ENGINE SECTION 2

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC)
INTAKE (INDUCTION)	IN(H4DOTC)
MECHANICAL	ME(H4DOTC)
EXHAUST	EX(H4DOTC)
COOLING	CO(H4DOTC)
LUBRICATION	LU(H4DOTC)
SPEED CONTROL SYSTEMS	SP(H4DOTC)
IGNITION	IG(H4DOTC)
STARTING/CHARGING SYSTEMS	SC(H4DOTC)
ENGINE (DIAGNOSTICS)	EN(H4DOTC)(diag)

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

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

FUJI HEAVY INDUSTRIES LTD.

G2360GE3

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

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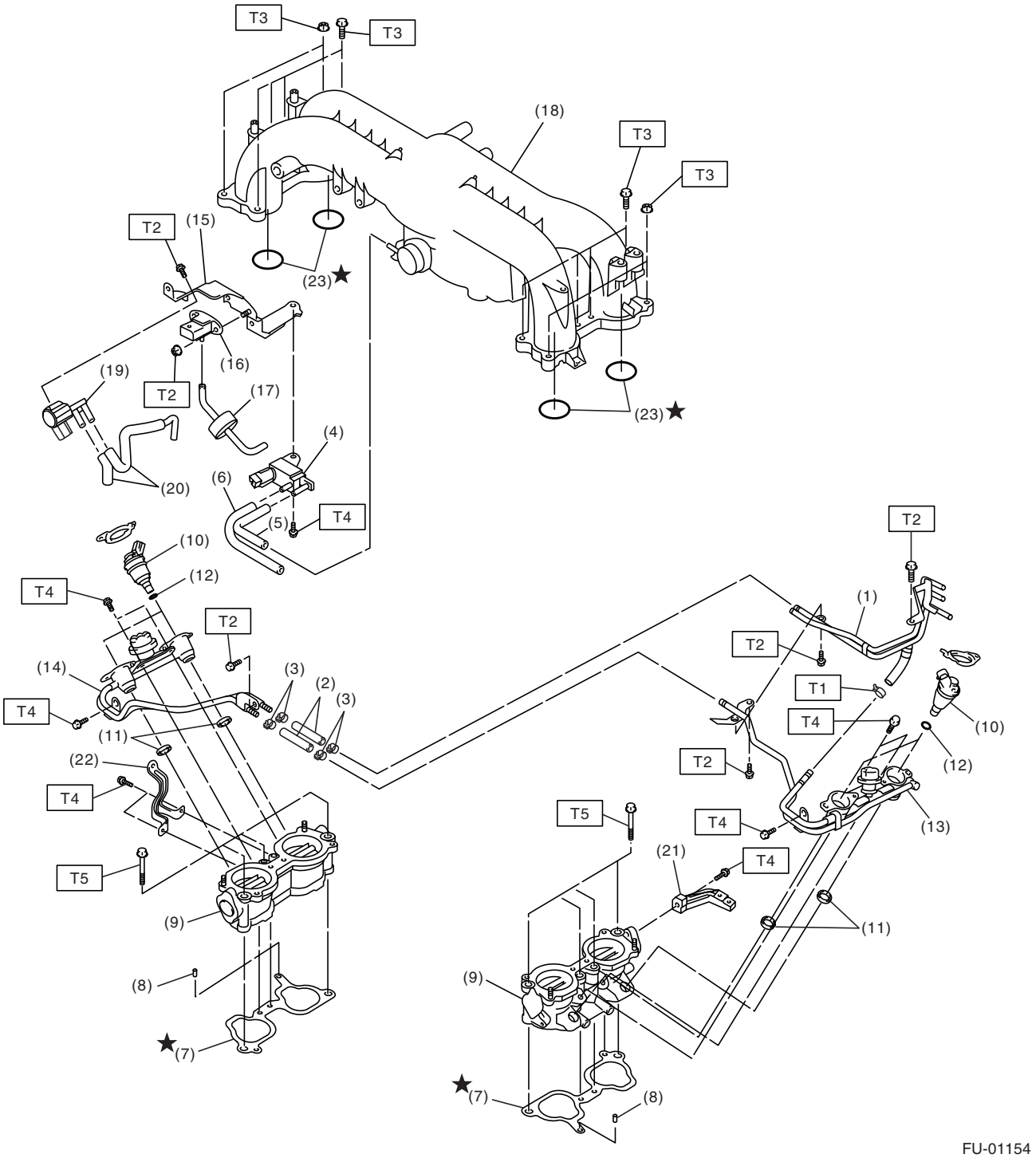
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	550 — 850 kPa (5.61 — 8.67 kgf/cm^2, 79.8 — 123.3 psi)
	Discharge rate	155 ℓ (40.9 US gal, 34.1 Imp gal)/h or more [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		In-tank type

B: COMPONENT

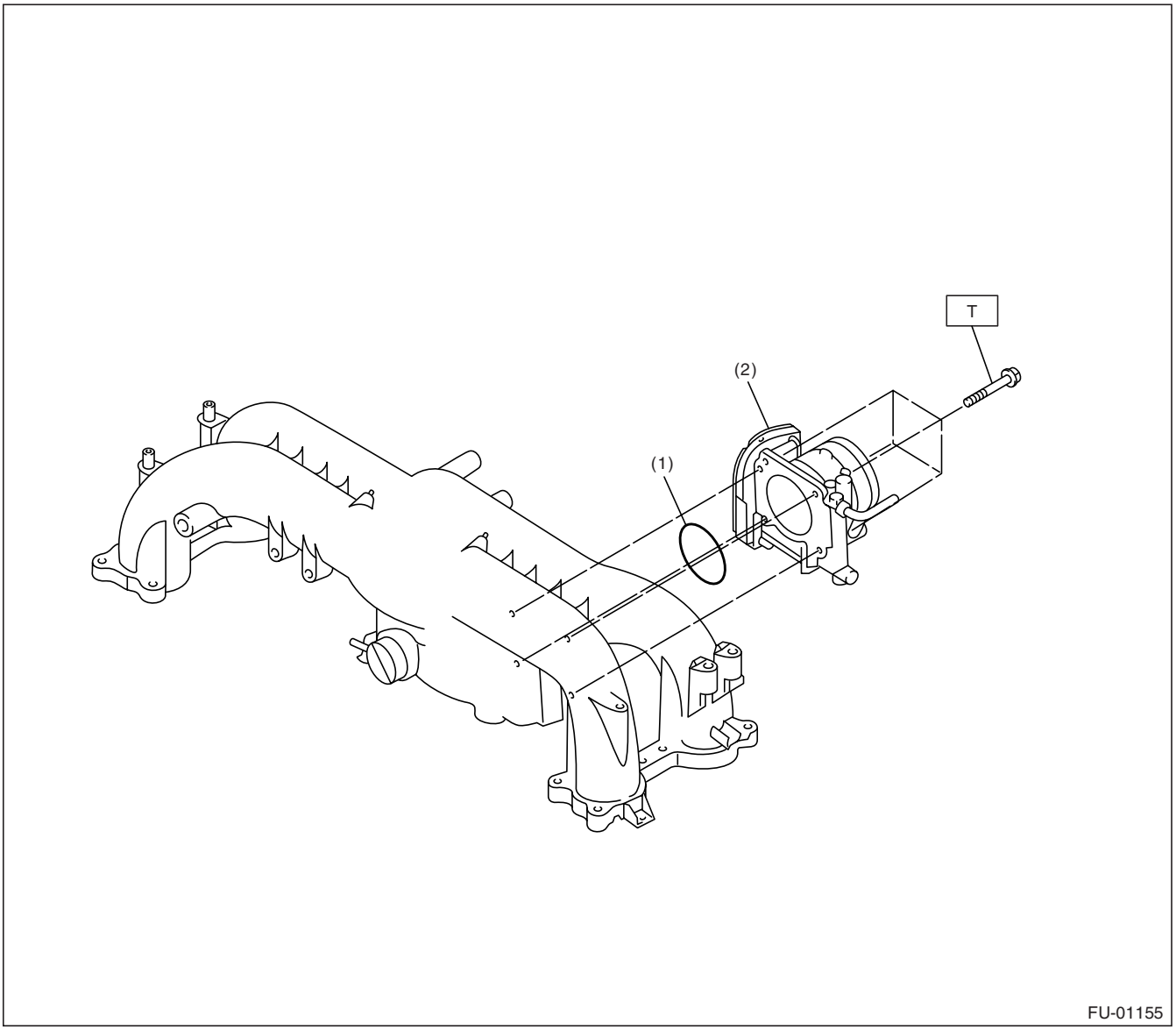
1. INTAKE MANIFOLD



(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Intake manifold (lower)
(10) Fuel injector
(11) Seal ring
(12) O-ring
(13) Fuel injector pipe LH
(14) Fuel injector pipe RH
(15) Solenoid valve bracket
(16) Manifold absolute pressure sensor
(17) Filter
(18) Intake manifold
(19) Wastegate control solenoid valve ASSY
(20) Vacuum hose
(21) Ground stay
(22) Coolant filler tank stay
(23) O-ring

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*1.5 (0.15, 1.1)*
T2:	*6.5 (0.66, 4.8)*
T3:	*8.3 (0.85, 6.1)*
T4:	*19 (1.9, 14)*
T5:	*25 (2.5, 18.4)*

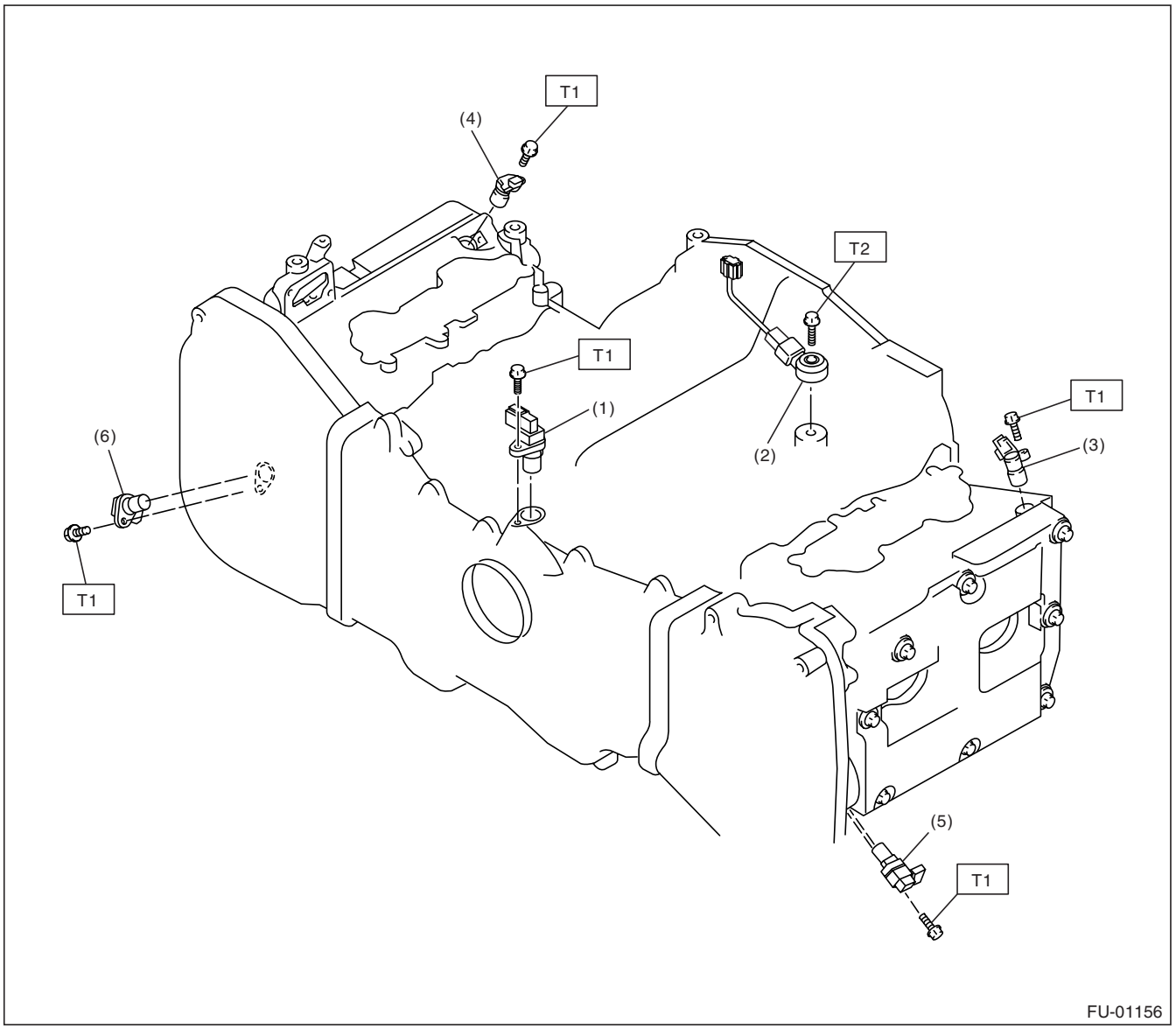
2. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

Tightening torque: N·m (kgf-m, ft-lb)	
T:	*8 (0.8, 5.9)*

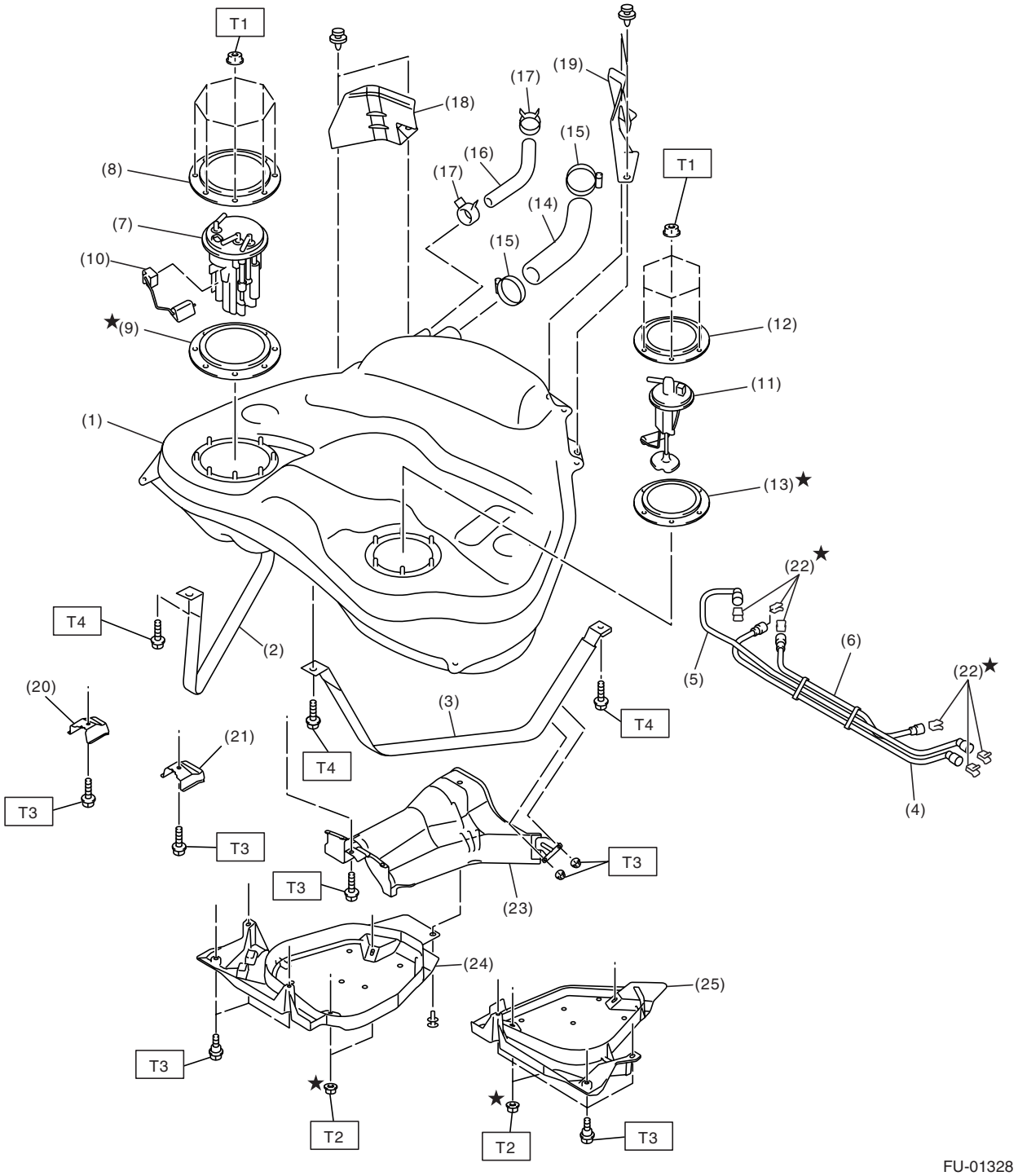
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Intake camshaft position sensor LH
(4) Intake camshaft position sensor RH
(5) Exhaust camshaft position sensor LH
(6) Exhaust camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.7)

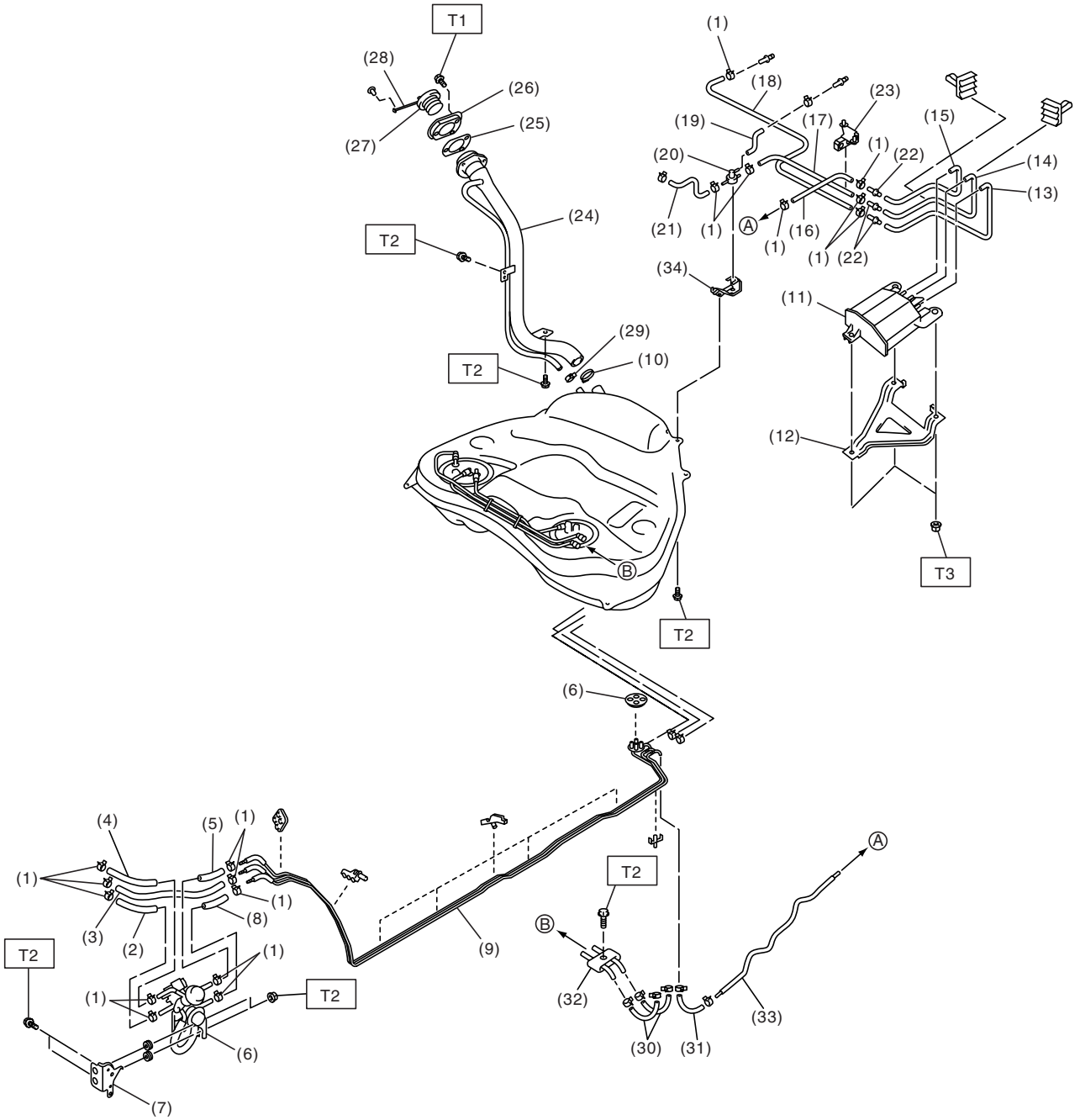
4. FUEL TANK


T1
(19)
(17)
(18)
(15)
(16)
(17)
T1
(8)
(14)
(7)
(15)
(10)
★(9)
(12)
(11)
(1)
(13)★
(22)★
T4
(2)
(6)
(5)
(22)★
(20)
(3)
T4
T4
(21)
(4)
T3
T3
T3
T3
(23)
(24)
(25)
T3
★
★
T2
T2
T3
FU-01328

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Delivery tube
(5) Return tube
(6) Jet pump tube
(7) Fuel pump ASSY
(8) Fuel pump upper plate
(9) Fuel pump gasket
(10) Fuel level sensor
(11) Fuel sub level sensor
(12) Fuel sub level sensor upper plate
(13) Fuel sub level sensor gasket
(14) Fuel filler hose
(15) Clamp
(16) Vent hose
(17) Clip
(18) Protector RH (Rear)
(19) Protector LH (Rear)
(20) Stopper RH
(21) Stopper LH
(22) Retainer
(23) Heat shield cover
(24) Fuel tank protector RH (Front)
(25) Fuel tank protector LH (Front)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.2)
T2: 9.0 (0.92, 6.6)
T3: 17.5 (1.78, 12.9)
T4: 33 (3.4, 24.3)

5. FUEL LINE



FU-01329

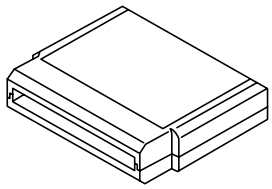
(1) Clip
(2) Fuel return hose A
(3) Evaporation hose
(4) Fuel delivery hose A
(5) Fuel delivery hose B
(6) Fuel bypass valve
(7) Fuel bypass valve bracket
(8) Fuel return hose B
(9) Fuel pipe ASSY
(10) Clamp
(11) Canister
(12) Canister protector (Sedan model)
(13) Canister drain hose A
(14) Two-way valve hose A
(15) Purge hose A
(16) Purge hose B
(17) Two-way valve hose B
(18) Canister drain hose B
(19) Two-way valve drain hose
(20) Two-way valve
(21) Two-way valve hose C
(22) Connector
(23) Evaporation hose holder
(24) Fuel filler pipe ASSY
(25) Filler pipe packing
(26) Filler ring
(27) Filler cap
(28) Tether
(29) Clip
(30) Fuel hose
(31) Purge hose C
(32) Fuel hose connector
(33) Purge pipe
(34) Two-way valve bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.2)
T2: 7.5 (0.76, 5.5)
T3: 8.3 (0.85, 6.1)

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 yourself, 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 rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
• Place “NO FIRE” signs near the working area.
• Be careful not to spill fuel on the floor.

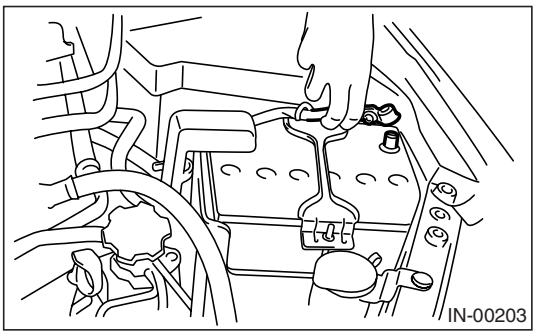
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

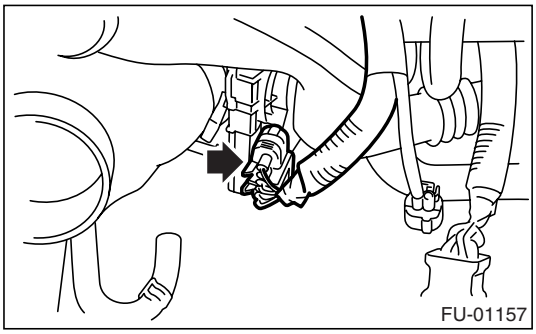
2. Throttle Body

A: REMOVAL

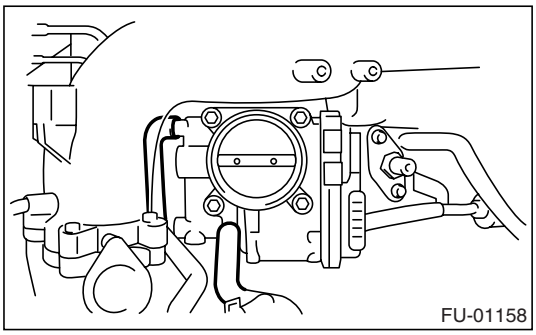
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the connector from throttle position sensor.



5) Disconnect the engine coolant hoses from throttle body.



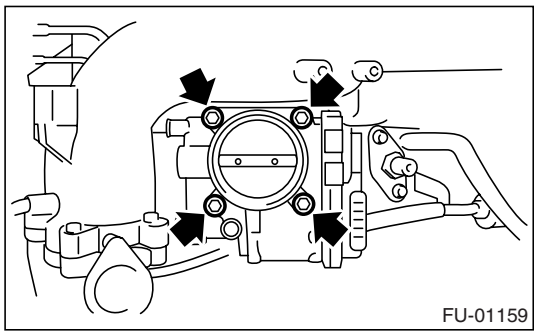
6) Remove the bolts which install throttle body to the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new O-rings.

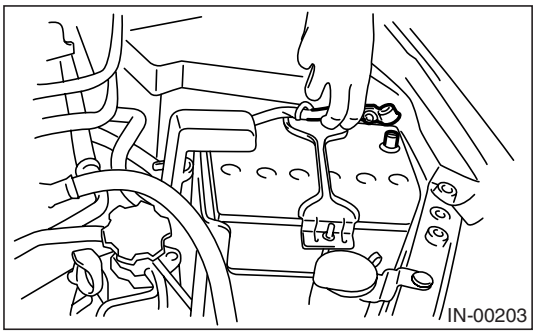
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



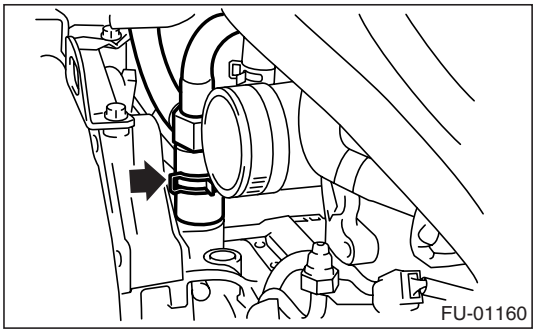
3. Intake Manifold

A: REMOVAL

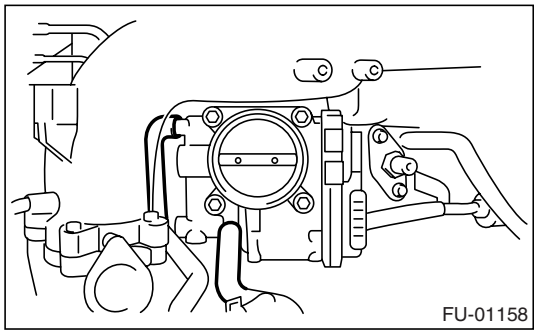
1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.



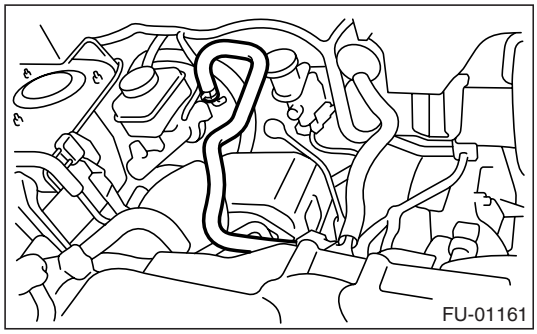
5) Lift-up the vehicle.
6) Remove the under cover.
7) Drain coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).
8) Remove the intake duct from air cleaner case.
9) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
10) Remove the generator. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
11) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
12) Disconnect the PCV hose assembly from cylinder block.



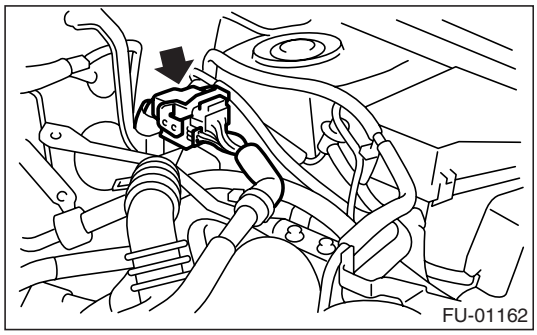
13) Disconnect the engine coolant hose from throttle body.

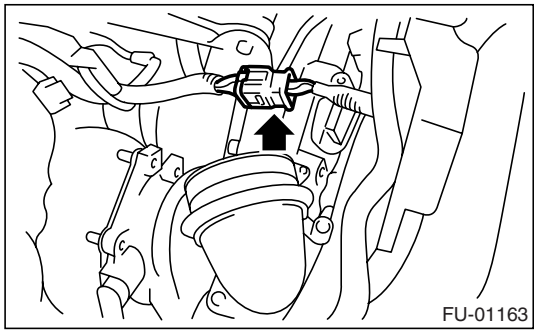


14) Disconnect the brake booster hose.

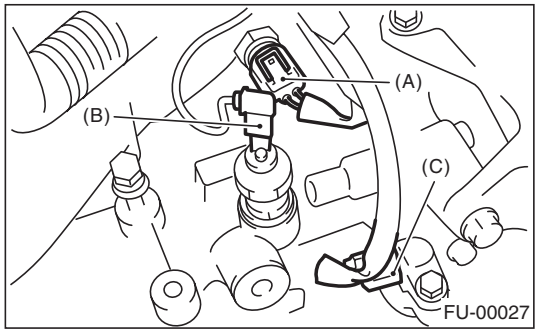


15) Disconnect the engine harness connectors from bulkhead harness connectors.

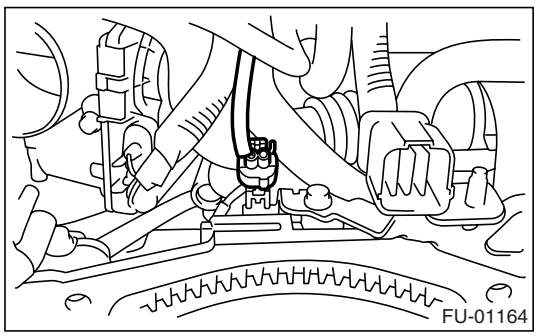




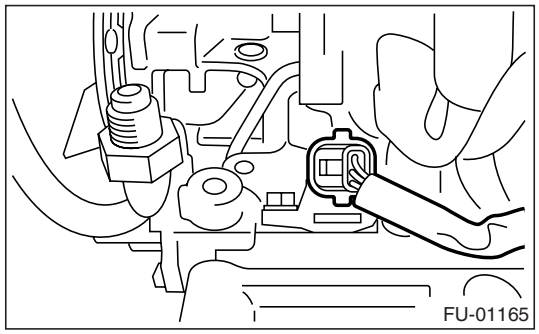
16) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



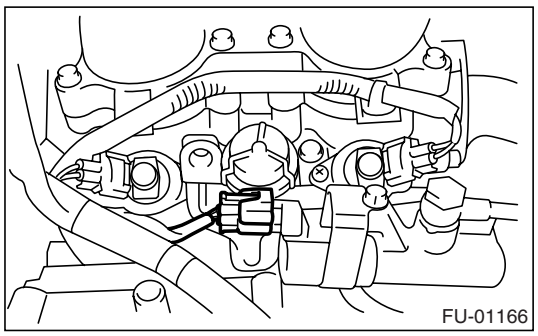
17) Disconnect the knock sensor connector.



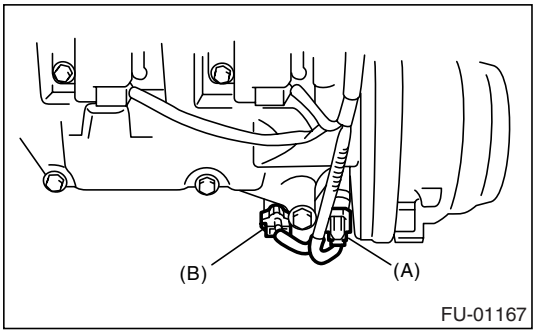
18) Disconnect the connector from intake camshaft position sensor.



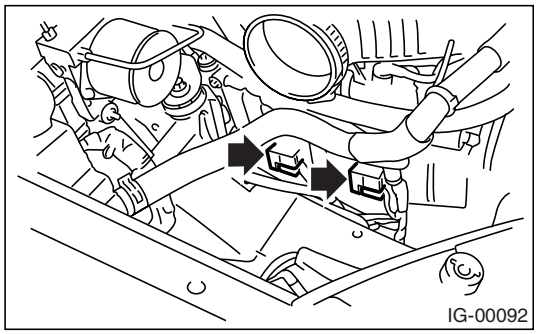
19) Disconnect the connector from intake oil flow control solenoid valve.



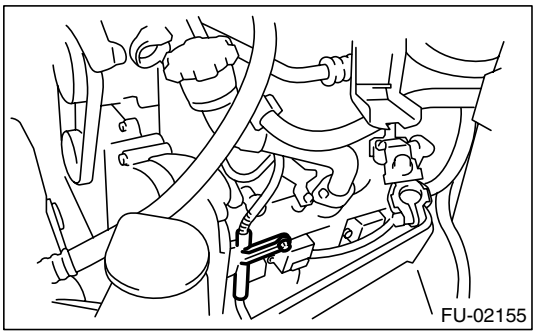
20) Disconnect the connector from the exhaust camshaft position sensor (A) and exhaust oil flow control solenoid valve (B).



21) Disconnect the connector from ignition coil.

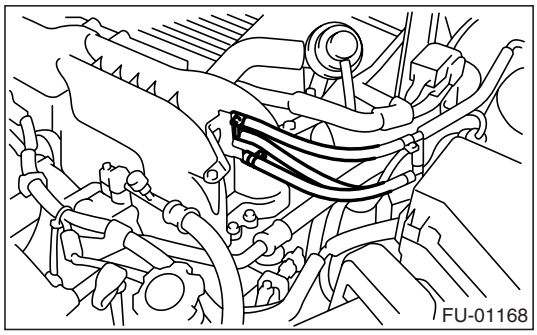


22) Remove the engine harness bracket from rocker cover.

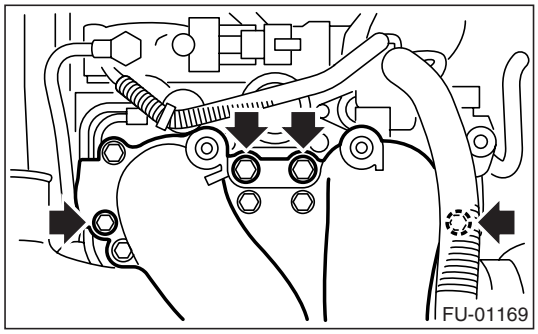


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



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



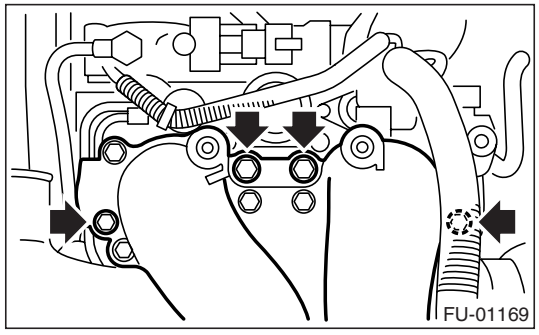
25) Remove the intake manifold.

B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

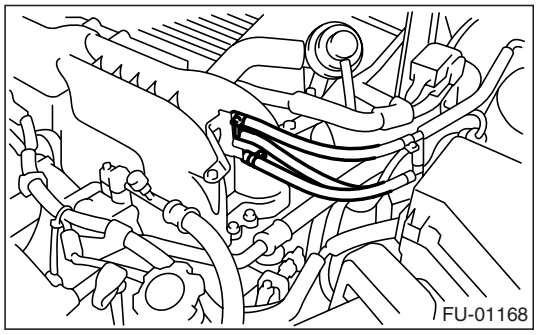
NOTE:
Use a new gasket.

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



2) Connect the fuel delivery hose, return hose and evaporation hose.

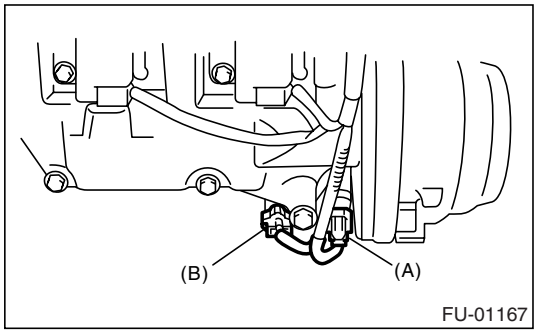
NOTE:
If fuel hoses or clamps are damaged, replace them with new ones.



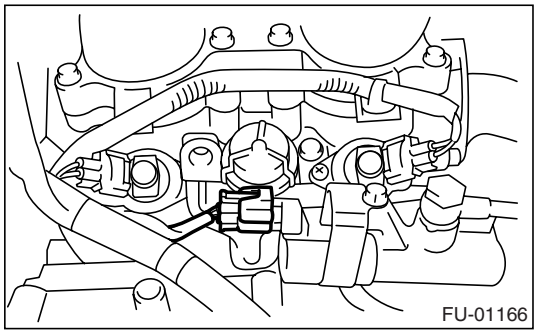
3) Tighten the hose clamp screws.

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)

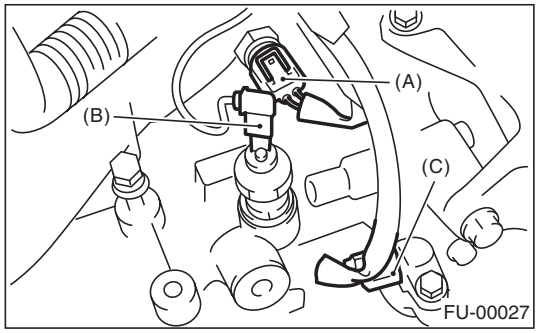
4) Connect the connectors to the exhaust camshaft position sensor (A) and exhaust oil flow control solenoid valve (B).



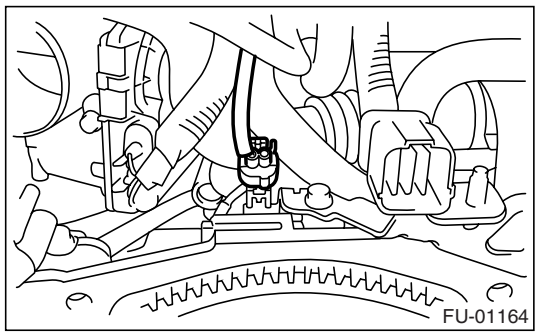
5) Connect the connector to intake oil flow control solenoid valve.



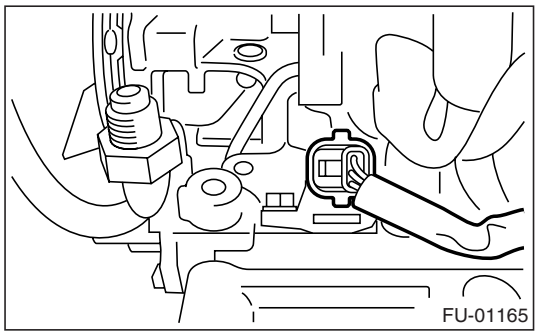
6) Connect the connectors to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



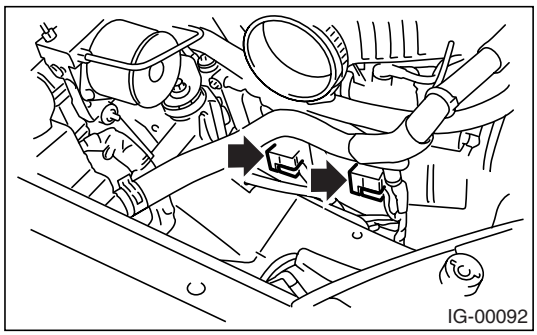
7) Connect the connector to knock sensor.



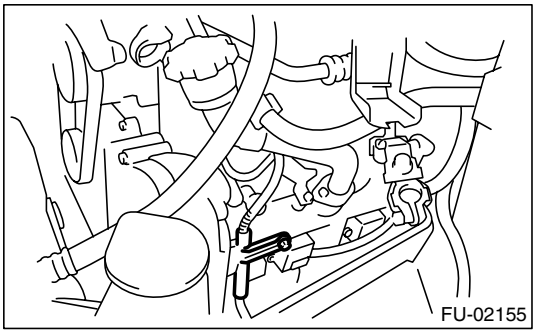
8) Connect the connector to intake crankshaft position sensor.



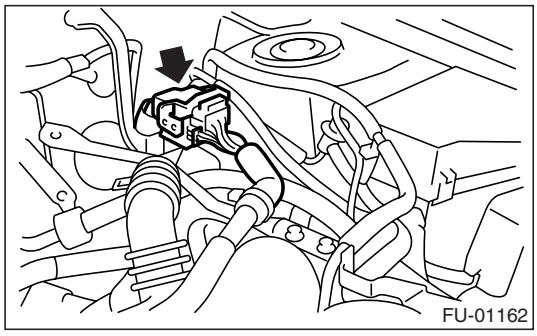
9) Connect the connector to ignition coil.

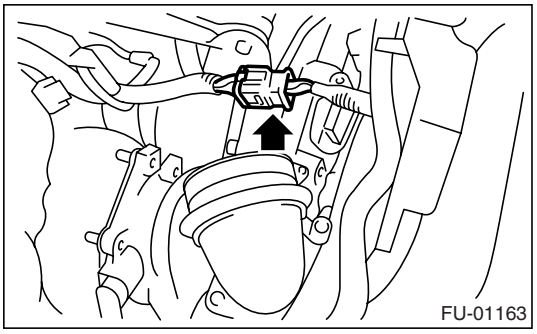


10) Install the engine harness bracket to rocker cover.

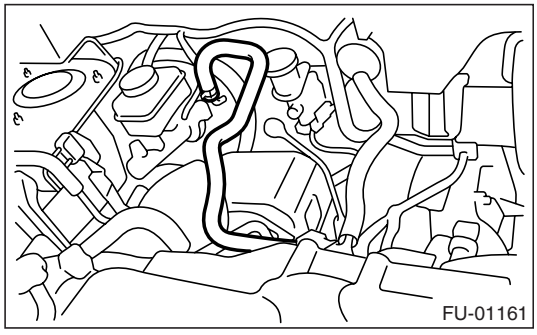


11) Connect the engine harness connectors to bulkhead harness connectors.

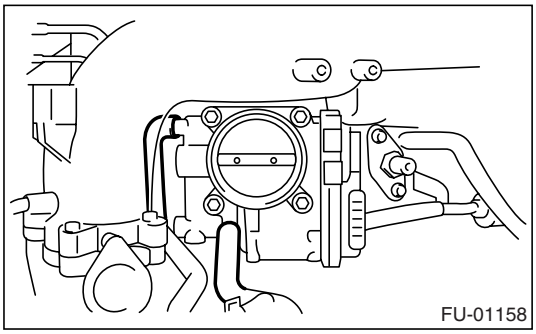




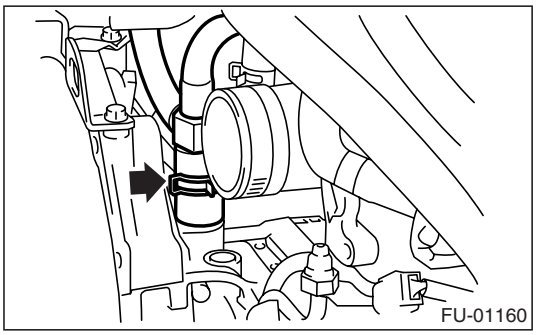
12) Connect the brake booster hose.



13) Connect the engine coolant hoses to throttle body.



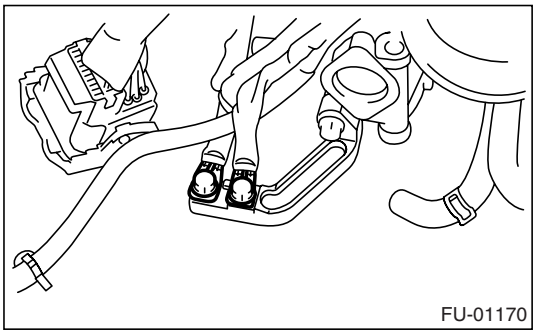
14) Connect the PCV hose assembly to cylinder block.



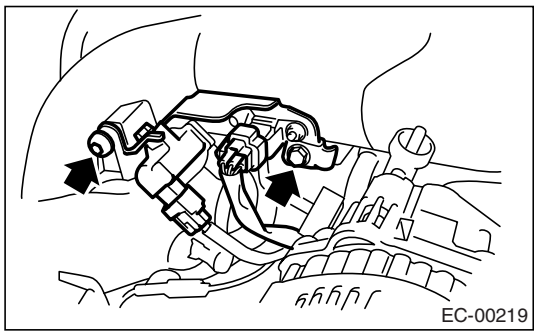
15) Install the coolant filler tank.
<Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>
16) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
17) Install the air cleaner case to intake duct.
18) Install the fuse of fuel pump to main fuse box.
19) Connect the ground cable to battery.
20) Lift-up the vehicle.
21) Install the under cover.
22) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
23) Install the collector cover.

C: DISASSEMBLY

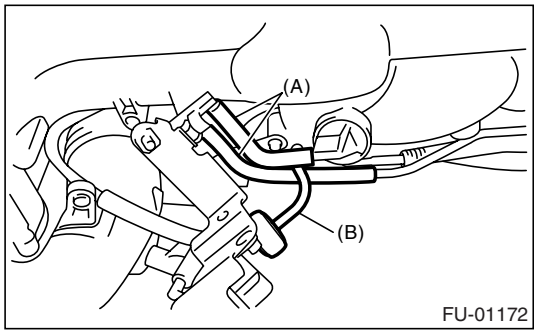
1) Disconnect the engine ground terminal from ground stay.



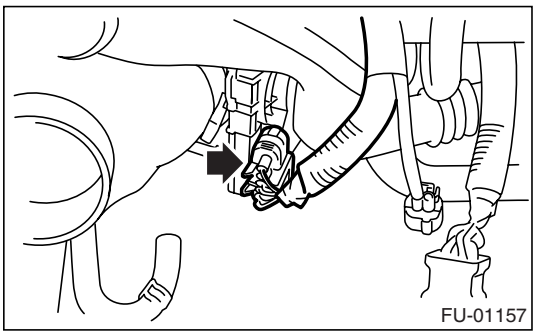
2) Remove the solenoid valve bracket assembly from intake manifold, and disconnect the connector from the wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve.



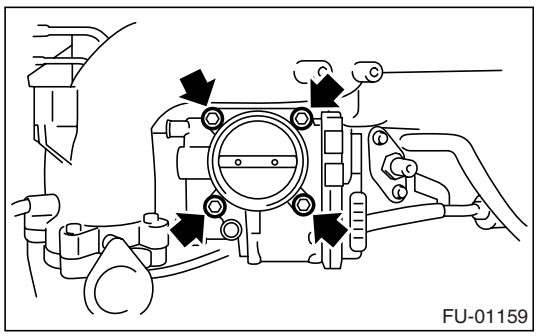
3) Disconnect the evaporation hoses (A) and filter assembly (B).



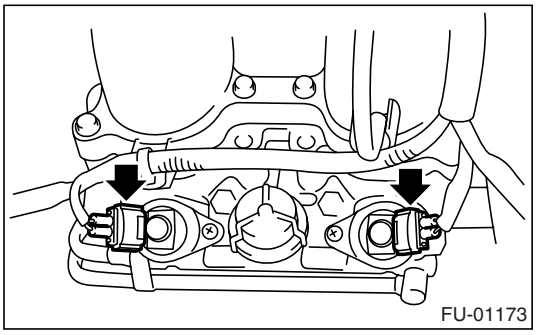
4) Disconnect the connector from throttle position sensor.



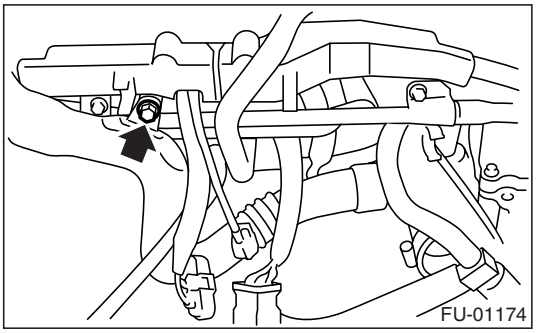
5) Remove the throttle body from intake manifold.



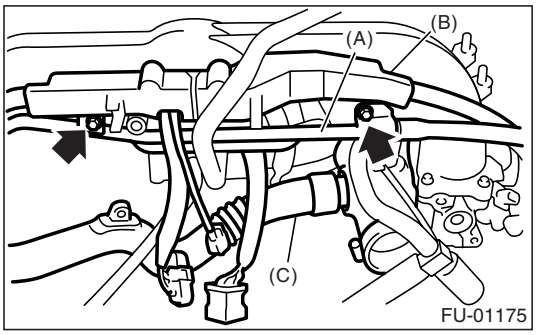
6) Disconnect the connector from fuel injector.



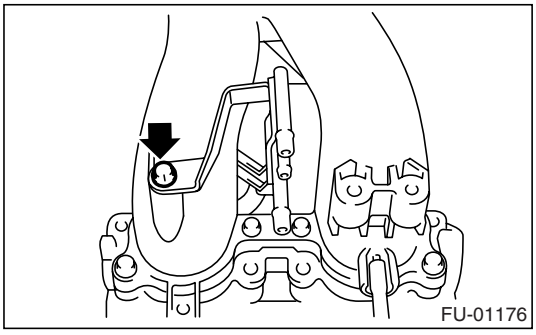
7) Remove the bolts which secure air bypass pipe to intake manifold.



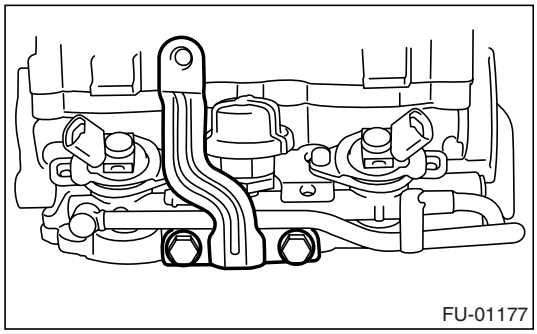
8) Disconnect the PCV pipe (A), harness assembly (B) and intake duct (C) from intake manifold.



9) Remove the bolt which holds fuel injector pipe LH onto the front side of intake manifold.

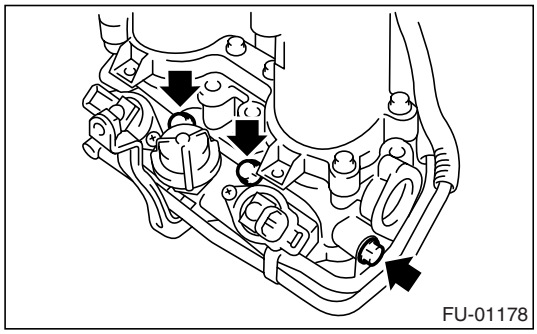


10) Remove the coolant filler tank stay from intake manifold.

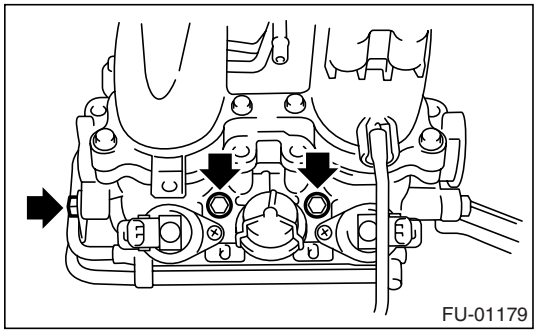


11) Remove the bolt which holds fuel injector pipe onto intake manifold.

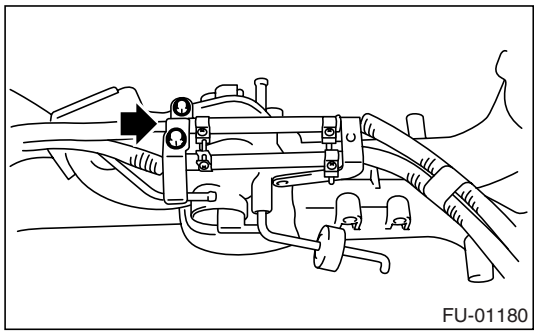
- RH side



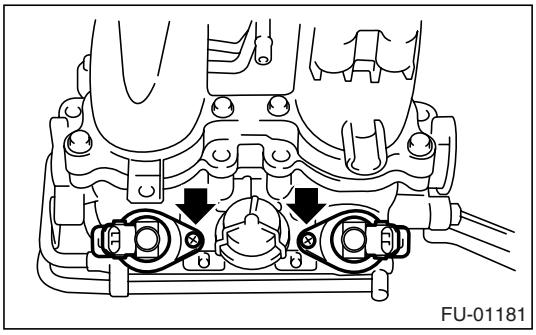
- LH side



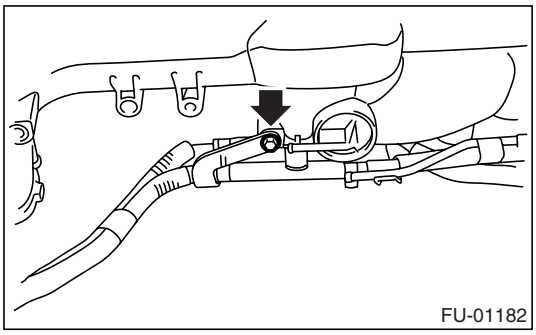
12) Remove the bolt which holds fuel pipe to intake manifold.



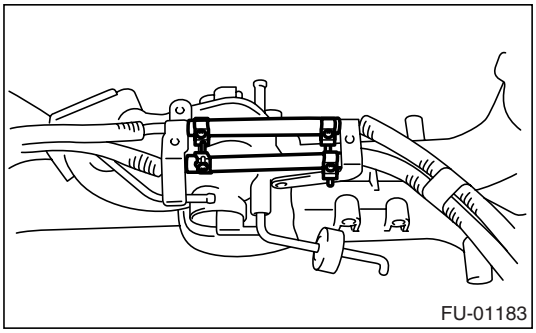
13) Remove the fuel injectors.



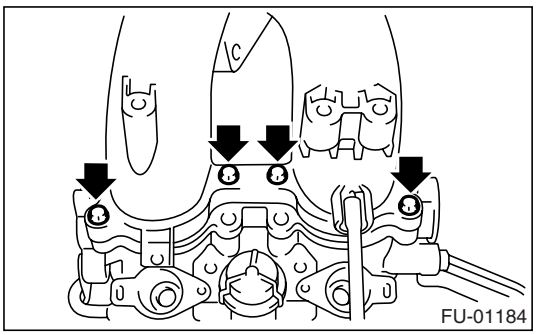
14) Remove the bolts which hold fuel injector pipe RH onto the lower side of intake manifold.



15) Loosen the clamp which holds fuel hose to injector pipe, and then disconnect the fuel hose from pipe.



16) Remove the fuel injector pipe.
17) Remove the intake manifold (upper) from intake manifold (lower).

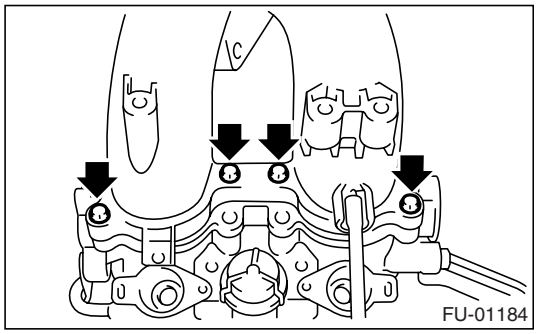


D: ASSEMBLY

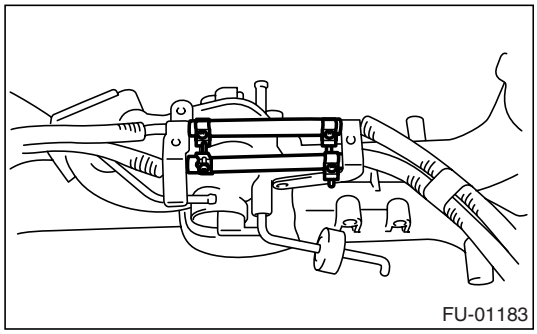
1) Install the intake manifold (lower) to intake manifold (upper).

NOTE:
Use a new O-ring.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)

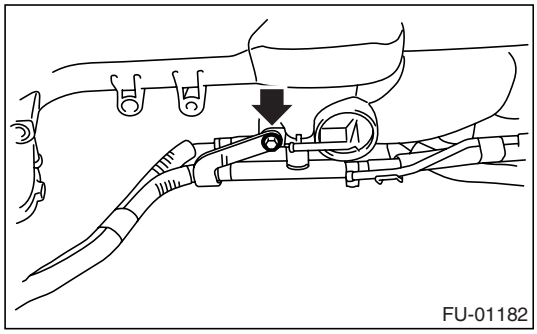


2) Install the fuel injector pipe.
3) Connect both the fuel injector pipes with a fuel hose and secure them with clamps.

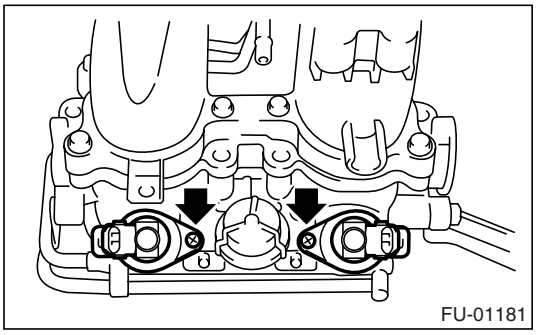


4) Tighten the bolt which secures fuel injector pipe RH onto the lower side of intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

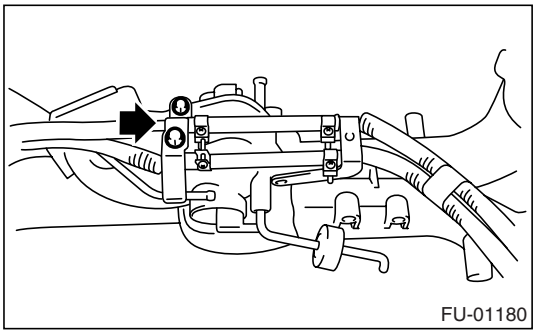


5) Install the fuel injector.



6) Tighten the bolt which secures fuel pipe onto intake manifold.

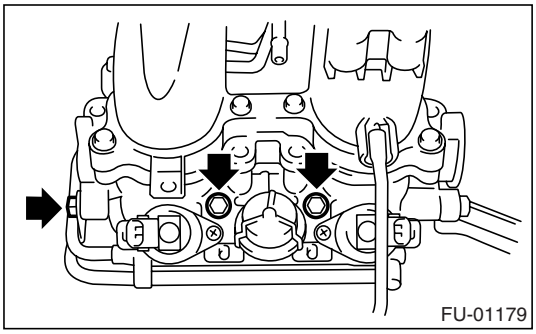
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



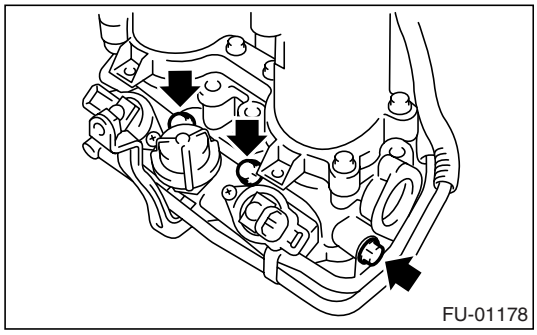
7) Tighten the bolts which secure fuel injector pipe onto intake manifold.

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

- LH side

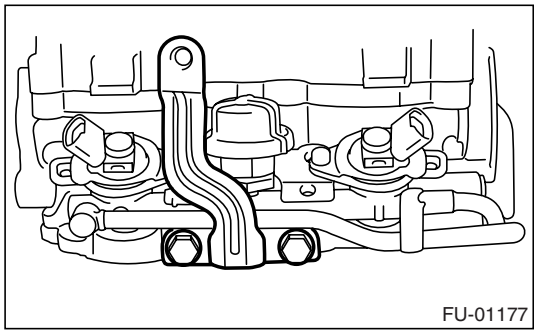


- RH side



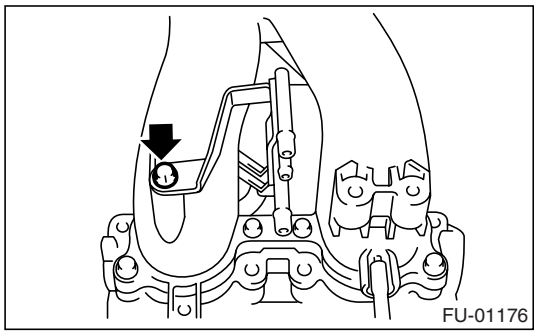
8) Install the coolant filler tank stay to intake manifold.

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



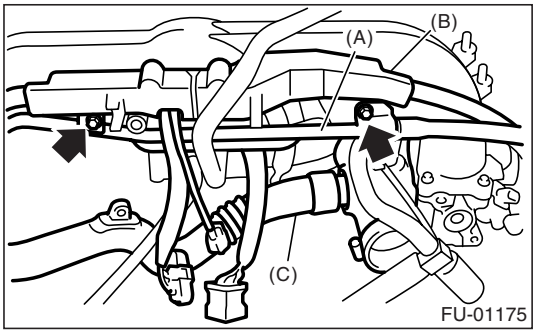
9) Tighten the bolt which installs fuel injector pipe LH on the front side of intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



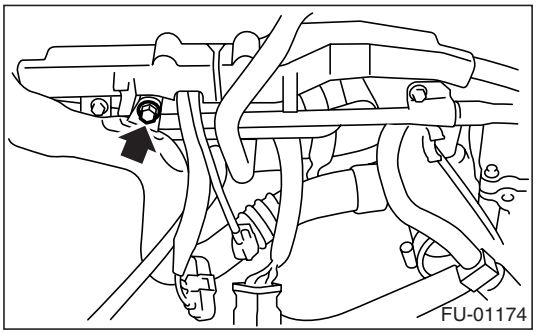
10) Install the PCV pipe (A), harness assembly (B) and intake duct (C) to intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

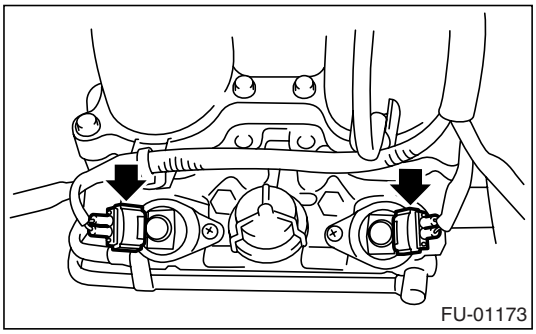


11) Tighten the bolt which secures air bypass pipe onto intake manifold.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



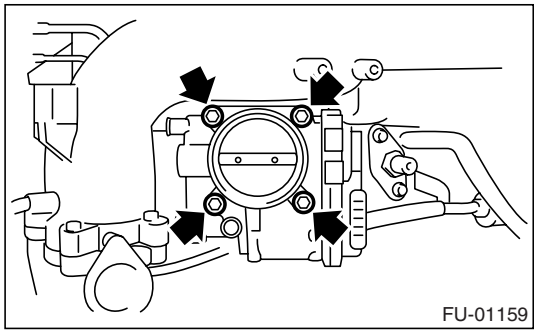
12) Connect the connectors to fuel injector.



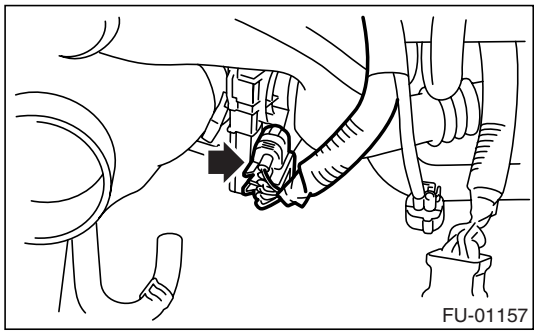
13) Install the throttle body to intake manifold.

NOTE:
Use a new O-ring.

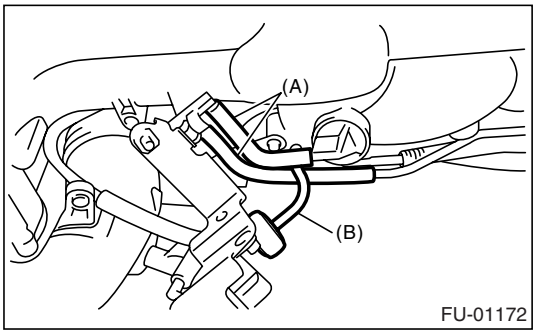
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



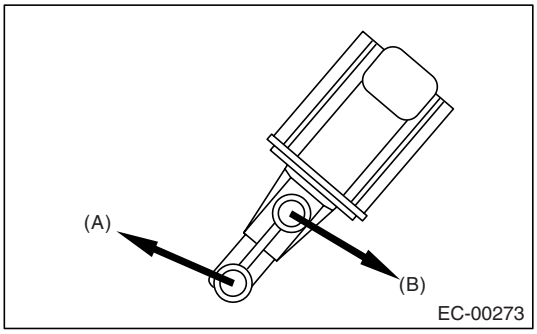
14) Connect the connector to throttle position sensor.



15) Connect the evaporation hoses (A) and filter assembly (B).



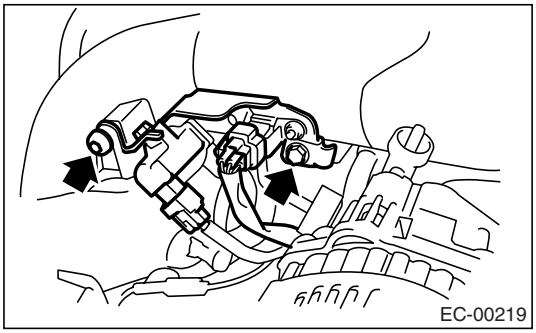
NOTE:
Connect the evaporation hose as shown in the figure.



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

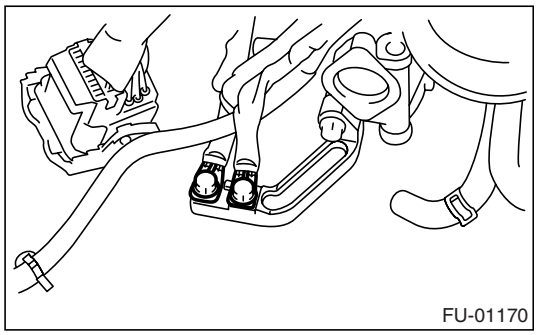
16) Connect the connectors to the wastegate control solenoid valve, manifold absolute pressure sensor and purge control solenoid valve, and install the solenoid bracket assembly to intake manifold.

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



17) Install the engine ground terminal to ground stay.

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



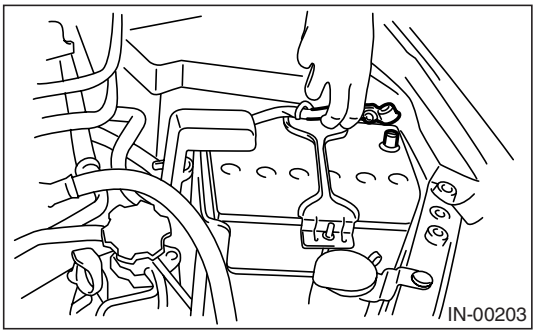
E: INSPECTION

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

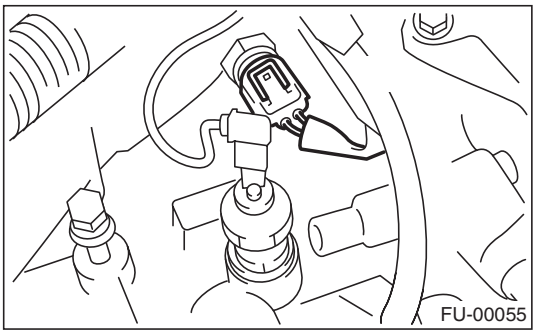
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the generator. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
4) Drain engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the connector from engine coolant temperature sensor.



6) Remove the engine coolant temperature sensor.

B: INSTALLATION

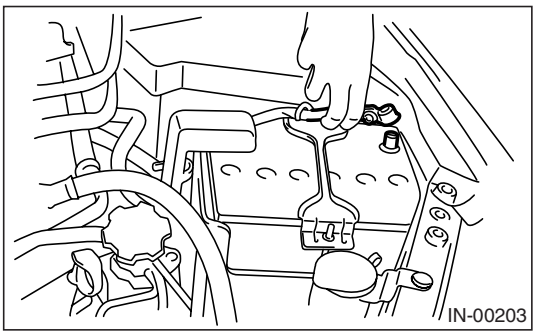
Install in the reverse order of removal.

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

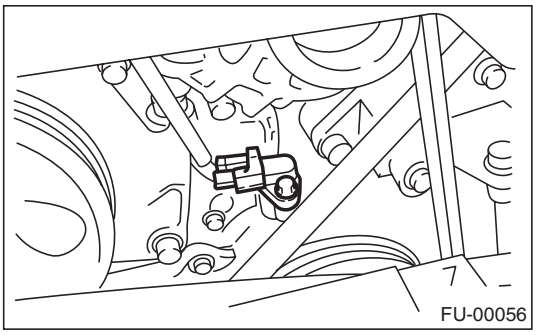
5. Crankshaft Position Sensor

A: REMOVAL

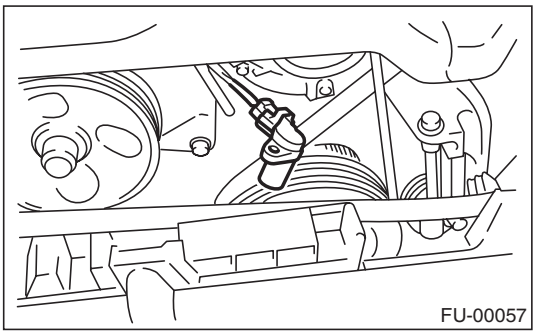
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the bolt which installs crankshaft position sensor to cylinder block.



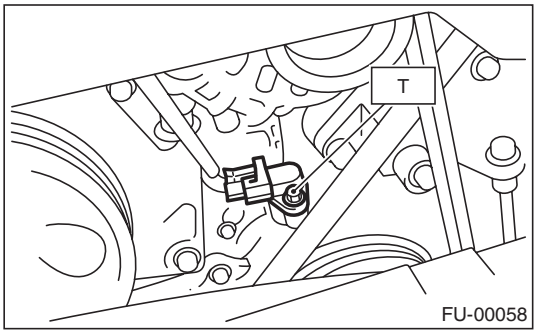
4) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

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

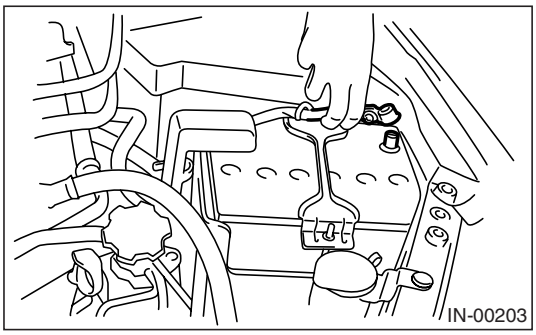


6. Camshaft Position Sensor

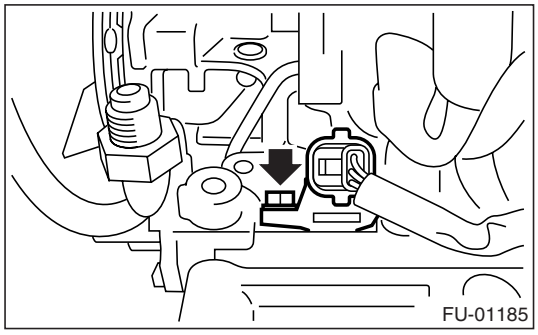
A: REMOVAL

1. INTAKE SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



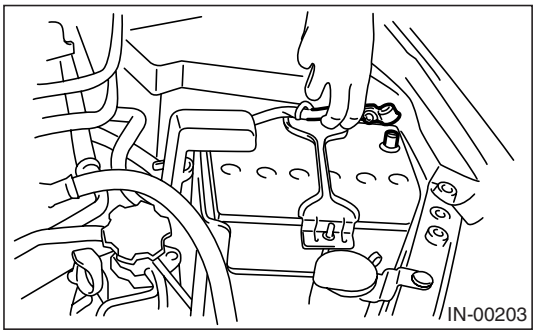
3) Disconnect the connector from camshaft position sensor RH.
4) Remove the camshaft position sensor RH from the rear side of cylinder head.



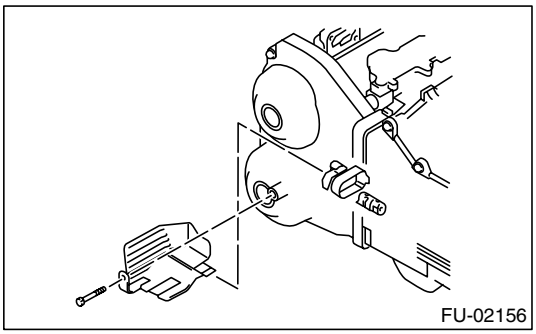
5) Remove the camshaft position sensor LH in the same procedure as RH.

2. EXHAUST SIDE

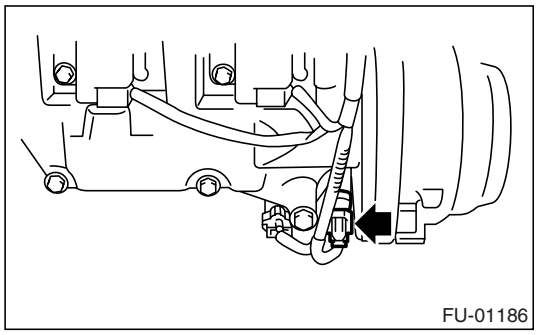
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the sensor cover.



5) Disconnect the connector from camshaft position sensor RH.
6) Remove the camshaft position sensor RH from the lower side of cylinder head.



7) Remove the camshaft position sensor LH in the same procedure as RH.

B: INSTALLATION

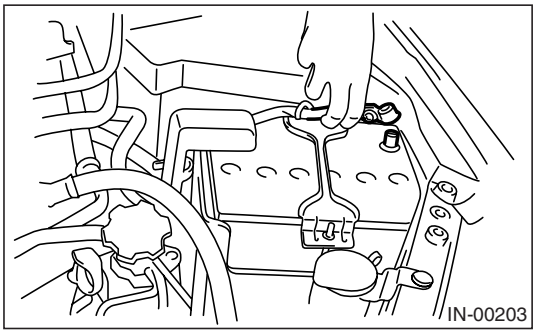
Install in the reverse order of removal.

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

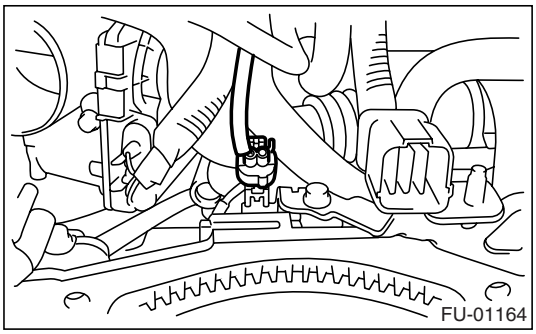
7. Knock Sensor

A: REMOVAL

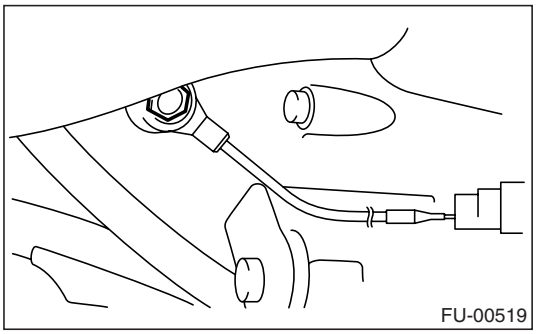
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
4) Disconnect the knock sensor connector.



5) Remove the knock sensor from cylinder block.

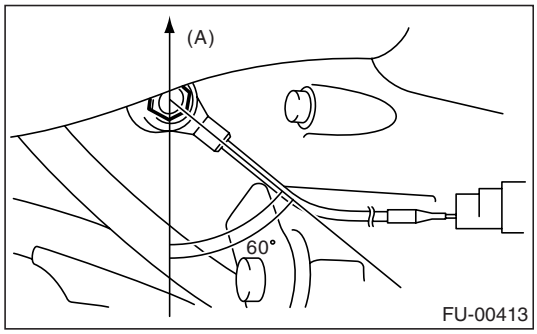


B: INSTALLATION

1) Install the knock sensor to cylinder block.

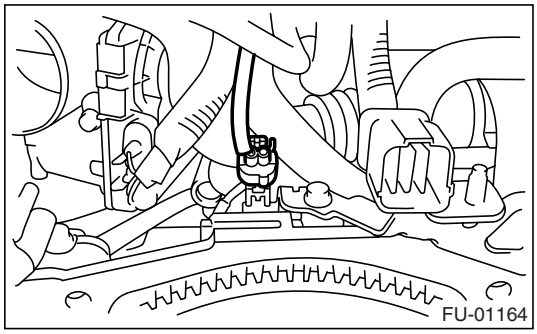
NOTE:
Extraction area of knock sensor cord must be positioned at a 60° angle relative to the engine rear.

Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)

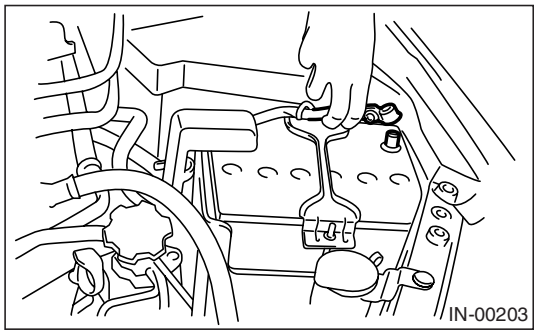


(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler.
<Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
4) Connect the ground cable to battery.



5) Install the collector cover.

8. Throttle Position Sensor

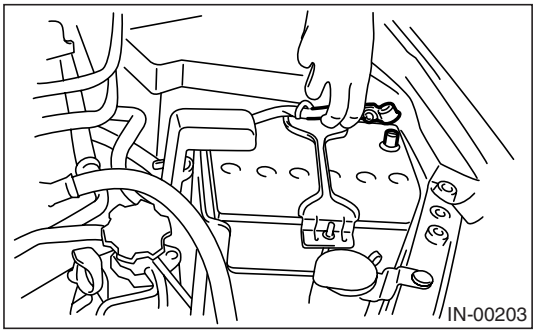
A: SPECIFICATION

Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.
Refer to “Throttle Body” for removal and installation procedures. <Ref. to FU(H4DOTC)-11, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-11, INSTALLATION, Throttle Body.>

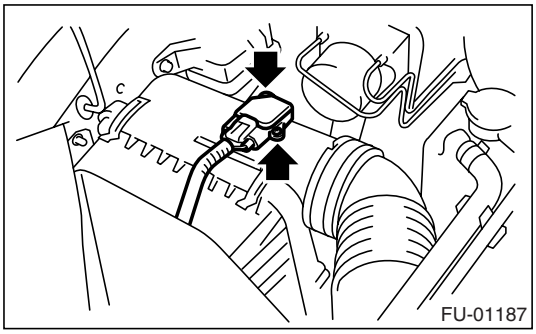
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

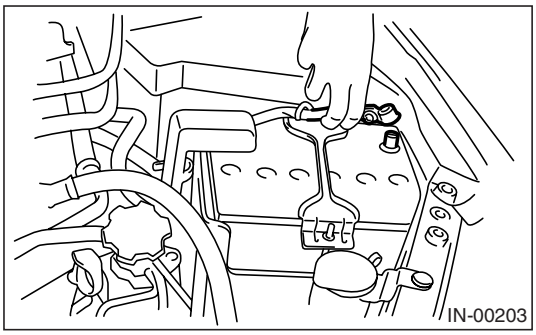
Install in the reverse order of removal.

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

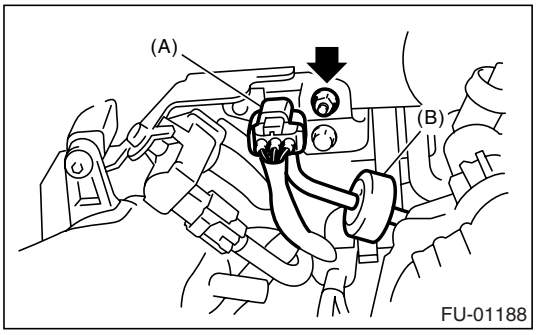
10. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector from manifold absolute pressure sensor (A), and remove the filter assembly (B) from intake manifold.
4) Remove the manifold absolute pressure sensor from solenoid valve bracket.



B: INSTALLATION

Install in the reverse order of removal.

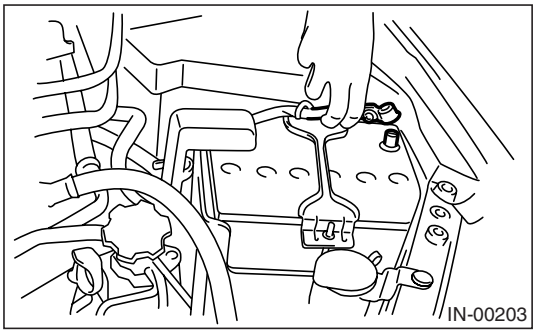
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

11.Fuel Injector

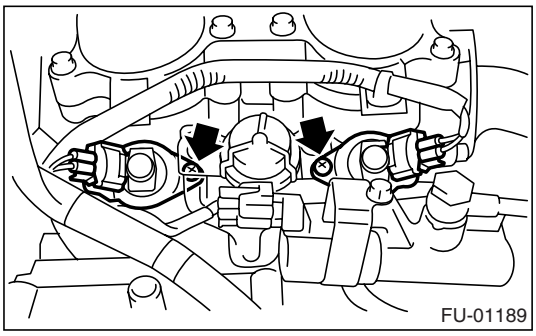
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.

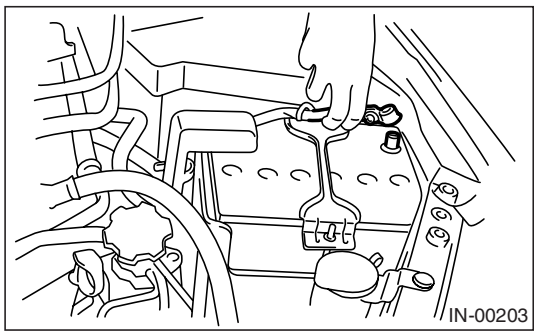


5) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
6) Disconnect the connector from fuel injector.
7) Remove the screw and remove the fuel injector.

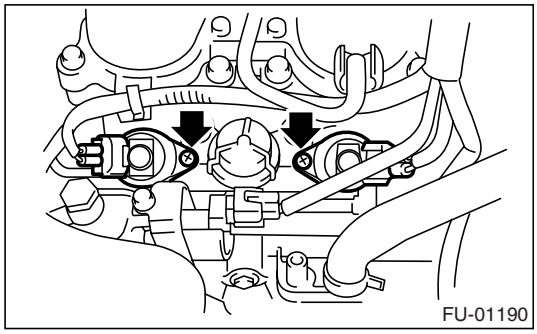


2. LH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.



5) Disconnect the connector from fuel injector.
6) Remove the screw and remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
Use a new O-ring.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

NOTE:
Use a new O-ring.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

12. Oil Flow Control Solenoid Valve

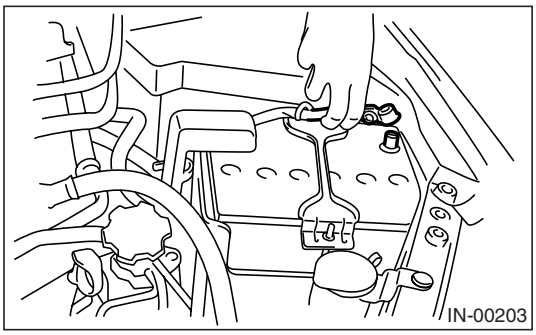
A: REMOVAL

1. INTAKE SIDE

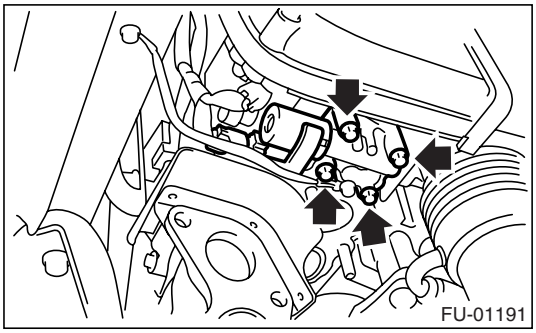
Oil flow control solenoid valve is a unit with camshaft cap.
Refer to “Camshaft” for removal. <Ref. to ME(H4DOTC)-56, REMOVAL, Camshaft.>

2. EXHAUST SIDE

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the oil flow control solenoid valve from cylinder head.



B: INSTALLATION

1. INTAKE SIDE

Install in the reverse order of removal.

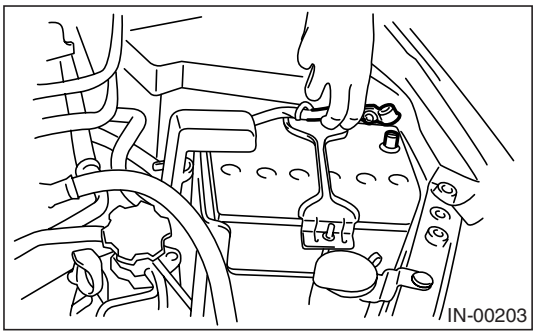
2. EXHAUST SIDE

Install in the reverse order of removal.

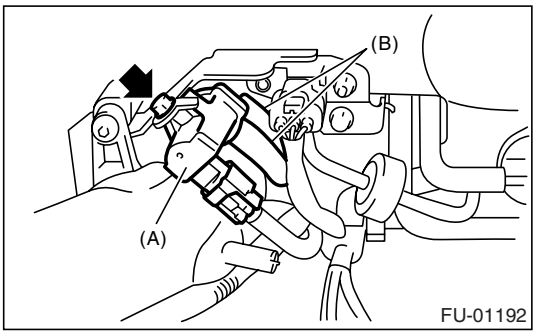
13. Wastegate Control Solenoid Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector from wastegate control solenoid valve (A).
4) Disconnect the pressure hose (B) from wastegate control solenoid valve.
5) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

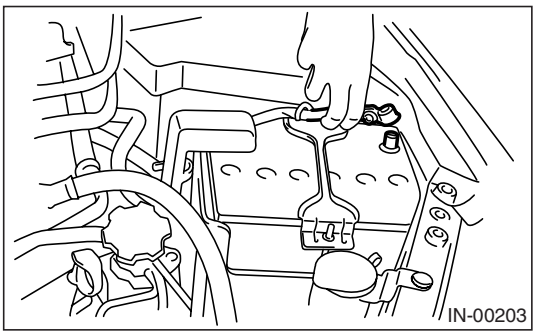
Install in the reverse order of removal.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

14.Front Oxygen (A/F) Sensor

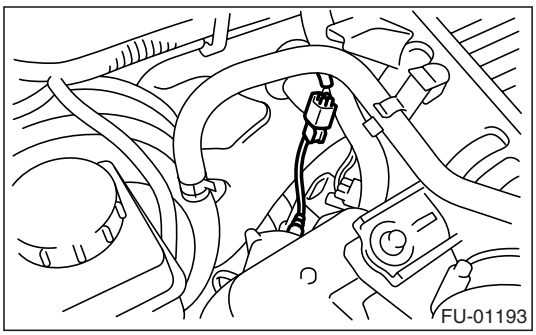
A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector from front oxygen (A/F) sensor.
4) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
5) Remove the front oxygen (A/F) sensor.

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



B: INSTALLATION

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

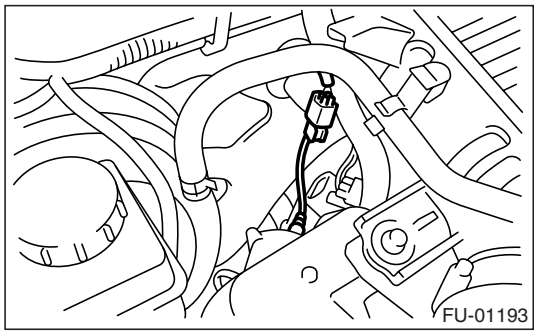
Anti-seize compound:
SS-30 JET LUBE

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

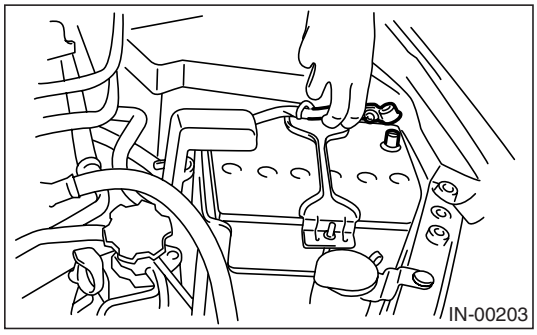
2) Install the front oxygen (A/F) sensor.

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

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



4) Connect the ground cable to battery.

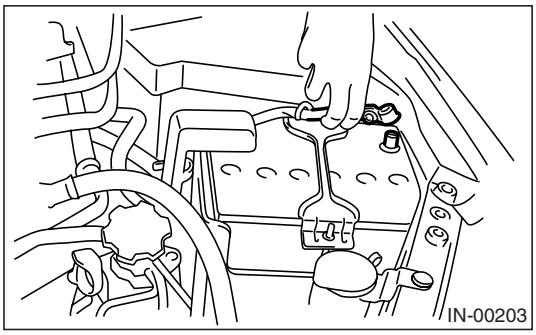


5) Install the collector cover.

15.Rear Oxygen Sensor

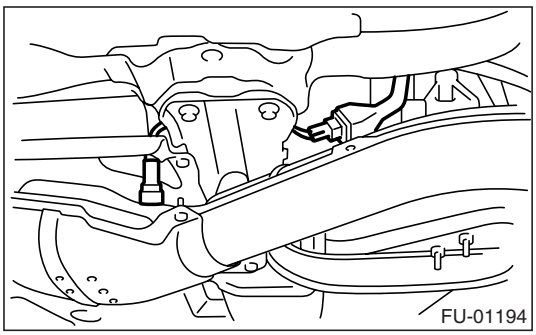
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from rear oxygen sensor.
4) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
5) Remove the rear oxygen sensor.

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



B: INSTALLATION

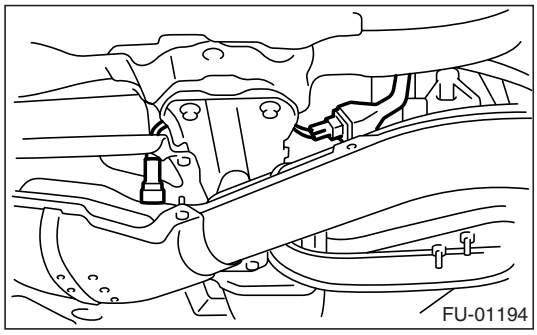
1) Before installing the rear oxygen sensor, apply anti-seize compound only to the threaded portion of the rear oxygen sensor to make the next removal easier.

Anti-seize compound:
SS-30 JET LUBE

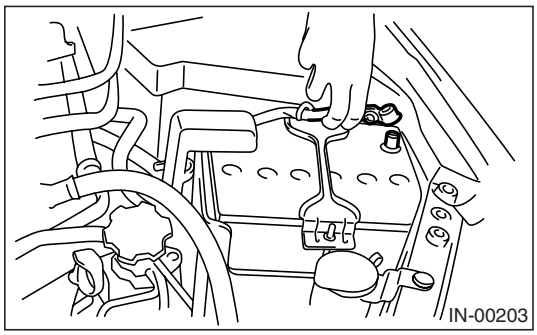
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

2) Install the rear oxygen sensor.

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



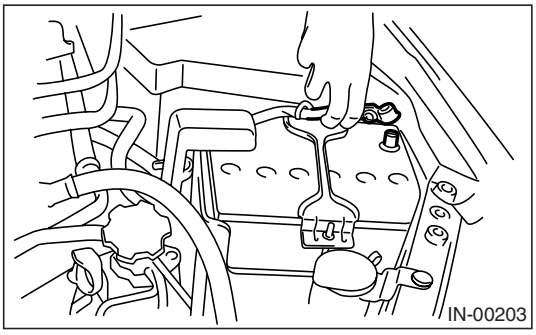
3) Connect the connector to rear oxygen sensor.
4) Lower the vehicle.
5) Connect the ground cable to battery.



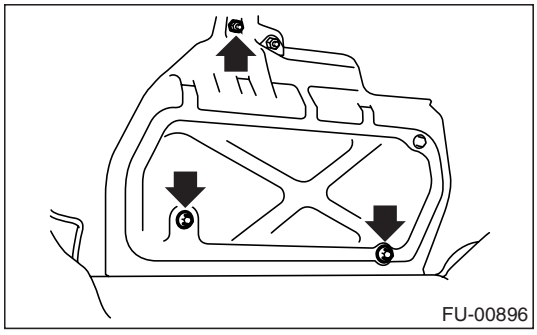
16. Engine Control Module (ECM)

A: REMOVAL

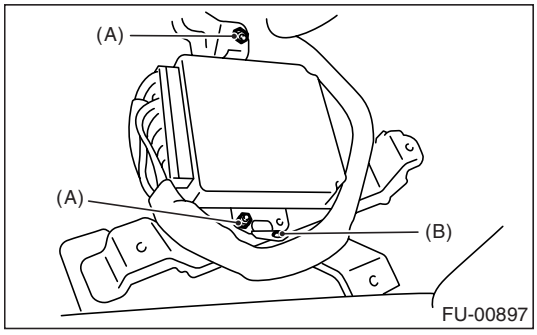
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger's side.
<Ref. to EI-60, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



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



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

B: INSTALLATION

Install in the reverse order of removal.

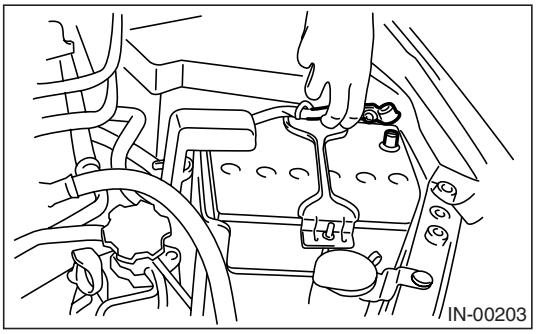
CAUTION:
• When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to fuel injection system.
• When replacing the ECM, be careful not to damage the harnesses and connectors.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

17.Main Relay

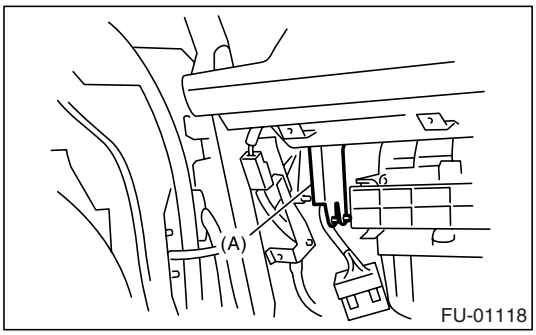
A: REMOVAL

1) Disconnect the ground cable from battery.

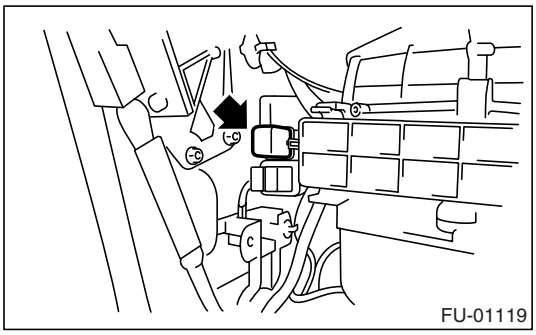


2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connector from main relay.



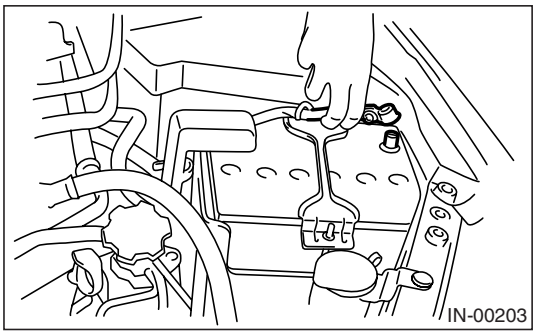
B: INSTALLATION

Install in the reverse order of removal.

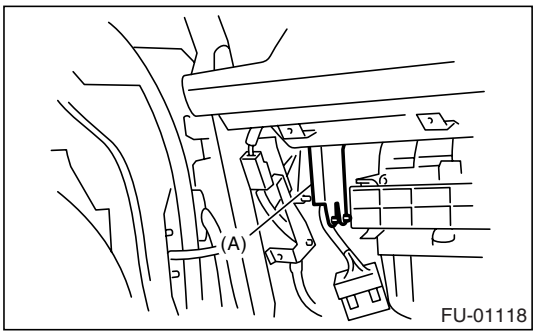
18.Fuel Pump Relay

A: REMOVAL

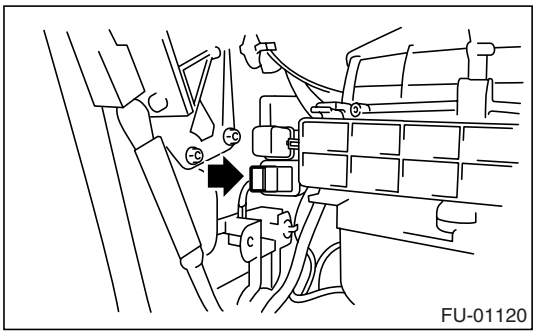
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from fuel pump relay.



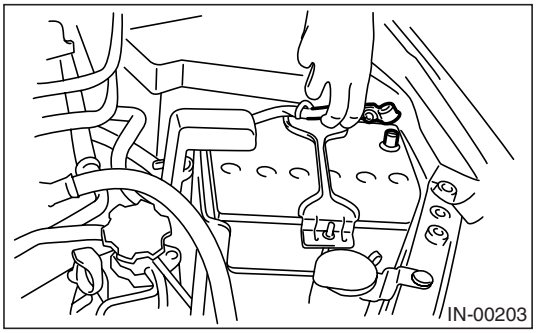
B: INSTALLATION

Install in the reverse order of removal.

19. Electronic Throttle Control Relay

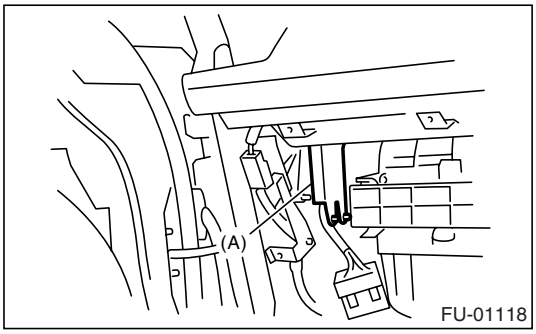
A: REMOVAL

1) Disconnect the ground cable from battery.

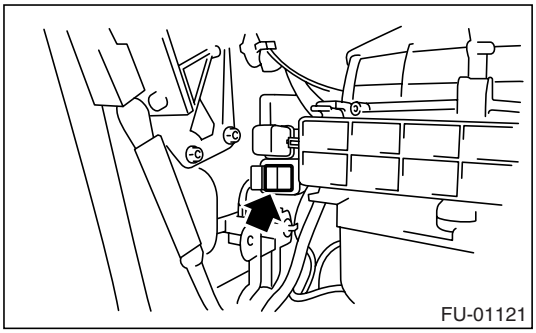


2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connector from electronic throttle control relay.



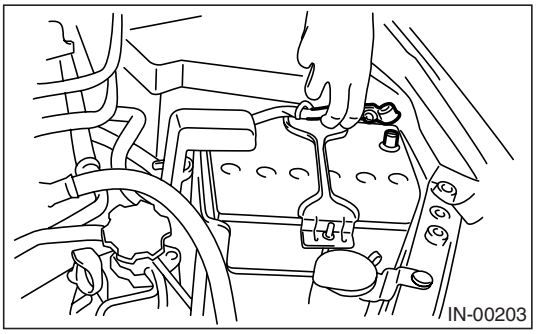
B: INSTALLATION

Install in the reverse order of removal.

20.Fuel Pump Control Unit

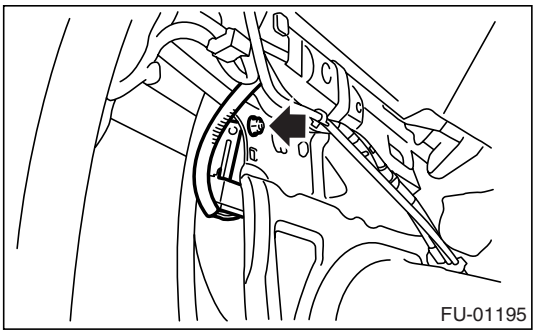
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-63, REMOVAL, Rear Quarter Trim.>

3) Remove the fuel pump control unit.



4) Disconnect the connector from fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

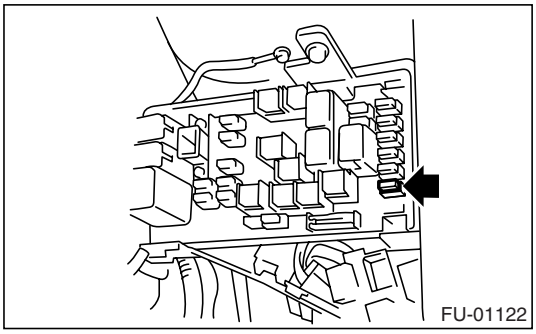
21.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

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

1) Remove the fuse of fuel pump from main fuse box.

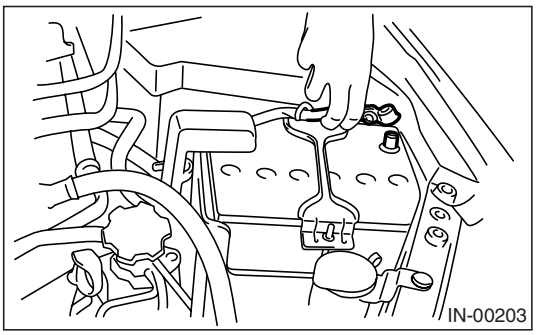


2) Start the engine and run until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

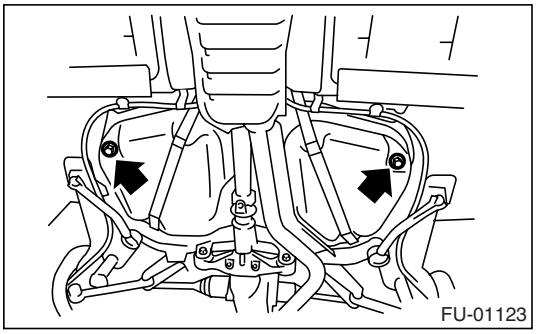
2. DRAINING FUEL

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

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



3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Lift-up the vehicle.
5) Remove the fuel tank protector.
6) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel from fuel tank.



7) Tighten the fuel drain plug.

NOTE:
Use a new gasket.

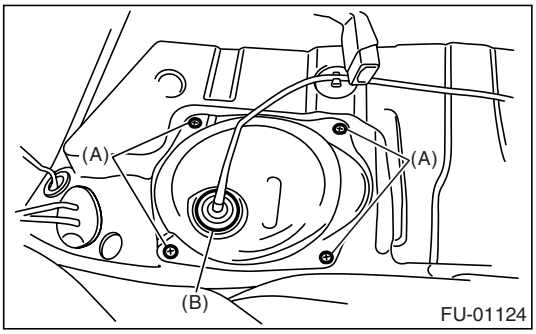
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

22. Fuel Tank

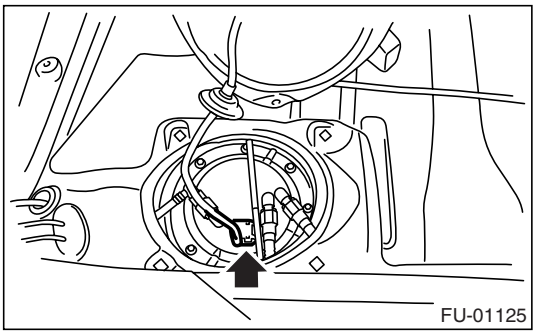
A: REMOVAL

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

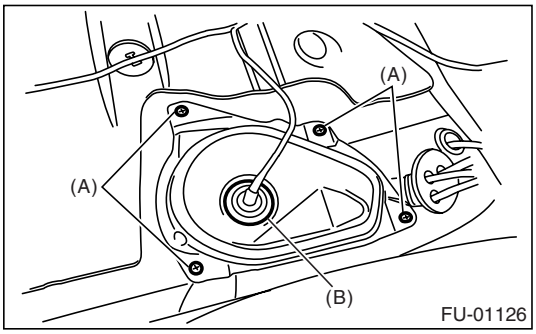
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from fuel tank.
<Ref. to FU(H4DOTC)-39, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Remove the service hole cover of fuel pump.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove service hole cover.



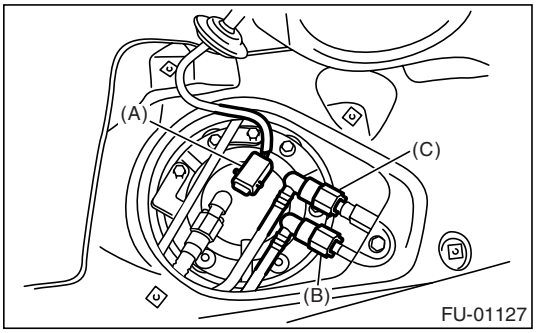
6) Disconnect the connector from fuel pump.



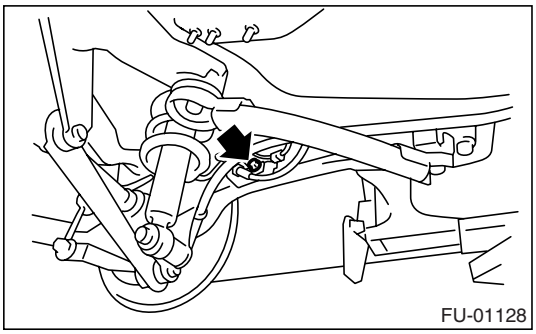
7) Remove the service hole cover of fuel sub level sensor.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove service hole cover.



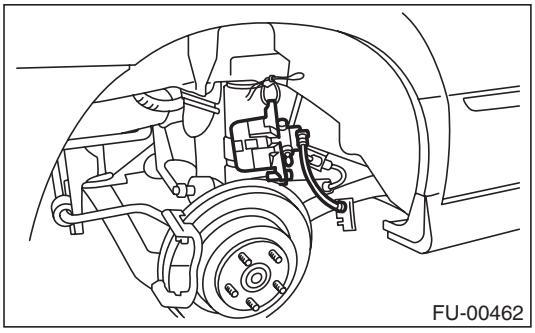
8) Disconnect the connector (A) from fuel sub level sensor.
9) Disconnect the quick connector of the fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



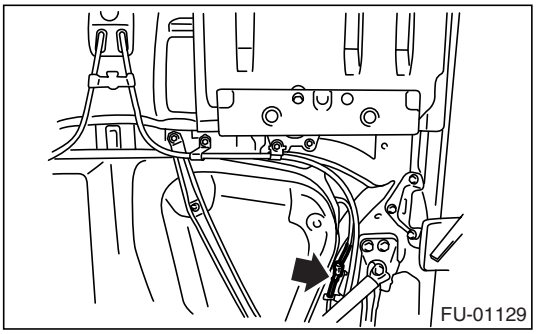
10) Lift-up the vehicle.
11) Remove the rear wheels.
12) Remove the bolts which secure the rear brake hose installation bracket.



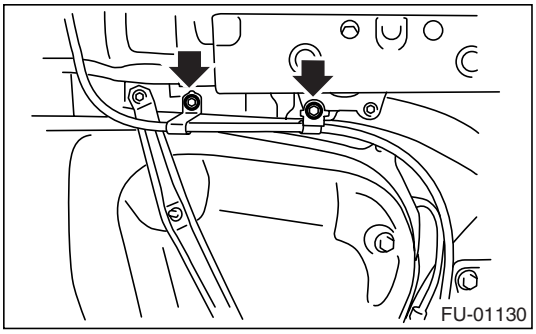
13) Remove the rear brake caliper and tie it to the vehicle body side.

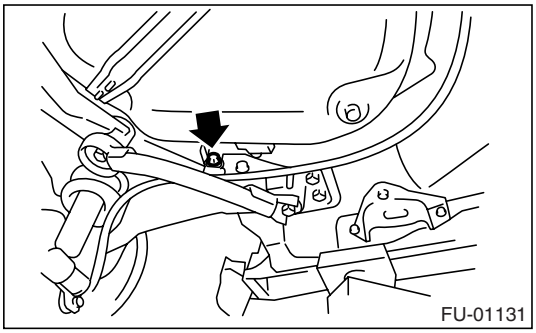


14) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
15) Remove the rear exhaust pipe.
<Ref. to EX(H4DOTC)-11, REMOVAL, Rear Exhaust Pipe.>
16) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
17) Remove the heat shield cover.
18) Disconnect the connector from rear ABS wheel speed sensor.



19) Remove the bolts which install parking brake cable clamp.

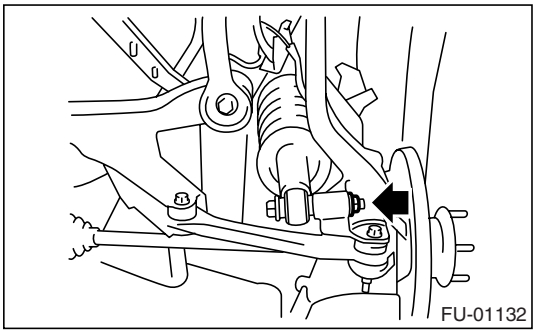




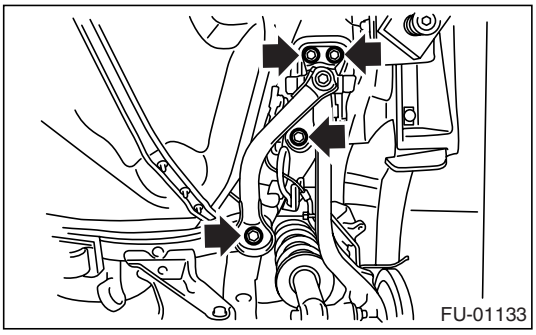
20) Remove the rear suspension assembly.

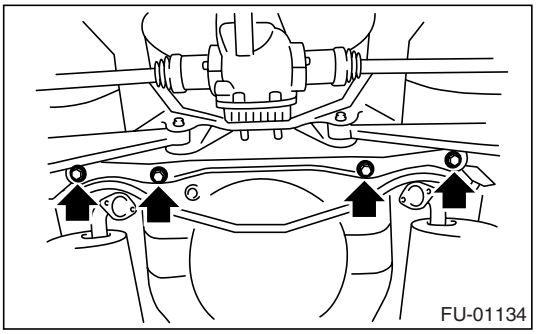
CAUTION:
A helper is required to perform this work.

(1) Support the rear differential with transmission jack.
(2) Remove the bolt which installs rear shock absorber to rear suspension arm.



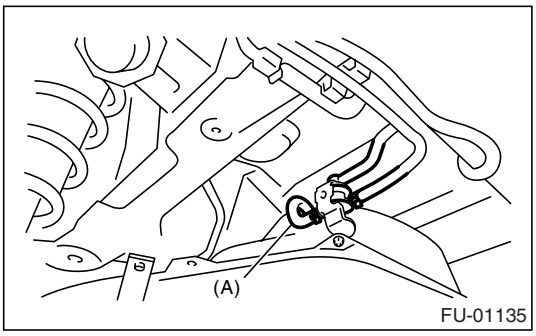
(3) Remove the bolts which secure rear suspension assembly to body.



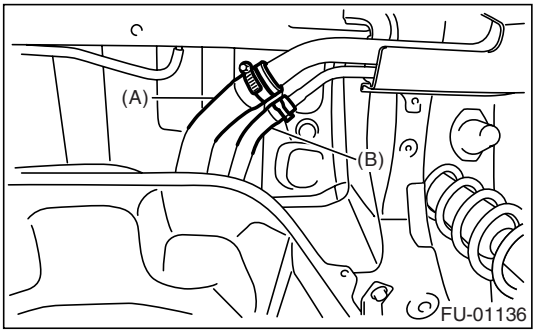


(4) Remove the rear suspension assembly.

21) Disconnect the two-way valve hose (A) from two-way valve, and then remove the two-way valve from bracket.

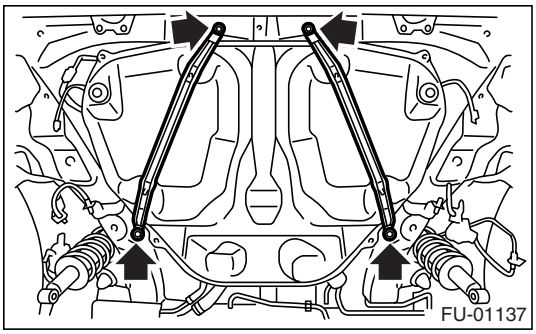


22) Loosen the clamp and disconnect the fuel filler hose (A) and vent hose (B) from fuel filler pipe.



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

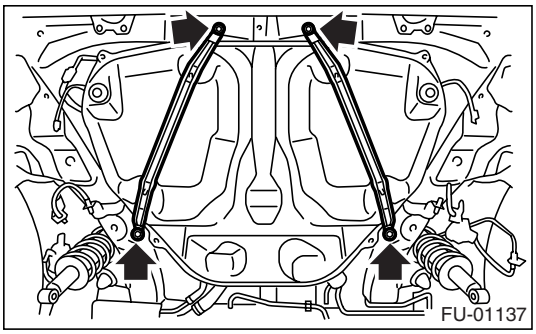
WARNING:
A helper is required to perform this work.



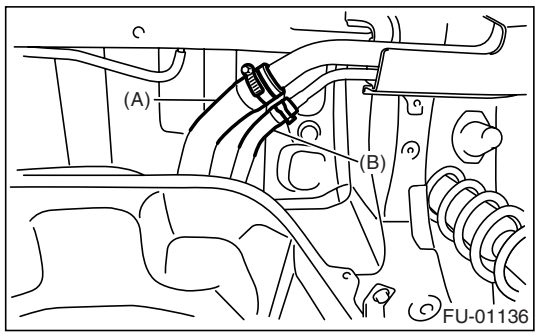
B: INSTALLATION

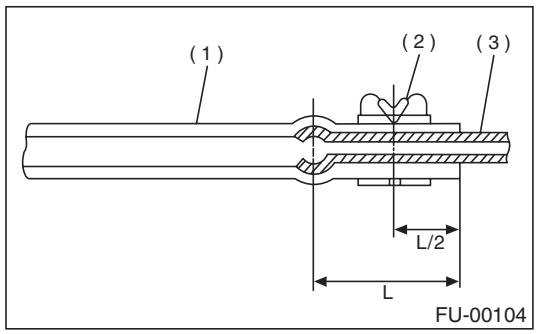
1) Support the fuel tank with transmission jack, set the fuel tank, and then temporarily tighten the bolts of fuel tank band.

WARNING:
A helper is required to perform this work.



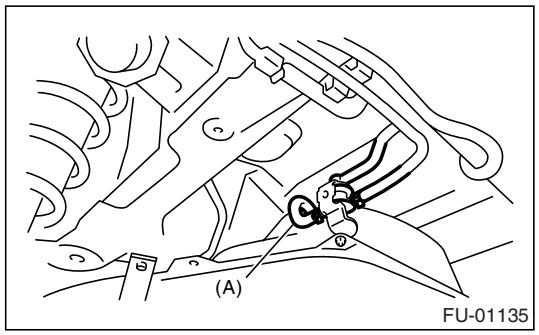
2) Correctly insert the fuel filler hose (A) and vent hose (B) to the specified position, and then tighten the clamp.





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

3) Install the two-way valve to bracket, and connect the two-way valve hose (A) to two-way valve.



4) Tighten the bolts of fuel tank band.

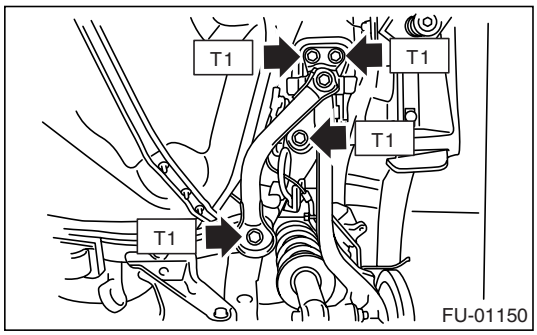
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

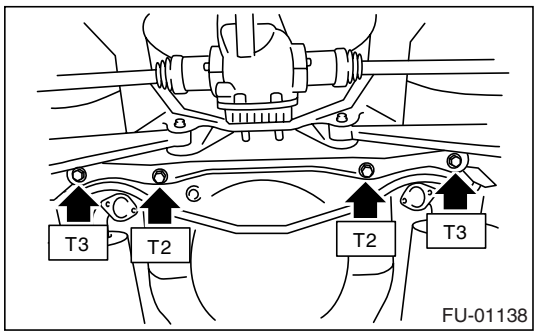
5) Install the rear suspension assembly.

CAUTION:
A helper is required to perform this work.

(1) Support the rear differential with transmission jack.
(2) Support the rear suspension assembly, and then tighten the bolts which secure the rear suspension assembly to body.

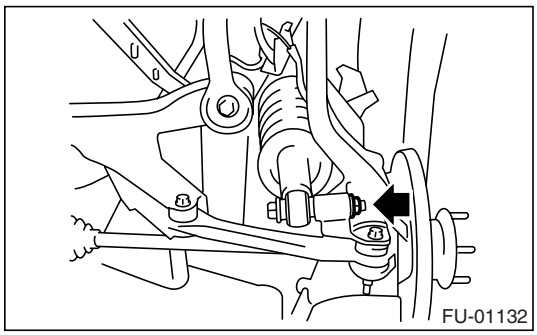
Tightening torque:
T1: 125 N·m (12.7 kgf-m, 92.2 ft-lb)
T2: 65 N·m (6.2 kgf-m, 48 ft-lb)
T3: 175 N·m (17.8 kgf-m, 129 ft-lb)





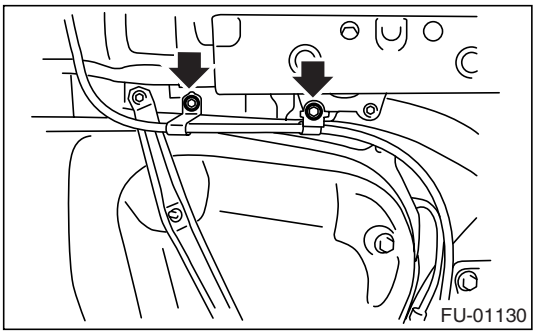
(3) Tighten the bolts which install rear shock absorber to rear suspension arm. <Ref. to RS-11, INSTALLATION, Rear Arm.>

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

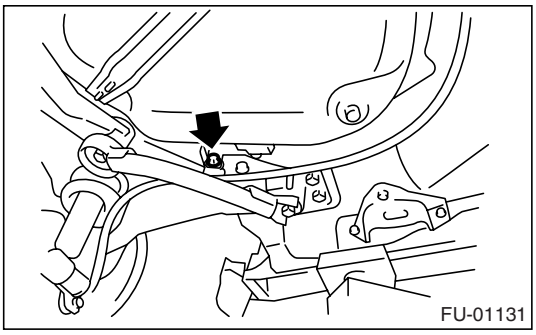


6) Tighten the bolts which install parking brake cable clamp.

