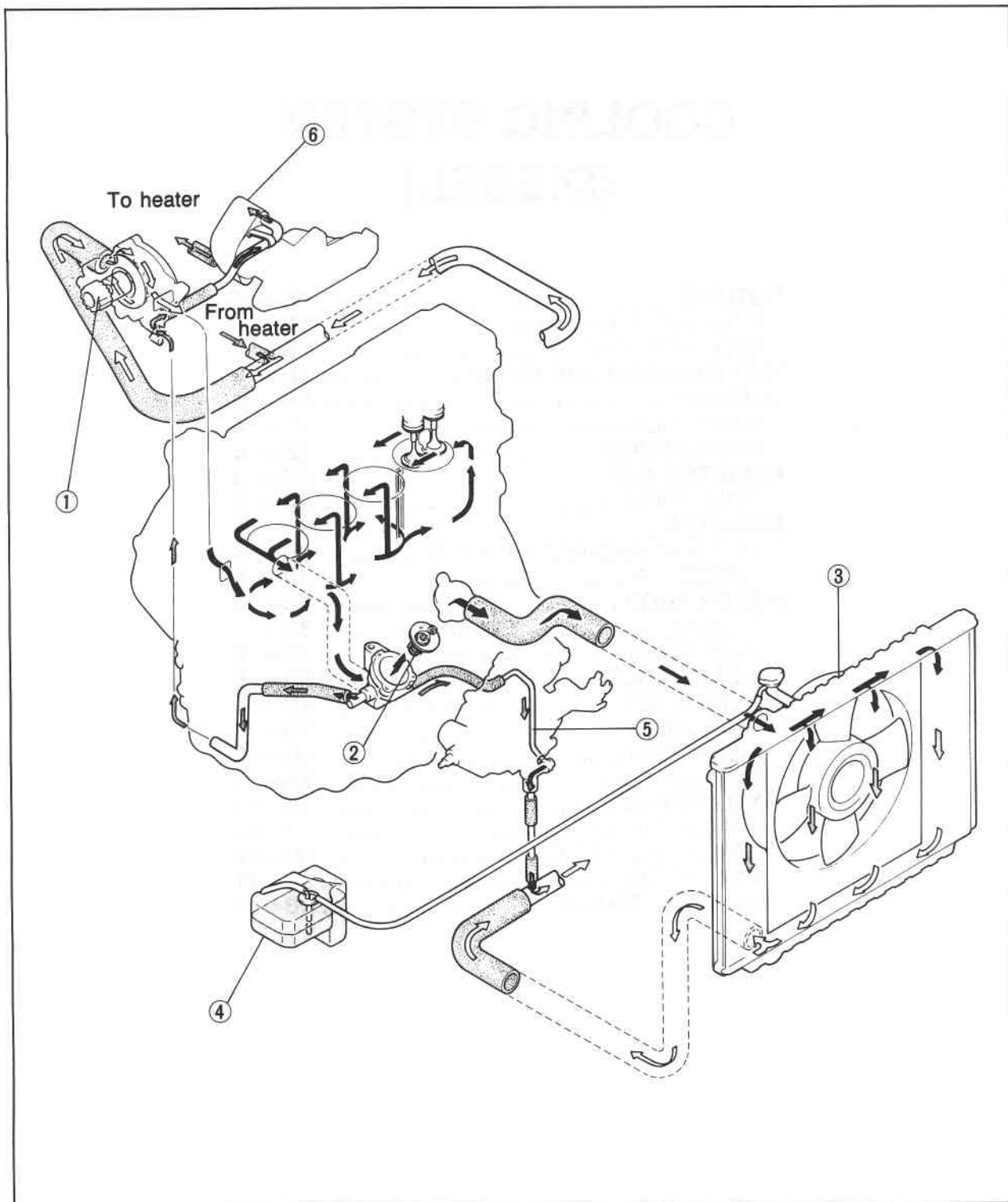


COOLING SYSTEM (DIESEL)

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OUTLINE

COOLANT FLOW CHART



76G03B-002

- 1. Water pump
- 2. Thermostat
- 3. Radiator

- 4. Coolant reservoir
- 5. CSD coolant passage
- 6. Oil cooler

SPECIFICATIONS

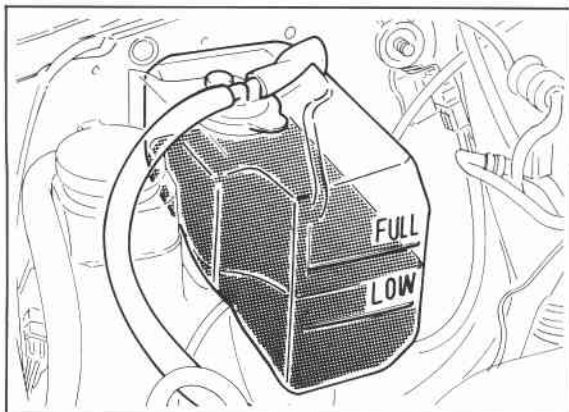
Cooling system		Water-cooled, forced circulation	
Coolant capacity	liters (US qt, Imp qt)	With heater	9.5 (10.0, 8.4)
		Without heater	9.0 (9.5, 7.9)
Water pump	Type	Centrifugal, timing belt driven	
	Water seal	Unified mechanical seal	
Thermostat	Type	Wax, two stage	
	Opening temperature	°C(°F)	
		Main	Sub
		86.5—89.5 (188—193)	78.5—81.5 (173—179)
	Full-open temperature	°C(°F)	100 (212)
	Full-open lift	mm (in)	8.0 (0.31) min.
Radiator	Type	Corrugated fin	
	Cap valve opening pressure	kPa (kg/cm ² , psi)	74—103 (0.75—1.05, 11—15)
Cooling fan	Type	Electric	
	Capacity	W	120
	Switching temperature	°C(°F)	91 (196)
	Number of blade	4	
	Outer diameter	mm (in)	340 (13.4)

