

SECTION 2-F

COOLING AND OILING SYSTEMS SERVICE

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2-20 COOLING SYSTEM SERVICES

a. Checking and Filling Cooling System

The coolant level should be checked only when the engine is cold and only enough coolant should be added to bring the level to the line marked "Filling Level Cold" stamped about $1\frac{1}{4}$ " below top of head tank.

It is unnecessary and undesirable to remove the radiator cap and check the coolant level whenever the car stops at a filling station for gasoline or oil, since the engine is usually hot at such times. The coolant level may be considered correct so long as the temperature gauge stays within the operating range marked on dial face.

CAUTION: *Never remove the radiator cap quickly when engine is HOT. Sudden release of cooling system pressure may cause the coolant to boil and some of it may be ejected from the radiator filler neck, resulting in injury to persons or damage to the car finish.*

If it is necessary at any time to remove the radiator cap when engine is hot, rotate the cap counterclockwise until a stop is reached. Leave cap in this position until all pressure in cooling system has been released, then turn cap forcibly past the stop and remove it.

b. Draining, Flushing, Conditioning Cooling System

It is advisable to drain and flush the engine cooling system twice a year. This should be done when the anti-freeze solution is added in the fall and again when it is removed in the spring.

To drain the cooling system remove radiator cap, then fully open the drain cocks at bottom of radiator core and on both sides of cylinder block (3 cocks). If car heater is installed, open the heater control valve to the "HIGH" position.

After the cooling system is drained and all cocks are closed, fill the cooling system with clean water. Run the engine long enough to open the thermostat for complete circulation

through the system, then completely drain the cooling system before sediment has a chance to settle.

c. Conditioning the Cooling System

"Radiator Stop Leak and Conditioner," listed under Group 8.800 is recommended for use in the cooling system, particularly when preparing for installation of anti-freeze solution. This material stops small seepage leaks, has rust preventive properties and its soluble oil is effective in eliminating a squealing noise which sometimes develops at the water pump seal washer. Instructions for its applications are printed on the conditioner bottle.

It is very important to make certain that the cooling system is properly prepared before an anti-freeze solution is installed; otherwise, loss of solution through leakage may occur or **seepage** may result in damage to the engine. The cooling system should be drained and flushed as described above (subpar. b.), all joints should be checked for leakage and corrected, and the conditioner described above should be added with the anti-freeze solution.

Inspect the water pump, radiator core, heater and defroster cores, drain cocks, water jacket plugs, and edge of cylinder head gaskets for evidence of water leaks. Tighten all hose clamps in the cooling and heating systems and replace any deteriorated hoses.

d. Using and Testing Anti-Freeze Solutions

Volatile (alcohol) type anti-freeze solutions up to 50% may be used with the standard 160° radiator thermostat. If a non-volatile (ethylene glycol) type solution is used, the higher limit 180° radiator thermostat may be used to improve car heater performance.

The practice of mixing alcohol type anti-freeze with ethylene glycol type anti-freeze is not recommended. Although anti-freeze protection may be afforded, the level of protection is impossible to check with a specific gravity

type of instrument due to the difference in weight of the two types of anti-freeze.

Every anti-freeze solution must be used in accordance with the instruction and in proportions specified by the anti-freeze manufacturer. The proportions must be selected as specified for the lowest temperature at which protection against freezing will be required.

The following solutions have been found to be unsatisfactory for use in automobile cooling systems: Salt solutions such as calcium or magnesium chloride, sodium silicate, etc.; honey, glucose, sugar solutions, oils or kerosene, untreated glycerine, untreated ethylene glycol.

It is advisable to test the anti-freeze solution at intervals during the winter to make certain that the solution has not been weakened by evaporation or leakage. Use only hydrometers which are calibrated to read both the specific gravity and the temperature, and have a table or other means of converting the freezing point at various temperatures of the solution. Disregarding the temperature of the solution when making the test may cause an error as large as 30° F. Care must be exercised to use the correct float or table for the particular type of anti-freeze being tested.

