

# COOLING

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## GENERAL INFORMATION

The cooling systems are basically of the same type regardless of whether an air conditioner is provided or not. This system consists of tubes, spacer type radiator, 88.3 kPa (12.8 psi) radiator pressure cap, centrifugal water pump, 82°C (180°F) (trucks for U.S.A.) or 88°C (190°F) (trucks for Canada) thermostat, six-blade fan, automatic transmission oil cooler and coolant reserve system.

### COOLANT CHANGE

[Every 24 months or 48,000 km (30,000 miles)]

(1) Remove the radiator cap, radiator drain plug and engine drain plug to drain the coolant.

#### CAUTION:

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a cloth over the cap and turn the cap counterclockwise a little to let steam escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

(2) Remove the reserve tank and drain the coolant.

(3) After draining coolant completely, reinstall the drain plugs and flush the engine and radiator using a radiator cleaning fluid.

(4) After flushing is completed, completely drain the cleaning fluid and install the radiator and engine drain plugs.

(5) Refill the system with water and a high quality ethylene glycol antifreeze. A convenient mixture is a 50% water and 50% antifreeze solution. Reinstall radiator cap.

(6) After running the engine a while, check the coolant level and add coolant until the specified coolant level is maintained.

(7) Add coolant to the reserve tank between the "FULL" and "LOW" mark if necessary.

#### CAUTION:

Do not overfill the reserve tank.

### ANTIFREEZE

Since the cylinder head and water pump body are made of aluminum alloy casting, be sure to use a 50% ethylene glycol antifreeze coolant to provide corrosion protection.

Recommended brand	Quantity used
Mopar P/N 2932531/4106784 Antifreeze Type or equivalent	50% or more by volume

### MEASUREMENT OF ANTIFREEZE CONCENTRATION

Run the engine until coolant is fully mixed. Drain off coolant (antifreeze) and measure temperature and specific gravity of coolant. Determine concentration and safe working temperature with reference to the following table. If the coolant is short of antifreeze, add antifreeze up to a concentration of 50%.

