

ENGINE SECTION 1

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.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4SO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4SO)
INTAKE (INDUCTION)	IN(H4SO)
MECHANICAL	ME(H4SO)
EXHAUST	EX(H4SO)
COOLING	CO(H4SO)
LUBRICATION	LU(H4SO)
SPEED CONTROL SYSTEMS	SP(H4SO)
IGNITION	IG(H4SO)
STARTING/CHARGING SYSTEMS	SC(H4SO)
ENGINE (DIAGNOSTICS)	EN(H4SO)(diag)
FUEL INJECTION (FUEL SYSTEMS)	FU(H4SOw/oOBD)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4SOw/oOBD)
INTAKE (INDUCTION)	IN(H4SOw/oOBD)
MECHANICAL	ME(H4SOw/oOBD)
EXHAUST	EX(H4SOw/oOBD)
COOLING	CO(H4SOw/oOBD)

ENGINE SECTION 1

LUBRICATION

LU(H4SOw/oOBD)

SPEED CONTROL SYSTEMS

SP(H4SOw/oOBD)

IGNITION

IG(H4SOw/oOBD)

STARTING/CHARGING SYSTEMS

SC(H4SOw/oOBD)

ENGINE (DIAGNOSTICS)

EN(H4SOw/oOBD)
(diag)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO)

	Page
1. General Description	2
2. Throttle Body	15
3. Intake Manifold	16
4. Engine Coolant Temperature Sensor.....	27
5. Crankshaft Position Sensor.....	28
6. Camshaft Position Sensor.....	29
7. Knock Sensor	30
8. Throttle Position Sensor	31
9. Manifold Absolute Pressure Sensor.....	33
10. Intake Air Temperature Sensor	34
11. Idle Air Control Solenoid Valve	35
12. EGR Valve	36
13. Air Assist Injector Solenoid Valve	37
14. Fuel Injector	38
15. Front Oxygen (A/F) Sensor	43
16. Rear Oxygen Sensor.....	45
17. Engine Control Module (ECM)	47
18. Main Relay	48
19. Fuel Pump Relay.....	49
20. Fuel	50
21. Fuel Tank	51
22. Fuel Filler Pipe	53
23. Fuel Pump	57
24. Fuel Level Sensor	59
25. Fuel Filter	60
26. Fuel Cut Valve.....	61
27. Fuel Damper Valve	62
28. Fuel Delivery, Return and Evaporation Lines.....	63
29. Fuel System Trouble in General	66

General Description

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

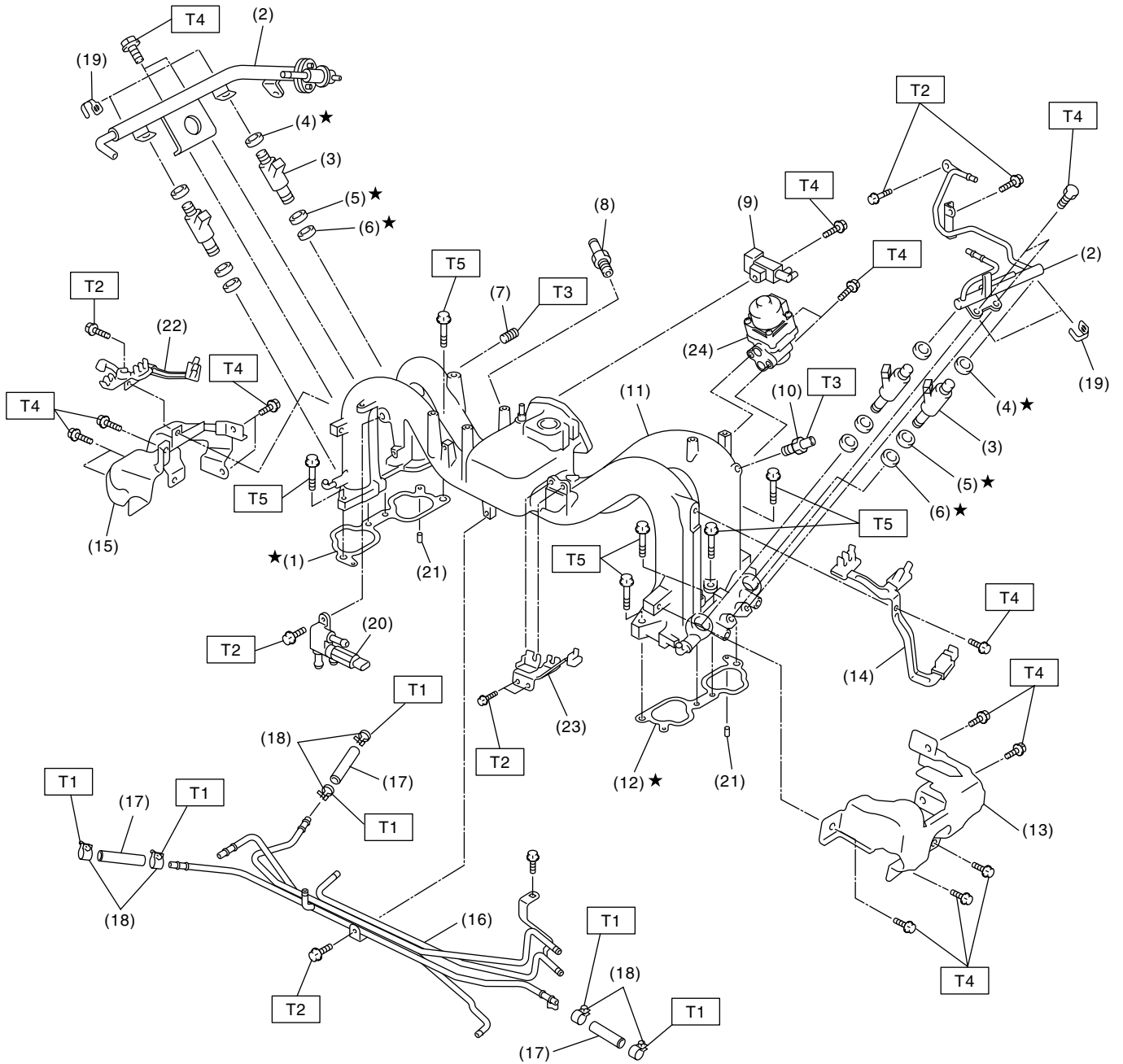
A: SPECIFICATIONS

Item		Specification
Fuel tank	Capacity	50 ℓ (13.2 US gal, 11.0 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm ² , 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

• 1.6 L MODEL



FU-02184

General Description

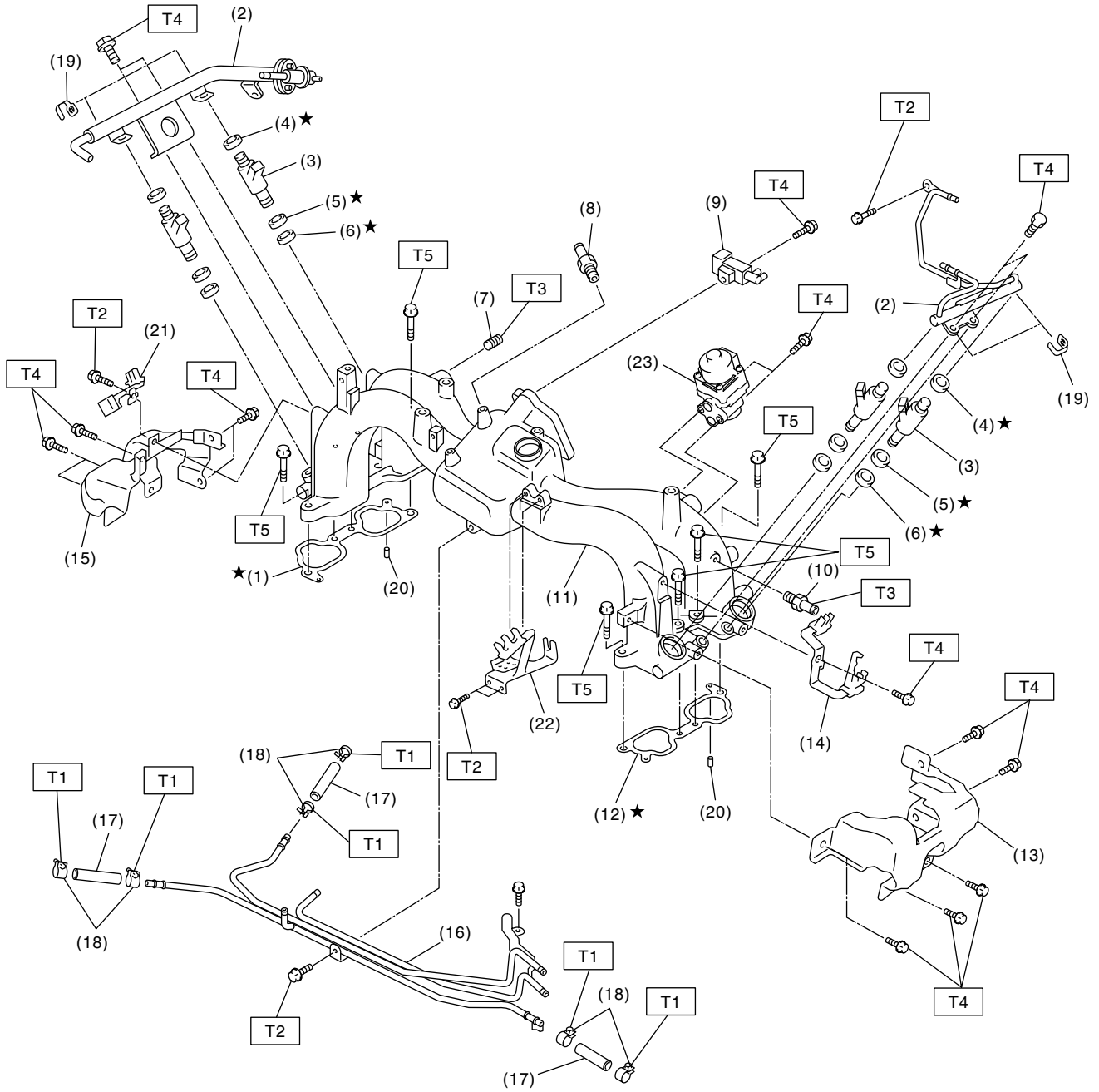
FUEL INJECTION (FUEL SYSTEMS)

(1) Intake manifold gasket RH	(12) Intake manifold gasket LH	(23) Accelerator cable bracket
(2) Fuel injector pipe	(13) Fuel pipe protector LH	(24) EGR valve
(3) Fuel injector	(14) Plug cord holder LH	
(4) O-ring	(15) Fuel pipe protector RH	<hr/> Tightening torque: N·m (kgf·m, ft·lb)
(5) O-ring	(16) Fuel pipe ASSY	T1: 1.5 (0.15, 1.1)
(6) O-ring	(17) Fuel hose	T2: 6.4 (0.65, 4.7)
(7) Plug	(18) Clip	T3: 17(1.7, 12.5)
(8) PCV valve	(19) Clip	T4: 19 (1.9, 14.0)
(9) Purge control solenoid valve	(20) Air assist injector solenoid valve	T5: 25 (2.5, 18.4)
(10) Nipple	(21) Guide pin	<hr/>
(11) Intake manifold	(22) Plug cord holder RH	

General Description

FUEL INJECTION (FUEL SYSTEMS)

• 2.0 L MODEL



FU-00954

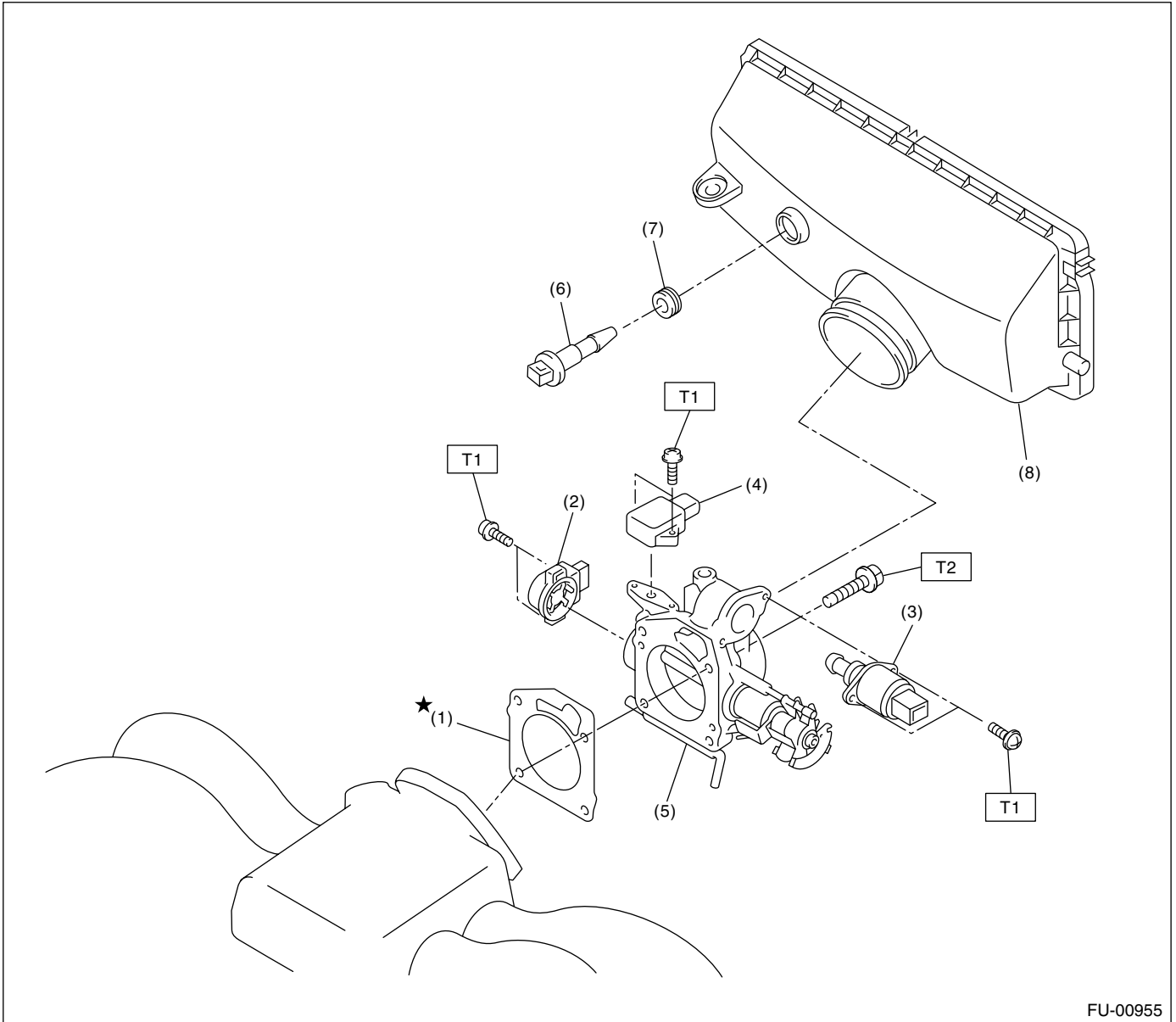
General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Intake manifold gasket RH	(11) Intake manifold	(21) Plug cord holder RH
(2) Fuel injector pipe	(12) Intake manifold gasket LH	(22) Accelerator cable bracket
(3) Fuel injector	(13) Fuel pipe protector LH	(23) EGR valve
(4) O-ring	(14) Plug cord holder LH	
(5) O-ring	(15) Fuel pipe protector RH	
(6) O-ring	(16) Fuel pipe ASSY	
(7) Plug	(17) Fuel hose	
(8) PCV valve	(18) Clip	
(9) Purge control solenoid valve	(19) Clip	
(10) Nipple	(20) Guide pin	