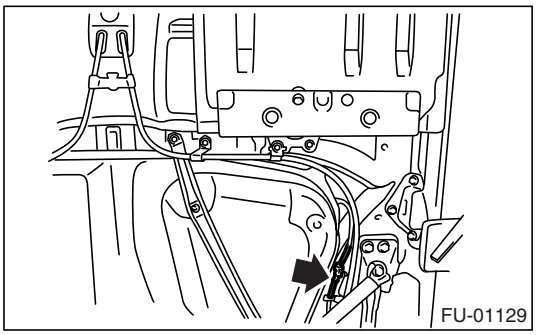
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


FU-01130

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)


FU-01131

7) Connect the connector to rear ABS wheel speed sensor.

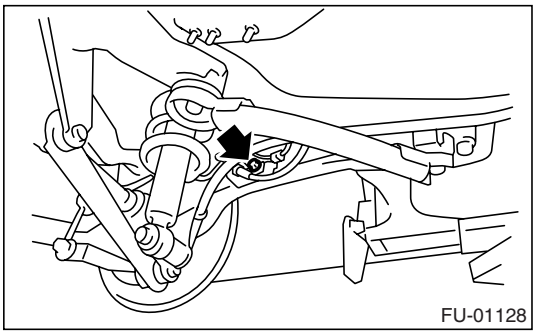

FU-01129

8) Install the heat shield cover.

Tightening torque:
17.5 N·m (1.78 kgf-m, 12.9 ft-lb)

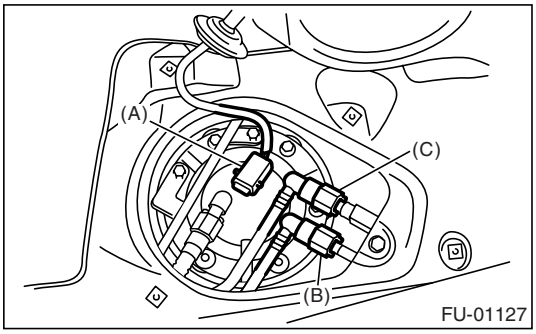
9) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
10) Install the rear exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Rear Exhaust Pipe.>
11) Lower the vehicle.
12) Connect the parking brake cable to parking brake assembly. <Ref. to PB-7, INSTALLATION, Parking Brake Assembly (Rear Disc Brake).>
13) Install the rear brake caliper.
14) Tighten the bolt which secures rear brake hose installation bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)


FU-01128

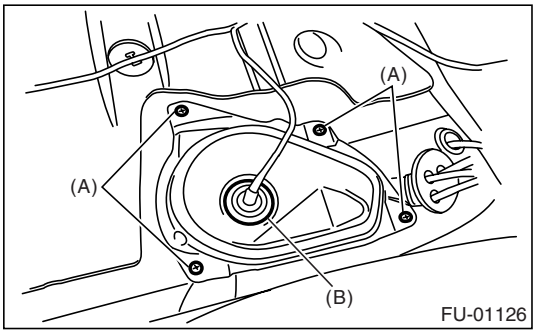
15) Install the rear wheels.
16) Lower the vehicle.
17) Connect the connector (A) to fuel sub level sensor.
18) Connect the quick connector to the fuel delivery (B) and return hose (C). <Ref. to FU(H4DOTC)-56, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
Be careful not to misconnect the delivery side and return side.



FU-01127

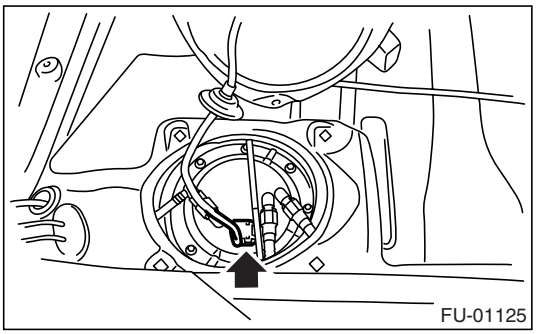
19) Install the service hole cover of fuel sub level sensor.



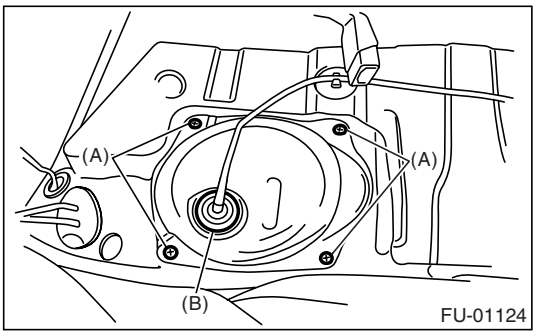
FU-01126

(A) Bolt
(B) Grommet

20) Connect the connector to fuel pump.



21) Install the service hole cover of fuel pump.



(A) Bolt
(B) Grommet

22) Install the rear seat.
23) Install the fuse of fuel pump to main fuse box.

C: INSPECTION

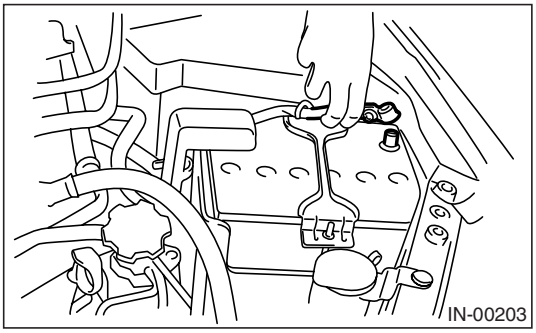
1) Check that the fuel tank is not holed, cracked or otherwise damaged.
2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

23. Fuel Filler Pipe

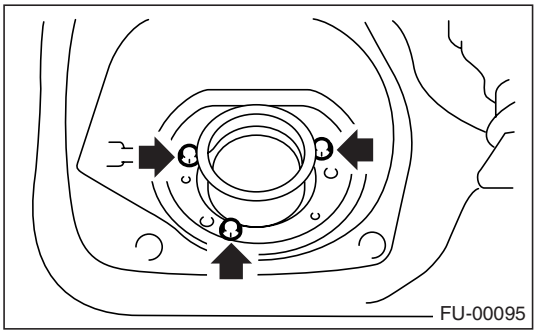
A: REMOVAL

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

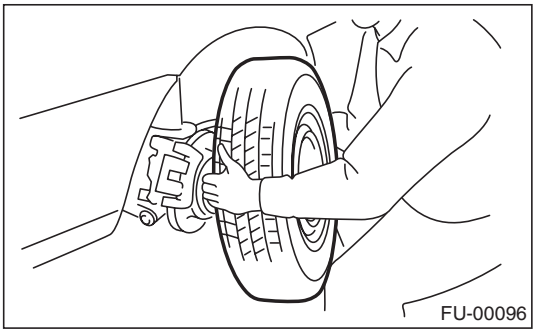
1) Disconnect the ground cable from battery.



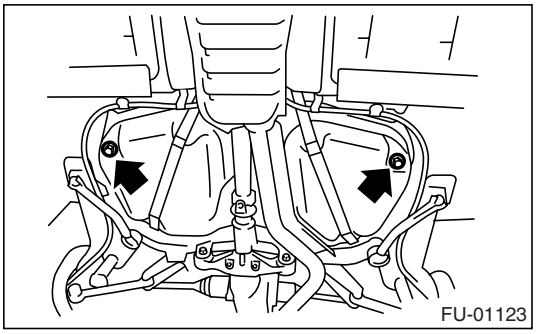
2) Open the fuel filler flap lid, and remove the filler cap.
3) Remove the screws which secure packing.



4) Lift-up the vehicle.
5) Remove the rear wheel RH.



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

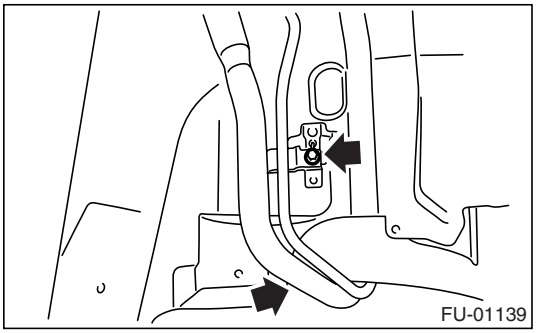


7) Tighten the fuel drain plug.

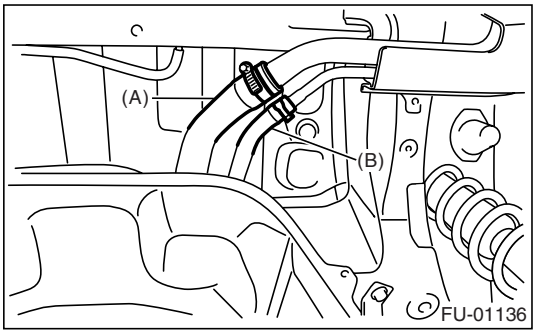
NOTE:
Use a new gasket.

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

8) Remove the mud guard. <Ref. to EI-29, REMOVAL, Mud Guard.>
9) Remove the rear sub frame. <Ref. to RS-23, REMOVAL, Rear Sub Frame.>
10) Remove the bolts which hold fuel filler pipe bracket on the body.



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

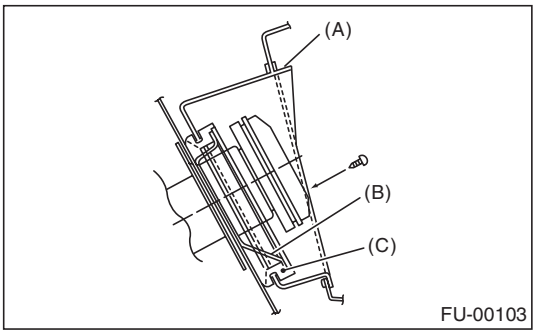


12) Remove the fuel filler pipe to under side of the vehicle.

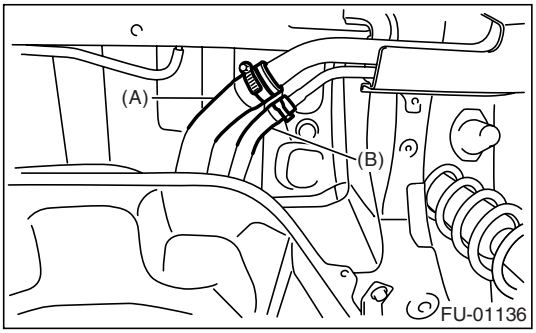
B: INSTALLATION

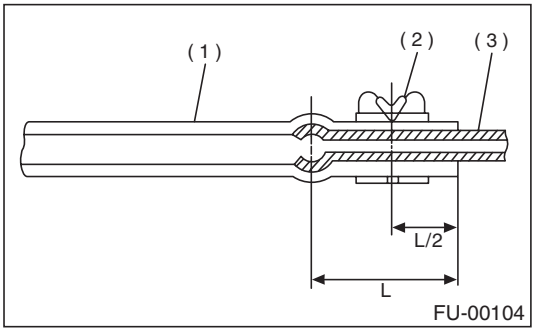
1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

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



4) Correctly insert the fuel filler hose (A) and vent pipe (B) to the specified position, and then tighten the clamp.

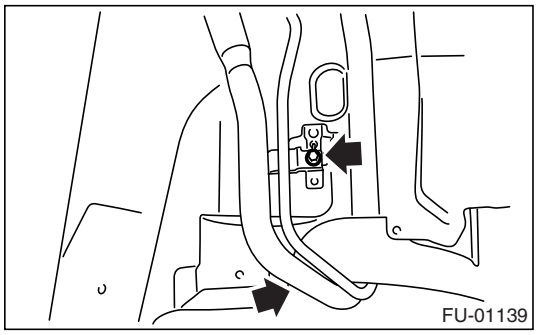




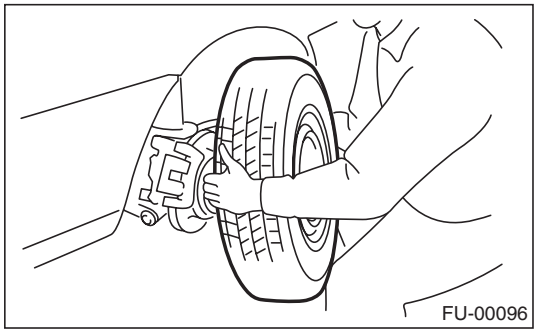
(1) Hose
(2) Clip or clamp
(3) Pipe

5) Tighten the bolts which hold fuel filler pipe bracket on the body.

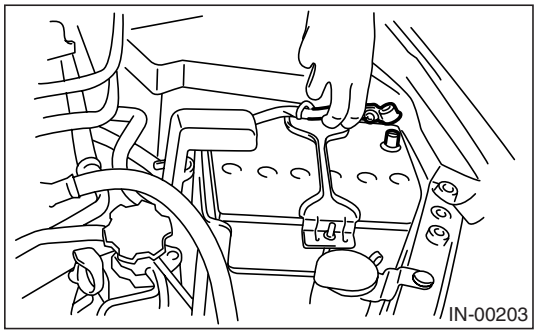
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-23, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-29, INSTALLATION, Mud Guard.>
8) Install the rear wheel RH.



9) Lower the vehicle.
10) Connect the ground cable to battery.



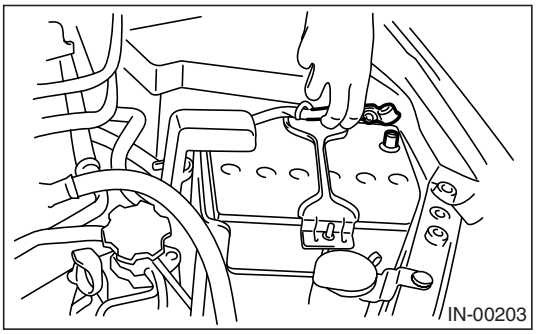
24.Fuel Pump

A: REMOVAL

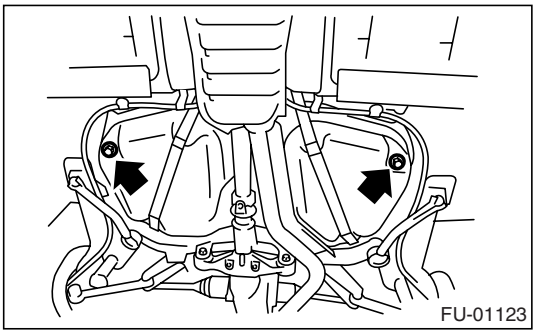
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.**

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

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



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

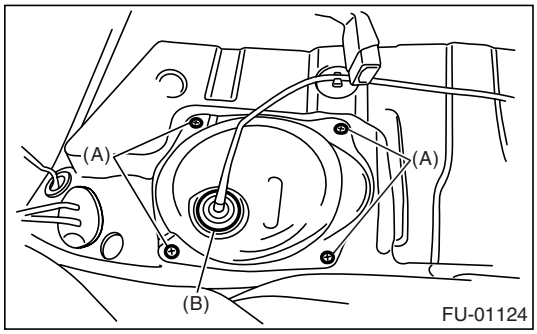


7) Tighten the fuel drain plug.

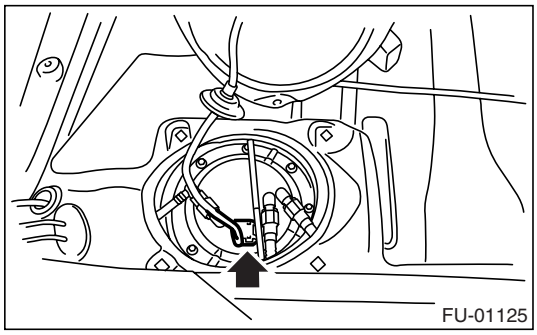
NOTE:
Use a new gasket.

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

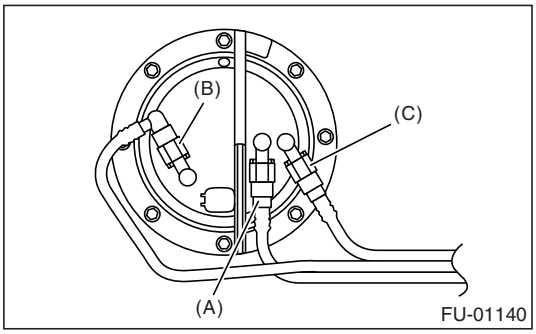
8) Remove the rear seat.
9) Remove the service hole cover.
(1) Remove the bolts (A).
(2) Push the grommet (B) down and remove service hole cover.



10) Disconnect the connector from fuel pump.



11) Disconnect the quick connector and then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
12) Remove the nuts which install fuel pump assembly onto fuel tank.



(A) Delivery hose
(B) Return hose
(C) Jet pump hose

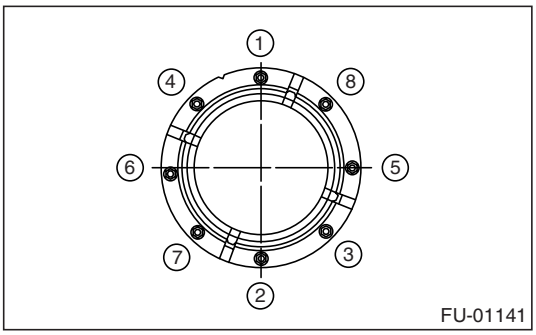
13) Remove the fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new gasket.
- Ensure the sealing portion is free from fuel or foreign particles before installation.
- Tighten the nuts to the specified torque in the order as shown in the figure.

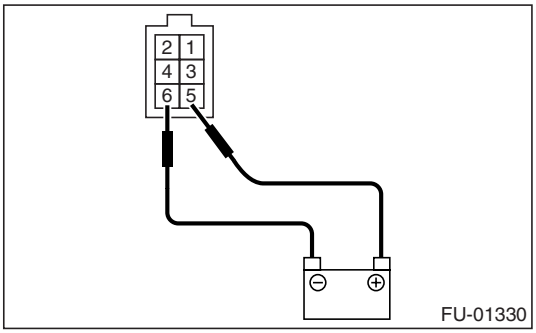
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)



C: INSPECTION

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

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



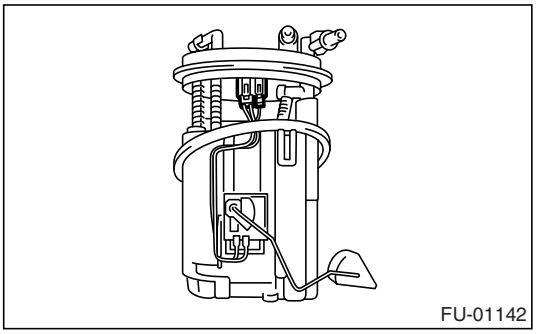
25.Fuel Level Sensor

A: REMOVAL

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

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

1) Remove the fuel pump assembly.
<Ref. to FU(H4DOTC)-48, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the fuel level sensor.

B: INSTALLATION

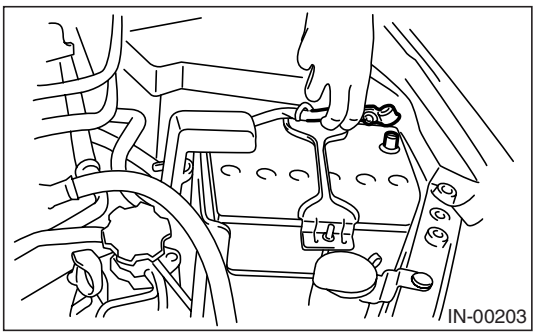
Install in the reverse order of removal.

26.Fuel Sub Level Sensor

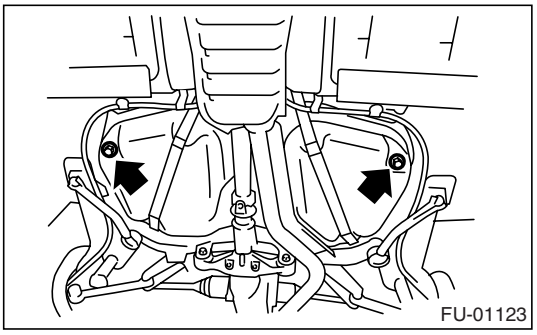
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.**

1) Disconnect the ground cable from battery.



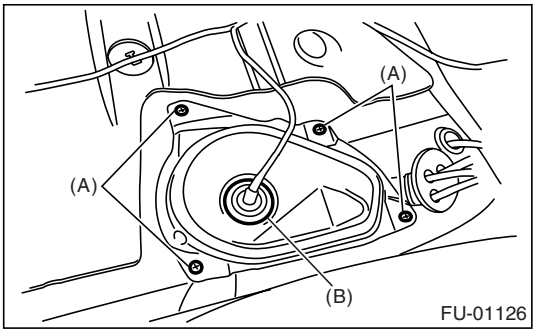
2) Lift-up the vehicle.
3) Set a container under the vehicle and remove drain plug from fuel tank to drain fuel from fuel tank.



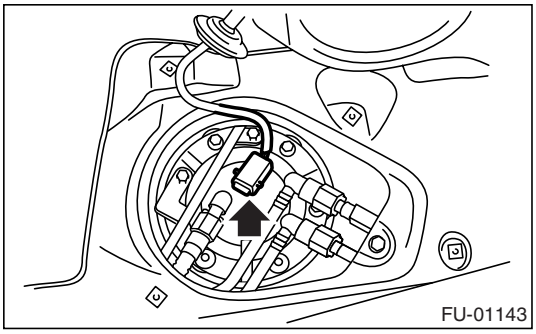
4) Tighten the fuel drain plug.

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

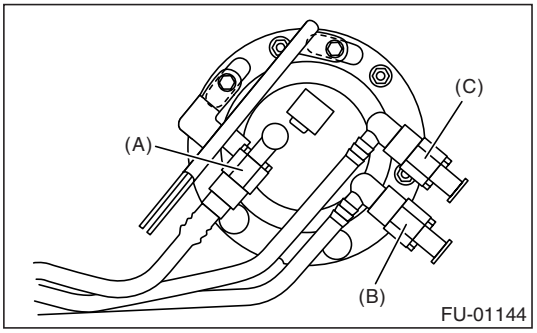
5) Remove the rear seat.
6) Remove the service hole cover.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove the service hole cover.



7) Disconnect the connector from fuel sub level sensor.



8) Disconnect the quick connector, and then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
9) Remove the bolts which install fuel sub level sensor on the fuel tank.



(A) Jet pump hose
(B) Delivery hose
(C) Return hose

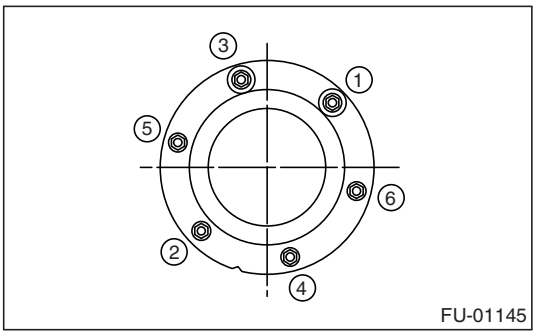
10) Remove the fuel sub level sensor.

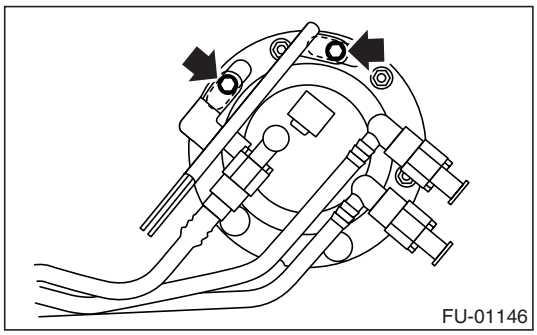
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new gasket.
- Ensure the sealing portion is free from fuel or foreign particles before installation.
- Tighten the nuts and bolts to the specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)





27.Fuel Filter

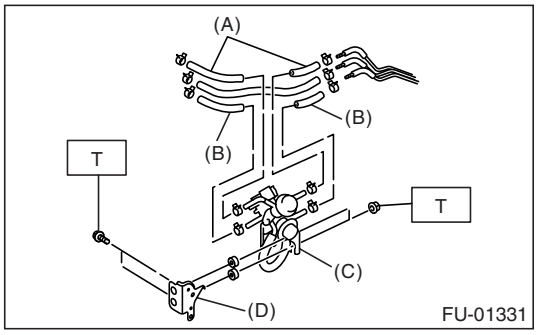
A: SPECIFICATION

Fuel filter forms a single unit with fuel pump.
Refer to “Fuel Pump” for removal and installation. <Ref. to FU(H4DOTC)-48, REMOVAL, Fuel Pump.> <Ref. to FU(H4DOTC)-49, INSTALLATION, Fuel Pump.>

28.Fuel Bypass Valve

A: REMOVAL

1) Release the fuel pressure.
<Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the fuel return line and delivery line from fuel bypass valve.
3) Remove the fuel bypass valve from vehicle.

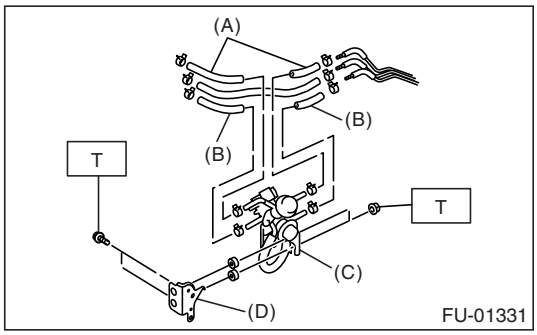


(A) Fuel delivery line
(B) Fuel return line
(C) Fuel bypass valve
(D) Fuel bypass valve bracket

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

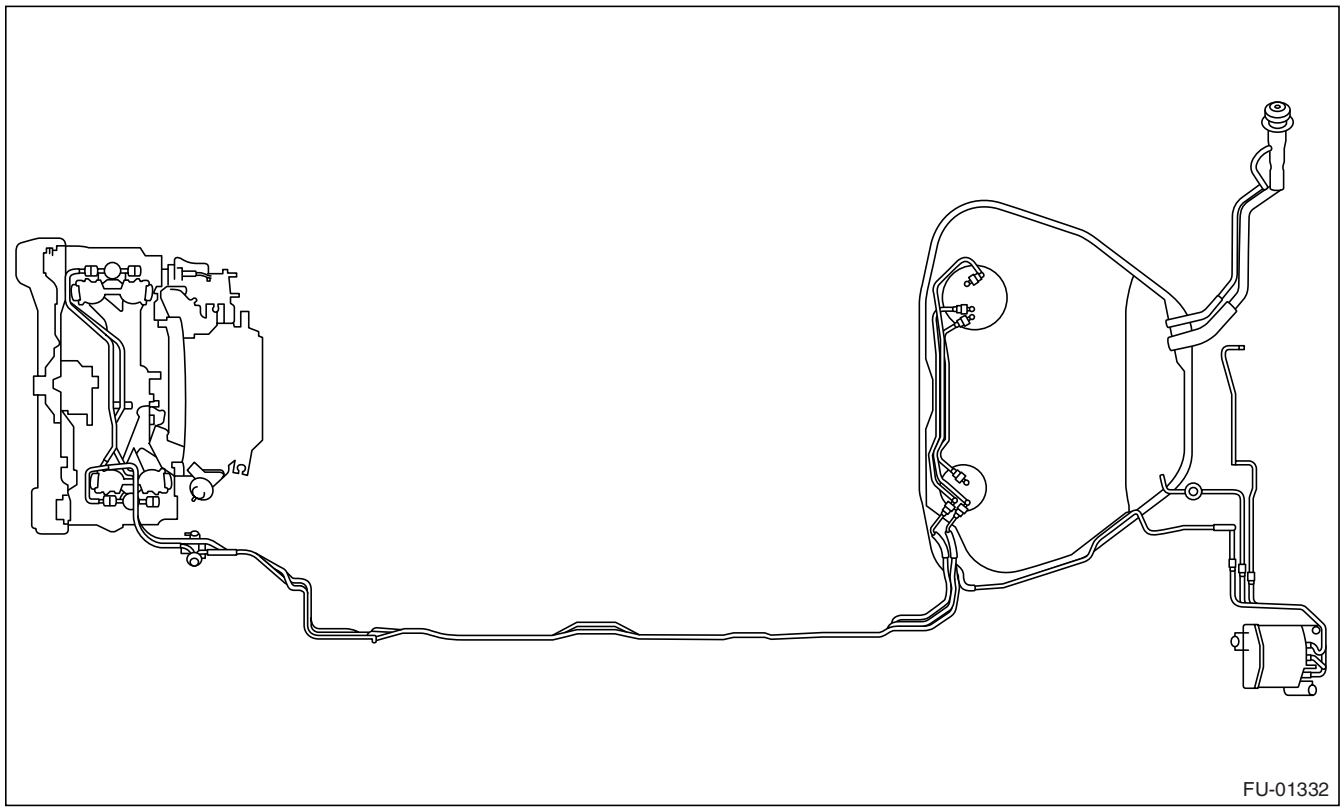


(A) Fuel delivery line
(B) Fuel return line
(C) Fuel bypass valve
(D) Fuel bypass valve bracket

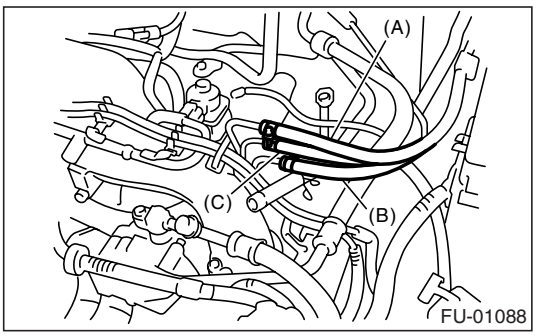
29.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-73, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.


FU-01332

6) In the engine compartment, disconnect the fuel delivery hoses, return hoses and evaporation hose.

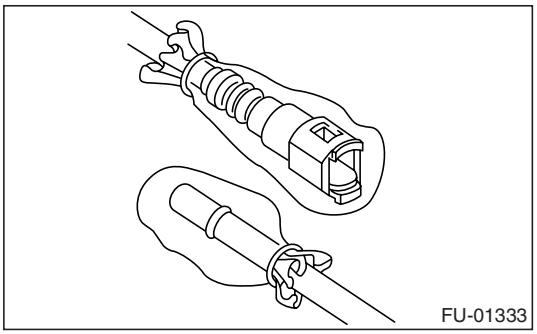


FU-01088

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

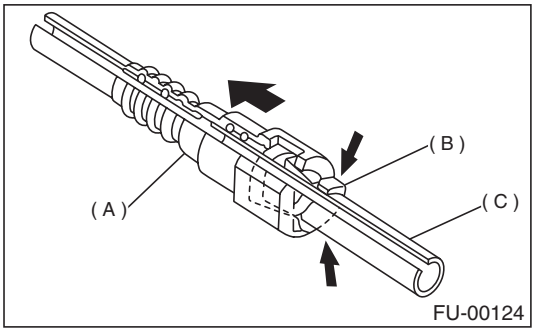
7) Lift-up the vehicle.
8) Remove the fuel tank. <Ref. to FU(H4DOTC)-40, REMOVAL, Fuel Tank.>

9) Separate the quick connector of fuel line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.


FU-01333

(3) Hold the connector (A) and push retainer (B) down.
(4) Pull out the connector (A) from retainer (B).

CAUTION:
Always use a new retainer.

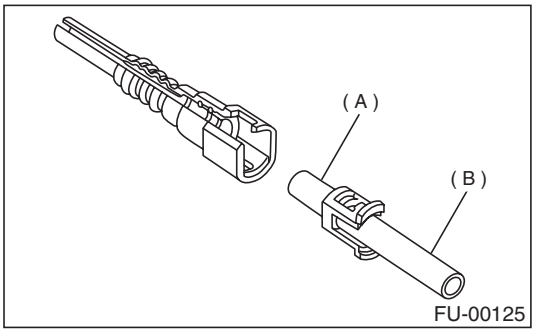


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

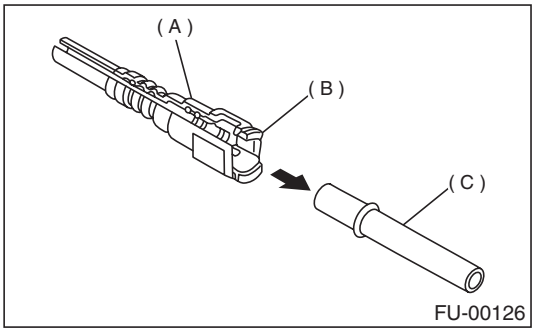
1) Connect the quick connector of fuel line.

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



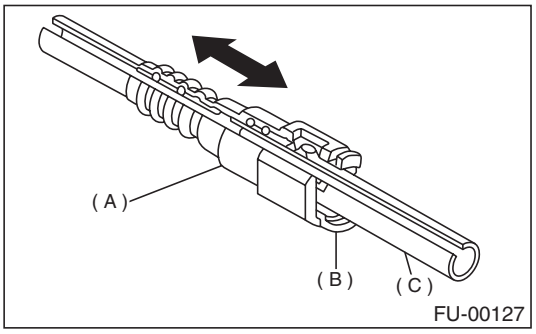
(A) Seal surface
(B) Pipe

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



(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 the hoses and their connections for fuel leakage.

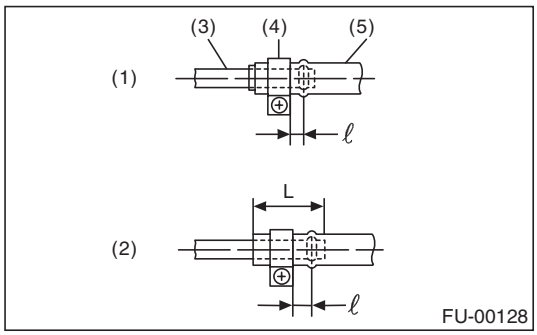


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the amount to be inserted is specified.
Type B: When the amount to be inserted 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)

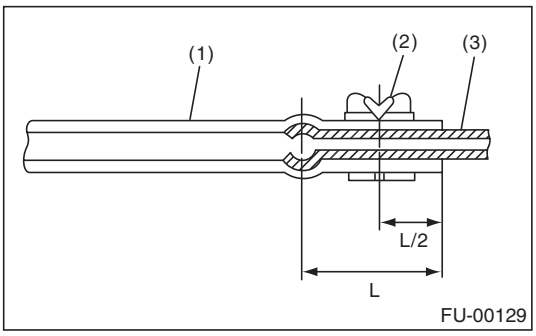


(1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

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

Fuel return hose:
L = 22.5±2.5 mm (0.885±0.098 in)
Fuel evaporation hose:
L = 17.5±2.5 mm (0.689±0.098 in)

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



(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 the fuel pipe and fuel hose connections are tightened firmly.

30.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to injector		
1)	Fuel pump does not operate.	
	❍ Defective terminal contact	Inspect contact, especially ground, and tighten it securely.
	❍ Trouble in electromagnetic or electronic circuit parts	Replace the faulty parts.
2)	Decline of fuel pump function	Replace the 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 the fuel pipe or hose.
5)	Air mixed in the fuel system	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator	Replace.
2. Leakage or run out of fuel		
1)	Loose joints of the fuel pipe	Retighten.
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 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	Retighten.
2)	Defective packing air tightness on the fuel saucer	Correct or replace the packing.
3)	Defective 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 unused for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain water from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent each time the fuel is reduced to half to maintain the advantage.
• When water is accumulated in fuel filter, drain water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC)

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1. General Description 2
2. Front Catalytic Converter 3
3. Rear Catalytic Converter 4
4. Canister 5
5. Purge Control Solenoid Valve 6
6. Two-way Valve 7
7. PCV Valve 8

1. General Description

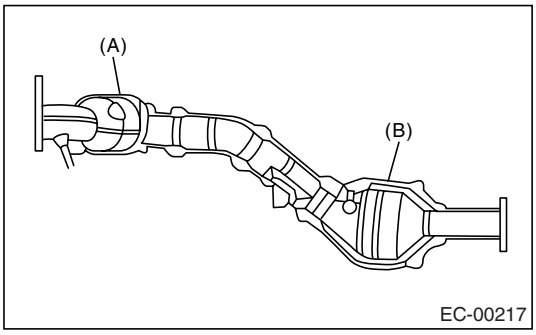
A: CAUTION

• 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 yourself, 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 rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-6, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gasket.

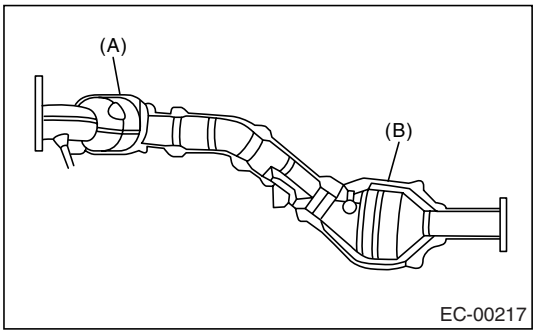
C: INSPECTION

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

1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-6, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gasket.

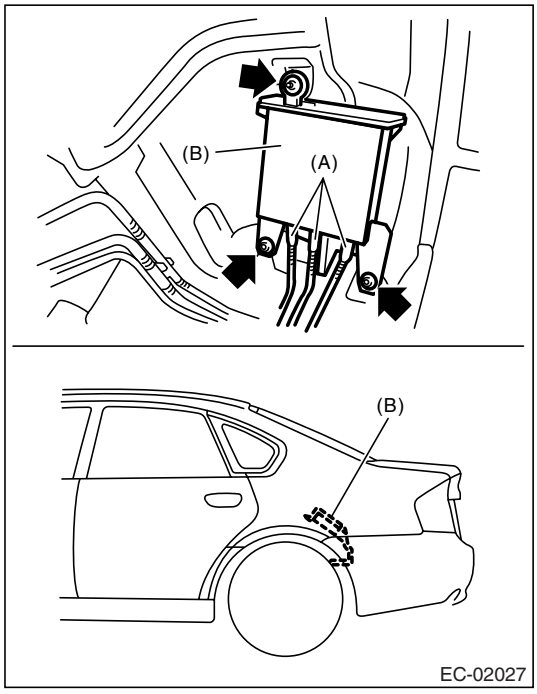
C: INSPECTION

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) Remove the rear wheel LH.
3) Remove the rear mud guard LH.
4) Remove the canister protector.
5) Disconnect the quick connector (A).
6) Remove the canister (B) from body.

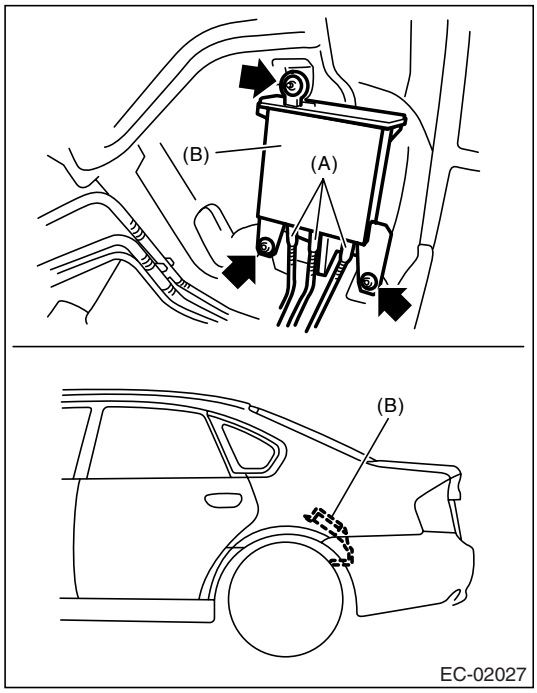


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure there are no damage or dust on the connection of quick connector. If necessary, clean the seal surface of pipe.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)



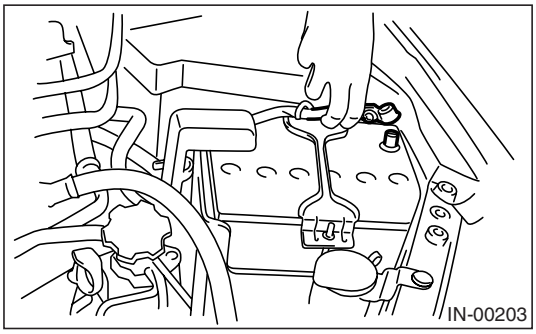
C: INSPECTION

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

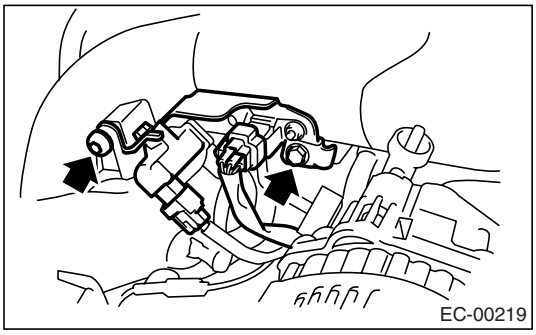
5. Purge Control Solenoid Valve

A: REMOVAL

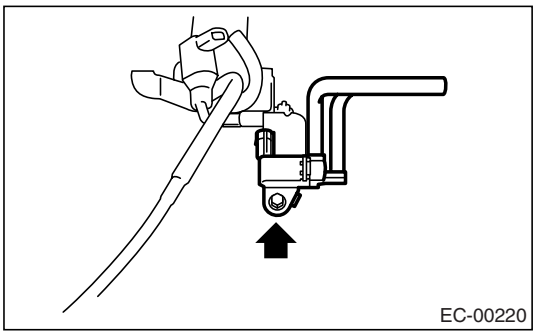
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the solenoid valve bracket assembly from intake manifold.



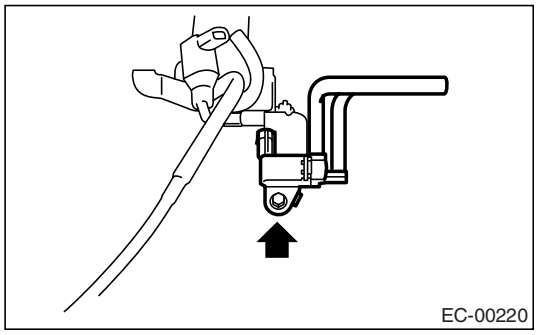
4) Disconnect the connector from purge control solenoid valve.
5) Disconnect the evaporation hose from the intake manifold and fuel pipe assembly.
6) Remove the purge control solenoid valve from solenoid valve bracket assembly.



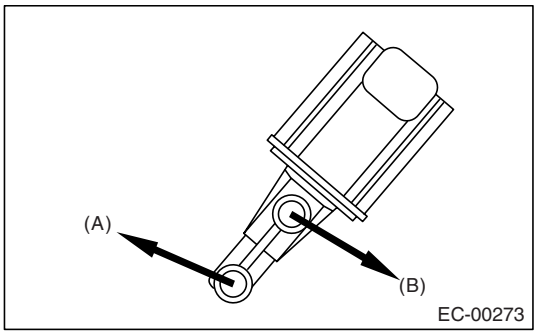
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

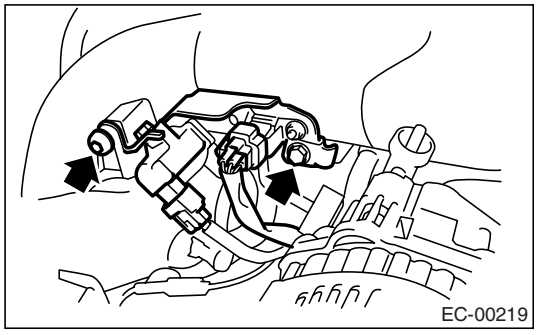


NOTE:
Connect the evaporation hose as shown in the figure.



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

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



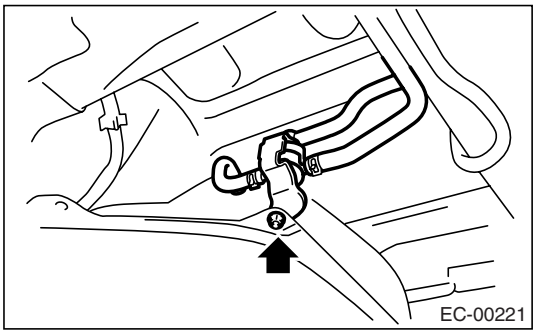
C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Disconnect the evaporation hoses from two-way valve.
3) Remove the two-way valve as a unit with bracket from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

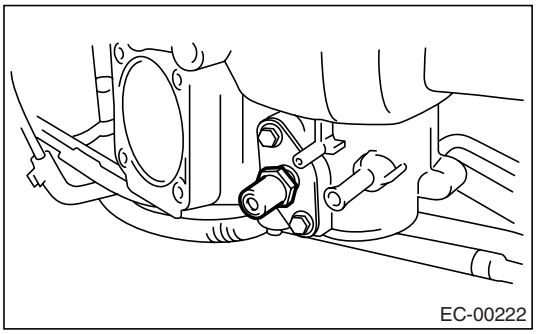
C: INSPECTION

Make sure the hoses are not cracked or loose.

7. PCV Valve

A: REMOVAL

1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-12, REMOVAL, Intake Manifold.>
2) Remove the PCV valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to the bolt threads of PCV valve.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

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

INTAKE (INDUCTION)

IN(H4DOTC)

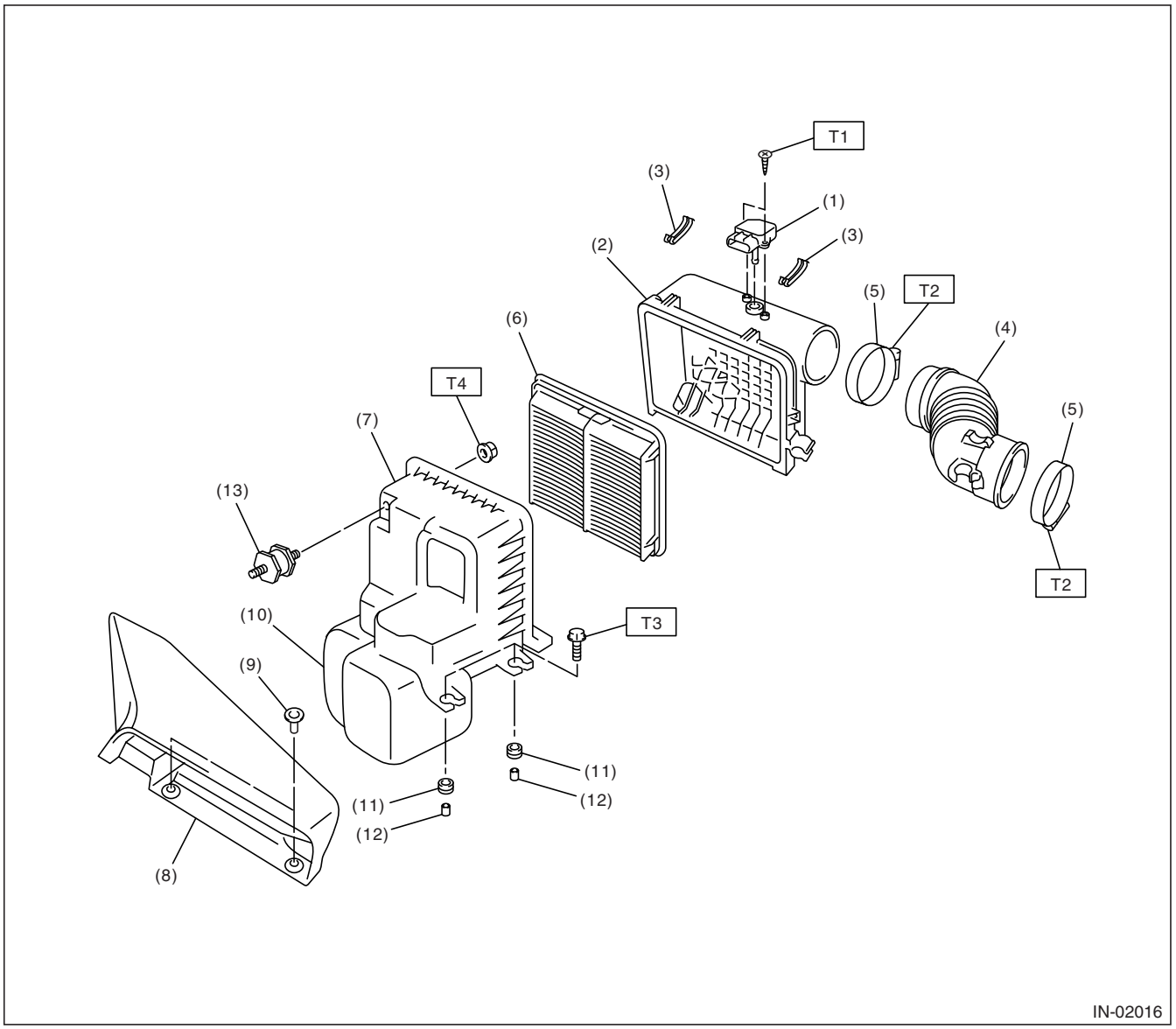
Page

1. General Description 2
2. Air Cleaner Element 7
3. Air Cleaner Case 8
4. Air Intake Duct 9
5. Resonator Chamber 10
6. Intake Duct 11
7. Intercooler 12
8. Turbocharger 14
9. Air By-pass Valve 16

1. General Description

A: COMPONENT

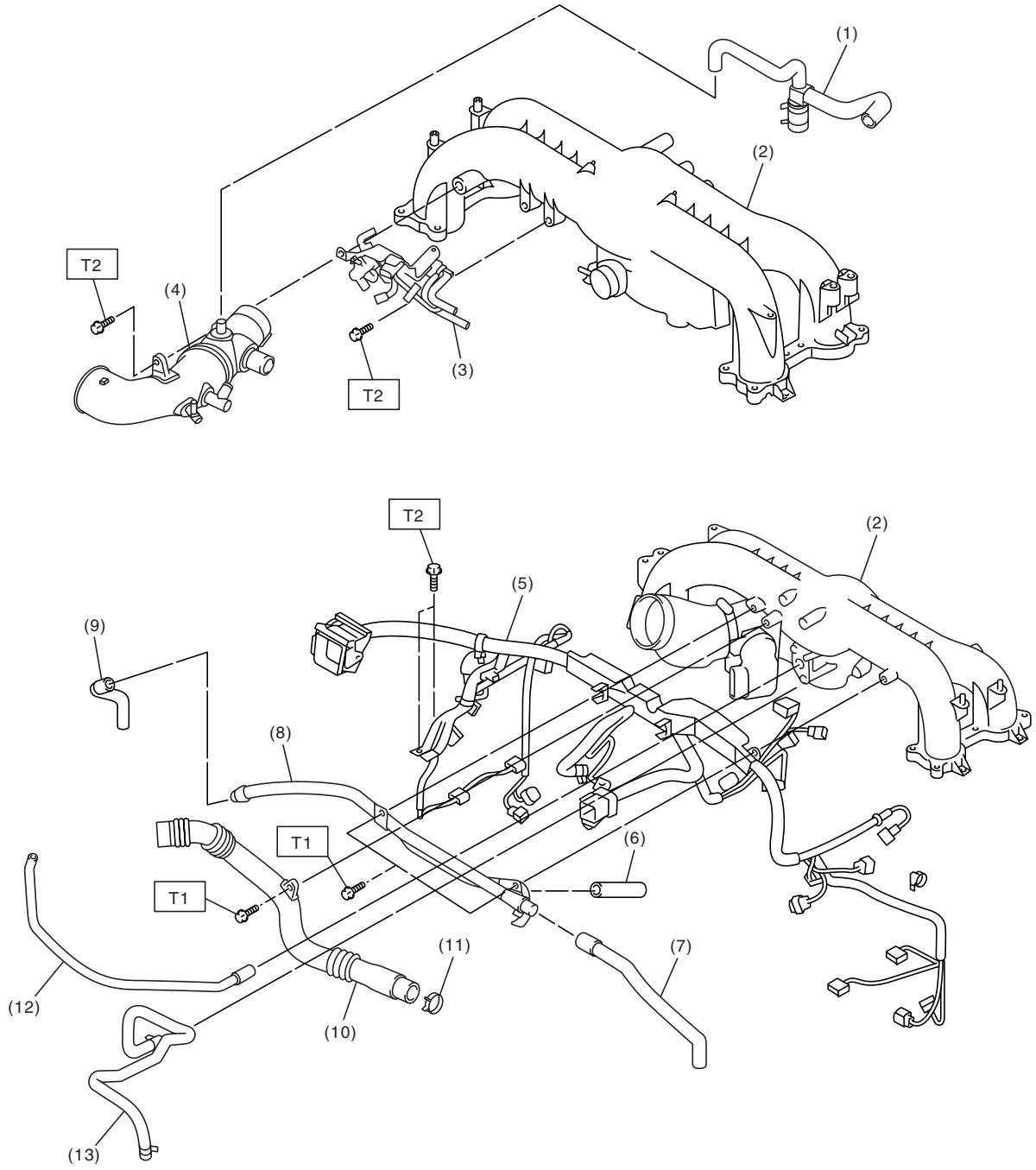
1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(7)	Air cleaner case (front)
(2)	Air cleaner case (rear)	(8)	Air intake duct
(3)	Clip	(9)	Clip
(4)	Air intake boot	(10)	Resonator chamber
(5)	Clamp	(11)	Cushion
(6)	Air cleaner element	(12)	Spacer
		(13)	Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.0 (0.10, 0.74)
T2: 2.5 (0.25, 1.8)
T3: 6.0 (0.61, 4.4)
T4: 7.5 (0.76, 5.5)

2. INTAKE DUCT

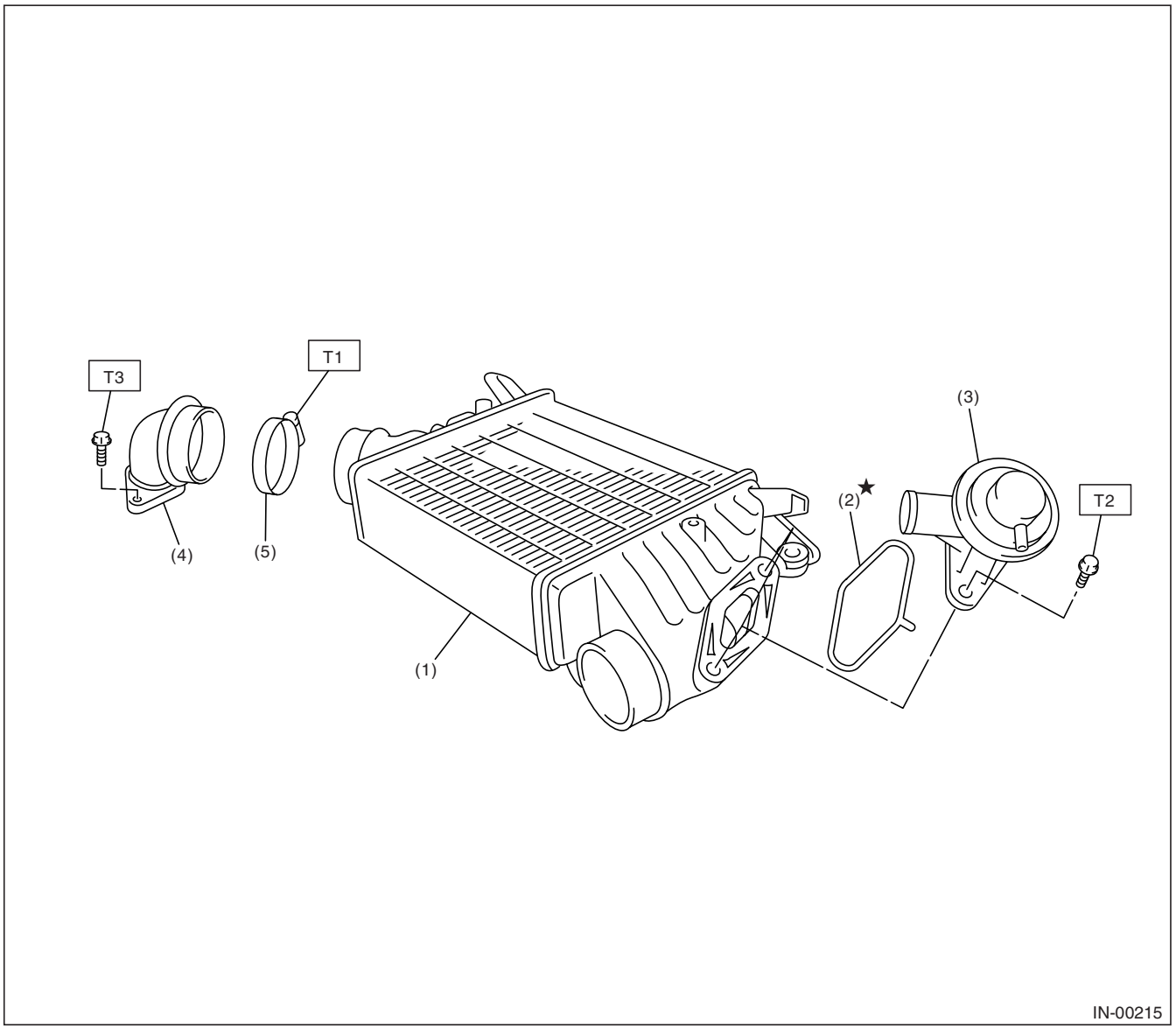


IN-00214

(1) PCV hose ASSY
(2) Intake manifold
(3) Solenoid valve bracket ASSY
(4) Intake duct
(5) Engine harness ASSY
(6) Vacuum hose
(7) Vacuum hose
(8) PCV pipe
(9) Vacuum hose
(10) Air by-pass pipe
(11) Clamp
(12) Vacuum hose
(13) Brake booster hose

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.5 (0.66, 4.8)
T2: 19 (1.9, 13.7)

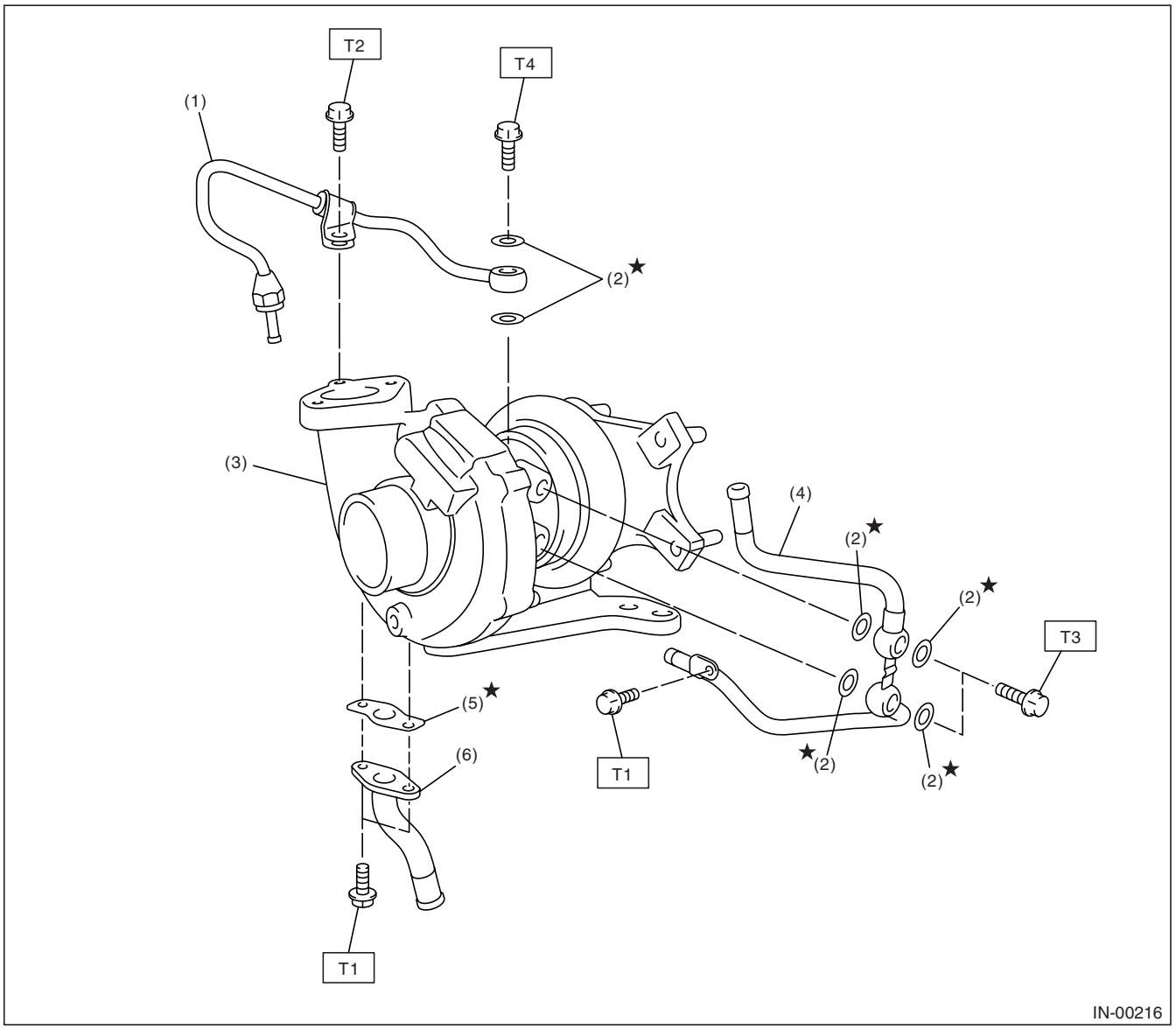
3. INTERCOOLER



(1) Intercooler
(2) Gasket
(3) Air by-pass valve
(4) Intake duct
(5) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.0 (0.3, 2.2)
T2: 6.5 (0.66, 4.8)
T3: 16 (1.6, 11.8)

4. TURBOCHARGER



(1) Oil inlet pipe
(2) Metal gasket
(3) Turbocharger
(4) Water pipe
(5) Gasket
(6) Oil outlet pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.7 (0.48, 3.5) (AT model)
6.5 (0.66, 4.8) (MT model)
T2: 5.0 (0.51, 3.7)
T3: 23 (2.3, 17.0)
T4: 16 (1.6, 11.8)

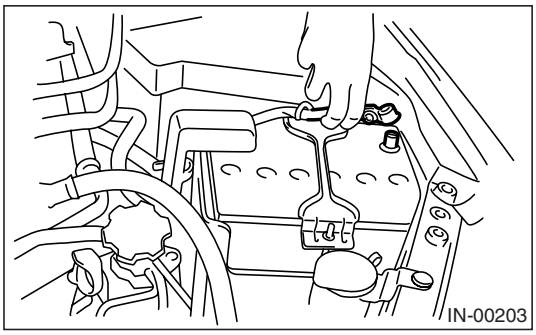
B: CAUTION

• 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 yourself, 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 rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

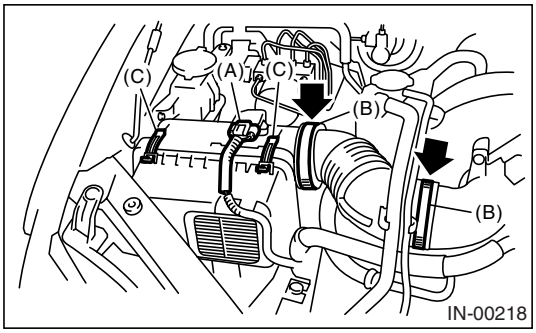
2. Air Cleaner Element

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from mass air flow sensor.
3) Loosen the clamps (B) which connect air intake boot to intake duct.
4) Remove the clips (C) from air cleaner case.

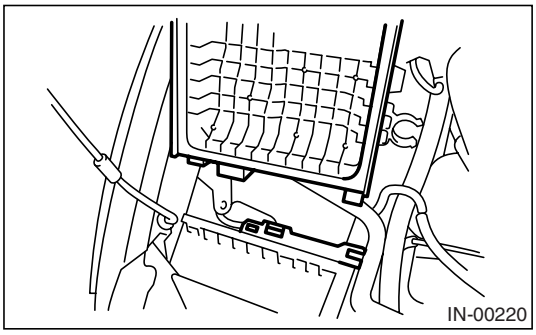


5) Remove the air cleaner case (rear) and air intake boot.
6) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
When installing the air cleaner case (rear), align the protrusion part of air cleaner case (rear) to the hole of air cleaner case (front).



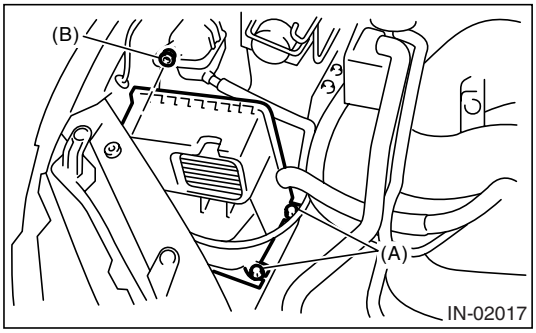
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Cleaner Case

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
2) Remove the air cleaner element.
<Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Element.>
3) Remove the bolts (A) and nut (B) which install air cleaner case (front) on the body.



4) Remove the air cleaner case (front).

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Bolt: 6.0 N·m (0.61 kgf-m, 4.4 ft-lb)
Nut: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

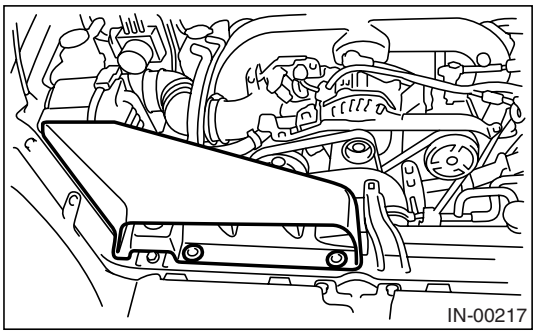
C: INSPECTION

Check for cracks or loose connections.

4. Air Intake Duct

A: REMOVAL

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



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check for cracks or loose connection.
2) Inspect that no foreign objects in the air intake duct.

5. Resonator Chamber

A: REMOVAL

Refer to “Air Cleaner Case” for removal procedure because the resonator chamber forms a single unit with air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>

B: INSTALLATION

Refer to “Air Cleaner Case” for installation procedure because the resonator chamber forms a single unit with air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

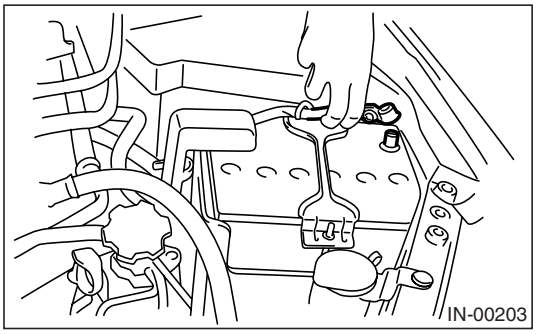
C: INSPECTION

Check for cracks or loose connections.

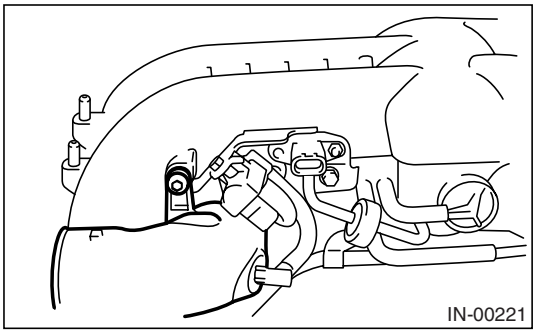
6. Intake Duct

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



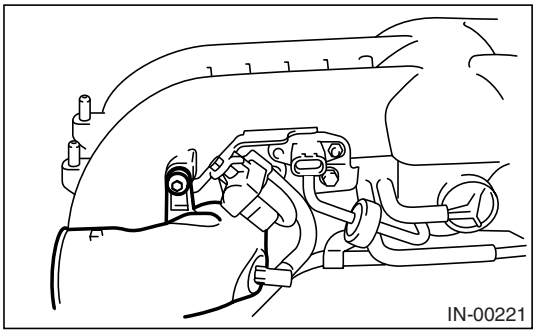
3) Remove the intake manifold.
<Ref. to FU(H4DOTC)-12, REMOVAL, Intake Manifold.>
4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-16, DISASSEMBLY, Intake Manifold.>
5) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

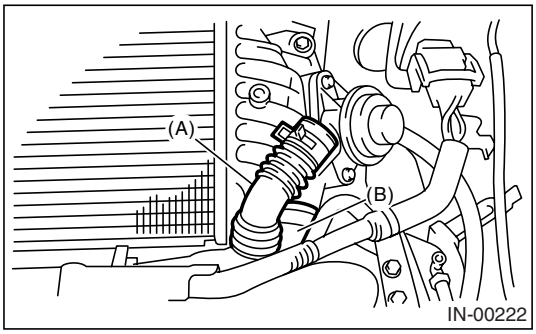
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



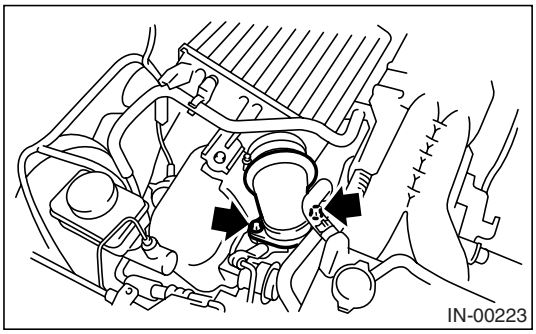
7. Intercooler

A: REMOVAL

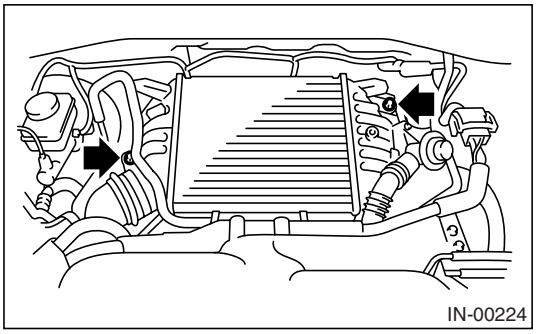
1) Remove the collector cover.
2) Loosen the clamp, and then remove the air by-pass pipe (A) from air by-pass valve.
3) Loosen the clamp, and then remove the intake duct (B) from intercooler.



4) Remove the bolts which secure intake duct to turbocharger.



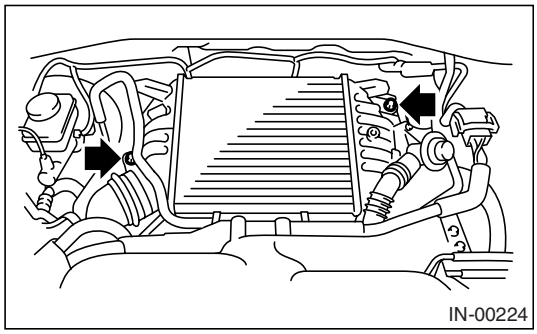
5) Remove the bolts which secure intercooler to bracket, and then remove the intercooler.

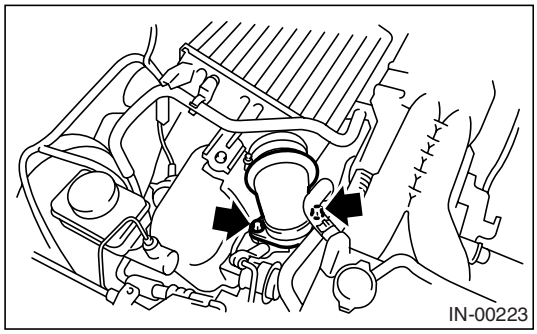


B: INSTALLATION

Install in the reverse order of removal.

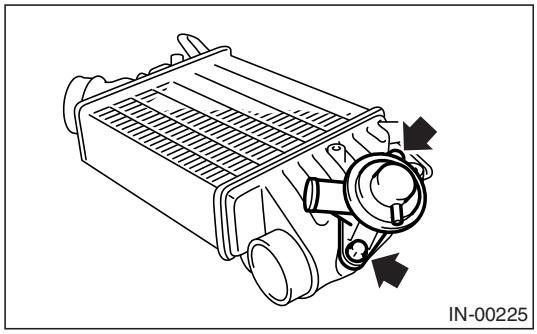
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)





C: DISASSEMBLY

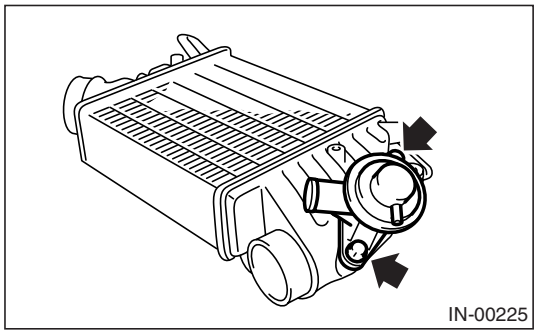
1) Remove the intake ducts from intercooler.
2) Remove the air by-pass valve from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

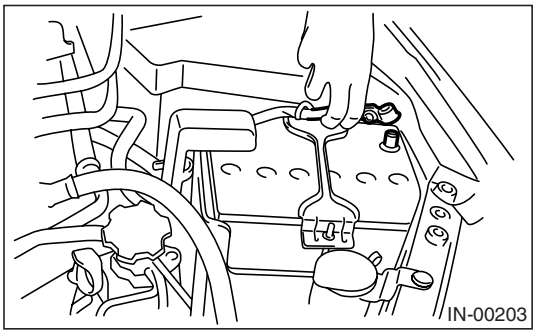
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



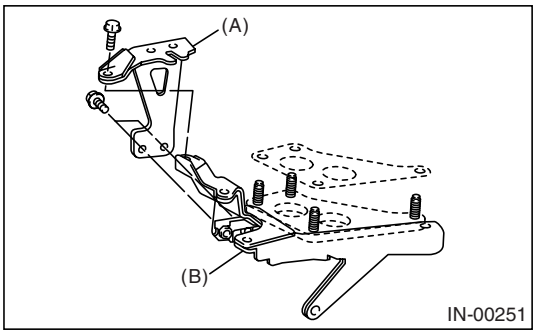
8. Turbocharger

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.

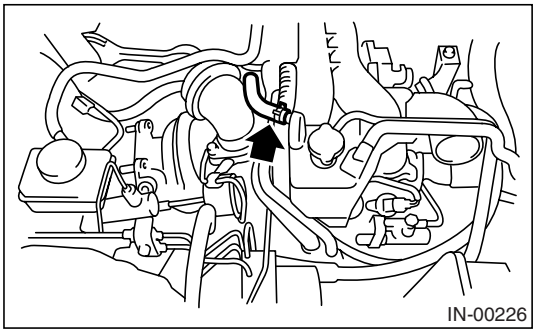


4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Remove the intercooler bracket RH.
6) Remove the linear motion mounting.
<Ref. to ME(H4DOTC)-38, REMOVAL, Linear Motion Mounting.>
7) Remove the linear motion mounting bracket.

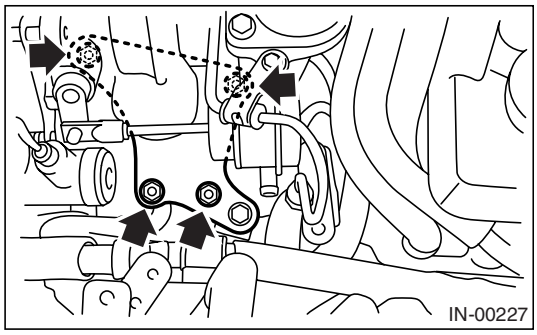


(A) Linear motion mounting bracket
(B) Turbocharger bracket

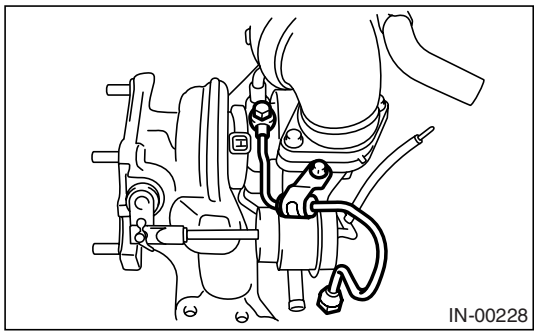
8) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-6, REMOVAL, Center Exhaust Pipe.>
9) Lower the vehicle.
10) Disconnect the engine coolant hose which is connected to coolant filler tank.



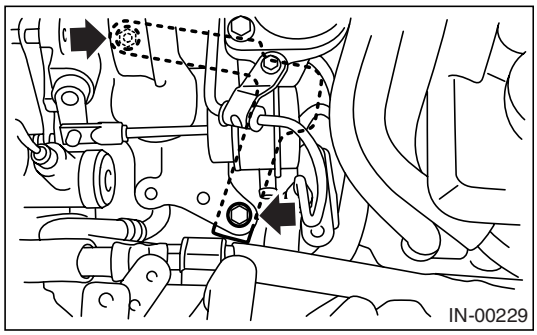
11) Separate the turbocharger joint pipe from turbocharger.



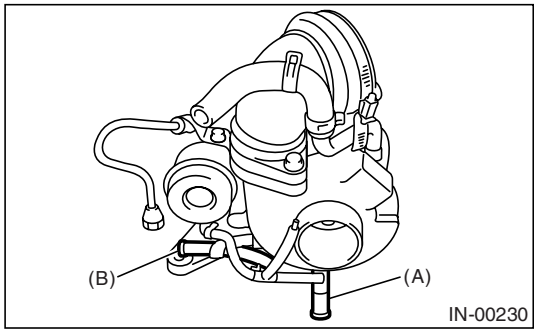
12) Remove the bolts which secure oil pipe bracket to turbocharger.
13) Remove the oil inlet pipe from turbocharger.



14) Remove the bolts which secure turbocharger to bracket.



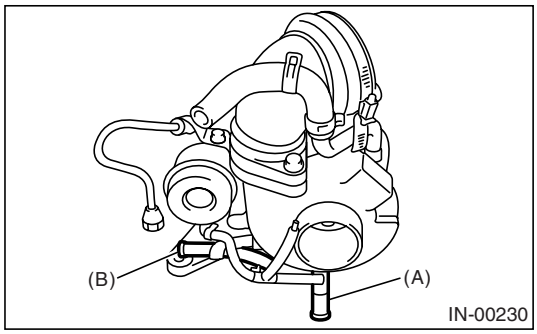
15) Disconnect the hoses from the oil outlet pipe (A) and coolant pipe (B) located under the turbocharger.



16) Take out the turbocharger from engine compartment.

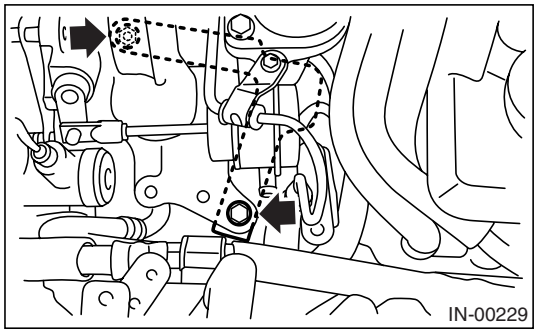
B: INSTALLATION

1) Connect the hoses to the oil outlet pipe (A) and coolant pipe (B) located under the turbocharger.



2) Install the turbocharger to bracket.

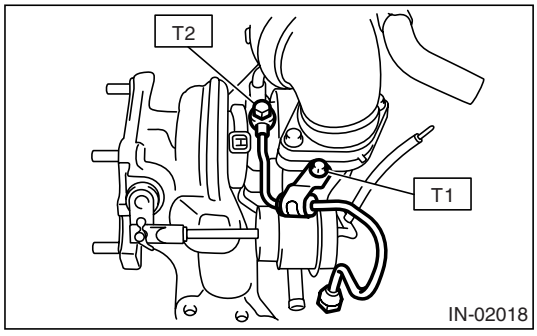
Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



3) Install the oil inlet pipe to turbocharger.

NOTE:
Use a new metal gasket.

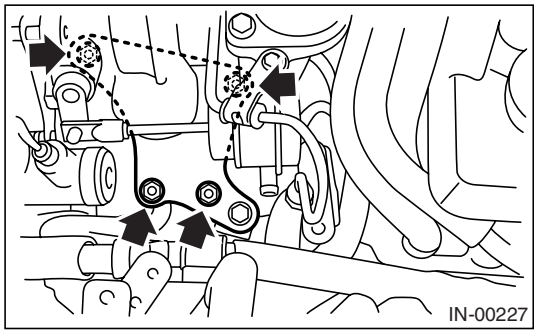
Tightening torque:
T1: 5.0 N·m (0.51 kgf-m, 3.7 ft-lb)
T2: 16 N·m (1.6 kgf-m, 11.8 ft-lb)



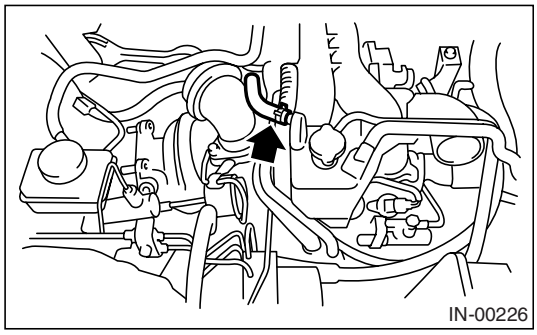
4) Install the joint pipe to turbocharger.

NOTE:
Use a new gasket.

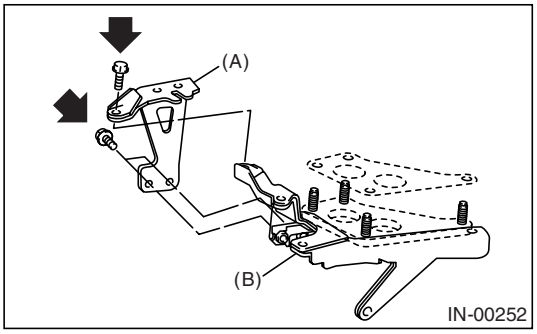
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)



5) Connect the engine coolant hose which is connected to the coolant filler tank.



6) Lift-up the vehicle.
7) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-7, INSTALLATION, Center Exhaust Pipe.>
8) Install the linear motion mounting bracket.



(A) Linear motion mounting bracket
(B) Turbocharger bracket

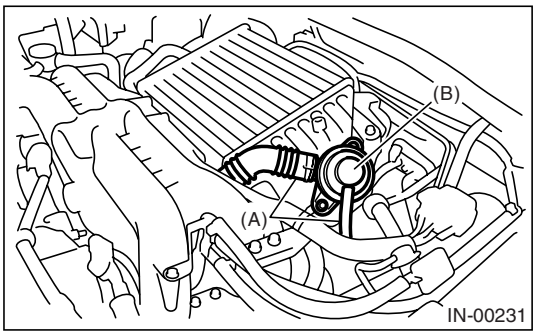
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

9) Install the linear motion mounting.
<Ref. to ME(H4DOTC)-38, INSTALLATION, Linear Motion Mounting.>
10) Install the intercooler bracket RH.
11) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
12) Install the collector cover.

9. Air By-pass Valve

A: REMOVAL

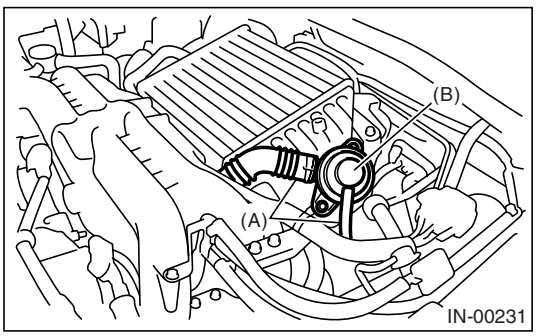
1) Remove the collector cover.
2) Disconnect the air by-pass hose (A) from air by-pass valve.
3) Remove the air by-pass valve (B) from intercooler.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



(A) Air by-pass hose
(B) Air by-pass valve

MECHANICAL

ME(H4DOTC)

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1. General Description

A: SPECIFICATION

Engine	Cylinder arrangement			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve system mechanism			Belt drive, double overhead camshaft, 4 valve/cylinder
	Bore × Stroke mm (in)			92 × 75 (3.62 × 2.95)
	Displacement cm^3 (cu in)			1,994 (121.67)
	Compression ratio			9.5
	Compression pressure (at 400 rpm) kPa (kgf/cm^2, psi)			1,100 — 1,300 (11.2 — 13.3, 160 — 189)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Open	Max. retard	ATDC 6°
			Min. advance	BTDC 37°
		Close	Max. retard	ABDC 62°
			Min. advance	ABDC 19°
	Exhaust valve timing	Open	Max. retard	BBDC 30°
			Min. advance	BBDC 60°
		Close	Max. retard	ATDC 28°
			Min. advance	BTDC 2°
	Valve clearance mm (in)	Intake		0.20±0.02 (0.0079±0.0008)
		Exhaust		0.35±0.02 (0.0138±0.0008)
	Idle speed [“P” or “N” range] rpm		No load	650±50
			A/C ON	825±50
	Ignition order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm			14°±3°/650

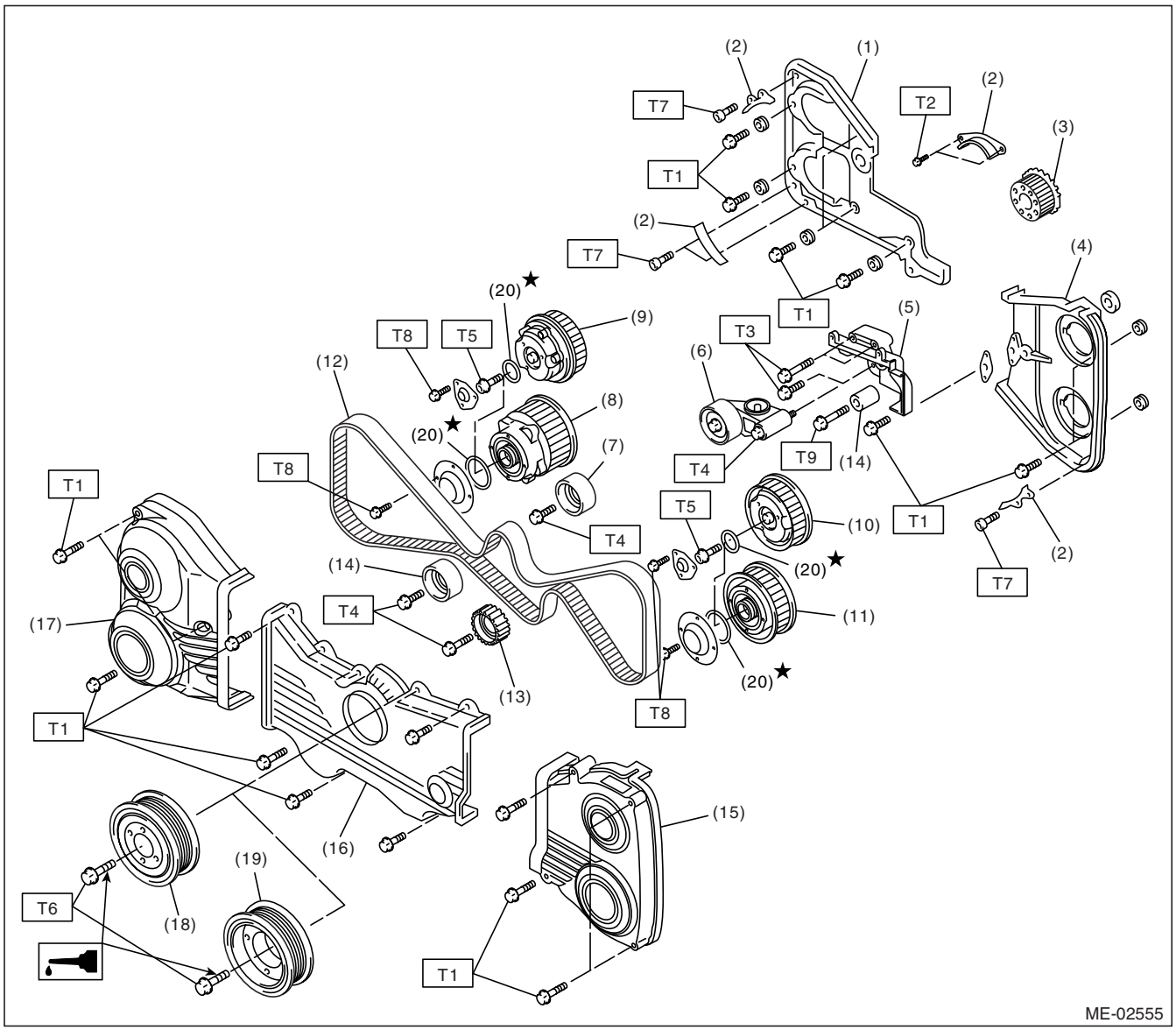
NOTE:
OS: oversize US: undersize

Belt tension adjuster	Protrusion of adjuster rod		mm (in)	5.2 — 6.2 (0.205 — 0.244)
Belt tensioner	Spacer O.D.		mm (in)	17.955 — 17.975 (0.7069 — 0.7077)
	Tensioner bushing I.D.		mm (in)	18.0 — 18.08 (0.7087 — 0.7118)
	Clearance between spacer and bushing	mm (in)	Standard	0.025 — 0.125 (0.0010 — 0.0049)
	Side clearance of spacer	mm (in)	Standard	0.2 — 0.55 (0.0079 — 0.0217)
Camshaft	Bend limit		mm (in)	0.020 (0.0008) or less
	Thrust clearance	mm (in)	Standard	0.068 — 0.116 (0.0027 — 0.0046)
	Cam lobe height mm (in)	Intake	Standard	45.85 — 45.95 (1.805 — 1.809)
		Exhaust	Standard	45.75 — 45.85 (1.801 — 1.805)
	Journal O.D. mm (in)	Standard	Front	37.946 — 37.963 (1.4939 — 1.4946)
			Center rear	29.946 — 29.963 (1.1790 — 1.1797)
	Clearance at journal	mm (in)	Standard	0.037 — 0.072 (0.0015 — 0.0028)
Cylinder head	Surface warpage limit		mm (in)	0.035 (0.0014)
	Grinding limit		mm (in)	0.3 (0.012)
	Standard height		mm (in)	127.5 (5.02)
Valve seat	Refacing angle			90°
	Contacting width mm (in)	Intake	Standard	0.6 — 1.4 (0.024 — 0.055)
		Exhaust	Standard	1.2 — 1.8 (0.047 — 0.071)
Valve guide	Inside diameter		mm (in)	6.000 — 6.012 (0.2362 — 0.2367)
	Protrusion above head		mm (in)	15.8 — 16.2 (0.622 — 0.638)
Valve	Head edge thickness mm (in)	Intake	Standard	1.0 — 1.4 (0.039 — 0.055)
		Exhaust	Standard	1.3 — 1.7 (0.051 — 0.067)
	Stem outer diameter mm (in)	Intake		5.955 — 5.970 (0.2344 — 0.2350)
		Exhaust		5.945 — 5.960 (0.2341 — 0.2346)
	Valve stem gap mm (in)	Standard	Intake	0.030 — 0.057 (0.0012 — 0.0022)
			Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
	Overall length mm (in)	Intake		104.4 (4.110)
		Exhaust		104.65 (4.1201)
Valve spring	Free length		mm (in)	44.67 (1.759)
	Squareness			2.5°, 2.0 mm (0.079 in)
	Tension/spring height	N (kgf, lbf)/mm (in)	Set	206 — 236 (21.0 — 24.1, 46.3 — 53.1)/ 36.00 (1.417)
			Lift	485 — 537 (49.5 — 54.8, 109 — 121)/ 26.60 (1.047)
Cylinder block	Surface warpage limit (mating with cylinder head)		mm (in)	0.025 (0.00098)
	Grinding limit		mm (in)	0.1 (0.004)
	Cylinder inner diameter mm (in)	Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
			B	91.995 — 92.005 (3.6219 — 3.6222)
	Cyrindricality	mm (in)	Standard	0.015 (0.0006)
	Out-of-roundness	mm (in)	Standard	0.010 (0.0004)
	Piston clearance	mm (in)	Standard	–0.010 — 0.010 (–0.00039 — 0.00039)
	Boring limit		mm (in)	0.5 (0.020)
Piston	Outer diameter mm (in)	Standard	A	92.005 — 92.015 (3.6222 — 3.6226)
			B	91.995 — 92.005 (3.6219 — 3.6222)
		0.25 (0.0098) OS		92.245 — 92.265 (3.6317 — 3.6325)
		0.50 (0.0197) OS		92.495 — 92.515 (3.6415 — 3.6423)

Piston pin	Standard clearance between piston and piston pin			mm (in)	Standard	0.004 — 0.008 (0.0002 — 0.0003)
	Degree of fit					Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Ring closed gap	mm (in)	Top ring		Standard	Outer circle side: 0.20 — 0.25 (0.0079 — 0.0098)
						Inner circle side: 0.20 — 0.30 (0.0079 — 0.012)
			Second ring		Standard	0.40 — 0.50 (0.016 — 0.020)
			Oil ring		Standard	0.20 — 0.50 (0.0079 — 0.0197)
	Ring groove gap	mm (in)	Top ring		Standard	0.040 — 0.080 (0.0016 — 0.0031)
			Second ring		Standard	0.030 — 0.070 (0.0012 — 0.0028)
Connecting rod	Bend or twist per 100 mm (3.94 in) in length			mm (in)	Limit	0.10 (0.0039)
	Thrust clearance of large end			mm (in)	Standard	0.070 — 0.330 (0.0028 — 0.0130)
Bearing of large end	Oil clearance			mm (in)	Standard	0.026 — 0.052 (0.0010 — 0.0020)
	Bearing size (Thickness at center)	mm (in)	Standard			1.486 — 1.498 (0.0585 — 0.0590)
			0.03 (0.0012) US			1.504 — 1.512 (0.0592 — 0.0595)
			0.05 (0.0020) US			1.514 — 1.522 (0.0596 — 0.0599)
			0.25 (0.0098) US			1.614 — 1.622 (0.0635 — 0.0639)
Bushing of small end	Clearance between piston pin and bushing			mm (in)	Standard	0 — 0.022 (0 — 0.0009)
Crankshaft	Bend limit				mm (in)	0.035 (0.0014)
	Crank pin and crank journal	Out-of-roundness			mm (in)	0.005 (0.0002) or less
		Grinding limit (dia.)			mm (in)	Crank pin: To 51.750 (2.0374)
						Crank journal: To 59.750 (2.3524)
	Crank pin outer diameter	mm (in)	Standard			51.984 — 52.000 (2.0466 — 2.0472)
			0.03 (0.0012) US			51.954 — 51.970 (2.0454 — 2.0461)
			0.05 (0.0020) US			51.934 — 51.950 (2.0447 — 2.0453)
			0.25 (0.0098) US			51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter	mm (in)	Standard			59.992 — 60.008 (2.3619 — 2.3625)
			0.03 (0.0012) US			59.962 — 59.978 (2.3607 — 2.3613)
			0.05 (0.0020) US			59.942 — 59.958 (2.3599 — 2.3606)
			0.25 (0.0098) US			59.742 — 59.758 (2.3521 — 2.3527)
	Thrust clearance			mm (in)	Standard	0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance			mm (in)	Standard	0.010 — 0.030 (0.00039 — 0.0012)
Main bearing	Bearing size (Thickness at center) mm (in)	#1, #3	Standard			1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US			2.017 — 2.020 (0.0794 — 0.0795)
			0.05 (0.0020) US			2.027 — 2.030 (0.0798 — 0.0799)
			0.25 (0.0098) US			2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	Standard			2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US			2.019 — 2.022 (0.0795 — 0.0796)
			0.05 (0.0020) US			2.029 — 2.032 (0.0799 — 0.0800)
			0.25 (0.0098) US			2.129 — 2.132 (0.0838 — 0.0839)

B: COMPONENT

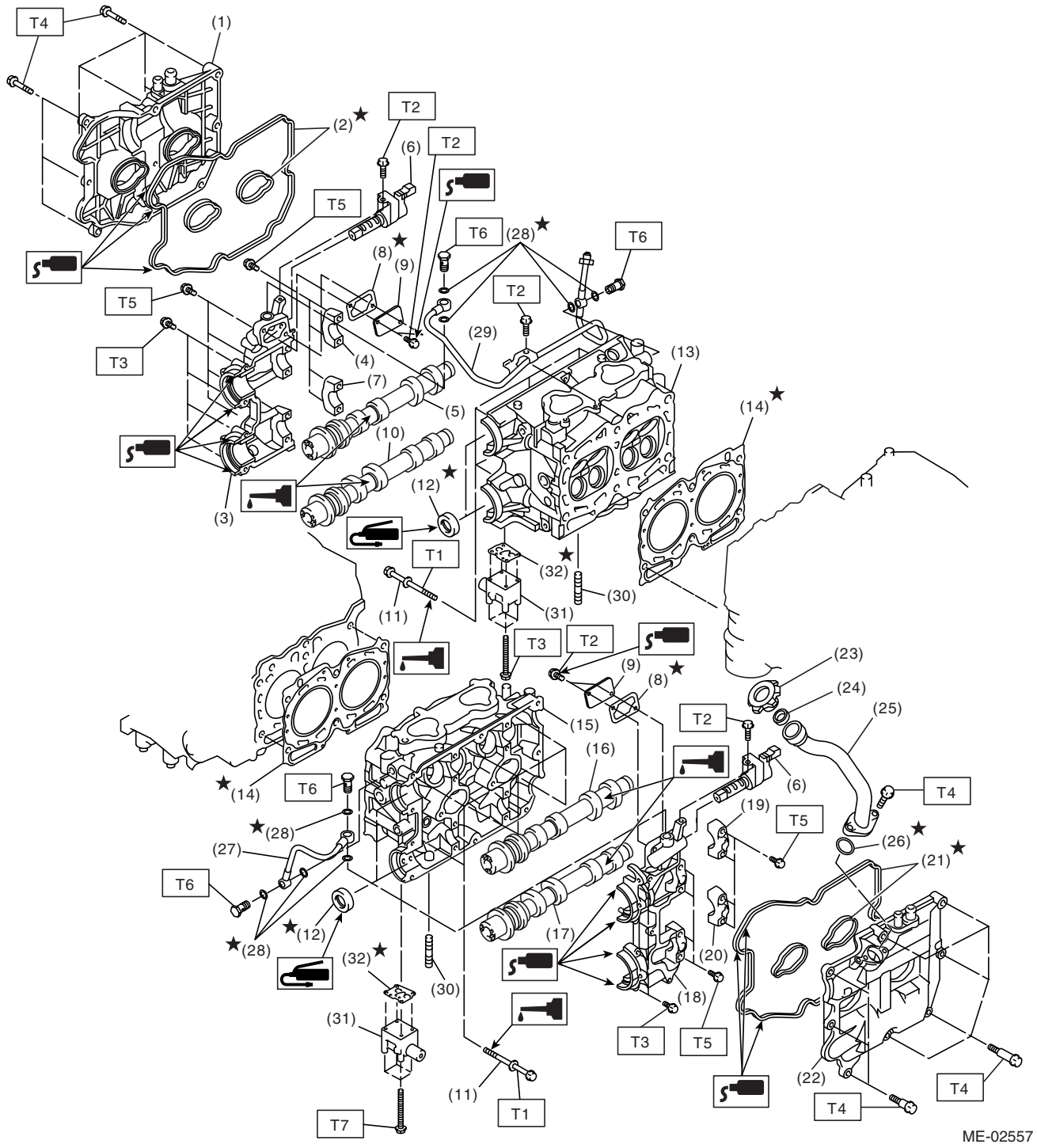
1. TIMING BELT



(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust cam sprocket (RH)
(9) Intake cam sprocket (RH)
(10) Intake cam sprocket (LH)
(11) Exhaust cam sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crank pulley (MT model)
(19) Crank pulley (AT model)
(20) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 39 (4.0, 28.8)
T5: <Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
T6: <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
T7: 6.4 (0.65, 4.7)
T8: 3.4 (0.3, 2.5)
T9: 25 (2.5, 18.4)

2. CYLINDER HEAD AND CAMSHAFT

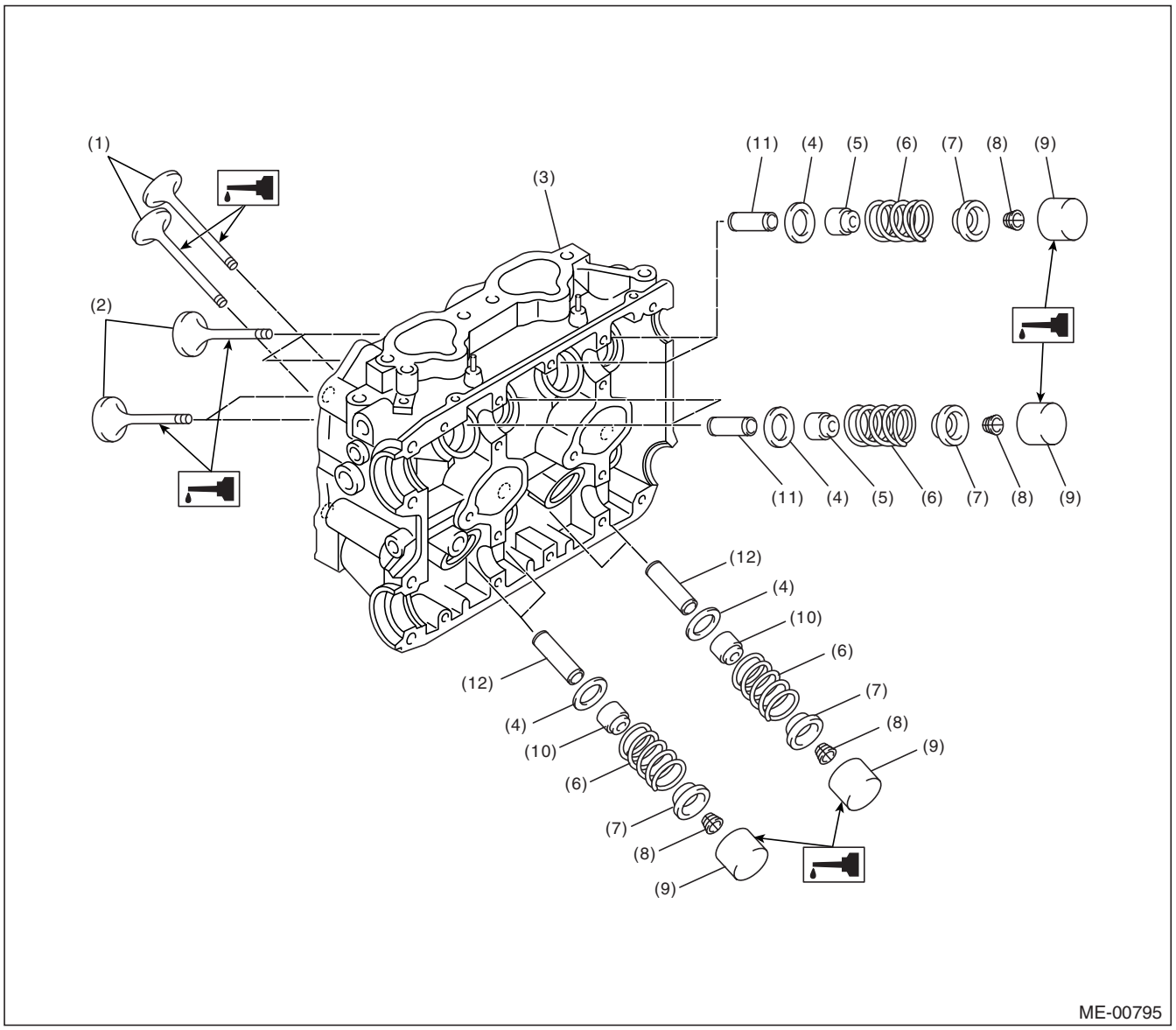


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Oil flow control solenoid valve (Intake)
(7) Exhaust camshaft cap (Rear RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt
(31) Oil flow control solenoid valve (Exhaust)
(32) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

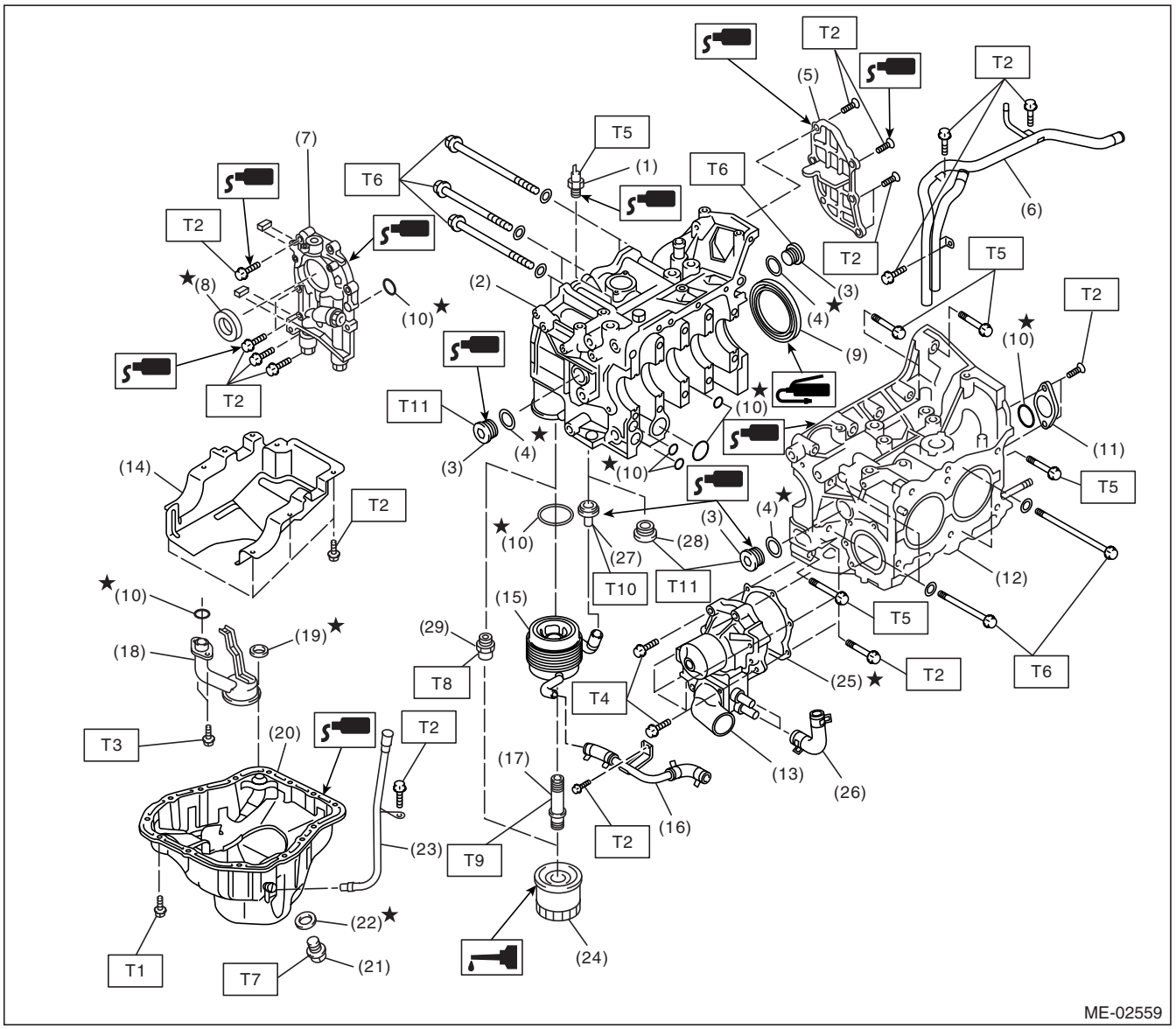
T1:	***<Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>***
T2:	***8 (0.8, 5.8)***
T3:	***9.75 (1.0, 7.2)***
T4:	***6.4 (0.65, 4.7)***
T5:	***20 (2.0, 14.8)***
T6:	***29 (3.0, 21.4)***
T7:	***10 (1.0, 7.4)***

3. CYLINDER HEAD AND VALVE ASSEMBLY



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

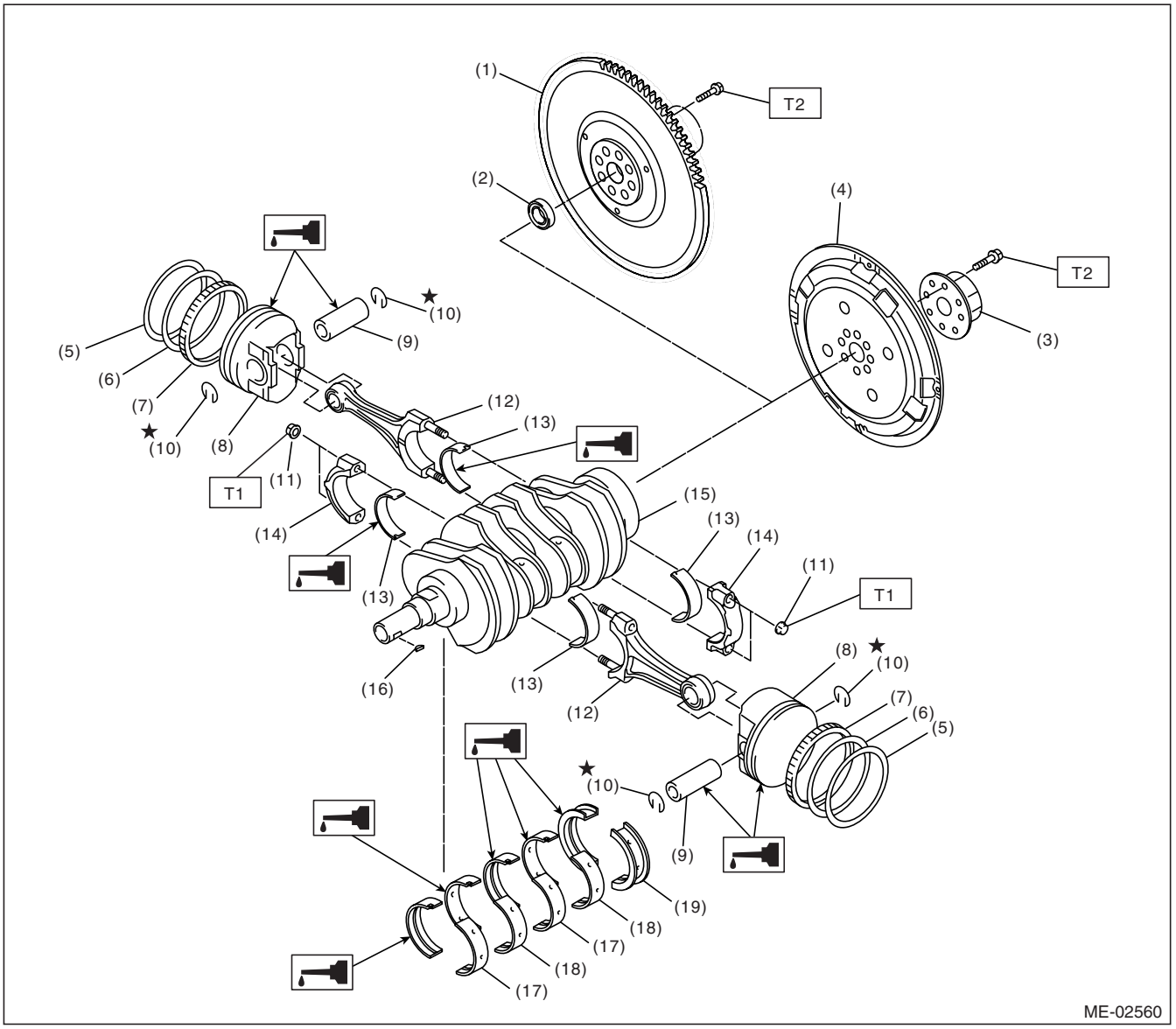
4. CYLINDER BLOCK



(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler (MT model)
(16) Water by-pass pipe (MT model)
(17) Connector (MT model)
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug (MT model)
(28) Plug (Except for MT model)
(29) Connector (Except for MT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.4)
T4: First 12 (1.2, 8.9)
Second 12 (1.2, 8.9)
T5: 25 (2.5, 18.4)
T6: <Ref. to ME(H4DOTC)-73, INSTALLATION, Cylinder Block.>
T7: 44 (4.5, 33)
T8: 45 (4.6, 33.3)
T9: 54 (5.5, 39.8)
T10: 69 (7.0, 50.9)
T11: 70 (7.1, 51.6)

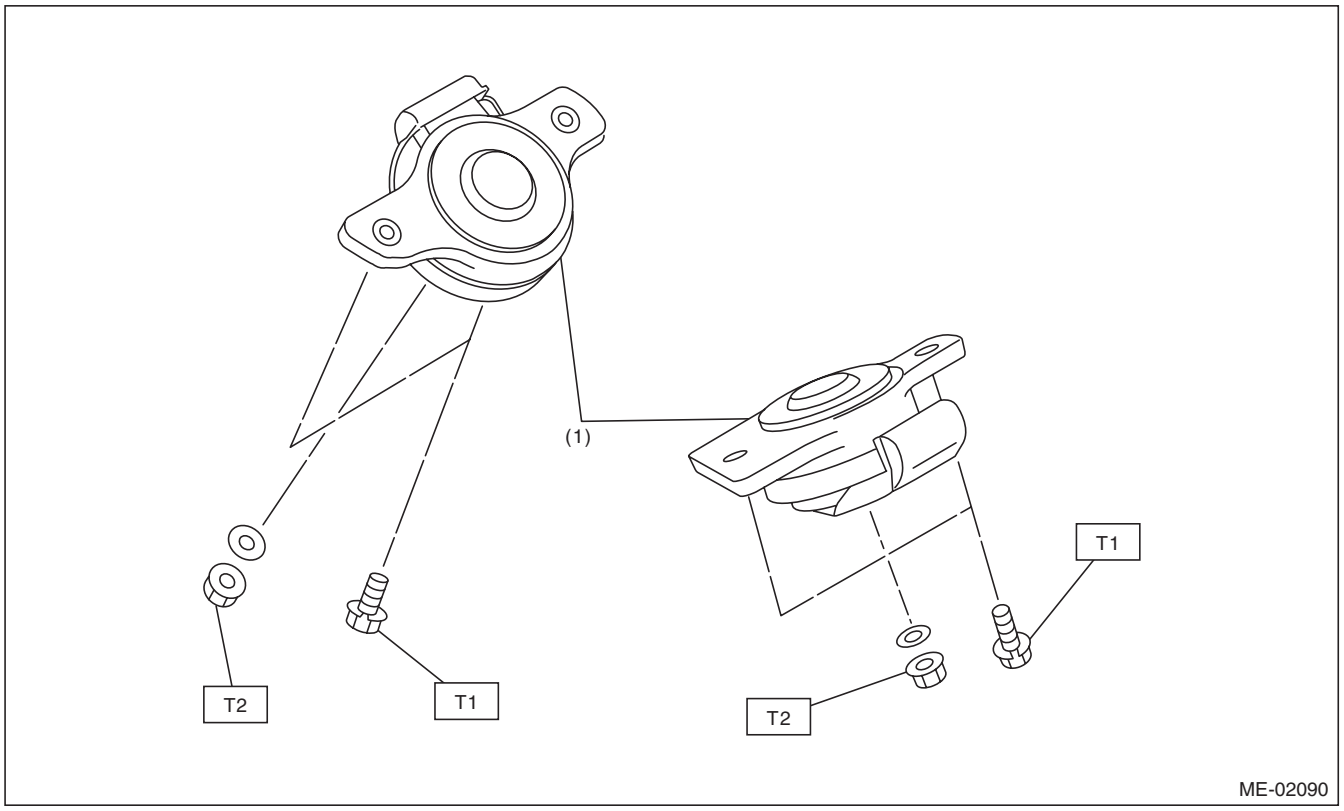
5. CRANKSHAFT AND PISTON



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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 53.1)

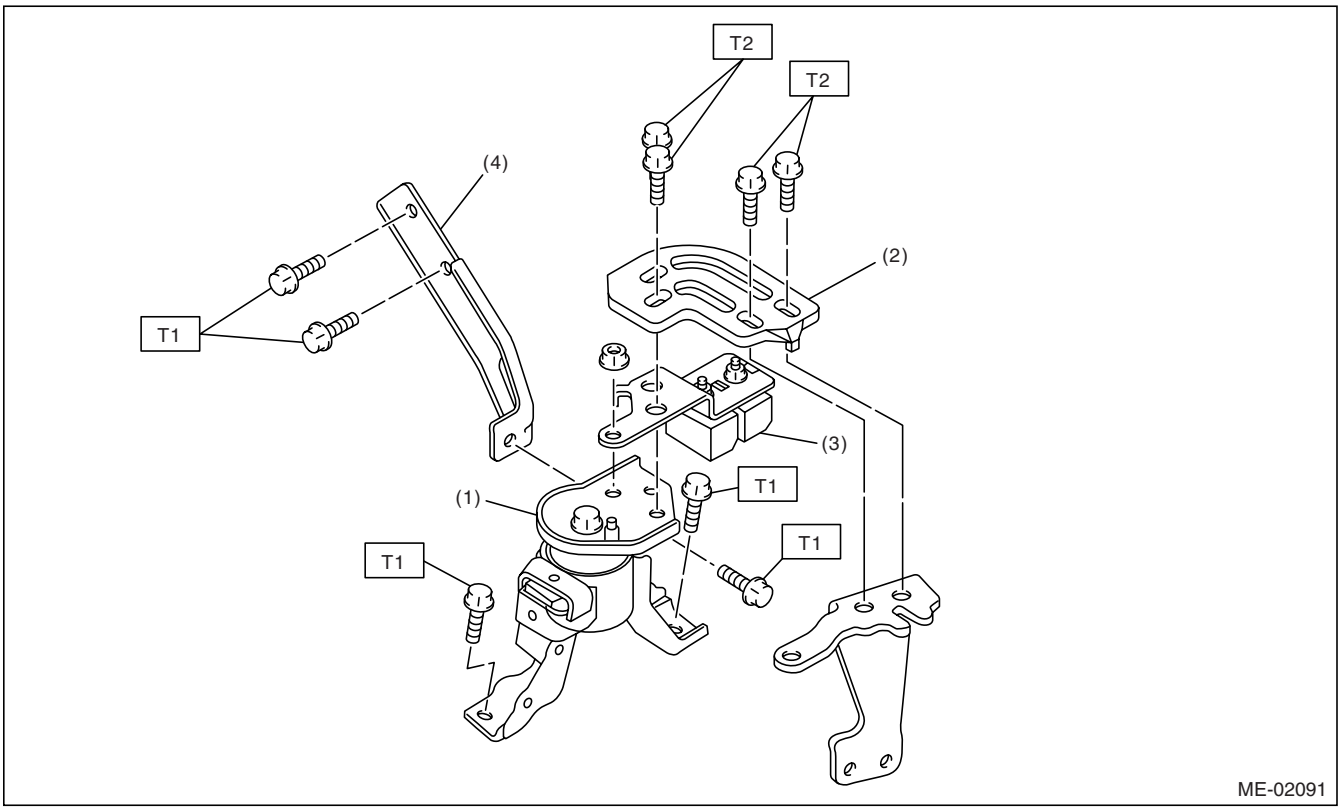
6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 85 (8.7, 62.7)

7. LINEAR MOTION MOUNTING



(1) Linear motion mounting
(2) Linear motion mounting bracket
(3) Dynamic damper
(4) Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.3)
T2: 30 (3.1, 22.1)

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 yourself, 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 rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with coolant or oil. Place a cover over fender, 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 TOOL

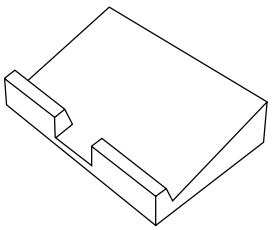
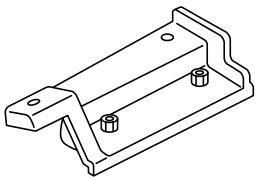
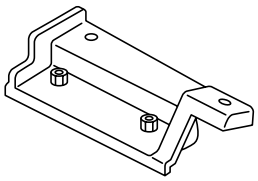
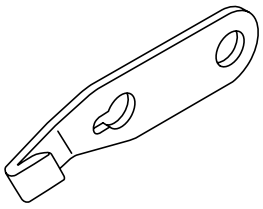
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of drive plate when loosening/tightening crank pulley bolt.

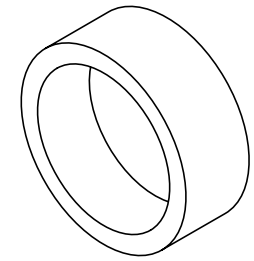
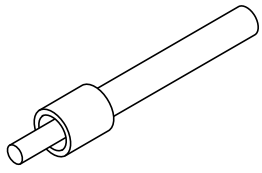
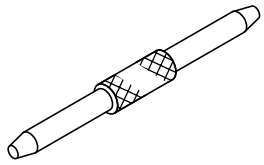
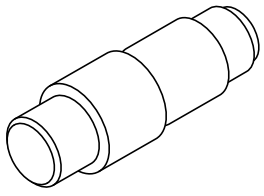
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston to cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.

