ENGINE COOLING SYSTEM 2-5

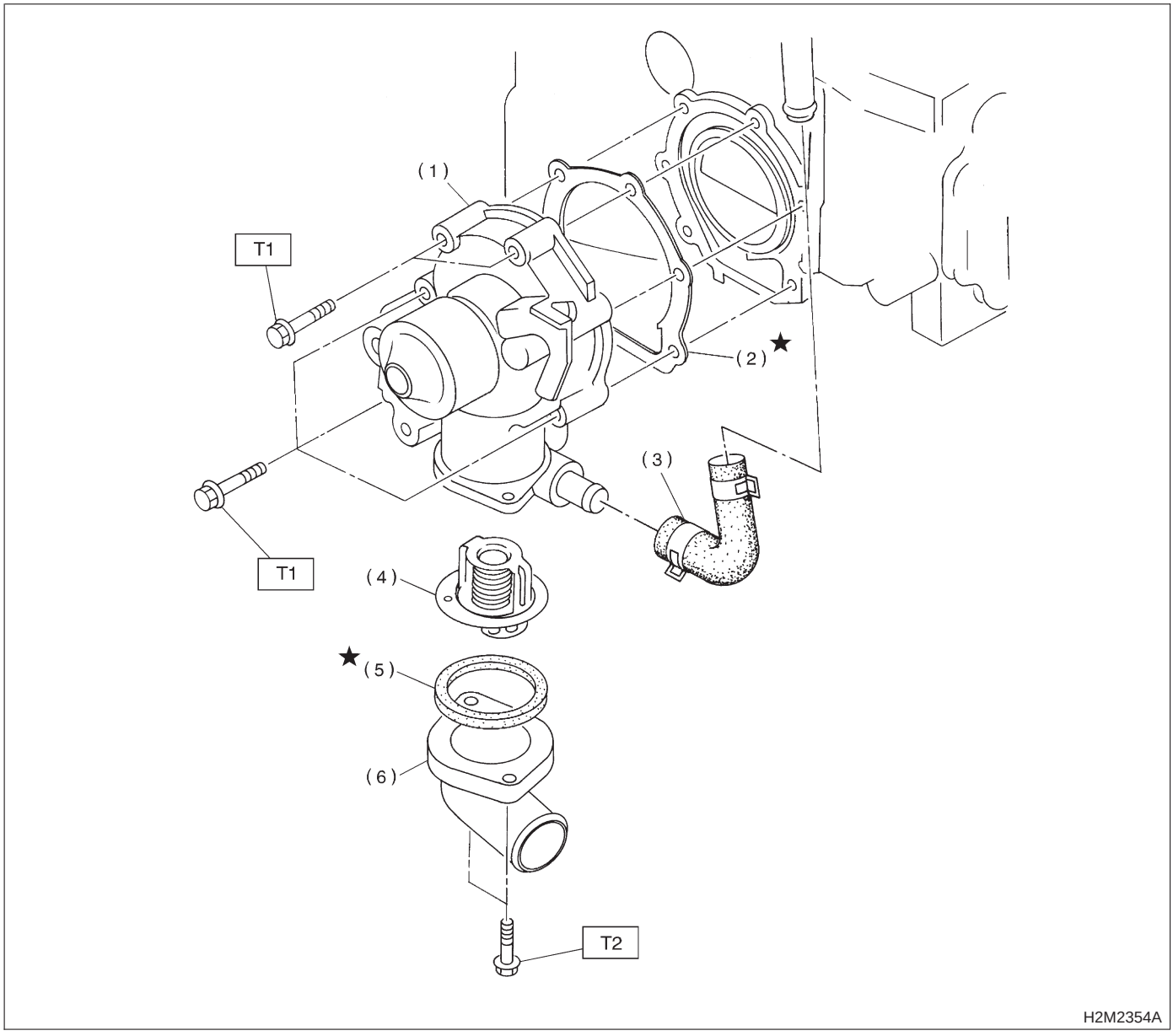
1. Specifications

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			6.2 (6.6, 5.5)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—total engine coolant head	760 rpm — 0.3 mAq (1.0 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—total engine coolant head	3,000 rpm — 5.0 mAq (16.4 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—total engine coolant head	6,000 rpm — 23.0 mAq (75.5 ftAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		70 W (main fan) 70 W (sub fan)
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions		691 × 340 × 16 mm (27.20 × 13.39 × 0.63 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 15.6±2.1 psi) Below: −9.8 to −4.9 kPa (−0.1 to −0.05 kg/cm^2, −1.4 to −0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.45 ℓ (0.5 US qt, 0.4 Imp qt)

2. Service Data

Water pump	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)

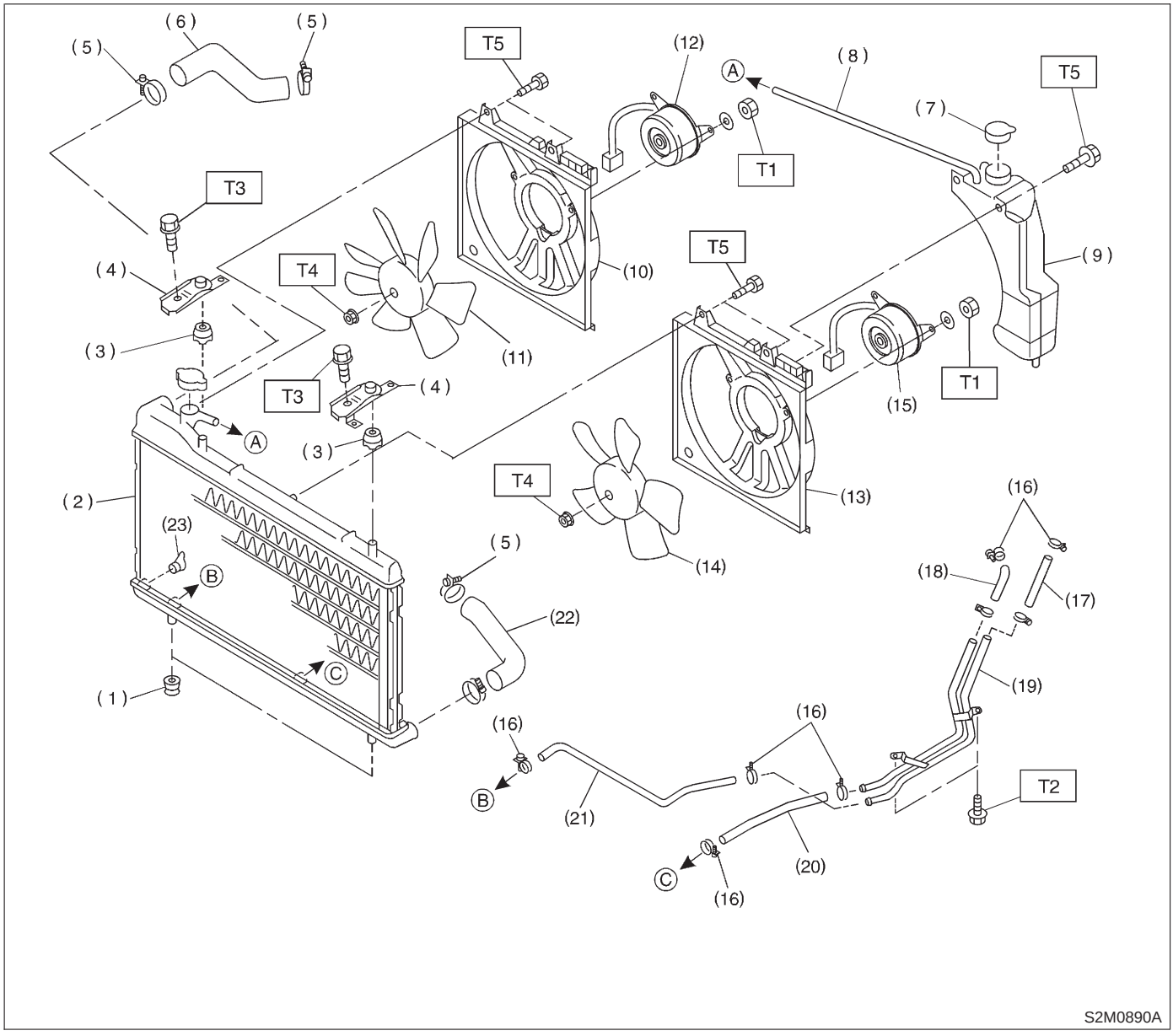
1. Water Pump



(1) Water pump ASSY
(2) Gasket
(3) Heater hose
(4) Thermostat
(5) Gasket
(6) Thermostat case

Tightening torque: N·m (kg-m, ft-lb)
T1: First 10^{+4}_{-0} ($1.0^{+0.4}_{-0}$, $7.2^{+2.9}_{-0}$)
Second 10^{+4}_{-0} ($1.0^{+0.4}_{-0}$, $7.2^{+2.9}_{-0}$)
T2: 6.4±0.5 (0.65±0.05, 4.7±0.4)

