



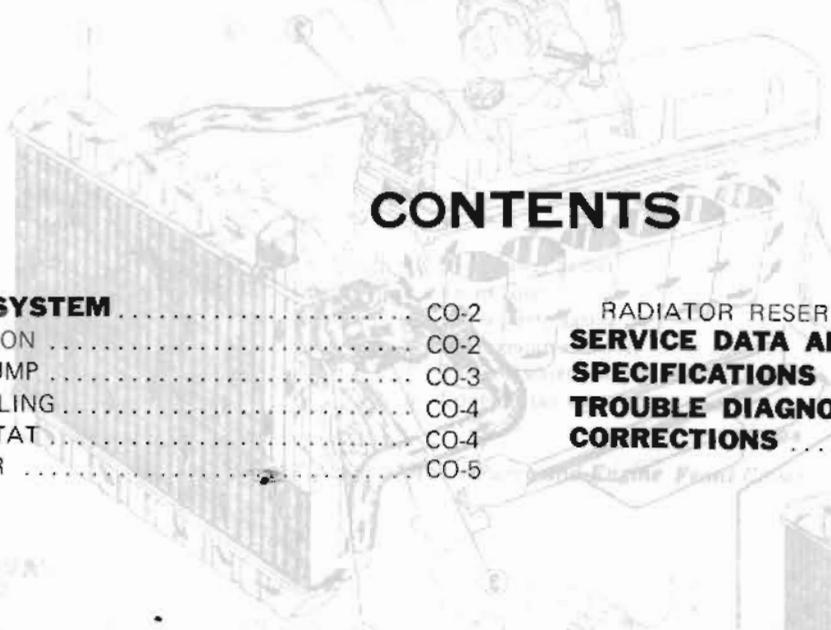
# SECTION CO

## COOLING SYSTEM

CO

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#### DISASSEMBLY

#### ADJUSTMENT

Check belt tension. The alternator and fan pulley should be pulled by a force of 10 kg (22 lb).

#### COOLANT LEVEL

- Without coolant reservoir: The coolant level should be checked and maintained at 10 to 12 mm (0.4 to 0.5 in) below the bottom of the radiator filler neck.
- With coolant reservoir: Pour coolant into the radiator up to the cap and also into the reservoir up to the "MAX" level.

#### INSTALLATION

Be careful not to scratch the painted surface of the radiator.

**WARNING:** To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Pressure of cooling system is very dangerous. If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

**MEASUREMENT**

Fig. CO-1 Cooling System

Drain cooling system, release drain cock at bottom of radiator, remove radiator cap and drain plug on right side of cylinder block. If heater system is installed, set heater temperature control valve to open position. After coolant is drained completely, close drain cock and plug and refill system with clean anti-rust water.

#### COOLING SYSTEM DRAINING AND FLUSHING

To drain cooling system, release drain cock at bottom of radiator, remove radiator cap and drain plug on right side of cylinder block. If heater system is installed, set heater temperature control valve to open position. After coolant is drained completely, close drain cock and plug and refill system with clean anti-rust water.

# COOLING SYSTEM

## DESCRIPTION

The cooling system is of the conventional pressure type. A centrifugal pump built in the front cover of the

engine serves to circulate the coolant. The pressure type radiator filler cap installed on the radiator operates the

cooling system at higher than atmospheric pressure.

