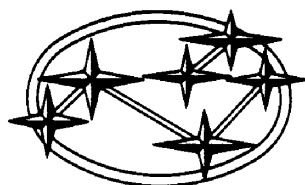


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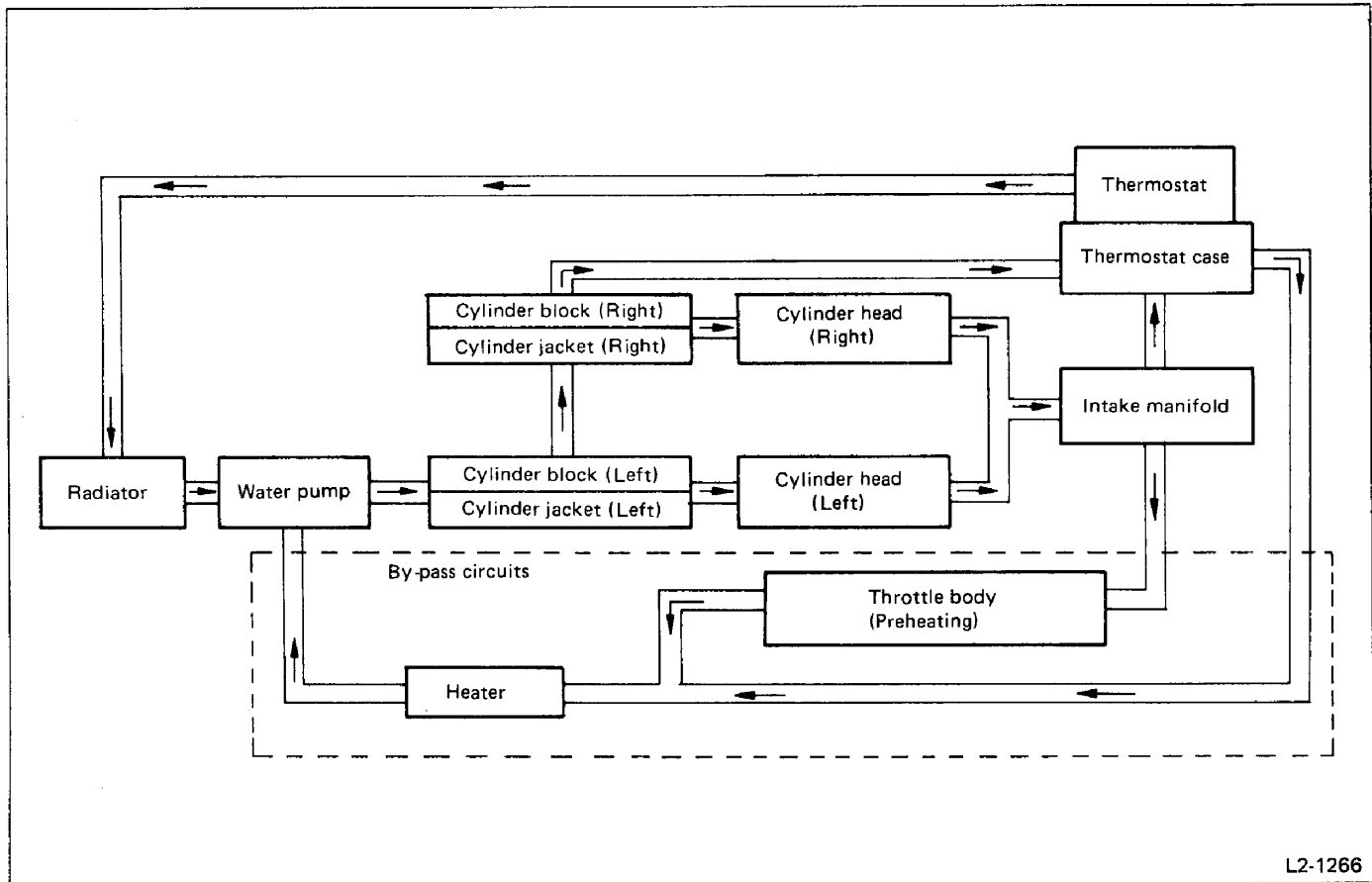


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# MECHANISM AND FUNCTION

## General

The engine cooling system consists of a cross-flow radiator, a reserve tank, an electric motor fan, a water pump, a thermostat, and a thermometer.



L2-1266

Fig. 1

## Cooling Lines

This cooling system operates in three steps depending on the temperature of the coolant flowing through the cooling circuit.

1) 1st step ... With thermostat closed

At coolant temperature of below  $88^{\circ}\text{C}$  ( $190^{\circ}\text{F}$ ), the thermostat remains closed and the coolant flows through the bypass and heater circuits.

This permits the engine to warm up quickly.

2) 2nd step ... With thermostat opened

When the coolant temperature is above  $88^{\circ}\text{C}$  ( $190^{\circ}\text{F}$ ), the thermostat opens and the coolant flows through the radiator where it is cooled.

3) 3rd step ... With electric cooling fan operating

When the coolant temperature rises above  $95^{\circ}\text{C}$  ( $203^{\circ}\text{F}$ ), the thermostwitch is turned on and the electric cooling fan rotates.

## Thermostat

### 1800 cc model

The thermostat is powered to open the valve by a totally-enclosed wax pellet which expands with increased temperature. It provides the sure open-close operation of the valve and features high durability.

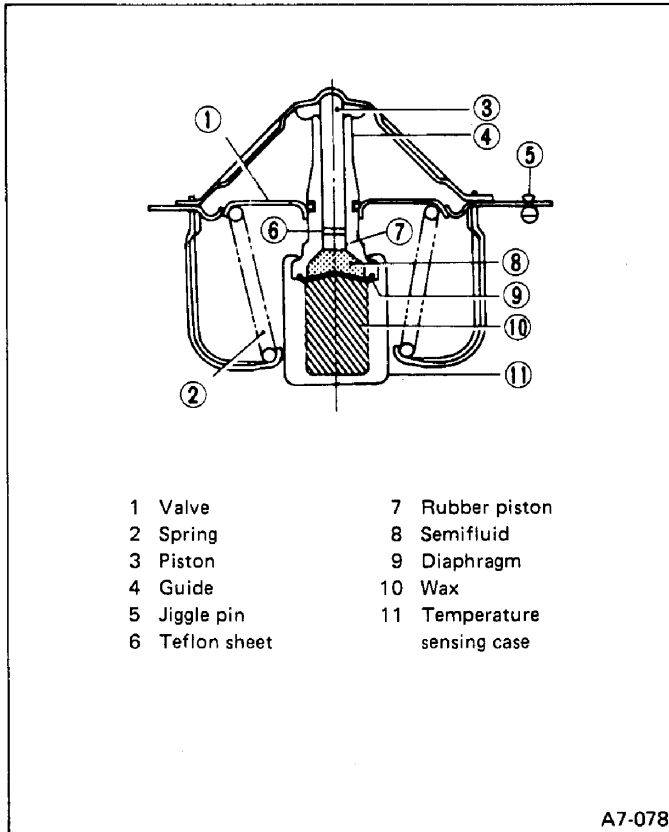


Fig. 2

### 2700 cc model

The thermostat is a wax-pellet type. It is equipped with a main valve and a sub-valve. Before the main valve opens, the sub-valve opens to prevent abrupt pressure variations.