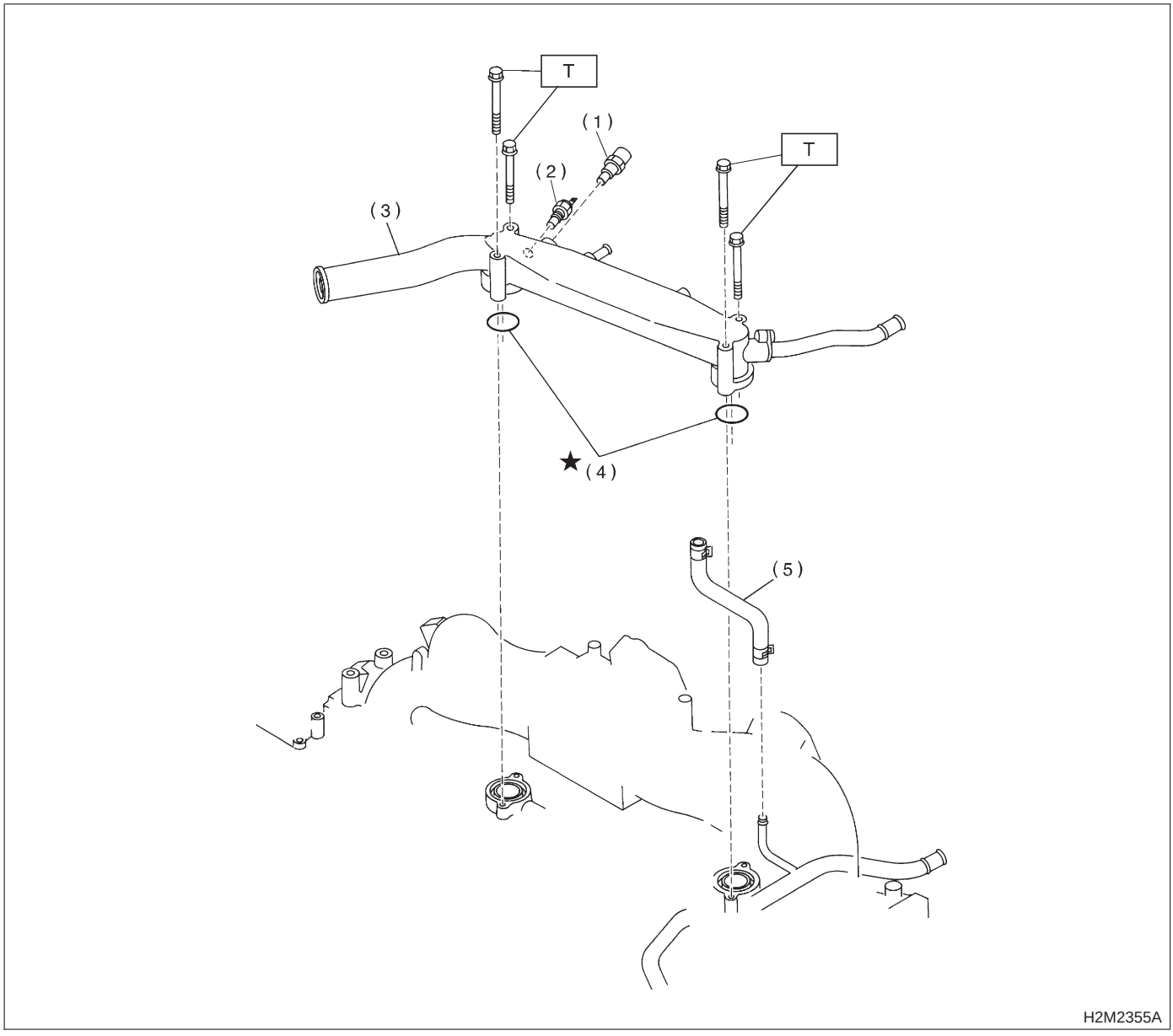
2. Radiator and Radiator Fan



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

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

3. Water Pipe



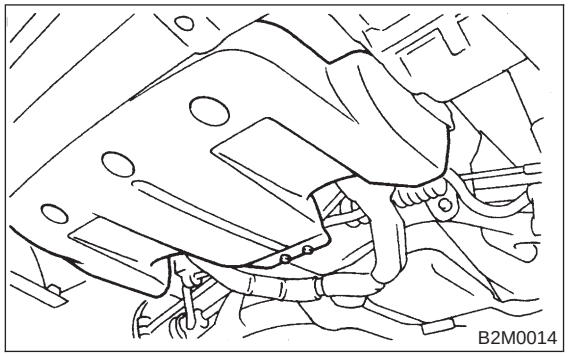
(1) Engine coolant temperature sensor
(2) Engine coolant temperature gauge
(3) Water pipe
(4) O-ring
(5) By-pass hose

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

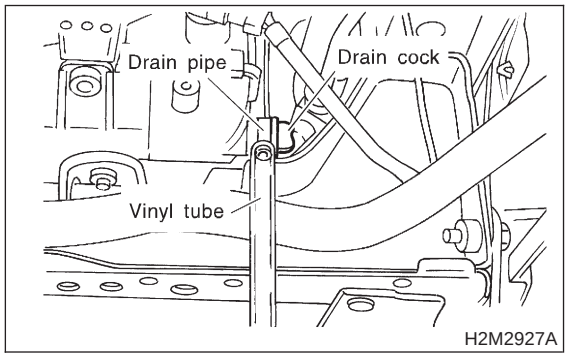
1. On-car Services

A: DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove under cover.


B2M0014

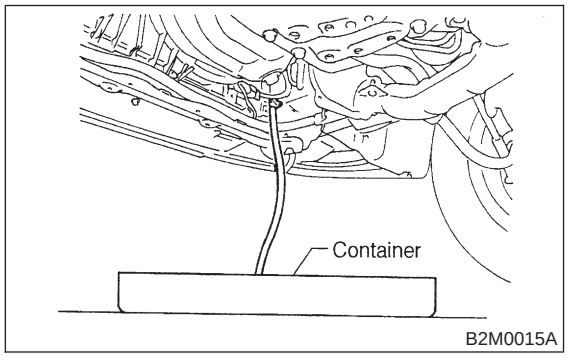
3) Fit vinyl tube to drain pipe.



H2M2927A

4) Loosen drain cock to drain engine coolant into container.

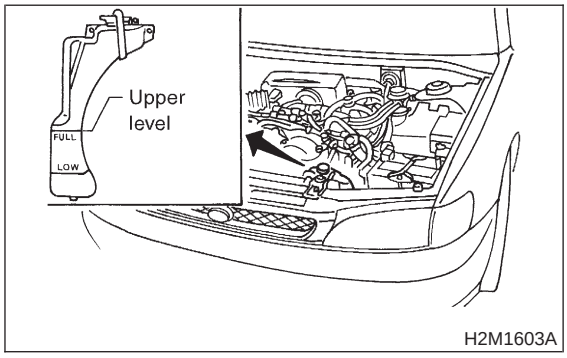
NOTE:
Remove radiator cap so that engine coolant will drain faster.



B2M0015A

B: FILLING OF ENGINE COOLANT

1) Fill engine coolant into radiator up to filler neck position.
2) Fill engine coolant into reservoir tank up to upper level.

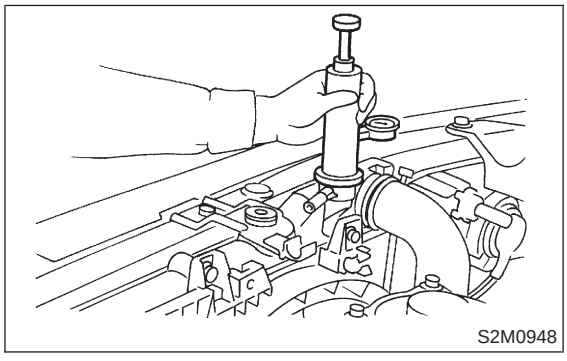


H2M1603A

3) Attach radiator cap and reservoir tank cap properly.
4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
5) Stop engine and wait until temperature drops to a safe level.
6) If engine coolant level drops in radiator, add engine coolant to filler neck position.
7) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
8) Attach radiator cap and reservoir tank cap properly.

C: CHECKING OF COOLING SYSTEM

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

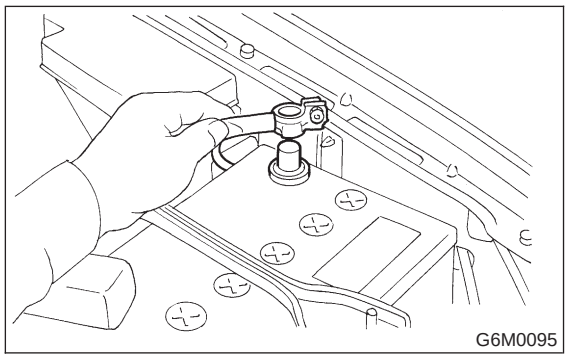

S2M0948

CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

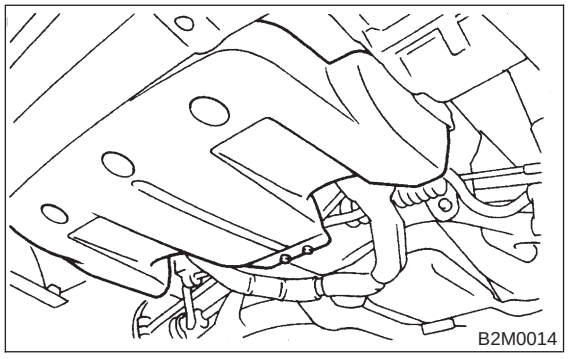
2. Water Pump

A: REMOVAL AND INSTALLATION

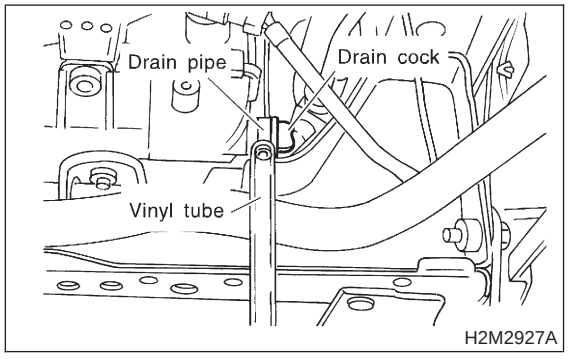
1) Disconnect ground cable from battery.


G6M0095

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

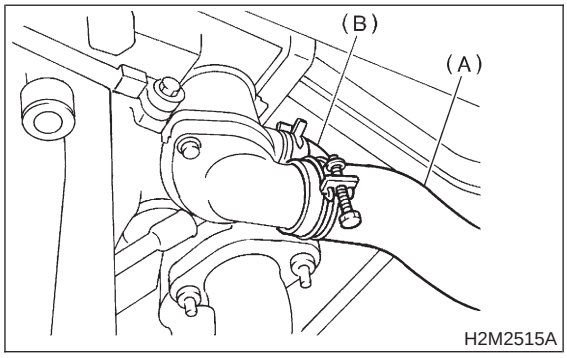

B2M0014

4) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>



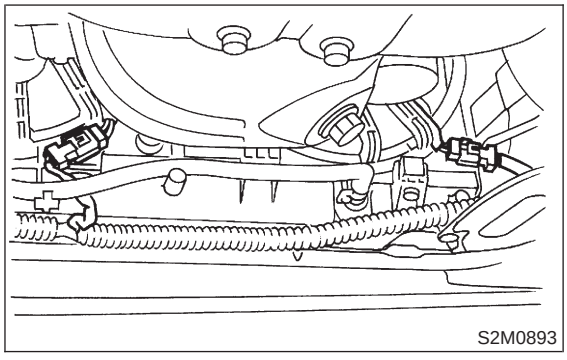
H2M2927A

5) Disconnect radiator outlet hose (A) and heater by-pass hose (B) from water pump.

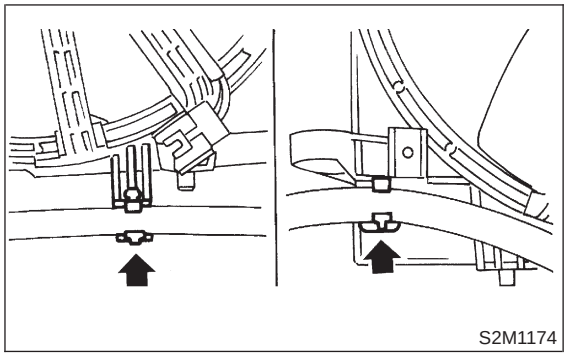


H2M2515A

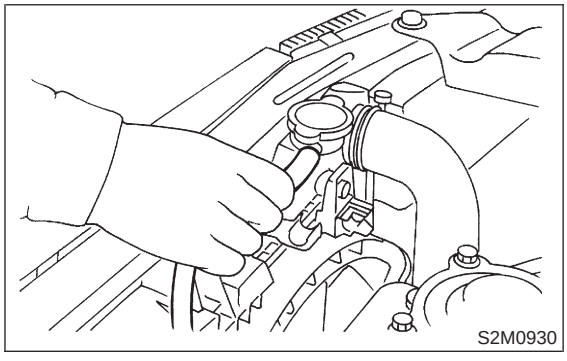
6) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.