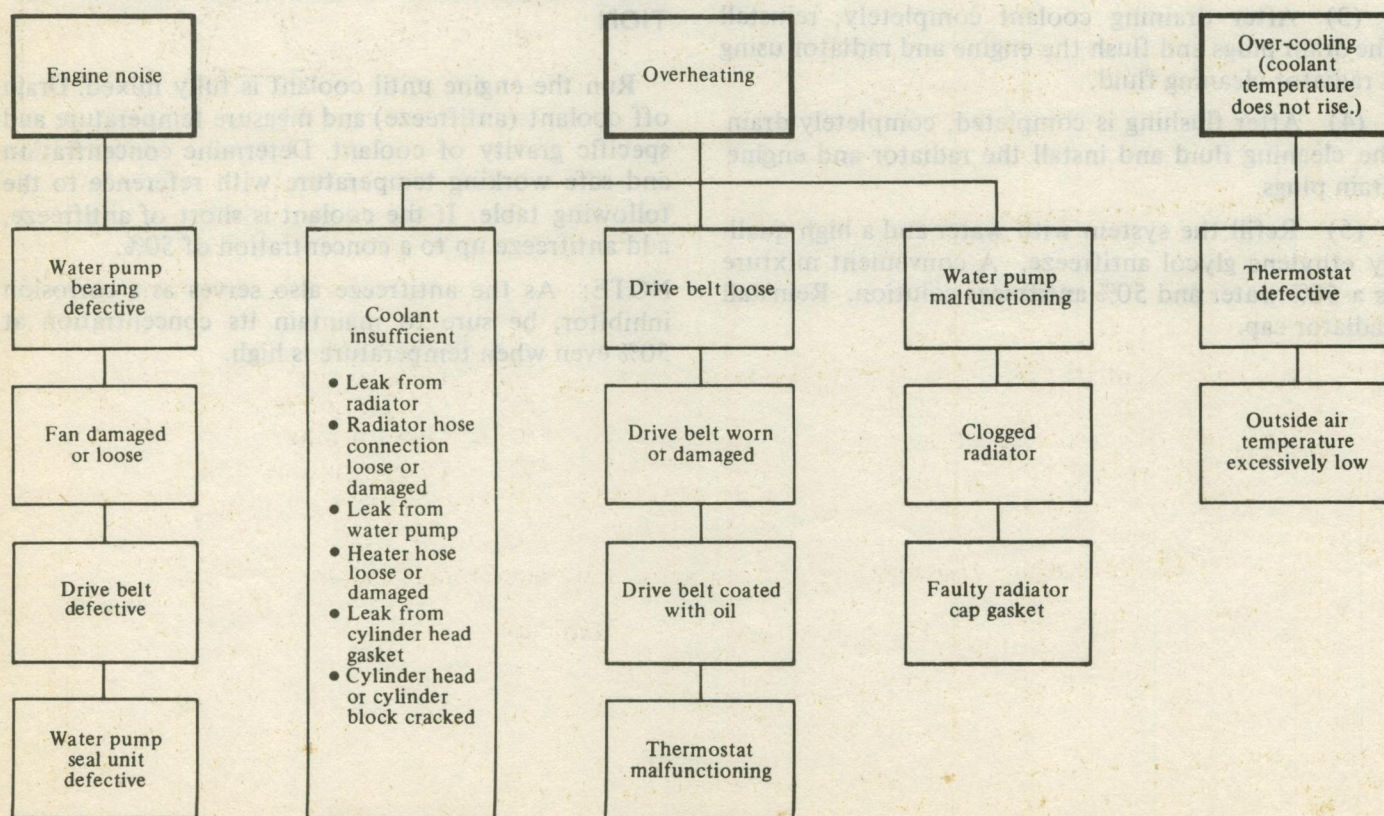
NOTE: As the antifreeze also serves as a corrosion inhibitor, be sure to maintain its concentration at 50% even when temperature is high.