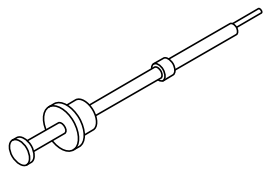
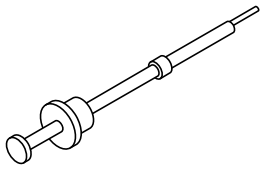
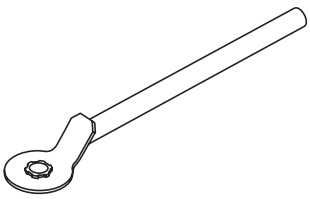
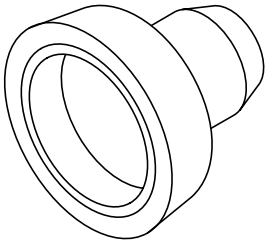
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097600	499097600	PISTON PIN REMOVER ASSY	Used for removing piston pin. (MT model)
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin. (Except for MT model)
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket and exhaust cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

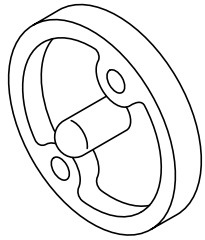
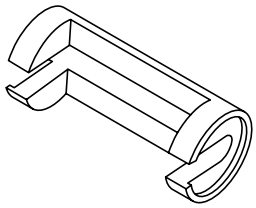
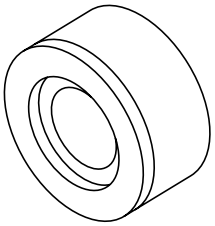
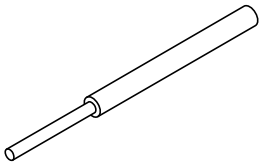
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

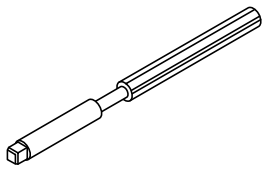
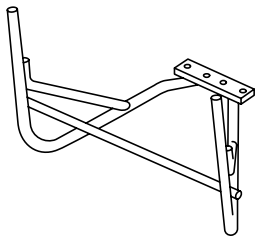
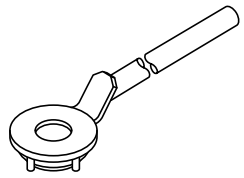
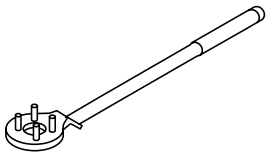
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Used for disassembling and assembling engine. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt. (AT model)
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt. (MT model)

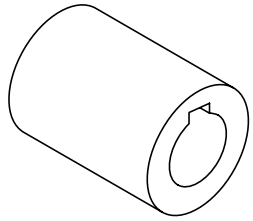
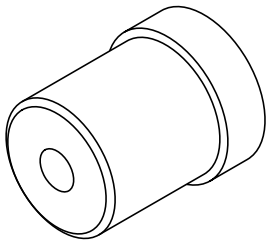
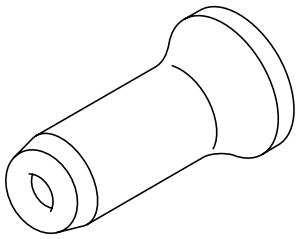
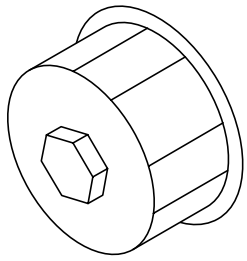
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))

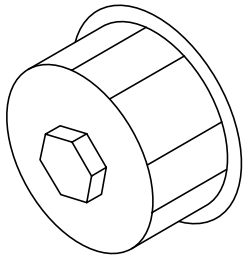
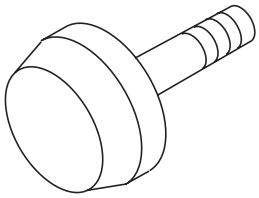
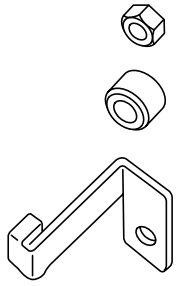
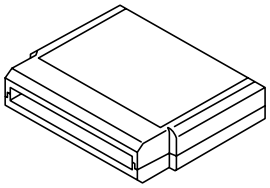
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

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.

- V-belt
- Timing belt
- Camshaft
- Cylinder head

2. Compression

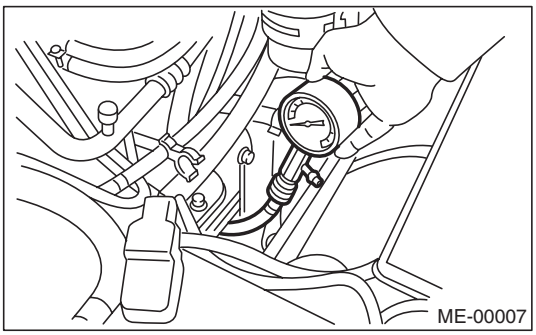
A: INSPECTION

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

1) Remove the collector cover.
2) After warming-up the engine, turn the ignition switch to OFF.
3) Make sure that the battery is fully charged.
4) Release the fuel pressure. <Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove all the spark plugs.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
6) Fully open the throttle valve.
7) Check the starter motor for satisfactory performance and operation.
8) Hold the compression gauge tightly against the spark plug hole.

NOTE:
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.

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



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

Compression (Throttle fully open):
Standard
1,100 — 1,300 kPa (11.2 — 13.3 kgf/cm^2, 160 — 189 psi)
Difference between cylinders
49 kPa (0.5 kgf/cm^2, 7 psi) or less

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Idle the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON and the Subaru Select Monitor power switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine, and read the engine idle speed.
12) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C, etc. are OFF.)

Idle speed [No load and gears in "N" or "P" range]:
650±50 rpm (AT model)
700±50 rpm (MT model)

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

Idle speed [A/C "ON", and gears in "N" or "P" range]:
825±50 rpm (AT model)
800±50 rpm (MT model)

NOTE:
Idle speed cannot be adjusted manually, because idle speed is automatically adjusted. If the idle speed is out of specification, refer to General Diagnostic Table under "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

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

1) Before checking the ignition timing, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Idle the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON and the Subaru Select Monitor power switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

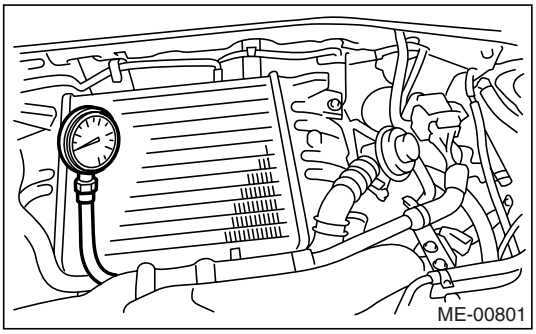
Ignition timing [BTDC/rpm]:
14°±3°/650 (AT model)
14°±3°/700 (MT model)

If the timing is not correct, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Remove the collector cover.
2) Idle the engine.
3) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
4) Keep the engine at idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, internal condition of the engine can be diagnosed with the following procedures.



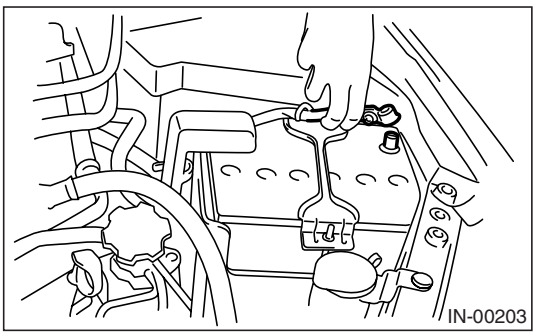
Vacuum pressure (at idling, A/C "OFF"):
–66.7 kPa (–500 mmHg, –19.70 inHg) or less

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, or disconnected or damaged vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Valve anchoring
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve spring
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

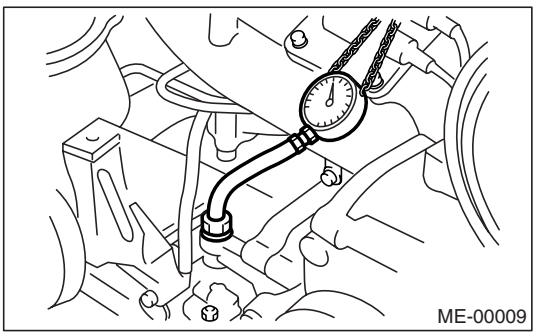
6. Engine Oil Pressure

A: INSPECTION

1) Remove the collector cover.
2) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4DOTC)-17, REMOVAL, Oil Pressure Switch.>
3) Connect the oil pressure gauge hose to cylinder block.
4) Connect the ground cable to battery.



5) Start the engine, and measure the oil pressure.



Oil pressure:

Standard (At 600 rpm)
98 kPa (1.0 kgf/cm^2, 14 psi) or more

Standard (At 6,000 rpm)
588 kPa (6.0 kgf/cm^2, 85 psi) or more

CAUTION:
• If the oil pressure is out of standard, check the oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-20, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light comes ON though the oil pressure is within standard, replace the oil pressure switch. <Ref. to LU(H4DOTC)-20, INSPECTION, Engine Lubrication System Trouble in General.>

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

6) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-17, INSTALLATION, Oil Pressure Switch.>

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

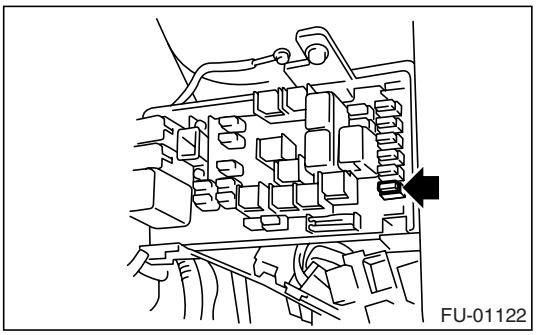
7. Fuel Pressure

A: INSPECTION

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

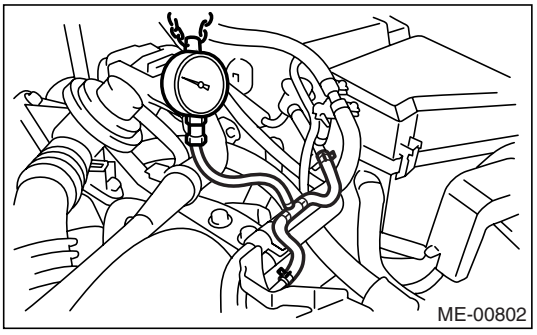
NOTE:
When the fuel pressure is out of standard, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Disconnect the fuel delivery hose and connect fuel pressure gauge.
5) Install the fuse of fuel pump to main fuse box.


FU-01122

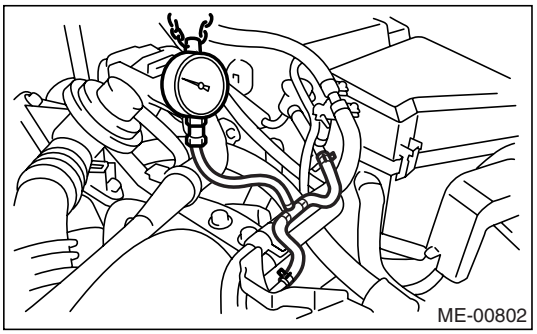
6) Start the engine.
7) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

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


ME-00802

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

Fuel pressure:
Standard: 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)


ME-00802

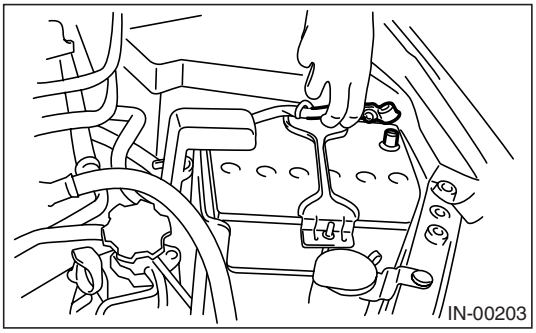
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard during high-altitude operations.

8. Valve Clearance

A: INSPECTION

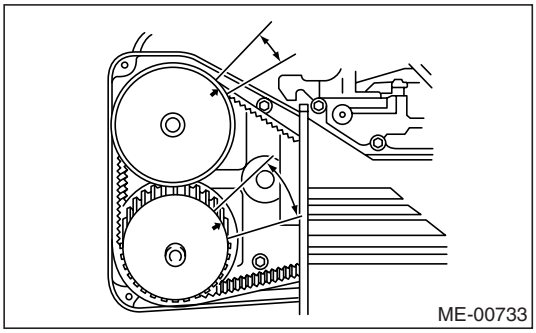
Inspection and adjustment of valve clearance should be performed while engine is cold.

1) Lift-up the vehicle.
2) Remove the under cover.
3) Lower the vehicle.
4) Remove the collector cover.
5) Disconnect the ground cable from battery.



6) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
7) Remove the bolt which secures timing belt cover (RH).
8) Loosen the remaining bolt which secures timing belt cover (RH), then remove the timing belt cover.
9) When inspecting #1 and #3 cylinders:
   (1) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
   (2) Disconnect the connector from ignition coil.
   (3) Remove the ignition coil.
   (4) Place a suitable container under the vehicle.
   (5) Disconnect the PCV hose from rocker cover (RH).
   (6) Remove the bolts, then remove the rocker cover (RH).
10) When inspecting #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.
   (2) Disconnect the connector of ignition coil.
   (3) Remove the ignition coil.
   (4) Place a suitable container under the vehicle.
   (5) Disconnect the PCV hose from rocker cover (LH).
   (6) Remove the bolts, then remove the rocker cover (LH).
11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

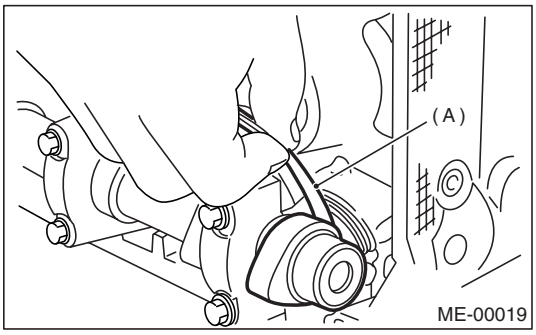


12) Measure the clearance between #1 cylinder intake valve and #3 cylinder exhaust valve by using thickness gauge (A).

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

Valve clearance :
Intake
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust
0.35±0.02 mm (0.0138±0.0008 in)

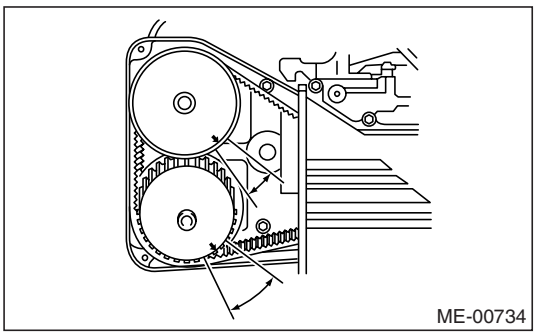
• If the measured value is not within standard, take notes of the value in order to adjust the valve clearance later on.



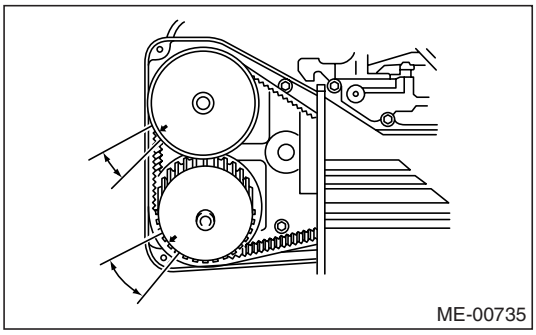
13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>

14) Further turn the crank pulley clockwise and then measure the valve clearances again.

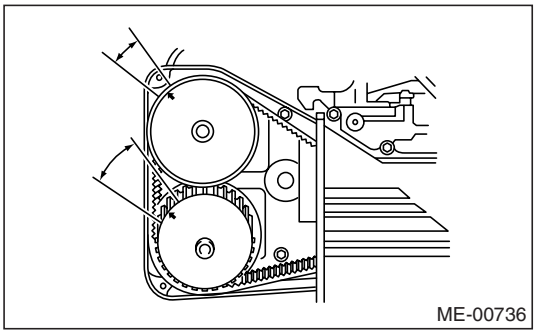
(1) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.


ME-00734

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


ME-00735

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


ME-00736

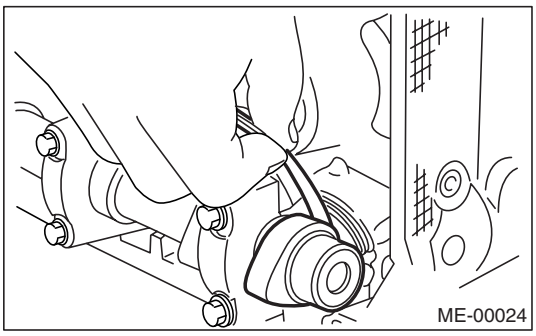
15) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

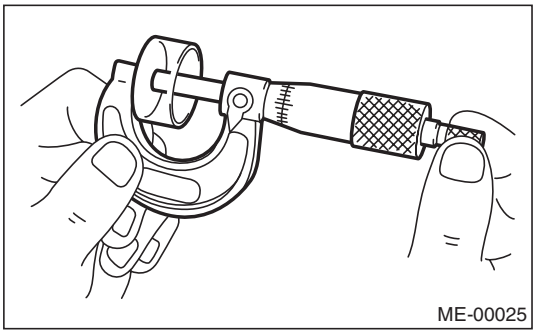
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances.
<Ref. to ME(H4DOTC)-28, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.


ME-00024

2) Remove the camshaft. <Ref. to ME(H4DOTC)-56, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter using a micrometer.


ME-00025

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

Unit: (mm)
Intake valve: S = (V + T) − 0.20 Exhaust valve: S = (V + T) − 0.35
S: Valve lifter thickness required V: Measured valve clearance T: Valve lifter thickness to be used

Valve Clearance

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)

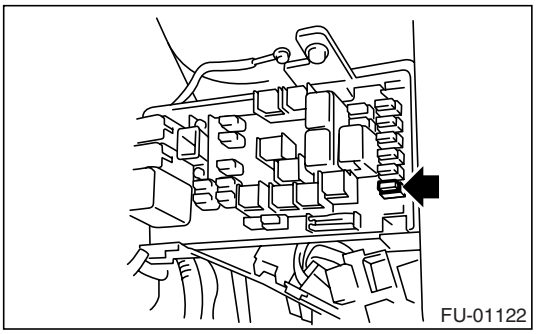
Part No.	Thickness mm (in)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

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.

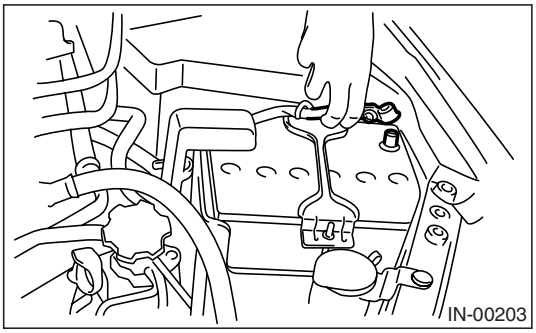
9. Engine Assembly

A: REMOVAL

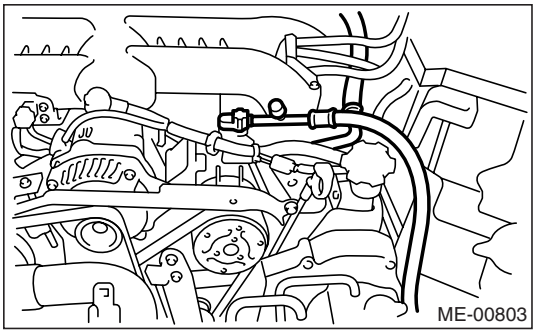
1) Set the vehicle on a lift.
2) Open the front hood fully and support it with front food stay.
3) Collect the refrigerant from A/C system. <Ref. to AC-20, Refrigerant Recovery Procedure.>
4) Release the fuel pressure.
   (1) Remove the fuse of fuel pump from main fuse box.


FU-01122

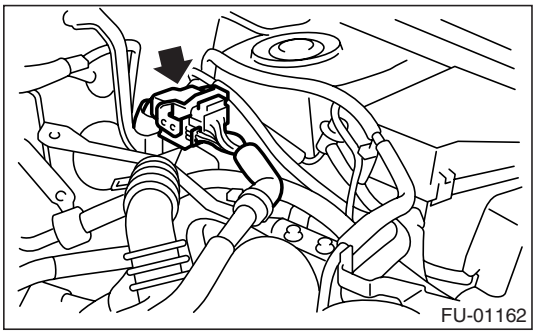
   (2) Start the engine, and run until it stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the fuel filler cap.
6) Remove the collector cover.
7) Disconnect the ground cable from battery.

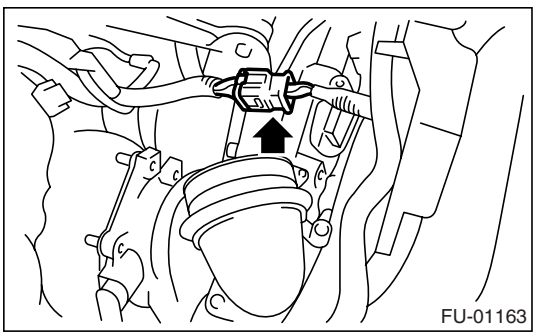

IN-00203

8) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
9) Remove the coolant filler tank.
<Ref. to CO(H4DOTC)-31, REMOVAL, Coolant Filler Tank.>
10) Disconnect the A/C pressure hoses from A/C compressor.

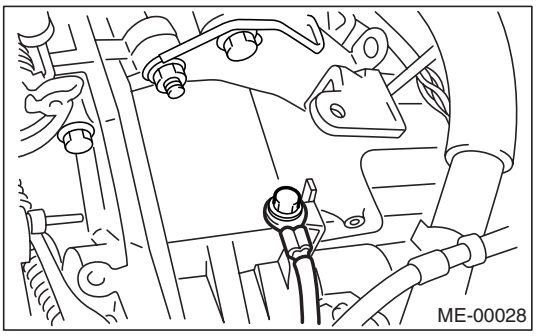

ME-00803

11) Remove the air intake system.
   (1) Remove the intercooler. (DOHC turbo model) <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
   (2) Remove the air cleaner element and air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
12) Disconnect the following connectors and cables.
   (1) Engine harness connectors

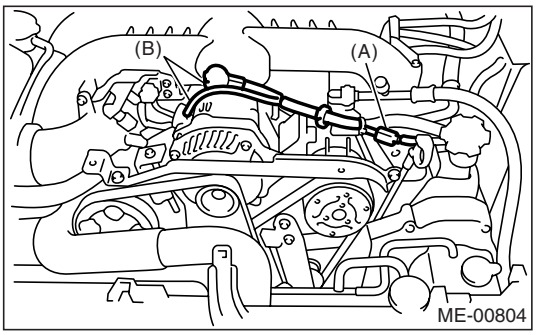

FU-01162


FU-01163

(2) Engine ground terminals

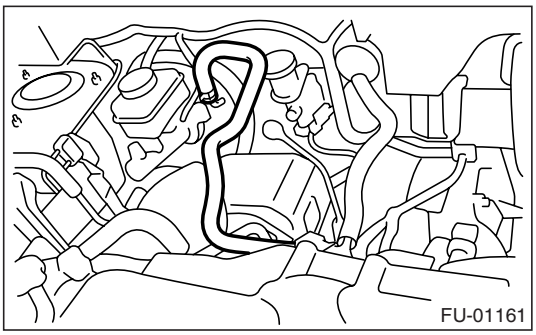


(3) Generator connector, terminal and A/C compressor connector

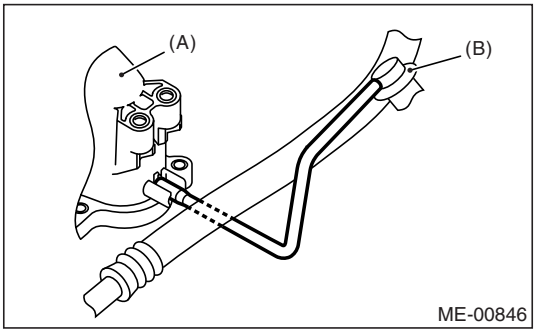


(A) A/C compressor connector
(B) Generator connector and terminal

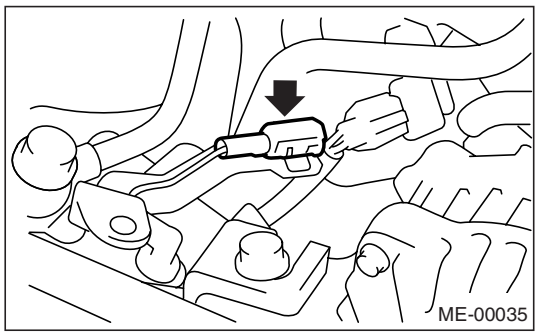
13) Disconnect the following hoses:
(1) Brake booster vacuum hose



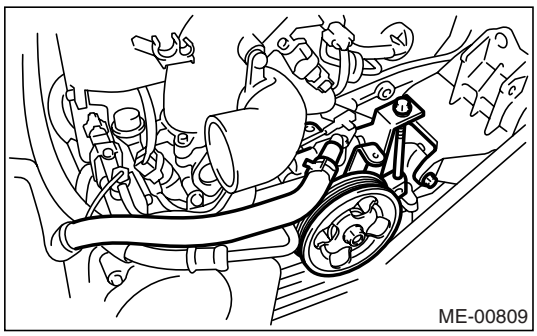
(2) Heater inlet and outlet hoses
(3) Remove the hose between intake manifold (A) and pressure regulator (B).



14) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and remove the front side belt. <Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



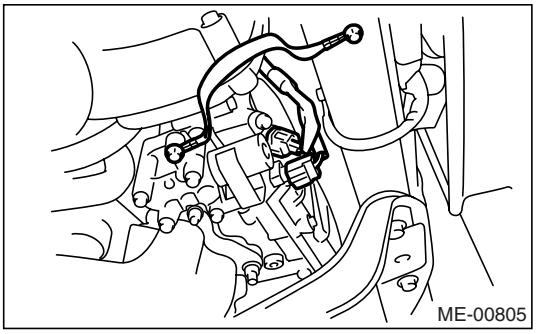
(3) Remove the power steering pump from engine.

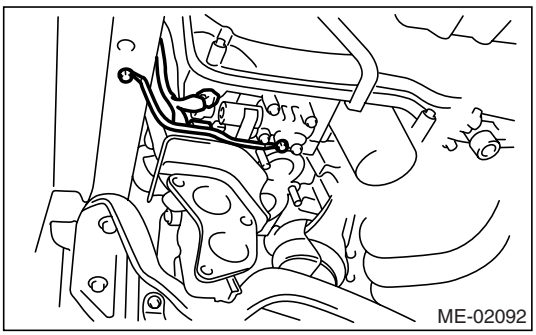


(4) Place the power steering pump onto right side wheel apron.

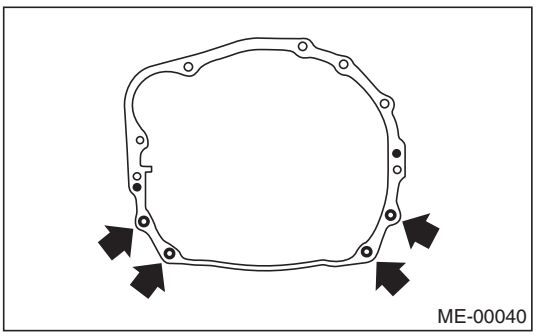
15) Remove the linear motion mounting. <Ref. to ME(H4DOTC)-38, REMOVAL, Linear Motion Mounting.>
16) Lift-up the vehicle.
17) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-6, REMOVAL, Center Exhaust Pipe.>

18) Disconnect the oil flow control solenoid valve connector and ground cable in exhaust side.

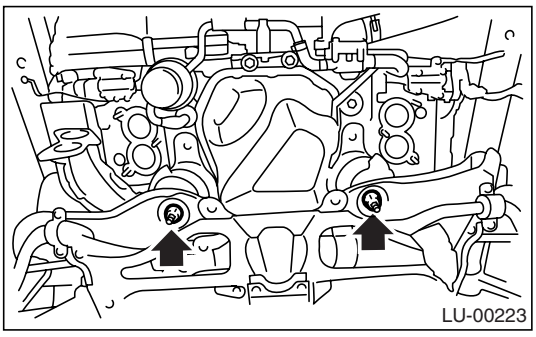

ME-00805


ME-02092

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

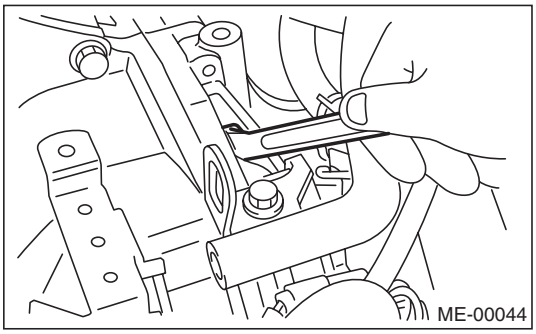

ME-00040

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

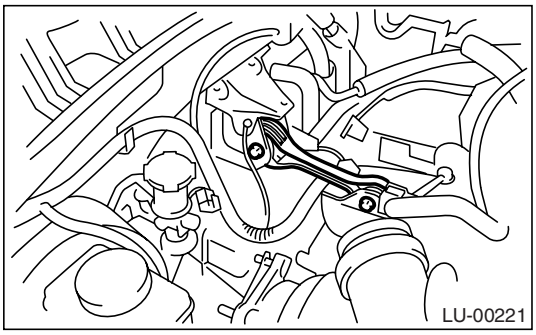

LU-00223

21) Separate the torque converter clutch from drive plate. (AT model)

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

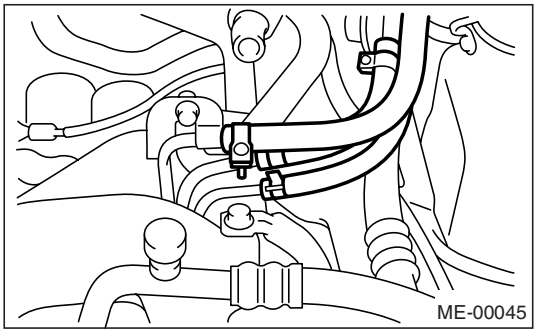

ME-00044

22) Remove the pitching stopper.

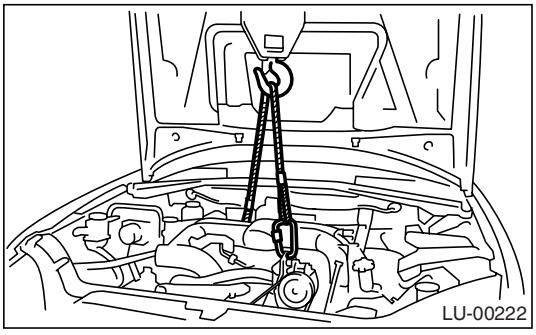

LU-00221

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

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

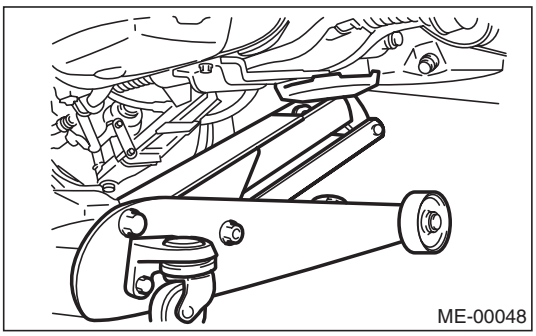

ME-00045

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


LU-00222

25) Support the transmission with a garage jack.

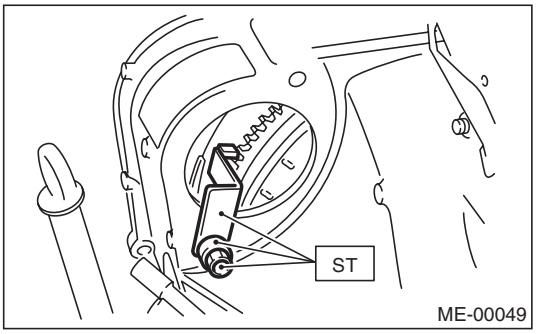
CAUTION:
Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.



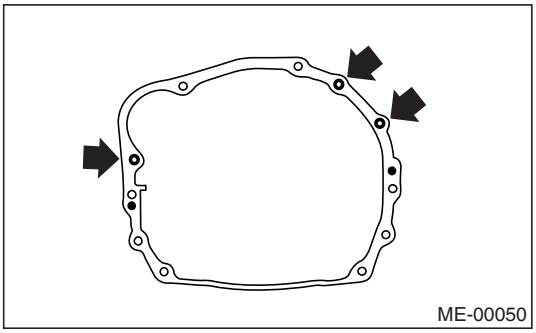
CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

26) Separation of engine and transmission
(1) Remove the starter. <Ref. to SC(H4SO 2.0)-6, REMOVAL, Starter.>
(2) Install the ST to converter case. (AT model)

ST 498277200 STOPPER SET



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



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

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

28) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers to engine.

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

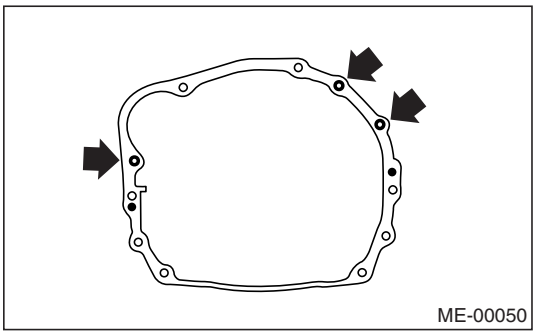
2) Install the engine to transmission.
(1) Position the engine in engine compartment and align it with transmission.

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

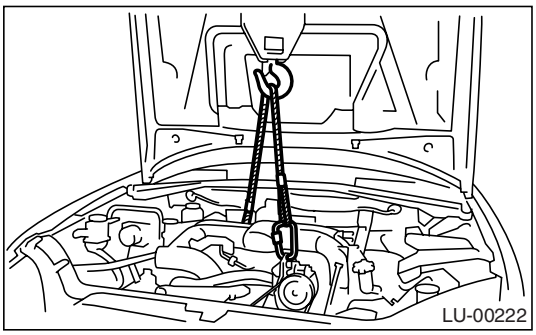
(2) Apply a small amount of grease to the spline of main shaft. (MT model)

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

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



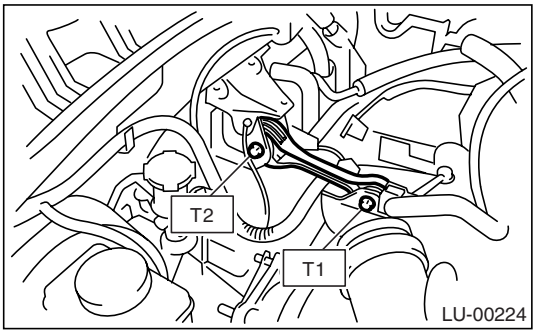
4) Remove the lifting device and wire ropes.



5) Remove the garage jack.

6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



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

NOTE:
Be careful not to drop the ST into the converter case when removing ST.
ST 498277200 STOPPER SET

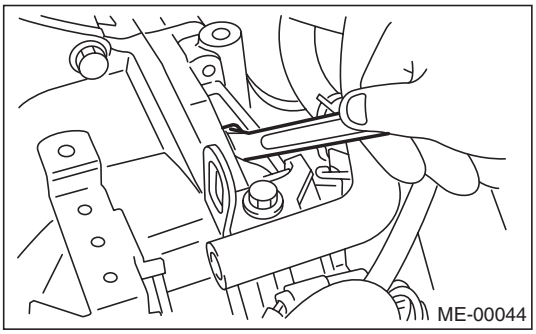
8) Install the starter. <Ref. to SC(H4SO 2.0)-6, INSTALLATION, Starter.>

9) Install the torque converter clutch to drive plate. (AT model)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the crankshaft by using ST.

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

ST 499977400 CRANK PULLEY WRENCH

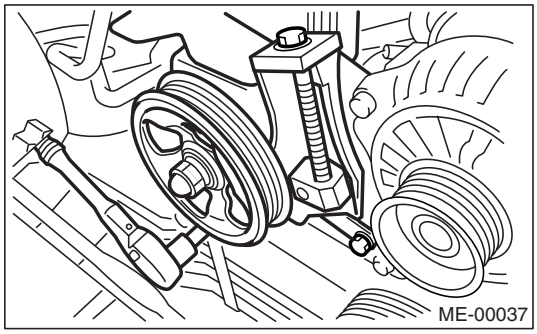
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



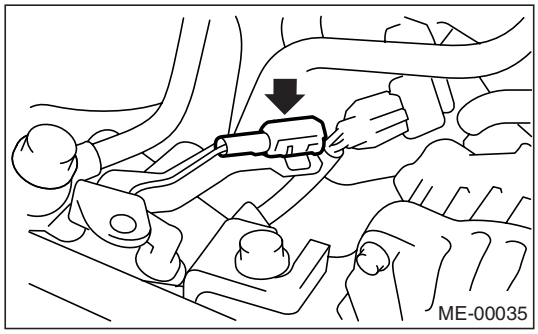
10) Install the linear motion mounting. <Ref. to ME(H4DOTC)-38, INSTALLATION, Linear Motion Mounting.>

11) Install the power steering pump on bracket.
(1) Install the power steering pump.

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



(2) Connect the power steering switch connector.

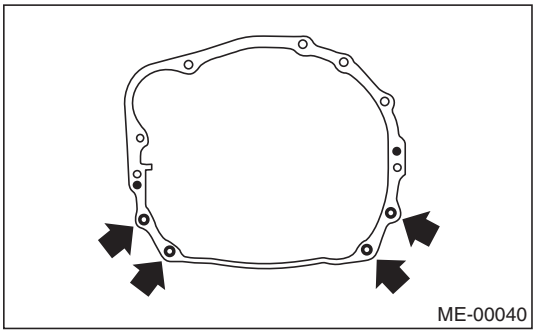


(3) Install the front side belt and adjust it. <Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

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

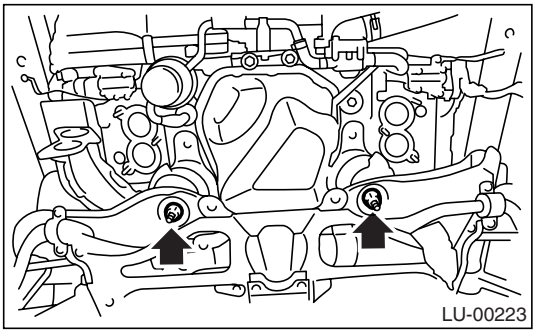
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



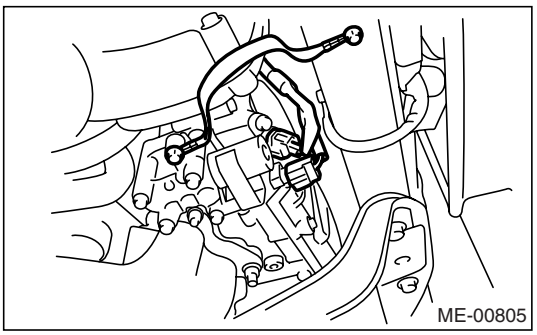
14) Tighten the nuts which install the front cushion rubber onto crossmember.

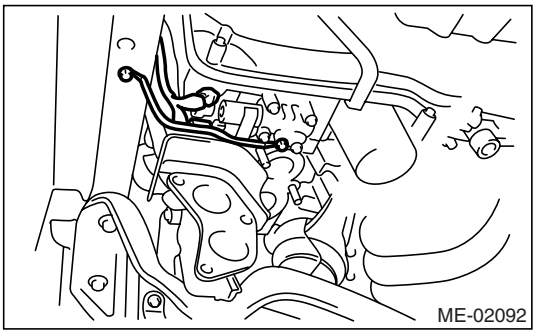
Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts and locator are securely installed.


LU-00223

15) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-7, INSTALLATION, Center Exhaust Pipe.>
16) Connect the oil flow control solenoid valve connector and ground cable of exhaust side.


ME-00805

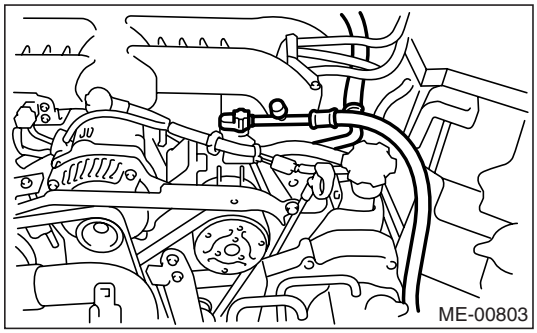

ME-02092

17) Lower the vehicle.
18) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
(4) Pressure regulator hose

19) Connect the following connectors and terminals.
(1) Engine ground terminals
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connector
20) Install the air intake system.
(1) Install the intercooler. (DOHC turbo model) <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
21) Install the A/C pressure hoses.

NOTE:
Use a new O-ring.

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


ME-00803

22) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
23) Install the coolant filler tank. (DOHC turbo model) <Ref. to CO(H4DOTC)-31, INSTALLATION, Coolant Filler Tank.>
24) Install the window washer tank.
25) Install the battery to vehicle, and install the battery ground terminal.
26) Fill with engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
28) Install the collector cover.
29) Remove the front hood stay, and close the front hood.
30) Take off the vehicle from a lift.

C: INSPECTION

1) Check pipes and hoses are connected firmly.
2) Check the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4DOTC)-31, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

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

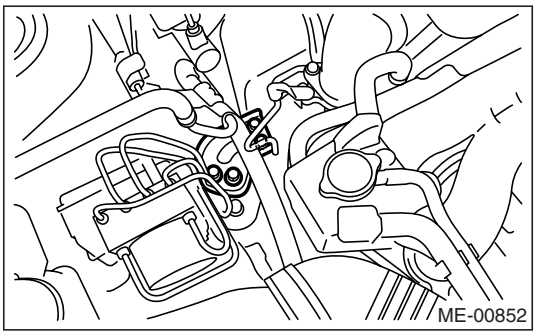
C: INSPECTION

Make sure that there are no cracks or other damages.

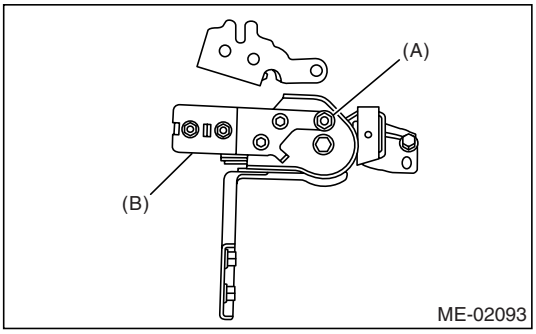
11.Linear Motion Mounting

A: REMOVAL

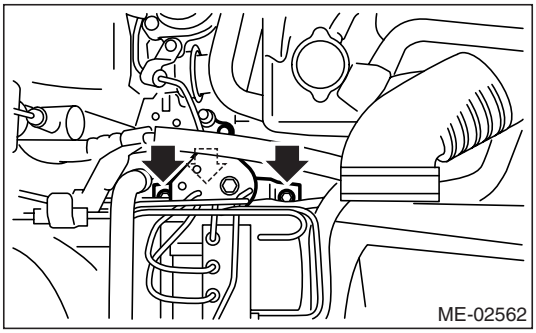
1) Remove the collector cover.
2) Remove the air cleaner case.
3) Remove the linear motion mounting bracket.



4) Remove the speed nut (A), and remove the dynamic damper (B).



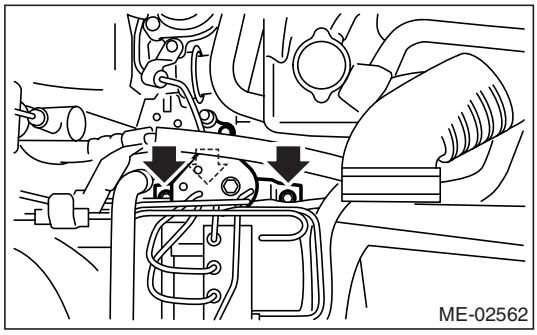
5) Remove the linear motion mounting.



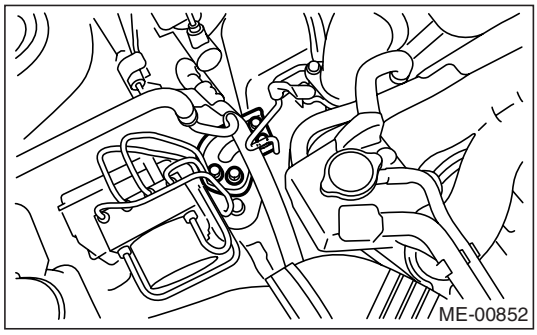
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

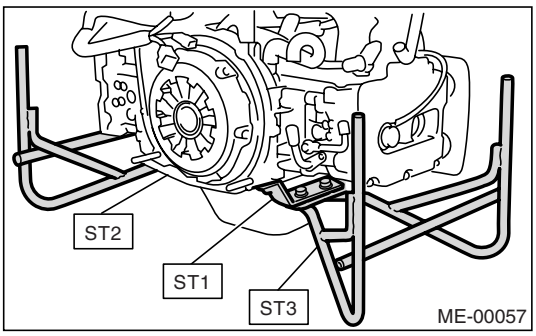


12.Preparation for Overhaul

A: PROCEDURE

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

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



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

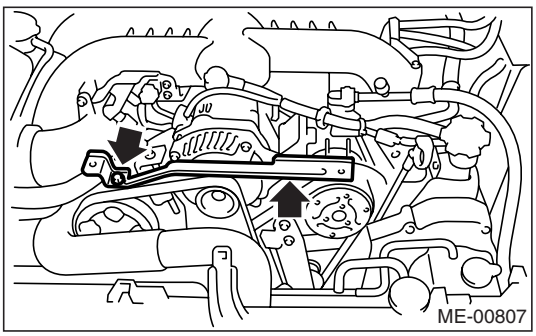
13. V-belt

A: REMOVAL

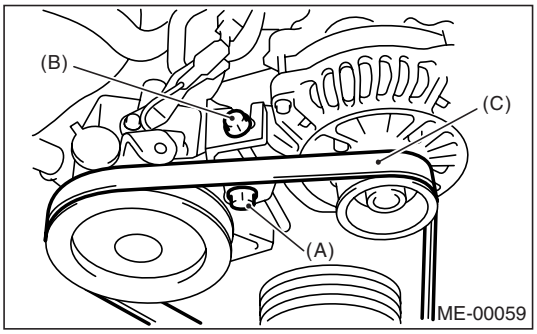
NOTE:
Perform the following procedures with the engine installed to the body.

1. FRONT SIDE BELT

1) Remove the collector cover.
2) Remove the V-belt covers.

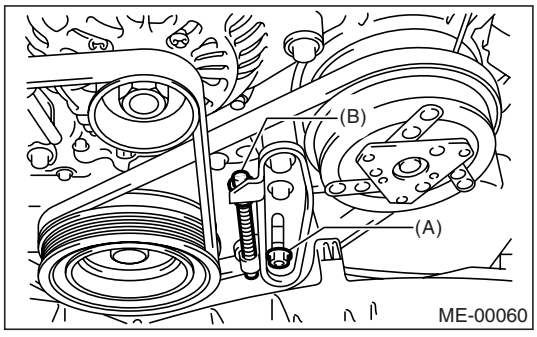


3) Loosen the lock bolt (A).
4) Loosen the slider bolt (B).
5) Remove the front side belt (C).

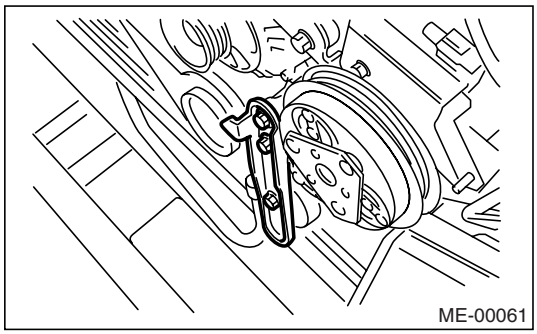


2. REAR SIDE BELT

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



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



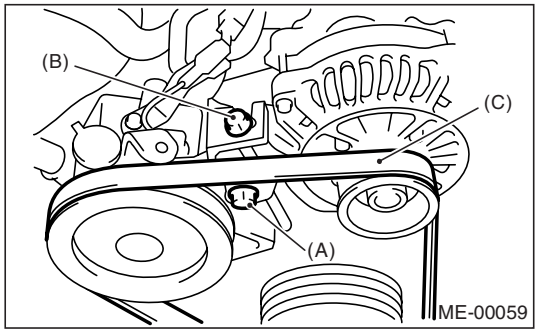
B: INSTALLATION

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

1. FRONT SIDE BELT

1) Install the V-belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

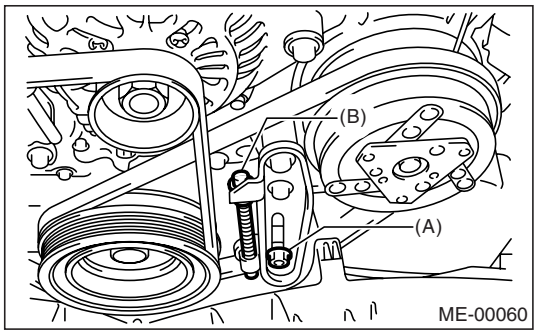
Tightening torque:
Lock bolt (A)
25 N·m (2.5 kgf-m, 18.4 ft-lb)
Slider bolt (B)
8 N·m (0.8 kgf-m, 5.8 ft-lb)



2. REAR SIDE BELT

1) Remove the A/C belt tensioner.
2) Install the V-belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
<Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
3) Tighten the lock nut (A).

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



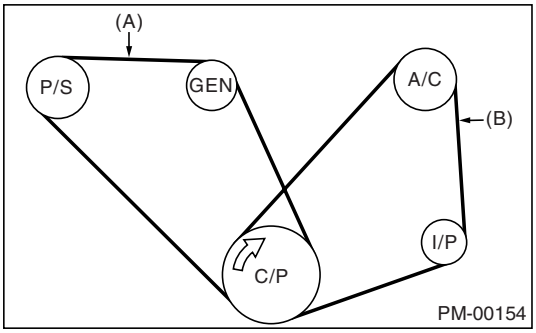
C: INSPECTION

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

Belt tension (with belt tension gauge):

(A)
When installing new parts
618 — 755 N (63 — 77 kgf, 139 — 170 lbf)
At inspection
490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

(B)
When installing new parts
740 — 880 N (75 — 90 kgf, 166 — 198 lbf)
At inspection
350 — 450 N (36 — 46 kgf, 78 — 101 lbf)

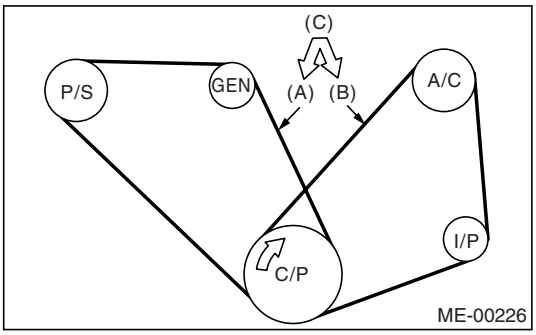


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

Belt tension (without belt tension gauge):

(A)
When installing new parts
7 — 9 mm (0.276 — 0.354 in)
At inspection
9 — 11 mm (0.354 — 0.433 in)

(B)
When installing new parts
7.5 — 8.5 mm (0.295 — 0.335 in)
At inspection
9.0 — 10.0 mm (0.354 — 0.394 in)

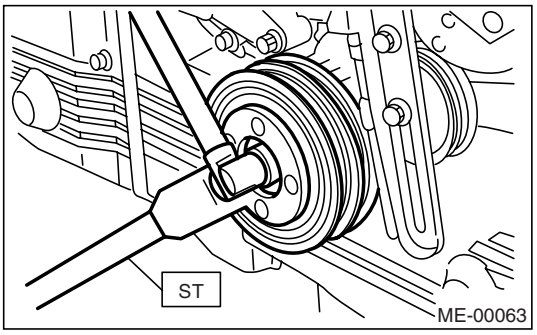


(A) Front side belt
(B) Rear side belt
(C) 98 N (10 kgf, 22 lbf)
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

14.Crank Pulley

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley bolt. To lock the crankshaft, use the ST.
ST 499977400 CRANK PULLEY WRENCH



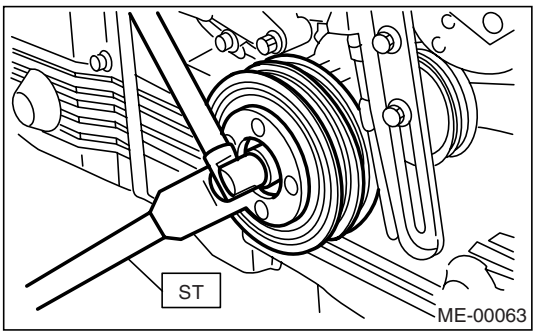
3) Remove the crank pulley.

B: INSTALLATION

1. EXCEPT FOR MT MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use the ST.
ST 499977400 CRANK PULLEY WRENCH
(1) Clean the crankshaft thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
130 N·m (13.3 kgf-m, 95.9 ft-lb)



3) Confirm that the tightening angle of the crank pulley bolt is 45° or more. Perform the following procedures when less than 45°.

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

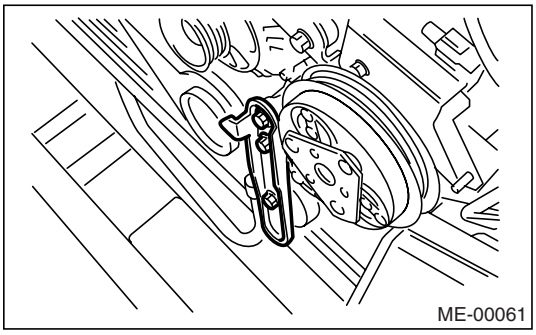
(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
Part No. 12369AA011

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

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

4) Install the A/C belt tensioner.

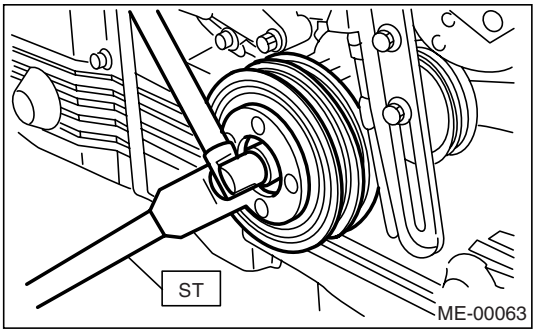


5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

2. MT MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use the ST.
ST 499977100 CRANK PULLEY WRENCH
(1) Clean the crank pully thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolt temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
180 N·m (18.4 kgf-m, 132.8 ft-lb)



3) Confirm that the tightening angle of the crank pulley bolt is 65° or more. Perform the following procedures when less than 65°.

CAUTION:
If the tightening angle of crank pulley bolt is less than 65°, the bolt should be damaged. In this case, the bolt must be replaced.

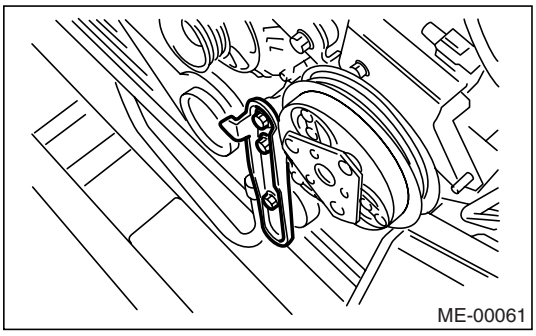
(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
Part No. 12369AA011

(2) Clean the crank pulley thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seat and thread.
(4) Tighten the bolt temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts keeping them in an angle between 65° — 75°.

NOTE:
Perform the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge of timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

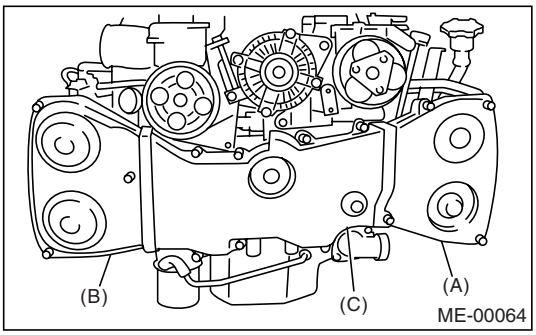
C: INSPECTION

1) Check the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>

15.Timing Belt Cover

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

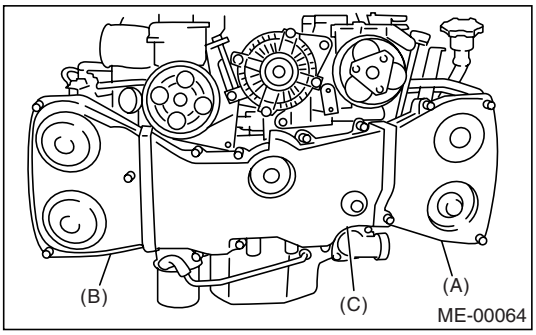
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

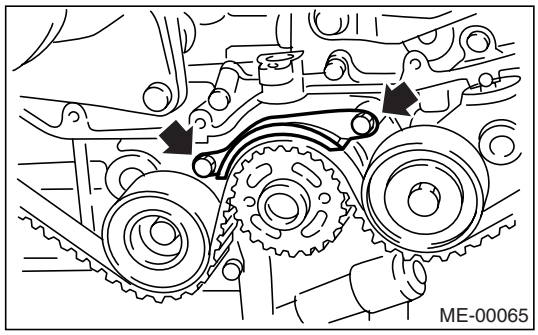
Check the cover for damage.

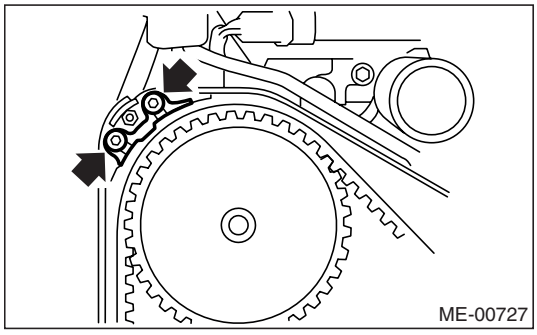
16.Timing Belt

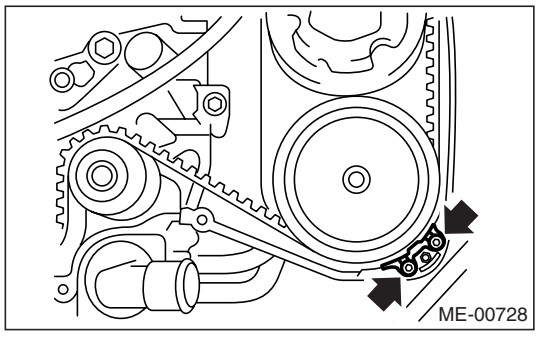
A: REMOVAL

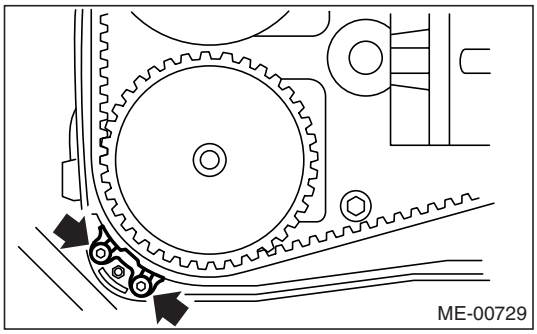
1. TIMING BELT

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guide. (Model with timing belt guide)


ME-00065

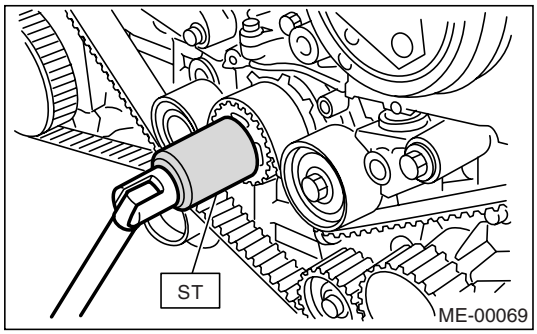

ME-00727


ME-00728


ME-00729

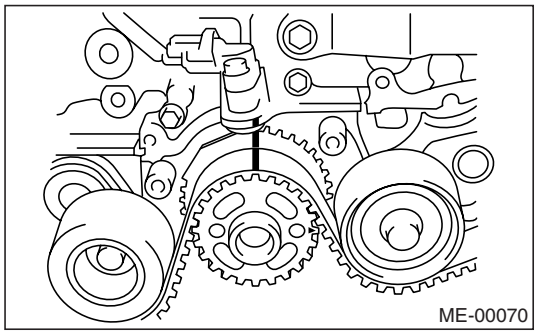
5) If the alignment mark or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
(1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

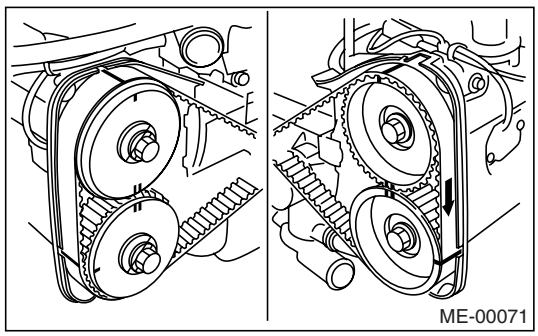
ST 499987500 CRANKSHAFT SOCKET



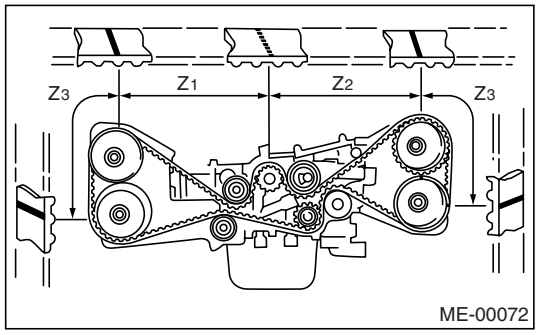
ME-00069

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


ME-00070

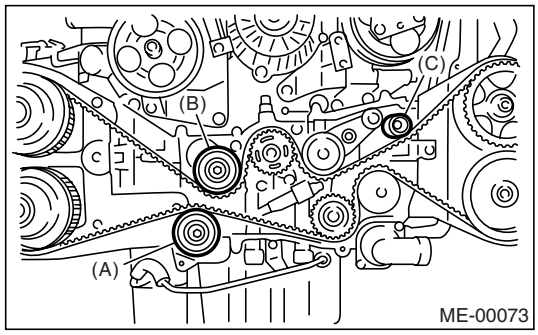

ME-00071

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



ME-00072

6) Remove the belt idler (A).



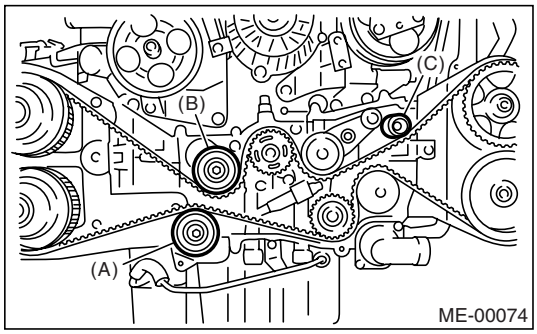
ME-00073

7) Remove the timing belt.

CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust cam sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

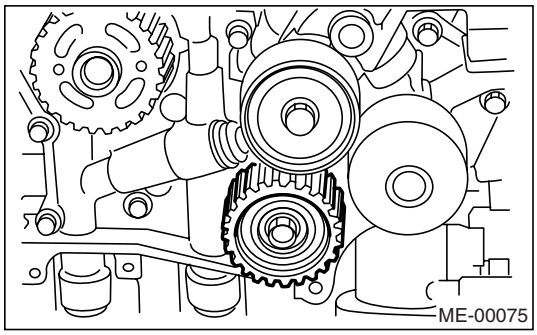
2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idlers (B) and (C).

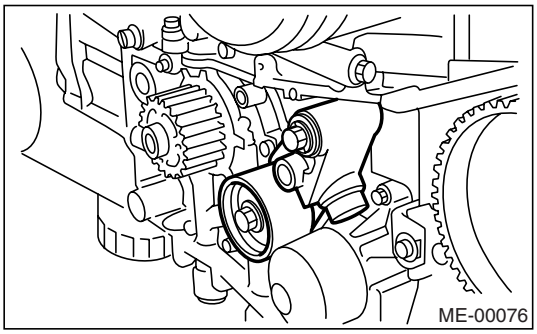


ME-00074

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-00076

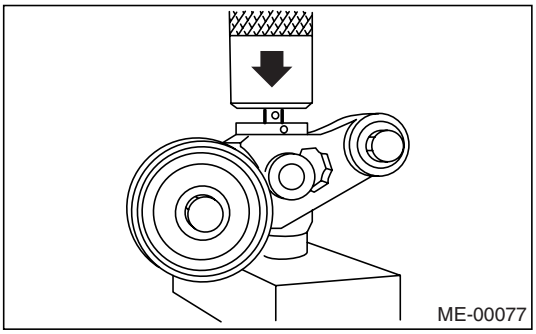
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

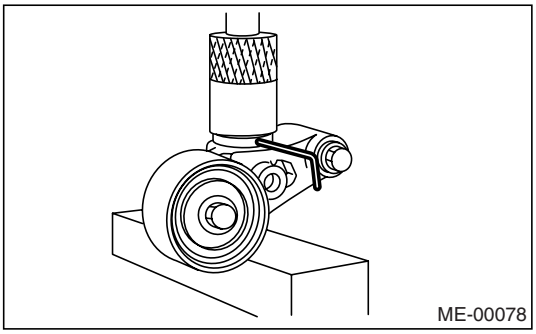
1) Preparation for installation of automatic belt tension adjuster assembly

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

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

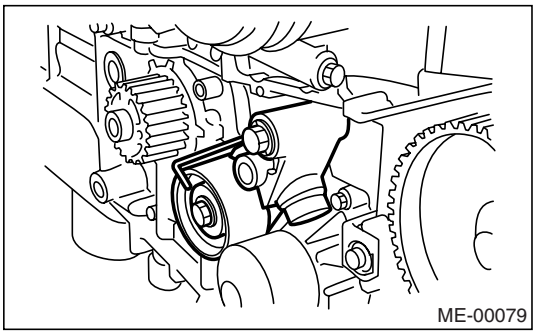

ME-00077

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


ME-00078

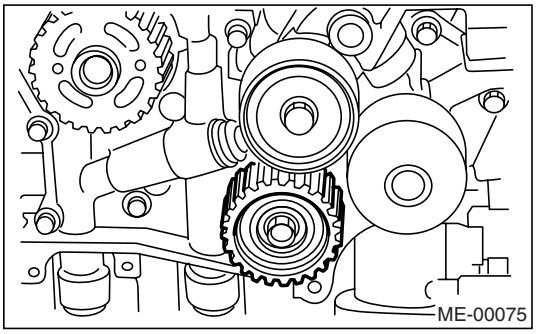
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)


ME-00079

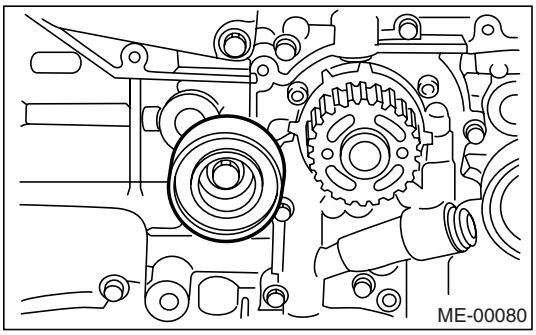
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)


ME-00075

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)

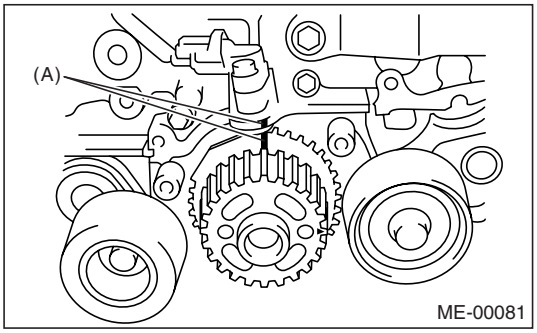

ME-00080

2. TIMING BELT

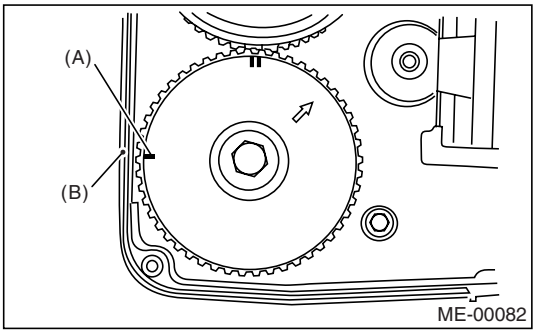
1) Preparation for installation of automatic belt tension adjuster assembly <Ref. to ME(H4DOTC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

2) Crankshaft and cam sprocket alignment

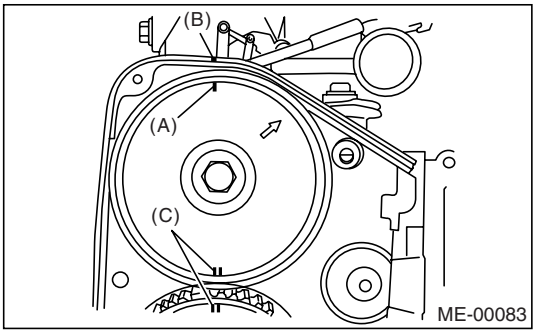
(1) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



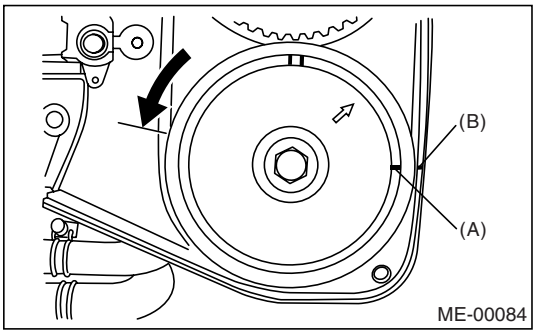
(2) Align single line mark (A) on the exhaust cam sprocket (RH) with the notch (B) on timing belt cover.



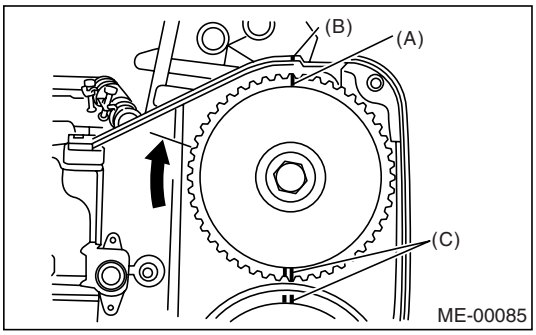
(3) Align single line mark (A) on the intake cam sprocket (RH) with the notch (B) on timing belt cover. (Ensure double lines (C) on intake and exhaust cam sprockets are aligned.)



(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

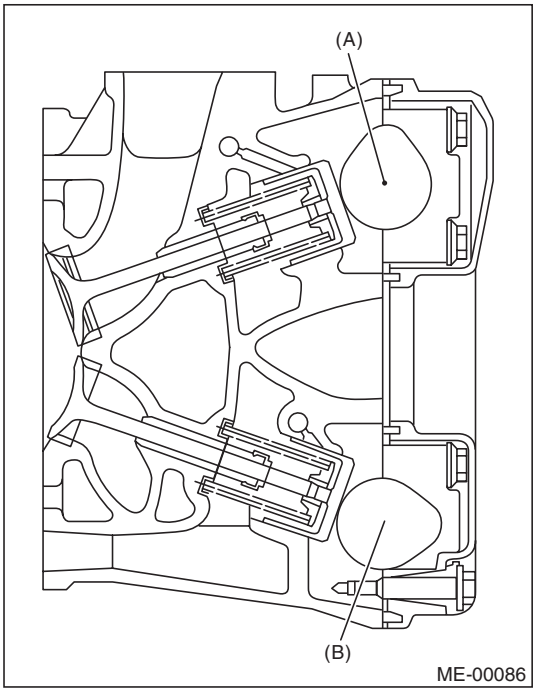


(5) Align single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). Ensure double lines (C) on intake and exhaust cam sprockets are aligned.



(6) Ensure that the cam sprocket and crank sprockets are positioned properly.

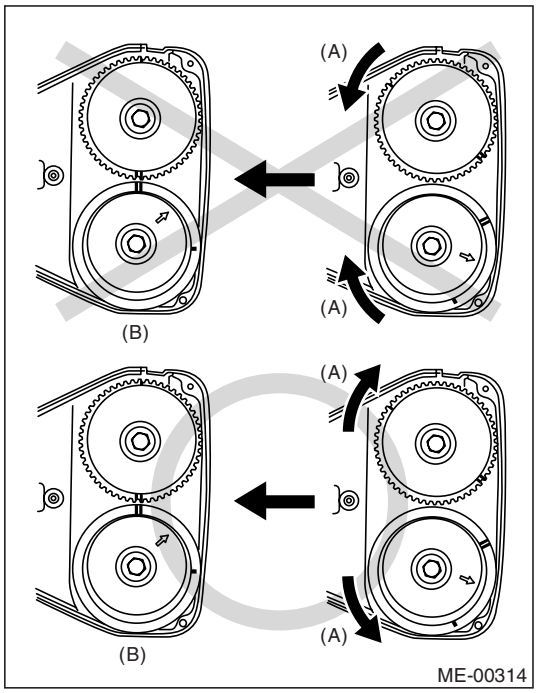
CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, none of cam on the camshafts push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed with the smallest possible angle, in order to prevent mutual interference of intake and exhaust valve heads.

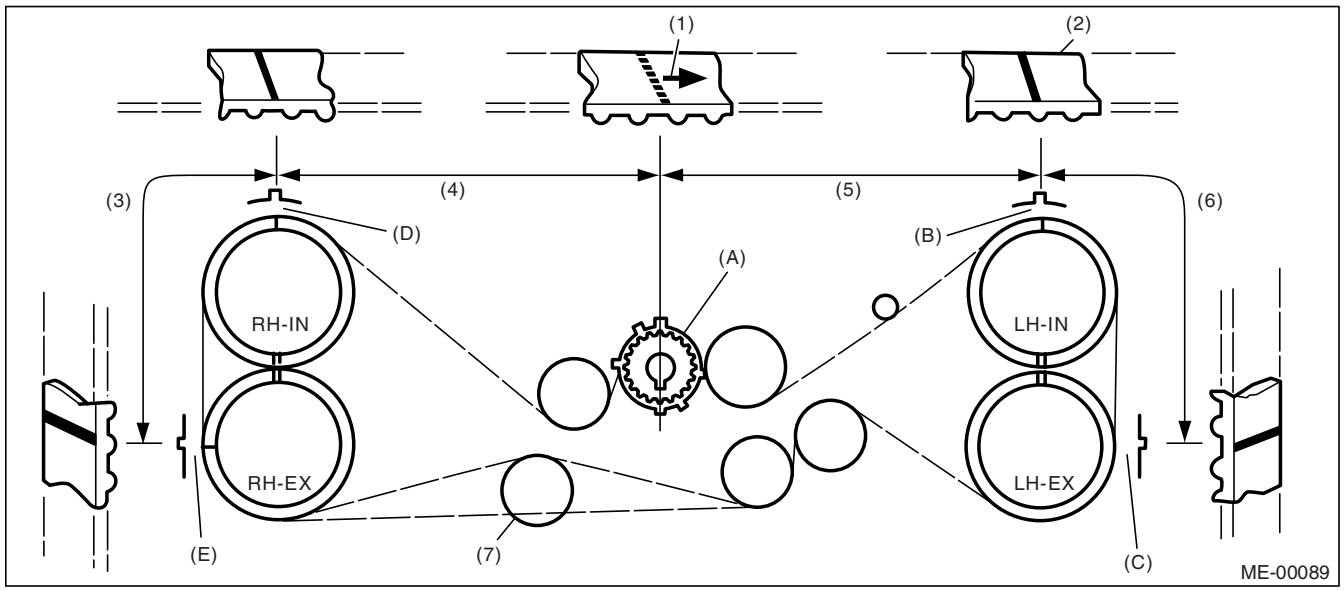
• Do not allow the camshafts to rotate in the direction shown in the figure of upper one. Doing this cause both the intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



(A) Revolving direction
(B) Timing belt installation position

3) Installation of timing belt:
Align the alignment marks on the timing belt with marks on the sprockets in the alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than one timing belt tooth may result in interference between valve and piston.
• Ensure the belt's rotating direction is correct.

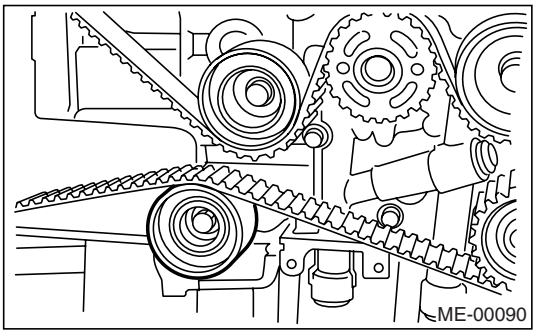


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end.

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)

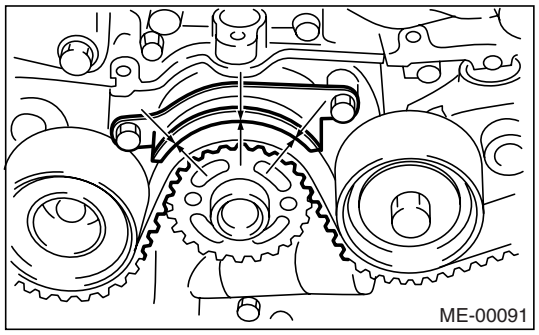
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

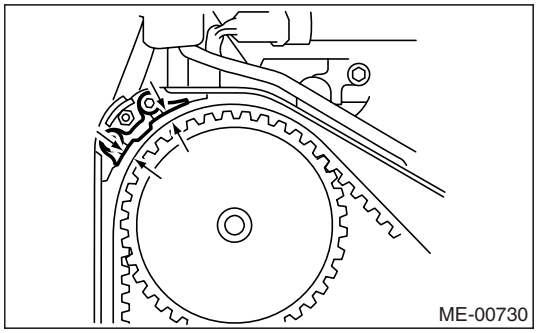


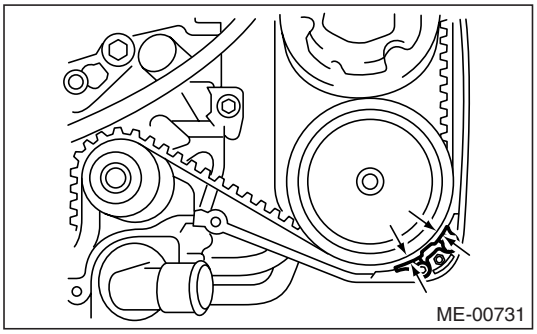
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

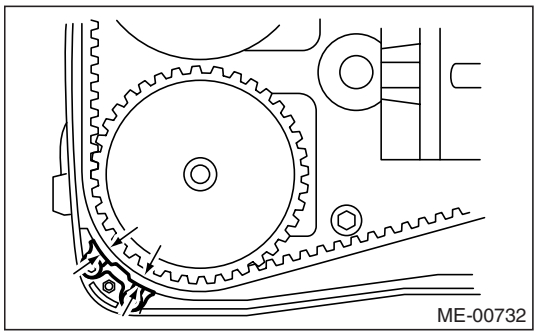
6) Install the timing belt guide.
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

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


ME-00091

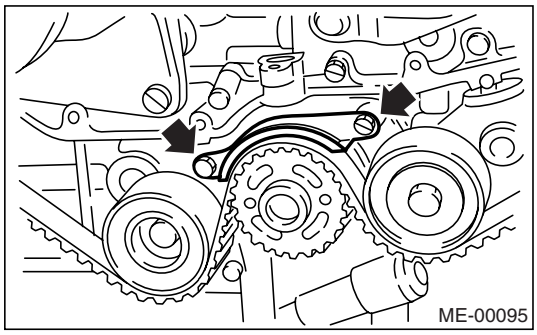

ME-00730


ME-00731

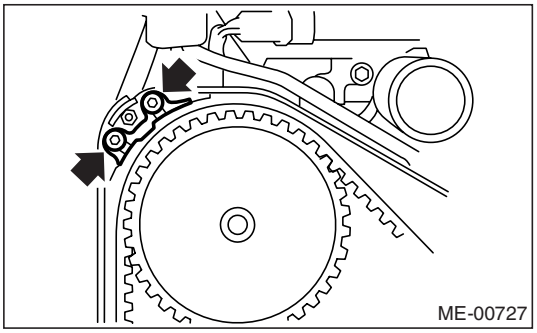

ME-00732

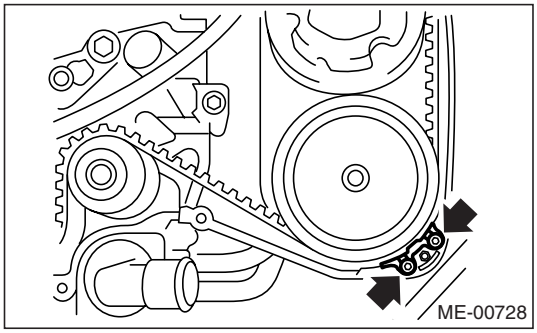
(3) Tighten the bolt.

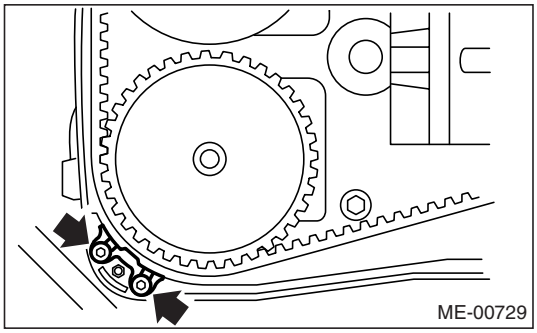
Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

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


ME-00727


ME-00728


ME-00729

7) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
8) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

9) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

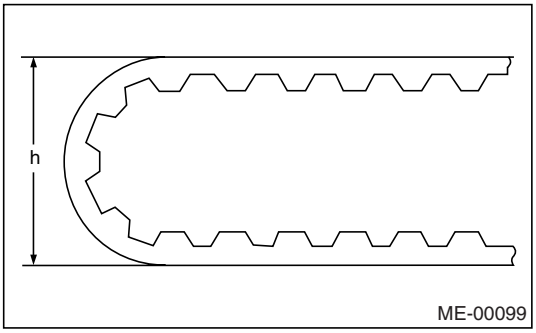
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the timing belt.
2) Check the condition of the backside of timing belt. If cracks are found, replace the timing belt.

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

In radial diameter h:
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear and scratches. If necessary, replace the automatic belt tension adjuster assembly.

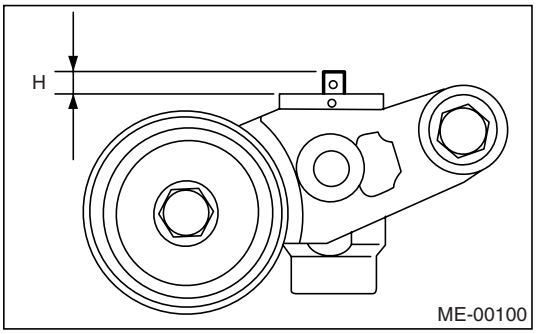
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lbf) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lbf), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this operation two to three times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lbf) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

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

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

Amount of rod protrusion H:
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

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

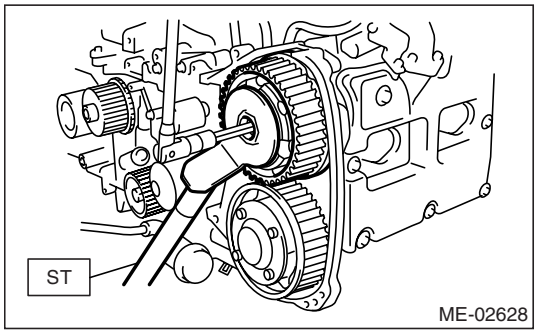
4. BELT IDLER

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

17.Cam Sprocket

A: REMOVAL

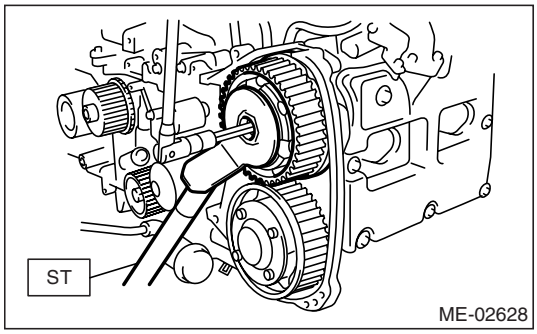
1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499977500 CAM SPROCKET WRENCH



B: INSTALLATION

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

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb), and then further tighten by 45°



2) Install the timing belt.
<Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt.>
3) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

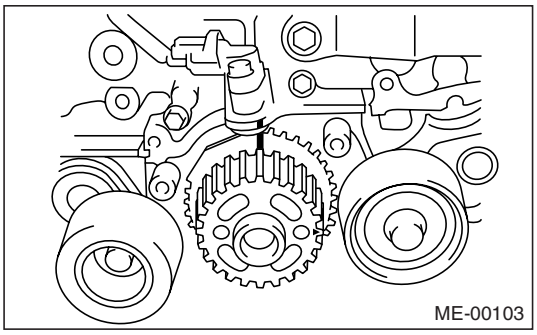
C: INSPECTION

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

18.Crank Sprocket

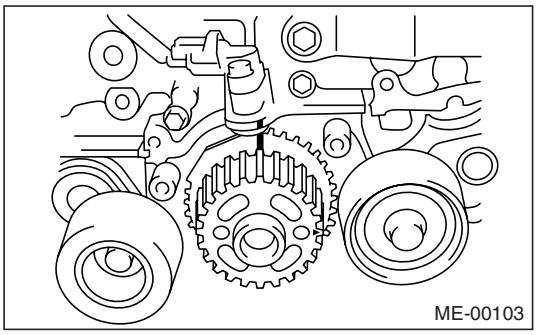
A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
5) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-54, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the cam sprocket.
<Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
3) Install the timing belt.
<Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt.>
4) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
5) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
6) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

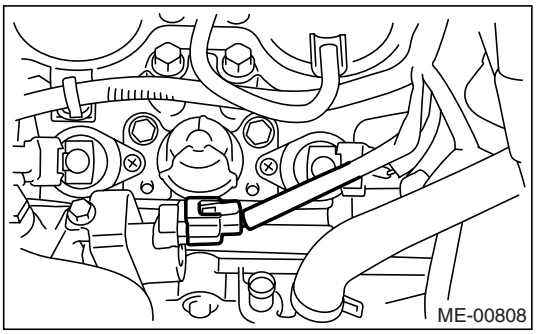
C: INSPECTION

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

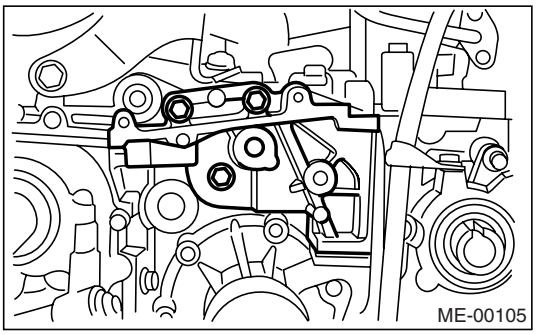
19.Camshaft

A: REMOVAL

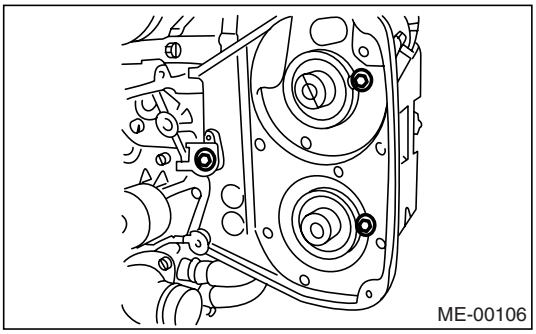
1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-54, REMOVAL, Cam Sprocket.>
6) Remove the crank sprocket. <Ref. to ME(H4DOTC)-55, REMOVAL, Crank Sprocket.>
7) Disconnect the oil flow control solenoid valve assembly connector.


ME-00808

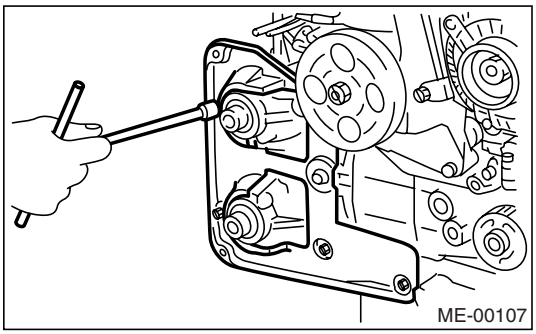
8) Remove the tensioner bracket.


ME-00105

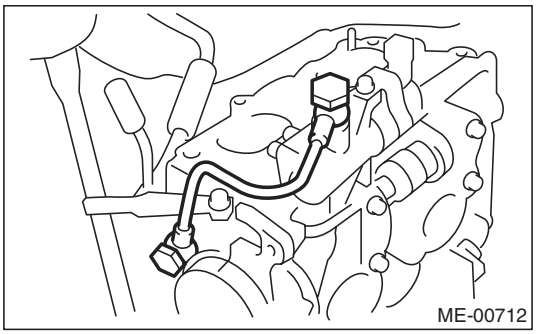
9) Remove the timing belt cover No. 2 (LH).


ME-00106

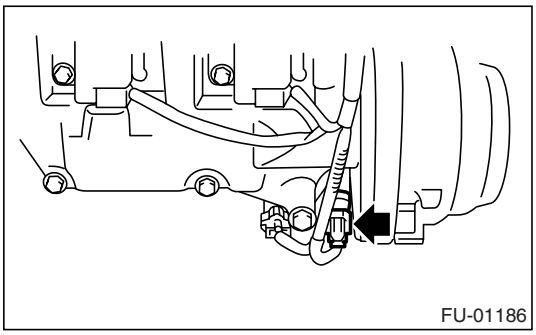
10) Remove the timing belt cover No. 2 (RH).


ME-00107

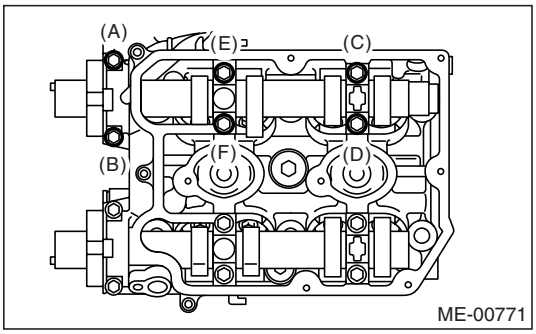
11) Remove the spark plug cords.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.


ME-00712

15) Remove the camshaft position sensor on exhaust side.

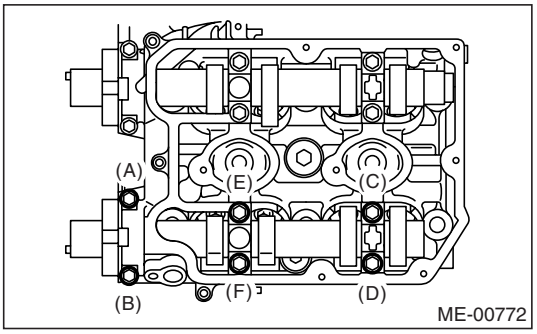

FU-01186

16) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00771

17) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the oil flow control solenoid valve assembly, intake camshaft cap and camshaft.
19) Remove the exhaust camshaft caps and camshaft.

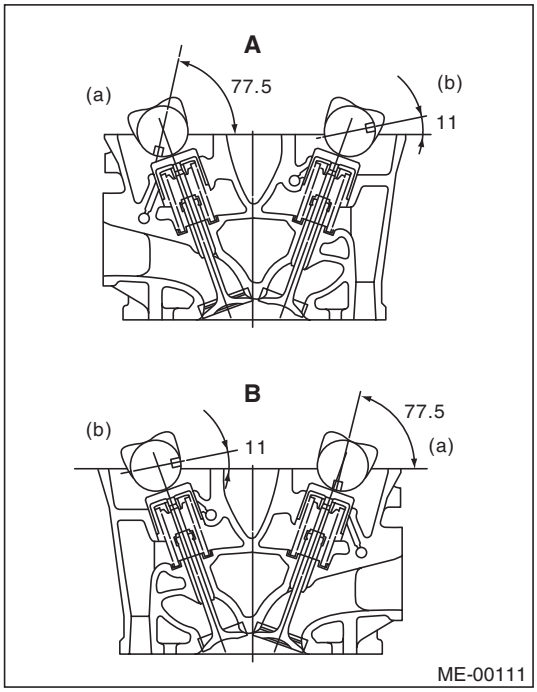
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

20) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation:
Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft RH need not be rotated when set at the position shown in the figure.
Intake camshaft (LH):
Rotate 80° clockwise.
Exhaust camshaft (LH):
Rotate 45° counterclockwise.



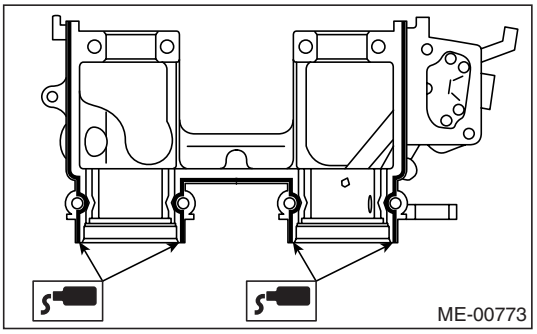
A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation:

(1) Apply small amount of liquid gasket to the cap mating surface.

NOTE:
Do not apply liquid gasket excessively. Otherwise, the excessive liquid gasket may come out and flow toward oil seal, resulting in oil leaks.

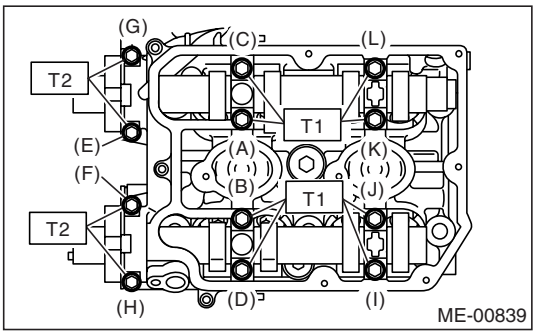
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(2) Apply engine oil to the cap bearing surface, and install the cap on camshaft as shown by identification mark.

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to the specified torque.

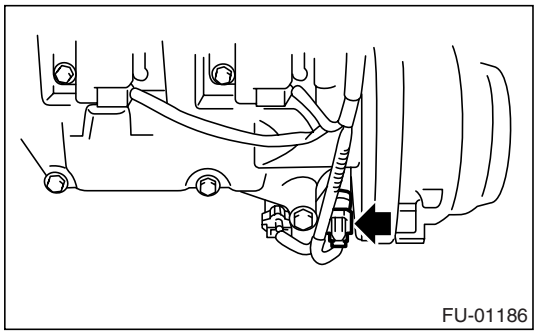
Tightening torque:
T1: 20 N·m (2.0 kgf-m, 14.8 ft-lb)
T2: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at “base circle”.

3) Install the camshaft position sensor on exhaust side.

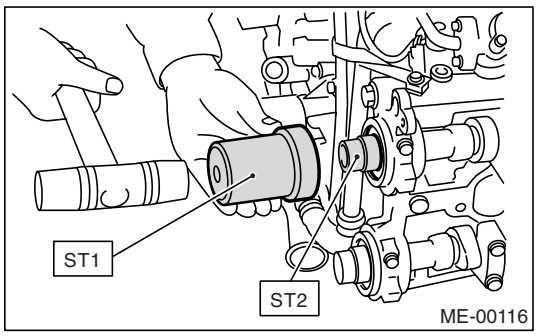
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Camshaft oil seal installation:
Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

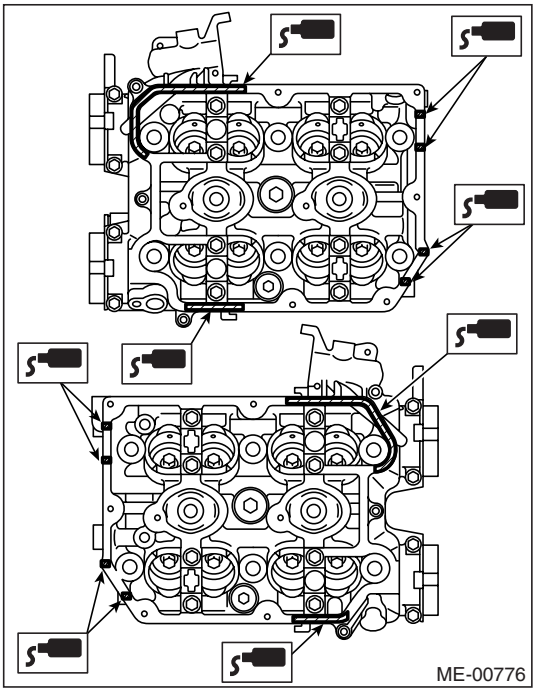
NOTE:
Use a new oil seal.

ST1	499587600	OIL SEAL INSTALLER
ST2	499597200	OIL SEAL GUIDE



5) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply liquid gasket to the designated point of cylinder head.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

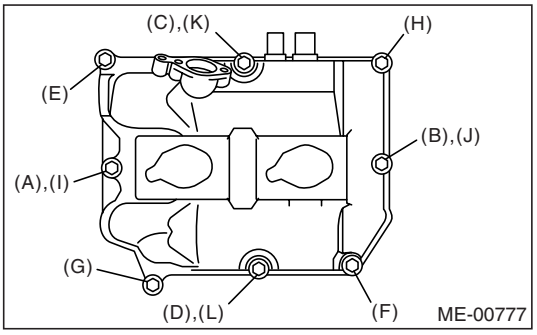


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

CAUTION:
Use a new rocker cover gasket.

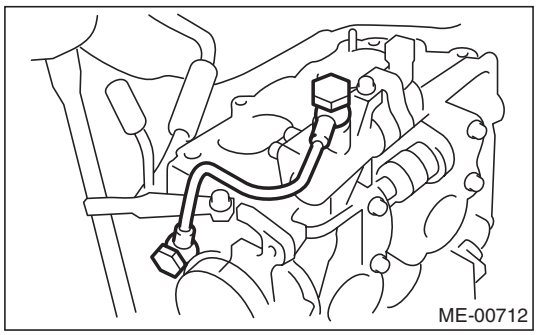
(4) Tighten the rocker cover tightening bolts in alphabetical sequence as shown in the figure, and then tighten to the specified torque.

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

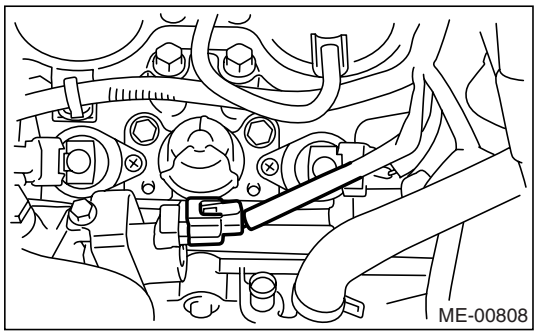


6) Install the oil pipe.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)

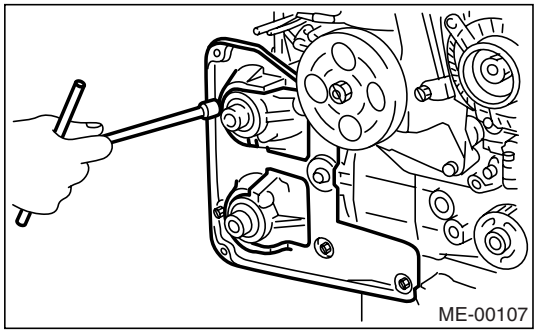


7) Connect the oil flow control solenoid valve connector.



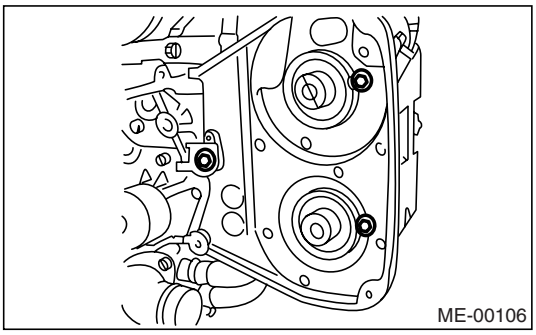
8) Install the spark plug cord.
9) Similarly, install the parts on RH side.
10) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



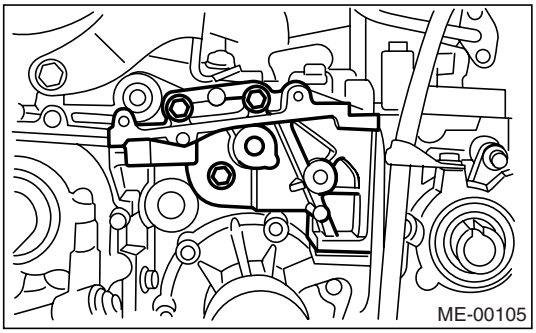
11) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



12) Install the tensioner bracket.

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

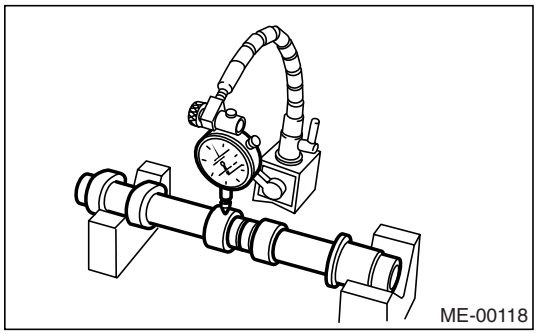


13) Install the crank sprocket.
<Ref. to ME(H4DOTC)-55, INSTALLATION, Crank Sprocket.>
14) Install the cam sprocket.
<Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
15) Install the timing belt. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt.>
16) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
17) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
18) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

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

Specification:
0.020 mm (0.0008 in) or less

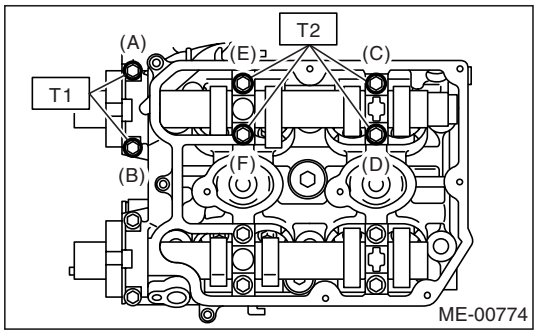


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Specification mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1797)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence as shown in the figure, and then tighten to the specified torque. Do not turn the camshaft.

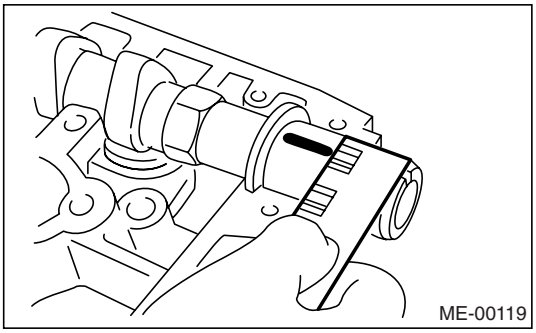
Tightening torque:
T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the bearing caps.

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

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



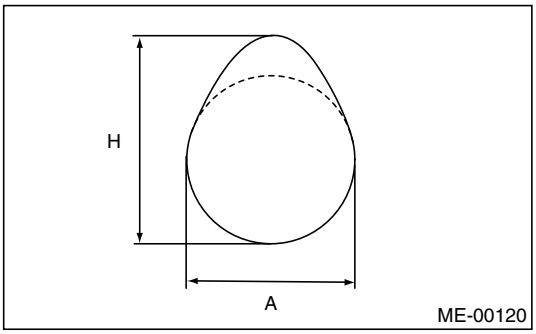
(7) Completely remove the plastigauge.

5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the standard or offset wear occurs, replace it.

Cam height H:

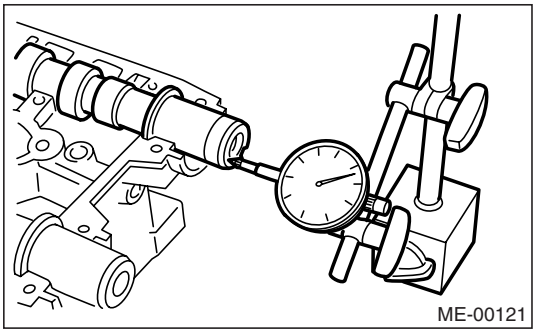
Standard
Intake
45.85 — 45.95 mm (1.805 — 1.809 in)
Exhaust
45.75 — 45.85 mm (1.801 — 1.805 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the side clearance of camshaft with dial gauge. If the side clearance exceeds the standard or offset wear occurs, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

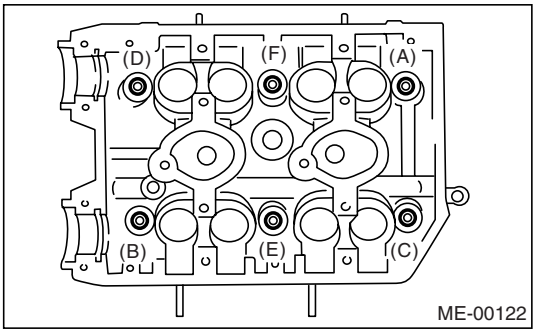
Standard:
0.068 — 0.116 mm (0.0027 — 0.0046 in)



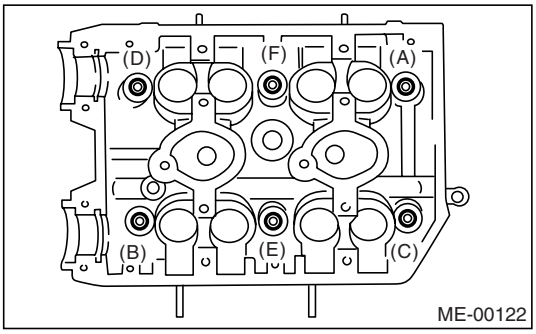
20.Cylinder Head

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt.
<Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
5) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-54, REMOVAL, Cam Sprocket.>
6) Remove the intake manifold.
<Ref. to FU(H4DOTC)-12, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(H4DOTC)-56, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

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

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

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

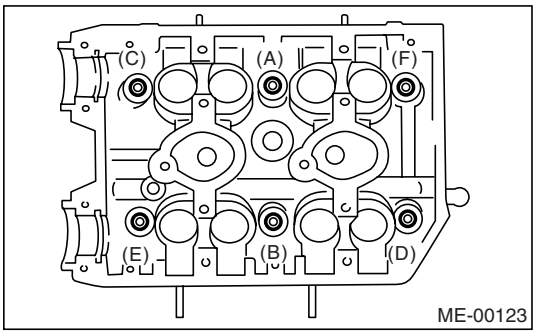
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder head and cylinder block.**

2) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 21.4 ft-lb) in alphabetical sequence.
(3) Retighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(4) Loosen all the bolts by 180° in the reverse order of installation, and loosen them again by 180°.
(5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
(6) Tighten all bolts by 80 — 90° in alphabetical sequence.
(7) Tighten all bolts by 40 — 45° in alphabetical sequence.

CAUTION:
Do not tighten the bolts more than 45°.

(8) Further tighten bolts (A) and (B) by 40 — 45°.

CAUTION:
Ensure the total "re-tightening angle" in the [former two steps] does not exceed 90°.



3) Install the camshaft. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold.
<Ref. to FU(H4DOTC)-14, INSTALLATION, Intake Manifold.>

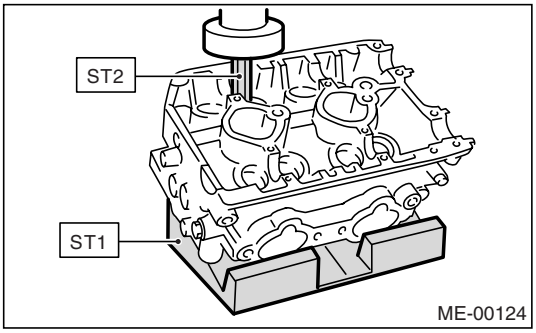
6) Install the cam sprocket.
<Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
7) Install the timing belt.
<Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt.>
8) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
9) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
10) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: DISASSEMBLY

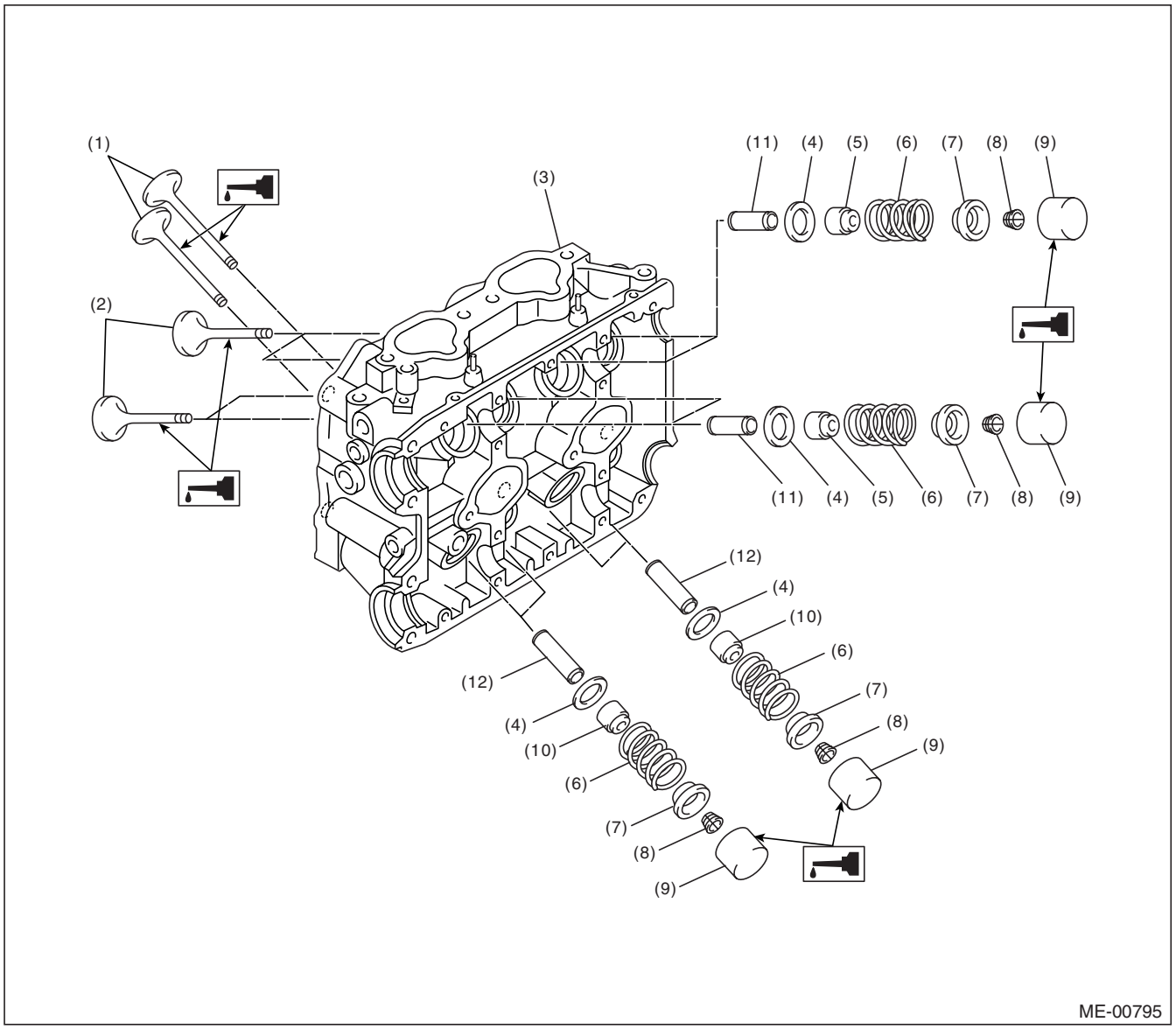
1) Remove the valve lifter.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Keep all the removed parts in order for re-installing in their original positions.

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



D: ASSEMBLY



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

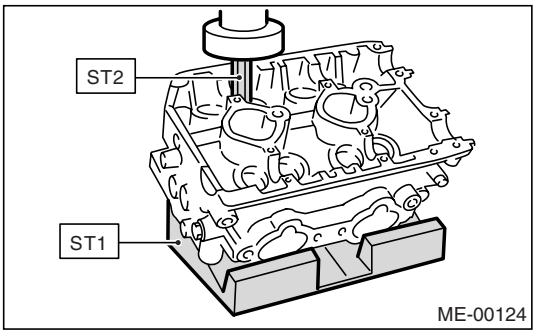
1) Installation of valve spring and valve
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

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

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring and install the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.

2) Apply oil to the surfaces of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

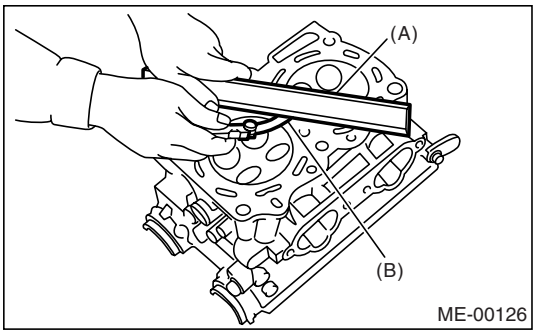
1) Make sure that crack or other damages do not exist. In addition to visual inspection, inspect important areas using liquid penetrant tester.
2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).
If the warping exceeds the limit, regrind the surface with a surface grinder.

Warping limit:
0.035 mm (0.0014 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



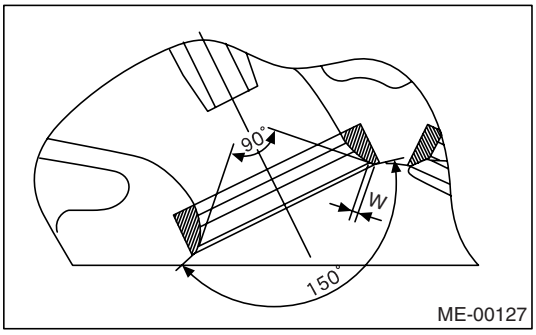
2. VALVE SEAT

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

Valve seat width W:

Intake
Standard
0.6 — 1.4 mm (0.024 — 0.055 in)

Exhaust
Standard
1.2 — 1.8 mm (0.047 — 0.071 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outer diameter of valve stem and inner diameter of valve guide 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)

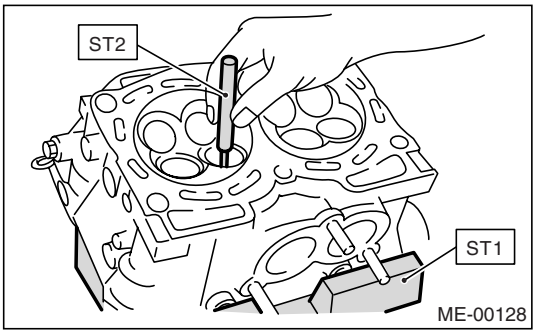
2) If the clearance between valve guide and stem exceeds the standard, replace the valve guide or valve itself whichever shows greater amount of wear or damage, etc. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6,000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameter:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

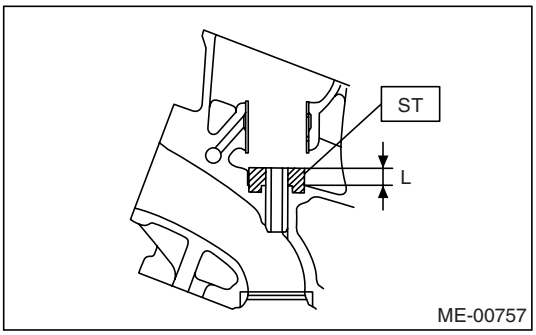
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



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

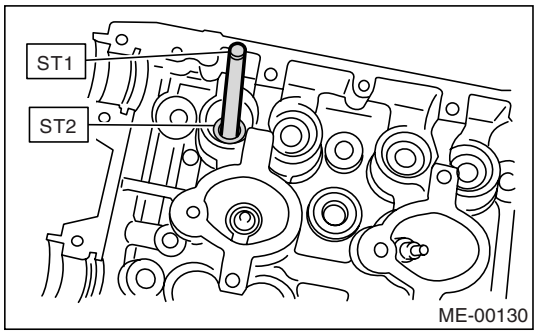
ST 18251AA020 VALVE GUIDE ADJUSTER



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

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

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

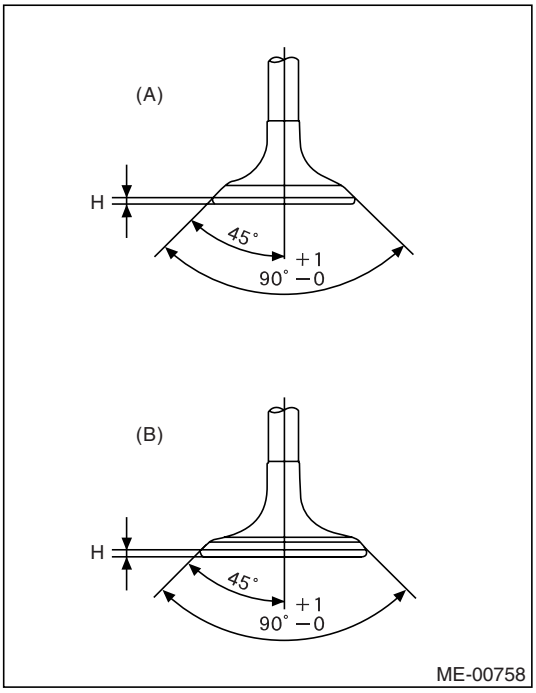
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn or deformed, or if "H" exceeds the standard or offset wear occurs.

Head edge thickness H:
Intake (A)
Standard
1.0 — 1.4 mm (0.039 — 0.055 in)
Exhaust (B)
Standard
1.3 — 1.7 mm (0.051 — 0.067 in)

Valve overall length:
Intake (A)
104.4 mm (4.110 in)
Exhaust (B)
104.65 mm (4.1201 in)

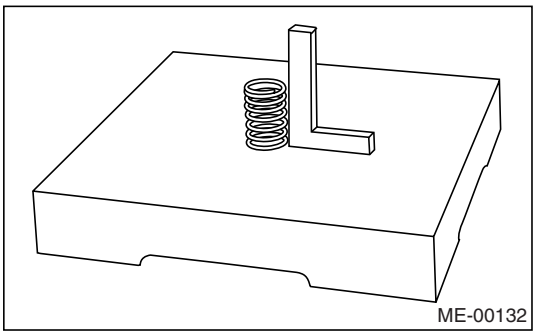


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRING

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

Free length mm (in)		44.67 (1.759)
Tension/spring height N (kgf, lbf)/mm (in)	Set	206 — 236 (21.0 — 24.1, 46.3 — 53.1)/36.0 (1.417)
	Lift	485 — 537 (21.0 — 24.1, 109 — 121)/26.6 (1.047)
Squareness		2.5°, 2.0 mm (0.079 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

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

1) Place the cylinder head on ST1.

2) Press-fit the oil seal to the specified dimension indicated in the figure using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

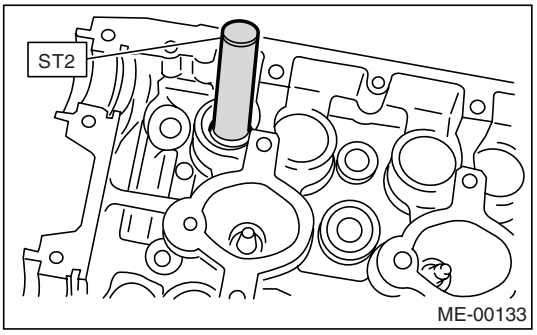
NOTE:

- Apply engine oil to oil seal before force-fitting.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:

Intake [Gray]

Exhaust [Green]



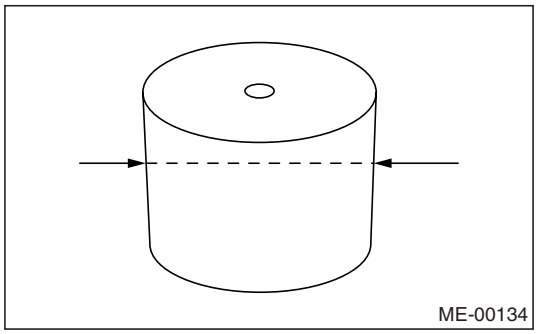
7. VALVE LIFTER

1) Check the valve lifter visually.