S2M0893

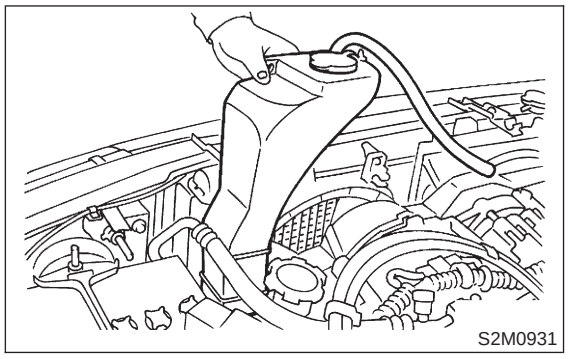
7) Detach ATF cooler hose attached to 2 clips under the radiator main fan shroud.


S2M1174

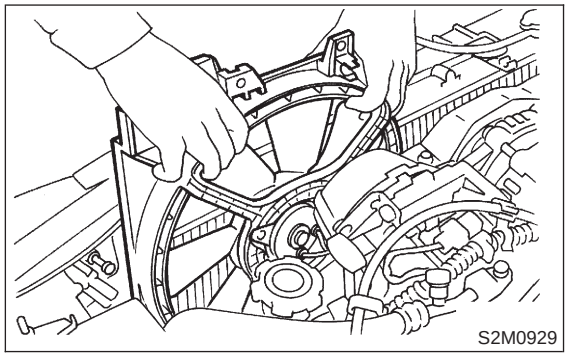
8) Lower the vehicles.
9) Disconnect over flow hose.


S2M0930

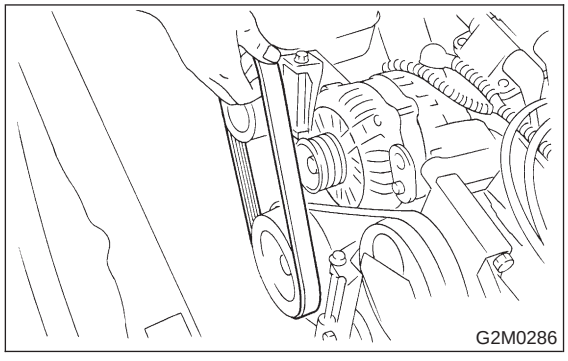
10) Remove reservoir tank.



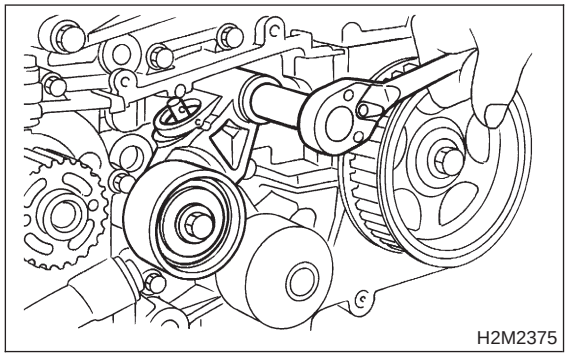
11) Remove radiator main fan and sub fan motor assembly.
<Ref. to 2-5 [W6A0].> and <Ref. to 2-5 [W7A0].>



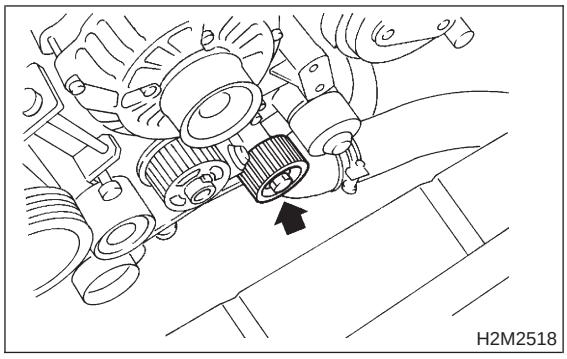
12) Remove V-belts.
<Ref. to 1-5 [G200].>



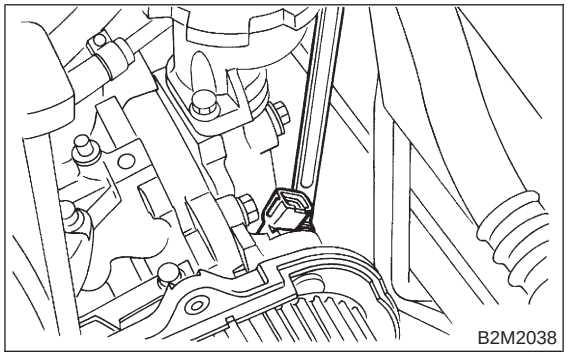
13) Remove timing belt.
<Ref. to 2-3 [W2A0].>
14) Remove automatic belt tension adjuster.



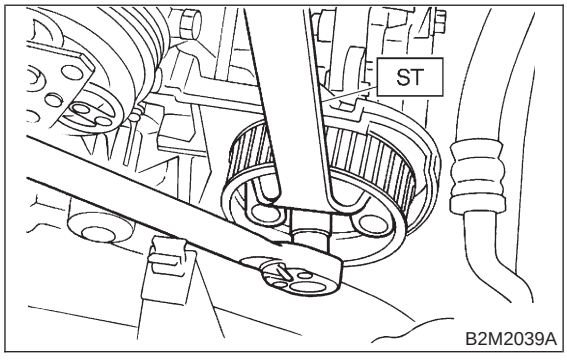
15) Remove belt idler No. 2.



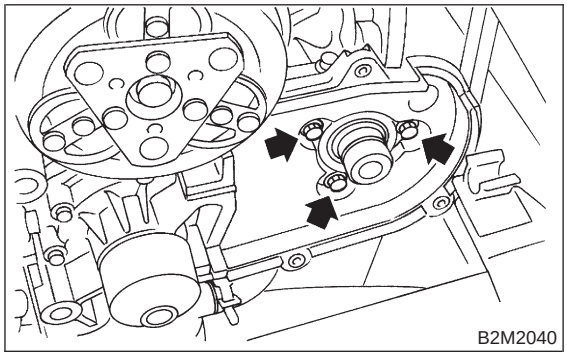
16) Remove camshaft position sensor.
<Ref. to 2-7 [W10A0].>



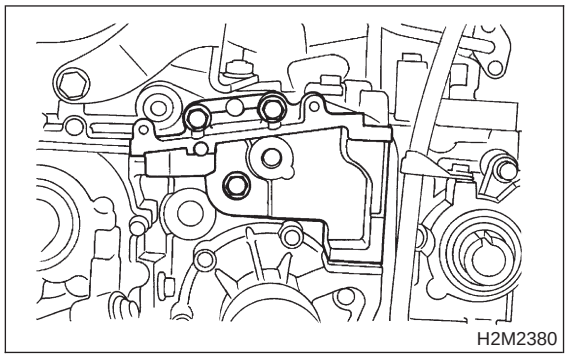
17) Remove left-hand camshaft sprocket by using ST.
ST 499207100 CAMSHAFT SPROCKET WRENCH



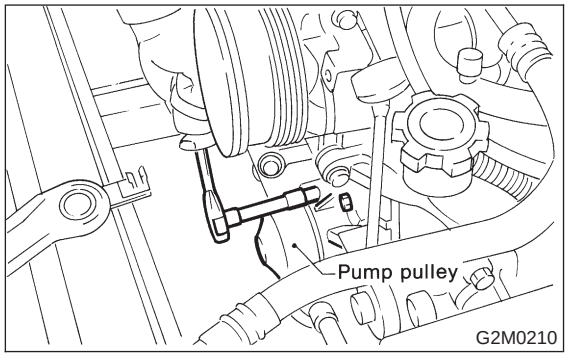
18) Remove left-hand belt cover No. 2.



19) Remove tensioner bracket.



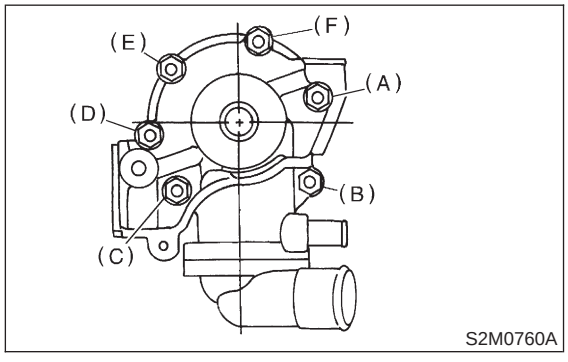
20) Remove tensioner bracket.
21) Disconnect heater hose from water pump.
22) Remove water pump.



23) Installation is in the reverse order of removal.

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

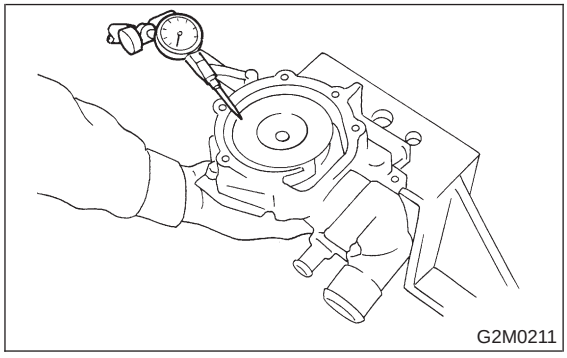
Tightening torque:
10^{+4}_{-0} N·m ($1.0^{+0.4}_{-0}$ kg-m, $7.2^{+2.9}_{-0}$ ft-lb)



B: INSPECTION

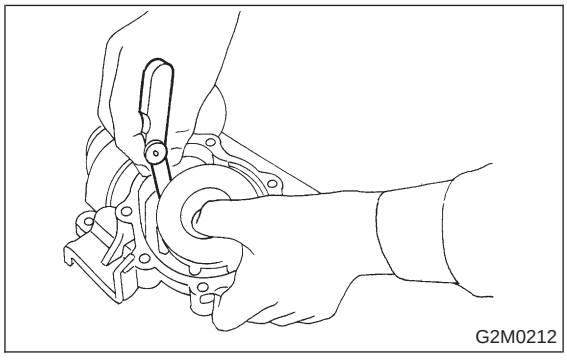
1) Check water pump bearing for smooth rotation.
2) Check water pump pulley for abnormalities.
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

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



4) Check clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

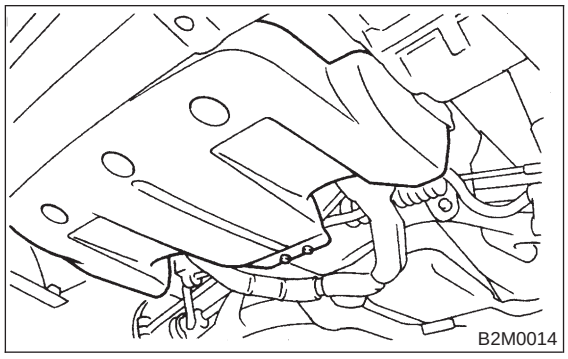


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

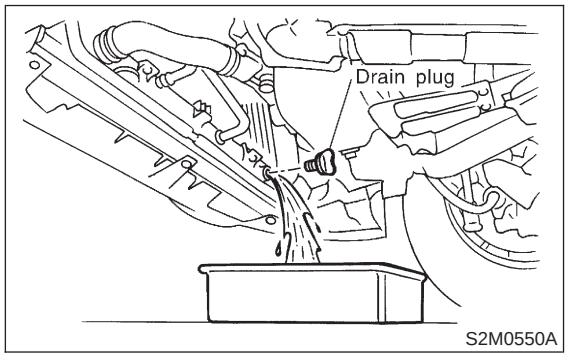
3. Thermostat

A: REMOVAL AND INSTALLATION

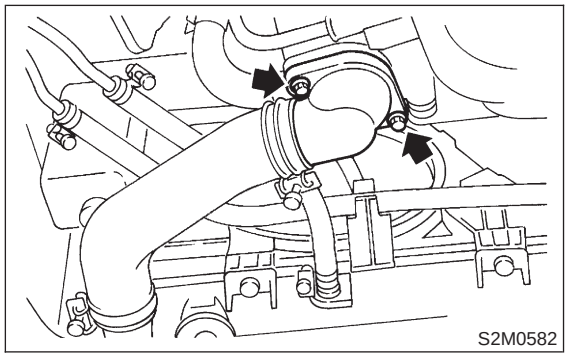
1) Lift-up the vehicle.
2) Remove under cover.



3) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>

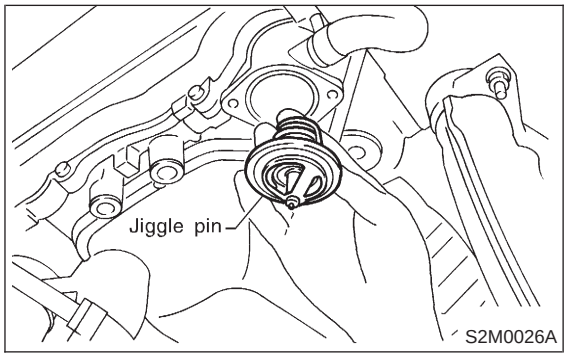


4) Remove thermostat cover and gasket, and pull out the thermostat.



5) Install the thermostat in the intake manifold, and install the thermostat cover together with a gasket.

CAUTION:
● When reinstalling the thermostat, use a new gasket.
● The thermostat must be installed with the jiggle pin upward.
● In this time, set the jiggle pin of thermostat for front side.

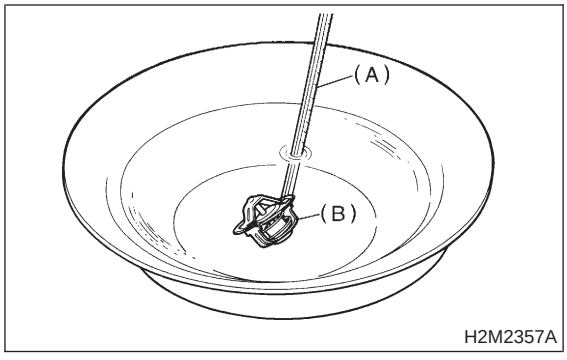


B: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76.0 — 80.0°C (169 — 176°F)

Fully opens:
91°C (196°F)

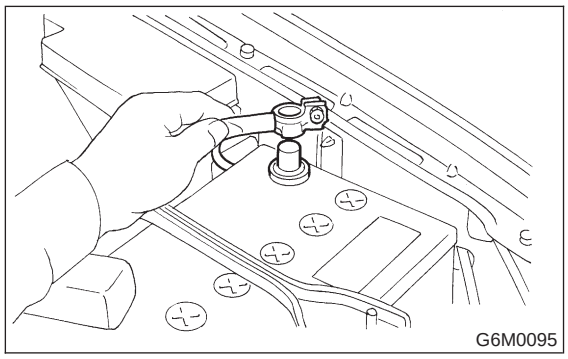


(A) Thermometer
(B) Thermostat

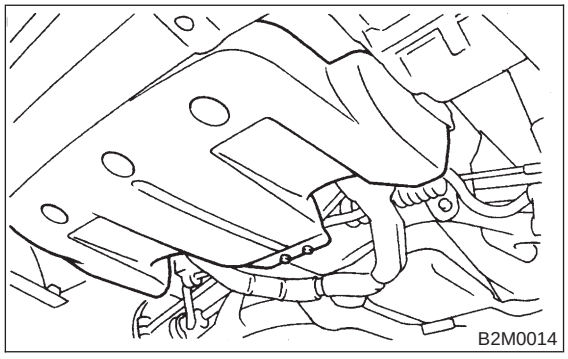
4. Radiator

A: REMOVAL

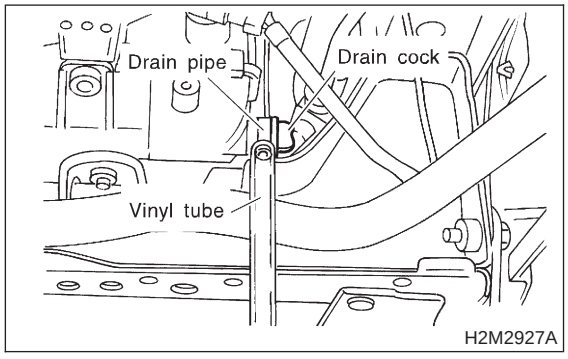
1) Disconnect battery ground cable.



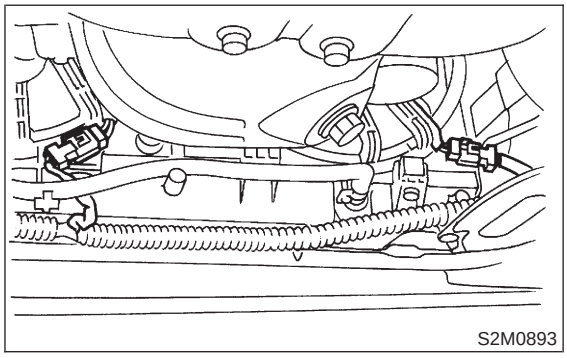
2) Lift-up the vehicle.
3) Remove under cover.



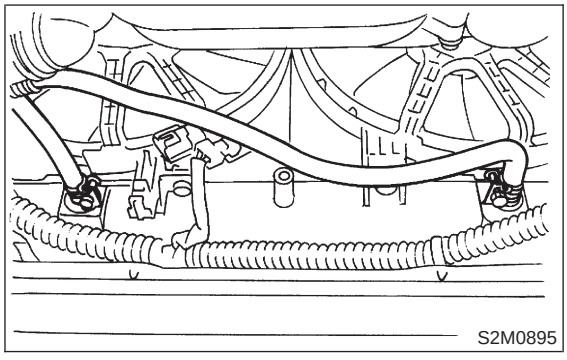
4) Drain engine coolant completely. <Ref. to 2-5 [W1A0].>



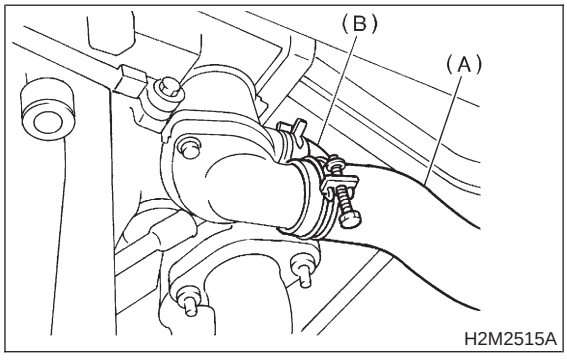
5) Disconnect connectors of radiator main fan and sub fan motor.



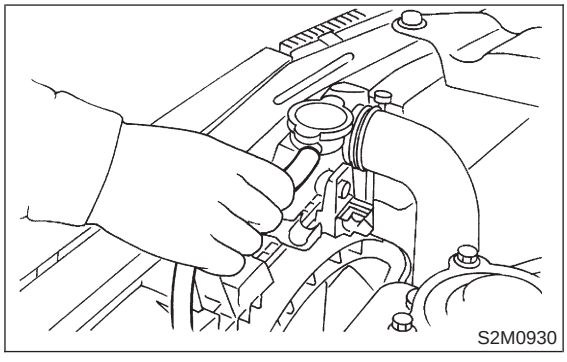
6) Disconnect ATF cooler hoses from radiator. (AT vehicles only)



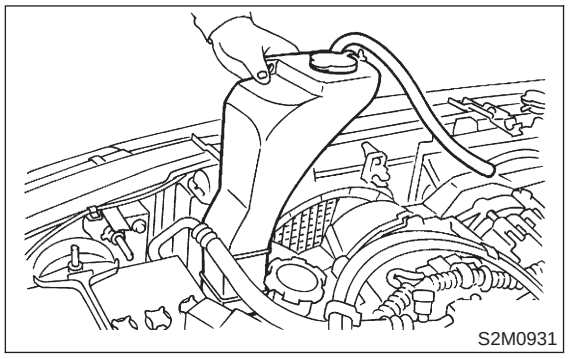
7) Disconnect radiator outlet hose (A) and water by-pass hose (B) (AT vehicles) from thermostat cover.



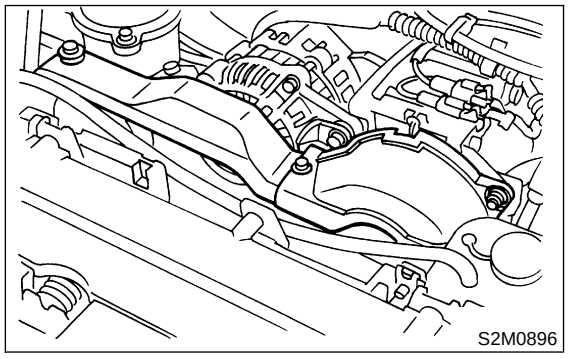
8) Lower the vehicle.
9) Disconnect over flow hose.



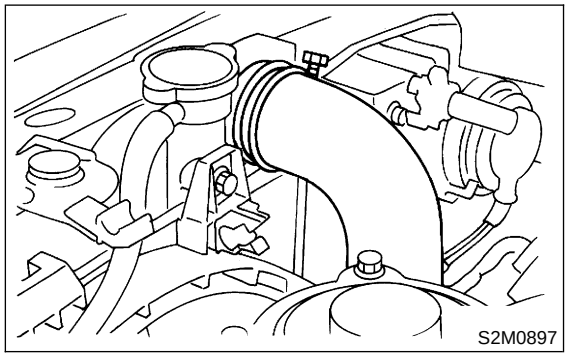
10) Remove reservoir tank.



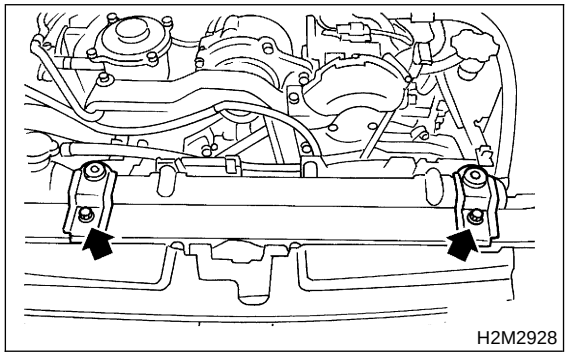
11) Remove V-belt covers.