76G03B-003

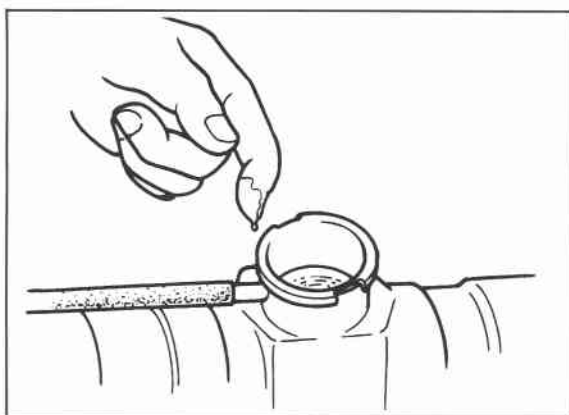
TROUBLESHOOTING GUIDE

Problem	Possible Cause	Remedy	Page
Overheating	Insufficient coolant	Add	3B— 4
	Coolant leakage	Repair	—
	Radiator fins clogged	Clean	3B— 6
	Radiator cap malfunction	Replace	3B— 5
	Cooling fan malfunction	Repair	3B—11
	Thermostat malfunction	Replace	3B— 9
	Water passage clogged	Clean	3B— 4
	Water pump malfunction	Repair or replace	3B— 7
Corrosion	Impurities in coolant	Replace	3B— 4

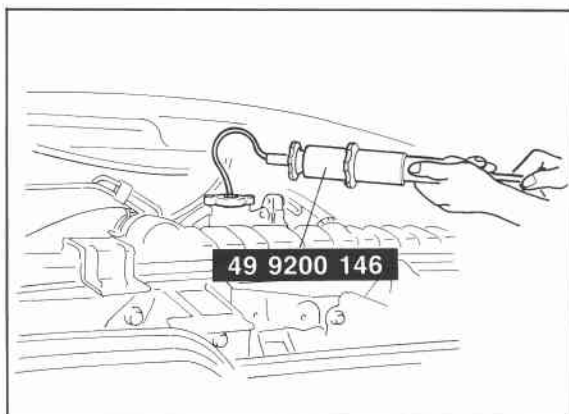
76G03B-004



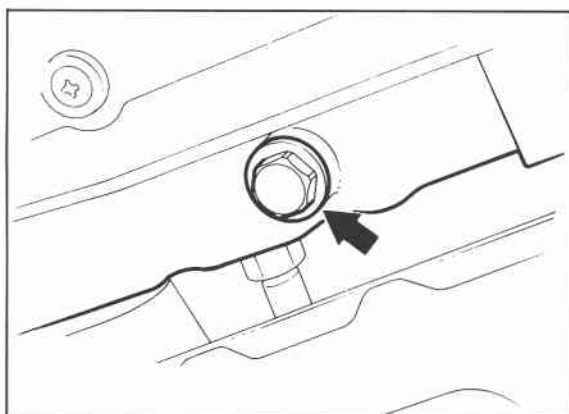
86U03X-004



69G03A-006



86U03X-005



86U03X-006

COOLANT

INSPECTION

Coolant Level (Engine cold)

1. Check that the coolant level is near the radiator inlet port.
2. Check that the coolant level in the coolant reservoir is between the FULL and Low marks. Add coolant if necessary.

Warning

- a) **Never remove the radiator cap while the engine is hot.**
- b) **Wrap a thick cloth around the cap when removing it.**

Coolant Quality

1. Check that there is no build-up of rust or scales around the radiator cap or radiator filler neck.
2. Check that coolant is free from oil.
3. Replace the coolant, if necessary.

Coolant Leakage

1. Connect a tester and **SST** to the radiator inlet port.
2. Apply **103 kPa (1.05 kg/cm², 15 psi)** pressure to the system.
3. Check that the pressure is held. If not, check for coolant leakage.

Warning

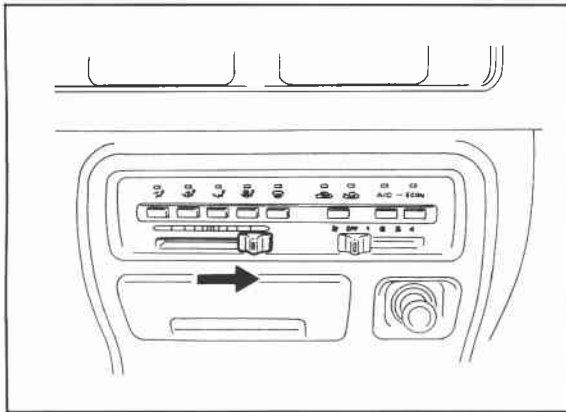
When removing either the radiator cap or the tester, loosen it slowly until the pressure in the radiator is released, and then remove it.

REPLACEMENT

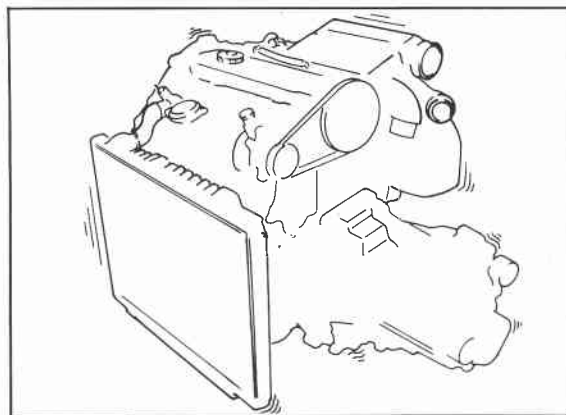
1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.