2) Measure the outer diameter of valve lifter.

Outer diameter:

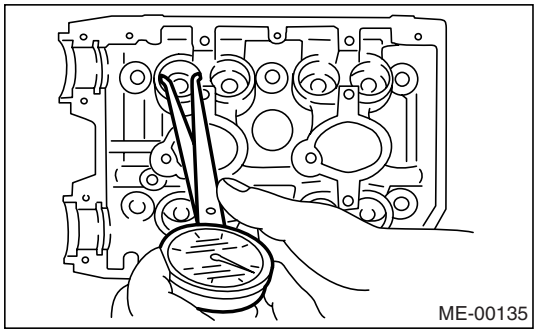
34.959 — 34.975 mm (1.3763 — 1.3770 in)



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

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part exceeds the standard or offset wear occurs, replace the cylinder head.

Standard:

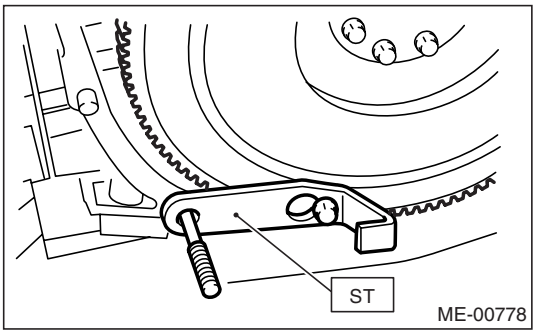
0.019 — 0.057 mm (0.0007 — 0.0022 in)

21.Cylinder Block

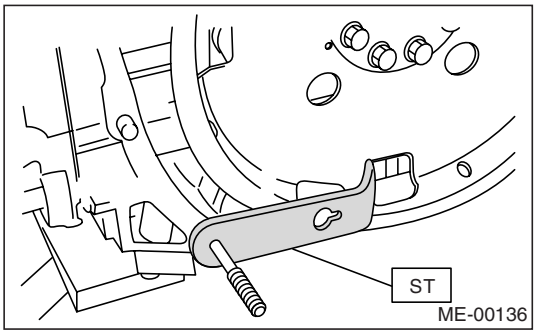
A: REMOVAL

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

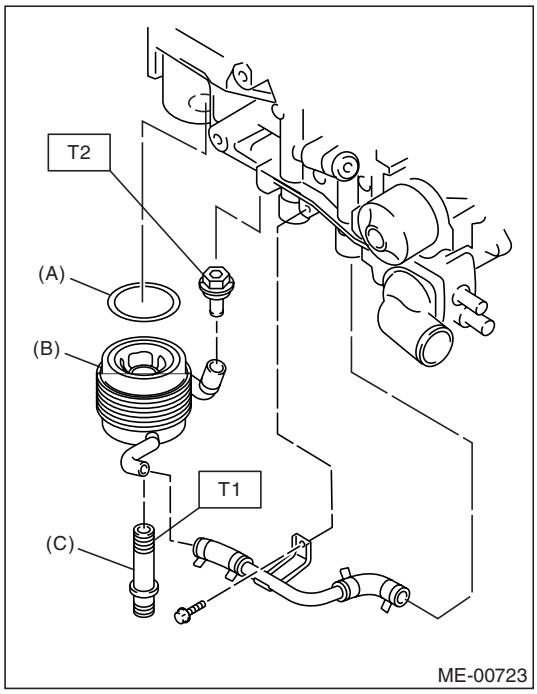
1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-12, REMOVAL, Intake Manifold.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
3) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt.
<Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
6) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-54, REMOVAL, Cam Sprocket.>
7) Remove the crank sprocket.
<Ref. to ME(H4DOTC)-55, REMOVAL, Crank Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head.
<Ref. to ME(H4DOTC)-62, REMOVAL, Cylinder Head.>
10) Remove the clutch disc and cover. (MT model)
<Ref. to CL-16, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model)
<Ref. to CL-16, REMOVAL, Clutch Disc and Cover.>
ST 498497100 CRANKSHAFT STOPPER



12) Remove the drive plate. (AT model)
Use the ST to lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the water pump.
16) Remove the oil filter.
17) Remove the oil cooler. (MT model)

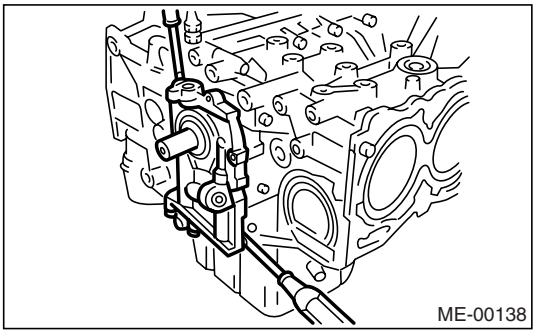


(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

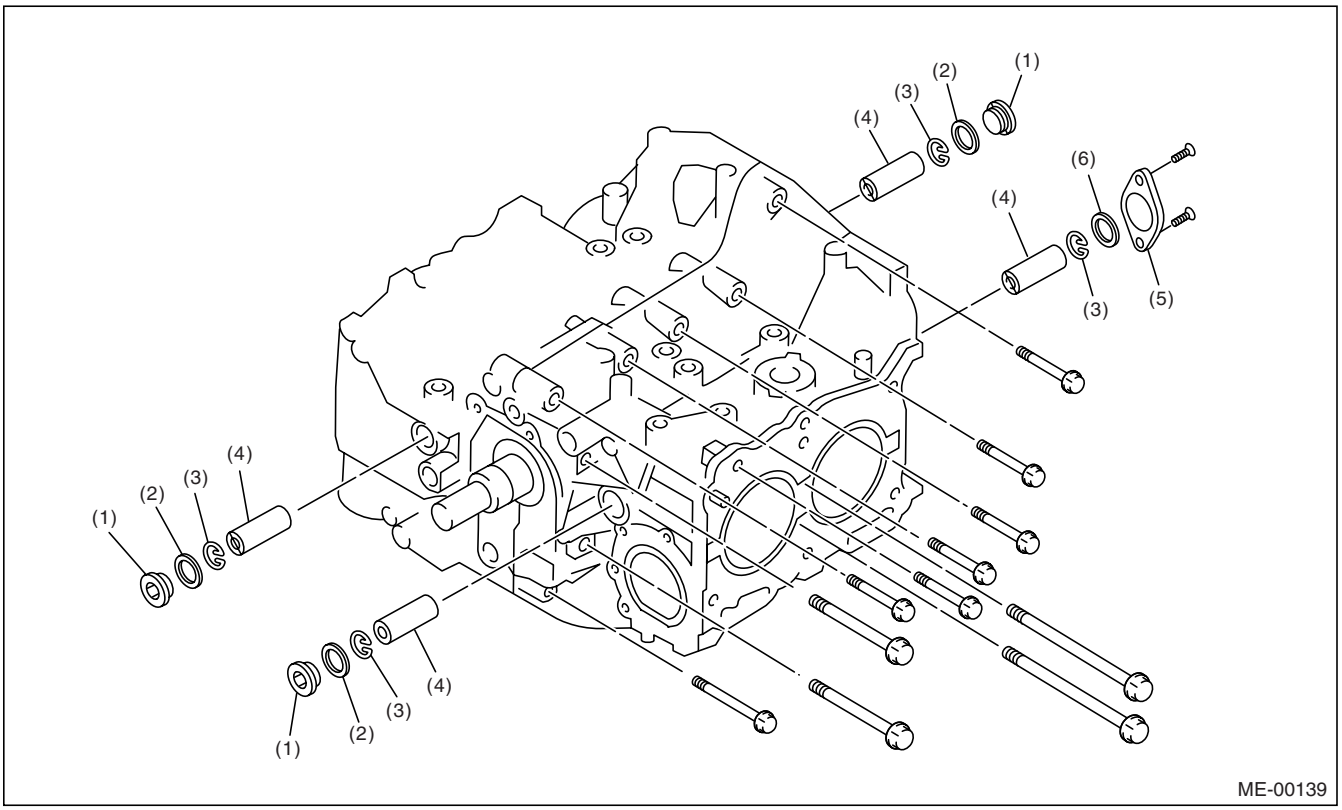
18) Removal of oil pan:
(1) Place the #2 and #4 cylinder side upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan. Do not use a screwdriver or similar tools in place of oil pan cutter.

19) Remove the oil pump from cylinder block using flat tip screwdriver.

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

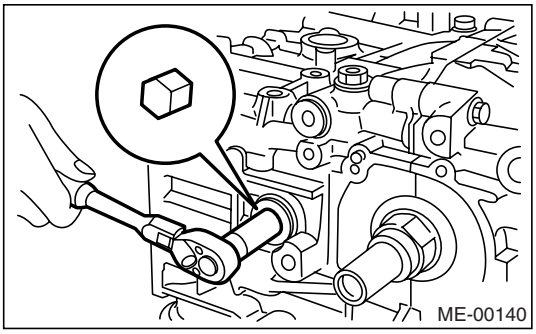


20) Remove the oil strainer stay.
21) Remove the oil strainer.
22) Remove the baffle plate.
23) Remove the water pipe.

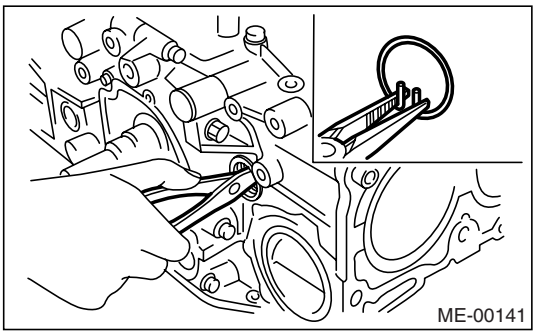


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring

24) Remove the service hole cover and service hole plugs using a hexagon wrench [14 mm].



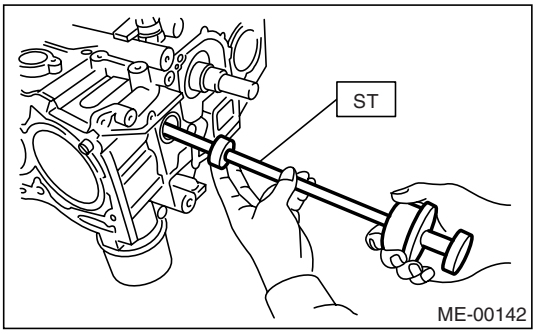
25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.



26) Draw out the piston pins from #1 and #2 pistons using ST.

ST	499097600	PISTON PIN REMOVER ASSY (MT MODEL)
ST	499097700	PISTON PIN REMOVER ASSY (EXCEPT FOR MT MODEL)

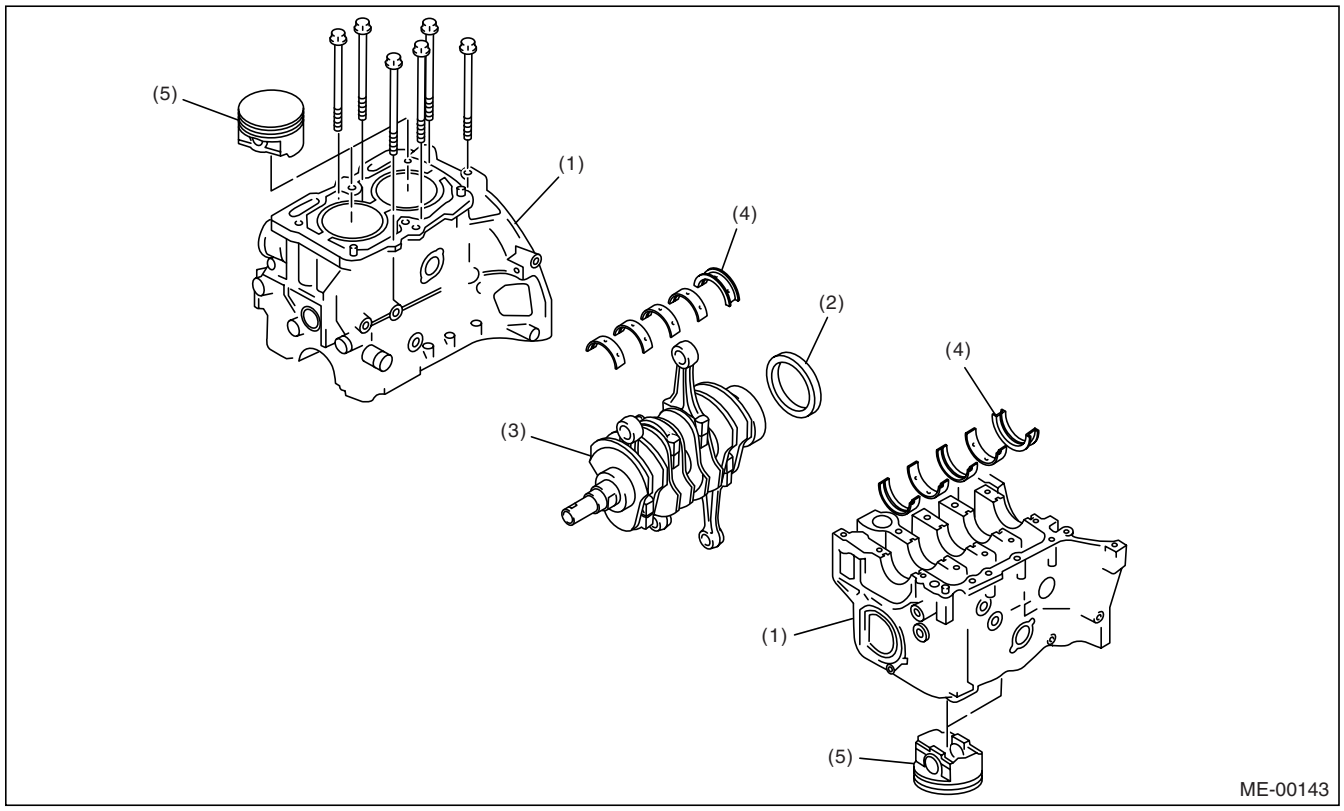
NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.
28) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
29) Loosen the bolts which connect cylinder block on the side of #1 and #3 cylinders for two or three turns.
30) Place the cylinder block to face the #1 and #3 cylinder side upward, and remove cylinder block connecting bolts.

31) Separate the cylinder block (LH) and (RH).

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



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

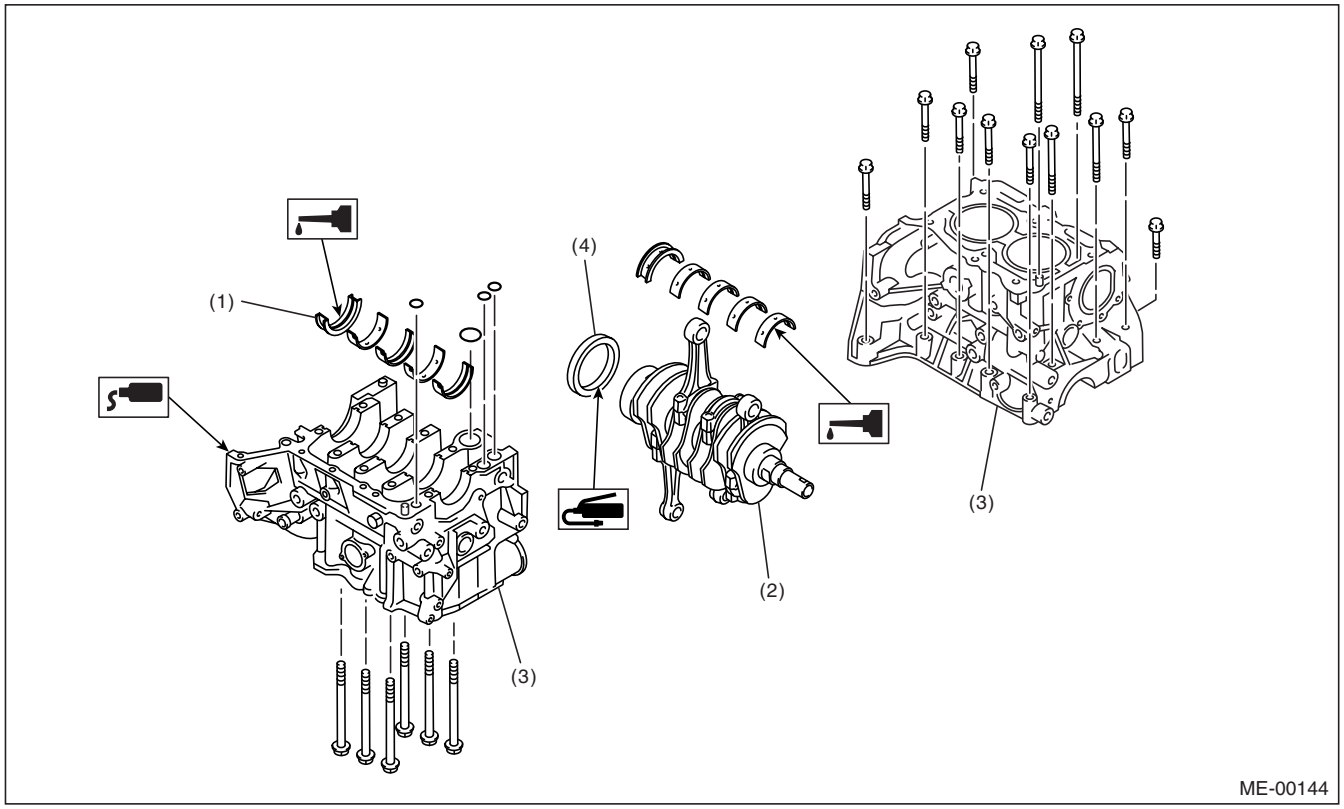
32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

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

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

NOTE:
Be careful not to confuse the original combination of piston and cylinder.

B: INSTALLATION

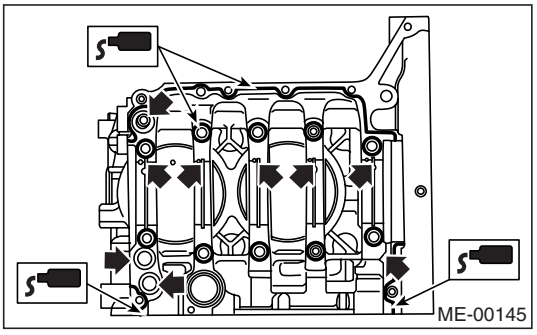


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil on the mating surface of bearing and cylinder block before installation. Apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on the #2 and #4 cylinder block.
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

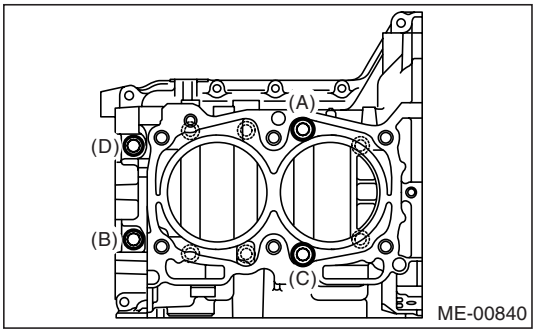
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

NOTE:
Do not allow liquid gasket to run over to O-ring grooves, oil passages, bearing grooves, etc.



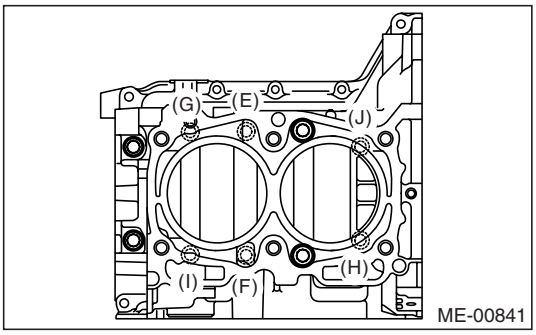
4) Apply a coat of engine oil to washers and bolt threads.
5) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



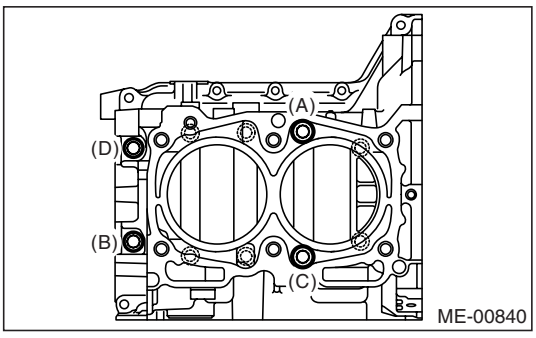
6) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



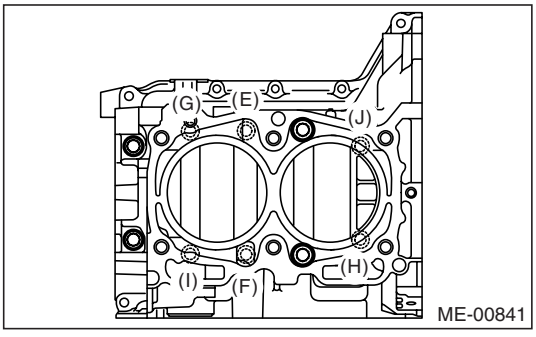
7) Further tighten the LH side bolts (A — D) in alphabetical sequence.

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

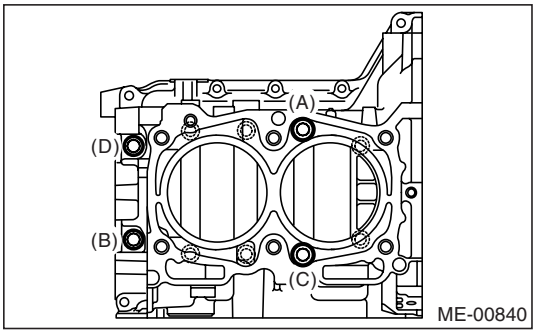


8) Further tighten the RH side bolts (E — J) in alphabetical sequence.

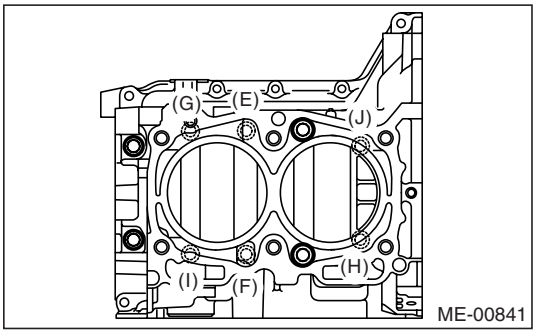
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Further tighten the LH side bolts by 90° for (A) and (C), and to 40 N·m (4.1 kgf-m, 29.5 ft-lb) for (B) and (D), in alphabetical sequence.

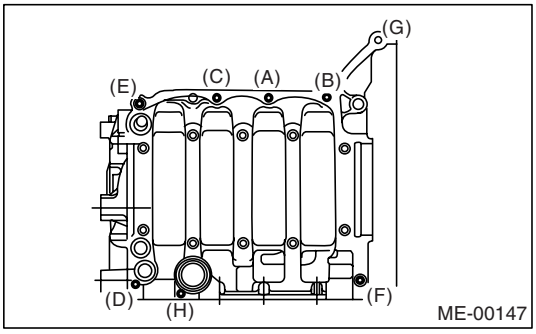


10) Further tighten the RH side bolts (E — J) by 90° in alphabetical sequence.



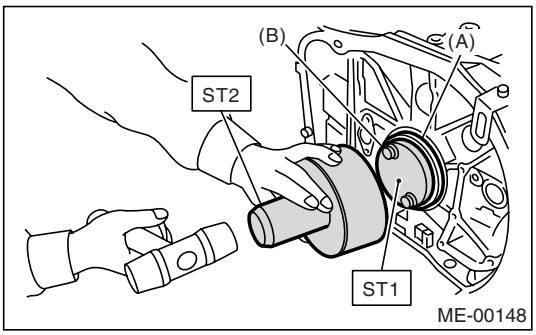
11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



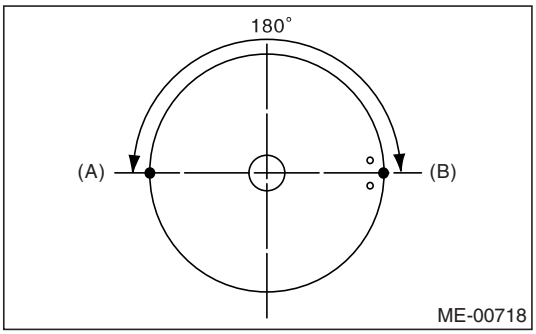
12) Install the rear oil seal using ST1 and ST2.

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

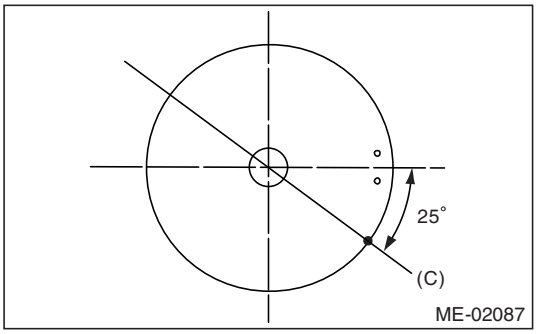


(A) Rear oil seal
(B) Flywheel attaching bolt

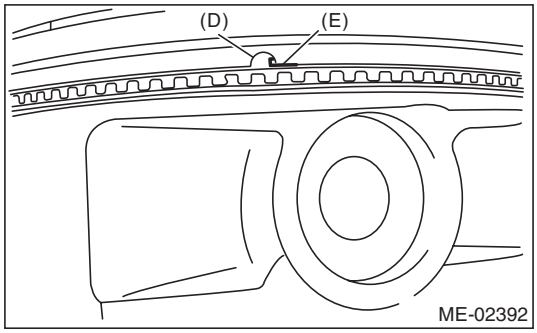
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



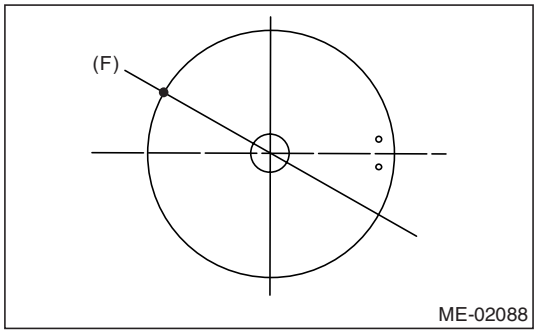
15) Position the upper rail gap at (C) in the figure.



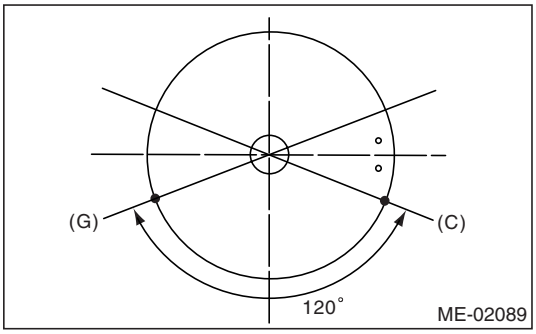
16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



17) Position the expander gap at 180° on the reverse side of (C) that shown (F) in the figure.



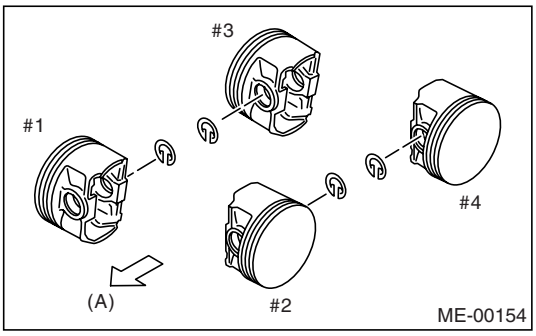
18) Position the lower rail gap at 120° clockwise of (C) that shown (G) in the figure.



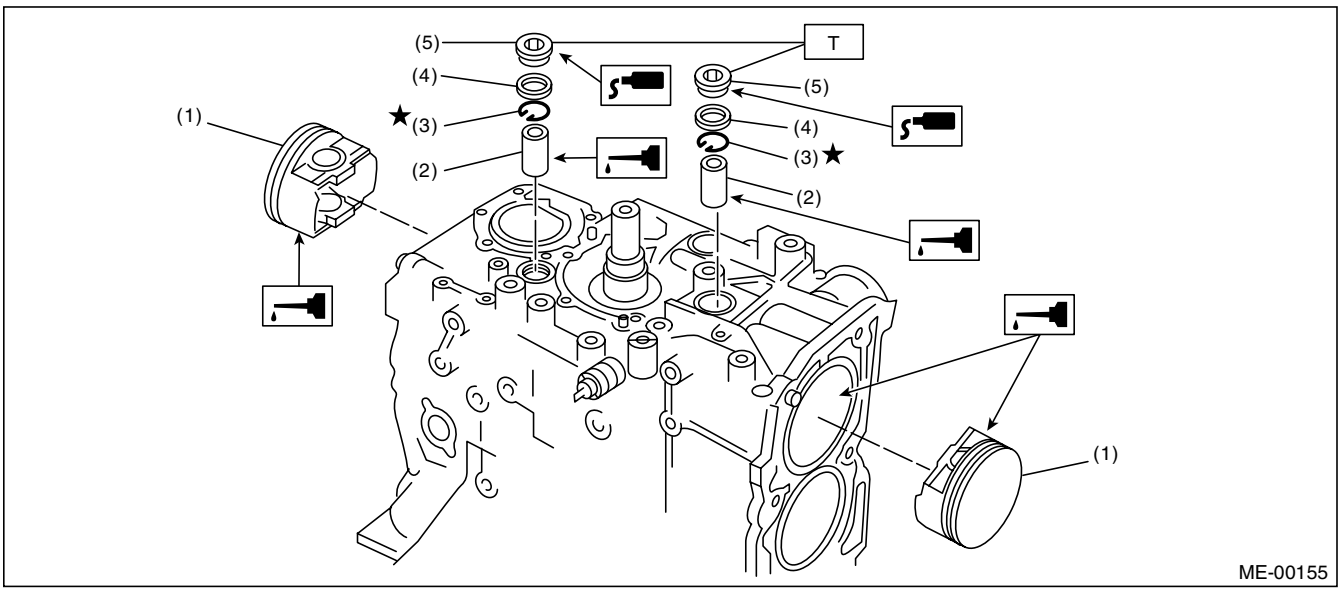
CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

19) Install the snap ring.
Install snap rings in the piston holes located opposite to the service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new snap rings.



(A) Forward



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

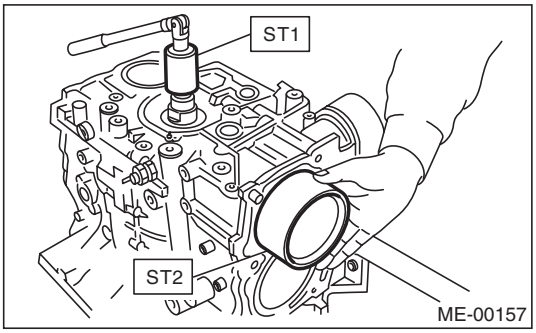
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

20) Installation of piston:
(1) Place the #1 and #2 cylinder side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

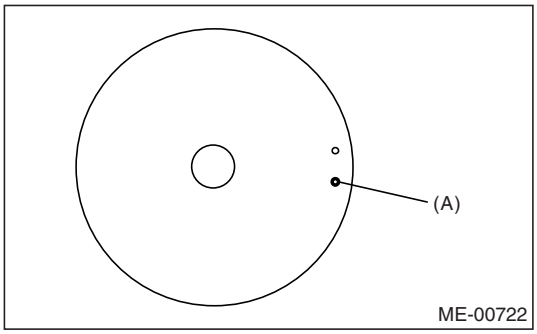
ST1 499987500 CRANKSHAFT SOCKET

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

ST2 398744300 PISTON GUIDE



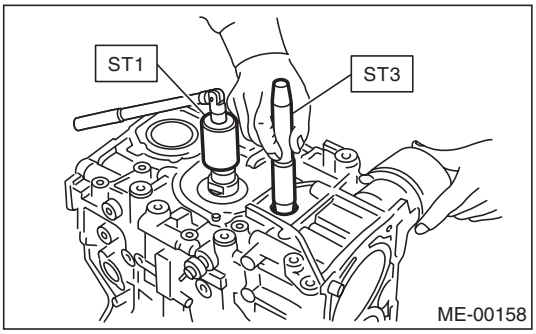
NOTE:
Piston front mark faces towards the front of engine.



(A) Front mark

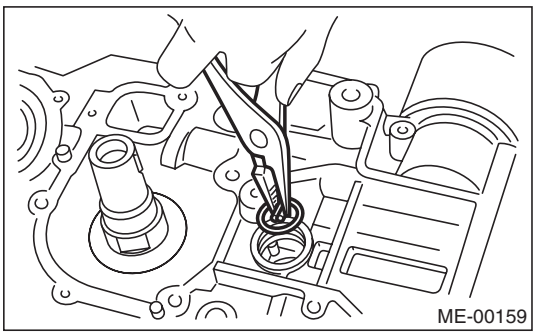
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3 before insertion, and then insert it into the service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



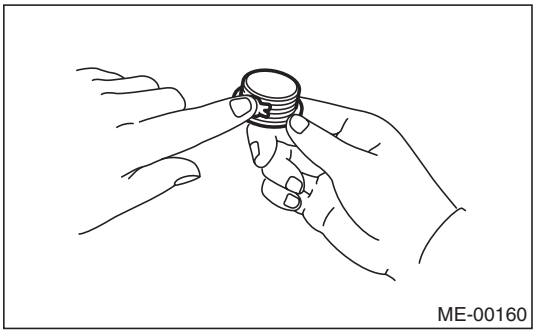
(2) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(3) Install the snap ring.

NOTE:
Use new snap rings.



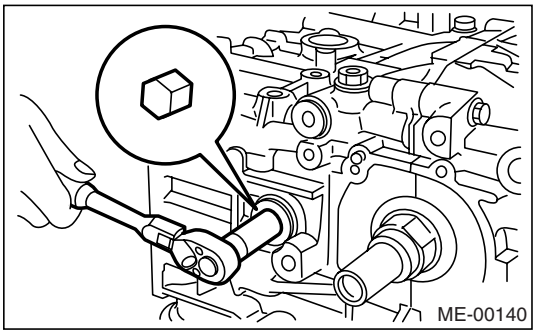
(4) Apply liquid gasket around the service hole plug.

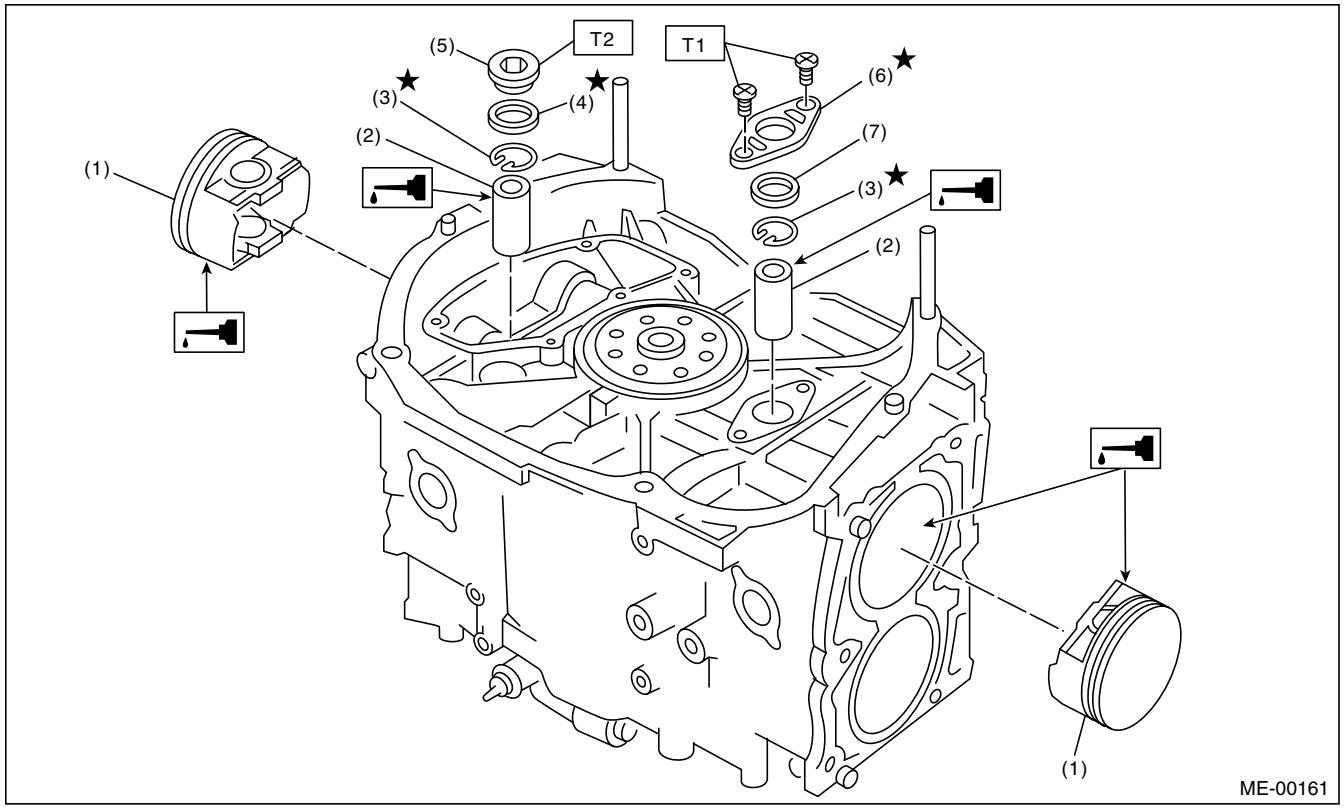
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.6)

(6) Place the #3 and #4 cylinder side upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

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

24) Install the oil strainer and O-ring.

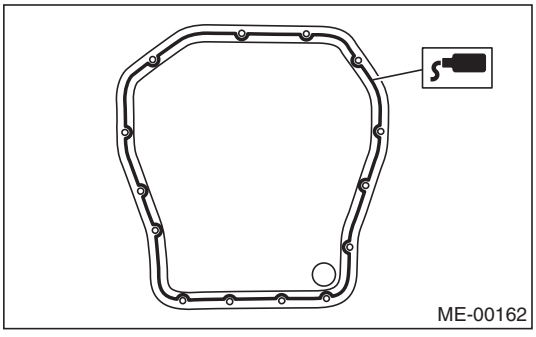
Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

25) Install the oil strainer stay.

26) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

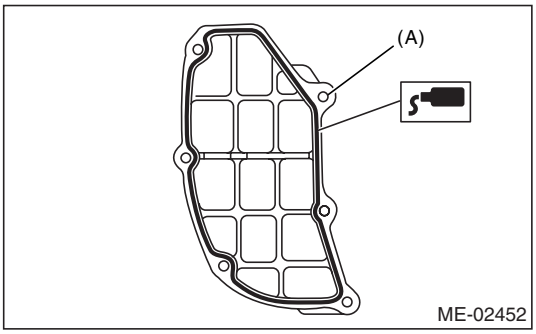


27) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure, and then install the oil separator cover.

NOTE:
Install them within 20 min. from applying liquid gasket.

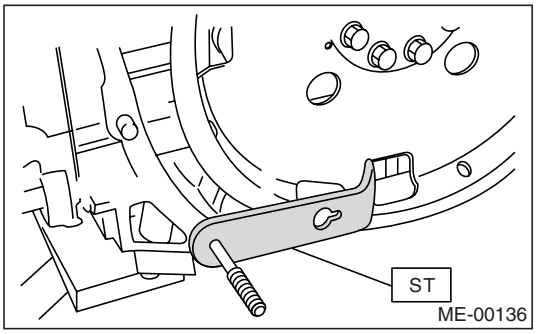
Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

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



28) Install the drive plate. (AT model)
To lock the crankshaft, use the ST.
ST 498497100 CRANKSHAFT STOPPER

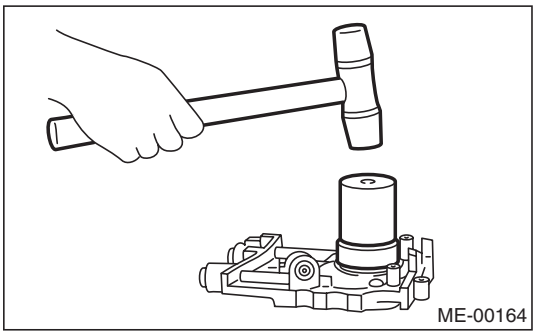
Tightening torque:
72 N·m (7.3 kgf-m, 53.1 ft-lb)



29) Install the flywheel. (MT model) <Ref. to CL-21, INSTALLATION, Flywheel.>
30) Install the clutch disk and cover. (MT model) <Ref. to CL-16, INSTALLATION, Clutch Disc and Cover.>

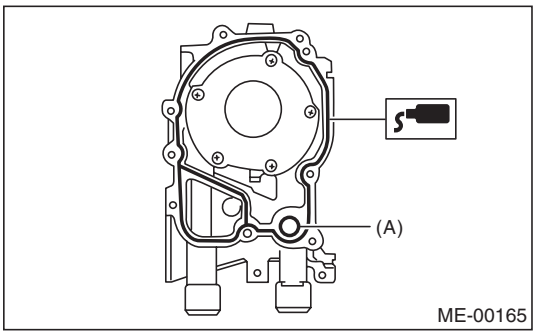
31) Installation of oil pump
(1) Install the front oil seal using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new front oil seal.



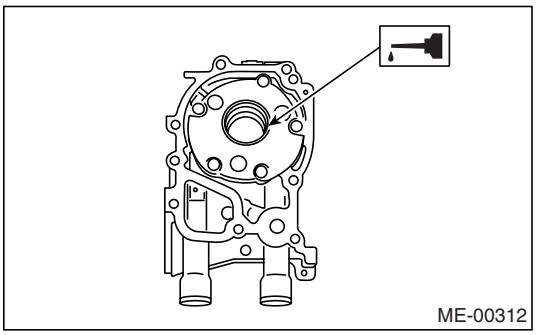
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

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



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

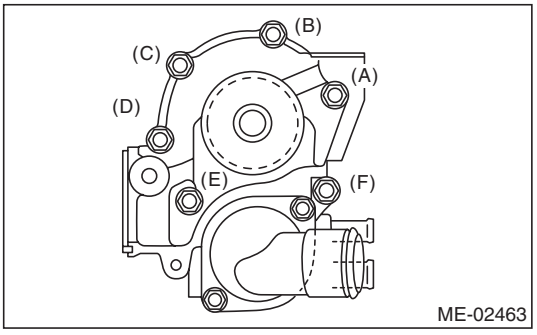
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

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

32) Install the water pump and gasket.

Tightening torque:
First: 12 N·m (1.2 kgf-m, 8.9 ft-lb)
Second: 12 N·m (1.2 kgf-m, 8.9 ft-lb)

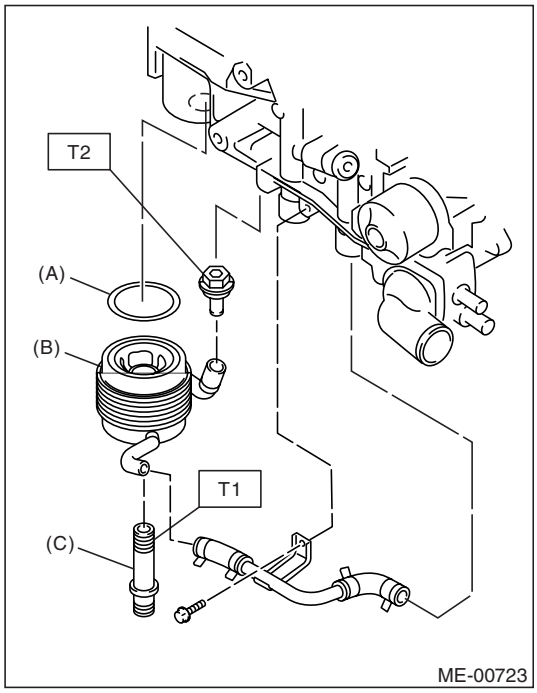
CAUTION:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



33) Install the water by-pass pipe for heater.

34) Install the oil cooler. (MT model)

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 39.8 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.9 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

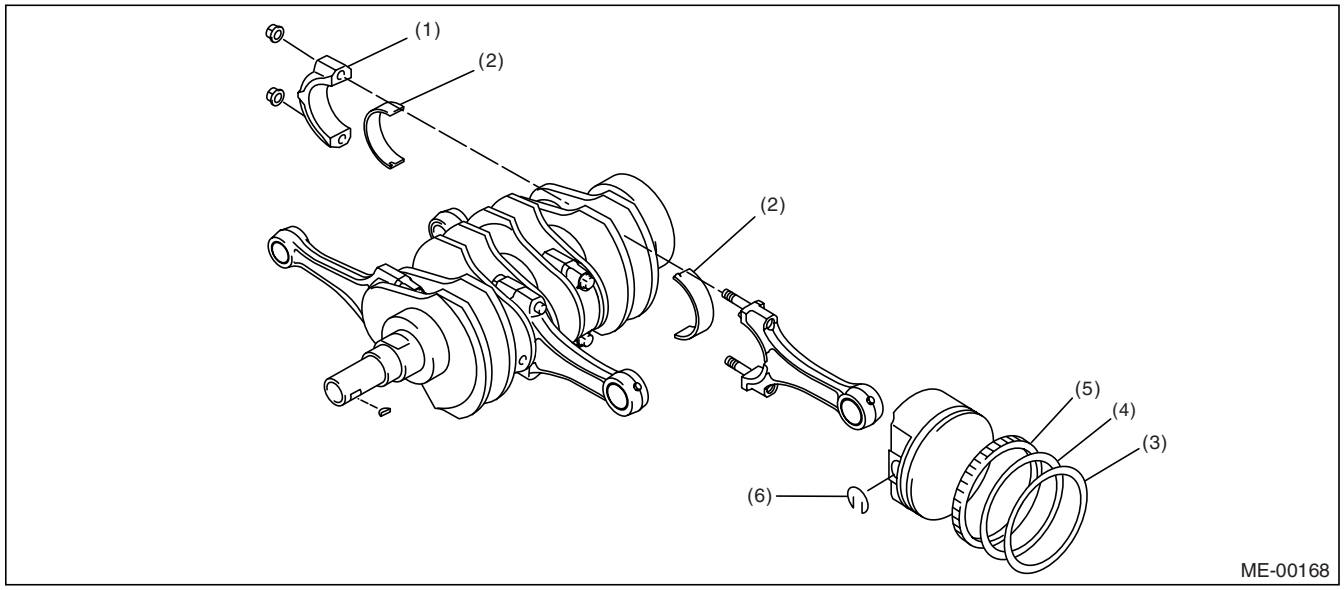
35) Install the oil filter.
36) Install the water by-pass pipe between oil cooler and water pump.
37) Install the water pipe.

NOTE:
Always use new O-rings.

38) Install the cylinder head.
<Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>
39) Install the oil level gauge guide. (LH side)
40) Install the rocker cover.
41) Install the crank sprocket. <Ref. to ME(H4DOTC)-55, INSTALLATION, Crank Sprocket.>
42) Install the cam sprocket.
<Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
43) Install the timing belt.
<Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt.>
44) Install the timing belt cover.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>

45) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
46) Install the generator and A/C compressor brackets on cylinder head.
47) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>
48) Install the intake manifold.
<Ref. to FU(H4DOTC)-14, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



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

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

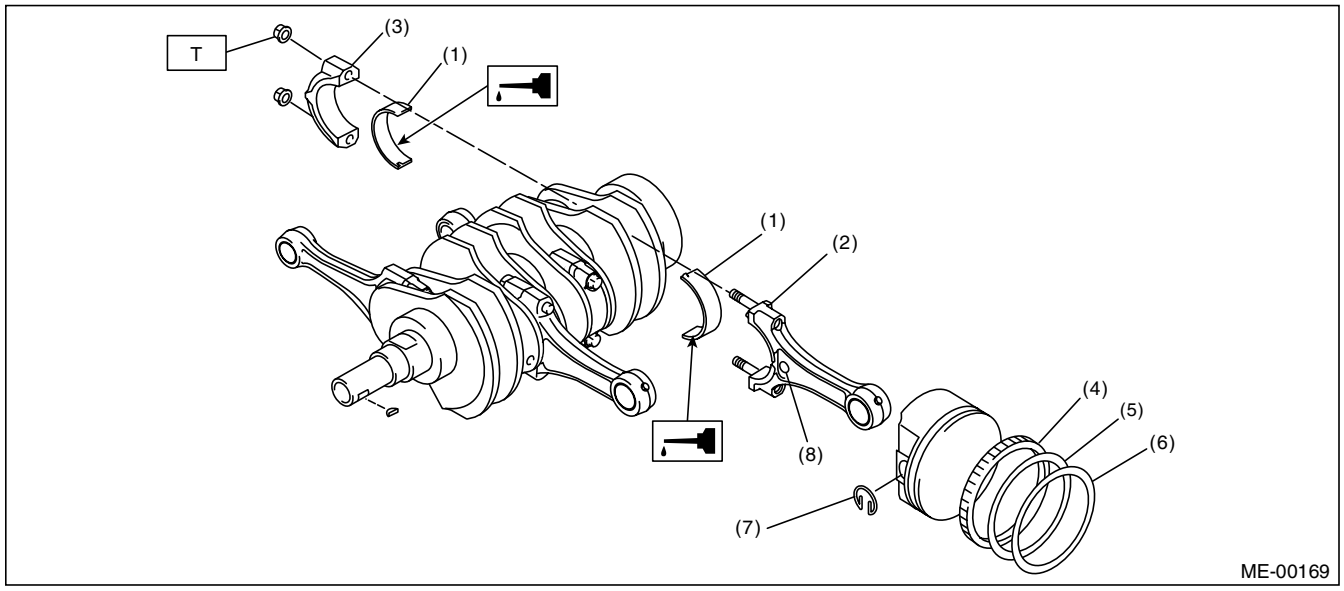
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

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

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

5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33.3)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

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

3) Install the connecting rod cap.
Ensure the arrow mark on connecting rod cap facing front during installation.

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

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

E: INSPECTION

1. CYLINDER BLOCK

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

Warping limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.004 in)

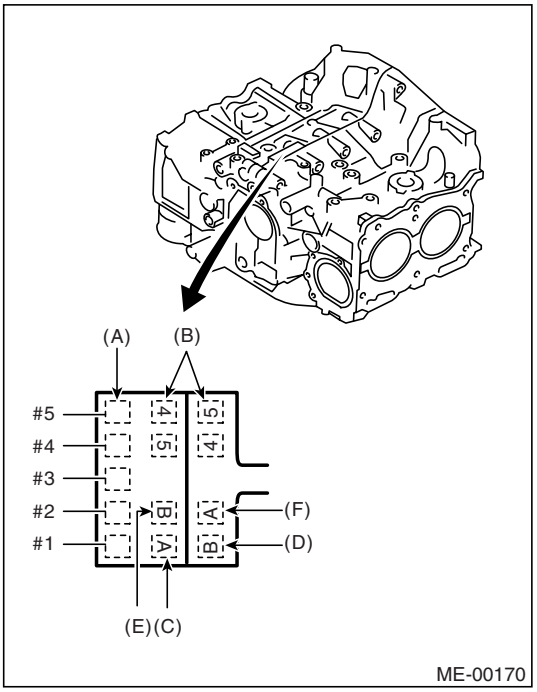
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

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

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6219 — 3.6222 in)



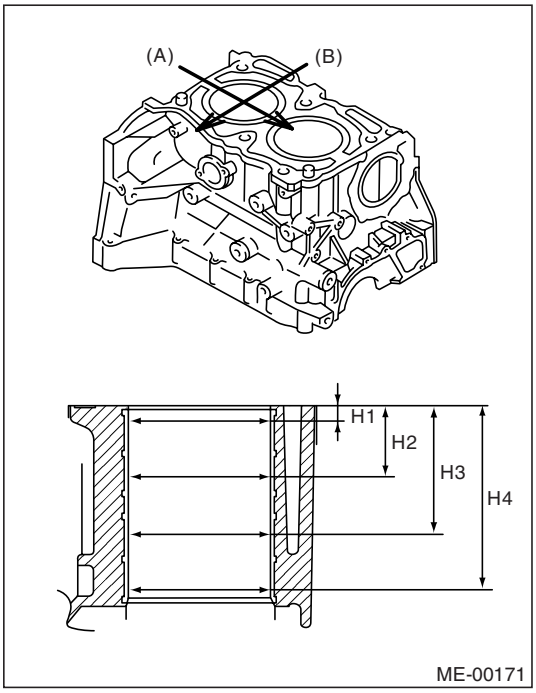
(A) Main journal size mark
(B) Cylinder block (RH) – (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

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

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

Cylindricality:
Standard
0.015 mm (0.0006 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)



(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

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

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

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

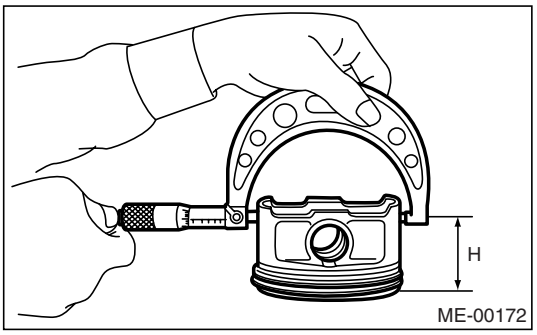
Piston grade point H:
40.0 mm (1.57 in)

Piston outer diameter:

Standard
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6219 — 3.6222 in)

0.25 mm (0.0098 in) oversize
92.245 — 92.265 mm (3.6317 — 3.6325 in)

0.50 mm (0.0197 in) oversize
92.495 — 92.515 mm (3.6415 — 3.6423 in)



5) Calculate the clearance between cylinder and piston.

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

Cylinder to piston clearance at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.00039 — 0.00039 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the standard 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.

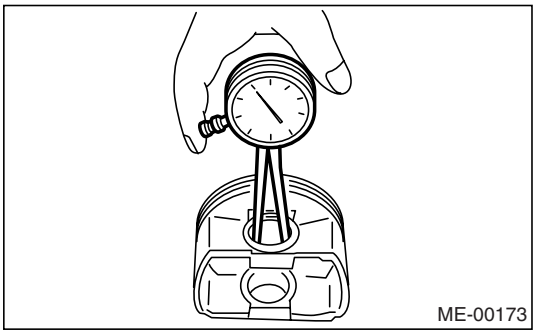
(2) If the cylinder inner diameter exceeds 92.515 mm (3.6423 in) after boring and honing, replace the cylinder block.

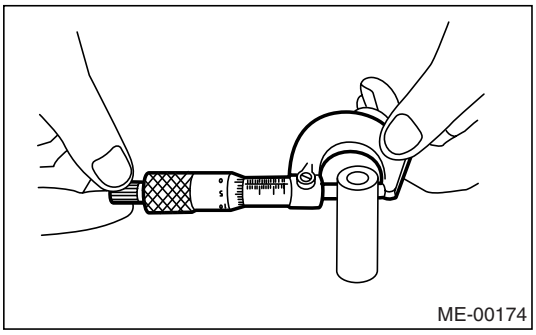
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

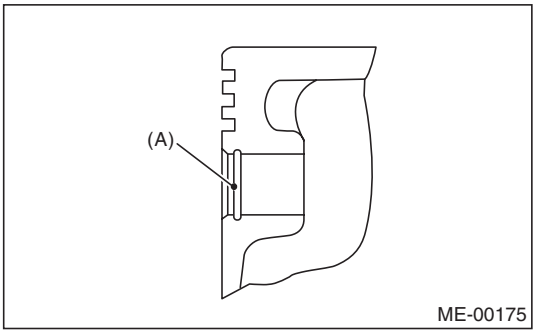
1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-83, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within standard, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

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





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

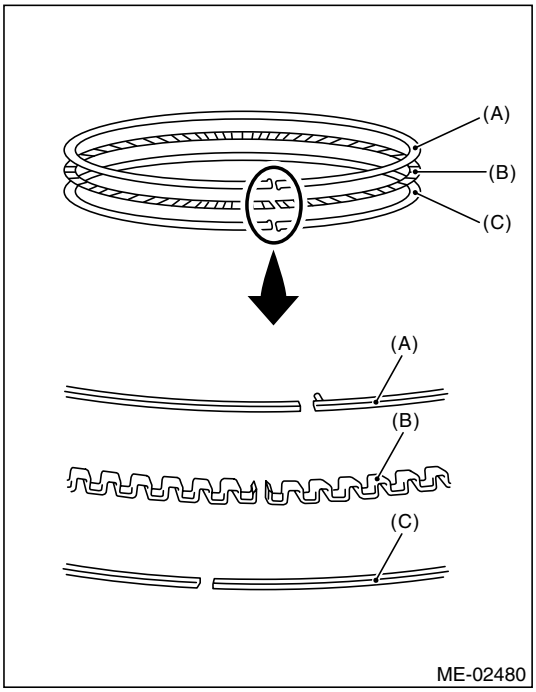


5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

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

CAUTION:
• Marks are displayed on the end of top and second rings. When installing the rings to the piston, face those marks upward.
• Oil ring consists of the upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.

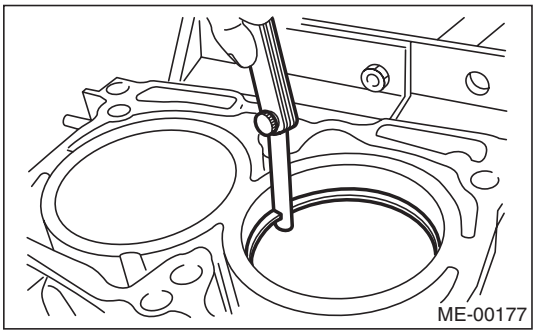


(A) Upper rail
(B) Expander
(C) Lower rail

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

		Standard mm (in)
Piston ring gap	Top ring	Outer circle side: 0.20 — 0.25 (0.0079 — 0.0098) Inner circle side: 0.20 — 0.30 (0.0079 — 0.012)
	Second ring	0.40 — 0.50 (0.016 — 0.020)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)

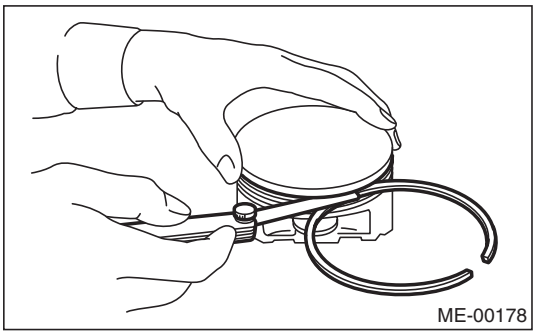
NOTE:
The difference between the outer and inner circle side of top ring must be less than 0.05 mm (0.0020 in).



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

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

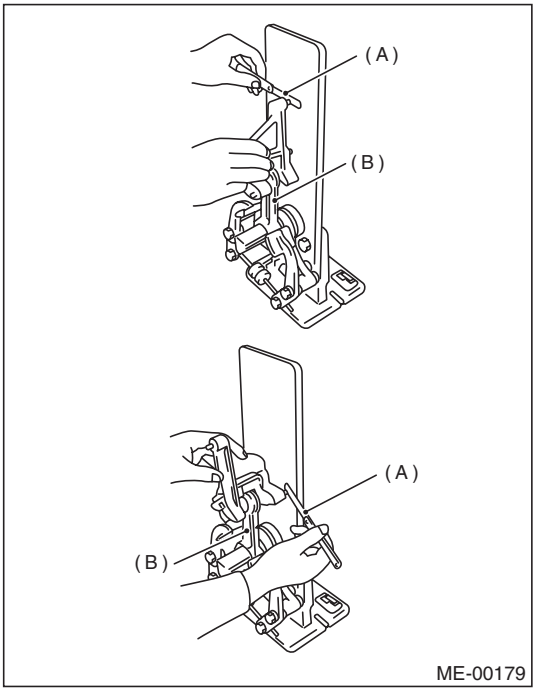
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)



5. CONNECTING ROD

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

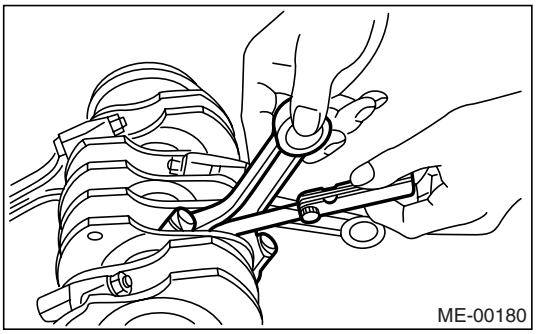
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the thrust clearance. If thrust clearance exceeds the standard or offset wear occurs, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)



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

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

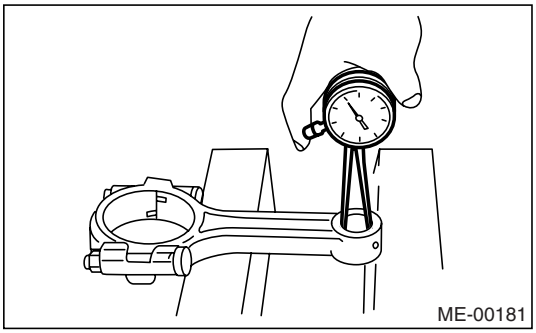
Connecting rod oil clearance:
Standard
0.026 — 0.052 mm (0.0010 — 0.0020 in)

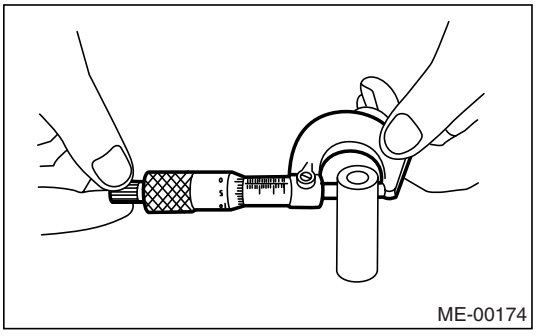
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

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

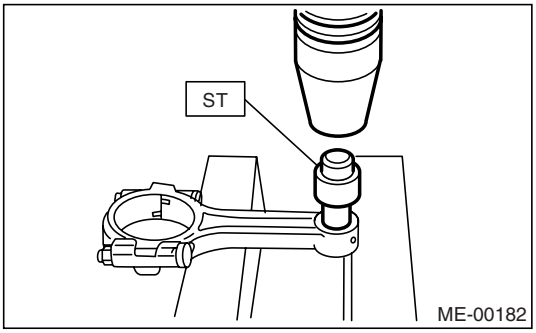
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)





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

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



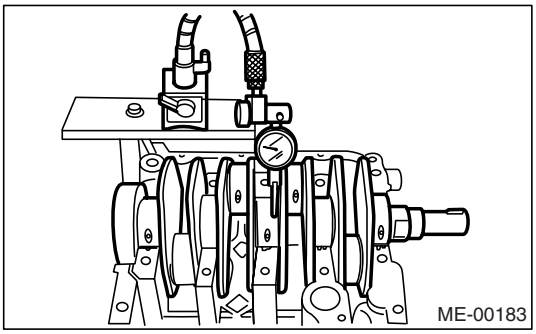
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
2) Measure the bend of crankshaft. If it exceeds the limit, repair or replace it.

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

Crankshaft bend limit:
0.035 mm (0.0014 in)



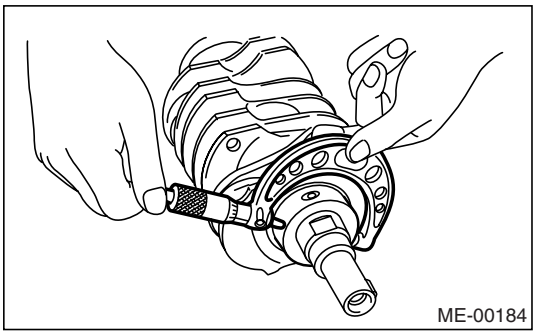
3) Inspect the crank journal and crank pin for wear. If they are not within the specification, replace the bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:

Out-of-roundness
0.005 mm (0.0002 in) or less

Cylindricality
0.006 mm (0.0002 in)

Grinding limit (dia.)
Crank pin: To 51.750 (2.0374)
Crank journal: To 59.750 (2.3524)

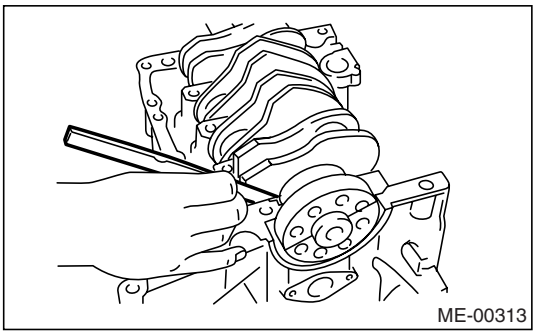


Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3606)	59.942 — 59.958 (2.3599 — 2.3606)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3521 — 2.3527)	59.742 — 59.758 (2.3521 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

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

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


ME-00313

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

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.00039 — 0.0012 in)

22.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H4DOTC)-62, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>

23.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H4DOTC)-69, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-73, INSTALLATION, Cylinder Block.>

24.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.
<Ref. to ME(H4DOTC)-69, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-73, INSTALLATION, Cylinder Block.>

25.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H4DOTC)-69, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-73, INSTALLATION, Cylinder Block.>

26.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of the cause of trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

Symptom	Problem parts, etc.	Possible cause	Rank
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral position 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
	Immobilizer System <Ref. to IM(diag)-2, Basic Diagnostic Procedure.>		A
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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

Symptom	Problem parts, etc.	Possible cause	Rank
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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

Symptom	Problem parts, etc.	Possible cause	Rank
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	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
	Other	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Symptom	Problem parts, etc.	Possible cause	Rank
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	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
	Other	Evaporative emission control system malfunction	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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
	Other	Evaporative emission control system malfunction	C

Symptom	Problem parts, etc.	Possible cause	Rank
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Other	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Other	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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
	Other	Evaporative emission control system malfunction	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

Symptom	Problem parts, etc.	Possible cause	Rank
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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

27.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Defective valve mechanism • Incorrect valve clearance • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn camshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank	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 1,000 to 2,000 rpm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn camshaft 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 sprocket • 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	—	• Insufficient compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting with case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*)
When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and inspection mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

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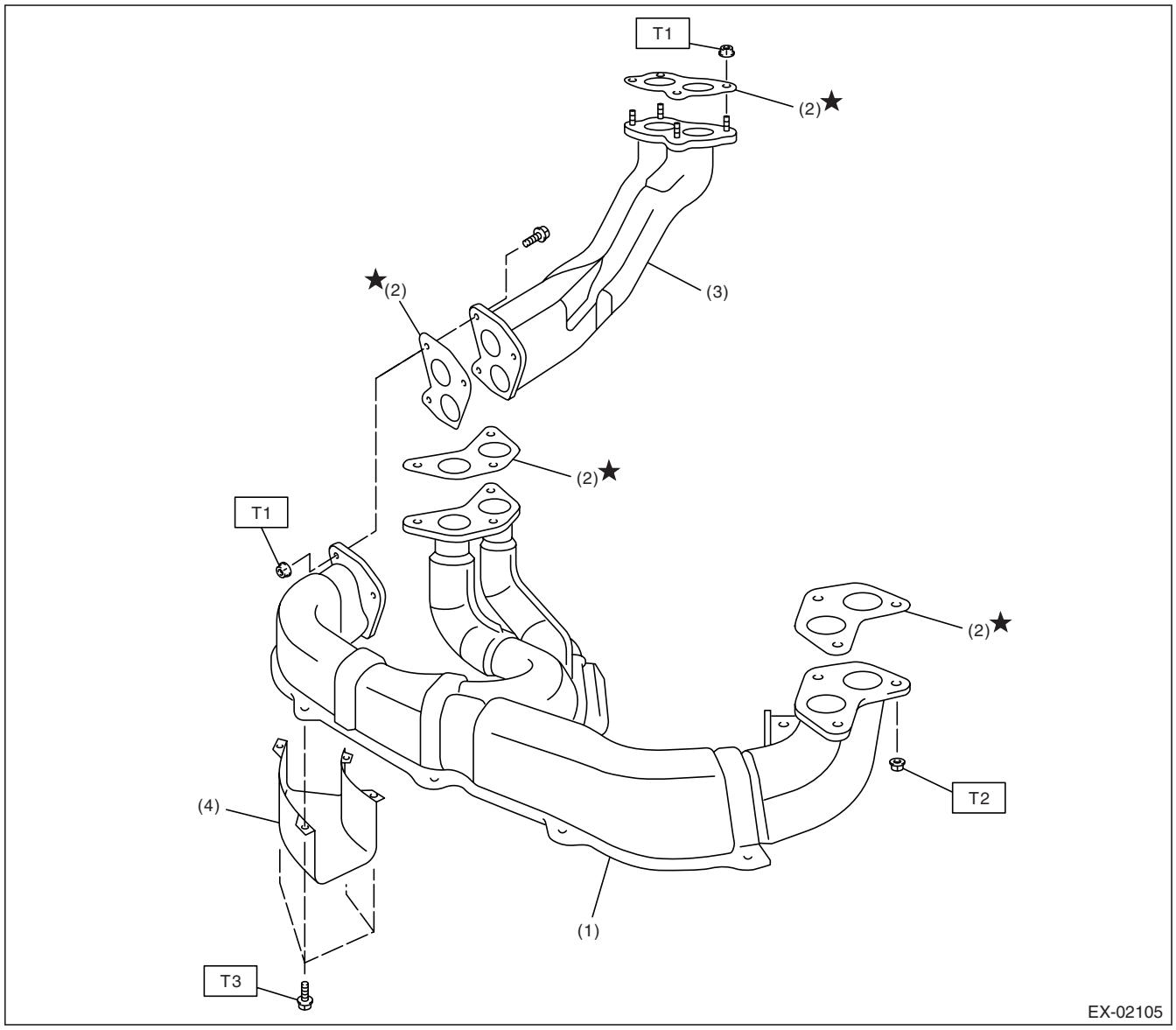
3. Center Exhaust Pipe 6
4. Joint Pipe 10
5. Rear Exhaust Pipe 11
6. Muffler 12

1. General Description

A: COMPONENT

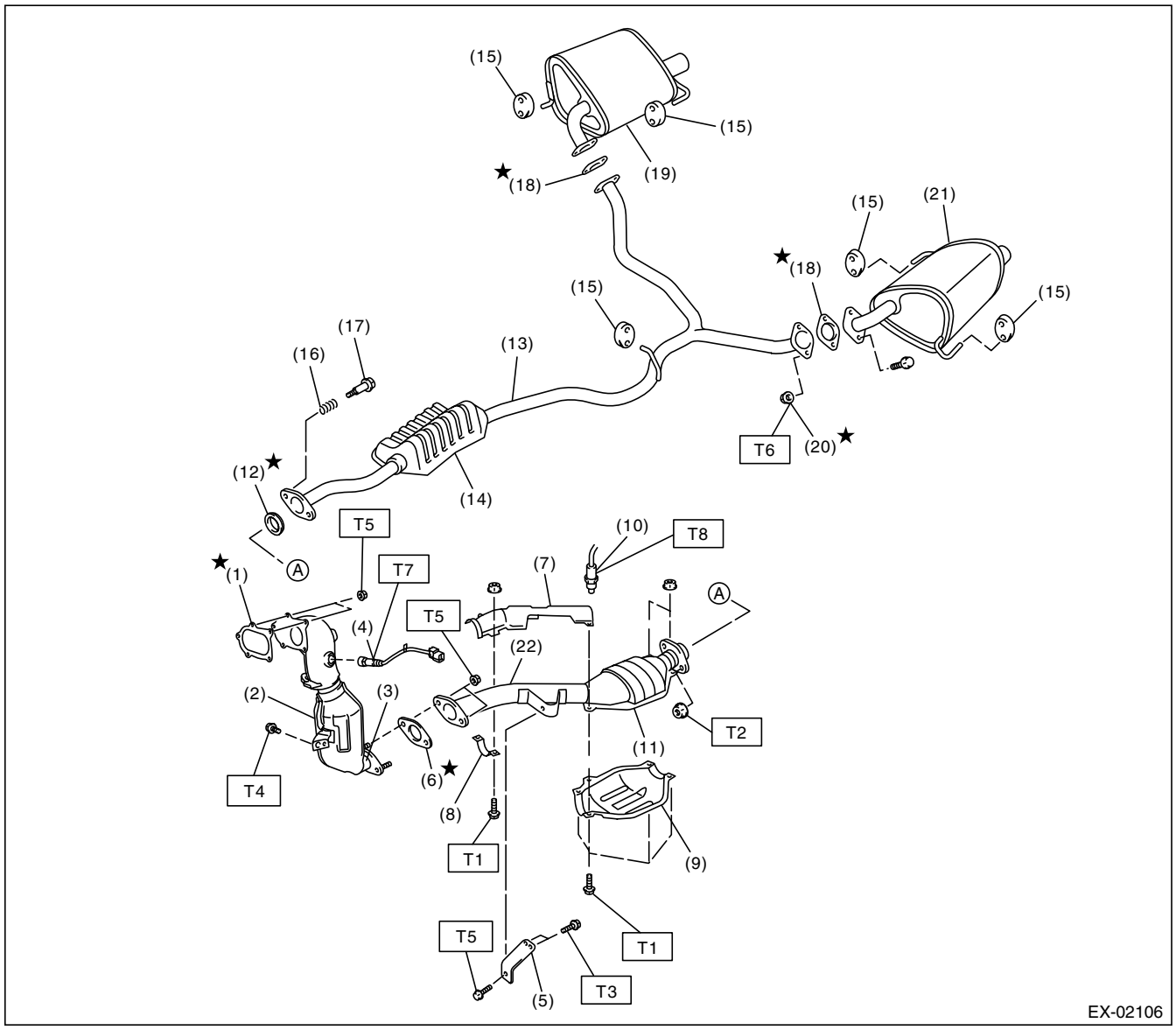
1. FRONT EXHAUST PIPE



(1) Front exhaust pipe ASSY
(2) Gasket
(3) Turbocharger joint pipe
(4) Front exhaust pipe cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26.0)
T2: 30 (3.1, 22.1)
T3: 7.5 (0.76, 5.5)

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(1) Gasket
(2) Front catalytic converter
(3) Center exhaust pipe (Front)
(4) Front oxygen (A/F) sensor
(5) Bracket
(6) Gasket
(7) Center pipe upper cover (Rear)
(8) Clamp
(9) Rear catalytic converter lower cover
(10) Rear oxygen sensor
(11) Rear catalytic converter
(12) Gasket
(13) Rear exhaust pipe
(14) Chamber
(15) Cushion rubber
(16) Spring
(17) Bolt
(18) Gasket
(19) Muffler (RH)
(20) Self-locking nut
(21) Muffler (LH)
(22) Center exhaust pipe (Rear)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.3)
T3: 23 (2.3, 17.0)
T4: 30 (3.1, 22.1)
T5: 35 (3.6, 26.0)
T6: 48 (4.9, 35.4)
T7: <Ref. to FU(H4DOTC)-32, INSTALLATION, Front Oxygen (A/F) Sensor.>
T8: <Ref. to FU(H4DOTC)-33, INSTALLATION, Rear Oxygen Sensor.>

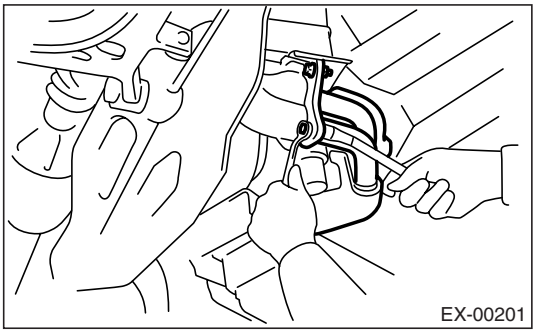
B: CAUTION

• 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 yourself, 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 rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

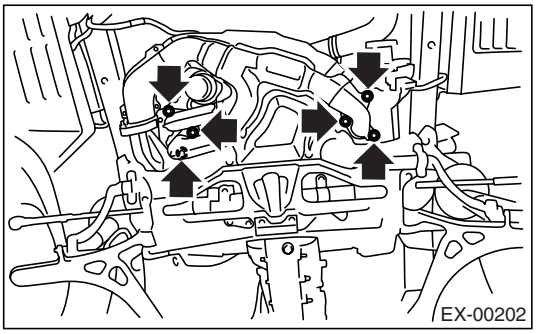
2. Front Exhaust Pipe

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the front exhaust pipe cover.
4) Remove the nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.



5) While holding the front exhaust pipe assembly, remove the nuts which hold front exhaust pipe assembly to cylinder head exhaust port.



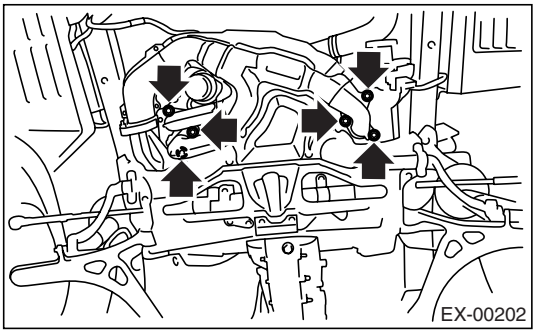
6) Remove the front exhaust pipe assembly.

B: INSTALLATION

NOTE:
Use a new gasket.

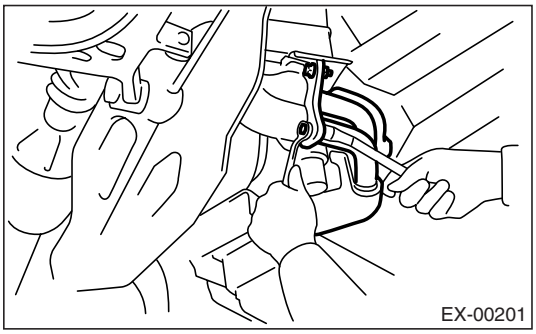
1) Install the front exhaust pipe assembly.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



2) Install the front exhaust pipe assembly to turbocharger joint pipe.

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



3) Install the front exhaust pipe cover.
4) Install the under cover.
5) Lower the vehicle.

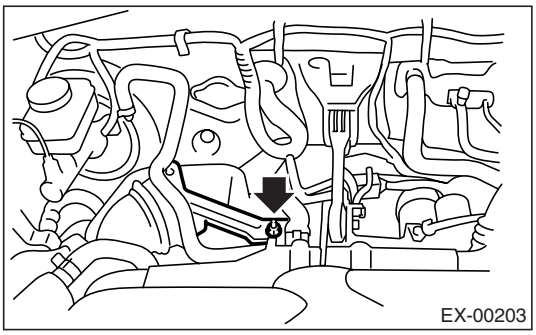
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

3. Center Exhaust Pipe

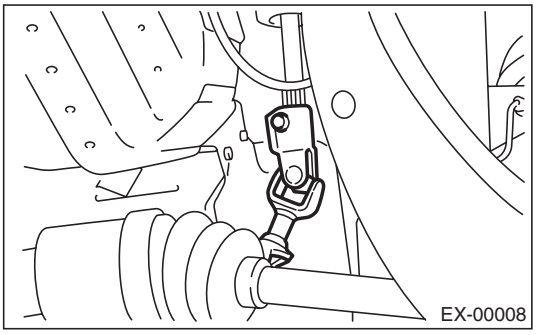
A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.
4) Remove the intercooler. <Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
5) Remove the intercooler bracket.

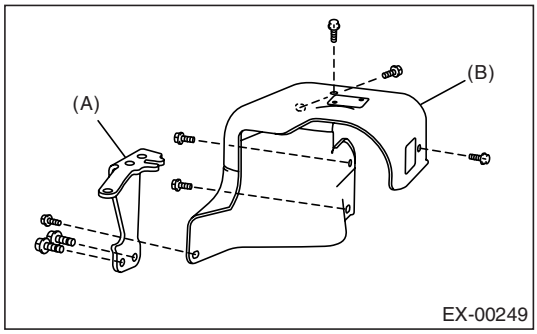


6) Lift-up the vehicle.
7) Remove the under cover.
8) Remove the universal joint bolts and then remove the universal joint.

CAUTION:
Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.

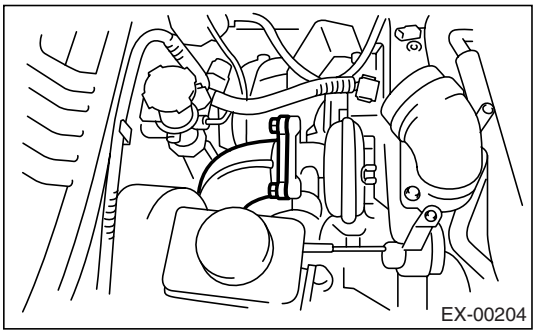


9) Lower the vehicle.
10) Remove the linear motion mounting.
<Ref. to ME(H4DOTC)-38, REMOVAL, Linear Motion Mounting.>
11) Remove the linear motion mounting bracket.
12) Remove the turbocharger cover.

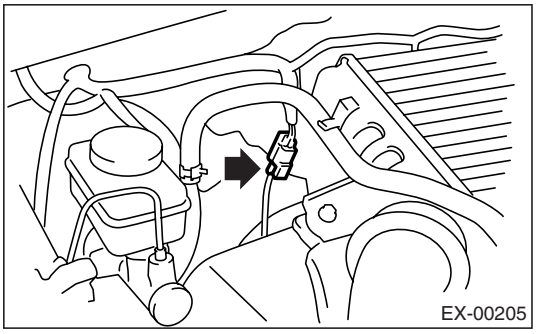


(A) Linear motion mounting bracket
(B) Turbocharger cover

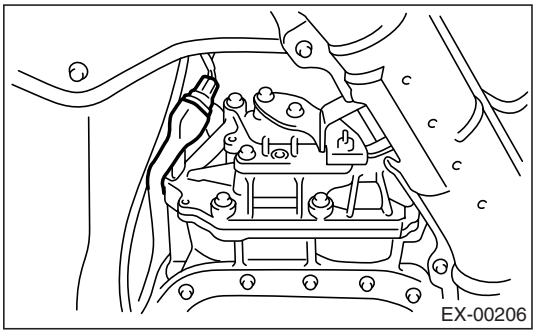
13) Separate the center exhaust pipe from turbocharger.



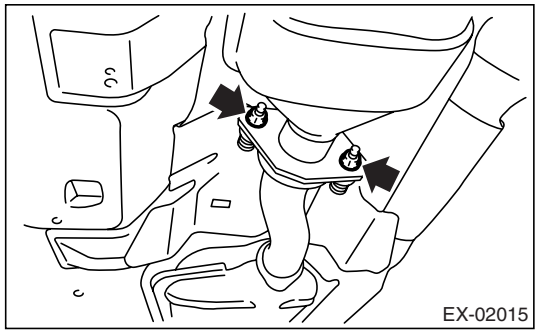
14) Disconnect the connector from front oxygen (A/F) sensor.



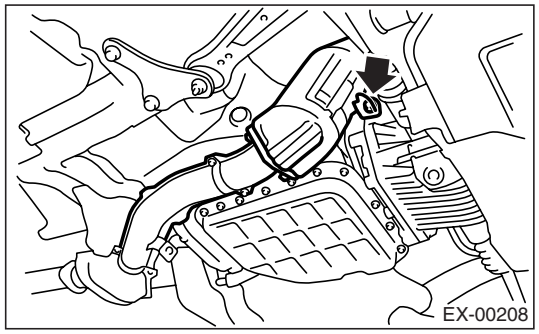
15) Lift-up the vehicle.
16) Disconnect the connector from rear oxygen sensor.



17) Separate the center exhaust pipe from rear exhaust pipe.

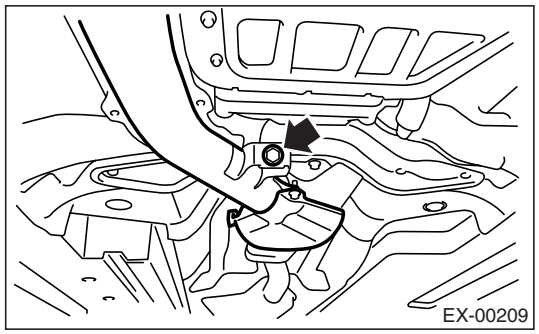


18) Remove the bolt which holds center exhaust pipe bracket to transmission.



19) Remove the intercooler bracket.
20) Remove the bolt which holds center exhaust pipe to hanger bracket.

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



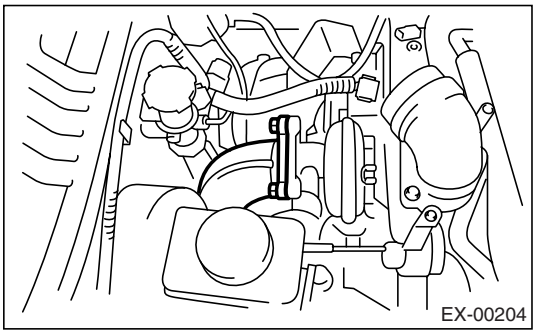
21) Remove the center exhaust pipe.

B: INSTALLATION

NOTE:
Use a new gasket.

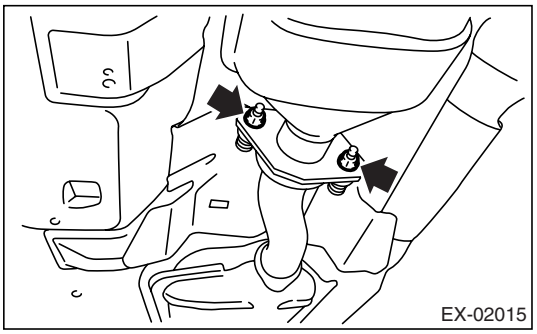
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds center exhaust pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

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

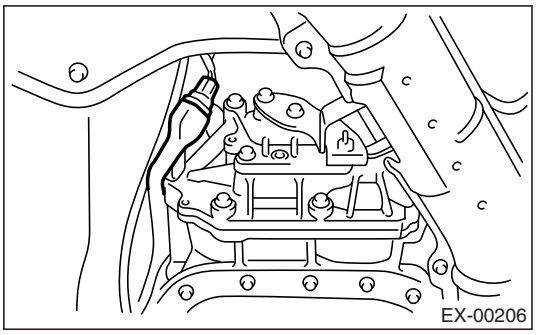


4) Install the center exhaust pipe to rear exhaust pipe.

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

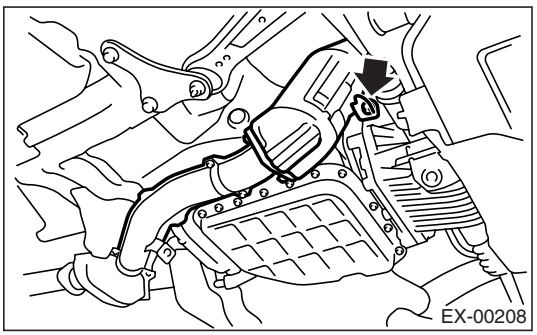


5) Connect the connector to rear oxygen sensor.



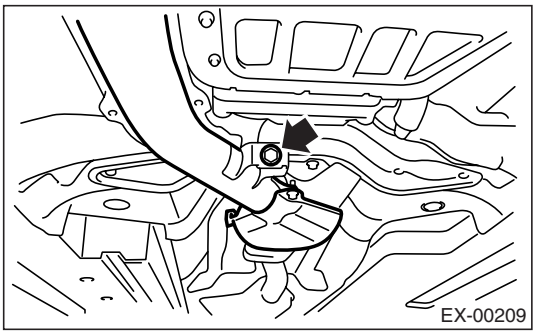
6) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



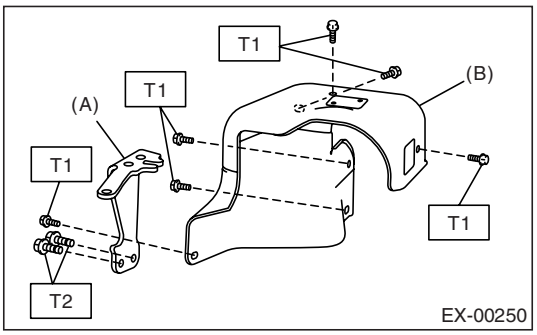
7) Tighten the bolt which holds center exhaust pipe to hanger bracket.

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



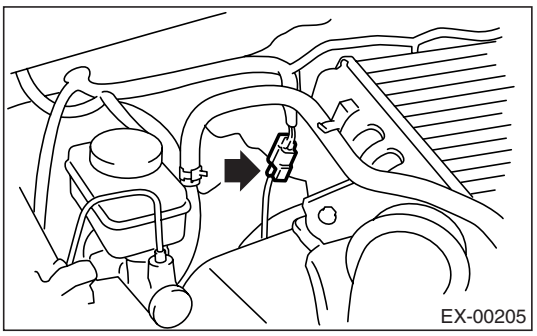
8) Lower the vehicle.
9) Install the turbocharger cover.
10) Install the linear motion mounting bracket.

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 40 N·m (4.1 kgf-m, 29.5 ft-lb)



(A) Linear motion mounting bracket
(B) Turbocharger cover

11) Install the linear motion mounting.
<Ref. to ME(H4DOTC)-38, INSTALLATION, Linear Motion Mounting.>
12) Connect the connector to front oxygen (A/F) sensor.



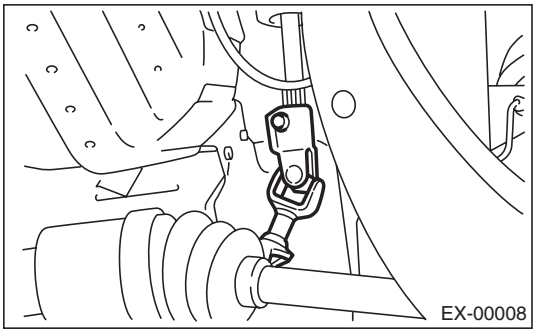
13) Lift-up the vehicle.
14) Install the universal joint.

(1) Align the bolt hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and then insert the universal joint.
(2) Align the bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt of short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
(4) Tighten the long yoke side bolt, and also tighten the short yoke side bolt.

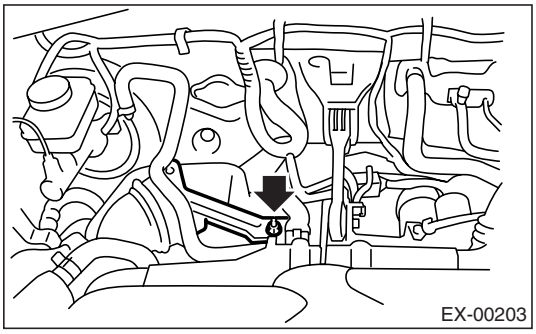
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure the universal joint bolts are tightened through the shaft serration notches.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox and DOJ:
15 mm (0.59 in) or more



15) Install the under cover.
16) Lower the vehicle.
17) Install the intercooler bracket.



18) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
19) Install the collector cover.

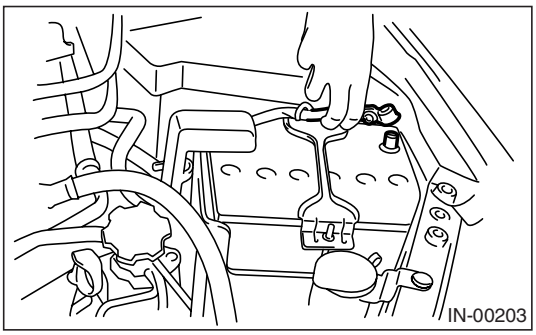
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

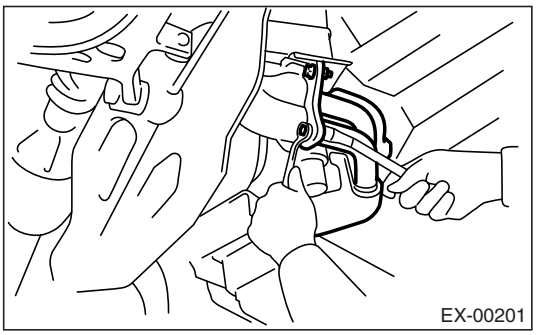
4. Joint Pipe

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Remove the front exhaust pipe cover.
6) Remove the nuts which hold front exhaust manifold to turbocharger joint pipe.

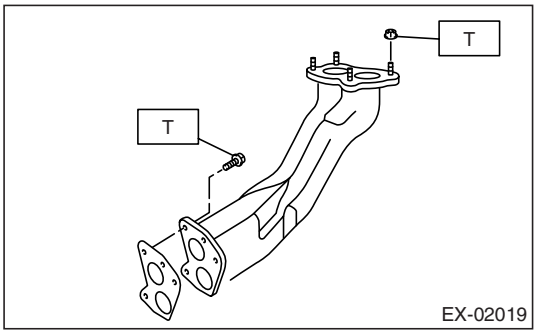


7) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-6, REMOVAL, Center Exhaust Pipe.>
8) Remove the turbocharger. <Ref. to IN(H4DOTC)-14, REMOVAL, Turbocharger.>
9) Remove the joint pipe from the lower side of vehicle.

B: INSTALLATION

Install in the reverse order of removal.

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



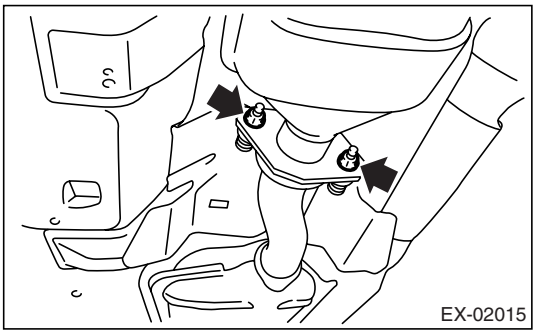
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

5. Rear Exhaust Pipe

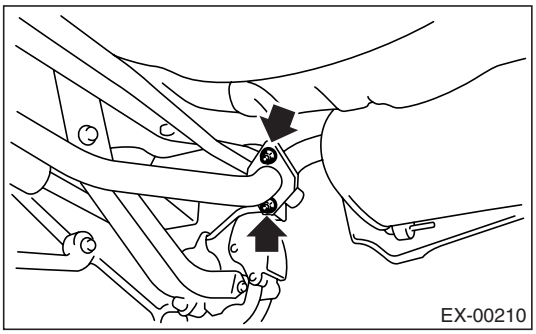
A: REMOVAL

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

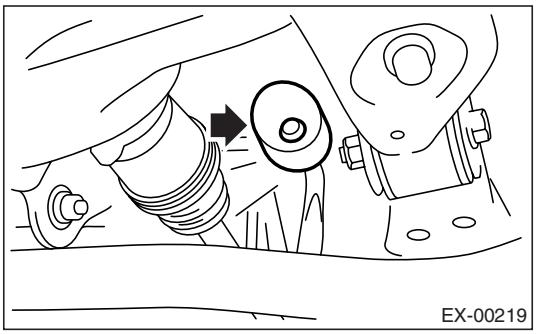


3) Separate the rear exhaust pipe from both mufflers.

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



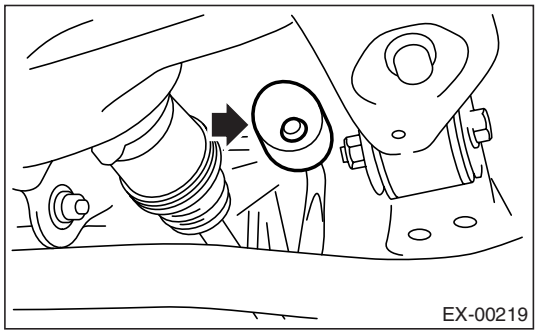
4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
5) Remove the rear exhaust pipe bracket from cushion rubber.



B: INSTALLATION

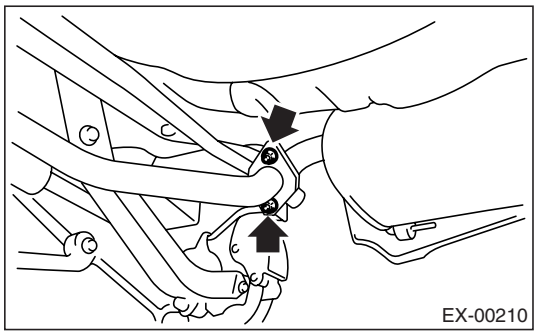
NOTE:
Use a new gasket and self-locking nut.

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe bracket to cushion rubber.



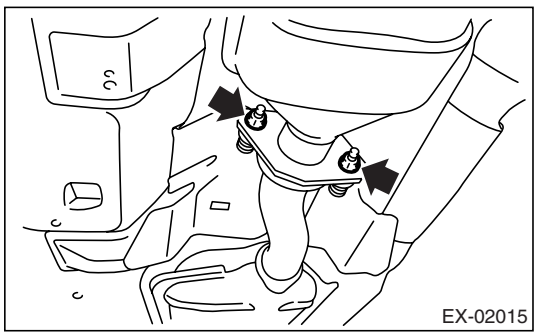
3) Install the rear exhaust pipe to both mufflers.

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



4) Install the rear exhaust pipe to center exhaust pipe.

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



5) Lower the vehicle.

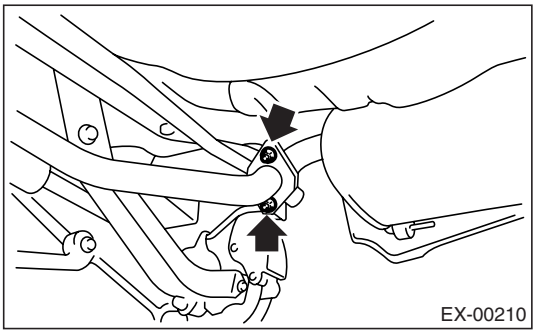
C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.
3) Check the cushion rubber for wear or crack.

6. Muffler

A: REMOVAL

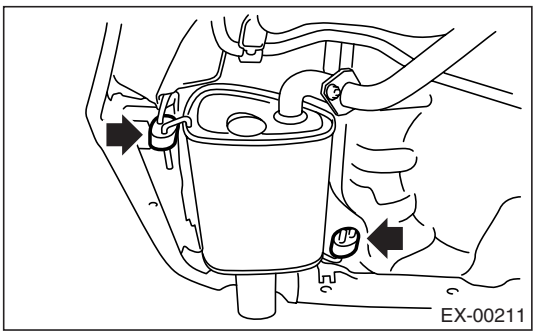
1) Separate the muffler (RH) from rear exhaust pipe.



2) Remove the cushion rubbers, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of spray type lubricant to the mating area of cushion rubbers in advance.



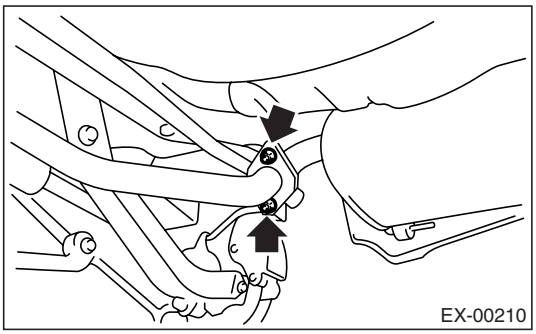
3) Perform the same procedure for muffler (LH).

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket and self-locking nut.

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



C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.
3) Check the cushion rubber for wear or crack.

COOLING

CO(H4DOTC)

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9. Radiator Sub Fan and Fan Motor....27
10. Reservoir Tank....30
11. Coolant Filler Tank 31
12. Engine Cooling System Trouble in General 32

1. General Description

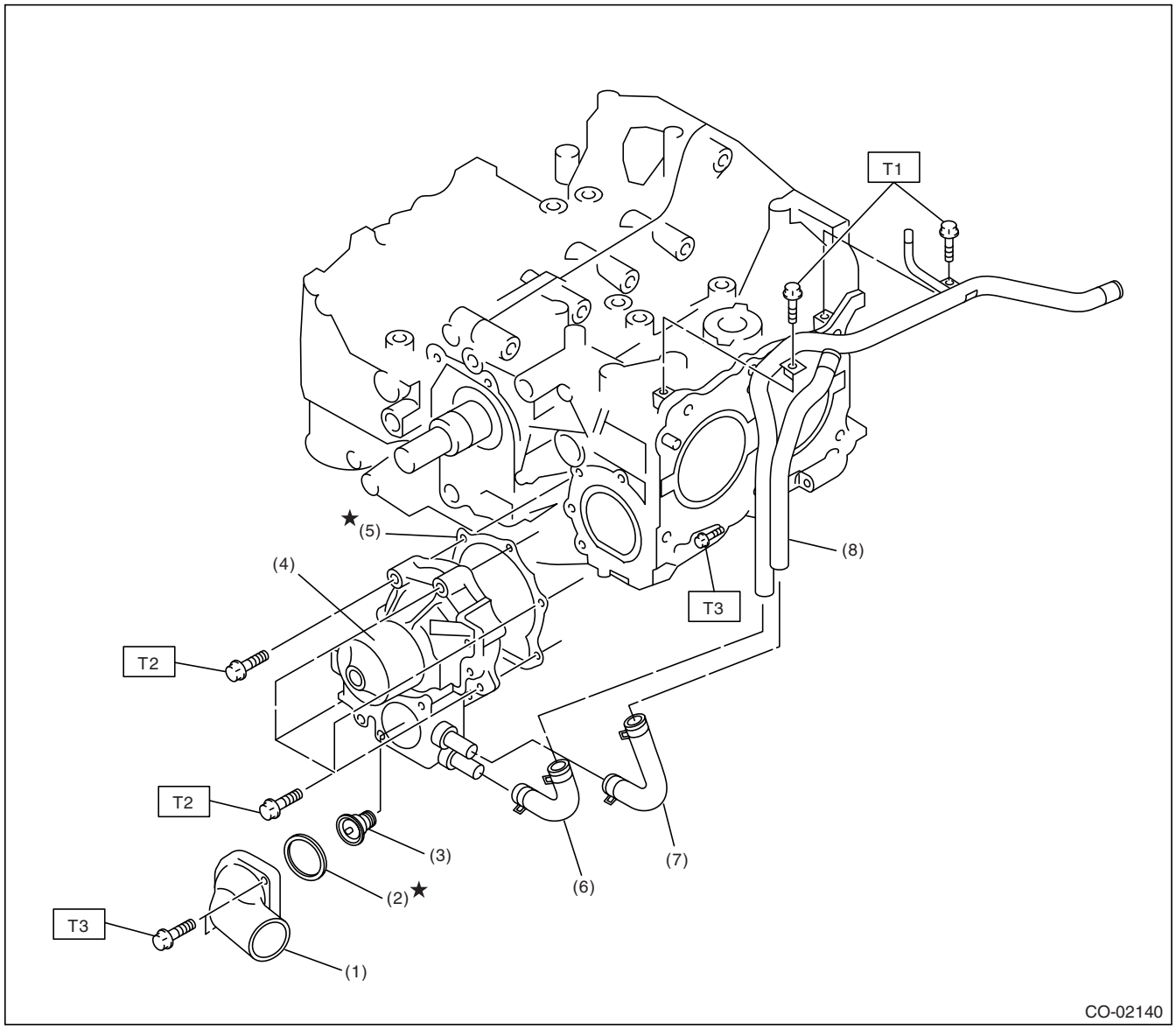
A: SPECIFICATION

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			AT model (with ATF warmer): 7.7 (8.1, 7.1)
			AT model (without ATF warmer): 7.3 (7.7, 6.4)
			MT model: 7.4 (7.8, 6.5)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate ℓ (US gal, Imp gal) /min	20 (5.3, 4.4)
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge rate ℓ (US gal, Imp gal) /min	100 (26.4, 22.0)
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge rate ℓ (US gal, Imp gal) /min	200 (52.8, 44.0)
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter mm (in)		76 (2.99)
	Number of impeller vanes		8
	Pump pulley diameter mm (in)		60 (2.36)
	Clearance between impeller and case	Standard mm (in)	0.5 — 1.5 (0.020 — 0.059)
Thermostat	Type		Wax pellet type
	Starting temperature to open		76 — 80°C (169 — 176°F)
	Fully opens		91°C (196°F)
	Valve lift mm (in)		9.0 (0.354) or more
	Valve bore mm (in)		35 (1.38)
Radiator fan	Motor input	Main fan W	90
		Sub fan W	90
	Fan diameter / Blades	Main fan	300 mm (11.8 in) / 4
		Sub fan	300 mm (11.8 in) / 5
Radiator	Type		Down flow
	Core dimensions	Width × Height ×Thickness mm (in)	687.4 × 340 × 16 (27.06 × 13.39 × 0.63)
	Pressure range in which cap valve is open	Coolant filler tank side kPa (kgf/cm^2, psi)	Above: 108±15 (1.1±0.15, 16±2) Below: −1.0 — −4.9 (−0.01 — −0.05, −0.1 — −0.7)
		Radiator side kPa (kgf/cm^2, psi)	Above only: 137±14.7 (1.40±0.15, 20±2.1)
	Fins		Corrugated fin type
Reservoir tank	Capacity ℓ (US qt, Imp qt)		0.45 (0.48, 0.40)

Vehicle speed	A/C compressor load	Engine coolant temperature		
		95°C (203°F) or less	96 — 99°C (205 — 210°F)	100°C (212°F) or more
		Operation of radiator fan	Operation of radiator fan	Operation of radiator fan
19 km/h (12 MPH) or less	OFF	OFF	Low-Speed	High-Speed
	Low	Low-Speed	Low-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
20 — 69 km/h (12 — 43 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
70 — 105 km/h (43 — 65 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	OFF	Low-Speed	High-Speed
	High	Low-Speed	High-Speed	High-Speed
106 km/h (66 MPH) or more	OFF	OFF	OFF	High-Speed
	Low	OFF	Low-Speed	High-Speed
	High	OFF	Low-Speed	High-Speed

B: COMPONENT

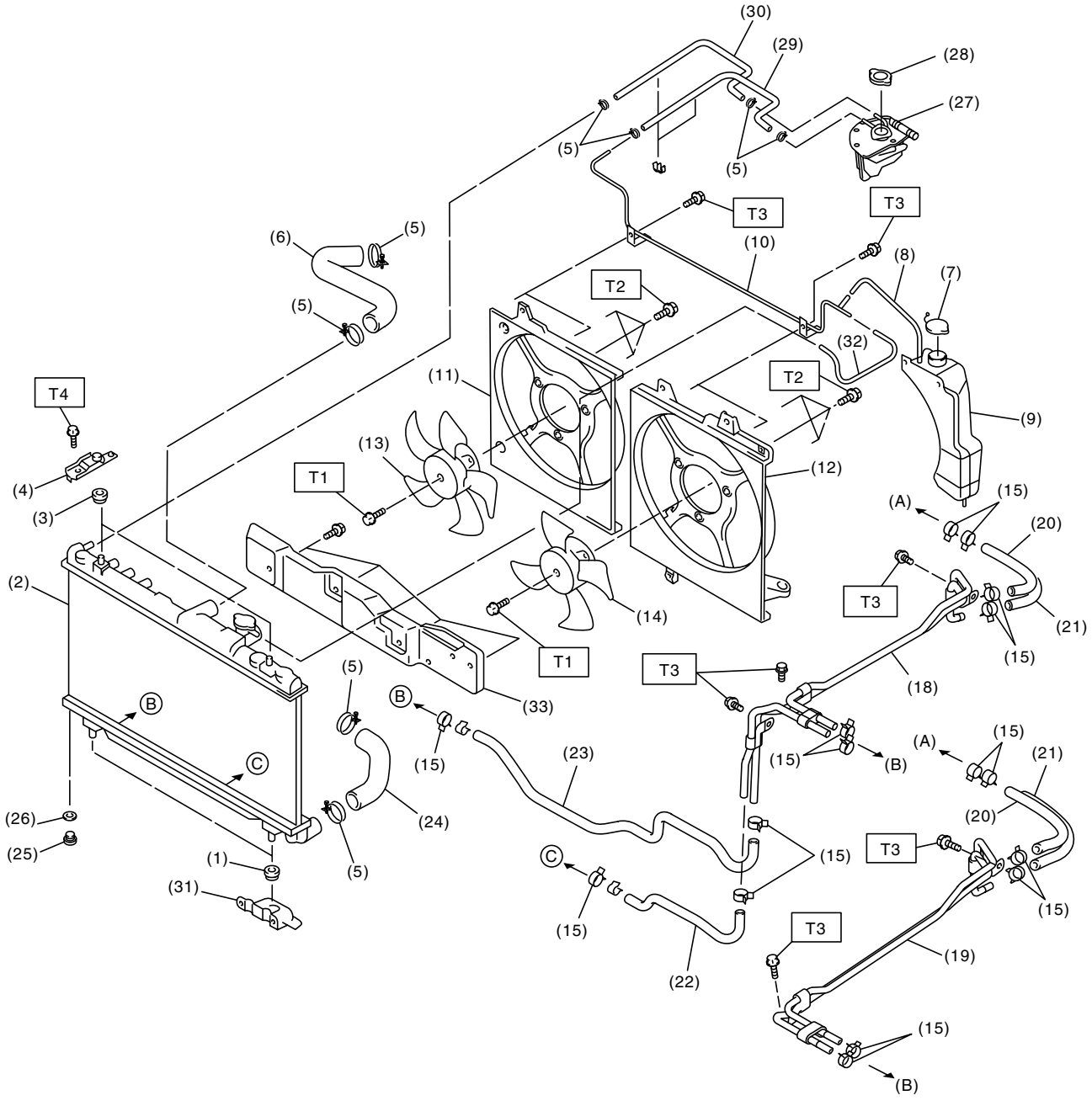
1. WATER PUMP



(1) Thermostat cover
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Heater by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: First 12 (1.2, 8.9)
Second 12 (1.2, 8.9)
T3: 12 (1.2, 8.9)

2. RADIATOR AND RADIATOR FAN



CO-02141

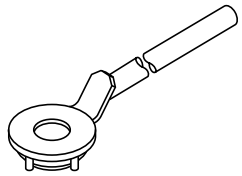
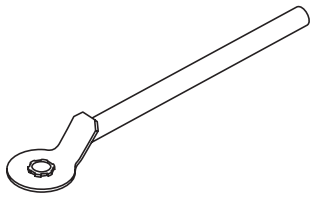
(A) To automatic transmission
(B) To ATF filter
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose A
(9) Engine coolant reservoir tank
(10) Overflow pipe
(11) Radiator sub fan shroud
(12) Radiator main fan shroud
(13) Radiator sub fan ASSY
(14) Radiator main fan ASSY
(15) ATF hose clamp (AT model)
(16) ATF hose A (Model without ATF warmer)
(17) ATF hose B (Model without ATF warmer)
(18) ATF pipe (Model without ATF warmer)
(19) ATF pipe (Model with ATF warmer)
(20) ATF hose C (Model with ATF warmer)
(21) ATF hose D (Model with ATF warmer)
(22) ATF hose E (Model without ATF warmer)
(23) ATF hose F (Model without ATF warmer)
(24) Radiator outlet hose
(25) Radiator drain plug
(26) O-ring
(27) Engine coolant filler tank
(28) Radiator cap (Engine coolant filler tank cap)
(29) Engine overflow hose
(30) Engine air breather hose
(31) Radiator lower bracket
(32) Overflow hose B
(33) Heat shield cover (Model without ATF warmer)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.4 (0.35, 2.5)
T2: 5.0 (0.5, 3.7)
T3: 7.5 (0.76, 5.5)
T4: 12 (1.2, 8.9)

C: CAUTION

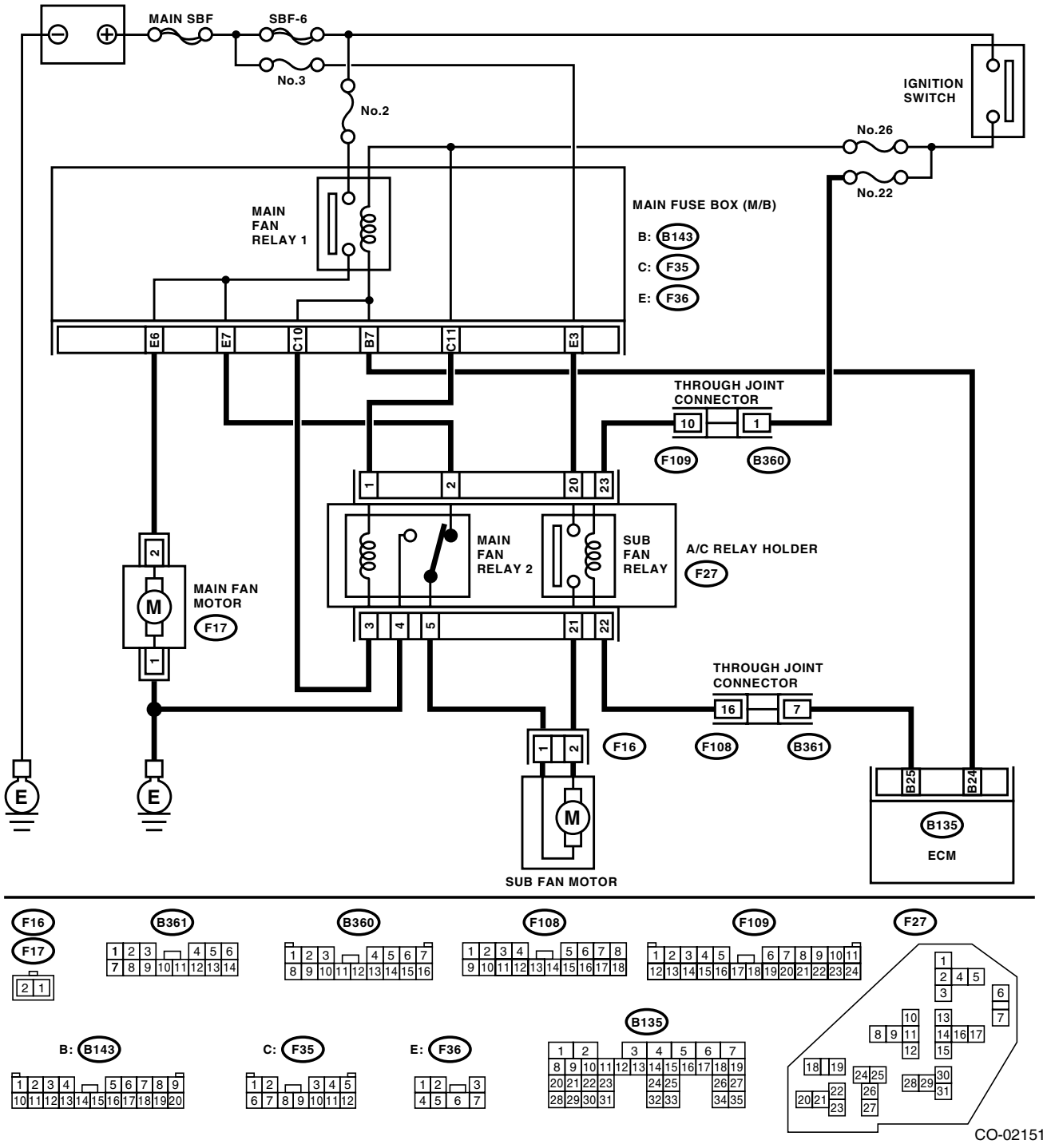
• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, 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 rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing the intake and exhaust camshaft sprocket.

2. Radiator Fan System

A: WIRING DIAGRAM



B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is more than 96°C (205°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOMS:

Radiator main and sub fan do not rotate under the above conditions.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the compulsory operation check for the radiator fan relay using Subaru Select Monitor. NOTE: • When performing the compulsory operation check for the radiator fan relay using Subaru Select Monitor, the radiator main fan and sub fan will repeat such a operation as low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for more operation procedure. <Ref. to EN(H4DOTC)(diag)-38, Compulsory Valve Operation Check Mode.>	Do the radiator main fan and sub fan rotate at low speed?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the compulsory operation check for the radiator fan relay using Subaru Select Monitor. NOTE: • When performing the compulsory operation check for the radiator fan relay using Subaru Select Monitor, the radiator main fan and sub fan will repeat such a operation as low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for more operation procedure. <Ref. to EN(H4DOTC)(diag)-38, Compulsory Valve Operation Check Mode.>	Do the radiator main fan and sub fan rotate at high speed?	Radiator fan system is normal.	Go to step **27.**
3	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 3. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
6	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 22. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
7	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Replace the sub fan relay.
8	**CHECK SUB FAN RELAY.** 1) Connect the terminals No. 22 and No. 23 of sub fan relay to battery. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the sub fan relay.
9	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from sub fan motor. 2) Measure the resistance of harness between sub fan relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 21:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness between sub fan relay terminal and sub fan motor connector.
10	**CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND MAIN FAN RELAY 2 CONNECTOR.** 1) Remove the main fan relay 2 from A/C relay holder. 2) Measure the resistance of harness between sub fan motor connector and main fan relay 2 connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 5:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit of harness between sub fan motor connector and main fan relay 2 connector.
11	**CHECK POOR CONTACT.** Check the poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **12.**
12	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 of sub fan motor, and the ground (–) terminal to terminal No. 1.	Does the sub fan rotate?	Go to step **13.**	Replace the sub fan motor.
13	**CHECK MAIN FAN RELAY 2.** Measure the resistance of main fan relay 2. ***Terminals*** ***No. 2 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **14.**	Replace the main fan relay 2.

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from main fan motor. 2) Measure the resistance of harness between main fan relay 2 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 2:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit of harness between main fan relay 2 terminal and main fan motor connector.
15	**CHECK MAIN FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **16.**	Repair the open circuit of harness between main fan motor connector and chassis ground.
16	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **17.**
17	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 of main fan motor, and the ground (−) terminal to terminal No. 1.	Does the main fan rotate?	Go to step **18.**	Replace the main fan motor.
18	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between sub fan relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 25 — (F27) No. 22:***	Is the resistance less than 1 Ω?	Go to step **19.**	Repair the open circuit of harness between sub fan relay terminal and ECM.
19	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).>
20	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 1 from main fuse box. 3) Measure the resistance of terminal in main fan relay 1 switch.	Is the resistance more than 1 MΩ?	Go to step **21.**	Replace the main fan relay 1.
21	**CHECK MAIN FAN RELAY 1.** 1) Connect the terminal of main fan relay 1 coil side terminal to battery. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **22.**	Replace the main fan relay 1.
22	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from main fan motor. 2) Measure the resistance of harness between main fan relay 1 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 2 — (F36) No. 6:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit of harness between main fan relay 1 terminal and main fan motor connector.

Step		Check	Yes	No
23	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between main fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (B143) No. 7:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit of harness between main fan relay 1 terminal and ECM.
24	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** Measure the resistance between main fan relay 2 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (F27) No. 3:***	Is the resistance less than 1 Ω?	Go to step **25.**	Repair the open circuit of harness between main fan relay 2 terminal and ECM.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 and No. 26. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **26.**
26	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Repair the power supply circuit for main fuse box.
27	**CHECK OPERATION OF RADIATOR FAN.** Check if the sub fan rotates when both fans do not rotate at high speed under the step 2.	Does the sub fan rotate?	Go to step **20.**	Go to step **28.**
28	**CHECK GROUND CIRCUIT OF MAIN FAN RELAY 2.** 1) Remove the main fan relay 2 from A/C relay holder. 2) Measure the resistance between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit of harness between main fan relay 2 and chassis ground.
29	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **30.**	Repair the power supply line.
30	**CHECK MAIN FAN RELAY 2.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 2. 3) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 4 — (F27) No. 5:***	Is the resistance more than 1 MΩ?	Go to step **31.**	Replace the main fan relay 2.
31	**CHECK MAIN FAN RELAY 2.** 1) Connect the battery to terminals No. 1 and No. 3 of main fan relay 2. 2) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 4 — (F27) No. 5:***	Is the resistance less than 1 Ω?	Go to step **23.**	Replace the main fan relay 2.

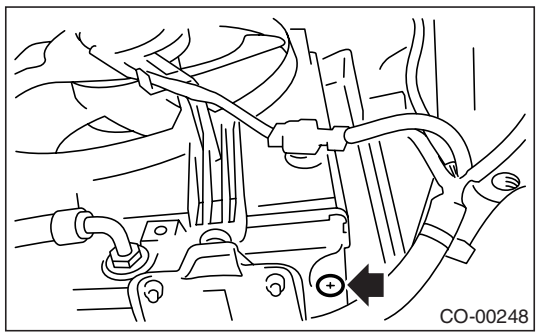
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the coolant filler tank cap so that engine coolant will drain faster.



