B: INSTALLATION

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

1) Install the baffle plate.

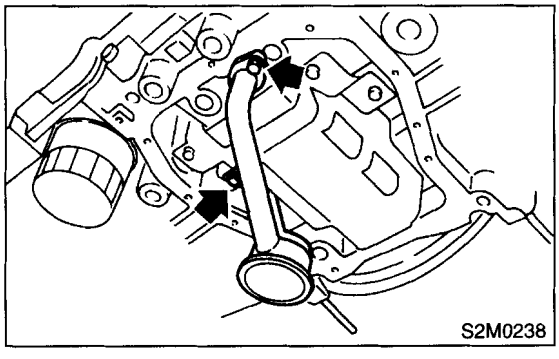
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the oil strainer onto baffle plate.

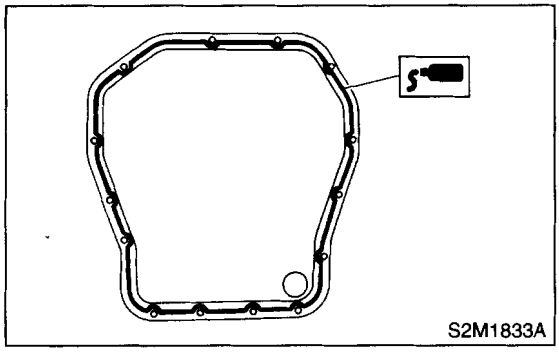
CAUTION:
Replace the O-ring with a new one.

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



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

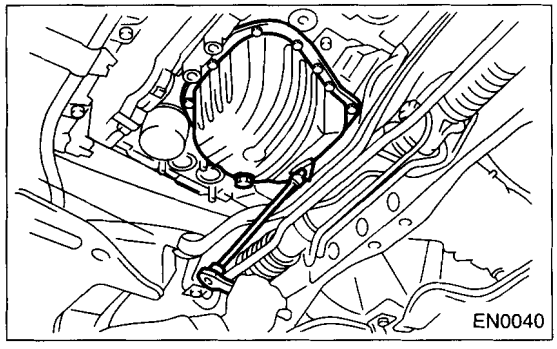
Fluid packing:
THREE BOND 1215 or equivalent



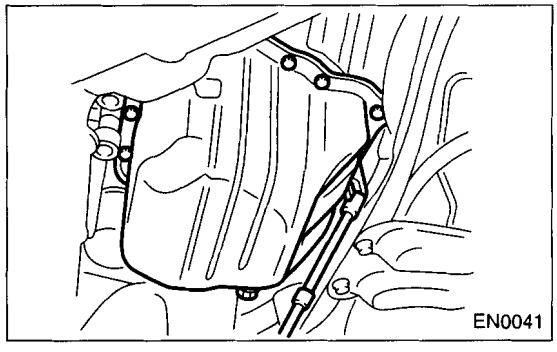
4) Tighten bolts which install the oil pan onto engine block.

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

- Non-Turbo model

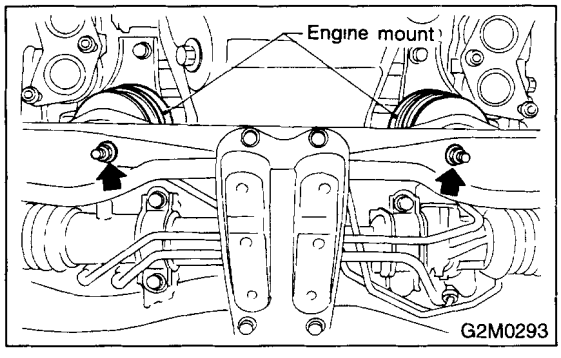


- Turbo model



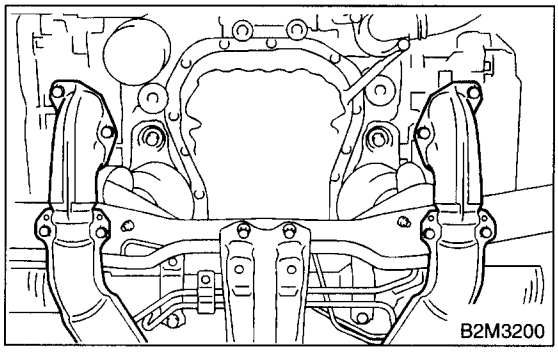
5) Lower the engine onto front crossmember.
6) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:
69 N·m (7.0 kgf-m, 51 ft-lb)



7) Install the front and center exhaust pipes. (Non-Turbo model)
<Ref. to EX(SOHC)-6, INSTALLATION, Front Exhaust Pipe.>

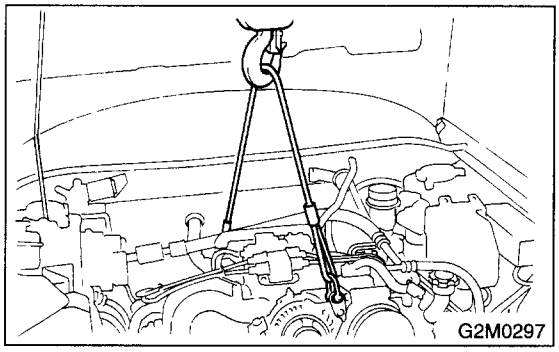
NOTE:
Always use new gaskets.



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

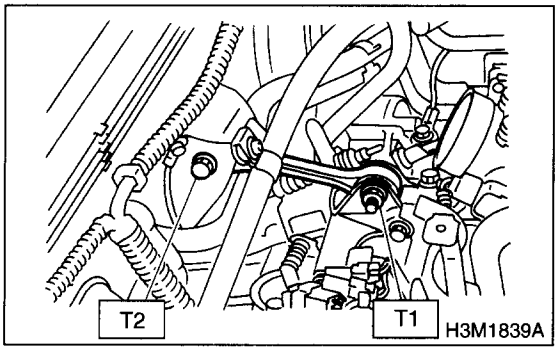
CAUTION:
At this time, lower the lifting device and release steel cables.

10) Remove the lifting device and steel cables.

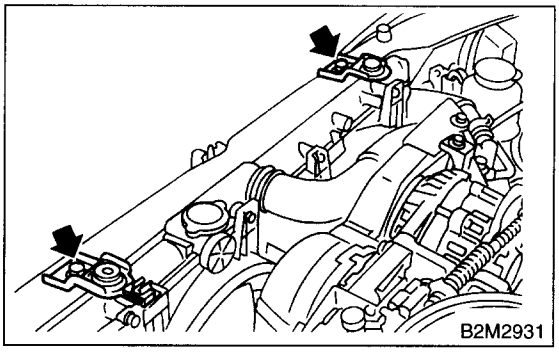


11) Install the pitching stopper.

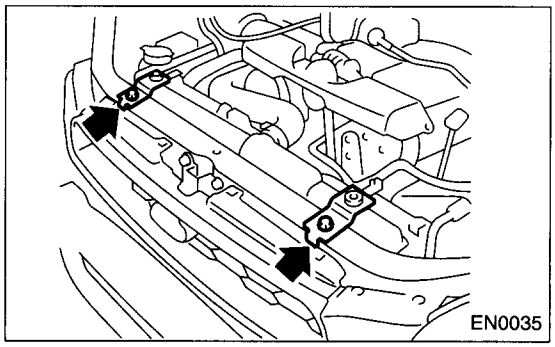
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



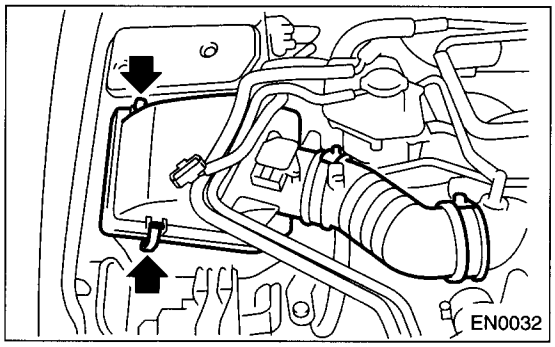
12) Install the radiator upper brackets.
- Non-Turbo model



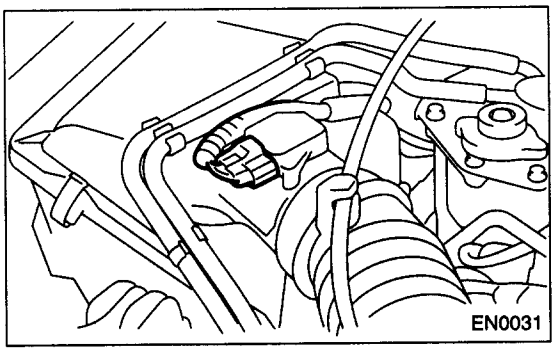
- Turbo model



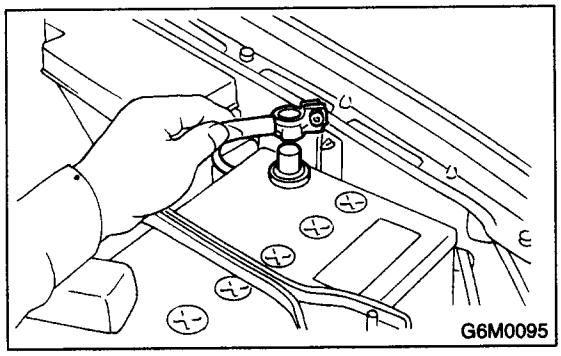
13) Install the air intake duct and air cleaner case. (Non-Turbo model)
<Ref. to IN(SOHC)-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(SOHC)-7, INSTALLATION, Air Intake Duct.>
14) Install the intercooler. (Turbo model) <Ref. to IN(DOHC TURBO)-11, INSTALLATION, Intercooler.>
15) Install the air intake boot and air cleaner upper cover. (Turbo model)



16) Connect the connector to mass air flow sensor. (Turbo model)



17) Install the front wheels.
18) Connect the battery ground cable.



19) Fill the engine oil. <Ref. to LU-10, INSPECTION, Engine Oil.>

C: INSPECTION

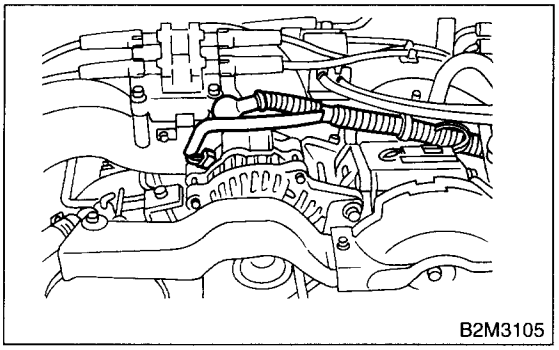
By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

6. Oil Pressure Switch

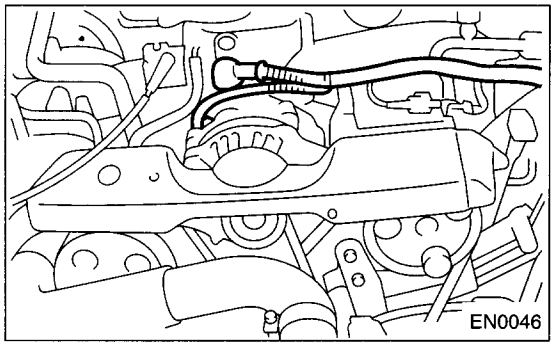
A: REMOVAL

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

- Non-Turbo model

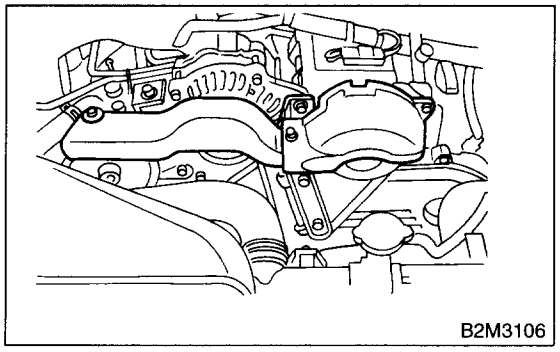

B2M3105

- Turbo model

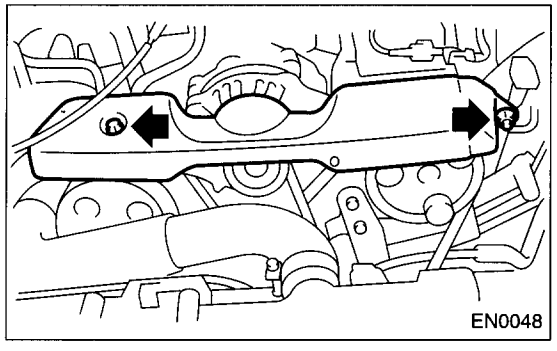

EN0046

   (2) Remove the V-belt cover.

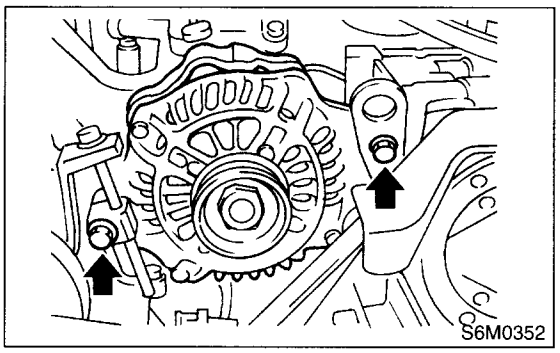
- Non-Turbo model


B2M3106

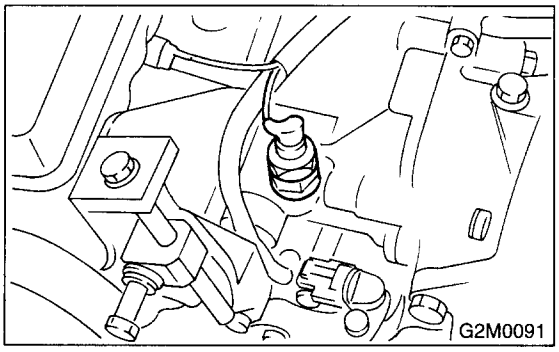
- Turbo model


EN0048

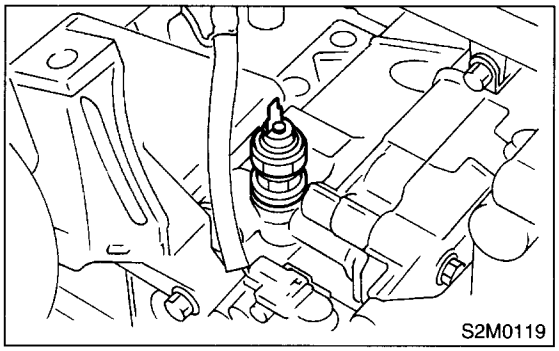
   (3) Remove the front side V-belt. <Ref. to ME(SOHC)-43, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
   (4) Remove the bolts which install generator on bracket.


S6M0352

2) Disconnect the terminal from oil pressure switch.


G2M0091

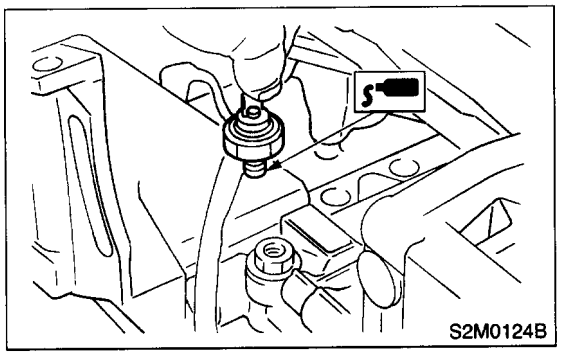
3) Remove the oil pressure switch.


S2M0119

B: INSTALLATION

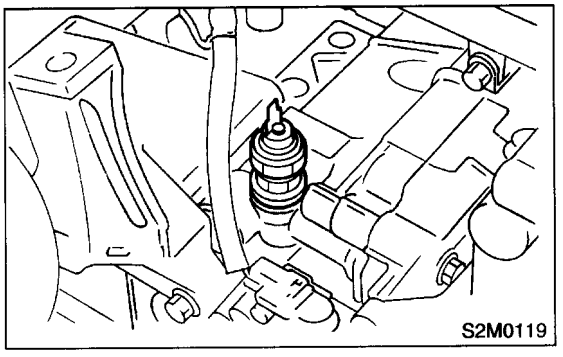
1) Apply fluid packing to oil pressure switch threads.

Fluid packing:
THREE BOND 1215 or equivalent

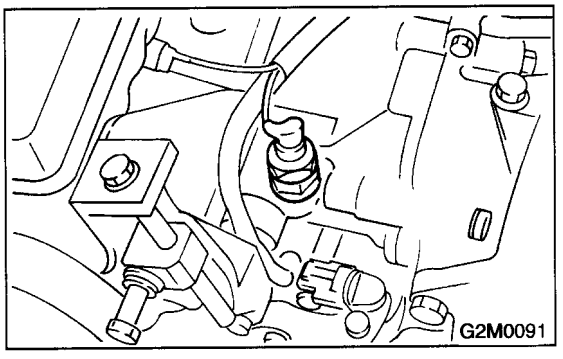


2) Install the oil pressure switch onto engine block.

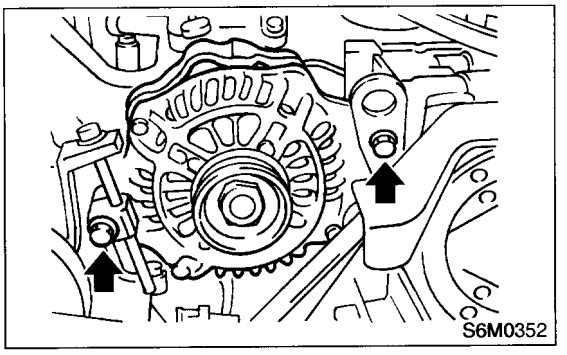
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



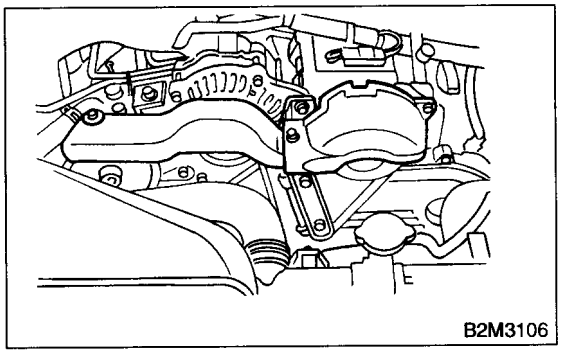
4) Install the generator on bracket and temporarily tighten installing bolts.



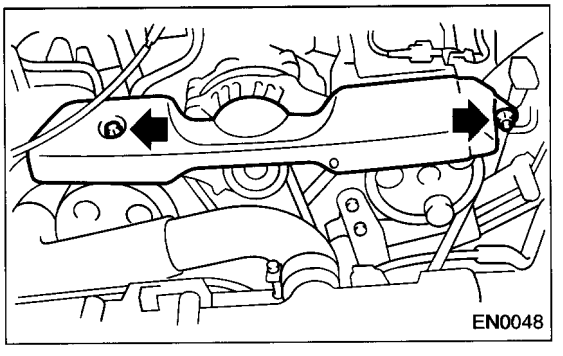
5) Install the front side V-belt and adjust it.
<Ref. to ME(SOHC)-43, INSTALLATION, V-belt.> or <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

6) Install the V-belt cover.

- Non-Turbo model

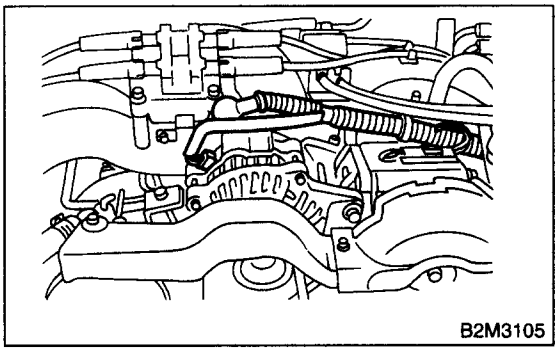


- Turbo model

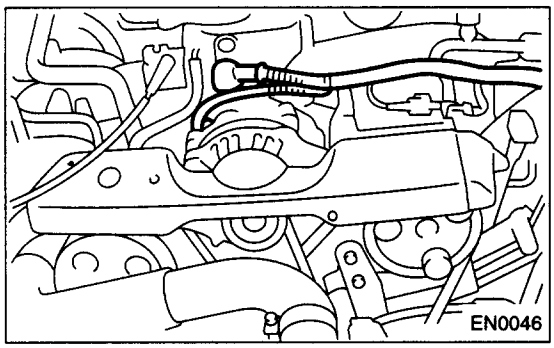


7) Connect the connector and terminal to generator.

- Non-Turbo model



- Turbo model



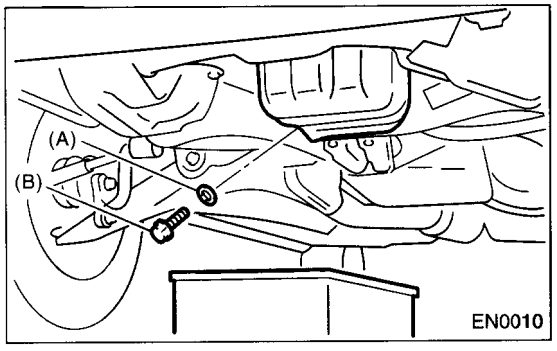
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Cooler

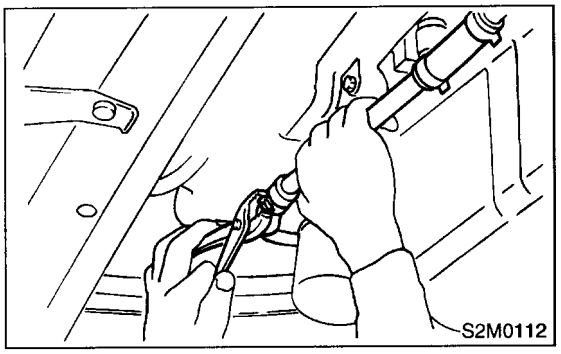
A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil.
Set a container under the vehicle, and remove drain plug from oil pan.



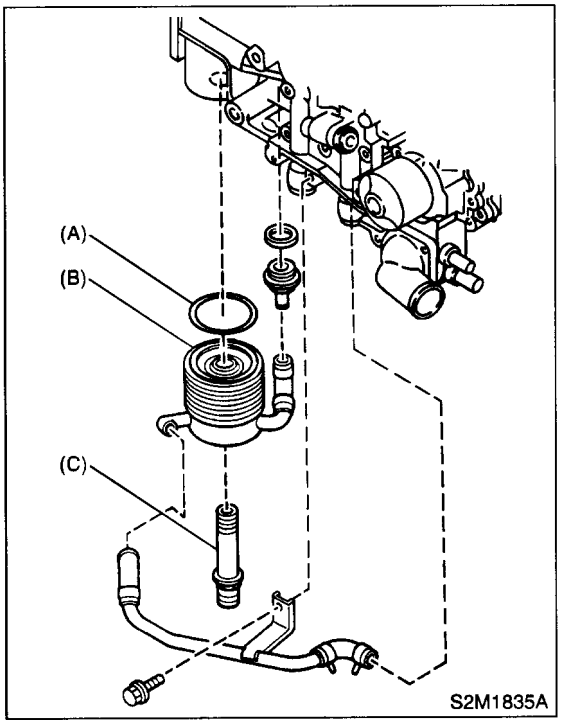
(A) Metal gasket
(B) Drain plug

4) Drain the coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU-27, REMOVAL, Engine Oil Filter.>

7) Remove the connector and remove oil cooler.



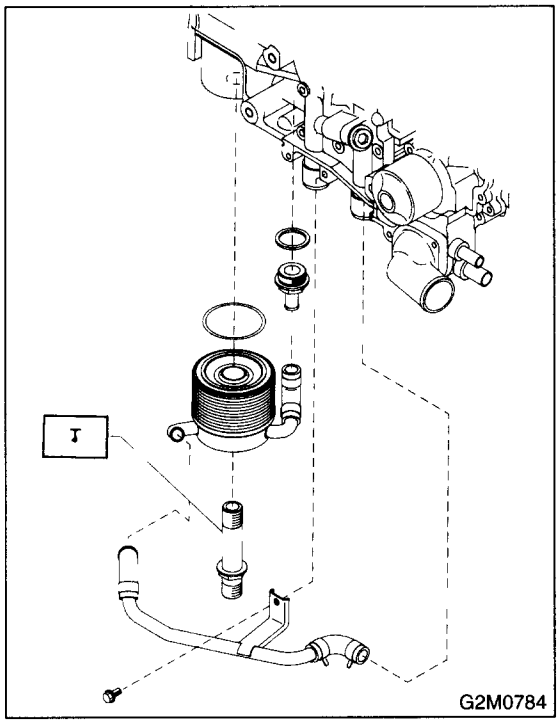
(A) O-ring
(B) Oil cooler
(C) Connector

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

CAUTION:
Always use a new O-ring.



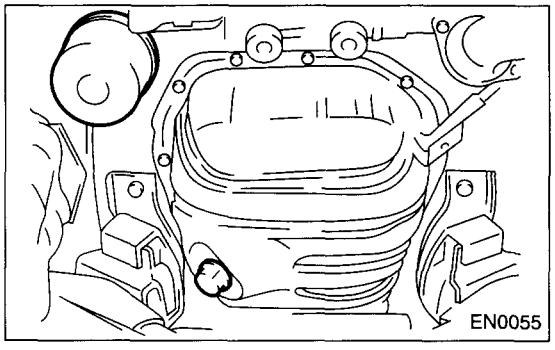
C: INSPECTION

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

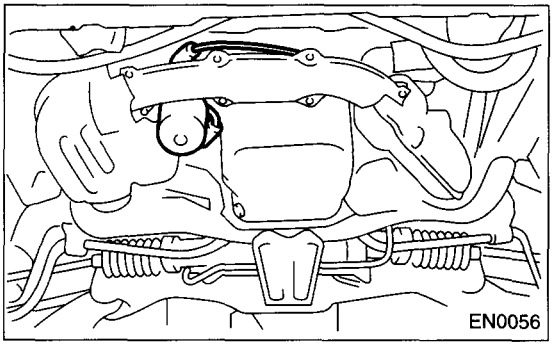
8. Engine Oil Filter

A: REMOVAL

1) Remove the under cover.
2) Remove the oil filter with ST.
ST 498547000 OIL FILTER WRENCH
- Non-Turbo model



- Turbo model



B: INSTALLATION

1) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
2) Install the oil filter turning it by hand, being careful not to damage seal rubber.
3) Tighten more (approximately 2/3 to 3/4 turn) after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak.

C: INSPECTION

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

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

2) Check the engine oil level. <Ref. to LU-10, INSPECTION, Engine Oil.>

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, 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 in oil filter	Clean or replace.
		Malfunction of oil relief valve in 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).

SPEED CONTROL SYSTEMS

SP

Page

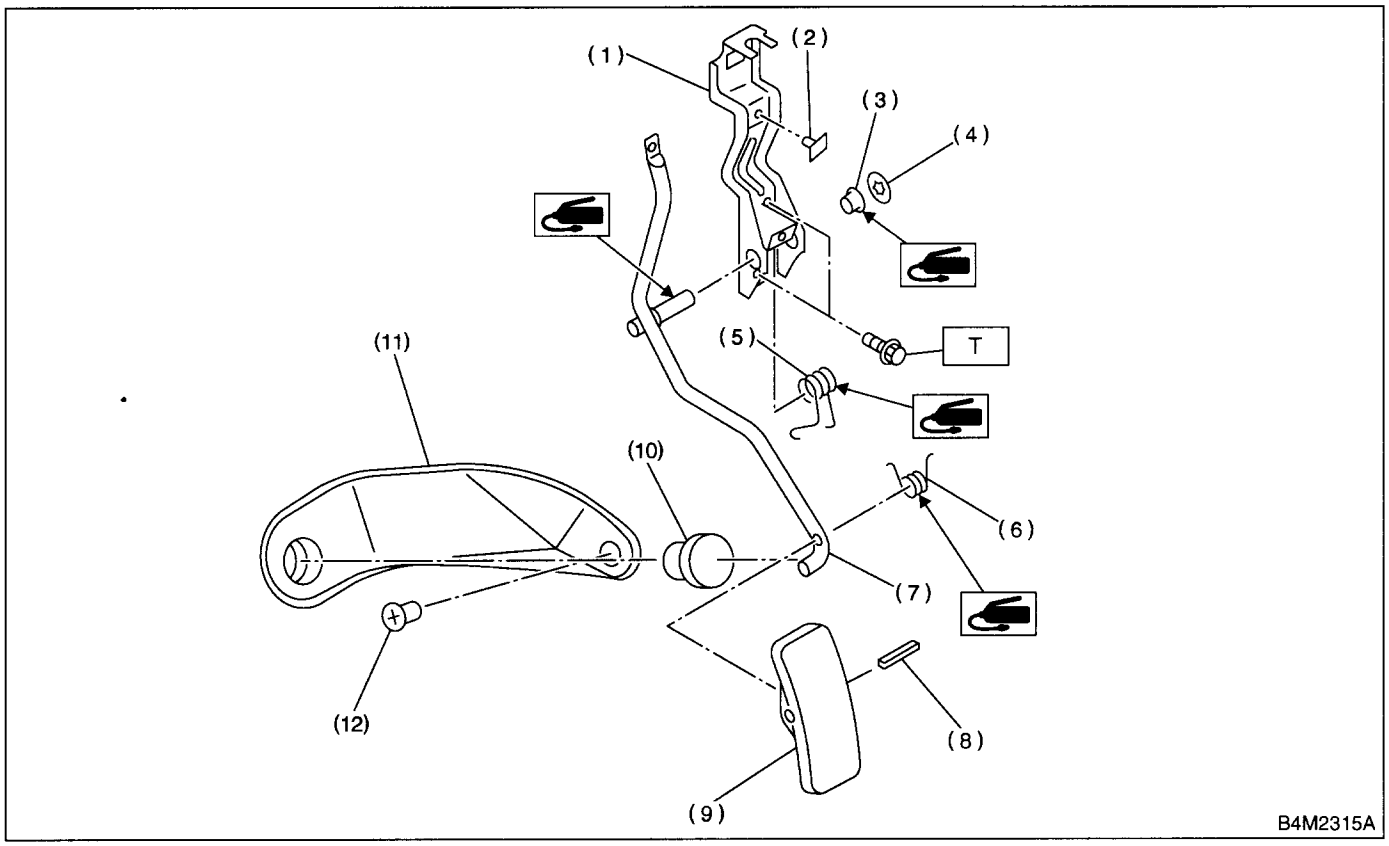
1. General Description 2
2. Accelerator Pedal 3
3. Accelerator Control Cable 7

1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



(1) Accelerator bracket
(2) Stopper
(3) Bushing
(4) Clip
(5) Accelerator spring
(6) Accelerator pedal spring
(7) Accelerator pedal lever
(8) Spring pin
(9) Accelerator pedal
(10) Accelerator stopper
(11) Accelerator plate
(12) Clip

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

C: CAUTION

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

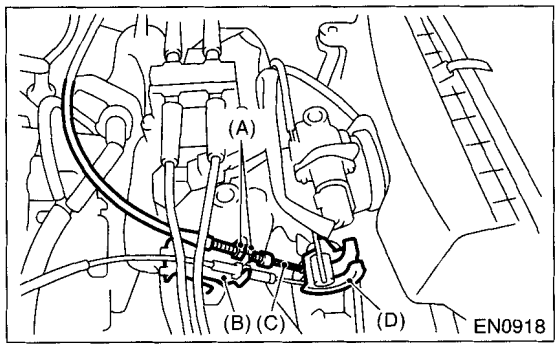
2. Accelerator Pedal

A: REMOVAL

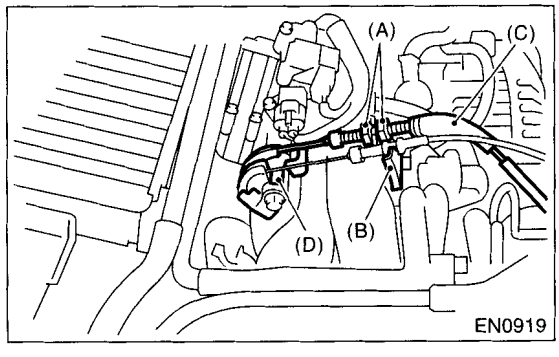
1) Disconnect the ground terminal from battery.
2) Remove the lock nut from accelerator cable bracket.
3) Separate the accelerator cable from bracket.
4) Remove the accelerator cable end from throttle cam.
5) Disconnect the accelerator cable from throttle body.

CAUTION:
Be careful not to kink the accelerator cable.

- SOHC model



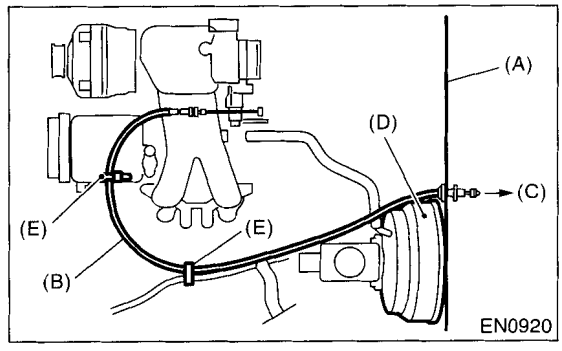
- DOHC TURBO model



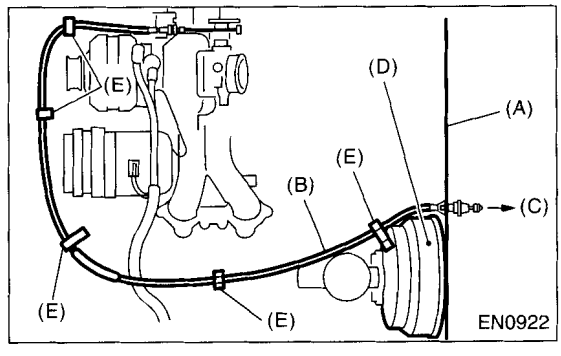
(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

6) Remove the clip inside engine compartment.

- SOHC model



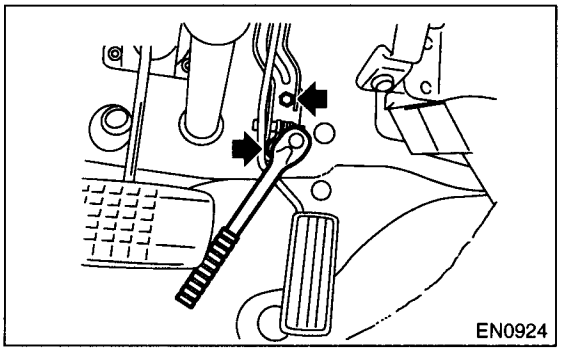
- DOHC TURBO model



(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Brake booster
(E) Clip

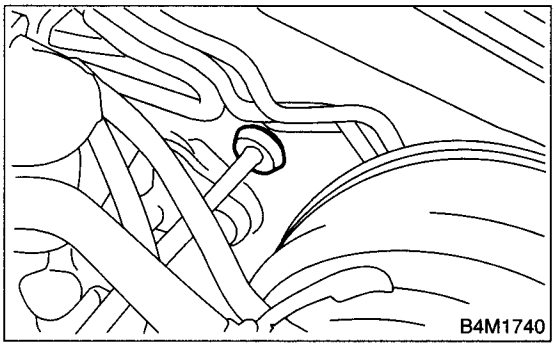
7) Remove the instrument panel lower cover from instrument panel, and connector.
8) Remove the brake and clutch pedal bracket. (MT model) <Ref. to BR-51, REMOVAL, Brake Pedal.>

9) Remove the accelerator pedal connecting bolt from accelerator pedal bracket.

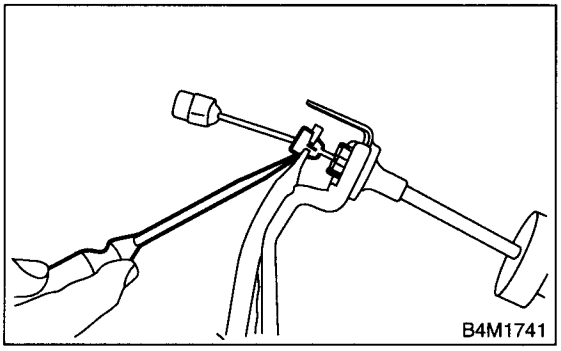


10) Disconnect the grommet from toe board.

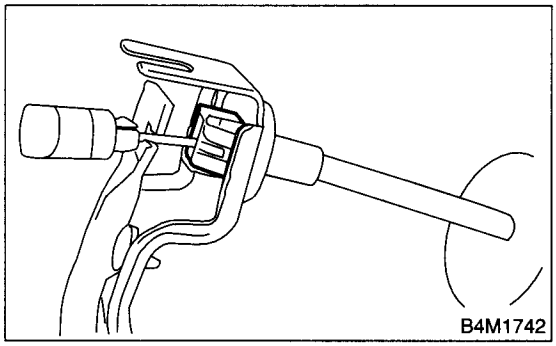
NOTE:
From inside the compartment, push grommet into hole.



11) Pull out the cable from the toe board hole.
12) Disconnect the accelerator cable bushing from accelerator pedal lever.



13) Disconnect the accelerator cable stopper from bracket.



14) Separate the accelerator cable and bracket.

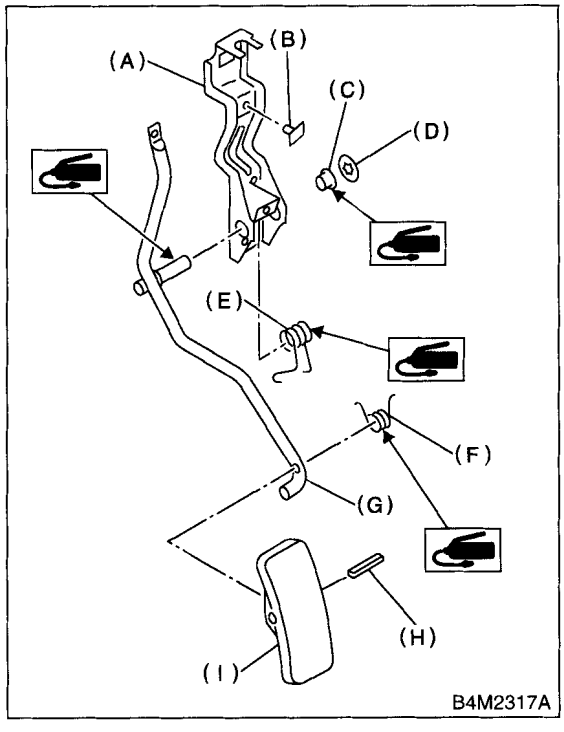
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **If cable clamp is damaged, replace it with a new one.**
- **Never fail to cover the outer cable end with boot.**
- **Be careful not to kink the accelerator cable.**
- **Always use new clevis pins.**

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal from the bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal

D: ASSEMBLY

Assemble in the reverse order of disassembly.

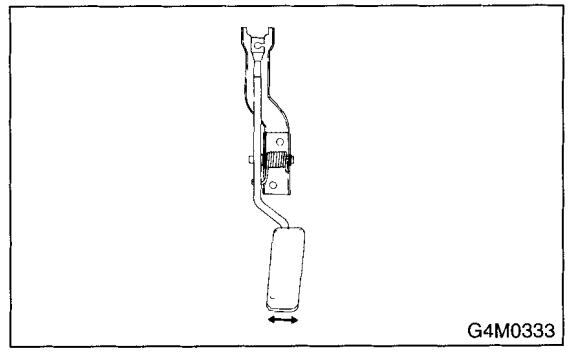
CAUTION:
Clean and apply grease to the spacer and inside bore of a accelerator pedal.

E: INSPECTION

Lightly move the pedal pad in lateral direction to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushing and clip with new ones.

Deflection of accelerator pedal:
Service limit
5.0 mm (0.197 in) or less

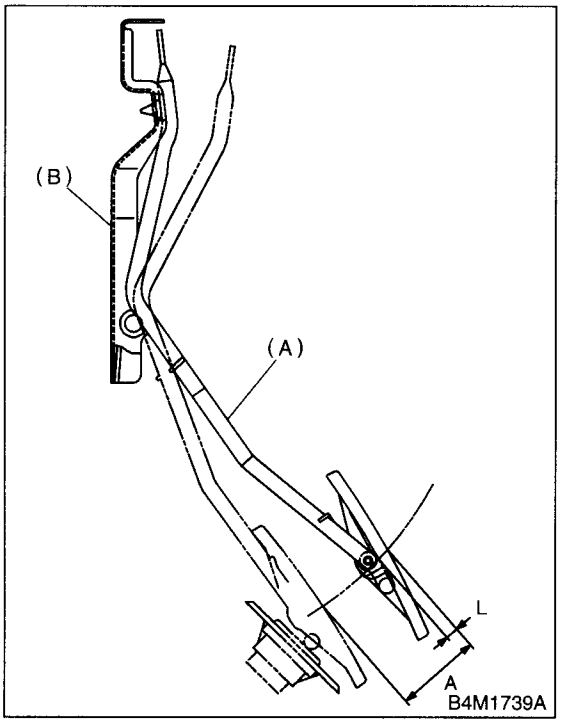


F: ADJUSTMENT

Check the pedal stroke and free play by operating accelerator pedal by hand.
If it is not within the specified value, adjust it by turning the nut connecting accelerator cable to throttle body.

Free play at pedal pad: L
1 — 4 mm (0.04 — 0.16 in)

Stroke at pedal pad: A
52 — 57 mm (2.05 — 2.24 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

3. Accelerator Control Cable

A: REMOVAL

1) Remove the accelerator pedal. <Ref. to SP-3, REMOVAL, Accelerator Pedal.>
2) Separate the accelerator cable and accelerator pedal.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover the outer cable end with boot.
• Be careful not to kink the accelerator cable.
• Do not apply grease to the throttle cable on the engine side.

2) Adjust after pedal installation. <Ref. to SP-4, INSTALLATION, Accelerator Pedal.>

C: INSPECTION

1) Make sure the inner cable is not twisted or frayed.
2) Make sure the outer cable is not cracked.

IGNITION

IG(SOHC)

Page

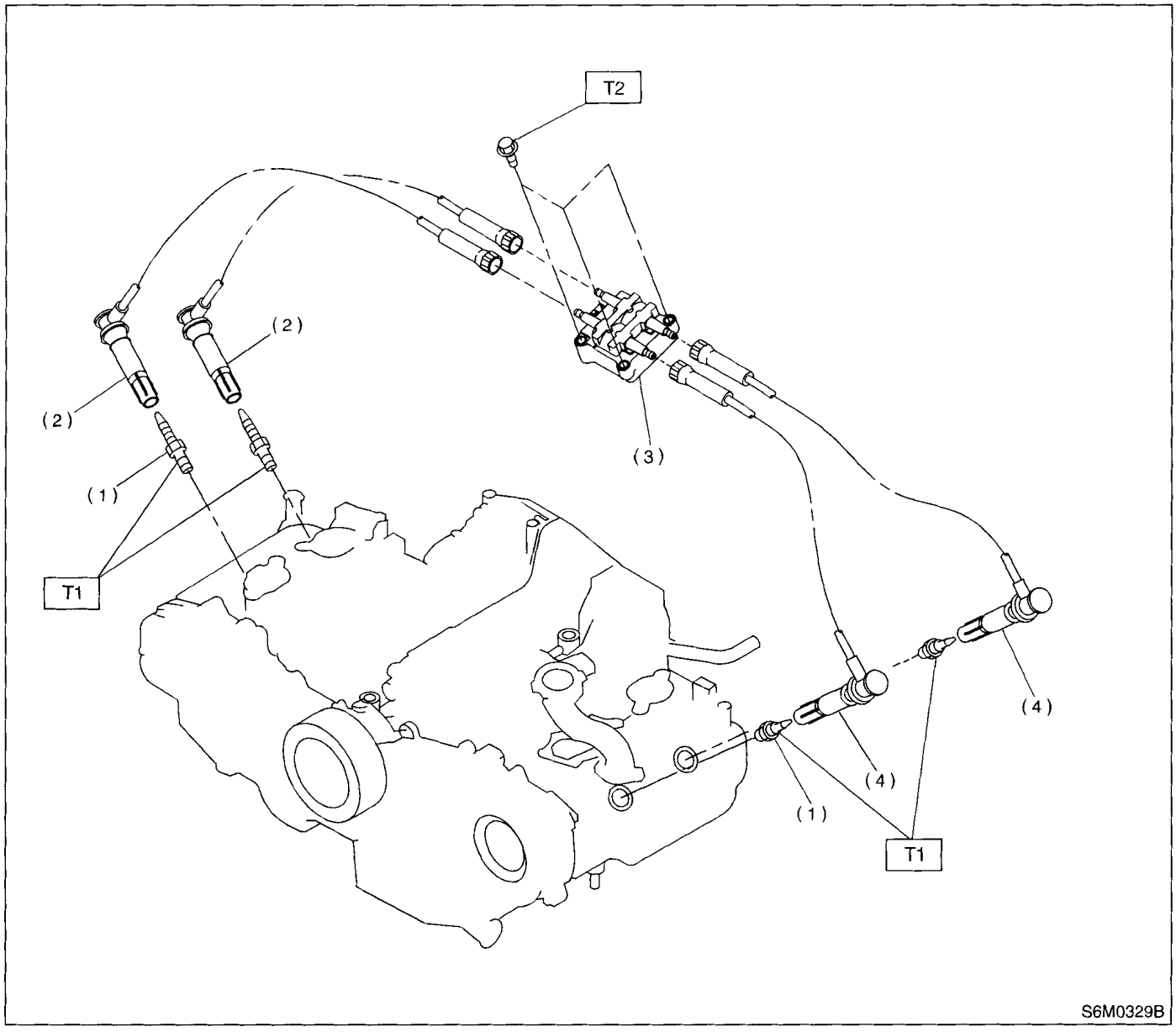
1. General Description 2
2. Spark Plug 4
3. Ignition Coil and Ignitor Assembly 7
4. Spark Plug Cord 9

1. General Description

A: SPECIFICATIONS

Item		Designation	
Ignition coil and ignitor assembly	Model	FH0137	
	Manufacturer	DIAMOND	
	Primary coil resistance	0.73 Ω±10%	
	Secondary coil resistance	12.8 kΩ±15%	
	Insulation resistance between primary terminal and case	More than 10 MΩ	
Spark plug	Type and manufacturer	RC10YC4: CHAMPION	
		Alternate	BKR5E-11: NGK BKR6E-11: NGK
	Thread size mm	14, P = 1.25	
	Spark gap mm (in)	1.0 — 1.1 (0.039 — 0.043)	

B: COMPONENT



(1) Spark plug
(2) Spark plug cord (#1, #3)
(3) Ignition coil and ignitor ASSY
(4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15)
T2: 6.4 (0.65, 4.7)

C: CAUTION

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

2. Spark Plug

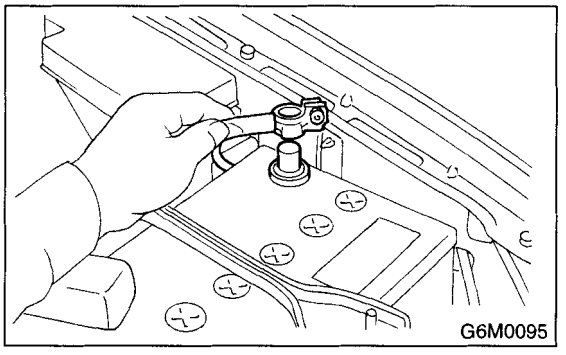
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

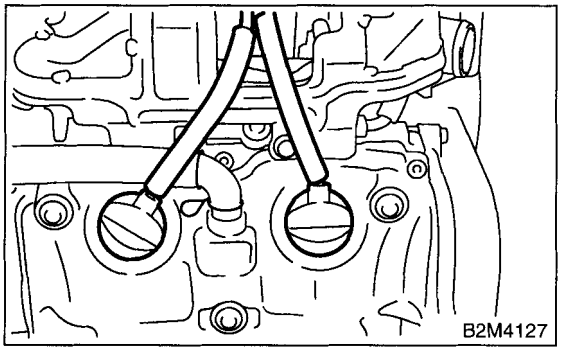
Spark plug
CHAMPION: RC10YC4
NGK: BKR5E-11 (Alternate)
NGK: BKR6E-11 (Alternate)

1. RH SIDE

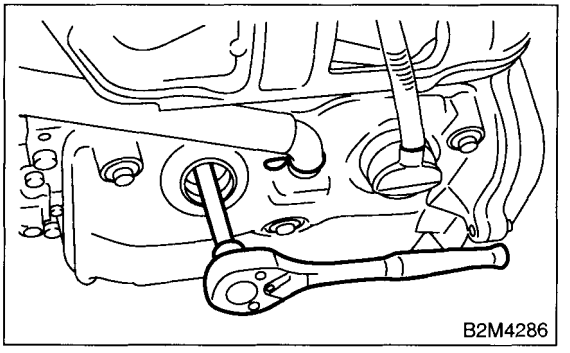
1) Disconnect the ground terminal from battery.



2) Remove the air intake duct. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
   (1) Remove the resonator chamber. <Ref. to IN(SOHC)-8, REMOVAL, Resonator Chamber.>
3) Remove the spark plug cords by pulling boot, not cord itself.

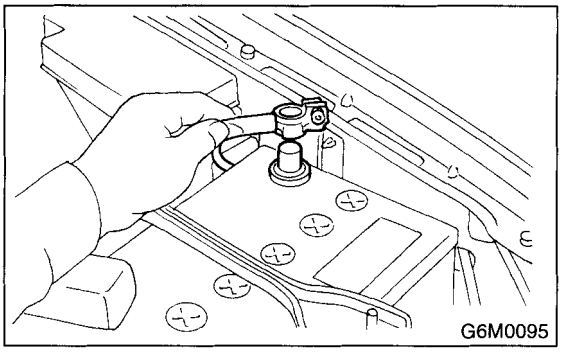


4) Remove the spark plugs with the spark plug sockets.

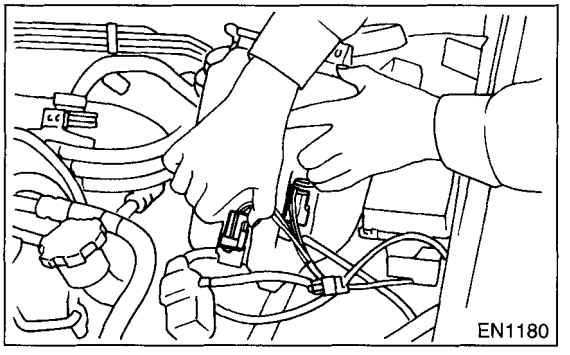


2. LH SIDE

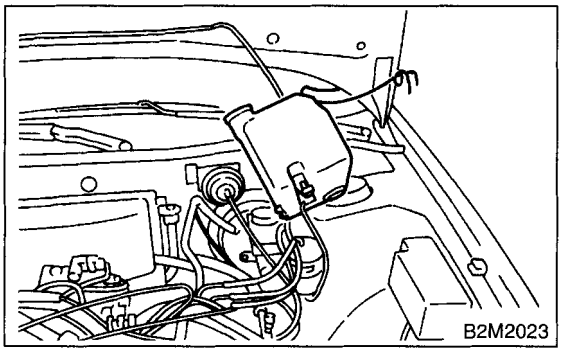
1) Disconnect the ground terminal from battery.



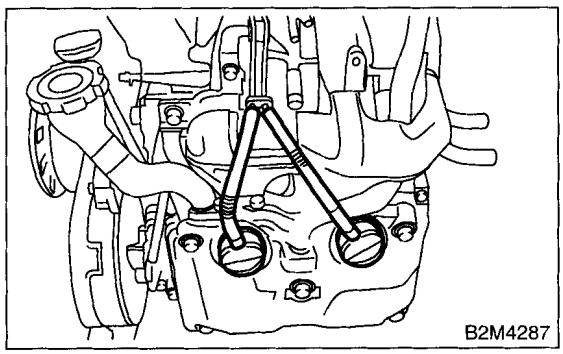
2) Disconnect the washer motor connector.



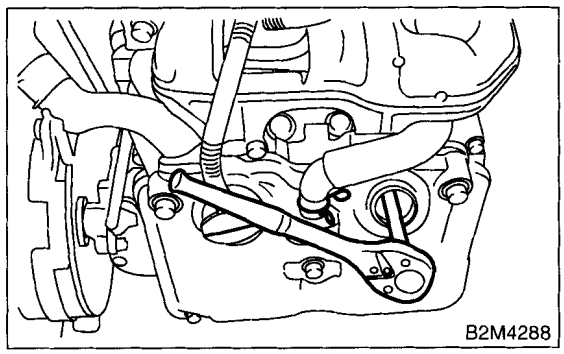
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



5) Remove the spark plug cords by pulling boot, not cord itself.



6) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

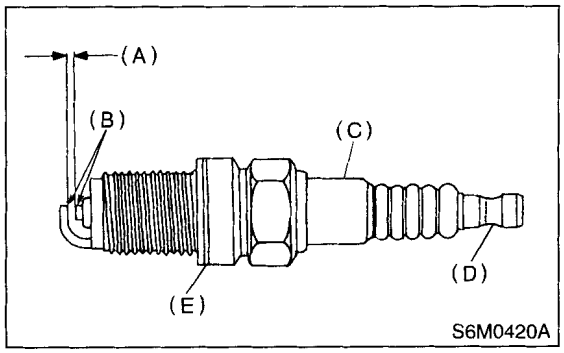
1) Install in the reverse order of removal.

Tightening torque (Spark plug):
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CAUTION:
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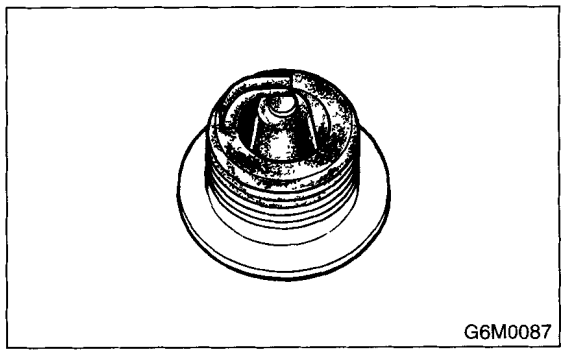
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

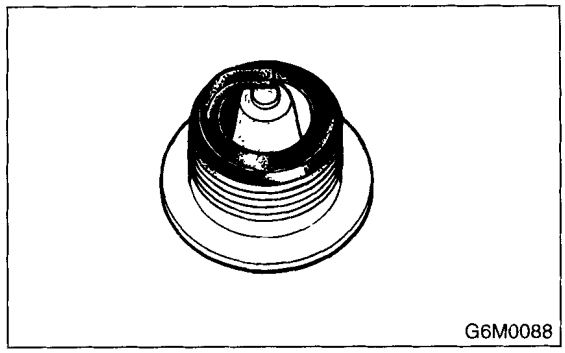


(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

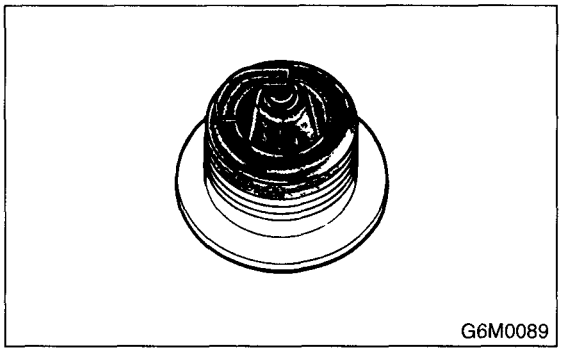
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



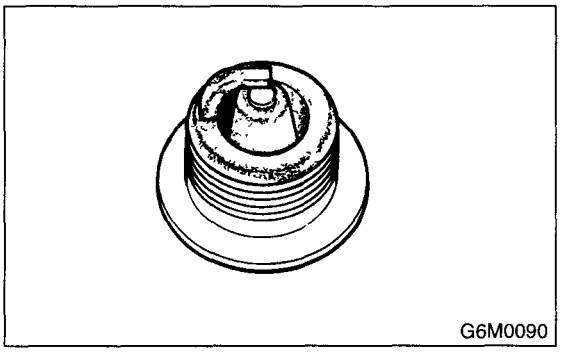
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.



3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


G6M0089

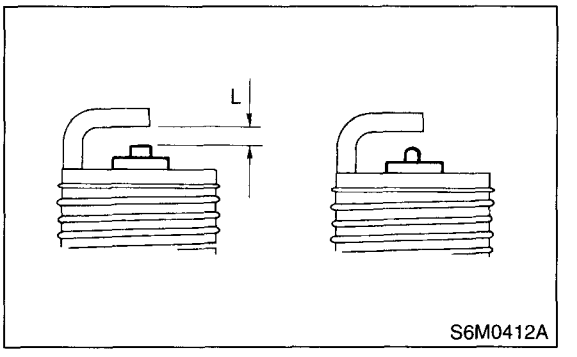
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


G6M0090

D: CLEANING
Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.

E: ADJUSTMENT
Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



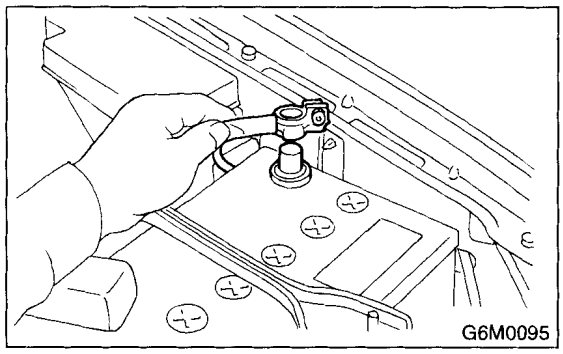
S6M0412A

NOTE:
Replae with a new spark plug if this area is worn to "ball" shape.

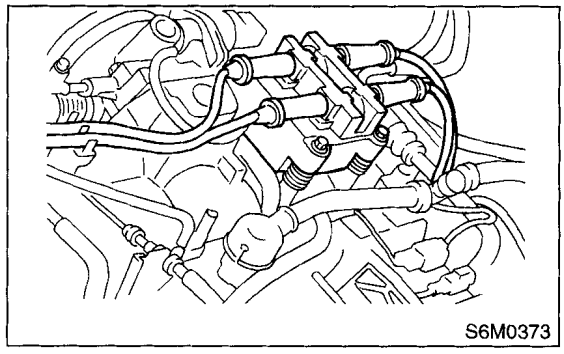
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

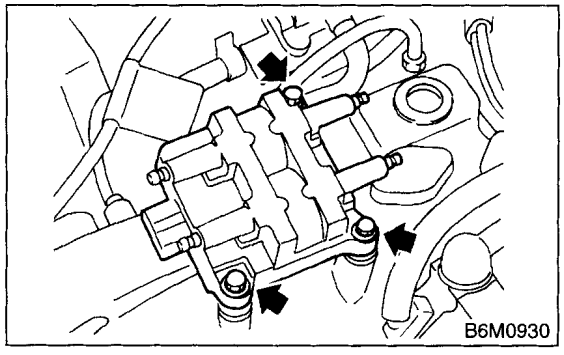
1) Disconnect the ground terminal from battery.



2) Disconnect the spark plug cords from ignition coil and ignitor assembly.



3) Disconnect the connector from ignition coil and ignitor assembly.
4) Remove the ignition coil and ignitor assembly.

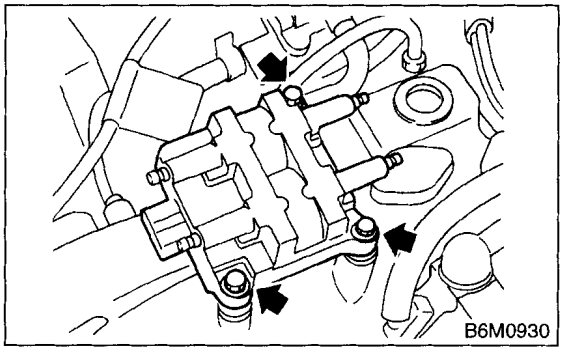


B: INSTALLATION

1) Install in the reverse order of removal.

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

CAUTION:
Be sure to connect wires to their proper positions. Failure to do so will damage the unit.



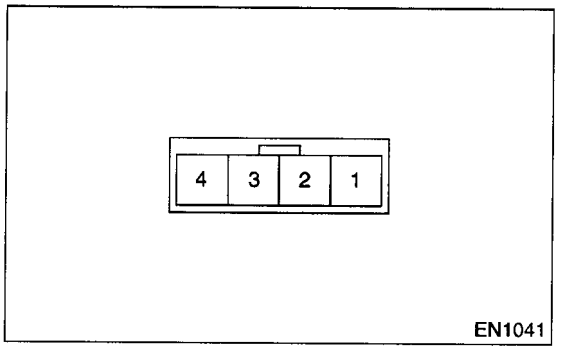
C: INSPECTION

Using an accurate tester, inspect the following items, and replace if defective.
1) Primary resistance
2) Secondary coil resistance

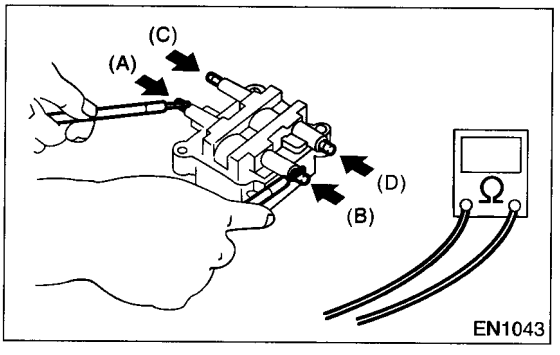
CAUTION:
If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

[Primary side]
Between terminal No. 1 and No. 2
0.73 Ω±10%
Between terminal No. 2 and No. 4
0.73 Ω±10%



[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



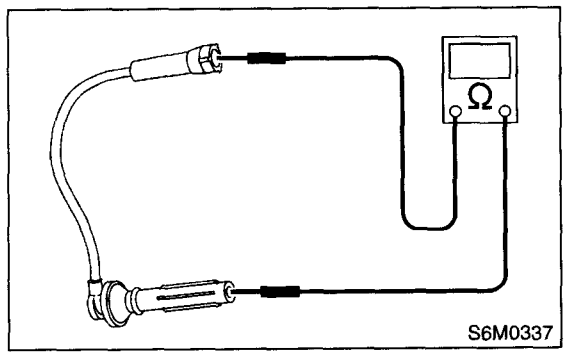
3) Insulation between primary terminal and case: 10 MΩ or more.

4. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals
2) Resistance values of cords

Resistance value:
#1 cord: 5.6 — 10.6 kΩ
#2 cord: 7.3 — 13.7 kΩ
#3 cord: 5.9 — 11.1 kΩ
#4 cord: 7.3 — 13.7 kΩ



SPARK PLUG CORD

STARTING/CHARGING SYSTEMS

SC

		Page
1.	General Description	2
2.	Starter	6
3.	Generator	13
4.	Battery	18

1. General Description

A: SPECIFICATIONS

1. NON-TURBO MODEL

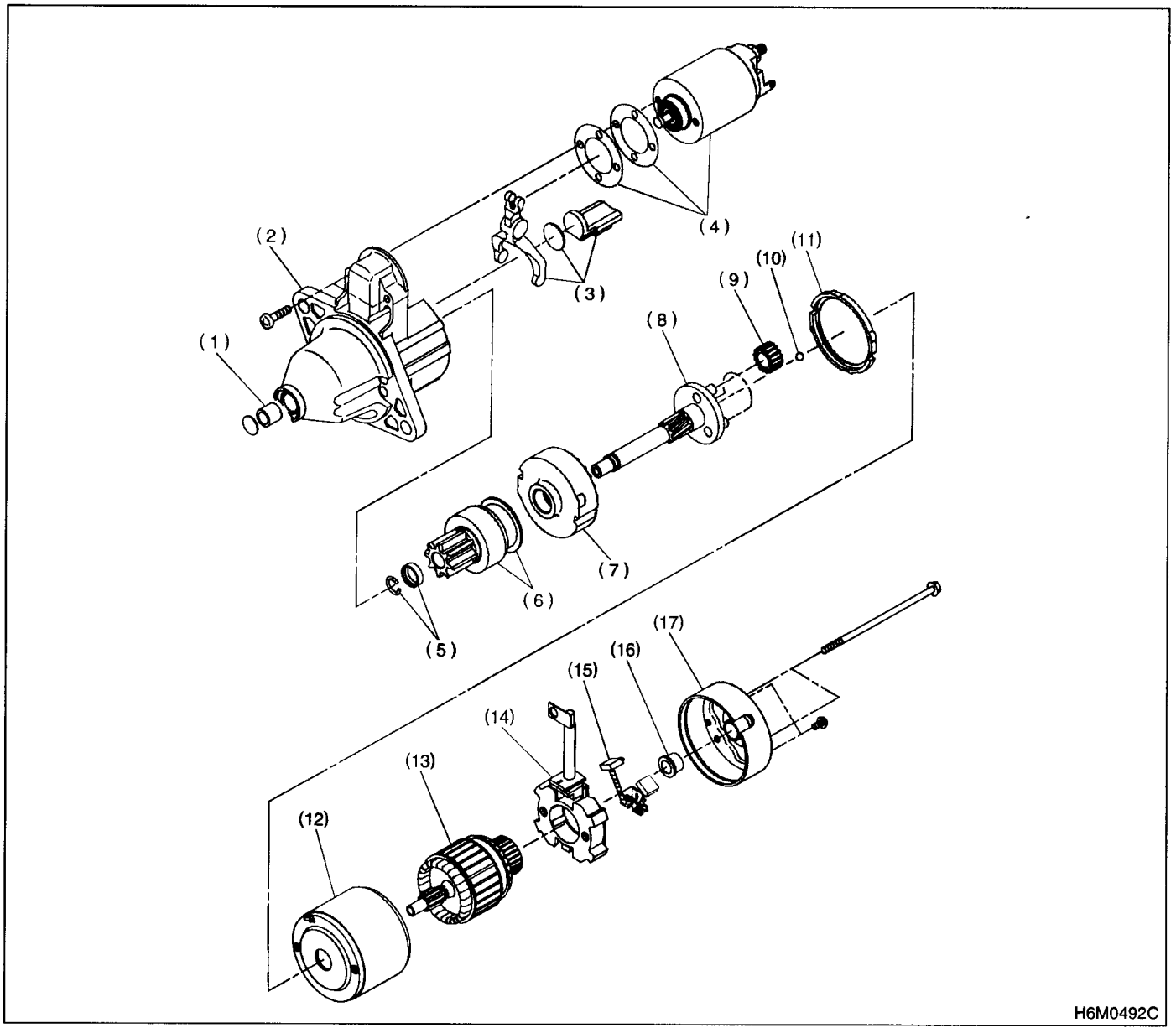
Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT vehicles	AT vehicles
	Model		M000T83981	M001T86481
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,800 rpm or more	2,400 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.6 N·m (0.88 kg-m, 6.3 ft-lb) or more	16.0 N·m (1.63 kg-m, 11.8 ft-lb) or more
		Rotating speed	920 rpm or more	740 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	650 A or less	940 A or less
		Torque	14.7 N·m (1.50 kgf-m, 10.8 ft-lb) or more	28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model		A2TB6291	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 90 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (when observed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 36 A or more 2,500 rpm — 65 A or more 5,000 rpm — 86 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	

2. TURBO MODEL

Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT vehicles	AT vehicles
	Model		228000 — 9270	M001T86481
	Manufacturer		DENSO	Mitsubishi Electric
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,860 rpm or more	2,400 rpm or more
	Load characteristics	Voltage	8 V	7.7 V
		Current	280 A	400 A
		Torque	9.3 N·m (0.95 kg-m, 6.9 ft-lb) or more	16.0 N·m (1.63 kg-m, 11.8 ft-lb) or more
		Rotating speed	860 rpm or more	740 rpm or more
	Lock characteristics	Voltage	5 V	3.5 V
		Current	515 A or less	940 A or less
		Torque	16 N·m (1.63 kgf-m, 11.8 ft-lb) or more	28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model		A2TB6291	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 75 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (when observed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	

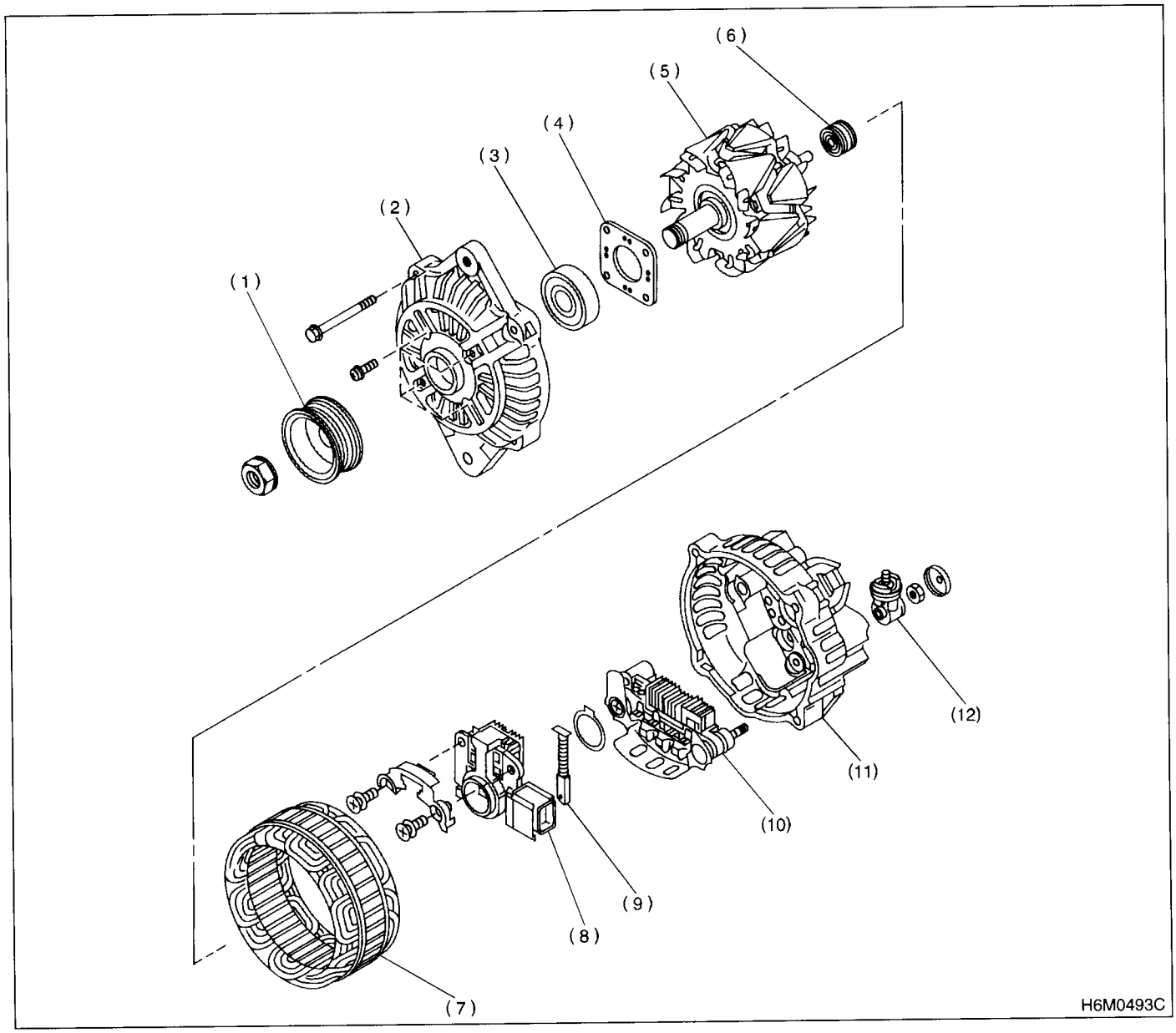
B: COMPONENT

1. STARTER



(1) Sleeve bearing
(2) Front bracket
(3) Lever set
(4) Magnet switch ASSY
(5) Stopper set
(6) Over running clutch
(7) Internal gear ASSY
(8) Shaft ASSY
(9) Gear ASSY
(10) Ball
(11) Packing
(12) Yoke
(13) Armature
(14) Brush holder
(15) Brush
(16) Sleeve bearing
(17) Rear bracket

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

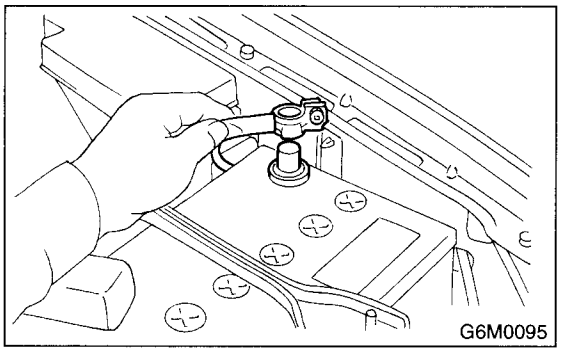
C: CAUTION

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

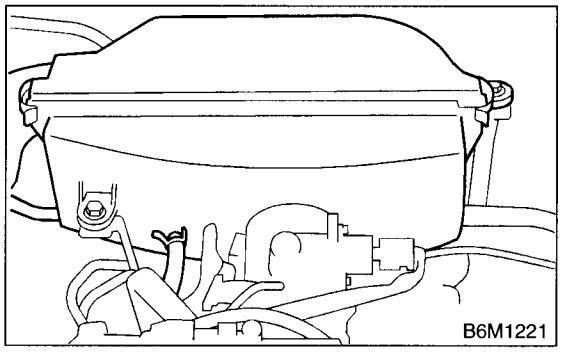
2. Starter

A: REMOVAL

1) Disconnect the ground terminal from battery.



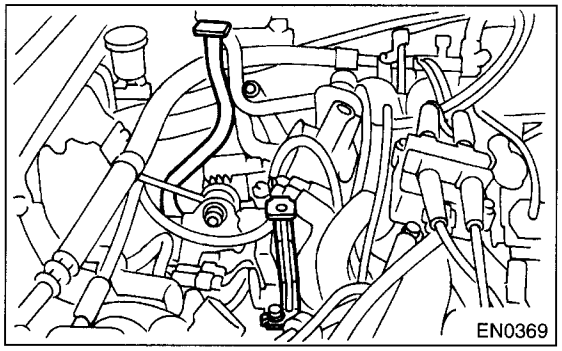
2) Remove the air cleaner case. (Non-Turbo Model)



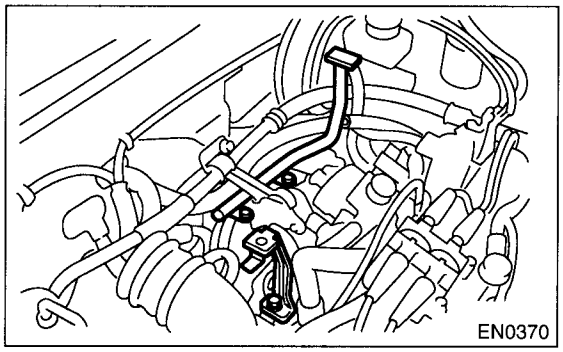
3) Remove the intercooler. (Turbo Model) <Ref. to IN(DOHC TURBO)-10, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-Turbo Model)

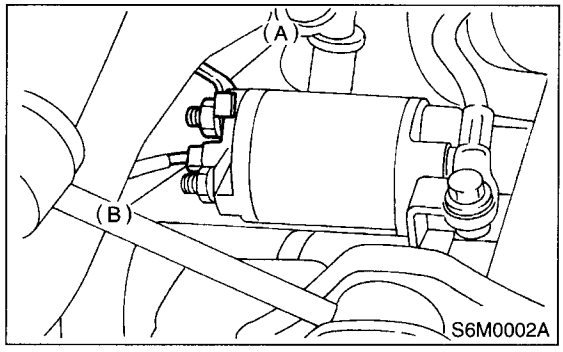
- MT vehicles



- AT vehicles

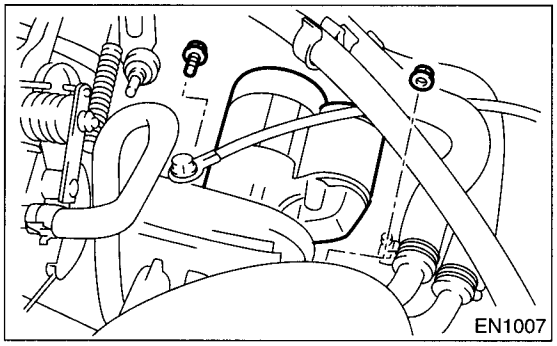


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

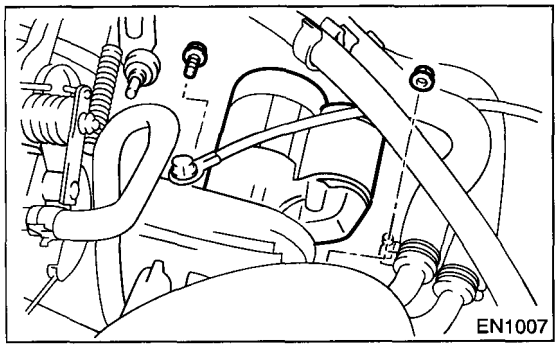
6) Remove the starter from transmission.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

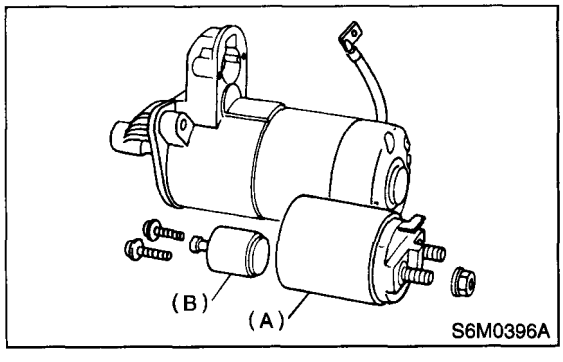


C: DISASSEMBLY

1. STARTER ASSEMBLY

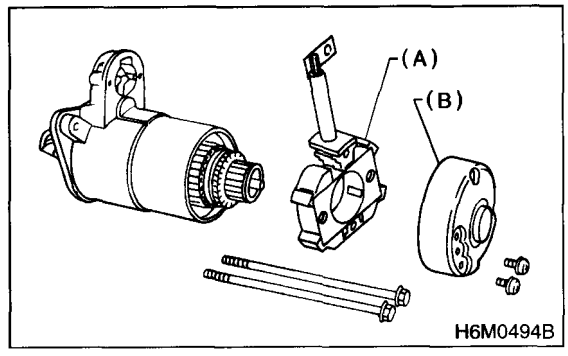
1) Loosen the nut which holds terminal M of switch assembly, and disconnect the connector.
2) Remove the bolts which hold switch assembly, and remove the switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:
Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



(A) Switch ASSY
(B) Plunger

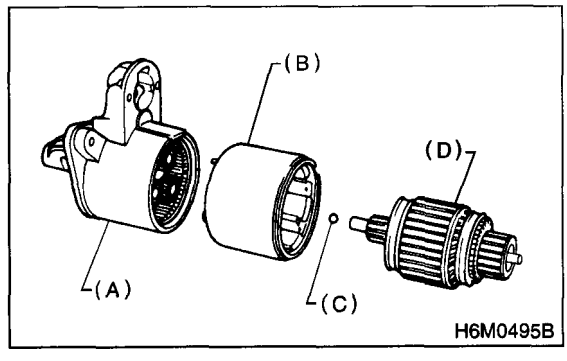
3) Remove both through-bolts and brush holder screws, and detach the rear bracket and brush holder.



(A) Brush holder
(B) Rear bracket

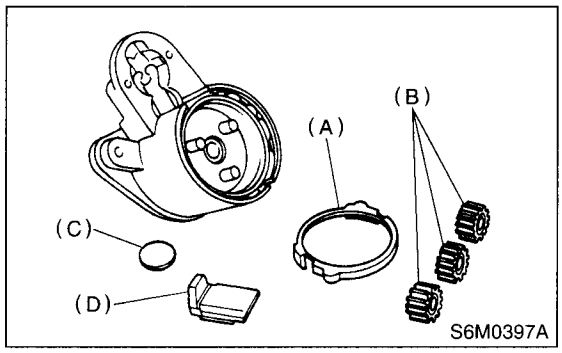
4) Remove the armature and yoke. Ball used as a bearing will then be removed from the end of armature.

CAUTION:
Be sure to mark an alignment mark on the yoke and front bracket before removing the yoke.



(A) Front bracket
(B) Yoke
(C) Ball
(D) Armature

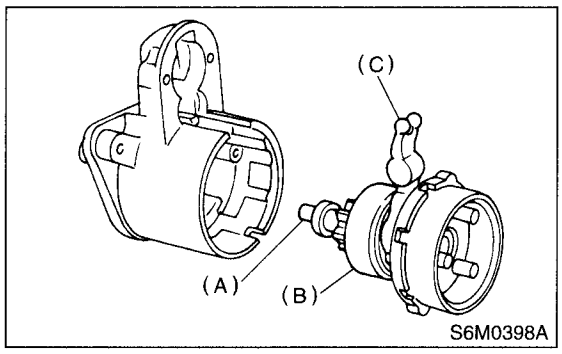
5) Remove packing A, three planetary gears, packing B and plate.



(A) Packing A
(B) Planetary gear
(C) Plate
(D) Packing B

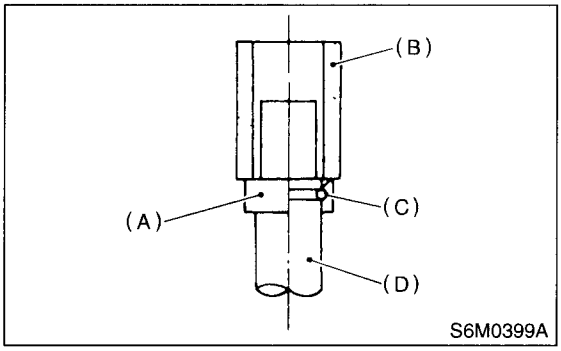
6) Remove the shaft assembly and overrunning clutch as a unit.

CAUTION:
Record the direction of the lever before removing.



(A) Shaft ASSY
(B) Overrunning clutch
(C) Lever

7) Remove the overrunning clutch from shaft assembly as follows:
(1) Remove the stopper from ring by lightly tapping a fit tool placed on stopper.
(2) Remove the ring, stopper and clutch from shaft.

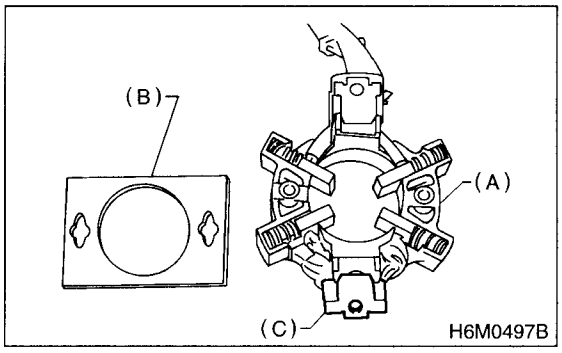


(A) Stopper
(B) Tool
(C) Ring
(D) Shaft

2. BRUSH HOLDER

Slightly open the metal fitting holding the insulating plate to the brush holder. Remove the insulating plate.

NOTE:
The brush and spring can be easily removed from the brush holder at this time.



(A) Brush holder
(B) Insulating plate
(C) Metal fitting

D: ASSEMBLY

Assembly is in the reverse order of disassembly procedures. Do the following:
1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.
2) Apply grease to the following parts during assembly.
- Front and rear bracket sleeve bearing
- Armature shaft gear
- Outer periphery of plunger
- Mating surface of plunger and lever
- Gear shaft splines
- Mating surface of lever and clutch
- Ball at the armature shaft end
- Internal and planetary gears

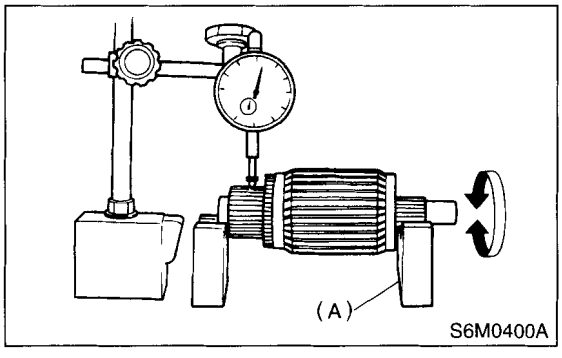
3) After assembling parts correctly, check to be sure the starter operates properly.

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test:
Check the commutator run-out and replace if it exceeds the limit.

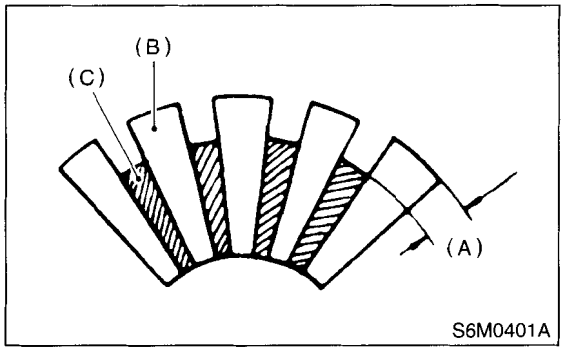
Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)



(A) V-block

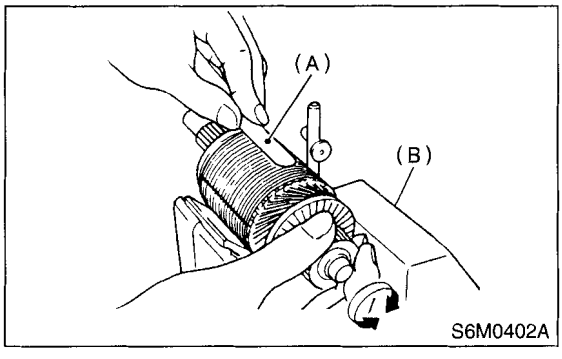
3) Depth of segment mold:
Check the depth of segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



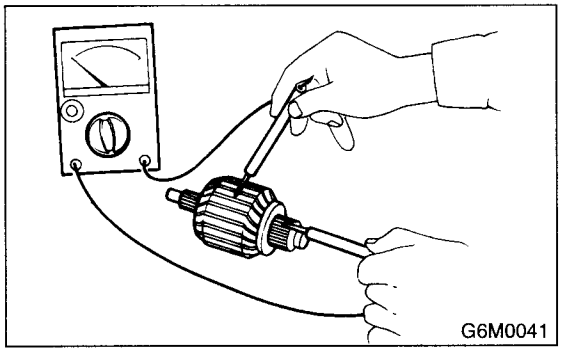
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test:
Check the armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against armature core while slowly rotating armature. A short-circuited armature will cause the blade to vibrate and to be attracted to core. If the hacksaw blade is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Growler

5) Armature ground test:
Using the circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, armature is grounded.
Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

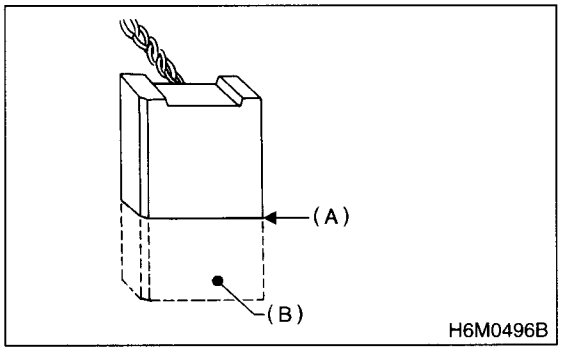
Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:
Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length:
Measure the brush length and replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
12.3 mm (0.484 in)
Service limit
7.0 mm (0.276 in)



(A) Service limit line
(B) Brush

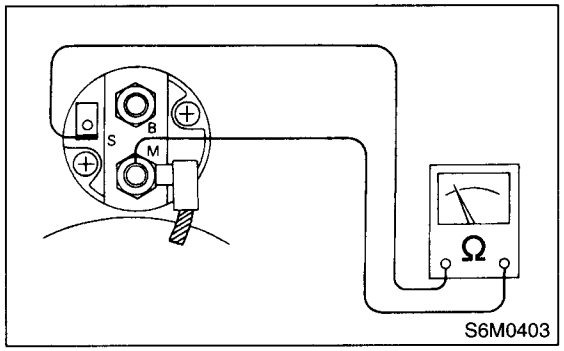
2) Brush movement:
Be sure the brush moves smoothly inside brush holder.
3) Brush spring force:
Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:
Standard
21.6 N (2.2 kg, 4.9 lb) (when new)
Service limit
5.9 N (0.6 kg, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:
S — M / less than 1Ω
S — Ground / less than 1Ω
M — B / More than 1MΩ

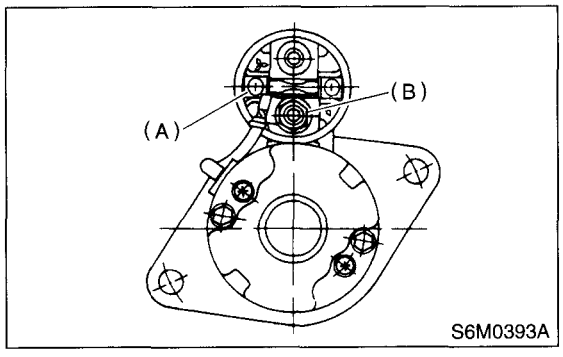


6. SWITCH ASSEMBLY OPERATION

1) Connect terminal S of switch assembly to the positive terminal of battery with a lead wire, and starter body to ground terminal of battery. Pinion should be forced endwise on the shaft.

CAUTION:
With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, pinion should return to its original position even when it is pulled out with a screwdriver.

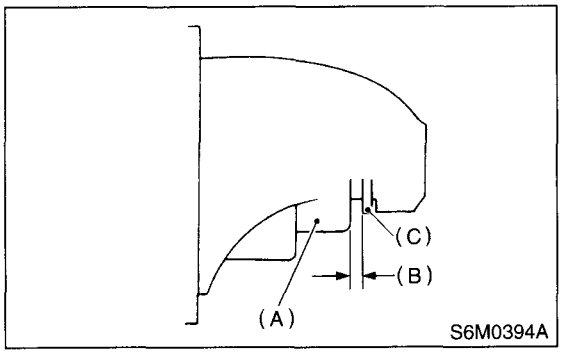


(A) Terminal S
(B) Terminal M

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:
0.5 — 2.0 mm (0.020 — 0.079 in)

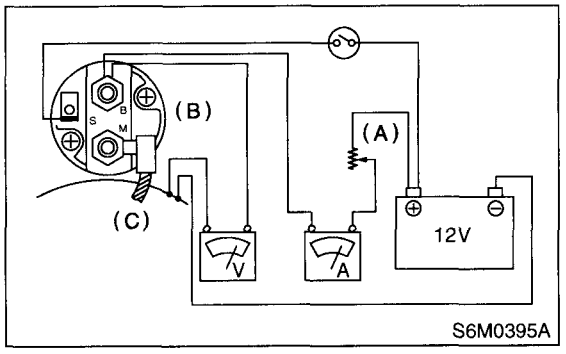


(A) Pinion
(B) Gap
(C) Stopper

If the motor is running with the pinion forced endwise on the shaft, disconnect the connector from terminal M of switch assembly and connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips and measure pinion gap.
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until the correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.



(A) Variable resistance
(B) Magnetic switch
(C) Starter body

1) No-load test:
With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading and measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current
11 V / 90 A max.

Rotating speed
Non-Turbo MT vehicles
2,800 rpm or more
Turbo MT vehicles
2,860 rpm or more
AT vehicles
2,400 rpm or more

2) Load test:
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within specifications.

Load test (Standard):

Voltage / Load
Non-Turbo MT vehicles
7.5 V/8.6 N·m (0.88 kgf-m, 6.3 ft-lb)
Turbo MT vehicles
8 V/9.3 N·m (0.95 kgf-m, 6.9 ft-lb)
AT vehicles
7.7 V/16.0 N·m (1.63 kg-m, 11.8 ft-lb)

Current / Speed
Non-Turbo MT vehicles
300 A/920 rpm or more
Turbo MT vehicles
280 A/860 rpm or more
AT vehicles
400 A/740 rpm or more

3) Lock test:
With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

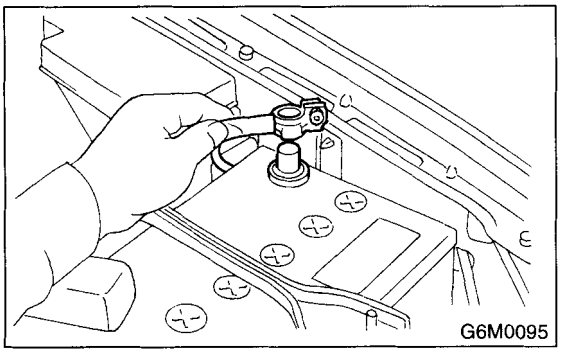
Voltage / Current
Non-Turbo MT vehicles
4 V/650 A or less
Turbo MT vehicles
5 V/515 A or less
AT vehicles
3.5 V/940 A or less

Torque
Non-Turbo MT vehicles
14.7 N·m (1.50 kgf-m, 10.8 ft-lb) or more
Turbo MT vehicles
16 N·m (1.63 kgf-m, 11.8 ft-lb) or more
AT vehicles
28.9 N·m (2.95 kgf-m, 21.3 ft-lb) or more

3. Generator

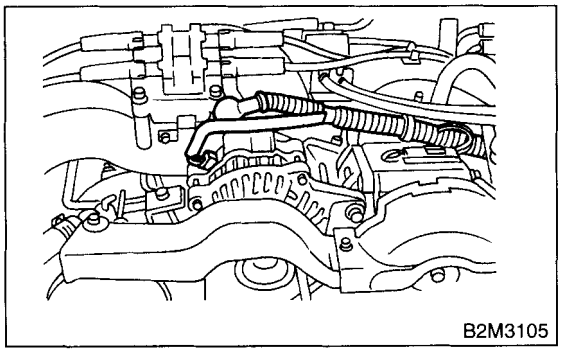
A: REMOVAL

1) Disconnect the ground terminal from battery.

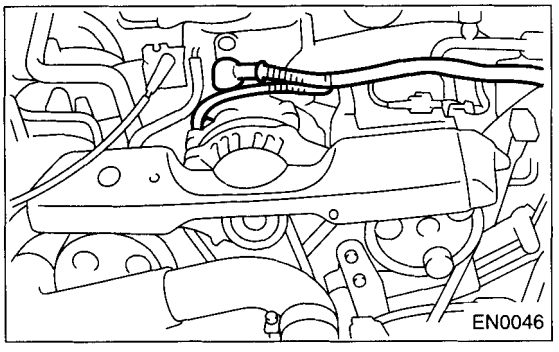


2) Disconnect the connector and terminal from generator.

- Non-Turbo Model

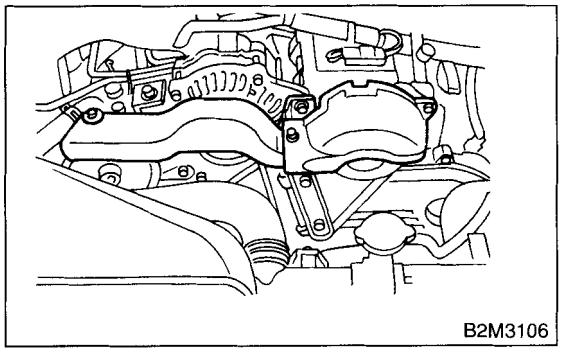


- Turbo Model

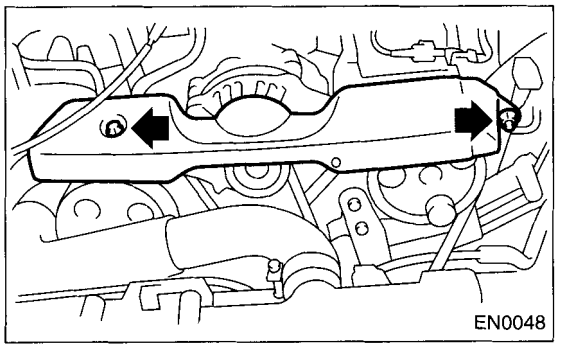


3) Remove the V-belt cover.

- Non-Turbo Model

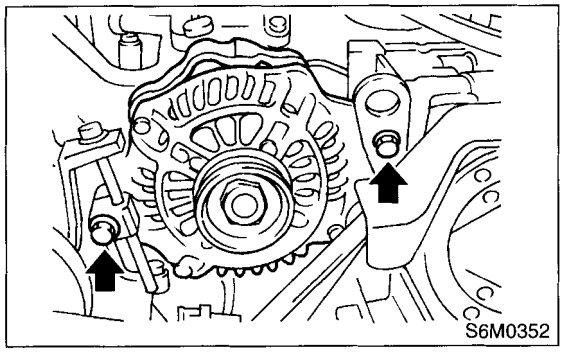


- Turbo Model



4) Remove the front side V-belt.
<Ref. to ME(SOHC)-43, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(DOHC TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>

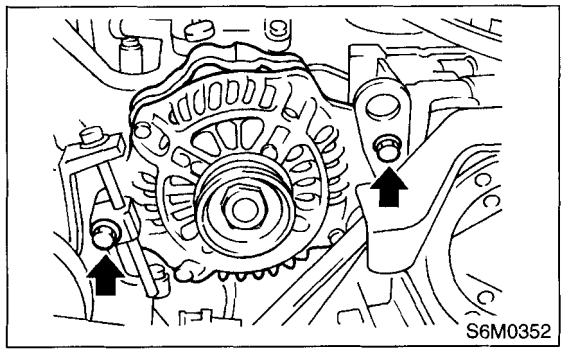
5) Remove the bolts which install the generator onto bracket.



B: INSTALLATION

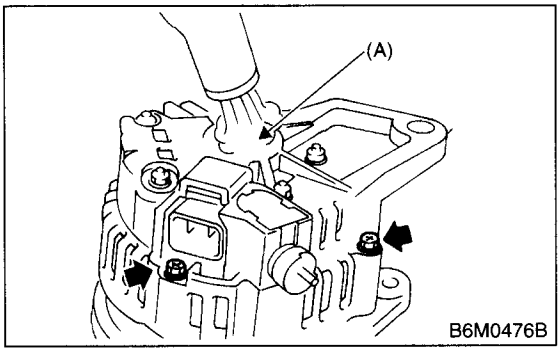
Install in the reverse order of removal.

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(SOHC)-44, INSPECTION, V-belt.> and <Ref. to ME(DOHC TURBO)-45, INSPECTION, V-belt.>

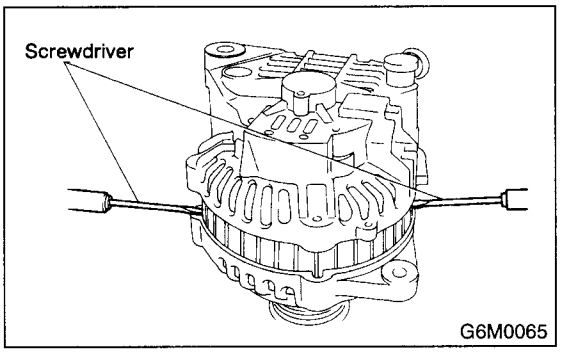


C: DISASSEMBLY

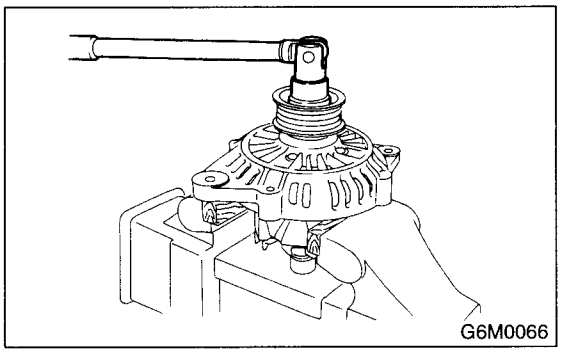
1) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.



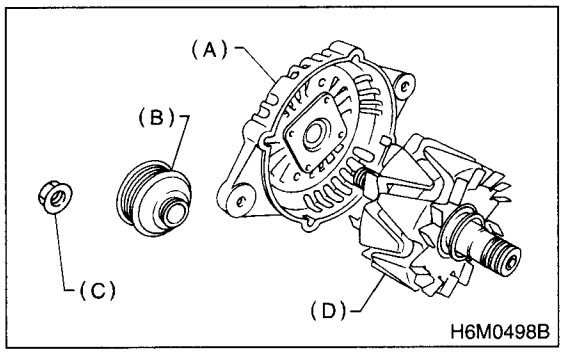
2) Remove the four through bolts. Then insert the tip of a flat-head screwdriver into the gap between the stator core and front bracket. Pry then apart to disassemble.



3) Hold the rotor with a vise and remove the pulley nut.



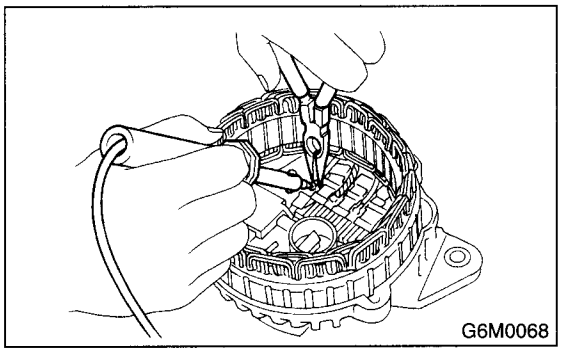
CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of the vise to prevent rotor from damage.



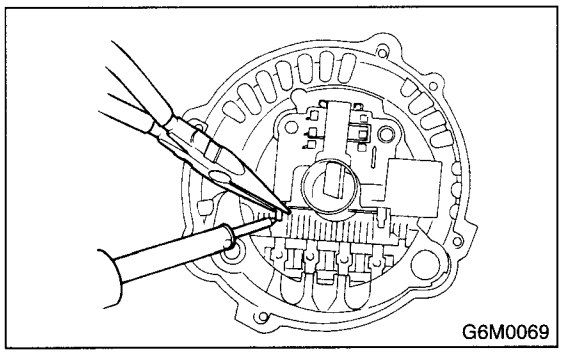
(A) Front bracket
(B) Pulley
(C) Nut
(D) Rotor

4) Unsolder connection between rectifier and stator coil to remove the stator coil.

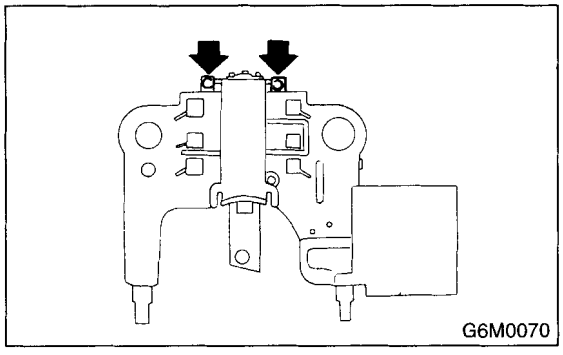
CAUTION:
Finish the work rapidly (less than three seconds) because the rectifier cannot withstand heat very well.



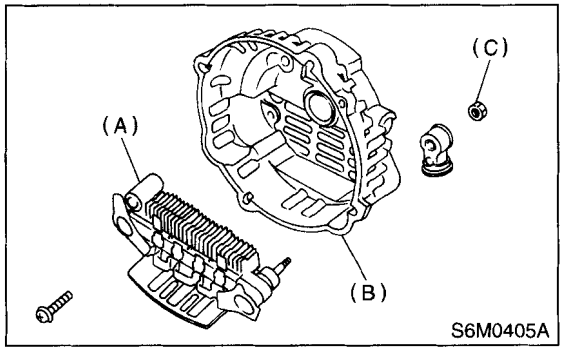
5) Remove the screws which secure the IC regulator to rear cover, and unsolder connection between IC regulator and rectifier to remove the IC regulator.



6) Remove the brushes by unsoldering at the pigtails.



7) Remove the nut and insulating bushing at terminal B, and remove the rectifier.

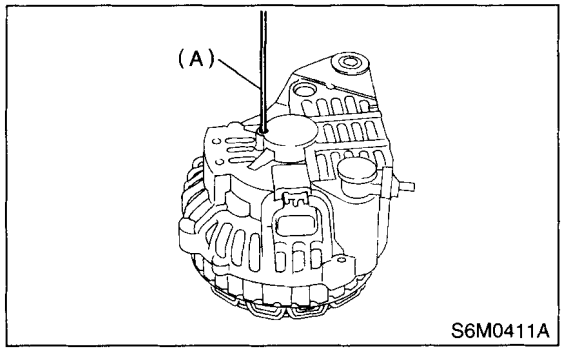


(A) Rectifier
(B) Rear cover
(C) Nut

D: ASSEMBLY

To assemble, reverse the order of disassembly.
1) Pulling up brush:
Before assembling, press the brush down into the brush holder with your finger and secure in that position by passing a [2 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire (A) through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



2) Heat the bearing box in the rear bracket [50 to 60°C (122 to 140°F)] and press the rear bearing into the rear bracket.

CAUTION:
Grease should not be applied for the rear bearing. Remove oil completely if it is found on the bearing box.

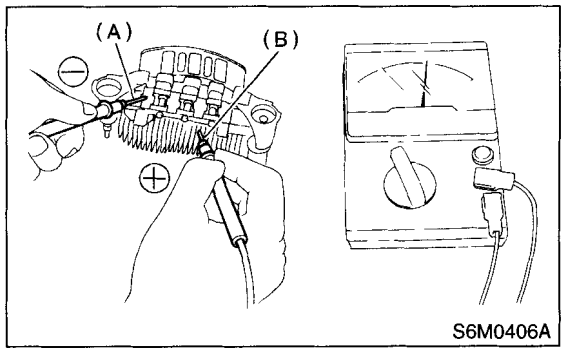
3) After reassembly, turn the pulley by hand to check that the rotor turns smoothly.

E: INSPECTION

1. DIODE

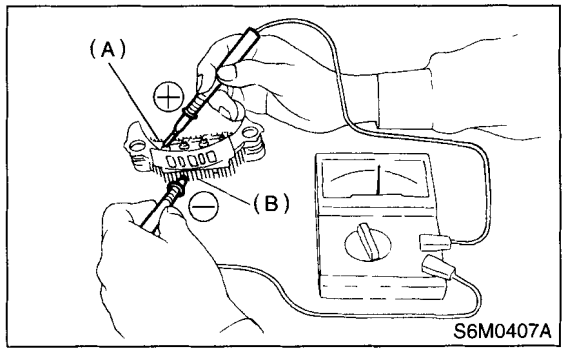
CAUTION:
Never use a megger tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode:
Check for continuity between the diode lead and the positive side heat sink. The positive diode is in good condition if continuity exists only in the direction from the diode lead to the heat sink.



(A) Diode lead
(B) Heat sink (Positive side)

2) Checking negative diode:
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if continuity exists only in the direction from the heat sink to the diode lead.



(A) Diode lead
(B) Heat sink (Negative side)

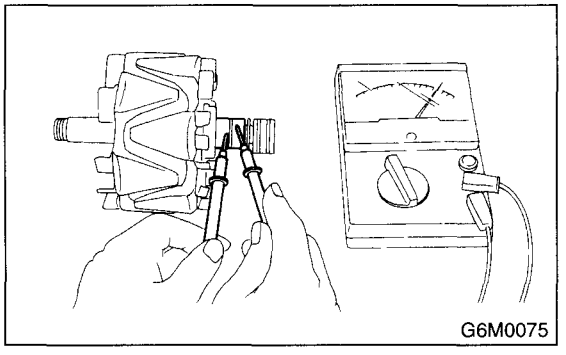
2. ROTOR

1) Slip ring surface:
Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter:
Measure the slip ring outer diameter. If the slip ring is worn replace the rotor assembly.

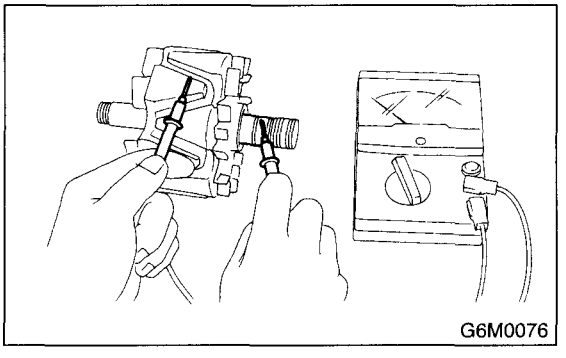
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test:
Check the resistance between slip rings using a circuit tester.
If the resistance is not within specification, replace the rotor assembly.

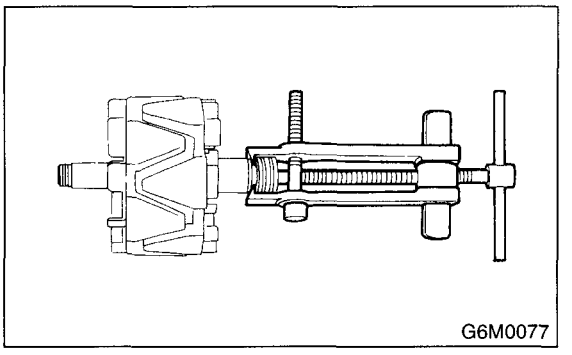
Specified resistance:
Approx. 2.7 — 3.2 Ω


G6M0075

4) Insulation test:
Check the continuity between slip ring and rotor core or shaft. If the resistance value is below 1Ω, the rotor coil is grounded, and so replace the rotor assembly.

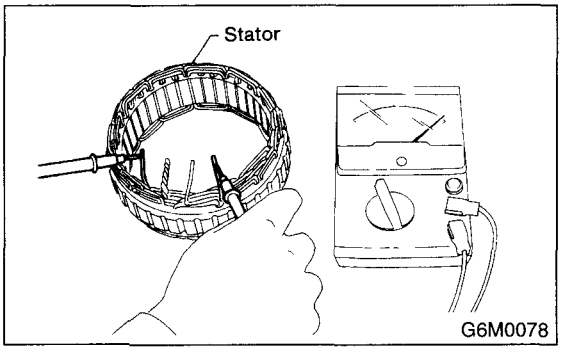

G6M0076

5) Ball bearing (rear side):
(1) Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.
(2) The rear bearing can be removed by using a common bearing puller.


G6M0077

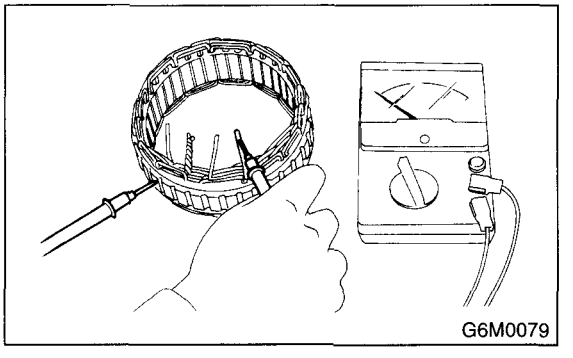
3. STATOR

1) Continuity test:
Inspect the stator coil for continuity between each end of the lead wires. If the resistance value is above 1MΩ between individual lead wires, the lead wire is broken, and so replace the stator assembly.



G6M0078

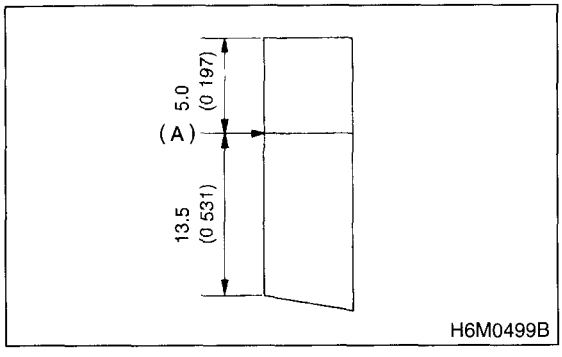
2) Insulation test:
Inspect the stator coil for continuity between stator coil and each end of the lead wire. If the resistance value is below 1Ω, the stator coil is grounded, and so replace the stator assembly.


G6M0079

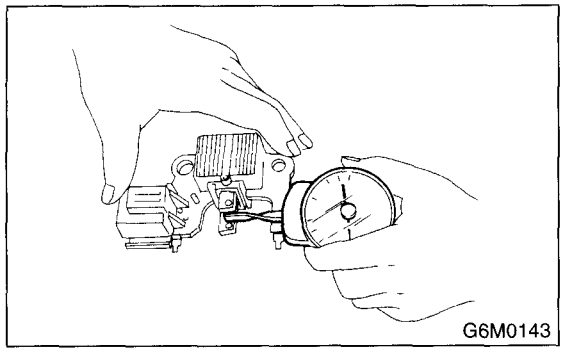
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Standard
18.5 mm (0.728 in)
Service limit
5.0 mm (0.197 in)

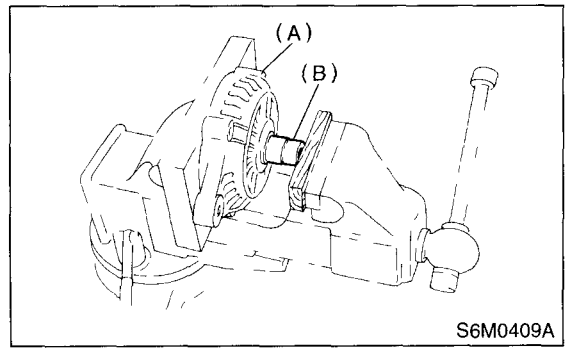


2) Checking brush spring for proper pressure:
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of the brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.81 oz).



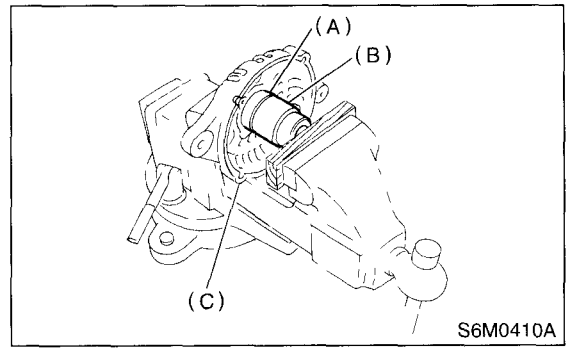
5. BEARING (FRONT SIDE)

1) Check the front ball bearing. If resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.
2) Replacing front bearing:
(1) Remove the front bearing retainer.
(2) Closely install a fit tool on the bearing inner race. Press the bearing down out of front bracket with a hand press or vise. A socket wrench can serve as the tool.



(A) Front bracket
(B) Socket wrench

(3) Set a new bearing and closely install a fit tool on the bearing outer race. Press the bearing down into place with a hand press or vise. A socket wrench can serve as the tool.
(4) Install the front bearing retainer.

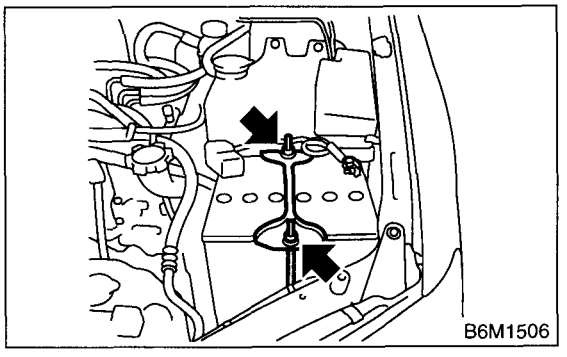


(A) Bearing
(B) Socket wrench
(C) Front bracket

4. Battery

A: REMOVAL

1) Disconnect the positive (+) terminal after disconnecting the negative (–) terminal of battery.
2) Remove the flange nuts from battery rods and take off battery holder.



3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean the battery cable terminals and apply grease to retard the formation of corrosion.
• Connect the positive (+) terminal of battery and then the negative (–) terminal of the battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

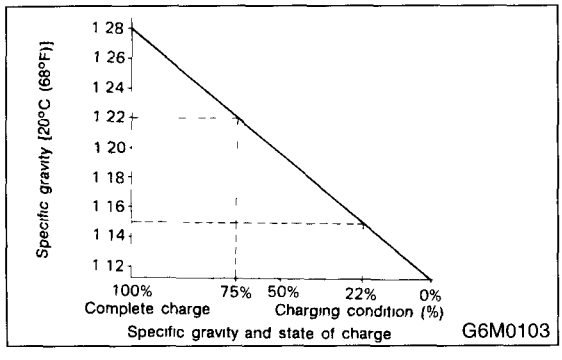
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

S_{20} = St + 0.0007 × (t − 20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St : Measured specific gravity
t : Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:
• Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
• Be careful since battery electrolyte overflows while charging the battery.
• Observe instructions when handling the battery charger.
• Before charging the battery on vehicle, disconnect the battery ground terminal. Failure to follow this rule may damage the generator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
• Observe the items in 1. NORMAL CHARGING.
• Never use more than 10 amperes when charging the battery because it will shorten battery life.

ENGINE (DIAGNOSTICS)

EN(SOHC)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1)Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(SOHC)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(SOHC)-57, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).**	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(SOHC)-330, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the diagnostic trouble code. Repair the trouble cause. <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(SOHC)-46, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1)Perform the clear memory mode. <Ref. to EN(SOHC)-43, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(SOHC)-40, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-84, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to AT-9, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to AT-11, Differential Gear Oil.>
3) ATF leak check <Ref. to AT-9, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to AT-11, Differential Gear Oil.>
5) Stall test <Ref. to AT-13, Stall Test.>
6) Line pressure test <Ref. to AT-16, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to AT-18, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to AT-15, Time Lag Test.>
9) Road test <Ref. to AT-12, Road Test.>
10) Shift characteristics <Ref. to AT-18, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Cooling fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:
• All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.
• A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

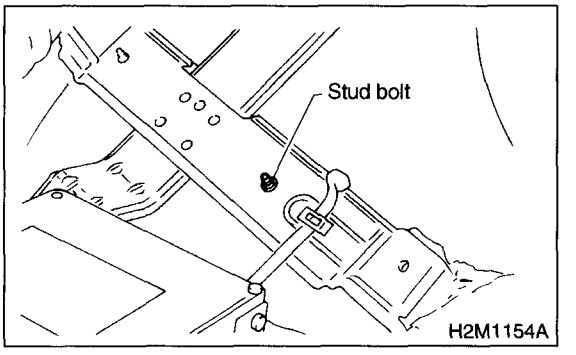
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

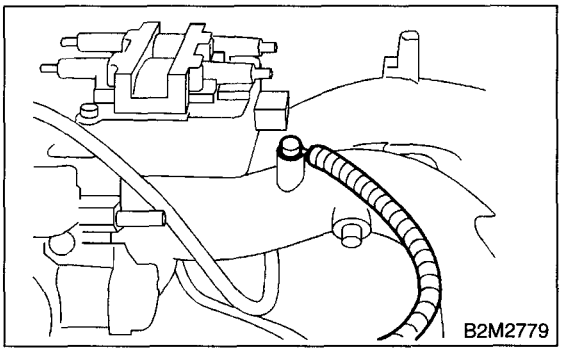
CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

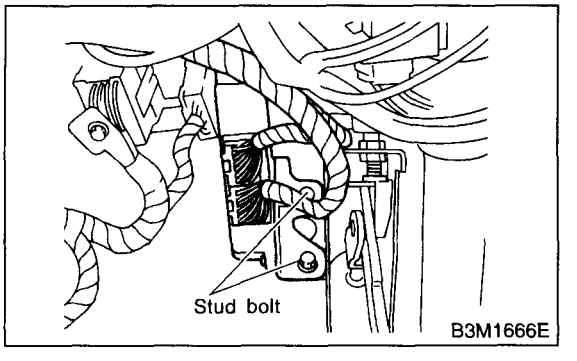
8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

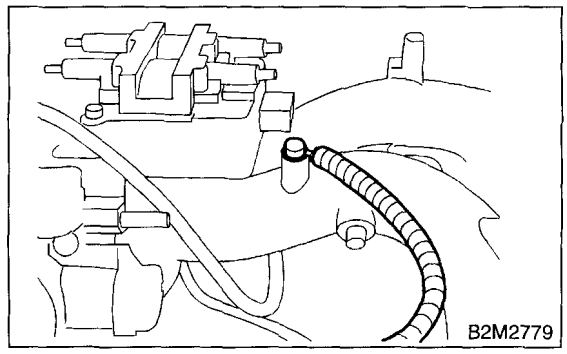
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

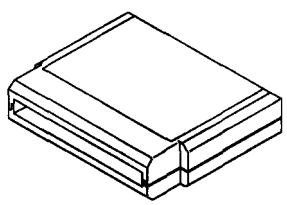
2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
• Reduced emission of harmful exhaust gases.
• Reduced in fuel consumption.
• Increased engine output.
• Superior acceleration and deceleration.
• Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

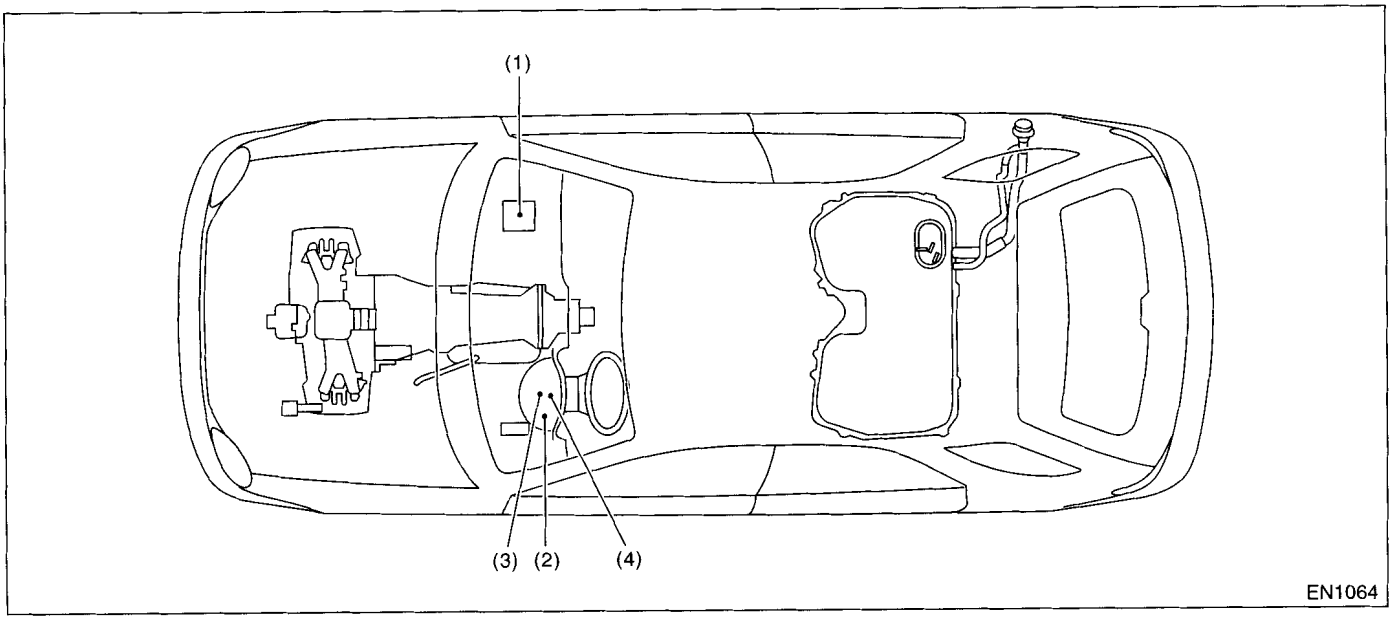
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA150 (New adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Components Location

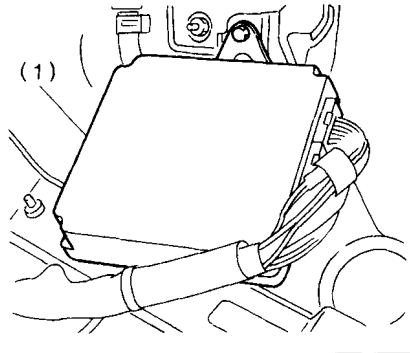
A: LOCATION

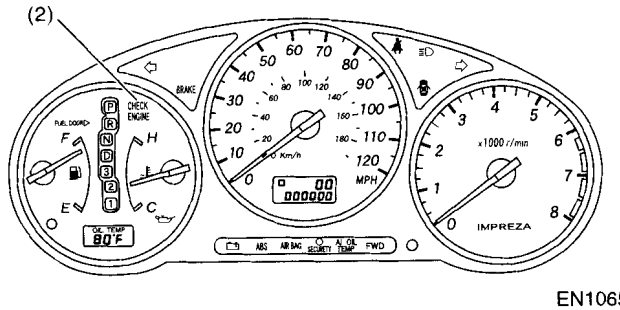
1. ENGINE

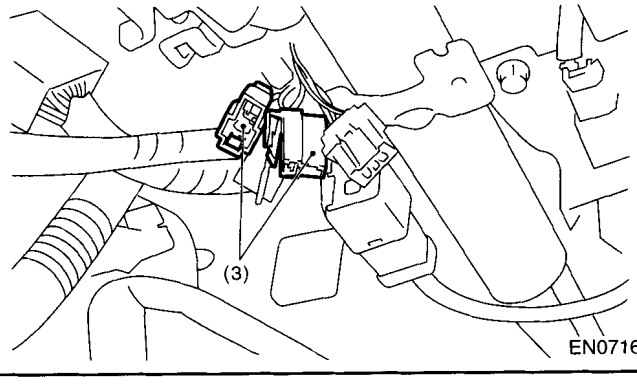
• MODULE

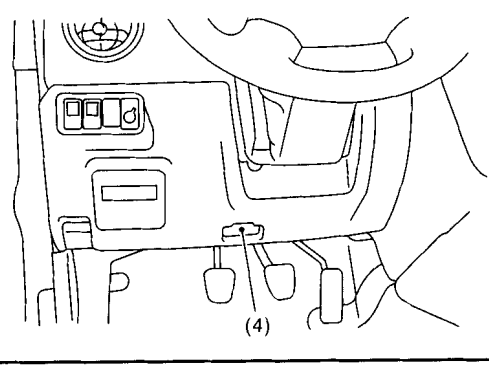


(1) Engine control module (ECM)
(2) CHECK ENGINE malfunction indicator lamp (MIL)
(3) Test mode connector
(4) Data link connector



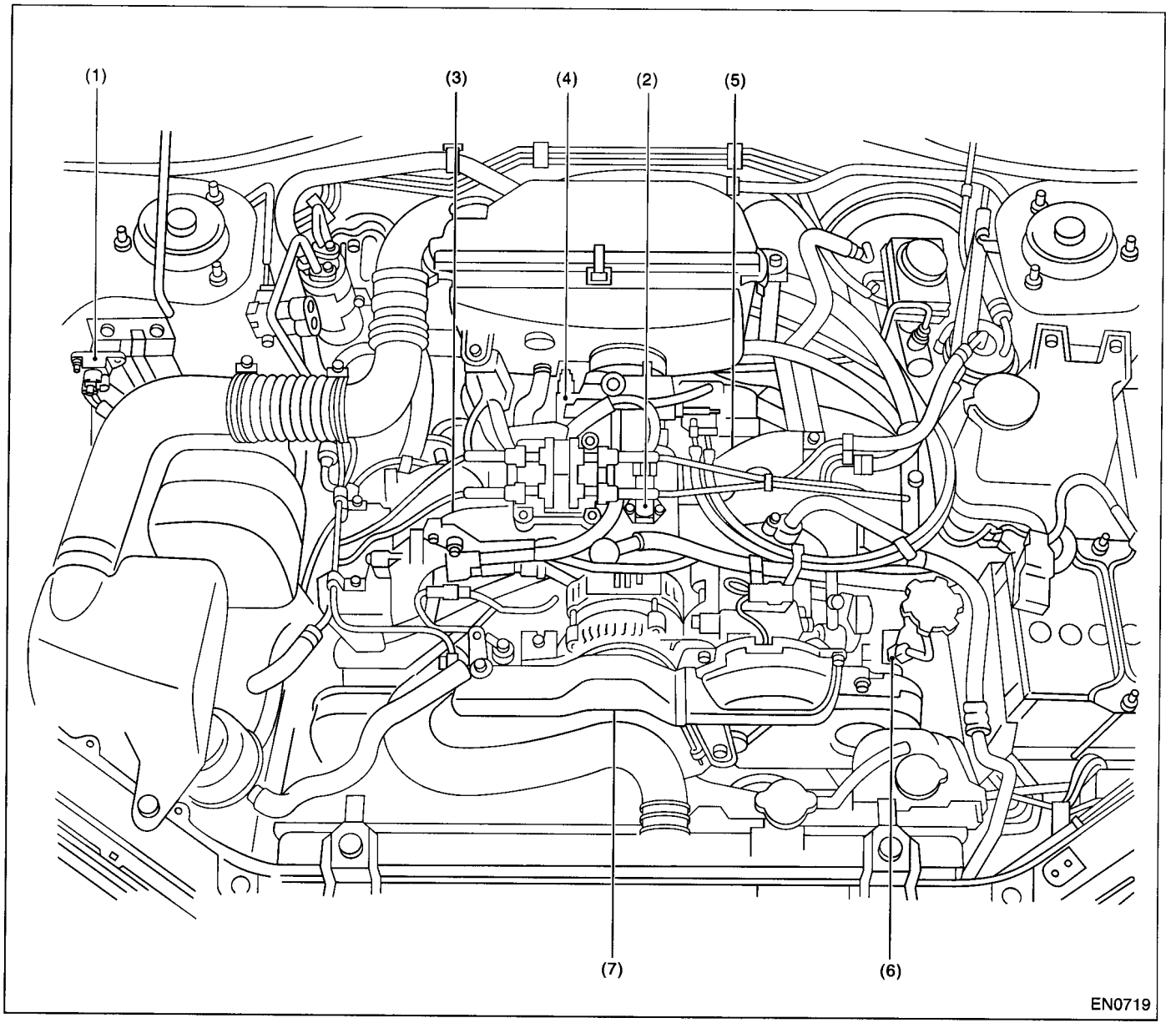




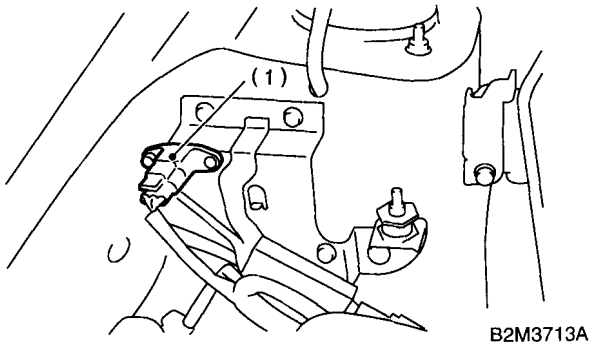


ELECTRICAL COMPONENTS LOCATION

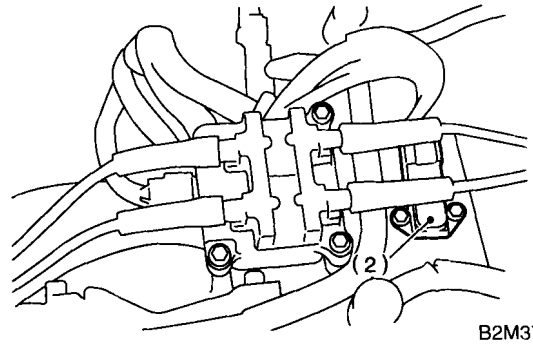
• SENSOR



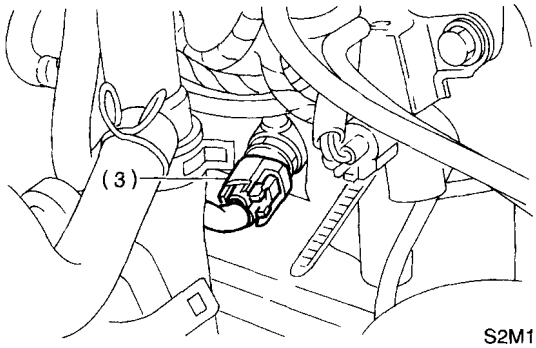
(1) Atmospheric pressure sensor
(2) Intake air temperature and pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor



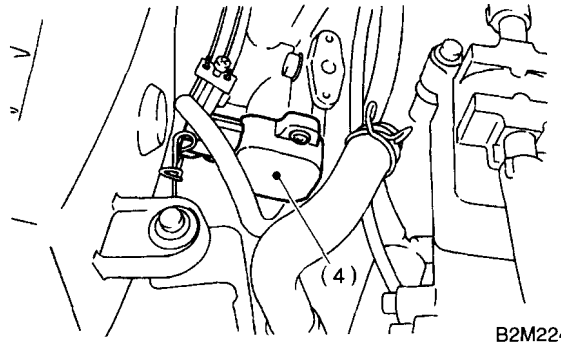
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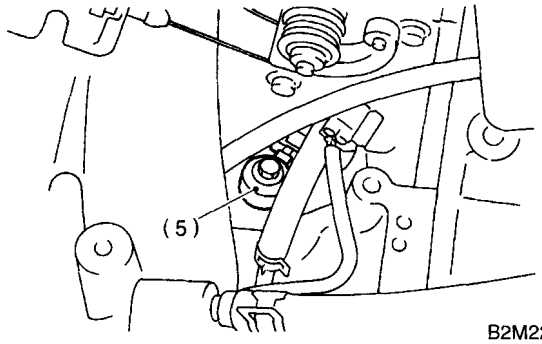
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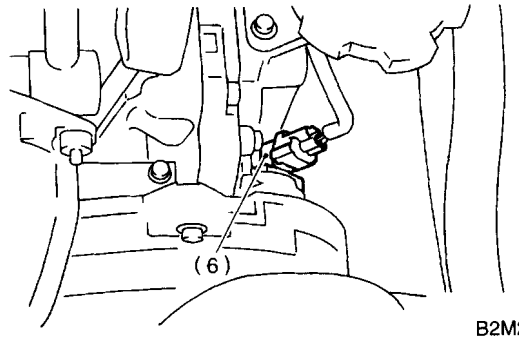
S2M1248B



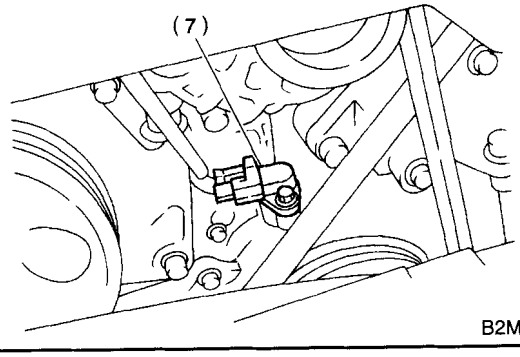
B2M2240A



B2M2241A



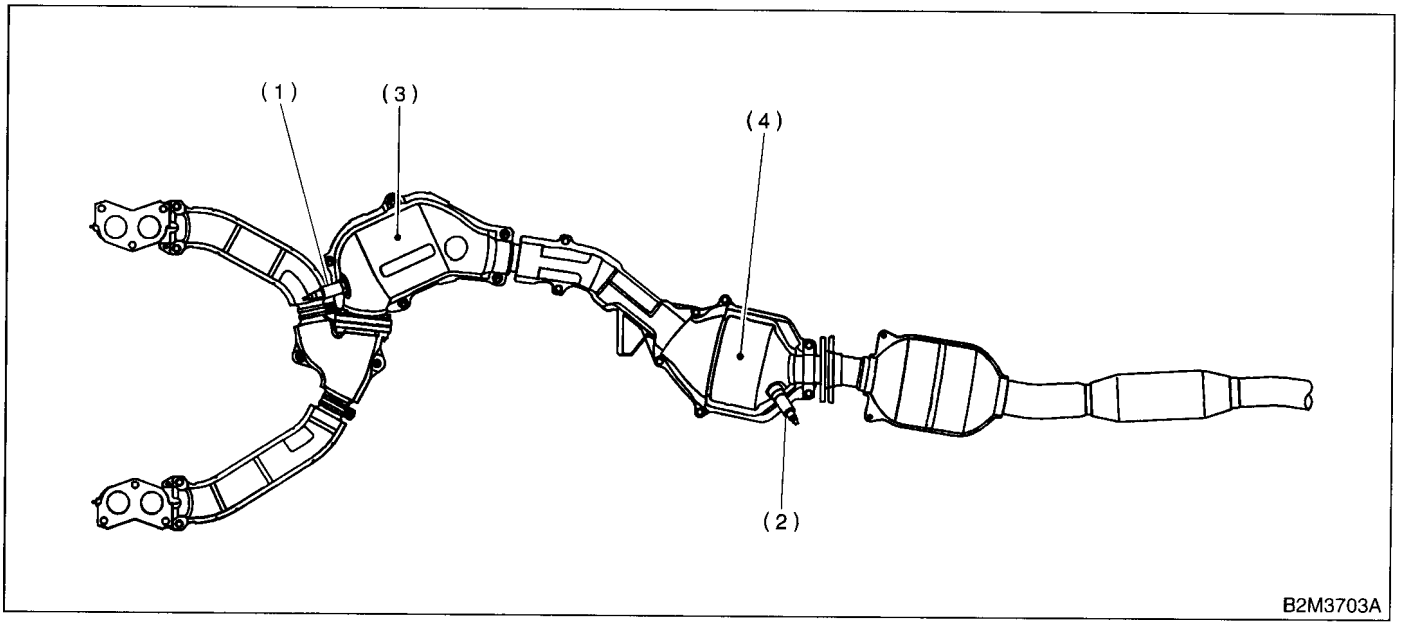
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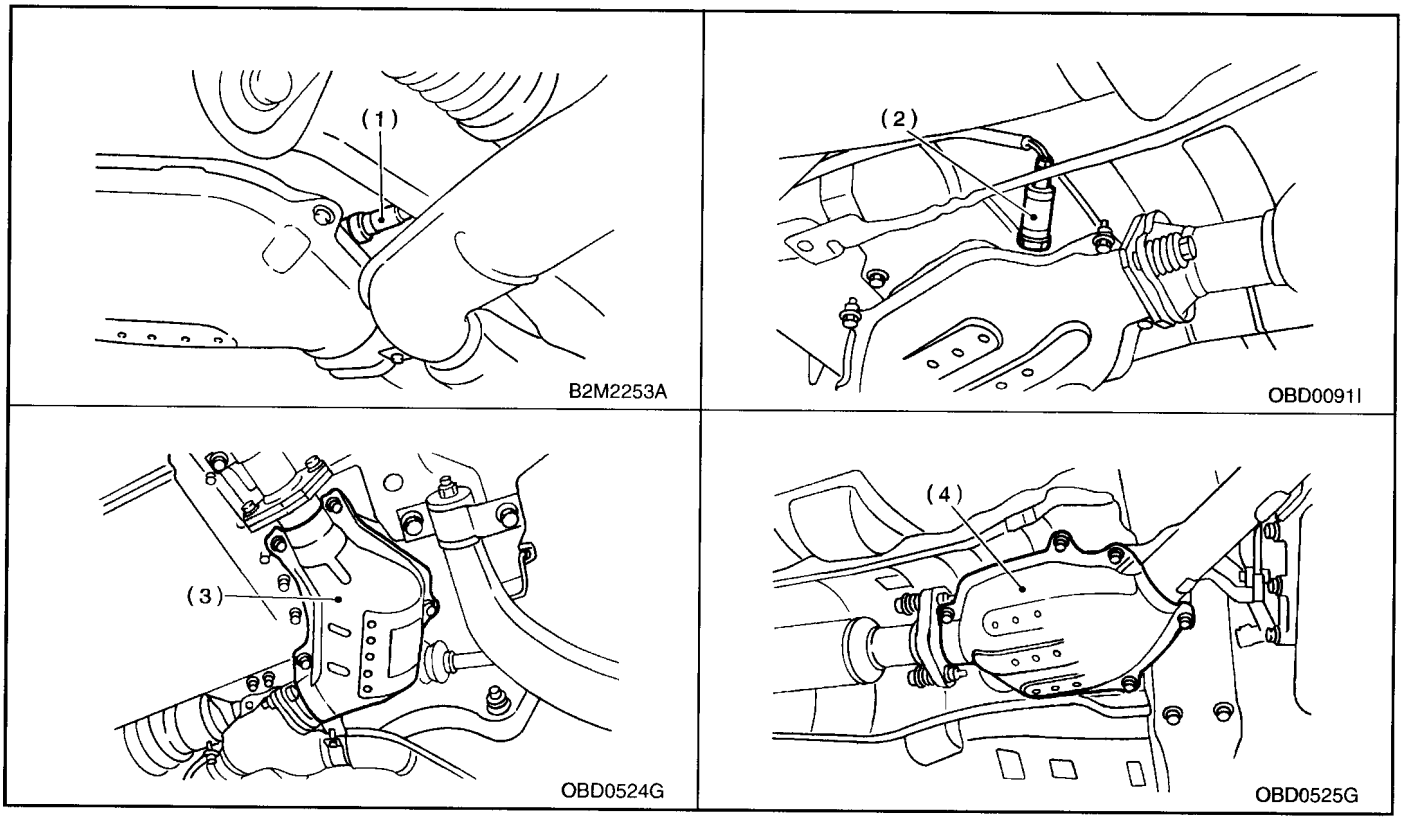
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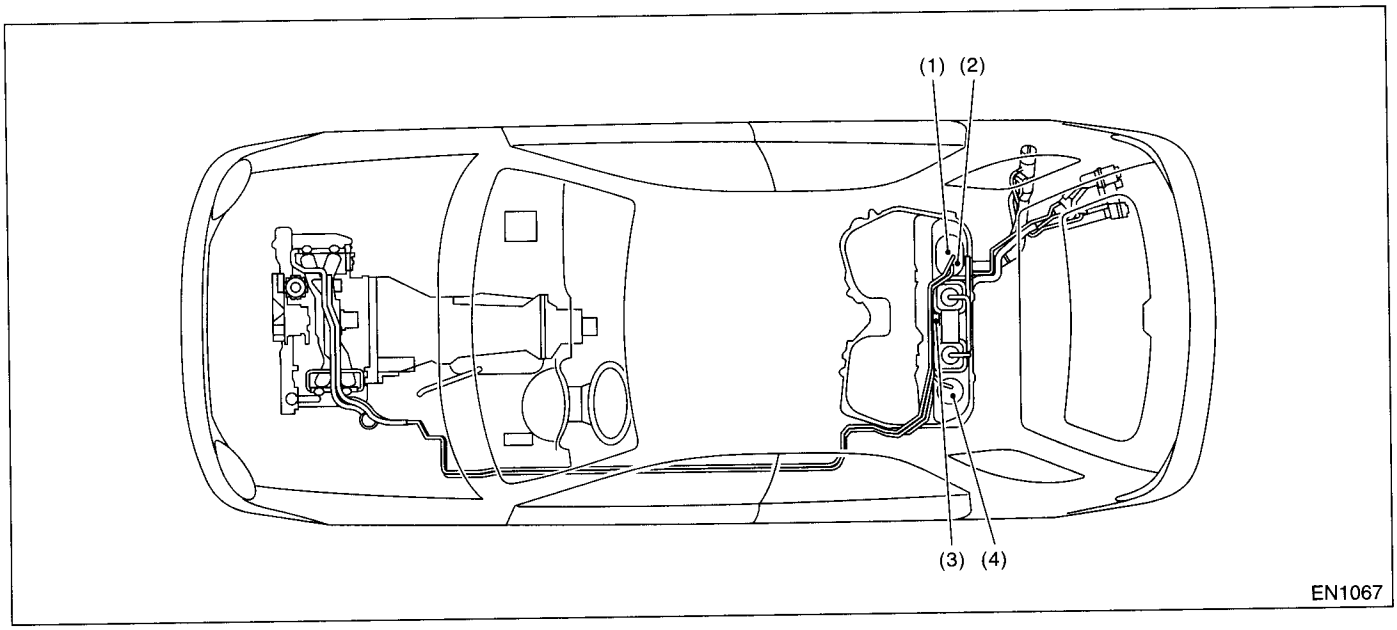
SUBARU

ELECTRICAL COMPONENTS LOCATION

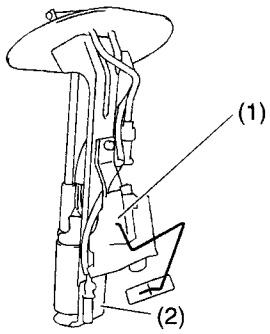


(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter

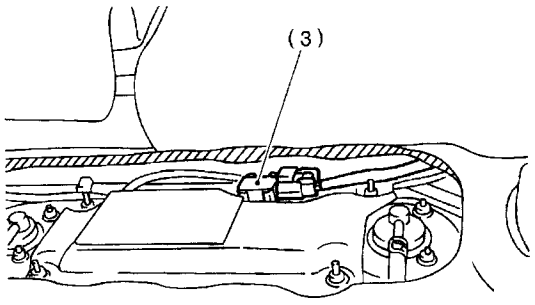




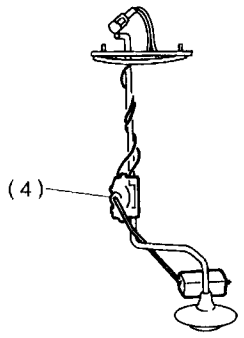
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



H2M3207A

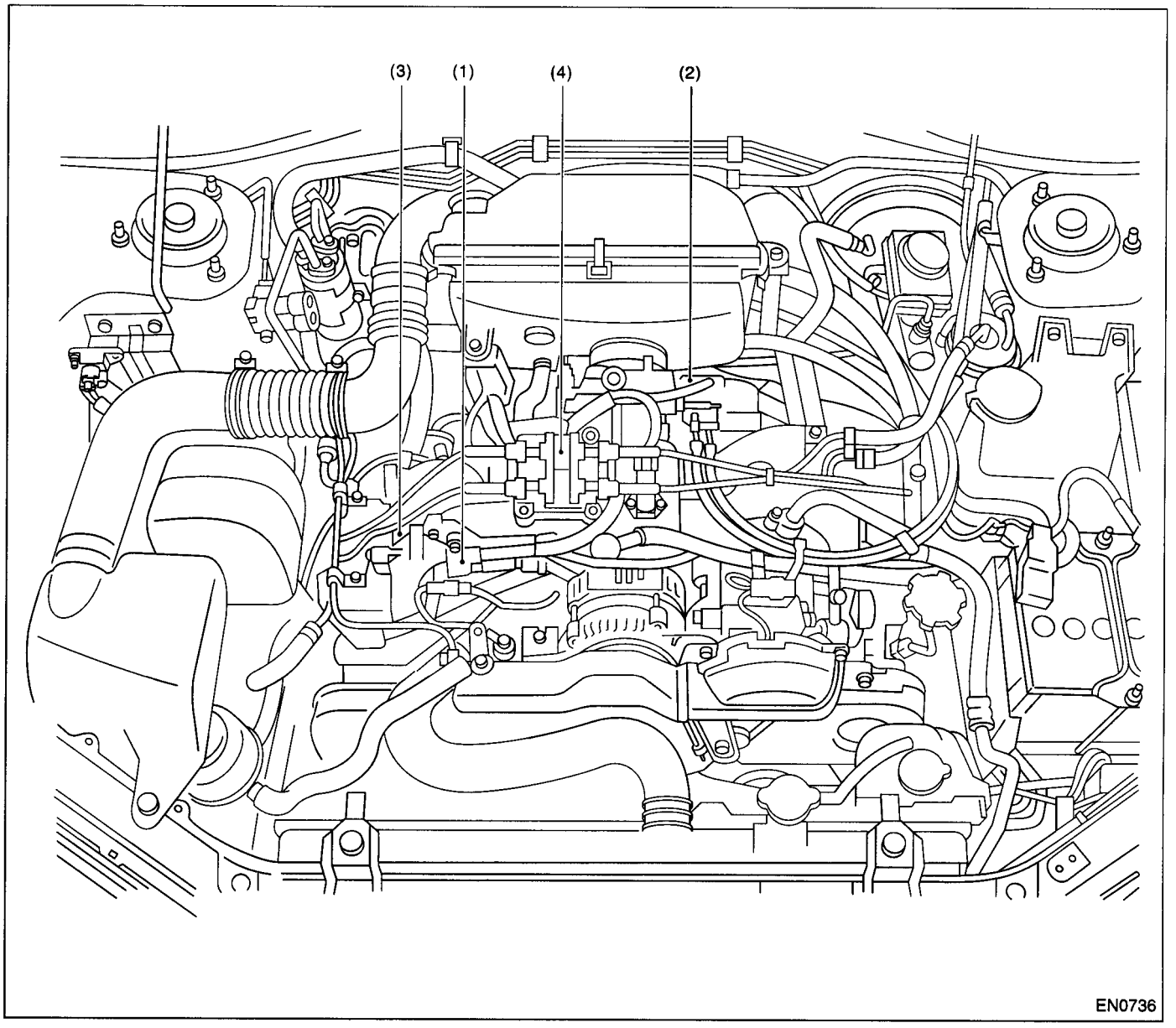


B2M1807A

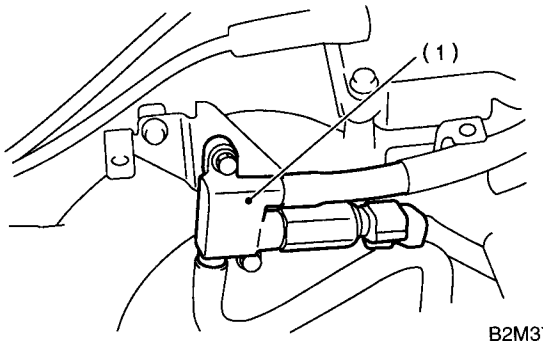


S2M0270A

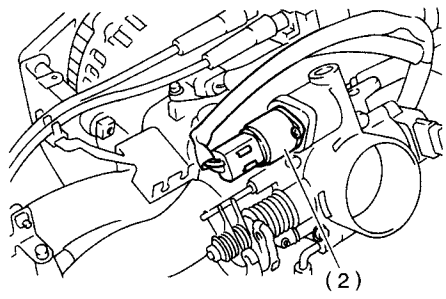
• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



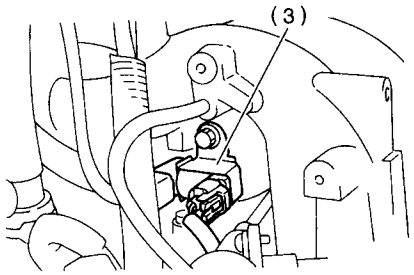
(1) Air assist injector solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil & ignitor ASSY



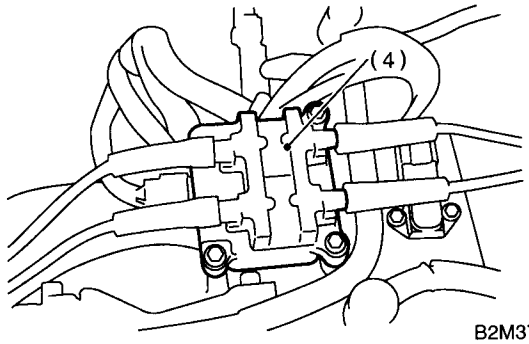
B2M3715A



H2M3259A

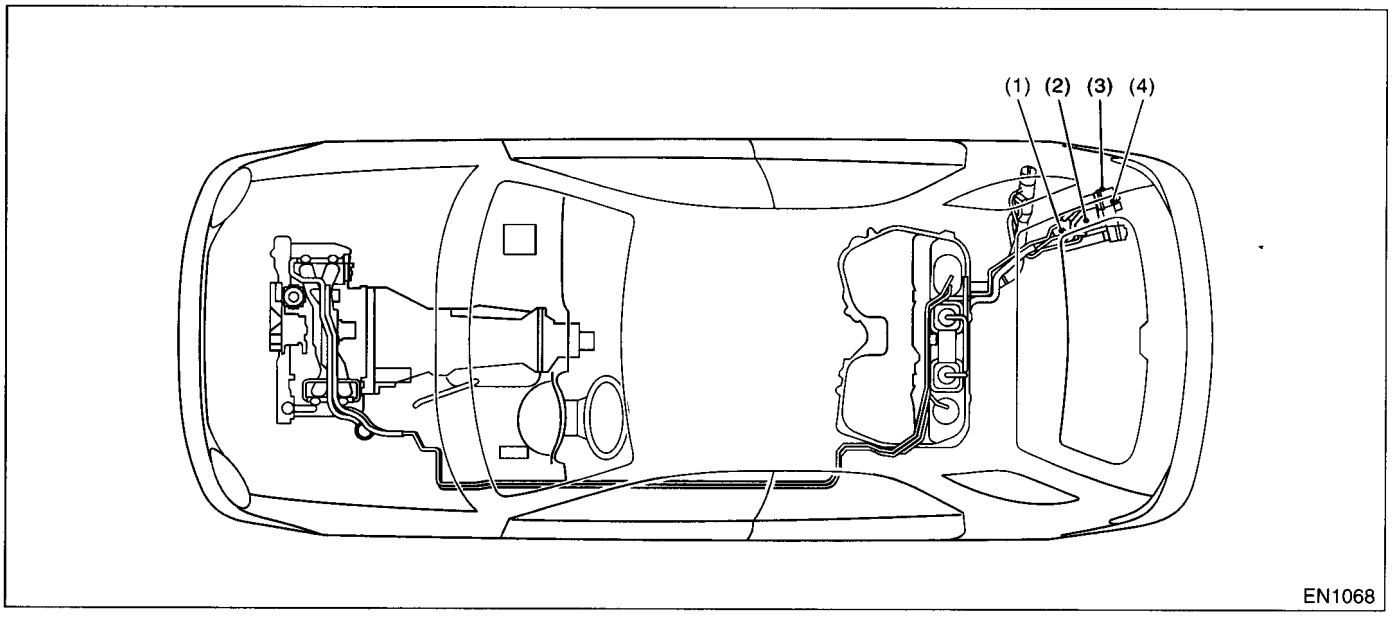


H2M3258B

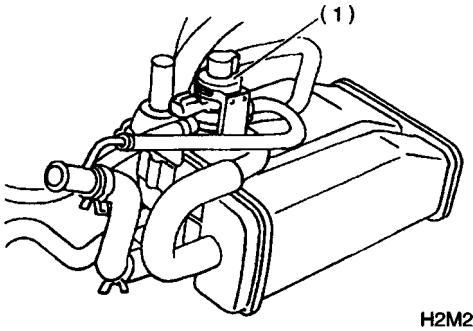


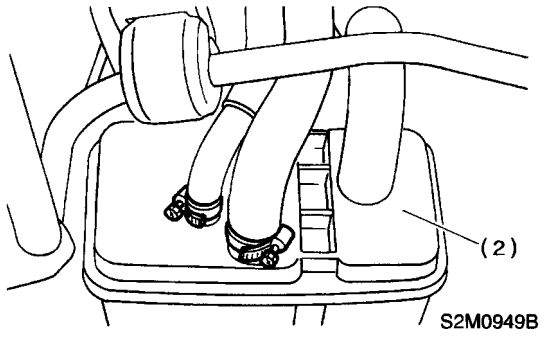
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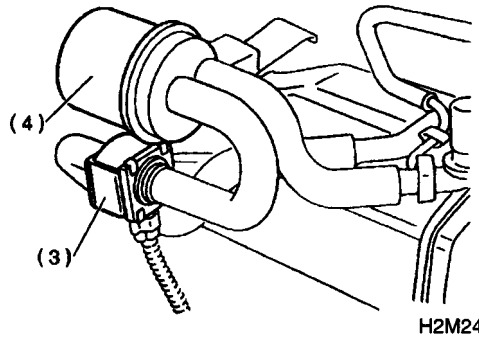
ELECTRICAL COMPONENTS LOCATION



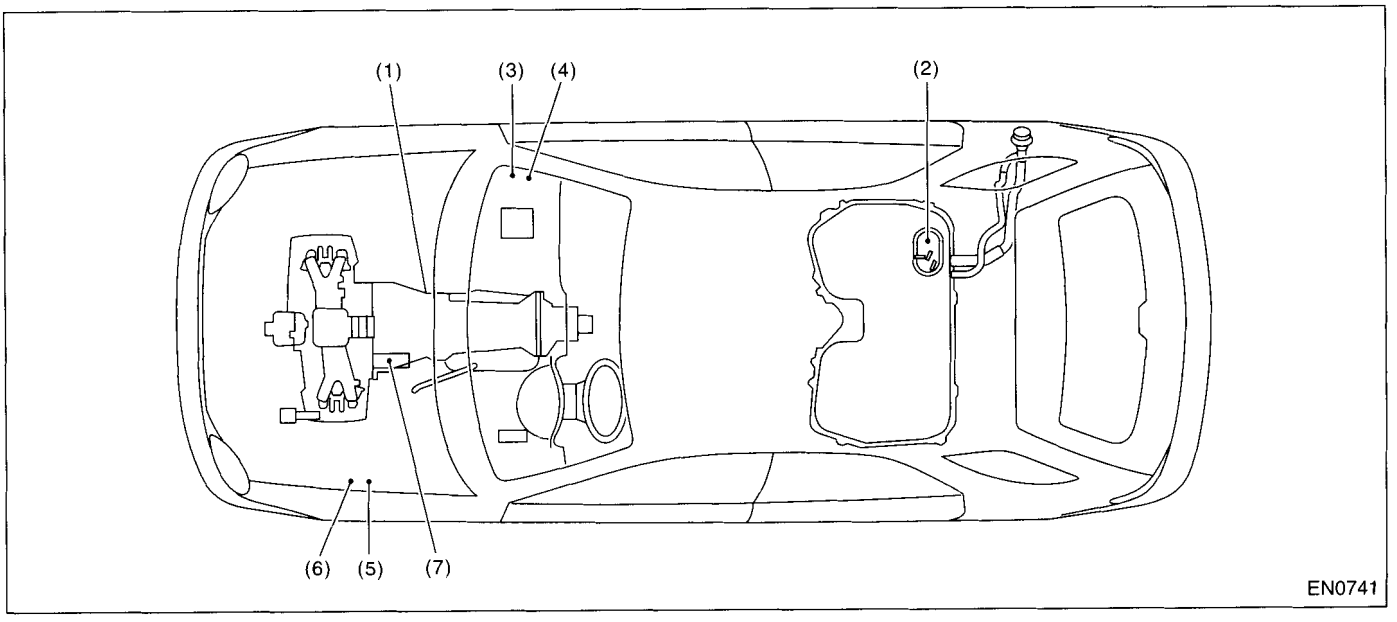
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter



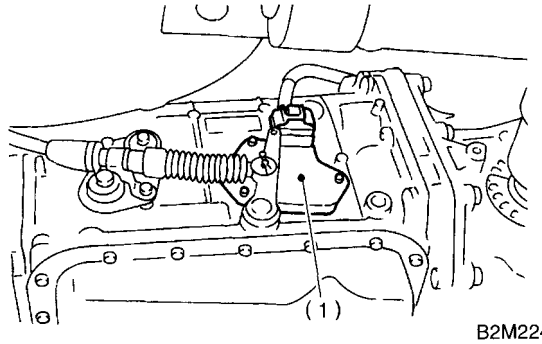


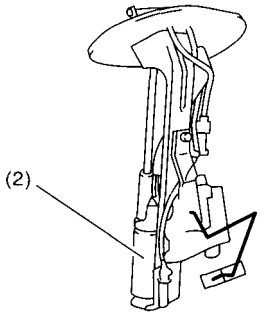


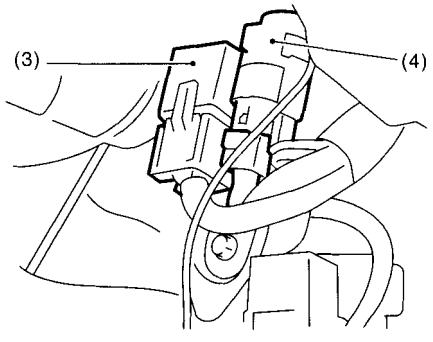
SUBARU

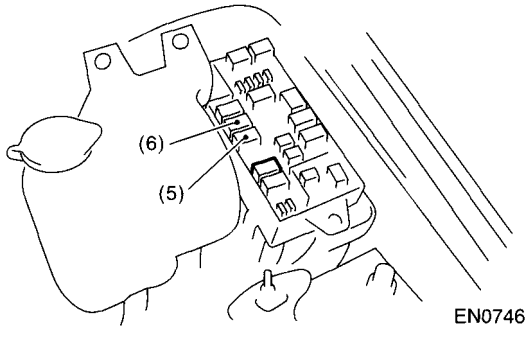


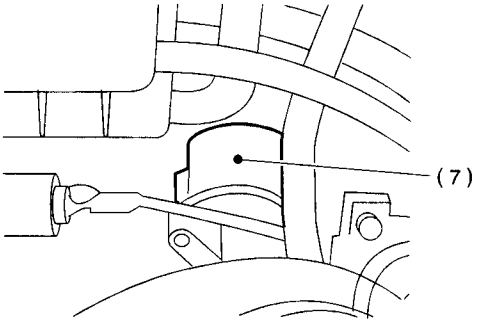
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Starter





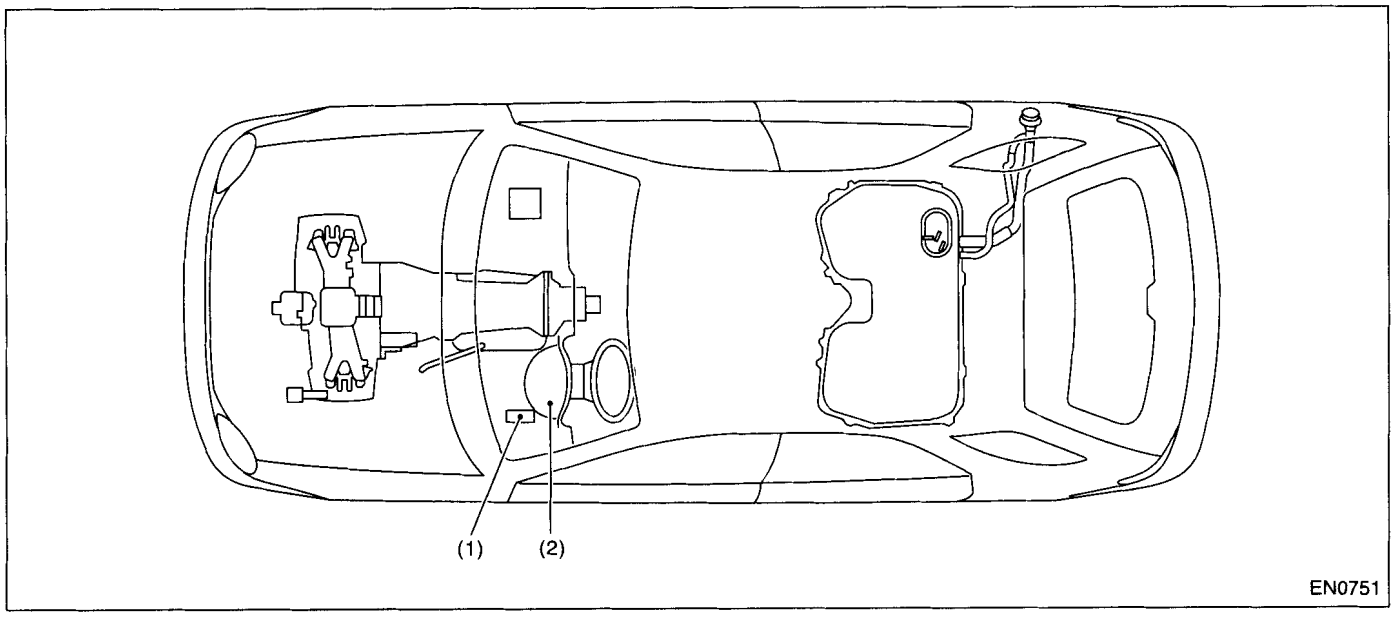





(7)
B2M2247E

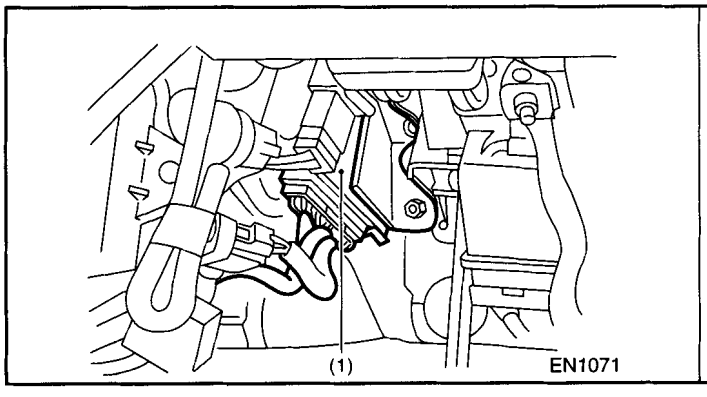
2. TRANSMISSION

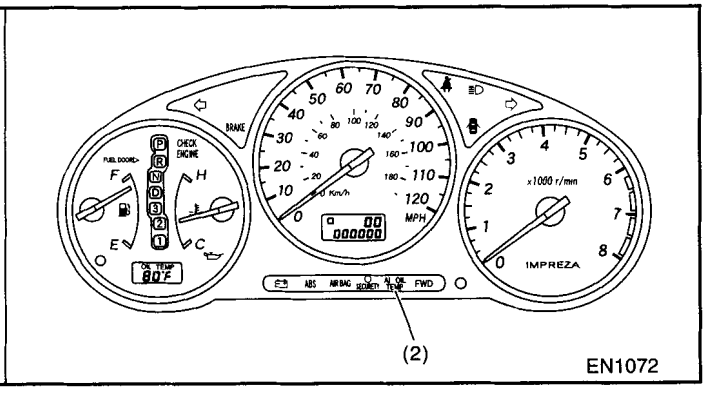
• MODULE



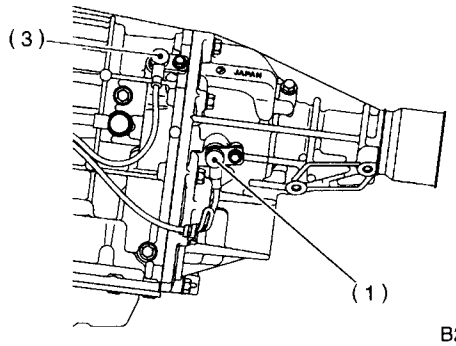
(1) Transmission Control Module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)

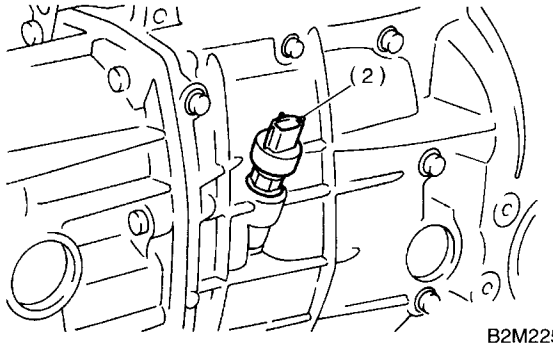




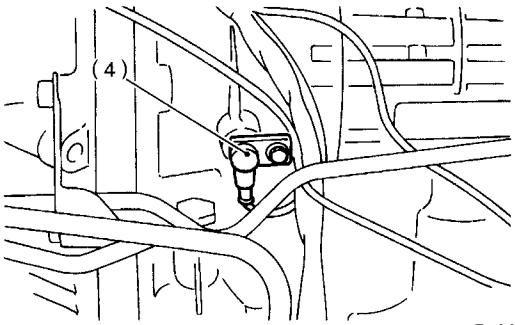
• SENSOR



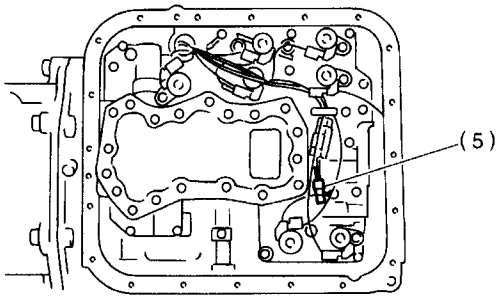
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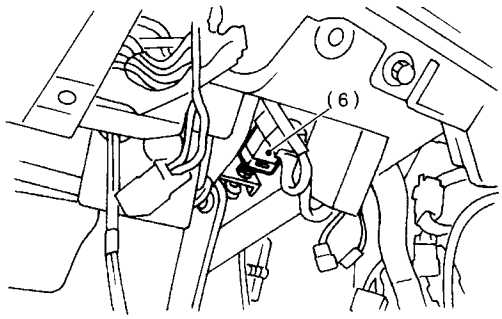
B2M2259A



B2M2260A



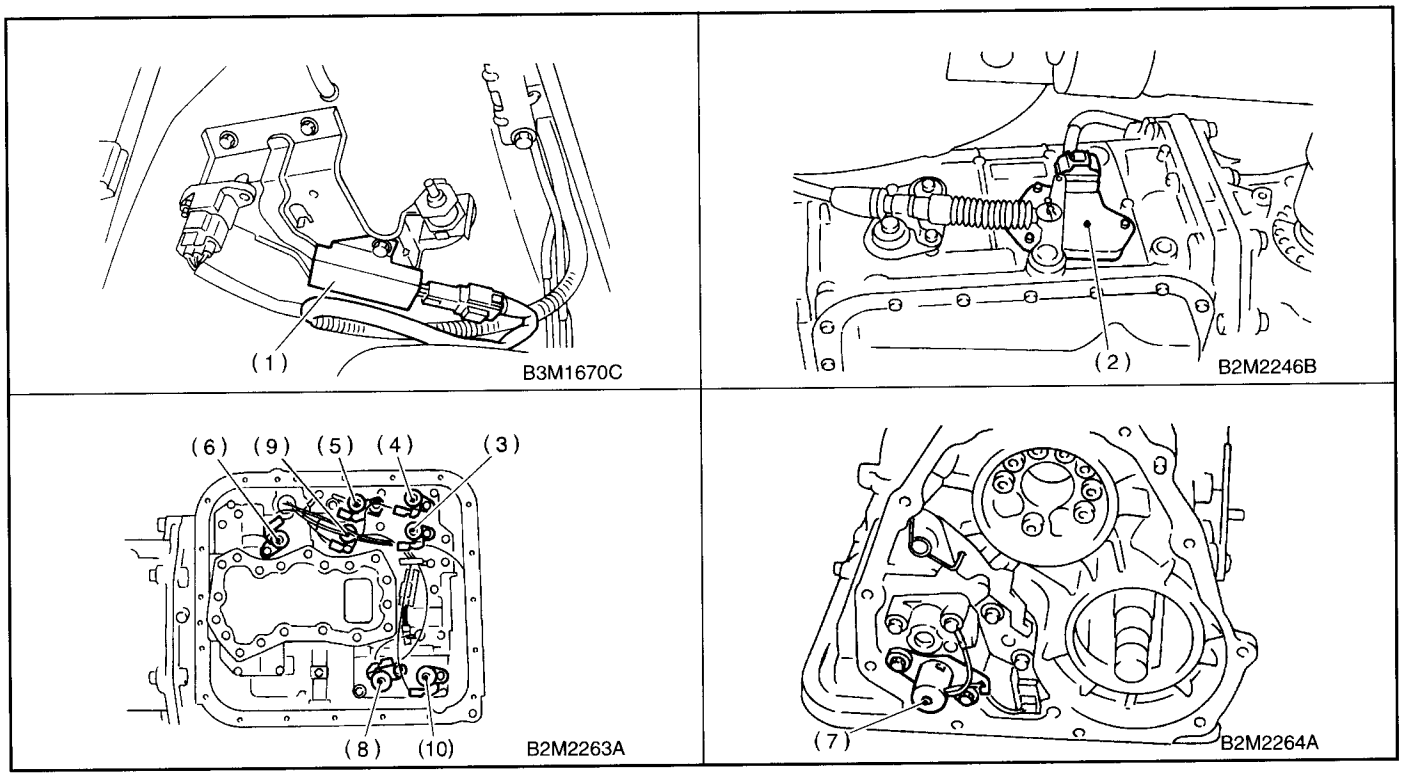
B2M2261A



OBD0653B

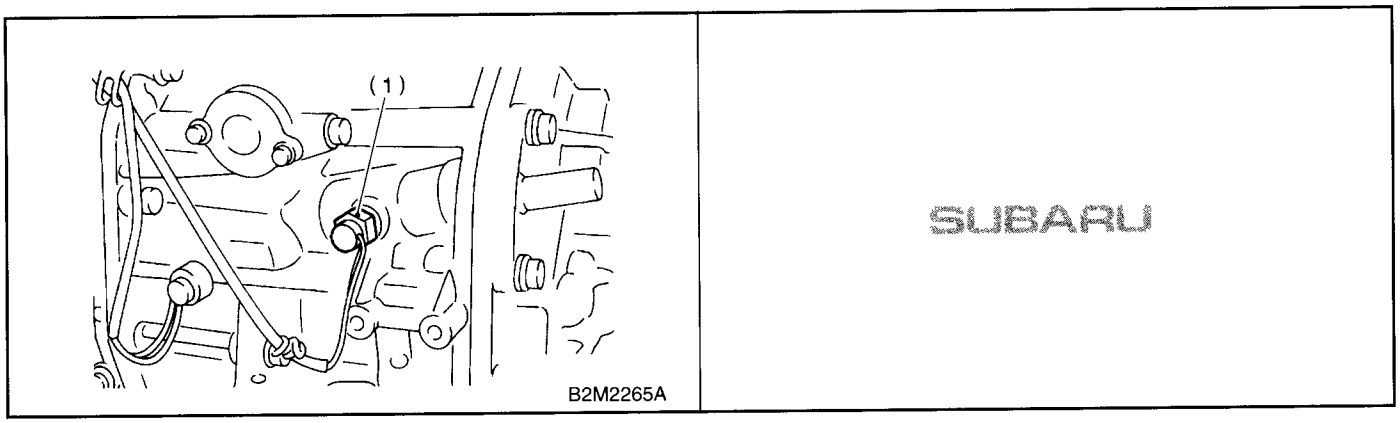
(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

• SOLENOID VALVE AND SWITCH (AT VEHICLES)



(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Lock up duty solenoid
(7) Transfer duty solenoid
(8) 2-4 brake duty solenoid
(9) Low clutch timing solenoid valve
(10) 2-4 brake timing solenoid valve

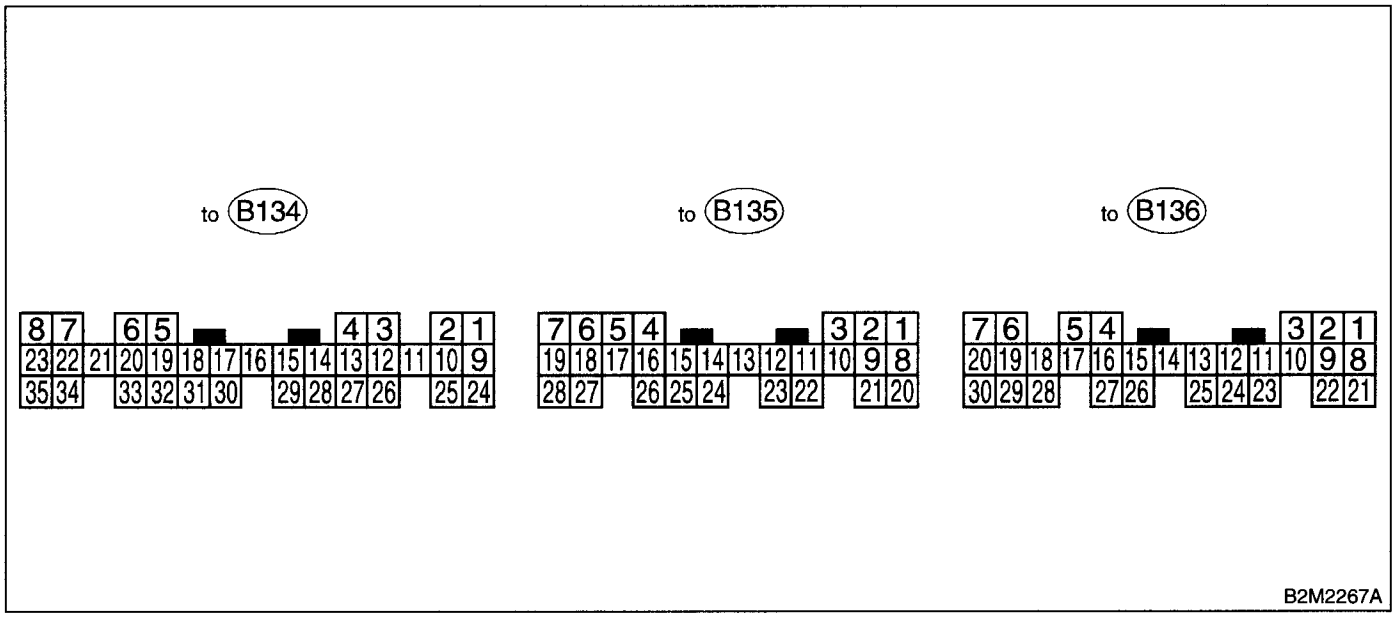
• SOLENOID VALVE AND SWITCH (MT VEHICLES)



(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	1	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	8	0	0	—
	Shield	B135	10	0	0	—
Camshaft position sensor	Signal (+)	B135	2	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	9	0	0	—
	Shield	B135	10	0	0	—
Throttle position sensor	Signal	B136	17	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B136	15	5	5	—
	GND (sensor)	B136	16	0	0	—
Rear oxygen sensor	Signal	B136	18	0	0 — 0.9	—
	Shield	B136	24	0	0	—
	GND (sensor)	B136	16	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	22	0 — 1.0	0 — 1.0	—
	Signal 2	B134	23	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B134	21	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B136	16	0	0	After warm-up the engine.
Vehicle speed signal		B135	24	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Starter switch		B135	28	0	0	Cranking: 8 — 14
A/C switch		B135	27	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B135	7	10 — 13	13 — 14	—
Neutral position switch	MT	B135	26	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
	AT	B135	26	ON: 0 OFF: 12±0.5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		B135	14	5	5	When connected: 0
Knock sensor	Signal	B136	4	2.8	2.8	—
	Shield	B136	25	0	0	—
Back-up power supply		B136	9	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply		B136	1	10 — 13	13 — 14	—
		B136	2	10 — 13	13 — 14	—
Sensor power supply		B136	15	5	5	—
Line end check 1		B135	20	0	0	—
Ignition control	#1, #2	B134	25	0	1 — 3.4	Waveform
	#3, #4	B134	26	0	1 — 3.4	Waveform
Fuel injector	#1	B134	4	10 — 13	1 — 14	Waveform
	#2	B134	13	10 — 13	1 — 14	Waveform
	#3	B134	14	10 — 13	1 — 14	Waveform
	#4	B134	15	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	5	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	19	—	1 — 13	Waveform
	Signal 4	B134	20	—	1 — 13	Waveform
	Power supply	B136	2	10 — 13	13 — 14	—
Fuel pump relay control		B134	16	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B134	3	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B134	12	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		B135	19	10 — 13	13 — 14	—
Malfunction indicator lamp		B134	11	—	—	Light "ON": 1, or less Light "OFF": 10 — 14
Engine speed output		B134	30	—	0 — 13, or more	Waveform
Torque control 1 signal		B135	16	5	5	—
Torque control 2 signal		B135	17	5	5	—
Torque control cut signal		B134	31	8	8	—
Purge control solenoid valve		B134	2	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Atmospheric pressure sensor	Signal	B136	29	3.9 — 4.1	2.0 — 2.3	—
	Power supply	B136	15	5	5	
	GND (sensor)	B136	16	0	0	

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Fuel temperature sensor		B136	26	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B136	27	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B136	12	2.3 — 2.7	2.3 — 2.7	The valve obtained after the fuel filler cap was removed once and recapped.
	Power supply	B136	15	5	5	—
	GND (sensor)	B136	16	0	0	—
Fuel tank pressure contol solenoid valve		B134	1	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve		B134	10	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
AT diagnosis input signal		B135	4	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
Small light switch		B136	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B135	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1		B136	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal 2		B136	6	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor signal 3		B136	7	0.2 — 4.9	0.2 — 4.9	—
Front oxygen (A/F) sensor signal 4		B136	20	0.2 — 4.9	0.2 — 4.9	—
Pressure sensor		B136	5	2.4 — 4.8	0.4 — 1.8	—
Intake air temperature sensor		B136	13	2.3 — 2.5	1.4 — 1.6	—
SSM/GST communication line		B135	3	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)		B136	16	0	0	—
GND (injectors)		B134	7	0	0	—
GND (ignition system)		B134	27	0	0	—
GND (power supply)		B134	8	0	0	—
GND (control systems)		B136	21	0	0	—
		B136	22	0	0	—
GND (oxygen sensor heater 1)		B134	35	0	0	—
GND (oxygen sensor heater 2)		B134	34	0	0	—

6. Engine Condition Data

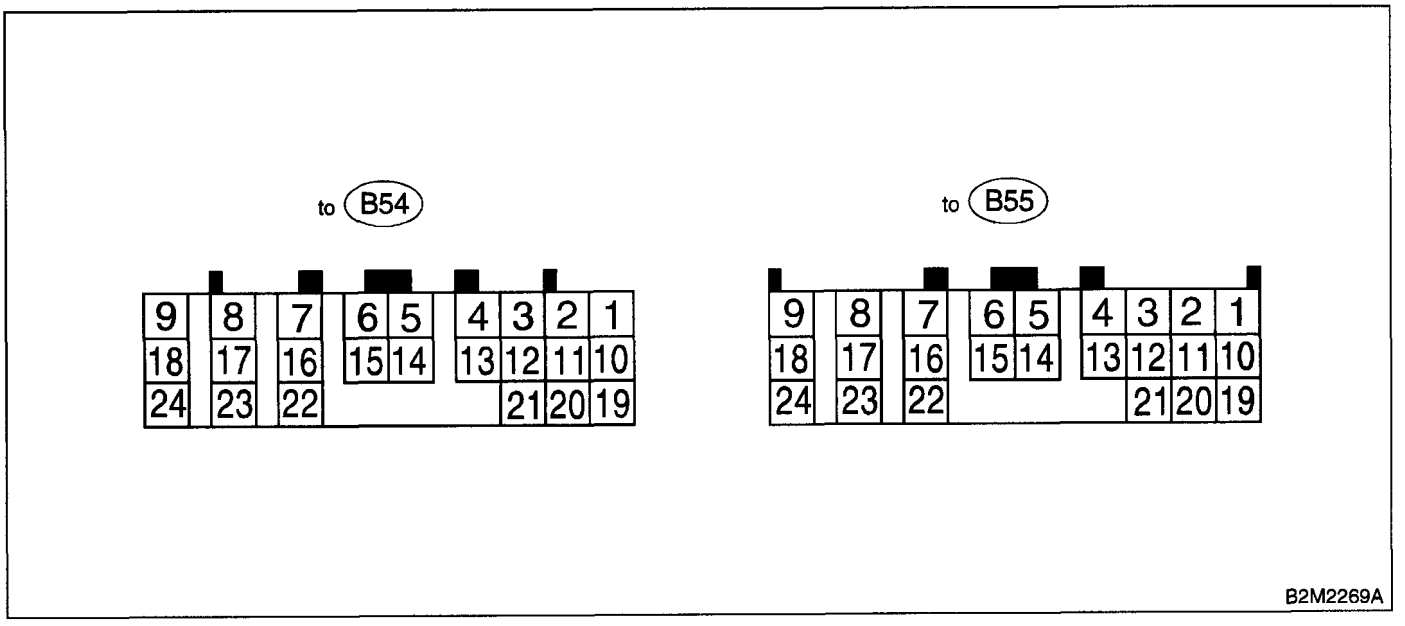
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in "N" or "P" position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	6	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	23	Selector lever in "P" range	Less than 1	—
				Selector lever in any other than "P" range	More than 8	
	"N" range switch	B55	22	Selector lever in "N" range	Less than 1	—
				Selector lever in any other than "N" range	More than 8	
	"R" range switch	B55	17	Selector lever in "R" range	Less than 1	—
				Selector lever in any other than "R" range	More than 8	
	"D" range switch	B55	8	Selector lever in "D" range	Less than 1	—
				Selector lever in any other than "D" range	More than 8	
	"3" range switch	B55	18	Selector lever in "3" range	Less than 1	—
				Selector lever in any other than "3" range	More than 8	
	"2" range switch	B54	10	Selector lever in "2" range	Less than 1	—
				Selector lever in any other than "2" range	More than 8	
	"1" range switch	B54	1	Selector lever in "1" range	Less than 1	—
				Selector lever in any other than "1" range	More than 8	
Brake switch		B55	24	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
ABS signal	B54	19	ABS switch ON	Less than 1	—
			ABS switch OFF	More than 6.5	
AT OIL TEMP light	B54	3	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B55	2	Throttle fully closed.	Approx. 0.5	—
			Throttle fully open.	Approx. 4.3	
Throttle position sensor power supply	B55	1	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B55	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	3	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	5	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	12	Engine idling after warm-up (D range).	0	450 — 650
			Engine idling after warm-up (N range).	More than 1 (AC range)	
Vehicle speed output signal	B55	13	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 5	—
Engine speed signal	B55	4	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	0 — 13 or more	
Cruise set signal	B54	11	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control 1 signal	B54	13	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control 2 signal	B54	21	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B54	2	Ignition switch ON	8	—
Intake manifold pressure signal	B55	20	Engine idling after warm-up.	1.2 — 1.8	—
AT load signal	B55	20	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	7	1st gear	More than 9	10 — 16
			3rd gear	Less than 1	
Shift solenoid 2	B54	6	2nd gear	More than 9	10 — 16
			4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
Dropping resistor	B54	18	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

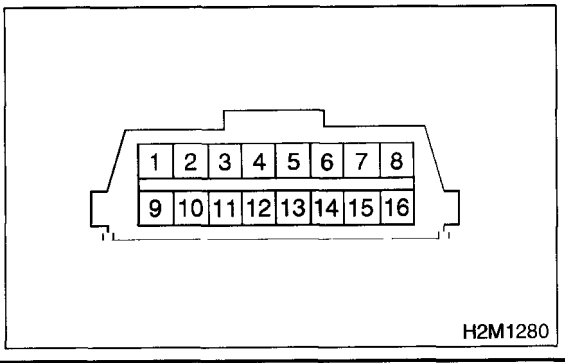
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Lock-up duty solenoid	B54	16	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	15	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 1	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	5	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	14	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line	B55	21	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B55	14	Fuse removed.	More than 9	—
			Fuse installed.	Less than 1	
FWD indicator light	B54	12	Fuse on FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
Data link signal (Subaru Select Monitor)	B55	7	—	—	—
		16	—	—	
AT diagnosis signal	B54	4	Ignition switch ON	Less than 1 ← → More than 4	—

8. Data Link Connector

A: NOTE

1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Subaru Select Monitor signal (ECM to Subaru Select Monitor)*	12	Ground
5	Subaru Select Monitor signal (Subaru Select Monitor to ECM)*	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

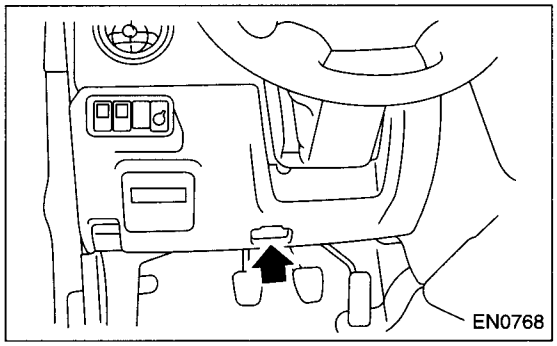
*: Circuit only for Subaru Select Monitor

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Connect the OBD-II general scan tool to the data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

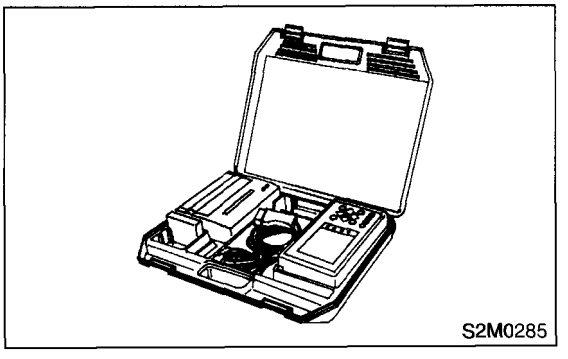
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

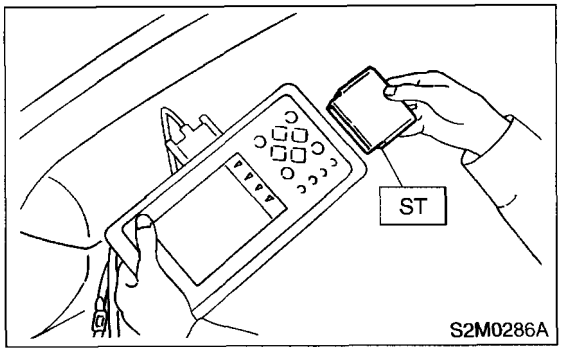
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

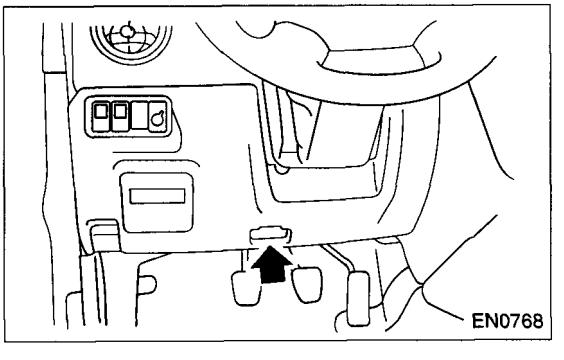
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



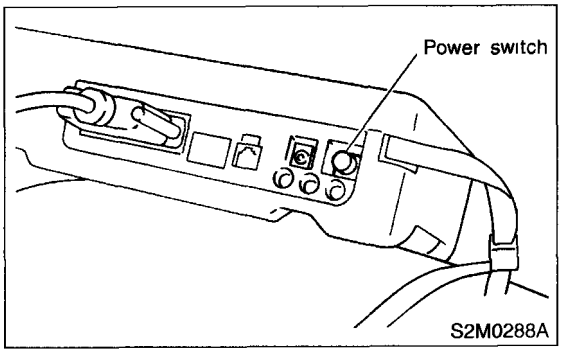
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



6) Using the Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(SOHC)-39, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Step	STEP
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	Front O2 Heater #1	A
Rear oxygen sensor heater current	Rear O2 Heater Current	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF

Contents	Display	Unit of measure
Starter switch signal	Starter Switch Signal	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Air assist injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF
AT vehicle ID signal	AT Vehicle ID Signal	ON or OFF

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

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
A/F sensor equipment	A/F sensor	ON or OFF
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—

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

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

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

7. READ OXYGEN SENSOR MONITORING TEST RESULTS DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {O2 Sensor Monitor} and press the [YES] key.
6) On the «O2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press the [YES] key.
• Bank 1-Sensor1 indicates the front oxygen or A/F sensor, and Bank 1-Sensor2 indicates the rear oxygen sensor.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Oxygen sensor for monitoring test	<O2 Sensor Monitor (-------)>	—
Rich to lean oxygen sensor threshold voltage	Rich to lean sensor volt	V
Lean to rich oxygen sensor threshold voltage	Lean to rich sensor volt	V
Low oxygen sensor voltage for switch time calculation	Low sensor voltage	V
High oxygen sensor voltage for switch time calculation	High sensor voltage	V
Rich to lean oxygen sensor switch time	Rich to lean switch time	sec
Lean to rich oxygen sensor switch time	Lean to rich switch time	sec
Maximum oxygen sensor voltage for test cycle	Maximum sensor Voltage	V
Minimum oxygen sensor voltage for test cycle	Minimum sensor Voltage	V

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

8. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Front oxygen (A/F) sensor rich signal	Front O2 Rich Signal #1	ON or OFF	When front oxygen (A/F) sensor mixture ratio is rich.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.

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

9. READ CURRENT DATA FOR AT.

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

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

11. Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

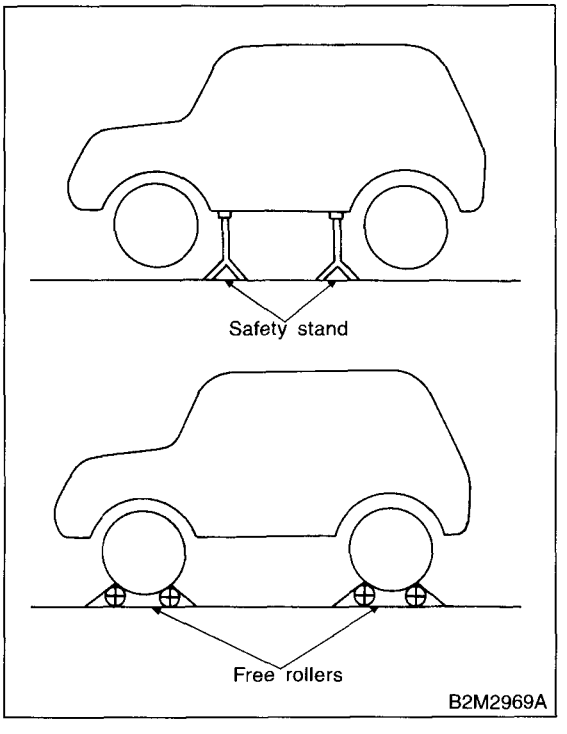
12.Inspection Mode

A: OPERATION

1. PREPARATION FOR THE INSPECTION MODE

Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

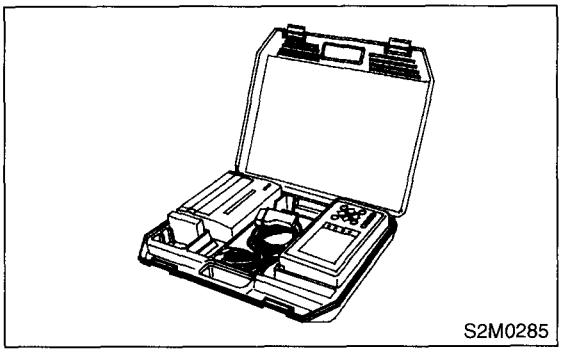
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause the vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



2. SUBARU SELECT MONITOR

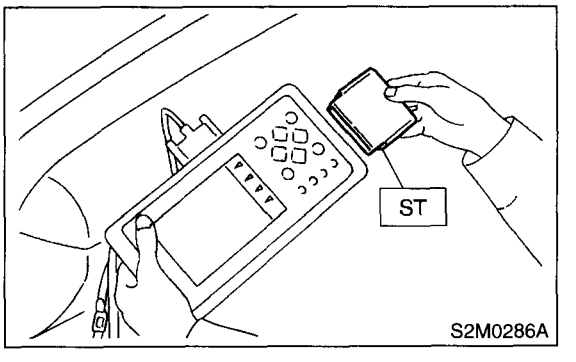
After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>

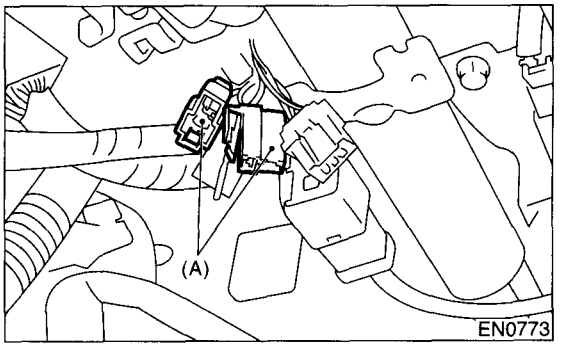


2) Connect the diagnosis cable to Subaru Select Monitor.

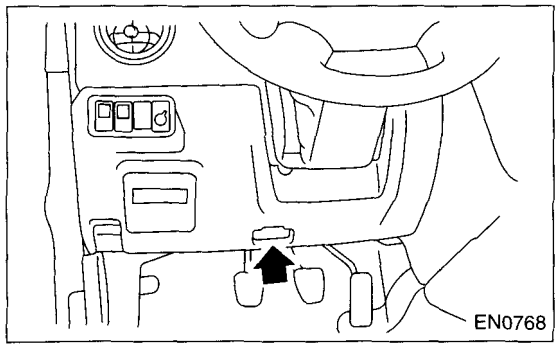
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



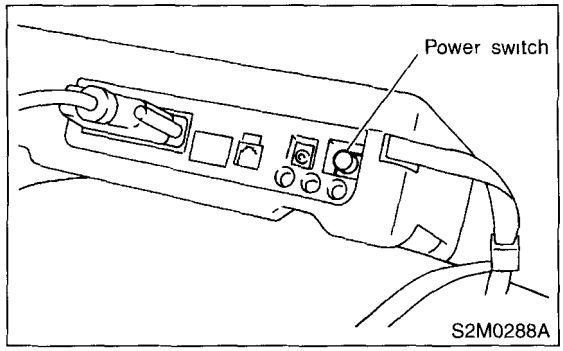
5) Connect the Subaru Select Monitor to data link connector.
(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.

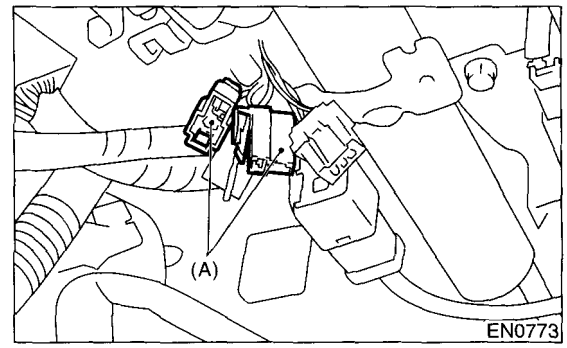


7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
11) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
12) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

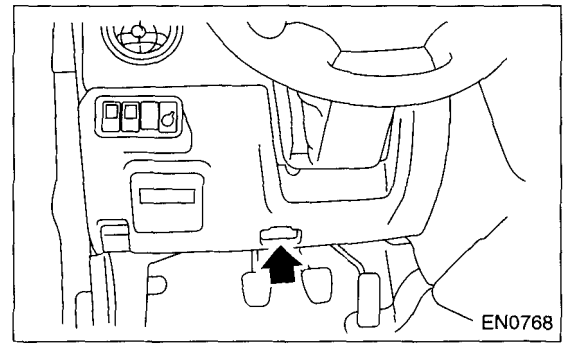
3. OBD-II GENERAL SCAN TOOL

After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data:
1) Connect the test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



2) Connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



3) Start the engine.

NOTE:
• Ensure the selector lever is placed in the "P" position before starting. (AT vehicles)
• Depress the clutch pedal when starting the engine. (MT vehicles)

4) Using the selector lever or shift lever, turn the "P" position switch and the "N" position switch to ON.
5) Depress the brake pedal to turn the brake switch ON. (AT vehicles)
6) Keep the engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

NOTE:
On models without tachometer, use the tachometer (Secondary pickup type).

7) Place the selector lever or shift lever in the "D" position (AT vehicles) or "1st" gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

8) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the `Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

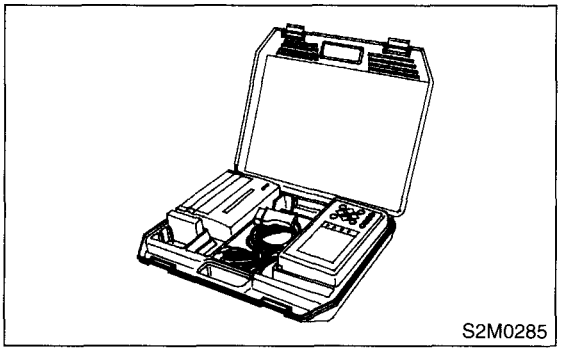
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

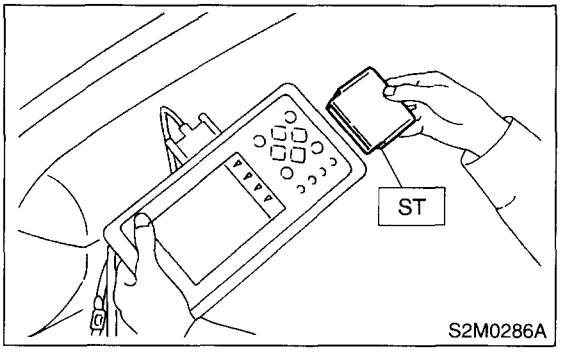
14.Compulsory Valve Operation Check Mode

A: OPERATION

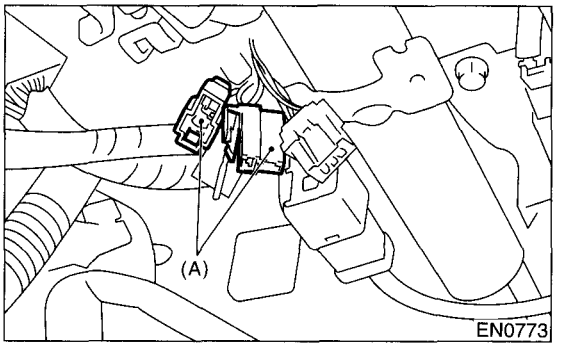
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



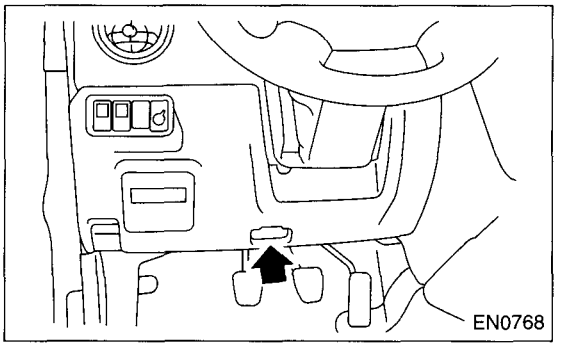
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(SOHC)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



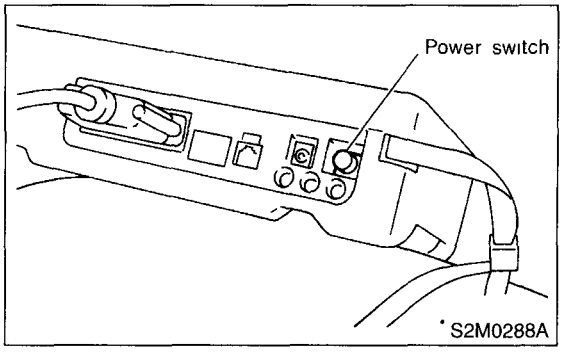
5) Connect the Subaru Select Monitor to data link connector.
(1) Connect Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve

NOTE:
- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15.Engine Malfunction Indicator Lamp (MIL)

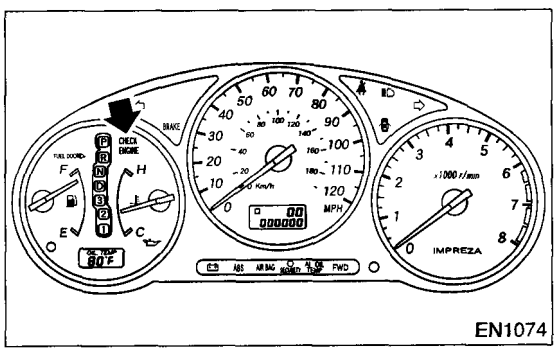
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(SOHC)-47, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(SOHC)-48, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(SOHC)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(SOHC)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(SOHC)-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

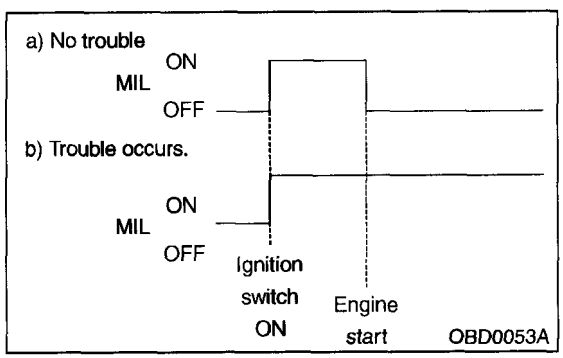
B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

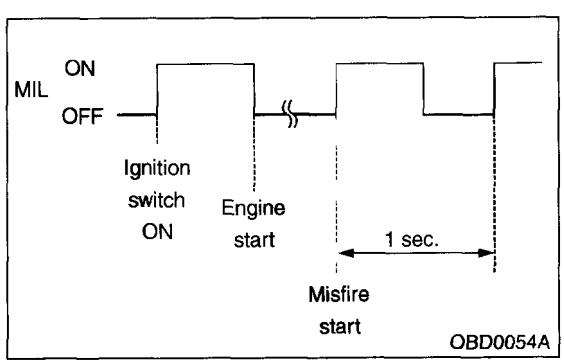
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(SOHC)-48, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



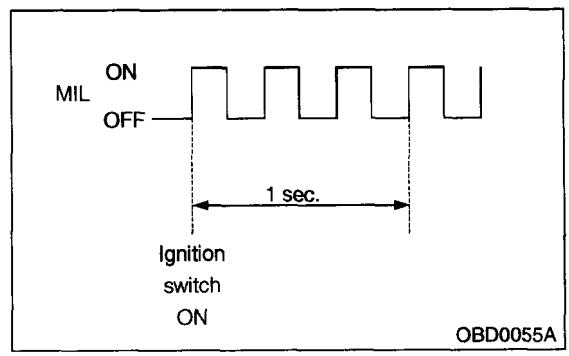
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.

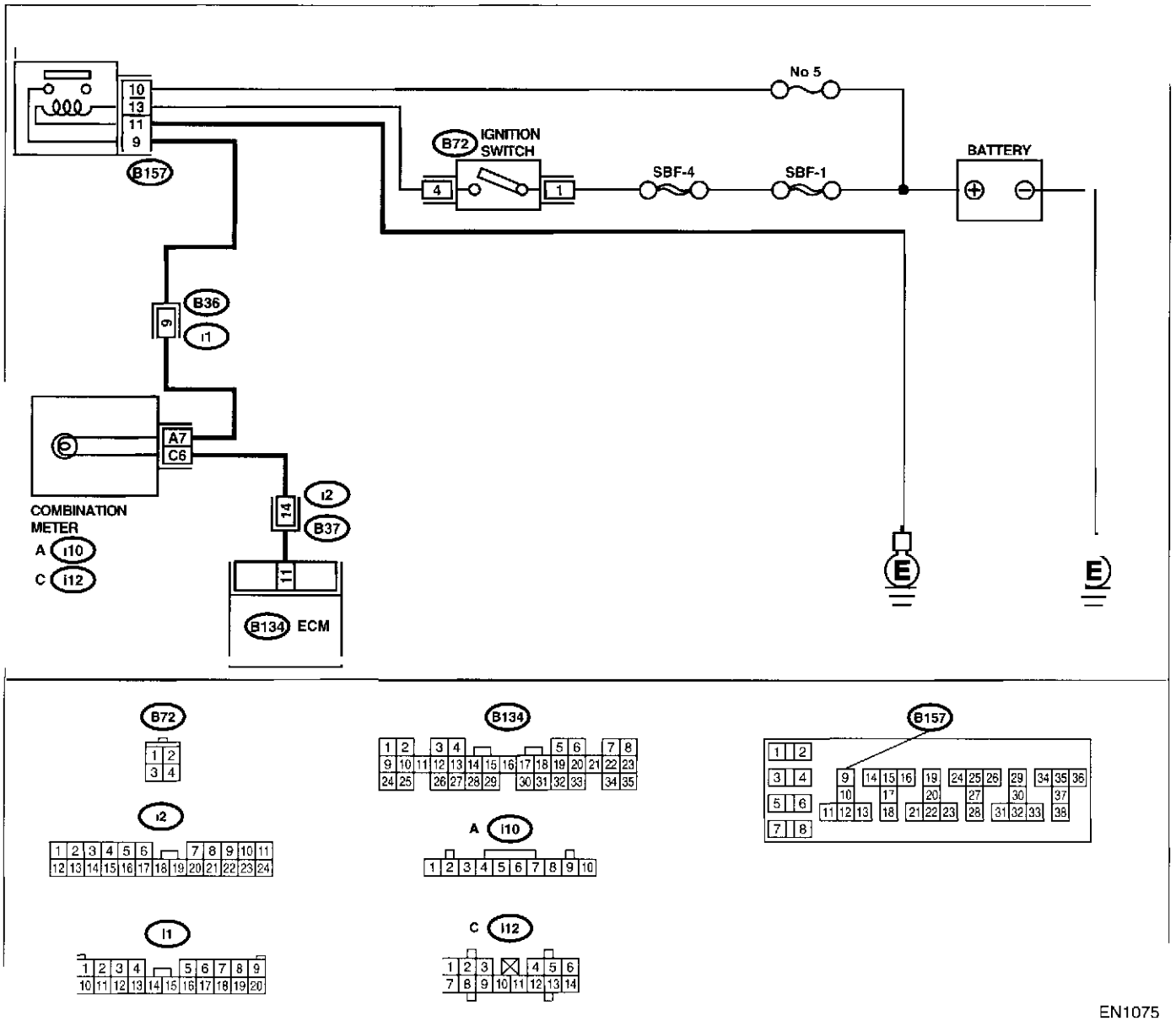


4) When the ignition switch is turned to ON (engine off) or to "START" with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When the ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**



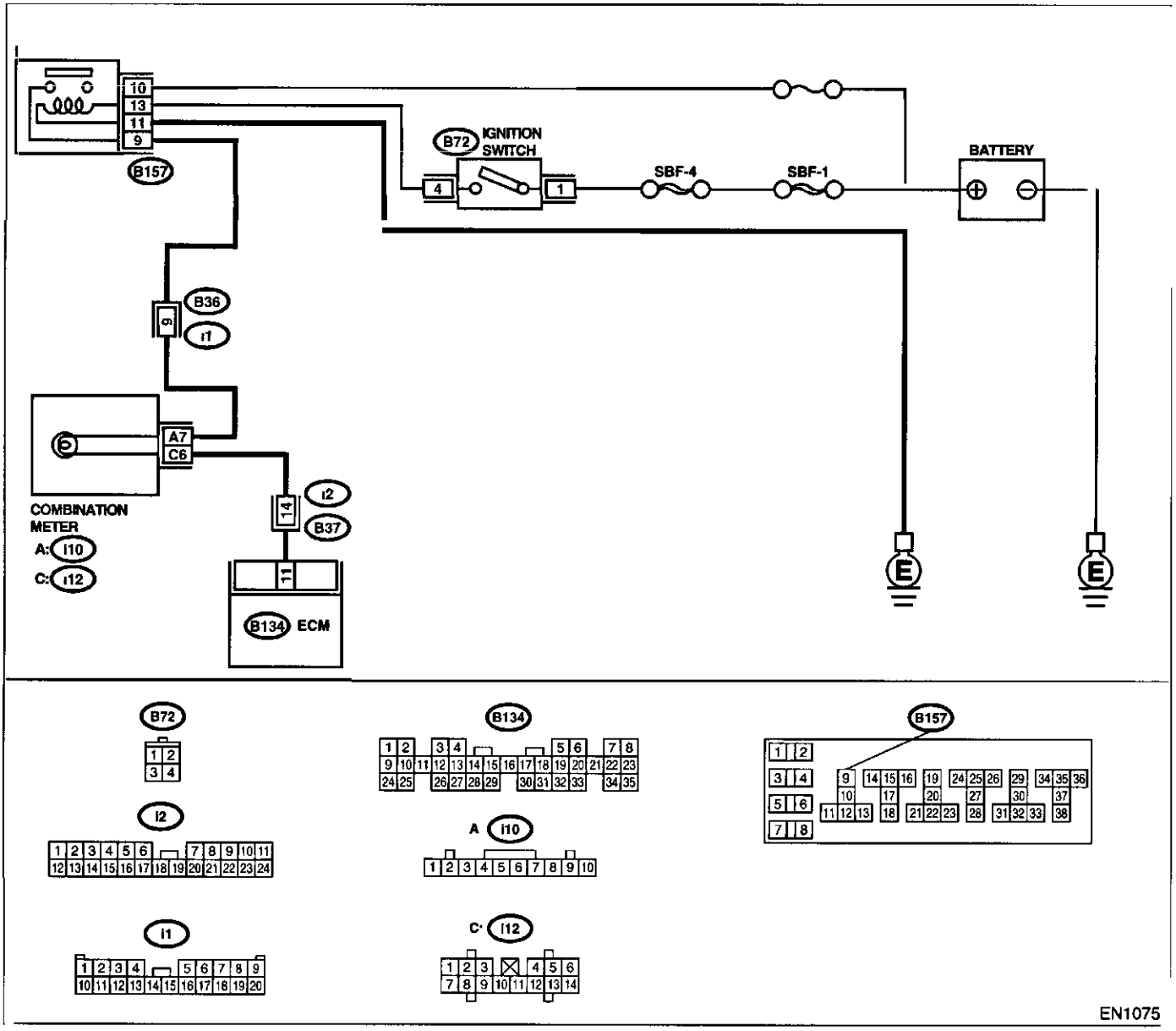
EN1075

Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON 2)Measure the voltage between ECM connector and chassis ground ***Connector & terminal*** ***(B134) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.**	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. <Ref. to IDI-11, Combination Meter Assembly.> 3)Disconnect the connector from ECM and combination meter. 4)Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 11 — (i12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector (i2)
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7	**CHECK LAMP BULB.** Remove the engine malfunction indicator lamp bulb.	Is the lamp bulb condition OK?	Repair combination meter connector.	Replace the lamp bulb.

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

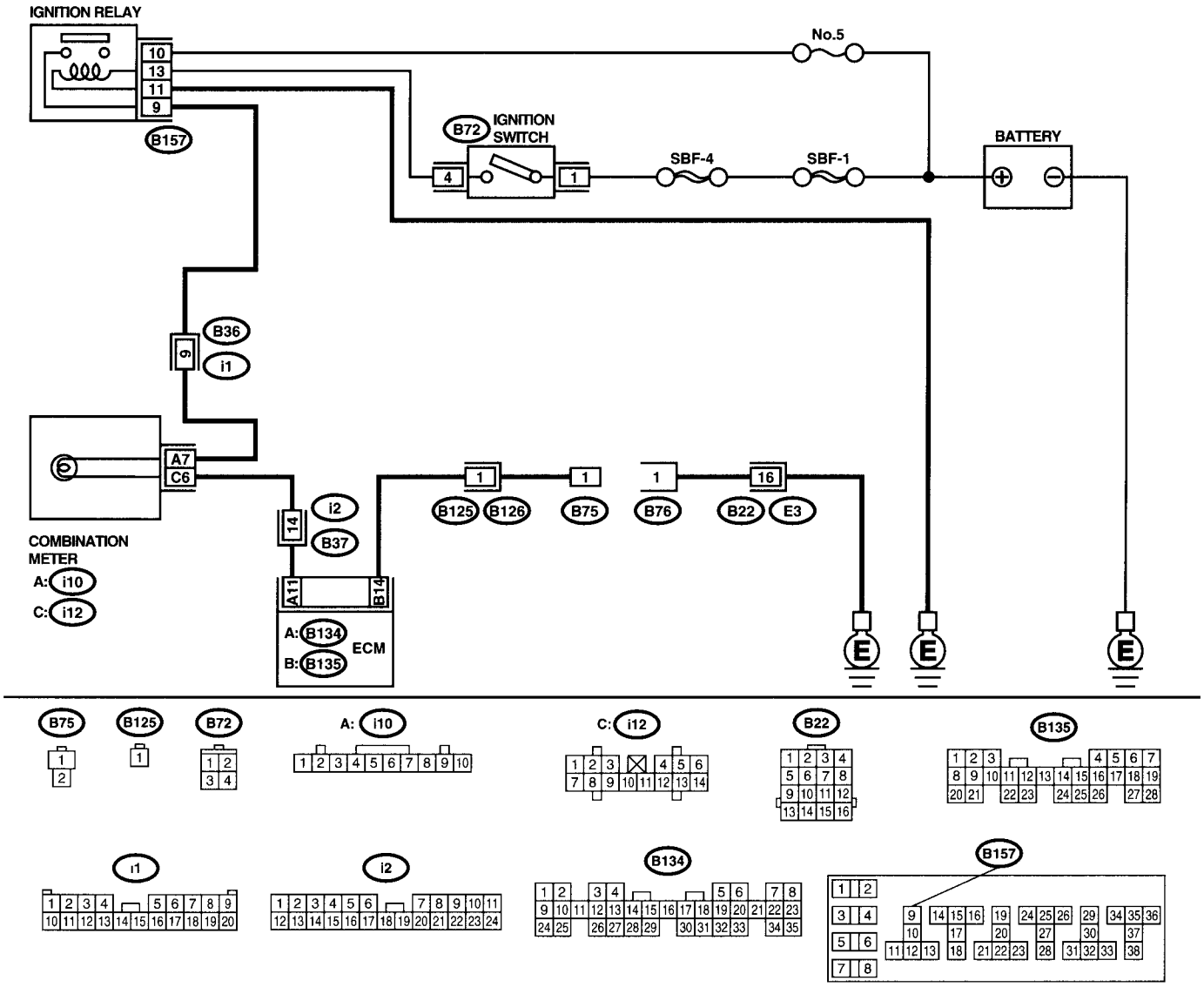
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when the engine runs, trouble code is not shown on the Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON.	Does the MIL come on?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM <Ref. to FU(SOHC)-47, Engine Control Module >.

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is in open.
- **TROUBLE SYMPTOM:**
  - When in inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**

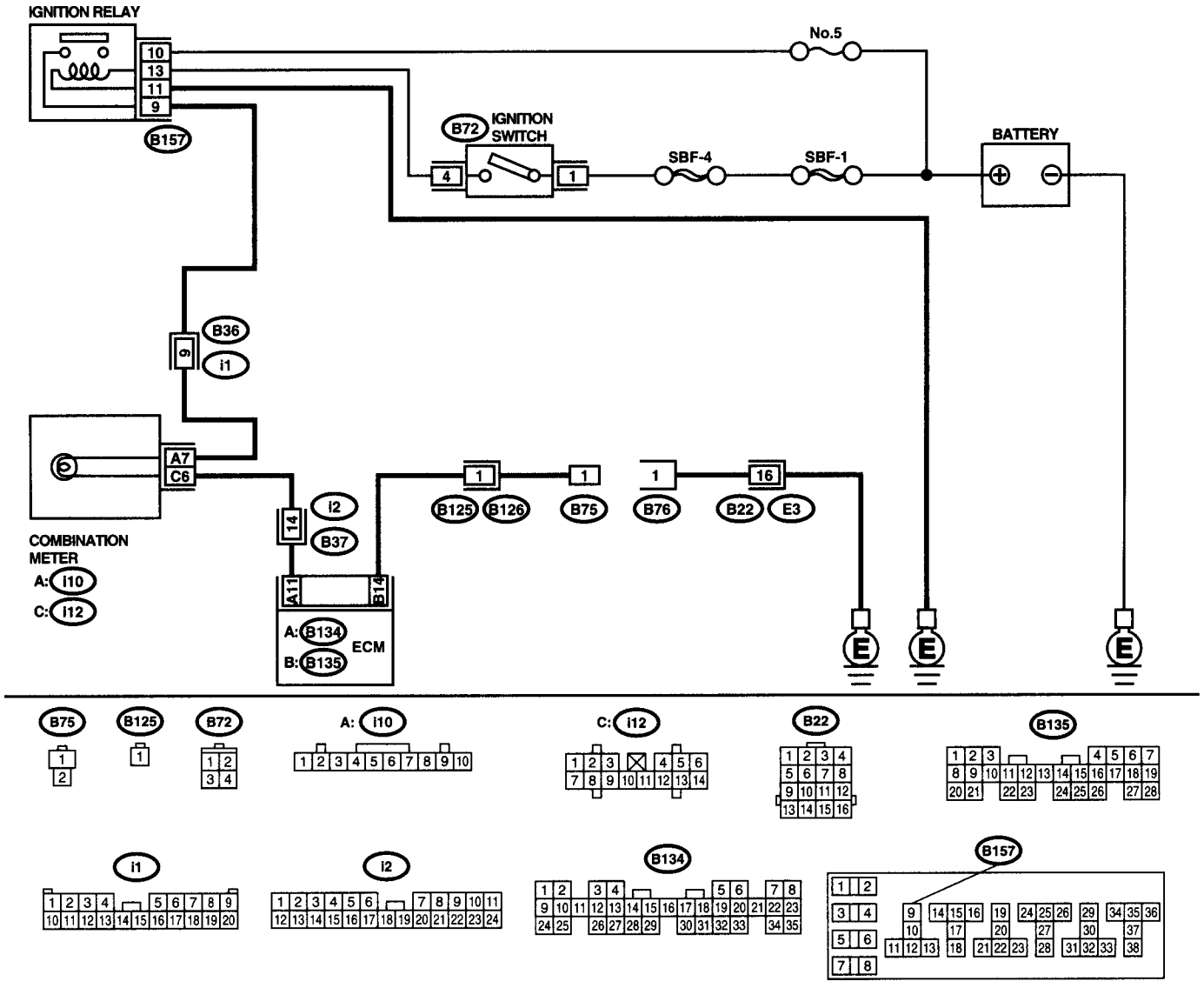


EN1076

	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Turn the ignition switch to OFF. 2)Disconnect the test mode connector. 3)Turn the ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(SOHC)-48, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON.	Does the MIL come on?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1)Connect the test mode connector. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 14 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when the ignition switch is turned to ON.
- **WIRING DIAGRAM:**



EN1076

	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1)Disconnect the test mode connector. 2)Turn the ignition switch to ON.	Does the MIL flash on and off?	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

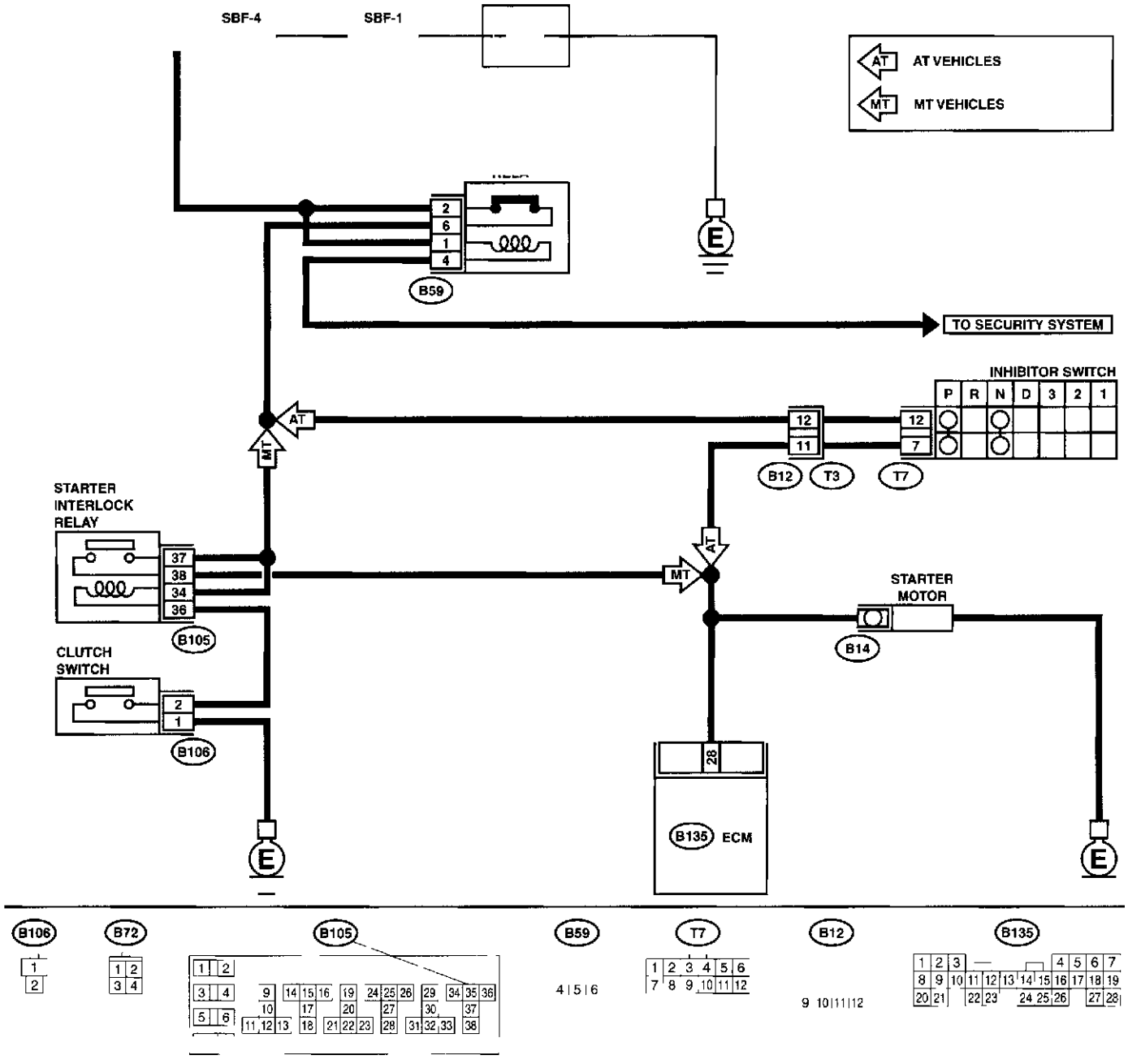
16.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(SOHC)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(SOHC)-62, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(SOHC)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(SOHC)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-43, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.



EN1077

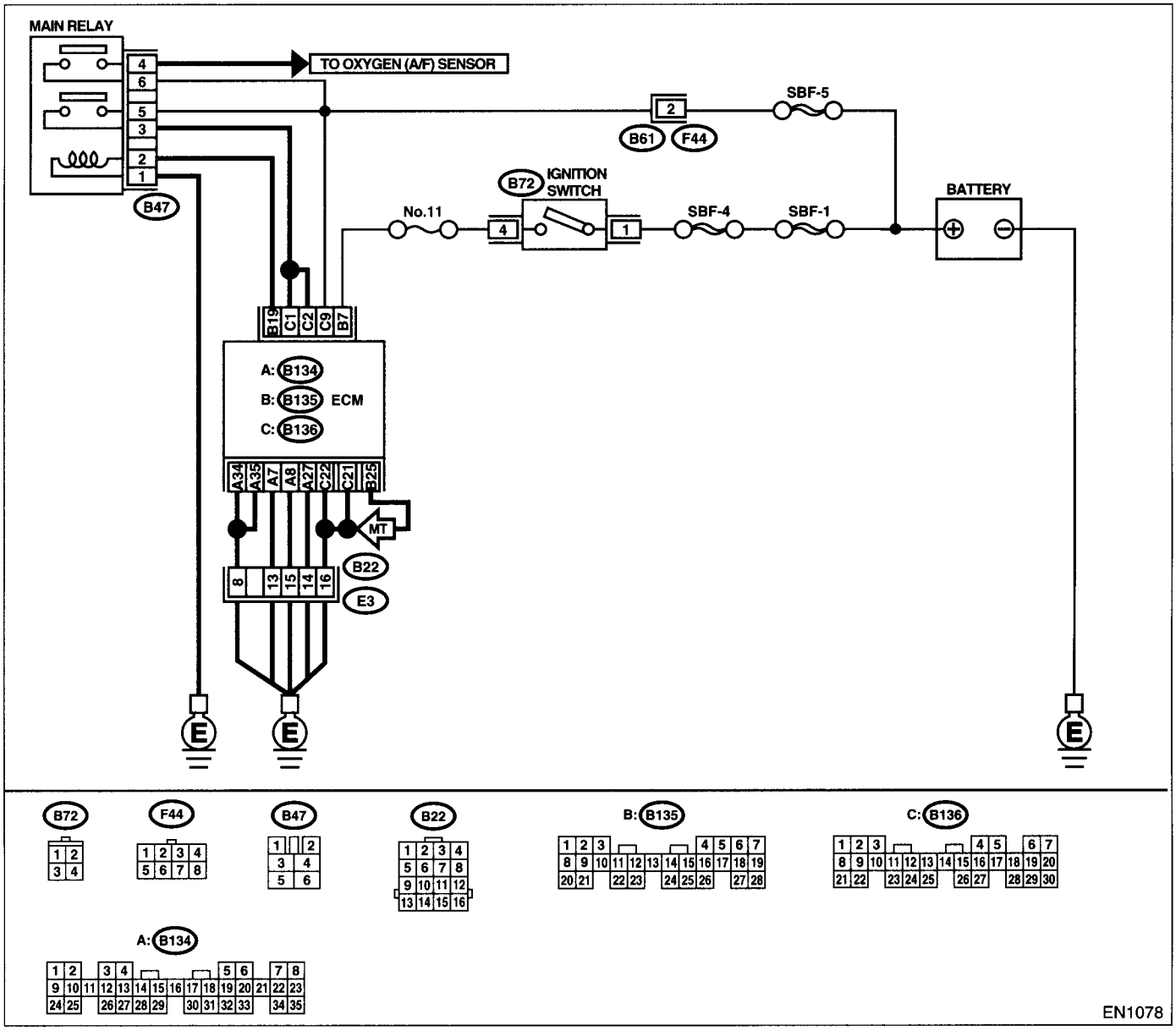
	Step	Check	Yes	No
1	**CHECK BATTERY.**	Is the voltage more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from starter motor. 3)Turn the ignition switch to ST. 4)Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: •On AT vehicles, place the selector lever in the "P" or "N" position. •On MT vehicles, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the terminal from starter motor. 3)Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC-6, Starter.>	Repair open circuit of ground cable.
4	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Disconnect the connector from ignition switch. 2)Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No.1.
5	**CHECK IGNITION SWITCH.** 1)Disconnect the connector from ignition switch. 2)Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **6.**	Replace the ignition switch.
6	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **7.**	Go to step **11.**
7	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from inhibitor switch. 3)Connect the connector to ignition switch. 4)Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>
8	**CHECK INHIBITOR SWITCH.** 1)Place the selector lever in the "P" or "N" position. 2)Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the resistance less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch.<Ref. to AT-28, Inhibitor Switch.>

	Step	Check	Yes	No
9	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from starter interlock relay. 3)Connect the connector to ignition switch. 4)Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to ST. ***Connector & terminal*** ***(B105) No. 37 (+) — Chassis ground (–):*** ***(B105) No. 34 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>
10	**CHECK STARTER INTERLOCK RELAY.** 1)Connect the battery to starter interlock relay terminals No. 34 and No. 36. 2)Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 37 — No. 38:***	Is the resistance less than 1 Ω?	Go to step **11.**	Replace the starter interlock relay.
11	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1)Disconnect the connector from clutch switch. 2)Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair open circuit of ground cable.
12	**CHECK CLUTCH SWITCH.** 1)Measure the resistance between clutch switch terminal while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the clutch switch. <Ref. to CL-30, Clutch Switch.>
13	**CHECK CLUTCH SWITCH CIRCUIT.** 1)Connect the connector to clutch switch. 2)Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B105) No. 36 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair open or ground short circuit in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-43, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-40, Inspection Mode.>

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main relay. 3)Connect the battery to main relay terminals No. 1 and No. 2. 4)Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.

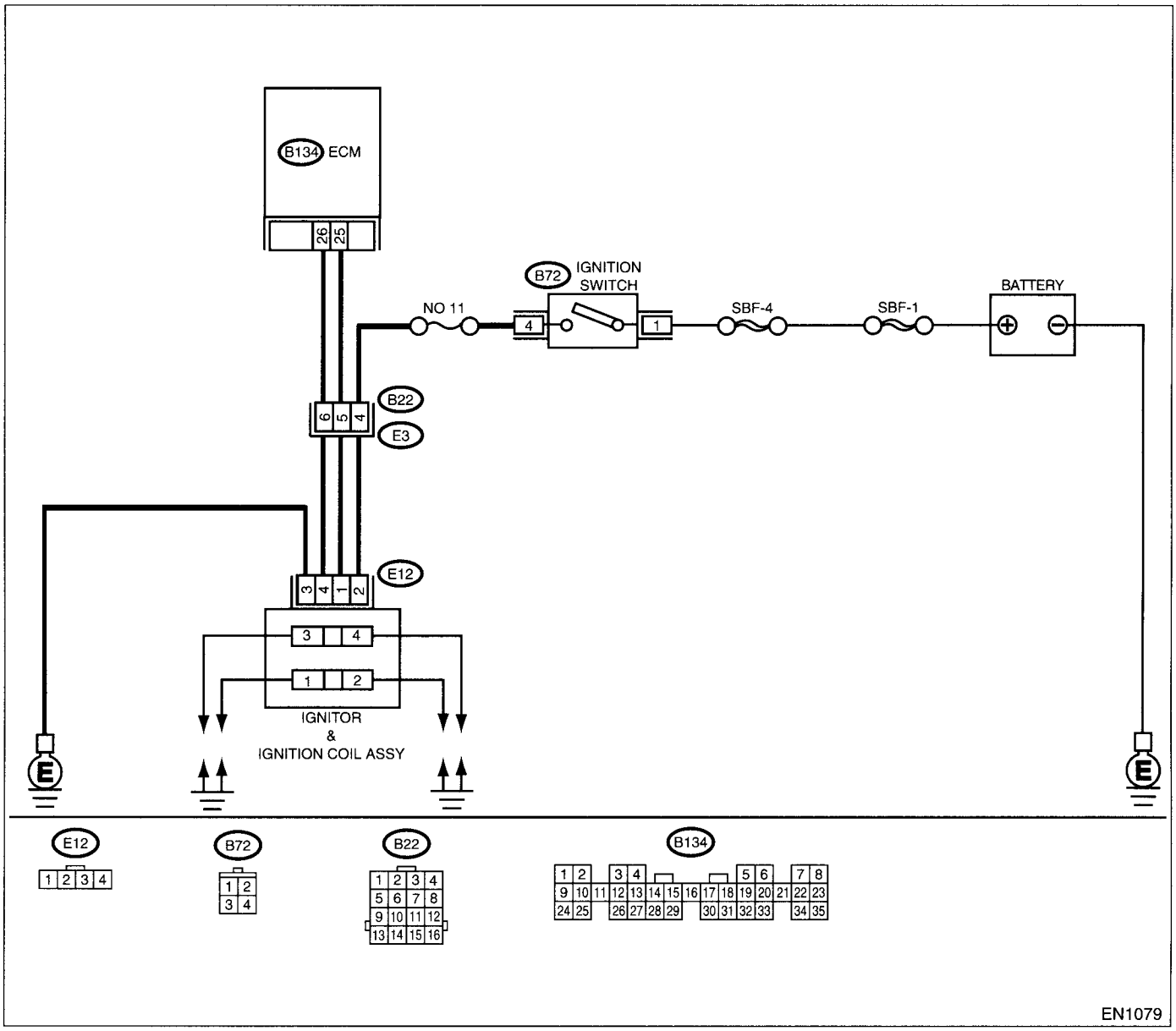
	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:*** ***(B134) No. 27 — Chassis ground:*** ***(B134) No. 8 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 34 — Chassis ground:*** ***(B134) No. 35 — Chassis ground:*** ***(B135) No. 25 — Chassis ground: (MT vehicle)***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Replace the ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.

	Step	Check	Yes	No
10	**CHECK INPUT VOLTAGE OF ECM.** 1)Connect the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B136) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(SOHC)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-43, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK IGNITION SYSTEM FOR SPARKS.** 1)Remove the plug cord cap from each spark plug. 2)Install the new spark plug on plug cord cap. **CAUTION:** **Do not remove the spark plug from engine.** 3)Contact the spark plug's thread portion on engine. 4)While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**

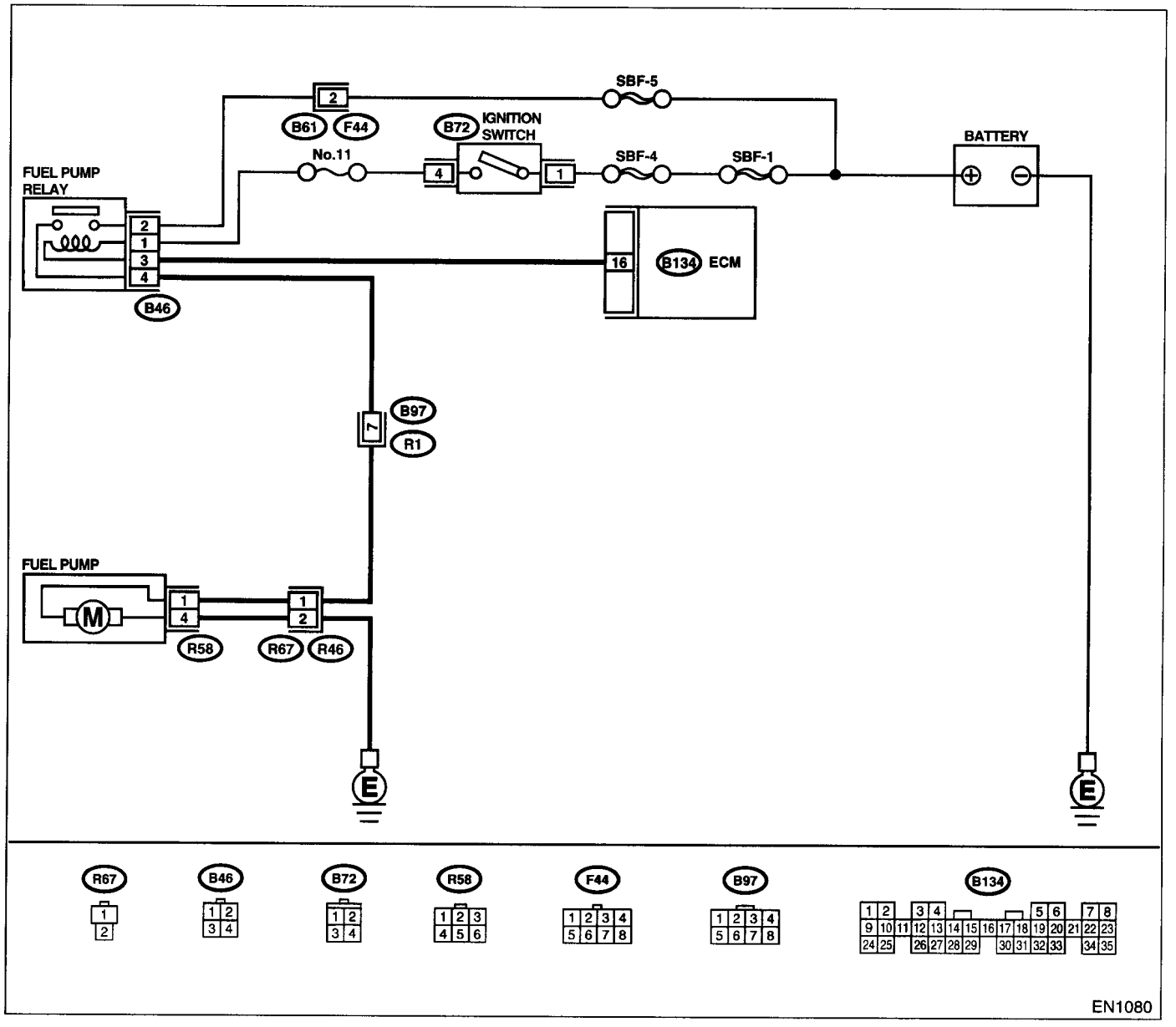
	Step	Check	Yes	No
2	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Turn the ignition switch to OFF 2)Disconnect the connector from ignition coil & ignitor assembly 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground *Connector & terminal* *(E12) No. 2 (+) — Engine ground (–):*	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector NOTE: In this case, repair the following. • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors (B22)
3	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coil & ignitor assembly connector and engine ground. *Connector & terminal* *(E12) No. 3 — Engine ground:*	Is the resistance between less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following. • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
4	**CHECK IGNITION COIL & IGNITOR ASSEMBLY.** 1)Remove the spark plug cords. 2)Measure the resistance between spark plug cord contact portions to check secondary coil. *Terminals* *No. 1 — No. 2:*	Is the resistance between 10 and 15 kΩ?	Go to step **5.**	Replace the ignition coil & ignitor assembly. <Ref. to G(SOHC)-7, Ignition Coil and Ignitor Assembly.>
5	**CHECK IGNITION COIL & IGNITOR ASSEMBLY.** Measure the resistance between spark plug cord contact portions to check secondary coil. *Terminals* *No. 3 — No. 4:*	Is the resistance between 10 and 15 kΩ?	Go to step **6.**	Replace the ignition coil & ignitor assembly. <Ref to G(SOHC)-7, Ignition Coil and Ignitor Assembly >
6	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Connect the connector to ignition coil & ignitor assembly 2)Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. *Connector & terminal* *(E12) No. 1 (+) — Engine ground (–):*	Is the voltage more than 10 V?	Go to step **7.**	Replace the ignition coil & ignitor assembly. <Ref. to IG(SOHC)-7, Ignition Coil and Ignitor Assembly.>
7	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. *Connector & terminal* *(E12) No. 4 (+) — Engine ground (–):*	Is the voltage more than 10 V?	Go to step **8.**	Replace the ignition coil & ignitor assembly. <Ref. to IG(SOHC)-7, Ignition Coil and Ignitor Assembly.>

	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Disconnect the connector from ignition coil & ignitor assembly. 4)Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B134) No. 25 — (E12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector (B22)
9	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B134) No. 26 — (E12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector (B22)
10	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 25 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
11	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 26 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
12	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(SOHC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(SOHC)-43, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**

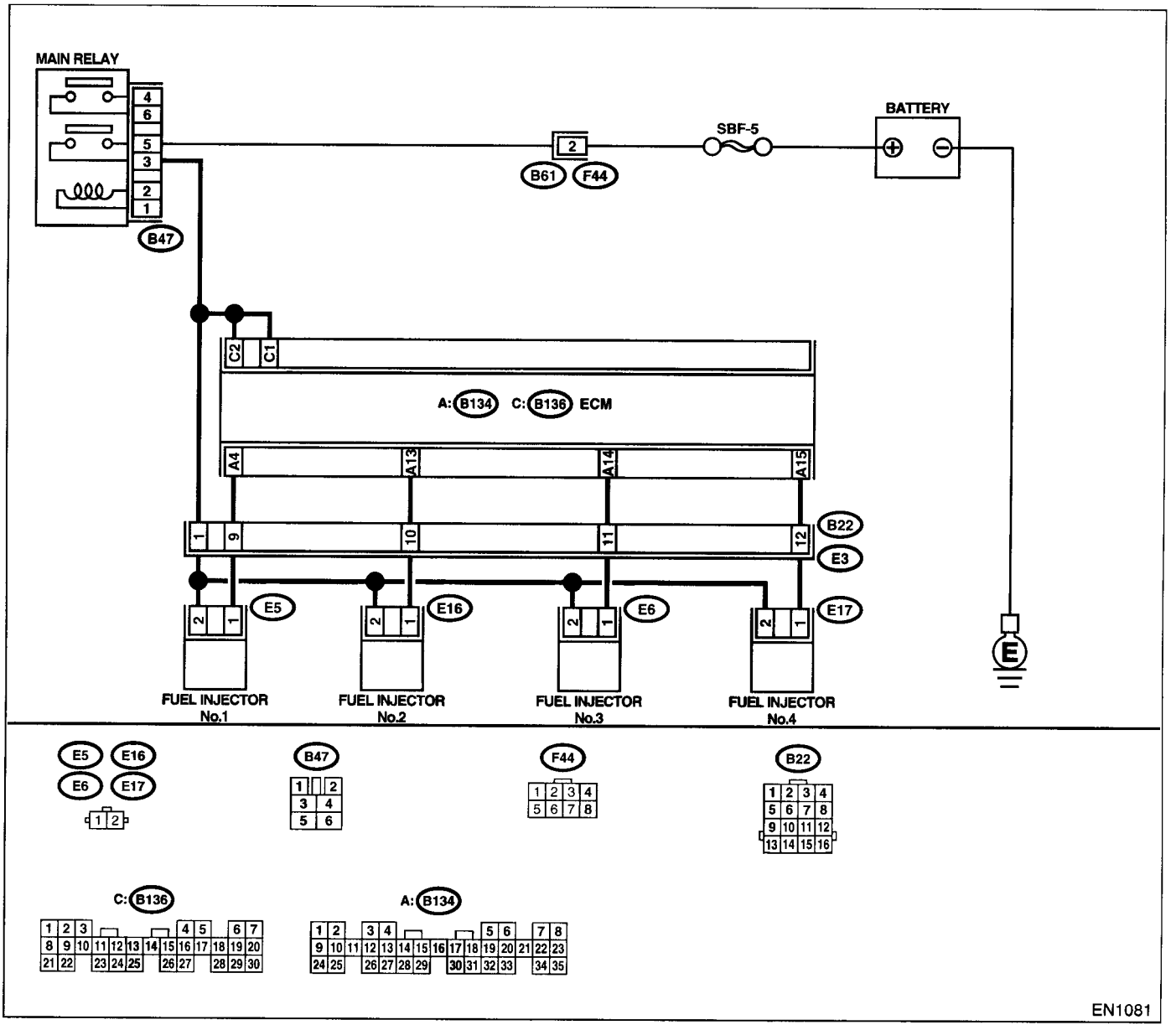


	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(SOHC)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1)Turn the ignition switch to OFF. 2)Remove the fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon). 3)Disconnect the connector from fuel pump. 4)Measure the resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector (R67)
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1)Turn the ignition switch to ON. 2)Measure the voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the fuel pump. <Ref. to FU(SOHC)-59, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 1 — (B46) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors (R67 and B97)
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.

	Step	Check	Yes	No
6	**CHECK FUEL PUMP RELAY.** 1)Disconnect the connectors from fuel pump relay and main relay. 2)Remove the fuel pump relay and main relay with bracket. 3)Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4)Measure the resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the fuel pump relay. <Ref. to FU(SOHC)-49, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1)Disconnect the connectors from ECM. 2)Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B134) No. 16 — (B46) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(SOHC)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(SOHC)-43, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(SOHC)-40, Inspection Mode.>**
- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to the injector for this check.	Is the fuel injector emits "operating" sound?	Check the fuel pressure. <Ref. to ME(SOHC)-28, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from #1 cylinder fuel injector. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 4 — (B136) No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 13 — (B136) No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
6	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 14 — (B136) No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
8	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **9.**
9	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 15 — (B136) No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **10.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
10	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **11.**
11	**CHECK EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **12.**	Replace the faulty fuel injector.
12	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(SOHC)-330, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0031	Front oxygen (A/F) sensor heater circuit low input	<Ref. to EN(SOHC)-84, DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	Front oxygen (A/F) sensor heater circuit high input	<Ref. to EN(SOHC)-88, DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	Rear oxygen sensor heater circuit malfunction	<Ref. to EN(SOHC)-90, DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	Rear oxygen sensor heater circuit high input	<Ref. to EN(SOHC)-94, DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0065	Air assist injector solenoid valve malfunction	<Ref. to EN(SOHC)-96, DTC P0065 — AIR ASSIST INJECTOR SOLENOID VALVE MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0066	Air assist injector solenoid valve circuit low input	<Ref. to EN(SOHC)-98, DTC P0066 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0067	Air assist injector solenoid valve circuit high input	<Ref. to EN(SOHC)-100, DTC P0067 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0106	Pressure sensor circuit range/performance problem (low input)	<Ref. to EN(SOHC)-102, DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Pressure sensor circuit low input	<Ref. to EN(SOHC)-104, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN(SOHC)-108, DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature sensor circuit range/performance problem	<Ref. to EN(SOHC)-112, DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature sensor circuit low input	<Ref. to EN(SOHC)-114, DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature sensor circuit high input	<Ref. to EN(SOHC)-116, DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature sensor circuit low input	<Ref. to EN(SOHC)-120, DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature sensor circuit high input	<Ref. to EN(SOHC)-122, DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle position sensor circuit range/performance problem (high input)	<Ref. to EN(SOHC)-126, DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle position sensor circuit low input	<Ref. to EN(SOHC)-128, DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0123	Throttle position sensor circuit high input	<Ref. to EN(SOHC)-132, DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(SOHC)-134, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Thermostat malfunction	<Ref. to EN(SOHC)-136, DTC P0128 — THERMOSTAT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	Front oxygen (A/F) sensor circuit range/performance problem (Lean)	<Ref. to EN(SOHC)-138, DTC P0130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	Front oxygen (A/F) sensor circuit malfunction (open circuit)	<Ref. to EN(SOHC)-142, DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	Front oxygen (A/F) sensor circuit malfunction (short circuit)	<Ref. to EN(SOHC)-144, DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	Front oxygen (A/F) sensor circuit slow response	<Ref. to EN(SOHC)-146, DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	Rear oxygen sensor circuit malfunction	<Ref. to EN(SOHC)-148, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN(SOHC)-152, DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	Fuel trim malfunction (A/F too Lean)	<Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	Fuel trim malfunction (A/F too Rich)	<Ref. to EN(SOHC)-154, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor A circuit range/performance problem	<Ref. to EN(SOHC)-156, DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor A circuit low input	<Ref. to EN(SOHC)-158, DTC P0182 — FUEL TEMPERATURE SENSOR A CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel temperature sensor A circuit high input	<Ref. to EN(SOHC)-160, DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(SOHC)-163, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(SOHC)-163, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(SOHC)-163, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(SOHC)-164, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor circuit low input	<Ref. to EN(SOHC)-170, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN(SOHC)-172, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(SOHC)-174, DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0336	Crankshaft position sensor circuit range/performance problem	<Ref. to EN(SOHC)-176, DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor circuit malfunction	<Ref. to EN(SOHC)-178, DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor circuit range/performance problem	<Ref. to EN(SOHC)-180, DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold	<Ref. to EN(SOHC)-184, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system malfunction	<Ref. to EN(SOHC)-187, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0444	Evaporative emission control system purge control valve circuit low input	<Ref. to EN(SOHC)-192, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative emission control system purge control valve circuit high input	<Ref. to EN(SOHC)-196, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control low input	<Ref. to EN(SOHC)-198, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control high input	<Ref. to EN(SOHC)-202, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance problem	<Ref. to EN(SOHC)-204, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(SOHC)-206, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative emission control system pressure sensor high input	<Ref. to EN(SOHC)-210, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative emission control system malfunction	<Ref. to EN(SOHC)-213, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(SOHC)-218, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(SOHC)-220, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(SOHC)-224, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN(SOHC)-228, DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0480	Cooling fan relay 1 circuit low input	<Ref. to EN(SOHC)-231, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(SOHC)-235, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN(SOHC)-238, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0506	Idle control system RPM lower than expected	<Ref. to EN(SOHC)-240, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle control system RPM higher than expected	<Ref. to EN(SOHC)-242, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(SOHC)-245, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module memory check sum error	<Ref. to EN(SOHC)-248, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN(SOHC)-250, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor (Front vehicle speed sensor) circuit malfunction	<Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine speed input circuit malfunction	<Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(SOHC)-252, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(SOHC)-252, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(SOHC)-252, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(SOHC)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch system malfunction	<Ref. to EN(SOHC)-254, DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical	<Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-86, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	2-4 brake pressure control solenoid valve circuit malfunction	<Ref. to AT-90, DTC 76 2–4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	2-4 brake timing control solenoid valve circuit malfunction	<Ref. to AT-82, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor low input	<Ref. to EN(SOHC)-256, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor high input	<Ref. to EN(SOHC)-260, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor range/performance problem	<Ref. to EN(SOHC)-264, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1137	Front oxygen (A/F) sensor circuit range/perfomance problem	<Ref. to EN(SOHC)-266, DTC P1137 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1142	Throttle position sensor circuit range/performance problem (low input)	<Ref. to EN(SOHC)-270, DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1146	Pressure sensor circuit range/performance problem (high input)	<Ref. to EN(SOHC)-272, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low input	<Ref. to EN(SOHC)-274, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high input	<Ref. to EN(SOHC)-278, P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1442	Fuel level sensor circuit range/performance problem 2	<Ref. to EN(SOHC)-280, DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Evaporative emission control system vent control function problem	<Ref. to EN(SOHC)-282, DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1480	Cooling fan relay 1 circuit high input	<Ref. to EN(SOHC)-285, DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1507	Idle control system malfunction (fail-safe)	<Ref. to EN(SOHC)-288, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	Idle air control solenoid valve signal 1 circuit low input	<Ref. to EN(SOHC)-290, DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	Idle air control solenoid valve signal 1 circuit high input	<Ref. to EN(SOHC)-290, DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	Idle air control solenoid valve signal 2 circuit low input	<Ref. to EN(SOHC)-290, DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	Idle air control solenoid valve signal 2 circuit high input	<Ref. to EN(SOHC)-290, DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	Idle air control solenoid valve signal 3 circuit low input	<Ref. to EN(SOHC)-290, DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	Idle air control solenoid valve signal 3 circuit high input	<Ref. to EN(SOHC)-290, DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	Idle air control solenoid valve signal 4 circuit low input	<Ref. to EN(SOHC)-292, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	Idle air control solenoid valve signal 4 circuit high input	<Ref. to EN(SOHC)-296, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(SOHC)-299, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1540	Vehicle speed sensor malfunction 2	<Ref. to EN(SOHC)-302, DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P1560	Back-up voltage circuit malfunction	<Ref. to EN(SOHC)-304, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1590	Neutral position switch circuit high input	<Ref. to EN(SOHC)-306, DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1591	Neutral position switch circuit low input	<Ref. to EN(SOHC)-310, DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1592	Neutral position switch circuit (MT model)	<Ref. to EN(SOHC)-312, DTC P1592 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1594	Automatic transmission diagnosis input signal circuit malfunction	<Ref. to EN(SOHC)-314, DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1595	Automatic transmission diagnosis input signal circuit low input	<Ref. to EN(SOHC)-316, DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1596	Automatic transmission diagnosis input signal circuit high input	<Ref. to EN(SOHC)-318, DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit low input	<Ref. to EN(SOHC)-320, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit high input	<Ref. to EN(SOHC)-322, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for automatic transmission	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN(SOHC)-324, DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1703	Low clutch timing control solenoid valve circuit malfunction	<Ref. to AT-78, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN(SOHC)-326, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal 2 circuit malfunction	<Ref. to EN(SOHC)-328, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

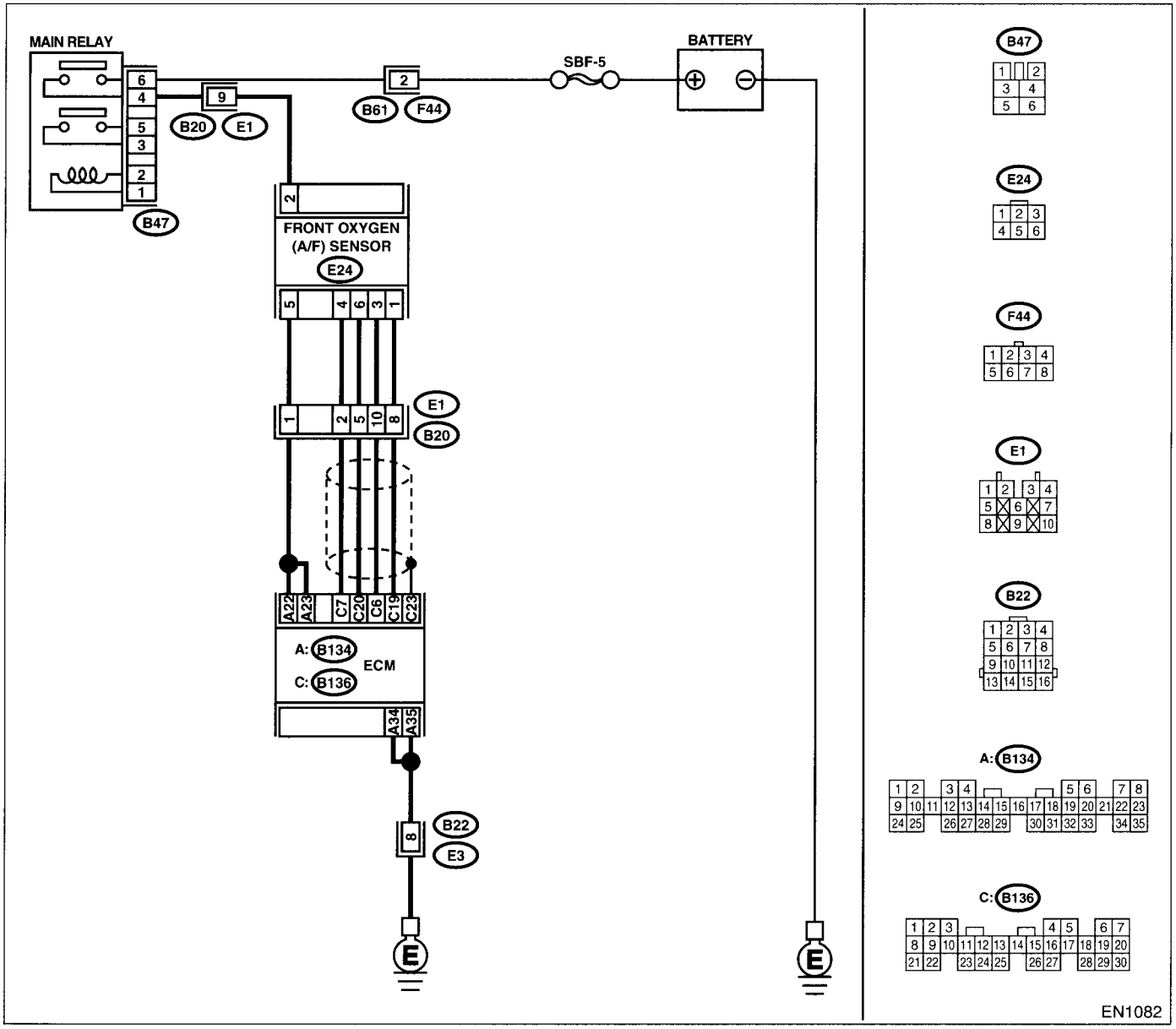
18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031 and P0037 at the same time?	Go to step **2.**	Go to step **5.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from front oxygen (A/F) sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E24) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 35 — Chassis ground:*** ***(B134) No. 34 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector (B22)
4	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 22 (+) — Chassis ground (–):***	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step **7.**
7	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Go to step **9.**	Go to step **8.**

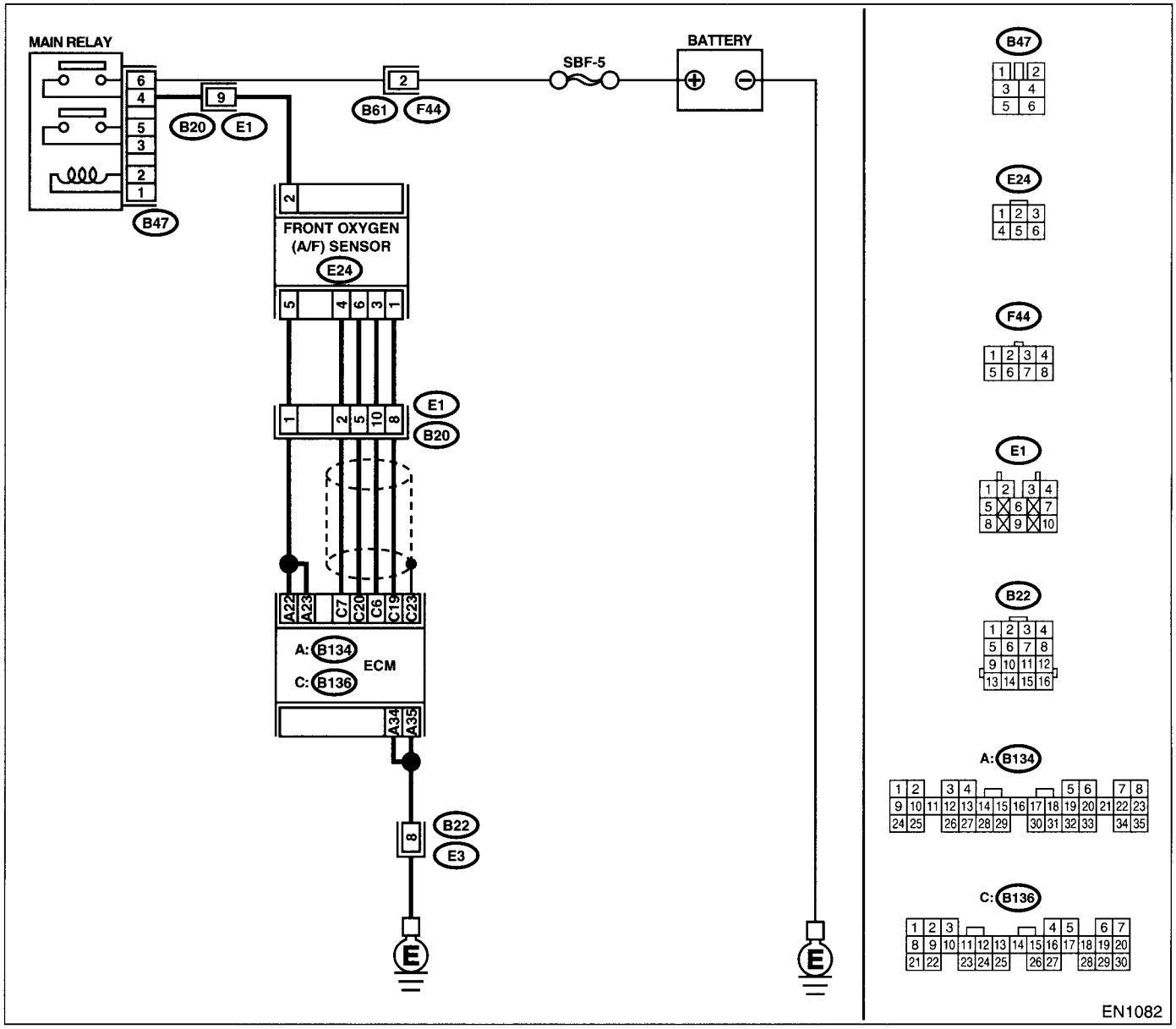
	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):***	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step **9.**
9	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 5:***	Is the resistance less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-50, Fuel.>

B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**

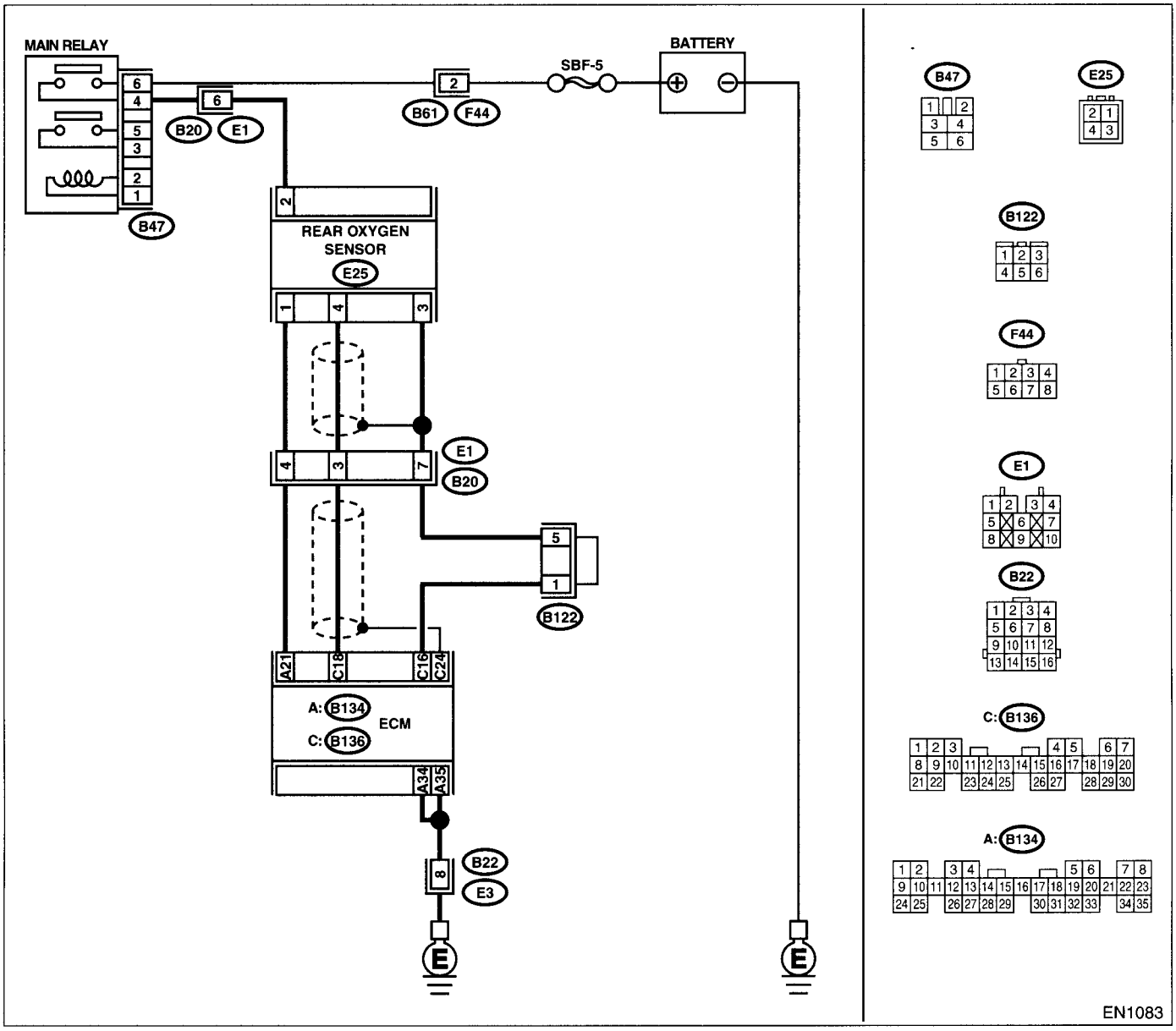
	Step	Check	Yes	No
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.3 A?	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	END
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):***	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 22 (+) — Chassis ground (–):***	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, **Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40,** OPERATION, **Inspection Mode.>.**

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 35 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Repair the harness and connector. NOTE: In this case, repair the following: •Open circuit in harness between ECM and engine ground terminal •Poor contact in ECM connector •Poor contact in coupling connector (B22) 1)Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
3	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 21 (+) — Chassis ground (–):***	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Disconnect the connector from rear oxygen sensor. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 1.0 V?	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

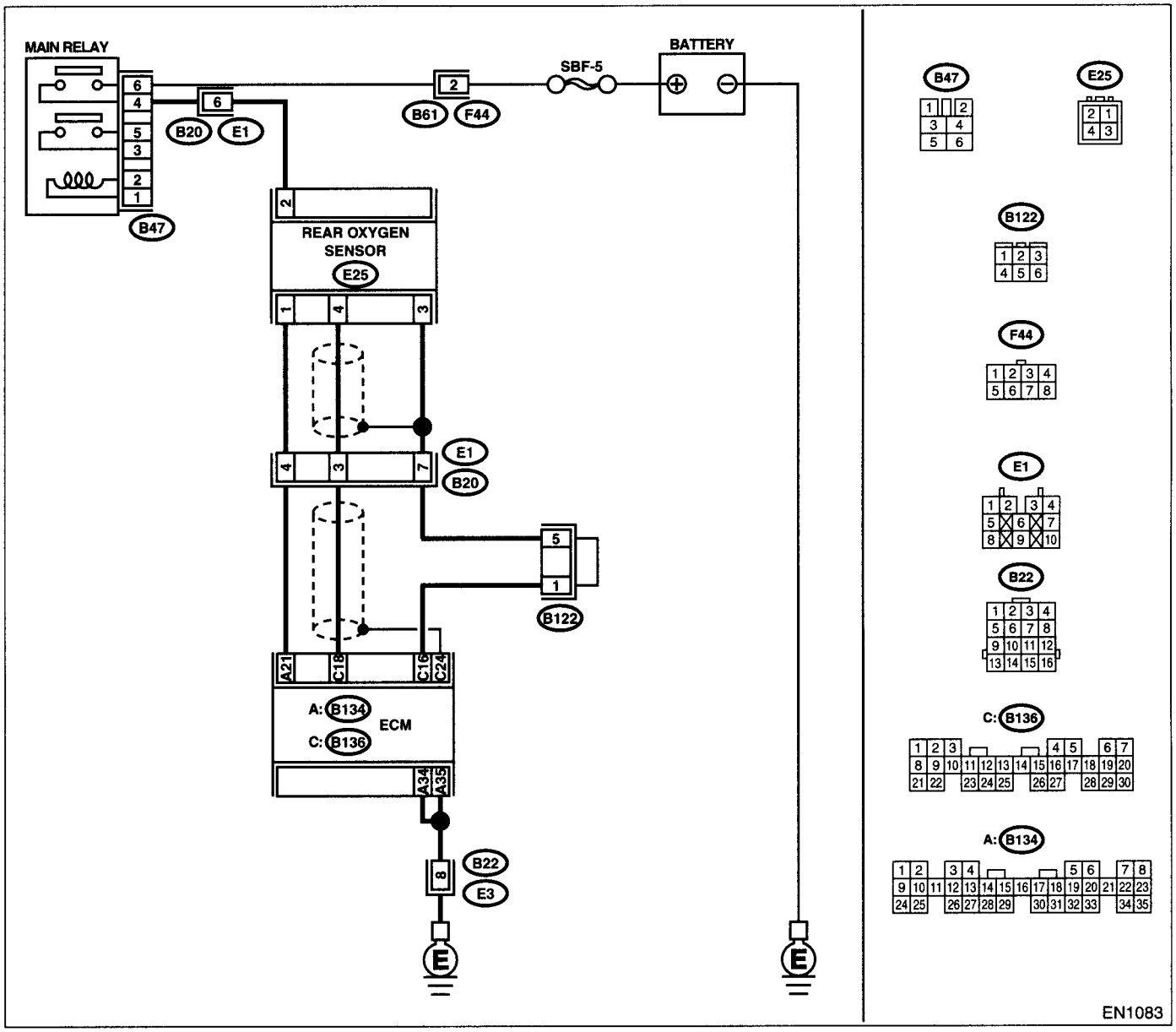
	Step	Check	Yes	No
7	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(E25) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector (E1)
8	**CHECK REAR OXYGEN SENSOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (E1)	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-45, Rear Oxygen Sensor.>

D: DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**

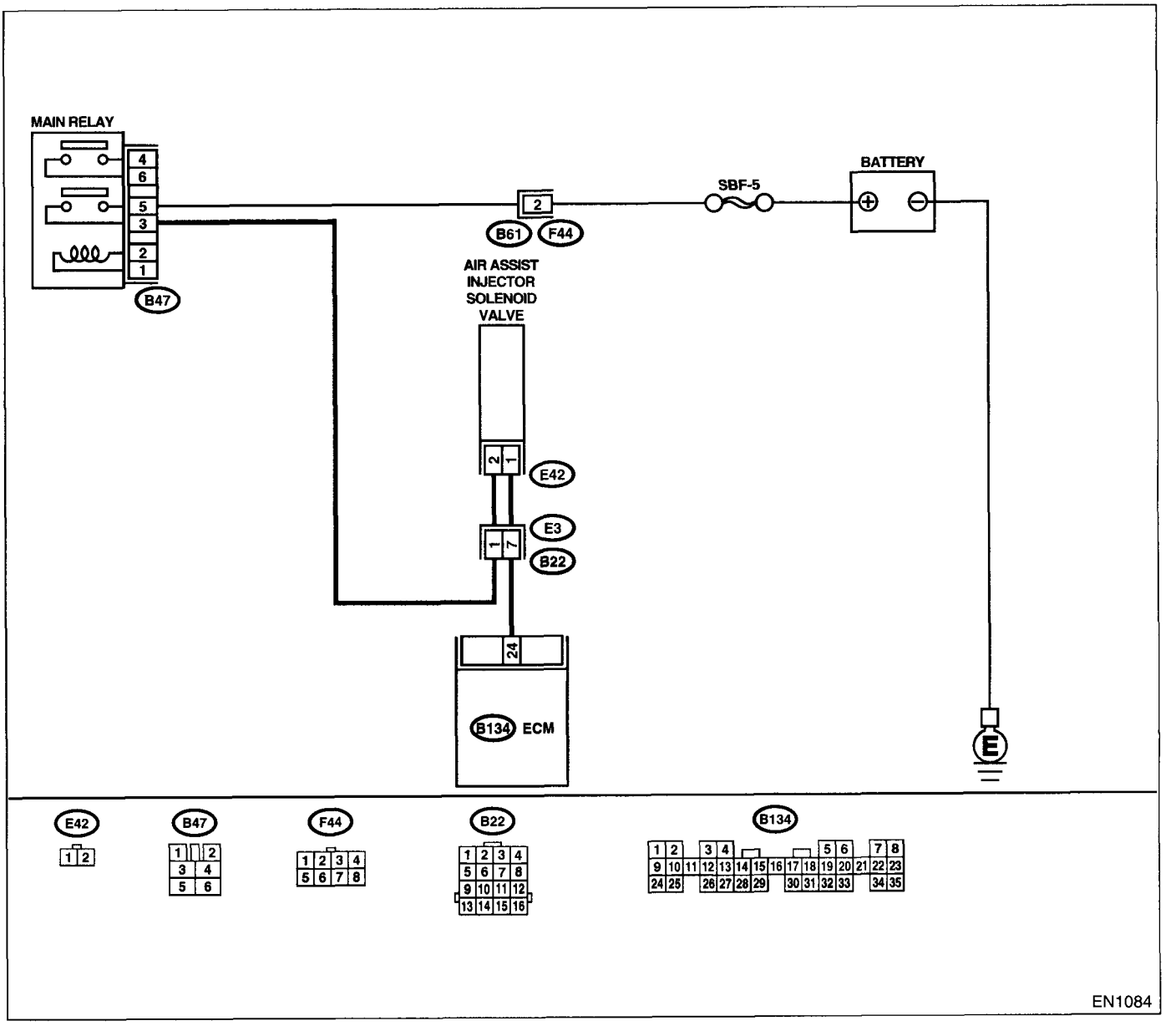
	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 7 A?	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

E: DTC P0065 — AIR ASSIST INJECTOR SOLENOID VALVE MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



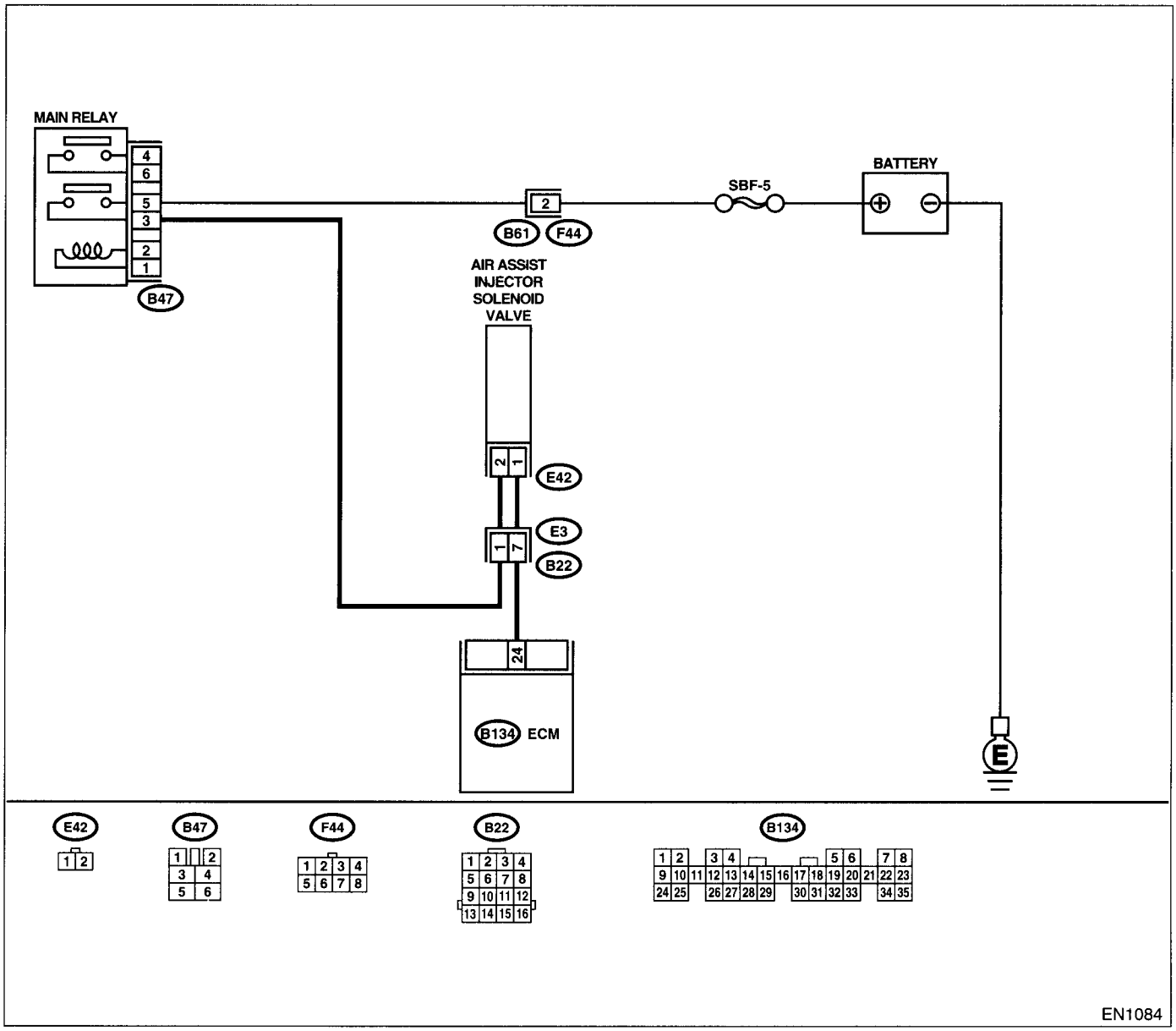
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR ASSIST INJECTOR SOLENOID VALVE OPERATION.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)Operate the air assist injector solenoid valve. NOTE: Air assist injector solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Does the air assist injector solenoid valve operating sound?	Go to step **3.**	Replace the air assist injector solenoid valve. <Ref. to FU(SOHC)-37, Air Assist Injector Solenoid Valve.>
3	**CHECK AIR BY-PASS HOSES.** Use your mouth to blow through the air by-pass hose to make sure that there is a smooth air flow (no clogging).	Is the air by-pass hose damaged?	Repair or replace the air by-pass hoses.	Go to step **4.**
4	**CHECK FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the fuel injector. <Ref. to FU(SOHC)-38, REMOVAL, Fuel Injector.> 3)Check for clogged fuel injectors.	Is the fuel injector clogged?	Replace the fuel injector. <Ref. to FU(SOHC)-41, INSTALLATION, Fuel Injector.>	Replace the air assist injector solenoid valve. <Ref. to FU(SOHC)-37, Air Assist Injector Solenoid Valve.>

F: DTC P0066 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



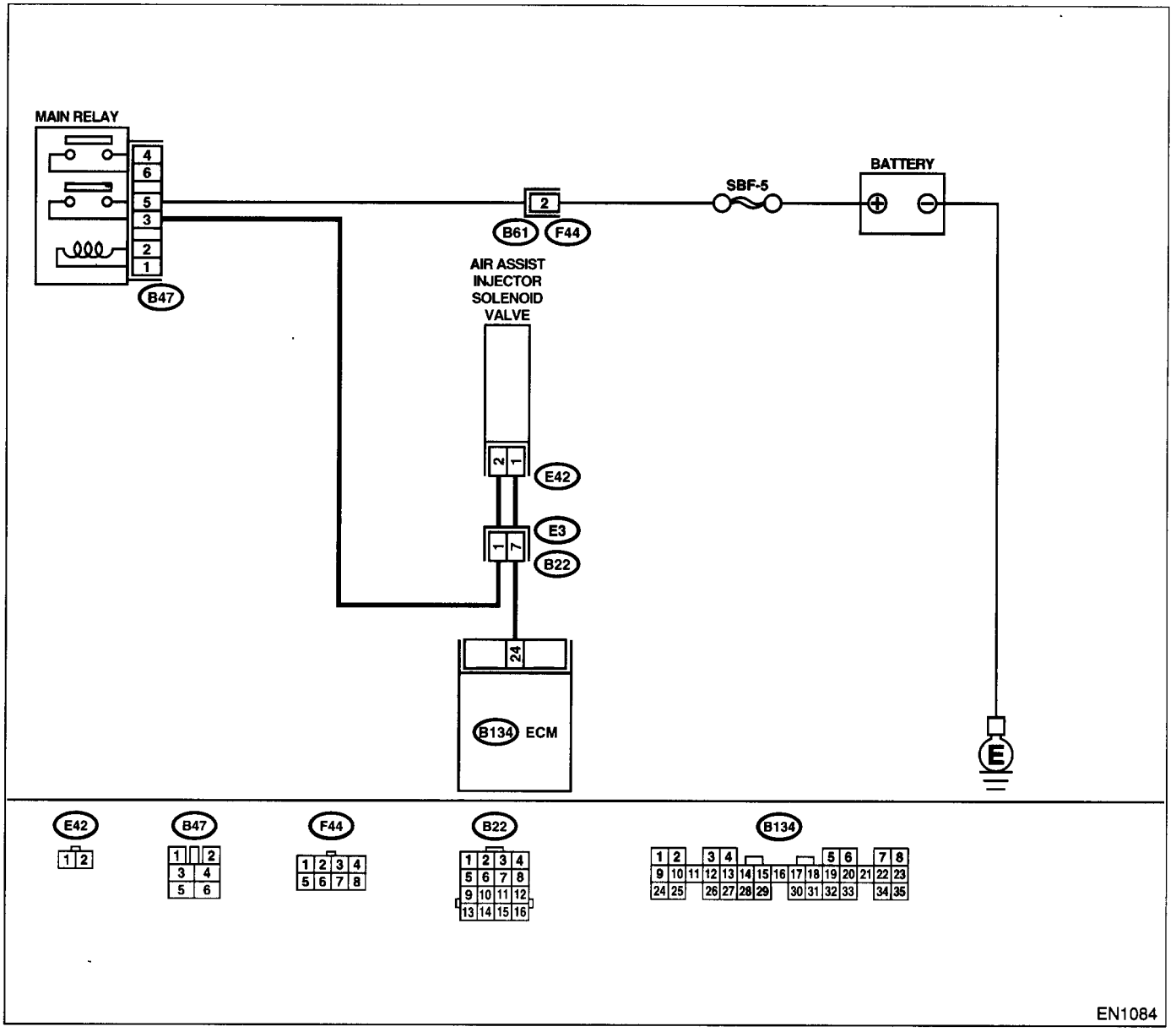
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO AIR ASSIST INJECTOR SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from air assist injector solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between air assist injector solenoid valve and engine ground. ***Connector & terminal*** ***(E42) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between air assist injector solenoid valve and main relay connector • Poor contact in coupling connector (B22)
3	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and air assist injector solenoid valve connector. ***Connector & terminal*** ***(B134) No. 24 — (E42) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and air assist injector solenoid valve connector • Poor contact in coupling connector (B22)
4	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and air assist injector solenoid valve connector.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM and air assist injector solenoid valve connectors.	Is there poor contact in ECM and air assist injector solenoid valve connectors?	Repair poor contact in ECM and air assist injector solenoid valve connectors.	Replace the air assist injector solenoid valve. <Ref. to FU(SOHC)-37, Air Assist Injector Solenoid Valve.>

G: DTC P0067 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



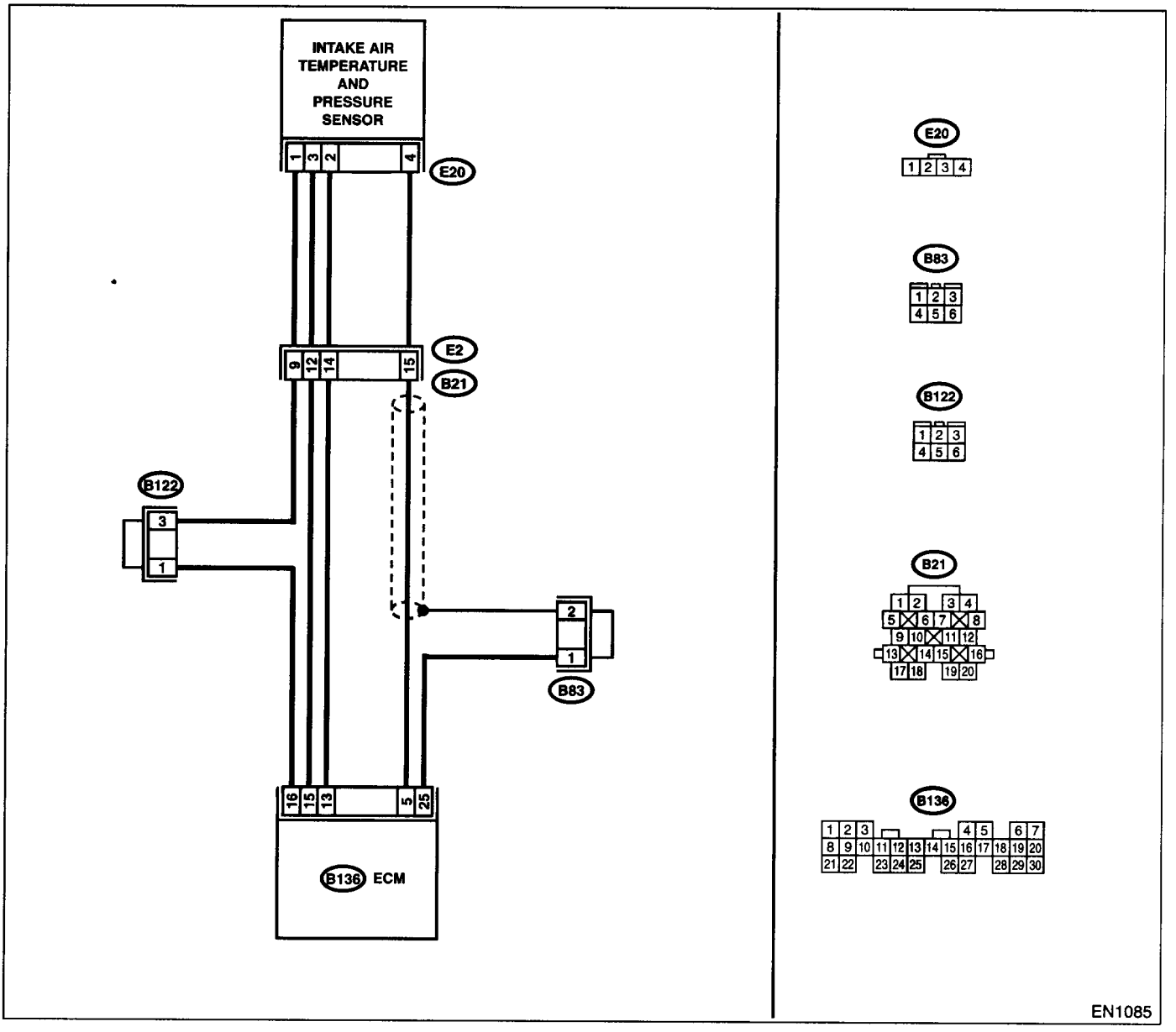
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from air assist injector solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Replace the air assist injector solenoid valve <Ref. to FU(SOHC)-37, Air Assist Injector Solenoid Valve.> and ECM <Ref. to FU(SOHC)-47, Engine Control Module.>
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. • ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Insepction by DTM is required, because probable cause is deterioration of multiple parts.

H: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



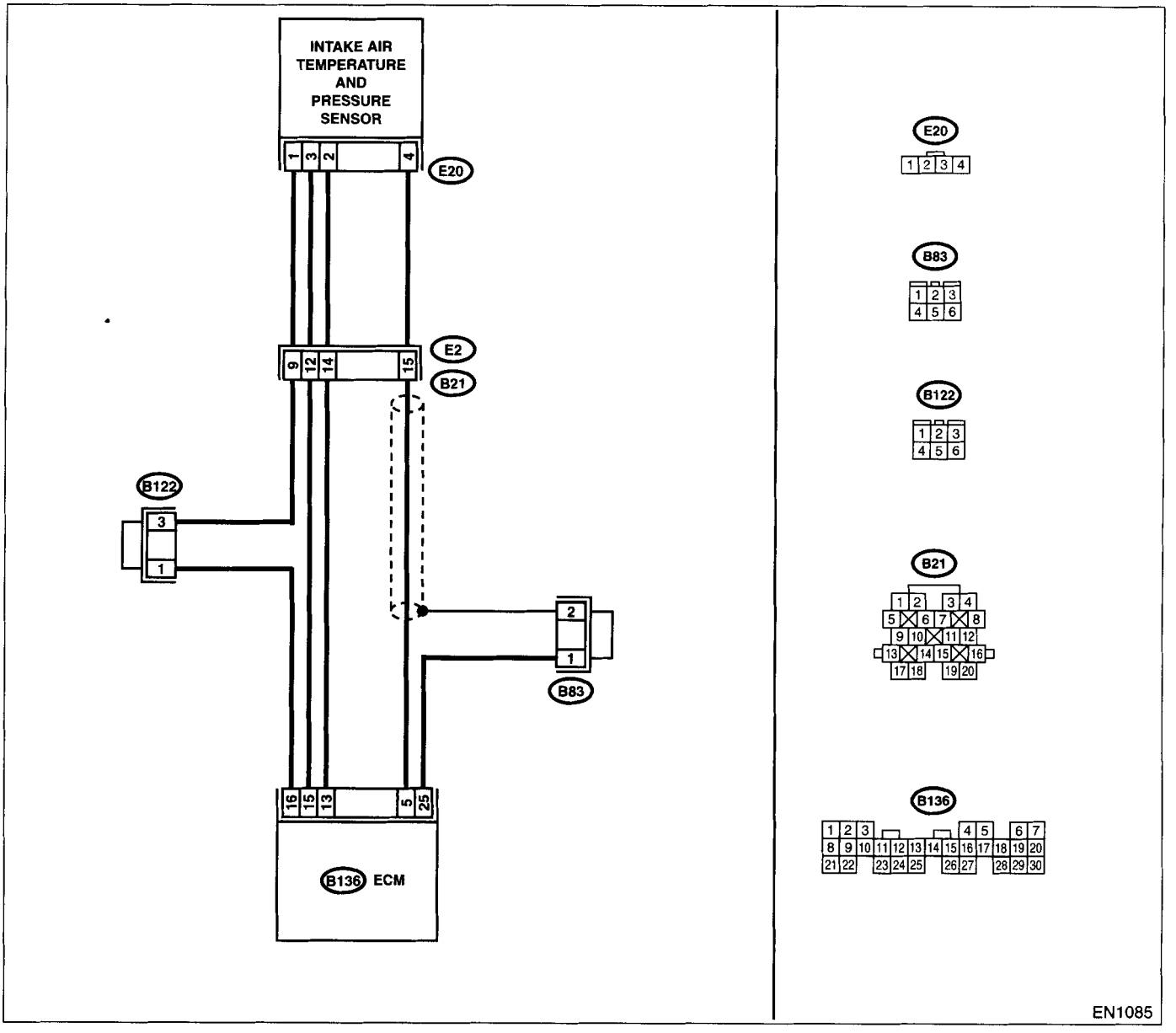
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in the selector lever in "N" or "P" position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure ***Ignition ON*** ***73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)*** ***Idling*** ***20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)***	Is the value within the specifications?	Go to step **4.**	Replace the intake air temperature sensor and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

I: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
CHECK CURRENT DATA. 1)Start the engine 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool NOTE •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or pressure sensor connector	Even if MIL lights up, the circuit has returned to a normal condition at this time
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector	Contact with SOA (distributor) service NOTE Inspection by DTM is required, because probable cause is deterioration of multiple parts
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **7.**	Go to step **6.**
CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE. •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE" <Ref to EN(SOHC)-32, Subaru Select Monitor >	Does the value change more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector	Go to step **7.**
CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn the ignition switch to OFF 2)Disconnect the connector from intake air temperature and pressure sensor 3)Turn the ignition switch to ON 4)Measure the voltage between intake air temperature sensor and pressure sensor connector and engine ground ***Connector & terminal*** ***(E20) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **8.**	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.

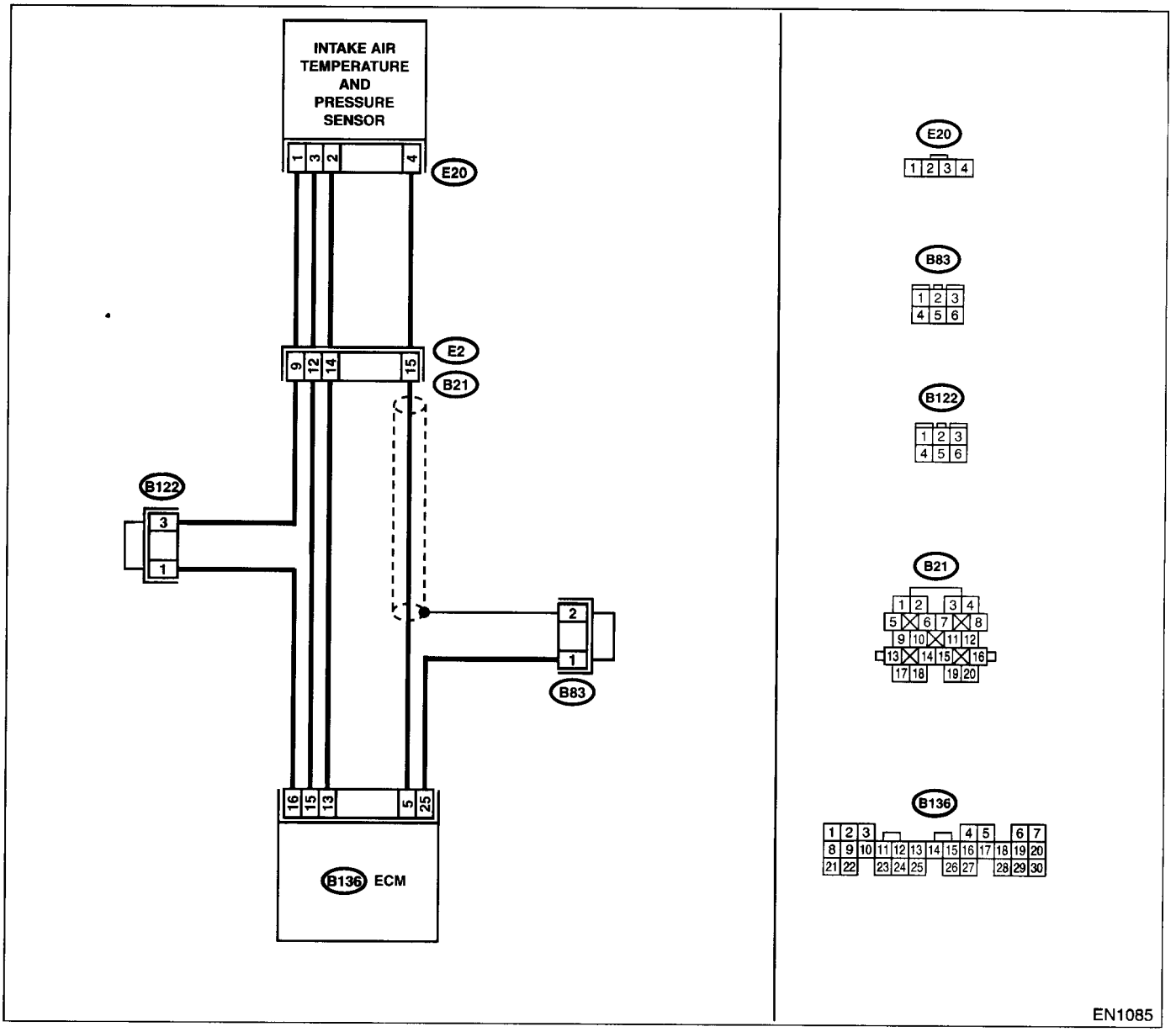
	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and intake air temperature and pressure sensor connector. ***Connector & terminal*** ***(B136) No. 16 — (E20) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
9	**CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 4 — Engine ground:***	Is the resistance more than 500 kΩ?	Go to step **10.**	Repair ground short circuit in harness between ECM and intake air temperature and pressure sensor connector.
10	**CHECK POOR CONTACT.** Check poor contact in intake manifold pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>

J: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
CHECK CURRENT DATA. 1)Start the engine 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE" <Ref to EN(SOHC)-32, Subaru Select Monitor > •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual	s the value more than 119 5 .Pa (896 5 mmHg, 35.29 nHg)?	;o to step **10.**	;o to step **2.**
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	s the voltage more than 4 5 V'	;o to step **4.**	;o to step **3.**
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground • ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	)oes the voltage change more han 4 5 V by shaking harness ınd connector of ECM while nonitoring the value with volt-ıge meter?	?epair poor con-act ın ECM con-ıector	)ontact with SOA distributor) ser-'ice. NOTE: nspection by DTN s required, be ;ause probabl ;ause ıs deterıora ıon of multipl ıarts.
CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):***	s the voltage less than 0 2 V?	;o to step **6.**	;o to step **5.**
CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor >	)oes the value change more han 13.3 kPa (100 mmHg, 3.94 ınHg) by shakıng harness ınd connector of ECM while nonitorıng the value with Sub-ıru Select Monitor?	?epair poor con-act ın ECM con-ıector	;o to step **6.**
CHECK HARNESS BETWEEN ECM AND IN-TAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn the ıgnition switch to OFF 2)Disconnect the connector from ıntake aır temperature and pressure sensor. 3)Turn the ıgnition switch to ON. 4)Measure the voltage between ıntake aır tem perature and pressure sensor connector and engine ground ***Connector & terminal*** ***(E20) No. 3 (+) — Engine ground (–):***	s the voltage more than 4 5 V	;o to step **7.**	?epair open circuı n harness)etween ECM anc ntake aır tempera ure and pressure ;ensor connector.

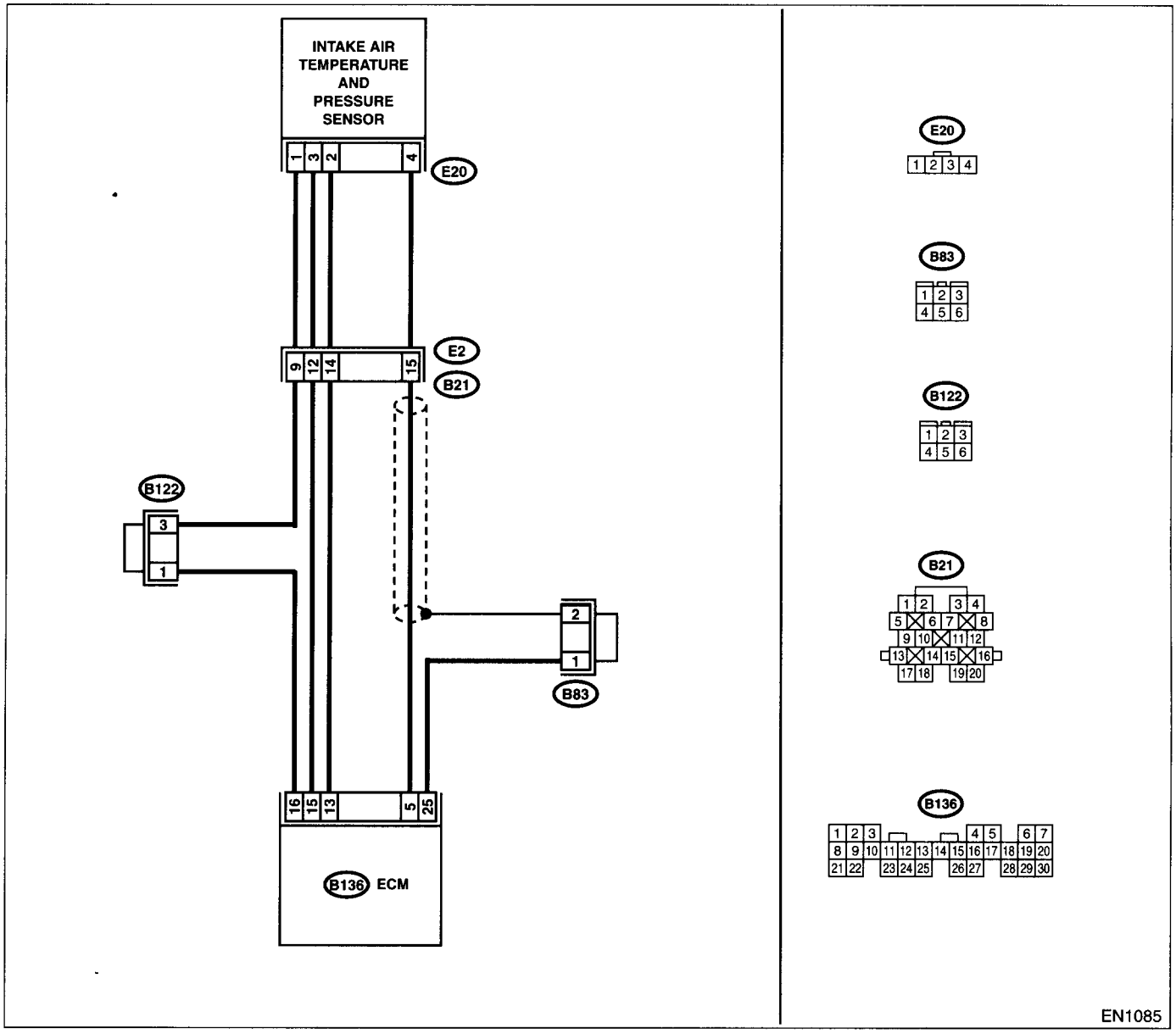
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and intake air temperature and pressure sensor connector. ***Connector & terminal (B136) No. 5 — (E20) No. 4:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and intake air temperature and pressure sensor connector. ***Connector & terminal (B136) No. 16 — (E20) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and intake air temperature and pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in intake air temperature and pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>
10	**CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short circuit in harness between ECM and intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>

K: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



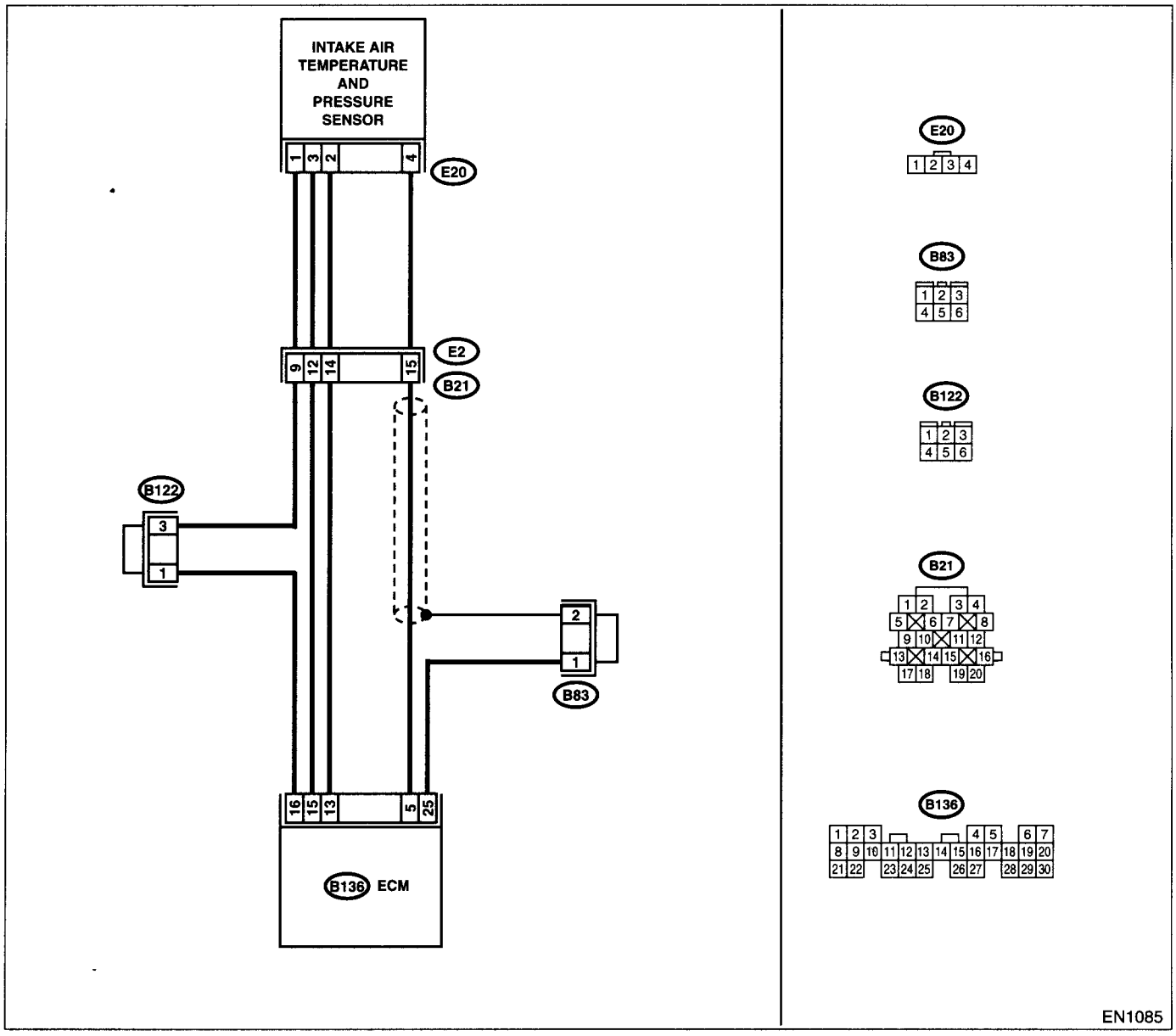
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0112, P0113, P0117, P0118 or P0125?	Inspect DTC P0112, P0113, P0117, P0118 or P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1)Start the engine and warm it up completely. 2)Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature between 75°C (167°F) and 95°C (203°F)?	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>	Inspect DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>

L: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



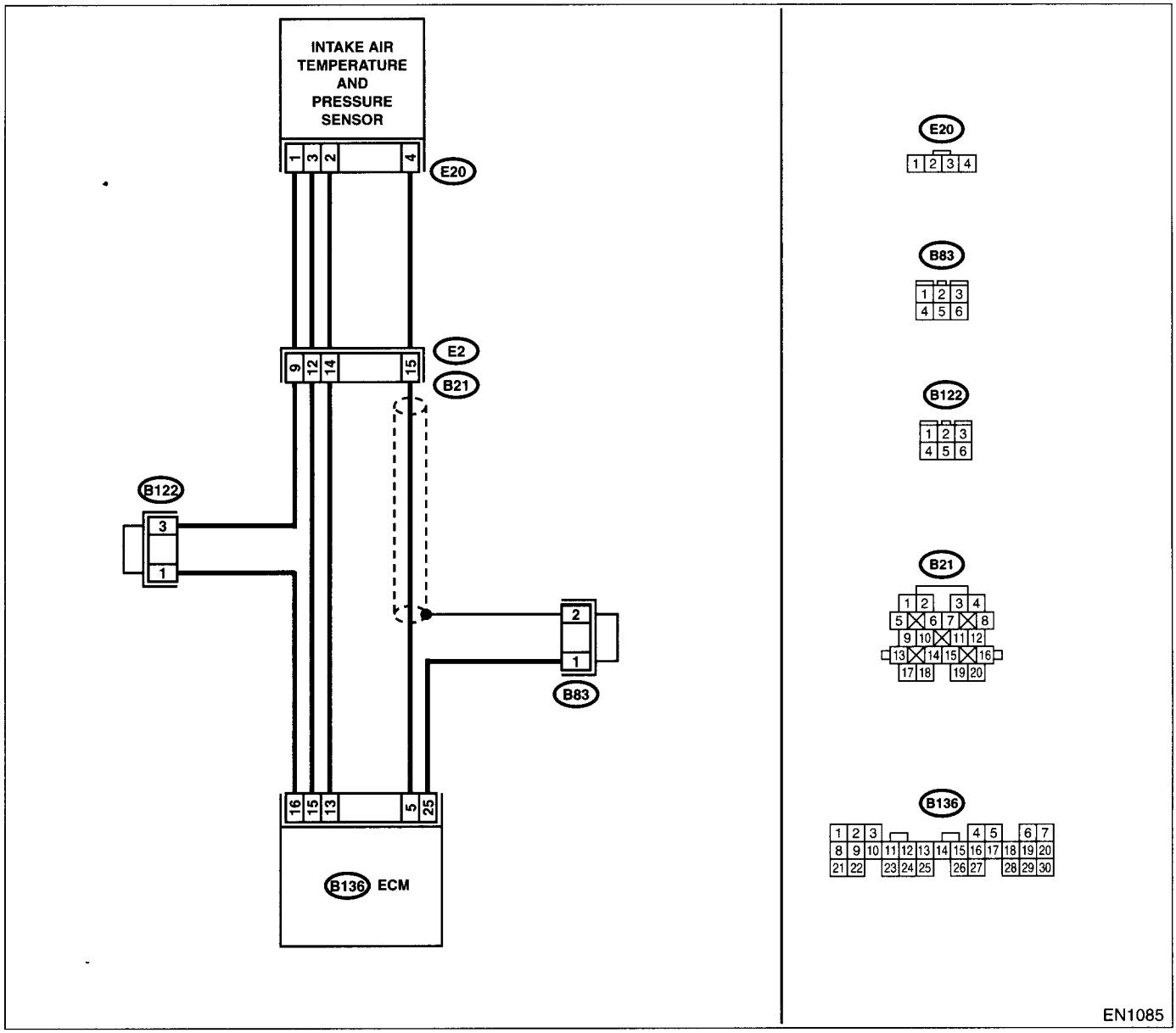
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83), (B122)
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Turn the ignition switch to ON. 4)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

M: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83), (B122)
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Measure the voltage between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.** Measure the voltage between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 (+) — Engine ground (–):***	Is the voltage more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature and pressure sensor and ECM connector • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) and (B122)

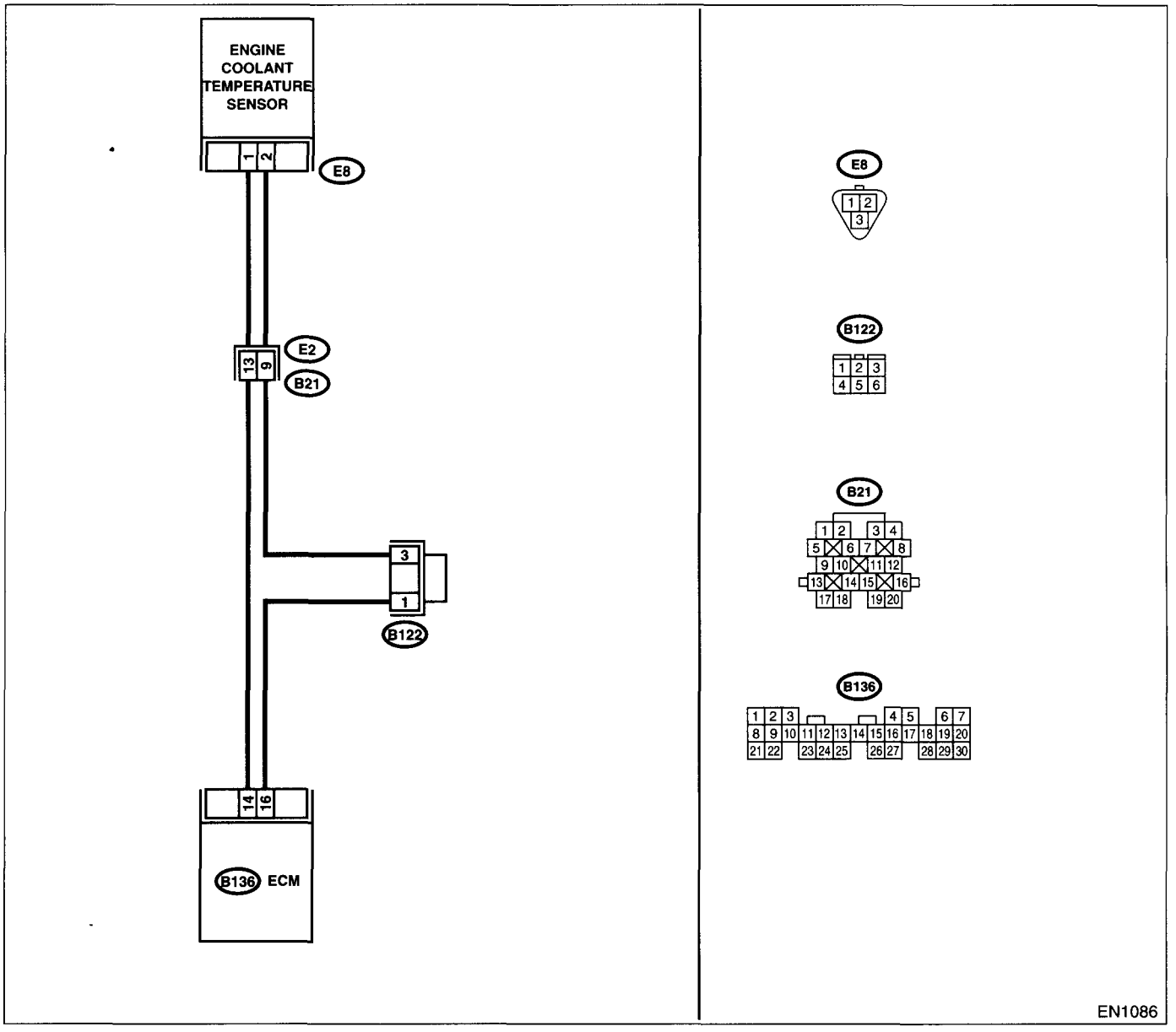
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature and pressure sensor and ECM connector • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) and (B122)

N: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



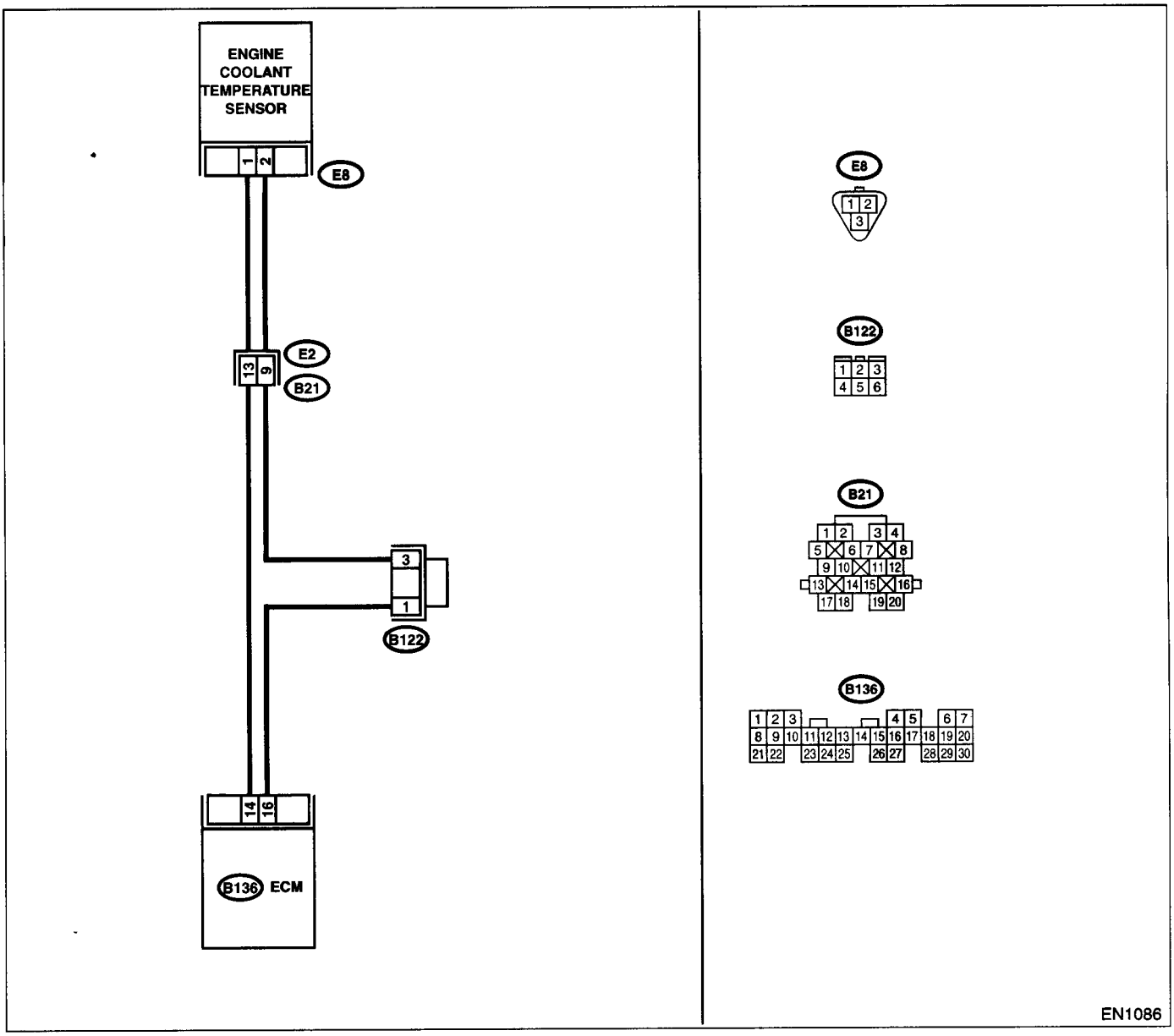
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 150°C (302°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-27, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

O: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from engine coolant temperature sensor. 3)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)

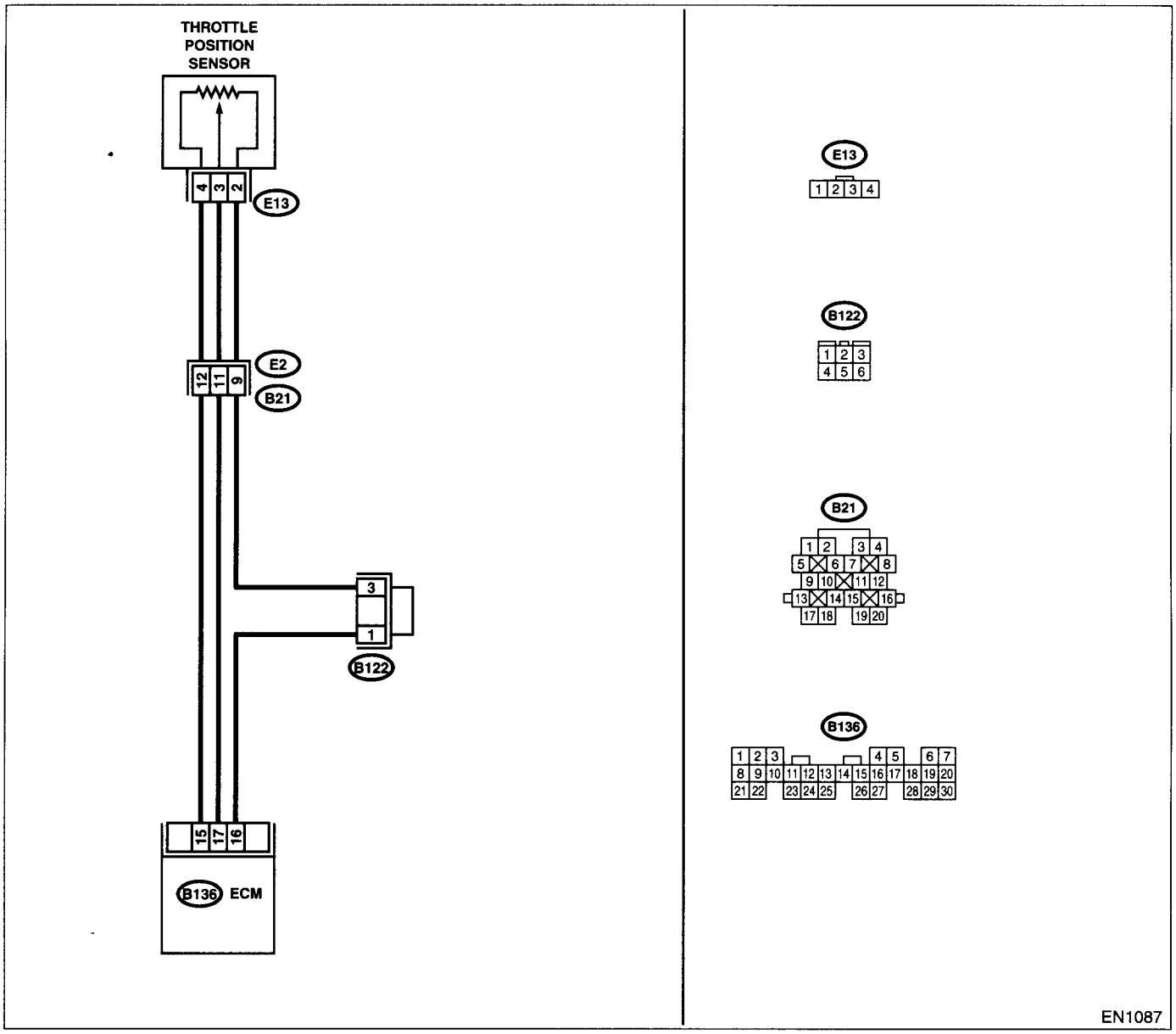
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-27, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)

P: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



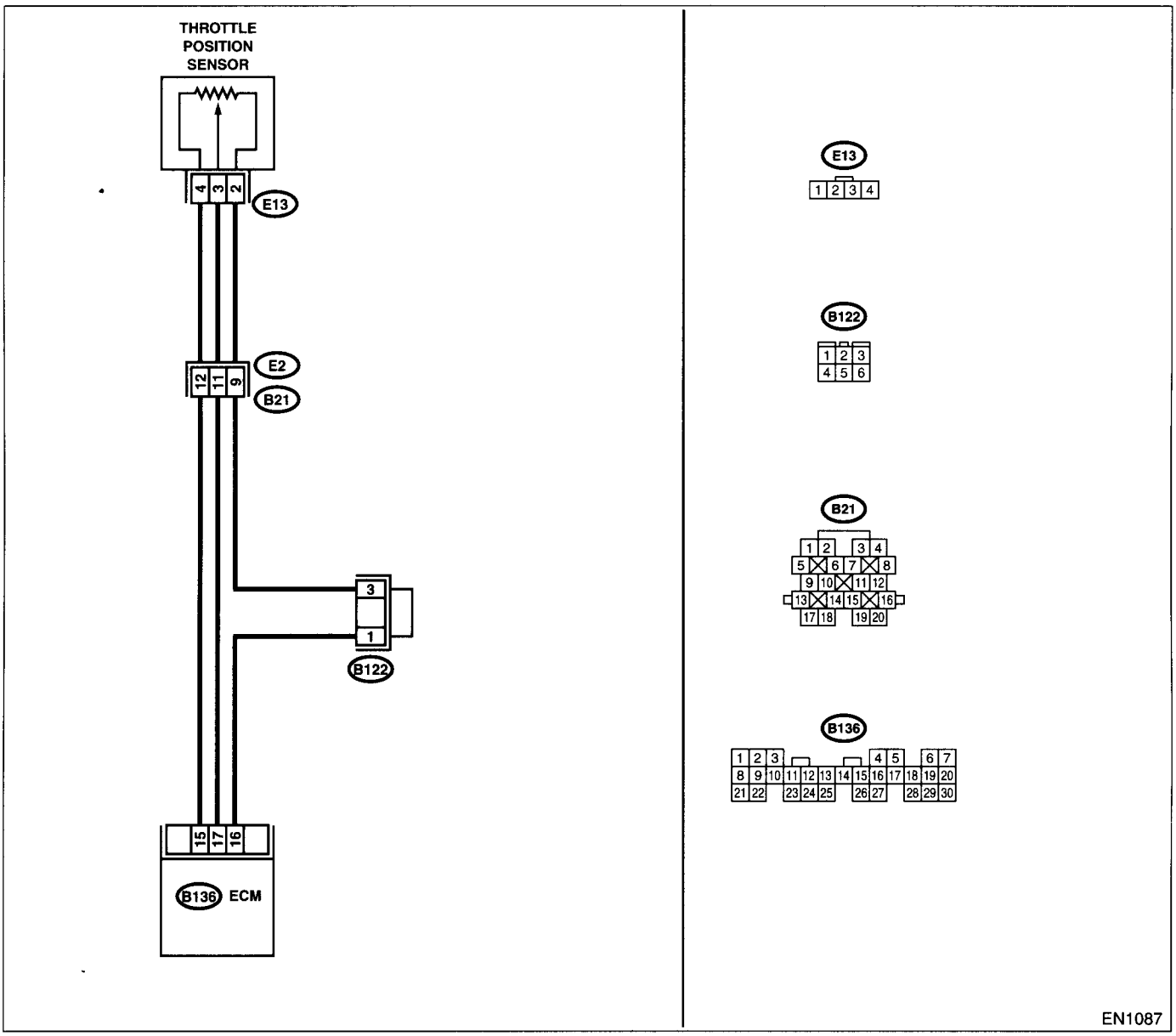
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

Q: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0.1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground.	Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**

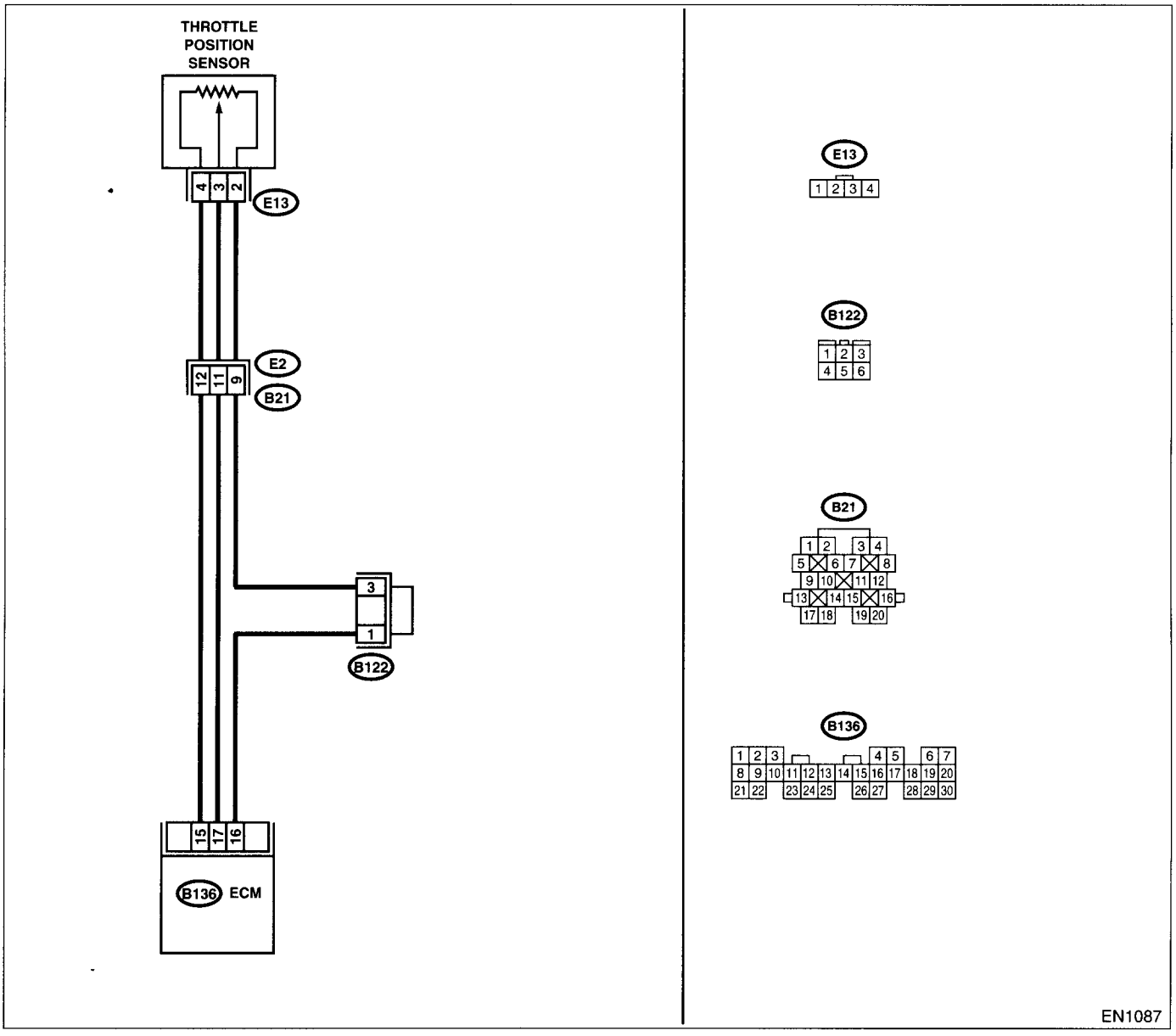
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector (B21)
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

R: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



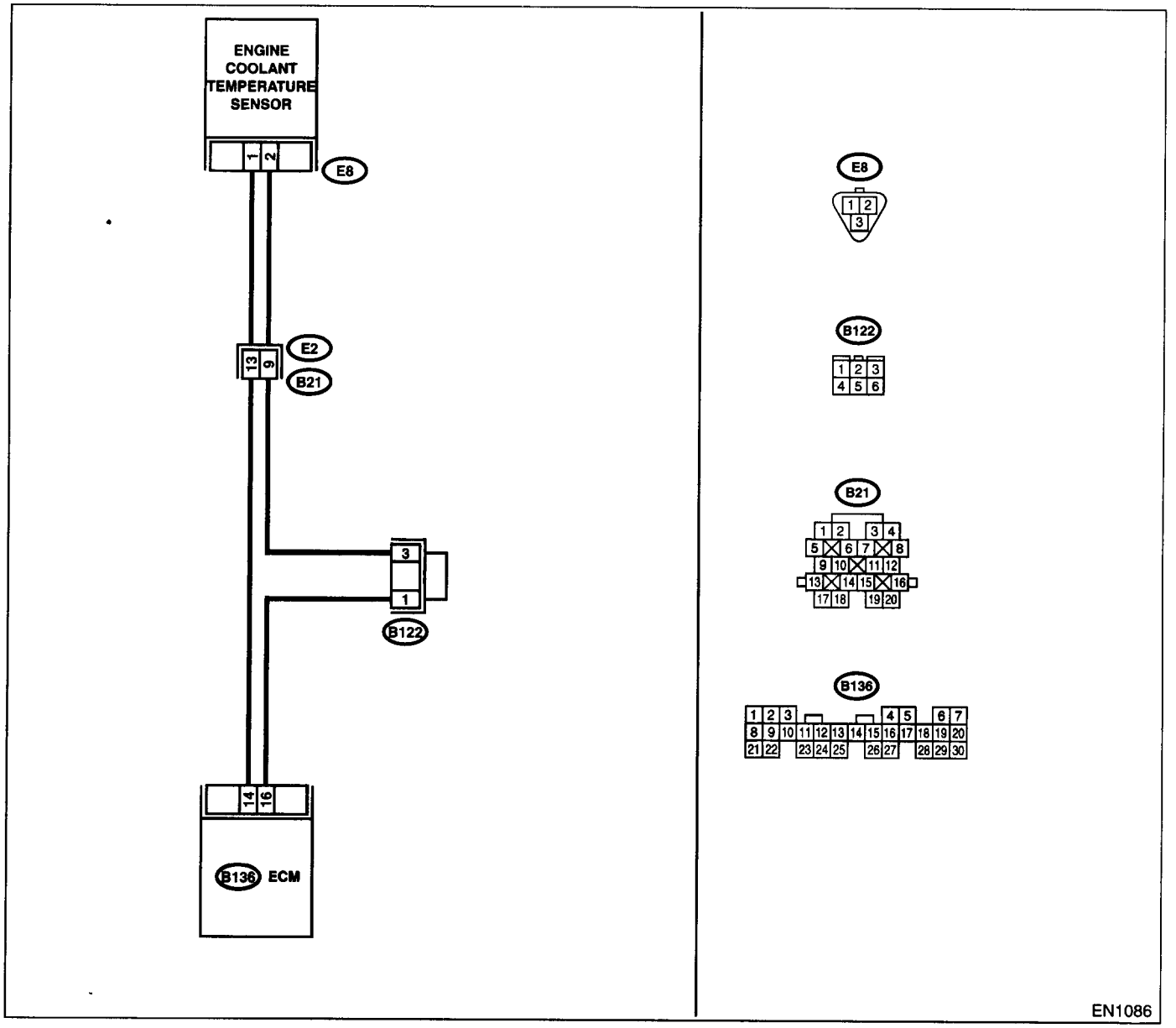
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 4.9 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B122)
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

S: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine would not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0117 or P0118?	Inspect DTC P0117 or P0118 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO-35, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(SOHC)-27, Engine Coolant Temperature Sensor.>

T: DTC P0128 — THERMOSTAT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

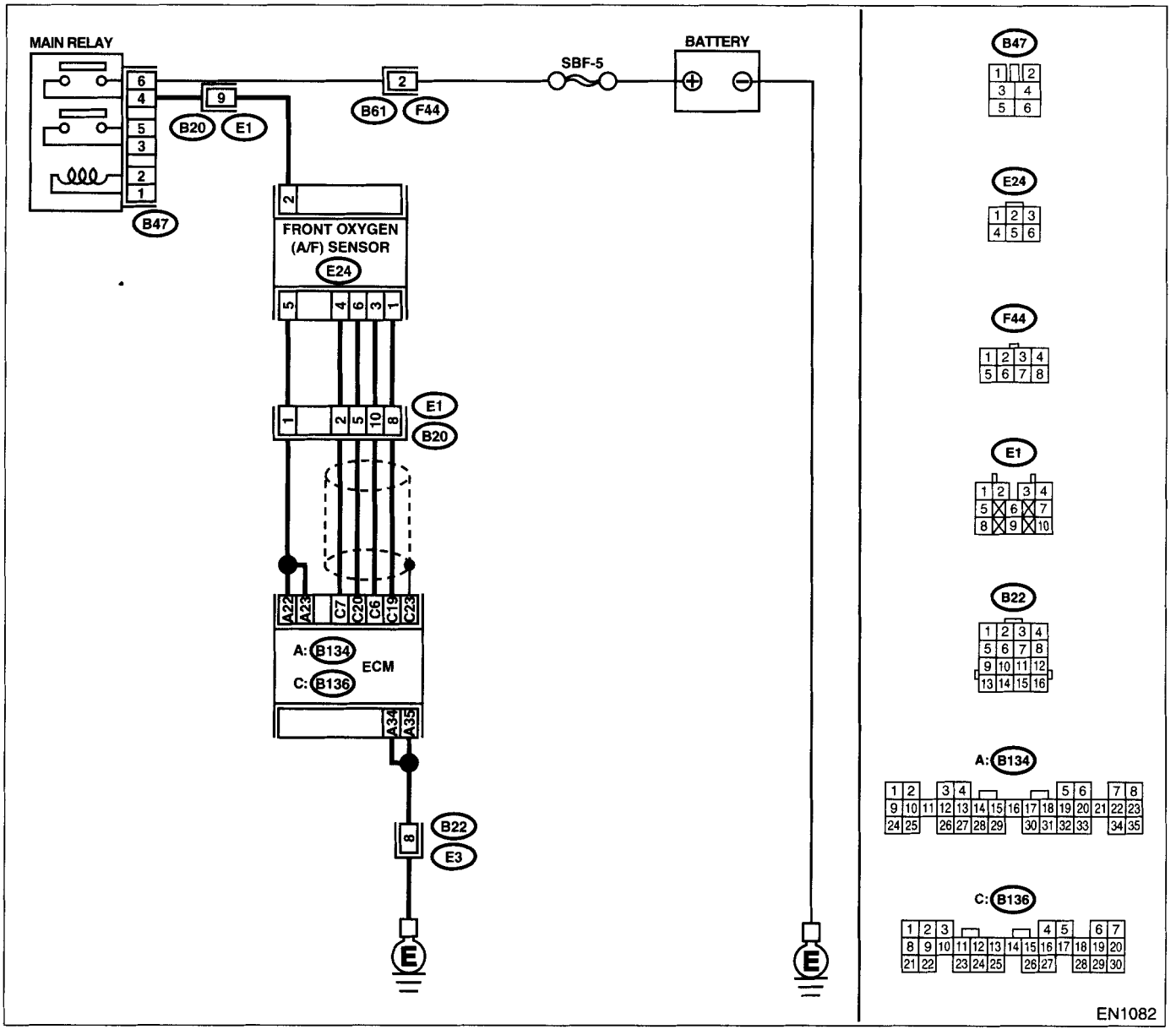
Step	Check	Yes	No
CHECK VEHICLE CONDITION.	Has engine operated at idle or has vehicle been driven with part of engine submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0125, P0301, P0302, P0303 and P0304 at same time?	Go to step **3.**	Inspect DTC P0125, P0301, P0302, P0303 and P0304 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC) >
CHECK ENGINE COOLANT.	Are coolant level and mixture ratio of cooling water to anti-freeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref to CO-25, REPLACEMENT, Engine Coolant.>
CHECK RADIATOR FAN. 1)Start the engine 2)Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO-46, Radiator Main Fan and Fan Motor > and <Ref. to CO-48, Radiator Sub Fan and Fan Motor.>	Replace the thermostat <Ref to CO-35, Thermostat.>

U: DTC P0130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LEAN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the value more than 1.1 for a moment?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 6 — (E24) No. 3:*** ***(B136) No. 7 — (E24) No. 4:*** ***(B136) No. 19 — (E24) No. 1:*** ***(B136) No. 20 — (E24) No. 6:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.

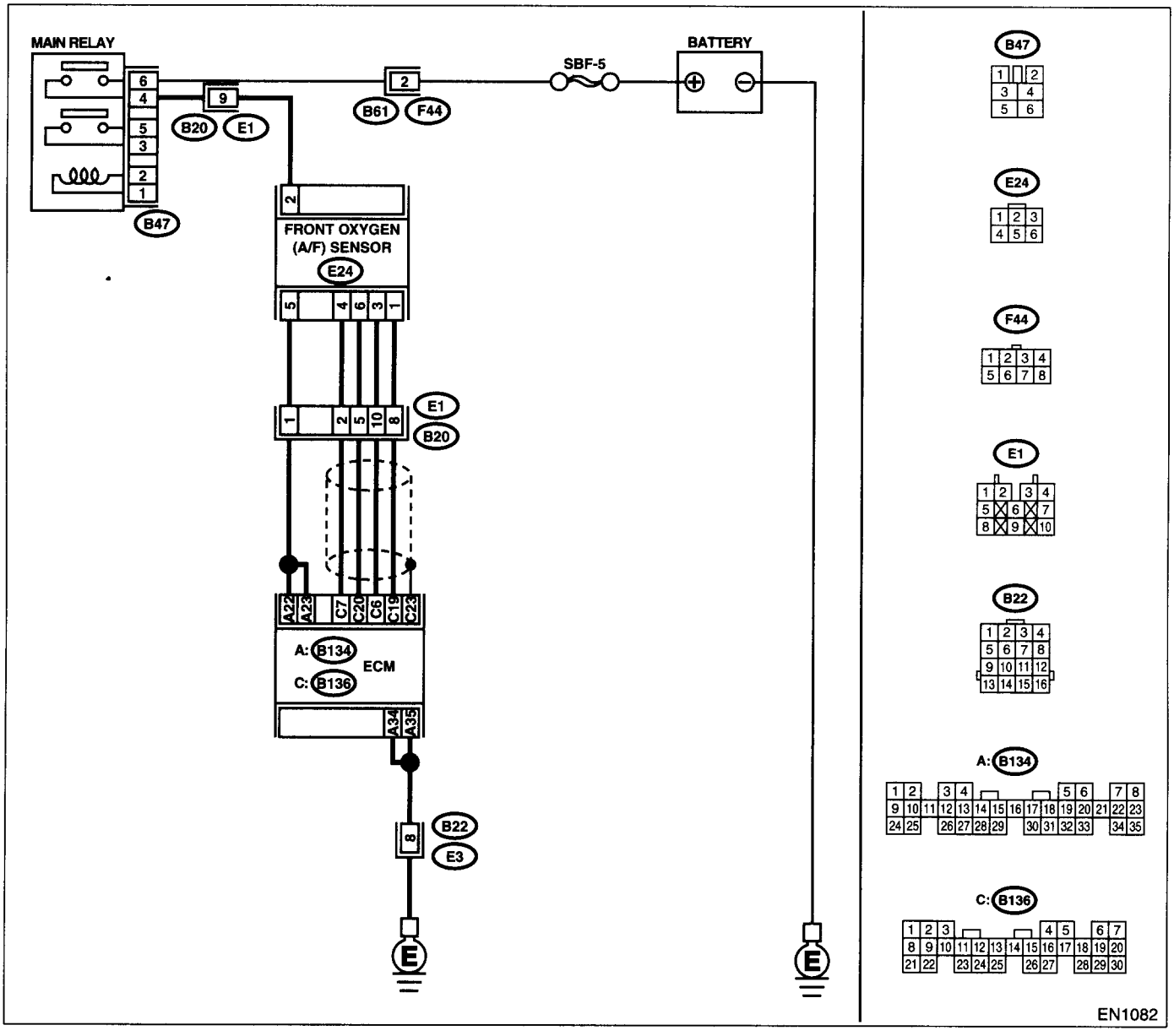
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

V: DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



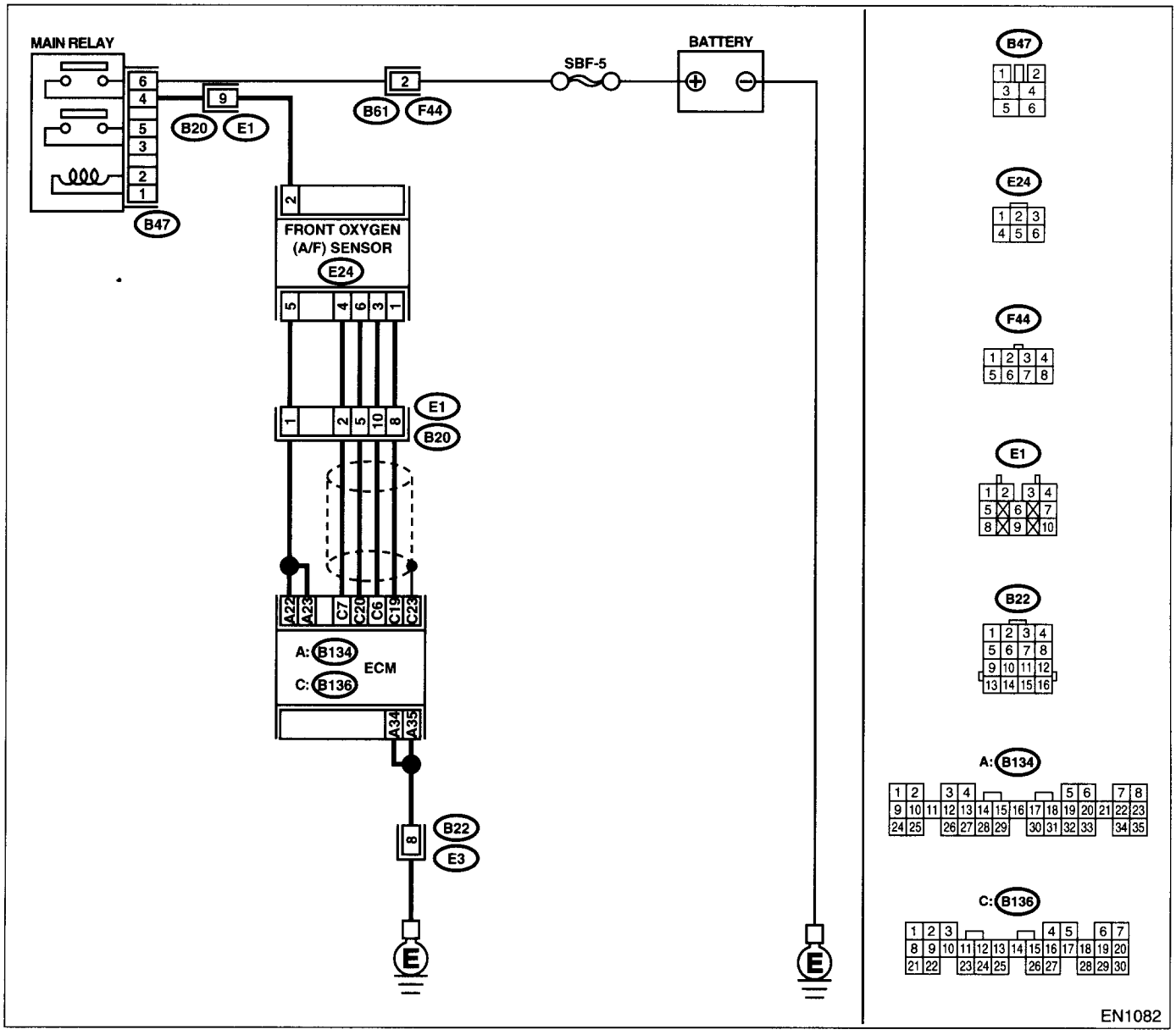
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 6 — (E24) No. 3:*** ***(B136) No. 7 — (E24) No. 4:*** ***(B136) No. 19 — (E24) No. 1:*** ***(B136) No. 20 — (E24) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

W: DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



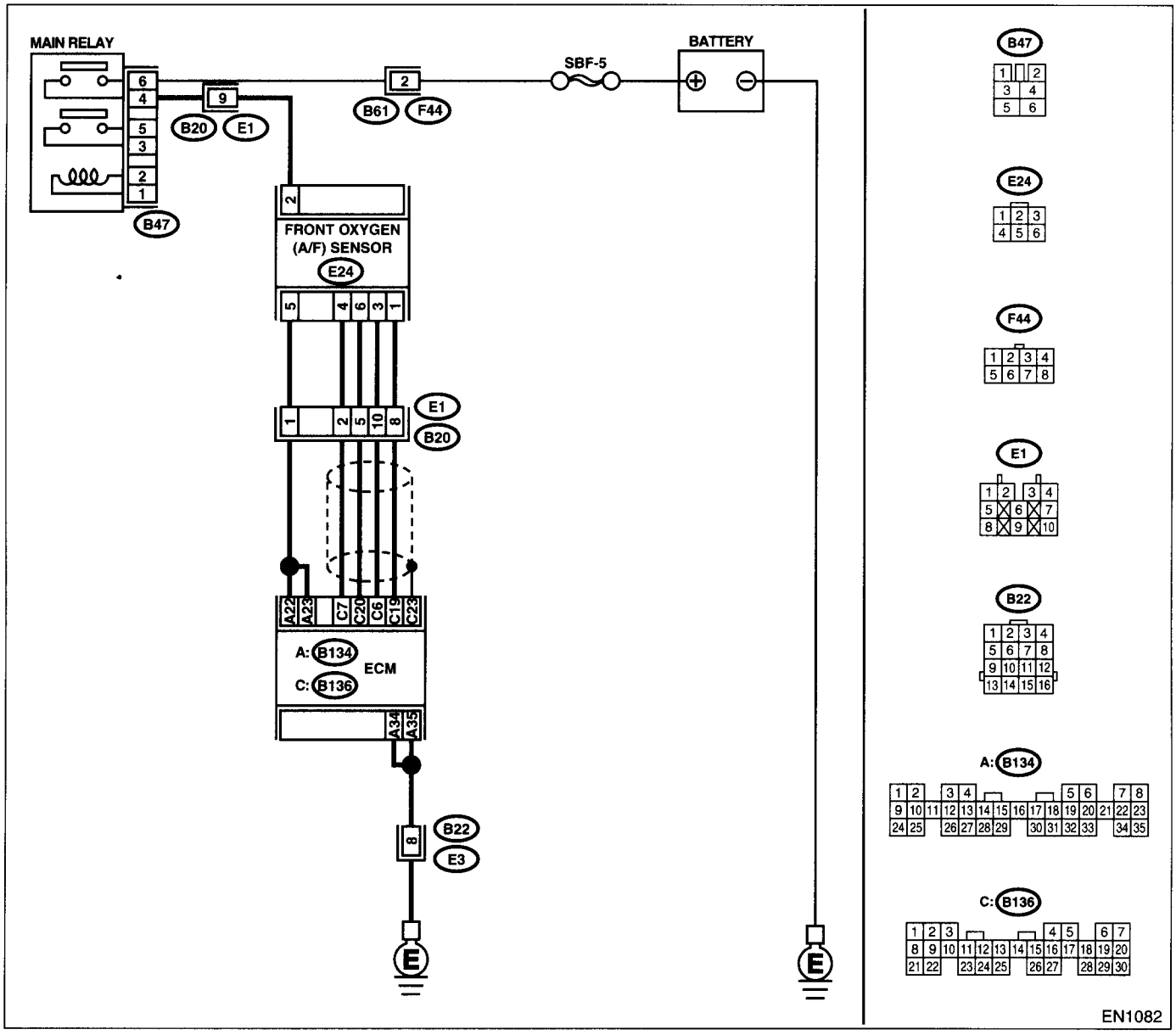
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 10 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

X: DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



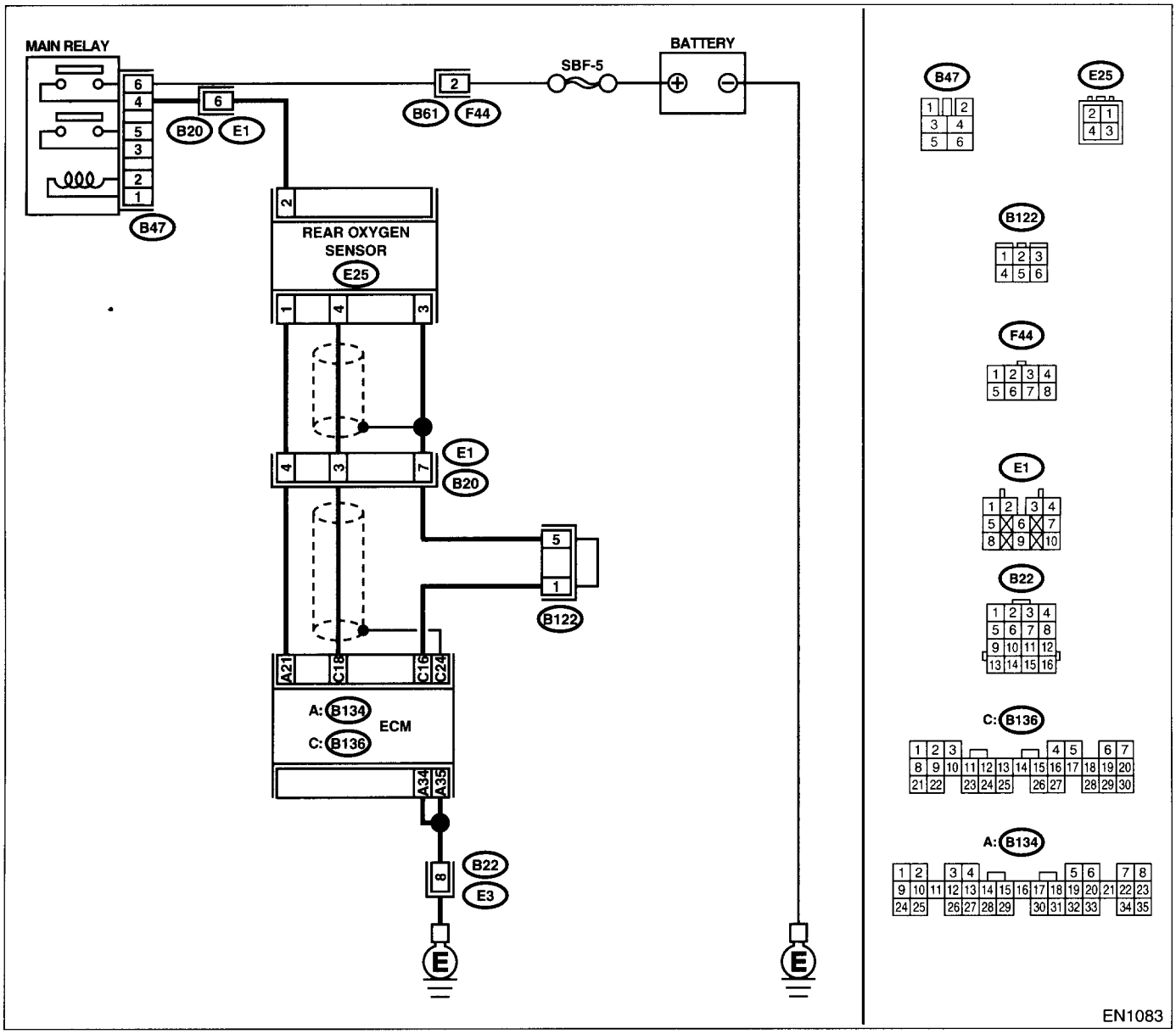
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

Y: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131 or P0132?	Go to step **2.**	Go to step **3.**

	Step	Check	Yes	No
2	**CHECK FAILURE CAUSE OF P0131 or P0132.** Inspect DTC P0131 or P0132 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check fuel system. NOTE: In this case, it is not necessary to inspect DTC P0136.	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **7.**	Go to step **4.**
4	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.	Is the value fixed between 0.2 and 0.4 V?	Go to step **5.**	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and rear oxygen sensor. 3)Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B136) No. 16 — (E25) No. 3:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(E25) No. 4 (+) — Engine ground (–):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

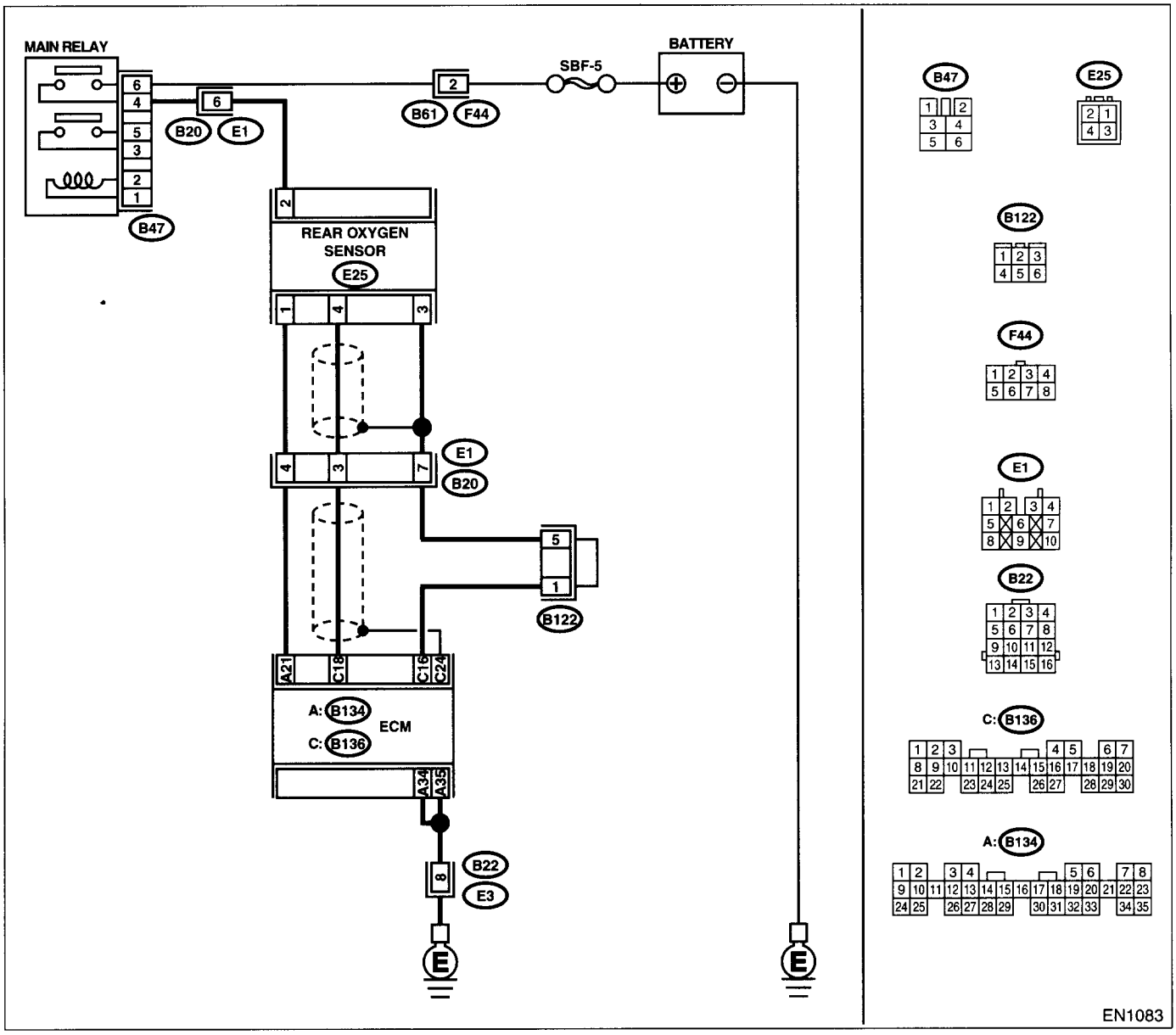
	Step	Check	Yes	No
7	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

Z: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0136?	Inspect DTC P0136 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

AA:DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(SOHC)-154, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AB:DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1)Release fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is fuel pressure between 284 and 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

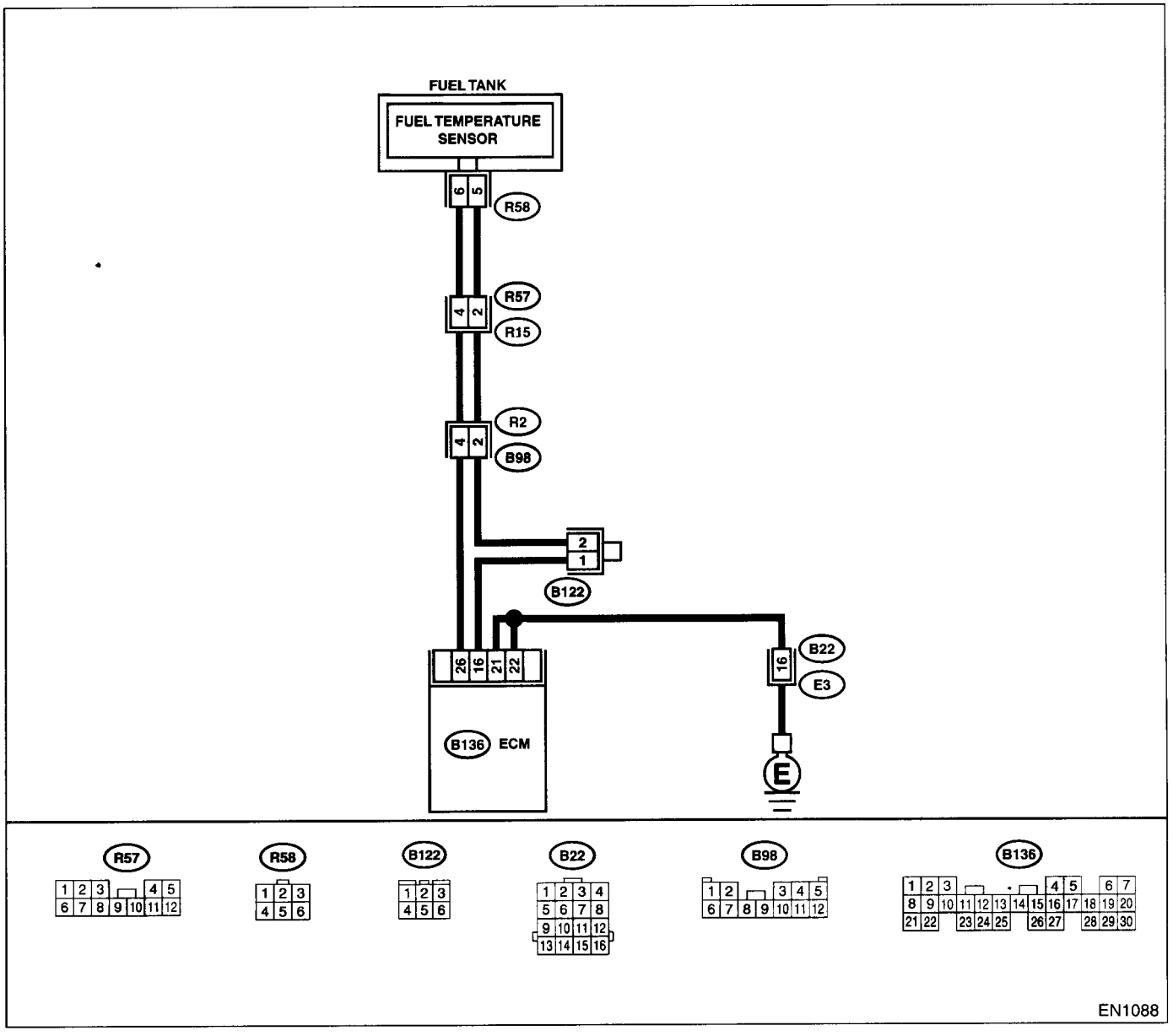
Step	Check	Yes	No
CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE •*If fuel pressure does not increase, squeeze* fuel return hose 2 to 3 times, then measure fuel pressure again •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose	s fuel pressure between 206 and 235 kPa (2.1 — 2 4 kg/ :m^2, 30 — 34 psi)?	;o to step **5.**	Repair the following items Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1)Start the engine and warm-up completely 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool NOTE •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE" <Ref to EN(SOHC)-32, Subaru Select Monitor > •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual	s temperature between 70°C 158°F) and 100°C (212°F)?	;o to step **6.**	Replace the engine coolant emperature sensor <Ref to FU(SOHC)-27, Engine Coolant Temperature Sensor >
CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL. 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the selector lever in "N" or "P" position 3)Turn the A/C switch to OFF 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE. •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref to EN(SOHC)-32, Subaru Select Monitor > •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. Specification ***Idling*** ***24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)*** ***Ignition ON*** ***73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)***	s the voltage within the specifi ;ations?	;ontact with SOA distributor) ser ;ice NOTE. nspection by DTM s required, because probable ;ause is deteriora- ion of multiple ;arts	Replace the intake ir temperature and pressure sen- ;or <Ref to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor >

AC:DTC P0181 — FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



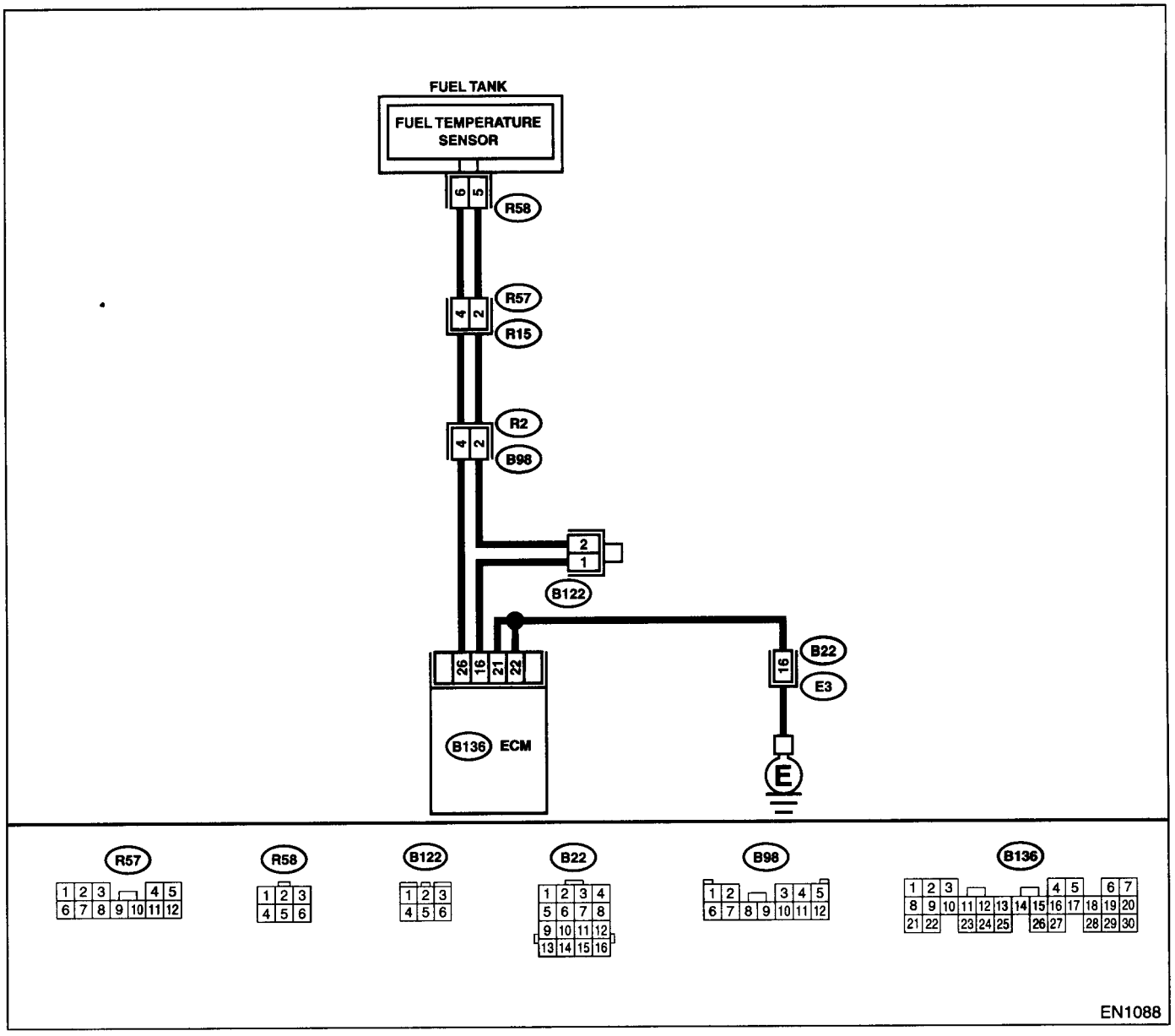
Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0182 or P0183?	Inspect DTC P0182 or P0183 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(SOHC)-8, Fuel Temperature Sensor.>

AD:DTC P0182 — FUEL TEMPERATURE SENSOR A CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



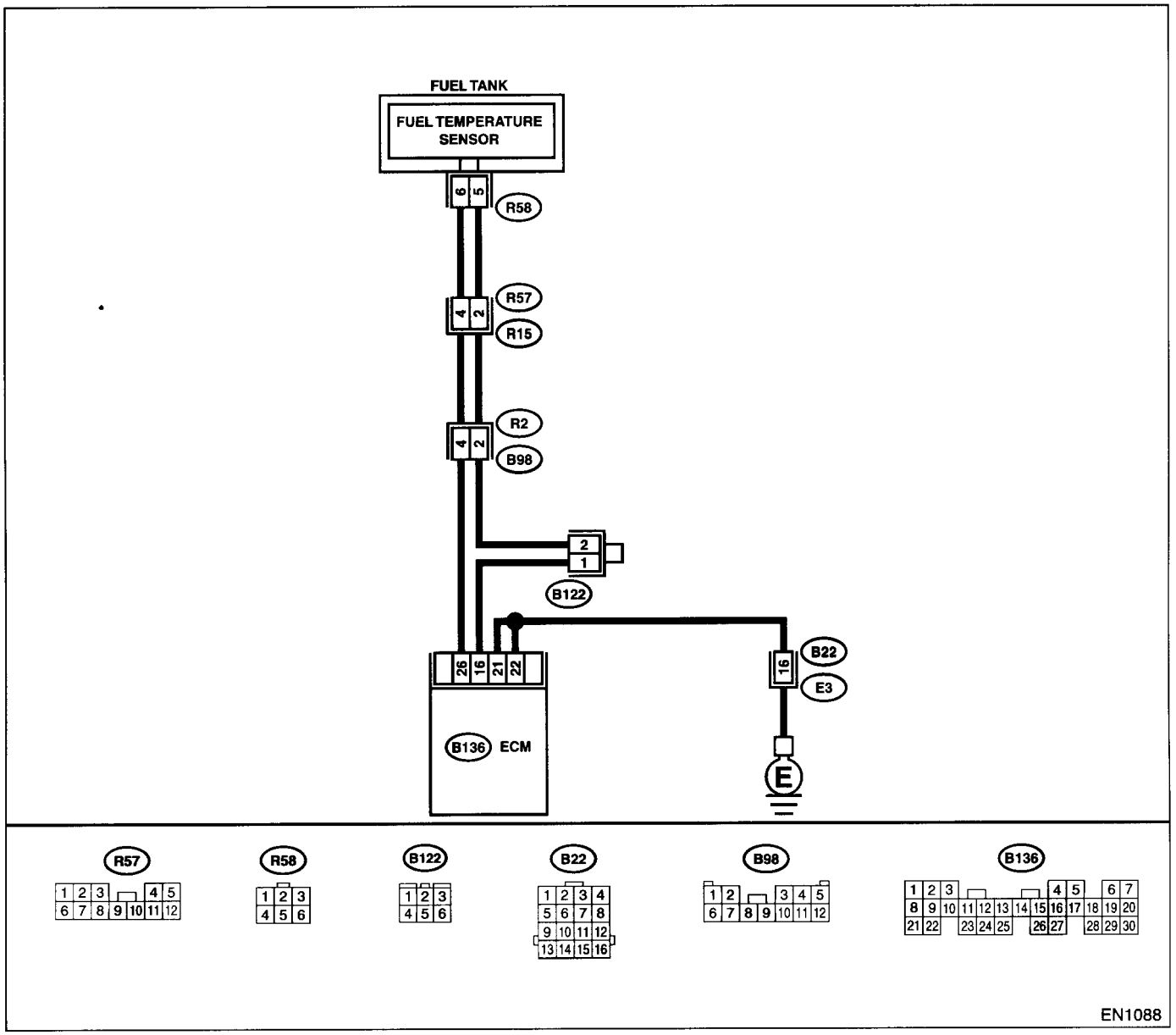
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value greater than 150°C (302°F)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the access hole lid. 3)Disconnect the connector from fuel pump. 4)Turn the ignition switch to ON. 5)Read the data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Replace the fuel temperature sensor. <Ref. to EC(SOHC)-8, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

AE:DTC P0183 — FUEL TEMPERATURE SENSOR A CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors (B22, B98 and R57) • Poor contact in joint connector (B122)
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the access hole lid. 3)Disconnect the connector from fuel pump. 4)Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors (B98 and R57)

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Replace the fuel temperature sensor. <Ref. to EC(SOHC)-8, Fuel Temperature Sensor.>	Repair harness and connector NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors (B98 and R57) • Poor contact in joint connector (B122)

AF:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-164, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AG:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-164, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

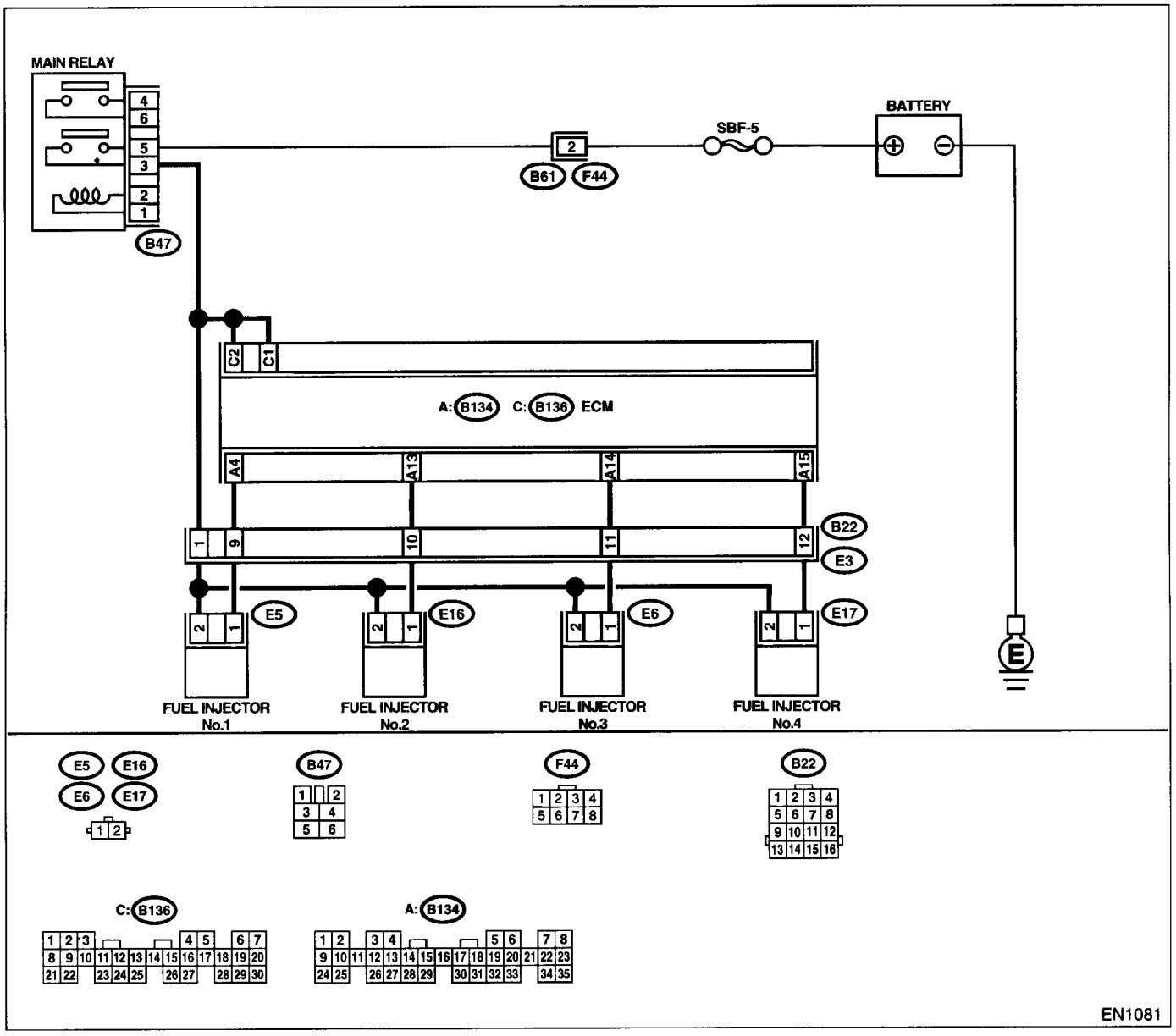
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(SOHC)-164, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P0117, P0118 or P0125?	Inspect DTC P0106, P0107, P0108, P0117, P0118 or P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 4 (+) — Chassis ground (–):*** ***#2 (B134) No. 13 (+) — Chassis ground (–):*** ***#3 (B134) No. 14 (+) — Chassis ground (–):*** ***#4 (B134) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinders. 3)Measure the voltage between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 4 — (E5) No. 1:*** ***#2 (B134) No. 13 — (E16) No. 1:*** ***#3 (B134) No. 14 — (E6) No. 1:*** ***#4 (B134) No. 15 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(SOHC)-38, Fuel Injector.>

	Step	Check	Yes	No
	CHECK POWER SUPPLY LINE. 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	s the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector NOTE In this case, repair the following. • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
	CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel injector on faulty cylinder. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 4 (+) — Chassis ground (–):*** ***#2 (B134) No. 13 (+) — Chassis ground (–):*** ***#3 (B134) No. 14 (+) — Chassis ground (–):*** ***#4 (B134) No. 15 (+) — Chassis ground (–):***	s the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **8.**
	CHECK FUEL INJECTOR. 1)Turn the ignition switch to OFF 2)Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	s the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(SOHC)-38, Fuel Injector > and ECM <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **9.**
	CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	s the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	s the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(SOHC)-54, Crankshaft Sprocket >	Go to step **11.**
	CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	s the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-47, Timing Belt Assembly.>	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the "Lower" level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1)Clear the memory using Subaru Select Monitor. <Ref. to EN(SOHC)-43, Clear Memory Mode.> 2)Start the engine, and drive the vehicle more than 10 minutes.	Is the MIL coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove the spark plug cord, etc.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK MISFIRE SYMPTOM.** 1)Turn the ignition switch to ON. 2)Read the diagnostic trouble code (DTC). •Subaru Select Monitor <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Go to step **21.**	Go to step **17.**
17	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **22.**	Go to step **18.**

	Step	Check	Yes	No
18	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **23.**	Go to step **19.**
19	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	Go to step **24.**	Go to step **20.**
20	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	Go to step **25.**	Go to step **26.**
21	**ONLY ONE CYLINDER**	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	**GROUP OF #1 AND #2 CYLINDERS**	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(SOHC)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

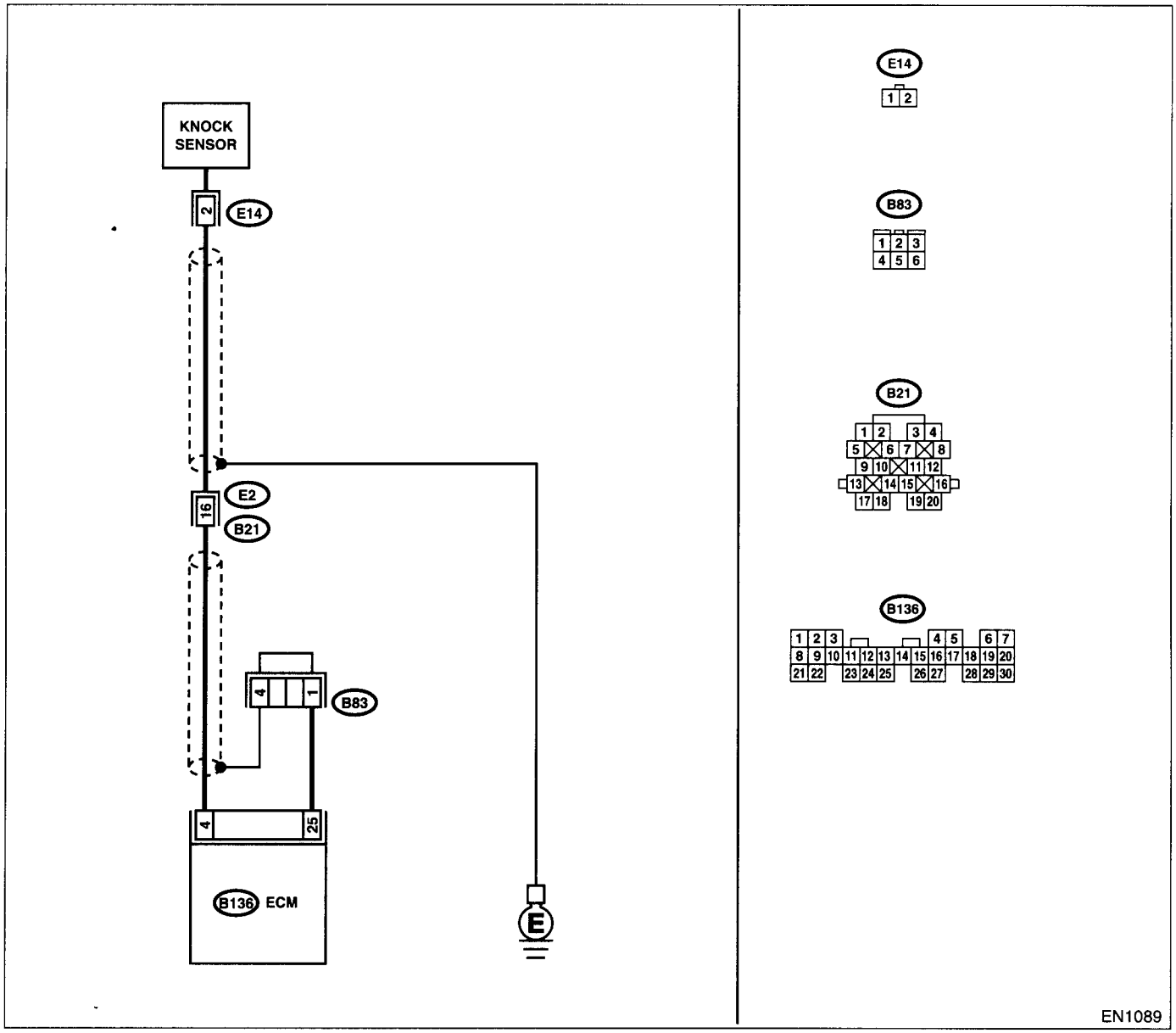
	Step	Check	Yes	No
23	**GROUP OF #3 AND #4 CYLINDERS**	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for "16. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(SOHC)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	**GROUP OF #1 AND #3 CYLINDERS**	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	**GROUP OF #2 AND #4 CYLINDERS**	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	**CYLINDER AT RANDOM**	Is the engine idle rough?	Go to DTC P0170. <Ref. to EN(SOHC)-154, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

AJ:DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



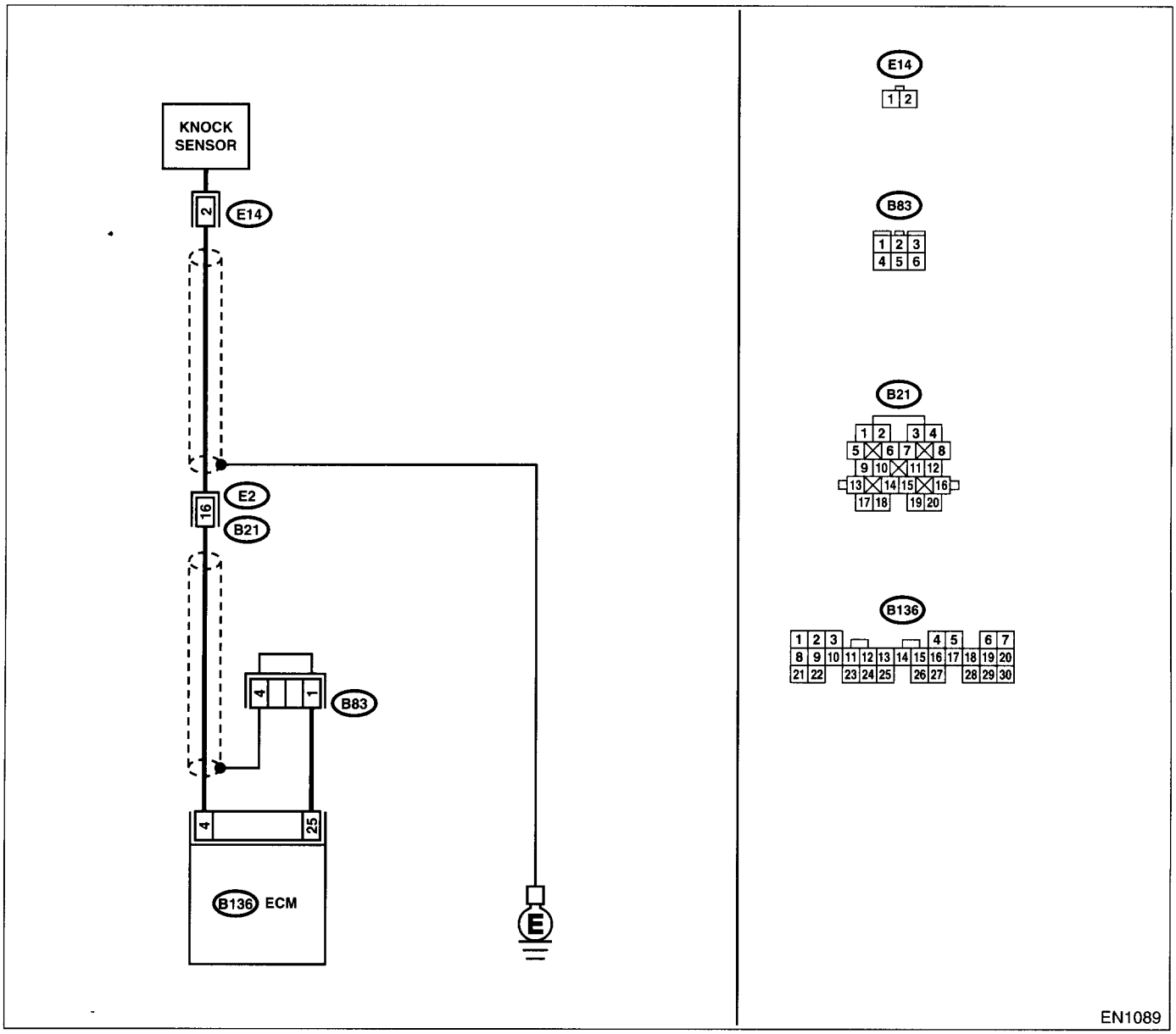
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector (B21)
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector (B21)
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(SOHC)-30, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AK:DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



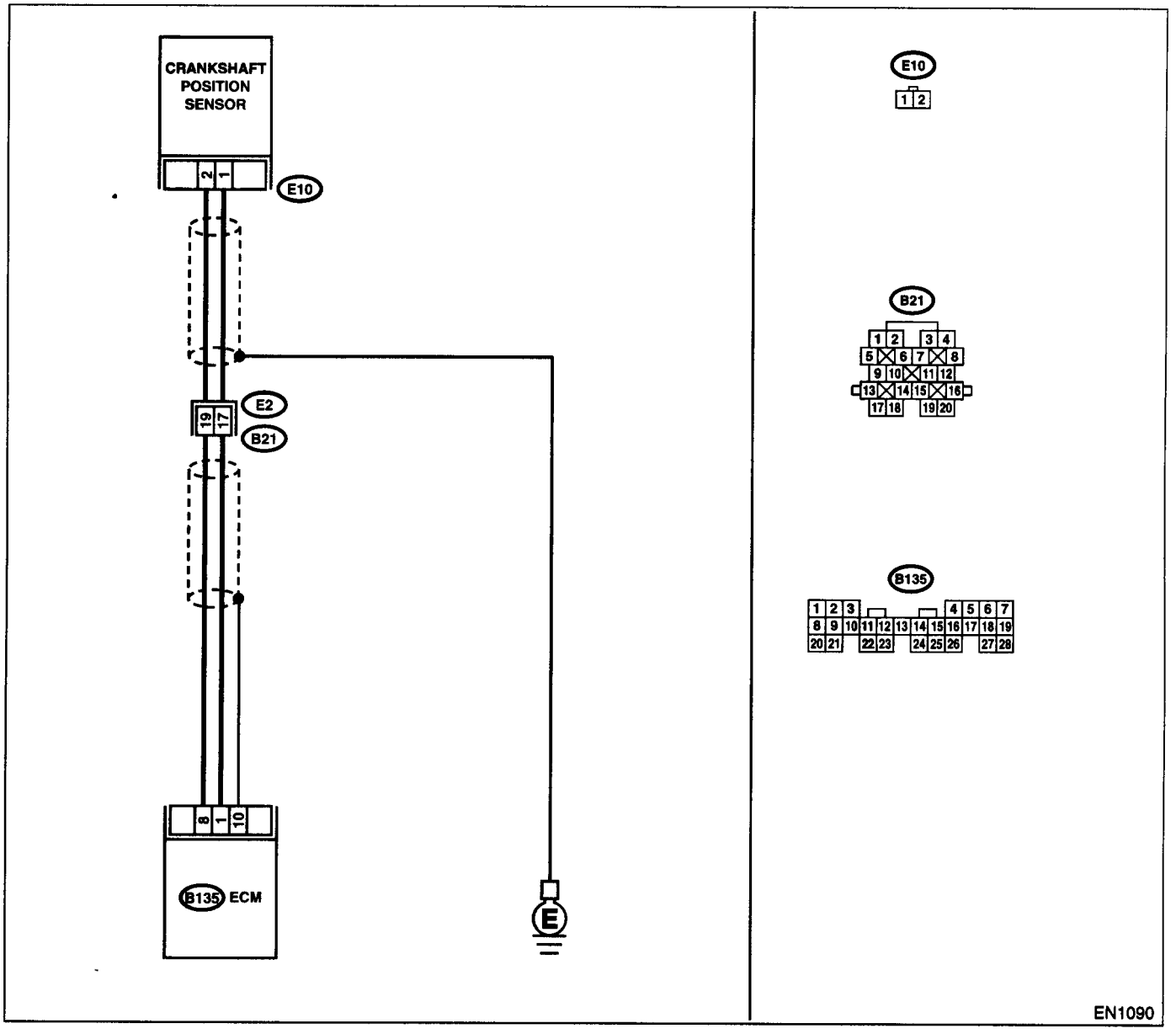
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1)Disconnect the connector from knock sensor. 2)Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(SOHC)-30, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1)Connect the connectors to ECM and knock sensor. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	Repair poor contact in ECM connector.

AL:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



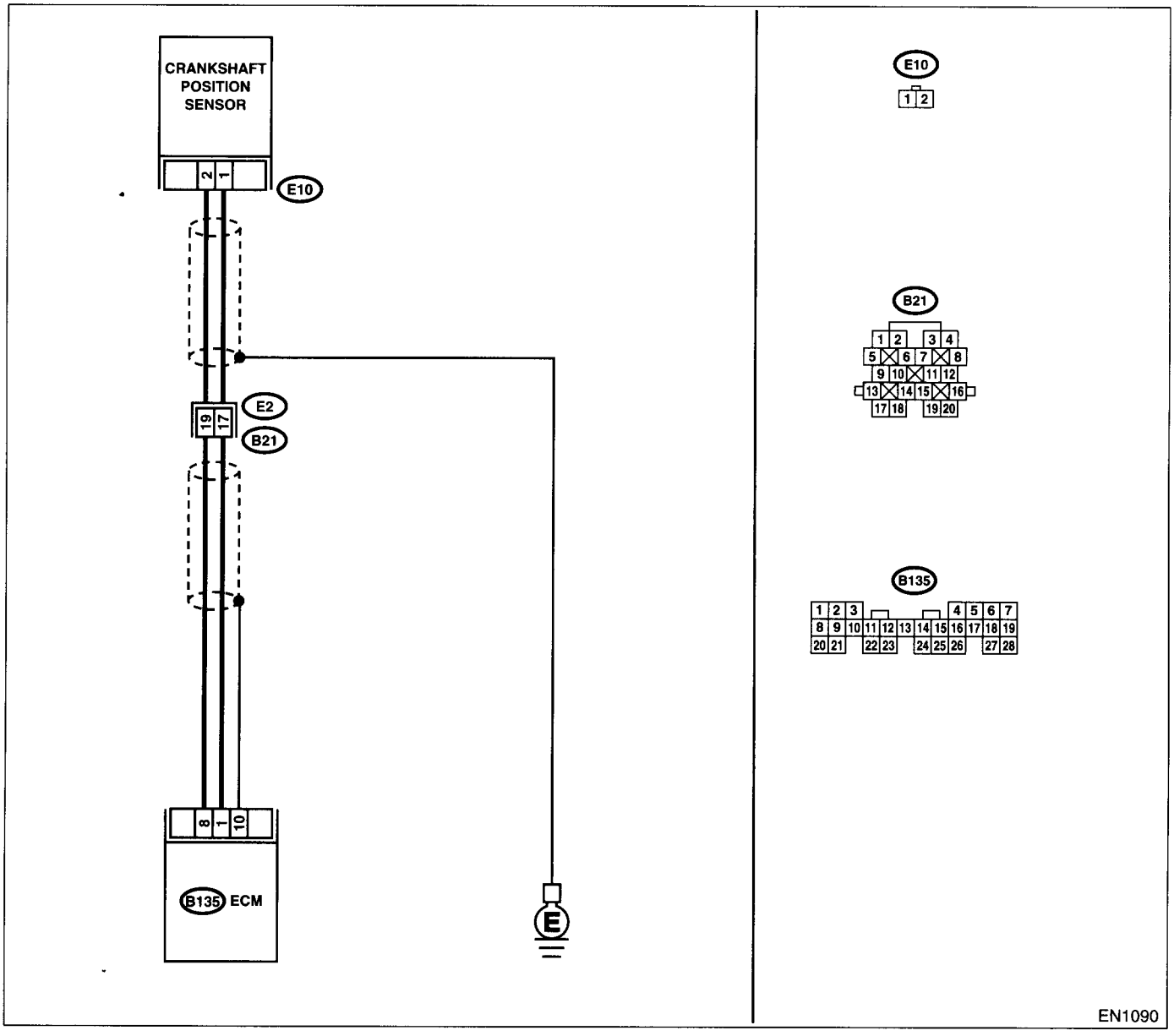
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from crankshaft position sensor. 3)Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1)Remove the crankshaft position sensor. 2)Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(SOHC)-28, Crankshaft Position Sensor.>

AM:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



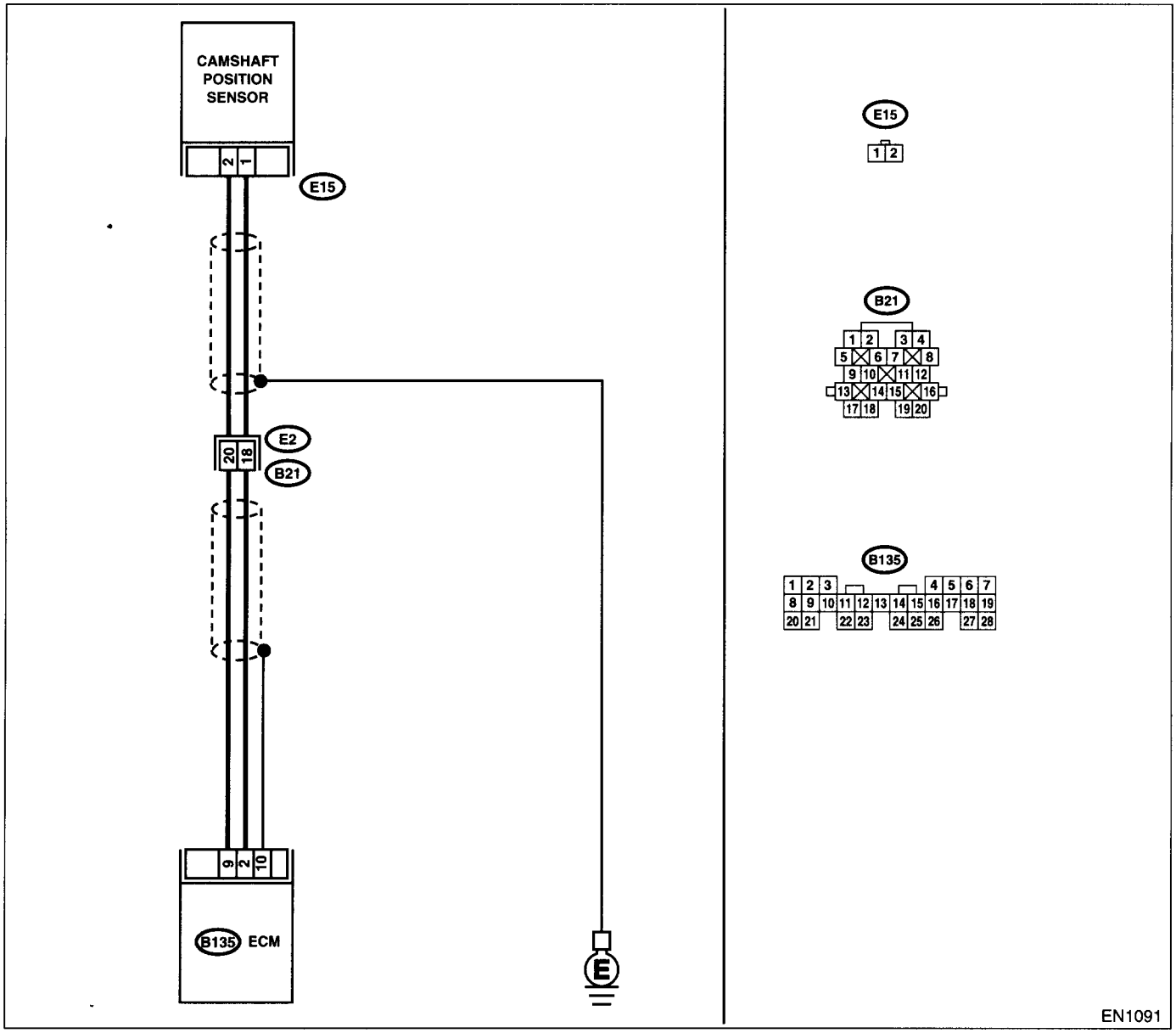
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to ME(SOHC)-54, Crankshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-47, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to <Ref. to FU(SOHC)-28, Crankshaft Position Sensor.>

AN:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



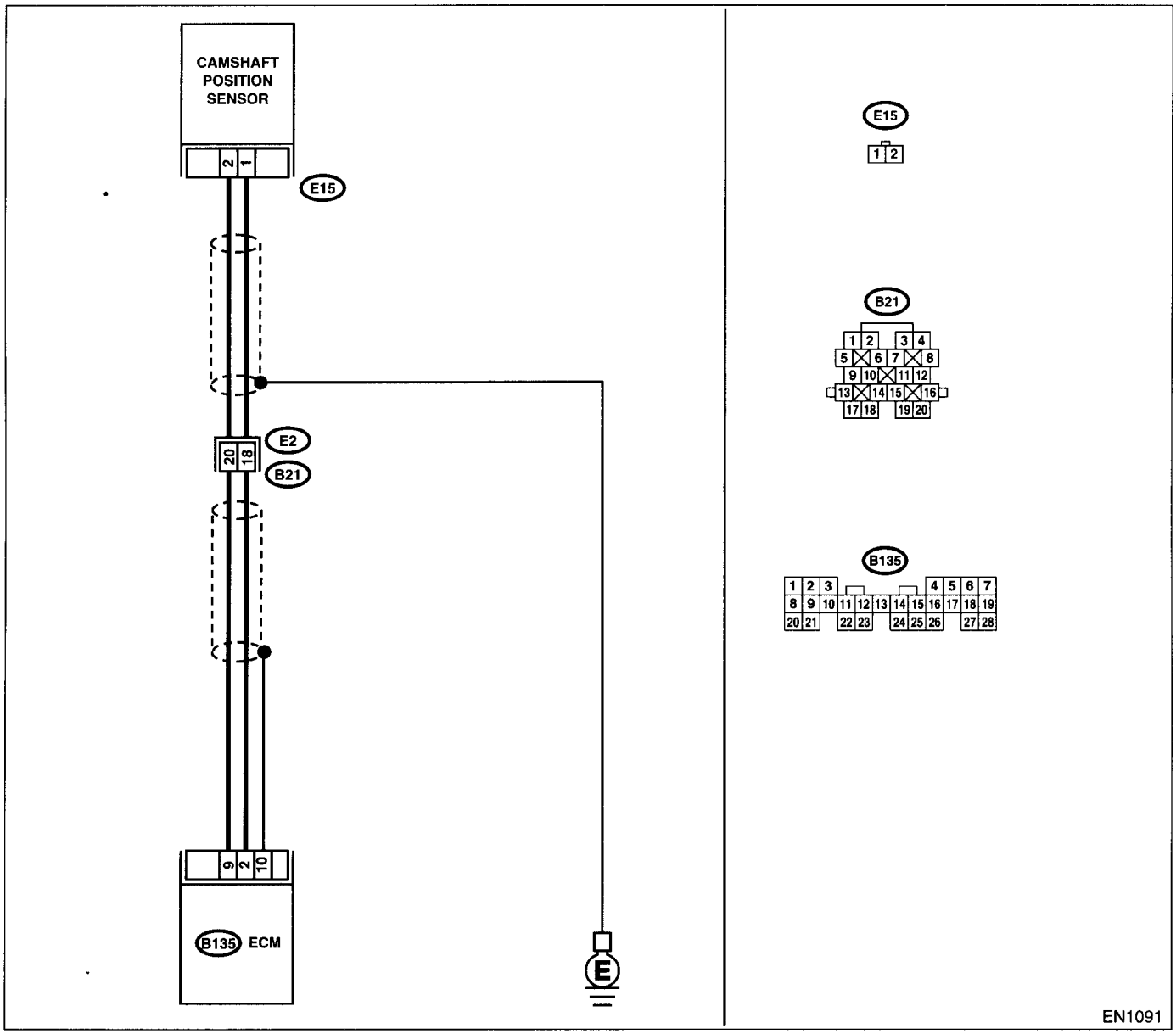
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(SOHC)-29, Camshaft Position Sensor.>

AO:DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
	CHECK ANY OTHER DTC ON DISPLAY.	)oes the Subaru Select Moni-)r or OBD-II general scan tool ıdicate DTC P0340?	Inspect DTC P0340 using "List)f Diagnostic Trou-)le Code (DTC)" <Ref to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	3o to step **2.**
!	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF 2)Disconnect the connector from camshaft position sensor 3)Measure the resistance of harness between camshaft position sensor connector and engine ground ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	s the resistance more than 00 kΩ?	Repair harness and connector. NOTE. In this case, repair the following. • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)	3o to step **3.**
)	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	s the resistance less than 10 2?	short circuit in harness between camshaft position sensor and ECM connector. NOTE· The harness between both connectors are shielded Repair ground short circuit in harness together with shield.	
)	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	s the resistance less than 5 2?	Go to step **5.**	Repair harness and connector. NOTE In this case, repa the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connecto (B21)
)	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	s the camshaft position sensor nstallation bolt tightened ;ecurely?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely

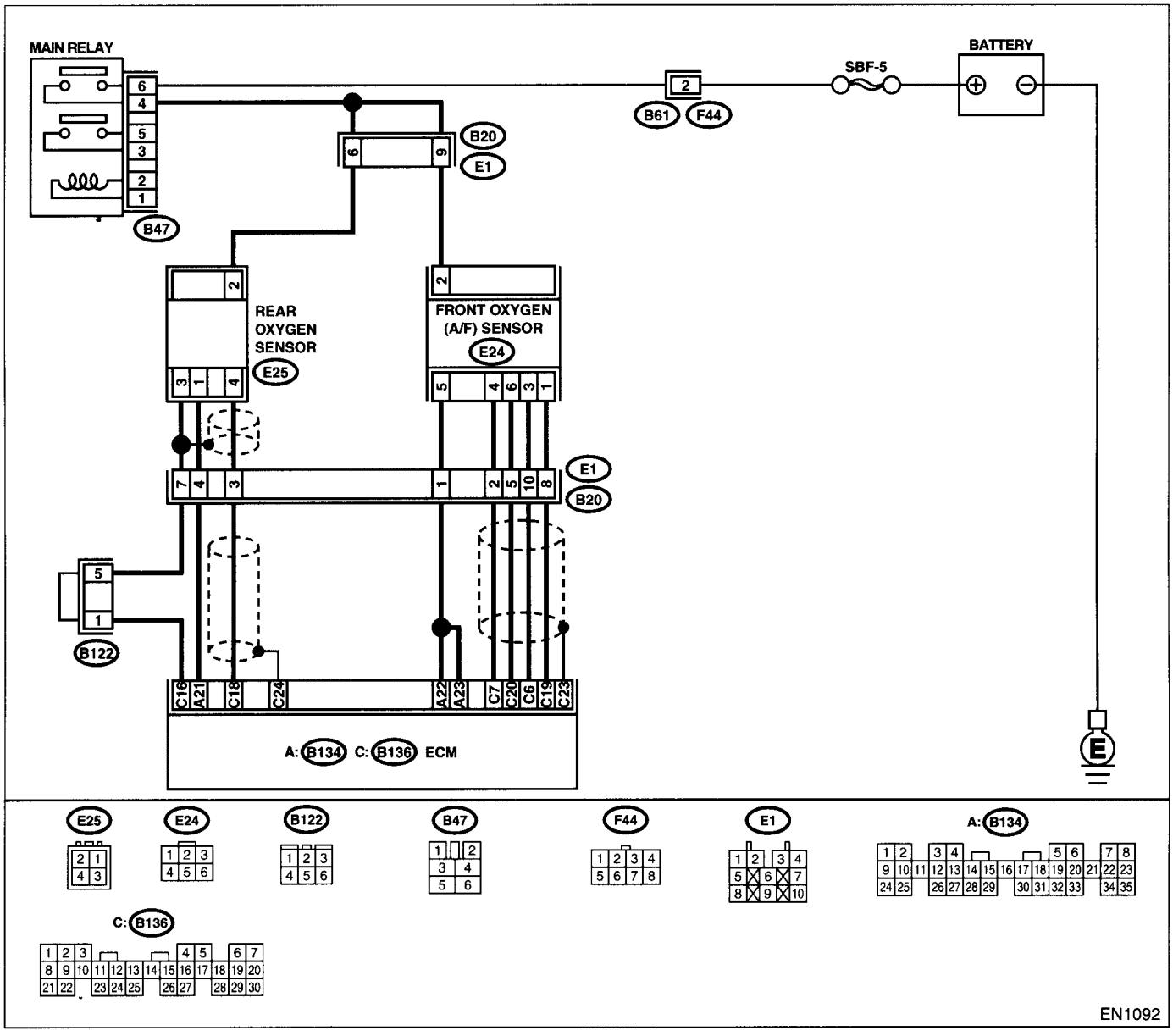
	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor <Ref to FU(SOHC)-29, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref to ME(SOHC)-46, Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket <Ref to ME(SOHC)-52, Camshaft Sprocket >	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 499207100 CAMSHAFT SPROCKET WRENCH	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(SOHC)-47, Timing Belt Assembly >	Replace the camshaft position sensor. <Ref. to FU(SOHC)-29, Camshaft Position Sensor.>

AP:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



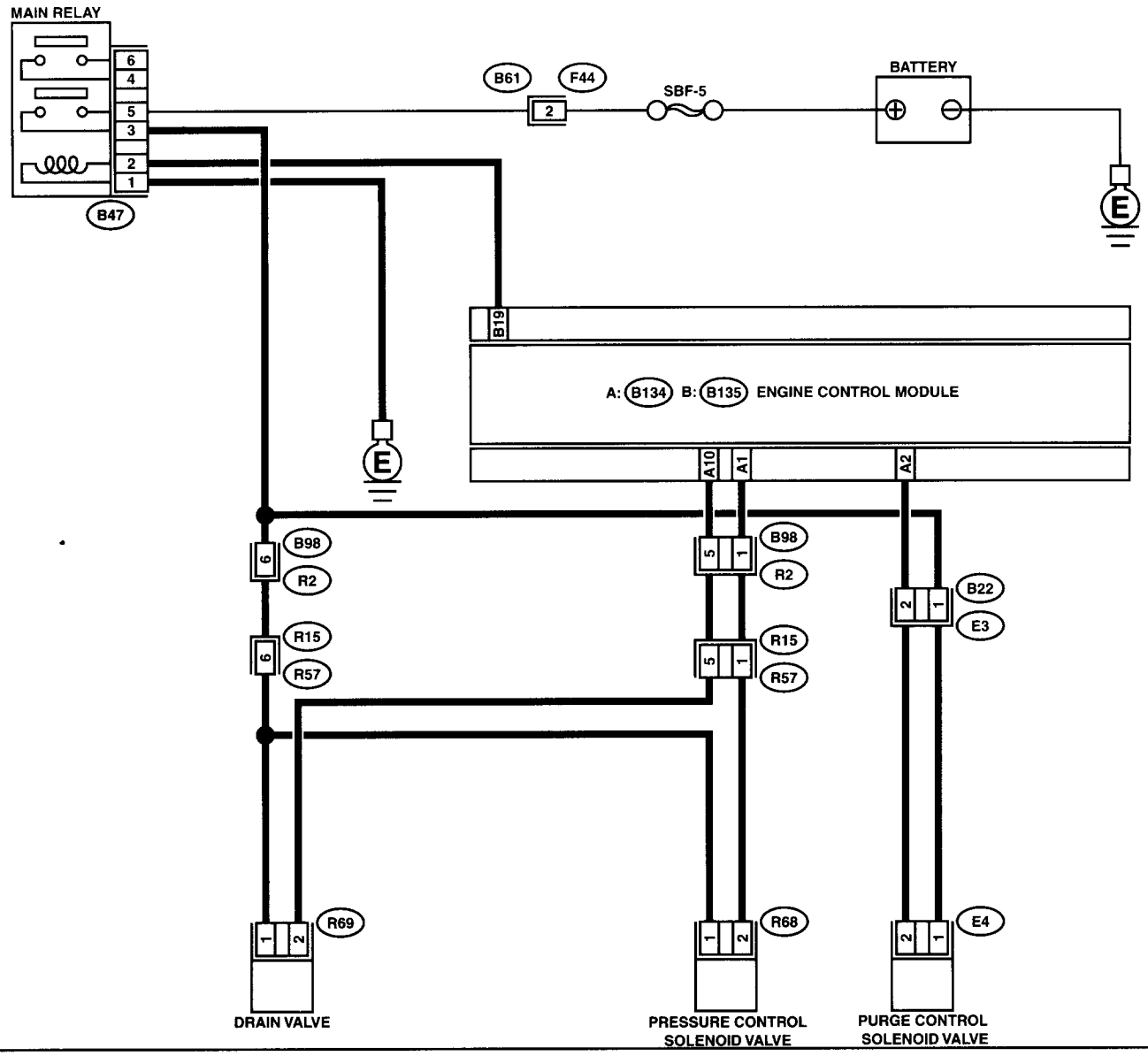
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0130, P0133, P0136, P0139, P0037, P0301, P0302, P0303, P0304, P1130, P1131, P0031, P0032 and P0038?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(SOHC)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter <Ref. to EC(SOHC)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(SOHC)-4, Rear Catalytic Converter.>.	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(SOHC)-3, Front Catalytic Converter.>	Contact with your Subaru distributor. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

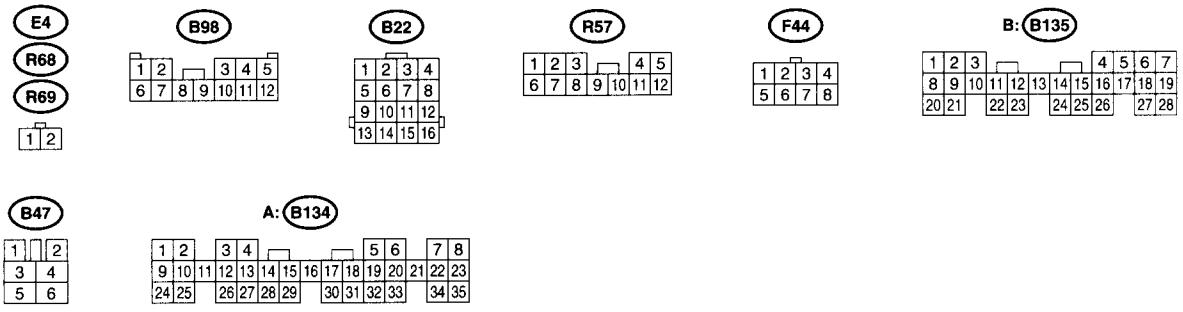
AQ:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1093

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1)Turn the ignition switch to OFF. 2)Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(SOHC)-54, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1)Connect the test mode connector. 2)Turn the ignition switch to ON. 3)Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the drain valve produce operating sound?	Go to step **5.**	Replace the drain valve. <Ref. to EC(SOHC)-16, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve produce operating sound?	Go to step **6.**	Replace the purge control solenoid valve. <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace the pressure control solenoid valve. <Ref. to EC(SOHC)-11, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on fuel line?	Repair or replace the fuel line. <Ref. to FU(SOHC)-68, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

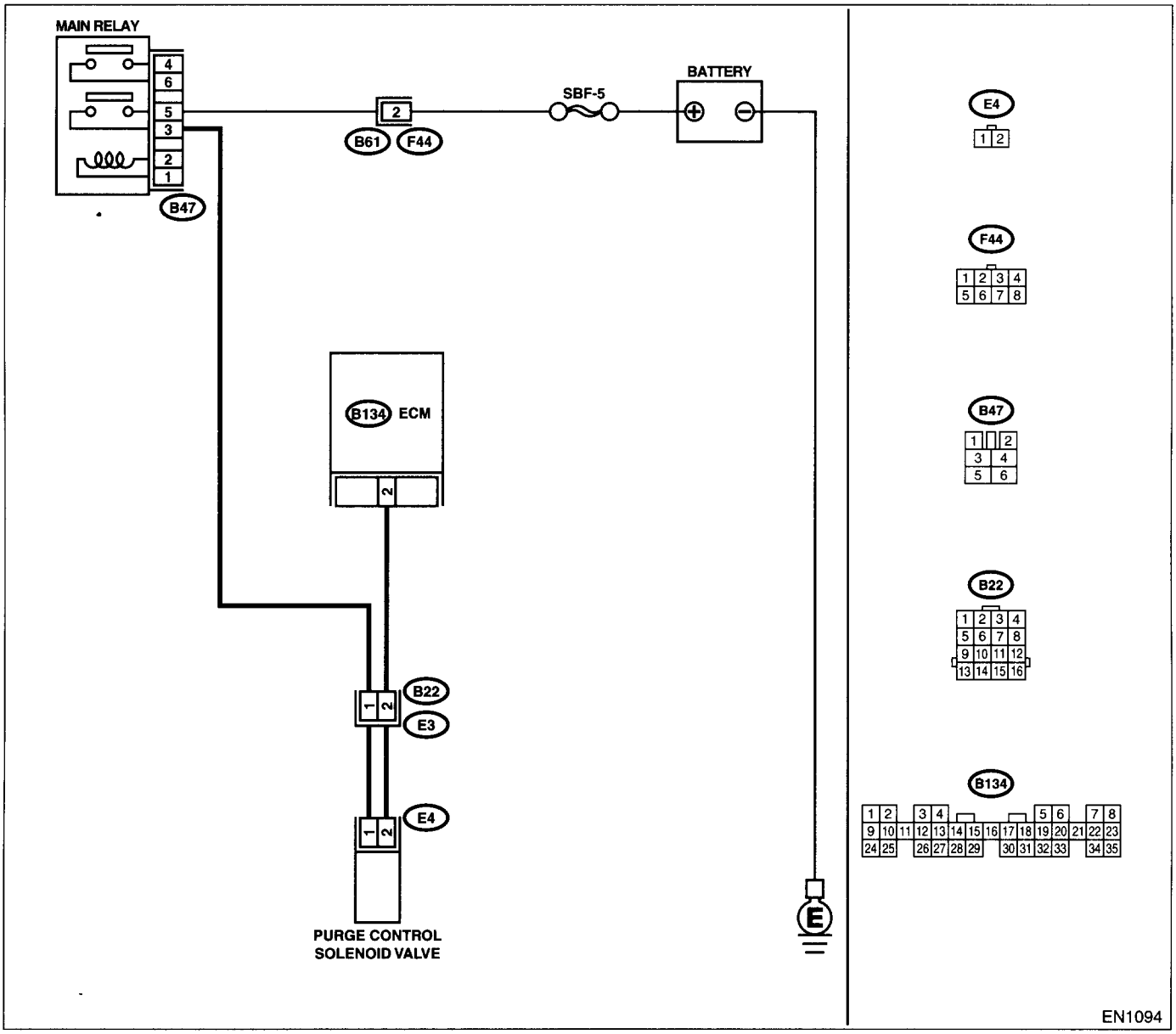
	Step	Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(SOHC)-5, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(SOHC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(SOHC)-51, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AR:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from purge control solenoid valve and ECM. 3)Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 2 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector (B22)
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Remove the purge control solenoid valve. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

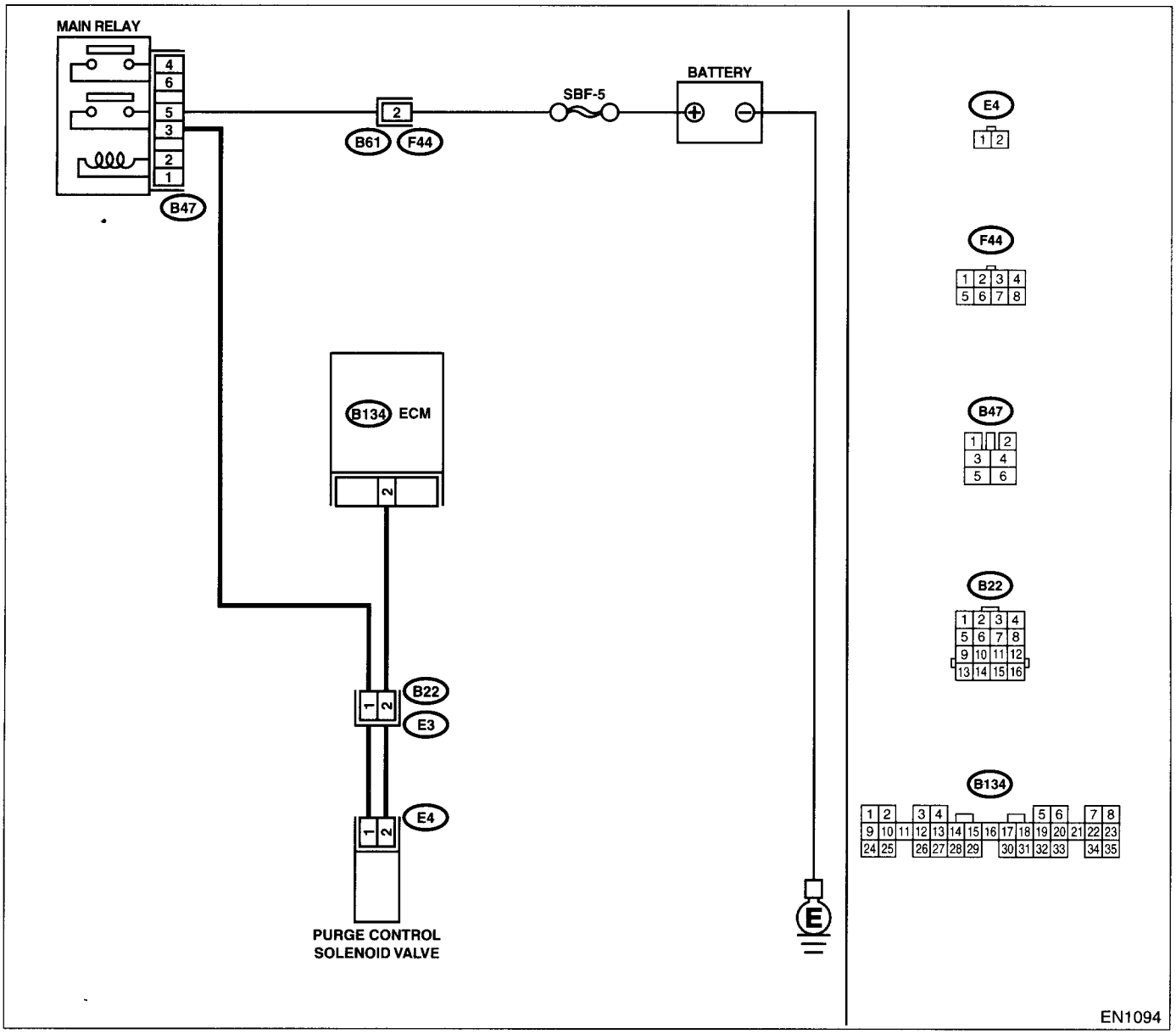
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AS:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



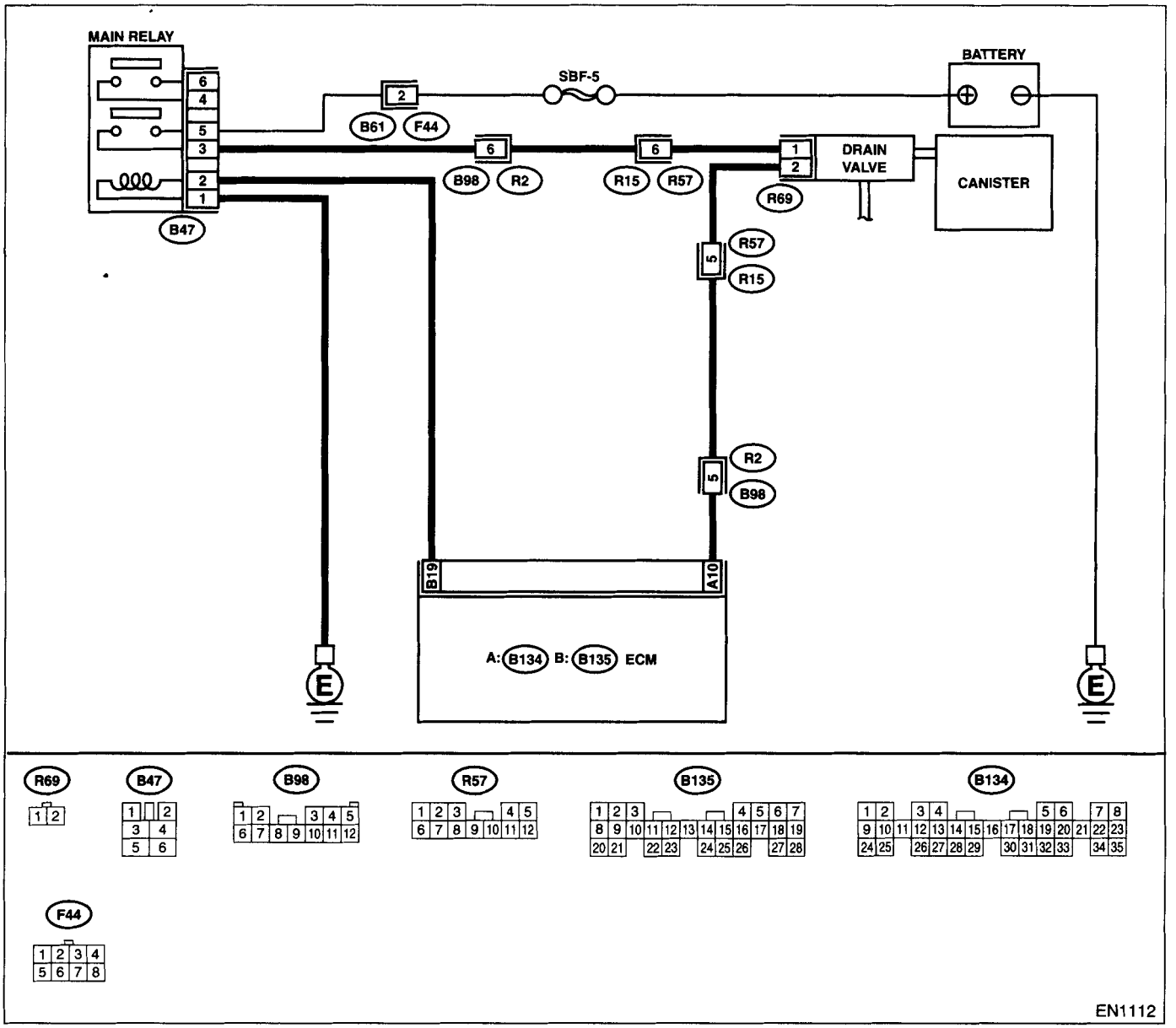
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from purge control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

AT:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connectors (R57 and B98)
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from drain valve and ECM. 3)Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and drain valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 10 — (R69) No. 2:***	Is the voltage less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connectors (R57 and B98)
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(SOHC)-16, Drain Valve.>
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connectors (R57 and B98) • Poor contact in main relay connector

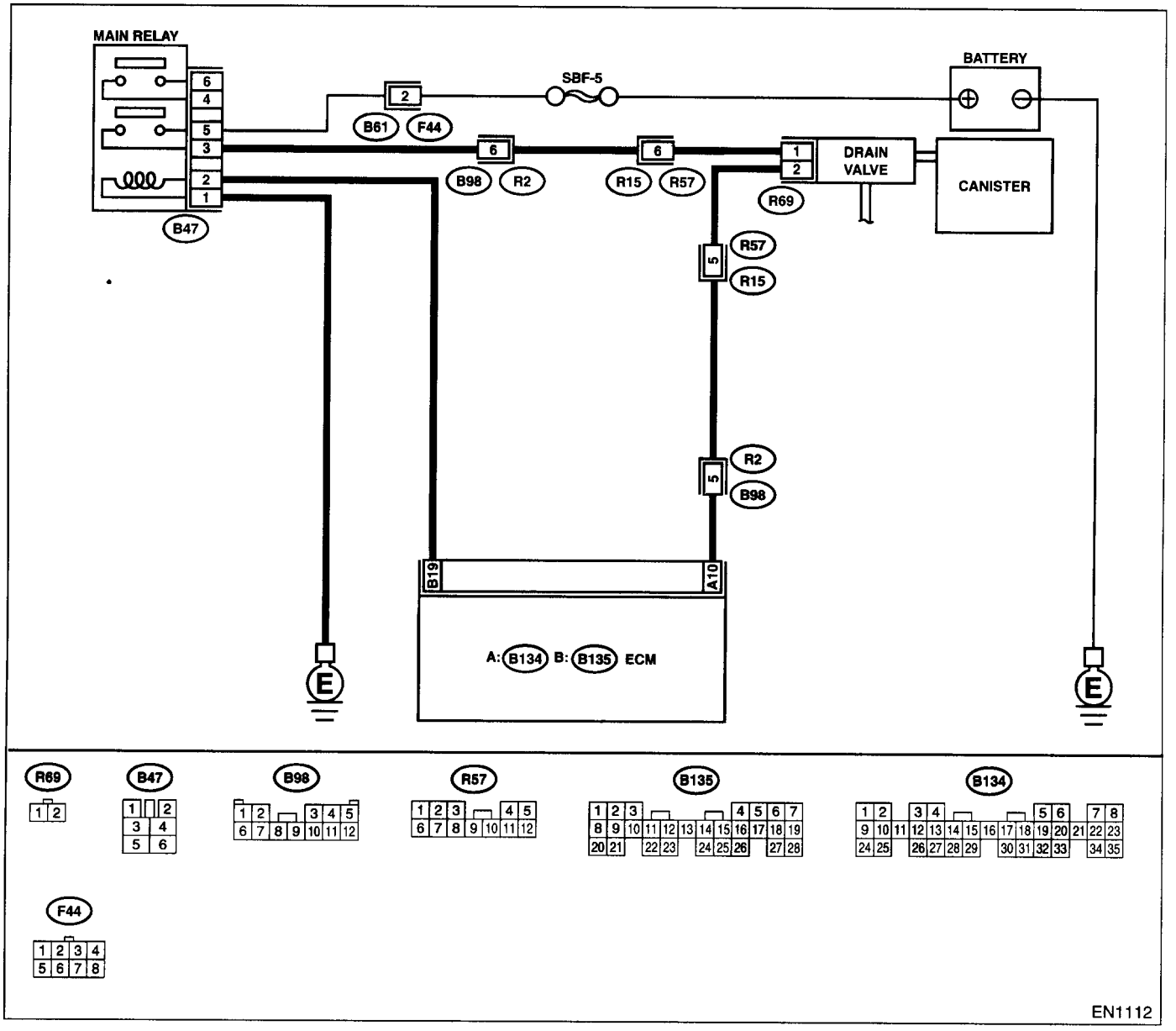
	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AU:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



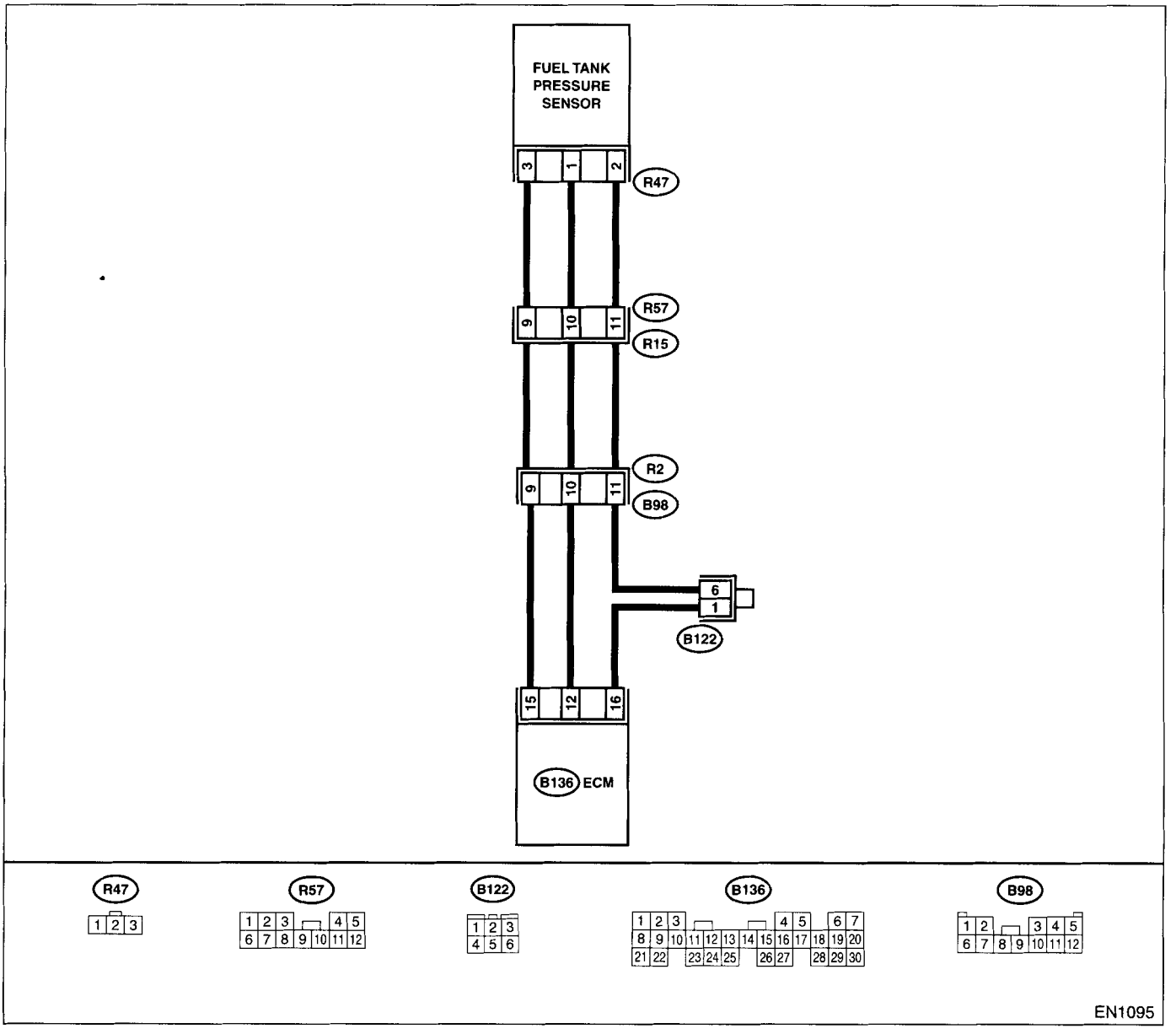
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be excecuted using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. • ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from drain valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(SOHC)-16, Drain Valve.> and ECM <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

AV:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE PROBLEM

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



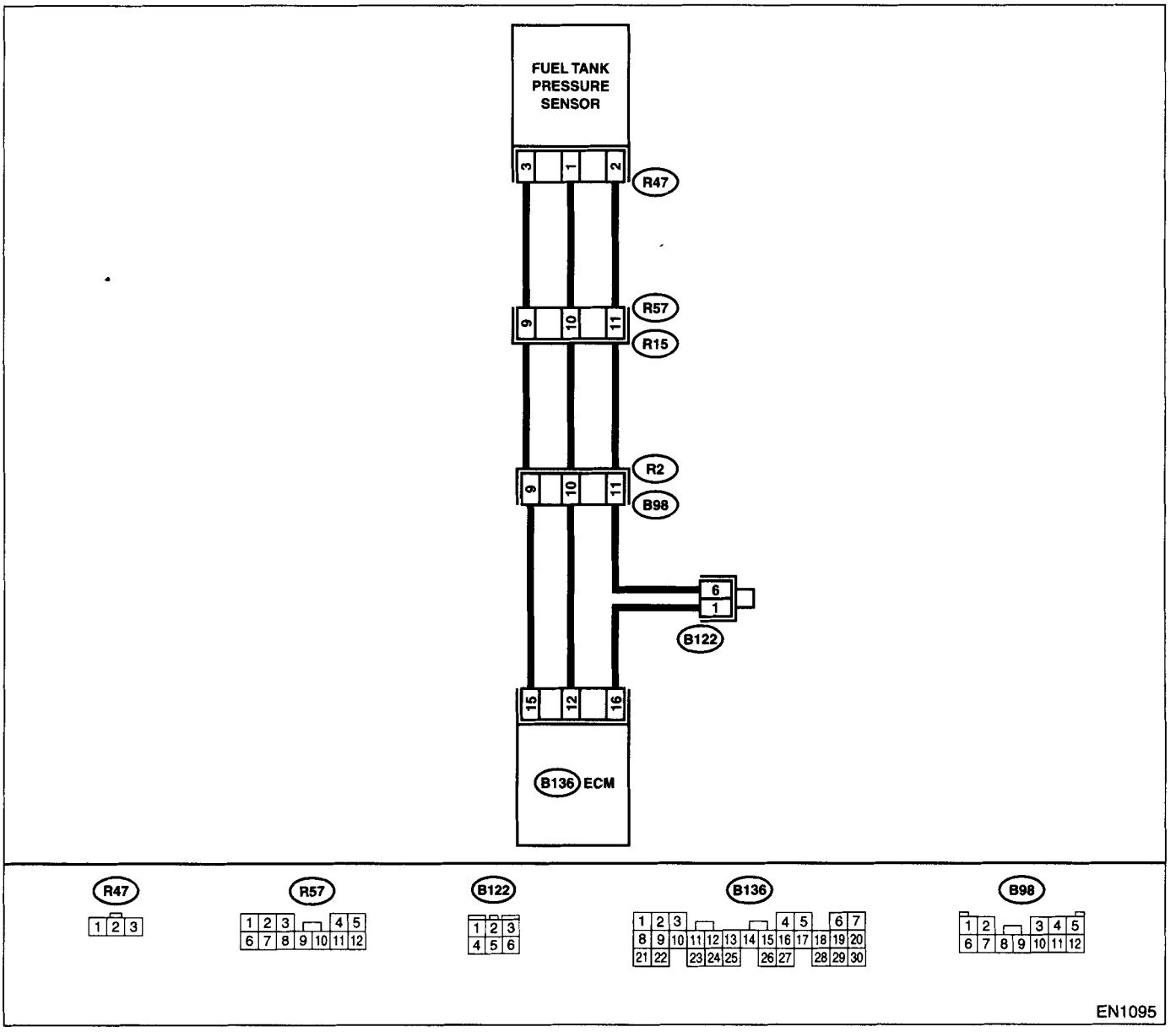
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1)Turn the ignition switch to OFF. 2)Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(SOHC)-10, Fuel Tank Pressure Sensor.>

AW:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the fuel filler cap. 3)Install the fuel filler cap. 4)Turn the ignition switch to ON. 5)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	Does the value change more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3)Separate rear wiring harness and fuel tank cord. 4)Turn the ignition switch to ON. 5)Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector (R57) • Poor contact in coupling connector (B98)

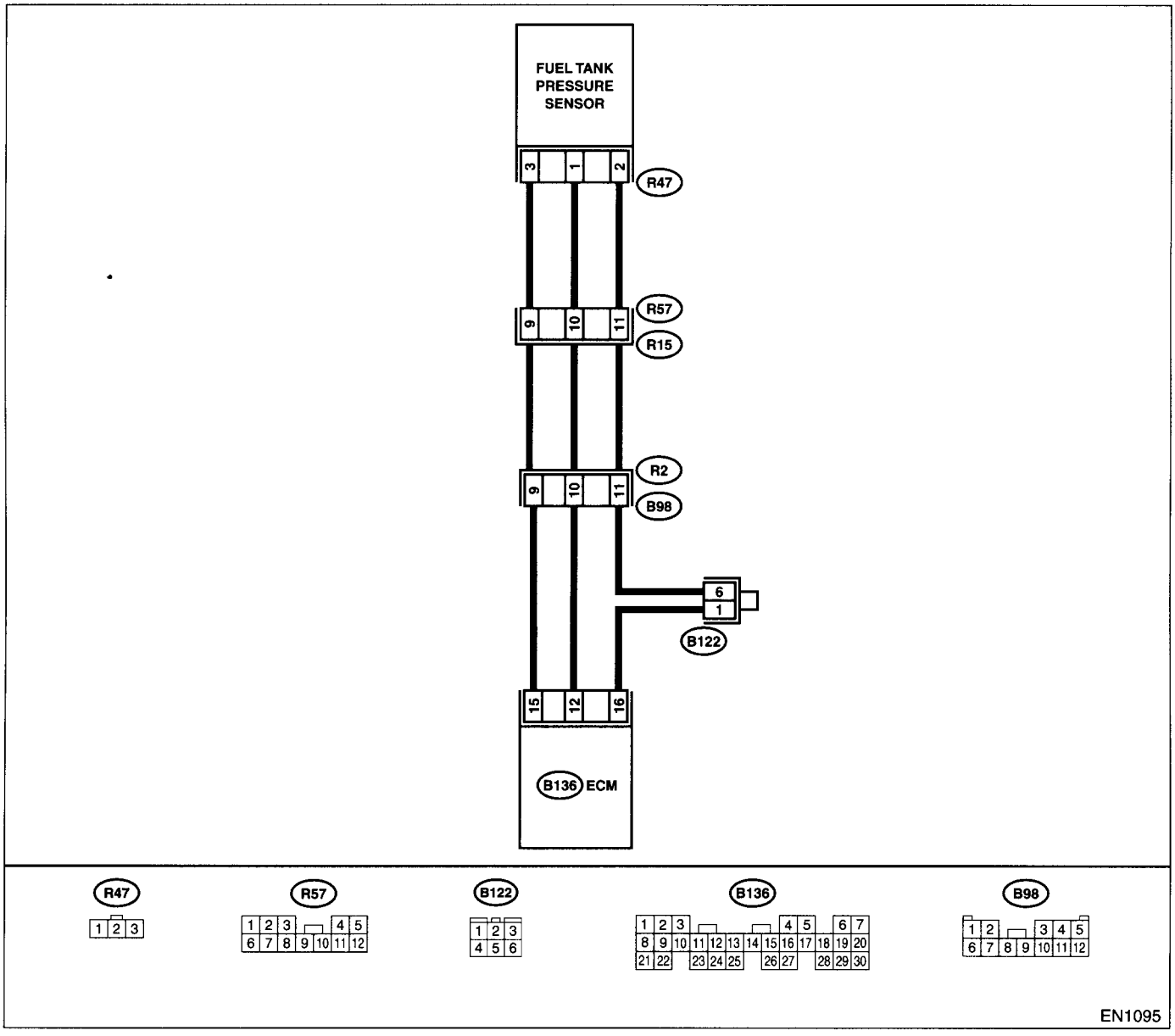
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 16 — (R15) No. 11:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector (R57) • Poor contact in coupling connector (B98) • Poor contact in joint connector (B122)
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance more than 500 kΩ?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector (R57).
9	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel tank pressure sensor. 2)Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 9 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 11 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the resistance more than 500 kΩ?	Go to step **12.**	Repair ground short circuit in fuel tank cord.
12	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(SOHC)-10, Fuel Tank Pressure Sensor.>

AX:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Remove the fuel filler cap. 3)Install the fuel filler cap. 4)Turn the ignition switch to ON. 5)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **12.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***• (B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	Does the value change more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Remove the rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3)Separate rear wiring harness and fuel tank cord. 4)Turn the ignition switch to ON. 5)Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector (R57) • Poor contact in coupling connector (B98)

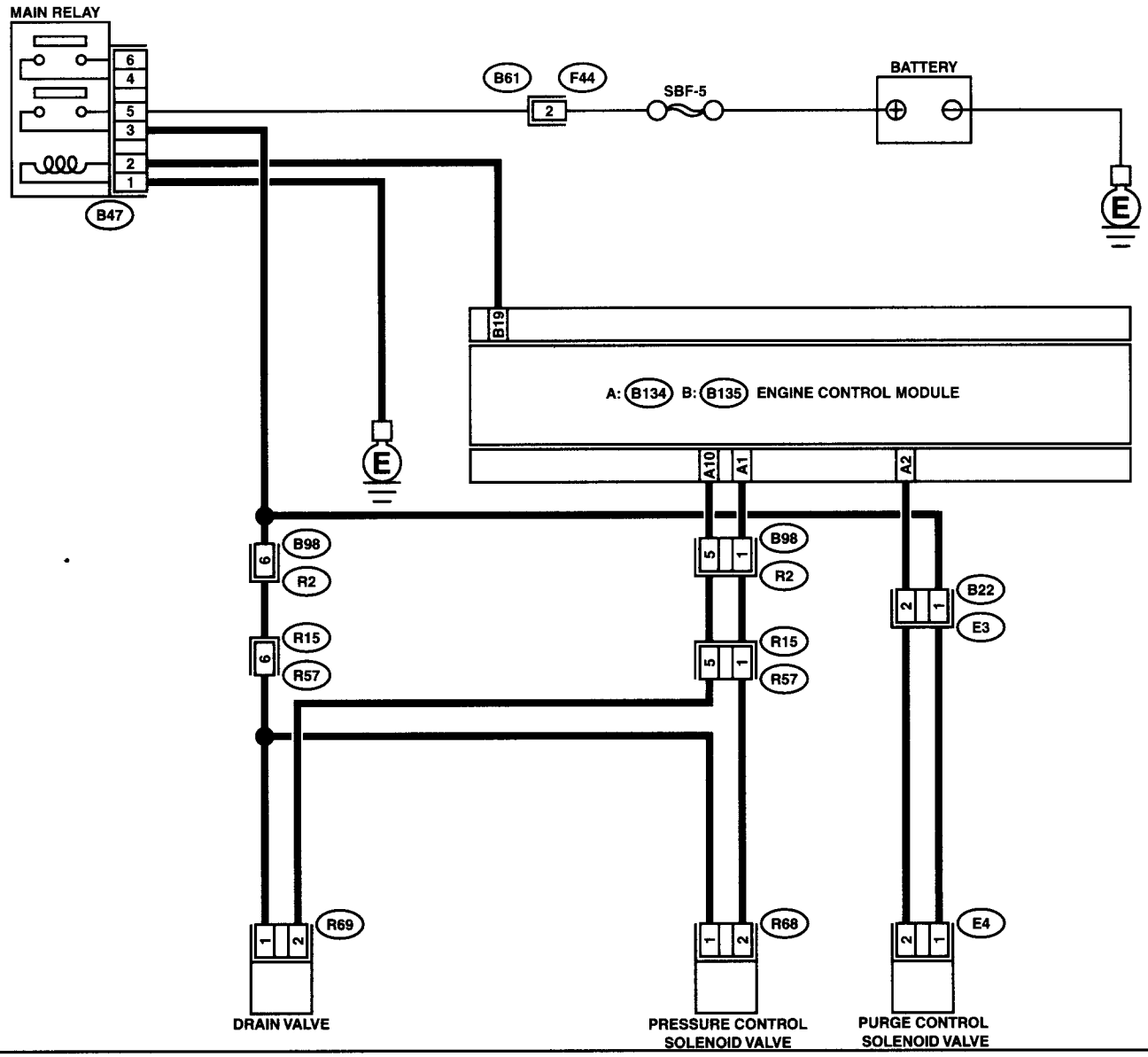
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 12 — (R15) No. 10:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE. In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector (R57) • Poor contact in coupling connector (B98)
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — (R15) No. 11:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector (R57).
9	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel tank pressure sensor. 2)Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 10 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 11 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(SOHC)-10, Fuel Tank Pressure Sensor.>
12	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel tank pressure sensor. 3)Turn the ignition switch to ON. 4)Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(SOHC)-10, Fuel Tank Pressure Sensor.>

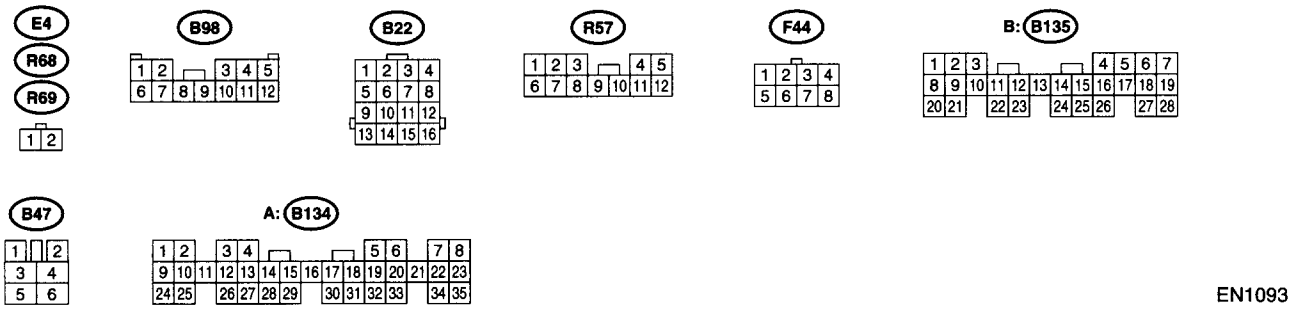
AY:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1093

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1)Turn the ignition switch to OFF. 2)Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(SOHC)-54, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1)Connect the test mode connector. 2)Turn the ignition switch to ON. 3)Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the drain valve produce operating sound?	Go to step **5.**	Replace the drain valve. <Ref. to EC(SOHC)-16, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve produce operating sound?	Go to step **6.**	Replace the purge control solenoid valve. <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace the pressure control solenoid valve. <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on fuel line?	Repair or replace the fuel line. <Ref. to FU(SOHC)-68, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

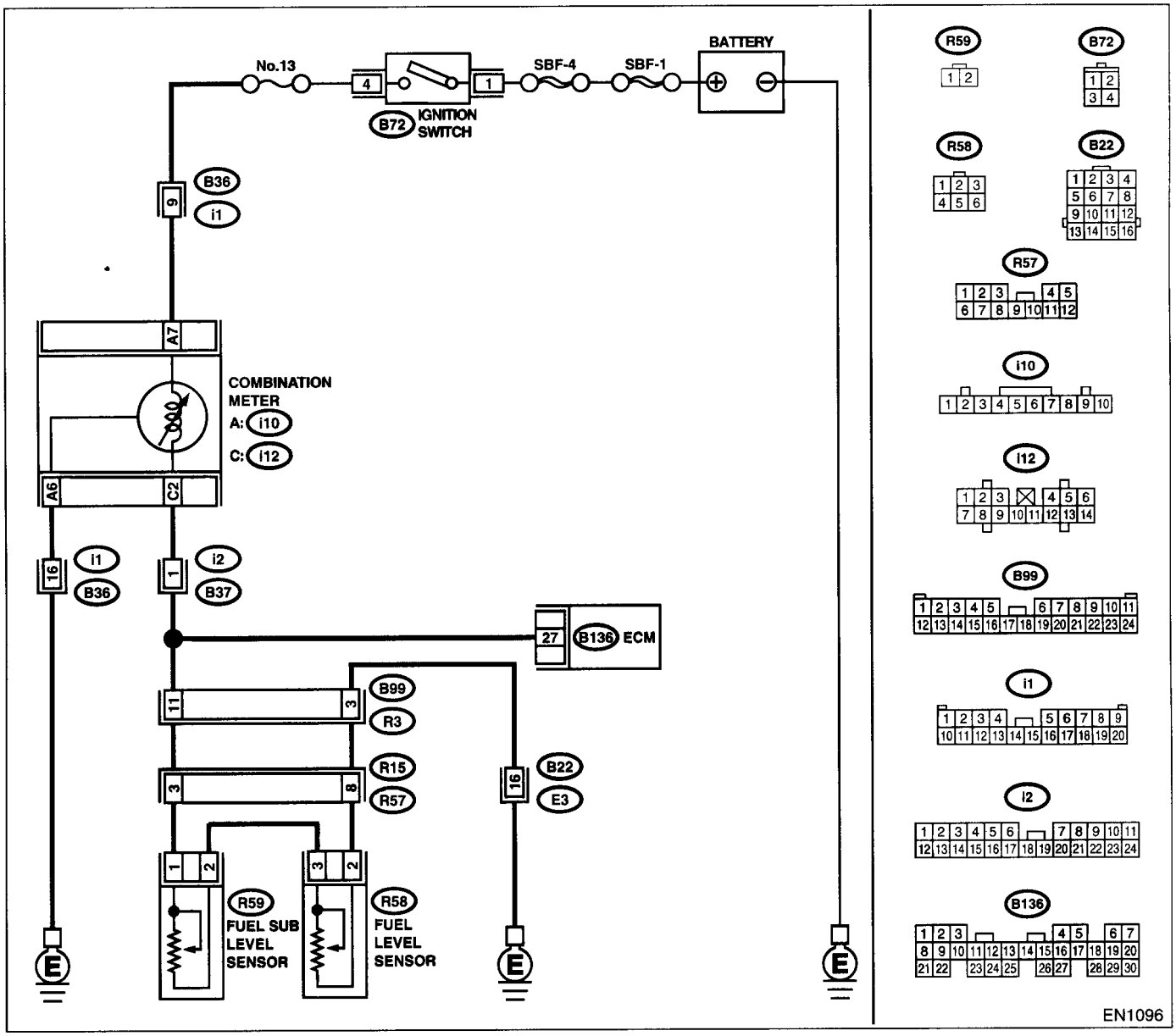
	Step	Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(SOHC)-5, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(SOHC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(SOHC)-51, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AZ:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



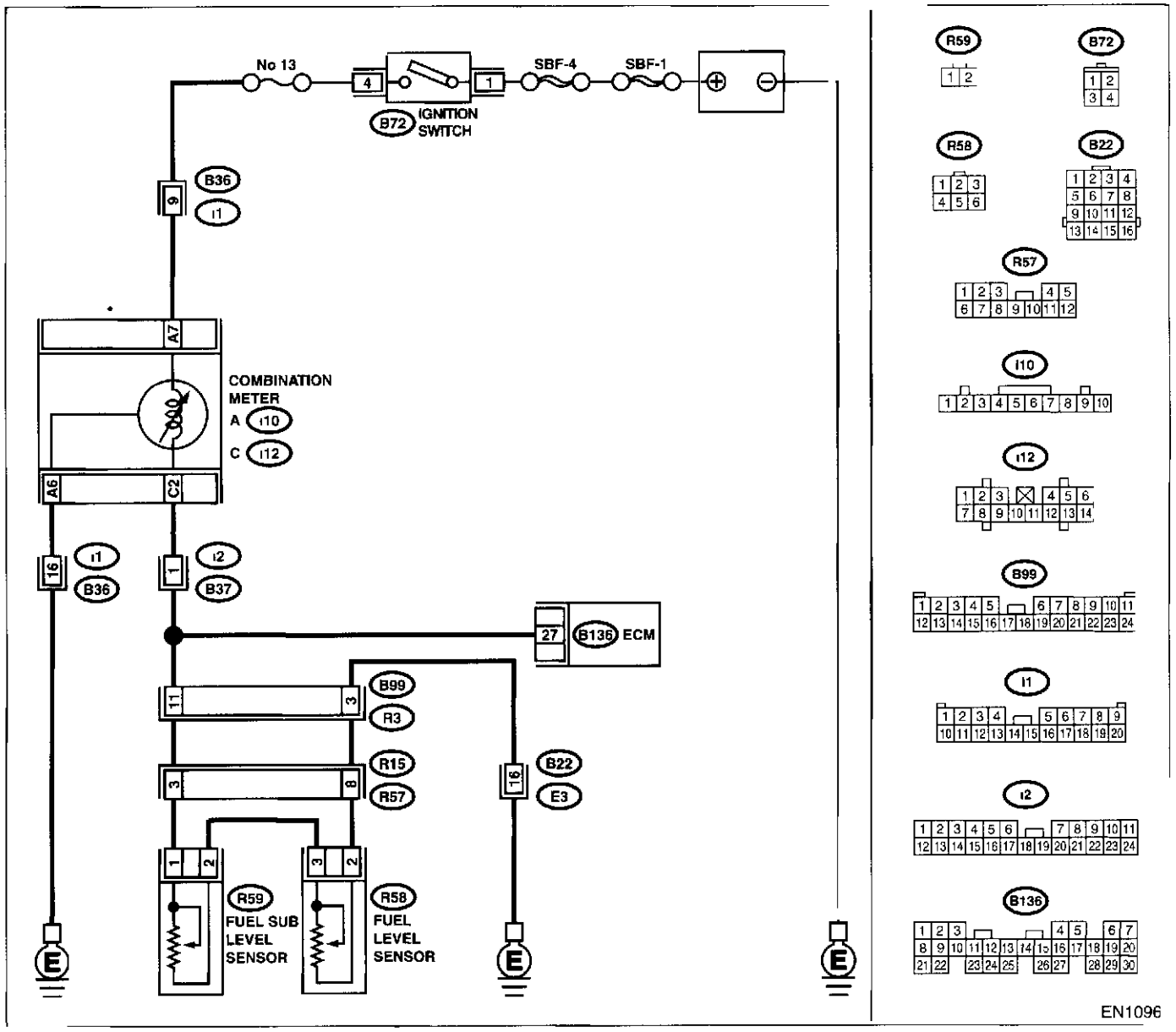
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(SOHC)-62, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(SOHC)-62, Fuel Level Sensor.>

BA:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter <Ref to IDI-4, Combination Meter System >

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (Engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 0.12 V?	Go to step **6.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	Does the value change less than 0.12 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors (B99 and R57)
4	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 0.12 V?	Go to step **4.**	Go to step **7.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from connector (i10) and ECM connector. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 27 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 27 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector (i2)

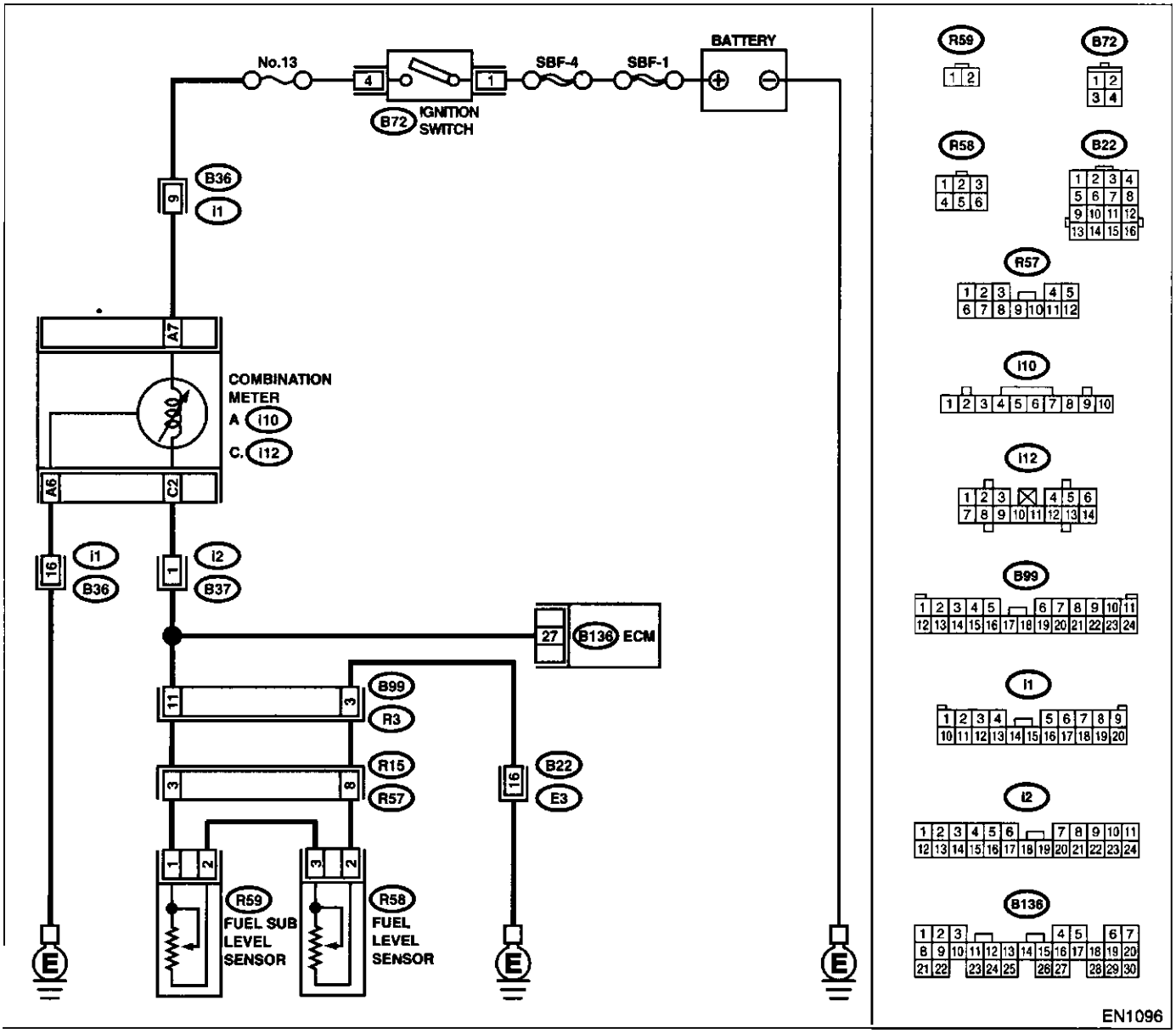
	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-59, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 2:***	Is the resistance between 0.5 and 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-63, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 0.5 and 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

BB:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter <Ref. to IDI-4, Combination Meter System.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. (Engine OFF) 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector (B22, B99 and R57)
3	**CHECK INPUT VOLTAGE OF ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the combination meter connector (j10) and ECM connector. 3)Turn the ignition switch to ON. 4)Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B136) No. 27 — (R15) No. 3:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 8 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors (B22 and B99)
6	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel level sensor. 2)Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 8 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel sub level sensor. 2)Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.

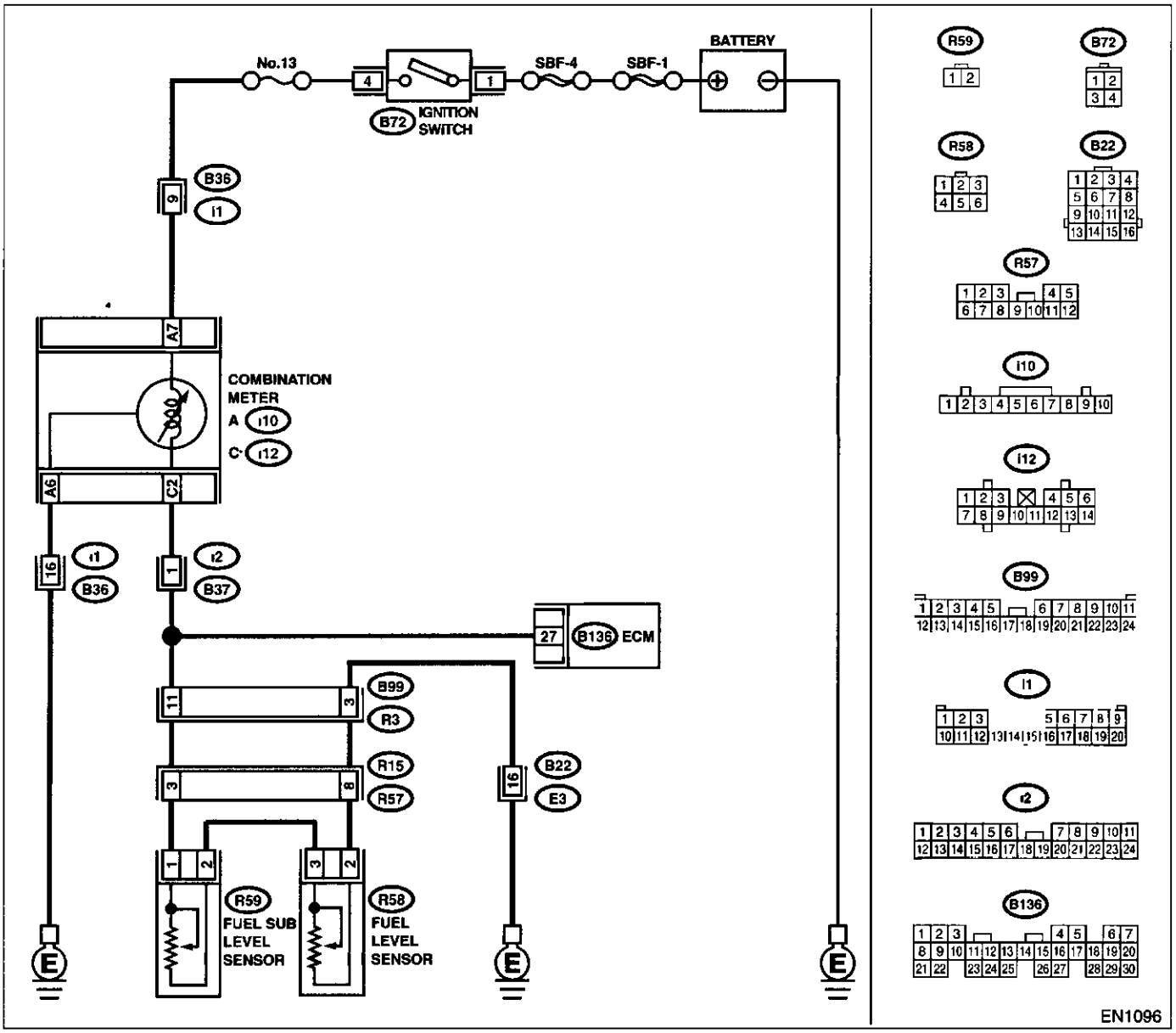
	Step	Check	Yes	No
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 3 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-59, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 2:***	Is the resistance more than 54.5 Ω?	Replace the fuel level sensor. <Ref. to FU(SOHC)-62, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-63, Fuel Sub Level Sensor.> 2)While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 41.5 Ω?	Replace the fuel sub level sensor. <Ref. to FU(SOHC)-63, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-11, Combination Meter Assembly.>

BC:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



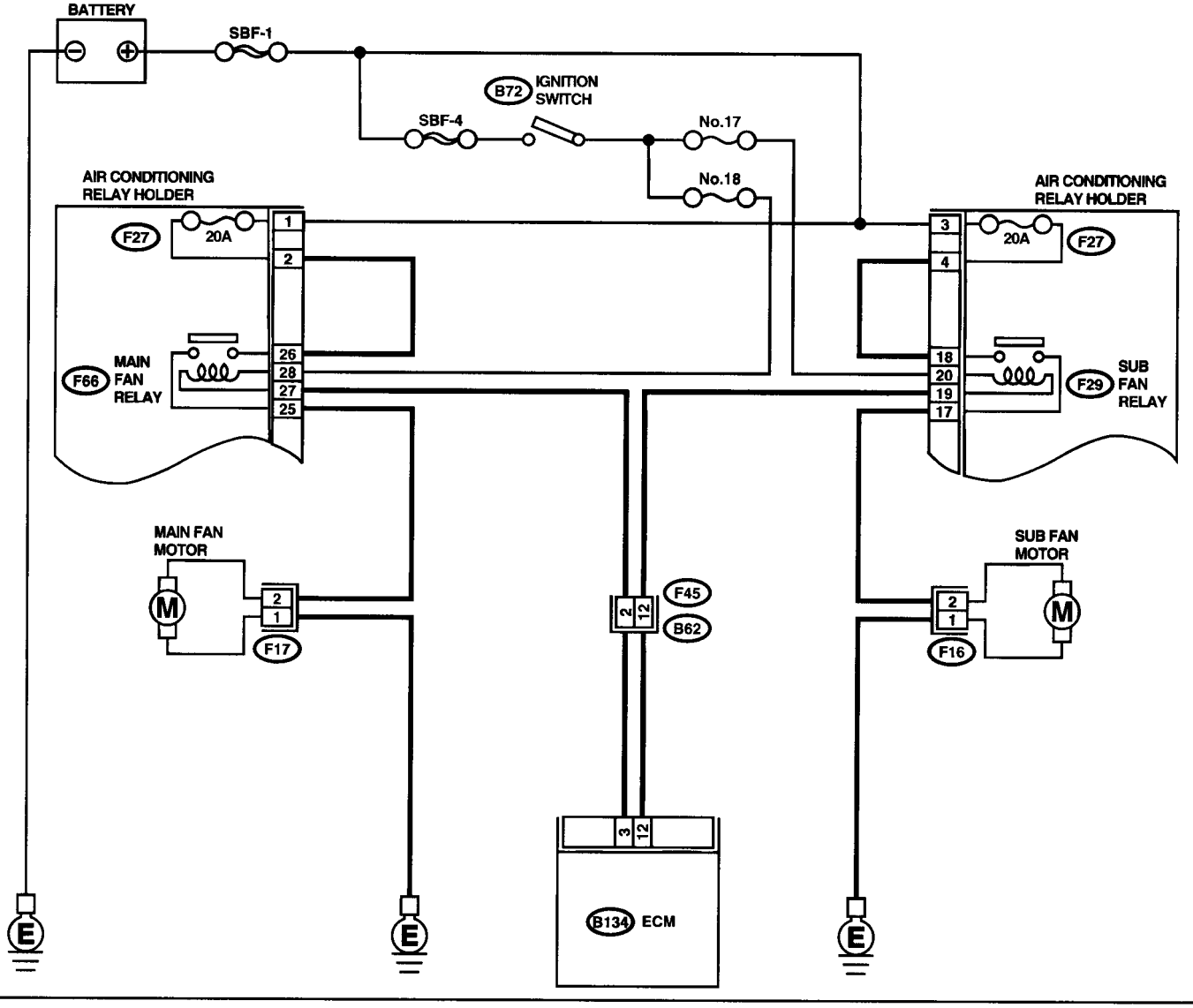
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0462 or P0463?	Inspect DTC P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel pump assembly. <Ref. to FU(SOHC)-59, Fuel Pump.> 2)While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(SOHC)-62, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1)Remove the fuel sub level sensor. <Ref. to FU(SOHC)-62, Fuel Level Sensor.> 2)While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(SOHC)-62, Fuel Level Sensor.>

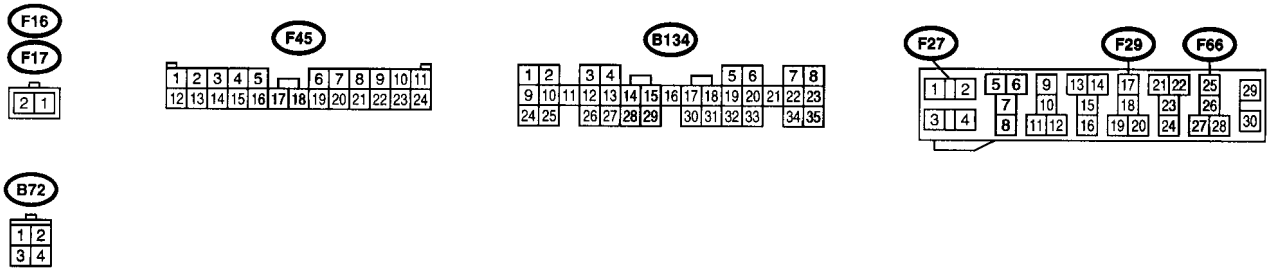
BD:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1097

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(SOHC)-32, Subaru Select Monitor.> ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in radiator main fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1)Remove the main fan relay from A/C relay holder. 2)Turn the ignition switch to ON. 3)Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F66) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 28 — No. 27:***	Is the resistance between 87 and 107 Ω?	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B134) No. 3 — (F66) No. 27:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector (F45)
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector.	Is there poor contact in ECM or main fan relay connector?	Repair poor contact in ECM or main fan relay connector.	Contact with SOA (distributor) service.

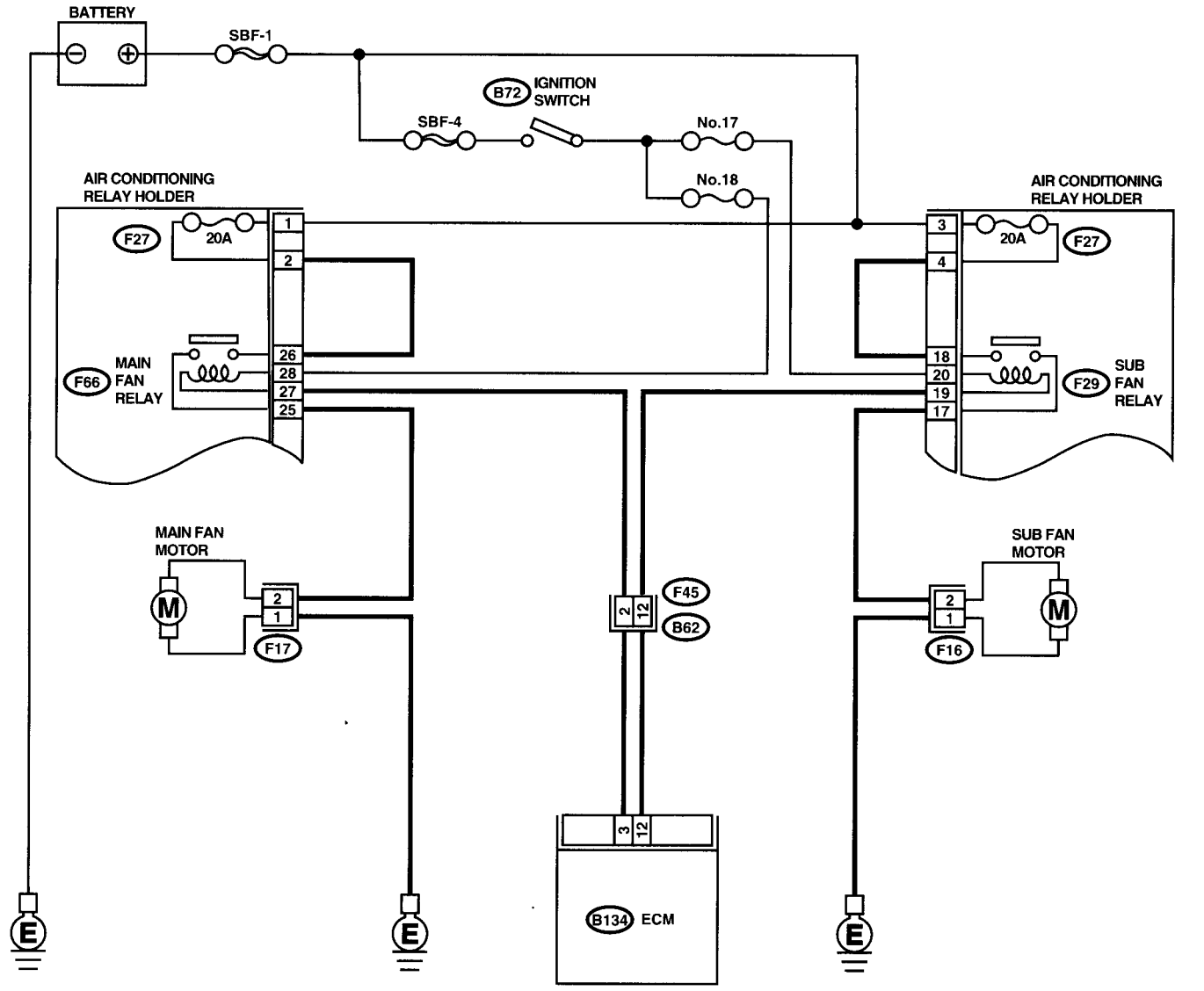
BE:DTC P0483 — COOLING FAN FUNCTION PROBLEM —

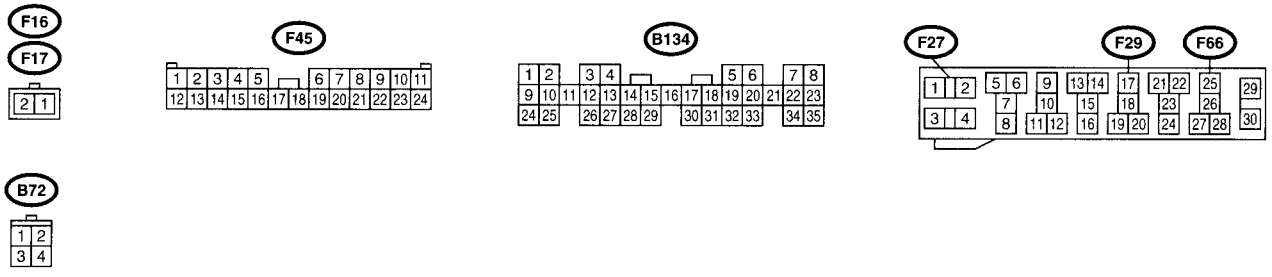
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - *Occurrence of noise*
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**





EN1097

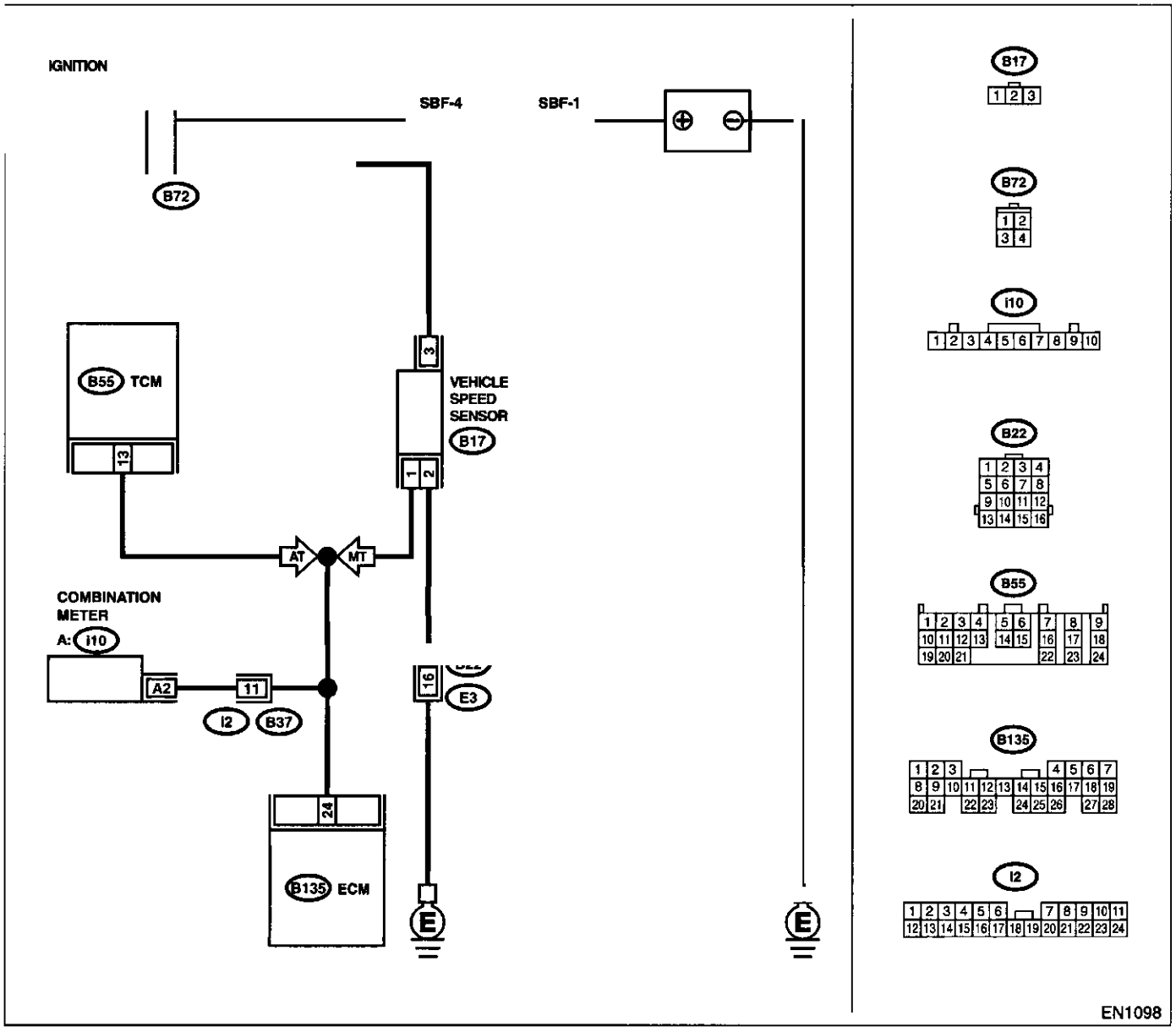
Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO-9, RADIATOR MAIN FAN SYSTEM, .> and <Ref. to CO-17, RADIATOR SUB FAN SYSTEM, .>

BF:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 2.	Go to step 3.

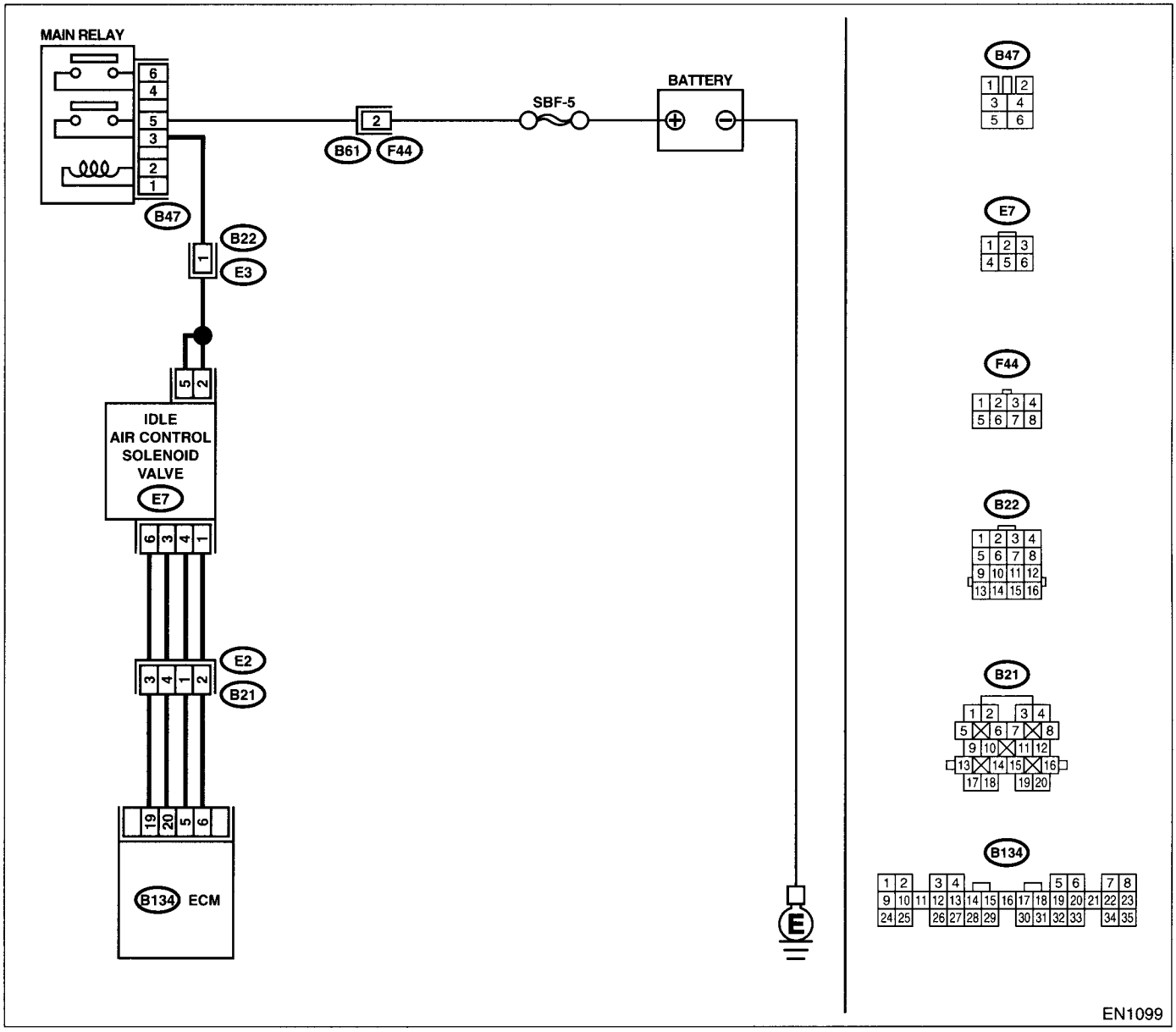
Step		Check	Yes	No
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-13, Speedometer.> and <Ref. to AT-32, Front Vehicle Speed Sensor.> and <Ref. to AT-35, Rear Vehicle Speed Sensor.> and <Ref. to AT-36, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter. 3)Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B135) No. 24 — (i10) No. 2:***	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector (B37)

BG:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



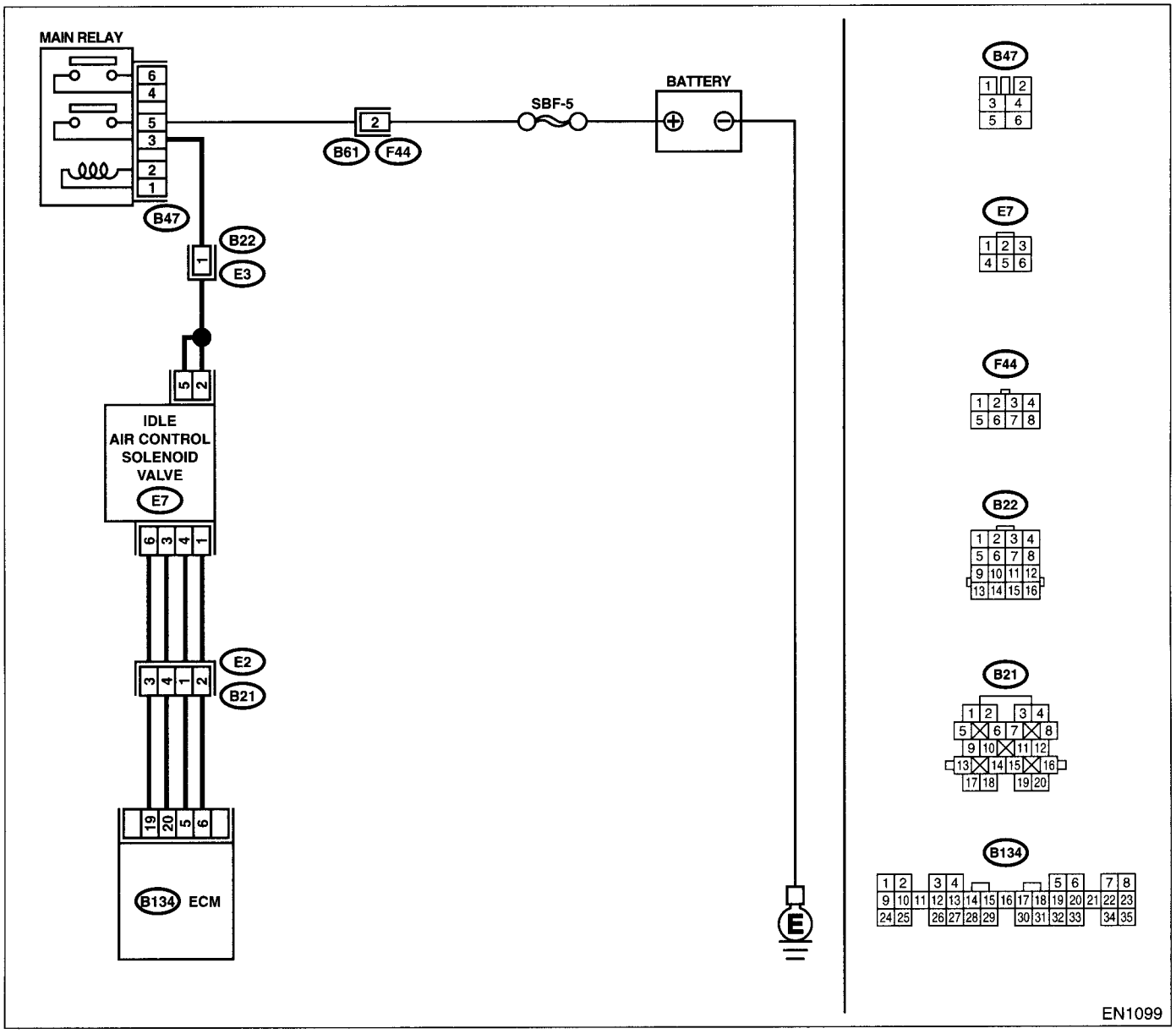
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body from intake manifold. <Ref. to FU(SOHC)-14, REMOVAL, Throttle Body.> 4)Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-36, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(SOHC)-14, INSTALLATION, Throttle Body.>

BH:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



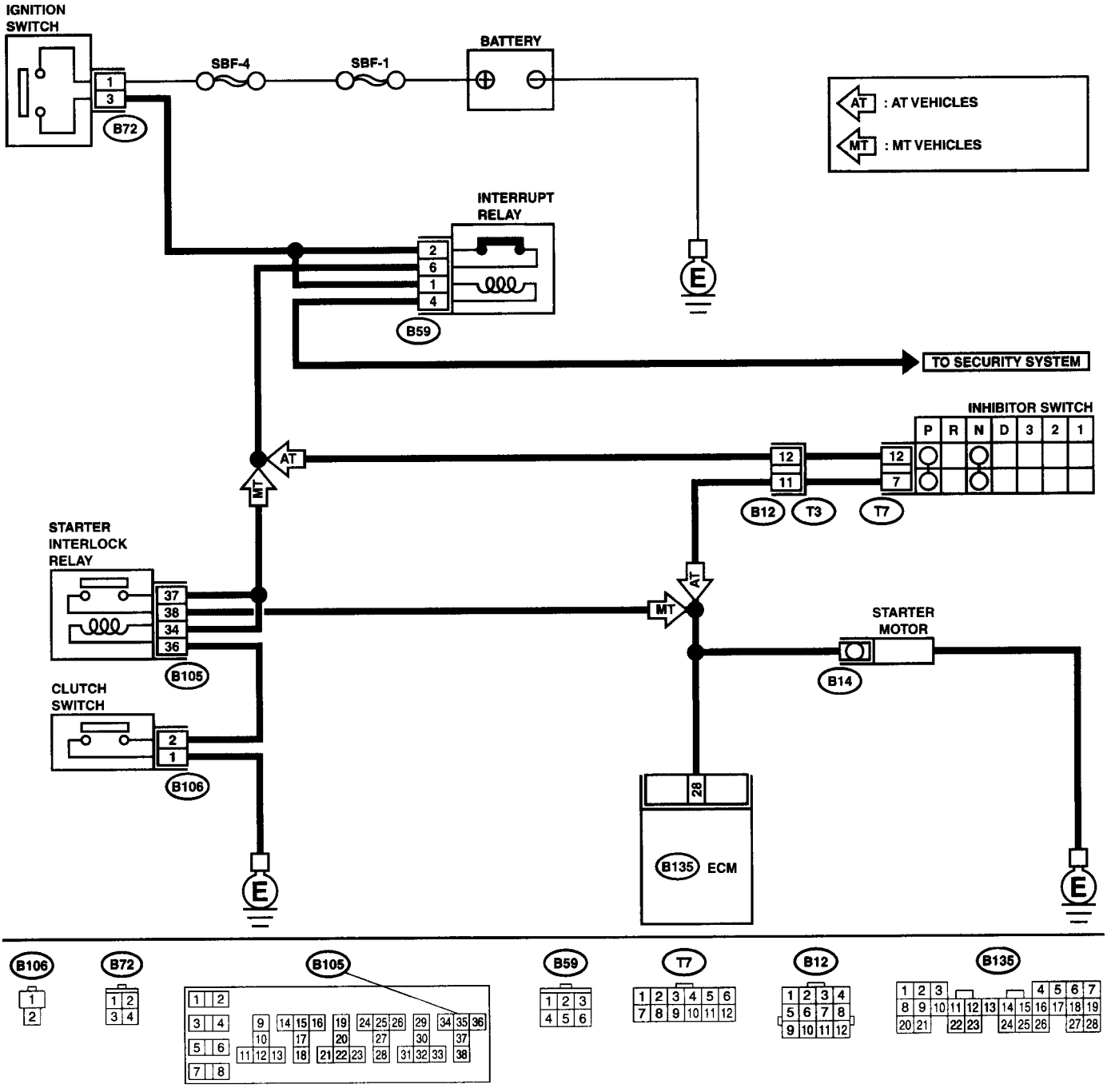
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP-7, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-36, INSTALLATION, Idle Air Control Solenoid Valve.>

BI: DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1077

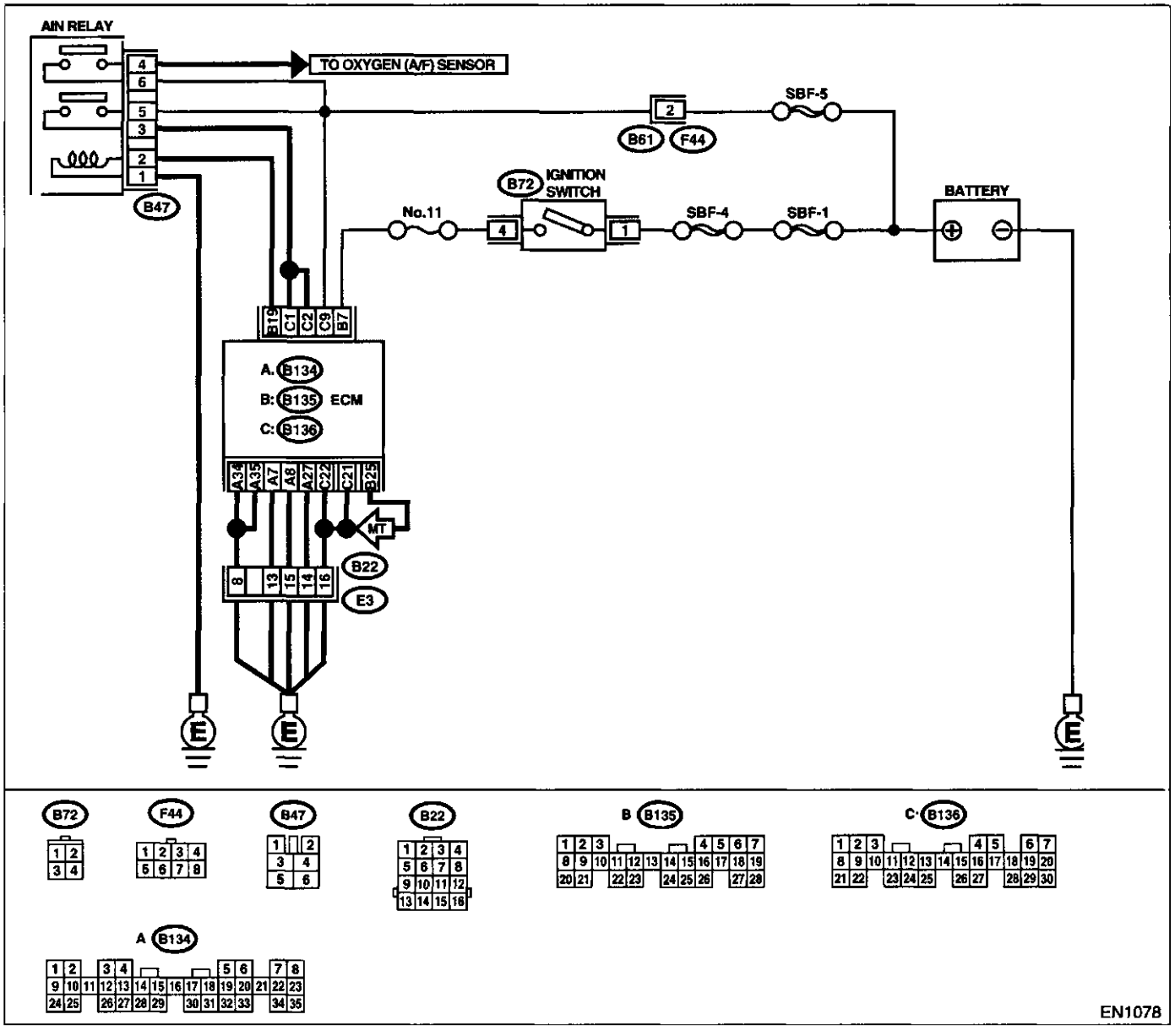
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in each position. (AT model) Depress or release the clutch pedal. (MT model)	Does the starter motor operate when ignition switch is turned to "ON"?	Repair battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Check starter motor circuit. <Ref. to EN(SOHC)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BJ:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



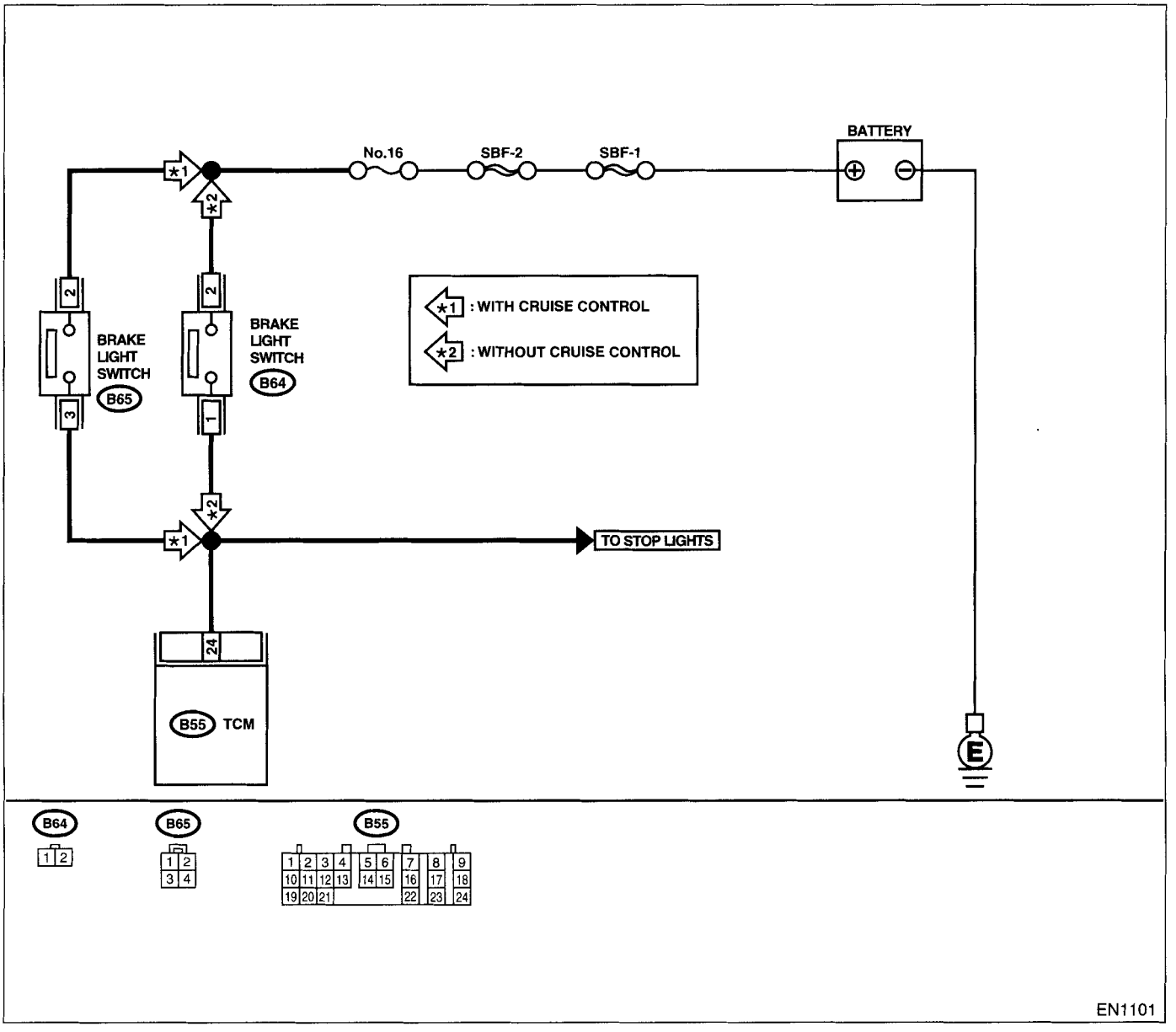
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0601?	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	It is not necessary to inspect DTC P0601.

BK:DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT.	Does the brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1)Disconnect the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** • ***Without cruise control*** ***(B55) No. 24 — (B64) No.1:*** • ***With cruise control*** ***(B55) No. 24 — (B65) No. 3***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (–):***	Is the voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (–):***	Is the voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BL:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BM:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BN:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(SOHC)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BO:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effected in "3" range; excessive shift shock; excessive tight corner "braking"

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BP:DTC P0741 — TORQUE CONVERTER CLUTCH SYSTEM MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner "braking"

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to AT-115, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to AT-112, CHECK BRAKE SWITCH., Diagnostic Procedure for No-Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**

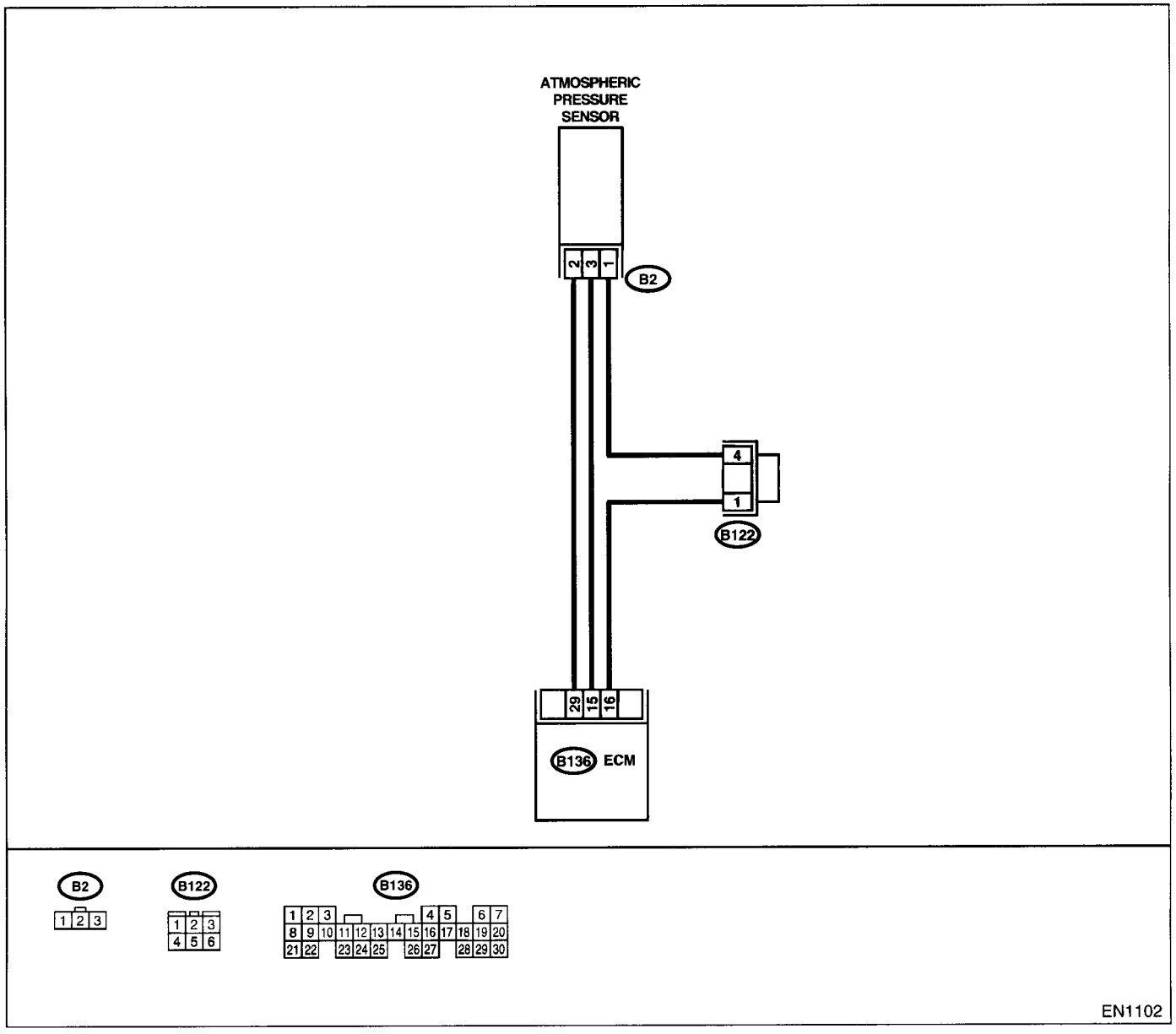
	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

BQ:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value less than 0 kPa (0 mmHg, 0 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and pressure sensor connector.	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or atmospheric pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 29 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	Does the value change more than 0 kPa (0 mmHg, 0 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Go to step **7.**

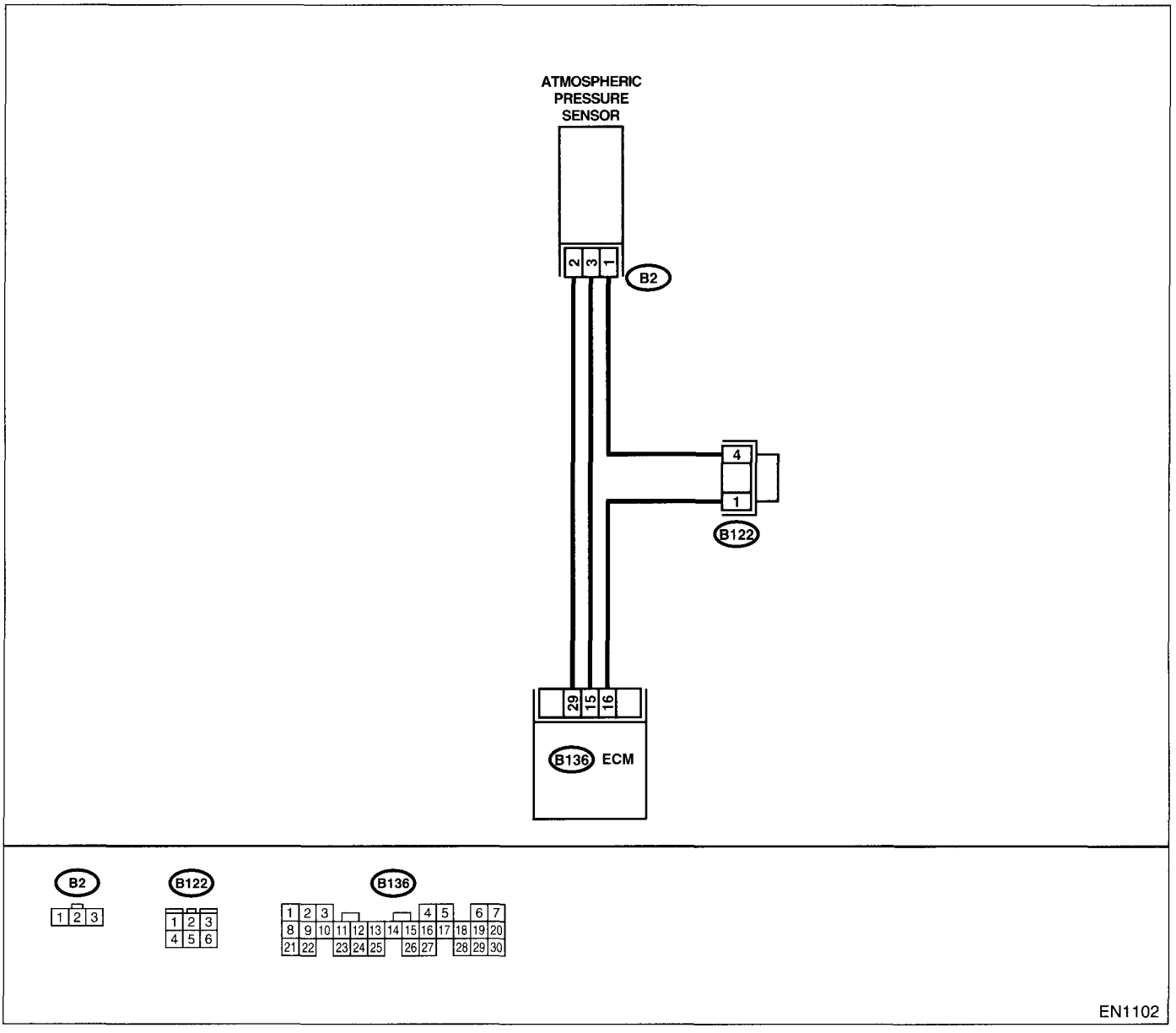
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from atmospheric pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between atmospheric pressure sensor connector and engine ground. ***Connector & terminal*** ***(B2) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and atmospheric pressure sensor connector • Poor contact in joint connector (B122)
8	**CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B136) No. 16 — (B2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector
9	**CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between pressure sensor connector and engine ground. ***Connector & terminal*** ***(B2) No. 2 — Engine ground:***	Is the resistance more than 500 kΩ?	Go to step **10.**	Repair ground short circuit in harness between ECM and pressure sensor connector.
10	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU(SOHC)-35, Atmospheric Pressure Sensor.>

BR:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 140 kPa (1,050 mmHg, 41.34 inHg)?	Go to step **10.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.>	Does the value change more than 0 kPa (0 mmHg, 0 inHg) by shaking harness and connector of ECM while monitoring the value with Subaru select monitor?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from atmospheric pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between atmospheric pressure sensor connector and engine ground. ***Connector & terminal*** ***(B2) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector • Poor contact in joint connector (B122)

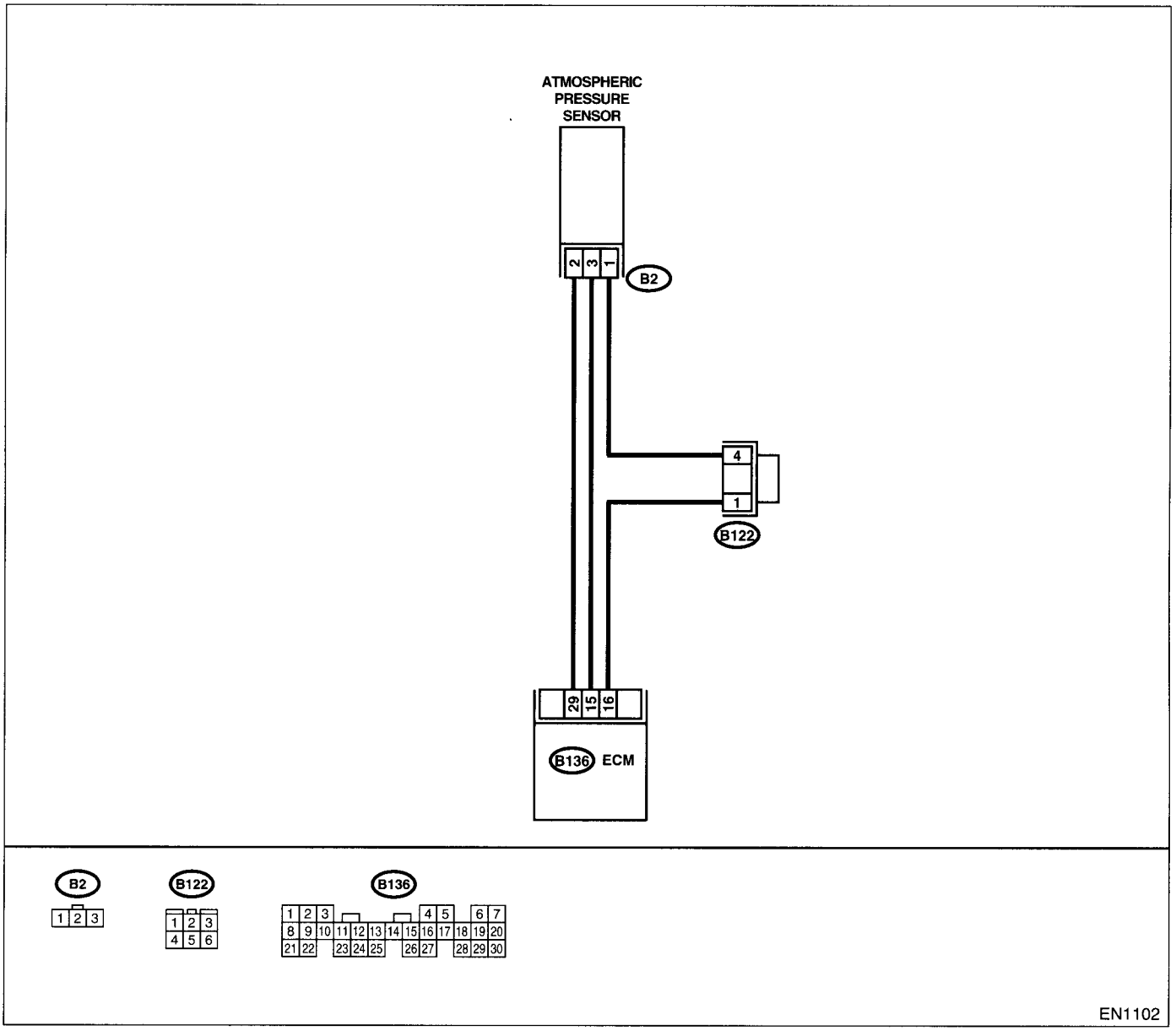
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B136) No. 29 — (B2) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector
8	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B136) No. 16 — (B2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure sensor connector • Poor contact in joint connector, (B122)
9	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU(SOHC)-35, Atmospheric Pressure Sensor.>
10	**CHECK CURRENT DATA.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from atmospheric pressure sensor. 3)Turn the ignition switch to ON. 4)Read the data of intake manifold absolute pressure signal using Subaru select monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value more than 140 kPa (1,050 mmHg, 41.34 inHg)?	Repair battery short circuit in harness between ECM and atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU(SOHC)-35, Atmospheric Pressure Sensor.>

BS:DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



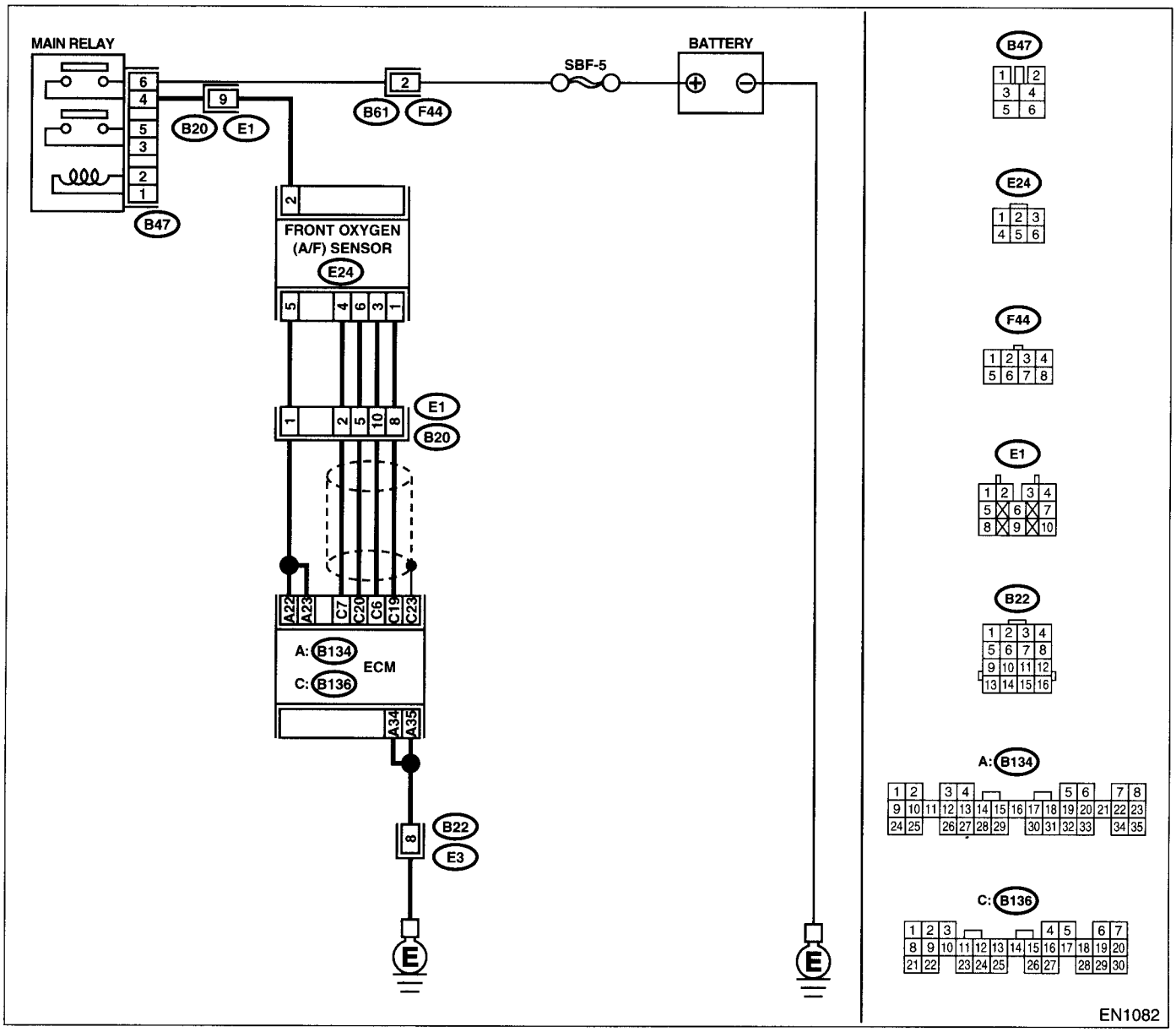
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0106, P0107, P0108, P1110 or P1111?	Inspect DTC P0106, P0107, P0108, P1110 or P1111 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK ATMOSPHERIC PRESSURE SENSOR FILTER.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from atmospheric pressure sensor. 3)Remove the atmospheric pressure sensor. 4)Check the atmospheric pressure sensor filter.	Is the atmospheric pressure sensor filter non-functional? (Check for contamination, damage, water leakage, etc.)	Replace the atmospheric pressure sensor filter.	Go to step **3.**
3	**CHECK CURRENT DATA.** 1)Turn the ignition switch to ON. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value between 73.3 kPa (550 mmHg, 21.65 inHg) and 106.6 kPa (800 mmHg, 31.50 inHg)?	Replace the atmospheric pressure sensor. <Ref. to FU(SOHC)-35, Atmospheric Pressure Sensor.>	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>

BT: DTC P1137 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132, P0031 or P0032?	Inspect DTC P0131, P0132, P0031 or P0032 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the value more than 1.1 for a moment?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 6 — (E24) No. 3:*** ***(B136) No. 7 — (E24) No. 4:*** ***(B136) No. 19 — (E24) No. 1:*** ***(B136) No. 20 — (E24) No. 6:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.

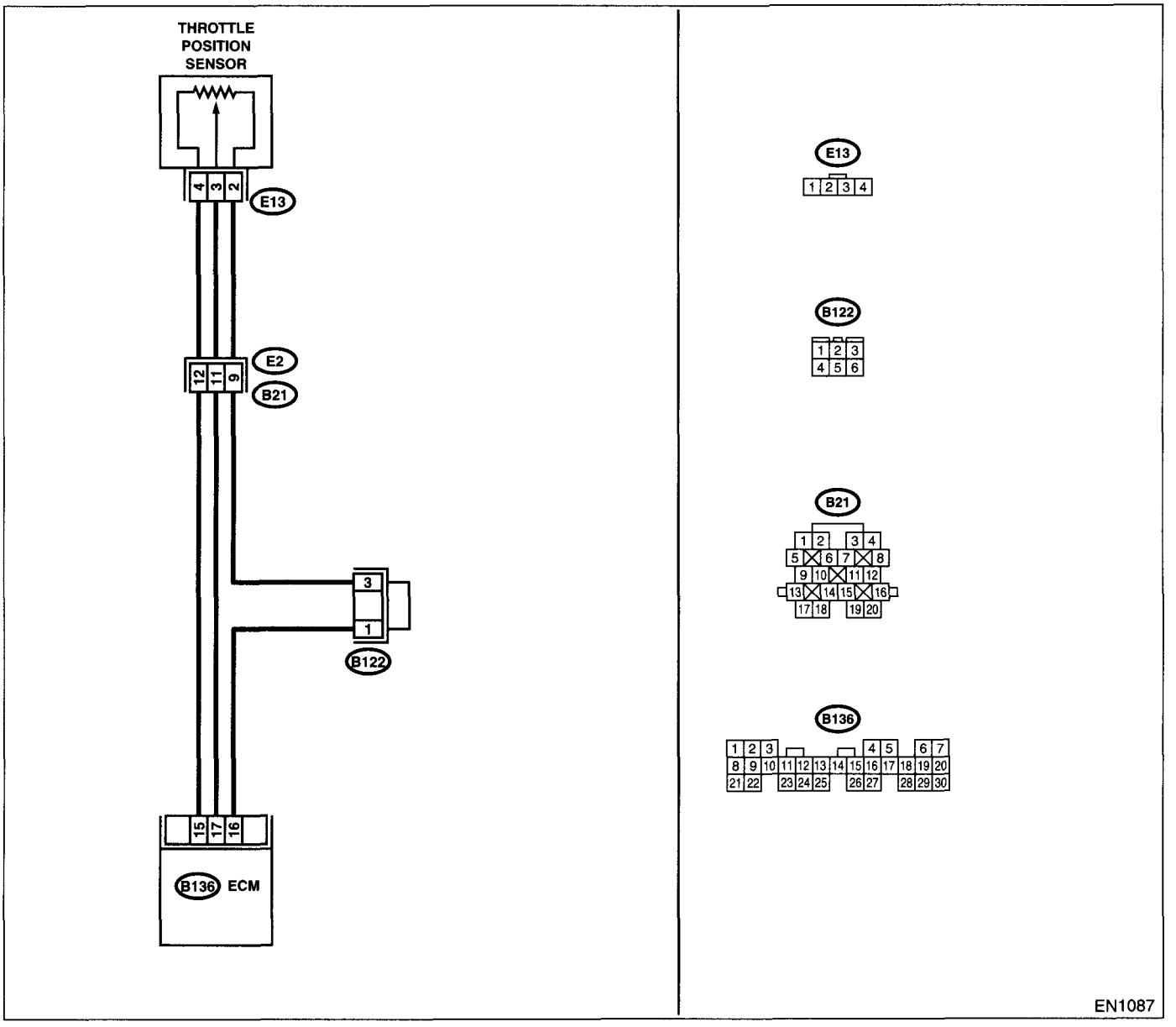
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(SOHC)-43, Front Oxygen (A/F) Sensor.>

BU:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



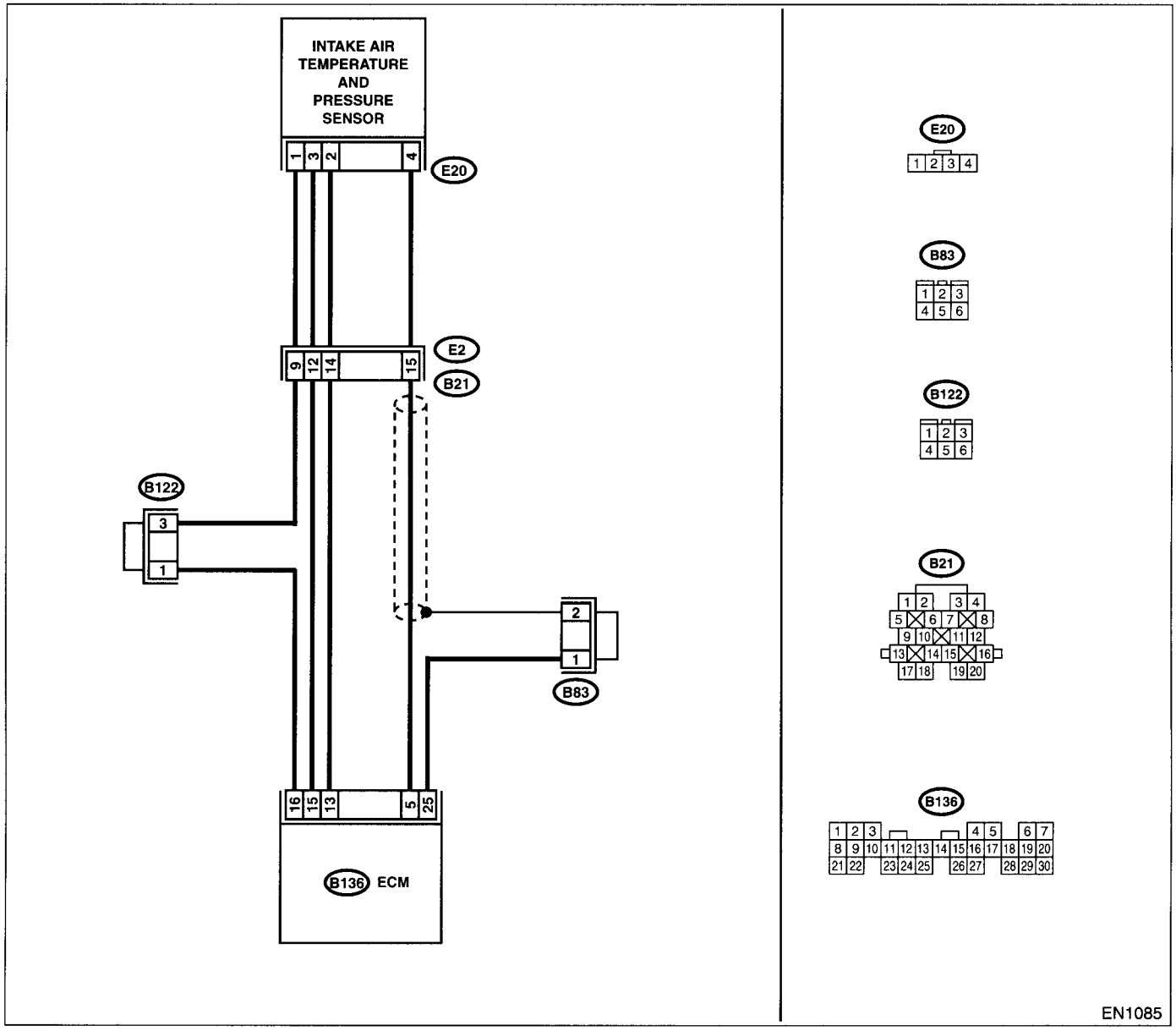
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0122 or P0123?	Inspect DTC P0122 or P0123 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

BV:DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



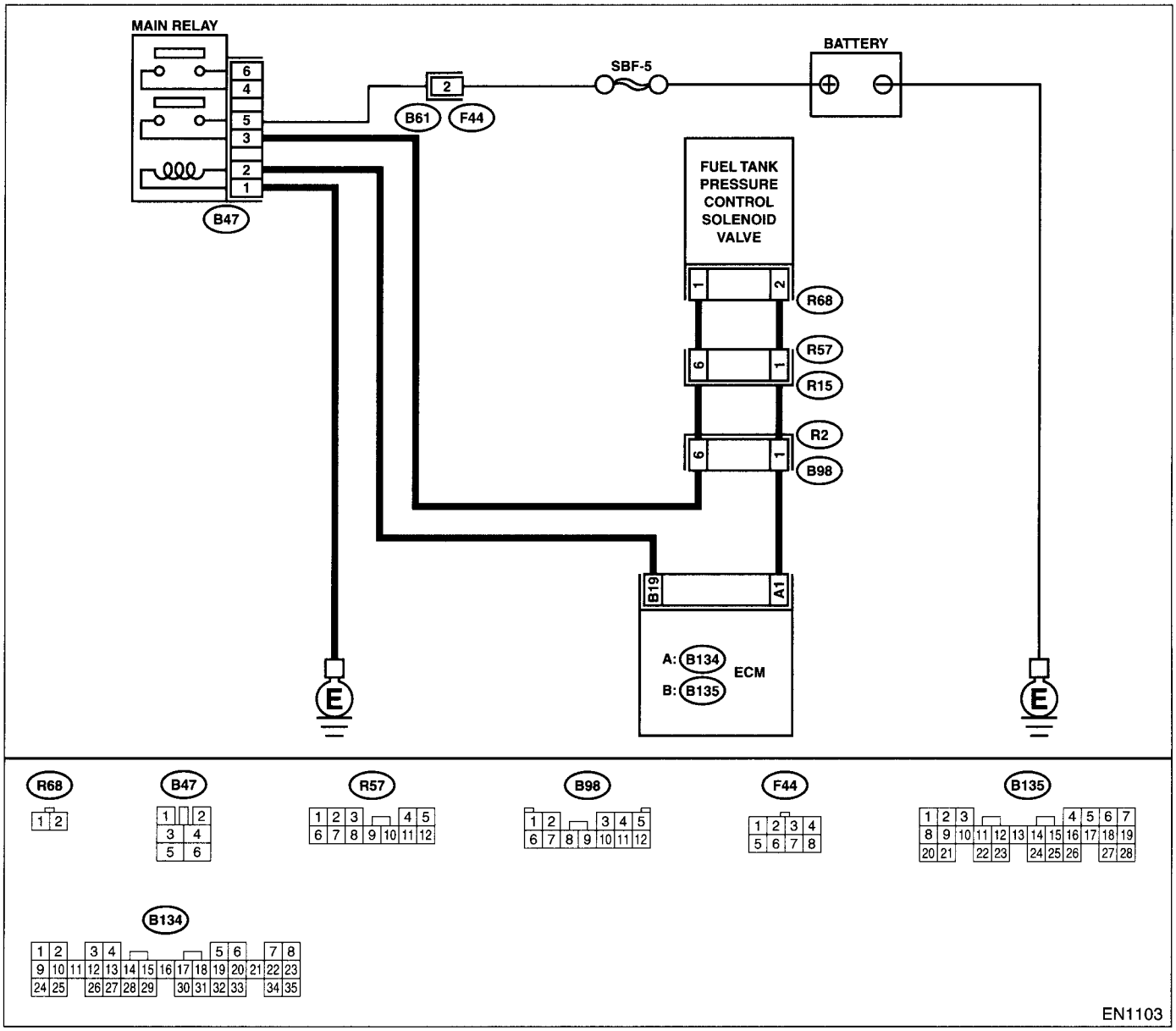
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** NOTE: In this case, it is not necessary to inspect DTC P0106.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0107, P0108 or P1112?	Inspect DTC P0107, P0108 or P1112 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in the selector lever in "N" or "P" position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification: •Intake manifold absolute pressure ***Ignition ON*** ***73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)*** ***Idling*** ***20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)***	Is the value within the specifications?	Go to step **4.**	Replace the intake air temperature sensor and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(SOHC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the throttle positioning ratio equal to or less than 5% when throttle is fully closed?	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the throttle positioning ratio equal to or more than 85% when throttle is fully open?	Replace the intake air temperature and pressure sensor. <Ref. to FU(SOHC)-34, Intake Air Temperature and Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(SOHC)-31, Throttle Position Sensor.>

BW:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distibutor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from fuel tank pressure control solenoid valve and ECM. 3)Measure the resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and fuel tank pressure control solenoid valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 1 — (R68) No. 2:***	Is the voltage less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank pressure control solenoid valve connector • Poor contact in coupling connectors (R57 and B98)
5	**CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **6.**	Replace the fuel tank pressure control solenoid valve. <Ref. to EC(SOHC)-6, Purge Control Solenoid Valve.>
6	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel tank pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank pressure control solenoid valve connector • Poor contact in coupling connectors (R57 and B98) • Poor contact in main relay connector

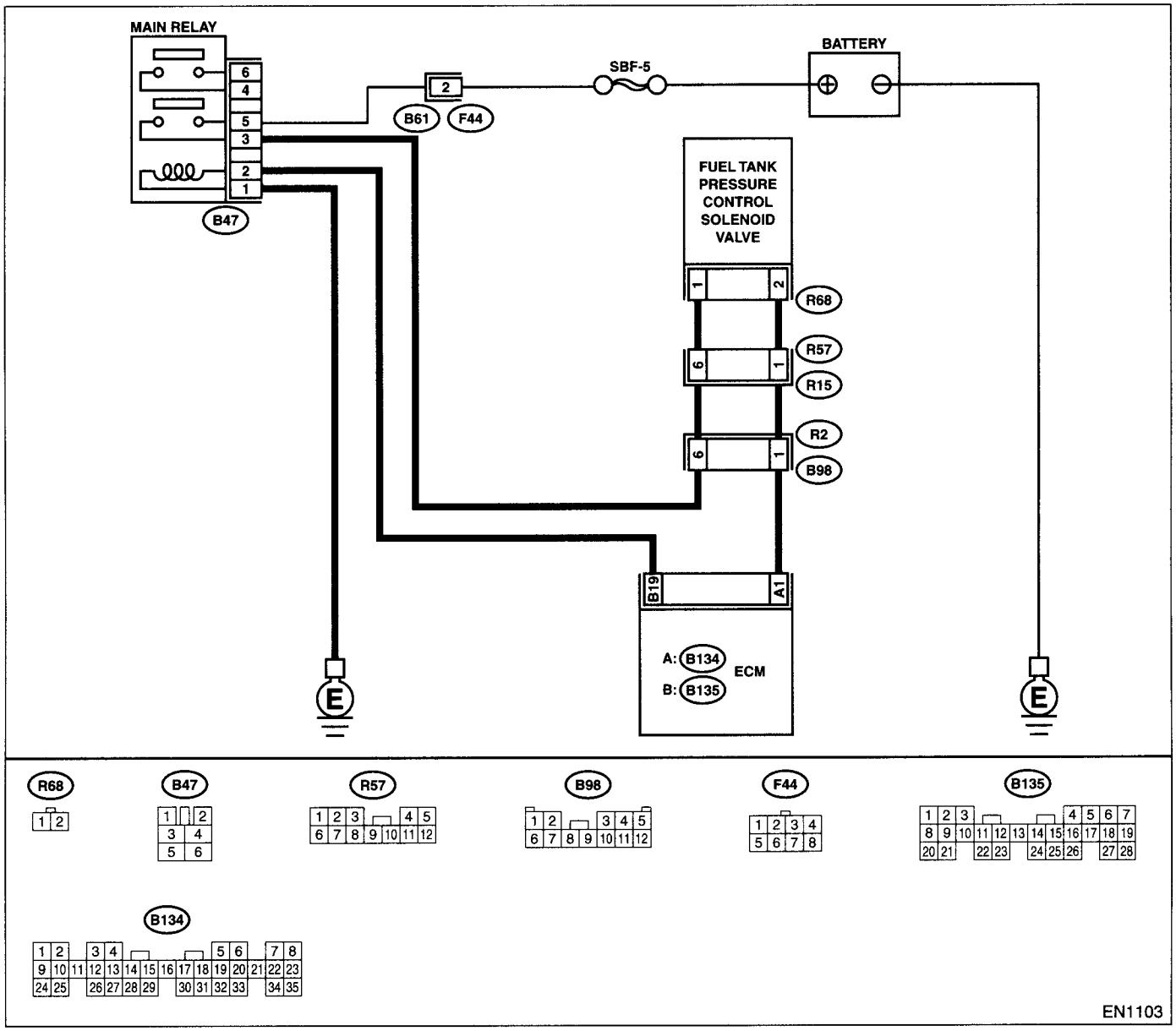
	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure control solenoid valve connector.	Is there poor contact in fuel tank pressure control solenoid valve connector?	Repair poor contact in fuel tank pressure control solenoid valve connector	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BX:P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



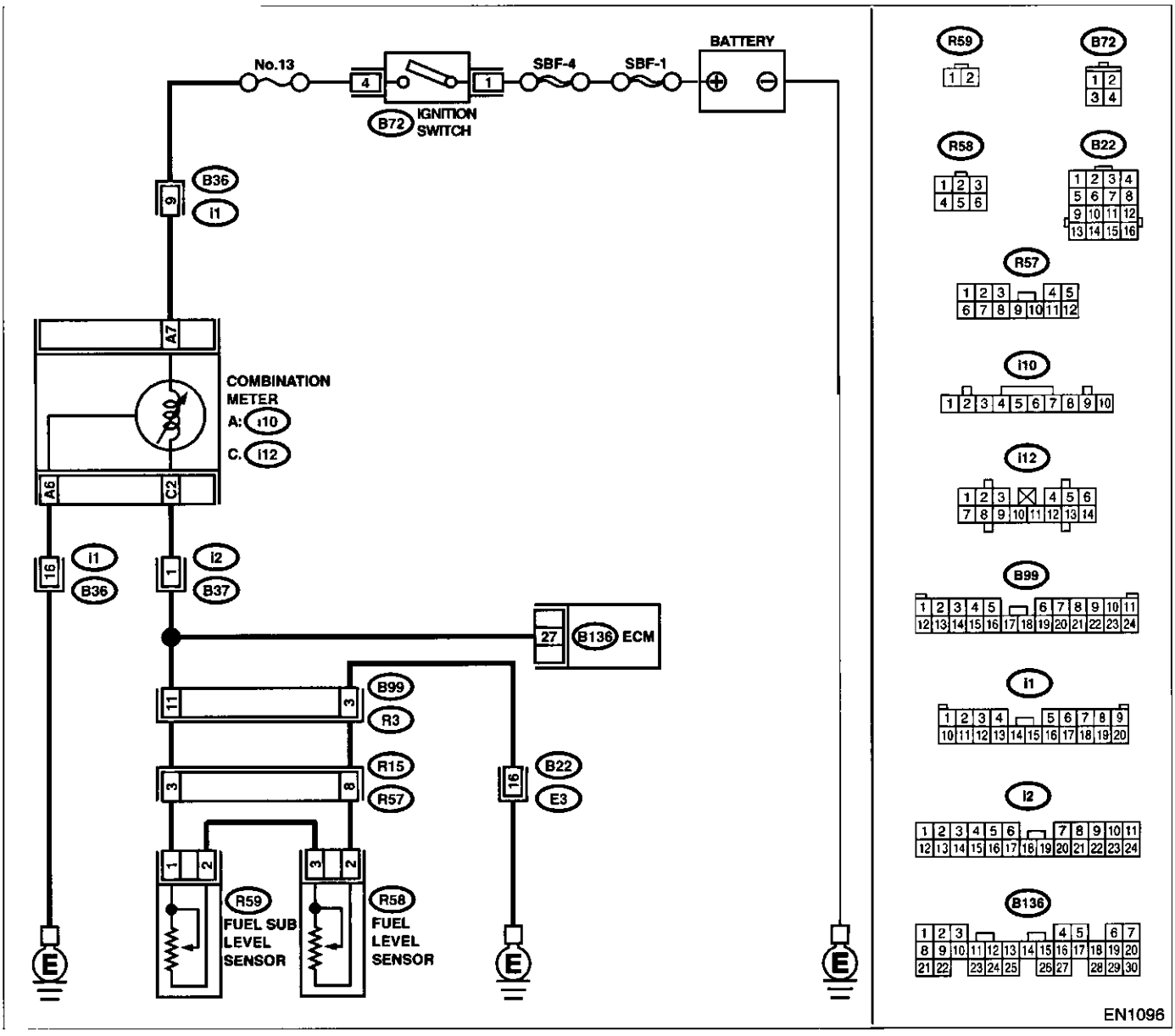
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the fuel tank pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Fuel tank pressure control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel tank pressure control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank pressure control solenoid valve <Ref. to EC(SOHC)-11, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

BY:DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM 2 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



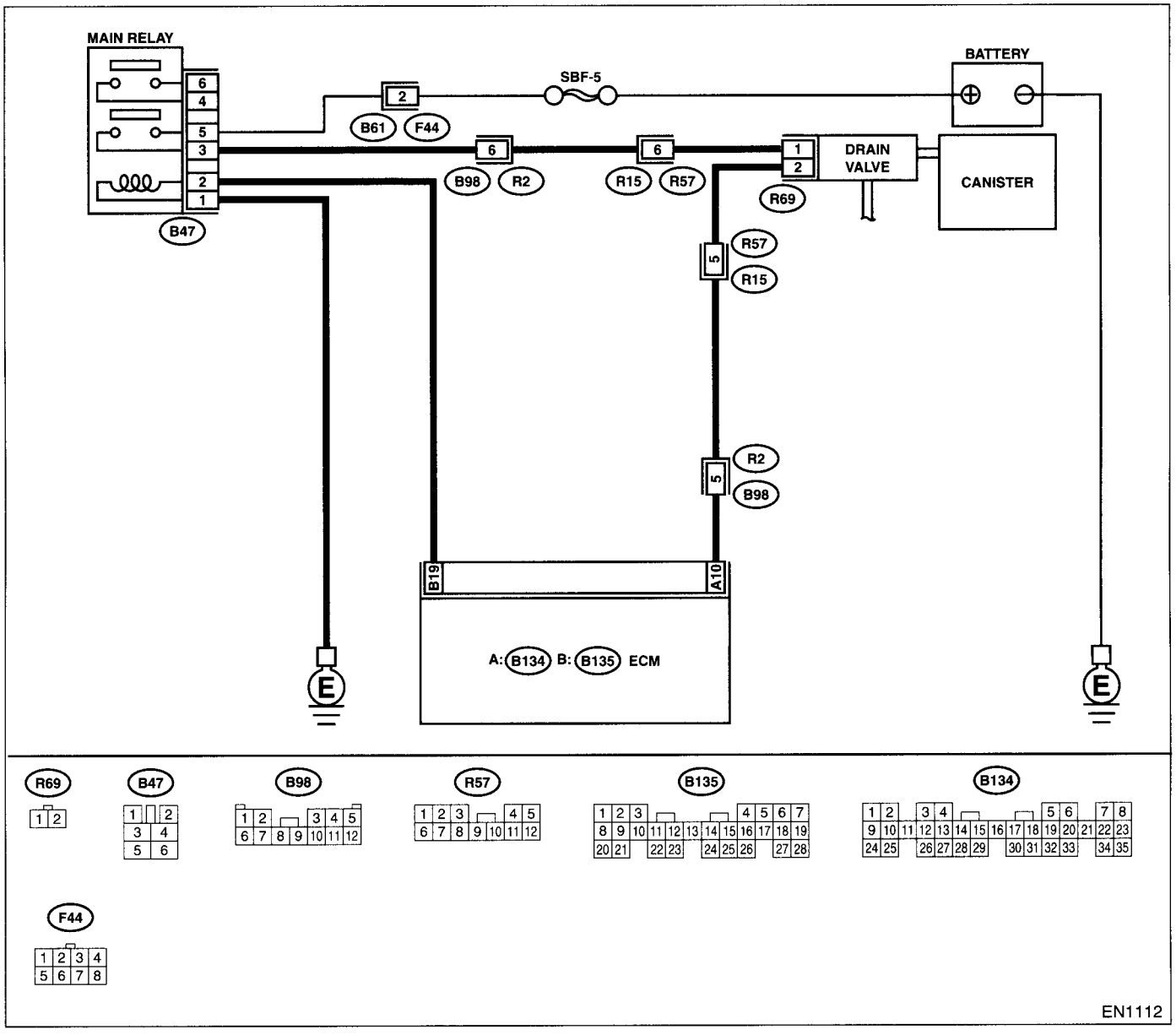
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0461, P0462 or P0463?	Inspect DTC P0461, P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(SOHC)-62, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(SOHC)-63, Fuel Sub Level Sensor.>

BZ:DTC P1443 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately after fault occurrence
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



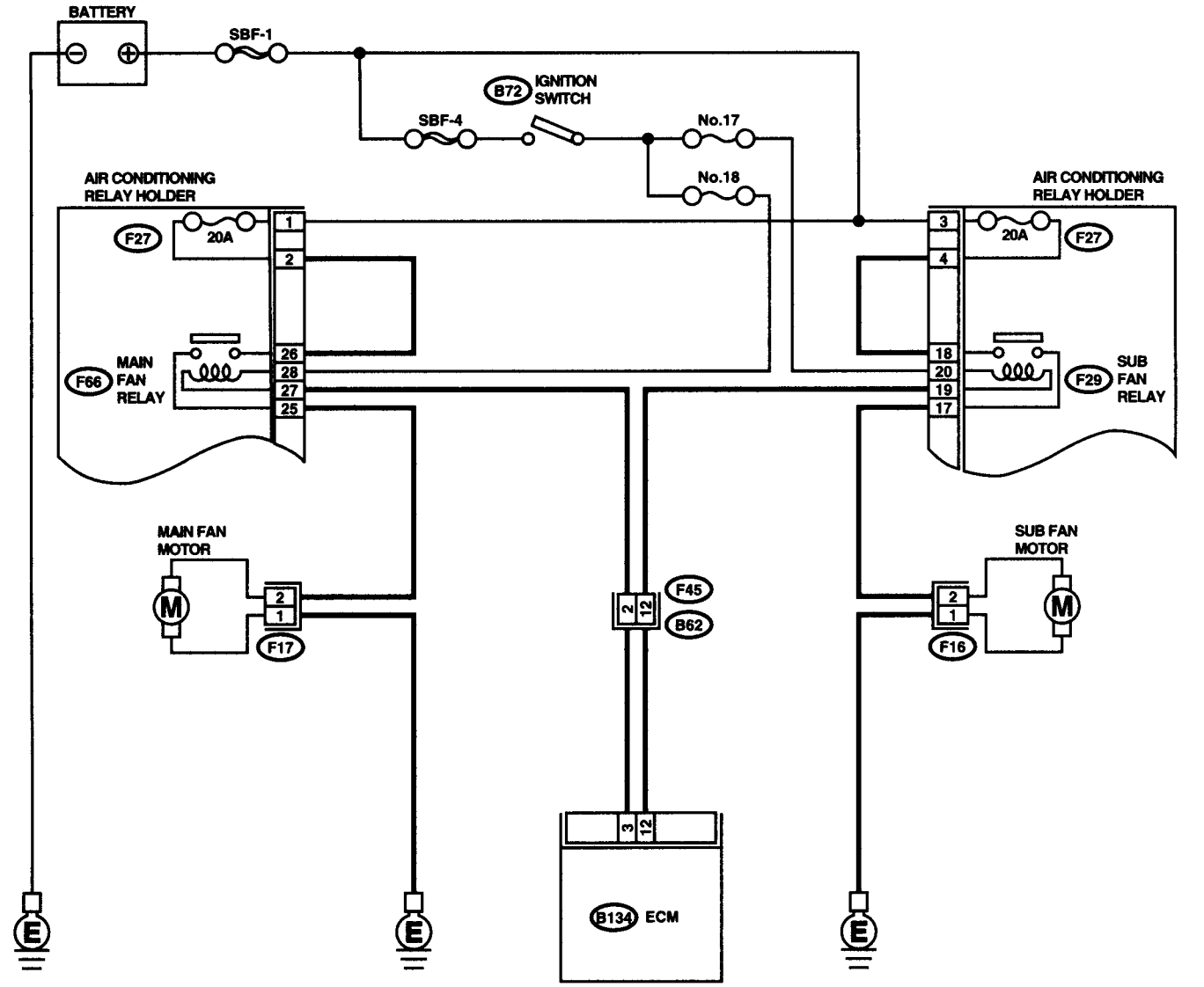
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. •Clogging of vent hoses between canister and drain valve •Clogging of vent hose between drain valve and air filter •Clogging of drain filter	Is there a fault in vent line?	Repair or replace the faulty part.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode". <Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.>	Does the drain valve produce operating sound?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(SOHC)-16, Drain Valve.>

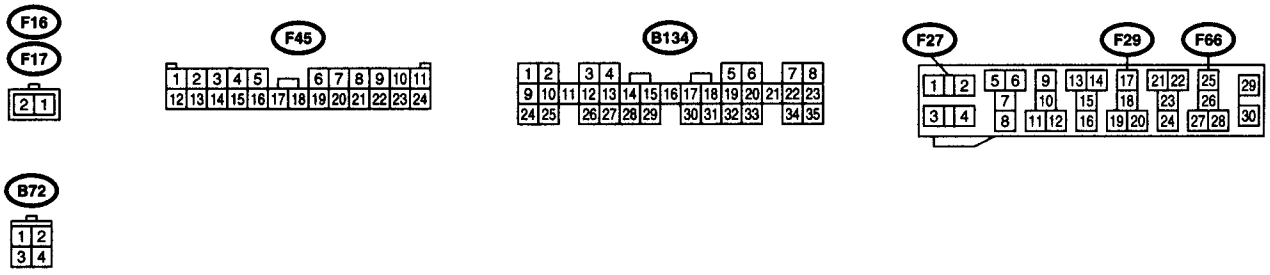
CA:DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN1097

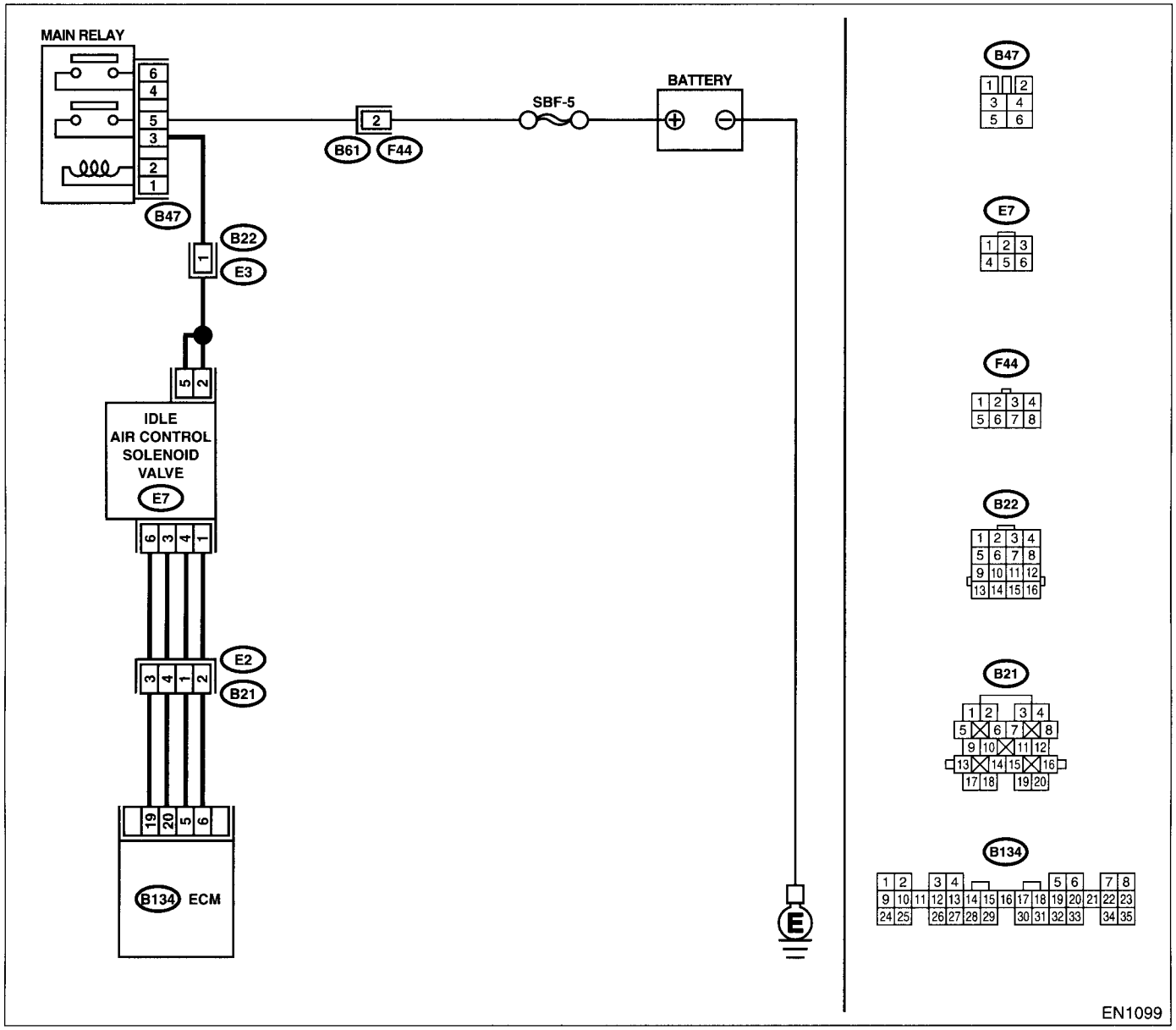
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(SOHC)-44, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Does the voltage change between 0 and 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay and sub fan relay. (with A/C models) 3)Disconnect the test mode connector. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay. 3)Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 26 — No. 25:***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1)Remove the sub fan relay. 2)Measure the resistance between sub fan relay terminals. ***Terminal*** ***No. 18 — No. 17***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

CB:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517?	Inspect DTC P1510, P1511, P1512, P1513, P1514, P1515, P1516 or P1517 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP-7, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(SOHC)-36, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-36, Idle Air Control Solenoid Valve.>

CC:DTC P1510 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-292, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CD:DTC P1511 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 1 CIRCUIT HIGH INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-296, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CE:DTC P1512 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-292, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-296, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P1514 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(SOHC)-292, DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —

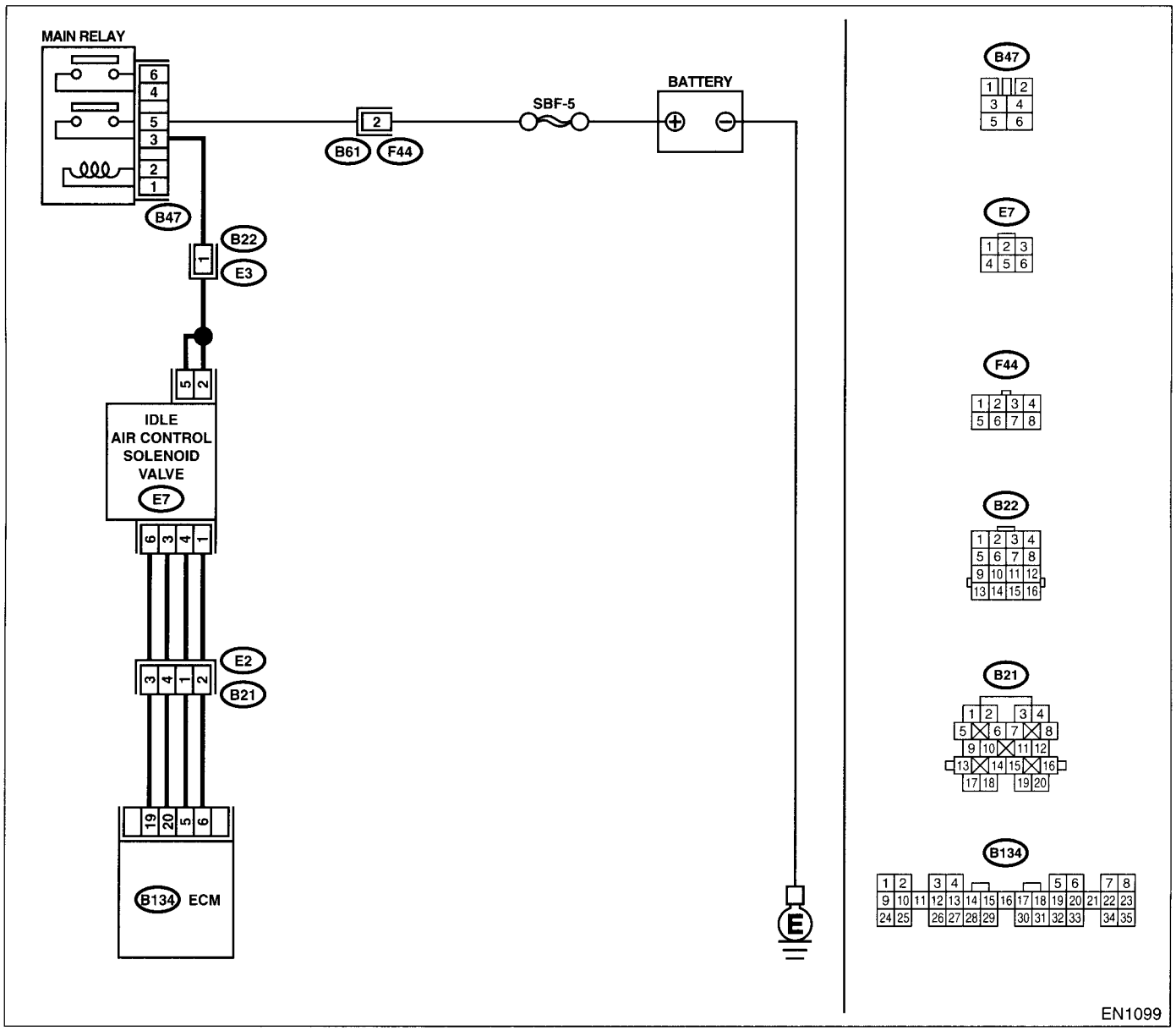
NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(SOHC)-296, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** Measure the voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 5 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***DTC P1510; (B134) No. 5 — (E7) No. 4:*** ***DTC P1512; (B134) No. 6 — (E7) No. 1:*** ***DTC P1514; (B134) No. 19 — (E7) No. 6:*** ***DTC P1516; (B134) No. 20 — (E7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector (B21)
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1510; (B134) No. 5 — Chassis ground:*** ***DTC P1512; (B134) No. 6 — Chassis ground:*** ***DTC P1514; (B134) No. 19 — Chassis ground:*** ***DTC P1516; (B134) No. 20 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step **5.**

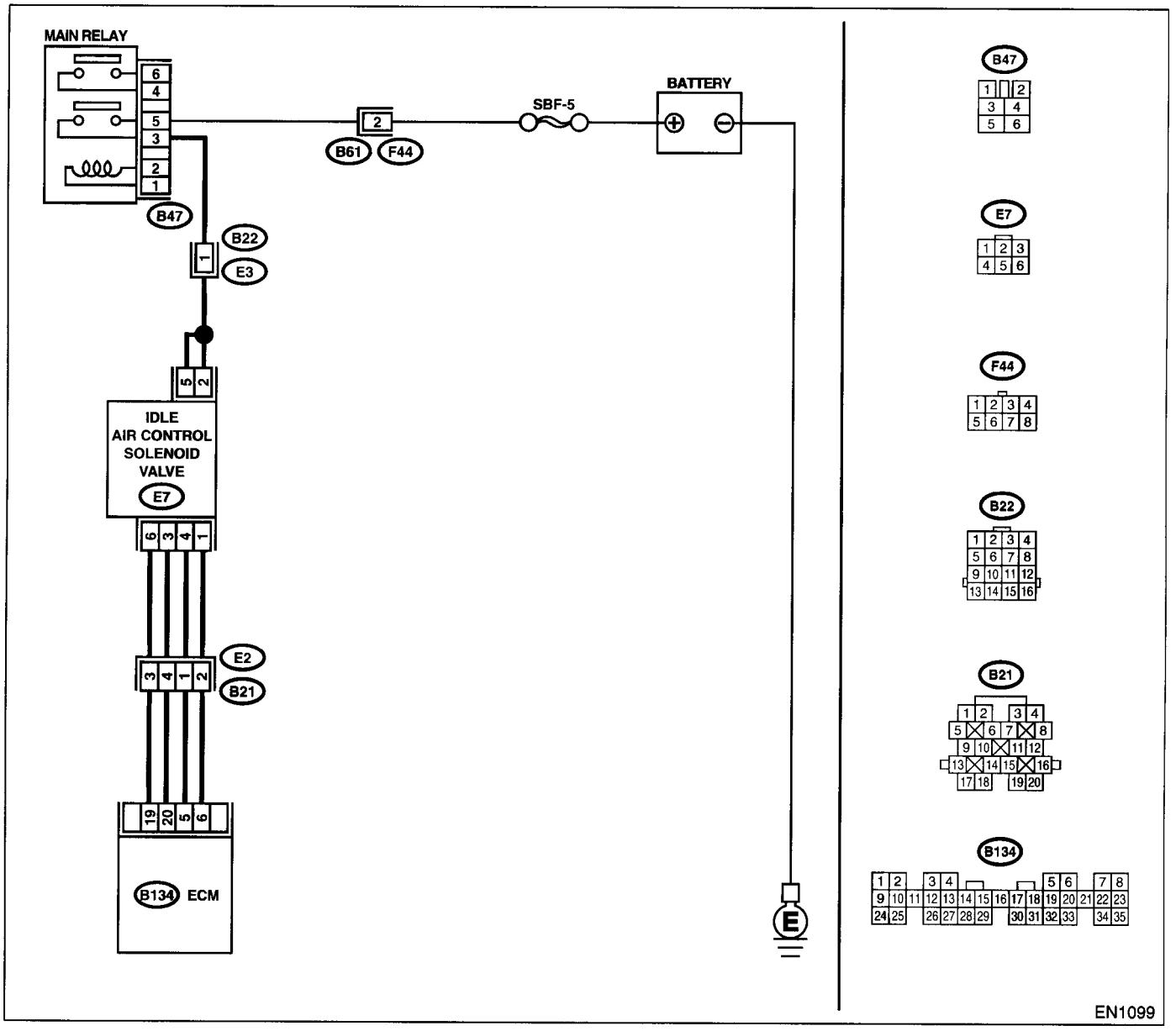
	Step	Check	Yes	No
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector and idle air control solenoid valve connector.	Is there poor contact in ECM connector or idle air control solenoid valve connector?	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace the idle air control solenoid valve. <Ref. to FU(SOHC)-36, Idle Air Control Solenoid Valve.>

CJ:DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



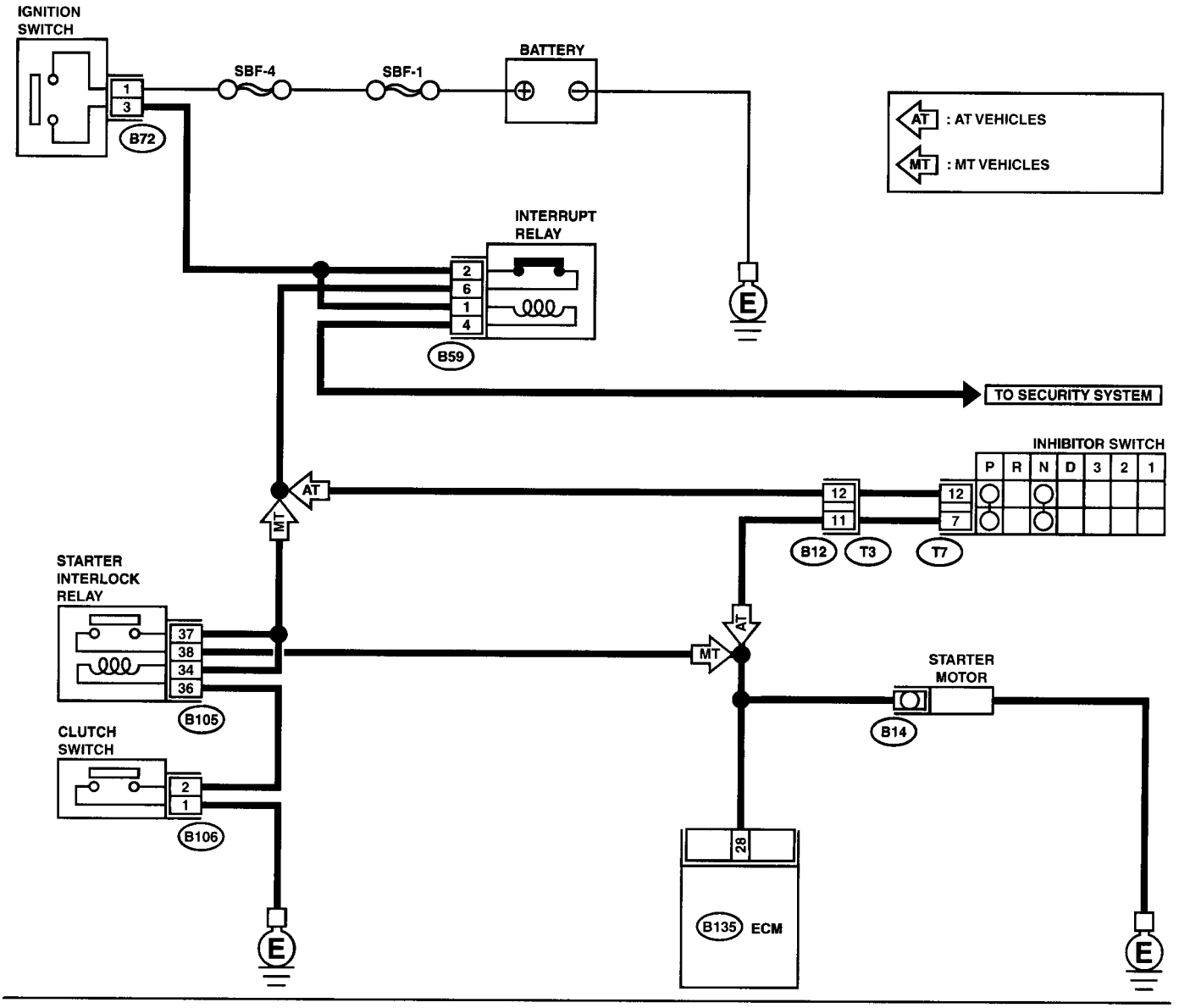
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1511, P1513, P1515 and P1517 at same time?	Go to step **2.**	Go to step **3.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1511; (B134) No. 5 (+) — Chassis ground (–):*** ***DTC P1513; (B134) No. 6 (+) — Chassis ground (–):*** ***DTC P1515; (B134) No. 19 (+) — Chassis ground (–):*** ***DTC P1517; (B134) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>

CK:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

• WIRING DIAGRAM:



EN1077

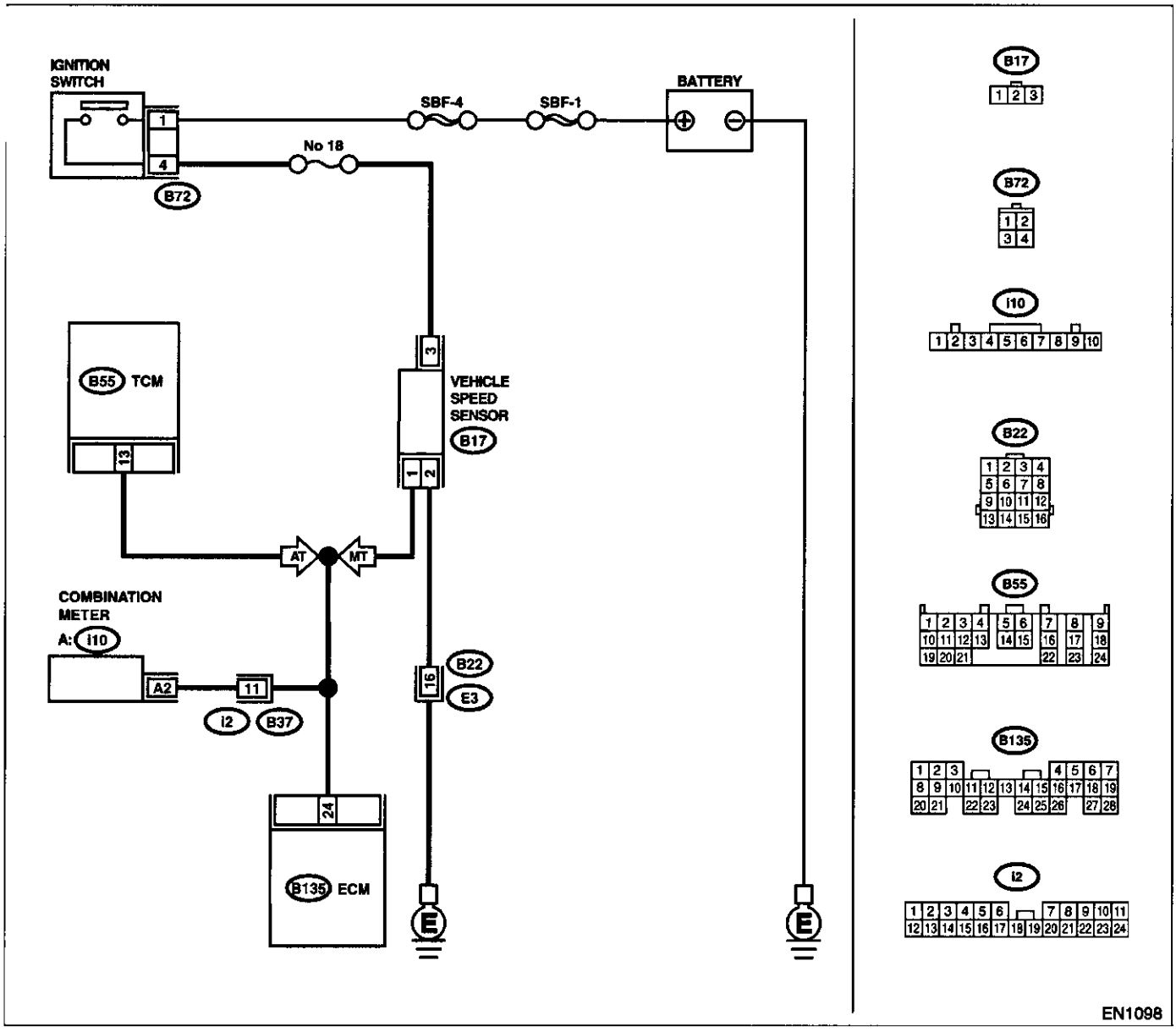
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in the "P" or "N" position. (AT model) Depress the clutch pedal. (MT model)	Does the starter motor operate when ignition switch is turned to "ST"?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(SOHC)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CL:DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



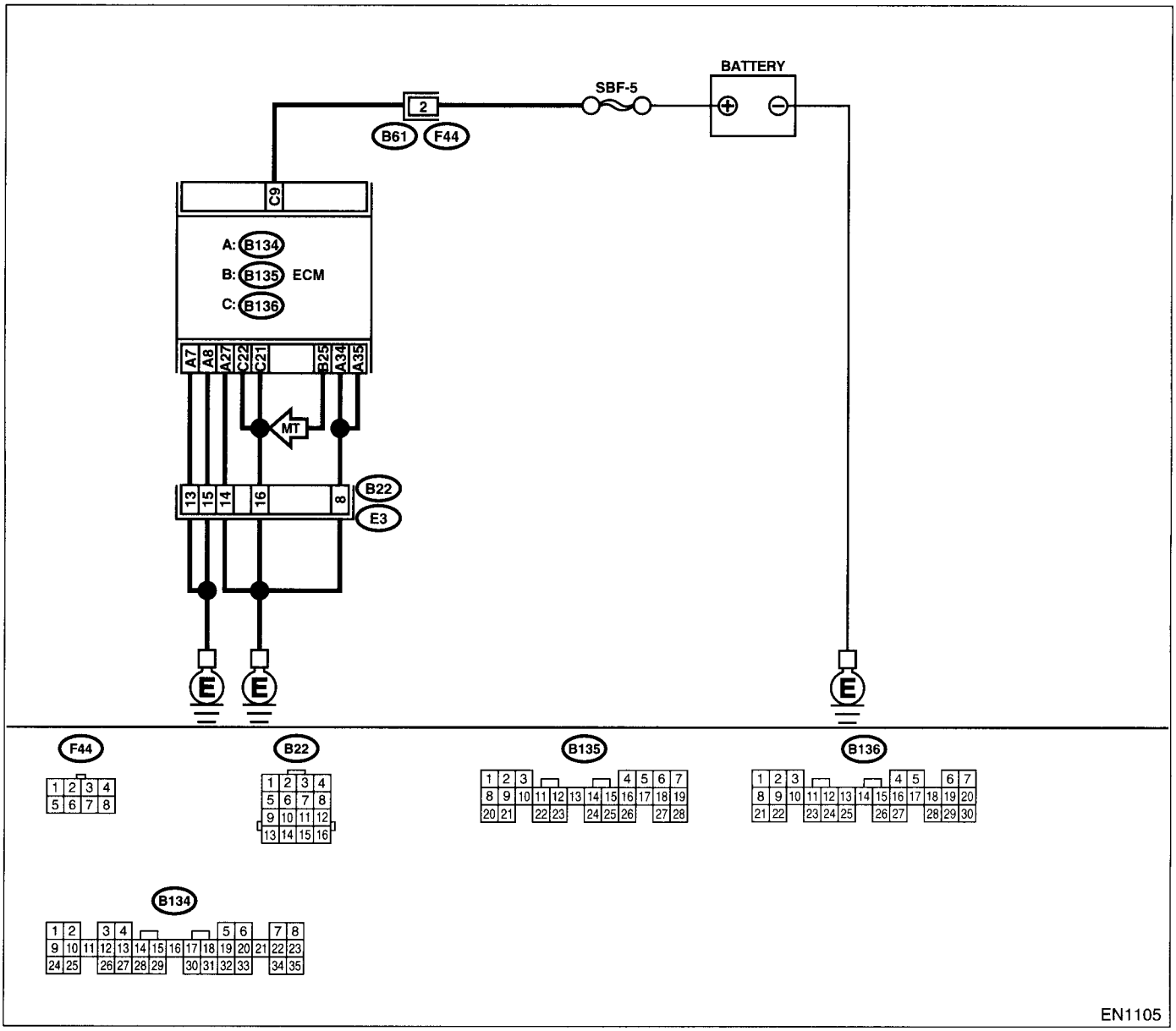
	Step	Check	Yes	No
1	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **3.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-13, Speedometer.>
3	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from combination meter. 3)Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B135) No. 24 — (i10) No. 2:***	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector (i2)

CM:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**

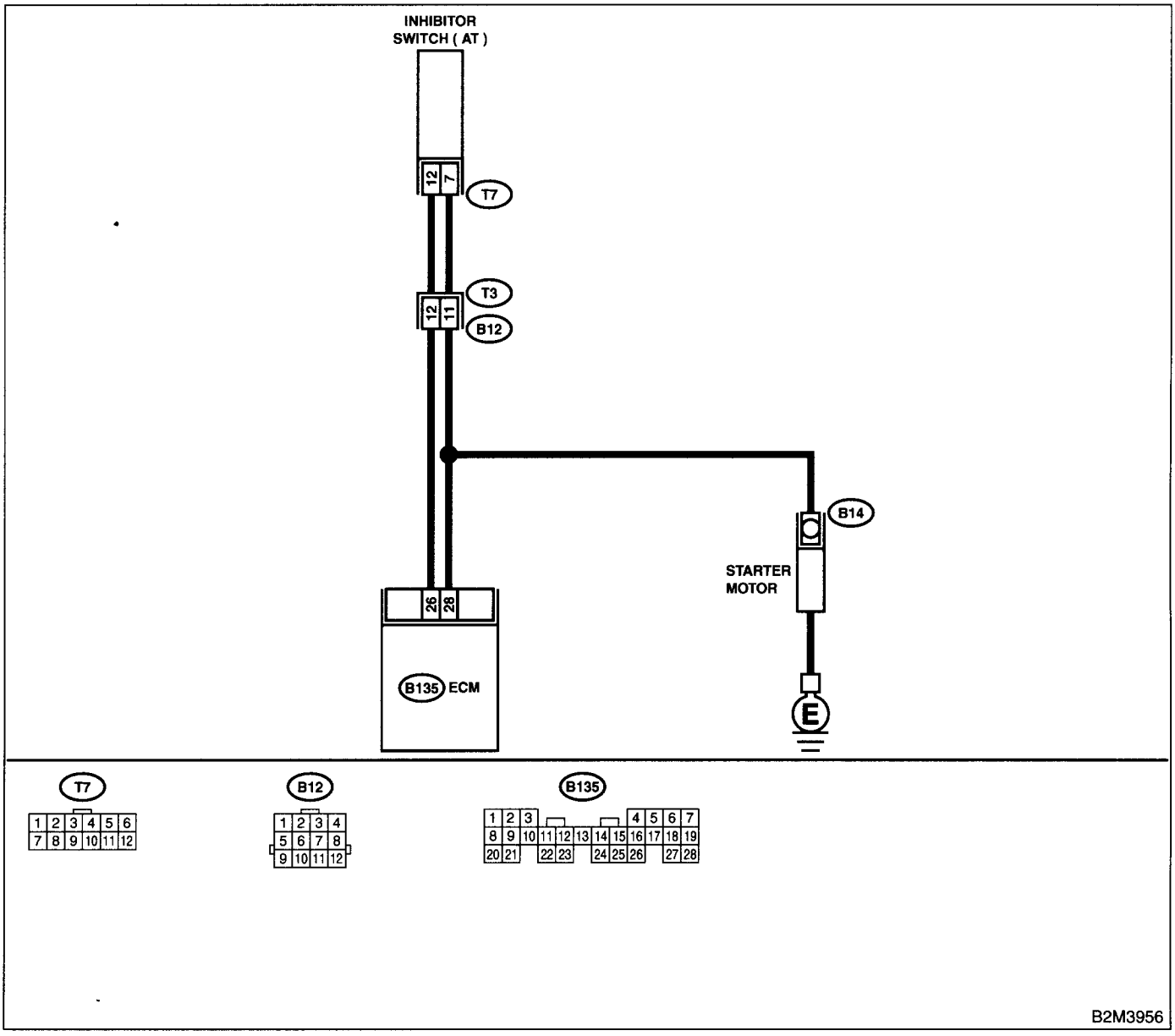
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is fuse blown?	Replace the fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

CN:DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** • ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage between 4.5 and 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and inhibitor switch. 3)Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B135) No. 26 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector (B12) • Poor contact in inhibitor switch connector • Poor contact in ECM connector

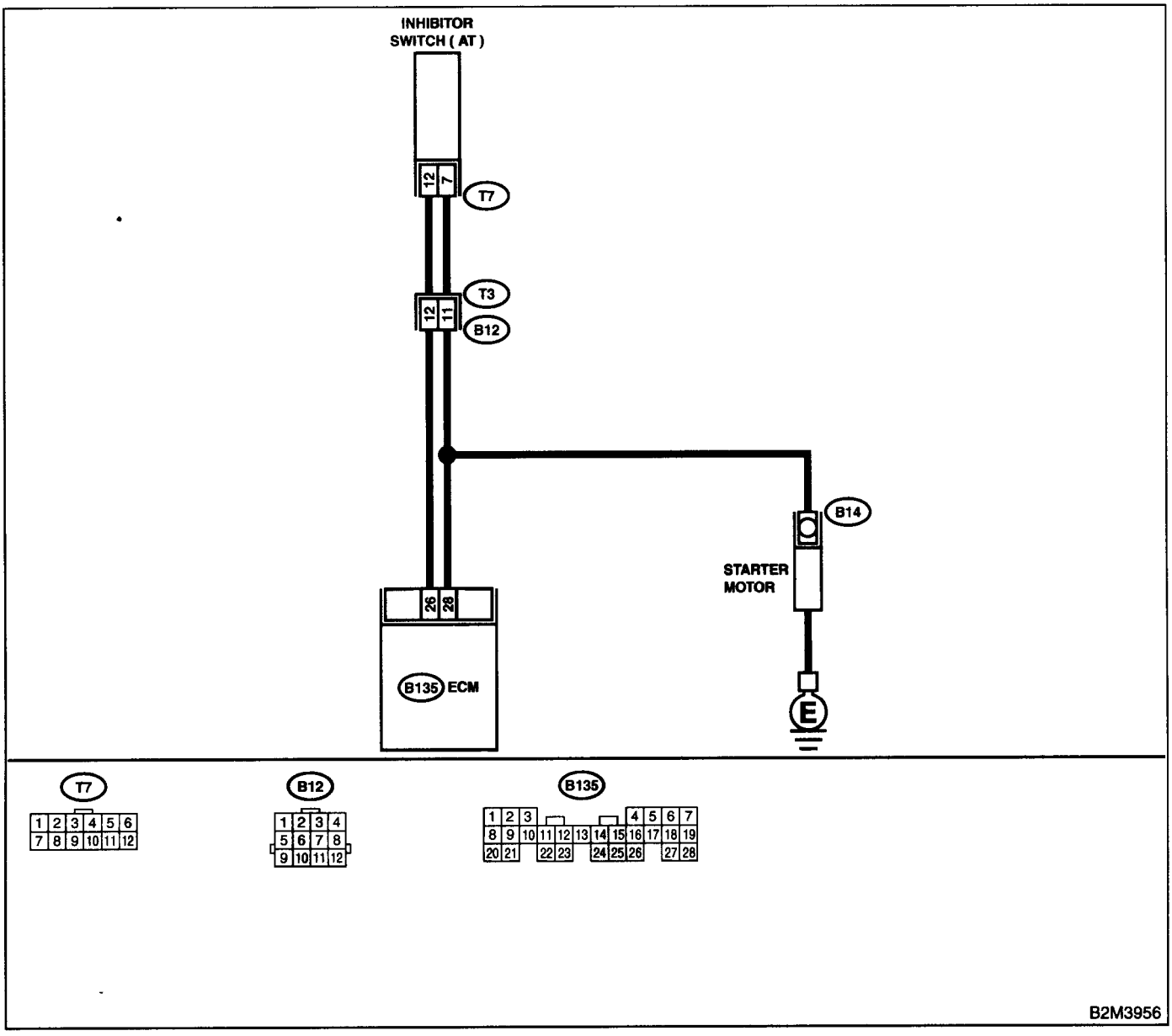
	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-27, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CO:DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



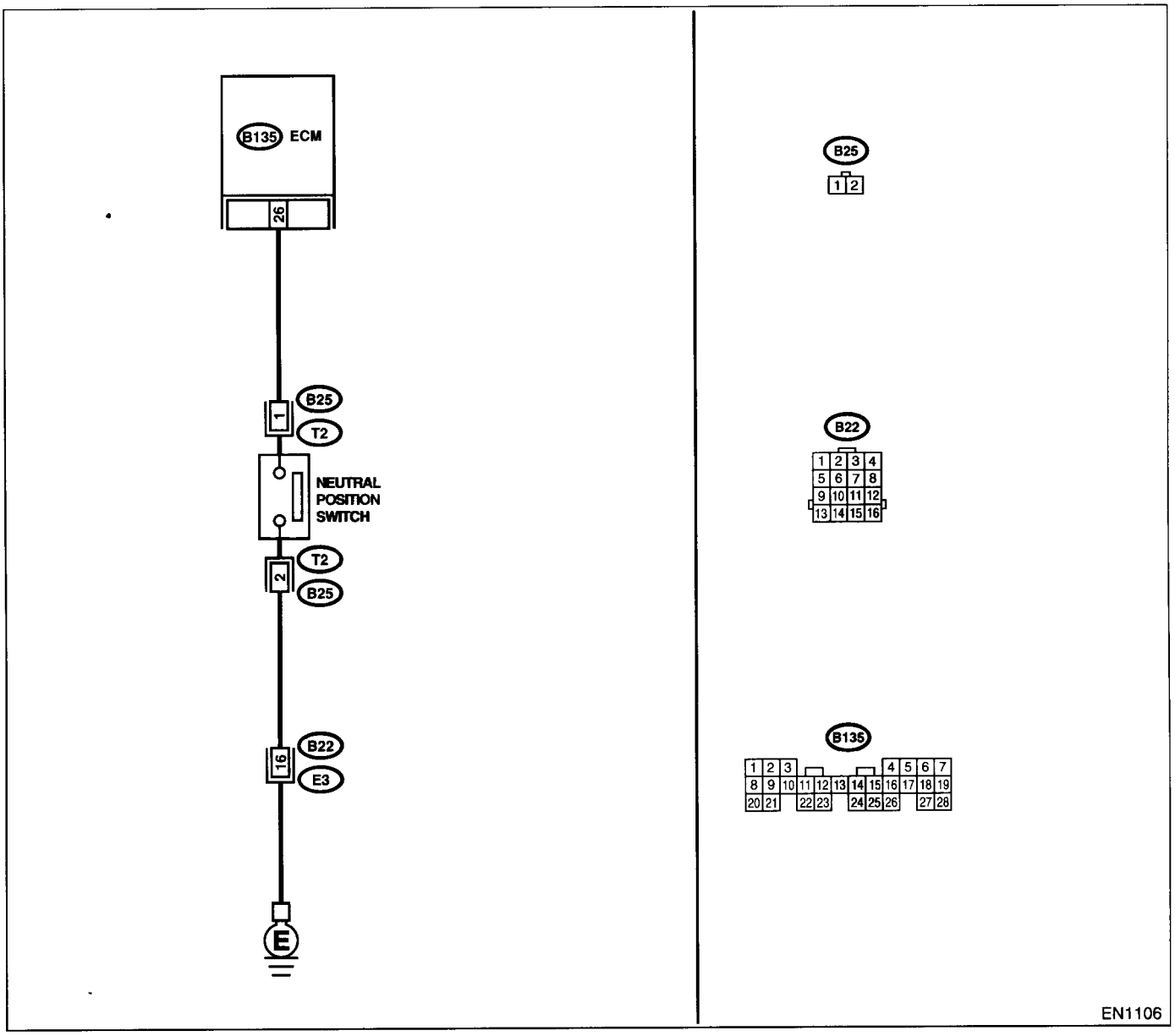
	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0705?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(SOHC)-77, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage between 4.5 and 5.5 V at except "N" and "P" positions?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and transmission harness connector (T3). 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 26 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step **4.**
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1)Disconnect the connector from inhibitor switch. 2)Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step **5.**
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ at except "N" and "P" positions?	Go to step **6.**	Replace the inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-27, INSPECTION, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CP:DTC P1592 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



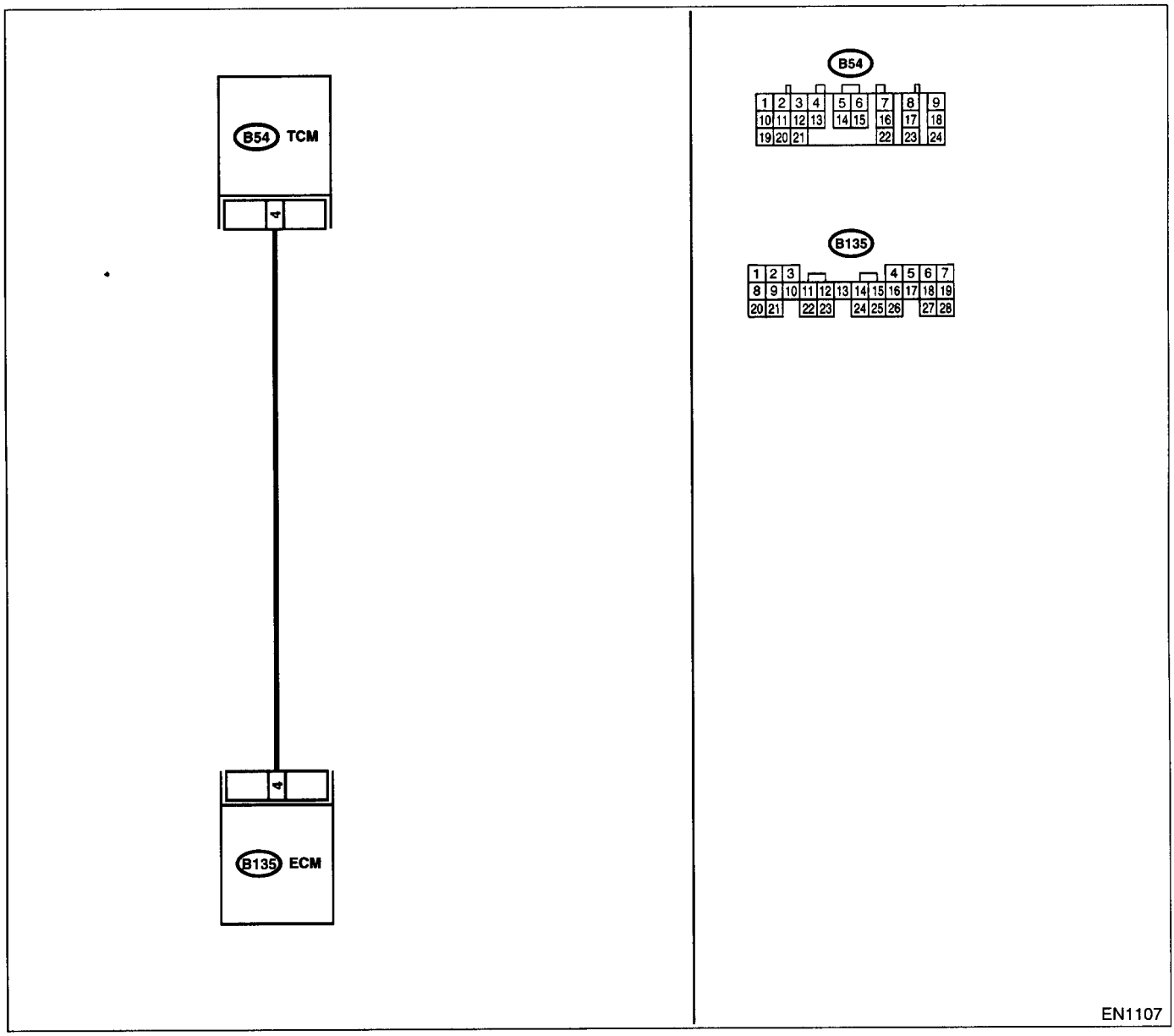
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 10V in neutral position?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage less than 1V in other position?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is the poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service.
4	**CHECK NEUTRAL POSITION SWITCH.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission harness. 3)Measure the resistance between transmission harness and connector termials. ***Connector & terminal*** • ***(T2) No. 1 — No. 2:***	Is the resistance more than 1MΩ in neutral position?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1Ω in other positions?	Go to step **6.**	Repair short circuit in transmissin harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step **7.**
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B135) No. 26 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact with SOA (distributor) service.

CQ:DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1)Start and warm-up the engine until the radiator fan makes one complete rotation. 2)Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

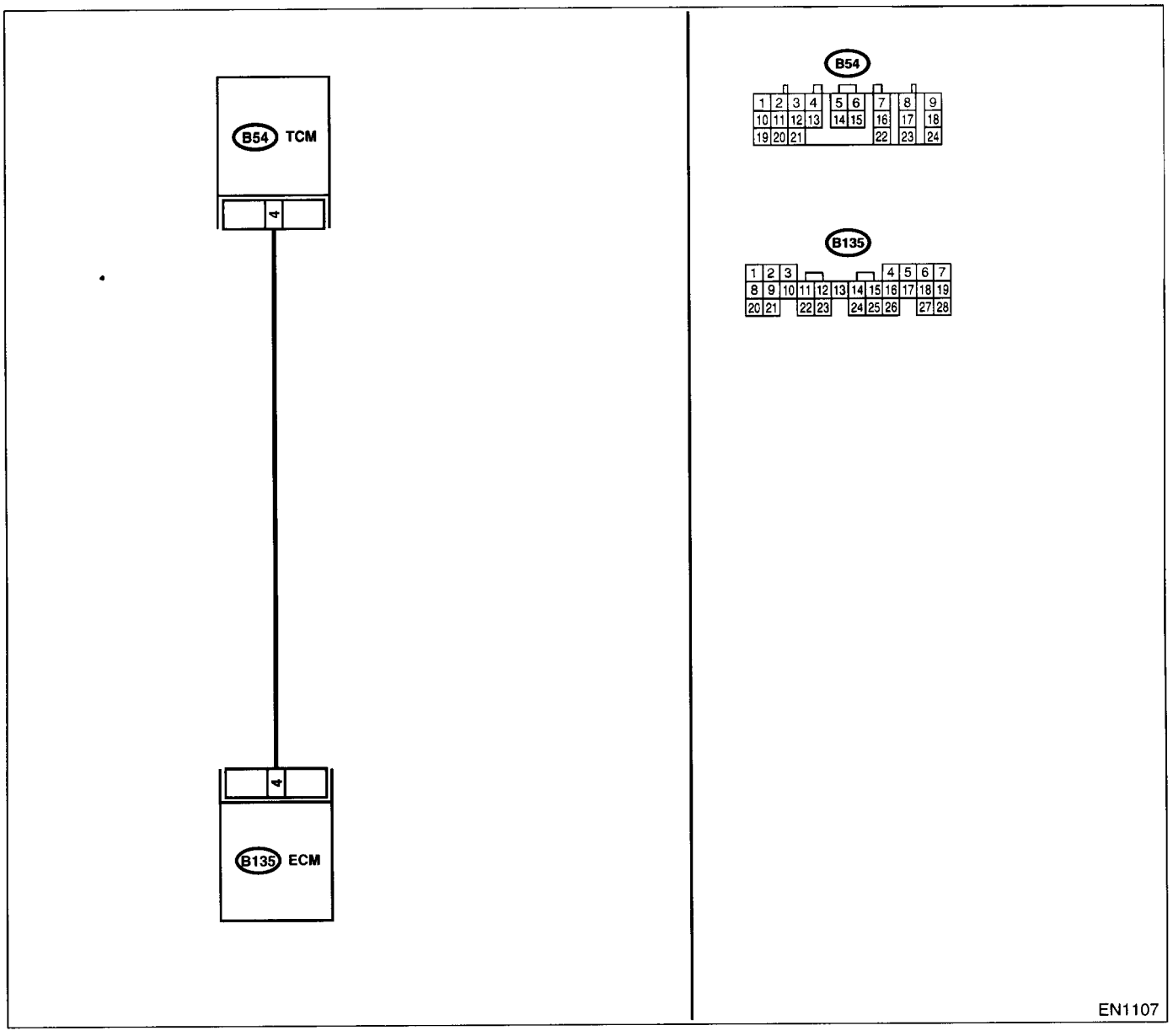
Step		Check	Yes	No
2	CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

CR:DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



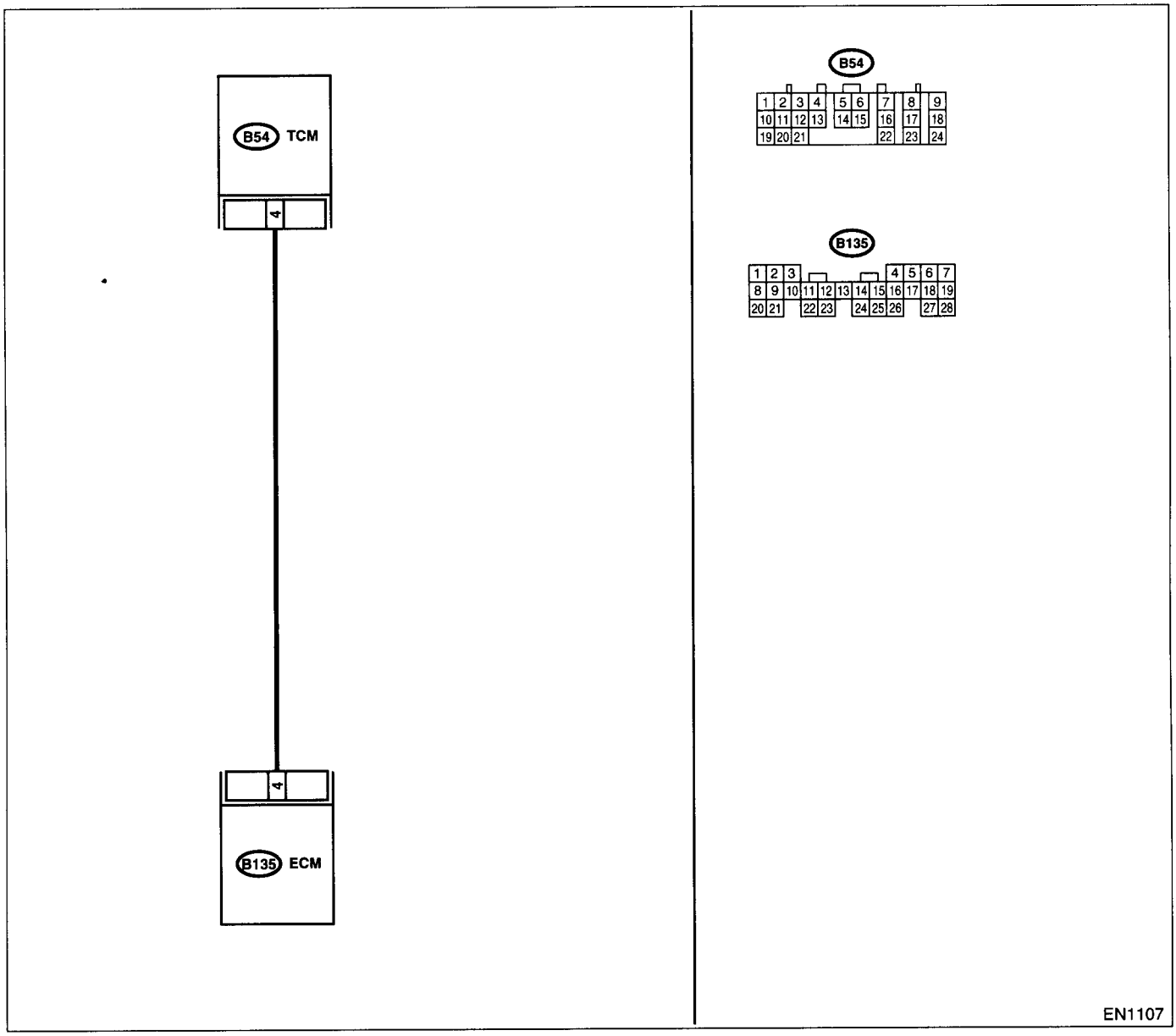
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read the trouble code for automatic transmission. <Ref. to AT-24, Read Diagnostic Trouble Code (DTC).>	Does the trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission. <Ref. to AT-44, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

CS:DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



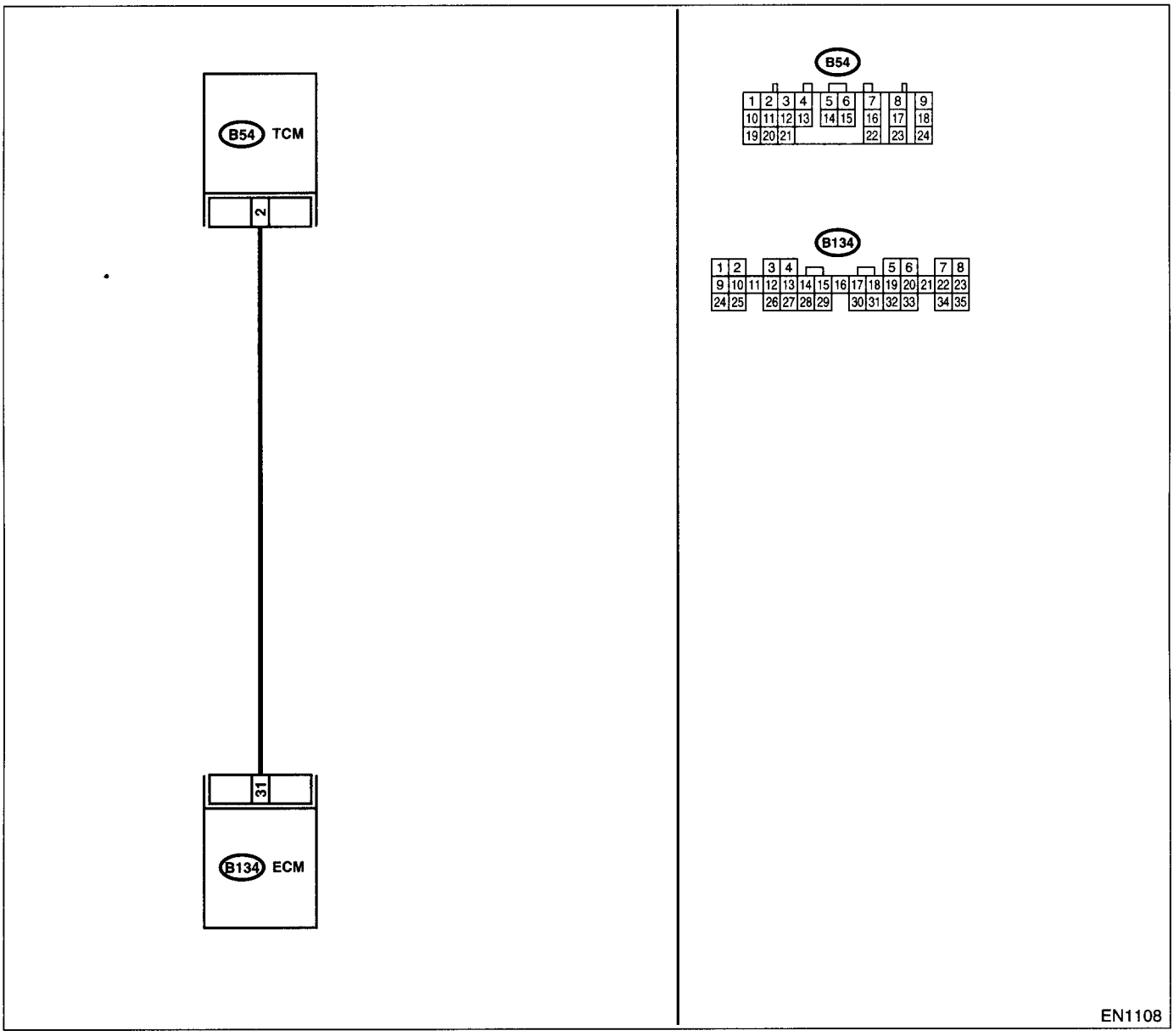
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Does the voltage change from 1 V to 4 V while monitoring the value with voltage meter?	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

CT:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



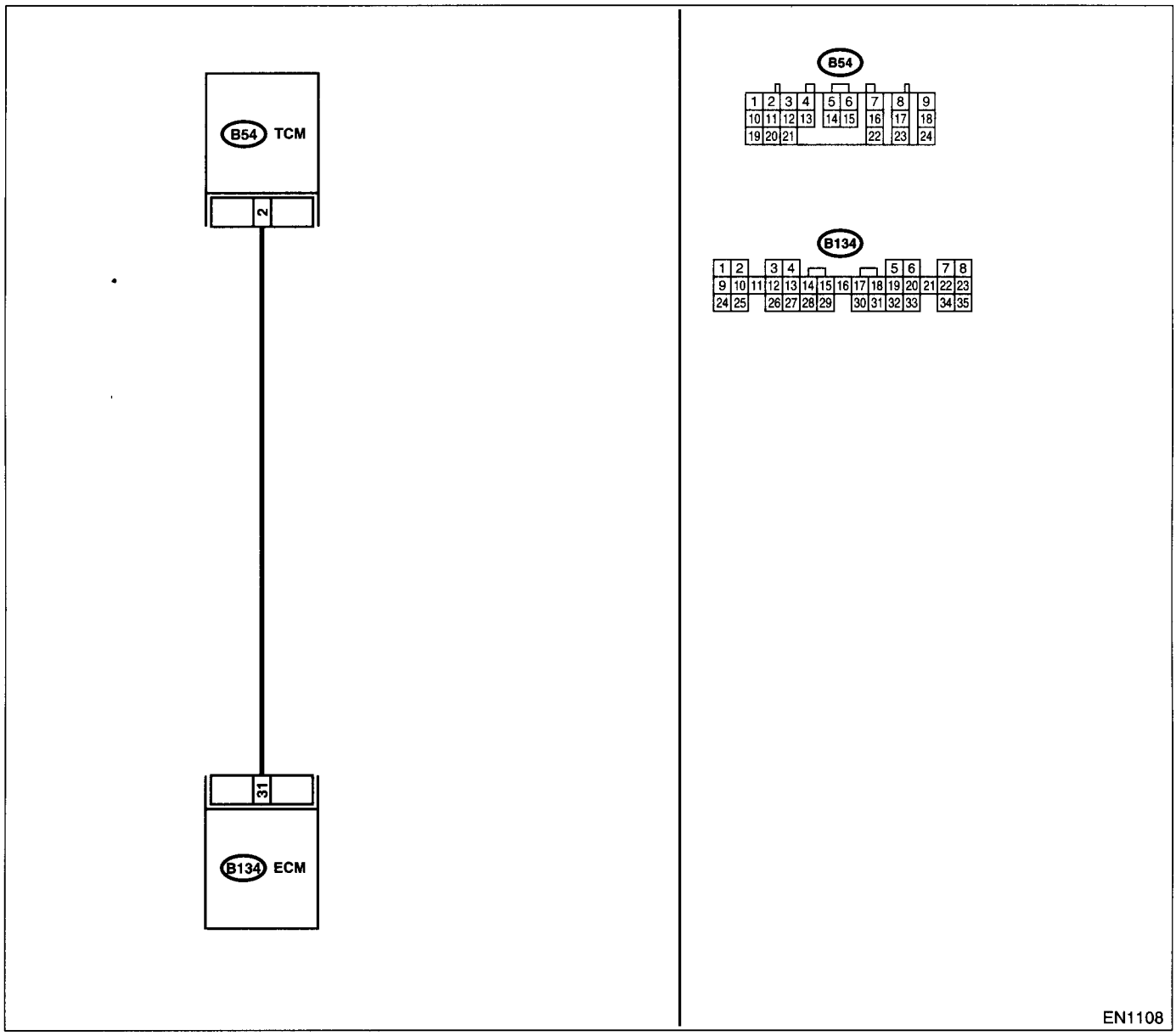
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 31 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness betwee ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 31 — (B54) No. 2:***	Is the resistance less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

CU:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



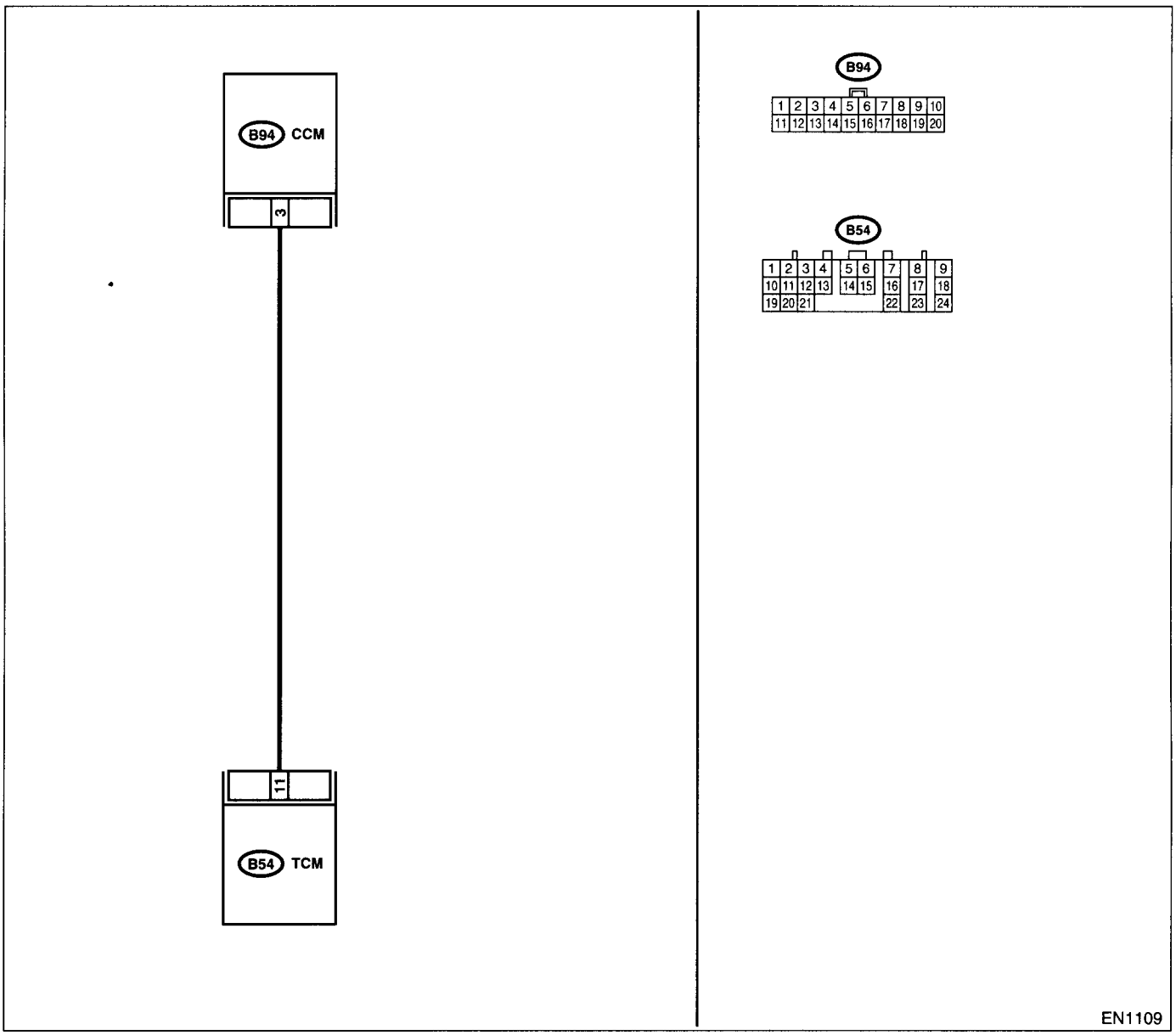
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine, and warm-up the engine. 2)Turn the ignition swtich to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 31 (+) — Chassis ground (–):***	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CV:DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



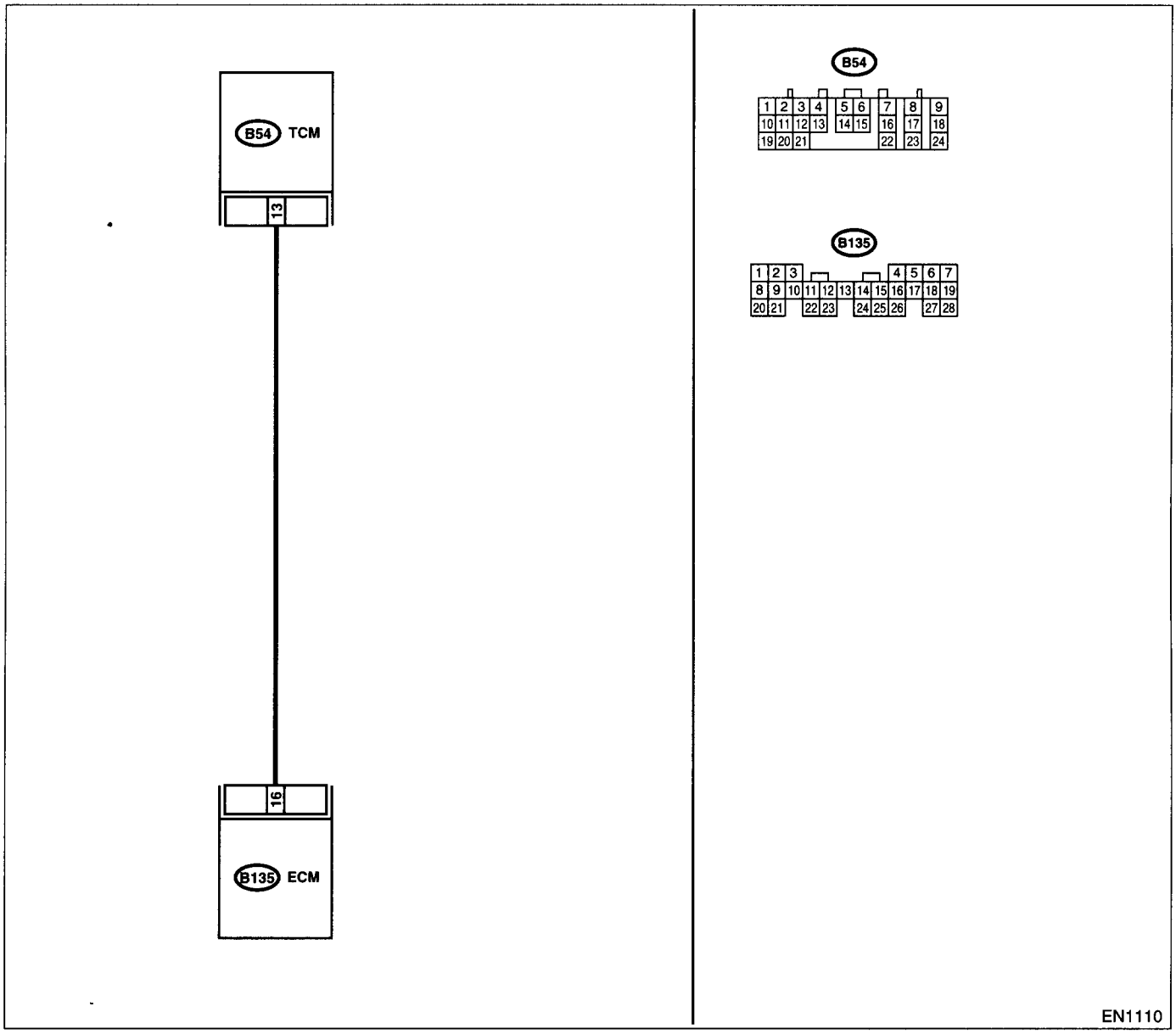
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and CCM. 3)Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B54) No. 11— (B94) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair short circuit in harness between TCM and CCM connector.	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to TCM and CCM. 2)Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3)Start the engine. 4)Turn the cruise control main switch to ON. 5)Move selector lever to "D" and slowly increase vehicle speed to 50 km/h (31 MPH). 6)Turn the cruise control command switch to ON. 7)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 (+) — Chassis ground (–):***	Is the resistance less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-7, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

CW:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



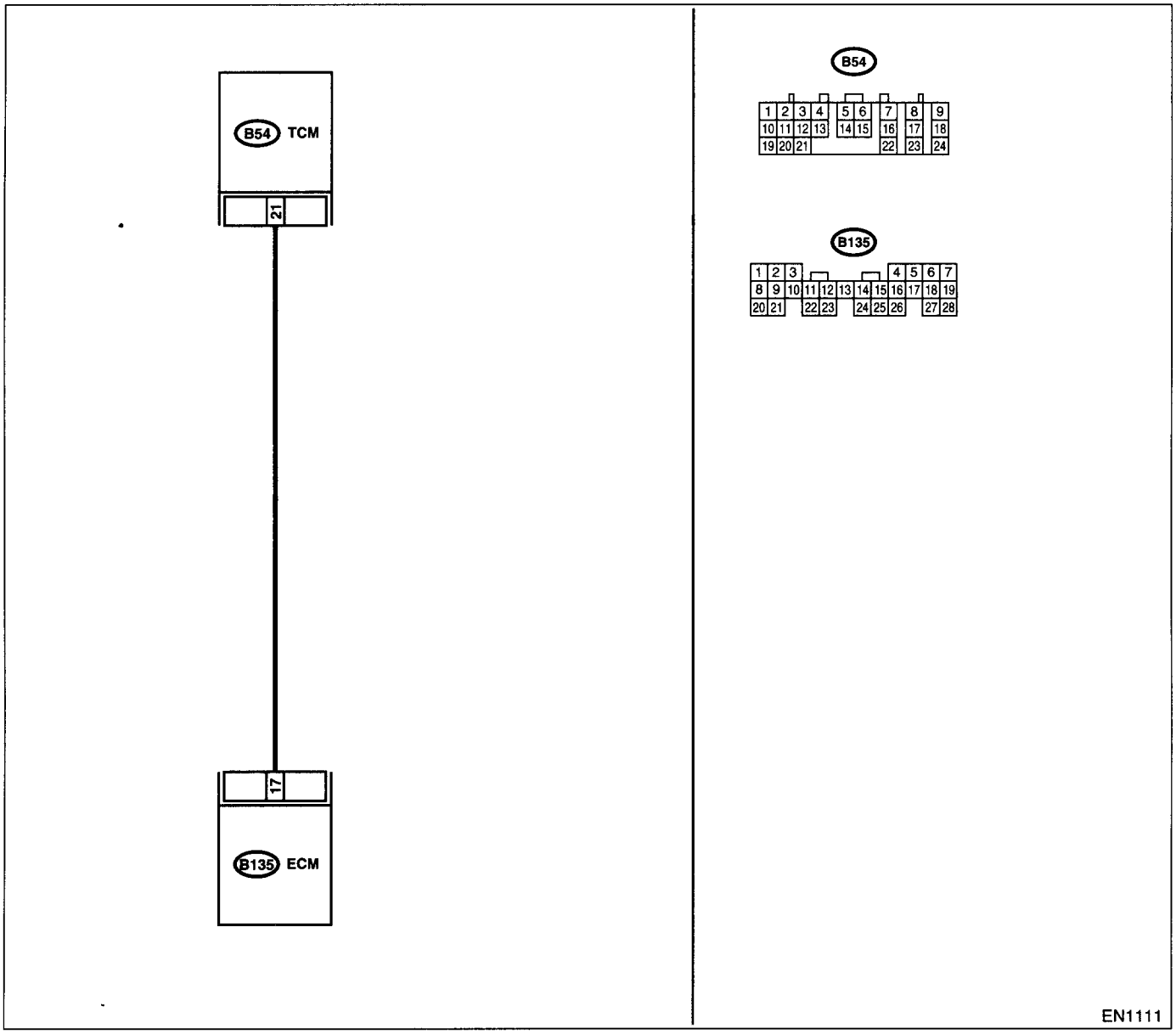
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B135) No. 16 — (B56) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

CX:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(SOHC)-43, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(SOHC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(SOHC)-47, Engine Control Module.>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B135) No. 17 — (B54) No. 21:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to AT-45, Transmission Control Module (TCM).>

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(SOHC)-89, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake air temperature and pressure sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Intake air temperature and pressure sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake air temperature and pressure sensor
4. Poor acceleration	1) Intake air temperature and pressure sensor 2) Throttle position sensor 3) Fuel injection parts (*4) 4) Fuel pump and fuel pump relay 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) A/C switch and A/C cut relay 9) Engine torque control signal circuit 10) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake air temperature and pressure sensor 2) Engine coolant temperature sensor (*2) 3) Crankshaft position sensor (*3) 4) Camshaft position sensor (*3) 5) Purge control solenoid valve 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE: •
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to AT-2, Basic Diagnostic Procedure.>