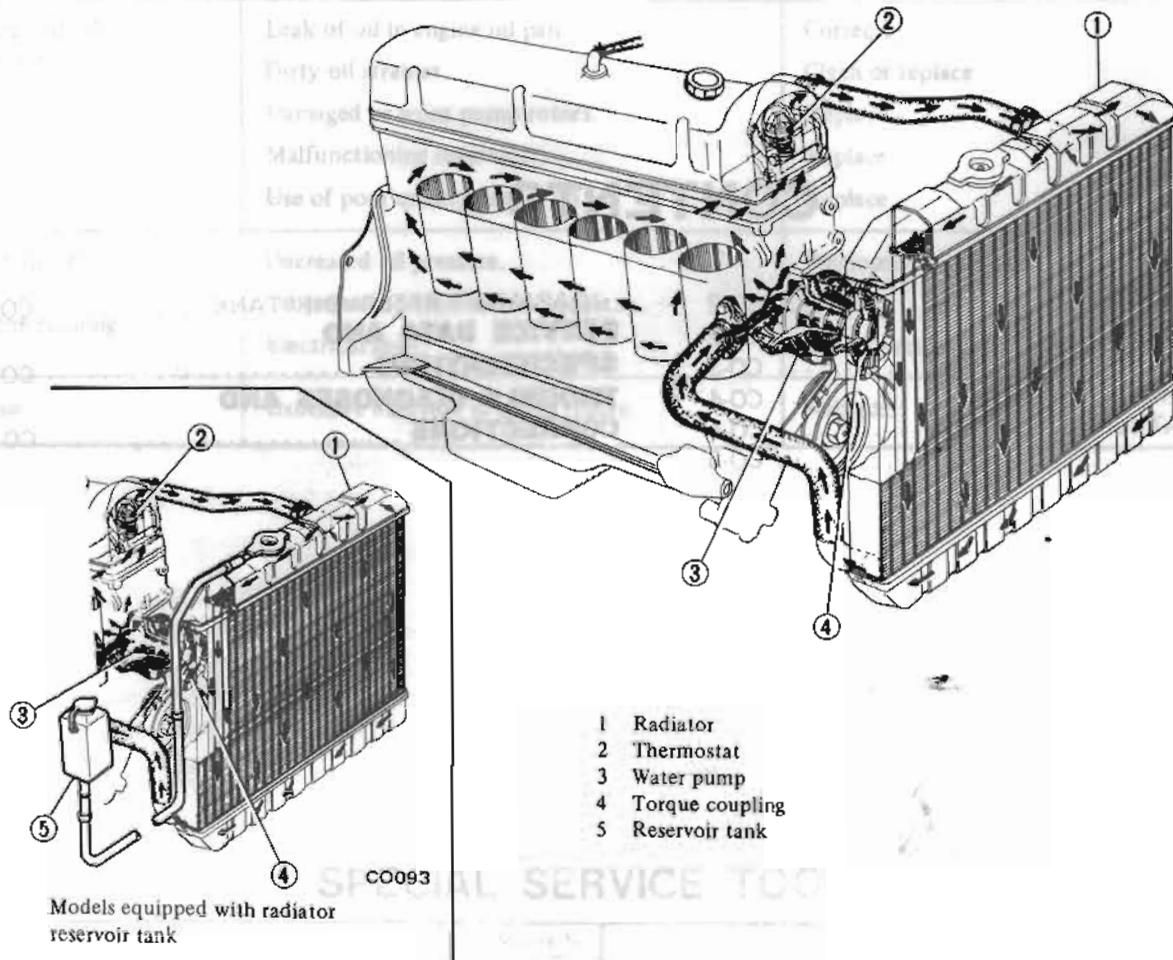


Fig. CO-1 Cooling System

## COOLANT LEVEL

- Without coolant reservoir  
The coolant level should be checked and maintained at 20 to 35 mm (0.79 to 1.38 in) below the bottom of the radiator filler neck.
- With coolant reservoir  
Pour coolant into the radiator up to the cap and also into the reservoir up to the "MAX" level.

### WARNING:

To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.

If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

## DRAINING AND FLUSHING COOLING SYSTEM

To drain cooling system, release drain cock at bottom of radiator, remove radiator cap and drain plug on right side of cylinder block. If heater system is installed, set heater temperature control valve to open position. After coolant is drained completely, close drain cock and plug and refill system with clean soft water.

## WATER PUMP

The water pump is of a centrifugal type, which is mounted on the engine front cover. The pump shaft is supported by a double row of ball bearings

press fit in an aluminum die cast pump body. The bearings are permanently lubricated and sealed to prevent loss of lubricant and entry of dirt.

2. Fill cooling system and check for leaks at pump.
3. Install fan pulley and fan blade, and tighten fixing bolts securely. Install belt and adjust to specified tension.
4. Operate the engine at fast idling and recheck for leaks.
5. Install fan shrouds if applicable.

**Note:** Ensure that clearance between shroud and fan is even at any place.

## DISASSEMBLY

Water pump should not be disassembled.

## INSPECTION

Inspect pump assembly for the following conditions and replace if necessary.