4) Install the drain plug.

2. FILLING OF ENGINE COOLANT

1) Remove the collector cover.
2) Fill engine coolant into coolant filler tank up to the filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model (model with ATF warmer)
7.7 ℓ (8.1 US qt, 7.1 Imp qt)
AT model (model without ATF warmer)
7.3 ℓ (7.7 US qt, 6.4 Imp qt)
MT model
7.4 ℓ (7.8 US qt, 6.5 Imp qt)

CAUTION:
Do not confuse the cap of coolant filler tank with that of radiator.

NOTE:
• When pouring the engine coolant, the radiator side cap must not be removed.
• The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

3) Fill engine coolant into the reservoir tank up to "FULL" level.
4) Close the coolant filler tank cap, start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)
5) Wait for one minute after the engine stops, open the coolant filler tank cap. If the engine coolant level drops, add engine coolant to the filler neck position of radiator.
6) Perform the procedures 4) and 5) again.
7) Attach the coolant filler tank cap and reservoir tank cap properly.
8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".
9) Run the engine at 2,000 rpm or less until ratiator fan starts and stops.

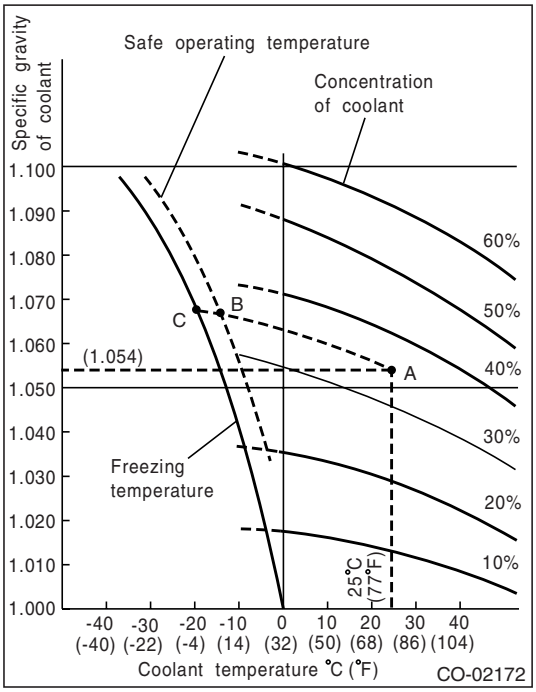
NOTE:
• Be careful with the engine coolant temperature gauge to prevent overheating.
• If the radiator hose becomes harden by engine coolant pressure at this time, air purge seems to be mostly completed.

10) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F) or less.
11) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position and the reservoir tank to "FULL" level.
12) Attach the coolant filler tank cap and reservoir tank cap properly.
13) Operate the heater at maximum hot position and the blower speed setting to "LO" and start the engine. Race at less than 3,000 rpm. If the flowing sound is heard from heater core, repeat the procedures from step 9).
14) Install the collector cover.

B: INSPECTION

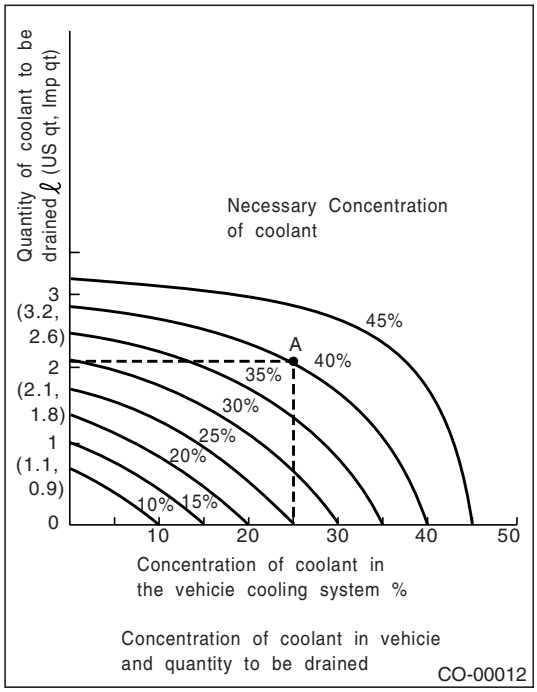
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERTAURE

The concentration and safe operating temperature of 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), its specific gravity is 1.054 and 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

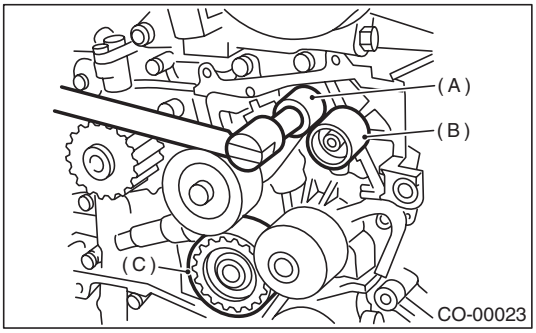
To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (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.



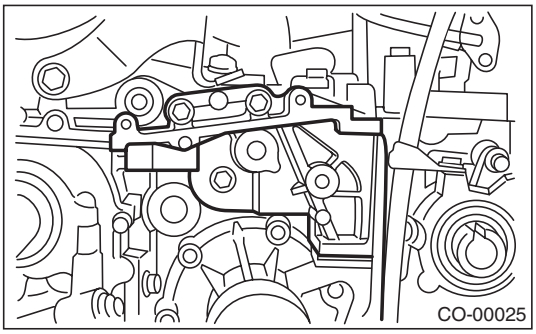
4. Water Pump

A: REMOVAL

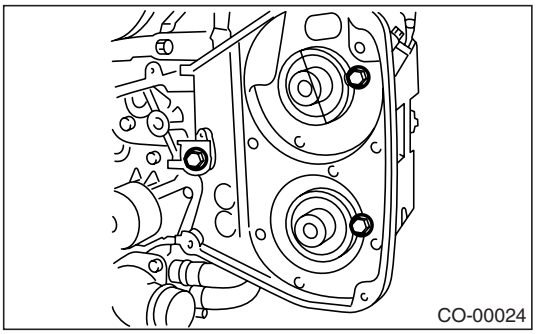
1) Remove the collector cover.
2) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
3) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt.>
5) Remove the automatic belt tension adjuster (A).
6) Remove the belt idler (B).
7) Remove the belt idler No. 2 (C).



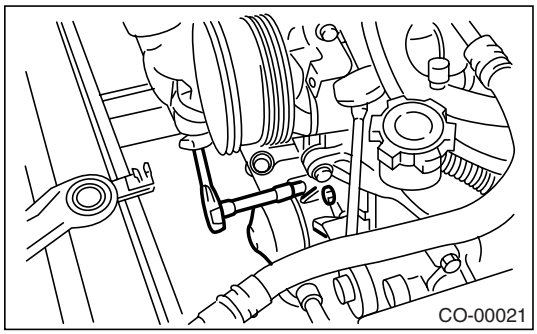
8) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-24, REMOVAL, Camshaft Position Sensor.>
9) Remove the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-54, REMOVAL, Cam Sprocket.>
10) Remove the tensioner bracket.



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



12) Disconnect the hose from water pump.
13) Remove the water pump.

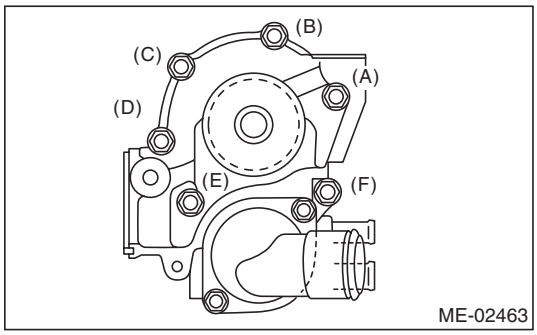


B: INSTALLATION

1) Install the water pump onto cylinder block (LH).

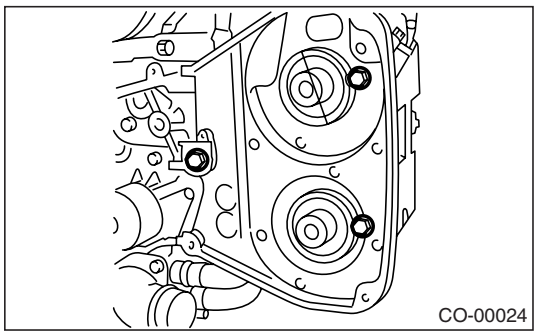
NOTE:
- Always use new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
1st
12 N·m (1.2 kgf-m, 8.9 ft-lb)
2nd
12 N·m (1.2 kgf-m, 8.9 ft-lb)



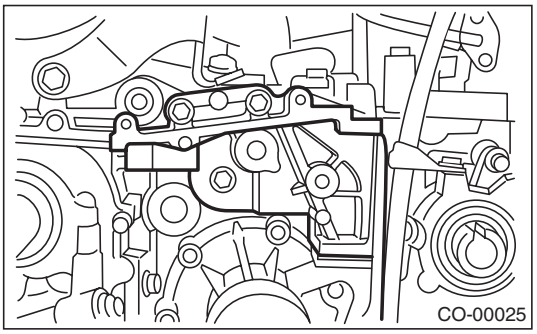
2) Connect the hose to water pump.
3) Install the belt cover No. 2 (LH).

Tightening torque:
5.0 N·m (0.5 kgf-m, 3.7 ft-lb)



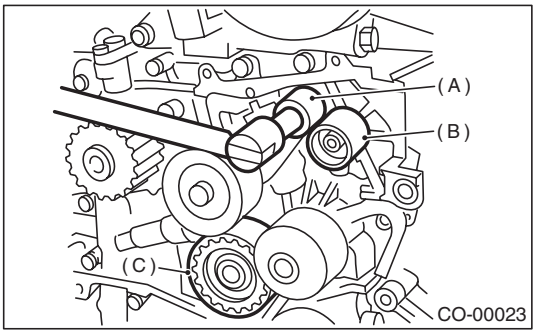
4) Install the tensioner bracket.

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



5) Install the cam sprocket (LH) using ST. <Ref. to ME(H4DOTC)-54, INSTALLATION, Cam Sprocket.>
6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-24, INSTALLATION, Camshaft Position Sensor.>
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(H4DOTC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

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

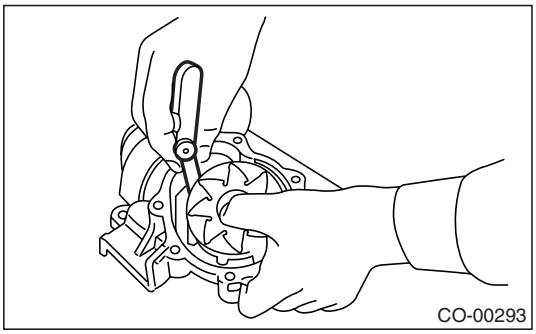


10) Install the timing belt. <Ref. to ME(H4DOTC)-49, TIMING BELT, INSTALLATION, Timing Belt.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
13) Install the collector cover.

C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Make sure the impeller is not deformed or damaged.
4) Inspect the clearance between impeller and pump case.

Clearance between impeller and pump case:
Specification
0.5 — 1.5 mm (0.020 — 0.059 in)

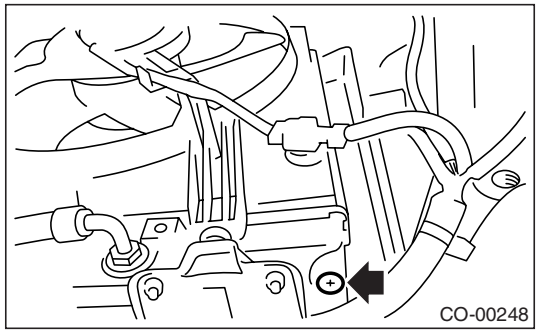


5) After water pump installation, check the pulley shaft for engine coolant leaks and noise. If leaks or noise are noted, replace the water pump assembly.

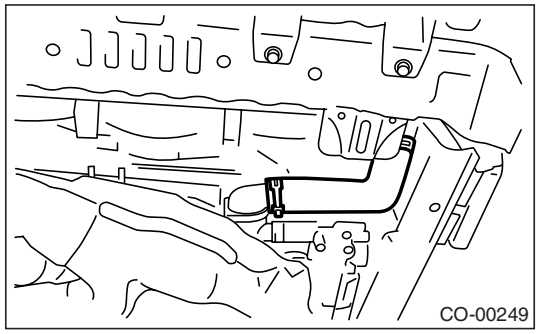
5. Thermostat

A: REMOVAL

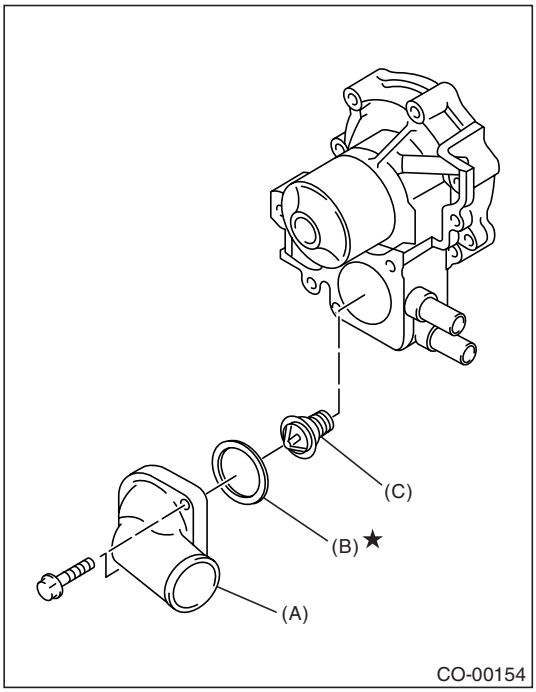
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



5) Disconnect the radiator outlet hose from thermostat cover.



6) Remove the thermostat cover, and then remove the gasket and thermostat.



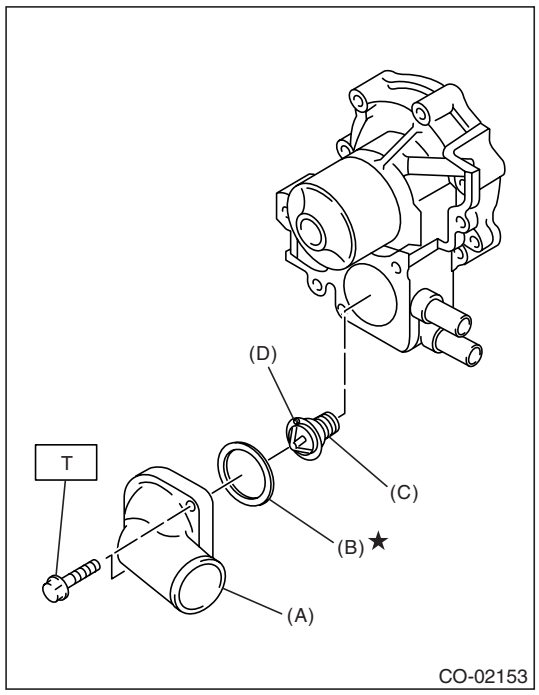
(A) Thermostat cover
(B) Gasket
(C) Thermostat

B: INSTALLATION

1) Install a gasket to thermostat, and install the thermostat and gasket to water pump as a unit. Then, install the thermostat cover.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin facing upward.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



(A) Thermostat cover
(B) Gasket
(C) Thermostat
(D) Jiggle pin

2) Connect the radiator outlet hose to thermostat cover.
3) Install the under cover.
4) Lower the vehicle.
5) Fill with engine coolant. <Ref. to CO(H4DOTC)-13, 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.

- Inspection method

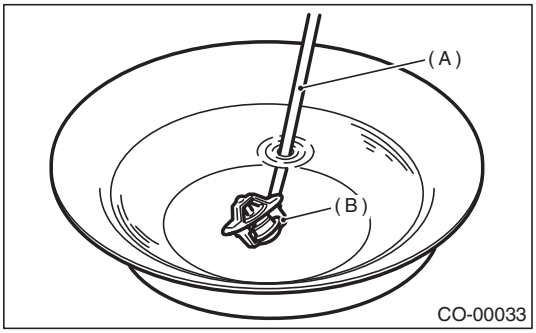
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

NOTE:
- Leave the thermostat in the boiling water for more than five minutes before measuring valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with container bottom.

Starting temperature to open:
76 — 80°C (169 — 176°F)

Fully opens:
91°C (196°F)

Valve lift:
9.0 mm (0.354 in) or more



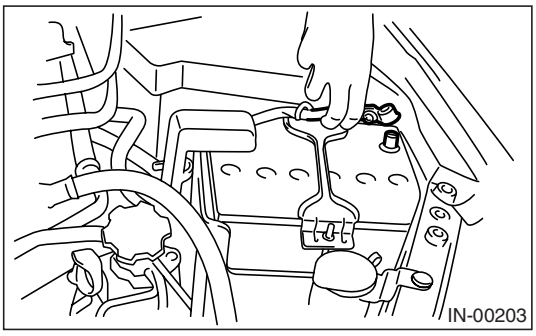
(A) Thermometer
(B) Thermostat

6. Radiator

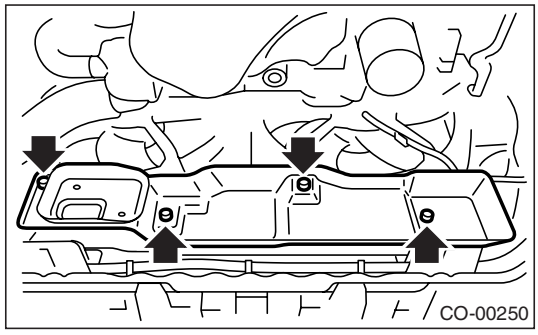
A: REMOVAL

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

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.

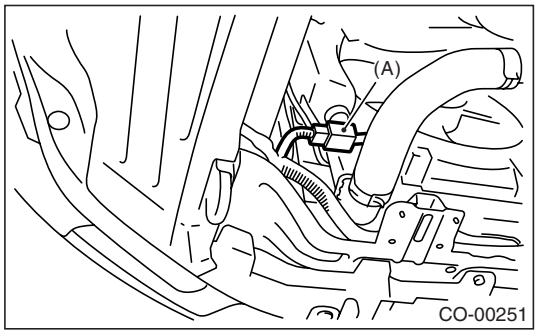


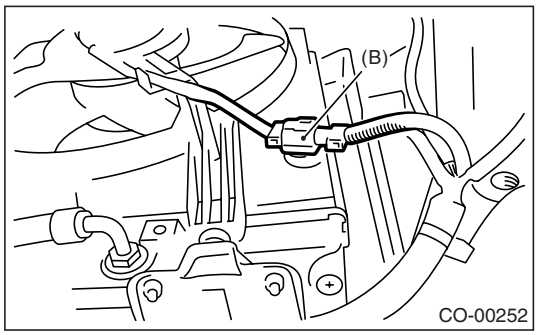
4) Lift-up the vehicle.
5) Remove the under cover.
6) Remove the heat shield cover from radiator. (Model without ATF warmer)



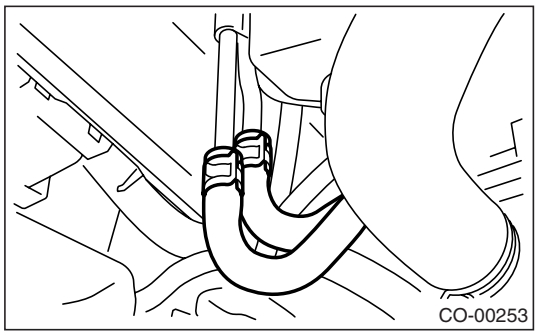
7) Drain engine coolant completely.
<Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

8) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

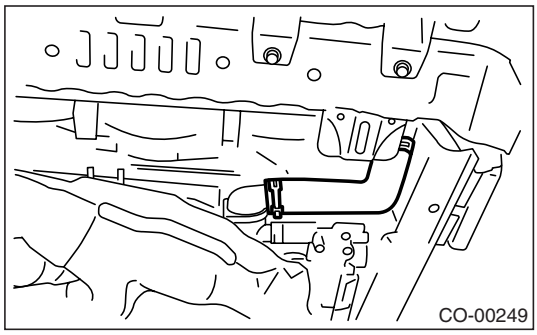




9) Disconnect the ATF cooler hoses from ATF pipes. (Model without ATF warmer)Plug the ATF pipe to prevent ATF leaks.

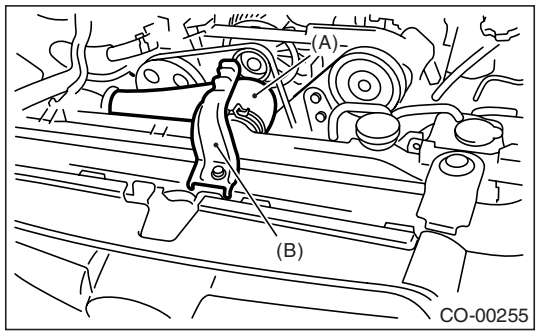


10) Disconnect the radiator outlet hose from thermostat cover.

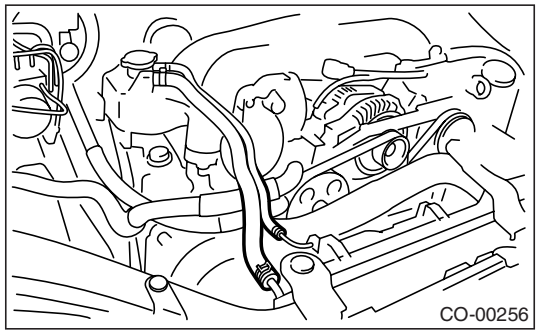


11) Lower the vehicle.
12) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
13) Disconnect the over flow hose.

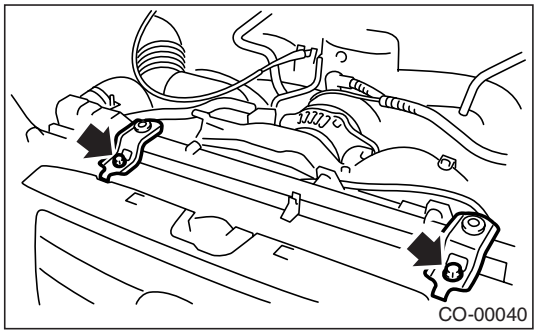
14) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
15) Disconnect the radiator inlet hose (A) from radiator.
16) Remove the hood stay holder (B).



17) Disconnect the two coolant filler tank hoses from radiator.



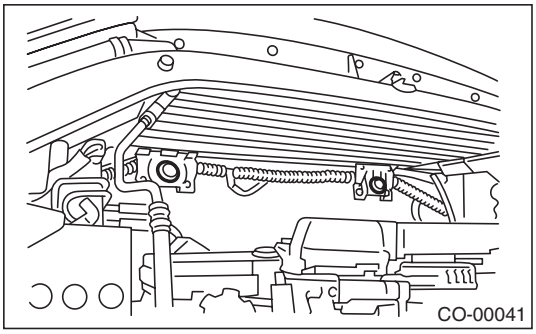
18) Remove the radiator upper brackets.



19) While lifting the radiator up, slide it to the left.
20) Lift the radiator up and away from vehicle.

B: INSTALLATION

1) Install the radiator lower cushions to holes on the radiator lower bracket.

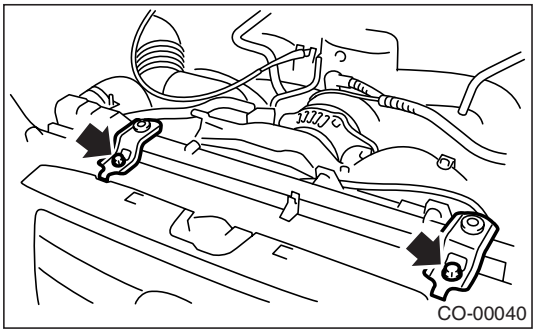


2) Install the radiator to vehicle.

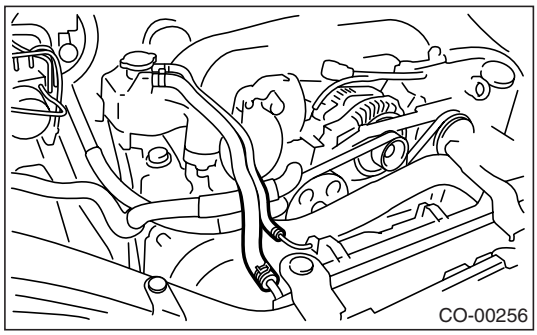
NOTE:
Make pins on the lower side of radiator be fitted into the radiator lower cushions on body side.

3) Install the radiator upper brackets and tighten the bolts.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

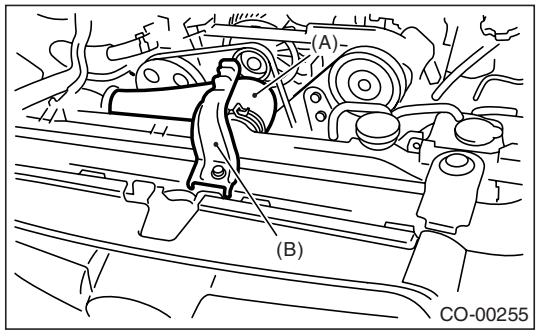


4) Connect the two coolant filler tank hoses to radiator.

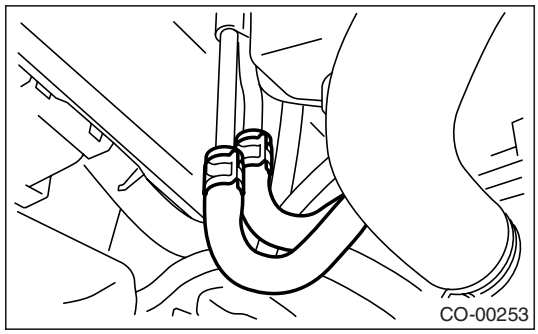


5) Connect the radiator inlet hose (A).

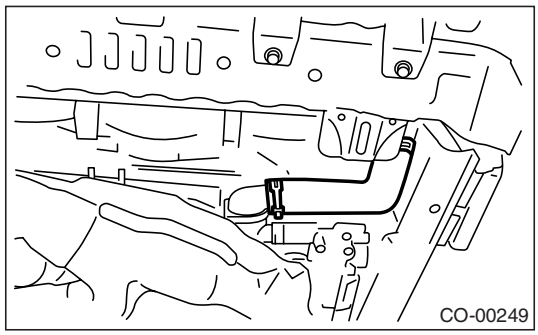
6) Install the hood stay holder (B).



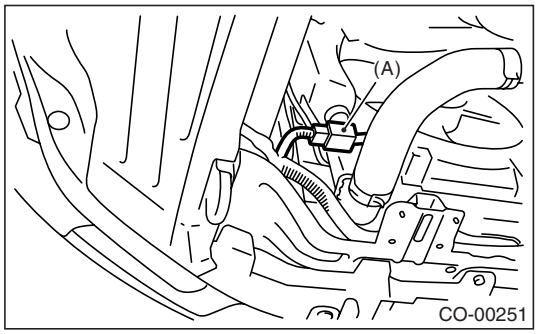
7) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
8) Connect the over flow hose.
9) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
10) Lift-up the vehicle.
11) Connect the ATF cooler hoses. (Model without ATF warmer)

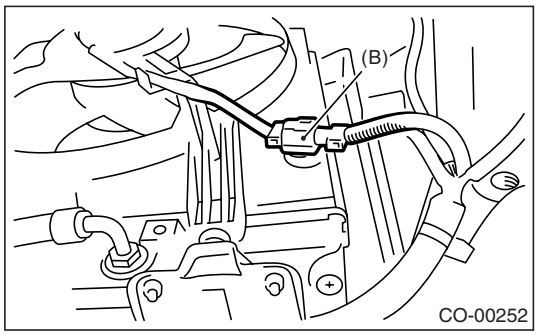


12) Connect the radiator outlet hose.

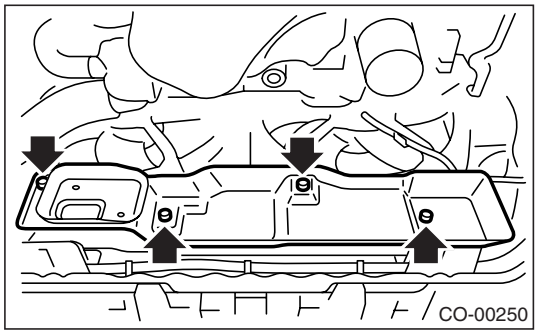


13) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).

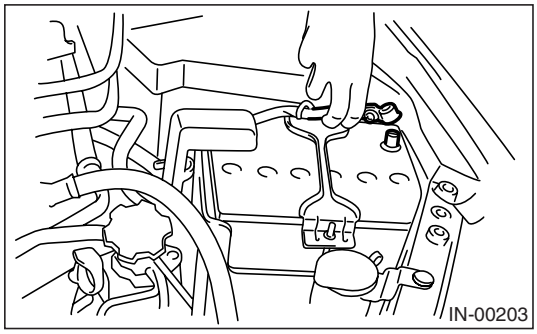




14) Install the heat shield cover. (Model without ATF warmer)



15) Install the under cover.
16) Lower the vehicle.
17) Connect the ground cable to battery.

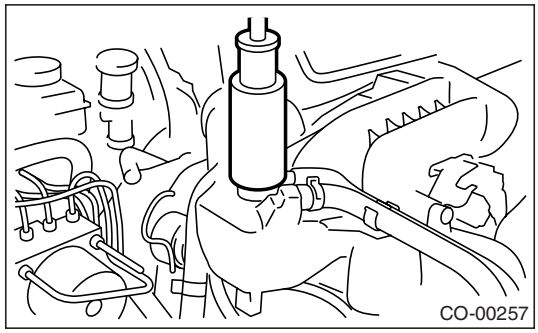


18) Fill engine coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
19) Check the ATF level. <Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>

20) Install the collector cover.

C: INSPECTION

1) Remove the coolant filler tank cap and fill engine coolant to coolant filler tank, then attach the tester to radiator in place of cap.



2) Apply a pressure of 122 kPa (1.2 kgf/cm^2, 18 psi) to the radiator to check if:

- Engine coolant leaks at/around radiator.
- Engine coolant leaks at/around hoses or connections.

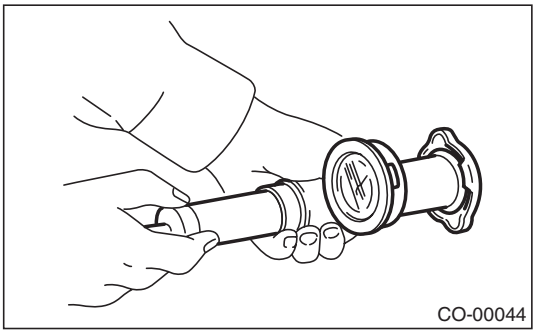
CAUTION:

- **Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.**
- **Engine should be turned off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful not to deform the filler neck of coolant filler tank when installing or removing the tester.**

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



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

Coolant filler tank side

Specified pressure:

93 — 123 kPa (0.95 — 1.25 kgf/cm^2, 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kgf/cm^2, 12 psi)

Radiator side

Specified pressure:

122 — 152 kPa (1.24 — 1.55 kgf/cm^2, 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kgf/cm^2, 16 psi)

CAUTION:

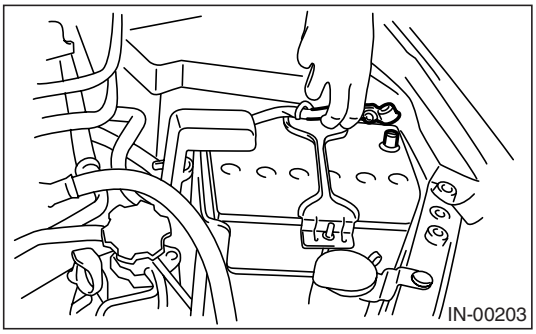
• Be sure to remove foreign matter and rust from the cap in advance, otherwise results of pressure test will be incorrect.

• Do not confuse the cap of coolant filler tank with that of radiator.

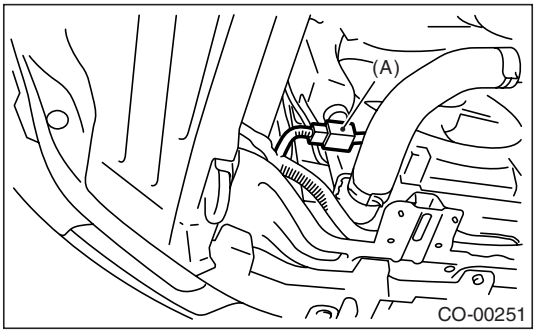
8. Radiator Main Fan and Fan Motor

A: REMOVAL

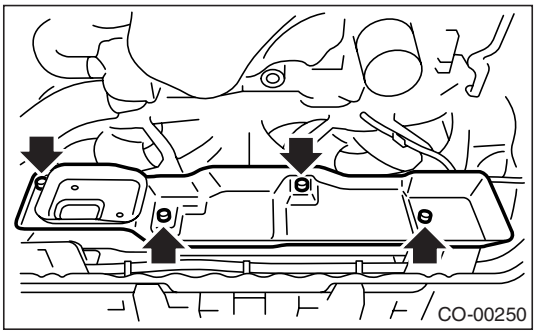
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the main fan motor connector (A).

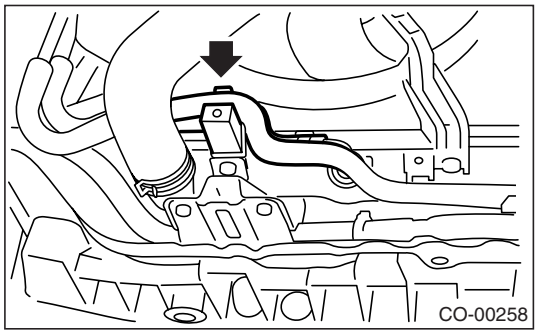


6) Remove the heat shield cover from radiator. (Model without ATF warmer)

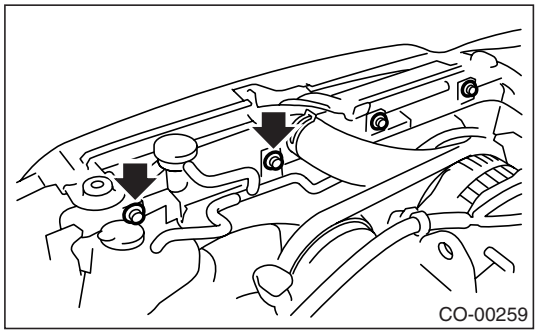


7) Drain the coolant about 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

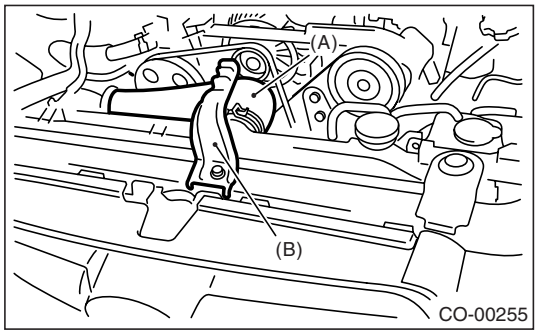
8) Remove the ATF hose from the clip of radiator main fan motor assembly.



9) Lower the vehicle.
10) Remove the air intake duct.
11) Disconnect the over flow hose.
12) Remove the over flow pipe.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
14) Remove the mounting bolts from radiator main fan motor assembly.



15) Disconnect the radiator inlet hose (A) from radiator.
16) Remove the hood stay holder (B).

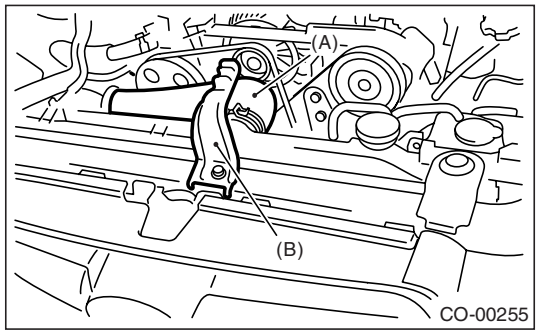


17) Remove the radiator main fan motor assembly from vehicle.

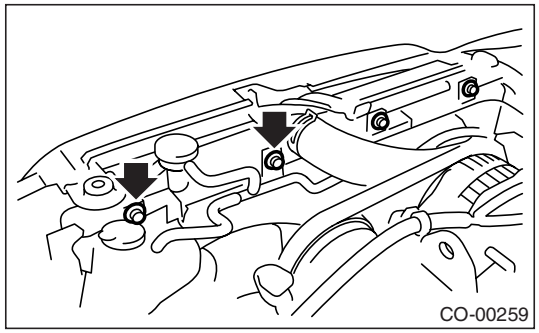
B: INSTALLATION

1) Install the radiator main fan motor assembly to vehicle.
2) Connect the radiator inlet hose (A) to radiator.

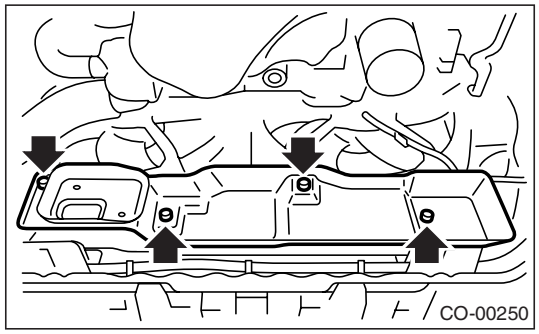
3) Install the hood stay holder (B).



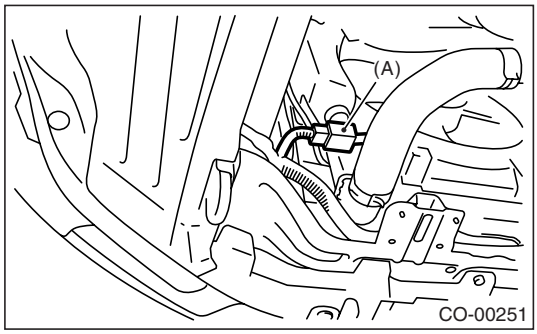
4) Install the mounting bolts to radiator main fan motor assembly.



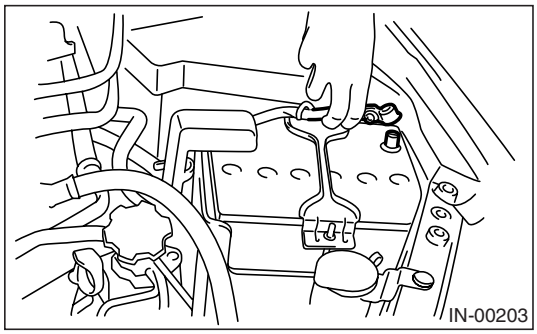
5) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift-up the vehicle.
10) Install the ATF hose to the clip of radiator main fan motor assembly.
11) Install the heat shield cover to radiator. (Model without ATF warmer)



12) Connect the main fan motor connector (A).



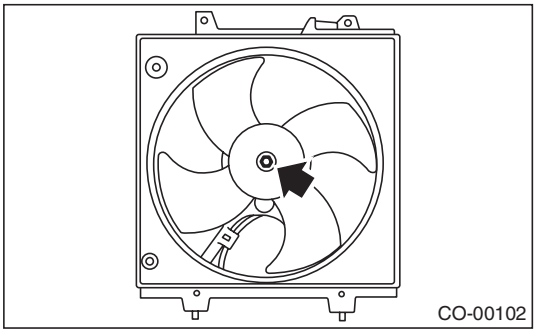
13) Install the under cover.
14) Lower the vehicle.
15) Connect the ground cable to battery.



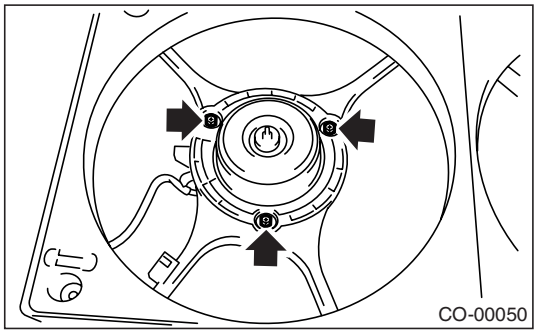
16) Fill engine coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds fan motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



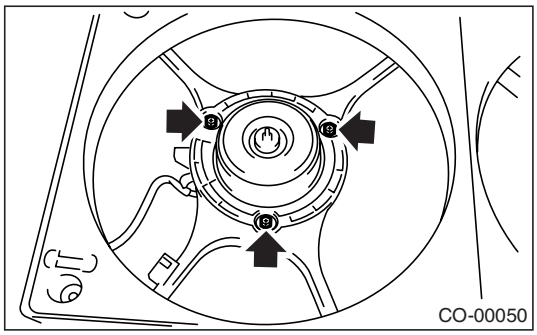
3) Remove the bolts which install fan motor onto the shroud.



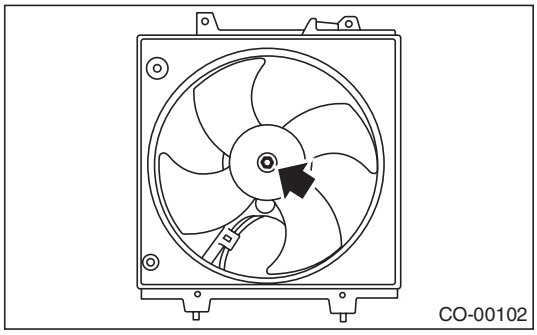
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
5.0 N·m (0.5 kgf-m, 3.7 ft-lb)



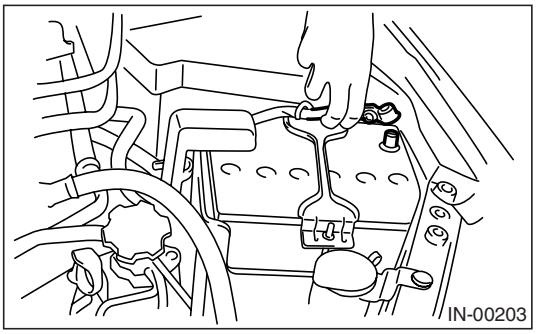
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



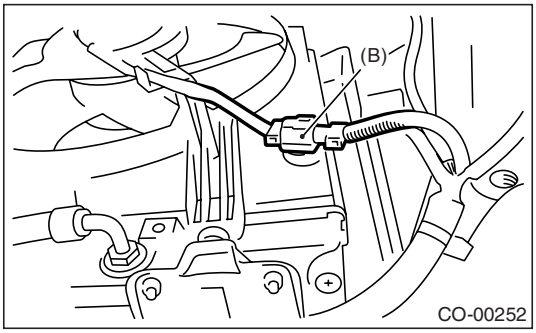
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

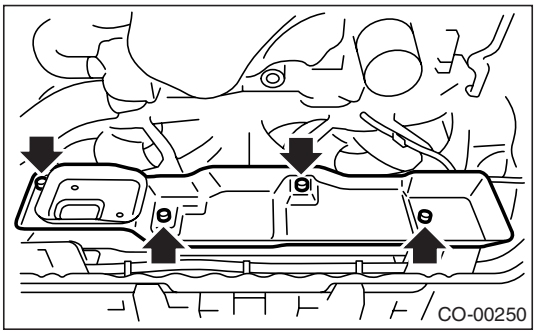
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



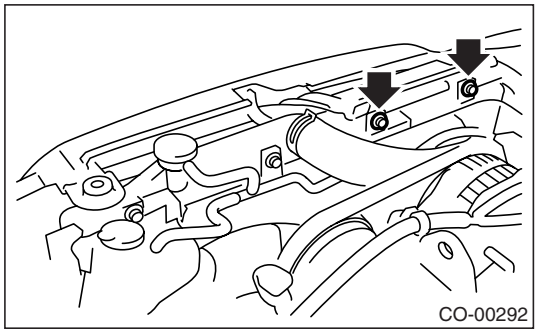
3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the sub fan motor connector (B).



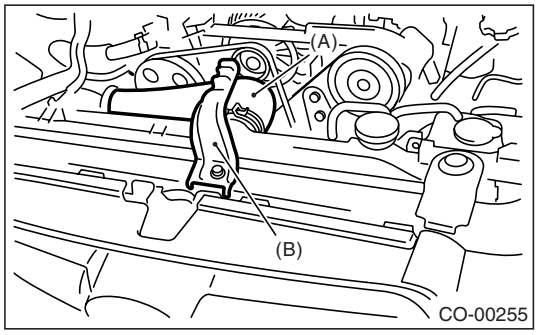
6) Remove the heat shield cover from radiator. (Model without ATF warmer)



7) Drain the coolant about 1 ℓ (1.06 US qt, 0.88 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
8) Disconnect the ATF hose from the clip of radiator sub fan motor assembly.
9) Lower the vehicle.
10) Remove the air intake duct.
11) Disconnect the over flow hose.
12) Remove the over flow pipe.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-30, REMOVAL, Reservoir Tank.>
14) Remove the mounting bolts of radiator sub fan motor assembly.



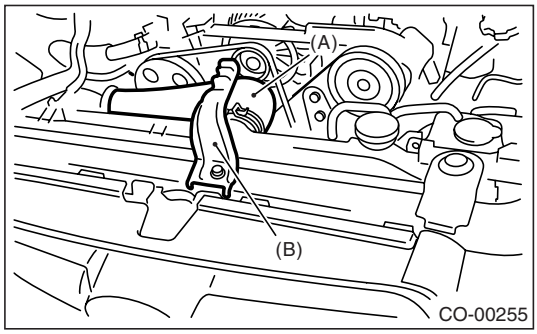
15) Disconnect the radiator inlet hose (A) from radiator.
16) Remove the hood stay holder (B).



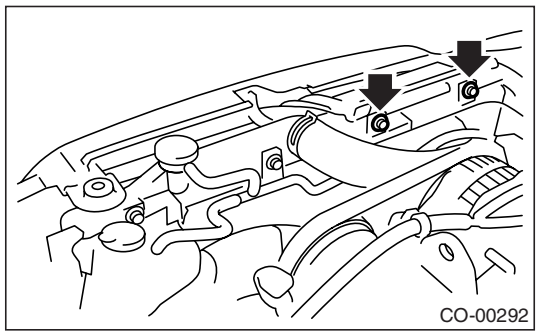
17) Remove the radiator sub fan motor assembly from vehicle.

B: INSTALLATION

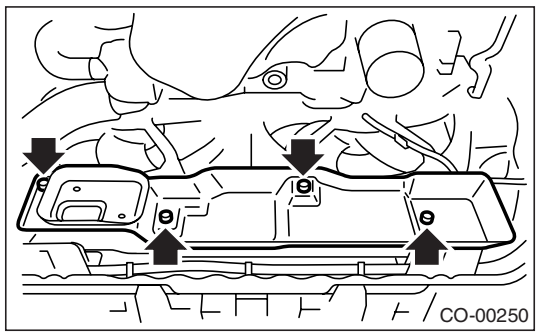
1) Install the radiator sub fan motor assembly to vehicle.
2) Connect the radiator inlet hose (A) to radiator.
3) Install the hood stay holder (B).



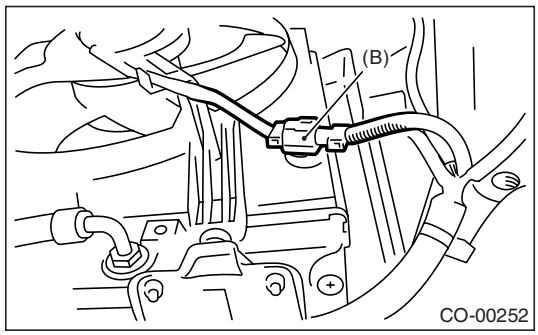
4) Install the mounting bolts of radiator sub fan motor assembly.



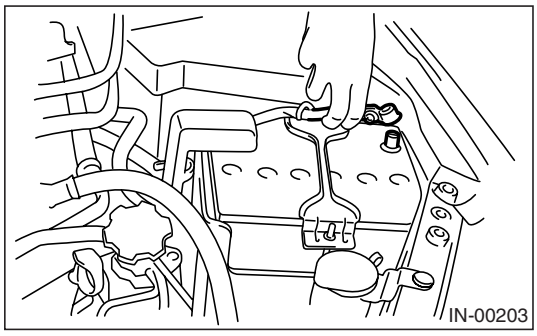
5) Install the reservoir tank. <Ref. to CO(H4DOTC)-30, INSTALLATION, Reservoir Tank.>
6) Install the over flow pipe.
7) Connect the over flow hose.
8) Install the air intake duct.
9) Lift-up the vehicle.
10) Connect the ATF hose to the clip of radiator sub fan motor assembly.
11) Install the heat shield cover to radiator. (Model without ATF warmer)



12) Connect the sub fan motor connector (B).



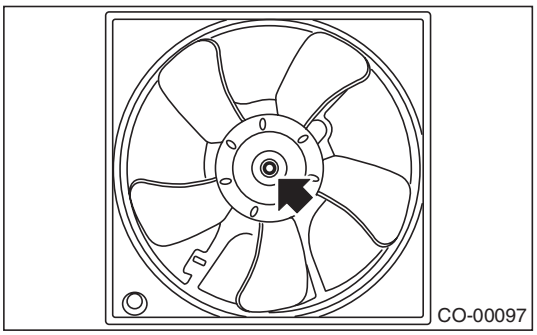
13) Install the under cover.
14) Lower the vehicle.
15) Connect the ground cable to battery.



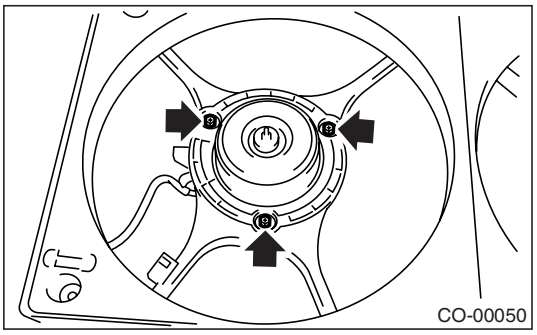
16) Fill engine coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Install the collector cover.

C: DISASSEMBLY

1) Remove the clip which holds fan motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



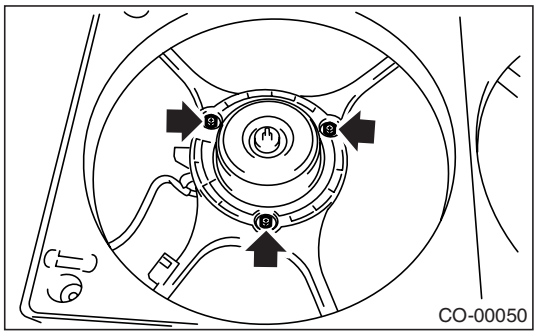
3) Remove the bolts which install fan motor onto the shroud.



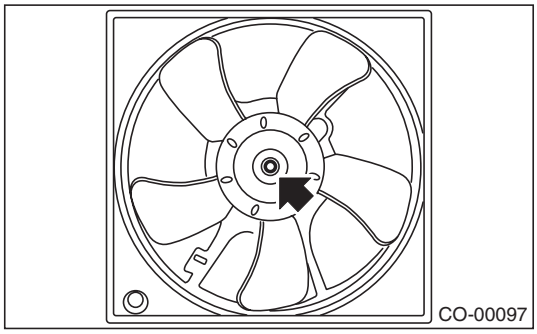
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
5.0 N·m (0.5 kgf-m, 3.7 ft-lb)



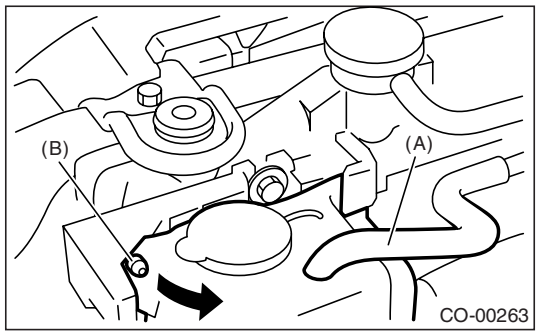
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



10.Reservoir Tank

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the over flow hose (A).
3) Pull out the reservoir tank to the direction of arrow while pushing the pawl (B).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

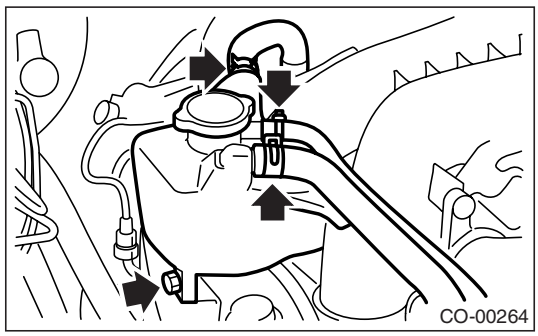
Make sure the engine coolant level is between “FULL” and “LOW”.

11.Coolant Filler Tank

A: REMOVAL

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

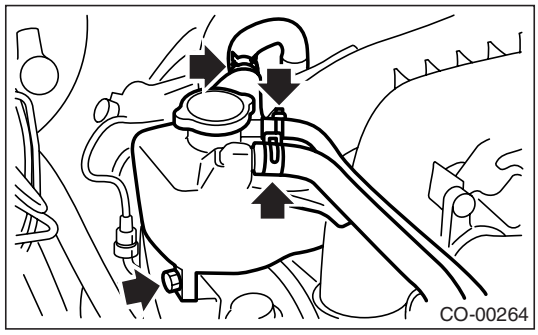
1) Remove the collector cover.
2) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Disconnect the engine coolant hoses from coolant filler tank.
4) Remove the bolts which install the coolant filler tank.
5) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
6) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

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



2) Fill with engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Overheating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean, repair or replace.
	i. Engine oil mixed in engine coolant	Check, repair or replace the parts around engine.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Correct or replace.
	n. Dragging brake	Adjust.
	o. Defective radiator fan	Inspect radiator fan relay, engine coolant temperature sensor or fan motor and replace them.
Over-cooling	a. Ambient temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Correct or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Correct or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Correct or replace.
	f. Damaged or cracked thermostat case	Correct or replace.
	g. Leakage from radiator	Correct or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H4DOTC)

		Page
1.	General Description	2
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3.	Engine Oil	9
4.	Oil Pump	10
5.	Oil Pan and Strainer	14
6.	Oil Pressure Switch	17
7.	Engine Oil Filter	18
8.	Engine Oil Cooler	19
9.	Engine Lubrication System Trouble in General	20

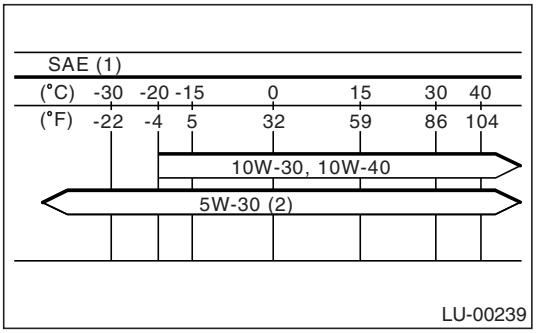
1. General Description

A: SPECIFICATION

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth	Inner rotor			9
		Outer rotor			10
	Outer rotor diameter × thickness			mm (in)	78 × 12 (3.07 × 0.47)
	Tip clearance between inner and outer rotors			mm (in)	0.04 — 0.14 (0.0016 — 0.0055)
	Side clearance between inner rotor and pump case			mm (in)	0.02 — 0.07 (0.0008 — 0.0028)
	Case clearance between outer rotor and pump case		Specification	mm (in)	0.10 — 0.175 (0.0039 — 0.0069)
	Performance at oil temperature 80°C (176°F)	600 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	98 (1.0, 14)
			Discharge rate	ℓ (US qt, Imp qt)/min.	6.5 (6.9, 5.7) or more
		6,000 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	588 (6.0, 85)
			Discharge rate	ℓ (US qt, Imp qt)/min.	59.0 (62.3, 51.9) or more
	Relief valve working pressure			kPa (kgf/cm^2, psi)	588 (6.0, 85)
Oil filter	Filter type				Full-flow filter type
	Filtration area		cm^2 (sq in)	(Outer diameter: 68 mm (2.68 in))	800 (124)
				(Outer diameter: 65 mm (2.56 in))	470 (72.9)
	By-pass valve opening pressure			kPa (kgf/cm^2, psi)	160 (1.63, 23.2)
	Outer diameter × width		mm (in)	(Outer diameter: 68 mm (2.68 in))	68 × 65 (2.68 × 2.56)
				(Outer diameter: 65 mm (2.56 in))	65 × 74.4 (2.56 × 2.93)
	Installation screw specifications				M 20 ×1.5
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure			kPa (kgf/cm^2, psi)	14.7 (0.15, 2.1)
	Proof pressure			kPa (kgf/cm^2, psi)	981 (10, 142) or more
Engine oil	Capacity (at overhaul)			ℓ (US qt, Imp qt)	5.0 (5.3, 4.4)
	When replacing engine oil and oil filter			ℓ (US qt, Imp qt)	MT: 4.3 (4.5, 3.8) AT: 4.2 (4.4, 3.7)
	When replacing engine oil only			ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)

Recommended oil:

API standard SL, SJ with "Energy Conserving" logo is printed (If SL, SJ grade is not available, use SH grade)
ACEA standard A1, A2 or A3
ILSAC standard GF-3 "Star burst mark" label on the container



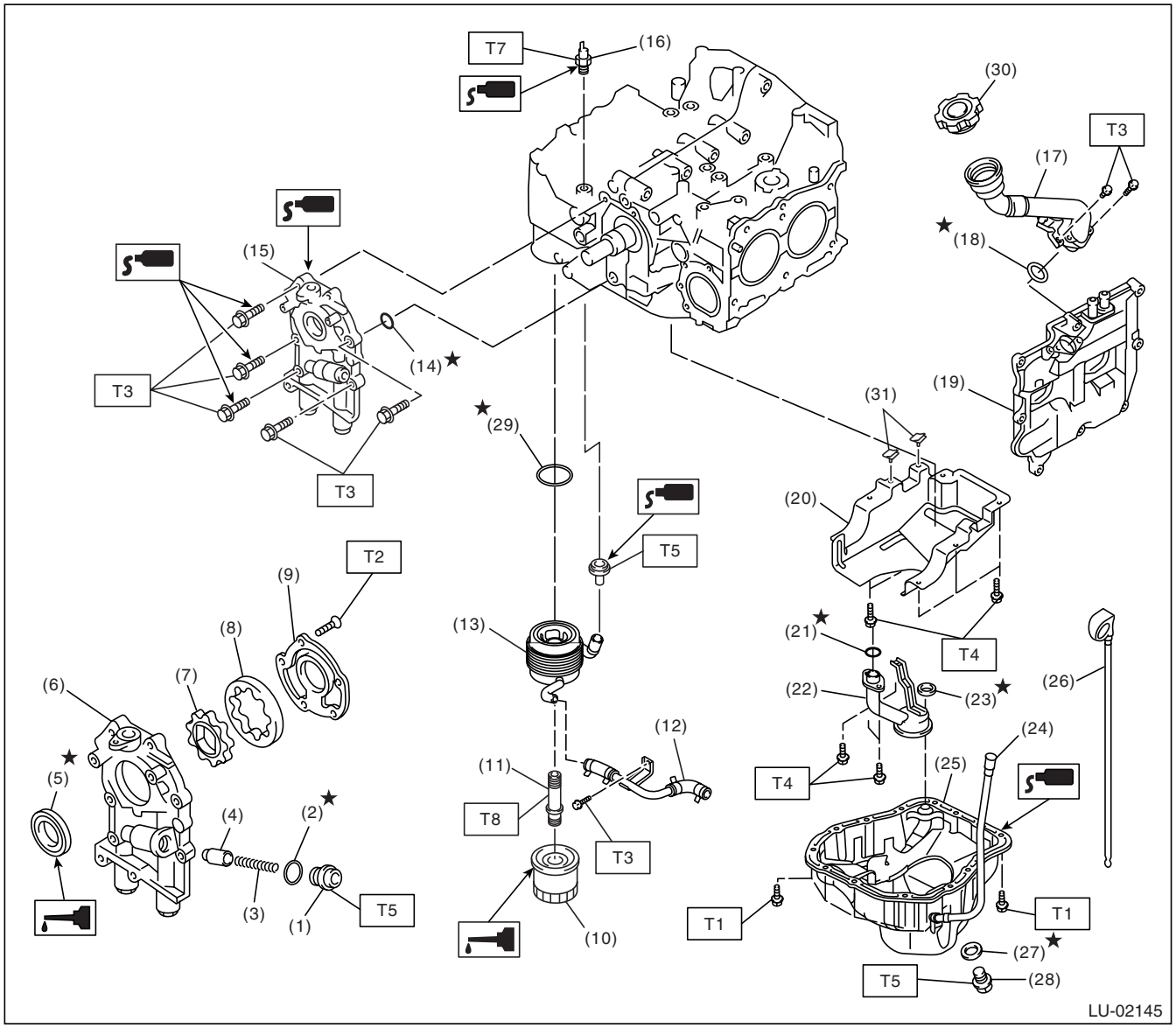
(1) SAE viscosity No. and applicable temperature
(2) Recommended

The proper viscosity oil make the engine ideal temperature, and cranking speed increased by reducing viscaus friction in hot condition.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils must be used: API standard: SL or SJ
SAE viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector (DOHC turbo MT model)
(12) Water bypass pipe (DOHC turbo MT model)
(13) Oil cooler (DOHC turbo MT model)
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Rocker cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Oil filler cap
(31) Seal

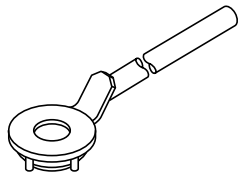
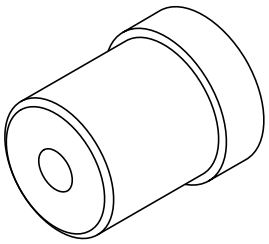
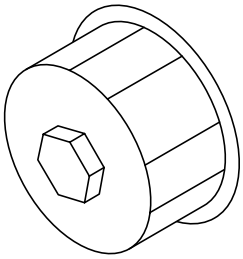
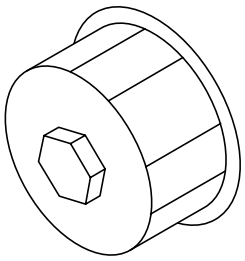
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 5.4 (0.55, 4.0)
T3: 6.4 (0.65, 4.7)
T4: 10 (1.0, 7.4)
T5: 44 (4.5, 33)
T6: 69 (7.0, 50.9)
T7: 25 (2.5, 18.4)
T8: 54 (5.5, 40)

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 yourself, 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 rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

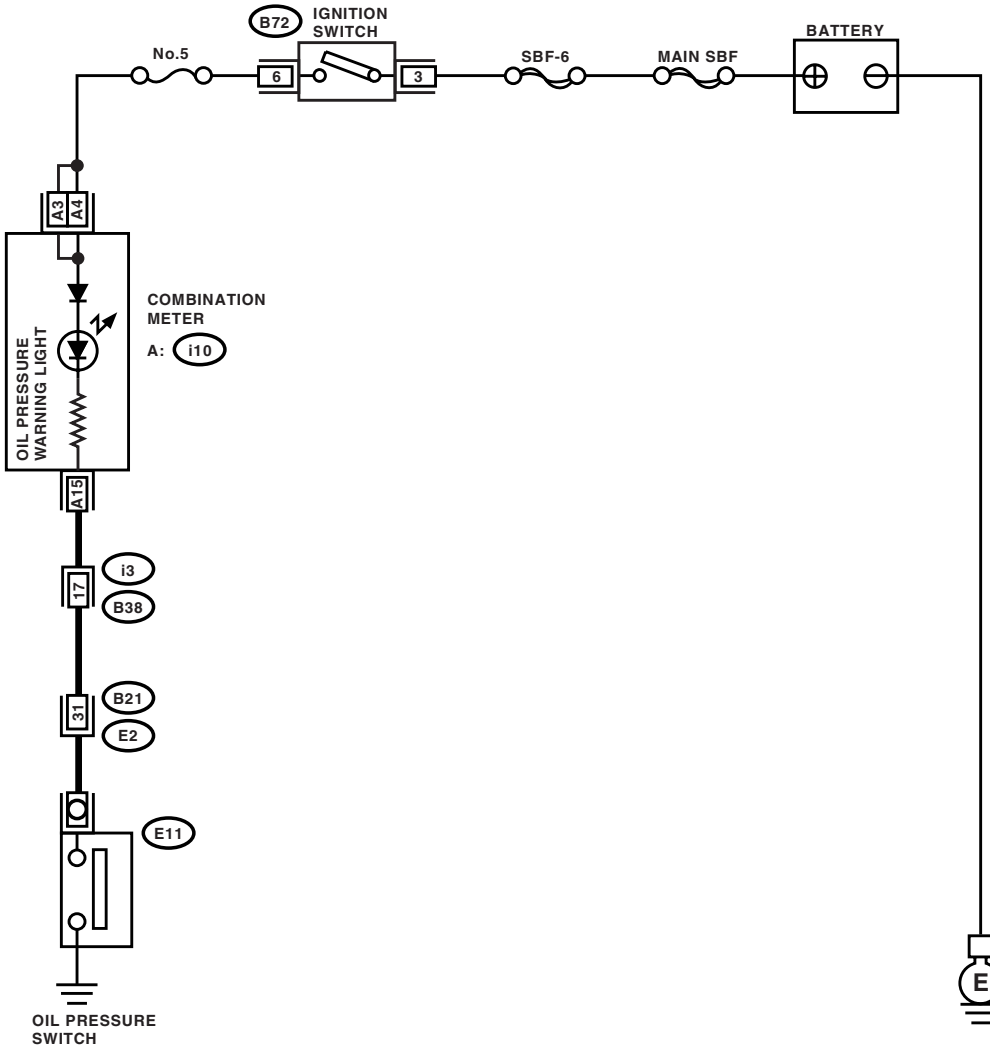
D: PREPARATION TOOL

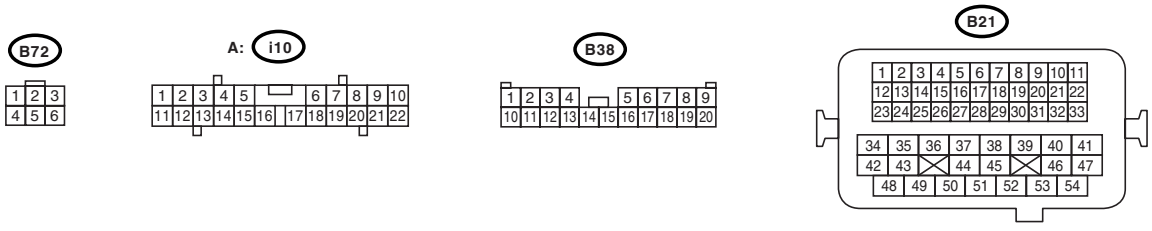
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when removing and tightening crank pulley bolt.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal into oil pump.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02152

B: INSPECTION

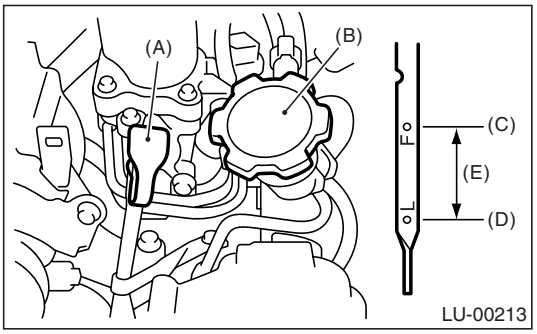
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Check the warning light of combination meter.	Does the warning light illuminate?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between oil pressure switch connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***No. 4 — No. 15:*** ***No. 3 — No. 15:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Remove the oil level gauge again and check the engine oil level. 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 return to the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level shows in the range between "F" line and notch mark. This is caused by thermal expansion of engine oil.

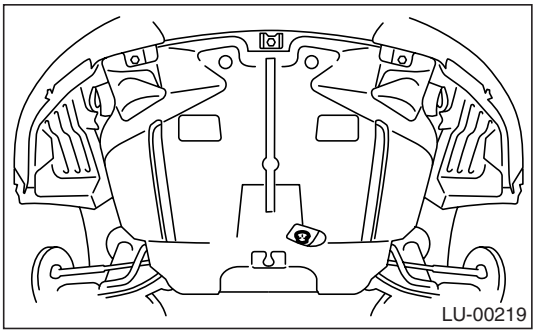
NOTE:
To prevent overfilling of engine oil, do not add oil above the "F" line when the engine is cold.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

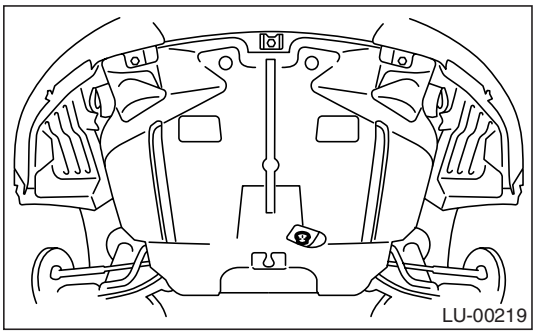
1) Open the engine oil filler cap for quick draining of engine oil.
2) Lift-up the vehicle.
3) Drain the engine oil by loosening the engine oil drain plug.



4) Tighten the engine oil drain plug after draining engine oil.

NOTE:
Use a new metal gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

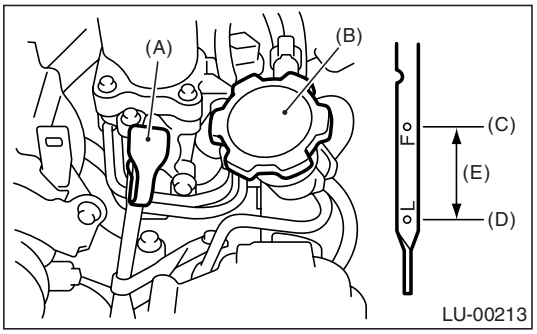


5) Use the engine oil of proper quality and viscosity, fill the engine oil through oil filler duct to upper level on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
<Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

Engine oil capacity (when replacing engine oil):
4.0 ℓ (4.2 US qt, 3.5 Imp qt)

6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.
8) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

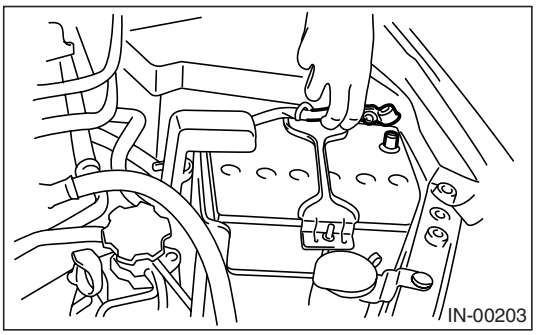


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

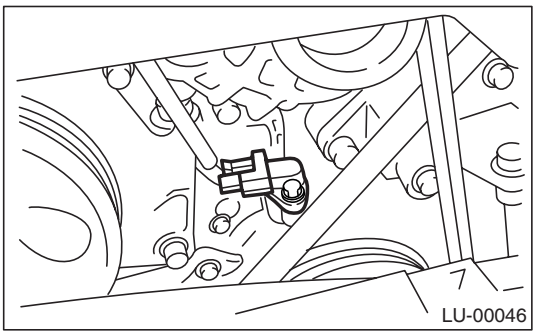
4. Oil Pump

A: REMOVAL

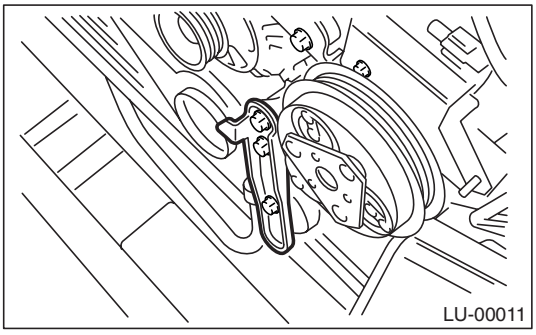
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



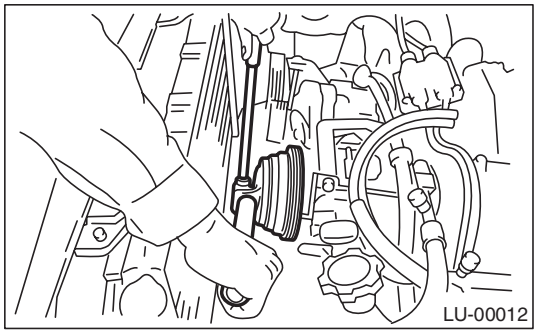
3) Lift-up the vehicle.
4) Remove the under cover.
5) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
6) Remove the crankshaft position sensor.



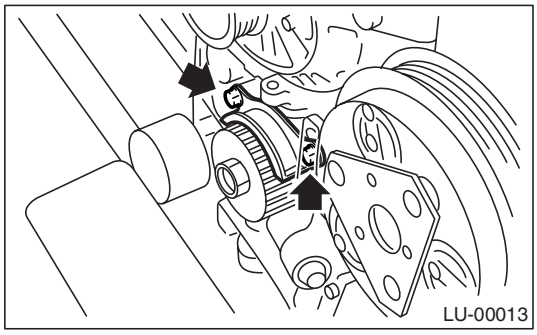
7) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
8) Remove the rear side V-belt tensioner.



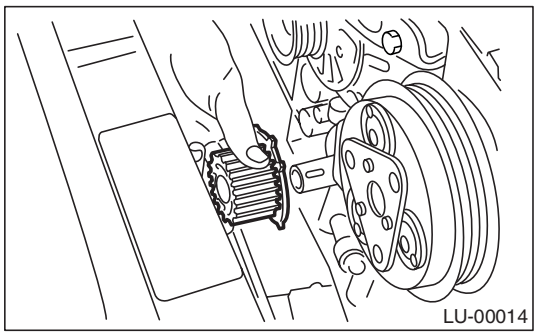
9) Remove the crank pulley using ST. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>



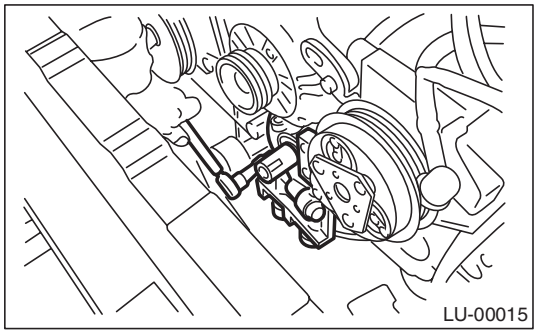
10) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
11) Remove the timing belt guide.



12) Remove the crank sprocket.

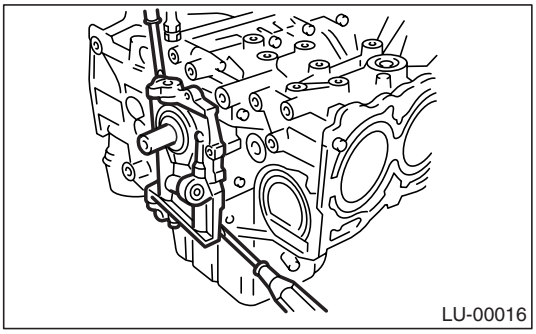


13) Remove the bolt which installs oil pump to cylinder block.



14) Remove the oil pump by using flat tip screwdriver.

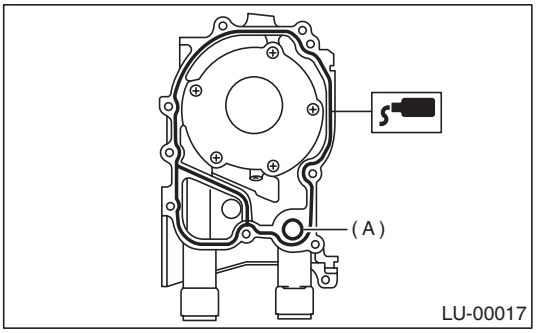
CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.


LU-00016

B: INSTALLATION

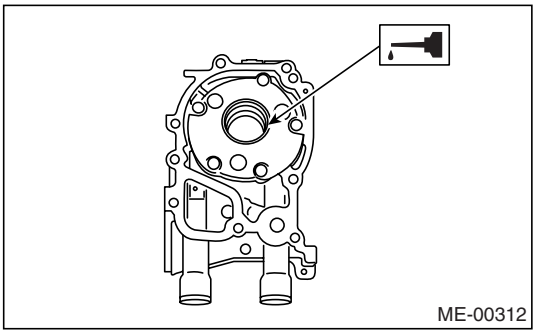
Install in the reverse order of removal.
Perform the following.
1) Apply liquid gasket to the mating surfaces of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



LU-00017

2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.


ME-00312

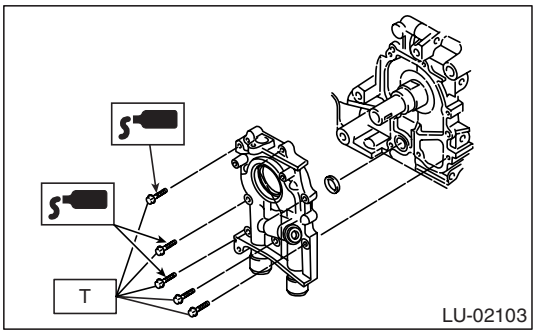
4) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
- **Make sure the oil seal lip is not folded.**
- **Be careful not to scratch the oil seal when installing oil pump on cylinder block.**

5) Install the oil pump.
6) Apply liquid gasket to the three bolts thread. (if to be reused)

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

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

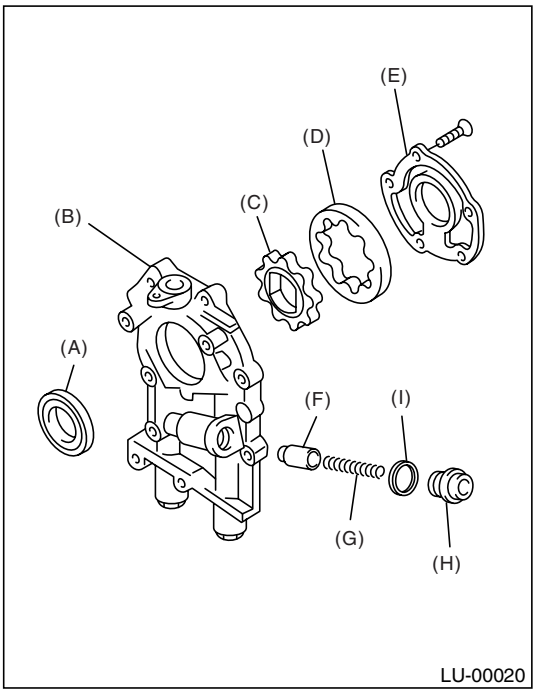


LU-02103

C: DISASSEMBLY

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

CAUTION:
Before disassembling the oil pump, remove the relief valve.

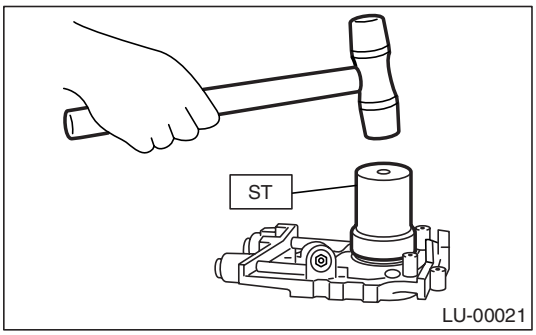


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

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

NOTE:
Use a new oil seal.

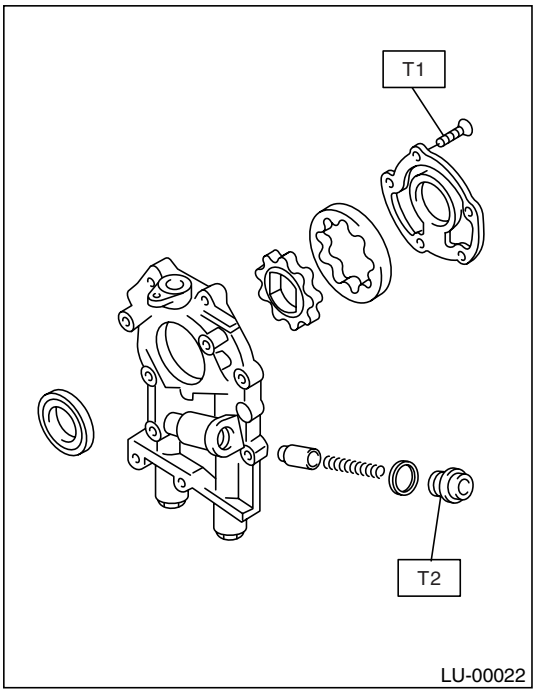


2) Apply a coat of engine oil to inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve and install relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)
T2: 44 N·m (4.5 kgf-m, 33 ft-lb)

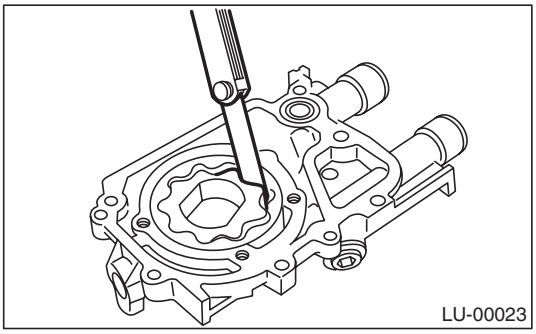


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance is out of the specification, replace rotors as a matched set.

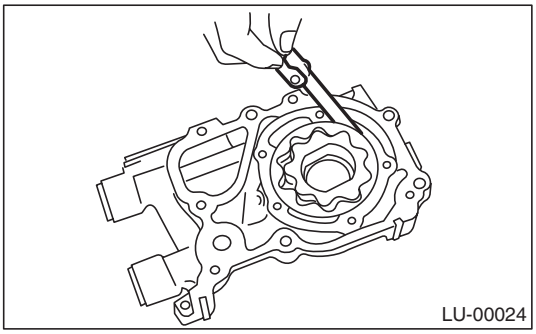
Tip clearance:
Specification
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If the clearance is out of the specification, replace the oil pump case.

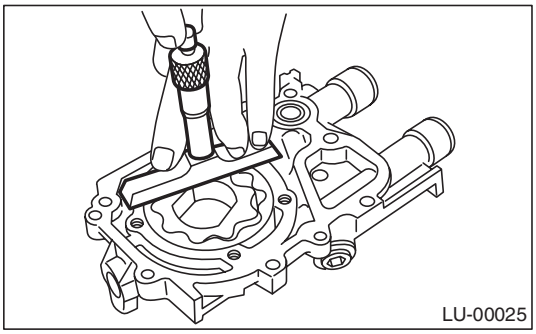
Case clearance:
Specification
0.10 — 0.175 mm (0.0039 — 0.0069 in)



3. SIDE CLEARANCE

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

Side clearance:
Specification
0.02 — 0.07 mm (0.0008 — 0.0028 in)



4. OIL RELIEF VALVE

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

Relief valve spring:
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lbf)

5. OIL PUMP CASE

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

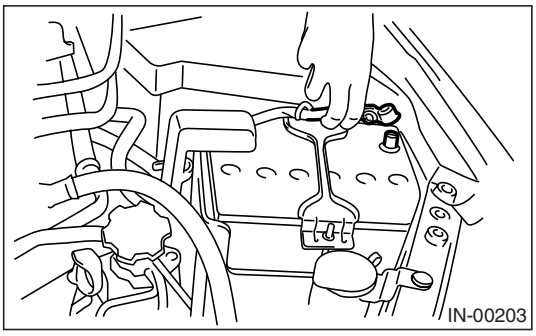
6. OIL SEAL

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

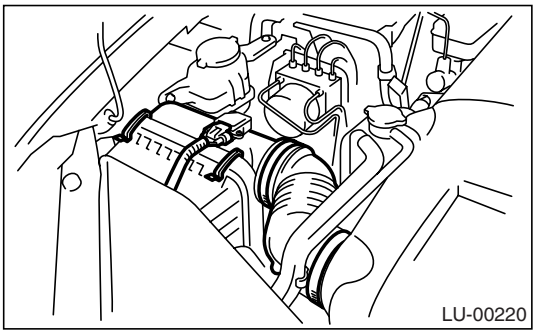
5. Oil Pan and Strainer

A: REMOVAL

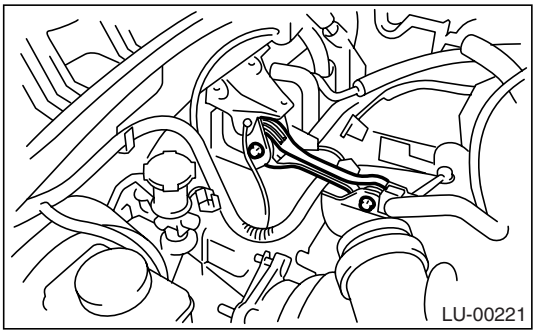
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Remove the collector cover.
4) Disconnect the ground cable from battery.



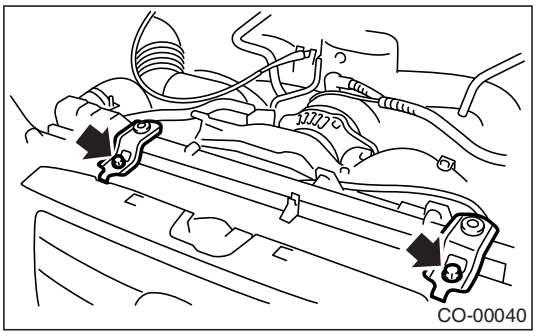
5) Disconnect the connector from mass airflow sensor.
6) Remove the air intake boot and air cleaner upper cover.



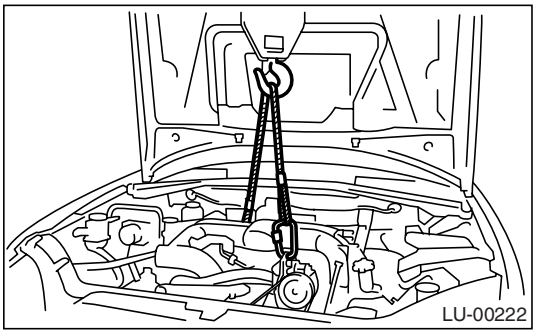
7) Remove the intercooler.
<Ref. to IN(H4DOTC)-12, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



9) Remove the linear motion mounting.
<Ref. to ME(H4DOTC)-38, REMOVAL, Linear Motion Mounting.>
10) Remove the radiator upper brackets.



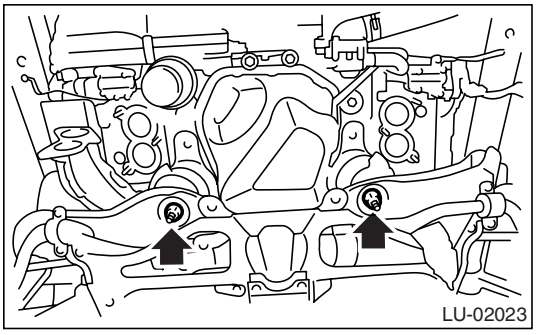
11) Support the engine with a lifting device and wire ropes.



12) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, raise up wire ropes at the same time.

13) Remove the under cover.
14) Drain the engine oil.
15) Remove the front exhaust pipe.
<Ref. to EX(H4DOTC)-5, REMOVAL, Front Exhaust Pipe.>
16) Remove the nuts which install front cushion rubber onto front crossmember.

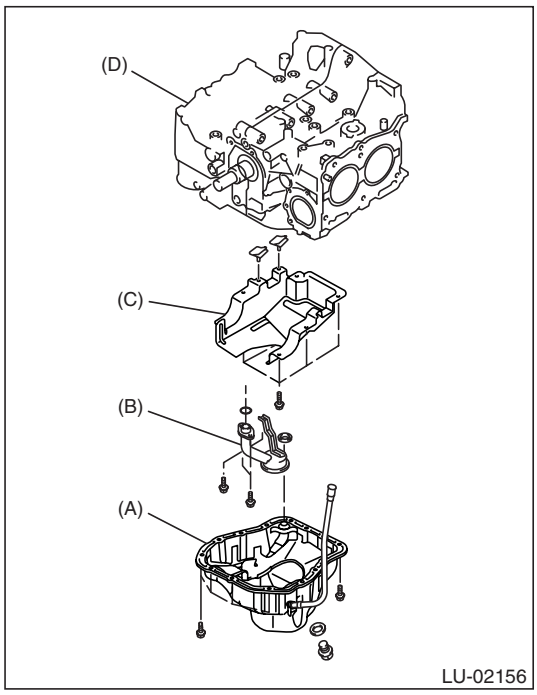


17) Remove the bolts which install oil pan on cylinder block with the engine raised up.
18) Insert the oil pan cutter blade into the gap between cylinder block and oil pan.

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

19) Remove the oil strainer.

20) Remove the baffle plate.

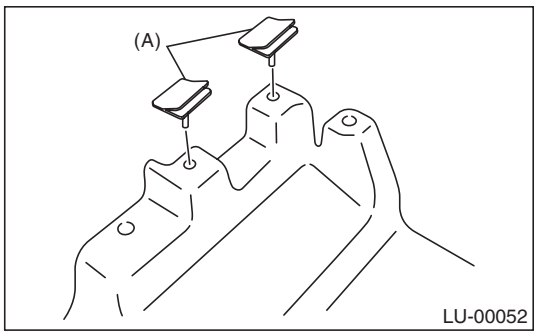


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

B: INSTALLATION

CAUTION:
Before installing the oil pan, wipe clean the oil pan and the mating face of engine block.

1) Make sure that the seals (A) are installed securely on the buffle plate in a direction as shown in the figure below.



2) Install the baffle plate.

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

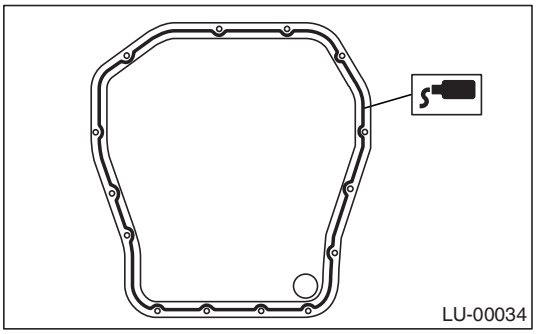
3) Install the oil strainer onto baffle plate.

NOTE:
Use a new O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

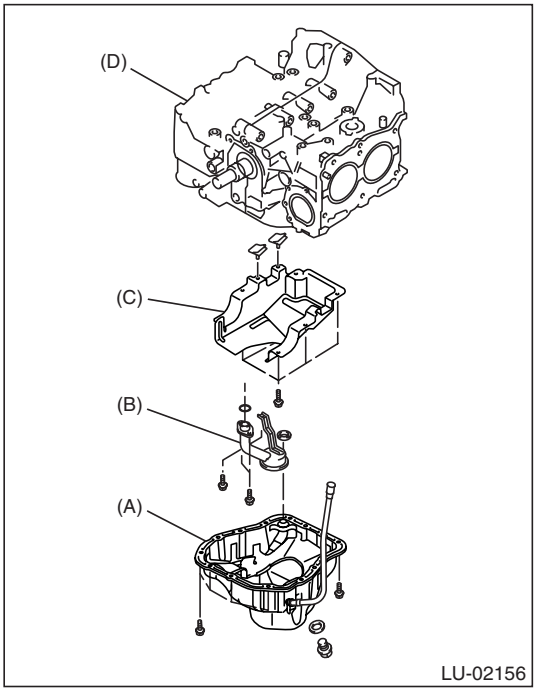
4) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent



5) Tighten the bolt which installs oil pan to engine block.

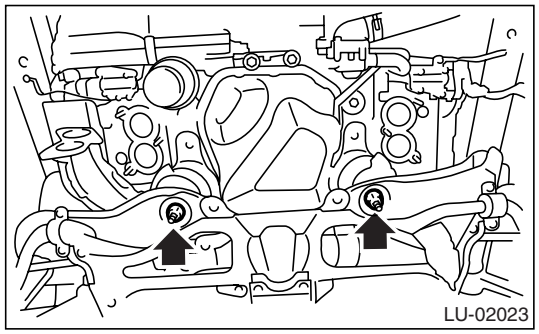
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

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

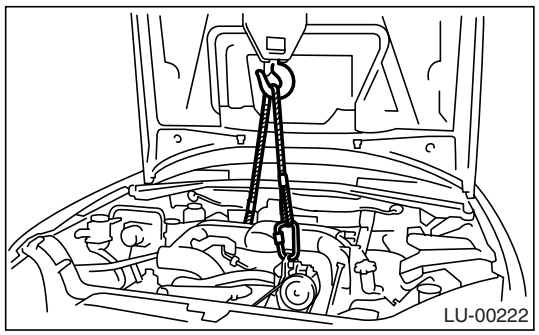
Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)



8) Install the front exhaust pipe. <Ref. to EX(H4DOTC)-5, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO 2.0)-7, INSTALLATION, Front Exhaust Pipe.>
9) Install the under cover.
10) Lower the vehicle.

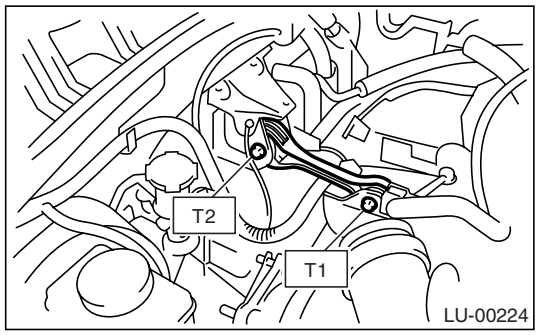
CAUTION:
When lowering the vehicle, lower the lift-up device and wire ropes at the same time.

11) Remove the lifting device and wire ropes.



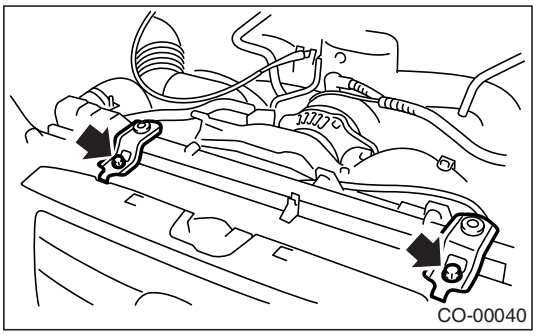
12) Install the pitching stopper.

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

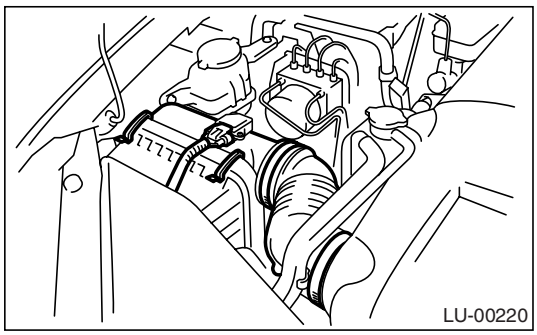


13) Install the linear motion mounting.
<Ref. to ME(H4DOTC)-38, INSTALLATION, Linear Motion Mounting.>

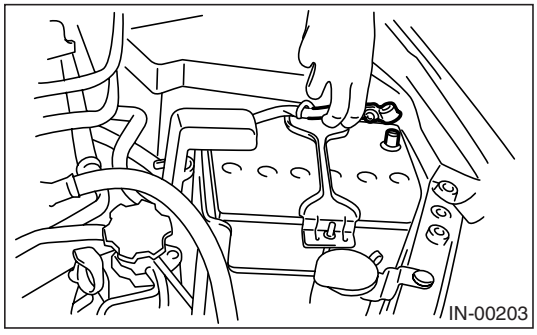
14) Install the radiator upper brackets.



15) Install the intercooler. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intercooler.>
16) Install the air intake boot and air cleaner upper cover.
17) Connect the connector to mass air flow sensor.



18) Install the front wheels.
19) Install the collector cover.
20) Connect the ground cable to battery.



21) Fill engine oil. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

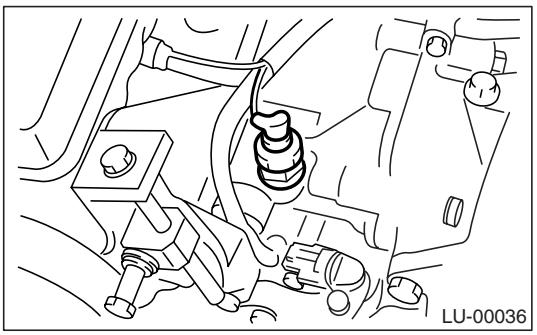
C: INSPECTION

Visually check that the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

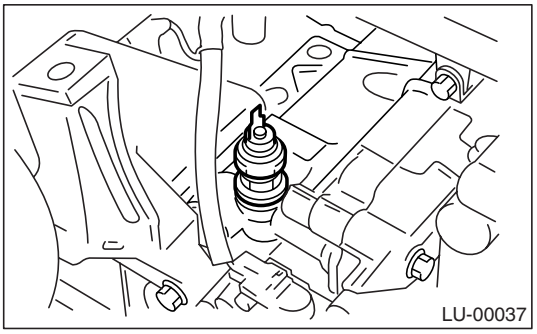
6. Oil Pressure Switch

A: REMOVAL

1) Remove the collector cover.
2) Remove the generator from bracket. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
3) Disconnect the terminal from oil pressure switch.



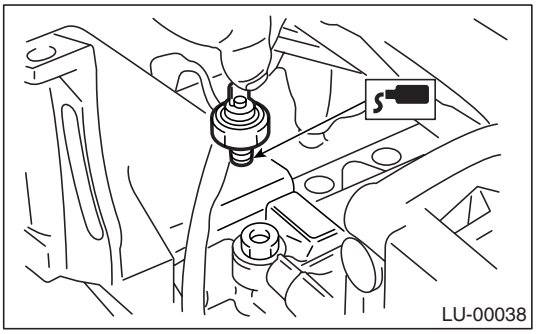
4) Remove the oil pressure switch.



B: INSTALLATION

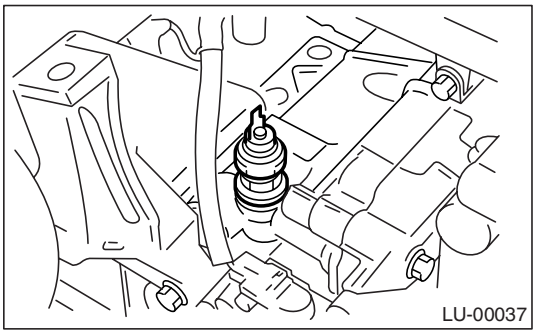
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

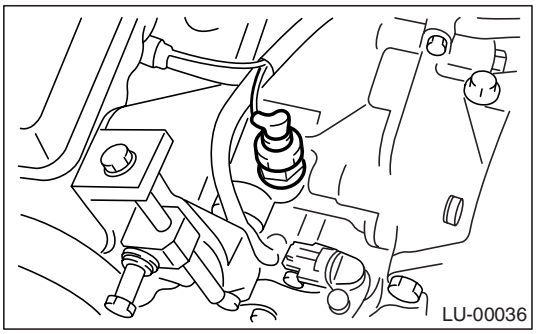


2) Install the oil pressure switch onto engine block.

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



3) Connect the terminal to oil pressure switch.



4) Install the generator to bracket. <Ref. to SC(H4SO 2.0)-14, INSTALLATION, Generator.>
5) Install the collector cover.

C: INSPECTION

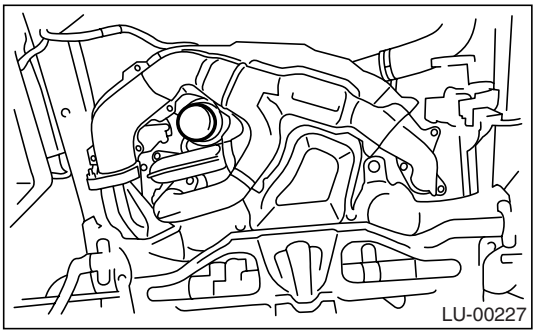
Check the oil pressure switch installation portion for oil leakage and oil seepage.

7. Engine Oil Filter

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



B: INSTALLATION

1) Clean the oil filter installation surface on cylinder block or oil cooler.
2) Apply a thin coat of engine oil to the seal rubber of new oil filter.
3) Install the oil filter turning it by hand, being careful not to damage the seal rubber.
4) Tighten more after the seal rubber contacts oil cooler.

NOTE:
• In case of oil filter in outer diameter 68 mm (2.68 in), tighten by approx. 1 turn.
• In case of oil filter in outer diameter 65 mm (2.56 in), tighten by approx. 2/3 to 3/4 turn.
• Do not tighten excessively because oil may leak.

5) Install the under cover.
6) Lower the vehicle.

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

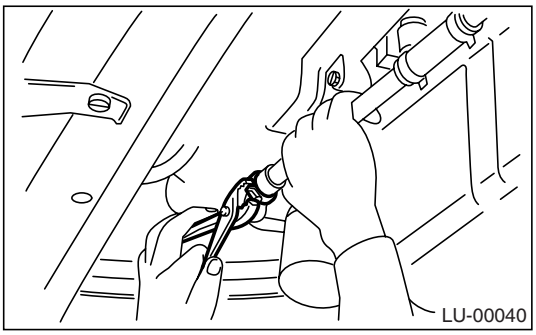
NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

2) Check the engine oil level.
<Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

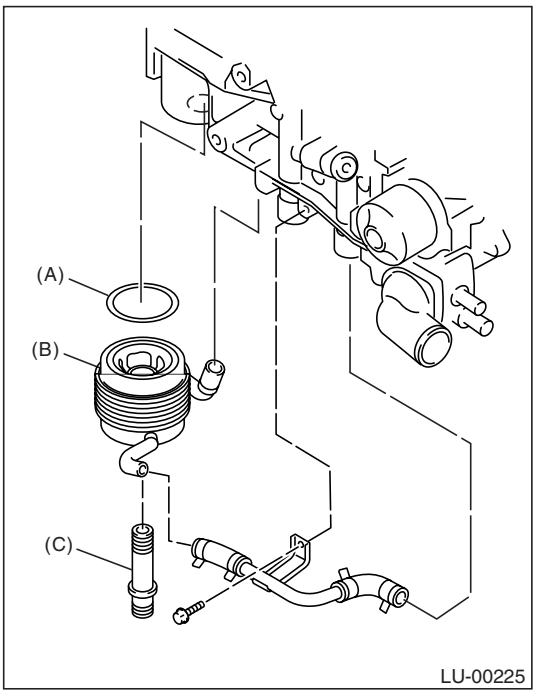
8. Engine Oil Cooler

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain engine oil.
4) Drain coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-18, REMOVAL, Engine Oil Filter.>
7) Remove the oil cooler connector and remove oil cooler.



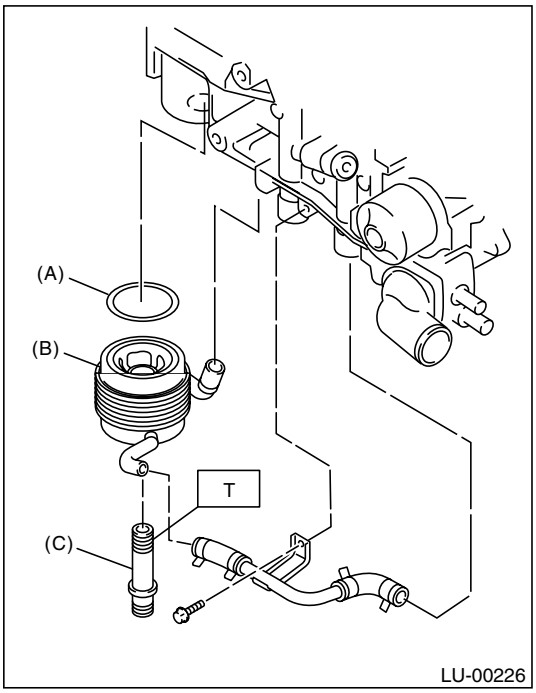
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

C: INSPECTION

1) Check that coolant passages are not clogged by blowing compressed air.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

9. Engine Lubrication System Trouble in General

A: INSPECTION

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

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

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SP(H4SO 2.0) section. <Ref. to SP(H4SO 2.0)-2, General Description.>

IGNITION

IG(H4DOTC)

Page

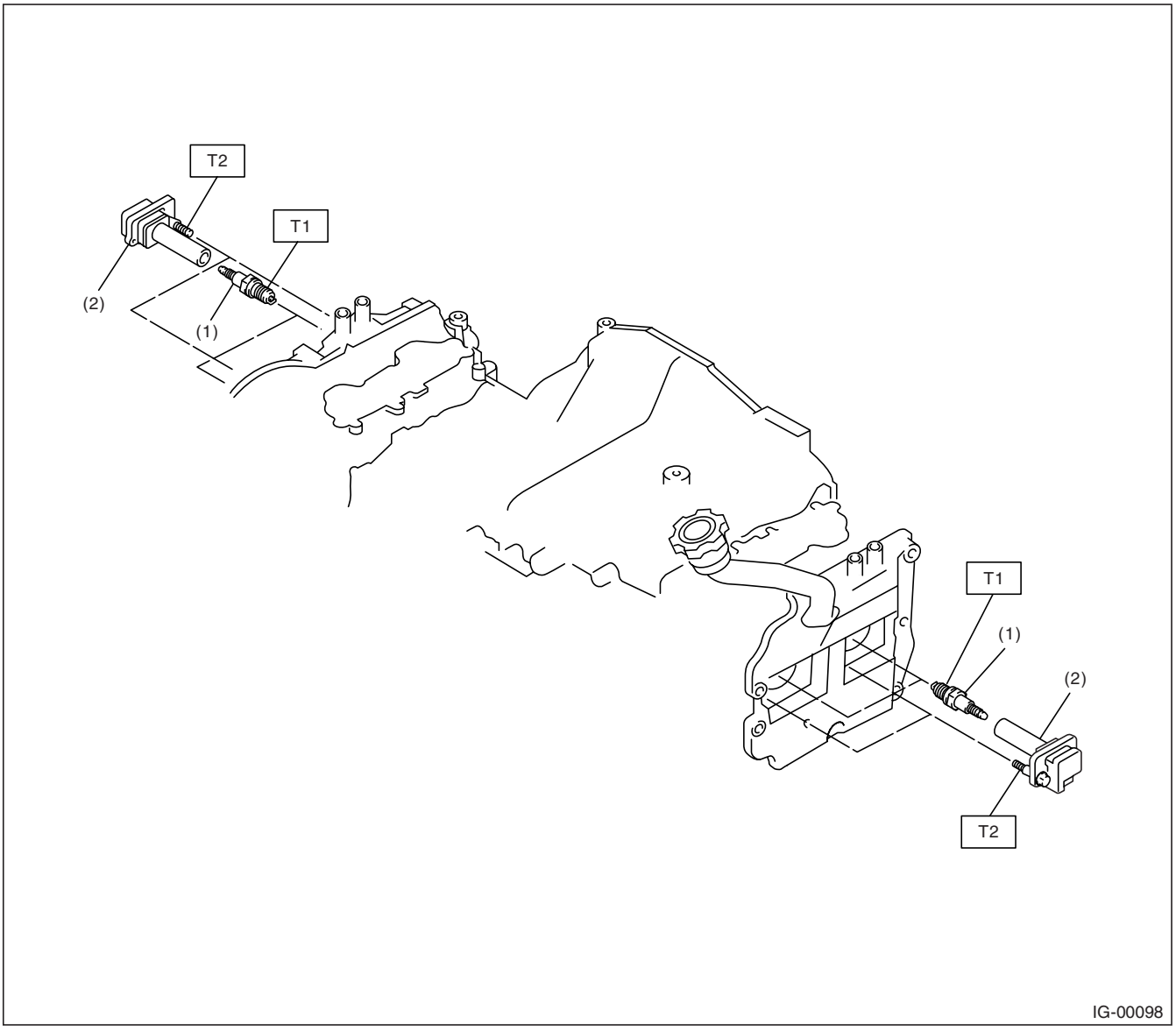
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil 6

1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Model	FK0186
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	Thread size (diameter, pitch, length) mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear work clothing, including a cap, protective goggle 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 yourself, 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 rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

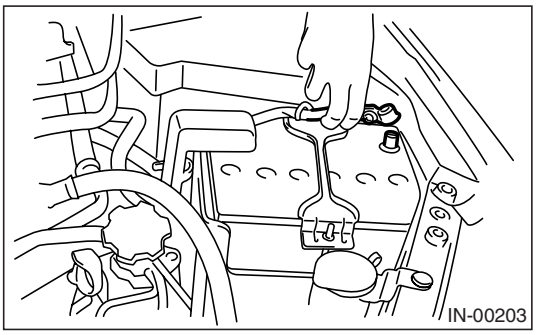
A: REMOVAL

CAUTION:
All spark plugs installed on an engine must be of the same heat range.

Spark plug:
<Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

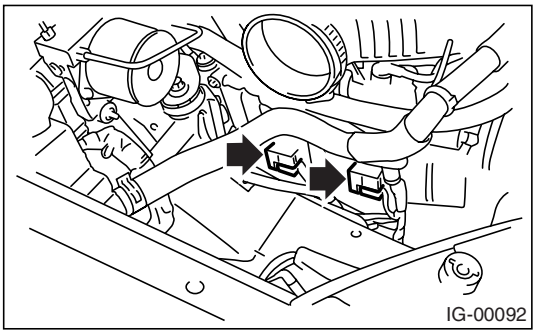
1. RH SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

NOTE:
Turn the #3 ignition coil by 180° to remove it.

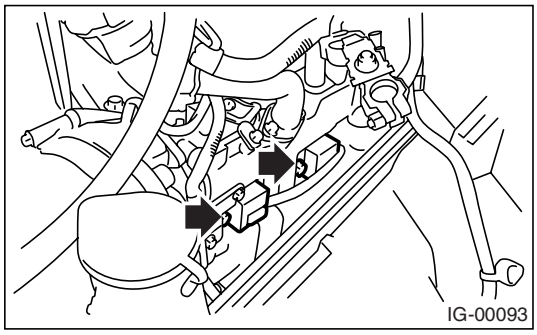


6) Remove the spark plug with a spark plug socket.

2. LH SIDE

1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Disconnect the connector from ignition coil.
4) Remove the ignition coil.

NOTE:
Turn the #4 ignition coil by 180° to remove it.



5) Remove the spark plug with a spark plug socket.

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

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

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should only be applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

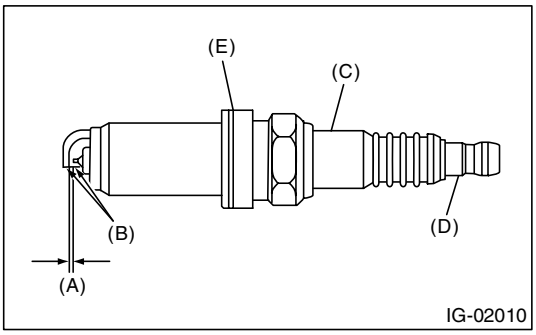
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should only be applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

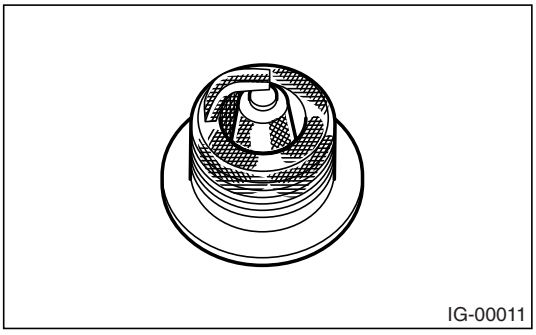
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

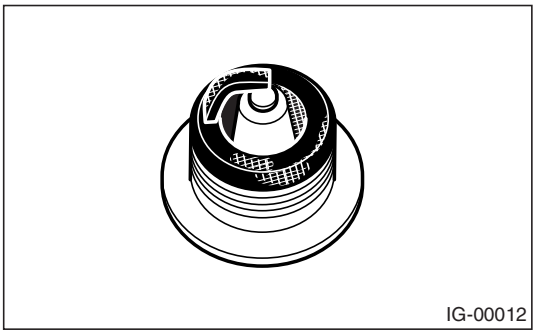


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

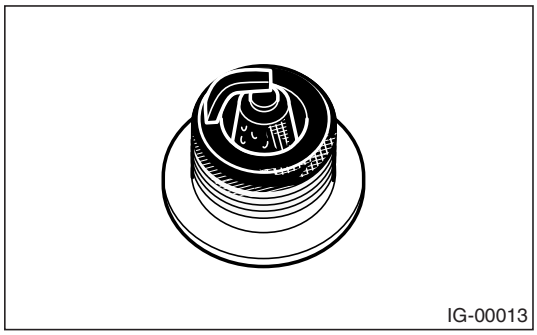
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



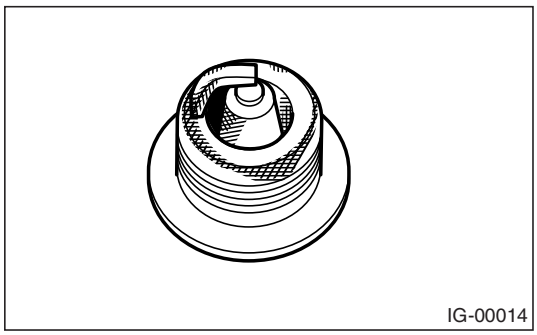
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.



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.



4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs or wrong selection of fuel.

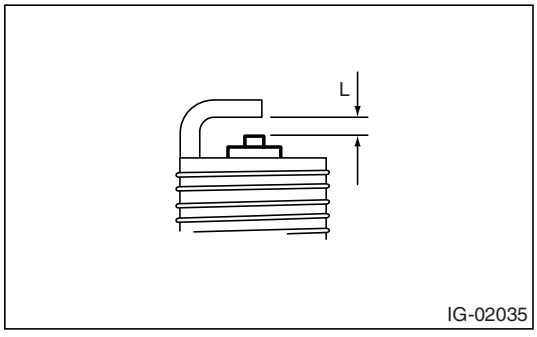


D: ADJUSTMENT

Clean the spark plugs using a wire brush.
Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator.
If deposits are too stubborn, replace the plugs.

NOTE:
Do not use a plug cleaner because the spark plugs are applied with iridium tip.

Spark plug gap L:
0.7 — 0.8 mm (0.028 — 0.031 in)



3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H4DOTC)(diag)-55, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SC(H4SO 2.0) section. <Ref. to SC(H4SO 2.0)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC)(diag)

		Page
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2.	Check List for Interview	3
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4.	Electrical Component Location	8
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6.	Engine Condition Data	19
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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Starting Failure" <Ref. to EN(H4DOTC)(diag)-49, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOTC)(diag)-213, General Diagnostic Table.>
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-40, Malfunction Indicator Light.>
4	**PERFORM DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-30, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-67, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

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
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	km/h (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	Audio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Radiator fan	❑ ON / ❑ OFF		
Front wiper	❑ ON / ❑ OFF		
Rear wiper	❑ ON / ❑ OFF		

Check List for Interview

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light 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 diagnostic indicator light ❑ ABS warning light ❑ Oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experience of running out of fuel: ❑ Yes / ❑ No
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 other parts except 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 ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All the airbag system wiring harnesses and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

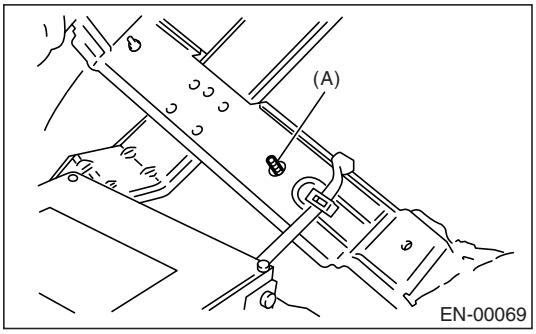
2) Never connect the battery in reverse polarity.
The ECM will be destroyed instantly.
The fuel injector and other parts will be damaged.
3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM.
4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF.
5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of each sensor or all electrical control modules using 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 parts.
6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

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

NOTE:
Immobilizer system must be registered when installing the ECM of the model with immobilizer. For doing so, all ignition keys and ID cards should be prepared. Refer to "IMMOBILIZER TEACHING OPERATION MANUAL"

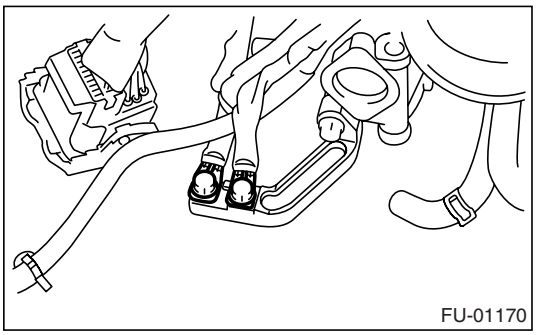
7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts as the grounding point to body when measuring voltage and resistance in the passenger compartment.



(A) Stud bolt

9) Use engine grounding terminal or engine as the grounding point to chassis when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.
11) 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 module.
• 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 mentioned above.
• Incorrect installation of the radio may affect the operation of ECM.

12) 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 until it stops.

13) Diagnostics should be conducted by starting with simple, easy operations then proceeding to complicate, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
14) For the model with ABS, the ABS warning light may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. This is due to speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

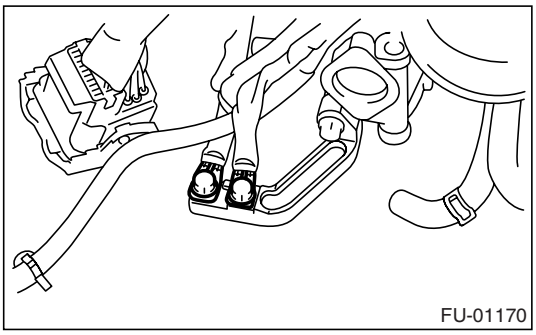
Standard voltage: 12 V

Specific gravity: 1.260 or more

2) Check the condition of main fuse, other fuses, harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

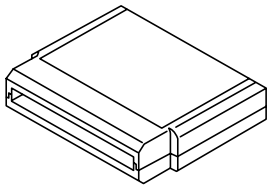
Make sure the engine grounding terminal is properly connected to engine.



3. SELF-DIAGNOSIS FUNCTION

When a malfunction is detected by the self-diagnosis function of ECM, the malfunction indicator light will come on to indicate the malfunction occurrence.
Calling the self-diagnosis result is performed by the Subaru Select Monitor.