Tightening torque: N·m (kgf·m, ft·lb)**T1: 1.5 (0.15, 1.1)****T2: 6.4 (0.65, 4.7)****T3: 17 (1.7, 12.5)****T4: 19 (1.9, 13.7)****T5: 25 (2.5, 18.1)**

2. AIR INTAKE SYSTEM



- | | |
|---------------------------------------|-----------------------------------|
| (1) Gasket | (5) Throttle body |
| (2) Throttle position sensor | (6) Intake air temperature sensor |
| (3) Idle air control solenoid valve | (7) Grommet |
| (4) Manifold absolute pressure sensor | (8) Air cleaner case |

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

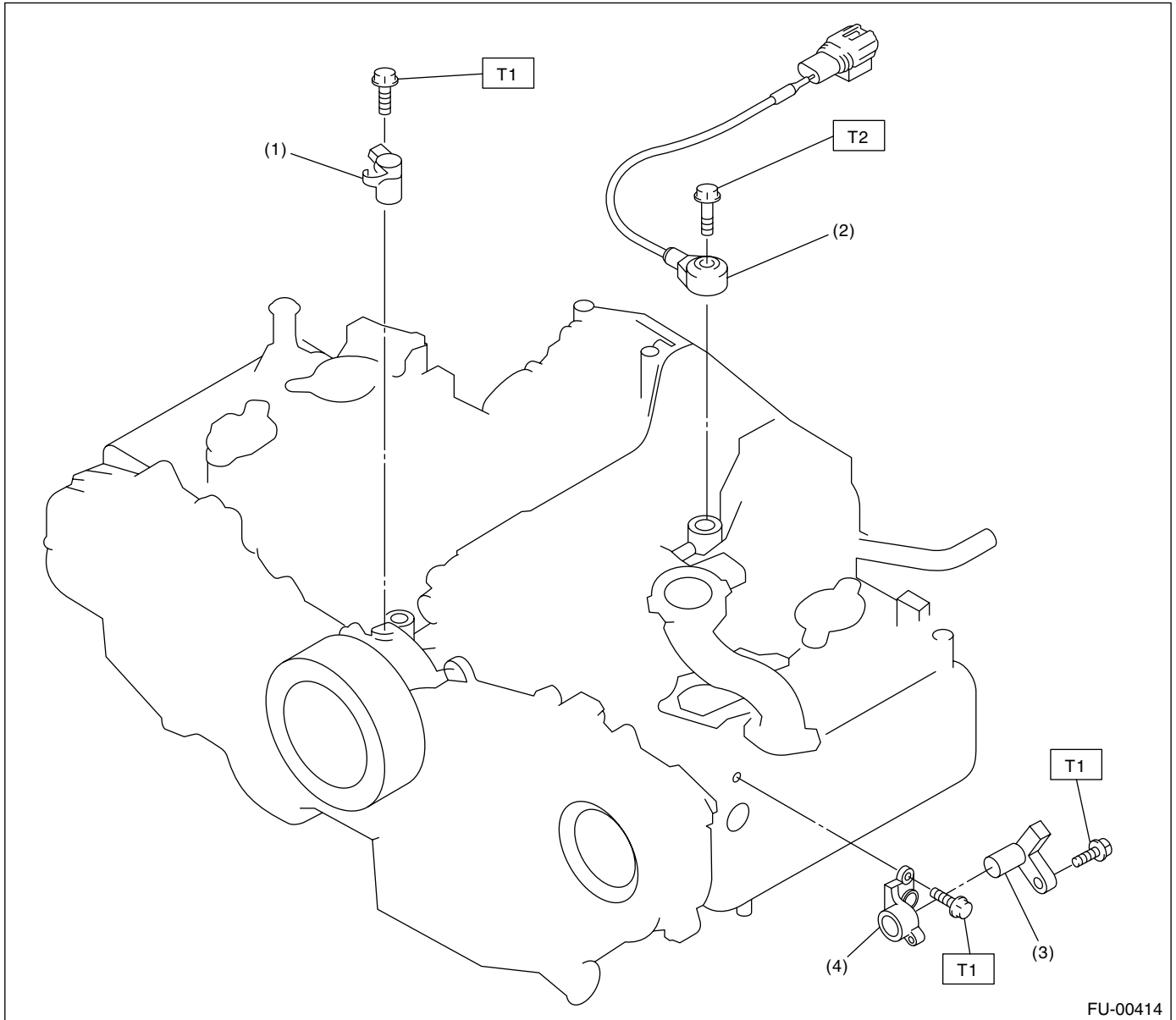
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 15.9)

General Description

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



- (1) Crankshaft position sensor
- (2) Knock sensor
- (3) Camshaft position sensor

- (4) Camshaft position sensor support

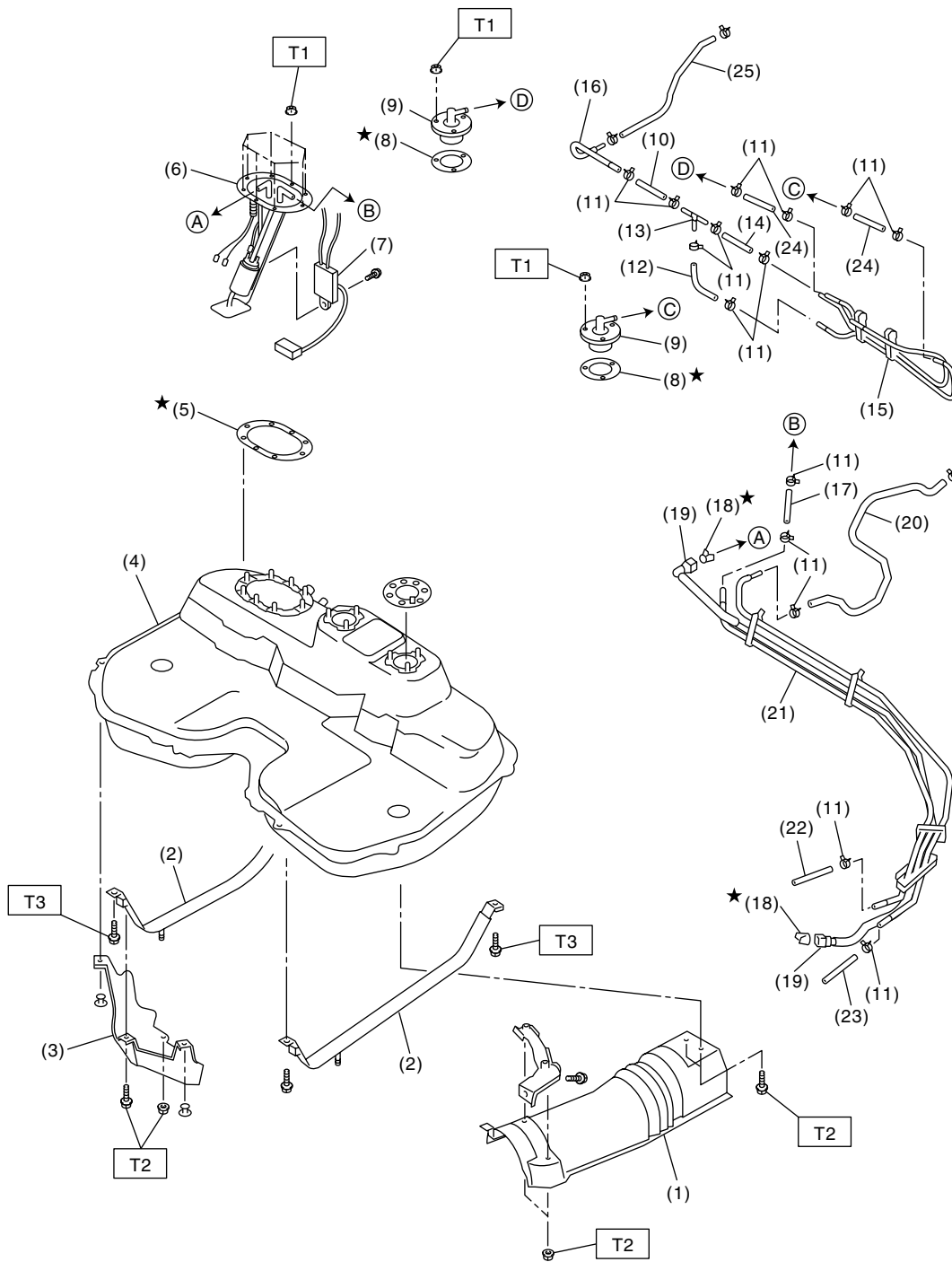
Tightening torque: N-m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

General Description

4. FUEL TANK



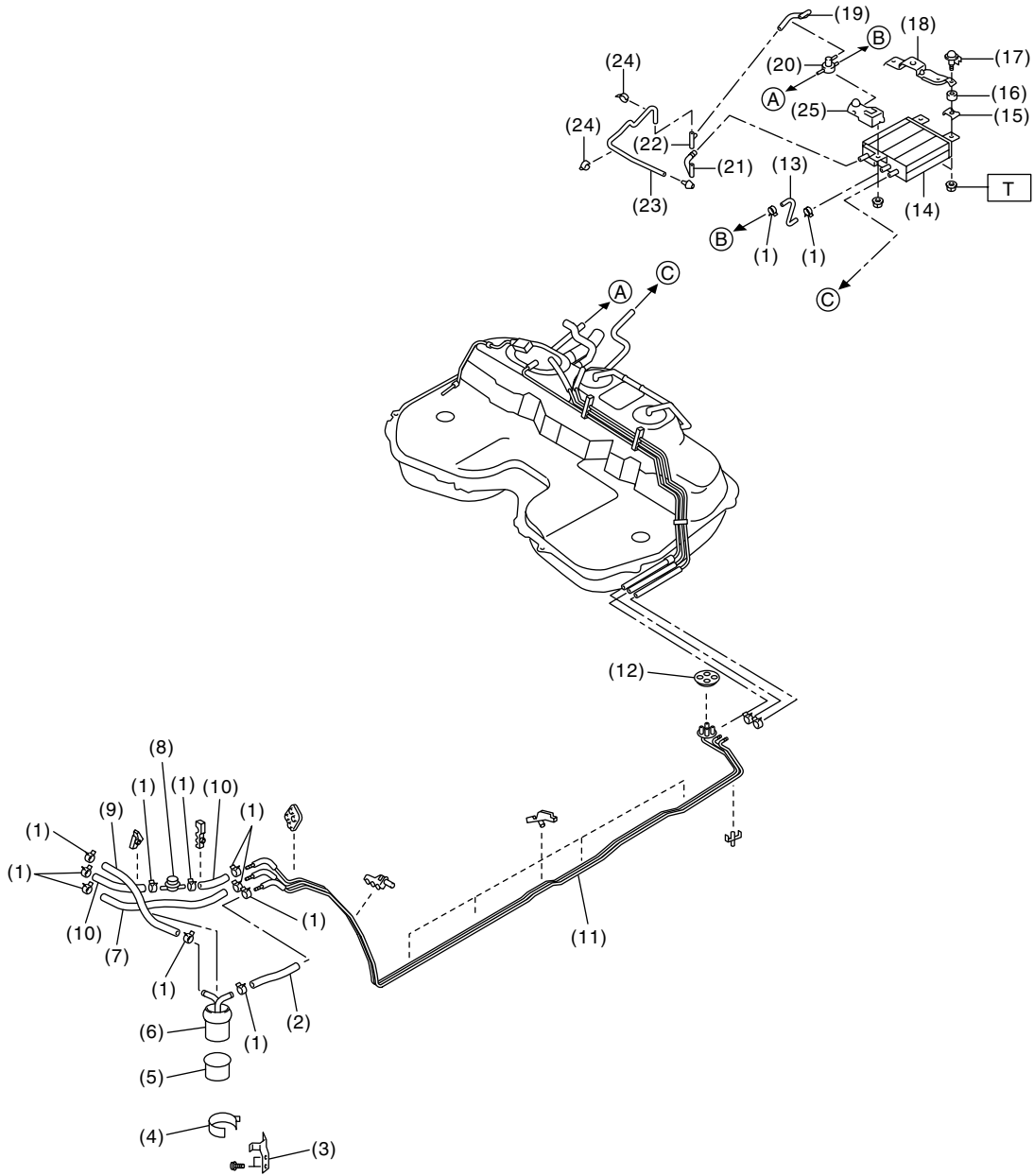
FU-00908

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(11) Clip	(21) Fuel pipe ASSY
(2) Fuel tank band	(12) Evaporation hose B	(22) Fuel return hose B
(3) Protector RH	(13) Joint pipe	(23) Evaporation hose E
(4) Fuel tank	(14) Evaporation hose C	(24) Evaporation hose F
(5) Fuel pump gasket	(15) Evaporation pipe ASSY	(25) Evaporation hose G
(6) Fuel pump ASSY	(16) Evaporation pipe	
(7) Fuel level sensor	(17) Fuel return hose A	<hr/>
(8) Fuel cut valve gasket	(18) Retainer	Tightening torque: N·m (kgf-m, ft-lb)
(9) Fuel cut valve	(19) Quick connector	T1: 4.4 (0.45, 3.3)
(10) Evaporation hose A	(20) Evaporation hose D	T2: 7.4 (0.75, 5.4)
		T3: 33 (3.4, 24.3)