Relation Between Antifreeze Concentration and Specific Gravity

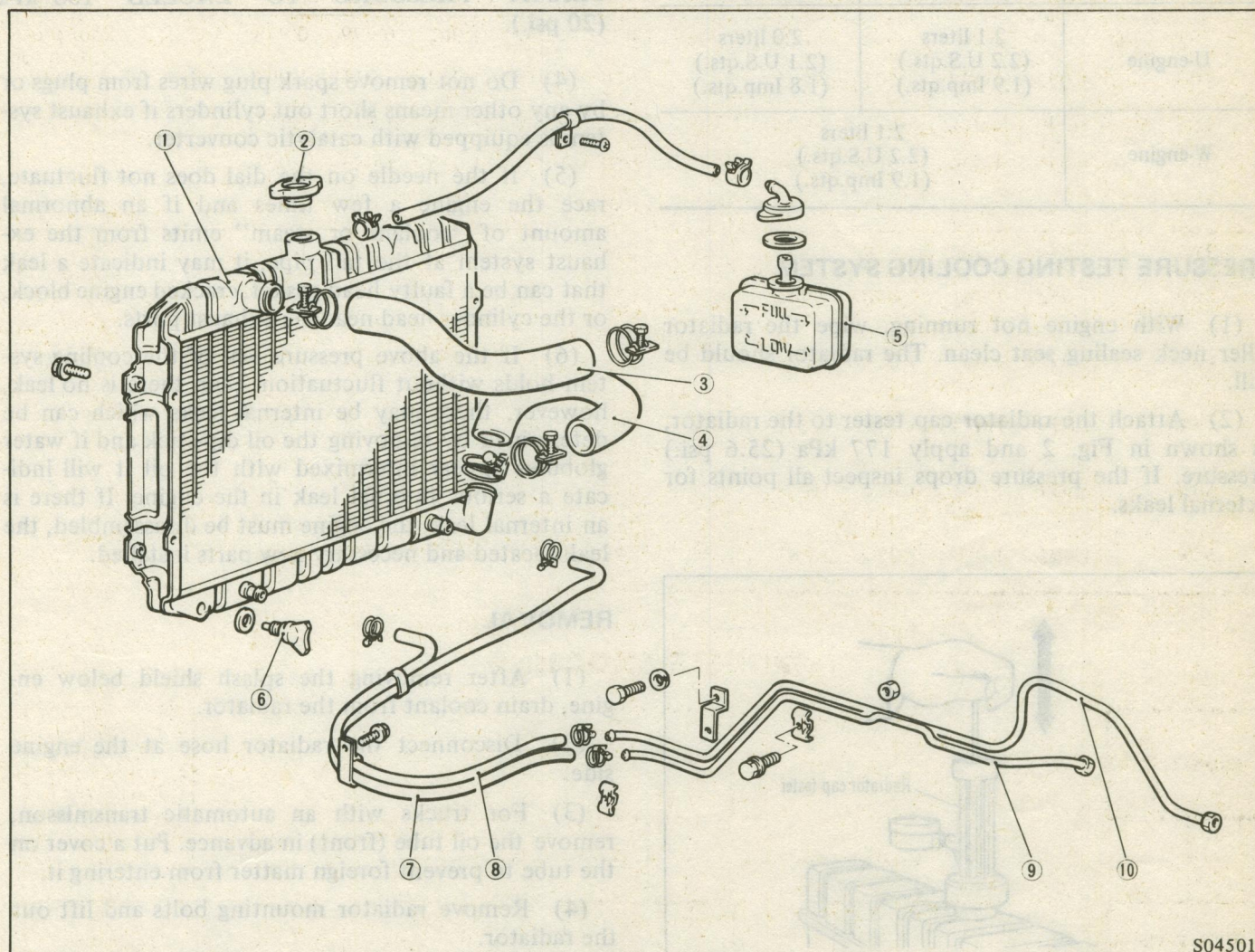
Concentration of antifreeze in coolant (by volume)	Specific gravity and temperature of coolant when specific gravity is measured										Freezing point	Remarks
	10°C (50°F)	15°C (59°F)	20°C (68°F)	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)	50°C (122°F)	55°C (131°F)		
5%	1.010	1.009	1.008	1.007	1.006	1.005	1.003	1.002	0.999	0.998		Poor protection for corrosion
10%	1.023	1.022	1.021	1.019	1.018	1.016	1.014	1.013	1.011	1.009		
15%	1.030	1.029	1.027	1.026	1.024	1.022	1.020	1.018	1.016	1.014		
20%	1.037	1.036	1.034	1.033	1.031	1.029	1.027	1.025	1.023	1.020		
25%	1.045	1.044	1.042	1.040	1.038	1.036	1.034	1.032	1.029	1.027		
30%	1.054	1.052	1.050	1.048	1.046	1.044	1.042	1.039	1.036	1.034		Good protection for corrosion
35%	1.063	1.061	1.058	1.056	1.054	1.051	1.049	1.046	1.044	1.041	-20°C (-4°F)	
40%	1.071	1.069	1.067	1.064	1.062	1.059	1.057	1.054	1.052	1.049	-25°C (-13°F)	
45%	1.079	1.077	1.074	1.072	1.069	1.066	1.064	1.061	1.058	1.055	-30°C (-22°F)	
50%	1.087	1.085	1.082	1.079	1.076	1.073	1.070	1.067	1.064	1.061	-36°C (-32.8°F)	
55%	1.095	1.093	1.090	1.087	1.084	1.081	1.077	1.074	1.070	1.066	-	

## TROUBLE SHOOTING





## RADIATOR



S04501

- |                         |                        |
|-------------------------|------------------------|
| (1) Radiator            | (6) Drain plug         |
| (2) Radiator cap        | (7) * Oil feed hose    |
| (3) Radiator upper hose | (8) * Oil return hose  |
| (4) Radiator lower hose | (9) * Oil feed tube    |
| (5) Reserve tank        | (10) * Oil return tube |

NOTE: \*Indicates part for trucks with automatic transmission

Fig. 1 Exploded View of Radiator



Radiator Specification

Engine	Model	
	Automatic transmission	Manual transmission
U-engine	2.1 liters (2.2 U.S.qts.) (1.9 Imp.qts.)	2.0 liters (2.1 U.S.qts.) (1.8 Imp.qts.)
W-engine	2.1 liters (2.2 U.S.qts.) (1.9 Imp.qts.)	