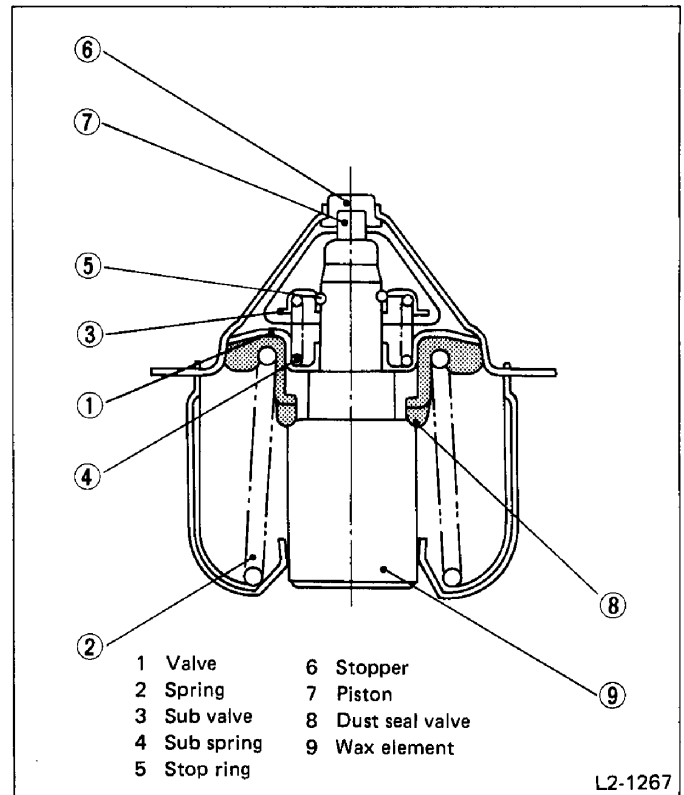


Fig. 3

## Thermometer

The thermometer is installed on the intake manifold and monitors the temperature of the coolant in the engine to activate the temperature gauge in the combination meter. The thermometer includes a thermistor, lead wire, spring, terminal plate and resin body, completely sealed by a threaded case which is integral with a hexagon nut.

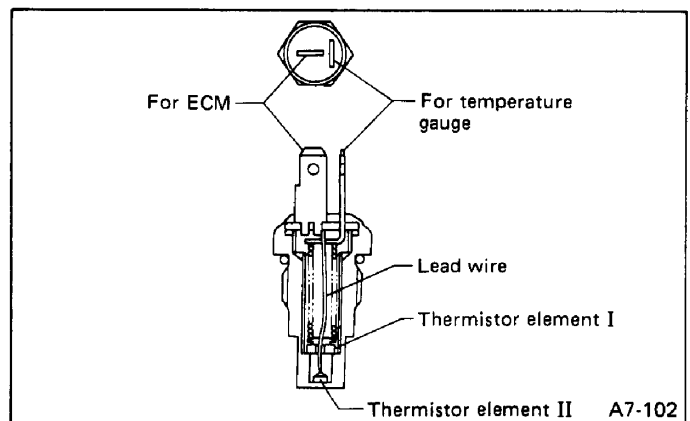


Fig. 4

## SPECIFICATIONS AND SERVICE DATA

## SPECIFICATIONS

Cooling system			Electric fan + Forced cooling water circulation system	
Model			1800 cc	2700 cc
Total coolant capacity			5.5 ℓ (5.8 US qt, 4.8 Imp qt)	7.0 ℓ (7.4 US qt, 6.2 Imp qt)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	7 ℓ/min (7.4 US qt/min, 6.2 Imp qt/min) or more	20 ℓ/min (21.1 US qt/min, 17.6 Imp qt/min) or more
		Pump speed - total water head	1,000 rpm - 0.29 m Aq (0.95 ft Aq)	3,000 rpm - 2m Aq (7 ft Aq)
		Water temperature	75 – 85°C (167 – 185°F)	
	Discharge performance II	Discharge	50 ℓ (13.2 US gal, 11.0 Imp gal)/min or more	160 ℓ (42.3 US gal, 35.2 Imp gal)/min or more
		Pump speed - total water head	4,000 rpm - 5.0 m Aq (16.4 ft Aq)	8,000 rpm - 16 m Aq (52 ft Aq)
		Water temperature	75 – 85°C (167 – 185°F)	
	Impeller diameter		66 mm (2.60 in)	62 mm (2.44 in)
	Number of impeller vanes		5	
	Pump pulley diameter		90 mm (3.54 in)	88 mm (3.46 in)
Thermostat	Type		Wax pellet type	
	Starts to open		86.5 – 89.5°C (188 – 193°F)	Sub-valve 86 – 90°C (187 – 194°F) Main valve 90 – 94°C (194 – 201°F)
	Fully opens		100°C (212°F)	102°C (216°F)
	Valve lift		8.5 mm (0.335 in)	Sub-valve 1.5 mm (0.059 in) Main valve 6.5 mm (0.256 in)
	Valve bore		31 mm (1.22 in)	Sub-valve 14 mm (0.55 in) Main valve 33 mm (1.30 in)
Thermoswitch	Type		Bimetal type	
	Operation temperature		ON: 92 – 98°C (198 – 208°F) Differential: 5 – 9°C (9 – 16°F)	

Model		1800 cc	2700 cc
Electric fan	Motor	120 W or less	140 W or less
	Fan dia.	280 mm (11.02 in)	340 mm (13.39 in)
Radiator	Type	Cross-flow, pressurized type	
	Radiation capacity	49.893 kW (42,900 kcal/h, 170,227 BTU/h)	56.522 kW (48,600 kcal/h, 192,845 BTU/h)
	Core dimensions	670 x 332 x 16 mm (26.38 x 13.07 x 0.63 in)	645 x 322 x 32 mm (25.39 x 12.68 x 1.26 in)
	Pressure range in which cap valve is open	Above 78 – 98 kPa (0.8 – 1.0 kg/cm <sup>2</sup> , 11 – 14 psi) Below –4.9 to –9.8 kPa (–0.05 to –0.1 kg/cm <sup>2</sup> , –0.7 to –1.4 psi)	
	Fins	Corrugated fin type	
Reserve tank	Capacity	1.3 ℓ (1.4 US qt, 1.1 Imp qt)	2.3 ℓ (2.4 US qt, 2.0 Imp qt)

## SERVICE DATA

Model		1800 cc	2700 cc
Water pump	Clearance between impeller and case	0.5 – 0.9 mm (0.020 – 0.035 in)	
	Distance between pulley attaching surface of hub and pump case surface, which mates with gasket	103.6 – 104.2 mm (4.08 – 4.10 in)	113.8 – 114.2 mm (4.48 – 4.50 in)