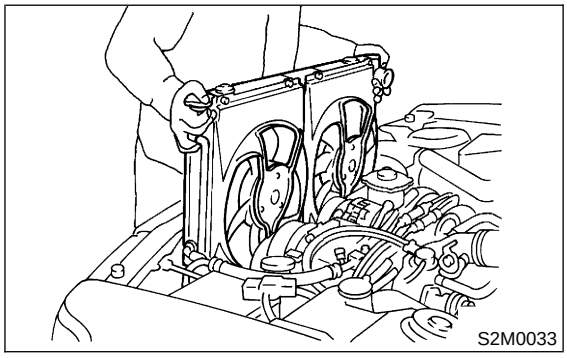
12) Disconnect radiator inlet hose from radiator.



13) Remove radiator upper brackets.

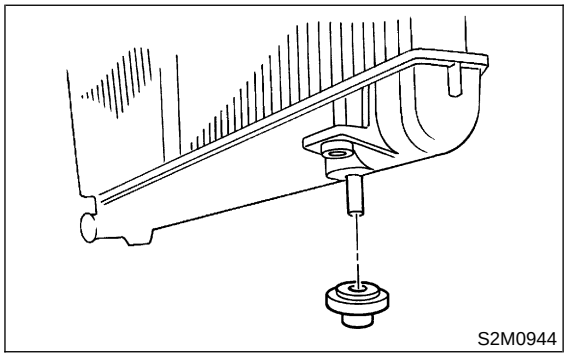


14) While slightly lifting radiator, slide it to left.
15) Lift radiator up and away from vehicle.



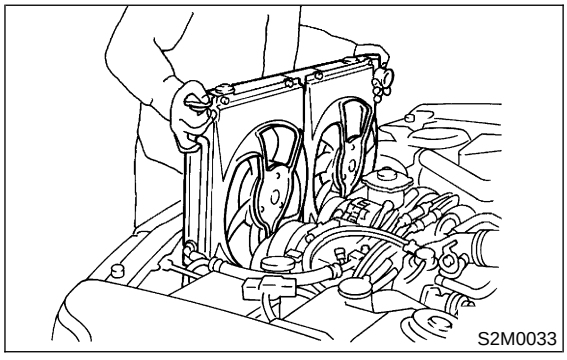
B: INSTALLATION

1) Attach radiator mounting cushions to pins on the lower side of radiator.



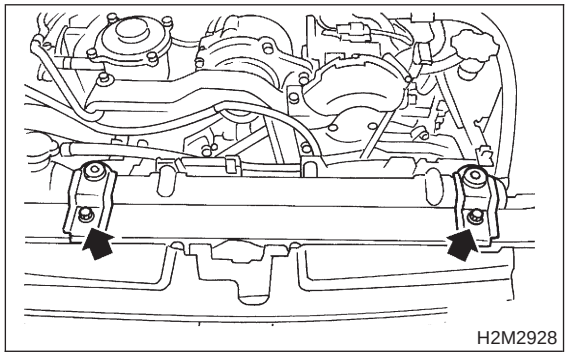
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit cushion on lower side of radiator into holes on body side.

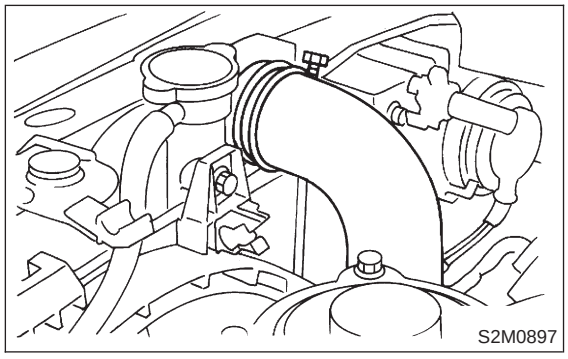


3) Install radiator brackets and tighten bolts.

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

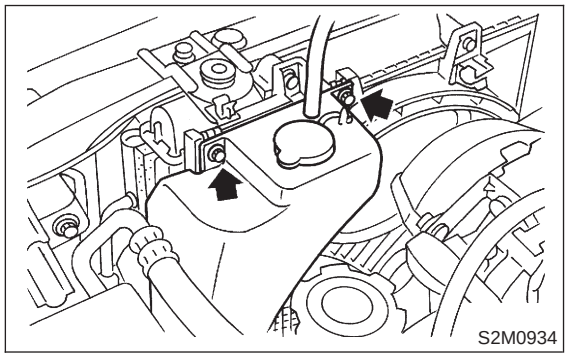


4) Connect radiator inlet hose.

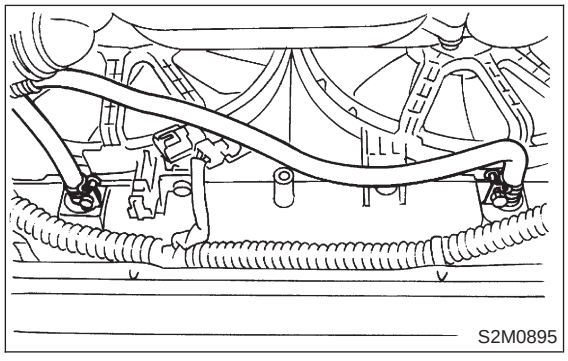


5) Install reservoir tank.

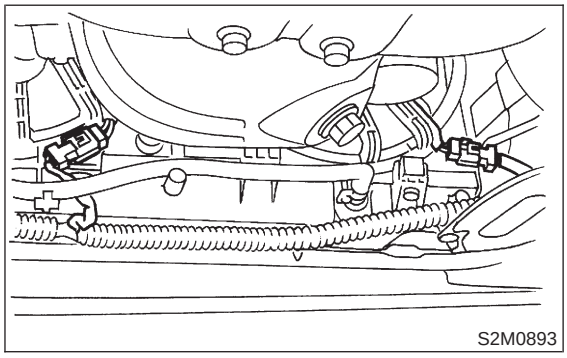
Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)



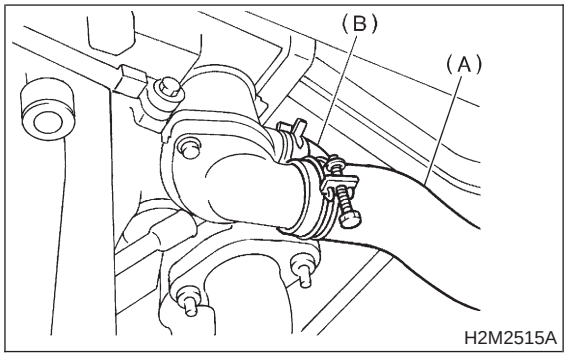
6) Lift-up the vehicle.
7) Connect ATF cooler hoses. (AT vehicles only)



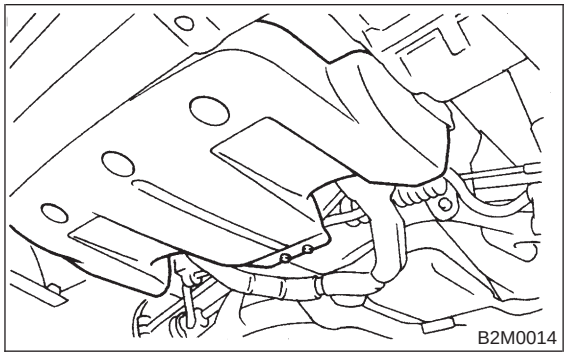
8) Connect connectors to radiator main fan motor and sub fan motor.



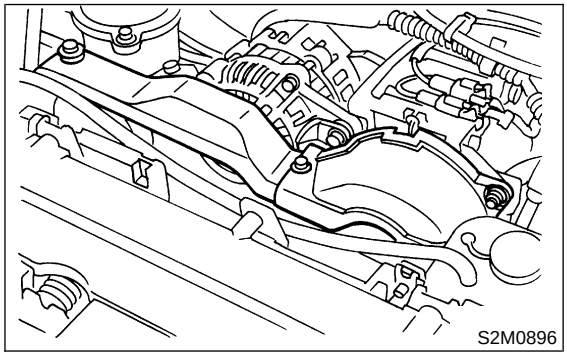
9) Connect radiator outlet hose (A) and water by-pass hose (B) (AT vehicles)



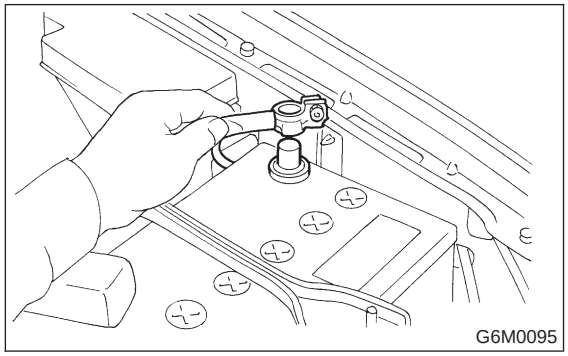
10) Install under cover.



11) Lower the vehicle.
12) Install V-belt covers.



13) Connect battery ground cable.

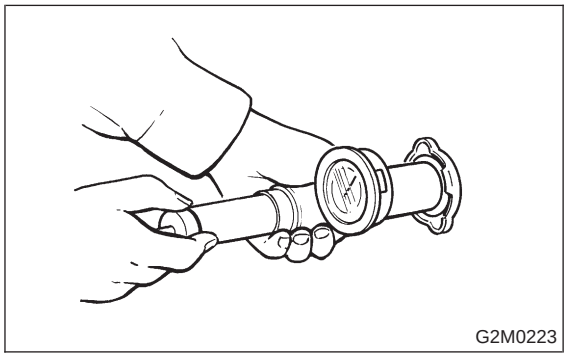


14) Fill coolant. <Ref. to 2-5 [W1B0].>

5. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

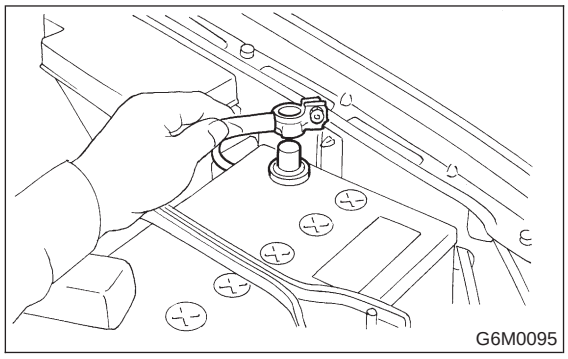
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance; otherwise, results of pressure test will be incorrect.

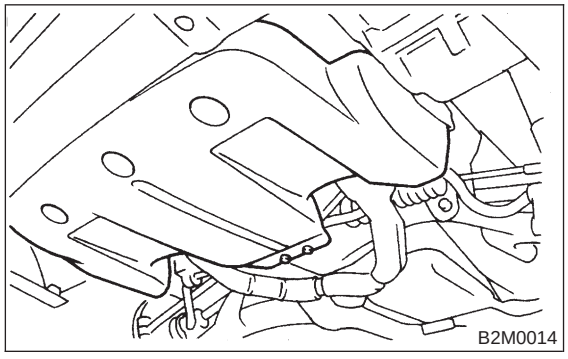
6. Radiator Main Fan and Fan Motor

A: REMOVAL AND INSTALLATION

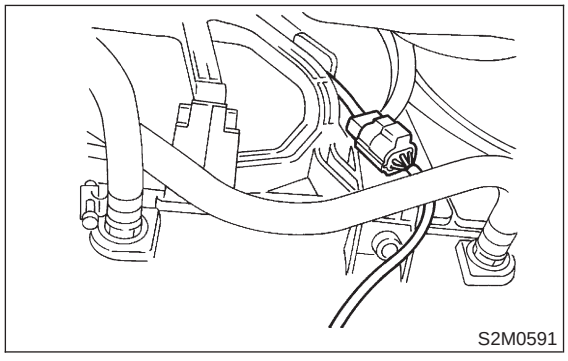
1) Disconnect battery ground cable.