### PRESSURE TESTING COOLING SYSTEM

(1) With engine not running, wipe the radiator filler neck sealing seat clean. The radiator should be full.

(2) Attach the radiator cap tester to the radiator, as shown in Fig. 2 and apply 177 kPa (25.6 psi.) pressure. If the pressure drops inspect all points for external leaks.

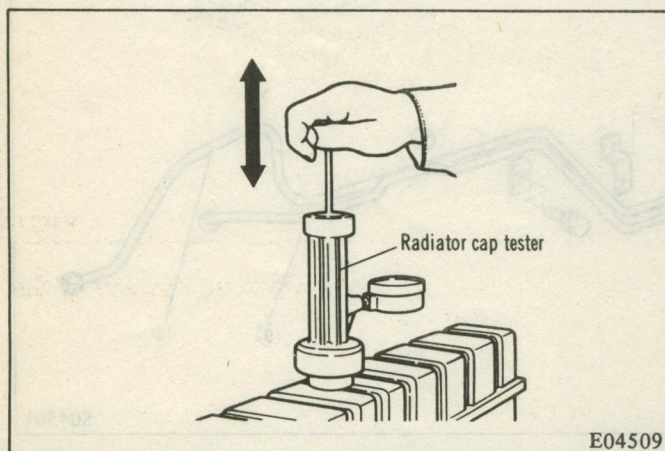


Fig. 2 Pressure Testing Cooling System

(3) If there are no external leaks, after the gauge dial shows a drop in pressure, detach the tester, start engine and run the engine to operating temperature in order to open the thermostat and allow the coolant to expand. Reattach the tester and pump to 48 kPa (7 psi.) pressure while the engine is running. Race the engine, and if the needle on the dial fluctuates it indicates a combustion leak, usually a head gasket.

### CAUTION:

Pressure builds up fast. Any excessive amount of pressure built up by continuous engine operation must be released to a safe pressure point. **NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi.).**

(4) Do not remove spark plug wires from plugs or by any other means short out cylinders if exhaust system is equipped with catalytic converter.

(5) If the needle on the dial does not fluctuate, race the engine a few times and if an abnormal amount of "coolant or steam" emits from the exhaust system at the tail pipe, it may indicate a leak that can be a faulty head gasket, cracked engine block, or the cylinder head near the exhaust ports.

(6) If the above pressure test of the cooling system holds without fluctuation, then there is no leak, however, there may be internal leaks which can be determined by removing the oil dip-stick and if water globules appear intermixed with the oil it will indicate a serious internal leak in the engine. If there is an internal leak, the engine must be disassembled, the leak located and necessary new parts installed.

### REMOVAL

(1) After removing the splash shield below engine, drain coolant from the radiator.

(2) Disconnect the radiator hose at the engine side.

(3) For trucks with an automatic transmission, remove the oil tube (front) in advance. Put a cover on the tube to prevent foreign matter from entering it.

(4) Remove radiator mounting bolts and lift out the radiator.

### RADIATOR

(1) Check for broken radiator hose, loose clamps and leaks. Correct or replace components if necessary.

(2) Check the leaking radiator. Correct leaks by soldering or replace it if necessary. After repair, perform the pressure proof test.