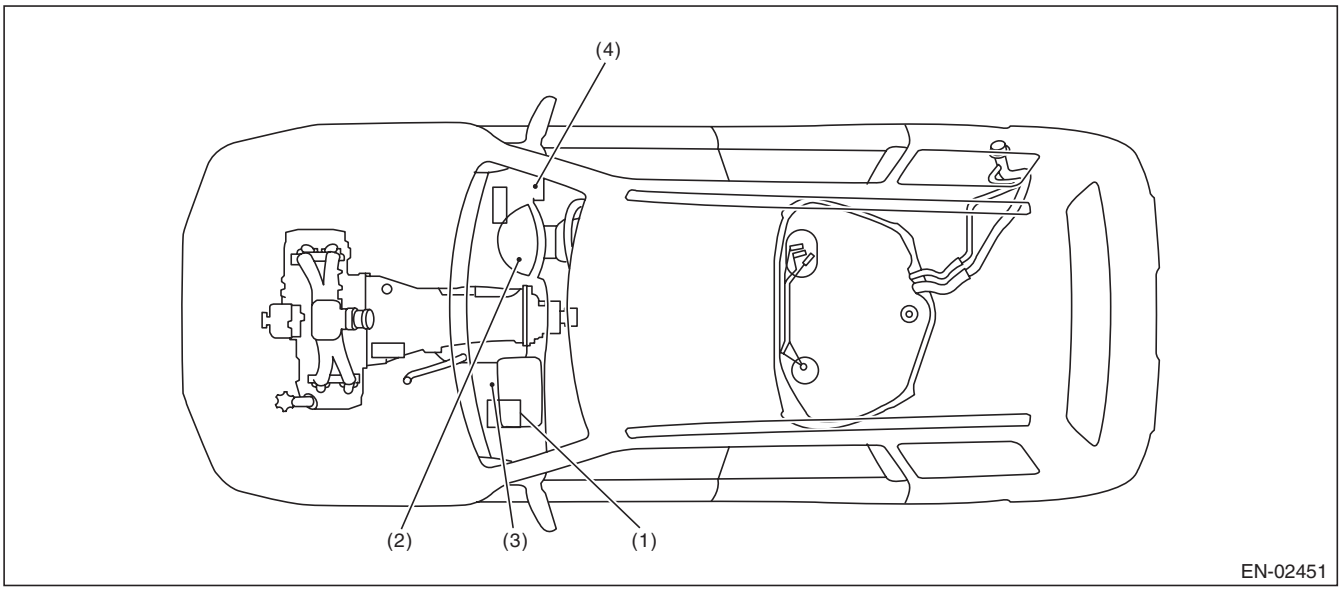
C: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

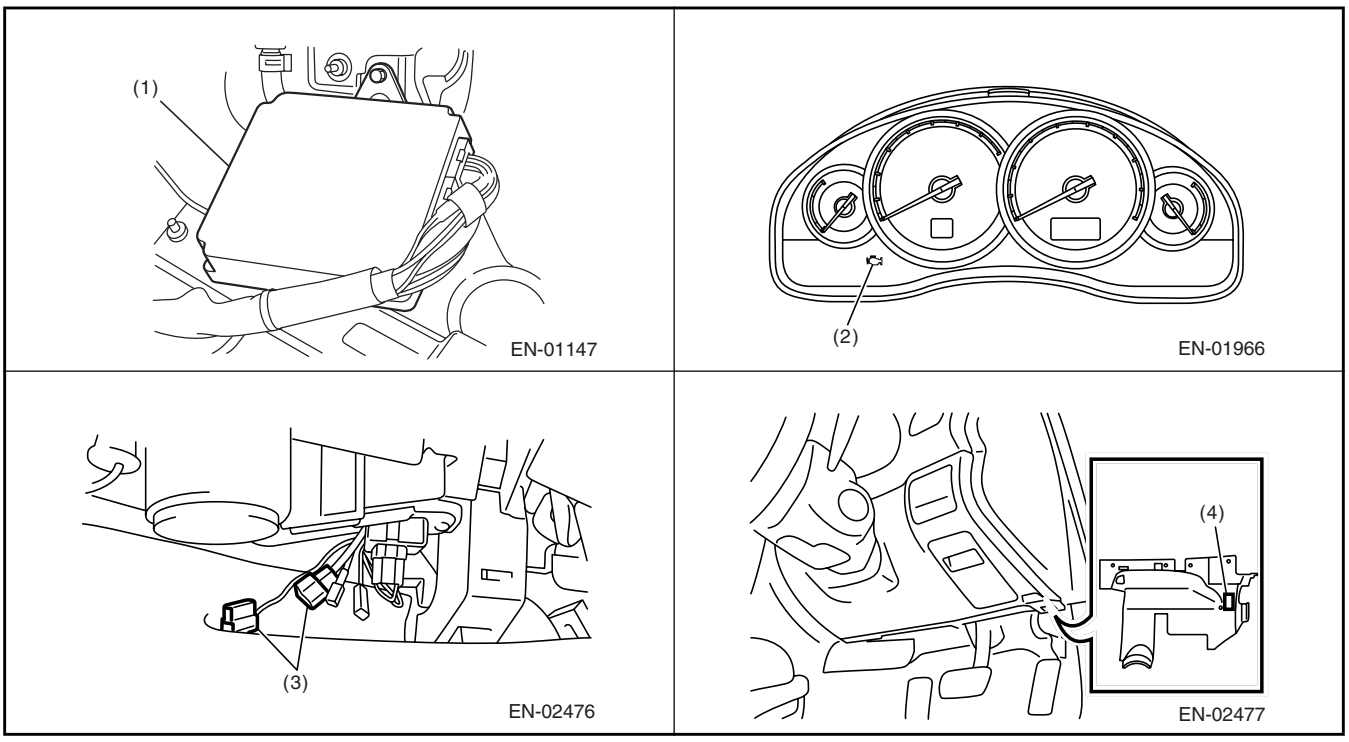
4. Electrical Component Location

A: LOCATION

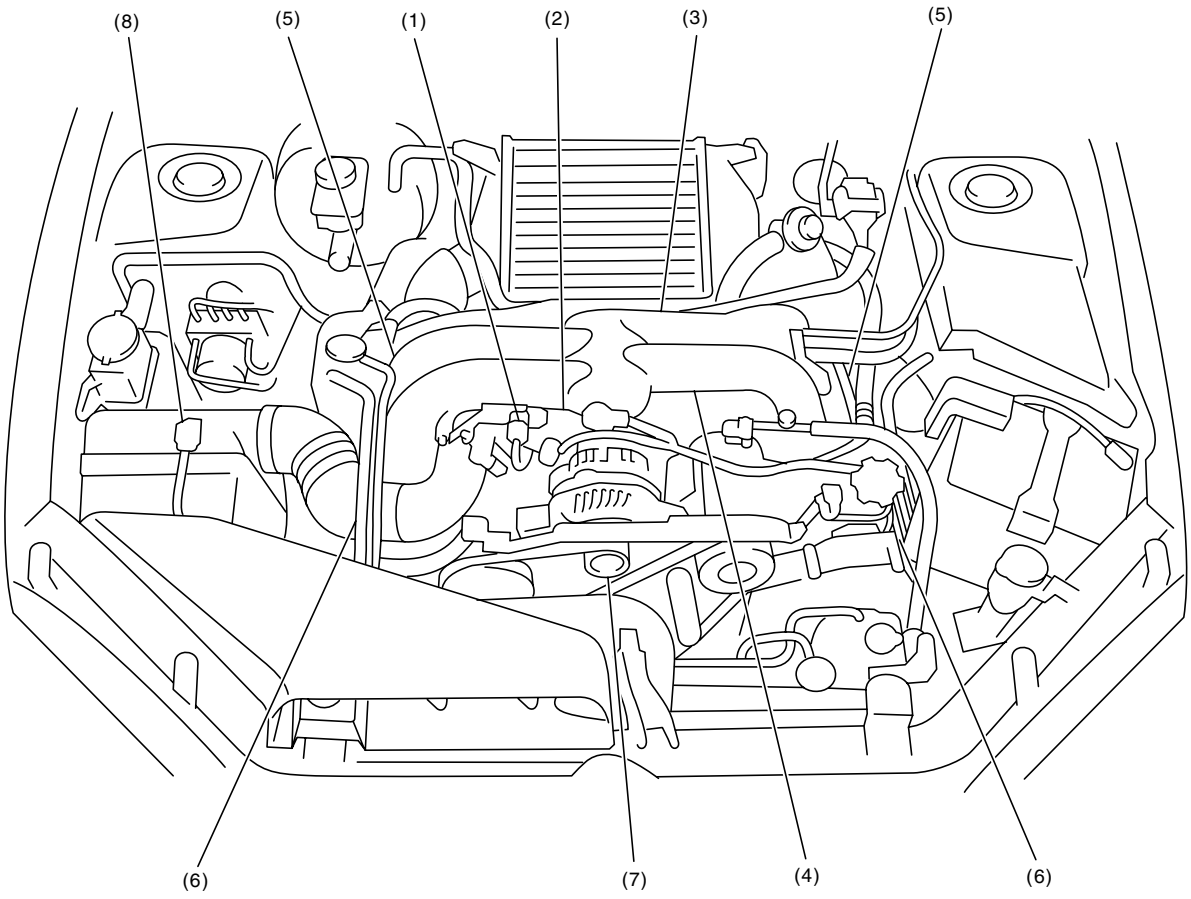
1. CONTROL MODULE



(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

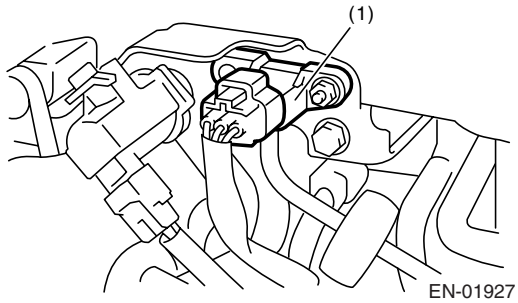


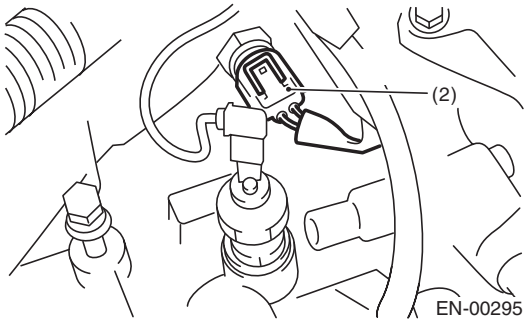
2. SENSOR

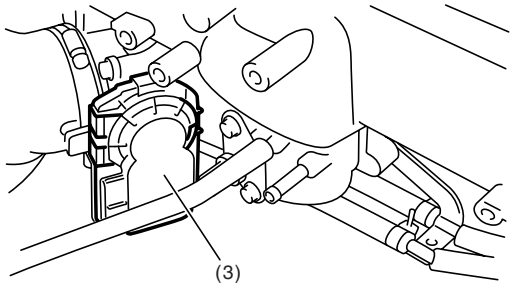


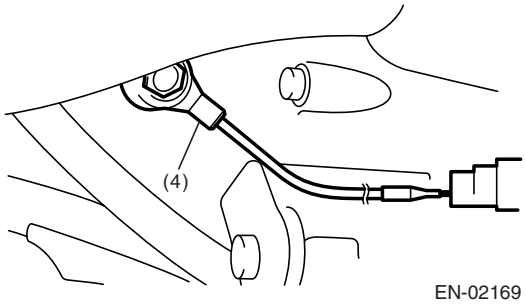
(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Intake camshaft position sensor
(6) Exhaust camshaft position sensor
(7) Crankshaft position sensor
(8) Mass air flow and intake air temperature sensor

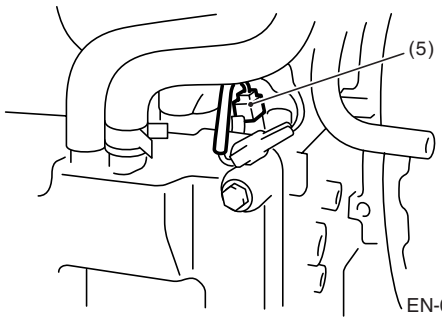
Electrical Component Location

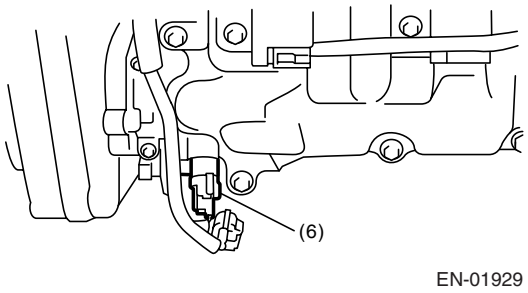


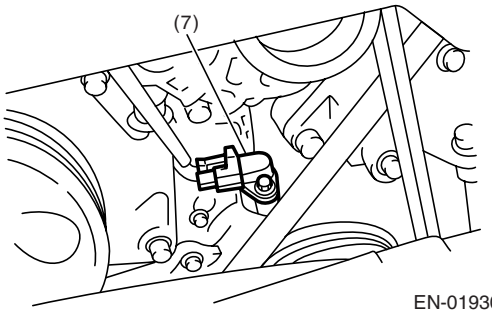


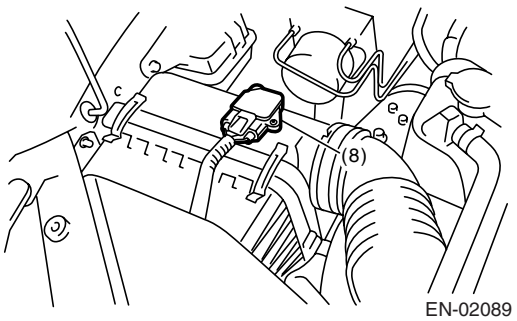


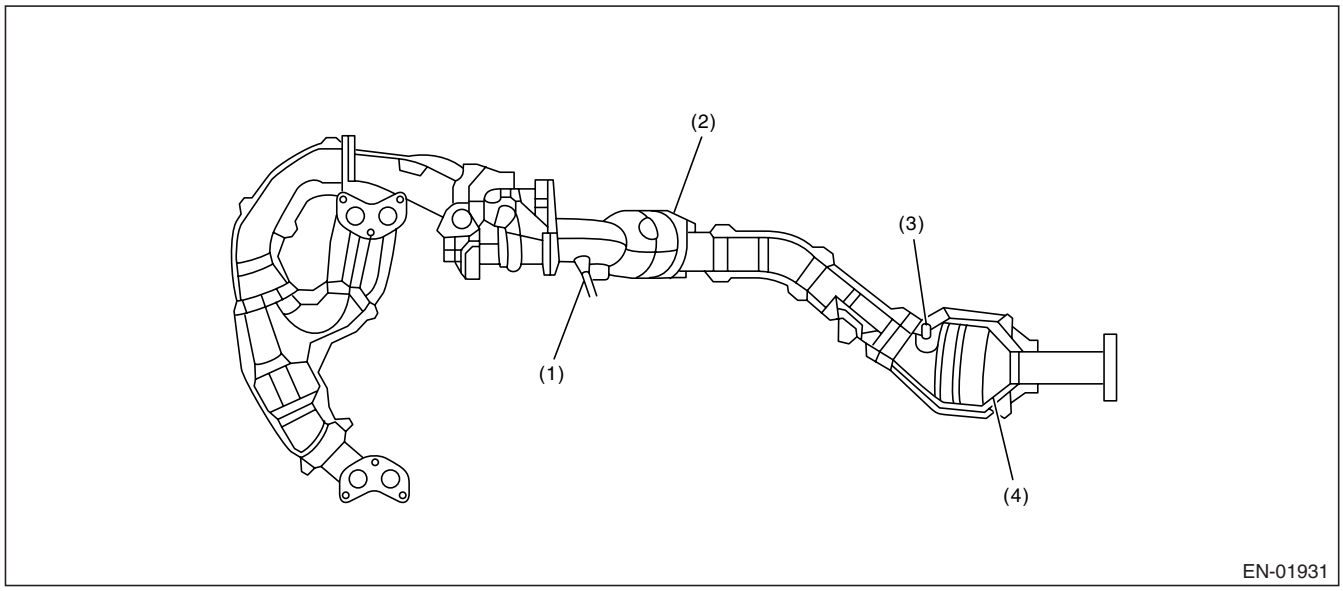




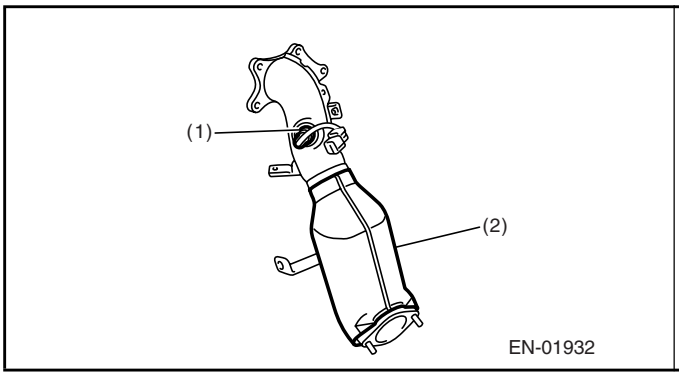


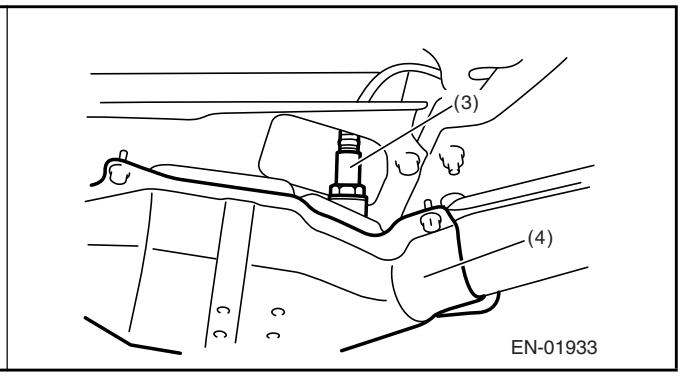




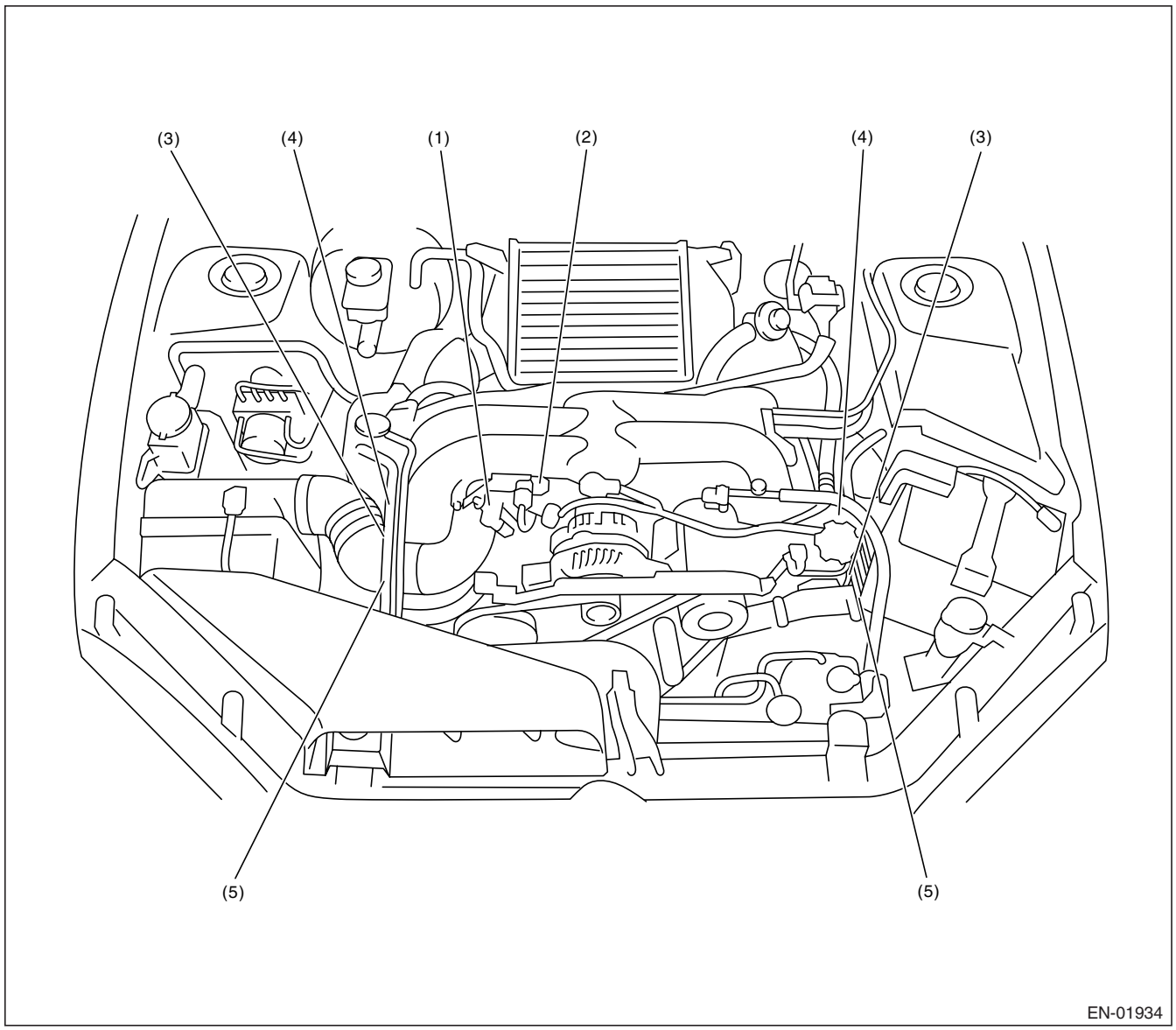


(1) Front oxygen (A/F) sensor
(2) Front catalytic converter
(3) Rear oxygen sensor
(4) Rear catalytic converter

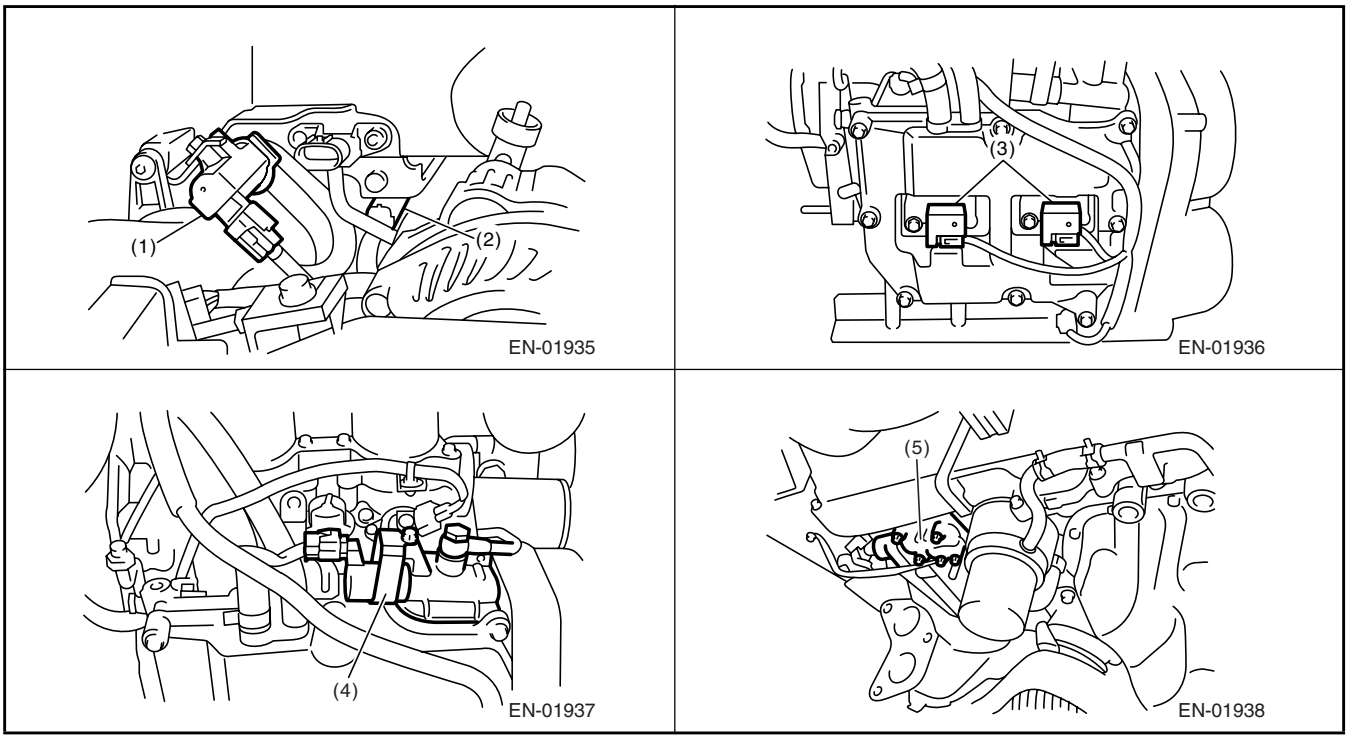


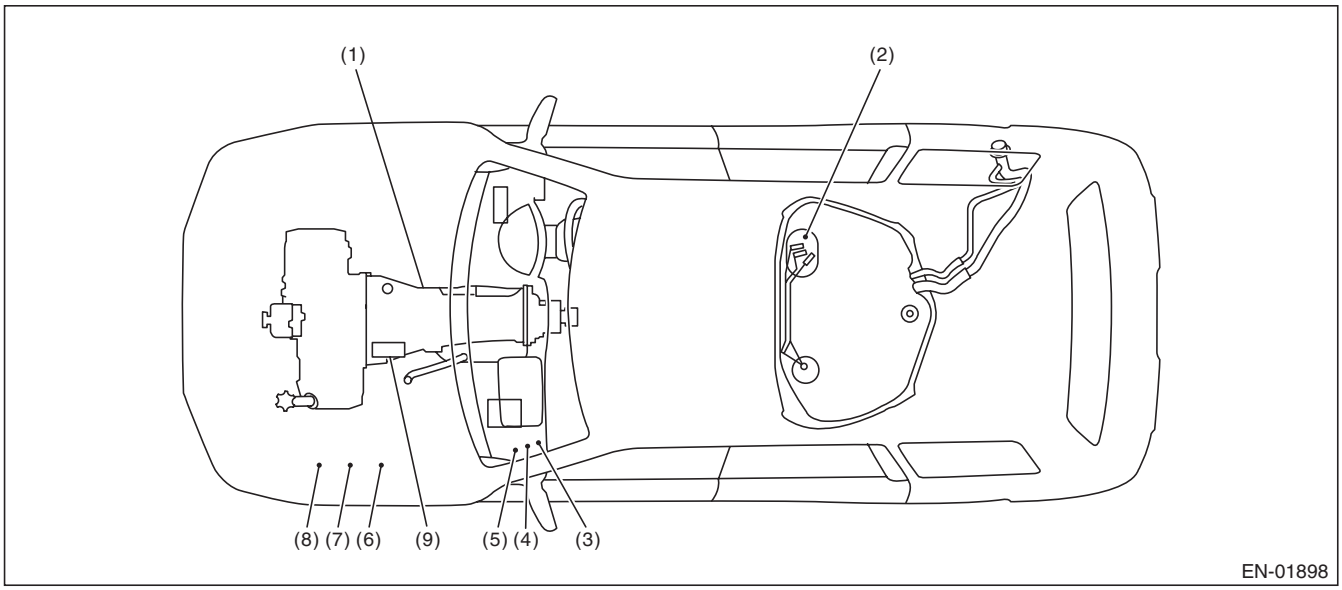


3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



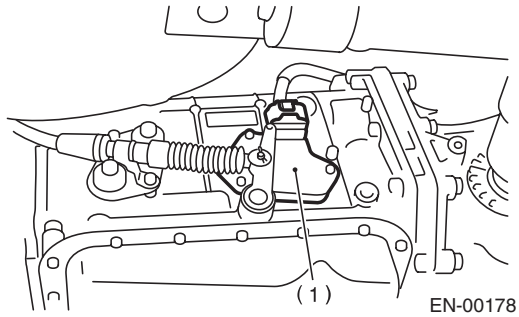
(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Intake oil flow control solenoid valve
(5) Exhaust oil flow control solenoid valve



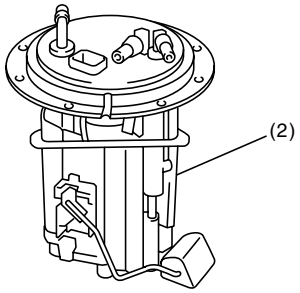


(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator main fan relay 1
(7) Radiator sub fan relay
(8) Radiator main fan relay 2
(9) Starter

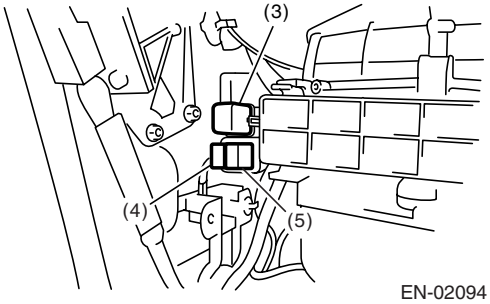
Electrical Component Location



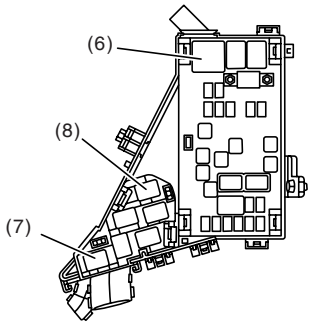
EN-00178



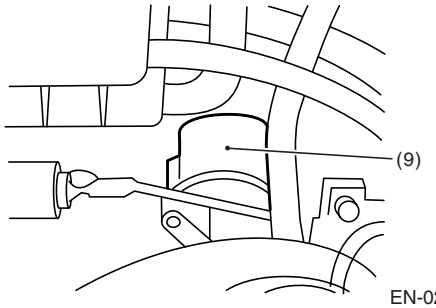
EN-02093



EN-02094



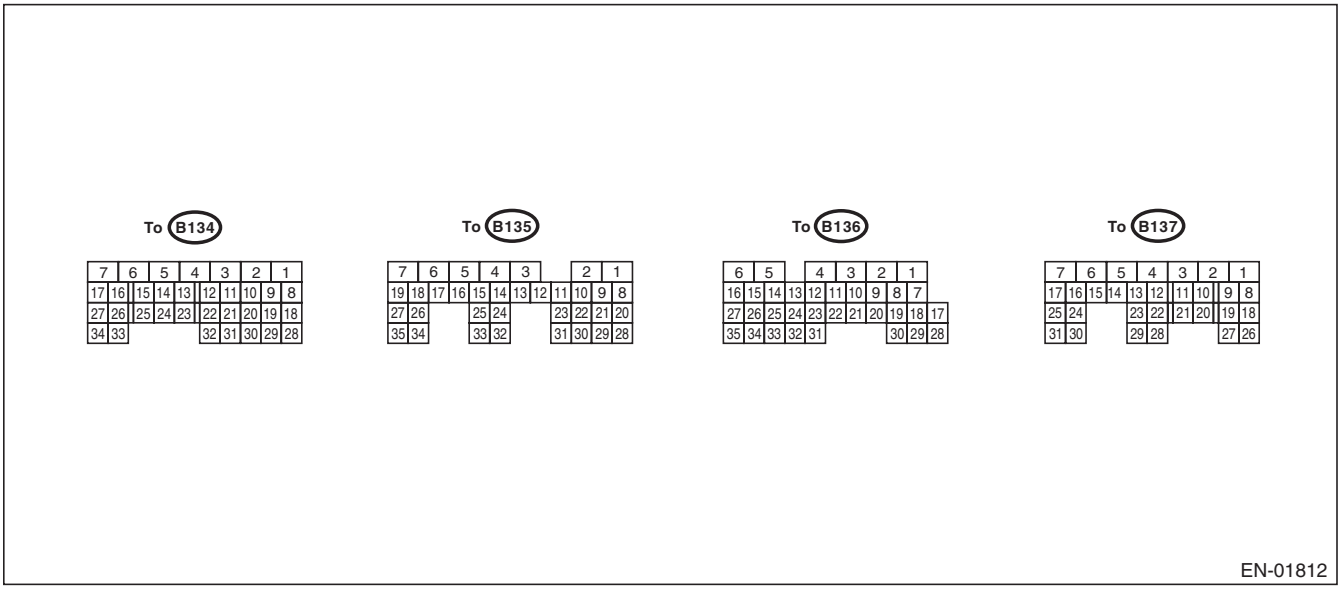
EN-02095



EN-02096

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



DESCRIPTION		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxygen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	Ground (sensor)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	—	—	Waveform
	Signal 2	B134	2	—	—	Waveform
Rear oxygen sensor heater signal		B135	2	0 — 13	—	Waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	Ground (sensor)	B136	35	0	0	After engine is warmed-up.
Air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	Ground	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 13 — 14	Waveform
Starter switch		B137	8	0	0	Cranking: 8 —14
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	14	10 — 13	13 — 14	—
Neutral position switch		B137	9	ON: 0 OFF: 10 —13	ON: 0 OFF: 13 —14	—
Test mode connector		B137	15	10 — 13	13 — 14	When connected: 0

Engine Control Module (ECM) I/O Signal

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Backup power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	5	10 — 13	13 — 14	—
		B135	6	10 — 13	13 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	16	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B137	28	10 — 13	13 — 14	—
	Signal 2	B135	27	0 or 5	0 or 5	Waveform
A/C relay control		B135	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 2 control		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Model with A/C only
Malfunction indicator light		B134	17	—	—	Light ON: 1 or less Light OFF: 10 — 14
Engine speed output		B134	23	—	0 — 13 or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	Waveform
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	Ground (sensor)	B136	35	0	0	
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	Model with manual A/C only
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B134	25	0	0	—
SSM communication line		B137	20	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
GND (injector)		B137	7	0	0	—
GND (sensor)		B136	35	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control system)		B137	1	0	0	—
		B137	2	0	0	—

Engine Control Module (ECM) I/O Signal

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
GND (front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
Intake camshaft position sensor (LH)		B135	8	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B135	9	0 or 5	0 or 5	Waveform
Electronic throttle control	Main	B136	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B136	29	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B136	16	5	5	—
	Ground (sensor)	B136	35	0	0	—
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B137	6	10 — 13	13 — 14	—
Electronic throttle control motor relay		B135	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	When ignition switch is turned to ON: ON
Intake AVCS solenoid (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Intake AVCS solenoid (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Exhaust AVCS solenoid (LH)	Signal (+)	B134	21	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	31	0	0	—
Exhaust AVCS solenoid (RH)	Signal (+)	B134	20	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	30	0	0	—
Exhaust camshaft position sensor (LH)	Signal (+)	B135	20	0	–7 — +7	Waveform
	Signal (–)	B135	28	0	0	—
	Shield	B135	30	0	0	—
Exhaust camshaft position sensor (RH)	Signal (+)	B135	21	0	–7 — +7	Waveform
	Signal (–)	B135	29	0	0	—
	Shield	B135	30	0	0	—

Engine Control Module (ECM) I/O Signal

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accelerator pedal position sensor	Main	B136	17	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Power supply	B136	15	5	5	—
	Ground (sensor)	B136	34	0	0	—
	Sub	B136	28	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Shield	B137	2	0	0	—
	Power supply	B136	16	5	5	—
	Ground (sensor)	B136	35	0	0	—
Starter relay		B135	32	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	ON: Cranking
A/C middle pressure switch		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Clutch switch		B134	1	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 13 — 14	—
Brake switch 1		B136	9	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B136	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
Cruise control command switch		B136	11	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Cruise control main switch		B136	7	ON: 0 OFF: 5	ON: 0 OFF: 5	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specifications
Engine load	1.2 — 2.9 (%): Idling
	4.7 — 12.8 (%): 2,500 rpm racing

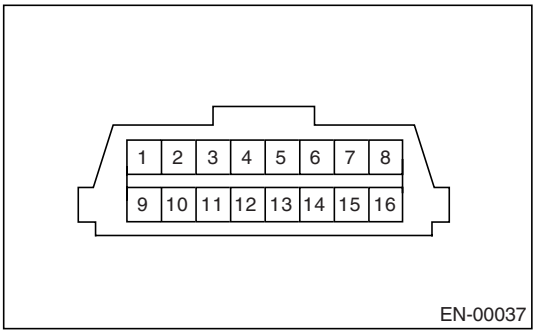
Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for connecting the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



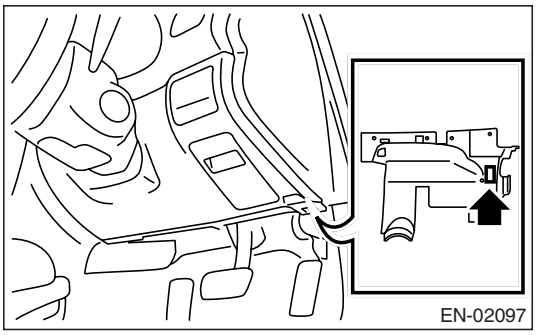
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Empty
2	Empty	10	Subaru Select Monitor signal
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Line end check signal 1	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

1) Prepare a general scan tool (general scan tool) required by SAE J1978.
2) Open the cover and connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up DTC and freeze frame data.
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 DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedure, refer to the general scan tool operation manual.)

NOTE:
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refer to data denoting the current operating condition of analog input/output, digital input/output 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 DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C or °F
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg, kPa, inHg or psig
0C	Engine revolution	rpm
0D	Vehicle speed	km/h or MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C or °F
10	Air flow rate from mass air flow sensor	gm/s
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
21	Driving distance after MIL illuminates	km or miles
24	A/F value and A/F sensor output voltage	— and V

NOTE:
Refer to general scan tool manufacturer's operation manual to access current powertrain diagnostic data (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refer to data denoting the operating condition when trouble is detected by 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	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C or °F
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg, kPa, inHg or psig
0C	Engine revolution	rpm
0D	Vehicle speed	km/h or MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C or °F
10	Air flow rate from mass air flow sensor	gm/s
11	Throttle valve absolute opening angle	%

NOTE:
Refer to general scan tool manufacturer's operation manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refer to the mode used to clear or reset emission-related diagnostic information.

NOTE:
Refer to general scan tool manufacturer's operation manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to the test value of troubleshooting and data of test specification on the support data bit sequence table. A list of the support data is shown in the following table.

TID	CID	Test value & Test specification
$81	$01	Catalyst system efficiency
$83	$01	Evaporative emission control system (0.04 inch leak)
	$02	Evaporative emission control system (0.04 inch leak)
	$03	Evaporative emission control system (0.04 inch leak) (Immediate normality judgment)
	$04	Evaporative emission control system (0.04 inch leak)
	$05	Evaporative emission control system (0.02 inch leak)
	$86	Evaporative emission control system (0.02 inch leak)
$84	$01	A/F sensor circuit slow response (Bank 1 Sensor 1)
$85	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2) Rich → Lean
	$02	O_2 sensor circuit slow response (Bank 1 Sensor 2) Lean → Rich
$41	$81	O_2 sensor circuit (Bank 1 Sensor 2)
	$02	

7. MODE $07

Refer to the data of DTC (pending code) for troubleshooting result about emission in the first time.

8. MODE $09

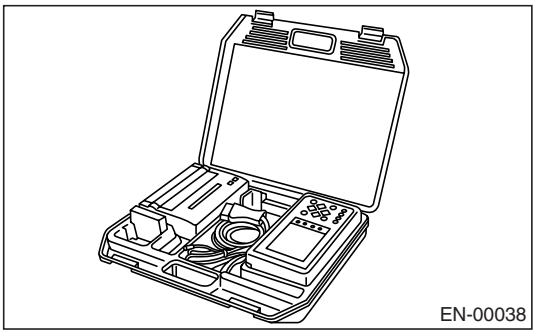
Refer to the data of vehicle specification (VIN, calibration ID, etc.).

9. Subaru Select Monitor

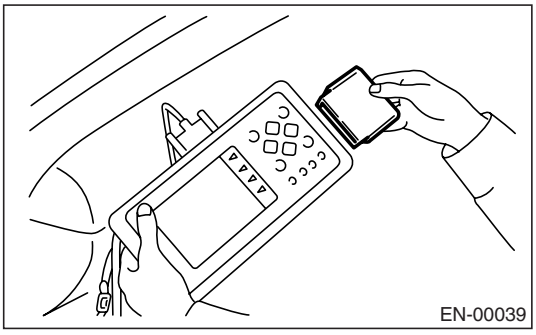
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

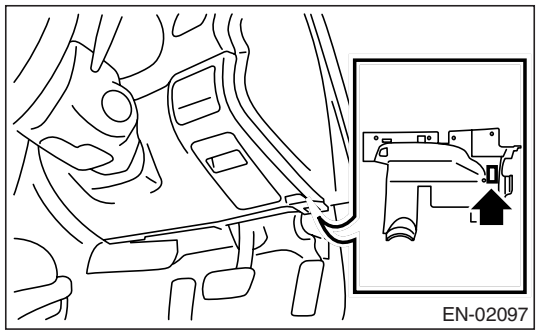


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



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

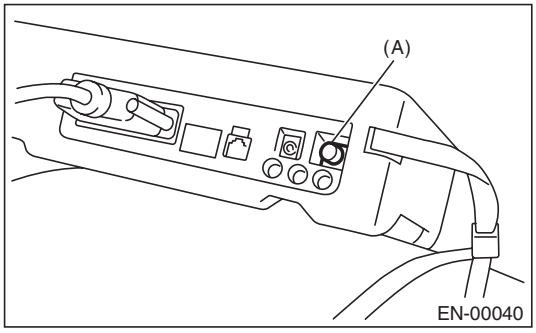
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

5) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTCs. <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTCs. <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).>

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save}, and then press the [YES] key.
5) On the «Data Display Menu» 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.

Remarks	Display	Unit of measure	Note (at idling)
Engine coolant temperature signal	Coolant Temp.	°C or °F	80 — 100°C or 176 — 211°F
A/F correction 1	A/F Correction #1	%	−10 — +10%
A/F learning 1	A/F Learning #1	%	−15 — +15%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	220 — 275 mmHg, 29.3 — 36.7 kPa, 8.7 — 10.8 inHg or 4.2 — 5.2 psig
Engine speed signal	Engine Speed	rpm	630 — 770 rpm (Agree with the tachometer indication)
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	10 — 15 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Amount of intake air	Mass Air Flow	g/s or lb/m	2.1 — 3.1 g/s or 0.28 — 0.41 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	2.0 — 2.4%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0 — 1.0 V
Battery voltage	Battery Voltage	V	12 — 15 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.0 — 1.7 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	1.2 — 2.2 ms
Knock sensor correction	Knocking Correction	deg	0.0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Primary supercharged pressure control signal	Primary Control	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 25%
Generator duty ratio	ALT Duty	%	0 — 100%
Fuel pump duty ratio	Fuel Pump Duty	%	30 — 40%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	±5 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	±5 deg
Oil flow control solenoid valve duty RH (AVCS)	OCV duty R	%	0 — 20%
Oil flow control solenoid valve duty LH (AVCS)	OCV duty L	%	0 — 20%
Oil flow control solenoid valve current RH	OCV Current R	mA	40 — 100 mA
Oil flow control solenoid valve current LH	OCV Current L	mA	40 — 100 mA
A/F sensor current value 1	A/F Sensor #1 Current	mA	−20 — 20 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	27 — 35 mA
A/F sensor output lambda 1	A/F Sensor #1	—	1.0
A/F correction 3	A/F Correction #3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	−5%
Throttle power supply voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-Throttle Sensor	V	1.5 V
Main throttle sensor voltage	Main-throttle Sensor	V	0.6 V

Remarks	Display	Unit of measure	Note (at idling)
Sub acceleration sensor voltage	Sub-Accelerator Sensor	V	1.1 V
Main acceleration sensor voltage	Main-Accelerator Sensor	V	1.0 V
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig	—
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	Intake manifold absolute pressure — Atmospheric pressure
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	—
Estimated cumulative driving distance	Odd Meter	km or miles	—
Exhaust AVCS retard angle amount RH	Exh. VVT Retard Ang. R	deg	±5 deg
Exhaust AVCS retard angle amount LH	Exh. VVT Retard Ang. L	deg	±5 deg
Exhaust oil flow control solenoid valve duty ratio RH	Exh. OCV Duty R	%	0 — 20%
Exhaust oil flow control solenoid valve duty ratio LH	Exh. OCV Duty L	%	0 — 20%
Exhaust oil flow control solenoid valve current value RH	Exh. OCV Current R	mA	40 — 100 mA
Exhaust oil flow control solenoid valve current value LH	Exh. OCV Current L	mA	40 — 100 mA

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

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
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 then press the [YES] key.
6) On the «Data Display Menu» 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.

Description	Display	Unit of measure
Number of diagnosis code	Number of Diag. Code:	—
Condition of malfunction indicator light	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	no support
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	no support
Test of heating-type catalyst	Heated catalyst	no support
Test of evaporative emission purge control system	Evaporative purge system	no support
Test of secondary air system	Secondary air system	no support
Test of air conditioning system refrigerant	A/C system refrigerant	no support
Test of oxygen sensor	Oxygen sensor	complete or incomplete
Test of oxygen sensor heater	O2 Heater Diagnosis	complete or incomplete
Test of EGR system	EGR system	no support

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
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.

Description	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing signal	Ignition Timing	°
Amount of intake air	Mass Air Flow	g/s or lb/m
Intake air temperature signal	Intake Air Temp	°C or °F
Throttle position signal	Throttle Opening Angle	%

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save}, and then press the [YES] key.
5) On the «Data 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.

Remarks	Display	Message	LED “ON” requirements
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	Illuminate (AT model)
Test mode signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Clear memory signal	Clear Memory Terminal	ON or OFF	Clear memory connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Steering wheel switch signal	Handle Switch	RHD or LHD	When handle switch signal is input.
Starter switch signal	Starter Switch	ON or OFF	When starter switch is input.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is input.

Remarks	Display	Message	LED "ON" requirements
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is input.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan SW	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Windshield wiper switch signal	Wiper Switch	ON or OFF	When windshield wiper switch is turned ON.
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When A/C middle pressure switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator fan relay 1 signal	Radiator Fan Relay #1	ON or OFF	When radiator fan relay 1 is in function.
Radiator fan relay 2 signal	Radiator Fan Relay #2	ON or OFF	When radiator fan relay 2 is in function.
AT retard angle demand signal	Retard Signal	ON or OFF	When AT retard angle demand signal is input.
AT fuel cut signal	Fuel Cut	ON or OFF	When AT fuel cut signal is input.
Torque down output signal	Ban of Torque Down	ON or OFF	When torque down output signal is input.
Torque down demand signal	Request Torque Down	ON or OFF	When torque down demand signal is input.
AT coordinate permission signal	Torque Permission Signal	ON or OFF	When AT coordinate permission signal is input.
Electronic throttle control motor relay signal	ETC Motor Relay	ON or OFF	When electronic throttle control motor relay is in function.
Clutch switch signal	Clutch Switch	ON or OFF	When clutch switch is turned to ON.
Stop light switch signal	Stop Light Switch	ON or OFF	When stop switch is turned to ON.
SET/COAST switch signal	SET/CST Switch	ON or OFF	When SET/CST switch is turned to ON.
RESUME/ACCEL switch signal	RES/ACC Switch	ON or OFF	When RES/ACC switch is turned to ON.
Brake switch signal	Brake Switch	ON or OFF	When brake switch is turned to ON.
Main switch signal	Main Switch	ON or OFF	When main switch is turned to ON.
Cancel switch signal	Cancel Switch	ON or OFF	When cancel switch is turned to ON.
Data reception signal	Body Int. Unit Data	ON or OFF	When data reception signal is entered.
Counter update signal	Body Int. Unit Count	ON or OFF	When counter update signal is entered.

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

10. Read Diagnostic Trouble Code (DTC)

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
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 {Diagnostic Code(s) Display} and press the [YES] key.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to the data denoting emission-related powertrain DTC.
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).>

NOTE:
Refer to the general scan tool manufacturer's operation manual to access powertrain DTC (MODE $03).

11.Inspection Mode

A: PROCEDURE

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(H4DOTC)(diag)-35, Drive Cycle.>

DTC	Item
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)
P0102	Mass or Volume Air Flow Circuit Low Input
P0103	Mass or Volume Air Flow Circuit High Input
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0112	Intake Air Temperature Sensor 1 Circuit Low
P0113	Intake Air Temperature Sensor 1 Circuit High
P0117	Engine Coolant Temperature Circuit Low
P0118	Engine Coolant Temperature Circuit High
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High
P0230	Fuel Pump Primary Circuit
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low
P0261	Cylinder 1 Injector Circuit Low
P0264	Cylinder 2 Injector Circuit Low
P0267	Cylinder 3 Injector Circuit Low
P0270	Cylinder 4 Injector Circuit Low
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)
P0335	Crankshaft Position Sensor “A” Circuit
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)
P0350	Ignition Coil Primary/Secondary Circuit
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)
P0458	Evaporative Emission System Purge Control Valve Circuit Low
P0500	Vehicle Speed Sensor “A”
P0512	Starter Request Circuit
P0513	Incorrect Immobilizer Key
P0519	Idle Air Control System Performance
P0600	Serial Communication Circuit
P0604	Internal Control Module Random Access Memory (RAM) Error
P0605	Internal Control Module Read Only Memory (ROM) Error
P0607	Control Module Performance
P0638	Throttle Actuator Control Range/Performance (Bank 1)
P0700	Transmission Control System (MIL Request)

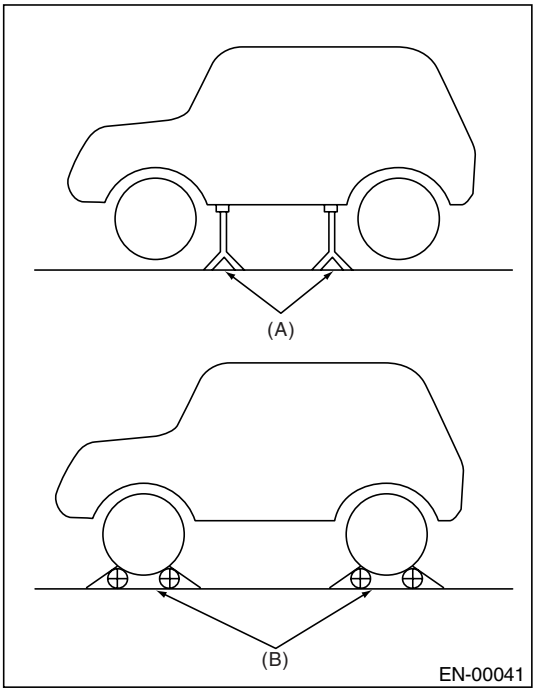
DTC	Item
P0851	Park/Neutral Switch Input Circuit Low
P0852	Park/Neutral Switch Input Circuit High
P1160	Return Spring Failure
P1518	Starter Switch Circuit Low Input
P1560	Back-up Voltage Circuit Malfunction
P1570	Antenna
P1571	Reference Code Incompatibility
P1572	IMM Circuit Failure (Except Antenna Circuit)
P1574	Key Communication Failure
P1576	EGI Control Module EEPROM
P1577	IMM Control Module EEPROM
P1578	Meter Failure
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)
P2090	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 1)
P2091	Exhaust Camshaft Position Actuator Control Circuit High (Bank 1)
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)
P2094	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 2)
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)
P2101	Throttle Actuator Control Motor Circuit Range/Performance
P2102	Throttle Actuator Control Motor Circuit Low
P2103	Throttle Actuator Control Motor Circuit High
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input
P2135	Throttle/Pedal Position Sensor/Switch “A” / “B” Voltage Correlation
P2138	Throttle/Pedal Position Sensor/Switch “D” / “E” Voltage Correlation
P2228	Barometric Pressure Sensor Circuit Low
P2229	Barometric Pressure Sensor Circuit High

1. PREPARATION FOR THE INSPECTION MODE

1) Check that the battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Lift-up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

WARNING:
• Before lifting-up the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the 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 rigid racks and vehicle.

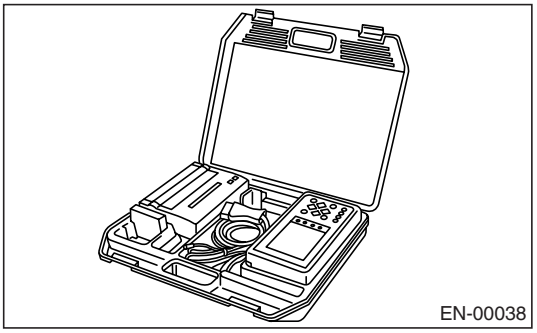
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



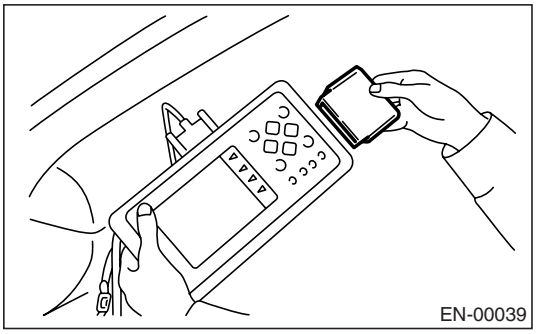
(A) Rigid racks
(B) Free rollers

2. SUBARU SELECT MONITOR

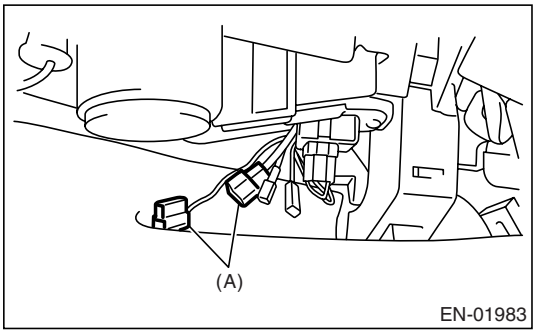
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.>
2) Idle the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



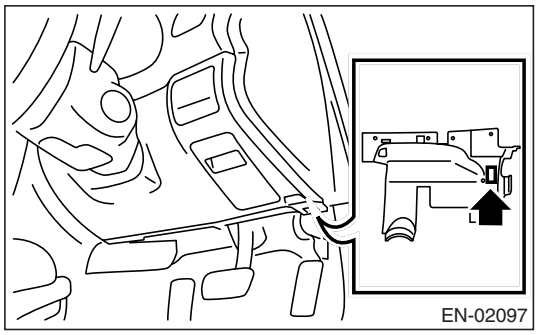
4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



6) Connect the test mode connector (A) located at the lower portion of glove box.

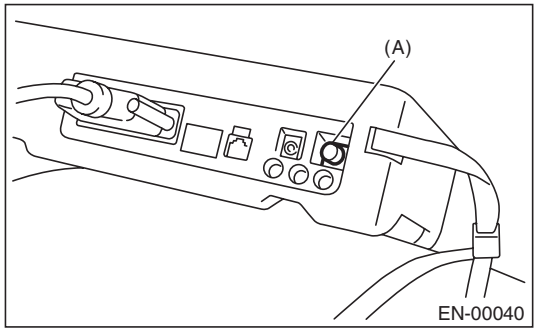


7) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

8) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor power switch to ON.



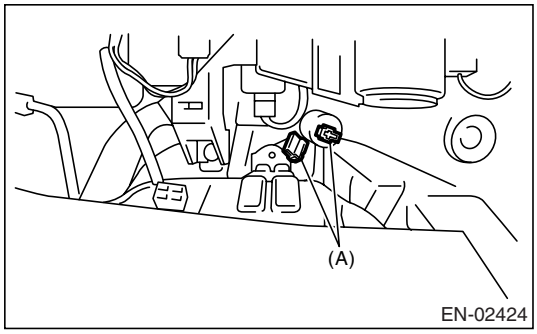
(A) Power switch

9) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
11) Press the [YES] key after the information of engine type has been displayed.
12) On the «Engine Diagnosis» screen, select the {D Check} and press the [YES] key.
13) When the "Perform D Check?" is shown on the screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>
• 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 function.

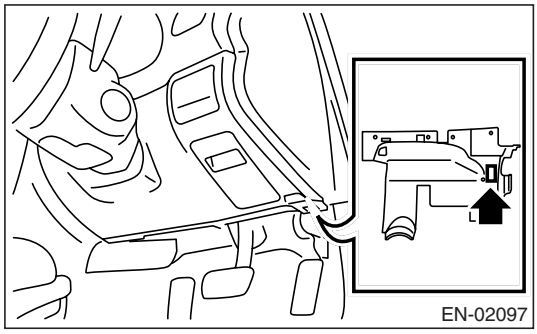
3. GENERAL SCAN TOOL

1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.>
2) Idle the engine.
3) Connect the test mode connector (A) located at the lower portion of glove box.



4) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.



5) Start the engine.

NOTE:
• Ensure the select lever is placed in "P" position before starting. (AT model)
• Depress the clutch pedal when starting the engine. (MT model)

6) Using the select lever or shift lever, turn the "P" position switch and "N" position switch to ON.
7) Depress the brake pedal to turn brake switch ON. (AT model)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Shift the select lever or shift lever in the "D" range (AT model) or "1st" gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• For AWD model, 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.

10) Using the general scan tool, check DTC and record the result(s).

NOTE:
• For detailed operation procedure, refer to the general scan tool operation manual.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
<Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the repair of the following trouble items, be sure to drive the vehicle with the specified drive patterns to check whether the function is resumed correctly.

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Perform the diagnosis after warming up the engine except when the engine coolant temperature at starting is specified.
• Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

2. DRIVE THE VEHICLE WITH 80 KM/H (50 MPH) FOR 20 MINUTES, AND THEN IDLE THE ENGINE FOR A MINUTE.

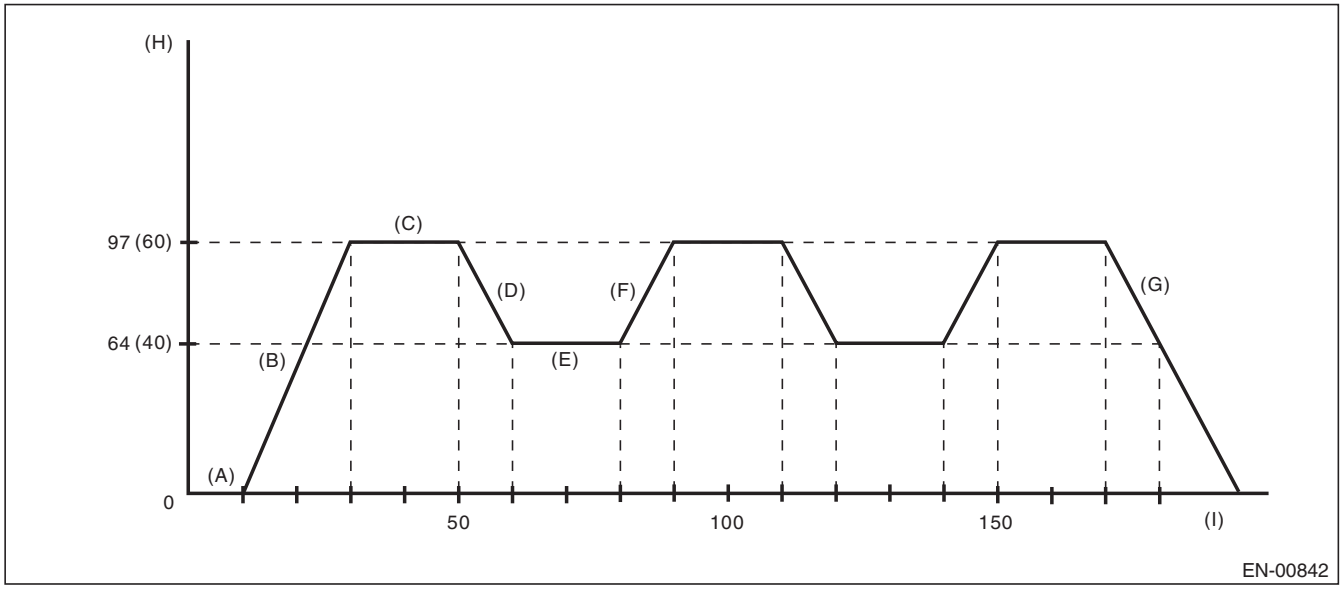
DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	—
*P0172	System Too Rich (Bank 1)	—
P0459	Evaporative Emission System Purge Control Valve Circuit High	—

3. 10 MINUTES IDLING

NOTE:
Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	—
*P0172	System Too Rich (Bank 1)	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle the engine for more than 10 seconds.
(B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate the vehicle to 64 km/h (40 MPH) with throttle fully closed.
(E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds.
(G) Stop the vehicle with throttle fully closed.
(H) Vehicle speed km/h (MPH)
(I) Sec.

DTC	Item	On condition
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	—
*P0172	System Too Rich (Bank 1)	—
P0246	Turbo/Super Charger Wastegate Solenoid A High	—
P0562	System Voltage Low	—
P0563	System Voltage High	—

13.Clear Memory Mode

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
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 ignition switch to OFF and then Subaru Select Monitor power 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 {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
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 {DTC Clear} and press the [YES] key.
6) When the “Clear Diagnostic Code?” is shown on the screen, press the [YES] key.
7) Turn the ignition switch to OFF, and the Subaru Select Monitor power switch to OFF.

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

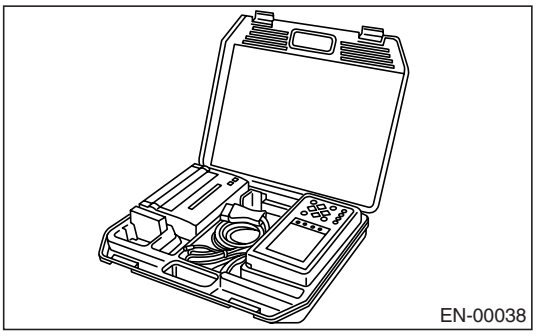
3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the general scan tool operation manual.

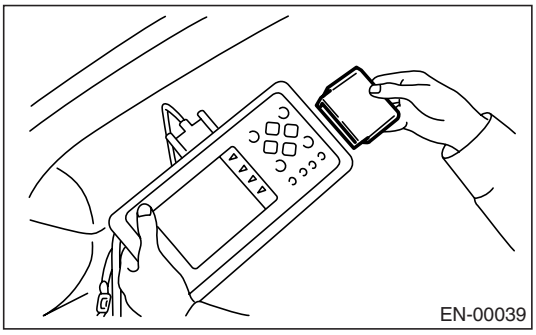
14. Compulsory Valve Operation Check Mode

A: OPERATION

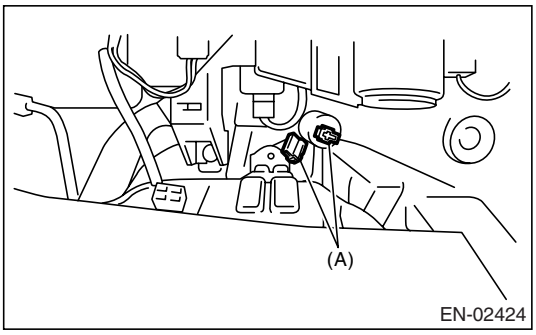
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>


EN-00038

2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

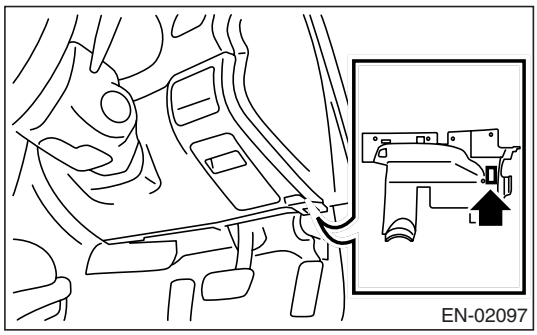

EN-00039

4) Connect the test mode connector (A) located at the lower portion of glove box.



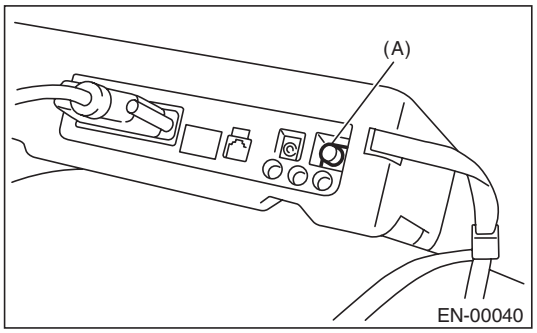
EN-02424

5) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-02097

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

6) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor power switch to ON.



EN-00040

(A) Power switch

7) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
9) Press the [YES] key after the information of engine type has been displayed.
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» screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) On the «Actuator ON/OFF Operation» screen, select the desired compulsory actuator and press the [YES] key.
13) Pressing the [NO] key completes the compulsory valve 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.

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump
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 wastegate control solenoid valve operation check	Turbocharger Wastegate Solenoid

NOTE:
• The following parts will be displayed but not functional.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Exchange Valve
PCV Solenoid Valve
AAI Solenoid Valve
Vcut Solenoid
Tank Sensor Cntl Valve

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15.Malfunction Indicator Light

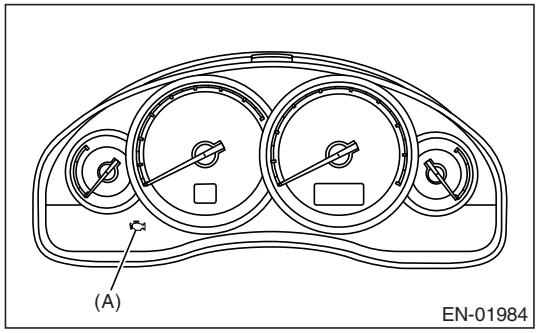
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-41, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-42, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-44, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink. <Ref. to EN(H4DOTC)(diag)-45, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking. <Ref. to EN(H4DOTC)(diag)-47, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING., Malfunction Indicator Light.>

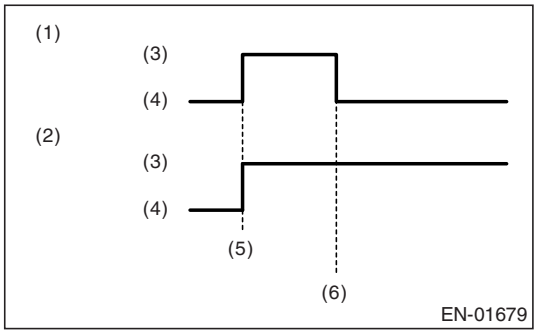
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light (A) in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform the diagnosis of malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-42, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

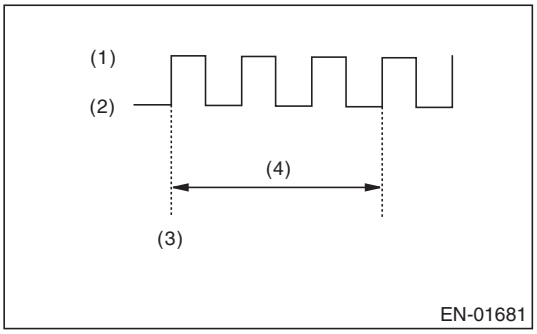


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system is malfunctioning.



(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

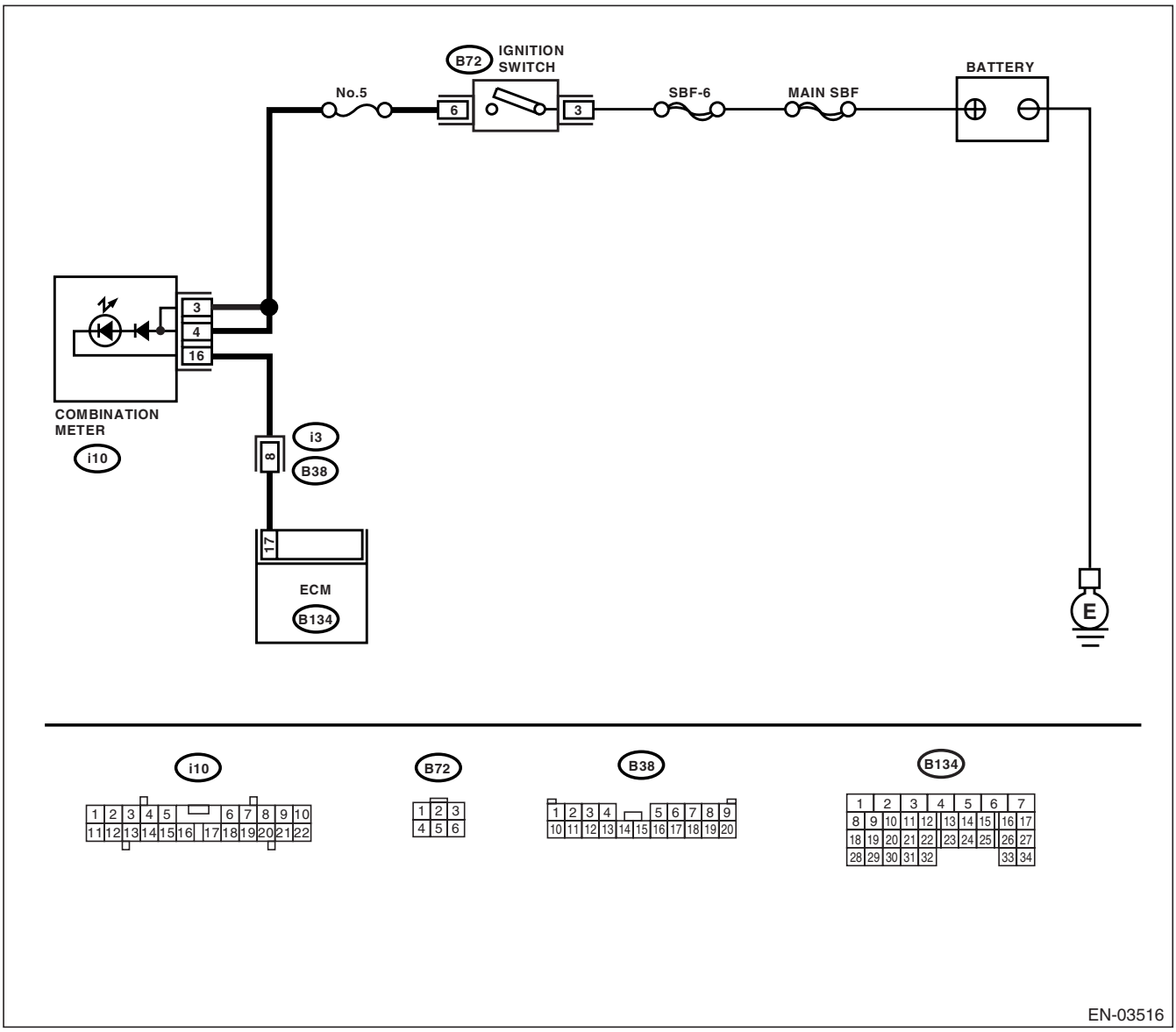
3) Turn the ignition switch to OFF and connect the test mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)
(3) Malfunction indicator light blinks at a cycle of 3 Hz after diagnosis if there is no trouble. Malfunction indicator light comes on if faulty.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 sec.

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

DIAGNOSIS:
The malfunction indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair the poor contact in ECM connector.	Go to step **3.**

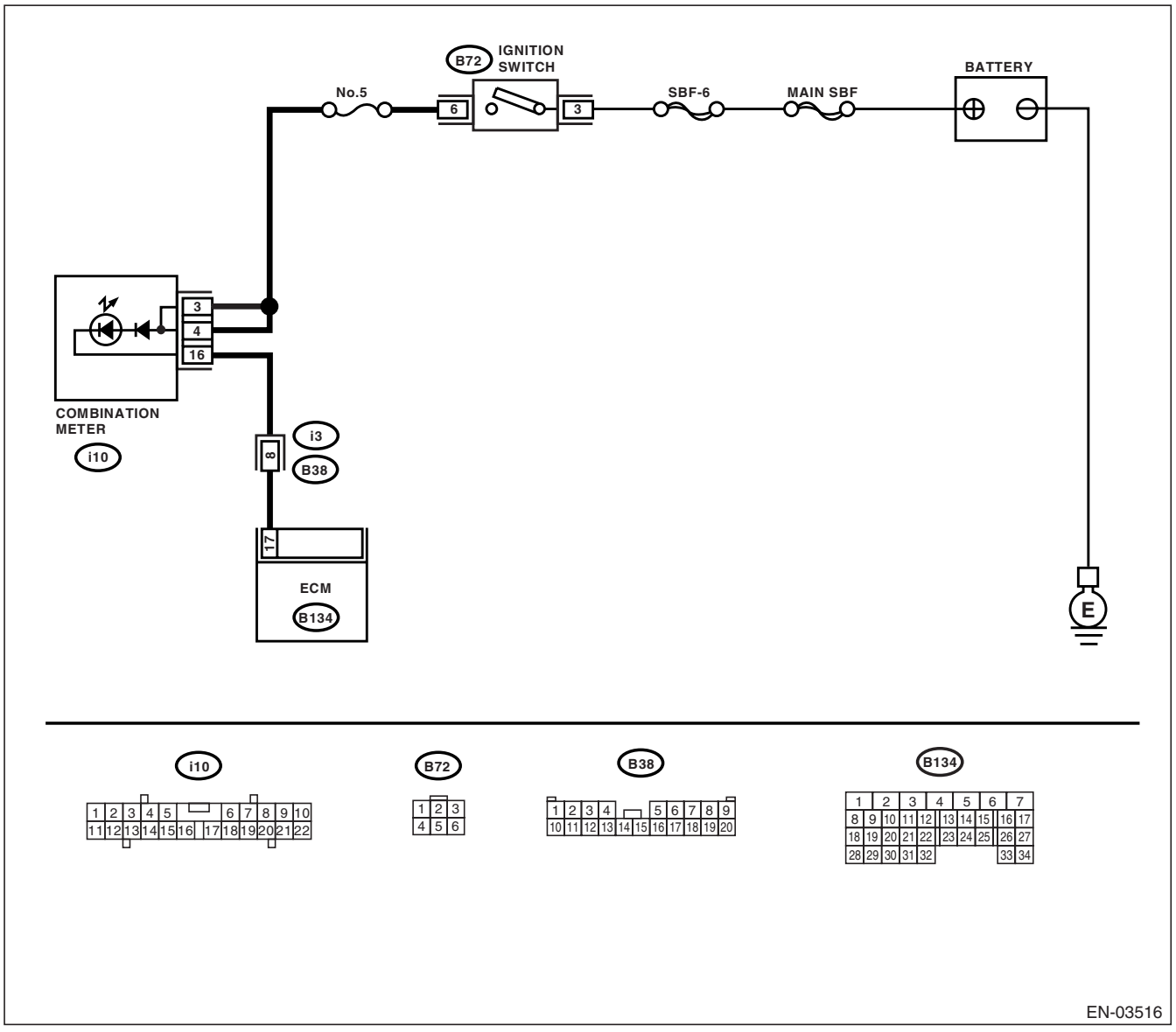
	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i10) No. 16:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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?	Repair the poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 (+) — Chassis ground (−):*** ***(i10) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the meter case assembly of combination meter. <Ref. to IDI-15, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out fuse • Open or short circuit of harness between fuse and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:
Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK.

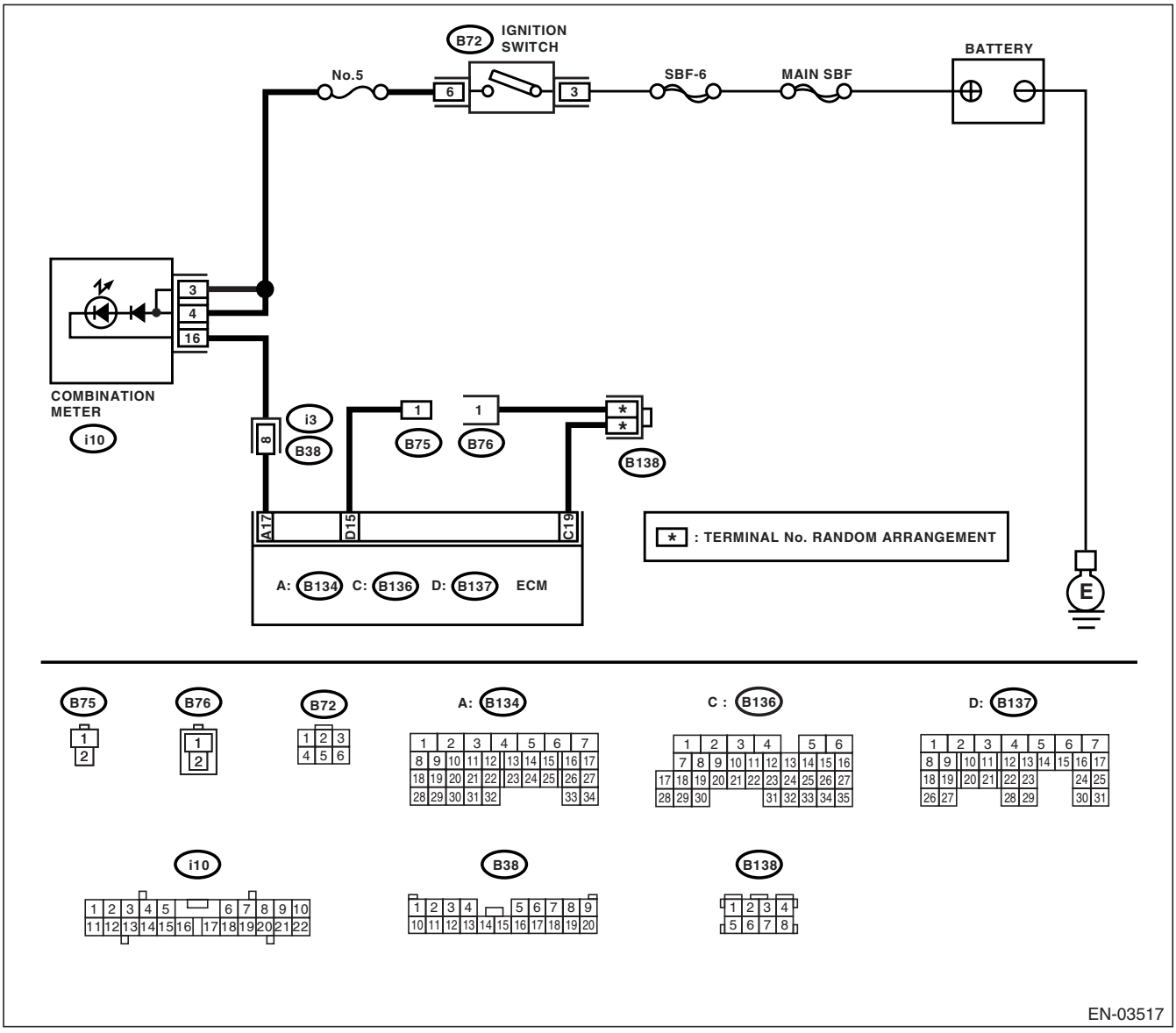
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during inspection mode.

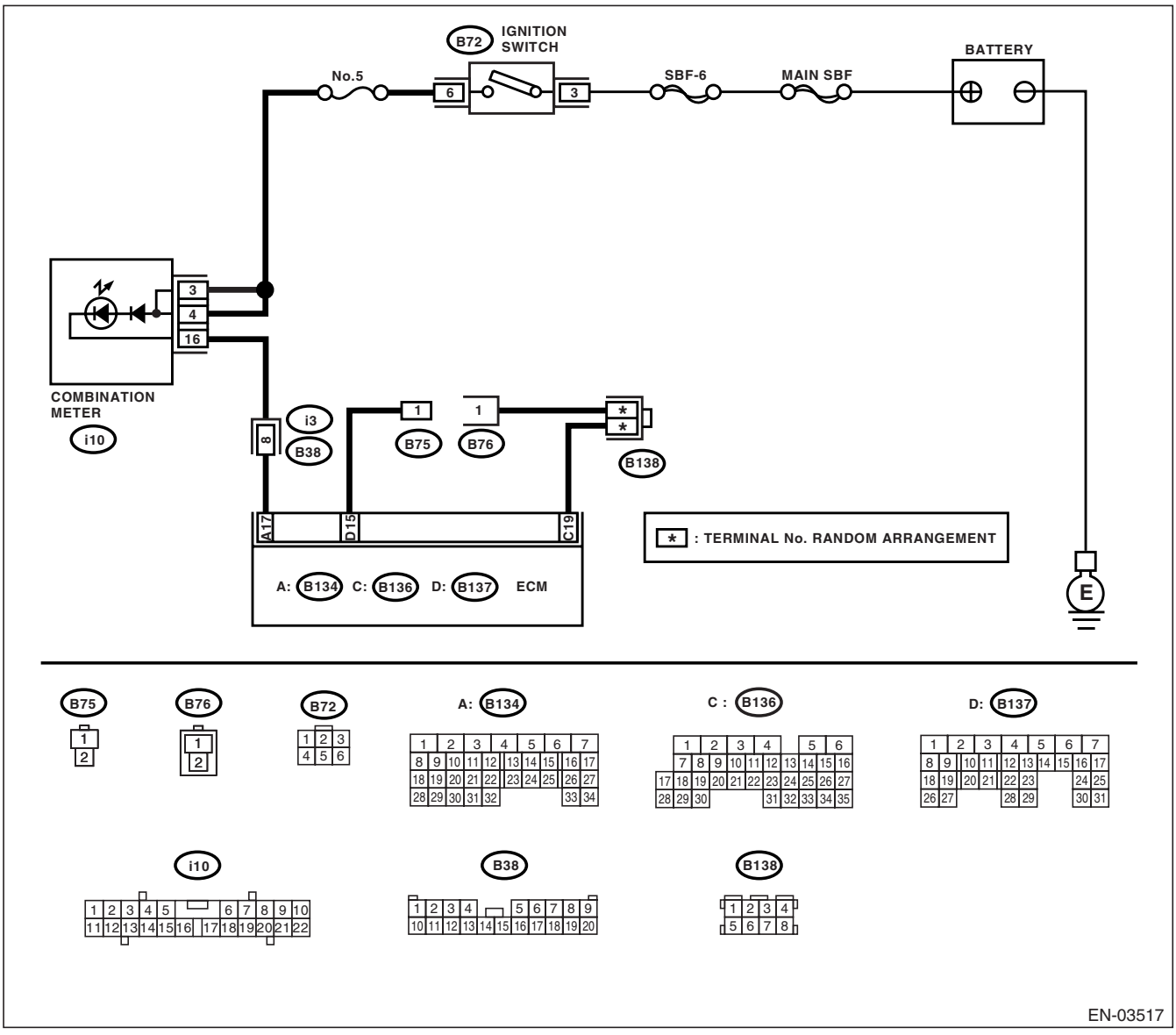
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connectors. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indictor light circuit. <Ref. to EN(H4DOTC)(diag)-42, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and ECM. ***Connector & terminal*** ***(B76) No. 1 — (B136) No. 19:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between test mode connector and ECM • Poor contact in joint connector
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** Measure the resistance of harness between ECM and test mode connector. ***Connector & terminal*** ***(B137) No. 15 — (B75) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING.

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks when test mode connector is not connected.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connectors. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit of harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

16.Diagnostics for Engine Starting Failure

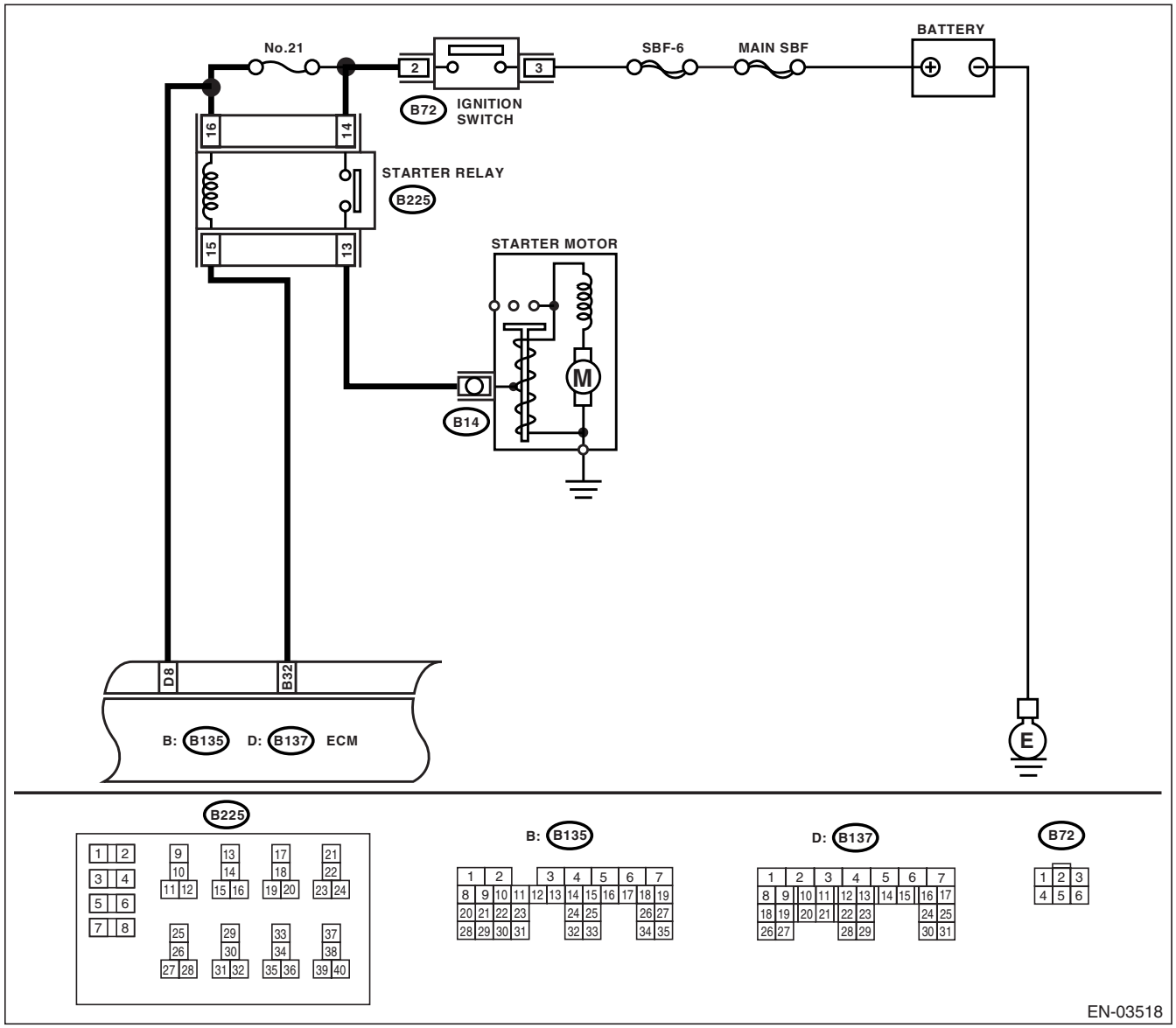
A: PROCEDURE

1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-50, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-53, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-55, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-58, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-60, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-29, OPERATION, Read Diagnostic Trouble Code (DTC).>	Inspect the relevant DTC using List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.

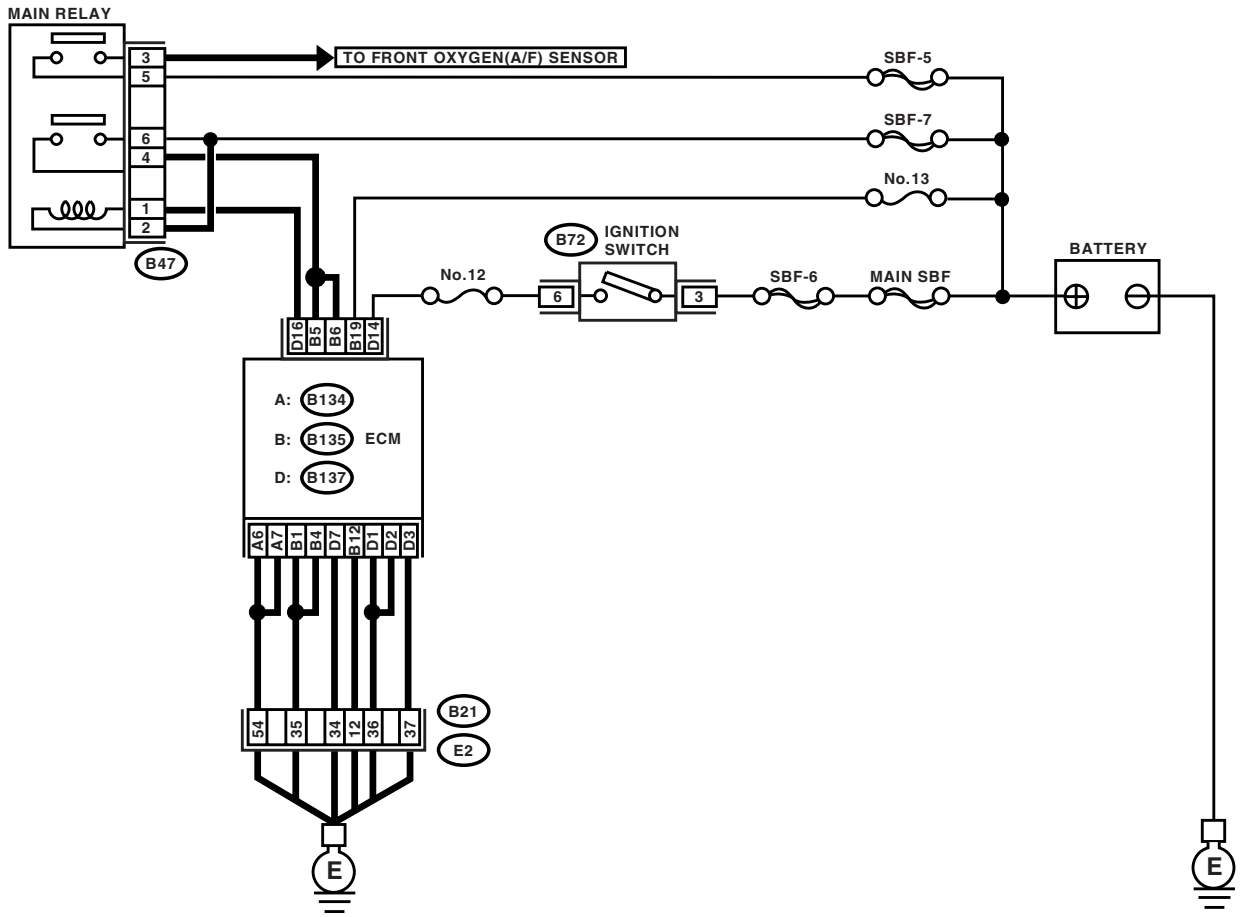
	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):*** NOTE: • For AT model, place the select lever in "P" or "N" range. • For MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ground cable terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO 2.0)-6, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the following and repair if necessary. • Blown out fuse • Open circuit of harness between ignition switch and battery
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **7.**	Replace the ignition switch.
7	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter relay connector and chassis ground after turning the ignition switch to START position. ***Connector & terminal*** ***(B225) No. 14 (+) — Chassis ground (−):*** ***(B225) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Repair the open or ground short circuit of harness between starter relay and ignition switch.
8	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 15 and No. 16. 2) Measure the resistance between starter relay terminals. ***Terminals*** ***No. 13 — No. 14:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the starter relay.

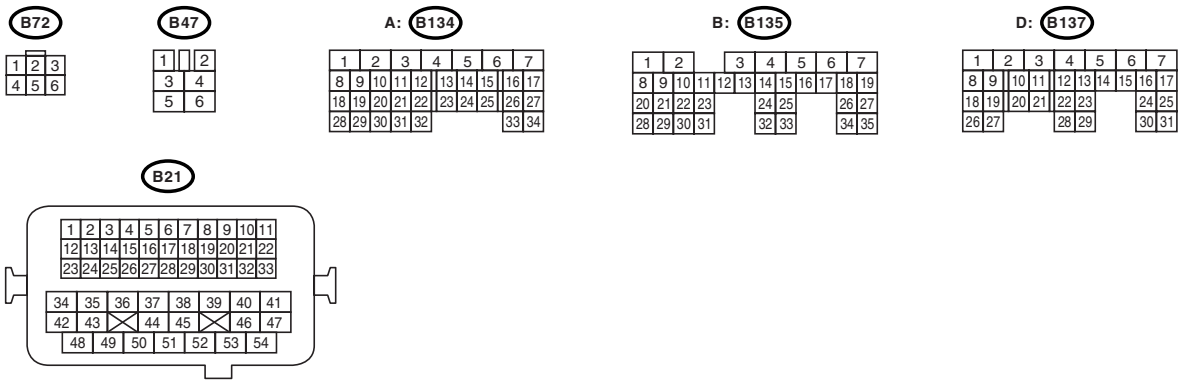
	Step	Check	Yes	No
9	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the starter relay connector. 3) Disconnect the connector from ECM. 4) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B135) No. 32 — (B225) No. 15:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness between ECM and starter relay.
10	**CHECK INPUT VOLTAGE OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Turn the ignition switch to START. 4) Measure the voltage between starter motor and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **11.**	Repair the open or ground short circuit of harness between starter relay and starter.
11	**CHECK HARNESS BETWEEN IGNITION SWITCH AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch and ECM. 3) Measure the resistance of harness between ignition switch and ECM connector. ***Connector & terminal*** ***(B137) No. 8 — (B72) No. 2:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DOTC)(diag)-53, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit between ignition switch and ECM.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03519

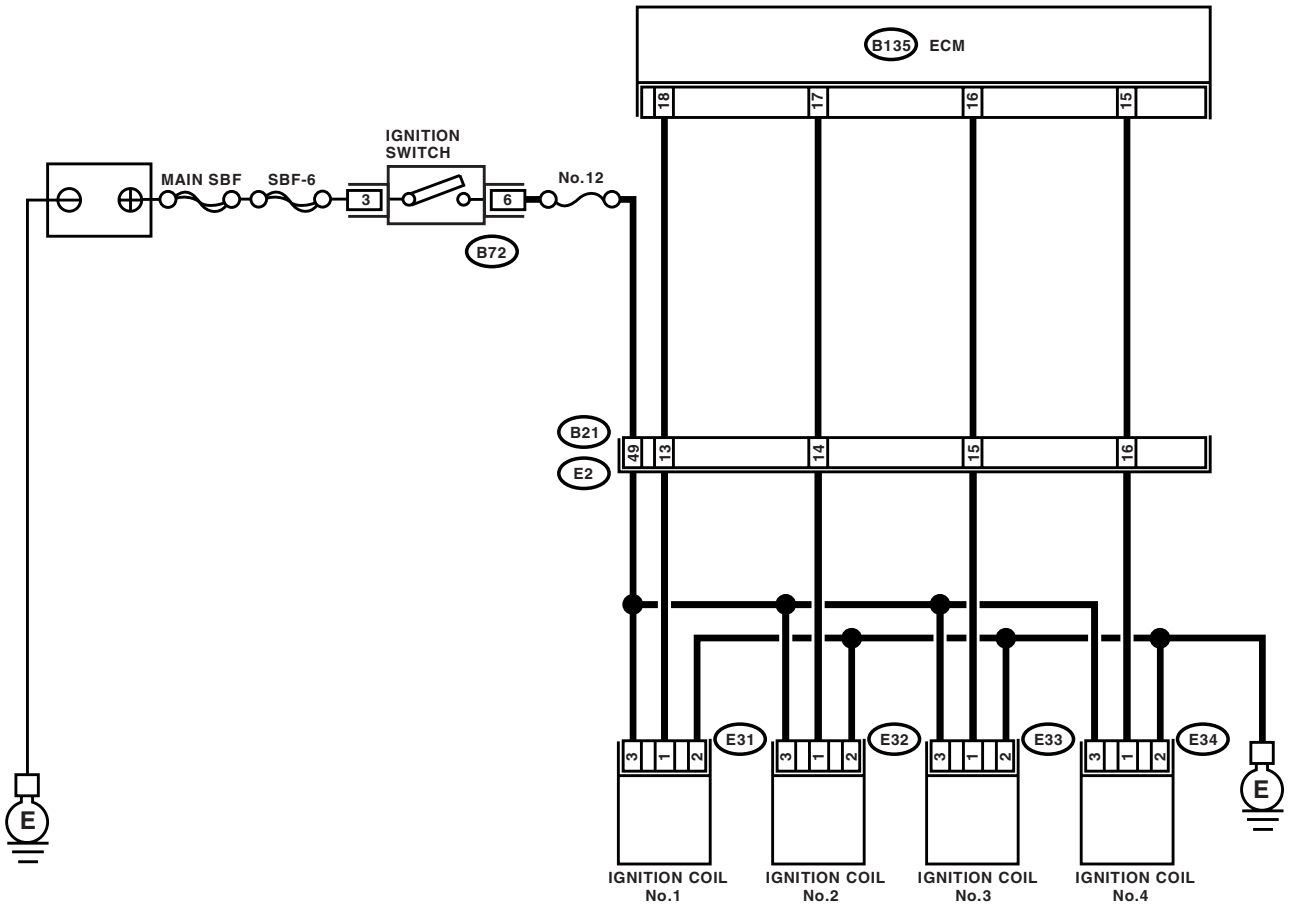
Diagnostics for Engine Starting Failure

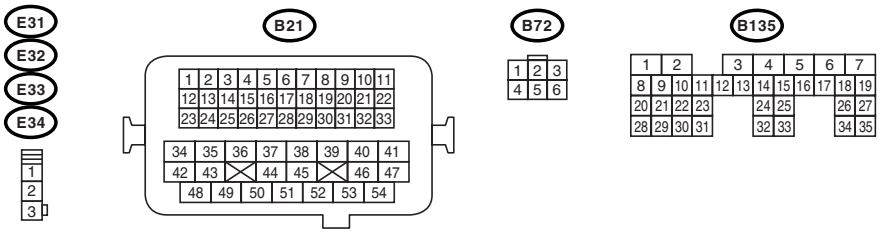
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit of harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the open or ground short circuit of power supply circuit.
5	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (−):*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open or ground short circuit of harness of power supply circuit.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-55, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03520

Diagnostics for Engine Starting Failure

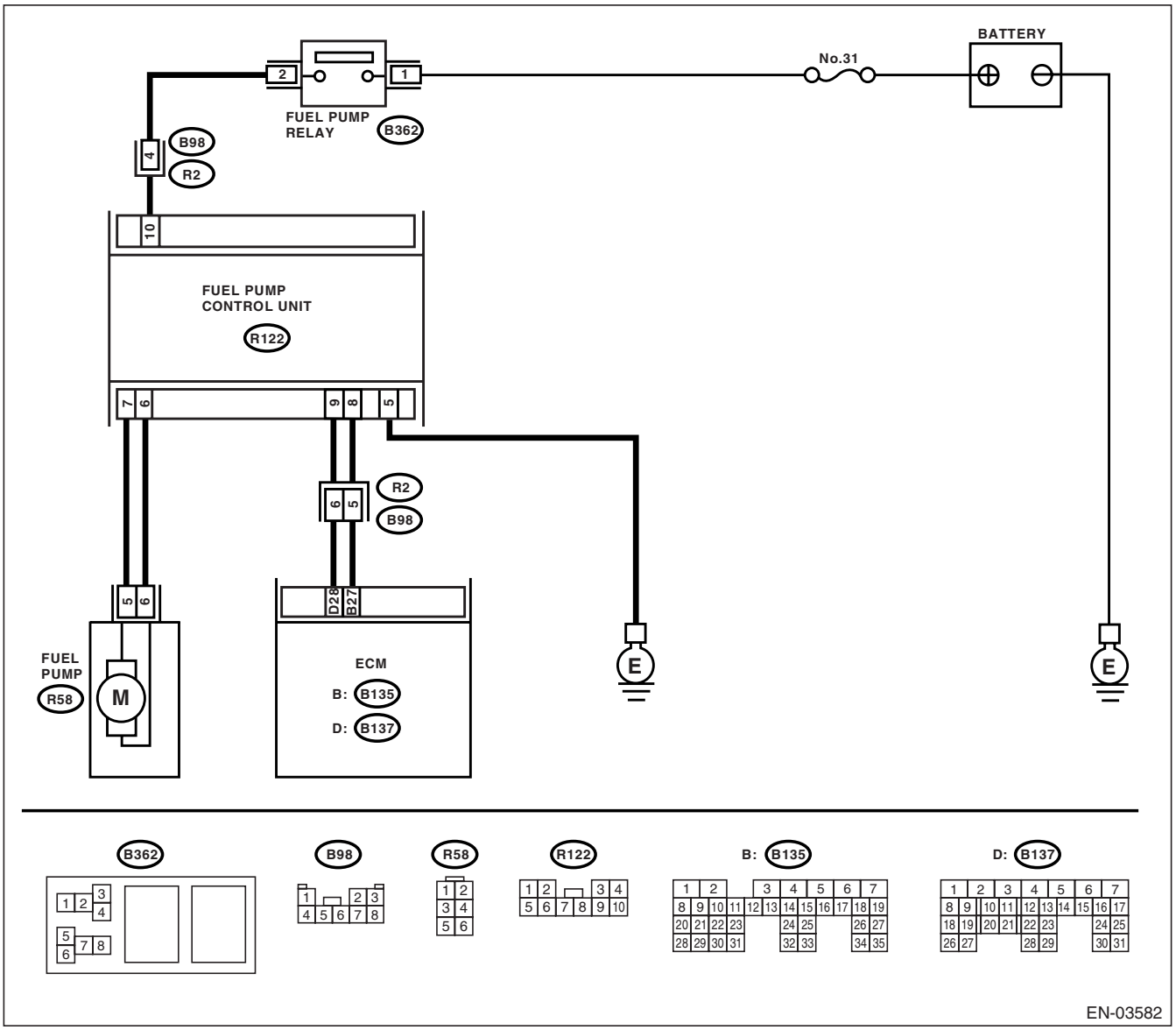
	Step	Check	Yes	No
1	**CHECK CONDITION OF SPARK PLUG.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug in normal condition?	Go to step **2.**	Replace the spark plug.
2	**CHECK SPARK OF IGNITION SYSTEM.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(H4DOTC)(diag)-58, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT OF IGNITION COIL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil 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 (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ignition coil and ignition switch connector • Poor contact in coupling connector
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil 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:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ignition coil connector and engine ground terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil. 4) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and ignition coil connector • Poor contact in coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit of harness between ECM and ignition coil connector.

	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil.

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

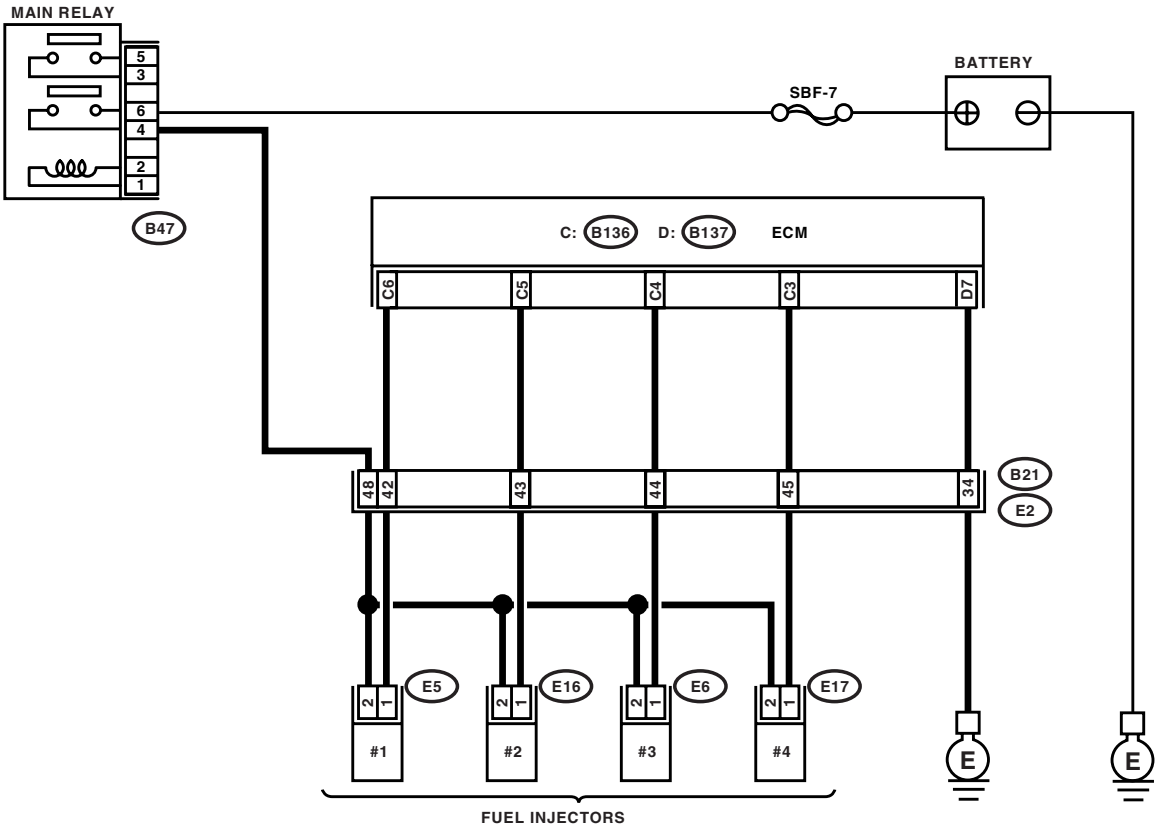


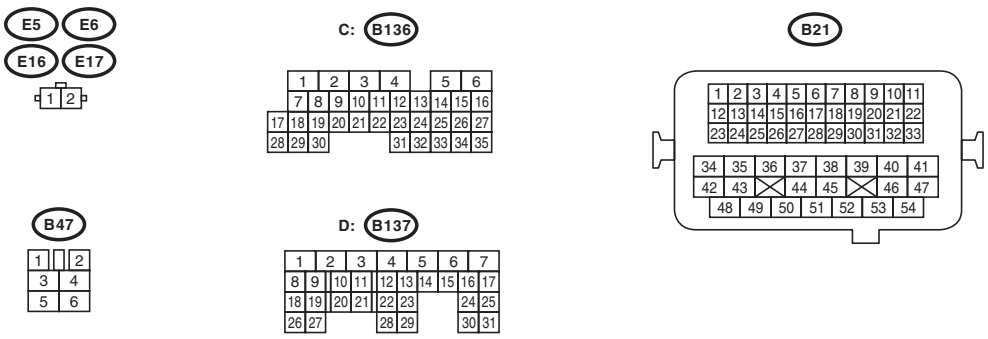
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. Refer to “Compulsory Valve Operation Check Mode” for procedures. <Ref. to EN(H4DOTC)(diag)-38, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-60, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display DTC. <Ref. to EN(H4DOTC)(diag)-29, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:





EN-03521

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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 the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC)(diag)-213, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Reference
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-67, 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(H4DOTC)(diag)-69, 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(H4DOTC)(diag)-71, 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(H4DOTC)(diag)-74, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-76, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)(diag)-79, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-81, 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(H4DOTC)(diag)-83, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)(diag)-85, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-87, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H4DOTC)(diag)-90, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4DOTC)(diag)-92, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to EN(H4DOTC)(diag)-95, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High	<Ref. to EN(H4DOTC)(diag)-97, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-99, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-101, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (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(H4DOTC)(diag)-103, 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(H4DOTC)(diag)-105, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-108, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-110, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-111, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to EN(H4DOTC)(diag)-114, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High	<Ref. to EN(H4DOTC)(diag)-116, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-118, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC)(diag)-121, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC)(diag)-123, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0261	Cylinder 1 Injector Circuit Low	<Ref. to EN(H4DOTC)(diag)-125, DTC P0261 CYLINDER 1 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0264	Cylinder 2 Injector Circuit Low	<Ref. to EN(H4DOTC)(diag)-125, DTC P0264 CYLINDER 2 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0267	Cylinder 3 Injector Circuit Low	<Ref. to EN(H4DOTC)(diag)-125, DTC P0267 CYLINDER 3 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0270	Cylinder 4 Injector Circuit Low	<Ref. to EN(H4DOTC)(diag)-125, DTC P0270 CYLINDER 4 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-128, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-130, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC)(diag)-132, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-134, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H4DOTC)(diag)-136, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0350	Ignition Coil Primary/Secondary Circuit	<Ref. to EN(H4DOTC)(diag)-138, DTC P0350 IGNITION COIL PRIMARY/ SECONDARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	<Ref. to EN(H4DOTC)(diag)-141, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	<Ref. to EN(H4DOTC)(diag)-143, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-145, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-147, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H4DOTC)(diag)-148, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-149, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-17, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Air Control System Performance	<Ref. to EN(H4DOTC)(diag)-150, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0562	System Voltage Low	<Ref. to EN(H4DOTC)(diag)-151, DTC P0562 SYSTEM VOLTAGE LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	System Voltage High	<Ref. to EN(H4DOTC)(diag)-153, DTC P0563 SYSTEM VOLTAGE HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-155, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-155, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4DOTC)(diag)-155, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)(diag)-155, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-157, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-157, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)(diag)-158, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC)(diag)-161, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-163, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-164, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-166, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-18, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-20, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-21, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-24, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-25, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-25, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-168, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-170, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2090	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-172, DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2091	Exhaust Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-174, DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-176, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-178, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2094	Exhaust Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-180, DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2095	Exhaust Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-182, DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-183, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC)(diag)-189, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC)(diag)-192, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to EN(H4DOTC)(diag)-193, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-194, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-197, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-199, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-202, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-204, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-208, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H4DOTC)(diag)-212, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H4DOTC)(diag)-212, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

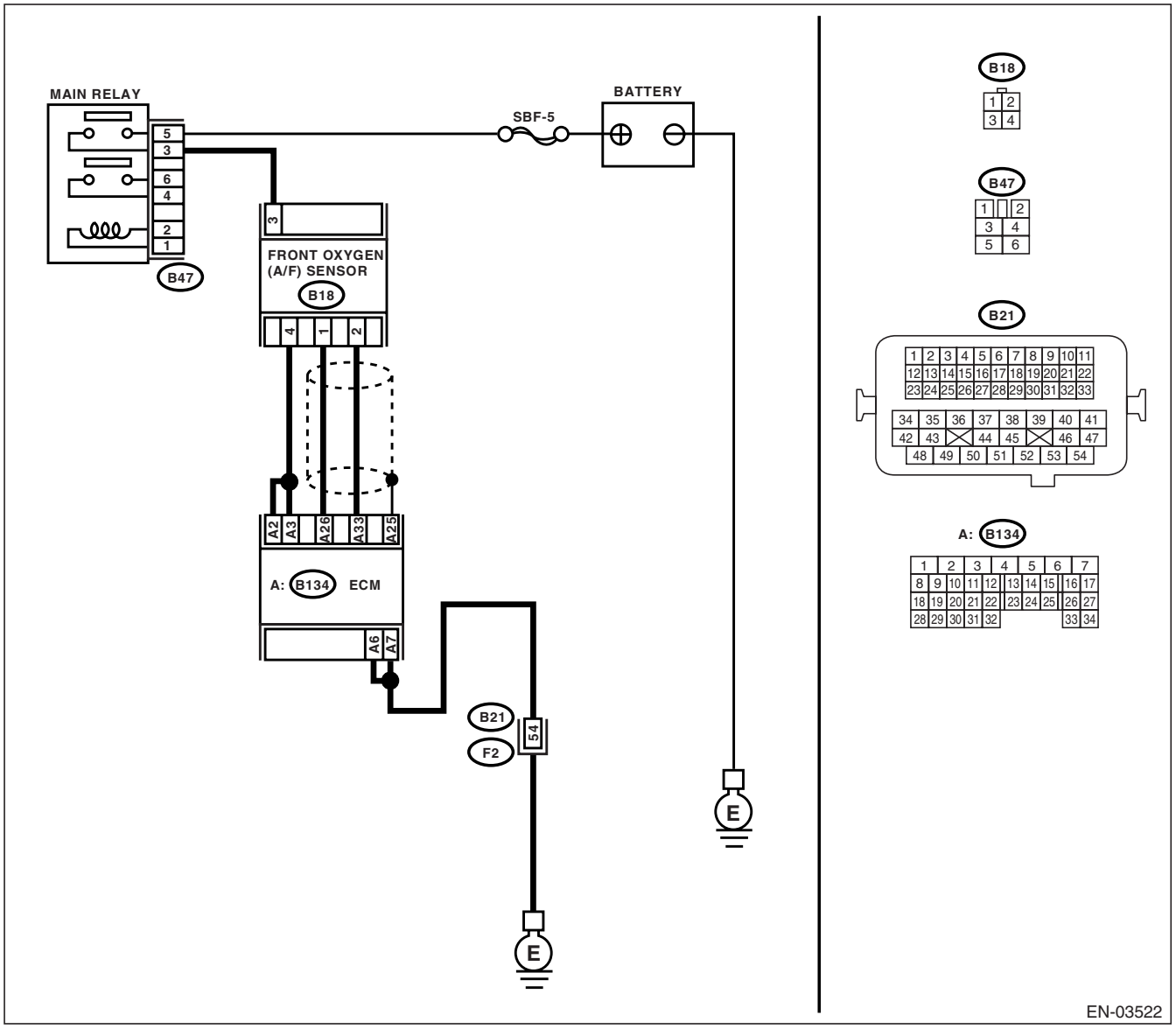
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit of 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
2	**CHECK HARNESS BETWEEN FRONT OXYGEN (A/F) SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between front oxygen (A/F) sensor connector and ECM connector. ***Connector & terminal*** ***(B18) No. 4 — (B134) No. 2:*** ***(B18) No. 4 — (B134) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor.
3	**CHECK HARNESS BETWEEN FRONT OXYGEN (A/F) SENSOR AND ECM.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 — Chassis ground:*** ***(B134) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 2.4 Ω?	Repair the poor contact in ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-32, Front Oxygen (A/F) Sensor.>

B: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

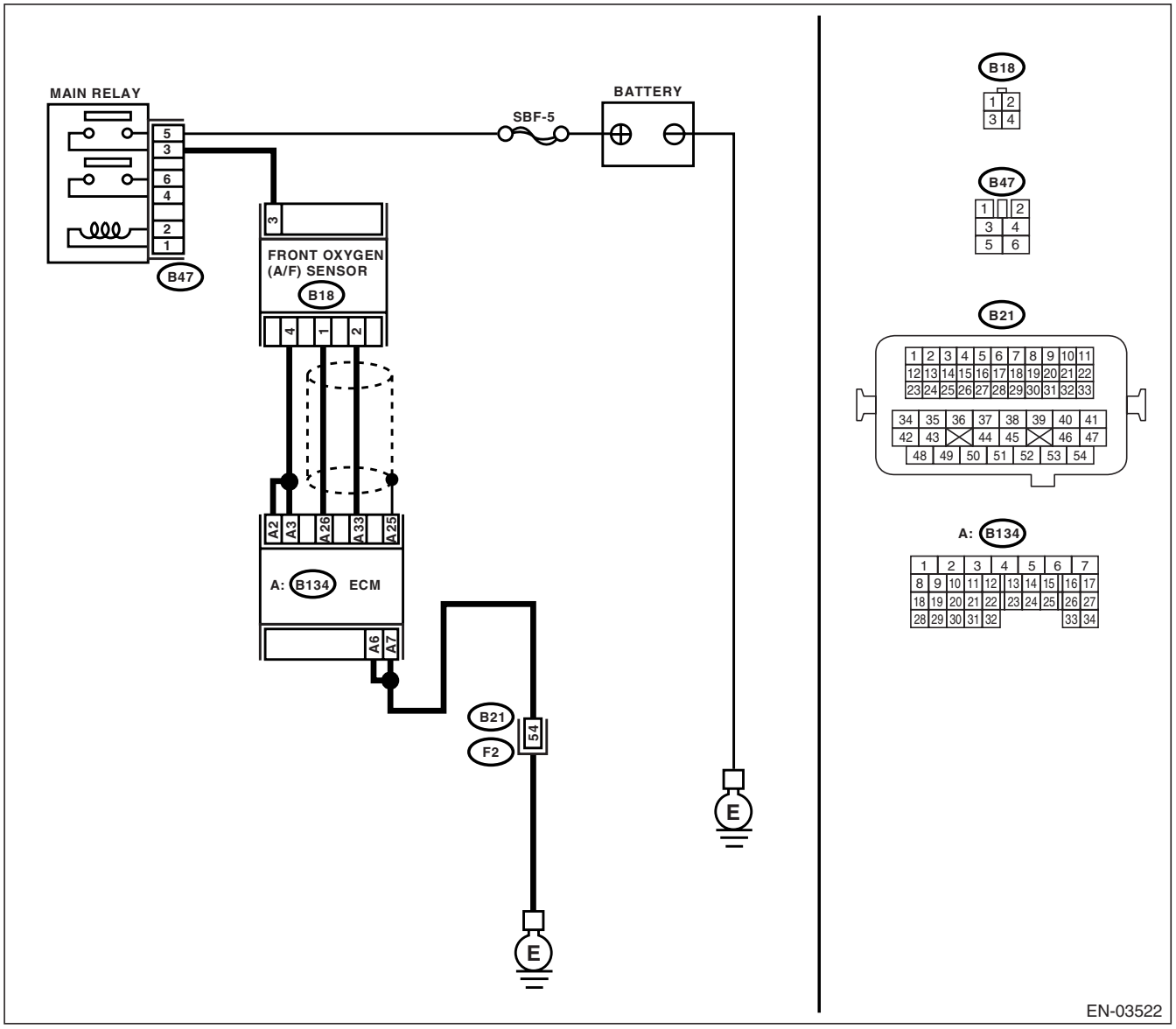
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM connector and chassis ground.
2	**CHECK VOLTAGE BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (−):*** ***(B137) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Repair the poor contact in ECM connector.

C: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

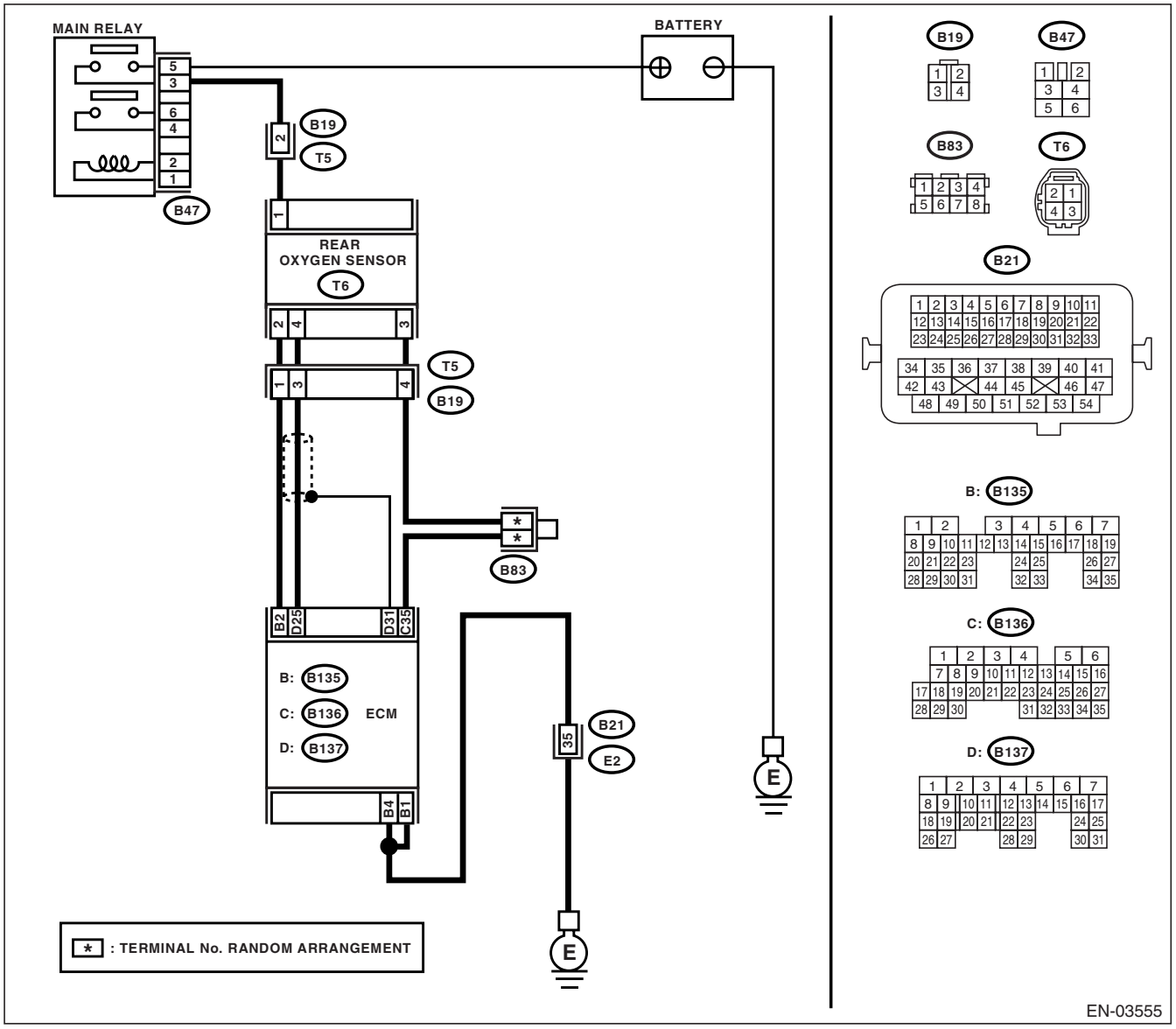
DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between ECM and rear oxygen sensor.
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 — Chassis ground:***	Does the resistance change by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **4.**
4	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit of harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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 the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>

D: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

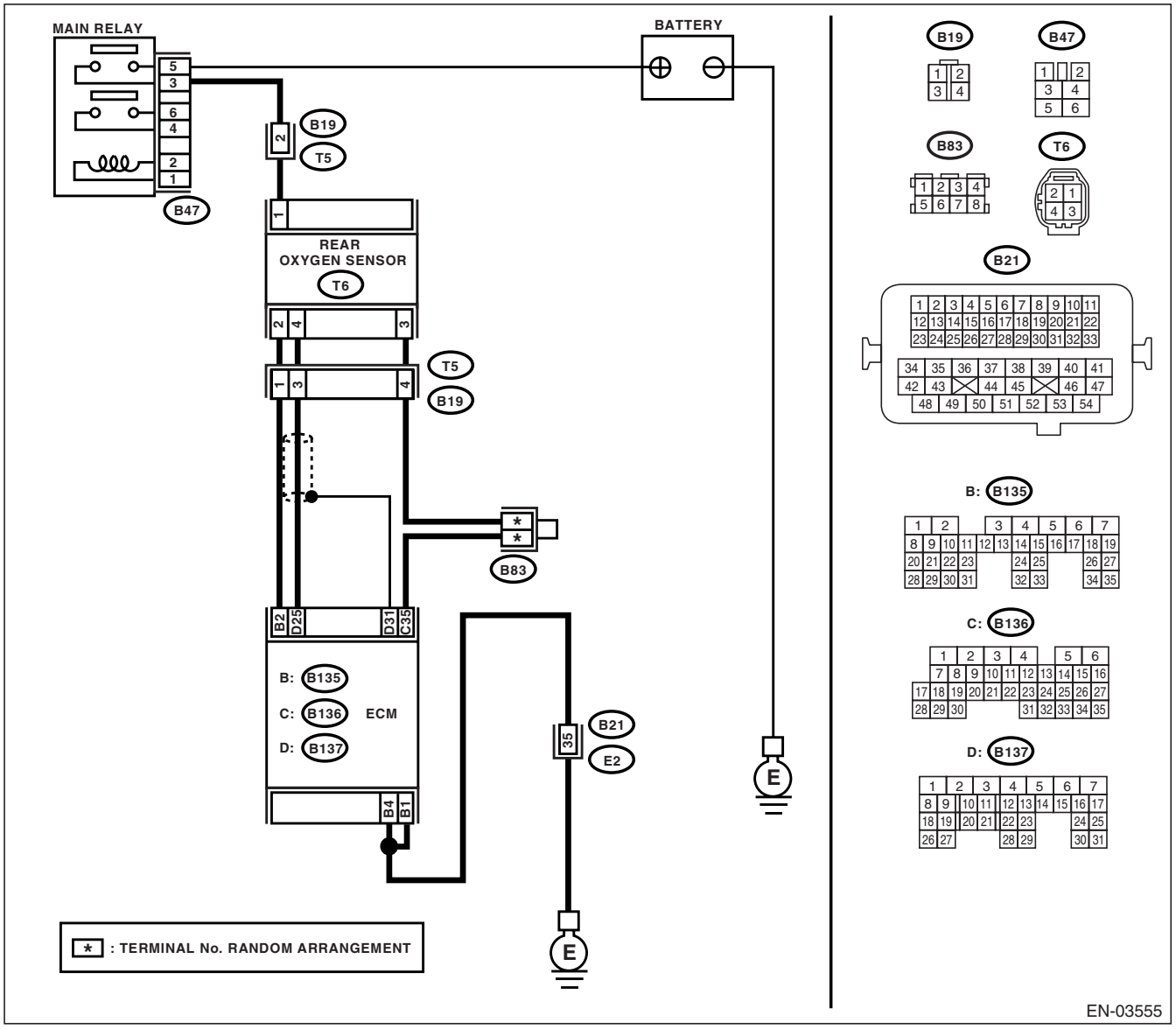
DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and rear oxygen sensor.	Repair the poor connection in ECM connector.