G6M0095

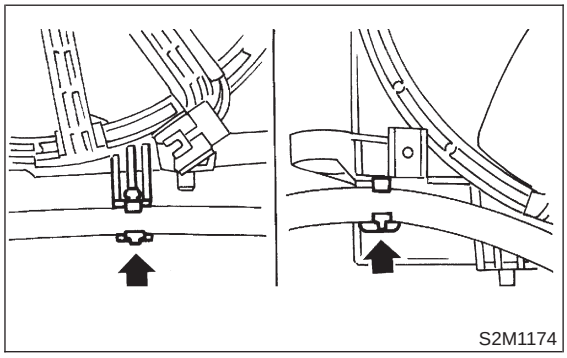
2) Lift-up the vehicle.
3) Remove under cover.


B2M0014

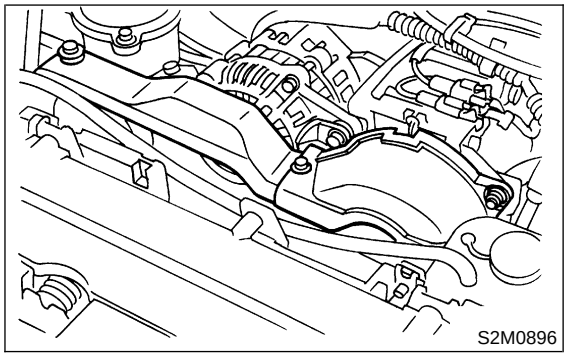
4) Disconnect connector of main fan motor.


S2M0591

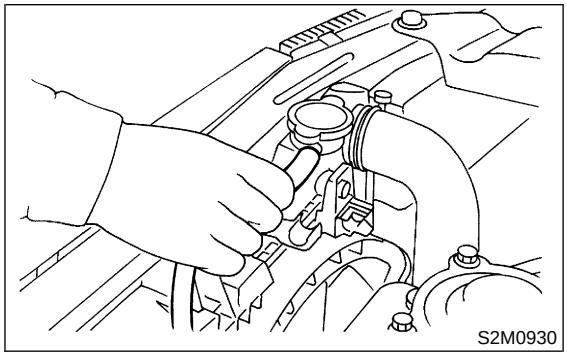
5) Detach ATF cooler hose attached to 2 clips under the radiator main fan shroud.


S2M1174

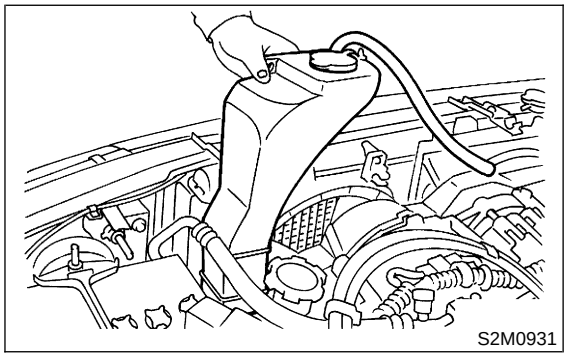
6) Lower the vehicle.
7) Remove V-belt covers.


S2M0896

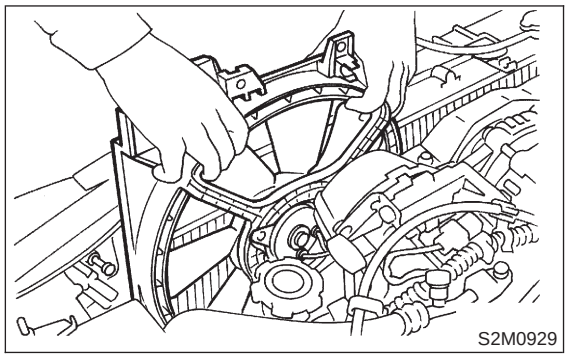
8) Disconnect over flow hose.


S2M0930

9) Remove reservoir tank.


S2M0931

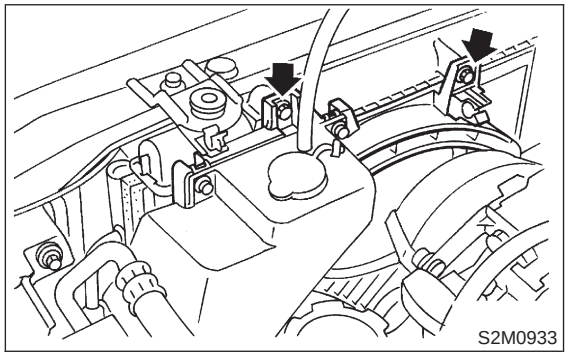
10) Remove radiator main fan motor assembly.



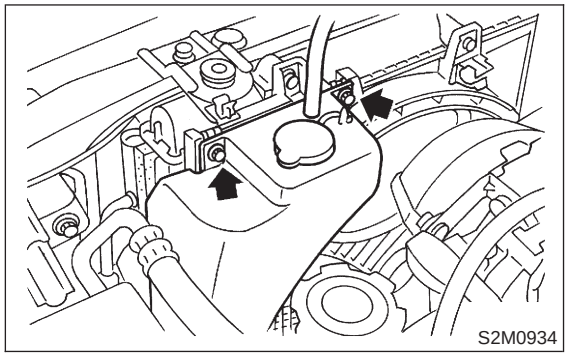
11) Installation is in the reverse order of removal.

NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it. <Ref. to 2-5 [W7A0].>

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

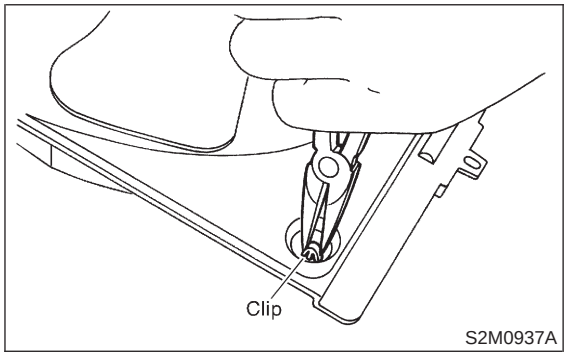


Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

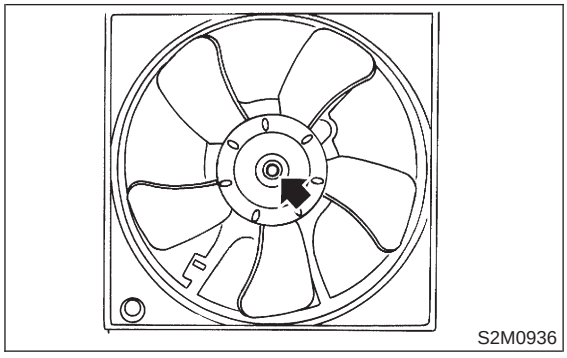


B: DISASSEMBLY AND ASSEMBLY

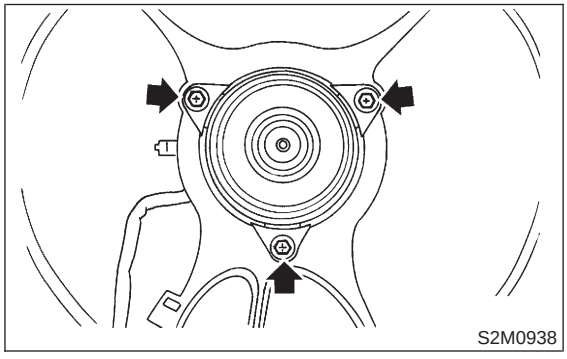
1) Remove clip which holds motor connector onto shroud.



2) Remove bolt which install fan itself onto fan motor and shroud assembly.

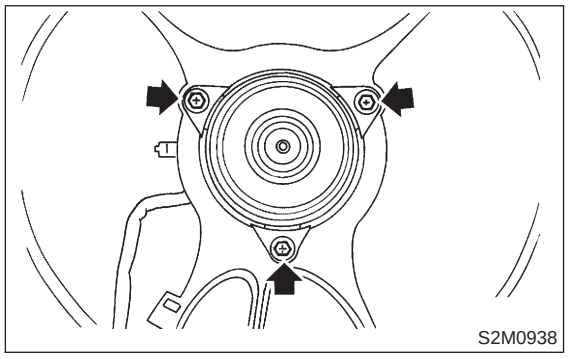


3) Remove bolts which install fan motor onto shroud.

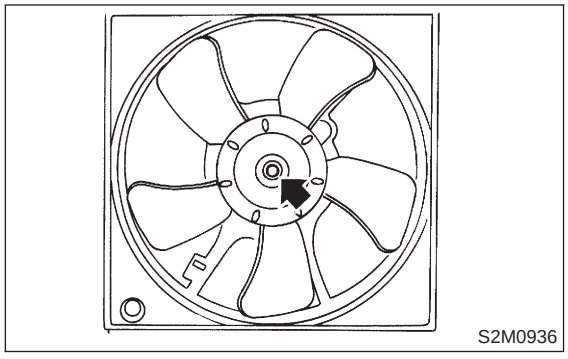


4) Installation is in the reverse order of removal.

Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)



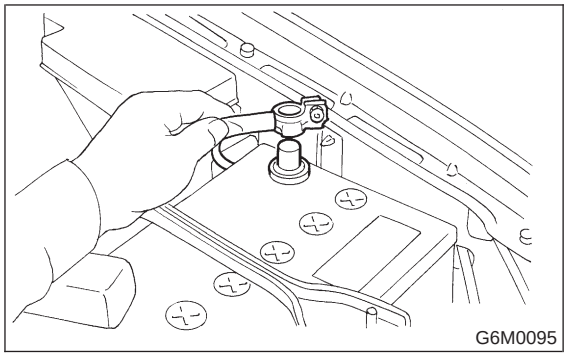
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)



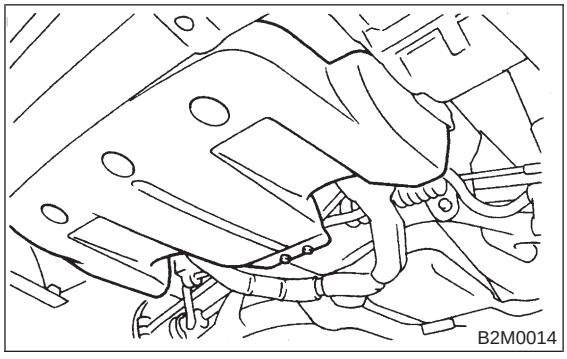
7. Radiator Sub Fan and Fan Motor

A: REMOVAL AND INSTALLATION

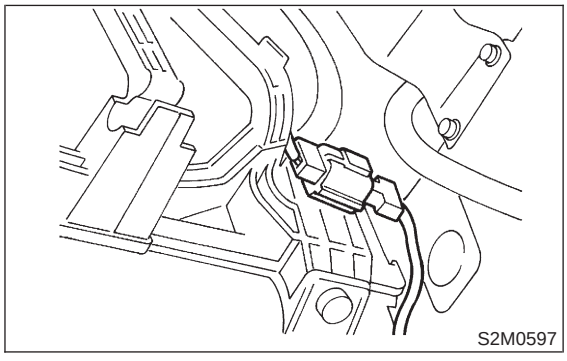
1) Disconnect battery ground cable.