2-21 FAN BELT ADJUSTMENT OR REPLACEMENT

A tight fan belt will cause rapid wear of the generator and water pump bearings. A loose belt will slip and wear excessively and will cause noise, engine overheating, and unsteady generator output. A fan belt which is cracked or frayed, or which is worn so that it bottoms in the pulleys should be replaced.

The fan belt may be replaced by loosening the generator brace at both ends, slightly loosening the generator mounting bolts and moving generator inward to provide maximum slack in the belt. On a car equipped with power steering, it is also necessary to remove the oil pump drive belt after loosening the pump mounting bolts to provide maximum slack in this belt.

The generator must be moved sidewise to adjust the fan belt. After the generator brace and mounting bolts are securely tightened, the fan belt tension should be checked by torque wrench at the generator pulley nut. A properly tensioned *new* belt will require 15-20 ft. lbs. torque to slip the generator pulley. A used belt will require 10 to 15 ft. lbs.

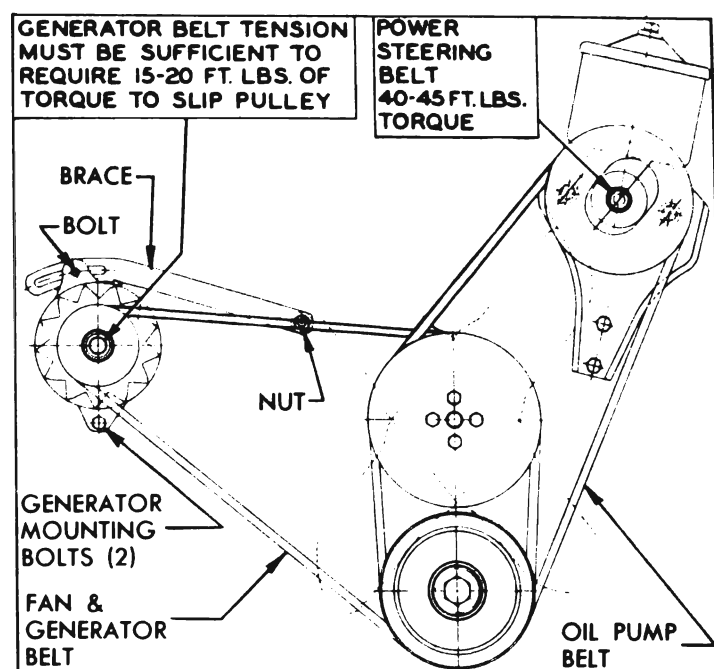


Figure 2-38—Belt Adjustments

If the power steering oil pump belt is removed it should be adjusted to torque specified in paragraph 8-12 (d).

If the Air Conditioner compressor belt is removed it should be adjusted as specified in paragraph 11-8.

2-22 RADIATOR THERMOSTAT INSPECTION AND TEST

A sticking radiator thermostat will prevent the cooling system from functioning properly. If the thermostat sticks in the open position, the engine will warm up very slowly. If the thermostat sticks in the closed position, overheating will result.

The thermostat may be removed for inspection and test by partially draining the cooling system and disconnecting the water outlet and hose from the water manifold, in which the thermostat is located.

If the thermostat valve does not fully close when cold, replace the thermostat. If the valve will fully close when cold, test the thermostat for correct opening temperature by immersing the unit and a thermometer in a container of water over a heater. While heating the water do not rest either the thermometer or thermostat on bottom of container as this will cause them to be at higher temperature than the water. Agitate the water to insure uniform temperature of water, thermostat and thermometer.

The standard thermostat (160°) valve should start to open at a temperature of 157° F. to 162° F., and should be fully open at a temperature not in excess of 182° F. On the high temperature (180°) thermostat which may be installed to improve car heater performance, the valve should start to open at a temperature of 177° F. to 182° F., and should be fully open at a temperature not in excess of 202° F. If thermostat does not operate at specified temperatures it should be replaced as it cannot be adjusted.

2-23 WATER PUMP REPAIRS

The water pump cover is die-cast aluminum. Due to the comparative softness of this material, pressing the old shaft and bearing assembly out would enlarge the bore to the extent that a new bearing would not have a tight press fit. Because it is felt that a rebuilt aluminum water pump would not be safe, *a defective pump should be replaced with a new one.*

a. Removal

1. Drain cooling system being sure to drain into a clean container if anti-freeze solution is to be saved.

2. Loosen belt or belts, then remove fan blade, spacer and pulley or pulleys from hub on water pump shaft. Remove belt or belts.

3. Disconnect hose from water pump inlet and heater hose from nipple. Remove bolts then remove pump assembly and gasket from timing chain cover.

4. Check pump shaft bearing for end play or roughness in operation. If bearing is not in serviceable condition or if seal is known to have been leaking, the pump assembly must be replaced.

b. Installation

1. Make sure the gasket surfaces on pump and timing chain covers are clean. Install pump assembly with new gasket. Bolts with lock-washers must be tightened uniformly.

2. Connect radiator hose to pump inlet and heater hose to nipple, then fill cooling system and check for leaks at pump and hose joints.

3. Install fan pulley or pulleys, spacer and fan blade, tighten attaching bolts securely. Install belt or belts and adjust for proper tension. (Par. 2-21).

2-24 OIL AND VACUUM REPAIRS

When an oil pump is removed for repairs the following procedure must be used to inspect parts and assemble pump in order to insure adequate oil pressure when the work is completed.

1. Remove vacuum pump housing with end cover, then remove the oil pump shaft and gear, and idler gear from the pump body. See figure 2-39.

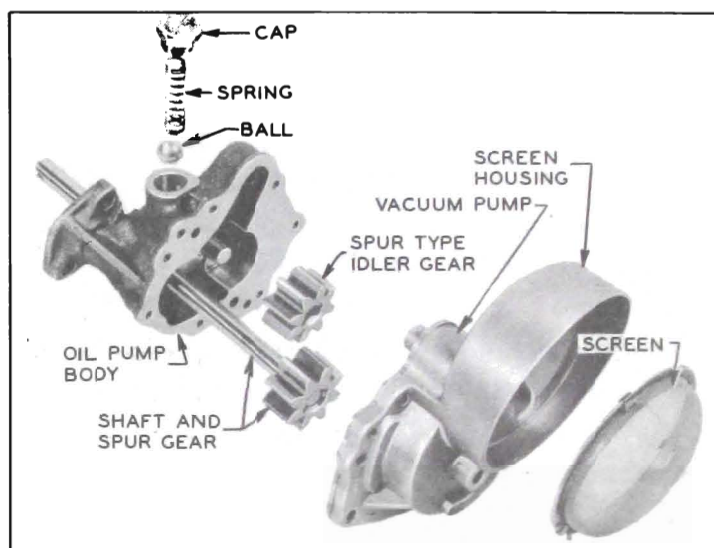


Figure 2-39—Oil Pump and Screen

2. Remove hex cap, spring, and pressure ball from pump body.

3. Thoroughly wash the screen and pump parts in solvent and blow dry with air hose.

4. Check oil pressure regulator ball to see if it is free in pump body. Also check hole in body to see that it is not oversize and that the ball fits hole throughout length. Check spring to see that it is not collapsed, worn on its side, or broken.

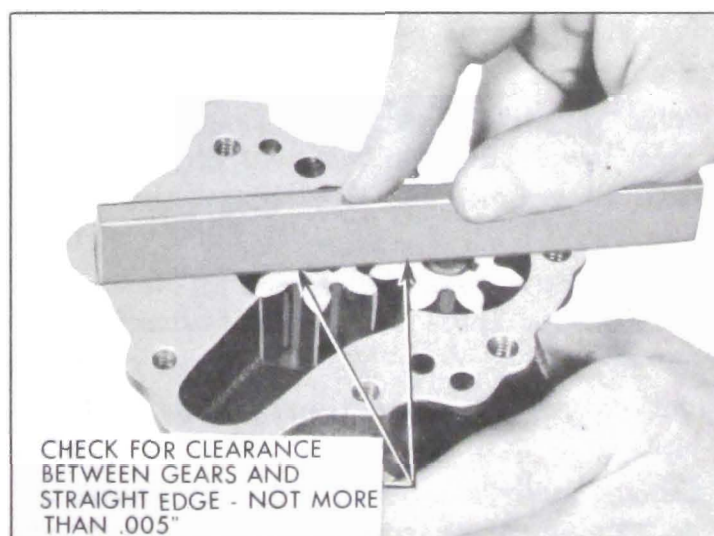


Figure 2-40—Checking Clearance of Gears at Cover

5. Inspect pump body, cover, gears, and shaft for wear, scoring, etc., and replace any unserviceable parts.

6. Install gear and shaft assembly in pump body and install idler gear with vacuum pump driving grooves toward pump cover.

7. Check for clearance between gears and cover by using a steel straight edge and feeler gages. The clearance between straight edge and gears should be such that the gears turn freely and must not be more than .005".

8. Assemble parts to pump body by reversing sequence of removal given in steps 1 and 2. After all screws are tightened, turn the shaft by hand to make sure that it turns freely and has a slight amount of end play (.0005" to .005").

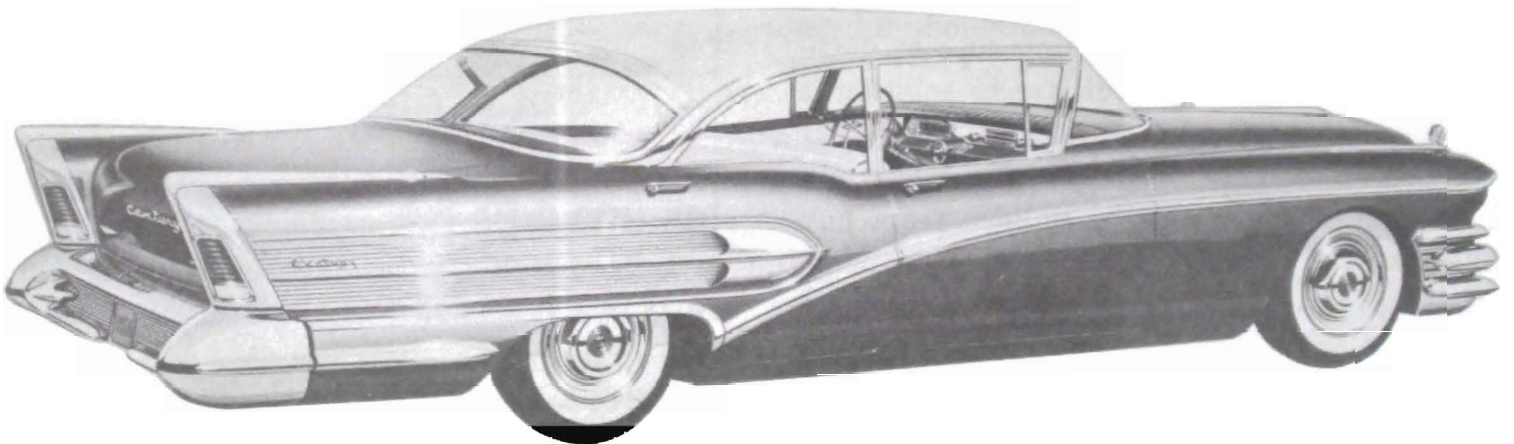
9. Before installation of oil pump, check

crankcase and pump body for dirt or burrs that might tilt the pump and cause binding.

10. Install oil and vacuum pump assembly with a new gasket, tightening attaching bolts alternately a little at a time. Check alignment by rotating pump shaft with screwdriver through distributor mounting hole.

If pump shaft tends to bind when bolts are evenly tightened, it may be freed up by rapping pump body lightly with a rawhide mallet. Pump shaft must be free of bind when bolts are securely tightened.

Vacuum pumps are serviced only as complete assemblies. If severe damage to vacuum pump is encountered, it is recommended that the oil pump idler gear and driving key be inspected before replacing vacuum pump.



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