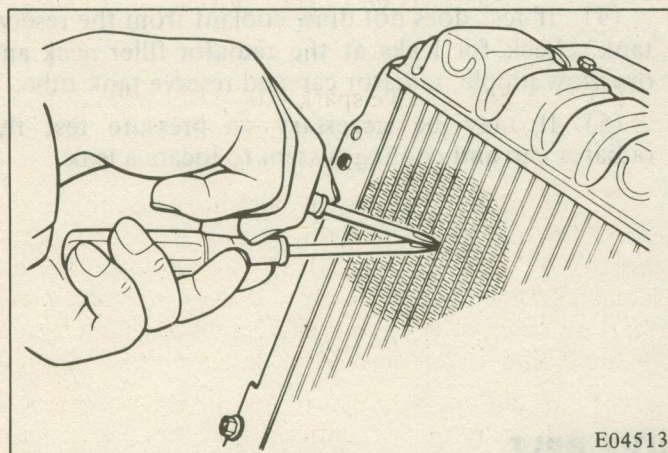
Proof pressure of radiator	177 kPa (25.6 psi.)
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(3) Check the radiator for clogging. Overhaul or replace it if necessary.



### Correction of Radiator Fins

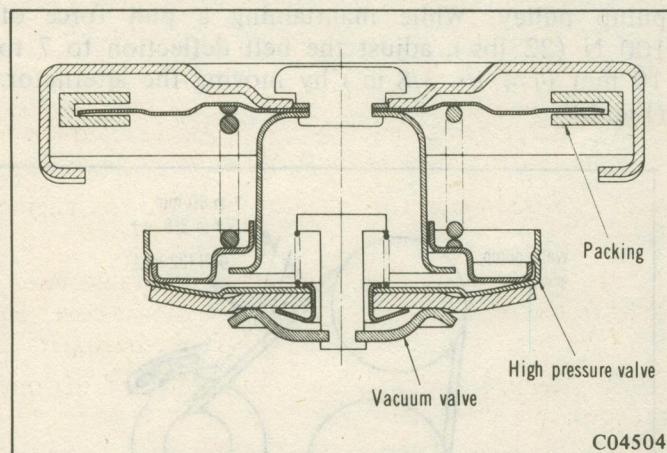
If bend or collapse is evident, correct it by using a screwdriver.



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Fig. 3 Correcting Radiator Fins

### RADIATOR CAP



C04504

Fig. 4 Radiator Cap

Check the valve and spring on the radiator cap for deterioration or broken packing. Also check the valve opening pressure and replace the radiator cap if necessary.

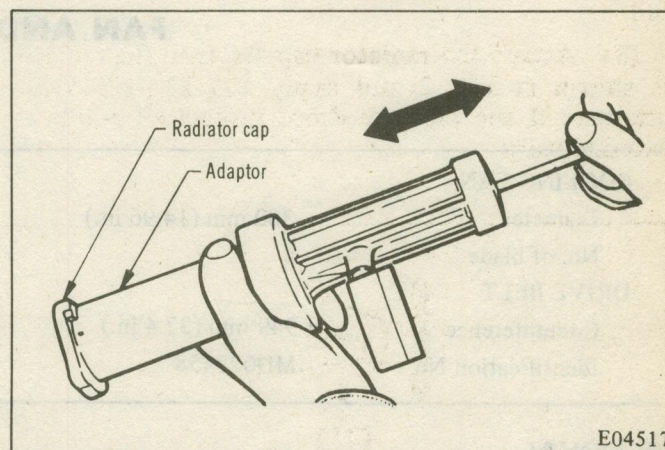
#### CAUTION:

A special radiator cap is used to insure sealing and to allow the coolant to return from the reserve tank to the radiator when the engine cools. If cap replacement is necessary, use proper cap.

Radiator cap valve opening pressure	kPa (psi.)
High pressure side	78.4 to 98.1 (11.3 to 14.2)
Vacuum side	-4.9 to -9.8 (-.7 to -1.4)

### Inspection of High Pressure Valve Opening Pressure

- (1) Install a radiator cap tester to the radiator cap.
- (2) Increase the pressure to the specified upper level.
- (3) Leave the test pressure within the specified range for approx. 10 seconds, and assure that no decrease in pressure will occur.