1. Badly rusted or corroded body assembly and vane.
2. Excessive end play or roughness of bearings in operation.

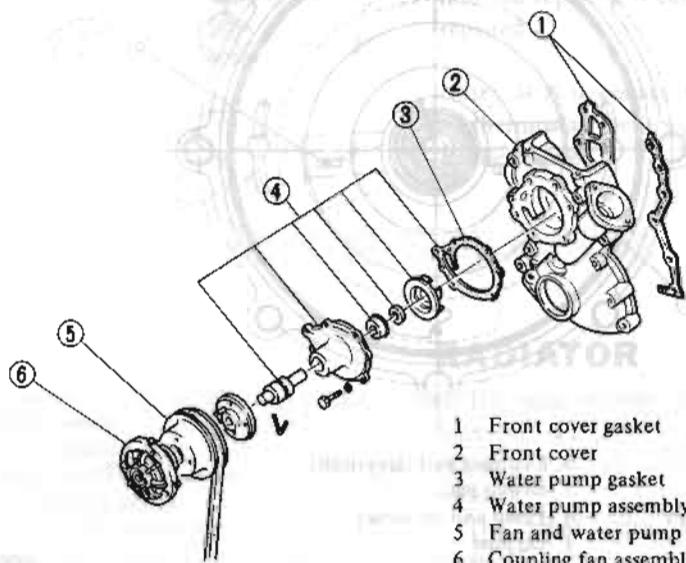
**Note:** If excessive mechanical seal squeak occurs when engine is running, use suitable water pump seal lubricant to prevent squeak.

## ADJUSTMENT

Check belt deflection between alternator and fan pulley by a force of 10 kg (22 lb).

**Fan belt deflection:**  
8 to 12 mm  
(0.31 to 0.47 in)

If adjustment is necessary, loosen bolt retaining alternator adjusting bar to alternator. Move alternator toward or away from engine until the correct tension is obtained.



- 1 Front cover gasket
- 2 Front cover
- 3 Water pump gasket
- 4 Water pump assembly
- 5 Fan and water pump pulley
- 6 Coupling fan assembly

CO094

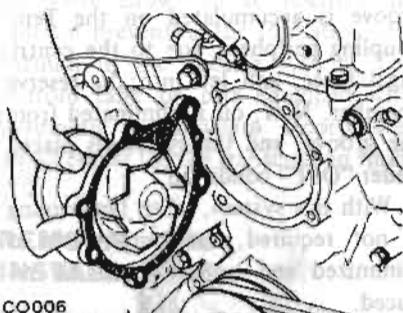
Fig. CO-2 Water Pump and Engine Front Cover

## REMOVAL

1. Drain coolant into a clean container.

**Note:** Prior to removing water pump, clean cooling system with suitable cleaner.

2. Loosen bolts retaining fan shroud to radiator and remove shroud.
3. Loosen belt, then remove fan blade and pulley from hub.
4. Remove water pump assembly and gasket from front cover.



CO006

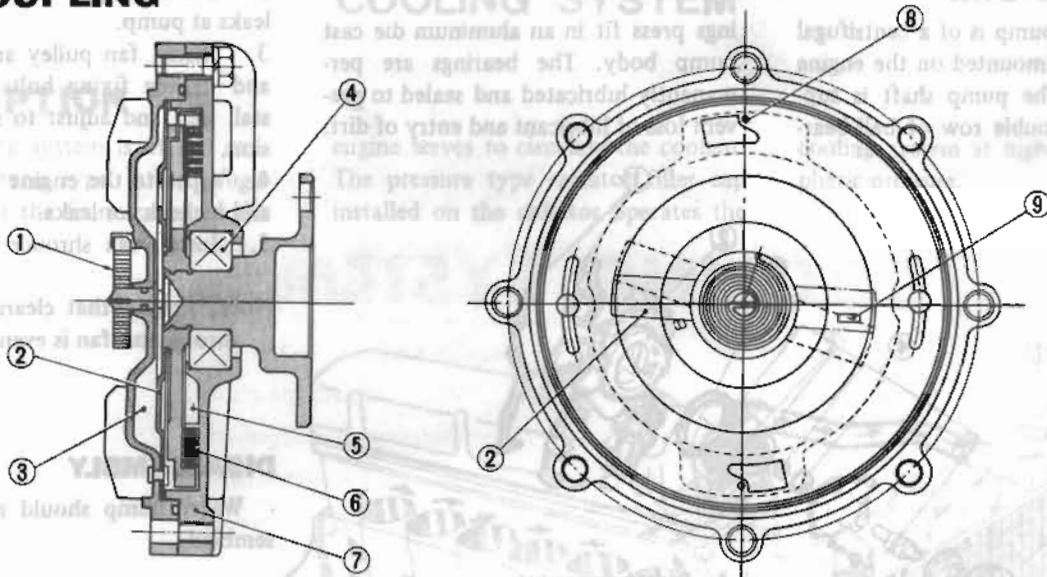
Fig. CO-3 Removing Water Pump

## INSTALLATION

1. Be sure to clean gasket surfaces in contact with pump and front cover. Always use new gaskets when installing water pump assembly. Be sure to tighten bolts.

