Section V

COOLING SYSTEM

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

COOLING SYSTEM

DATA AND SPECIFICATIONS

	C-67	C-68 and C-69	C-70
COOLING SYSTEM			
Type	Pressure Vent	Pressure Vent	Pressure Vent
Capacity:			
With Heater	25 qts.	26 qts.	26 qts.
Without Heater	24 qts.	25 qts.	25 qts.
Radiator Cap Relief Valve			
Pressure—psi	7	7	7
With Air Conditioning	14	14	14
WATER PUMP			
Type	Centrifugal	Centrifugal	Centrifugal
Bearing Type	Ball Bearing	Ball Bearing	Ball Bearing
Shaft End Play	.015 in. max.	.015 in. max.	.015 in. max.
THERMOSTAT			
Type	Choke	Choke	Choke
Starts to Open			
(up to)	159° to 165° F.	159° to 165° F.	159° to 165° F.
(after)	155° to 160° F.	155° to 160° F.	155° to 160° F.
Fully Open	189° F.	189° F.	189° F.
FAN BELT			
No. Used	one	one	two*
Type	V	V	V
Tension	½ in. Slack	½ in. Slack	½ in. Slack
FAN			
No. of Blades	six	four*	four*
Diameter	18 in.	18 in.	18 in.
Radiator-to-Blade			
Clearance	Top—$4\frac{13}{16}$ in. Bottom—$3\frac{31}{32}$ in.	Top—$4\frac{13}{16}$ in. Bottom—$3\frac{31}{32}$ in.	Top—$4\frac{13}{16}$ in. Bottom—$3\frac{31}{32}$ in.
RADIATOR			
Type	Cellular*	Fin & Tube	Fin & Tube
Thickness	2¾ in.	3 in.	3 in.
FAN SHROUD			
Type	Ring*	Ring*	Ring*

*The Model C-67 uses the fin and tube type radiator with a 3-inch core. All Models with air conditioning have a box type fan shroud. On Models C-68, C-69 and C-70 a 6 blade fan with one fan belt is used with air conditioning.

Section V

COOLING SYSTEM

DESCRIPTION

The cooling system incorporates either the cellular or the fin and tube type full flow radiator and a centrifugal pump. Full length water jackets insure an even dissipation of heat within the cylinder block.

The water pump circulates the coolant through both blocks, around the cylinder bores, and up into the cylinder heads. The coolant then circulates through the cylinder heads, and around the exhaust valve ports. From the valve ports the coolant flows through the thermostat housing and returns to the radiator.

The cooling system of all models can be pressurized to 7 psi (14 psi when equipped with air conditioning). The radiator pressure cap is of the pressure vented type and normally will not go under pressure until the boiling point of the coolant is reached.

SERVICE PROCEDURES

1. REMOVAL AND INSTALLATION OF WATER PUMP

Refer to Figure 1 and proceed as follows:

a. Removal From Engine

(1) Drain the cooling system.

(2) Remove radiator inlet hose (and heater hoses if so equipped.)

(3) Remove wire from temperature gauge sending unit.

(4) Remove fan shroud.

(5) Remove idler pulley, fan, generator, and fan assembly.

(6) Remove radiator outlet hose from oil cooler, and disconnect oil cooler from the water pump housing (if so equipped).