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Fig. 5 Checking the Valve Opening Pressure of the Radiator Cap

### INSTALLATION

When installing the radiator, observe the following instructions:

- (1) When connecting hoses to the radiator and engine, push them on fully and clamp them securely so that the connection does not leak.
- (2) Attach the oil cooler hose pad to the stabilizer securely to prevent jamming of hose.
- (3) On vehicles with an automatic transmission, replenish transmission oil up to the specified quantity. (See GROUP 21.)



**RESERVE TANK**

- (1) Check the level of the reserve tank.
- (2) It should be between the "FULL" and "LOW" marks on the tank, indicating a volume of between 0.7 liter (.73 U.S.qts.) (.61 Imp.qts.) and 0.2 liter (.20 U.S.qts.) (.17 Imp.qts.) respectively.
- (3) The capacity of tank is 1.08 liters. (1.1 U.S.qts.) (.92 Imp.qts.)

**Testing Coolant Reserve System**

- (1) With coolant in the reserve tank at the proper level and radiator cap installed, open the radiator drain cock.

(2) Coolant should be drawn from the reserve tank into the radiator.

(3) Do not leave drain cock open to drain reserve tank and allow air into system.

(4) If test does not draw coolant from the reserve tank, check for leaks at the radiator filler neck and overflow nipple, radiator cap and reserve tank tube.

(5) It may be necessary to pressure test the radiator cap and cooling system to locate a leak.

**FAN AND DRIVE BELT****COOLING FAN**

Diameter	380 mm (14.96 in.)
No. of blade	6

**DRIVE BELT**

Circumference	949 mm (37.4 in.)
Identification No.	MD027458

**REMOVAL**

(1) Slightly loosen the alternator support bolt nut and alternator brace bolt, push the alternator toward the engine, and remove the drive belt.

(2) Remove the cooling fan bolts and remove the fan.

**INSPECTION**

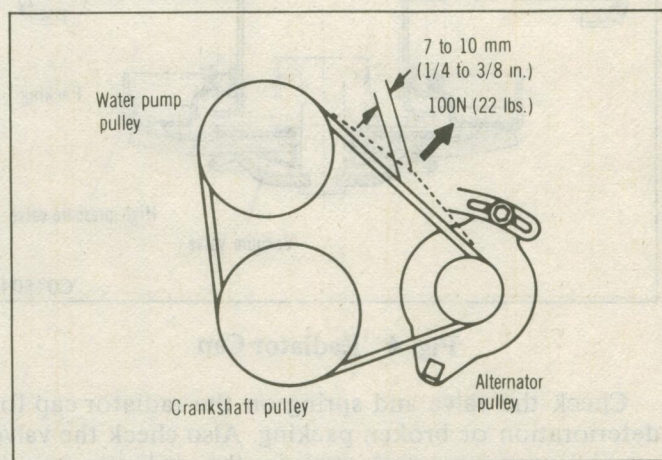
(1) Check the belt for stretch or cracks due to deterioration. Replace it if necessary.

(2) Check the fan for damage. Replace it if necessary.

**INSTALLATION**

- (1) Install the fan.
- (2) Install the drive belt and adjust the tension of the drive belt by the following procedures.

(a) Using a force gauge pull the belt at a point halfway between the alternator pulley and water pump pulley. While maintaining a pull force of 100 N (22 lbs.), adjust the belt deflection to 7 to 10 mm (1/4 to 3/8 in.) by moving the alternator. (Fig. 6)



**Fig. 6 Adjustment of Drive Belt Tension**

(b) After the adjustment, tighten the alternator support bolt and alternator brace bolt firmly.

Parts to be tightened	Torque Nm (ft-lbs.)
Alternator support bolt	20 to 24 (15 to 18)
Alternator brace bolt	12 to 14 (9 to 10)



## FAN CLUTCH

The fan clutch is a torque type clutch. It is designed to lower the fan speed without regard to atmospheric temperature as the pulley speed increases, thus regulating the volume of cooling air to reduce the loss of output during high-speed travel.

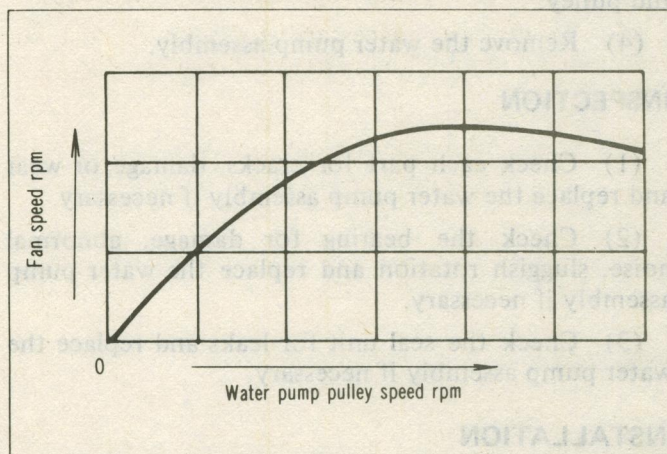


Fig. 7 Fan Clutch Characteristics

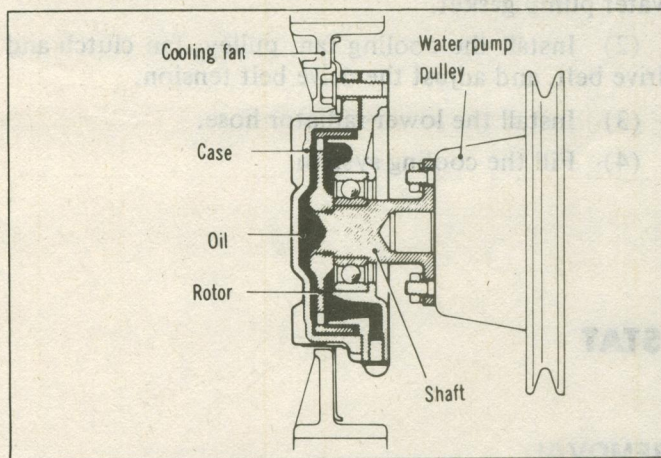


Fig. 8 Sectional View of Fan Clutch

### REMOVAL

- (1) Remove the cooling fan.
- (2) Remove the drive belt.
- (3) Remove the fan clutch mounting nuts and remove fan clutch and pulley.

### INSPECTION

- (1) Check for leaks from the case joining surfaces and bearing seal. If leaks are evident, replace clutch as assembly.
- (2) Check to ensure that the case or input shaft rotates smoothly at higher engine R.P.M. and no noise is produced from the bearing section.

### INSTALLATION

- (1) Install the water pump pulley and fan clutch, and tighten nuts.
- (2) Install the drive belt and adjust the tension of the belt.
- (3) Install the cooling fan and tighten bolts.
- (4) Turn the cooling fan by hand to confirm that it rotates smoothly.

## WATER PUMP

The water pump is a centrifugal impeller type with its body attached to the timing chain case. The water pump body is made of aluminum alloy and is pro-

vided with a double row radial ball bearing of superior durability. It requires no greasing.



