1. General Description

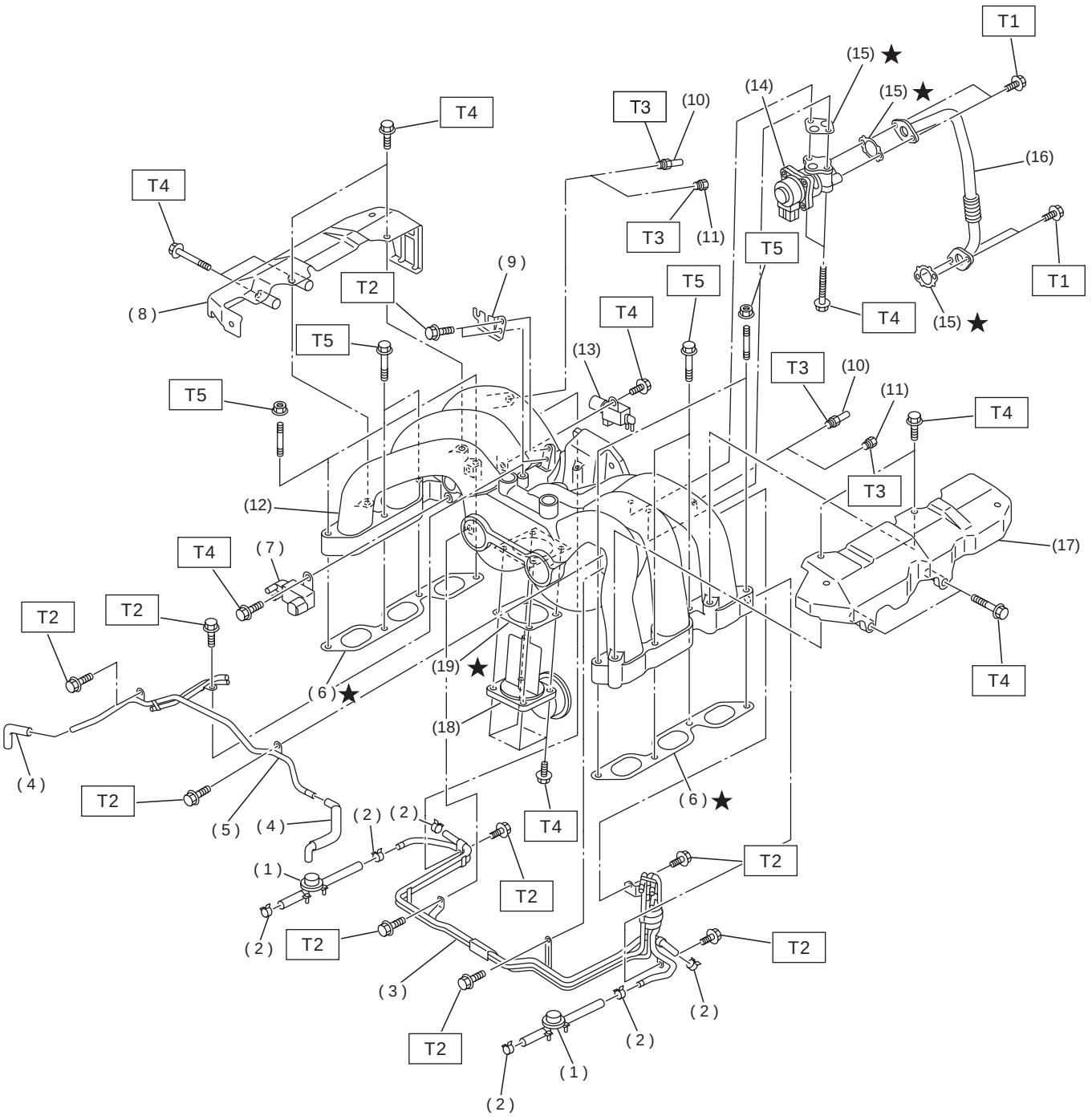
A: SPECIFICATIONS

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 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 85 ℓ (22.5 US gal, 18.7 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

B: COMPONENT

1. INTAKE MANIFOLD

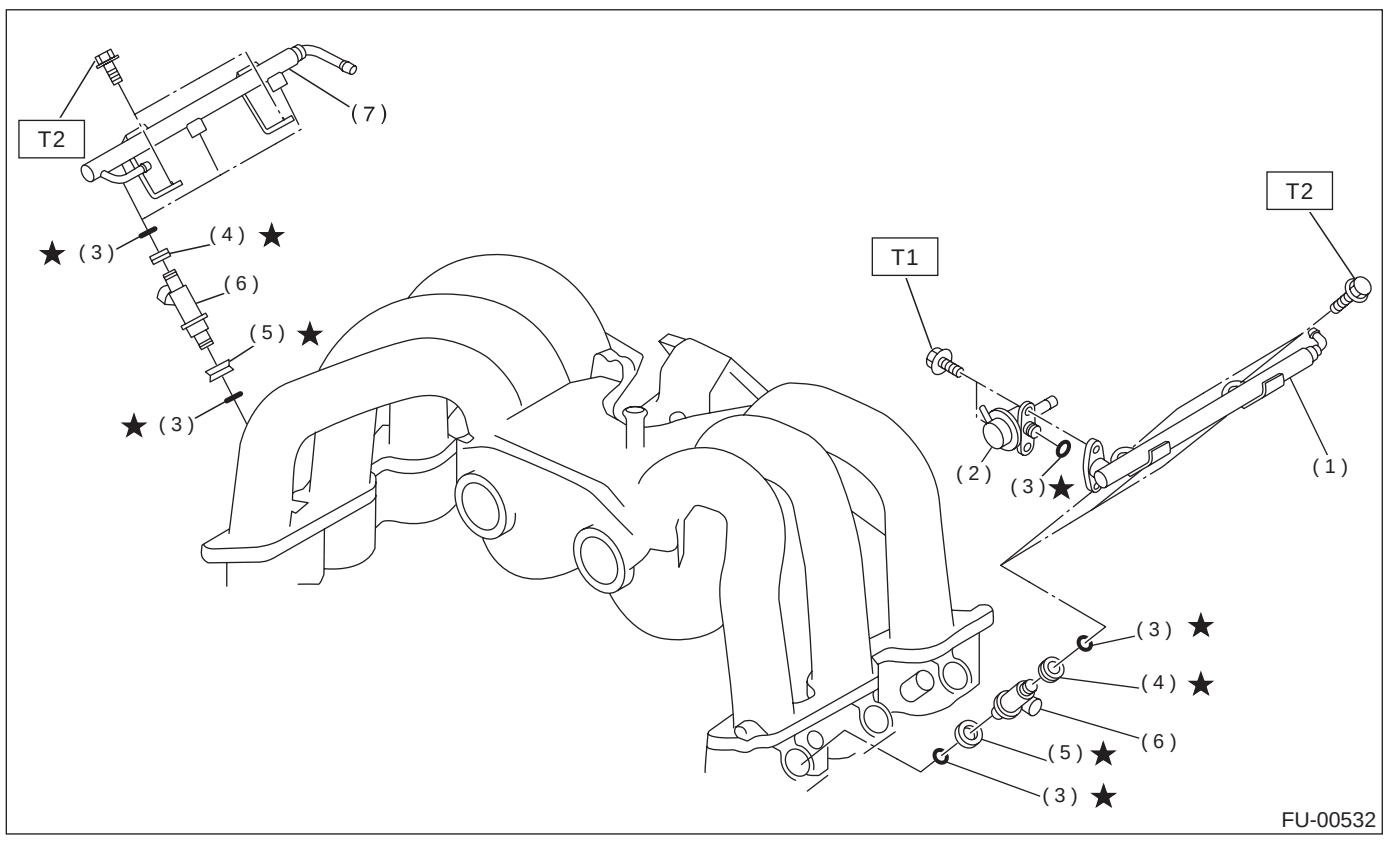


FU-00531

(1) Fuel damper valve
(2) Clamp
(3) Fuel pipe ASSY
(4) Air assist hose
(5) Air assist and purge pipe ASSY
(6) Gasket
(7) Purge control solenoid valve
(8) Fuel pipe protector RH
(9) Accelerator cable bracket
(10) Nipple
(11) Plug
(12) Intake manifold
(13) Induction valve control solenoid
(14) EGR valve
(15) Gasket
(16) EGR pipe
(17) Fuel pipe protector LH
(18) Induction valve
(19) Gasket

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.65, 4.7)***
T2:	***5.0 (0.51, 3.7)***
T3:	***17 (1.7, 12)***
T4:	***19 (1.9, 14)***
T5:	***25 (2.5, 18)***

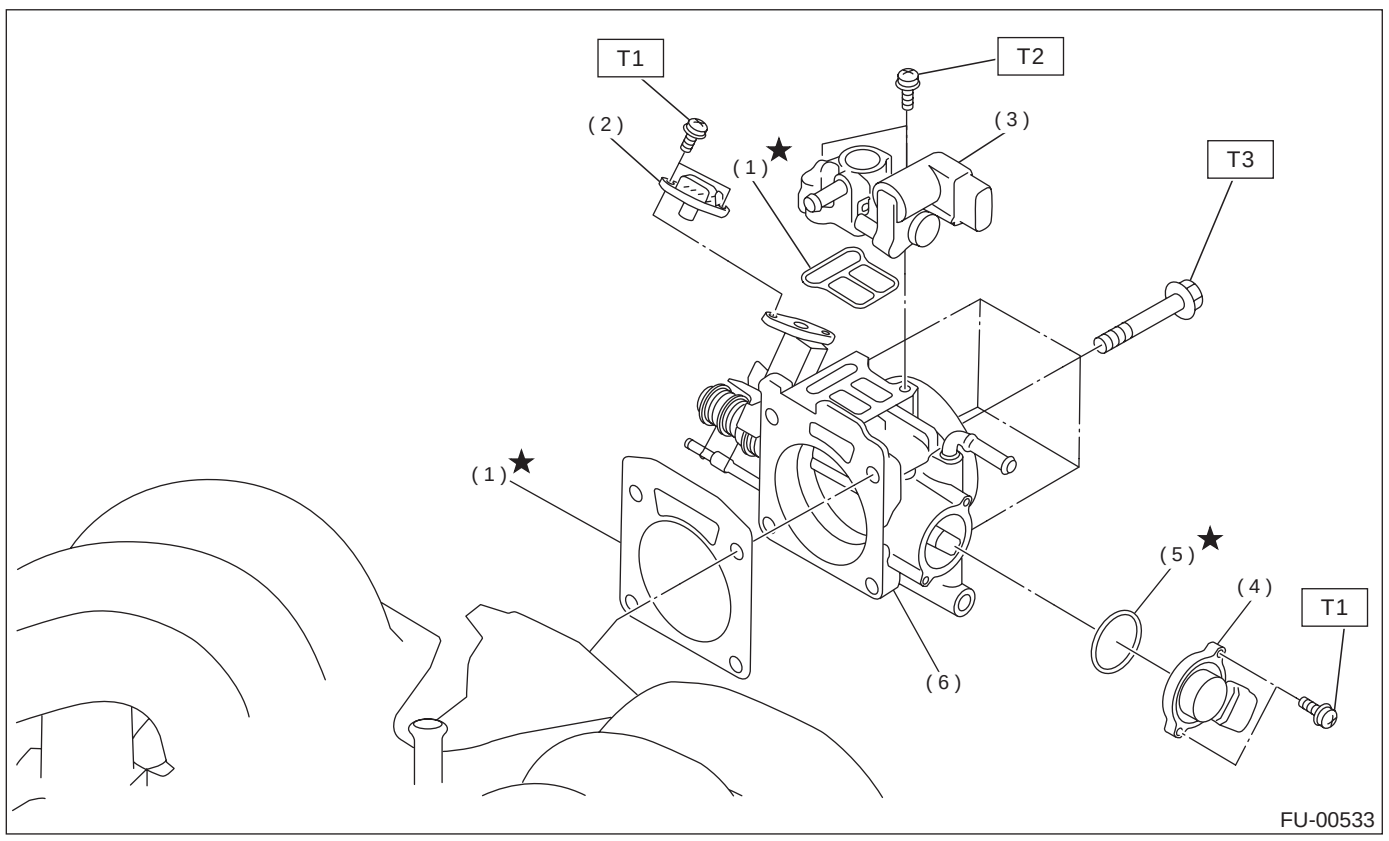
2. FUEL INJECTOR



(1) Fuel injector pipe LH
(2) Pressure regulator
(3) O-ring
(4) Injection rubber
(5) Insulator
(6) Fuel injector
(7) Fuel injector pipe RH

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.65, 4.7)***
T2:	***19 (1.9, 14)***

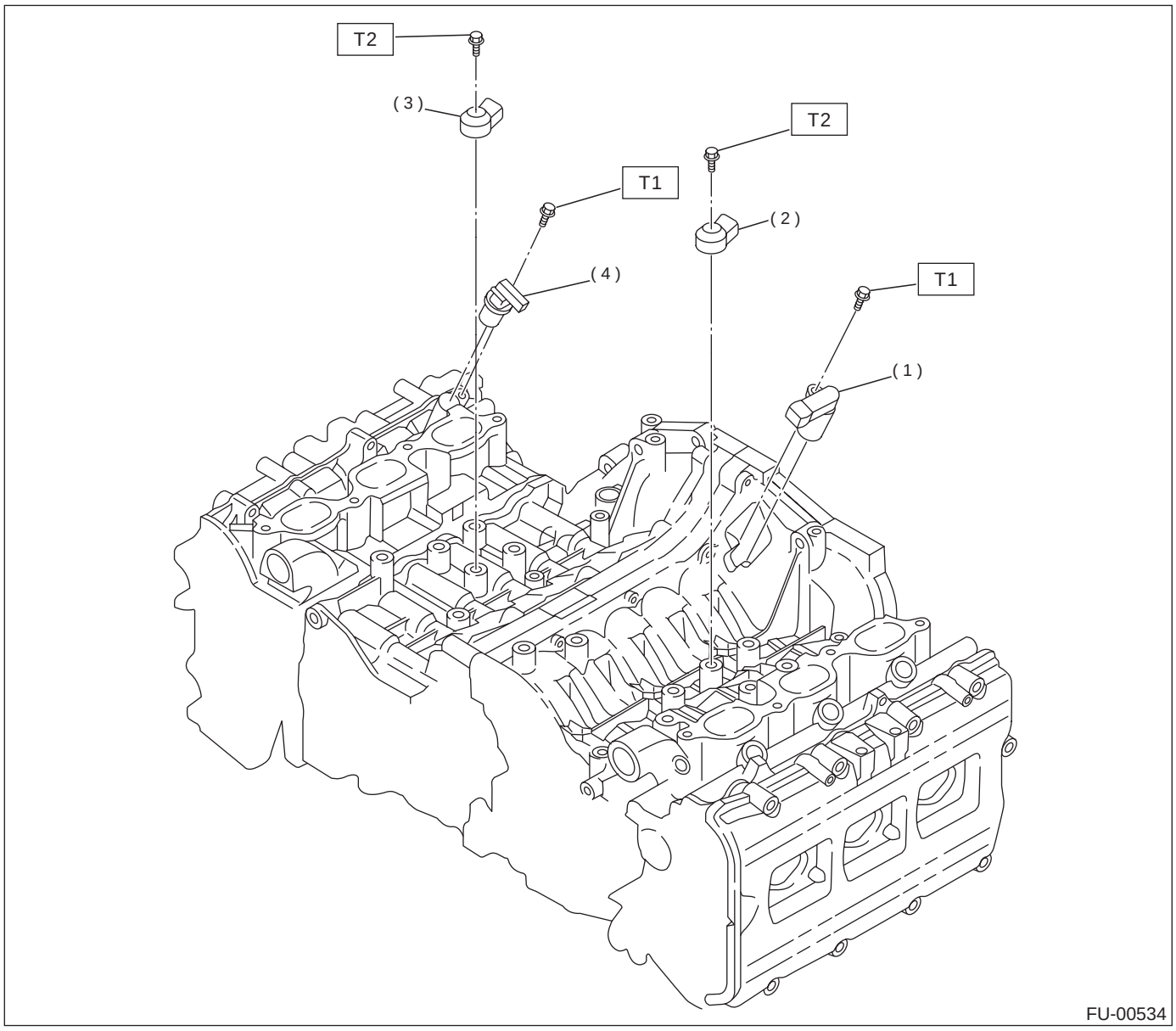
3. AIR INTAKE SYSTEM



(1) Gasket
(2) Intake manifold pressure sensor
(3) Idle air control solenoid valve
(4) Throttle position sensor
(5) O-ring
(6) Throttle body

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*1.6 (0.16, 1.2)*
T2:	*2.8 (0.29, 2.1)*
T3:	*22 (2.2, 15.9)*

4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS

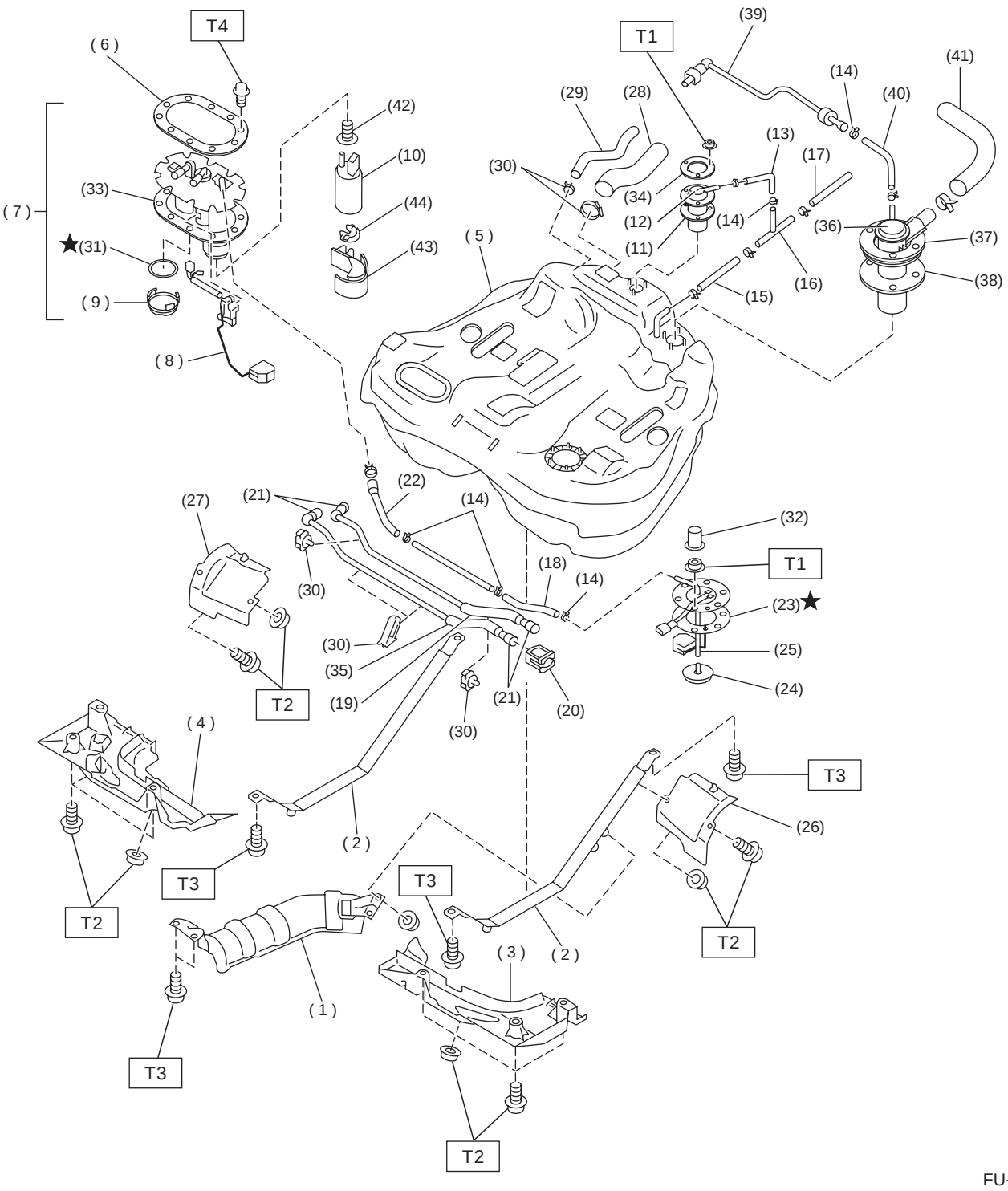


(1) Crankshaft position sensor
(2) Knock sensor LH
(3) Knock sensor RH
(4) Camshaft position sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 25 (2.5, 18)

MEMO:

5. FUEL TANK

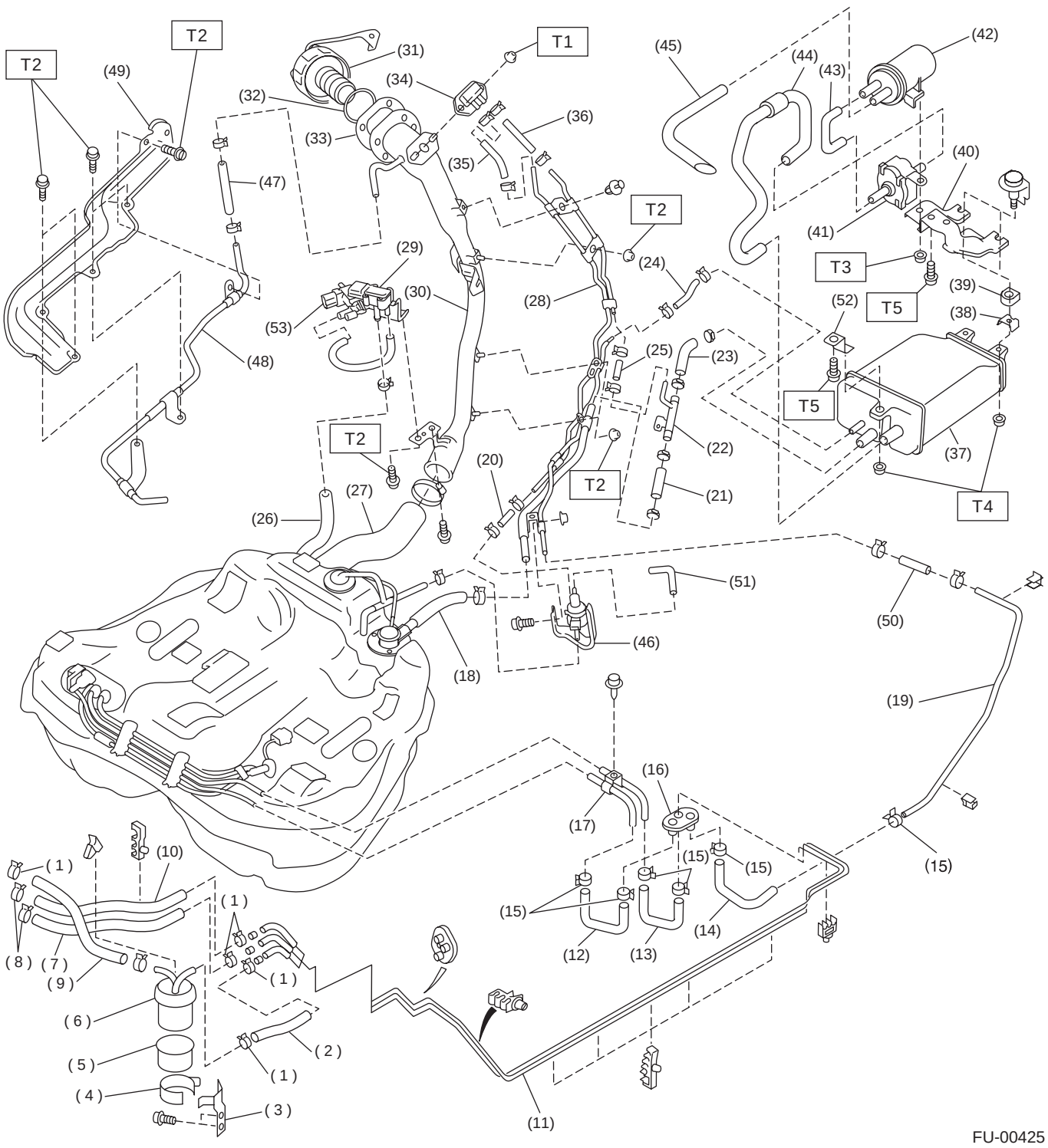


FU-00424

(1) Heat sealed cover
(2) Fuel tank band
(3) Protector LH (Front)
(4) Protector RH (Front)
(5) Fuel tank
(6) Fuel pump plate
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Cap
(10) Fuel pump
(11) Fuel cut valve gasket
(12) Fuel cut valve
(13) Evaporation hose A
(14) Clip
(15) Evaporation hose C
(16) Joint pipe
(17) Evaporation hose B
(18) Jet pump hose A
(19) Fuel return tube
(20) Retainer
(21) Quick connector
(22) Jet pump hose B
(23) Fuel sub level sensor gasket
(24) Jet pump filter
(25) Fuel sub level sensor
(26) Protector LH (Rear)
(27) Protector RH (Rear)
(28) Fuel filler hose
(29) Fuel tank pressure sensor hose
(30) Clamp
(31) Gasket
(32) Cap
(33) Gasket
(34) Fuel cut valve plate
(35) Fuel delivery tube
(36) Vent valve
(37) Vent valve plate
(38) Vent valve gasket
(39) Evaporation tube
(40) Evaporation hose D
(41) Air vent hose
(42) Seal
(43) Fuel pump holder
(44) Rubber lower

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 5.9 (0.6, 4.3)

6. FUEL LINE


T1
T2
T3
T4
T5
(1)
(2)
(3)
(4)
(5)
(6)
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(8)
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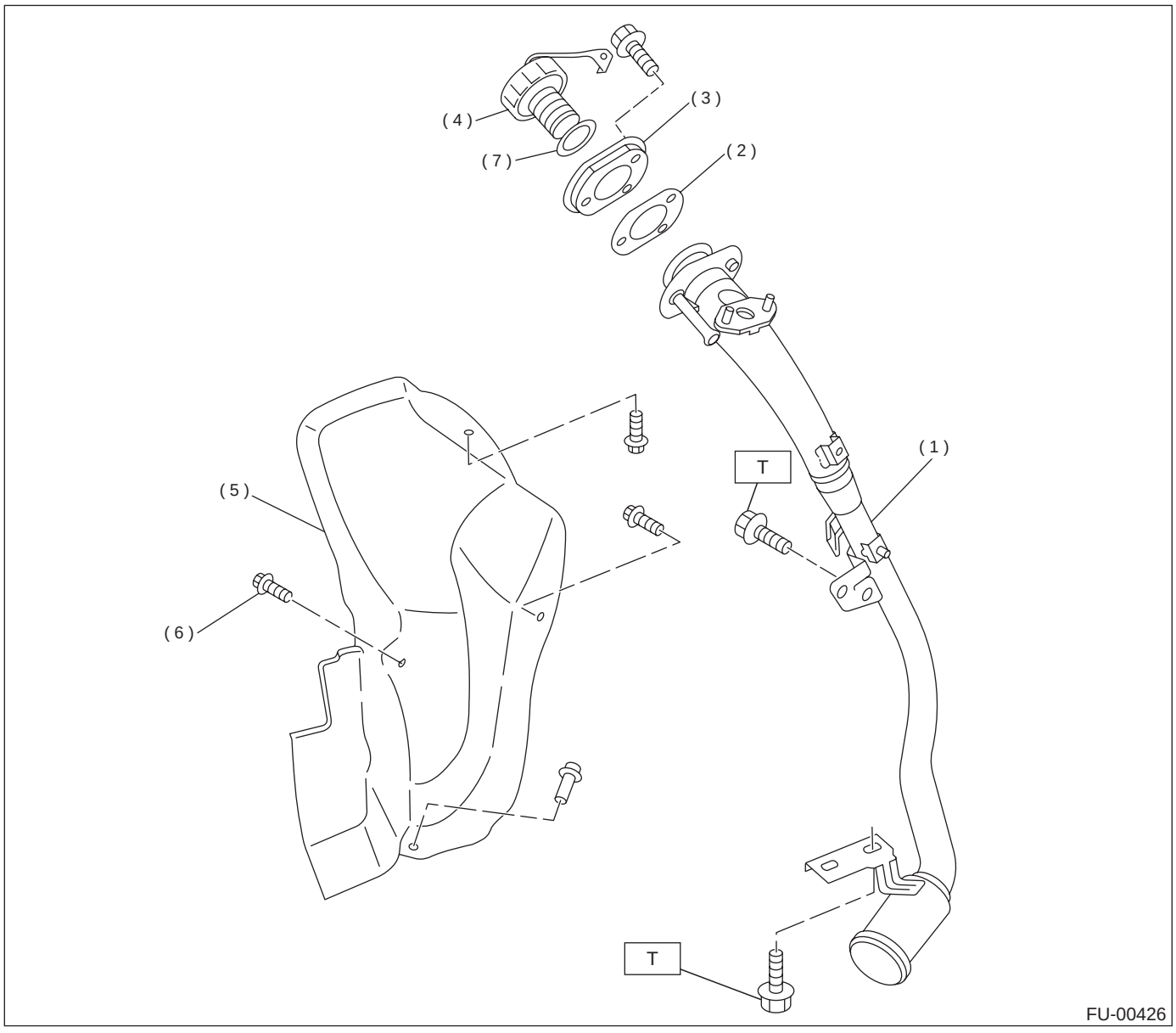
FU-00425

(1) Clamp
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose F
(8) Clip
(9) Fuel delivery hose B
(10) Fuel return hose
(11) Fuel pipe ASSY
(12) Fuel delivery hose C
(13) Fuel return hose C
(14) Evaporation hose G
(15) Clamp
(16) Grommet
(17) Fuel pipe ASSY
(18) Air vent hose A
(19) Evaporation hose H
(20) Evaporation hose I
(21) Air vent hose B
(22) Air vent pipe
(23) Evaporation hose J
(24) Evaporation hose K
(25) Evaporation hose L
(26) Fuel tank pressure sensor hose
(27) Fuel filler hose
(28) Evaporation pipe B
(29) Fuel tank pressure sensor
(30) Fuel filler pipe
(31) Fuel filler cap
(32) Ring
(33) Packing
(34) Shut valve
(35) Evaporation hose M
(36) Evaporation hose N
(37) Canister
(38) Canister lower bracket
(39) Cushion rubber
(40) Canister upper bracket
(41) Drain valve
(42) Drain filter
(43) Drain filter hose A
(44) Drain valve hose
(45) Drain filter hose B
(46) Pressure control solenoid valve
(47) Evaporation hose O
(48) Evaporation pipe C
(49) Pipe protector
(50) Evaporation hose P
(51) Pressure control solenoid valve hose
(52) Canister front bracket
(53) Fuel tank sensor control valve

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.5 (0.46, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 23 (2.3, 16.6)
T5: 33 (3.4, 25)

7. FUEL FILLER PIPE



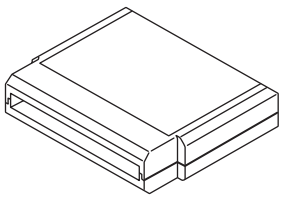
(1) Fuel filler pipe ASSY
(2) Filler pipe packing
(3) Filler ring
(4) Filler cap
(5) Filler pipe protector
(6) Clip
(7) Ring

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

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 ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

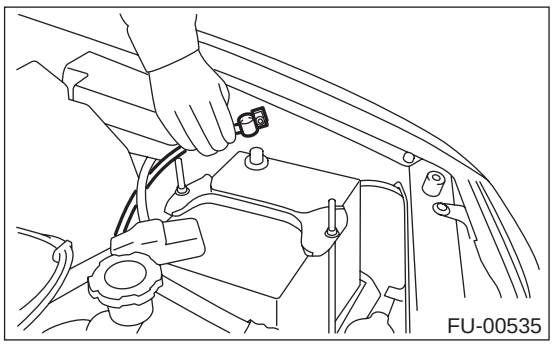
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

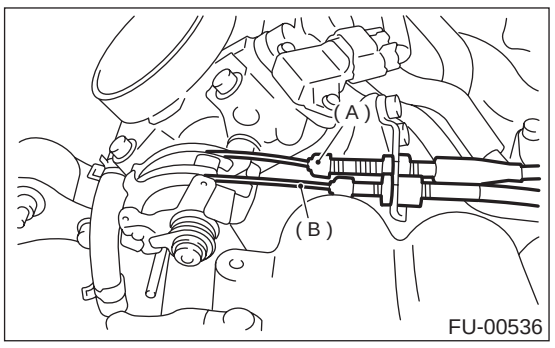
2. Throttle Body

A: REMOVAL

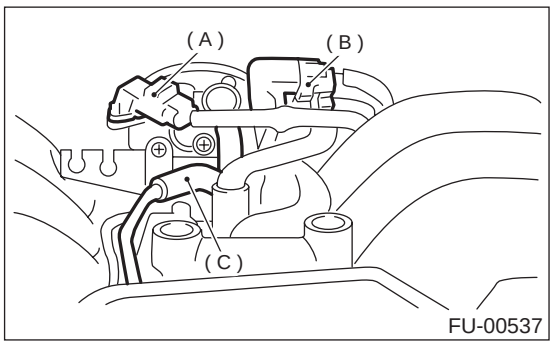
1) Disconnect battery ground cable.



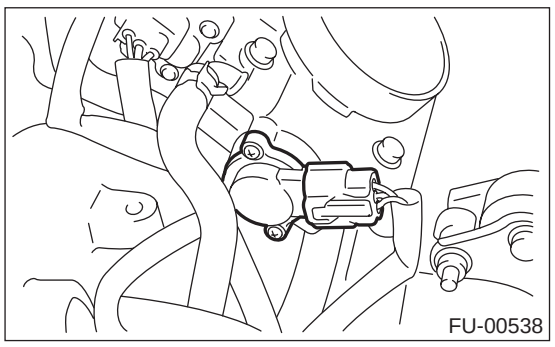
2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect accelerator cable (A).
4) Disconnect cruise control cable (B). (With cruise control model)



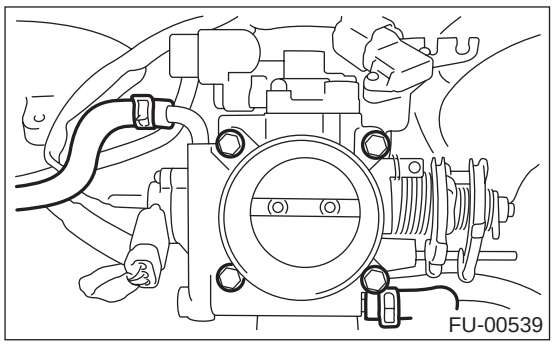
5) Disconnect connectors from intake manifold pressure sensor (A) and idle air control solenoid valve (B).
6) Disconnect air by-pass hose (C) from idle air control solenoid valve.



7) Disconnect throttle position sensor connector.



8) Disconnect engine coolant hoses from throttle body.
9) Remove bolts which secure throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

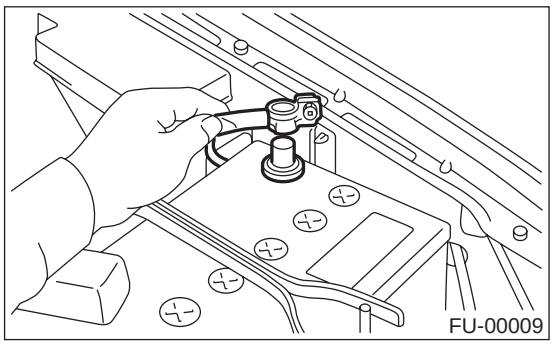
NOTE:
Always use a new gasket.

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

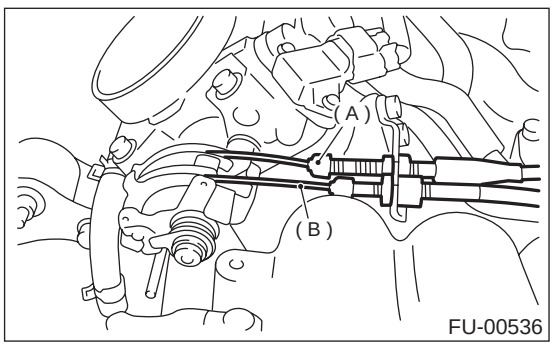
3. Intake Manifold

A: REMOVAL

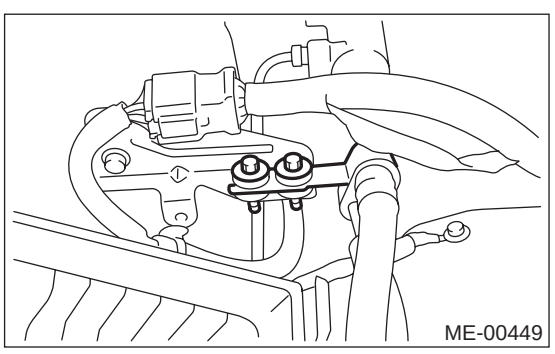
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



4) Remove air intake duct, air cleaner assembly and air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> or <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
5) Disconnect accelerator cable (A).
6) Disconnect cruise control cable (B). (With cruise control model)

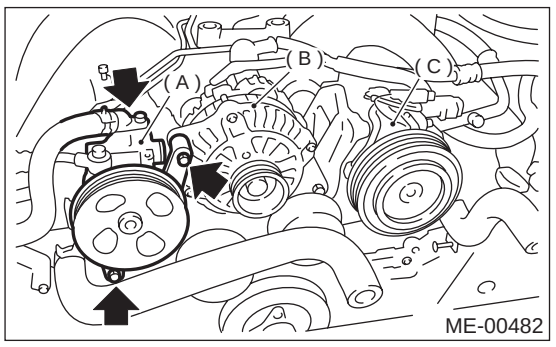


7) Remove power steering pump and tank from brackets.
(1) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
(2) Remove power steering oil pipe with bracket.



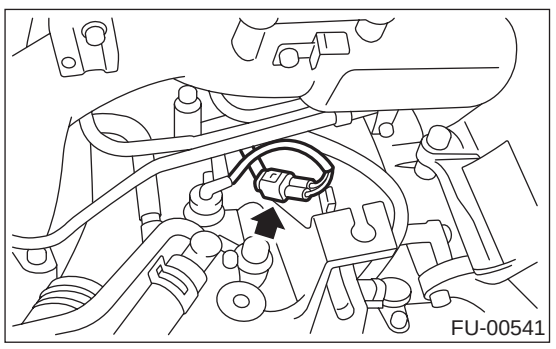
(3) Remove bolts which install power steering pump bracket.

NOTE:
Do not separate hose and pipe from the main pump.

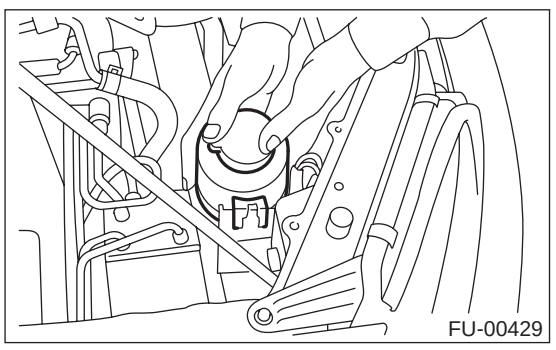


(A) Power steering pump
(B) Generator
(C) A/C compressor

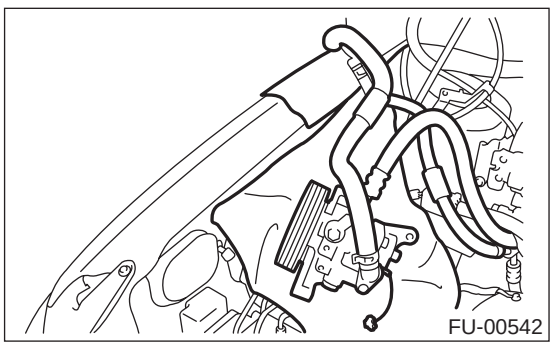
(4) Disconnect power steering pump switch connector.



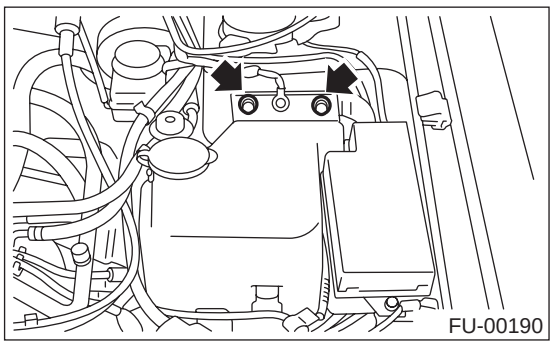
(5) Remove power steering tank from the bracket by pulling it upward.



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

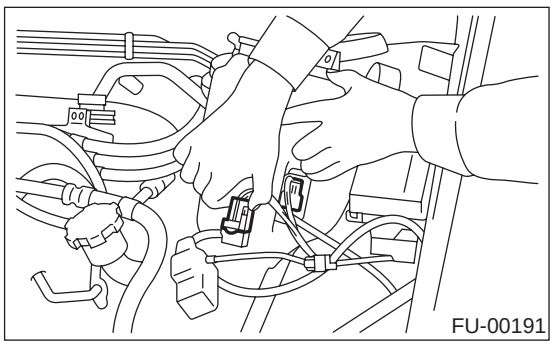

FU-00542

8) Remove two bolts which install washer tank on body.


FU-00190

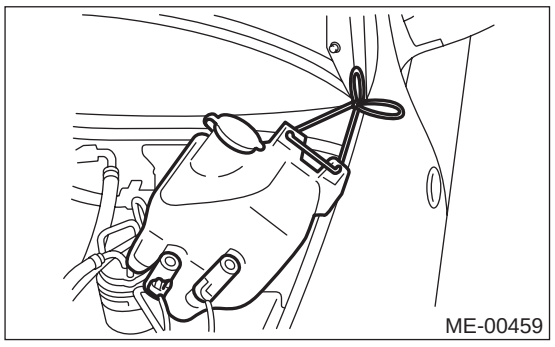
9) Disconnect connector from front window washer motor.

10) Disconnect connector from rear gate glass washer motor.

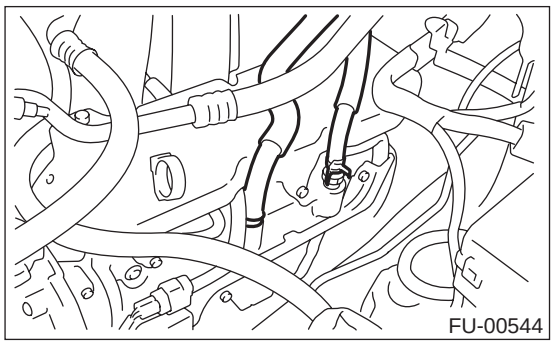

FU-00191

11) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

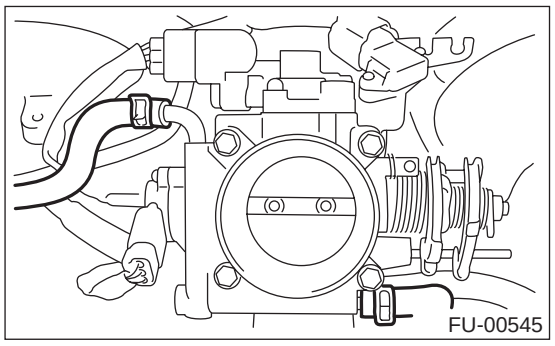
12) Move washer tank upward.


ME-00459

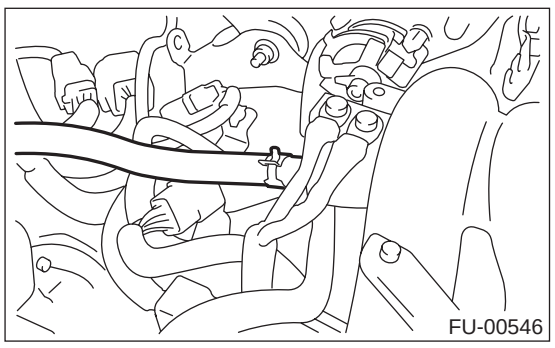
13) Disconnect PCV hoses from cylinder head cover.


FU-00544

14) Disconnect engine coolant hose from throttle body.

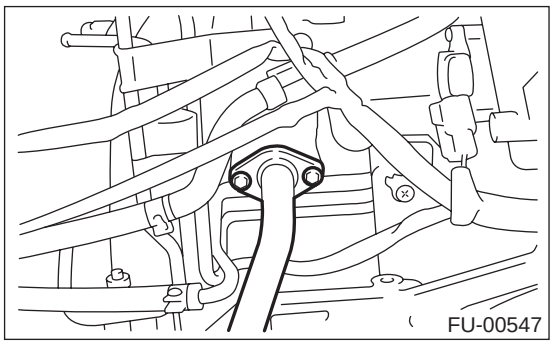

FU-00545

15) Disconnect brake booster hose.

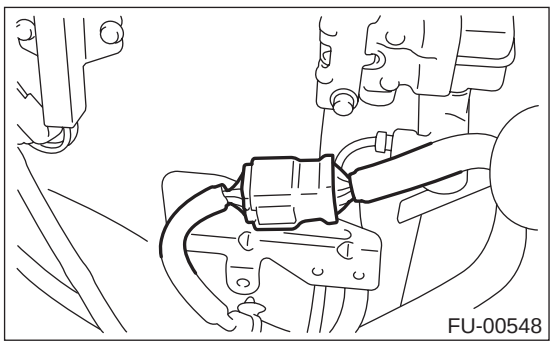

FU-00546

16) Remove EGR pipe from EGR valve.

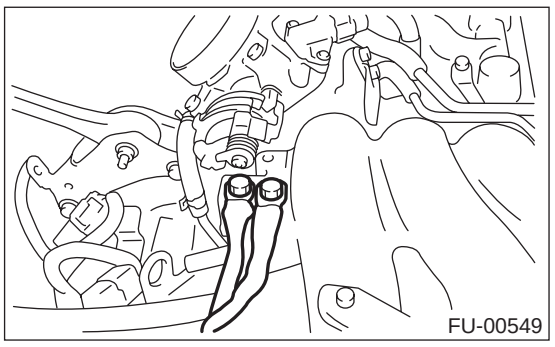
NOTE:
Be careful not to drop gaskets.



17) Disconnect engine harness connectors from bulkhead harness connectors.

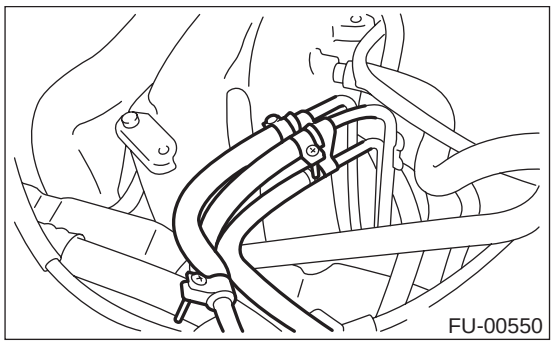


18) Disconnect engine ground terminal from intake manifold.

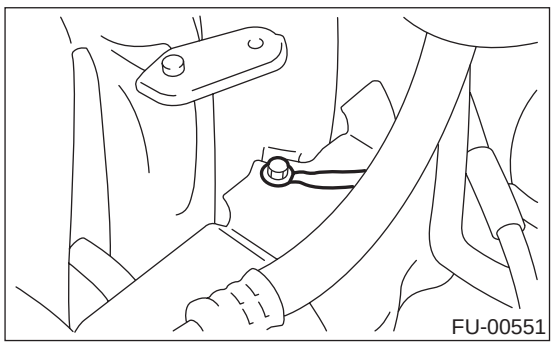


19) Disconnect fuel hoses from fuel pipes.

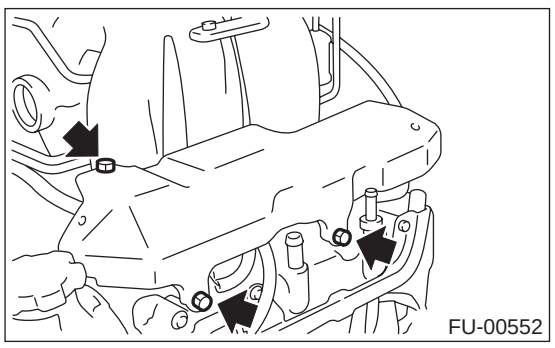
WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



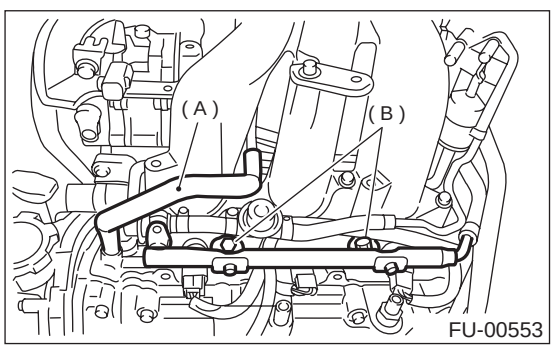
20) Remove ground cable from fuel pipe protector LH.



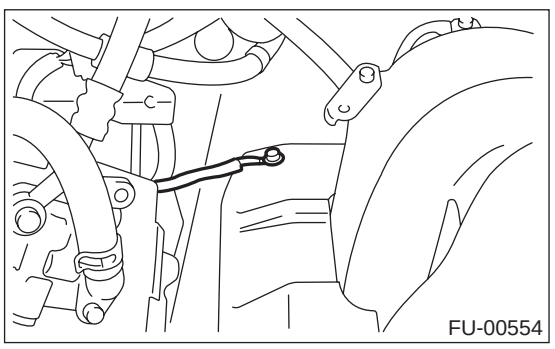
21) Remove fuel pipe protector LH.



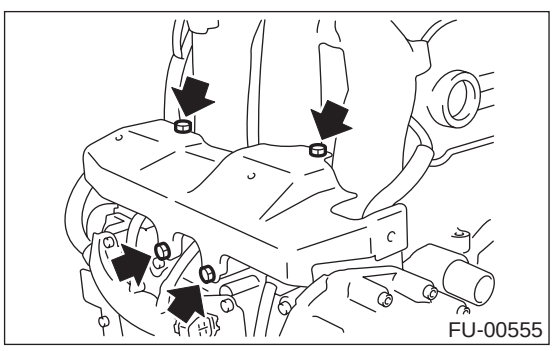
22) Disconnect air assist hose (A).
23) Remove the bolt (B), which holds fuel injector pipe LH onto cylinder head.



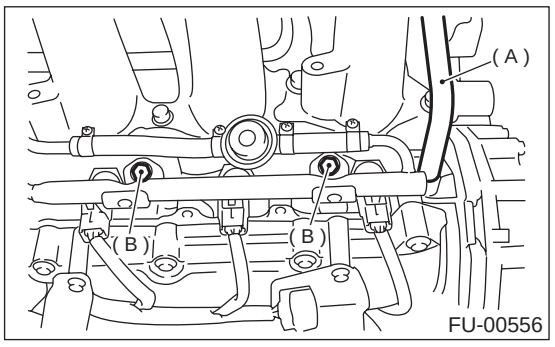
24) Remove ground cable from fuel pipe protector RH.



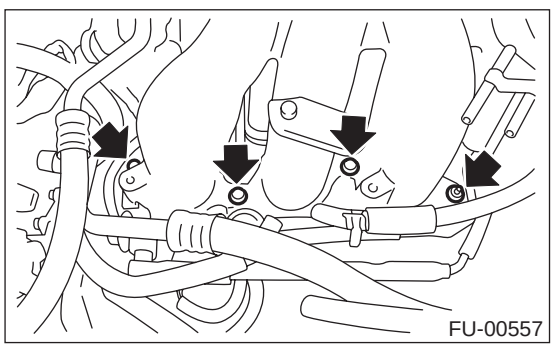
25) Remove fuel pipe protector RH.

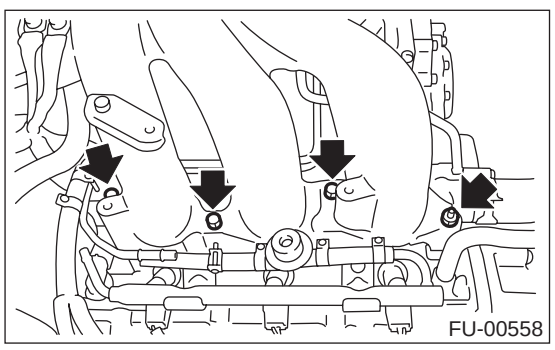


26) Disconnect air assist hose (A).
Remove the bolt (B), which holds fuel injector pipe RH onto cylinder head.



27) Remove bolts which holds intake manifold onto cylinder heads.



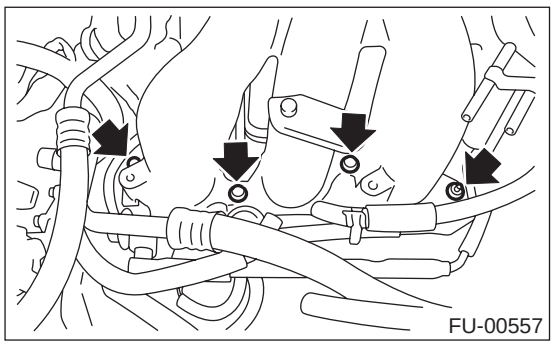


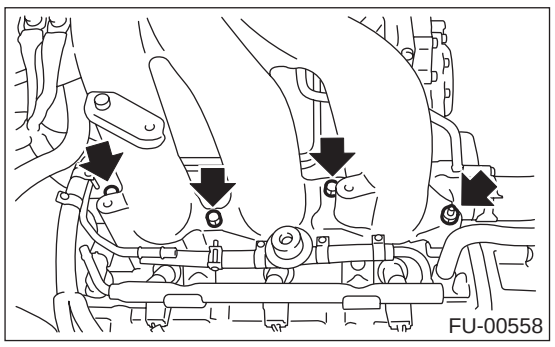
28) Remove intake manifold.

B: INSTALLATION

1) Install intake manifold onto cylinder heads.
NOTE:
Always use new gaskets.

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

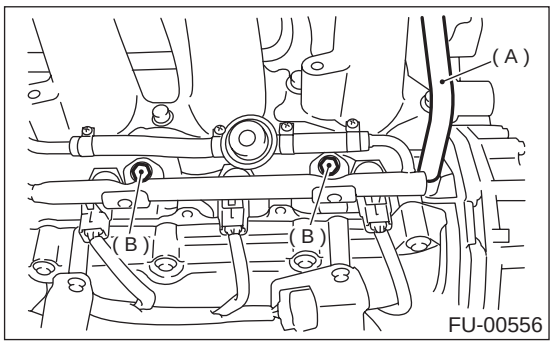




2) Install the bolt (B), which holds fuel injector pipe RH onto cylinder head.

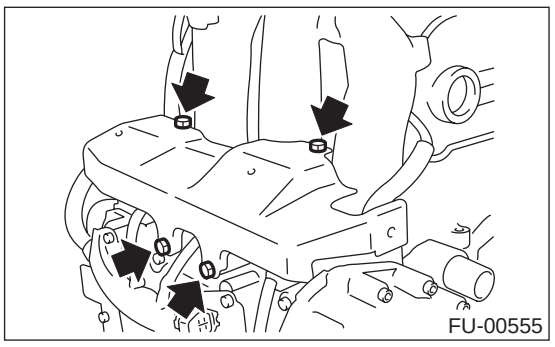
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

3) Connect air assist hose (A).

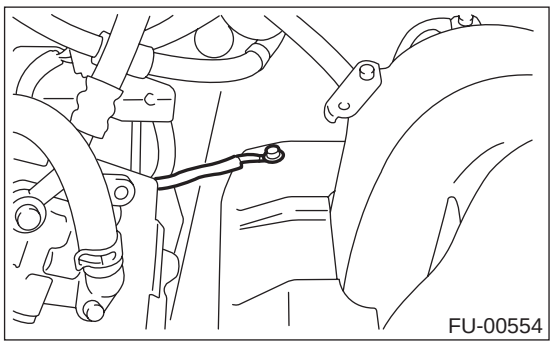


4) Install fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



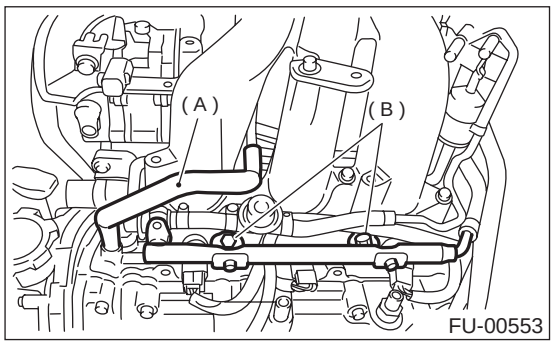
5) Install ground cable to fuel pipe protector RH.



6) Install the bolt (B) which holds fuel injector pipe RH onto cylinder head.

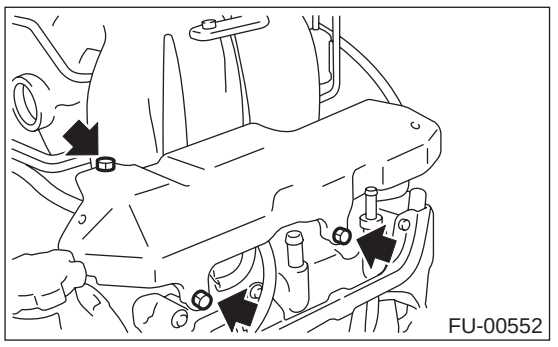
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

7) Connect air assist hose (A).

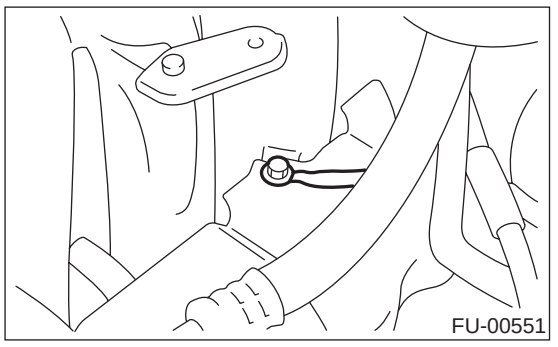


8) Install fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



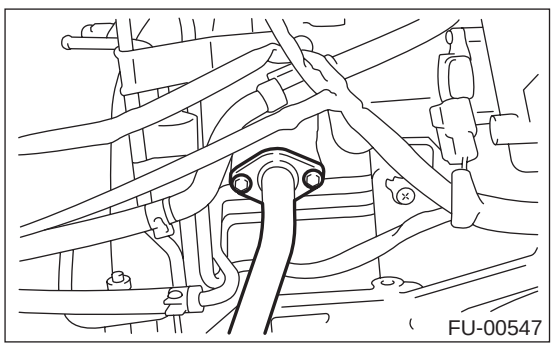
9) Install ground cable to fuel pipe protector LH.



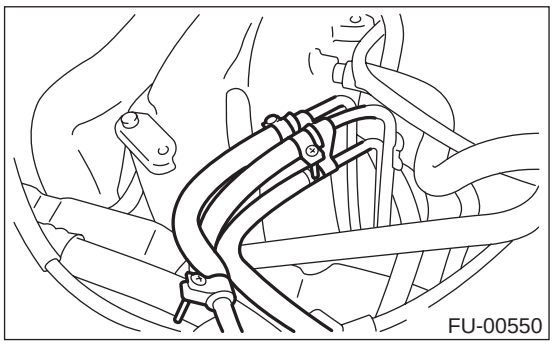
10) Install EGR pipe to EGR valve.

NOTE:
Always use new gasket.

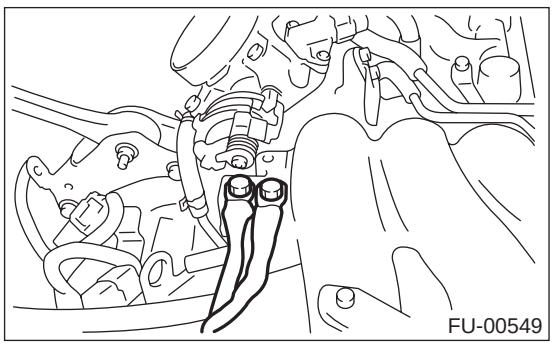
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



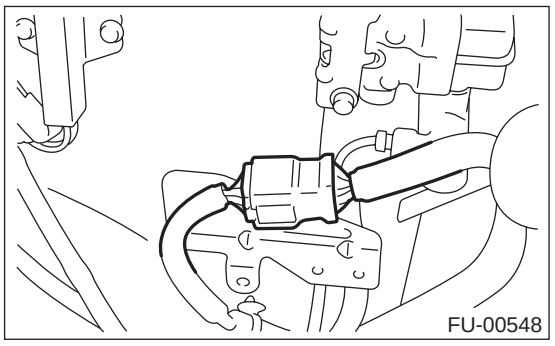
11) Connect fuel hoses.



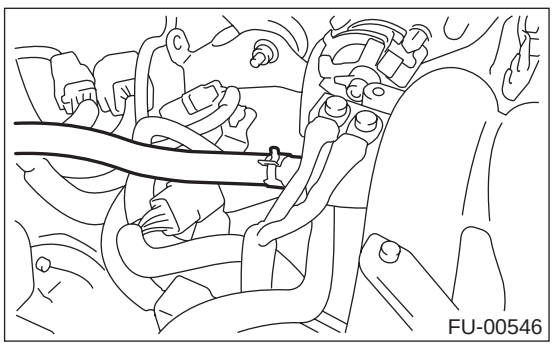
12) Connect engine ground terminal to intake manifold.



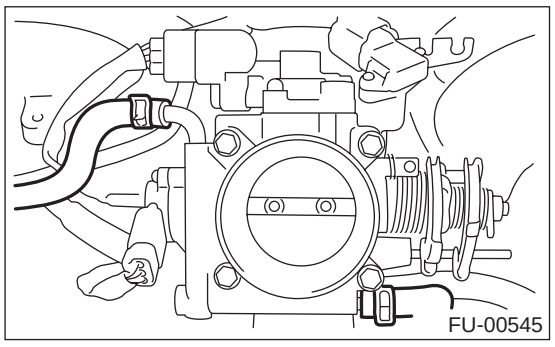
13) Connect engine harness connectors to bulkhead connectors.



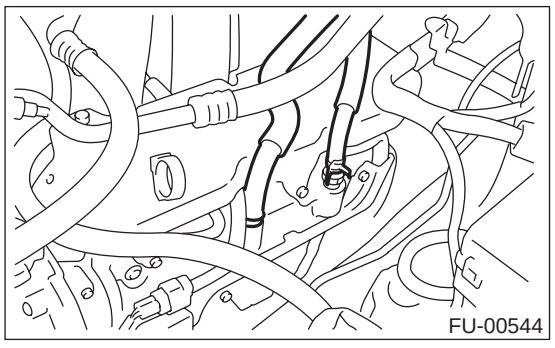
14) Connect brake booster hose.



15) Connect engine coolant hose to throttle body.

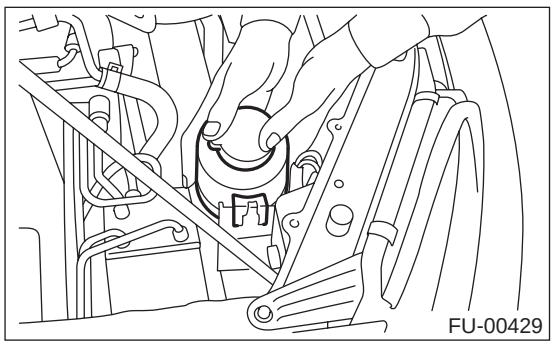


16) Connect PCV hose to cylinder head cover.

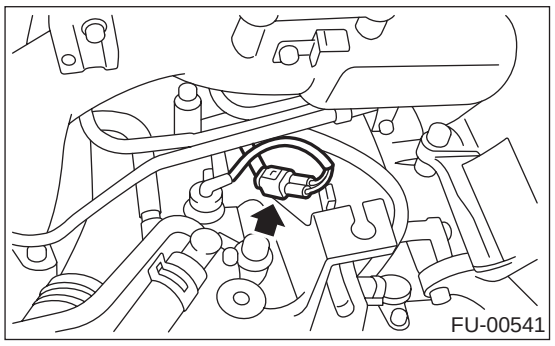


17) Install power steering pump and tank on brackets.

(1) Install power steering tank on bracket.

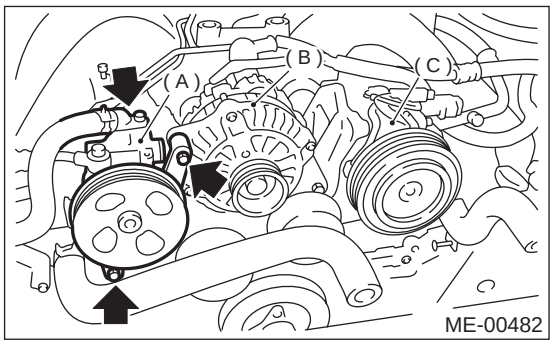


(2) Connect connector to power steering pump switch.



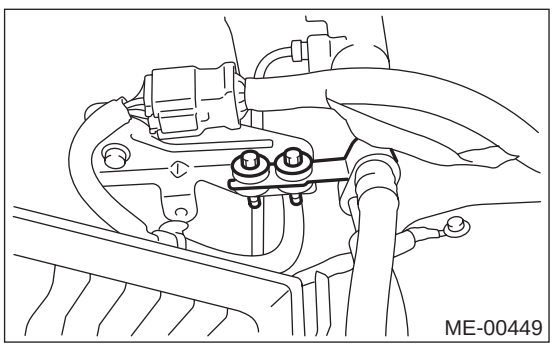
(3) Tighten bolts which install power steering pump on bracket.

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



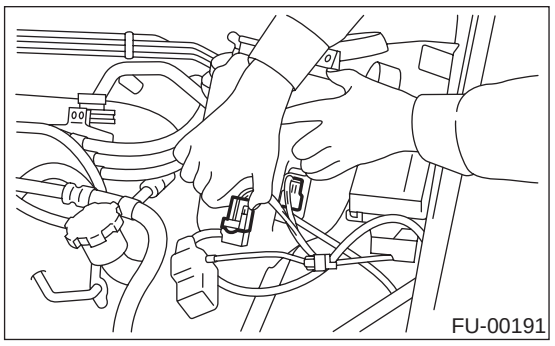
(A) Power steering pump
(B) Generator
(C) A/C compressor

(4) Install power steering pipes with bracket.

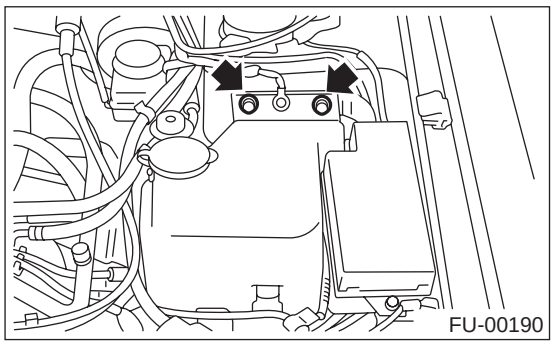


(5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>

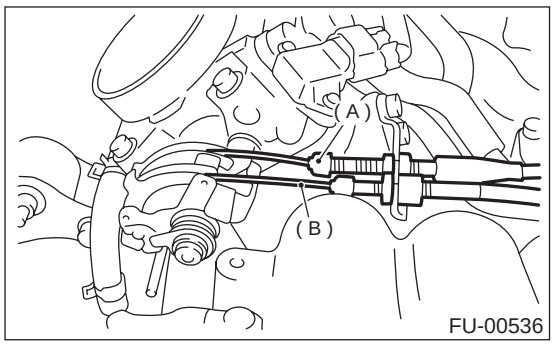
18) Connect rear window washer hose to washer motor.
19) Connect front window washer motor connector.
20) Connect rear window washer motor connector.



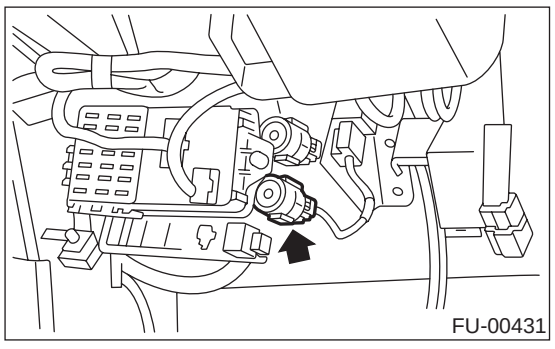
21) Install washer tank on body.



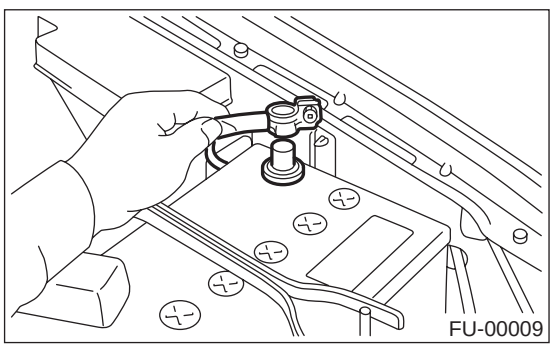
22) Connect accelerator cable (A).
23) Connect cruise control cable (B). (With cruise control models)



24) Install air intake duct, air cleaner and air intake chamber. <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
25) Connect connector to fuel pump relay.

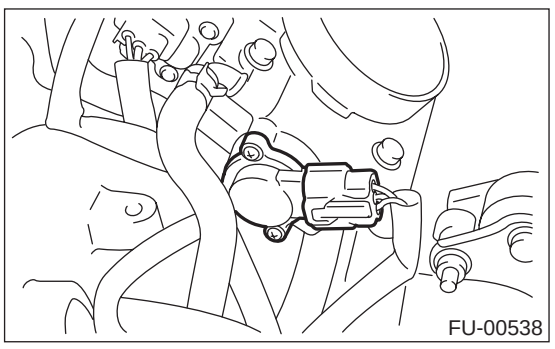


26) Connect battery ground cable.

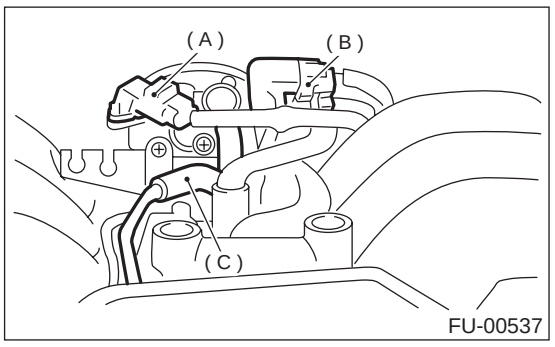


C: DISASSEMBLY

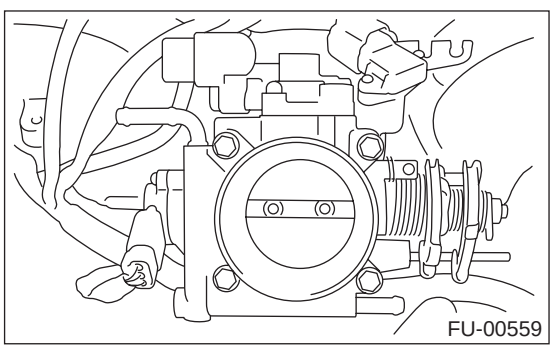
1) Disconnect connectors from throttle position sensor.



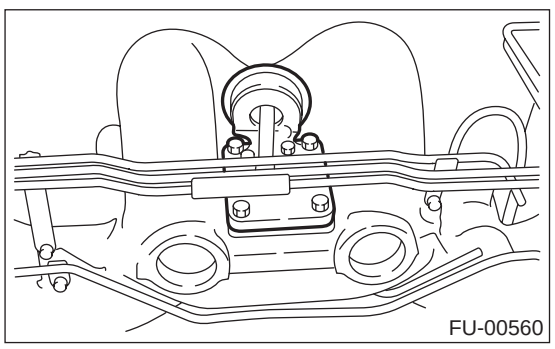
2) Disconnect connectors from intake manifold pressure sensor (B) and idle air control solenoid valve (A).
3) Disconnect air by-pass hose (C) from idle air control solenoid valve.



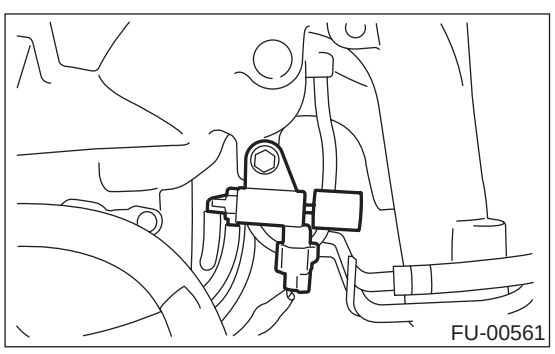
4) Remove throttle body.



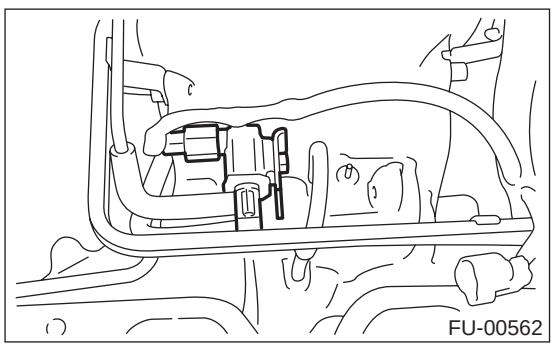
5) Remove induction valve.



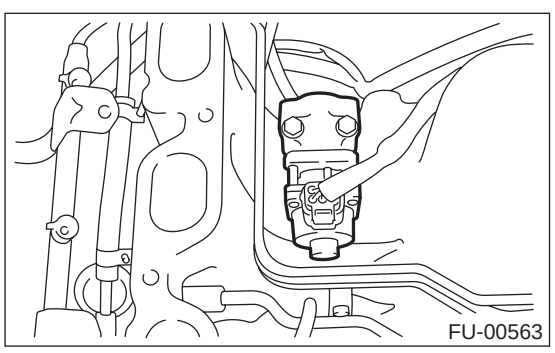
6) Disconnect connector from induction valve control solenoid.
7) Remove induction valve control solenoid.



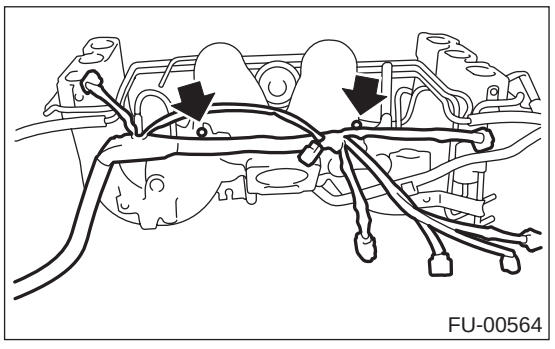
8) Disconnect connector from purge control solenoid valve.
9) Remove purge control solenoid valve.



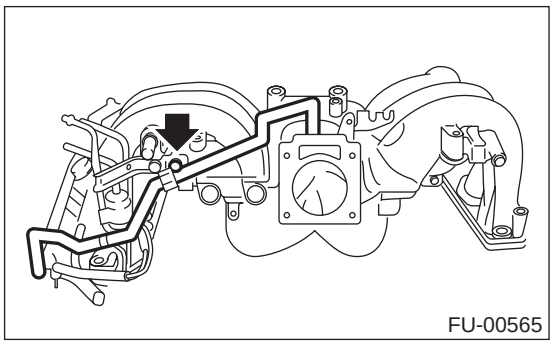
10) Disconnect connector from EGR valve.
11) Remove EGR valve.



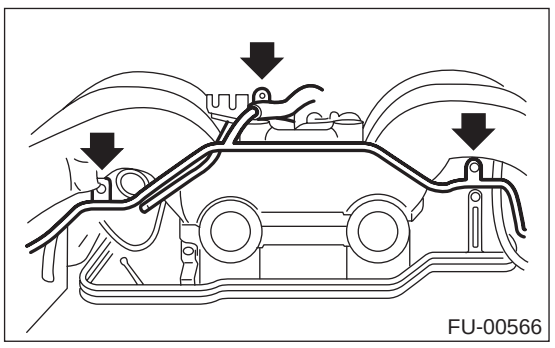
12) Remove engine harness assembly from intake manifold.


FU-00564

13) Remove PCV pipe from intake manifold.

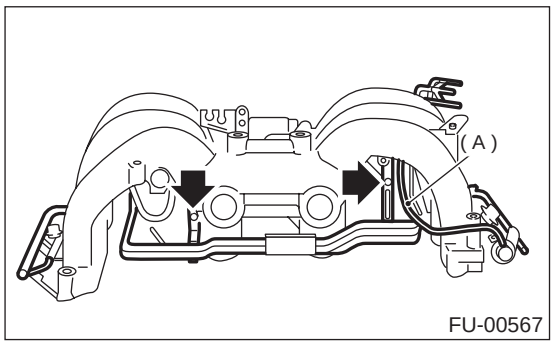

FU-00565

14) Remove air assist and purge pipe assembly.

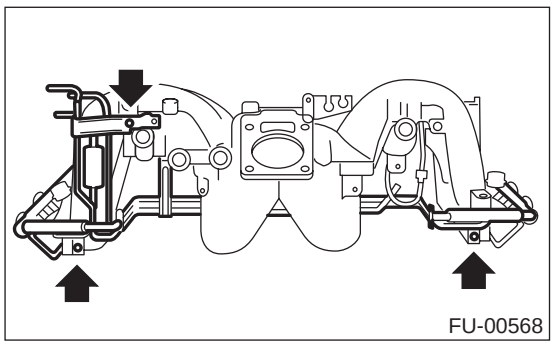

FU-00566

15) Disconnect pressure regulator vacuum hose (A) from intake manifold.

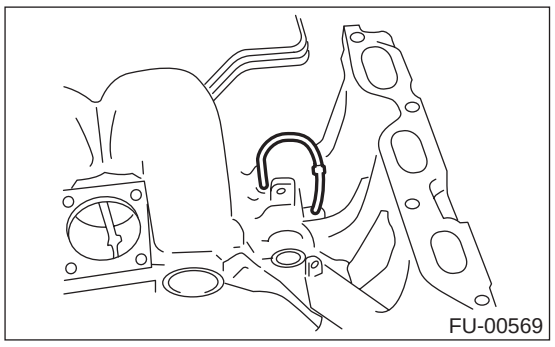
16) Remove fuel pipe and injector pipe assembly.



FU-00567

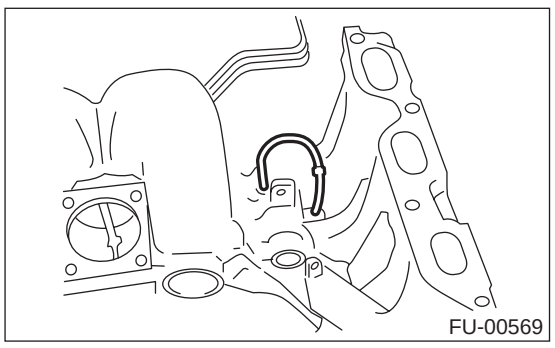

FU-00568

17) Remove induction valve vacuum hose from intake manifold.


FU-00569

D: ASSEMBLY

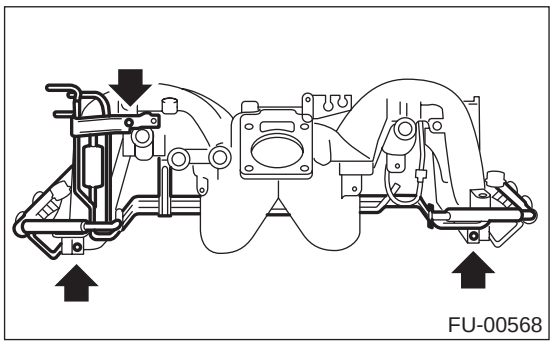
1) Intake induction valve vacuum hose to intake manifold.

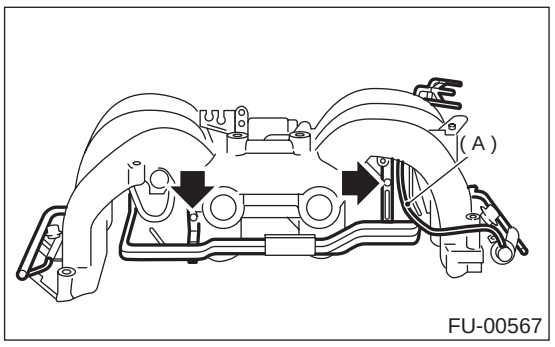

FU-00569

2) Install fuel pipe and injector pipe assembly.

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

3) Connect pressure regulator vacuum hose (A) to intake manifold.

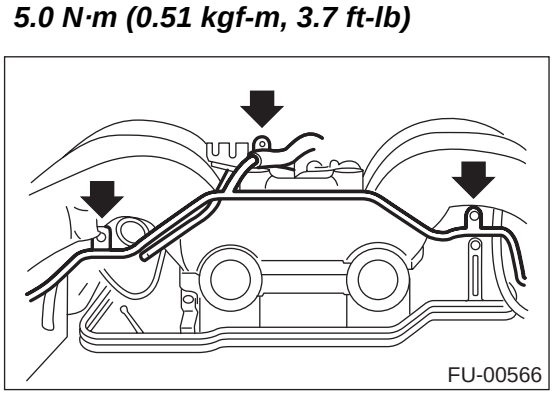

FU-00568



FU-00567

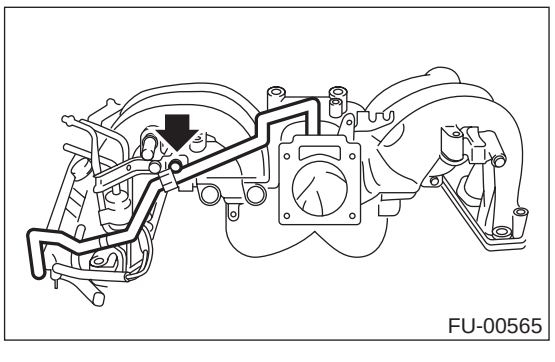
4) Install air assist and purge pipe assembly.

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


FU-00566

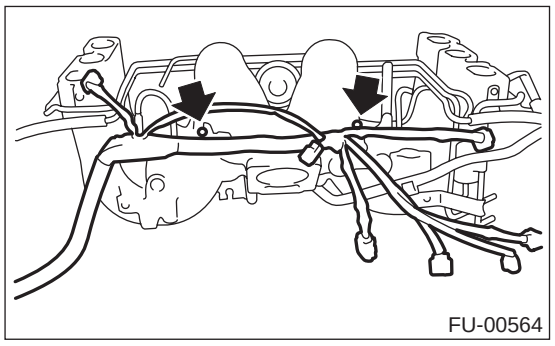
5) Install PCV pipe to intake manifold.

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


FU-00565

6) Install engine harness assembly to intake manifold.

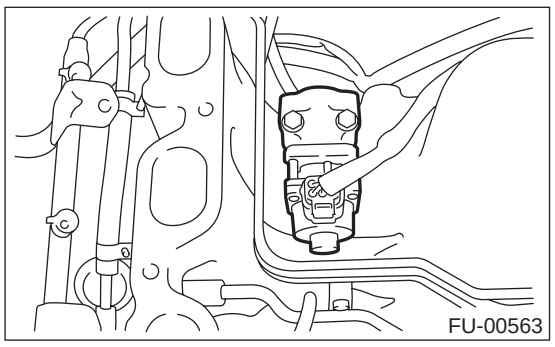
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)


FU-00564

7) Install EGR valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

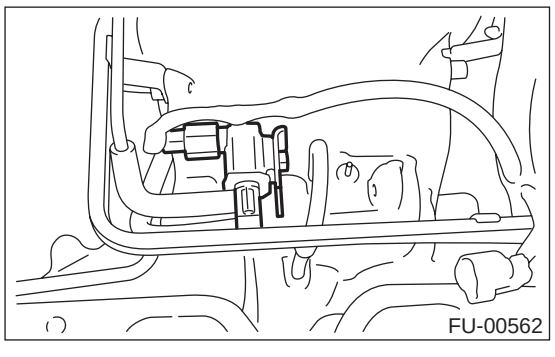
8) Connect connector to EGR valve.


FU-00563

9) Install purge control solenoid valve.

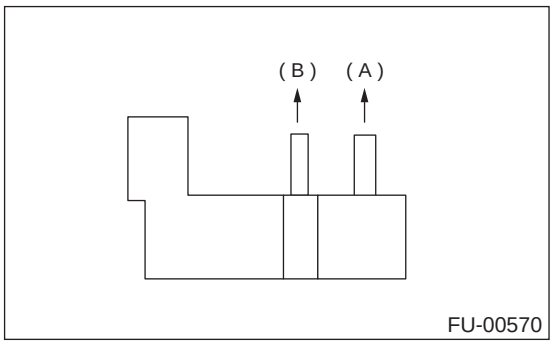
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

10) Connect connector to purge control solenoid valve.


FU-00562

11) Connect hoses to purge control solenoid valve.

CAUTION:
Carefully connect the evaporation hoses.

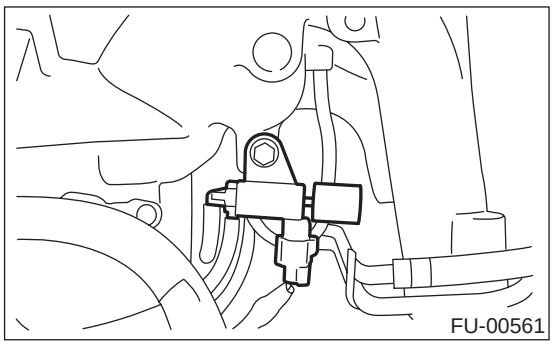


(A) To purge pipe
(B) To fuel pipe

12) Install induction valve control solenoid.

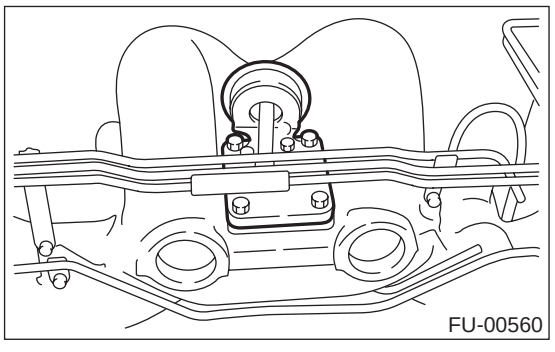
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

13) Connect connector to induction valve control solenoid.



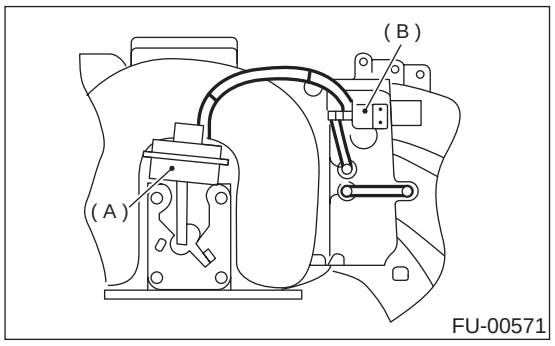
14) Install induction valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



15) Connect hoses to induction valve control solenoid.

CAUTION:
Carefully connect the vacuum hoses.



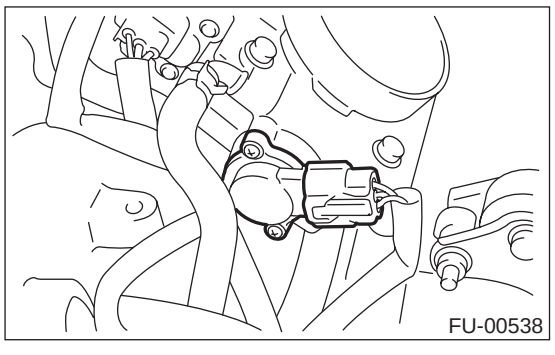
(A) Induction valve
(B) Induction valve control solenoid

16) Install throttle body to intake manifold.

NOTE:
Replace gasket with a new one.

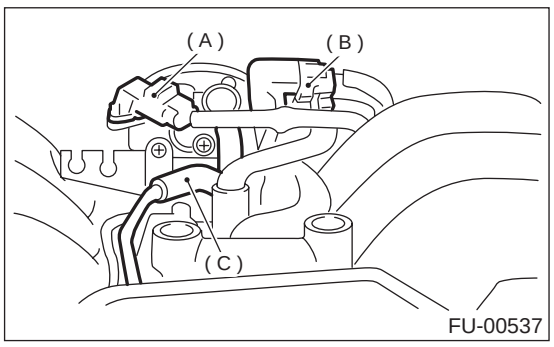
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

17) Connect connectors to throttle position sensor.



18) Connect connectors to intake manifold pressure sensor (A) and idle air control solenoid valve (B).

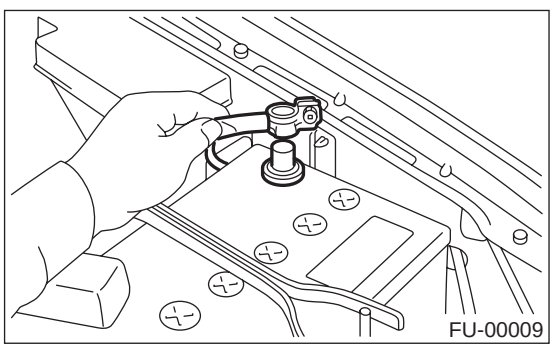
19) Connect air by-pass hose (C) to idle air control solenoid valve.



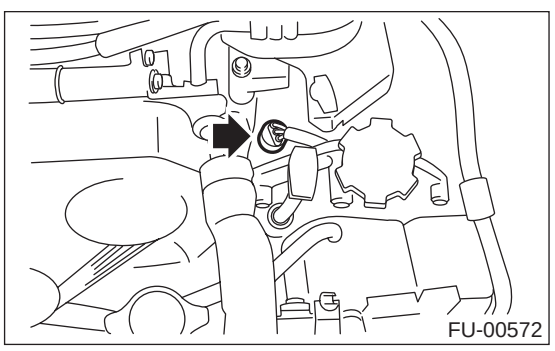
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect battery ground cable.



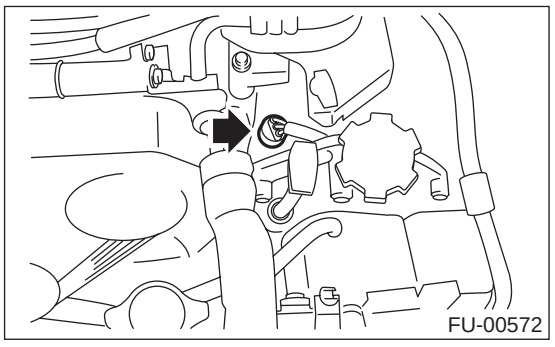
2) Disconnect connector from engine coolant temperature sensor.
3) Remove engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

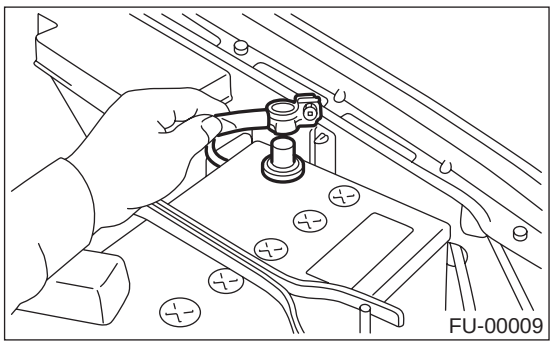
Tightening torque:
16 N·m (0.16 kgf-m, 1.2 ft-lb)



5. Crankshaft Position Sensor

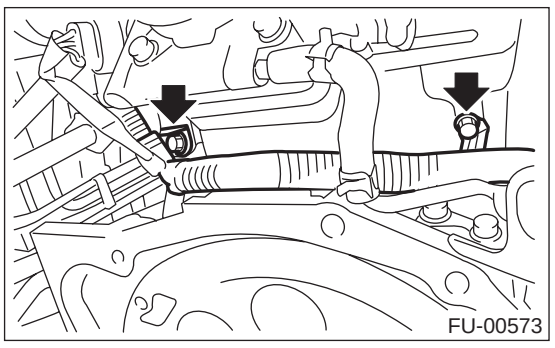
A: REMOVAL

1) Disconnect battery ground cable.

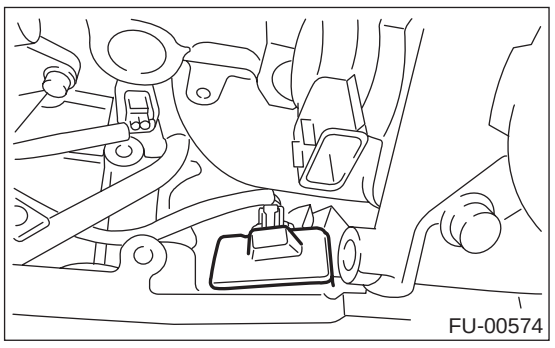


2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Remove engine harness bracket from intake manifold.

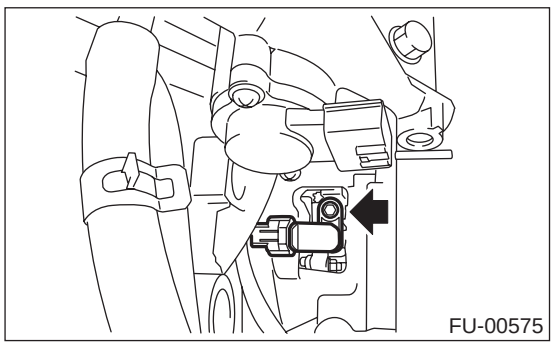


4) Remove service hole cover.



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

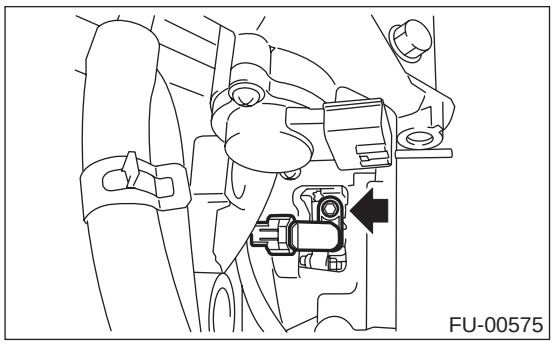
6) Remove crankshaft position sensor, and disconnect connector from it.



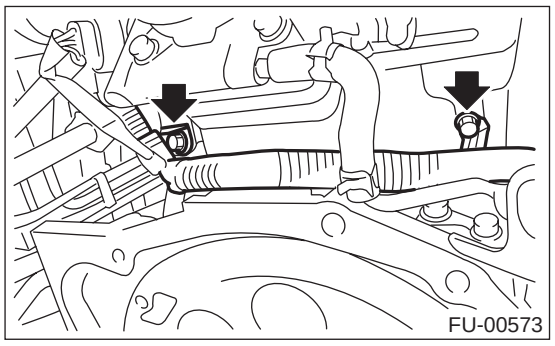
B: INSTALLATION

Install in the reverse order of removal.

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



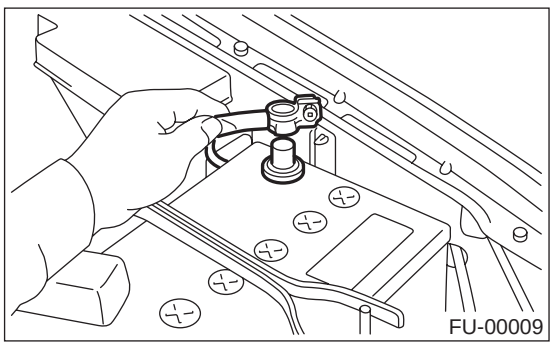
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



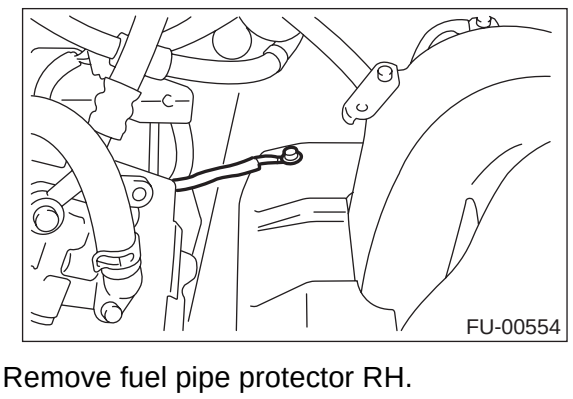
6. Camshaft Position Sensor

A: REMOVAL

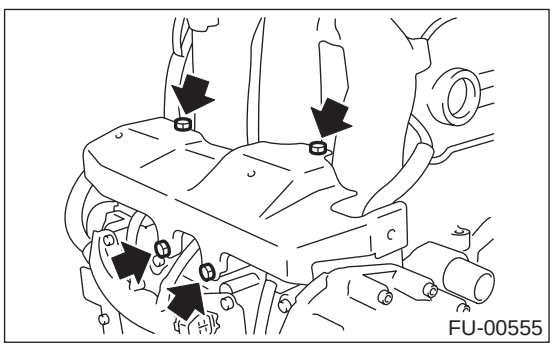
1) Disconnect battery ground cable.



2) Remove air cleaner.
<Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
3) Remove ground cable from fuel pipe protector RH.

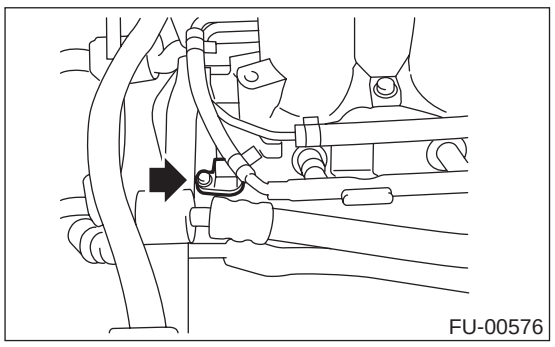


4) Remove fuel pipe protector RH.



5) Disconnect connector from camshaft position sensor.

6) Remove camshaft position sensor.



B: INSTALLATION

Install in the reverse order of removal.

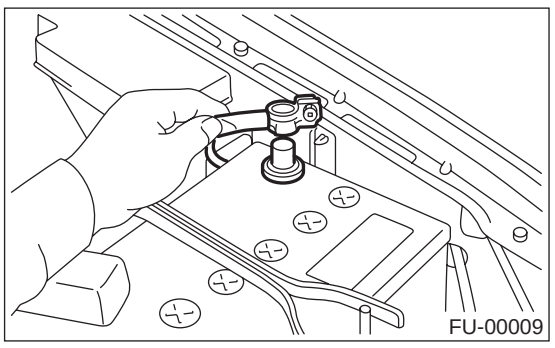
Tightening torque:

- ***Camshaft position sensor;***
  6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
- ***Fuel pipe protector RH;***
  19 N·m (1.9 kgf-m, 14 ft-lb)

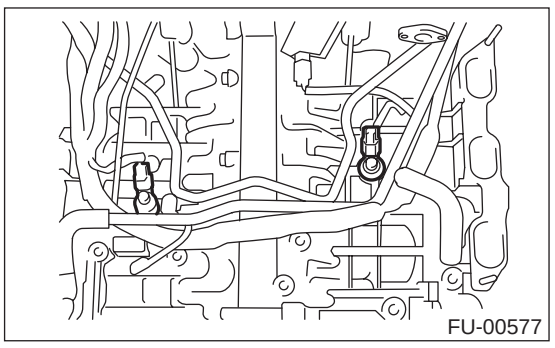
7. Knock Sensor

A: REMOVAL

1) Disconnect battery ground cable from battery ground terminal.



2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Disconnect knock sensor connector.
4) Remove knock sensor from cylinder block.

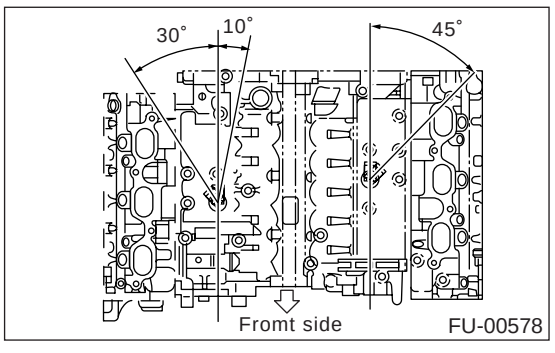


B: INSTALLATION

1) Install knock sensor to cylinder block.

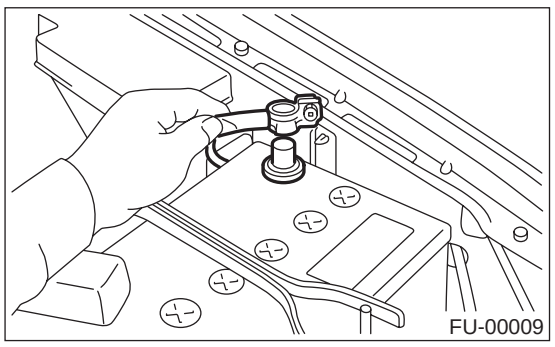
Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

NOTE:
For the knock sensor's installation angle, refer to the figure below.



2) Connect knock sensor connector.
3) Install intake manifold. <Ref. to FU(H6DO)-20, INSTALLATION, Intake Manifold.>

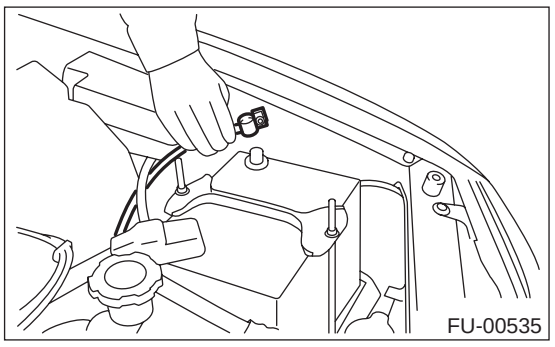
4) Connect battery ground cable.



8. Throttle Position Sensor

A: REMOVAL

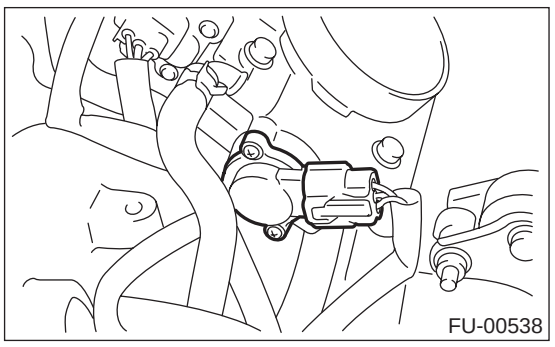
1) Disconnect battery ground cable.



Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

2) Disconnect connector from throttle position sensor.

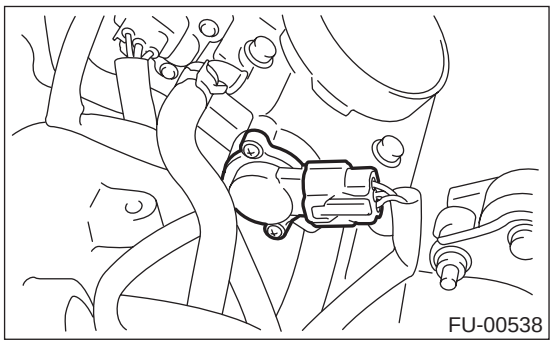
3) Remove throttle position sensor holding screws, and remove throttle position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

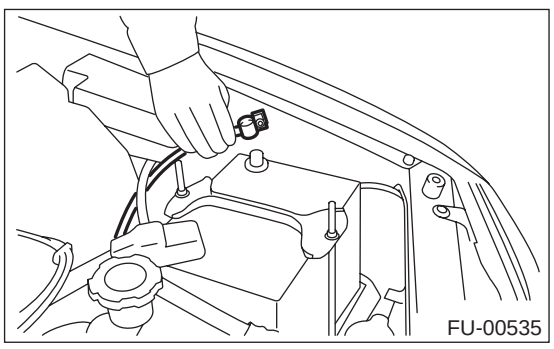
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



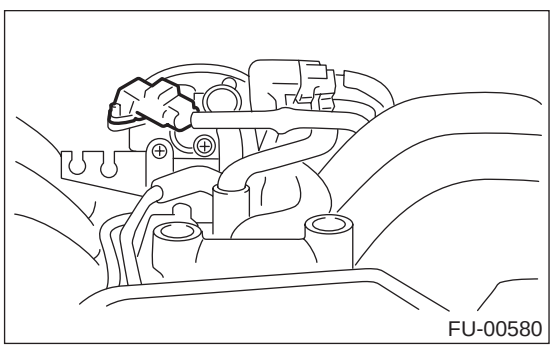
9. Intake Manifold Pressure Sensor

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect connector from intake manifold pressure sensor.
3) Remove intake manifold pressure sensor from throttle body.

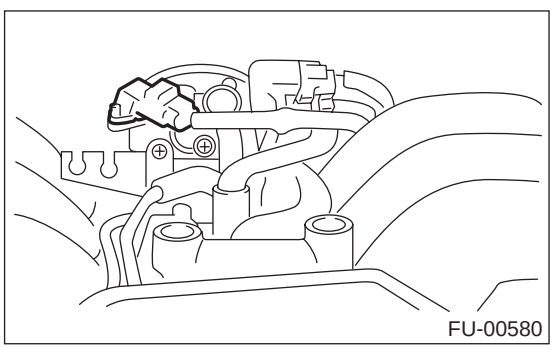


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace gasket with new one.

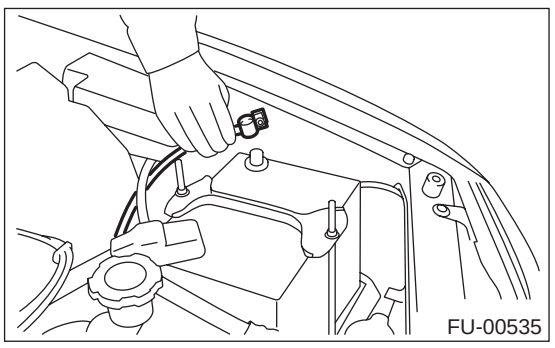
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



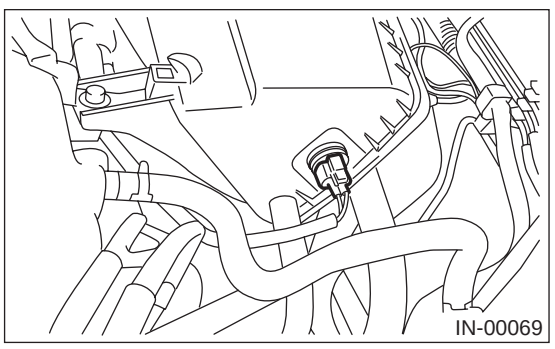
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect connector from intake air temperature sensor.
3) Remove intake air temperature sensor from air intake chamber.



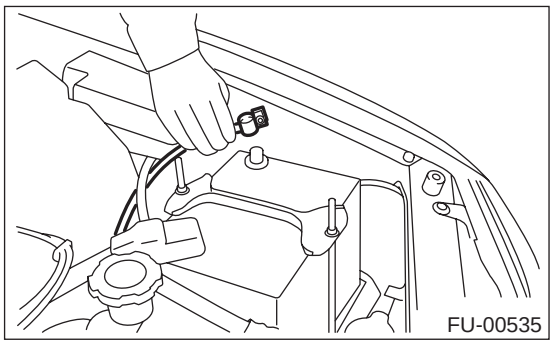
B: INSTALLATION

Install in the reverse order of removal.

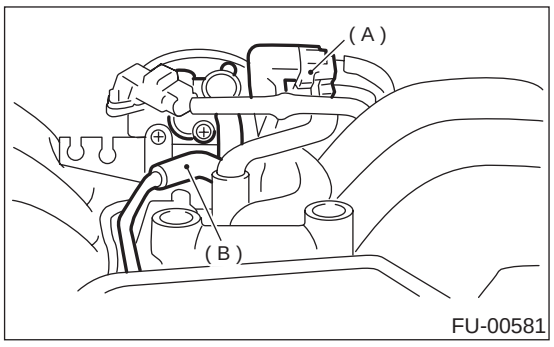
11.Idle Air Control Solenoid Valve

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect connector (A) from idle air control solenoid valve.
3) Disconnect air by-pass hose (B) from idle air control solenoid valve.
4) Remove idle air control solenoid valve from throttle body.



B: INSTALLATION

Install in the reverse order of removal.

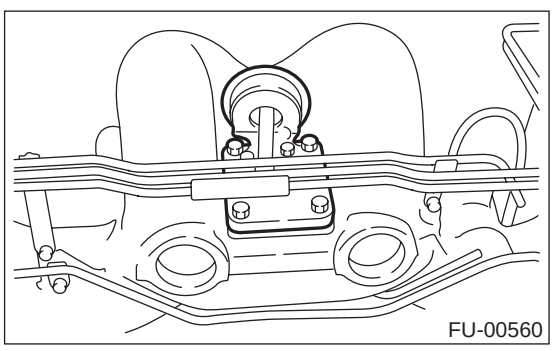
NOTE:
Replace gasket with a new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

12.Induction Valve

A: REMOVAL

1) Disconnect battery ground cable.
2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Remove induction valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

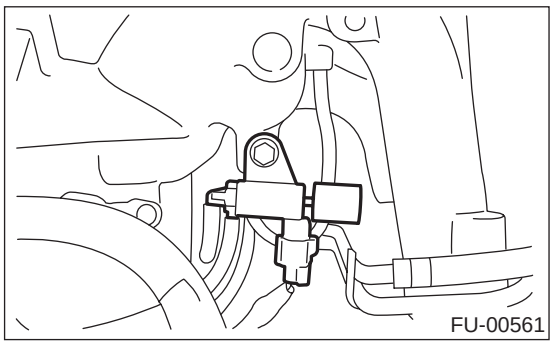
NOTE:
Always use a new gasket.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

13.Induction Valve Control Solenoid

A: REMOVAL

1) Disconnect battery ground cable.
2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Disconnect connector from induction valve control solenoid.
4) Remove induction valve control solenoid from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

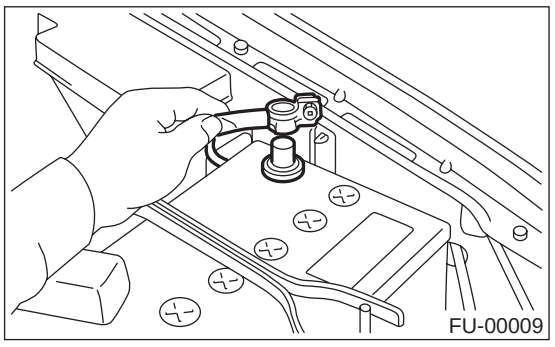
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

14.Fuel Injector

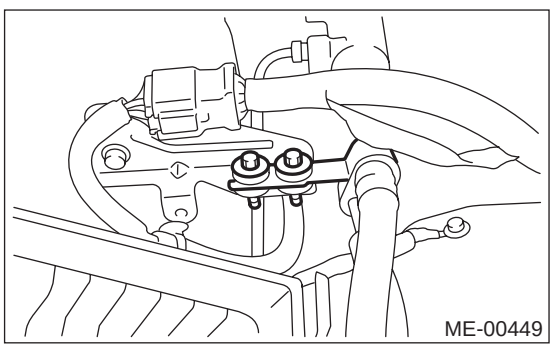
A: REMOVAL

1. RH SIDE

1) Release fuel pressure.
<Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.

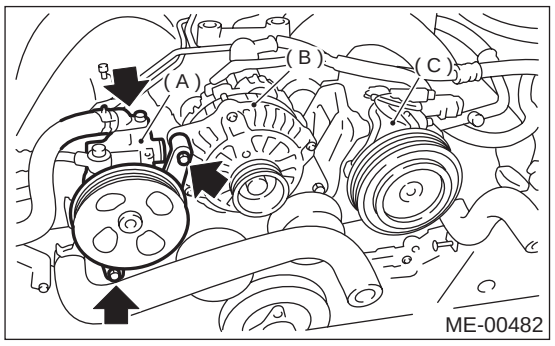


4) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
5) Remove power steering pump and tank from brackets.
(1) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
(2) Remove power steering oil pipe with bracket.



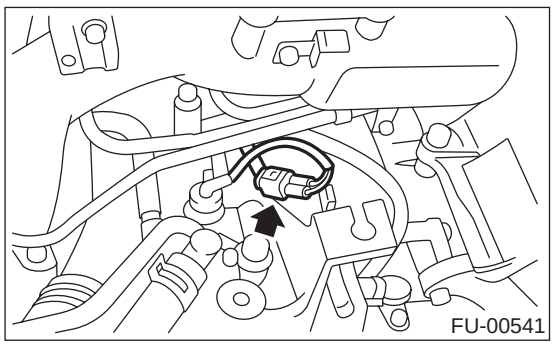
(3) Remove bolts which install power steering pump bracket.

CAUTION:
Do not separate hose and pipe from the main pump.

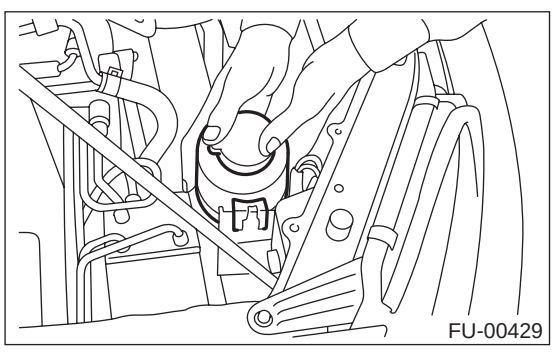


(A) Power steering pump
(B) Generator
(C) A/C compressor

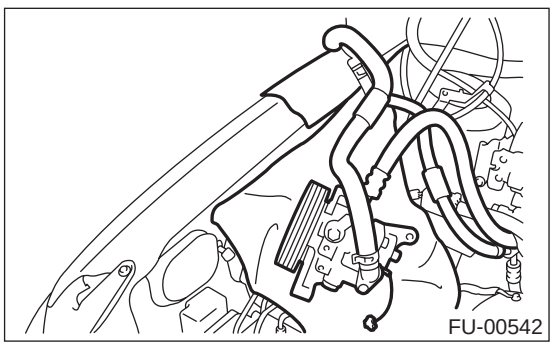
(4) Disconnect power steering pump switch connector.



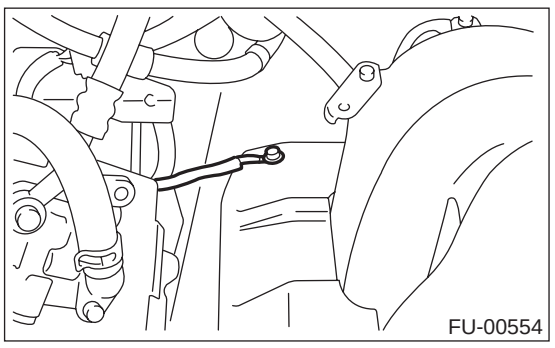
(5) Remove power steering tank from the bracket by pulling it upward.



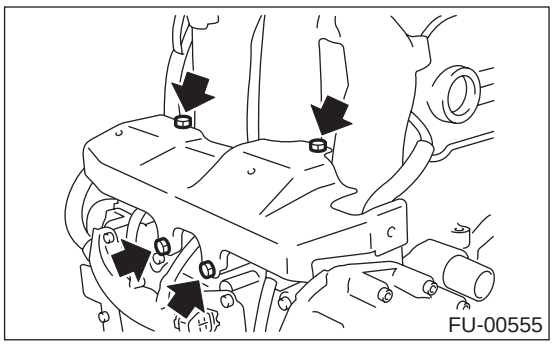
(6) Place power steering pump on the right side wheel apron.


FU-00542

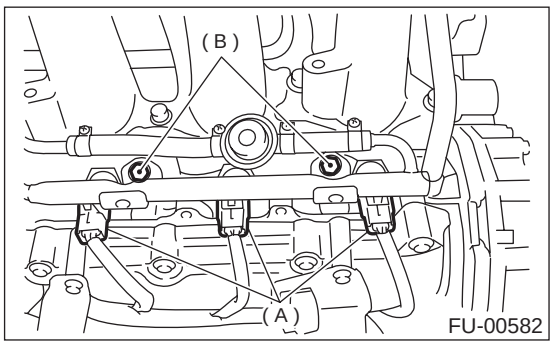
6) Remove ground cable from fuel pipe protector RH.


FU-00554

7) Remove fuel pipe protector RH.


FU-00555

8) Disconnect connector (A) from fuel injector.
9) Remove bolt (B) which holds injector pipe onto cylinder head.

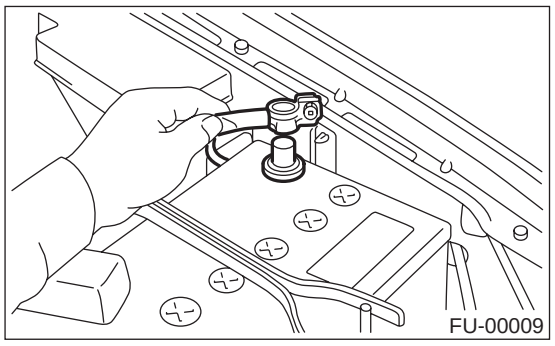


FU-00582

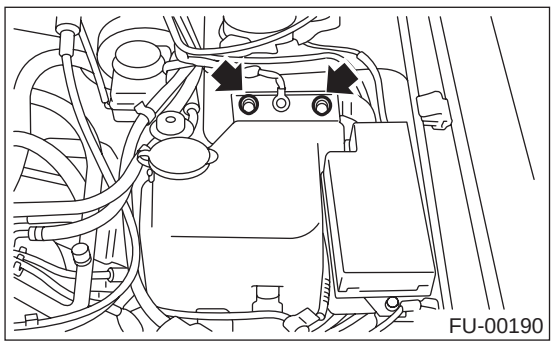
10) Remove fuel injector while lifting up fuel injector pipe.

2. LH SIDE

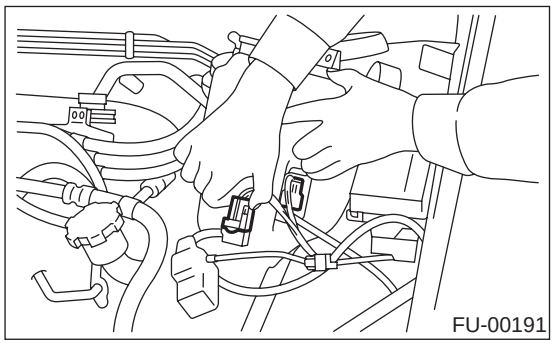
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.


FU-00009

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

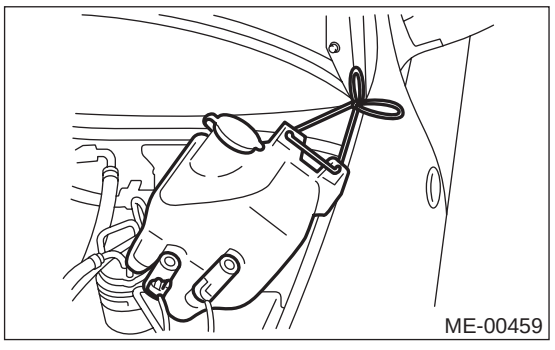

FU-00190

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

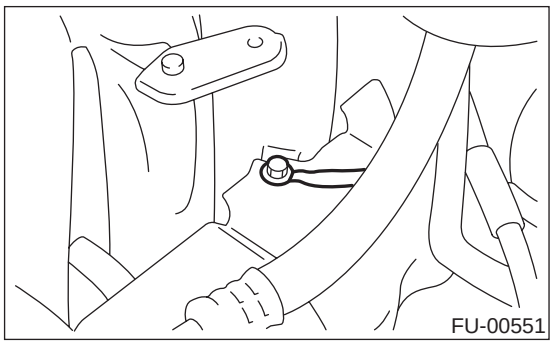

FU-00191

7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

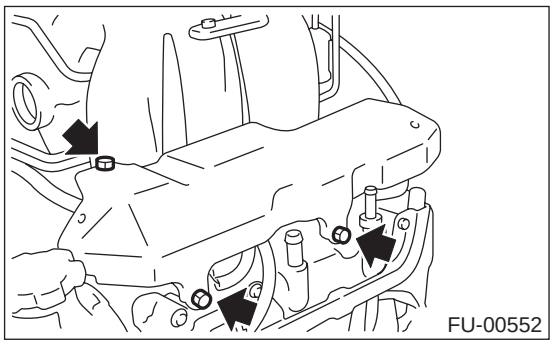
8) Move washer tank upward.


ME-00459

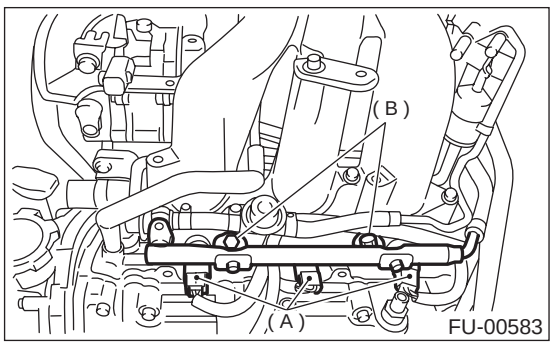
9) Remove ground cable from fuel pipe protector LH.


FU-00551

10) Remove fuel pipe protector LH.


FU-00552

11) Disconnect connector (A) from fuel injector.
12) Remove bolt (B) which holds injector pipe onto cylinder head.



FU-00583

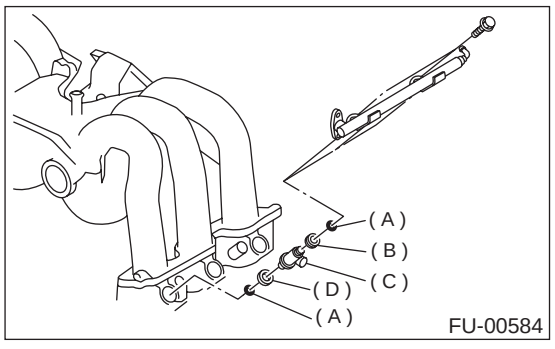
13) Remove fuel injector while lifting up fuel injector pipe.

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

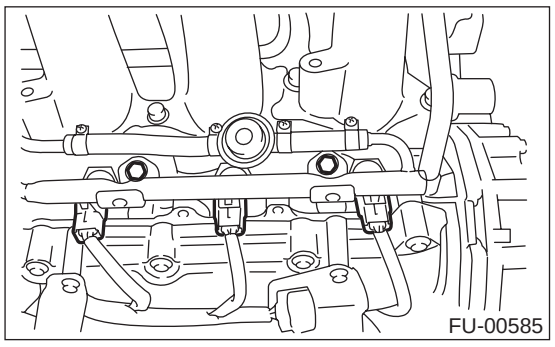
NOTE:
Replace O-rings and insulators with new ones.



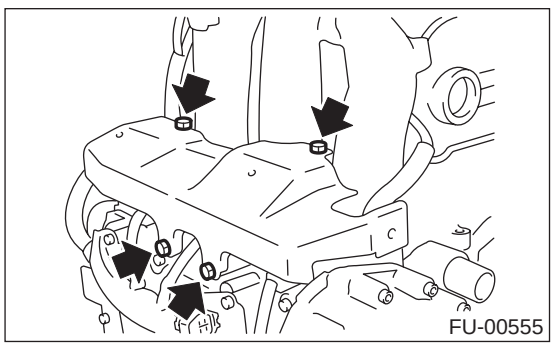
FU-00584

(A) O-ring
(B) Injection rubber
(C) Fuel injector
(D) Insulator

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)


FU-00585

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

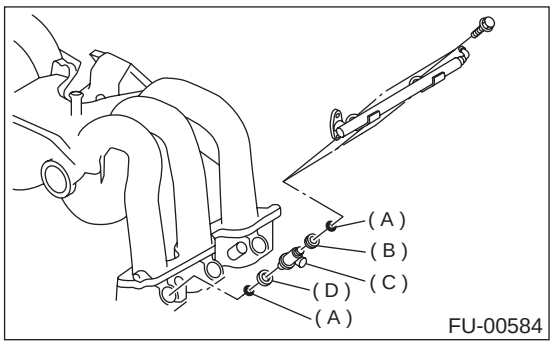

FU-00555

2. LH SIDE

Install in the reverse order of removal.

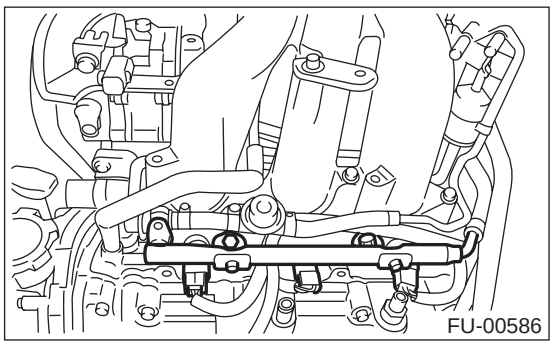
FUEL INJECTOR

NOTE:
Replace O-rings and insulators with new ones.

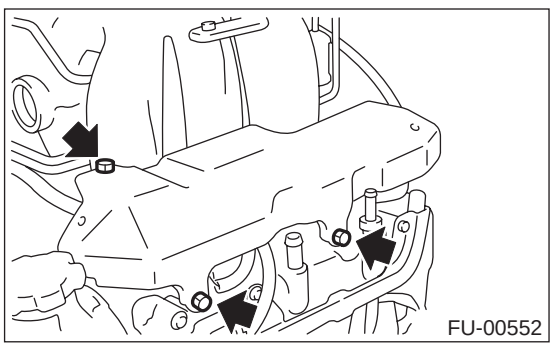


(A) O-ring
(B) Injection rubber
(C) Fuel injector
(D) Insulator

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



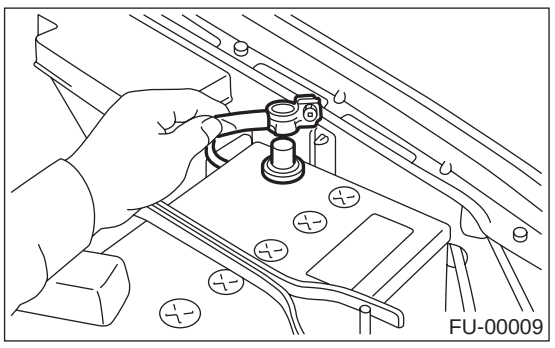
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



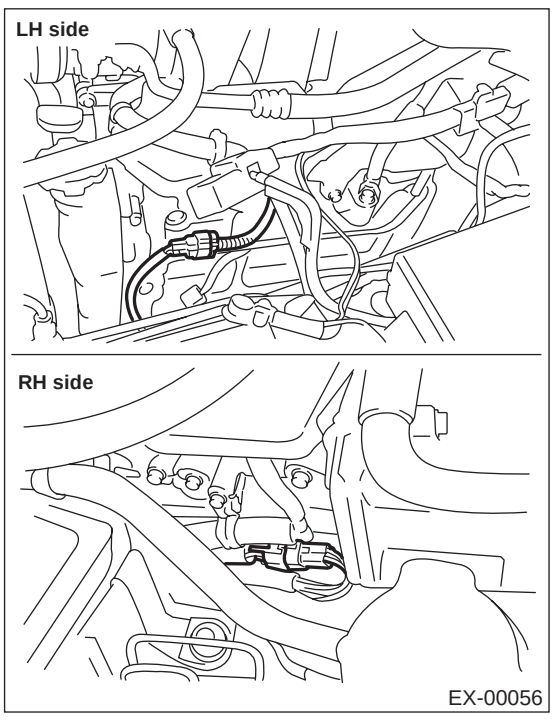
15.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect battery ground cable.

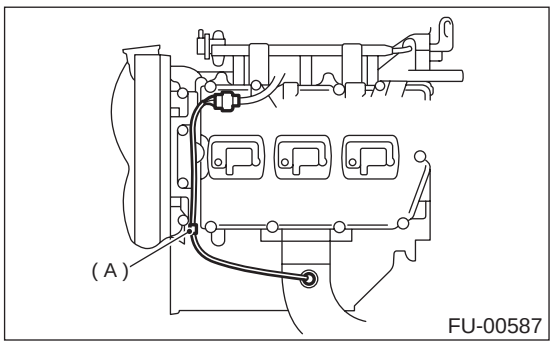


2) Disconnect connector from front oxygen (A/F) sensor.

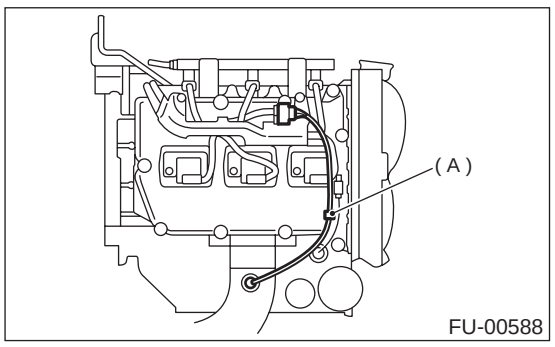


3) Lift-up the vehicle.
4) Remove under cover.
5) Separate harness from clip (A).

• LH side



• RH side

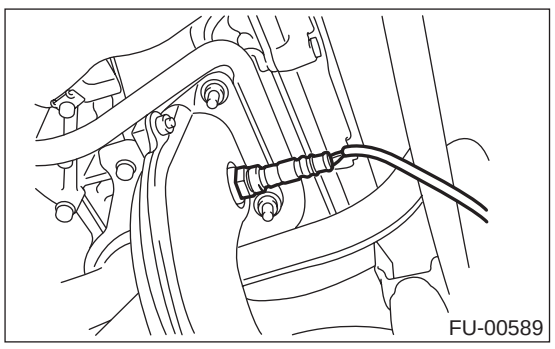


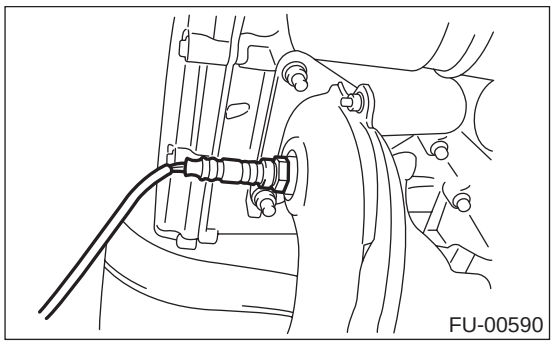
6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

7) Remove front oxygen (A/F) sensor.

CAUTION:
When removing front oxygen (A/F) sensor, do not force front oxygen (A/F) sensor especially when exhaust pipe is cold, otherwise it will damage exhaust pipe.





B: INSTALLATION

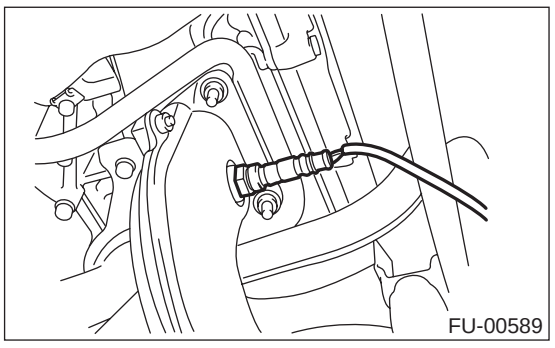
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

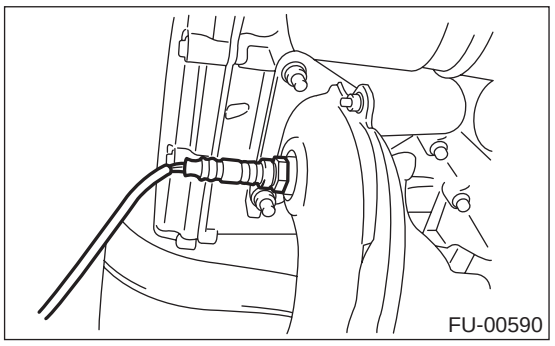
Anti-seize compound:
SS-30 by JET LUBE

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

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

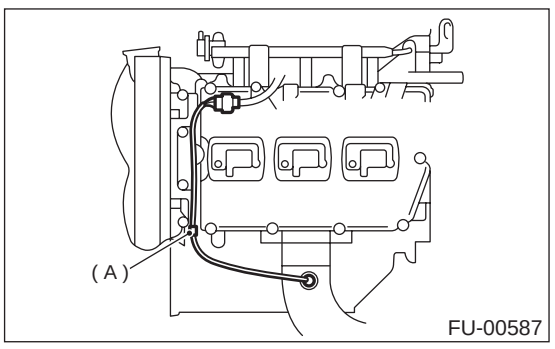
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)


FU-00589


FU-00590

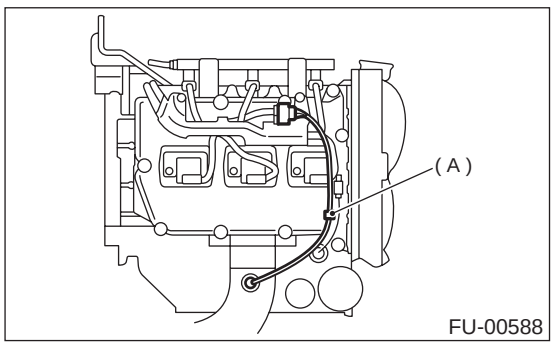
3) Secure harness to clip (A).

• LH side



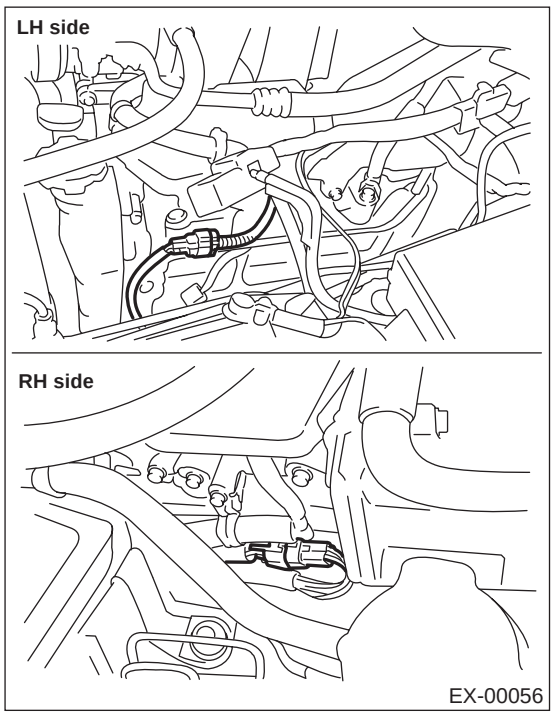
FU-00587

• RH side



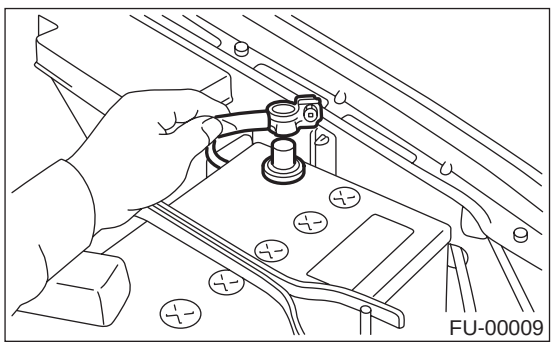
FU-00588

4) Install under cover.
5) Lower the vehicle.
6) Connect connector of front oxygen (A/F) sensor.



EX-00056

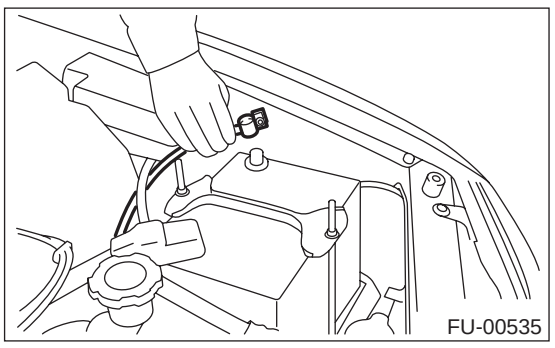
7) Connect battery ground cable.


FU-00009

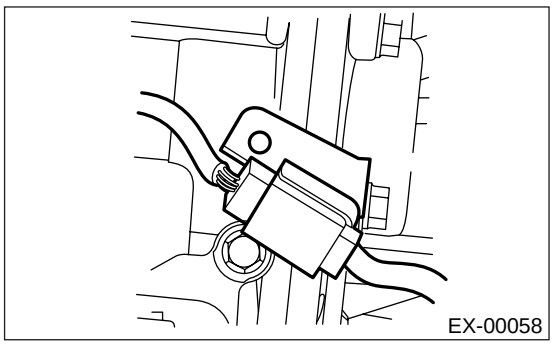
16.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect battery ground cable.


FU-00535

2) Disconnect connector from rear oxygen sensor.

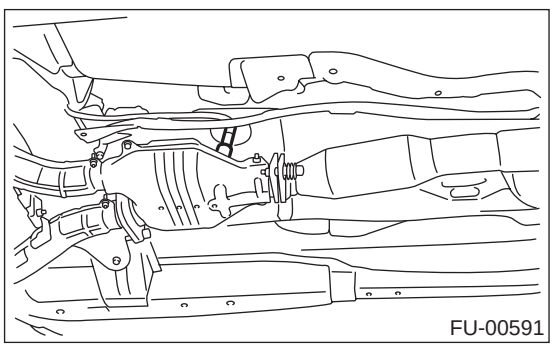

EX-00058

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

SUBARU CRC (Part No. 004301003)

5) Remove rear oxygen sensor.

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


FU-00591

B: INSTALLATION

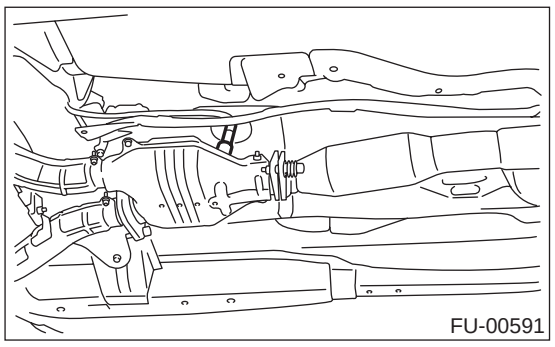
1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

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

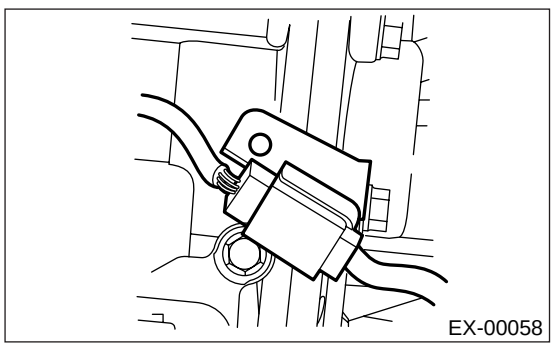
Anti-seize compound:
SS-30 by JET LUBE

2) Install rear oxygen sensor.

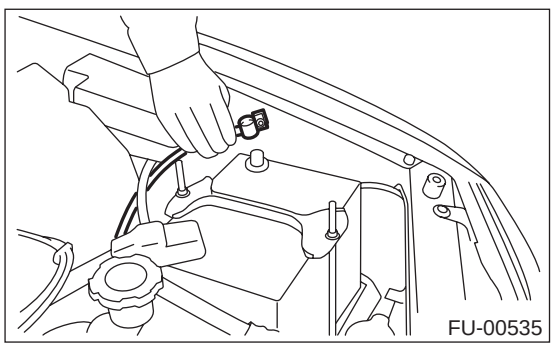
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)


FU-00591

3) Connect connector to rear oxygen sensor.


EX-00058

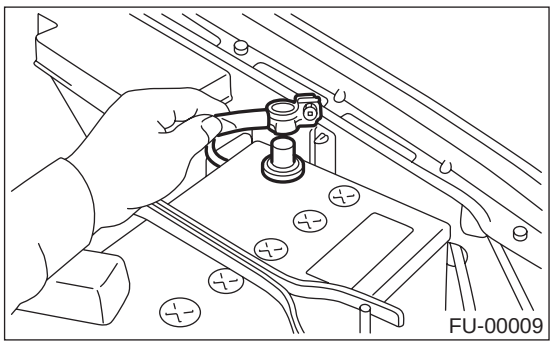
4) Lower the vehicle.
5) Connect battery ground cable.


FU-00535

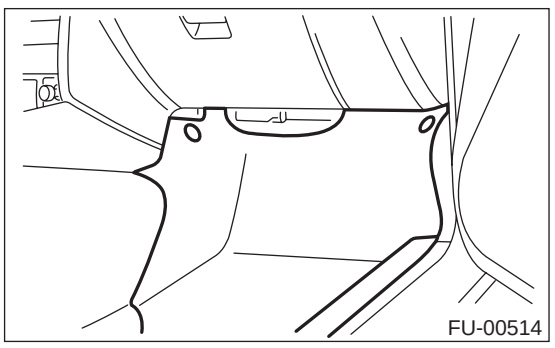
17.Engine Control Module

A: REMOVAL

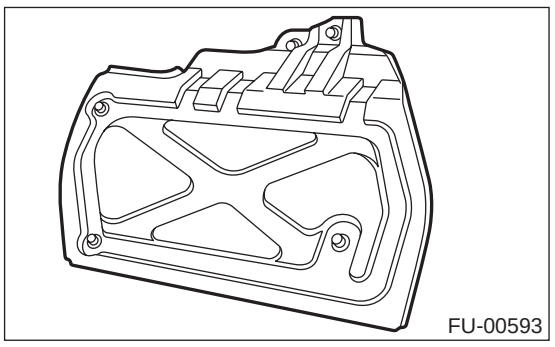
1) Disconnect battery ground cable.



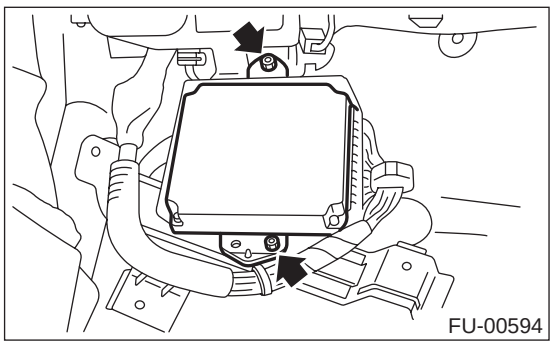
2) Remove lower inner trim of passenger side.
<Ref. to EI-42, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front passenger seat.



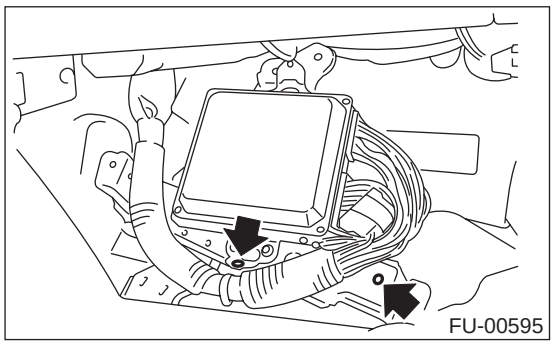
4) Remove protect cover.



5) Remove nuts which hold ECM to bracket.



6) Remove clip from bracket.



7) Disconnect ECM connectors and take out ECM.

B: INSTALLATION

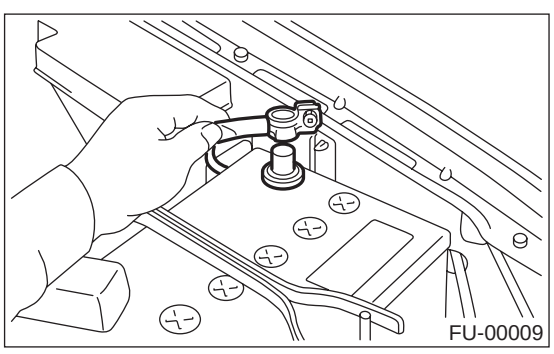
Install in the reverse order of removal.

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

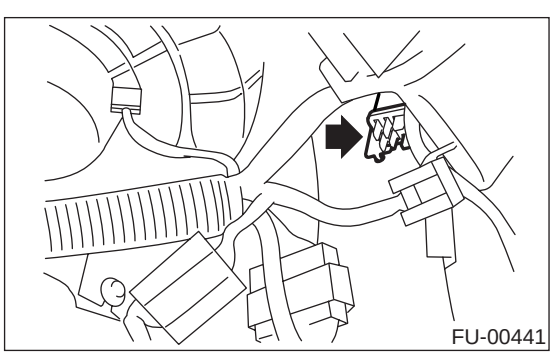
18.Main Relay

A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower inner trim of passenger side. <Ref. to EI-42, REMOVAL, Lower Inner Trim.>
3) Disconnect connectors from main relay.
4) Remove bolt which holds main relay bracket on body.



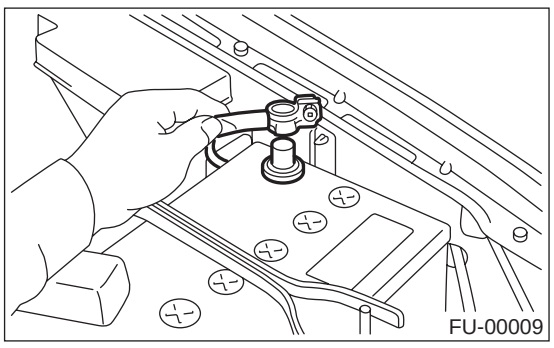
B: INSTALLATION

Install in the reverse order of removal.

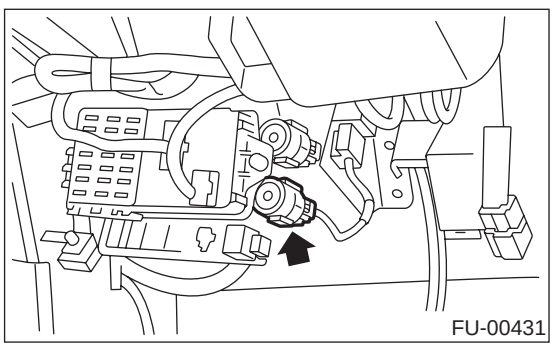
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower cover. <Ref. to EI-37, REMOVAL, Instrument Panel Assembly.>
3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from mounting bracket.

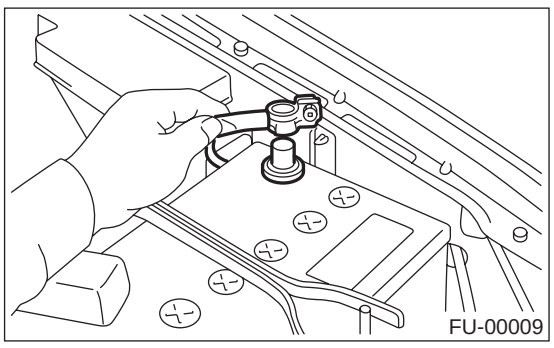
B: INSTALLATION

Install in the reverse order of removal.

20.Fuel Pump Controller

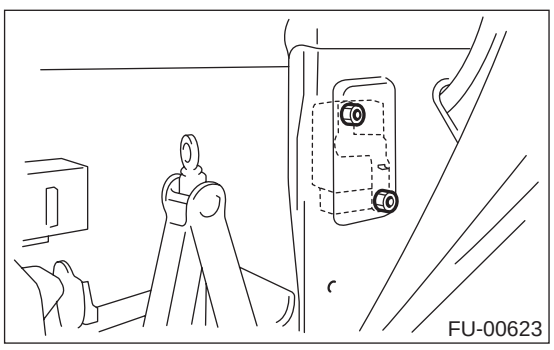
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove rear quarter Trim. <Ref. to EI-43, REMOVAL, Rear Quarter Trim.>

3) Disconnect connector from fuel pump control unit.



4) Remove fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

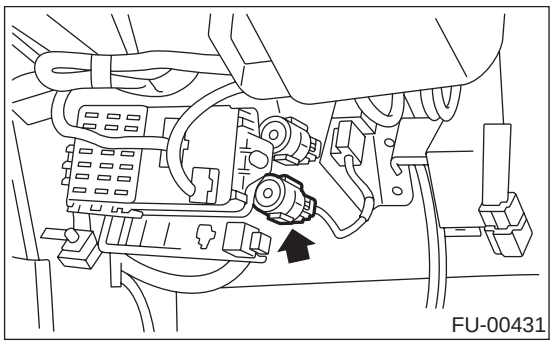
21.Fuel

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 connector from fuel pump relay.

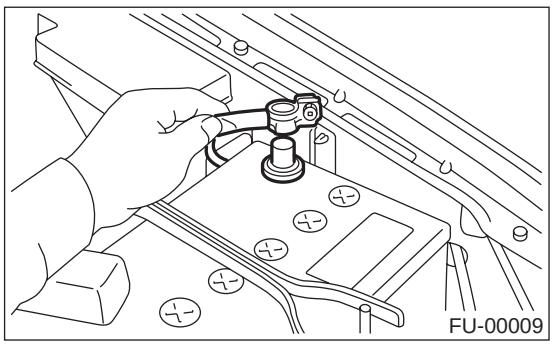


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn ignition switch to OFF.

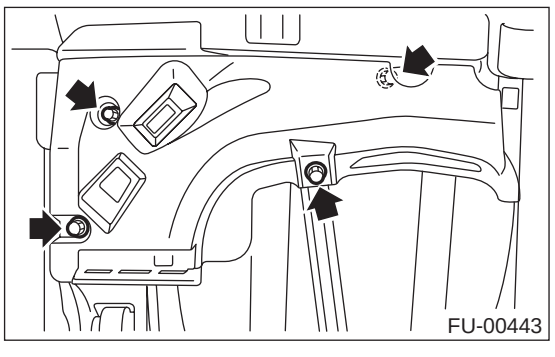
2. DRAINING FUEL

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

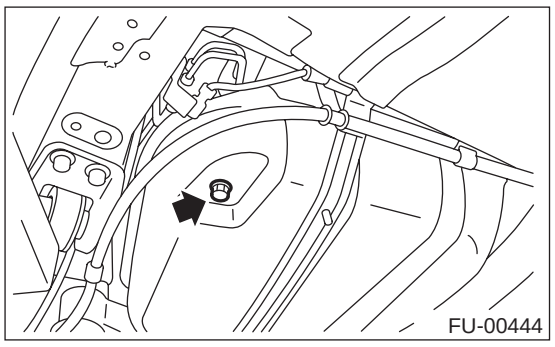
1) Set vehicle on the lift.
2) Disconnect battery ground cable.



3) Lift-up the vehicle.
4) Remove front right side fuel tank cover.

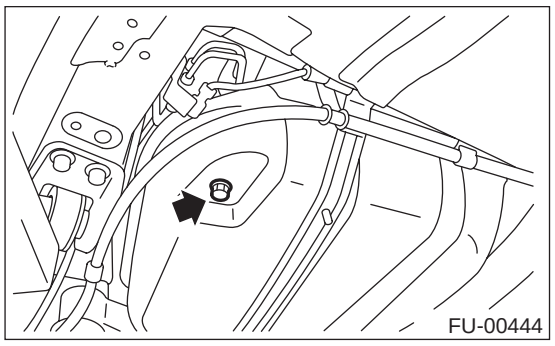


5) Drain fuel from fuel tank.
Set a container under the vehicle and remove drain plug from fuel tank.

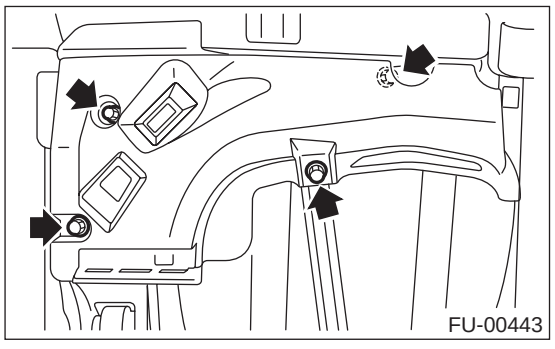


6) Tighten fuel drain plug and install front right side tank cover.

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

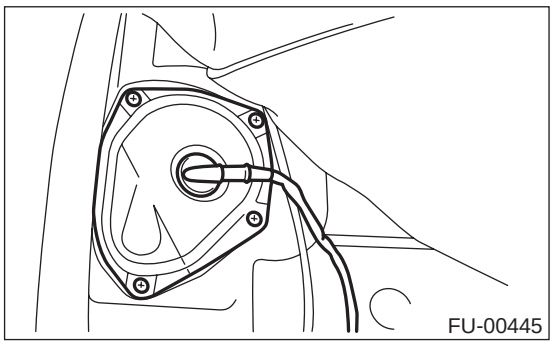


Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

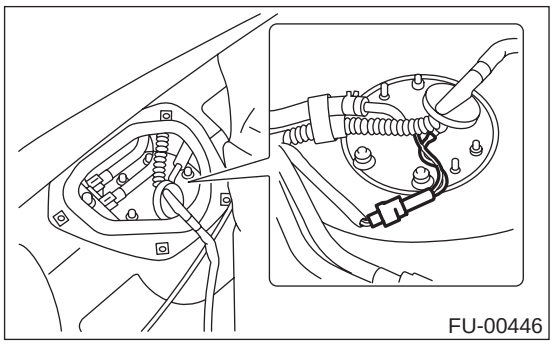


7) Lower the vehicle.

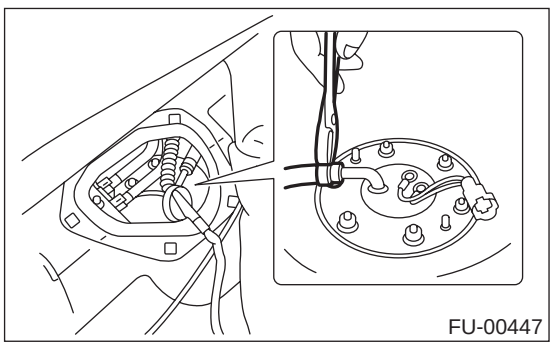
8) Remove sub service hole cover.



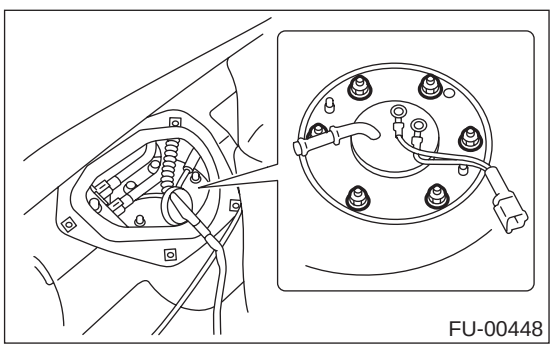
9) Disconnect connector from fuel sub level sensor.



10) Disconnect fuel jet pump hose.



11) Remove fuel sub level sensor.

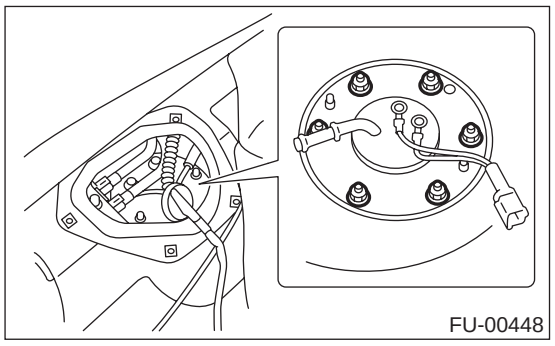


12) Drain fuel from fuel tank by using hand pump.

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

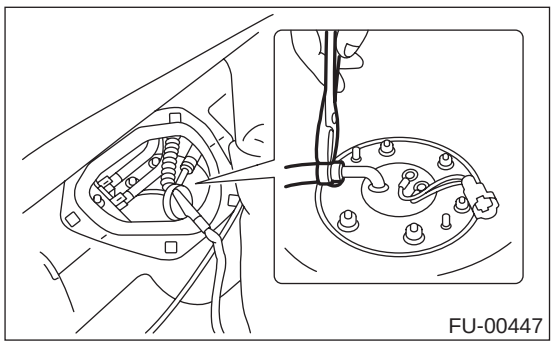
13) After draining fuel, reinstall fuel sub level sensor.

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

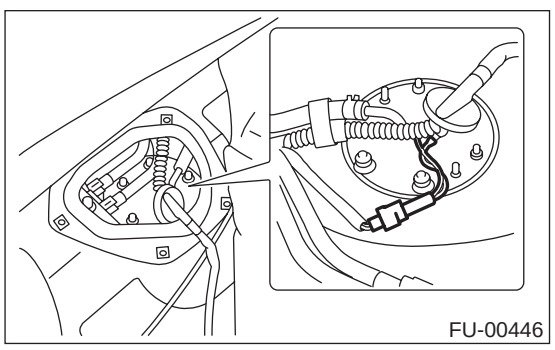


NOTE:
If you have not removed fuel tank yet, proceed with the procedure below for installation.

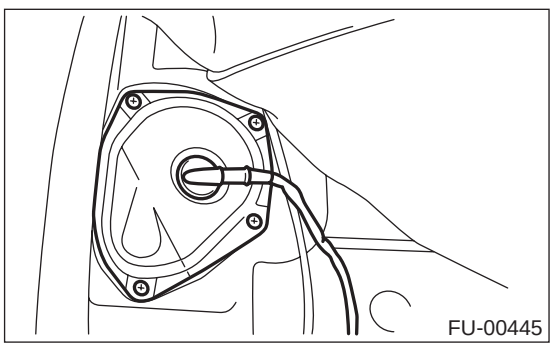
(1) Connect fuel jet pump hose.



(2) Connect connector from fuel sub level sensor.



(3) Install sub service hole cover.

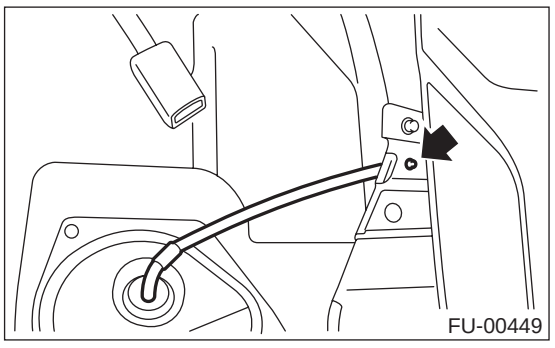


(4) Set rear seat and floor mat.

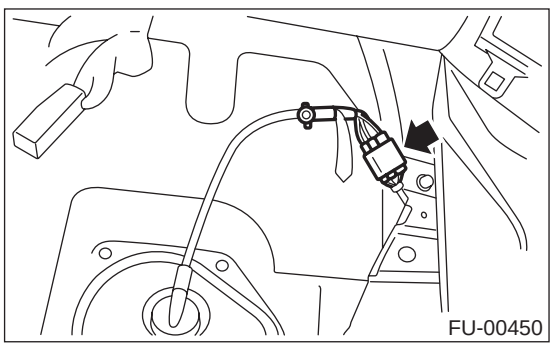
22.Fuel Tank

A: REMOVAL

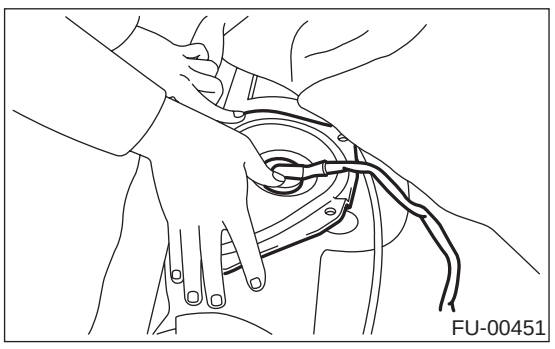
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
4) Remove holder clip which secures fuel tank cord on bracket.


FU-00449

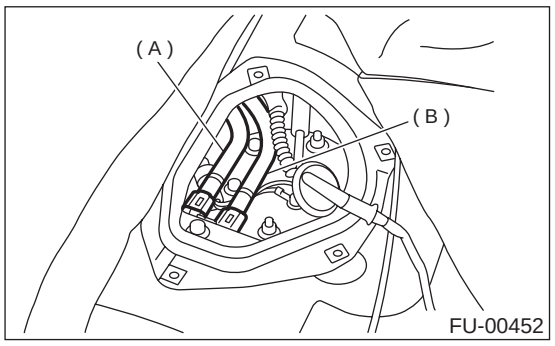
5) Disconnect connector of fuel tank cord to rear harness.


FU-00450

6) Push grommet which holds fuel tank cord on service hole cover into body side.

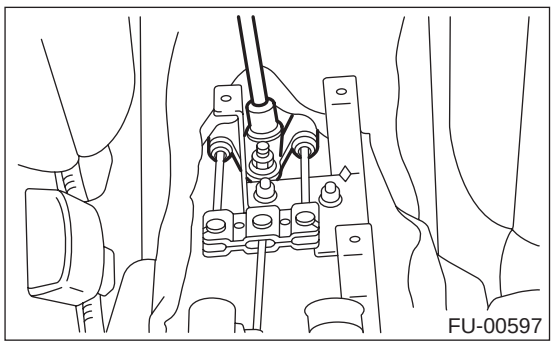

FU-00451

7) Separate quick connector of fuel delivery (A) and return hose (B).<Ref. to FU(H6DO)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

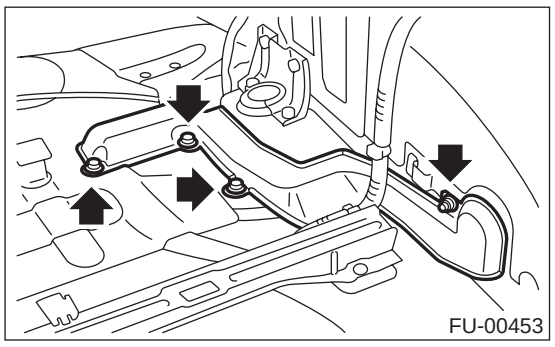


FU-00452

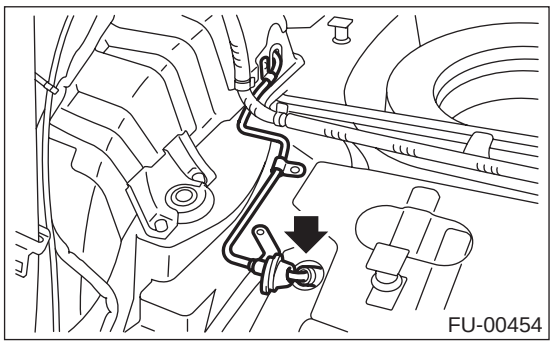
8) Remove parking brake cable.
(1) Remove console box. <Ref. to EI-36, REMOVAL, Console Box.>
(2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>


FU-00597

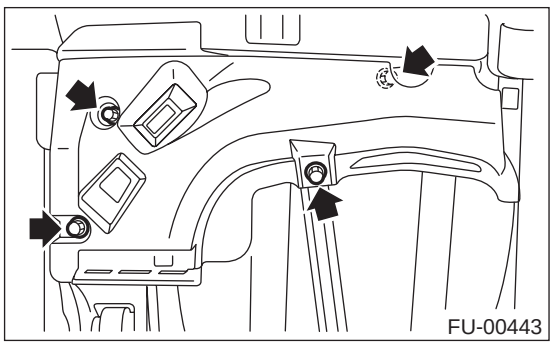
9) Remove pipe protector.


FU-00453

10) Separate quick connector of evaporation pipe (A). <Ref. to FU(H6DO)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



11) Remove wheel nuts from rear wheels.
12) Lift-up the vehicle.
13) Remove rear wheel.
14) Remove front side fuel tank cover.

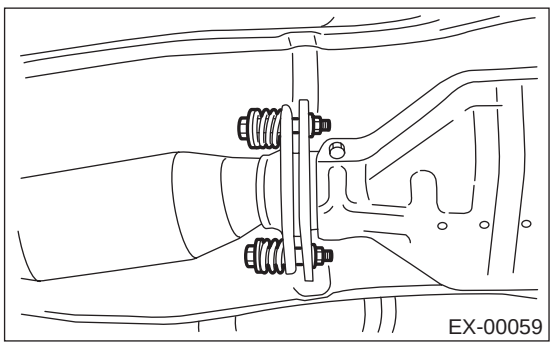


15) Remove rear exhaust pipe and muffler.

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

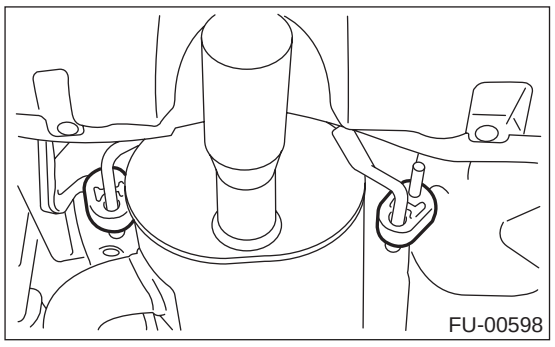
SUBARU CRC (Part No. 004301003)

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

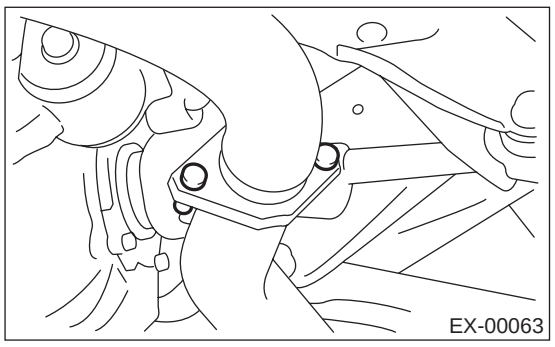


(2) Remove left and right rubber cushions.

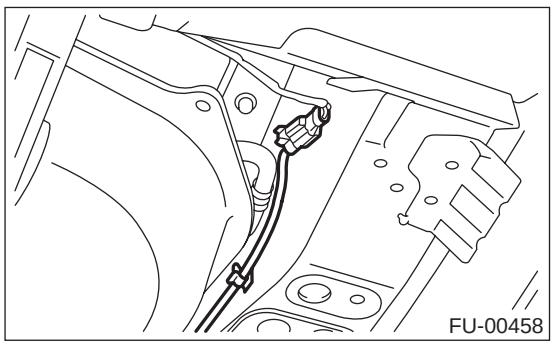
CAUTION:
Be careful not to pull down muffler.