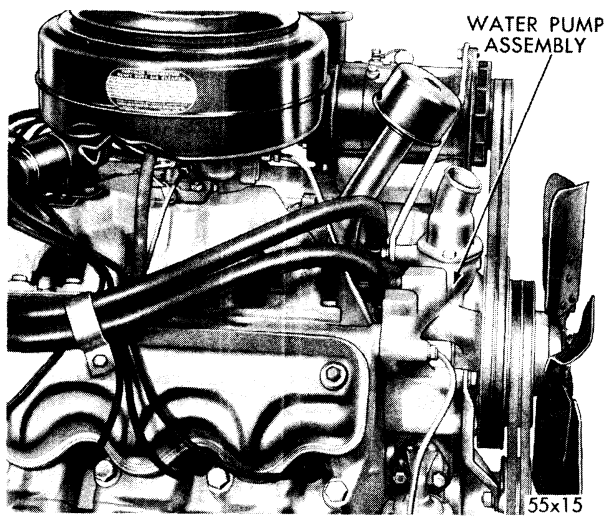

Fig. 1—Water Pump Installed

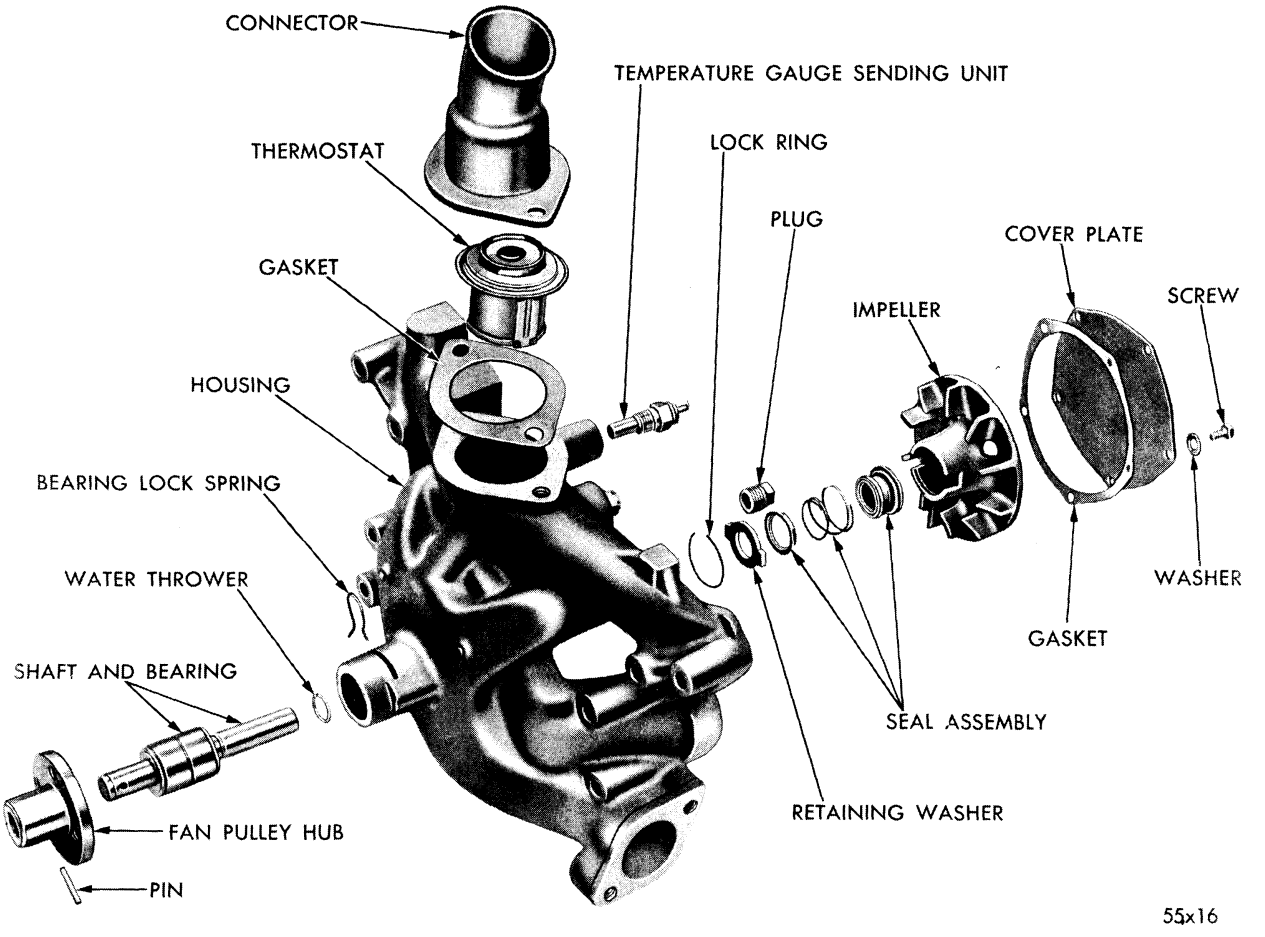

Fig. 2 — Water Pump (Exploded View)

(7) Remove screws which hold the water pump housing to cylinder head and block. (Remove compressor bracket screws from the water pump housing if so equipped.) Remove the water pump housing.

b. Disassembly of Water Pump (Removed)

Refer to Figure 2 and proceed as follows:

(1) Remove the bearing lock spring.