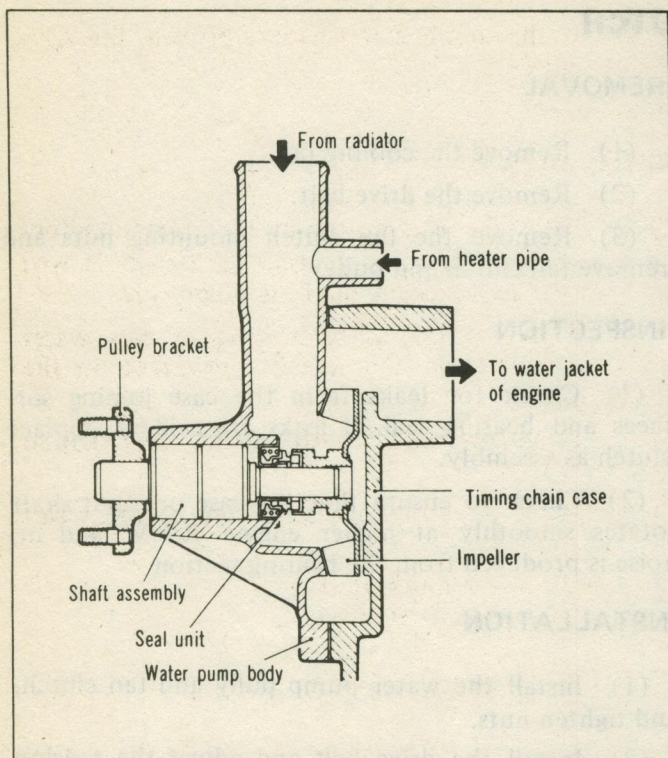


Fig. 9 Sectional View of Water Pump

## REMOVAL

- (1) Drain the cooling system. Disconnect the battery ground cable.
- (2) Remove the lower radiator hose.
- (3) Remove the drive belt, cooling fan, fan clutch and pulley.
- (4) Remove the water pump assembly.

## INSPECTION

- (1) Check each part for cracks, damage or wear and replace the water pump assembly if necessary.
- (2) Check the bearing for damage, abnormal noise, sluggish rotation and replace the water pump assembly if necessary.
- (3) Check the seal unit for leaks and replace the water pump assembly if necessary.

## INSTALLATION

- (1) Install the water pump assembly using a new water pump gasket.
- (2) Install the cooling fan, pulley, fan clutch and drive belt, and adjust the drive belt tension.
- (3) Install the lower radiator hose.
- (4) Fill the cooling system.

## THERMOSTAT

The thermostat is equipped with a movable valve and is designed so that the valve opening temperature cannot be affected by the pressure in the water jacket.

The movable valve prevents leakage through a bleed hold and assists fast warm-up.

## REMOVAL

- (1) Drain coolant below the lever of thermostat housing.
- (2) Remove the lower radiator hose from the water outlet fitting.
- (3) Remove the water outlet fitting and take out the thermostat.



**INSPECTION**

(1) With the thermostat immersed in water, raise the water temperature by heating it and measure the valve opening temperature and the valve lift at full opening position.

Replace the thermostat if the test result is not satisfactory.

Description	U.S.A.	Canada
Valve opening temperature	82°C (180°F)	88°C (190°F)
Valve full opening temperature	95°C (203°F)	100°C (212°F)
Identification mark	82	88

Note: Identification mark is stamped on the flange of thermostat.

(2) If the valve is open at all at room temperature or if the external damage is found excessive, replace it.

NOTE: If the thermostat sensor is broken, the valve remains closed.

**INSTALLATION**

(1) Insert the thermostat in the inlet manifold and make sure that the thermostat flange is well seated in the spot-faced area of inlet manifold.

(2) Apply sealant to both sides of new water outlet fitting gasket and install the gasket on the inlet manifold.

(3) Install the water outlet fitting and tighten with two bolts.

(4) Install the lower radiator hose to the water outlet fitting.

(5) Fill the cooling system.

**WATER TEMPERATURE GAUGE UNIT**

The gauge unit is a thermistor type and is attached to the bottom of the thermostat housing integral with intake manifold.

**REMOVAL**

(1) Disconnect electrical lead from the water temperature gauge unit.

(2) Remove the water temperature gauge unit from the inlet manifold.

**INSPECTION**

Refer to Group 8 Electrical "Gauges".

**INSTALLATION**

(1) Apply sealant to the threaded portion of the gauge unit and tighten the gauge unit to the specified torque.

Part to be tightened	Torque Nm (ft-lbs.)
Water temperature gauge unit	30 to 39 (22 to 28)