Group 7
COOLING SYSTEM
CONTENTS

DATA AND SPECIFICATIONS

MODELS	PS-1, PS-3, PC-1, PC-2, PC-3, PY-1
COOLING	
Type	Pressure Vent
Capacity:	
With Heater	17 qts.
Without Heater	16 qts.
Radiator Cap Relief	
Valve Pressure	14 psi
With Air Conditioning	16 psi

DATA AND SPECIFICATIONS (Con'd)

WATER PUMP	
Type	Centrifugal
Bearing Type	Ball Bearing
THERMOSTAT	
Type	Pellet
Starts to Open	178 to 182° F.
Fully Open	202° F.
FAN BELT	
Number Used (Standard Steering)	One
(Power Steering)	Two (One is fan and generator) (One is steering pump)
Type	V
Tension	See Accessory Belt Drives Group 7-A
FAN	
Number of Blades	Four
Diameter	18 in.
No. of Blades (Air Conditioning)	7
Diameter (Air Conditioning)	PS-3 18 All Other Models 18½
RADIATOR-TO-BLADE	
Clearance	Top—¾ inch Bottom—¾ inch
RADIATOR	
Type	Tube and Spacer
Thickness (Standard)	1½ inch Tube and Spacer
With Air Conditioning	2¼ inch Tube and Spacer

PS-3, PC-1 with Air Conditioning have a box type shroud, seven blade fan with 2¼ inch Tube and Spacer radiator and Fan Drive (Black color hub).

PC-2, PC-3, PY-1 with Air Conditioning have a box type fan shroud, seven blade fan with 2¼ inch tube and spacer radiator and fan drive (Silver color hub).

SPECIAL TOOLS

Tool Number	Tool Name
C-311	Flushing Gun
C-3208	Remover — Water Pump Shaft Bushing
C-3476	Puller — Plastic Water Pump Impeller Insert
C-3468	Sleeve — Water Pump Bearing and Shaft Installing
C-551	Refacer — Water Pump Housing Seat

TIGHTENING REFERENCE

	(Foot-Pounds)
Water Pump Body Bolt	30
Water Pump Body to Housing	30
Water Pump Inlet Elbow Bolt	30

SERVICE DIAGNOSIS

1. POOR CIRCULATION

Possible Causes

a. Check for low coolant level and refill to 1¼ inches below filler neck.

b. Check for loose or defective fan belt, tighten or replace as necessary.

c. Inspect and replace hoses if collapsed.

d. Check for plugged radiator or cylinder block and reverse flush as necessary.

e. Check for loose water pump impeller and repair as necessary.

2. OVERHEATING

Possible Causes

a. Refer to Poor Circulation listed in paragraph above.

b. Check for plugged air passages of radiator core and clean passages by applying air pressure on reverse side of radiator core.

c. Check for excessive sludge in the crankcase. Drain and flush crankcase as necessary. In severe cases, remove oil pan and clean inside of block by hand.

d. Failed thermostat.

e. Incorrect valve timing.

f. Incorrect ignition timing.

g. Excessive engine idling.

3. OVERCOOLING

Possible Causes

a. Test temperature gauge units and replace as necessary.

b. Test operation of thermostat (may be sticking in the open position).

Group 7
COOLING SYSTEM

The cooling system incorporates a tube and spacer type full flow radiator, and a centrifugal water pump with an 180° F. thermostat. On cars equipped with an air conditioning-heater unit, there is a 16 psi radiator pressure cap, and should be equipped with sufficient permanent type anti-freeze to insure the engine coolant 20° F. in the summer and greater strength of anti-freeze in the winter according to the prevailing

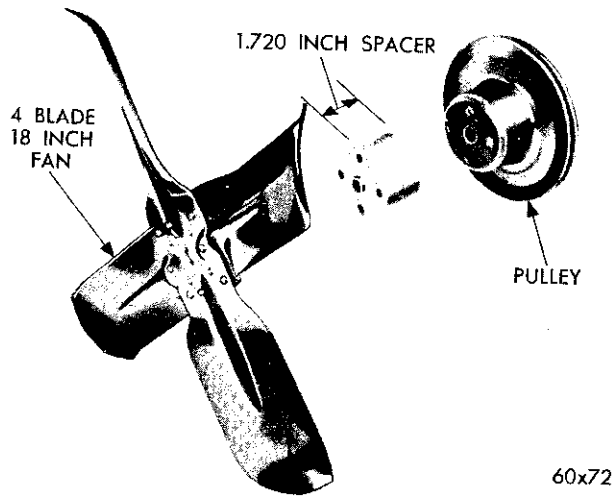

Fig. 1—Standard Fan Drive (Exploded View)