Warning

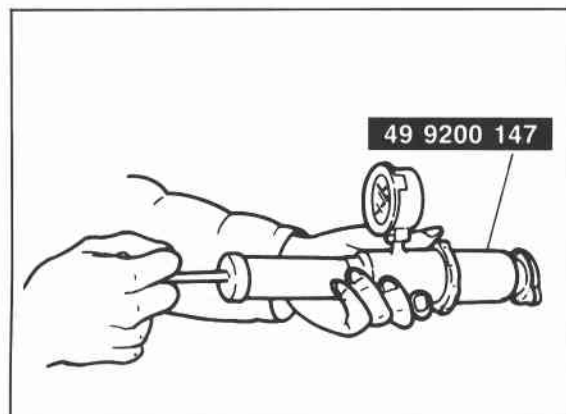
- a) **Never open the radiator cap while the engine is hot.**
- b) **Wrap a thick cloth around the cap when loosening.**
- c) **Use caution when draining hot coolant.**



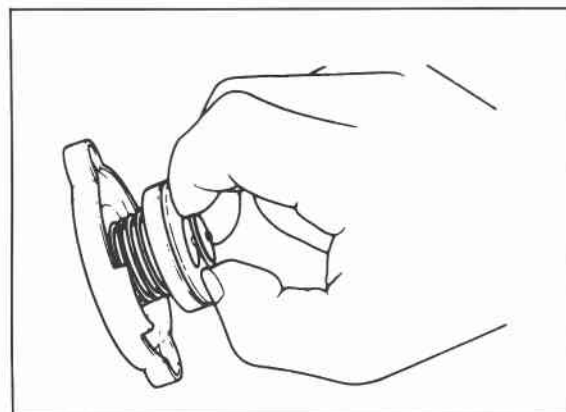
86U03X-028



86U03X-007



86U03X-008



86U03X-009

3. Set the heater control switch to the maximum heat position.
4. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
5. Fill with the proper mixture and amount of ethylene glycol-based coolant.

Caution

- a) Do not use alcohol- or methanol-based coolant.
- b) Use only soft (demineralized) water in the coolant mixture.

Anti-freeze solution mixture percentage

Protection	Volume percentage		Gravity at 20°C (68°F)
	Solution	Water	
Above -16°C (3°F)	35	65	1.054
Above -26°C (-15°F)	45	55	1.066
Above -40°C (-40°F)	55	45	1.078

6. Run the engine at idle with the radiator cap removed. Let any air bleed from the system, and add more coolant.
7. Install the radiator cap, and inspect all connections for leakage.

RADIATOR CAP

INSPECTION

Radiator Cap Valve

1. Remove foreign material (such as water residue) from between the radiator cap valve and the valve seat.
2. Attach the radiator cap to a tester with the **SST**. Apply pressure gradually to **74—103 kPa (0.75—1.05 kg/cm², 11—15 psi)**.
3. Wait about 10 seconds; then check that the pressure has not decreased.

Negative Pressure Valve

1. Pull the negative-pressure valve to open it. Check that it closes completely when released.
2. Check for damage on the contact surfaces, and for cracked or deformed seal packing.
3. Replace the radiator cap if necessary.

