

# COOLING SYSTEM

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## 5-1 COOLING SYSTEM

# COOLING SYSTEM

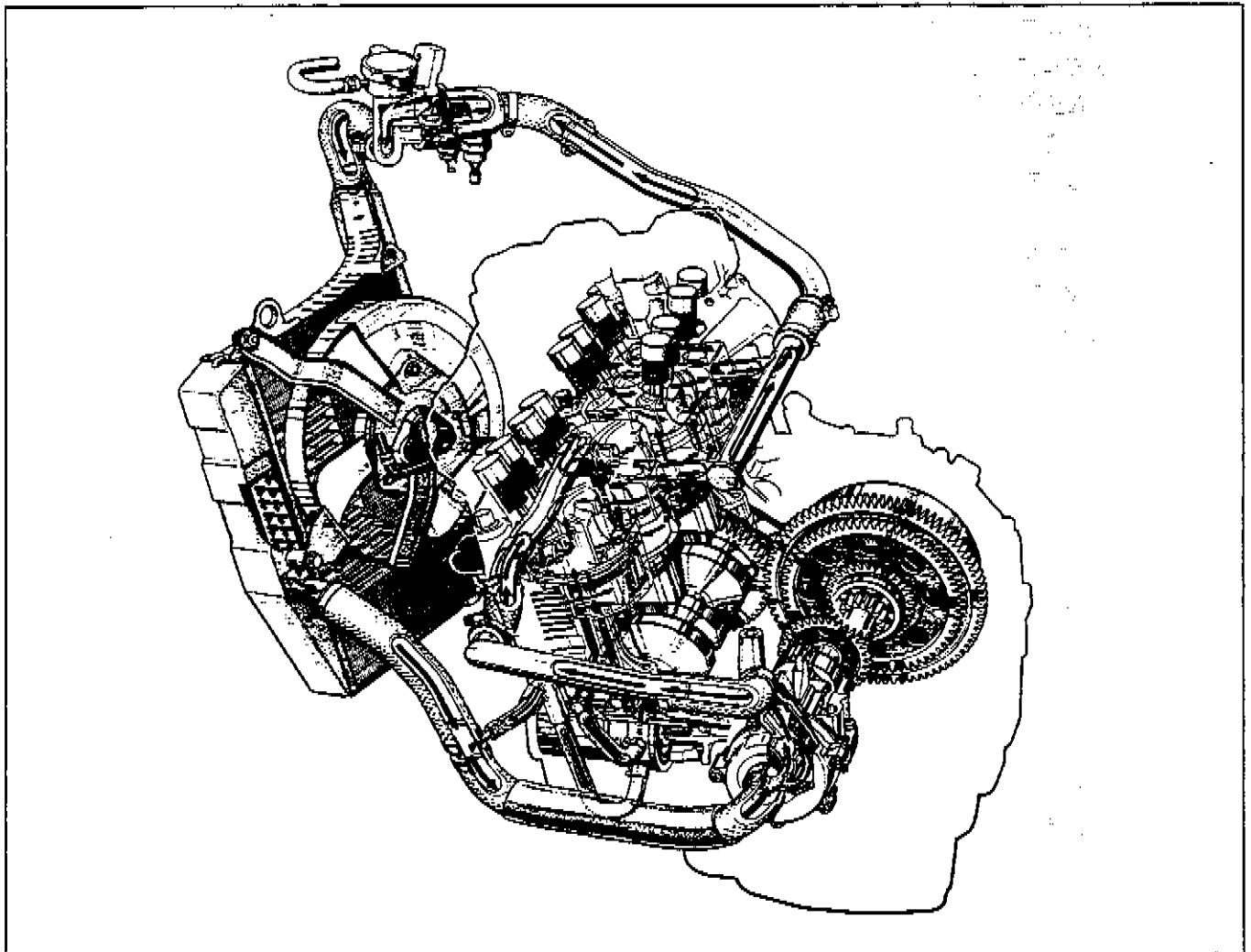
## DESCRIPTION

The engine is cooled by engine coolant set in forced recirculation through jackets formed in the cylinder and cylinder head, and through the radiator. For the water pump, a high-capacity centrifugal pump is used. The radiator is a tube-and-fin type made of aluminum material, which is characterized by lightness in weight and good heat dissipation.

The thermostat is of wax pellet type, complete with a valve as the means of temperature-dependent control over the flow of engine coolant through the radiator. The valve is actuated by the temperature-sensitive wax contained in the pellet.

Referring to the following illustration, the thermostat is in the closed condition, so that engine coolant recirculates through the route comprising pump, engine, by-pass hole of the thermostat and radiator in the regulated condition.