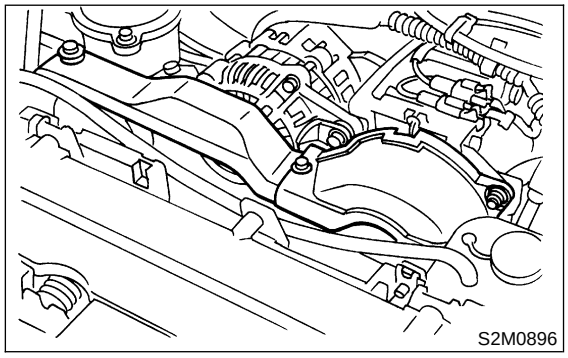
2) Lift-up the vehicle.
3) Remove under cover.



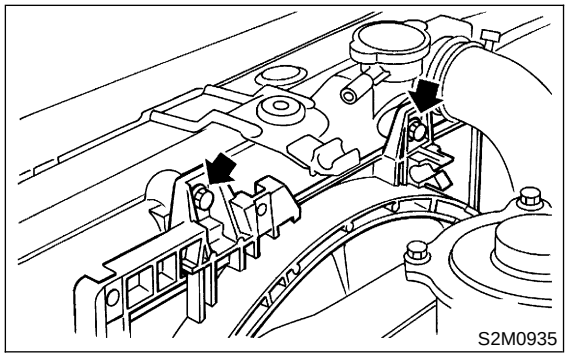
4) Disconnect connector of sub fan motor.



5) Lower the vehicle.
6) Remove V-belt covers.

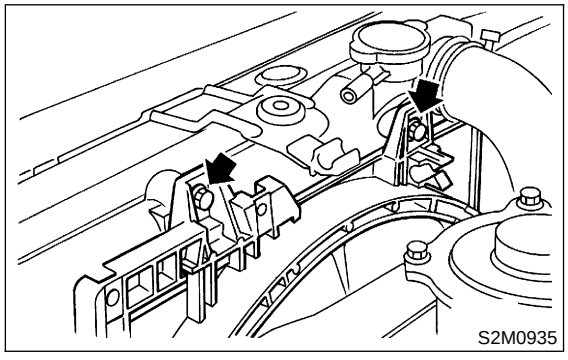


7) Remove bolts which hold sub fan shroud to radiator.
8) Remove radiator sub fan motor assembly.



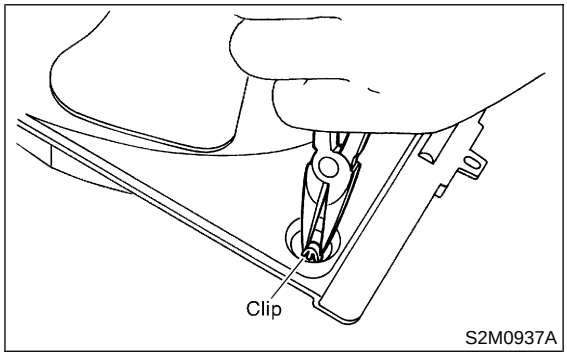
9) Installation is in the reverse order of removal.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)

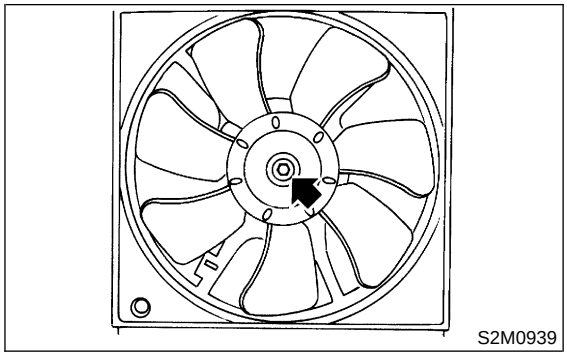


B: DISASSEMBLY AND ASSEMBLY

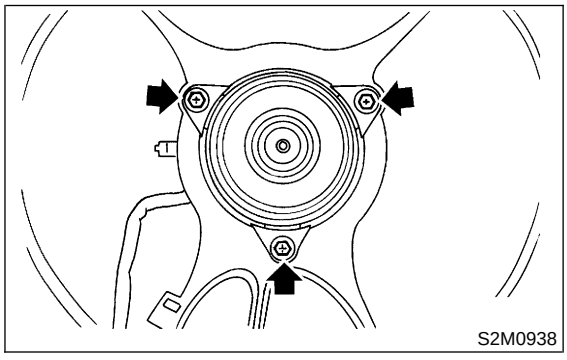
1) Remove clip which holds motor harness onto shroud.



2) Remove nut which install fan itself onto fan motor and shroud assembly.

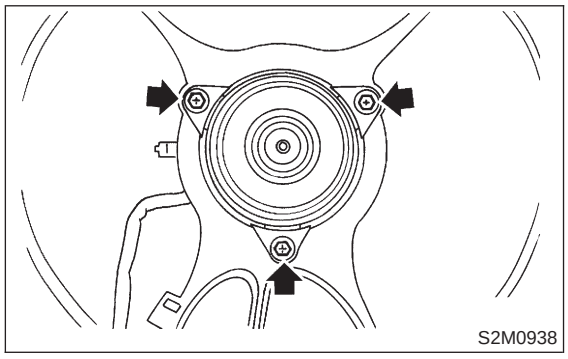


3) Remove bolts which install fan motor onto shroud.

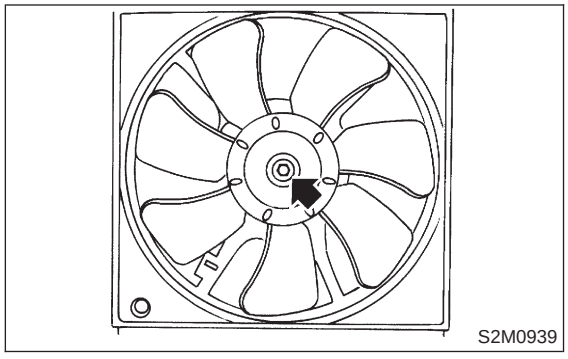


4) Installation is in the reverse order of removal.

Tightening torque:
4.4±0.5 N·m (0.45±0.05 kg-m, 3.3±0.4 ft-lb)


S2M0938

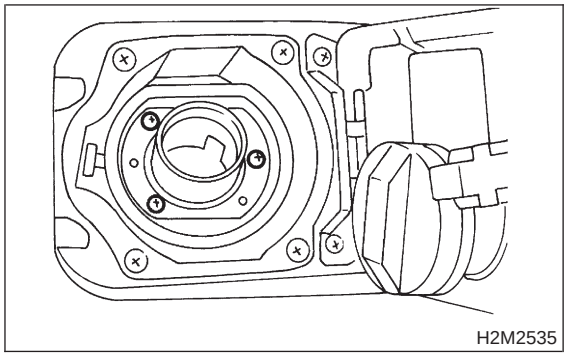
Tightening torque:
3.4±0.5 N·m (0.35±0.05 kg-m, 2.5±0.4 ft-lb)


S2M0939

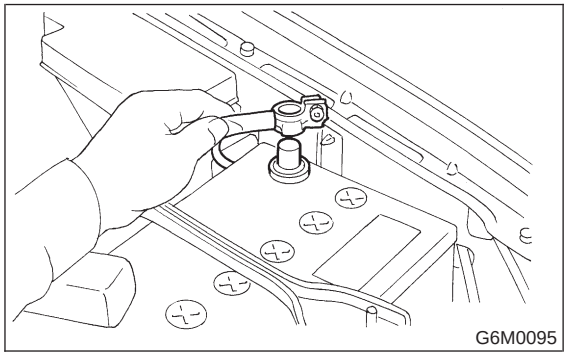
8. Water Pipe

A: REMOVAL

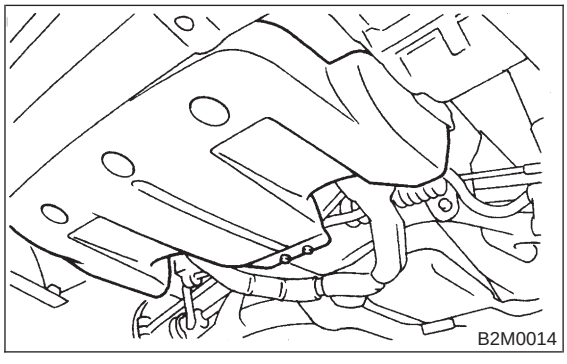
1) Release fuel pressure.
<Ref. to 2-8 [W1B0].>
2) Open fuel flap lid, and remove fuel filler cap.


H2M2535

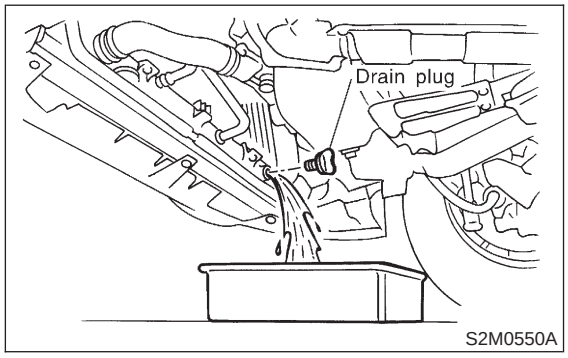
3) Disconnect ground cable from battery.


G6M0095

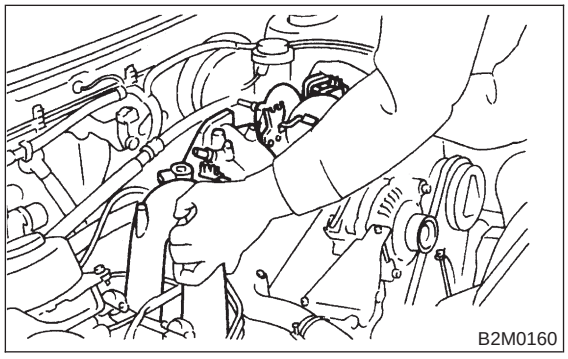
4) Lift-up the vehicle.
5) Remove under cover.


B2M0014

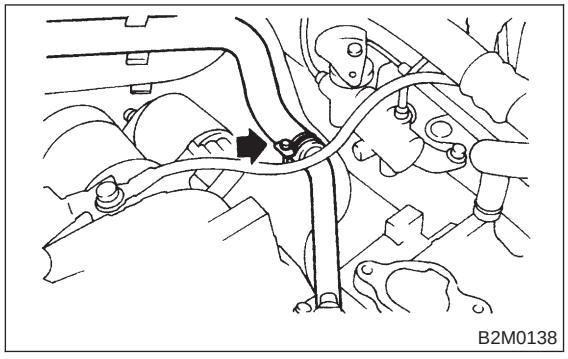
6) Drain engine coolant completely.
<Ref. to 2-5 [W1A0].>



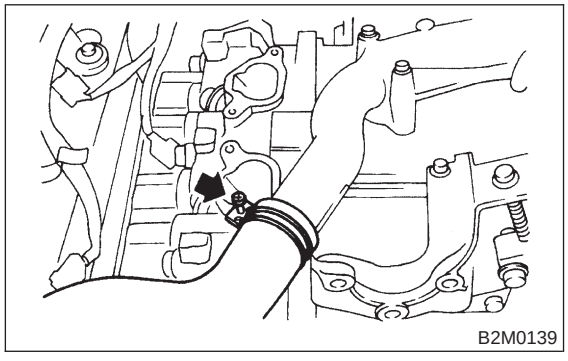
7) Lower the vehicle.
8) Remove intake manifold.
<Ref. to 2-7 [W4A0].>



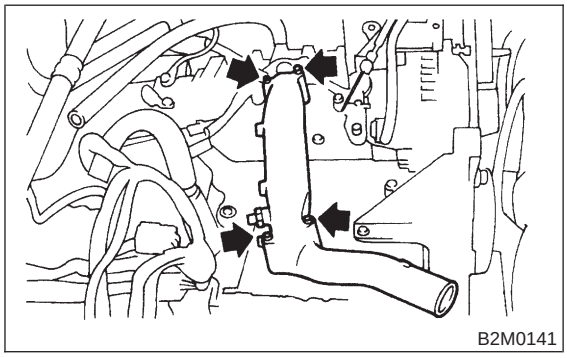
9) Disconnect heater inlet hose.



10) Disconnect radiator inlet hose from water pipe.



11) Remove bolts which install water pipe on cylinder block.

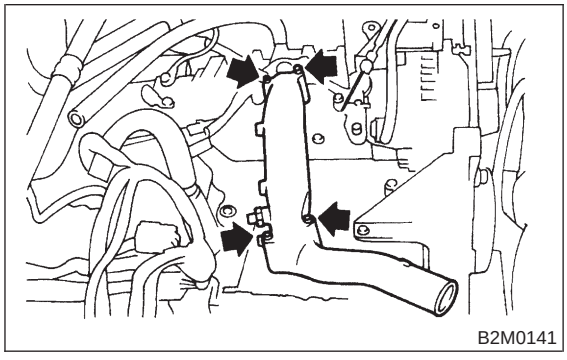


B: INSTALLATION

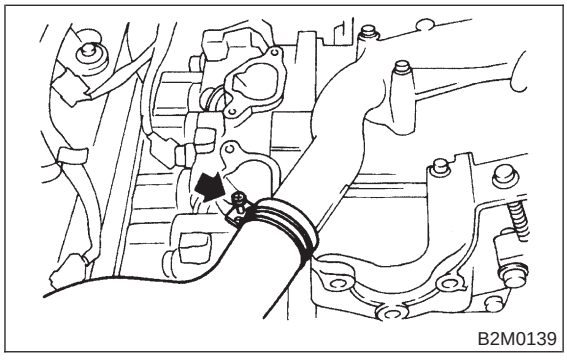
1) Install water pipe on cylinder block.

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

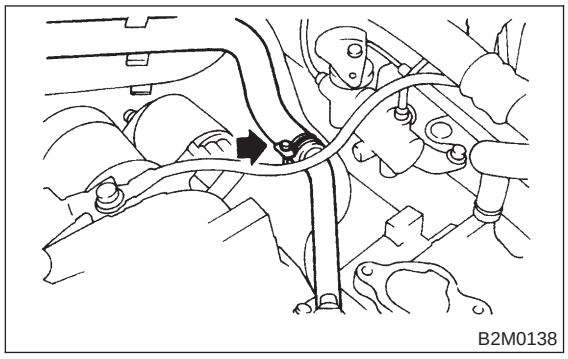
CAUTION:
Use a new O-ring.



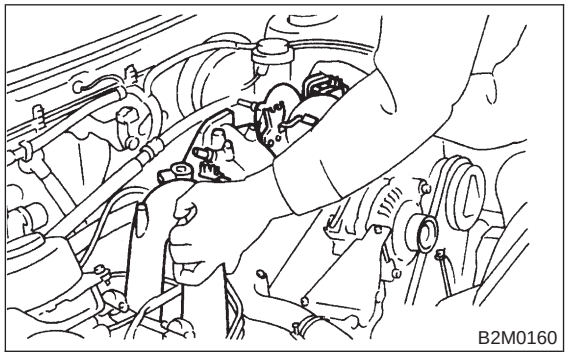
2) Connect radiator inlet hose.



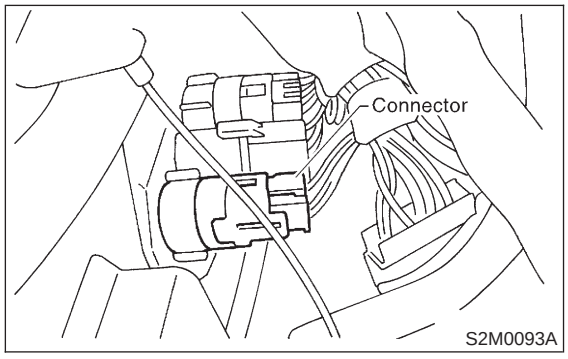
3) Connect heater inlet hose.


B2M0138

4) Install intake manifold.
<Ref. to 2-7 [W4D0].>

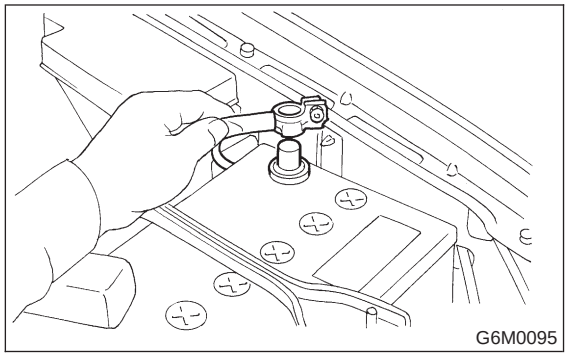

B2M0160

5) Connect connector to fuel pump relay.

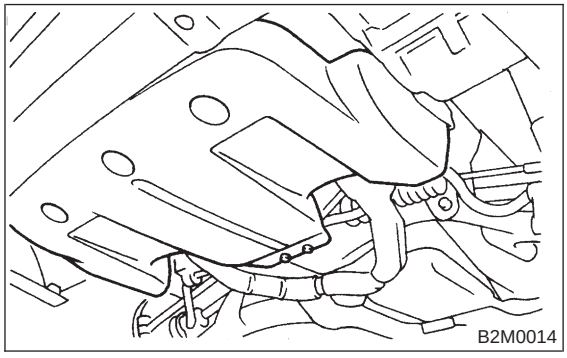


S2M0093A

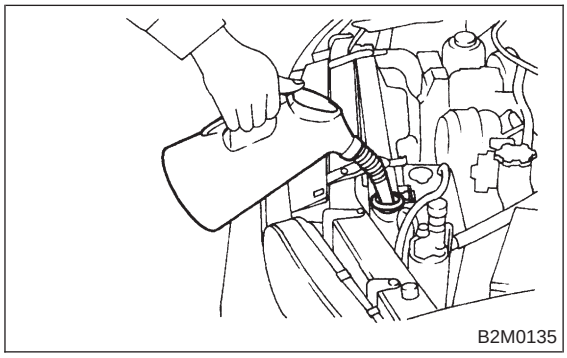
6) Connect ground cable to battery.


G6M0095

7) Lift-up the vehicle.
8) Install under cover.


B2M0014

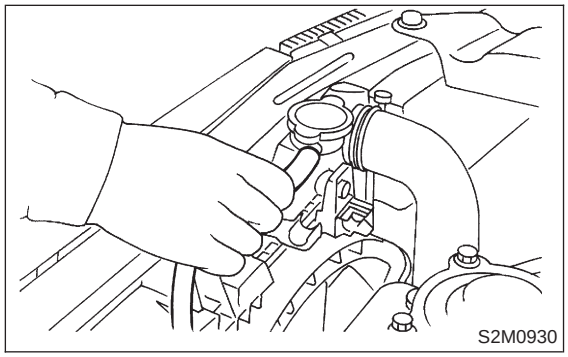
9) Lower the vehicle.
10) Fill coolant.
<Ref. to 2-5 [W1B0].>


B2M0135

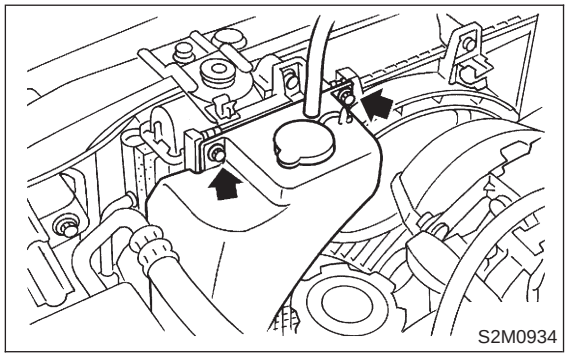
9. Reservoir Tank

A: REMOVAL AND INSTALLATION

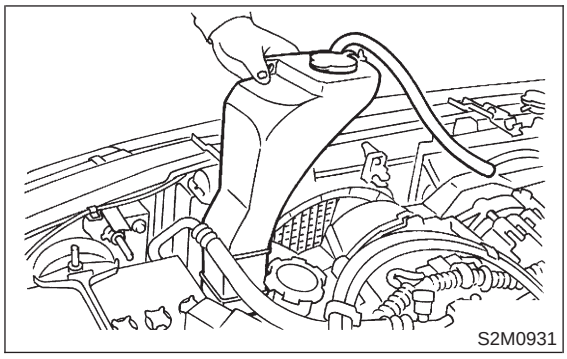
1) Disconnect over flow hose from radiator filler neck position.


S2M0930

2) Remove bolts which install reservoir tank onto radiator main fan shroud.

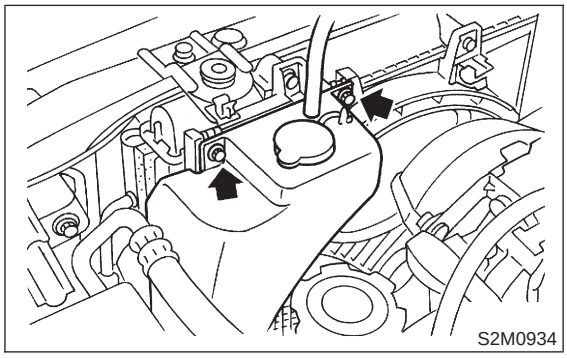

S2M0934

3) Remove reservoir tank.


S2M0931

4) Installation is in the reverse order of removal.

Tightening torque:
4.9±1.5 N·m (0.50±0.15 kg-m, 3.6±1.1 ft-lb)


S2M0934

1. Engine Cooling System Trouble in General

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. Refer to “2-7 On-Board Diagnostics II System”.
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. Refer to “2-7 On-Board Diagnostics II System”.
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Improper transmission oil	Replace.
	p. Defective thermostat	Replace.
	q. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

MEMO: