

SERVICE MANUAL

SECTION XIV RADIATOR AND COOLING



Packard Motor Car Company
Detroit 32, Michigan

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SECTION XIV

RADIATOR AND COOLING

Description

The Packard Thunderbolt engine uses a centrifugal type water pump to circulate water or the coolant through the cooling system. Water jackets around each cylinder and full thermostatic control of the whole system provide uniform temperatures throughout the engine.

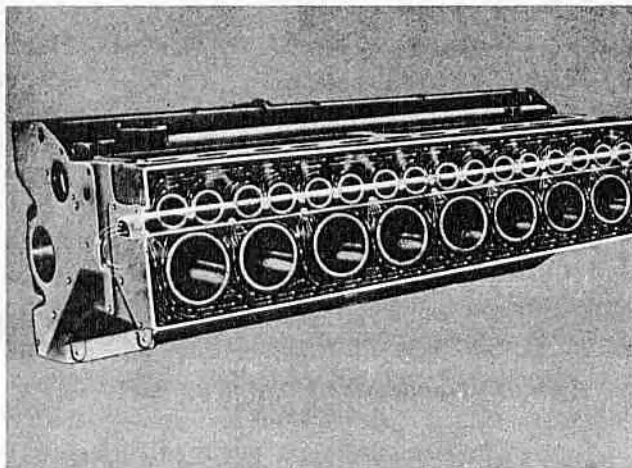


Figure 1—Water Jackets Around Each Cylinder Provide Uniform Temperature Throughout the Engine

The cooling system consists of the radiator core, thermostat, fan, fan belt, water pump, water distributor manifold tube, and water temperature indicator.

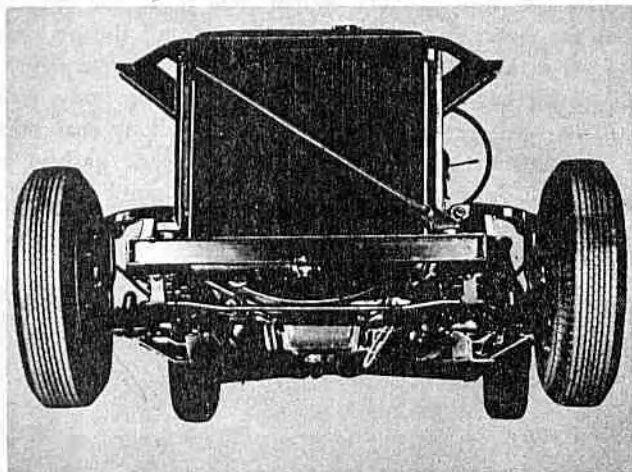


Figure 2—The Tube and Fin Type Core Has an Almost Square Frontal Area

The cooling system has a 20-quart capacity, and has a gravity flow capacity of $39\frac{1}{2}$ gallons per minute. The radiator drain cock for draining the cooling system is located in the tank at the front bottom center of the radiator. The radiator core is almost square and is made up of cooling tubes and fins. The core is supported by the cradle, which is insulated from the frame by two rubber grommets to prevent the transmission of road

shock to radiator from the frame when driving over rough roads.

A specially constructed radiator cap with a built-in safety valve raises the coolant boiling point by pressurizing the cooling system.

The thermostat, which is installed in the water outlet flange on the cylinder head, regulates the amount of coolant that flows from the cylinder block to the radiator. When the engine is cold, the thermostatic valve is closed, preventing circulation through the radiator. When normal temperature is reached, the thermostat valve opens gradually, permitting the coolant to circulate throughout the entire system.

Radiator Core Removal

Drain the cooling system. Disconnect the upper and lower hose connections. Remove the radiator draincock. Remove the screws attaching the radiator core to the radiator core cradle brackets. Then lift upward on the radiator to remove.

Radiator Core Installation

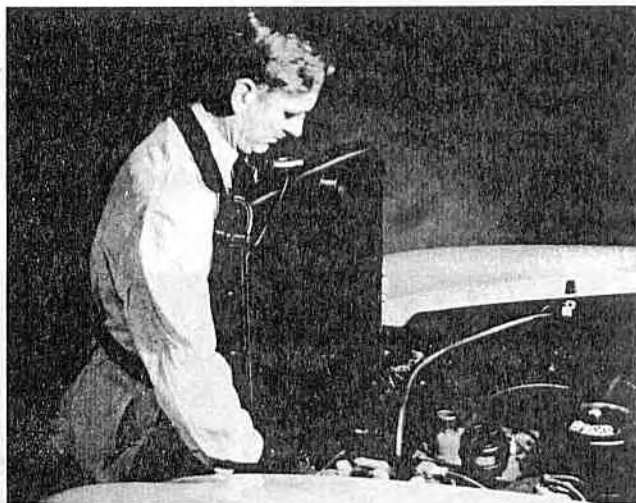


Figure 3—Installing the Radiator Core

Position the radiator core in the radiator core cradle brackets. Install the core attaching screws and torque tighten to 12 to 15 foot-pounds. Thread the radiator draincock in position and torque tighten. Assemble the upper and lower hoses and tighten the hose clamps securely. Fill the cooling system with water or anti-freeze.

Fan Belt, Fan, and Pulley Removal

Loosen the two motor generator bracket to generator screw nuts three or four turns. Loosen the motor generator adjusting strap to generator screw. Loosen

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the motor generator adjusting strap to water pump screw. Then move the generator toward the motor. Slip the fan belt off the generator pulley, fan pulley, and vibration damper, and then over the fan blade to remove.

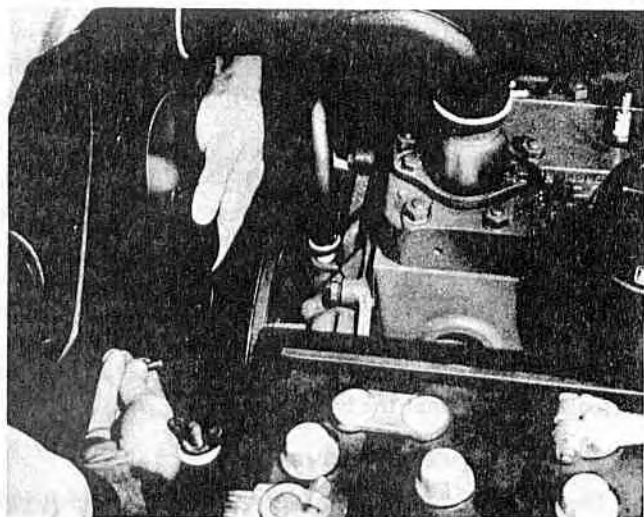


Figure 4—Removing the Fan

Remove the screws attaching the fan to the pump shaft hub and lift out the fan. The fan belt pulley may then be slipped off the water pump shaft hub.

Water Pump Removal

Disconnect the hose from the water pump. Remove the nut and washers attaching the battery ground cable to the water pump. Remove the screws holding the water pump to the front face of the engine cylinder block and the water pump may be lifted out.

Water Pump Disassembly

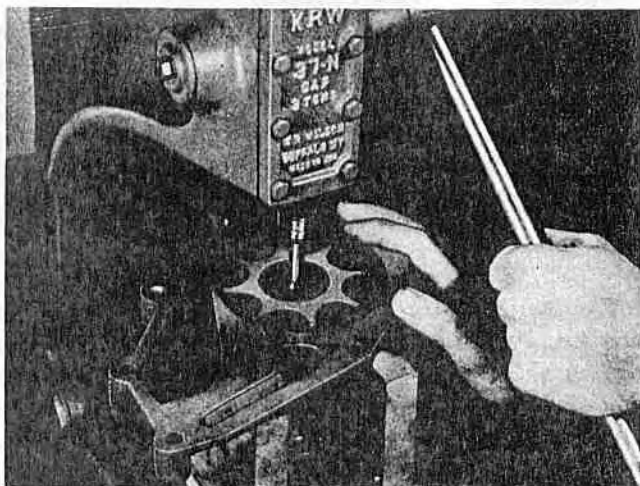


Figure 5—Pressing Out the Water Pump Shaft

Using a screwdriver, pry out the bearing retainer lock. Remove the pump rear cover plate and gasket by taking out the screws and bolts. Support the pump body securely and press the shaft out of the impeller. The

shaft and bearing assembly that has been pressed out of the water pump body consists of a shaft, a bearing, and a brass bushing which is pressed on the long end of the shaft. Press the seal assembly out of the water pump body. Press the fan hub off the shaft.

Inspection

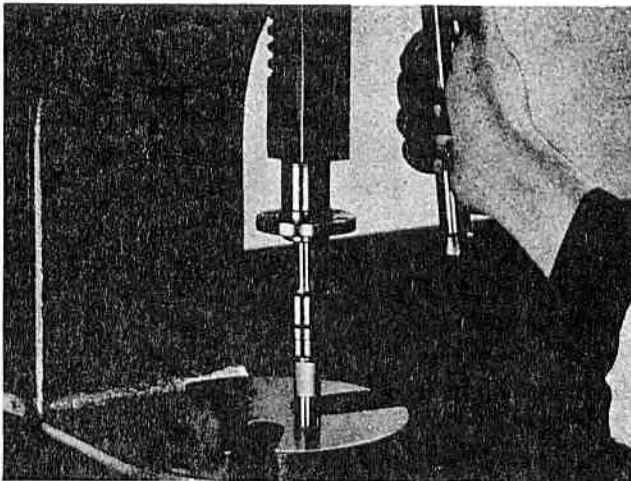


Figure 6—Pressing the Fan Hub on the Water Pump Shaft

Before installing the water pump parts, inspect the bearing and shaft assembly. If this assembly is found worn or bent, it must be replaced. Make certain the impeller is properly spaced in the pump body to prevent impeller noise. Inspect the pump body seal and replace if worn or damaged. Make certain the surfaces on which the gaskets are used are clean and free from dirt. Use new gaskets. When new parts are required in the water pump, a repair kit with all the necessary parts is available under Packard part number 410954. This kit has all the parts except the pump body, cover plate, and screws. If only the pump body seal needs replacement, this part and the two cork gaskets are available in a kit under Packard part number 410952.

Water Pump Assembly

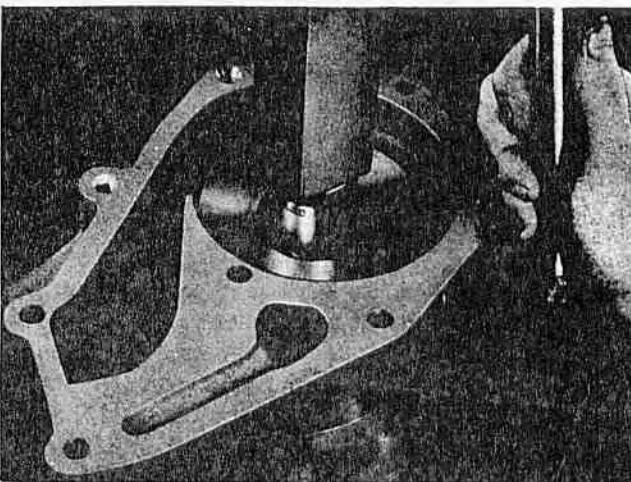


Figure 7—Pressing in the Water Pump Seal Assembly

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Press the fan hub on the shaft and bearing assembly. Install this assembly into the pump body with the groove in the center of the bearing and shaft assembly lined up with the slotted opening in the water pump body. Insert the bearing lock through this opening and spring the end of the bearing lock over the pump body hub.

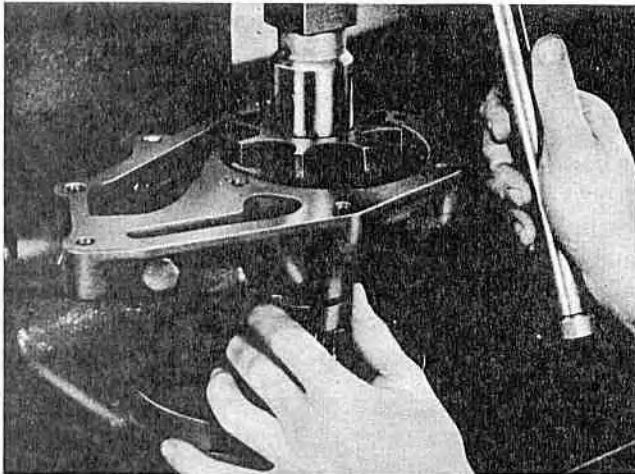


Figure 8—Pressing on the Water Pump Impeller

Support the pump body and press the seal into the bore until it bottoms against the shoulder in the pump body. Support the pump body and press the impeller onto the shaft, leaving a clearance of .030 inch plus or minus .010 inch between the face of the impeller and the pump body.

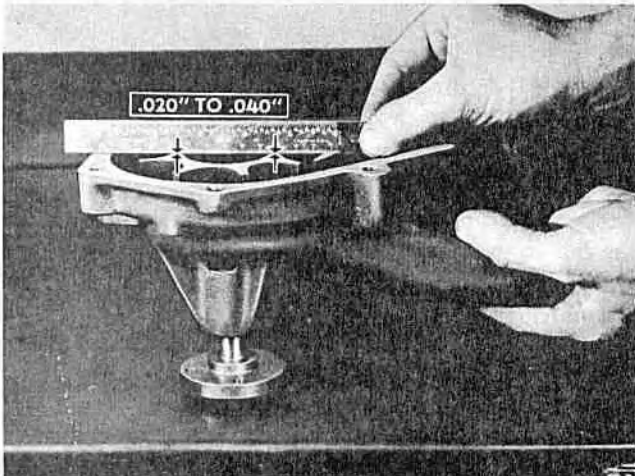


Figure 9—Checking the Location of the Impeller

Coat the cover gasket with Perfect Seal Grade A paste or its equivalent and install on the body. Assemble the pump cover plate with the attaching screws and tighten. Coat the smaller gasket, which is the water pump assembly gasket, with Perfect Seal grade "A" paste or its equivalent, and position it on the body. Install the pump cover attaching bolts and nuts and torque tighten to 15 to 18 foot-pounds.

Water Pump Installation

Install the water pump assembly to the cylinder block. Install the attaching cap screws and torque tighten to 25 to 30 foot-pounds. Attach the hose to the water pump and tighten the hose clamps. Refill the cooling system.

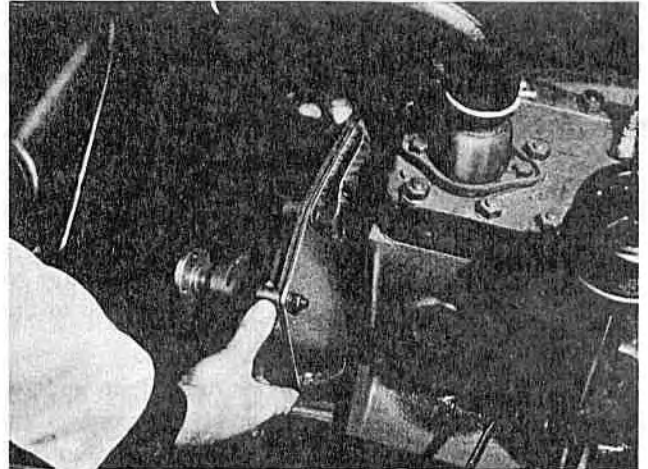


Figure 10—Installing the Water Pump

Fan, Fan Pulley, and Belt Installation

Install the fan pulley and fan on the water pump shaft and bearing assembly hub and torque tighten the screws to 10 to 12 foot-pounds. Slip the fan belt over the fan pulley, vibration damper, and generator pulley. It is now necessary to tighten and adjust the fan belt. From underneath the car, place the fan belt adjusting tool J-4714 over the head of the front motor generator bracket nut and rotate the tool clockwise until the arm of the tool contacts the edge of the generator drive end plate. Using a torque wrench with a $\frac{7}{8}$ inch socket

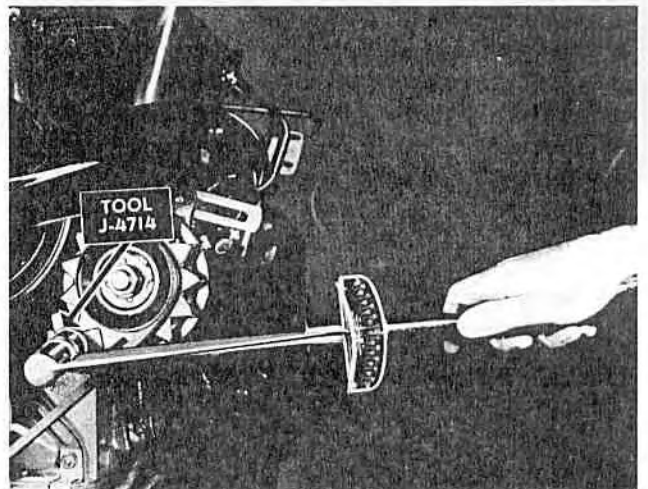


Figure 11—Adjusting the Fan Belt Using Tool J-4714 and a Torque Wrench

over the tool, rotate the wrench clockwise and move the generator outward until 15 foot-pounds torque is indicated on the scale. The adjusting strap to generator screw should be tightened to hold the generator in this

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position while maintaining the 15 foot-pounds torque. Tighten the generator bracket screws and nuts. The torque specifications are: adjusting strap to generator, 15 to 18 foot-pounds; adjusting strap to water pump, 25 to 30 foot-pounds; generator bracket to generator, 15 to 18 foot-pounds.

It is recommended that the fan belt be adjusted by the dealer prior to delivery of the car, again at the 1,000 mile inspection, and approximately once per year thereafter.

Water Distributor Tube Removal

Although it is recommended that when the engine is completely reconditioned a new water distributor tube be installed, it is otherwise seldom necessary to remove the tube unless it is clogged or corroded to the point where solvent will not clean it.

To remove the water distributor tube, drain and remove the radiator. Loosen the generator. Disconnect the hose at the water pump, remove the fan, the fan belt pulley, and the water pump from the cylinder block. After completing this disassembly as described in the preceding paragraphs, the tube will be exposed on the right front face of the cylinder block.

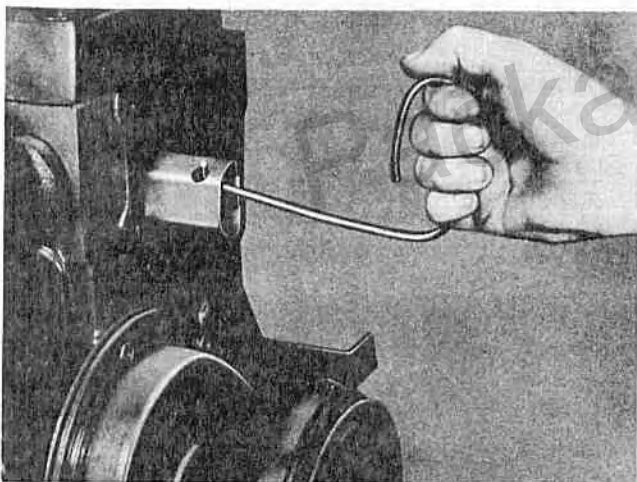


Figure 12—Removing the Water Distributing Tube

A heavy rod with a hook formed on the end will facilitate removal of the water distributor tube. Insert this tool into the opening in the cylinder block and hook the point of the tool into one of the holes in the forward end of the tube and pull it outward until the tube is removed.

Water Distributor Tube Installation

Install the tube into the cylinder block with the holes

of the tube facing upward and the closed end of the tube entering the cylinder block first. Push the tube until the tabs on the end reach the cylinder block. Then install in the following order the water pump, water pump hose, fan pulley, fan belt, and tighten the generator. Install the radiator and refill the cooling system.

Cylinder Head Thermostat Removal and Installation

Drain the cooling system until the water level is below the cylinder head. Disconnect the hose from the cylinder head water outlet flange. Remove the cap screws attaching the water outlet flange to the cylinder head. Remove the outlet flange from the cylinder head and lift out the thermostat. There are no repairs or adjustments that can be made on the thermostat, and failure to operate properly should be corrected by replacement with a new unit.

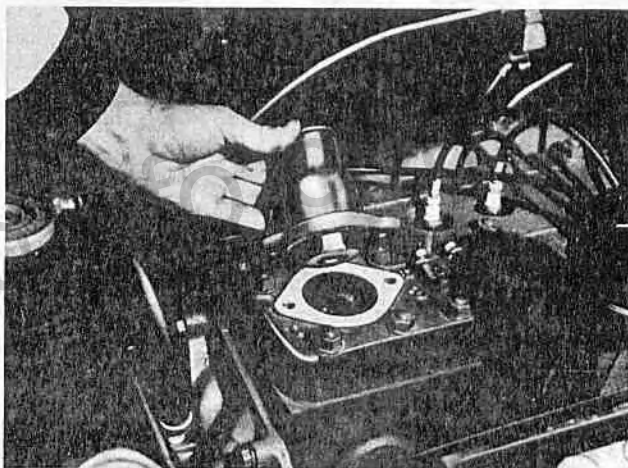


Figure 13—Installing the Cylinder Head Water Outlet Flange

Install a new water outlet flange gasket on the cylinder head. Install the thermostat in the water outlet flange. Install the flange and thermostat. Torque tighten the cap screws to 25 to 30 foot-pounds. Install the hose and clamp on the water outlet flange to complete the assembly. Refill the cooling system.

Water Temperature Indicator Sending Unit Removal and Installation

Drain the cooling system. Remove the nut and wire from the water temperature indicator sending unit, which is located in the left side of the cylinder head above the starter. Then unscrew the indicator from the cylinder head. Install and tighten the temperature indicator in the cylinder head. Install the wire and nut and tighten. Refill the cooling system.

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TROUBLE SHOOTING AND CORRECTIVE MEASURES

CONDITION	POSSIBLE CAUSE	CORRECTION
1. Engine overheating due to a faulty cooling system.	(a) Loose or broken fan belt.	(a) Tighten the fan belt to the proper torque or replace the broken belt.
	(b) Water supply in radiator low or exhausted due to leaky radiator.	(b) Fill the radiator to its proper level. Inspect the radiator and repair or replace as required.
	(c) Loose or broken hose connections.	(c) Tighten the hoses, or replace the broken hoses.
	(d) Water supply escaping through water pump seal.	(d) Replace with a new seal.
	(e) Engine thermostat inoperative or not operating properly.	(e) Test the thermostat and replace if necessary.
	(f) Radiator clogged causing improper circulation.	(f) Clean the radiator with Packard Radiator and Engine Cleaner or have the radiator reverse flushed.
	(g) Obstruction in hose.	(g) Remove the hose, replace if necessary.
	(h) Loose or worn water pump impeller.	(h) Replace the impeller, shaft, and bearing assembly.
	(i) Water distributor manifold tube clogged.	(i) Flush the cooling system with Packard Radiator and Engine Cleaner or reverse flush the cooling system. Replace the water distributor tube.
2. Heat indicator gauge in instrument cluster not operating or operating erratically.	(a) Faulty water temperature sending indicator unit.	(a) Replace the sending unit.
	(b) Voltage regulator inoperative or loose connections at the voltage regulator.	(b) Repair or replace the voltage regulator. Tighten the connections at the voltage regulator.
	(c) Loose connections at the sending unit or panel unit.	(c) Tighten the connections.
3. Persistent overheating that cannot be traced to the cooling system.		(a) Check the engine for improper ignition timing, excessive carbon, loose cylinder head nuts, blown cylinder head gasket, or engine overloading.
4. "Metallic Fluttering" noise occurring at certain combinations of engine speed and heat control settings which seem to be coming from the heater.	(a) Heater hoses reversed or a faulty heater control valve.	(a) Hook up the heater hoses to the proper connections, or replace the heater control valve.