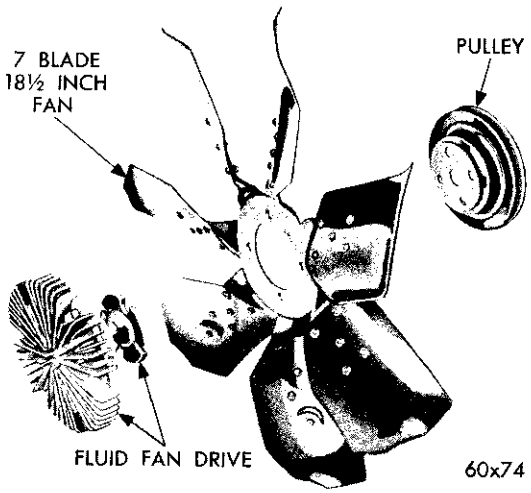

Fig. 2—Silent Flite 7 Blade Fan Drive (Air Conditioning only) (Exploded View)

temperatures. Models with standard equipment have a 4 blade, 18 inch fan, as shown in Figure 1, and models equipped with air conditioning have 7 blade, 18½ inch fan, as shown in Figure 2, except on Model PS-3, which has an 18 inch fan with air conditioning.

4. SILENT FLITE FAN DRIVE (Fig. 2)
(All Models with Air Conditioning)

The fan drive consists of a rotor driven by the shaft which is secured to the water pump flange. The rotor is enclosed by the housing to which the fan is bolted. This housing is mounted on the shaft through permanently sealed bearings.

A nominal clearance space is maintained between the housing and rotor. The housing is partially filled with a special fluid and the shear resistance of the fluid between the housing and rotor provides the driving force rotating the fan.

The power required to rotate any fan increases very greatly with speed. The fan drive has been designed to provide the necessary driving force to maintain cooling at low speeds and to limit the top speed of the fan at higher engine speeds, thus making more power available to the wheels and eliminating the fan noise generally encountered at higher engine speeds.

a. Engine Overheating Due to Silent Flite Fan Malfunction

If the fan drive operates below its minimum design speed, excessive engine heating may occur. Check as follows: (1) The water pump to engine speed ratio is 1.3 to 1. The drive characteristics are such that approximately a 1 to 1 ratio between the crank pulley and the fan should be obtained at an engine speed of 2000 rpm or above on Models PC-1, PC-2, PC-3, PY-1 and 1665 rpm on Model PS-3. This can be checked with a timing light. The speed of the fan and crank shaft pulley is the same when both components are stopped by the timing light. If both components are stopped by the timing light at 2000 engine rpm on Models PC-1, PC-2, PC-3, PY-1 and 1665 rpm on Model PS-3, or at a higher engine speed, the drive is satisfactory. If, however, the engine speed at which this occurs is less than 1665 rpm on Model PS-3 and less than 2000 rpm on Models PC-1, PC-2, PC-3, PY-1, the drive is operated below minimum speed and must be replaced with a new unit. DO NOT ATTEMPT TO SERVICE THIS UNIT.

b. Excessive Fan Noise

Should the fluid drive lock-up, excessive fan noise will result. This may occur if a bearing fails or if drive is binding internally. On a properly functioning unit the fan can be rotated with only light finger pressure, while the water pump pulley is held stationary. When rotating the fan by hand there will be a marked decrease in the effort to rotate it after the fan has been turned through several complete revolutions. If there is excessive fan noise, and if the fan cannot be rotated relative to the pump pulley, the drive is at fault and must be replaced.

5. WATER PUMP

a. Removal from Vehicle (Fig. 3)

(1) Drain the cooling system. (Remove upper half of fan shroud on Air Conditioning models only.)

(2) Loosen the power steering pump, idler pulley and generator and remove all belts.

(3) Remove fan, spacer and pulley. On Air Conditioning models, remove the pulley from water pump fan hub, loosen all nuts from fan to remove the fan drive.

(4) Remove bolts holding water pump body to housing and remove water pump.

b. Disassembly (Fig. 3)

(1) Support pump body on hub and remove impeller by breaking the plastic away from metal inserts, as shown in Figure 4.

(2) Remove impeller metal insert using Tool C-3476.

NOTE: Shaft and bearing assembly do not have to be removed to service a leaking pump.

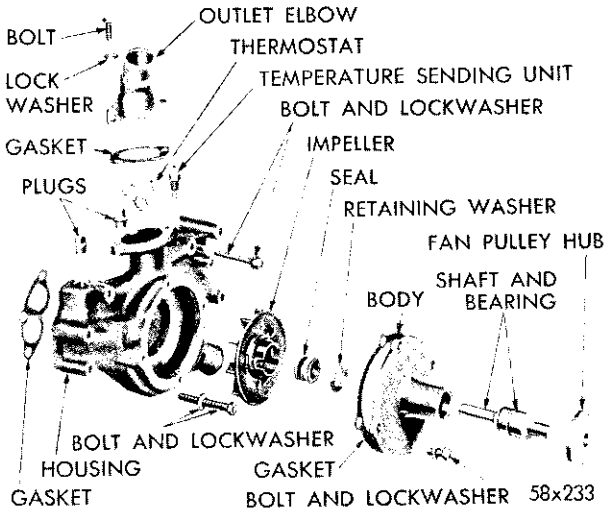

Fig. 3—Water Pump Assembly (Exploded View)

(3) The shaft and bearing assembly should be very carefully inspected to be sure the pump leak has not damaged the bearing.

(4) In removing the impeller and seal, support the pump assembly so that pressure is applied to the shaft. The bearing and shaft will be damaged if pressure is applied to the pump body.

(5) Support body on fan hub end and press out shaft and bearing assembly.

CAUTION

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

NOTE: Bearing and hub assemblies removed from water pumps for any reason should not be used again because damage to bearings and hub usually results during removal.

(6) Clean parts thoroughly. Inspect condition of seal seat and recondition using refacing Tool C-551.

c. Assembly (Fig. 3)

(1) Support pump body as close to center bore as possible in an arbor press. DO NOT SUPPORT BODY ON ATTACHING FACE, OR ON SEAL SEAT.

(2) Press shaft and bearing assembly into body, using Tool C-3468, as shown in Figure 5.