5. FUEL LINE



FU-00516

General Description

FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|--------------------------|--------------------------------|---------------------------------|
| (1) Clip | (11) Fuel pipe ASSY | (21) Two-way valve drain hose A |
| (2) Fuel delivery hose A | (12) Grommet | (22) Connector |
| (3) Fuel filter bracket | (13) Canister hose A | (23) Two-way valve drain hose B |
| (4) Fuel filter holder | (14) Canister | (24) Clamp |
| (5) Fuel filter cup | (15) Canister bracket plate | (25) Front canister bracket |
| (6) Fuel filter | (16) Cushion | |
| (7) Evaporation hose | (17) Canister bracket spacer | |
| (8) Fuel damper | (18) Rear canister bracket | |
| (9) Fuel delivery hose B | (19) Two-way valve return hose | |
| (10) Fuel return hose | (20) Two-way valve | |

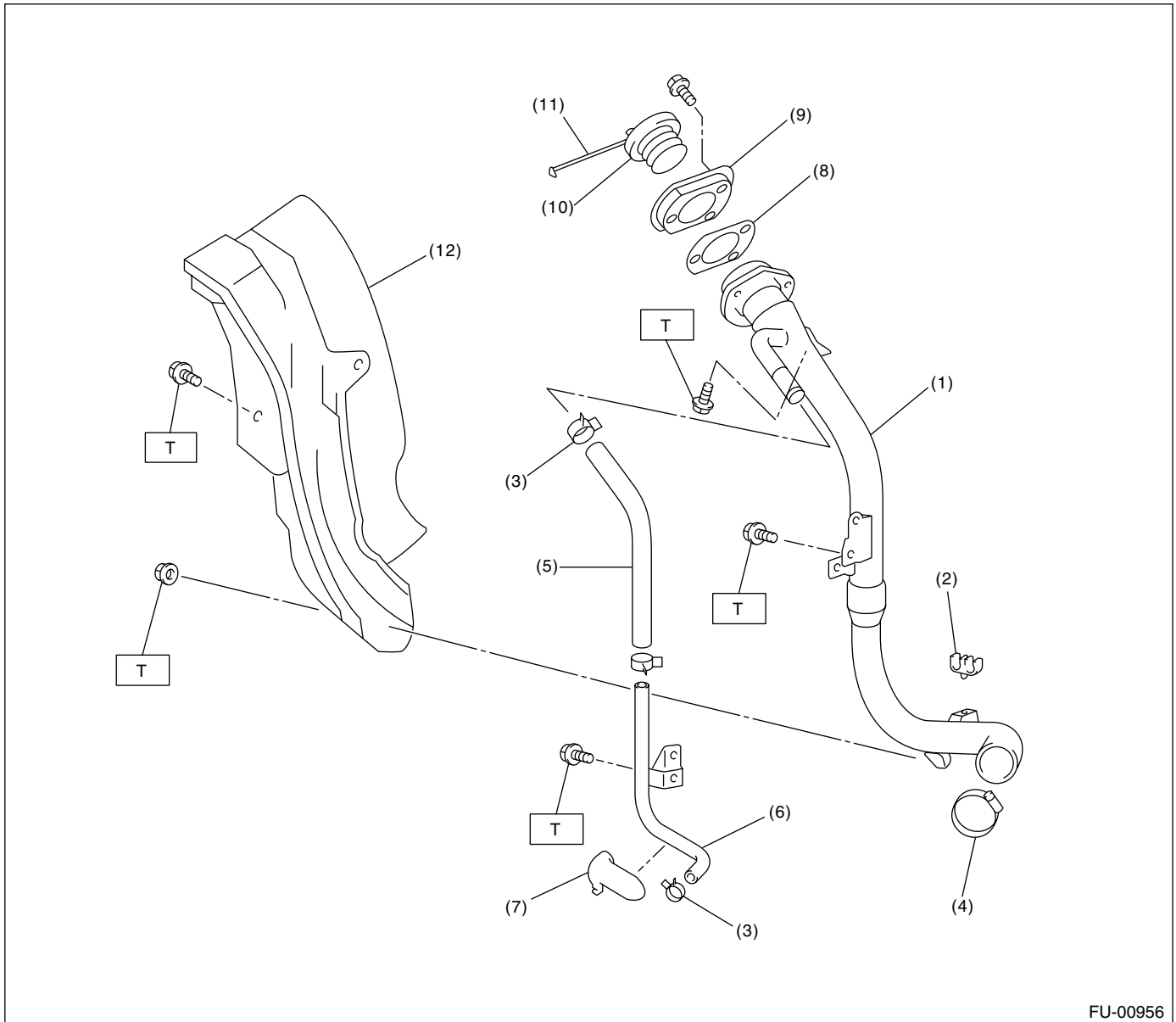
Tightening torque: N·m (kgf·m, ft·lb)

T: 23 (2.3, 17.0)

General Description

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-00956

- | | | |
|-----------------------------|--------------------------|----------------------------|
| (1) Fuel filler pipe ASSY | (6) Air vent pipe | (11) Filler cap tether |
| (2) Evaporation hose holder | (7) Air vent pipe holder | (12) Filler pipe protector |
| (3) Clip | (8) Filler pipe packing | |
| (4) Clamp | (9) Filler ring | |
| (5) Air vent hose | (10) Filler cap | |

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.4 (0.75, 5.4)

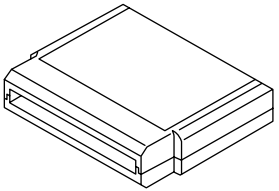

General Description

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

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

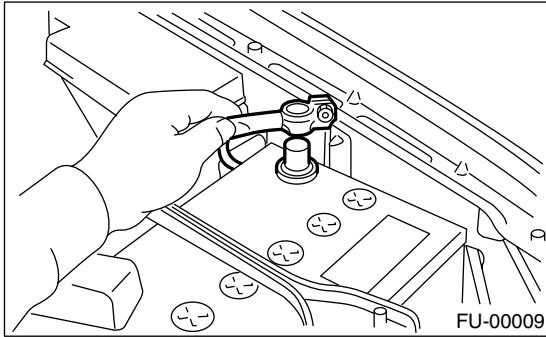
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical system.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. Throttle Body

A: REMOVAL

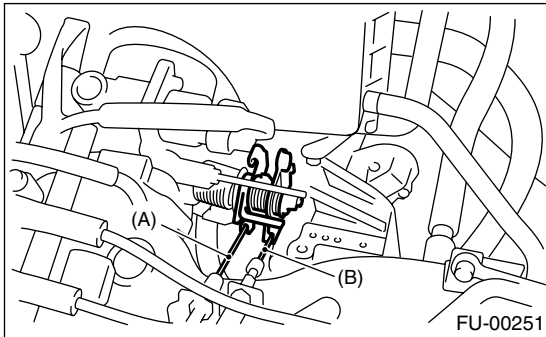
1) Disconnect the ground cable from battery.



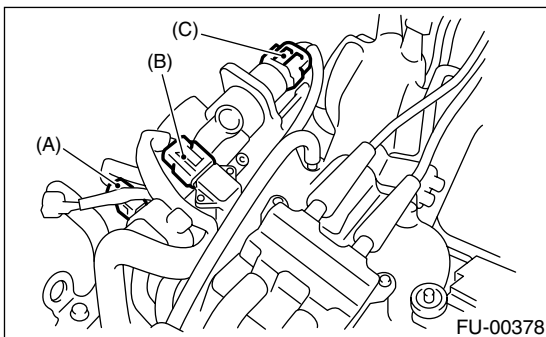
2) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

3) Disconnect the accelerator cable (A).

4) Disconnect the cruise control cable (B). (With cruise control model)

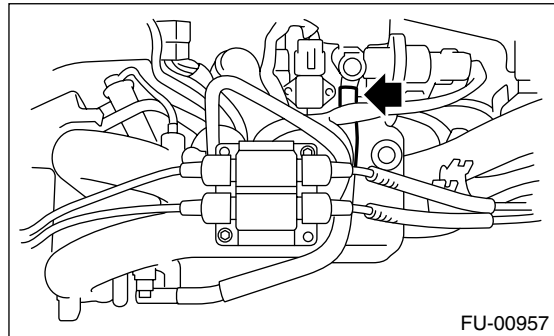


5) Disconnect the connectors from the idle air control solenoid valve, throttle position sensor and manifold absolute pressure sensor.



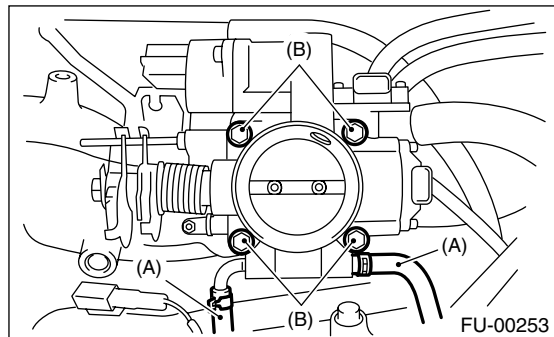
- (A) Throttle position sensor
- (B) Manifold absolute pressure sensor
- (C) Idle air control solenoid valve

6) Disconnect the air by-pass hose from throttle body. (1.6 L model)



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

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



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

- Replace the gasket with a new one.
- For tightening torque, refer to "COMPONENT". <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

2) Adjust the accelerator cable play. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>

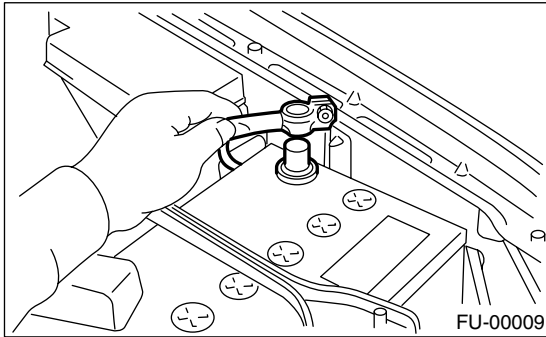
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

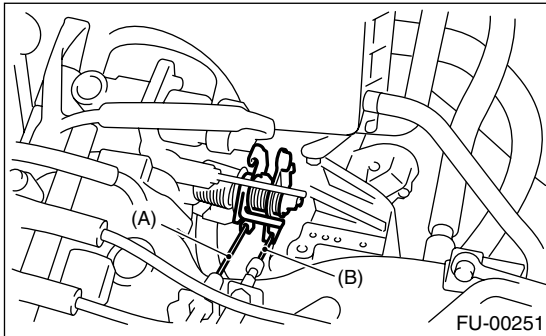
3. Intake Manifold

A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(H4SO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel flap lid, and then remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.



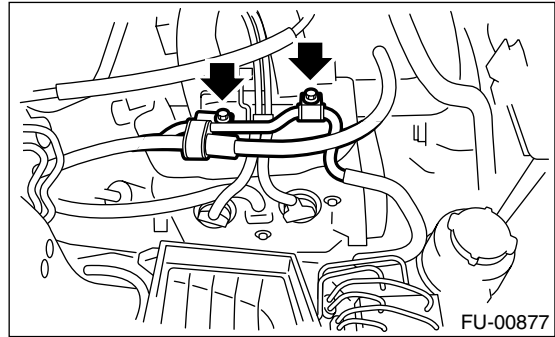
- 4) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 5) Disconnect the accelerator cable (A).
- 6) Disconnect the cruise control cable (B). (With cruise control model)



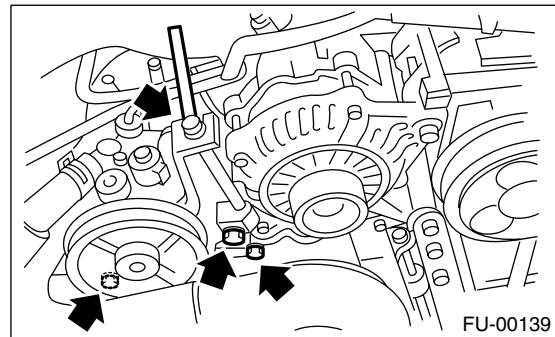
- 7) Remove the power steering pump and reservoir tank from bracket.
 - (1) Remove the resonator chamber. <Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
 - (2) Remove the front side V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
 - (3) Remove the bolts which hold the power steering pipes onto intake manifold protector.

NOTE:

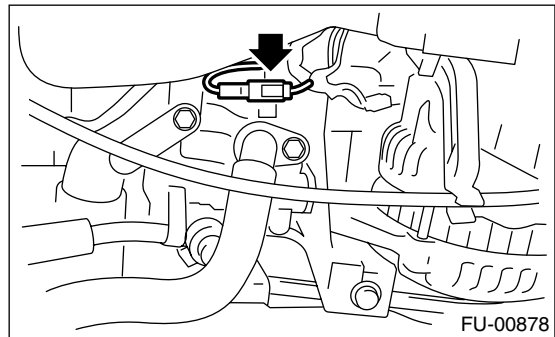
Do not disconnect the power steering hose.



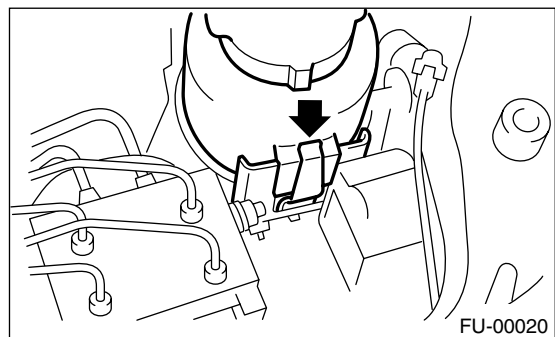
- (4) Remove the bolts which install the power steering pump bracket.



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



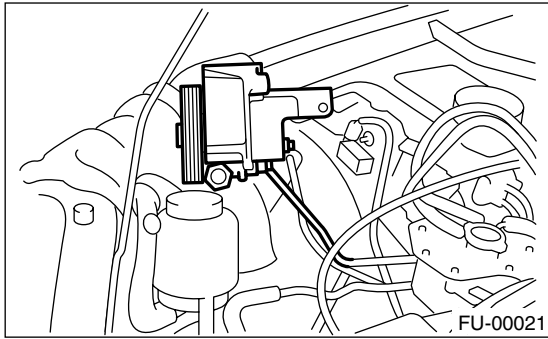
- (6) Remove the power steering tank from the bracket by pulling it upwards.