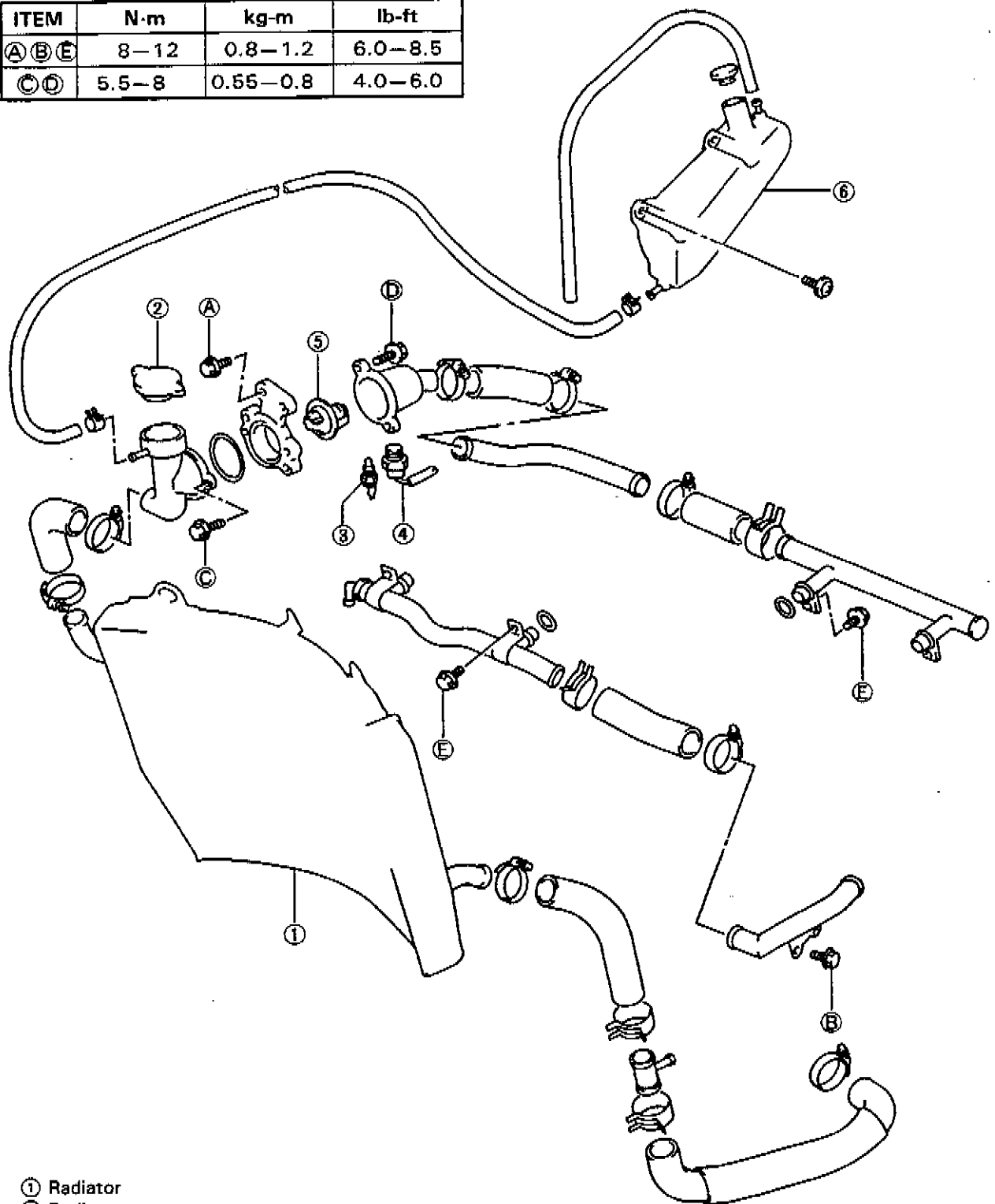
As the engine coolant temperature rises to  $76.5^{\circ}\text{C}$  and the thermostat valve unseats, the normal engine coolant flow is established. At about  $90^{\circ}\text{C}$  of engine coolant temperature, the thermostat becomes completely open and most of heat is released to the atmosphere through the radiator core.



## CONSTRUCTION

## Tightening torque

ITEM	N·m	kg·m	lb·ft
A B E	8-12	0.8-1.2	6.0-8.5
C D	5.5-8	0.55-0.8	4.0-6.0



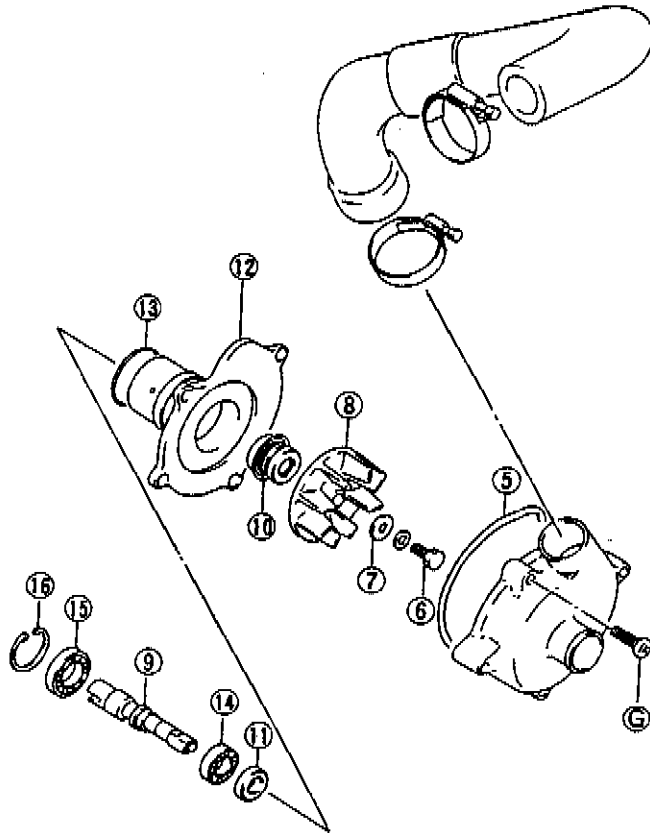
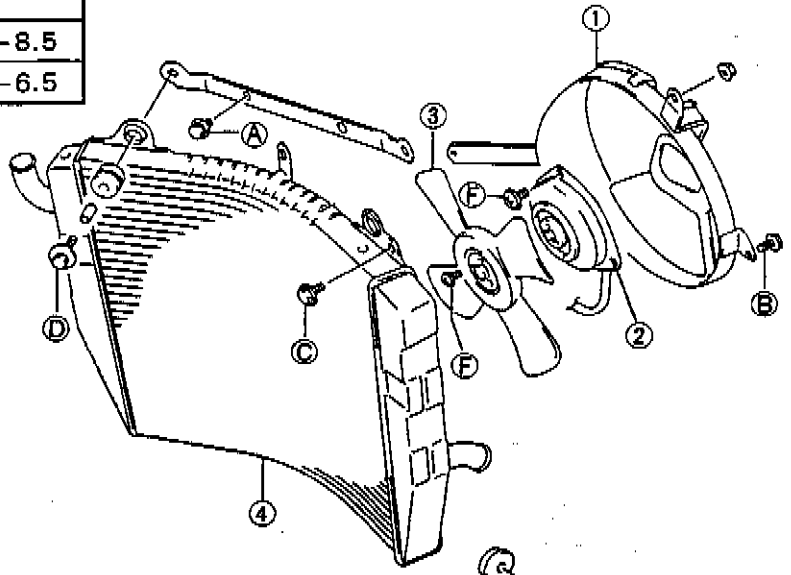
- ① Radiator
- ② Radiator cap
- ③ Engine coolant temperature gauge
- ④ Cooling fan thermo-switch
- ⑤ Thermostat
- ⑥ Engine coolant reservoir

**5-3 COOLING SYSTEM**

**Tightening torque**

ITEM	N·m	kg·m	lb·ft
Ⓐ Ⓑ Ⓒ	4-7	0.4-0.7	3.0-5.0
Ⓓ Ⓔ	8-12	0.8-1.2	6.0-8.5
Ⓕ	7-9	0.7-0.9	5.0-6.5

- ① Shroud
- ② Fan motor
- ③ Cooling fan
- ④ Radiator



- Ⓔ O-ring
- Ⓕ Bolt
- Ⓖ Gasket
- Ⓗ Impeller
- Ⓖ Impeller shaft
- ⓫ Mechanical seal
- ⓫ Oil seal
- ⓫ Stuffing box
- ⓫ O-ring
- ⓫ Bearing
- ⓫ Bearing
- ⓫ Circlip

**Tightening Torque**

ITEM	N·m	kg·m	lb·ft
Ⓖ	7-11	0.7-1.1	5.0-8.0
Ⓕ	7-9	0.7-0.9	5.0-6.5

# COOLING SOLUTION

At the time of manufacture, the cooling system is filled with a 50 : 50 solution of distilled water and anti-freeze/summer coolant. This 50 : 50 mixture will provide excellent heat protection, and will protect the cooling system from freezing at temperatures above  $-31^{\circ}\text{C}$  ( $-24^{\circ}\text{F}$ ).

If the motorcycle is to be exposed to temperatures below  $-31^{\circ}\text{C}$  ( $-24^{\circ}\text{F}$ ), this mixing ratio should be increased up to 55% or 60% according to the Fig. 2.

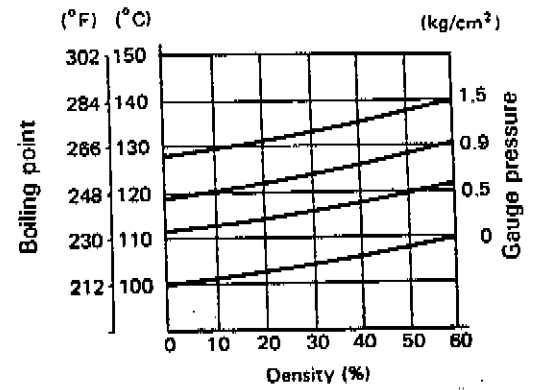
**NOTE:**

*The characteristics of different anti-freezes vary. Read the label to know the protection you will have.*

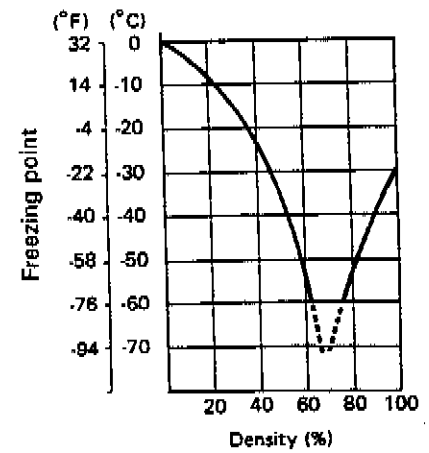
**CAUTION:**

**Do not put in more than 60% anti-freeze or less than 50%.  
Do not mix different brands of anti-freeze.**

50%	Water	1225 ml (1.3/1.1 US/Imp. qt)
	Engine coolant	1225 ml (1.3/1.1 US/Imp. qt)



**Fig. 1 Engine coolant density-boiling point curve.**



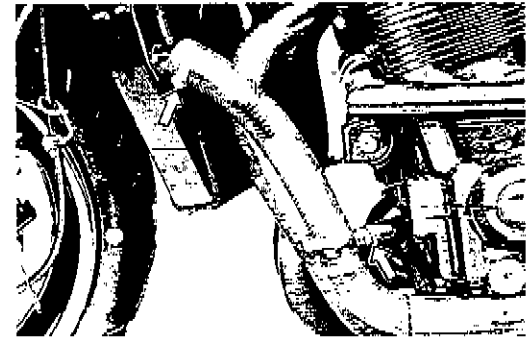
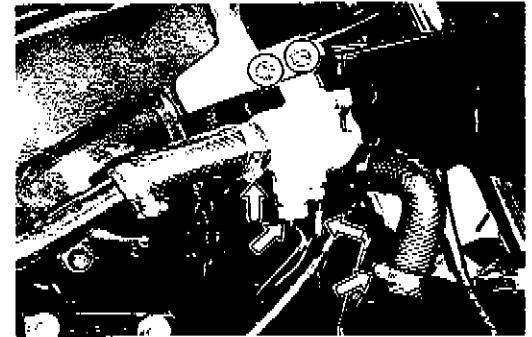
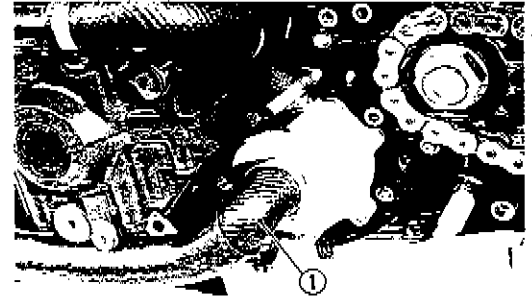
**Fig. 2 Engine coolant density-freezing point curve.**

## 5-5 COOLING SYSTEM

### COOLING SYSTEM REMOVAL AND DISASSEMBLY

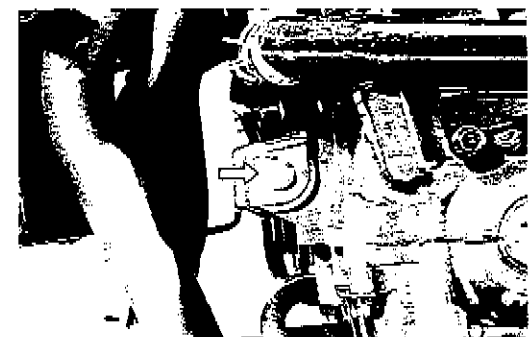
#### WATER HOSES AND THERMOSTAT CASE

- Remove the lower cowling. (Refer to page 7-2.)
  - Remove the gearshift lever and engine sprocket cover. (Refer to page 3-6.)
  - Drain out engine coolant by removing the water hose ①.
- 
- Remove the thermostat case bracket mounting bolts.
  - Loosen the clamp screws and disconnect water hoses.
  - Disconnect the engine coolant temperature gauge lead wire, cooling fan switch lead wire coupler and ground wire.
  - Remove the thermostat case along with the water hoses.



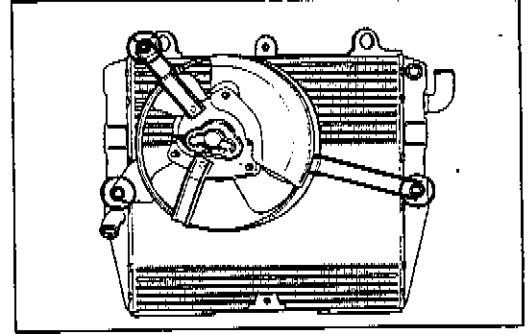
#### RADIATOR

- Remove the radiator by removing the mounting bolts.

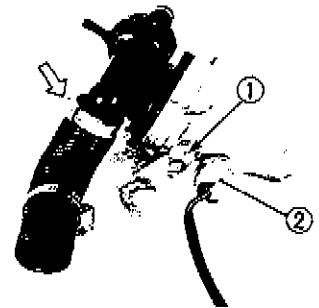


**COOLING FAN**

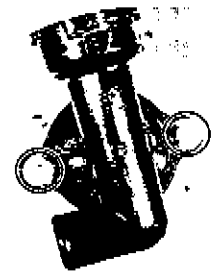
- Remove the cooling fan.

**ENGINE COOLANT TEMPERATURE GAUGE AND COOLING FAN THERMO-SWITCH**

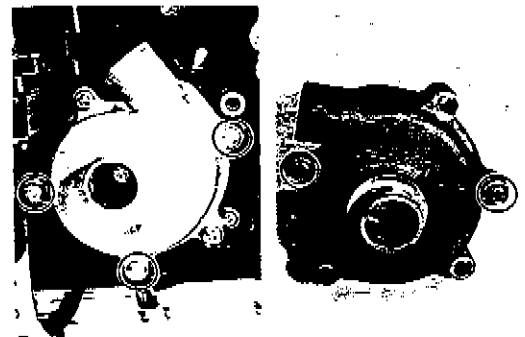
- Loosen the clamp screw and disconnect the water hose.
- Remove the water temperature gauge ① and cooling fan thermo-switch ②.

**THERMOSTAT**

- Separate the thermostat case into halves and remove the thermostat.

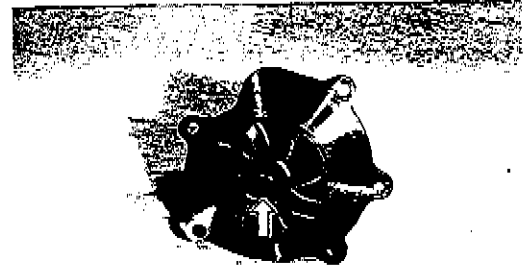
**WATER PUMP**

- Remove the gearshift lever and engine sprocket cover. (Refer to page 3-6.)
- Remove the water pump assembly.
- Remove the water pump cover.



## 5-7 COOLING SYSTEM

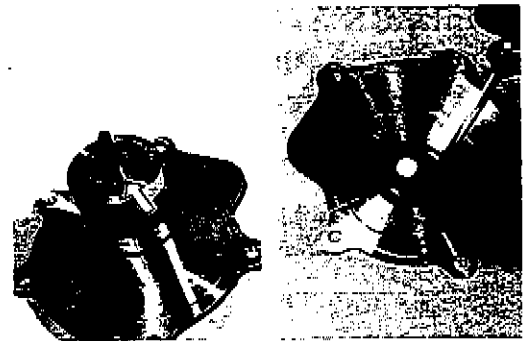
- Remove the impeller securing bolt by holding the impeller shaft with a water pump pliers.



- Remove the mechanical seal ring.



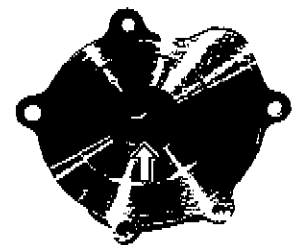
- Remove the circlip from the impeller shaft.
- Remove the impeller shaft.
- Remove the mechanical seal.



- Remove the oil seal.

### CAUTION:

The removed mechanical seal or oil seal should be replaced with a new one.



- Drive out the bearings by using a suitable bar.

### CAUTION:

The removed bearings should be replaced with new ones.

Refer to page 5-13 for INSPECTION AND REASSEMBLY.



## RADIATOR

### INSPECTION

Before removing the radiator and draining the engine coolant, inspect the following items.

1. Test the cooling system for tightness by using the radiator tester as follows: Remove the radiator cap, and connect the tester to the filler. Give a pressure of about  $1.2 \text{ kg/cm}^2$  (17 psi, 120 kPa) and see if the system holds this pressure for 10 seconds. If the pressure should fall during this 10-second interval, it means that there is a leaking point in the system. In such a case, inspect the entire system and replace the leaking component or part.
2. Test the radiator cap for relieving pressure by using the radiator tester in the following manner: Fit the cap to the tester, as shown, and build up pressure slowly by operating the tester. Make sure that the pressure build-up stops at  $1.1 \pm 0.15 \text{ kg/cm}^2$  ( $15.6 \pm 2.1 \text{ psi}$ ,  $110 \pm 15 \text{ kPa}$ ) and that, with the tester held standstill, the cap is capable of that pressure for at least 10 seconds. Replace the cap if it is found not to satisfy either of these two requirements.

#### Radiator cap valve

release pressure:  $1.1 \pm 0.15 \text{ kg/cm}^2$   
( $15.6 \pm 2.1 \text{ psi}$ ,  $110 \pm 15 \text{ kPa}$ )

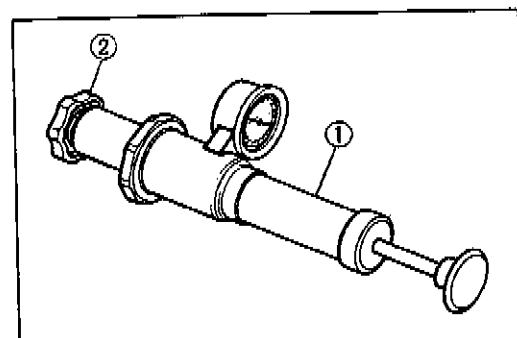
3. Road dirt or trash stuck to the fins must be removed. Use of compressed air is recommended for this cleaning. Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver.
4. Any water hose found in a cracked condition or flattened must be replaced. Any leakage from the connecting section should be corrected by proper tightening.

### REMOVAL

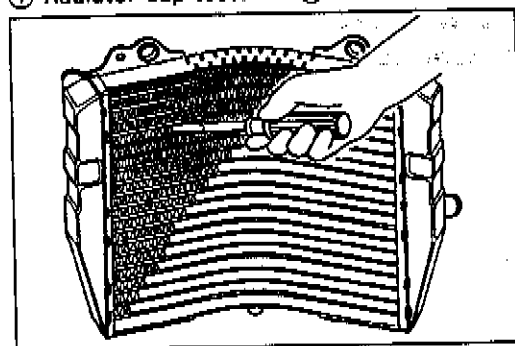
- Refer to page 5-5.

### INSTALLATION

The radiator is to be installed in the reverse order of the removal procedure. After installing the radiator, be sure to add engine coolant: refer to page 2-13 for refilling information.



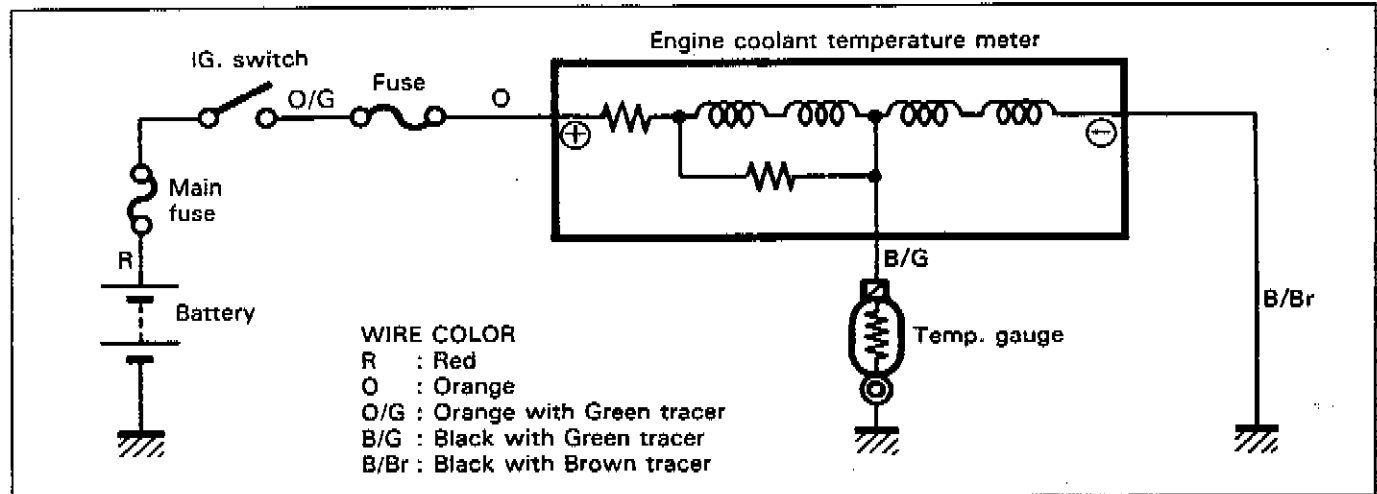
① Radiator cap tester    ② Radiator cap



## 5-9 COOLING SYSTEM

### ENGINE COOLANT TEMPERATURE GAUGE

The following circuit diagram shows the electrical wiring for the thermometer. The major components are temperature gauge in contact with engine coolant; and temperature indicator (engine coolant temperature meter).

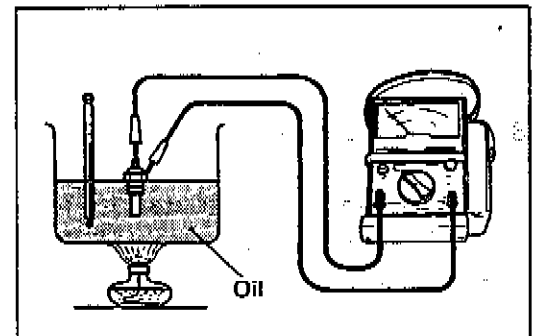


### REMOVAL

- Refer to page 5-6.

### INSPECTION

Test the temperature gauge at the bench to see if its ohmic value changes, as specified, with temperature. The test is to be run as follows: Connect the temperature gauge to the ohmmeter and place it in the oil contained in a pan, which is placed on a stove; heat the oil to raise its temperature slowly, reading the thermometer placed in the pan and also the ohmmeter. A temperature gauge whose ohmic value does not change in the proportion indicated in the table must be replaced.



#### 09900-25002: Pocket tester

#### Temperature gauge specification

Engine coolant temperature	Standard resistance
50°C (122°F)	Approx. 153.9 Ω
80°C (176°F)	Approx. 51.9 Ω
100°C (212°F)	Approx. 27.4 Ω
120°C (248°F)	Approx. 16.1 Ω

If the resistance noted to show infinity or too much different resistance value, temperature gauge must be replaced. For inspecting the engine coolant temperature meter, refer to page 6-24.

## REASSEMBLY

Apply SUZUKI BOND NO.1207B to the thread portion of the temperature gauge and tighten it to the specified torque.

99104-31140; SUZUKI BOND NO.1207B

### Tightening torque

Engine coolant temperature gauge: 6.0—9.0 N·m  
(0.6—0.9 kg-m, 4.5—6.5 lb-ft)

### CAUTION:

Take special care when handling the temperature gauge. It may cause damage if it gets a sharp impact.

- Fill the specified engine coolant. (Refer to page 2-13.)

## COOLING FAN

### REMOVAL

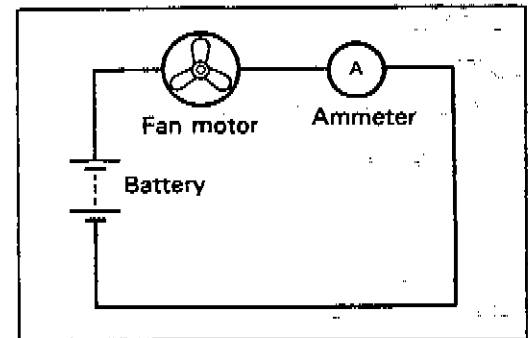
- Refer to page 5-6.

### INSPECTION

Test the cooling fan drive motor for load current with an ammeter connected as shown in the illustration.

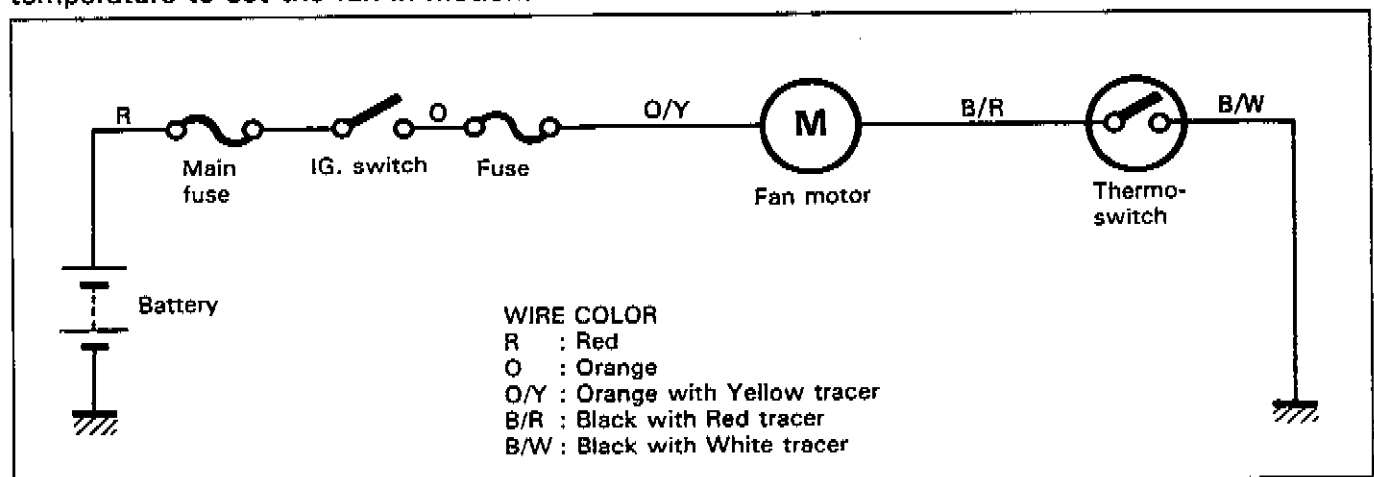
The voltmeter is for making sure that the battery applies 12 volts to the motor. With the motor with electric motor fan running at full speed, the ammeter should be indicating not more than 5 amperes.

If the fan motor does not turn, replace the motor assembly with a new one.



## COOLING FAN THERMO-SWITCH

The cooling fan, being located behind the radiator, is secured to the radiator by three bolts. The fan drive motor is automatically controlled by the thermo-switch. This switch remains open when the temperature of engine coolant is low, but it closes at about 105°C (221°F) of rising engine coolant temperature to set the fan in motion.



## 5-11 COOLING SYSTEM

### REMOVAL

- Refer to page 5-6.

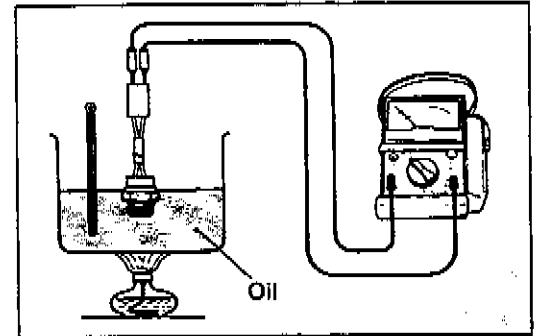
### INSPECTION

- The thermo-switch must be checked for its temperature-initiated closing action at the specification value of 105°C (221°F) by testing it at the bench as shown in the figure. Connect the thermo-switch to a circuit tester and place it in the oil contained in a pan, which is placed on a stove; heat the oil to raise its temperature slowly, and read the column thermometer when the switch closes.

09900-25002: Pocket tester

#### Thermo-switch specification

OFF → ON	Approx. 105°C (221°F)
ON → OFF	Approx. 100°C (212°F)



### REASSEMBLY

#### NOTE:

*Do not forget the new O-ring.*

#### Tightening torque

Thermo-switch: 9.0–14 N·m  
(0.9–1.4 kg·m, 6.5–10.0 lb-ft)

#### CAUTION:

Take special care when handling the thermo-switch. It may cause damage if it gets a sharp impact.  
Replace the O-ring with a new one.

## THERMOSTAT

### REMOVAL

- Refer to page 5-6.

### INSPECTION

Inspect the thermostat pellet for signs of cracking.

Test the thermostat at the bench for control action, in the following manner.

- Pass a string between flange, as shown in the illustration.
- Immerse the thermostat in the water contained in a beaker, as shown in the illustration. Note that the immersed thermostat is in suspension. Heat the water by placing the beaker on a stove and observe the rising temperature on a thermometer.
- Read the thermometer just when opening the thermostat. This reading, which is the temperature level at which the thermostat valve begins to open, should be anywhere between 74.5°C (166.1°F) and 78.5°C (173.3°F).

**Thermostat valve opening temperature: 74.5–78.5°C  
(166.1–173.3°F)**

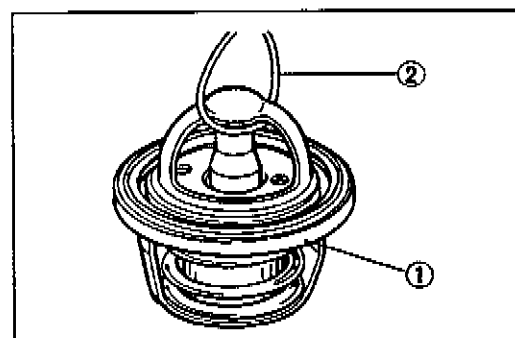
- Keep on heating the water to raise its temperature to and beyond 90°C (194°F).
- Just when the water reaches 90°C (194°F), the thermostat valve should have lifted by at least 7.0 mm (0.28 in).

**Thermostat valve lift: Over 7.0 mm at 90°C  
(Over 0.28 in at 194°F)**

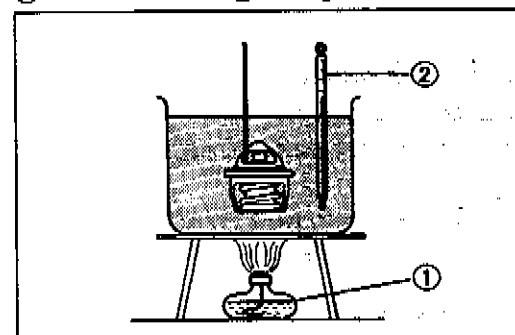
- A thermostat failing to satisfy either of the two requirements (start-to-open temperature and valve lift) must be replaced.

### REASSEMBLY

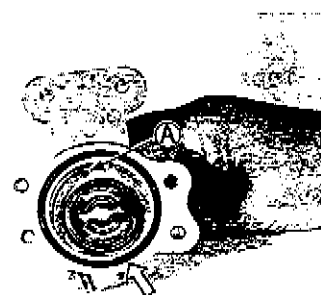
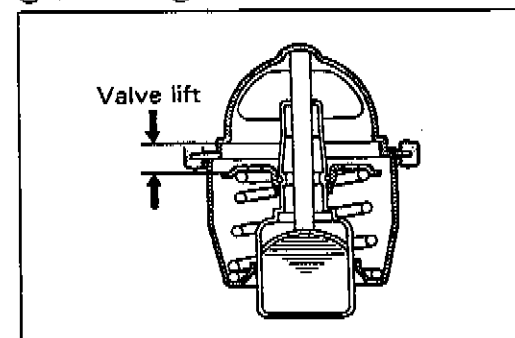
- The air bleeder hole (A) of the thermostat faces upside.
- Replace the O-ring with a new one.



① Thermostat ② String



① Stove ② Thermometer



## 5-13 COOLING SYSTEM

### WATER PUMP

#### REMOVAL AND DISASSEMBLY

- Refer to page 5-6 for the water pump removal and disassembly procedures.

#### INSPECTION

##### WATER PUMP BEARING

Turn the inner race and check the bearing play. If abnormal noise occurs or any sign of stickiness is noted, replace the bearing with a new one.

##### MECHANICAL SEAL

Visually inspect the mechanical seal for damage, with particular attention given to the sealing face. Replace the mechanical seal that shows indications of leakage. Also replace the oil seal if necessary.

#### REASSEMBLY

Reassemble and remount the water pump in the reverse order of removal and disassembly. Pay attention to the following points:

- Press the new bearings into the stuffing box with the special tool and a suitable size sleeve etc.

##### 09924-84521: Bearing Installer

- Apply grease to the oil seal lip before installing.

##### 99000-25030: SUZUKI SUPER GREASE "A"

- Press the new oil seal into the stuffing box with the special tool and a suitable size sleeve etc.

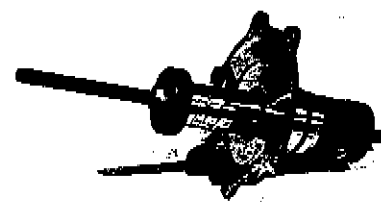
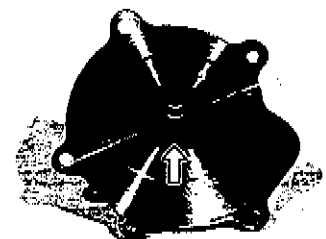
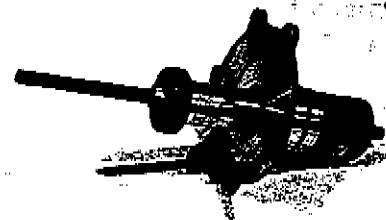
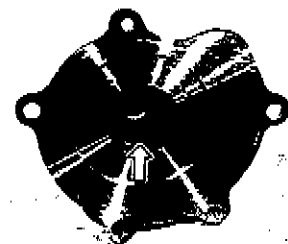
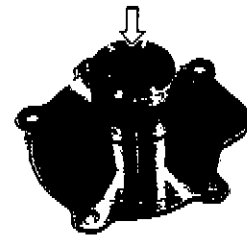
##### 09924-84521: Bearing installer

- Press the new mechanical seal into the stuffing box with the special tool and a suitable size sleeve etc.

#### NOTE:

When installing the mechanical seal, apply SUZUKI BOND NO.1207B to its outer surface.

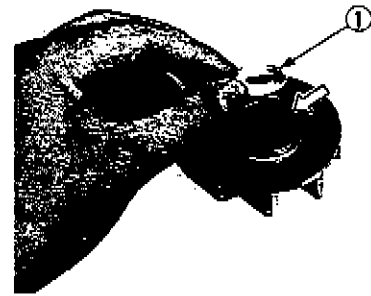
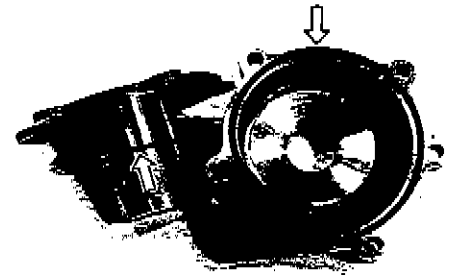
##### 99104-31140: SUZUKI BOND NO.1207B



- Replace the O-rings and water seal with new ones when reassembling the water pump.

**NOTE:**

The mechanical seal ring must be assembled with marked face ① of the ring toward the impeller.

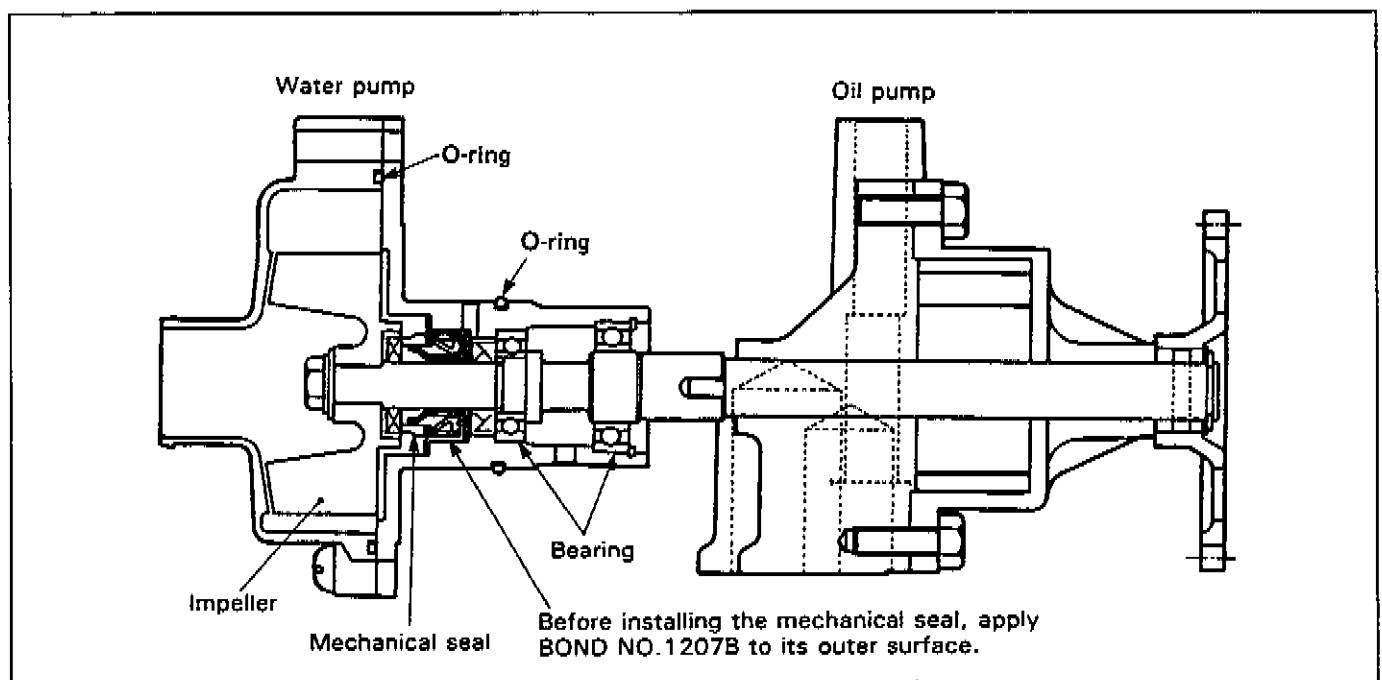


- Tightening the impeller securing bolt to the specified torque.

**Tightening torque: 7–9 N·m  
(0.7–0.9 kg·m, 5.0–6.5 lb·ft)**

**NOTE:**

The seal lip side ② faces impeller.



Refer to page 8-18 for the radiator hose routing.