# COMPONENT PARTS

## Water Pump

1800 cc model

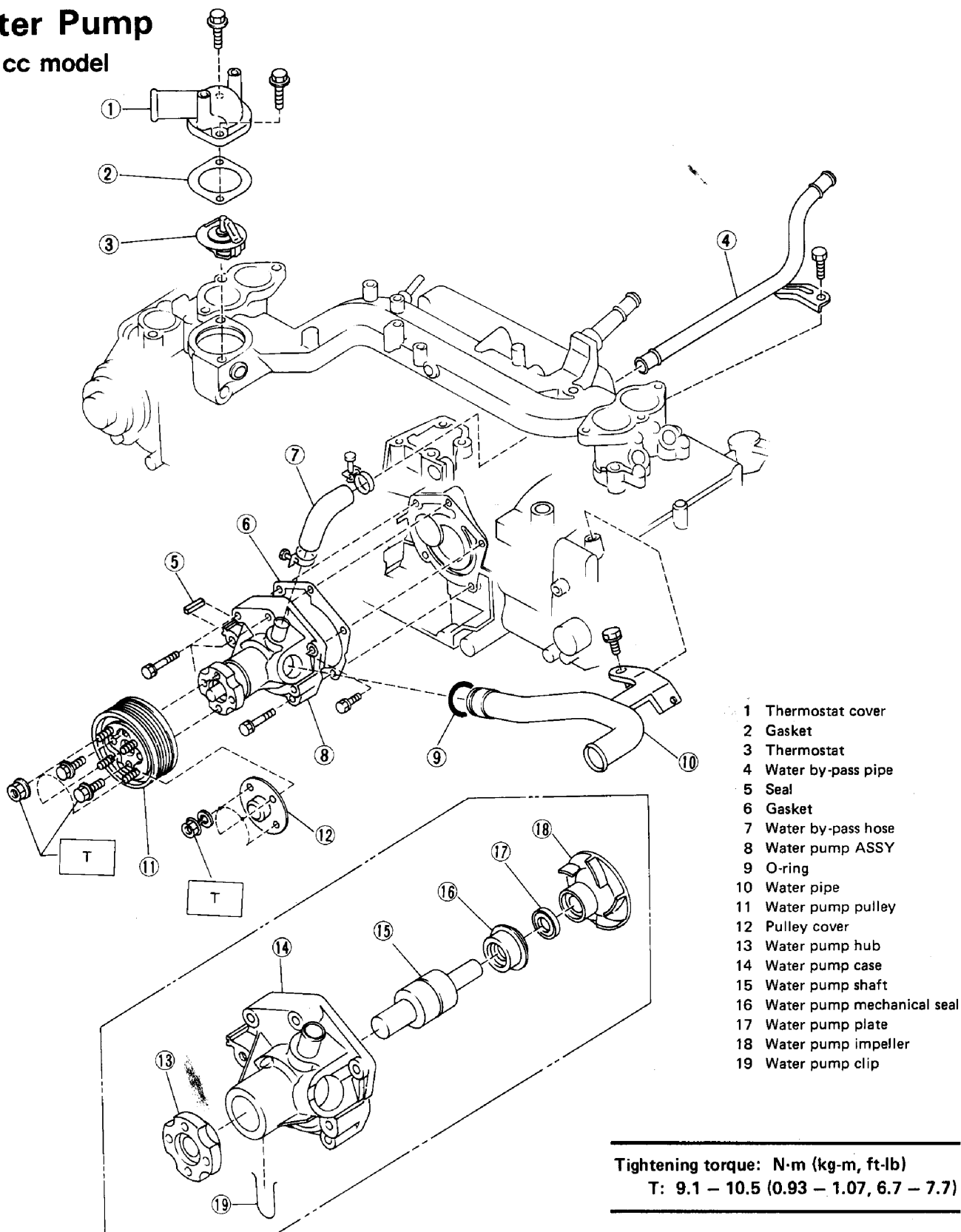


Fig. 5

L2-1268

## 2700 cc model

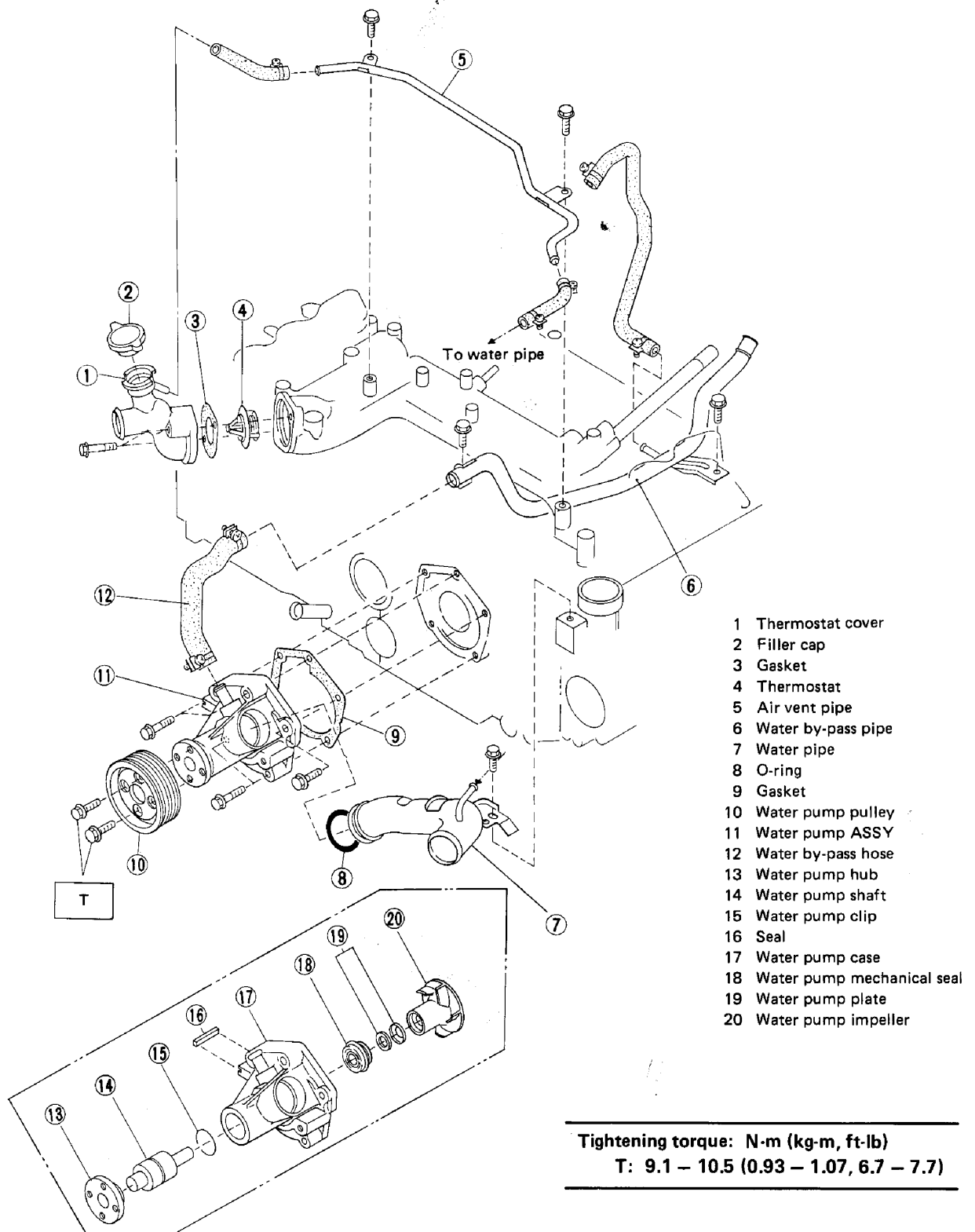


Fig. 6

# Radiator and Cooling Fan

1800 cc model

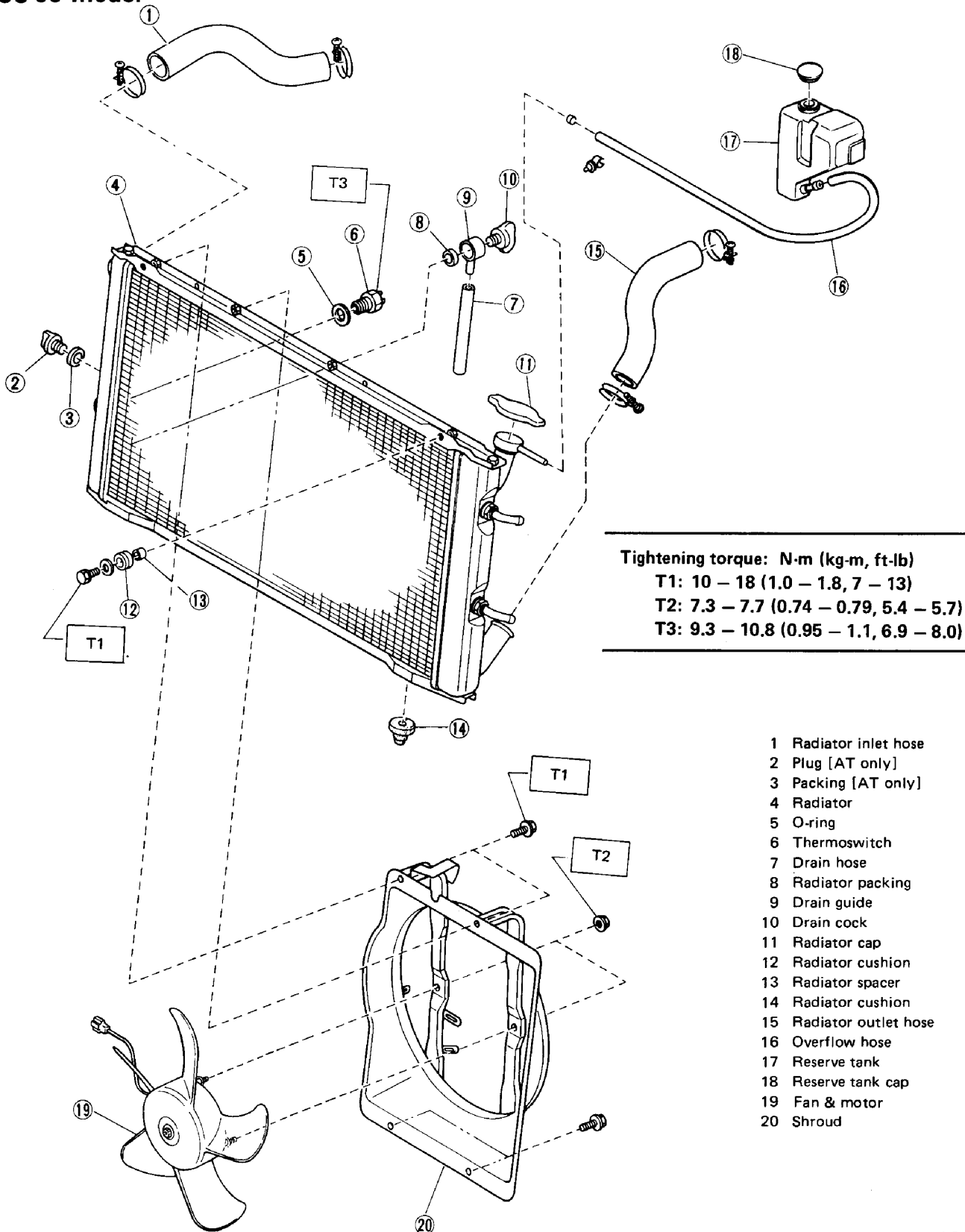


Fig. 7

L2-1270



## 2700 cc model

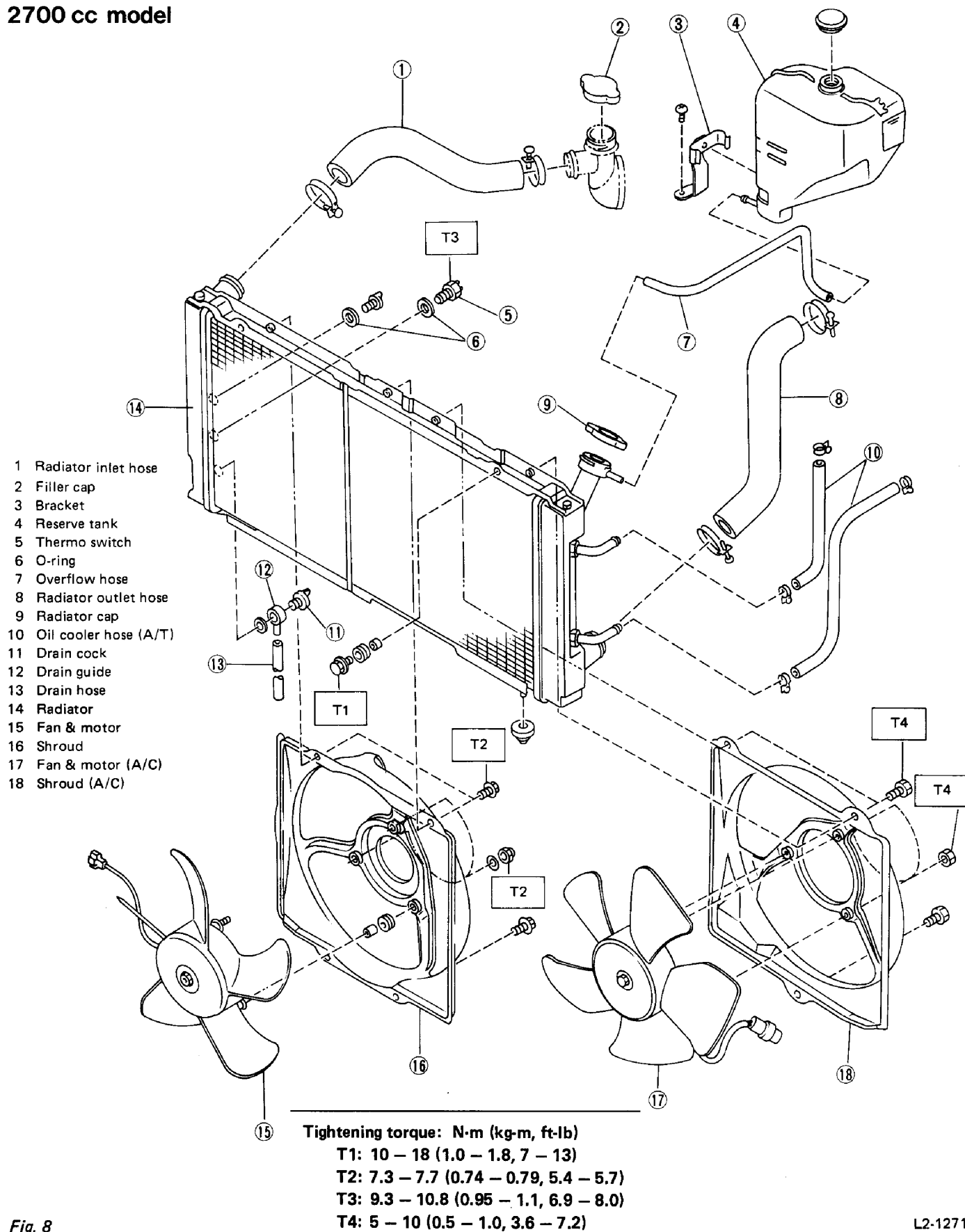


Fig. 8

L2-1271

# SERVICE PROCEDURE

## Water Pump

### REMOVAL

- 1) Drain coolant and disconnect the radiator outlet hose, water by-pass hose and air vent hose (2700 cc model only) from the water pump.
- 2) Loosen pulley nuts so that they can be turned by hand.
- 3) Loosen alternator ASSY mounting bolts (1800 cc model). Loosen belt tensioner pulley locking nut (2700 cc model).
- 4) Remove drive belt.
- 5) Remove front belt cover. Refer to 2-3 "Engine Disassembly" for procedures.

Be careful not to spill coolant on drive belt. If spilled, wipe clean immediately.