**Tightening torque:**  
Water pump securing bolts  
0.4 to 0.5 kg-m  
(2.9 to 3.6 ft-lb)

**TEM-COUPLING**



- |                             |                             |
|-----------------------------|-----------------------------|
| 1 Bi-metal thermostat       | 6 Coupling part (labyrinth) |
| 2 Slide valve               | 7 Driven part               |
| 3 Reserve chamber for "OFF" | 8 Pump unit oil outlet      |
| 4 Bearing                   | 9 Oil inlet                 |
| 5 Driving chamber           |                             |

CO078

Fig. CO-4 Tem-Coupling

Tem-coupling is a type of fan coupling which is provided with a temperature control system.

The conventional coupling always slips the fan at a high speed under a constant ratio regardless of the engine cooling requirement.

The slipping ratio of the Tem-coupling, however, is properly changed with the cooling requirement.

"ON" denotes that cooling is required and the fan operates up to about 2,450 rpm. When high cooling is not required (during cold season, with the engine warmed up, etc.), the operation is placed under "OFF" condition and the fan slips at about 1,100 rpm.

The coiled bimetal thermostat installed on the front center portion of the Tem-coupling detects temperature of air passing through the radiator (The air temperature is directly relative to the engine coolant temperature.) and the inside slide valve is opened or closed as required, and thus, the ON-OFF control is performed. When the air temperature rises, the bimetal is expanded, and the valve is opened, silicone oil is forwarded to the groove that transmits torque, and the system is placed under "ON" condition.

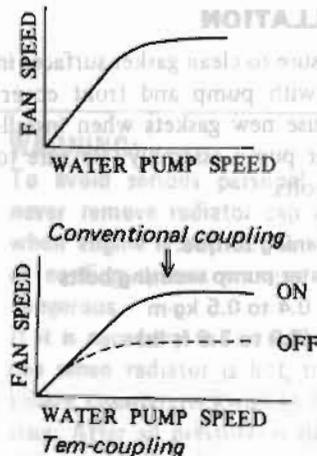
When the valve closes, silicone oil is not supplied to the groove, oil in the groove is accumulated on the Tem-coupling periphery due to the centrifugal force, and led into the reserve chamber. Now, oil is eliminated from the groove, and the system is placed under "OFF" condition.

With this system, when fan cooling is not required, the output loss is minimized and noise can be far reduced.

**INSPECTION**

Check Tem-coupling for oil leakage or bend of bimetal.

If the above symptoms are found, replace it with a new one as an assembly.



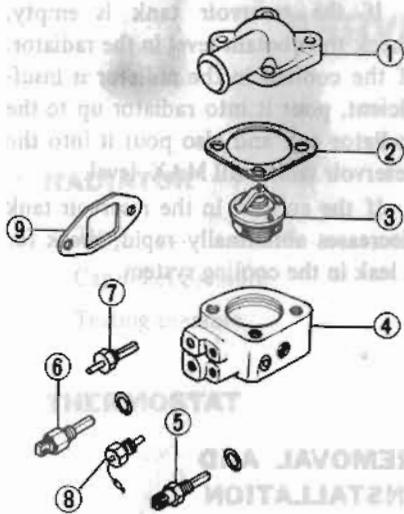
CO029

Fig. CO-5 Characteristic of Tem-Coupling

**THERMOSTAT REMOVAL AND INSTALLATION**

1. Disconnect upper radiator hose, water hose and then disconnect cable at thermotime switch, water temperature switch and water temperature sensor.
2. Remove thermostat housing from cylinder head.
3. Loosen securing bolts and remove water outlet, gasket and thermostat from thermostat housing.