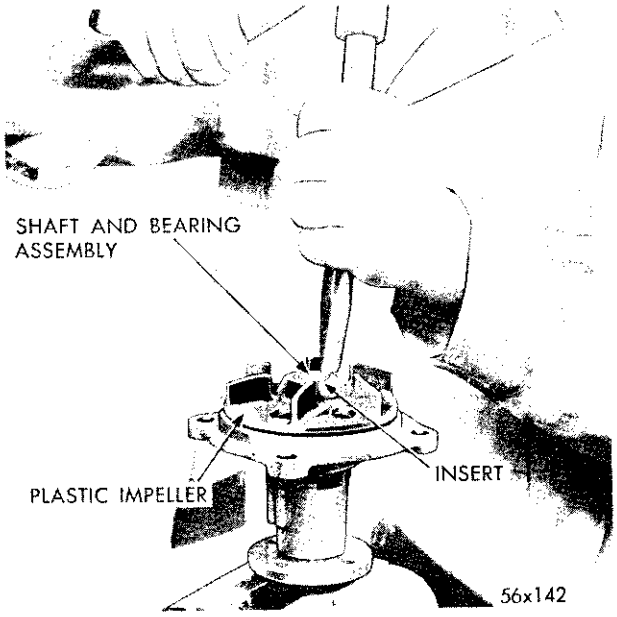

Fig. 4—Removing Plastic Impeller

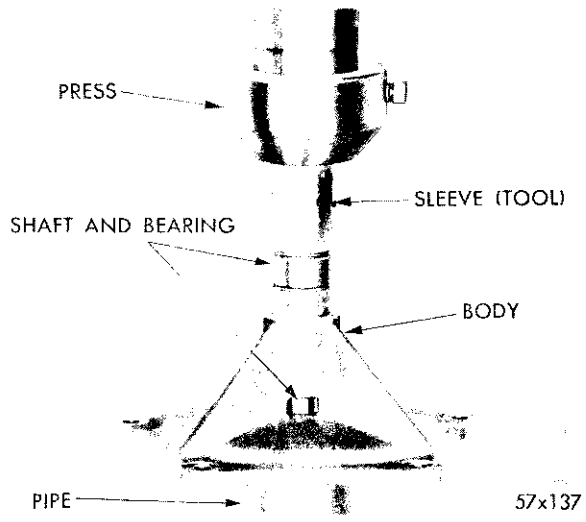

Fig. 5—Installing Shaft and Bearing Assembly using Tool C-3468

NOTE: The .090 inch dimension must be maintained when installing new shaft and bearing assembly, as shown in Figure 5. The undercut on the tool does not control the .090 inch dimension.

(3) Install new seal assembly into impeller with ears of retaining washer engaged in slots of impeller.

(4) Support pump body on shaft in arbor press and press impeller on shaft with a sleeve Tool C-3468 (.625 inch I.D.) and (.750 inch O.D.) that will apply pressure on the metal insert only.

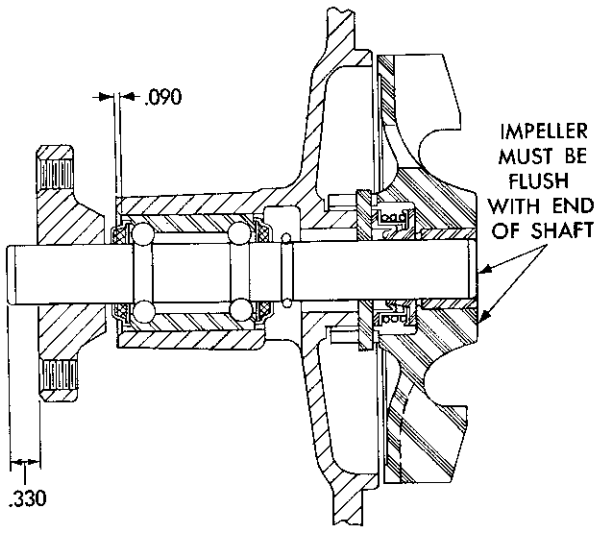

Fig. 6—Water Pump (Schematic Drawing)

CAUTION

When pressing on impeller, support the pump body so that pressure is applied to the shaft and not the pump body. If pressure is applied to pump body, damage to bearings will result. Press impeller on evenly to prevent breakage.

(5) Install fan hub while supporting pump body on impeller and on shaft, as this will apply pressure to the end of shaft, and not to the body. Maintain .330 inch dimension, as shown in Figure 6.

d. Installation on Vehicle

(1) Install water pump body on housing, using a new gasket.

(2) Tighten bolts to 30 foot-pounds torque. Install pulley, spacer and fan. (On Air Conditioning models, assemble the fan to the fan drive and pulley, and attach the assembly to the water pump.)

(3) Tighten nuts to 15 foot-pounds torque. Install the upper half of fan shroud, run the engine, and check for leaks.

6. RADIATOR

The transmission oil cooler is located in the bottom of the pan in the radiator tank, which is an integral part of the radiator. The bottom of the radiator tank, therefore, acts in the capacity of a heat exchanger in that the oil flowing from the torque converter is directed through a tube into the bottom of the radiator pan, coming out on the opposite side of the radiator to be returned to the torque converter.

a. Removal

(1) Remove the two oil cooler connections at the bottom of the radiator.

(2) Drain the oil from the transmission oil cooler.

(3) Drain the cooling system, remove hoses, fan shroud (on Air Conditioning models only) and radiator support bolts.

(4) Remove the radiator.

b. Cleaning

(1) Drain cooling system and refill with clean SOFT water and add the contents of one can (No. 1 top-compartment) of MoPar Cooling System Cleaner.

(2) Run engine at a fast idle for ½ to ¾ hour.

(3) Drain cooling system and refill with clean water.

(4) Pour conditioner (No. 2 bottom-compartment) into radiator and run engine for ten minutes.

(5) Flush entire cooling system until water runs clean.

(6) Refill radiator with clean SOFT water.

(7) Use MoPar Radiator Rust Inhibitor during the summer months.

c. Installation

(1) Attach radiator to radiator support bolts and reconnect the two oil cooler connections.

(2) Install fan shroud (if so equipped), connect hoses and refill cooling system. Check for leaks.

(3) Add sufficient oil to the transmission to refill the system.

NOTE: Clearance from outside edge of fan blade to radiator core should be ¾ inch + or − ¼ inch.

7. TRANSMISSION OIL COOLER

In case of leak, engine coolant may become mixed with the transmission fluid. Also, the transmission fluid may enter the cooling system. Both the cooling system and the transmission should be checked in case the cooler is leaking.

a. Testing Oil Cooler for Leaks

(1) Disconnect both oil lines at the radiator.

(2) Connect a pressure gauge to one cooler connection and a shut off valve to the other. Close the valve.

(3) Connect a source of air pressure to the valve.

(4) Carefully open valve to admit no more than 50 psi to oil cooler before closing the valve. Gauge reading will then drop if cooler is leaking.

b. Repairing Oil Cooler in the Radiator

(1) Remove radiator from car.

(2) Remove radiator lower tank.

(3) Fill lower tank with water and test cooler. Leak may be in such position that it can be re-

paired (use silver solder) without removing cooler from tank. If repair is made, remove excess solder and neutralize the flux. Blow water out of cooler **thoroughly.**

c. Replacing Oil Cooler on Radiator

(1) Melt the soft solder holding cooler to tank.

(2) Remove spring washers holding cooler connectors to tank and remove cooler.

(3) Position new cooler in tank and apply spring washers on connectors.

(4) Use soft solder to hold cooler in tank.

(5) Test for leaks.

(6) Remove excess solder and neutralize flux.

(7) Attach lower tank (soft solder).

(8) Install radiator, connect oil lines to cooler.

(9) Fill cooling system.

If the transmission operates properly after repairing the leak, drain the transmission and torque converter while hot, remove the transmission oil pan and inspect for sludge, rust, dirty or plugged inlet screen. If none of these conditions are found, reconditioning may not be necessary. Reassemble, using Transmission Fluid Type "A", Suffix "A".

8. REVERSE FLUSHING COOLING SYSTEM

Reverse flushing of the cooling system is the forcing of water through the cooling system, using air pressure, in a direction opposite to that of the normal flow of water.

a. Flushing Cylinder Block

(1) Drain radiator and remove hoses at radiator.

(2) Remove thermostat and reinstall thermostat housing.

(3) Install flushing gun Tool C-311, or other suitable flushing gun to the inlet hose.

(4) Connect water hose of gun to a pressure water source and the air hose of gun to a pressure air source.

(5) Turn on water, and when cylinder block is filled, turn on the air in short blasts.

(6) Allow cylinder block to fill between the blasts of air.

(7) Continue this procedure until water runs clean. Check thermostat and if satisfactory, reinstall; otherwise, replace.

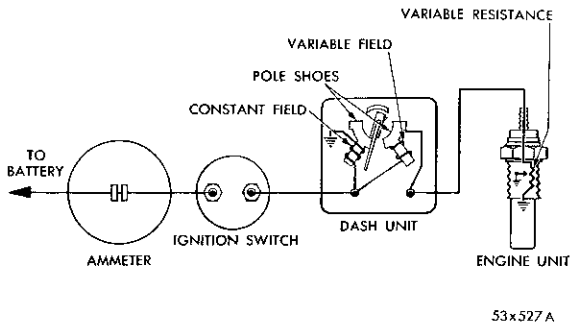

Fig. 7—Water Temperature Gauge

(8) Use a new thermostat housing gasket. Refill cooling system and check for leaks.

b. Reverse Flushing Radiator

(1) Drain cooling system and remove hoses from engine.

(2) Install flushing gun Tool C-311, or other suitable flushing gun in radiator lower outlet neck.

(3) Fill radiator and turn on air in short blasts.

NOTE: Do not apply more than 15 psi pressure when pressure flushing radiator, as damage to radiator may result.

(4) Continue this procedure until water runs clean. Refill cooling system.

(5) Run engine and check for leaks.

9. ENGINE WATER TEMPERATURE GAUGE (Fig. 7)

a. The Instrument Panel Unit

The instrument panel unit consists of two electromagnets, one connected to the ignition switch and ground, and the other between the ignition switch and a unit in the engine coolant which provides a variable ground resistance according to engine temperature. The temperature of the engine coolant varies the current in the one electro-magnet which pulls against the pointer (and other magnet) away from (C) cold position.

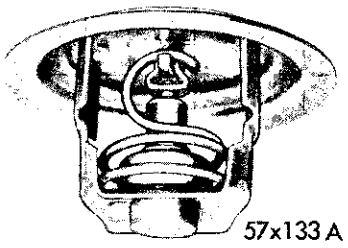

Fig. 8—Thermostat Assembly

b. Temperature Sending Unit

The temperature sending unit is a sensing unit located in the water pump housing and provides the variable resistance for the instrument panel unit.

c. Electrical Circuit (Testing)

(1) Remove wire at sending unit and turn ignition switch on. Gauge pointer should not move.

(2) If the pointer moves, the wire is grounded or gauge is faulty.

(3) Remove wire at dash gauge terminal "GA", and if pointer hand still moves, replace dash gauge; otherwise, replace wire.

(4) If gauge does not move when wire on sending unit is removed, replace the sending unit.

10. THERMOSTAT (Testing) (Fig. 8)

The thermostat starts to open at 178-182° F. and is fully opened at 202° F. To test, place thermostat in a pail of water with a thermometer and heat water until thermostat starts to open. Check thermometer and continue heating until thermostat is wide open and again check thermometer. Replace thermostats that do not open completely, open at too low temperature, or open at too high temperature.

11. RADIATOR PRESSURE CAP

Radiators are equipped with a 14 psi cap, as standard equipment and 16 psi with air conditioning, as shown in Figure 9. Always check identification number on cap when replacing.

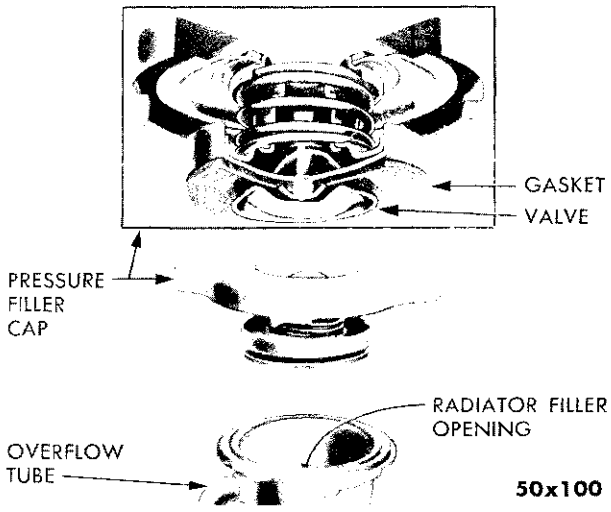

Fig. 9—Radiator Pressure Cap

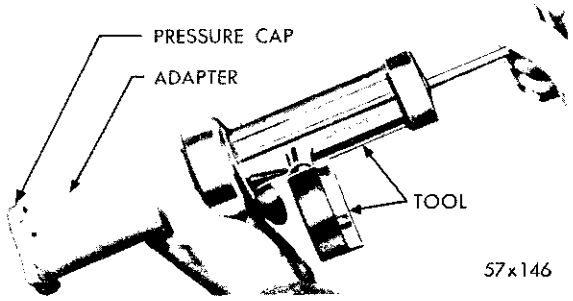

Fig. 10—Checking Pressure Cap

WARNING

When removing pressure cap, turn counter-clockwise to the stop, permitting built up pressure to escape through overflow tube. This will prevent hot water from spraying out of radiator filler opening.

12. TESTING RADIATOR CAP

Select the short neoprene seal and metal adapter from kit, Tool C-3499. Slip seal on the tube at the bottom of the instrument. Then attach either end of the short adapter to the instrument. Dip pressure cap in water and apply cap to end of adapter. Working the plunger, as shown in Figure 10, bring pressure to 14 pounds on the gauge. If pressure cap fails to hold pressure within a range of 12-15 pounds, replace cap with a new **tested** cap. If car is equipped with air conditioning, the cap should test between 14-16 psi.

13. PRESSURE TESTING COOLING SYSTEM

(1) Wipe radiator filler neck sealing seat clean. Water level should be ½ inch below neck of radiator.

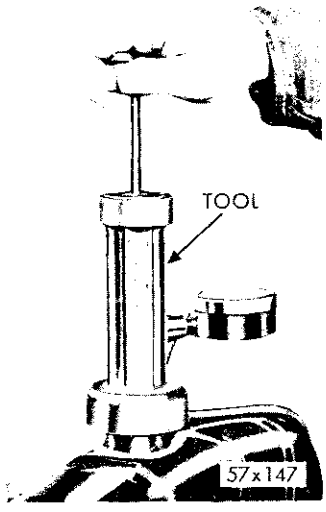

Fig. 11—Checking the Cooling System for leaks

(2) Attach Tester Tool C-3499 to the radiator, as shown in Figure 11 and apply 15 pounds pressure. If pressure drops check all points for exterior leaks.

WARNING

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 15 Lbs.

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

(4) Remove wires from spark plugs on one bank and operate engine on the opposite bank. If the needle continues to fluctuate, it indicates a leak on the bank still in operation. If needle ceases to fluctuate, the leak is in the bank, combustion has been released from.

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

(6) If the above pressure test of the cooling system holds the pressure as outlined above, then there is no leak, however, there may be internal leaks which can be checked by removing the oil dipstick and if water globules appear intermixed with the oil it will indicate a serious internal leak in the engine block. If there is an internal leak, a new cylinder block must be installed.

Group 7A
ACCESSORY BELT DRIVES

CONTENTS

DATA AND SPECIFICATIONS

Torque Method

Torque (Ft. Lbs.) to be Applied to Components

ALL MODELS

Accessory	Belt In Use	New Belt
Power Steering Bracket	55	90
Generator—Without A/C*	20	30
With A/C*	35	65
Fan Idler Bracket	35	50

*A/C—Air Conditioning

Belt Deflection Method

Deflection (Inches) to be Applied at Midpoint of Belt Segment Under a 5 Lb. Load. See Figure 1

ALL MODELS

Accessory	Belt In Use	New Belt
Power Steering	3/16	1/8
Fan Belt—Idler	1/8	1/16
Generator—Without A/C*	1/4	1/8
With A/C*	3/8	1/4

*A/C—Air Conditioning

SERVICE DIAGNOSIS

1. INSUFFICIENT ACCESSORY OUTPUT DUE TO BELT SLIPPAGE

a. Check belt tension and belt condition.

b. If belt is excessively glazed or worn, replace and tighten as specified.

2. BELT SQUEAL WHEN ACCELERATING ENGINE

a. Belts too loose — retighten.

b. Belts glazed — replace belts.

3. BELT SQUEAK AT IDLE

a. Misaligned pulleys — align accessories (file brackets or use spacers as required.)

b. Non-uniform groove or eccentric pulley — replace pulley.

c. Non-uniform belt — replace belt.

d. Dirt and paint imbedded in belt—replace belt.

e. Belt too loose — retighten.

4. BELT ROLLED OVER IN GROOVE

a. Broken cord in belt — replace belt.

5. BELT JUMPS OFF

a. Belt too loose — retighten.

b. Misaligned pulleys — align accessories.

Group 7A
ACCESSORY BELT DRIVES

SERVICE PROCEDURES

6. PROPER BELT TENSION

The satisfactory performance of the belt driven accessories depends on the maintenance of the proper belt tension. If the specified tensions are not maintained, belt slippage may cause engine overheating, lack of power steering assist, loss in air conditioning capacity, reduced generator charging rates, and greatly reduced belt life. To avoid any such adverse effects, the following service procedure should be followed:

(1) Adjust all belts to the specified used belt* tension at new car preparation.

(2) Readjust all belts as part of the "during warranty inspection."

(3) Check all belt tensions by the deflection method at servicing and retighten if needed.

(4) The new belt tension specifications should be used on all belt replacements, and the above procedure followed thereafter.

There are two methods by which belt tensions can be properly established:

7. TORQUE METHOD

All generator and power steering pump belts can be tightened to the specified tension (see Data and Specifications) by use of a torque wrench. The generator belts are tensioned by using a special Tool C-3379 and torque wrench. The power steering belts are tightened by inserting the torque wrench in the square hole provided in the pump mounting bracket. Other belts can also be tightened by this method if the adjusting bracket has a square hole. To tighten belts by the torque method, loosen all mounting bolts and apply the specified torque to the accessory or

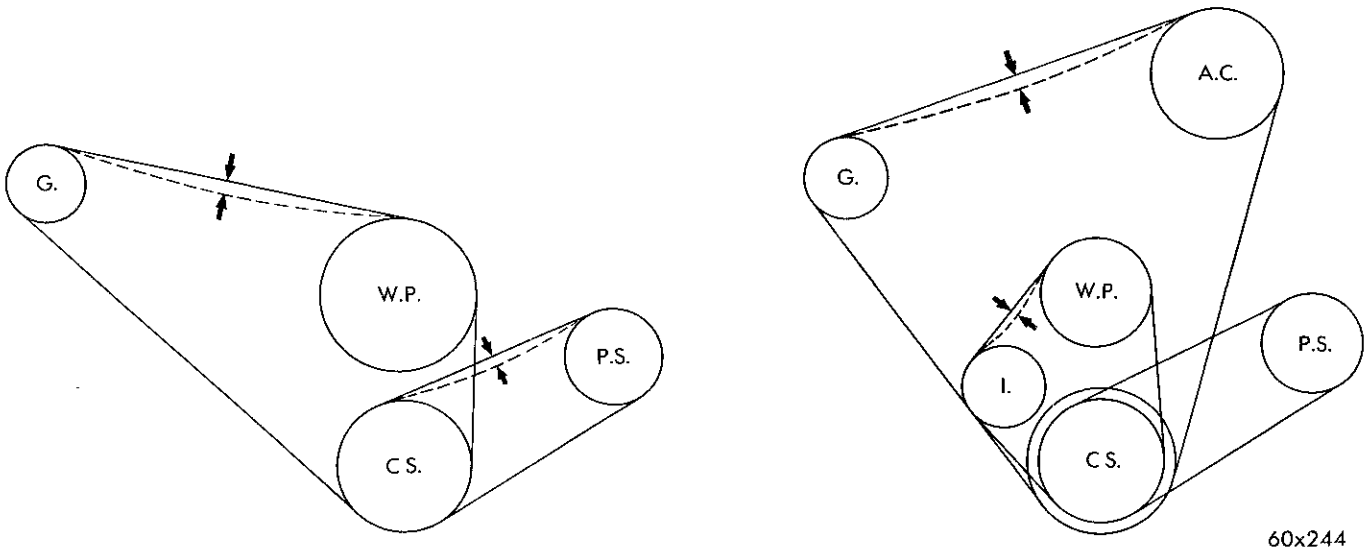

Fig. 1—Belt Deflection Location

AC—Air Conditioning
WP—Water Pump
CS—Crankshaft
PS—Power Steering
I—Idler
G—Generator

idler. Tighten all mounting bolts while the torque is applied to the accessory. It it is not possible to use the torque wrench because of clearance, use an extension.

8. BELT DEFLECTION METHOD

All belts can also be tightened by measuring the deflection of the belt at the mid-point between two pulleys under a five-pound push or pull. A small spring scale can be used to establish the five-pound load. See Figure 1 for correct location at which to measure deflection.

This method should be used only when it is not possible to use the torque method. To tension the belts by the deflection method, loosen all mounting bolts and use a bar to apply tension to the belts being careful not to damage the accessory. A ½ inch square drive hinge handle can be used if the accessory has a square hole. Tighten the mounting bolts and check the deflection. (See Data and Specifications.) It may be necessary to repeat this procedure several times to establish the correct tension.

*Any belt that has operated for a minimum of a half-hour is considered a "belt in use."