### DISASSEMBLY

- a. Do not disassemble water pump unless absolutely necessary. It is advisable to replace water pump ASSY.
- b. In case of disassembling water pump, be sure to check "runout" of water pump hub after assembling. If it is outside specifications, replace water pump ASSY.

- 1) Remove water pump pulley.
- 2) Insert a screwdriver into the slit in water pump case and lift end of water pump clip.

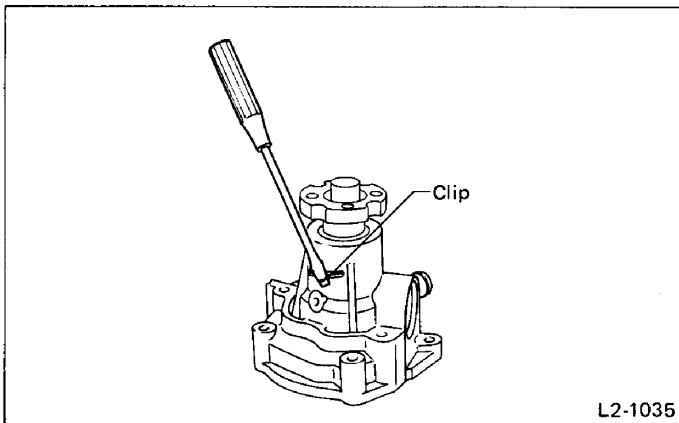


Fig. 9

- 3) Extract water pump clip with pliers.
- 4) Using a press, drive hub from water pump ASSY.

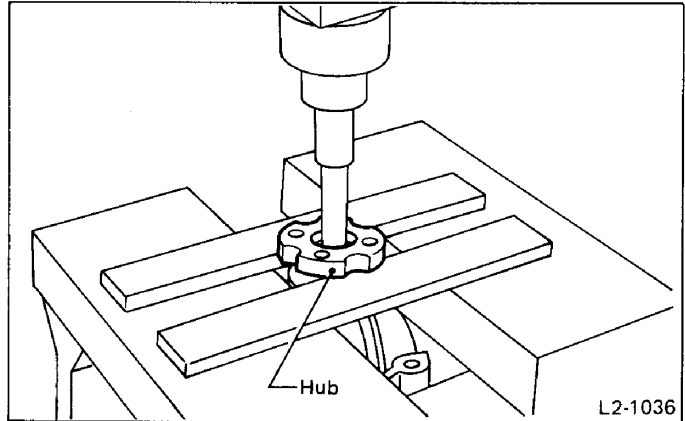


Fig. 10

- 5) Remove shaft, impeller, and mechanical seal from water pump case as a unit.

Do not press the shaft, or the bearings will be damaged. Press the bearing outer race.

- 6) Remove impeller from shaft with a press.

### INSPECTION

- 1) Clean all the disassembled parts thoroughly.
- 2) Inspect the pump shaft for wear, damage, and operation.
- 3) Inspect the impeller surface that contacts the mechanical seal for wear and damage.
- 4) Inspect the mechanical seal and plate for wear, crack and damage.
- 5) Inspect the other parts for crack, wear and damage, and replace if defective.

### ASSEMBLY

- 1) Heat water pump case to a temperature of 80 to 100°C, (176 to 212°F), and press shaft into bore in water pump case. Do not press any section other than outer race.

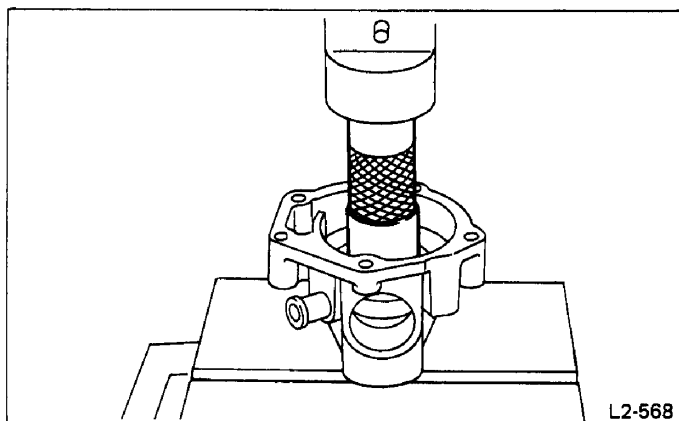


Fig. 11

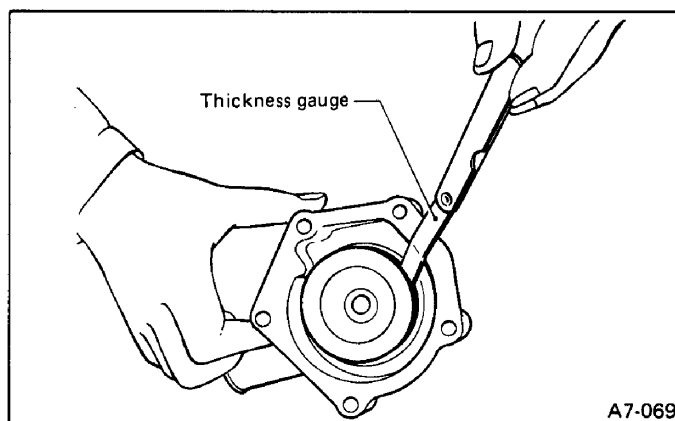


Fig. 13

**Be sure to install a new mechanical seal.**

2) Press the seal into the pump case with the carbon washer of the seal facing the impeller.

3) Apply coolant on the sliding surface between mechanical seal and impeller.

With a thin coat of oil on the shaft surface, install the impeller onto the pump shaft with a press.

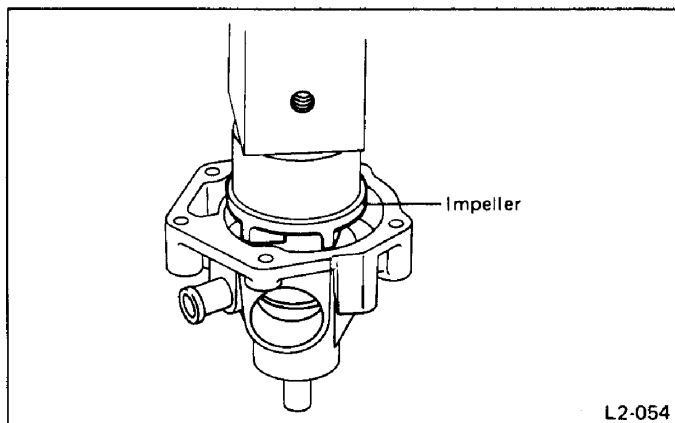


Fig. 12

5) Before pressing, apply oil on the pump shaft.

Support the impeller side of the pump shaft end and install the hub by using a press until the distance "L" between the pump case surface, which mates with the gasket, and the pulley attaching surface of the hub becomes specified value.

**After pressing water pump hub into place, measure "runout". If it exceeds 0.05 mm (0.0020 in), replace water pump ASSY.**

"L":

1800 cc model	103.6 – 104.2 mm (4.08 – 4.10 in)
2700 cc model	113.8 – 114.2 mm (4.48 – 4.50 in)

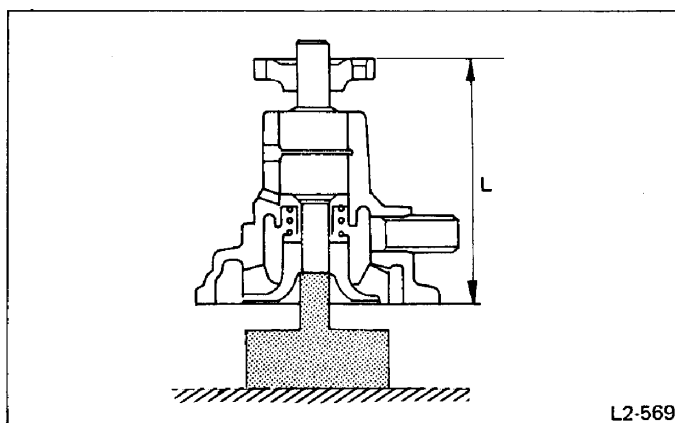


Fig. 14

4) Check for the following clearance after installation and correct if defective.

**Clearance between impeller and pump case:**  
0.5 – 0.9 mm (0.020 – 0.035 in)

6) Looking through slit in water pump case, ensure that groove on water pump case is aligned with groove on outer surface of shaft.

Insert water pump clip into grooves and drive it into place with a plastic hammer.

Be careful not to deform the clip.

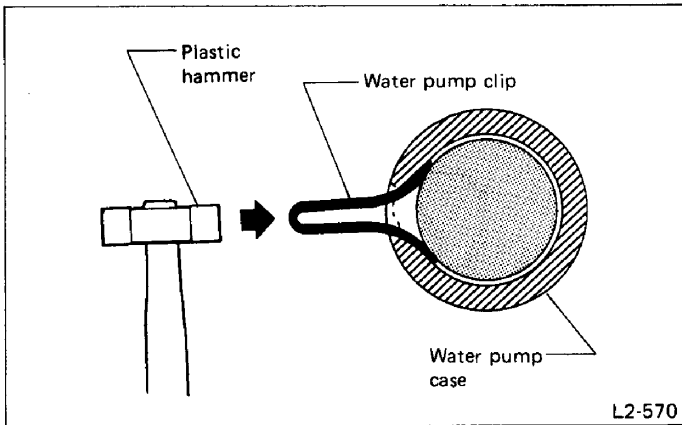


Fig. 15

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	Fully opens
1800 cc		86.5 – 89.5°C (188 – 193°F)	100°C (212°F)
2700 cc	Sub-valve	86 – 90 °C (187 – 194 °F)	102°C (216°F)
	Main valve	90 – 94°C (194 – 201°F)	

- 7) Rotate water pump shaft by hand. It should turn smoothly without emitting noise.

## INSTALLATION

Installation is in the reverse order of removal procedures. Observe the following:

- 1) Replace the gasket with a new one.
- 2) After reinstalling the water pump, adjust the drive belt tension and run the engine to make sure that neither water leakage nor abnormal noise exists.

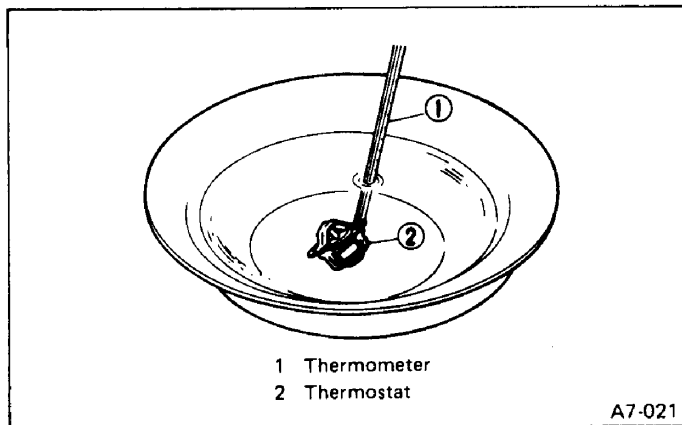


Fig. 16

## Thermostat

### REMOVAL AND INSTALLATION

- 1) Remove the thermostat case cover and gasket, and pull out the thermostat.
- 2) Install the thermostat in the intake manifold, and install the thermostat cover together with a gasket.

- a. When reinstalling the thermostat, use a new gasket.  
b. The thermostat must be installed with the jiggle pin upward. (1800 cc model only)

### INSPECTION

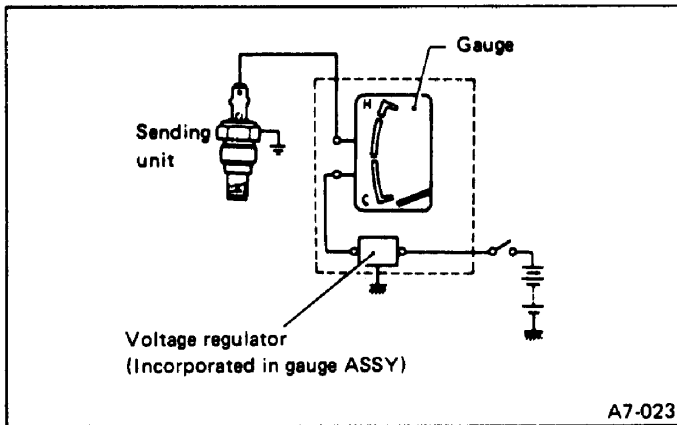
Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

## Thermometer

### INSPECTION

- 1) To test the thermometer, connect the gauge section and the sensor unit in series.
- 2) The thermometer performance data are shown below.

Temperature	Resistance
[120°C (248°F)]	14.9 – 17.3Ω
100°C (212°F)	26.2 – 29.3Ω
80°C (176°F)	47.5 – 56.8Ω
[50°C (122°F)]	133.9 – 178.9Ω



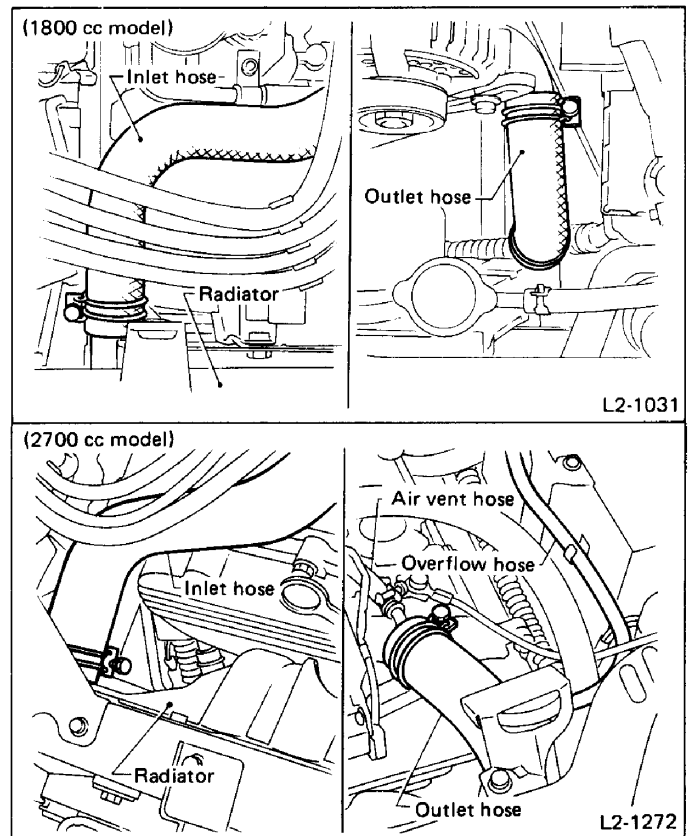
### PRECAUTIONS FOR HANDLING

- 1) When testing, do not apply battery voltage directly to the temperature gauge or sensor unit, because these two parts are designed to be connected in series. If the battery voltage is applied to only one of them, the heating wire on gauge or thermistor may be damaged.
- 2) Connect the wire firmly to the terminals. When the gauge reading is abnormal, inspect not only the gauge but also the grounding wire or the terminal for loose connections.
- 3) Use care not to short or ground the terminals or wirings, otherwise troubles described in 1) may occur.
- 4) Use care not to drop or strike either the gauge or unit, since these are precision products.
- 5) Make sure that the gauge needle indicates C when the ignition switch is not turned on.

## Radiator

### REMOVAL

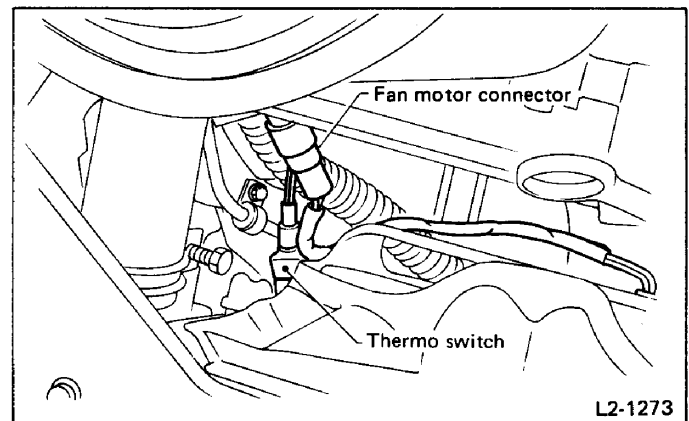
- 1) Disconnect ground cable from battery terminal.
- 2) Drain coolant.
- 3) Loosen hose clamps and disconnect both inlet and outlet hoses from radiator.



- 4) Disconnect oil cooler's inlet and outlet hoses at radiator location (A/T model).

**Catch both coolant and oil remained in the hoses into containers.**

- 5) Disconnect main harness connector from thermoswitch.



- 6) Disconnect lead wire connector from fan motor.

(2700 cc model only)

- a. Disconnect lead wire connector from sub (condenser) fan motor.
- b. Remove lower and upper bolts holding shrouds (sub and main fan) to radiator.

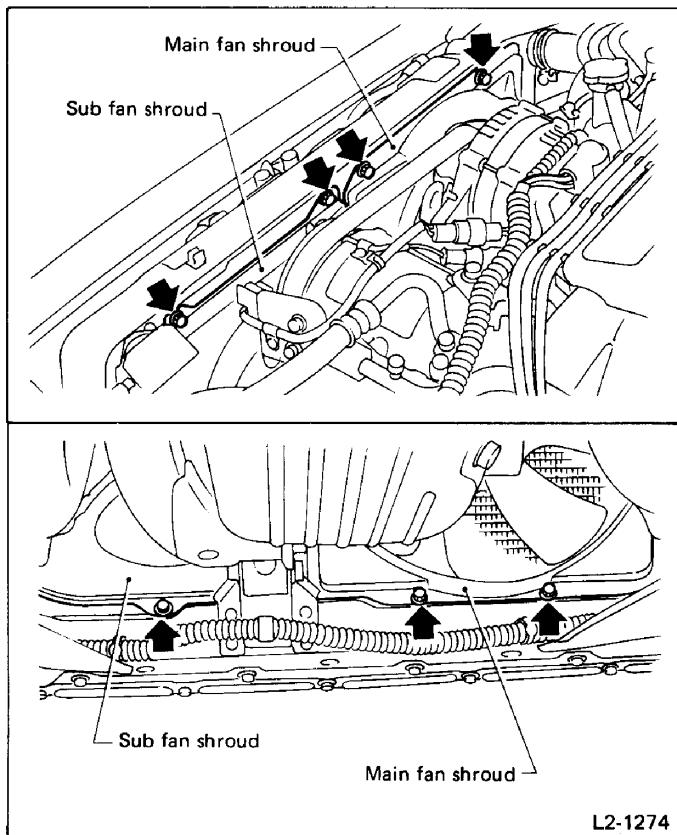


Fig. 20

- c. Remove sub and main fan shroud with motor ASSY.
- 7) Remove two radiator mounting bolts.
- 8) Lift radiator up and away from vehicle with radiator cap facing up to prevent remaining coolant from spilling.

## INSPECTION

Check all removed parts and replace if defective.

- 1) A clogged radiator should be cleaned.
- 2) A deteriorated hose should be replaced.
- 3) Check the valve opening pressure of the pressure cap with a cap tester. If the pressure is out of specification, replace the cap ASSY.

Cap valve opening pressure:

Positive pressure side

78 – 98 kPa

(0.8 – 1.0 kg/cm<sup>2</sup>, 11 – 14 psi)

Negative pressure side

–4.9 to –9.8 kPa

(–0.05 to –0.1 kg/cm<sup>2</sup>, –0.7 to –1.4 psi)

## INSTALLATION

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

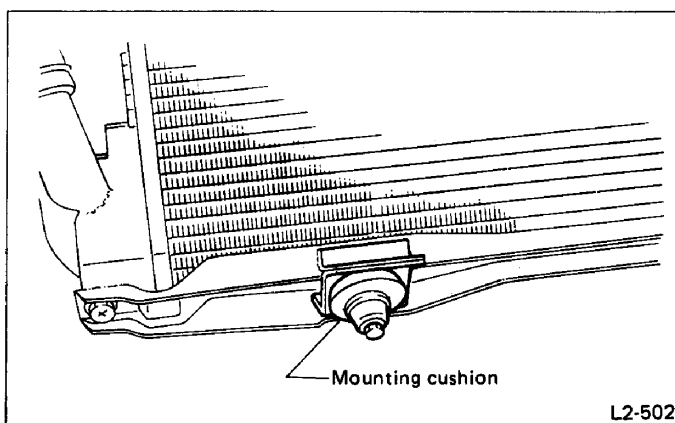


Fig. 21

- 2) Fit cushions, on lower side of radiator, into holes on body side and install radiator.

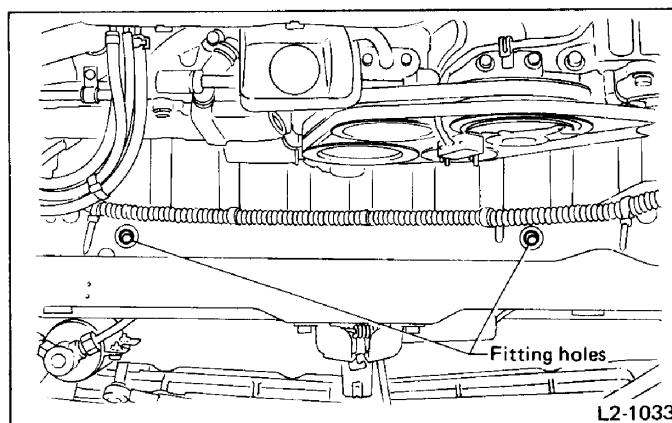


Fig. 22

- 3) Tighten two radiator mounting bolts.

Tightening torque:

10 – 18 N·m (1.0 – 1.8 kg·m, 7 – 13 ft·lb)

- 4) Install sub and main fan shroud on radiator (2700 cc model only).

**Tightening torque:****Lower and upper bolt****7.3 – 7.7 N·m****(0.74 – 0.79 kg-m, 5.4 – 5.7 ft-lb)**

- 5) Connect main harness connector to thermoswitch.
- 6) Connect lead wire connector to fan motor.
- 7) Connect both inlet and outlet hoses to radiator with marked sides facing up and tighten with hose clamps.

**Be careful not to twist hoses.**

- 8) Connect both inlet and outlet hoses to radiator's oil cooler and tighten with hose clamps (A/T model).
- 9) Pour coolant into radiator.
- 10) Connect ground cable to battery terminal.

## Cooling Fan and Fan Motor

### REMOVAL

- 1) Disconnect ground cable from battery terminal.
- 2) Disconnect lead wire connector.
- 3) Remove bolts holding shroud to radiator and detach shroud.

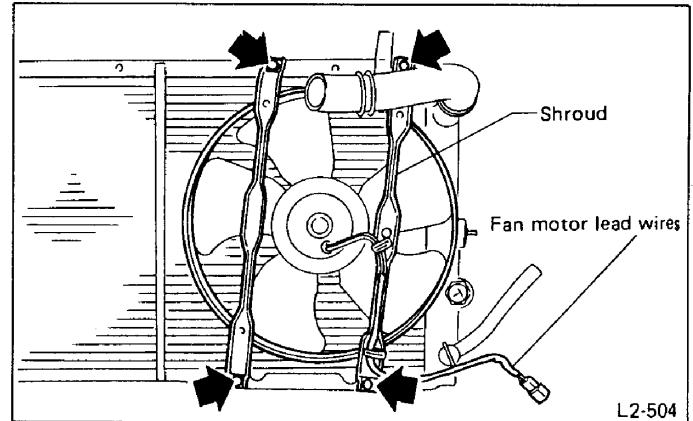


Fig. 23

- 4) Remove fan motor mounting nuts and detach fan motor from shroud.

**Do not separate fan motor and fan as they are balanced properly.**

### INSTALLATION

Installation is in the reverse order of removal procedures. Observe the following:

- 1) Before installing cooling fan motor, apply a coat sealant to threads and tighten nuts.

**Tightening torque:****Fan motor to shroud****7.3 – 7.7 N·m****(0.74 – 0.79 kg-m, 5.4 – 5.7 ft-lb)**

- 2) Make sure cooling fan does not come into contact with shroud when installed.
- 3) After installation, make sure there is no unusual noise or vibration when fan is rotated.

## TROUBLESHOOTING

Trouble	Possible cause	Corrective action
Over-heating	<ul style="list-style-type: none"> <li>a. Insufficient coolant.</li> <li>b. Loose drive belt.</li> <li>c. Oil on drive belt.</li> <li>d. Malfunction of thermostat.</li> <li>e. Malfunction of water pump.</li> <li>f. Clogged coolant passage.</li> <li>g. Improper ignition timing.</li> <li>h. Clogged or leaking radiator.</li> <li>i. Improper engine oil.</li> <li>j. Air-fuel mixture too thin.</li> <li>k. Excessive back pressure in exhaust system.</li> <li>l. Insufficient clearance between piston and cylinder.</li> <li>m. Improper valve clearance.</li> <li>n. Slipping clutch.</li> <li>o. Dragging brake.</li> <li>p. Improper transmission oil.</li> <li>q. Defective thermostat.</li> <li>r. Malfunction of electric fan.</li> </ul>	<ul style="list-style-type: none"> <li>Replenish coolant, inspect for leakage, and repair.</li> <li>Adjust drive belt tension.</li> <li>Replace.</li> <li>Replace.</li> <li>Repair or replace.</li> <li>Clean.</li> <li>Adjust.</li> <li>Clean or repair, or replace.</li> <li>Replace.</li> <li>Inspect and repair fuel system.</li> <li>Clean or replace.</li> <li>Adjust or replace.</li> <li>Adjust.</li> <li>Repair or replace.</li> <li>Adjust.</li> <li>Replace.</li> <li>Replace.</li> <li>Replace thermoswitch or motor.</li> </ul>
Over-cooling	<ul style="list-style-type: none"> <li>a. Atmospheric temperature extremely low.</li> <li>b. Defective thermostat.</li> </ul>	<ul style="list-style-type: none"> <li>Partly cover radiator front area.</li> <li>Replace.</li> </ul>
Coolant leaks	<ul style="list-style-type: none"> <li>a. Loosened or damaged connecting units on hoses.</li> <li>b. Leakage from water pump.</li> <li>c. Leakage from intake manifold.</li> <li>d. Leakage around cylinder head gasket.</li> <li>e. Damaged or cracked cylinder head and crankcase.</li> <li>f. Damaged or cracked thermostat case.</li> <li>g. Leakage from radiator.</li> </ul>	<ul style="list-style-type: none"> <li>Repair or replace.</li> <li>Repair or replace.</li> <li>Repair or replace.</li> <li>Retighten cylinder head nuts or replace gasket.</li> <li>Repair or replace.</li> <li>Repair or replace.</li> <li>Repair or replace.</li> </ul>
Noise	<ul style="list-style-type: none"> <li>a. Defective drive belt.</li> <li>b. Defective electric fan.</li> <li>c. Defective water pump bearing.</li> <li>d. Defective water pump mechanical seal.</li> </ul>	<ul style="list-style-type: none"> <li>Replace.</li> <li>Replace.</li> <li>Replace.</li> <li>Replace.</li> </ul>