## Cooling System



- 1 Water outlet
- 2 Gasket
- 3 Thermostat
- 4 Thermostat housing
- 5 Water temperature sensor
- 6 Thermostime switch
- 7 Thermal transmitter
- 8 Water temperature sensing switch
- 9 Gasket

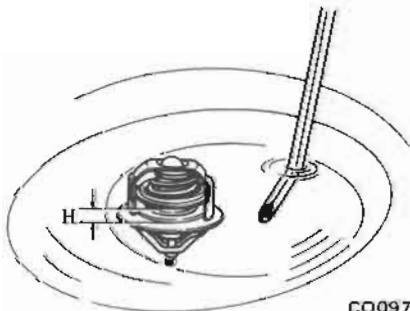
CO127

Fig. CO-6 Thermostat

4. After checking thermostat, re-install, replacing with a new housing gasket.
5. Reinstall water outlet and tighten securing nuts.
6. Replenish coolant and check for leaks.

### INSPECTION

1. Submerge thermostat in hot water  $5^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ) above the specified temperature. (Refer to Service Data and Specifications.)
2. After preparing for the marked screwdriver at about 8 mm (0.31 in) from the tip, inspect the lift height "H" of valve by inserting it.



CO097

Fig. CO-7 Inspecting Thermostat

3. Now, place thermostat in water  $5^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ) below the specified temperature.

If thermostat does not operate at the above specified temperature, it must be replaced because it cannot be repaired.

**Note:** It is necessary to check a new thermostat before installing it in the engine.

### RADIATOR

The radiator filler cap is designed to maintain a pre-set pressure ( $0.9 \text{ kg/cm}^2$ , 13 psi) above atmospheric pressure.

The relief valve consisting of a blow-off valve and a vacuum valve, helps to prevent the coolant from boiling by giving pressure to it. However, when the pressure is reduced below atmospheric pressure, the vacuum valve allows air to re-enter the radiator preventing the formation of a vacuum in the cooling system. The bottom tank on cars equipped with automatic transmission incorporates an oil cooler for the transmission fluid.

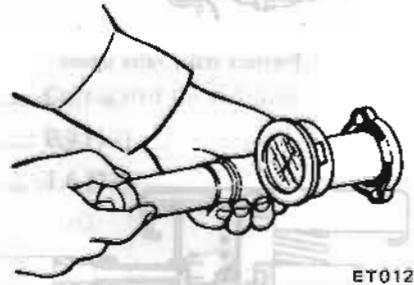
### REMOVAL AND INSTALLATION

1. Drain coolant into a clean container.
2. Disconnect radiator upper and lower hoses, and reservoir tank hoses.
3. Remove radiator shroud attaching bolts and then remove shroud. (if applicable)
4. On a car with automatic transmission, disconnect cooler inlet and outlet lines from radiator.
5. Remove radiator retaining bolts and then remove radiator upward.
6. Install radiator in the reverse sequence of removal.

### INSPECTION

Radiator cap should be checked for working pressure at regular tune up intervals. First, check rubber seal on cap for tears, cracks or deterioration

after cleaning it. Then, install radiator cap on a tester. If cap does not hold or will not release at the specified pressure, replace cap.

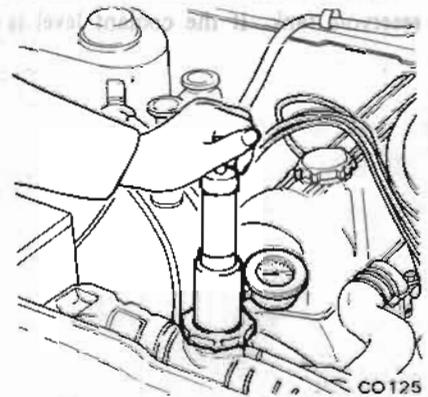


ET012

Fig. CO-8 Testing Radiator Cap

Also, inspect radiator for water leakage using cap tester and applying a pressure of  $1.6 \text{ kg/cm}^2$  (23 psi).

If a malfunction is detected, repair or replace radiator.