3B RADIATOR

RADIATOR

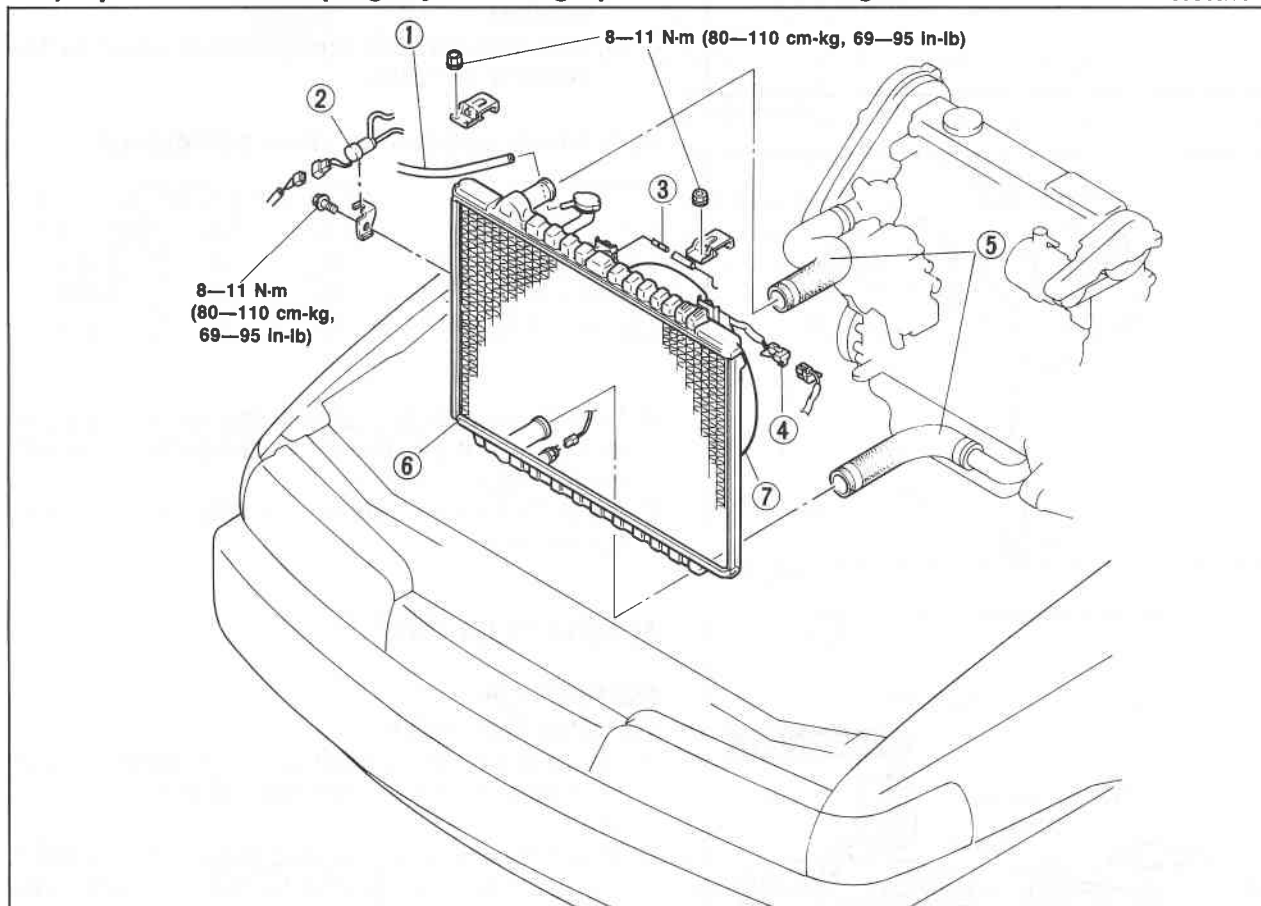
REMOVAL AND INSTALLATION

1. Drain the engine coolant.
2. Remove in the sequence shown in the figure.
3. Install in the reverse order of removal.

Note

- a) Position the hose clamp in the original location on the hose.
- b) Squeeze the clamp lightly with large pliers to ensure a good fit.

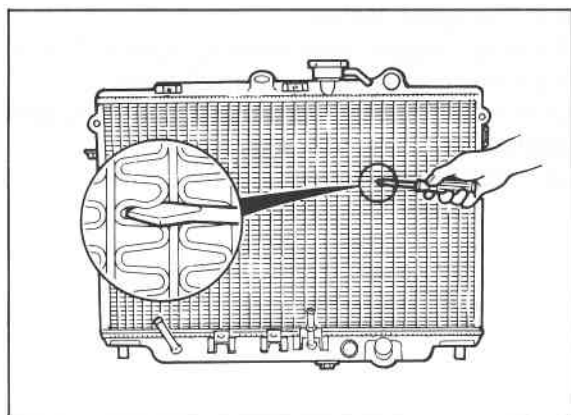
86U03X-010



76G03B-005

1. Coolant reservoir hose
2. Fast idle solenoid
3. Coolant level sensor connector
4. Cooling fan connector

5. Upper and lower radiator hose
6. Cooling fan and radiator assembly
7. Cooling fan



86U03X-012

INSPECTION

Check the following points. Repair or replace if necessary.

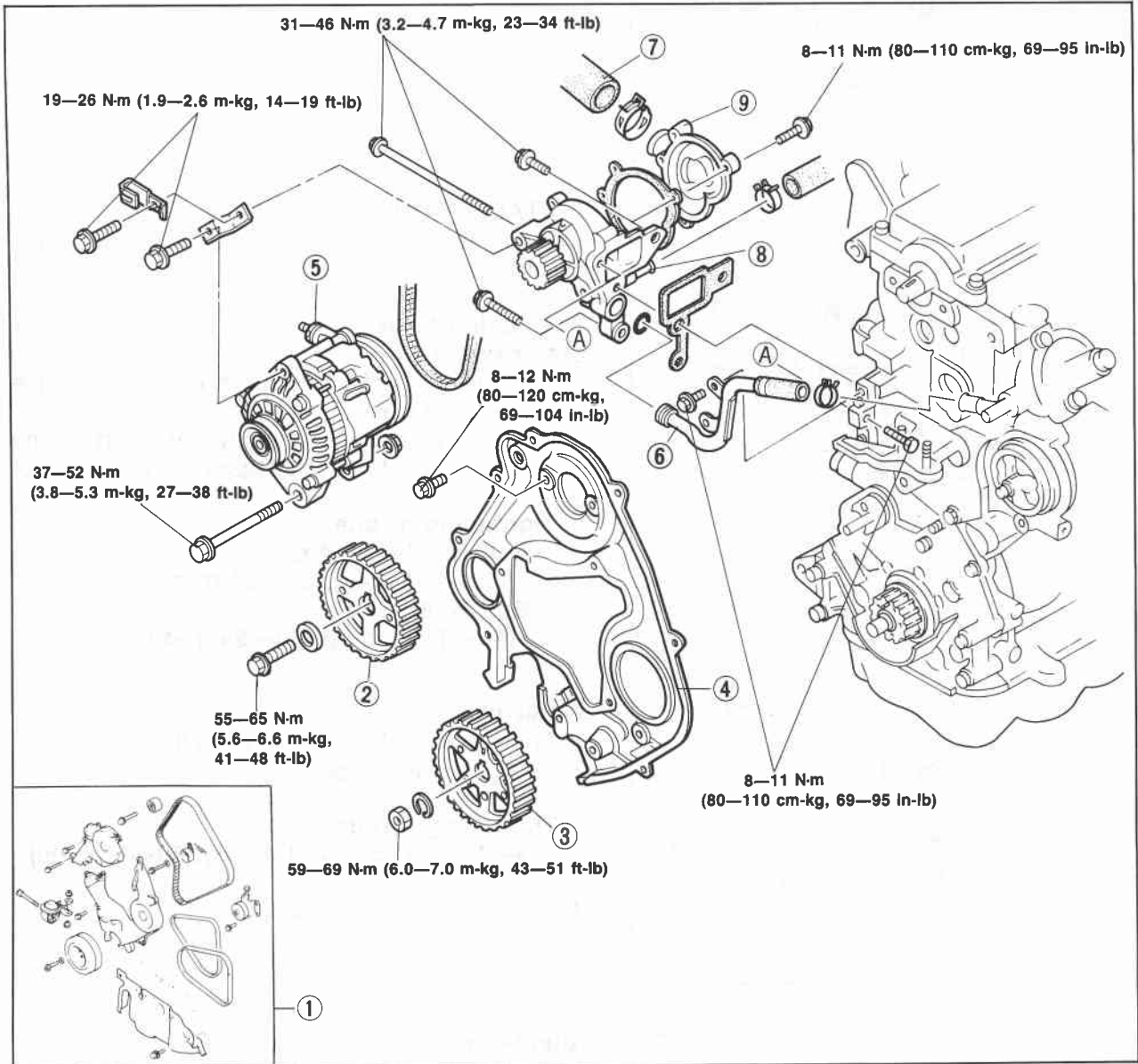
1. Cracks, damage, or water leakage
2. Bent fins (Repair with a screwdriver)
3. Distorted or bent radiator inlet

WATER PUMP

REMOVAL

1. Disconnect the negative battery cable.
2. Turn the crankshaft so that the No. 1 cylinder is at TDC of compression.
3. Drain the engine coolant.
4. Remove in the sequence shown in the figure.

69G03A-025



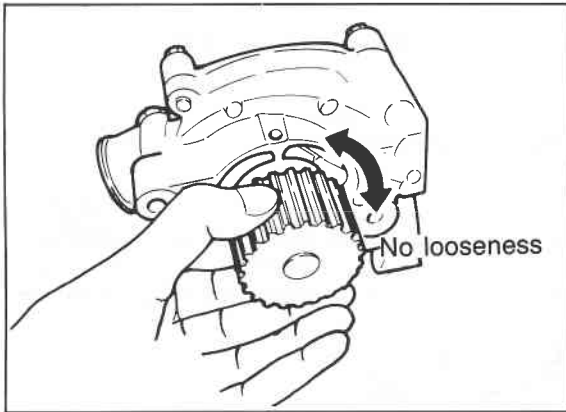
76G03B-006

1. Timing belt (Refer to page 1C—11)
2. Camshaft pulley (Refer to page 1C—36)
3. Injection pump pulley (Refer to page 1C—36)
4. Seal plate
5. Alternator
6. Water pipe
7. Water hose
8. Water pump body
9. Water pump inlet

Note

Do not disassemble the water pump body, if a problem is found replace it as a unit.

3B WATER PUMP

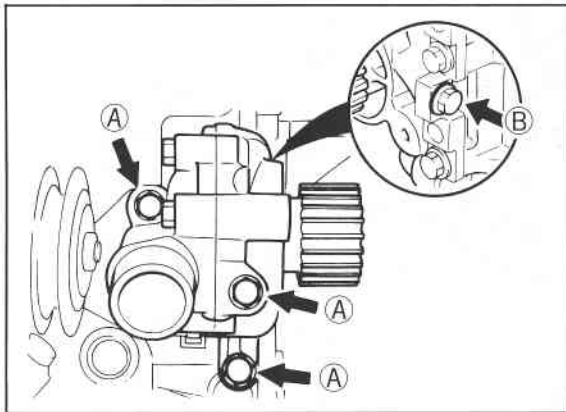


86U03X-014

INSPECTION

Check the following. Replace the pump if necessary.

1. Cracks or damage
2. Abnormal noise, bearing sticking or loose



76G03B-007

INSTALLATION

Install in the reverse order of removal referring to the installation note.

Installation Note

Water pump

1. Remove any gasket fragments, dirt or oil from the contact surfaces.
2. Install the water pump and new gasket so that the printed side of the gasket faces the water pump.

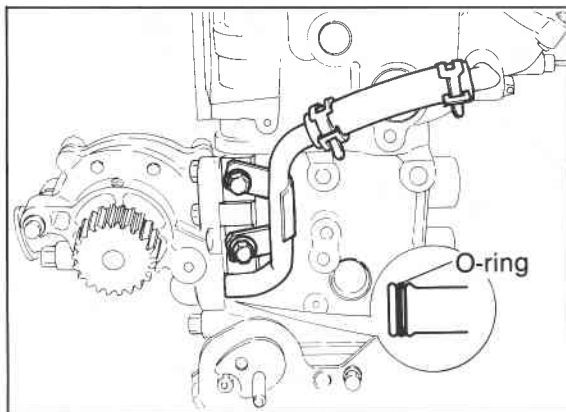
Tightening torque:

Bolt A: 31—46 N·m

(3.2—4.7 m·kg, 23—34 ft·lb)

Bolt B: 8—11 N·m

(80—110 cm·kg, 69—95 in·lb)



76G03B-008

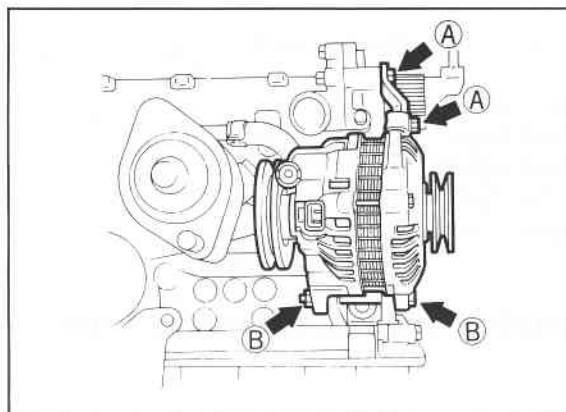
Water pipe

1. Apply a coat of vegetable oil to the O-ring.
2. Install the water pipe.

Tightening torque:

8—11 N·m (80—110 cm·kg, 69—95 in·lb)

3. Connect the water hose.



76G03B-009

Alternator

1. Install the alternator.

Tightening torque:

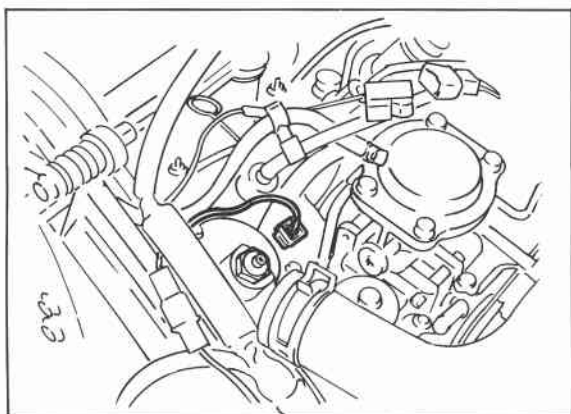
Bolt A: 19—26 N·m

(1.9—2.6 m·kg, 14—19 ft·lb)

Bolt B: 37—52 N·m

(3.8—5.3 m·kg, 27—38 ft·lb)

2. Install the alternator drive belt and Compress supercharger drive belt, and adjust the belt deflection. (Refer to page 1C—7)

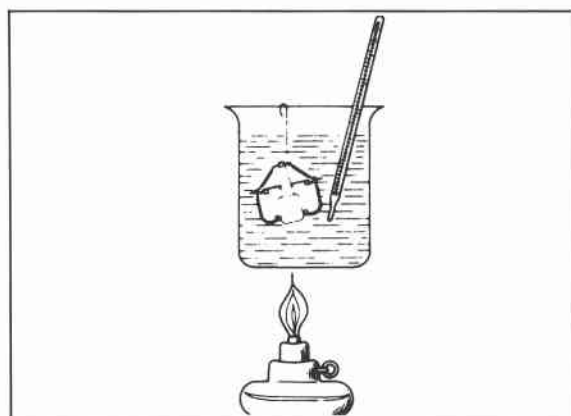


76G03B-010

THERMOSTAT

REMOVAL

1. Drain the engine coolant.
2. Disconnect the upper radiator hose, and water thermo switch connector.
3. Remove the thermostat cover.
4. Remove the thermostat.



76G03B-011

INSPECTION

Check the thermostat. Replace if necessary.

1. Visually check that the valve is airtight.
2. Place the thermostat and a thermometer in water.
3. Gradually heat the water and check the following:

Valve opening temperature

Sub valve : 78.5—81.5°C (173—179°F)

Main valve : 86.5—89.5°C (188—193°F)

Full open lift

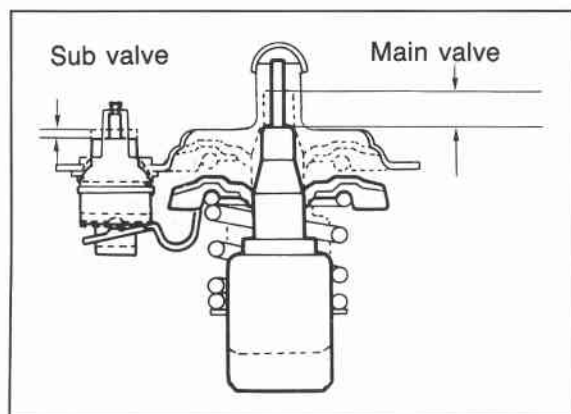
Sub valve : 1.5 mm (0.06 in) min. at 100°C (212°F)

Main valve : 8 mm (0.31 in) min. at 100°C (212°F)

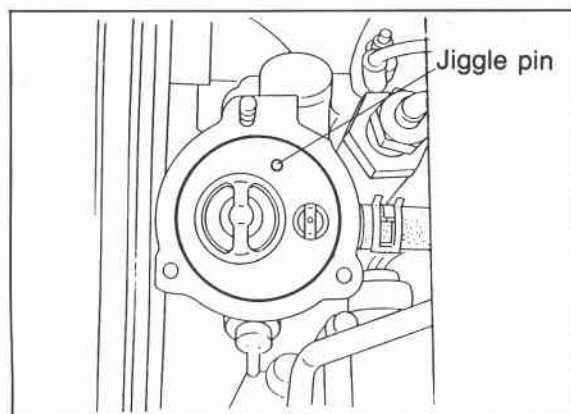
Valve closing temperature

Sub valve : 75°C (167°F)

Main valve : 83°C (181°F)



69G03B-012



76G03B-012

INSTALLATION

1. Install the thermostat into the thermostat case with jiggle pin at the top.
2. Install a new gasket with the seal print side facing the thermostat case.
3. Install the thermostat cover.

Tightening torque:

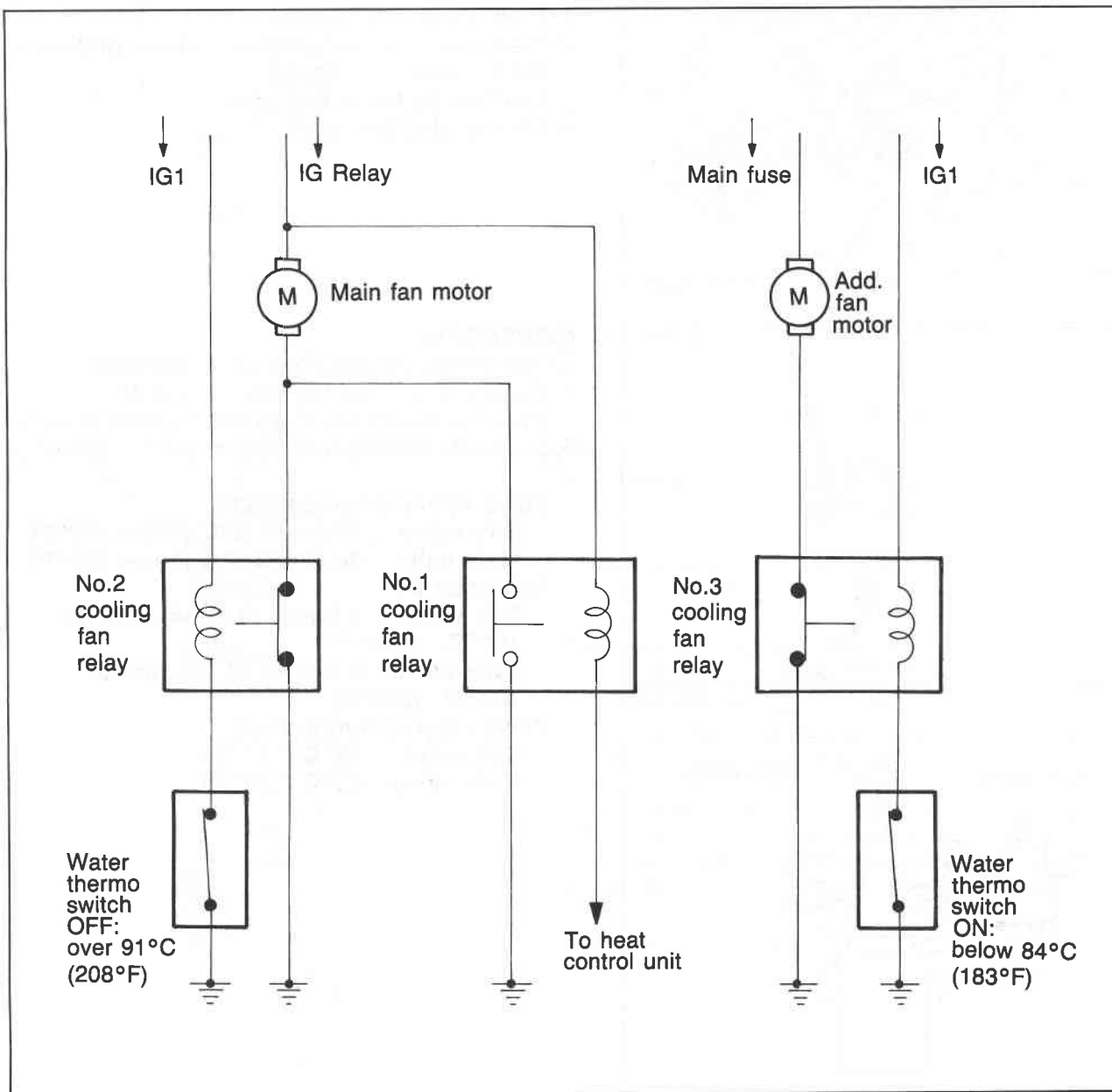
7—10 N·m (70—100 cm·kg, 61—87 in·lb)

4. Install the upper radiator hose and water thermo switch connector.
5. Replenish the coolant.
6. Start the engine and check for leaks.

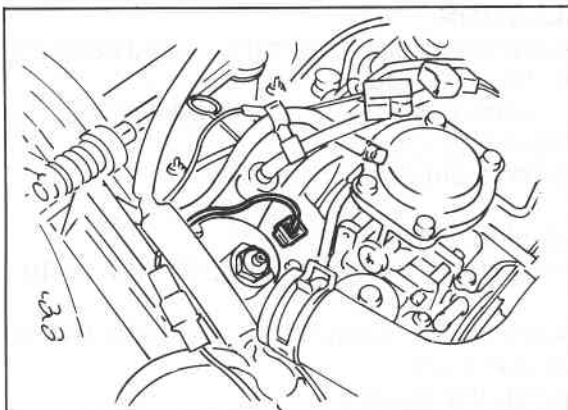
3B COOLING FAN

COOLING FAN

SYSTEM CIRCUIT



76G03B-015



76G03B-016

CIRCUIT INSPECTION

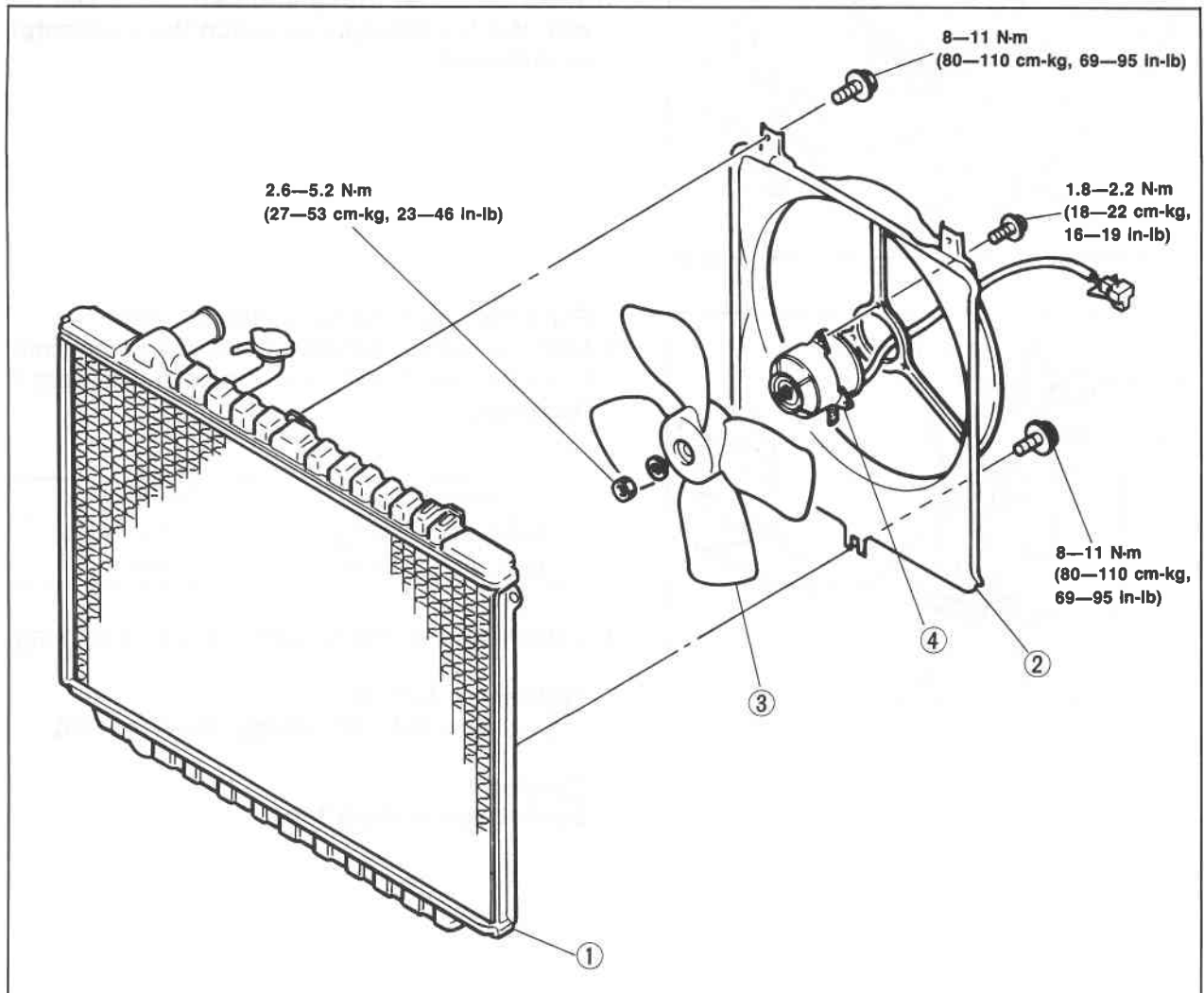
1. Turn the ignition switch ON.
2. Disconnect the water thermo switch connector, and check that the fan begins to operate.
3. If the fan doesn't operate, check the fuse, fan relay, fan motor, thermo switch, and wiring harness.

FAN MOTOR

Removal and Installation

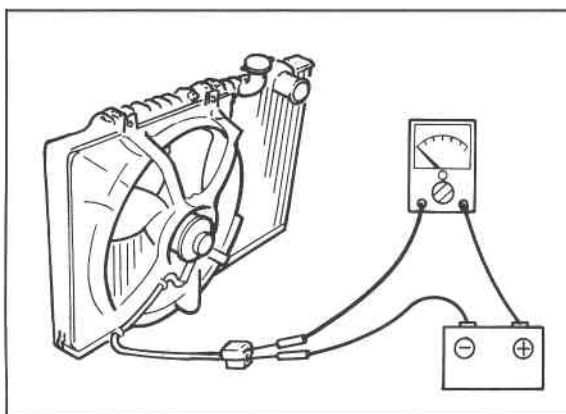
1. Remove in the sequence shown in the figure.
2. Install in the reverse order of removal.

86U03X-021



76G03B-013

1. Cooling fan assembly (Refer to page 3B—6)
2. Cowling
3. Fan
4. Fan motor



76G03B-014

Inspection

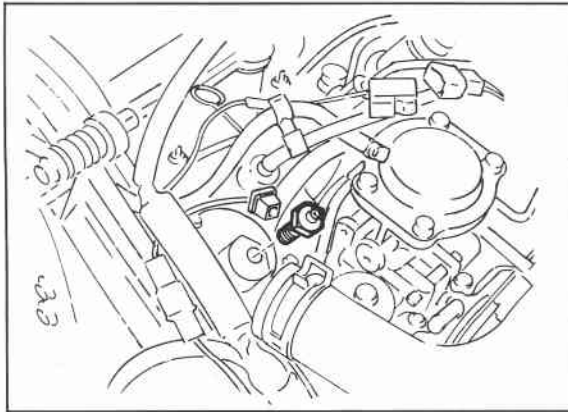
1. Connect an ammeter and battery to the fan motor connectors.
2. Check that the fan motor operates smoothly at the specified current or less.

Current

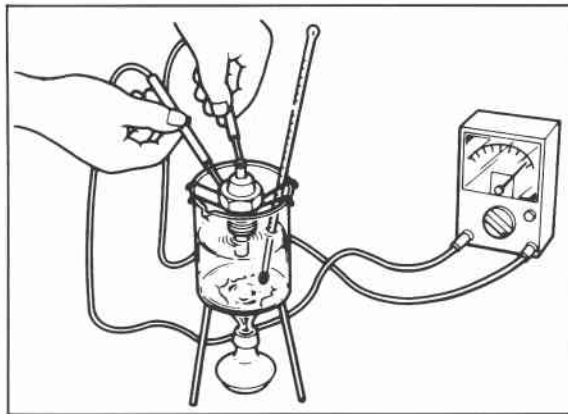
8.0—11.0 Amperes

3. Replace the fan motor if necessary.

3B COOLING FAN



76G03B-017



76G03B-018

WATER THERMO SWITCH

1. Remove the cooling fan water thermo switch.

Note

Make sure that the ignition switch is OFF. If not, the fan will operate when the connector is removed.

2. Place the water thermo switch in water.
3. Heat the water gradually, and check for continuity of the switch with an ohmmeter. Replace if necessary.

Temperature	Continuity
Above 91°C (208°F)	No
Below 84°C (183°F)	Yes

4. Install the water thermo switch and a new O-ring.

Tightening torque:

6—9 N·m (60—90 cm·kg, 52—78 in·lb)

Caution

Do not use sealing tape.