Intake Manifold

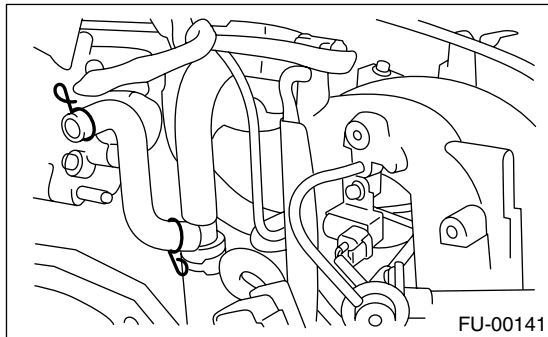
FUEL INJECTION (FUEL SYSTEMS)

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

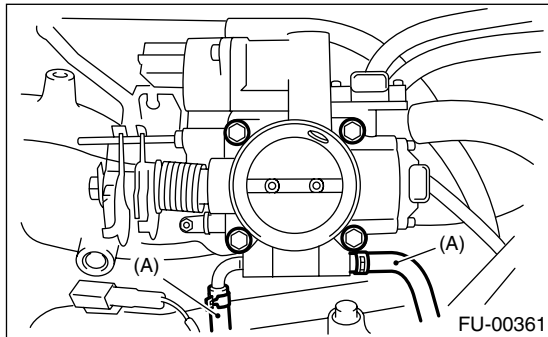


8) Disconnect the spark plug cords from spark plugs.

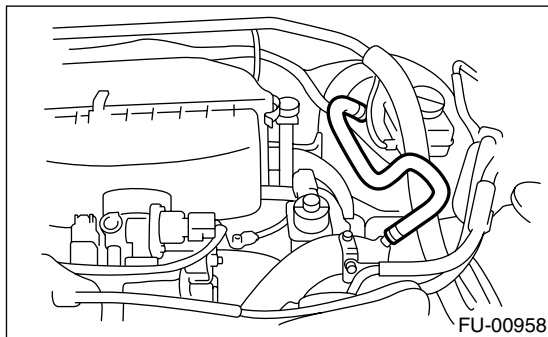
9) Disconnect the PCV hose from intake manifold.



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



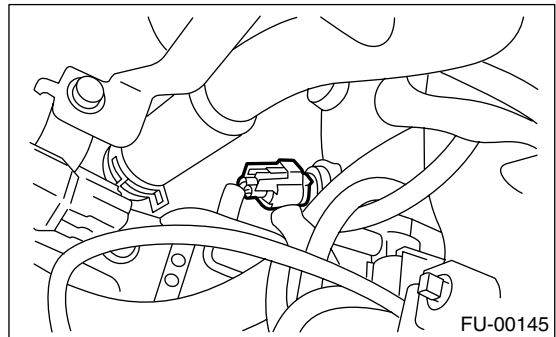
11) Disconnect the brake booster hose.



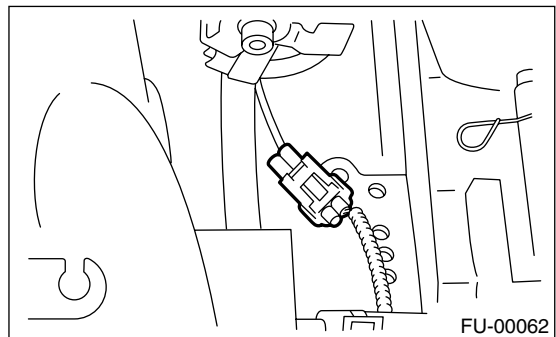
12) Remove the air cleaner case stay RH and engine harness bracket, and then disconnect the engine harness connectors from the bulkhead harness connectors.



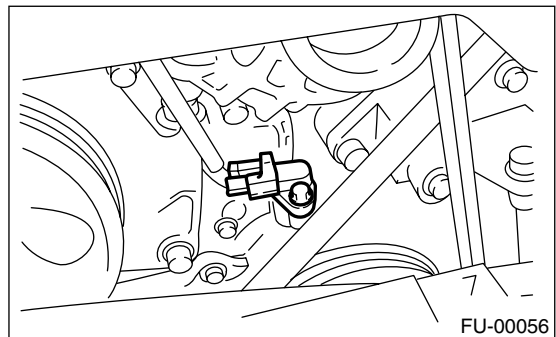
13) Disconnect the connectors from the engine coolant temperature sensor.



14) Disconnect the knock sensor connector.



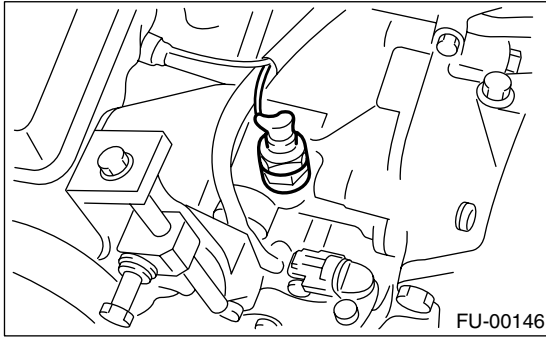
15) Disconnect the connector from the crankshaft position sensor.



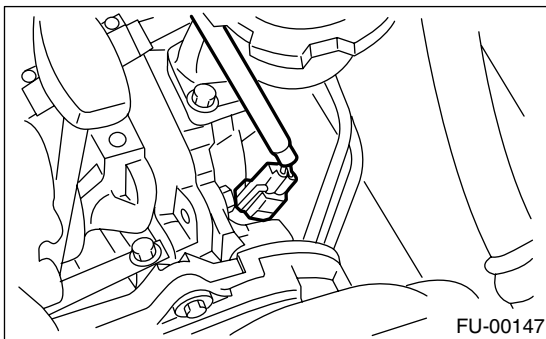
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

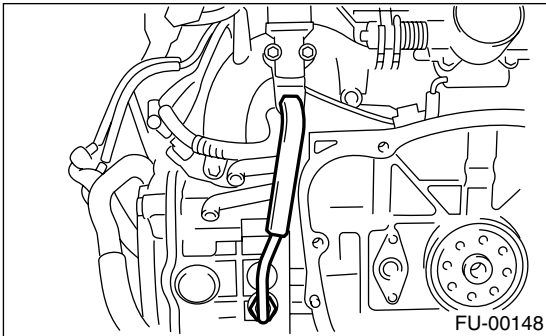
16) Disconnect the connector from the oil pressure switch.



17) Disconnect the connector from the camshaft position sensor.



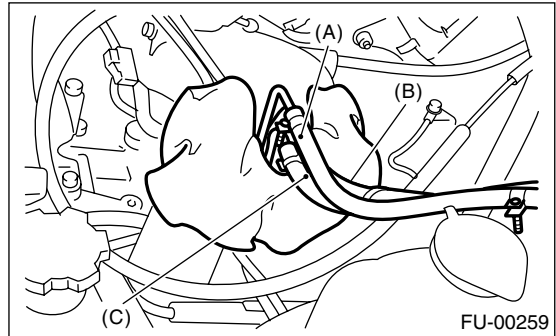
18) Remove the EGR pipe from intake manifold.



19) Disconnect the fuel hoses from fuel pipes.

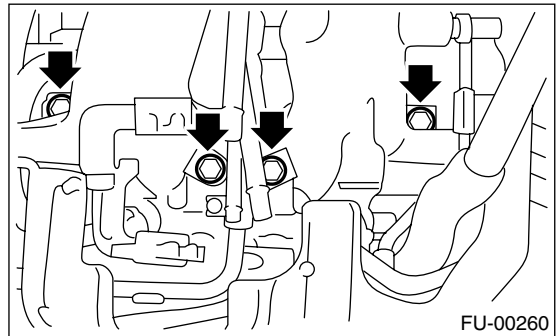
WARNING:

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



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

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



21) Remove the intake manifold.

B: INSTALLATION

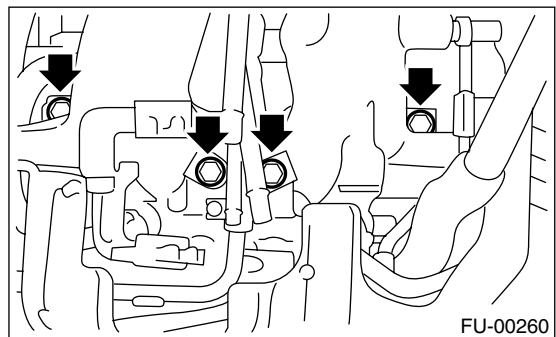
1) Install the intake manifold onto cylinder heads.

NOTE:

Replace the gaskets with new ones.

Tightening torque:

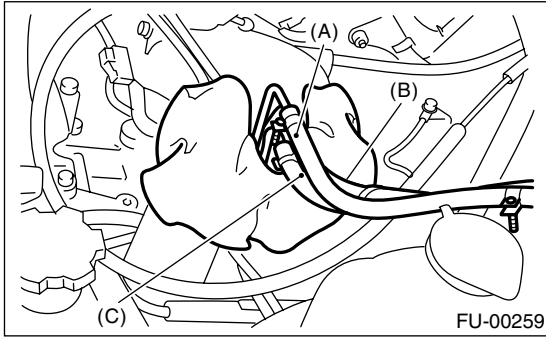
25 N·m (2.5 kgf-m, 18.1 ft-lb)



Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

2) Connect the fuel hoses.

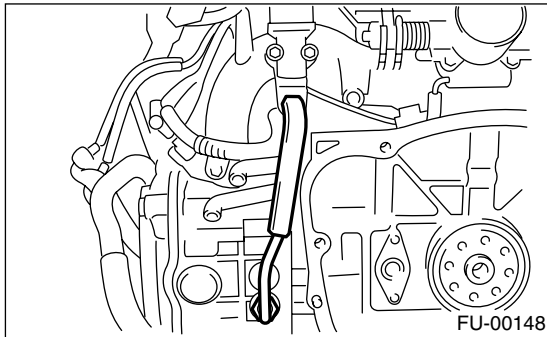


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

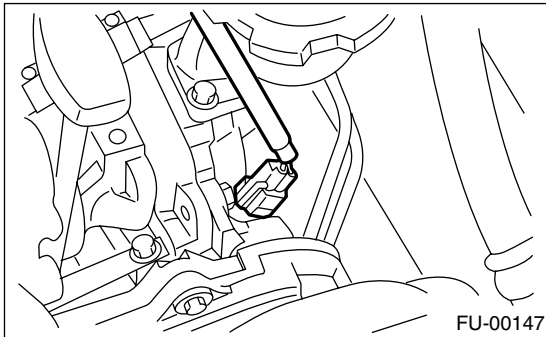
3) Connect the EGR pipe to intake manifold.

Tightening torque:

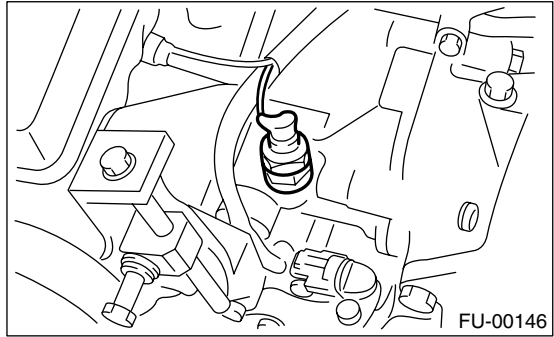
34 N·m (3.4 kgf·m, 24.6 ft·lb)



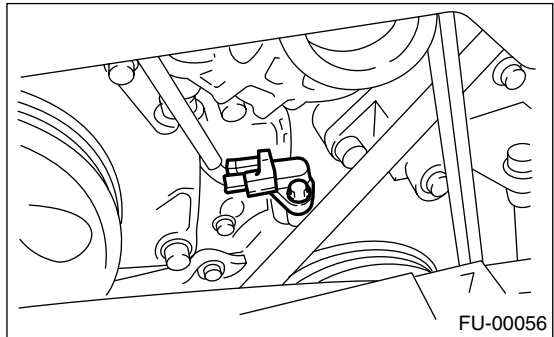
4) Connect the connector to the camshaft position sensor.



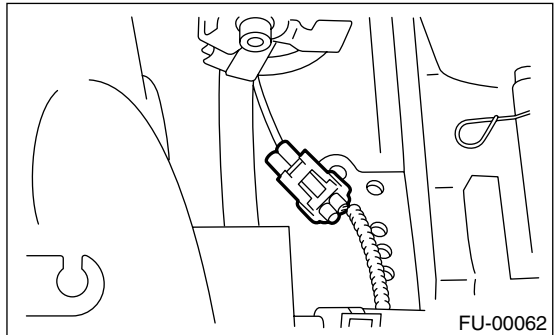
5) Connect the connector to the oil pressure switch.



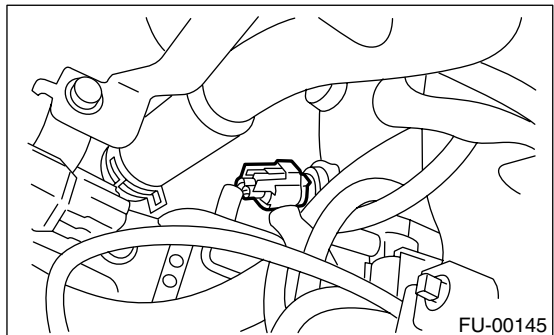
6) Connect the connector to the crankshaft position sensor.



7) Connect the knock sensor connector.



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



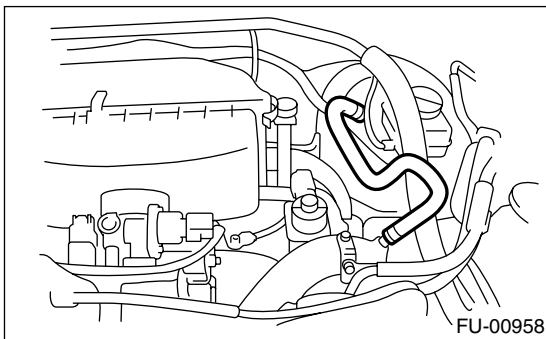
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

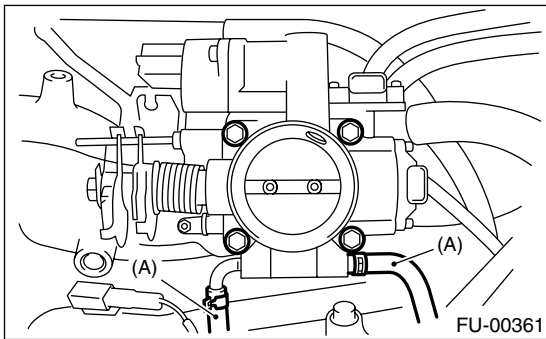
9) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to bulkhead connectors.



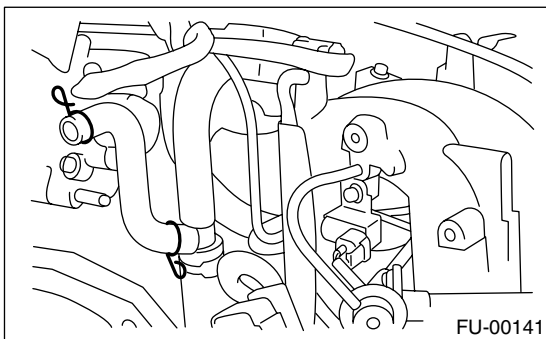
10) Connect the brake booster hose.