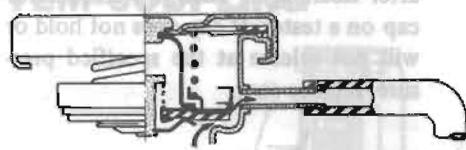
CO125

Fig. CO-9 Testing Cooling System Pressure

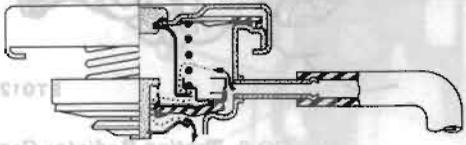
### RADIATOR RESERVOIR TANK

#### OPERATION

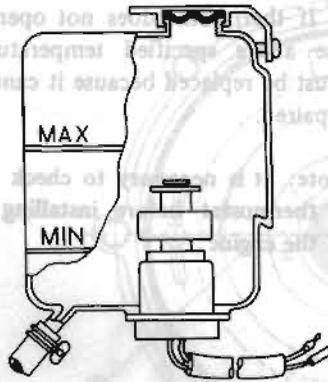
The radiator reservoir tank is mounted to the right hand side hood-ledge panel. When the coolant temperature in the radiator rises and pressure builds up to an extent, the pressure relief valve provided in the radiator cap opens to release excess coolant into the reservoir tank. When the coolant temperature lowers and pressure decreases in the radiator, the vacuum valve provided in the radiator cap opens to allow the coolant to re-enter the radiator.



Pressure relief valve opens



Vacuum valve opens



CO129

Fig. CO-10 Operation of Reservoir Tank

**INSPECTION**

Check the amount of coolant in the reservoir tank. If the coolant level is

below the MIN. level, remove the reservoir tank filler cap and add enough coolant to reach MAX. level.

If the reservoir tank is empty, check the coolant level in the radiator. If the coolant in the radiator is insufficient, pour it into radiator up to the radiator cap and also pour it into the reservoir tank until MAX. level.

If the coolant in the reservoir tank decreases abnormally rapid, check for a leak in the cooling system.

**REMOVAL AND INSTALLATION**

1. Disconnect water gauge sensor harness connector.
2. Remove reservoir tank hose from radiator upper side.
3. Remove reservoir tank.
4. Install in the reverse order of removal.



The CO-8 Testing Cooling System Pressure

to inspect the system. Pressure gauge should be used to check the system pressure. The CO-8 Testing Cooling System Pressure

**RADIATOR RESERVOIR TANK OPERATION**

The reservoir tank is mounted to the right hand side hood ledge gauge. When the coolant level rises up to an extent, the pressure relief valve provided in the radiator cap opens to release excess coolant into the reservoir tank. When the coolant temperature lowers and pressure decreases in the radiator, the vacuum valve opens to draw the coolant from the radiator.

**REMOVAL AND INSTALLATION**

1. Drain coolant into a clean container.
2. Disconnect radiator upper and lower hoses, and reservoir tank hoses.
3. Remove radiator shroud attaching bolts and then remove shroud (if applicable).
4. On a car with automatic transmission, disconnect coolant reservoir outlet lines from radiator.

**INSPECTION**

Radiator cap should be checked for working pressure at regular time up to 1.5 kg/cm<sup>2</sup> (21.7 psi). Check rubber seal on cap for leaks, cracks or deterioration.

**INSPECTION**

1. Submerge thermostat in hot water 70°C (160°F) show the specified temperature (Refer to Service Data and Specifications).
2. After preparing for the packed screwdriver at about 10 mm (0.4 in.) from the tip, inspect the fit height of valve by inserting it.





## TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Loss of water	Damaged radiator seams. Leaks at heater connections or plugs. Leak at water temperature gauge. Loose joints. Damaged cylinder head gasket. Cracked cylinder block. Cracked cylinder head. Loose cylinder head bolts.	Repair. Repair. Tighten. Tighten. Replace. Check engine oil for contamination and refill as necessary. Replace. Check engine oil in crankcase for mixing with water by pulling oil level gauge. Replace. Tighten.
Poor circulation	Restriction in system. insufficient coolant. Inoperative water pump. Loose fan belt. Inoperative thermostat.	Check hoses for crimps, and clear the system of rust and sludge by flushing radiator. Replenish. Replace. Adjust. Replace.
Corrosion	Excessive impurity in water. Infrequent flushing and draining of system.	Use soft, clean water. (rain water is satisfactory). Cooling system should be drained and flushed thoroughly at least twice a year. Permanent antifreeze (Ethylene glycol base) can be used throughout the seasons of a year.
Overheating	Faulty thermostat. Radiator fin choked with mud, chaff, etc. Incorrect ignition and valve timing. Dirty oil and sludge in engine. Inoperative water pump. Loose fan belt. Restricted radiator. Inaccurate temperature gauge. Impurity in water.	Replace. Clean out air passage thoroughly by using air pressure from engine side of radiator. Adjust. Refill. Replace. Adjust. Flush radiator. Replace. Use soft, clean water.
Overcooling	Faulty thermostat. Inaccurate temperature gauge.	Replace. Replace.