(2) Remove the pump cover plate screws and washers; remove plate and gasket.

(3) Position water pump in suitable fixture **impeller side up.** Use a rod smaller in diameter than the bearing shaft to press out (downward) the bearing and shaft assembly.

CAUTION

Bearing and shaft assembly can be removed only in the direction described. If an attempt is made to remove shaft in opposite direction, damage to water pump housing will result.

(4) Lift out impeller. Remove lock ring from impeller and remove retaining washer and seal assembly from impeller.

(5) Drive out the fan pulley hub pin and remove hub from shaft with puller tool C-412.

(6) Clean parts in a suitable solvent and dry with compressed air.

c. Inspection

(1) Inspect pump shaft bore in housing for proper fit, burrs, and scoring.

(2) Inspect pump shaft for proper fit in impeller and for scoring.

(3) Inspect condition of water thrower.

(4) Inspect pump housing machined faces for scoring and burrs.

d. Assembly

Refer to Figure 2 and proceed as follows:

NOTE

Seal and seal washer should be replaced whenever the water pump is disassembled. It is advisable to replace the bearing and shaft assembly, since damage to the bearing usually results during the removal of the assembly.

(1) Assemble the fan pulley hub to pump shaft, line up hub pin hole and press hub on shaft. Insert pin and peen over both ends of pin.

NOTE

The hub and impeller must fit tightly on the shaft. A hub that has been used previously usually will not fit tight enough. Replace parts, as necessary, to insure a proper fit.

(2) If replacement is necessary, install new water thrower on pump shaft.

(3) Install seal assembly in impeller and install lock ring.

(4) Place impeller in housing. Support pump housing in suitable fixture (impeller side down) and press shaft into impeller with Tool C-3468, as shown in Figure 3.

(5) Install a new gasket on pump housing cover plate. Position cover plate in place on housing and replace the attaching screws and washers.

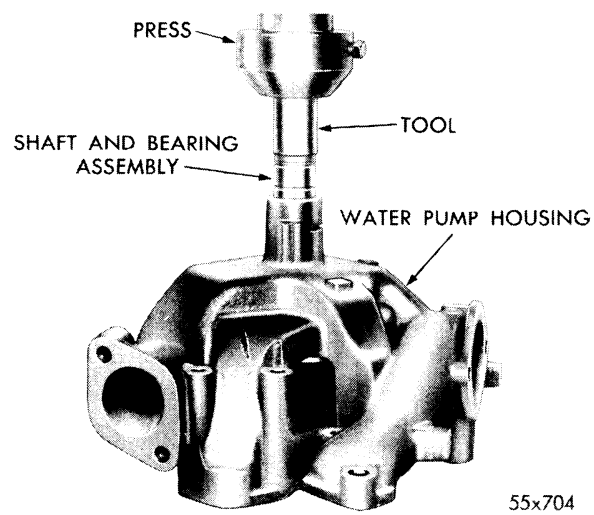

Fig. 3—Installing Pump Shaft and Bearing Assembly

NOTE

Be sure to use the special sealing washers when installing cover plate.

(6) Install bearing lock spring.

2. INSTALLATION OF WATER PUMP TO ENGINE (See Fig. 1)

(1) Using a new pump housing gasket, install the water pump on the engine.

(2) Tighten bolts to 30 foot-pounds torque.

(3) Install fan, pulley, fan belts and fan shroud.

(4) Refill the cooling system. Run engine and check for leaks.