11) Connect the engine coolant hose (A) to throttle body.



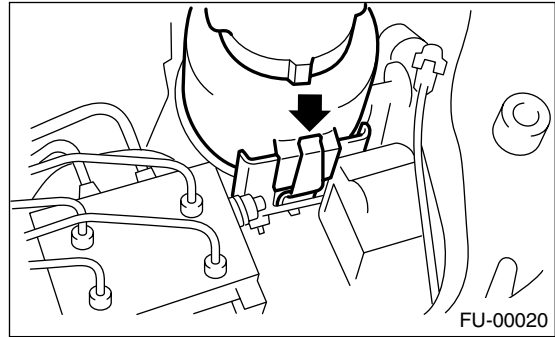
12) Connect the PCV hose to intake manifold.



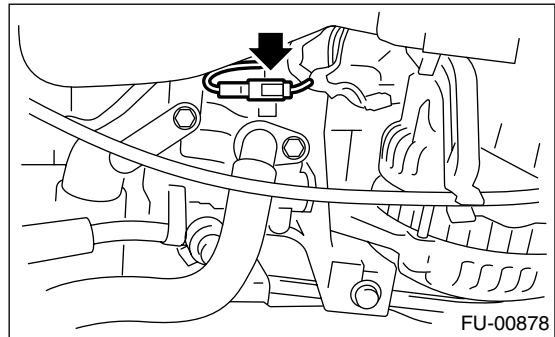
13) Connect the spark plug cords to spark plugs.

14) Install the power steering pump and reservoir tank to bracket.

(1) Install the reservoir tank to bracket.



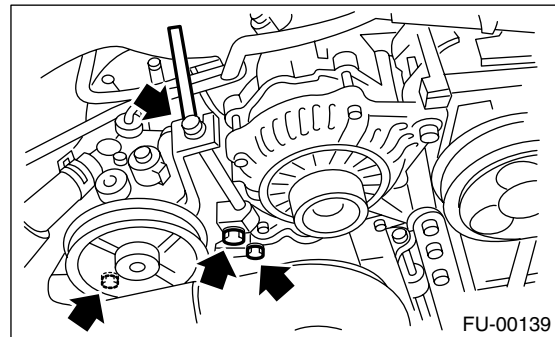
(2) Connect the connector to the power steering pump switch.



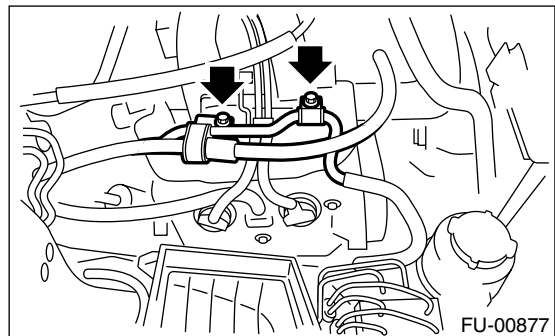
(3) Tighten the bolts which install the power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



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



Intake Manifold

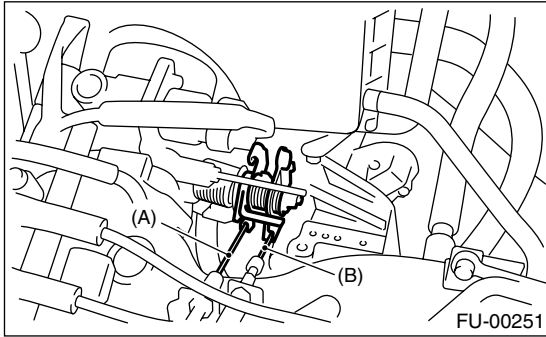
FUEL INJECTION (FUEL SYSTEMS)

(5) Install the front side V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

(6) Install the resonator chamber. <Ref. to IN(H4SO)-7, INSTALLATION, Resonator Chamber.>

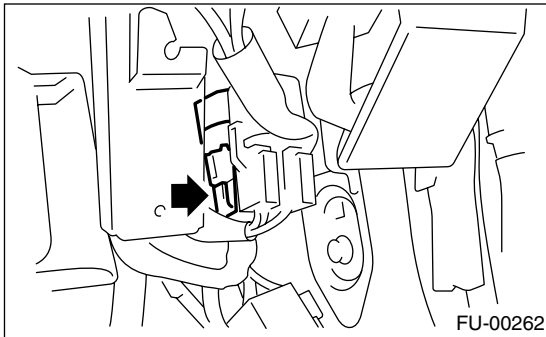
15) Connect the accelerator cable (A). <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>

16) Connect the cruise control cable (B). (With cruise control model)

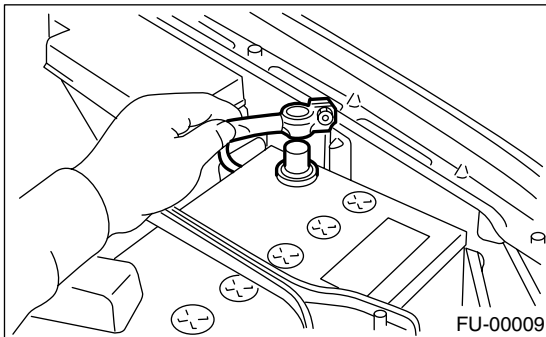


17) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>

18) Connect the connector to the fuel pump relay.

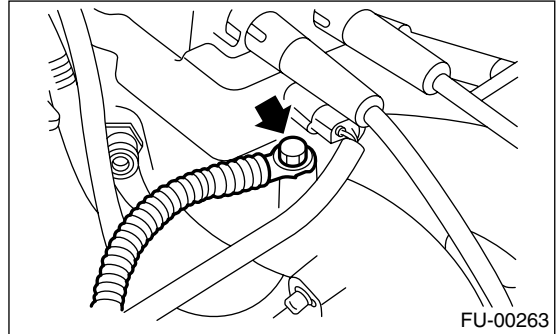


19) Connect the battery ground cable to battery.



C: DISASSEMBLY

1) Disconnect the engine ground terminal from intake manifold.



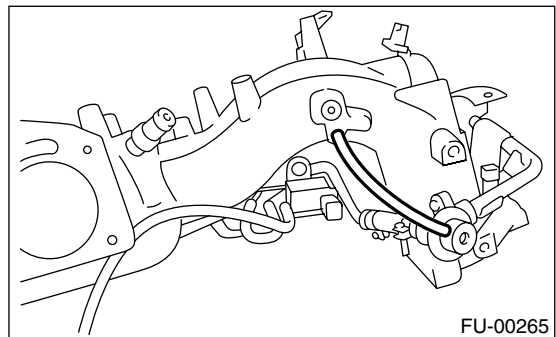
2) Disconnect the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-8, REMOVAL, Ignition Coil & Ignitor ASSY.>

3) Remove the throttle body. <Ref. to FU(H4SO)-15, REMOVAL, Throttle Body.>

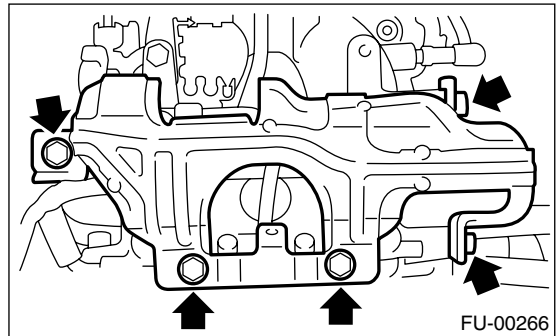
4) Remove the EGR valve. <Ref. to FU(H4SO)-36, REMOVAL, EGR Valve.>

5) Remove the air assist injector solenoid valve. (1.6 L model) <Ref. to FU(H4SO)-37, REMOVAL, Air Assist Injector Solenoid Valve.>

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



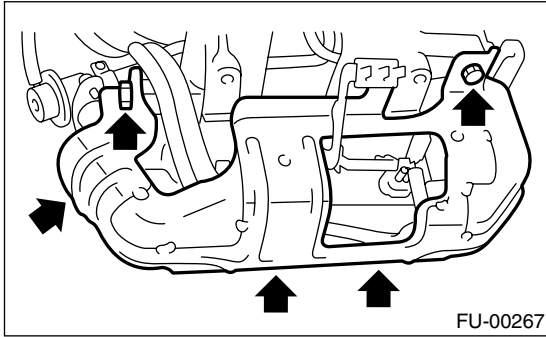
7) Remove the fuel pipe protector LH.



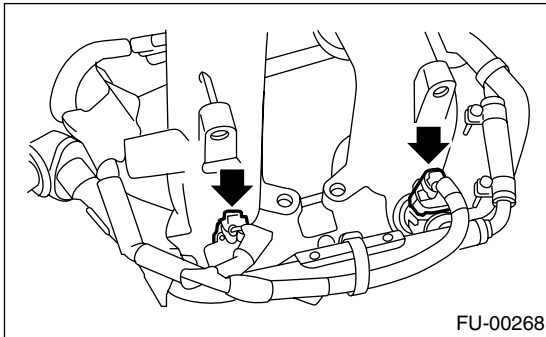
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

8) Remove the fuel pipe protector RH.

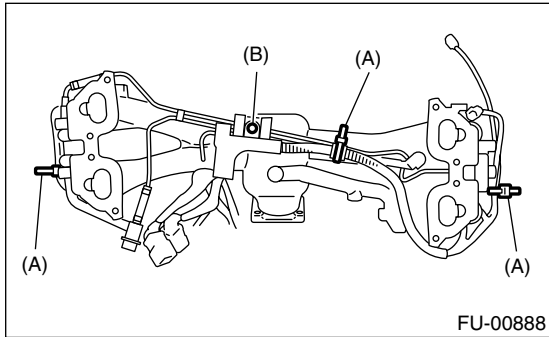


9) Disconnect the connectors from fuel injectors.



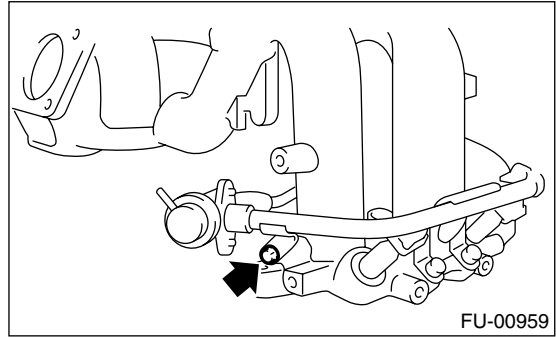
10) Disconnect the purge control solenoid valve.
<Ref. to EC(H4SO)-7, REMOVAL, Purge Control Solenoid Valve.>

11) Remove the harness bands (A) and bolts (B) which hold the engine harness onto intake manifold.

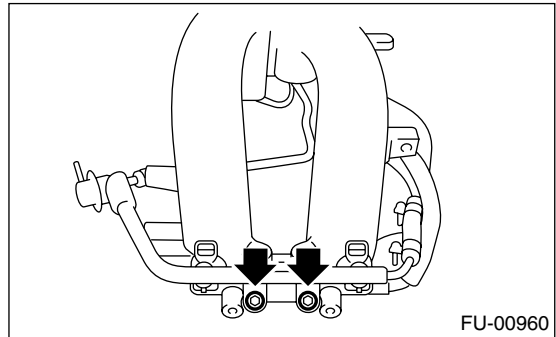


12) Remove the engine harness from the intake manifold.

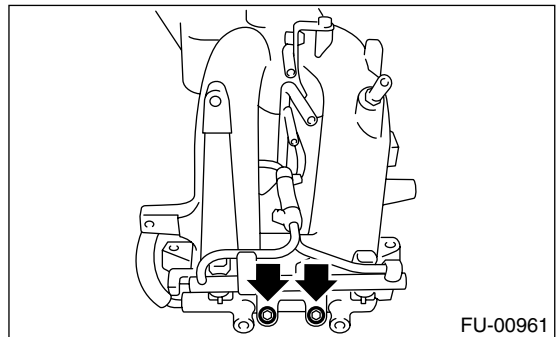
13) Remove the bolt which installs the fuel injector pipe on the intake manifold as shown in the figure.



• RH SIDE

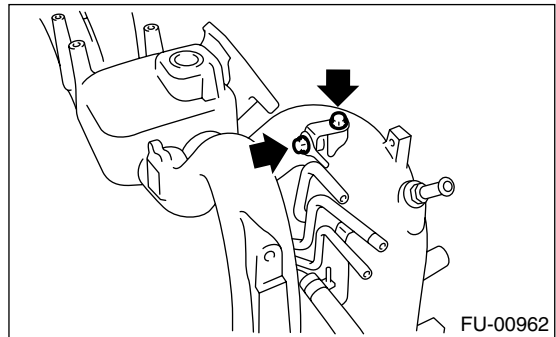


• LH SIDE



14) Remove the two bolts which hold the fuel pipes on intake manifold.

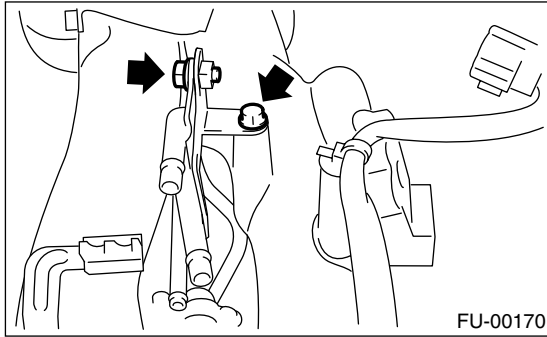
• 1.6 L MODEL



Intake Manifold

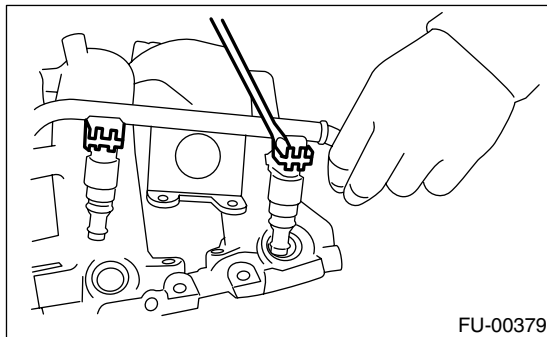
FUEL INJECTION (FUEL SYSTEMS)

• 2.0 L MODEL

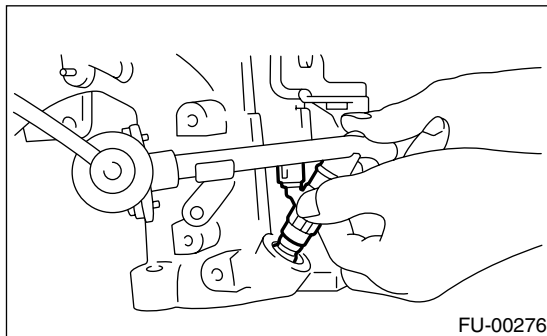


15) Remove the fuel injectors.