E: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

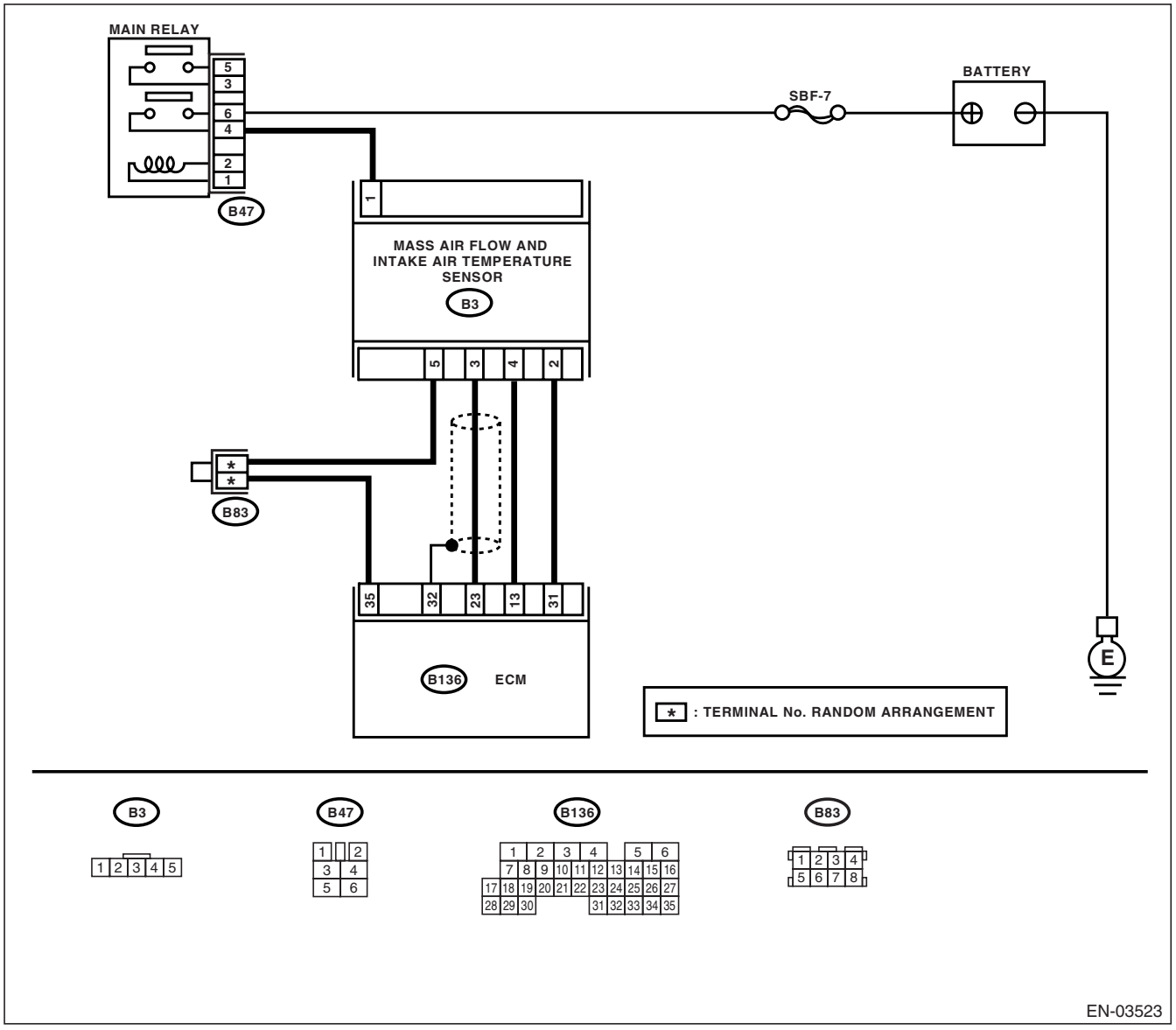
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**READ DATA CONNECTING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor power switch to ON. 4) Start and idle the engine. 5) Read the voltage of mass air flow sensor using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact in connector or harness may be the cause. Repair the harness or connector in mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit of harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL OF ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Replace and check it again because of ECM malfunction possibility.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>

F: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

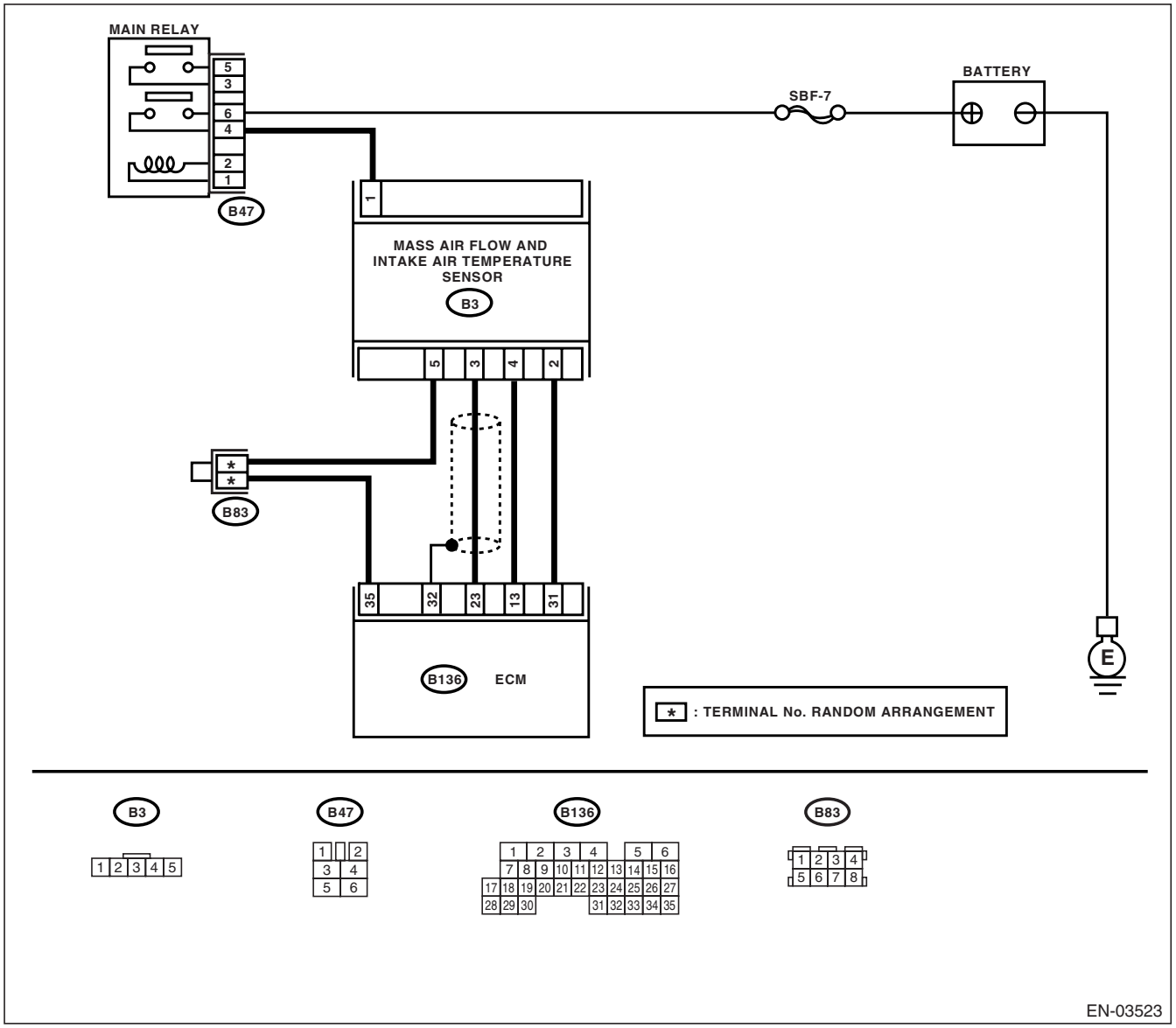
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



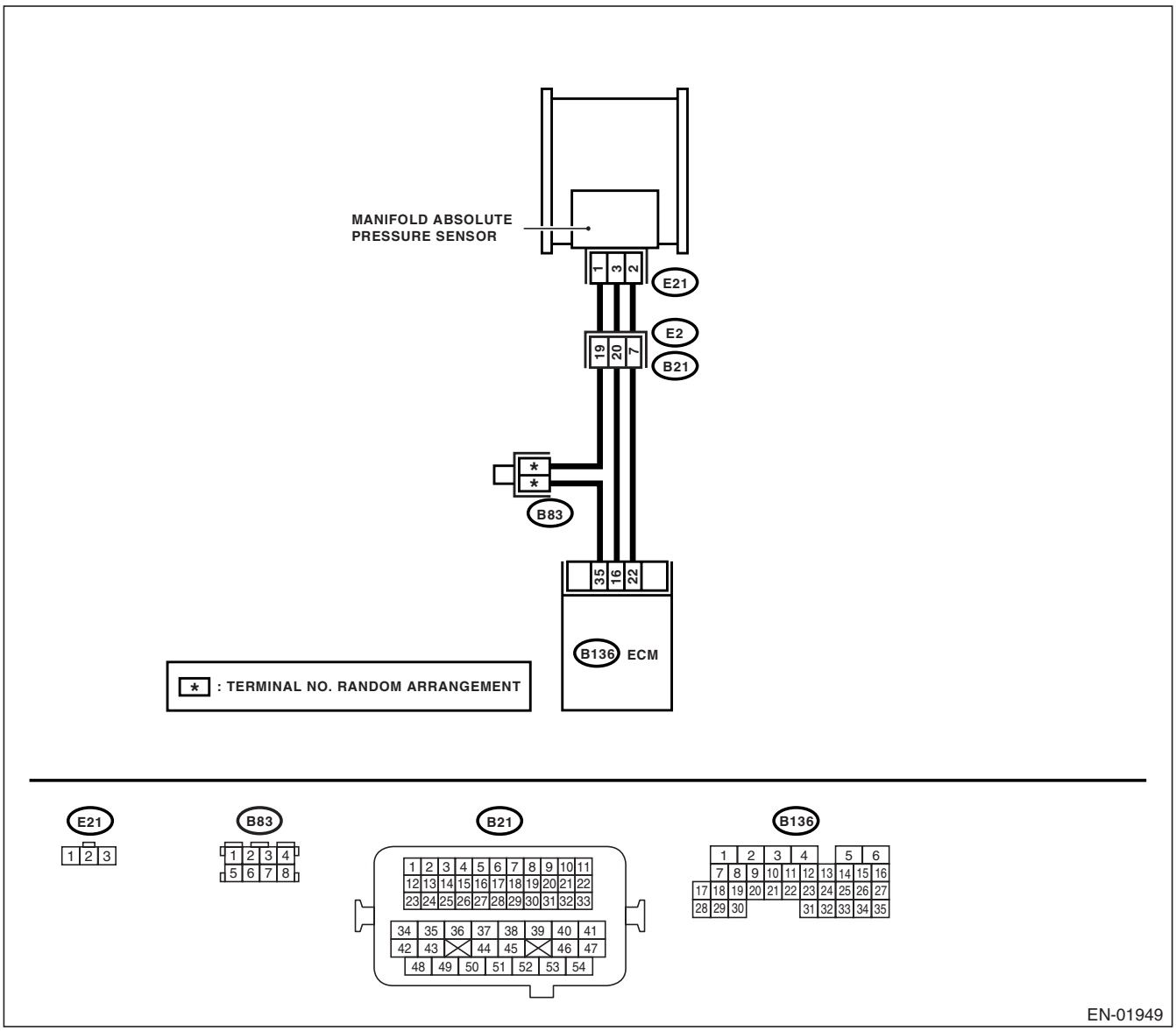
	Step	Check	Yes	No
1	**READ DATA CONNECTING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON. 4) Start and idle the engine. 5) Read the voltage of mass air flow sensor using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Repair the battery short circuit of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open circuit of harness between mass air flow sensor connector and ECM connector.

G: 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, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**

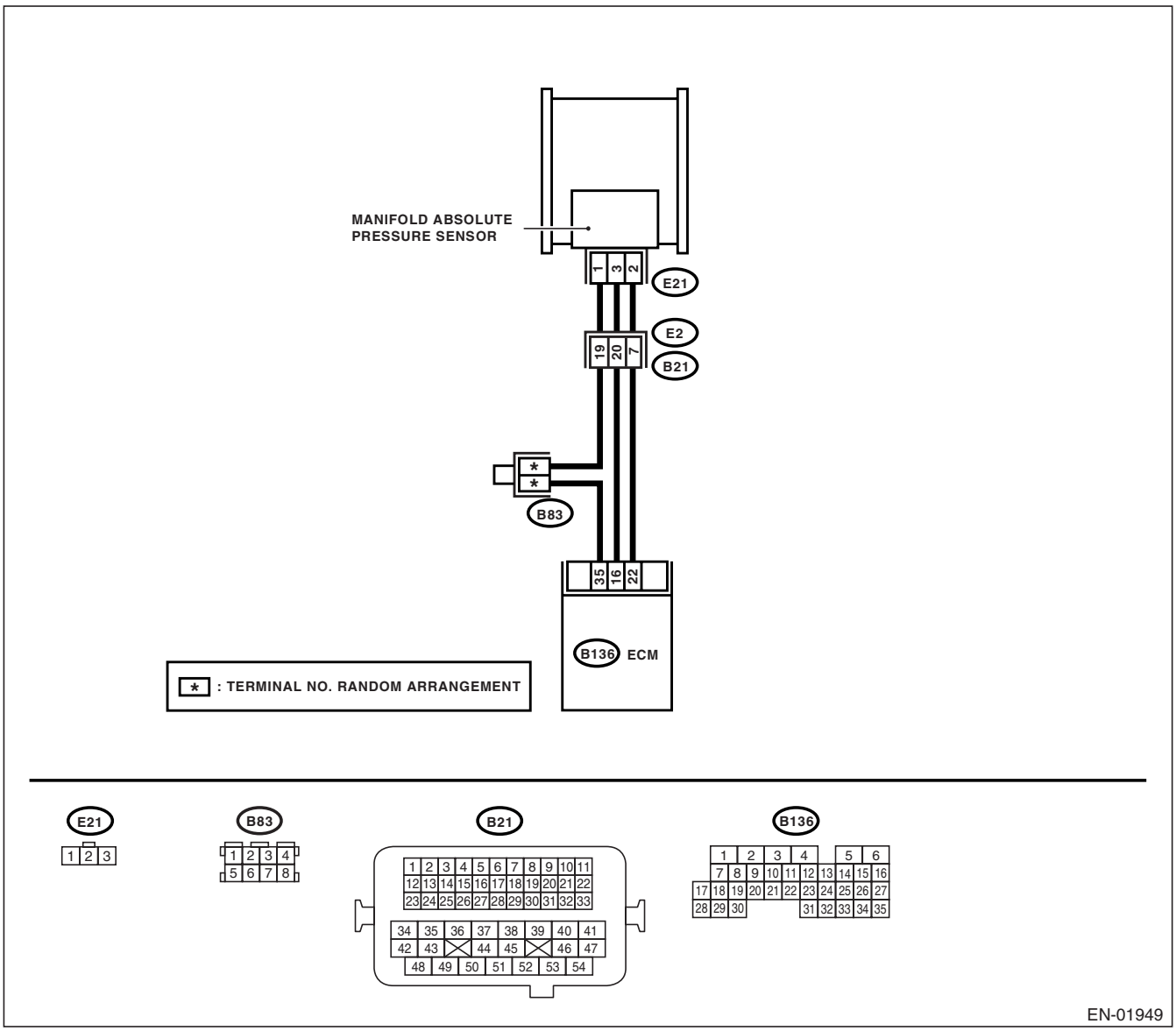
	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>

H: 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, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-28, Manifold Absolute Pressure Sensor.>

I: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

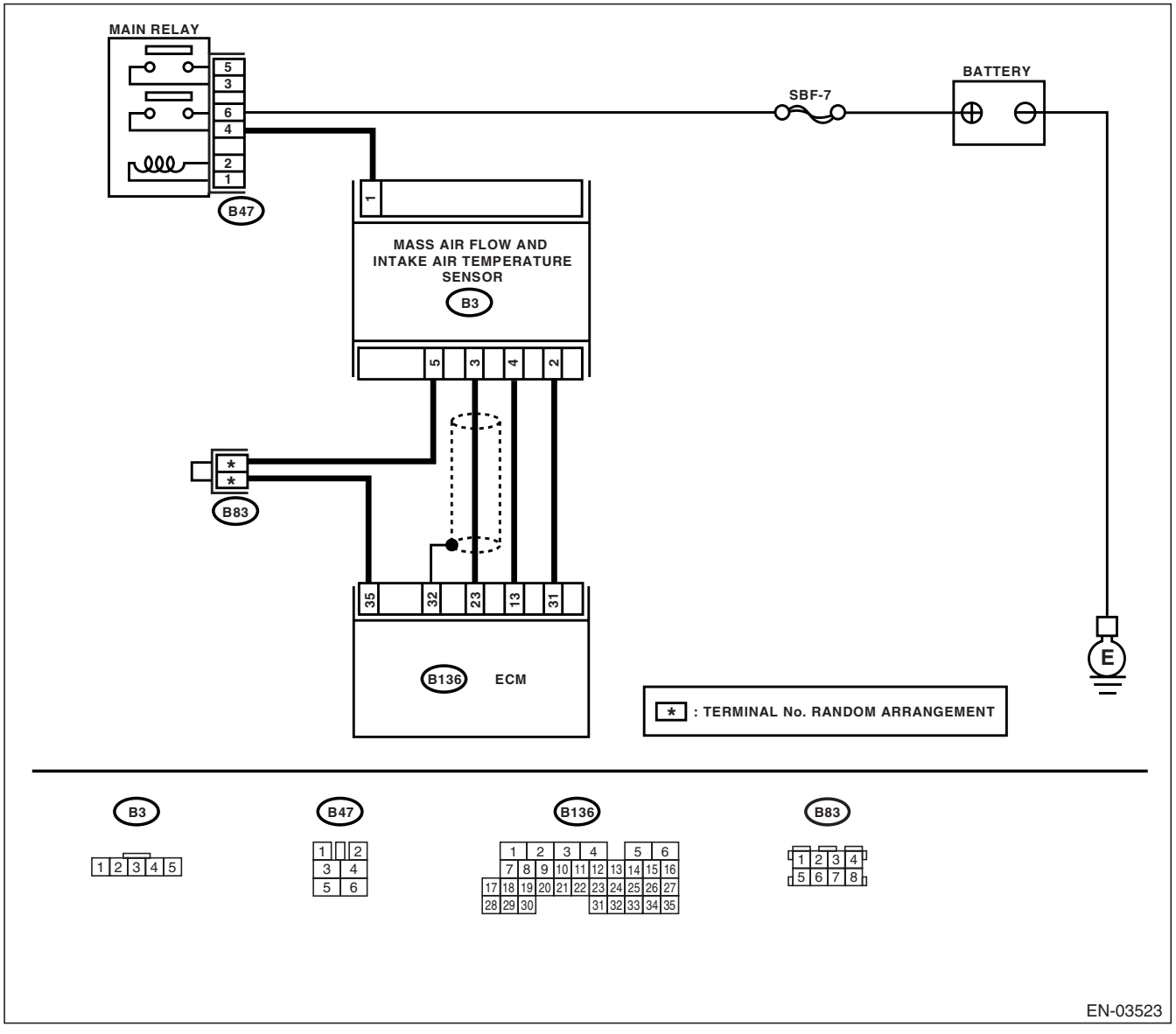
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than −36°C (−33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit of harness between mass air flow and intake air temperature sensor and ECM connector.

J: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

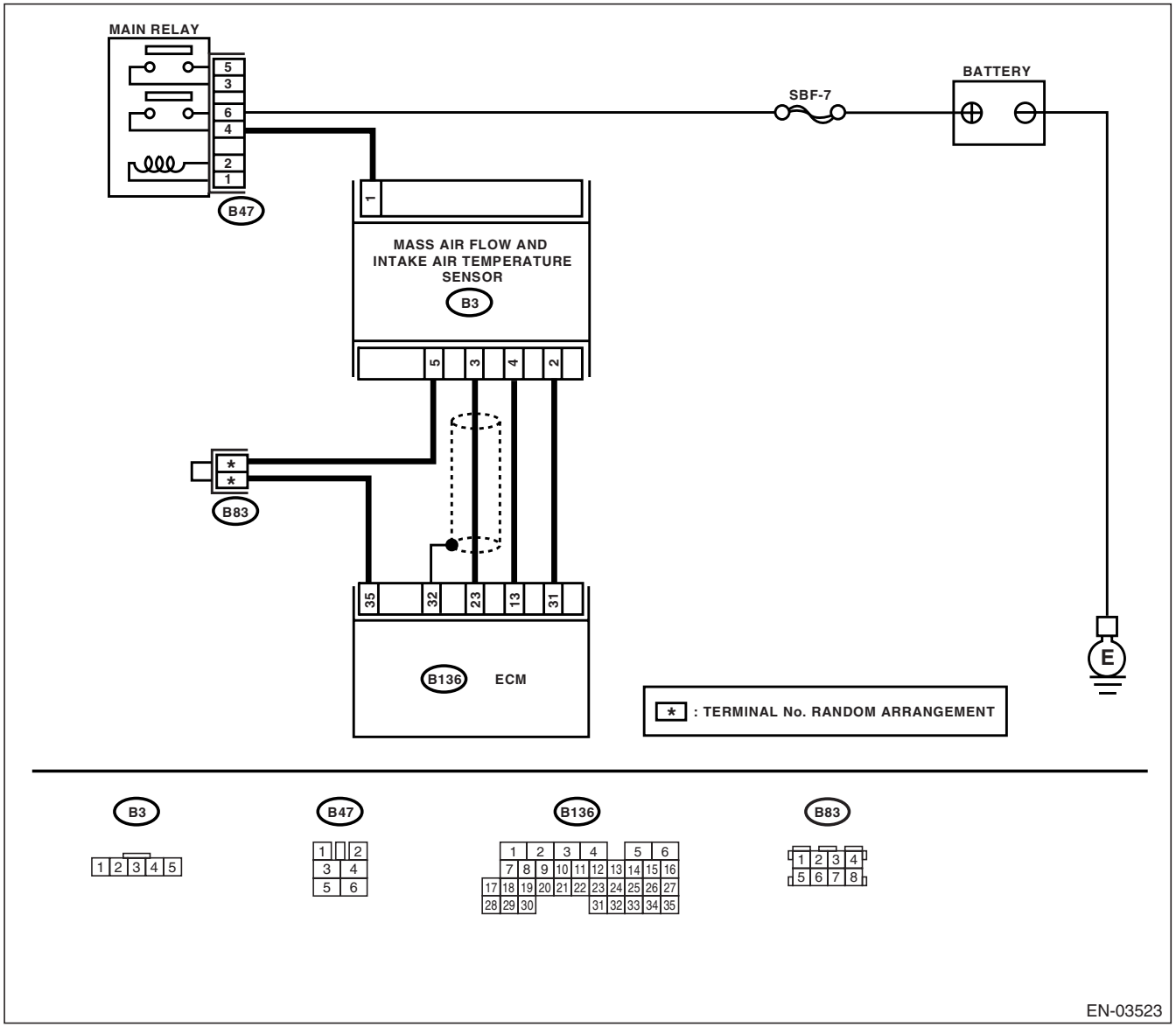
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –36°C (–33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

K: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

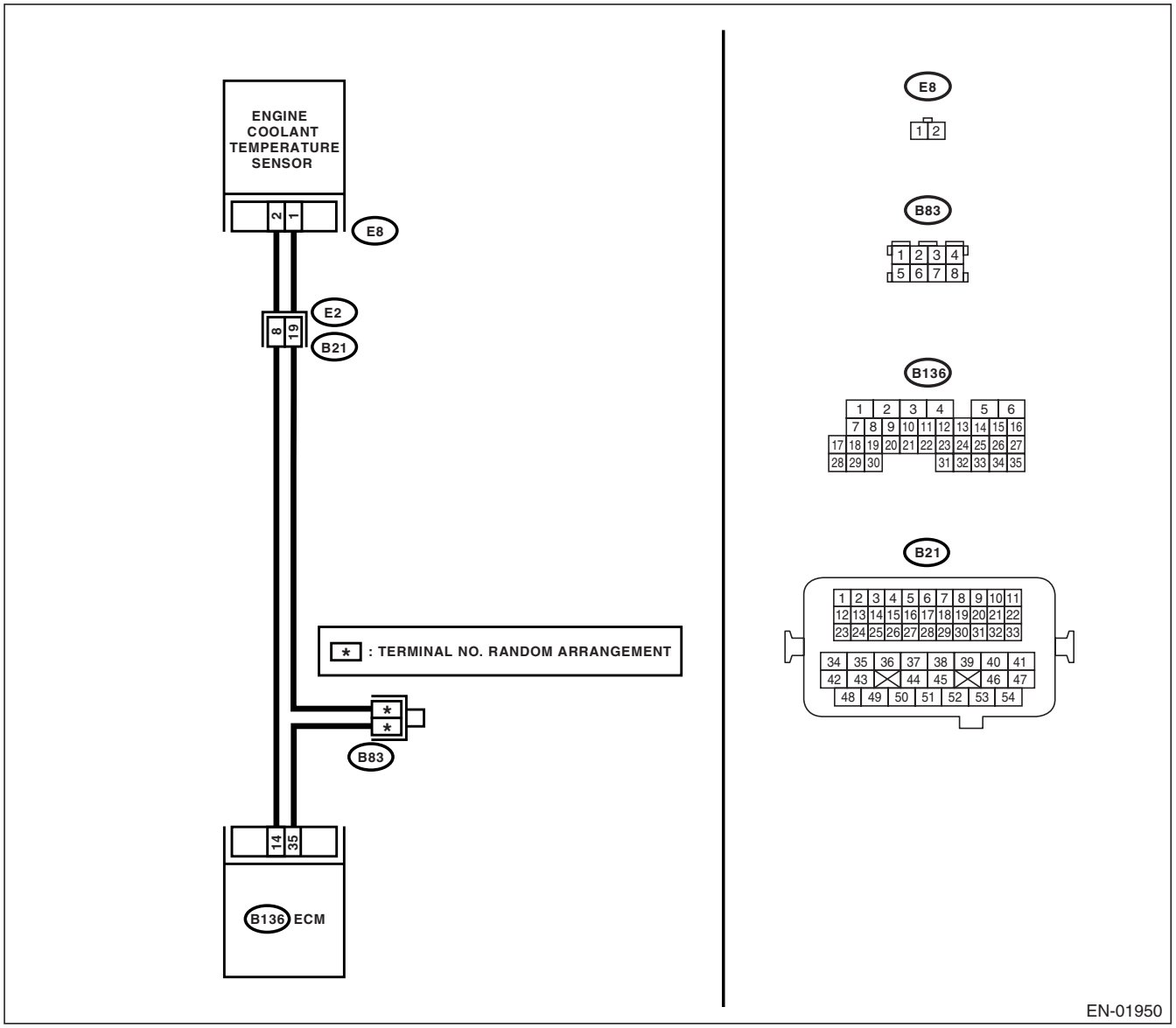
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature more than 120°C (248°F)?	Go to step **2.**	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-22, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.

L: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

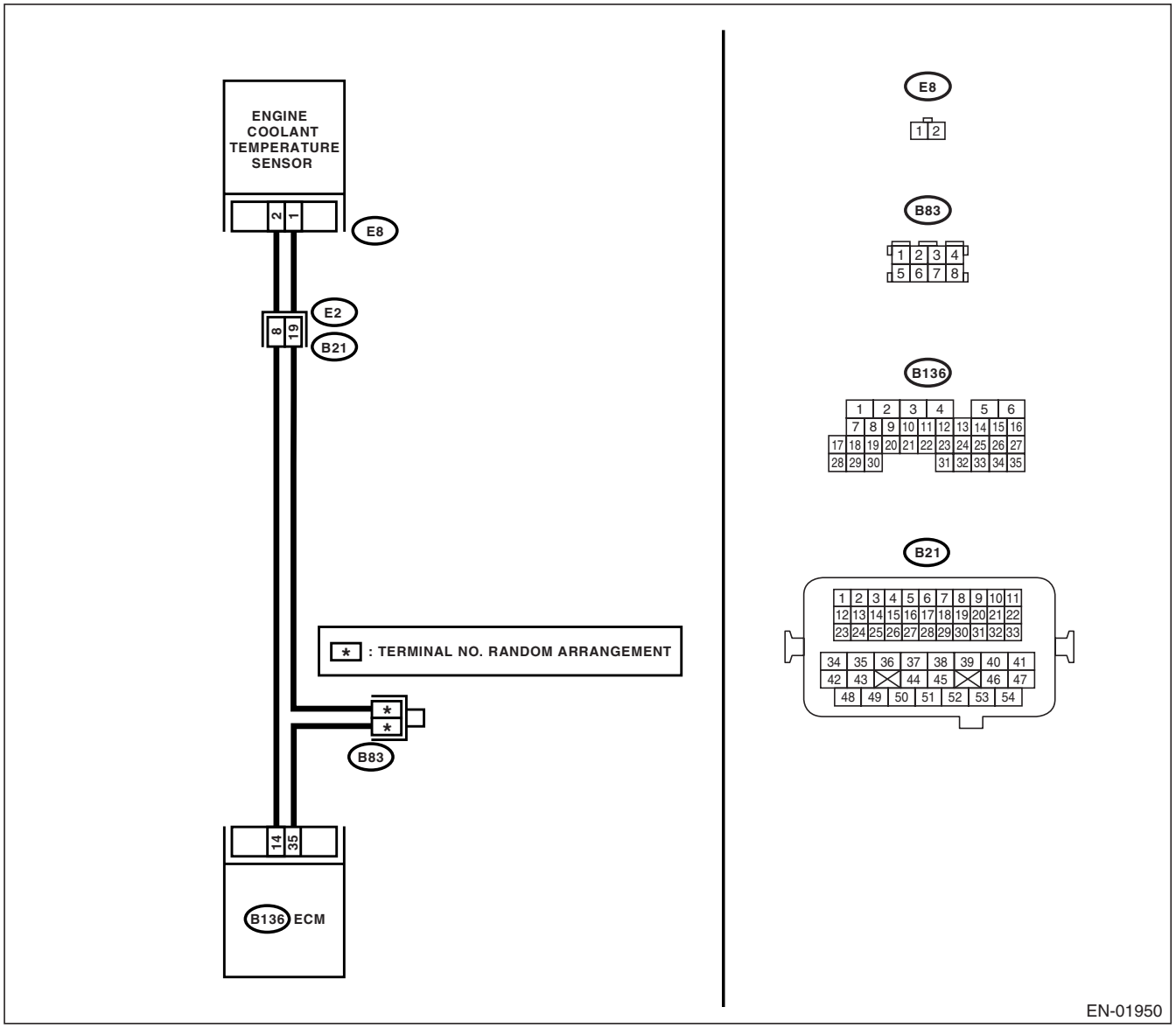
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



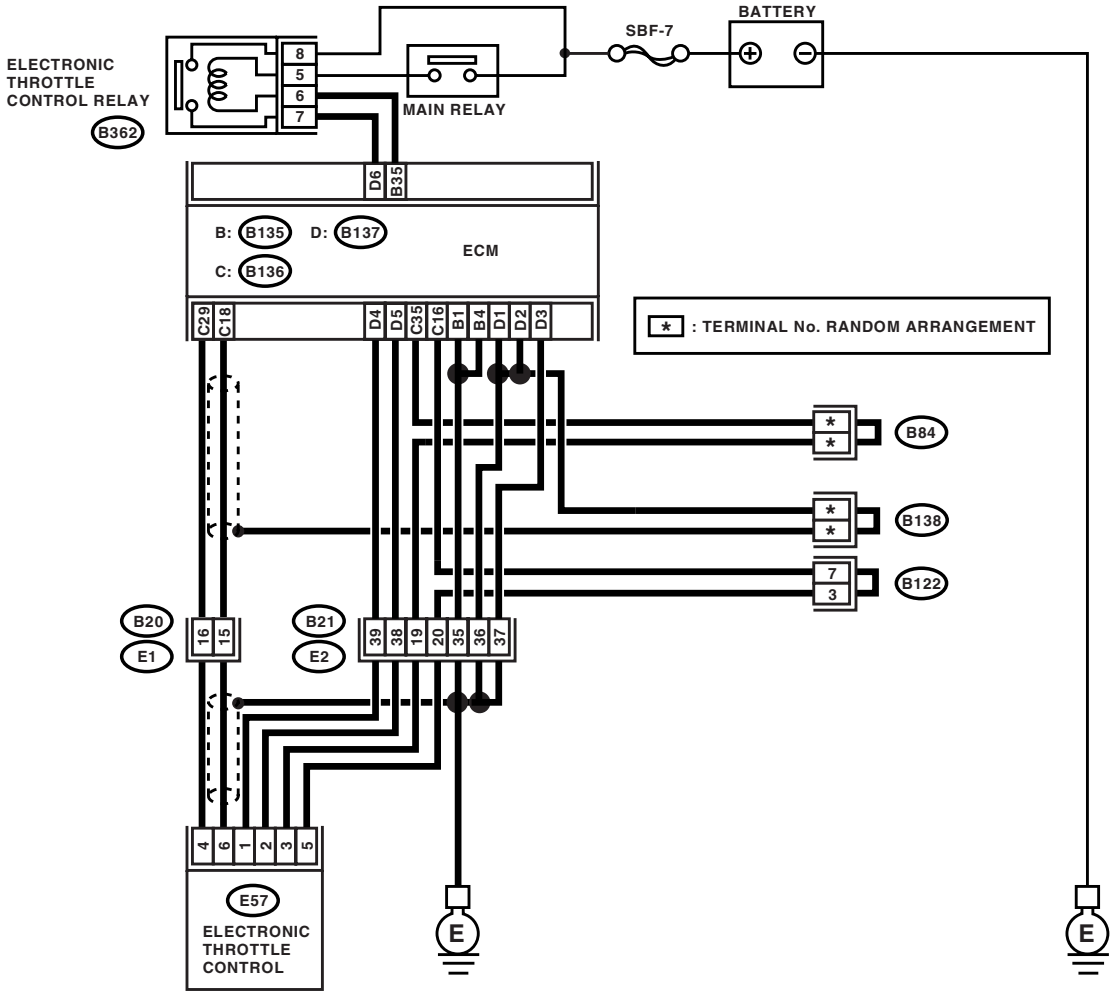
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than −40°C (−40°F)?	Go to step **2.**	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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

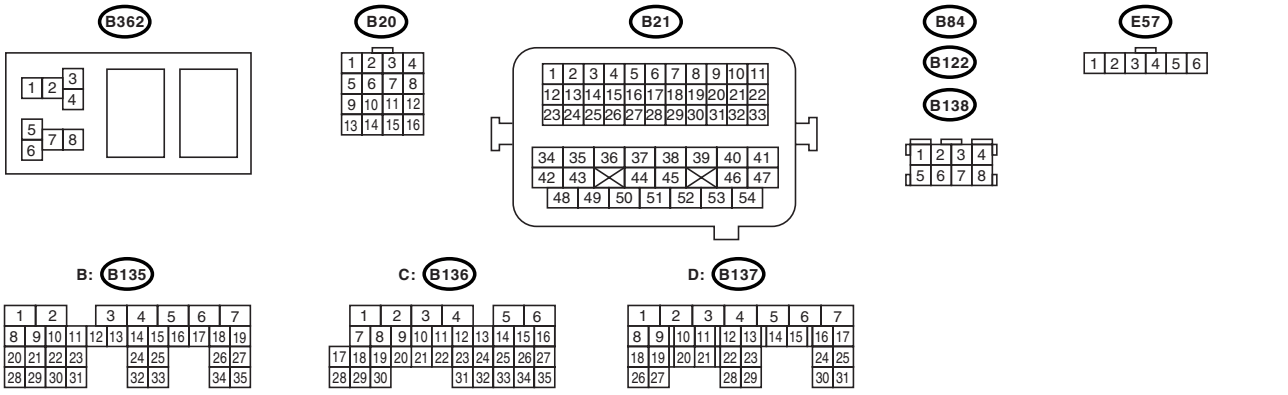
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-22, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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

M: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





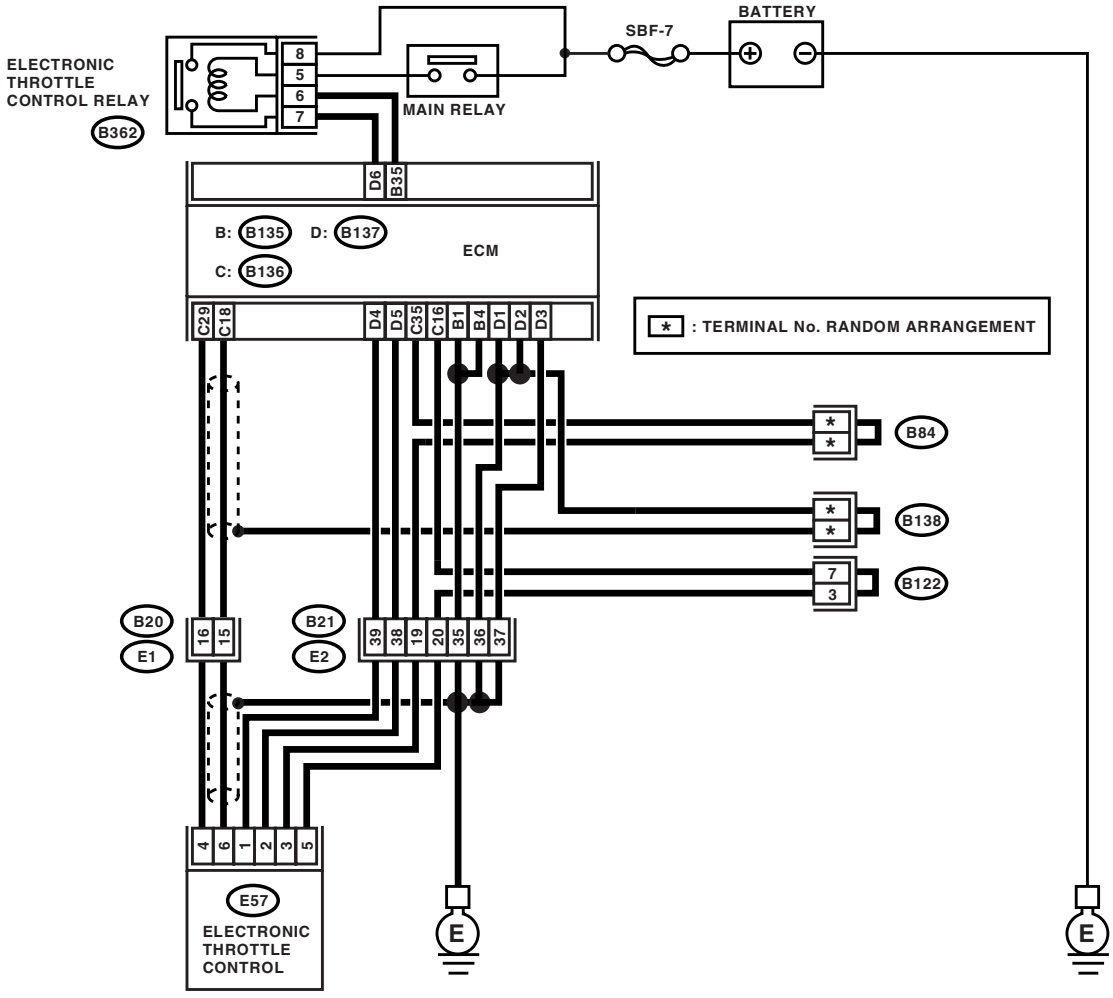
EN-03524

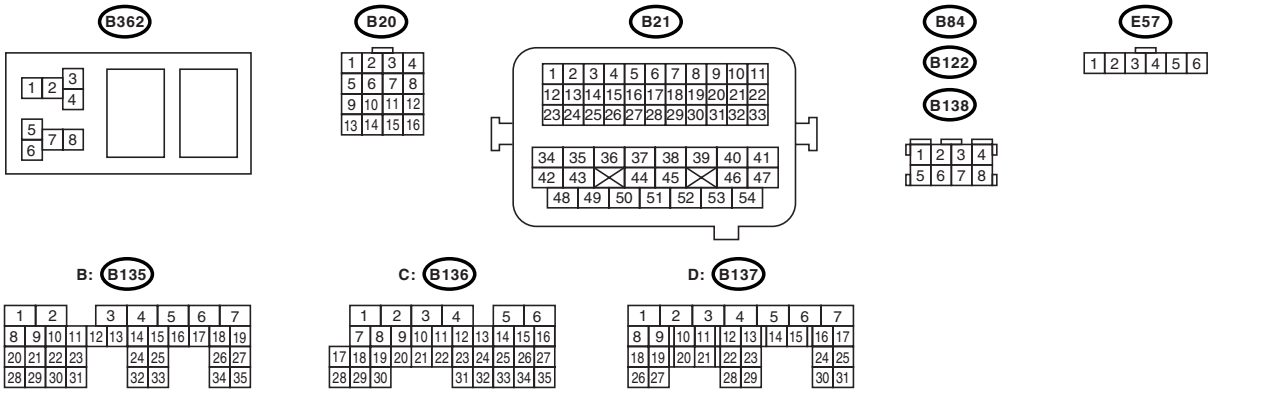
	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:*** ***(B136) No. 18 — (E57) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

N: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





EN-03524

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** 3) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **5.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in harness. Replace the electronic throttle control.	Repair the short circuit to sensor power supply.

O: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

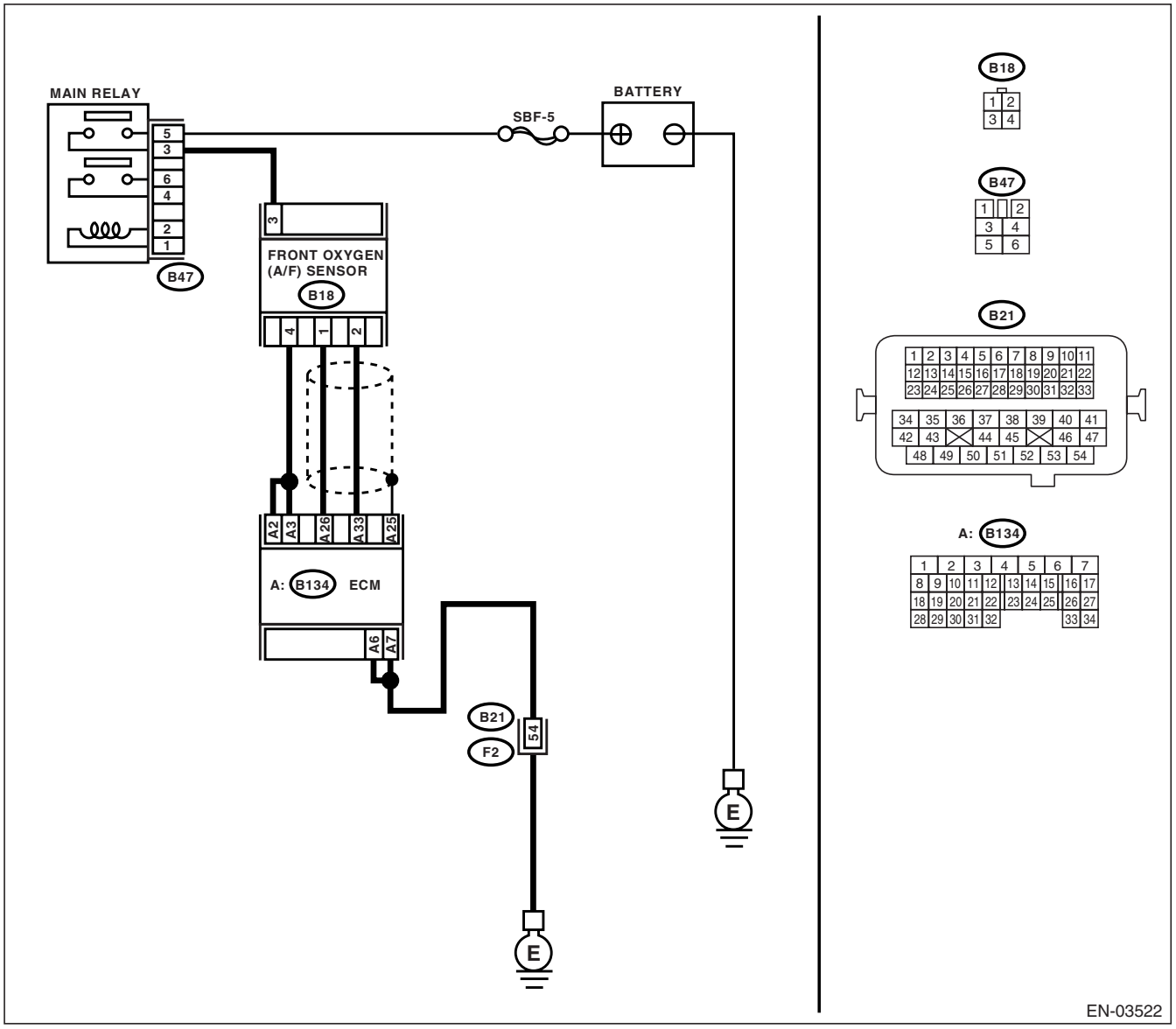
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connectors. ***Connector & terminal*** ***(B134) No. 26 — (B134) No. 33:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-32, Front Oxygen (A/F) Sensor.>	Repair the harness short of harness between ECM and front oxygen (A/F) sensor connector.

P: DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

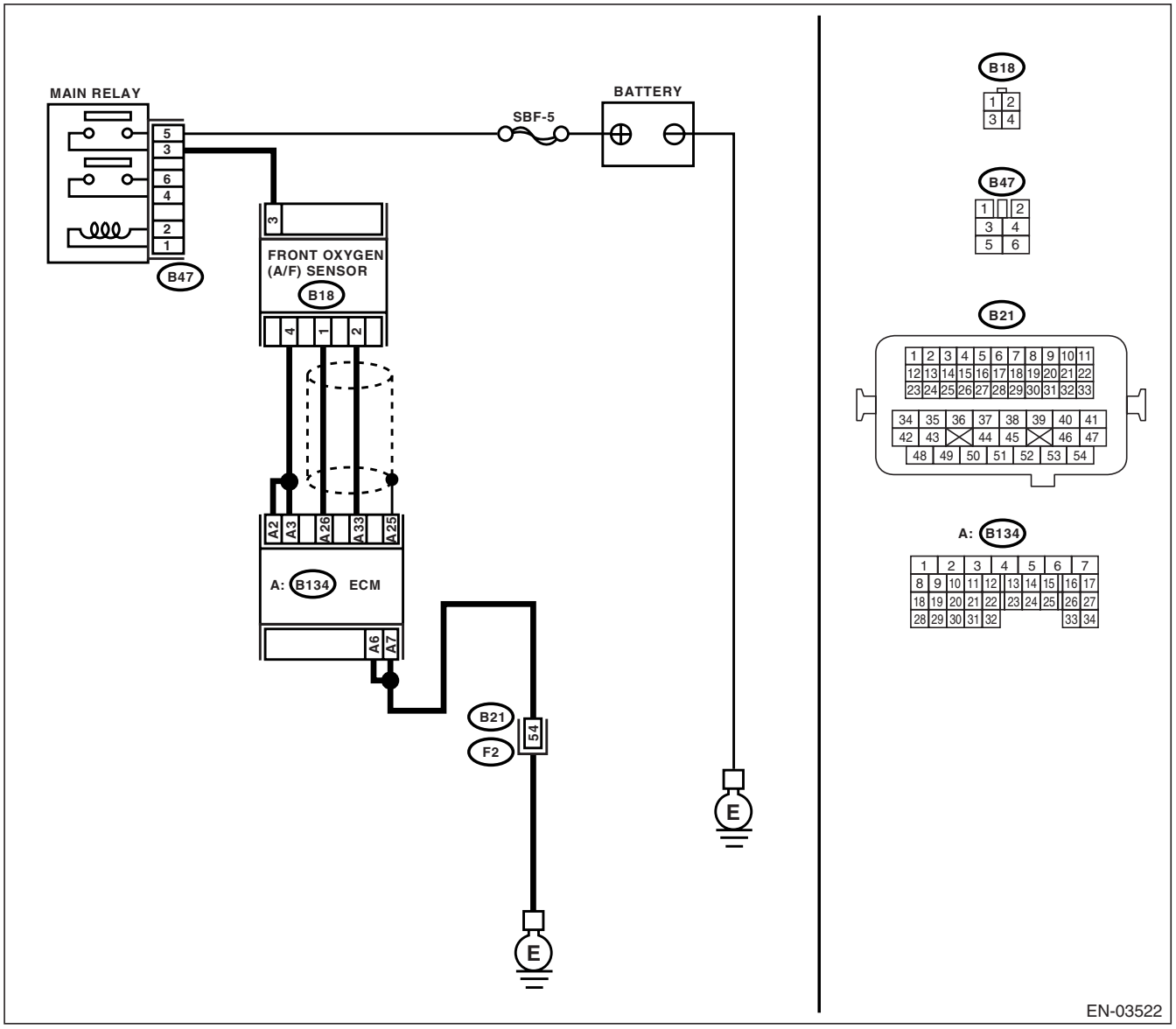
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



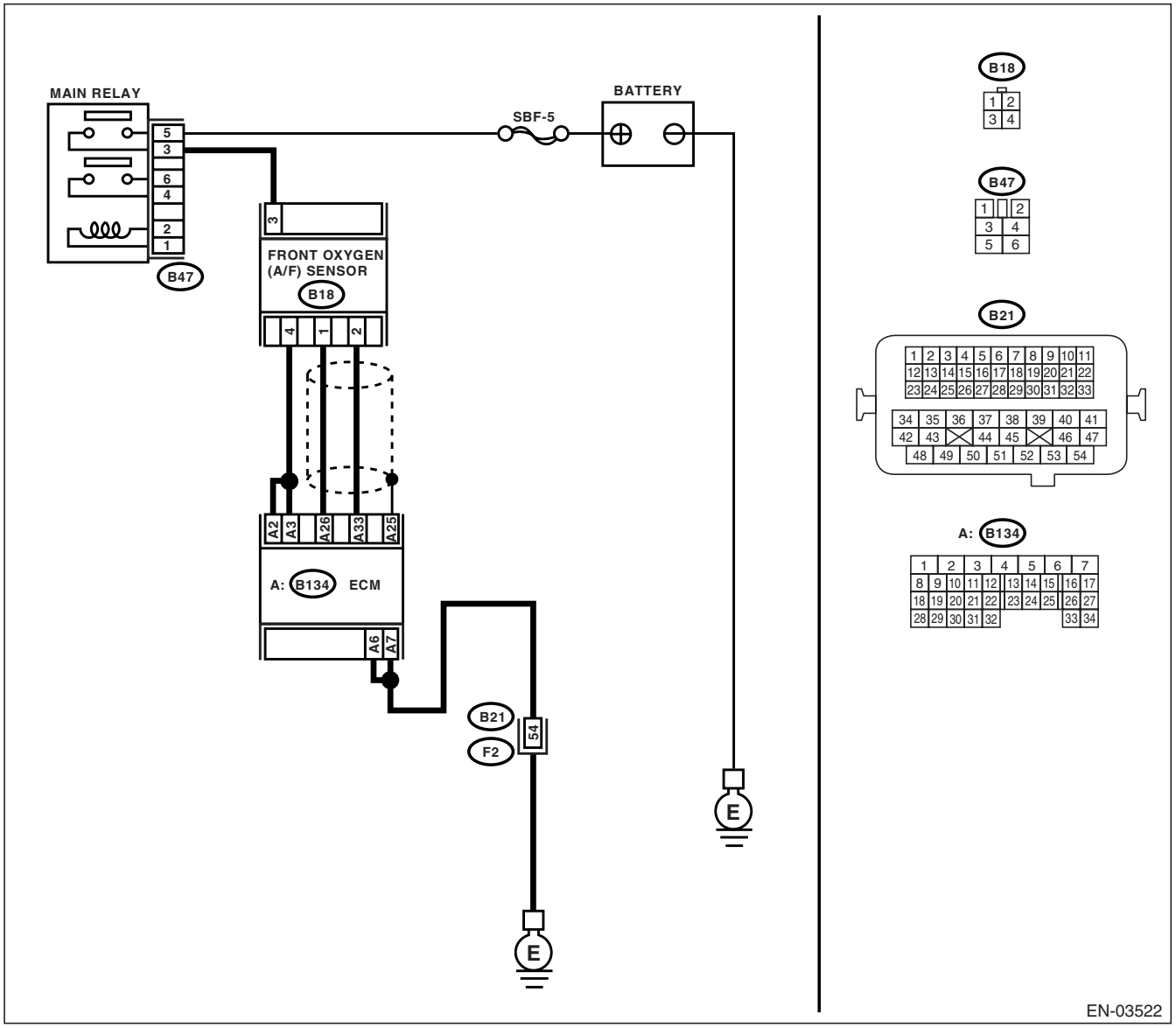
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-32, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

Q: 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, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 1:*** ***(B134) No. 33 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-32, Front Oxygen (A/F) Sensor.>	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.

R: DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

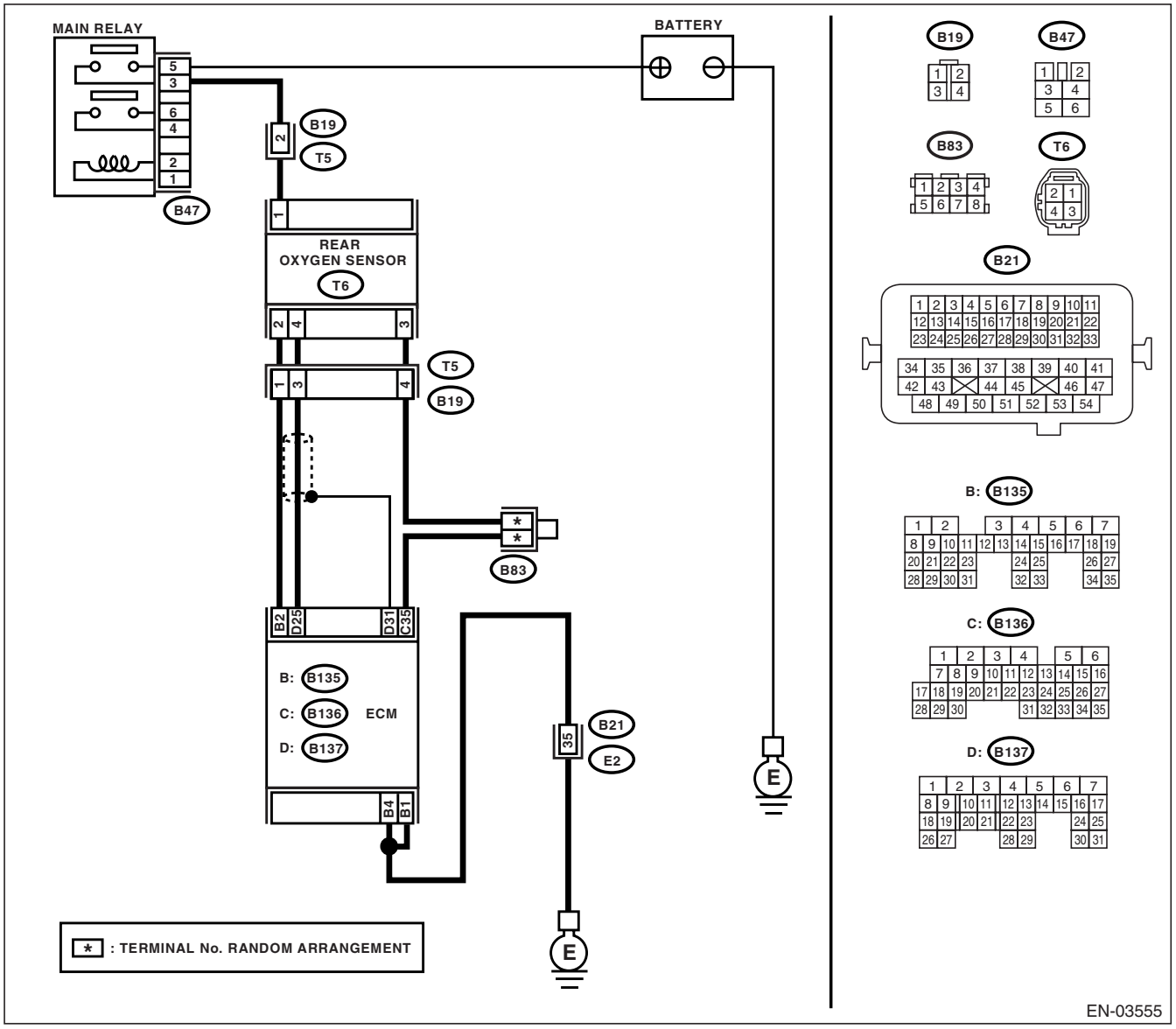
DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, 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 to 3,000 rpm for two minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>

S: DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

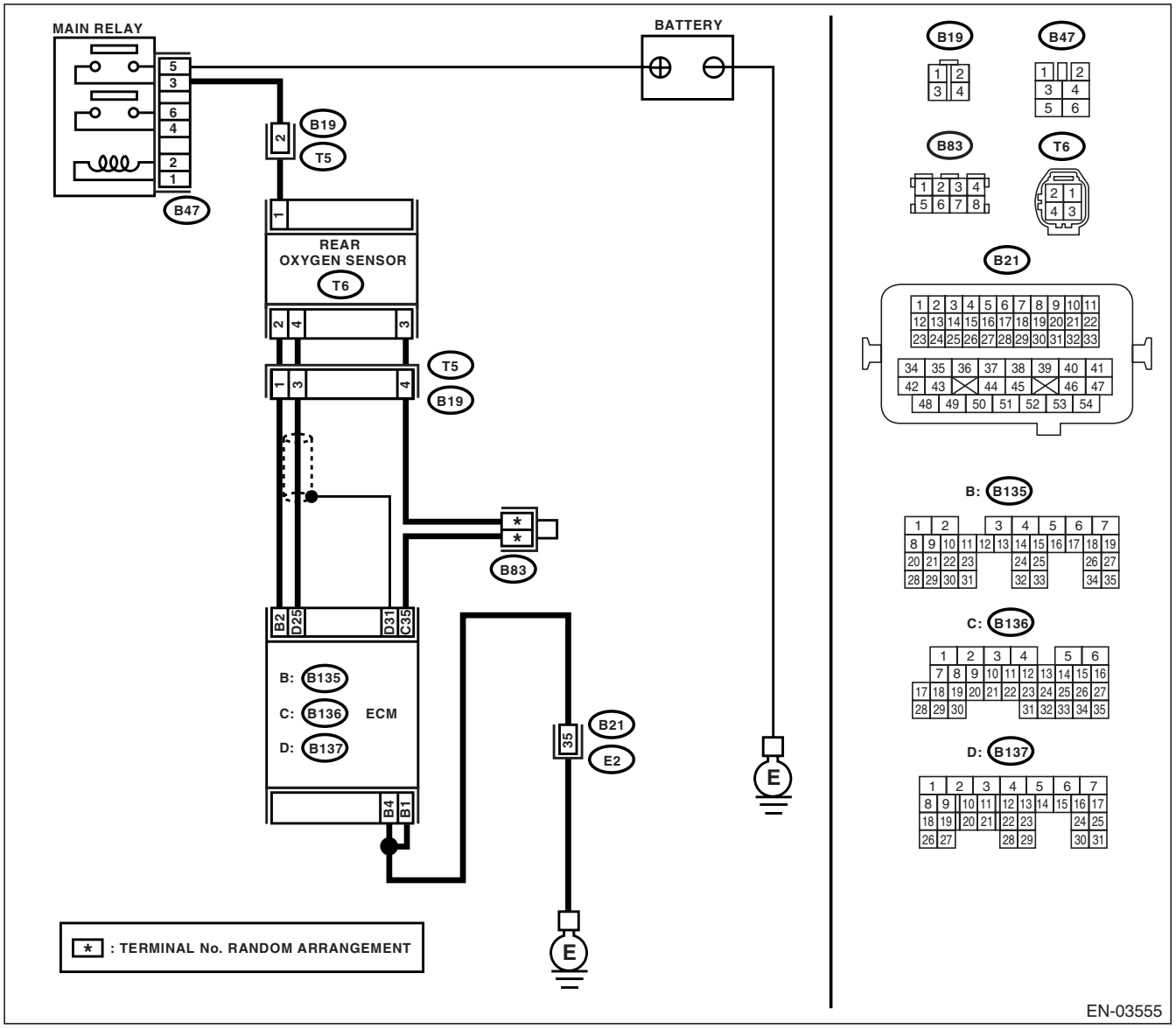
DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, 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 to 3,000 rpm for two minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-33, Rear Oxygen Sensor.>

T: DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-111, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hoses on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect the fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specifications, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kgf/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-22, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start and warm-up the engine until engine coolant temperature is above 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value within the following? 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 **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>

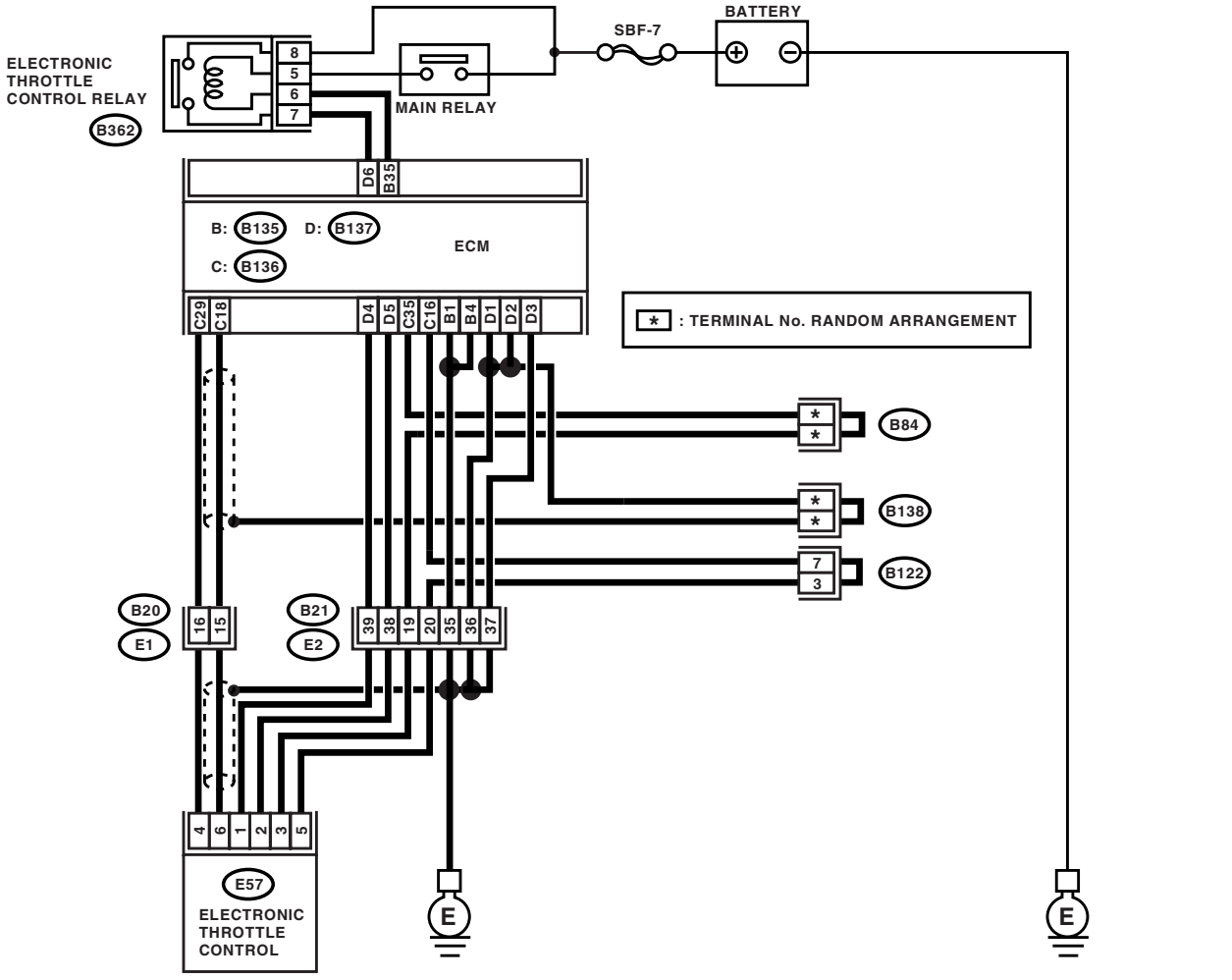
	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start and warm-up the engine until engine coolant temperature is above 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract the ambient temperature from intake air temperature. Is the value from −10°C (14°F) to 50°C (122°F)?	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-27, Mass Air Flow and Intake Air Temperature Sensor.>

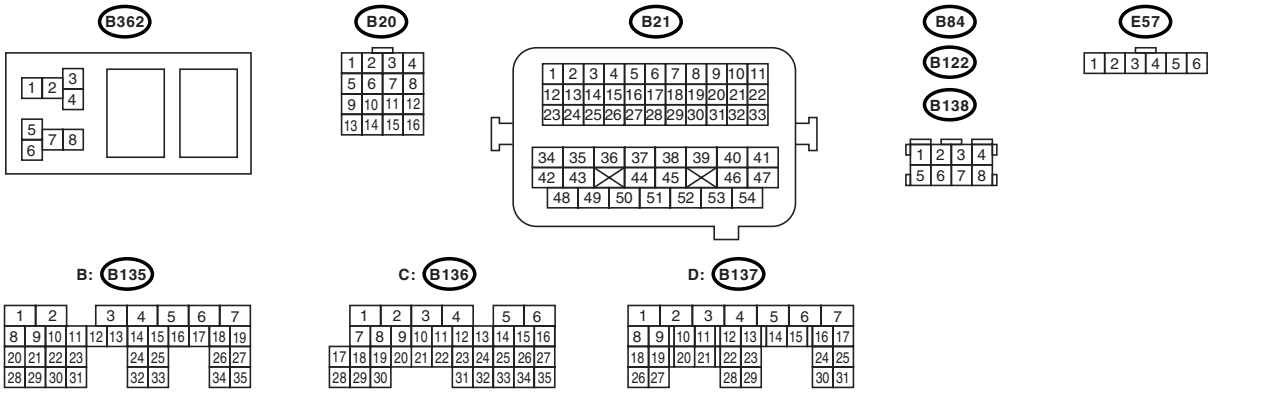
V: DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03524

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

W: DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

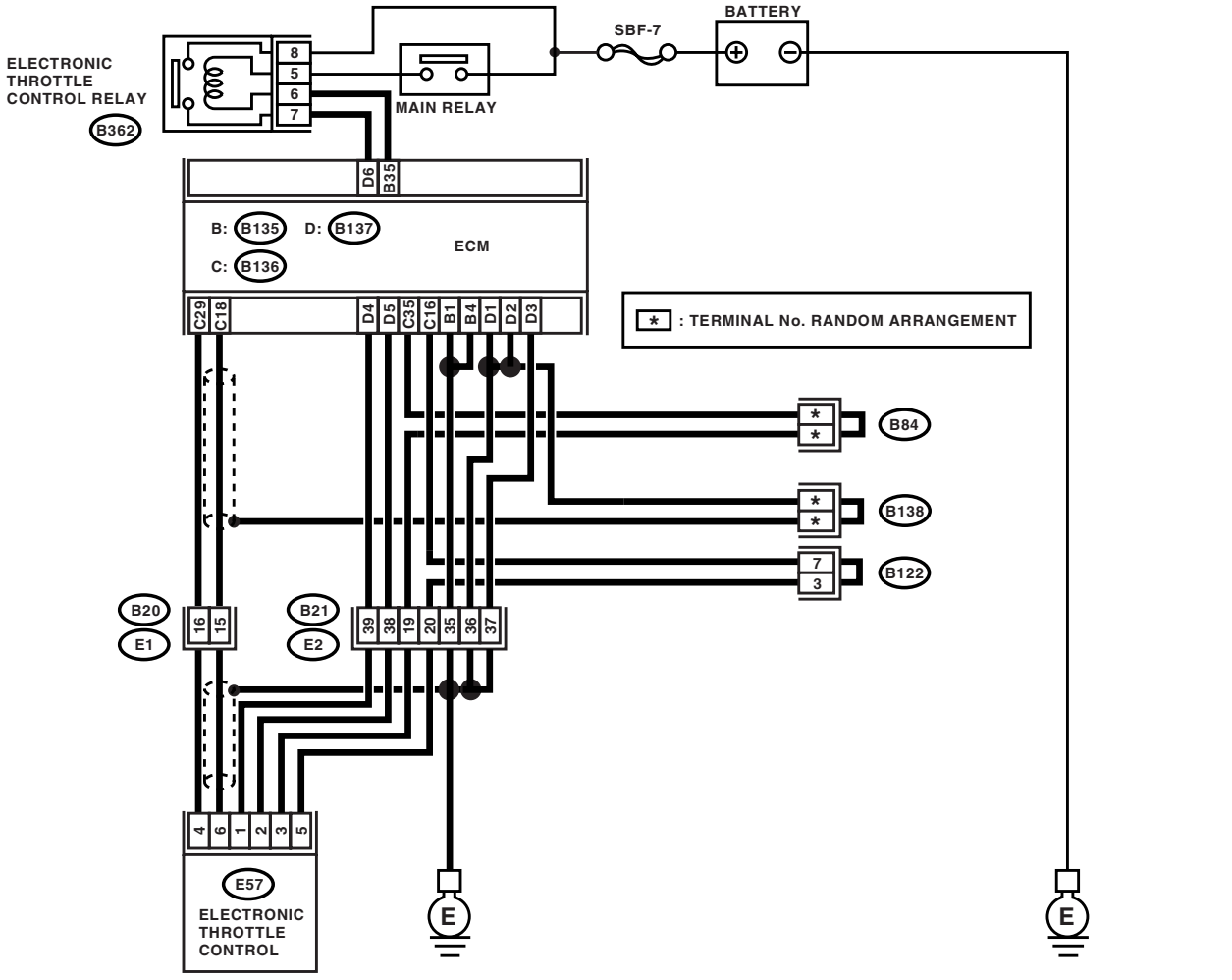
DTC DETECTING CONDITION:

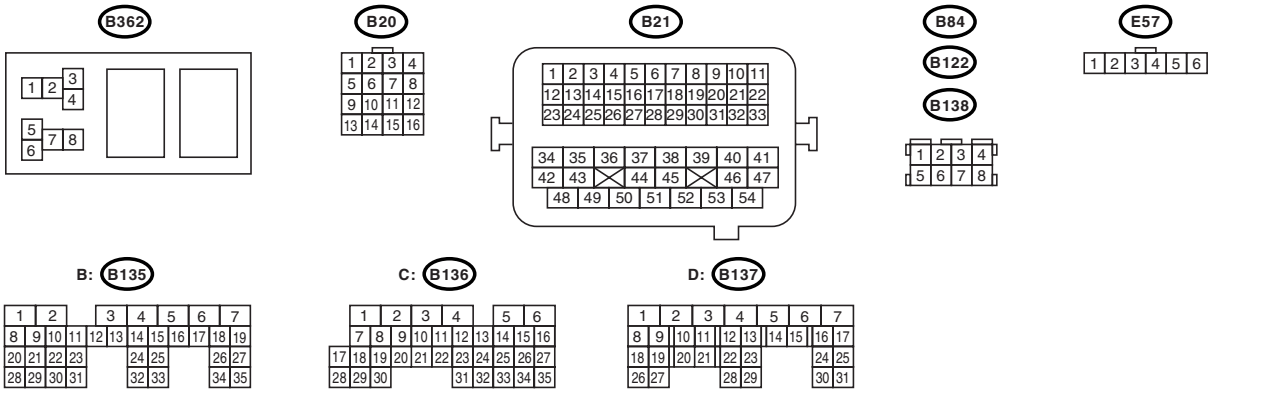
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03524

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **5.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between connector terminals. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact. Replace the electronic throttle control.	Sensor power supply circuit may be shorted.

X: DTC P0230 FUEL PUMP PRIMARY CIRCUIT

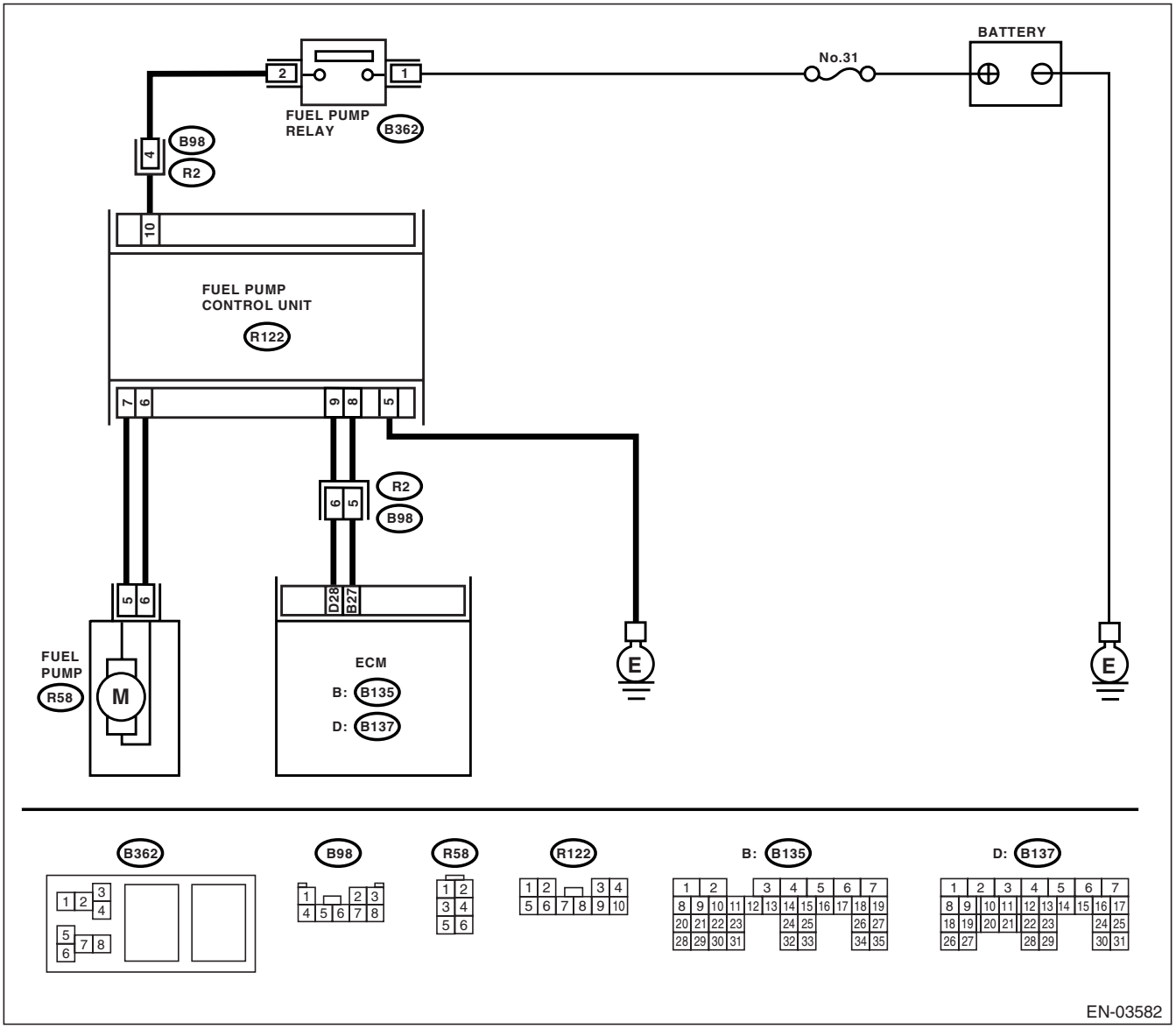
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case, repair the following: • Open or ground short circuit of harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 5:*** ***(R122) No. 6 — (R58) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B137) No. 28:*** ***(R122) No. 8 — (B135) No. 27:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step **8.**
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-38, Fuel Pump Control Unit.>

Y: DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

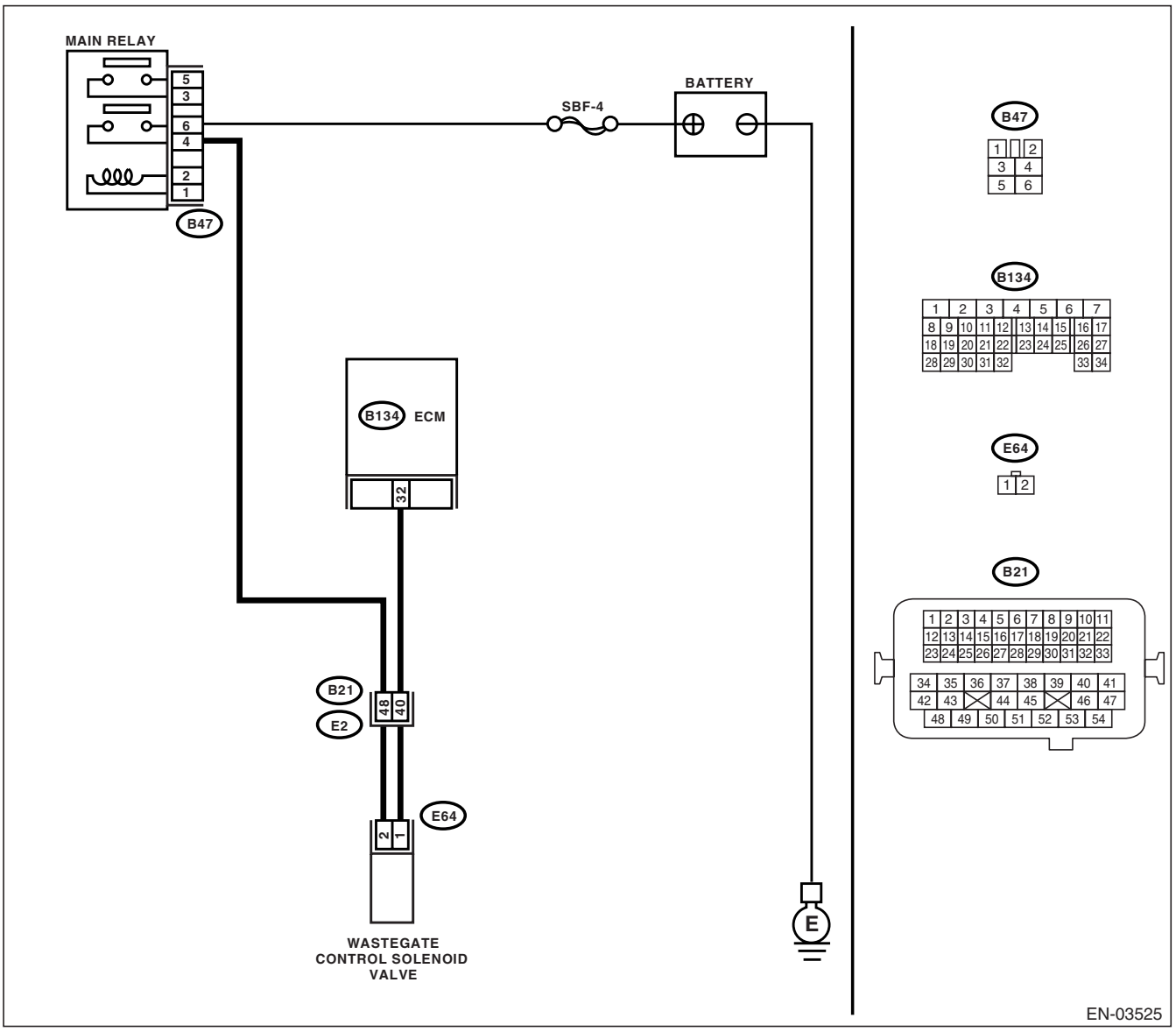
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E64) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between ECM and wastegate control solenoid valve connector.
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between wastegate control solenoid valve of harness connector and ECM. ***Connector & terminal*** ***(B134) No. 32 — (E64) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 30 — 34 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-31, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(E64) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit of harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair the poor contact in wastegate control solenoid valve connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

Z: DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

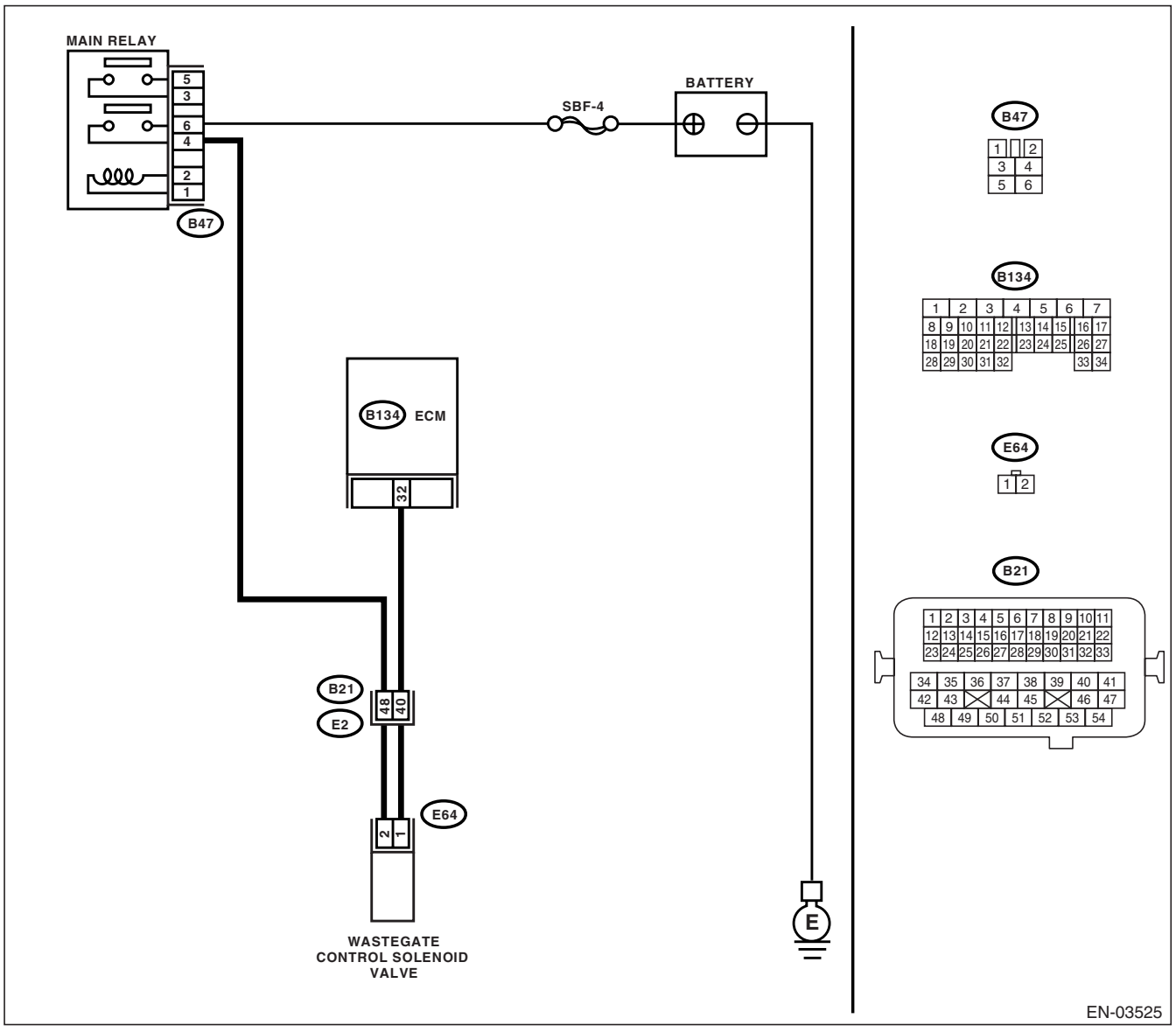
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 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?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC)-31, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

AA:DTC P0261 CYLINDER 1 INJECTOR CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOTC)(diag)-125, DTC P0270 CYLINDER 4 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AB:DTC P0264 CYLINDER 2 INJECTOR CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOTC)(diag)-125, DTC P0270 CYLINDER 4 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AC:DTC P0267 CYLINDER 3 INJECTOR CIRCUIT LOW

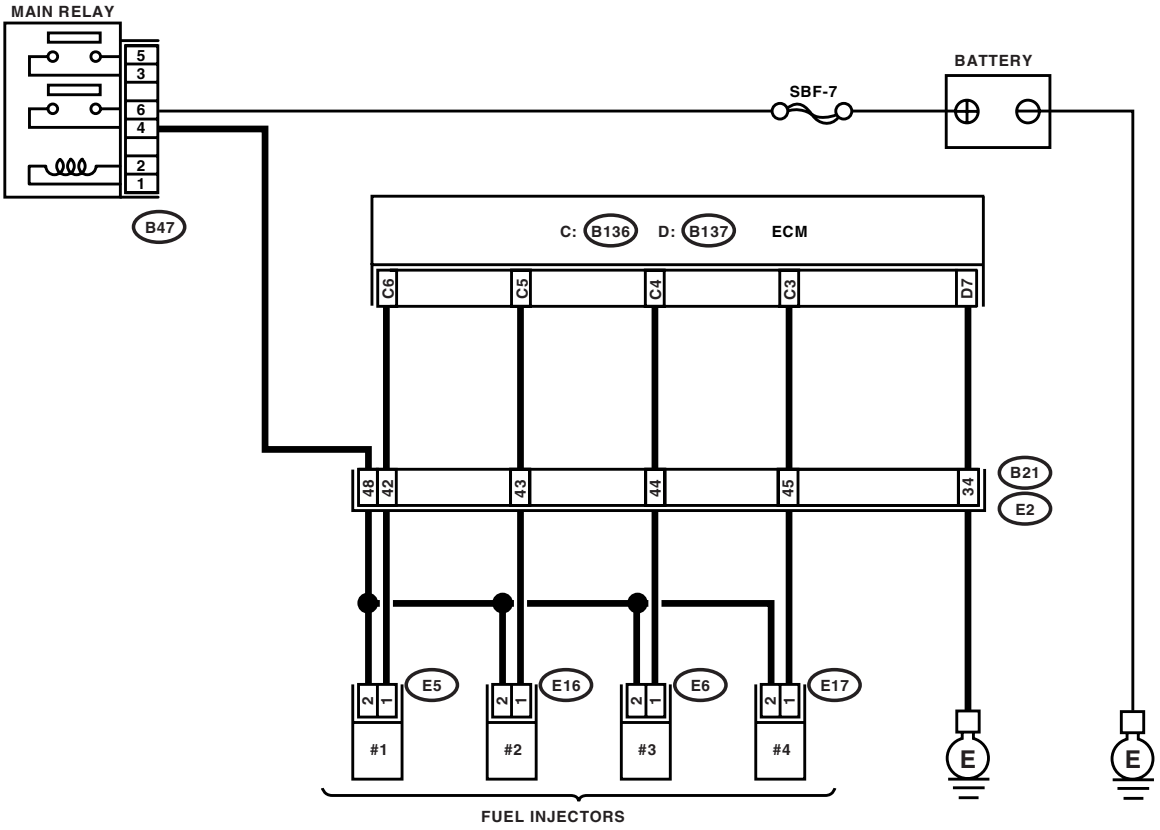
NOTE:
For the diagnostic procedure, refer to DTC P0270. <Ref. to EN(H4DOTC)(diag)-125, DTC P0270 CYLINDER 4 INJECTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

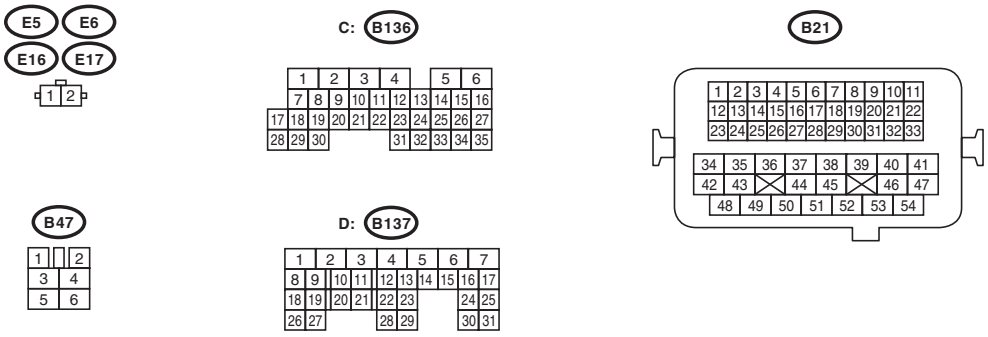
AD:DTC P0270 CYLINDER 4 INJECTOR CIRCUIT LOW

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03521

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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
2	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 11 — 12Ω?	Go to step **3.**	Replace the faulty fuel injector and ECM. <Ref. to FU(H4DOTC)-29, Fuel Injector.>
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Connect the connector to fuel injector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136) No. 5 (+) — Chassis ground (−):*** ***#3 (B136) No. 4 (+) — Chassis ground (−):*** ***#4 (B136) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact in fuel injector and ECM connector.	Repair the ground open circuit in ECM.

AE:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

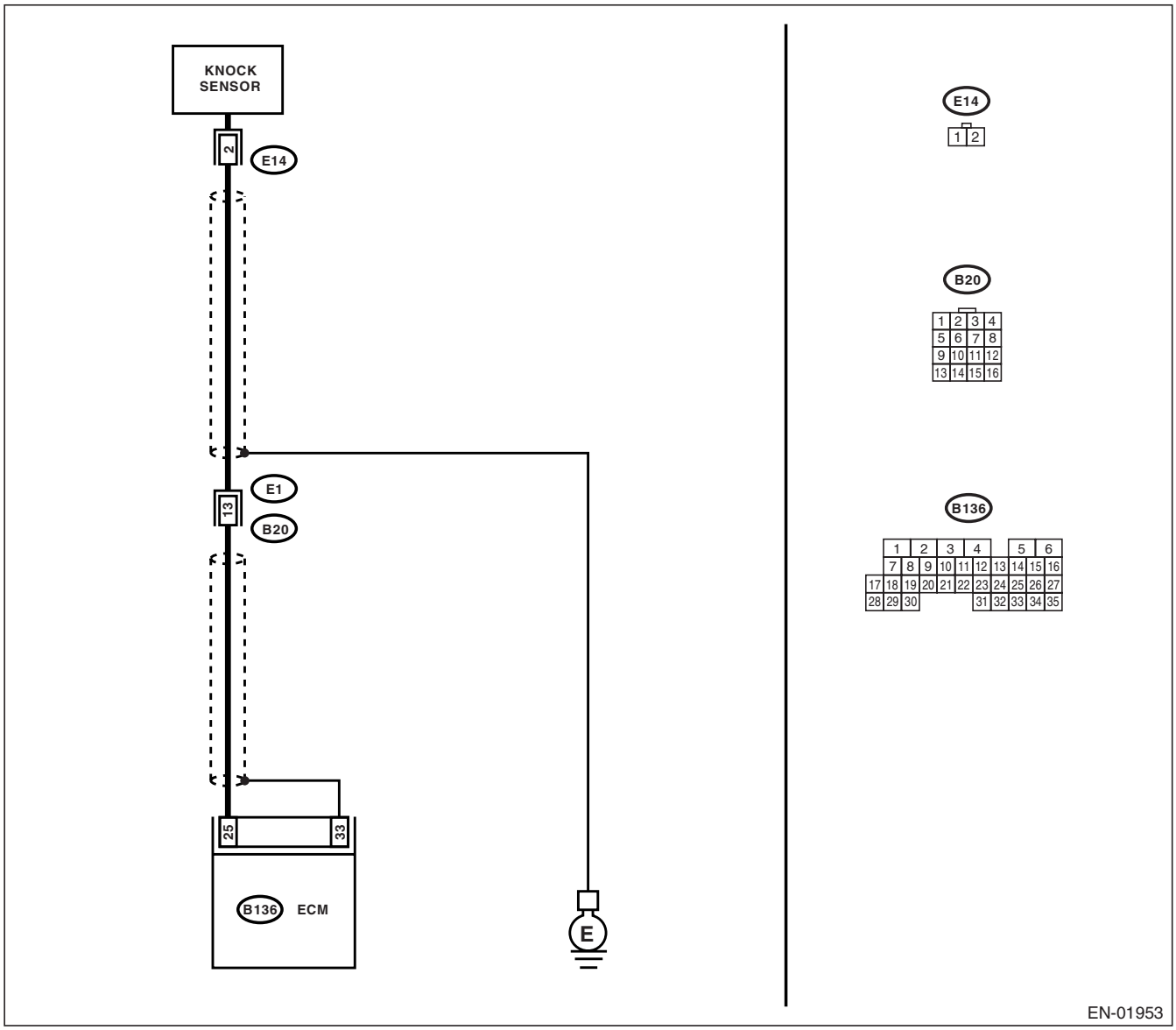
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK INSTALLATION CONDITION OF KNOCK SENSOR.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-25, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AF:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

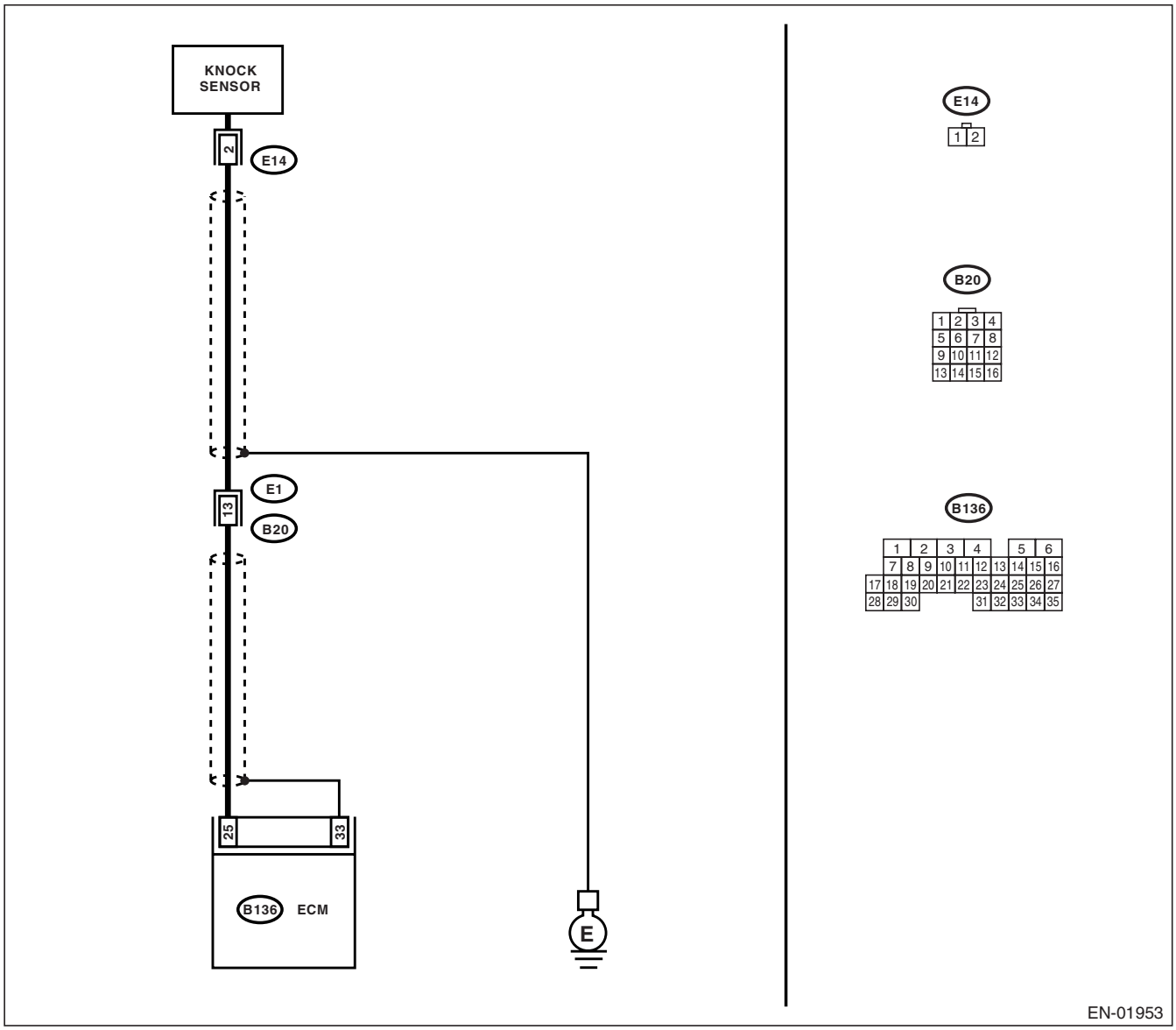
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-25, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair the short circuit of harness covered with shield.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AG:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

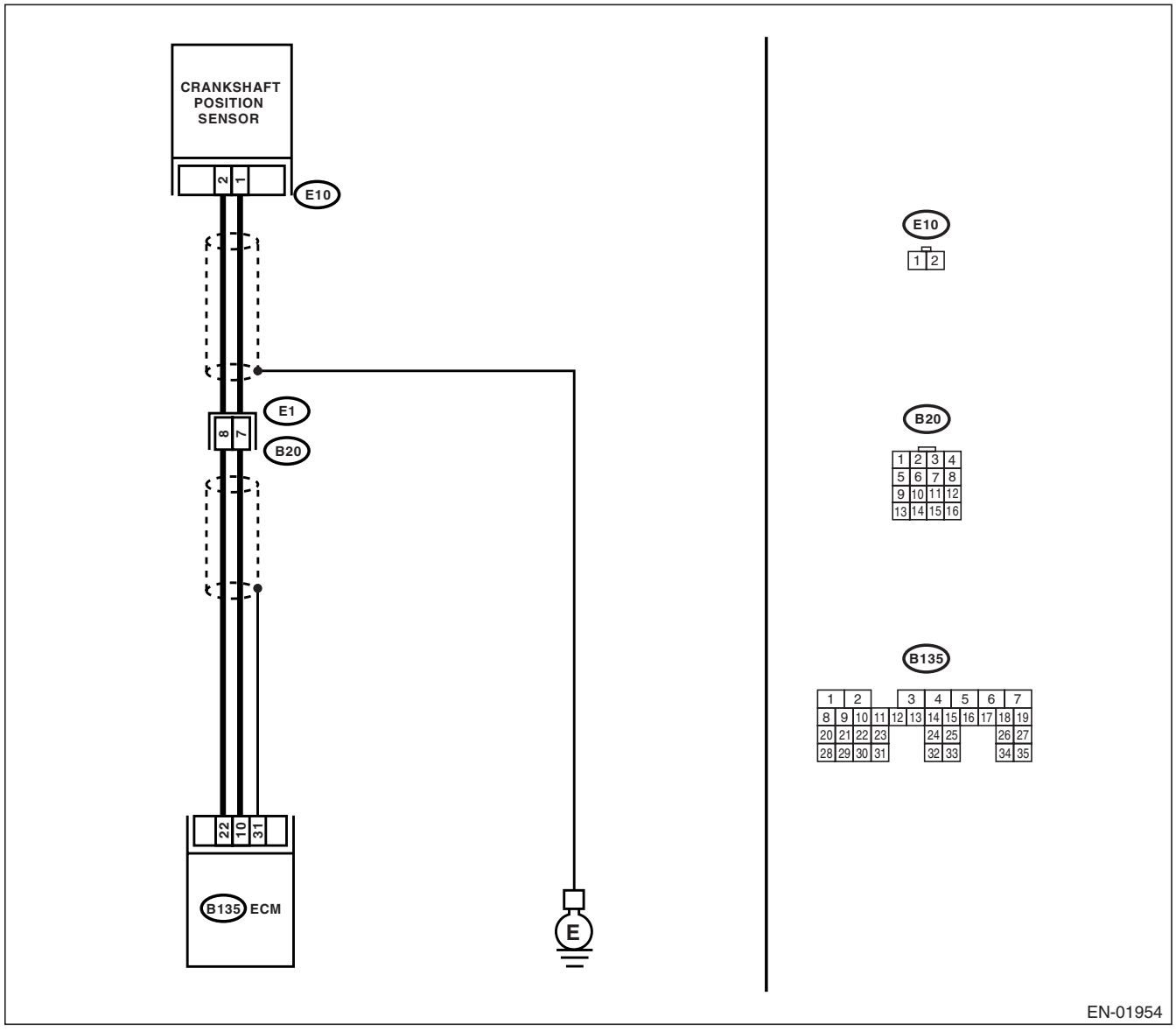
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — (B135) No. 10:*** ***(E10) No. 2 — (B135) No. 22:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** ***(E10) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit of harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-23, Crankshaft Position Sensor.>

AH:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

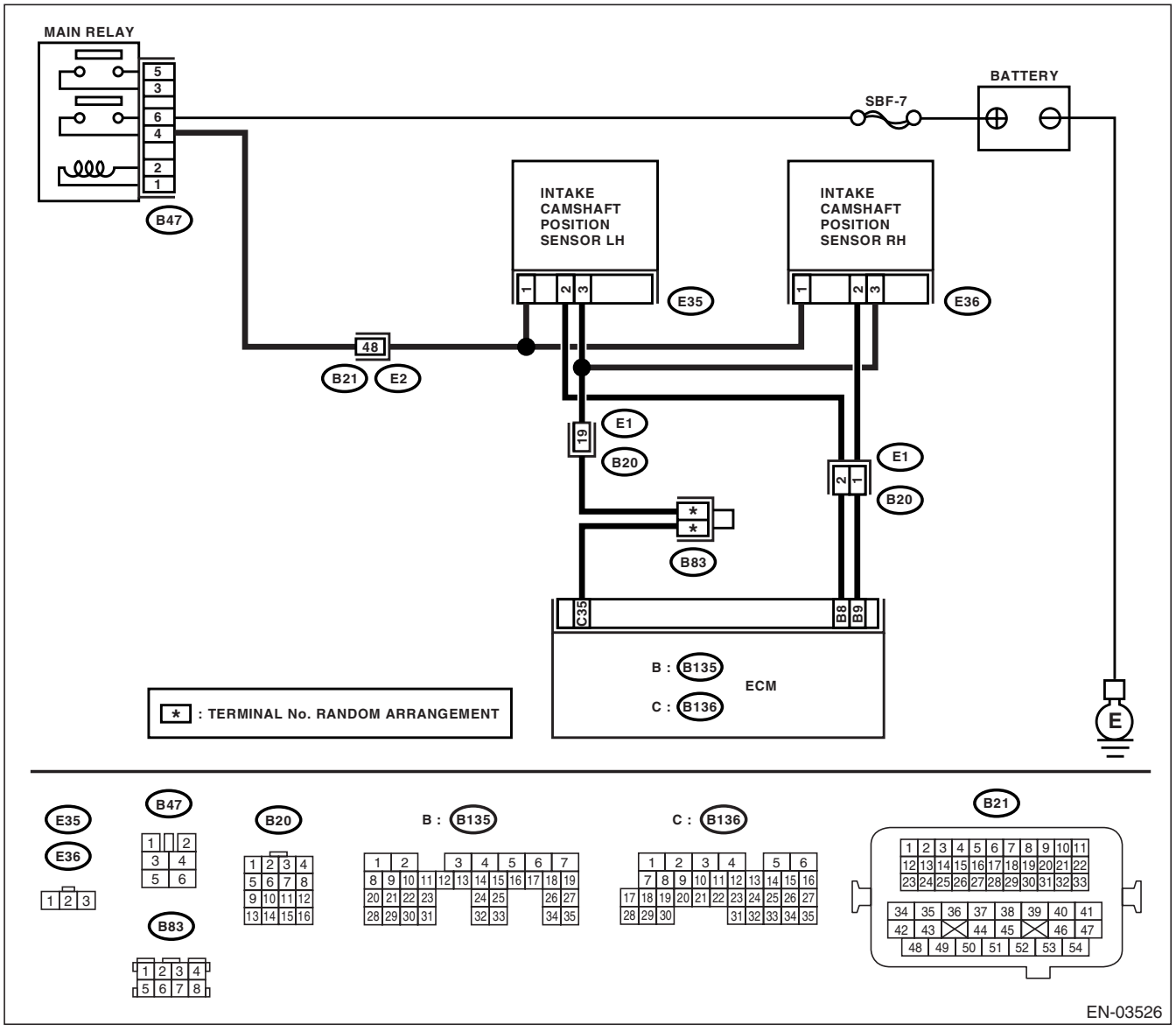
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3.**
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E36) No. 2 — (B135) No. 9:*** ***(E36) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7.**	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-15, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-23, Crankshaft Position Sensor.>	Go to step **8.**
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

AI: DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

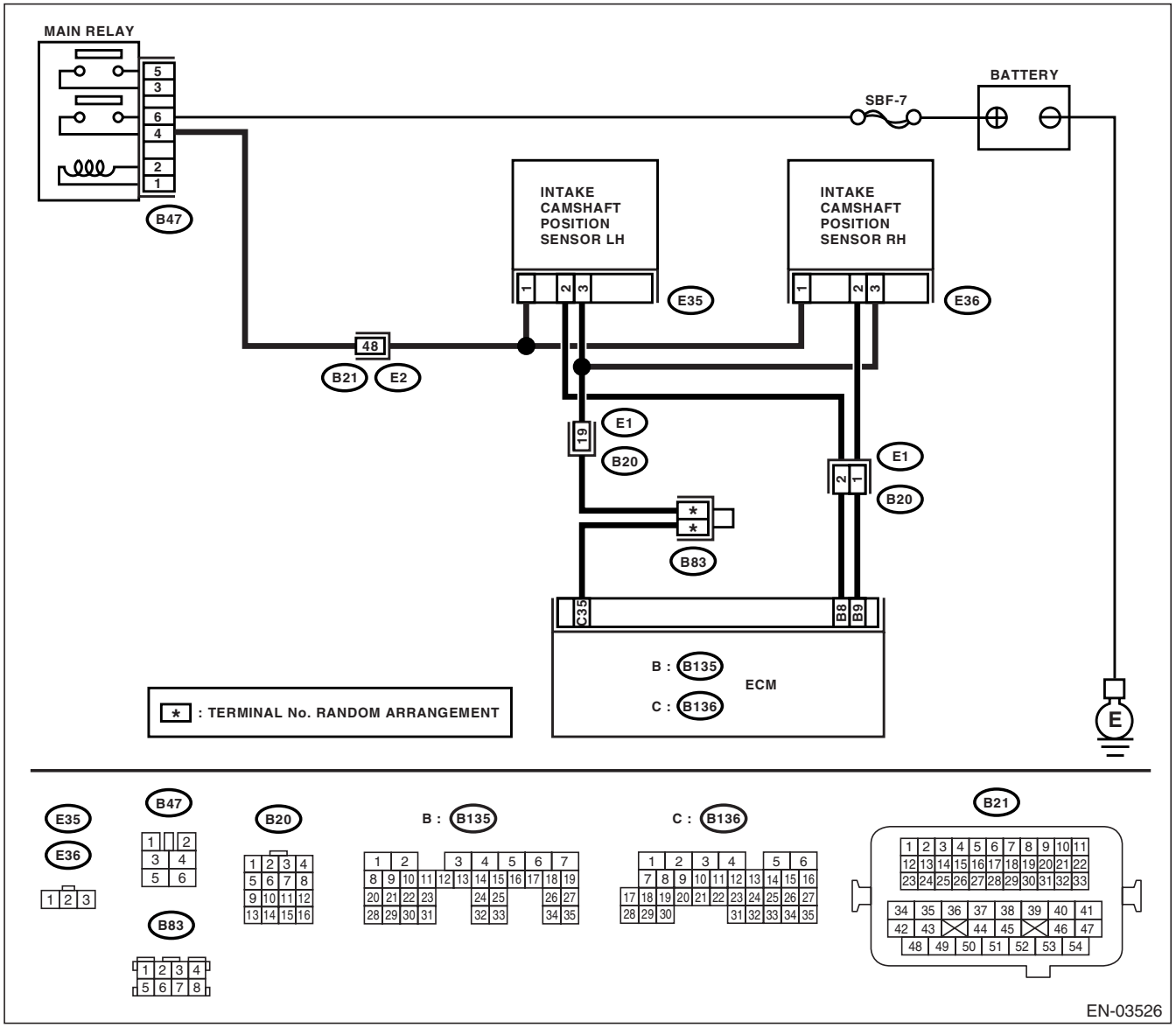
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3.**
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B135) No. 8:*** ***(E35) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7.**	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-15, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-24, Camshaft Position Sensor.>	Go to step **8.**
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

AJ:DTC P0350 IGNITION COIL PRIMARY/SECONDARY CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

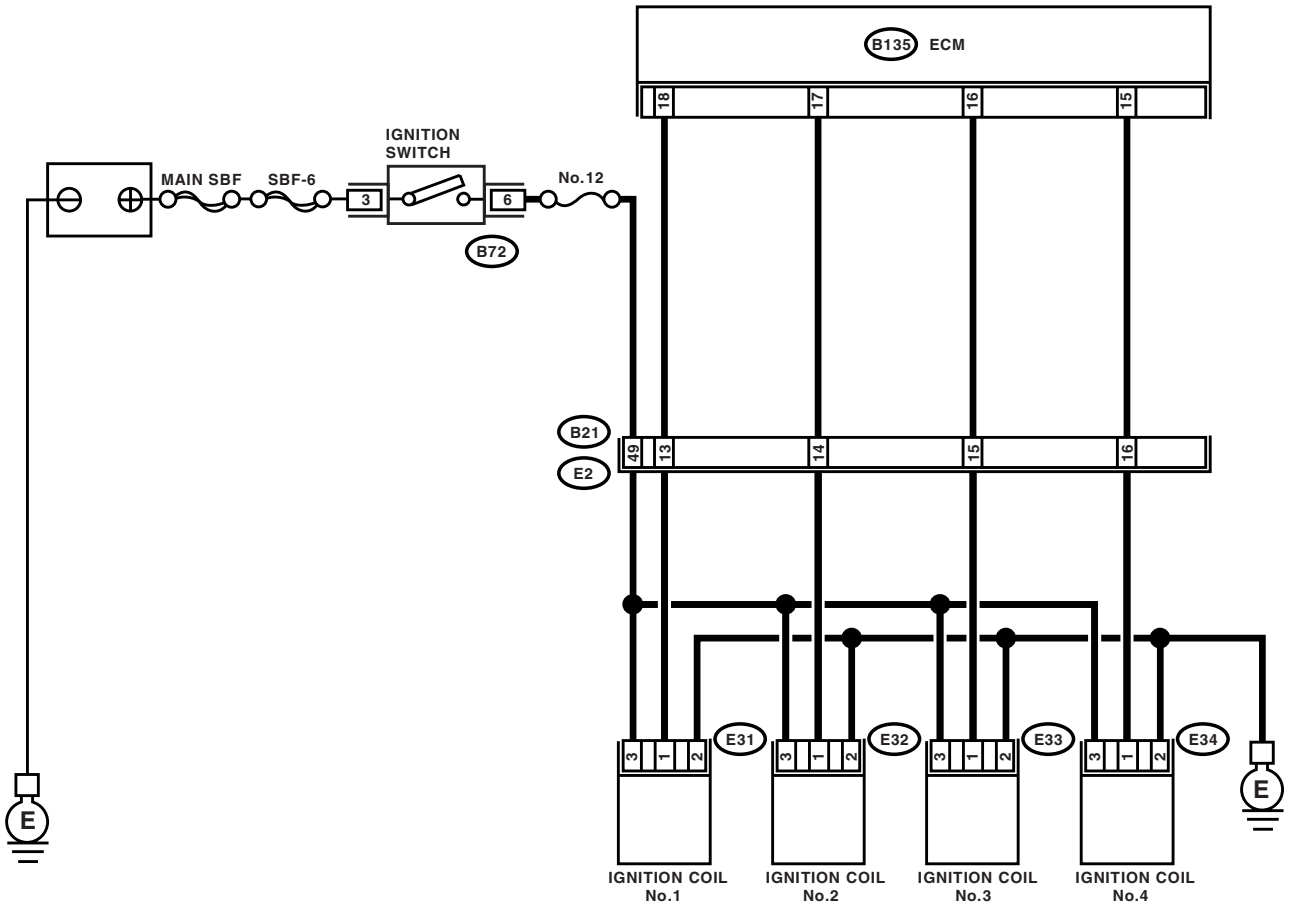
TROUBLE SYMPTOM:

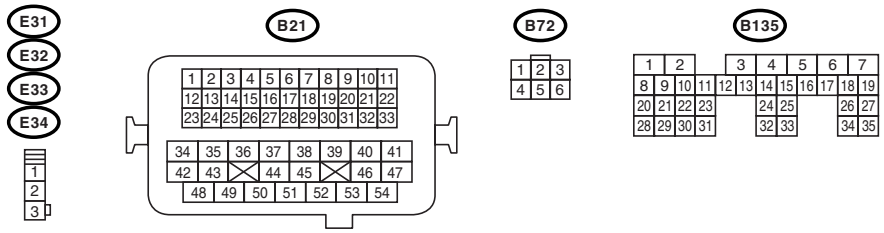
- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT OF IGNITION COIL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil 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 (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ignition coil and ignition switch connector • Poor contact in coupling connector
2	**CHECK HARNESS OF ECM AND IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ignition coil 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:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ignition coil connector and engine ground terminal • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Disconnect the connector from ignition coil. 2) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B135) No. 18 — (E31) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 15 — (E34) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and ignition coil connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ignition coil connector and engine ground. ***Connector & terminal:*** ***(E31) No. 1 — Engine ground:*** ***(E32) No. 1 — Engine ground:*** ***(E32) No. 1 — Engine ground:*** ***(E34) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in terminal.	Repair the harness and connector.

AK:DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1)

DTC DETECTING CONDITION:

Immediately at fault recognition

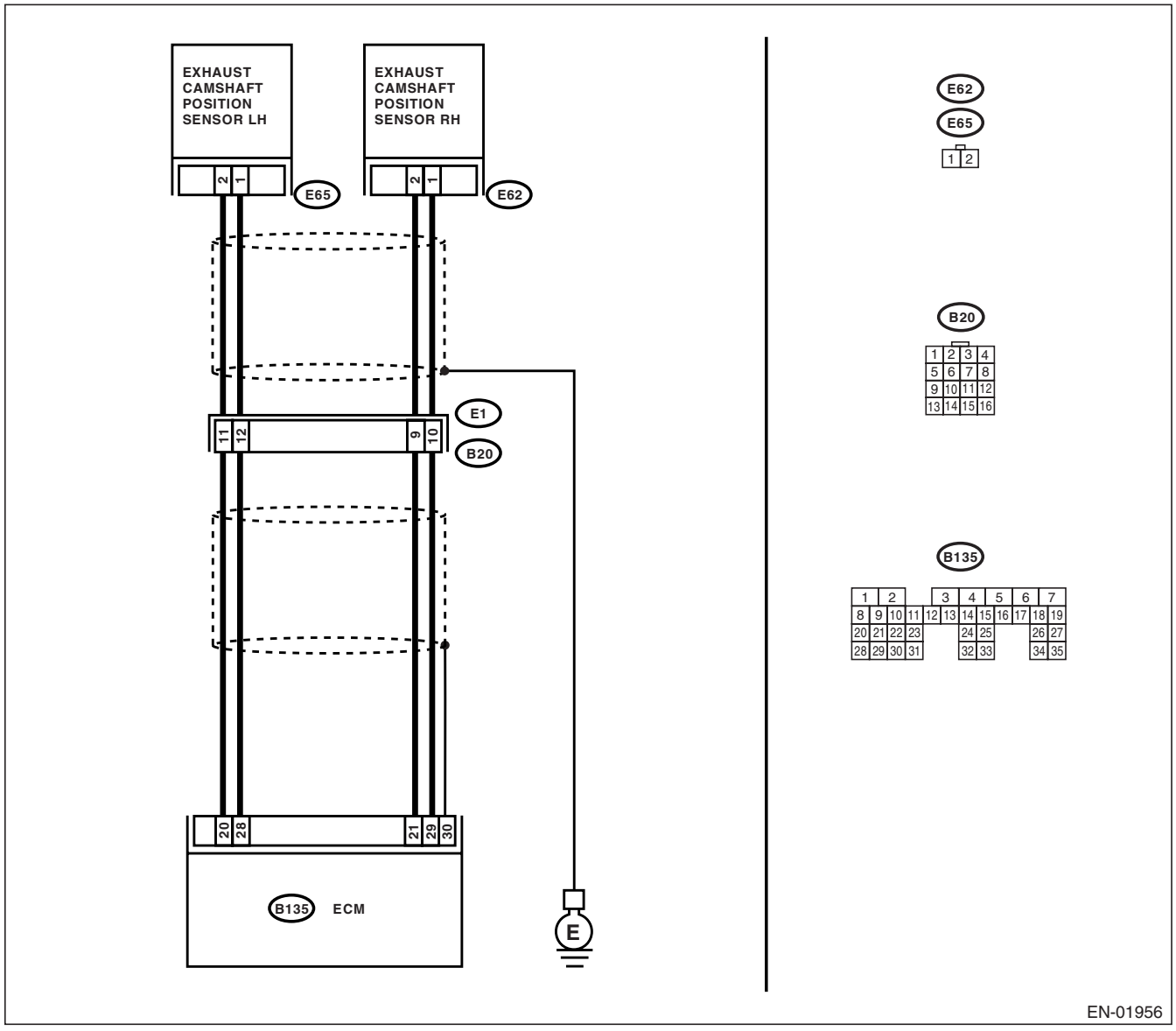
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E62) No. 1 — (B135) No. 29:*** ***(E62) No. 2 — (B135) No. 21:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E62) No. 1 — Engine ground:*** ***(E62) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.
3	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **4.**	Tighten the camshaft position sensor installation bolt securely.
4	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-24, Camshaft Position Sensor.>

AL:DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

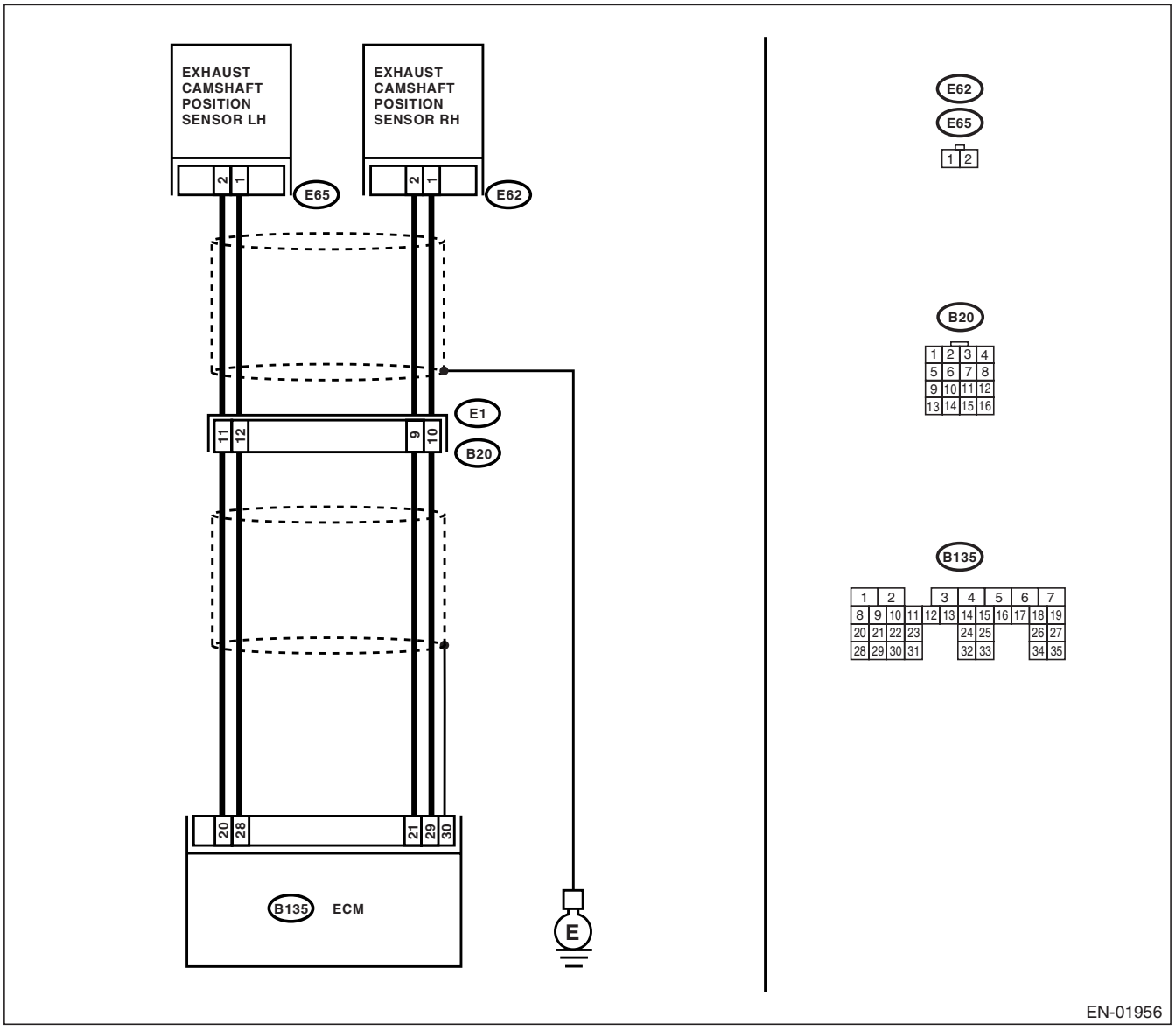
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E65) No. 1 — (B135) No. 28:*** ***(E65) No. 2 — (B135) No. 20:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E65) No. 1 — Engine ground:*** ***(E65) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.
3	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **4.**	Tighten the camshaft position sensor installation bolt securely.
4	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-24, Camshaft Position Sensor.>

AM:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

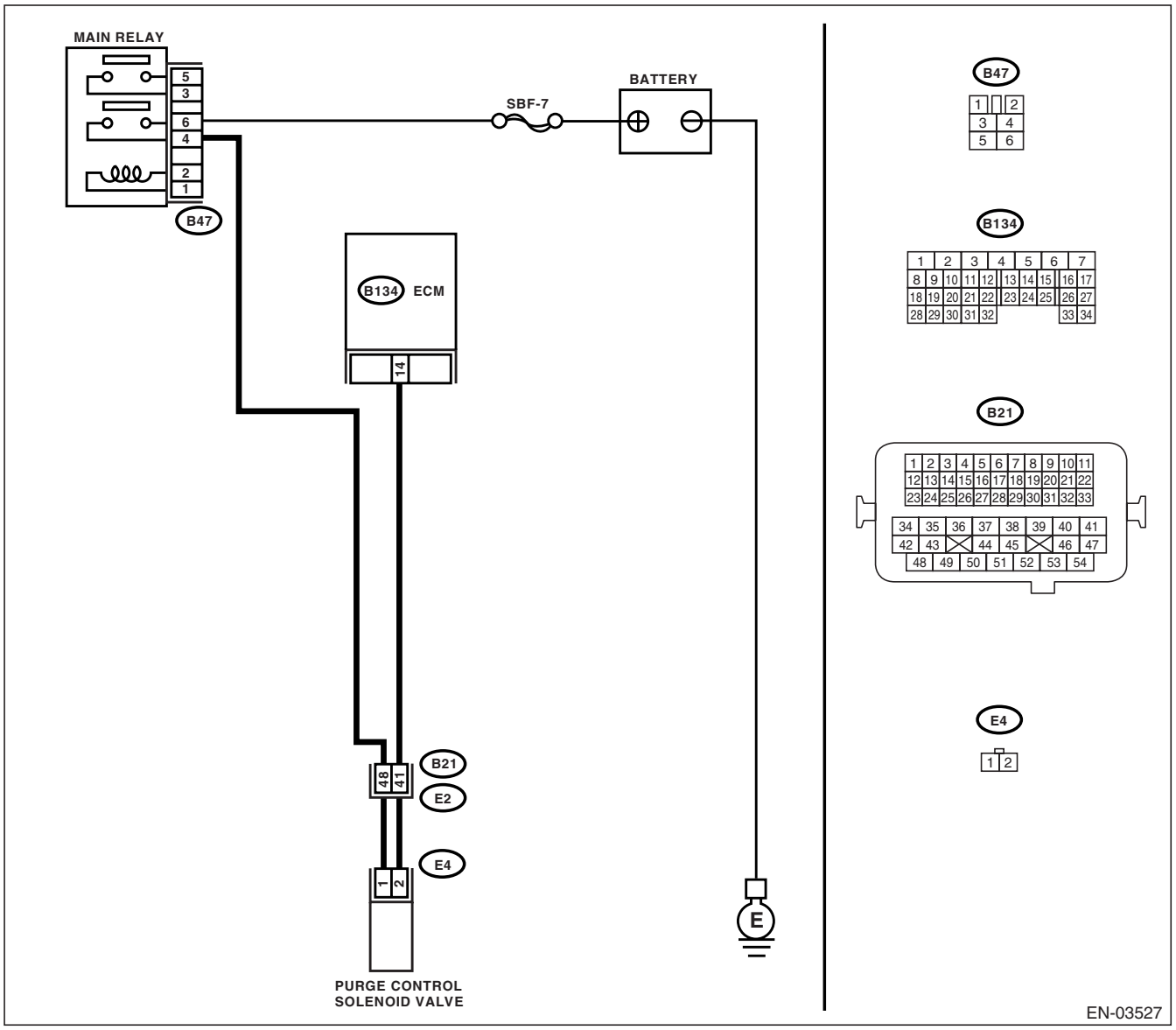
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 29 — 35 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit of 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?	Repair the poor contact in purge control solenoid valve connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

AN:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

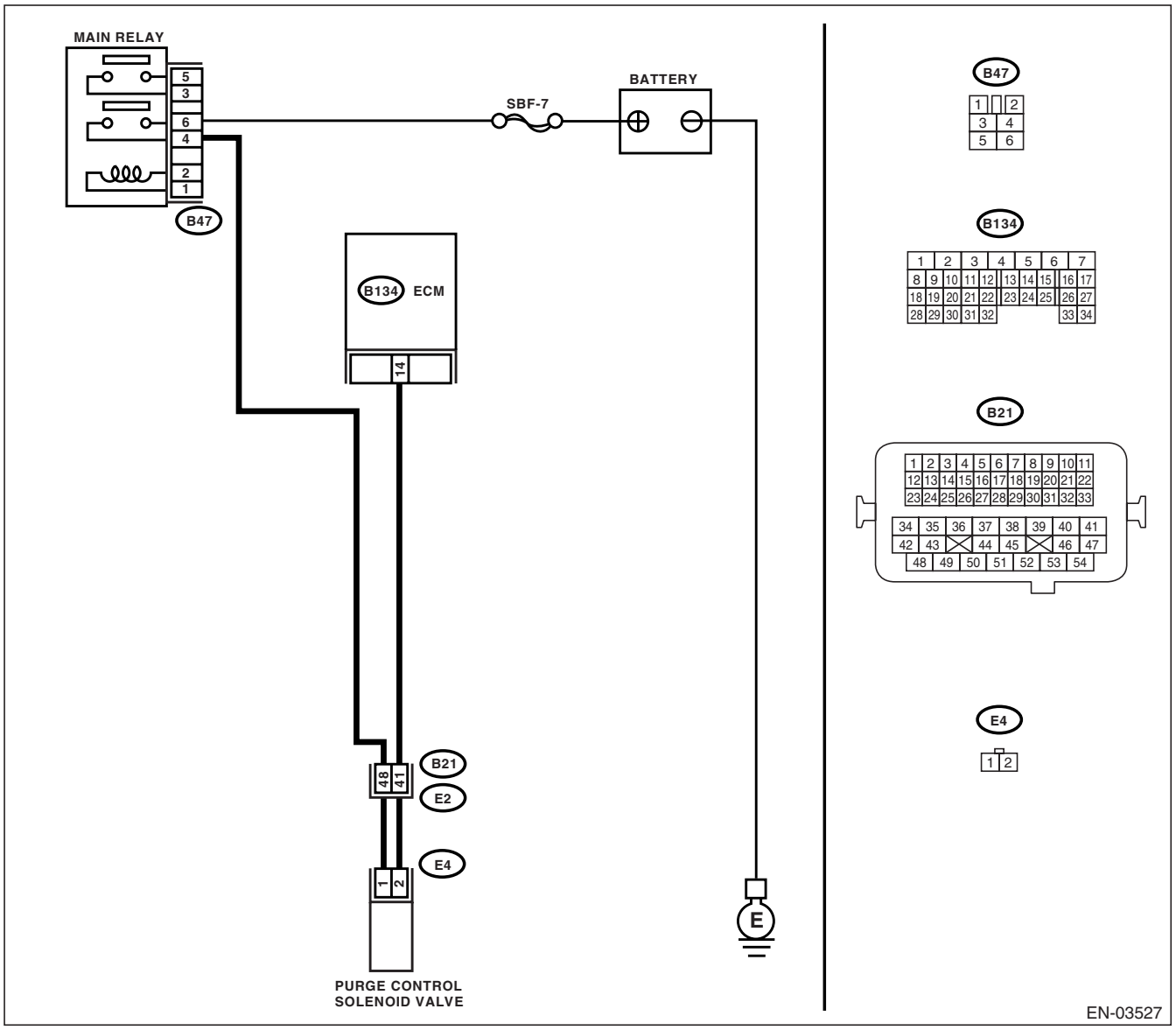
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON.	Does the purge control solenoid valve operate?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 29 — 35Ω?	Go to step **3.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge Control Solenoid Valve.>
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Repair the battery short circuit of harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

AO:DTC P0500 VEHICLE SPEED SENSOR "A"

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK DTC OF ABS.** Check DTC of ABS.	Is DTC of ABS displayed?	Perform the diagnosis according to DTC. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM.

AP:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

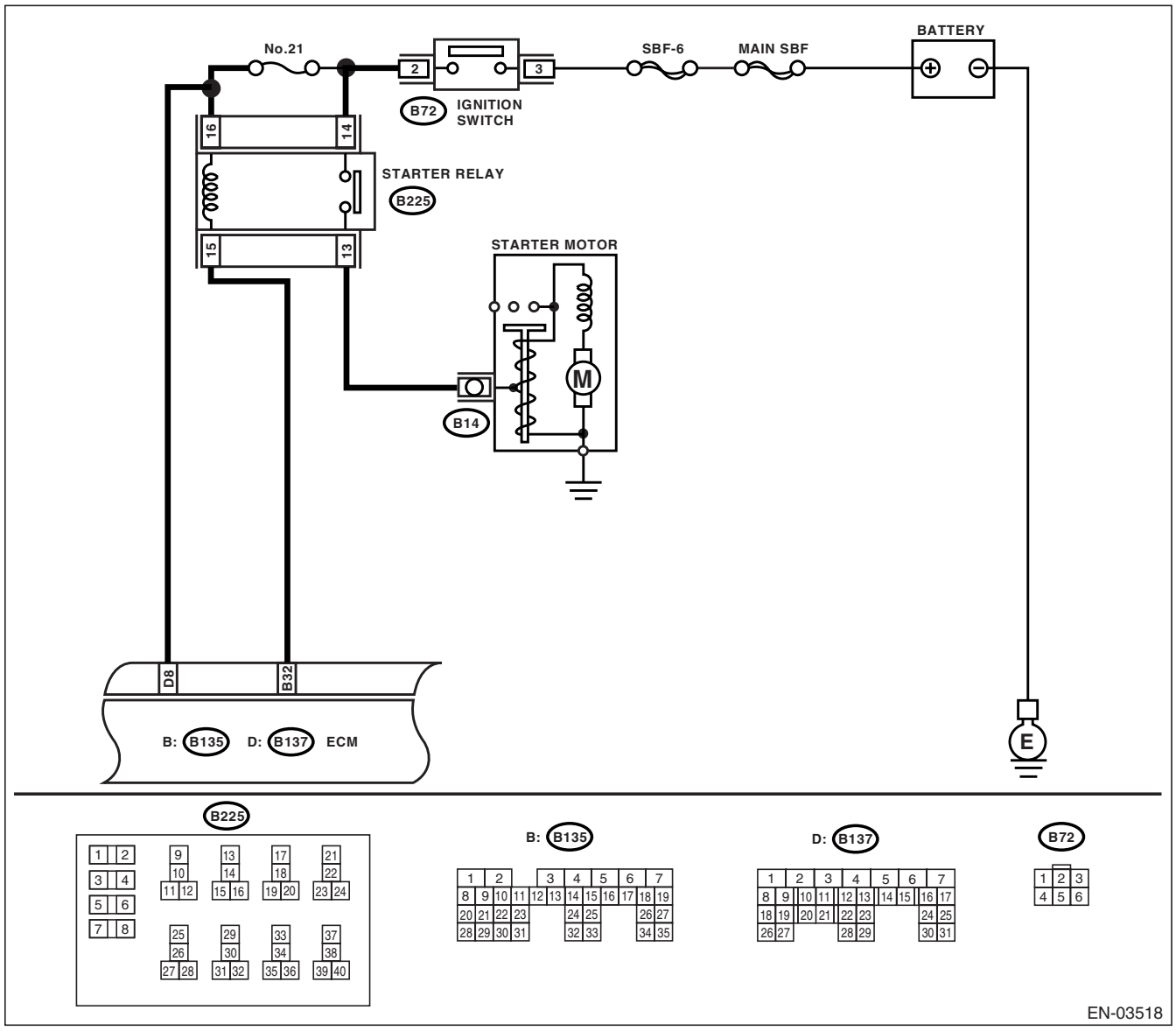
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN IGNITION SWITCH AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ignition switch and ECM.	Repair the poor contact in ECM.

AQ:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matters found inside the electronic throttle control?	Remove foreign matters from the electronic throttle control.	Perform the diagnosis of DTC P2101.

AR:DTC P0562 SYSTEM VOLTAGE LOW

DTC DETECTING CONDITION:

Detects when the power supply voltage of ECM is low.

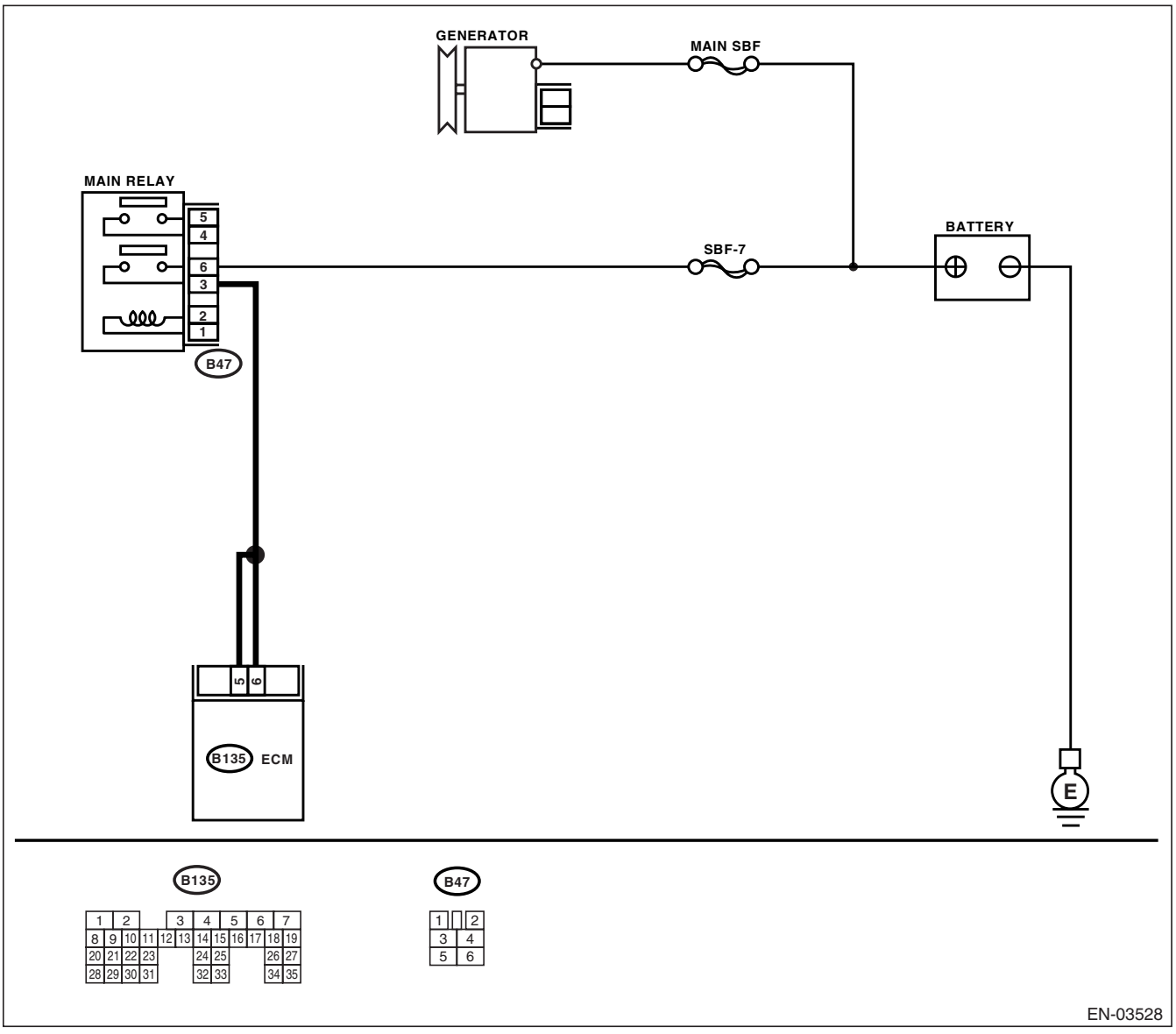
TROUBLE SYMPTOM:

Charge indicator light illuminates.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage and specific gravity of electrolyte.	Is the voltage more than 12 V and the specific gravity more than 1.26?	Go to step **2.**	Charge or replace the battery.
2	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO 2.0)-14, Generator.>
3	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **4.**	Repair the generator. <Ref. to SC(H4SO 2.0)-14, Generator.>
4	**CHECK BATTERY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Check the installation of positive and negative terminals of battery.	Are the positive and negative battery terminals clamped tightly?	Go to step **5.**	Tighten the clamp of terminal.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **6.**	Repair the harness connectors between battery, main relay and ECM.
6	**CHECK POOR CONTACT IN CONNECTORS.** Check the poor contact in connectors between generator, battery and ECM.	Is there poor contact in connectors between generator, battery and ECM?	Repair the poor contact.	Go to step **7.**
7	**CHECK ECM.** 1) Connect all the connectors. 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-30, Inspection Mode.> 4) Read the DTC. <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).> Check if the same DTC is displayed.	Is the same DTC displayed?	Replace the generator.	Go to step **8.**
8	**CHECK OTHER DTC DETECTION.** Check if any other DTC is displayed.	Is any other DTC displayed?	Perform the diagnosis of DTC displayed.	Temporary poor contact occurs.

AS:DTC P0563 SYSTEM VOLTAGE HIGH

DTC DETECTING CONDITION:

Detects when the power supply voltage of ECM is high.

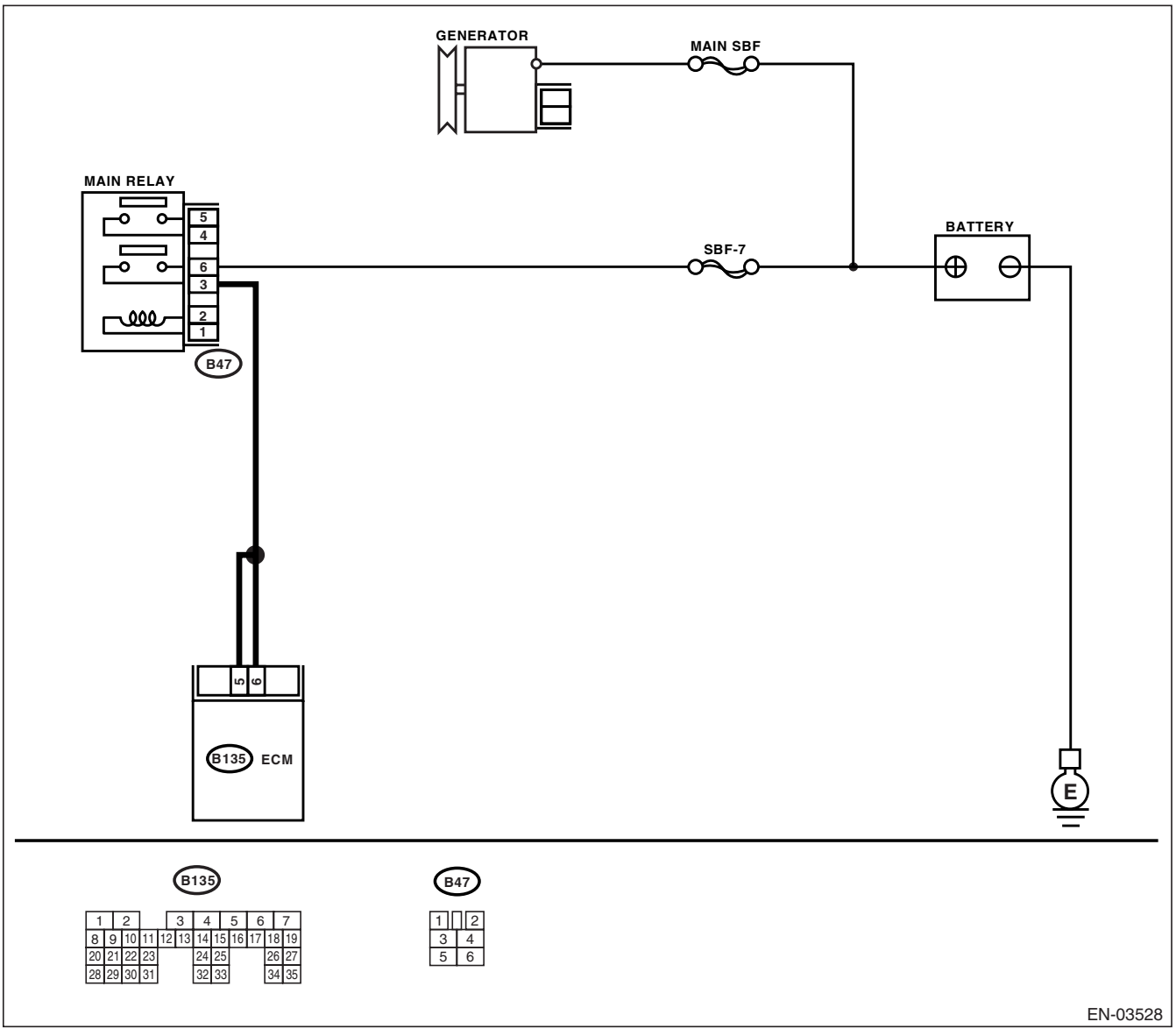
TROUBLE SYMPTOM:

Charge indicator light illuminates.

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage and specific gravity of electrolyte.	Is the voltage more than 12 V and the specific gravity more than 1.26?	Go to step **2.**	Replace the battery.

	Step	Check	Yes	No
2	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO 2.0)-14, Generator.>
3	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **4.**	Repair the generator. <Ref. to SC(H4SO 2.0)-14, Generator.>
4	**CHECK BATTERY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Check the installation of positive and negative terminals of battery.	Are the positive and negative battery terminals clamped tightly?	Go to step **5.**	Tighten the clamp of terminal.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **6.**	Repair the harness connectors between battery, main relay and ECM.
6	**CHECK POOR CONTACT IN CONNECTORS.** Check the poor contact in connectors between generator, battery and ECM.	Is there poor contact in connectors between generator, battery and ECM?	Repair the poor contact.	Go to step **7.**
7	**CHECK ECM.** 1) Connect all the connectors. 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-37, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-30, Inspection Mode.> 4) Read the DTC. <Ref. to EN(H4DOTC)(diag)-29, Read Diagnostic Trouble Code (DTC).> Check if the same DTC is displayed.	Is the same DTC displayed?	Replace the generator.	Go to step **8.**
8	**CHECK OTHER DTC DETECTION.** Check if any other DTC is displayed.	Is any other DTC displayed?	Perform the diagnosis of DTC displayed.	Temporary poor contact occurs.

AT:DTC P0600 SERIAL COMMUNICATION LINK

NOTE:
For the diagnostic procedure, refer to LAN system.

AU:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-155, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

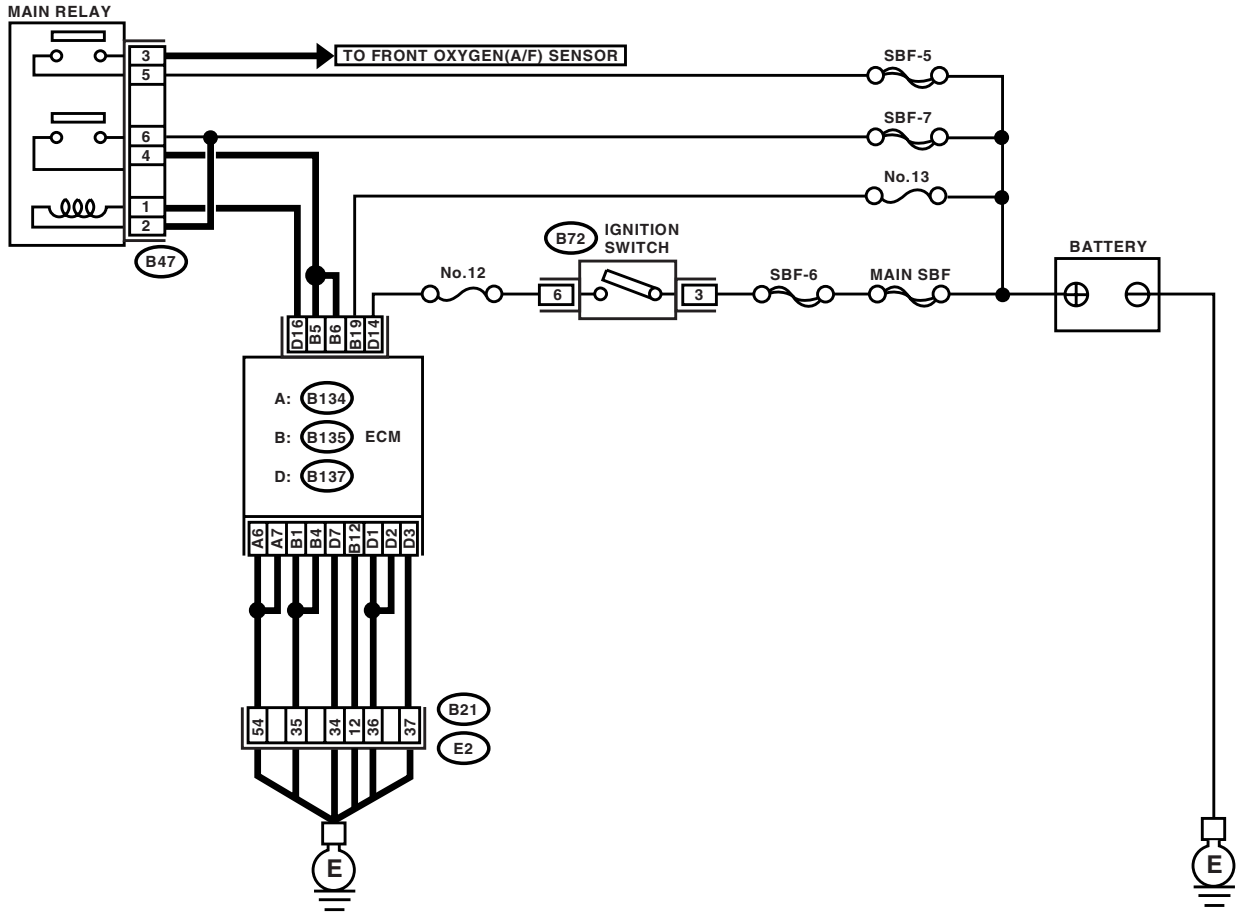
NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-155, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

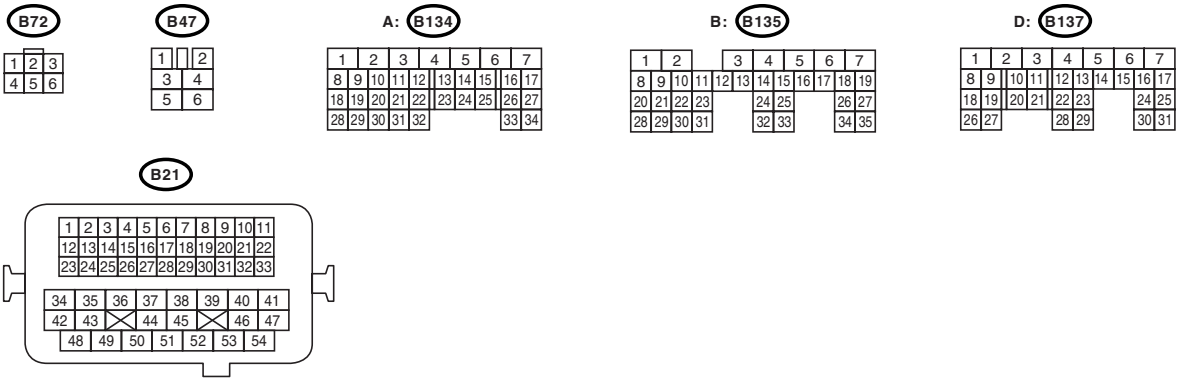
AW:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Erroneous idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03519

Step		Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **2.**	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 13 — 15 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK ECM GROUND HARNESS.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (−):*** ***(B137) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Further tighten the engine ground terminal.

AX:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-183, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AY:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 5AT(diag)-2, Basic Diagnostic Procedure.>

AZ:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

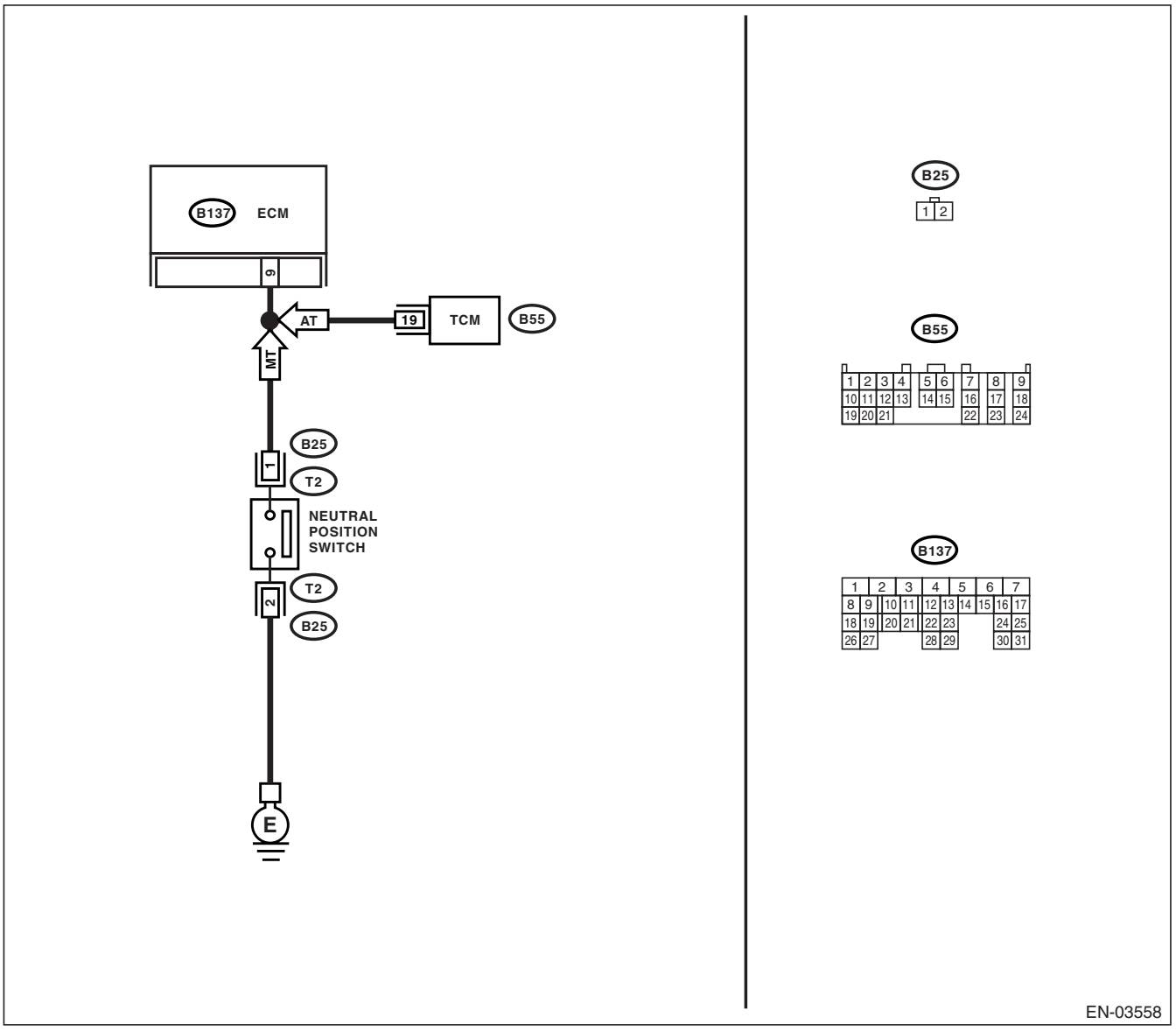
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **5.**
2	**CHECK DTC.** Check the DTC of AT.	Is DTC of AT displayed?	Perform the diagnosis for AT. <Ref. to 5AT(diag)-35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM. ***Connector & terminal*** ***(B137) No. 9 — (B55) No. 19:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and TCM.
4	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM and TCM connector.	Repair the ground short circuit of harness between ECM and TCM.
5	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **7.**
6	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever except in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step **7.**
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in transmission harness, or replace the neutral position switch.
8	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the short circuit in transmission harness, or replace the neutral position switch.
9	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the ground short circuit of harness between ECM and transmission harness connector.

	Step	Check	Yes	No
10	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B137) No. 9 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit of harness between ECM and transmission harness connector.
11	**CHECK HARNESS BETWEEN NEUTRAL POSITION SWITCH CONNECTOR AND ENGINE GROUND.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit between transmission harness connector and engine ground terminal.
12	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair the poor contact in transmission harness connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

BA:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

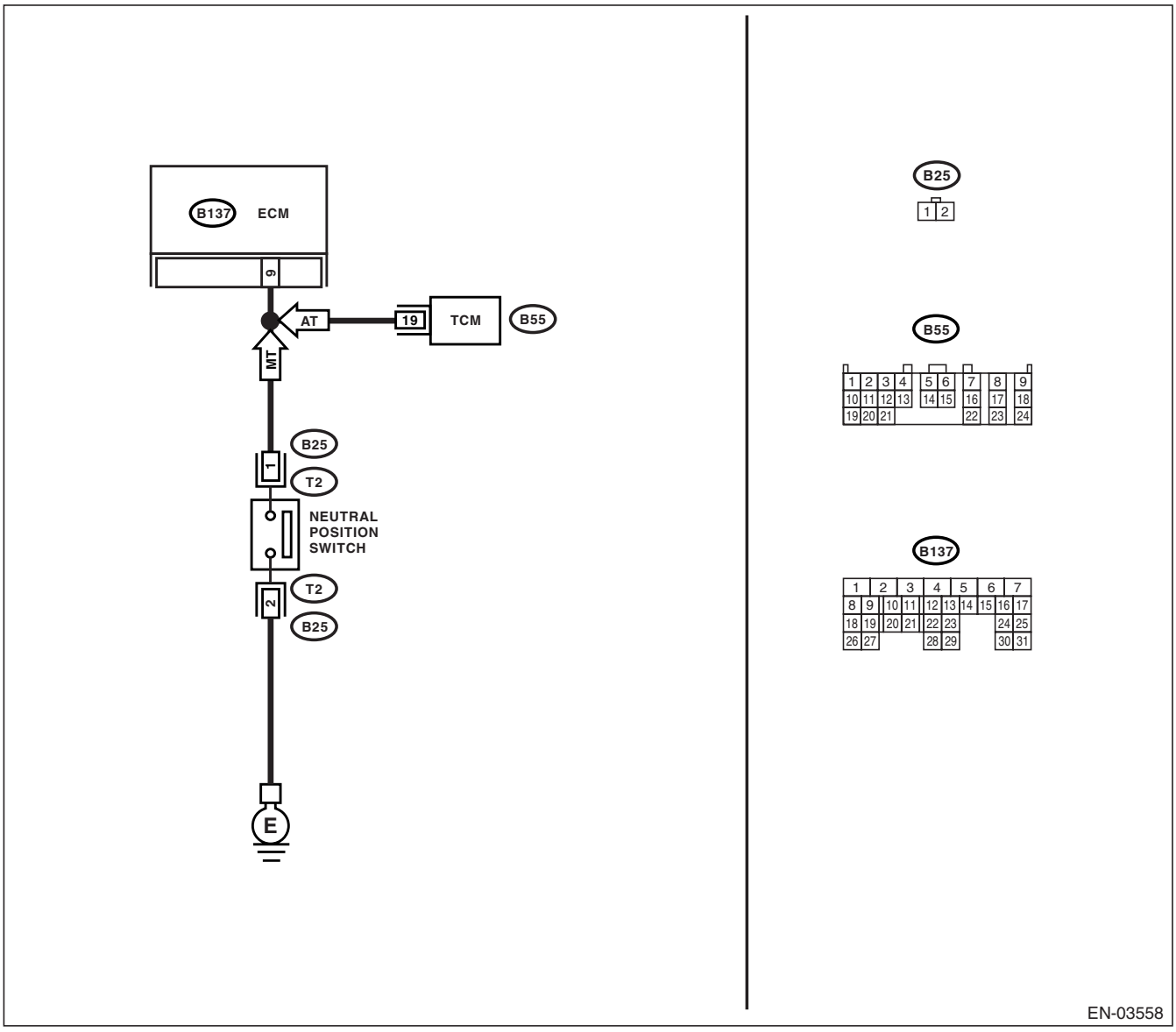
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **5.**
2	**CHECK DTC.** Check the DTC of AT.	Is DTC of AT displayed?	Perform the diagnosis for AT. <Ref. to 5AT(diag)-35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM. ***Connector & terminal*** ***(B137) No. 9 — (B55) No. 19:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and TCM.
4	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM and TCM connector.	Repair the ground short circuit of harness between ECM and TCM.
5	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **7.**
6	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever in neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **7.**
7	**CHECK INPUT SIGNAL OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and transmission harness connector.	Go to step **8.**
8	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral position switch connector. ***Connector & terminal*** ***(B137) No. 9 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and transmission harness connector • Poor contact in transmission harness connector • Poor contact in ECM connector

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN NEUTRAL POSITION SWITCH AND ENGINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit in the neutral position switch ground line.
10	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral position. 2) Measure the resistance between transmission harness connector socket terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Replace the neutral position switch.
11	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair the poor contact in transmission harness connector.	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

BB:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-183, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

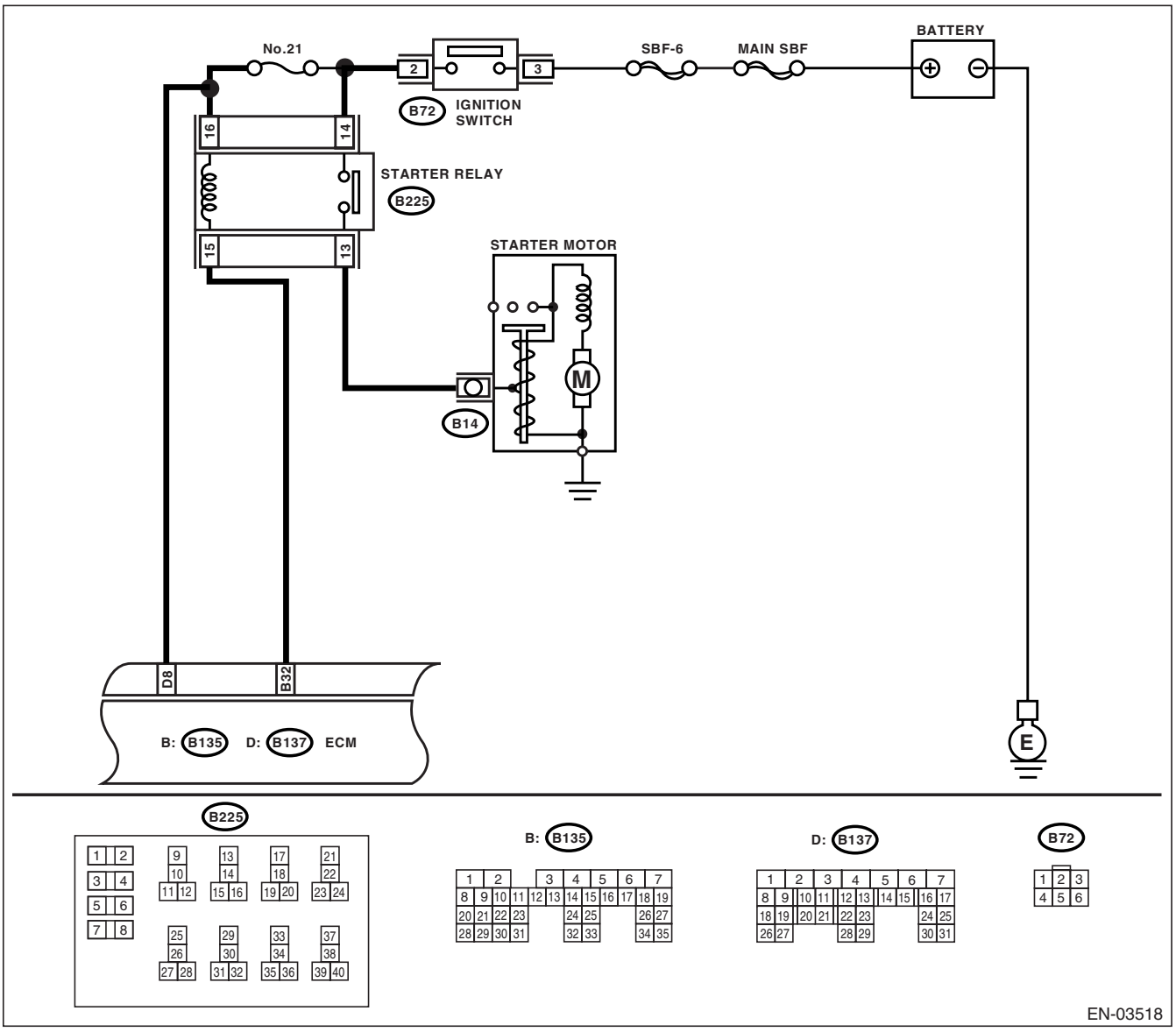
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-62, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN STARTER RELAY AND ECM.** 1) Disconnect the connectors from starter relay and ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 32 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit between starter motor and ECM.	Repair the poor contact in ECM connector.

BD:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

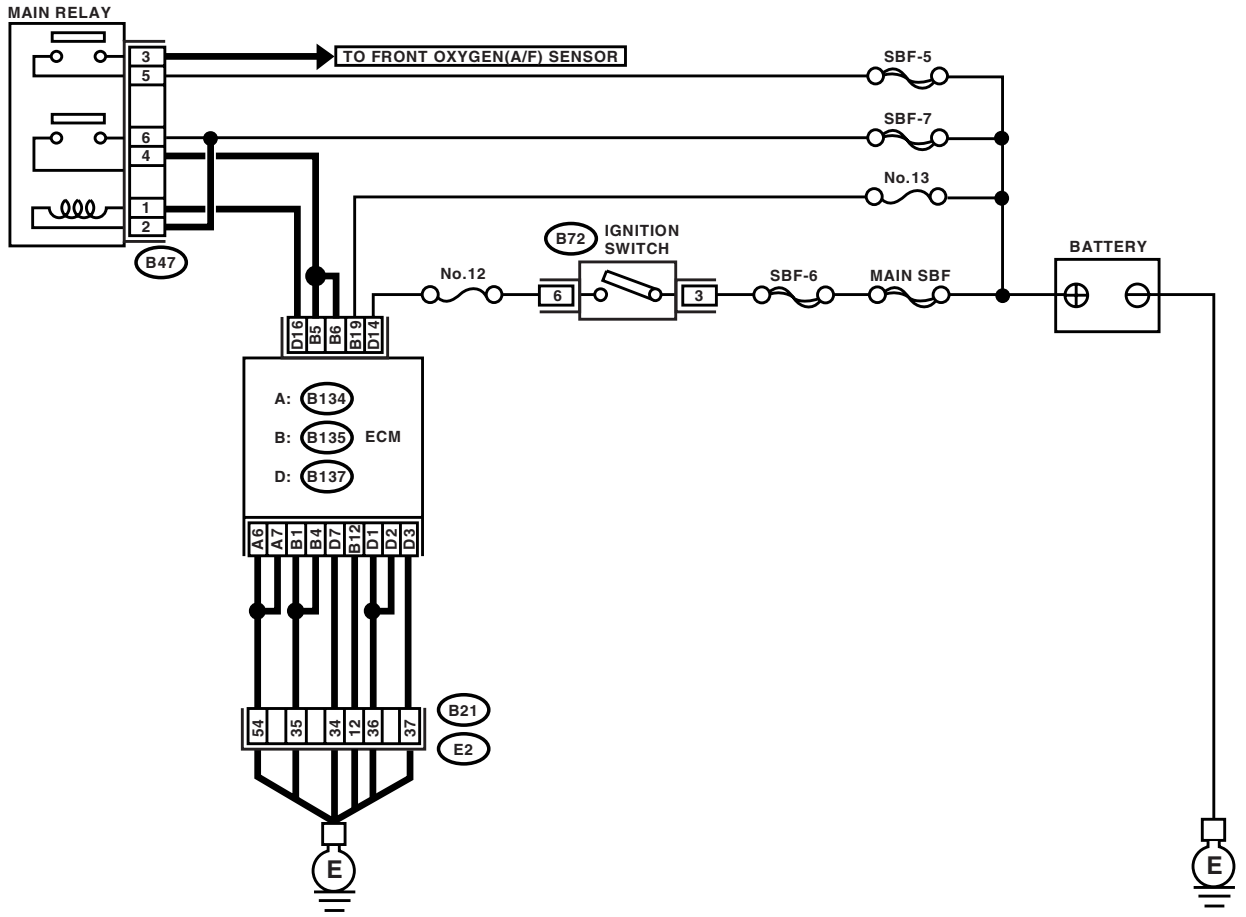
DTC DETECTING CONDITION:

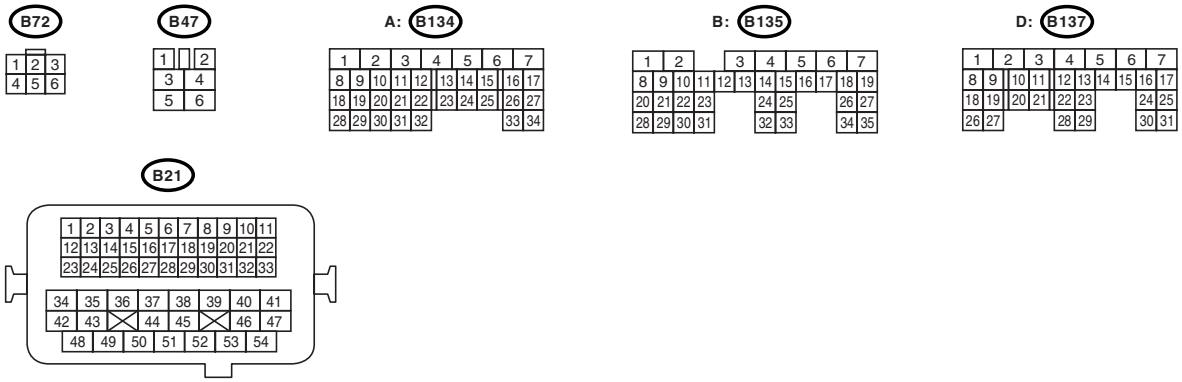
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





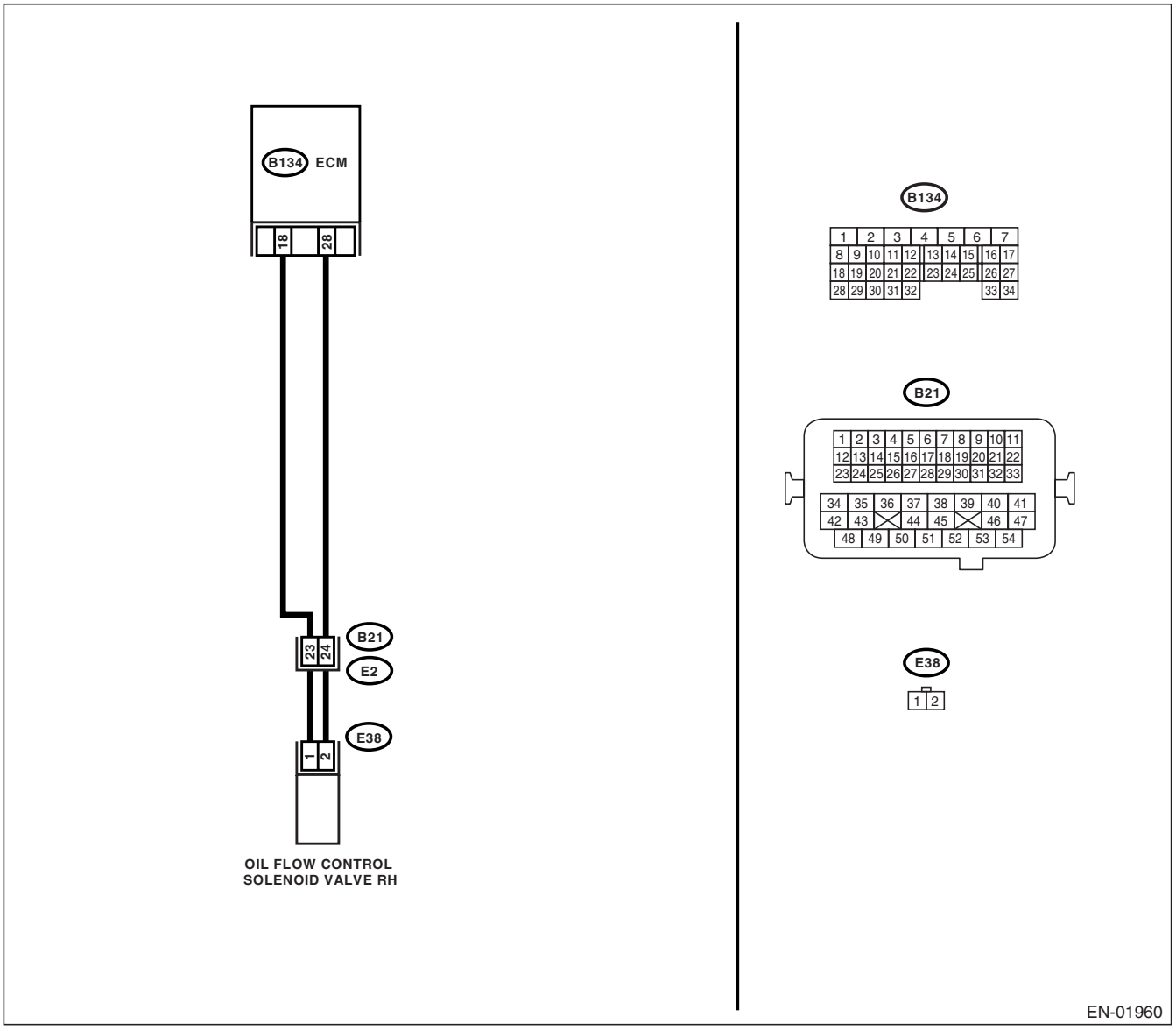
EN-03519

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE No. 13.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

BE:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



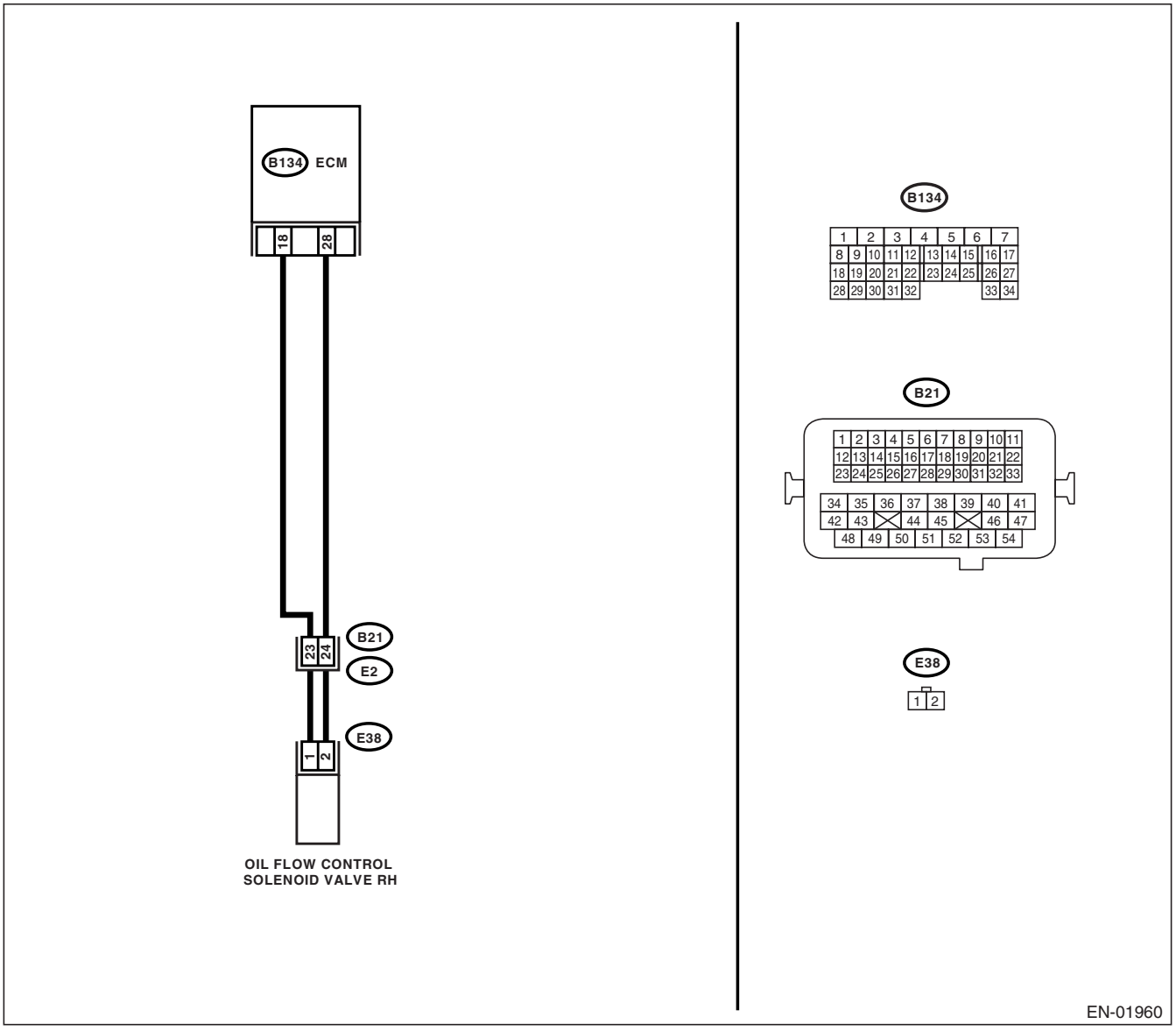
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BF:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



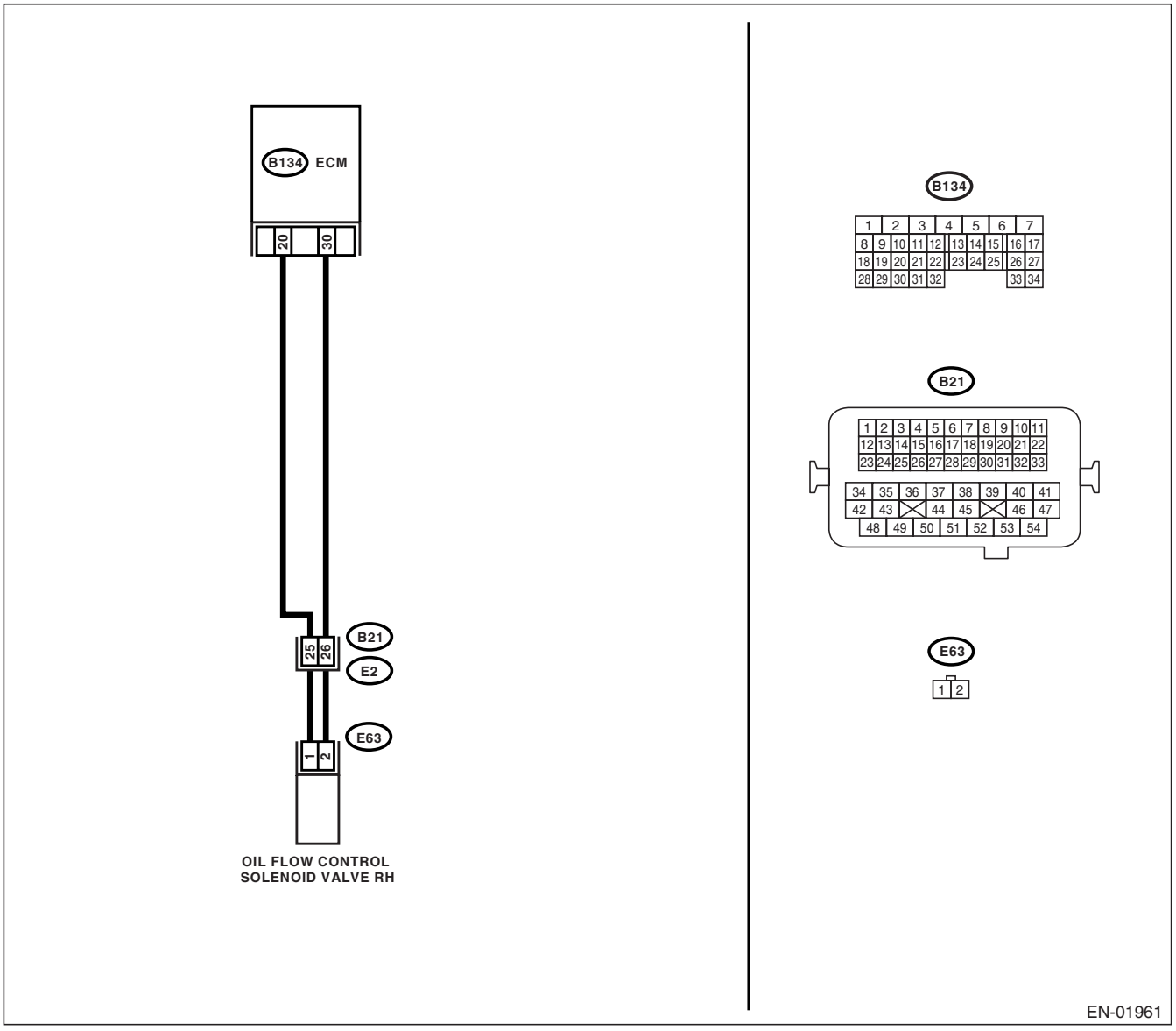
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BG:DTC P2090 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

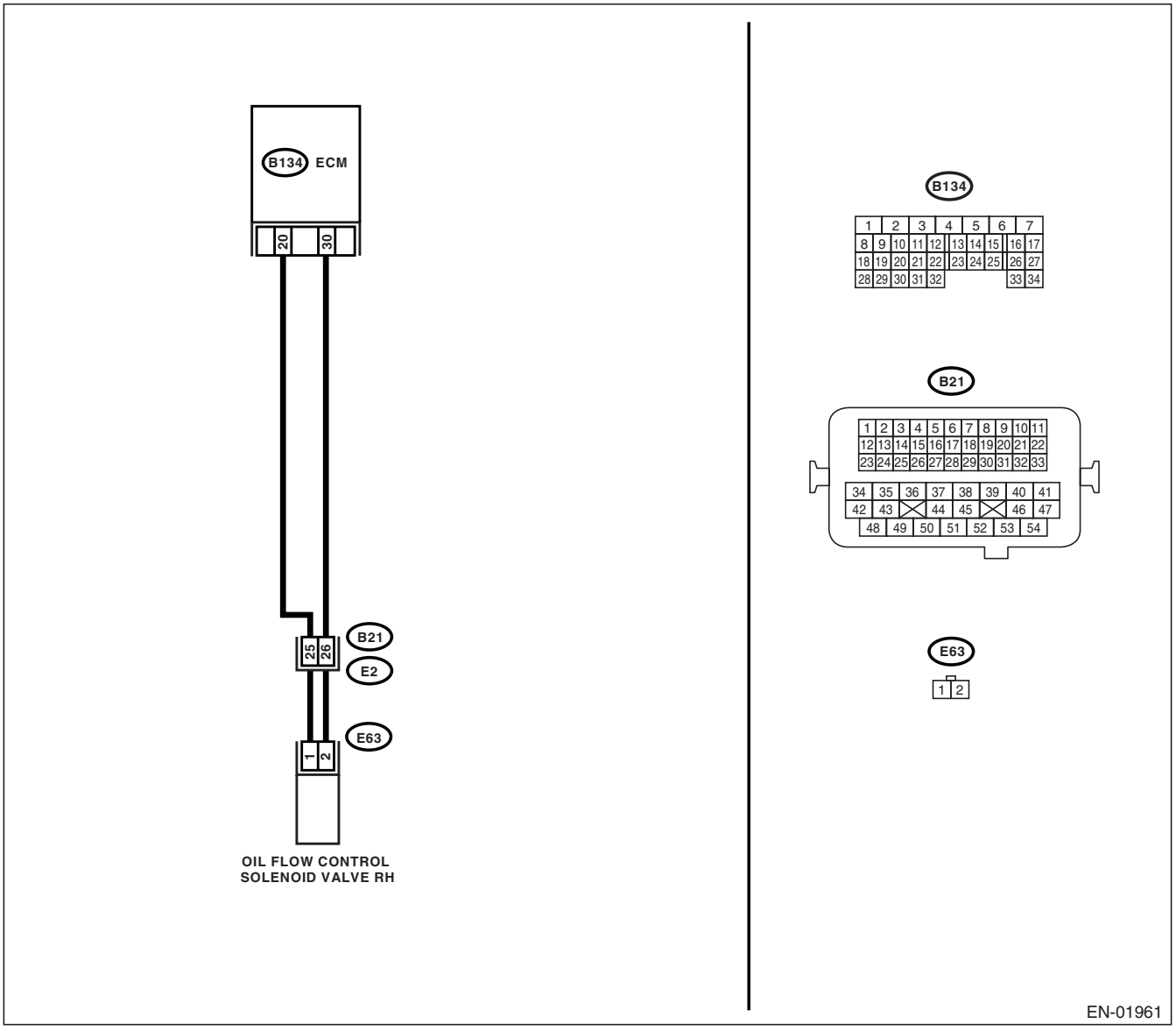


	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 20 — (E63) No. 1:*** ***(B134) No. 30 — (E63) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BH:DTC P2091 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

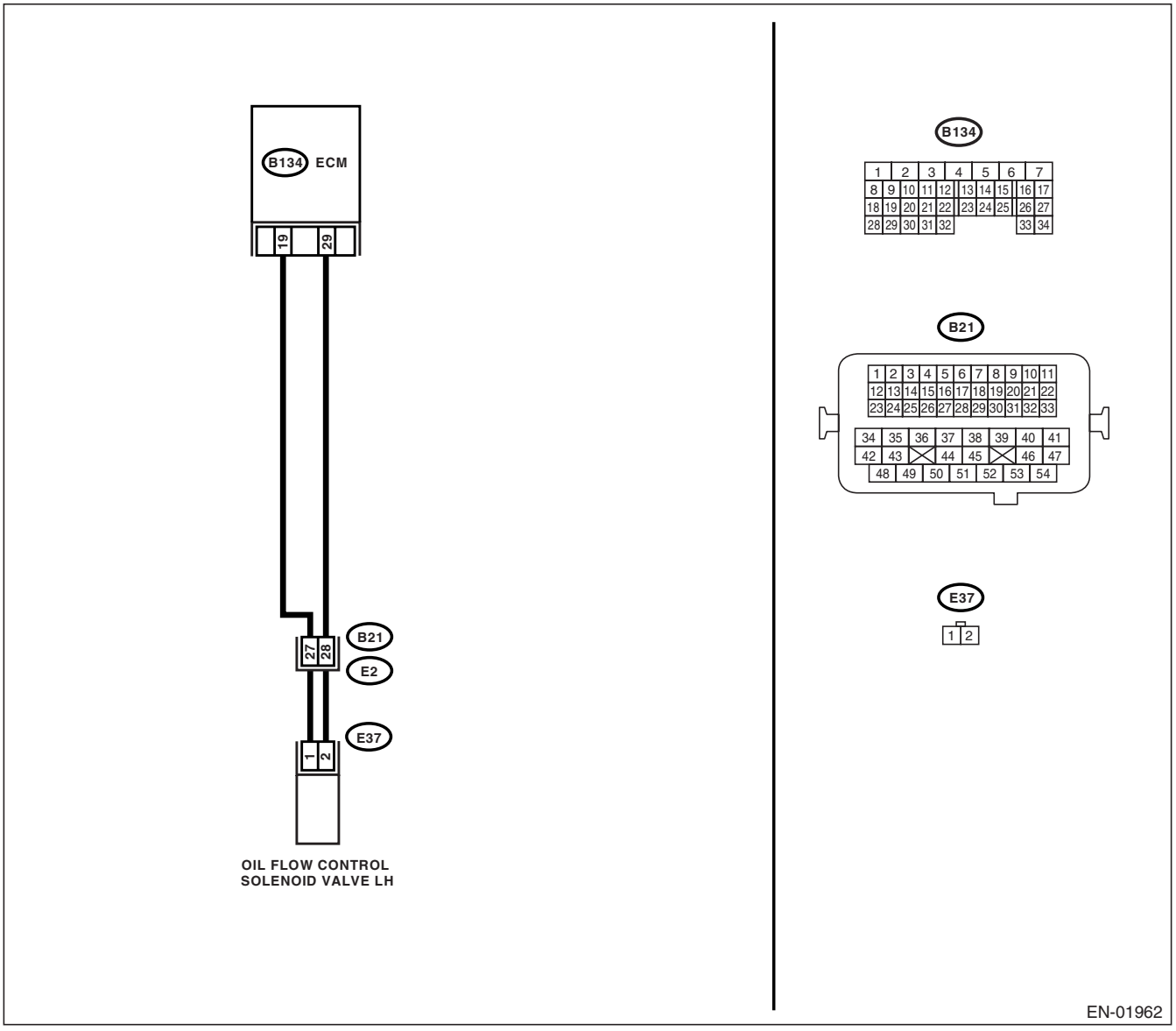


	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E63) No. 1 — Engine ground:*** ***(E63) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BI: DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



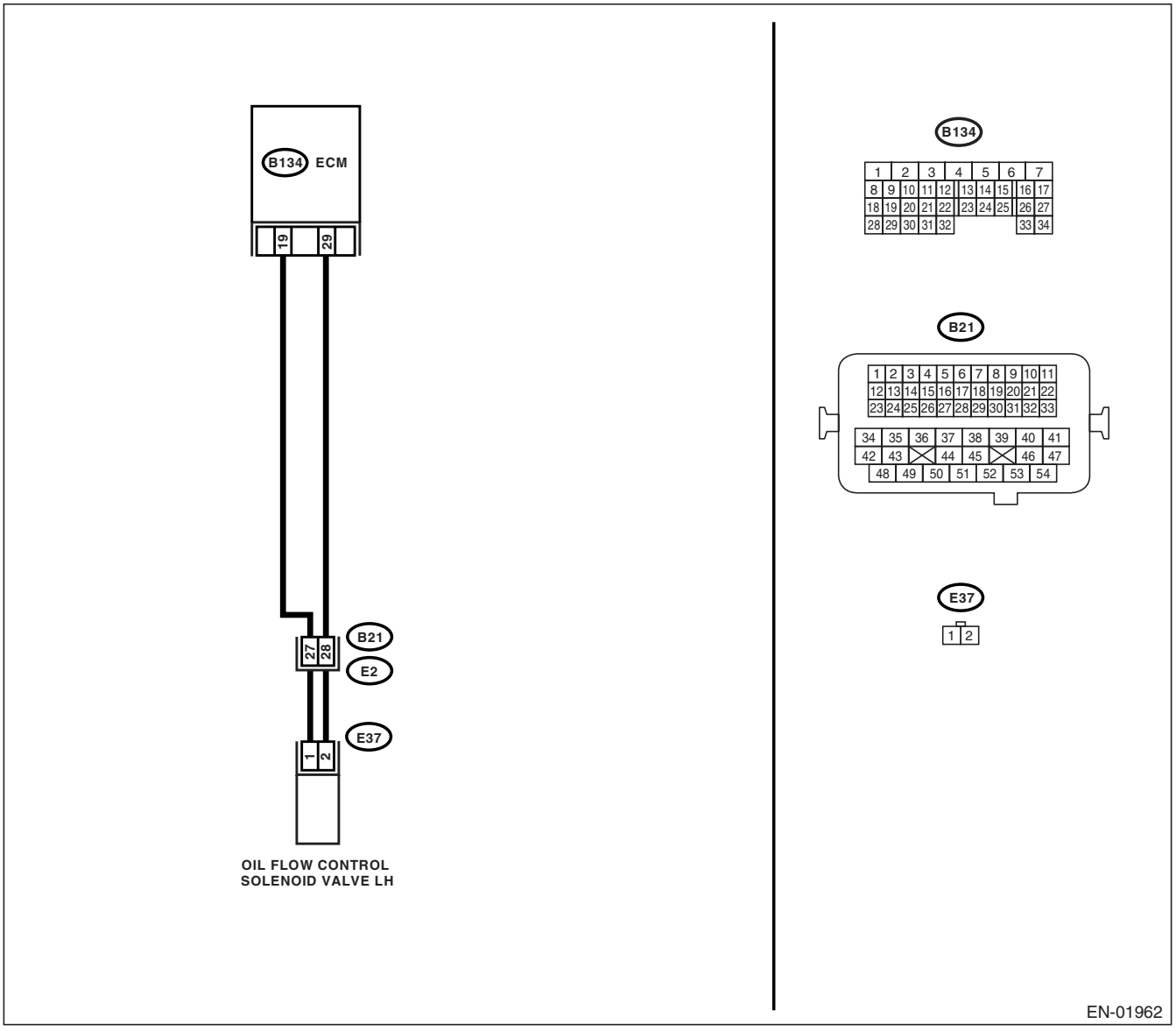
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BJ:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

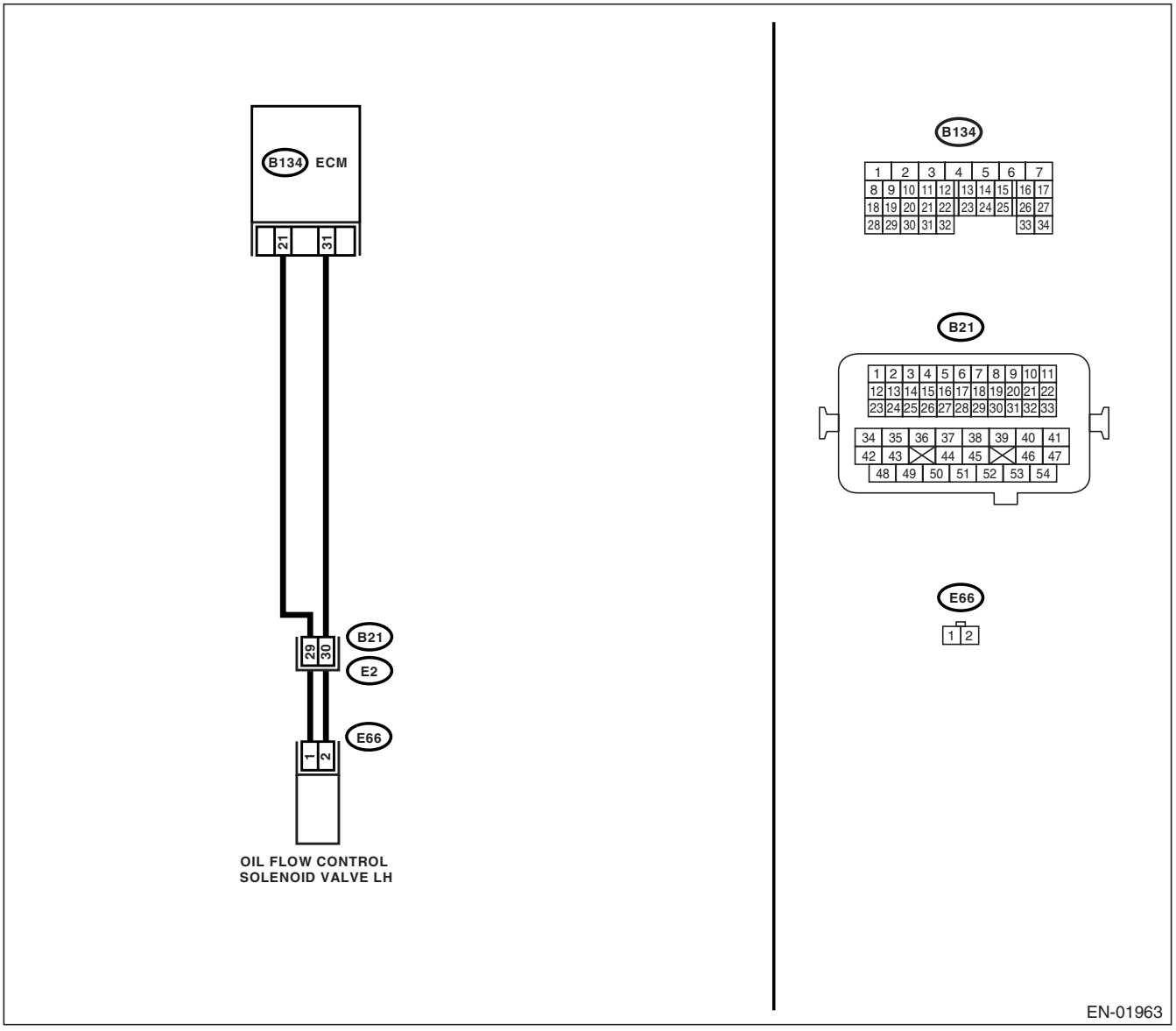


	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BK:DTC P2094 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



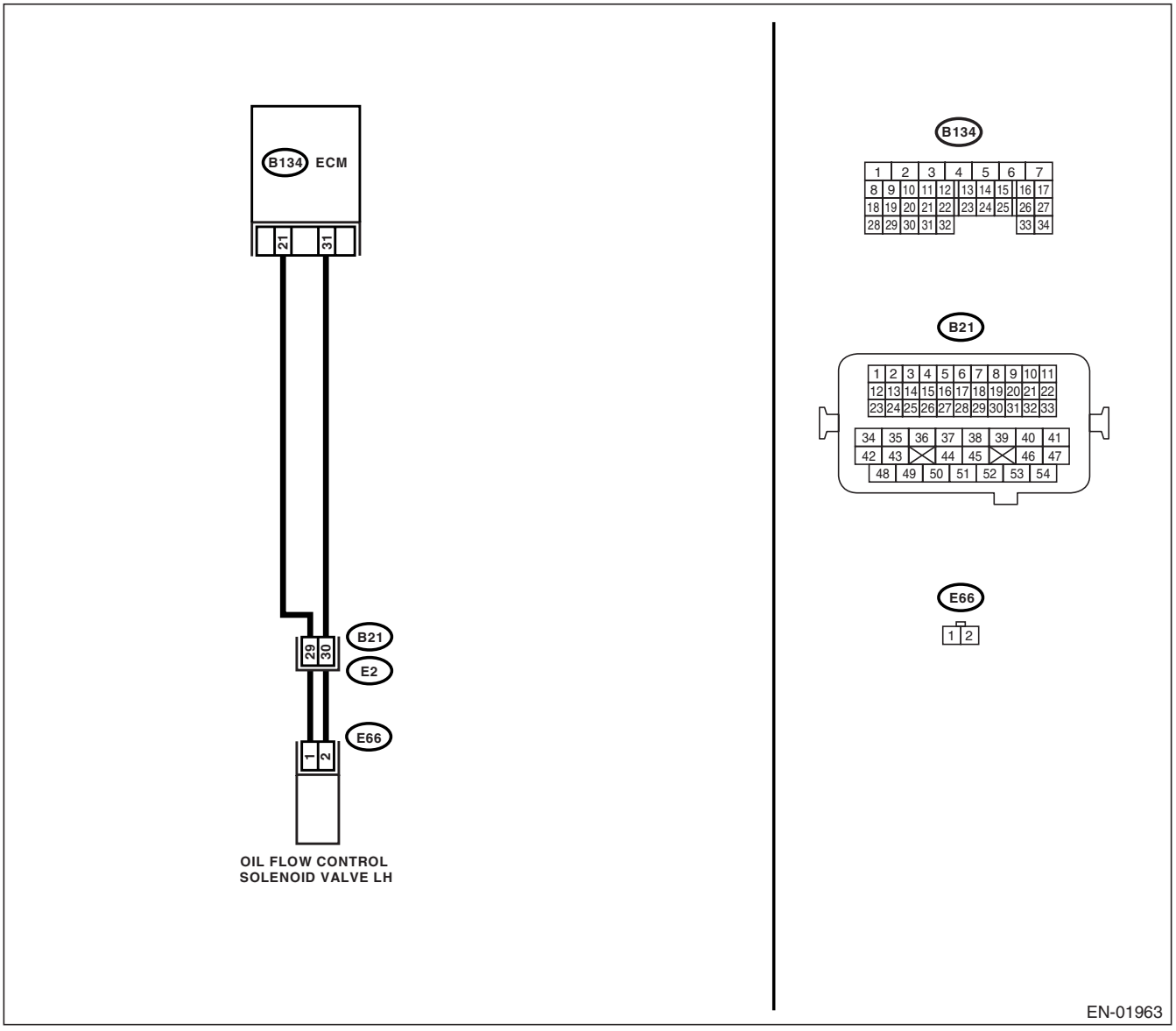
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 21 — (E66) No. 1:*** ***(B134) No. 31 — (E66) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BL:DTC P2095 EXHAUST CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E66) No. 1 — Engine ground:*** ***(E66) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-56, Camshaft.>

BM:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

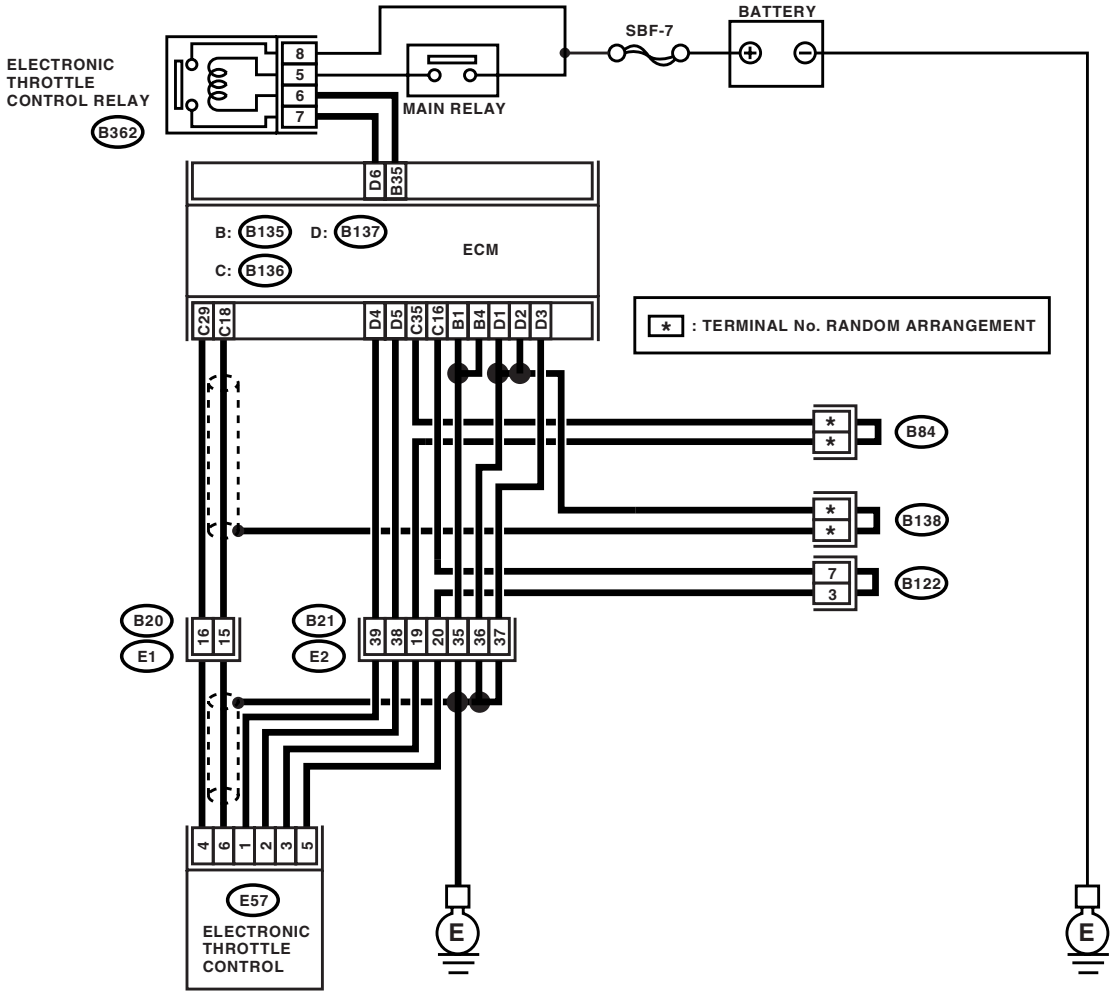
DTC DETECTING CONDITION:

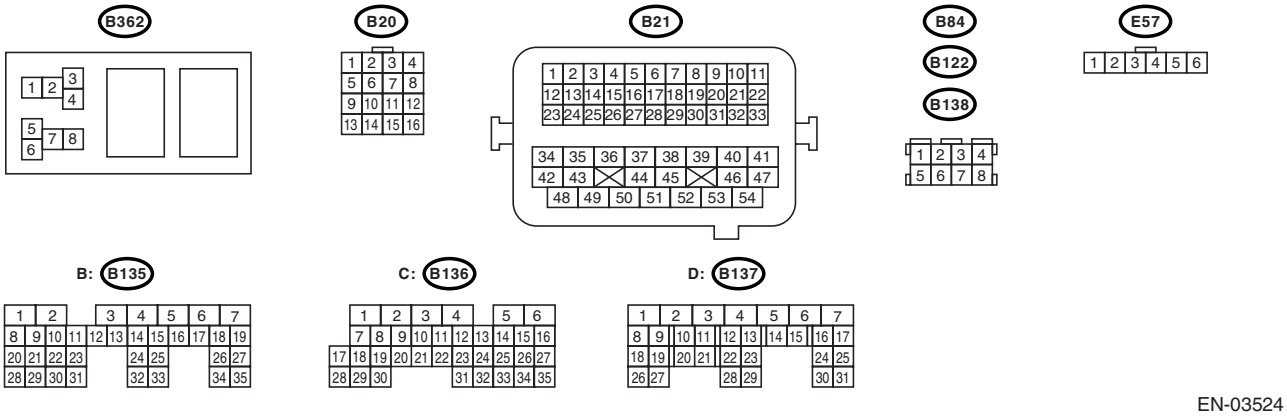
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03524

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 5 and No. 6. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 8 (+) — Chassis ground (−):*** ***(B362) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 6:*** ***(B137) No. 6 — (B362) No. 7:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and electronic throttle control relay.
6	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (−):***	Is the voltage more than 0.4 V?	Go to step **7.**	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (−):***	Is the voltage more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **13.**
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness connector.
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the ground short circuit of harness.
11	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
12	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
13	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 4.63 V?	Go to step **14.**	Go to step **16.**

	Step	Check	Yes	No
14	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **20.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the open circuit of harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
18	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **19.**	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **20.**	Repair the short circuit to sensor power supply.

	Step	Check	Yes	No
20	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **21.**	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
21	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **22.**	Repair the poor contact in ECM connector. Replace the electronic throttle control if defective.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit of harness connector.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (−):*** ***(E57) No. 1 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **24.**	Repair the power supply short circuit of harness between ECM and electronic throttle control.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **25.**	Repair the short circuit of harness.
25	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair the short circuit of harness.

	Step	Check	Yes	No
26	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **27.**	Repair the open circuit of harness.
27	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **28.**	Replace the electronic throttle control.
28	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Specification: 3 mm (0.12 in) from fully closed position	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Replace the electronic throttle control.

BN:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

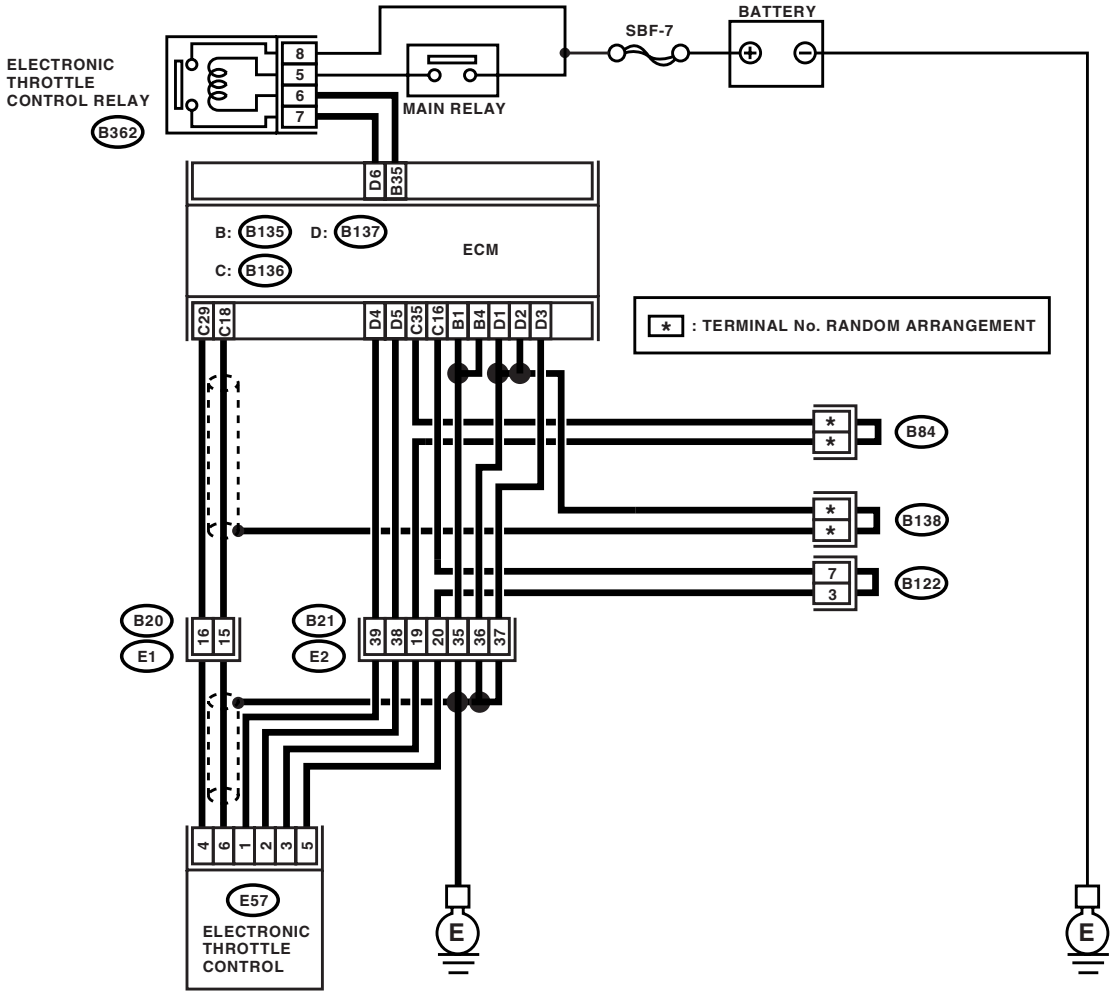
DTC DETECTING CONDITION:

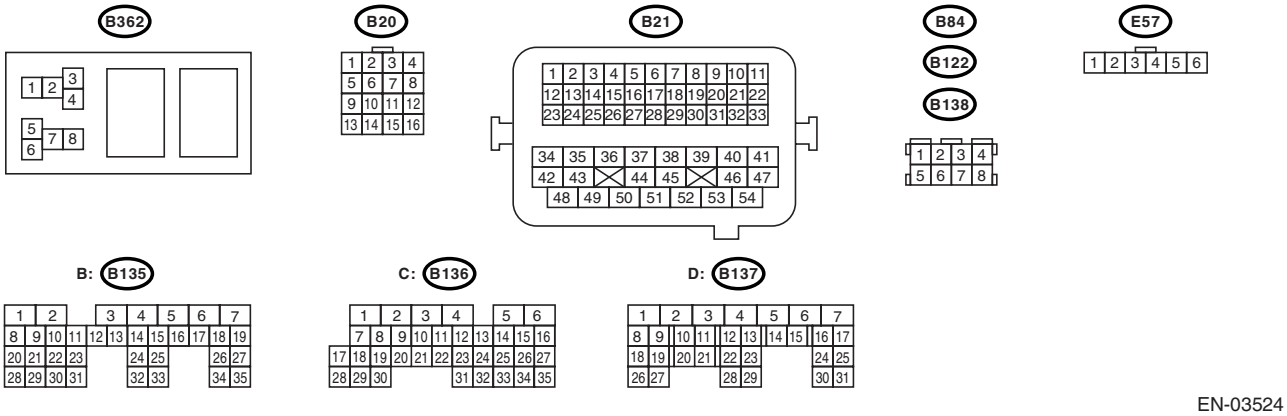
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





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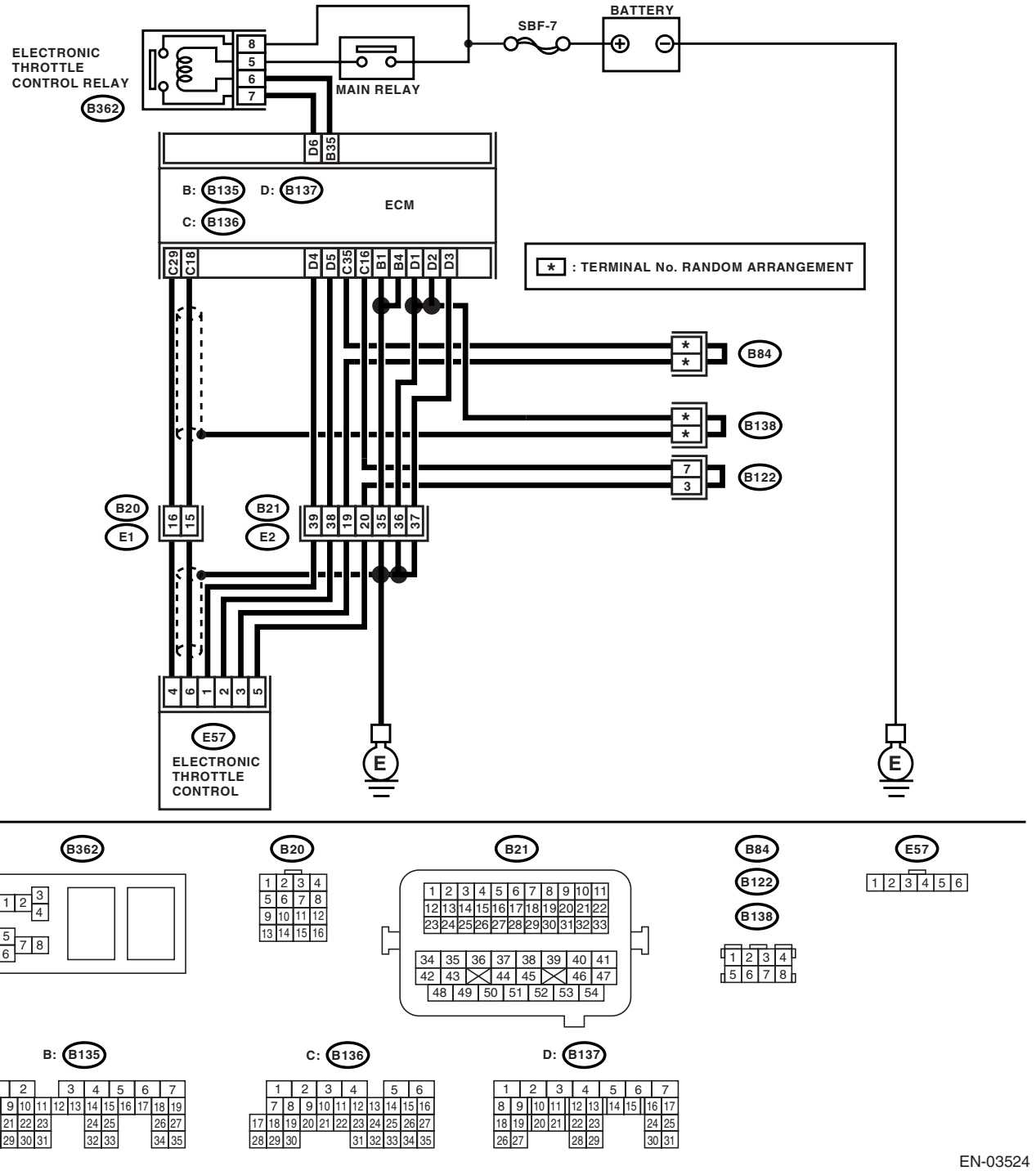
	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 5 and No. 6. 4) Measure the resistance between electronic throttle control terminals. ***Terminals*** ***(B362) No. 7 — (B362) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 8 (+) — Chassis ground (−):*** ***(B362) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 6:*** ***(B137) No. 6 — (B362) No. 7:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Repair the open circuit of harness between ECM and electronic throttle control relay.

BO:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

WIRING DIAGRAM:



EN-03524

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

BP:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-183, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BQ:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

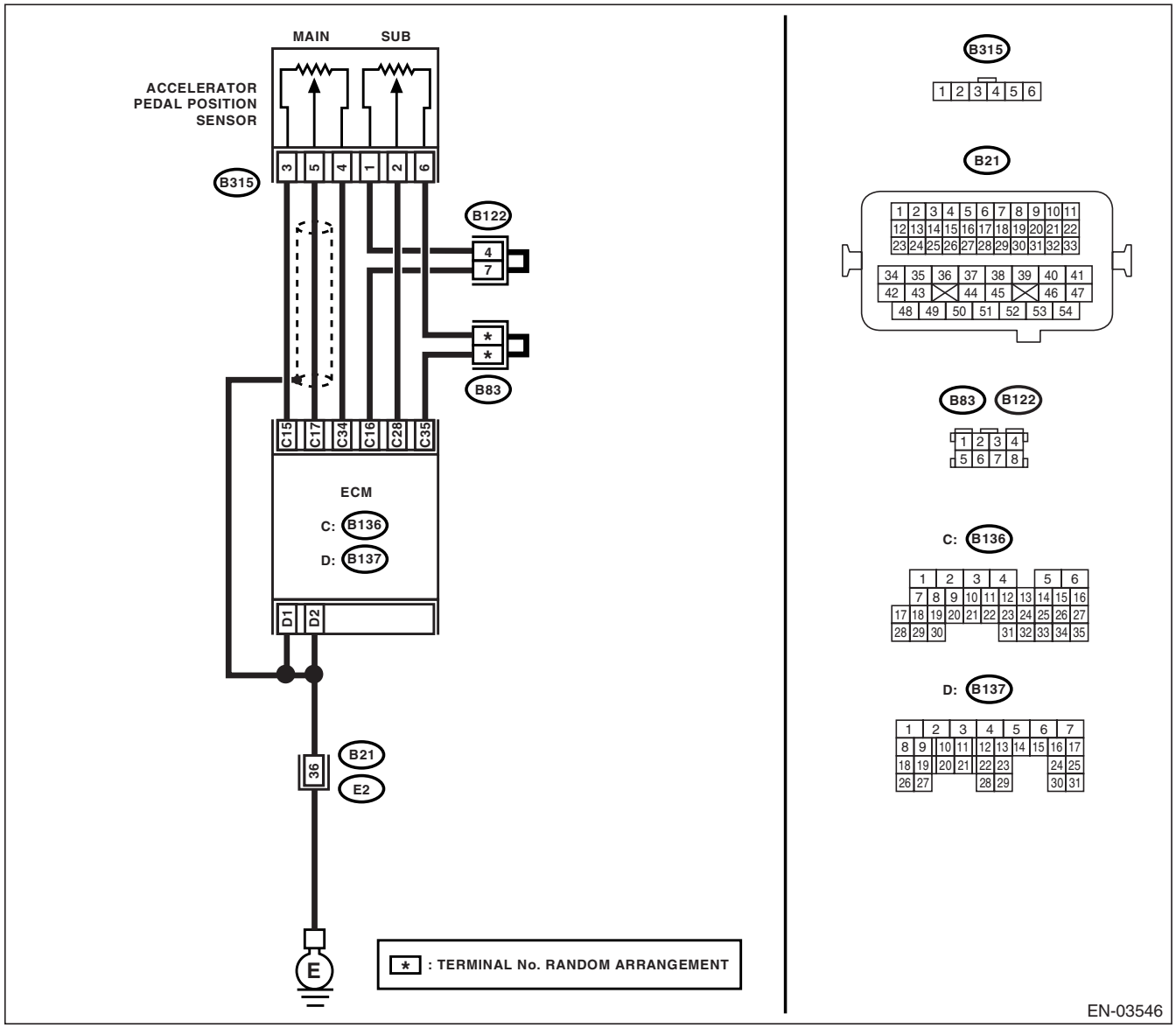
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.2 — 1.0 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.5 — 2.5 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

BR:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

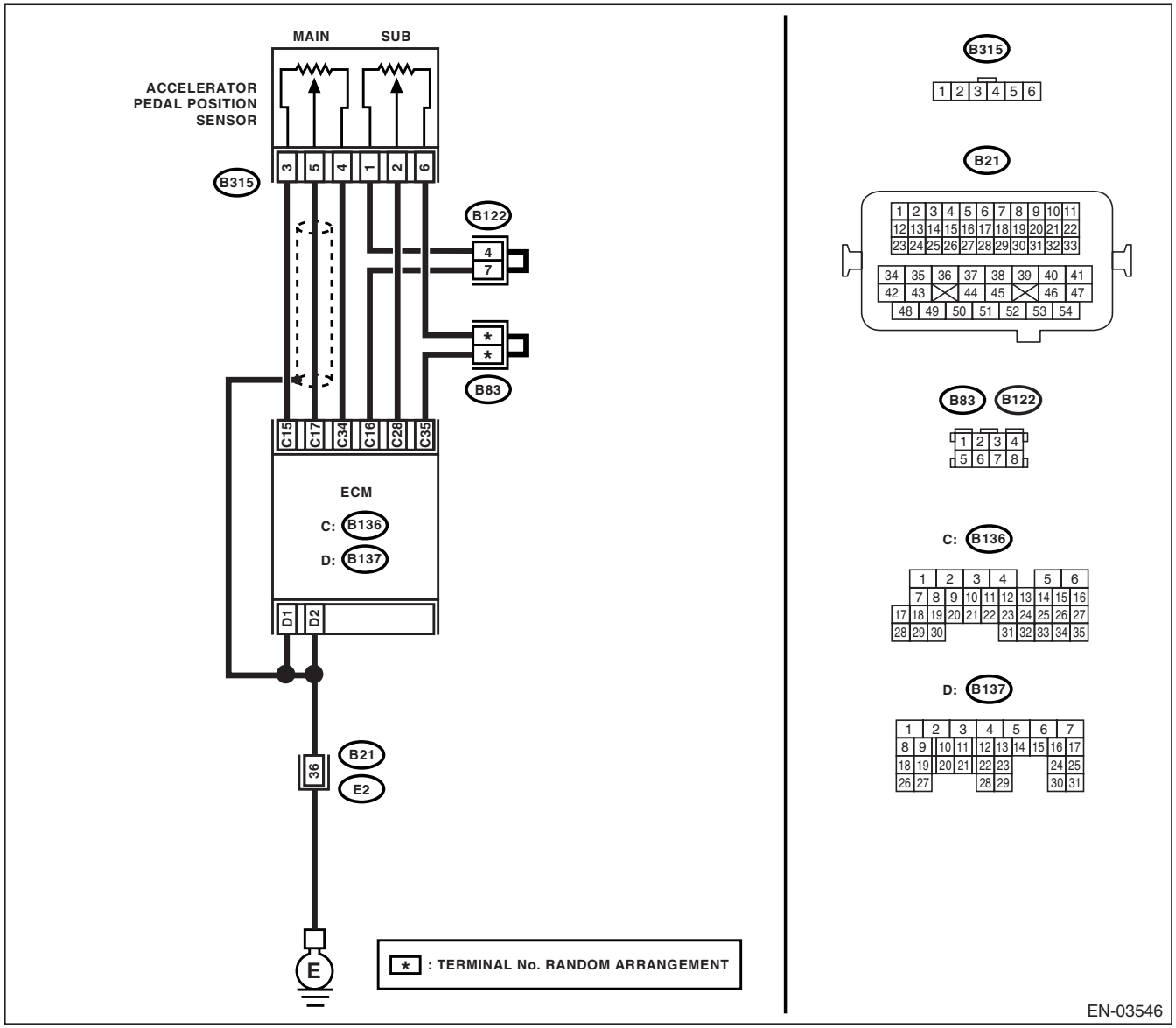
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

BS:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

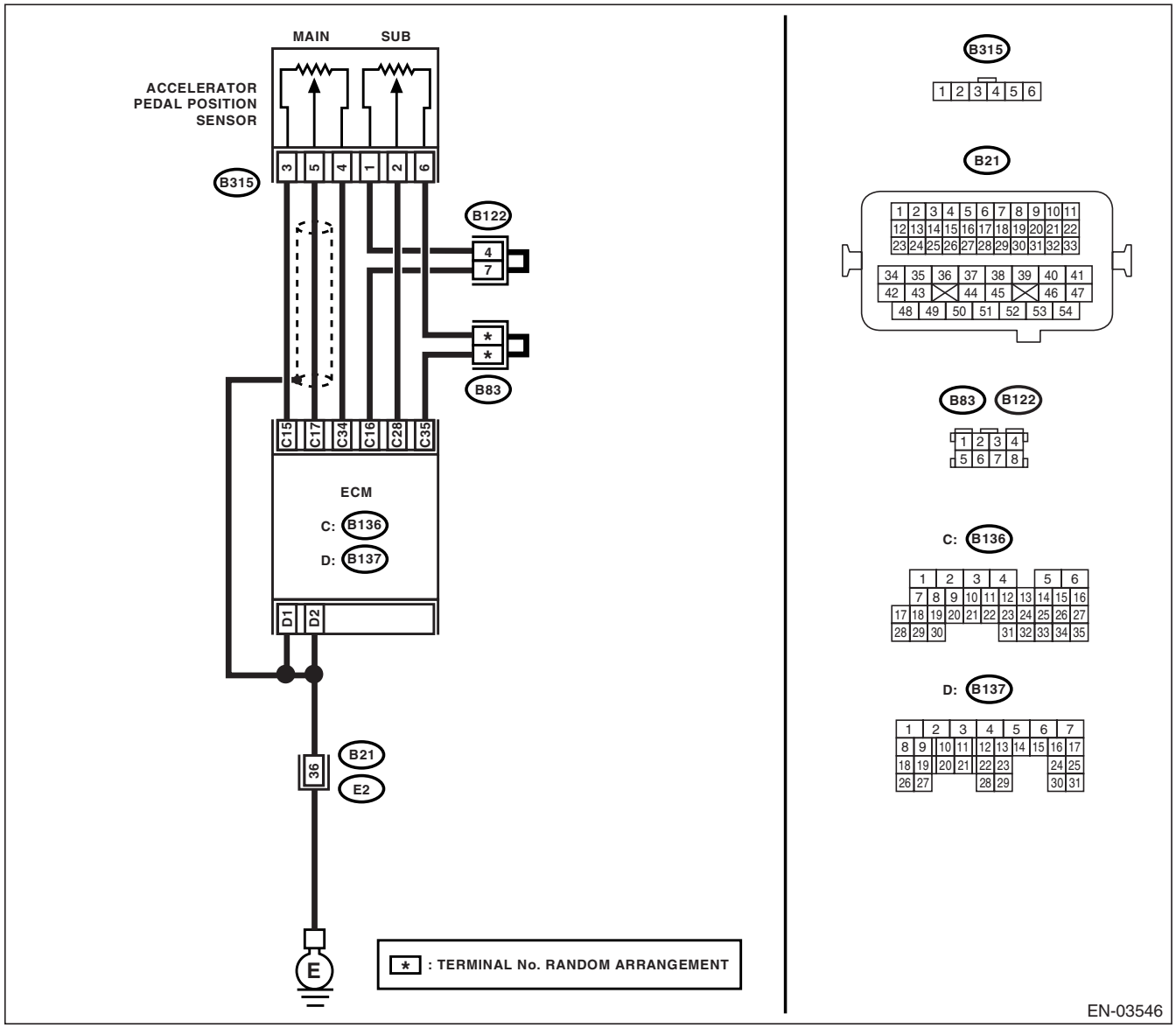
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.15 — 0.63 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.28 — 1.68 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

BT:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

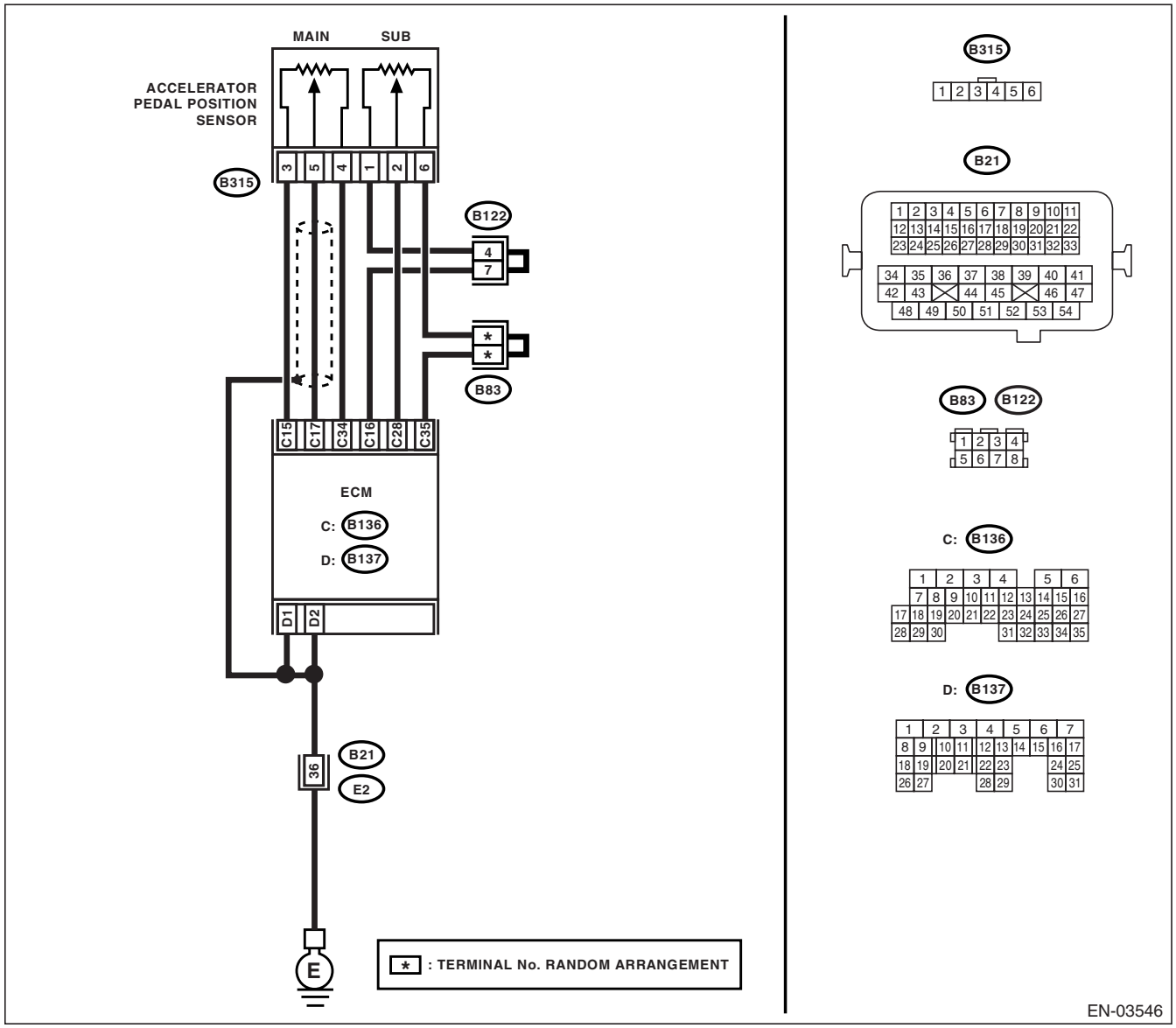
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B137) No. 28 — (B137) No. 15:*** ***(B137) No. 28 — (B137) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

BU:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE CORRELATION

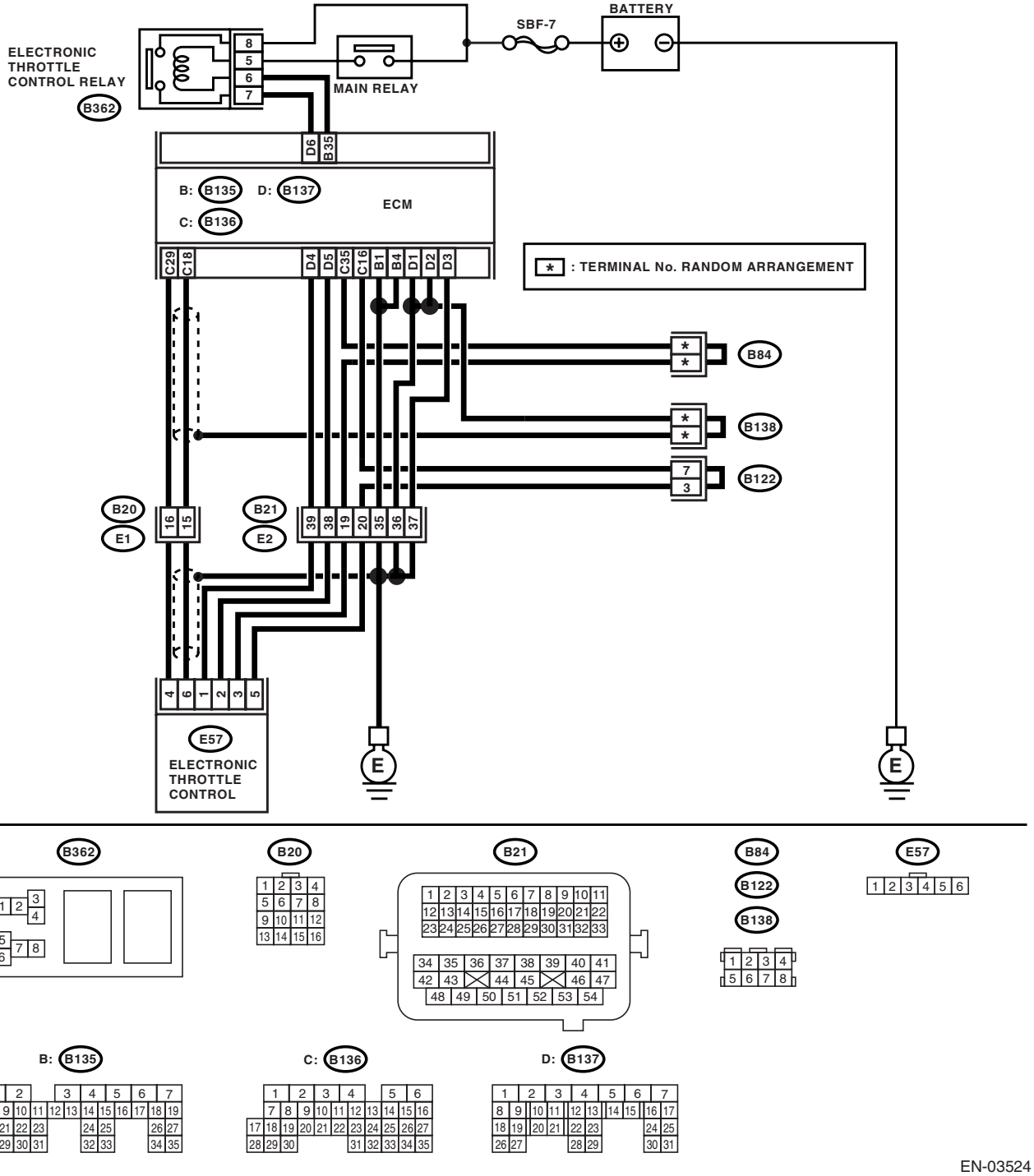
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK SENSOR OUTPUT.** Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):***	Is the voltage more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
7	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>

	Step	Check	Yes	No
8	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **10.**	Go to step **11.**
10	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit of harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
13	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **14.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **15.**	Repair the short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Repair the short circuit to sensor power supply.
16	**CHECK ELECTRONIC THROTTLE CONTROL HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Repair the short circuit of harness.

BV:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE CORRELATION

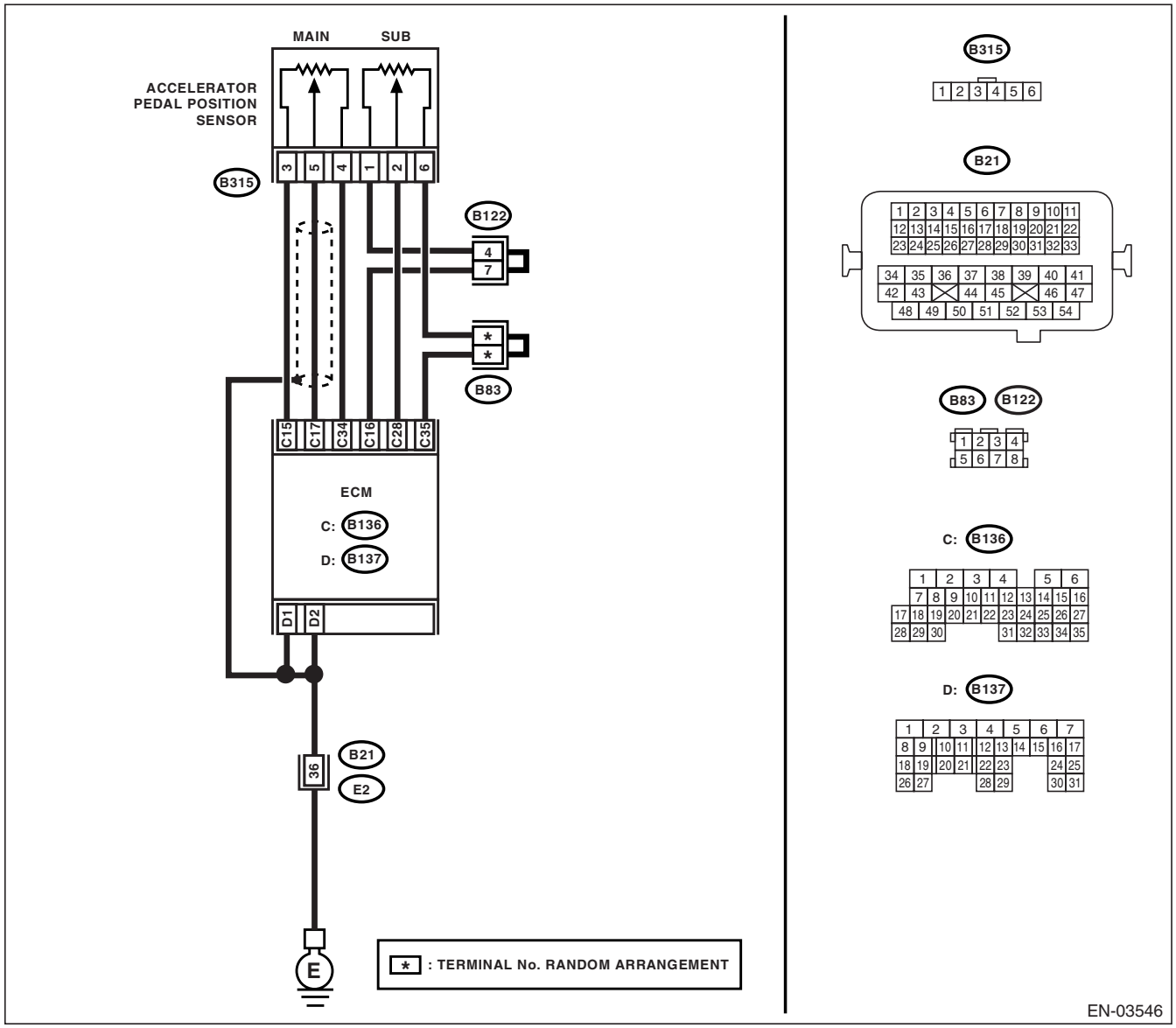
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **12.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (−):*** ***(B315) No. 1 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 0.8 kΩ?	Go to step **9.**	Replace the accelerator pedal position sensor.
9	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **10.**	Replace the accelerator pedal position sensor.
10	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with depressing the accelerator pedal. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Go to step **11.**	Replace the accelerator pedal position sensor.
11	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with depressing the accelerator pedal. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.28 — 1.68 kΩ?	Go to step **12.**	Replace the accelerator pedal position sensor.
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-24, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **18.**

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit of harness connector.
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 4 — Chassis ground:*** ***(B315) No. 6 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (−):*** ***(B315) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 6 V?	Go to step **17.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
17	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:*** ***(B136) No. 28 — (B136) No. 15:*** ***(B136) No. 28 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Repair the short circuit to sensor power supply.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).>	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

BW:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:
Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P2228 displayed on the Subaru Select Monitor?	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is integrated into ECM.	Temporary poor contact occurs.

BX:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:
Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-30, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P2229 displayed on the Subaru Select Monitor?	Replace the ECM. <Ref. to FU(H4DOTC)-34, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is integrated into ECM.	Temporary poor contact occurs.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-93, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls, engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surging	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.