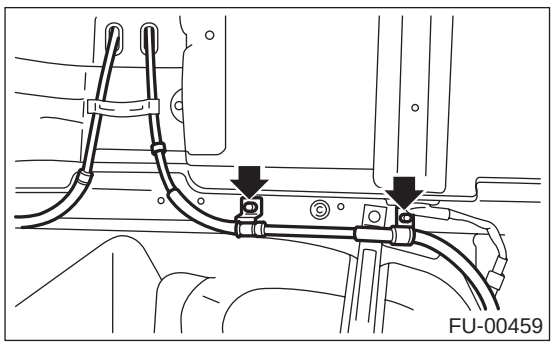
(3) Remove front rubber cushion and detach muffler assembly.



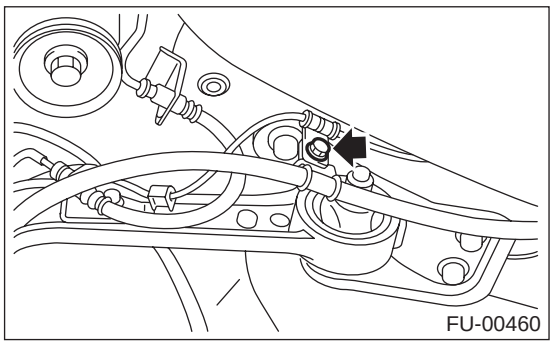
16) Remove propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
17) Disconnect connector from ABS sensor.



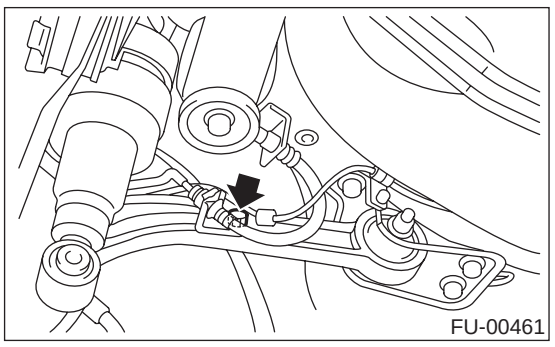
18) Remove bolts which hold parking brake cable holding bracket.
19) Remove parking brake cable from cabin by forcibly pulling it backward.



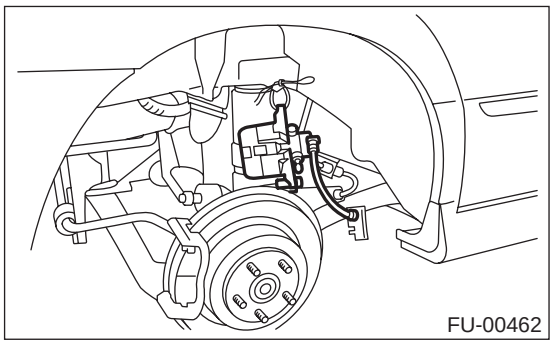
20) Remove bolts which hold parking brake cable holding bracket.


FU-00460

21) Remove bolts which hold rear brake hoses holding bracket.


FU-00461

22) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.

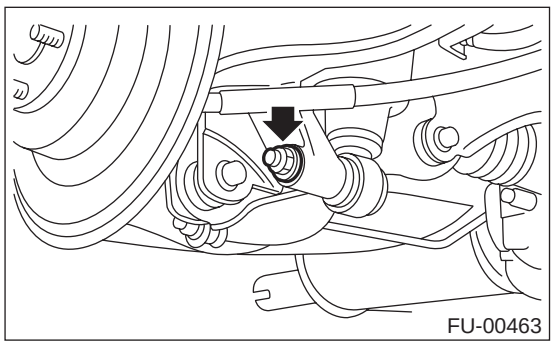

FU-00462

23) Remove rear suspension assembly.

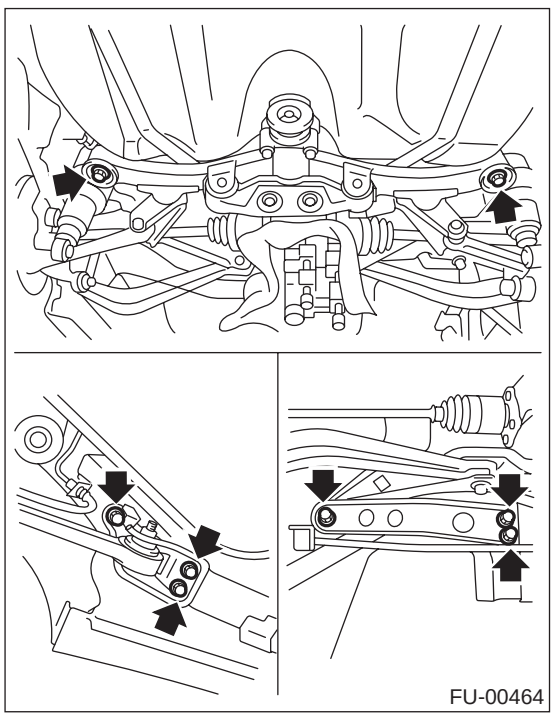
WARNING:
A helper is required to perform this work.

(1) Support rear differential with transmission jack.

(2) Remove bolt which holds rear shock absorber to rear suspension arm.

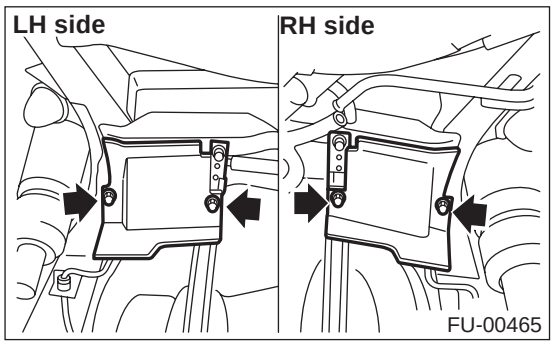

FU-00463

(3) Remove bolts which secure rear suspension assembly to body.


FU-00464

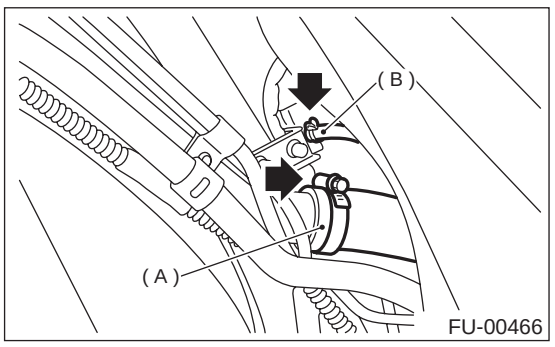
(4) Remove rear suspension assembly.

24) Remove rear side fuel tank cover.

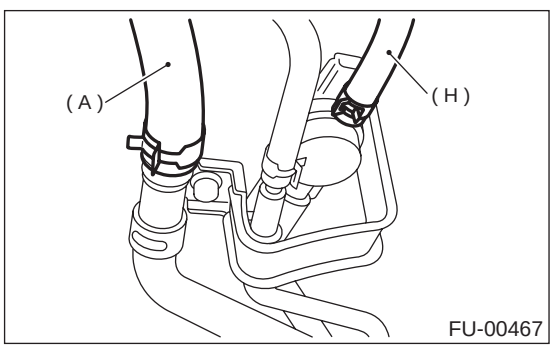


FU-00465

25) Disconnect fuel filler hose (A) and fuel tank pressure sensor (B) hose.

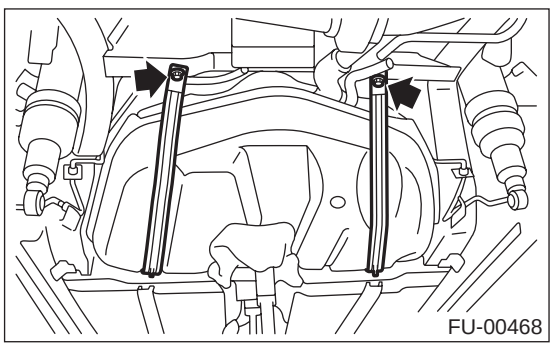


26) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (I) from pressure control solenoid valve.



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

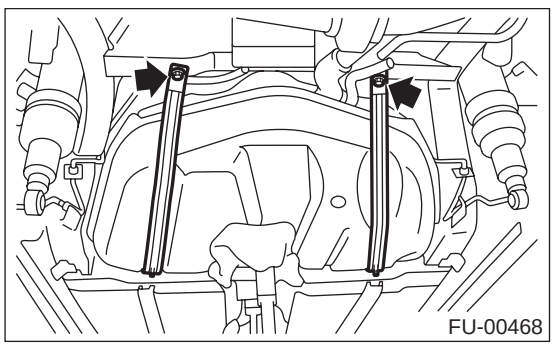
WARNING:
A helper is required to perform this work.



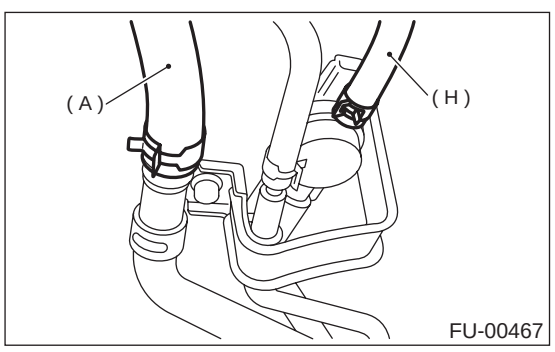
B: INSTALLATION

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

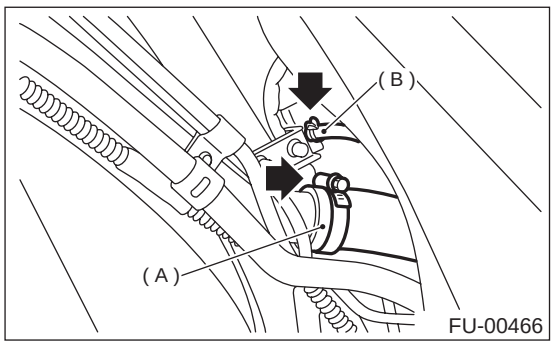
WARNING:
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (I) to pressure control solenoid valve.

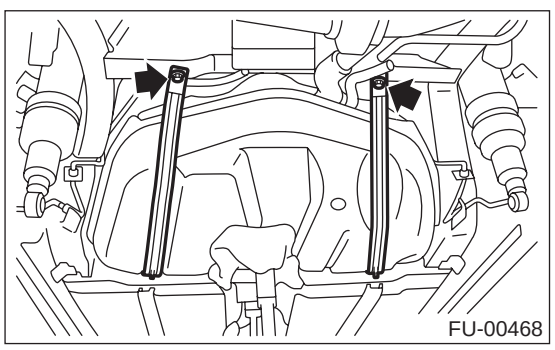


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



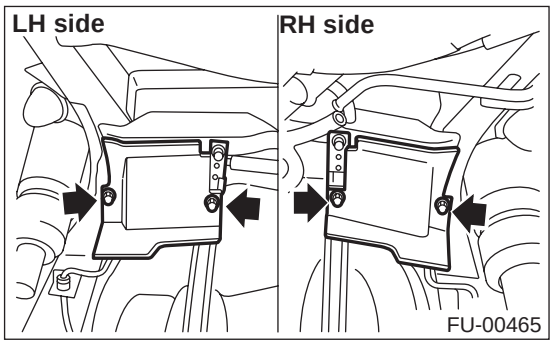
5) Tighten band mounting bolts.

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



6) Install rear side fuel tank cover.

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

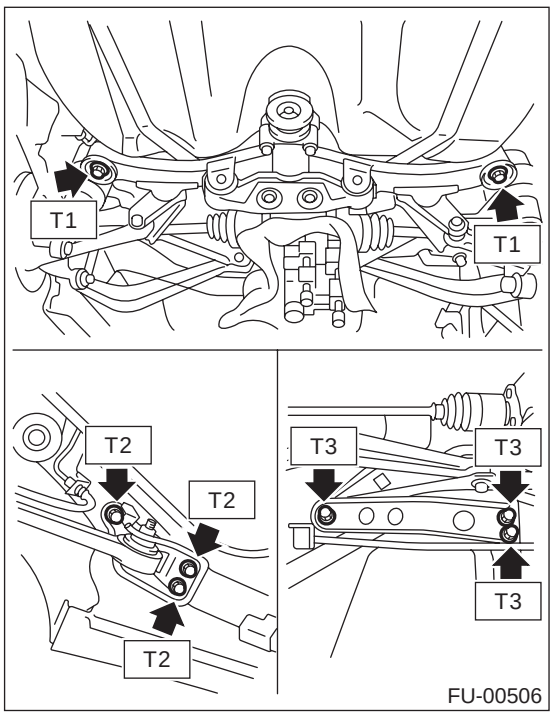


7) Install rear suspension assembly.

WARNING:
A helper is required to perform this work.

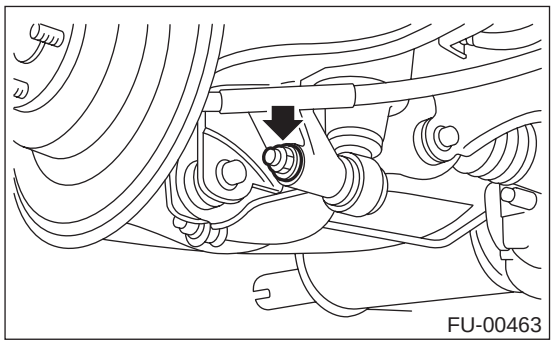
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf-m, 127 ft-lb)
T2: 108 N·m (11.0 kgf-m, 80 ft-lb)
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)

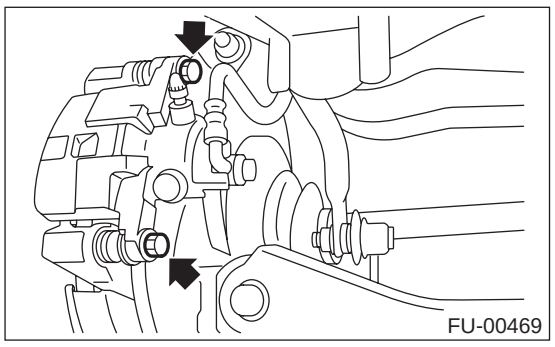


(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)

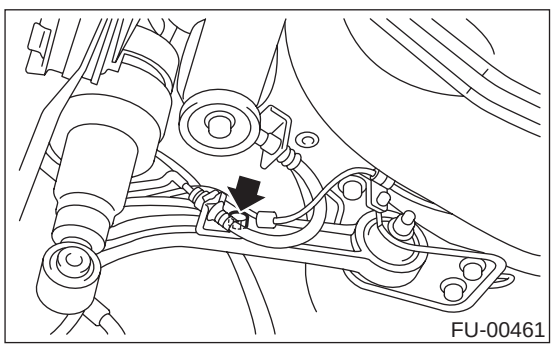


8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



9) Tighten bolt which holds rear brake hoses holding bracket.

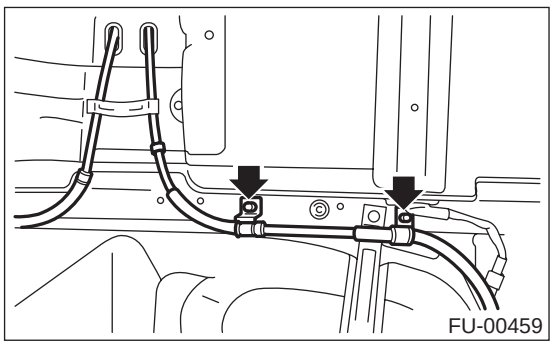
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



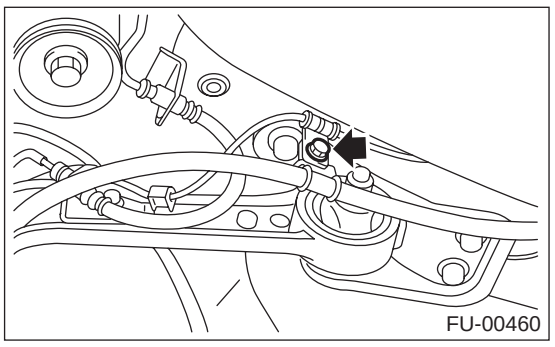
10) Install parking brake cable to cabin by forcibly pushing it forward.

11) Tighten bolts which hold parking brake cable holding bracket.

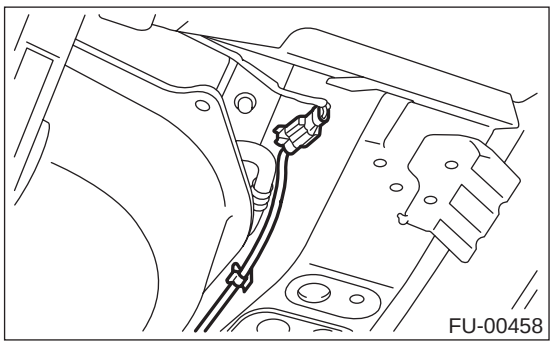
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


FU-00459

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)


FU-00460

12) Connect connector to ABS sensor.

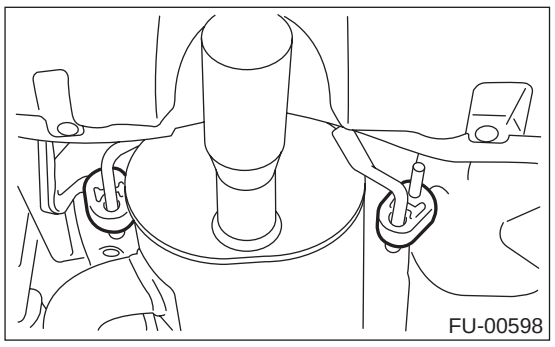

FU-00458

13) Install propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>,
14) Install rear exhaust pipe and muffler.

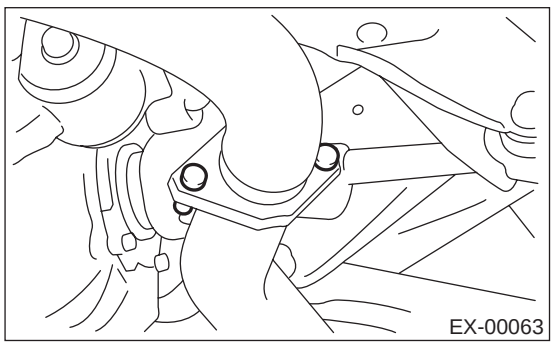
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

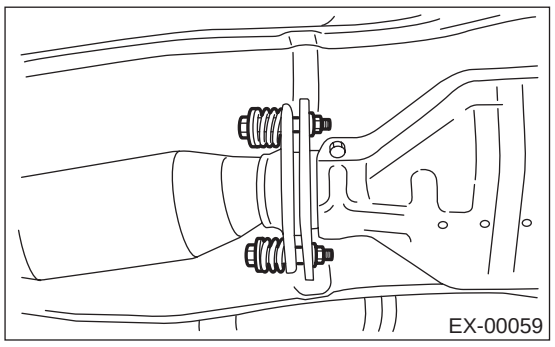

FU-00598

(2) Install front rubber cushion and attach muffler assembly.


EX-00063

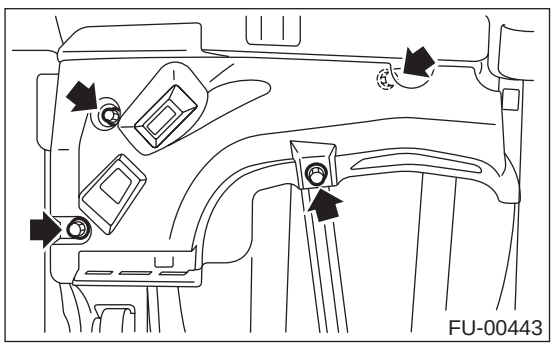
(3) Install rear exhaust pipe to center exhaust pipe.

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

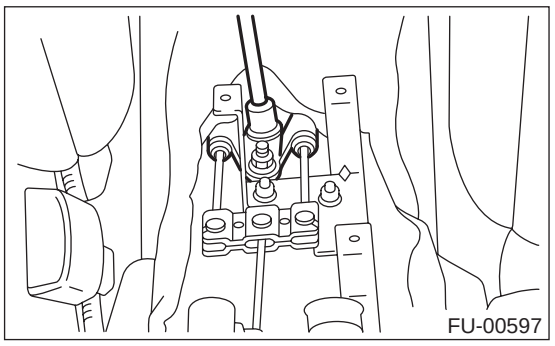

EX-00059

15) Install front side fuel tank cover.

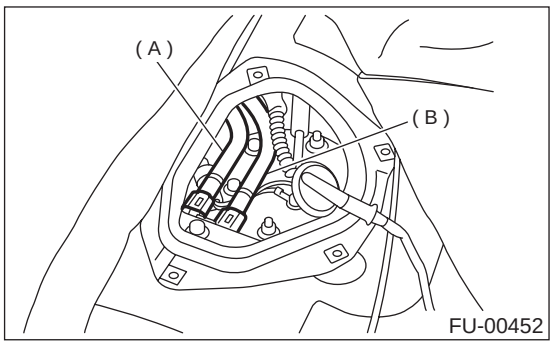
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


FU-00443

16) Install rear wheel.
17) Lower the vehicle.
18) Tighten wheel nuts to rear wheel.
19) Install parking brake cable. <Ref. to PB-6, INSTALLATION, Parking Brake Cable.>


FU-00597

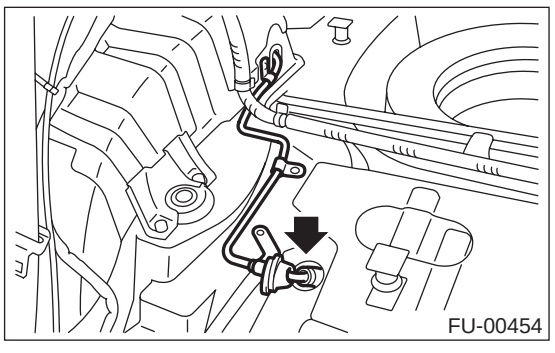
20) Install console box. <Ref. to EI-36, INSTALLATION, Console Box.>
21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H6DO)-79, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



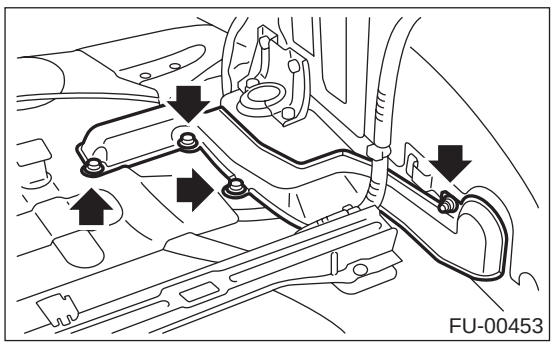
FU-00452

(A) Delivery hose
(B) Return hose

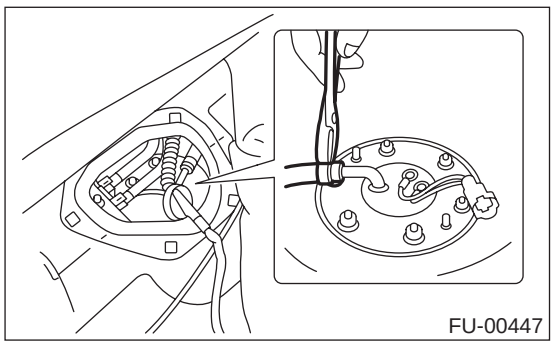
22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H6DO)-79, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>


FU-00454

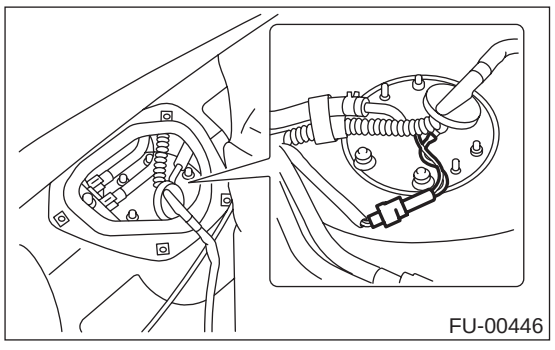
23) Install pipe protector.


FU-00453

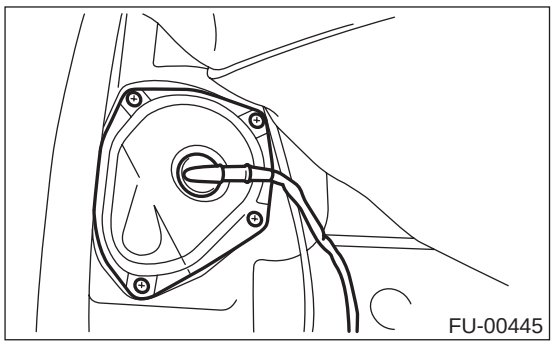
24) Install trunk room trim. (Sedan model)
25) Install luggage room trim. (Wagon model)
26) Connect fuel jet pump hose.


FU-00447

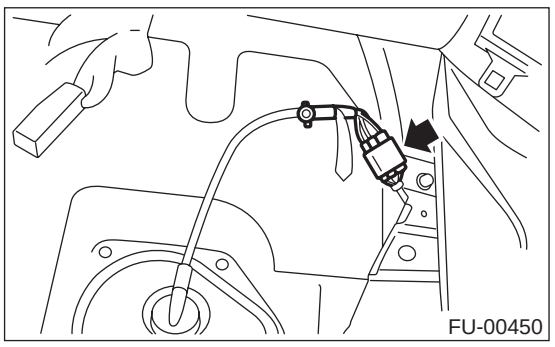
27) Connect connector to fuel sub level sensor.


FU-00446

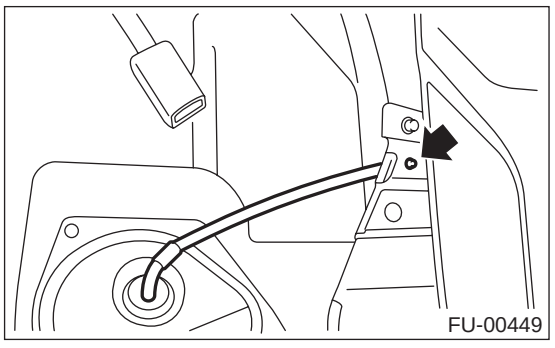
28) Install sub service hole cover.


FU-00445

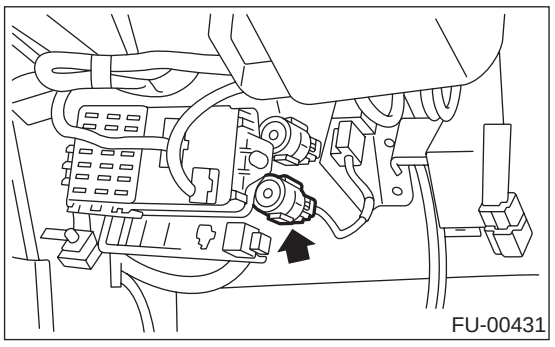
29) Connect connectors to fuel tank cord and plug service hole with grommet.



30) Install holder clip which secures fuel tank cord on bracket.



31) Set rear seat and floor mat.
32) Connect connector to fuel pump relay.



33) Adjust parking brake lever stroke. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>
34) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

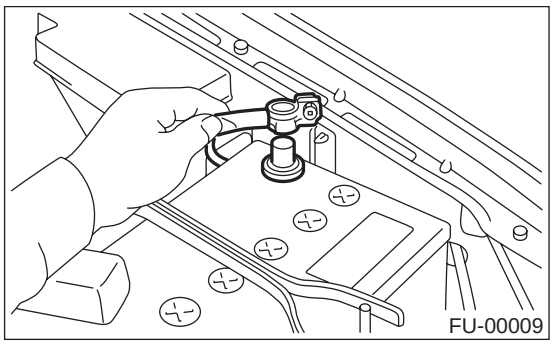
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

23.Fuel Filler Pipe

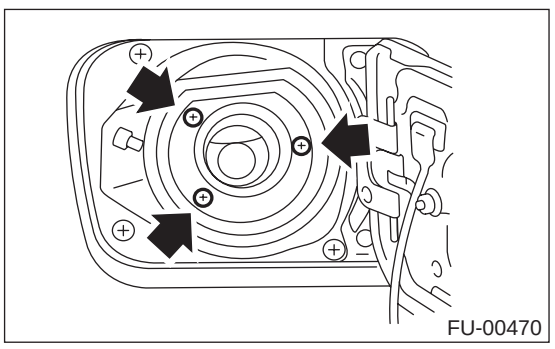
A: REMOVAL

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

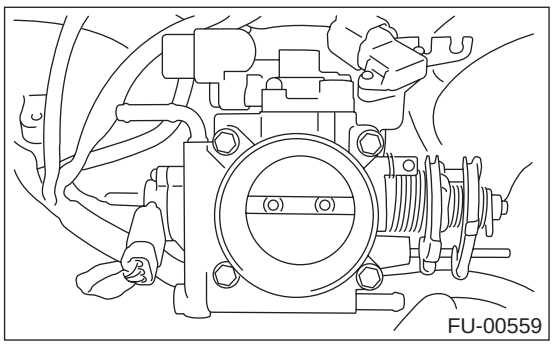
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


FU-00009

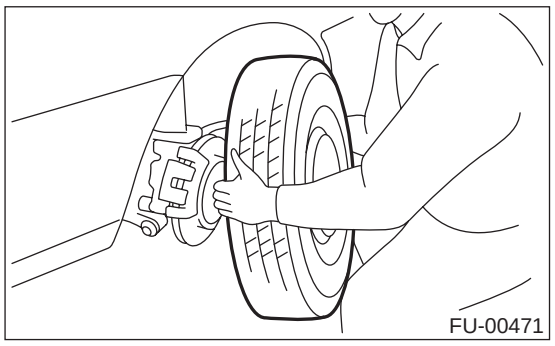
3) Open fuel filler flap lid and remove filler cap.


FU-00470

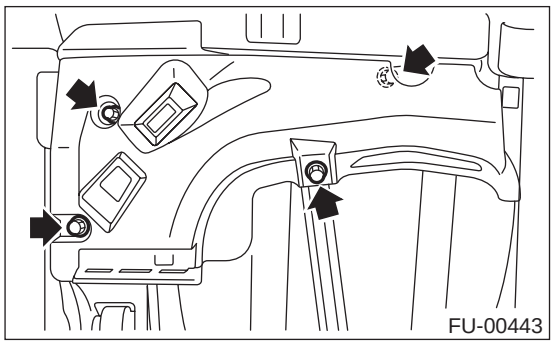
4) Remove screws holding packing in place.


FU-00559

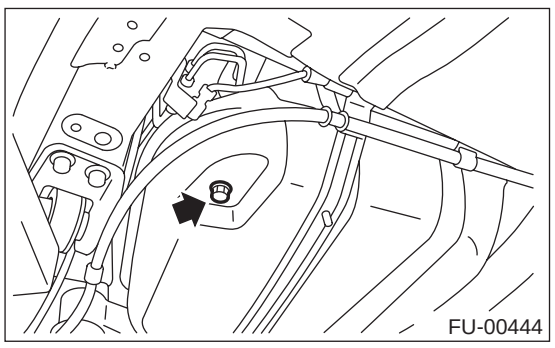
5) Lift-up the vehicle.
6) Remove rear right side wheel nuts.
7) Remove rear right side wheel.


FU-00471

8) Remove front right side fuel tank cover.

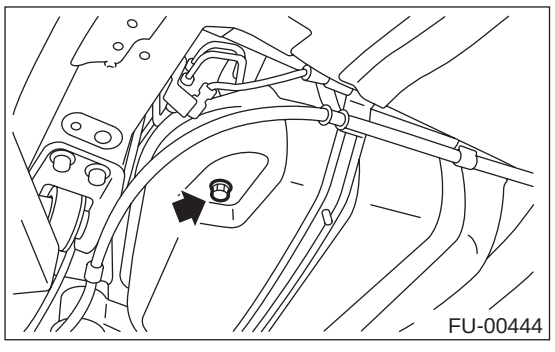

FU-00443

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

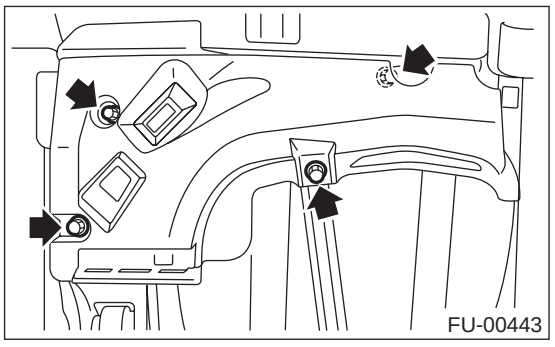

FU-00444

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

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


FU-00444

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

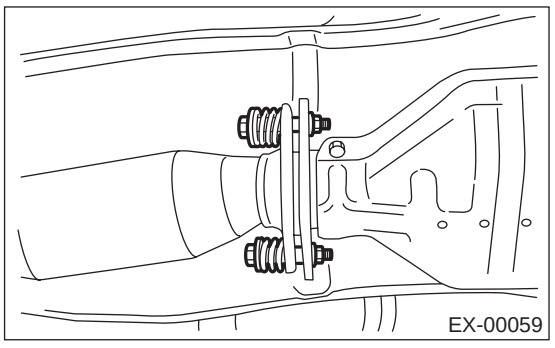

FU-00443

11) Remove rear exhaust pipe and muffler.

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

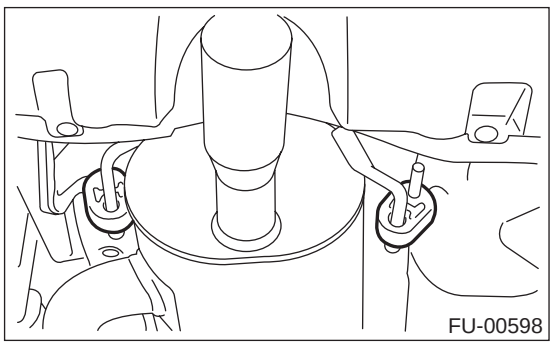
SUBARU CRC (Part No. 004301003)

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

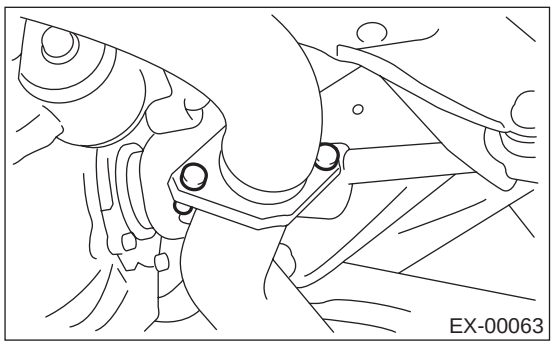

EX-00059

(2) Remove left and right rubber cushions.

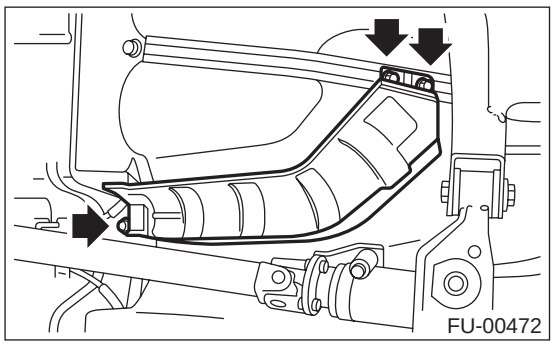
CAUTION:
Be careful not to pull down muffler.


FU-00598

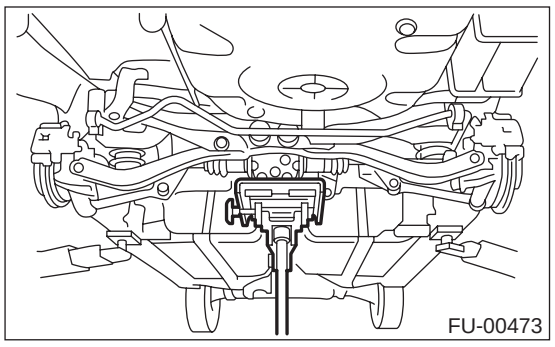
(3) Remove front rubber cushion and detach muffler assembly.


EX-00063

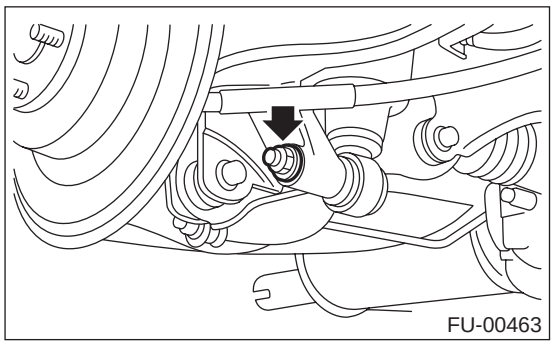
12) Remove heat sealed cover.


FU-00472

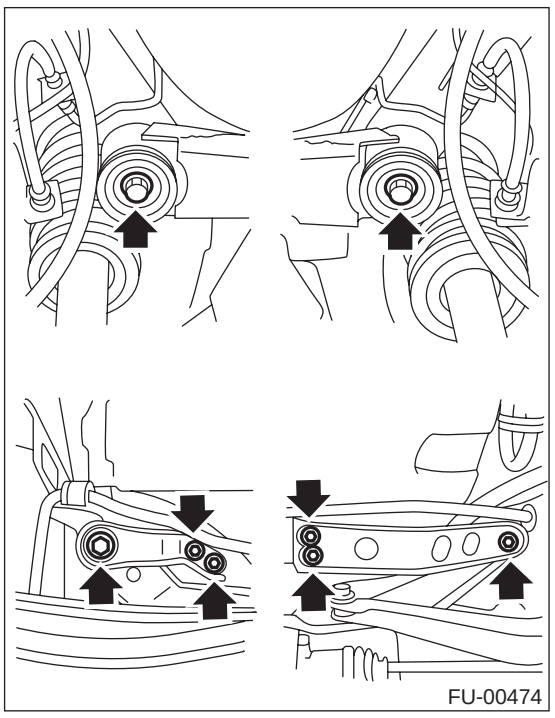
13) Place transmission jack under sub frame.


FU-00473

14) Remove bolt which holds rear shock absorber to rear suspension arm.


FU-00463

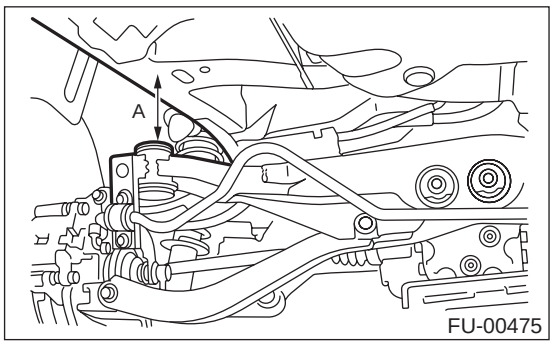
15) Remove bolts which hold rear sub frame on body.



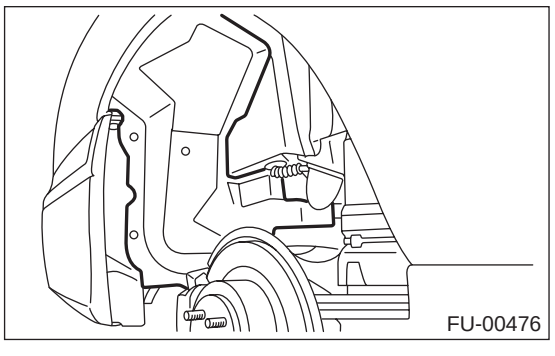
16) Lower the rear sub frame.

CAUTION:
Be sure to lower sub frame slowly.

A = 150 mm (5.91 in)

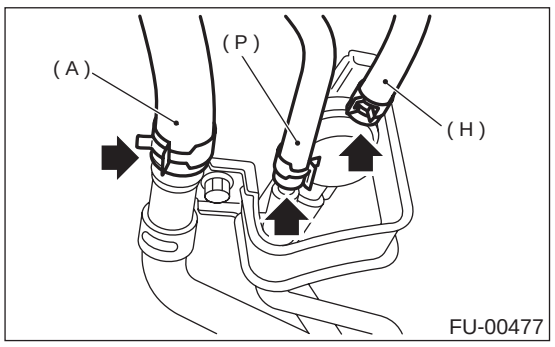


17) Remove fuel filler pipe protector.

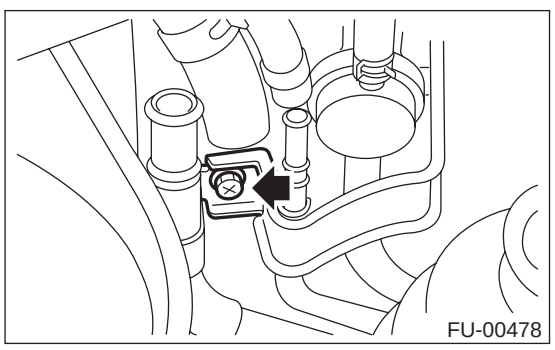


18) Disconnect air vent hose (A) and evaporation hose (H) from evaporation pipe assembly.

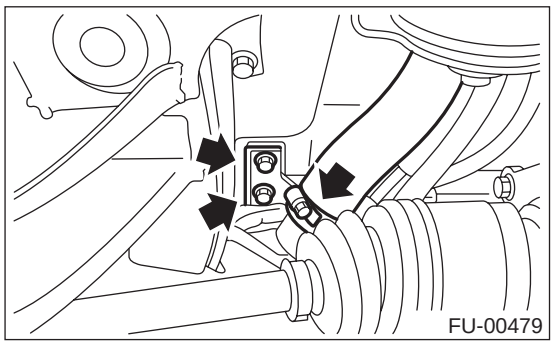
19) Disconnect evaporation hose (I) from pressure control solenoid valve.



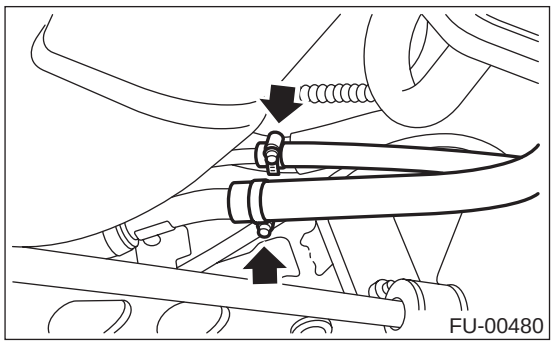
20) Remove bolt which holds evaporation pipe assembly on body.



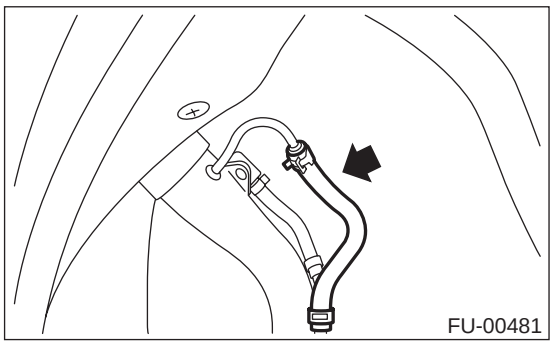
21) Disconnect fuel filler hose.
22) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



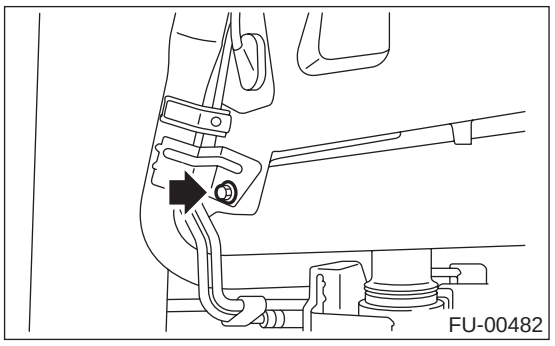
23) Disconnect canister hose from evaporation pipe assembly.



24) Disconnect evaporation hose (O) from fuel filler pipe.



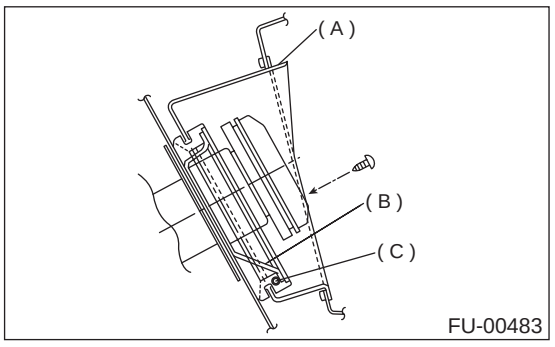
25) Remove bolt which holds fuel filler pipe to body.



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

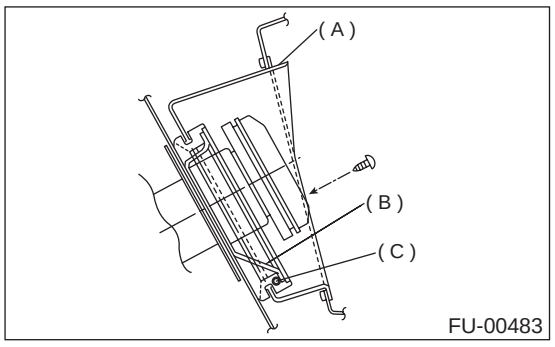
B: INSTALLATION

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



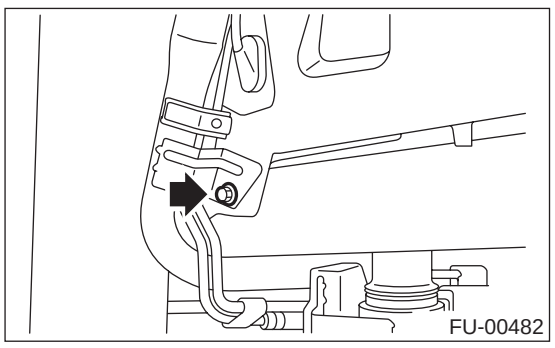
3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

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

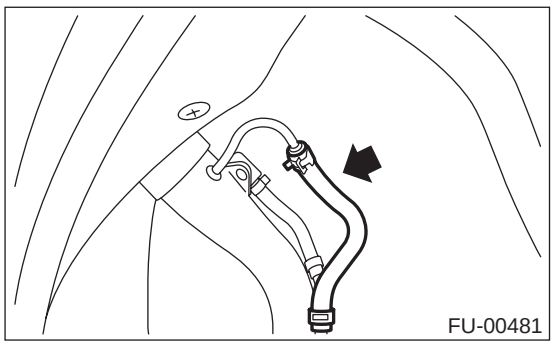


4) Tighten bolt which holds fuel filler pipe on body.

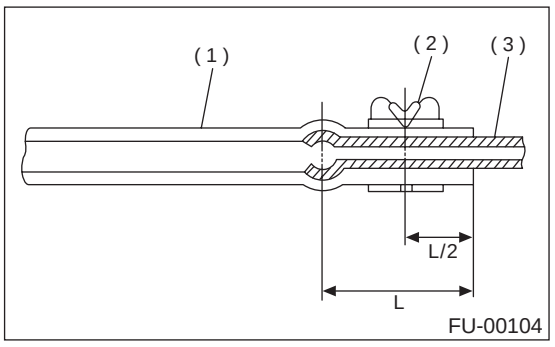
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



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

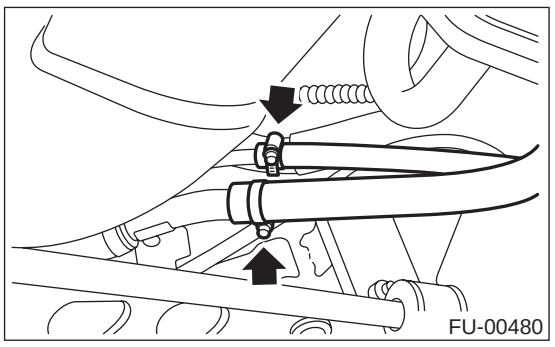


L = 27.5±2.5 mm (1.083±0.098 in)

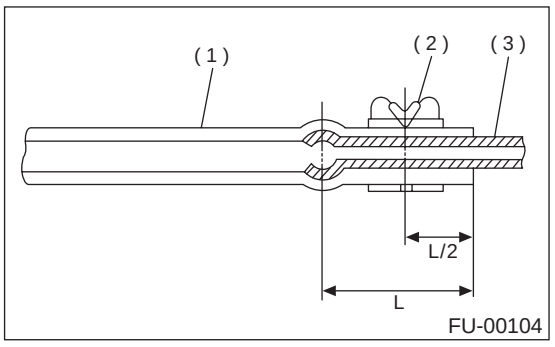


(1) Hose
(2) Clip
(3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



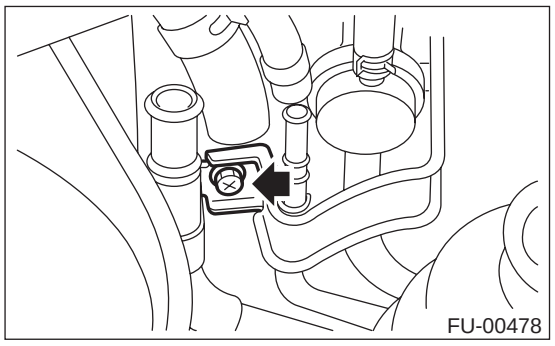
L = 27.5±2.5 mm (1.083±0.098 in)



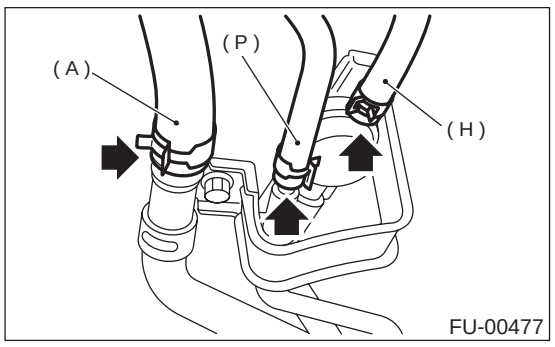
(1) Hose
(2) Clip
(3) Pipe

7) Tighten bolt which holds evaporation pipe assembly on body.

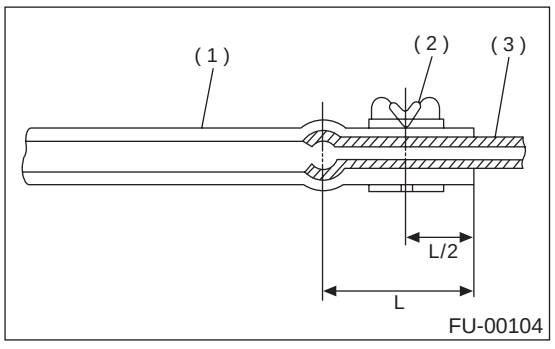
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



8) Insert air vent hose (A), evaporation hose (H) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.
9) Insert evaporation hose (I) to pressure control solenoid valve and hold clip.



L = 27.5±2.5 mm (1.083±0.098 in)

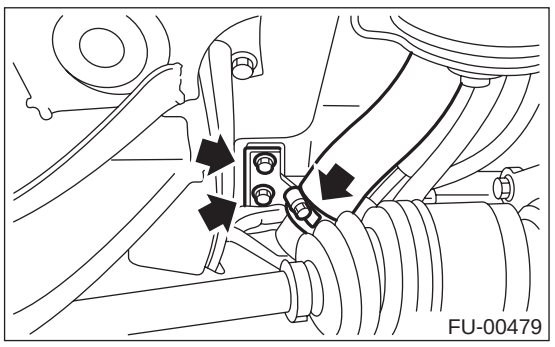


(1) Hose
(2) Clip
(3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

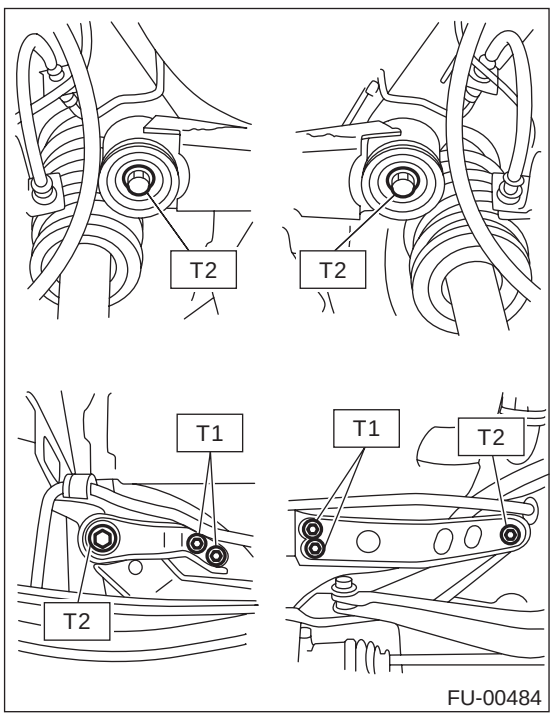
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

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



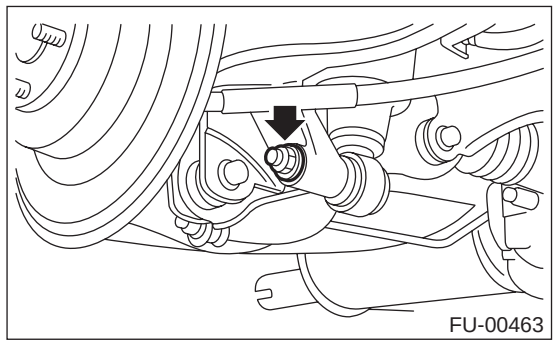
12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

Tightening torque:
T1: 66 N·m (6.7 kgf-m, 48.5 ft-lb)
T2: 172 N·m (17.5 kgf-m, 127 ft-lb)

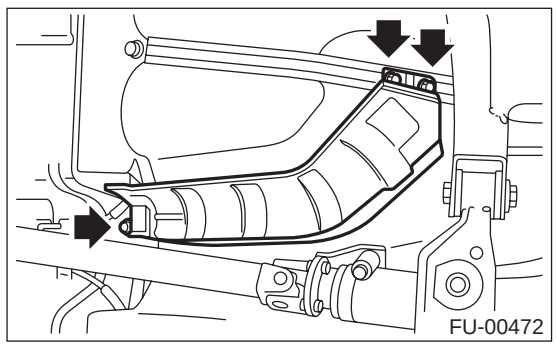


13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)



14) Install heat shield cover.

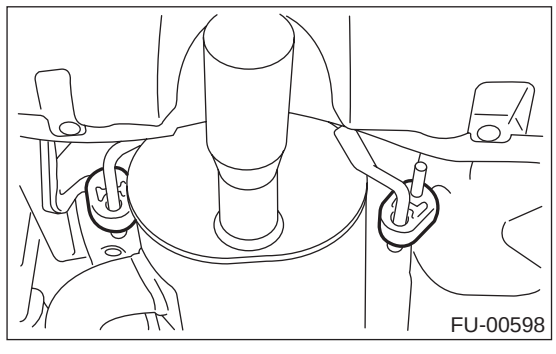


15) Install rear exhaust pipe and muffler.

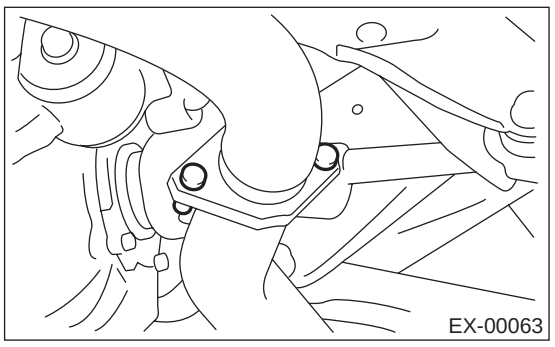
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

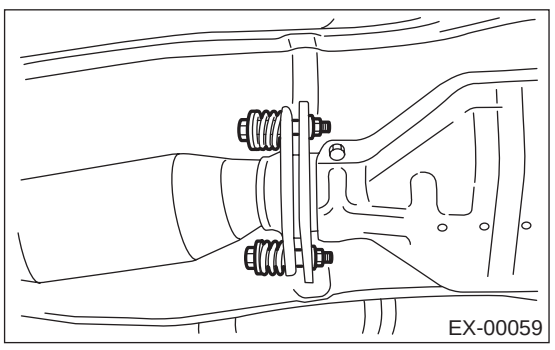


(2) Install front rubber cushion and attach muffler assembly.

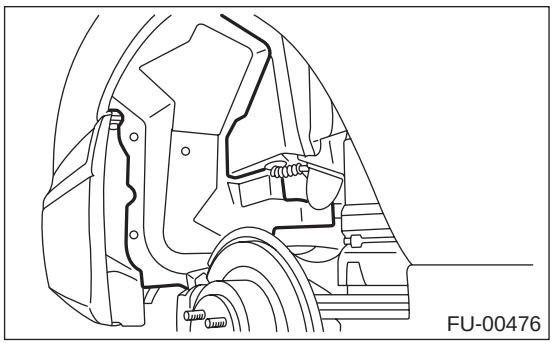

EX-00063

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

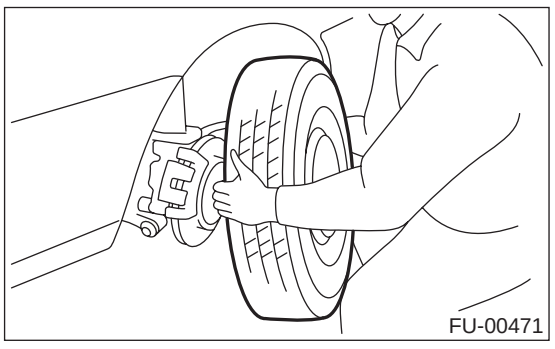
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


EX-00059

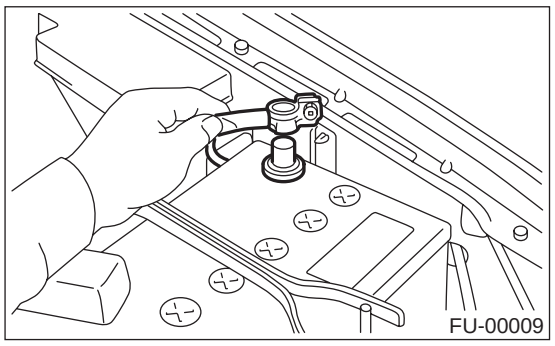
16) Install fuel filler pipe protector.


FU-00476

17) Install rear right wheel.

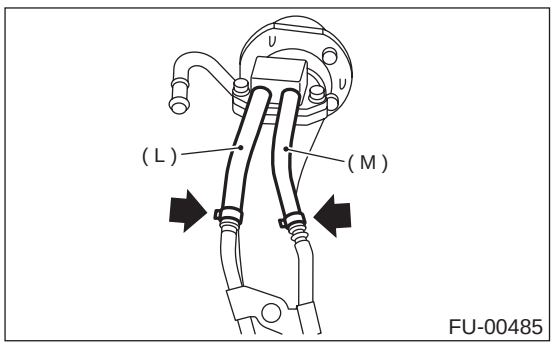

FU-00471

18) Lower the vehicle.
19) Tighten wheel nuts.
20) Connect battery ground cable.


FU-00009

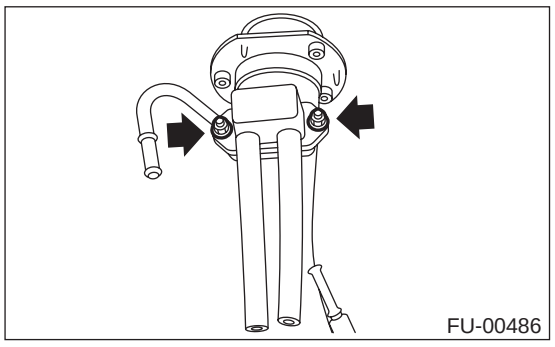
C: DISASSEMBLY

1) Disconnect evaporation hose (M) and (N) from evaporation pipe assembly.

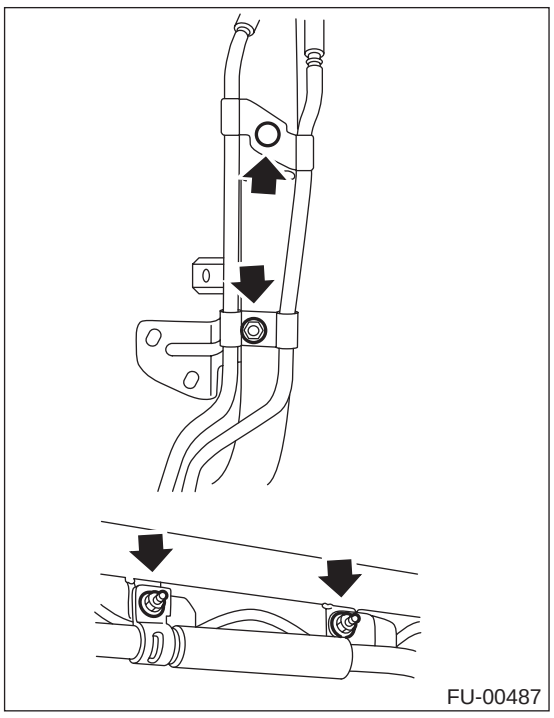


FU-00485

2) Remove shut valve from fuel filler pipe.


FU-00486

3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

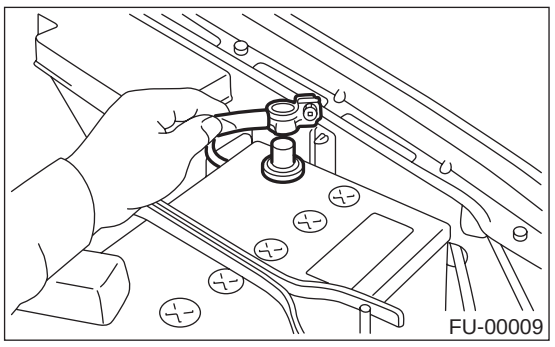
24.Fuel Pump

A: REMOVAL

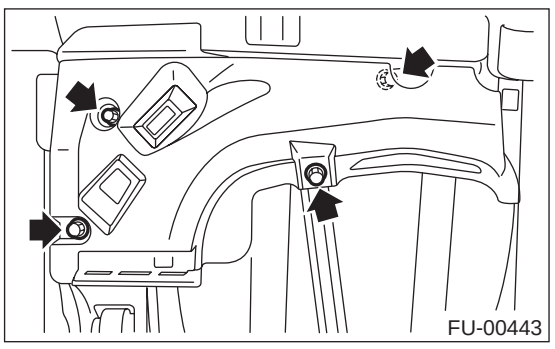
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

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

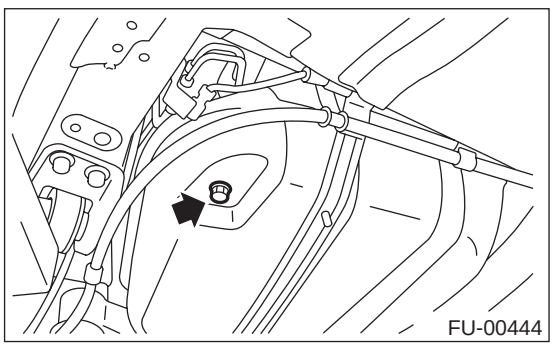
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect battery ground cable.


FU-00009

3) Open fuel filler flap lid and remove fuel filler cap.
4) Lift-up the vehicle.
5) Remove front side fuel tank cover.

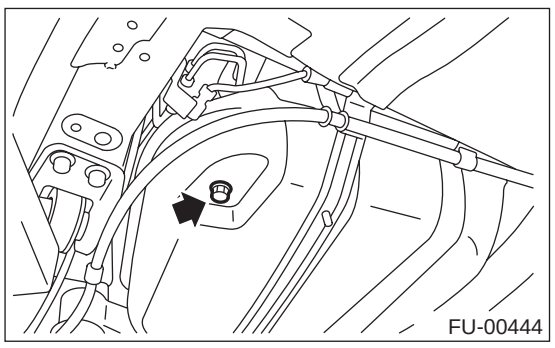

FU-00443

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

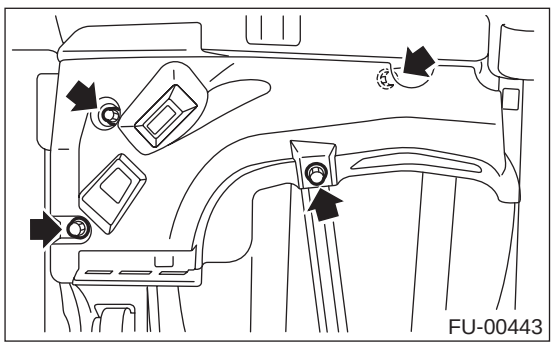

FU-00444

7) Tighten fuel drain plug and install front right side fuel tank cover.

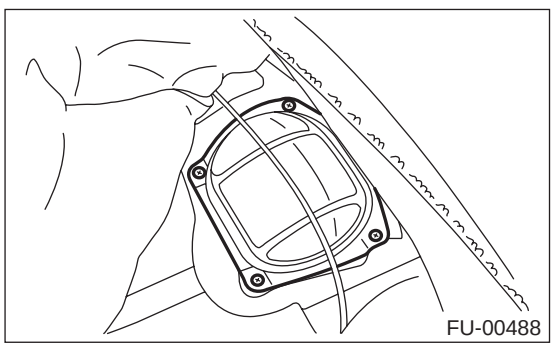
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00444

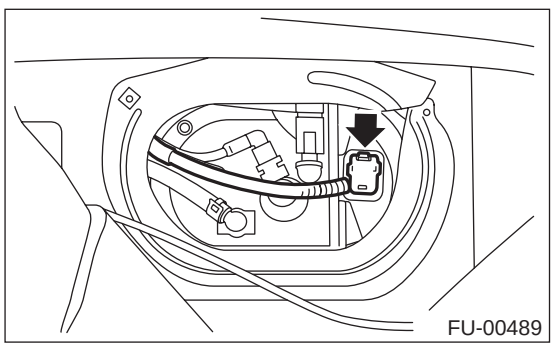
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


FU-00443

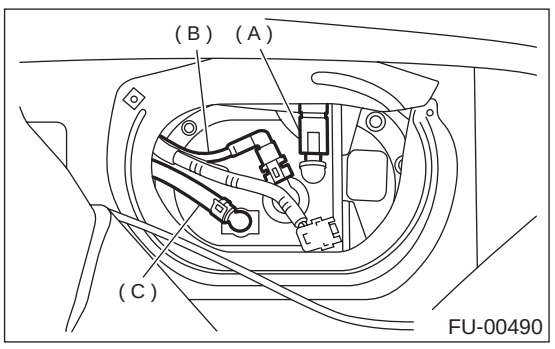
8) Raise rear seat and turn floor mat up.
9) Remove access hole lid.


FU-00488

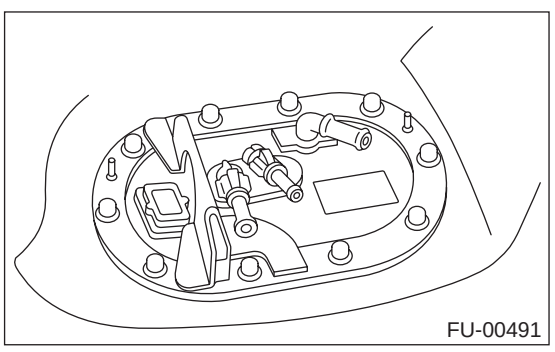
10) Disconnect connector from fuel pump.


FU-00489

11) Move clips and then disconnect jet pump hose (C).
12) Disconnect quick connector and then disconnect fuel delivery hose (A) and return hose (B). <Ref. to FU(H6DO)-78, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



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

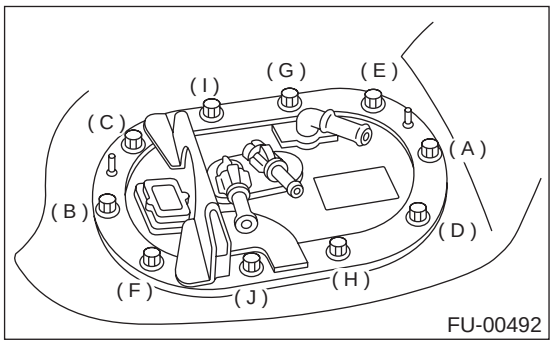


14) Take off fuel pump assembly from fuel tank.

B: INSTALLATION

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

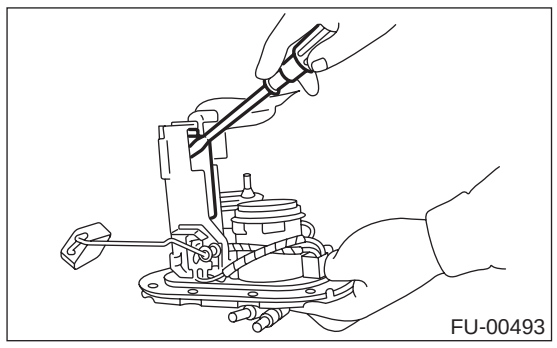
Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)



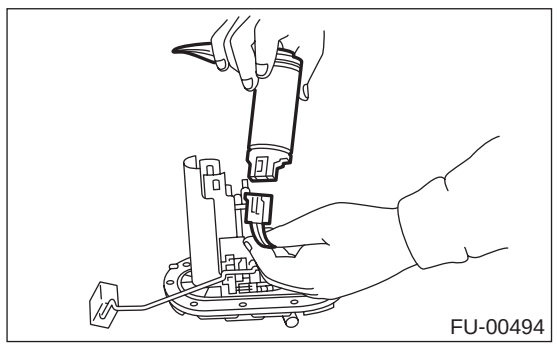
C: DISASSEMBLY

1) Remove fuel pump and pump holder.

NOTE:
When disassembling pump holder, be careful as it is installed with two pawls.



2) Disconnect connector from fuel pump.



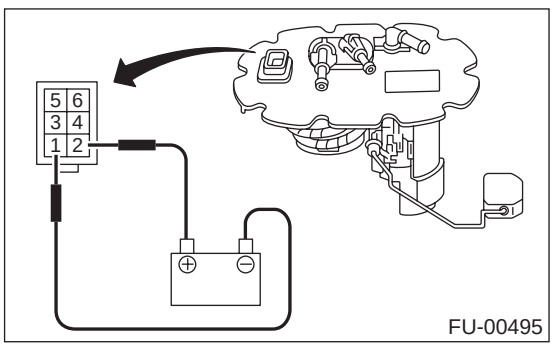
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

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

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 no-load condition.**



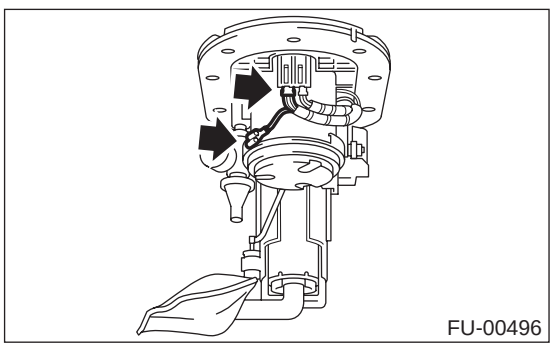
25.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

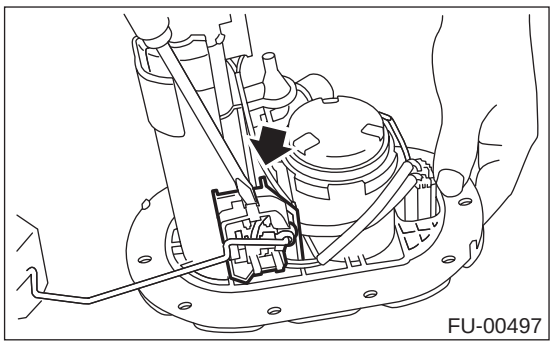
NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H6DO)-69, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


FU-00496

3) Pushing the pawls with a screwdriver, remove fuel meter unit by pulling it downwards.

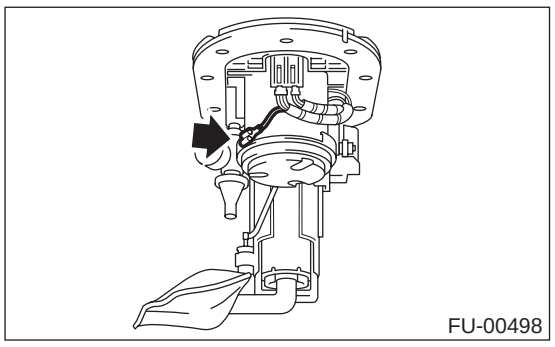
NOTE:
Replace fuel filter pawls with new ones as they might brake when removed.


FU-00497

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**

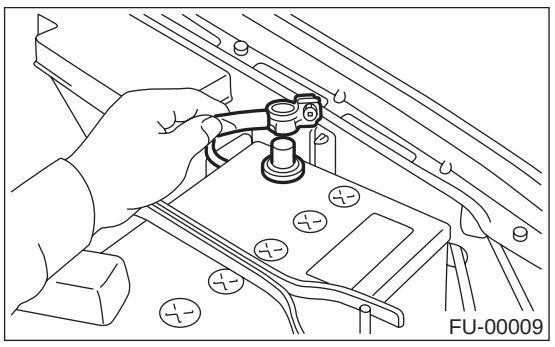

FU-00498

26.Fuel Sub Level Sensor

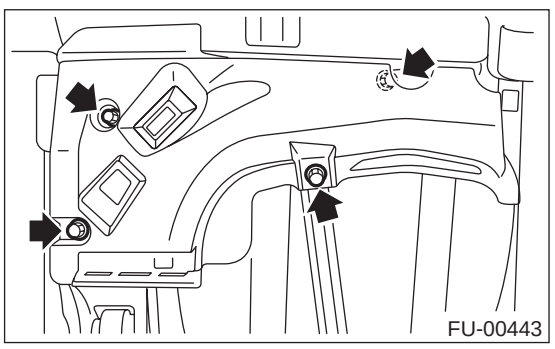
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

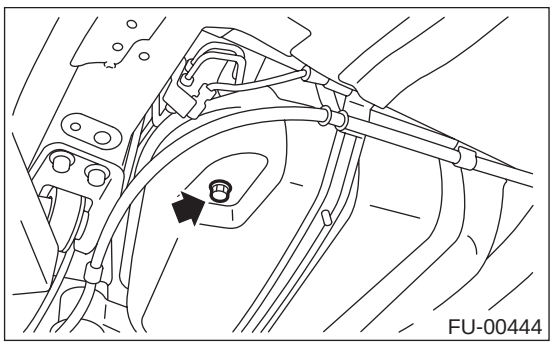
1) Disconnect battery ground cable.


FU-00009

2) Lift-up the vehicle.
3) Remove front side fuel tank cover.

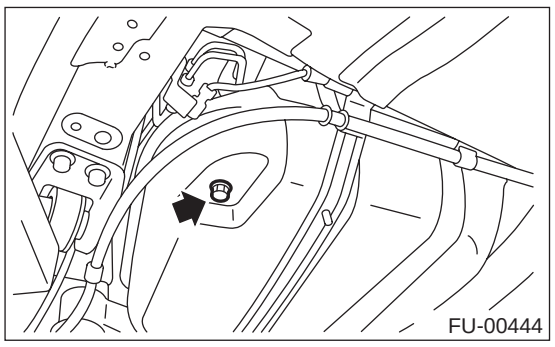

FU-00443

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

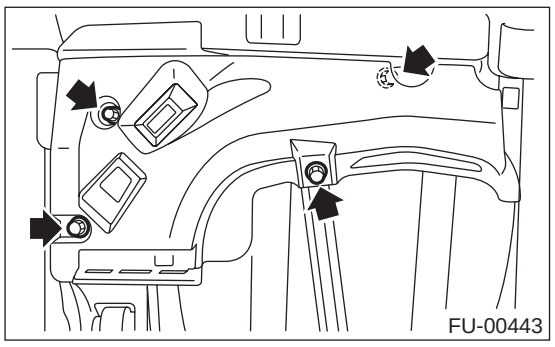

FU-00444

5) Tighten fuel drain plug and install front right side fuel tank cover.

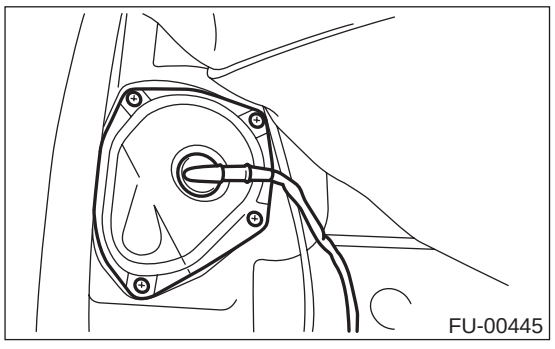
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00444

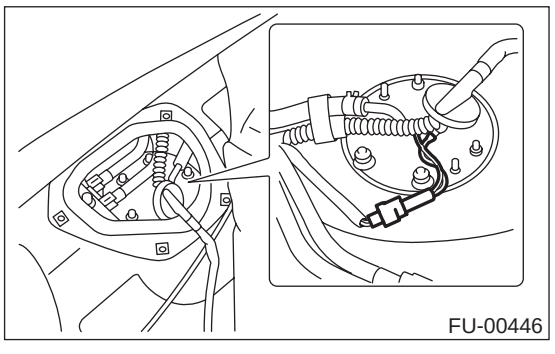
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


FU-00443

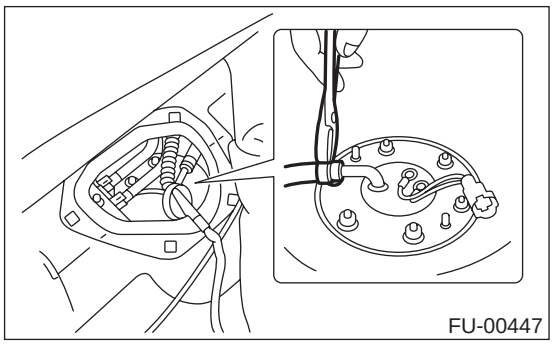
6) Raise rear seat and turn floor mat up. (Wagon model)
7) Remove rear seat. (Sedan model)
8) Remove service hole cover.


FU-00445

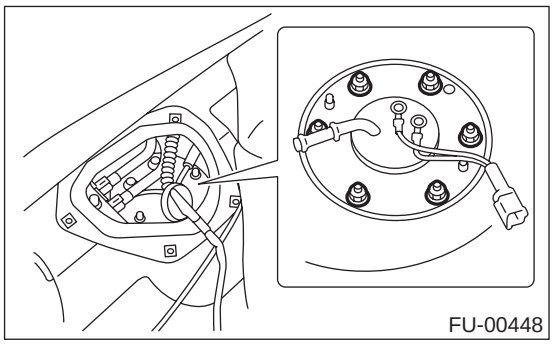
9) Disconnect connector from fuel sub level sensor.


FU-00446

10) Disconnect fuel jet pump hose.


FU-00447

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

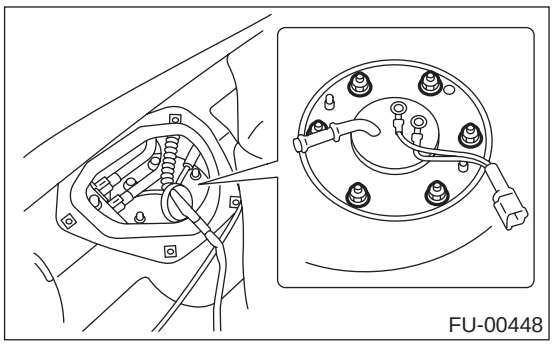

FU-00448

12) Remove fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

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

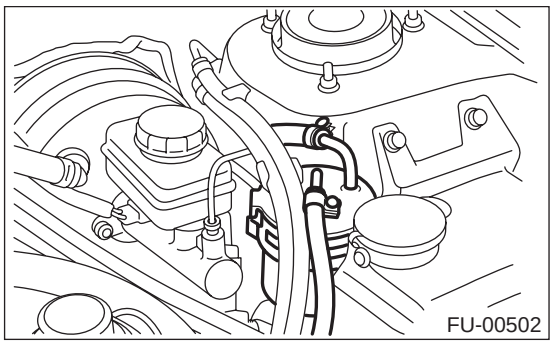

FU-00448

27.Fuel Filter

A: REMOVAL

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

1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect fuel delivery hoses from fuel filter.



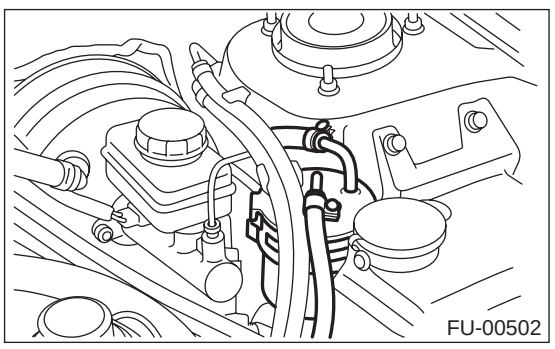
3) Remove filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace it with a new one.**
- **If clamps are badly damaged, replace with new ones.**

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

Tightening torque:
1.0 N·m (0.1 kgf-m, 0.7 ft-lb)



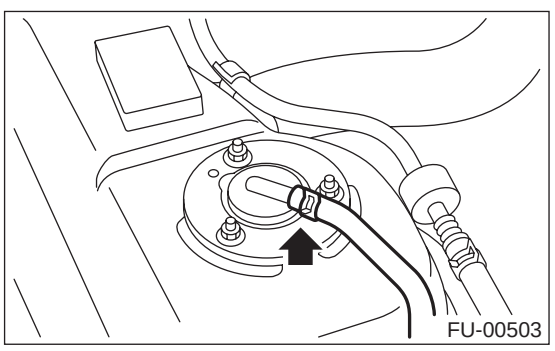
C: INSPECTION

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

28.Fuel Cut Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Move clip and disconnect evaporation hose from fuel cut valve.

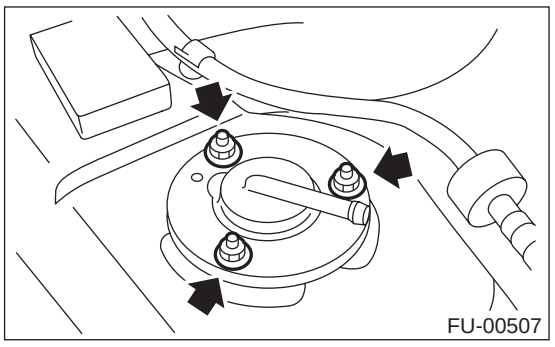


3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

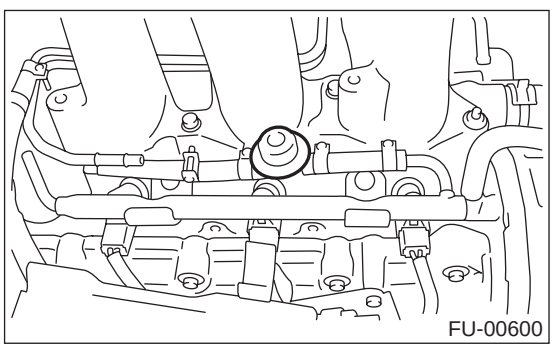
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



29.Fuel Damper Valve

A: REMOVAL

1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove fuel damper valve from return line.



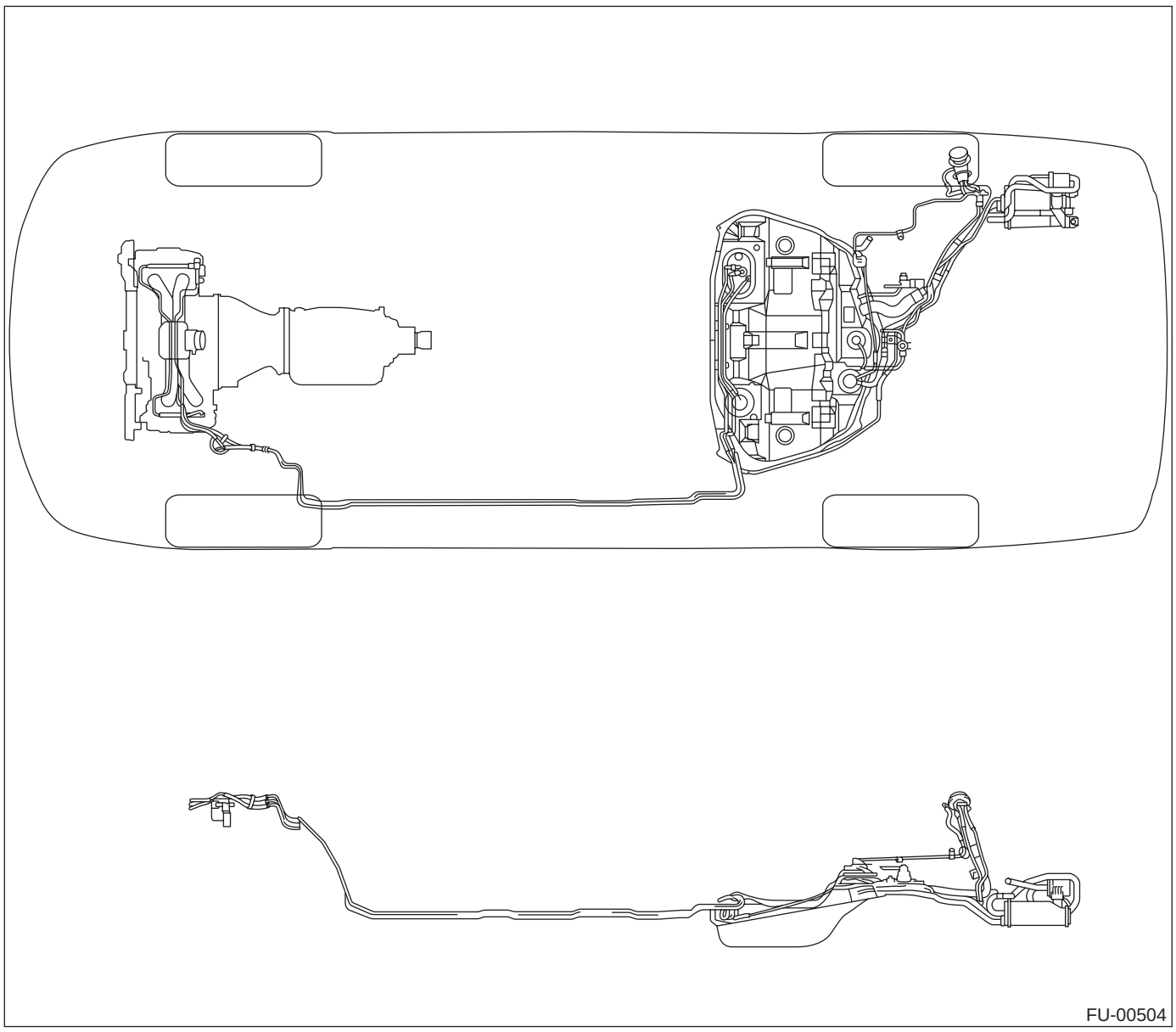
B: INSTALLATION

Install in the reverse order of removal.

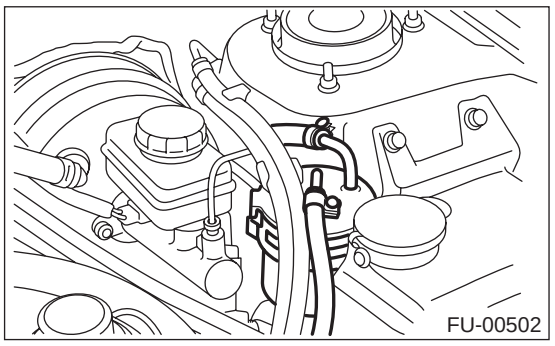
30.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open fuel filler flap lid and remove fuel filler cap.
4) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
5) Remove fuel filler pipe. <Ref. to FU(H6DO)-61, REMOVAL, Fuel Filler Pipe.>
6) Remove floor mat. <Ref. to EI-50, REMOVAL, Floor Mat.>
7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



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



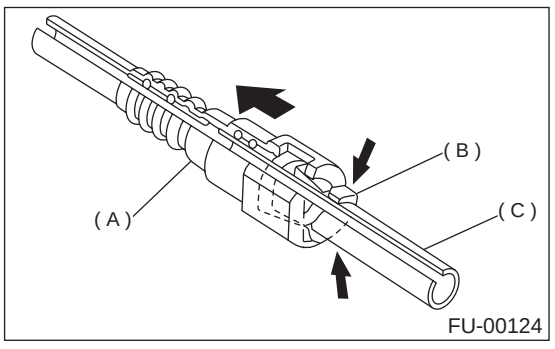
9) Separate quick connector on fuel delivery and return line.

(1) Clean pipe and connector, if they are covered with dust.

(2) Hold connector (A) and push retainer (B) down.

(3) Pull out connector (A) from retainer (B).

CAUTION:
Replace retainer with new ones.

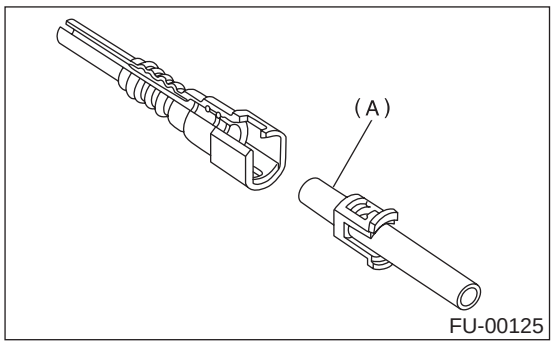


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect quick connector on fuel delivery and return line.

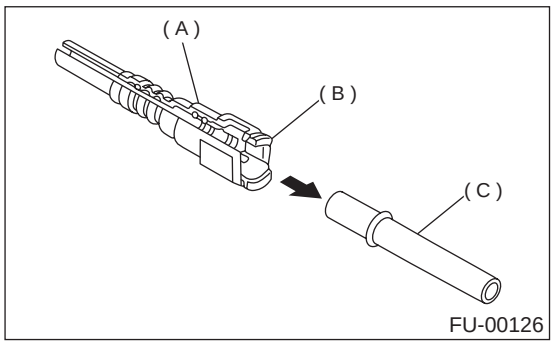
CAUTION:
• Always use a new retainer.
• Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe (B).



(1) Set new retainer (B) to connector (A).

(2) Push pipe into connector completely.

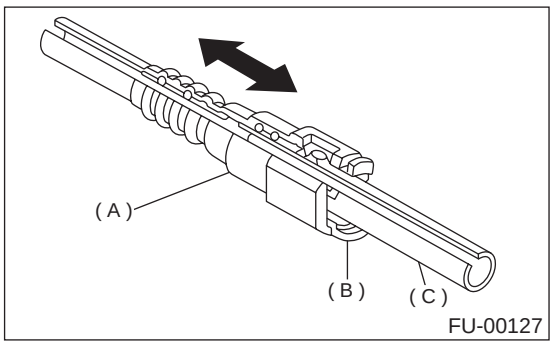
NOTE:
At this time, two clicking sounds are heard.



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

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

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

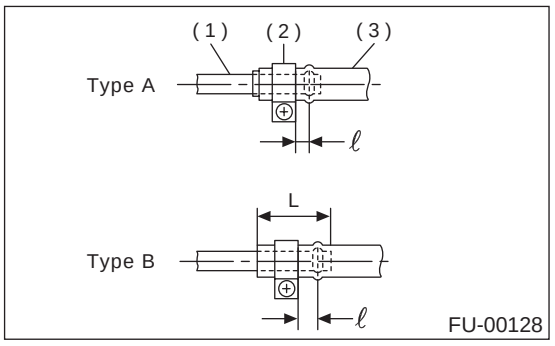


(A) Connector
(B) Retainer
(C) Pipe

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

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

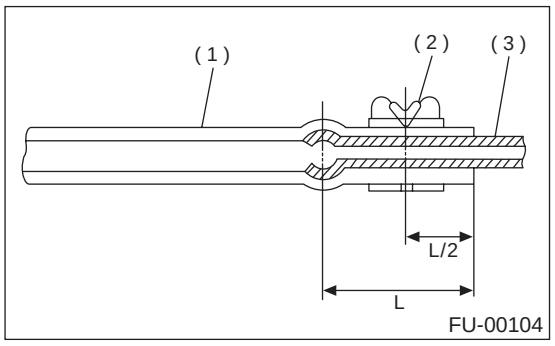


(1) Fitting
(2) Clamp
(3) Hose

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

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.

31.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 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.

(1) Cold areas

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

(2) Affected areas

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

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

FUEL SYSTEM TROUBLE IN GENERAL

MEMO:

1. General Description

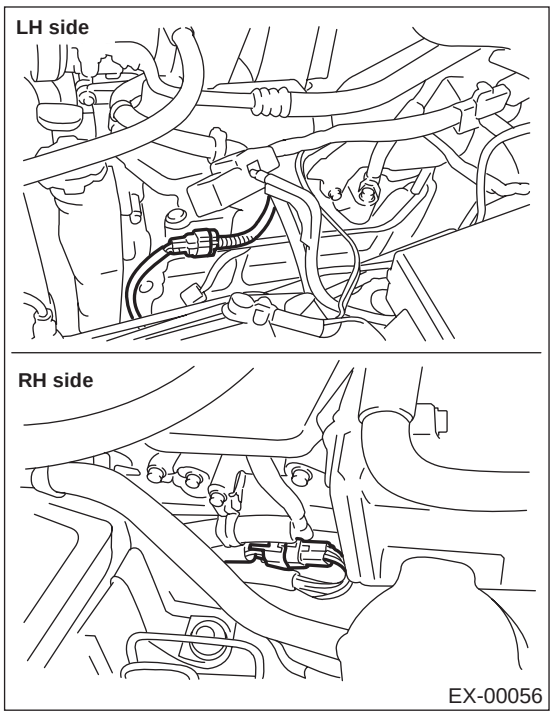
A: CAUTION

• 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 ground cable from battery.

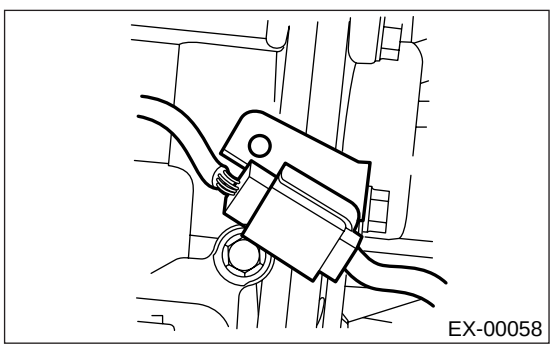
2. Front Catalytic Converter

A: REMOVAL

1) Set the vehicle on the lift.
2) Remove battery.
3) Remove air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
4) Disconnect front oxygen (A/F) sensor connectors.

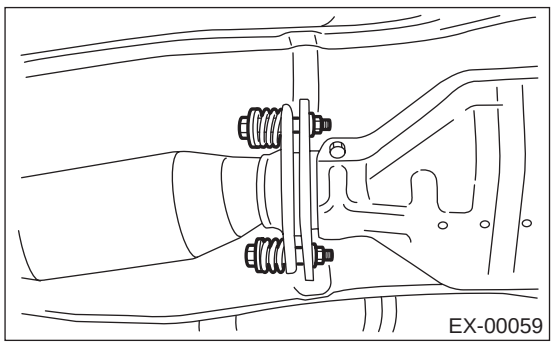


5) Lift-up the vehicle.
6) Remove under cover.
7) Remove front oxygen (A/F) sensor harness from the clips attached to both right and left cylinder head covers.
8) Disconnect connector from rear oxygen sensor connector.

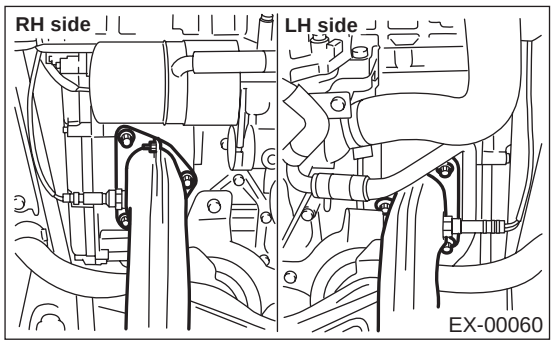


9) Separate front exhaust pipe from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

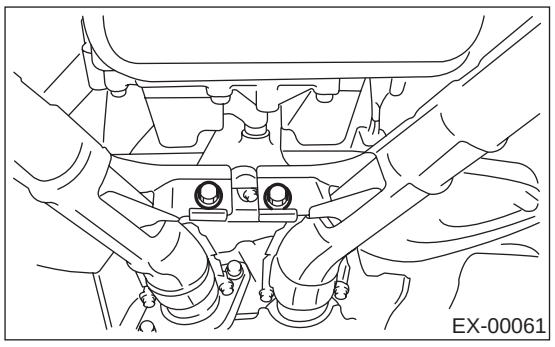


10) Remove nuts which hold front exhaust pipe onto cylinder heads.

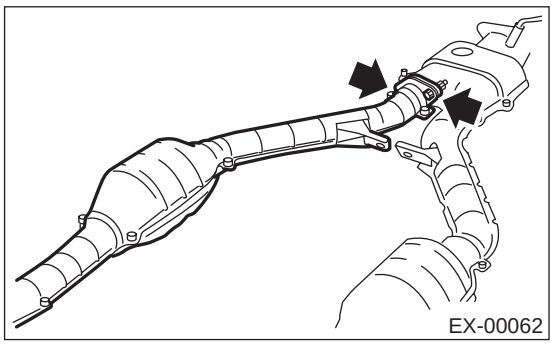


11) Remove front exhaust pipe from hanger bracket.

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



12) Separate front catalytic converter (RH) from front exhaust pipe.

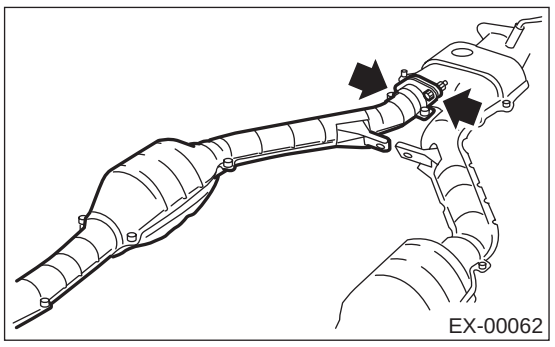


B: INSTALLATION

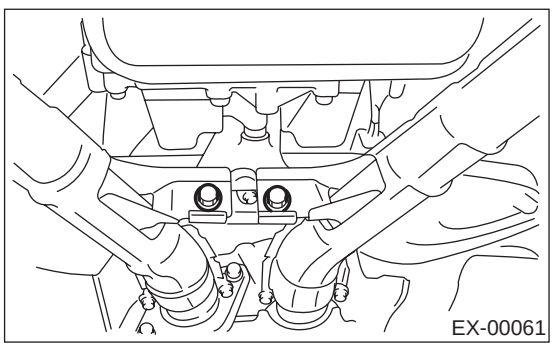
NOTE:
Replace gaskets with new ones.

1) Install front catalytic converter (RH) to front exhaust pipe.

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

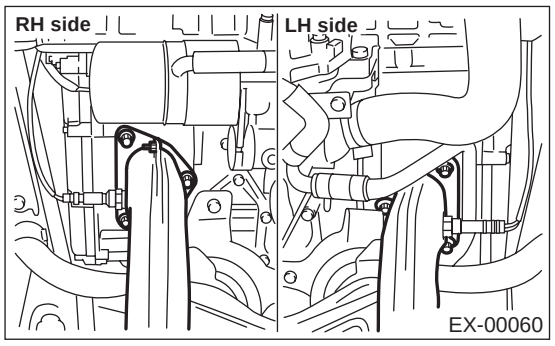


2) Install front exhaust pipe assembly to the vehicle. And temporarily tighten bolt which installs front exhaust pipe to hanger bracket.



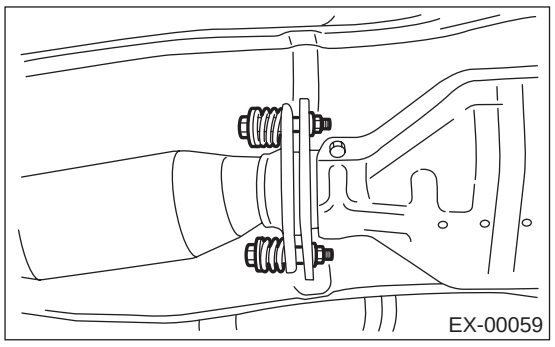
3) Tighten nuts which hold front exhaust pipe onto cylinder heads.

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



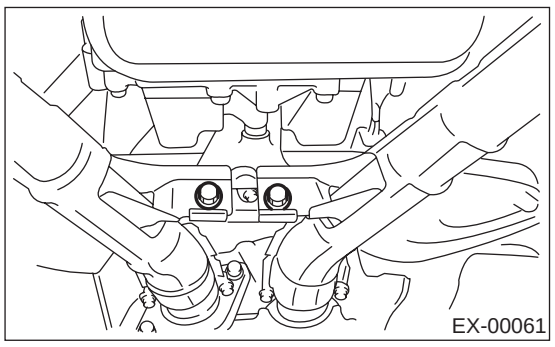
4) Tighten bolts which secure front exhaust pipe assembly to rear exhaust pipe.

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

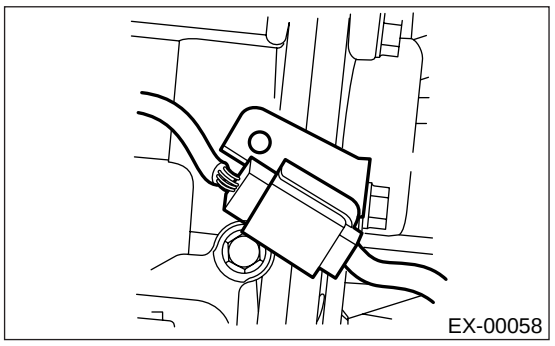


5) Tighten bolt which holds front exhaust pipes to hanger bracket.

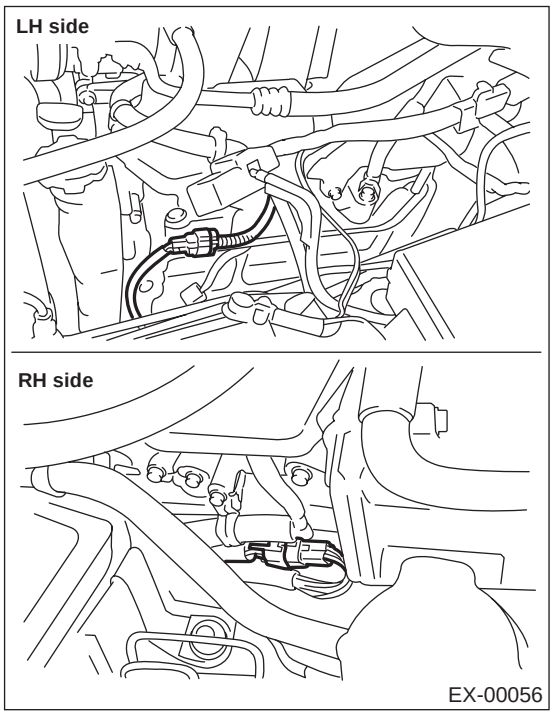
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



6) Connect connector to rear oxygen sensor connector.



7) Install front oxygen (A/F) sensor harness to the clips attached to the cylinder head covers.
8) Install under cover.
9) Lower the vehicle.
10) Connect front oxygen (A/F) sensor connector.



11) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
12) Install battery.

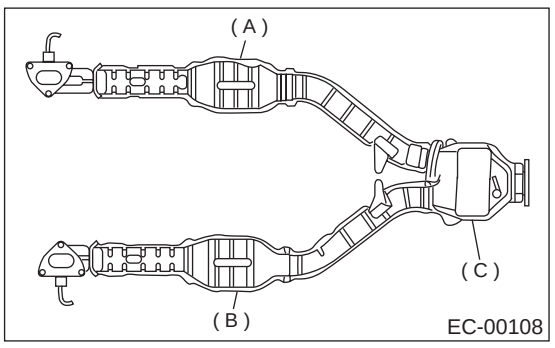
C: INSPECTION

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

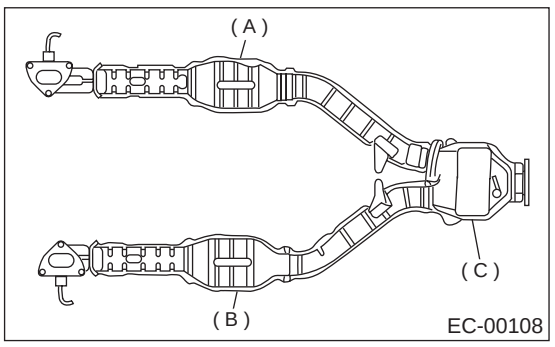
The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(H6DO)-3, REMOVAL, Front Catalytic Converter.>



(A) Front catalytic converter RH
(B) Front catalytic converter LH
(C) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to EC(H6DO)-4, INSTALLATION, Front Catalytic Converter.>



(A) Front catalytic converter RH
(B) Front catalytic converter LH
(C) Rear catalytic converter

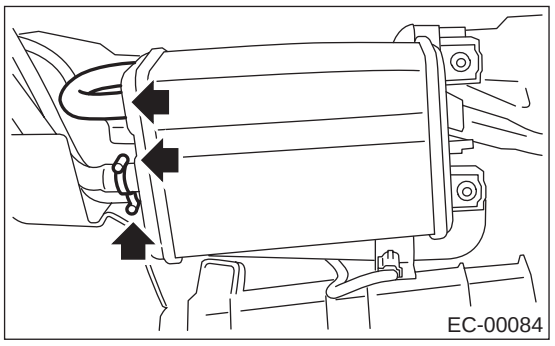
C: INSPECTION

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

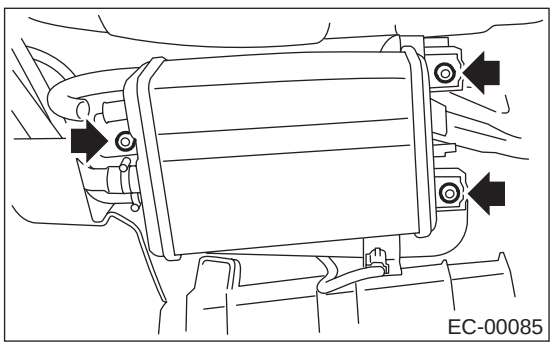
4. Canister

A: REMOVAL

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



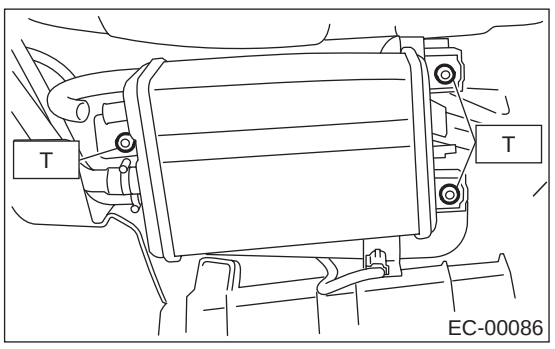
3) Remove canister from body.



B: INSTALLATION

Install in the reverse order of removal.

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



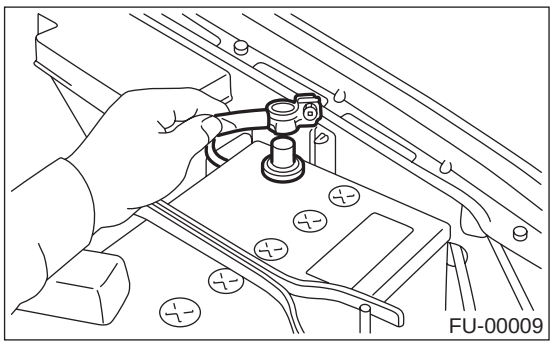
C: INSPECTION

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

5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect battery ground cable.

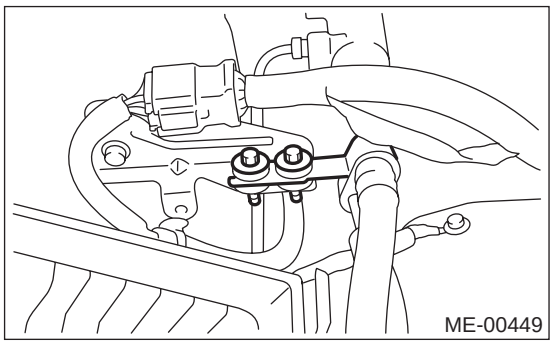


2) Remove power steering pump from bracket.

(1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>

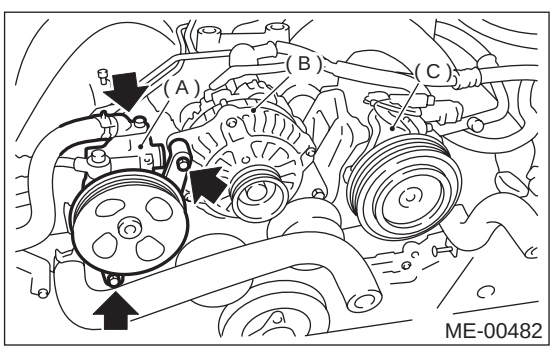
(2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

(3) Remove power steering oil pipe with bracket.



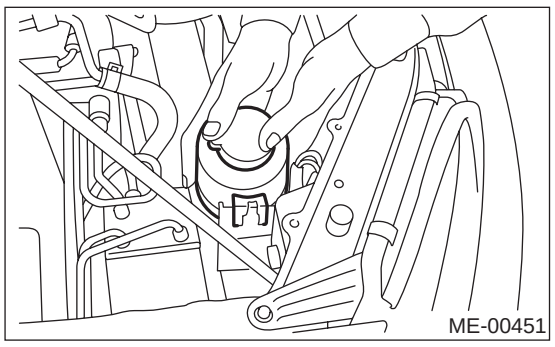
(4) Remove bolts which install power steering pump bracket.

CAUTION:
Do not separate hose and pipe from the pump main unit.

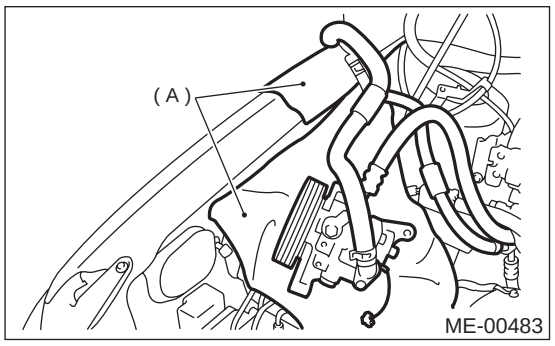


(A) Power steering pump
(B) Generator
(C) A/C compressor

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

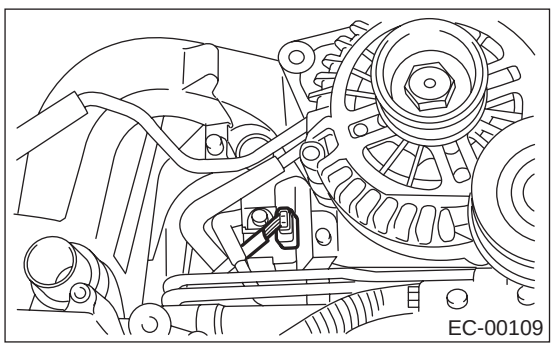


(6) Place power steering pump on the right side wheel apron.

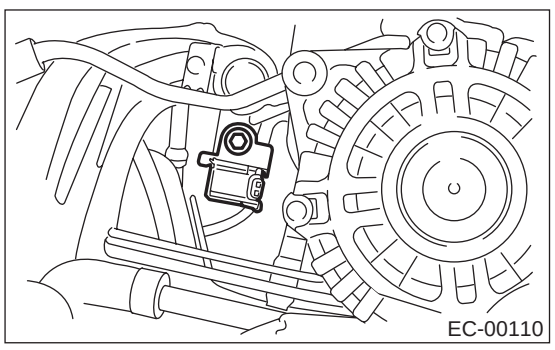


(A) Cloth

3) Disconnect connector and hoses from purge control solenoid valve.



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

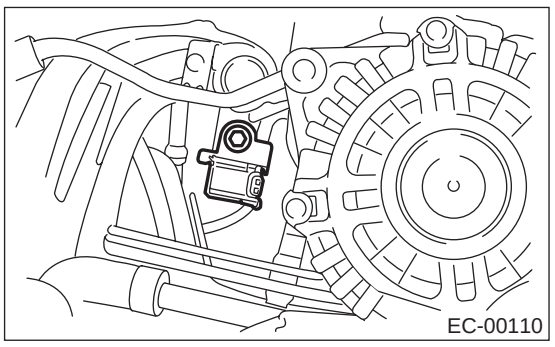


5) Take out purge control solenoid valve through the bottom of the intake manifold.

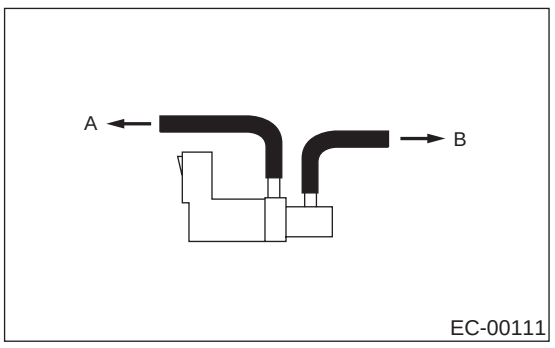
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



CAUTION:
Carefully connect the evaporation hoses.



A: To fuel pipe
B: To intake manifold

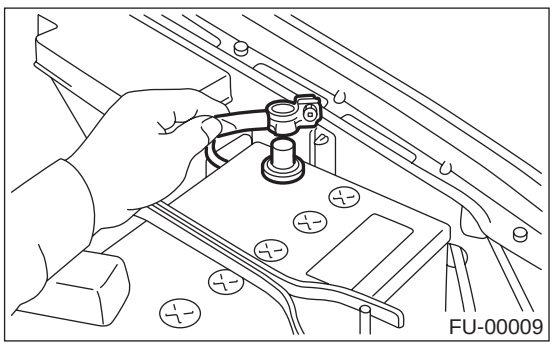
C: INSPECTION

Make sure hoses are not cracked or loose.

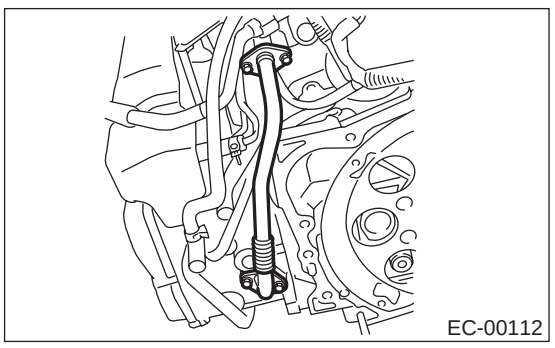
6. EGR Valve

A: REMOVAL

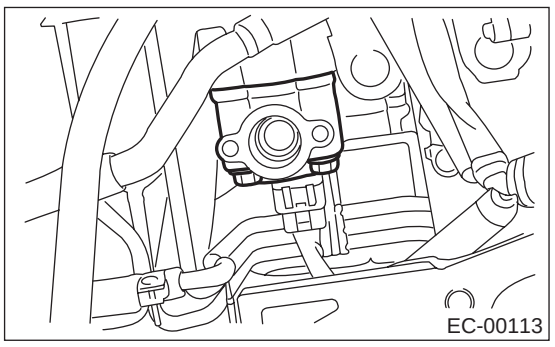
1) Disconnect battery ground cable.



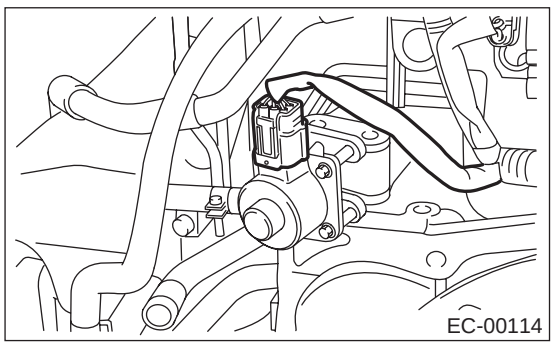
2) Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
3) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
4) Remove EGR pipe from EGR valve and cylinder head.



5) Remove EGR valve from intake manifold.

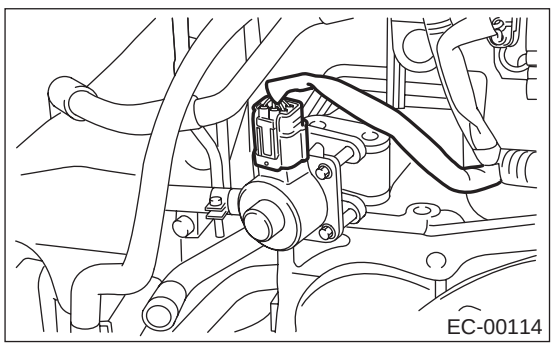


6) Disconnect connector from EGR valve.



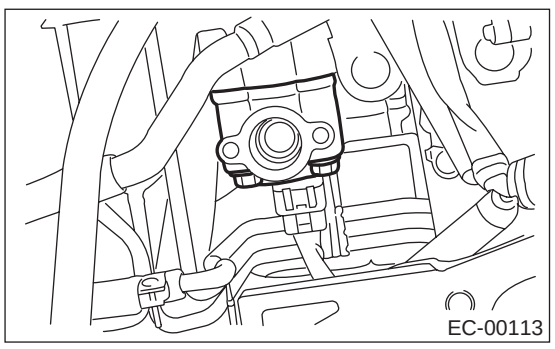
B: INSTALLATION

NOTE:
Replace old gaskets with new one.
1) Connect connector EGR valve.



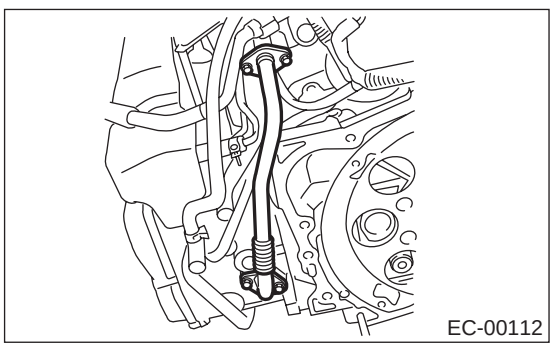
2) Install EGR valve to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



3) Install EGR pipe to EGR valve and cylinder head.

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



4) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>
5) Install air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
6) Connect battery ground cable.

C: INSPECTION

1) Check the EGR valve for proper valve movement.
2) Check the EGR pipe, etc., for blockages or cracks.

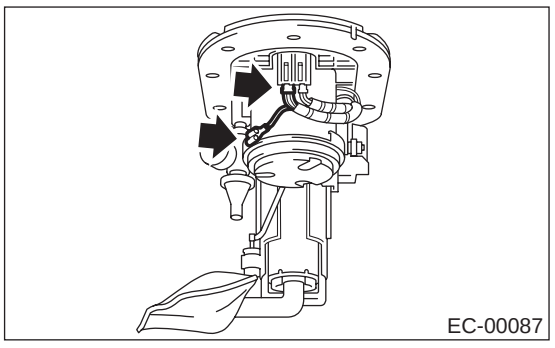
7. Fuel Temperature Sensor

A: REMOVAL

WARNING:
During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

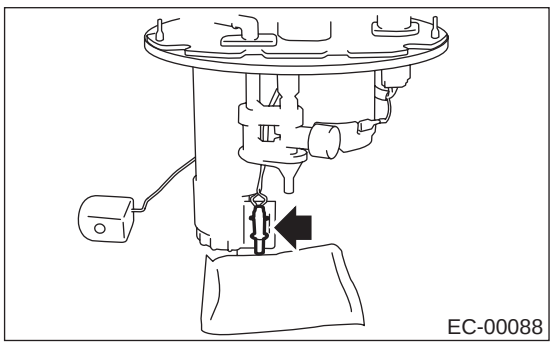
NOTE:
Fuel temperature sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H6DO)-69, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


EC-00087

3) Remove fuel temperature sensor.

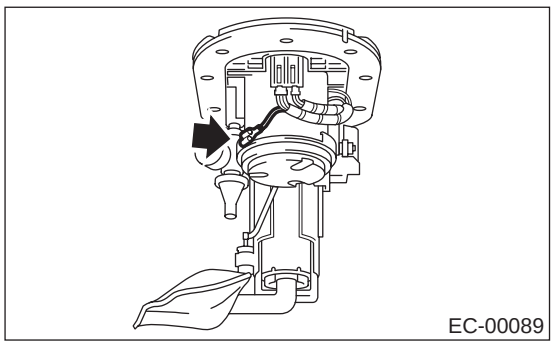
NOTE:
When replacing fuel temperature sensor, also replace fuel level sensor. <Ref. to FU(H6DO)-72, REMOVAL, Fuel Level Sensor.>


EC-00088

B: INSTALLATION

1) Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**


EC-00089

8. Sub Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H6)” section. <Ref. to FU(H6DO)-73, REMOVAL, Fuel Sub Level Sensor.>

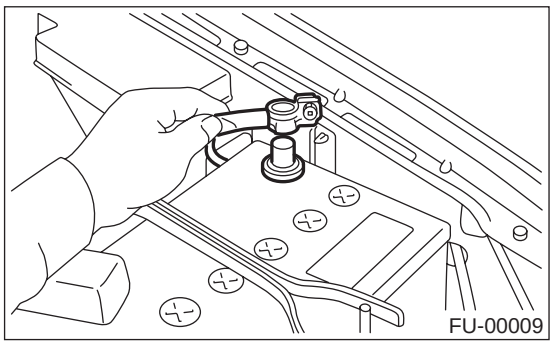
B: INSTALLATION

For work procedures, refer to “FU(H6)” section. <Ref. to FU(H6DO)-74, INSTALLATION, Fuel Sub Level Sensor.>

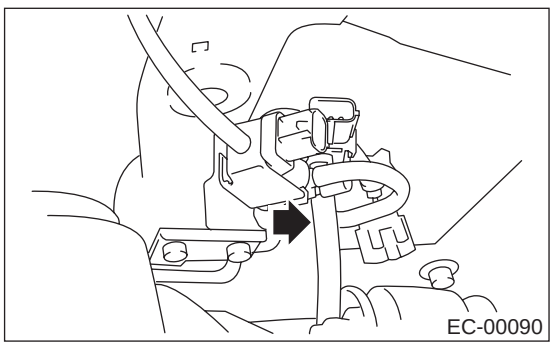
9. Fuel Tank Pressure Sensor

A: REMOVAL

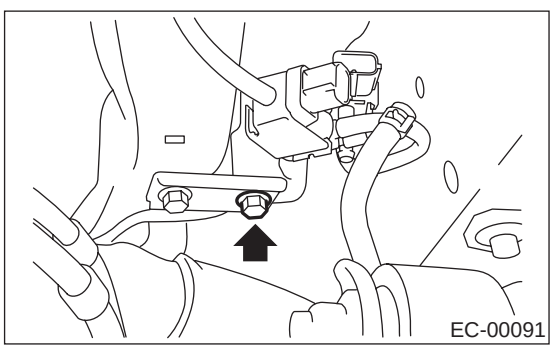
1) Set the vehicle on the lift.
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



4) Lift-up the vehicle.
5) Disconnect connector from fuel tank pressure sensor and atmospheric pressure solenoid valve.
6) Disconnect pressure hose from fuel tank pressure sensor.

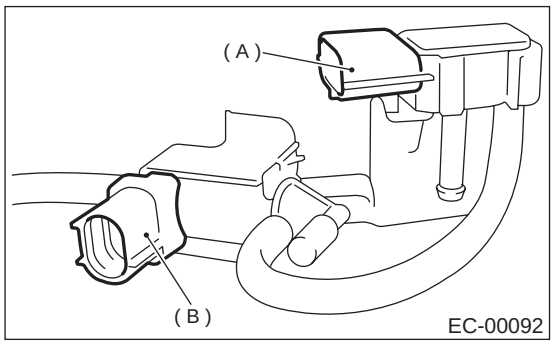


7) Remove fuel tank pressure sensor and atmospheric pressure solenoid valve with bracket.



8) Remove atmospheric pressure solenoid valve from bracket.

NOTE:
Fuel tank pressure sensor cannot be removed because it is integral with bracket.

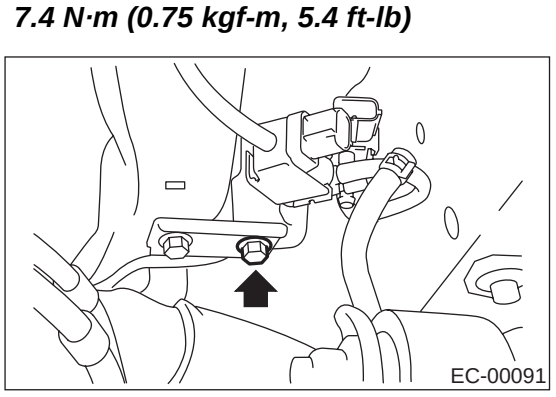


(A) Fuel tank pressure sensor
(B) Atmospheric pressure solenoid valve

B: INSTALLATION

Install in the reverse order of removal.

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



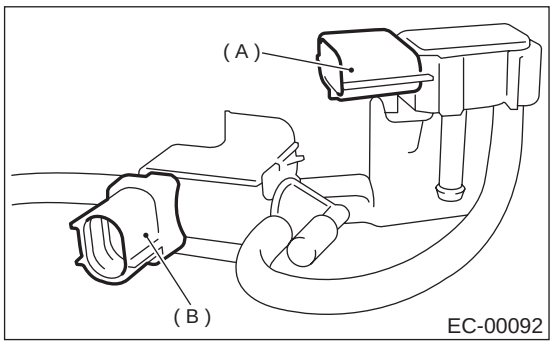
C: INSPECTION

Make sure that hoses are not cracked or loose.

10.Fuel Tank Sensor Control Valve

A: REMOVAL

1) Remove fuel tank pressure sensor. <Ref. to EC(H6DO)-14, REMOVAL, Fuel Tank Pressure Sensor.>
2) Remove fuel tank sensor control valve from bracket.



(1) Fuel tank pressure sensor
(2) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

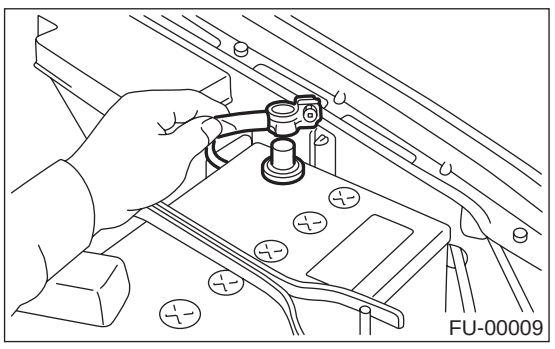
C: INSPECTION

Make sure that hoses are not cracked or loose.

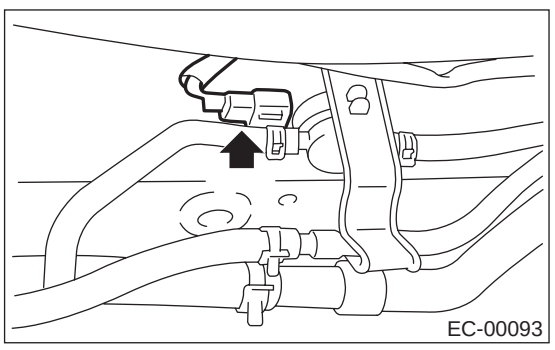
11.Pressure Control Solenoid Valve

A: REMOVAL

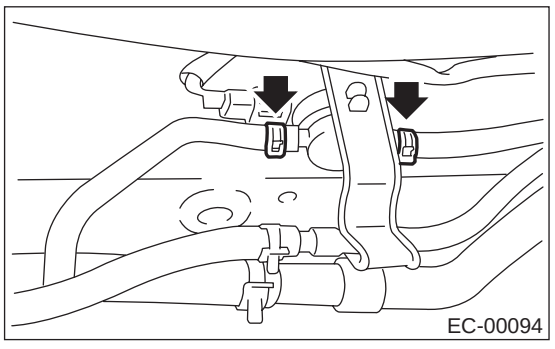
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



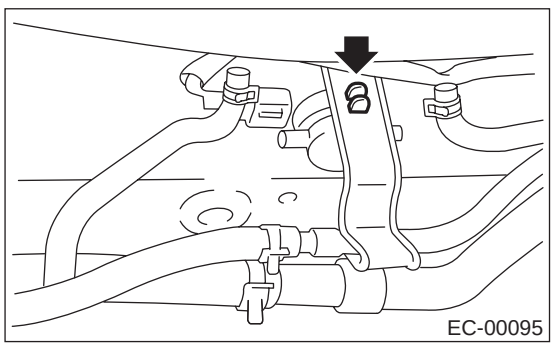
3) Lift-up the vehicle.
4) Disconnect connector from pressure control solenoid valve.



5) Disconnect two evaporation hoses from pressure control solenoid valve.



6) Remove pressure control solenoid valve from bracket.



B: INSTALLTION

Install in the reverse order of removal.

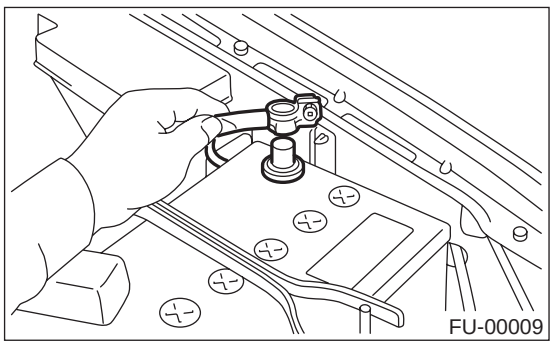
C: INSPECTION

Make sure that hoses are not cracked or loose.

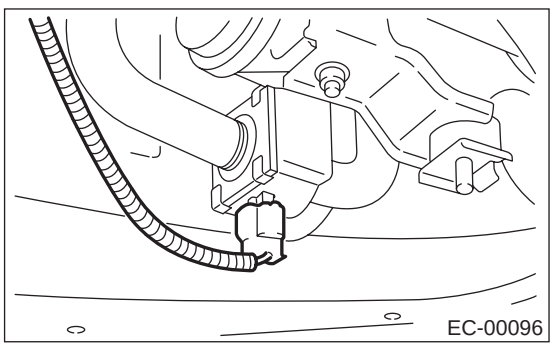
12.Drain Filter

A: REMOVAL

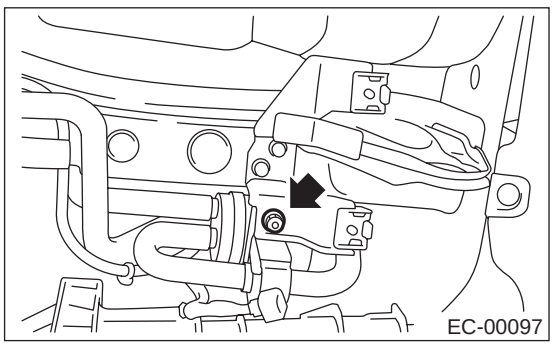
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



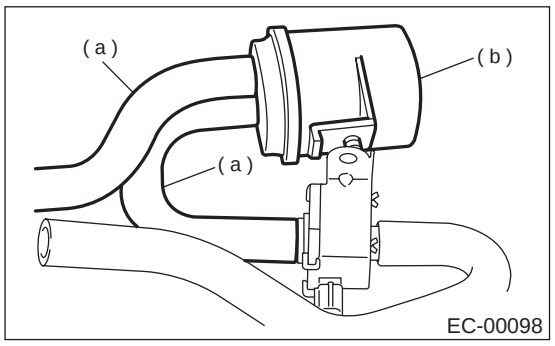
3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H6DO)-7, REMOVAL, Canister.>
5) Disconnect connector from drain valve.



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



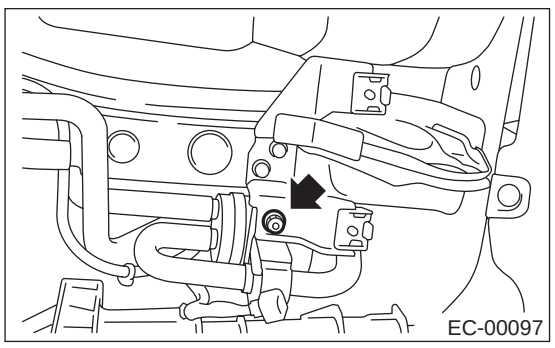
7) Disconnect evaporation hoses, (a) and remove drain filter (b).



B: INSTALLATION

Install in the reverse order of removal.

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



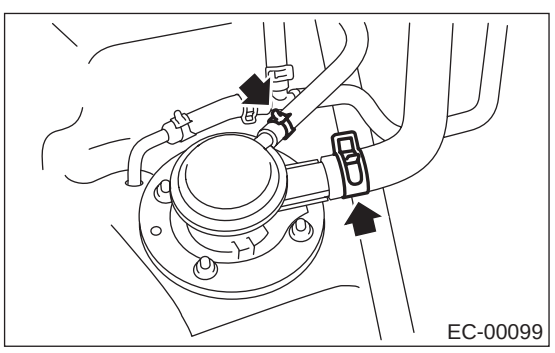
C: INSPECTION

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

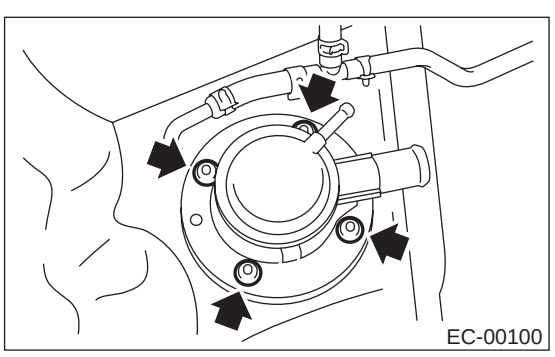
13.Vent Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Move clips, and disconnect hoses from vent valve.



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

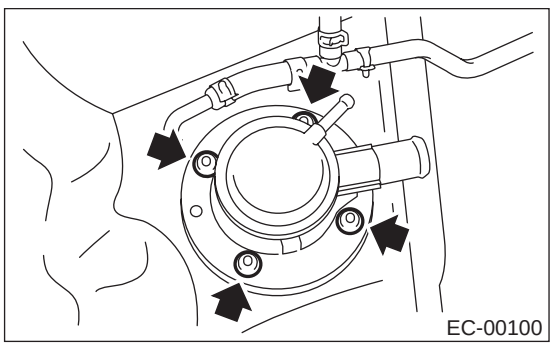


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace rubber seat with a new one.

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



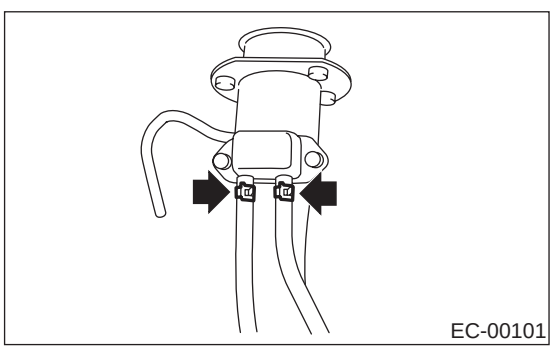
C: INSPECTION

Make sure that hoses are not cracked or loose.

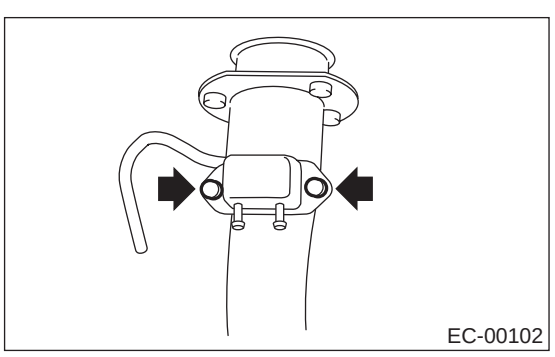
14.Shut Valve

A: REMOVAL

1) Drain fuel from fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Remove fuel filler pipe. <Ref. to FU(H6DO)-61, REMOVAL, Fuel Filler Pipe.>
3) Disconnect evaporation hoses from shut valve.



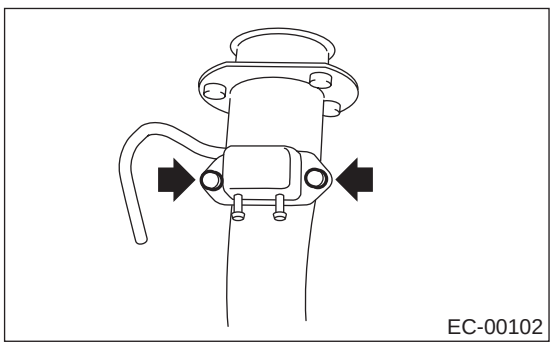
4) Remove shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

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



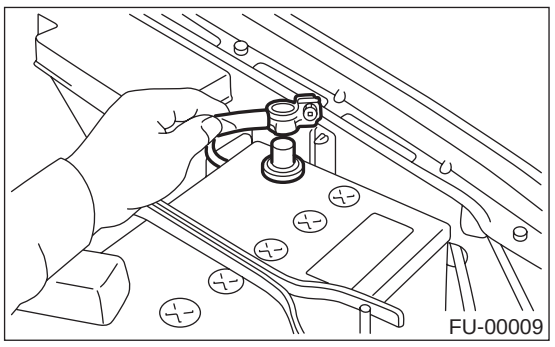
C: INSPECTION

Make sure that hoses are not cracked or loose.

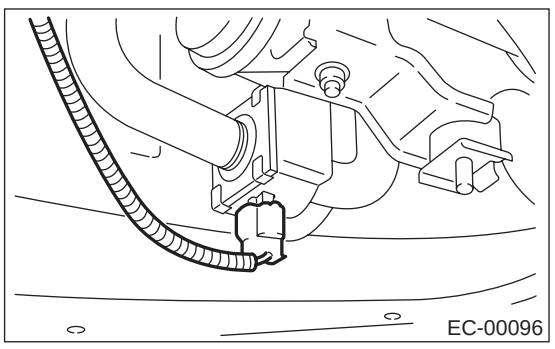
15.Drain Valve

A: REMOVAL

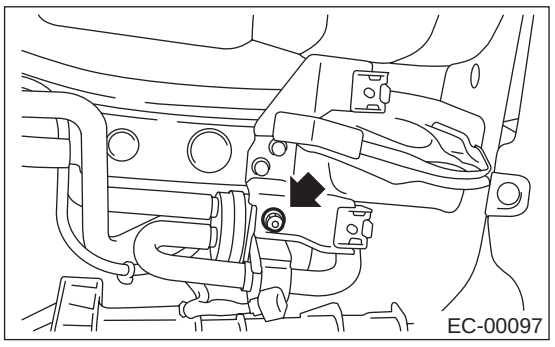
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



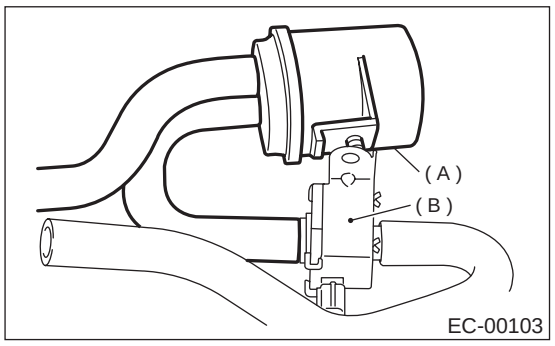
3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H6DO)-7, REMOVAL, Canister.>
5) Disconnect connector from drain valve.



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



7) Disconnect evaporation hose and remove drain valve.

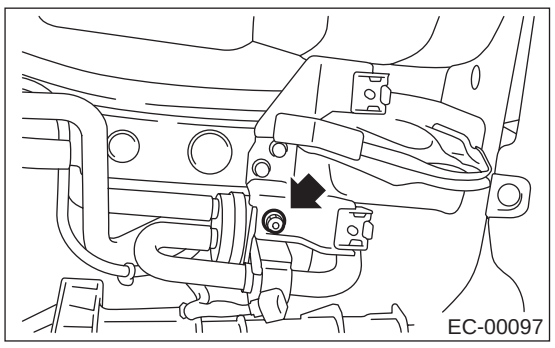


(1) Drain filter
(2) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

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

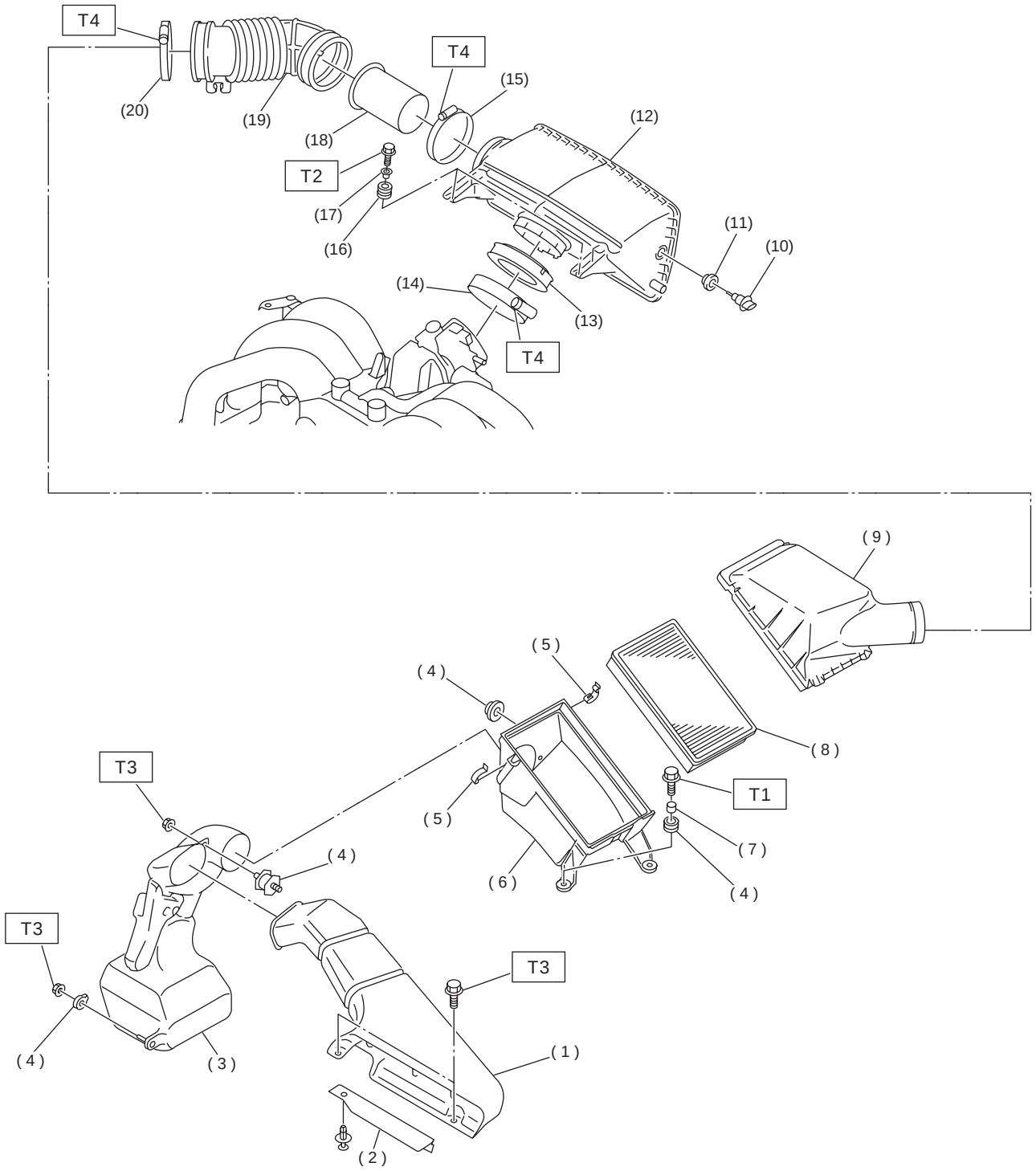


C: INSPECTION

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

1. General Description

A: COMPONENT



IN-00064

(1) Air intake duct
(2) Plate
(3) Resonator chamber
(4) Cushion
(5) Clip
(6) Air cleaner lower case
(7) Spacer
(8) Air cleaner element
(9) Air cleaner upper cover
(10) Intake air temperature sensor
(11) Grommet
(12) Air intake chamber
(13) Grommet
(14) Clamp
(15) Clamp
(16) Cushion
(17) Spacer
(18) Intake duct
(19) Air intake boot
(20) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32.3 (3.3, 23.9)
T2: 6.4 (0.65 4.7)
T3: 7.5 (0.76, 5.5)
T4: 3 (0.3, 2.2)

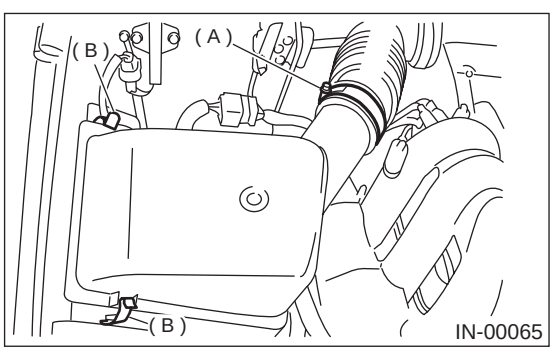
B: CAUTION

• 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 ground cable from battery.

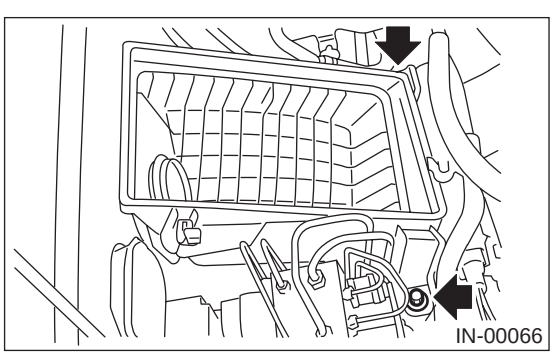
2. Air Cleaner

A: REMOVAL

1) Loosen clamp (A), and separate air cleaner upper cover from air intake boot.
2) Remove the clip (B) above the air cleaner upper cover.



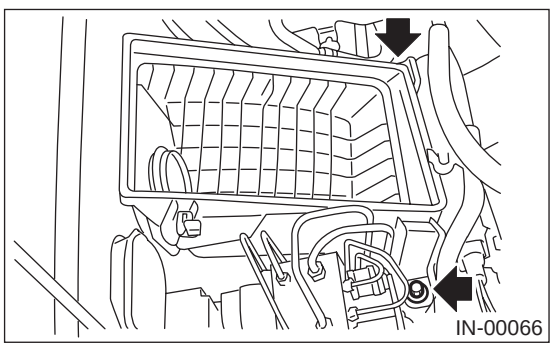
3) Remove air cleaner element.
4) Remove air cleaner lower case.



B: INSTALLATION

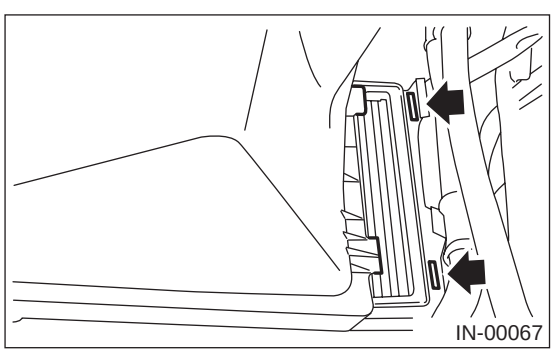
1) Install the air cleaner lower case.

Tightening torque:
32.3 N·m (3.3 kgf-m, 23.9 ft-lb)

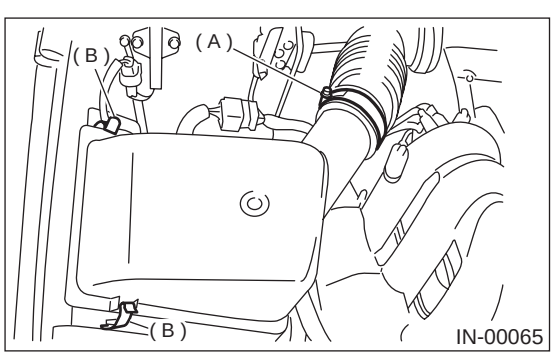


2) Set the air cleaner element.
3) Install the air cleaner upper cover.

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



4) Install the clip (B) above the air cleaner upper cover.
5) Tighten clamp (A), and connect air intake boot and air cleaner upper cover.



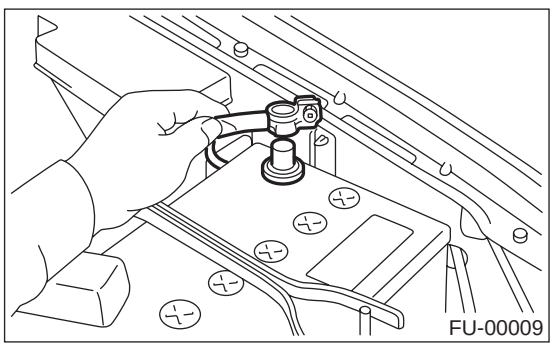
C: INSPECTION

Replace if excessively damaged or dirty.

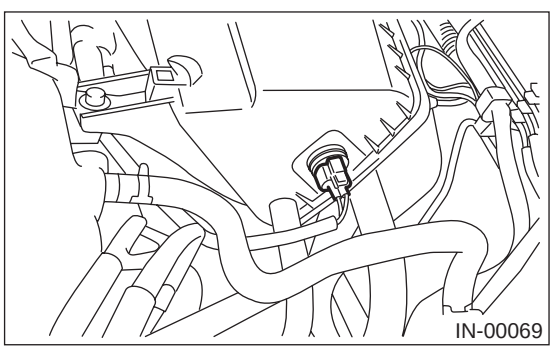
3. Air Intake Chamber

A: REMOVAL

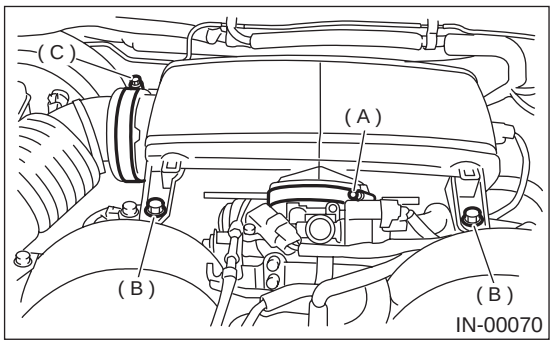
1) Disconnect battery ground cable.



2) Disconnect connector from intake air temperature sensor.



3) Loosen clamp (A) which connects air intake chamber to throttle body.
4) Remove bolts (B) which install air intake chamber to intake manifold.
5) Loosen clamp (C) which connects air intake chamber to air intake boot.



6) Disconnect hoses from air intake chamber.
7) Remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

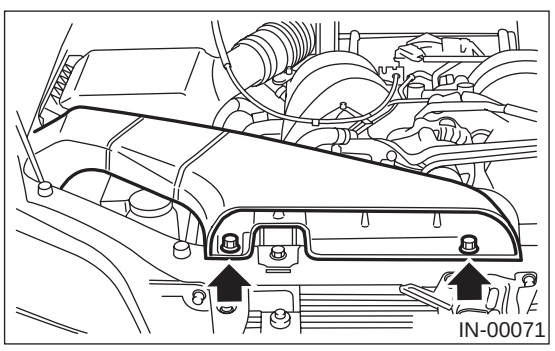
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

Remove bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

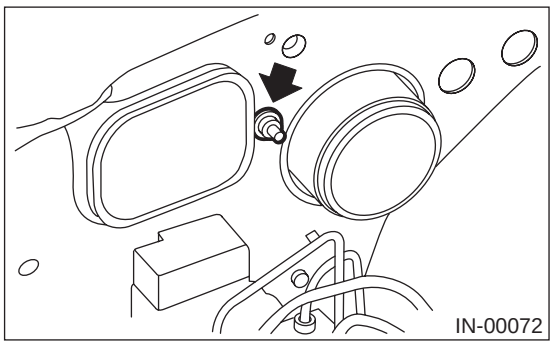
C: INSPECTION

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

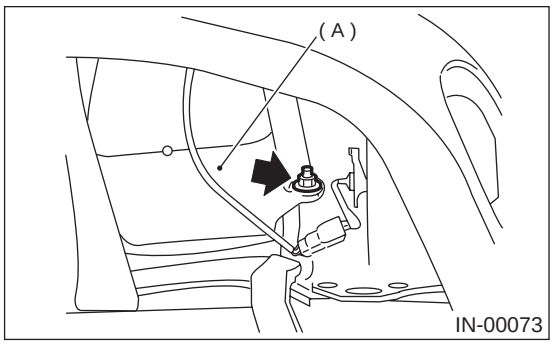
5. Resonator Chamber

A: REMOVAL

1) Set vehicle on a lift.
2) Remove air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on the right of engine compartment.



5) Remove the front right tire, and lift the vehicle.
6) Remove front mudguard RH.
7) Remove the resonator chamber (A) from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

1. General Description

A: SPECIFICATIONS

Engine	Type		Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve arrangement		Chain driven, double over-head camshaft, 4-valve/cylinder
	Bore x Stroke mm (in)		89.2 x 80 (3.512 x 3.150)
	Displacement cm^3 (cu in)		3,000 (183)
	Compression ratio		10.7
	Compression pressure (350 rpm and fully open throttle) kPa (kg/cm^2, psi)		1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings		Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	5° BTDC
		Closing	55° ABDC
	Exhaust valve timing	Opening	52° BBDC
		Closing	0° ATDC
	Valve clearance	Intake mm (in)	$0.20^{+0.04}/_{-0.06}$ ($0.0079^{+0.0016}/_{-0.0024}$)
		Exhaust mm (in)	0.25±0.05 (0.0098±0.0020)
	Idle speed [At “P” or “N” position] rpm		600±50 (No load) 700±50 (A/C switch ON)
	Firing order		1 → 6 → 3 → 2 → 5 → 4
	Ignition timing BTDC/rpm		10°±8°/600

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

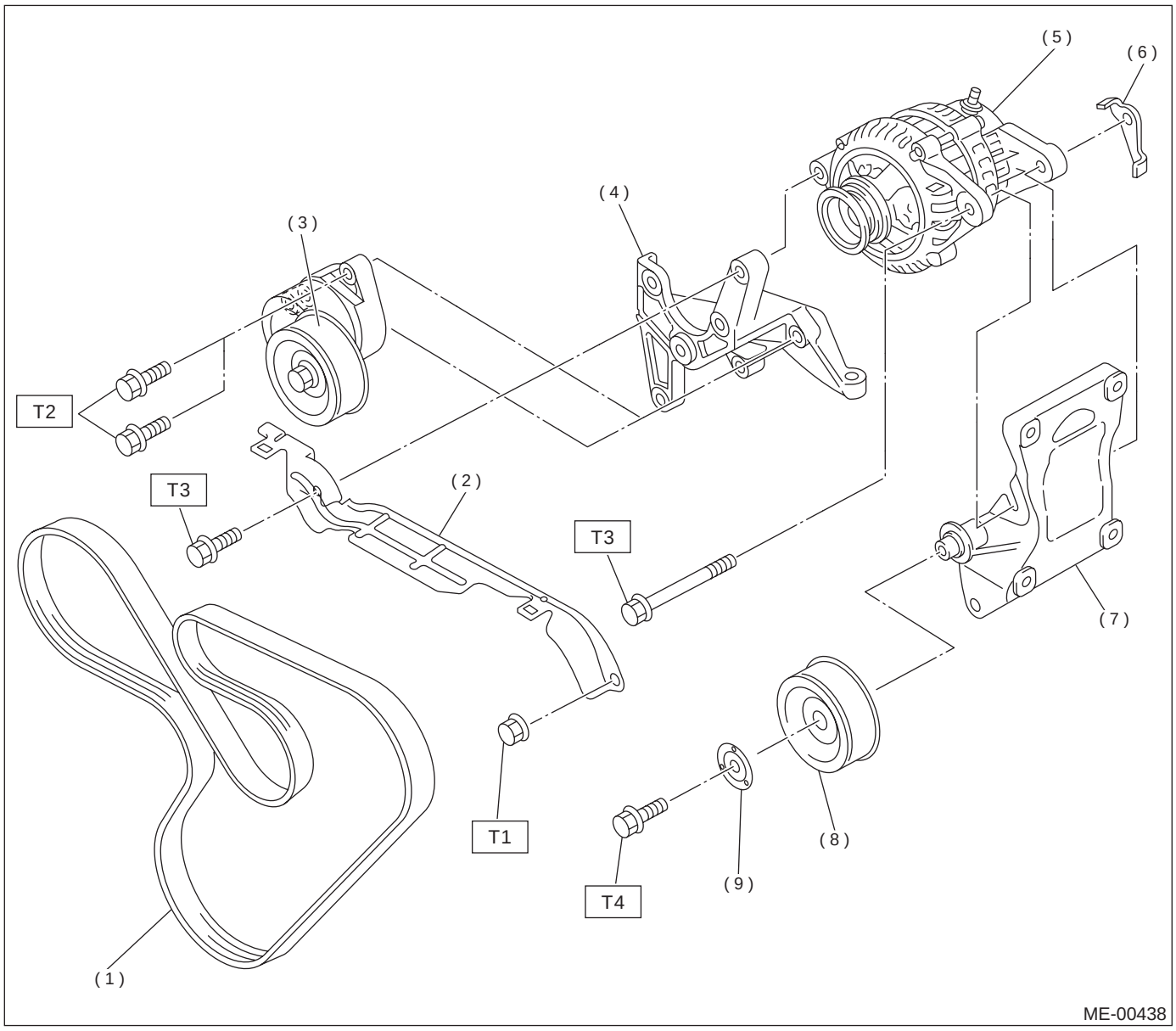
Camshaft	Bend limit			0.020 mm (0.0008 in)
	Thrust clearance	Intake	STD	0.075 — 0.135 mm (0.0030 — 0.0053 in)
			Limit	0.155 mm (0.0061 in)
		Exhaust	STD	0.048 — 0.108 mm (0.0019 — 0.0043 in)
			Limit	0.130 mm (0.0051 in)
	Cam lobe height	Intake	STD	45.75 — 45.85 mm (1.8012 — 1.8051 in)
			Limit	45.65 mm (1.7972 in)
		Exhaust	STD	45.25 — 45.35 mm (1.7815 — 1.7854 in)
			Limit	45.15 mm (1.7776 in)
	Camshaft journal O.D.	Front		37.946 — 37.963 mm (1.4939 — 1.4946 in)
		Center & Rear		27.946 — 27.963 mm (1.1002 — 1.1009 in)
	Camshaft journal hole I.D.	Front		38.000 — 38.018 mm (1.4961 — 1.4968 in)
		Center & Rear		28.000 — 28.018 mm (1.1024 — 1.1031 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			124 mm (4.88 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			5.500 — 5.512 mm (0.2165 — 0.2170 in)
	Protrusion above head		Intake	12.3 — 12.7 mm (0.484 — 0.500 in)

Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)
			Limit	0.8 mm (0.315 in)
		Exhaust	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.315 in)
	Stem diameter		Intake	5.455 — 5.470 mm (0.2148 — 0.2154 in)
			Exhaust	5.455 — 5.460 mm (0.2148 — 0.2150 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	103.5 mm (4.07 in)
			Exhaust	103.2 mm (4.06 in)
Valve spring	Free length			46.79 mm (1.8421 in)
	Squareness			2.5°, 2.0 mm (0.079 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	89.205 — 89.215 mm (3.5120 — 3.5124 in)
			B	89.195 — 89.205 mm (3.5116 — 3.5120 in)
	Taper		Limit	0.050 mm (0.0020 in)
	Out-of-round-ness		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	89.185 — 89.195 mm (3.5112 — 3.5116 in)
			B	89.175 — 89.185 mm (3.5108 — 3.5112 in)
		0.25 mm (0.0098 in) OS		89.425 — 89.435 mm (3.5207 — 3.5211 in)
		0.50 mm (0.0197 in) OS		89.675 — 89.685 mm (3.5305 — 3.5309 in)
	Standard inner diameter of piston pin hole			22.000 — 22.006 mm (0.8661 — 0.8664 in)
Piston pin	Outer diameter			21.994 — 22.000 mm (0.8659 — 0.8661 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 — 0.60 mm (0.0079 — 0.0236 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.022 — 0.052 mm (0.0009 — 0.0020 in)
			Limit	0.065 mm (0.0026 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US	1.520 — 1.523 mm (0.0598 — 0.0600 in)
			0.25 mm (0.0098 in) US	1.620 — 1.623 mm (0.0638 — 0.0639 in)

Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 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, #3, #5, #7	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
		#2, #4, #6	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance		STD	0.015 — 0.030 mm (0.0006 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3, #5, #7	STD	1.992 — 2.005 mm (0.0784 — 0.0789 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, #4, #5	STD	1.996 — 2.000 mm (0.0786 — 0.0787 in)
			0.03 mm (0.0012 in) US	2.019 — 2.020 mm (0.0795 — 0.0795 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

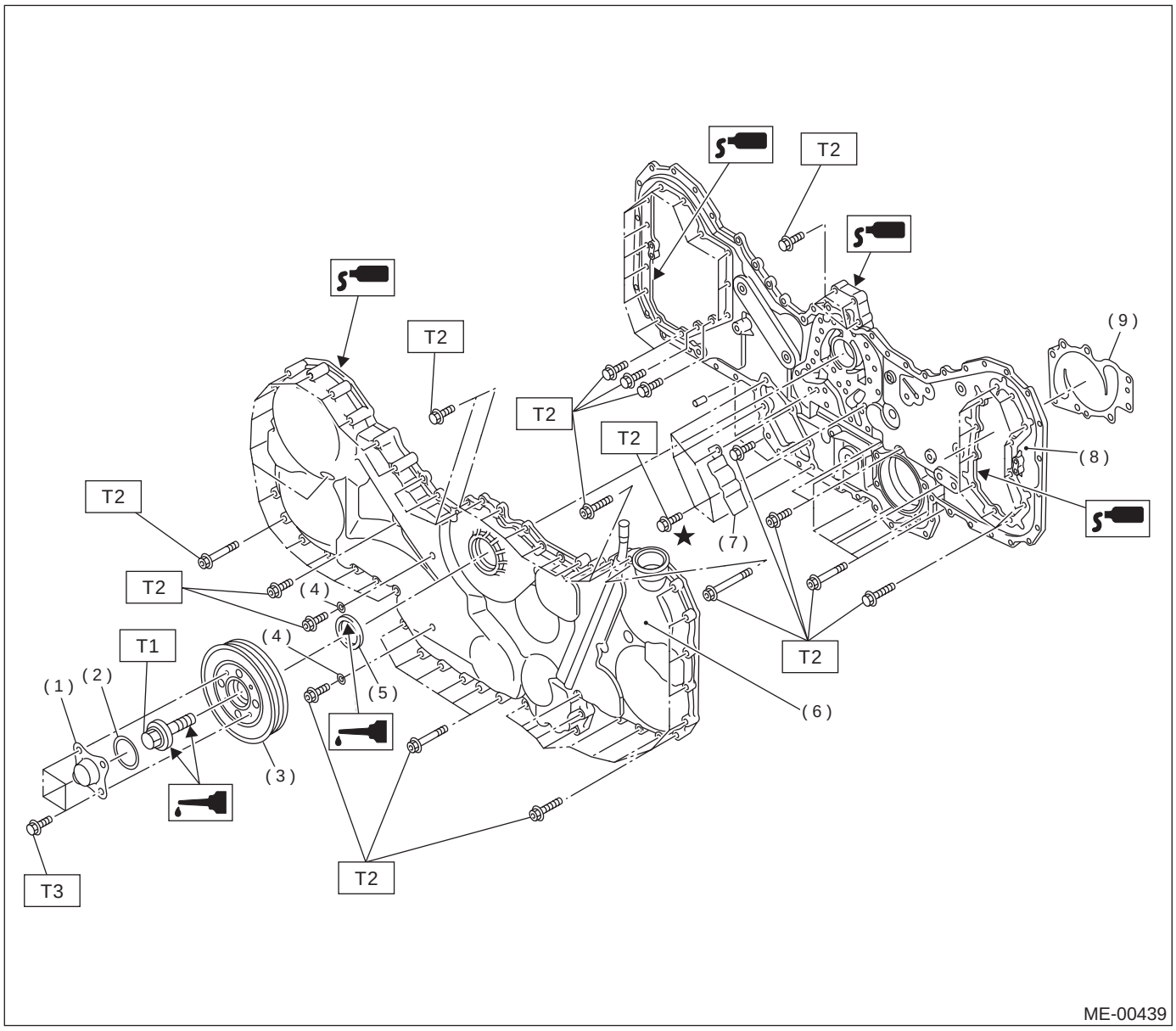
1. V-BELT



(1) V-belt
(2) Belt cover
(3) Belt tensioner
(4) Power steering pump bracket
(5) Generator
(6) Generator plate
(7) A/C compressor stay
(8) Idler pulley
(9) Idler pulley cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 20 (2.0, 14)
T3: 25 (2.5, 18)
T4: 33 (3.4, 25)

2. TIMING CHAIN COVER



(1) Crank pulley cover
(2) O-ring
(3) Crank pulley
(4) Sealing washer
(5) Oil seal
(6) Front chain cover
(7) Baffle
(8) Rear chain cover
(9) Water pump gasket

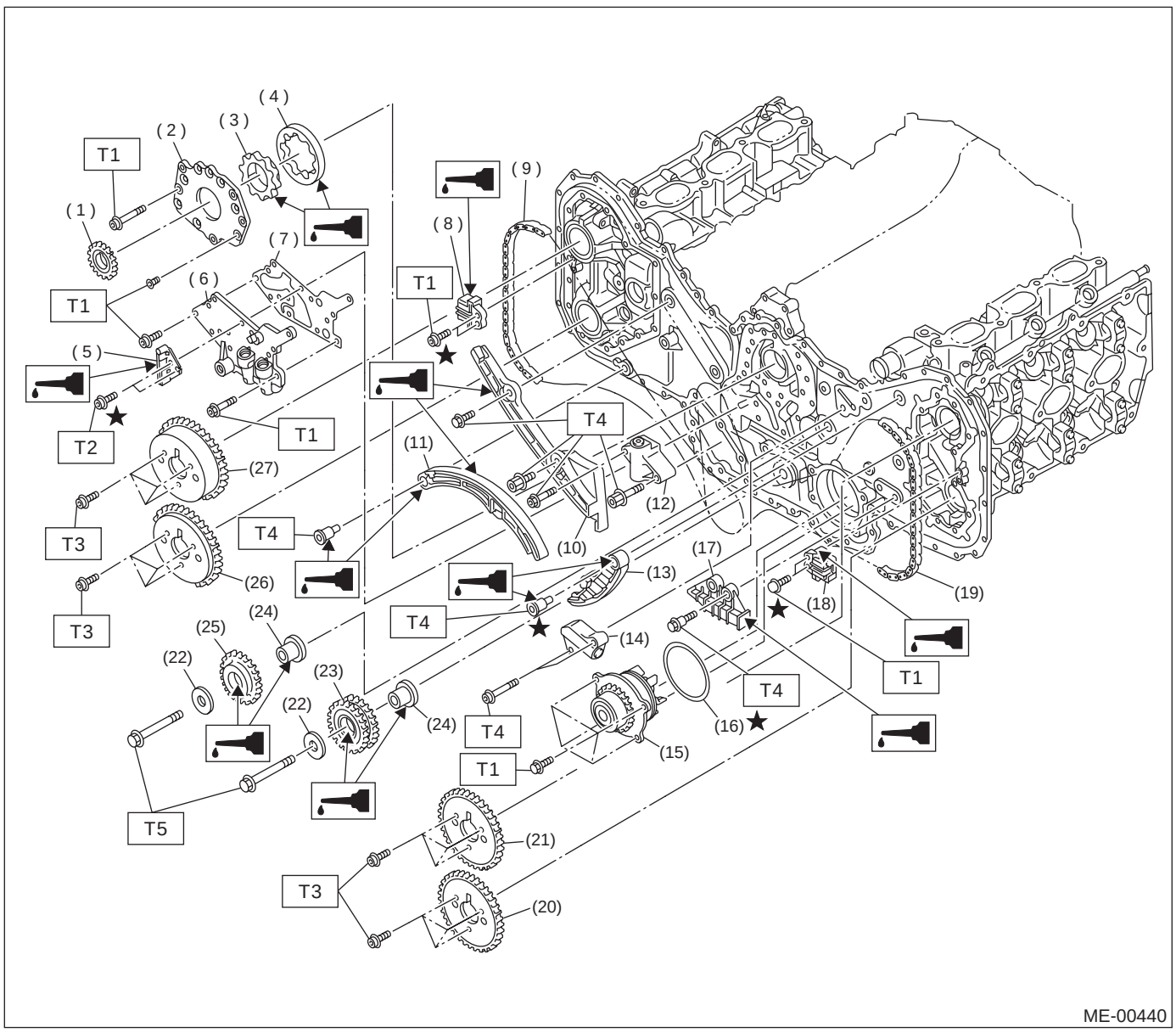
Tightening torque: N·m (kgf-m, ft-lb)

T1: ***<Ref. to ME(H6DO)-38, Crankshaft Pulley.>***

T2: ***<Ref. to ME(H6DO)-39, Front Chain Cover.>***

T3: ***6.4 (0.65, 4.7)***

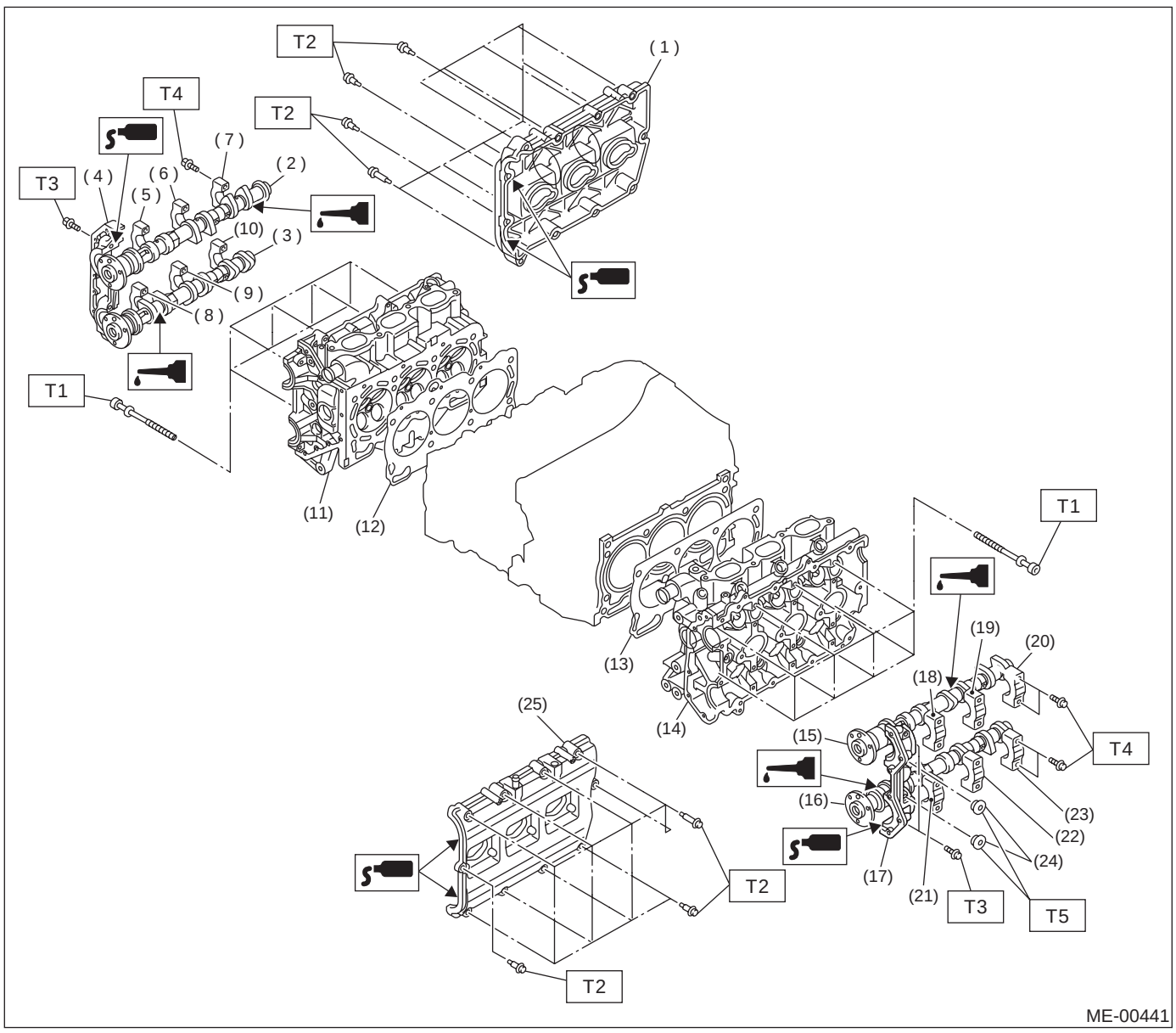
3. TIMING CHAIN



(1) Crank sprocket
(2) Oil pump cover
(3) Inner rotor
(4) Outer rotor
(5) Chain guide (Center)
(6) Relief valve case
(7) Relief valve case gasket
(8) Chain guide (Right-hand between cams)
(9) Timing chain (RH)
(10) Chain guide (RH)
(11) Chain tensioner lever (RH)
(12) Chain tensioner (RH)
(13) Chain tensioner lever (LH)
(14) Chain tensioner (LH)
(15) Water pump
(16) O-ring
(17) Chain guide (LH)
(18) Chain guide (Left-hand between cams)
(19) Timing chain (LH)
(20) Exhaust cam sprocket (RH)
(21) Intake cam sprocket (RH)
(22) Idler sprocket plate
(23) Idler sprocket (Lower)
(24) Idler sprocket color
(25) Idler sprocket (Upper)
(26) Exhaust cam sprocket (LH)
(27) Intake cam sprocket (LH)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.64, 4.7)
T2: 7.8 (0.80, 5.8)
T3: 13 (1.3, 9.4)
T4: 16 (1.6, 11.6)
T5: 69 (7.0, 50.6)

4. CYLINDER HEAD AND CAMSHAFT

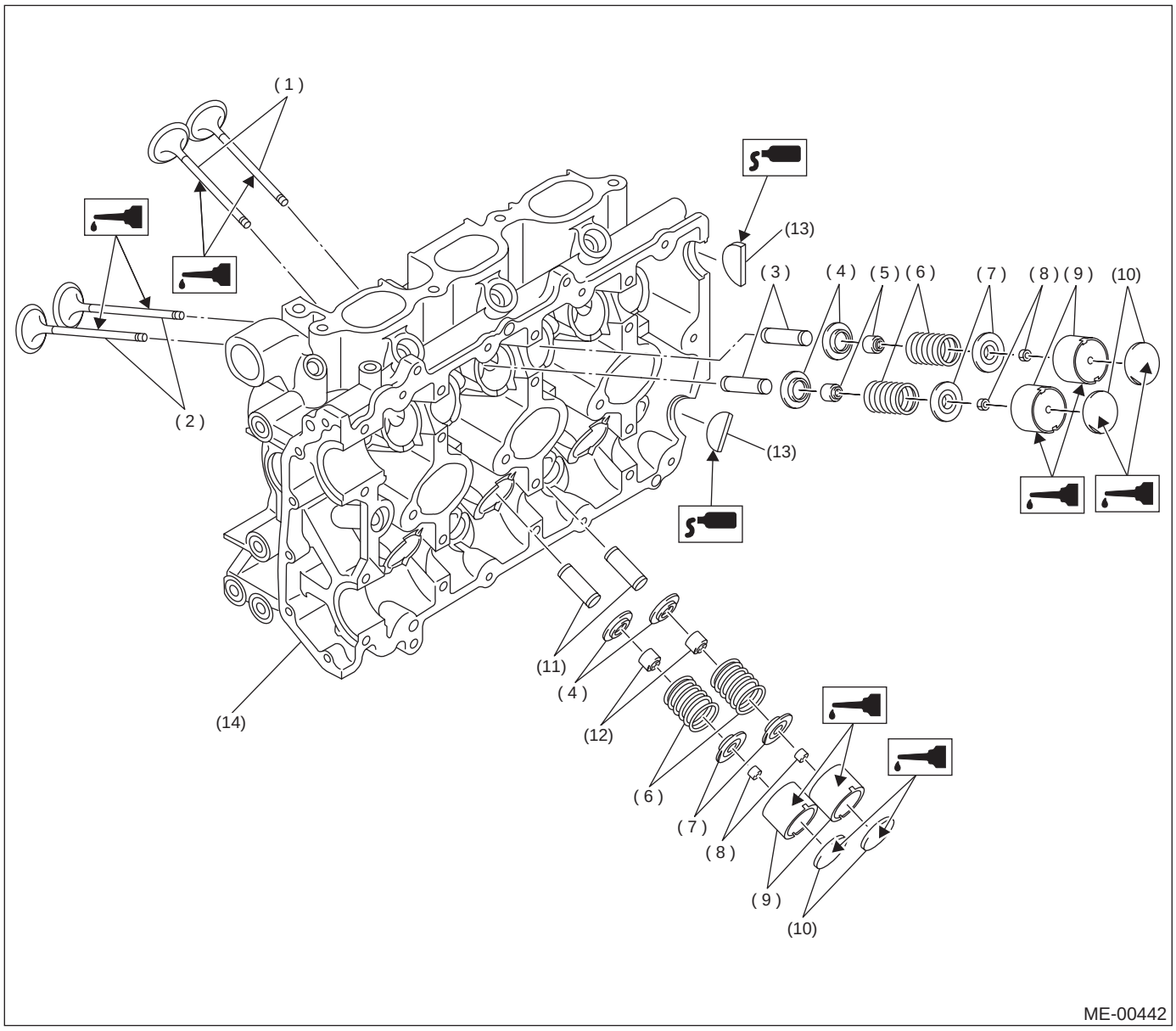


(1) Rocker cover (RH)
(2) Intake camshaft (RH)
(3) Exhaust camshaft (RH)
(4) Front camshaft cap (RH)
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Exhaust camshaft cap (Front RH)
(9) Exhaust camshaft cap (Center RH)
(10) Exhaust camshaft cap (Rear RH)
(11) Cylinder head (RH)
(12) Cylinder head gasket (RH)
(13) Cylinder head gasket (LH)
(14) Cylinder head (LH)
(15) Intake camshaft (LH)
(16) Exhaust camshaft (LH)
(17) Front camshaft cap (LH)
(18) Intake camshaft cap (Front LH)
(19) Intake camshaft cap (Center LH)
(20) Intake camshaft cap (Rear LH)
(21) Exhaust camshaft cap (Front LH)
(22) Exhaust camshaft cap (Center LH)
(23) Exhaust camshaft cap (Rear LH)
(24) Plug
(25) Rocker cover (LH)

Tightening torque: N·m (kgf-m, ft-lb)

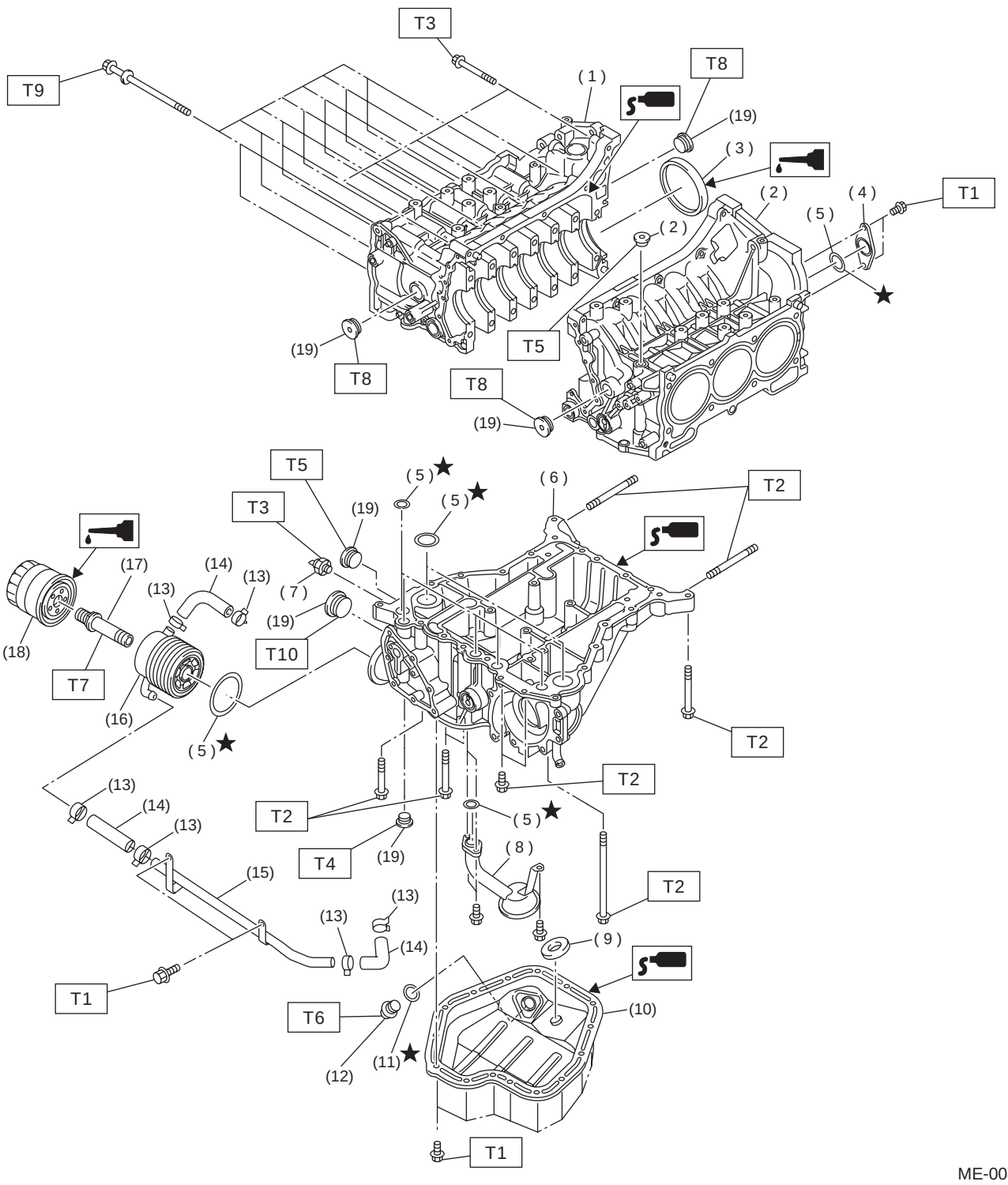
T1: <Ref. to ME(H6DO)-54, Cylinder Head Assembly.>
T2: <Ref. to ME(H6DO)-50, Camshaft.>
T3: 9.8 (1.0, 7.2)
T4: 16 (1.6, 12)
T5: 59 (6.0, 43)

5. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Intake valve guide
(4) Valve spring seat
(5) Intake valve stem seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Shim
(11) Exhaust valve guide
(12) Exhaust valve stem seal
(13) Cylinder head plug
(14) Cylinder head

6. CYLINDER BLOCK

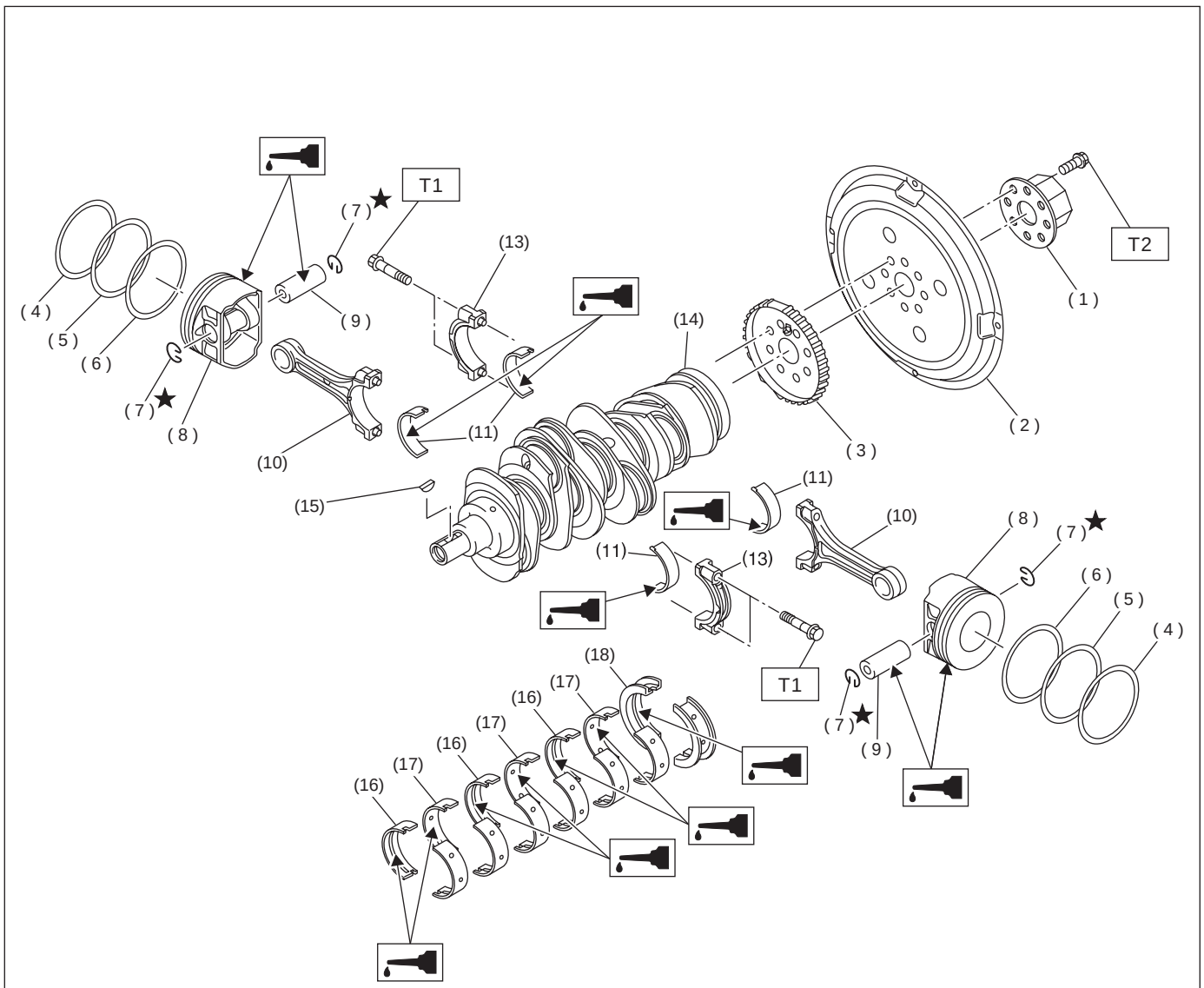


ME-00443

(1) Cylinder block (RH)
(2) Cylinder block (LH)
(3) Rear oil seal
(4) Service hole cover
(5) O-ring
(6) Oil pan upper
(7) Oil pressure switch
(8) Oil strainer
(9) Magnet
(10) Oil pan
(11) Metal gasket
(12) Drain plug
(13) Clamp
(14) Hose
(15) Oil cooler pipe
(16) Oil cooler
(17) Connector
(18) Oil filter
(19) Plug

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.65, 4.7)***
T2:	***18 (1.8, 13.0)***
T3:	***25 (2.5, 18)***
T4:	***34 (3.5, 25)***
T5:	***37 (3.8, 27)***
T6:	***44 (4.5, 33)***
T7:	***54 (5.5, 40)***
T8:	***69 (7.0, 51)***
T9:	***<Ref. to ME(H6DO)-60, Cylinder Block.>***
T10:	***90 (9.2, 67)***

7. CRANKSHAFT AND PISTON

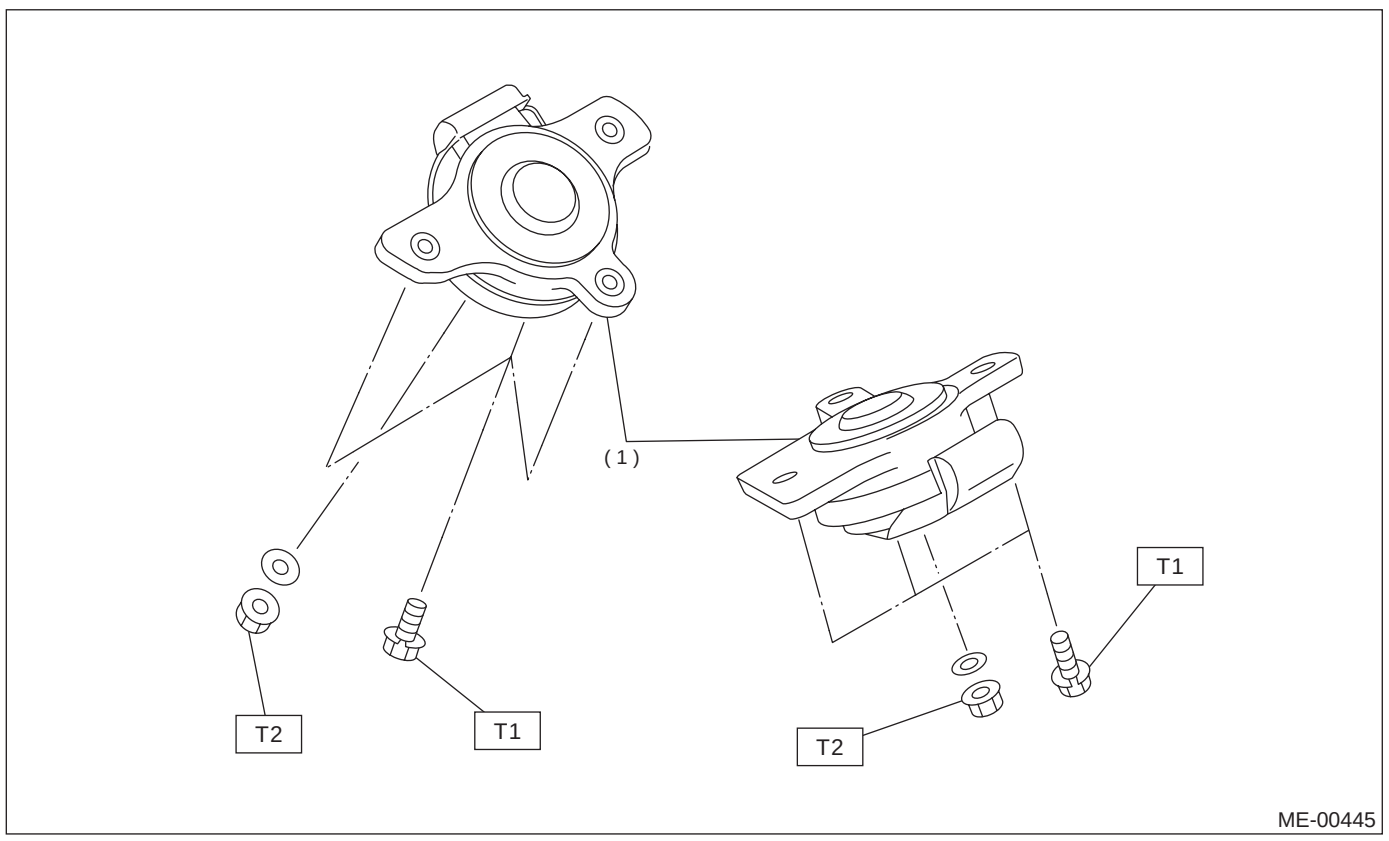


ME-00444

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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 53 (5.4, 39)
T2: 81 (8.3, 60)

8. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 34 (3.5, 25.3)
T2: 74 (7.5, 54)

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 ground cable 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 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 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

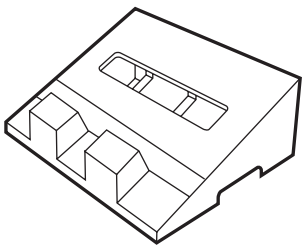
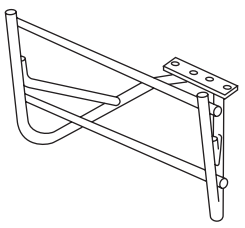
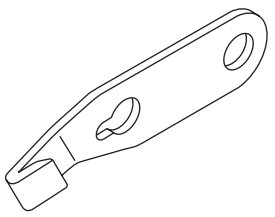
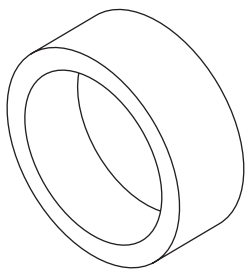
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA000	18250AA000	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST18232AA000	18232AA000	ENGINE STAND	Used for engine disassembly and assembly.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST18254AA000	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

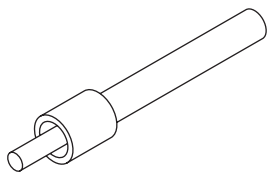
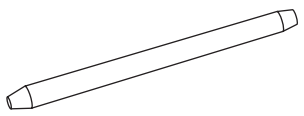
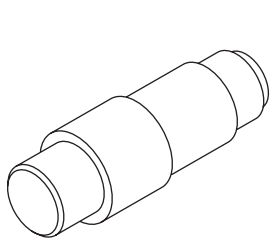
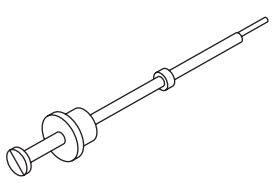
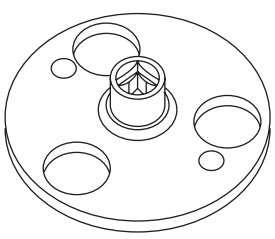
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498857100	498857100	VALVE STEM SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide stem seals.
 ST18253AA000	18253AA000	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097500	499097500	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST18231AA000	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

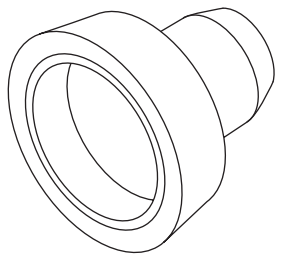
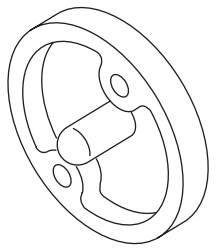
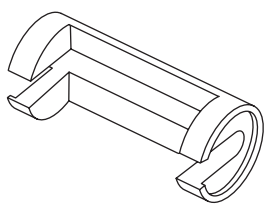
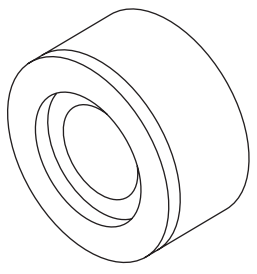
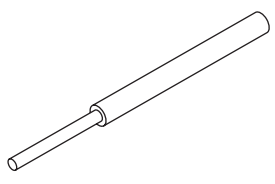
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA000	18251AA000	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.

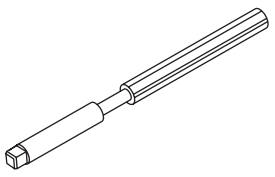
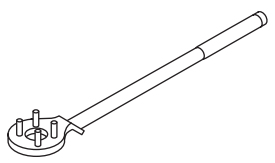
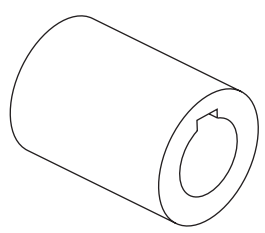
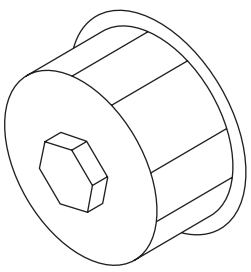
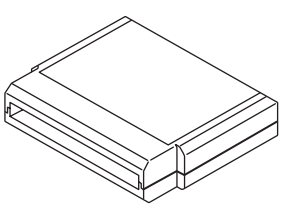
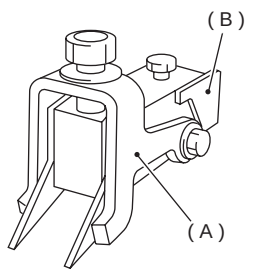
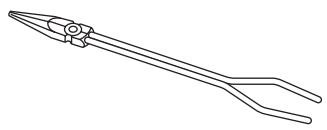
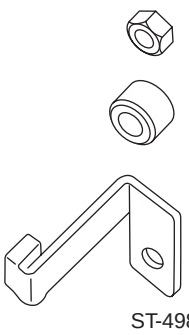
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST22771AA020	22771AA020	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA020 (With printer) 22771AA030 (Without printer)
 ST18329AA000	18329AA000	SHIM REPLACER ASSY	Used for correct valve clearance.
	A: 18330AA010	LIFTER	If 498187200 SHIM REPLACER ASSY (H4) tool is available, it is commonly used for H6 by partially replacing the following parts: • LIFTER (H4) → LIFTER (H6) A: 18330AA010 • SLIDER (H4) → SLIDER (H6) B: 18351AA000
	B: 18351AA000	SLIDER	
 ST18233AA000	18233AA000	PISTON PIN CIRCLIP PLIERS	Used for removing piston pin circlip.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

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.

- Camshaft
- Cylinder Head

2. Compression

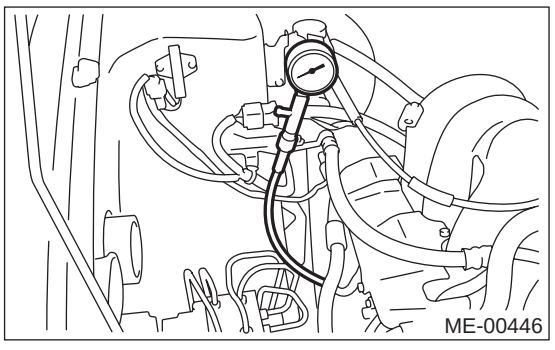
A: INSPECTION

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

1) After warming-up the engine, turn ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
5) Check the starter motor for satisfactory performance and operation.
6) 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.

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



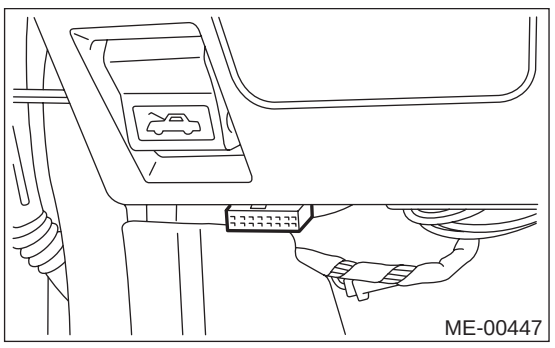
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,275 — 1,471 kPa (13.0 — 15.0 kg/cm^2, 185 — 213 psi)
Limit;
1,128 kPa (11.5 kg/cm^2, 164 psi)

3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect SUBARU SELECT MONITOR to the data link connector.


ME-00447

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

NOTE:
• When using the OBD-II general scan tool, carefully read its operation manual.
• This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

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

Idle speed (No load and gears in N or P position):
600±50 rpm

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

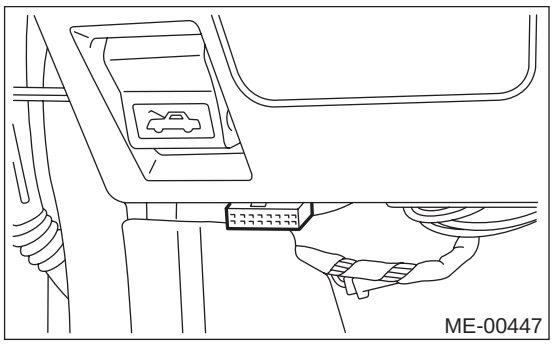
Idle speed [A/C "ON", no load and gears in N or P position]:
700±50 rpm

CAUTION:
Idle speed cannot be adjusted manually because it is controlled automatically. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1) Before checking ignition timing, check the following:
   (1) Ensure that air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect SUBARU SELECT MONITOR to the data link connector.


ME-00447

   (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
   (4) Select {2. Each System Check} in Main Menu.
   (5) Select {Engine Control System} in Selection Menu.
   (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select {1.12 Data Display} in Data Display Menu.
   (8) Start engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±8°/600

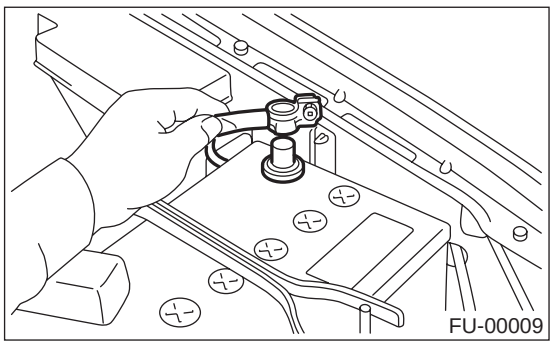
If the timing is not correct, check the ignition control system.
Refer to EN(H6) Engine Control System. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

5. Valve Clearance

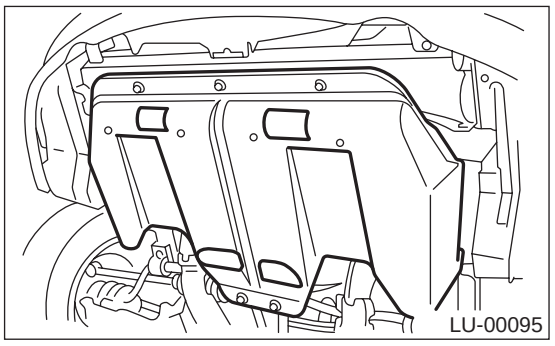
A: INSPECTION

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

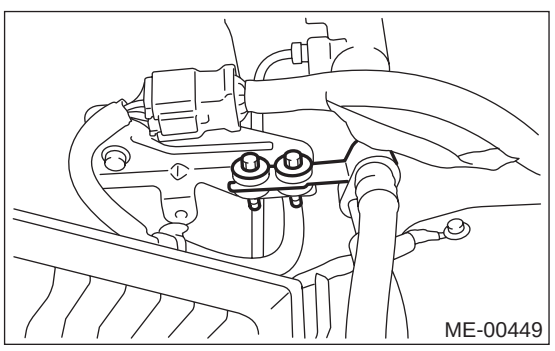
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.


FU-00009

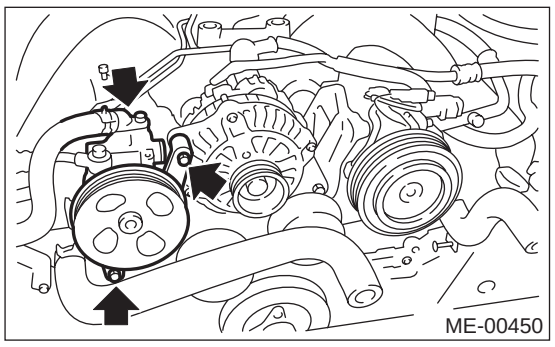
3) Lift up the vehicle.
4) Remove under cover.


LU-00095

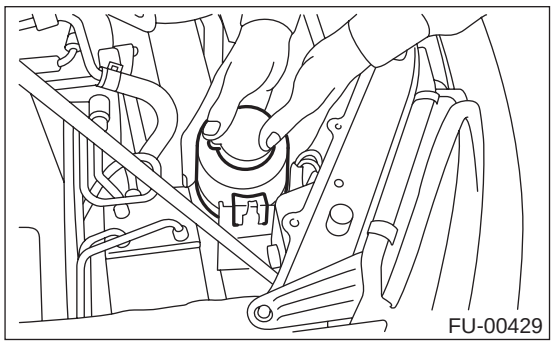
5) Lower the vehicle.
6) Place suitable container under the vehicle.
7) When inspecting RH side cylinder.
   (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
   (2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
   (3) Remove power steering hose from bracket.


ME-00449

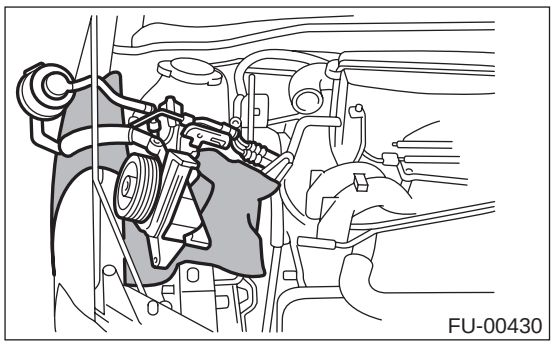
(4) Remove bolts which install power steering pump bracket.


ME-00450

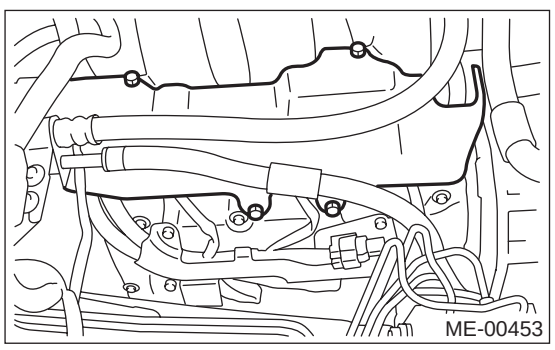
(5) Remove power steering tank from the bracket by pulling it upward.


FU-00429

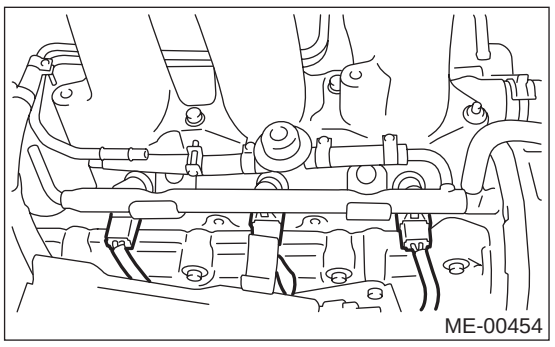
(6) Place power steering pump on the right side wheel apron.


FU-00430

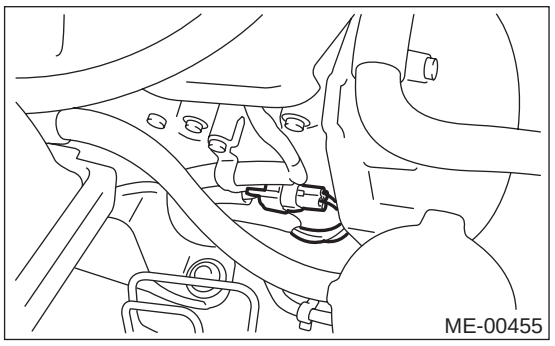
(7) Remove fuel pipe protector RH.


ME-00453

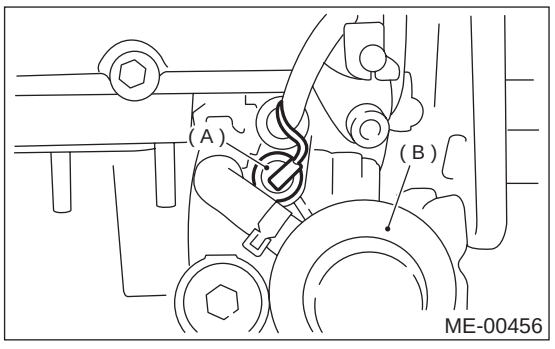
(8) Disconnect fuel injector connectors.


ME-00454

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


ME-00455

(10)Disconnect oil pressure switch connector.

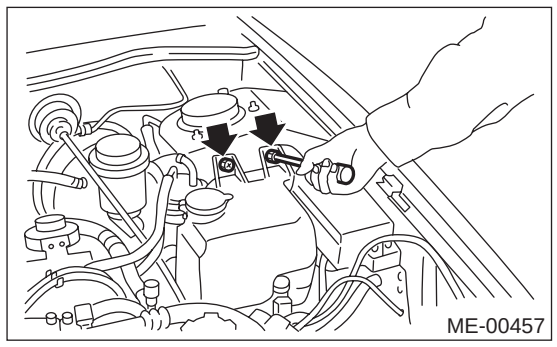


ME-00456

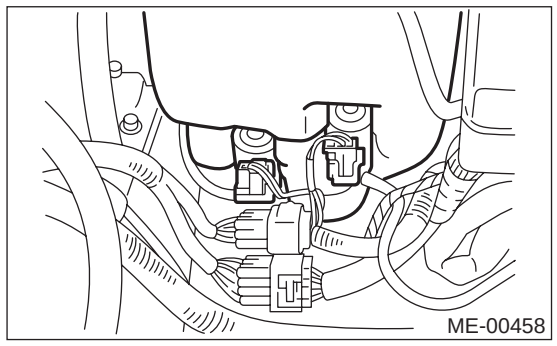
(A) Oil pressure switch
(B) Oil filter

(11)Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>
(12)Remove rocker cover RH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

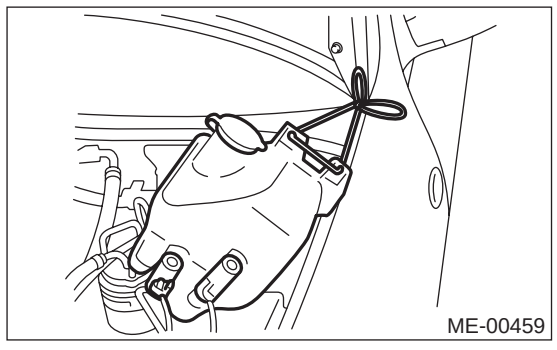
8) When inspecting LH side cylinder.
(1) Set the vehicle on the lift.
(2) Remove battery.
(3) Remove washer tank mounting bolts.


ME-00457

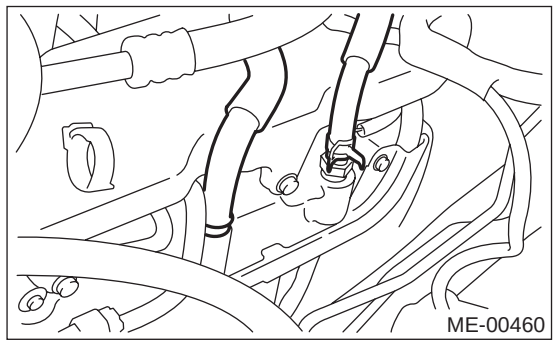
(4) Disconnect washer motor connectors.


ME-00458

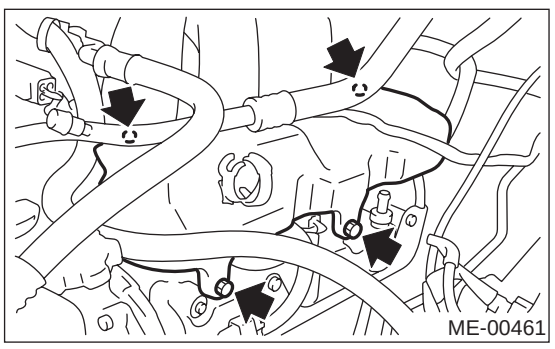
(5) Move washer tank upward.


ME-00459

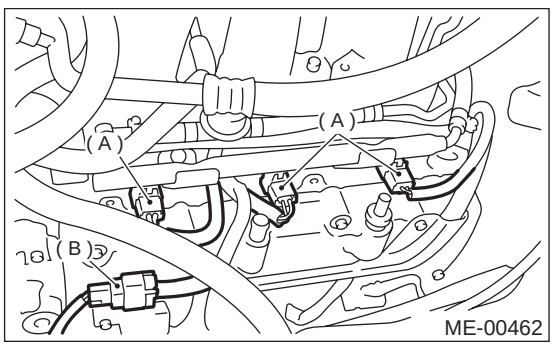
(6) Disconnect PCV and blow-by hose from rocker cover LH.


ME-00460

(7) Remove fuel pipe protector LH.

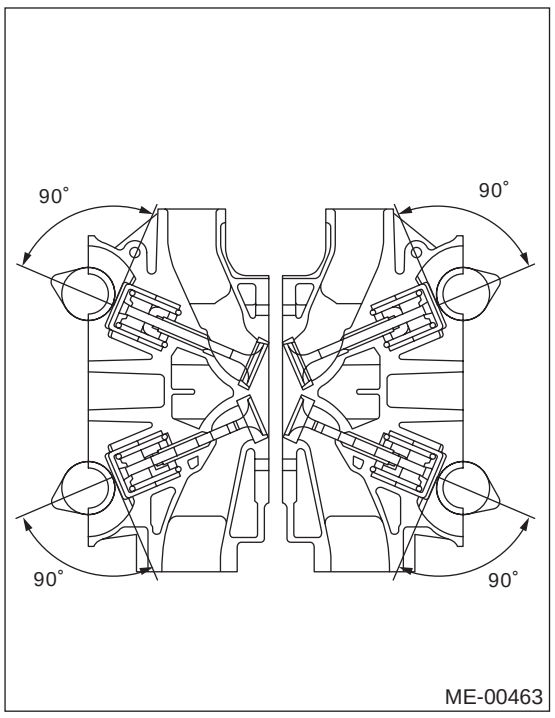


(8) Disconnect fuel injector connectors. (A)
(9) Disconnect front oxygen (A/F) sensor connector. (B)



(10)Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>
(11)Remove rocker cover LH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

9) Using the ST, turn the crankshaft clockwise. Adjust the camshaft position so that the cam lobe is perpendicular to the shim as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET

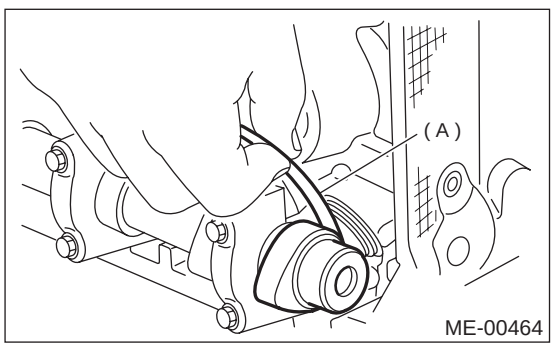


10) Measure intake valve and exhaust valve clearances by using thickness gauge (A).

CAUTION:
Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.

Valve clearance:
Intake: $0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.0024}$ in)
Exhaust: 0.25±0.05 mm (0.0098±0.0020 in)

NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



11) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-25, ADJUSTMENT, Valve Clearance.>

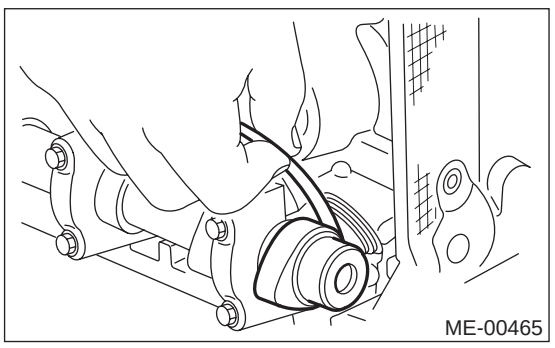
12) Further turn crankshaft pulley clockwise. Using the same procedure described previously, then measure valve clearances again.
13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

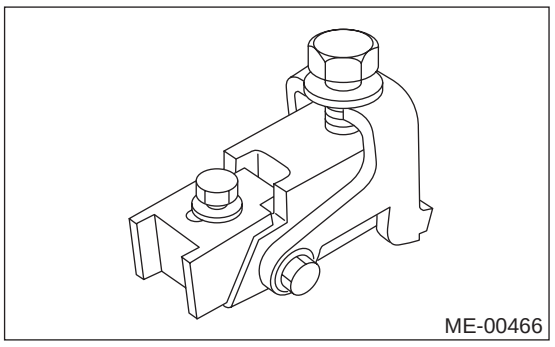
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(H6DO)-22, INSPECTION, Valve Clearance.>

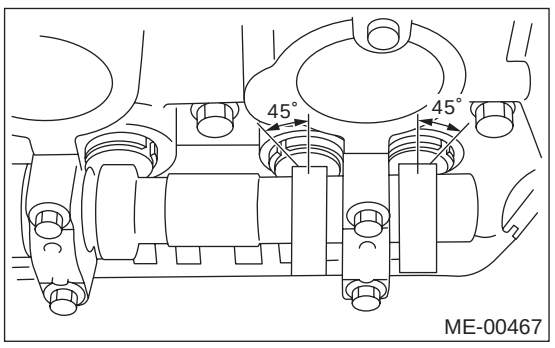
NOTE:
Record each valve clearance after it has been measured.


ME-00465

2) Remove shim from valve lifter.
(1) Prepare the ST.
ST 18329AA000 SHIM REPLACER
<Ref. to ME(H6DO)-14, PREPARATION TOOL, General Description.>

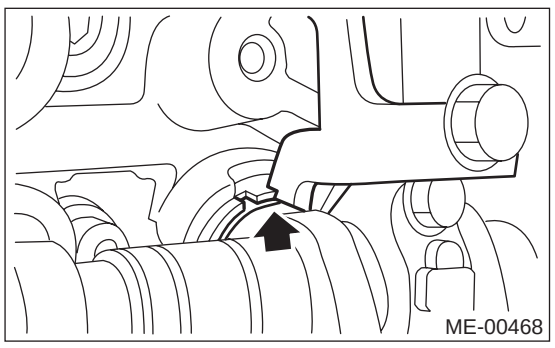

ME-00466

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



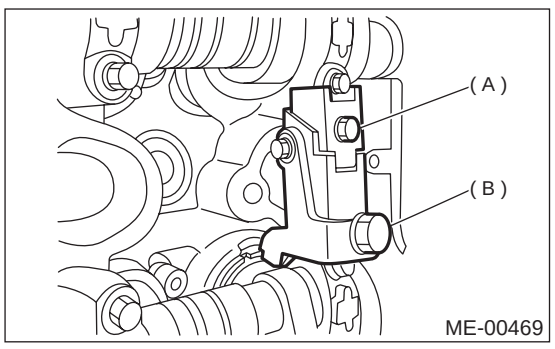
ME-00467

(3) Adjust SHIM REPLACER notch to valve lifter and set it.


ME-00468

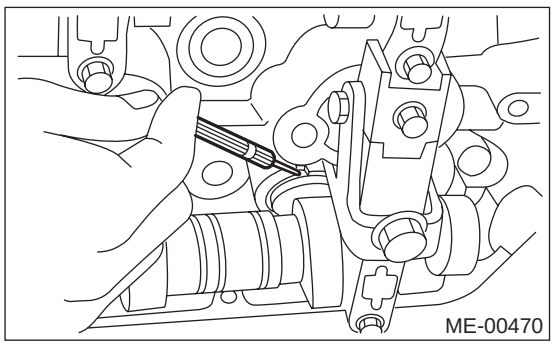
NOTE:
When setting, be careful SHIM REPLACER edge does not touch shim.

(4) Tighten bolt (A) and install it to the cylinder head.
(5) Tighten bolt (B) and insert the valve lifter.



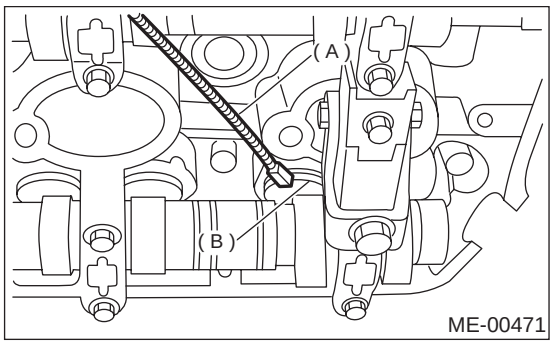
ME-00469

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

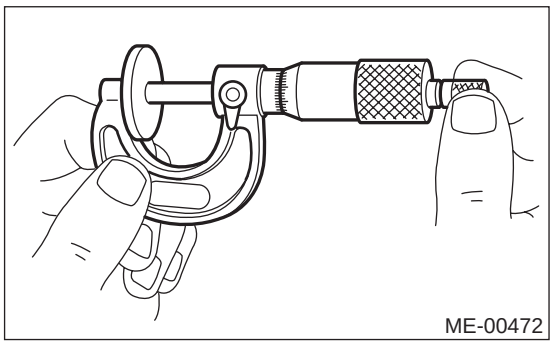

ME-00470

VALVE CLEARANCE

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



3) Measure thickness of shim with micrometer.



4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.
5) Set suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: S = (V + T) – 0.20 Exhaust valve: S = (V + T) – 0.25
S: Shim thickness to be used V: Measured valve clearance T: Shim thickness required

Part No.	Thickness mm (in)
13218 AK010	2.00 (0.0787)
13218 AK020	2.02 (0.0795)
13218 AK030	2.04 (0.0803)
13218 AK040	2.06 (0.0811)
13218 AK050	2.08 (0.0819)
13218 AK060	2.10 (0.0827)
13218 AK070	2.12 (0.0835)
13218 AK080	2.14 (0.0843)
13218 AK090	2.16 (0.0850)
13218 AK100	2.18 (0.0858)
13218 AK110	2.20 (0.0866)
13218 AE710	2.22 (0.0874)
13218 AE720	2.23 (0.0878)
13218 AE730	2.24 (0.0882)
13218 AE740	2.25 (0.0886)
13218 AE750	2.26 (0.0890)
13218 AE760	2.27 (0.0894)
13218 AE770	2.28 (0.0898)
13218 AE780	2.29 (0.0902)
13218 AE790	2.30 (0.0906)
13218 AE800	2.31 (0.0909)
13218 AE810	2.32 (0.0913)
13218 AE820	2.33 (0.0917)
13218 AE830	2.34 (0.0921)
13218 AE840	2.35 (0.0925)
13218 AE850	2.36 (0.0929)
13218 AE860	2.37 (0.0933)
13218 AE870	2.38 (0.0937)
13218 AE880	2.39 (0.0941)
13218 AE890	2.40 (0.0945)
13218 AE900	2.41 (0.0949)
13218 AE910	2.42 (0.0953)
13218 AE920	2.43 (0.0957)
13218 AE930	2.44 (0.0961)
13218 AE940	2.45 (0.0965)
13218 AE950	2.46 (0.0969)
13218 AE960	2.47 (0.0972)
13218 AE970	2.48 (0.0976)
13218 AE980	2.49 (0.0980)
13218 AE990	2.50 (0.0984)
13218 AF000	2.51 (0.0988)
13218 AF010	2.52 (0.0992)
13218 AF020	2.53 (0.0996)
13218 AF030	2.54 (0.1000)
13218 AF040	2.55 (0.1004)
13218 AF050	2.56 (0.1008)
13218 AF060	2.57 (0.1012)
13218 AF070	2.58 (0.1016)
13218 AF090	2.60 (0.1024)
13218 AF100	2.61 (0.1028)
13218 AF110	2.62 (0.1031)
13218 AF120	2.63 (0.1035)
13218 AF130	2.64 (0.1039)
13218 AF140	2.65 (0.1043)
13218 AF150	2.66 (0.1047)
13218 AF160	2.67 (0.1051)
13218 AF170	2.68 (0.1055)
13218 AF180	2.69 (0.1059)
13218 AF190	2.70 (0.1063)
13218 AF200	2.71 (0.1067)
13218 AF210	2.72 (0.1071)
13218 AF220	2.73 (0.1075)
13218 AF230	2.74 (0.1079)
13218 AF240	2.75 (0.1083)
13218 AF250	2.76 (0.1087)
13218 AF260	2.77 (0.1091)

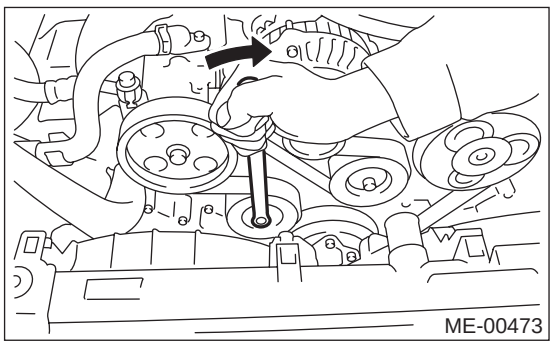
Part No.	Thickness mm (in)
13218 AF270	2.78 (0.1094)
13218 AF280	2.79 (0.1098)
13218 AF290	2.80 (0.1102)
13218 AF300	2.81 (0.1106)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

6. V-belt

A: REMOVAL

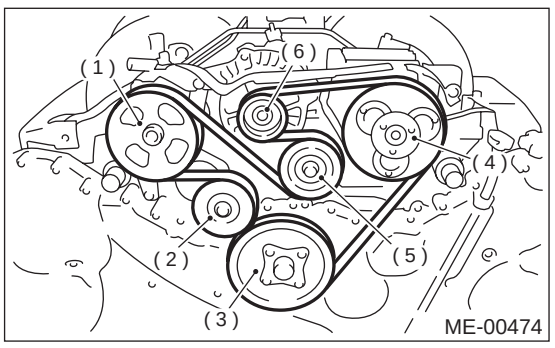
1) Fit the tool to the belt tensioner mounting bolt.
2) Turn the tool clockwise, and loosen the V-belt to remove.



3) Remove the V-belt cover.

B: INSTALLATION

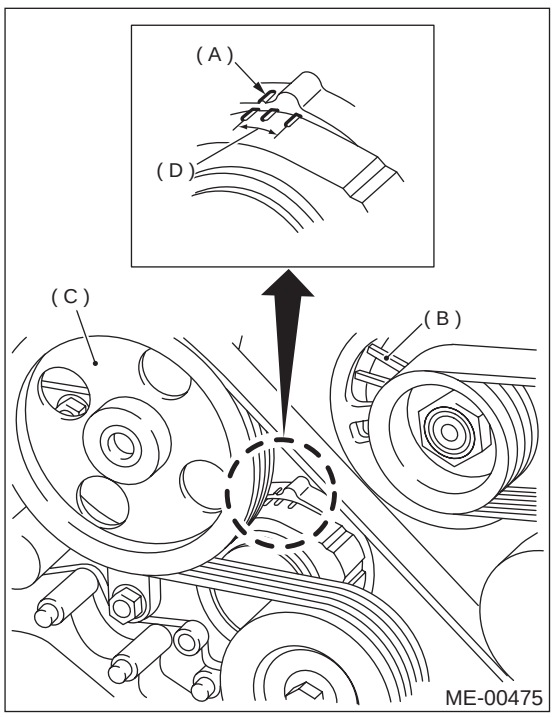
1) Install in the reverse order of removal.



(1) Power steering oil pump
(2) Belt tension adjuster
(3) Crankshaft pulley
(4) A/C compressor
(5) Belt idler
(6) Generator

C: INSPECTION

1) Replace belts, if cracks, fraying or wear is found.
2) Check that the V-belt automatic tensioner indicator (A) is within the range (D).

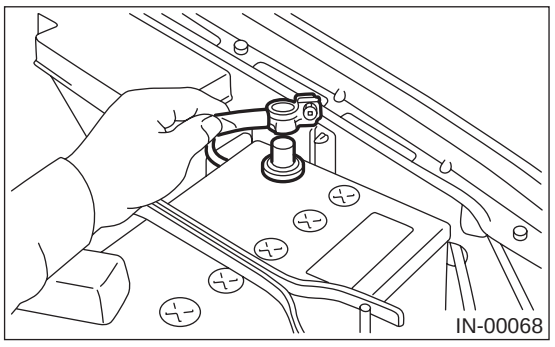


(A) Indicator
(B) Generator
(C) Power steering oil pump
(D) Service limit

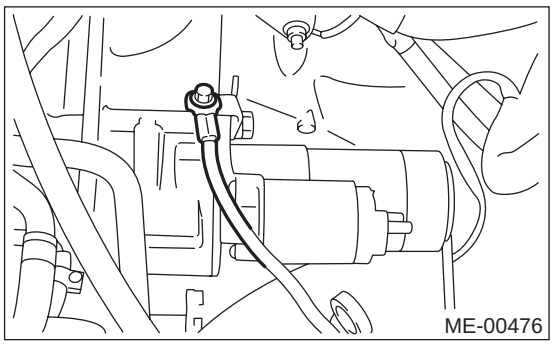
7. Engine Assembly

A: REMOVAL

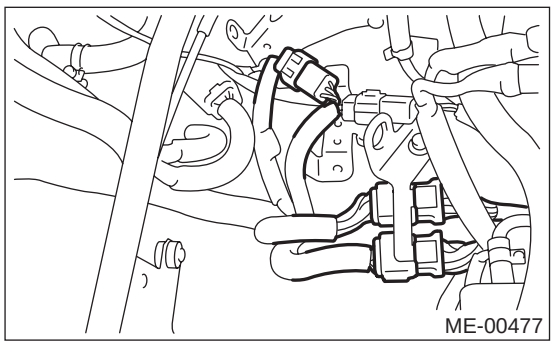
1) Set the vehicle on lift arms.
2) Open front hood fully and support with stay.
3) Raise rear seat, and turn floor mat up.
4) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
5) Remove filler cap.
6) Disconnect battery ground cable.


IN-00068

7) Remove air intake duct, air cleaner case and air intake chamber.
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>, <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
8) Lift up the vehicle.
9) Remove under cover.
10) Remove radiator from vehicle. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
11) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
12) Disconnect A/C pressure hoses from A/C compressor. <Ref. to AC-36, REMOVAL, Flexible Hose.>
13) Disconnect the following connectors and cables.
(1) Engine ground terminal


ME-00476

(2) Engine harness connectors

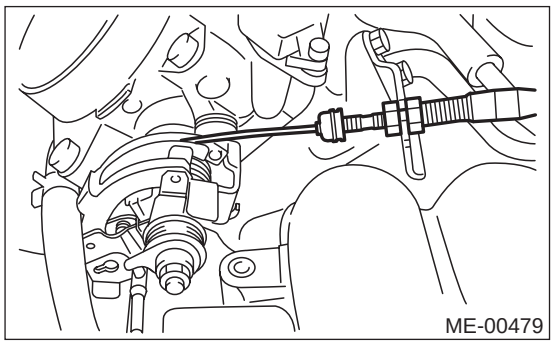

ME-00477

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

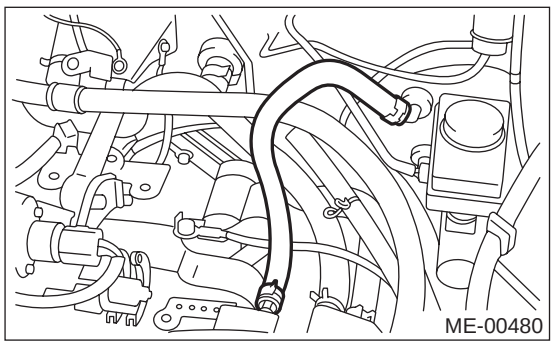
ME-00478

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

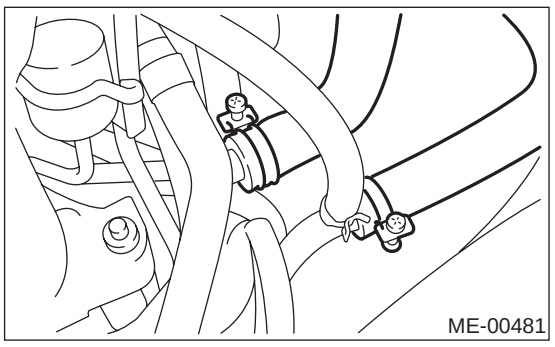
(4) Accelerator cable


ME-00479

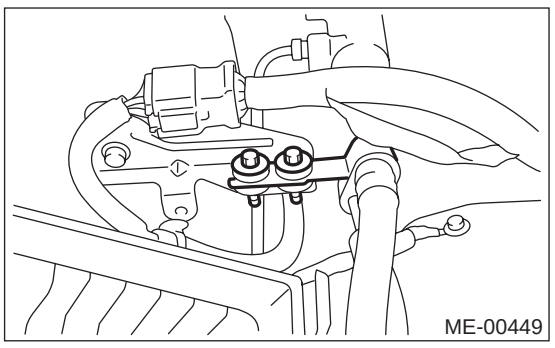
14) Disconnect the following hoses.
(1) Brake booster vacuum hose


ME-00480

(2) Heater inlet outlet hose

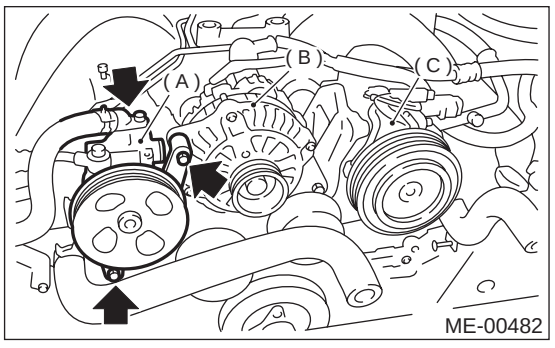

ME-00481

15) Remove power steering pump from bracket.
(1) Remove pipe with bracket.


ME-00449

(2) Remove bolts which install power steering pump bracket.

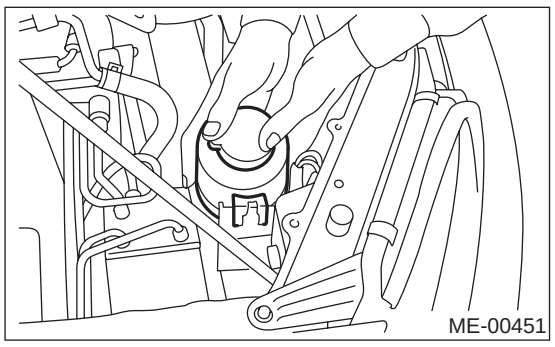
CAUTION:
Do not separate the hose and the pipe from the pump body.



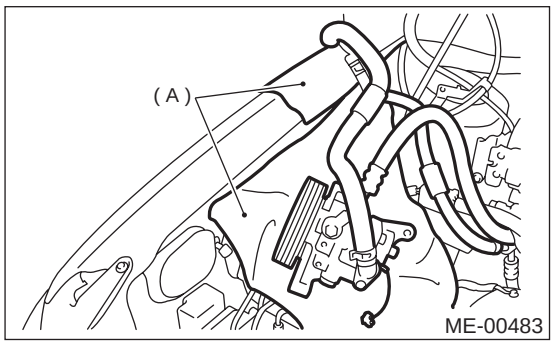
ME-00482

(A) Power steering pump
(B) Generator
(C) A/C compressor

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


ME-00451

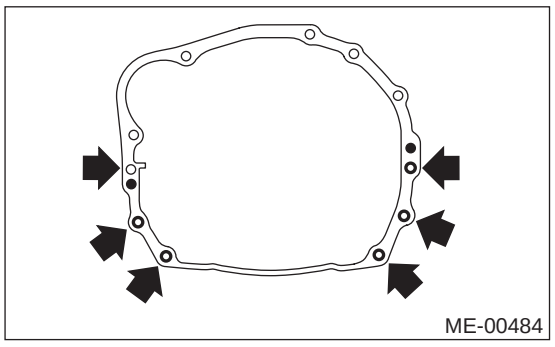
(4) Place power steering pump on the right side wheel apron.



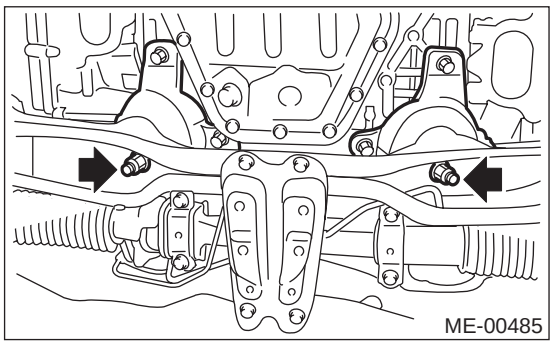
ME-00483

(A) Cloth

16) Remove front exhaust pipe.
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
17) Remove nuts which hold lower side of transmission to engine.


ME-00484

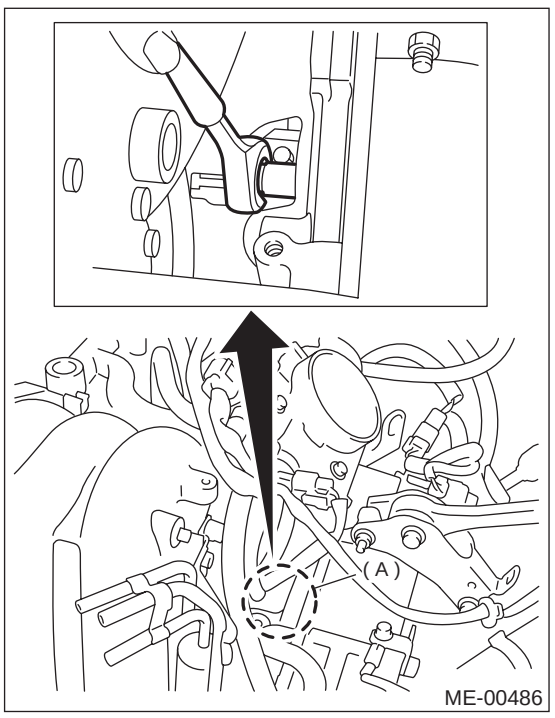
18) Remove nuts which install front cushion rubber onto front crossmember.


ME-00485

19) Separate torque converter clutch from drive plate.

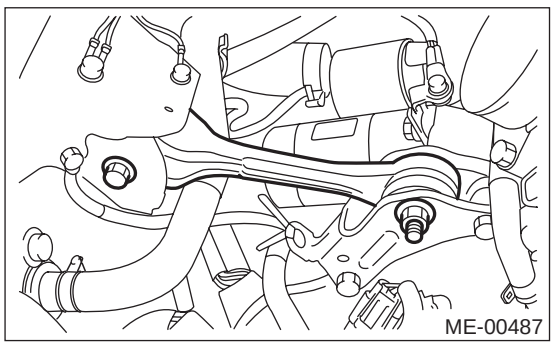
(1) Lower the vehicle.
(2) Remove service hole plug (A).
(3) Remove bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using ST.

ST 499977100 CRANK PULLEY WRENCH



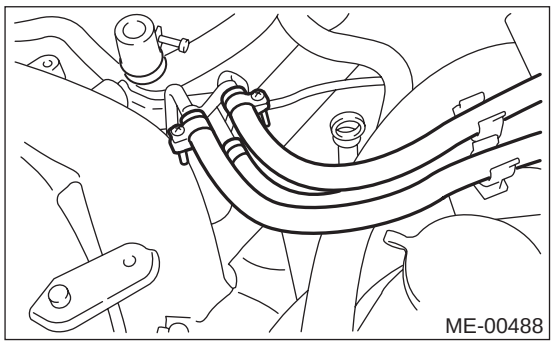
ME-00486

20) Remove pitching stopper.

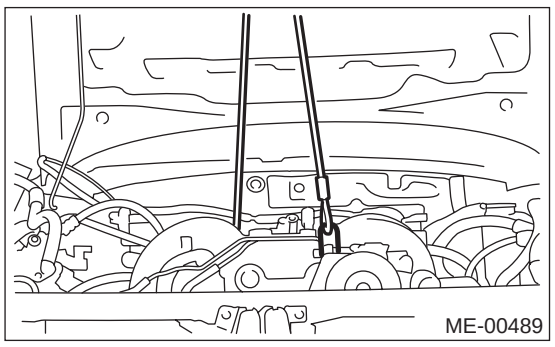

ME-00487

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

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

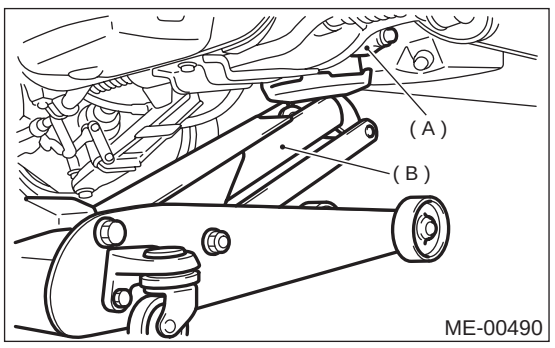

ME-00488

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


ME-00489

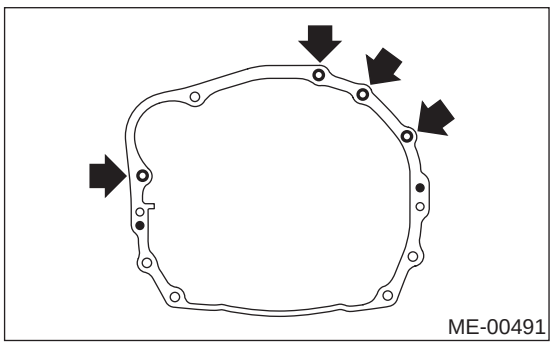
23) Support transmission with a garage jack.

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

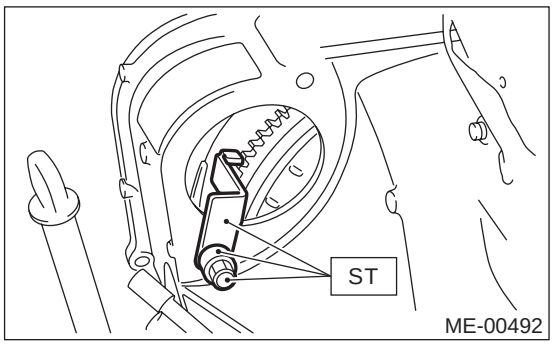


(A) Transmission
(B) Garage jack

24) Separation of engine and transmission.
(1) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
(2) Remove bolts which hold upper side of transmission to engine.

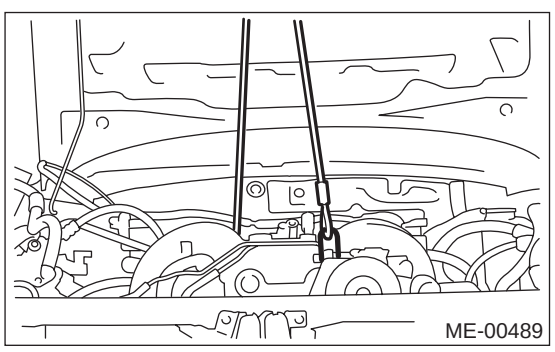


25) Install ST to torque converter clutch case.
ST 498277200 STOPPER SET



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

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



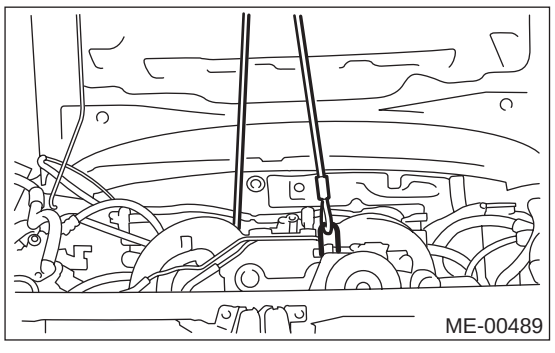
27) Remove front cushion rubbers.

B: INSTALLATION

1) Install front cushion rubbers.
Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

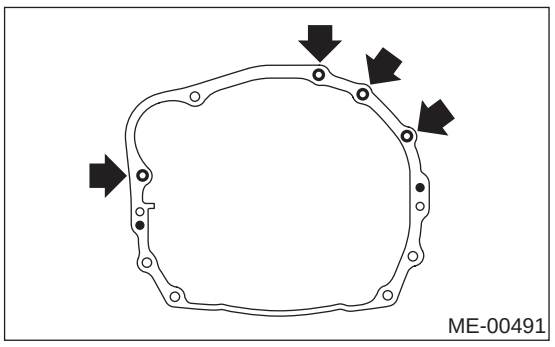
2) Position engine in engine compartment and align it with transmission.

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

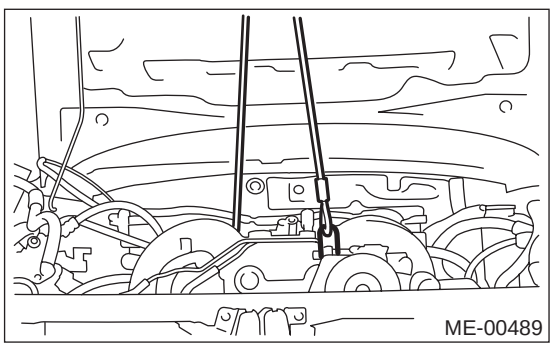


3) Tighten bolts which hold upper side of transmission to engine.

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

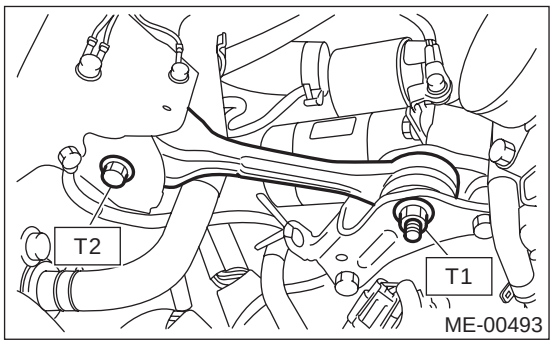

ME-00491

4) Remove lifting device and wire ropes.


ME-00489

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

Tightening torque:
T1: 49 N·m (5.0 kgf-m, 36.2 ft-lb)
T2: 57 N·m (5.8 kgf-m, 42 ft-lb)



ME-00493

7) Remove ST from torque converter clutch case.

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

ST 498277200 STOPPER SET

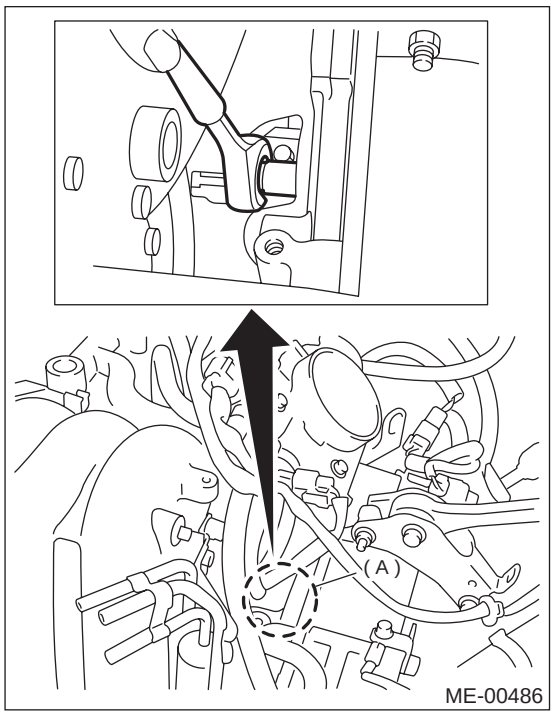
8) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate.
(1) Tighten 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 torque converter clutch housing.

ST 499977100 CRANK PULLEY WRENCH

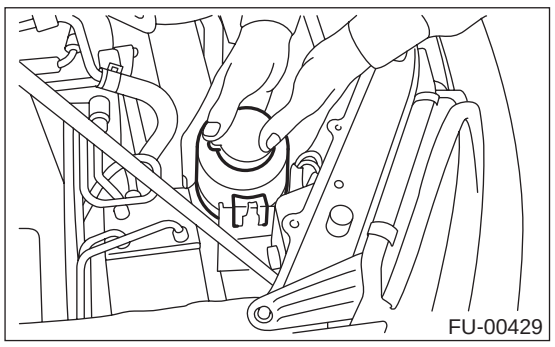
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



ME-00486

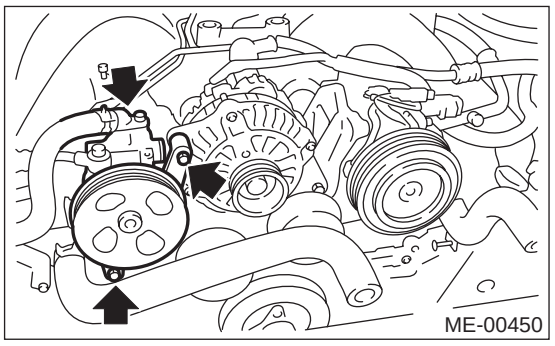
(3) Clog plug (A) onto service hole.

10) Install power steering pump on bracket.
(1) Install power steering tank on bracket.

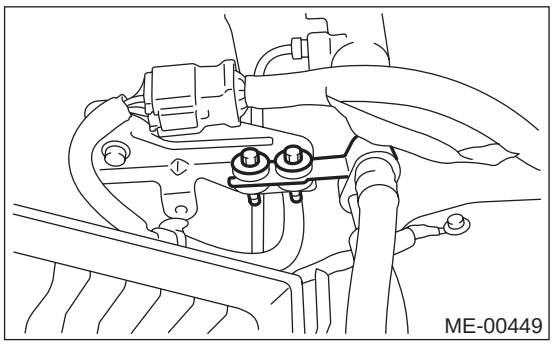

FU-00429

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

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

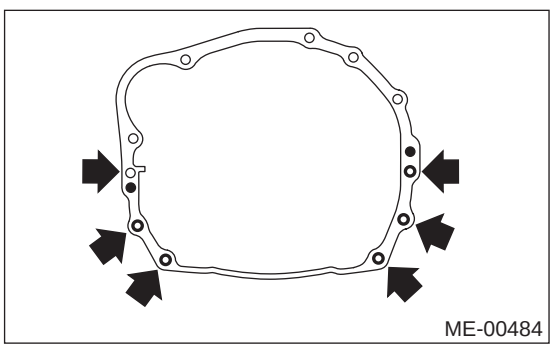

ME-00450

(3) Tighten bolt which installs power steering pipe bracket.


ME-00449

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

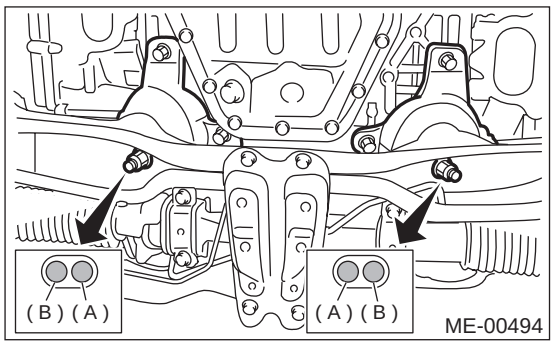
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)


ME-00484

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

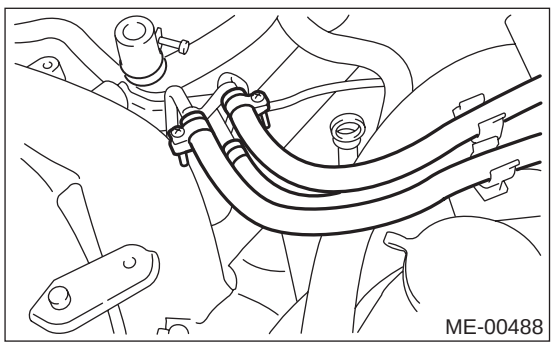
Tightening torque:
74 N·m (7.5 kgf-m, 54 ft-lb)

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

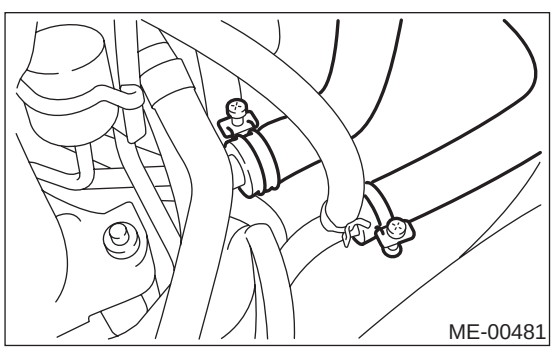


ME-00494

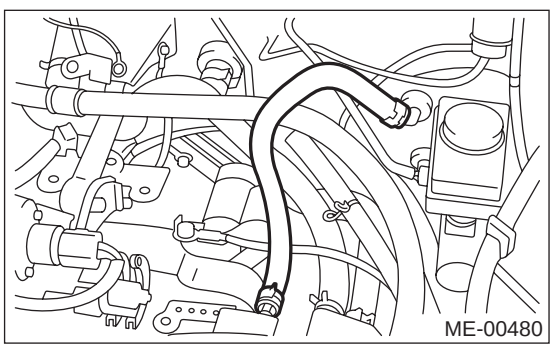
13) Install front exhaust pipe.
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>
14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose


ME-00488

(2) Heater inlet and outlet hoses

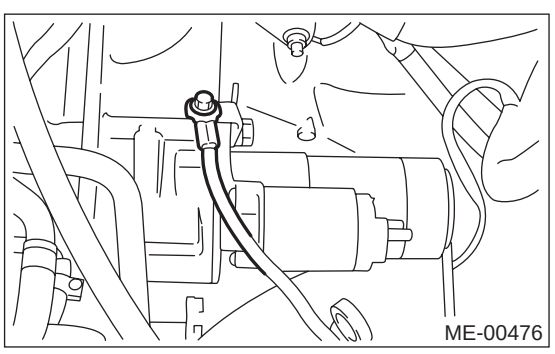

ME-00481

(3) Brake booster vacuum hose

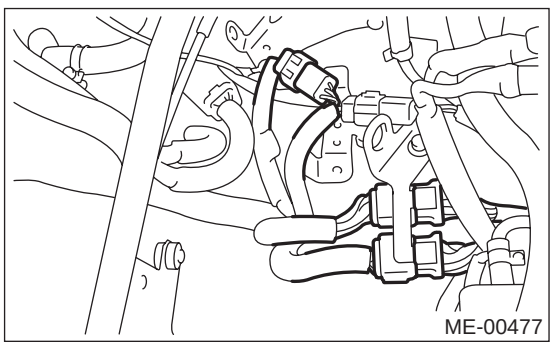

ME-00480

15) Connect the following connectors.
(1) Engine ground terminals

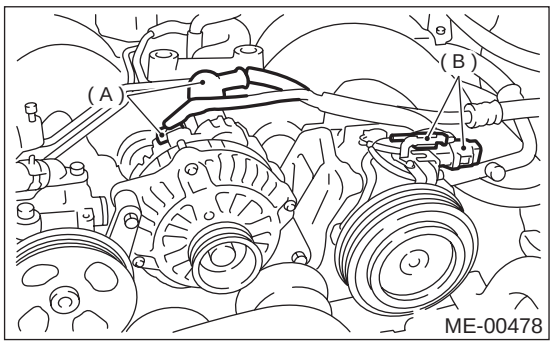
Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)


ME-00476

(2) Engine harness connectors

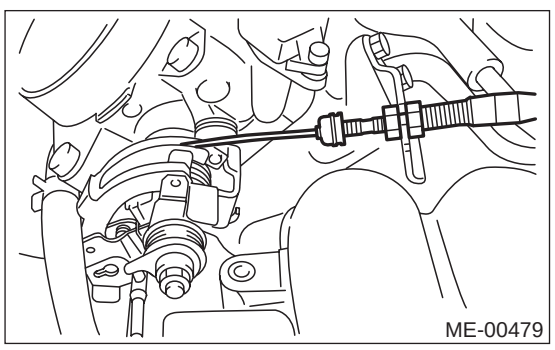

ME-00477

(3) Alternator connector and terminal (A)
(4) A/C compressor connectors (B)



ME-00478

16) Connect the following cables.
(1) Accelerator cable


ME-00479

CAUTION:
After connecting each cable, adjust them.

17) Install A/C pressure hoses.
<Ref. to AC-36, INSTALLATION, Flexible Hose.>
18) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
19) Install radiator to vehicle. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
20) Install air intake duct, cleaner case and air intake chamber.
<Ref. to IN(H6DO)-2, General Description.>
21) Install under cover.
22) Install battery in the vehicle, and connect cables.
23) Fill coolant.
<Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
24) Check ATF level and correct if necessary.
<Ref. to AT-30, Automatic Transmission Fluid.>
25) Charge A/C system with refrigerant.
<Ref. to AC-19, Refrigerant Charging Procedure.>
26) Remove front hood stay, and close front hood.
27) 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.

8. Engine Mounting

A: REMOVAL

1) Remove engine assembly. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>
2) Remove engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

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

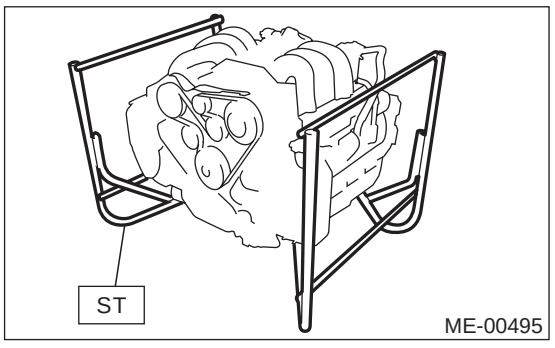
C: INSPECTION

Make sure there are no cracks or other damage.

9. Preparation for Overhaul

A: REMOVAL

1) Remove engine from body. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>
2) After removing engine from body, install ST onto engine.
ST 18232AA000 ENGINE STAND

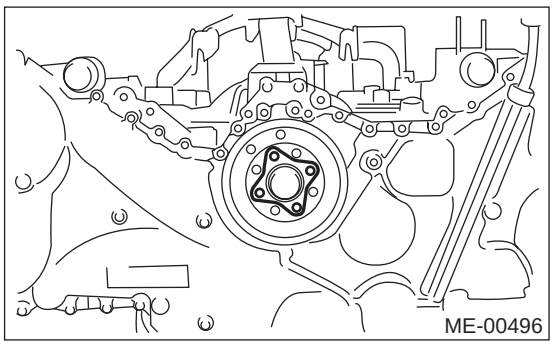


3) Remove sensors, pipes, and hoses installed on engine before starting overhaul.
(1) Remove intake manifold. <Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
(2) Remove generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>
(3) Remove A/C compressor. <Ref. to AC-30, REMOVAL, Compressor.>
(4) Remove EGR pipe. <Ref. to EC(H6DO)-10, REMOVAL, EGR Valve.>
(5) Remove water pipe and hoses.
(6) Remove engine harness.
(7) Remove spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
(8) Remove camshaft position sensor. <Ref. to FU(H6DO)-31, REMOVAL, Camshaft Position Sensor.>
(9) Remove crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
(10) Remove knock sensor. <Ref. to FU(H6DO)-32, REMOVAL, Knock Sensor.>
(11) Remove engine coolant temperature sensor. <Ref. to FU(H6DO)-29, REMOVAL, Engine Coolant Temperature Sensor.>
(12) Remove oil pressure switch. <Ref. to LU(H6DO)-16, REMOVAL, Oil Pressure Switch.>
(13) Remove oil filter. <Ref. to LU(H6DO)-17, REMOVAL, Engine Oil Filter.>
(14) Remove oil cooler. <Ref. to LU(H6DO)-18, REMOVAL, Oil Cooler.>

10.Crankshaft Pulley

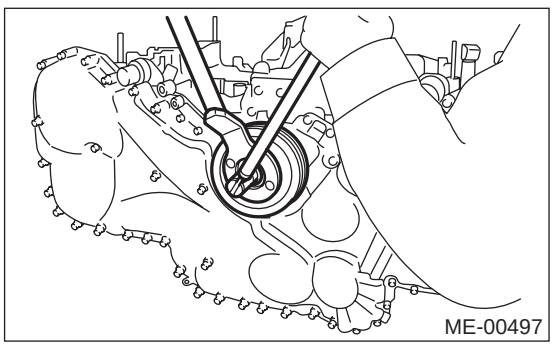
A: REMOVAL

1) Remove crankshaft pulley cover.


ME-00496

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

ST 499977100 CRANKSHAFT PULLEY WRENCH


ME-00497

3) Remove crankshaft pulley.

B: INSTALLATION

1) Install crankshaft pulley.

2) Install crankshaft pulley bolt. To lock crankshaft, use ST.

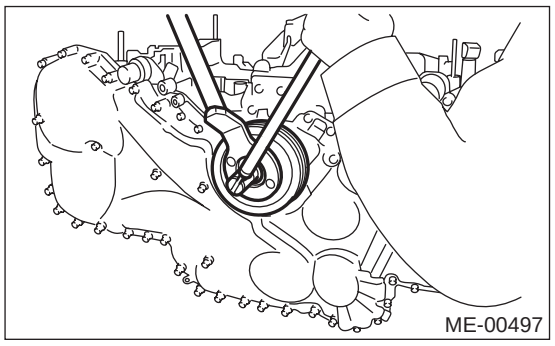
ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

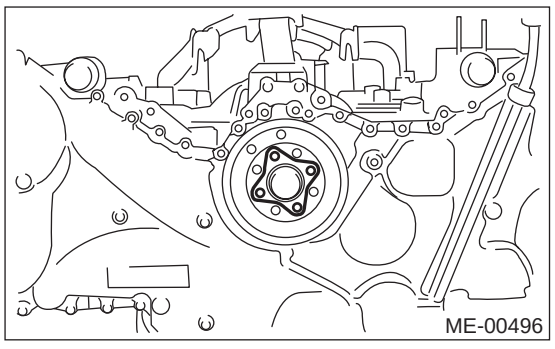
(3) Tighten the crankshaft pulley bolts.

Tightening torque:
178 N·m (18.1 kgf-m, 131 ft-lb)


ME-00497

3) Install the crankshaft pulley cover.

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


ME-00496

C: INSPECTION

1) Check crankshaft pulley cover for oil leaks and bleeding.

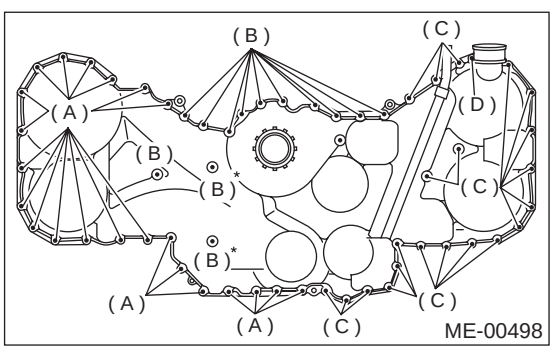
2) Check crankshaft pulley for looseness.

11.Front Chain Cover

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover.

NOTE:
There are four different types of chain cover mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

(A) 6 × 45
(B) 6 × 16
(C) 6 × 30
(D) 6 × 50

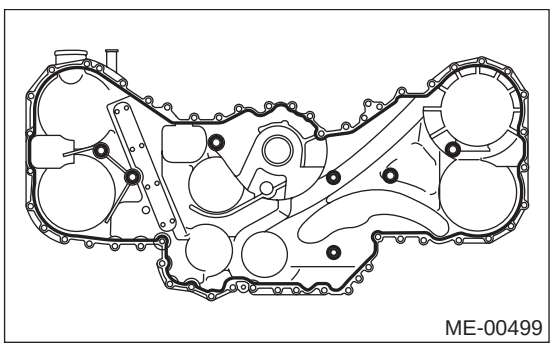
*: Sealing washer

B: INSTALLATION

1) Remove old fluid gasket on the matching surface, and degrease it.
2) Apply fluid gasket to the mating surface of front chain cover.

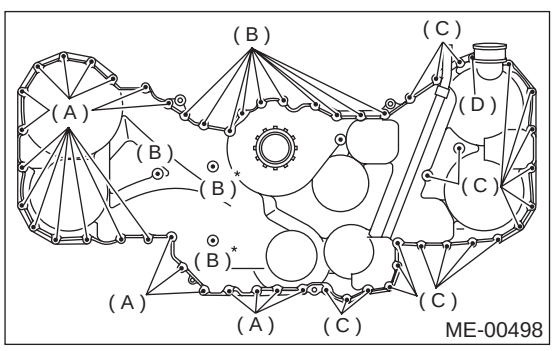
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
2.5±0.5 mm (0.098±0.020 in)



3) Install front chain cover. Temporarily tighten the bolts.

CAUTION:
Do not confuse the mounting positions of the bolts.



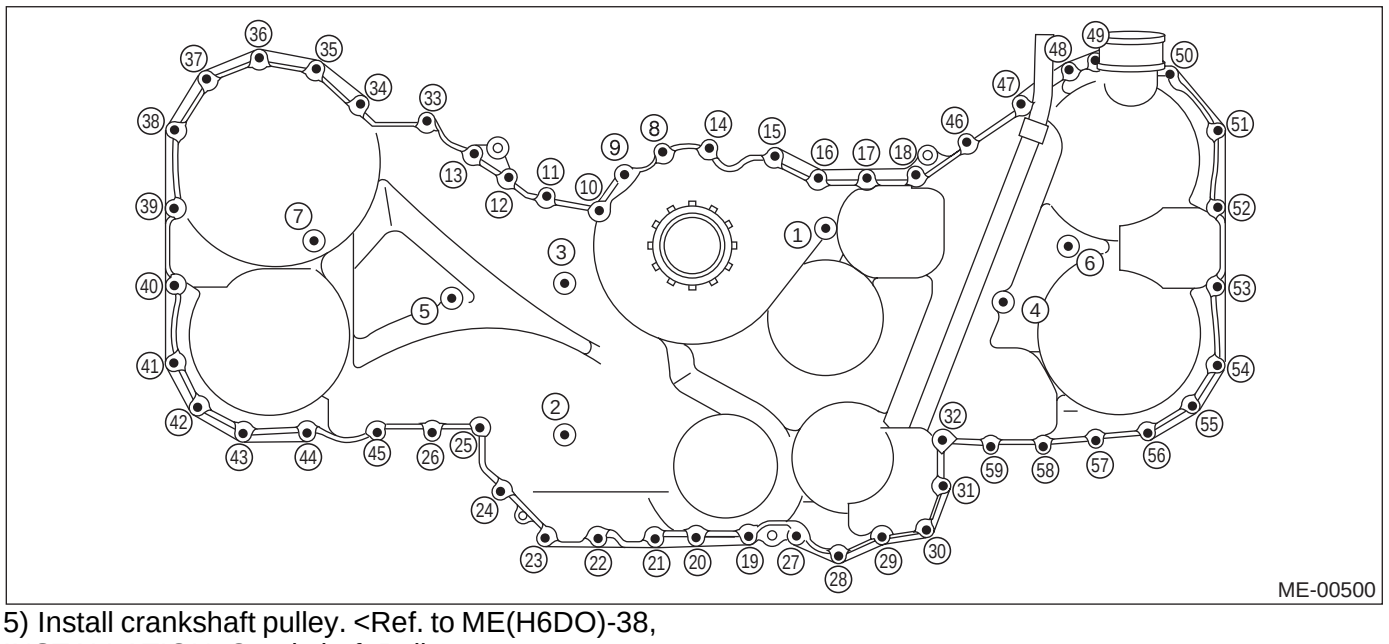
Bolt dimension:

(A) 6 × 45
(B) 6 × 16
(C) 6 × 30
(D) 6 × 50

*: Sealing washer

4) Tighten the bolts in the numerical sequence shown in figure.

Tightening torque:
6.6 N·m (0.67 kgf-m, 4.8 ft-lb)



5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

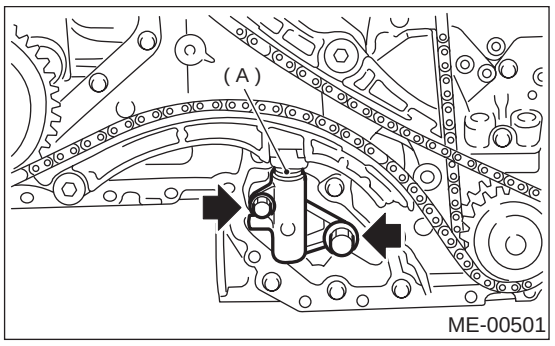
Check the cover surface for flaws and dents.
Check the cover mating surface and the mounting point of crankshaft pulley for oil leaks.

12.Timing Chain Assembly

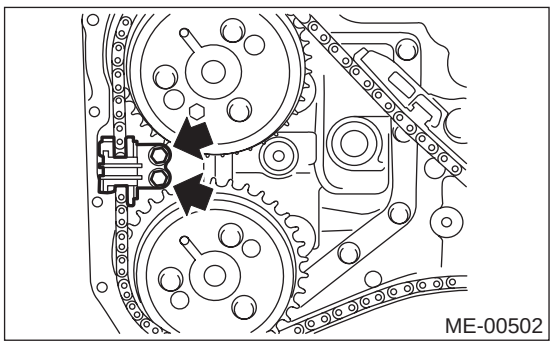
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove chain tensioner (RH).

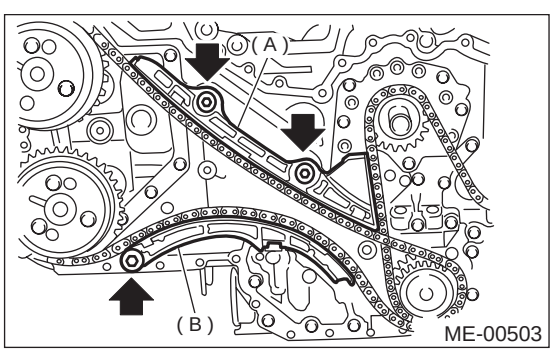
NOTE:
Make sure plunger (A) does not come out.



4) Remove chain guide. (Right-hand between cams)



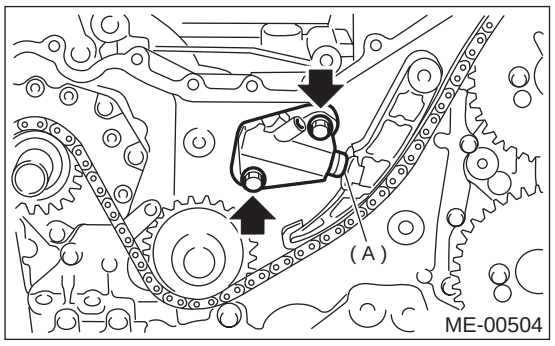
5) Remove chain guide (RH).
6) Remove chain tensioner lever (RH).



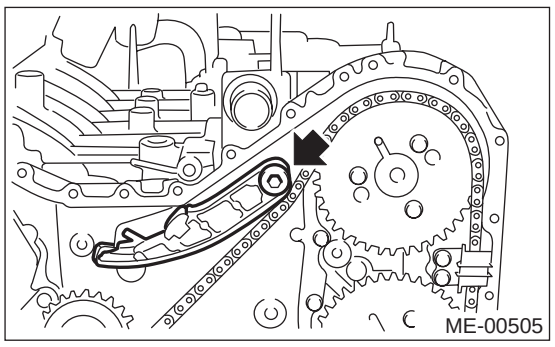
(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

7) Remove timing chain (RH).
8) Remove chain tensioner (LH).

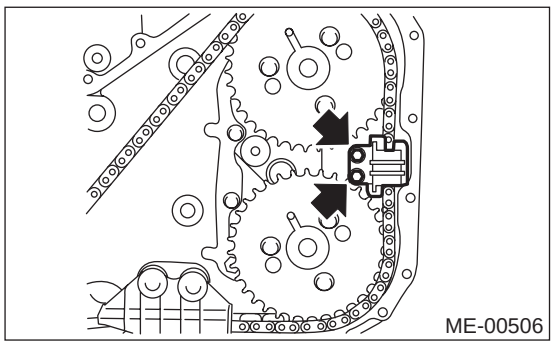
NOTE:
Make sure plunger (A) does not come out.



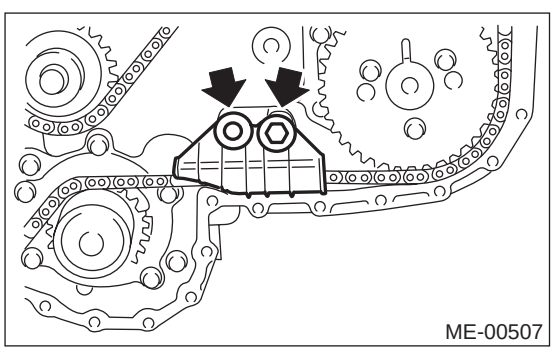
9) Remove chain tensioner lever (LH).



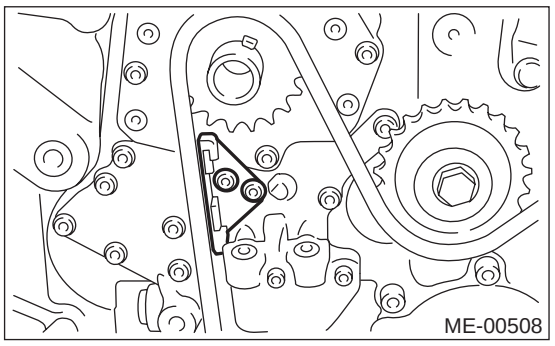
Remove chain guide. (Left-hand between cams)



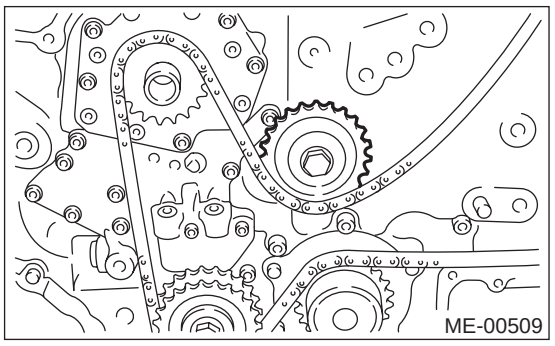
10) Remove chain guide (LH).



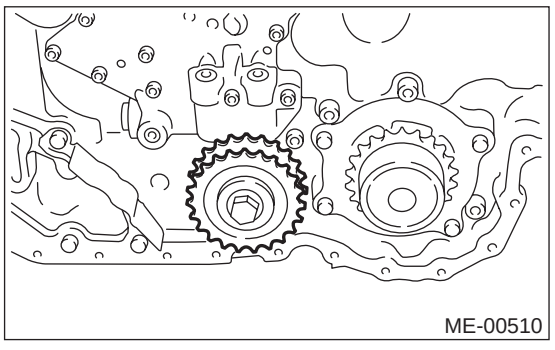
11) Remove chain guide. (Center)


ME-00508

12) Remove idler sprocket. (Upper)


ME-00509

13) Remove timing chain (LH).
14) Remove idler sprocket. (Lower)

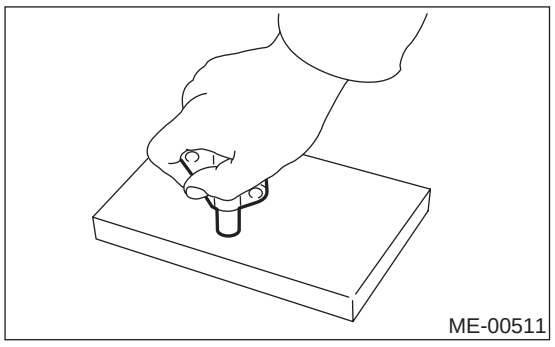

ME-00510

B: INSTALLATION

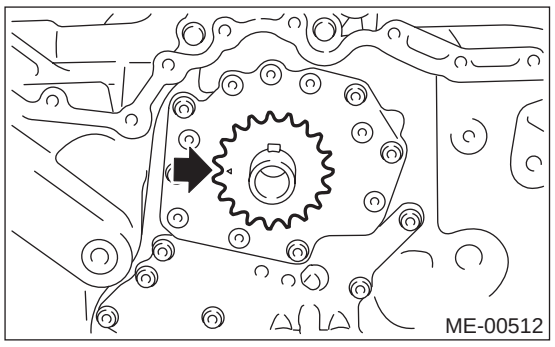
CAUTION:
• During installation, be careful to prevent foreign objects from attaching to or mixing with assembled components.
• Apply engine oil to chain guide, chain tensioner lever, and idler sprocket during installation.

1) Preparation for installation of chain tensioner.
   (1) Put the screw, spring, pin and tension rod into the tensioner body.
   (2) While pressing tensioner onto rubber mat, twist it left and right to shorten tension rod. Then set a thin pin into the holes between tension rod and tensioner body to hold it.

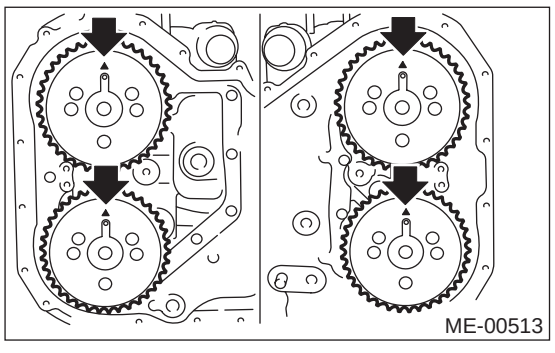
NOTE:
Carry out the work on rubber mat or other nonslip material.


ME-00511

2) Using ST, align “top mark” on crankshaft sprocket at 9 o'clock position as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET

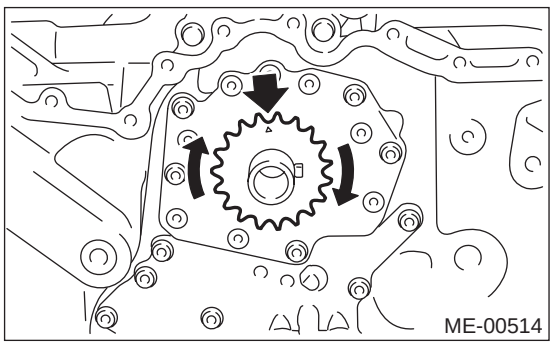

ME-00512

3) Using ST, align four key grooves on camshaft sprocket at 12 o'clock position as shown in the figure.
ST 18231AA000 CAMSHAFT SPROCKET WRENCH


ME-00513

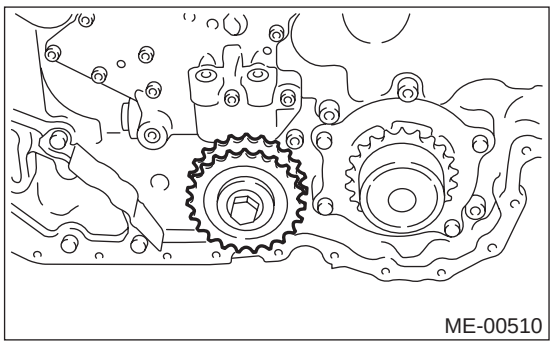
4) Rotate crankshaft sprocket clockwise to align “top mark” at 12 o'clock position as shown in the figure. (Piston # 1 is at TDC.)

CAUTION:
Do not rotate crankshaft and camshaft sprockets until timing chain is completely routed.

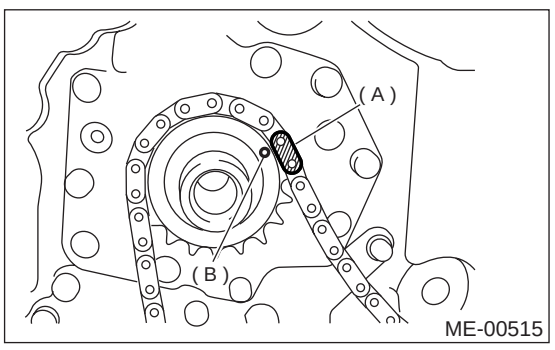


5) Install the idler sprocket. (Lower)

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



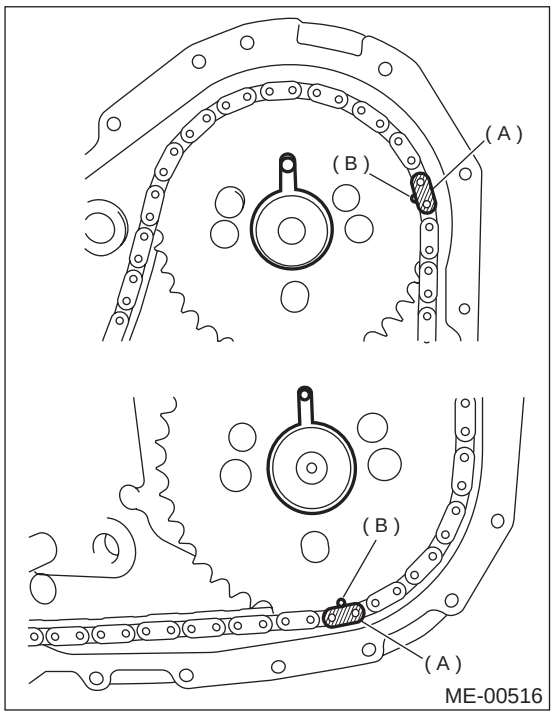
6) Install timing chain LH.
(1) Align the timing mark (B) on crankshaft sprocket with the matching mark (A) on timing chain LH.



(A) Gold
(B) Mark

(2) Route timing chain LH on idler sprocket (Lower), water pump, exhaust cam sprocket, and intake cam sprocket in order.

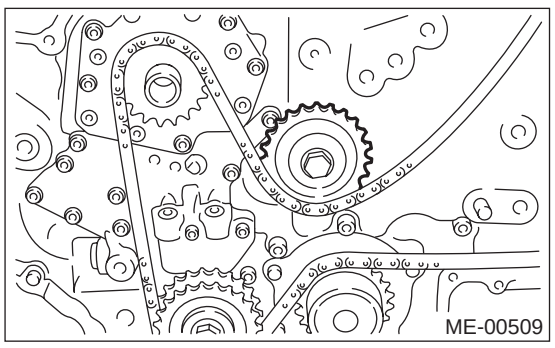
CAUTION:
Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.



(A) Dark blue
(B) Mark

(3) Install chain idler. (Upper)

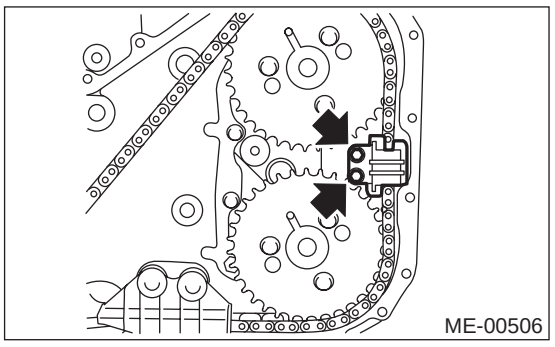
Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



(4) Install chain guide. (Left-hand between cams)

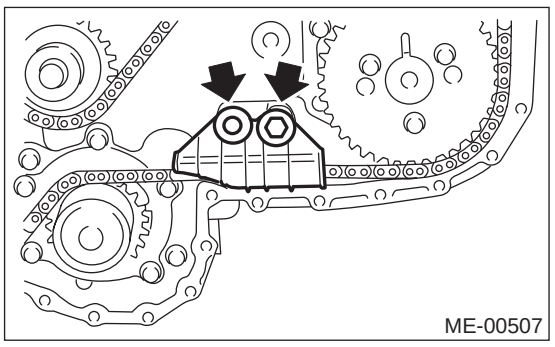
Tightening torque:
6.3N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
Replace mounting bolt with a new one.



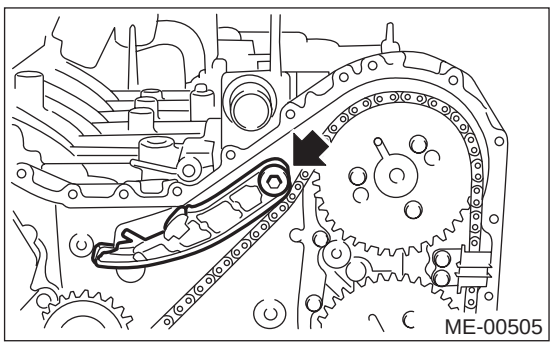
(5) Install chain guide (LH).

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



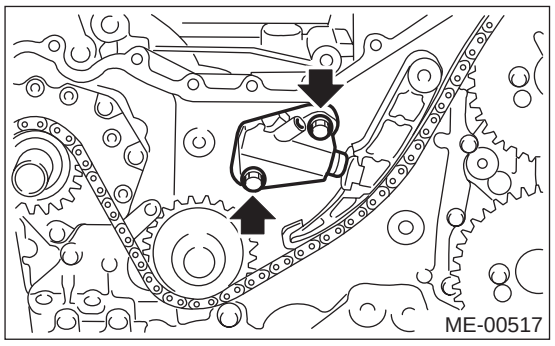
(6) Install chain tensioner lever LH.

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

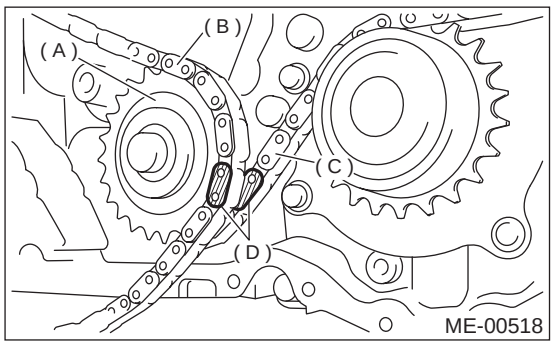


(7) Install chain tensioner LH.

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



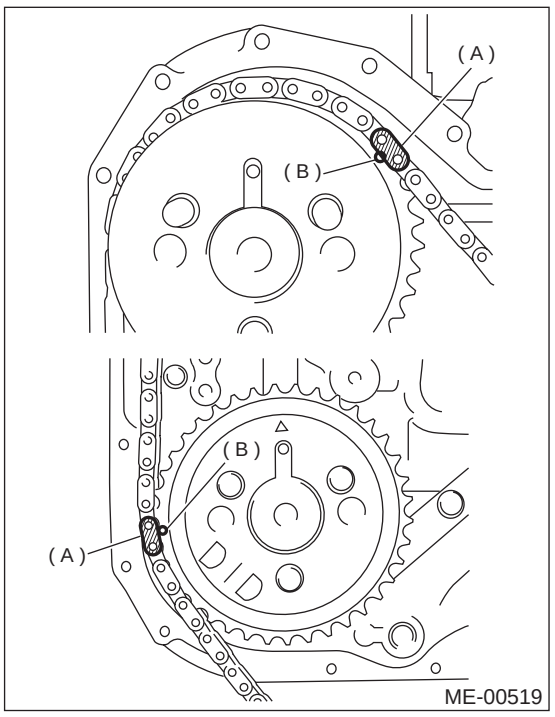
7) Install timing chain RH.
(1) On idler sprocket (Lower) , align matching marks on timing chains LH and RH.



(A) Lower idler sprocket
(B) Timing chain RH
(C) Timing chain LH
(D) Dark gray

(2) Route timing chain RH on intake cam sprocket and then exhaust cam sprocket.

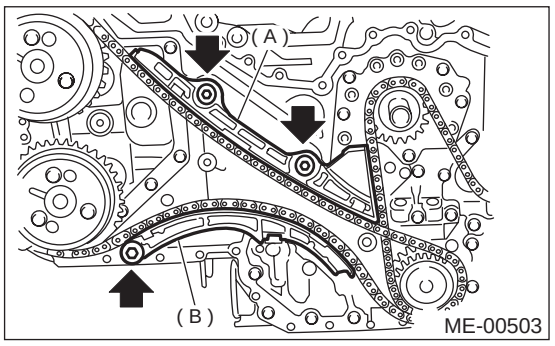
CAUTION:
Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.



(A) Gold
(B) Mark

(3) Install chain guide (RH).
(4) Install chain tensioner lever (RH).

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

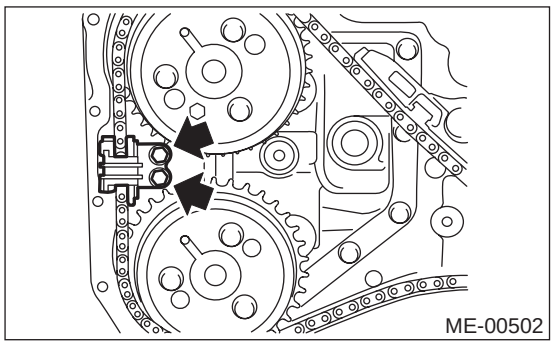


(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

(5) Install timing chain guide RH No. 1.

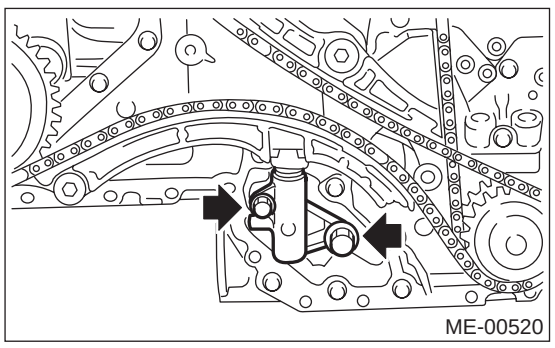
Tightening torque:
6.3 N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
Replace mounting bolt with a new one.



(6) Install the chain tensioner (RH).

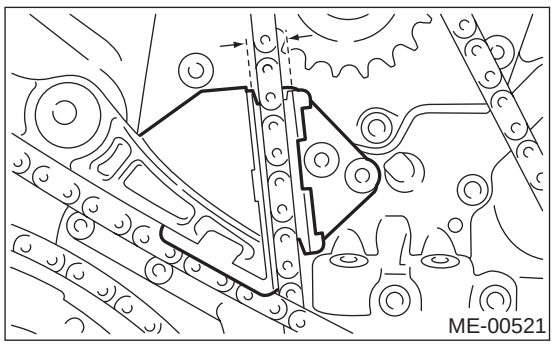
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



(7) Adjust the clearance between chain guide (RH) and chain guide (Center) to the range between 8.4 mm (0.331 in) to 8.6 mm (0.339 in). And install chain guide (Center).

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

NOTE:
Replace mounting bolt with a new one.



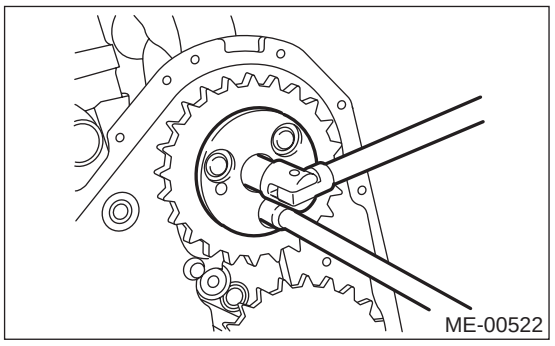
(8) After checking the matching marks on each sprocket and corresponding timing chain are aligned, pull stopper pin out of chain tensioner.

13.Camshaft Sprocket

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH

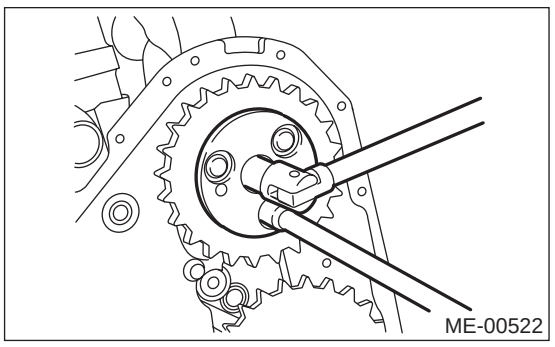


B: INSTALLATION

1) Install camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH

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



2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
3) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
4) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

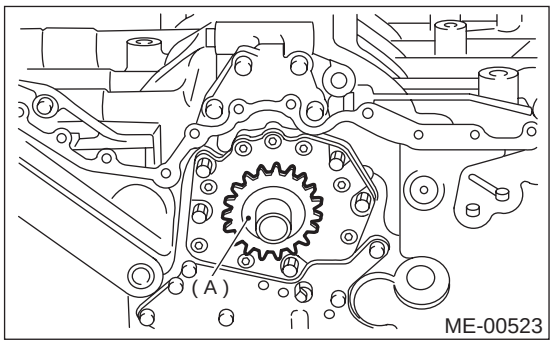
C: INSPECTION

1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.

14.Crankshaft Sprocket

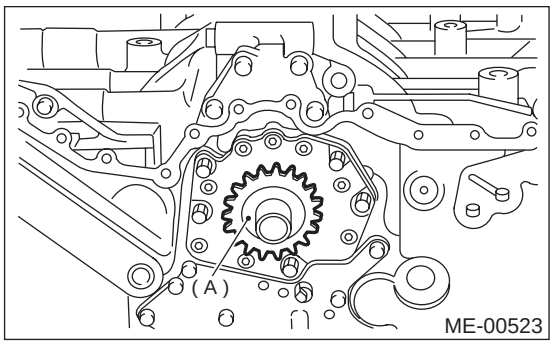
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket (A).



B: INSTALLATION

1) Install crankshaft sprocket (A).



2) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

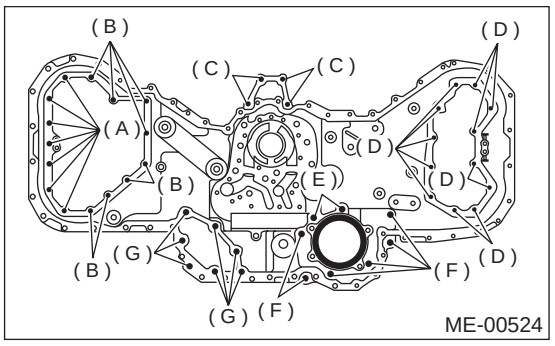
1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.

15.Rear Chain Cover

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket.
6) Remove oil pump. <Ref. to LU(H6DO)-11, REMOVAL, Oil Pump.>
7) Remove oil pump relief valve. <Ref. to LU(H6DO)-13, REMOVAL, Oil Pump Relief Valve.>
8) Remove water pump. <Ref. to CO(H6DO)-24, REMOVAL, Water Pump.>
9) Remove rear chain cover.

NOTE:
There are seven different types of mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

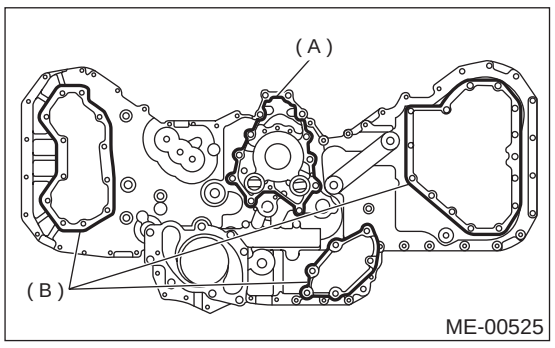
(A) 6 × 14
(B) 6 × 18 (Silver)
(C) 6 × 30
(D) 6 × 18
(E) 6 × 40
(F) 6 × 30
(G) 6 × 22

B: INSTALLATION

1) Remove old fluid gasket on the matching surface, and degrease it.
2) Apply fluid gasket to the mating surface of rear chain cover.

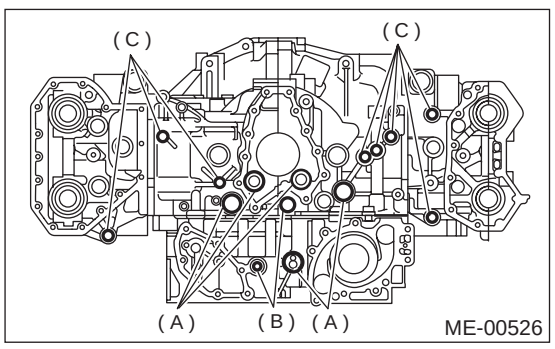
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
(A) 1.0±0.5 mm (0.039±0.020 in)
(B) 3.0±1.0 mm (0.118±0.039 in)



3) Install O-ring.

NOTE:
Do not reuse the O-ring.

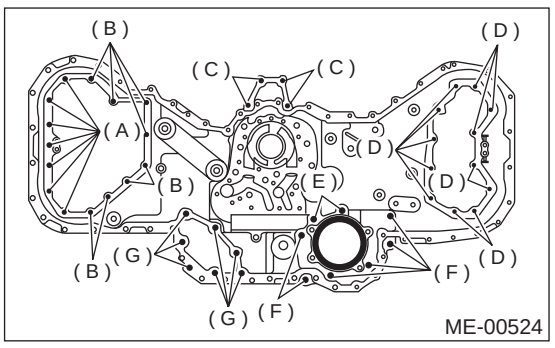


(A) O-ring (Large)
(B) O-ring (Medium)
(C) O-ring (Small)

4) Temporarily tighten rear chain cover.

CAUTION:
Do not confuse the mounting positions of the bolts.

NOTE:
Replace mounting bolts (G) with new ones.



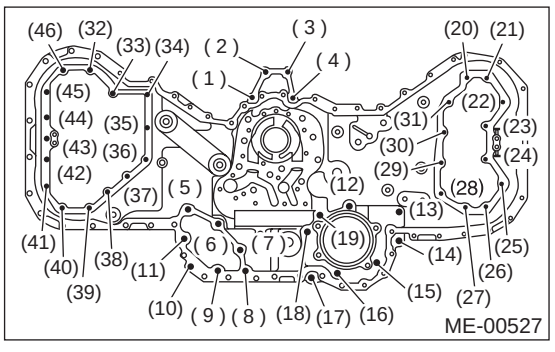
Bolt dimension:

(A) 6 × 14
(B) 6 × 18 (Silver)
(C) 6 × 30
(D) 6 × 18
(E) 8 × 40
(F) 8 × 30
(G) 6 × 22

5) Tighten the bolts in the numerical sequence shown in figure.

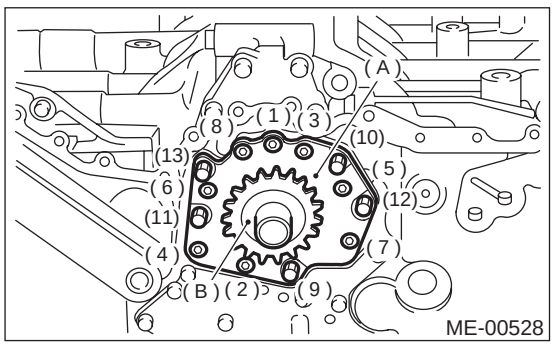
Tightening torque:

(1) to (11)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) to (19)	20 N·m (2.0 kgf-m, 14 ft-lb)
(20) to (31)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(32) to (39)	12 N·m (1.2 kgf-m, 8.7 ft-lb)
(40) to (46)	9 N·m (0.9 kgf-m, 6.5 ft-lb)



6) Install water pump. <Ref. to CO(H6DO)-24, REMOVAL, Water Pump.>
7) Install oil pump relief valve. <Ref. to LU(H6DO)-13, INSTALLATION, Oil Pump Relief Valve.>
8) Install oil pump. <Ref. to LU(H6DO)-11, INSTALLATION, Oil Pump.>

9) Install crankshaft sprocket.

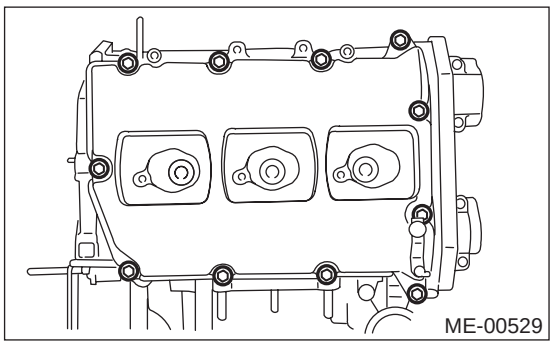


10) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
11) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
12) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
13) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

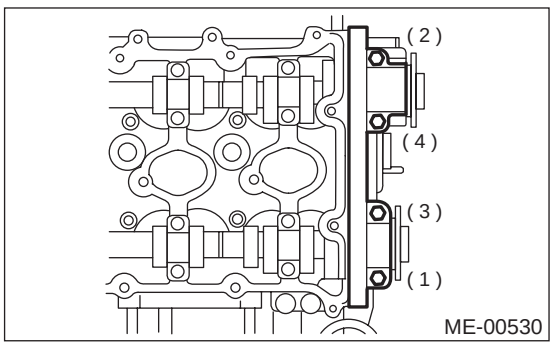
16.Camshaft

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove rocker cover (RH).


ME-00529

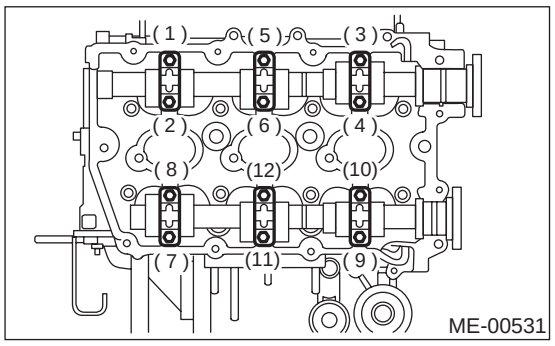
8) Loosen front camshaft cap bolts equally, a little at a time in numerical sequence shown in the figure (RH).



ME-00530

9) Remove camshaft cap and intake camshaft (RH).

10) Loosen camshaft cap bolts equally, a little at a time in the numerical sequence shown in the figure.

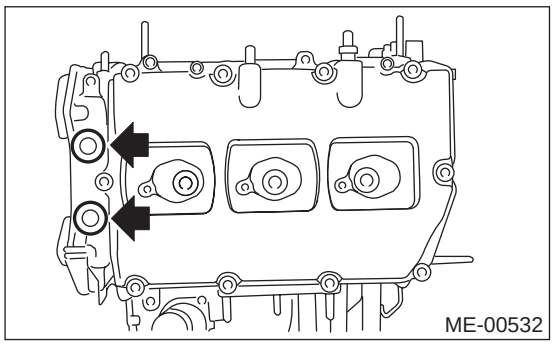


ME-00531

11) Remove camshaft cap and exhaust camshaft (RH).

CAUTION:
Arrange camshaft caps in order so that they can be installed in their original position.

12) Remove plug (LH).

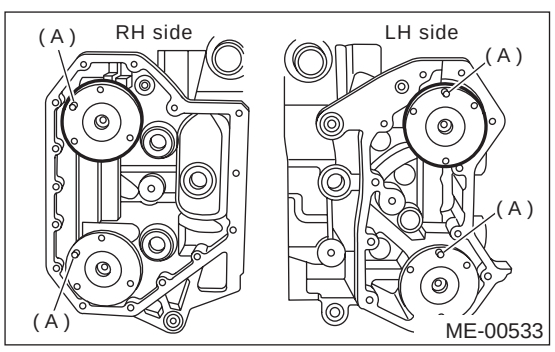

ME-00532

13) Similarly, remove left-hand camshafts and related parts.

B: INSTALLATION

1) Apply a coat of engine oil to camshaft journals and install camshaft.

CAUTION:
When installing camshaft, adjust camshaft front flange knock pin (A) position as follows:
LH side: 12 o'clock
RH side: 10 o'clock



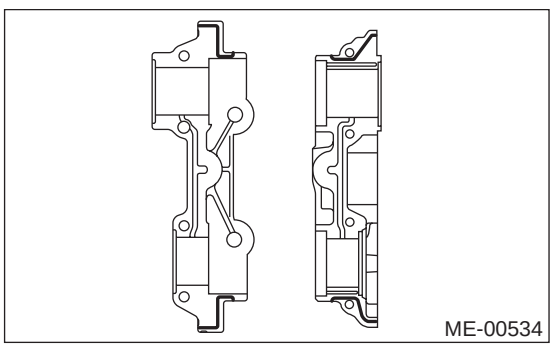
ME-00533

2) Install camshaft cap.
(1) Apply fluid packing sparingly to back of front camshaft cap shown in the figure.

CAUTION:
Do not apply fluid gasket excessively. Failure to do so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

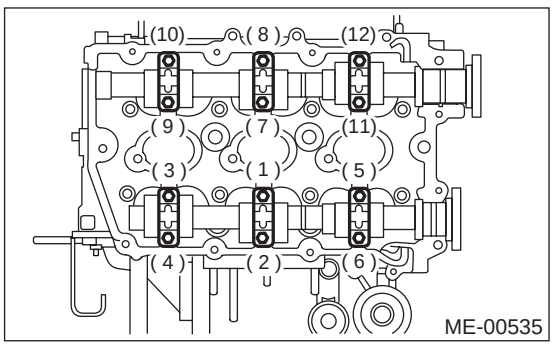
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
2.0±0.5 mm (0.079±0.020 in)



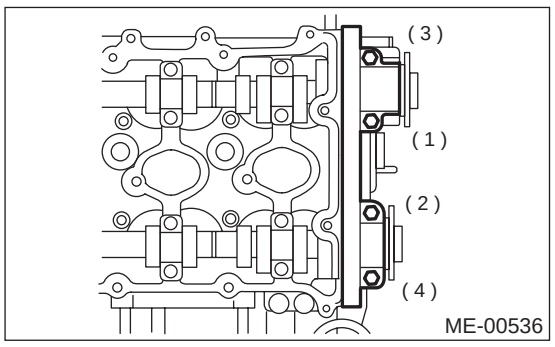
(2) Apply engine oil to cap bearing surface and install cap on camshaft.
(3) Tighten the camshaft cap bolts in the numerical sequence shown in the figure.

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



(4) Tighten the front camshaft cap bolts in the numerical sequence shown in the figure.

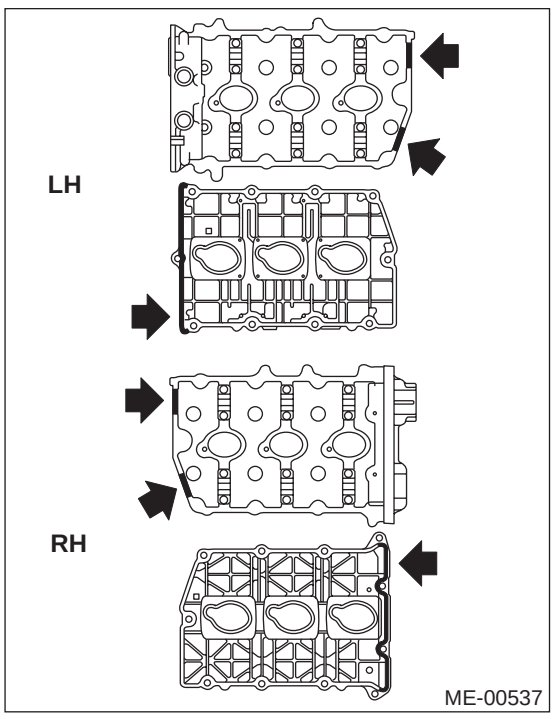
Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Install rocker cover.
(1) Apply fluid gasket sparingly to matching surface of cylinder heads and rocker covers shown in the figure.

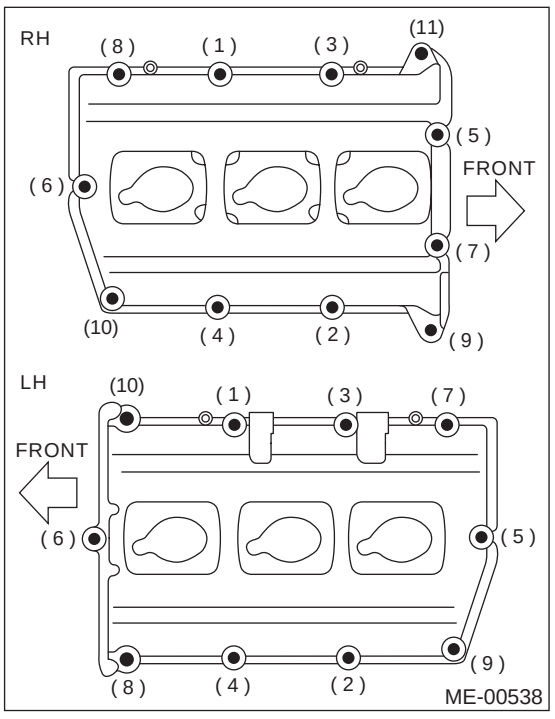
CAUTION:
Do not apply fluid gasket excessively. Doing so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

Fluid gasket:
THREE BOND 1280B



(2) Tighten the rocker cover bolts in the numerical order shown in the figure.

Tightening torque:
6.4 N·m (0.64 kgf-m, 4.6 ft-lb)



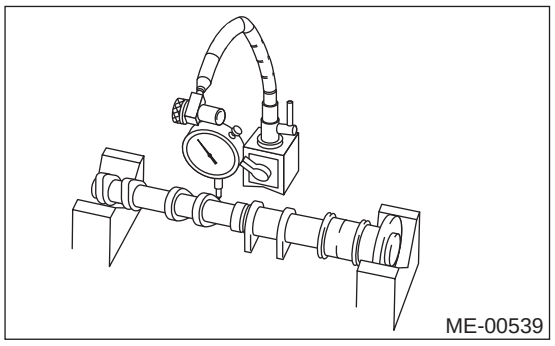
4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

1. CAMSHAFT

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

Limit:
0.020 mm (0.0008 in)



2) Check journal for damage and wear. Replace if faulty.
3) Measure outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	27.946 — 27.963 mm (1.1002 — 1.1009 in)

4) Measurement of the camshaft journal oil clearance
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head.
(3) Place plastigauge across each of the camshaft journals.
(4) Install the bearing caps.

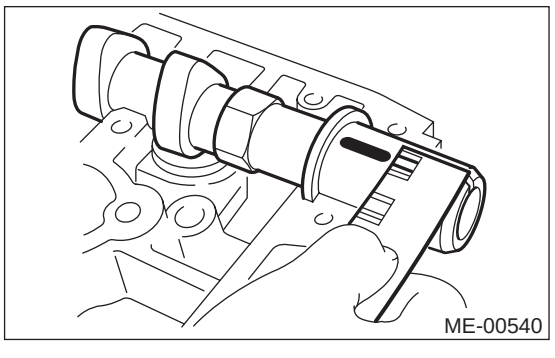
CAUTION:
Do not turn the camshaft.

(5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal.
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard oil clearance:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)


ME-00540

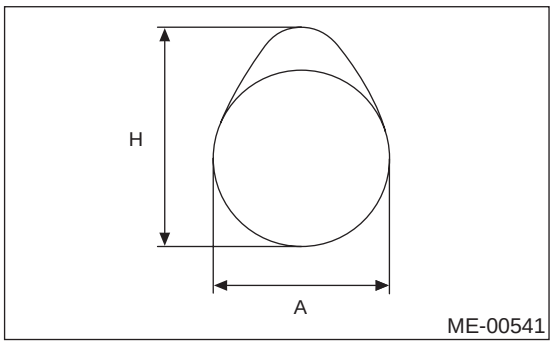
(7) Completely remove the plastigauge.

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

Cam height: H
Standard:
Intake:
45.75 — 45.85 mm (1.8012 — 1.8051 in)
Exhaust:
45.25 — 45.35 mm (1.7815 — 1.7854 in)

Limit:
Intake:
45.65 mm (1.7972 in)
Exhaust:
45.15 mm (1.7776 in)

Cam base circle diameter A:
36.0 mm (1.4173 in)

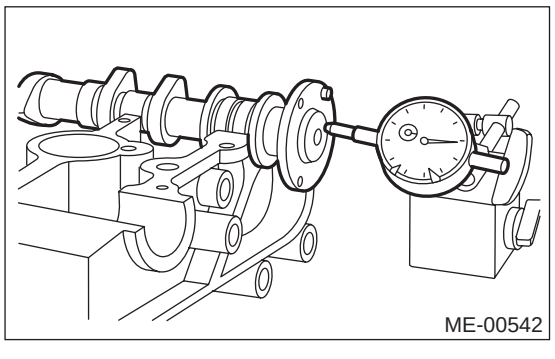


ME-00541

6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

Standard:
Intake:
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust:
0.048 — 0.108 mm (0.0019 — 0.0043 in)

Limit:
Intake:
0.155 mm (0.0061 in)
Exhaust:
0.130 mm (0.0051 in)

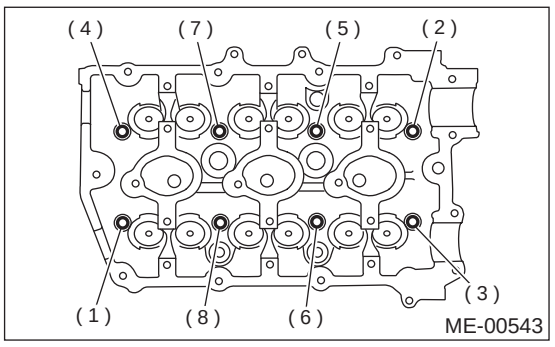

ME-00542

17.Cylinder Head Assembly

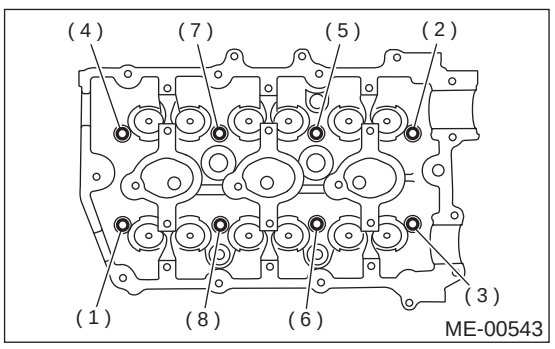
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
8) Remove cylinder head bolts in numerical sequence shown in figure.

CAUTION:
Leave bolts (2) and (4) engaged by three or four threads to prevent cylinder head from falling.



9) Tap cylinder head with a plastic hammer to separate it from cylinder block.
10) Remove bolts (2) and (4) to remove cylinder head.



11) Remove cylinder head gasket.

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

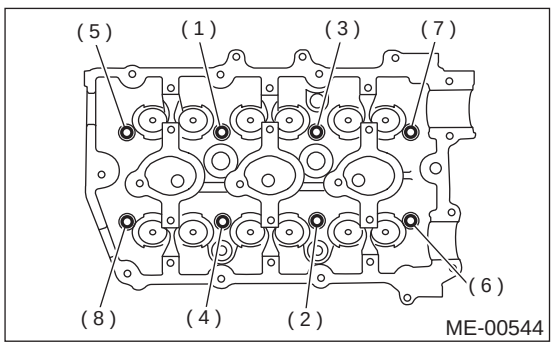
12) Similarly, remove right side cylinder head.

B: INSTALLATION

1) Install 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 oil pump.**

2) Tighten cylinder head bolts.
   (1) Coat the washers and threaded parts of the cylinder head bolts with engine oil.
   (2) Install the cylinder head on the cylinder block and tighten the bolts in the numerical order shown in the figure to a tightening torque of 20 N·m (2.0 kgf-m, 14 ft-lb).
   (3) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 50 N·m (5.1 kgf-m, 37 ft-lb).
   (4) Loosen all the bolts in 2 stages, 180° at a time, in the reverse order of tightening.
   (5) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf-m, 18 ft-lb).
   (6) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf-m, 18 ft-lb).
   (7) Tighten all the bolts 90° in the numerical order shown in the figure.
   (8) Tighten the (1) to (4) bolts 90° again in the numerical order shown in the figure.
   (9) Tighten the (5) to (8) bolts 45° again in the numerical order shown in the figure.



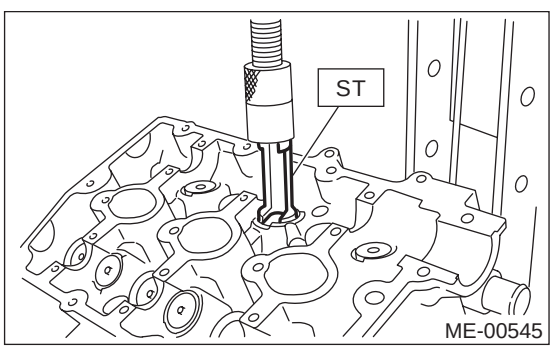
3) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>
4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY

1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
2) Remove valve shims and valve lifters.
3) Set ST on valve spring retainer. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:
• For correct re-installation, keep removed parts in order in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve stem seals.



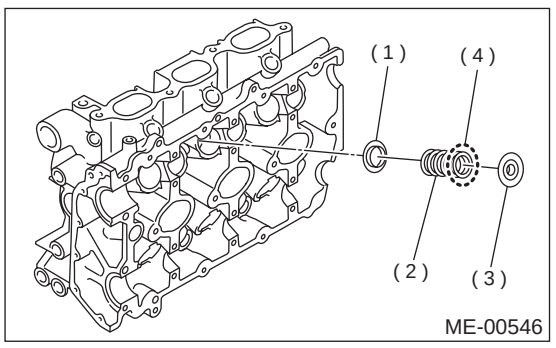
D: ASSEMBLY

1) Installation of valve spring and valve
(1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
(2) Coat stem of each valve with engine oil and insert valve into valve guide.

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

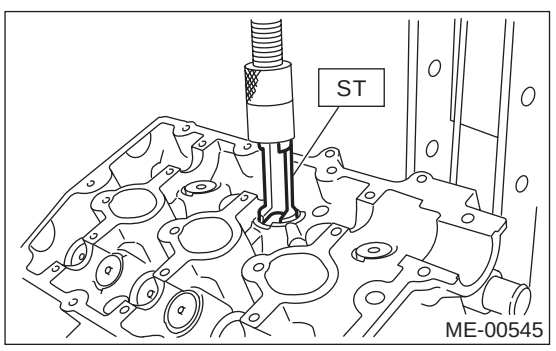
(3) Install valve spring and retainer.

CAUTION:
• Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.
• Install valve spring with the painted surface facing the retainer side.



(1) Seat
(2) Valve spring
(3) Retainer
(4) Painted face

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



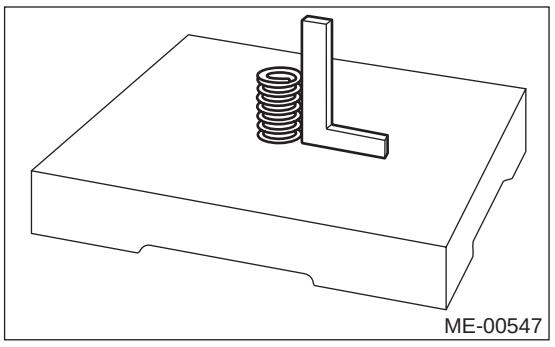
(5) Compress valve spring and fit valve spring retainer key.
(6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.
2) Apply oil to the surface of the valve lifter and valve shim.
3) Install valve lifter and valve shim.

E: INSPECTION

1. VALVE SPRING

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

Free length	46.79 mm (1.8421 in)
Squareness	2.5°, 2.0 mm (0.079 in)

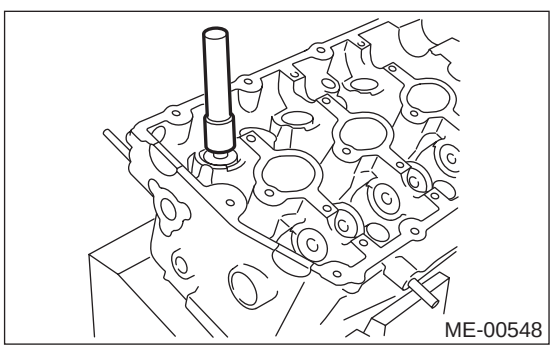

ME-00547

2. INTAKE AND EXHAUST VALVE STEM SEAL

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

CAUTION:
• Apply engine oil to stem seal before press-fitting.
• When press-fitting stem seal, do not use hammer or strike in.

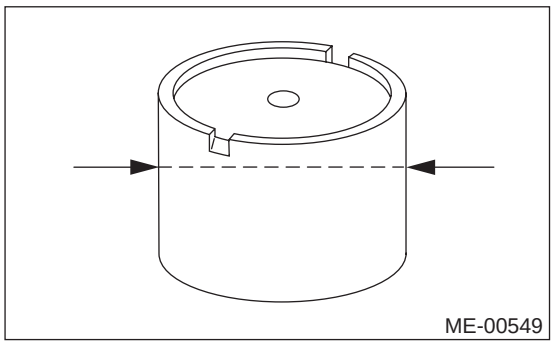
ST1 18250AA000 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE


ME-00548

3. VALVE LIFTER

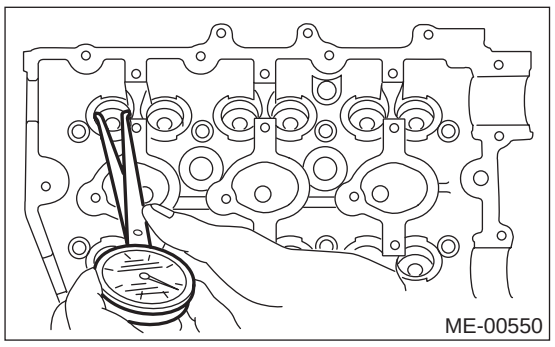
1) Check valve lifter visually.
2) Measure outer diameter of valve lifter.

Outer diameter:
33.959 — 33.975 mm (1.3370 — 1.3376 in)


ME-00549

3) Measure inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.006 — 34.016 mm (1.3388 — 1.3392 in)


ME-00550

CAUTION:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

F: ADJUSTMENT

1. CYLINDER HEAD

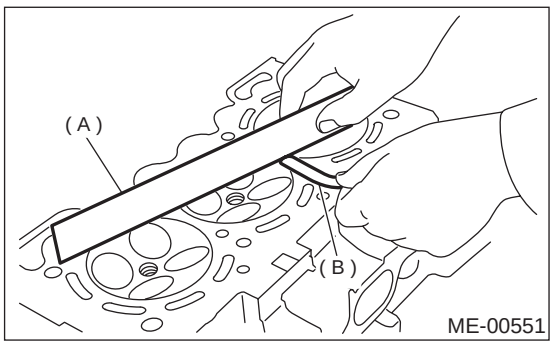
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
124 mm (4.88 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.



(A) Straight edge
(B) Thickness gauge

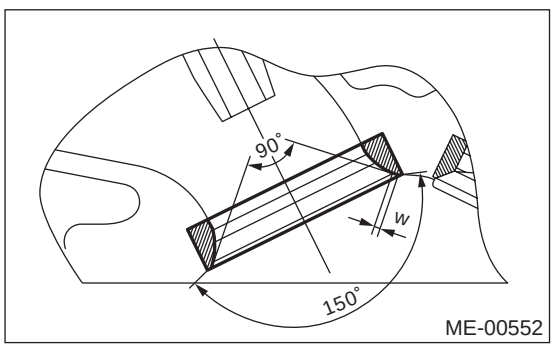
2. VALVE SEAT

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

Valve seat width: W

Intake
Standard
1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)

Exhaust
Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 in)



3. VALVE GUIDE

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

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 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 valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

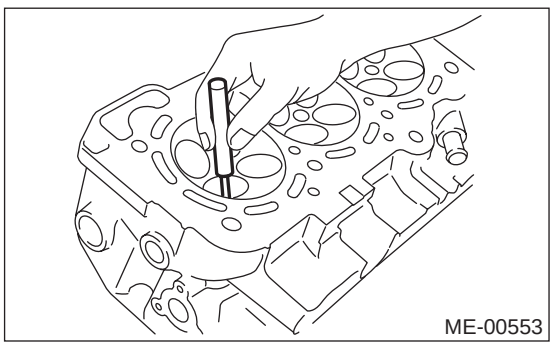
Valve guide inner diameter:
5.500 — 5.512 mm (0.2165 — 0.2170 in)

Valve stem outer diameter:
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.455 — 5.460 mm (0.2148 — 0.2150 in)

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

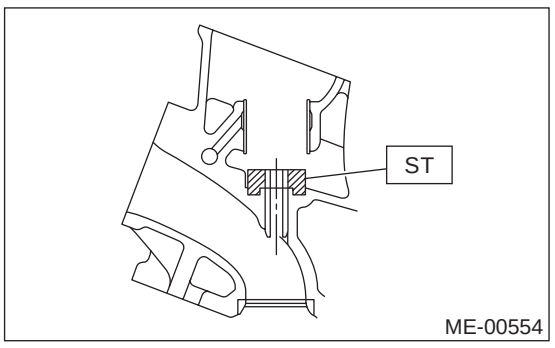
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 18250AA000 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



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

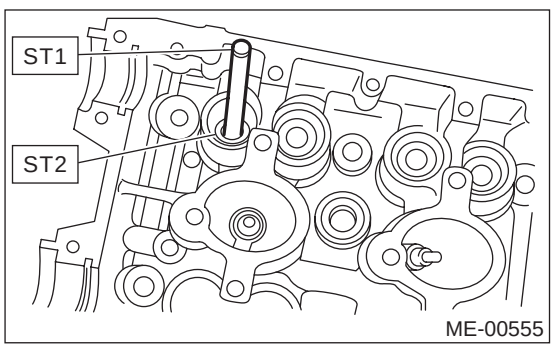
ST 18251AA000 VALVE GUIDE ADJUSTER



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

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

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
12.3 — 12.7 mm (0.484 — 0.500 in)

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

ST 499765900 VALVE GUIDE REAMER

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

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

4. INTAKE AND EXHAUST VALVE

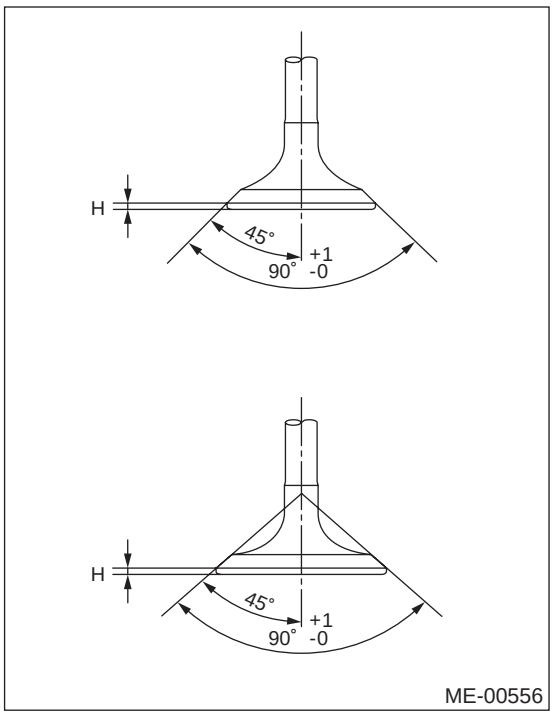
1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:

Intake
Standard
1.0 mm (0.039 in)
Limit
0.8 mm (0.031 in)

Exhaust
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)

Valve overall length:
Intake
103.5 mm (4.075 in)
Exhaust
103.2 mm (4.063 in)

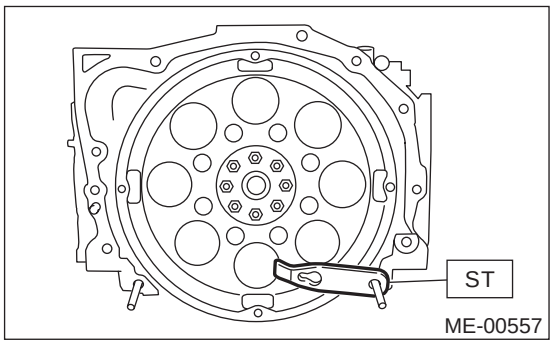


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

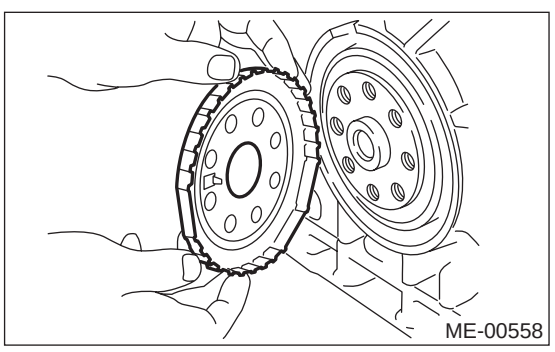
18.Cylinder Block

A: REMOVAL

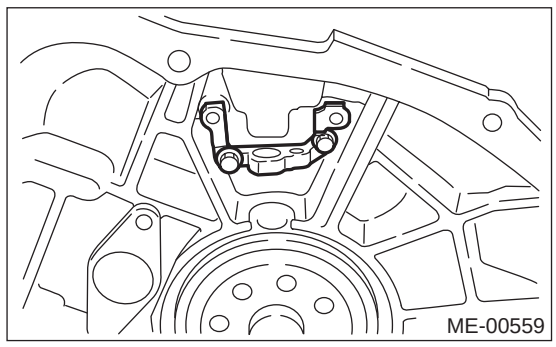
1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
8) Remove cylinder head assembly. <Ref. to ME(H6DO)-54, REMOVAL, Cylinder Head Assembly.>
9) Remove drive plate.
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



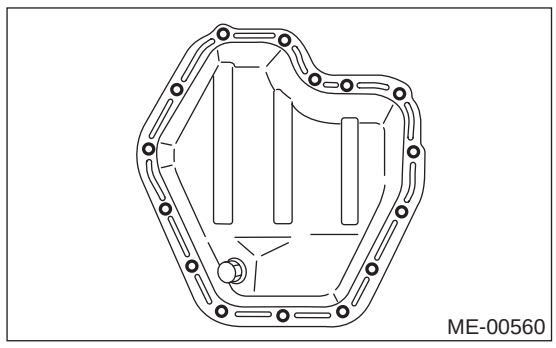
10) Remove crankshaft position sensor plate.



11) Remove crankshaft position sensor bracket.



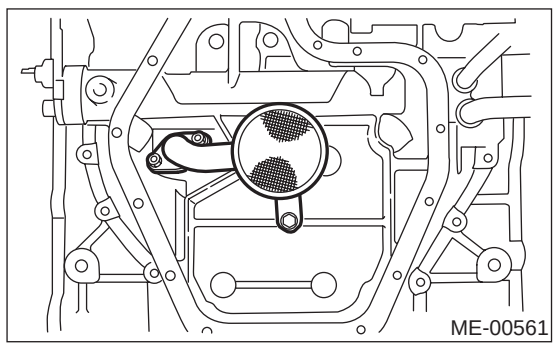
12) Rotate engine until oil pan comes to the top.
13) Remove bolts which secure lower oil pan to upper oil pan.



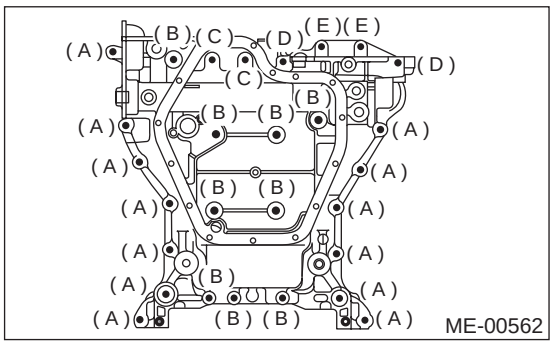
14) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

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

15) Remove oil strainer.



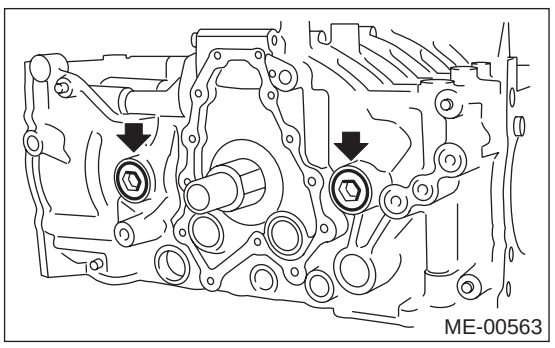
16) Remove bolts which secure upper oil pan to cylinder block.



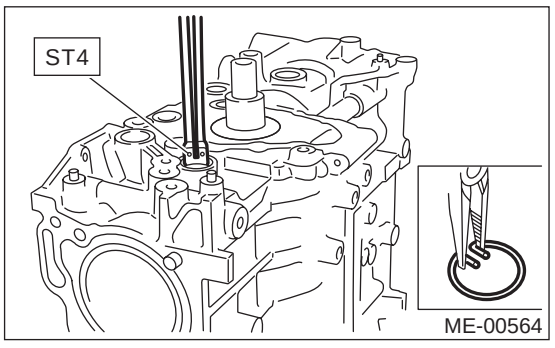
Bolt dimension:

(A) 8 × 40
(B) 8 × 65
(C) 8 × 85
(D) 8 × 130
(E) 8 × 24

17) Remove service hole cover and service hole plugs using hexagon wrench.

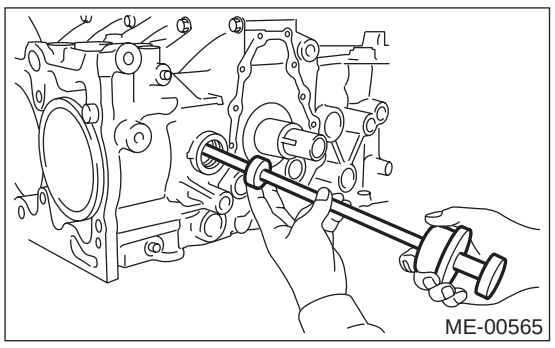


18) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders by using ST.
ST 18233AA000 PISTON PIN CIRCLIP PLIER

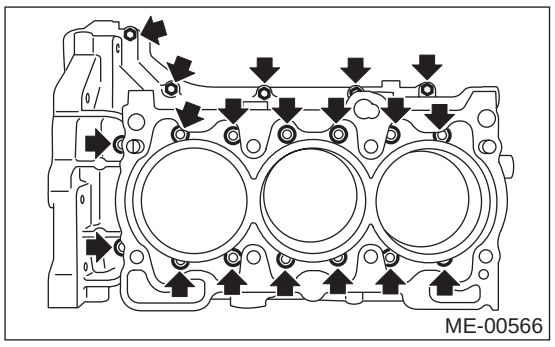


19) Draw out piston pin from #1 and #2 pistons by using ST.
ST 499097500 PISTON PIN REMOVER

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



20) Similarly remove piston pins from #3, #4, #5 and #6 pistons.
21) Remove bolts which connect cylinder block.



22) Separate left-hand and right-hand cylinder blocks.

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

23) Remove rear oil seal.
24) Remove crankshaft together with connecting rod.
25) Remove crankshaft bearings from cylinder block using hammer handle.

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

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

CAUTION:
Do not confuse combination of piston, piston pin and cylinder.

B: INSTALLATION

1) Install ST to cylinder block, then install crankshaft bearing.
ST 18232AA000 ENGINE STAND

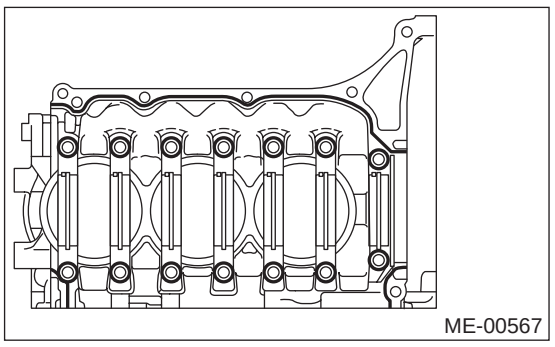
CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft and connecting rod on the #2, #4 and #6 cylinder.
3) Apply fluid gasket to the mating surface of #1, #3 and #5 cylinder block.

Fluid gasket:
THREE BOND 1215B or equivalent

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

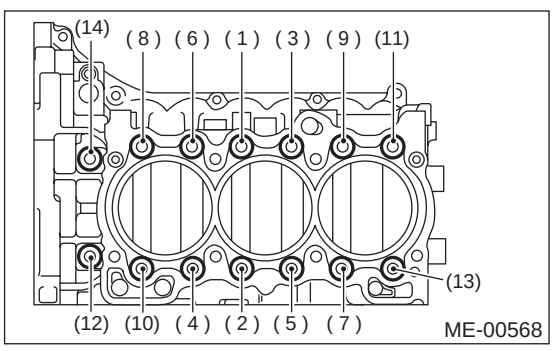
Fluid gasket application diameter:
1.0±0.2 mm (0.039±0.008 in)


ME-00567

4) Apply engine oil to washers and threads of cylinder block connecting bolts. Tighten the bolts following the steps below.
(1) Tighten all the bolts in the numerical order shown in the figure.

Tightening torque:

(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)

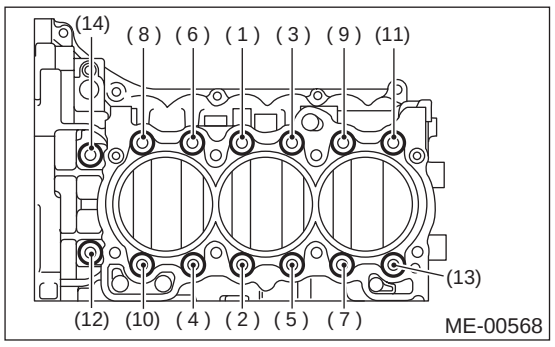


ME-00568

(2) Tighten all the bolts again in the order shown in the figure.

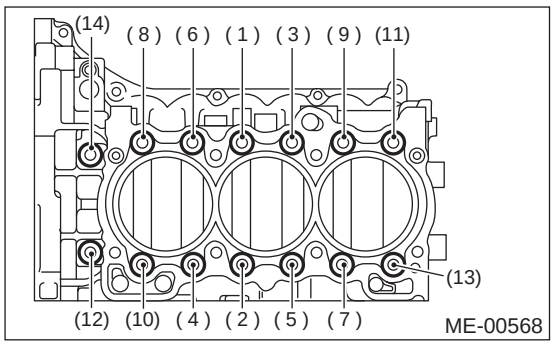
Tightening torque:

(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



ME-00568

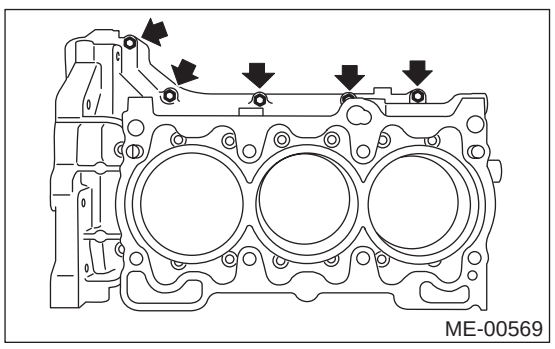
5) Tighten all the bolts by 90° in the order shown in the figure.



ME-00568

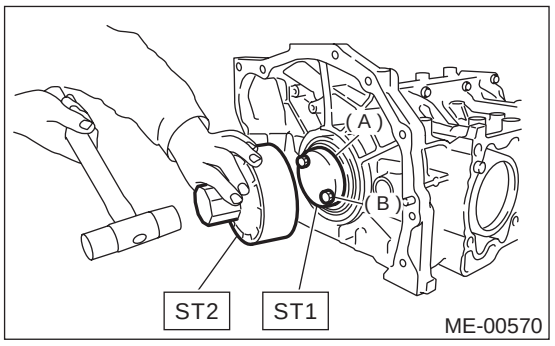
6) Install upper bolts on cylinder block.

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)


ME-00569

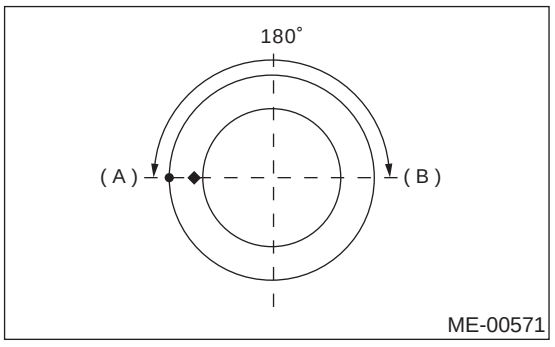
7) Install rear oil seal using ST1 and ST2.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

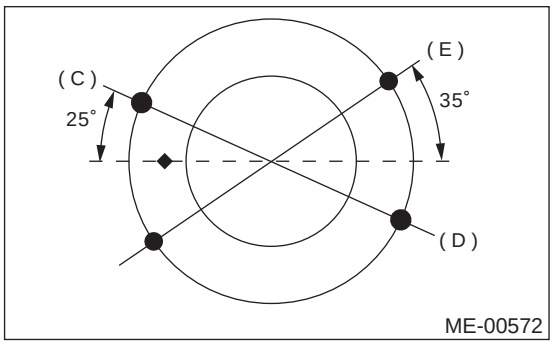


(A) Rear oil seal
(B) Drive plate attaching bolt

8) Positioning of piston ring.
(1) Position the top ring gap at (A) in the figure.
(2) Position the second ring gap at (B) in the figure.



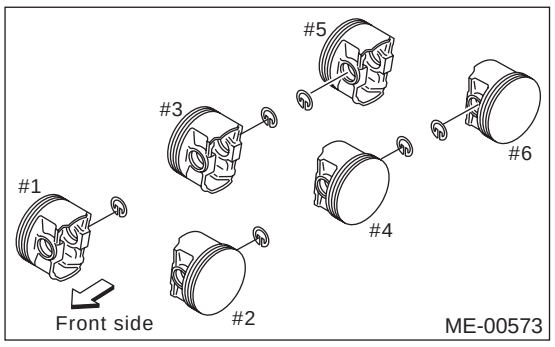
(3) Position the upper rail gap at (C) in the figure.
(4) Position the expander gap at (D) in the figure.
(5) Position the lower rail gap at (E) in the figure.



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

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

NOTE:
Use new circlips.

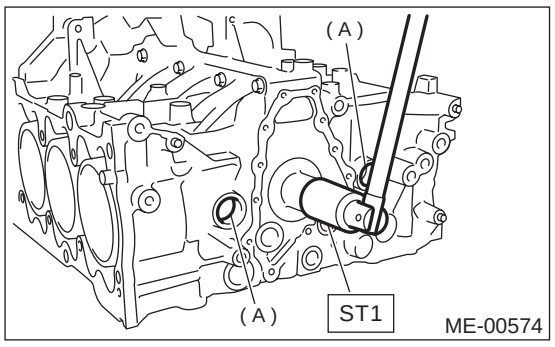


9) Installing piston.

CAUTION:
Install piston and piston pin to the same cylinder they were installed before overhaul.

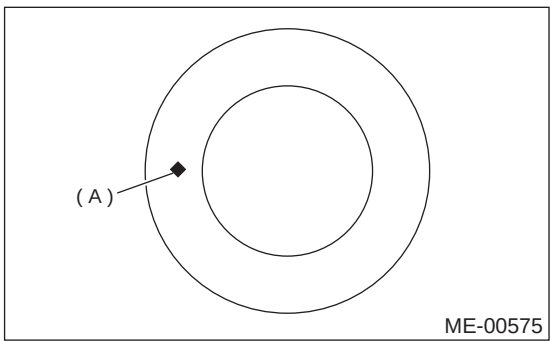
(1) Using ST1, rotate crankshaft until each small end of connecting rods #3 and #4 is aligned over service hole (A).

ST1 18252AA000 CRANKSHAFT SOCKET



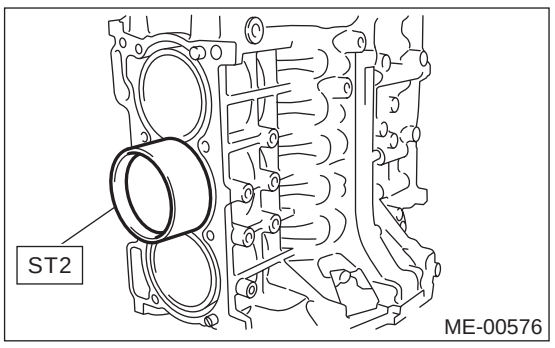
(2) Apply a coat of engine oil to piston and cylinders.

(3) Install pistons with their front marks (A) facing the front of engine.



(4) Insert pistons in their cylinders using ST2.

ST2 18254AA000 PISTON GUIDE

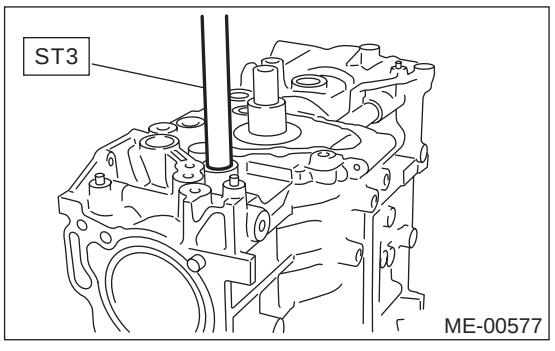


10) Installing piston pin.

(1) Apply a coat of engine oil to ST3.

ST3 18253AA000 PISTON PIN GUIDE

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

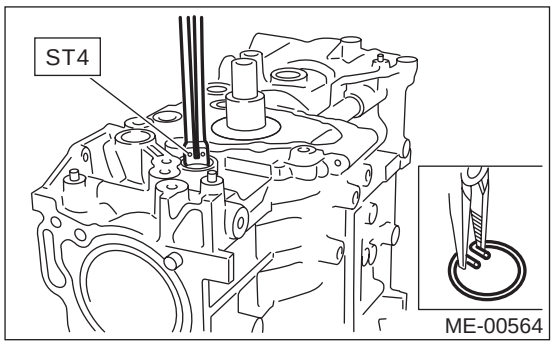


(3) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod small end through service hole.

(4) Using ST4, install circlip.

ST4 18233AA000 PISTON PIN CIRCLIP PLIER

NOTE:
Use a new circlip.



11) Repeat the same steps for pistons #1 and #2, #5 and #6.

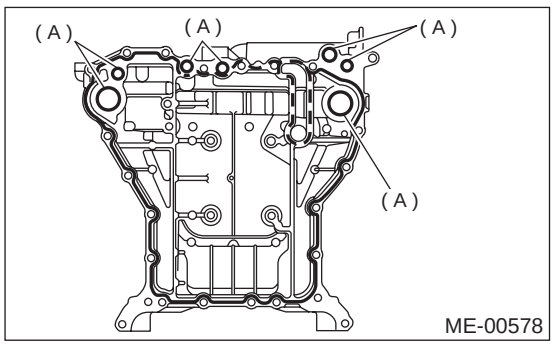
12) Install service hole plug and cover.

13) Apply fluid gasket to mating surface of upper oil pan.

14) Install O-ring.

Fluid gasket:

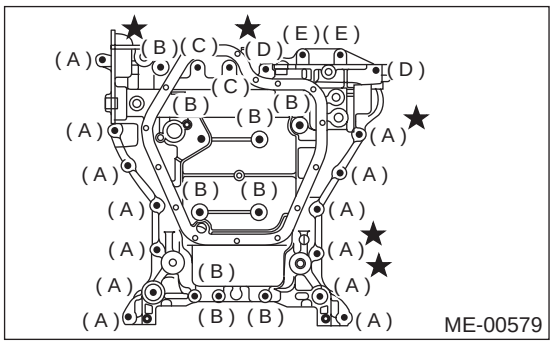
THREE BOND 1280B



(A) O-ring

15) Temporarily tighten the upper oil pan.

CAUTION:
Do not confuse the mounting positions of the bolts.

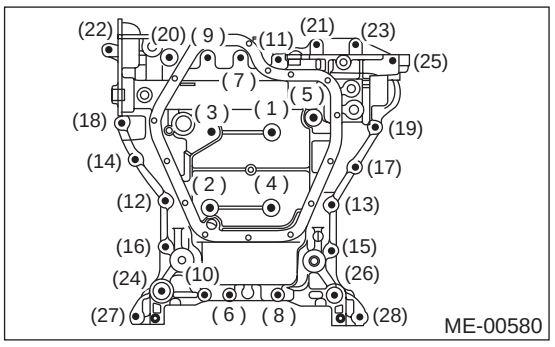


Bolt dimension:

(A) 8 × 40
(B) 8 × 65
(C) 8 × 85
(D) 8 × 130
(E) 8 × 20

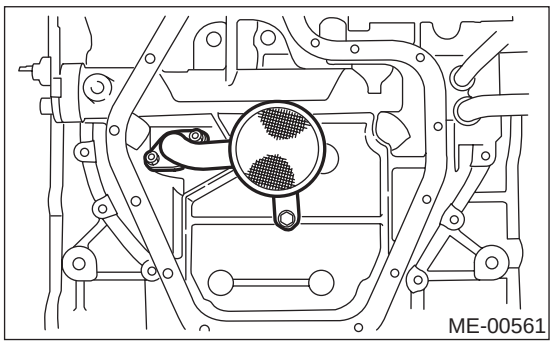
16) Tighten the upper oil pan mounting bolts in the numerical sequence shown in the figure.

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



17) Install oil strainer.

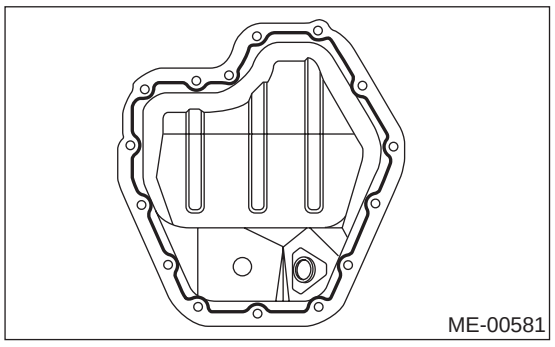
NOTE:
Use a new O-ring.



18) Apply fluid gasket to mating surface of lower oil pan.

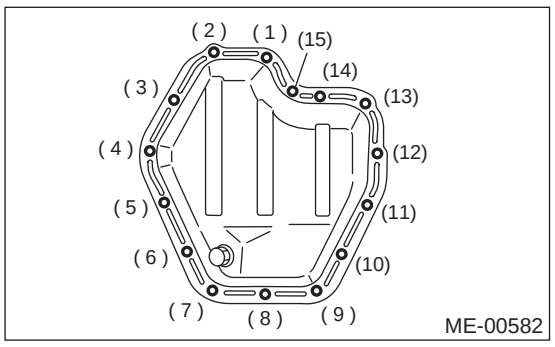
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
5.0±1.0 mm (0.097±0.039 in)



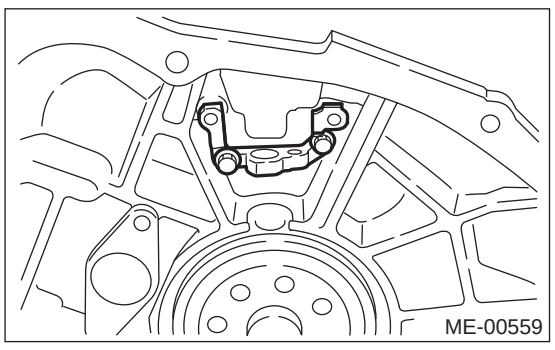
19) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

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

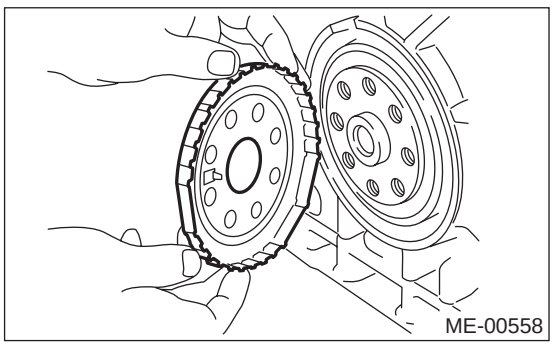


20) Install crankshaft position sensor bracket.

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

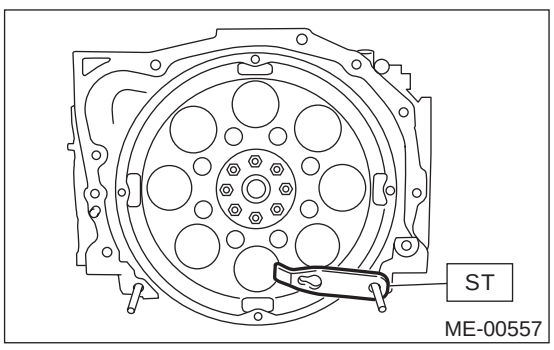


21) Install crankshaft position sensor plate.



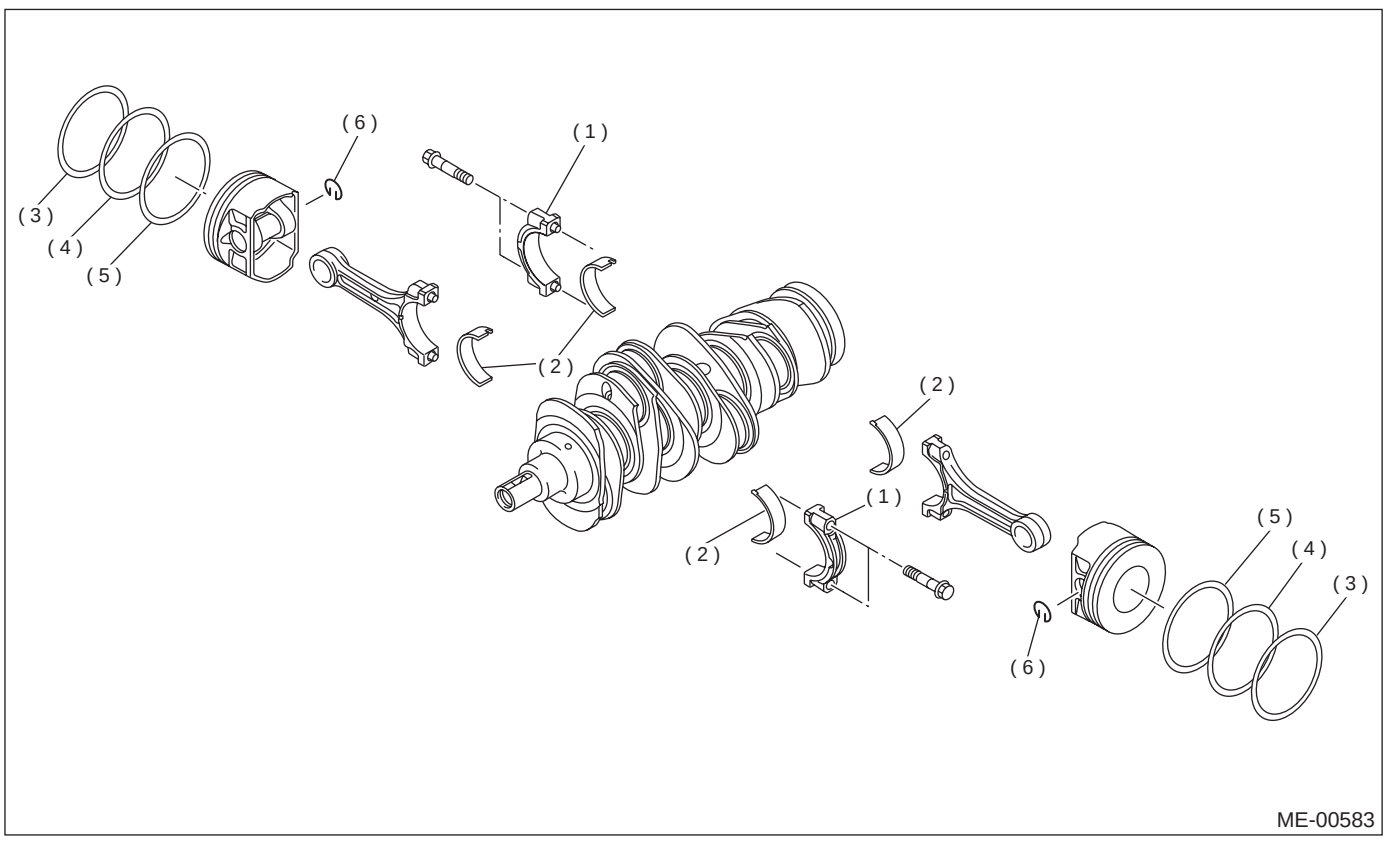
22) Install drive plate.
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
81 N·m (8.3 kgf-m, 60 ft-lb)



23) Install cylinder head assembly. <Ref. to ME(H6DO)-54, INSTALLATION, Cylinder Head Assembly.>
24) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>
25) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
26) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
27) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
28) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
29) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
30) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY



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

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

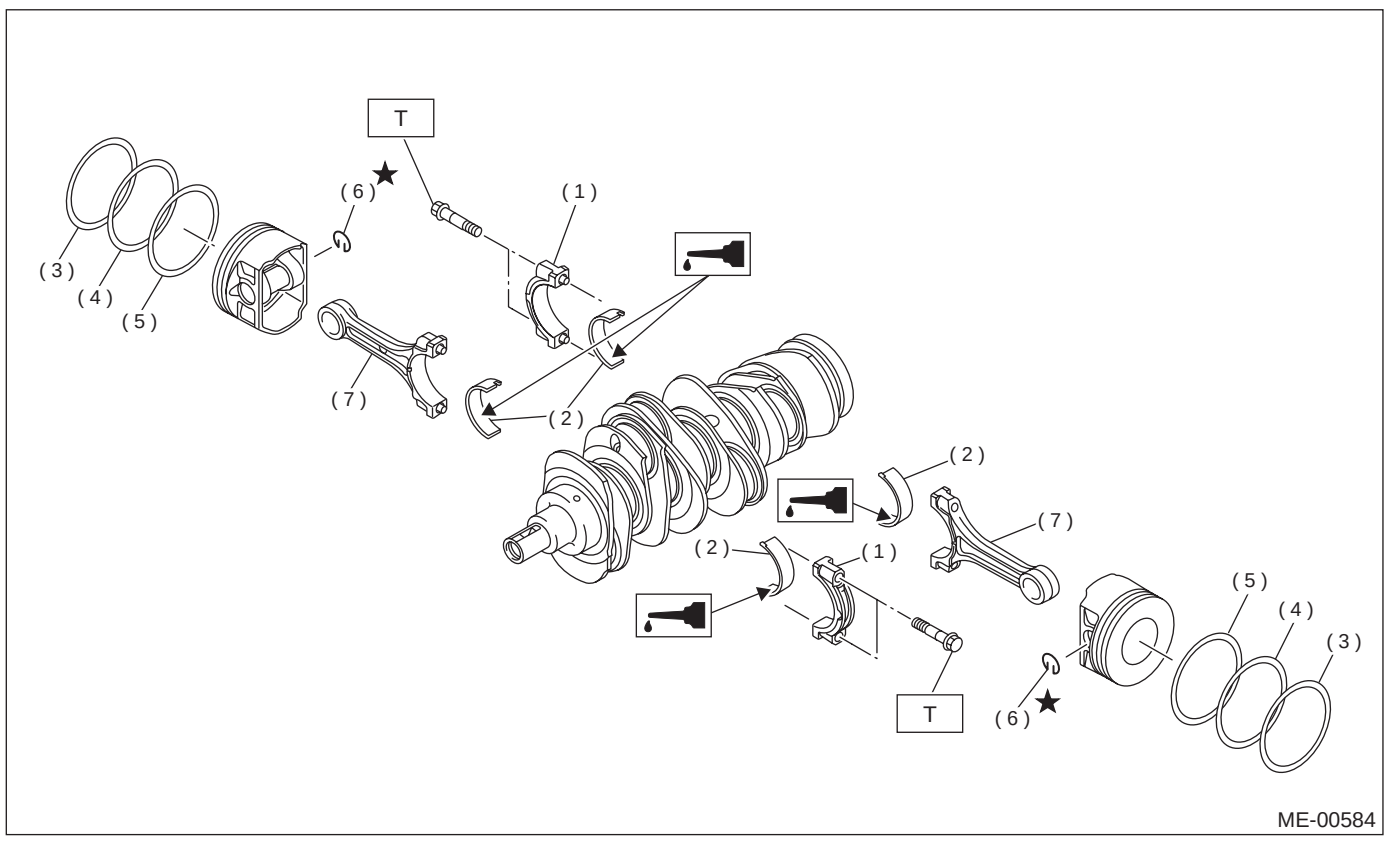
CAUTION:
Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

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

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

5) Remove circlip.

D: ASSEMBLY



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

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39)

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

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

2) Install connecting rod on crankshaft.

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

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

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

4) Installation of piston rings and oil ring

E: INSPECTION

1. CYLINDER BLOCK

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

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
202 mm (7.95 in)

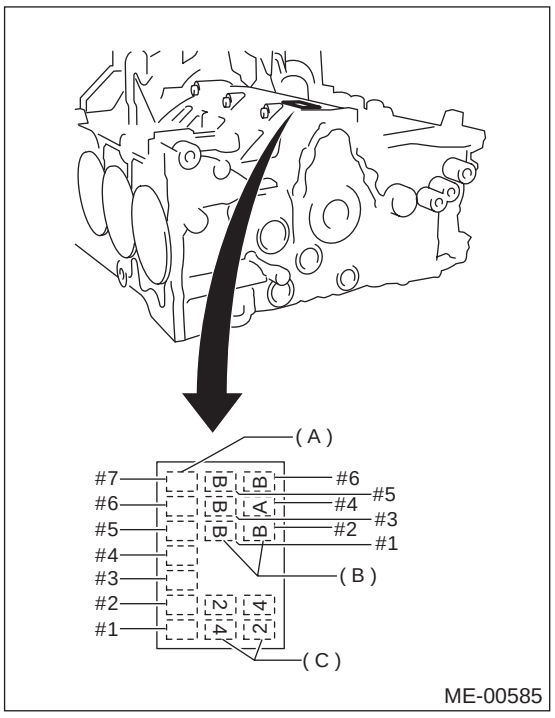
2. CYLINDER AND PISTON

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

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

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

Standard diameter:
A: 89.205 — 89.215 mm (3.5120 — 3.5124 in)
B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)



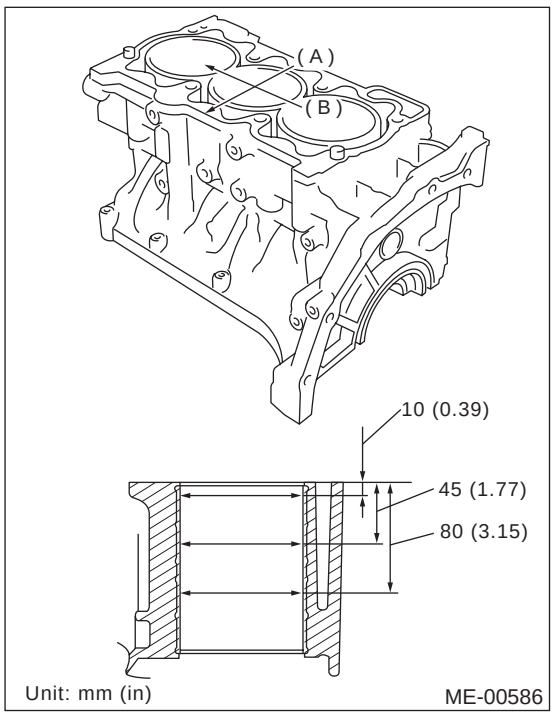
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block RH-LH combination mark

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

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

Taper:
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Limit
0.050 mm (0.0020 in)



(A) Thrust direction
(B) Piston pin direction

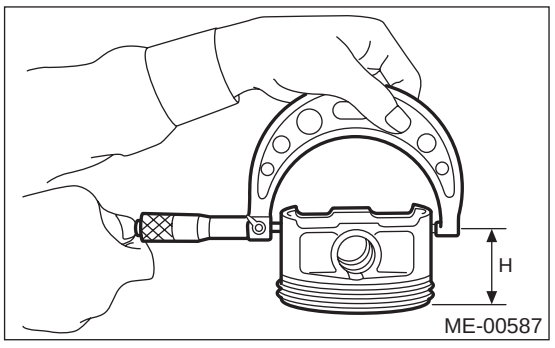
3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

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

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

Piston grade point H:
39.0 mm (1.535 in)

Piston outer diameter:
Standard
A: 89.185 — 89.195 mm
(3.5112 — 3.5116 in)
B: 89.175 — 89.185 mm
(3.5108 — 3.5112 in)
0.25 mm (0.0098 in) oversize
89.425 — 89.435 mm
(3.5207 — 3.5211 in)
0.50 mm (0.0197 in) oversize
89.675 — 89.685 mm
(3.5305 — 3.5309 in)



5) Calculate the clearance between cylinder and piston.

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

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

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

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

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

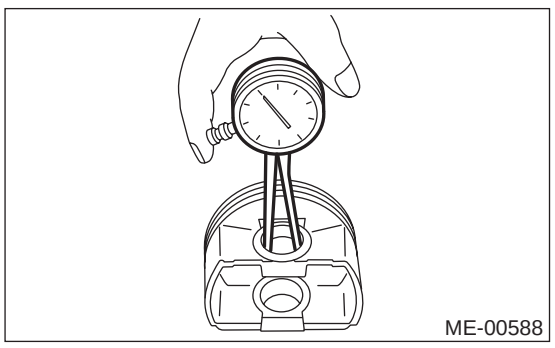
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

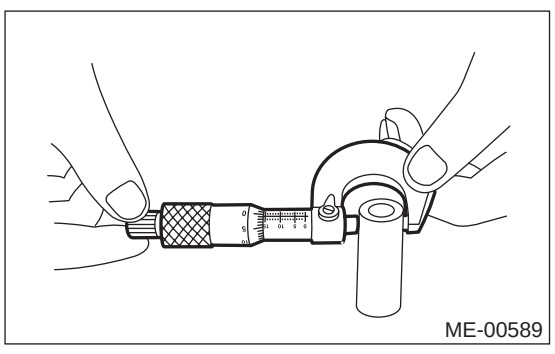
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

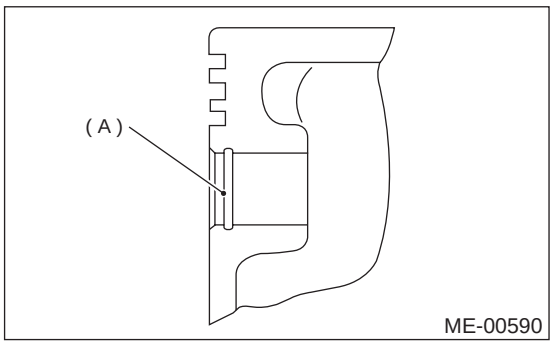
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6DO)-68, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)





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

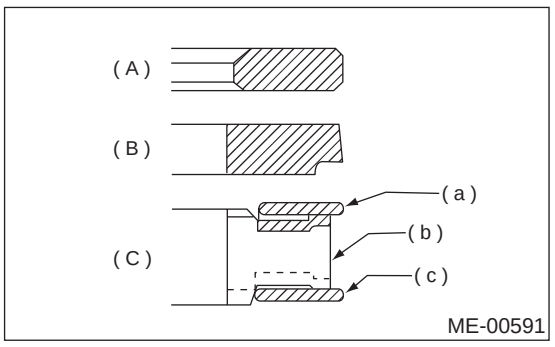


5) Check piston pin circlip for distortion, cracks and wear.

4. PISTON RING

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

CAUTION:
• Marks are shown on the end of the top and second rings. When installing the rings to the piston, face this mark upward.
• The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.

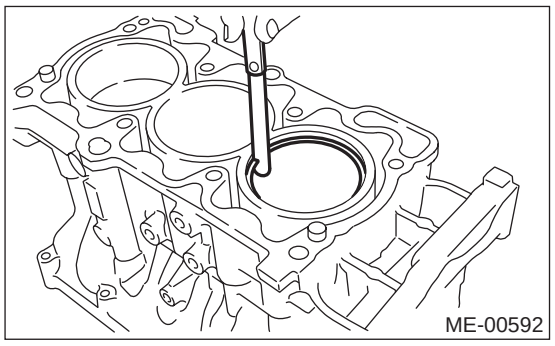


(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Expander
(c) Lower rail

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

Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.60 (0.0079 — 0.0236)	1.5 (0.059)

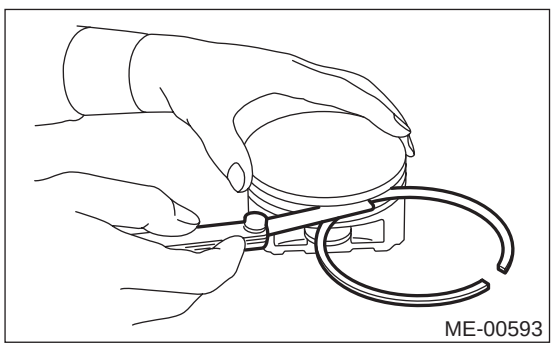


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

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

Unit: mm (in)

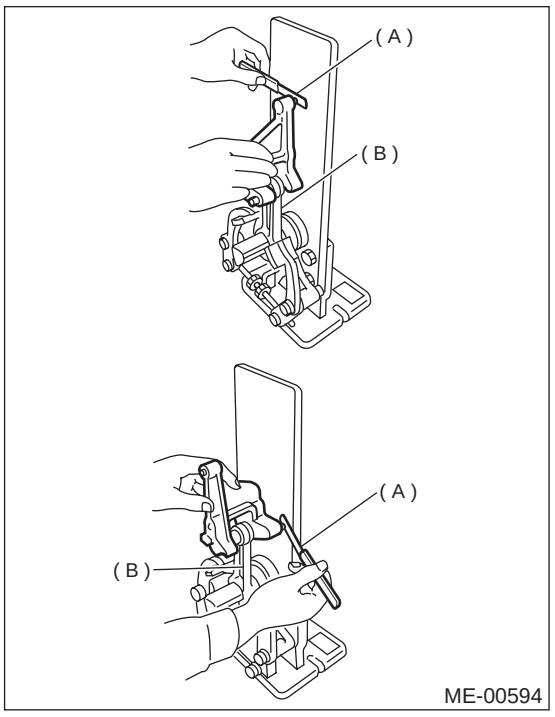
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)
Clearance between oil ring and oil ring groove		0.065 — 0.155 (0.0026 — 0.0061)	—



5. CONNECTING ROD

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

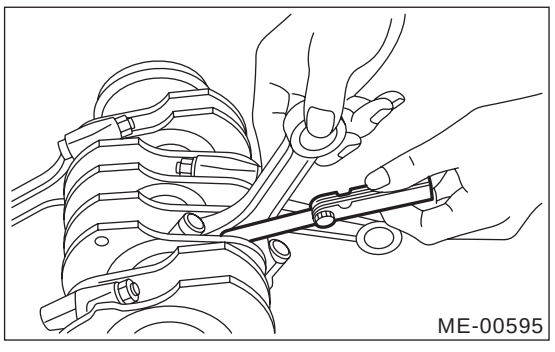
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

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

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



4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

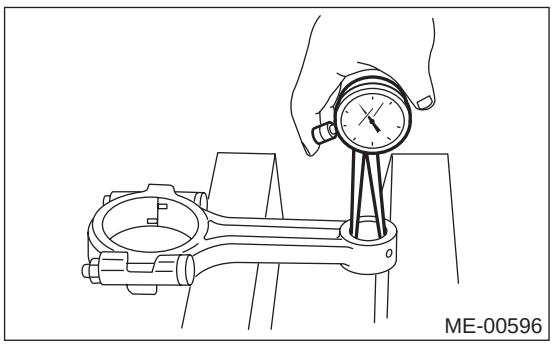
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

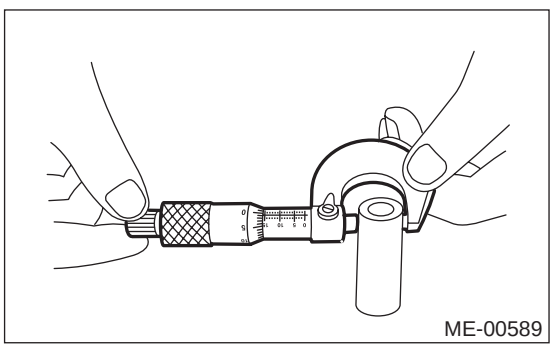
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

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

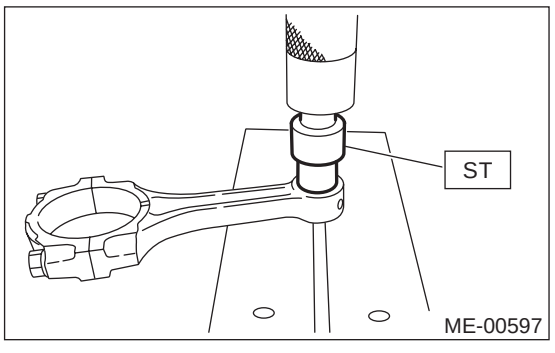
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00596


ME-00589

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

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00597

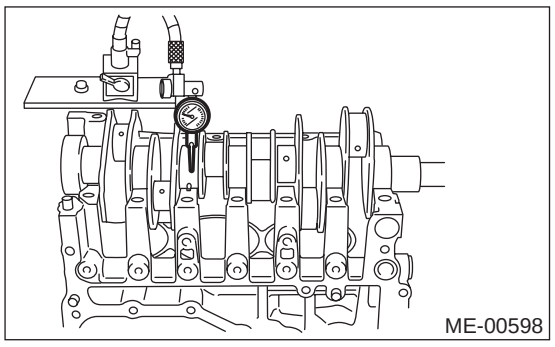
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

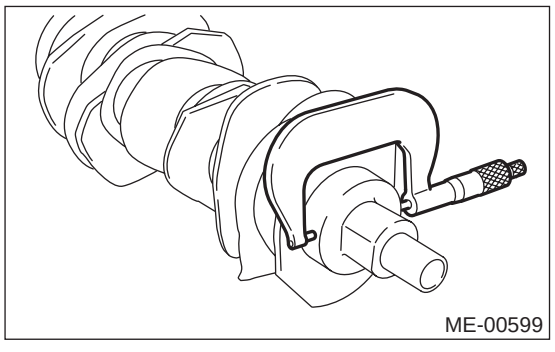
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00598

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

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Grinding limit
0.250 mm (0.0098 in)


ME-00599

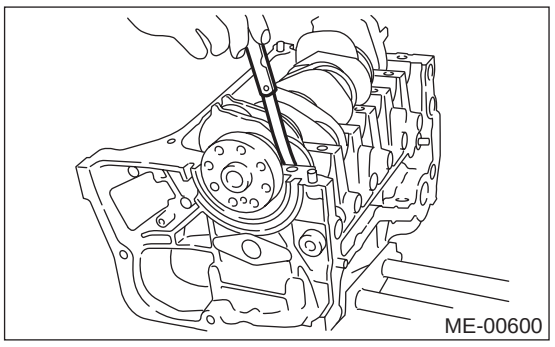
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3, #5, #7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.000 (0.0786 — 0.0787)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.020 (0.0795 — 0.0795)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)		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.	63.742 — 63.758 (2.5095 — 2.5102)		51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D. ... Outer Diameter

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

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


ME-00600

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance	
Standard	0.010 — 0.030 (0.0004 — 0.0012)
Limit	0.050 (0.0020)

19.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occur.	• Engine control system <Ref. to EN(H6DO)-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
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H6DO)-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
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H6DO)-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 filter cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• 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(H6DO)-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
	• Chain	• 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(H6DO)-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
	• Chain	• 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(H6DO)-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(H6DO)-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(H6DO)-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
	• Chain	• 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(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filter cap	B
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Chain	• 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

20.Engine Noise

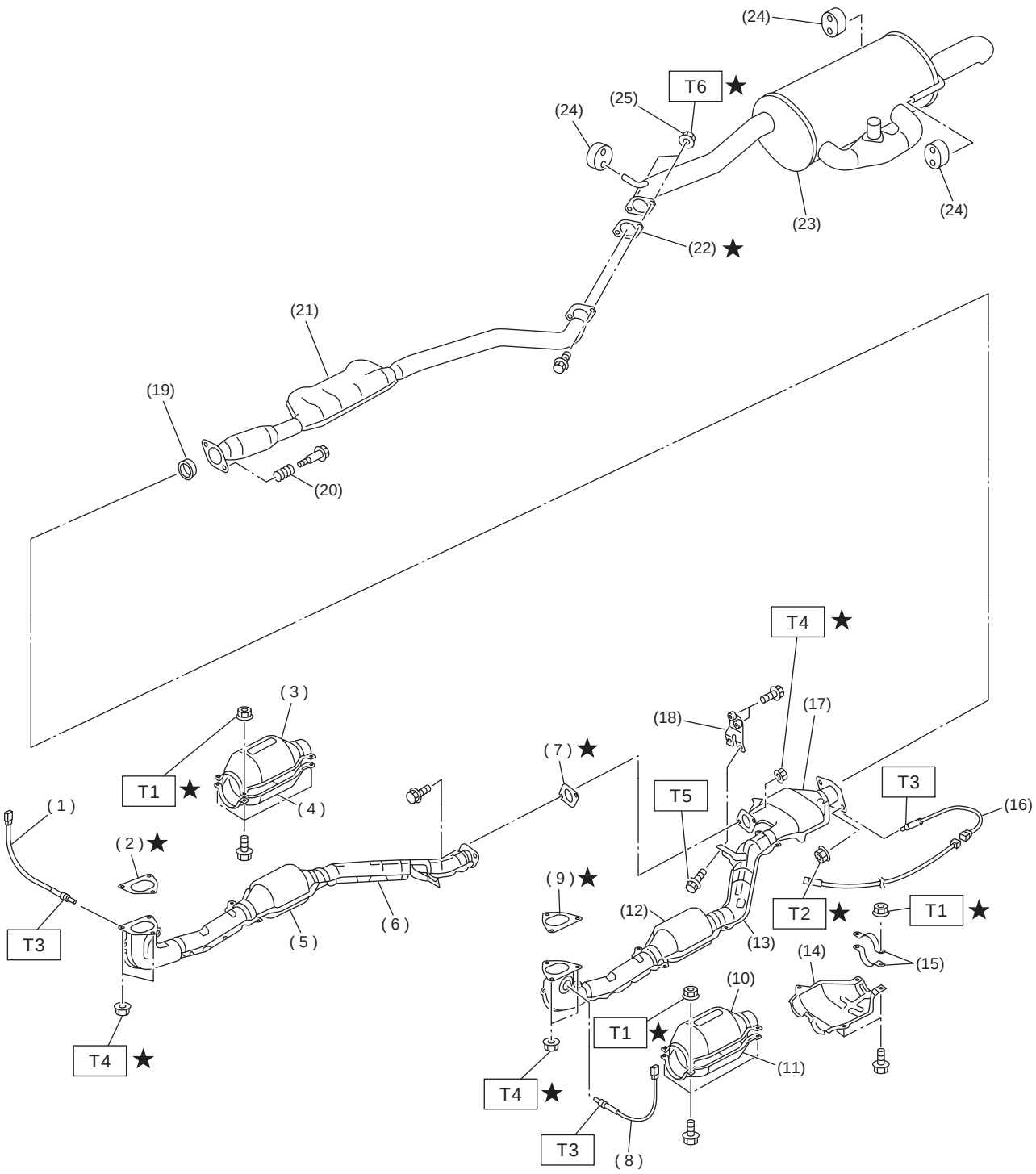
A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn 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 chain noise	—	• Loose timing chain • Chain contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H6DO)-59, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, Inspection Mode.> after connecting fuel injector connector.

1. General Description

A: COMPONENT



EX-00055

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.4)
T2*: *18 (1.8, 13.0)
T3: 21 (2.1, 15)
T4: 30 (3.1, 22.4)
T5*: *35 (3.6, 26.0)
T6: 48 (4.9, 35.4)

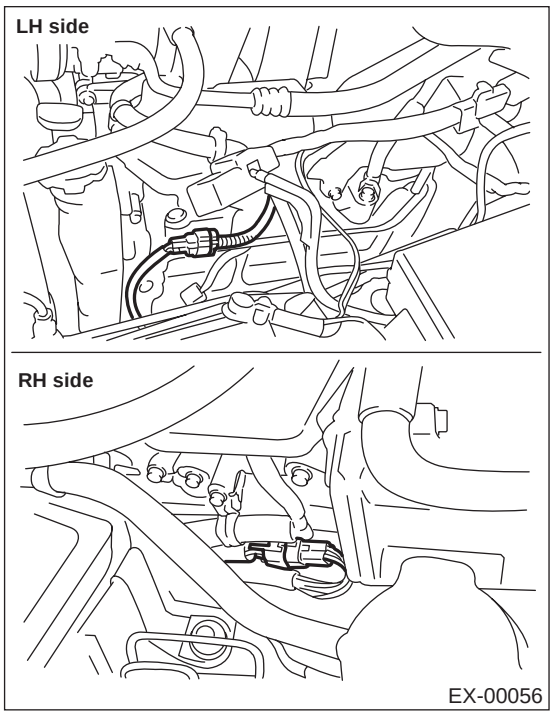
B: CAUTION

• 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 ground cable from battery.

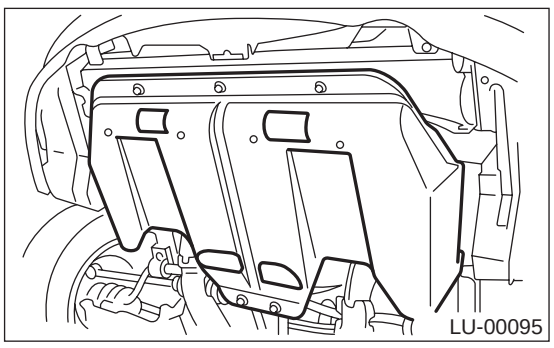
2. Front Exhaust Pipe

A: REMOVAL

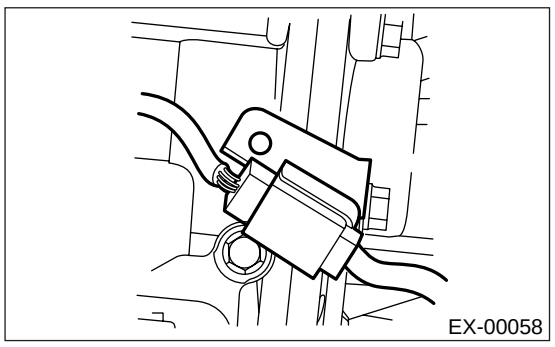
1) Remove battery.
2) Remove air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Disconnect front oxygen (A/F) sensor connector.



4) Lift-up the vehicle.
5) Remove under cover.

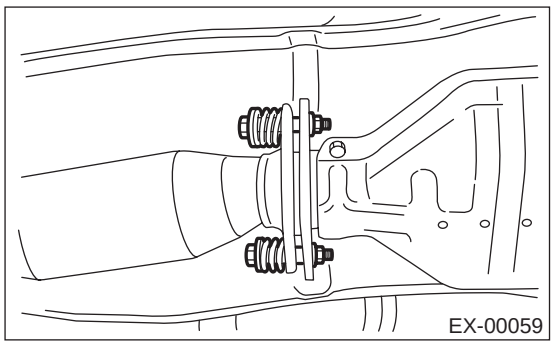


6) Disconnect rear oxygen sensor connector.



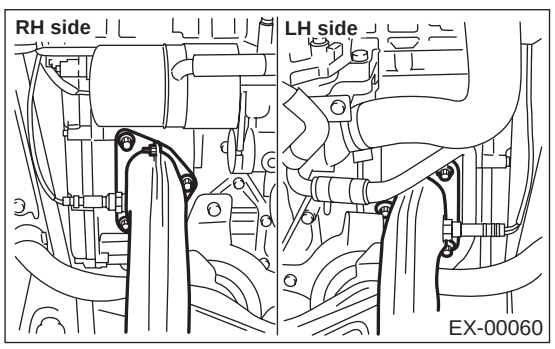
7) Separate front exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.

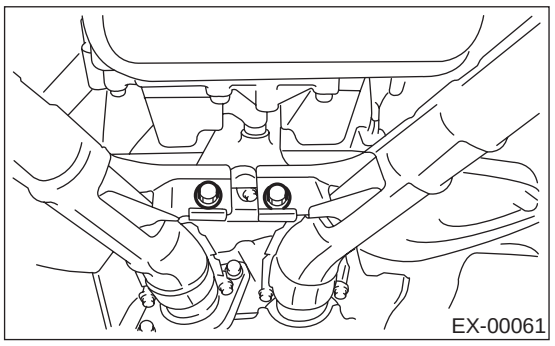


8) Remove nuts which hold front exhaust pipe onto cylinder heads.

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



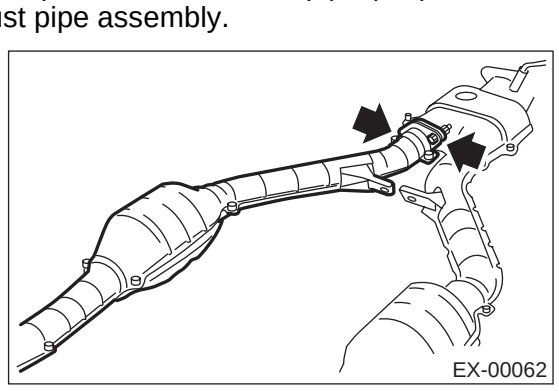
9) Remove bolt which secures front exhaust pipe assembly to hanger bracket.



10) Remove front exhaust pipe from the vehicle.

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

11) Separate front exhaust pipe (RH) from front exhaust pipe assembly.

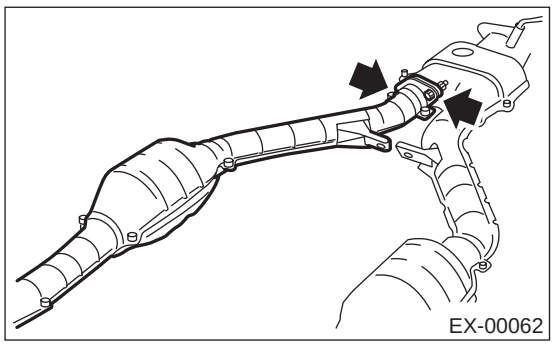


B: INSTALLATION

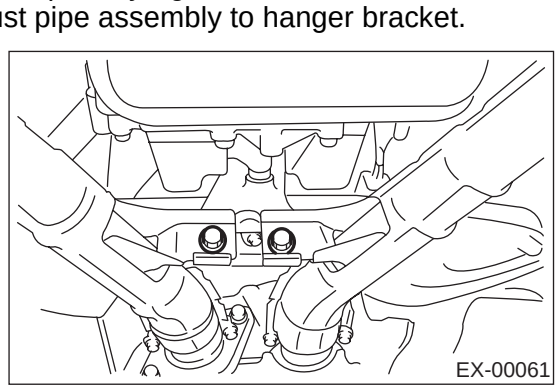
1) Install front exhaust pipe (RH) to front exhaust pipe assembly.

NOTE:
Replace gaskets with new ones.

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

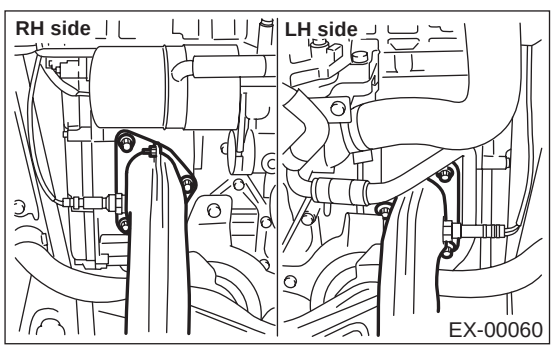


2) Install front exhaust pipe assembly to the vehicle.
3) Temporarily tighten bolt which installs front exhaust pipe assembly to hanger bracket.



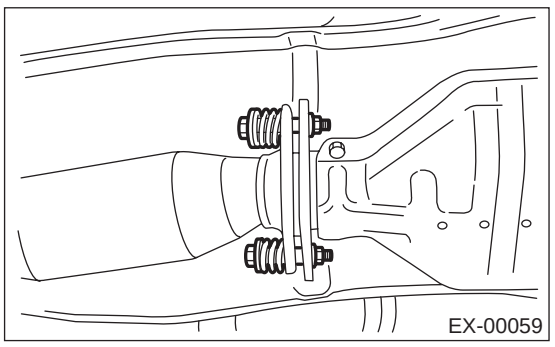
4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

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



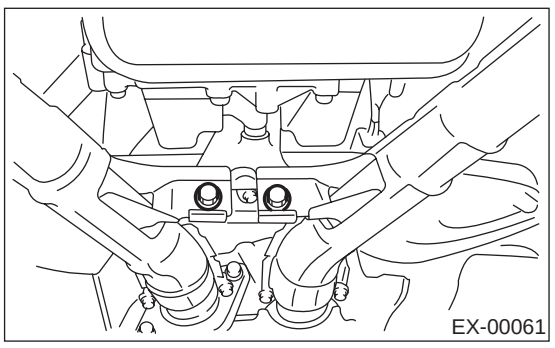
5) Install under cover.
6) Tighten bolts which install front exhaust pipe to rear exhaust pipe.

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

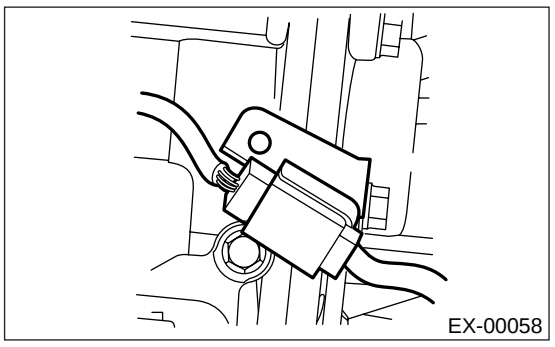


7) Tighten bolt which holds front exhaust pipe assembly to hanger bracket.

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

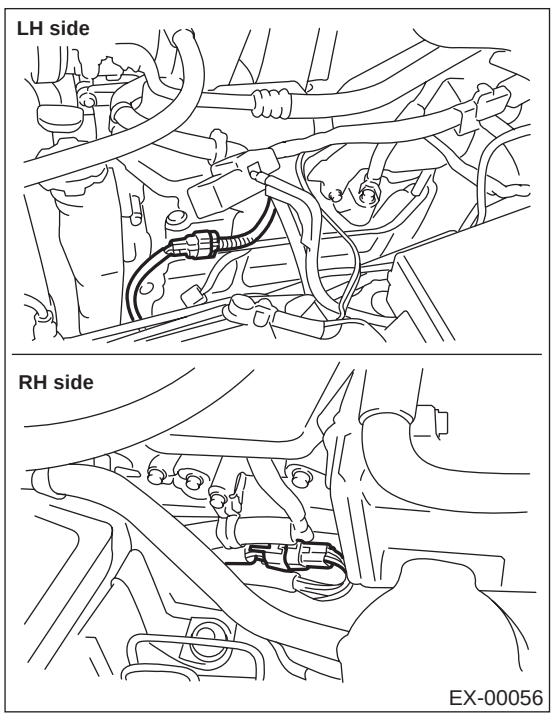


8) Connect rear oxygen sensor connector.



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

11) Connect front oxygen (A/F) sensor connectors.



12) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
13) Install battery.

C: INSPECTION

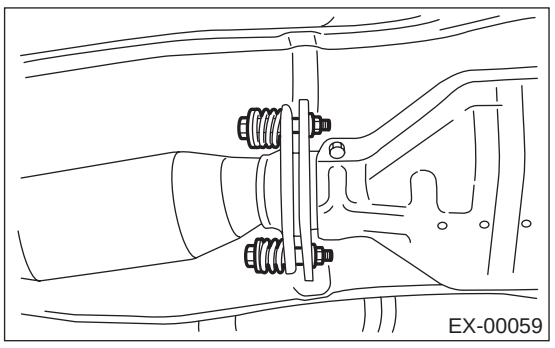
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

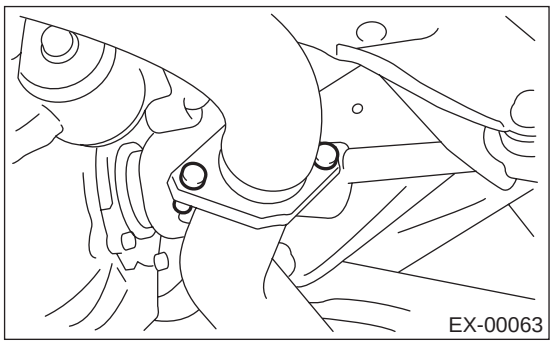
1) Separate rear exhaust pipe from front exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

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



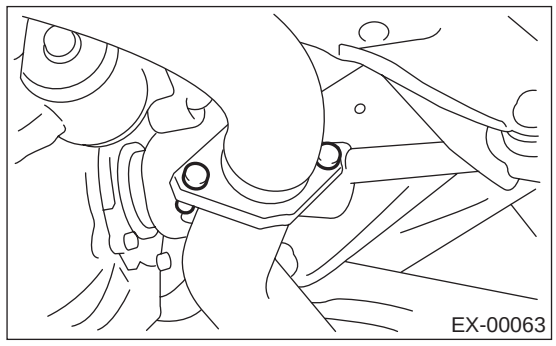
3) Remove rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace gaskets and self-lock nut with new ones.

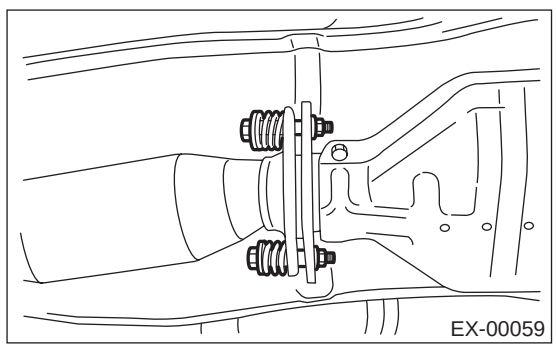
1) Install rear exhaust pipe to muffler.

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



2) Install rear exhaust pipe to front exhaust pipe.

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



C: INSPECTION

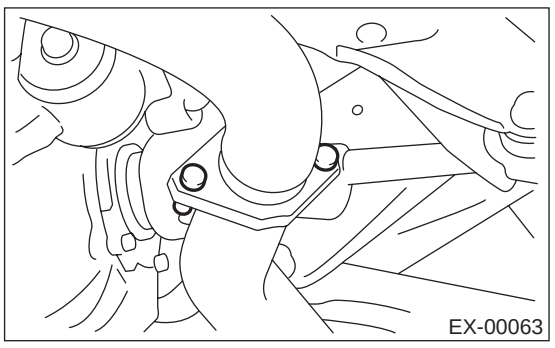
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

4. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

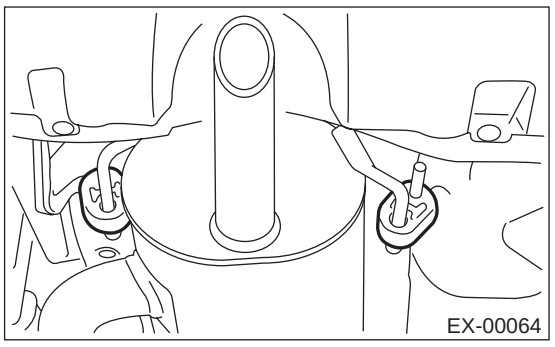


2) Remove left and right rubber cushions.

CAUTION:
Be careful not to drop the muffler during removal.

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

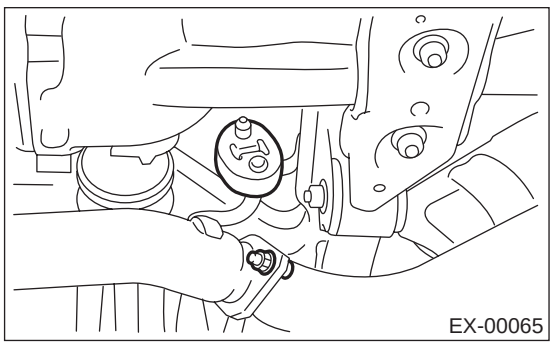
SUBARU CRC (Part No. 004301003)



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

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

SUBARU CRC (Part No. 004301003)

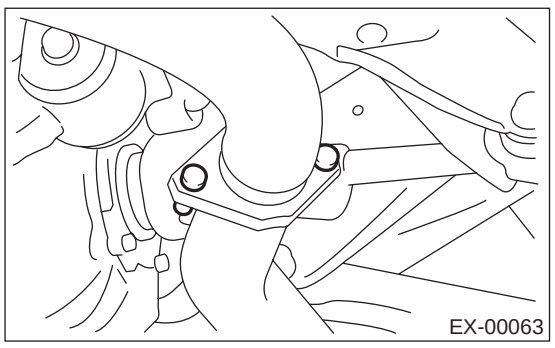


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace gasket and self-lock nut 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.

MUFFLER

EXHAUST

MEMO:

EX(H6DO)-10

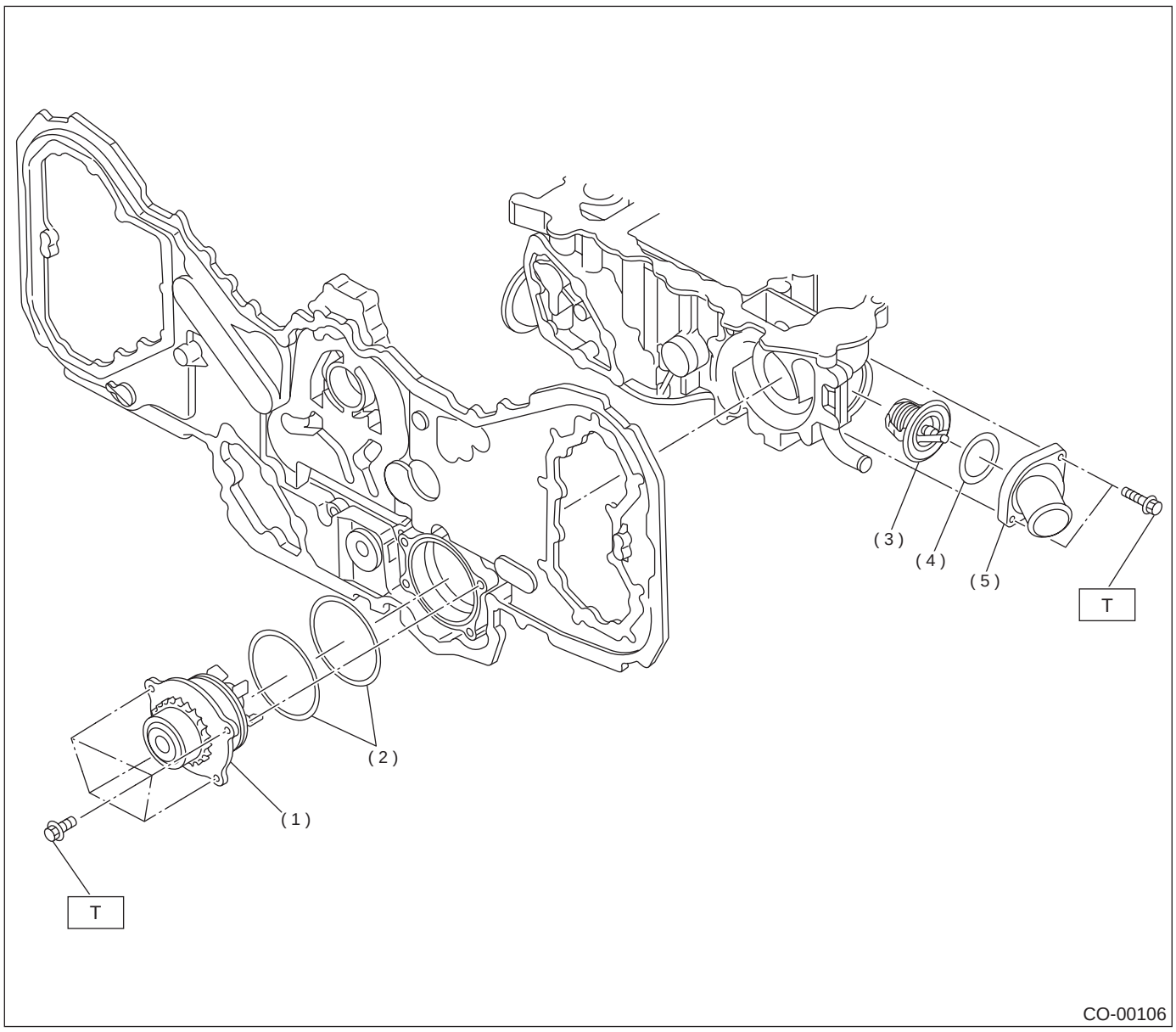
1. General Description

A: SPECIFICATIONS

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 7.9 (8.4, 7.0)
Water pump	Type		Centrifugal impeller type
	Discharge performance	Discharge	320 L (84.5 US gal, 70.4 Imp gal)/min.
		Pump speed—total engine coolant head	5,500 rpm — 18 mAq (59 ft Aq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		73.2 mm (2.882 in)
	Number of impeller vanes		6
	Tooth number of pump sprocket		22 t
Thermostat	Type		Wax pellet type
	Start to open		76 — 80°C (169 — 176°F)
	Fully open		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		120 W (main fan) 120 W (sub fan)
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions		699 × 349 × 27 mm (27.52 × 13.74 × 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)

B: COMPONENT

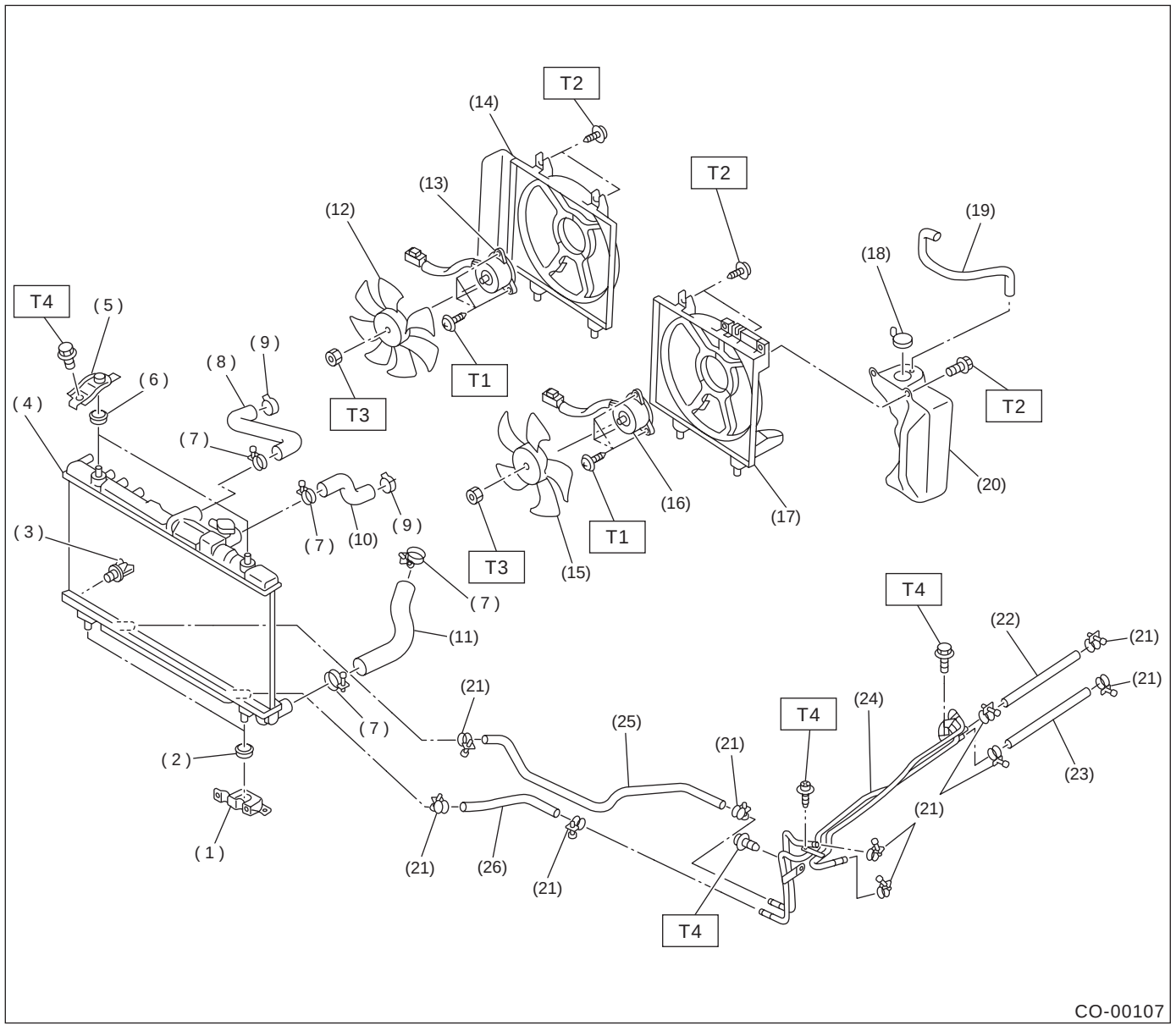
1. WATER PUMP



(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover

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

2. RADIATOR AND RADIATOR FAN



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

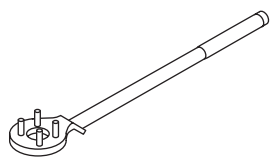
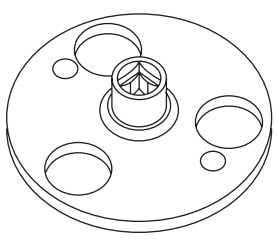
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 7.5 (0.76, 5.5)
T4: 12 (1.2, 8.7)

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 ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

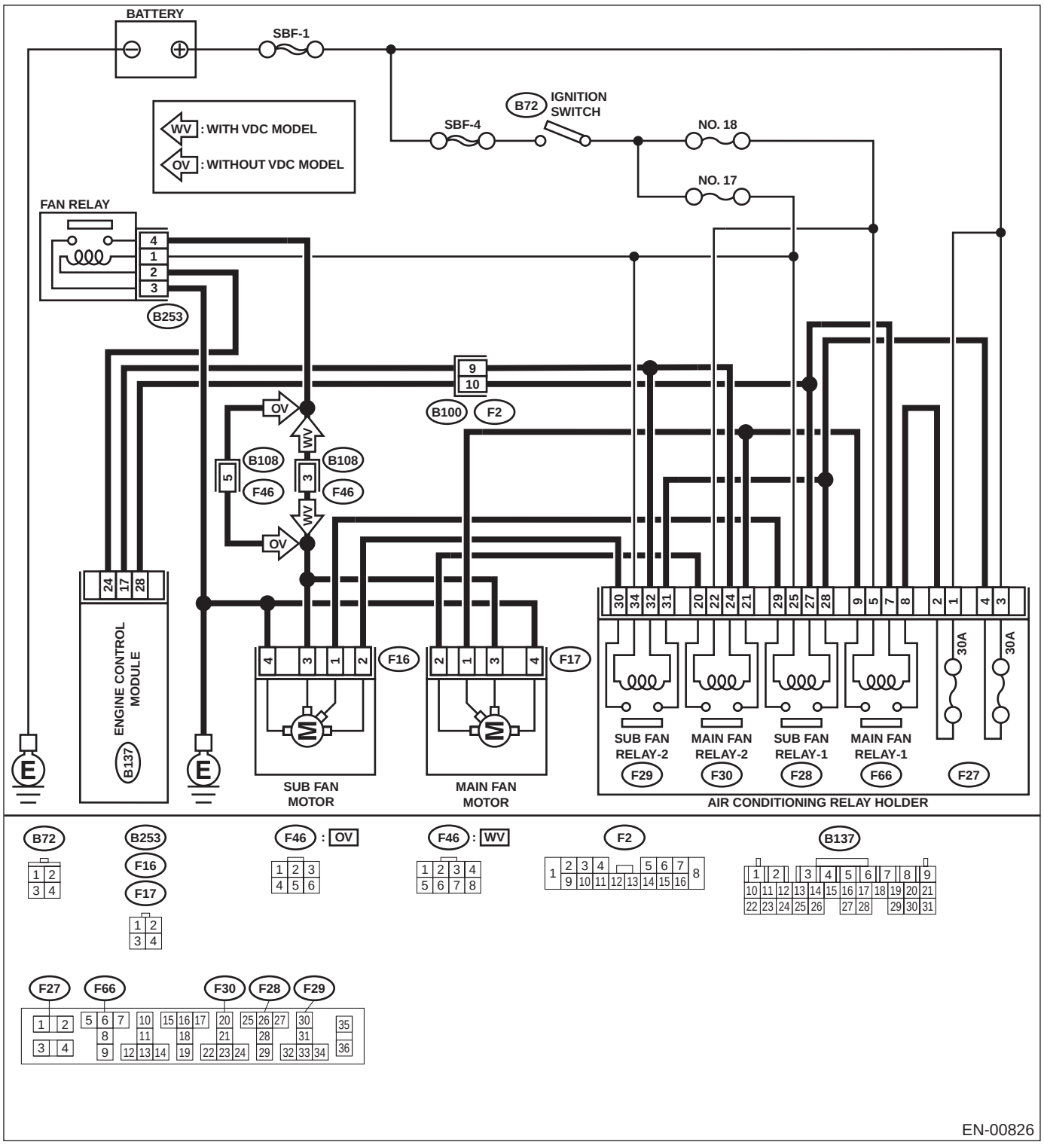
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA000	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

2. Radiator Main Fan System

A: SCHEMATIC



B: INSPECTION

TROUBLE SYMPTOM:

- Radiator main fan does not rotate in low speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to OFF.
- Radiator main fan does not rotate in middle speed under the following conditions:
  (1) Coolant temperature 94°C (201°F) or less.
  (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator main fan does not rotate in high speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to ON and A/C temperature at the lowest position.

	Step	Value	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less. When A/C compressor is operating, does the radiator main fan rotate in middle speed?	Rotates in middle speed.	Go to step **2.**	Go to step **4.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F). When A/C compressor is operating, does the radiator main fan rotate in low speed?	Rotates in low speed.	Go to step **3.**	Go to step **18.**
3	**CHECK OPERATION OF RADIATOR FAN.** Turn the A/C switch to ON, set temperature at the lowest position. When A/C compressor is operating, does the radiator main fan rotate in high speed?	Rotates in high speed.	Radiator main fan system is okay.	Go to step **31.**
4	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **5.**	Go to step **8.**

	Step	Value	Yes	No
5	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **6.**	Repair open circuit in harness between main fan motor connector and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step **7.**
7	**CHECK MAIN FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2 and negative (–) terminal to terminal No. 4 of main fan motor connector. Does the main fan rotate?	Rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
8	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 2 from A/C relay holder. 3) Measure voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F30) No. 29 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **9.**	Go to step **10.**
9	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F30) No. 22 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **13.**	Go to step **12.**
10	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Go to step **11.**
11	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and main fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relay 2 and ignition switch.

	Step	Value	Yes	No
13	**CHECK MAIN FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 2. 3) Measure resistance of main fan relay 2. ***Terminal*** ***No. 20 — No. 21:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **14.**	Replace main fan relay 2.
14	**CHECK MAIN FAN RELAY 2.** 1) Connect battery to terminals No. 19 and No. 20 of main fan relay 2. 2) Measure resistance of main fan relay 2. ***Terminal*** ***No. 20 — No. 21:*** Is the measured value less than the specified value?	1 Ω	Go to step **15.**	Replace main fan relay 2.
15	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure resistance of harness between main fan motor connector and main fan relay 2 terminal. ***Connector & terminal*** ***(F17) No. 2 — (F30) No. 20:*** Is the measured value less than the specified value?	1 Ω	Go to step **16.**	Repair open circuit in harness between main fan motor connector and main fan relay 2 terminal.
16	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 2 connector and ECM connector. ***Connector & terminal*** ***(F30) No. 24 — (B137) No. 17:*** Is the measured value less than the specified value?	1 Ω	Go to step **17.**	Repair open circuit in harness between main fan relay 2 and ECM.
17	**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?	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.
18	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Measure voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **19.**	Go to step **21.**

	Step	Value	Yes	No
19	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Go to step **20.**
20	**CHECK MAIN FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 1, and negative (–) terminal to terminal No. 4 of main fan motor connector. Does the main fan rotate?	Rotates.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
21	**CHECK POWER SUPPLY TO MAIN FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 from A/C relay holder. 3) Measure voltage between main fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 8 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **22.**	Go to step **23.**
22	**CHECK POWER SUPPLY TO MAIN FAN RELAY 1.** 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F66) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **26.**	Go to step **25.**
23	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Go to step **24.**
24	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relay 1 and ignition switch.
26	**CHECK MAIN FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 1. 3) Measure resistance of main fan relay 1. ***Terminal*** ***No. 8 — No. 9:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **27.**	Replace main fan relay 1.

	Step	Value	Yes	No
27	**CHECK MAIN FAN RELAY.** 1) Connect battery to terminals No. 5 and No. 6 of main fan relay 1. 2) Measure resistance of main fan relay 1. ***Terminal*** ***No. 8 — No. 9:*** Is the measured value less than the specified value?	1 Ω	Go to step **28.**	Replace main fan relay 1.
28	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure resistance of harness between main fan motor connector and main fan relay 1 terminal. ***Connector & terminal*** ***(F17) No. 1 — (F66) No. 9:*** Is the measured value less than the specified value?	1 Ω	Go to step **29.**	Replace open circuit in harness between main fan motor connector and main fan relay 1 terminal.
29	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 1 connector and ECM connector. ***Connector & terminal*** ***(F66) No. 7 — (B137) No. 28:*** Is the measured value less than the specified value?	1 Ω	Go to step **30.**	Repair open circuit in harness between main fan relay 1 and ECM.
30	**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?	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.
31	**CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Measure resistance of harness between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **32.**	Go to step **33.**
32	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector. Is there poor contact in main fan motor connector?	There is poor contact.	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.

RADIATOR MAIN FAN SYSTEM

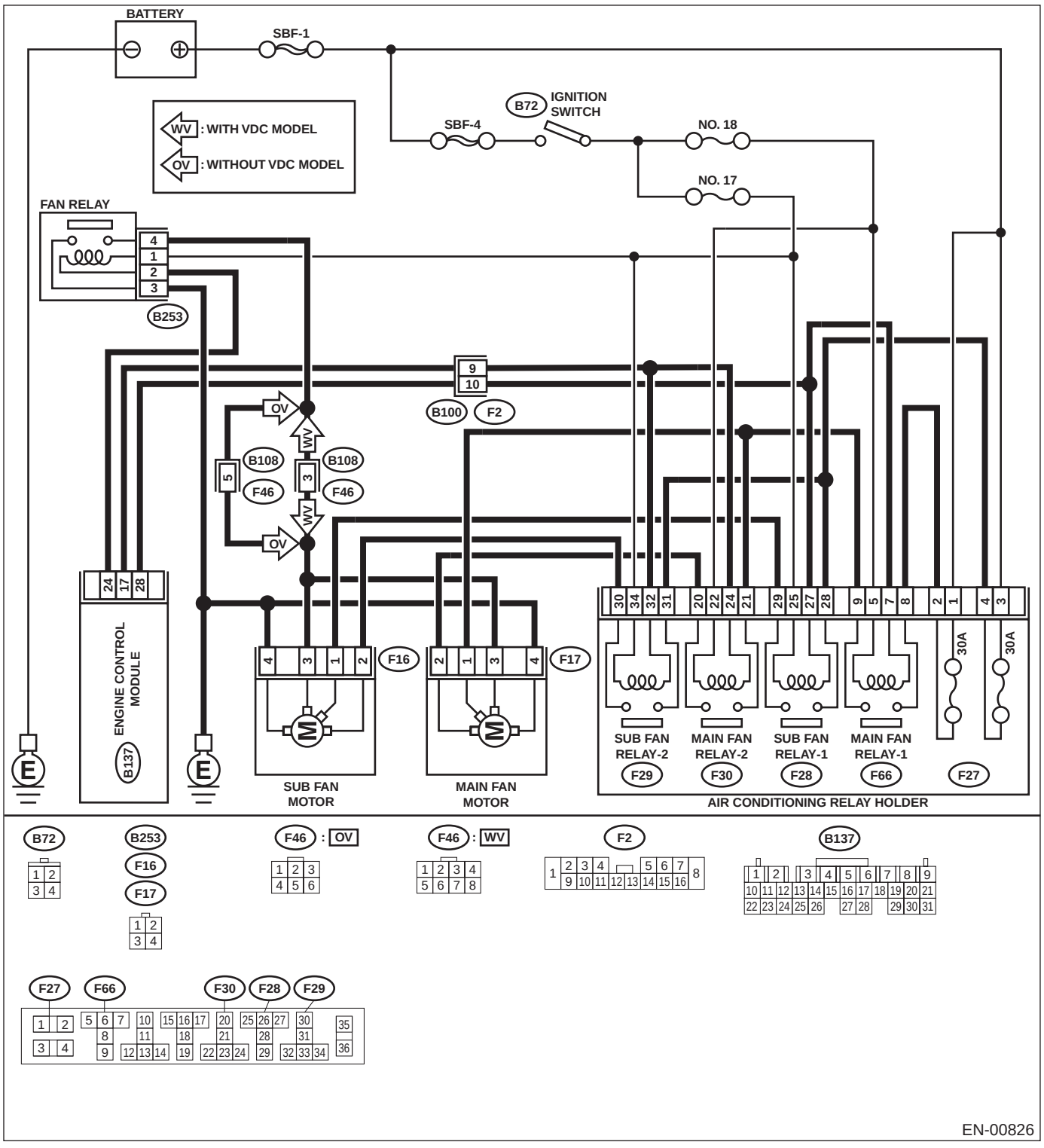
	Step	Value	Yes	No
33	**CHECK HARNESS BETWEEN MAIN FAN AND FAN RELAY.** 1) Disconnect fan relay connector. 2) Measure resistance of between main fan motor connector and fan relay connector. ***Connector & terminal*** ***(F17) No. 3 — (B253) No. 4:*** Is the measured value less than the specified value?	1 Ω	Go to step **34.**	Repair open circuit between main fan motor connector and fan relay connector.
34	**CHECK POWER SUPPLY TO FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. ***Connector & terminal*** ***(B253) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **36.**	Go to step **35.**
35	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown out.	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
36	**CHECK FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **37.**	Replace fan relay.
37	**CHECK FAN RELAY.** 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **38.**	Replace fan relay.
38	**CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.** Measure resistance of harness between fan relay connector and chassis ground. ***Connector & terminal*** ***(B253) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	1 Ω	Go to step **39.**	Repair open circuit in harness between fan relay connector and chassis ground.
39	**CHECK HARNESS BETWEEN FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay and ECM connector. ***Connector & terminal*** ***(B253) No. 2 — (B137) No. 24:*** Is the measured value less than the specified value?	1 Ω	Go to step **40.**	Repair open circuit in harness between fan relay connector and ECM.

Step		Value	Yes	No
40	**CHECK POOR CONTACT.** Check poor contact in connector between fan relay and ECM. Is there poor contact in connector between fan relay and ECM?	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.

NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC



B: INSPECTION

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate in low speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to OFF.
- Radiator sub fan does not rotate in middle speed under the following conditions:
  (1) Coolant temperature 94°C (201°F) or less.
  (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator sub fan does not rotate in high speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to ON and A/C temperature at the lowest position.

	Step	Value	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less. When A/C compressor is operating, does the radiator sub fan rotate in middle speed?	Rotates in middle speed.	Go to step **2.**	Go to step **4.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F). When A/C compressor is operating, does the radiator sub fan rotate in low speed?	Rotates in low speed.	Go to step **3.**	Go to step **18.**
3	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to ON, set temperature at the lowest position. When A/C compressor is operating, does the radiator sub fan rotate in high speed?	Rotates in high speed.	Radiator sub fan system is okay.	Go to step **31.**
4	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **5.**	Go to step **8.**

	Step	Value	Yes	No
5	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **6.**	Repair open circuit in harness between sub fan motor connector and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Go to step **7.**
7	**CHECK SUB FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2 and negative (–) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan rotate?	Rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
8	**CHECK POWER SUPPLY TO SUB FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2 from A/C relay holder. 3) Measure voltage between sub fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F29) No. 26 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **9.**	Go to step **10.**
9	**CHECK POWER SUPPLY TO SUB FAN RELAY 2.** 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F29) No. 34 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **13.**	Go to step **12.**
10	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step **11.**
11	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and sub fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relay 2 and ignition switch.

	Step	Value	Yes	No
13	**CHECK SUB FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2. 3) Measure resistance of sub fan relay 2. ***Terminal*** ***No. 30 — No. 31:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **14.**	Replace sub fan relay 2.
14	**CHECK SUB FAN RELAY 2.** 1) Connect battery to terminals No. 27 and No. 28 of sub fan relay 2. 2) Measure resistance of sub fan relay 2. ***Terminal*** ***No. 30 — No. 31:*** Is the measured value less than the specified value?	1 Ω	Go to step **15.**	Replace sub fan relay 2.
15	**CHECK HARNESS BETWEEN SUB FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure resistance of harness between sub fan motor connector and sub fan relay 2 terminal. ***Connector & terminal*** ***(F16) No. 2 — (F29) No. 30:*** Is the measured value less than the specified value?	1 Ω	Go to step **16.**	Repair open circuit in harness between sub fan motor connector and sub fan relay 2 terminal.
16	**CHECK HARNESS BETWEEN SUB FAN RELAY 2 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 2 connector and ECM connector. ***Connector & terminal*** ***(F29) No. 32 — (B137) No. 17:*** Is the measured value less than the specified value?	1 Ω	Go to step **17.**	Repair open circuit in harness between sub fan relay 2 and ECM.
17	**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.	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.
18	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Turn A/C switch to OFF. 3) Disconnect sub fan motor connector. 4) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 5) Measure voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **19.**	Go to step **21.**

	Step	Value	Yes	No
19	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Go to step **20.**
20	**CHECK SUB FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 1, and negative (–) terminal to terminal No. 4 of sub fan motor connector. Does the sub fan rotate?	Rotates.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
21	**CHECK POWER SUPPLY TO SUB FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1 from A/C relay holder. 3) Measure voltage between sub fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 28 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **22.**	Go to step **23.**
22	**CHECK POWER SUPPLY TO SUB FAN RELAY 1.** 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F28) No. 25 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **26.**	Go to step **25.**
23	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Go to step **24.**
24	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3(+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair open circuit in harness between 30 A fuse and sub fan relay 1 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between sub fan relay 1 and ignition switch.
26	**CHECK SUB FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1. 3) Measure resistance of sub fan relay 1. ***Terminal*** ***No. 28 — No. 29:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **27.**	Replace sub fan relay 1.

	Step	Value	Yes	No
27	**CHECK SUB FAN RELAY.** 1) Connect battery to terminals No. 21 and No. 22 of sub fan relay 1. 2) Measure resistance of sub fan relay 1. ***Terminal*** ***No. 28 — No. 29:*** Is the measured value less than the specified value?	1 Ω	Go to step **28.**	Replace sub fan relay 1.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure resistance of harness between sub fan motor connector and sub fan relay 1 terminal. ***Connector & terminal*** ***(F16) No. 1 — (F28) No. 29:*** Is the measured value less than the specified value?	1 Ω	Go to step **29.**	Replace open circuit in harness between sub fan motor connector and sub fan relay 1 terminal.
29	**CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 1 connector and ECM connector. ***Connector & terminal*** ***(F28) No. 27 — (B137) No. 28:*** Is the measured value less than the specified value?	1 Ω	Go to step **30.**	Repair open circuit in harness between sub fan relay and ECM.
30	**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?	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.
31	**CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Measure resistance of harness between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **32.**	Go to step **33.**
32	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector. Is there poor contact in sub fan motor connector?	There is poor contact.	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

	Step	Value	Yes	No
33	**CHECK HARNESS BETWEEN SUB FAN AND FAN RELAY.** 1) Disconnect fan relay connector. 2) Measure resistance between sub fan motor connector and fan relay connector. ***Connector & terminal*** ***(F16) No. 3 — (B253) No. 4:*** Is the measured value less than the specified value?	1 Ω	Go to step **34.**	Repair open circuit between sub fan motor connector and fan relay connector.
34	**CHECK POWER SUPPLY TO FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. ***Connector & terminal*** ***(B253) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **36.**	Go to step **35.**
35	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Fuse is blown-out.	Replace fuse.	Repair open circuit in harness between fan relay and ignition switch.
36	**CHECK FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **37.**	Replace fan relay.
37	**CHECK FAN RELAY.** 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **38.**	Replace fan relay.
38	**CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.** Measure resistance of harness between fan relay connector and chassis ground. ***Connector & terminal*** ***(B253) No. 3 — Chassis ground:*** Is the measured value less than the specified value?	1 Ω	Go to step **39.**	Repair open circuit in harness between fan relay connector and chassis ground.
39	**CHECK HARNESS BETWEEN FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay connector and ECM connector. ***Connector & terminal*** ***(B253) No. 2 — (B137) No. 24:*** Is the measured value less than the specified value?	1 Ω	Go to step **40.**	Repair open circuit in harness between fan relay connector and ECM.

	Step	Value	Yes	No
40	**CHECK POOR CONTACT.** Check poor contact in connector between fan relay and ECM. Is there poor contact in connector between fan relay and ECM?	There is poor contact.	Repair poor contact connector.	Contact with SOA (distributor) service.

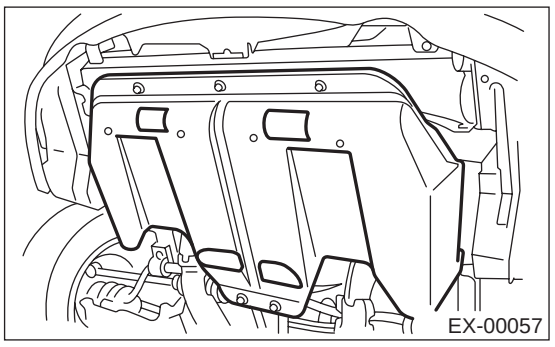
NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

A: REPLACEMENT

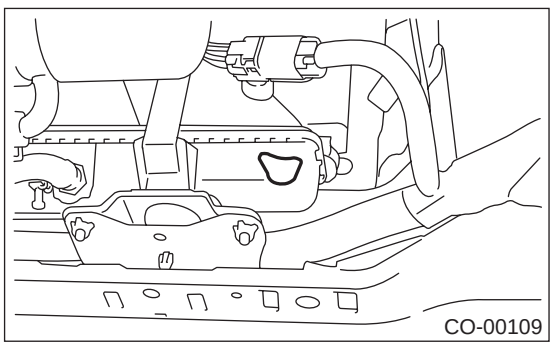
1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove under cover.


EX-00057

3) Remove drain cock to drain engine coolant into container.

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


CO-00109

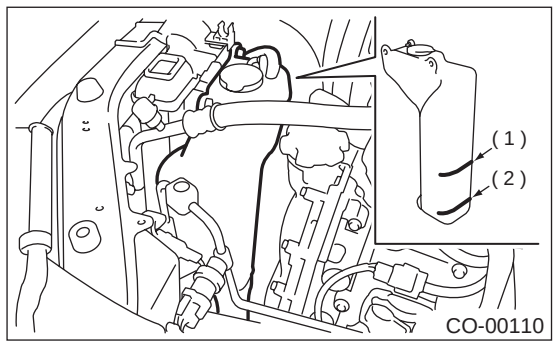
2. FILLING OF ENGINE COOLANT

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

Coolant amount for refill:
Approx. 7.9 ℓ (8.4 US qt, 7.0 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 upper level.



CO-00110

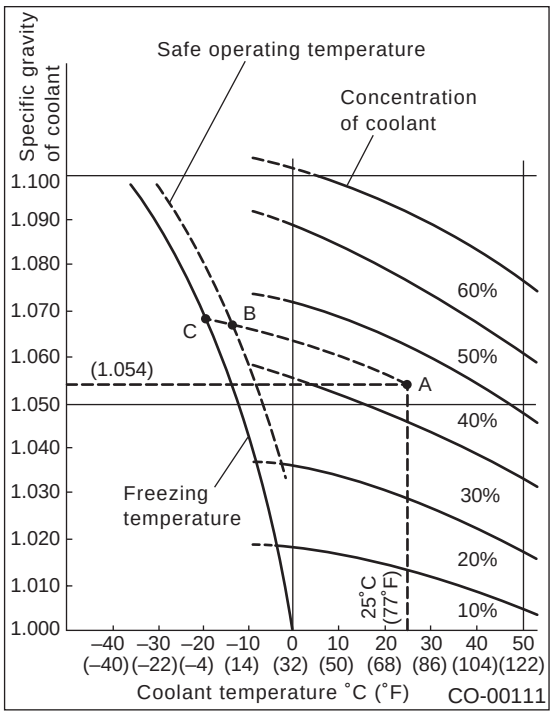
(1) Full level
(2) Low level

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

B: INSPECTION

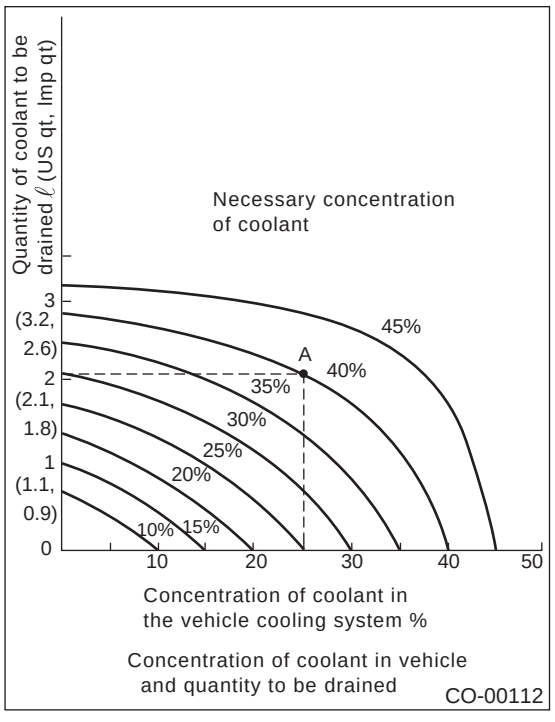
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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 form 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

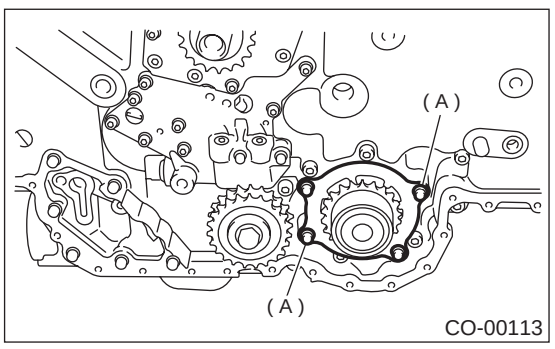


5. Water Pump

A: REMOVAL

1) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
2) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
3) Remove front chain cover.
<Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
4) Remove timing chain.
<Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
5) Remove water pump.

NOTE:
When water pump cannot be easily removed, install M8 bolt in opposing bolt holes (“A” in figure). Alternately tightening each bolt should be enough to gradually free water pump from rear chain cover.



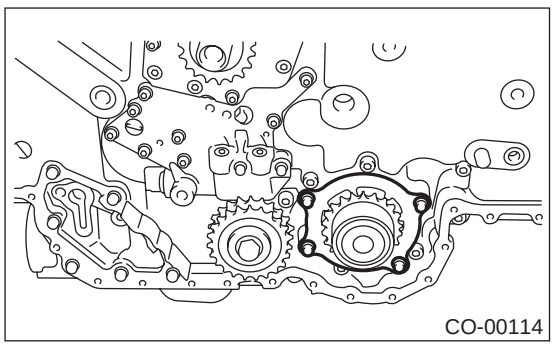
B: INSTALLATION

1) Install water pump onto rear chain cover.

NOTE:
Apply engine coolant to O-ring.

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

NOTE:
- Replace O-rings with a new one.
- Applying engine coolant to O-ring makes water pump installation easier.



2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
3) Install front chain cover.
<Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
4) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
5) Install radiator. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
6) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

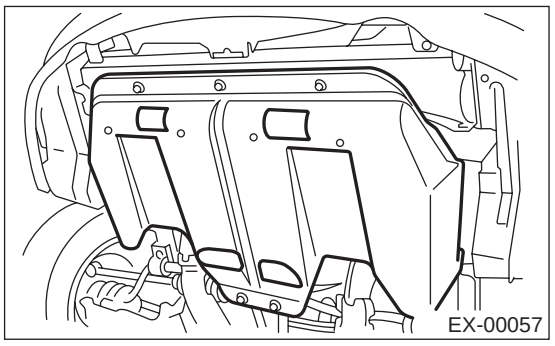
C: INSPECTION

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

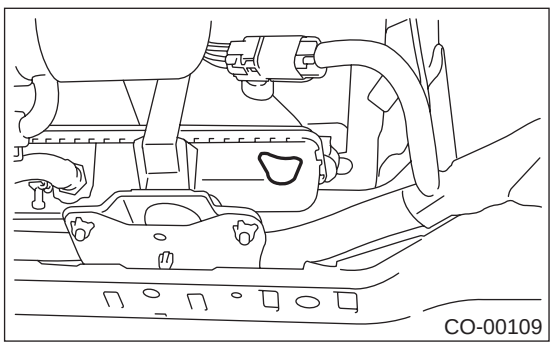
6. Thermostat

A: REMOVAL

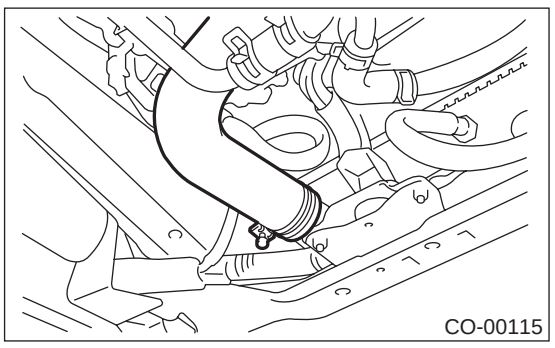
1) Lift-up the vehicle.
2) Remove under cover.



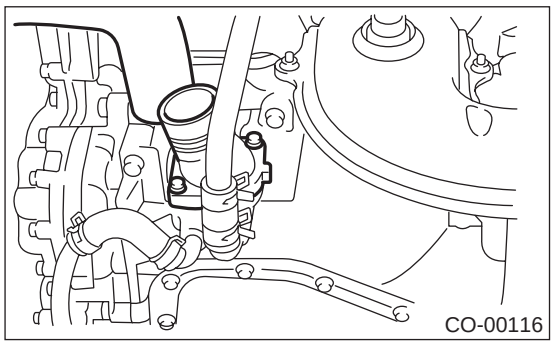
3) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



4) Disconnect radiator outlet hose from thermostat cover.



5) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

1) Install the thermostat to oil pan upper, and install the thermostat cover together with a gasket.

NOTE:
When reinstalling the thermostat, use a new gasket.

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

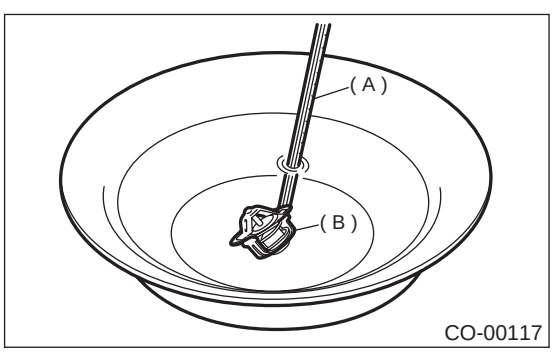
2) Connect radiator outlet hose to thermostat cover.
3) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

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:
76.0 — 80.0°C (169 — 176°F)

Fully opens:
91°C (196°F)

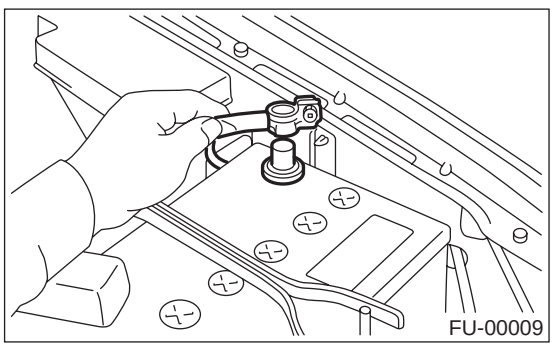


(A) Thermometer
(B) Thermostat

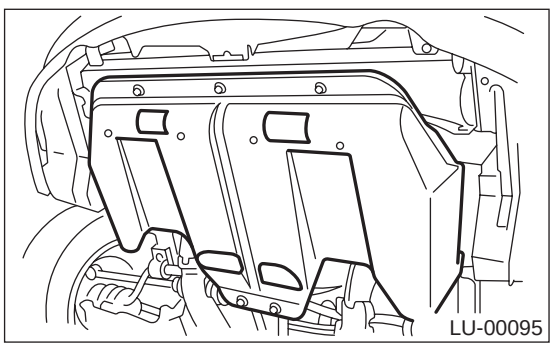
7. Radiator

A: REMOVAL

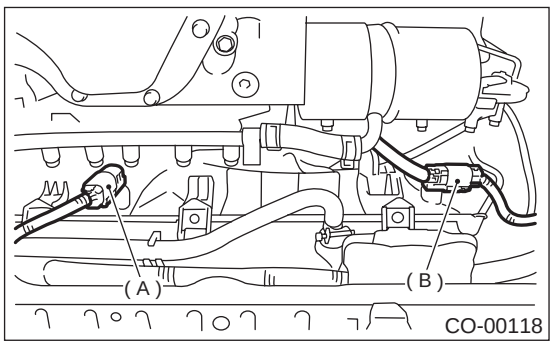
1) Disconnect battery ground cable.



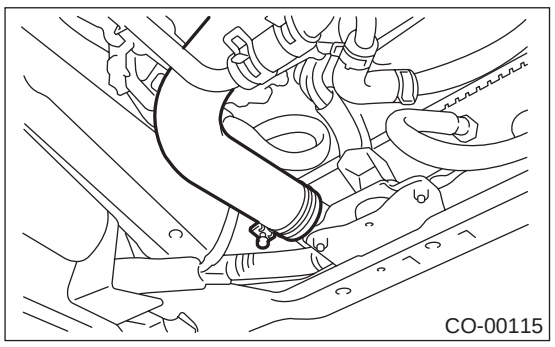
2) Lift-up the vehicle.
3) Remove under cover.



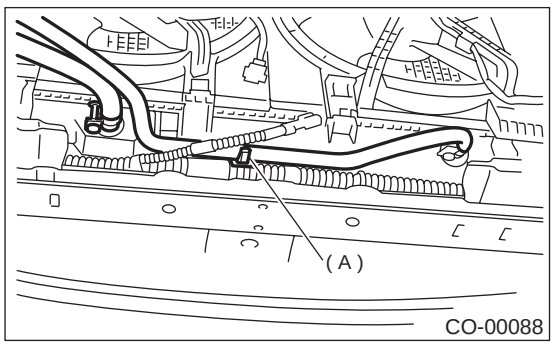
4) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect connectors of radiator main fan motor (A) and sub fan motor (B).



6) Disconnect radiator outlet hose from radiator.

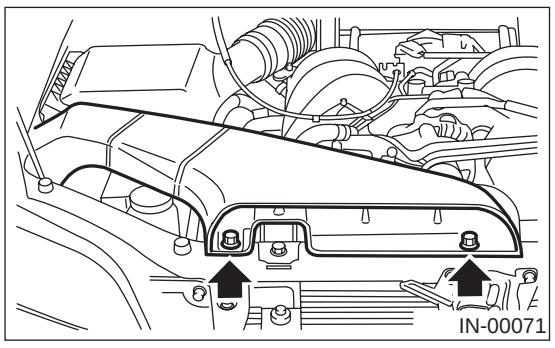


7) Disconnect ATF cooler hoses from radiator.

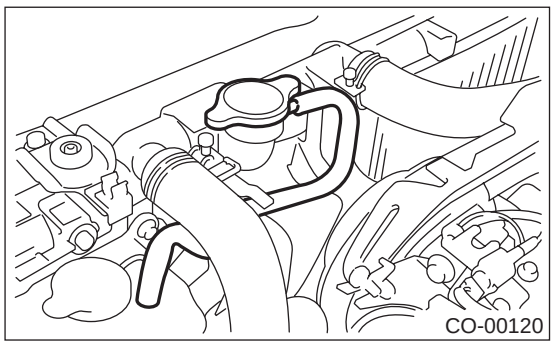


(A) Clip

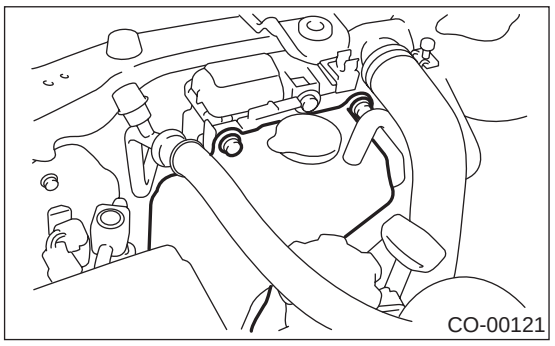
8) Lower the vehicle.
9) Remove air intake duct.



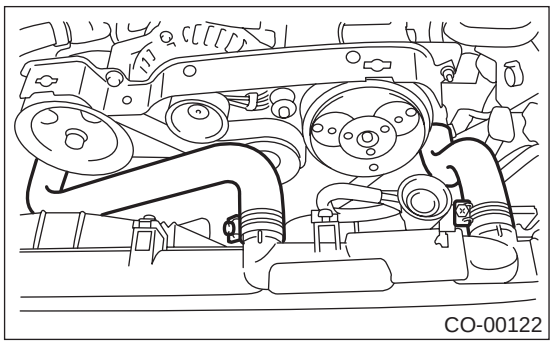
10) Disconnect over flow hose.



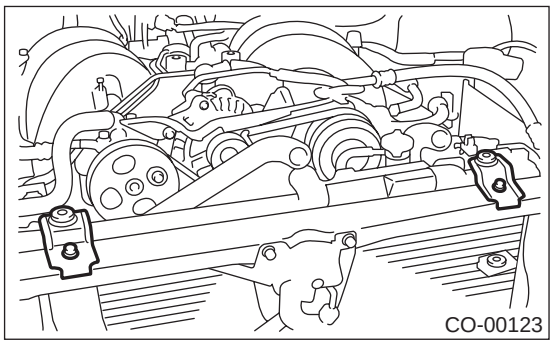
11) Remove reservoir tank.


CO-00121

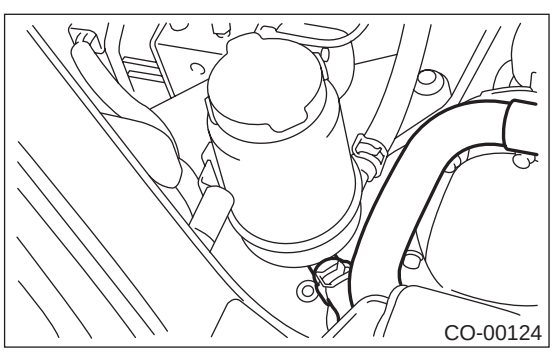
12) Disconnect radiator inlet hoses from radiator.


CO-00122

13) Remove radiator upper brackets.

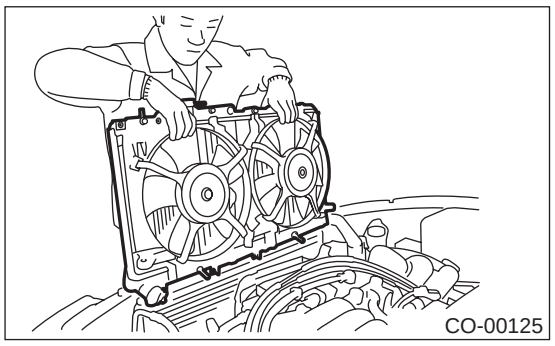

CO-00123

14) Detach power steering hose from the clip on the radiator.


CO-00124

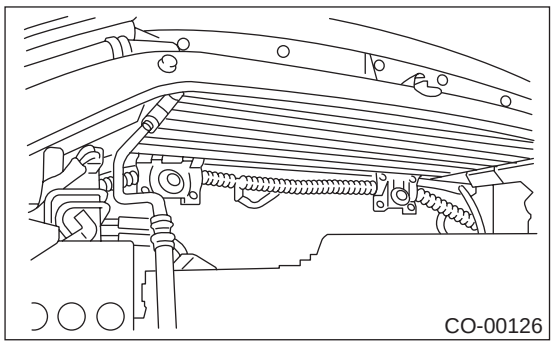
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.


CO-00125

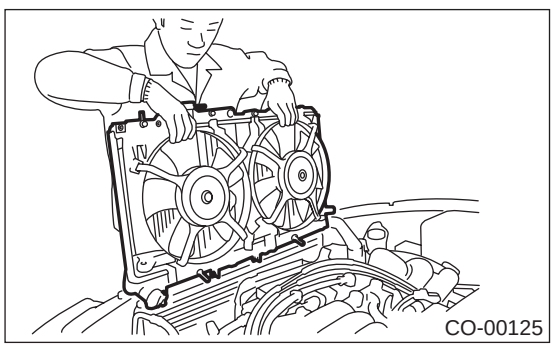
B: INSTALLATION

1) Attach radiator mounting cushions to holes on the vehicle.


CO-00126

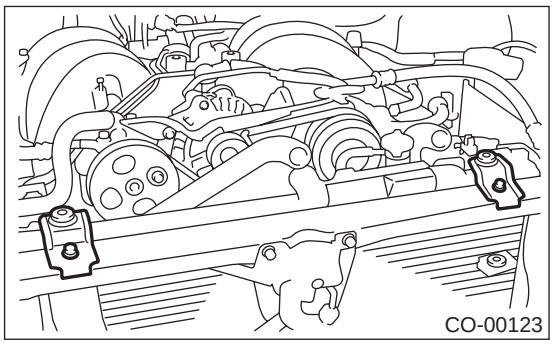
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit pins on lower side of radiator into cushions on body side.

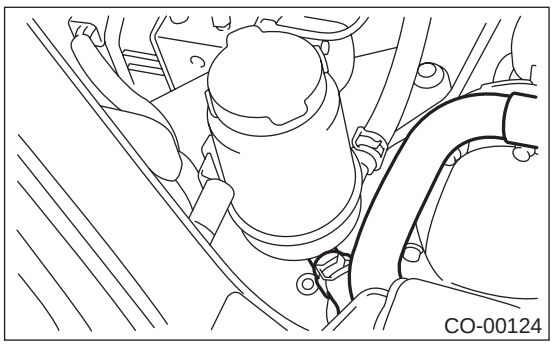

CO-00125

3) Install radiator brackets and tighten bolts.

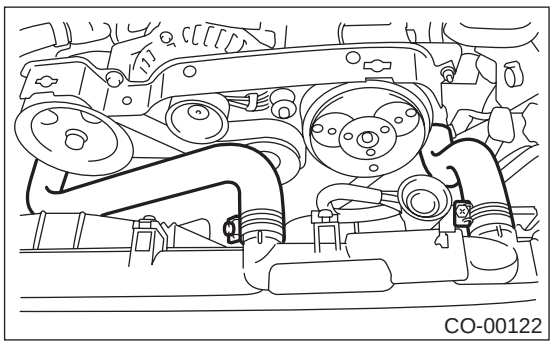
Tightening torque:
12 N·m (1.2 kgf-m, 8.7 ft-lb)


CO-00123

4) Attach power steering hose to the radiator.

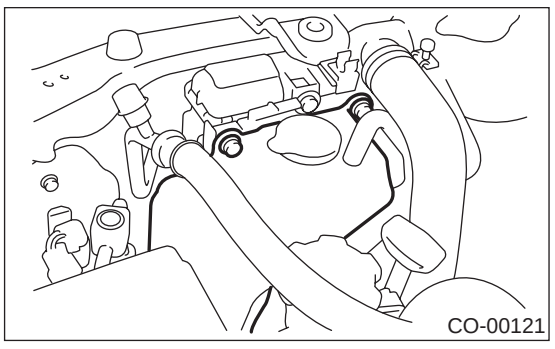

CO-00124

5) Connect radiator inlet hoses.

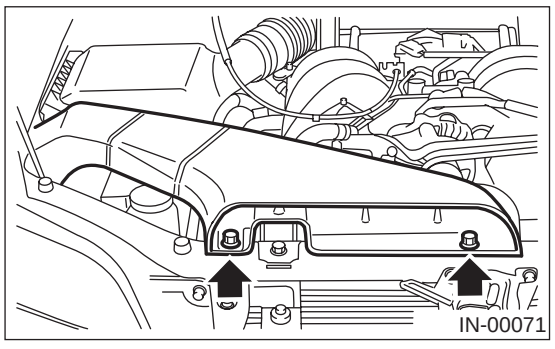

CO-00122

6) Install reservoir tank.

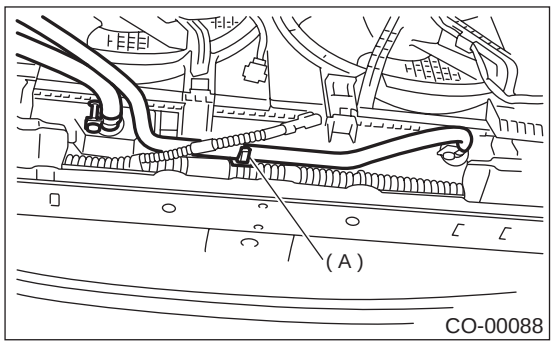
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)


CO-00121

7) Install air intake duct.


IN-00071

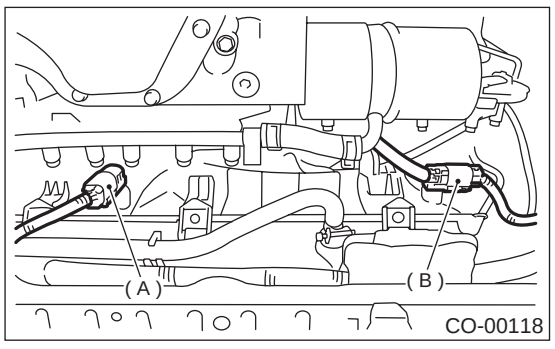
8) Lift-up the vehicle.
9) Connect ATF cooler hoses.



CO-00088

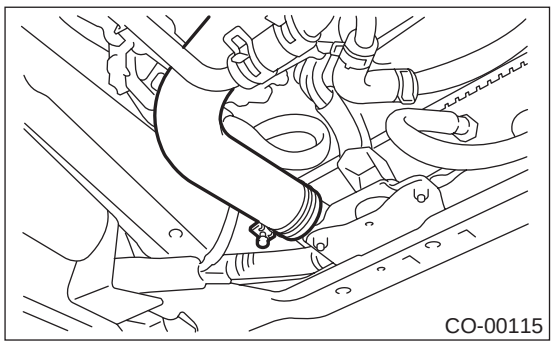
(A) Clip

10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).

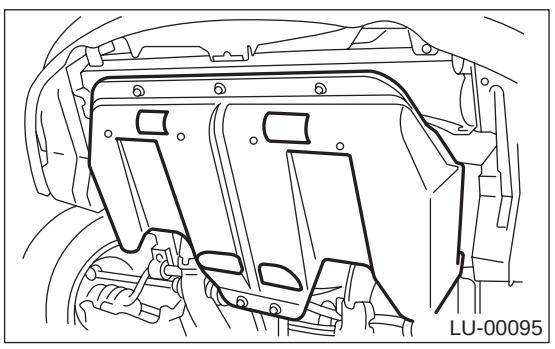


CO-00118

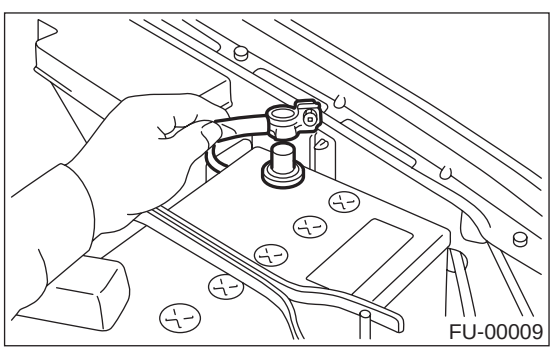
11) Connect radiator outlet hose.


CO-00115

12) Install under cover.



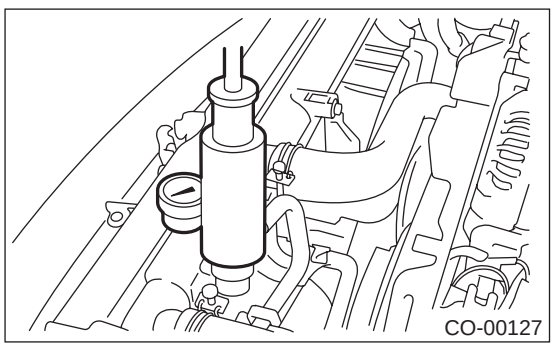
13) Lower the vehicle.
14) Connect battery ground cable.



15) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check ATF level. <Ref. to AT-30, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



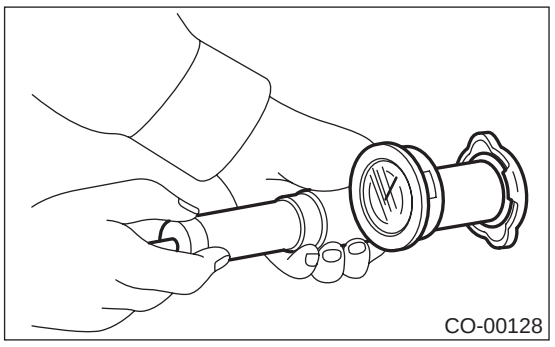
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

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

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



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

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

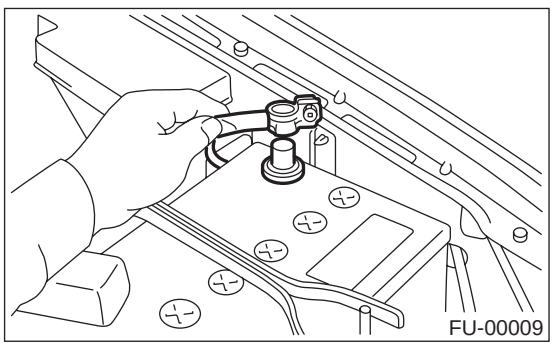
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

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

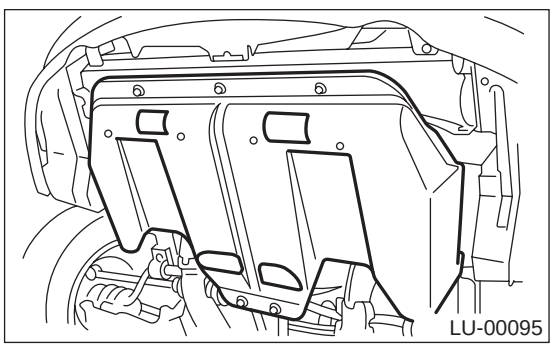
9. Radiator Main Fan and Fan Motor

A: REMOVAL

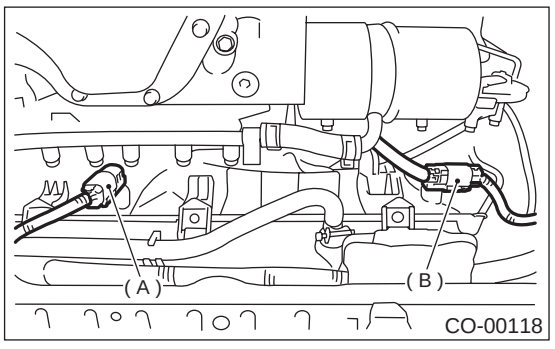
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.

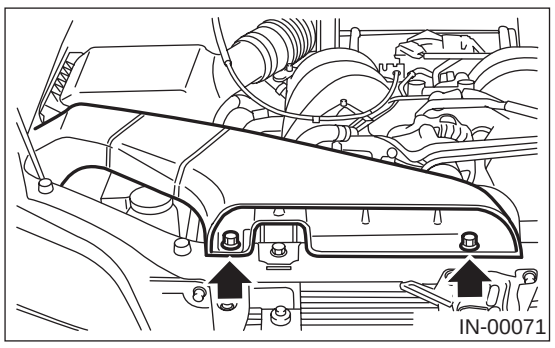


4) Drain engine coolant completely.
<Ref. to CO(H6DO)-22, Engine Coolant.>
5) Disconnect connectors of main and sub fan motor.

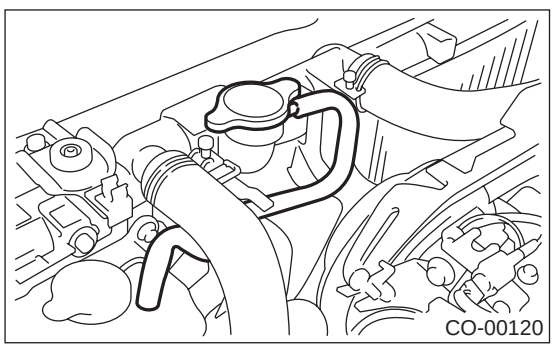


(A) Main fan motor connector
(B) Sub fan motor connector

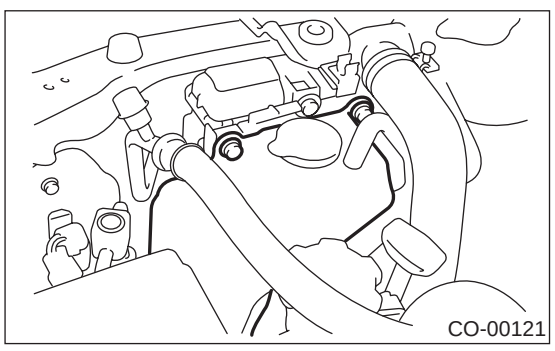
6) Lower the vehicle.
7) Remove air intake duct.



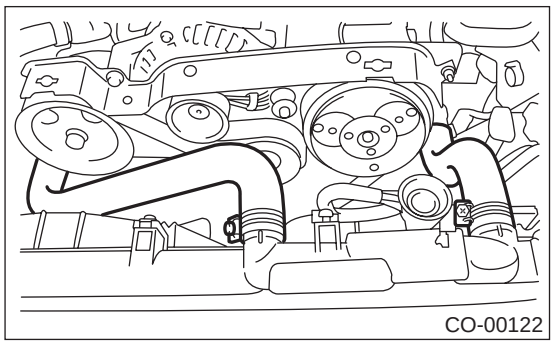
8) Disconnect over flow hose.



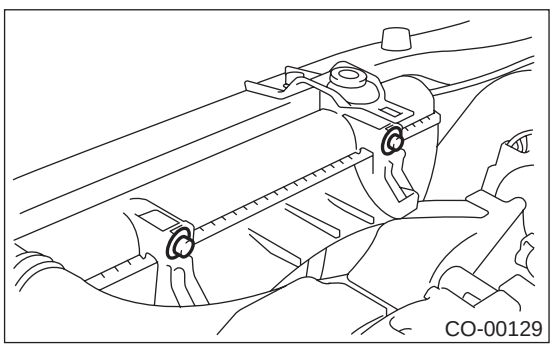
9) Remove reservoir tank.



10) Disconnect radiator inlet hoses from radiator.

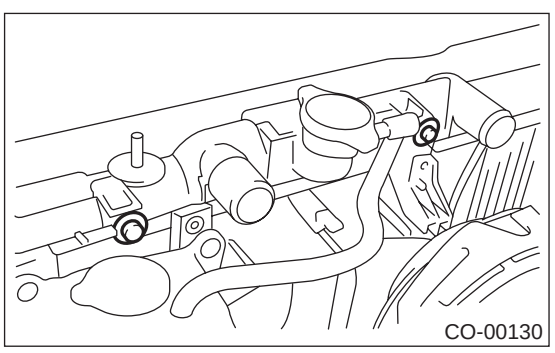


11) Remove radiator sub fan motor assembly.


CO-00129

12) Remove radiator main fan motor assembly.

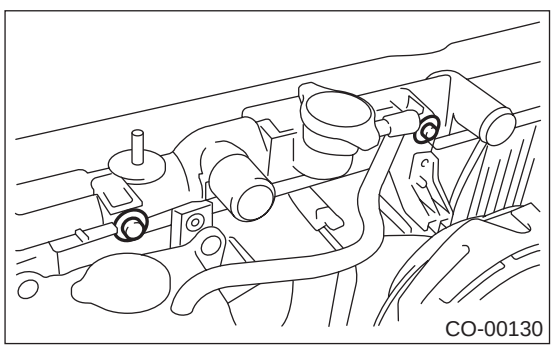
NOTE:
When removing main fan assembly by lifting it upward, main fan shroud will cause interference with coolant suction area. In order to avoid this, shift the main fan assembly over to sub fan side before removing it.


CO-00130

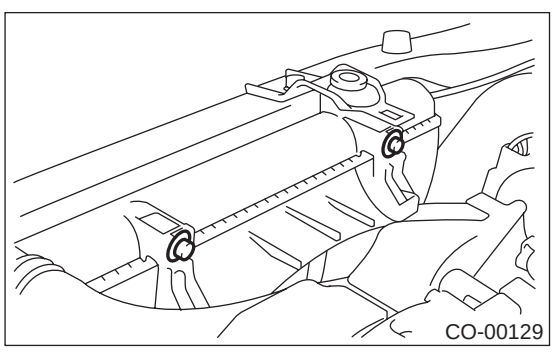
B: INSTALLATION

Install in the reverse order of removal.

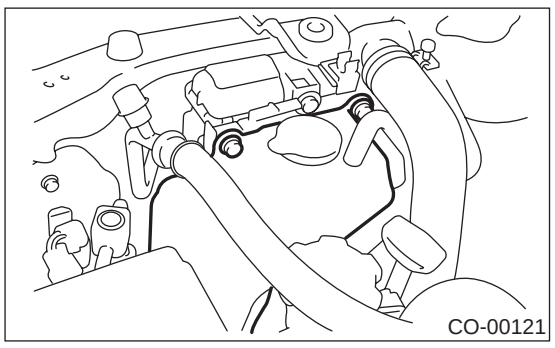
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)


CO-00130

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

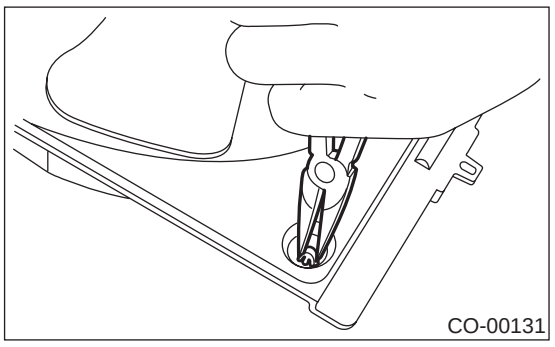

CO-00129

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

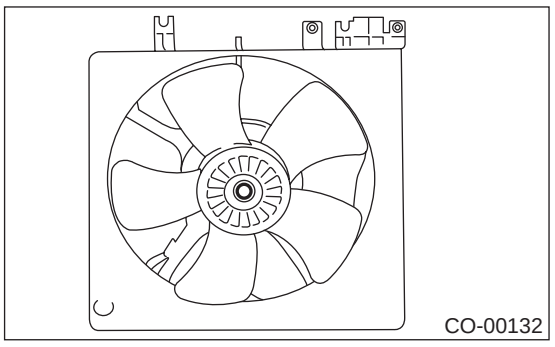

CO-00121

C: DISASSEMBLY

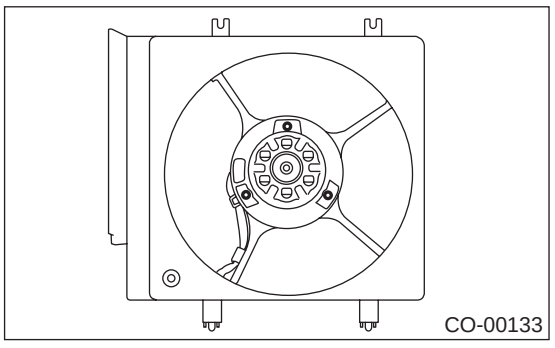
1) Remove clip which holds motor connector onto shroud.


CO-00131

2) Remove nut which holds fan itself onto fan motor and shroud assembly.


CO-00132

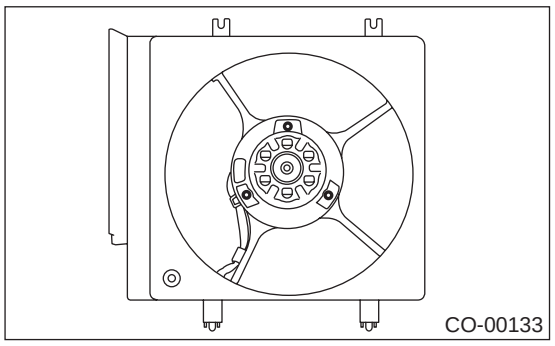
3) Remove screws which install fan motor onto shroud.


CO-00133

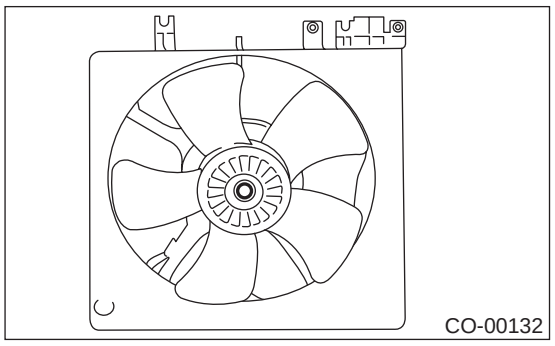
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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

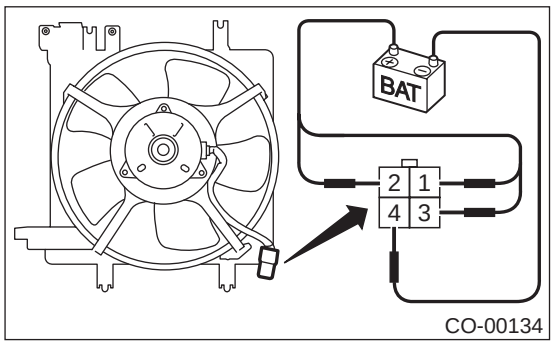

CO-00133

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)


CO-00132

E: INSPECTION

1) Connect battery as shown in the figure.



CO-00134

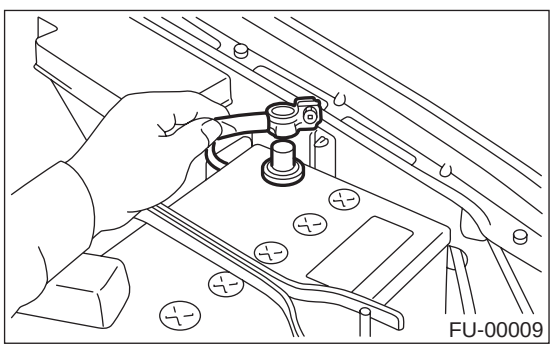
Terminal
No. 1 (+) — No. 4 (–): Low speed
No. 2 (+) — No. 4 (–): Middle speed
No. 3 (+) — No. 4 (–): High speed

2) Make sure the main fan motor operates properly. Replace it if it doesn't.

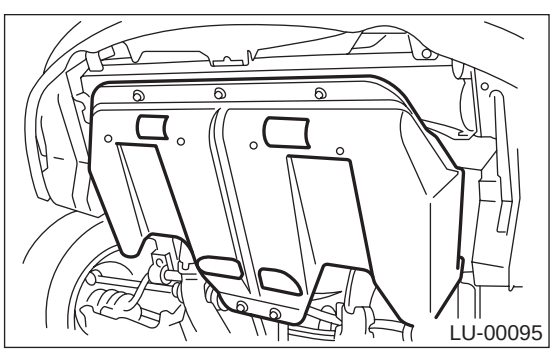
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

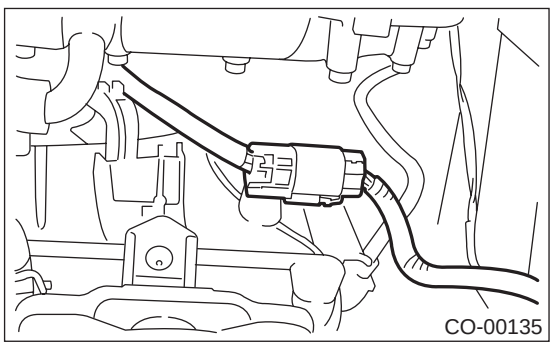
1) Disconnect battery ground cable.



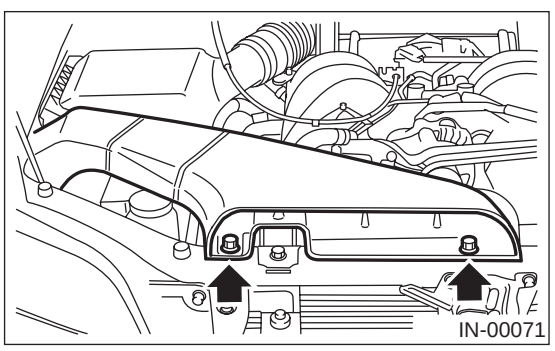
2) Lift-up the vehicle.
3) Remove under cover.



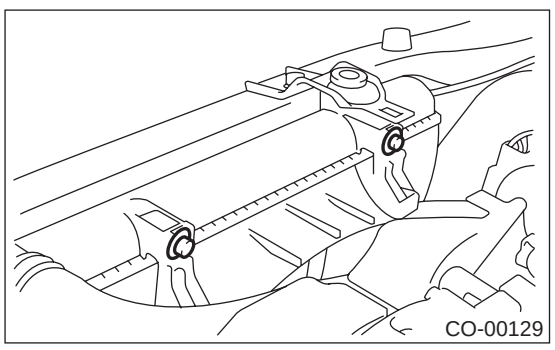
4) Disconnect connector of sub fan motor.



5) Lower the vehicle.
6) Remove air intake duct.



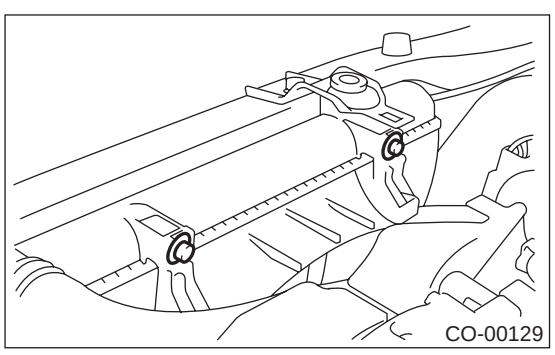
7) Remove bolts which hold sub fan shroud to radiator.
8) Remove radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

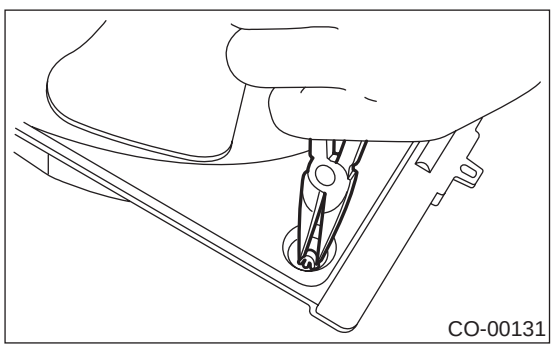
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

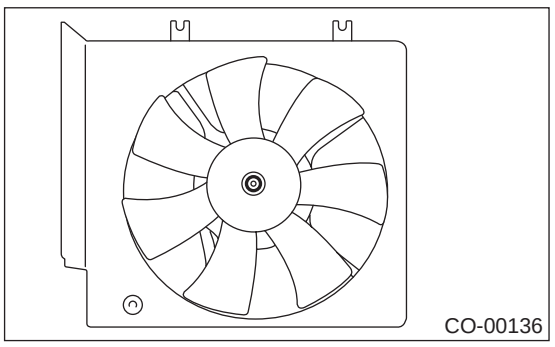


C: DISASSEMBLY

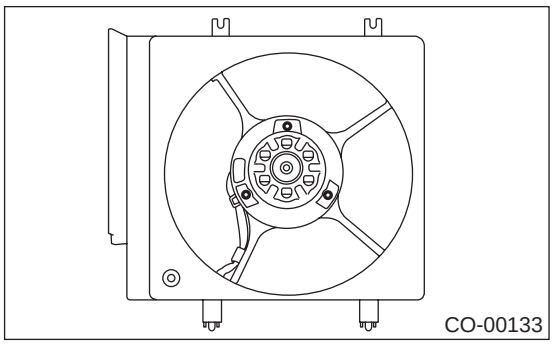
1) Remove clip which holds motor harness onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



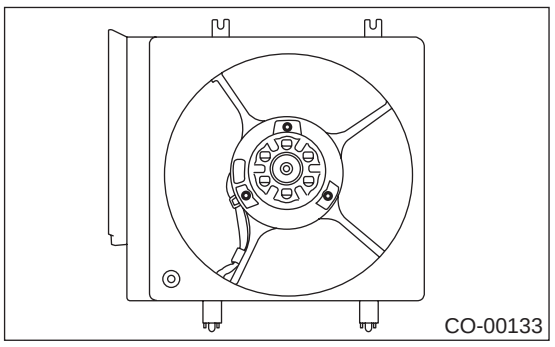
3) Remove screws which install fan motor onto shroud.



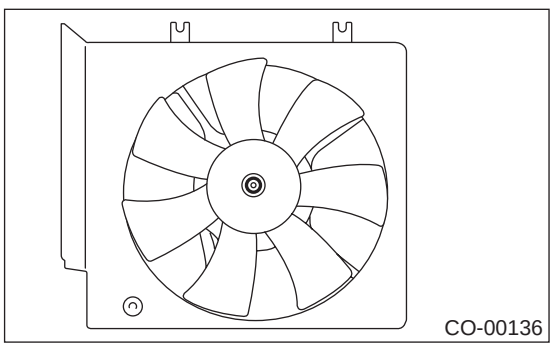
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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

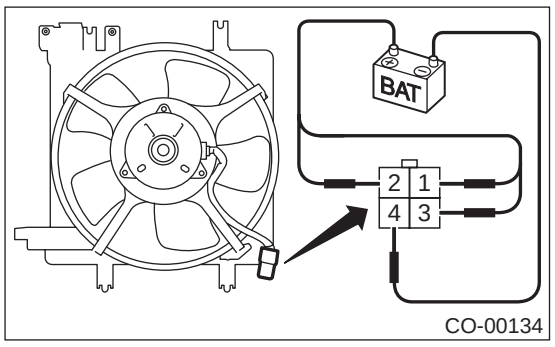


Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



E: INSPECTION

1) Connect battery as shown in the figure.



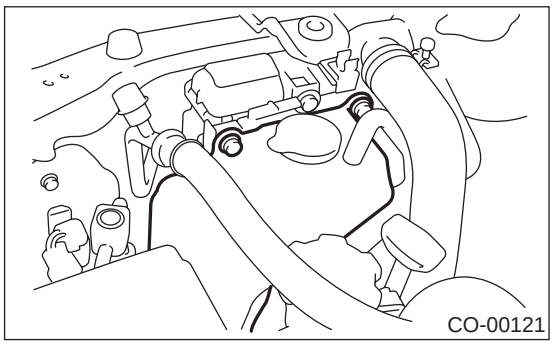
Terminal
No. 1 (+) — No. 4 (–): Low speed
No. 2 (+) — No. 4 (–): Middle speed
No. 3 (+) — No. 4 (–): High speed

2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.

11.Reservoir Tank

A: REMOVAL

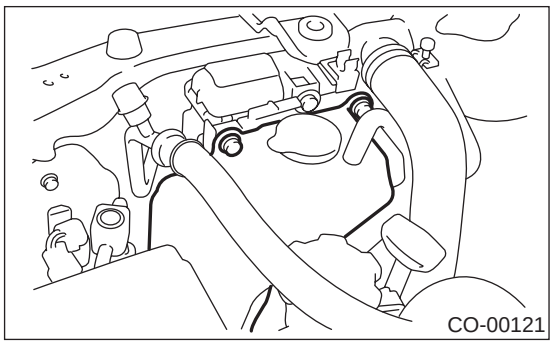
1) Disconnect over flow hose from radiator filler neck position.
2) Remove bolts which install reservoir tank onto radiator main fan shroud.
3) Remove reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble		Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Malfunction of thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean or repair, or replace.
	g. Improper engine oil in engine coolant	Replace engine coolant.
	h. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	i. Excessive back pressure in exhaust system	Clean or replace.
	j. Insufficient clearance between piston and cylinder	Adjust or replace.
	k. Slipping clutch	Repair or replace.
	l. Dragging brake	Adjust.
	m. Improper transmission oil	Replace.
	n. Defective thermostat	Replace.
	o. 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 timing chain	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

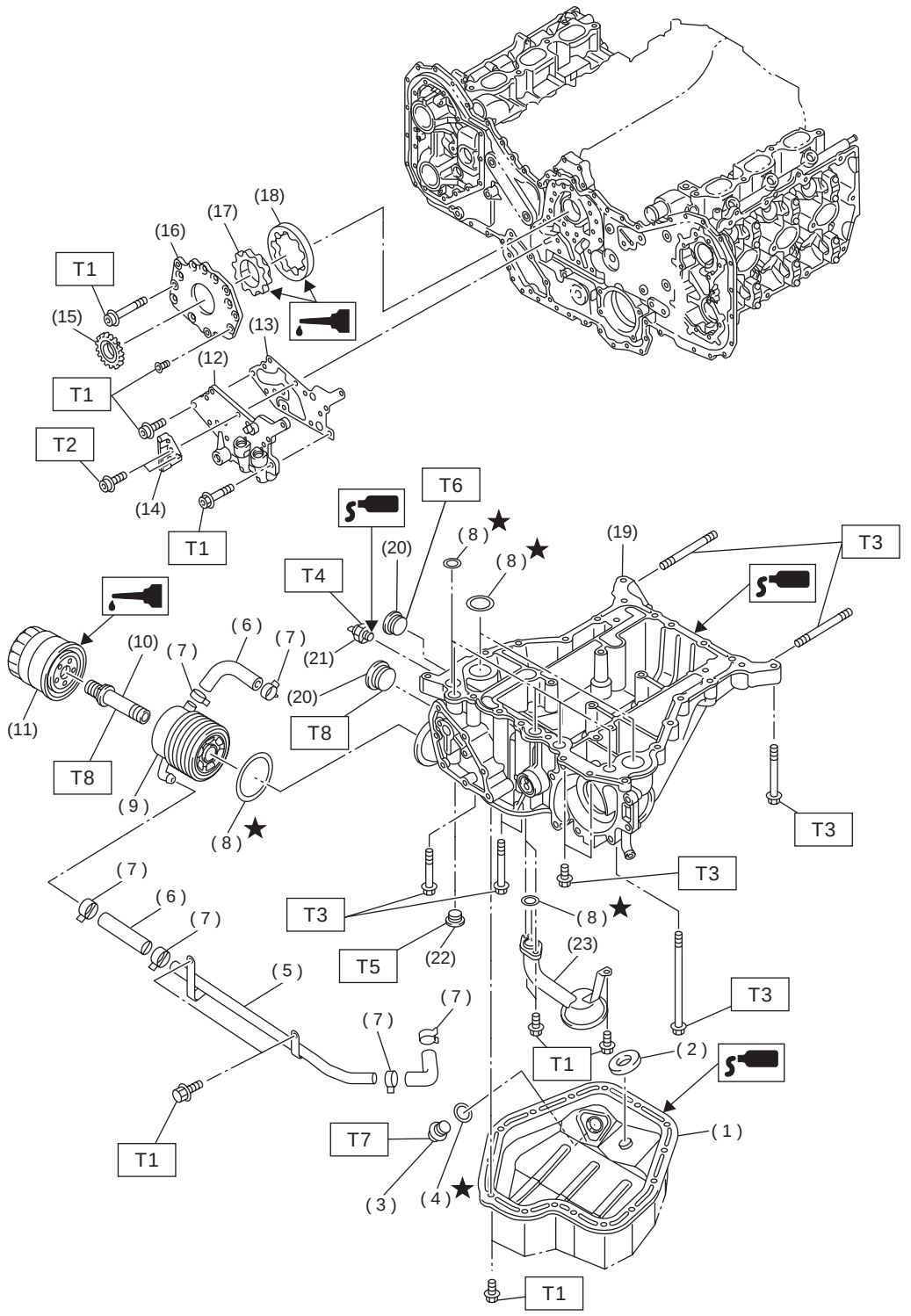
1. General Description

A: SPECIFICATIONS

Lubrication method			Forced lubrication
Oil pump	Pump type		Trochoid type
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 11 mm (3.07 × 0.43 in)
	Tip clearance between inner and outer rotor	Standard	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		Limit	0.20 mm (0.0079 in)
	Side clearance between inner rotor and pump case	Standard	0.02 — 0.08 mm (0.0008 — 0.0031 in)
		Limit	0.15 mm (0.0059 in)
	Case clearance between outer rotor and pump case	Standard	0.11 — 0.18 mm (0.0043 — 0.0071 in)
		Limit	0.25 mm (0.0098 in)
Oil filter	Type		Full-flow filter type
	Filtration area		1,300 cm^2 (201.5 sq in)
	By-pass valve opening pressure		160 kPa (1.63 kg/cm^2, 23 psi)
	Outer diameter × width		80 × 75 mm (3.15 × 2.95 in)
	Oil filter to engine thread size		M 20 × 1.5
Relief valve peration pressure			588 kPa (6 kg/cm^2, 85 psi)
Oil pressure switch	Type		Immersed contact point type
	Working voltage — wattage		12 V — 3.4 W or less
	Warning light activation pressure		15 kPa (0.153 kg/cm^2, 2.18 psi)
	Proof pressure		More than 980 kPa (9.993 kg/cm^2, 142 psi)
Oil capacity	Total capacity		6.6 L (7.0 US qt, 5.8 Imp qt)
	Engine oil amount for refill		5.6 L (5.9 US qt, 4.9 Imp qt)

MEMO:

B: COMPONENT



LU-00109

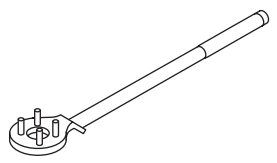
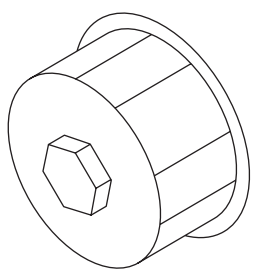
(1) Oil pan lower
(2) Magnet
(3) Drain plug
(4) Gasket
(5) Oil cooler pipe
(6) Hose
(7) Clamp
(8) O-ring
(9) Oil cooler
(10) Connector
(11) Oil filter
(12) Relief valve case
(13) Relief valve case gasket
(14) Chain guide (center)
(15) Crank sprocket
(16) Oil pump cover
(17) Inner rotor
(18) Outer rotor
(19) Oil pan upper
(20) Plug
(21) Oil pressure switch
(22) Plug
(23) Oil strainer

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.65, 4.7)***
T2:	***7.8 (0.80, 5.8)***
T3:	***18 (1.8, 13)***
T4:	***25 (2.5, 18)***
T5:	***34 (3.5, 25)***
T6:	***37 (3.8, 27)***
T7:	***44 (4.5, 33)***
T8:	***54 (5.5, 40)***

C: CAUTION

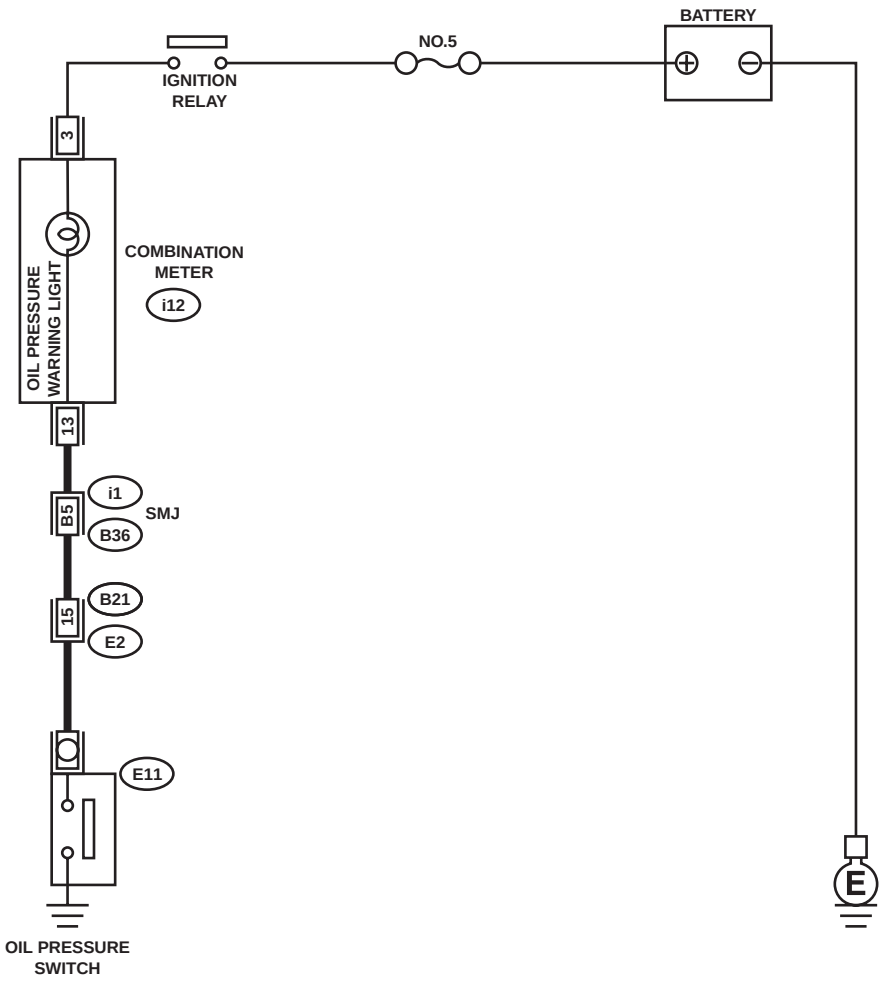
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation 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 ground cable from battery.

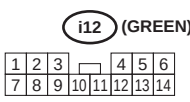
D: PREPARATION TOOL

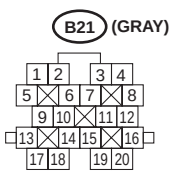
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

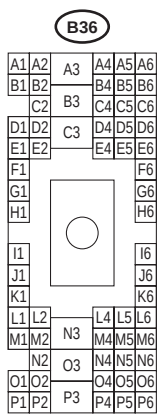
2. Oil Pressure System

A: SCHEMATIC









LU-00110

B: INSPECTION

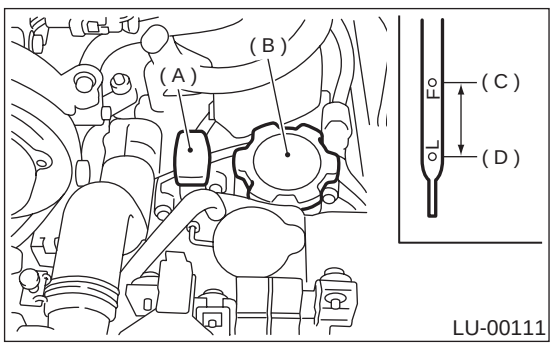
Step		Value	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights. Do the warning lights go on?	Lights up.	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn 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 measured value exceed the specified value?	10 V	Replace oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. ***Terminals*** ***No. 13 — No. 3:*** Is the measured value less than the specified value?	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 vehicle on a level surface.
2) Remove 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 in the proper orientation.
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) To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.

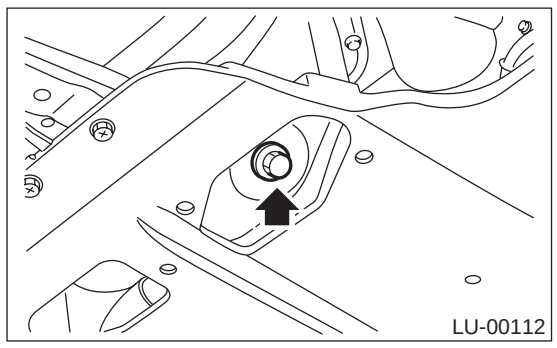
NOTE:
Just after driving or during warm-up, engine oil level may rise above the “F” mark.



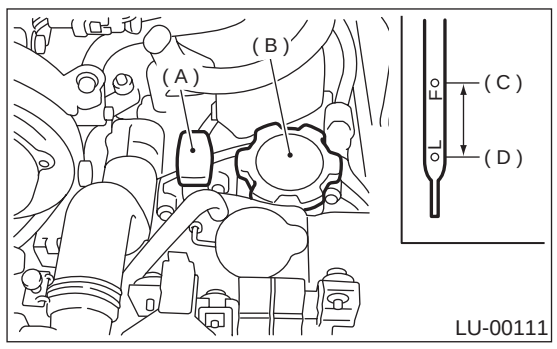
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

B: REPLACEMENT

1) Drain engine oil by loosening engine oil drain plug.



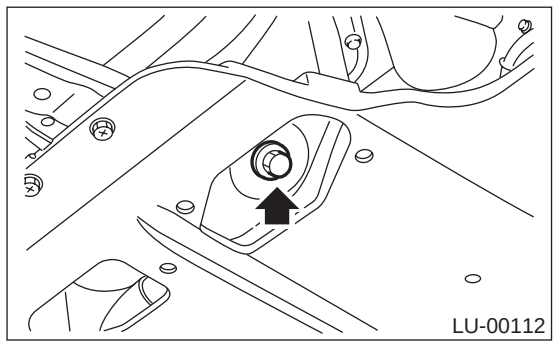
2) Open engine oil filler cap for quick draining of the engine oil.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

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

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



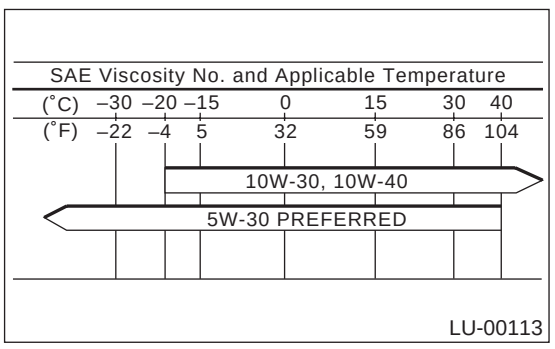
5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil

ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark)
API certification SL with the words "ENERGY CONSERVING" (if you cannot obtain the oil with SL grade, you may use SJ grade "ENERGY CONSERVING" oil)
ACEA specification A1, A2 or A3

Engine oil amount for preparation (with replacing engine oil):

Approx. 5.6 L (5.9 US qt, 4.9 Imp qt)



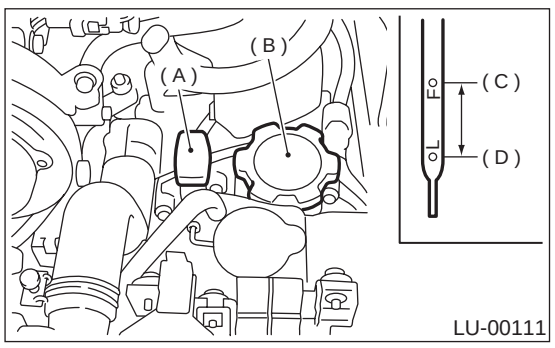
The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

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 ILSAC or API classification and SAE viscosity No. designated by SUBARU.

NOTE:
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: ILSAC classification : GF-3 or API classification: SL
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

6) Close engine oil filler cap.
7) Start engine and warm it up for a time.

8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.

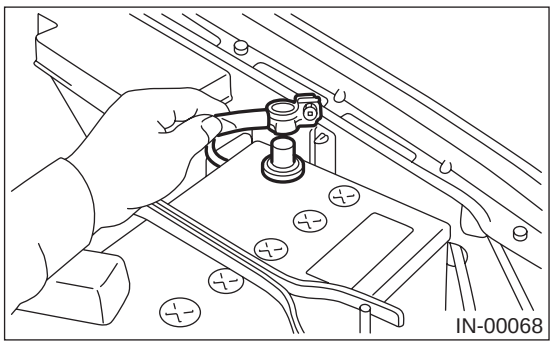


(A) Oil level gauge
(B) Engine oil filler cap

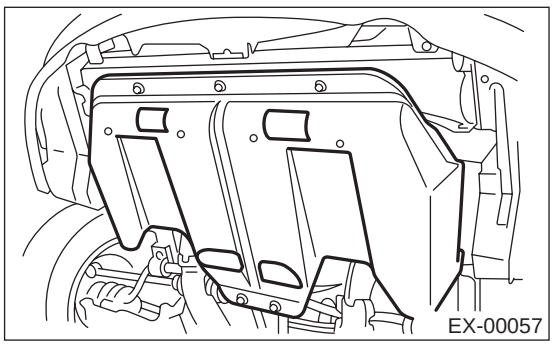
4. Oil Pump

A: REMOVAL

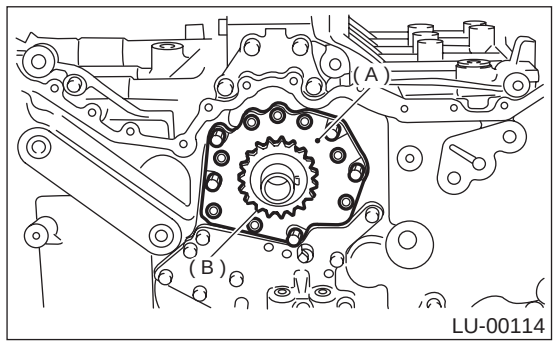
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.



4) Drain coolant. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Lower the vehicle.
6) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
7) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
8) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
9) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
10) Remove oil pump cover and crankshaft sprocket.

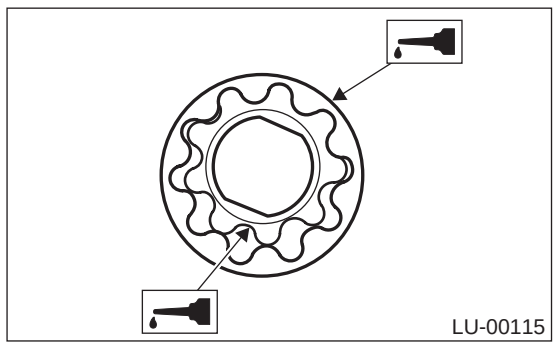


(A) Oil pump cover
(B) Crankshaft sprocket

11) Remove inner rotor and outer rotor.

B: INSTALLATION

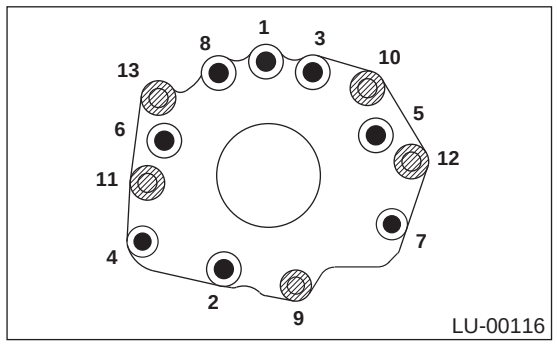
1) Apply engine oil to the entire surface area of both inner and outer rotor.



2) Install the inner rotor by fitting it into the groove on the crankshaft, and then assemble the outer rotor.
3) Install oil pump cover.
4) Tighten the bolts in the numerical sequence shown in the figure.

CAUTION:
Make sure that bolt mounting position is correct.

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



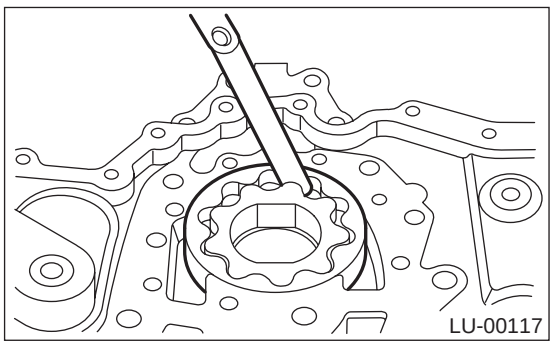
5) Install crank sprocket.
6) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
7) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
8) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
9) Install radiator. <Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
10) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

1. TIP CLEARANCE

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

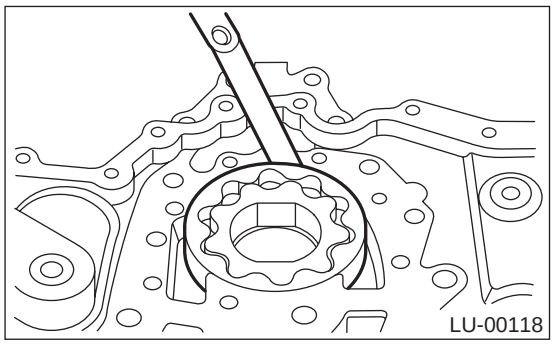
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.20 mm (0.0079 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the rear chain cover rotor housing. If the clearance exceeds the limit, replace the rotor.

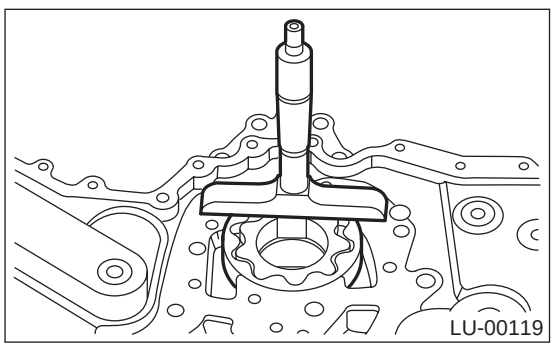
Case clearance:
Standard
0.11— 0.18 mm (0.0043 — 0.0071 in)
Limit
0.25 mm (0.0098 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and rear chain cover. If the clearance exceeds the limit, replace rotors as a set.

Side clearance:
Standard
0.02 — 0.08 mm (0.0008 — 0.0031 in)
Limit
0.15 mm (0.0059 in)



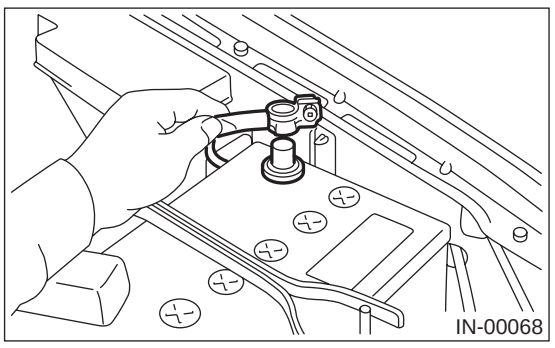
4. OIL PUMP CASE

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

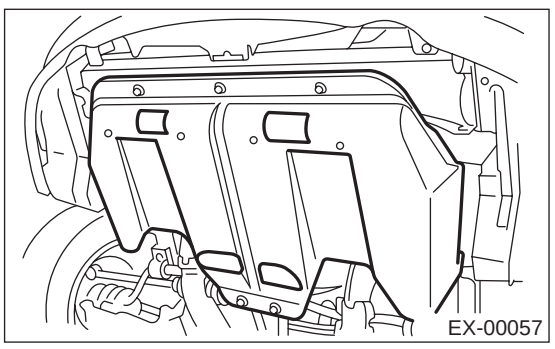
5. Oil Pump Relief Valve

A: REMOVAL

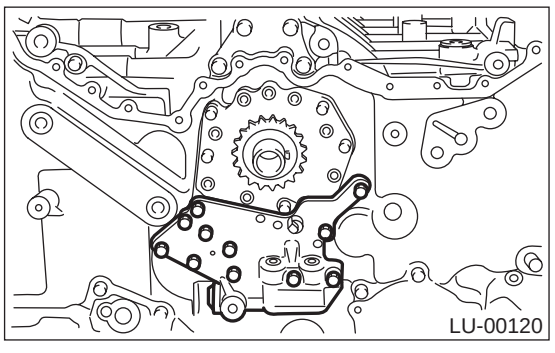
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.



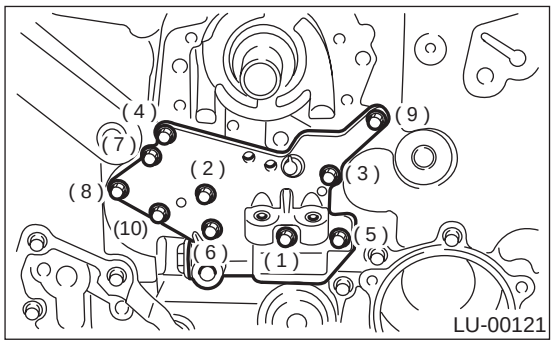
4) Drain coolant. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Lower the vehicle.
6) Remove radiator. <Ref. to CO(H6DO)-27, REMOVAL, Radiator.>
7) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
8) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
9) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
10) Remove oil pump relief valve.



B: INSTALLATION

1) Install oil pump relief valve case and gasket
2) Tighten the bolts in the numerical sequence shown in the figure.

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



Bolt installation position	Bolt dimension
(1) and (5)	6 x 26
(2), (3), (4) and (9)	6 x 35
(6), (7), (8) and (10)	6 x 16

3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
6) Install radiator.<Ref. to CO(H6DO)-28, INSTALLATION, Radiator.>
7) Fill coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

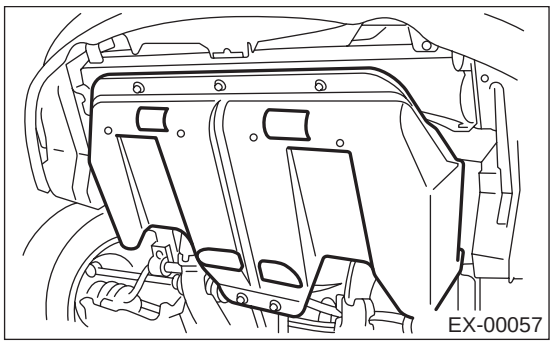
- Check the oil pump relief valve case for worn shaft hole, clogged oil passage, cracks and other faults.
- Make sure that there are no foreign materials on the gasket filter.

6. Oil Pan and Strainer

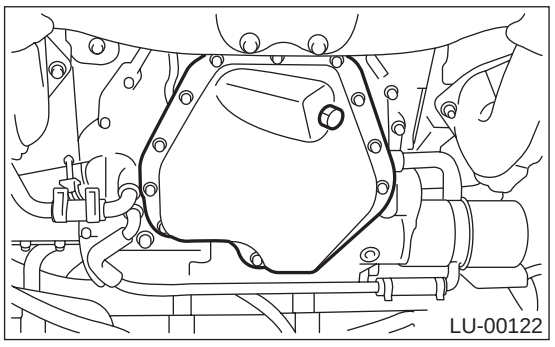
A: REMOVAL

NOTE:
Oil pan upper cannot be removed from the normal vehicle position. The engine must be separated from the vehicle prior to removal. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>

1) Set the vehicle on lift arms.
2) Lift-up the vehicle.
3) Remove under cover.



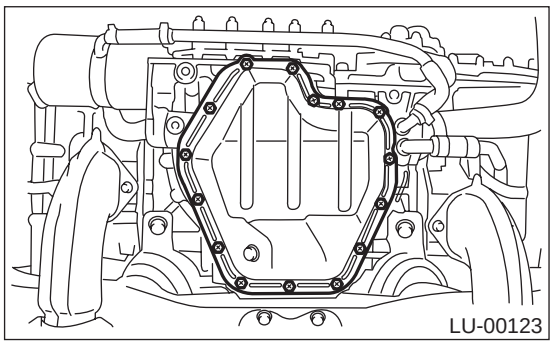
4) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



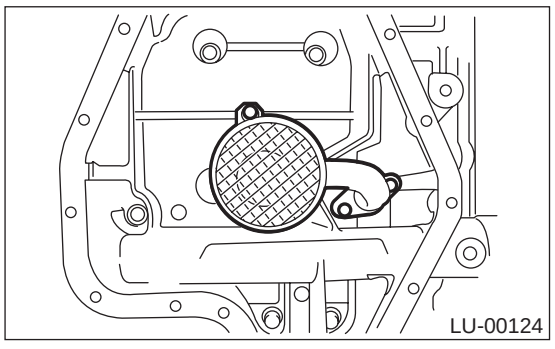
5) Insert oil pan cutter blade between upper and lower oil pans.

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

6) Remove lower oil pan.



7) Remove oil strainer.



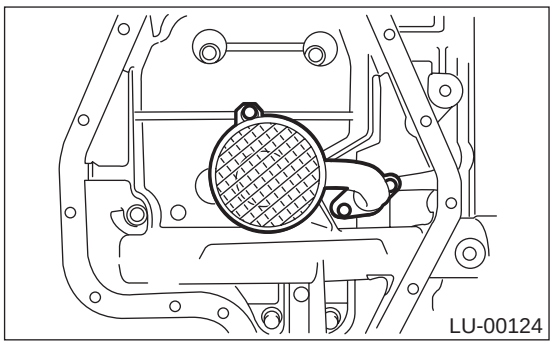
B: INSTALLATION

CAUTION:
Before installing oil pan, clean liquid gasket from lower oil pan and upper oil pan.

1) Install oil strainer onto upper oil pan.

CAUTION:
Replace O-ring with a new one.

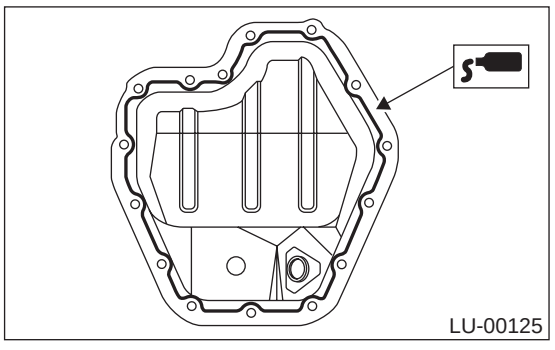
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Apply liquid gasket to mating surfaces and install oil pan.

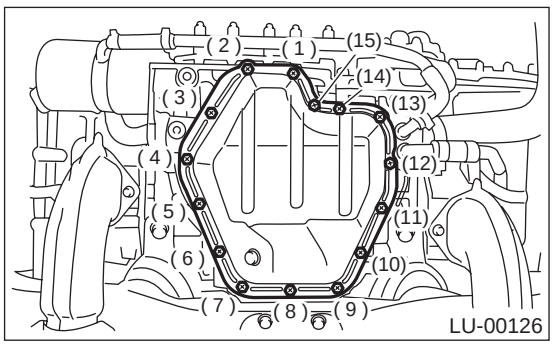
Liquid gasket:
THREE BOND 1280B

Liquid gasket application diameter:
5.0±1.0 mm (0.197±0.039 in)

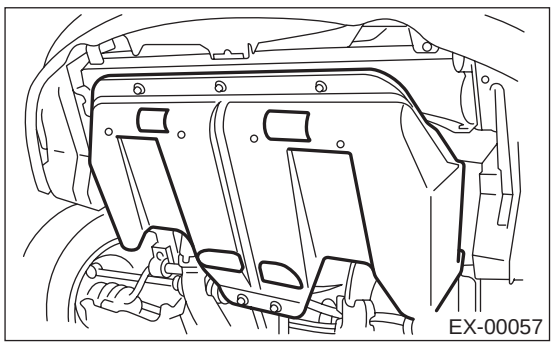


3) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

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



4) Install under cover.



5) Fill engine oil. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

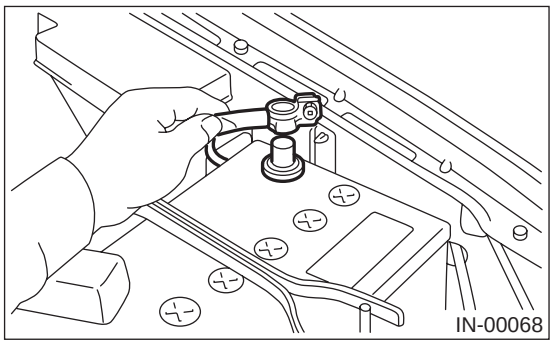
C: INSPECTION

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

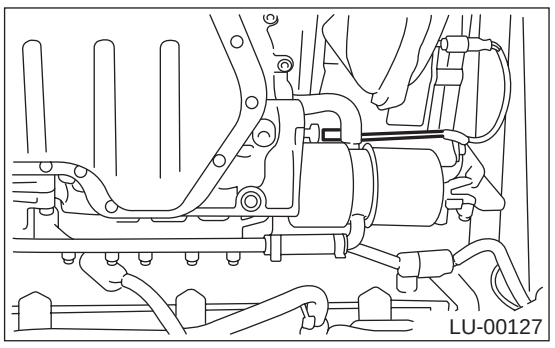
7. Oil Pressure Switch

A: REMOVAL

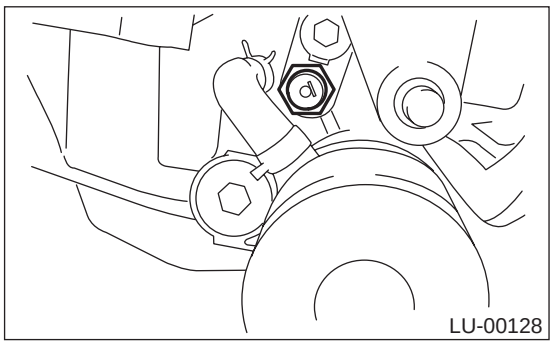
1) Set vehicle on the lift.
2) Disconnect battery ground cable.



3) Lift-up the vehicle.
4) Remove under cover.
5) Disconnect terminal from oil pressure switch.



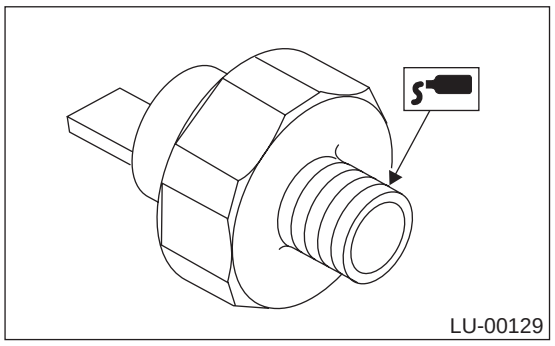
6) Remove oil pressure switch.



B: INSTALLATION

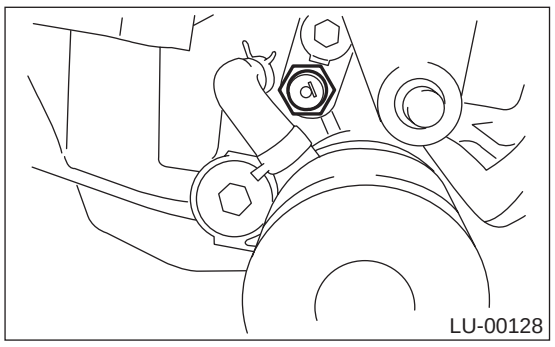
1) Apply liquid gasket to oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 or equivalent

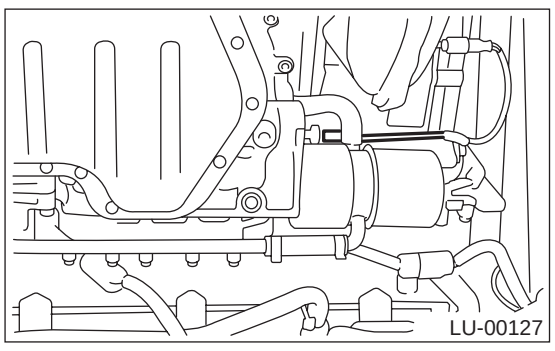


2) Install oil pressure switch.

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



3) Connect terminal of oil pressure switch.



4) Install under cover.

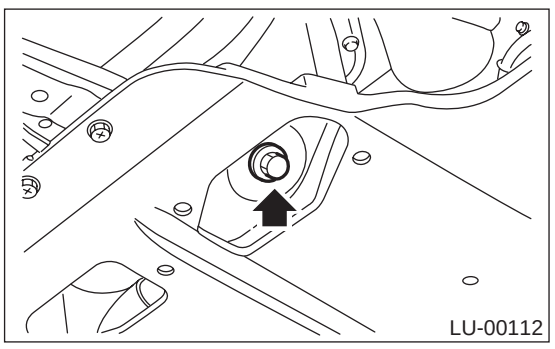
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

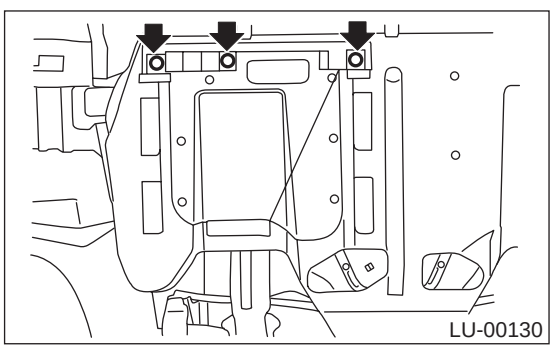
8. Engine Oil Filter

A: REMOVAL

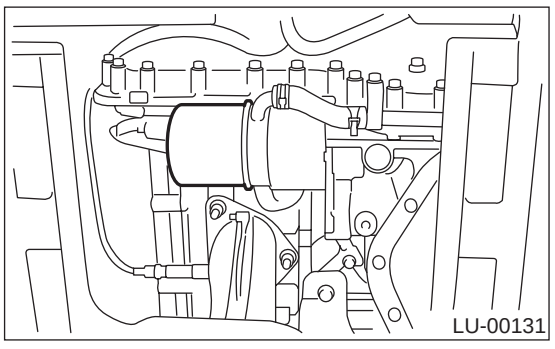
1) Drain engine oil by loosening engine oil drain plug.



2) Remove access lid.



3) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



B: INSTALLATION

1) Get a new oil filter and thinly apply engine oil to the rubber seal.
2) Install oil filter by turning it by hand, being careful not to damage rubber seal.
3) Tighten more (approximately 3/4 turn) after the rubber seal contacts the oil cooler. Do not tighten excessively, or oil may leak.

C: INSPECTION

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

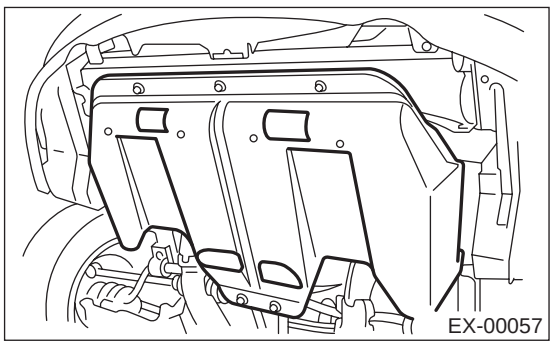
NOTE:
The filter element and filter case are unified; therefore, interior cleaning is not necessary.

2) Check the engine oil level. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

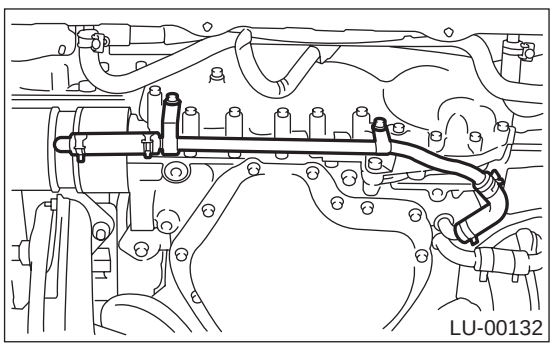
9. Oil Cooler

A: REMOVAL

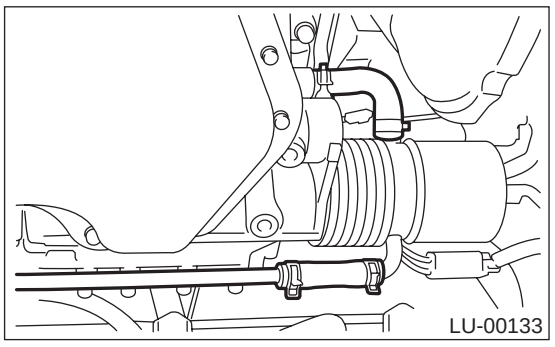
1) Lift-up the vehicle.
2) Remove under cover.



3) Drain engine coolant completely. <Ref. to CO(H6DO)-22, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Drain engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
5) Remove bolts which installs water pipe to engine.

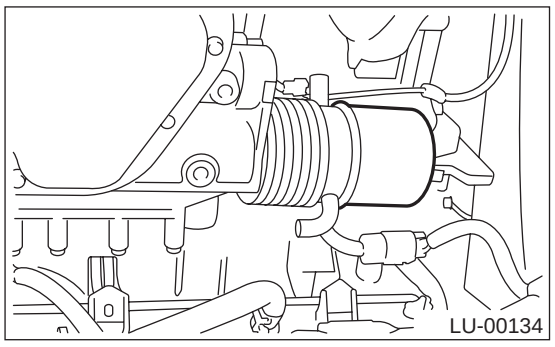


6) Disconnect water hoses from oil cooler.

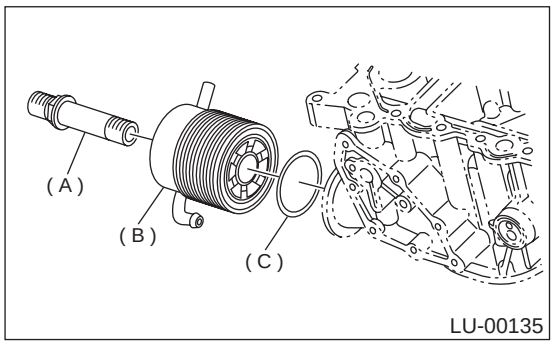


7) Remove oil filter using ST. <Ref. to LU(H6DO)-17, REMOVAL, Engine Oil Filter.>
ST 498547000 OIL FILTER WRENCH

NOTE:
Set container under the vehicle.



8) Remove connector and remove oil cooler.



(A) Connector
(B) Oil cooler
(C) O-ring

B: INSPECTION

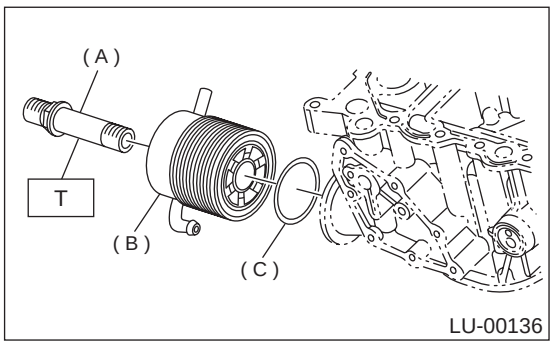
1) Check that coolant passages are not clogged using air blow method.
2) Check upper oil pan and the installation surface of oil filter O-ring for damage.

C: INSTALLATION

1) Install oil cooler on upper oil pan with connector pipe.

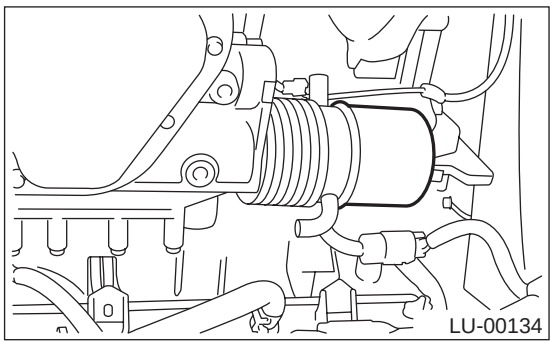
Tightening torque:
T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:
Always use a new O-ring.

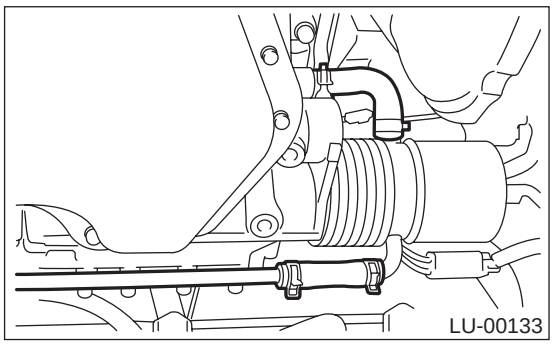


(A) Connector
(B) Oil cooler
(C) O-ring

2) Install oil filter using ST. <Ref. to LU(H6DO)-17, INSTALLATION, Engine Oil Filter.>
ST 498547000 OIL FILTER WRENCH

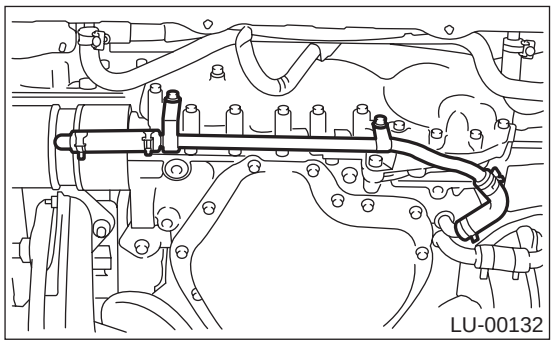


3) Install water hose.



4) Install water pipe to engine.

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



5) Fill engine oil. <Ref. to LU(H6DO)-9, REPLACEMENT, Engine Oil.>
6) Fill engine coolant. <Ref. to CO(H6DO)-22, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Check the engine oil level. <Ref. to LU(H6DO)-9, INSPECTION, Engine Oil.>

10.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 pressure leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		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.
		Oil pump rotor does not rotate.	Replace.
2. Warning light does not go on.	1) Broken line related to bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

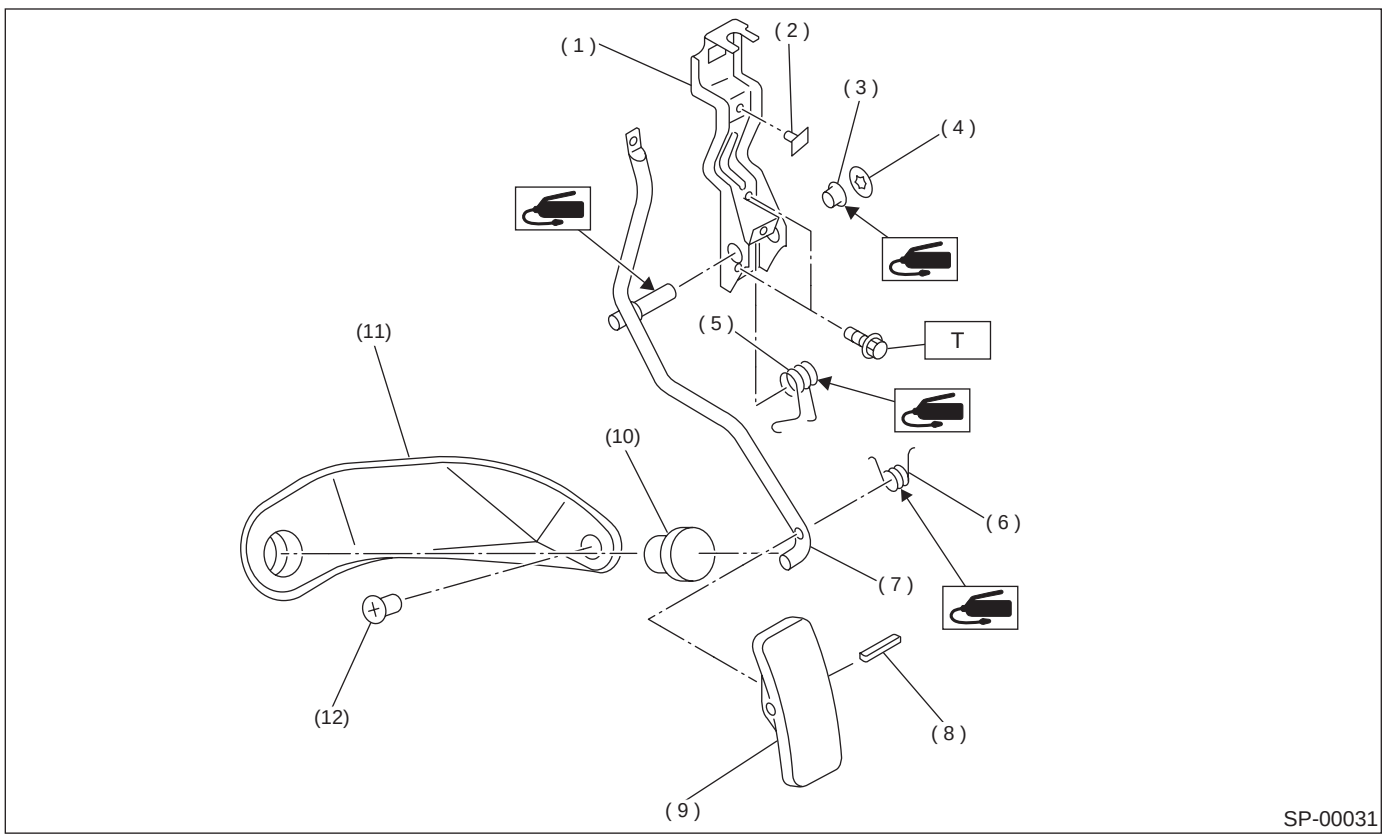
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	1 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

B: COMPONENT

1. LHD MODEL



(1)	Accelerator bracket	(7)	Accelerator pedal lever
(2)	Stopper	(8)	Spring pin
(3)	Bushing	(9)	Accelerator pedal
(4)	Clip	(10)	Accelerator stopper
(5)	Accelerator spring	(11)	Accelerator plate
(6)	Accelerator pedal spring	(12)	Clip

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

C: CAUTION

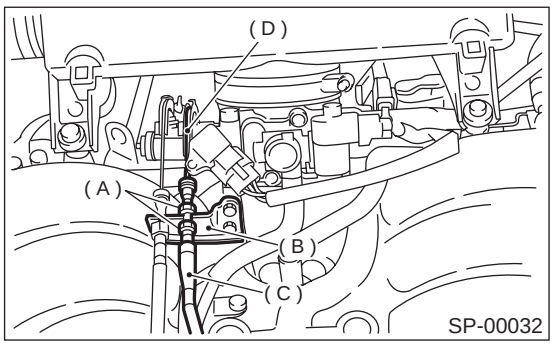
• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation 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 ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

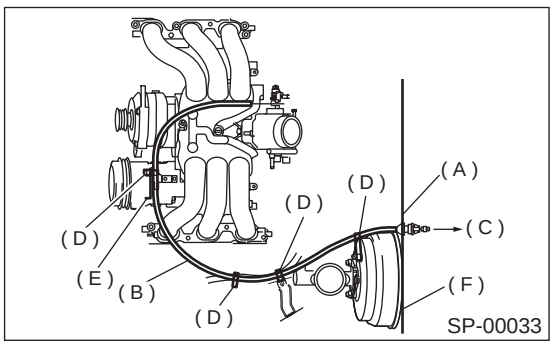
1) Disconnect ground cable from battery.
2) Remove lock nut from accelerator cable bracket.
3) Separate accelerator cable from bracket.
4) Remove accelerator cable end from throttle cam.
5) Disconnect accelerator cable from throttle body.

CAUTION:
Be careful not to kink accelerator cable.



(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

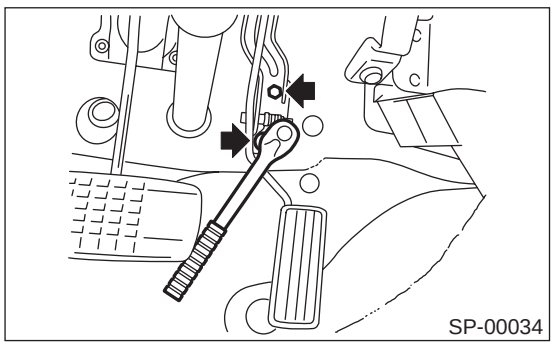
6) Remove clip inside engine compartment.



(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Clip
(E) Bracket
(F) Brake booster

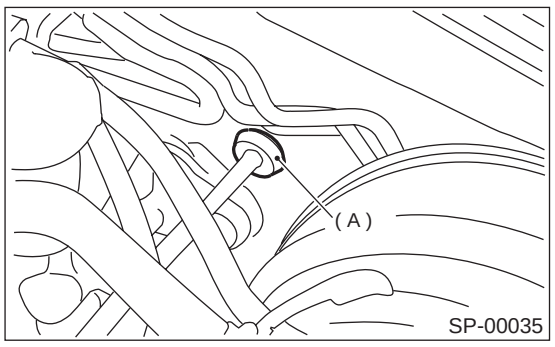
7) Remove instrument panel lower cover from instrument panel, and connector.
8) Remove brake and clutch pedal bracket. (MT model) <Ref. to BR-39, REMOVAL, Brake Pedal.>

9) Remove accelerator pedal connecting bolt from accelerator pedal bracket.

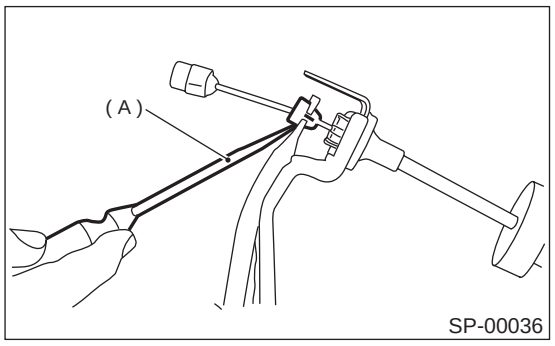


10) Disconnect grommet (A) from toe board.

NOTE:
From inside compartment, push grommet into hole.

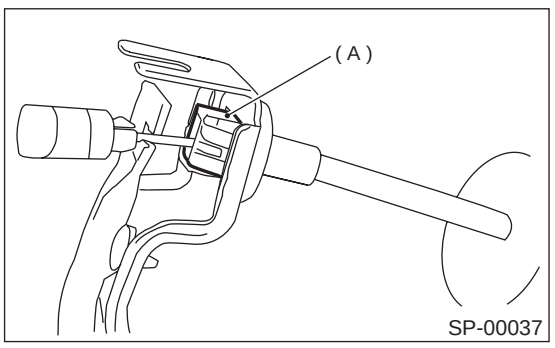


11) Pull out the cable from the toe board hole.
12) Disconnect accelerator cable bushing from accelerator pedal lever.



(A) Slot-type screwdriver

13) Disconnect accelerator cable stopper (A) from bracket.



14) Separate accelerator cable and bracket.

B: INSTALLATION

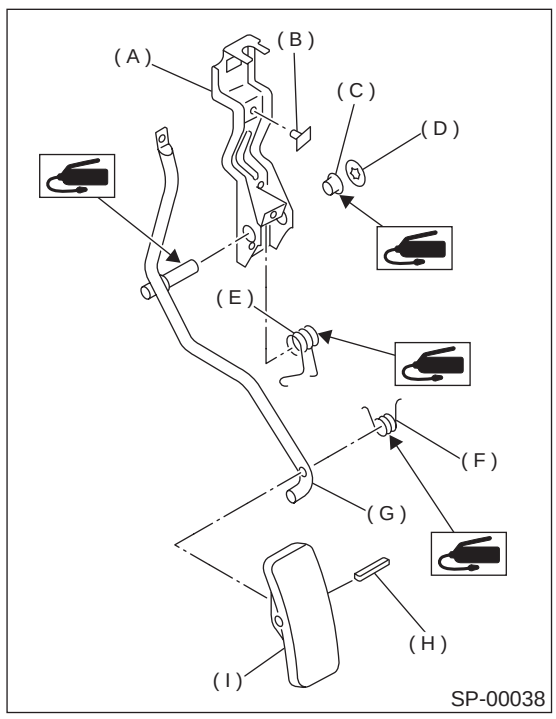
Install in the reverse order of removal.

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Always use new clevis pins.

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

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 spacer and inside bore of a accelerator pedal.

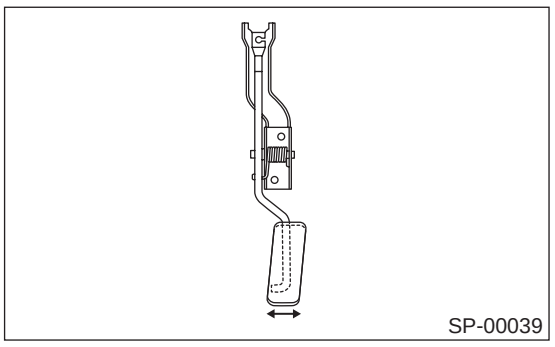
E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move pedal pad in the lateral direction to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace bushing and clip with new ones.

Deflection of accelerator pedal:
Service limit
5.0 mm (0.197 in) or less

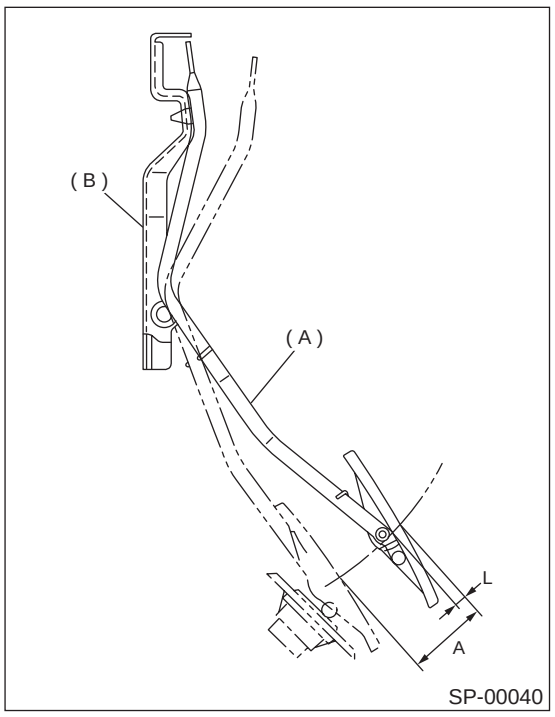


F: ADJUSTMENT

1) Check pedal stroke and free play by operating accelerator pedal by hand.
If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L
1 — 4 mm (0.04 — 0.16 in)

Stroke at pedal pad: A
50 — 55 mm (1.97 — 2.17 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

3. Accelerator Control Cable

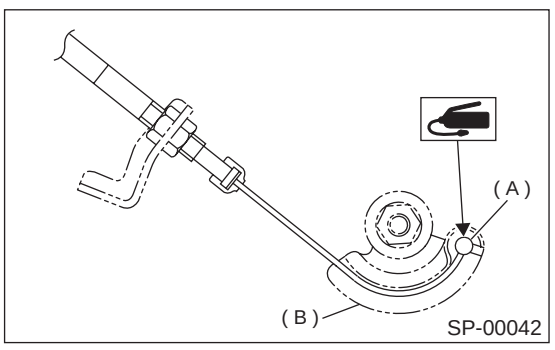
A: REMOVAL

1) Remove accelerator pedal. <Ref. to SP(H6DO)-4, REMOVAL, Accelerator Pedal.>
2) Separate accelerator cable and accelerator pedal.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to engine side accelerator cable end.

Grease:
Part No. 004404002
Slicolube G-30M



(A) Grease application area
(B) Throttle cam

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Do not apply grease to the throttle cable on the engine side.

3) Adjustment after pedal installation <Ref. to SP(H6DO)-5, 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.

ACCELERATOR CONTROL CABLE

SPEED CONTROL SYSTEMS

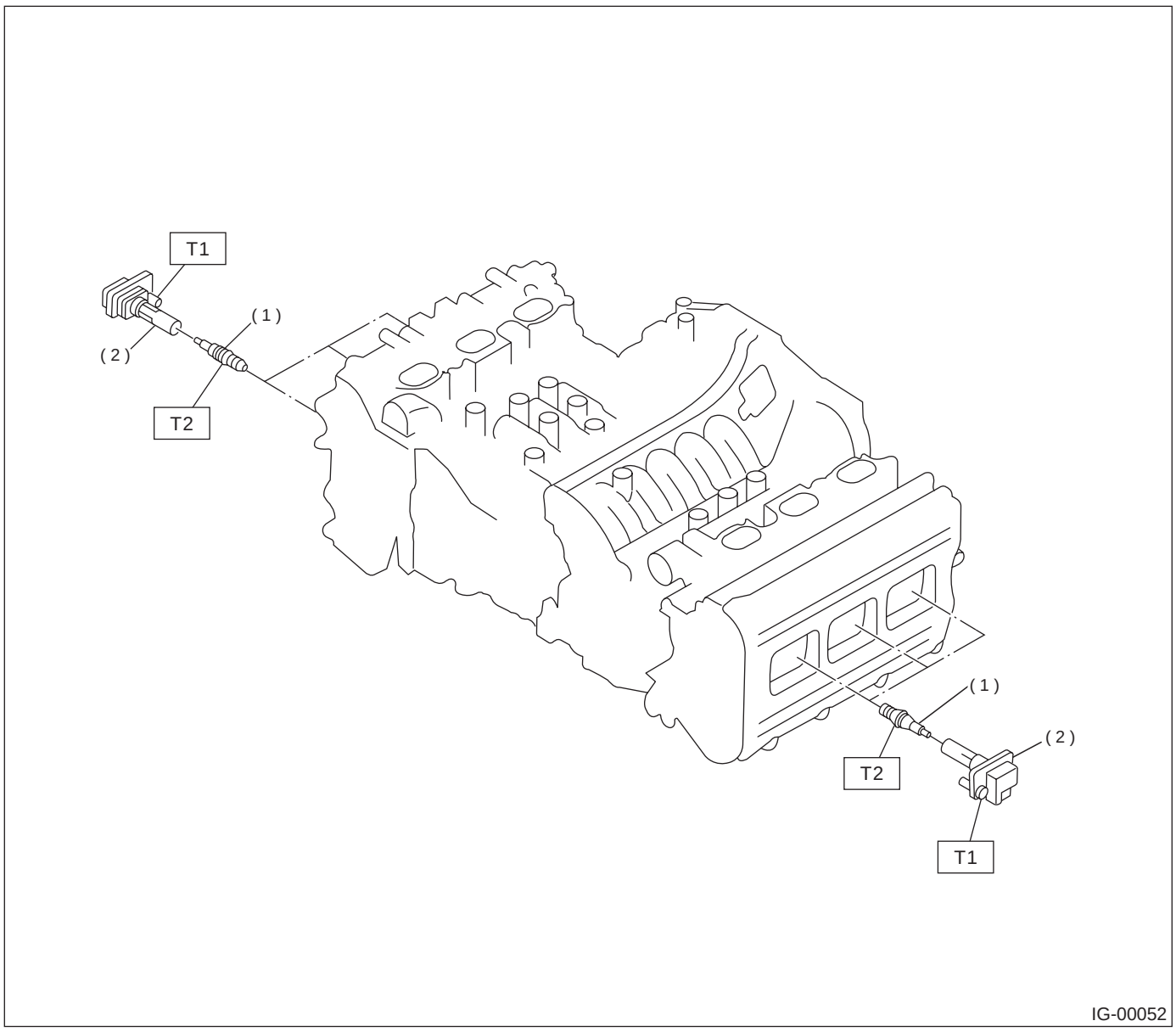
MEMO:

1. General Description

A: SPECIFICATIONS

Item			Designation
Ignition coil and ignitor assembly	Model		FK0140
	Manufacturer		DIAMOND
Spark plug	Type and manufacturer		NGK : PLFR6A-11
	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) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 12)
T2: 21 (2.1, 15)

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 ground cable from battery.

2. Spark Plug

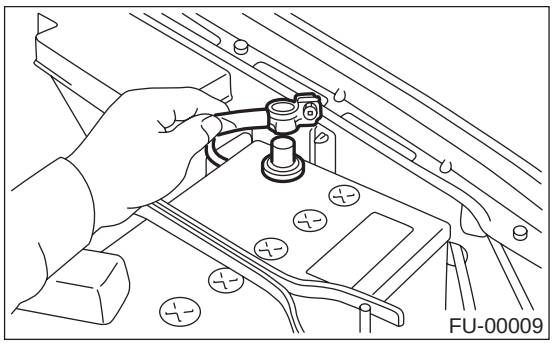
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

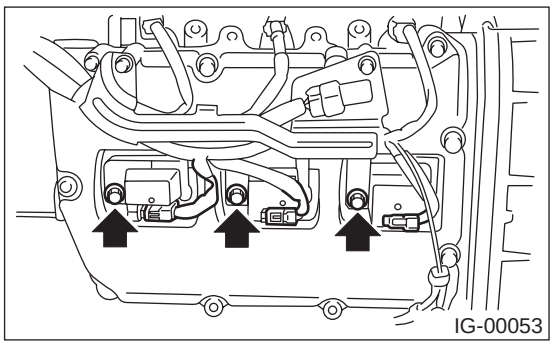
Spark plug:
NGK: PLFR6A-11

1. RH SIDE

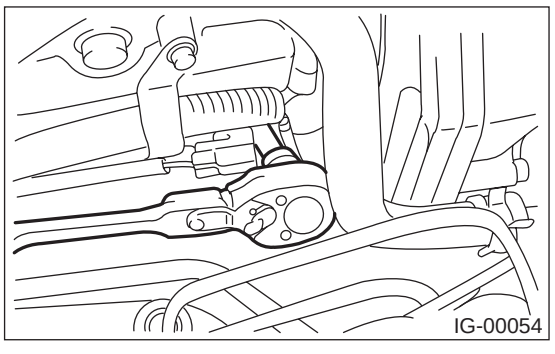
1) Disconnect battery ground cable.


FU-00009

2) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
3) Disconnect connector from ignition coil.
4) Remove ignition coil.

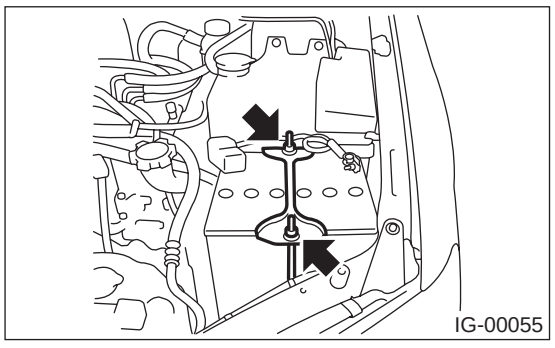

IG-00053

5) Remove spark plugs with the spark plug socket.

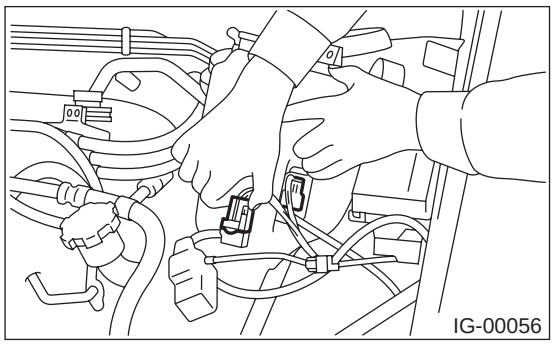

IG-00054

2. LH SIDE

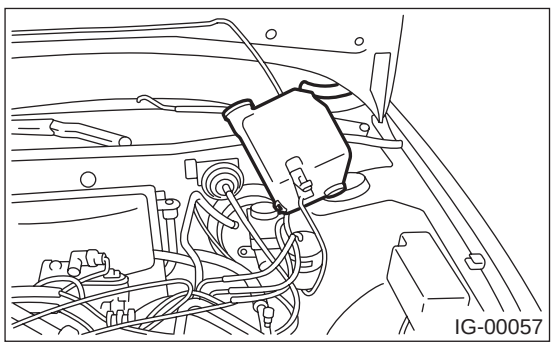
1) Disconnect battery cables and then remove battery and battery carrier.


IG-00055

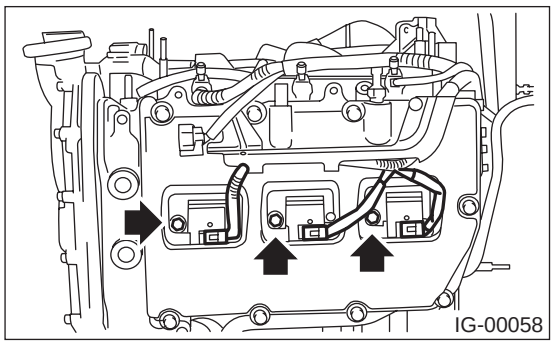
2) Disconnect washer motor connector.


IG-00056

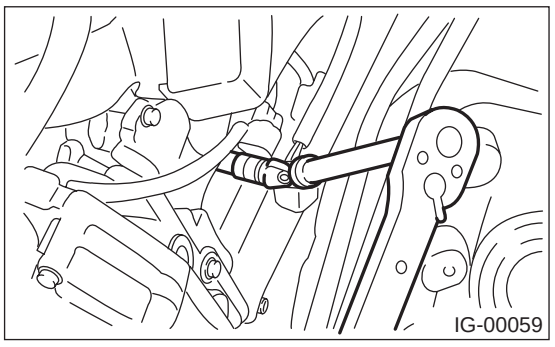
3) Remove the two bolts which hold the washer tank, then take the tank away from the working area.


IG-00057

4) Disconnect connector from ignition coil.
5) Remove ignition coil.


IG-00058

6) Remove spark plug with the spark plugs socket.


IG-00059

B: INSTALLATION

1. RH SIDE

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.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

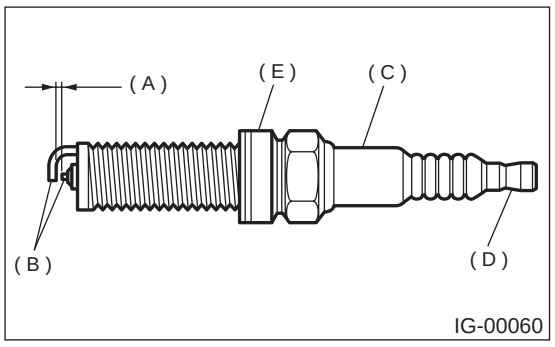
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

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.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

C: INSPECTION

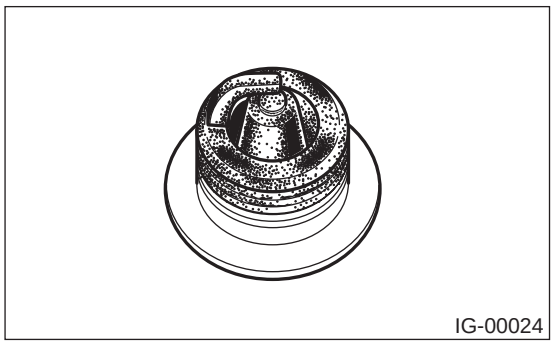
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



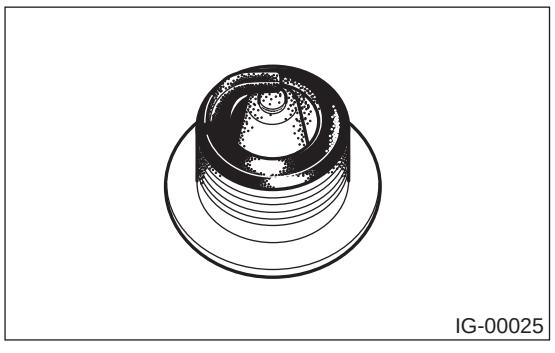
IG-00060

(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

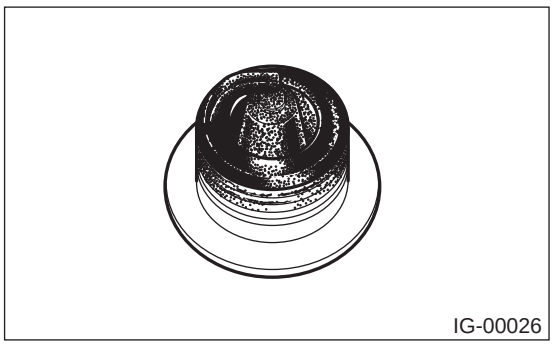
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.


IG-00024

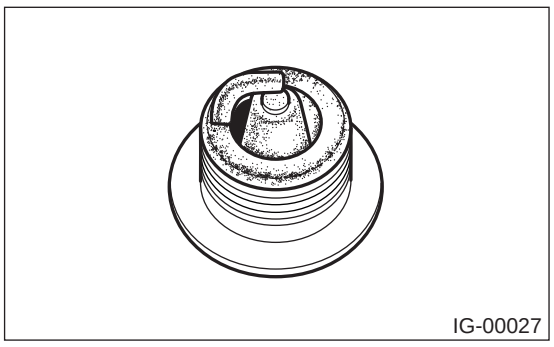
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00025

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.


IG-00026

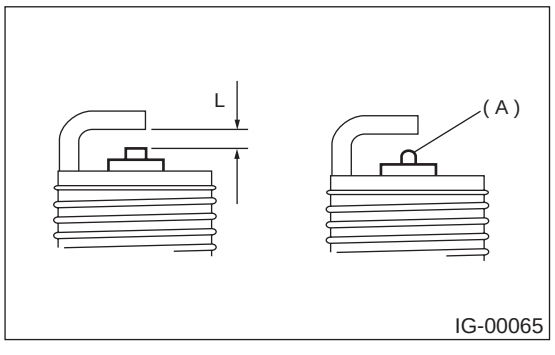
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


IG-00027

D: CLEANING
Clean spark plugs in a sand blast type cleaner.
Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace 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)



IG-00065

NOTE:
Replace with new spark plug if this area (A) is worn to “ball” shape.

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type is adopted.
For the order of removal, refer to the removal of spark plugs.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)

C: INSPECTION

Because ignition coil is a direct ignition type, the resistance cannot be measured in a single unit. For inspection procedure of ignition system, refer to the following. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

IGNITION COIL AND IGNITOR ASSEMBLY

MEMO:

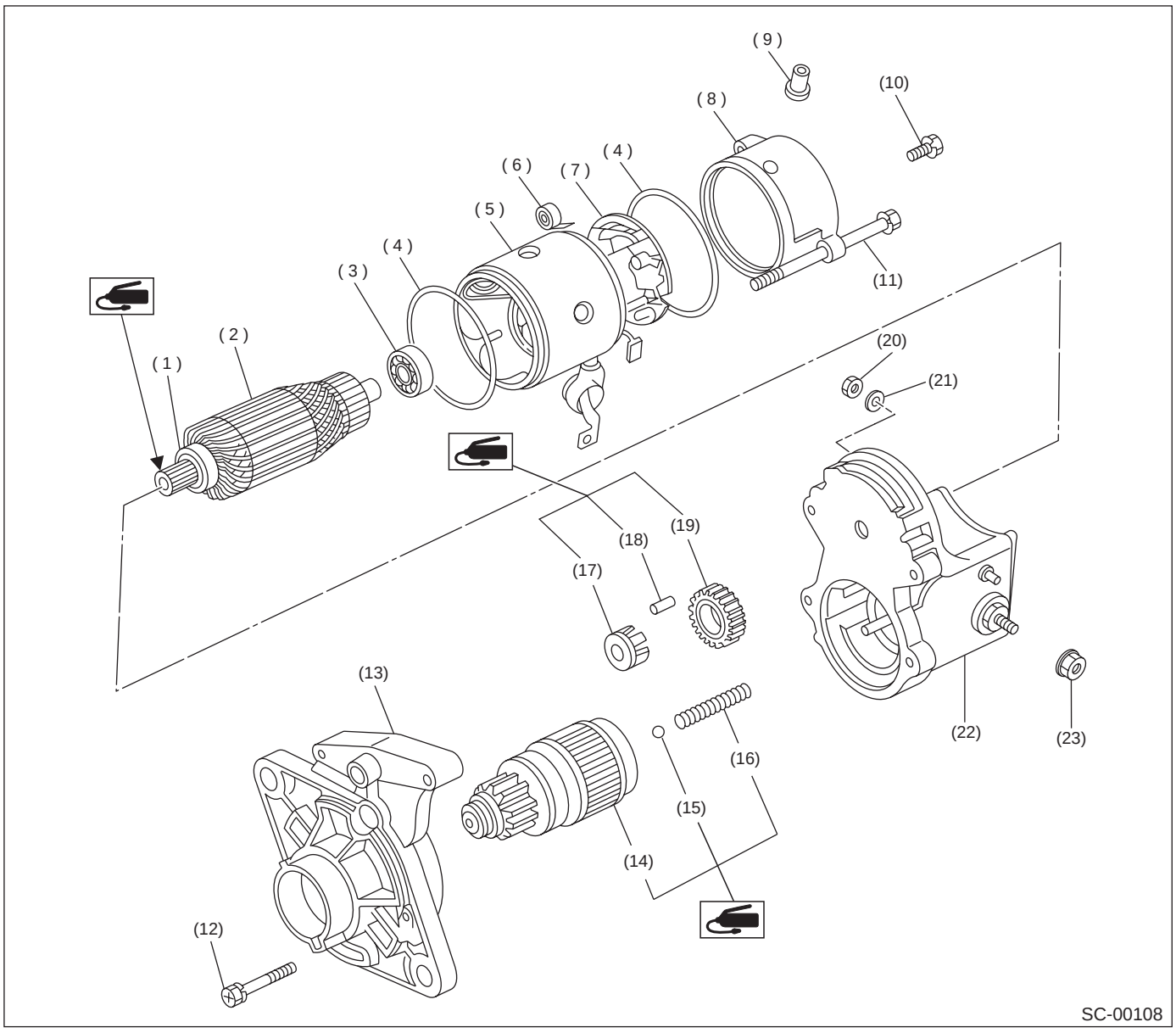
1. General Description

A: SPECIFICATIONS

Item			Designation
Starter	Type		Reduction type
	Model		228000-7141
	Manufacturer		NIPPONDENSO TENNESSEE
	Voltage and output		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	2,900 rpm or more
	Load characteristics	Voltage	8 V
		Current	370 A or less
		Torque	13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
		Rotating speed	880 rpm or more
	Lock characteristics	Voltage	5 V
		Current	1,050 A or less
		Torque	27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type
	Model		A003EB1870
	Manufacturer		MITSUBISHI ELECTRIC
	Voltage and output		12 V — 100 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 — 43 A or more 2,500 rpm — 76 A or more 5,000 rpm — 100 A or more
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]
Battery	Reserve capacity	amps min.	110
	Cold cranking	amp.	490

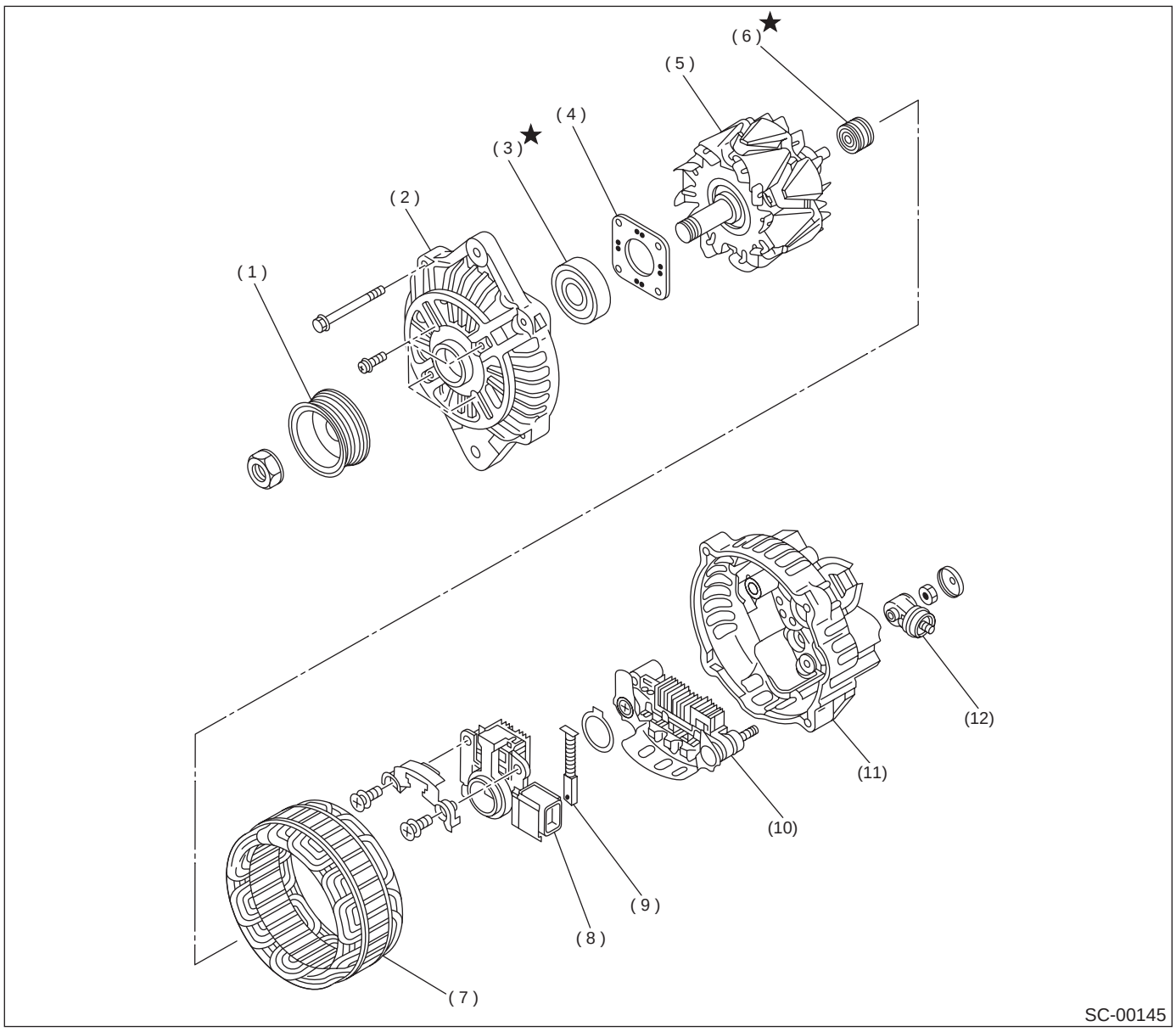
B: COMPONENT

1. STARTER



(1)	Front ball bearing	(9)	Cover	(17)	Retainer
(2)	Armature	(10)	Screw	(18)	Roller
(3)	Rear ball bearing	(11)	Through-bolt	(19)	Idle gear
(4)	O-ring	(12)	Screw & washer	(20)	Nut
(5)	Yoke	(13)	Starter housing	(21)	Spring washer
(6)	Brush spring	(14)	Overrunning clutch	(22)	Magnetic switch
(7)	Brush holder	(15)	Steel ball	(23)	Nut
(8)	End frame	(16)	Spring		

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

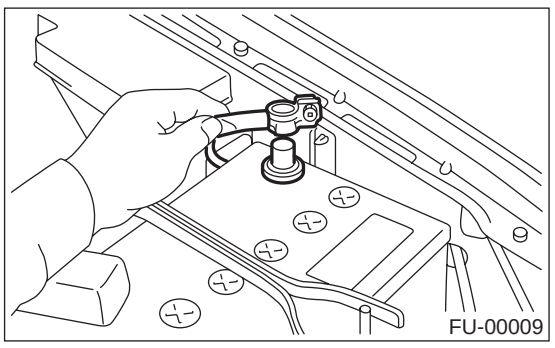
C: CAUTION

• 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 ground cable from battery.

2. Starter

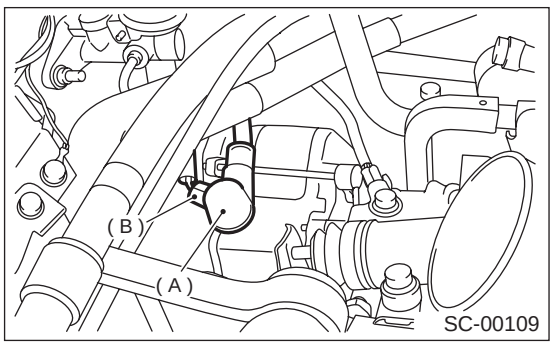
A: REMOVAL

1) Disconnect battery ground cable.



2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Disconnect connector and terminal from starter.



(A) Terminal
(B) Connector

4) Remove starter from transmission.

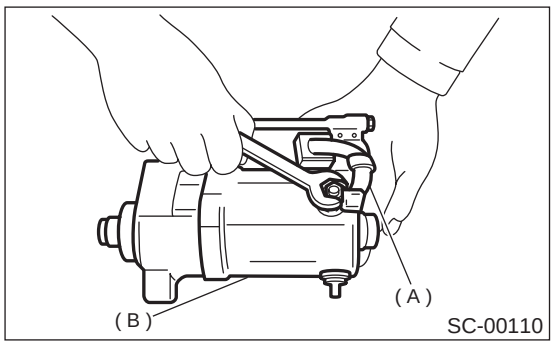
B: INSTALLATION

Install in the reverse order of removal.

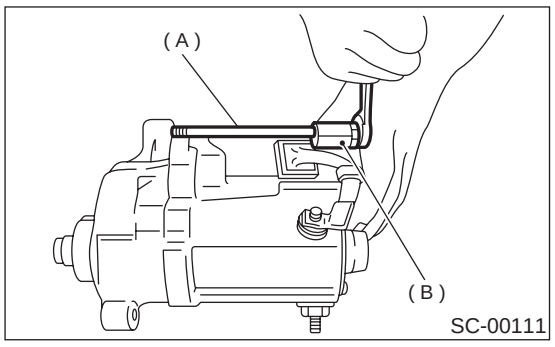
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

C: DISASSEMBLY

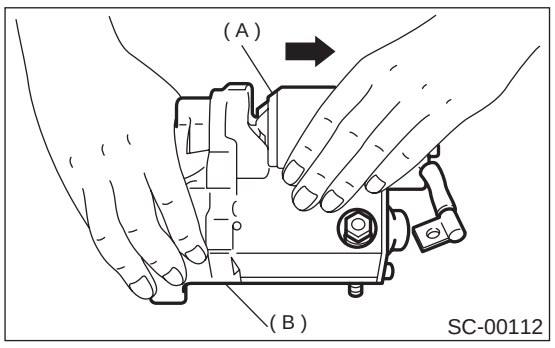
1) Disconnect lead wire (A) from magnetic switch (B).



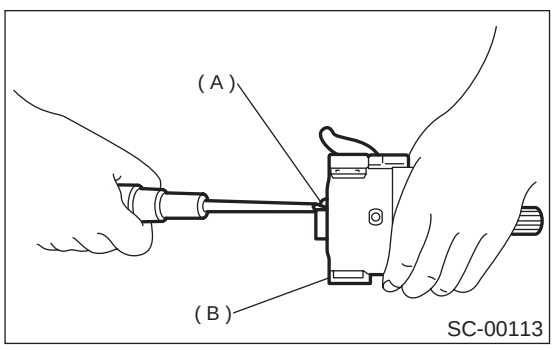
2) Remove through-bolts (A) from end frame (B).



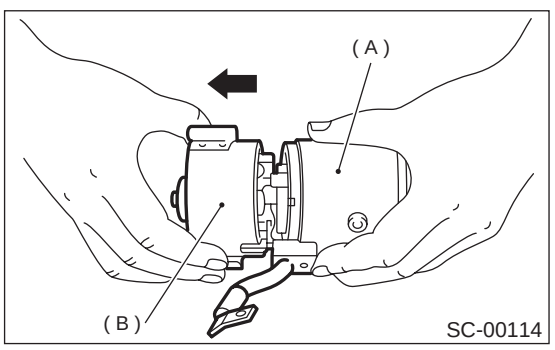
3) Remove yoke (A) from magnetic switch (B).



4) Remove screws (A) securing brush holder to end frame (B).

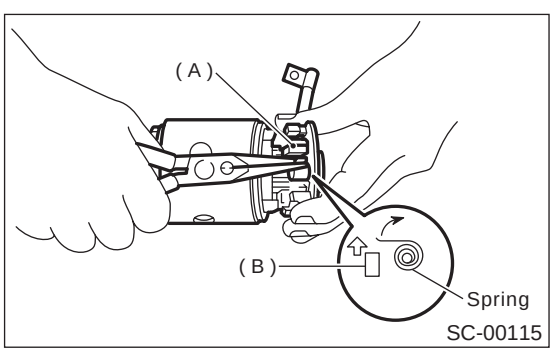


5) Separate yoke (A) from end frame (B).

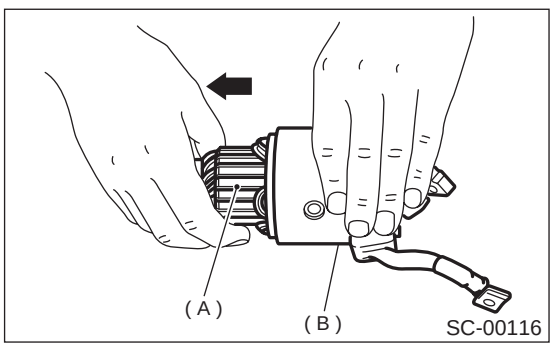


6) Remove brush (A) by lifting up positive (+) side brush spring (B) using long-nose pliers.

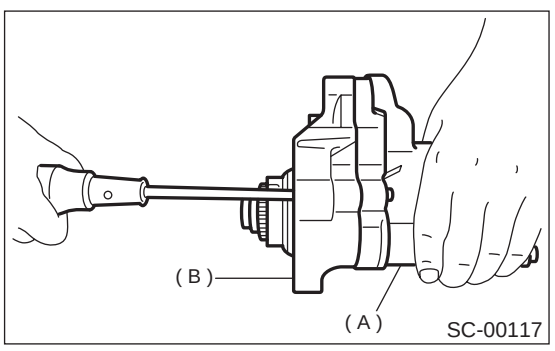
CAUTION:
Be careful not to damage brush and commutator.



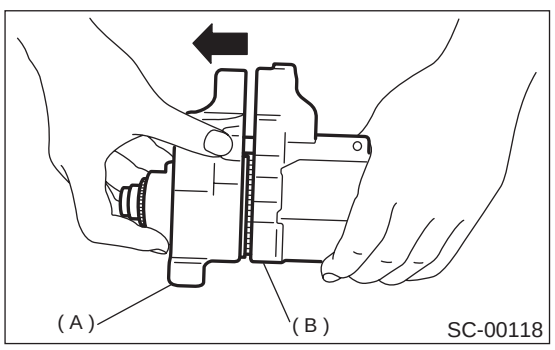
7) Remove armature (A) from yoke (B).



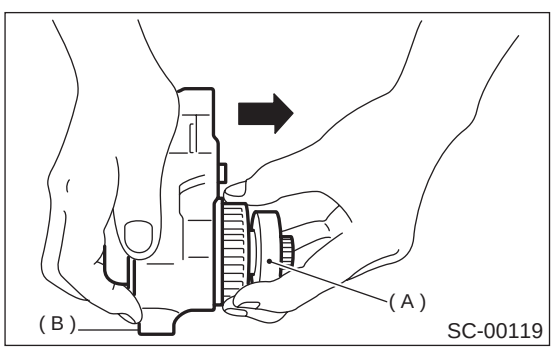
8) Remove screws securing magnetic switch (A) to housing (B).



9) Remove housing (A) from magnetic switch (B).

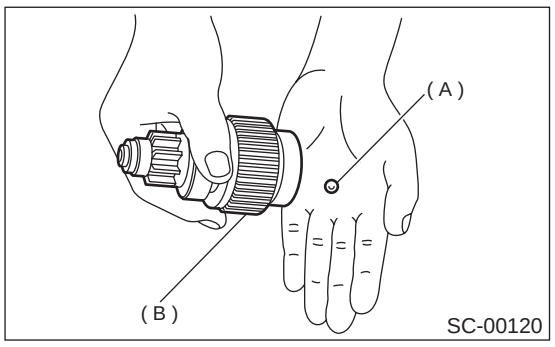


10) Remove clutch (A) from housing (B).

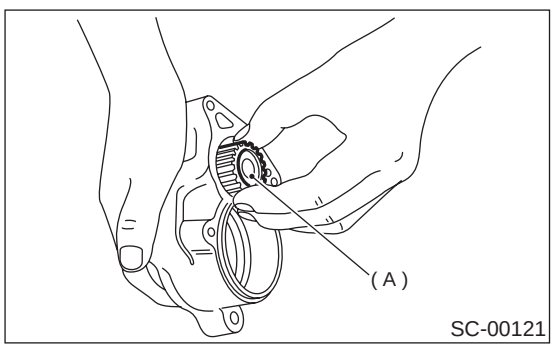


11) Take out steel ball (A) from clutch (B).

CAUTION:
Be careful not to lose steel ball.

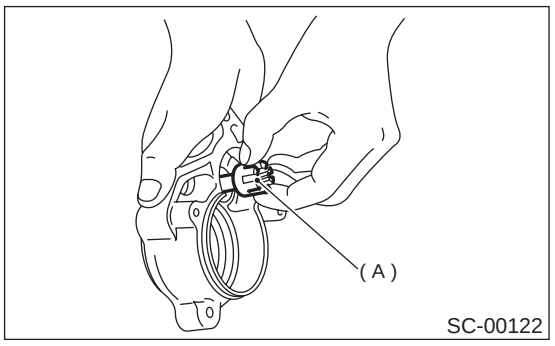


12) Remove idle gear (A) from housing.

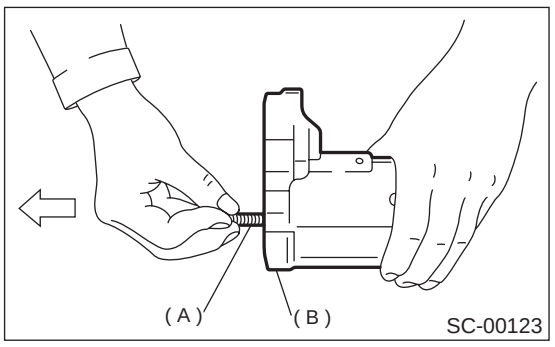


13) Remove retainer and roller (A) from housing.

CAUTION:
Be careful not to drop retainer and roller.



14) Remove coil spring (A) from magnetic switch (B).



D: ASSEMBLY

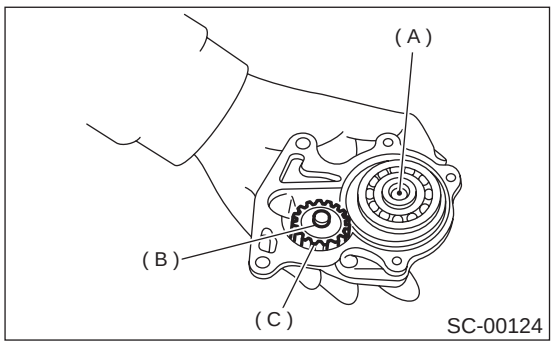
Assemble in the reverse order of disassembly. Observe the following:

1) Before assembling, apply grease to the points shown in “COMPONENT PARTS”. <Ref. to SC(H6DO)-3, COMPONENT, General Description.>

2) Assembling magnetic switch, clutch, and housing

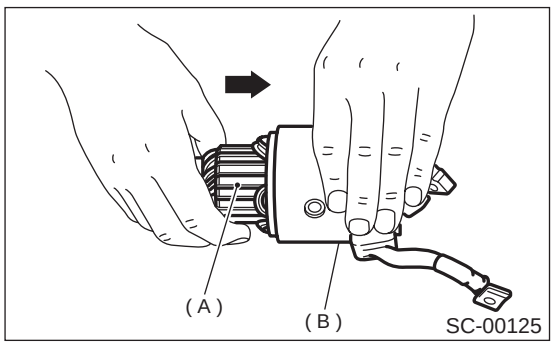
To assemble, first install clutch to magnetic switch, then install idle gear, and finally install clutch.

CAUTION:
• Do not forget to install steel ball and coil spring to clutch.
• Attach bearing to idle gear beforehand.

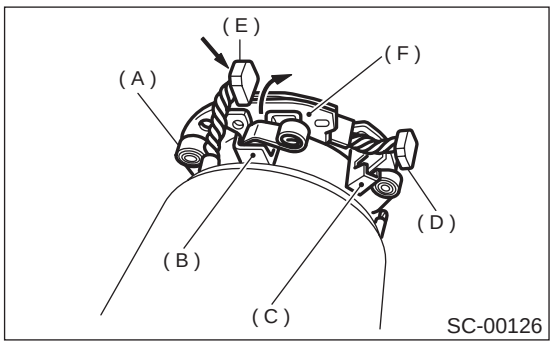


(A) Steel ball
(B) Retainer
(C) Idle gear

3) Installing armature (A) to yoke (B)

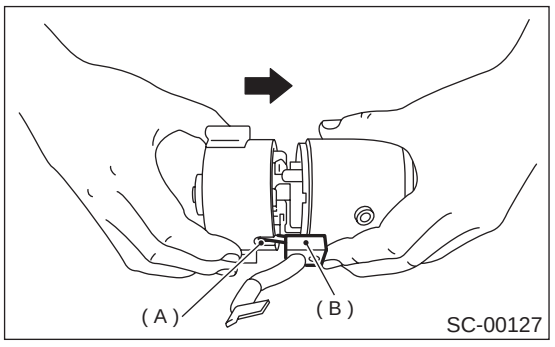


4) Installing brushes
Assemble brush holder to yoke as shown, then assemble two yoke-side brushes to brush holder.

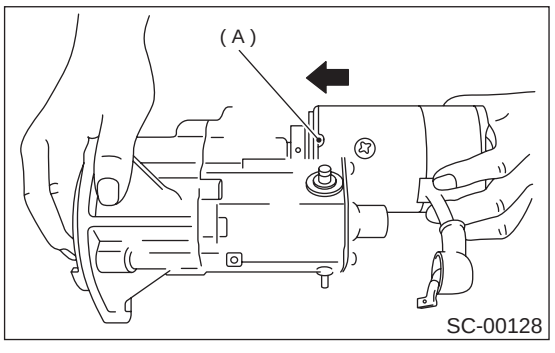


(A) Brush spring
(B) Brush holder hole (+)
(C) Brush holder hole (–)
(D) Brush (–)
(E) Brush (+)
(F) Insulator

5) Installing end frame
When assembling end frame to yoke, align notched portion (A) of end frame with lead wire grommet (B).



6) Installing yoke
When installing yoke to magnetic switch, align notch (A) of yoke with groove of magnetic switch.

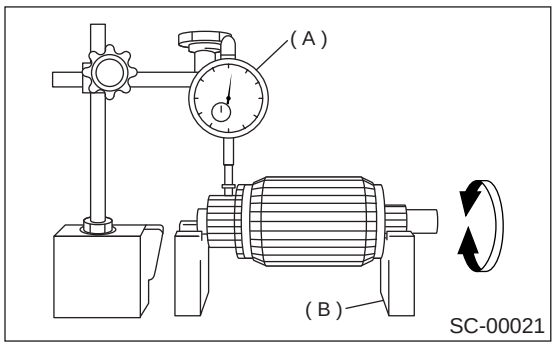


E: INSPECTION

1. ARMATURE

1) Check commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out and replace if it exceeds the limit.

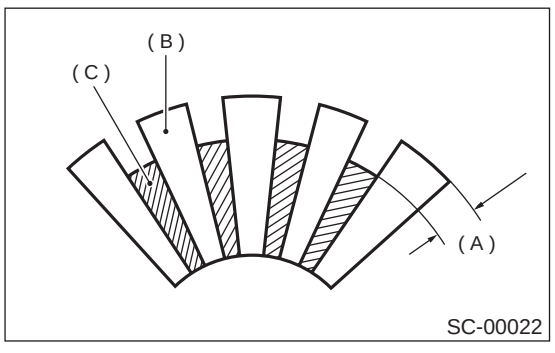
Commutator run-out:
Standard
0.02 mm (0.0008 in), or less
Service limit
Less than 0.05 mm (0.0020 in)



(A) Dial gauge
(B) V-block

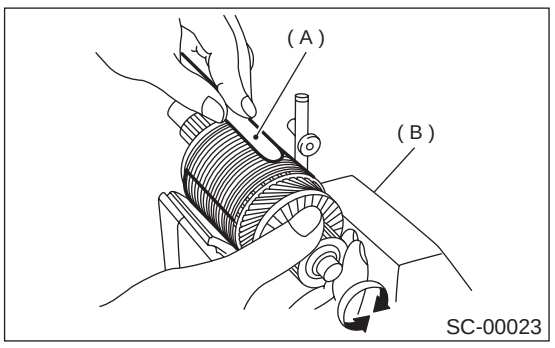
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.6 mm (0.024 in)
Limit
0.2 mm (0.008 in)



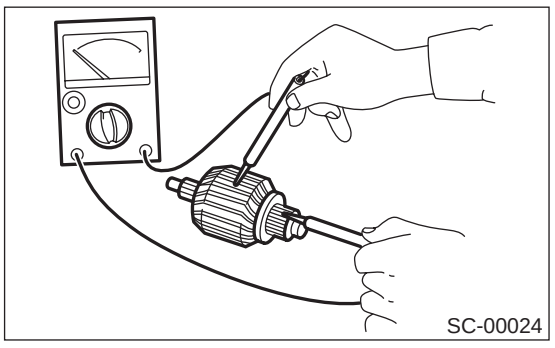
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check armature for short-circuit by placing it on growler tester. Hold a iron sheet against armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Growler tester

5) Armature ground test
Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is a continuity, armature is grounded.
Replace armature if it is grounded.



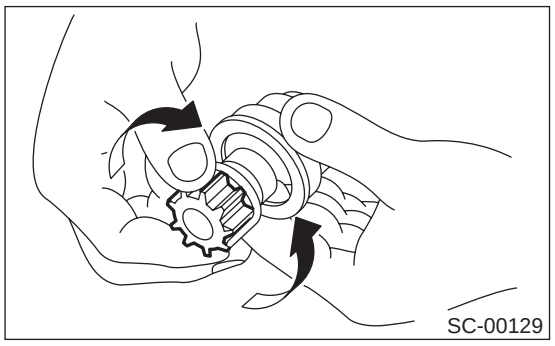
2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in correct direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

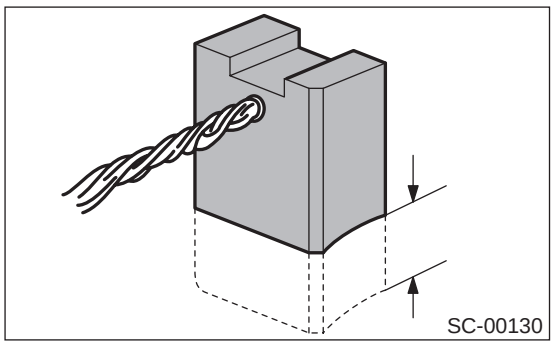
CAUTION:
Do not clean overrunning clutch with oil to prevent grease from flowing out.



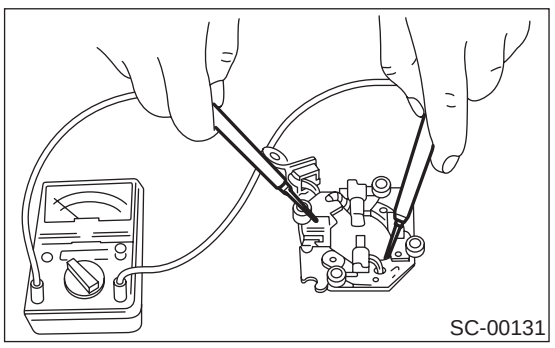
4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length and replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
15 mm (0.59 in)
Service limit
10 mm (0.39 in)



2) Brush movement
Be sure brush moves smoothly inside brush holder.
3) Insulation resistance of brush holder
Be sure there is no continuity between brush holder and its plate.

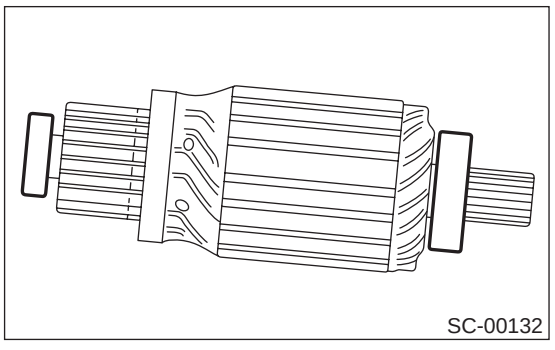

SC-00131

4) Brush spring force
Measure brush spring force with a spring scale. If it is less than the service limit, replace brush spring.

Brush spring force:
Standard
18.6 N (1.9 kgf, 4.2 lb) (when new)
Service limit
6.9 N (0.7 kgf, 1.5 lb)

5. BEARING

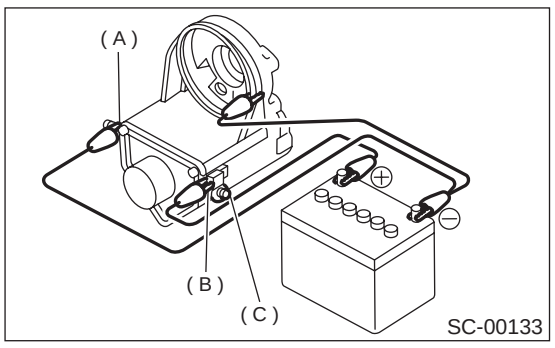
1) Rotate bearing by hand; no binding should exist.
2) Rotate bearing rapidly; no abnormal noise should be heard.


SC-00132

6. MAGNETIC SWITCH

CAUTION:
• The following magnetic switch tests should be performed with specified voltage applied.
• Each test should be conducted within 3 to 5 seconds. Power to be furnished should be one-half the rated voltage.

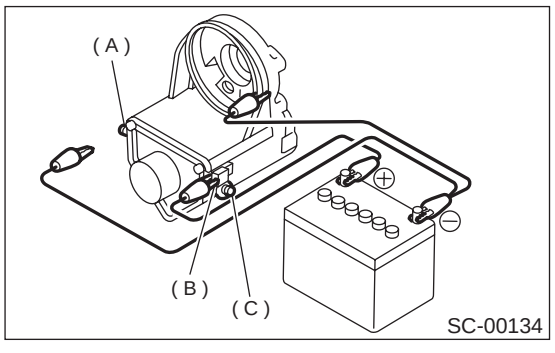
1) Pull-in test
Connect two battery negative leads onto magnetic switch body and terminal C respectively. Then connect battery positive lead onto terminal 50. Pinion should extend when lead connections are made.



SC-00133

(A) Terminal C
(B) Terminal 50
(C) Terminal M

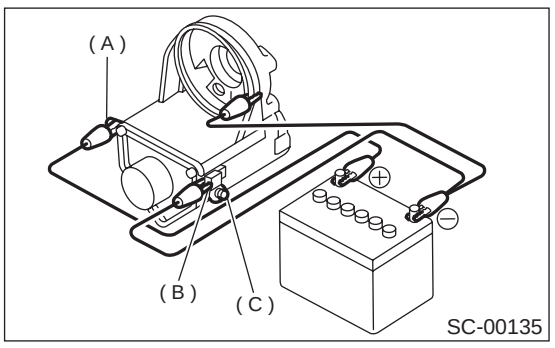
2) Holding-in test
Disconnect lead from terminal C with pinion extended. Pinion should be held in the extended position.



SC-00134

(A) Terminal C
(B) Terminal 50
(C) Terminal M

3) Return test
Connect two battery negative leads onto terminal 50 and onto switch body respectively. Then connect battery positive lead onto terminal C. Next, disconnect lead from terminal 50. Pinion should return immediately.

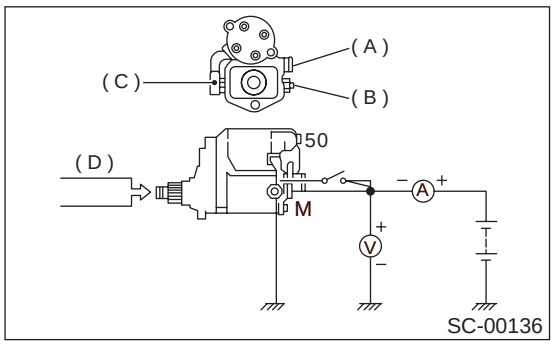


(A) Terminal C
(B) Terminal 50
(C) Terminal M

7. PERFORMANCE TEST

The starter is required to produce a large torque and high rotating speed, but these starter characteristics vary with the capacity of the battery. It is therefore important to use a battery with the specified capacity whenever testing the starter.
The starter should be checked for the following three items:
• No-load test
Measure the maximum rotating speed and current under a no-load state.
• Load test
Measure the magnitude of current needed to generate the specified torque and rotating speed.
• Stall test
Measure the torque and current when the armature is locked.
1) No-load test
Under no-load state, measure its rotating speed and current, using the specified battery. Measured values must meet the following standards:

No-load test (Standard):
Voltage/Current
11 V/90 A, or more
Rotating speed
228000-7141
2900 rpm, or more



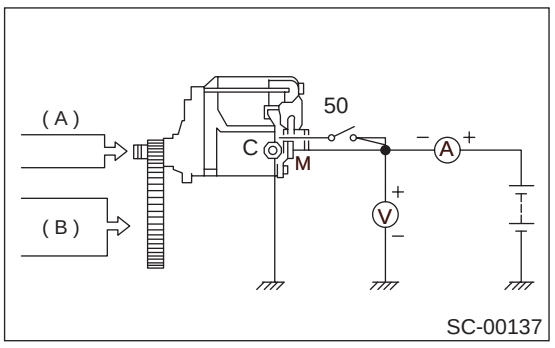
(A) Terminal 50
(B) Terminal M
(C) Terminal C
(D) Tachometer

2) Load test (For reference)
Perform this test to check maximum output of starter. Use test bench which is able to apply load (brake) to starter. Measure torque value and rotating speed under the specified voltage and current conditions while controlling braking force applied to starter.

CAUTION:
Change engagement position of overrunning clutch and make sure it is not slipping.

Load test (Standard):

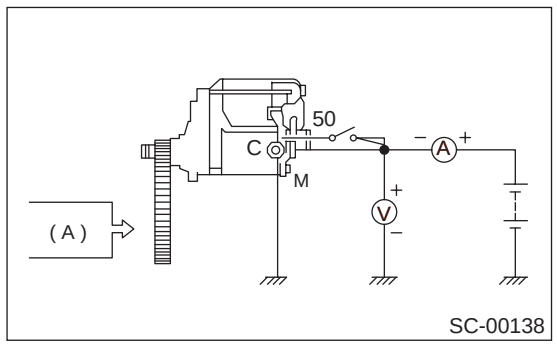
228000-7141
Voltage/Load
8 V/13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
Current/Speed
370 A, or less/880 rpm, or more



(A) Tachometer
(B) Torque gauge

3) Stall test
Using the same test equipment used for load test, apply brake to lock starter armature. Then measure voltage, current, and torque values.
Measured values must meet the following standard.
Stall test (Standard):

228000-7141
Voltage/Current
5 V/1,050 A, or less
Torque
27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more.



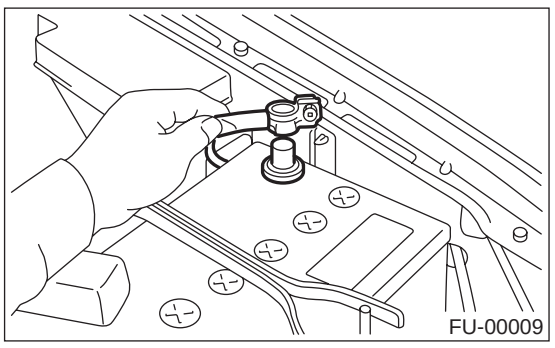
(A) Torque gauge

NOTE:
Low rotating speed or excessive current during no-load test may be attributable to high rotating resistance of starter due to improper assembling.
Small current and no torque during stall test may be attributable to excessive contact resistance between brush and commutator; whereas, normal current and insufficient torque may be attributable to shorted commutator or poor insulation.
Starter can be considered normal if it passes no-load and stall tests; therefore, load test may be omitted.

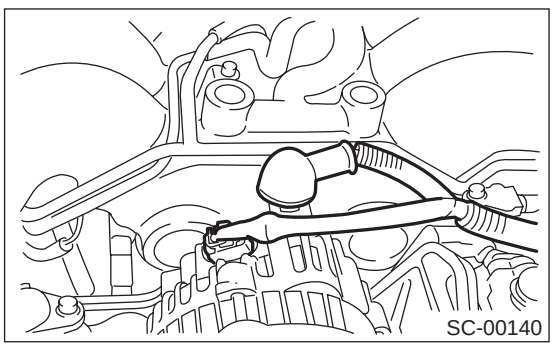
3. Generator

A: REMOVAL

1) Disconnect battery ground cable.

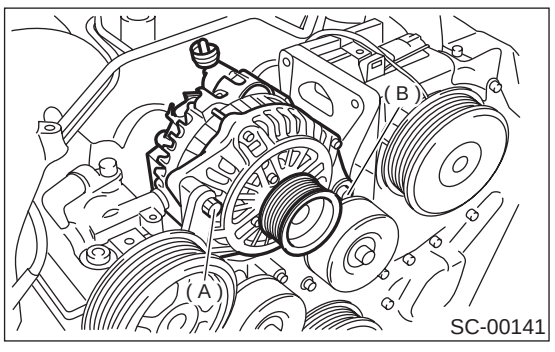


2) Disconnect connector and terminal from generator.



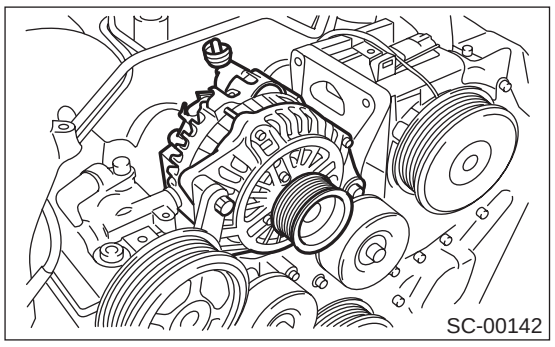
3) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

4) Remove bolt (A), and loosen bolt (B). Then, remove generator from bracket.



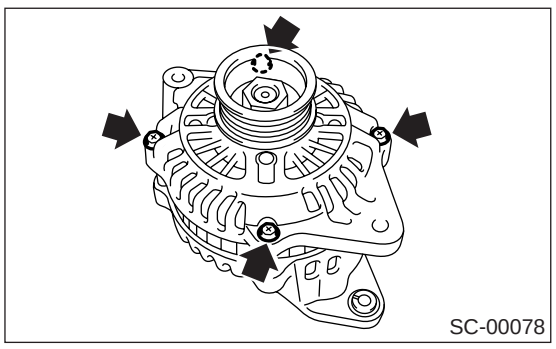
B: INSTALLATION

Install in the reverse order of removal.

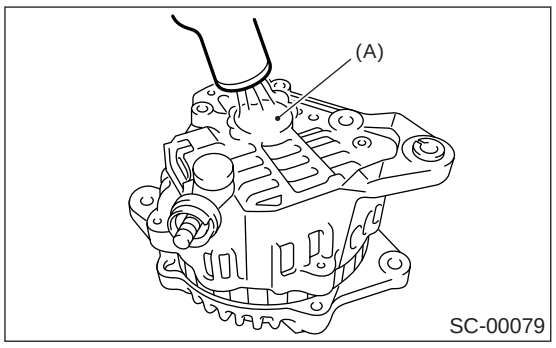


C: DISASSEMBLY

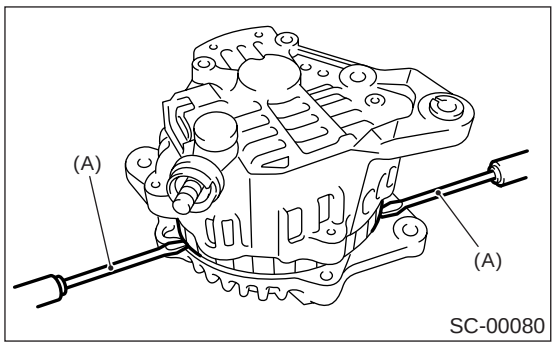
1) Remove the four through-bolts.



2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

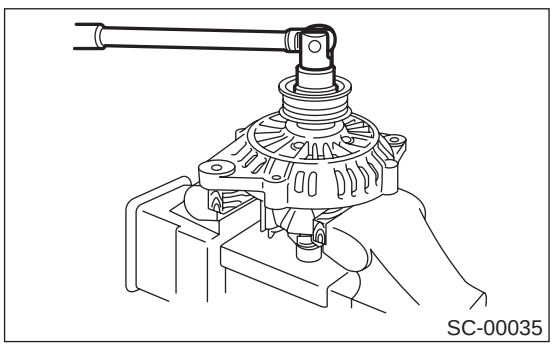


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

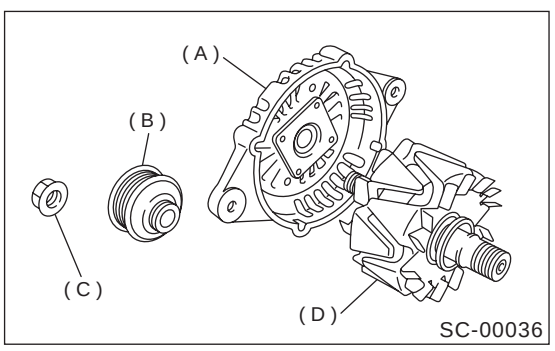


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.


SC-00035

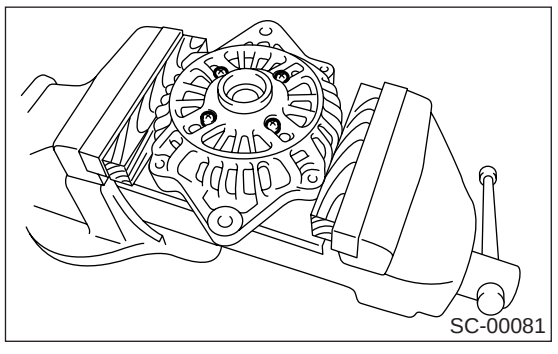
CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.



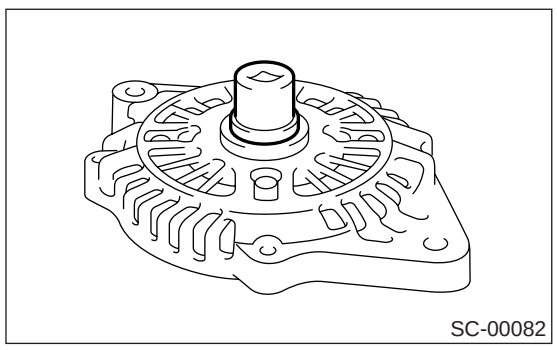
SC-00036

(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

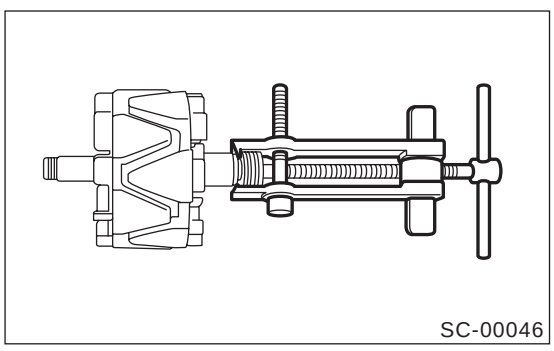

SC-00081

(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.


SC-00082

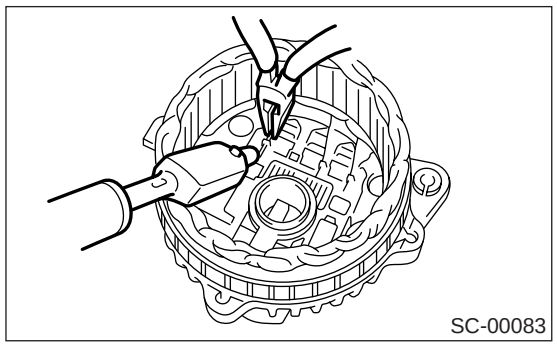
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

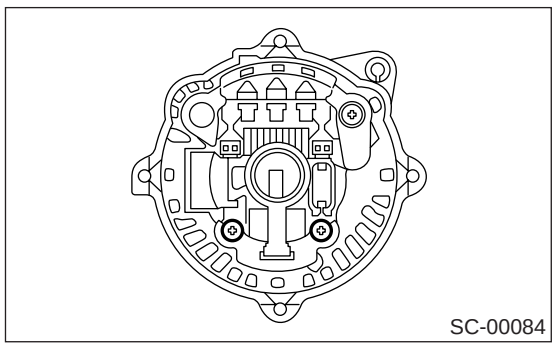

SC-00046

7) Unsolder connection between rectifier and stator coil to remove the stator coil.

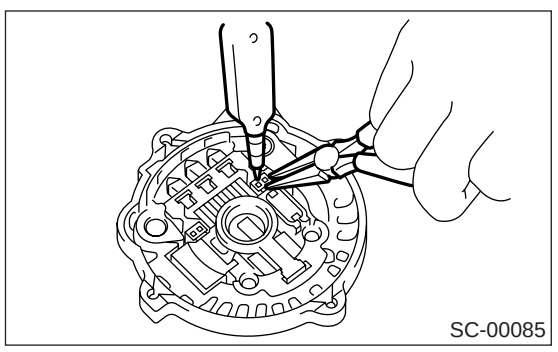
CAUTION:
Do not allow the 180 — 270 W solding bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.


SC-00083

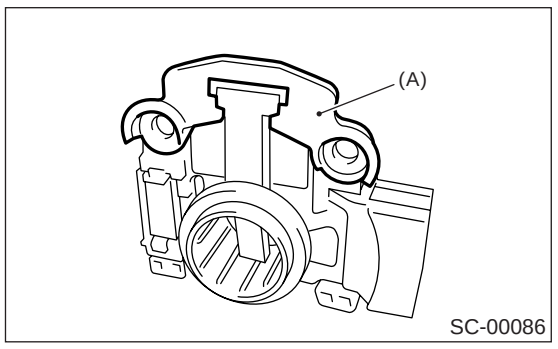
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

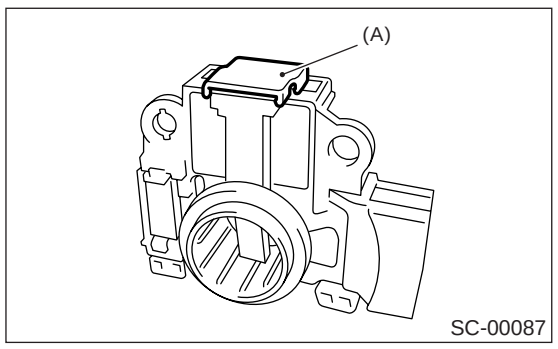
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

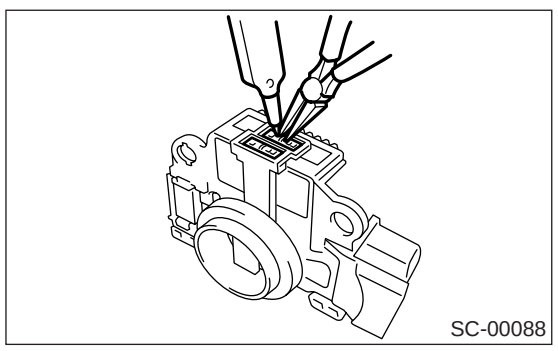
(2) Remove the cover B.



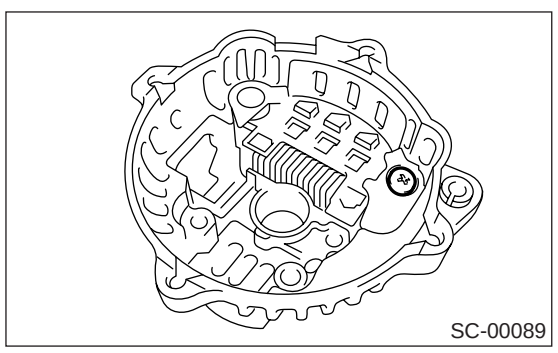
SC-00087

(A) Cover B

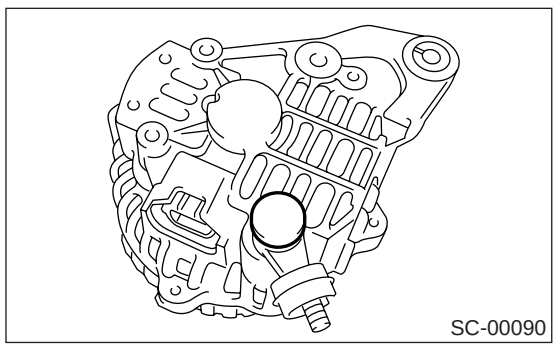
(3) Separate the brush from connection to remove.


SC-00088

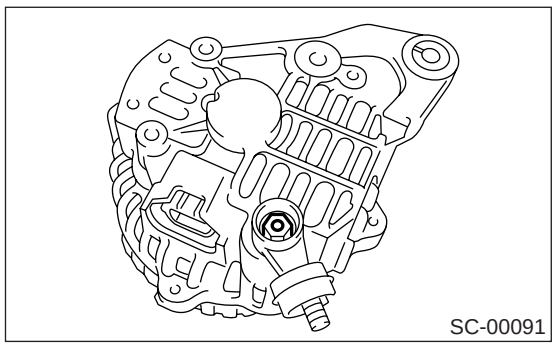
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.


SC-00089

(2) Remove the cover of terminal B.


SC-00090

(3) Remove the nut of terminal B, and then remove the rectifier.


SC-00091

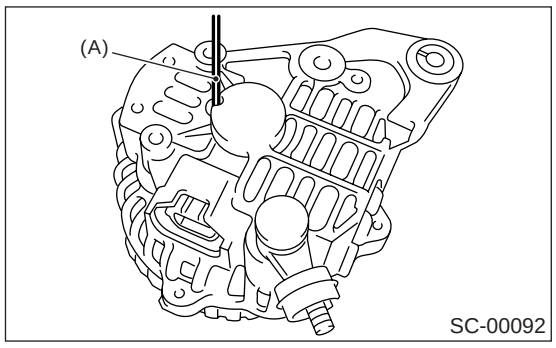
D: ASSEMBLY

To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



SC-00092

(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing.
Remove the oil completely if it is found on bearing box.

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

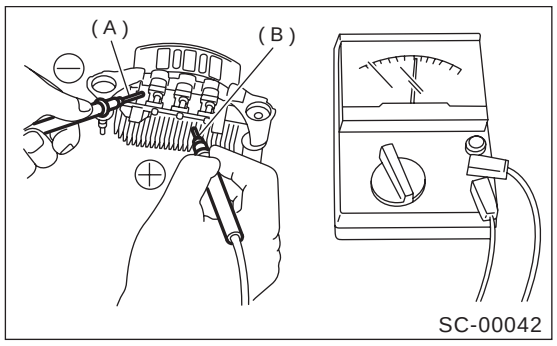
E: INSPECTION

1. DIODE

CAUTION:
Never use a mega 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 positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.

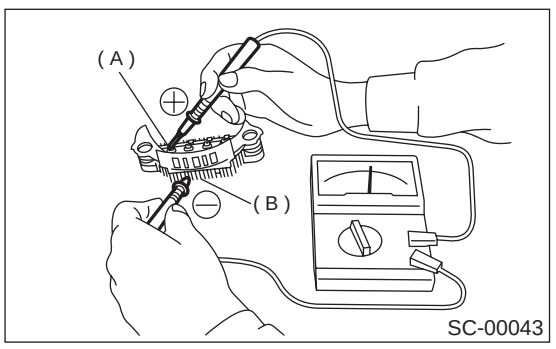


SC-00042

(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 resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



SC-00043

(A) Diode lead
(B) Heat sink (Negative side)

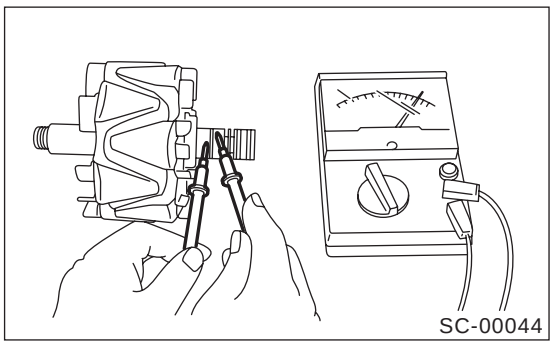
2. ROTOR

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 rotor assembly.

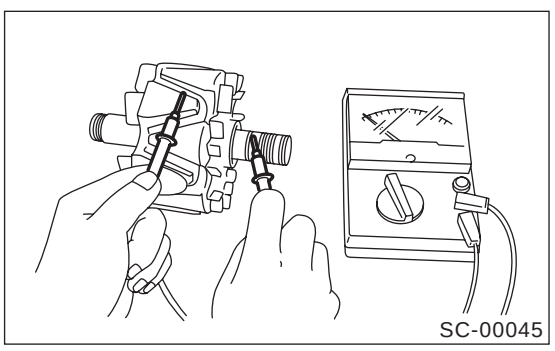
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within specification, replace the rotor assembly.

Specified resistance:
Approx. 2.0 — 2.4 Ω



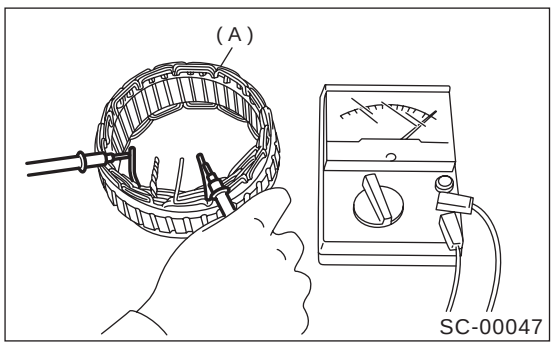
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

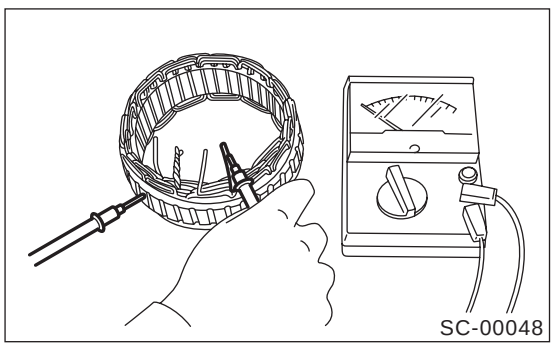
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

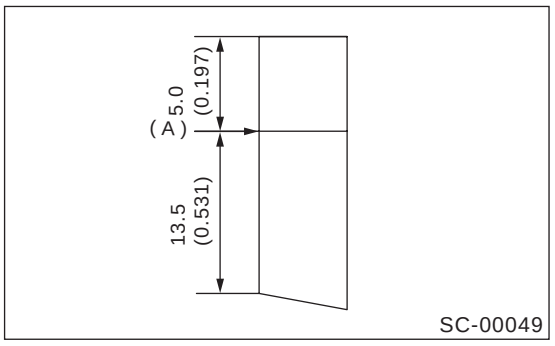
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



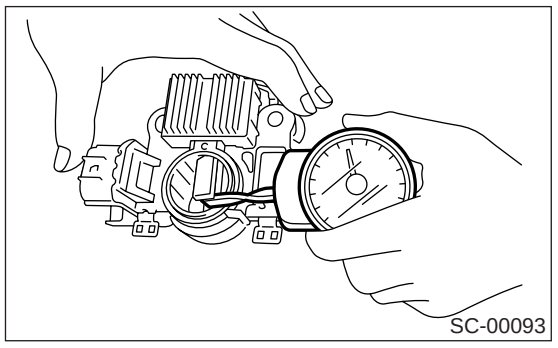
4. BRUSH

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 brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



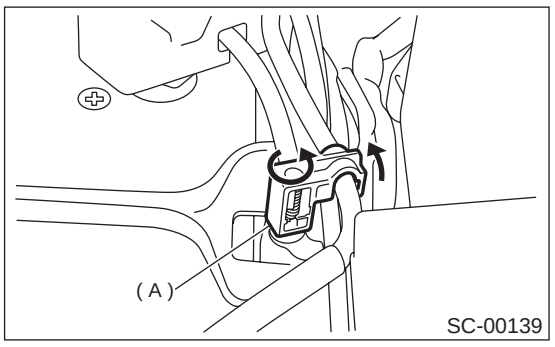
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

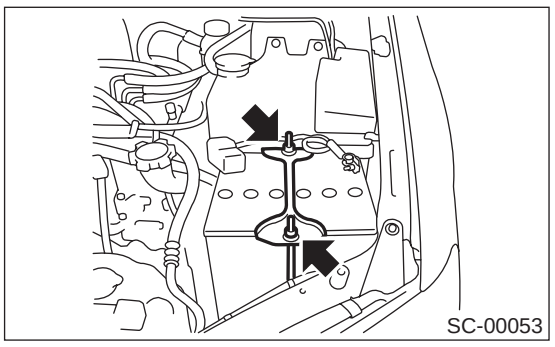
4. Battery

A: REMOVAL

1) Remove battery cable holder (A) from battery rod.



2) Disconnect the positive (+) cable after disconnecting the negative (–) cable of battery.
3) Remove flange nuts from battery rods and take off battery holder.



4) Remove 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 battery cable terminals and apply grease to prevent corrosion.
• Connect the positive (+) cable of battery and then the negative (–) cable 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 gases. 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:

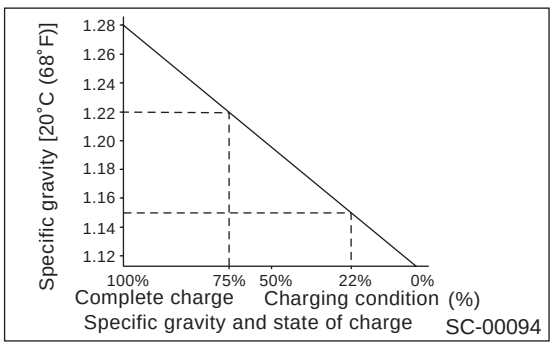
Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

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:

$$S_{20} = St + 0.0007 \times (t - 20)$$

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)]



Specific gravity and state of charge SC-00094

2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

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 battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. 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 3. NORMAL CHARGING.
• Never use more than 10 amperes when charging the battery because that will shorten battery life.

BATTERY

MEMO:

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step		Value	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(H6DO)-4, CHECK, Check List for Interview.> 2) Start the engine. Does the engine start?	Engine starts.	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H6DO)-75, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** Does CHECK ENGINE malfunction indicator lamp illuminate?	Indicator lamp illuminates.	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H6DO)-380, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read 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?	DTC indicated.	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(H6DO)-62, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H6DO)-50, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H6DO)-59, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H6DO)-51, Inspection Mode.> Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	DTC indicated.	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to AT-30, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to AT-31, Differential Gear Oil.>
3) ATF leak check <Ref. to AT-30, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to AT-31, Differential Gear Oil.>
5) Stall test <Ref. to AT-33, Stall Test.>
6) Line pressure test <Ref. to AT-36, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to AT-38, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to AT-35, Time Lag Test.>
9) Road test <Ref. to AT-32, Road Test.>
10) Shift characteristics <Ref. to AT-38, 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	°F (°C)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Cooling fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ VDC 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 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 alternator, 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.

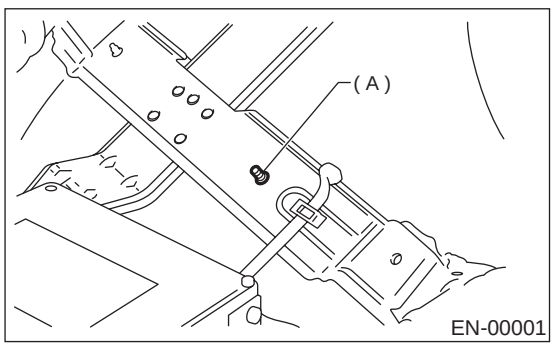
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

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

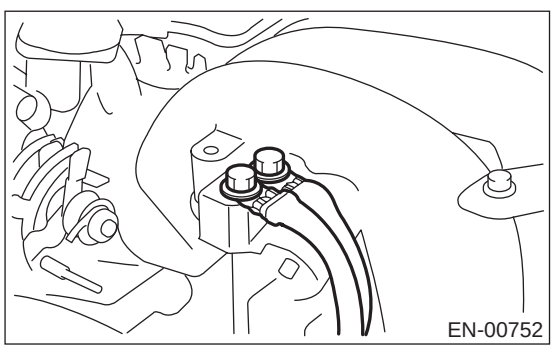
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

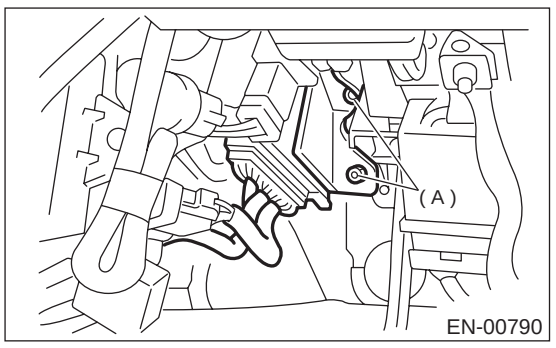


(A) Stud bolt

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.



(A) Stud bolt

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.

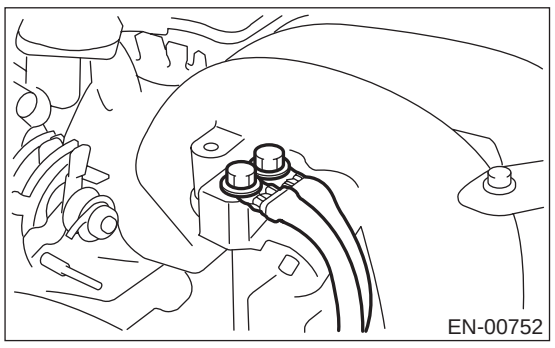
Standard voltage: 12 V

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.

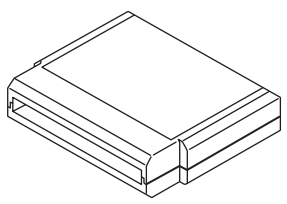
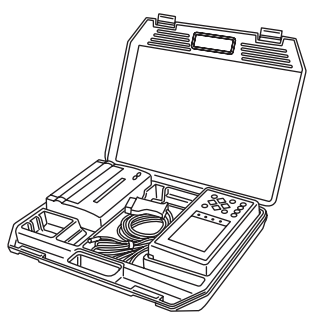
2. ENGINE AND EMISSION CONTROL SYSTEM

• 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

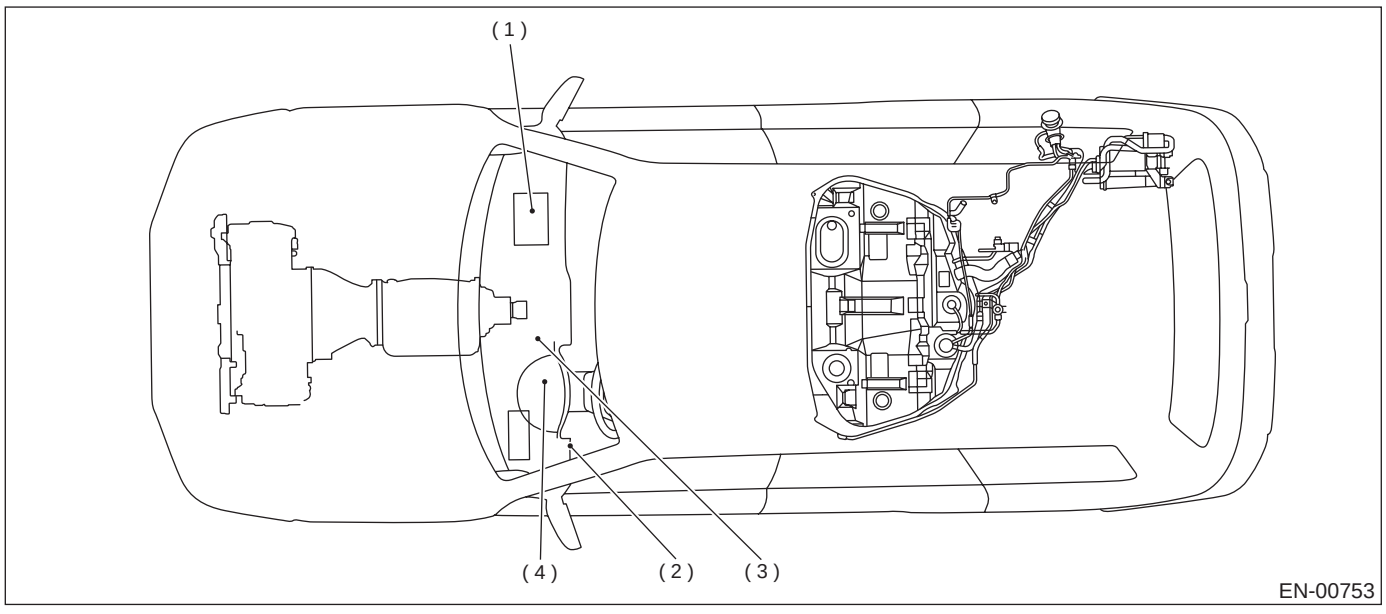
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Components Location

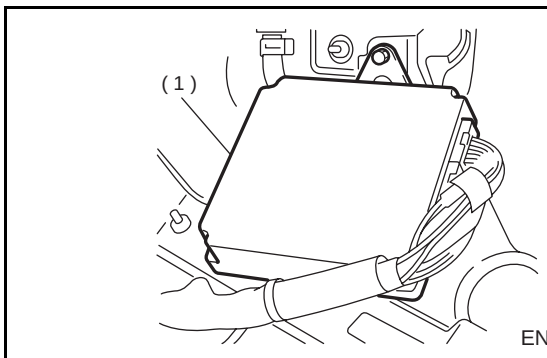
A: LOCATION

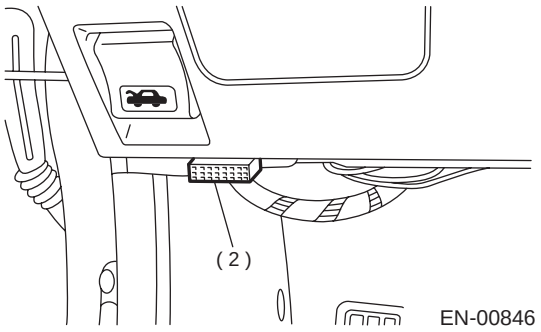
1. ENGINE

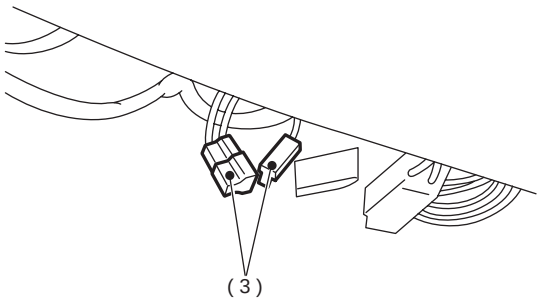
• MODULE

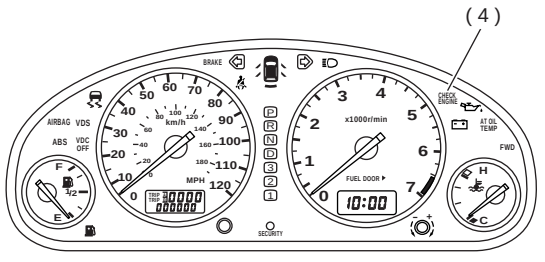


(1) Engine control module (ECM)
(2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool)
(3) Test mode connector
(4) CHECK ENGINE malfunction indicator lamp (MIL)



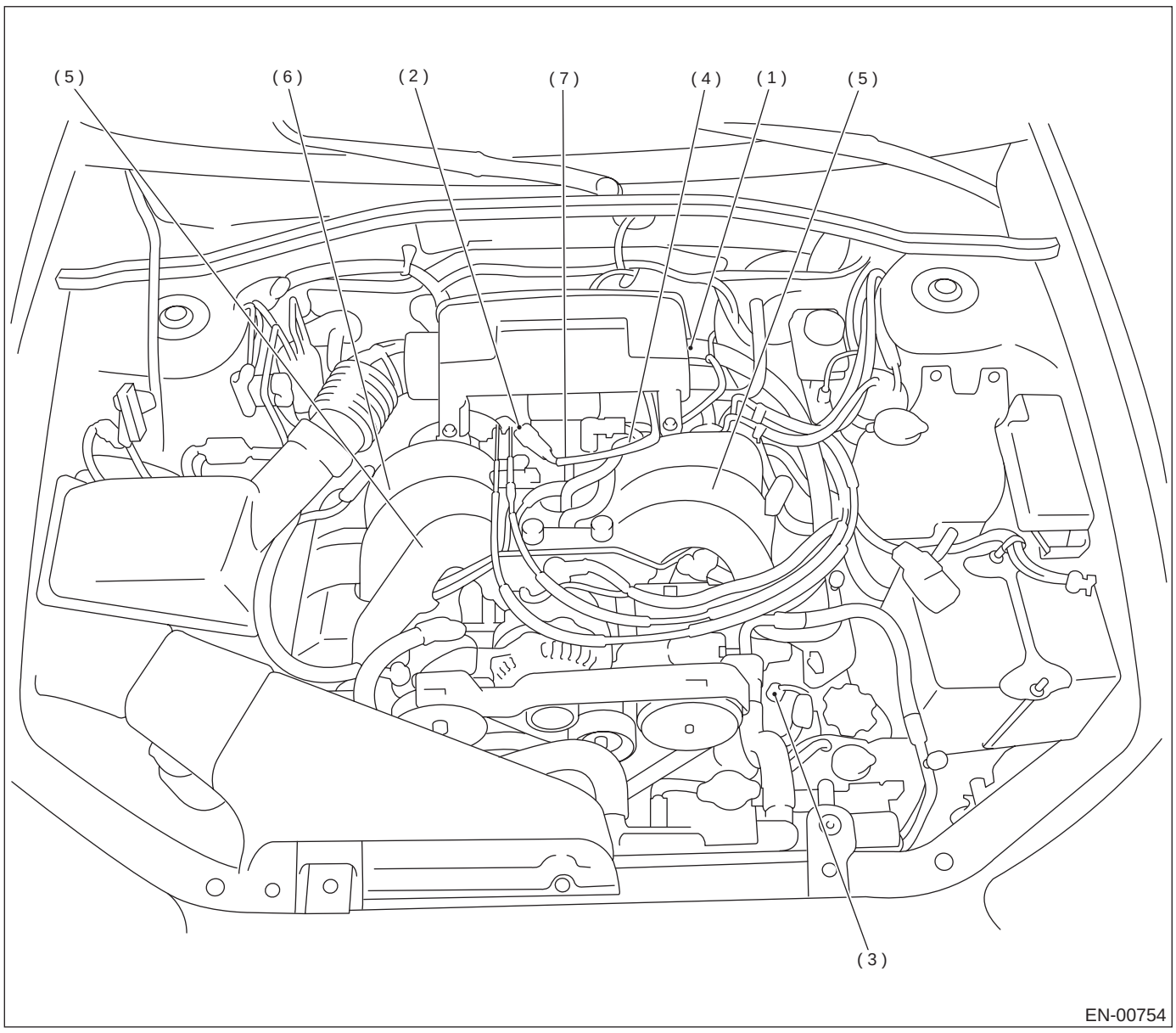




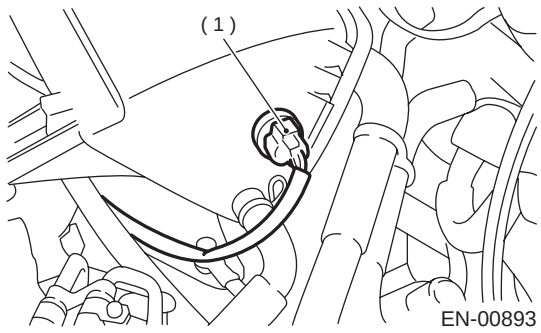


MEMO:

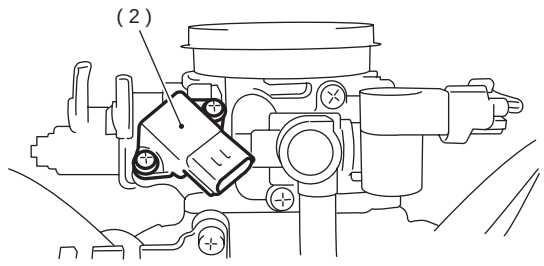
• SENSOR



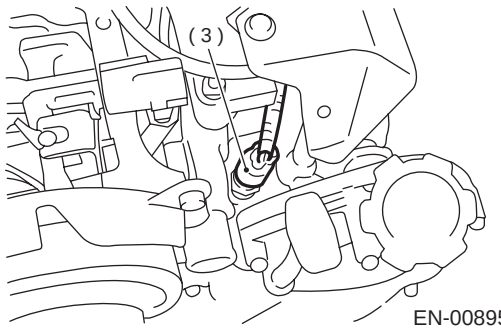
(1) Intake air temperature sensor
(2) Intake manifold pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor



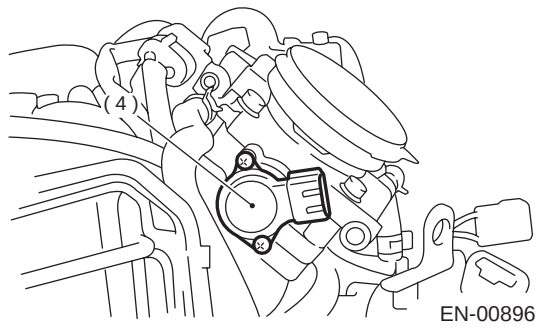
EN-00893



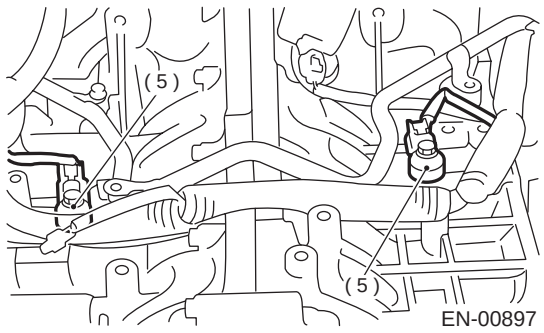
EN-00894



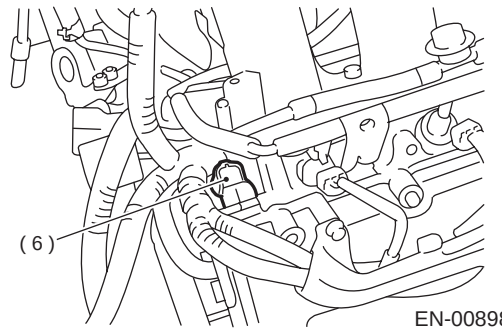
EN-00895



EN-00896



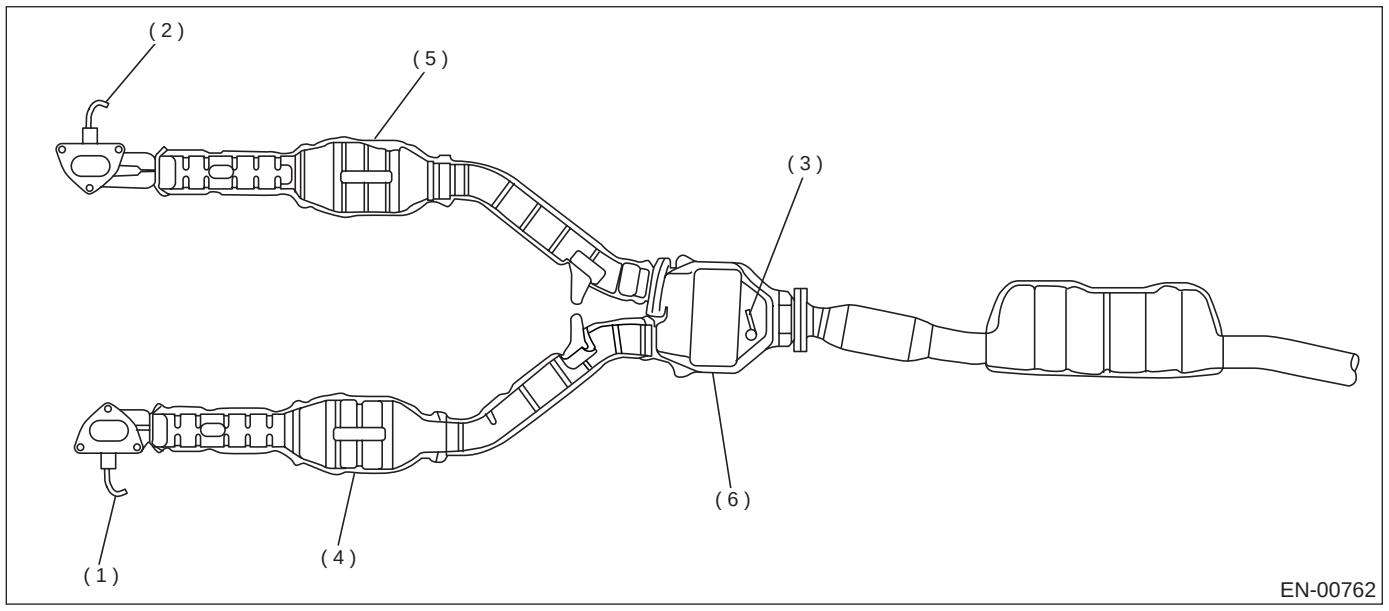
EN-00897



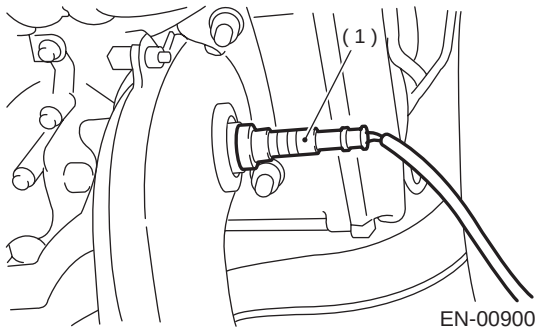
EN-00898

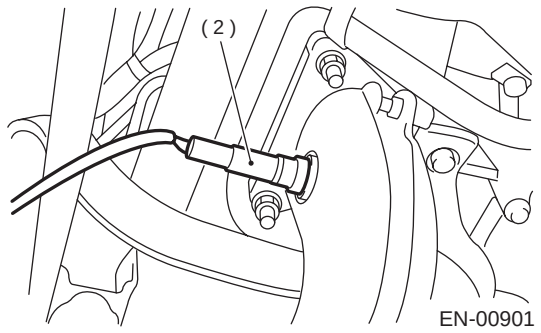
EN-00899

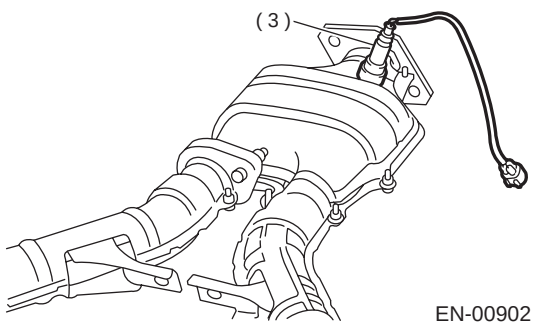
ELECTRICAL COMPONENTS LOCATION

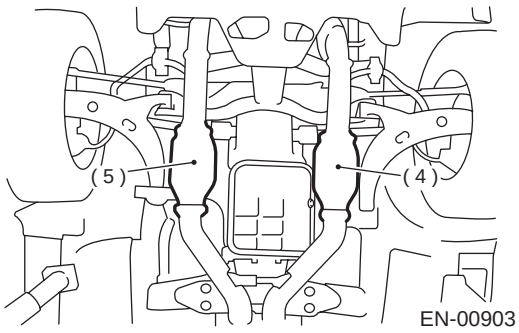


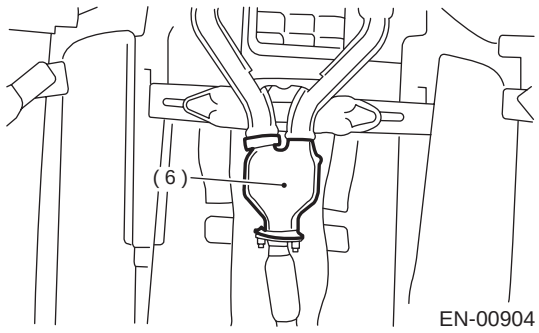
(1) Front oxygen (A/F) sensor (LH)
(2) Front oxygen (A/F) sensor (RH)
(3) Rear oxygen sensor
(4) Front catalytic converter (LH)
(5) Front catalytic converter (RH)
(6) Rear catalytic converter

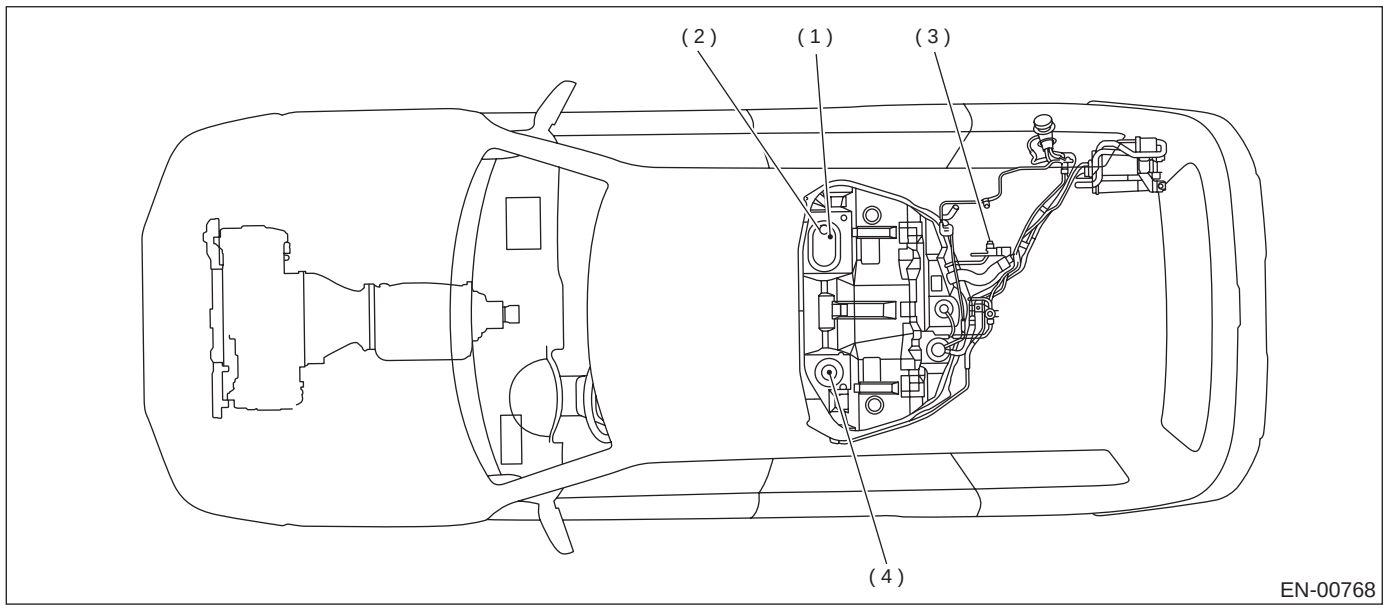




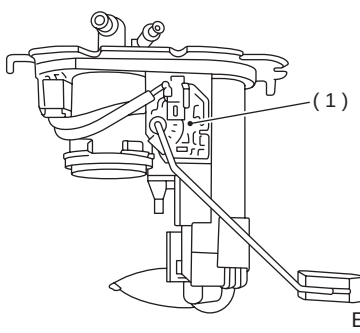


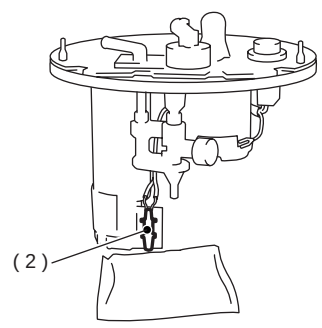


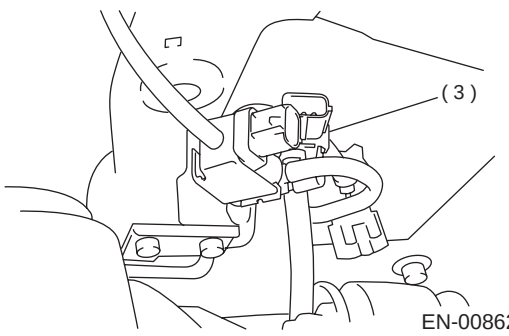


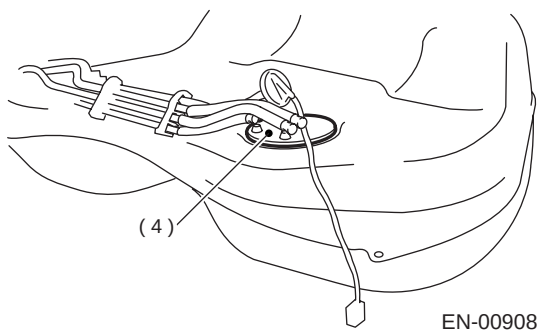


(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor

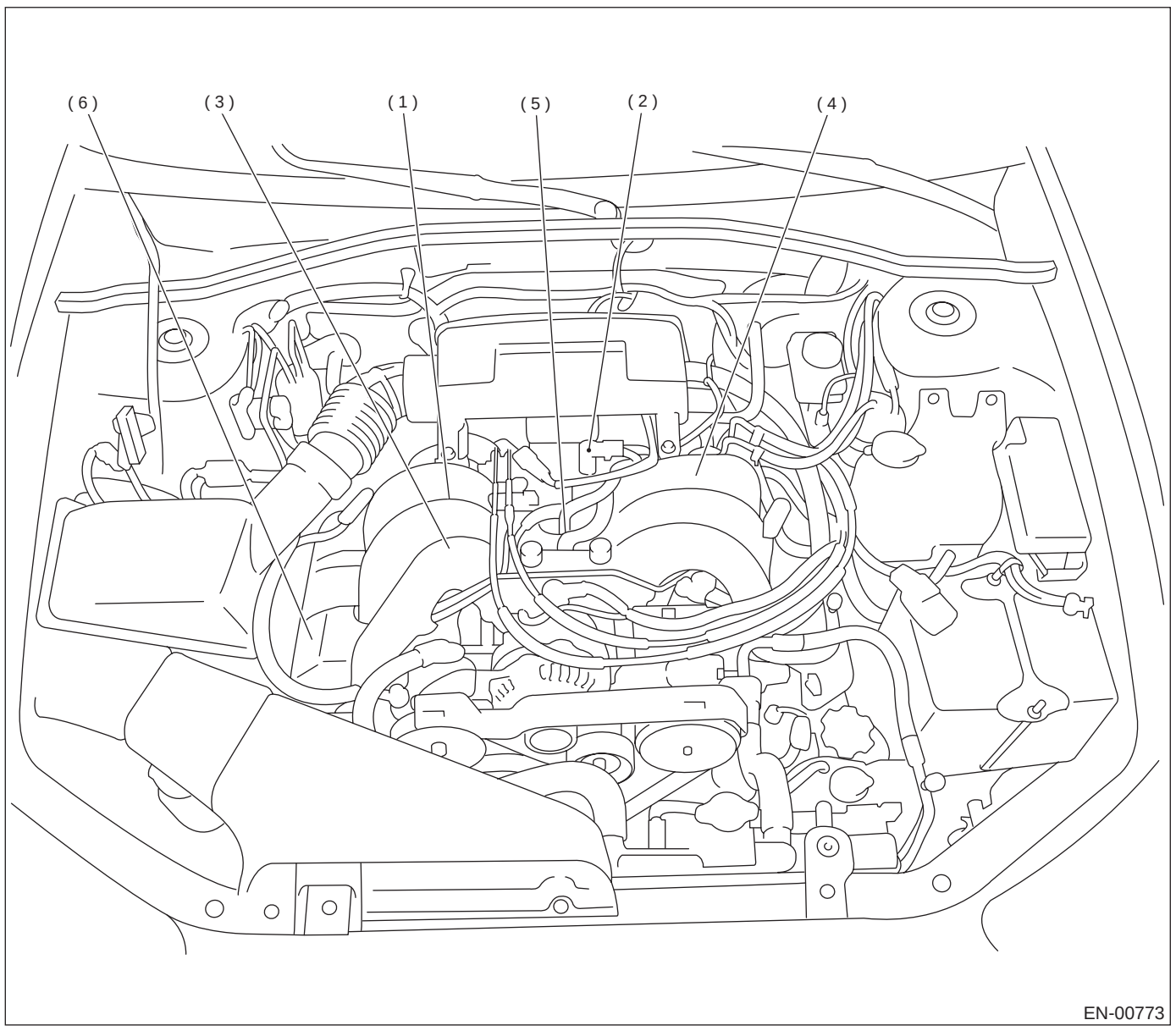




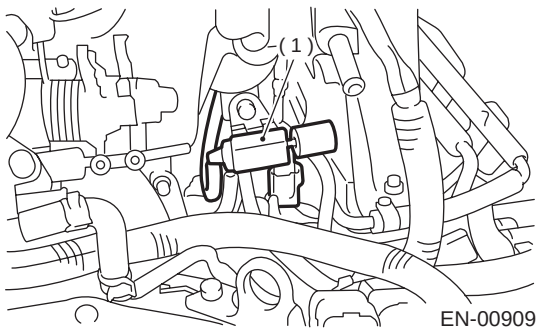




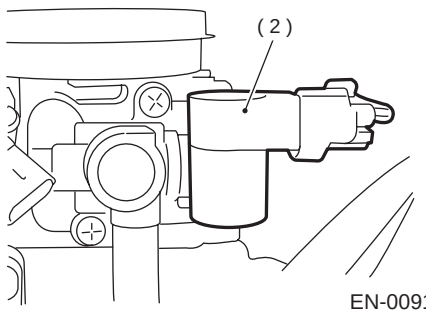
• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



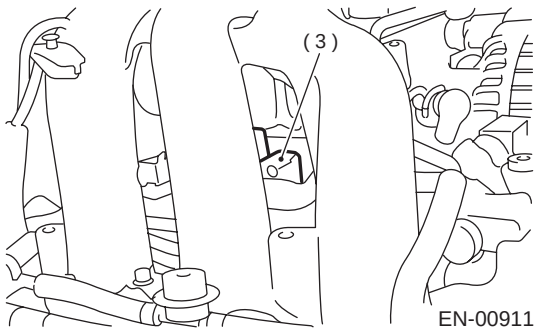
(1) Induction control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) EGR solenoid valve
(5) Induction control valve
(6) Ignition coil & ignitor ASSY



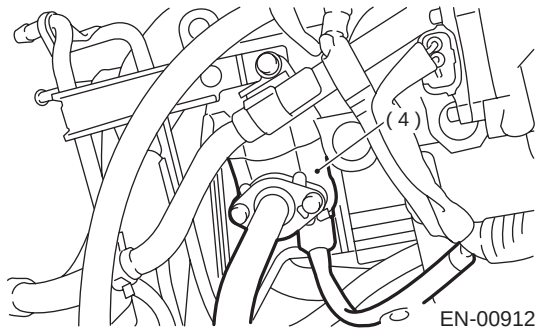
EN-00909



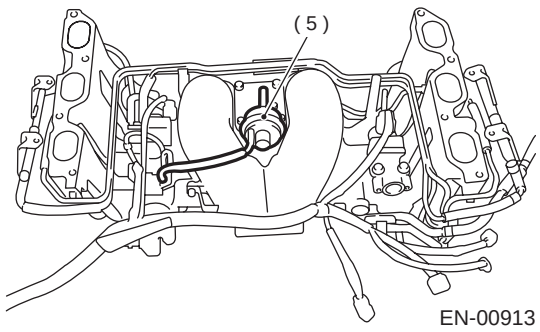
EN-00910



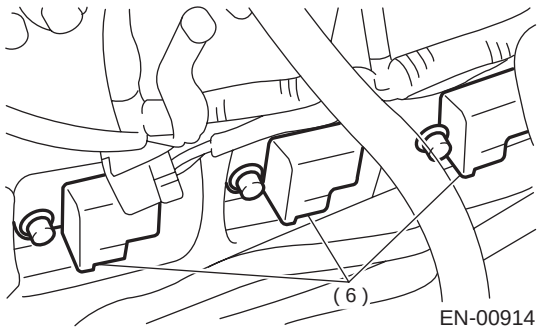
EN-00911



EN-00912

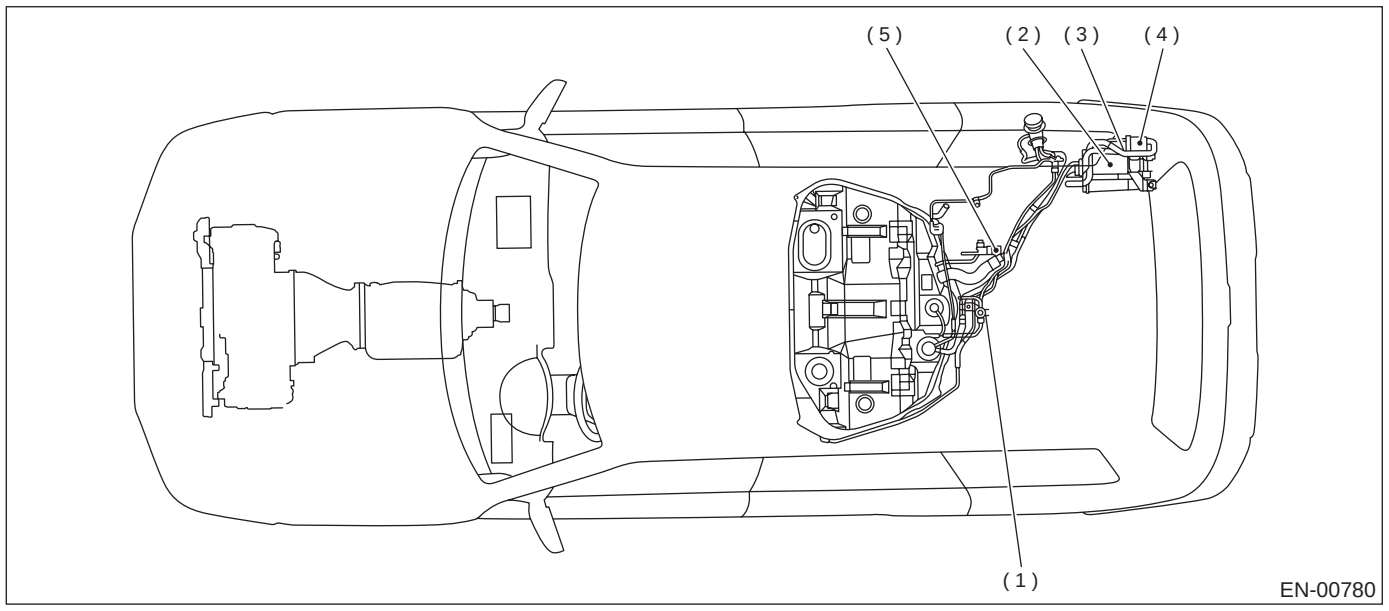


EN-00913

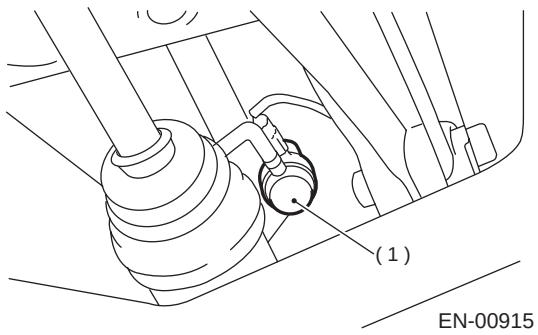


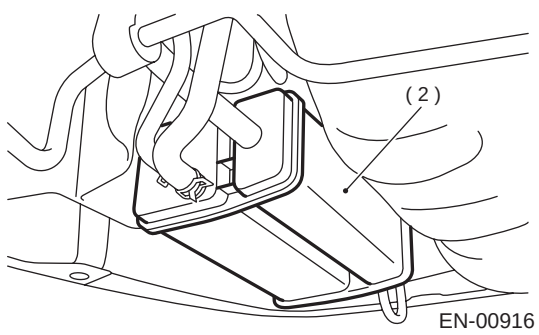
EN-00914

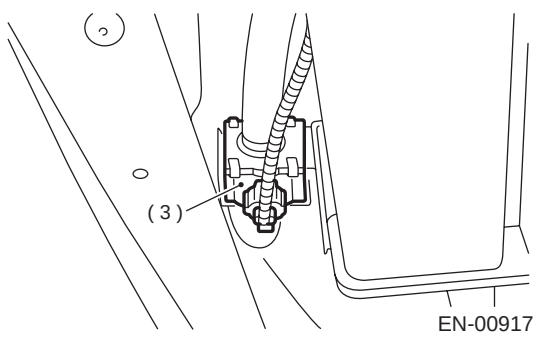
ELECTRICAL COMPONENTS LOCATION

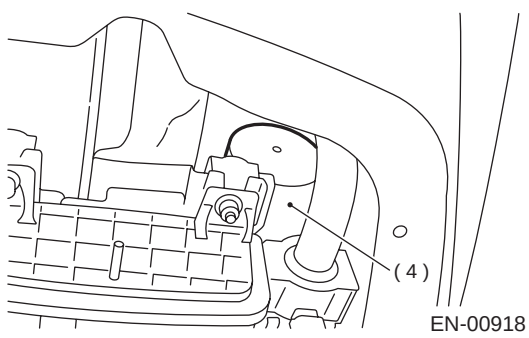


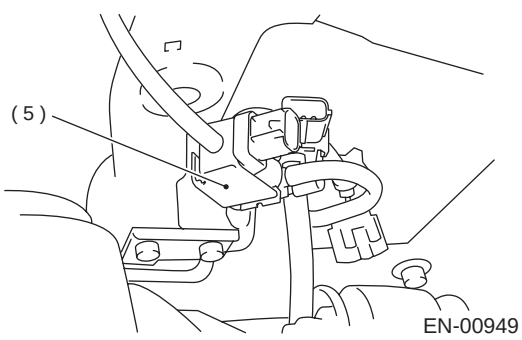
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve





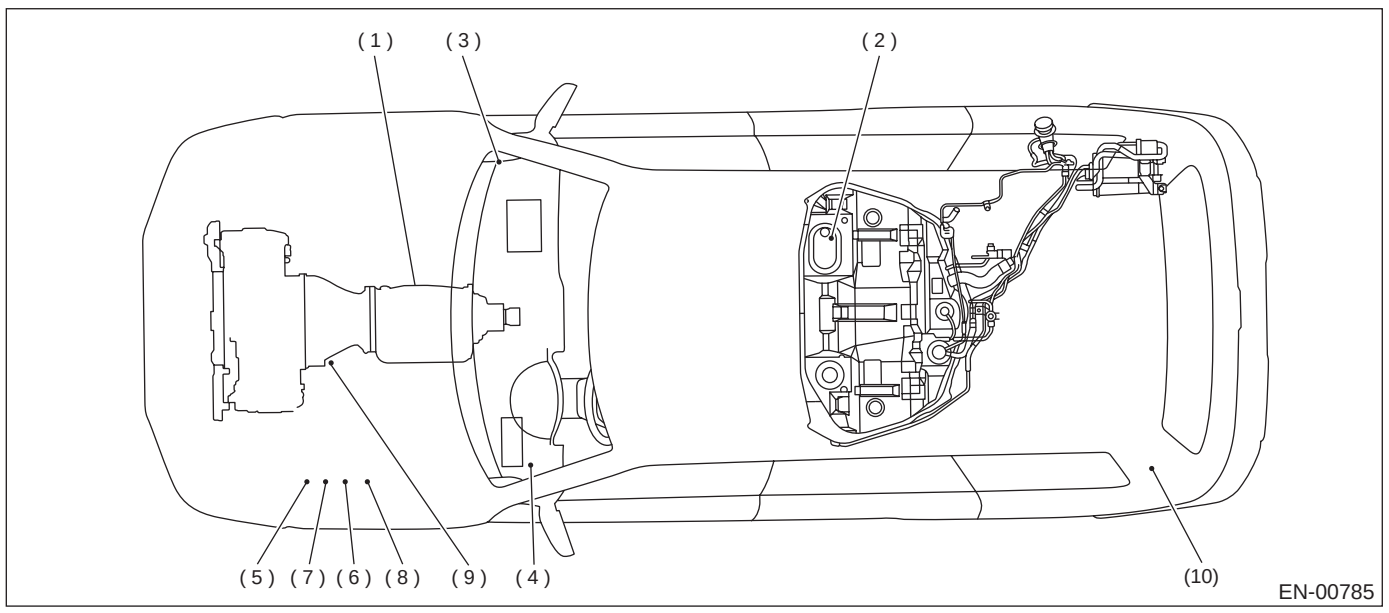




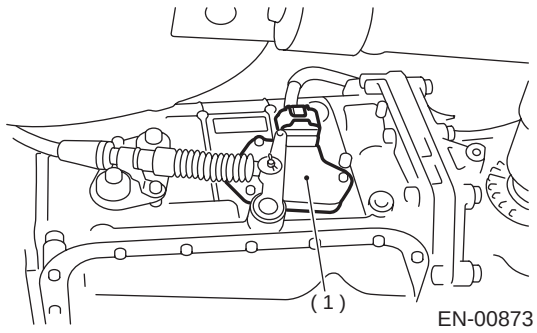


MEMO:

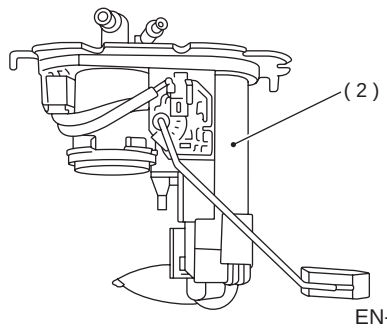
ELECTRICAL COMPONENTS LOCATION



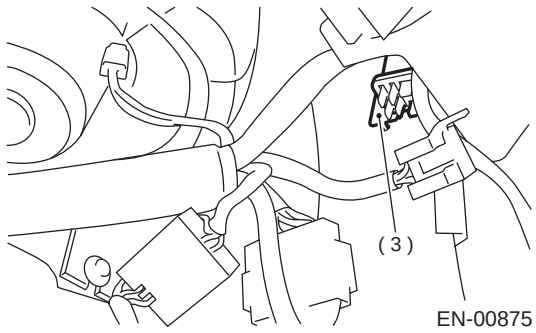
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay-1
(6) Radiator sub fan relay-1
(7) Radiator main fan relay-2
(8) Radiator sub fan relay-2
(9) Starter
(10) Fuel pump controller



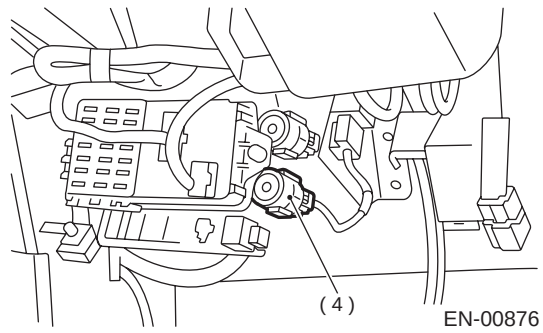
EN-00873



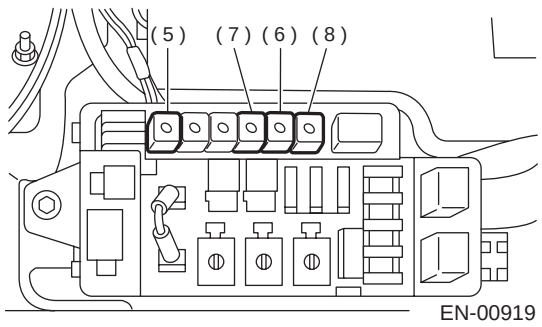
EN-00874



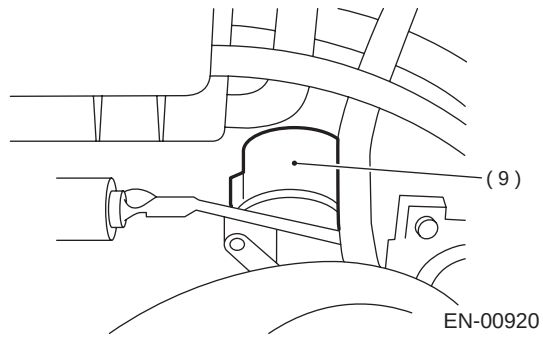
EN-00875



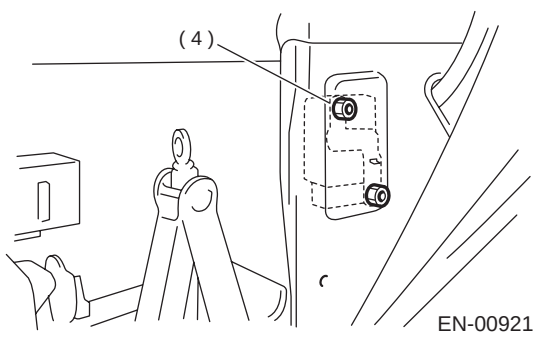
EN-00876



EN-00919



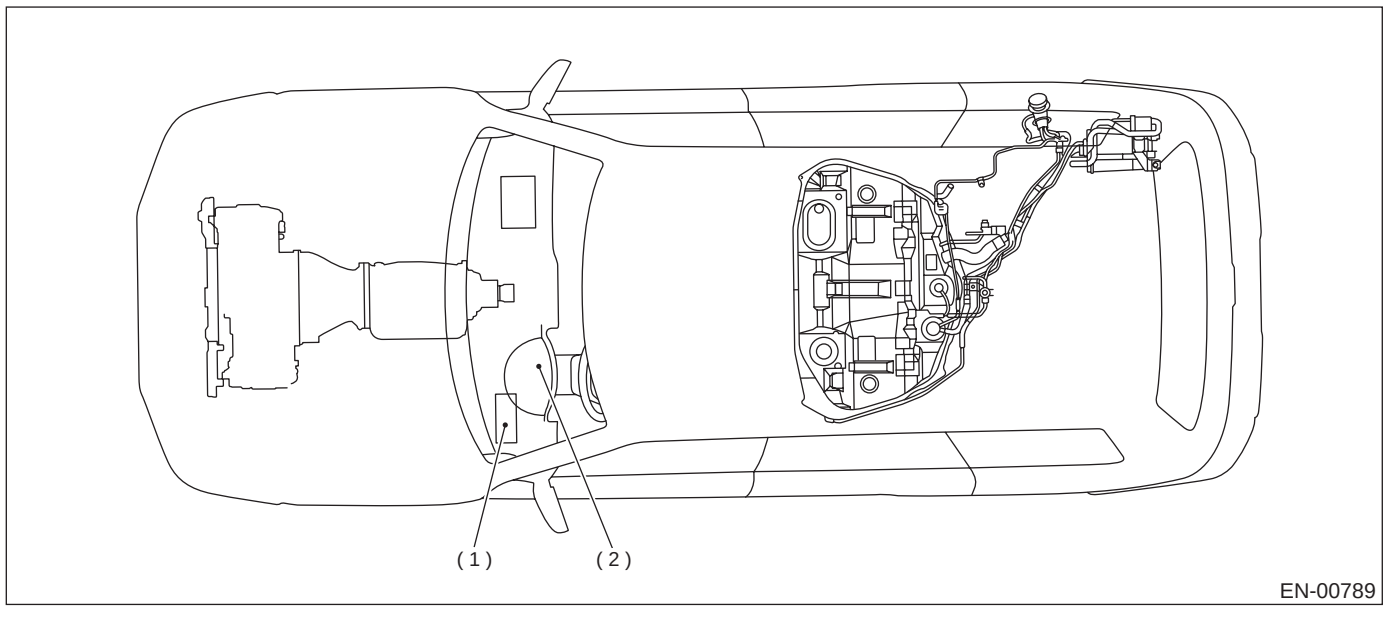
EN-00920



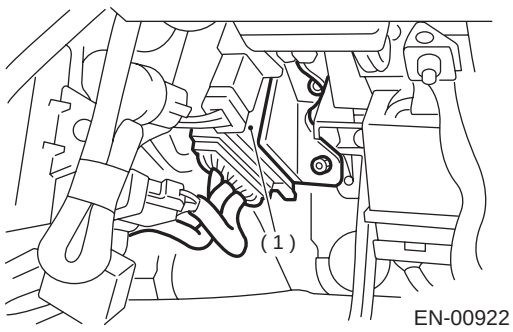
EN-00921

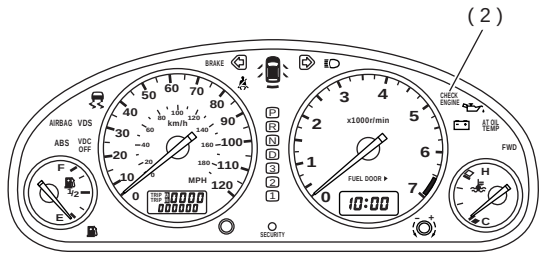
2. TRANSMISSION

• MODULE

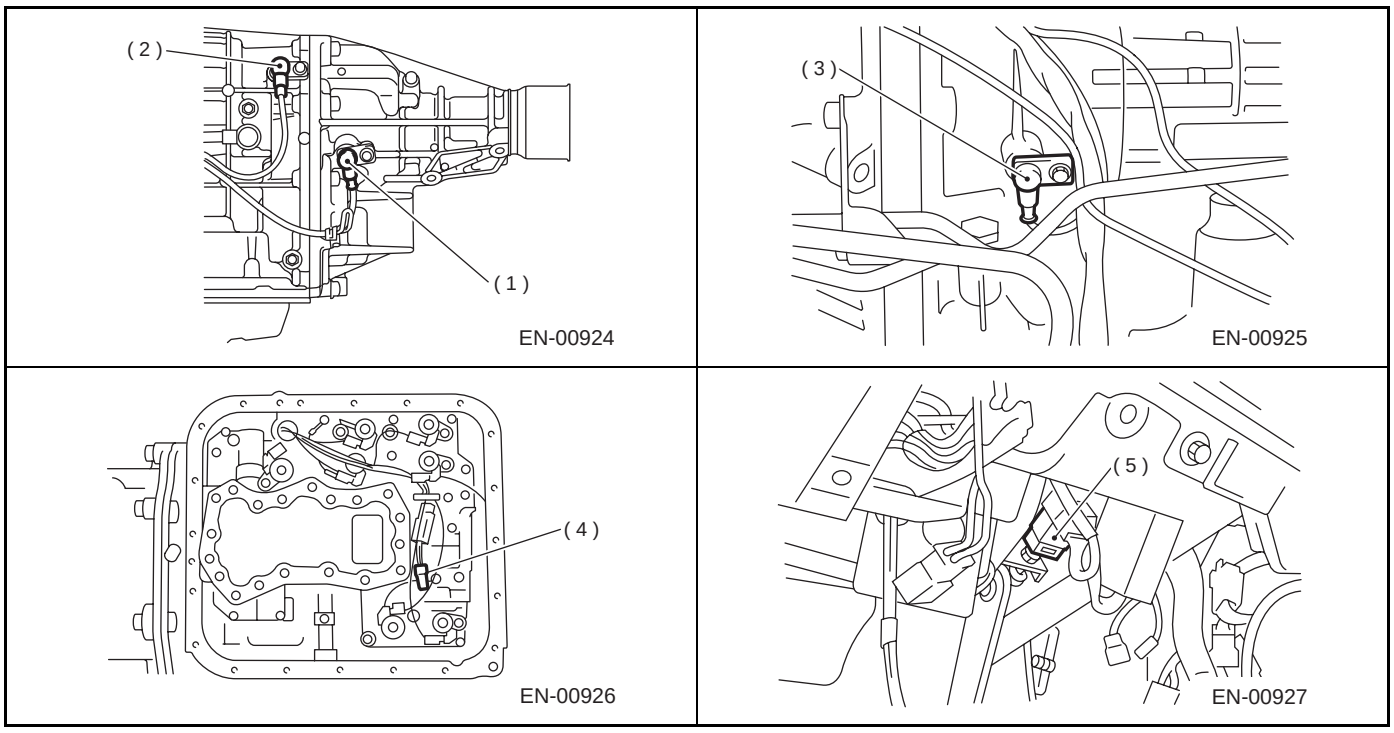


(1) Transmission Control Module (TCM)
(2) AT diagnostic indicator light



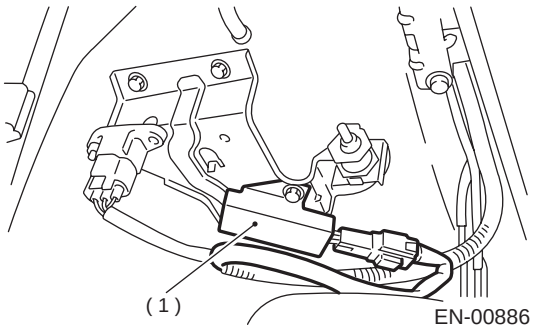


• SENSOR

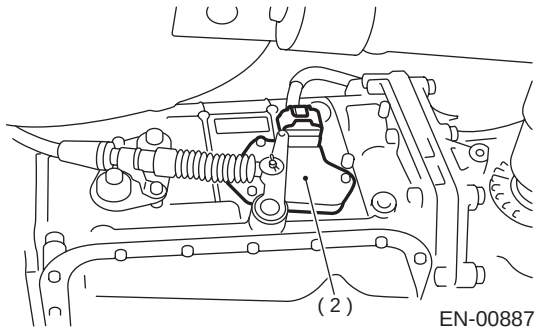


(1) Rear vehicle speed sensor
(2) Front vehicle speed sensor
(3) Torque converter turbine speed sensor
(4) ATF temperature sensor
(5) Brake light switch

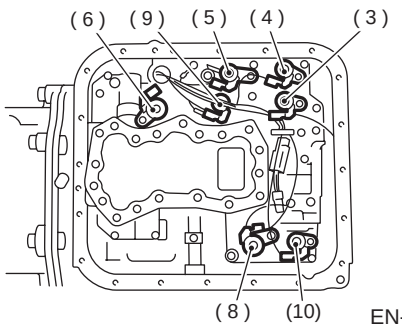
• SOLENOID VALVE AND SWITCH



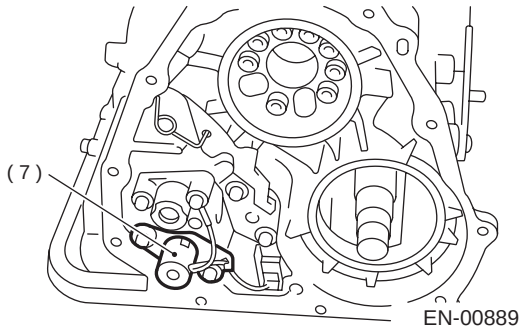
EN-00886



EN-00887



EN-00888



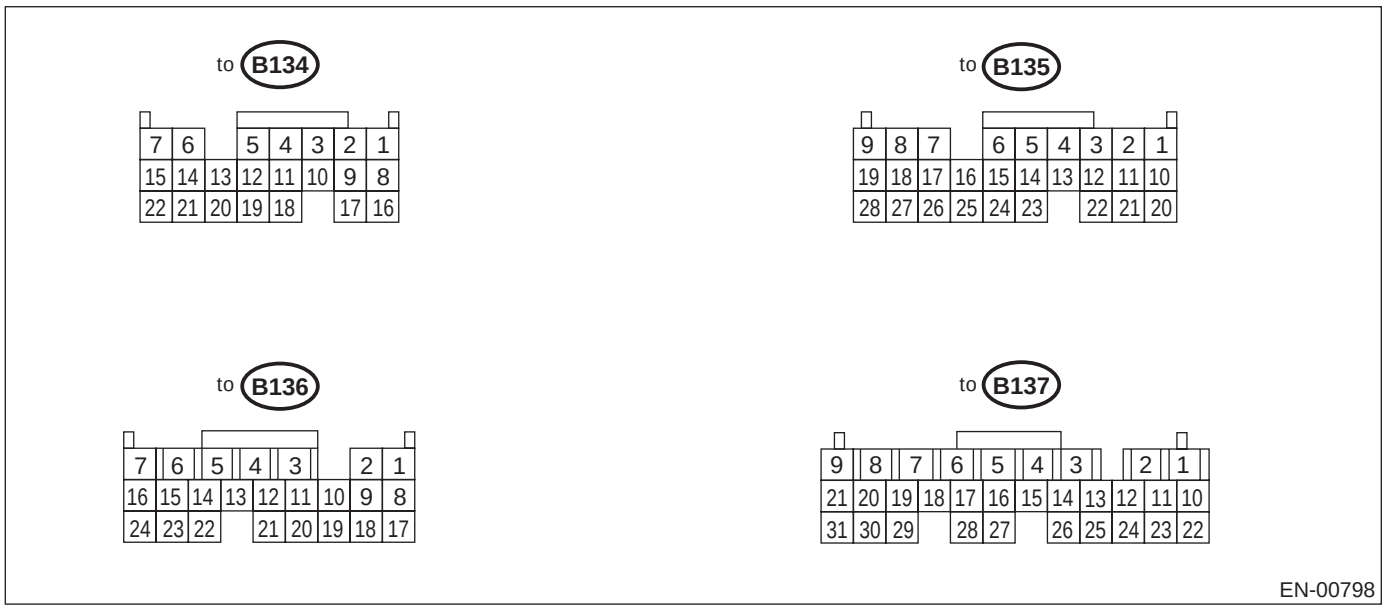
EN-00889

(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

MEMO:

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	2	0	—	Sensor output waveform <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (–)		B135	11	0	0	—
	Shield		B135	21	0	0	—
Camshaft position sensor	Signal (+)		B135	1	0	—	Sensor output waveform <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (–)		B135	10	0	0	—
Throttle position sensor	Signal		B135	7	Fully closed: 0.3 — 0.8 Fully open: 4.2 — 4.7	0.3 — 0.8	—
	Power supply		B135	9	5	5	—
	GND (sensor)		B135	19	0	0	—
Rear oxygen sensor	Signal		B135	17	0 — 0.5	0 — 0.9	—
	Shield		B135	26	0	0	—
Front oxygen (A/F) sensor heater	Signal	LH1	B137	7	—	—	—
		LH2	B137	6	—	—	—
		RH1	B137	5	—	—	—
		RH2	B137	4	—	—	—
Rear oxygen sensor heater signal			B136	13	—	—	—
Vehicle speed signal			B134	1	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)	
Engine coolant temperature sensor	Signal		B135	18	—	—	After warm-up the engine.
	GND (sensor)		B134	7	0	0	After warm-up the engine.
				15			
Generator signal			B137	12	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 10 — 13	Waveform
Starter switch			B134	16	0	0	Cranking: 9 — 12
A/C switch			B134	2	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch			B134	5	10 — 13	13 — 14	—
Neutral position switch			B134	8	ON: 0 OFF: 5		Switch is ON when shift is in “N” or “P” position.
Test mode connector			B134	14	5	5	When connected: 0
Knock sensor	Signal	1	B135	4	2.5	2.5	—
		2		13	2.5	2.5	—
	Shield		B135	22	0	0	—
Back-up power supply			B137	10	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply			B137	2	10 — 13	13 — 14	—
				3	10 — 13	13 — 14	—
Sensor power supply			B135	9	5	5	—
Line end check 1			B134	10	0	0	—
Ignition control	#1		B136	24	0	—	Waveform
	#2		B136	23	0	—	Waveform
	#3		B136	22	0	—	Waveform
	#4		B136	21	0	—	Waveform
	#5		B136	20	0	—	Waveform
	#6		B136	19	0	—	Waveform
Fuel injector	#1		B137	1	10 — 13	1 — 14	Waveform
	#2		B136	6	10 — 13	1 — 14	Waveform
	#3		B136	5	10 — 13	1 — 14	Waveform
	#4		B136	4	10 — 13	1 — 14	Waveform
	#5		B136	3	10 — 13	1 — 14	Waveform
	#6		B136	1	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal		B136	10	10 — 13	—	Waveform
Fuel pump controller		Signal	B135	12	—	—	—
			B136	15	—	—	—
A/C relay control			B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control			B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control			B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Radiator fan relay 3 control			B137	24	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Self-shutoff control			B134	6	10 — 13	13 — 14	—
Malfunction indicator lamp			B137	15	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output			B136	9	—	0 — 13	Waveform

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Con-nector No.	Termi-nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Torque control 1 signal		B134	19	5	5	—
Torque control 2 signal		B134	18	5	5	—
Torque control cut signal		B136	14	8	8	—
EGR solenoid valve (A–)		B137	26	10 — 13	13 — 14	—
EGR solenoid valve (B–)		B137	25	10 — 13	13 — 14	—
EGR solenoid valve (A+)		B137	14	10 — 13	13 — 14	—
EGR solenoid valve (B+)		B137	13	10 — 13	13 — 14	—
Induction control solenoid valve		B137	23	0	ON: 0 OFF: 13 — 14	—
Purge control solenoid valve		B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel temperature sensor		B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B135	15	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	GND (sensor)	B134	15	0	0	—
Fuel tank pressure control solenoid valve		B137	22	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel tank sensor control valve		B136	7	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve		B137	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
A/C compressor switch		B134	13	—	—	—
A/C pressure switch		B135	23	OFF: 5	ON: 1, or less OFF: 5	—
AT diagnosis input signal		B135	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
AT load signal		B135	28	4.3 — 4.4	0.9 — 1.4	—
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal RH (+)		B137	29	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal RH (–)		B137	19	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor signal LH (+)		B137	30	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal LH (–)		B137	20	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor shield		B137	18	0	0	—
Pressure sensor		B135	8	3.0 — 4.2	1.0 — 2.6	—
Intake air temperature sensor		B135	27	—	—	—
Power steering switch		B135	24	ON: 0 OFF: 5	ON: 0 OFF: 5	—
SSM/GST communication line		B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)		B134	15	0	0	—

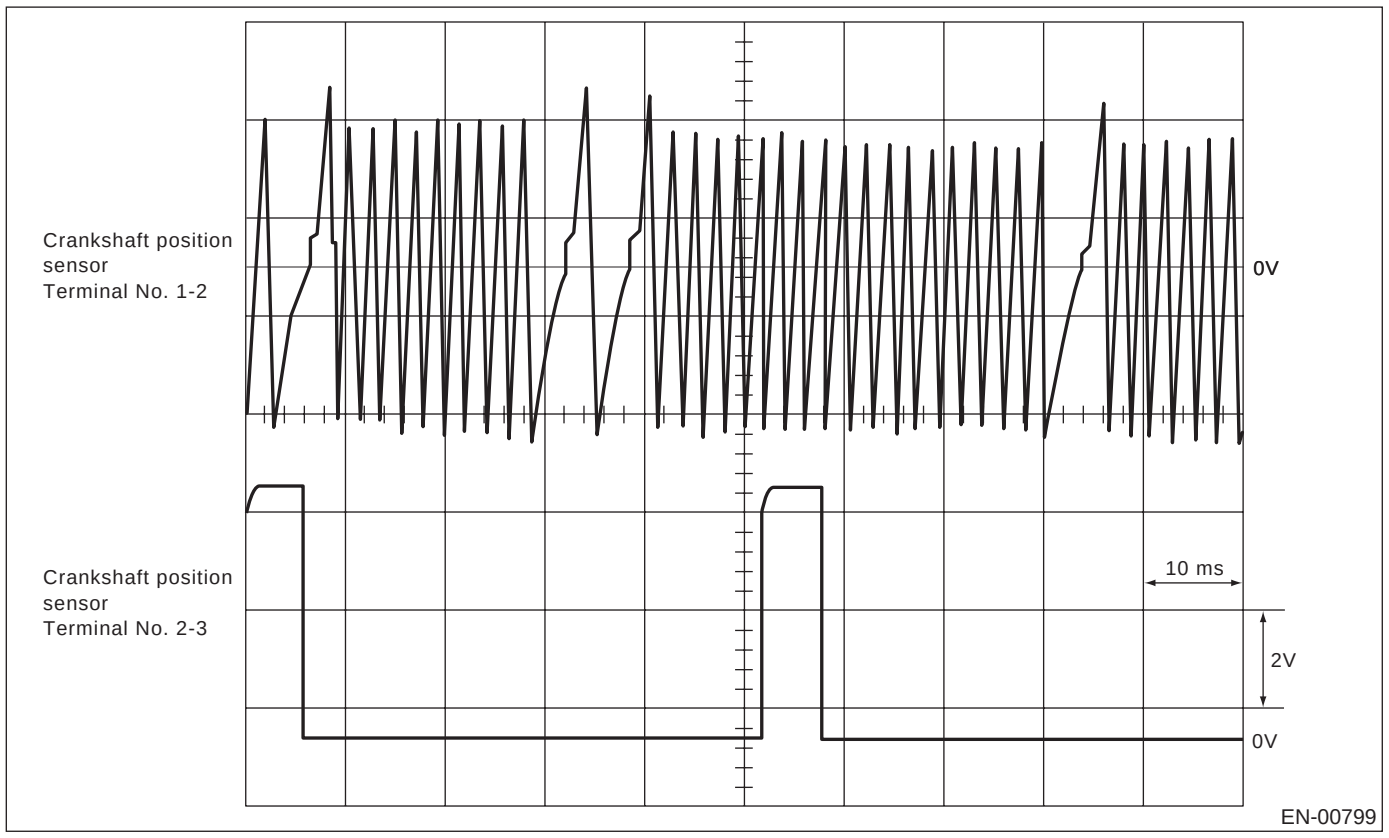
ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Con-nector No.	Termi-nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (injectors)		B136	8	0	0	—
GND (ignition system)		B136	18	0	0	—
GND (power supply)		B134	22	0	0	—
		B136	17	0	0	—
GND (control systems)		B134	7	0	0	—
			15	0	0	—
GND (oxygen sensor heater LH)	1	B137	21	0	0	—
	2	B137	31			
GND (oxygen sensor heater RH)	1	B137	9	0	0	—
	2	B137	8			

B: MEASUREMENT

Measure input/output signal voltage.