3. RADIATOR (ALL MODELS)

Only clean, soft water should be used in the radiator and the cooling system of the engine. Hard water will form a scale, not only in the radiator core, but in the engine block and cylinder heads as well. This scale, or lime deposit, causes hot spots within the engine and will plug the small passages of the radiator core. Dirty water will close the tubes in the core and restrict coolant flow and, in extreme cases, collect in the engine and cause overheating and eventual engine failure.

a. Cleaning the Radiator

The following procedure is recommended to assure maximum efficiency from cooling systems in need of cleaning.

(1) Drain the coolant from the system by opening all three drain cocks. (One at the bottom of the radiator and one on each side of the cylinder block.) After draining close all the drain cocks.

(2) Refill the cooling system with fresh water and add the contents of one can (No. 1, top compartment) of MOPAR Cooling System Cleaner.

CAUTION

Handle cleaner with care. It will burn the skin, clothing, and car finish. Wash hands promptly if contacted by the cleaner; rinse clothing or painted surface with water if the cleaner is spilled or splashed on them.

(3) Install the radiator cap, and run the engine at a fast idle speed from ½ to ¾ hour, for moderate cases. (Be sure to partially cover the radiator to raise the temperature between 180 and 190 degrees F. The solution must be used hot.)

NOTE

Reverse flushing will not be necessary except in severe cases of rust and a partially blocked cooling system.

(4) Stop the engine and drain the system thoroughly, with all drain cocks open.

(5) Close drain cocks and refill with clean fresh water.

(6) Pour conditioner (No. 2, bottom compartment) into radiator.

(7) Run the engine for ten minutes, then drain the cooling system. Flush with clean water, with all the drain cocks open, until the water comes out clear.

(8) Close the drain cocks and refill the cooling system with clean, soft water.

(9) During the summer, use MOPAR Radiator Rust Resistor to prevent recurrence of rust in the cooling system. **THIS IS IMPORTANT!!**

b. Reverse Flushing the Cooling System (Cylinder Block)

(1) Drain radiator.

(2) Remove water hose from radiator inlet (top).

(3) Remove thermostat housing from water pump housing and remove thermostat. Reinstall thermostat housing.

(4) Remove water hose from radiator outlet (bottom).

(5) Attach a suitable hose or a flushing gun, Tool C-311, to radiator inlet hose.

(6) Turn on water supply and force water through cylinder block until clean water is forced through. **A pulsating flow of water will loosen sediment more quickly than a steady flow.**

c. Reverse Flushing the Cooling System (Radiator)

(7) Remove flushing gun and install on radiator outlet (bottom) and force water upward through radiator until clean water is forced through.

CAUTION

Do not apply excessive pressure, when pressure-flushing the radiator, as damage may result to the radiator.

(8) Remove flushing gun and install thermostat. Connect hoses, refill cooling system with coolant. Check for leaks in system at hose connection and correct as necessary.

d. Removal of Radiator Assembly

(1) Drain cooling system.

(2) Disconnect radiator inlet and outlet hoses.

(3) Remove fan shroud.

(4) Remove nuts and cap screws holding the radiator to radiator support, and remove radiator.

4. WATER TEMPERATURE GAUGE (Fig. 4)

The electric (or magnetic) water temperature gauge consists of two units, the dash unit and the sending unit. The gauge is connected to the voltage through the ignition switch.

a. Dash Unit

The dash unit has two magnetic poles. One of the windings is connected to the ignition switch and to a ground. This electromagnet exerts a steady pull to hold the gauge pointer to the left or "cold" position, whenever the ignition switch is turned on.

The other winding in the dash unit connects to a ground through the engine unit. This electromagnet exerts a steady magnetic pull on the gauge pointer toward the right or "hot" side of the gauge. The strength of this electromagnet is dependent upon the current allowed to pass through the engine unit resistor.

b. Sending Unit

The engine unit, located in the water pump housing, is equipped with a flat disc that changes re-

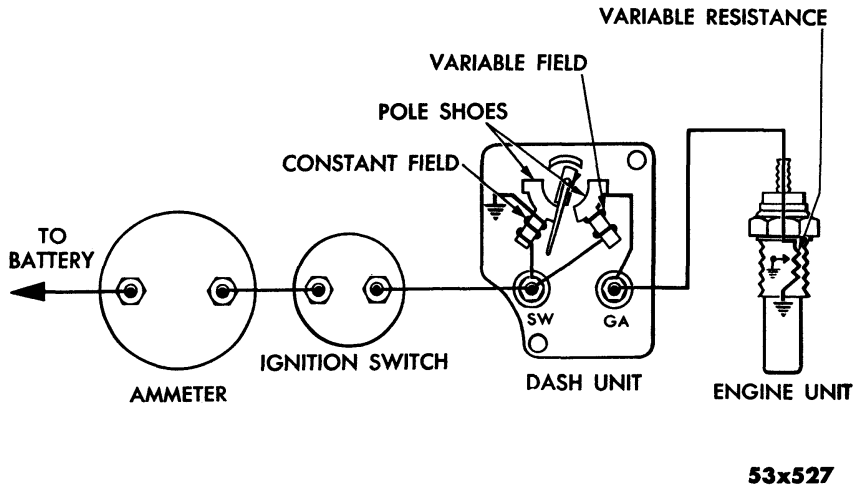

Fig. 4—Water Temperature Gauge

sistance as its temperature varies. The resistance of this disc is greatest when the temperature is cold and its resistance decreases as the temperature increases. The decrease in resistance (with an increase in temperature) allows more current to flow through the electromagnet that is connected to the engine unit. The resulting increase in magnetic pull causes the gauge pointer to move to the right or "hot" side.

c. Electrical Circuit

(1) Testing

Two tests must be performed in order to test the electrical temperature gauge circuit to determine if it is in satisfactory condition. The tests are as follows:

Test 1—Disconnect the wire at sending unit and turn on the ignition switch. The gauge hand should stay against the left side stop pin.

Test 2—Ground the wire disconnected from the sending unit. Turn on the ignition switch. The gauge hand should swing across the dial to the right side stop pin.

(2) Test Results and Corrective Measures

If the gauge hand does not stay on the left hand stop in Test 1 above, either the wire is grounded between the dash unit and the engine unit or the dash unit is defective. Test further by disconnecting the wire at the dash unit "GA" terminal and turn on the ignition switch. If the gauge hand now stays on the left hand stop pin, replace wire. But, if the gauge hand still moves, replace the dash unit.

If the gauge hand does not swing across the dial as in Test 2, there is an open circuit in the wire between the dash unit and the engine unit, the dash unit is defective, or power is not reaching the dash unit. Test further by grounding the "GA" terminal on the dash unit and turn on the ignition switch. If the gauge hand now moves, replace the wire. If the gauge hand still does not move, connect a test lamp from the dash unit. If the test lamp does not light, test the wire between the ignition switch and the dash unit by connecting a test lamp to the "Accessory" terminal at the ignition switch and to a ground. When this is done, the test lamp should light.

If the gauge hand operates correctly as in Tests 1 and 2, but the gauge does not indicate temperature changes correctly, either the engine unit is defective or the dash unit is not calibrated properly. Replace engine unit with one that is in good condition. If the gauge is still not accurate, replace the dash unit.

If the gauge hand is at the right hand stop pin (maximum) at all times and Tests 1 and 2 indicate that the wiring and the dash unit are in good condition, the engine unit is defective and a new unit must be installed.

If the gauge hand will not move, the dash unit is either damaged or incorrectly installed. Install unit correctly or replace, as necessary.

5. THERMOSTAT (Fig. 5)

A choke-type thermostat is used to control cool-

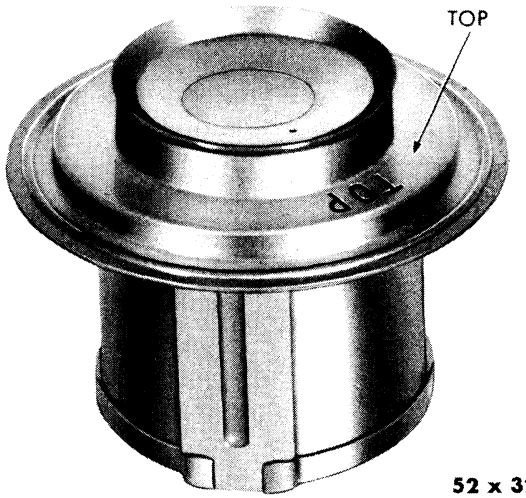

Fig. 5—Thermostat (Choke Type)

ant temperatures by restricting or permitting the flow of coolant from the cylinder head to the radiator. This choke-type thermostat starts to open at 159 to 165 degrees F. and is fully open at 190 degrees F. (All "After Cars" are equipped with a thermostat which starts to open at temperatures of 155 to 160 degrees F.)

6. TESTING THERMOSTAT

To test the thermostat for correct opening, gently force the poppet open, insert a piece of thin string or thread into the opening and allow the poppet to close. Suspend the thermostat in a pail of water containing a thermometer. Heat the water and stir gently with thermometer. At the moment the thermostat drops off the string or thread the thermometer should read from 159 to 165 degrees F. or 155 to 160 degrees F. depending on thermostat opening temperature. Heating the water to 190 degrees F. should open the thermostat fully. The temperature at which the thermostat opens is very important and should be tested whenever the cooling system is checked.

When installing the thermostat, be sure the notation "TOP" is facing the outlet tube.

NOTE

There are no repairs or adjustments to be made on the thermostat. Replace the unit if it fails to operate properly.

7. RADIATOR PRESSURE CAP

The radiators, in all models, are equipped with a pressure vent type radiator filler cap, as shown in Figure 6.

Under normal operating conditions, pressure is not built up in the system. However, if an increased operating temperature develops, due to heavy traffic, extremely hot weather, hill climbing, high-speed driving, etc.; the relief valve at the bottom of the cap closes, seating against the gasket. This action pressurizes the system up to approximately 7 psi (14 psi with air conditioning), at which time the valve and seat rise and allow the build-up of pressure to escape through the overflow tube.

CAUTION

When removing the pressure cap, turn the cap counter-clockwise to the stop, permitting any built-up pressure to be released through the overflow tube. This will prevent possible personal injury due to hot water spraying out under pressure.

To remove the cap after pressure has been released, press down and continue to turn cap counter-clockwise until the cap is released.

8. COOLING SYSTEM PROTECTORS

a. Rust Resistor

When MOPAR Rust Resistor is added to the water in the cooling system, it helps to prevent the formation of scale and rust. It is also a safeguard against electrolytic corrosion, which takes place where dissimilar metals are connected together, such as in the radiator core.

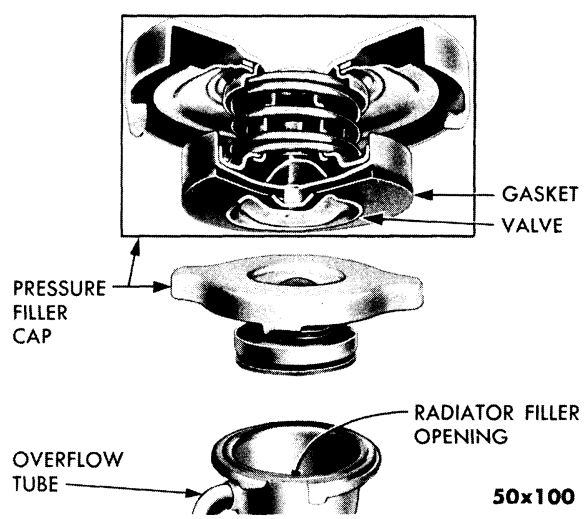

Fig. 6—Radiator Pressure Cap

b. Anti-Freeze Solutions

MOPAR Anti-Freeze is recommended for use in the cooling system when the temperature is likely to be below 32° F. Other anti-freeze solutions that are suitable, when suitable inhibitors are added, are denatured alcohol, methanol, synthetic wood alcohol, and ethylene glycol.

NOTE

Mixing of various brands of anti-freeze is not recommended because of the possibility of separation of inhibitors and, also because of the difficulty in determining the freezing point.

Alcohol anti-freeze solutions are subject to evaporation. When these liquids are used, the solution should be tested at regular intervals during the cold months.

Alcohol base liquids, if spilled on the vehicle, should be washed off immediately with a generous amount of water to prevent damage to the finish.

It is recommended that the entire cooling system be flushed before installing anti-freeze.

Be sure no leaks occur at hose connections; if necessary, replace these parts to obtain tight connections. If there are leaks in the system, they should be stopped.

NOTE

Coolant should be filled to 1¼ inches below the bottom of the filler neck to allow for expansion.

CAUTION

Anti-freeze solutions containing sodium chloride (common salt), calcium chloride, magnesium chloride, or any inorganic salt, should never be used as an anti-freeze. Water-soluable organic products such as sugar, honey, glucose, or any organic crystalline compounds are not recommended. Mineral oils, such as kerosene or engine oil, may damage rubber parts and therefore prove harmful.

The freezing point of an anti-freeze solution may be determined by the use of a Radiator Solution Tester. The solution should be tested at the temperature for which the tester is calibrated.

SERVICE DIAGNOSIS

9. EXTERNAL LEAKAGE

Possible Causes:

a. Loose hose clamps.

b. Defective rubber hose.

c. Broken radiator seams.

d. Loose core hole plugs.

e. Damaged gaskets.

f. Warped cylinder head.

g. Cracked cylinder head.

h. Cracked cylinder block.

i. Cracked thermostat housing (water outlet elbow).

j. Leak at heater connections.

k. Leak at water temperature sending unit.

l. Leak at exhaust manifold studs (long).

m. Leak at water pump attaching bolt holes.

Remedies:

a. Tighten hose clamps as required to stop leaking. Replace if necessary.

b. Replace defective hose as needed.

c. Remove radiator and solder seams. Test radiator before installation.

d. Remove leaking plug. Clean out hole and install new plug.

e. Check for leaks at water pump, cylinder head, and thermostat housing (water outlet elbow). Replace gaskets as required.

f. Replace cylinder head and gasket. Draw down bolts to 70 foot pounds torque. Tighten in sequence, as illustrated in the Engine Section.

g. Replace cylinder head and tighten. (See f. above).

h. Replace cylinder block, as described in Engine Section.

i. Replace thermostat housing and gasket.

j. Tighten heater connections, as required.

k. Tighten or replace sending unit.

l. Remove studs and coat with a suitable sealing compound. Reinstall and check for leaks.

m. Apply a suitable sealer to the bolts and tighten.

10. INTERNAL LEAKAGE

Possible Causes:

a. Warped cylinder head.

b. Blown cylinder head gasket.

c. Cracked cylinder wall.

d. Loose cylinder head bolts.

e. Cracked valve port.

f. Sand holes or porous condition.

g. Porous condition around distributor hole in cylinder block.

Remedies:

a. Replace cylinder head and gasket. Tighten bolts evenly to 70 foot pounds torque. Tighten in sequence as illustrated in the Engine Section.

b. Replace gasket; tighten bolts, as described in (a) above.

c. Replace cylinder block, as described in Engine Section.

d. Tighten cylinder head bolts to 70 foot pounds torque. Tighten in sequence as illustrated in Engine Section.

e. Weld crack in valve port or replace cylinder head, as described in Engine Section.

f. Weld sand holes or replace cylinder blocks, as outlined in Engine Section.

g. A porous condition in the cylinder block may be corrected by the use of a good sealing compound. It is suggested that the manufacturer's instructions be followed for the best results.

11. OVERFLOW LOSS

Possible Causes:

a. Refer to causes listed in Paragraph 12.

b. Boiling (overheating).

c. Leak in cylinder head gasket.

d. Restricted radiator.

e. Overfilling.

Remedies:

a. Refer to causes listed in Paragraph 12.

b. Check cooling system, reverse flush if necessary.

c. Replace cylinder head gasket. If leak was internal, check oil for contamination. Drain, flush, and refill to correct level.

d. Reverse flush radiator.

e. Fill radiator to approximately 1¼ inches below filler neck. Excess water is forced out of the overflow tube as a result of expansion and this may give the impression that the cooling system has developed a leak.

12. POOR CIRCULATION

Possible Causes:

a. Restricted radiator core.

b. Restricted water jacket.

c. Low coolant level.

d. Collapsed radiator hose.

e. Water pump impeller loose on shaft.

f. Loose adjustment of fan belt.

g. Scale in cylinder block.

Remedies:

a. Drain and reverse flush radiator.

b. Drain system. Disconnect radiator hoses and reverse flush cylinder block.

c. Refill radiator to approximately 1¼ inches below filler neck.

d. Replace radiator hose; check clamps for fatigue and replace as required.

e. Remove and recondition water pump.

f. Tighten fan belt after checking the driving surfaces. If the belt is frayed, cracked, or greasy on the sides or bottom, replace belt and adjust for approximately ½ inch slack (when pushed from a straight line) midway between the fan and fan drive pulley.

g. Use MOPAR Cooling System Cleaner for correction of this condition. After correction, use MOPAR Rust Resistor to prevent recurrence.

13. CORROSION

Possible Causes:

a. Impurities in water.

b. Lack of rust inhibitor.

c. Improper draining and service.

d. Air leaks in system.

Remedies:

a. Drain and flush radiator and cylinder block until clean. Refill system with clean water and add MOPAR Rust Resistor. (Rust Resistor contains a special water softener, making it effective when hard water is used in the cooling system.)

b. Drain and flush radiator and cylinder block until clean. Refill system with clean water and add MOPAR Rust Resistor.

c. Be sure, in all draining operations, that the drain cock in the cylinder block is opened. In severe cases, it is recommended that the drain cock be removed in order to allow larger particles of sediment to be washed out.

d. Tighten all hose connections, check for possible leaks in cylinder head gasket. Check water level in system. If necessary, fill to required level.

14. OVERHEATING

Possible Causes:

a. All causes listed in Paragraph 12.

b. Excessive sludge in crankcase of engine.

c. Air passages of radiator core plugged.

d. Obstruction in front of radiator.

Remedies:

a. Refer to remedies listed in Paragraph 12.

b. Drain lubricating oil from engine. Refill to required level with light flushing oil, and operate engine at slow speed for approximately 15 to 20 minutes. Drain and refill case with proper grade of oil. In severe cases, remove oil pan and clean inside of block by hand.

c. Use air pressure on reverse side of radiator core and clean out passages thoroughly.

d. Remove any obstruction that blocks air entrance to the radiator.

15. FACTORS WHICH MAY CAUSE HIGHER THAN NORMAL ENGINE OPERATING TEMPERATURE

Possible Causes:

a. Incorrect ignition timing.

b. Incorrect valve timing.

c. Low oil level.

d. Tight engine.

e. Defective heat control valve.

f. Clogged or defective muffler or exhaust pipes.

g. Dragging brakes.

h. Overloading vehicle.

i. Driving in heavy sand or mud.

j. Engine laboring on grades.

k. Excessive engine idling.

l. Loose fan belt.

Remedies:

a. Check ignition timing, as described in Electrical Section.

b. Check valve timing, as described in Engine Section.

c. Check condition of oil. If necessary, drain and refill to required level.

d. Use extreme care during "break-in" of a tight engine. Drive at moderate speeds—not too slow. Check oil and water levels often, adding oil or water as required.

e. Replace heat control valve spring. Check valve stop for wear or damage. Replace stop if necessary.

f. Check exhaust system for restriction, replace parts as required.

g. Refer to the Brake Section for correction of this condition.

h. Avoid excessive weight in or on car.

i. Avoid driving in heavy mud or sand whenever possible.

j. To avoid engine lugging or laboring on grades, shift to the next lowest gear.

k. Avoid excessive idling over prolonged periods.

l. Tighten fan belt.

16. OVERCOOLING

Possible Causes:

a. Defective thermostat

b. Defective temperature gauge.

Remedies:

a. Check thermostat for operation, as outlined in Paragraph 6. Replace if necessary.

b. Check water temperature gauge, as described in Paragraph 4.