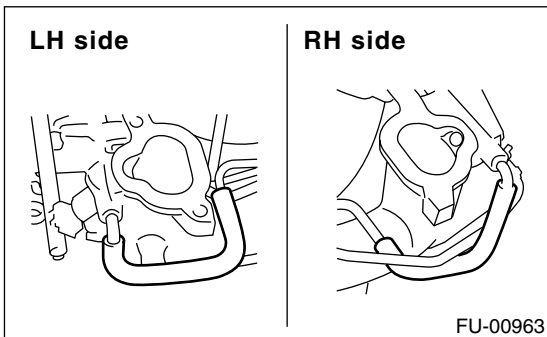
(1) Remove the fuel injector securing clip.



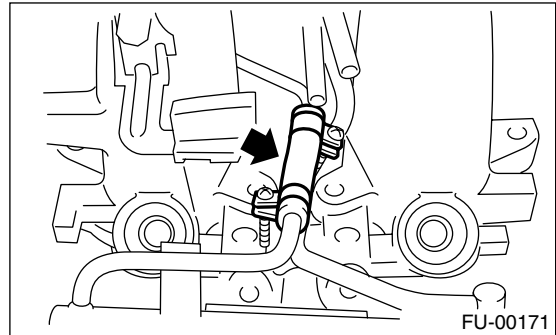
(2) Remove the fuel injector while lifting up the fuel injector pipe.



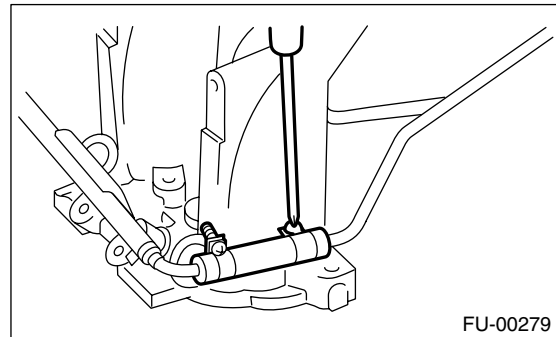
16) Disconnect the air by-pass hose from intake manifold. (1.6 L model)



17) Loosen the clamp which holds the fuel injector pipe LH to fuel hose, and then remove the pipe from fuel hose.

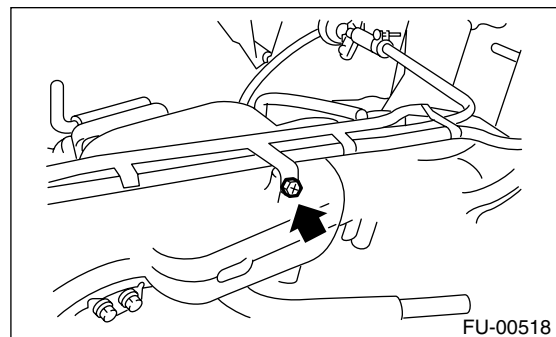


18) Loosen the clamp which holds the fuel injector pipe RH to fuel hose, and then remove the pipe from fuel hose.



19) Remove the fuel injector pipe.

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



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

D: ASSEMBLY

1) Install the fuel pipe assembly and pressure regulator, etc. to intake manifold.

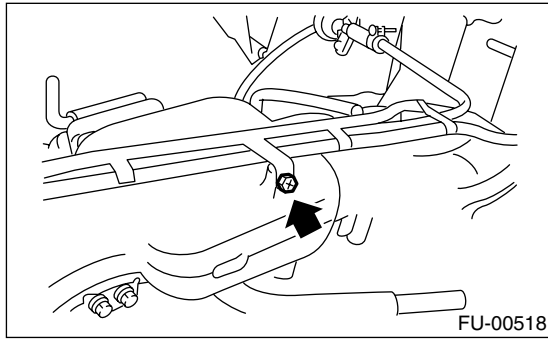
2) Tighten the bolt which installs the fuel pipes on intake manifold.

Intake Manifold

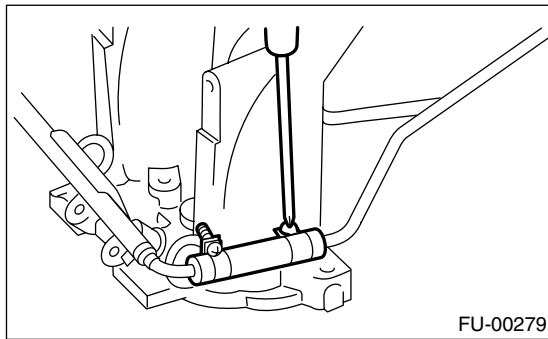
FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

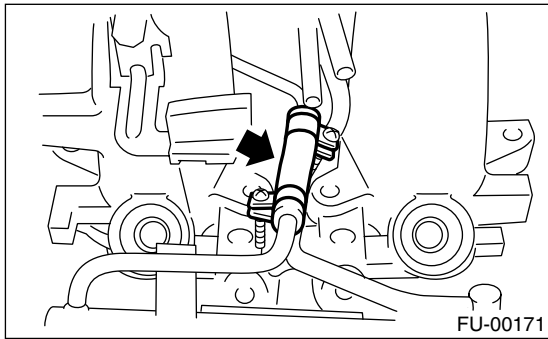
5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



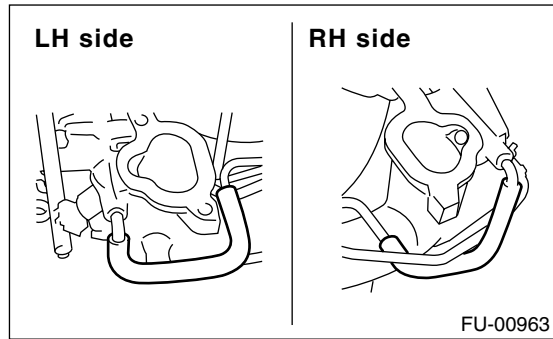
3) Connect the fuel injector pipe RH to fuel hose, and then tighten the clamp screw.



4) Connect the fuel injector pipe LH to fuel hose, and then tighten the clamp screw.



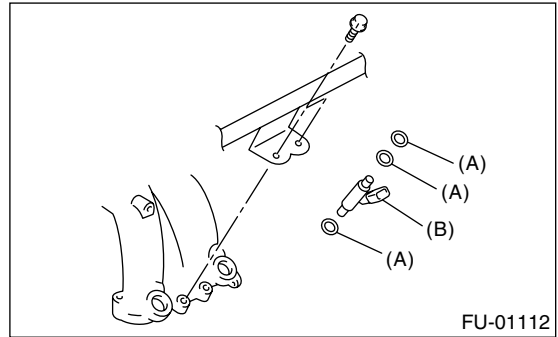
5) Connect the air by-pass hose. (1.6 L model)



6) Install the fuel injectors.

NOTE:

Replace the O-rings with new ones.

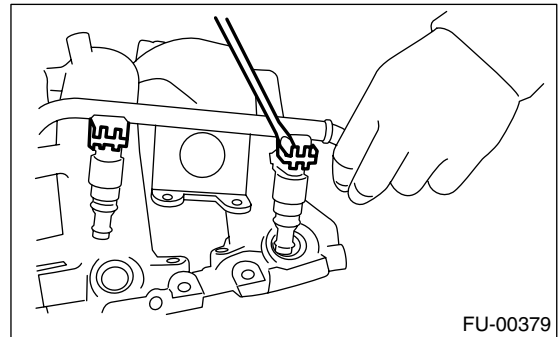


(A) O-ring

(B) Fuel injector

NOTE:

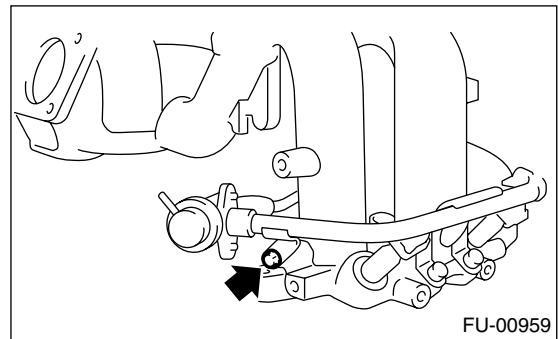
Do not forget to install the fuel injector securing clip.



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

Tightening torque:

5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



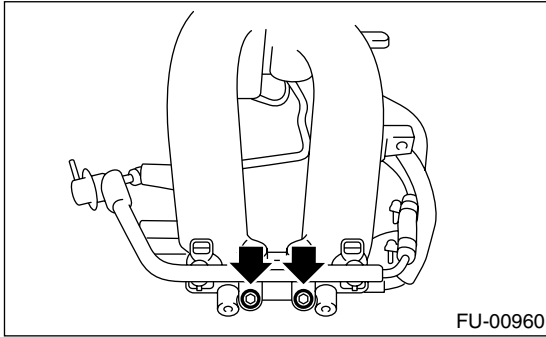
Tightening torque:

19 N-m (1.9 kgf-m, 13.7 ft-lb)

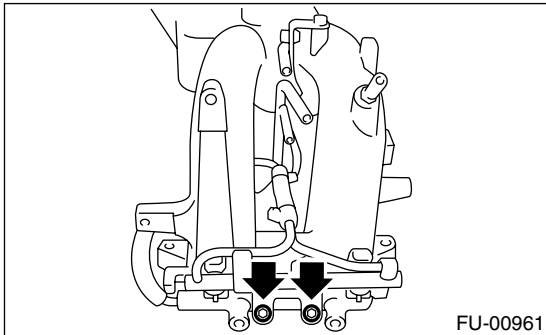
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

- RH SIDE



- LH SIDE

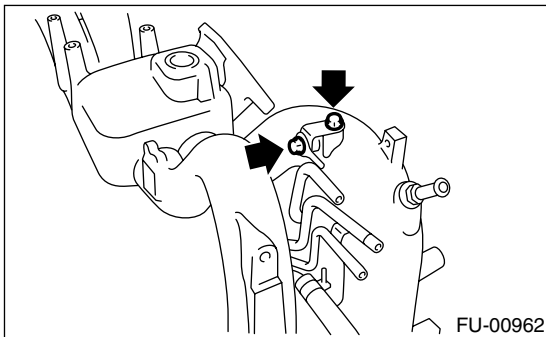


8) Tighten the two bolts which install the fuel pipes on intake manifold.

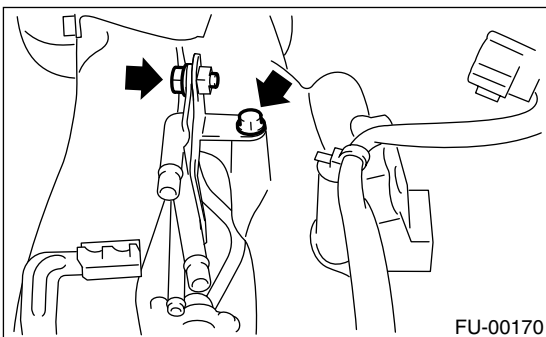
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

- 1.6 L MODEL

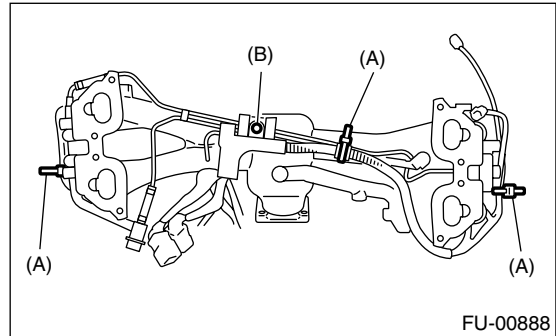


- 2.0 L MODEL

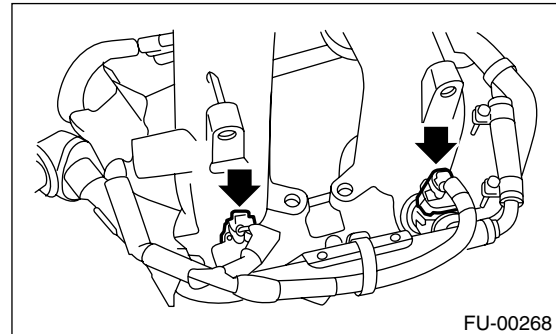


9) Install the engine harness onto intake manifold.

10) Hold the engine harness by harness bands (A) and bolts (B).



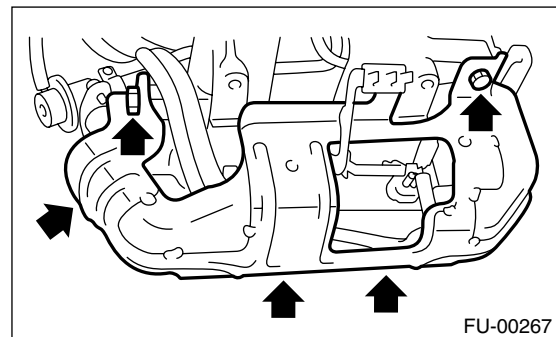
11) Connect the connector to fuel injector.



12) Install the fuel pipe protector RH.

Tightening torque:

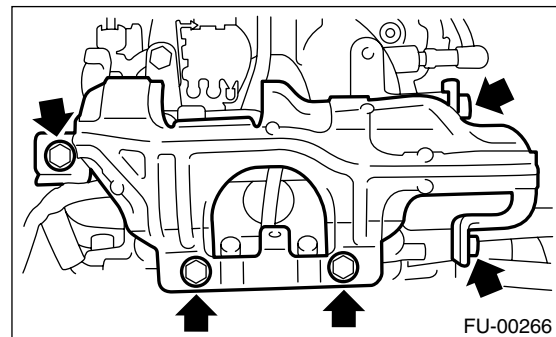
19 N·m (1.9 kgf·m, 13.7 ft·lb)



13) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf·m, 13.7 ft·lb)

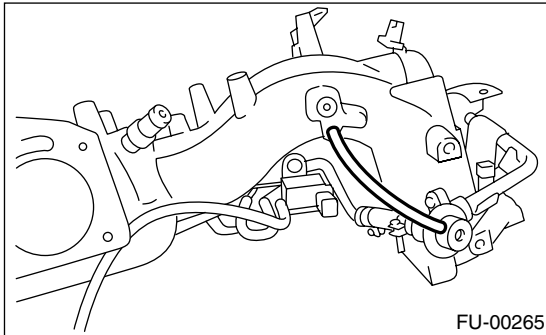


Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

14) Install the purge control solenoid valve. <Ref. to EC(H4SO)-7, INSTALLATION, Purge Control Solenoid Valve.>

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



16) Install the air assist injector solenoid valve. (1.6 L model) <Ref. to FU(H4SO)-37, INSTALLATION, Air Assist Injector Solenoid Valve.>

17) Install the EGR valve. <Ref. to FU(H4SO)-36, INSTALLATION, EGR Valve.>

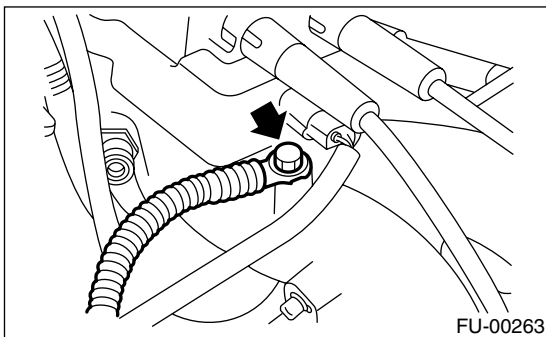
18) Install the throttle body to intake manifold. <Ref. to FU(H4SO)-15, INSTALLATION, Throttle Body.>

19) Install the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-8, INSTALLATION, Ignition Coil & Ignitor ASSY.>

20) Install the engine ground terminal to intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)



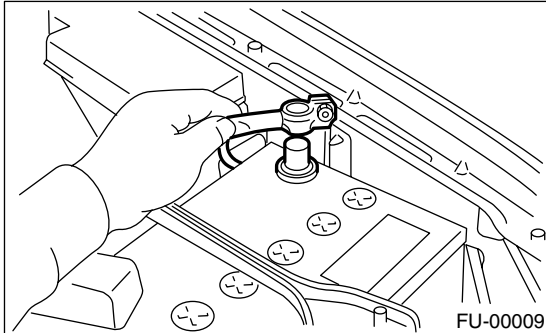
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened firmly.

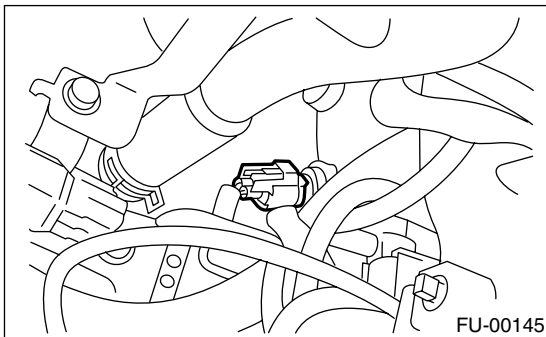
4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Remove the air intake duct and air cleaner case.
<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 3) Disconnect the connector from the engine coolant temperature sensor.



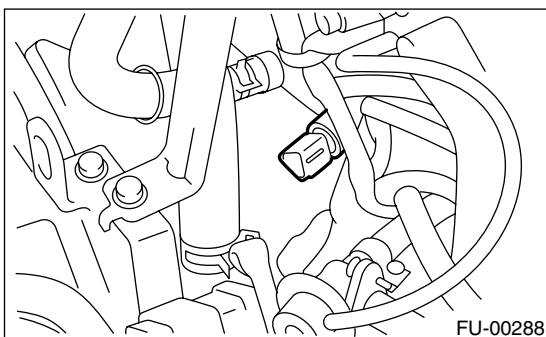
- 4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



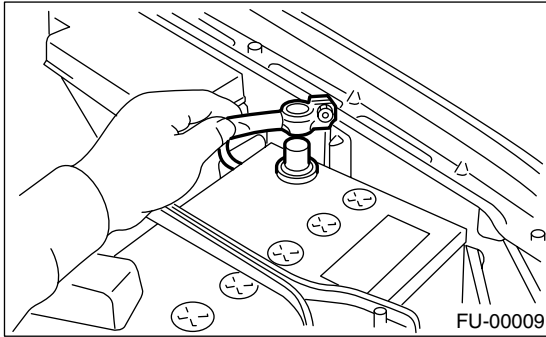
Crankshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

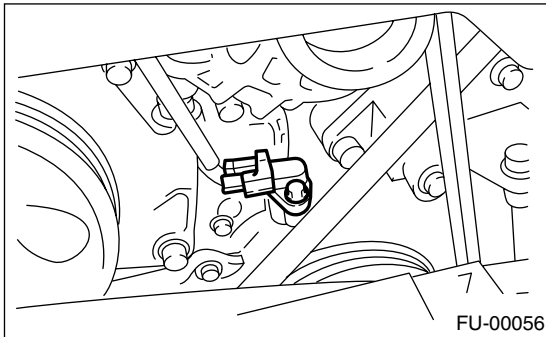
5. Crankshaft Position Sensor

A: REMOVAL

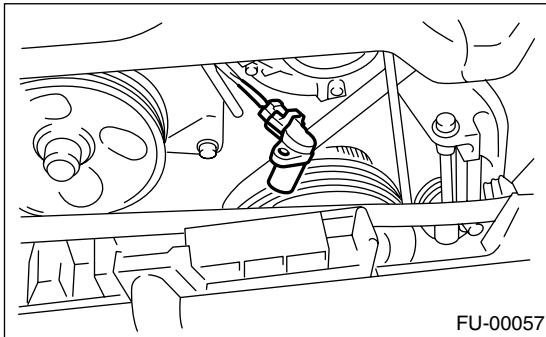
1) Disconnect the ground cable from battery.



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



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



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>

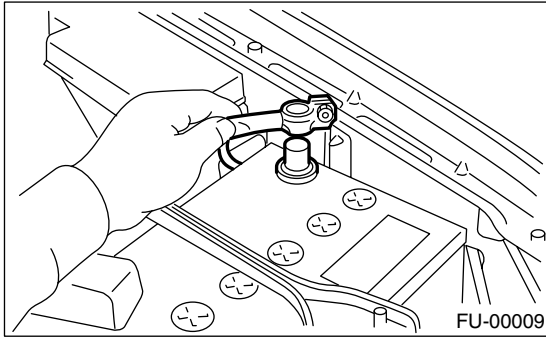
Camshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

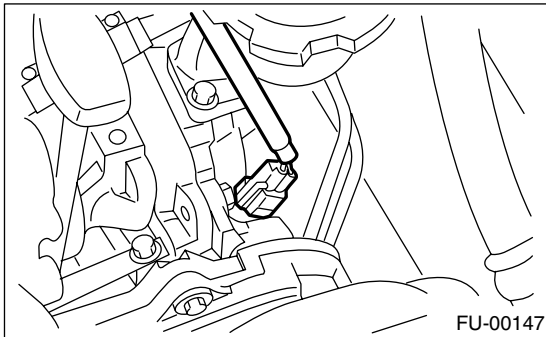
6. Camshaft Position Sensor

A: REMOVAL

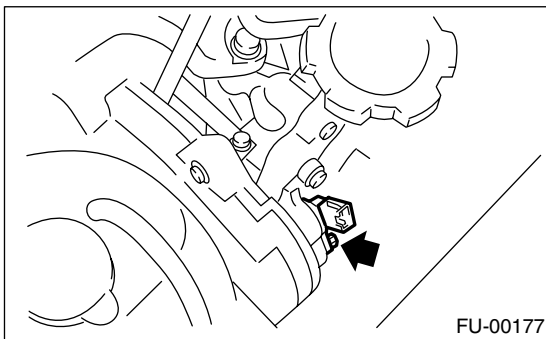
1) Disconnect the ground cable from battery.



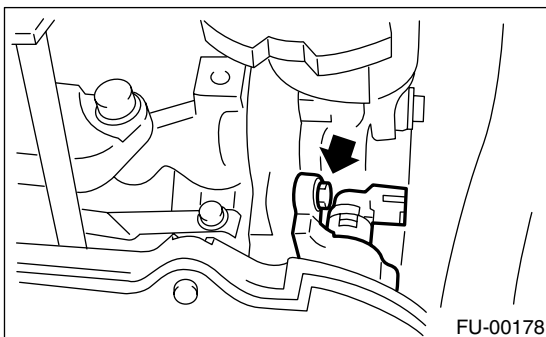
2) Disconnect the connector from the camshaft position sensor.



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

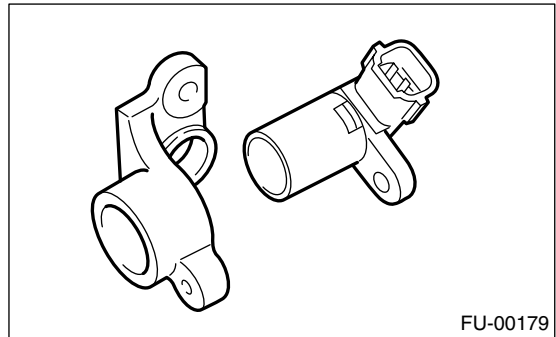


4) Remove the bolt which installs the camshaft position sensor support to the camshaft cap LH.



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

6) Remove the camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>

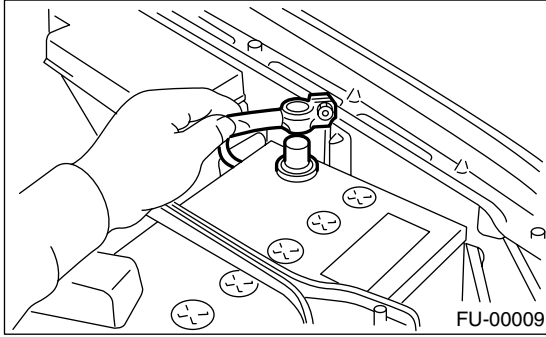
Knock Sensor

FUEL INJECTION (FUEL SYSTEMS)

7. Knock Sensor

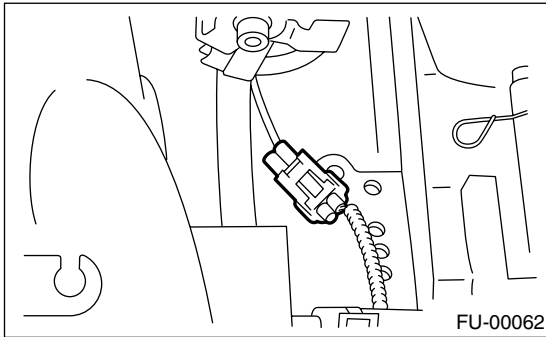
A: REMOVAL

1) Disconnect the ground cable from battery.

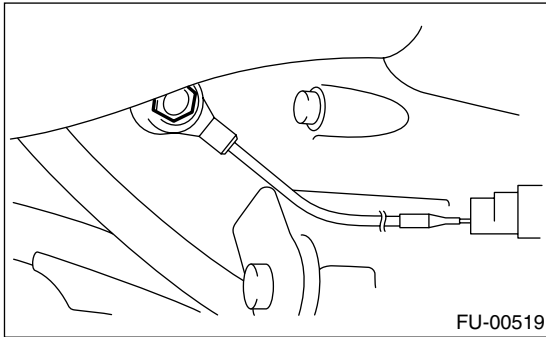


2) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from cylinder block.



B: INSTALLATION

1) Install the knock sensor to cylinder block.

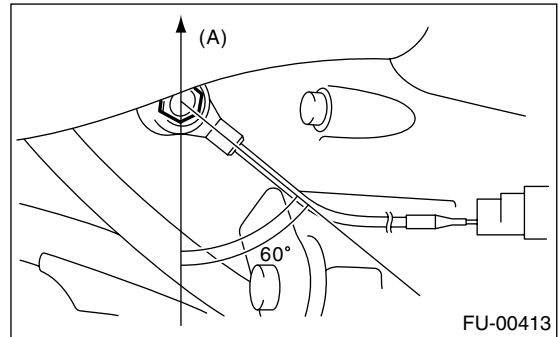
Tightening torque:

24 N·m (2.4 kgf·m, 17.4 ft·lb)

NOTE:

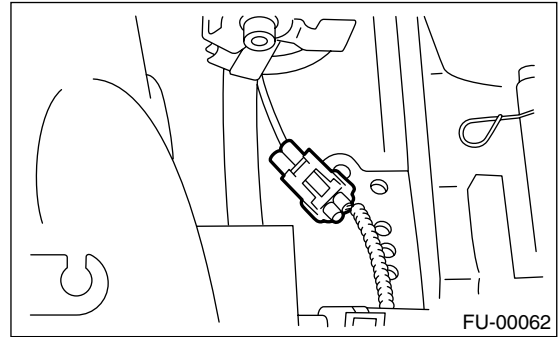
- For tightening torque, refer to "COMPONENT". <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

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



(A) Front side

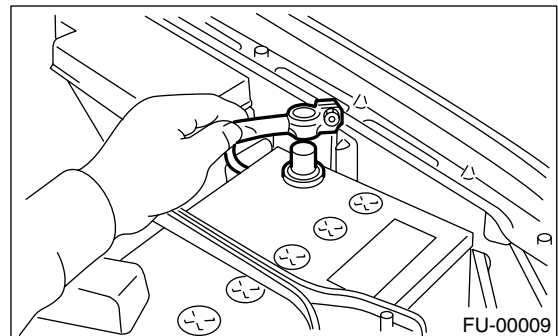
2) Connect the knock sensor connector.



3) Install the air cleaner case.

<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

4) Connect the battery ground cable to battery.



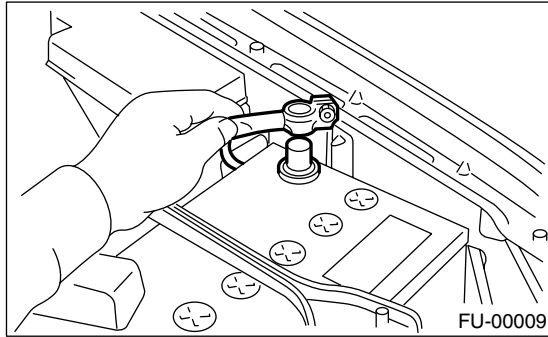
Throttle Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

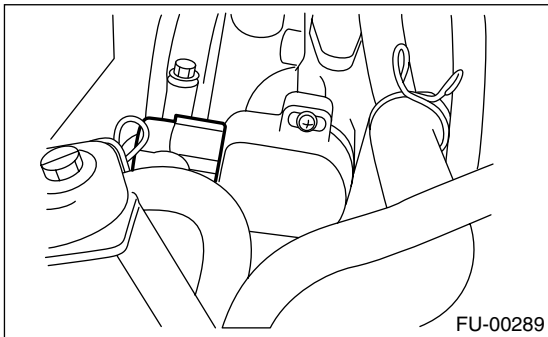
8. Throttle Position Sensor

A: REMOVAL

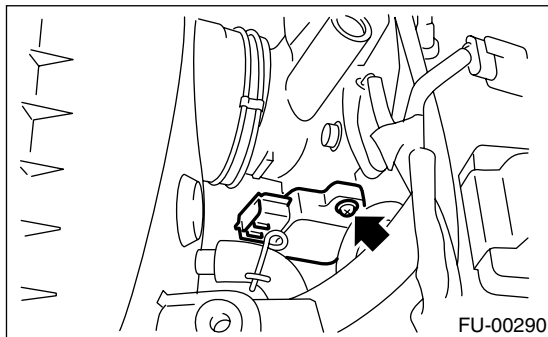
- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from the throttle position sensor.



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



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

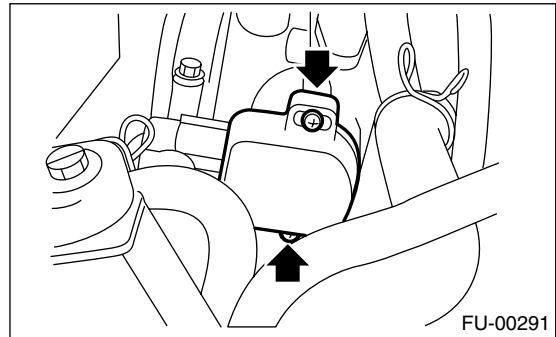
For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>

CAUTION:

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

C: ADJUSTMENT

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

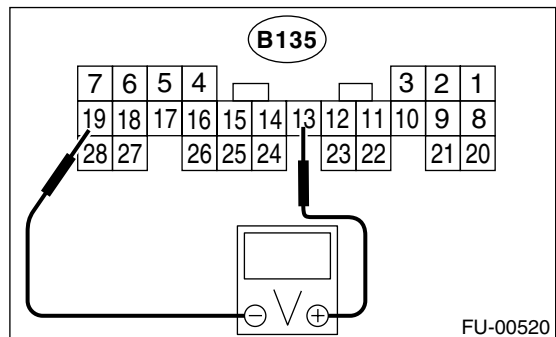


- 3) When using voltage meter;
 - (1) Take out the ECM.
 - (2) Turn the ignition switch to ON.
 - (3) Adjust the throttle position sensor to proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage

(B135) No. 13 (+) — (B135) No. 19 (–) / 0.45 — 0.55 V

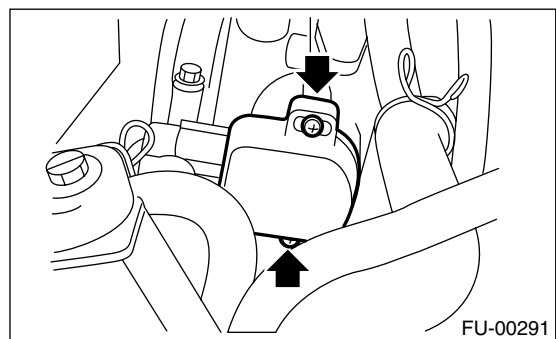
[Fully closed.]



- (4) Tighten the throttle position sensor holding screws.

Tightening torque:

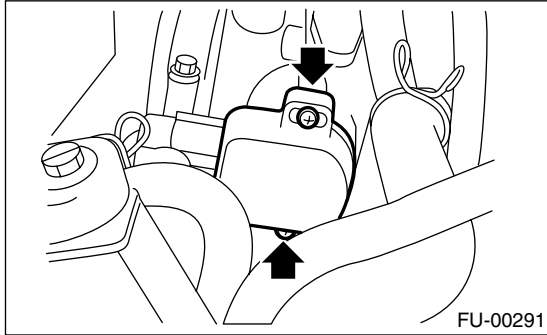
1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



Throttle Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

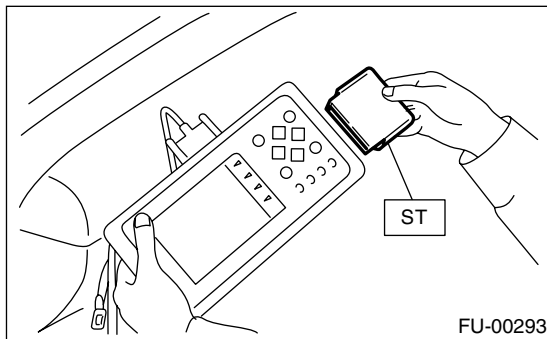
- 4) When using Subaru Select Monitor;
- (1) Turn the ignition switch to OFF.
 - (2) Loosen the throttle position sensor holding screws.



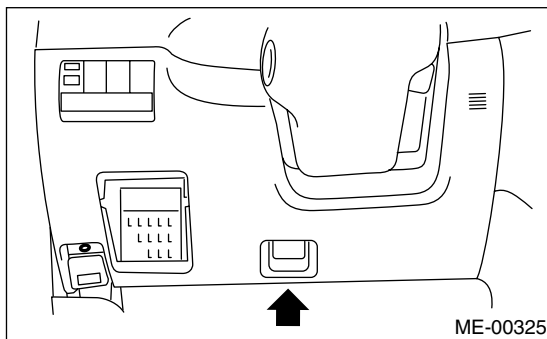
NOTE:

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

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



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



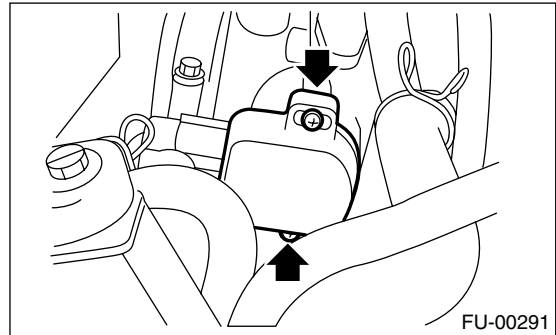
- 5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
- 6) Select the {2. Each System Check} in «Main Menu».
- 7) Select the {Engine Control System} in «Selection Menu».
- 8) Select the {1. Current Data Display & Save} in «Engine Control System Diagnosis».
- 9) Select the {1.12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

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

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

- 11) Tighten the throttle position sensor holding screws.

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



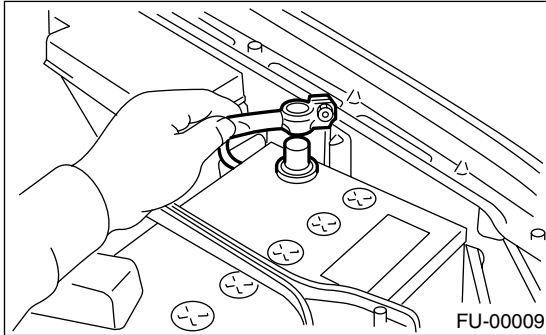
Manifold Absolute Pressure Sensor

FUEL INJECTION (FUEL SYSTEMS)

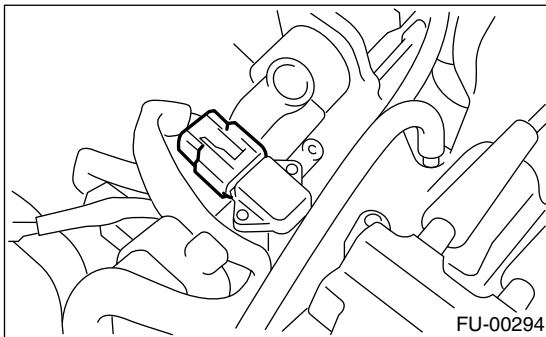
9. Manifold Absolute Pressure Sensor

A: REMOVAL

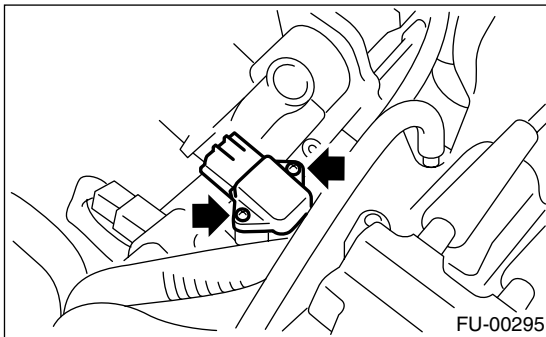
1) Disconnect the ground cable from battery.



2) Disconnect the connector from manifold absolute pressure sensor.



3) Remove the manifold absolute pressure sensor.



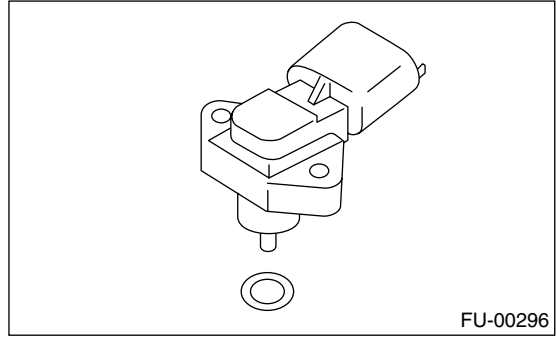
B: INSTALLATION

Install in the reverse order of removal.

NOTE:

- For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>

- Replace the O-ring with a new one.



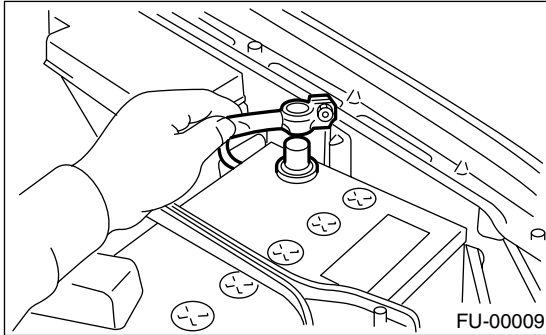
Intake Air Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

10. Intake Air Temperature Sensor

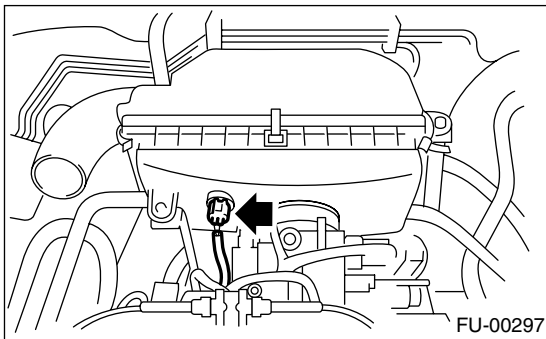
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the intake air temperature sensor.

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



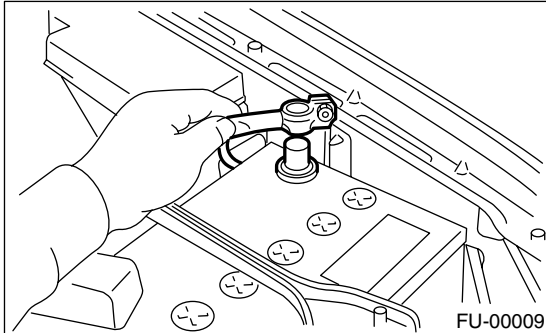
B: INSTALLATION

Install in the reverse order of removal.

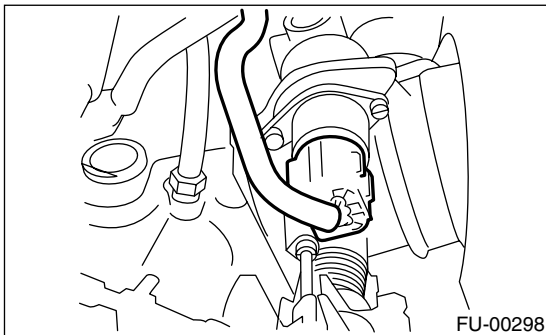
11. Idle Air Control Solenoid Valve

A: REMOVAL

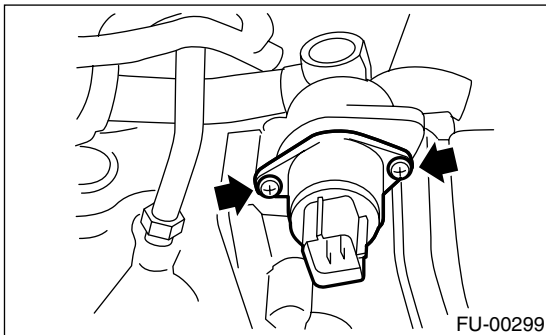
1) Disconnect the ground cable from battery.



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



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



B: INSTALLATION

Install in the reverse order of removal.

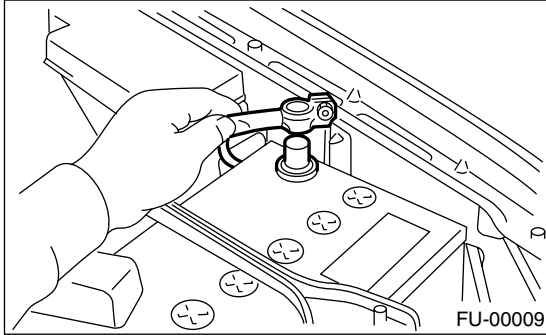
NOTE:

- For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>
- Replace the gasket with a new one.

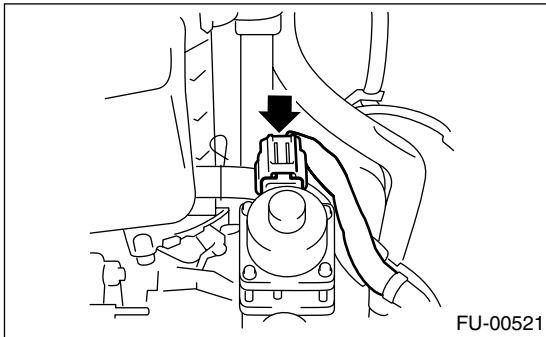
12.EGR Valve

A: REMOVAL

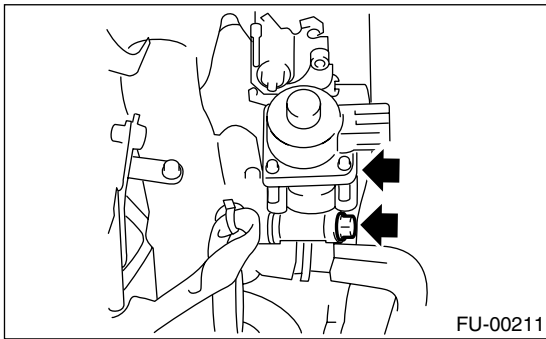
1) Disconnect the ground cable from battery.



2) Disconnect the connector from EGR valve.



3) Remove the EGR valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

For tightening torque, refer to "COMPONENT".
<Ref. to FU(H4SO)-3, COMPONENT, General Description.>