1. WAVEFORM



6. Engine Condition Data

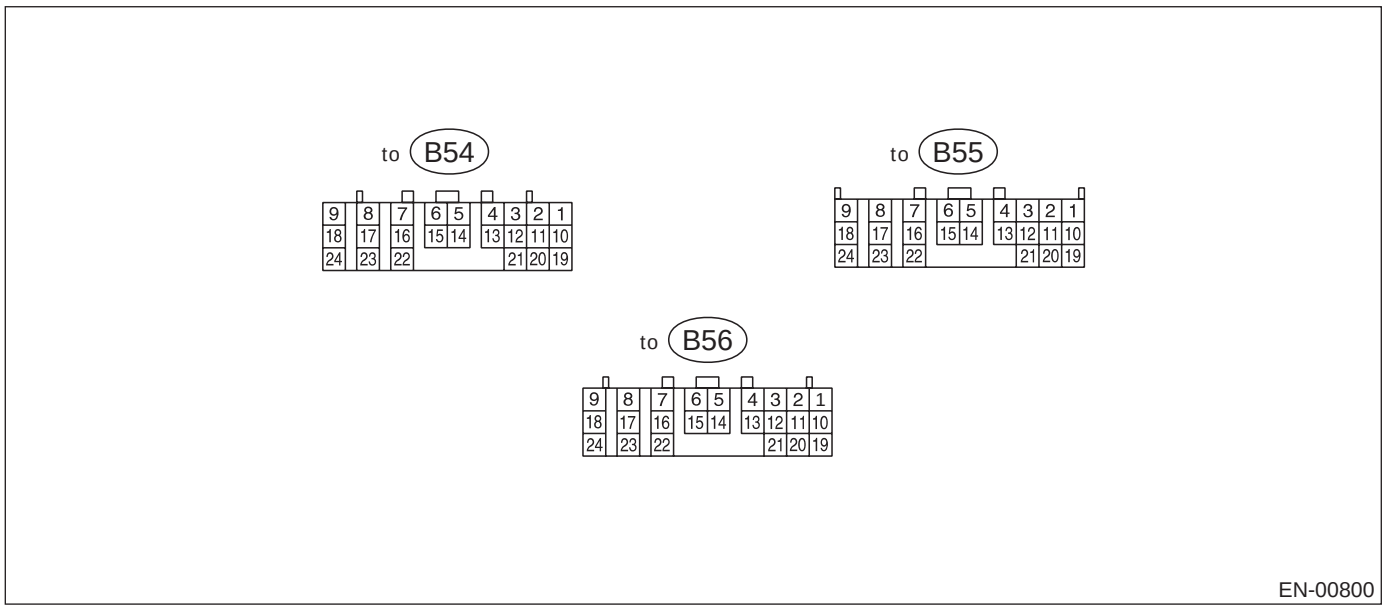
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 4.0 (%): 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



Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 16	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 16	—
		B54	24			
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
VDC communication signal +	B56	9	Ignition ON	(+) — (–) Plus signal	—
VDC communication signal –	B56	18		(+) — (–) Plus signal	—
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.5 — 0.8	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range) 4	
Torque converter turbine speed sensor	B55	8	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	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 4	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal	B54	10	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

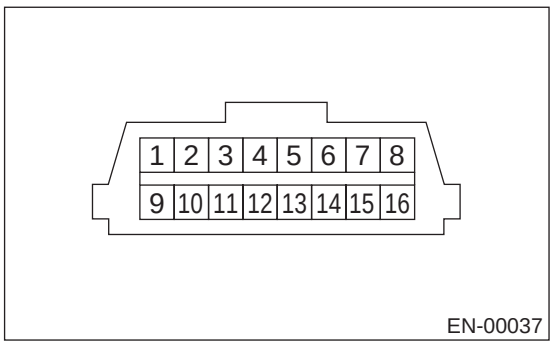
Check with ignition switch ON.					
Content	Con-nector No.	Termi-nal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Dropping resistor	B54	8	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	6	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	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
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	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B54	19	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	20			
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

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.



(A) Data link connector

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	Blank	12	Ground
5	Blank	13	Ground
6	—	14	Blank
7	Blank	15	Blank
8	—	16	Blank

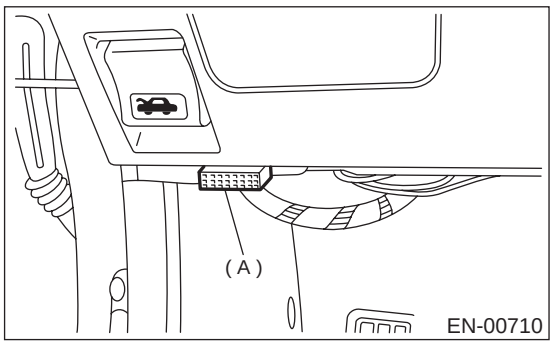
*: Circuit only for Subaru Select Monitor

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) Open the cover and connect the OBD-II general scan tool to the data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(A) Data link connector

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(H6DO)-93, 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 and number
03	Fuel system control status	%
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
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.	—
24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
28	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 (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
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(H6DO)-50, 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).

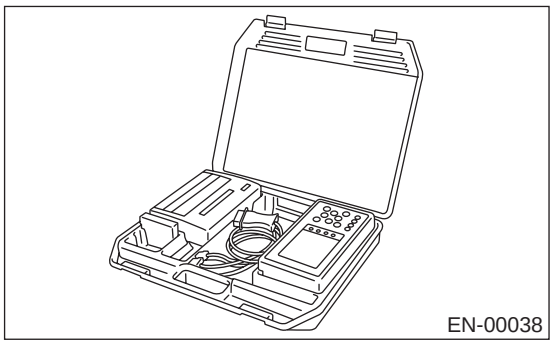
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

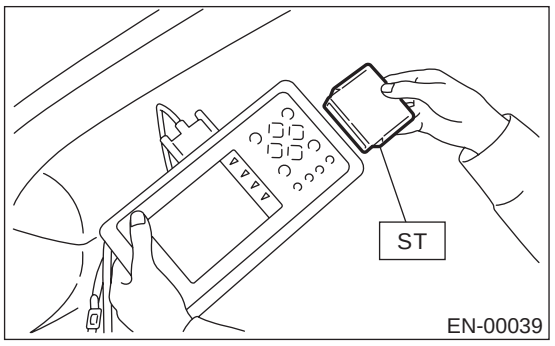
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>

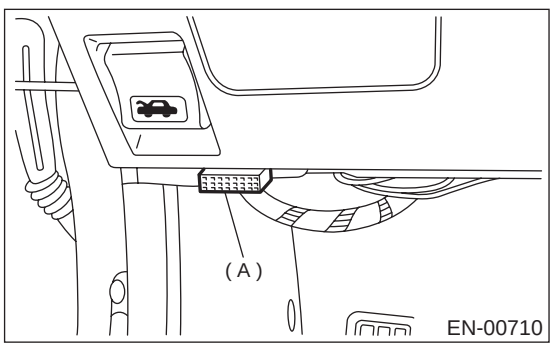

EN-00038

2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



EN-00039

4) Connect 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).



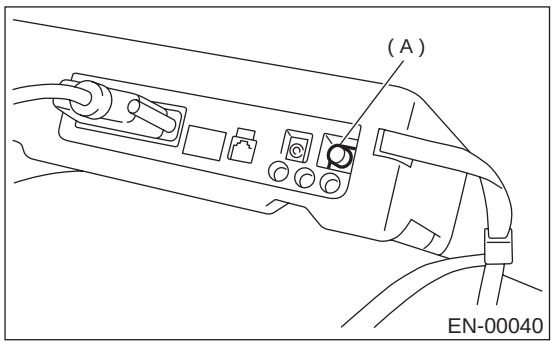
EN-00710

(A) Data link connector

(2) Connect 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 ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



EN-00040

(A) Power switch

6) Using 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(H6DO)-50, 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(H6DO)-50, 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 1	Fuel Injection #1 Pulse	ms
Injection pulse width 2	Fuel Injection #2 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal 1	A/F Sensor #1	—
Front oxygen (A/F) sensor output signal 2	A/F Sensor #2	—
Front oxygen (A/F) sensor resistance 1	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor resistance 2	A/F Sensor #2 Resistance	Ω
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim 1	A/F Correction #1	%
Short term fuel trim 2	A/F Correction #2	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
EGR control signal	No. of EGR Steps	STEP
Front oxygen (A/F) sensor 1 current	A/F Sensor #1 Current	mA
Front oxygen (A/F) sensor 2 current	A/F Sensor #2 Current	mA
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim 1	A/F Learning #1	%
Long term whole fuel trim 2	A/F Learning #2	%
Long term whole fuel trim 3	A/F Learning #3	%
Front oxygen (A/F) sensor heater current 1	A/F Heater Current 1	A
Front oxygen (A/F) sensor heater current 2	A/F Heater Current 2	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psig
Fuel temperature signal	Fuel Temp.	°C or °F
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Ignition switch signal	Ignition Switch	ON or OFF

Contents	Display	Unit of measure
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioner switch signal	A/C Switch	ON or OFF
Radiator fan relay signal 1	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 fan relay signal 2	Radiator Fan Relay #2	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 Control Permission Signal	ON or OFF
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF
Drain valve	Vent. Solenoid Valve	ON or OFF
Starter switch signal	Starter Switch	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 SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF
Air conditioner compressor signal	A/C Compressor Signal	ON or OFF
Radiator fan relay signal 3	Radiator Fan Relay #3	ON or OFF
Induction control solenoid signal	Variable Intake Air Sol.	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF

NOTE:
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

Engine Load
Display: 0 — 100%

The engine load is displayed. The ECM calculates the engine load via the engine speed and signals from the pressure sensor. The engine load increases when the engine speed and absolute pressure of the intake manifold increase.

Coolant Temp.
Display: –40 to 215°C (–40 to 419°F)

The coolant temperature transmitted from the engine coolant temperature sensor is displayed.

ATF Correction #1, #2 and #3
Display: –100 to 99%

Using the signal from the front oxygen (A/F) sensor, the correction value of the fuel supply amount regulated by the ECM is indicated. When the A/F is lean and when displayed value becomes 0 % or more, ECM increases the fuel. When the A/F is rich and when displayed value becomes 0 % or less, ECM decreases the fuel.

A/F Learning #1, #2 and #3
Display: –100 to 99.2%

The ECM calculates the long-term fuel trim value from the short-term fuel trim value. The long-term fuel trim value means the correction value of long-term fuel supply amount. If the displayed value is less than 0 %, the fuel system is in rich status and the ECM restricts the fuel supply (by shortening the injector pulse). If the displayed value is more than 0 %, the fuel system is in lean status and the ECM increases the fuel supply (by extending the injector pulse).

Mani Absolute Pressure
Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)

The pressure in the intake manifold is displayed. The ECM detects the pressure in the intake tube via the signal from the pressure sensor. The ECM calculates the air mass required for the engine.

Engine Speed
Display: 0 — 16,383 rpm
The engine speed transmitted from the crankshaft position sensor is detected.

Vehicle Speed
Display: 0 — 255 km/h (0 — 158 MPH)
The vehicle speed transmitted from the vehicle speed sensor is displayed.

Ignition Timing
Display: –64 to 63.5 deg.
The advanced ignition timing value is displayed. The ECM calculates the advanced ignition timing value using engine coolant temperature, engine speed, and engine load.

Intake Air Temp.
Display: 40 — 215°C (104 — 419°F)
The intake air temperature is displayed. The ECM detects the intake air temperature via the signal from the intake air temperature sensor, and corrects the ignition timing and fuel supply amount.

Rear O2 Sensor
Display: 0 — 327.7 Volt
The ECM corrects air-fuel ratio by the signal sent from O2 sensor. Also, the signal is used for catalyst degradation diagnosis.

Battery Voltage
Display: 0 — 20.4 V
The battery voltage is displayed.

Throttle Sensor Voltage
Display: 0 — 5 V
The throttle angle is displayed in voltage. When the throttle is fully-closed, the displayed voltage value is approx. 0.5 V. When it is fully-open, the voltage is approx. 4 V or more.

Fuel Injection #1 and #2 Pulse
Display: 0 — 65.3 msec (0 — 214.2 ft/sec)
The injector valve opening time is displayed. The longer the injector valve opening time, the more the fuel is supplied. The higher the engine load, the longer the injector valve opening time becomes.

Knocking Correction
Display: –64 to 63.5 deg.
The ECM controls the ignition timing via the signal from the knock sensor.

Atmosphere Pressure
Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)
The atmospheric pressure is displayed. The ECM detects the atmospheric pressure via the signal from the atmosphere sensor.

Mani. Relative Pressure
Display: –128 — 128 kPa (–952 — 952 mmHg, –37.5 — 37.5 inHg)
A value calculated by subtracting the absolute pressure in the intake tube from the atmospheric pressure is displayed. A larger load leads to a larger value.

Fuel Tank Pressure
Display: –3.2 — 3.2 kPa (–24 — 24 mmHg, –0.94 — 0.94 inHg)
The pressure in the fuel tank is displayed.

Fuel Temp.
Display: –40 to 215°C
The fuel temperature is displayed. The ECM detects the fuel temperature via the signal from the fuel temperature sensor. This signal is used for the evaporation diagnosis.

Front O2 Heater #1, #2 Current
Display: 0 — 25.5 A
The heater current of the A/F sensor is displayed. A larger current value leads to increased heat generation.

Fuel Level
Display: 0 — 5 V
The float inside the fuel tank is a variable resistor which varies the resistance based on fuel level. The ECM then averages this voltage and the signal voltage from the fuel tank in order to determine fuel level. The scan tool displays close to 0.7 volts for an empty tank, and close to 5 volts for a full tank.

CPC Valve Duty Ratio
Display: 0 — 100%
The purge control solenoid valve is regulated by the ECM. The displayed value of 0 % indicates that the purge amount is 0, and 100 % indicates that the purge amount becomes the maximum.

A/F sensor #1, #2
Display: 0 — 2
The air surplus ratio output from the front oxygen (A/F) sensor is displayed. Air overflow ratio = 1.0 is regarded as a stoichiometric A/F ratio. A value above 1.0 indicates A/F lean range, and below 1.0 indicates A/F rich range.

A/F Correction #3
Display:

The correction value of fuel supply amount regulated by the ECM via the signal from the rear oxygen sensor is displayed.

A/F Sensor #1, #2 Current
Display: –16 — 15.9 mA

A value of 0 mA is regarded as a stoichiometric A/F ratio. A negative value indicates A/F rich range, and positive value indicates A/F lean range.

A/F Sensor #1, #2 Resistance
Display: 0 — 255 Ω

The resistance value of the front oxygen (A/F) sensor is displayed. At idle after warm-up, the resistance value shows 27 to 32 ohm.

ISC Valve Duty Ratio
Display: 0 — 127.5%

The duty value of the idle air control solenoid valve is displayed. This value is regulated by the ECM. The displayed value of 0 % indicates that the air bypass circuit is closed, and 100 % indicates that it is fully-open.

No of EGR Steps
Display: 0 — 255 step

The number of the EGR valve steps is displayed. The EGR valve is driven by the stepping motor, and the number of steps is regulated by the ECM. A value of 0 steps indicates that the EGR ratio is 0 %.

Rear O2 Heater Voltage
Display: 0 — 5.1 V

The heater voltage value of the rear oxygen sensor is displayed. The heater current duty-controlled by driving range regulates heater temperature.

A/F Heater Current 1, 2
Display: 0 — 25.5 A

The heater voltage value of the front oxygen (A/F) sensor is displayed. To stabilize the output, the heater current is regulated to keep heater temperature to the specified value.

AT Vehicle ID Signal
Display: ON or OFF

AT and MT vehicles are identified. For AT vehicles, ON is displayed, and for MT ones, OFF is displayed.

Neutral Position Switch
Display: ON or OFF

When the shift lever stays in the neutral position, ON is displayed. When in other positions, OFF is displayed.

Idle Switch Signal
Display: ON or OFF

When the accelerator pedal is released fully, ON is displayed. When depressed fully, OFF is displayed.

P/S Switch
Display: ON or OFF

When the steering wheel is turned fully, ON is displayed. When returned, OFF is displayed. This signal is used for idle control or other controls.

A/C Switch
Display: ON or OFF

When the A/C switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Starter Switch
Display: ON or OFF

When the vehicle is cranking, ON is displayed. When not cranking, OFF is displayed.

Rear O2 Rich Signal
Display: ON or OFF

When the A/F ratio is rich, ON is displayed. When lean, OFF is displayed.

Knocking Signal
Display: ON or OFF

When knocking occurs and the ignition timing is retarded, ON is displayed. At any other time, OFF is displayed.

Crankshaft Position Sig.
Display: ON or OFF

When a crankshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Camshaft Position Sig.
Display: ON or OFF

When a camshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Rear Defogger SW
Display: ON or OFF

When the rear defogger switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Blower Fan SW
Display: ON or OFF

When the blower fan switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Light Switch
Display: ON or OFF

When the light switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

A/C Lock Signal
Display: ON or OFF

Whether or not the A/C compressor is active is detected. When it is active, ON is displayed. When inactive, OFF is displayed.

A/C Mid Pressure Switch
Display: ON or OFF

The status of the A/C compressor is detected. When the A/C compressor voltage is high, ON is displayed. When low, OFF is displayed.

A/C Compressor Signal
Display: ON or OFF

When the A/C clutch is engaged, ON is displayed. When disengaged, OFF is displayed.

Radiator Fan Relay #1, #2, #3
Display: ON or OFF

When the radiator fan relay is ON (radiator operates), ON is displayed. When OFF (radiator stops), OFF is displayed.

Fuel Pump Relay
Display: ON or OFF

When the radiator fan relay is ON (fuel pump operates), ON is displayed. When OFF (fuel pump stops), OFF is displayed.

PCV Solenoid Valve
Display: ON or OFF

The status of the pressure control solenoid valve is displayed. When the pressure control solenoid valve is closed, OFF is displayed. When open, ON is displayed. During an evaporation leak diagnosis, the pressure control solenoid valve is only open when vacuum in the intake tube is taken into the fuel tank.

Vent Solenoid Valve
Display: ON or OFF

The status of the drain valve is displayed. When the drain valve is closed, ON is displayed. When open, OFF is displayed. Except during an evaporation leak diagnosis, the drain valve is always open.

Torque Control Signal #1, #2
Display: ON or OFF

When a torque down signal exists, ON is displayed. When it doesn't, OFF is displayed.

Torque Permission Signal
Display: ON or OFF

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

Variable Intake Air Sol.
Display: ON or OFF

The status of the induction control valve is displayed. When the valve is closed for the control to improve low- and mid-speed range, ON is displayed. When open, OFF is displayed.

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 Diag 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 (Bank 1, Bank 2, Rear)	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater (Bank 1, Bank 2, Rear)	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR steps	
Air fuel ratio control system for bank 1	Fuel System for Bank 1	C1 normal
Air fuel ratio control system for bank 2	Fuel System for Bank 2	C1 normal
Engine load data	Calculated load valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
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
Throttle position signal	Throttle Opening Angle	%
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	—
Oxygen sensor equipment	Oxygen Sensor #11	Supported
Oxygen sensor equipment	Oxygen Sensor #12	Supported
Oxygen sensor equipment	Oxygen Sensor #21	Supported
A/F sensor equipment	A/F Sensor #11	—
A/F sensor output signal	A/F Sensor #11	V
A/F sensor equipment	A/F Sensor #21	—
A/F sensor output signal	A/F Sensor #21	V

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
Air fuel ratio control system for bank 2	Fuel System for Bank 2	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 bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
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. 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 functioning.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is functioning.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is functioning.
Knocking signal	Knocking Signal (#1 or #2)	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 functioning.
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.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF	When pressure control solenoid valve is functioning.
Drain valve	Vent. Solenoid Valve	ON or OFF	When drain valve is functioning.
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.
Radiator sub fan relay 2 signal	Radiator Fan Relay 3	ON or OFF	When radiator sub fan relay is functioning.
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When air conditioner mid pressure switch is entered.
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF	When air conditioner lock switch is entered.

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

8. 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
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.
• For select monitor display details, refer to the following.

Front Wheel Speed
Display: 0 — 255 km/h (0 — 158 MPH)

The front wheel speed is displayed. This signal is used for the shift control, lock-up control, line pressure control, and transfer control.

ATF Temp.
Display: –40 to 215°C (–40 to 419°F)

The ATF temperature via the signal from the ATF temperature sensor is displayed.

Gear Position
Display:

The present gear position is displayed. The gear position is calculated from the engine speed and torque converter turbine speed.

Line Pressure Duty Ratio
Display: 0 — 123%

The duty value of the line pressure duty solenoid is displayed. The line pressure duty solenoid is regulated by the TCM, adjusting the line pressure to the optimum value depending on driving conditions.

Lock Up Duty Ratio
Display: 0 — 123%

The duty value of the lock-up duty solenoid is displayed. The lock-up duty solenoid is regulated by the TCM. Because the lock-up duty solenoid controls the lock-up control valve, the lock-up clutch engages and disengages smoothly.

Transfer Duty Ratio
Display: 0 — 123%

The duty value of the transfer duty solenoid is displayed. The transfer duty solenoid is regulated by the TCM, adjusting the transfer clutch oil pressure and controlling the driving force of the rear wheels.

Turbine Revolution Speed
Display: 0 — 8,160 rpm

The input shaft speed detected by the torque converter speed sensor is displayed. This signal is used to control the line pressure and 2 - 4 brake pressure control timing during shifting.

Throttle Sensor Power
Display: 0 — 256 V

The supply voltage to the throttle sensor is displayed. This signal is used for the throttle sensor output correction.

Brake Clutch Duty Ratio
Display: 0 — 123%

The duty value of the 2 - 4 brake duty solenoid. The 2 - 4 brake duty solenoid is regulated by the TCM, adjusting the 2 - 4 brake pressure during shifting and relieving from harsh shifting.

Rear Wheel Speed
Display: 0 — 255 km/h (0 — 158 MPH)

The rear wheel speed is displayed. This signal is used to control the transfer. If the front vehicle speed sensor is malfunctioning, this signal is used as a substitute.

Cruise Control Signal
Display: ON or OFF

When the cruise control switch is ON, ON is displayed. When OFF, OFF is displayed.

ABS Signal
Display: ON or OFF

When the ABS function is active, ON is displayed. When inactive, OFF is displayed.

Stop Light Signal
Display: ON or OFF

When the brake pedal is depressed, ON is displayed. When released, OFF is displayed.

1st, 2nd, 3rd, D, R, Range Signal
Display: ON or OFF

When the switch for each range is ON, ON is displayed.

2-4 Brake Timing Sol.
Display: ON or OFF

When the 2-4 brake timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The 2-4 brake timing solenoid is regulated by the TCM, controlling the release timing of the 2-4 brake.

Low Clutch Timing Sol.
Display: ON or OFF

When the low clutch timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The low clutch timing solenoid is regulated by the TCM, controlling the release timing of the low clutch.

Shift Solenoid #1, #2
Display: ON or OFF

When the solenoid valve is ON, ON is displayed. When OFF, OFF is displayed. By combining No. 1 and No. 2 solenoids, the shifting mechanism is controlled.

P Range
Display: ON or OFF

When the shift lever stays in P range, ON is displayed. When not in P range, OFF is displayed.

N Range
Display: ON or OFF

When the shift lever stays in N range, ON is displayed. When not in N range, OFF is displayed.

Torque Control Signal #1, #2
Display: ON or OFF

When the torque down signal exists, ON is displayed. When it does not exist, OFF is displayed.

Torque Permission Signal
Display: ON or OFF

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

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(H6DO)-93, 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(H6DO)-93, 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(H6DO)-93, 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

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H6DO)-57, Drive Cycle.>

DTC No.	Item
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)
P0068	Manifold absolute pressure/barometric pressure circuit range/performance
P0107	Manifold absolute pressure/barometric pressure circuit low input
P0108	Manifold absolute pressure/barometric pressure circuit high input
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0122	Throttle/pedal position sensor/switch “A” circuit low input
P0123	Throttle/pedal position sensor/switch “A” circuit high input
P0129	Barometric pressure too low
P0130	O2 sensor circuit (Bank 1 Sensor 1)
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)
P0150	O2 sensor circuit (Bank 2 Sensor 1)
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)
P0182	Fuel temperature sensor “A” circuit low input
P0183	Fuel temperature sensor “A” circuit high input
P0230	Fuel pump primary circuit
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)
P0332	Knock sensor 2 circuit low input (Bank 2)
P0333	Knock sensor 2 circuit high input (Bank 2)
P0335	Crankshaft position sensor “A” circuit
P0336	Crankshaft position sensor “A” circuit range/performance
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)
P0447	Evaporative emission control system vent control circuit open
P0448	Evaporative emission control system vent control circuit shorted
P0452	Evaporative emission control system pressure sensor low input
P0458	Evaporative emission control system purge control valve circuit low
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0502	Vehicle speed sensor circuit low input
P0503	Vehicle speed sensor intermittent/erratic/high
P0508	Idle control system circuit low
P0509	Idle control system circuit high

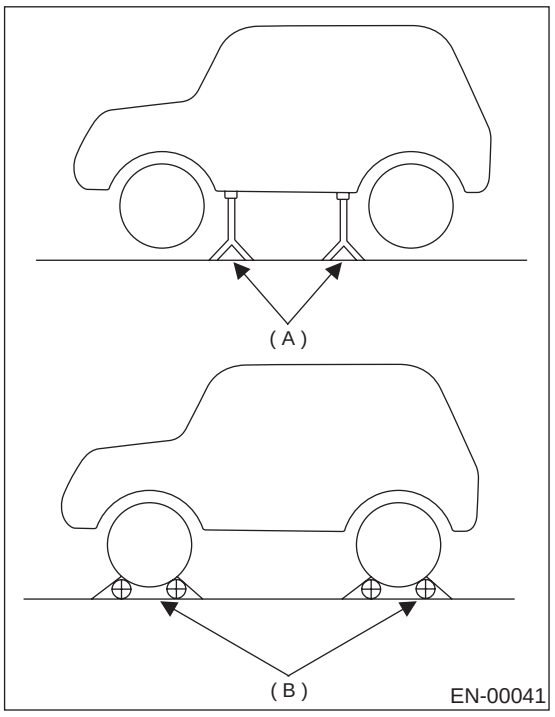
DTC No.	Item
P0512	Starter request circuit
P0519	Idle air control circuit system performace
P0558	Alternator circuit low input
P0559	Alternator circuit high input
P0565	Cruise control on signal
P0604	Internal control module random access memory (RAM) error
P0661	Intake manifold tuning valve control circuit low - bank 1
P0662	Intake manifold tuning valve control circuit high - bank 2
P0691	Cooling fan 1 control circuit low
P0692	Cooling fan 1 control circuit high
P0703	Torque converter/brake switch “B” circuit
P0705	Transmission range sensor circuit (PRNDL input)
P0710	Transmission fluid temperature sensor circuit
P0716	Input/turbine speed sensor circuit range/performance
P0720	Output speed sensor circuit
P0726	Engine speed input circuit range/performance
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0743	Torque converter clutch circuit electrical
P0748	Pressure control solenoid “A” electrical
P0753	Shift solenoid “A” electrical
P0758	Shift solenoid “B” electrical
P0771	Shift solenoid “E” performance or stuck off
P0778	Pressure control solenoid “B” electrical
P0785	Shift/timing solenoid
P0851	Neutral switch input circuit low
P0852	Neutral switch input circuit high
P0864	TCM communication circuit range/performance
P0865	TCM communication circuit low
P0866	TCM communication circuit high
P1110	Atmospheric pressure sensor circuit malfunction (low input)
P1111	Atmospheric pressure sensor circuit malfunction (high input)
P1134	A/F sensor micro-computer problem
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 2)
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)
P1400	Fuel tank pressure control solenoid valve circuit low
P1420	Fuel tank pressure control solenoid valve circuit high
P1443	Vent control solenoid valve function problem
P1446	Fuel tank sensor control valve circuit low
P1447	Fuel tank sensor control valve circuit high
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1698	Engine torque control cut signal circuit malfunction (low input)
P1699	Engine torque control cut signal circuit malfunction (high input)
P1700	Throttle position sensor circuit malfunction for AT

DTC No.	Item
P1711	Engine torque control signal #1 circuit malfunction
P1712	Engine torque control signal #2 circuit malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) 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 clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

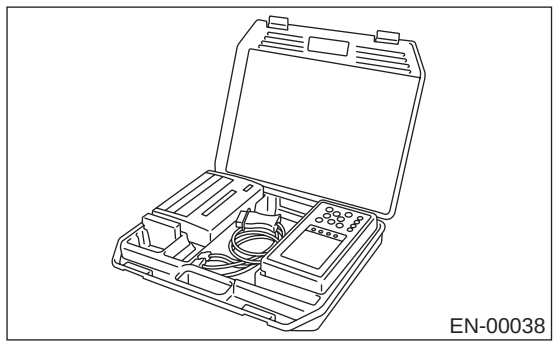


(A) Safety stand
(B) Free rollers

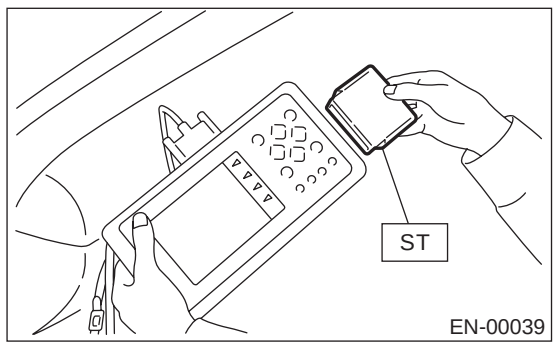
3) Warm up engine.

2. SUBARU SELECT MONITOR

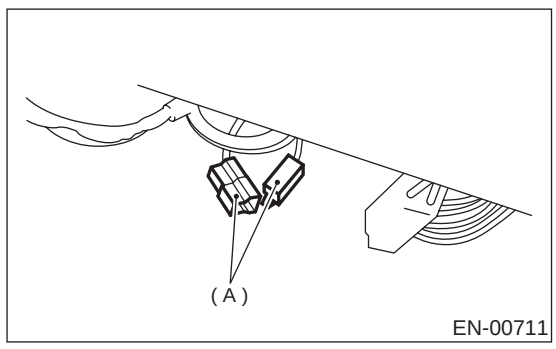
1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-59, Clear Memory Mode.>
2) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



3) Connect diagnosis cable to Subaru Select Monitor.
4) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



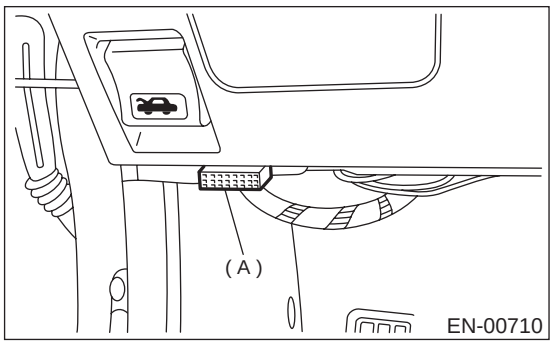
5) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

6) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

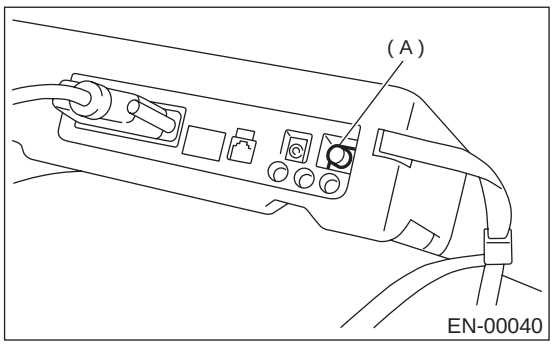


(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

7) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



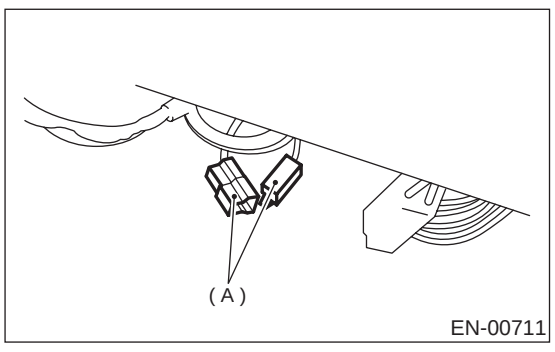
(A) Power switch

8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
10) Press the [YES] key after displayed the information of engine type.
11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
12) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
13) 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(H6DO)-93, 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

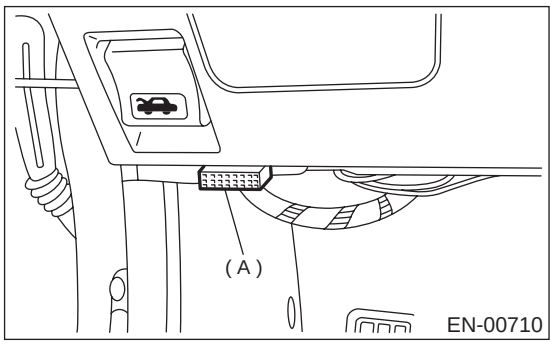
1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H6DO)-59, Clear Memory Mode.>
2) Connect test mode connector at the lower side of the instrument panel (on the driver's side).



(A) Test mode connector

3) 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.



(A) Data link connector

4) Start the engine.

NOTE:
Ensure the selector lever is placed in the “P” position before starting.

5) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.
6) Depress the brake pedal to turn the brake switch ON.
7) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
8) Place the selector lever or shift lever in the “D” position 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.

9) 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(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE.

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-59, Clear Memory Mode.>
3) Separate test mode connector.

NOTE:
• Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
• Carry out diagnosis which is marked * on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

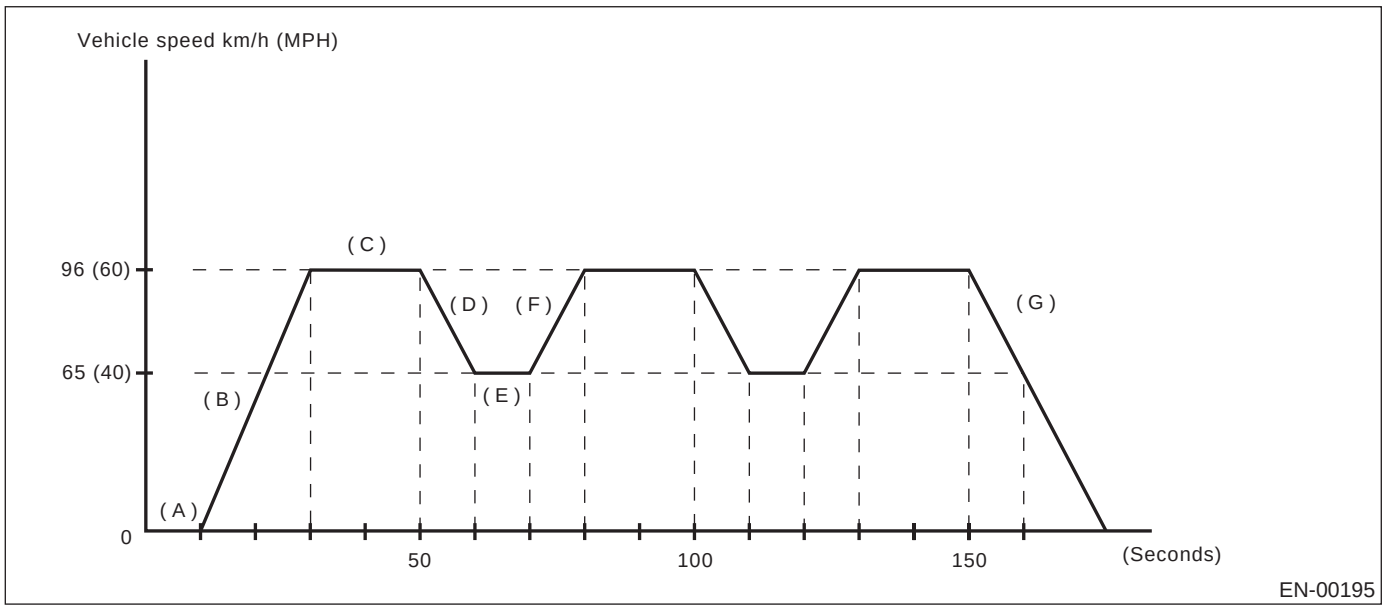
DTC No.	Item	Condition
*P0111	Intake air temperature circuit range/performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	Coolant temperature at start is less than 55°C (131°F).
*P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	—
*P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	—
*P0181	Fuel temperature sensor “A” circuit range/performance	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative emission control system leak detected (small leak)	—
*P0451	Evaporative emission control system pressure sensor range/performance	—
P0453	Evaporative emission control system pressure sensor high input	—
P0456	Evaporative emission control system leak detected (very small leak)	—
*P0457	Evaporative emission control system leak detected (fuel cap loose/off)	—
P0459	Evaporative emission control system purge control valve circuit high	—
P0461	Fuel level sensor circuit range/performance	—
*P0464	Fuel level sensor circuit intermittent	—
P1448	Fuel Tank Sensor Control Valve Range/Performance	—

3. IDLE FOR 10 MINUTES

NOTE:
Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan rationality check	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC No.	Item	Condition
*P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	Coolant temperature at start is more than 80°C (176°F).
*P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	—
*P0171	System too lean (Bank 1)	—
*P0172	System too rich (Bank 1)	—
*P0174	System too lean (Bank 2)	—
*P0175	System too rich (Bank 2)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0305	Cylinder 5 misfire detected	—
*P0306	Cylinder 6 misfire detected	—
*P0400	Exhaust gas recirculation flow	—

14.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:
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 Subaru Select Monitor and ignition switch to OFF.

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

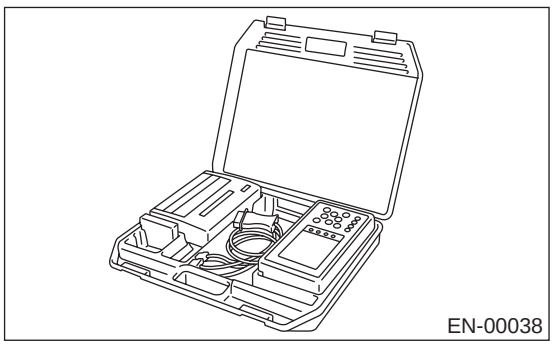
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

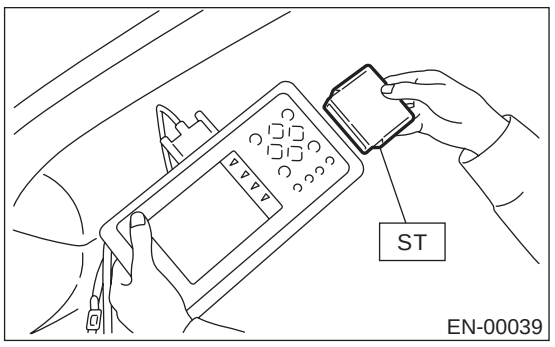
15.Compulsory Valve Operation Check Mode

A: OPERATION

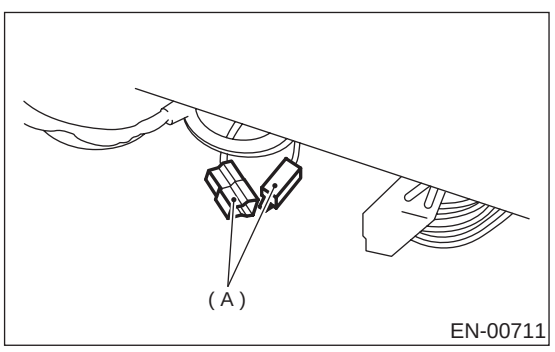
1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



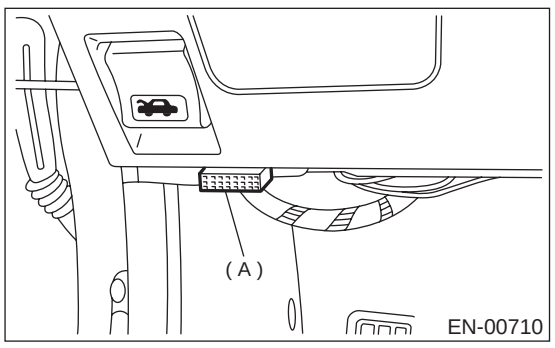
4) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

5) Connect Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(A) Data link connector

(2) Connect 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 ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.

(A) Power switch

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
Compulsory fuel tank pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent Control Solenoid Valve

NOTE:

• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve
AAI Solenoid Valve

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Engine Malfunction Indicator Lamp (MIL)

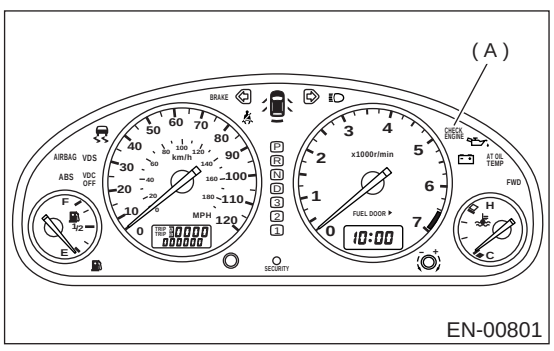
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(H6DO)-63, 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(H6DO)-64, 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(H6DO)-68, 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(H6DO)-70, 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(H6DO)-72, 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 ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

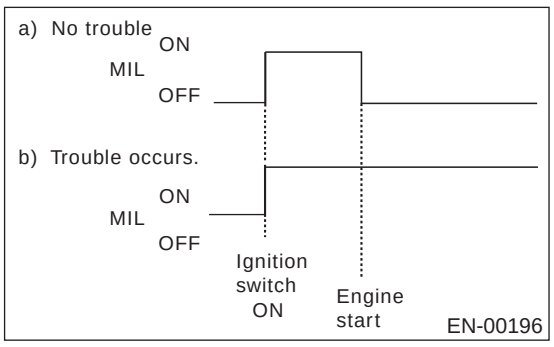
NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H6DO)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



EN-00801

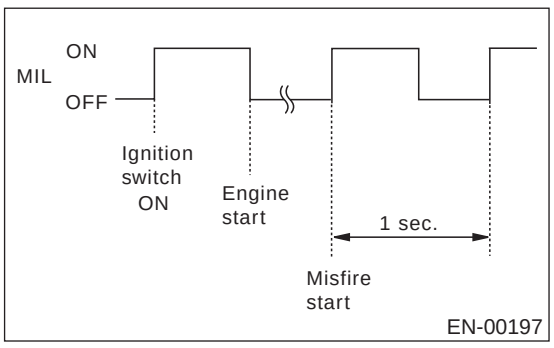
(A) Malfunction indicator lamp

2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



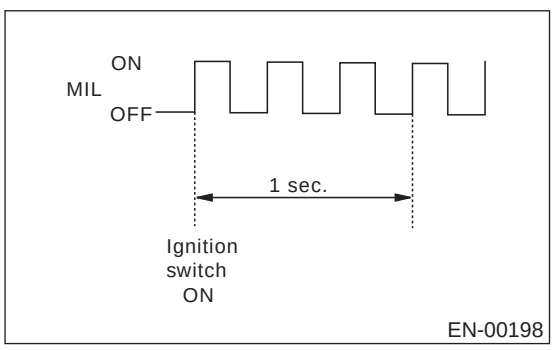
EN-00196

3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



EN-00197

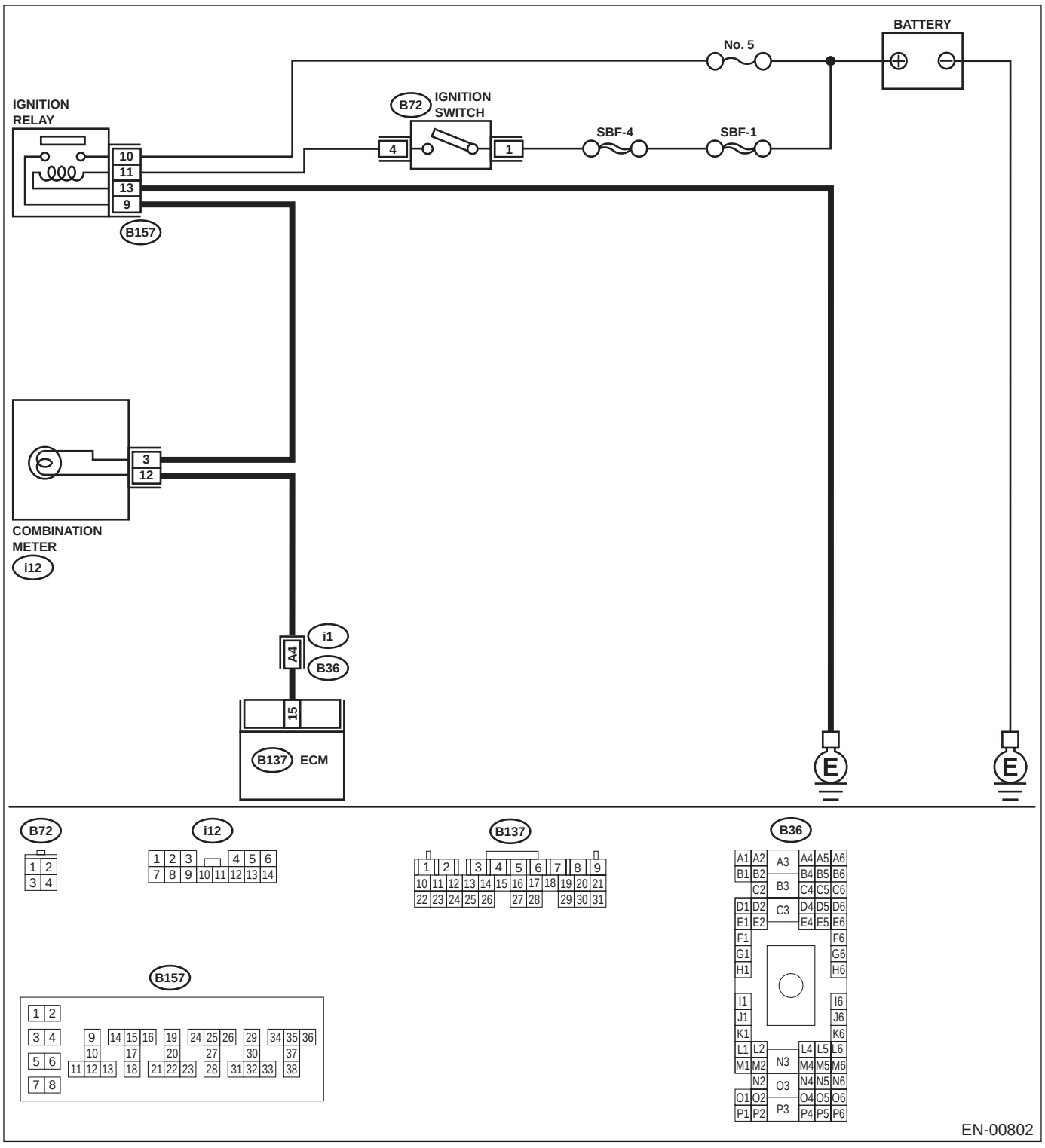
4) When ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



EN-00198

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 ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**



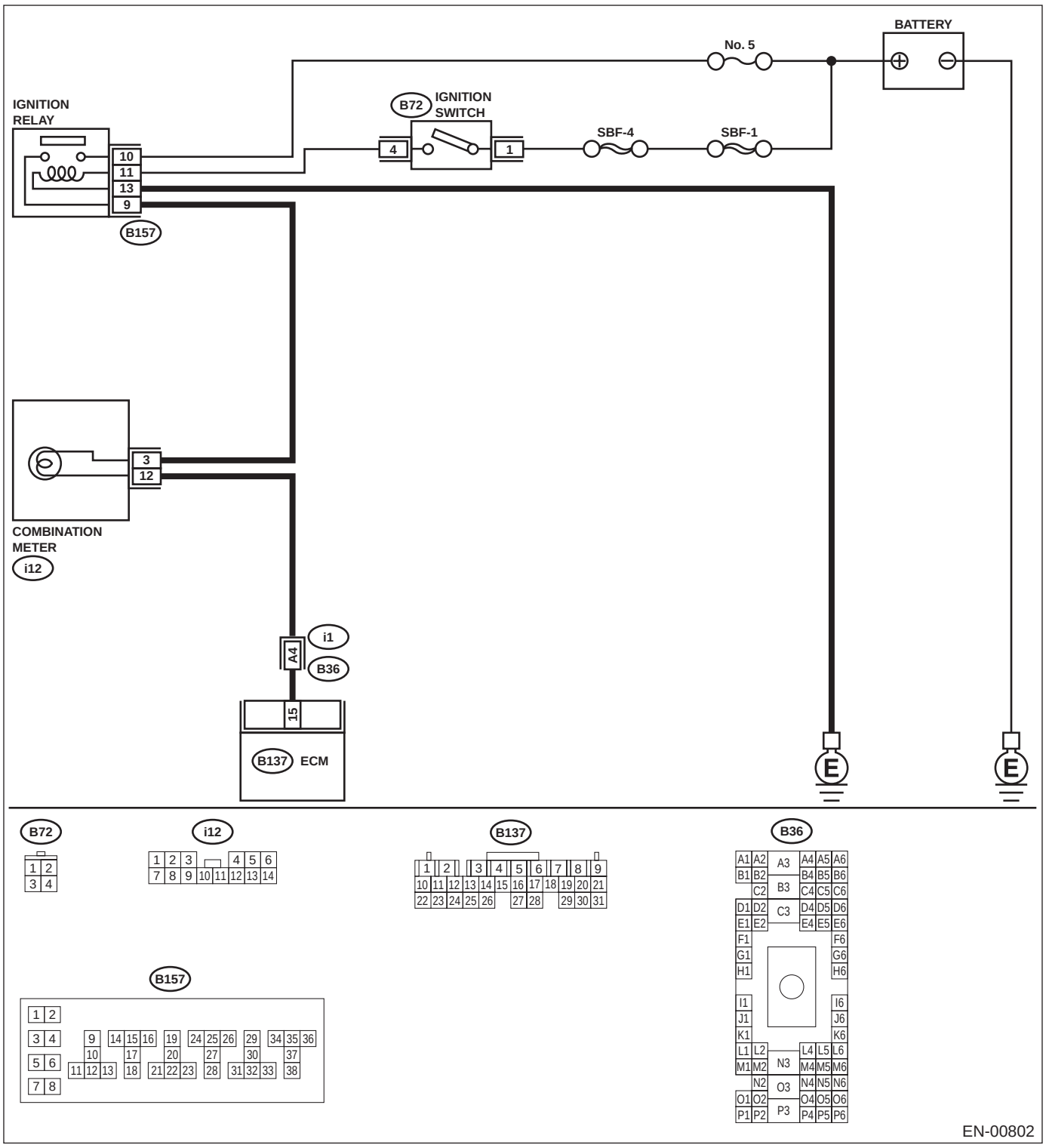
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Does the MIL come on when shaking or pulling ECM connector and harness?	MIL comes on.	Repair poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.** Is ECM connector correctly connected?	Connected correctly.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-12, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B137) No. 15 — (i12) No. 12:*** Is the measured value less than the specified value?	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
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector. Is there poor contact in combination meter connector?	There is poor contact.	Repair poor contact in combination meter connector.	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 engine malfunction indicator lamp bulb. Is lamp bulb condition OK?	Bulb is OK.	Repair combination meter connector.	Replace lamp bulb.

MEMO:

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

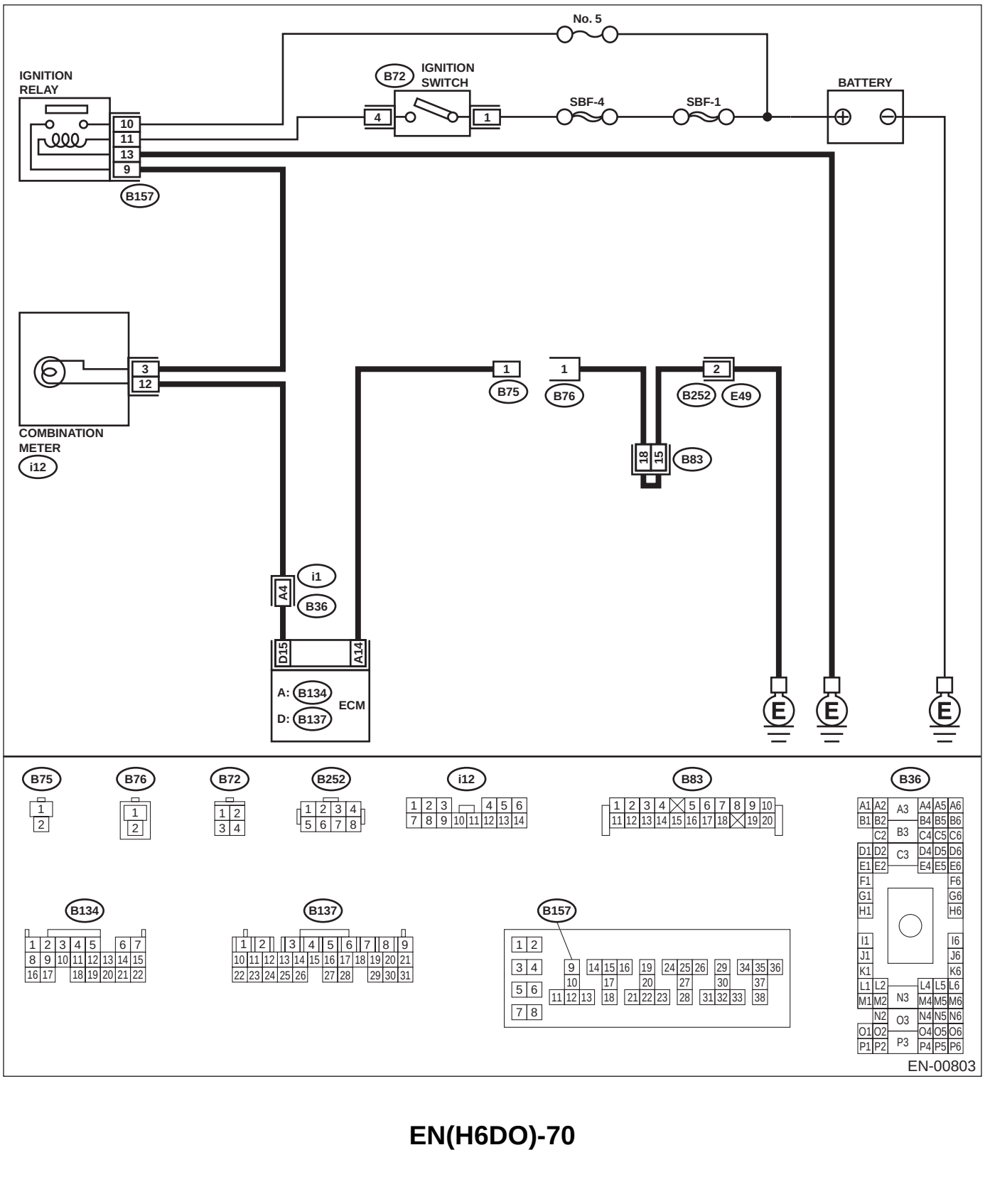
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



Step		Value	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MIL come on?	MIL comes on.	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

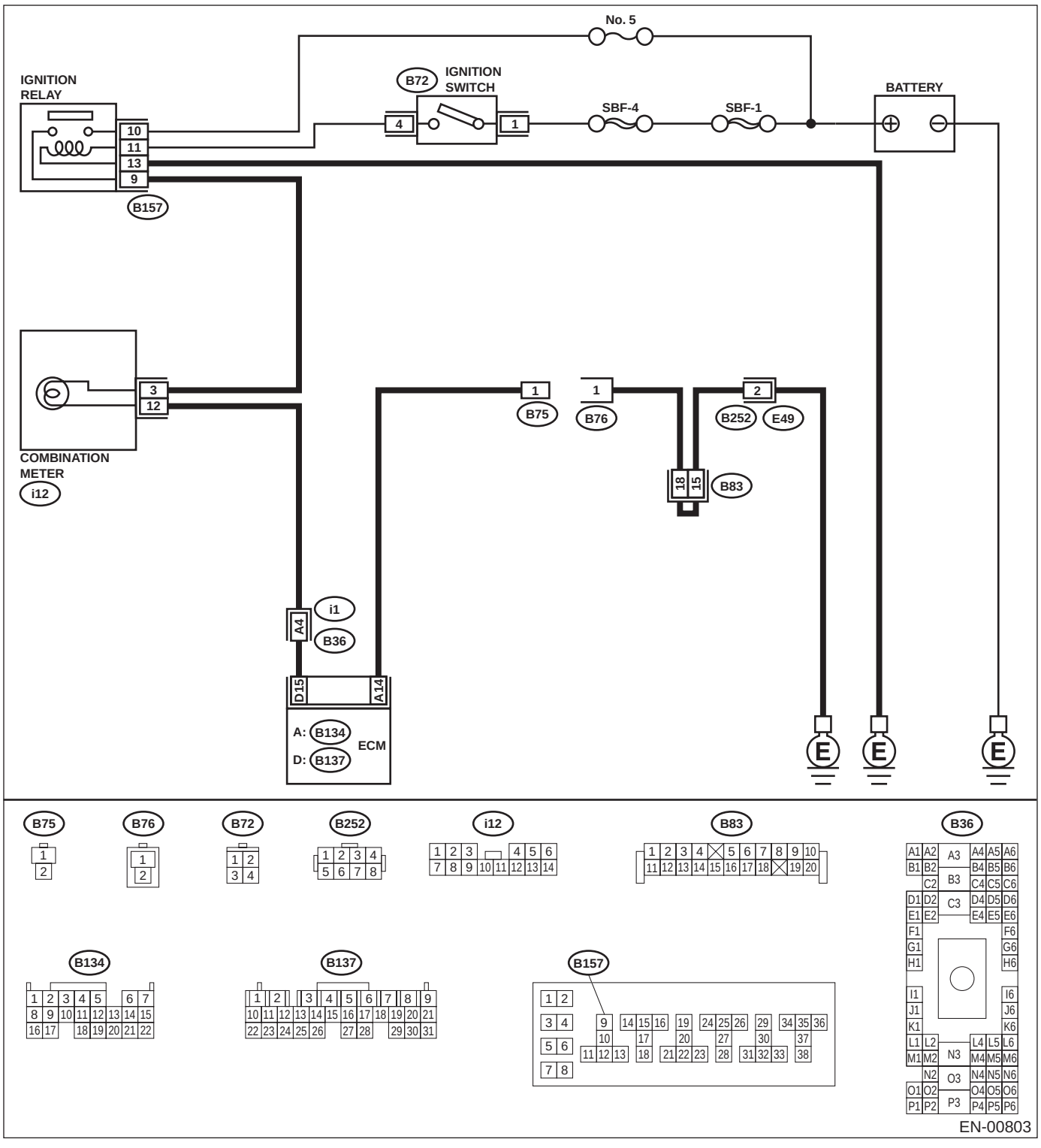
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is open.
- **TROUBLE SYMPTOM:**
  - When inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF) Does the MIL come on?	MIL comes on.	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(H6DO)-64, 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 ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON. Does the MIL come on?	MIL comes 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 ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, 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 ignition switch is turned to ON.
- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect test mode connector. 2) Turn ignition switch to ON. Does MIL flash on and off?	MIL comes on.	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 ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair short circuit in harness between ECM and test mode connector.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

MEMO:

17.Diagnostics for Engine Starting Failure

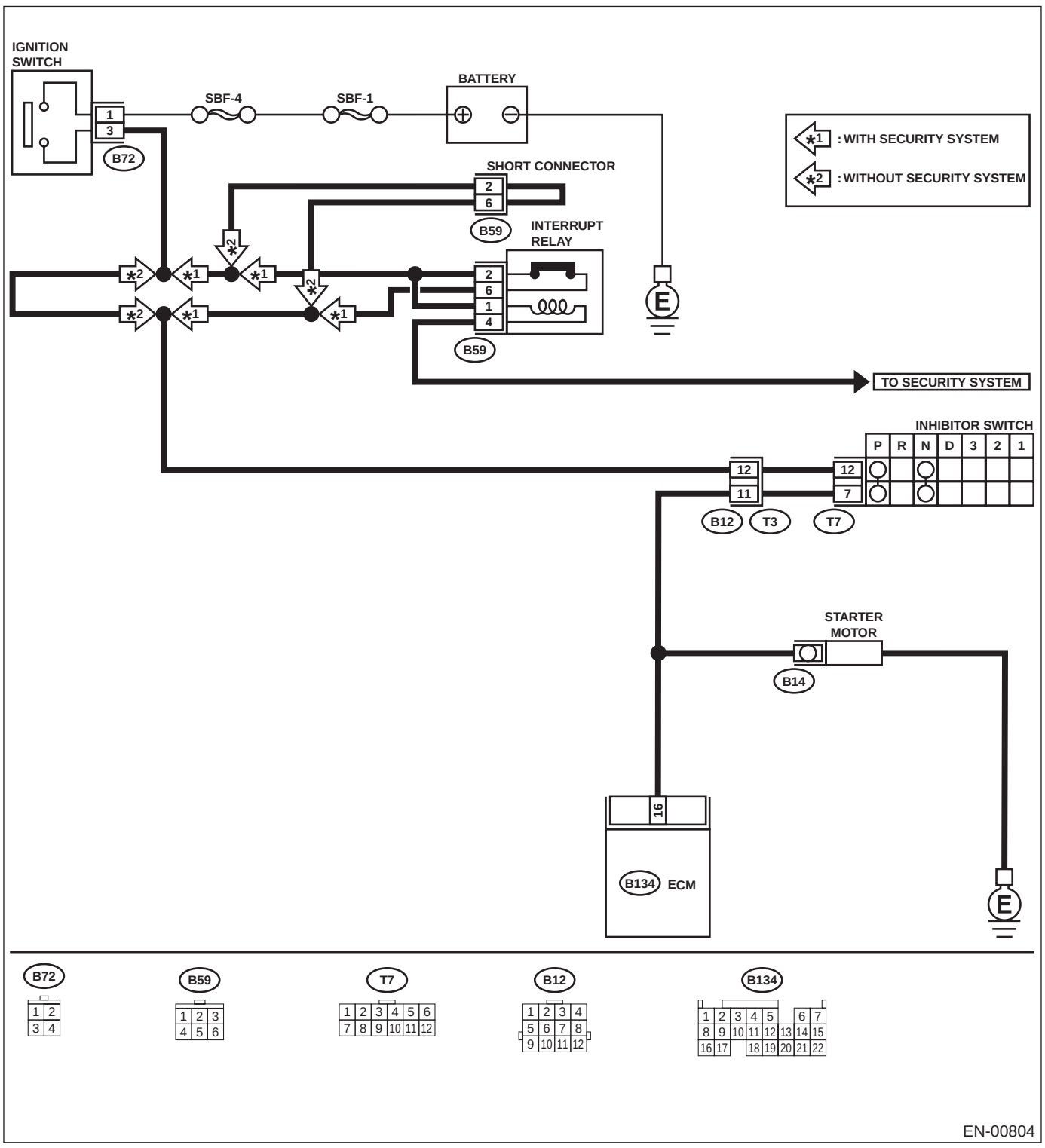
A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H6DO)-76, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)-80, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H6DO)-90, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection using Subaru Select Monitor or OBD-II general scan tool <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or inspection using “General Diagnostics Table”. <Ref. to EN(H6DO)-380, General Diagnostic Table.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00804

	Step	Value	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Does starter motor operate when the switch starts?	Starter motor operates.	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.** Is diagnostic trouble code (DTC) displayed? <Ref. to EN(H6DO)-50, OPERATION, Read Diagnostic Trouble Code.>	Diagnostic trouble code (DTC) is displayed.	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Repair poor contact of ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from starter motor. 3) Turn ignition switch to ST. 4) Measure power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value? NOTE: Place the selector lever in the "P" or "N" position.	10 V	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of ground cable between ground cable terminal and engine ground. Is the measured value less than the specified value?	5 Ω	Check starter motor. <Ref. to SC(H6DO)-6, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Ignition switch to OFF. 2) Disconnect connector from ignition switch. 3) Measure power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **6.**	Check the following items and repair, if necessary. • Blown out fuse • Open circuit in harness between ignition switch and battery
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Connect connector to ignition switch. 2) Turn ignition switch to START. 3) Measure voltage between ignition switch and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **8.**	Go to step **7.**

	Step	Value	Yes	No
7	**CHECK POOR CONTACT.** Check ignition switch connector for poor contact. Is there any poor contact in ignition switch connector?	There is poor contact.	Repair poor contact in ignition switch connector.	Replace ignition switch.
8	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn ignition switch to OFF. 2) Place the selector lever in the “P” or “N” position. 3) Separate transmission harness connector. 4) Measure resistance between transmission harness connector receptacle's terminals. ***Connector & terminal (T3) No. 11 — No. 12:*** Is the measured value less than the specified value?	1 Ω	Repair open circuit in harness between starter motor and ignition switch connector.	Go to step **9.**
9	**CHECK TRANSMISSION HARNESS.** 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness and inhibitor switch connector. ***Connector & terminal (T3) No. 11 — (T7) No. 7:*** Is the measured value less than the specified value?	1 Ω	Go to step **10.**	Repair open circuit in harness between transmission harness and inhibitor switch connector.
10	**CHECK POOR CONTACT.** Check poor contact in inhibitor switch connector. Is there poor contact in inhibitor switch connector?	There is poor contact.	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

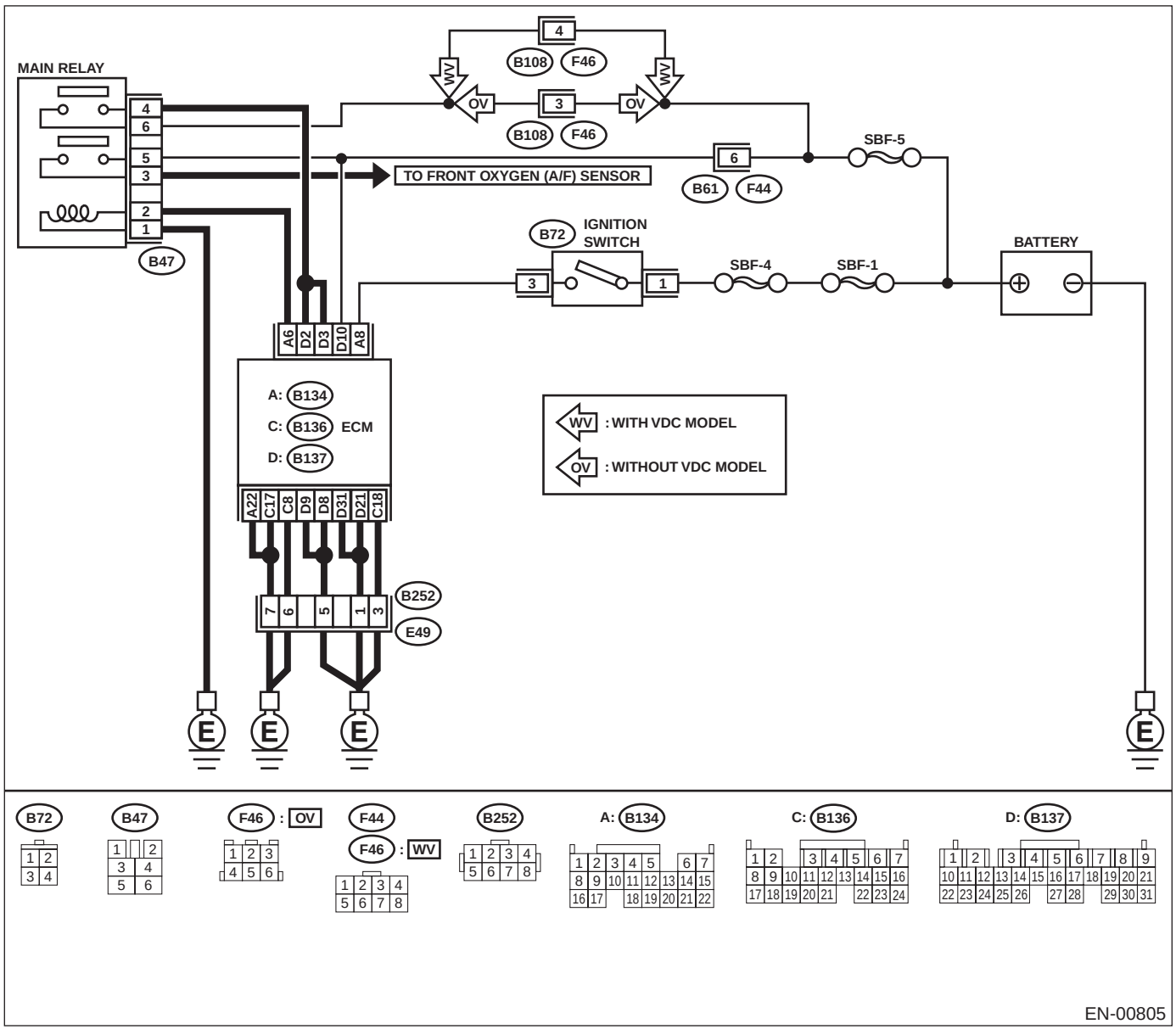
DIAGNOSTICS FOR ENGINE STARTING FAILURE

MEMO:

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:*** Is the measured value less than the specified value?	10 Ω	Go to step **2.**	Replace main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 22 — Chassis ground:*** ***(B136) No. 8 — Chassis ground:*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 31 — Chassis ground:*** Is the measured value less than the specified value?	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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to OFF. 2) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.

	Step	Value	Yes	No
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **7.**	Replace ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Check ignition control system. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

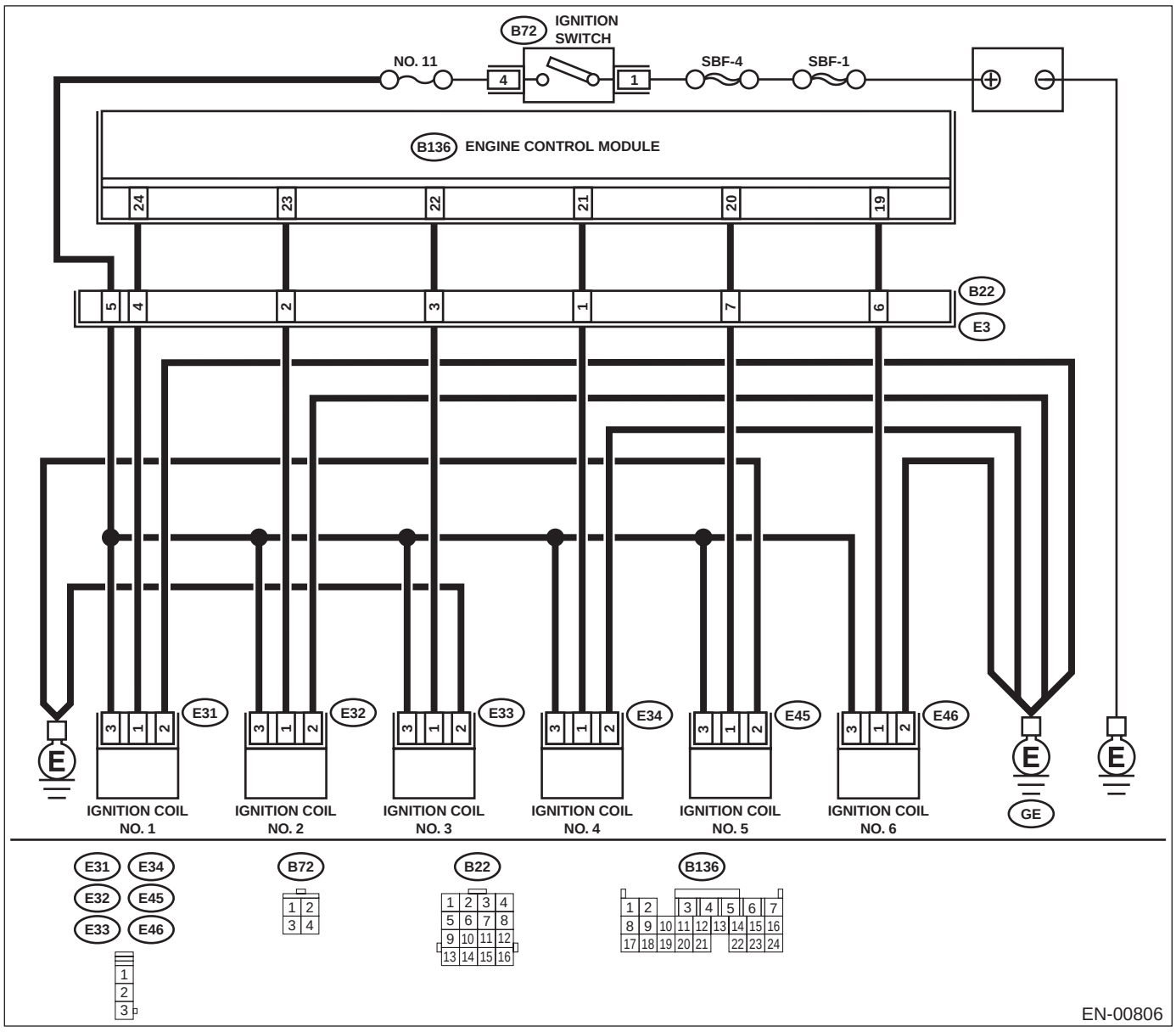
DIAGNOSTICS FOR ENGINE STARTING FAILURE

MEMO:

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.> Is the spark plug OK?	Spark plug is OK.	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect spark plug to ignition coil. 2) Lower fuel pressure. 3) Contact spark plug thread portion with engine block. 4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder. Does spark occur at each cylinder?	Spark occurs.	Check fuel pump system. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):*** ***(E45) No. 3 (+) — Engine ground (–):*** ***(E46) No. 3 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **4.**	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
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:*** ***(E45) No. 2 — Engine ground:*** ***(E46) No. 2 — Engine ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **5.**	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

	Step	Value	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Disconnect connector from ignition coil & ignitor assembly. 4) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B136) No. 24 — (E31) No. 1:*** ***(B136) No. 23 — (E32) No. 1:*** ***(B136) No. 22 — (E33) No. 1:*** ***(B136) No. 21 — (E34) No. 1:*** ***(B136) No. 20 — (E45) No. 1:*** ***(B136) No. 19 — (E46) No. 1:*** Is the measured value less than the specified value?	1 Ω	Go to step **6.**	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
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B136) No. 24 — Engine ground:*** ***(B136) No. 23 — Engine ground:*** ***(B136) No. 22 — Engine ground:*** ***(B136) No. 21 — Engine ground:*** ***(B136) No. 20 — Engine ground:*** ***(B136) No. 19 — Engine ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Connect 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*** ***(E31) No. 1 (+) — Engine ground (–):*** ***(E32) No. 1 (+) — Engine ground (–):*** ***(E33) No. 1 (+) — Engine ground (–):*** ***(E34) No. 1 (+) — Engine ground (–):*** ***(E45) No. 1 (+) — Engine ground (–):*** ***(E46) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **8.**	Replace ignition coil & ignitor assembly. <Ref. to IG(H6DO)-7, Ignition Coil and Ignitor Assembly.>
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

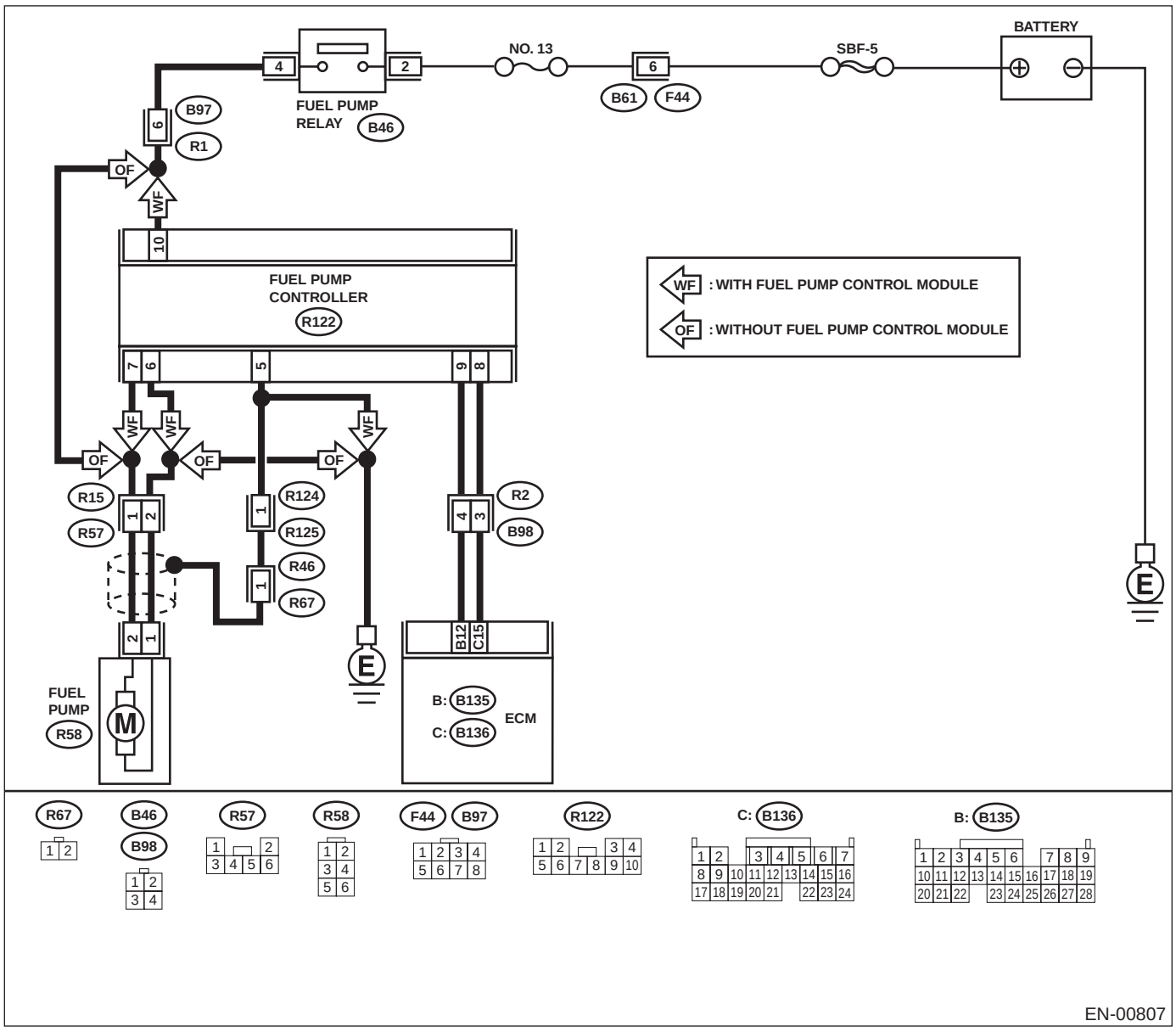
DIAGNOSTICS FOR ENGINE STARTING FAILURE

MEMO:

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

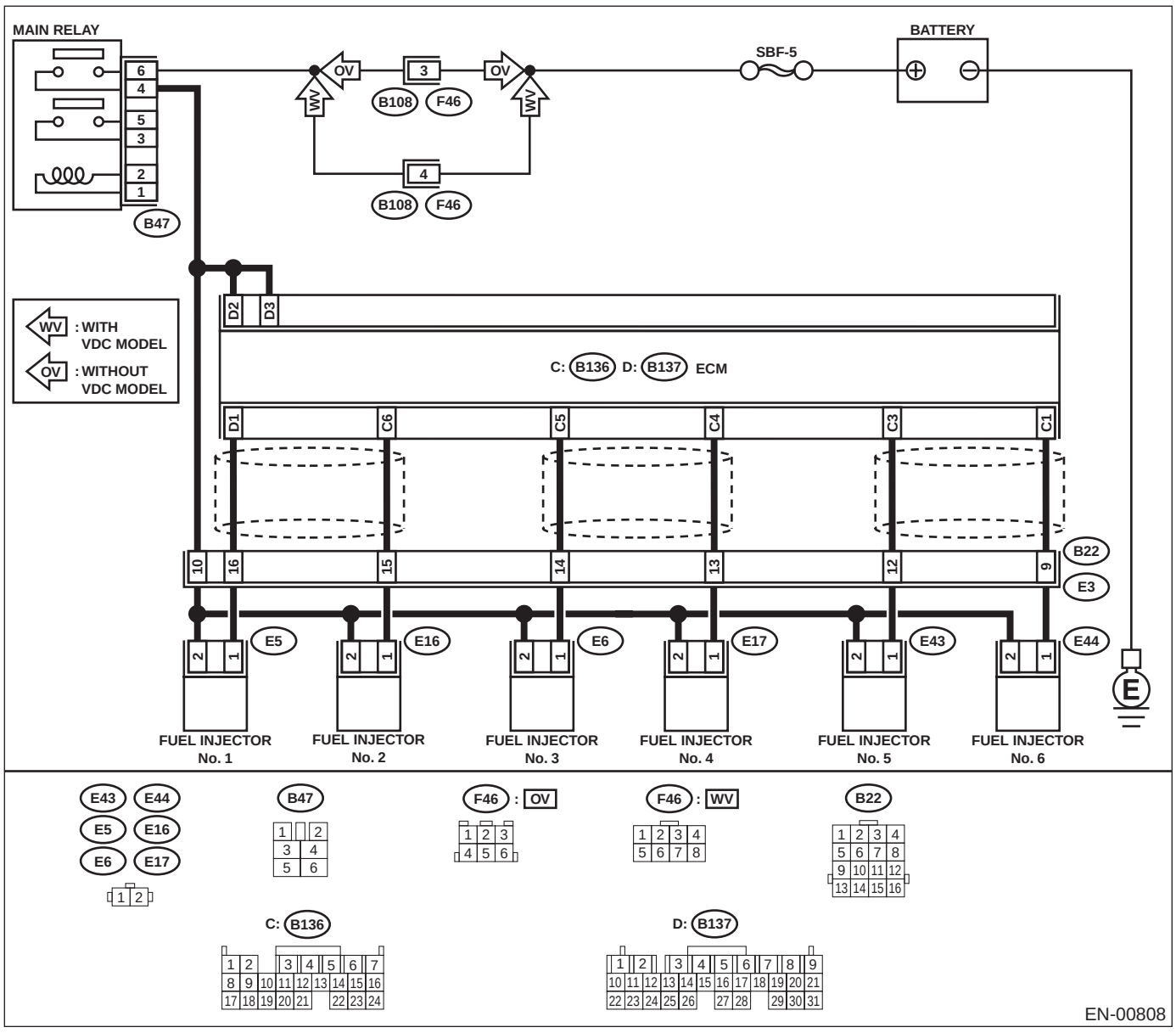


DIAGNOSTICS FOR ENGINE STARTING FAILURE

	Step	Value	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)-60, Compulsory Valve Operation Check Mode.> Does the fuel pump produce operating sound?	Operating sound produced.	Check fuel injector circuit. <Ref. to EN(H6DO)-90, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Read the diagnostic Trouble Code (DTC) and check related DTC. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

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(H6DO)-59, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>**
- **WIRING DIAGRAM:**



	Step	Value	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 injector for this check. Does the fuel injector emit “operating” sound?	Operating sound produced.	Check fuel pressure. <Ref. to FU(H6DO)-50, Fuel.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector. 3) Turn ignition switch to ON. 4) Measure 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 (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E43) No. 2 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect connector from ECM and fuel injector. 2) Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — (E5) No. 1:*** ***(B136) No. 6 — (E16) No. 1:*** ***(B136) No. 5 — (E6) No. 1:*** ***(B136) No. 4 — (E17) No. 1:*** ***(B136) No. 3 — (E43) No. 1:*** ***(B136) No. 1 — (E44) No. 1:*** Is the measured value less than the specified value?	1 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
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:*** ***(B136) No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.

	Step	Value	Yes	No
5	**CHECK EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	5 — 20 Ω	Go to step **6.**	Replace faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H6DO)-380, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-100, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-102, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-106, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-108, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-112, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-114, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-116, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-120, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold absolute pressure/barometric pressure circuit range/performance	<Ref. to EN(H6DO)-122, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold absolute pressure/barometric pressure circuit low input	<Ref. to EN(H6DO)-124, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold absolute pressure/barometric pressure circuit high input	<Ref. to EN(H6DO)-128, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature circuit range/performance	<Ref. to EN(H6DO)-132, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature circuit low input	<Ref. to EN(H6DO)-134, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature circuit high input	<Ref. to EN(H6DO)-136, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature circuit low input	<Ref. to EN(H6DO)-140, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature circuit high input	<Ref. to EN(H6DO)-142, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	<Ref. to EN(H6DO)-146, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0122	Throttle/pedal position sensor/switch “A” circuit low input	<Ref. to EN(H6DO)-148, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/pedal position sensor/switch “A” circuit high input	<Ref. to EN(H6DO)-152, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H6DO)-154, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	<Ref. to EN(H6DO)-156, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric pressure too low	<Ref. to EN(H6DO)-157, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-158, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-162, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-164, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-166, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-166, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-170, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0150	O2 sensor circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-172, DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-176, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-178, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too lean (Bank 1)	<Ref. to EN(H6DO)-180, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too rich (Bank 1)	<Ref. to EN(H6DO)-180, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System too lean (Bank 2)	<Ref. to EN(H6DO)-184, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System too rich (Bank 2)	<Ref. to EN(H6DO)-184, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor “A” circuit range/performance	<Ref. to EN(H6DO)-188, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor “A” circuit low input	<Ref. to EN(H6DO)-190, 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(H6DO)-192, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0230	Fuel pump primary circuit	<Ref. to EN(H6DO)-196, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H6DO)-199, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H6DO)-199, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H6DO)-199, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H6DO)-199, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 misfire detected	<Ref. to EN(H6DO)-199, DTC P0305 — CYLINDER 5 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 misfire detected	<Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-208, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-210, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock sensor 2 circuit low input (Bank 2)	<Ref. to EN(H6DO)-212, DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0333	Knock sensor 2 circuit high input (Bank 2)	<Ref. to EN(H6DO)-214, DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor “A” circuit	<Ref. to EN(H6DO)-216, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor “A” circuit range/performance	<Ref. to EN(H6DO)-218, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-220, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-222, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust gas recirculation flow	<Ref. to EN(H6DO)-224, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)-228, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system leak detected (small leak)	<Ref. to EN(H6DO)-230, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control circuit open	<Ref. to EN(H6DO)-234, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control circuit shorted	<Ref. to EN(H6DO)-238, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance	<Ref. to EN(H6DO)-240, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(H6DO)-242, 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(H6DO)-246, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative emission control system leak detected (very small leak)	<Ref. to EN(H6DO)-250, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative emission control system leak detected (fuel cap loose/off)	<Ref. to EN(H6DO)-254, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low	<Ref. to EN(H6DO)-258, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high	<Ref. to EN(H6DO)-262, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance	<Ref. to EN(H6DO)-264, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H6DO)-266, 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(H6DO)-270, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor circuit intermittent	<Ref. to EN(H6DO)-274, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan rationality check	<Ref. to EN(H6DO)-276, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle speed sensor circuit low input	<Ref. to EN(H6DO)-279, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle speed sensor intermittent/ erratic/high	<Ref. to EN(H6DO)-280, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H6DO)-284, 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(H6DO)-286, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low	<Ref. to EN(H6DO)-288, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high	<Ref. to EN(H6DO)-290, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter request circuit	<Ref. to EN(H6DO)-292, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle air control circuit system performace	<Ref. to EN(H6DO)-296, DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMACE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0558	Alternator circuit low input	<Ref. to EN(H6DO)-298, DTC P0558 — ALTERNATOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0559	Alternator circuit high input	<Ref. to EN(H6DO)-298, DTC P0559 — ALTERNATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0565	Cruise control on signal	<Ref. to EN(H6DO)-300, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module random access memory (RAM) error	<Ref. to EN(H6DO)-302, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0661	Intake manifold tuning valve control circuit low -bank 1	<Ref. to EN(H6DO)-304, DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0662	Intake manifold tuning valve control circuit high -bank 2	<Ref. to EN(H6DO)-308, DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan 1 control circuit low	<Ref. to EN(H6DO)-310, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan 1 control circuit high	<Ref. to EN(H6DO)-314, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque converter/brake switch “B” circuit	<Ref. to EN(H6DO)-318, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit (PRNDL input)	<Ref. to AT-136, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit	<Ref. to AT-48, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/turbine speed sensor circuit range/performance	<Ref. to AT-64, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor circuit	<Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine speed input circuit range/performance	<Ref. to AT-44, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H6DO)-320, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H6DO)-320, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H6DO)-320, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(H6DO)-320, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch circuit performance or stuck off	<Ref. to EN(H6DO)-322, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch circuit electrical	<Ref. to AT-104, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid “A” electrical	<Ref. to AT-92, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid “A” electrical	<Ref. to AT-76, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid “B” electrical	<Ref. to AT-80, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift solenoid “E” performance or stuck off	<Ref. to AT-84, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure control solenoid “B” electrical	<Ref. to AT-98, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/timing solenoid	<Ref. to AT-88, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral switch input circuit low	<Ref. to EN(H6DO)-324, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC No.	Item	Index
P0852	Neutral switch input circuit high	<Ref. to EN(H6DO)-326, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM communication circuit range/performance	<Ref. to EN(H6DO)-330, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM communication circuit low	<Ref. to EN(H6DO)-332, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM communication circuit high	<Ref. to EN(H6DO)-334, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit malfunction (low input)	<Ref. to EN(H6DO)-336, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit malfunction (high input)	<Ref. to EN(H6DO)-337, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor micro-computer problem	<Ref. to EN(H6DO)-338, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-339, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-340, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-343, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-344, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low	<Ref. to EN(H6DO)-348, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high	<Ref. to EN(H6DO)-352, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent control solenoid valve function problem	<Ref. to EN(H6DO)-356, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel tank sensor control valve circuit low	<Ref. to EN(H6DO)-358, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel tank sensor control valve circuit high	<Ref. to EN(H6DO)-362, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(H6DO)-364, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H6DO)-366, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H6DO)-370, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit malfunction (low input)	<Ref. to EN(H6DO)-372, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1699	Engine torque control cut signal circuit malfunction (high input)	<Ref. to EN(H6DO)-374, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for AT	<Ref. to AT-52, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal #1 circuit malfunction	<Ref. to EN(H6DO)-376, 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(H6DO)-378, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

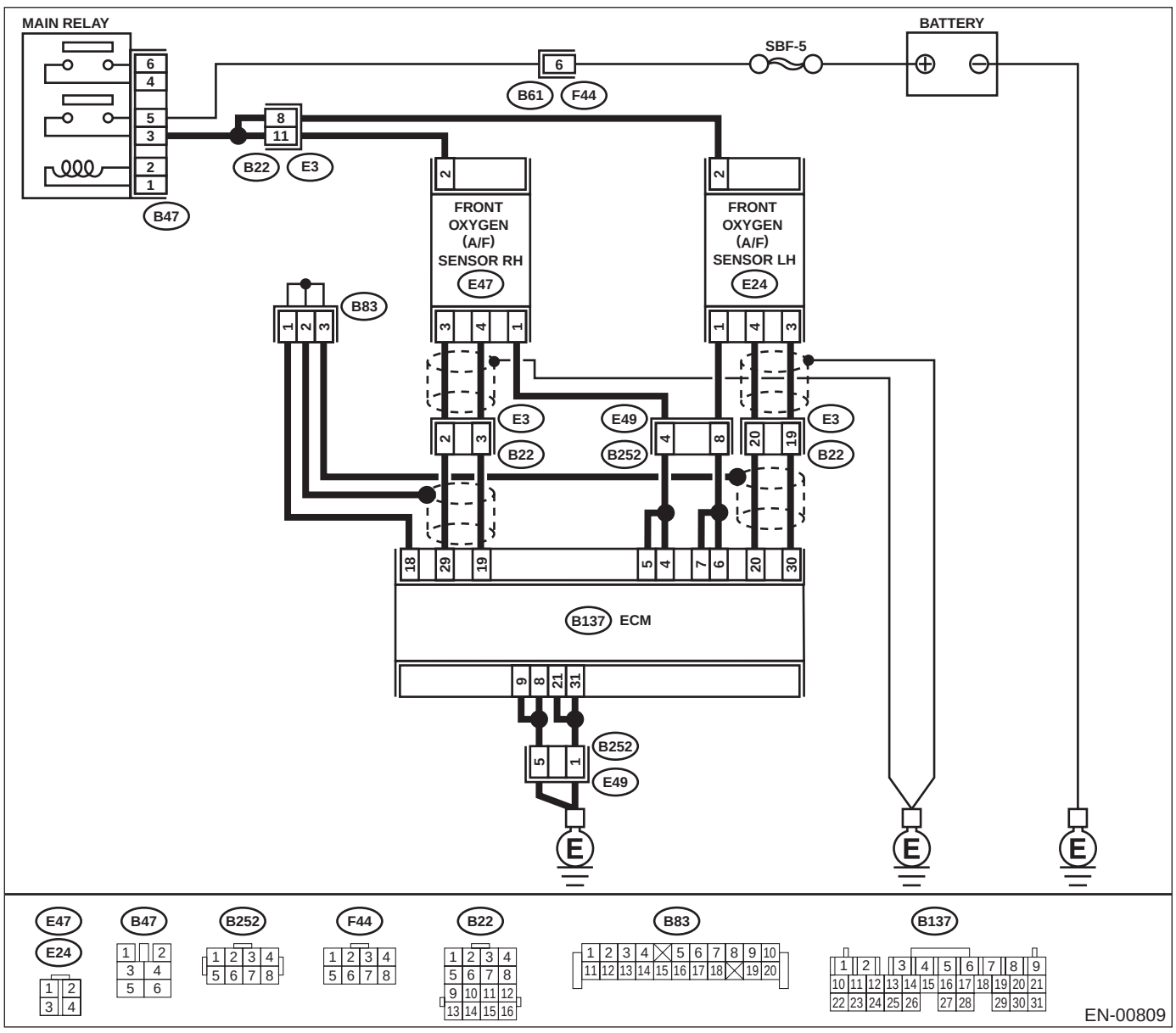
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



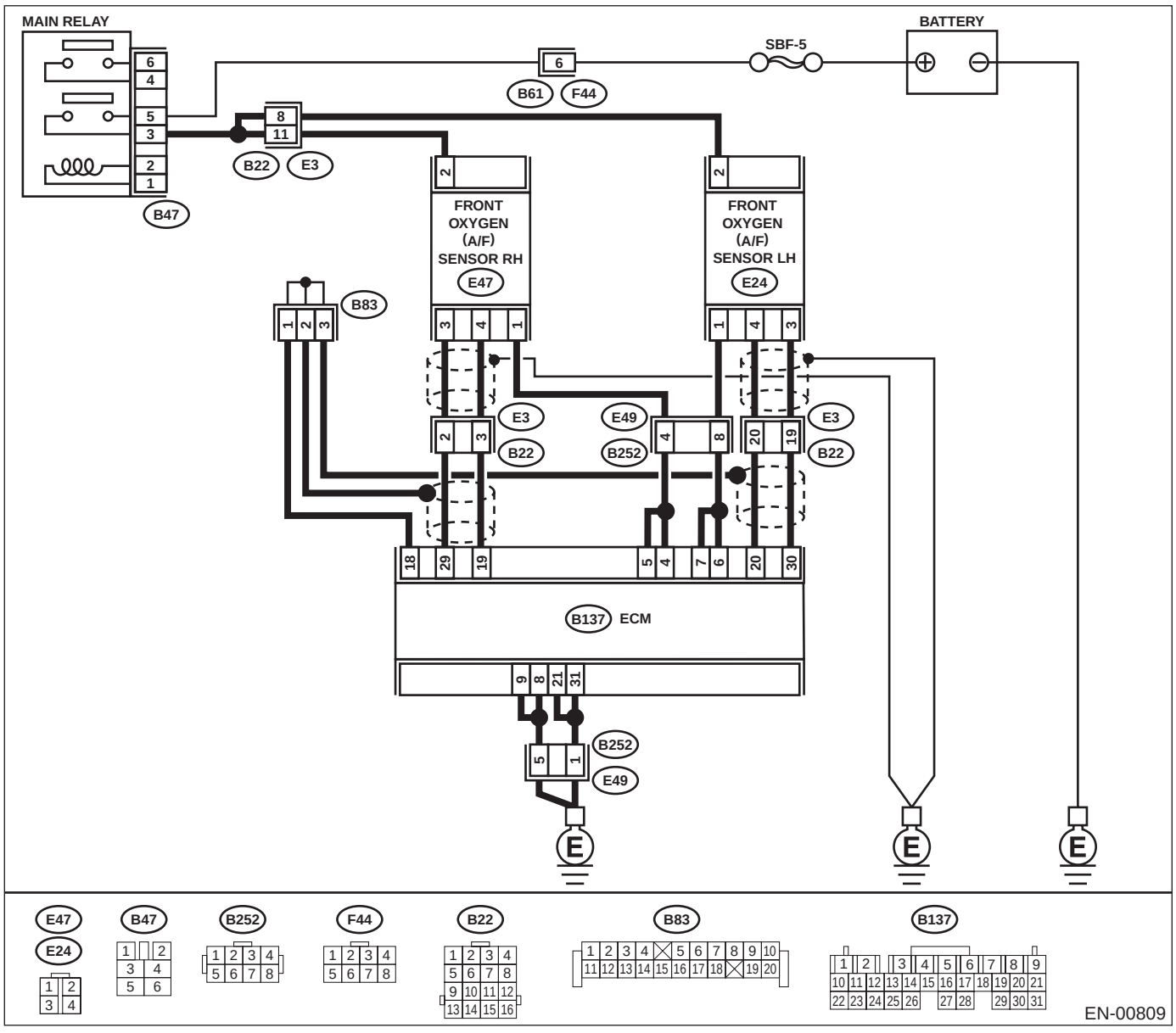
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 4 — (E47) No. 1:*** ***(B137) No. 5 — (E47) No. 1:*** Is the measured value less than the specified value?	1 Ω	Go to step **2.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than the specified value?	5 Ω	Go to step **5.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector. Is there poor contact in ECM or front oxygen (A/F) sensor connector?	There is poor contact.	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **2.**	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
2	**CHECK CURRENT DATA.** 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	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 **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	1.0 V	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Go to step **7.**	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	1.0 V	Repair poor contact in ECM connector.	Go to step **7.**
7	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E47) No. 2 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than the specified value?	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 front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

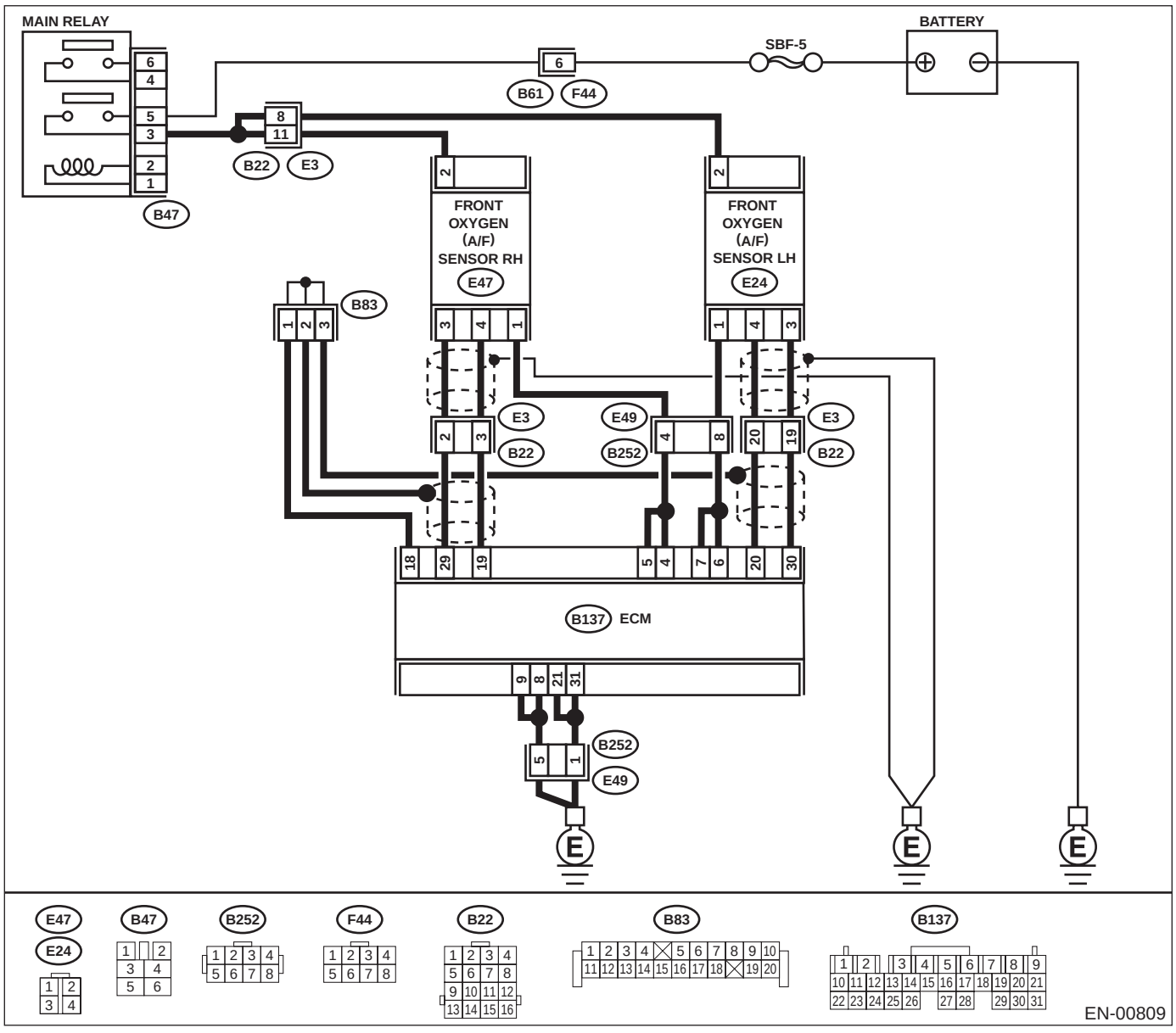
MEMO:

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



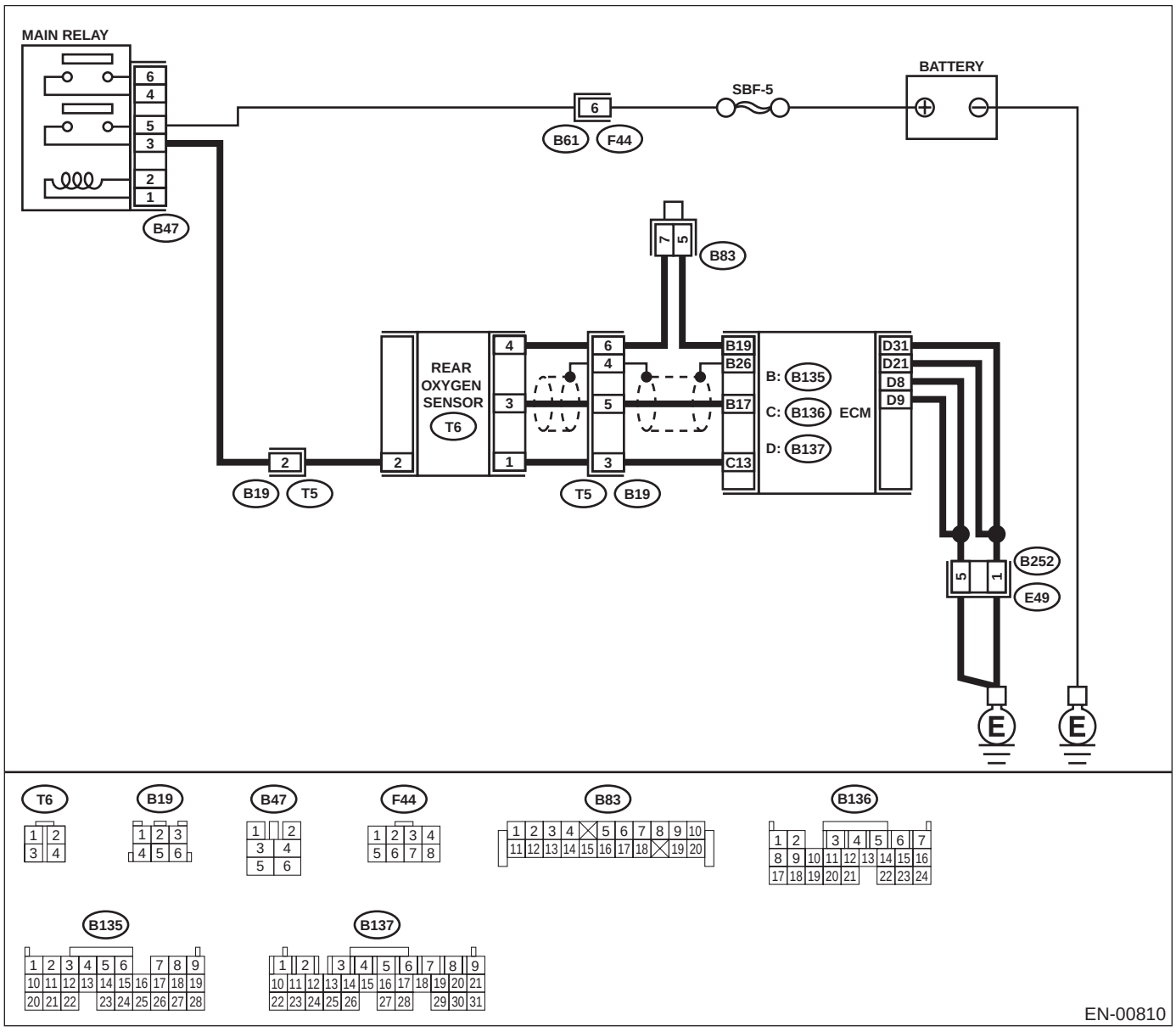
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	8 V	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	8 V	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect ECM connector. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **2.**	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
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.2 A	Repair connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	1.0 V	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

	Step	Value	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **7.**	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
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	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	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

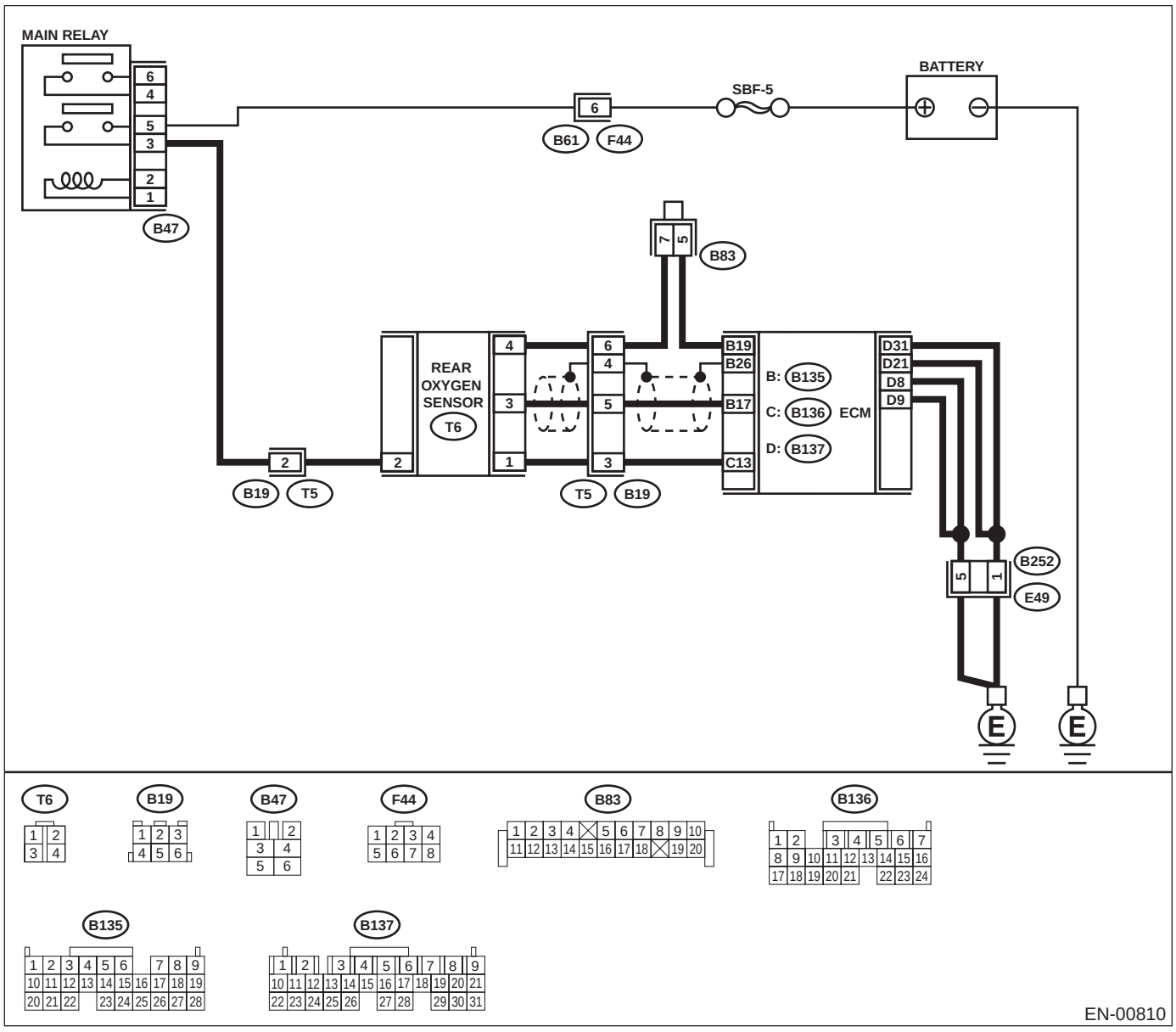
MEMO:

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



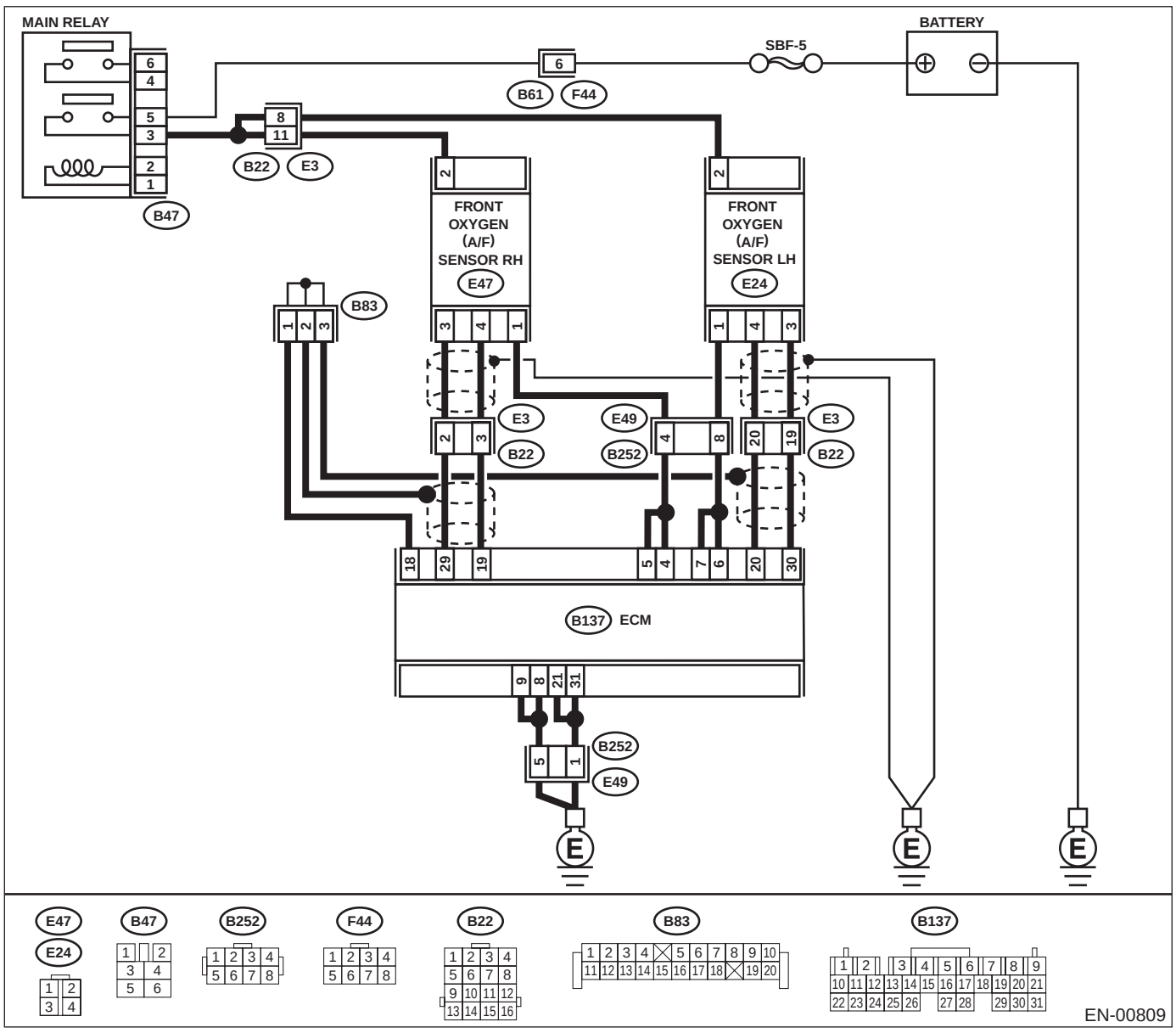
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	8 V	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn ignition switch to ON. 3) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	7 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	END

F: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



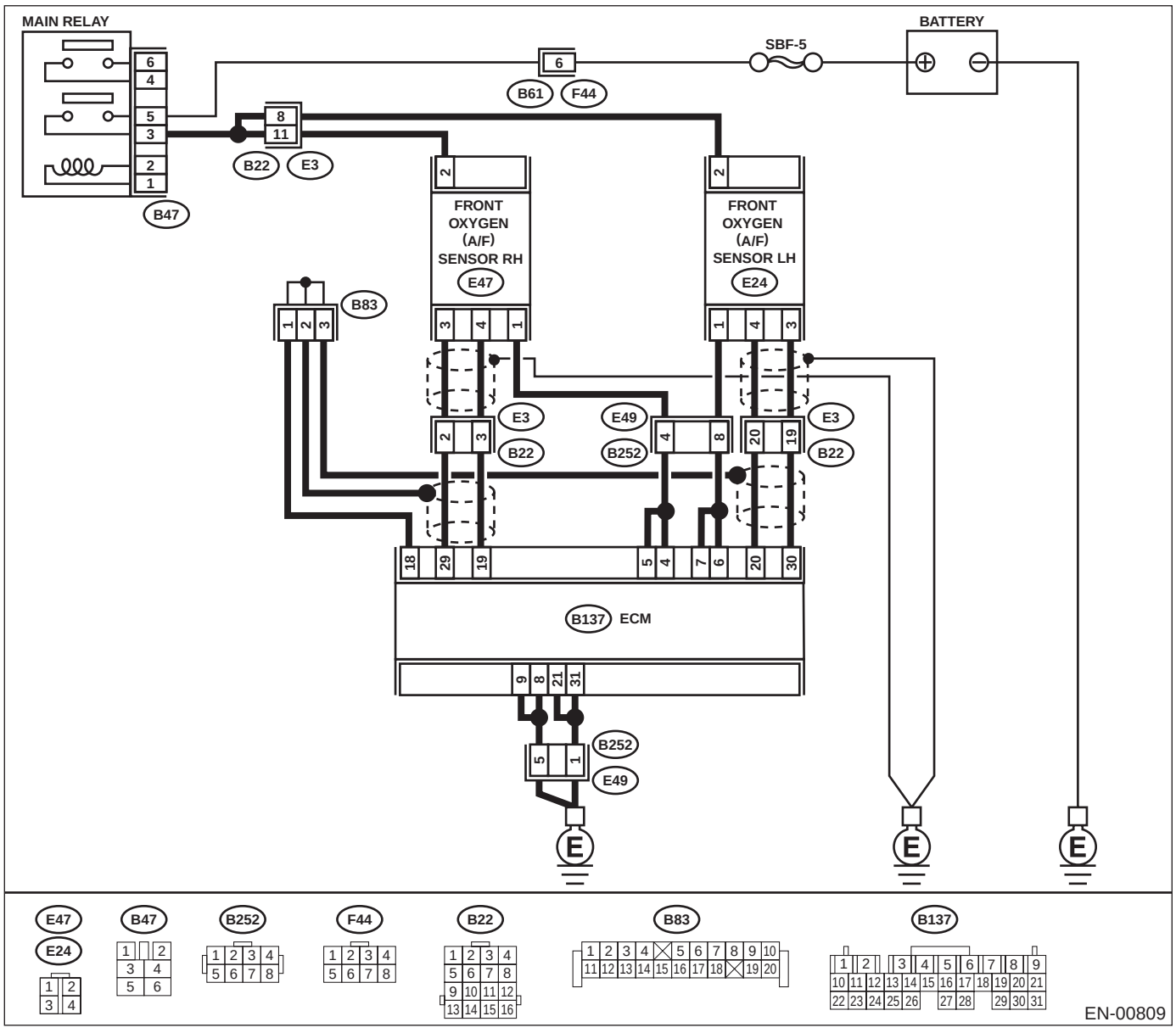
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 4 — (E24) No. 6:*** ***(B137) No. 5 — (E24) No. 7:*** Is the measured value less than the specified value?	1 Ω	Go to step **2.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E24) No. 4:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 30 — (E24) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than the specified value?	5 Ω	Go to step **5.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector. Is there poor contact in ECM or front oxygen (A/F) sensor connector?	There is poor contact.	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

G: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **2.**	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
2	**CHECK CURRENT DATA.** 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	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 **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):*** Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	1.0 V	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1.0 V	Go to step **7.**	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):*** Does the voltage change less than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	1.0 V	Repair poor contact in ECM connector.	Go to step **7.**
7	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E24) No. 2 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:*** Is the measured value less than the specified value?	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 front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

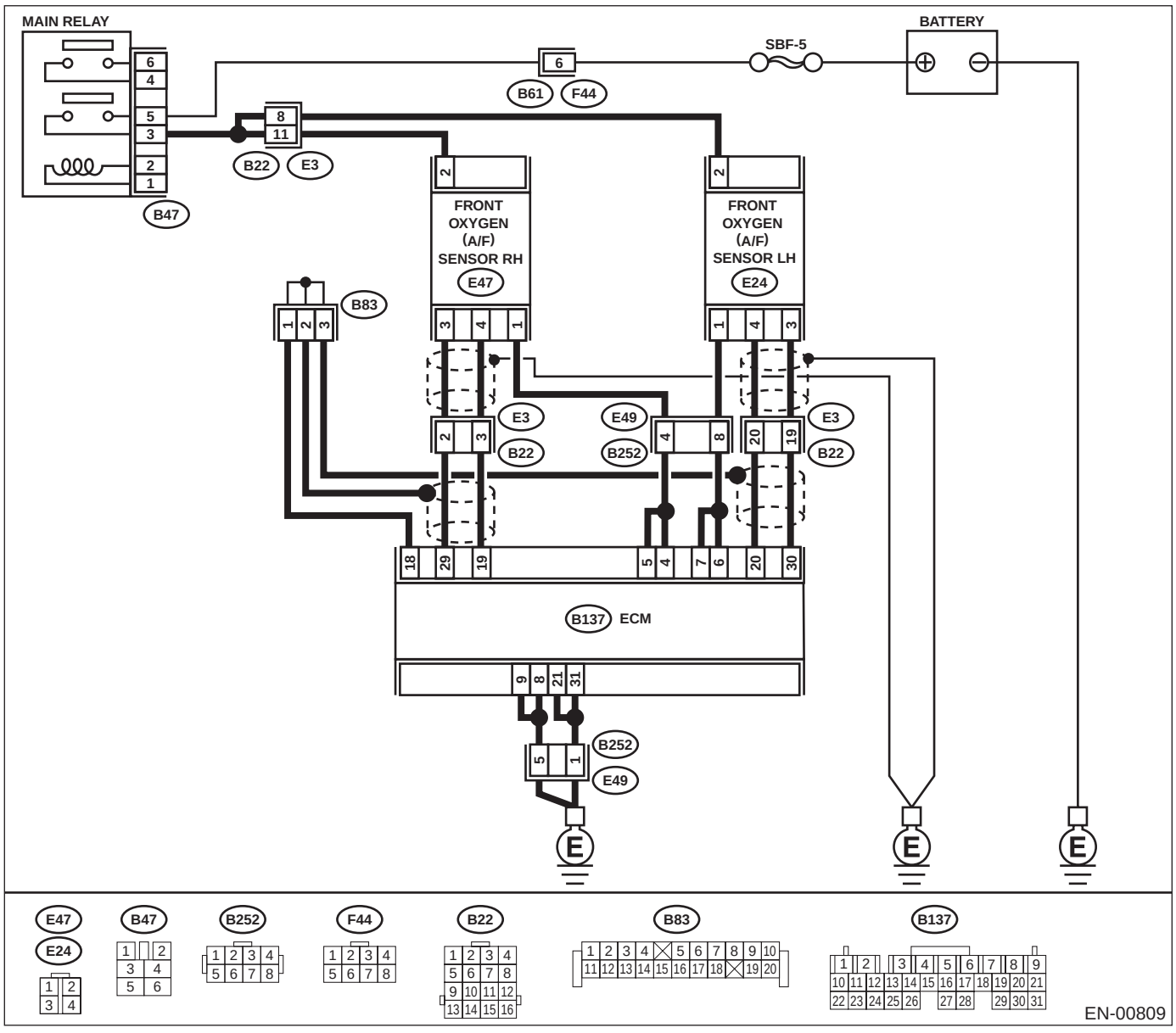
MEMO:

H: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	8 V	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	8 V	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	2.3 A	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):*** Does the voltage change more than the specified value shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	8 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

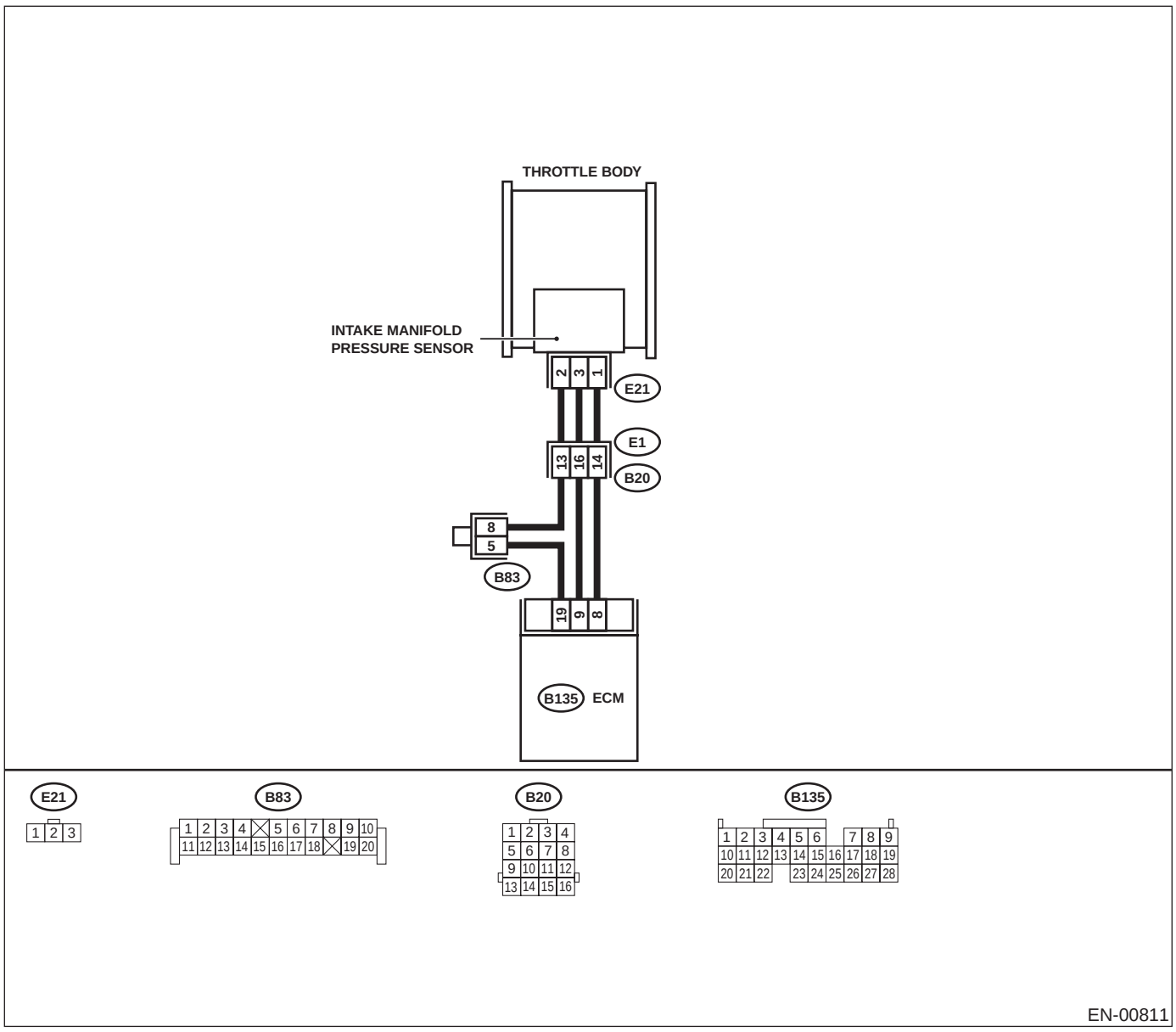
I: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



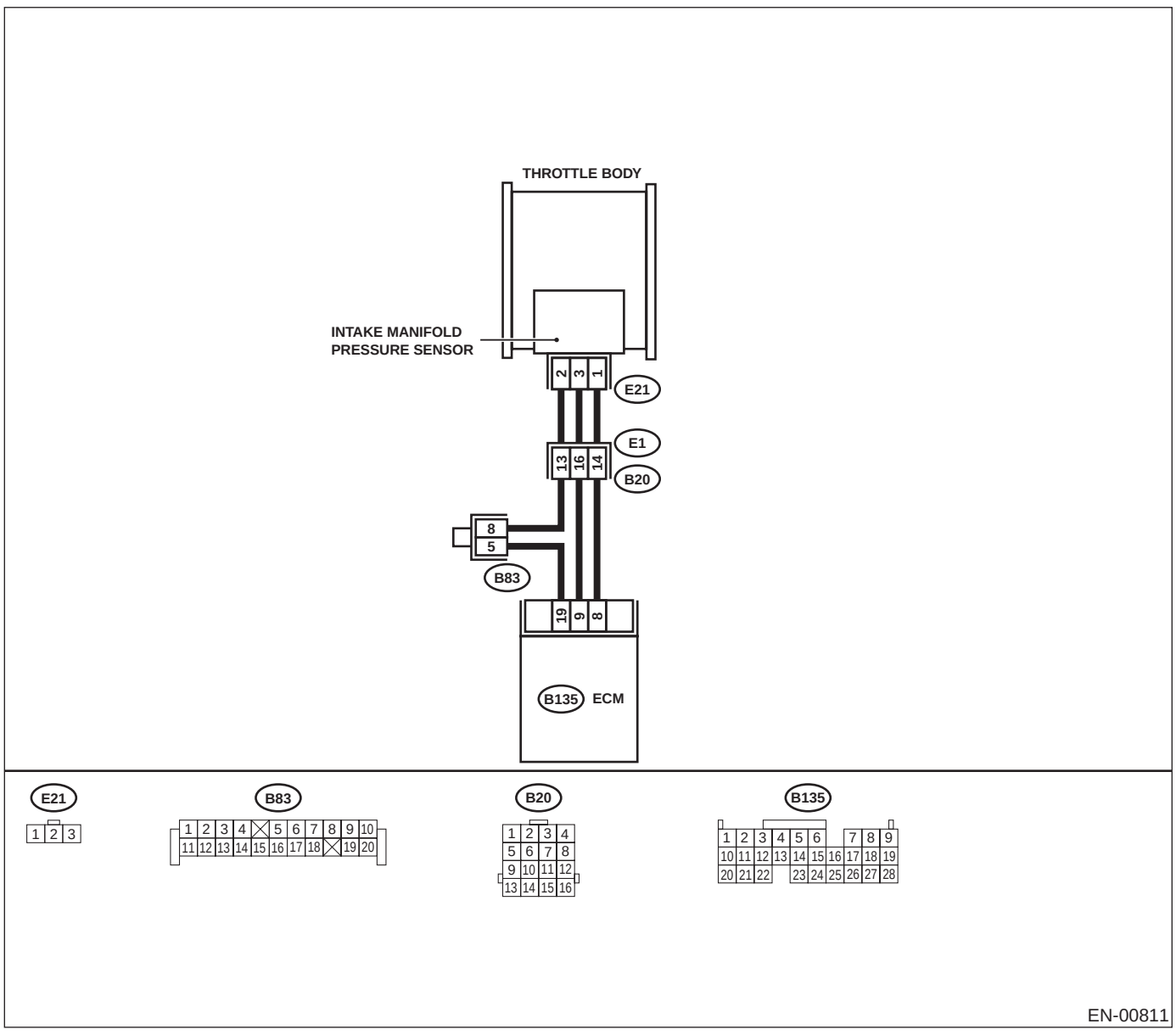
	Step	Value	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. Does the LED of {Idle Switch Signal} come on? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	LED comes on.	Go to step **2.**	Check throttle position sensor circuit. <Ref. to EN(H6DO)-146, DTC P0121 — THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT RANGE/ PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF INTAKE MANIFOLD PRESSURE SENSOR.** Is the intake manifold pressure sensor installation bolt tightened securely?	Tightened securely.	Go to step **4.**	Tighten intake manifold pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.** Is the throttle body installation bolt tightened securely?	Tightened securely.	Go to step **5.**	Tighten throttle body installation bolt securely.
5	**CHECK CONDITION OF EGR VALVE.** Is there any foreign object caught between EGR solenoid valve and intake manifold?	There is a foreign object.	Completely remove foreign object, and install EGR solenoid valve securely to the intake manifold.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00811

	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	1.7 kPa (13 mmHg, 0.51 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?	There is poor contact.	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.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	4.5 V	Repair poor contact in ECM connector.	Contact with SOA service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.7 V	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM.** Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. Does the value change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	1.7 kPa (13 mmHg, 0.51 inHg)	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Value	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **8.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:*** Is the measured value less than the specified value?	1 Ω	Go to step **9.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** Measure resistance of harness between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **10.**	Repair ground short circuit in harness between ECM and intake manifold 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?	There is poor contact.	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

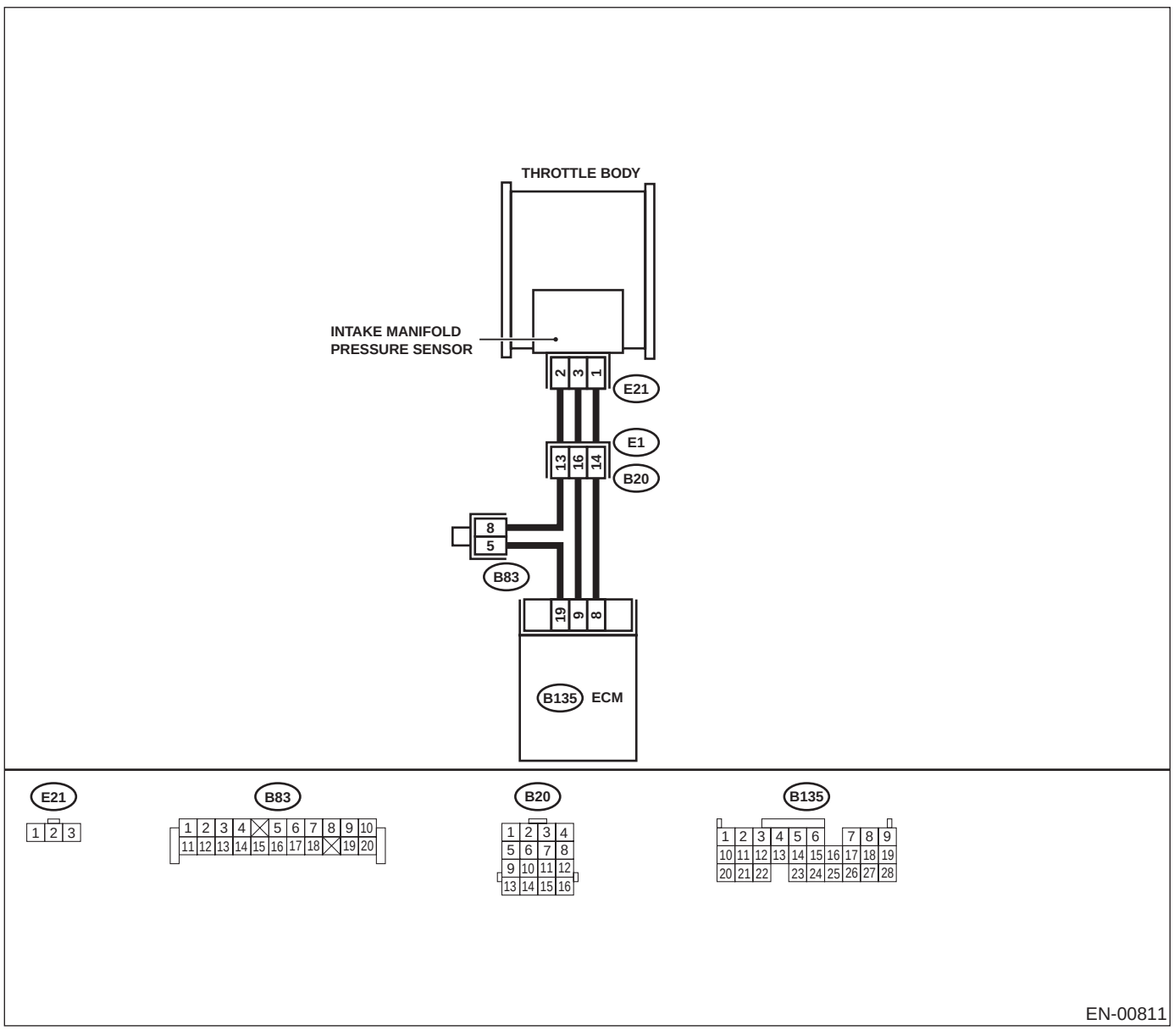
MEMO:

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00811

	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	130 kPa (975 mmHg, 38.39 inHg)	Go to step **10.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	4.5 V	Repair poor contact in ECM connector.	Contact with SOA service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.7 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM.** Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. Does the value change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	1.7 kPa (13 mmHg, 0.51 inHg)	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **7.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
7	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E21) No. 1:*** Is the measured value less than the specified value?	1 Ω	Go to step **8.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:*** Is the measured value less than the specified value?	1 Ω	Go to step **9.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in intake manifold pressure sensor connector. Is there poor contact in intake manifold pressure sensor connector?	There is poor contact.	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

	Step	Value	Yes	No
10	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	130 kPa (975 mmHg, 38.39 inHg)	Repair battery short circuit in harness between ECM and intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

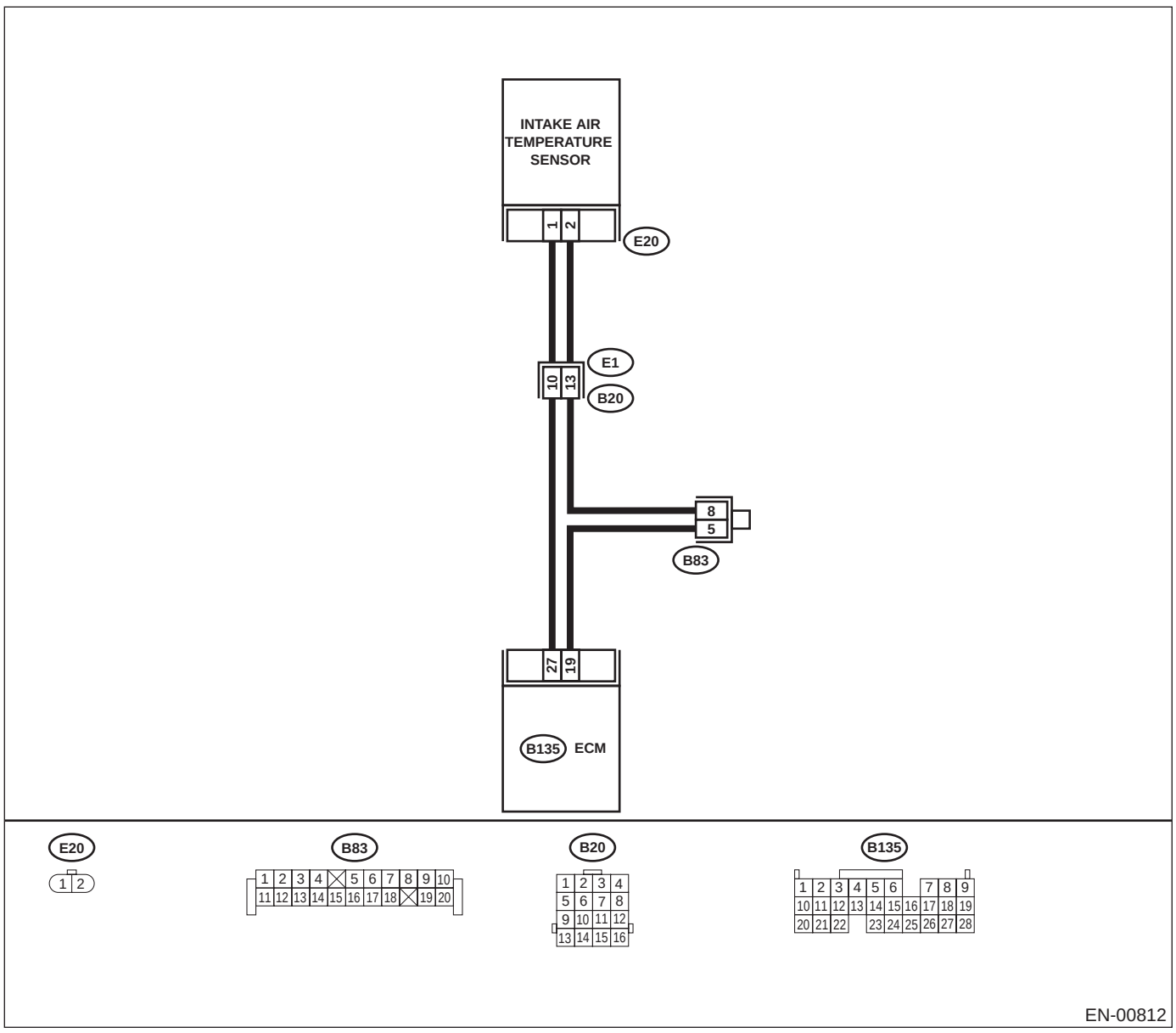
L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

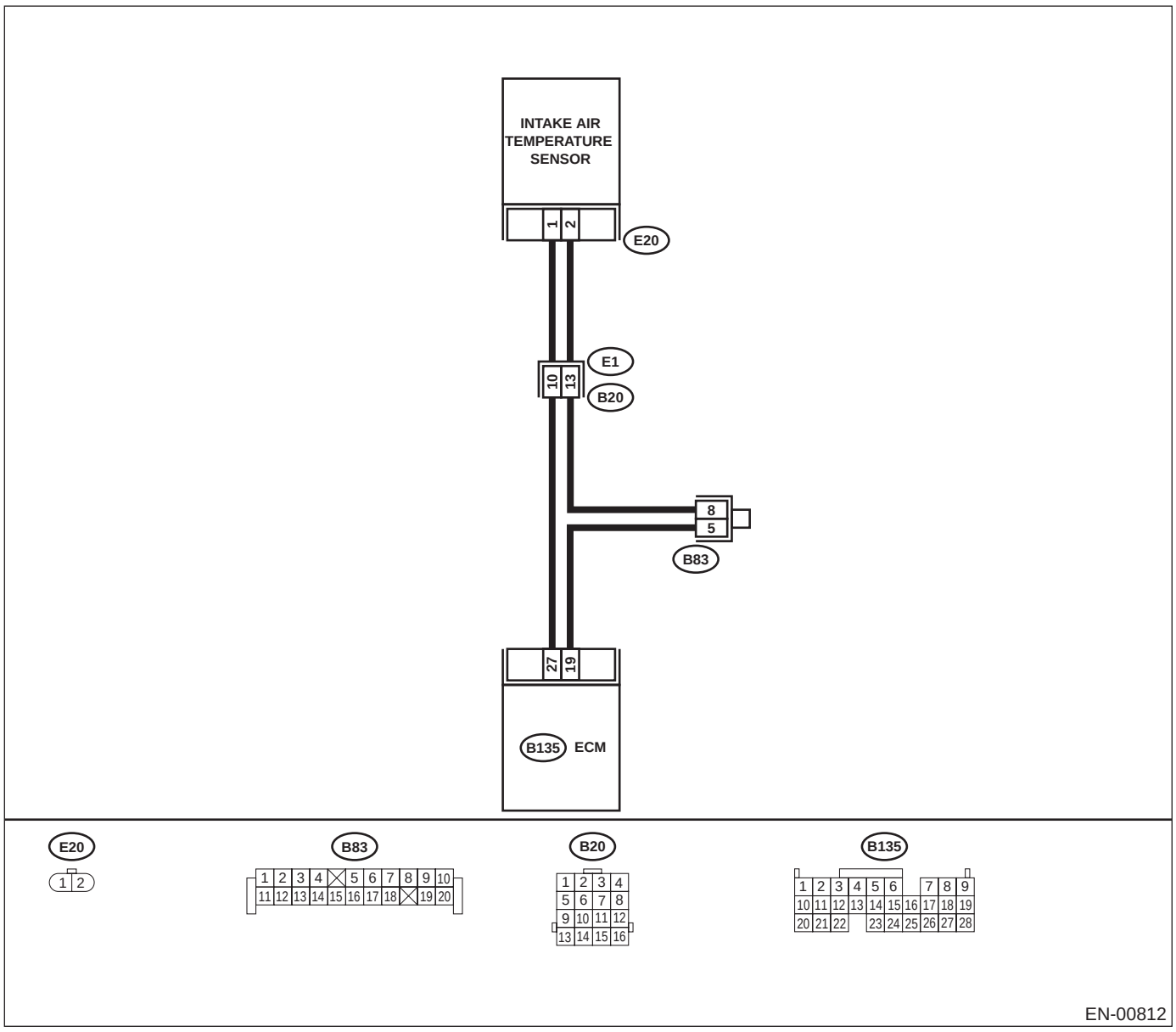
M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	120°C (248°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Turn ignition switch to ON. 4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

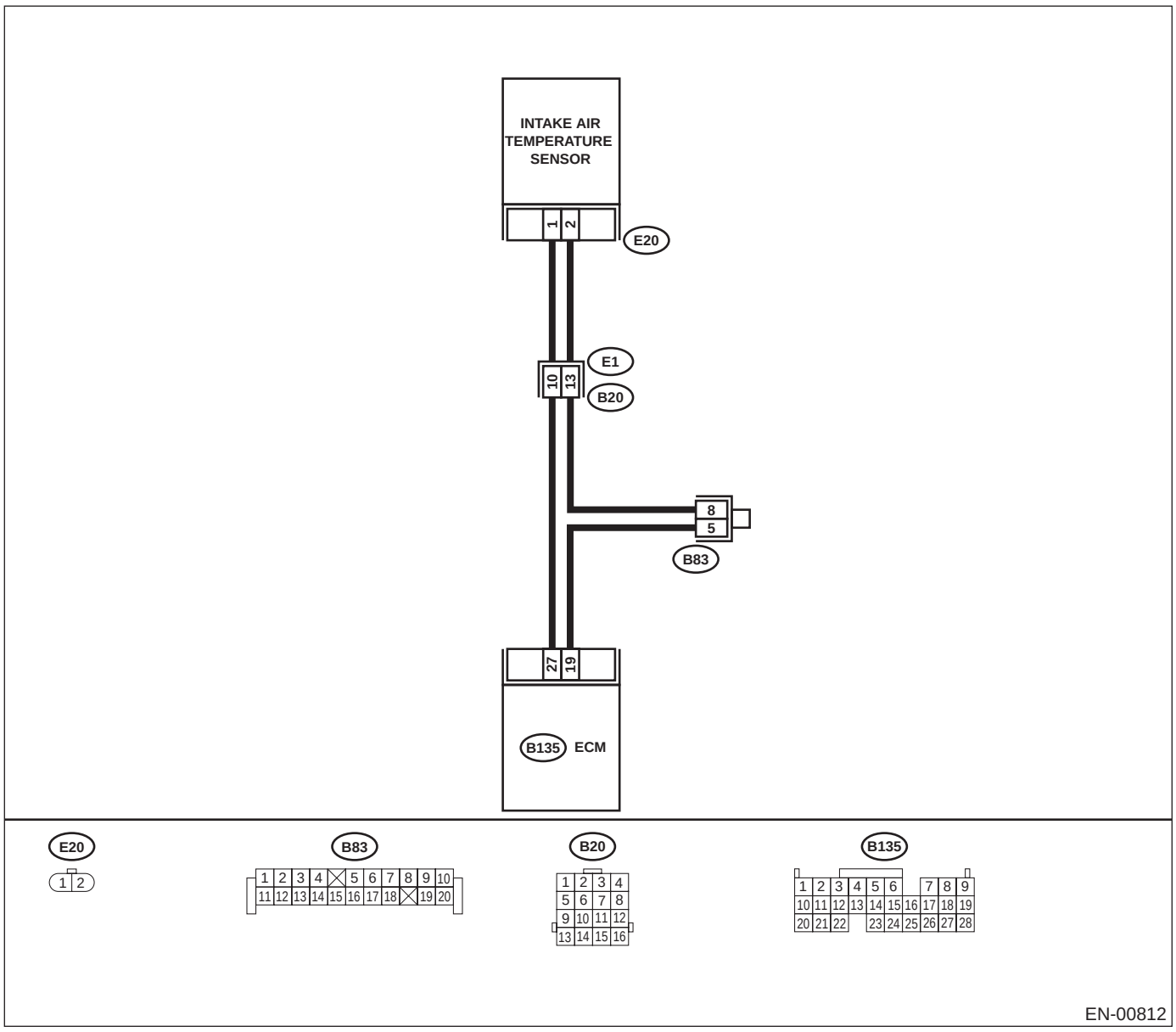
N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to ON. 2) Start engine. 3) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Value	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:*** Is the measured value less than the specified value?	5 Ω	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

MEMO:

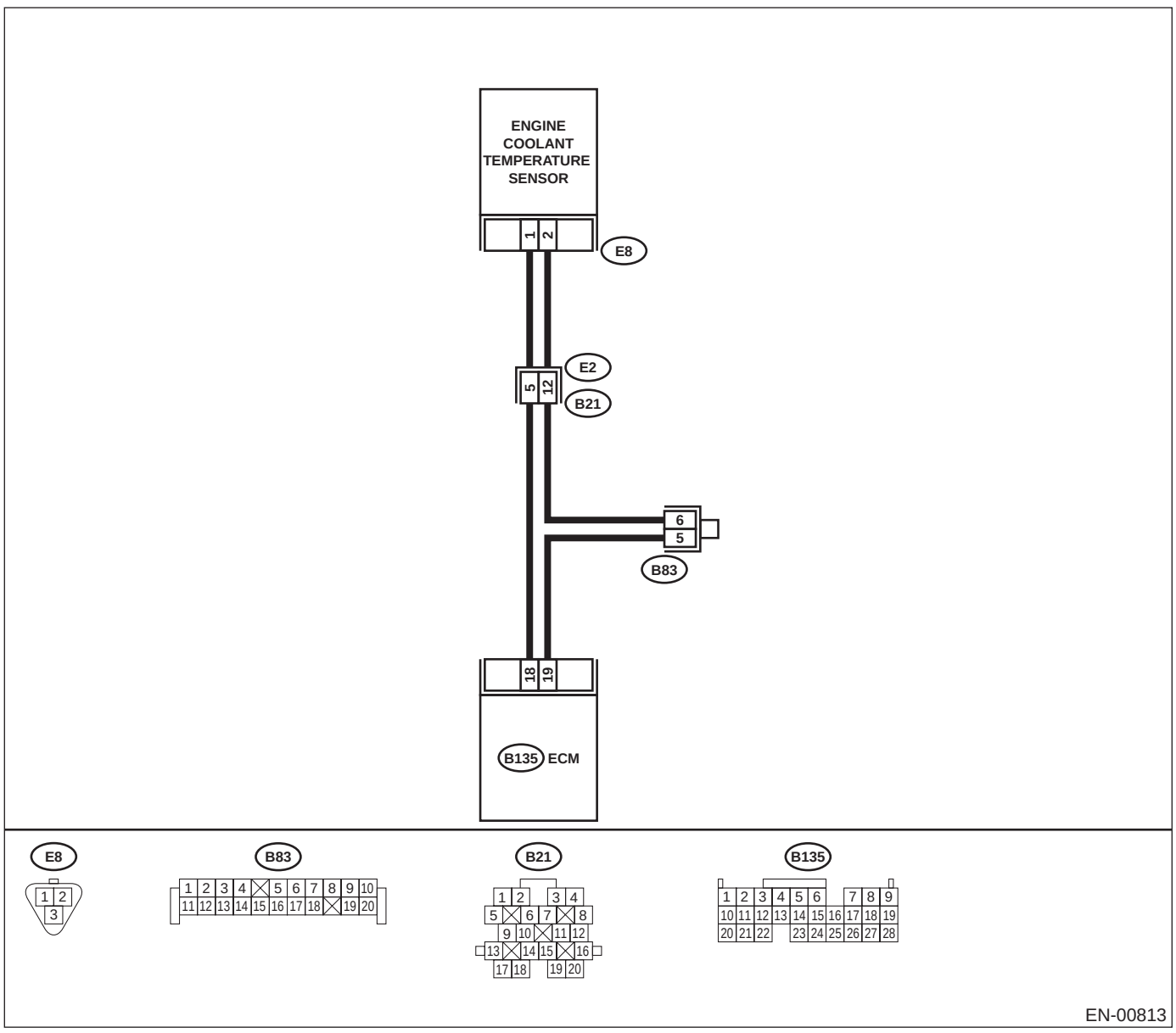
O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



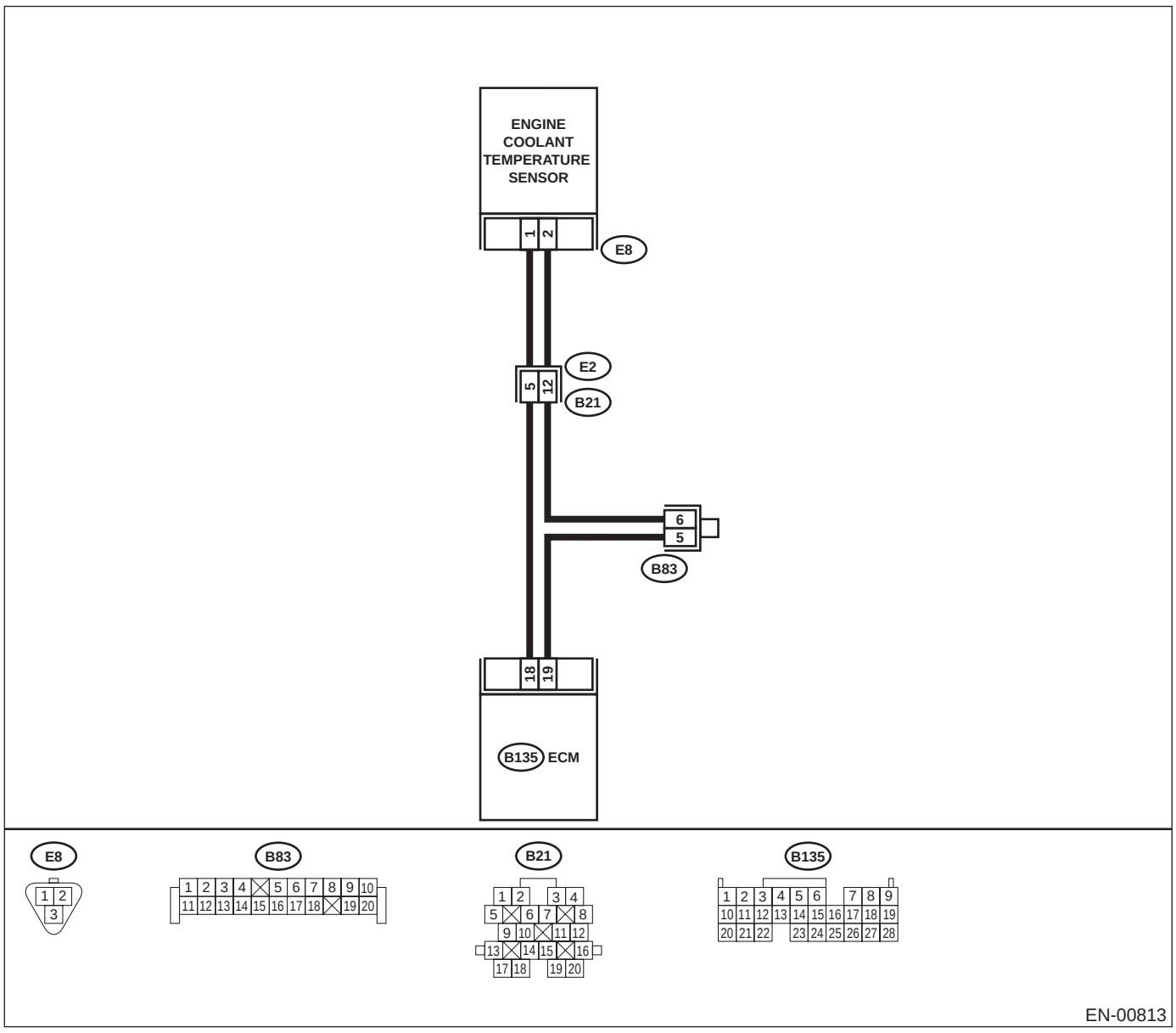
	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	120°C (248°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 • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Turn ignition switch to ON. 4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

P: DTC P0118 — ENGINE COOLANT TEMPERATURE 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–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 • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**

	Step	Value	Yes	No
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in joint connector
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:*** Is the measured value less than the specified value?	5 Ω	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, 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 • Poor contact in joint connector

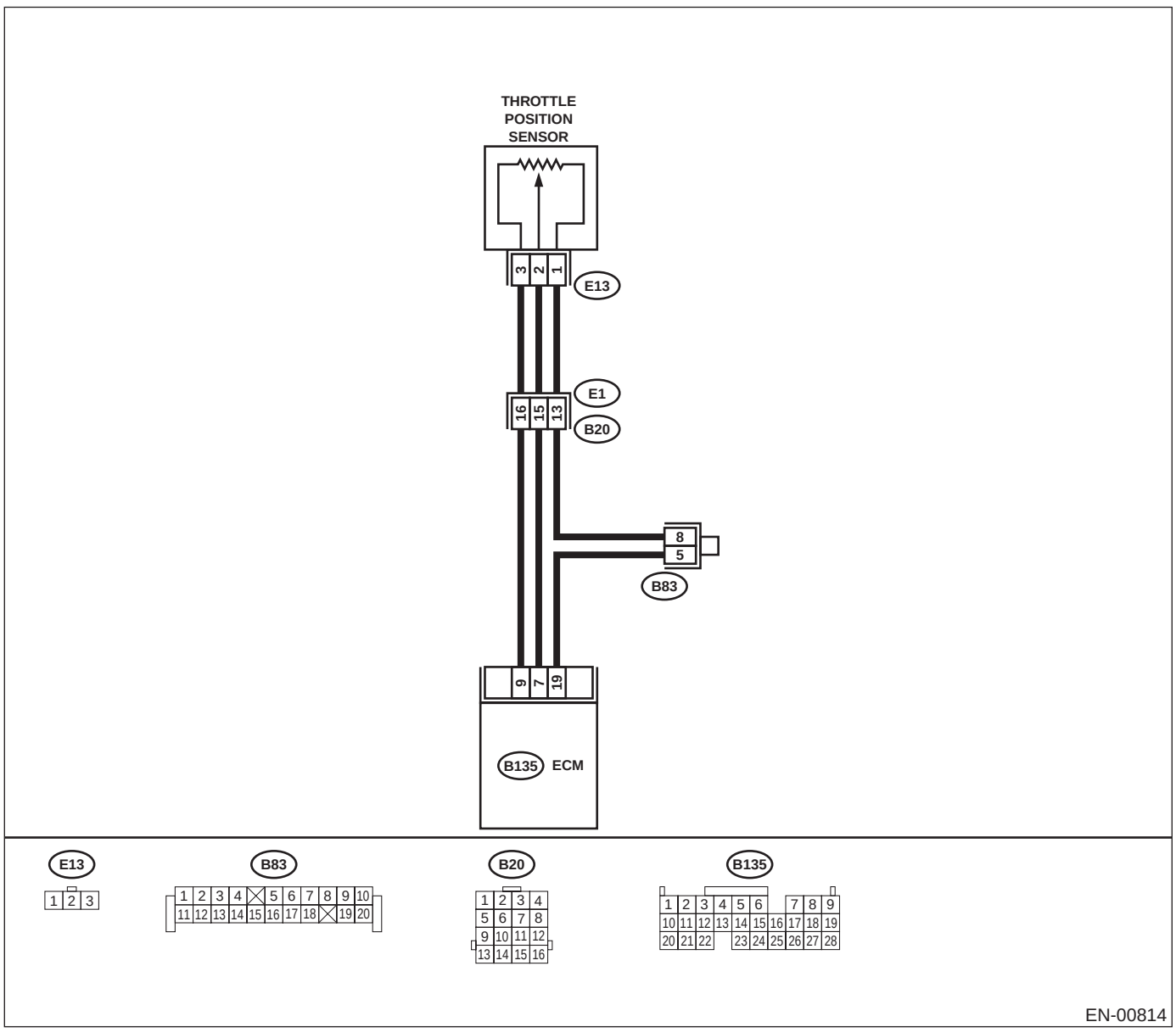
MEMO:

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00814

Step		Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

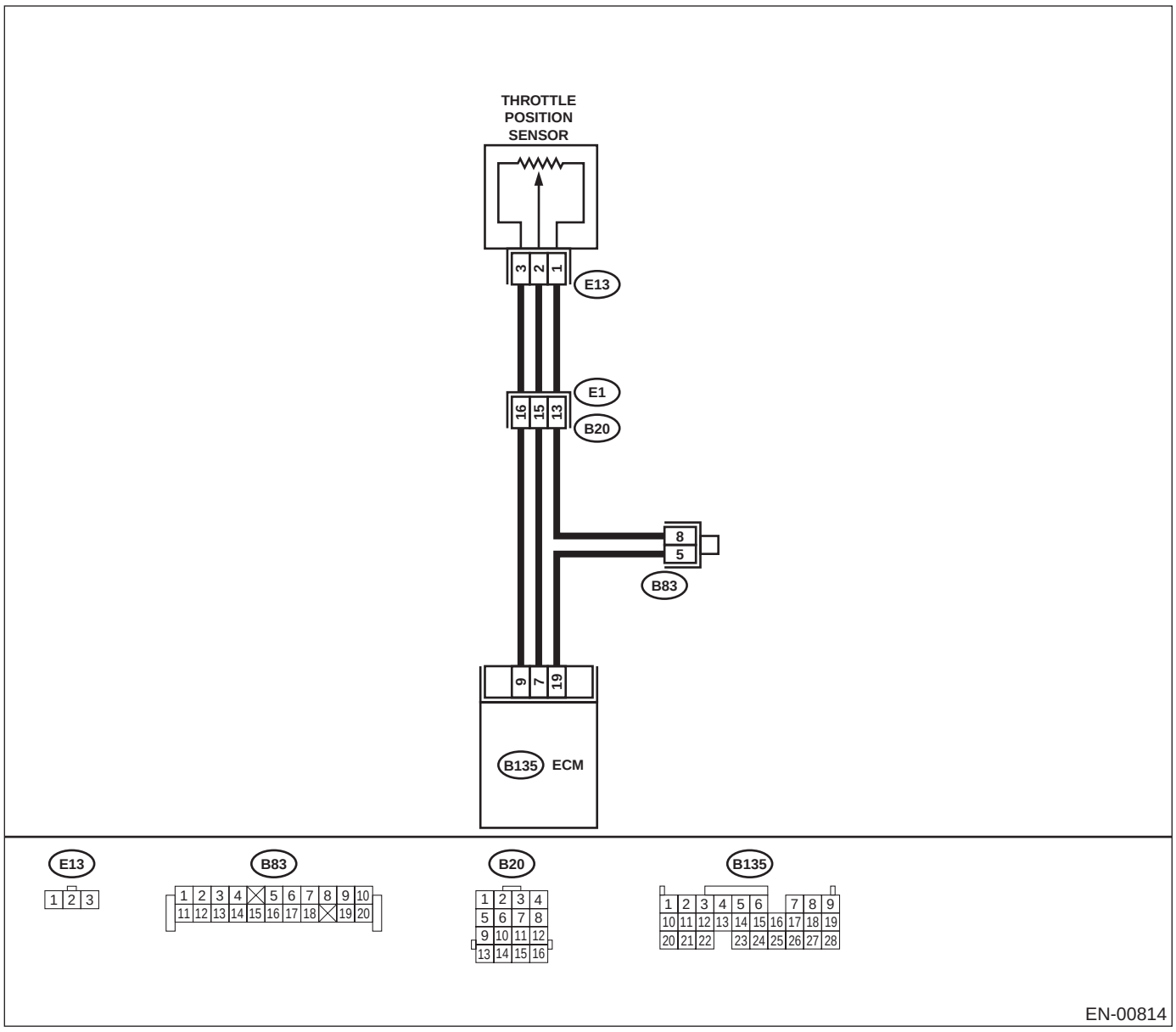
R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	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
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	4.5 V	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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.1 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure voltage between ECM connector and chassis ground. Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?	0.1 V	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from throttle position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (E13) No. 3:*** Is the measured value less than the specified value?	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
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

MEMO:

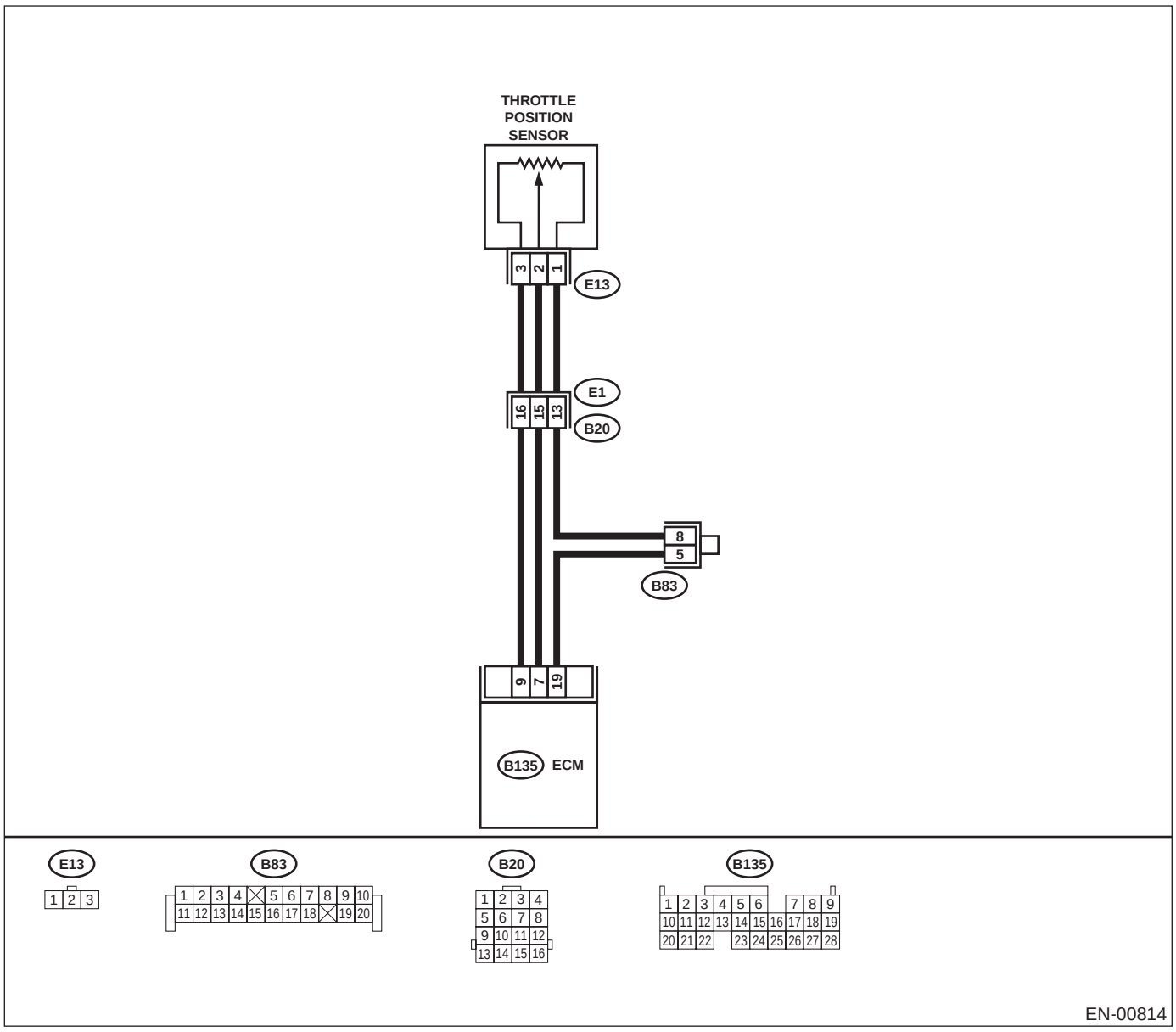
S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



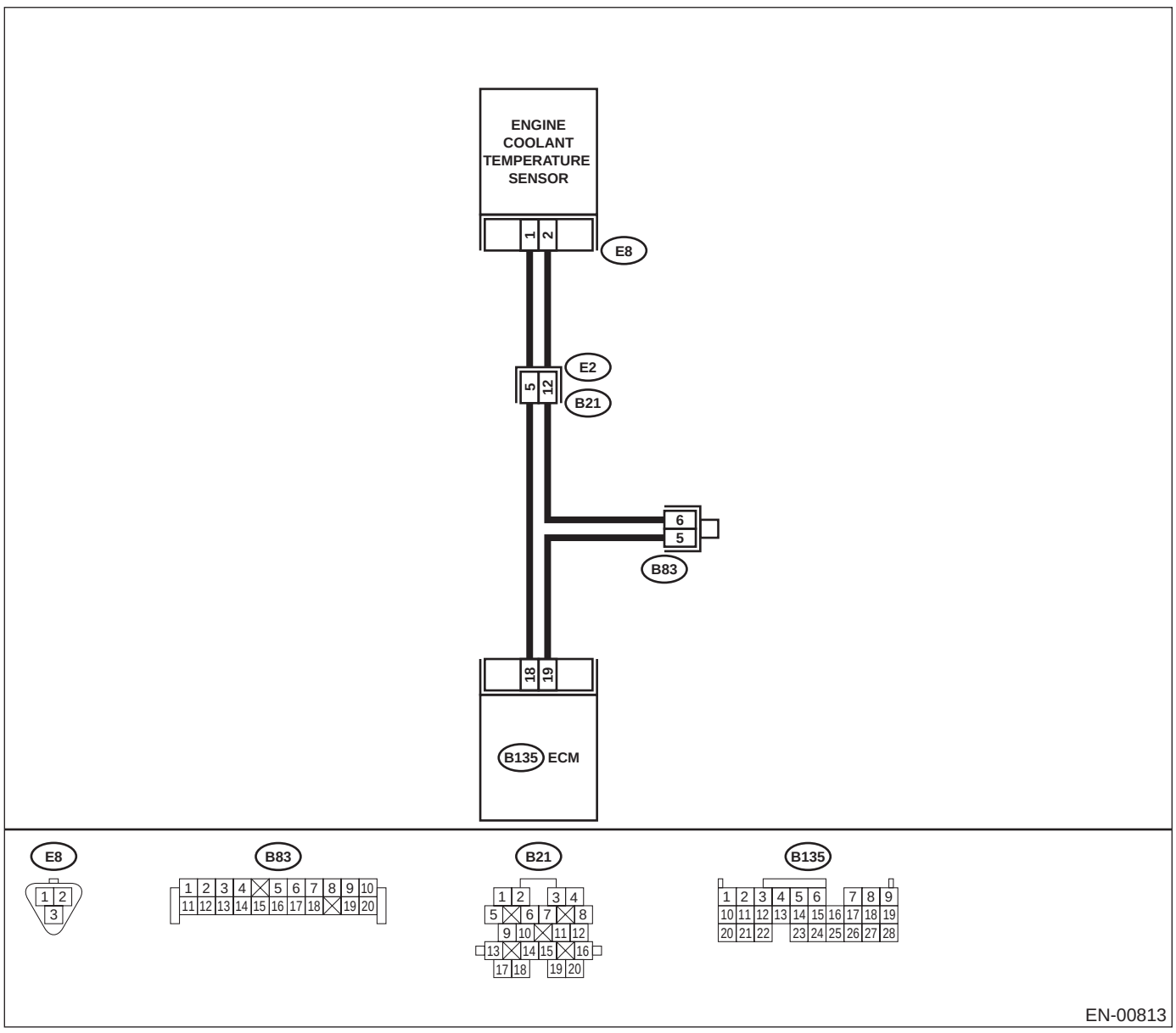
	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	4.75 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
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from throttle position sensor. 3) Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:*** Is the measured value less than the specified value?	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 • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	4.9 V	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine does not return to idle.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK TIRE SIZE.** Is the tire size the same as designated tire and four-wheel tire?	Same.	Go to step **3.**	Replace tire.
3	**CHECK ENGINE COOLANT.** Check the following items. • Engine coolant volume • Engine coolant freezing • Contamination in engine coolant Is the engine coolant normal?	Normal.	Go to step **4.**	Refill or replace coolant. <Ref. to CO(H6DO)-23, INSPECTION, Engine Coolant.>
4	**CHECK THERMOSTAT.** Does thermostat remain open?	Remains open.	Replace thermostat. <Ref. to CO(H6DO)-25, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

U: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Value	Yes	No
1	**CHECK VEHICLE CONDITION.** Has engine operated or has vehicle been driven with engine submerged under water?	Engine has operated or vehicle has been driven with engine submerged under water.	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	DTC indicated.	Go to step **3.**	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
3	**CHECK TIRE SIZE.** Is the tire size the same as designated tire and four wheel tire?	Same.	Go to step **4.**	Replace tire.
4	**CHECK ENGINE COOLANT.** Check the following items: • Engine coolant for level • Engine coolant for icing • Engine coolant for dirt Is condition of engine coolant OK?	OK.	Go to step **5.**	Replace engine coolant. <Ref. to CO(H6DO)-22, REPLACEMENT, Engine Coolant.>
5	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation. Does radiator fan continuously rotate for more than 3 minutes during idling?	Continously rotates.	Repair radiator fan circuit. <Ref. to CO(H6DO)-32, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6DO)-35, Radiator Sub Fan and Fan Motor.>	Replace thermostat. <Ref. to CO(H6DO)-25, Thermostat.>

V: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

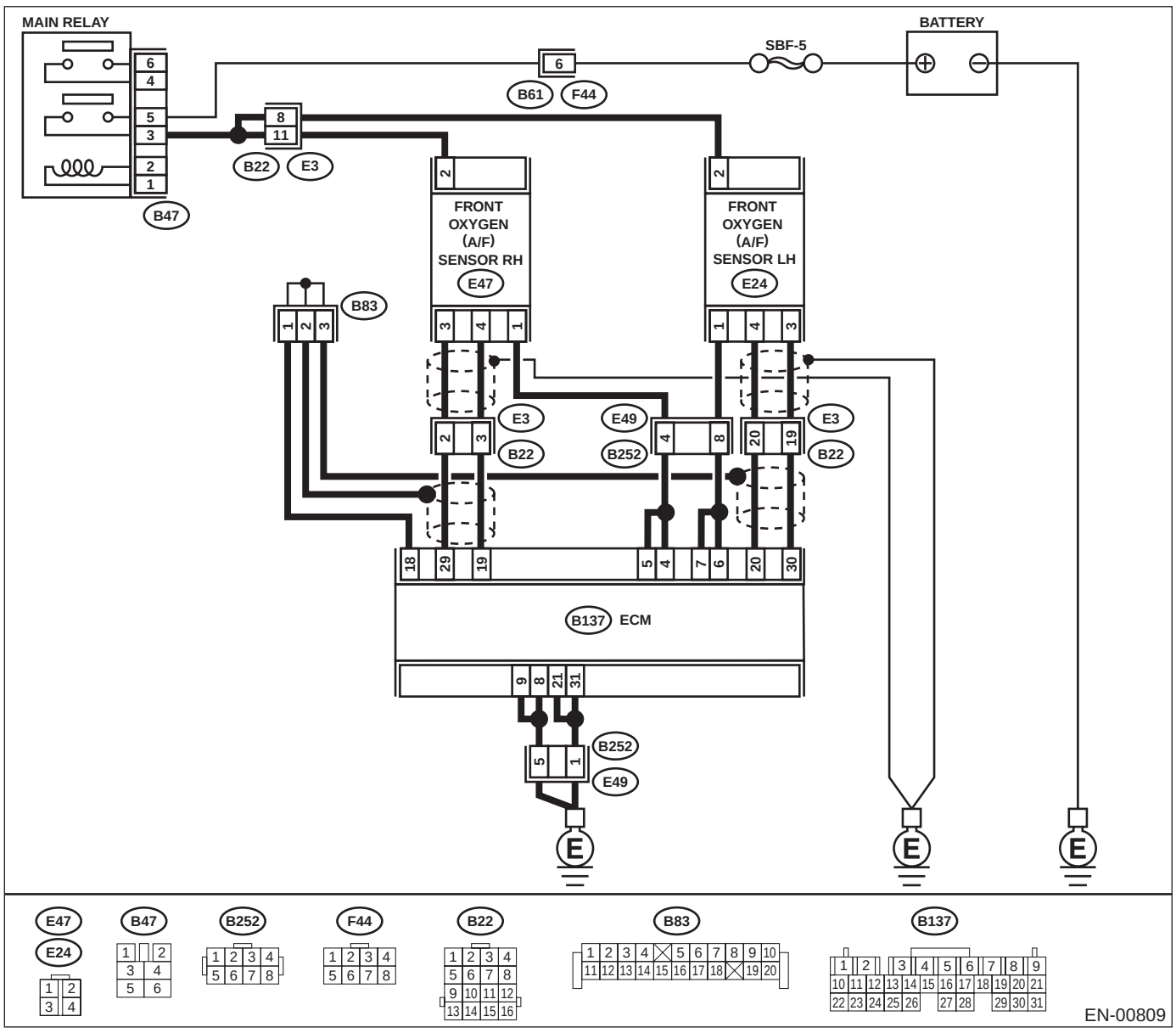
Step		Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

W: DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:*** Does the measured value exceed the specified value?	10 Ω	Go to step **2.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 — Chassis ground:*** Does the measured value exceed the specified value?	10 Ω	Go to step **3.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.95 V	Go to step **6.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

	Step	Value	Yes	No
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

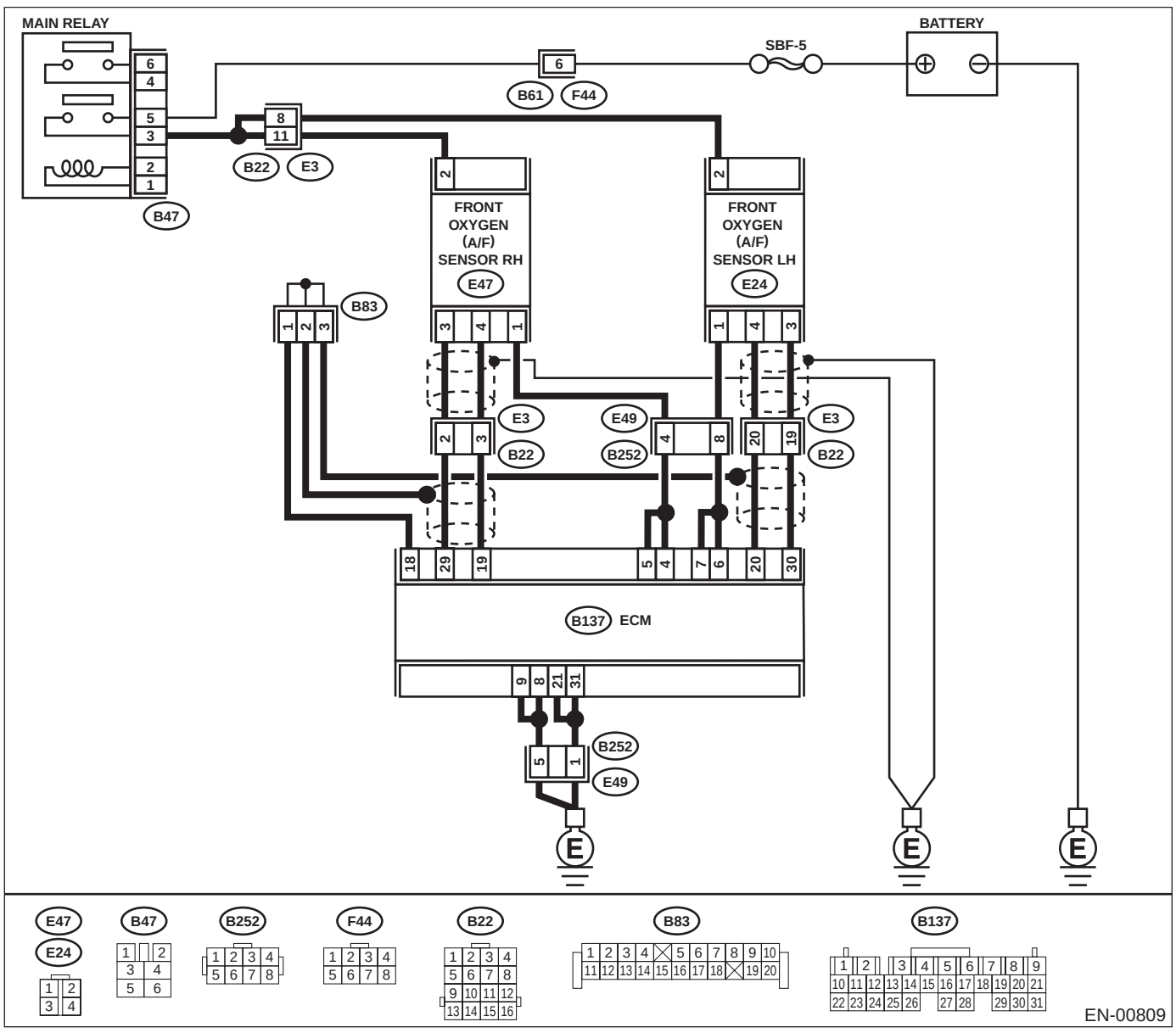
MEMO:

X: DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



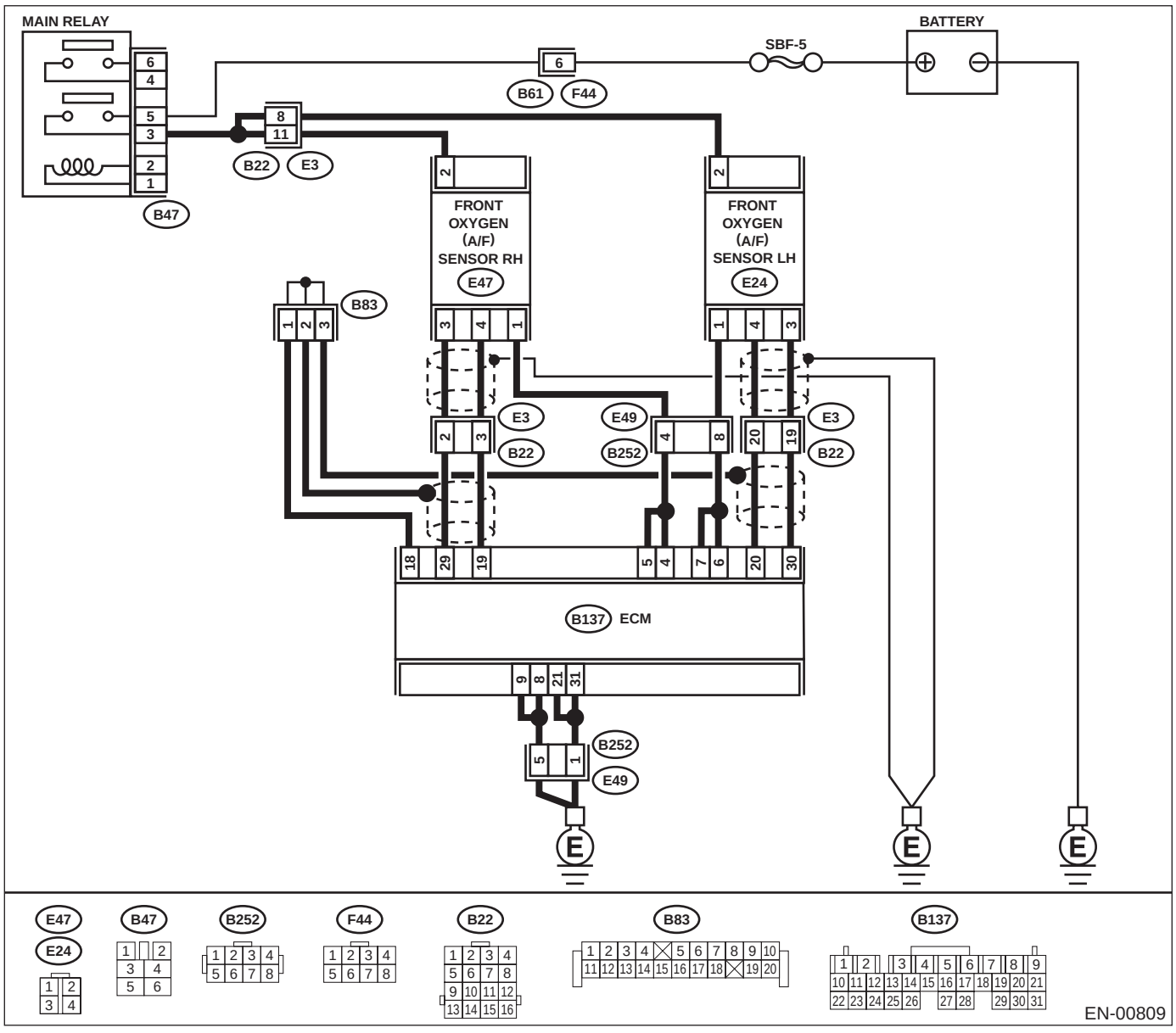
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	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 (RH side) • Damage of exhaust pipe resulting in a hole Is there a fault in exhaust system?	There is a malfunction.	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

Y: DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:*** Is the measured value less than the specified value?	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 HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	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
3	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?	There is poor contact.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

Z: DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

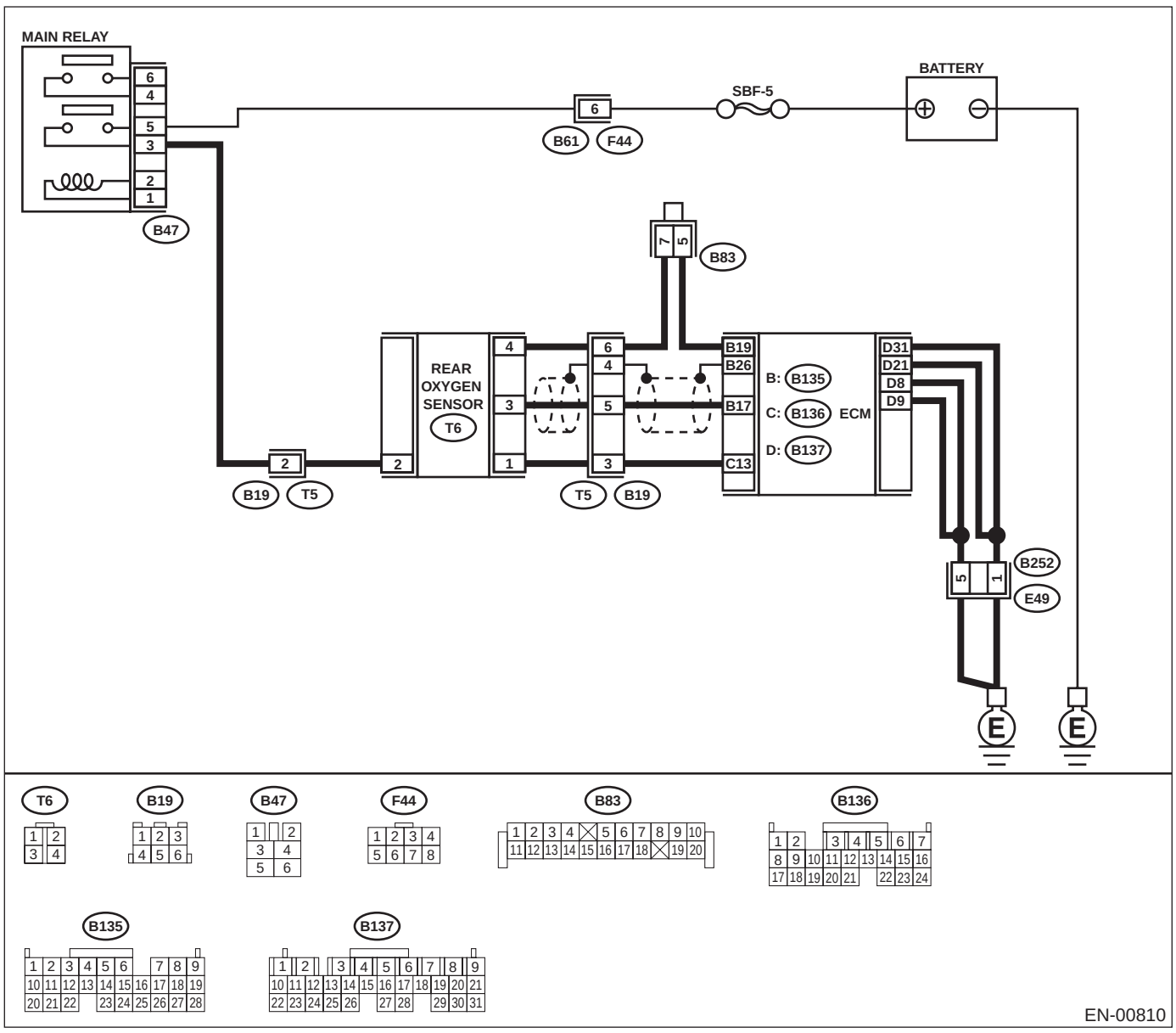
NOTE:
For diagnostic procedure, refer to DTC P0138.
<Ref. to EN(H6DO)-166, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC is displayed?	Another DTC is displayed.	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**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 data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the value fluctuate? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Value fluctuates.	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool. Is the measured value within the specified range?	Output maximum value 0.49 V or more and output minimum value 0.25 V or less.	Go to step **4.**	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (T6) No. 4:*** Does the measured value exceed the specified value?	3 Ω	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	0.2 V	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen 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		Value	Yes	No
6	**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?	There is a trouble.	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

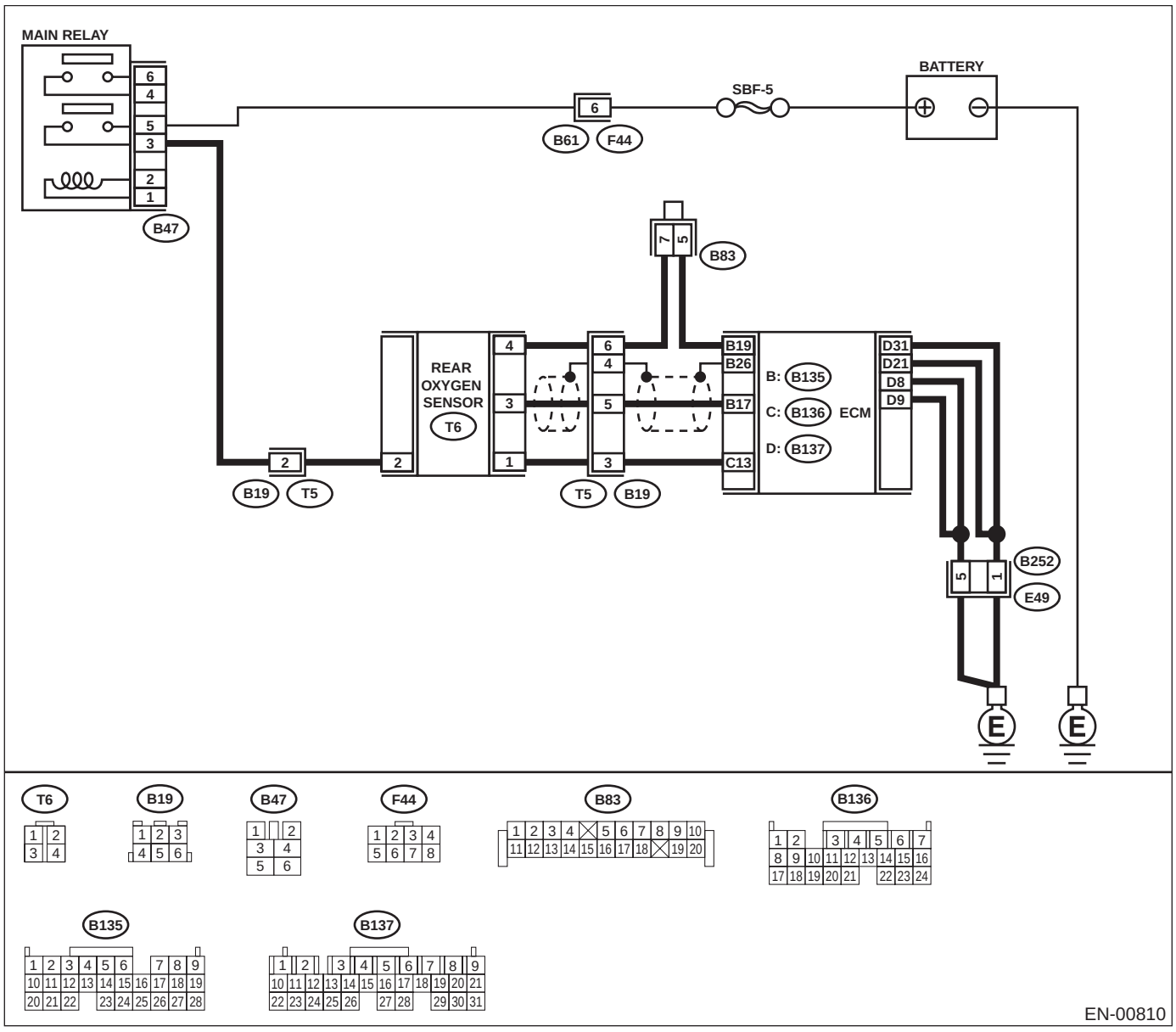
MEMO:

AB:DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



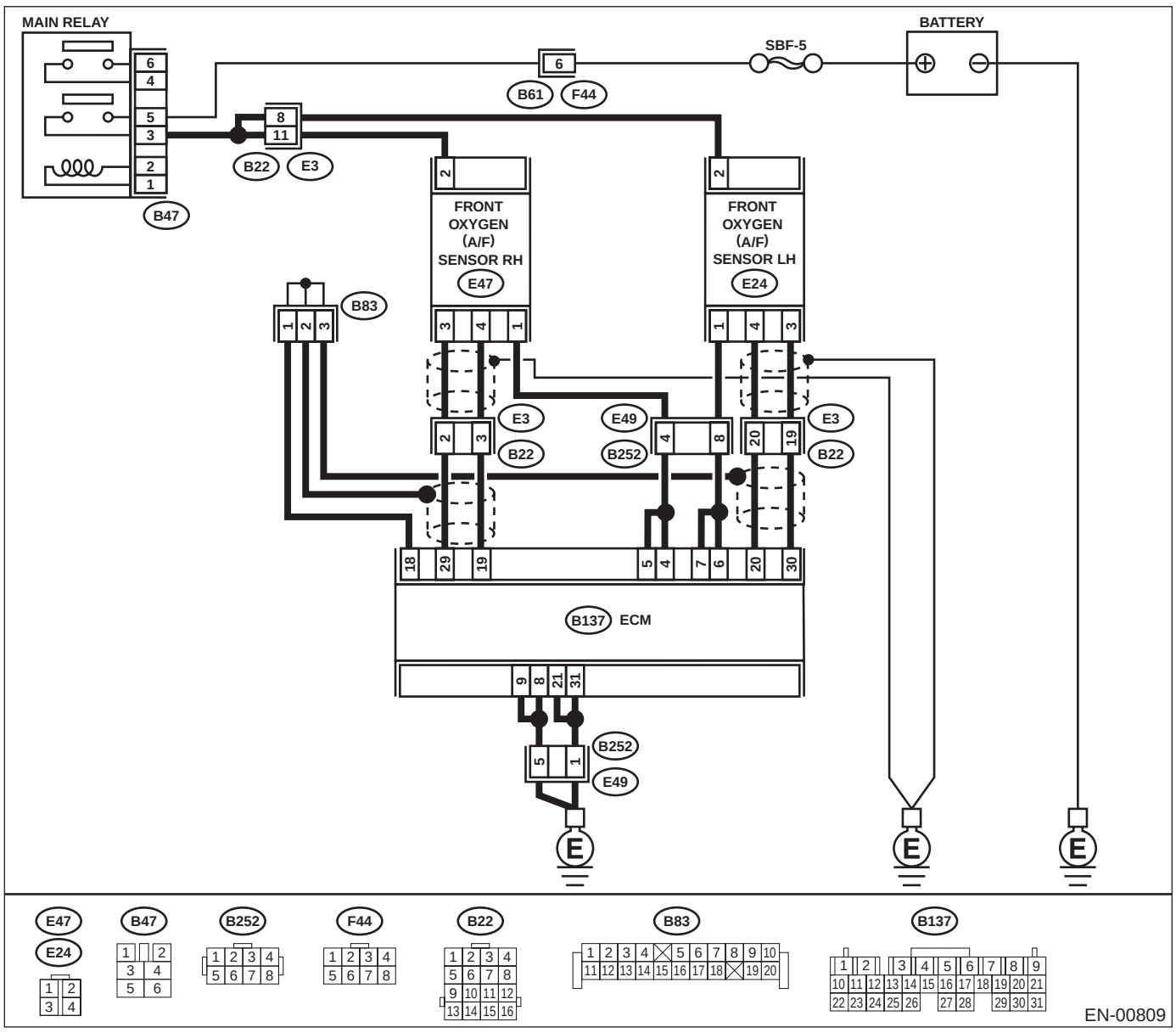
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

AC:DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 — Chassis ground:*** Does the measured value exceed the specified value?	10 Ω	Go to step **2.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 — Chassis ground:*** Does the measured value exceed the specified value?	10 Ω	Go to step **3.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.95 V	Go to step **6.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

	Step	Value	Yes	No
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

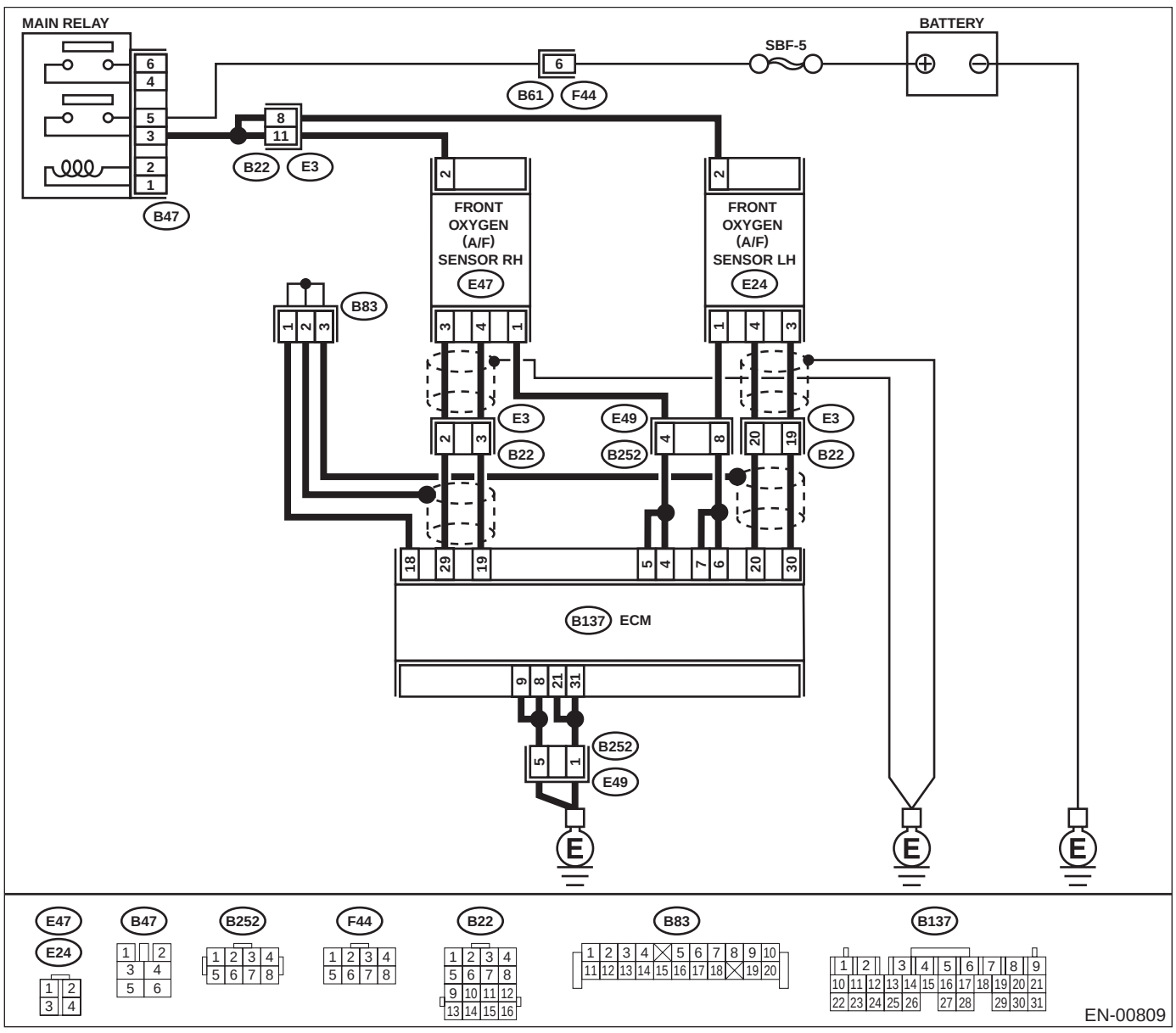
MEMO:

AD:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



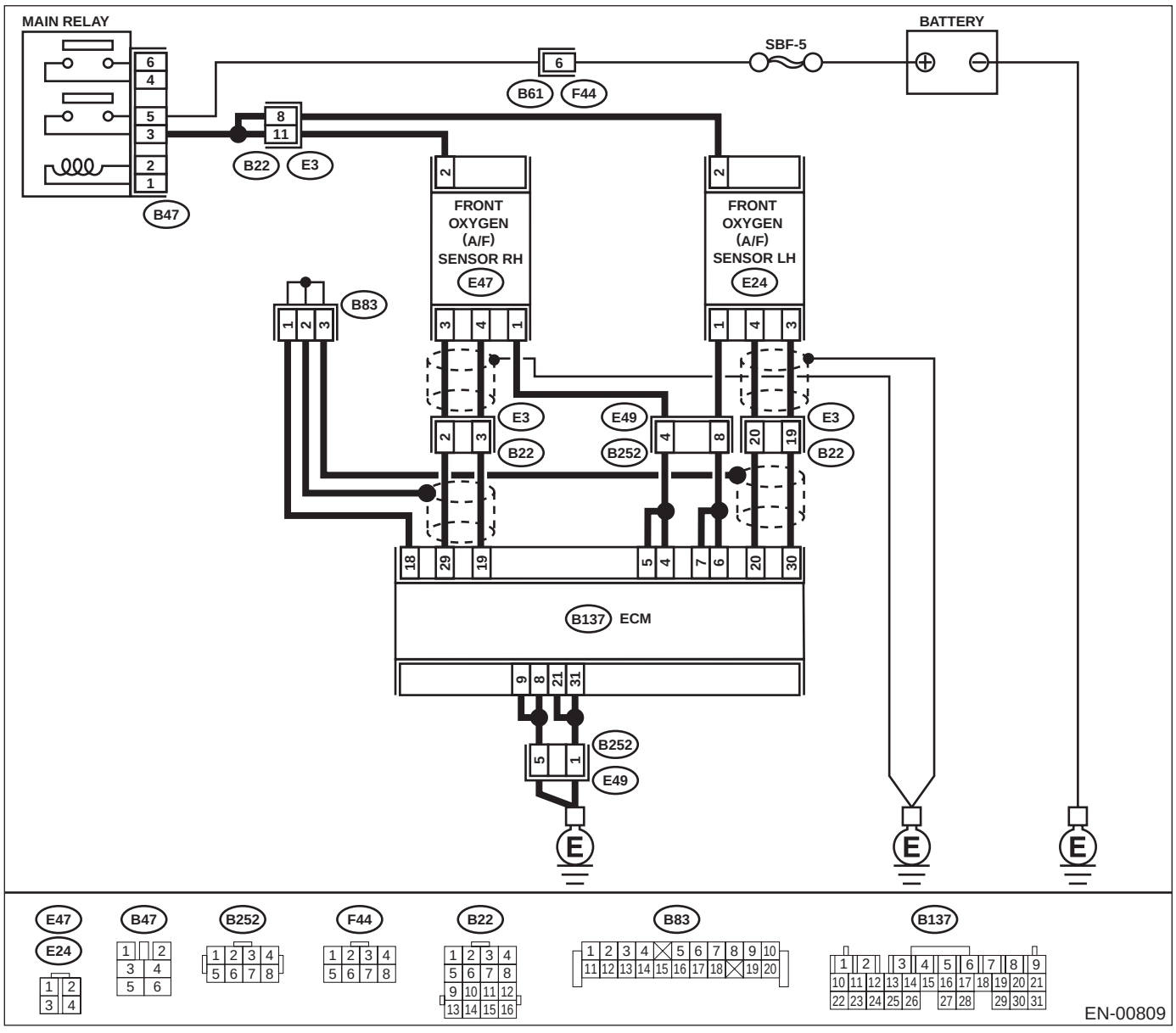
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0153.	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 (RH side) • Damage of exhaust pipe resulting in a hole Is there a fault in exhaust system?	There is a trouble.	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

AE:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E24) No. 4:*** Is the measured value less than the specified value?	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 HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 30 — (E24) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	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
3	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector. Is there poor contact in front oxygen (A/F) sensor connector?	There is poor contact.	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

AF:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H6DO)-180, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AG:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Are there holes or loose bolts on exhaust system?	Holes or loose bolts are found.	Repair exhaust system.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.** Are there holes, loose bolts or disconnection of hose on air intake system?	Holes, loose bolts or disconnection of hose is found.	Repair air intake system.	Go to step **4.**

	Step	Value	Yes	No
4	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect 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 ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified range? **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)	Go to step **5.**	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
5	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified range? **Warning:** **Before removing fuel pressure gauge, lower 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.	206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)	Go to step **6.**	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
6	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove right bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector Is fuel injector clogged?	Fuel injector is clogged.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **7.**
7	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2*** Is the measured value within the specified range?	5 — 20 Ω	Go to step **8.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>

	Step	Value	Yes	No
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	75°C (167°F)	Go to step **9.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
9	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg), Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **10.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

	Step	Value	Yes	No
10	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is value within the specified range when ambient temperature is subtracted from intake air temperature greater than –10°C (14°F) and less than 50°C (122°F)? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–10 — 50°C (14 — 122°F)	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

AH:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:
For the diagnostic procedure, refer to DTC P0175. <Ref. to EN(H6DO)-184, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0175 — SYSTEM TOO RICH (BANK 2) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Are there holes or loose bolts on exhaust system?	Holes or loose bolts are found.	Repair exhaust system.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.** Are there holes, loose bolts or disconnection of hose on air intake system?	Holes, loose bolts or disconnection of hose is found.	Repair air intake system.	Go to step **4.**

	Step	Value	Yes	No
4	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect 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 ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Is the measured value within the specified range? **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)	Go to step **5.**	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
5	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. Is the measured value within the specified range? **Warning:** **Before removing fuel pressure gauge, lower 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.	206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)	Go to step **6.**	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
6	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove left bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector. Is fuel injector clogged?	Fuel injector is clogged.	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **7.**

	Step	Value	Yes	No
7	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2*** Is the measured value within the specified range?	5 — 20 Ω	Go to step **8.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	75°C (167°F)	Go to step **9.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
9	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg), Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **10.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

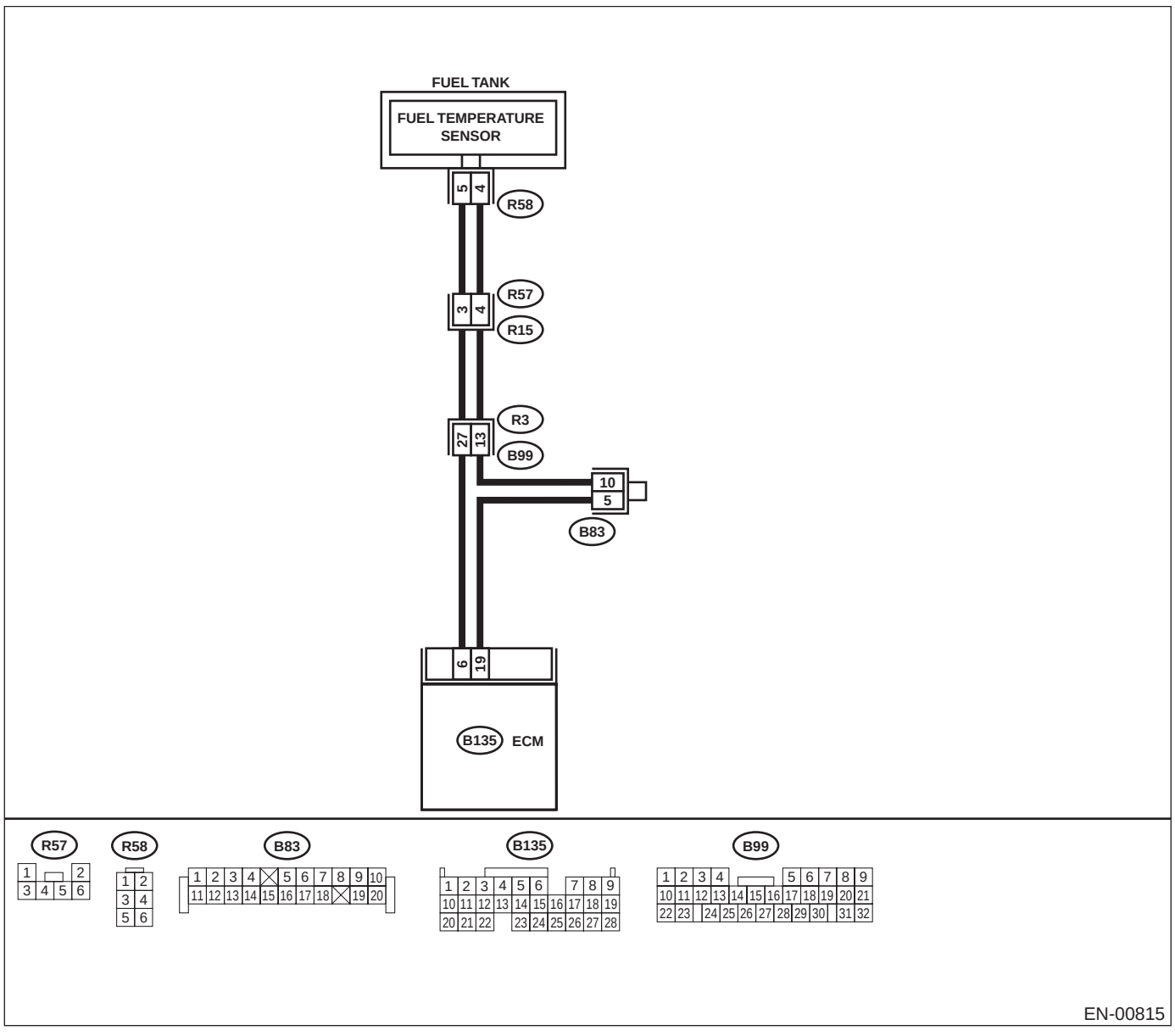
	Step	Value	Yes	No
10	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is value the specified range when ambient temperature is subtracted from intake air temperature? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	–10 — 50°C (14 — 122°F)	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

AJ:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

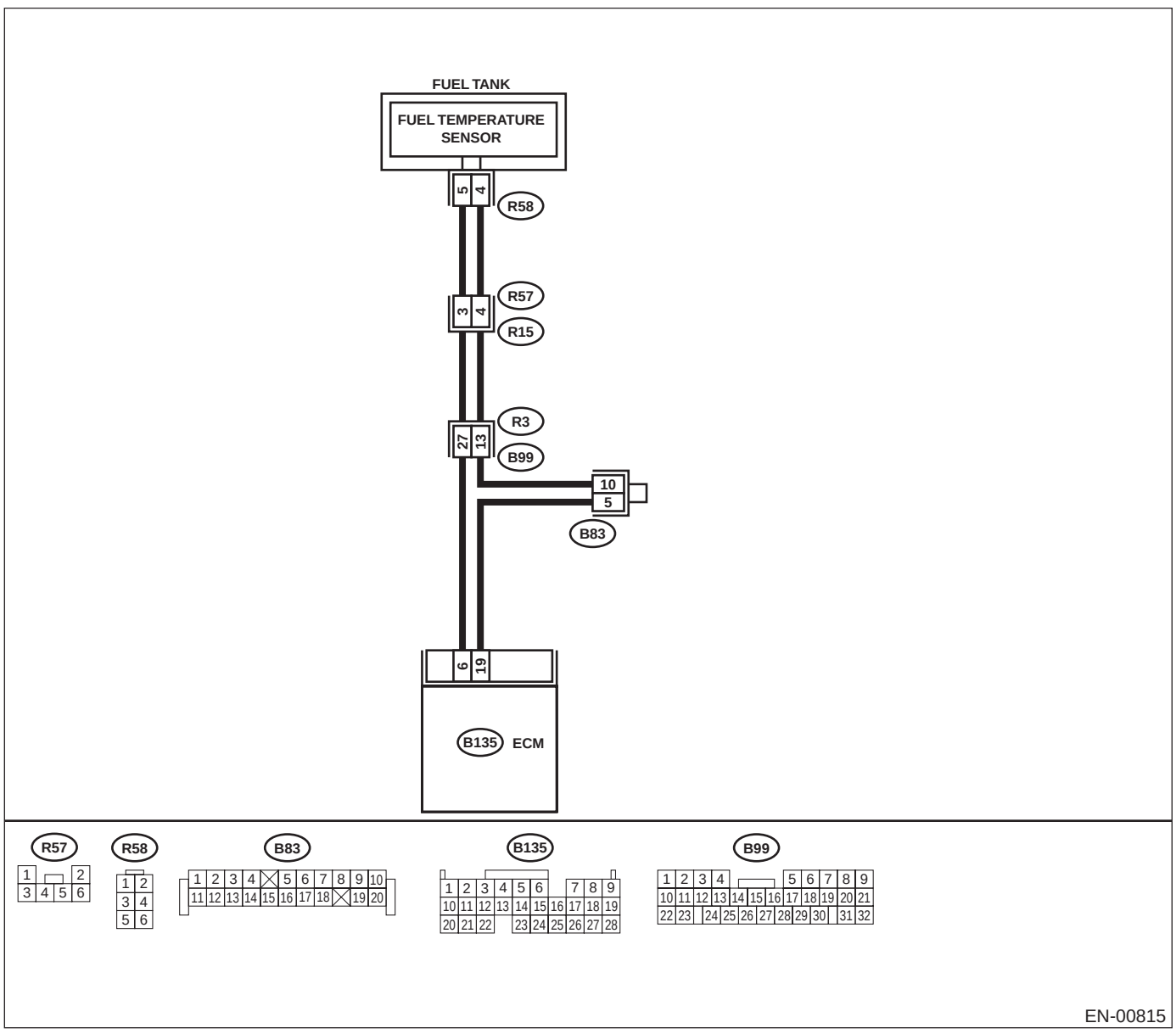
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace fuel temperature sensor. <Ref. to EC(H6DO)-12, Fuel Temperature Sensor.>

AK: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



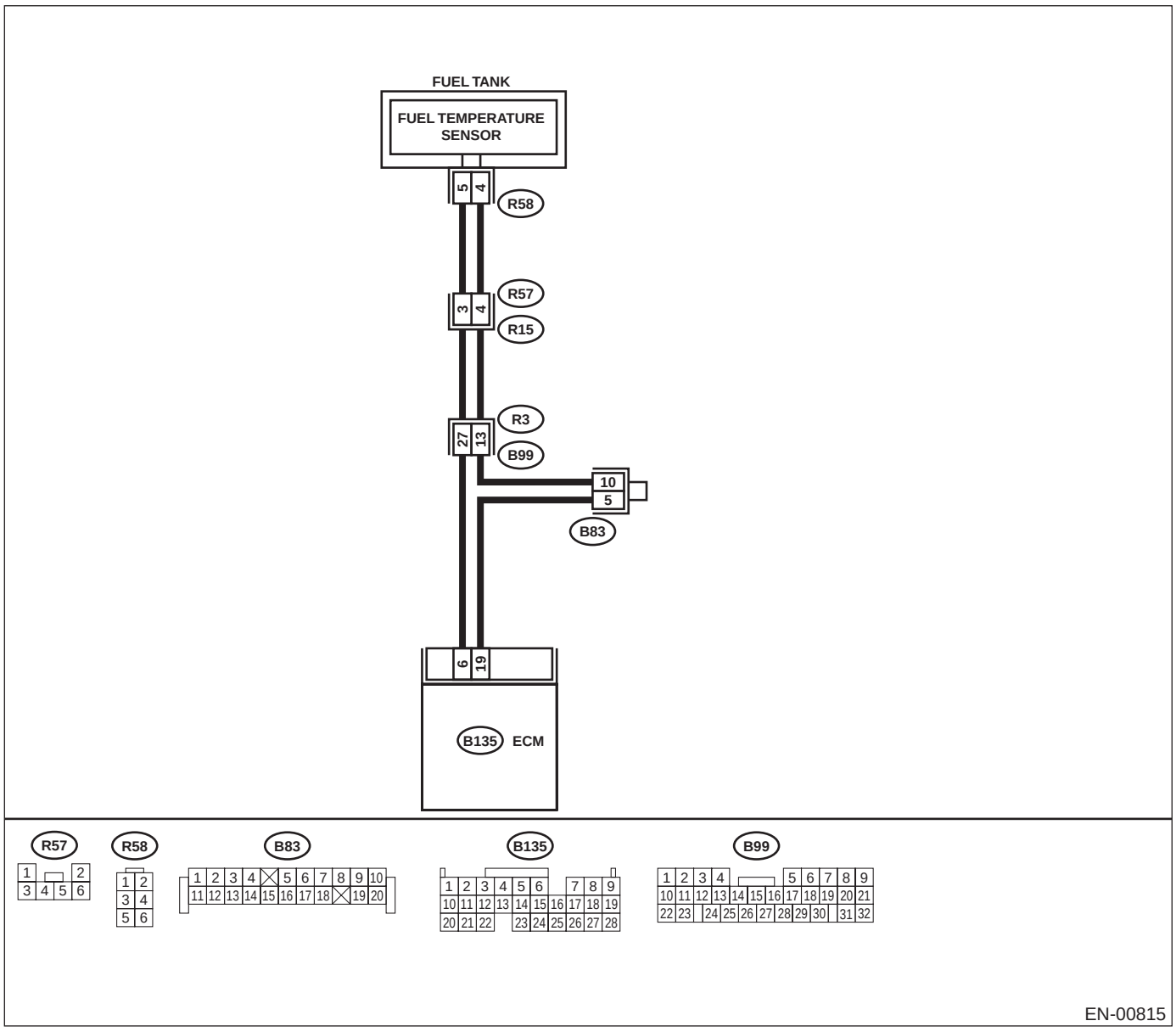
	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	120°C (248°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 ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Turn ignition switch to ON. 5) Read data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–40°C (–40°F)	Replace fuel temperature sensor. <Ref. to EC(H6DO)-12, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

AL: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–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 • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to ON. 2) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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

	Step	Value	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Replace fuel temperature sensor. <Ref. to EC(H6DO)-12, 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 • Poor contact in joint connector

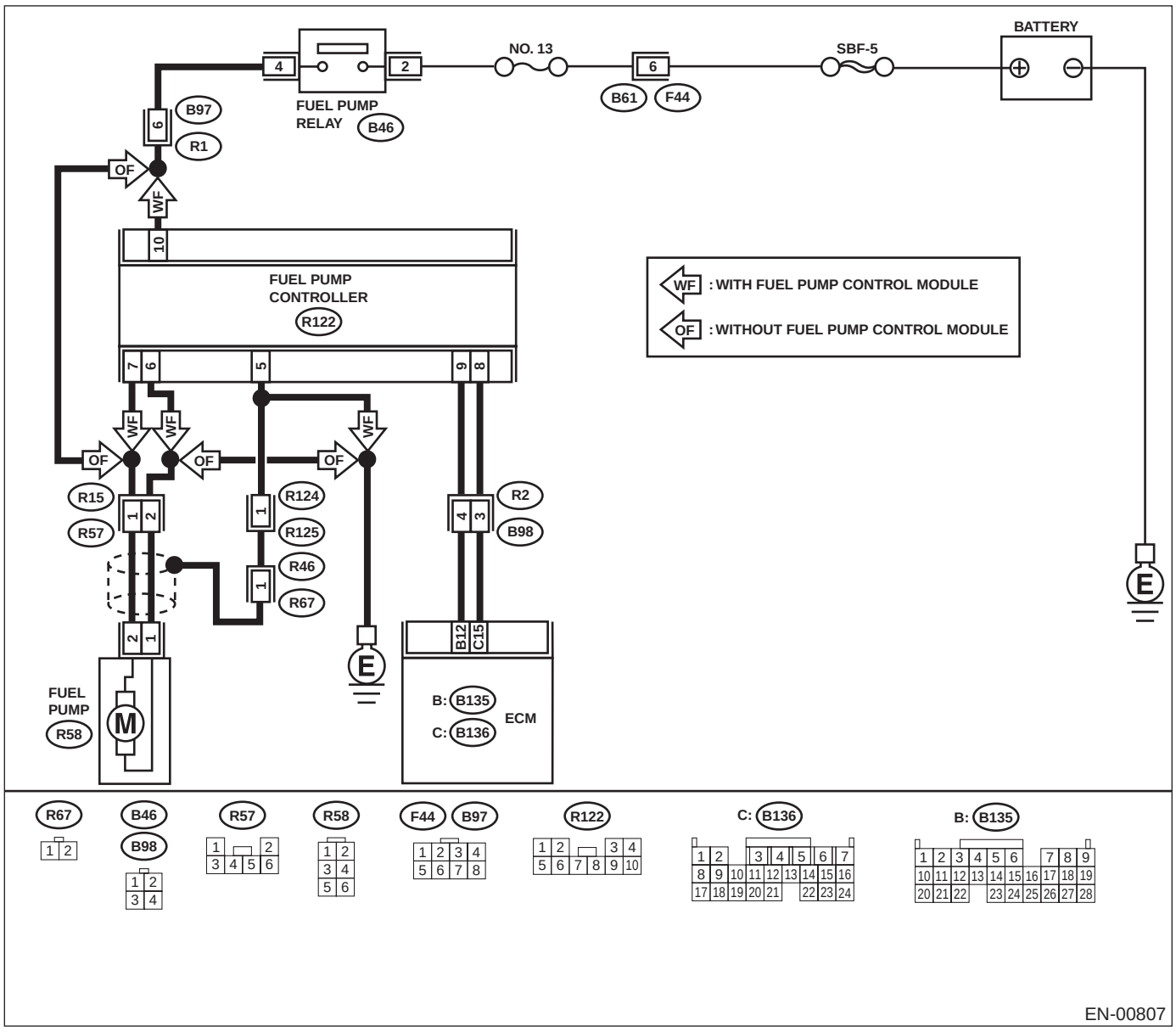
MEMO:

AM:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel pump controller. 3) Turn ignition switch to ON. 4) Measure voltage between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **2.**	Repair power supply circuit. NOTE: In this case, repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump controller. • Poor contact in fuel pump controller connector. • Poor contact in fuel pump relay connector.
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and chassis ground. • Poor contact in fuel pump controller connector.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** 1) Disconnect connector from fuel pump. 2) Measure resistance of harness between fuel pump controller and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 2:*** ***(R122) No. 6 — (R58) No. 1:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit between fuel pump controller and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit between fuel pump controller and fuel pump.

	Step	Value	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fuel pump controller and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B135) No. 12:*** ***(R122) No. 8 — (B136) No. 15:*** Is the measured value less than the specified value?	1 Ω	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and ECM. • Poor contact in fuel pump controller and ECM connector.
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **7.**	Repair ground short circuit between fuel pump controller and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump controller connector. Is there poor contact in ECM and fuel pump controller connector.	There is poor contact.	Repair poor contact in ECM and fuel pump controller.	Replace fuel pump controller. <Ref. to FU(H6DO)-49, Fuel Pump Controller.>

AN:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AO:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AP:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0305 — CYLINDER 5 MISFIRE DETECTED —

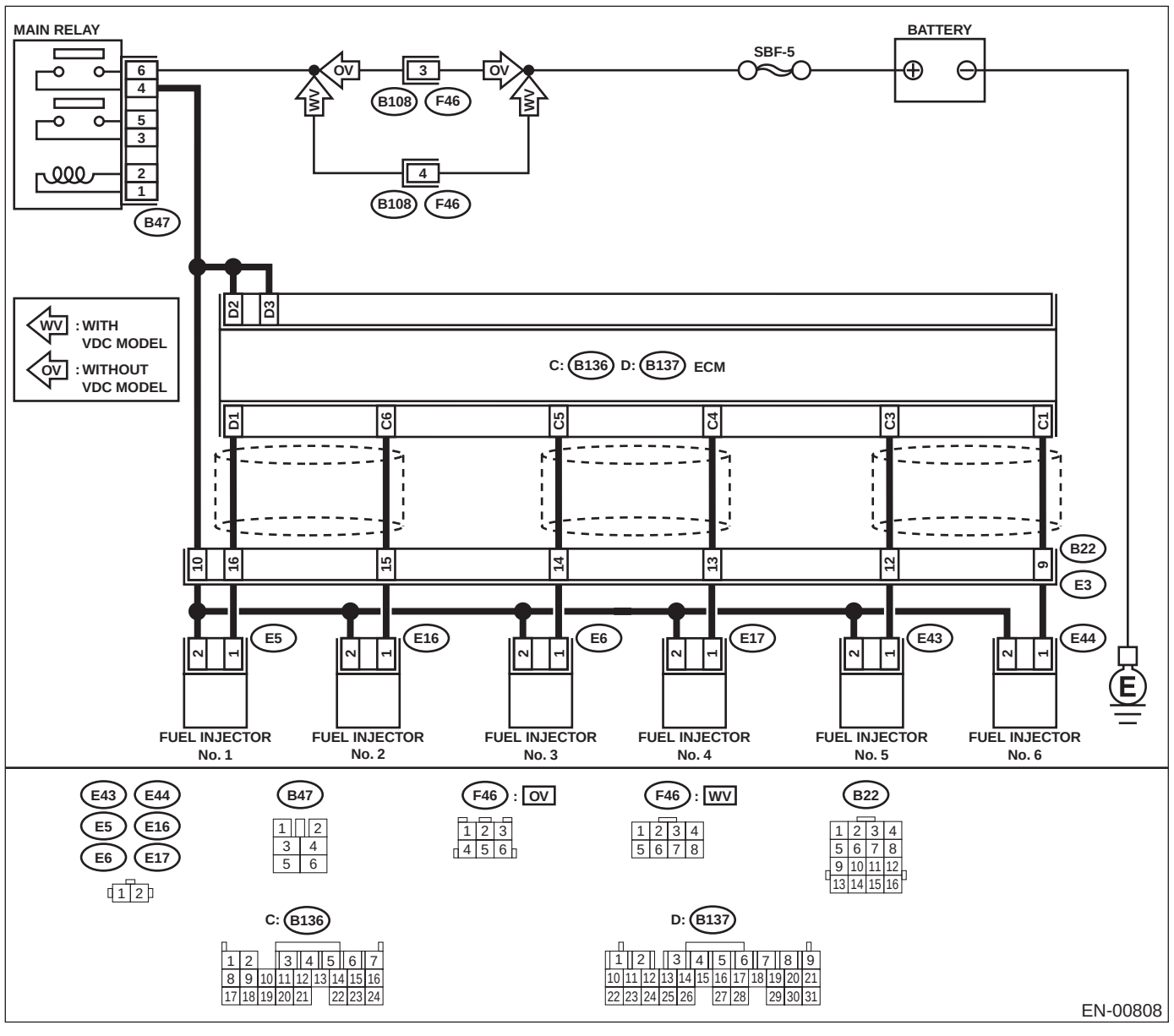
NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-200, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0306 — CYLINDER 6 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303, P0304, P0305 and P0306.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** ***#5 (B136) No. 3 (+) — Chassis ground (–):*** ***#6 (B136) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinders. 3) Measure 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:*** ***#5 (E43) No. 1 — Engine ground:*** ***#6 (E44) No. 1 — Engine ground:*** Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step **4.**

	Step	Value	Yes	No
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 — (E5) No. 1:*** ***#2 (B136) No. 6 — (E16) No. 1:*** ***#3 (B136) No. 5 — (E6) No. 1:*** ***#4 (B136) No. 4 — (E17) No. 1:*** ***#5 (B136) No. 3 — (E43) No. 1:*** ***#6 (B136) No. 1 — (E44) No. 1:*** Is the measured value less than the specified value?	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
5	**CHECK FUEL INJECTOR.** Measure resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	5 — 20 Ω	Go to step **6.**	Replace faulty fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
6	**CHECK POWER SUPPLY LINE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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

	Step	Value	Yes	No
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** ***#5 (B136) No. 3 (+) — Chassis ground (–):*** ***#6 (B136) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace faulty fuel injector <Ref. to FU(H6DO)-39, Fuel Injector.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>.	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.** Is camshaft position sensor or crankshaft position sensor loosely installed?	Loosely installed.	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT PLATE.** Is crankshaft plate rusted or does it have broken teeth?	Rusted or teeth is broken.	Replace crankshaft plate.	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark. ST 18252AA000 Is timing chain dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.** Is the fuel meter indication lower than the “Lower” level?	The indication is lower.	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**	Go to step **13.**

	Step	Value	Yes	No
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H6DO)-59, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes. Is the MIL coming on or blinking?	Comes 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?	Diagnosed.	Finish diagnostics operation, if the engine has no abnormality.	Repair poor contact. NOTE: In this case, repair the following: • 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?	There is a malfunction.	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 ignition switch to ON. 2) Read diagnostic trouble code (DTC) using the Subaru Select Monitor or OBD-II general scan tool. • Subaru Select Monitor <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Only one DTC is indicated.	Go to step **22.**	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?	Indicated.	Go to step **23.**	Go to step **18.**

	Step	Value	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?	Indicated.	Go to step **24.**	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 P0305 and P0306?	Indicated.	Go to step **25.**	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 P0301, P0303 and P0305?	Indicated.	Go to step **26.**	Go to step **21.**
21	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302, P0304 and P0306?	Indicated.	Go to step **27.**	Go to step **28.**
22	**ONLY ONE CYLINDER** Is there a fault in that cylinder?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
23	**GROUP OF #1 AND #2 CYLINDERS** Are there faults in #1 and #2 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil Compression ratio • If no abnormality is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

	Step	Value	Yes	No
24	**GROUP OF #3 AND #4 CYLINDERS** Are there faults in #3 and #4 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil • If no abnormality is discovered, check for “17. D: IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
25	**GROUP OF #5 AND #6 CYLINDERS** Are there faults in #5 and #6 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: • Check the following items: Spark plugs, fuel injector, ignition coil and compression ratio • If no abnormality is discovered, check for “17. IGNITION CONTROL SYSTEM” of #5 and #6 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
26	**GROUP OF #1, #3 AND #5 CYLINDERS** Are there faults in #1, #3 and #5 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing chain	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

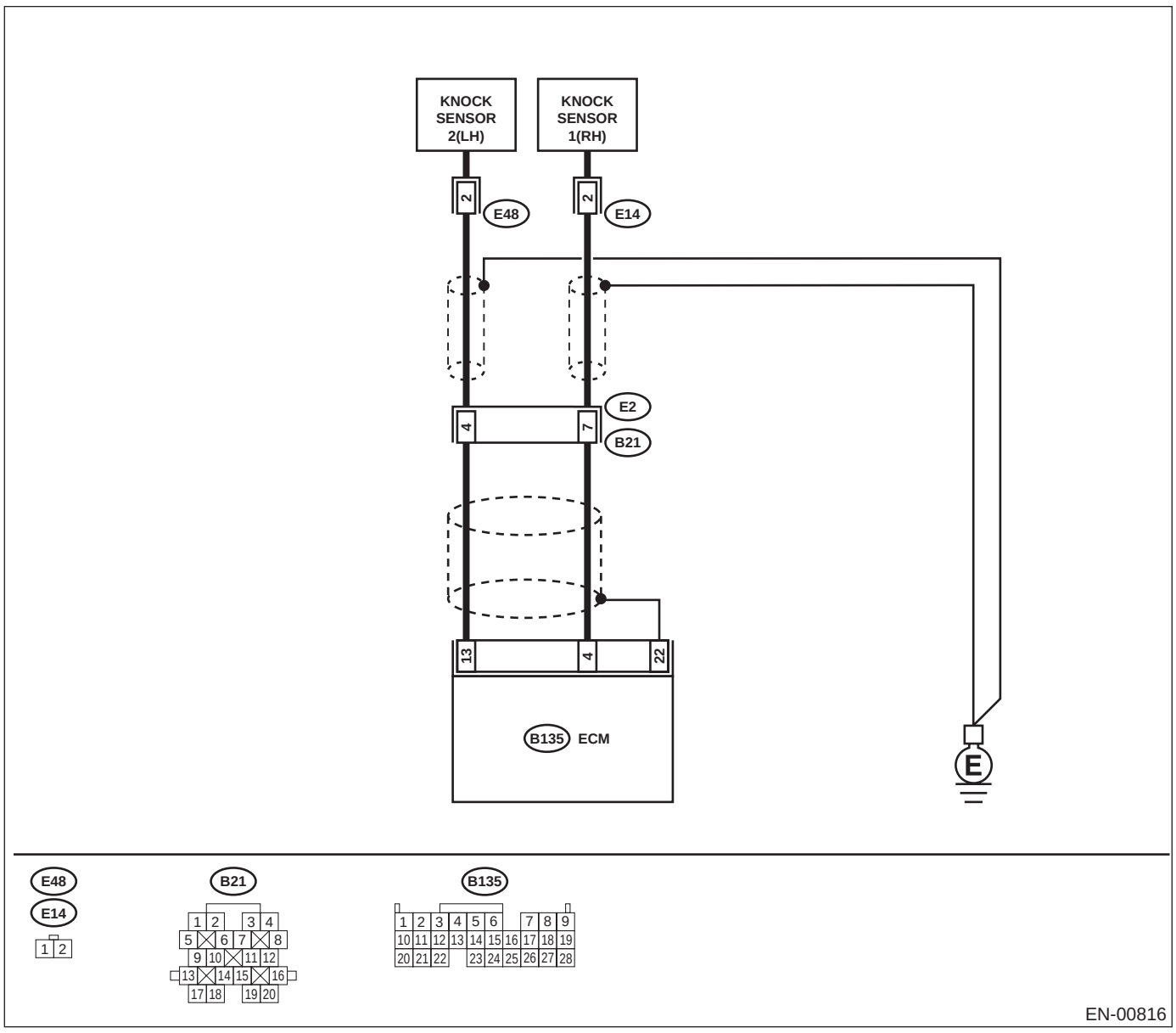
Step		Value	Yes	No
27	**GROUP OF #2, #4 AND #6 CYLINDERS** Are there faults in #2, #4 and #6 cylinders?	There is a malfunction.	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing chain	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
28	**CYLINDER AT RANDOM** Is the engine idle unstable?	Engine idle is unstable.	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



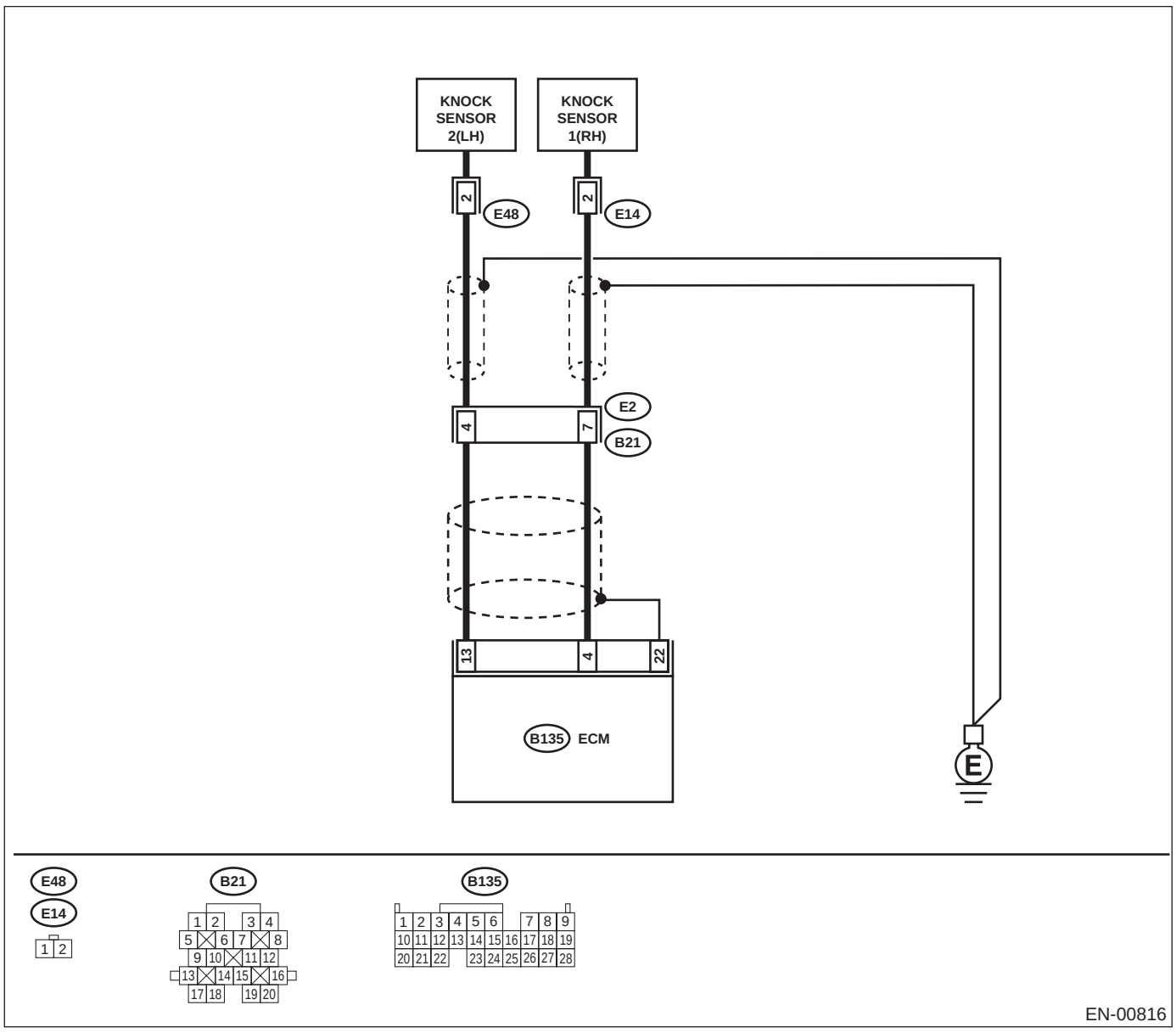
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 1 AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** Does the measured value exceed the specified value?	700 kΩ	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR 1 (RH).** 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Does the measured value exceed the specified value?	700 kΩ	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR 1 (RH) INSTALLATION.** Is the knock sensor 1 (RH) installation bolt tightened securely?	Tightened securely.	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 1 (RH) installation bolt securely.

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



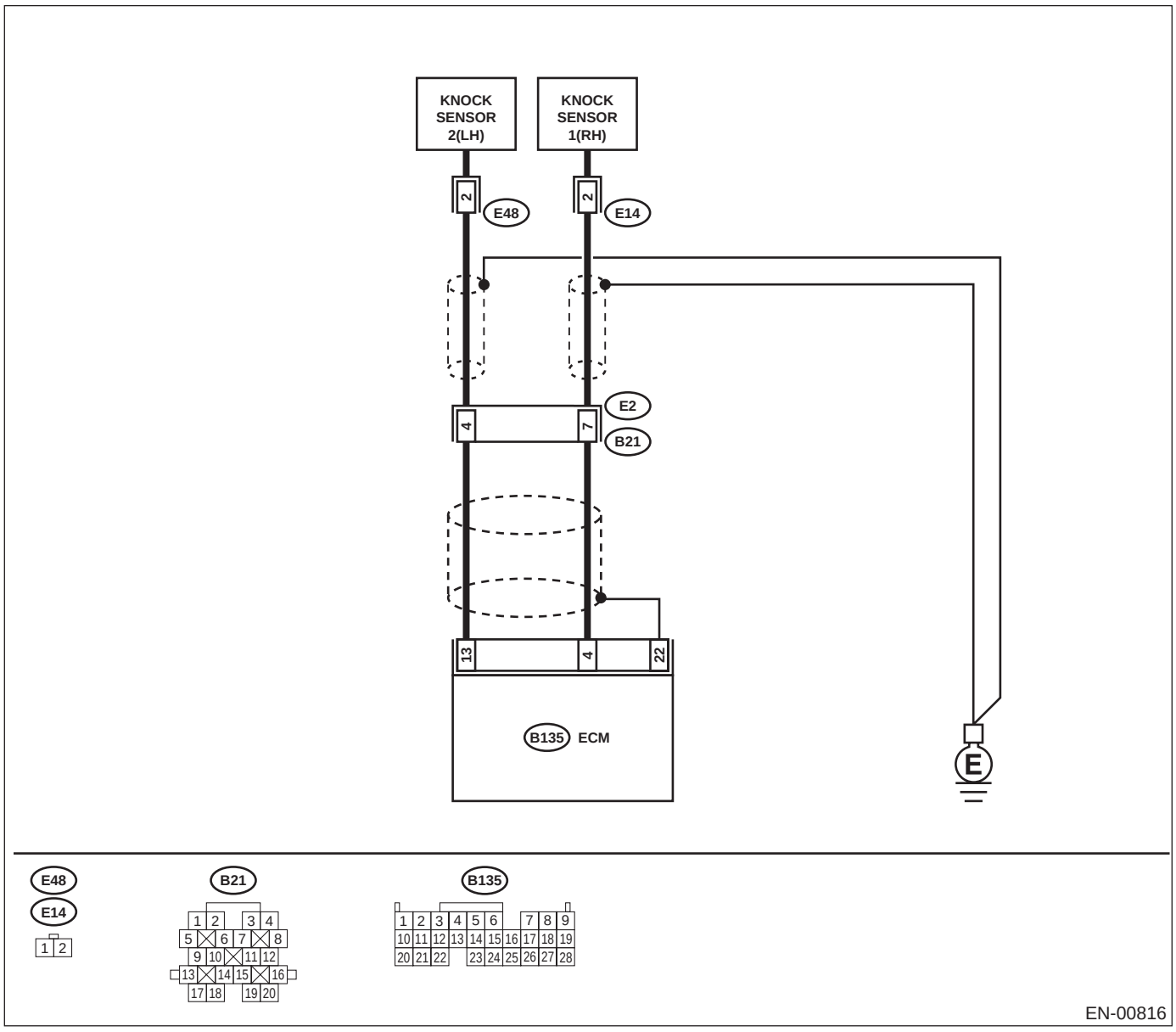
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 1 (RH) AND ECM CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** Is the measured value less than the specified value?	400 kΩ	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR 1 (RH).** 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value less than the specified value?	400 kΩ	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 1 (RH) 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 connectors to ECM and knock sensor 1 (RH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 1 (RH) connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AV:DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



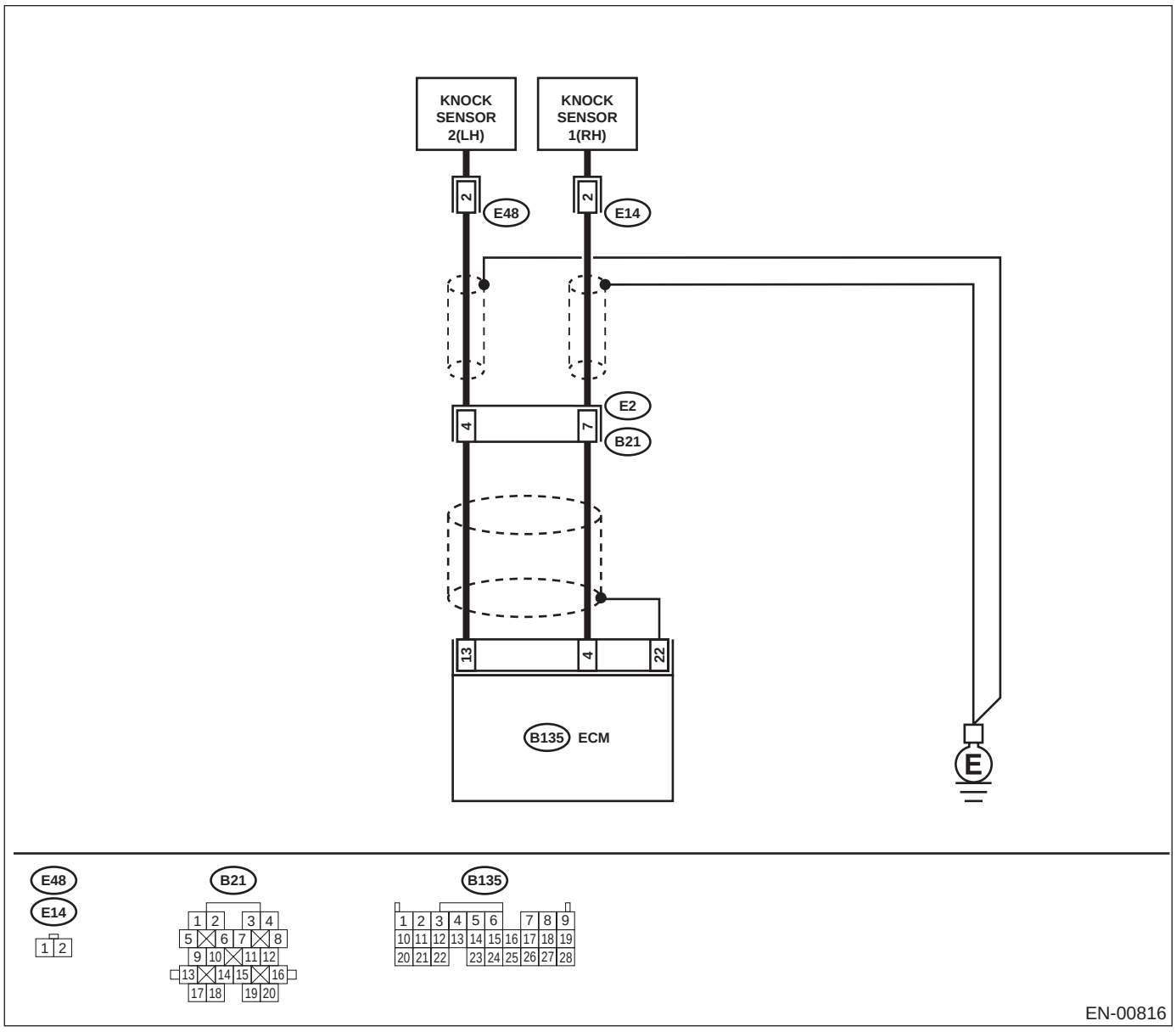
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 — Chassis ground:*** Does the measured value exceed the specified value?	700 kΩ	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR 2 (LH).** 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Does the measured value exceed the specified value?	700 kΩ	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR 2 (LH) INSTALLATION.** Is the knock sensor 2 (LH) installation bolt tightened securely?	Tightened securely.	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 2 (LH) installation bolt securely.

AW:DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



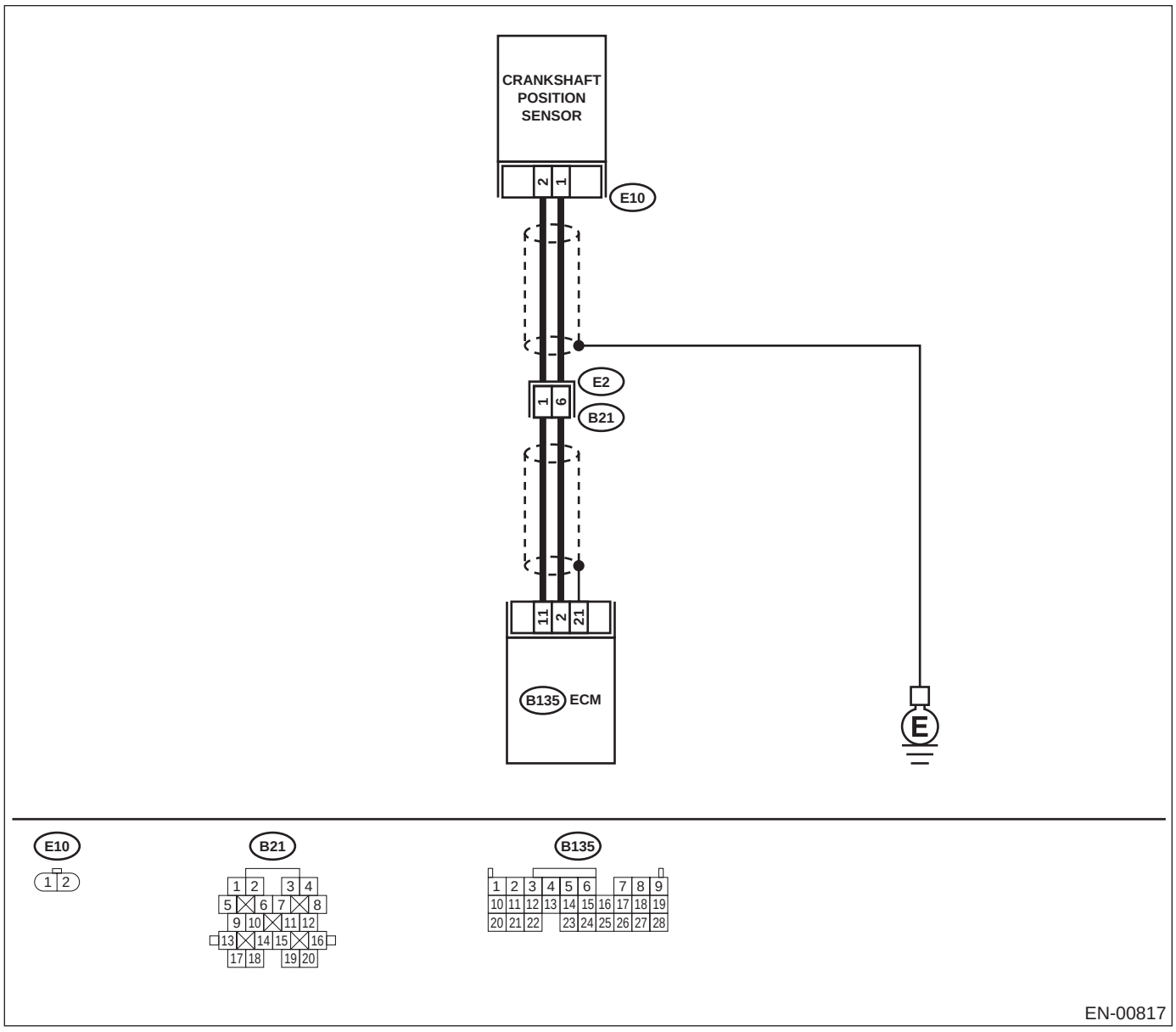
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 — Chassis ground:*** Is the measured value less than the specified value?	400 kΩ	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR 2 (LH).** 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:*** Is the measured value less than the specified value?	400 kΩ	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 2 (LH) 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 connectors to ECM and knock sensor 2 (LH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 2 (LH) • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AX:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



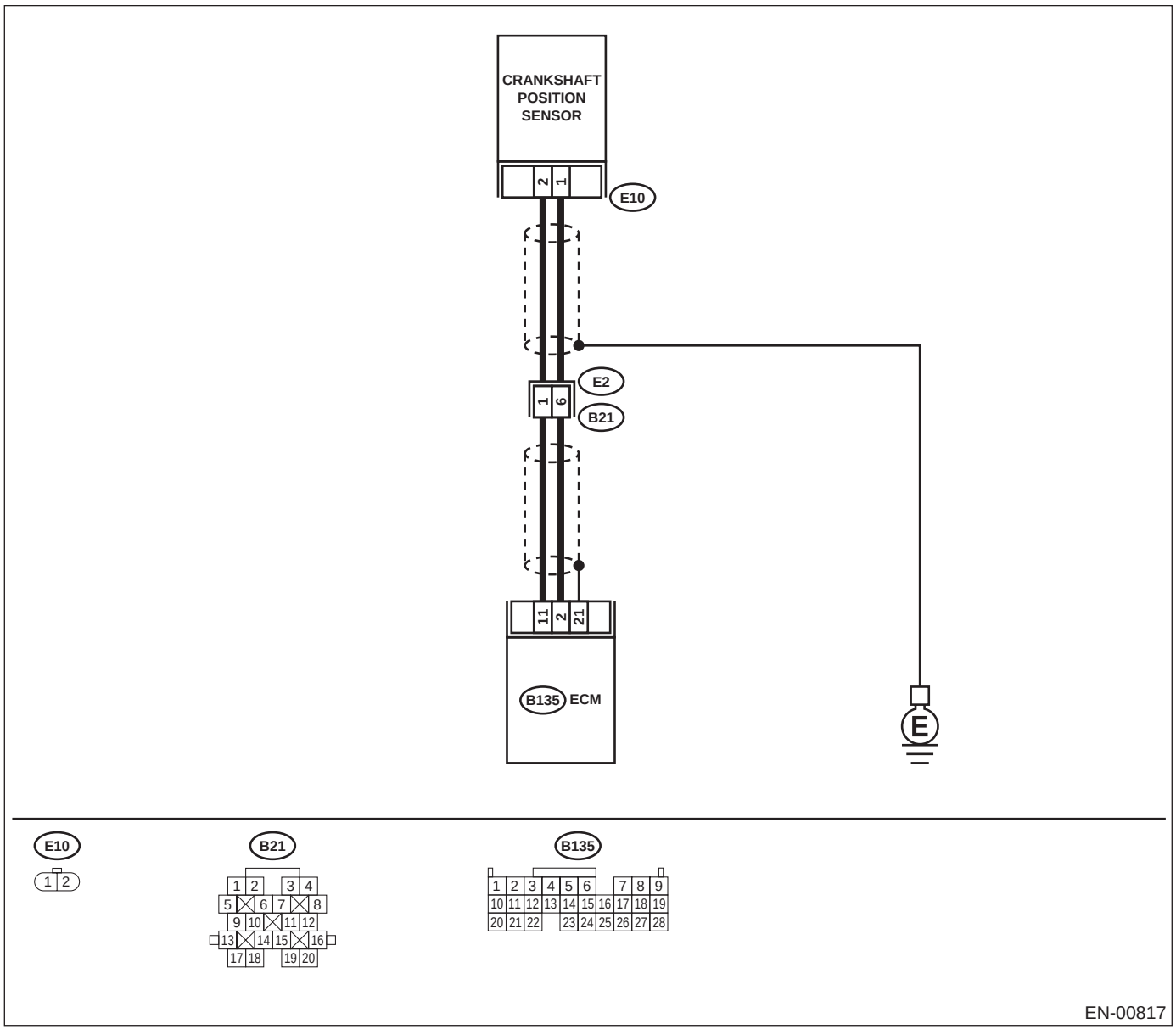
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between crankshaft position sensor and ECM. ***Connector & terminal*** ***(E10) No. 1 — (B135) No. 2:*** ***(E10) No. 2 — (B135) No. 11:*** Is the measured value less than the specified value?	1 Ω	Go to step **2.**	Repair open circuit between crankshaft position sensor and ECM.
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.** Measure resistance between crankshaft position sensor and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** ***(E10) No. 2 — Engine ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair ground short circuit between crankshaft position sensor and ECM.
3	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Is the crankshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step **4.**	Tighten crankshaft position sensor installation bolt securely.
4	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn ignition switch to OFF. 2) Remove crankshaft position sensor. 3) Measure resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	800 — 1300 kΩ	Go to step **5.**	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

AY:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Tow consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



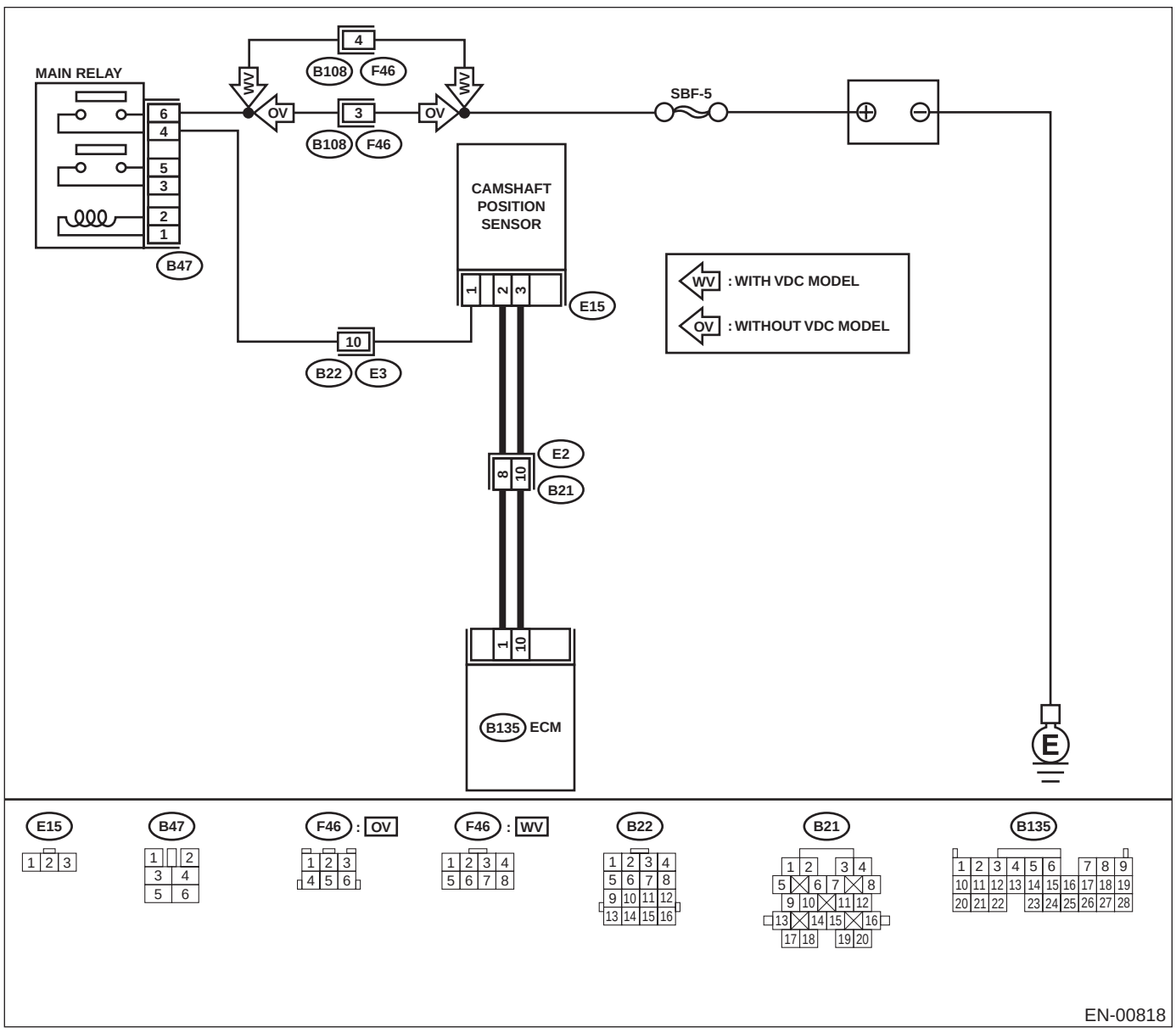
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect DTC P0335 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn ignition switch to OFF. Is the crankshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT PLATE.** Are crankshaft plate teeth cracked or damaged?	Cracked or damaged.	Replace crankshaft plate.	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET Is timing chain dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, Crankshaft Position Sensor.>

AZ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



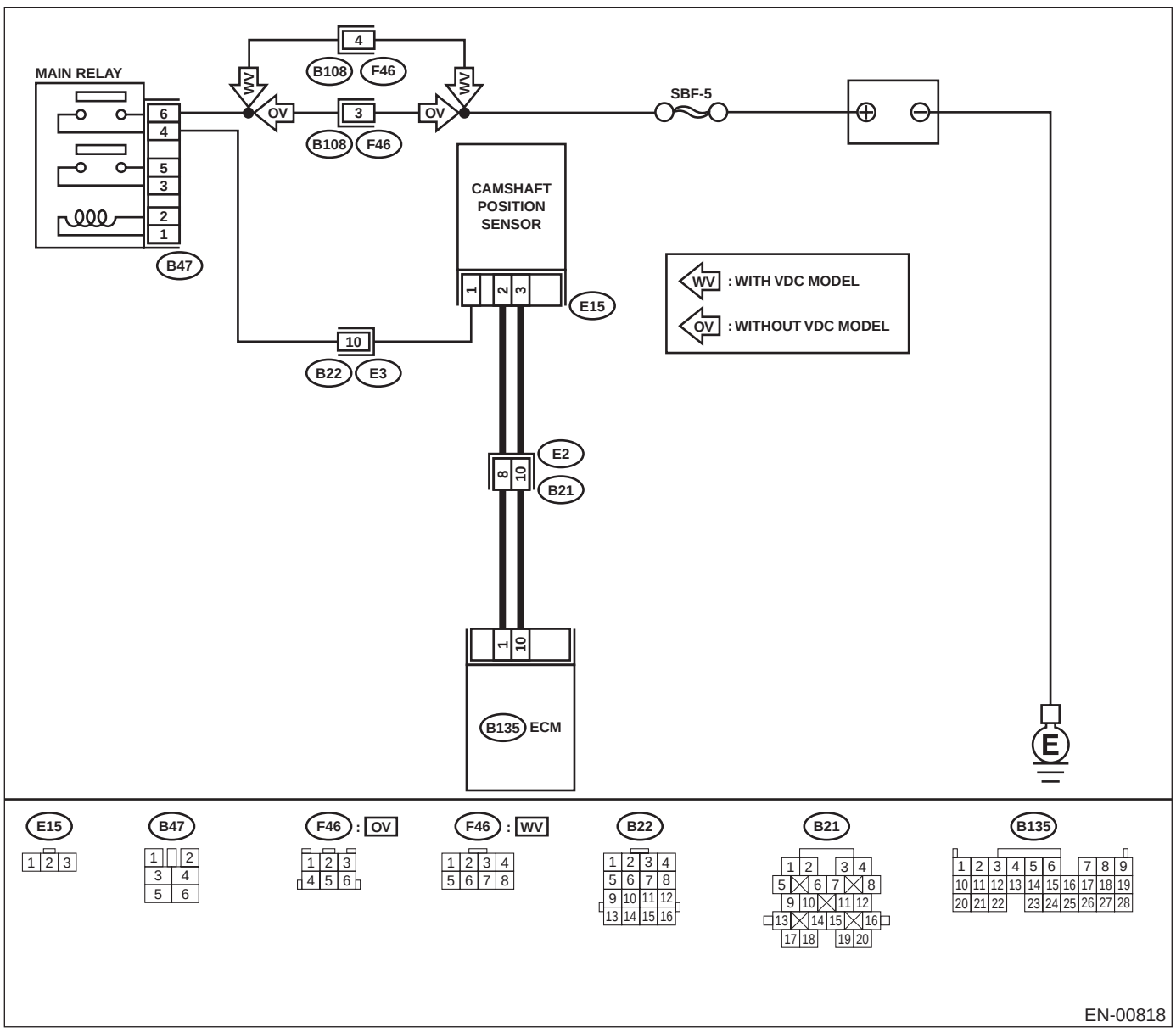
	Step	Value	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10V	Repair ground short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10V	Go to step **3.**	Repair open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E15) No. 2 — (B135) No. 1:*** ***(E15) No. 3 — (B135) No. 10:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** ***(E15) No. 3 — Engine ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Repair ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check camshaft position sensor wave form. <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.> Is any abnormality found in waveform?	Normal waveform.	Go to step **7.**	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BA:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Tow consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect DTC P0340 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Is the camshaft position sensor installation bolt tightened securely?	Tightened securely.	Go to step **3.**	Tighten camshaft position sensor installation bolt securely.
3	**CHECK CAMSHAFT SPROCKET.** Remove front chain cover. <Ref. to ME(H6DO)-39, Front Chain Cover.> Are camshaft sprocket teeth cracked or damaged?	Cracked or damaged.	Replace camshaft sprocket. <Ref. to ME(H6DO)-46, Camshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark. ST 18231AA000 CAMSHAFT SPROCKET WRENCH Is timing belt dislocated from its proper position?	Dislocated from proper position.	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>

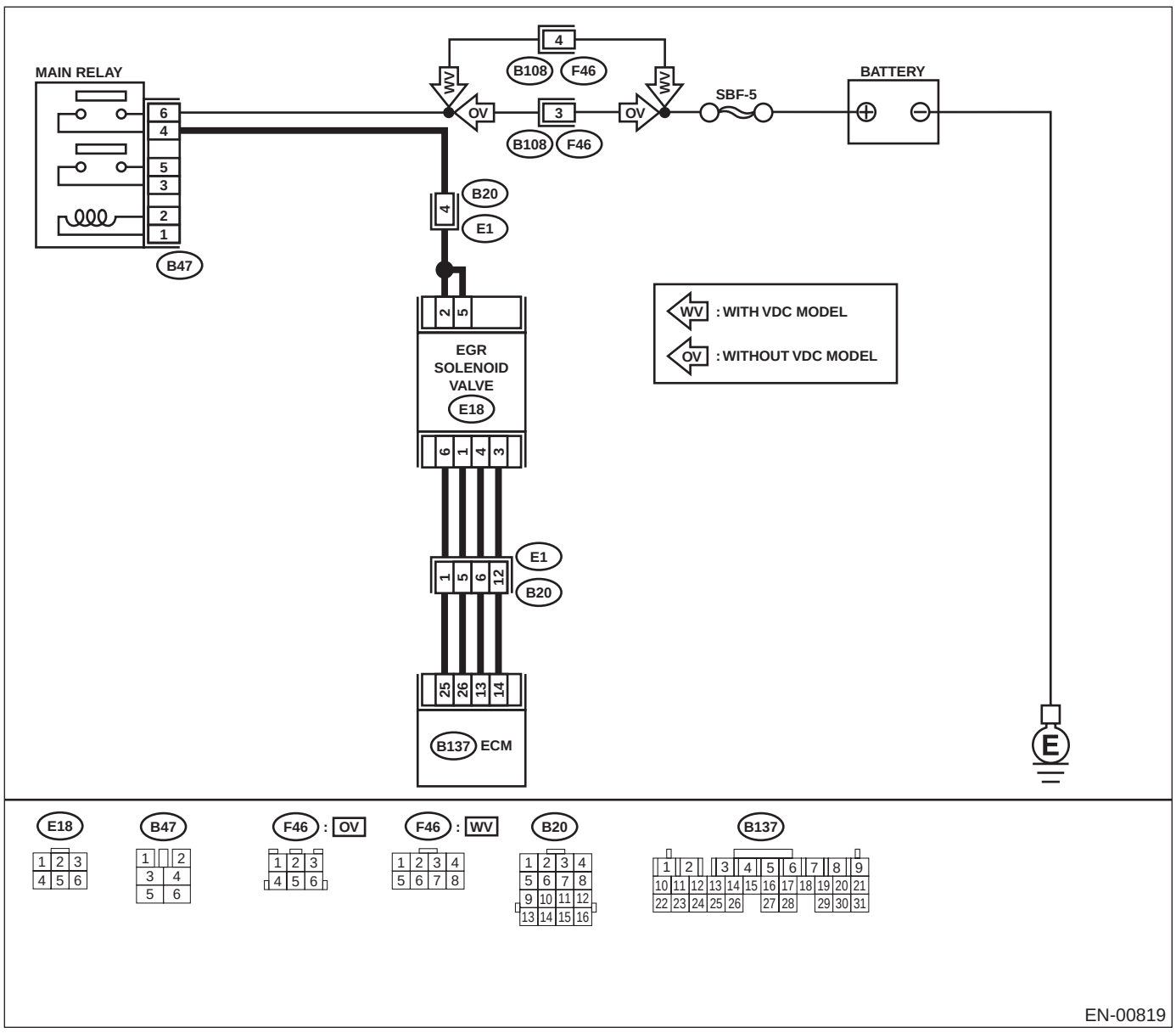
BB:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

- **TROUBLE SYMPTOM:**
  - Poor driving performance on low engine speed
  - Erroneous idling
  - Poor driving performance.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	53.3 kPa (400 mmHg, 15.75 inHg)	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step **3.**
3	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:*** Does the measured value exceed the specified value?	10 V	Go to step **4.**	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:*** Is the measured value within the specified range?	20 — 30 Ω	Go to step **5.**	Replace EGR solenoid valve. <Ref. to EC(H6DO)-10, EGR Valve.>

	Step	Value	Yes	No
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** Does the measured value fluctuate within the specified range?	0 — 10 V	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B137) No. 25 — (E18) No. 6:*** ***(B137) No. 26 — (E18) No. 1:*** ***(B137) No. 13 — (E18) No. 4:*** ***(B137) No. 14 — (E18) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **7.**	Repair open circuit in harness between ECM and EGR solenoid valve connector.
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector. Is there poor contact in ECM and EGR solenoid valve connector?	There is poor contact.	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

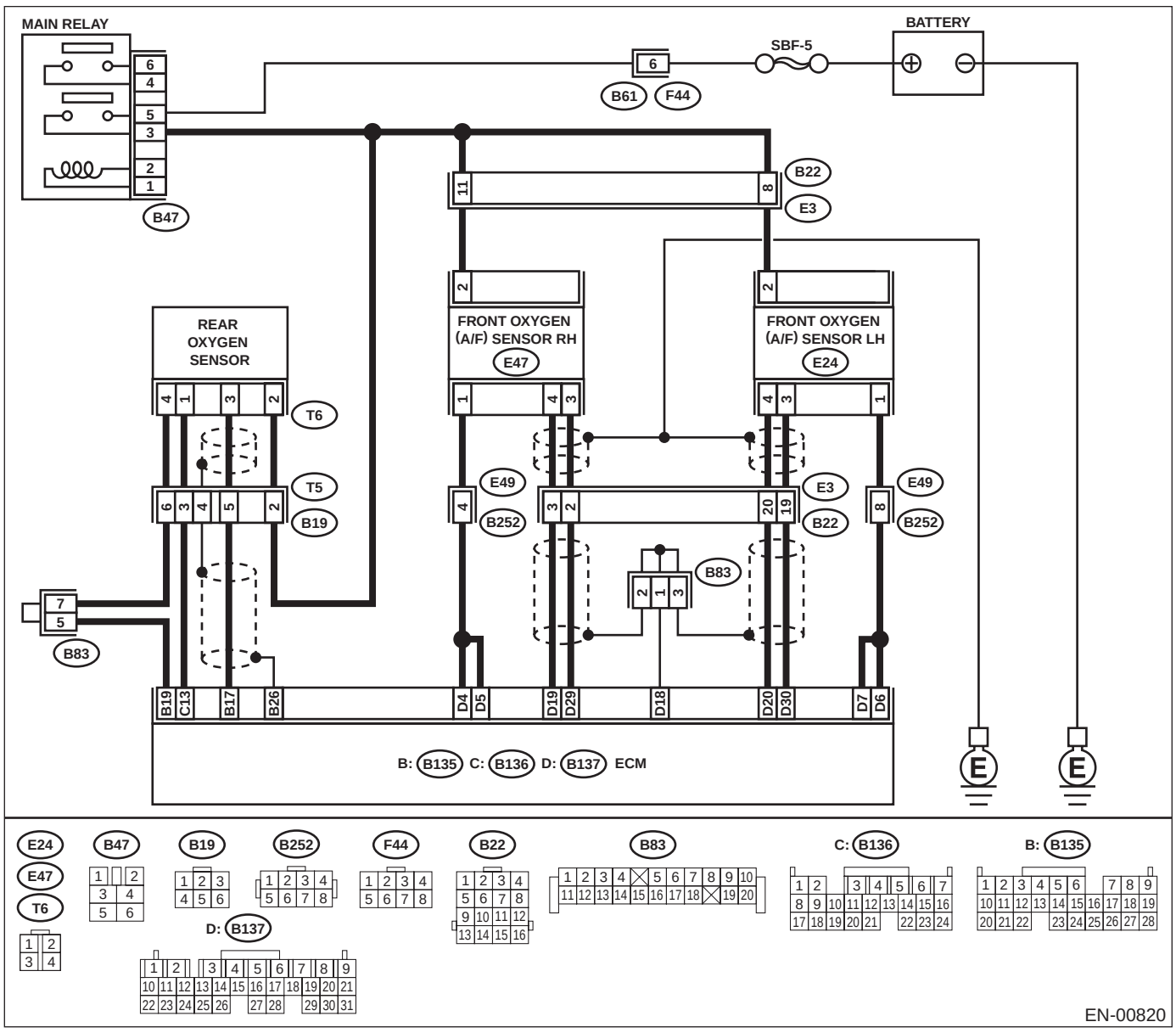
MEMO:

BC:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



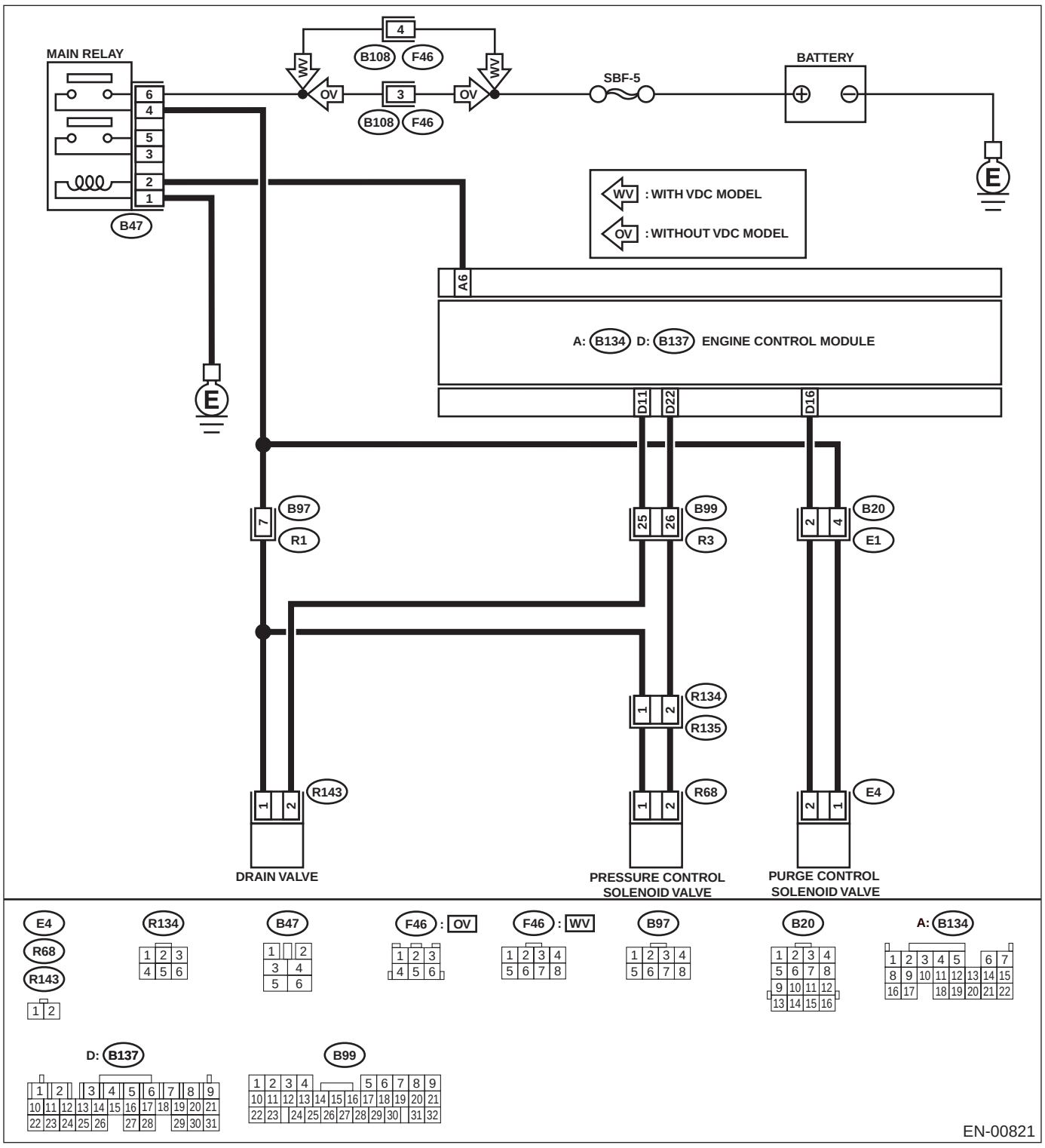
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	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?	There is a malfunction.	Repair or replace exhaust system.	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?	There is damage.	Replace front catalytic converter <Ref. to EC(H6DO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H6DO)-6, Rear Catalytic Converter.>.	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove front catalytic converter. Is there damage at rear face or front face of front catalyst?	There is damage.	Replace front catalytic converter. <Ref. to EC(H6DO)-3, Front Catalytic Converter.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BD:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn 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?	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?	There is a malfunction.	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does drain valve produce operating sound?	Operating sound produced.	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-20, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does purge control solenoid valve produce operating sound?	Operating sound produced.	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does pressure control solenoid valve produce operating sound?	Operating sound produced.	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-16, Pressure Control Solenoid Valve.>

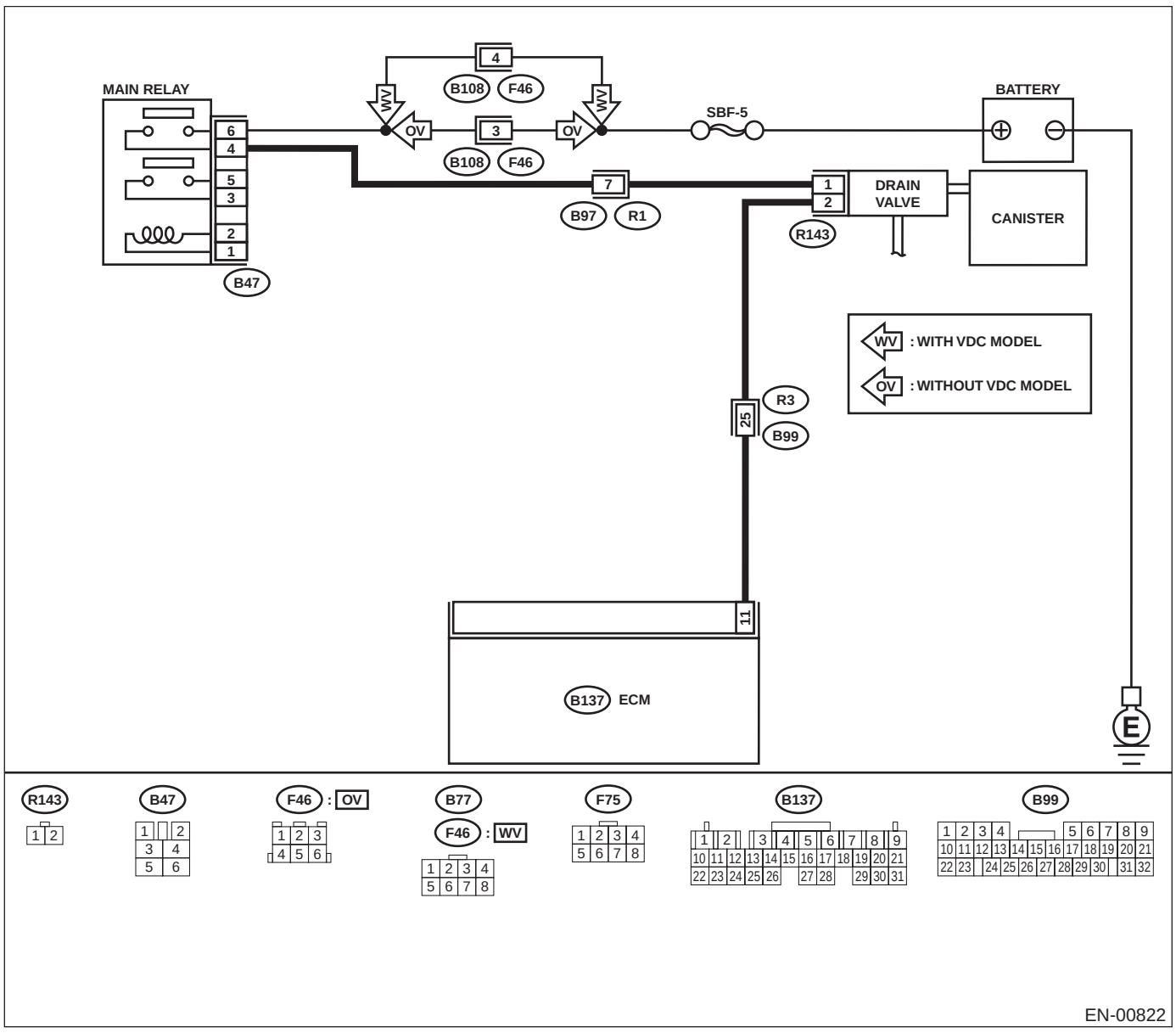
	Step	Value	Yes	No
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF. Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	There is a hole.	Repair or replace evaporation line. <Ref. to FU(H6DO)-78, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**
8	**CHECK CANISTER.** Is canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Damaged or there is a hole.	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.> Is fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Damaged or there is a hole.	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, 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?	There is a malfunction on hose or pipe.	Repair or replace hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BE:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	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
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from drain valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 2 — Chassis ground:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B137) No. 11 — (R143) No. 2:*** Is the measured value less than the specified value?	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
5	**CHECK DRAIN VALVE.** Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	10 — 100 Ω	Go to step **6.**	Replace drain valve. <Ref. to EC(H6DO)-20, Drain Valve.>

	Step	Value	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in drain valve connector. Is there poor contact in drain valve connector?	There is poor contact.	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.

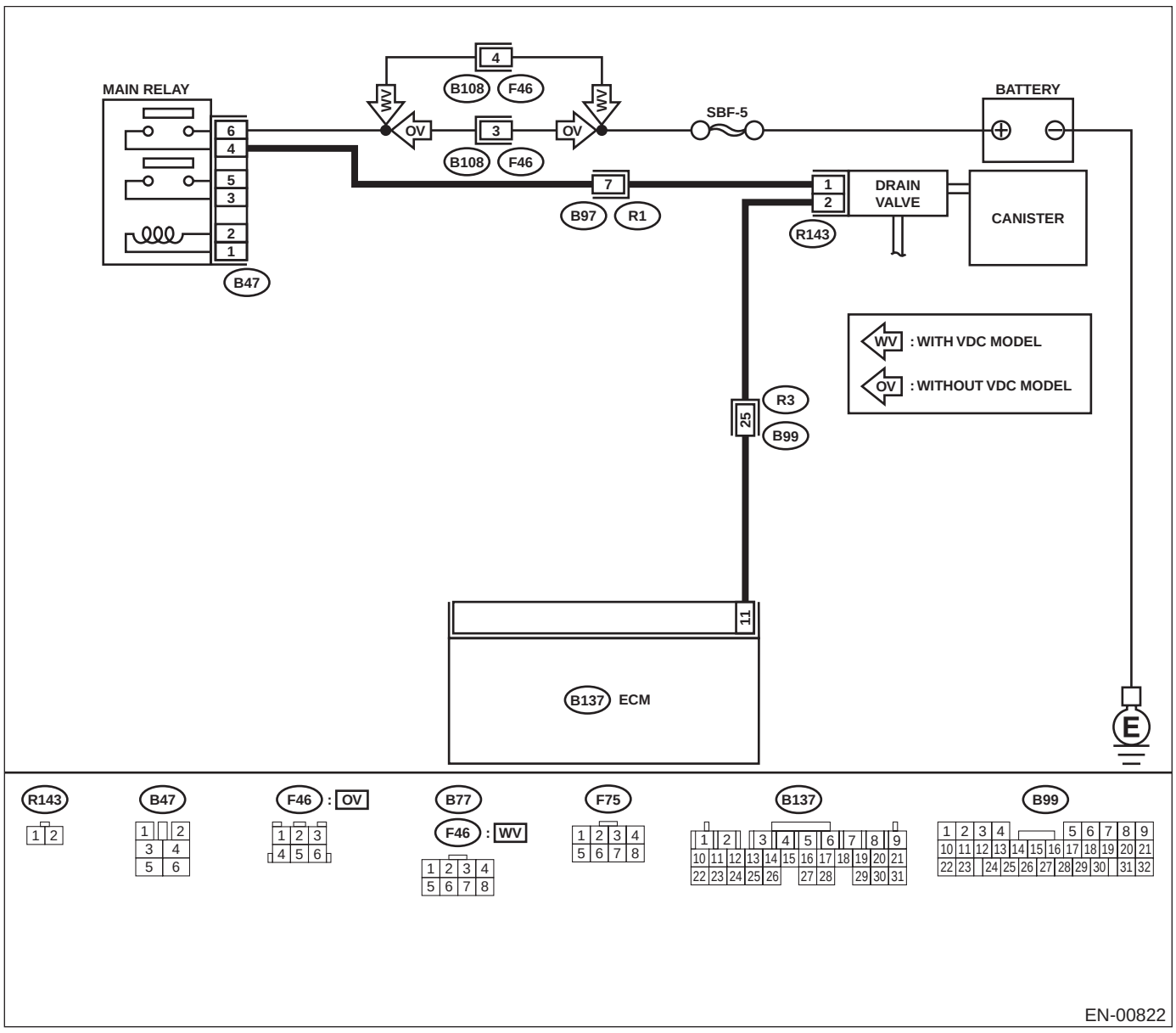
MEMO:

BF:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



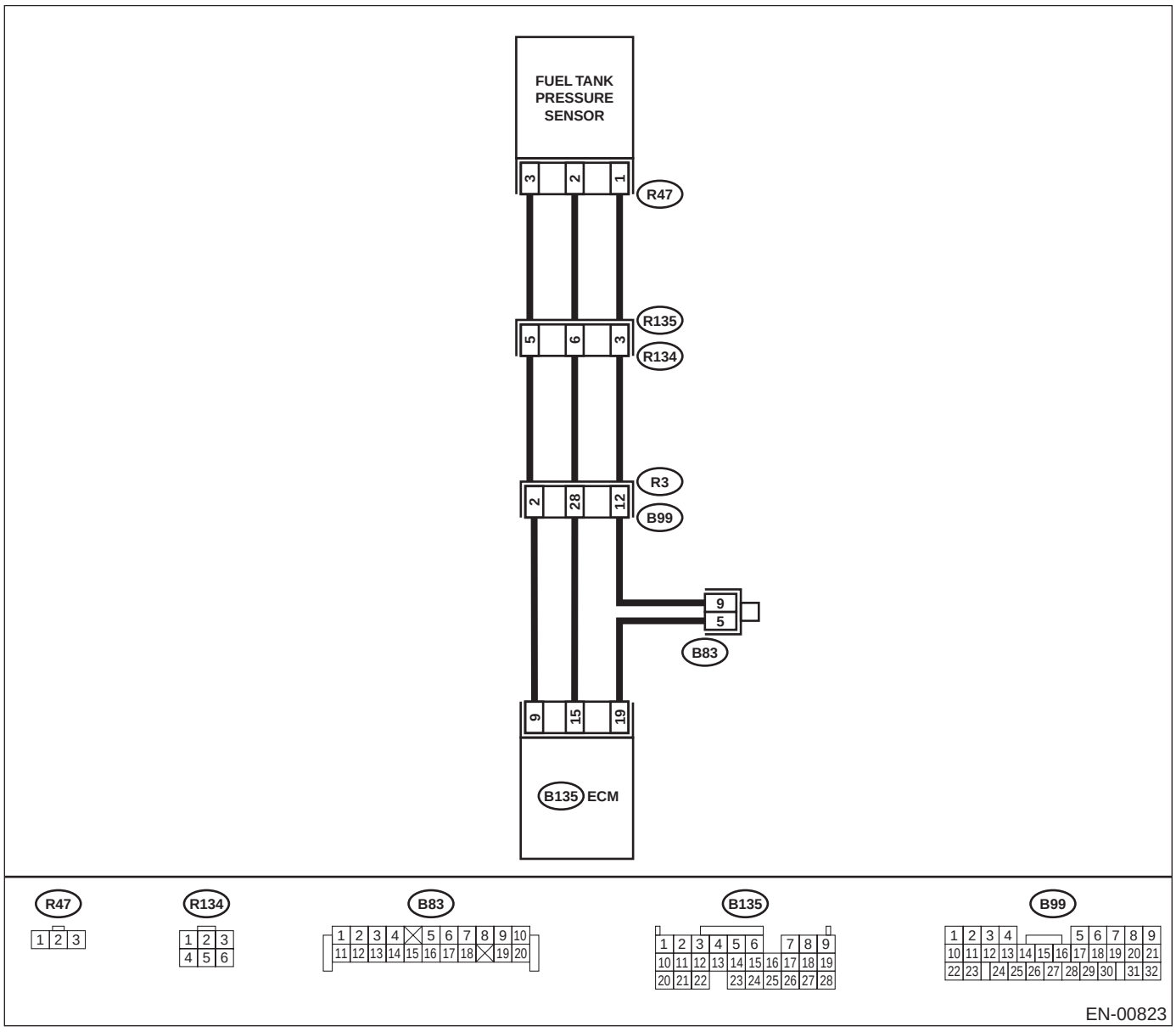
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-60, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):*** Does the measured value fluctuate within the specified range?	0 — 10 V	Go to step **2.**	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.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from drain valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace drain valve <Ref. to EC(H6DO)-20, Drain Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BG:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



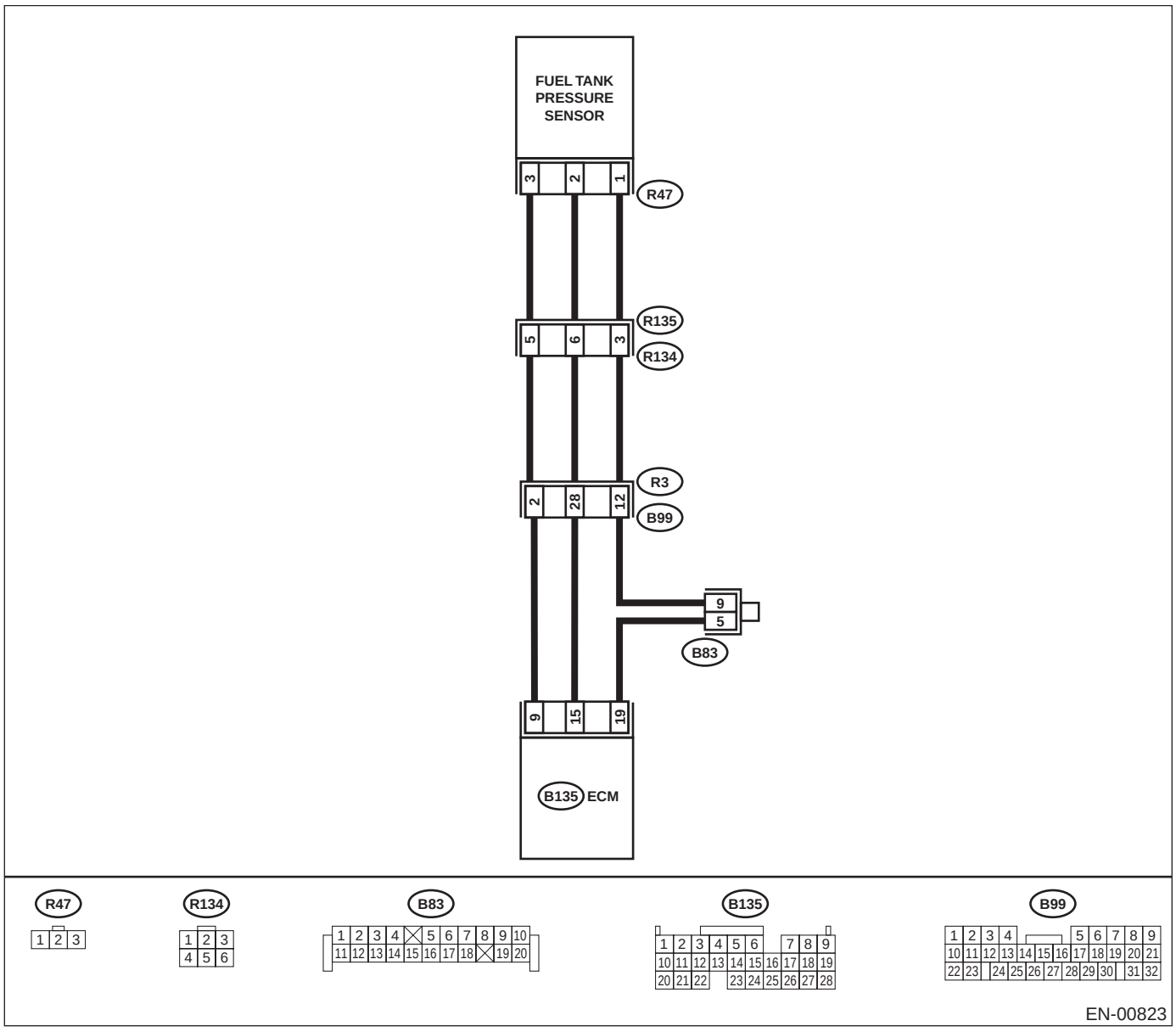
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap. Is the fuel filler cap tightened securely?	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?	There is a malfunction.	Repair or replace hoses and pipes.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-14, Fuel Tank Pressure Sensor.>

BH:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn 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. Is the measured value less than the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	–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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the voltage change more than the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	4.5 V	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 voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.2 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. Does the value change more than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	–2.8 kPa (–21.0 mmHg, –0.827 inHg)	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R134) No. 3:*** Is the measured value less than the specified value?	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 • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 3 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 5 — (R47) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:*** Is the measured value less than the specified value?	1 Ω	Go to step **11.**	Repair open circuit in fuel tank cord.

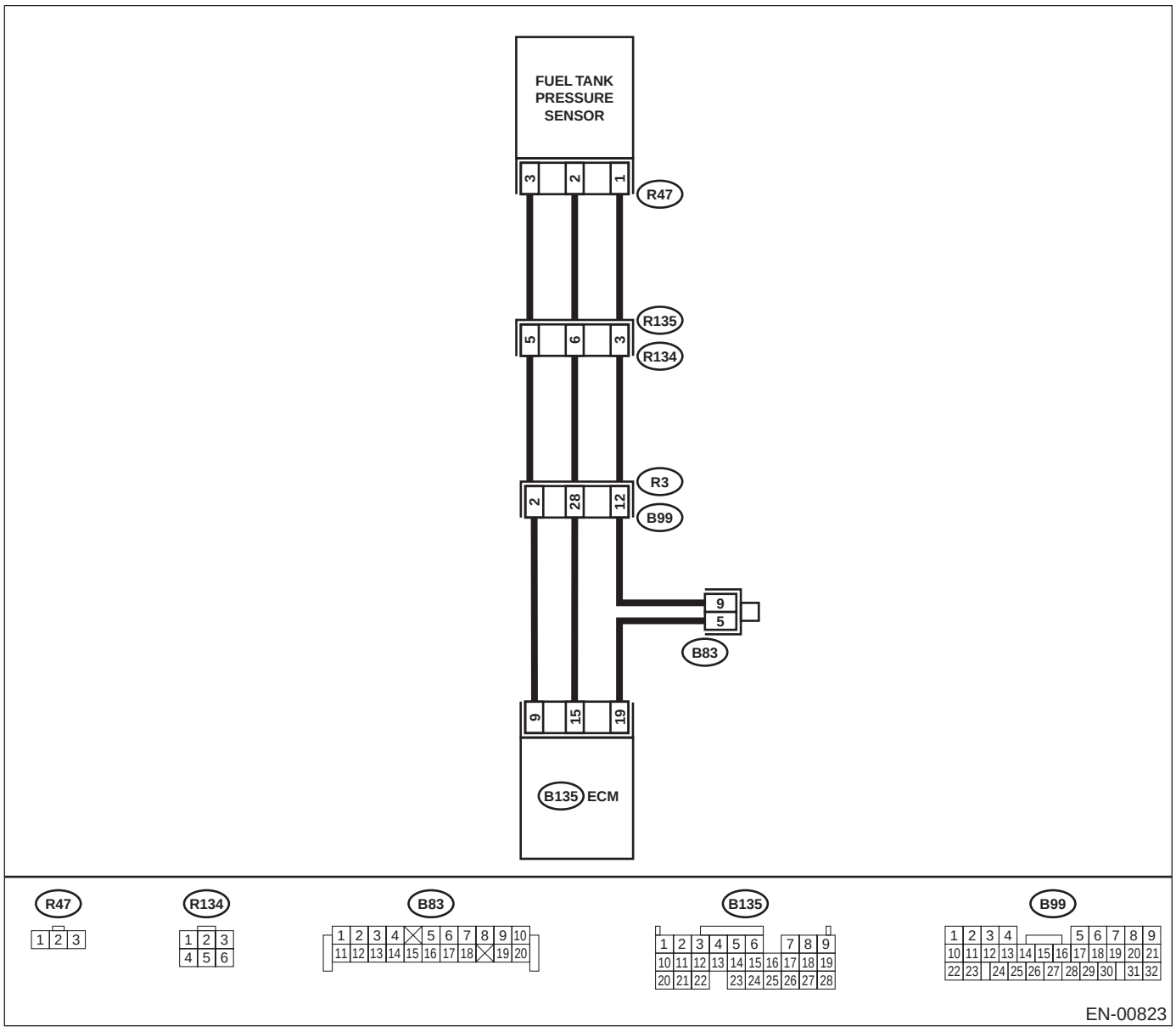
	Step	Value	Yes	No
11	**CHECK FUEL TANK CORD.** Measure resistance of harness between fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **12.**	Repair ground short circuit 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?	There is poor contact.	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-14, Fuel Tank Pressure Sensor.>

BI: DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00823

	Step	Value	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	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 voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):*** Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	4.5 V	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.2 V	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	–2.8 kPa (–21.0 mmHg, –0.827 inHg)	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 15 — (R134) No. 6:*** Is the measured value less than the specified value?	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 • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — (R135) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 6 — (R47) No. 2:*** Is the measured value less than the specified value?	1 Ω	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-14, Fuel Tank Pressure Sensor.>

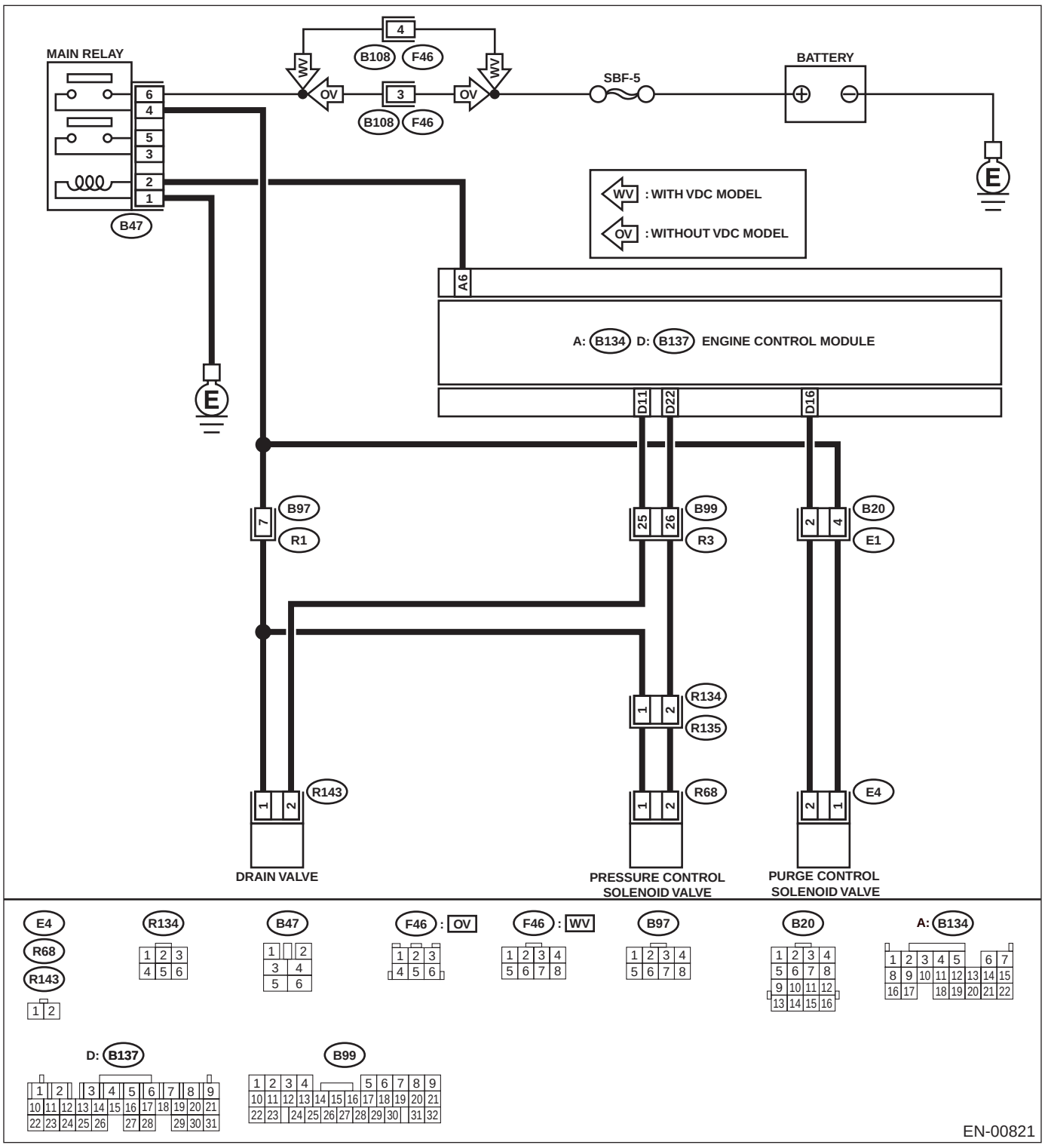
	Step	Value	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. Does the measured value exceed the specified value? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	2.8 kPa (21.0 mmHg, 0.827 inHg)	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-14, Fuel Tank Pressure Sensor.>

BJ:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn 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?	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?	There is damage.	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does drain valve produce operating sound?	Operating sound produced.	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-20, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does purge control solenoid valve produce operating sound?	Operating sound produced.	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does pressure control solenoid valve produce operating sound?	Operating sound produced.	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-16, Pressure Control Solenoid Valve.>

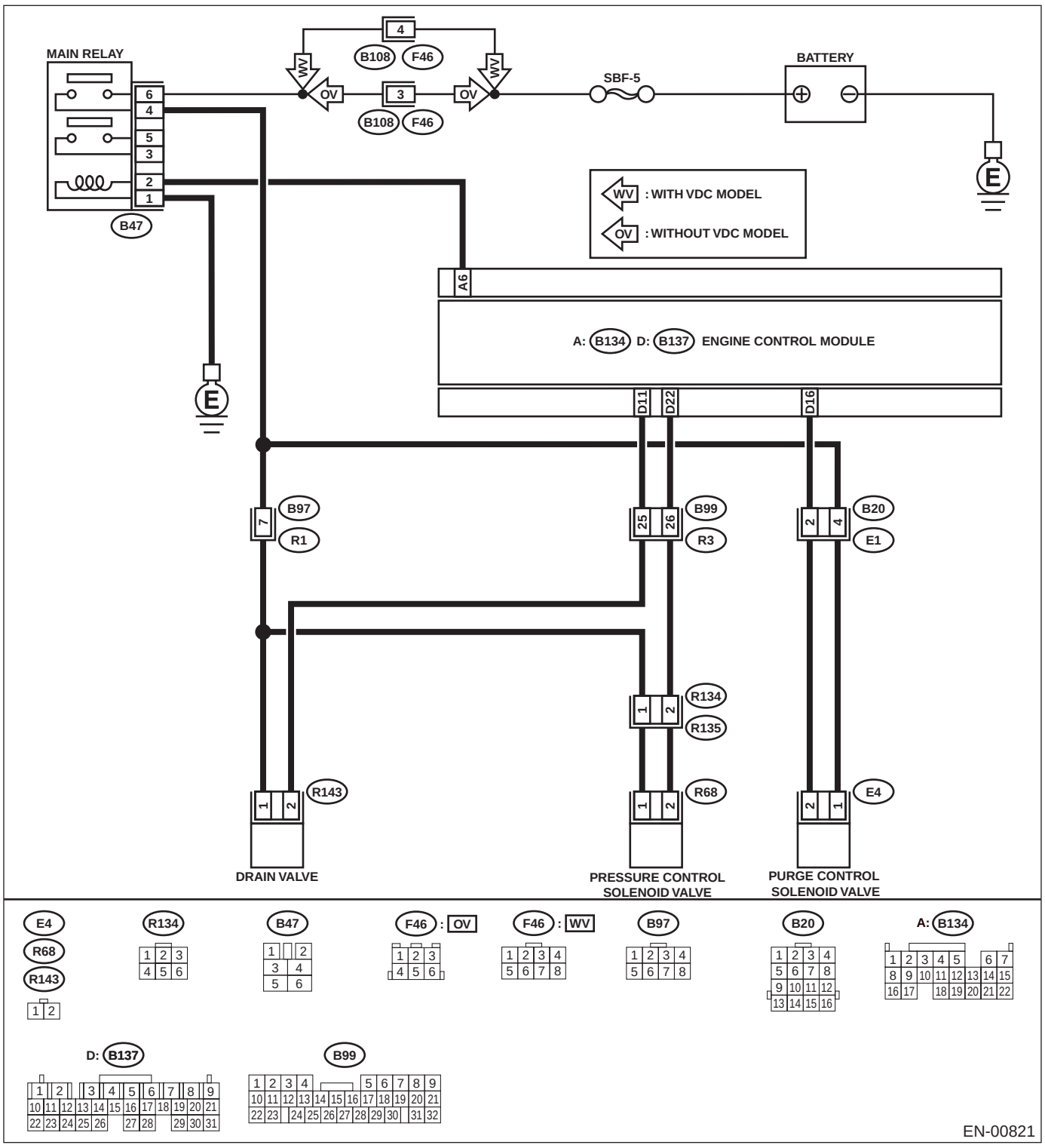
	Step	Value	Yes	No
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF. Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Hole is found.	Repair or replace evaporation line. <Ref. to FU(H6DO)-78, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**
8	**CHECK CANISTER.** Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Damage or hole is found.	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.> Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Damage or hole is found.	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, 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?	There is a malfunction on hose or pipe.	Repair or replace hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BK:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - Fuel filler cap loose or missing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn 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?	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?	There is damage.	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does drain valve produce operating sound?	Operating sound produced.	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-20, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does purge control solenoid valve produce operating sound?	Operating sound produced.	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate 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(H6DO)-60, Compulsory Valve Operation Check Mode.> Does pressure control solenoid valve produce operating sound?	Operating sound produced.	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-16, Pressure Control Solenoid Valve.>

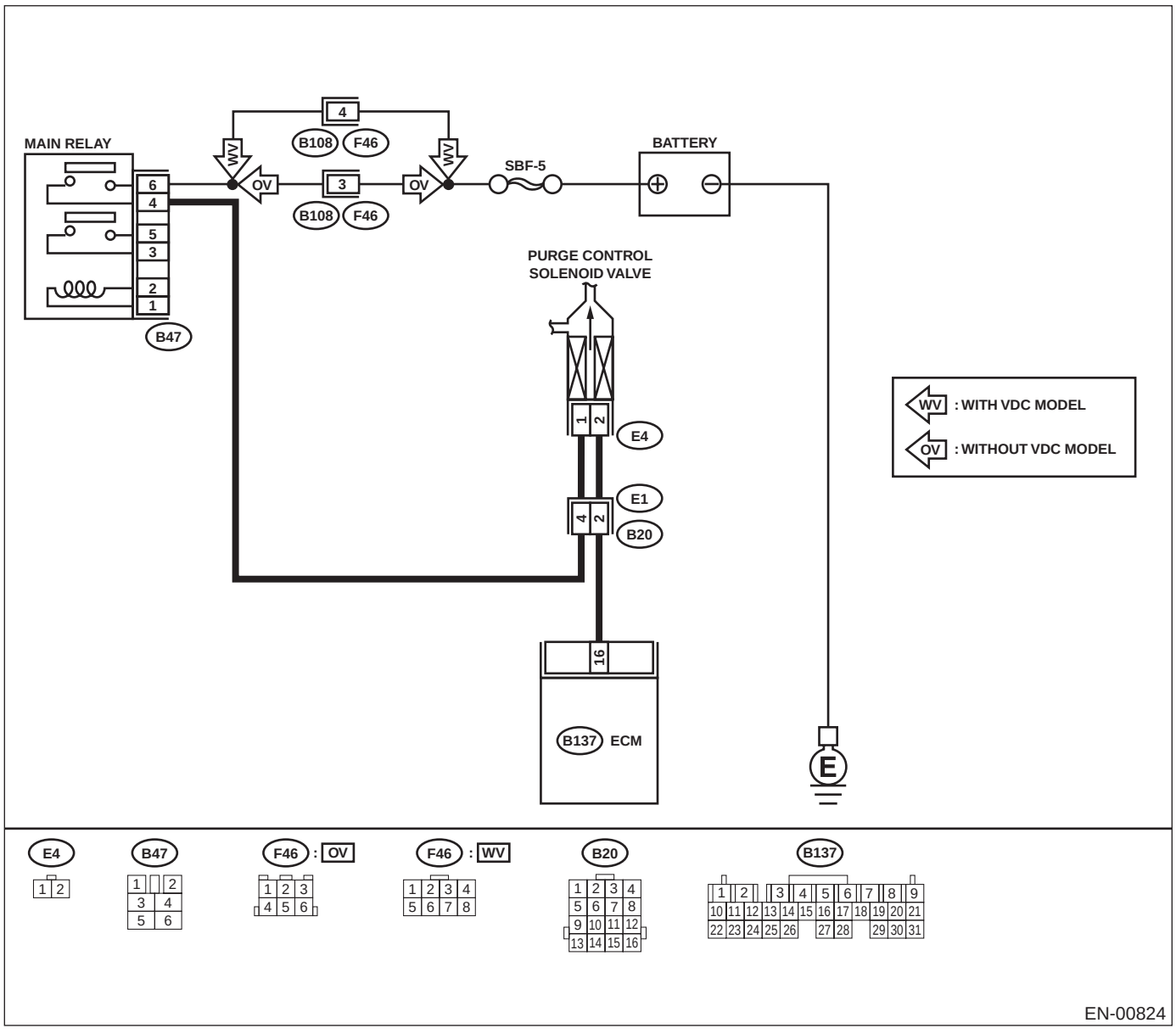
	Step	Value	Yes	No
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF. Is there a hole of more than 0.5 mm (0.020 in) dia. on fuel line?	Hole is found.	Repair or replace fuel line. <Ref. to FU(H6DO)-78, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**
8	**CHECK CANISTER.** Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Damage or hole is found.	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.> Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Damage or hole is found.	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, 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?	There is a non-standard condition in hose or pipe.	Repair or replace hoses or pipes.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BL:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00824

	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to OFF. 2) Disconnect connectors from purge control solenoid valve and ECM. 3) Measure resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 16 — (E4) No. 2:*** Is the measured value less than the specified value?	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
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	10 — 100 Ω	Go to step **5.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>

	Step	Value	Yes	No
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector. Is there poor contact in purge control solenoid valve connector?	There is poor contact.	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.

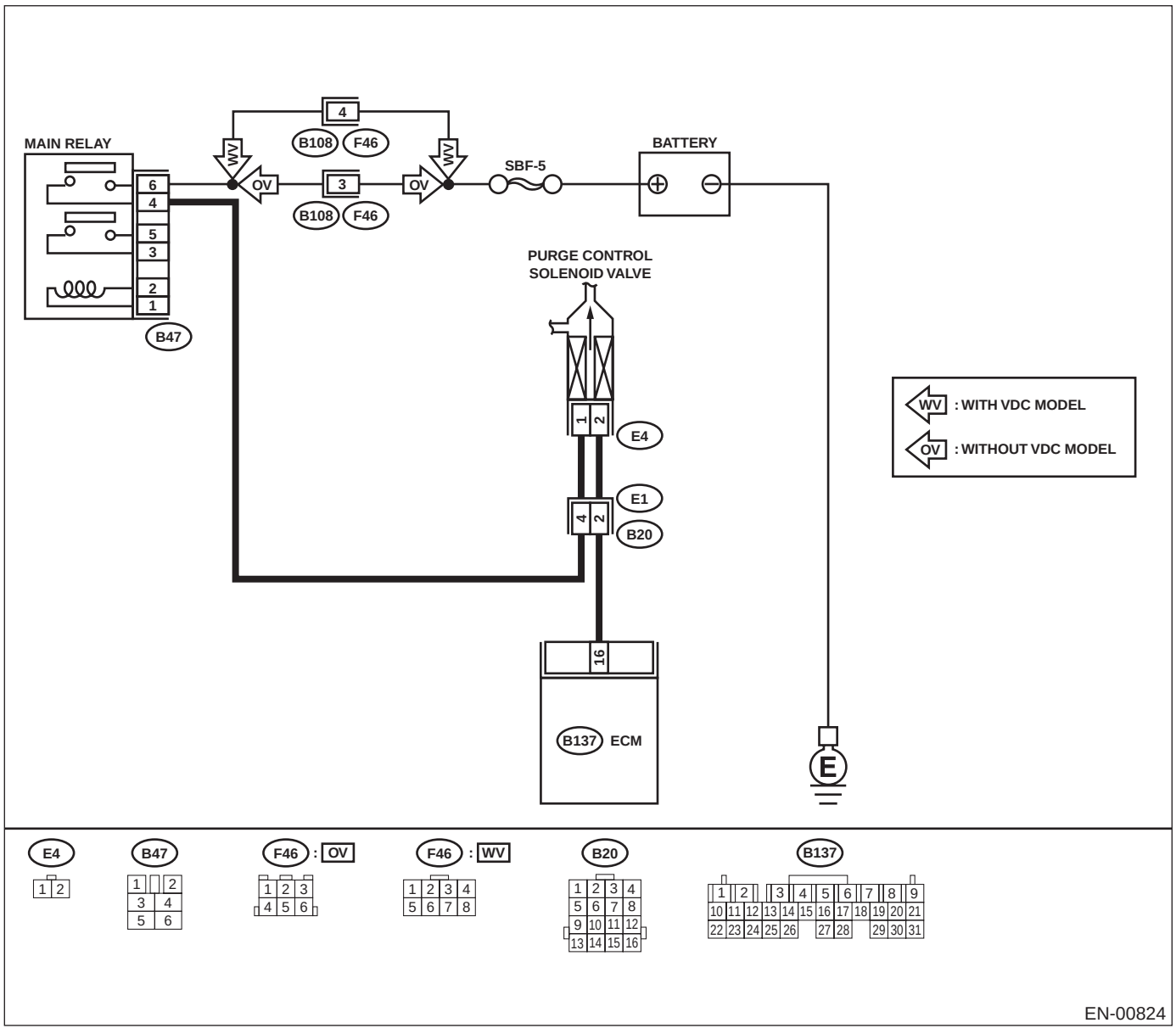
MEMO:

BM:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00824

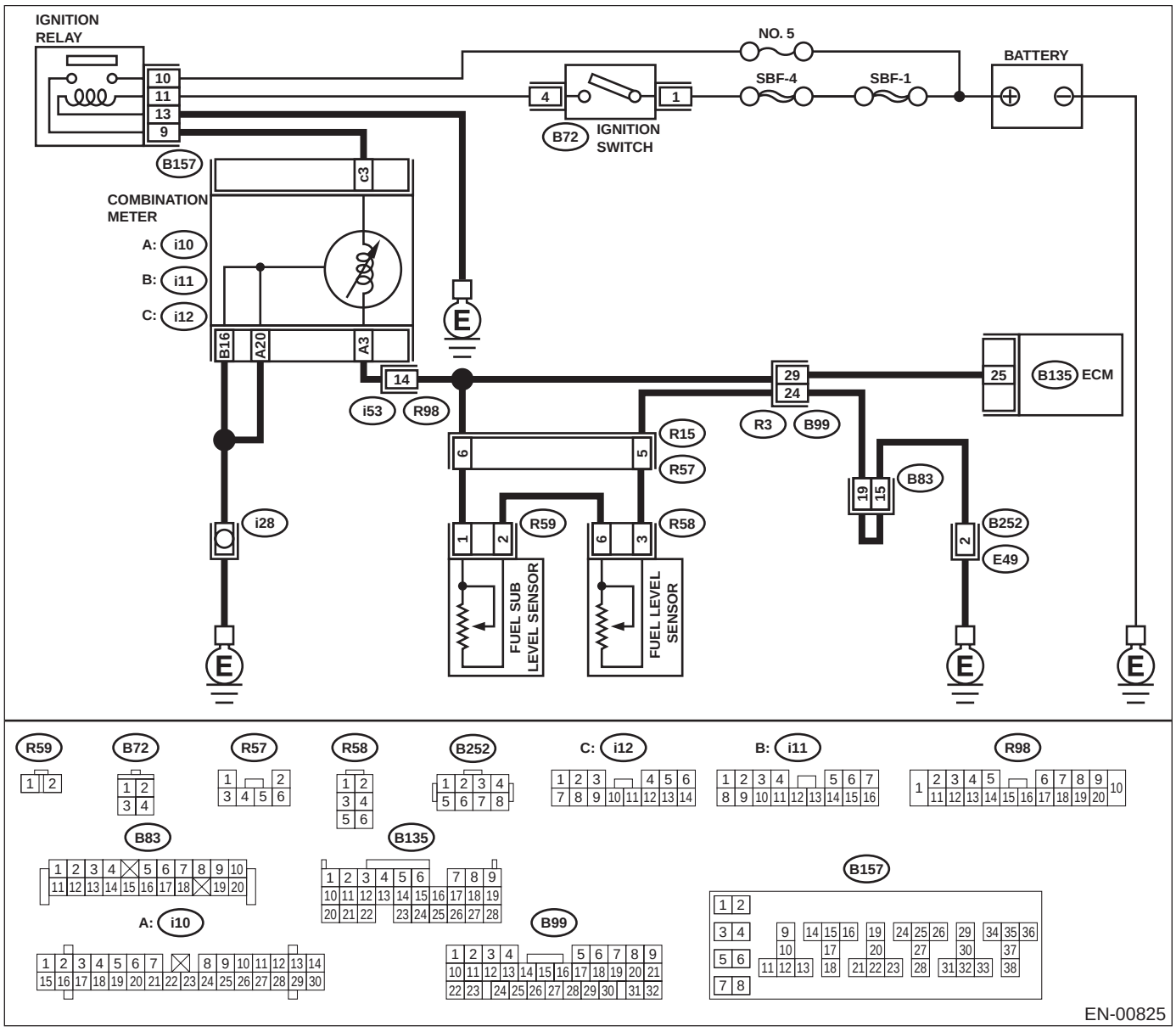
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)-60, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Does the measured value change within the specified range?	0 — 10 V	Go to step **2.**	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.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Is the measured value within the specified range?	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?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from purge control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace purge control solenoid valve <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BN:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00825

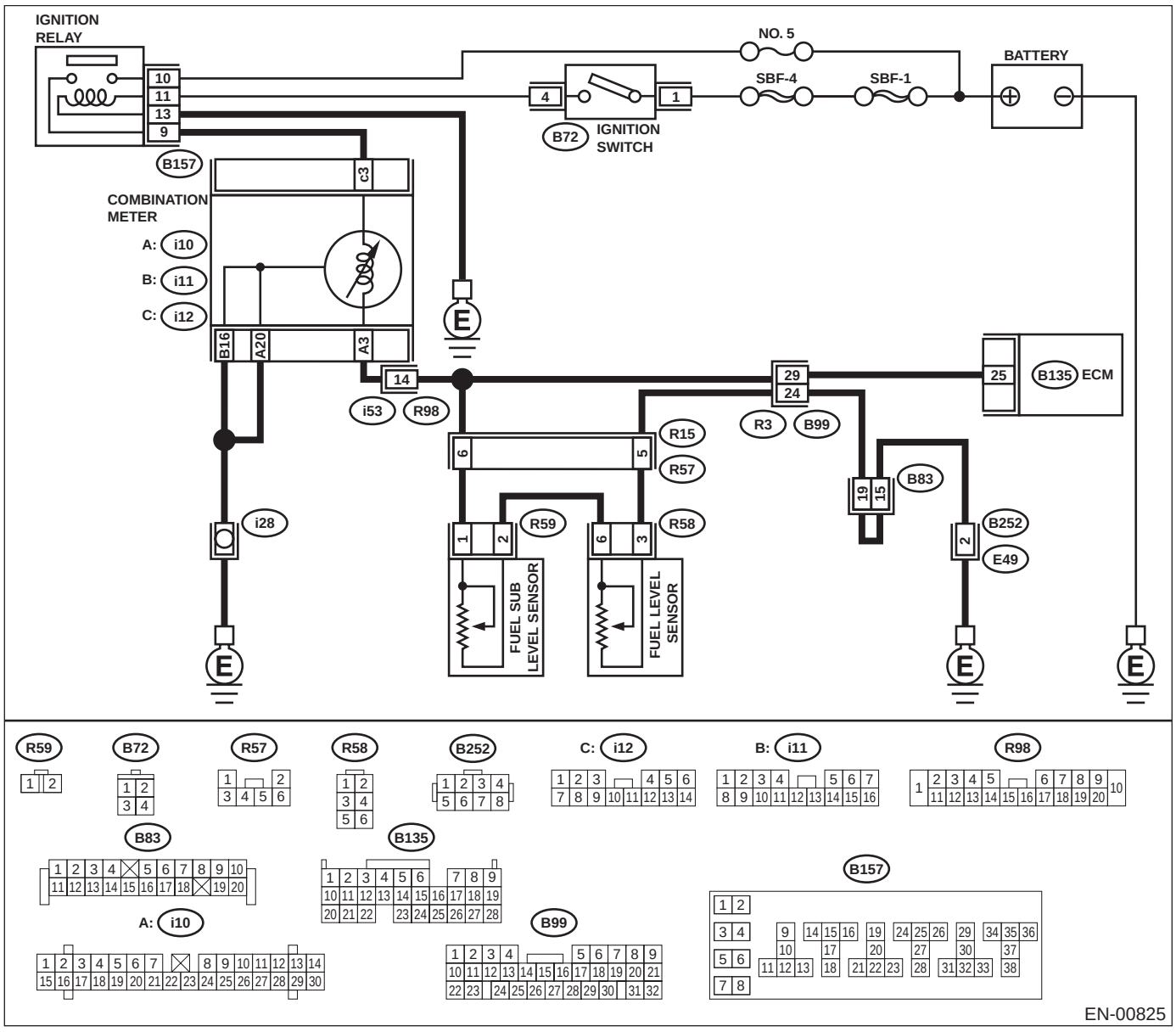
Step		Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to FU(H6DO)-72, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.>.

BO: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00825

	Step	Value	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does speedometer and tachometer operate normally?	Operates properly.	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-12, Combination Meter Assembly.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	0.12 V	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel level sensor signal using Subaru Select Monitor. Does the value change less than the specified value by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	0.12 V	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
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	0.12 V	Go to step **5.**	Go to step **7.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from connector (i10) and ECM connector. 3) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **6.**	Repair ground short circuit in harness between ECM and combination meter connector.

	Step	Value	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i10) No. 3:*** Is the measured value less than the specified value?	10 Ω	Repair or replace combination meter. <Ref. to IDI-12, Combination Meter Assembly.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel sub level sensor. 3) Measure resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel pump assembly. 2) Measure resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:*** Does the measured value exceed the specified value?	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 fuel pump assembly. <Ref. to FU(H6DO)-69, Fuel Pump.> 2) Measure resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 6:*** Is the measured value within the specified range?	0.5 — 2.5 Ω	Go to step **10.**	Replace 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 fuel sub level sensor. <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.> 2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	0.5 — 2.5 Ω	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

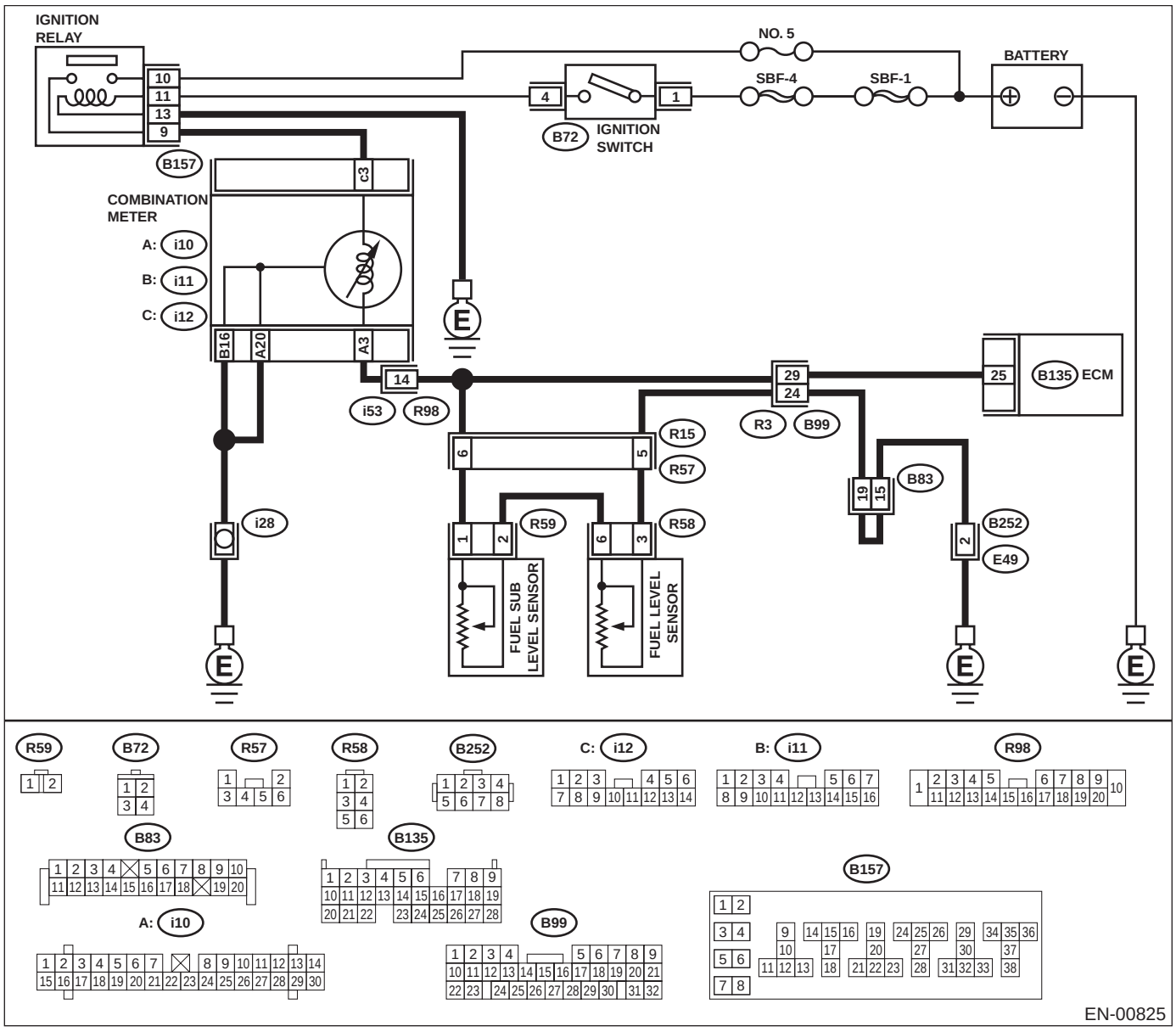
MEMO:

BP: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.** Does speedometer and tachometer operate normally?	Operates properly.	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-12, Combination Meter Assembly.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect combination meter connector (i10) and ECM connector. 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 6:*** Is the measured value less than the specified value?	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 resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 5 — Chassis ground:*** Is the measured value less than the specified value?	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

	Step	Value	Yes	No
6	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel level sensor. 2) Measure resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 5 — (R58) No. 3:*** Is the measured value less than the specified value?	10 Ω	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel sub level sensor. 2) Measure resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 6 — (R59) No. 2:*** Is the measured value less than the specified value?	10 Ω	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R59) No. 1:*** Is the measured value less than the specified value?	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 fuel pump assembly. <Ref. to FU(H6DO)-69, Fuel Pump.> 2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 6:*** Does the measured value exceed the specified value?	54.5 Ω	Replace fuel level sensor. <Ref. to FU(H6DO)-72, 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 fuel sub level sensor. <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:*** Does the measured value exceed the specified value?	41.5 Ω	Replace fuel sub level sensor. <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-12, Combination Meter Assembly.>

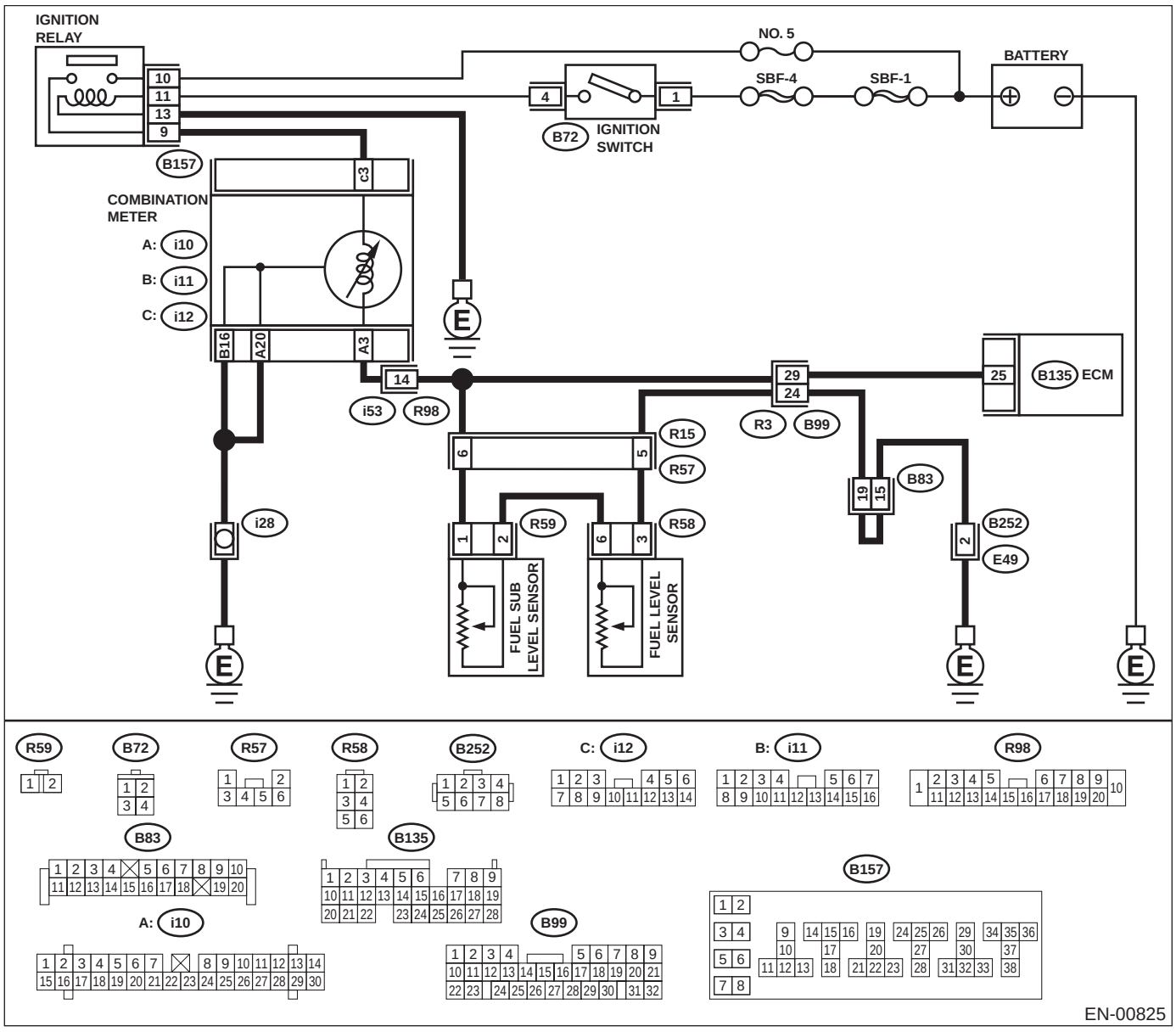
MEMO:

BQ:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00825

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-69, Fuel Pump.> 2) While moving fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 6:*** Does the resistance change smoothly?	Changes smoothly.	Go to step **3.**	Replace fuel level sensor. <Ref. to FU(H6DO)-72, 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 fuel sub level sensor. <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.> 2) While moving 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?	Changes smoothly.	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(H6DO)-73, Fuel Sub Level Sensor.>

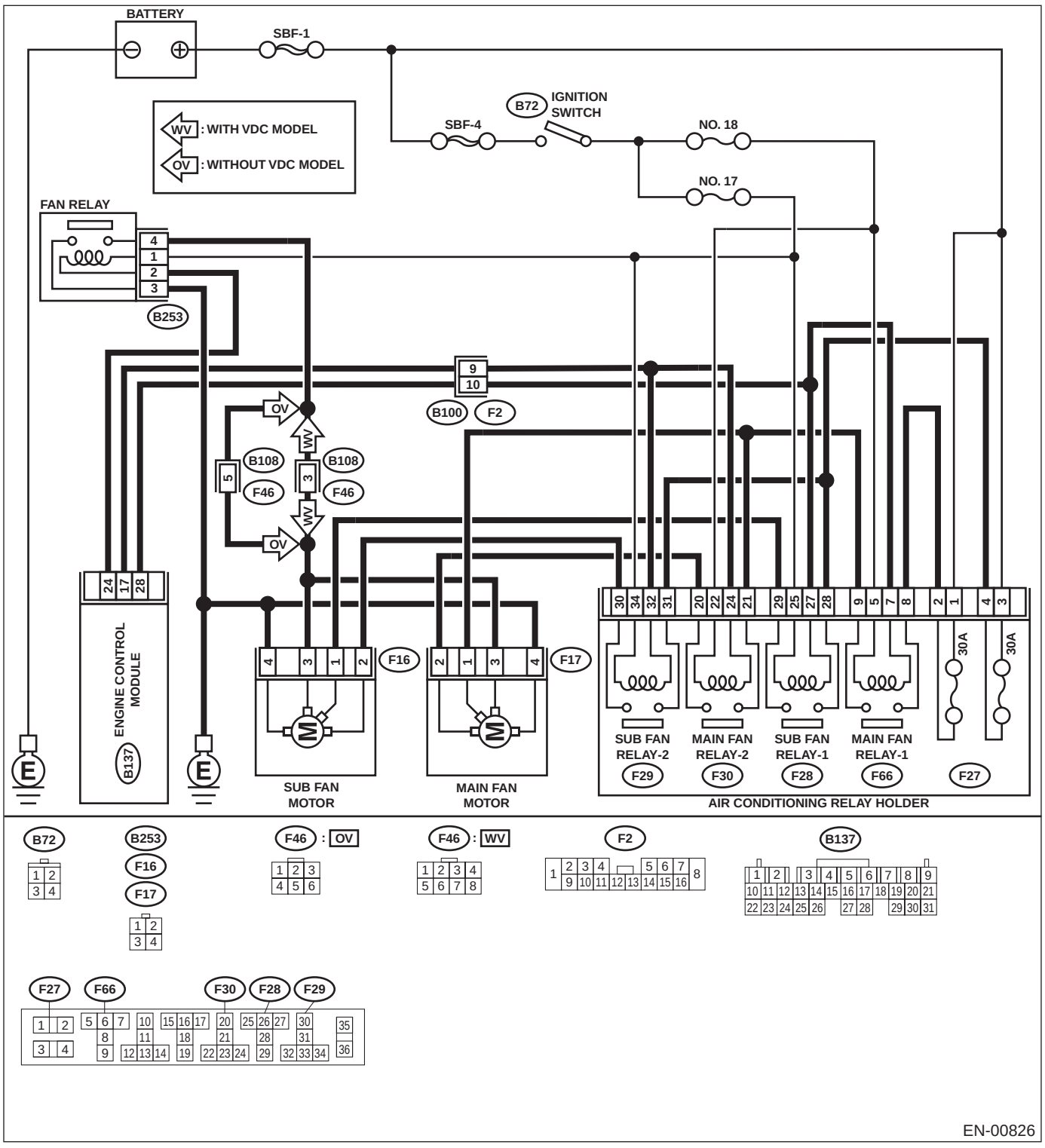
BR:DTC P0483 — COOLING FAN RATIONALITY CHECK —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, 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:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H6DO)-7, INSPECTION, Radiator Main Fan System.> and <Ref. to CO(H6DO)-15, INSPECTION, Radiator Sub Fan System.>

BS:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H6DO)-280, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

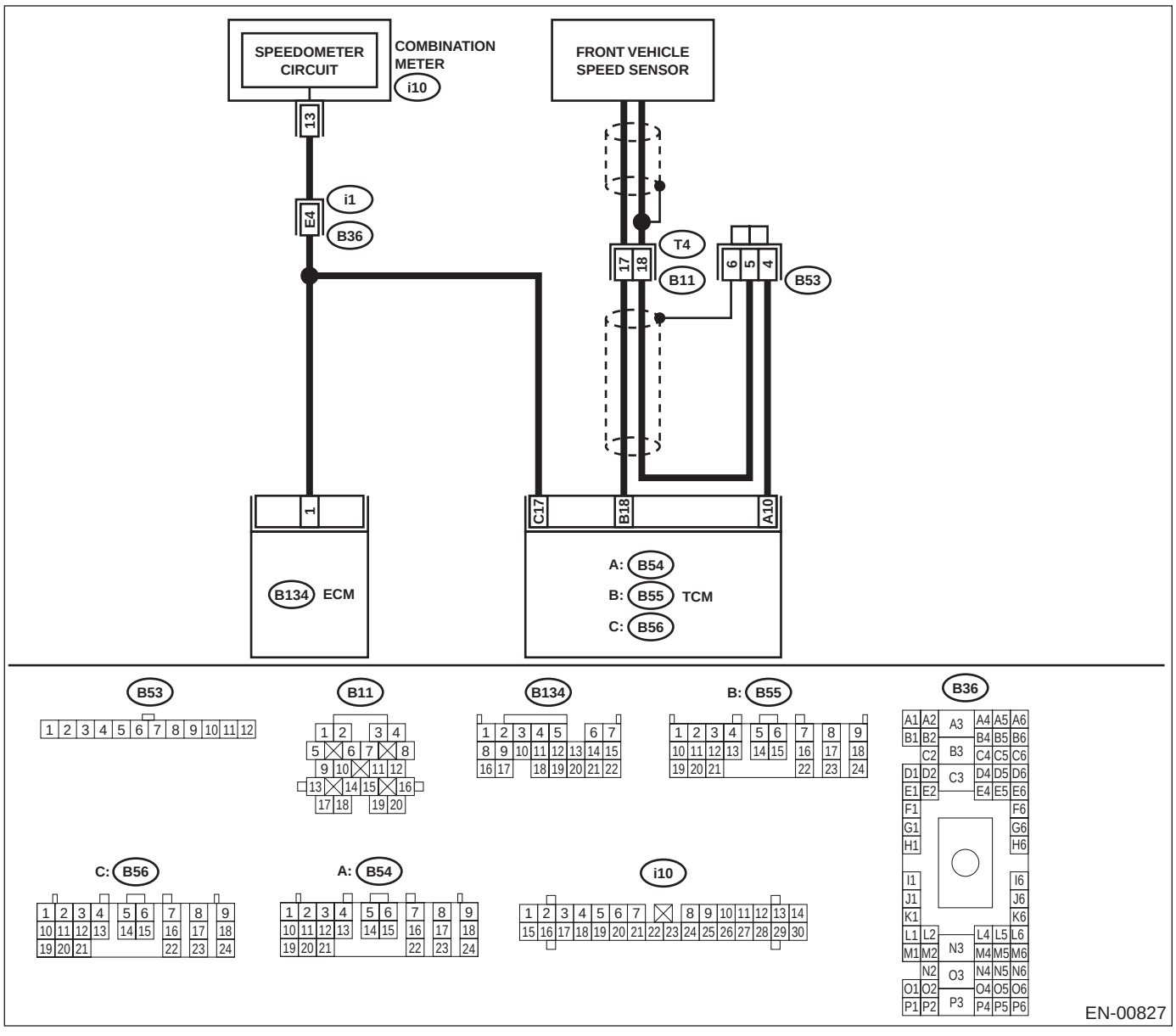
BT:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

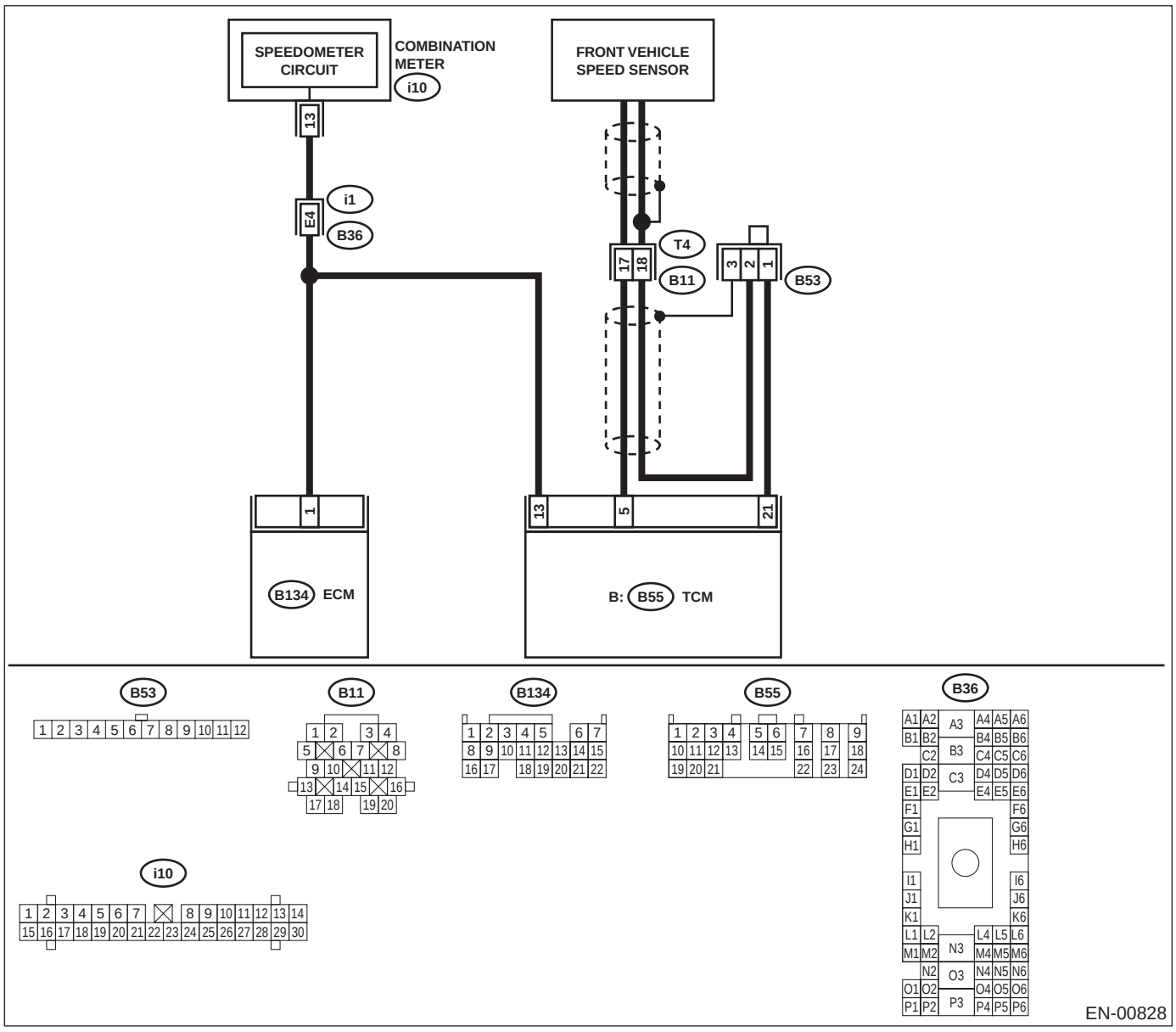
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

WITH VDC MODEL



WITHOUT VDC MODEL



	Step	Value	Yes	No
1	**CHECK DTC P0720 ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	DTC P0720 is indicated.	Check front vehicle speed sensor signal circuit. <Ref. to AT-58, 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 speedometer operate normally?	Operates properly.	Go to step **3.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-14, Speedometer.>, <Ref. to AT-54, Front Vehicle Speed Sensor.>, <Ref. to AT-58, Rear Vehicle Speed Sensor.> and <Ref. to AT-59, Torque Converter Turbine Speed Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 1 — (i10) No. 13:*** Is the measured value less than the specified value?	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

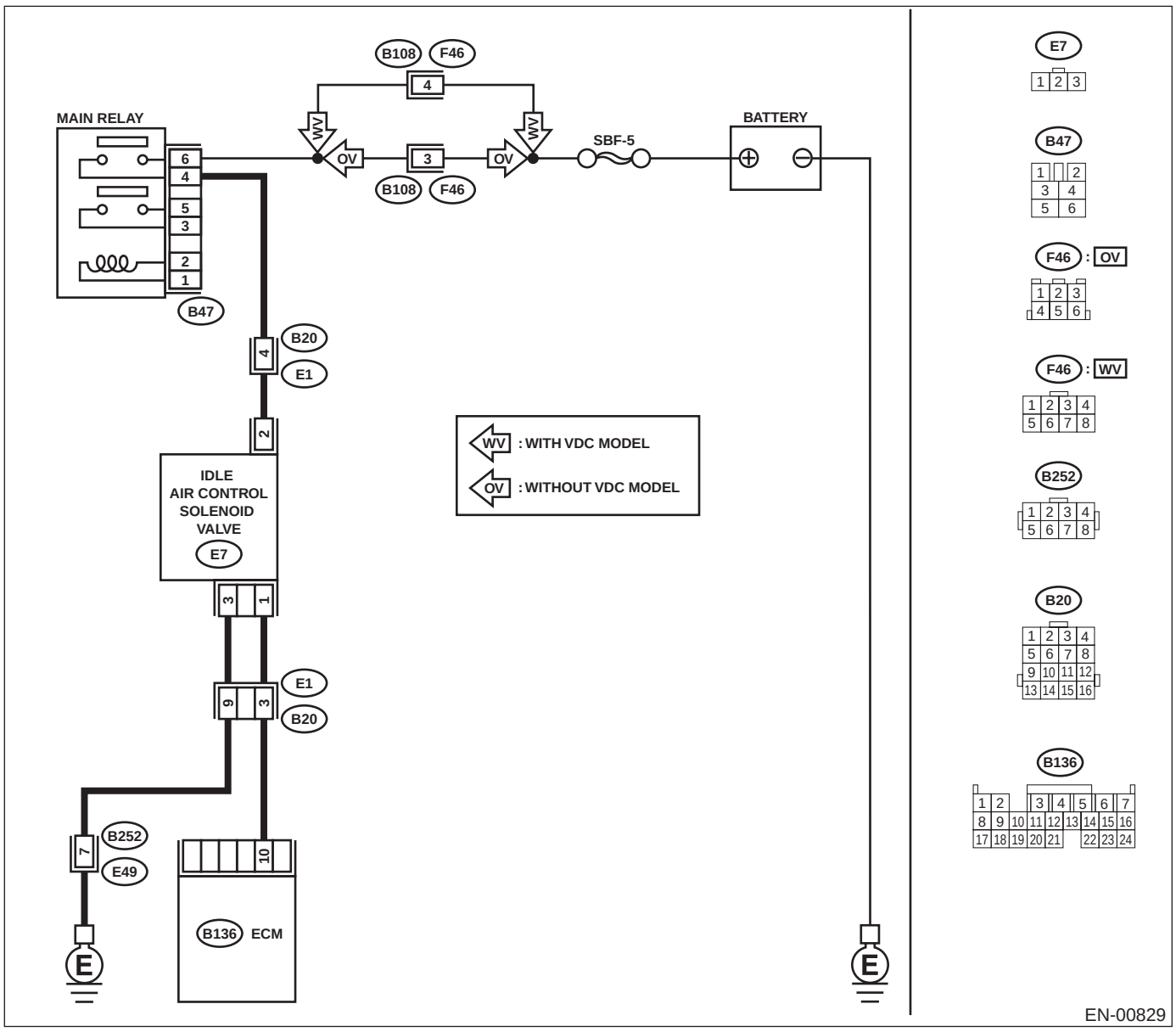
MEMO:

BU: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



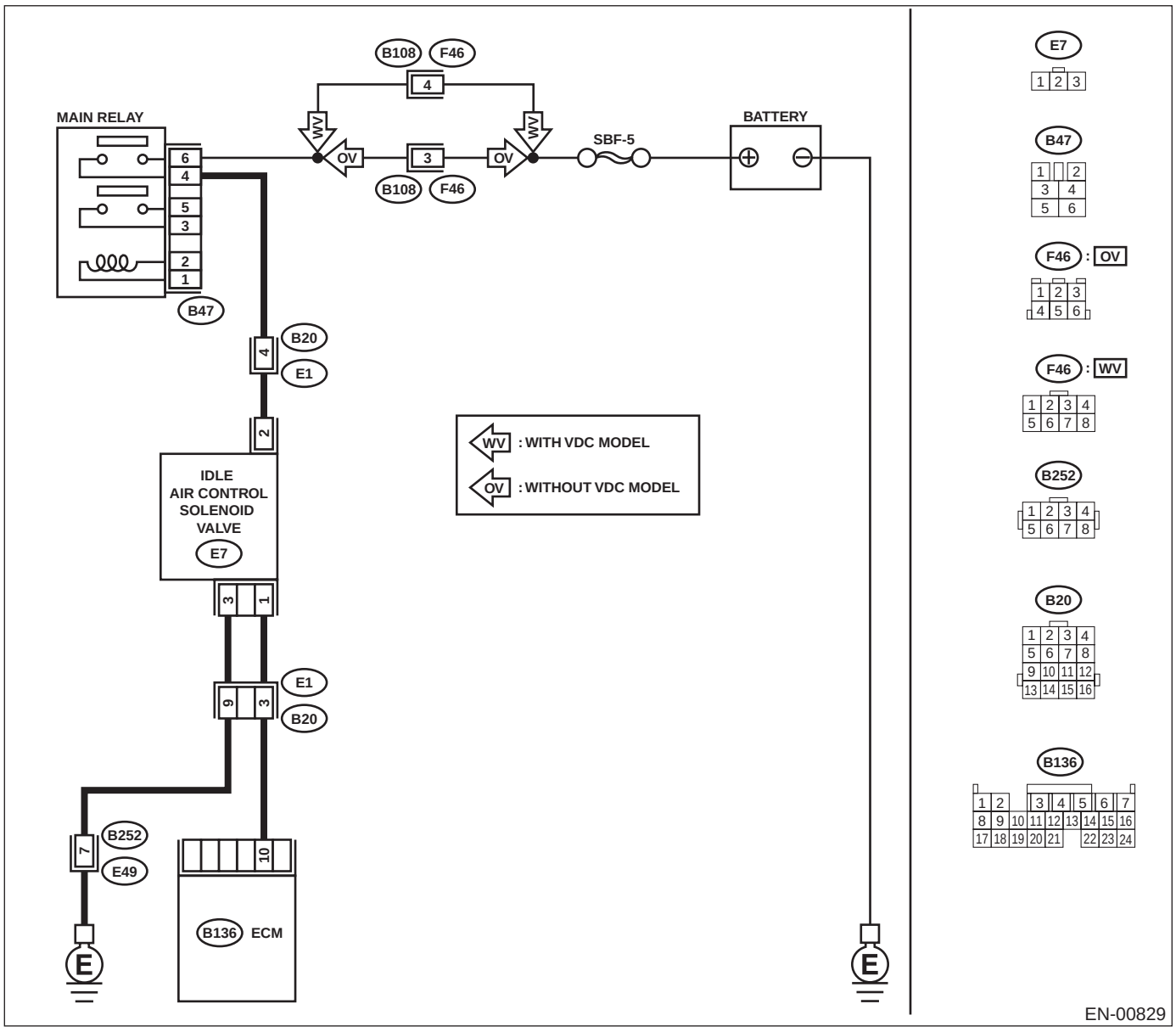
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H6DO)-16, Throttle Body.> 4) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior. Does air flow out?	Air flows out.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H6DO)-16, Throttle Body.>

BV:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



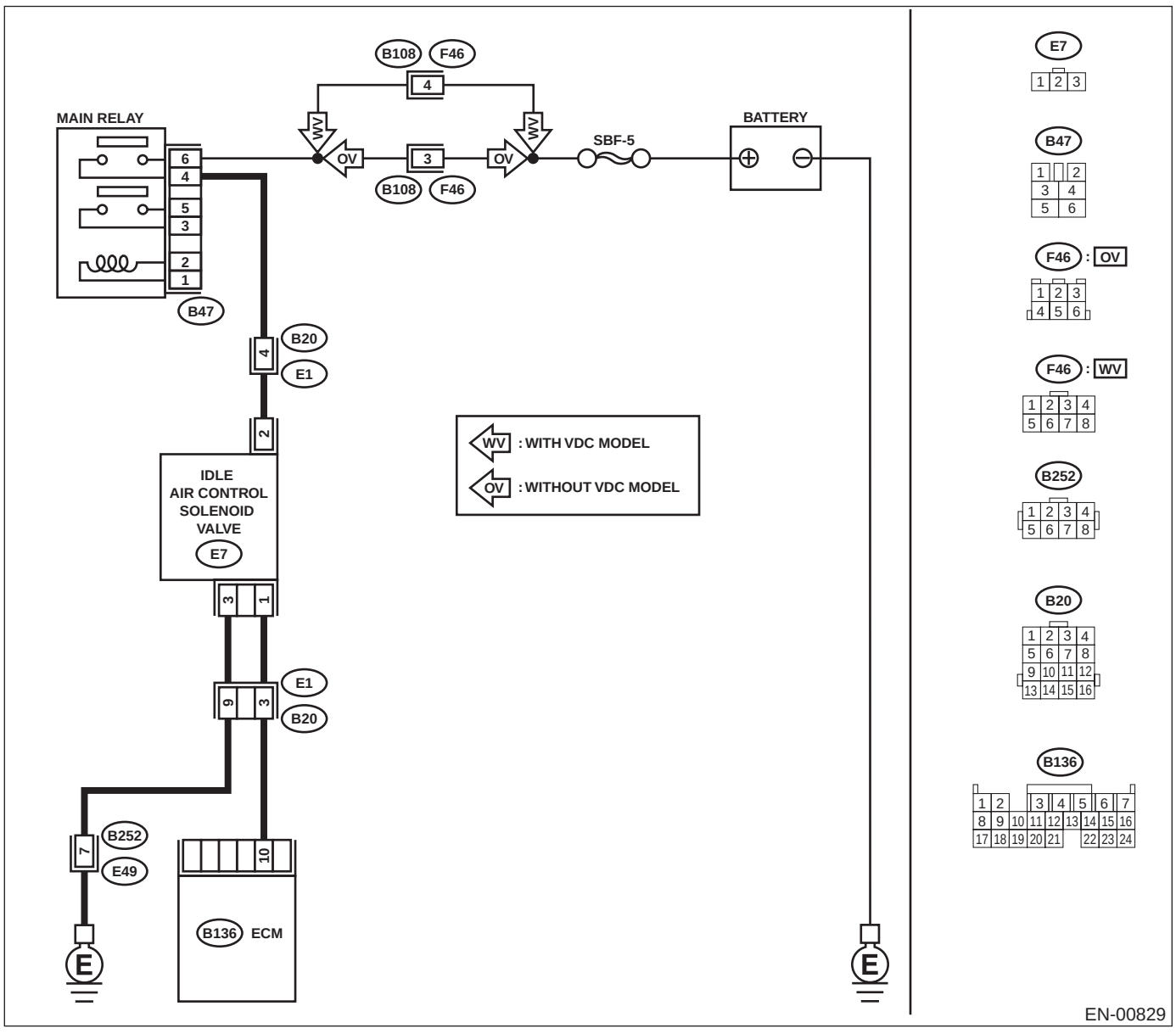
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start 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?	There is a fault.	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.** Does throttle cable have play for adjustment?	Throttle cable has a play.	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-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?	Foreign particles are in by-pass air line.	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

BW:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



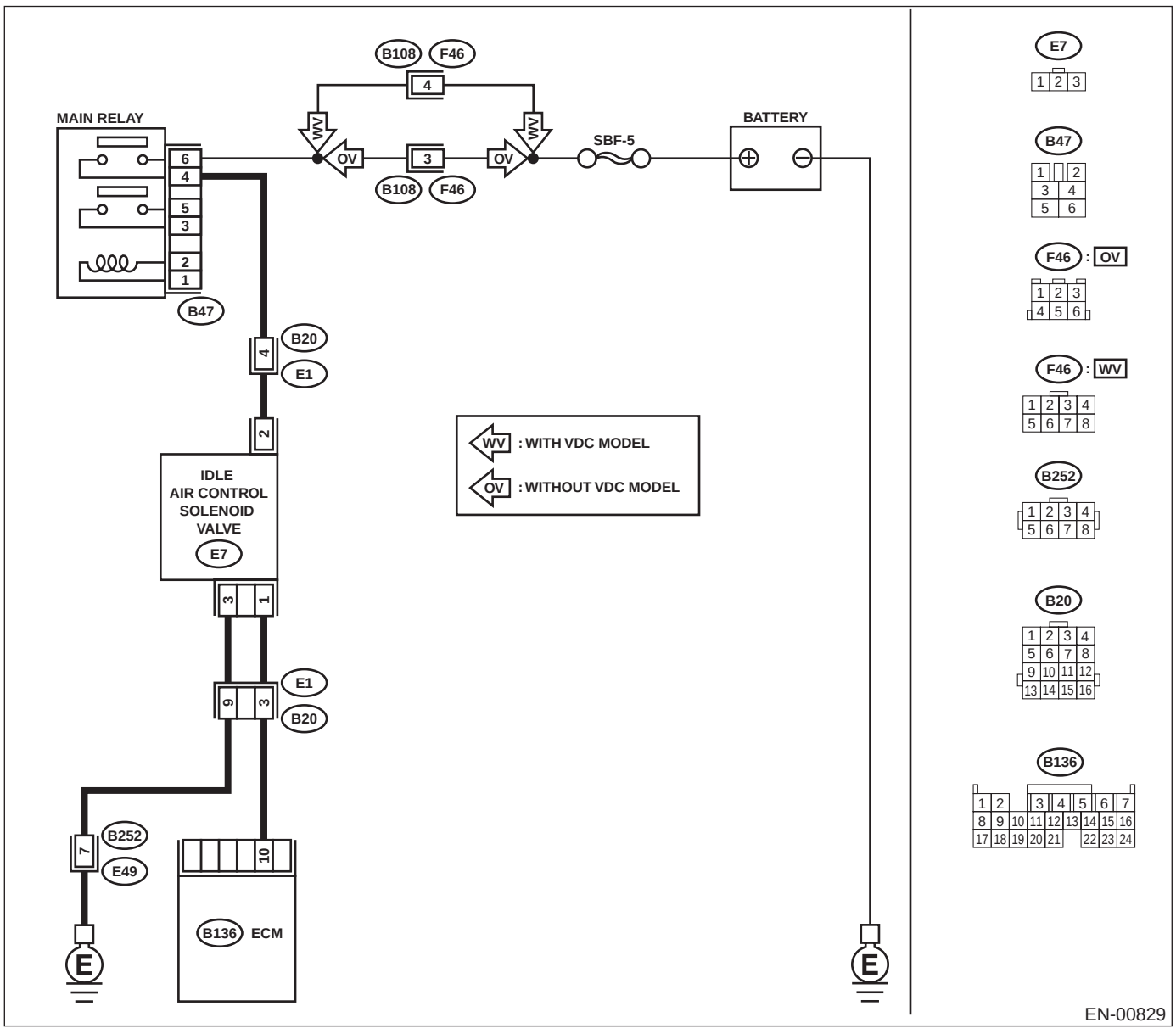
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	3 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):*** Does the measured value exceed the specified value?	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
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B136) No. 10 — (E7) No. 1:*** Is the measured value less than the specified value?	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
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 — Chassis ground:*** Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step **5.**
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:*** Is the measured value less than the specified value?	5 Ω	Go to step **6.**	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors. Is there poor contact in ECM and idle air control solenoid valve connectors?	There is poor contact.	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

BX:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



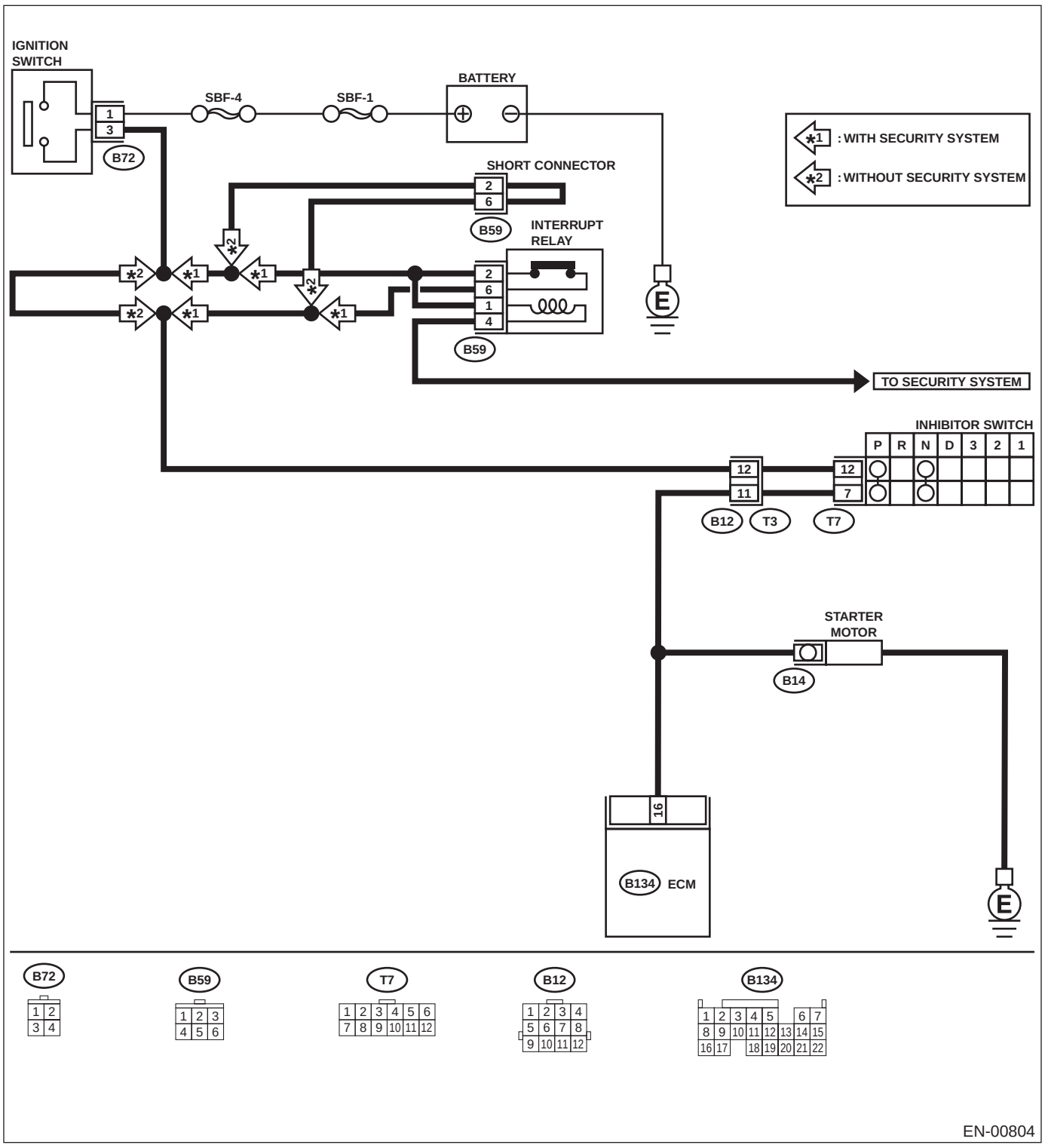
	Step	Value	Yes	No
1	**CHECK THROTTLE CABLE.** Does throttle cable have play for adjustment?	Throttle cable has play for adjustment.	Go to step **2.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Replace idle air control solenoid valve <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>.
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	10 V	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BY:DTC P0512 — STARTER REQUEST CIRCUIT —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00804

	Step	Value	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in each position. Does starter motor operate when ignition switch to “ON”?	Starter motor operates.	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H6DO)-75, Diagnostics for Engine Starting Failure.>

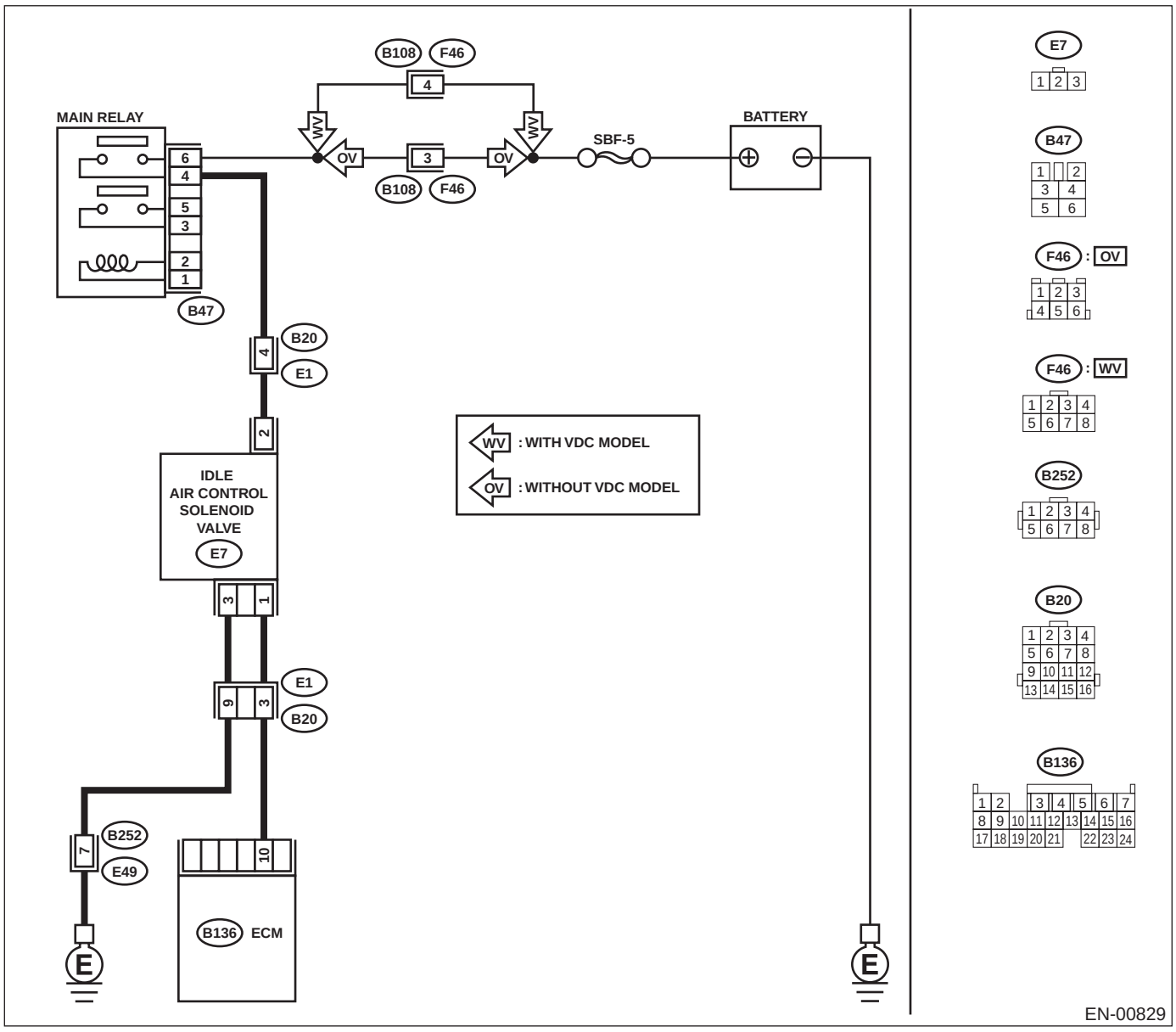
MEMO:

BZ:DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMACE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.** Does throttle cable have play for adjustment?	Throttle cable has a play.	Go to step **3.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
3	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start 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?	There is a fault.	Repair air suction and leaks.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

CA:DTC P0558 — ALTERNATOR CIRCUIT LOW INPUT —

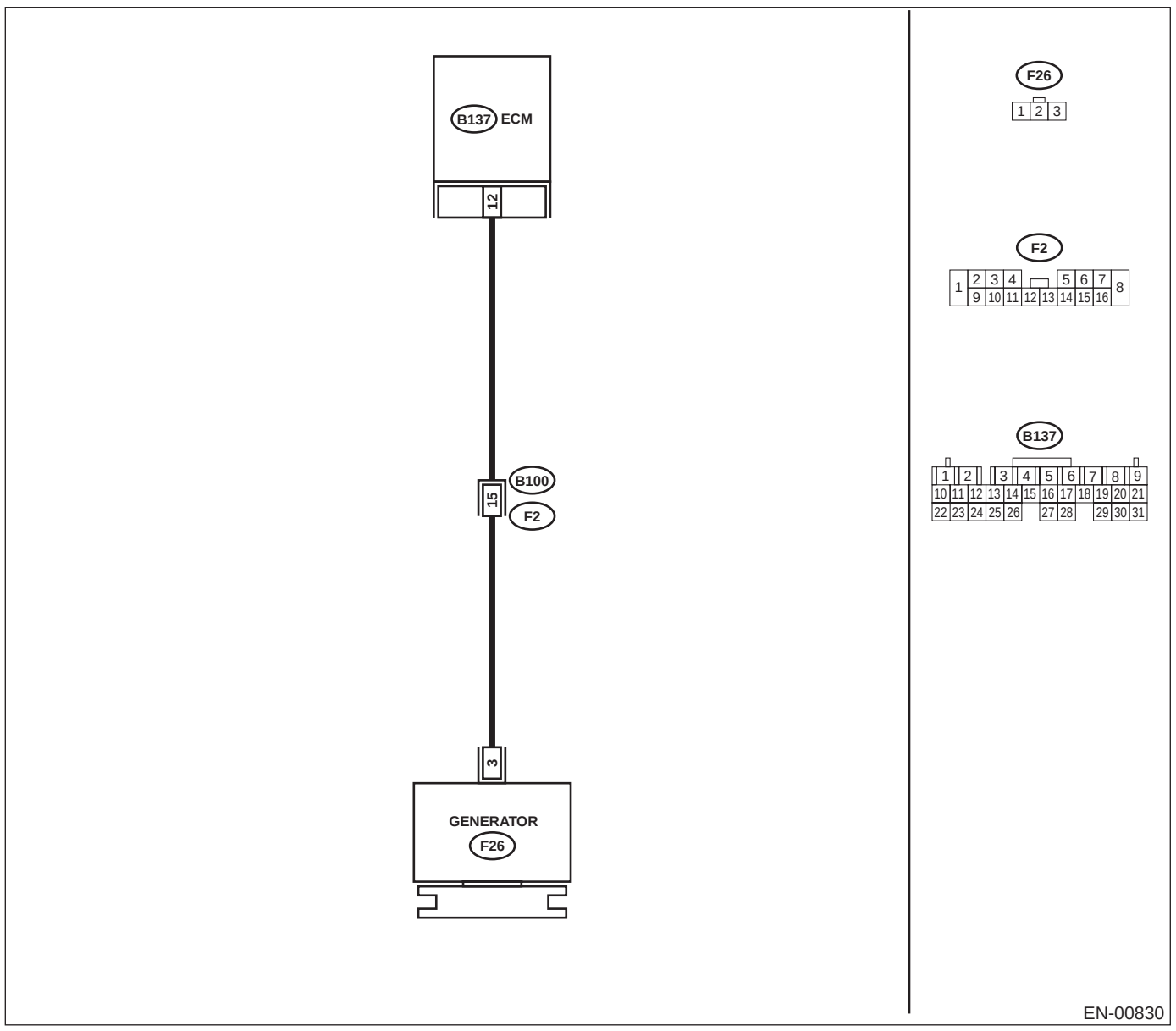
NOTE:
For the diagnostic procedure, refer to DTC P0559. <Ref. to EN(H6DO)-298, DTC P0559 — ALTERNATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P0559 — ALTERNATOR 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



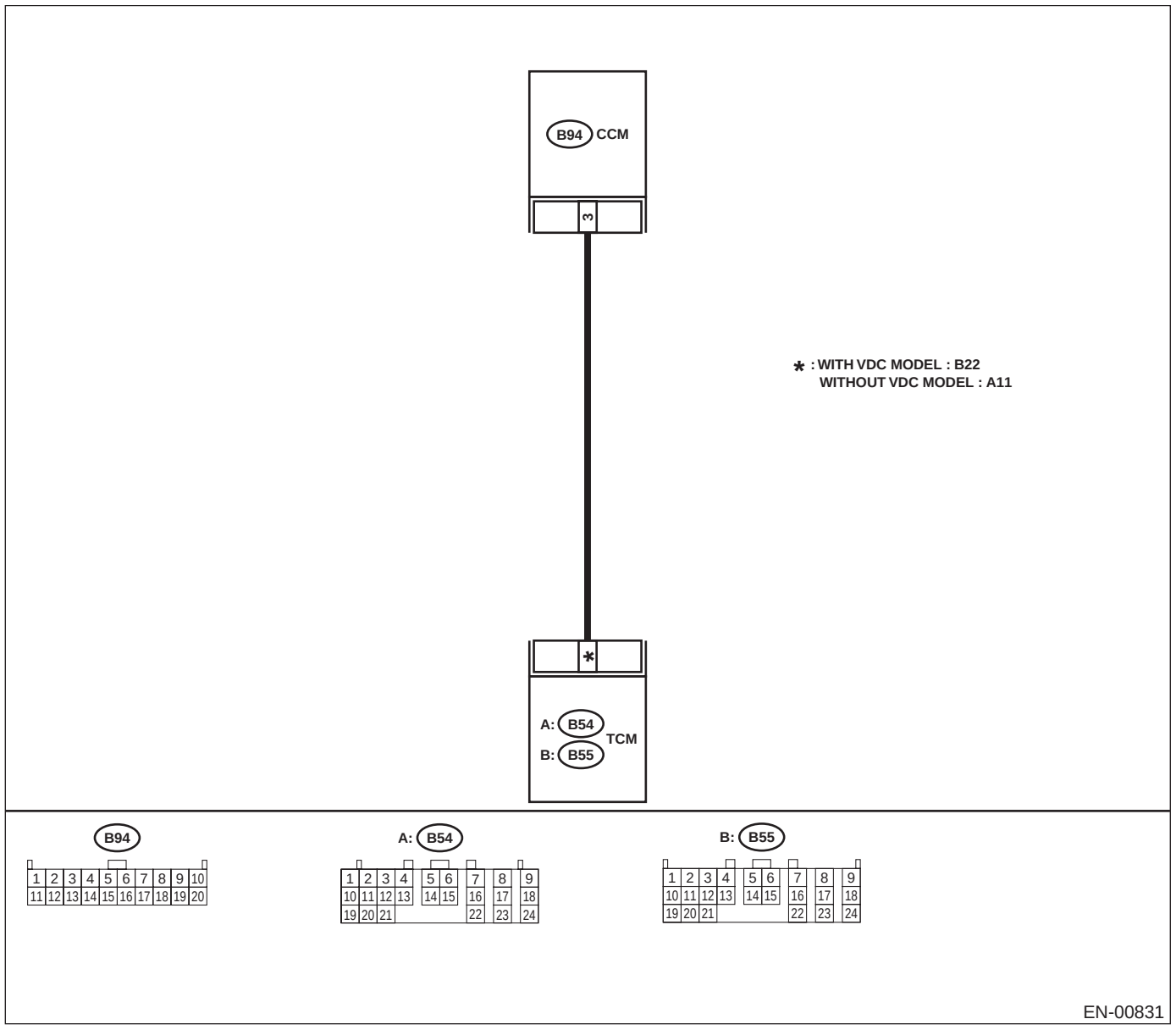
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from generator and ECM. 3) Measure the resistance of harness between generator connector and engine ground. ***Connector & terminal*** ***(F26) No. 3 — Engine ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **2.**	Repair the short circuit in harness between ECM and generator connector.
2	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and generator of harness connector. ***Connector & terminal*** ***(B137) No. 12 — (F26) No. 3:*** Is the measured value less than the specified value?	1 Ω	Repair poor contact in connector.	Repair the open circuit in harness between ECM and generator connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and generator connector • Poor contact in coupling connector

CC:DTC P0565 — CRUISE CONTROL ON SIGNAL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



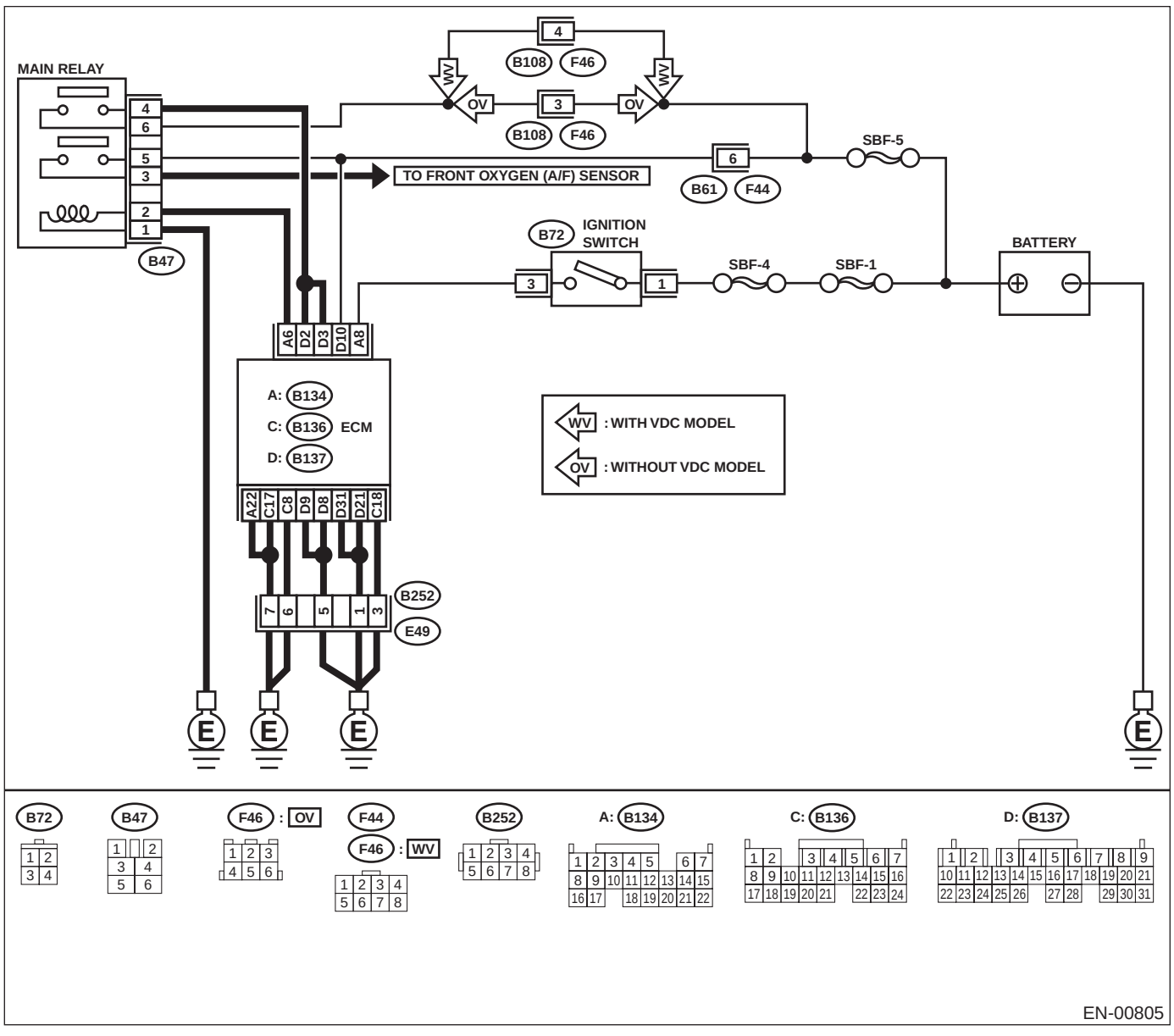
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 — (B94) No. 3:*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 — (B94) No. 3:*** Is the measured value less than the specified value?	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 resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 — Chassis ground:*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 — Chassis ground:*** Is the measured value less than the specified value?	10 Ω	Repair short circuit in harness between TCM and CCM connector.	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-7, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CD:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



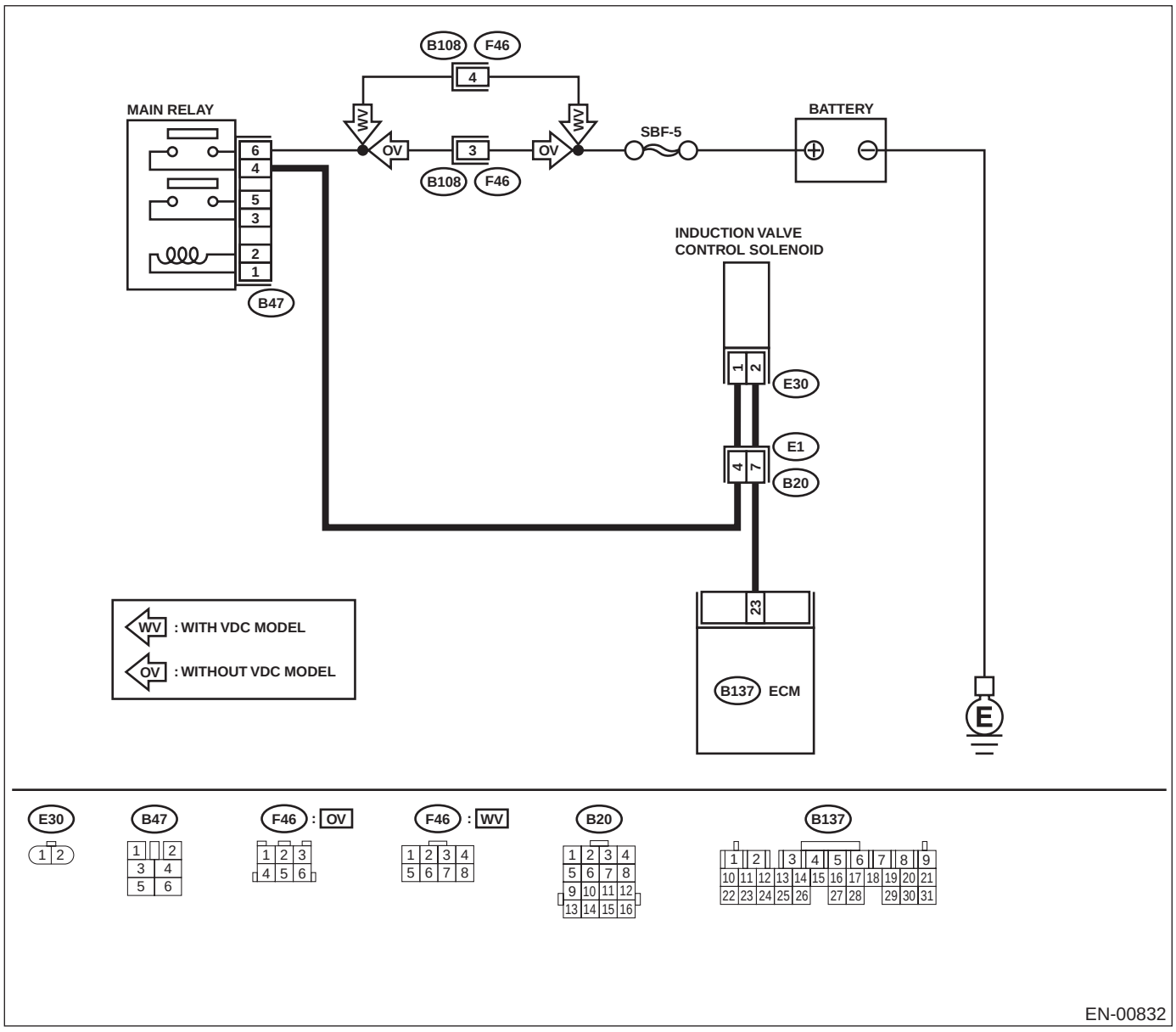
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	DTC P0604 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	It is not necessary to inspect DTC P0604.

CE:DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW - BANK 1 —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 23 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from induction control solenoid valve and ECM. 3) Measure resistance of harness between induction control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E30) No. 2 — Engine ground:*** Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between ECM and induction control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and induction control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 23 — (E30) No. 2:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit in harness between ECM and induction control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and induction control solenoid valve connector • Poor contact in coupling connector
4	**CHECK INDUCTION CONTROL SOLENOID VALVE.** 1) Remove induction control solenoid valve. 2) Measure resistance between induction control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	37 — 44 Ω	Go to step **5.**	Replace induction control solenoid valve. <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.>

	Step	Value	Yes	No
5	**CHECK POWER SUPPLY TO INDUCTION CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between induction control solenoid valve and engine ground. ***Connector & terminal*** ***(E30) No. 1 (+) — Engine ground (–):*** Is the measured value within the specified range?	10 V	Go to step **6.**	Repair open circuit in harness between main relay and induction control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in induction control solenoid valve connector. Is there poor contact in induction control solenoid valve connector?	There is poor contact.	Repair poor contact in induction control solenoid valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

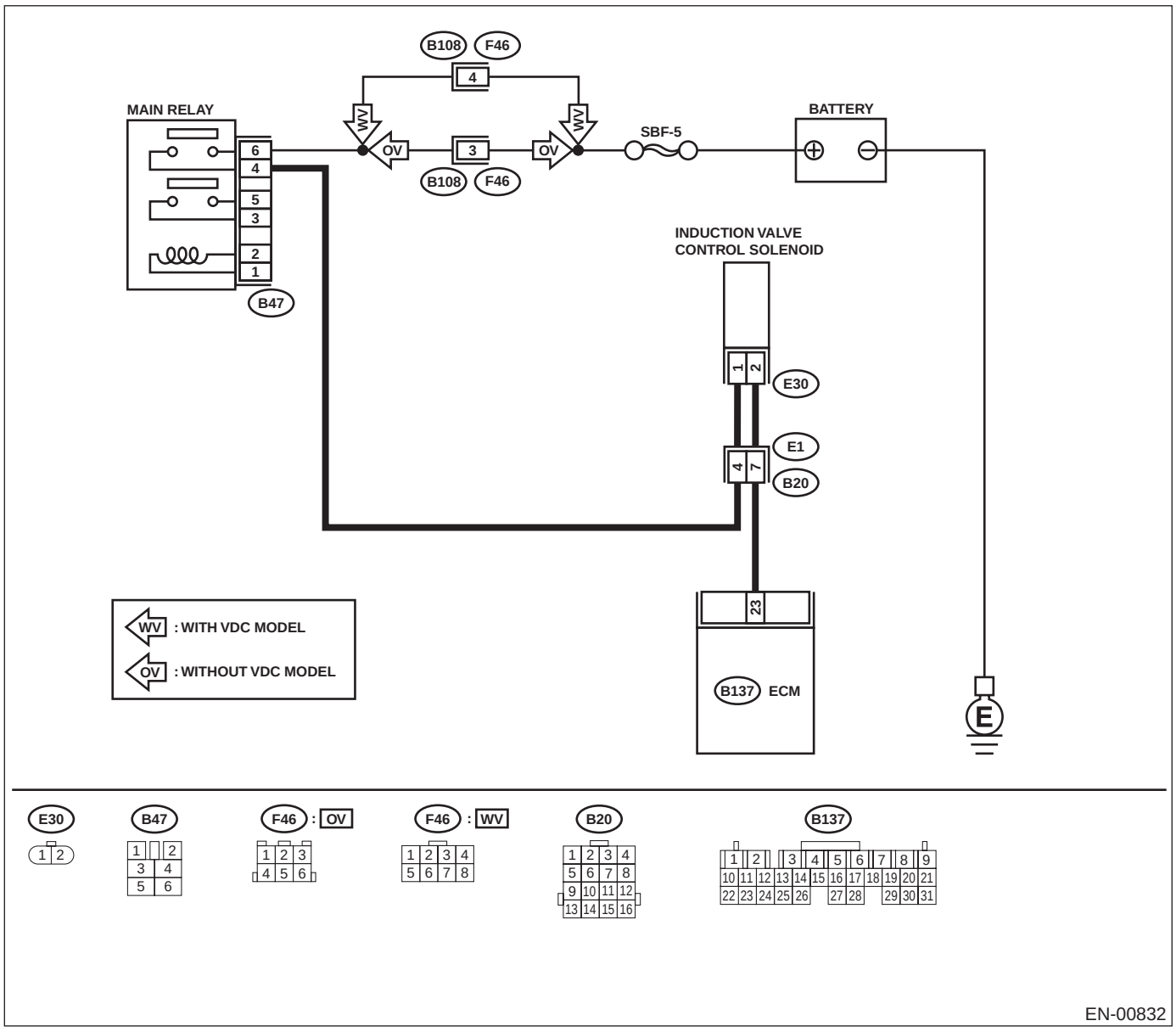
MEMO:

CF:DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH - BANK 1 —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00832

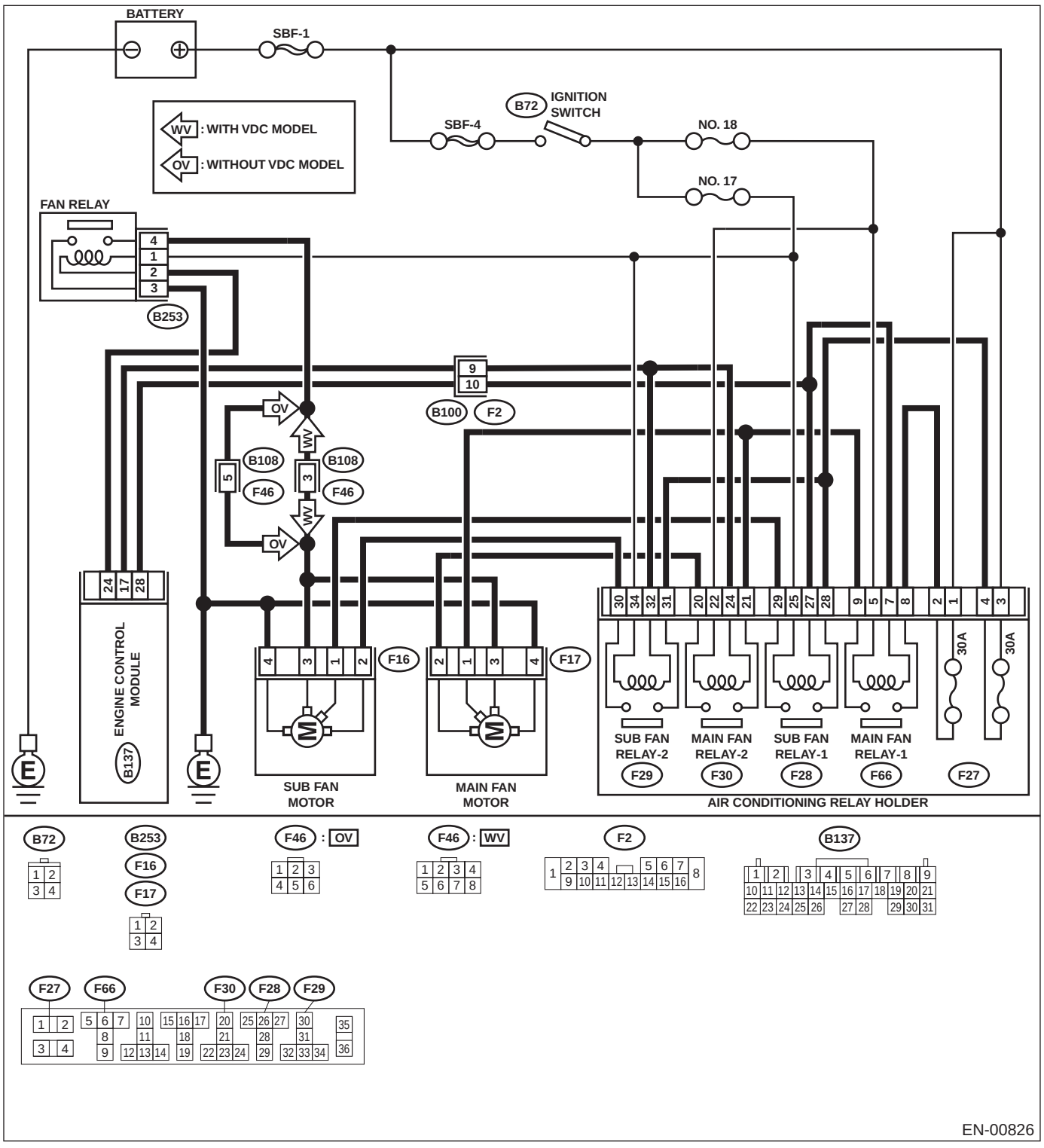
	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 23 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
3	**CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from induction control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and induction control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **4.**
4	**CHECK INDUCTION CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between induction control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace induction control solenoid valve <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

CG:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00826

	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating 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(H6DO)-38, Subaru Select Monitor.> ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):*** Does the measured value change within the specified range?	0 — 10 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and remove main fan relays from A/C relay holder. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 28 — Chassis ground:*** ***(B137) No. 17 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **3.**	Repair ground short circuit in radiator fan relay 1 control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F66) No. 5 (+) — Chassis ground (–):*** ***(F30) No. 22 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 RELAYS.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. ***Terminal*** ***(F66) No. 5 — No. 7:*** ***(F30) No. 22 — No. 24:*** Is the measured value within the specified range?	87 — 107 Ω	Go to step **5.**	Replace main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B137) No. 28 — (F66) No. 6:*** ***(B137) No. 17 — (F30) No. 24:*** Is the measured value less than the specified value?	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

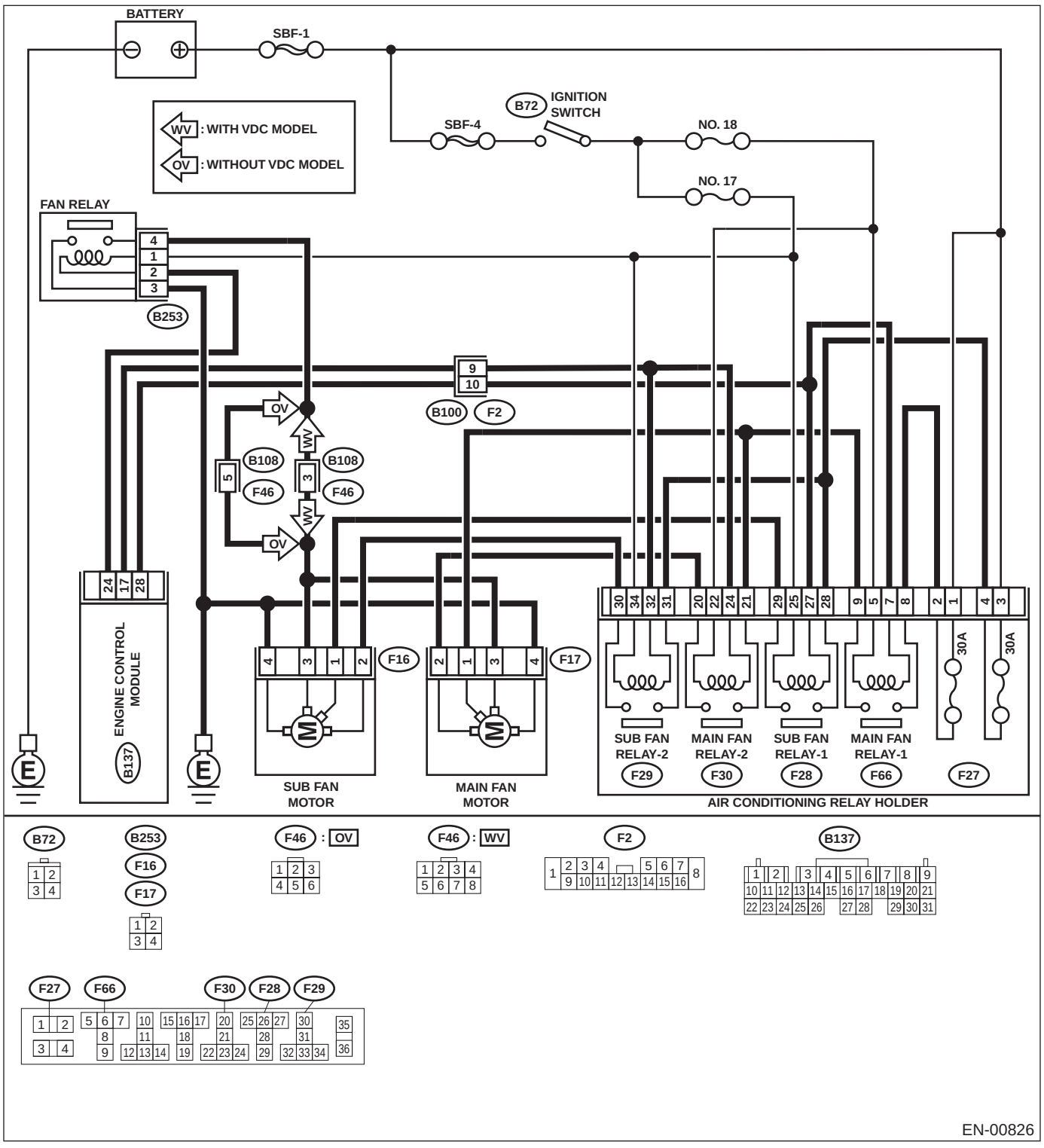
Step		Value	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector. Is there poor contact in ECM or main fan relay connector?	There is poor contact.	Repair poor contact in ECM or main fan relay connector.	Contact with SOA (distributor) service.

CH:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00826

	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating 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(H6DO)-60, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):*** Does the measured value change within the specified range?	0 — 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 ignition switch to OFF. 2) Remove main fan relay and sub fan relay. (with A/C models) 3) Disconnect test mode connector. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals. ***Terminal*** ***(F66) No. 5 — No. 7:*** ***(F30) No. 22 — No. 24:*** Is the measured value less than the specified value?	1 Ω	Replace main fan relay.	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. ***Terminal*** ***(F28) No. 25 — No. 27:*** ***(F29) No. 32 — No. 34:*** Is the measured value less than the specified value?	1 Ω	Replace sub fan relay.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

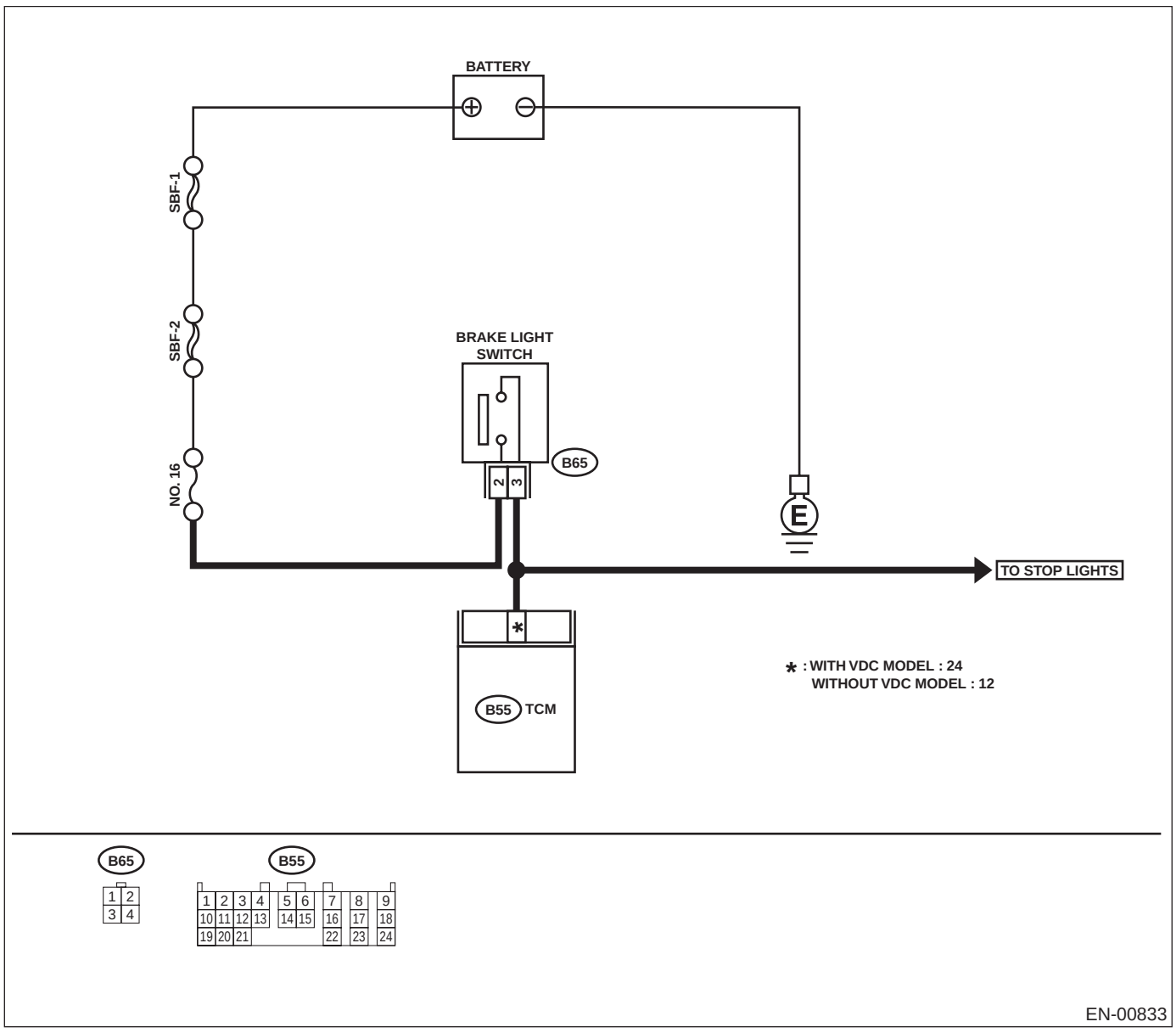
MEMO:

CI: DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.** Does brake light come on when depressing the brake pedal?	Comes on.	Go to step **2.**	Repair or replace brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect connectors from TCM and brake light switch. 2) Measure resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 — (B65) No. 3:*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 — (B65) No. 3:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	Repair or replace harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 connectors to TCM and brake light switch. 2) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):*** Is the measured value less than the specified value when releasing the brake pedal?	1 V	Go to step **5.**	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):*** Does the measured value exceed the specified value when depressing the brake pedal?	10 V	Go to step **6.**	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector. Is there poor contact in TCM connector?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CJ:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-320, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-320, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-320, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CM: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 effective 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, 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?	There is a malfunction.	Repair or replace throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to AT-58, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in front throttle position sensor circuit?	There is a malfunction.	Repair or replace front vehicle speed sensor circuit.	Go to step **4.**

	Step	Value	Yes	No
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to AT-64, 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?	There is a malfunction.	Repair or replace 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?	There is poor contact.	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?	There is a malfunction.	Repair or replace automatic transmission.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CN:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, 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-104, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Is there any trouble in lock-up duty solenoid circuit?	There is a malfunction.	Repair or replace 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?	There is a malfunction.	Repair or replace 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-64, 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?	There is a malfunction.	Repair or replace 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?	There is a malfunction.	Repair or replace engine speed input circuit.	Go to step **6.**

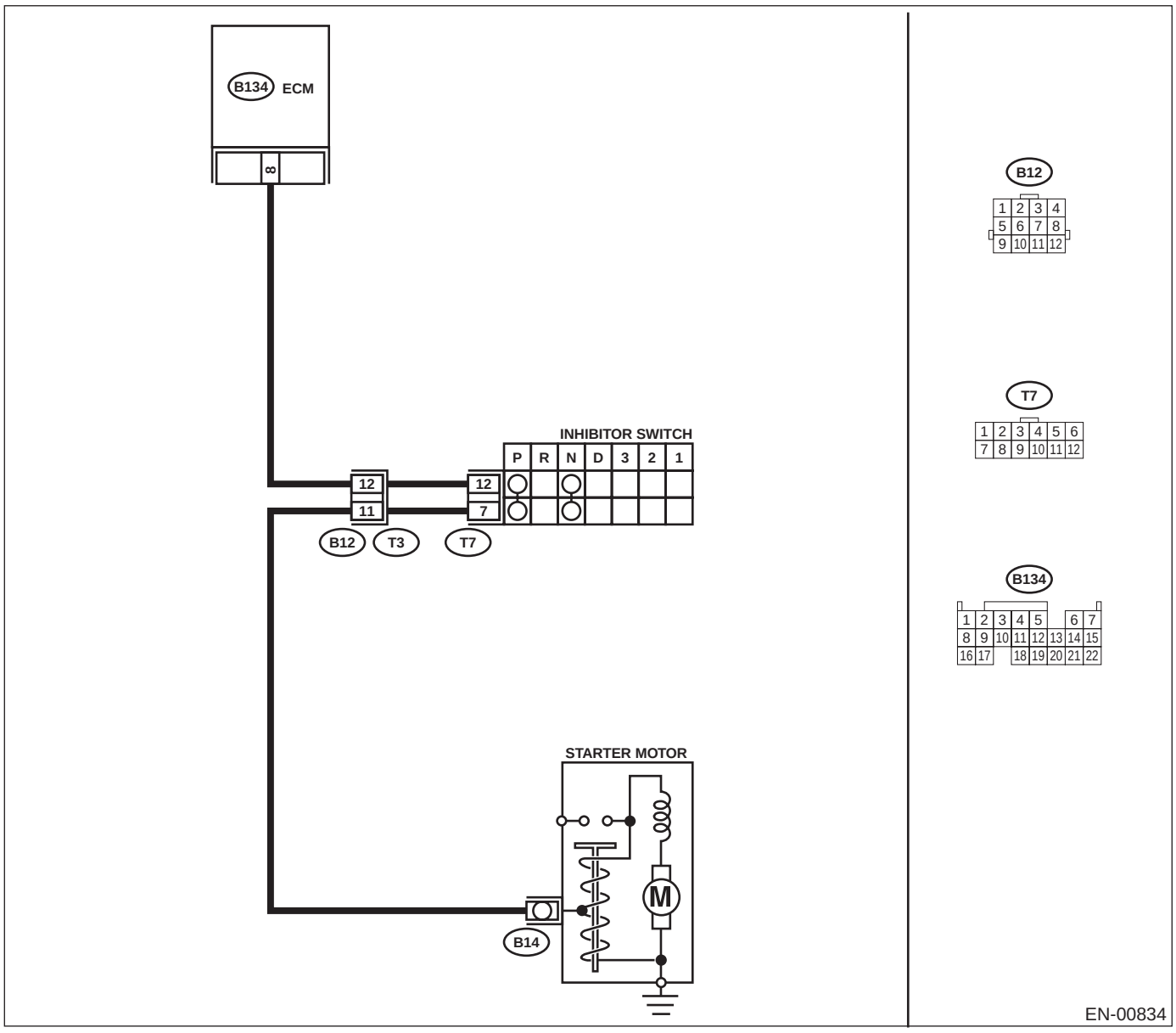
Step		Value	Yes	No
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to AT-136, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in inhibitor switch circuit?	There is a malfunction.	Repair or replace inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to AT-133, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> Is there any trouble in brake light switch circuit?	There is a malfunction.	Repair or replace brake light switch circuit.	Go to step **8.**
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?	There is a malfunction.	Repair or replace 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?	There is poor contact.	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?	There is a malfunction.	Repair or replace automatic transmission.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CO:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



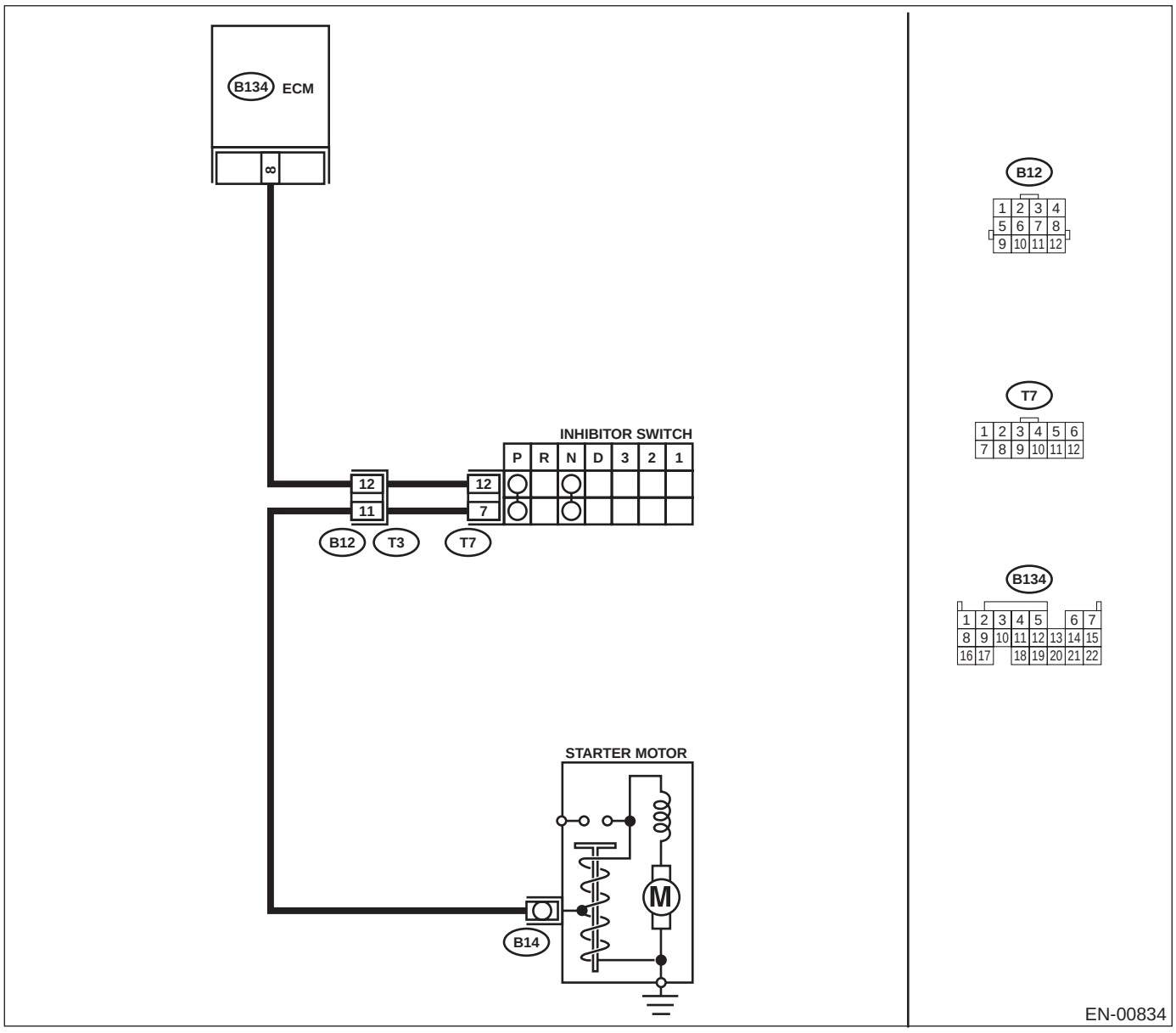
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range at except "N" and "P" positions?	4.5 — 5.5 V	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 ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:*** Is the measured value less than the specified value?	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 connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:*** Is the measured value less than the specified value?	10 Ω	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step **5.**
5	**CHECK INHIBITOR SWITCH.** Measure resistance between inhibitor switch connector receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:*** Does the measured value exceed the specified value at except "N" and "P" positions?	1 MΩ	Go to step **6.**	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a malfunction.	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CP:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

- **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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range?	4.5 — 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?	There is poor contact.	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 voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 ignition switch to OFF. 2) Disconnect connectors from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 8 — (T7) No. 12:*** Is the measured value less than the specified value?	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 • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Value	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:*** Is the measured value less than the specified value?	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 resistance between inhibitor switch connector receptacle's terminals in selector lever “N” and “P” positions. ***Terminals*** ***No. 7 — No. 12:*** Is the measured value less than the specified value?	1 Ω	Go to step **9.**	Replace inhibitor switch. <Ref. to AT-49, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.** Is there any fault in selector cable connection to inhibitor switch?	There is a malfunction.	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

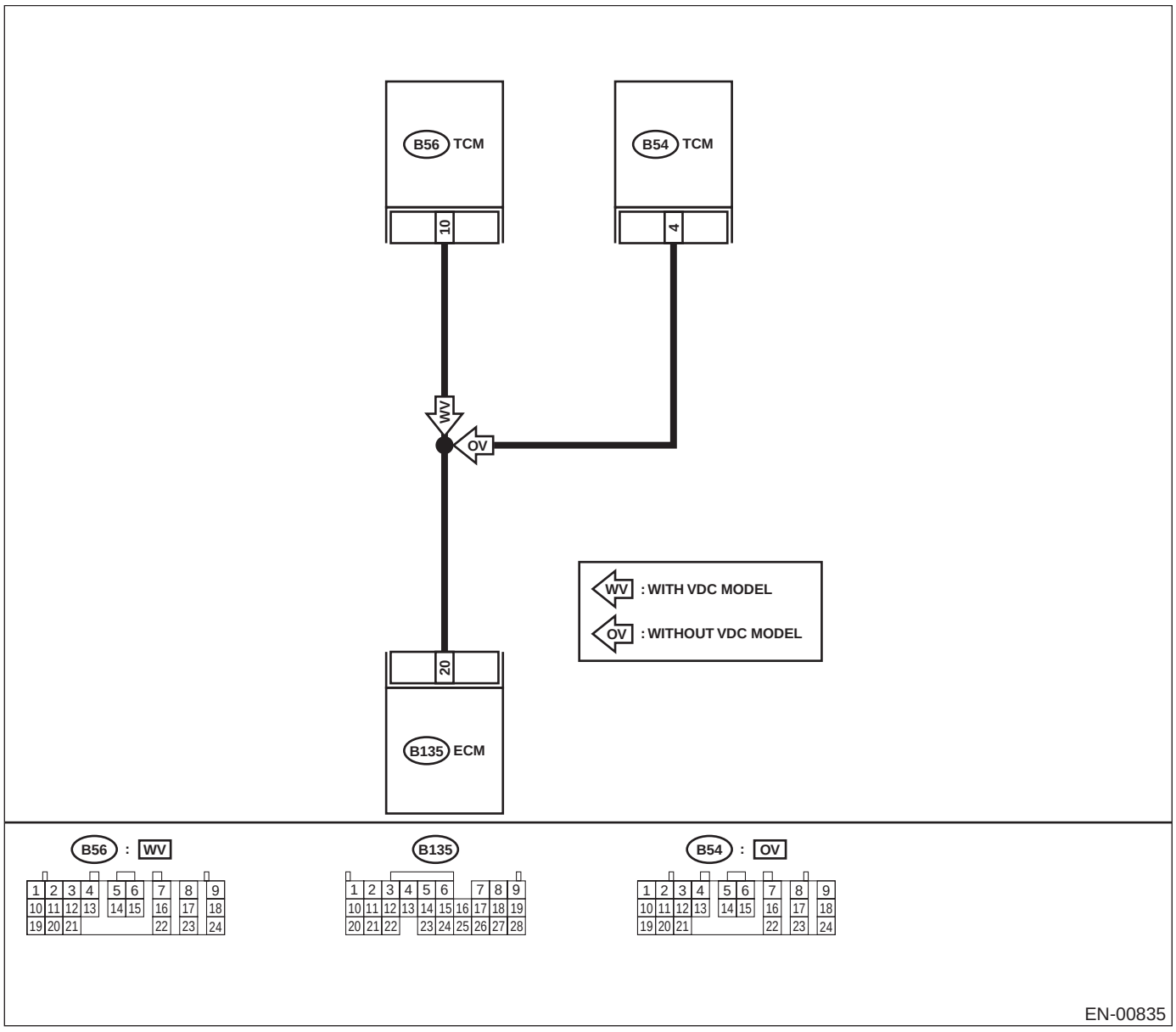
MEMO:

CQ:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



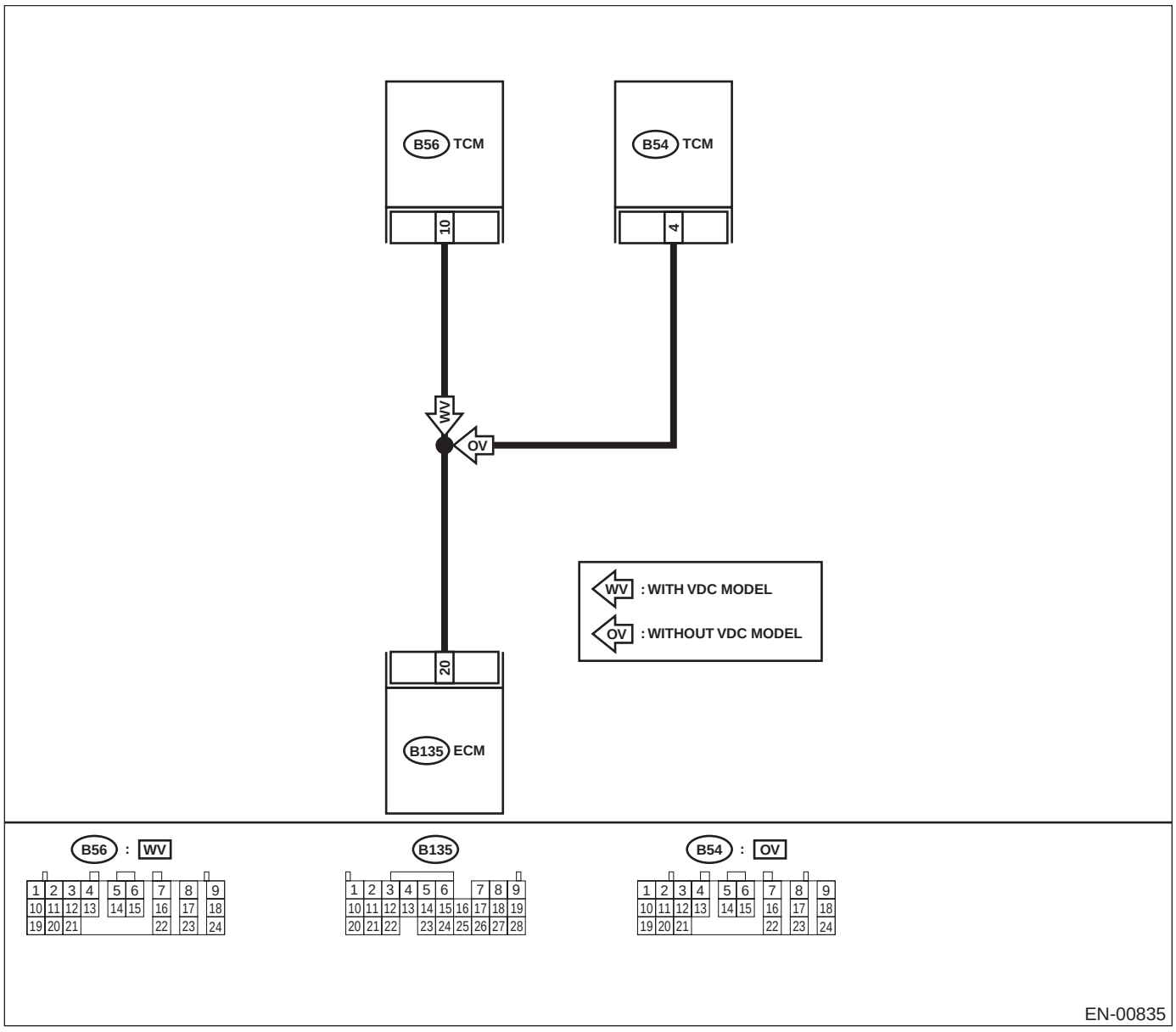
Step		Value	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle. Is AT shift control functioning properly?	Operates properly.	Go to step **2.**	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.** Are car phone and/or CB installed on vehicle?	Equipped.	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CR:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



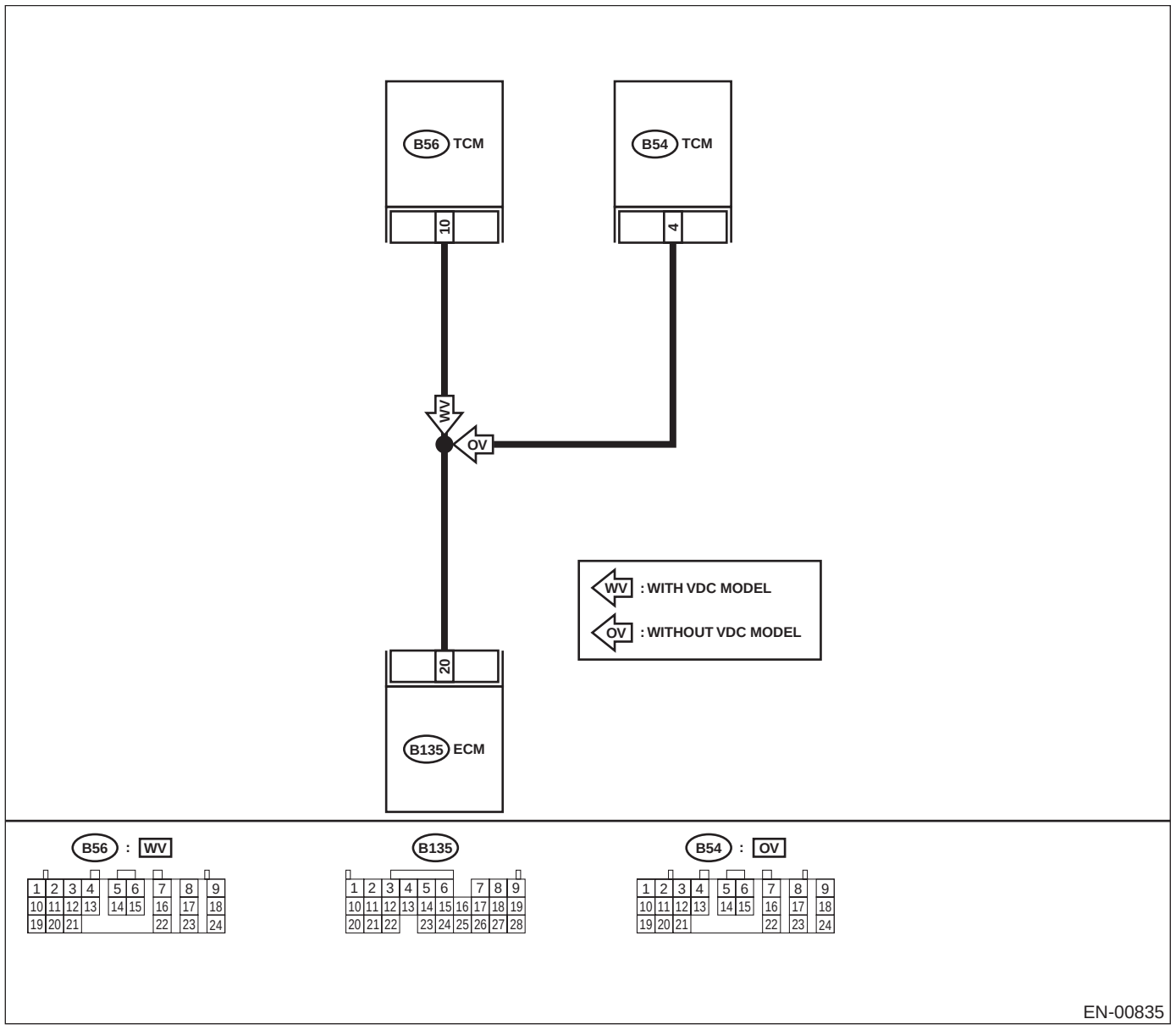
	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Go to step **2.**	Even 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 ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 — Chassis ground:*** Is the measured value less than the specified value?	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 connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	5 V	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read trouble code for automatic transmission. <Ref. to AT-26, Read Diagnostic Trouble Code (DTC).> Does trouble code appear for automatic transmission?	Trouble code for automatic transmission is indicated.	Inspect trouble code for automatic transmission.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

CS:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4 V	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	1 V	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):*** Does the measured value change within the specified range?	1 V — 4 V	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 voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B56) No. 10 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B54) No. 4 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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?	There is poor contact.	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

CT:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	DTC P1110 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

CU:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

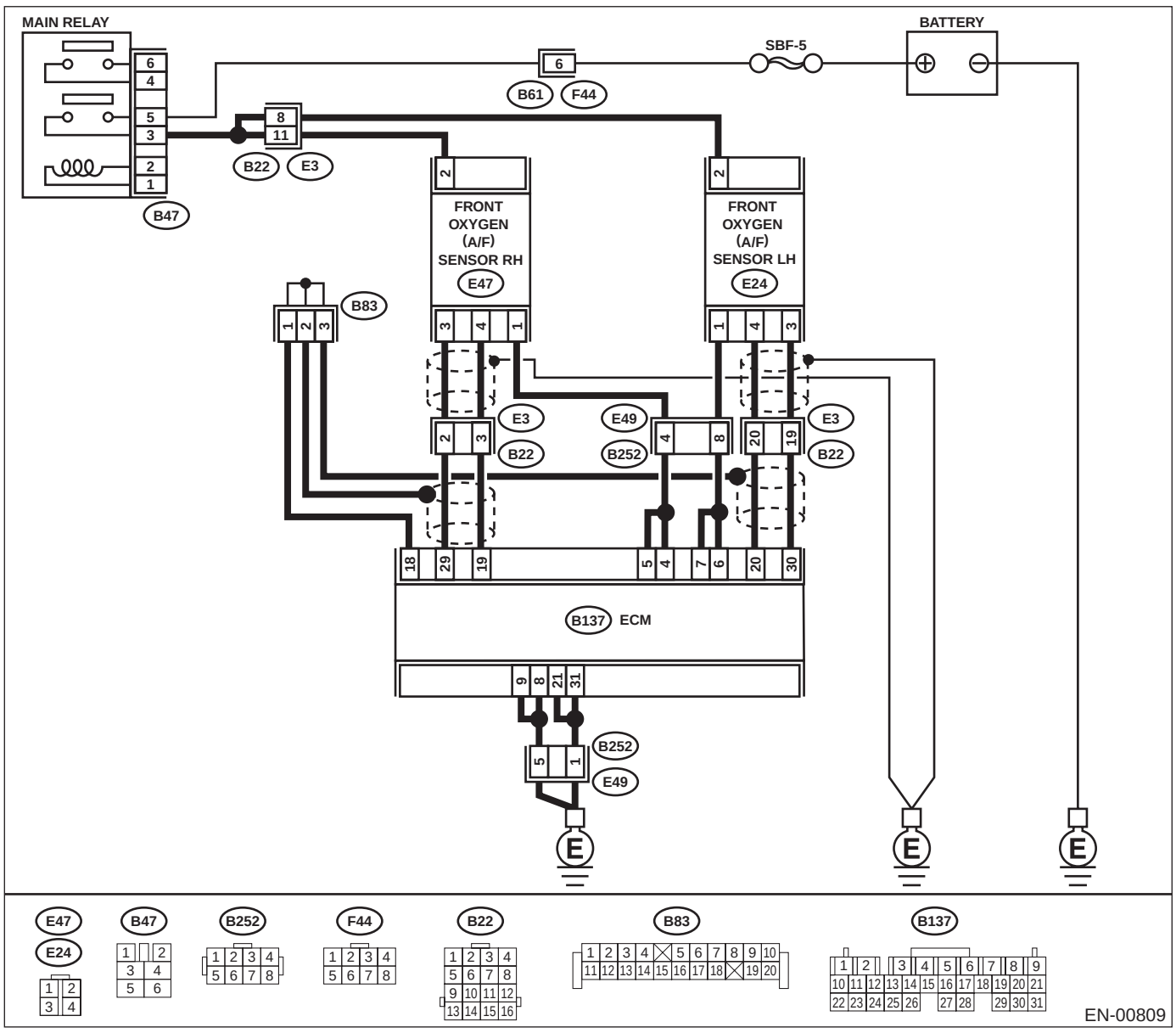
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	DTC P1111 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1111.

CV:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	DTC P1134 is indicated.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	It is not necessary to inspect DTC P1134.

CW:DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —

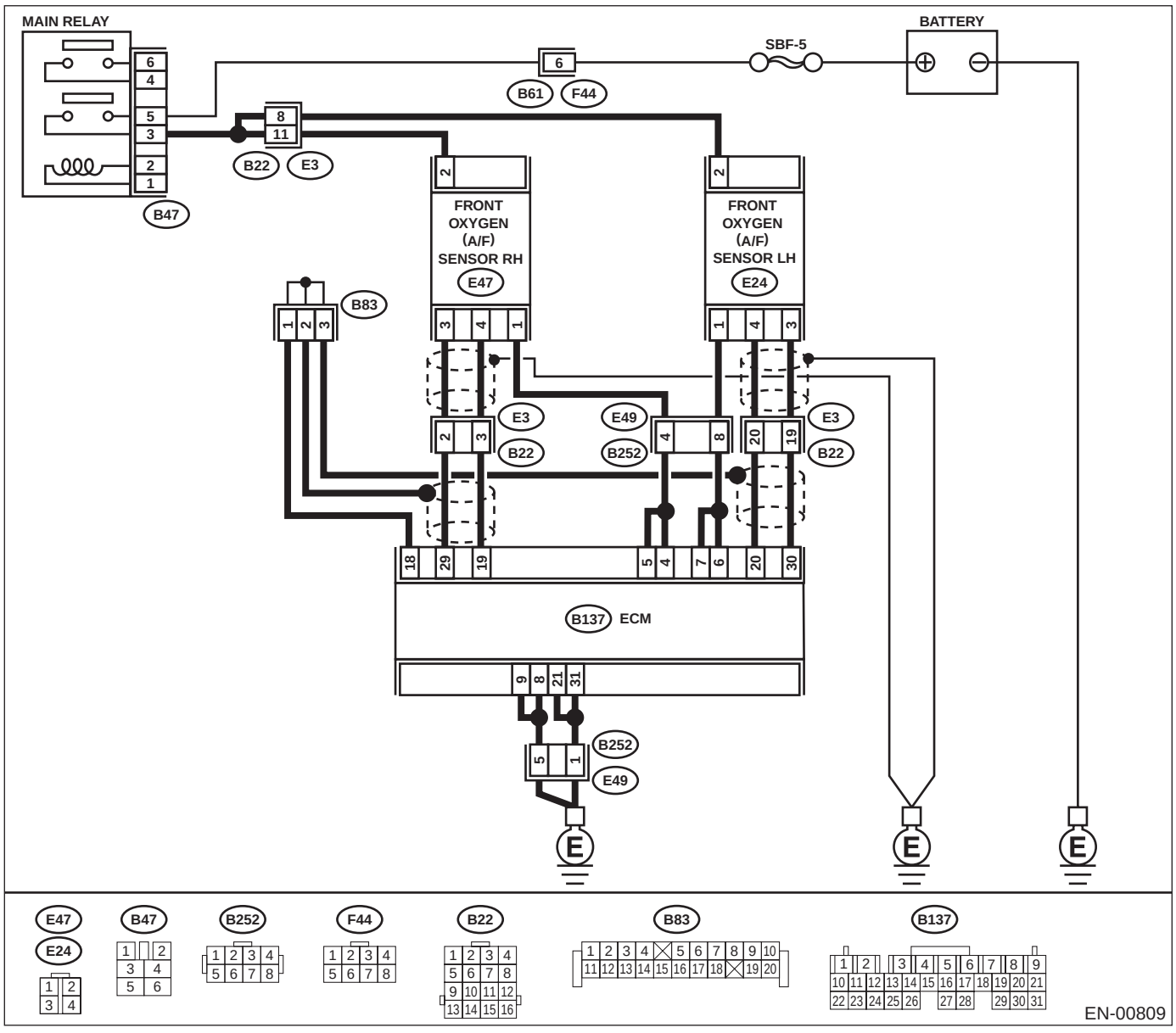
NOTE:
For the diagnostic procedure, refer to DTC P1153. <Ref. to EN(H6DO)-340, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CX:DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range at idle? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race 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. 2) Operate the LED operation mode for engine. Does the LED of {Rear O2 Rich Signal} blink? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	LED blinks.	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

	Step	Value	Yes	No
4	**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?	There is a malfunction.	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

CY: DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —

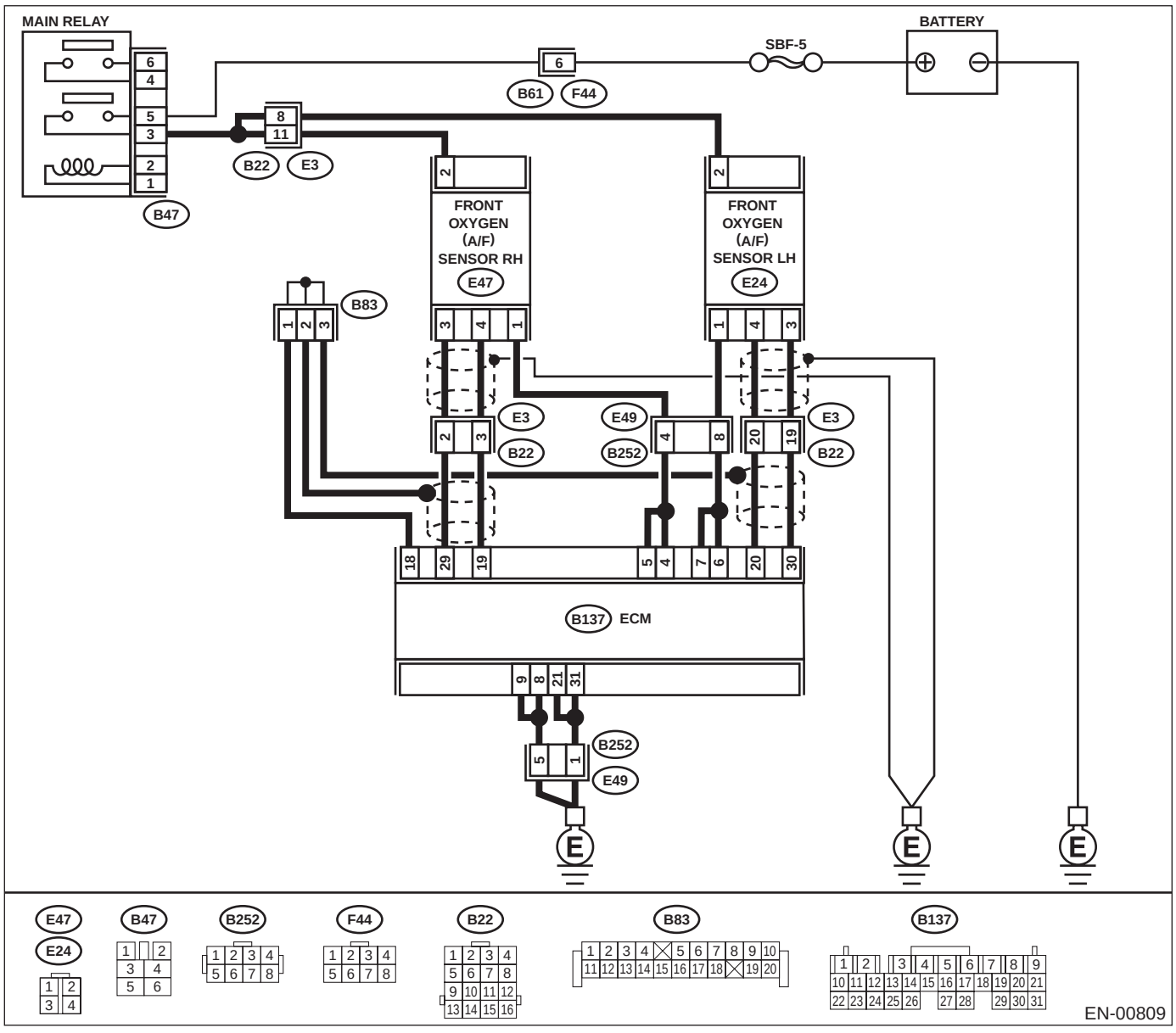
NOTE:
For the diagnostic procedure, refer to DTC P1155. <Ref. to EN(H6DO)-344, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CZ:DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range at idle? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	0.85 — 1.15	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race 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. 2) Operate the LED operation mode for engine. Does the LED of {Rear O2 Rich Signal} blink? NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “LED OPERATION MODE FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	LED blinks.	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

	Step	Value	Yes	No
4	**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?	There is a malfunction.	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

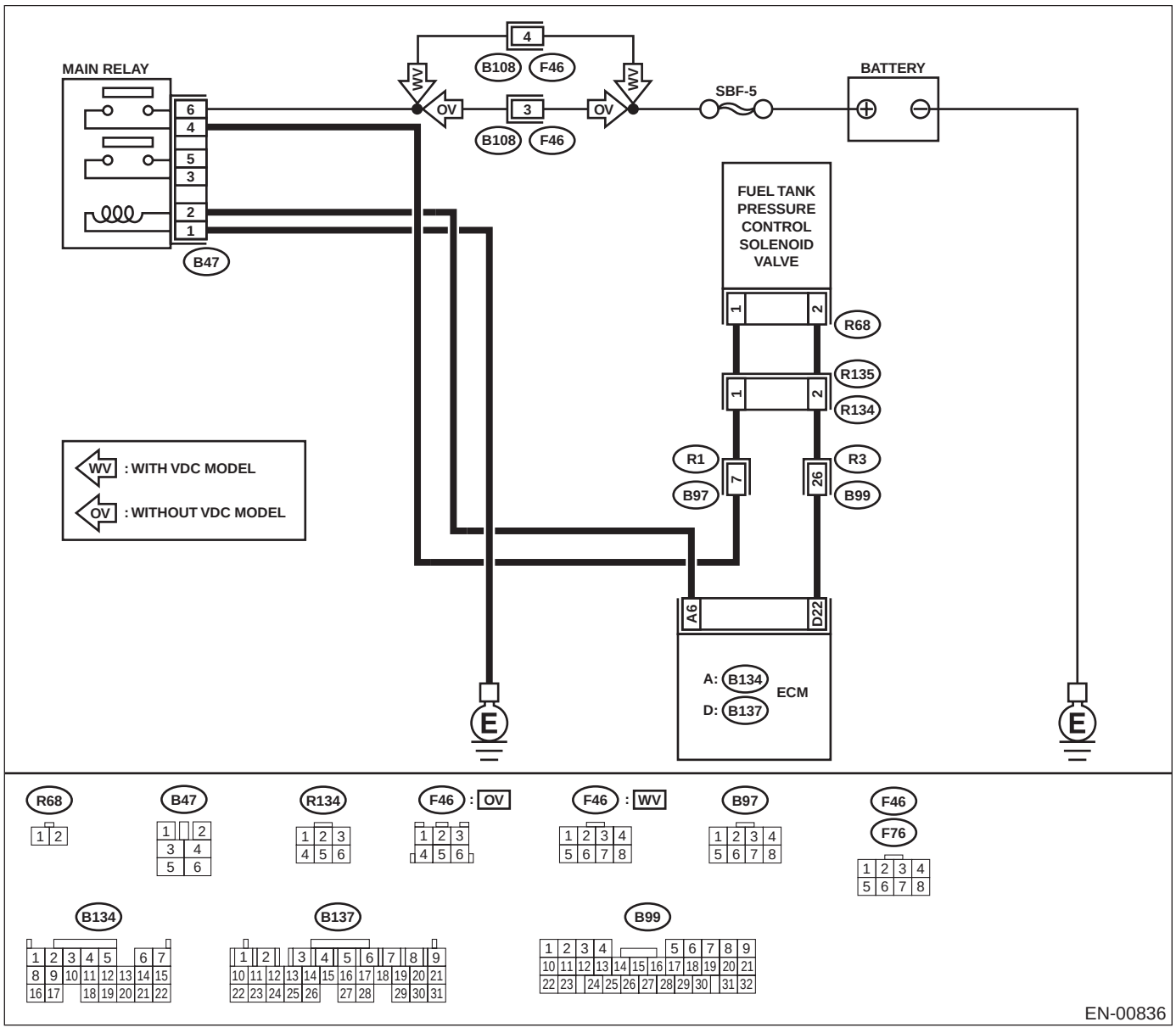
MEMO:

DA:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	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.
3	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from fuel tank pressure control solenoid valve and ECM. 3) Measure resistance of harness between fuel tank pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and fuel tank pressure control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 22 — (R68) No. 2:*** Is the measured value less than the specified value?	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
5	**CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** Measure resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	10 — 100 Ω	Go to step **6.**	Replace fuel tank pressure control solenoid valve. <Ref. to EC(H6DO)-16, Pressure Control Solenoid Valve.>

	Step	Value	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel tank pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 • Poor contact in main relay connector
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?	There is poor contact.	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.

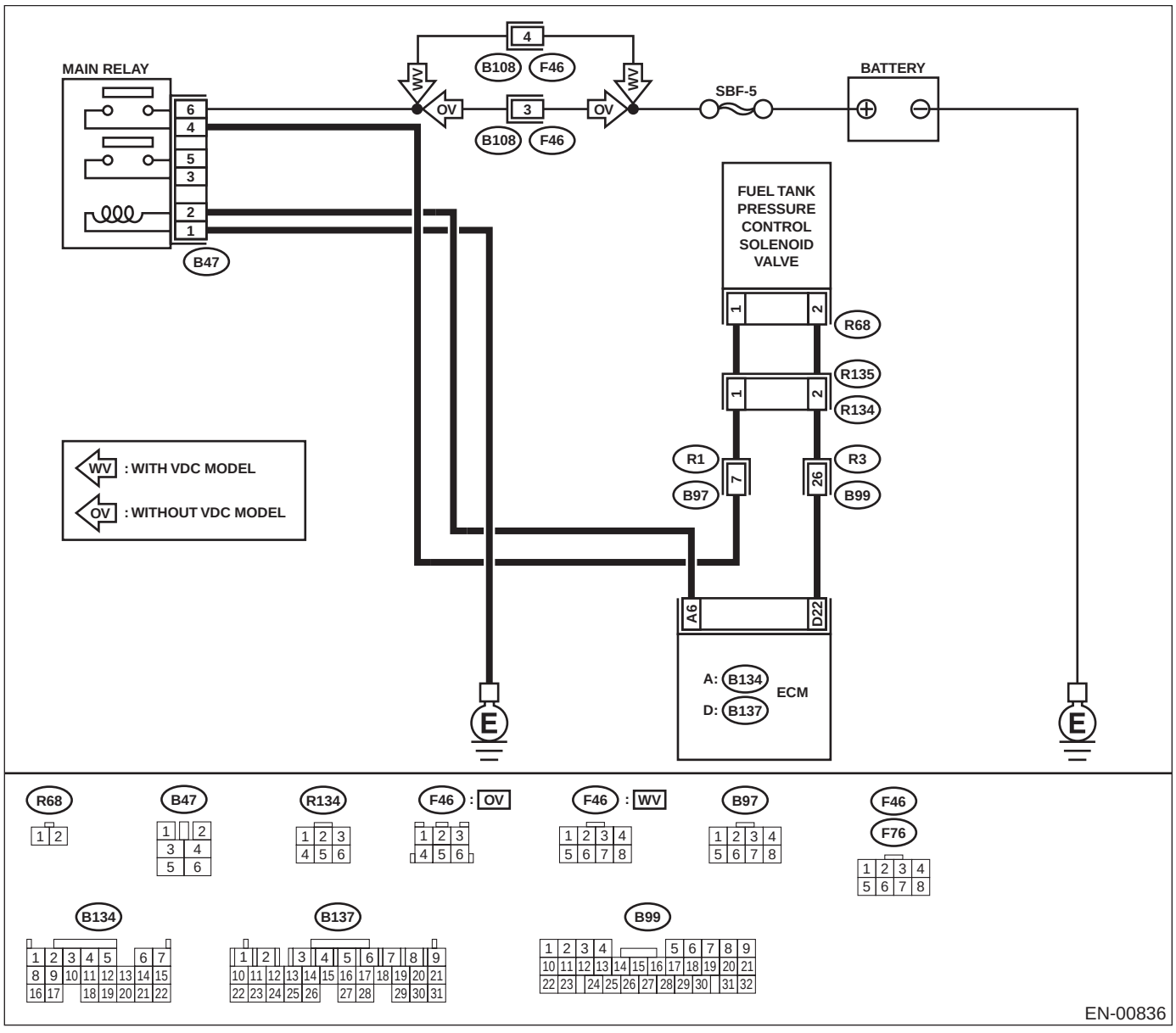
MEMO:

DB:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating fuel tank pressure control solenoid valve, measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):*** Is the measured value within the specified range? 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(H6DO)-60, Compulsory Valve Operation Check Mode.>	0 — 10 V	Go to step **2.**	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.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN FUEL TANK PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and fuel tank pressure control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK FUEL TANK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel tank pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace fuel tank pressure control solenoid valve <Ref. to EC(H6DO)-16, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**

	Step	Value	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

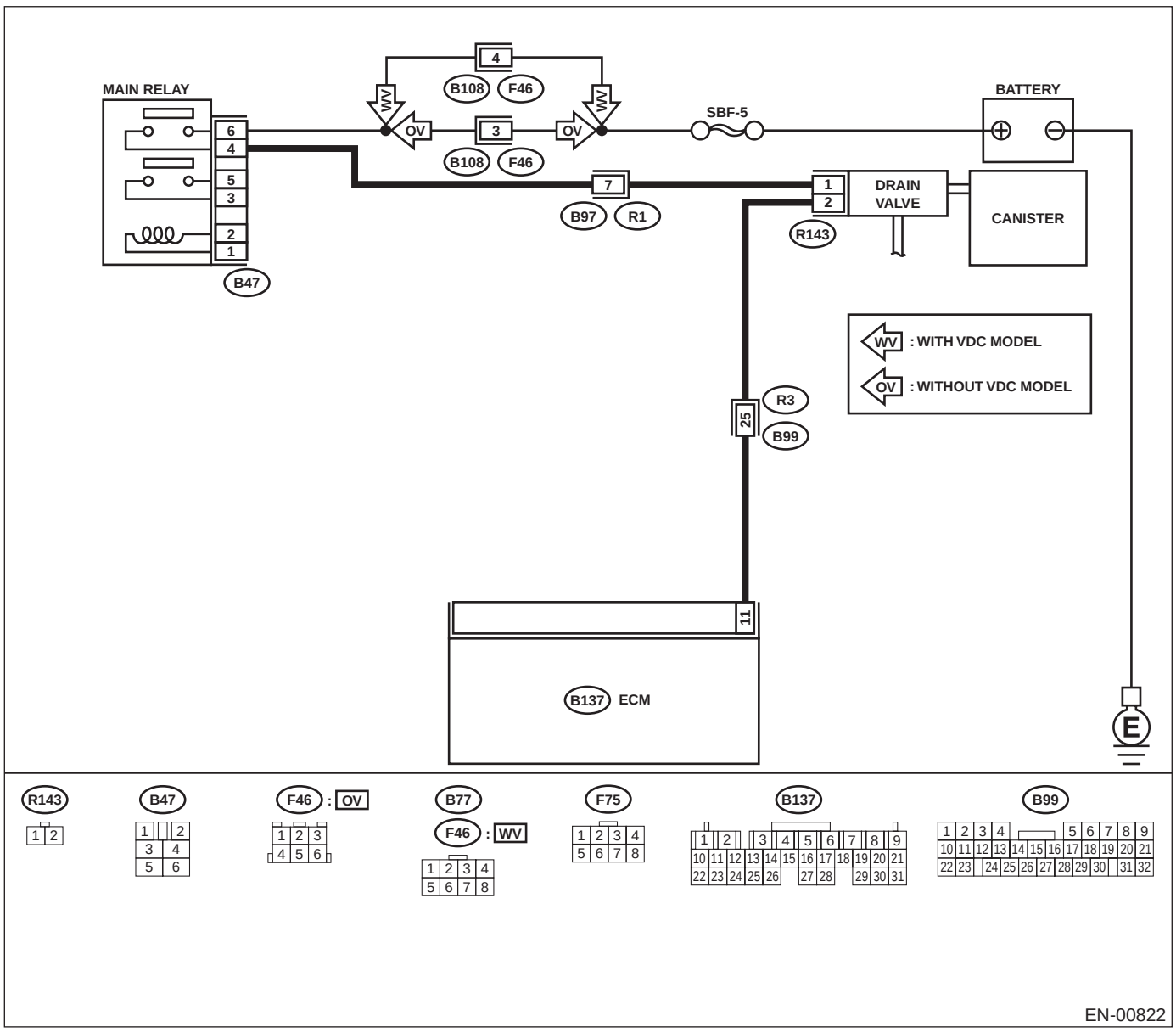
MEMO:

DC:DTC P1443 — VENT CONTROL SOLENOID VALVE 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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



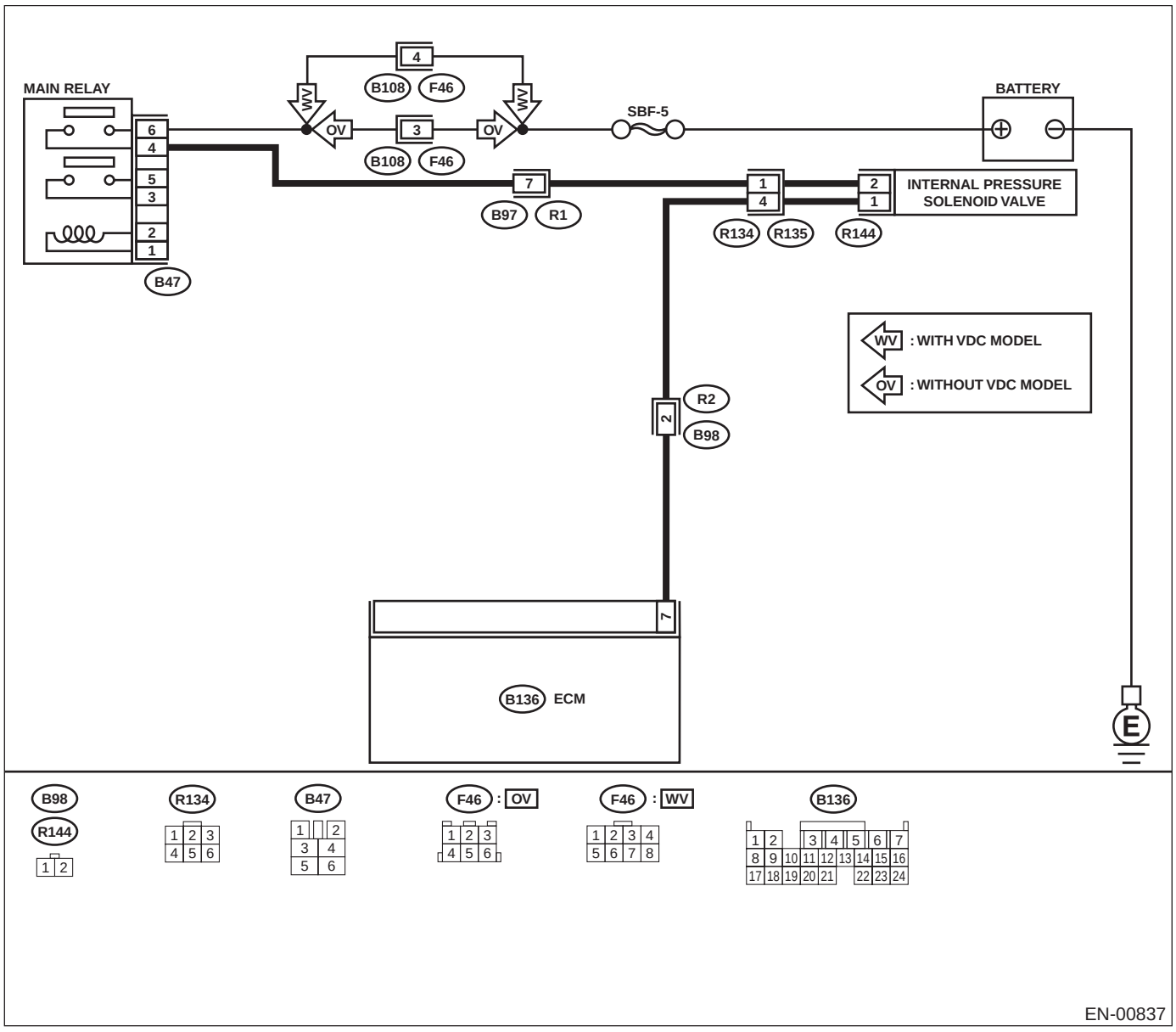
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is any other DTC displayed?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the 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?	There is a malfunction.	Repair or replace the faulty part.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) Operate drain valve. Does drain valve produce operating sound? 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(H6DO)-60, Compulsory Valve Operation Check Mode.>	Operating sound produced.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace drain valve. <Ref. to EC(H6DO)-20, Drain Valve.>

DD:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00837

	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	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 fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from fuel tank sensor control valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 1 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **4.**	Repair ground short circuit in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B136) No. 7 — (R144) No. 1:*** Is the measured value less than the specified value?	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 sensor control valve connector • Poor contact in coupling connectors

	Step	Value	Yes	No
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	10 — 100 Ω	Go to step **6.**	Replace fuel tank sensor control valve. <Ref. to EC(H6DO)-15, Fuel Tank Sensor Control Valve.>
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 2 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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 sensor control valve • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in fuel tank sensor control valve connector. Is there poor contact in fuel tank sensor control valve connector?	There is poor contact.	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

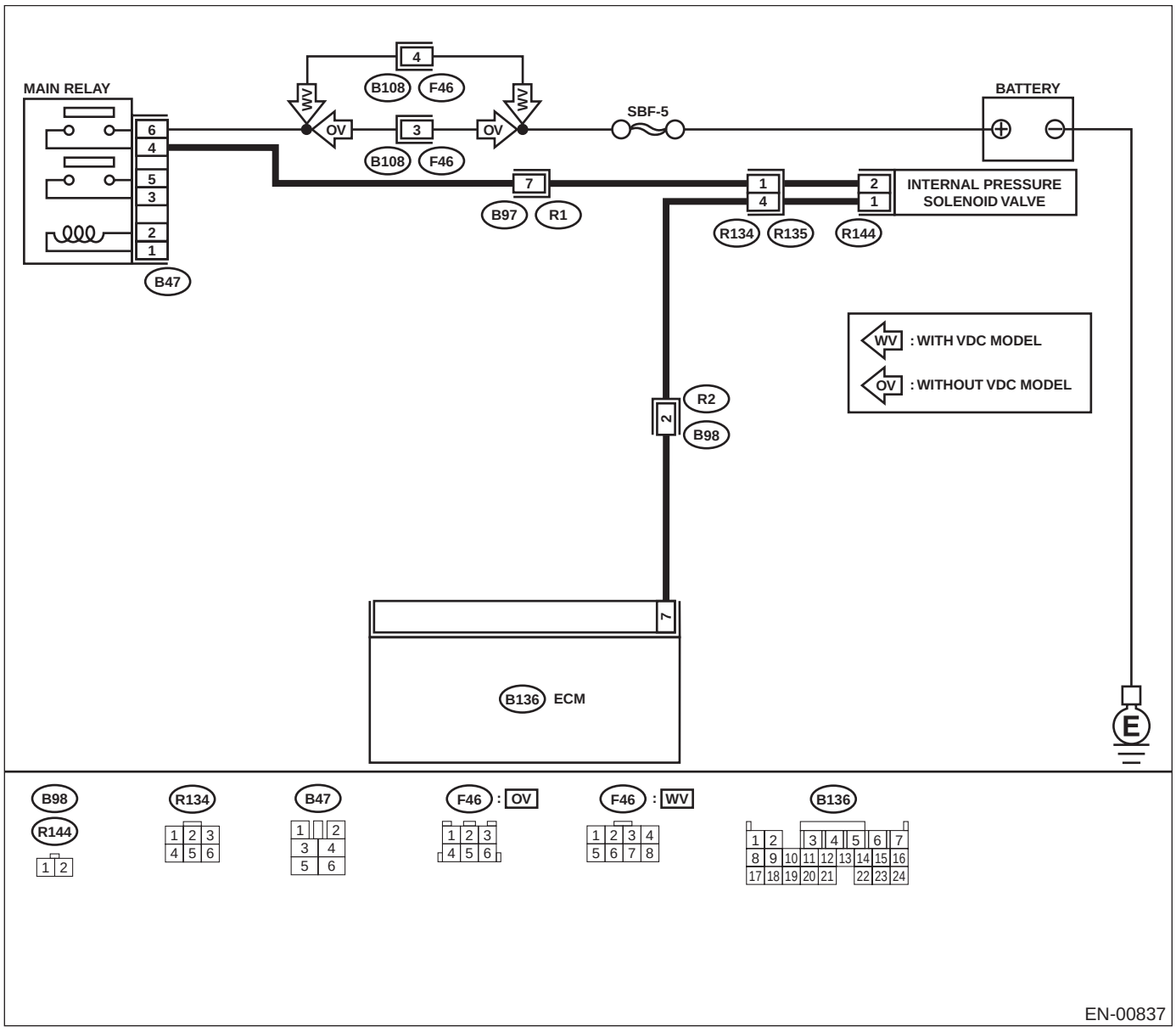
MEMO:

DE:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00837

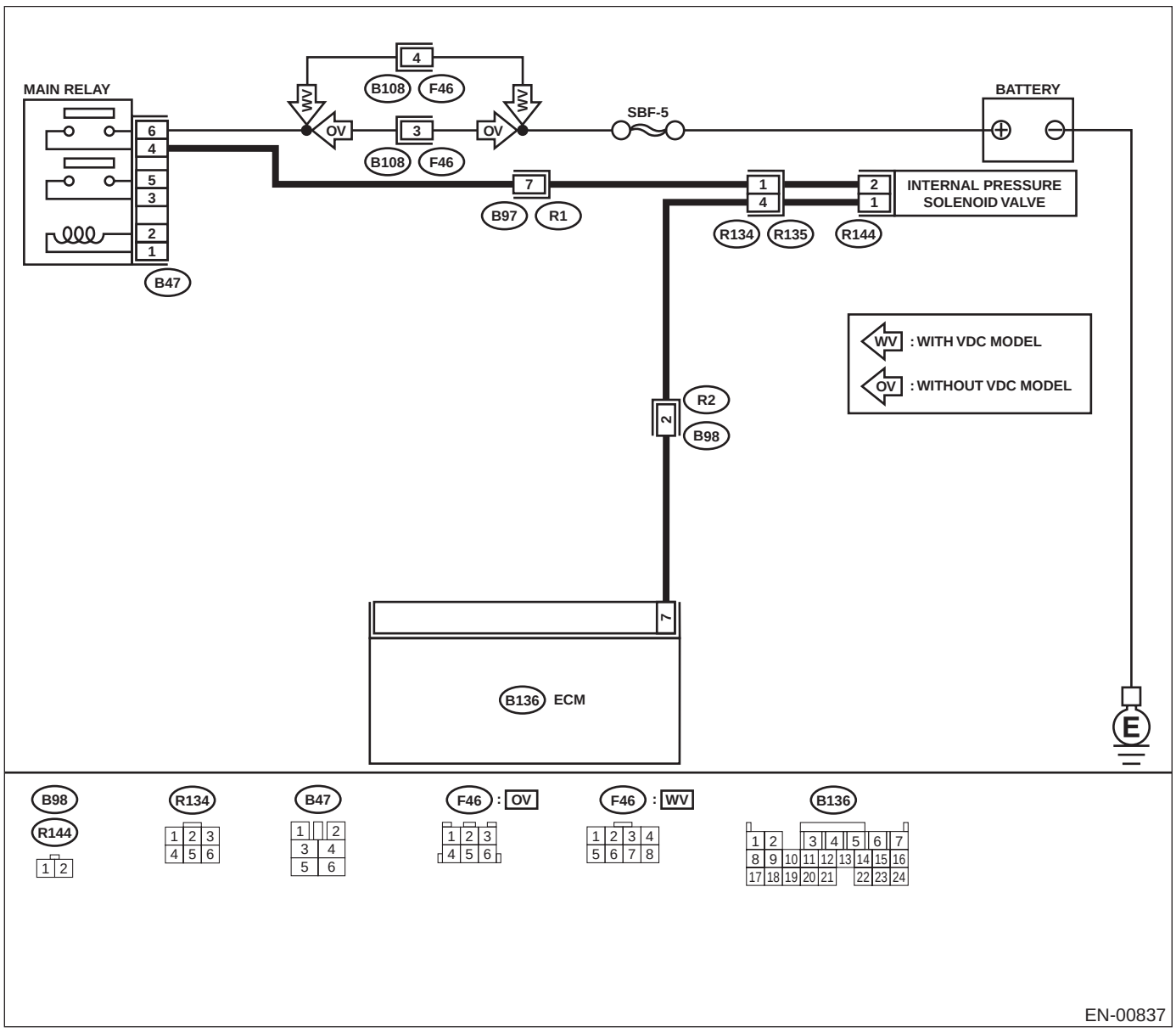
	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair battery short circuit in harness between ECM and fuel tank sensor control valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value less than the specified value?	1 Ω	Replace fuel tank sensor control valve <Ref. to EC(H6DO)-15, Fuel Tank Sensor Control Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector. Is there poor contact in ECM connector?	There is poor contact.	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DF:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00837

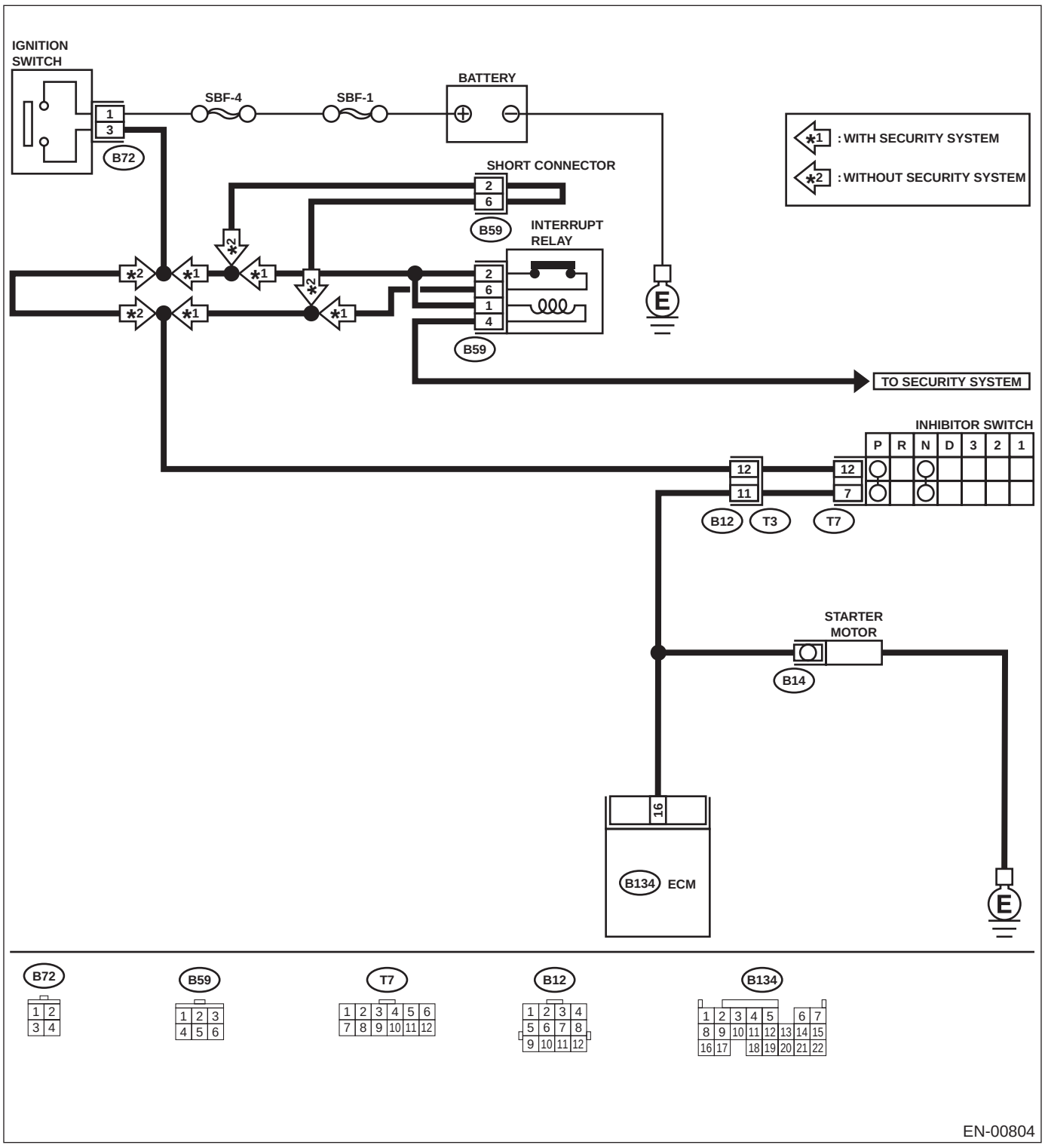
	Step	Value	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.** Is there any DTC on display?	Another DTC is displayed.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap. Is the fuel filler cap tightened securely?	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?	There is a fault.	Repair or replace hoses and pipes.	Replace fuel tank sensor control valve. <Ref. to EC(H6DO)-15, Fuel Tank Sensor Control Valve.>

DG: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in the “P” or “N” position. Does starter motor operate when turning ignition switch to “ST”?	Starter motor operates.	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(H6DO)-76, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

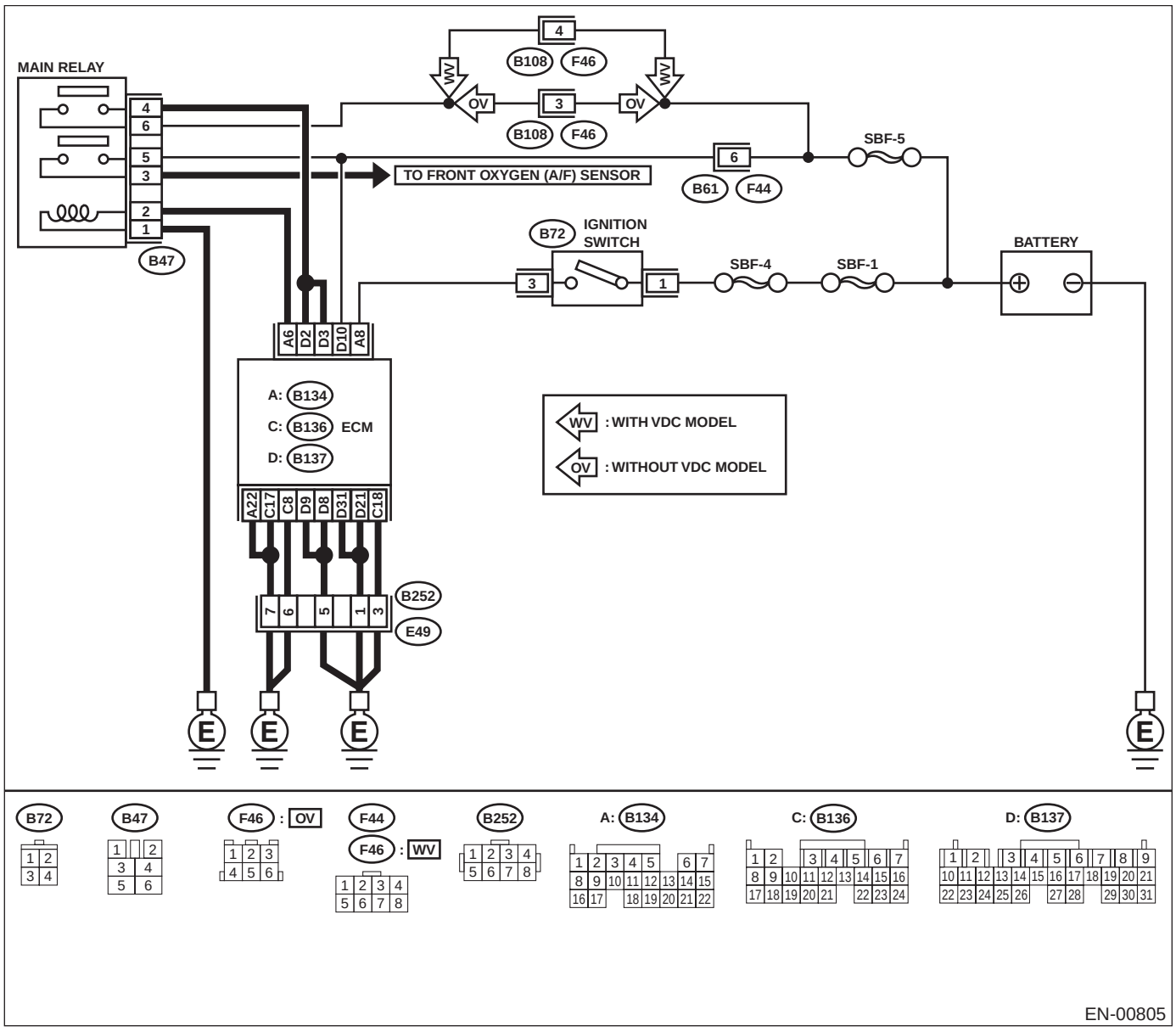
MEMO:

DH: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00805

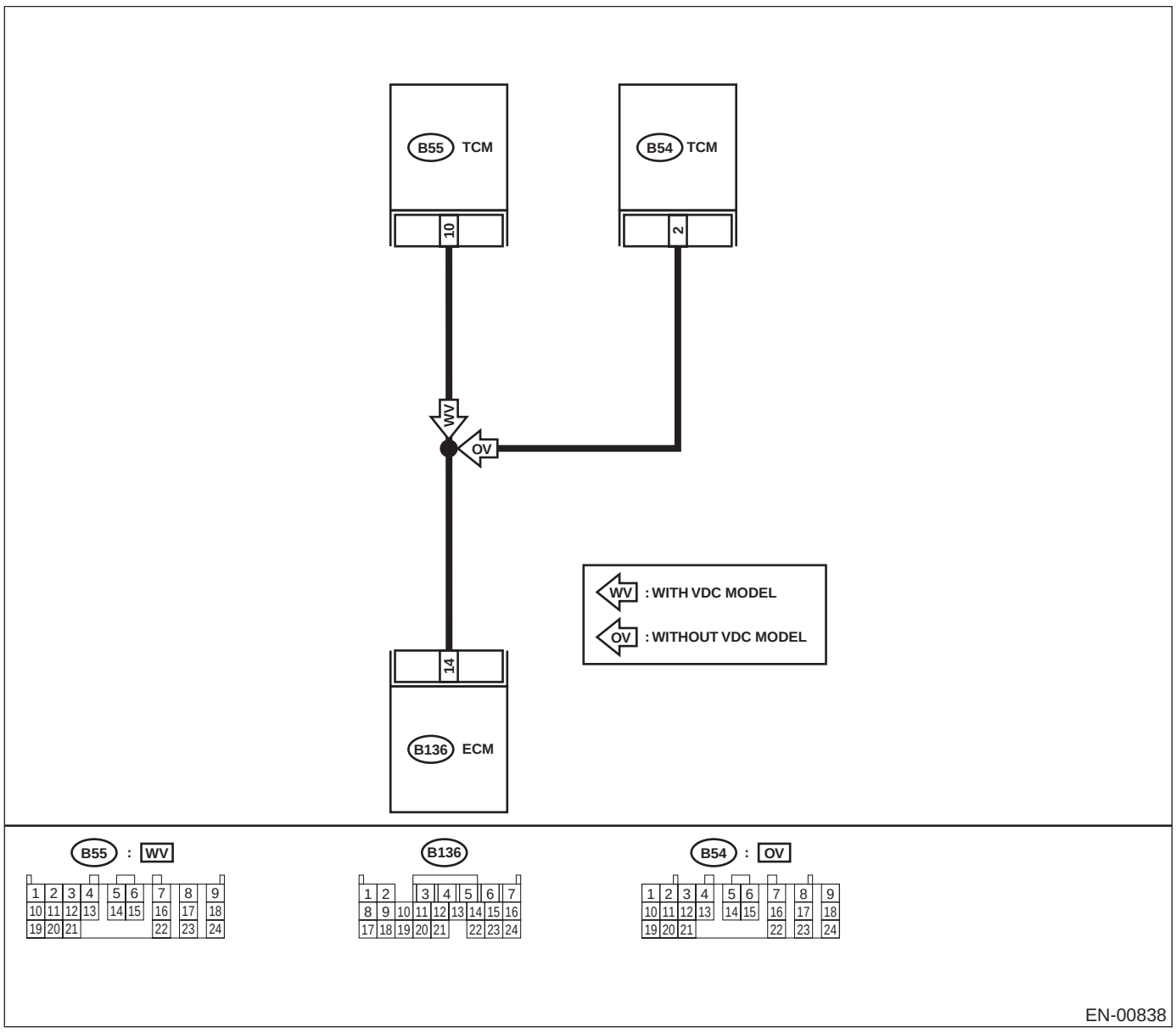
	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	10 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:*** Is the measured value less than the specified value?	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?	Fuse blown out.	Replace 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

DI: DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



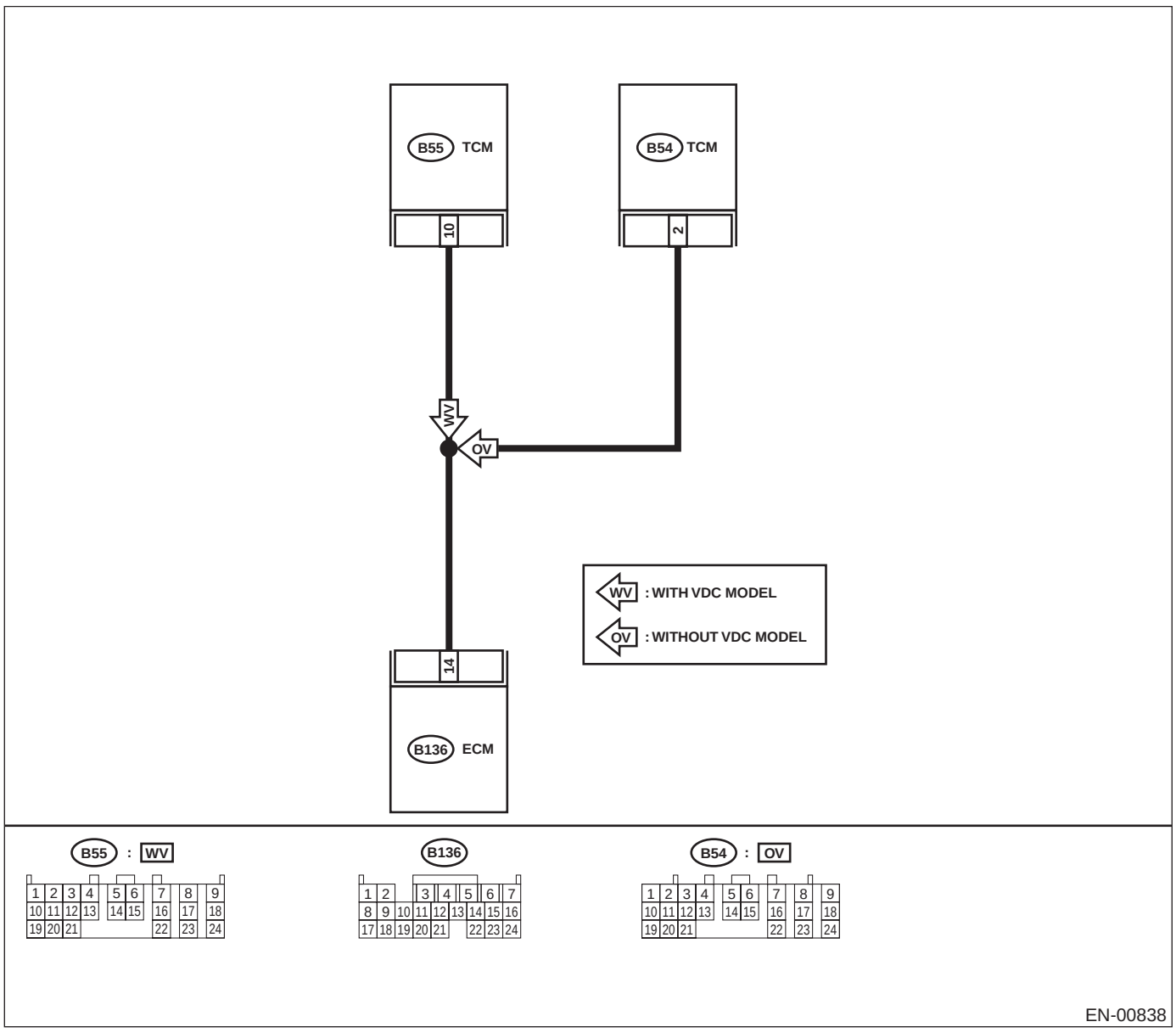
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	3 V	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 — Chassis ground:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 14 — (B55) No. 20:*** Is the measured value less than the specified value?	1 Ω	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DJ:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



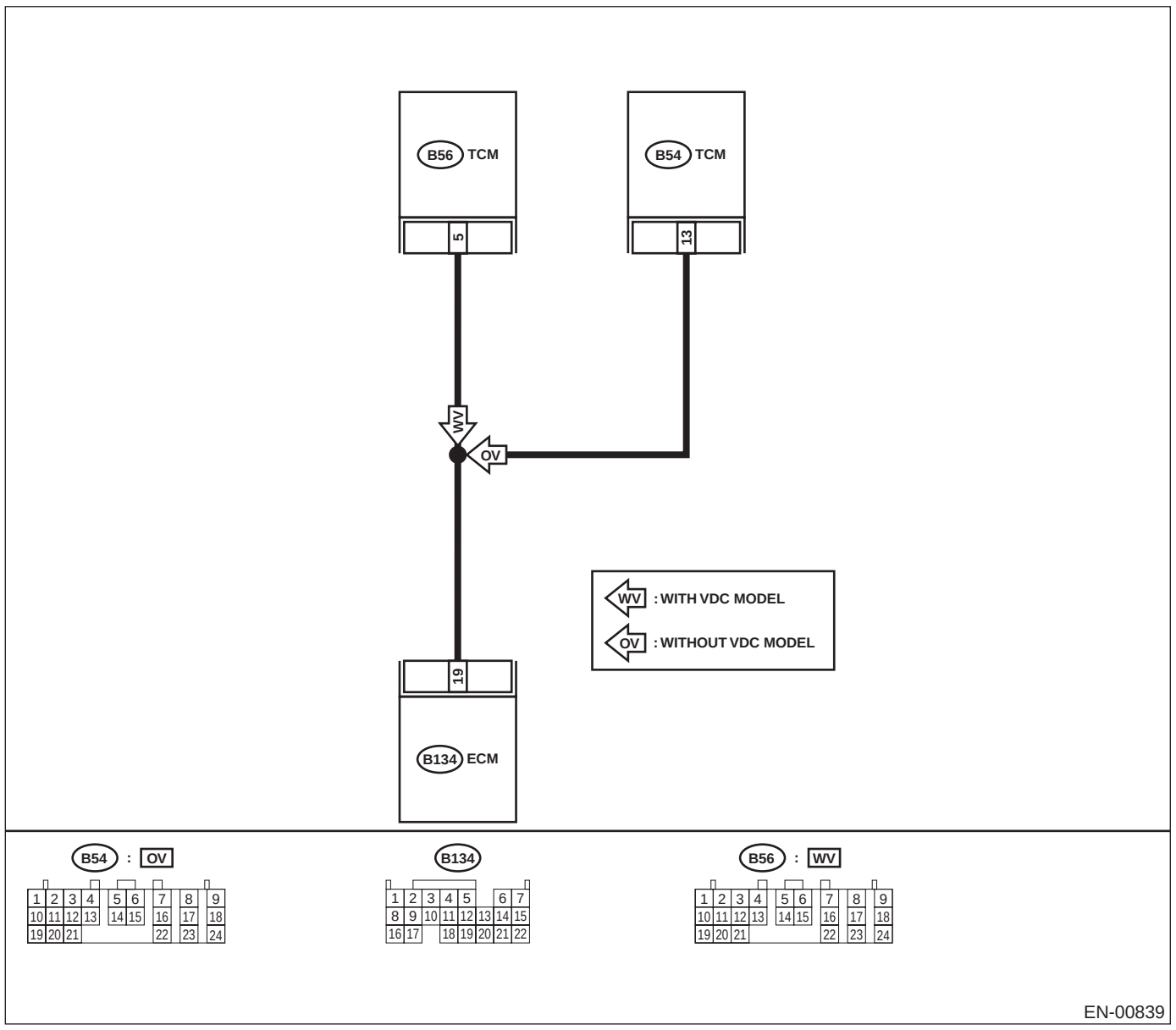
	Step	Value	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Is the measured value less than the specified value?	3 V	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):*** Does the voltage change exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	10 V	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DK: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



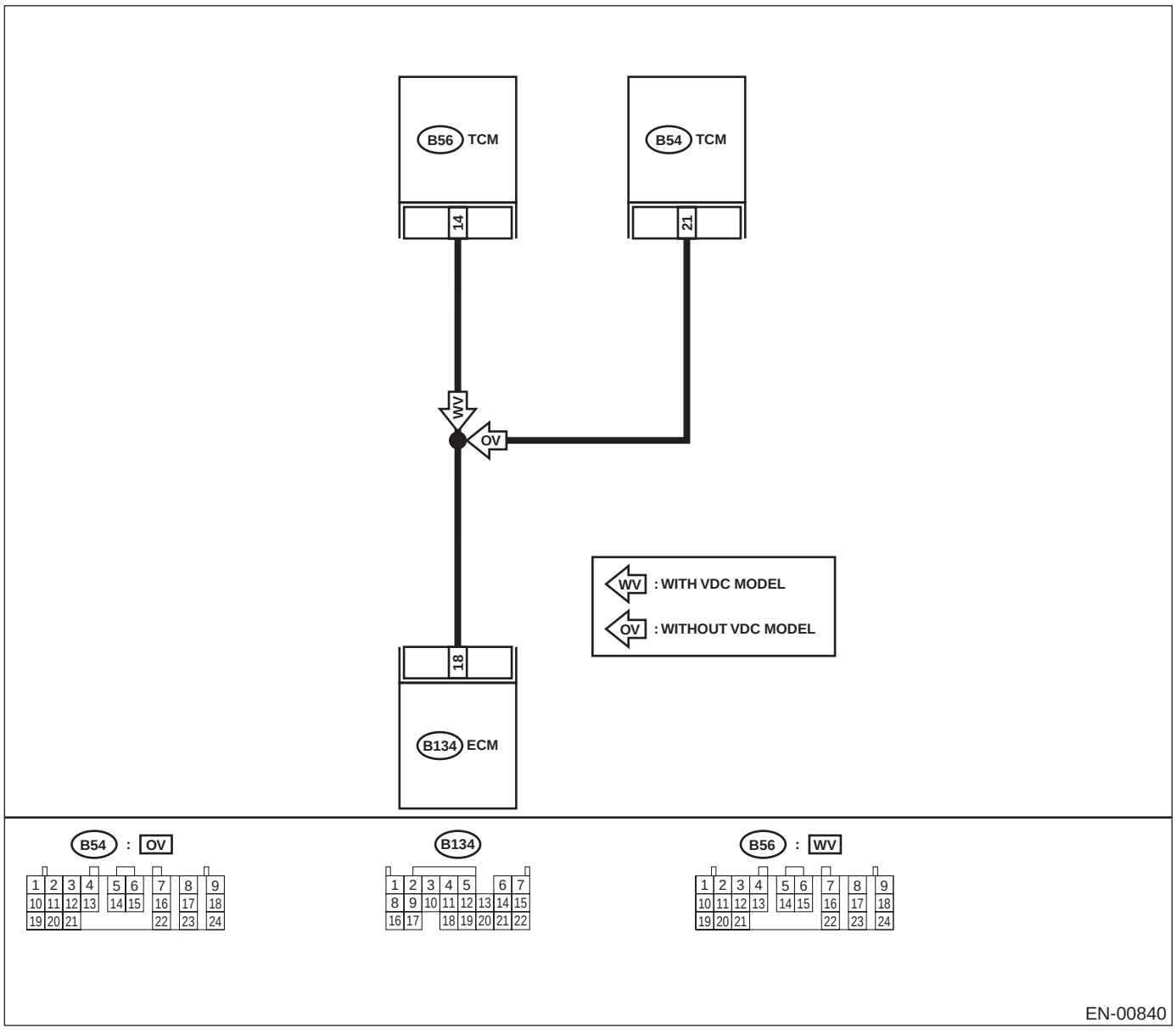
	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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?	There is poor contact.	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 HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***Model with VDC:*** ***(B134) No. 19 — (B56) No. 5:*** ***Model without VDC:*** ***(B134) No. 19 — (B54) No. 13:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

DL: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(H6DO)-59, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Value	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	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?	There is poor contact.	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 HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***Model with VDC:*** ***(B134) No. 18 — (B56) No. 14:*** ***Model without VDC:*** ***(B134) No. 18 — (B54) No. 21:*** Is the measured value less than the specified value?	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 resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:*** Is the measured value less than the specified value?	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?	There is poor contact.	Repair poor contact in TCM connector.	Replace TCM. <Ref. to AT-75, Transmission Control Module (TCM).>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-75, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Ignition parts (*1) 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) Fuel injection parts (*4) 10) EGR valve
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Engine coolant temperature sensor (*2) 6) Ignition parts (*1) 7) Air intake system (*5) 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Crankshaft position sensor (*3) 11) Camshaft position sensor (*3) 12) Oxygen sensor 13) Fuel pump and fuel pump relay 14) EGR valve
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 manifold pressure sensor 6) Intake air temperature sensor 7) Intake air temperature and pressure sensor 8) EGR valve
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Throttle position sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) Engine coolant temperature sensor (*2) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) A/C switch and A/C cut relay 11) Engine torque control signal circuit 12) Ignition parts (*1) 13) EGR valve

Symptom	Problem parts
5. Engine stalls or engine sags or hesitates at acceleration.	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) Purge control solenoid valve 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Fuel pump and fuel pump relay 11) EGR valve
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 10) EGR valve
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.>

GENERAL DIAGNOSTIC TABLE

MEMO: