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# 1994 Wildcat<sup>®</sup> Service Manual



# ARCTIC CAT<sup>®</sup> SNOWMOBILES

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## FOREWORD

This manual contains service, maintenance, and troubleshooting information for the 1994 Wildcat EFI and Wildcat EFI Mountain Cat Snowmobiles. The manual is designed to aid service personnel in service-oriented applications and may be used as a textbook for service training.

This manual is divided into sections. Each section of the manual covers a specific snowmobile component or system and in addition to the standard service procedures, includes assembling, disassembling, and inspecting instructions. A troubleshooting section is also included in this manual.

The service technician should become familiar with the operation and construction of each component or system of the snowmobile by carefully studying this manual. This manual will assist the service technician in becoming more aware of and efficient with service procedures. Such efficiency not only helps build consumer confidence but also saves time and labor.

The procedures in this manual include the complete disassembly of the 1994 Wildcat EFI and Wildcat EFI Mountain Cat components. When servicing, the technician should use discretion as to how much disassembly is needed to correct any given condition.

All Arctco publications and snowmobile decals display the words Warning, Caution, and Note to emphasize important information. The symbol **⚠WARNING** identifies personal safety-related information. Be sure to follow the directive because it deals with the possibility of severe injury or even death. The symbol **⚠CAUTION** identifies unsafe practices which may result in snowmobile-related damage. Follow the directive because it deals with the possibility of damaging a part or parts of the snowmobile. The symbol **■NOTE:** identifies supplementary information worthy of particular attention.

At the time of publication, all information, photographs, and illustrations were technically correct. Because Arctco, Inc. constantly refines and improves its products, no retroactive obligation is incurred.

All materials and specifications are subject to change without notice.

Keep this manual accessible in the shop area for reference.

Service Department  
Arctco, Inc.

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# SECTION 1 - GENERAL INFORMATION

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# Specifications\*

ENGINE AND DRIVE			
Engine Model		AC70L4	
Displacement	cc (cu in.)	700 (42.71)	
Bore x Stroke	mm (in.)	81 x 68 (3.188 x 2.667)	
Compression Ratio		6.2:1	
Piston-Ring End Gap Range	mm (in.)	0.20-0.80 (0.008-0.031)	
Piston Skirt/Cylinder Clearance Range	mm (in.)	0.095-0.150 (0.0037-0.0059)	
Piston Pin Diameter Range	mm (in.)	19.995-20.000 (0.7872-0.7874)	
Piston-Pin Bore Diameter Range	mm (in.)	20.002-20.010 (0.7875-0.7878)	
Connecting-Rod Small End Diameter Range	mm (in.)	26.003-26.011 (1.0237-1.0241)	
Crankshaft End Play Range	mm (in.)	0.05-0.10 (0.002-0.004)	
Crankshaft Runout (max.) (Total Indicator Reading)	mm (in.)	0.05 (0.002)	
Cylinder Trueness (max.)	mm (in.)	0.10 (0.004)	
Drive Clutch/Driven Pulley Offset	mm (in.)	34.67 (1.365)	
Center-to-Center Distance	cm (in.)	28.9 (11.375)	
Engagement Speed	(RPM)	3200-3600	
Peak RPM		8100-8300	
Cam Arm	Standard	p/n	0646-117 (53.0 g)
	4-10,000 ft	p/n	0646-102 (50.5 g)
	over 10,000 ft	p/n	0646-031 (48.5 g)
Spring	Standard	p/n	0646-083
		(color)	(Red)
	over 4000 ft	p/n	0146-526
		(color)	(Green/Yellow)
Chain Pitch	Standard	72	
	(over 4000 ft)	70	
Sprocket Ratio	Standard	23/40	
	(over 4000 ft)	20/39	
Lighting Coil Output @ 3000 RPM		12V/240W	
Ignition Type		CDI/NCI	
Spark Plug		NGK BR9ES	

## ENGINE AND DRIVE (cont.)

Spark-Plug Gap	mm (in.)	0.7 (0.028)	
Brake Type		Hydraulic Brake/ Double Piston/ Fixed Disc	
Track Width	cm (in.)	38 (15)	
Overall Track Length	cm (in.)	307 (121)	345.4** (136**)
Track Length on Ground	cm (in.)	88.9 (35)	104** (41**)

## CHASSIS

Length w/Skis	cm (in.)	282 (111)	299** (118**)
Height w/Windshield	cm (in.)	116.2 (45.75)	
Overall Width	cm (in.)	114.3 (45)	
Ski "Center-to-Center" Distance	cm (in.)	99 (39)	

## MISCELLANY

Curb Weight (approx.)	kg (lb)	277 (610)	288** (635**)
Dry Weight (approx.)	kg (lb)	235 (518)	246** (543**)
Gas Tank Capacity	l (U.S. Gal)	41.6 (11)	
Coolant Capacity	l (U.S. qt)	3.3 (3.5)	
Chain Case Fluid Level	ml (fl oz)	236 (8)	
Gasoline Octane (rating) Minimum		87	
Engine Oil		50:1 Injection Oil	
Chain Case Lubricant		Transmission Lube	
Grease		Low Temperature	
Taillight/Brakelight	p/n	0109-460	
Headlight	p/n	0609-171	
Drive Belt	p/n	0627-011	
Ignition Timing B.T.D.C. @ 4000 RPM	degree mm (in.)	30 5.670 (0.223)	
Gas/Oil Mixture		Oil Injection	

\* Specifications subject to change without notice.

\*\* Wildcat EFI Mountain Cat.

## Break-In Procedure

New and overhauled EFI snowmobile engines require a short break-in period (1 tankful of fuel). During the break-in period, a maximum of 1/2 throttle is recommended. However, brief full throttle acceleration (only after the engine has reached operating temperature) and variations in driving speed contribute to good engine break-in.

Do not pre-mix the first tank of fuel with oil. Start the engine and allow to idle. Using a long stiff wire with a hook bent at one end, hook the actuator arm of the oil-injection pump. Raise the arm to the full-open position. With the engine running hold the arm in the full-open position for 3 to 4 minutes or until the oil lines to each cylinder are free of all air bubbles.

## Recommended Gasoline

The recommended gasoline to use in this snowmobile is 87 minimum octane regular unleaded. In many areas, oxygenates (either ethanol or MTBE) are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol or up to 15% MTBE are acceptable gasolines.

When using ethanol blended gasoline, it is not necessary to add a fuel de-icer since ethanol will prevent the accumulation of moisture in the fuel system.

### CAUTION

Do not use white gas or gasolines containing methanol. Only Arctco approved gasoline additives may be used.

## Recommended Oil

The correct oil to use in the oil-injection system is Arctco 50:1 Injection Oil. This oil is specially formulated to be used as an injection oil and meets all of the lubrication requirements of the Arctic Cat Snowmobile engine.

### CAUTION

Any oil used in place of the recommended oil could cause serious engine damage.

## Genuine Parts

When replacement of parts is necessary, use only genuine Arctco Arctic Cat parts. They are precision-made to ensure high quality and correct fit. Refer to the Illustrated Parts Manual for the correct part number, quantity, and description.

## Summer Storage

Prior to storing a snowmobile for the summer, it must be properly serviced to prevent corrosion and component deterioration. If a customer requests you to prepare the snowmobile for storage, use the following procedure:

1. Clean the seat cushion with a damp cloth and Vinyl Protectant (p/n 0636-173).
2. Clean the snowmobile thoroughly by hosing dirt, oil, grass, and other foreign matter from the skid frame, tunnel, hood, and belly pan. Allow the snowmobile to dry thoroughly. DO NOT get water into any part of the engine.

3. Fill the gas tank to its rated capacity; then add the correct ratio of Arctic Cat Fuel Stabilizer (p/n 0638-165) to the gas tank. Tighten the gas cap securely.
4. Place the rear of the snowmobile up on a shielded safety stand. Remove the air intake silencer boots from the throttle body.
5. Start the engine and allow to idle until operating temperature is reached. With the engine idling, spray Arctco Engine Preserver (p/n 0636-177) into the throttle body until the engine exhaust starts to smoke heavily, or until the engine starts to drop in RPM. Turn the engine off.
6. Install the intake silencer boots.
7. Plug the exhaust system outlet with a clean cloth.
8. With the ignition switch key in the OFF position:
  - A. Disconnect the spark-plug caps from the spark plugs and remove the spark plugs.
  - B. Pour 29.5 ml (1 fl oz) of SAE #30 petroleum based oil into each spark-plug hole and pull the recoil handle slowly about 10 times.
  - C. Install the spark plugs and connect the spark-plug caps.
9. Every year or 1000 miles, drain the chain-case lubricant by removing the chain-case drain plug located on the backside of the chain case assembly. Remove the chain-case cover and inspect the chain, sprockets, chain tensioner, and rollers for wear. Check the chain for proper tension. Install the chain-case cover, O-ring seal, and drain plug; then pour 236 ml (8 fl oz) of Transmission Lube (p/n 0636-817) into the filler hole. On models with reverse, pour 354 ml (12 fl oz) of Transmission Lube into the filler hole.
10. Open the clutch shield; then remove the drive belt from the driven pulley and drive clutch. Lay the belt on a flat surface or slide it into a cardboard sleeve to prevent warping or distortion during storage. Secure the clutch shield.
11. Apply a light oil to the upper steering post bushing, pivot bushings of the ski frame, and plungers of the shock absorbers.
12. Lubricate the front and rear suspension, spindles, ball joints, and speedometer drive adapter with a low-temperature grease.
13. Tighten all nuts, bolts, and screws. Make sure all rivets holding the components together are tight. Replace all loose rivets. Care must be taken that all calibrated nuts and bolts are tightened to specifications.
14. Fill the cooling system to within 2.5 cm (1 in.) of the filler cap with properly mixed coolant.
15. Disconnect the battery cables from the battery; then clean the battery posts and cables. Fully charge the battery and store in a cool dry place off cement floors. Periodically charge the battery.
16. Lightly sand the bottom of the skis; then using black paint (p/n 0652-024), paint the entire bottom of the skis.
17. Clean and polish the hood, console, and chassis with Arctco Hood and Windshield Cleaner Polish (p/n 0636-174). DO NOT USE SOLVENTS OR SPRAY CLEANERS. THE PROPPELLENT WILL DAMAGE THE FINISH.
18. Store the snowmobile indoors. Raise the track off the floor by blocking up the rear of the snowmobile making sure the snowmobile is secure. Loosen the rear idler wheel adjusting bolts to decrease track tension. Cover with a machine cover to protect from dirt and dust. If the snowmobile must be stored outdoors, position the snowmobile out of direct sunlight; then block the entire snowmobile off the ground making sure it is secure. Loosen the rear idler wheel adjusting bolts to decrease track tension. Cover with a machine cover to protect from dirt, dust, and rain.

 **CAUTION**

Avoid storing in direct sunlight and using a plastic cover as moisture may collect on the snowmobile causing corrosion.

## Preparation After Storage

Taking the snowmobile out of summer storage and correctly preparing it for another season will assure many miles and hours of trouble-free snowmobiling. Arctco recommends the following procedure to prepare the snowmobile.

1. Clean the snowmobile thoroughly. Polish the exterior of the snowmobile using Arctco Hood and Windshield Cleaner Polish (p/n 0636-174).
2. Remove the cloth from the exhaust system; then check the exhaust system and air silencer for obstructions.
3. Inspect all control wires and cables for signs of wear or fraying; replace if necessary. Use cable ties or tape to route wires and cables away from hot or rotating parts.
4. Inspect the drive belt for cracks and tears. Check belt specifications. Replace if damaged or worn. If the old belt is worn but still in good condition, keep it in the tool box as a spare in case of emergency. Install drive belt.
5. Examine fuel hoses and connections for deterioration, tightness, and cracks; replace as necessary.
6. Fill the oil-injection tank with Arctco 50:1 Injection Oil.
7. Check the coolant level and all coolant lines and connections for deterioration or cracks. Add properly mixed coolant as necessary.
8. Check brake lever travel, wear indicator clearance, all controls, headlight, tail light, brake light, ski alignment, ski wear-bars, wear-strips, and headlight aim. Adjust or replace if necessary.
9. Inspect throttle cable adjustment.
10. Tighten all nuts, bolts, and screws making sure all calibrated nuts and bolts are tightened to specifications.
11. Lubricate the front and rear suspension spindles, ball joints, and speedometer drive adapter with a low-temperature grease.
12. Check the chain case fluid level. Inspect for leakage.
13. Check the spark plugs. Clean or replace as necessary.
14. Charge the battery and test. Install the battery and clean the connections. Attach the positive battery cable to the battery positive terminal; then the negative battery cable to the negative terminal.
15. Adjust the track to the proper tension and alignment.

**NOTE: Arctco recommends the replacement of all coolant lines every four years or 4000 miles.**

# SECTION 2 - ENGINE

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## Engine Specifications

Engine Model		AC70L4
No. of Cylinders		2
Engine Lubrication		Oil Injection
Starter System		Recoil
Bore x Stroke	mm (in.)	81 x 68 (3.188 x 2.677)
Displacement	cc (cu in.)	700 (42.71)
Compression Ratio		6.2:1
Piston-Ring End Gap Range	mm (in.)	0.20-0.80 (0.008-0.031)
Piston Skirt/Cylinder Clearance Range	mm (in.)	0.095-0.150 (0.0037-0.0059)
Piston Pin Diameter Range	mm (in.)	19.995-20.000 (0.7872-0.7874)
Piston-Pin Bore Diameter Range	mm (in.)	20.002-20.010 (0.7875-0.7878)
Connecting-Rod Small End Diameter Range	mm (in.)	26.003-26.011 (1.0237-1.0241)
Crankshaft End Play Range	mm (in.)	0.05-0.10 (0.002-0.004)
Crankshaft Runout (max.) (Total Indicator Reading)	mm (in.)	0.05 (0.002)
Cylinder Trueness (max.)	mm (in.)	0.10 (0.004)
Reed Stopper Height	mm (in.)	8.8 ± 0.2 0.350 ± 0.008

## Removing Engine

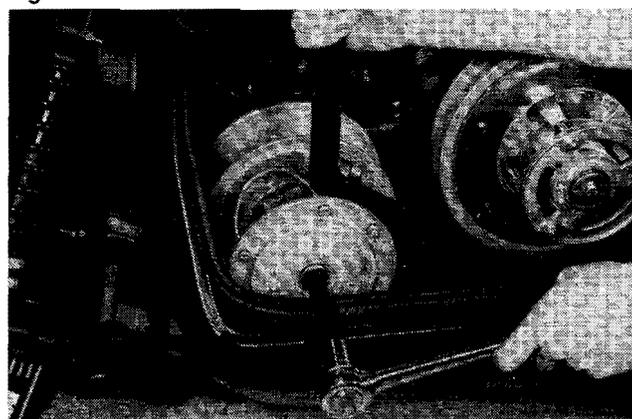
1. Disconnect the negative battery cable from the battery.
2. Disconnect the headlight harness. Remove the cap screw securing the hood cable to the engine; then remove the two hood hinge pins and remove the hood from the snowmobile.

3. Open and remove the clutch shield; then remove the drive belt. Remove the drive clutch retainer plug and washer.

**NOTE:** Before installing the clutch puller apply grease to the tip and oil to the threads.

4. Remove the retainer plug and washer. Bend the top edge of the belly pan inward and down; then using a 1/2 in. 12-point socket, remove the bolt and lock washer securing the drive clutch to the crankshaft. Next, using the Clutch Puller (p/n 0644-096) and an impact wrench (or a breaker bar and Drive Clutch Spanner Wrench (p/n 0644-136)), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat complete procedure until the clutch releases. Account for the two sleeves found in the clutch bore. Remove the driven pulley. Account for all washers and key.

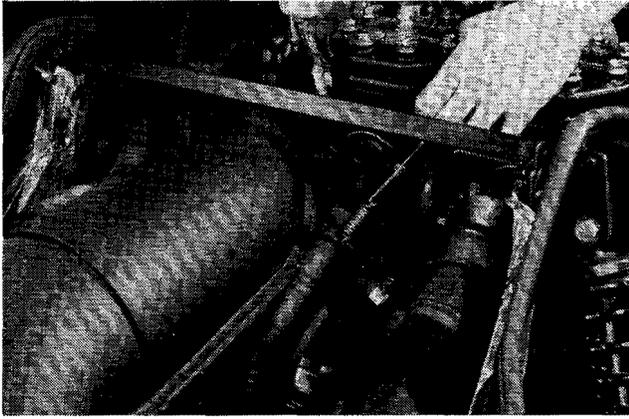
Fig. 2-1



AM055

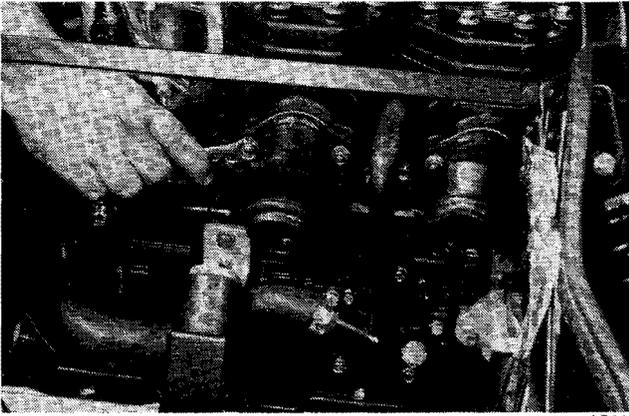
5. Remove the four springs securing each expansion chamber to the header pipe; then remove the two springs securing each expansion chamber to the resonator. Remove the springs securing the expansion chambers to the front end and remove the expansion chambers.

Fig. 2-2



6. Remove the nuts and lock washers securing the head pipes; then remove the head pipes. Discard the exhaust gaskets.

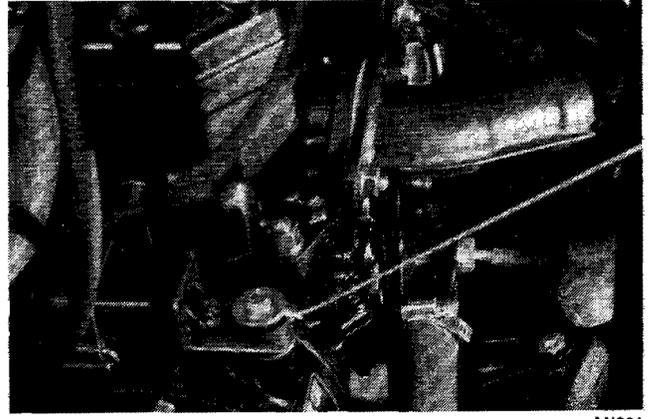
Fig. 2-3



7. Attach a long piece of fuel line to the engine coolant drain (located on the exhaust side of the engine). Route the line outside the engine compartment and into a container. Open the drain and remove the filler cap. Once the coolant stops flowing, remove the hose and tighten the drain valve.

**NOTE:** The cooling system can be more completely drained if the rear of snowmobile is elevated on a jackstand and the filler cap is removed.

Fig. 2-4



8. Loosen the intake flange clamp securing the throttle body; then remove the throttle body from the flanges.
9. Disconnect the main wiring harness from the engine harness. Disconnect the spark-plug caps from the spark plugs and the CDI unit wiring harness. Remove the timing sensor, injector sensor, and ground wires from the magneto housing.
10. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the injection pump. Disconnect the oil-supply hose from the pump and plug the hose to prevent oil drainage.

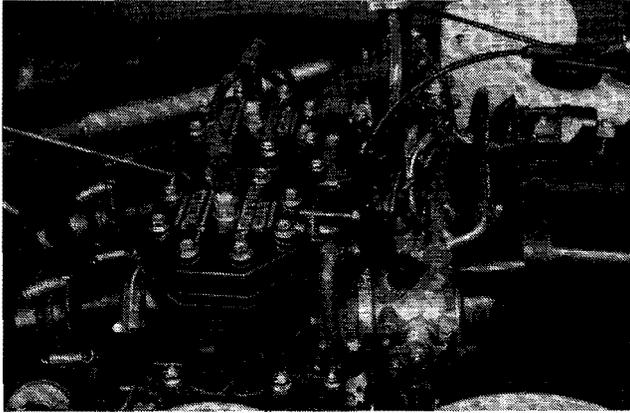
**NOTE:** To prevent oil drainage from the supply hose during removal from the pump, attach a vacuum pump (p/n 0644-131) to the oil tank vent hose and apply 2 to 3 in.-lb of vacuum to the oil tank. Plug the hose using a large bolt; then remove the vacuum pump.

Fig. 2-5



11. Loosen the clamp securing the hose to the thermostat housing and pull the hose from the housing. Loosen the clamp securing the supply hose to the water pump housing and pull the hose from the water pump. Loosen the clamp securing the coolant hose to the PTO-side of the throttle body. Remove coolant hoses.

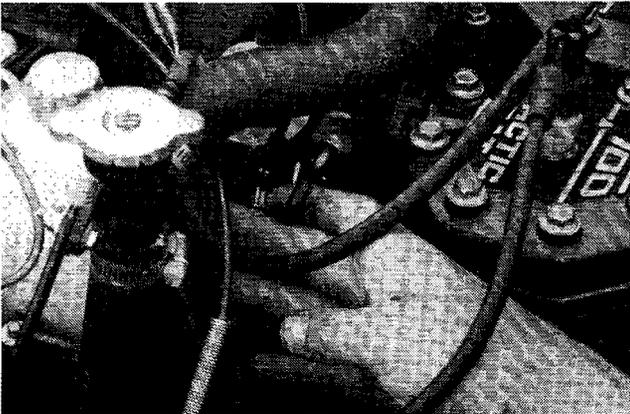
Fig. 2-6



AO065

12. Disconnect the wires from the temperature warning light sensor and the ECU coolant temperature sensor.

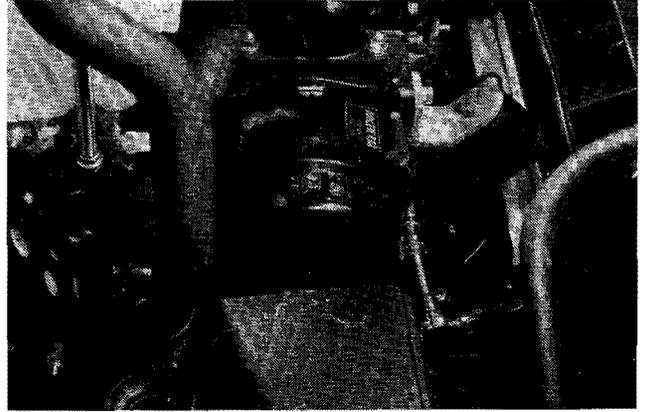
Fig. 2-7



AJ159

13. Remove the four cap screws and lock washers securing the recoil; then remove the recoil from the engine. Leave the recoil in the engine compartment.

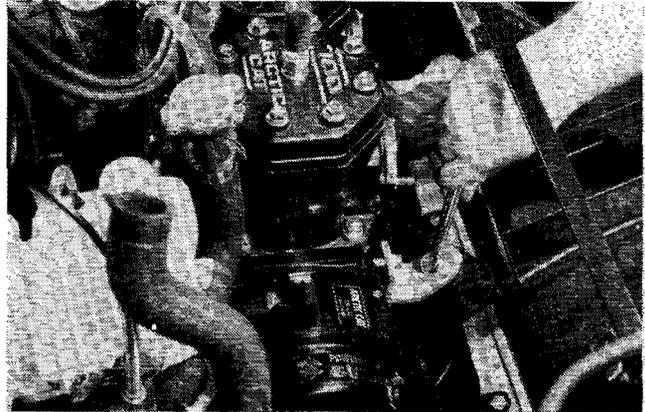
Fig. 2-8



AP011

14. Remove the four cap screws securing the engine to the front end. Note the position of the shims on the left rear mount. The rear right-side and front left-side cap screws will require using a 3/8 in. twelve-point socket for removal.

Fig. 2-9



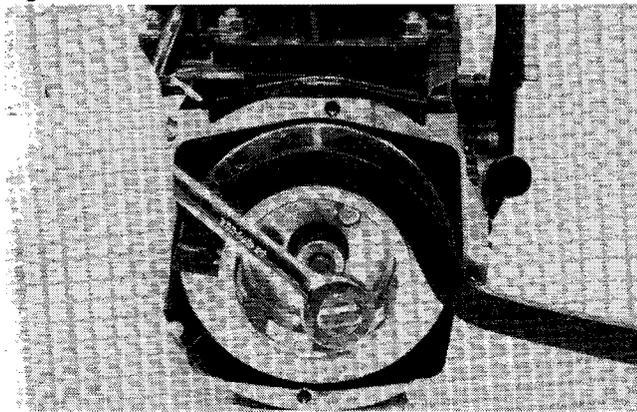
AP009

15. Slowly lift the engine and watch for any wires or hoses which may have been overlooked. Twist the engine to the side to clear the support brace as it is lifted from the engine compartment.
16. Remove the front and rear mounting brackets from the engine crankcase.

## Disassembling Engine

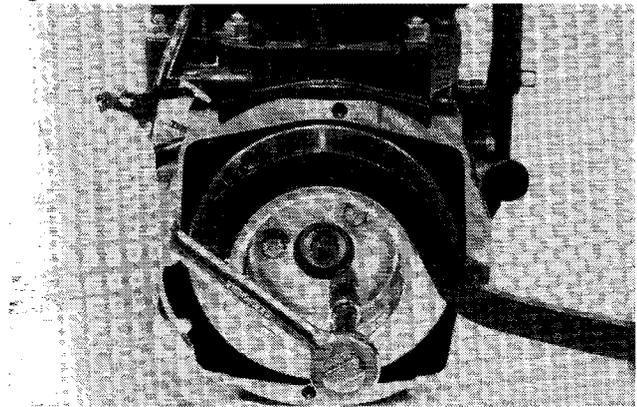
1. Using a spanner wrench to secure the flywheel, remove the flywheel nut, lock washer, and flat washer.

Fig. 2-10



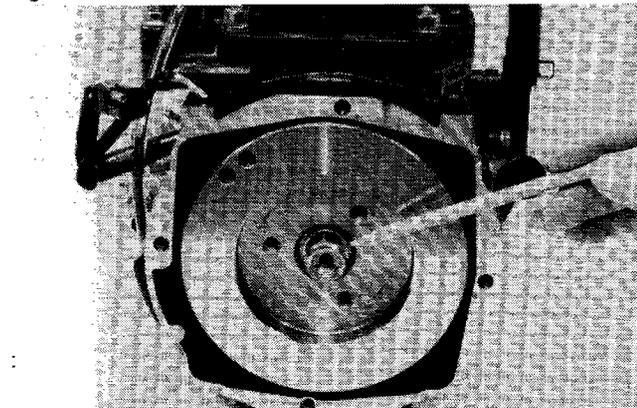
- Using a spanner wrench to secure the crankshaft, remove the three cap screws from the starter pulley. Remove the starter pulley.

Fig. 2-11



- Install a protective cap onto the end of the crankshaft.

Fig. 2-12



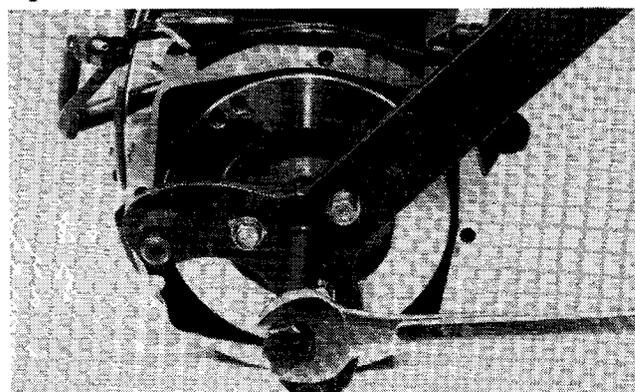
**NOTE:** A protective cap can be made by welding a 3 mm (1/8 in.) plate on one end of a spare flywheel nut.

**CAUTION**

To prevent damage to the crankshaft, thread a protective cap onto the crankshaft. The puller must bottom on the cap and not on the crankshaft. Also, do not thread puller bolts more than 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.

- Using the Flywheel Puller (p/n 0144-310), remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a brass hammer, and tightening again. Repeat procedure until the flywheel is free. Account for the key in the crankshaft keyway.

Fig. 2-13



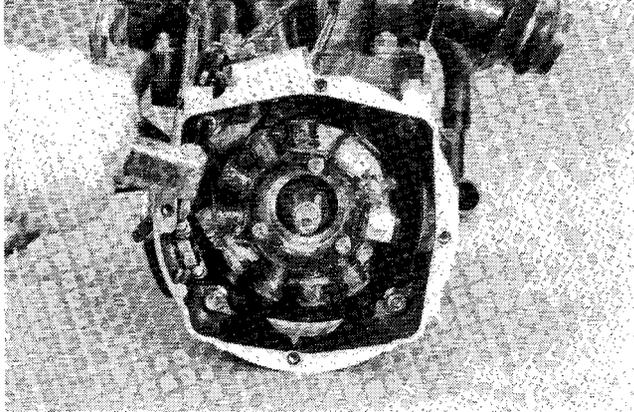
**CAUTION**

Before applying excessive pressure to the center flywheel puller bolt, check to make sure puller bolt is pulling straight. If it is pulling to one side, the crankshaft will be damaged. Square the puller using the three bolts that attach the puller to the flywheel.

**NOTE:** To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.

- Using a 6 mm hex head wrench, remove the four cap screws securing the magneto housing to the crankcase; then remove the housing. Account for the two alignment pins.

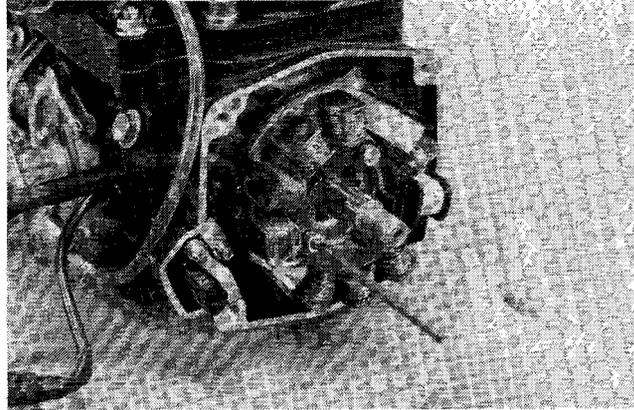
Fig. 2-14



AO008

6. Remove the three cap screws securing the coil ring to the backing plate using a 5 mm hex wrench. Slide the coil ring off the crankshaft and remove from the engine.

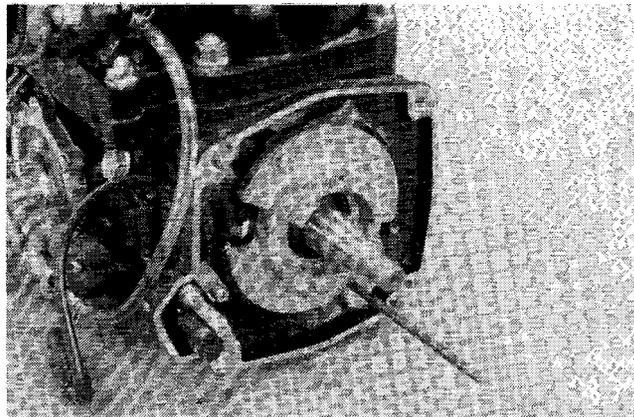
Fig. 2-15



AO002

7. Remove the two cap screws securing the backing plate to the crankcase; then remove the backing plate from the engine. You may wish to mark the backing plate for ease of assembly.

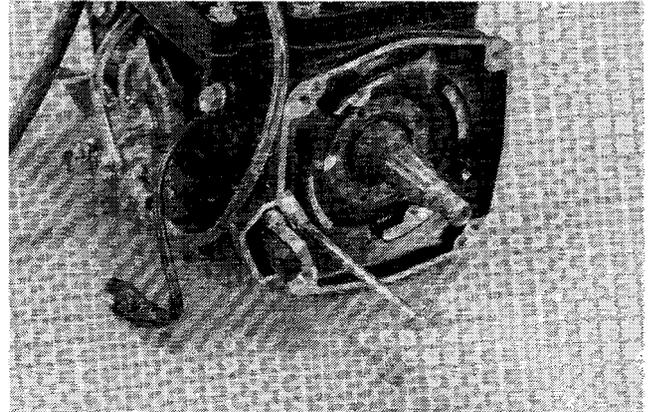
Fig. 2-16



AO004

8. Remove the two screws securing the RPM sensor; then loosen the screw securing the wiring harness clamp and remove the sensor from the engine.

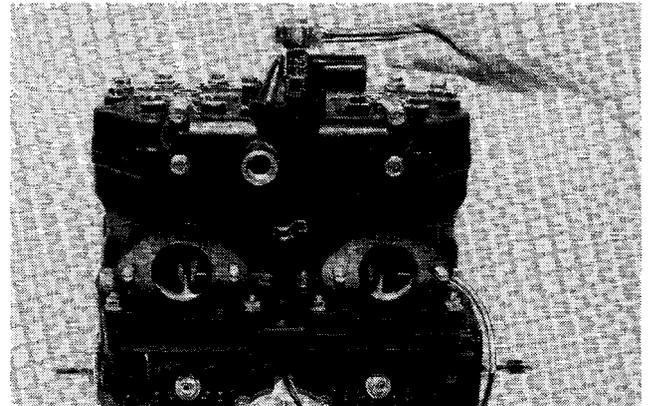
Fig. 2-17



AO005

9. Remove the four nuts and washers securing the intake flanges; then remove the flanges with balance hoses.
10. Compress and slide the clamp securing the bypass hose away from the end of the hose; then pull the hose from the thermostat housing.
11. Remove the three cap screws securing the thermostat cap; then remove the cap, rubber gasket, and thermostat.

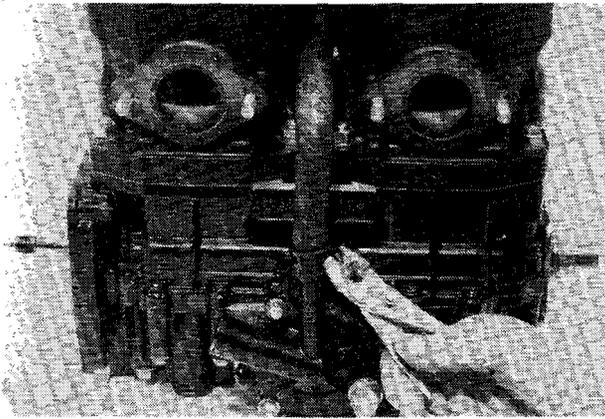
Fig. 2-18



AJ020

12. Slip the hose clamp up from the end of the bypass hose at the water-pump cover and pull the hose free of the water-pump cover. Remove the hose from between the cylinders.

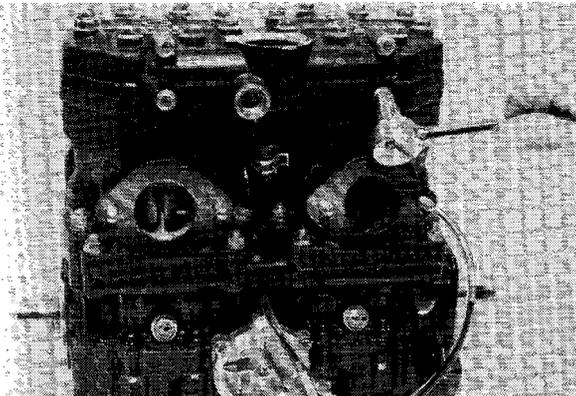
Fig. 2-19



AJ026

13. Remove the four cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard gaskets.

Fig. 2-20

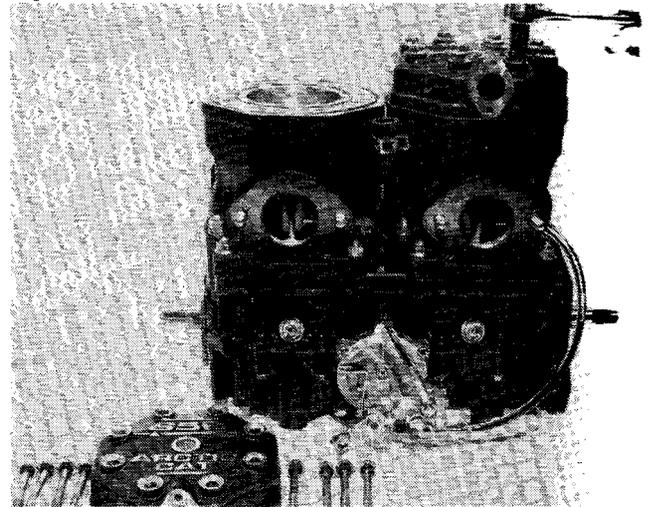


AJ022

14. Remove the spark plugs.
15. Remove the eight cap screws and O-rings securing each head; then separate each head from each cylinder. Account for two O-rings beneath each head.

**NOTE:** Mark each cylinder head, cylinder, and piston and keep together as an assembly. Mark the MAG cylinder #1 and PTO cylinder #2.

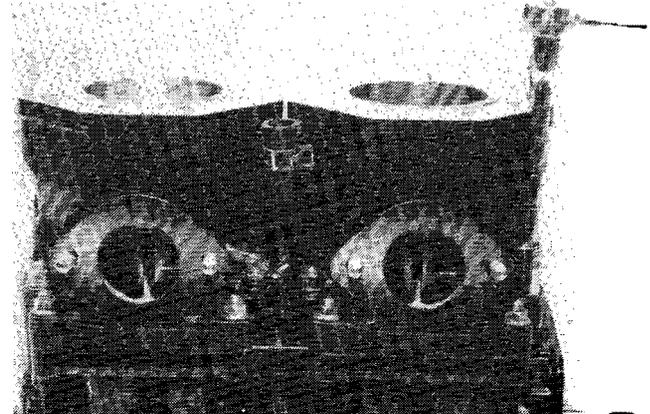
Fig. 2-21



AJ023

16. Remove the oil-injection line from each cylinder nozzle.
17. Remove the eight cylinder base nuts and four flange nuts securing the cylinders to the crankcase. Account for eight flat washers and lock washers. Using a rubber hammer, gently tap on the side of each cylinder to free it from the crankcase.

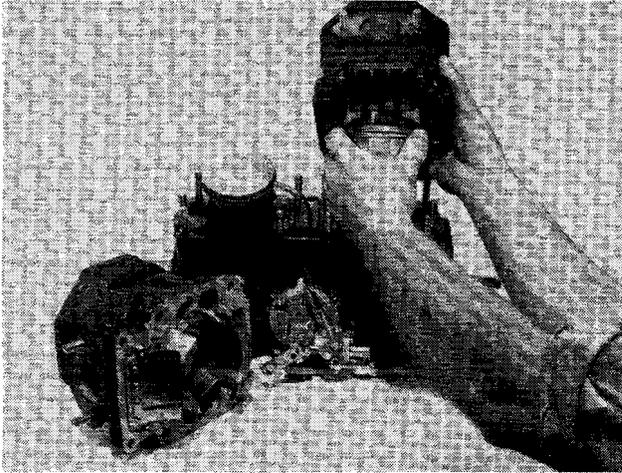
Fig. 2-22



AJ027

18. Slowly lift each cylinder straight up and free of the studs. Grasp the connecting rod and piston as the cylinder clears the piston to prevent the rod from dropping against the crankcase. Remove and save the cylinder base gaskets.

Fig. 2-23



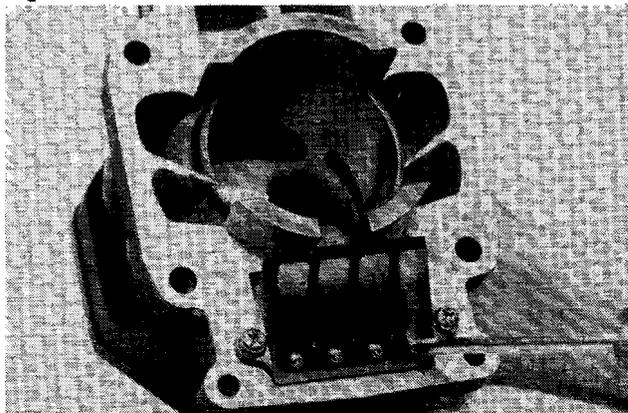
AJ028

**CAUTION**

As cylinders are removed, lay them on their side on the workbench. Never set cylinders upright on any hard surface. The reed stoppers will be damaged.

19. Remove the four screws securing each reed stopper to each reed seat. Remove stopper and reed valve assembly.

Fig. 2-24

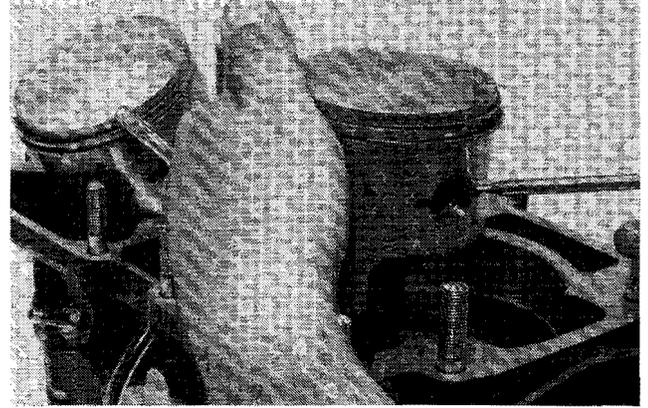


AJ058

**NOTE:** The reed seat can remain on the cylinder unless it requires service, in which case, remove the two screws securing the reed seat to the cylinders; then remove the reed seat and discard the gasket.

20. Remove the PTO-side piston-pin circlip from the PTO-side piston; remove the MAG-side piston-pin circlip from the MAG-side piston.

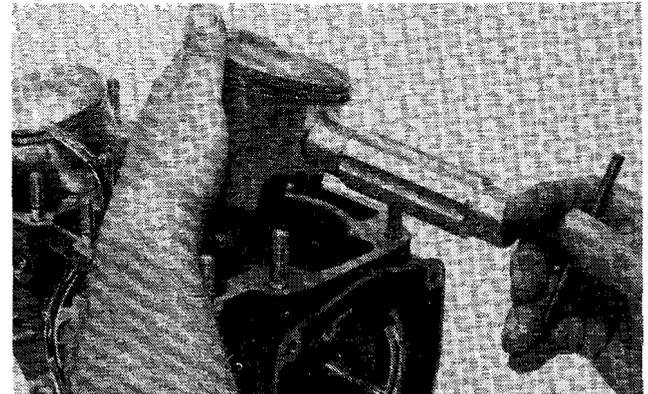
Fig. 2-25



AJ029

21. Using the Piston Pin Puller (p/n 0144-003), remove the piston pins from both pistons.

Fig. 2-26



AJ030

**NOTE:** For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.

**CAUTION**

DO NOT use any type of punch to drive the pin free of the piston; damage may result. Use a piston-pin puller only.

22. Lift the pistons clear of the connecting rods and account for two washers. Remove the small-end connecting-rod bearings; then remove the piston rings. Keep each piston with its rings; keep each piston, pin, bearing, and washers together as a set.

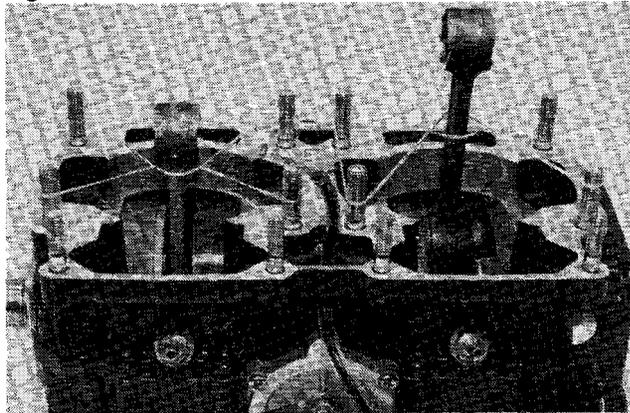
Fig. 2-27



AQ059

**NOTE:** Place rubber bands over the connecting rods and around the cylinder studs. This will keep the connecting rods from damaging the crankcase.

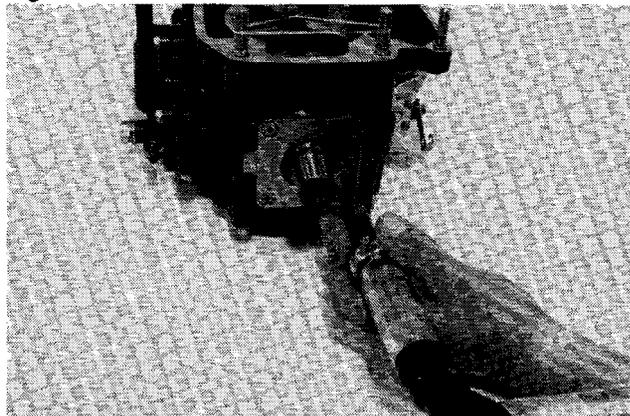
Fig. 2-28



AJ031

23. Using an impact driver, remove the four screws securing the PTO end plate to the crankcase; then remove the plate.

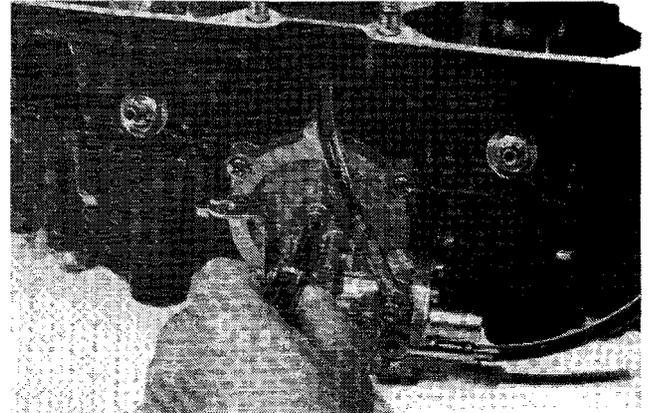
Fig. 2-29



AJ032

24. Remove the two screws and lock washers securing the oil-injection pump to the crankcase.

Fig. 2-30



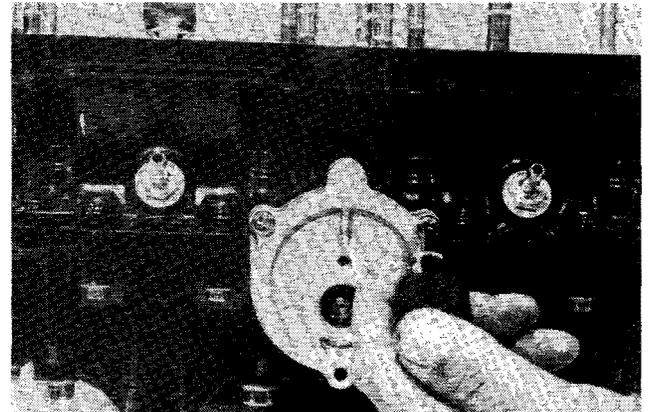
AJ035

**CAUTION**

Note that the shorter of the two screws securing the oil pump to the crankcase came from the top mounting hole of the oil-injection pump. It must be installed in the same location.

25. Remove the two screws securing the oil injection pump retainer to the crankcase. Gently tap on the retainer with a plastic hammer to free it from the crankcase. Pull the retainer straight back and free of the crankcase. Account for the O-ring found around the inner flange of the retainer sealing surface.

Fig. 2-31

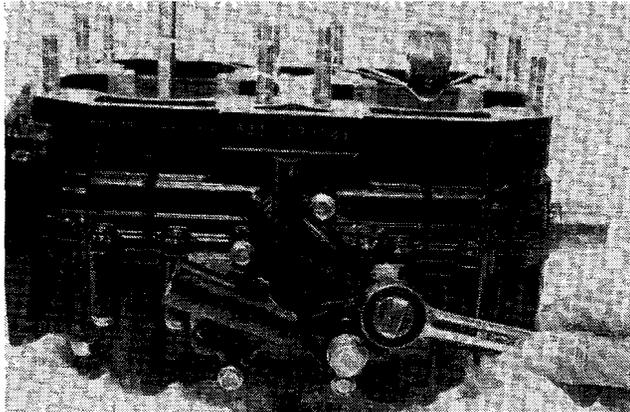


AJ036

**NOTE:** Account for the shim washer(s) found on the upper pinion driven shaft. If no shim(s) are found on the shaft, check the retainer just removed as they will sometimes stick to the bearing race. Remove shim(s) and place in a safe place where they won't be lost.

26. Remove the five cap screws securing the water-pump cover to the crankcase. Remove the cover and O-ring seal.

Fig. 2-32

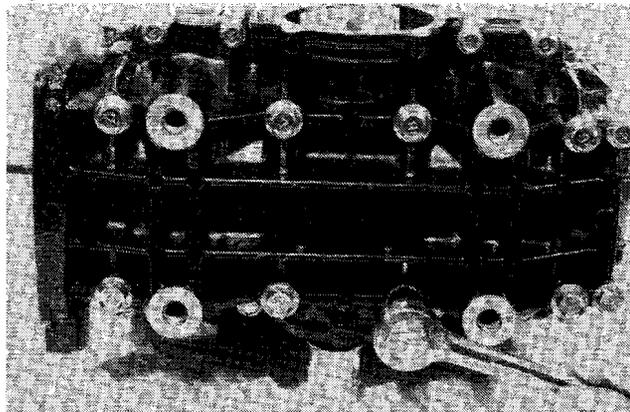


AJ033

**NOTE:** Do not remove the water pump impeller or the impeller shaft unless necessary. Only remove impeller and shaft if there are signs of coolant leakage from the small hole located in the bottom of the crankcase, directly behind the water pump housing.

27. Lay the engine on its side and remove the 18 cap screws securing the crankcase halves. Note the position of the different-sized cap screws.

Fig. 2-33



AJ038

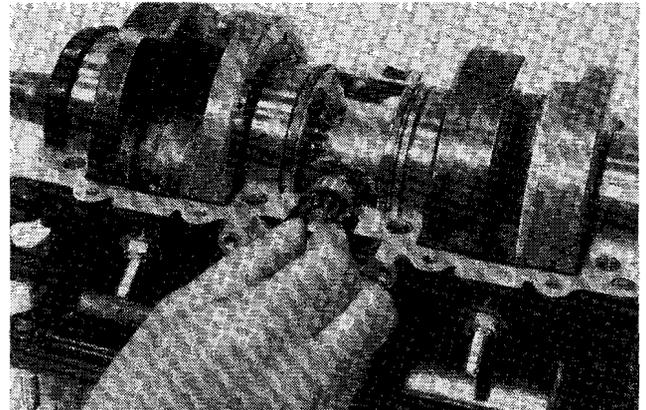
28. Separate the crankcase halves by installing two crankcase cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic tipped hammer, tap on each cap screw head until the case halves separate; then remove the two cap screws. Remove the rubber bands and lift the top half of the crankcase off the bottom half. Grasp the connecting rods as the top half of the crankcase is removed. Do not allow them to drop onto the sealing surface of the bottom case half.

**CAUTION**

**DO NOT** drive any tool between halves to separate the crankcase. Damage to the sealing surfaces will result.

29. Remove the pinion gear from the crankcase account for the C-ring.

Fig. 2-34



AJ041

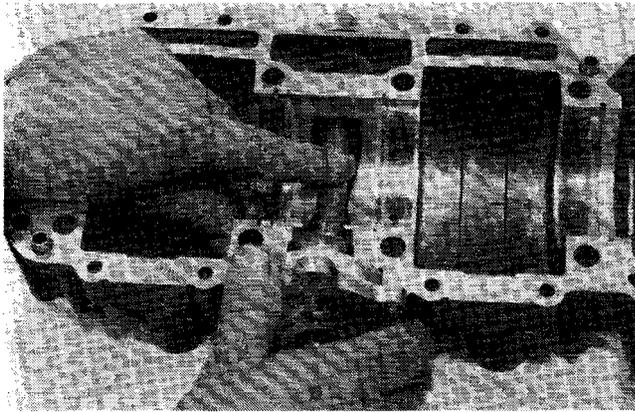
30. Lift the crankshaft free from the crankcase and slide the crankshaft oil seals off the ends of the crankshaft. Account for the C-ring. Slide the bearing off the PTO end of crankshaft. Remove the bearing dowel pins from the crankcase.

**CAUTION**

**DO NOT** remove the water pump impeller or shaft unless necessary. The shaft and impeller should only be removed from the lower crankcase half when there is a coolant leakage problem or a rough inner bearing. To inspect for either condition, follow steps A through D.

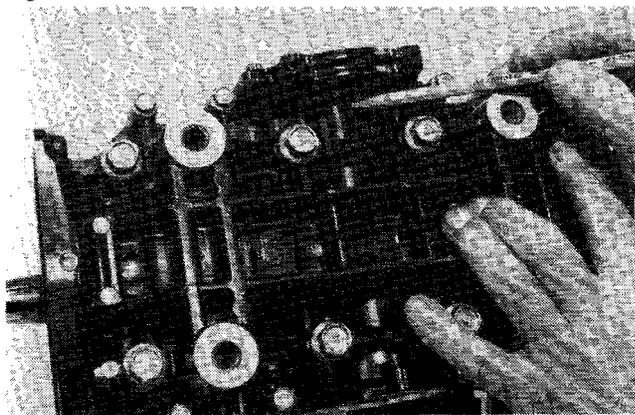
- A. Remove the O-ring from the oil-injection pump retainer. Slide the retainer into position on the shaft in the lower half of the crankcase.
- B. While holding the retainer with one hand tight against the crankcase, rotate the shaft with your other hand. Bearing rotation must feel smooth.

Fig. 2-35



- C. If any roughness is felt, remove the retainer and inspect its bearing by turning it several revolutions. If it is smooth, the shaft must then be removed and the inner bearing inspected. Turn inner bearing by hand. If any roughness is felt, replace the inner bearing.
- D. Check the bottom of the water pump housing for any signs of coolant leakage. The small hole, located on the bottom of the crankcase directly behind the water pump housing, will show coolant stains if the seal has any leakage problems. If stains or any signs of leakage are present, remove impeller and shaft and replace seals.

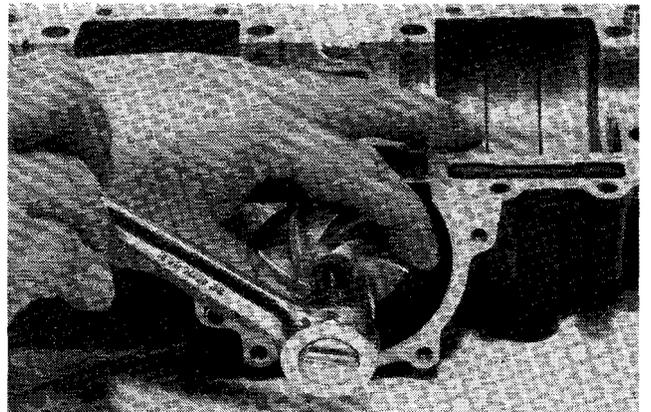
Fig. 2-36



**NOTE:** For instructions on bearing and seal replacement, see **Assembling Engine** section of this manual. Only complete steps 31-37 if there is a bad seal or shaft bearing.

- 31. Remove the cap screw securing the impeller to the shaft.

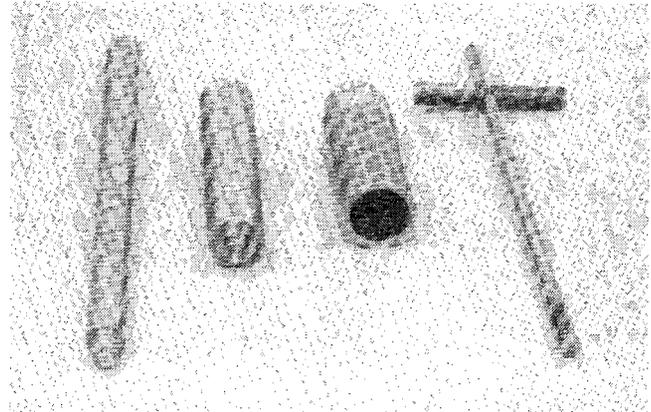
Fig. 2-37



- 32. Slowly pull the shaft from the lower half of the crankcase.

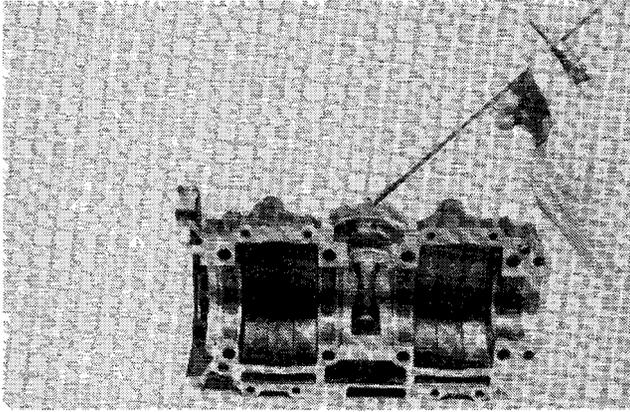
**NOTE:** Use the **Water Pump Rebuilding & Bearing Kit (p/n 0644-084)** to remove and replace the water pump bearing and seals.

Fig. 2-38



- 33. Using the special tool, remove the water pump seal by inserting the tool rod down through the inner bearing and seal. Position the end of the tool up against the backside of the metal case of the outer water pump seal.

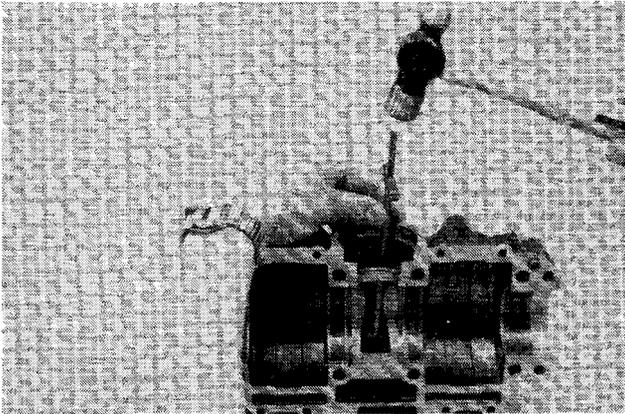
Fig. 2-39



AJ143

34. Using a hammer, gently tap on the rod while moving the end of the tool from side to side of the seal casing. Repeat until the seal is free of the crankcase.

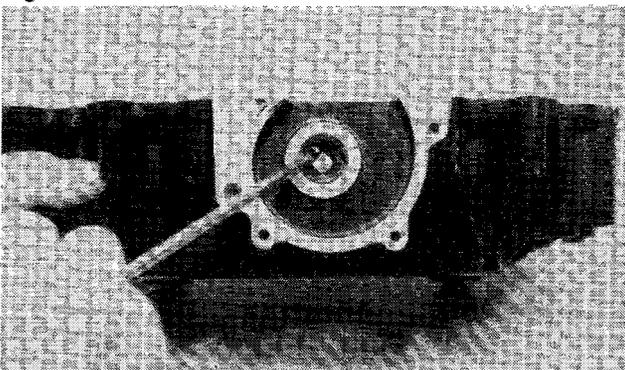
Fig. 2-40



AJ144

35. Using the hooked end of the tool, pull the inner seal free of the crankcase.

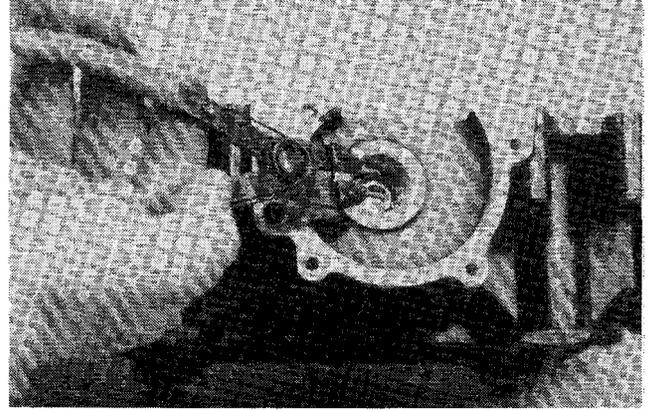
Fig. 2-41



AJ145

36. Using a pair of snap ring pliers, remove the snap ring located in front of the water pump bearing.

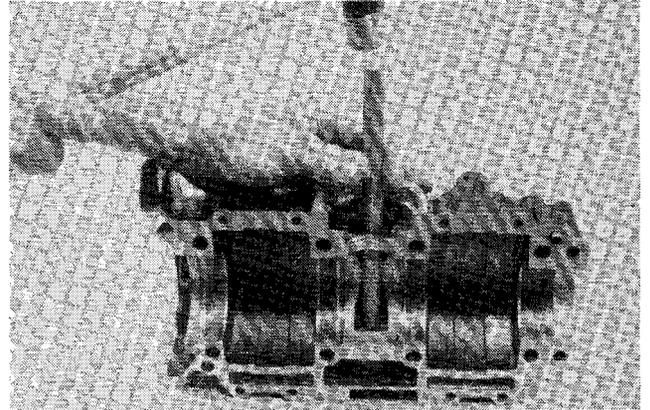
Fig. 2-42



AJ146

37. Using the bearing driver from the special tool kit, drive the water pump bearing from the crankcase.

Fig. 2-43



AJ147

## Cleaning and Inspecting Engine

**NOTE:** Whenever a part is worn excessively, cracked, defective, or damaged in any way, replacement is necessary.

### CYLINDER HEADS

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chambers being careful not to nick, scrape, or damage the combustion chambers or the sealing surfaces.
2. Inspect the spark-plug holes for any damaged threads. Repair damaged threads using a "heli-coil" insert.

- Place each cylinder head on a surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

<b>⚠ CAUTION</b>
Water or cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

Fig. 2-44

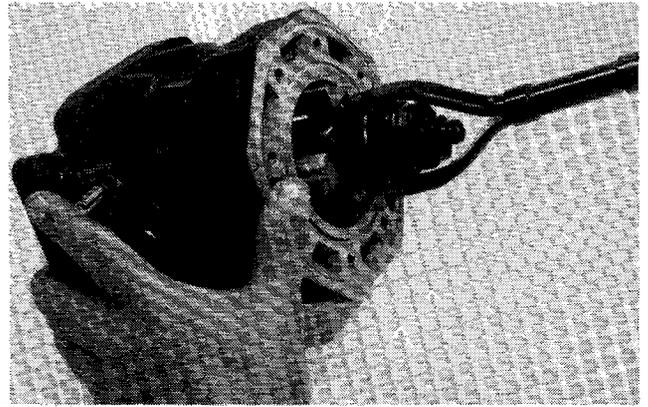


AJ160

## CYLINDERS

- Using a non-metallic carbon removal tool, remove carbon buildup from the exhaust ports.
- Wash the cylinders in cleaning solvent.
- Inspect the cylinders for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface with a surface hone using #500 grit stones and honing oil.

Fig. 2-45



AJ060

**NOTE:** To produce the proper 60° "cross-hatch" pattern, use a low RPM drill (600 RPM) at a rate of 30 strokes per minute. If honing oil is not available, use a lightweight, petroleum-based oil. Thoroughly clean cylinders after honing using detergent soap and hot water, and dry with compressed air; then immediately apply oil to the cylinder bores. If a bore is severely damaged or gouged, the cylinder will have to be replaced.

- Place the head surface of each cylinder on a surface plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move each cylinder in a figure eight motion. Inspect the surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

<b>⚠ CAUTION</b>
Water or cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

## PISTON ASSEMBLY

- Using a non-metallic carbon removal tool, remove carbon buildup from the dome of each piston.
- Using an old piston ring as a tool, snap the ring in two pieces. Grind one end of the ring at a 45 degree angle and to a sharp edge. Clean carbon from the ring-groove using the ring. Be sure to position the ring with its tapered side up.

**⚠ CAUTION**

Improper cleaning of the ring grooves by using the wrong type of ring-groove cleaner will result in severe damage to the piston.

3. Inspect each piston for cracks in the piston pin and skirt areas.
4. Inspect each piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.

Fig. 2-46



AN135

**NOTE:** If scuffing or seizure marks are too deep to correct with the sandpaper, it will be necessary to replace the piston.

5. Inspect the perimeter of each piston for signs of excessive "blowby". Excessive "blowby" indicates either worn piston rings or an out-of-round cylinder.

### CRANKCASE

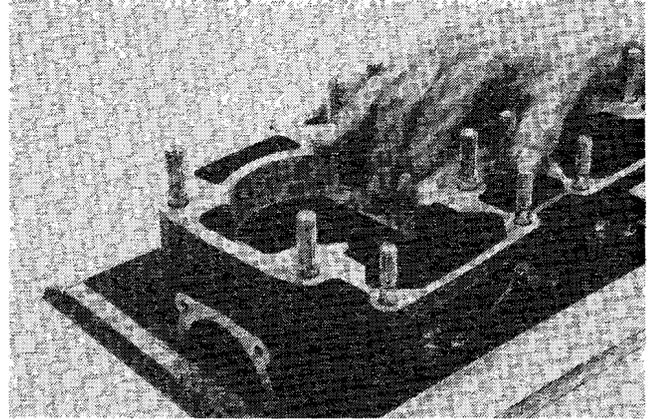
1. Wash the crankcase halves in cleaning solvent.

**NOTE:** Before washing the crankcase halves, make sure the four bearing-dowel pins have been removed and accounted for.

2. Inspect crankcase halves for scoring, pitting, scuffing, or any imperfections in the casting.
3. Inspect all threaded areas for damaged or stripped threads.
4. Inspect the bearing areas for cracks or excessive bearing movement. If evidence of excessive bearing movement is noted, repair by peening the bearing area using a center punch in a pinking (saw tooth) pattern.
5. Inspect the bearing dowel pins for wear.

6. Inspect the sealing surfaces of the crankcase halves for trueness by placing each crankcase half on a surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move each half in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots by continuing to move the half in a figure eight motion until a uniform bright metallic finish is attained.

Fig. 2-47



AJ056

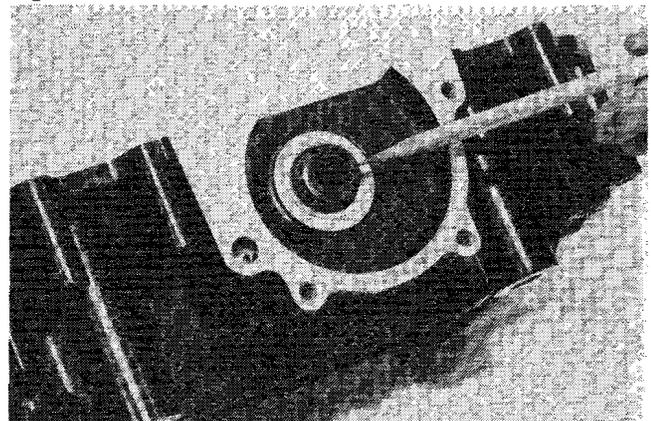
**⚠ CAUTION**

Water or cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

### WATER PUMP ASSEMBLY

1. If the water pump shaft was removed, inspect the water pump seal for any rough areas or scratches on its outer sealing surface. If either condition is found, replace the seal.

Fig. 2-48



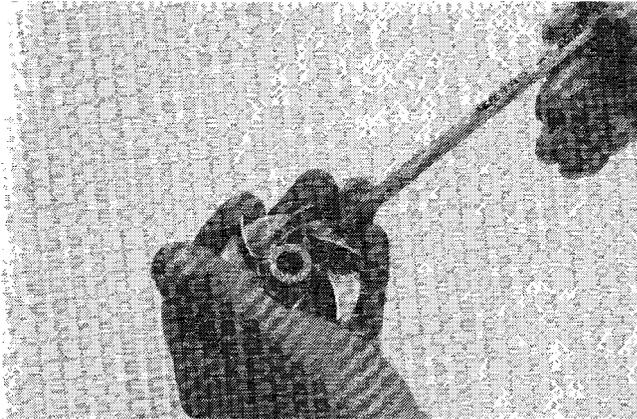
AJ089

2. Inspect the water pump shaft bearing located in the crankcase. Turn the bearing by hand. If any roughness or binding is noted, replace the bearing.

**NOTE:** For seal or bearing replacement instructions, see Assembling Engine section of this manual.

3. Inspect the water pump impeller. Inspect impeller blades for any signs of cracking or chipping. If either condition exists, replace the impeller.

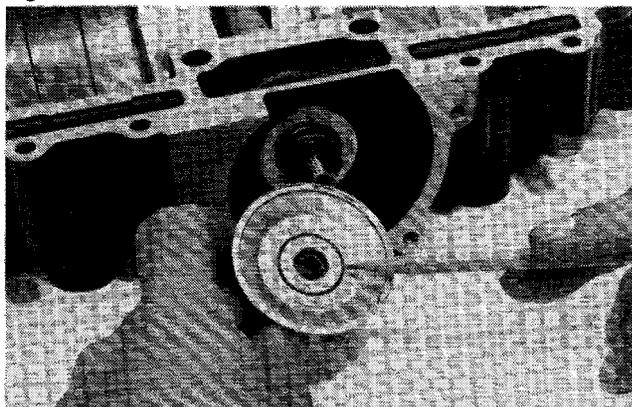
Fig. 2-49



AJ049

4. Inspect the impeller sealing surface (located on the backside of the impeller). The sealing surface must be smooth and free of any worn, scratched, or chipped areas. If any of these conditions exist, replace the impeller sealing ring. It can be removed by prying upward using a small screwdriver blade. To install the new sealing ring place the rubber cup washer into the impeller seal area. Next, place the seal (marked side down) into the rubber cup and press firmly into position using your thumbs.

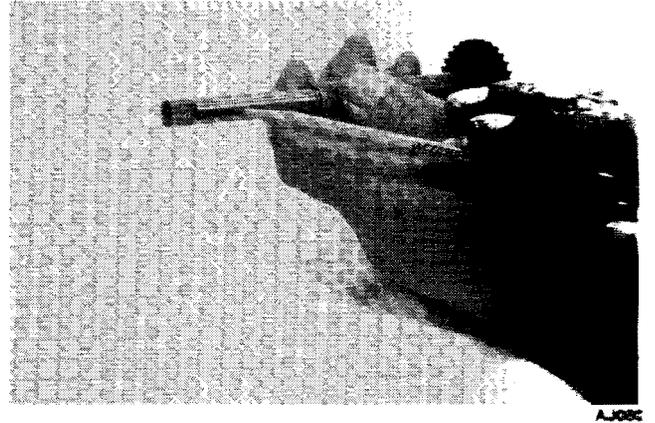
Fig. 2-50



AJ048

5. Inspect the water pump driveshaft. Inspect the gear for any signs of chipping or gear tooth roughness. If either condition is found, replace the driveshaft.
6. Inspect the bearing and seal areas of the driveshaft. If roughness or discoloration is noted in these areas, replace the driveshaft.

Fig. 2-51

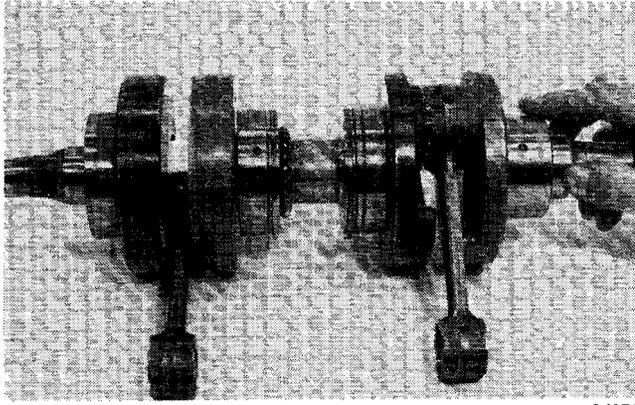


AJ050

## CRANKSHAFT

1. Wash the crankshaft and bearings in cleaning solvent.
2. Inspect the bearings for wear, scoring, scuffing, damage, or discoloration. Rotate the bearings. Bearings must rotate freely and must not bind or feel rough. If any abnormal condition is noted, replace the bearing (see Removing Outer Crankshaft Bearings section).
3. Inspect crankshaft PTO-end bearing. Rotate bearing and check for roughness. If any roughness or binding is noted, replace the bearing. The bearing may be removed by simply sliding straight off the PTO end. Wash, oil, and check bearing again. If the bearing still feels rough, replace the bearing. Check PTO-end of the crankshaft. If the bearing-race area is rough, replace the PTO end of the crankshaft.

Fig. 2-52



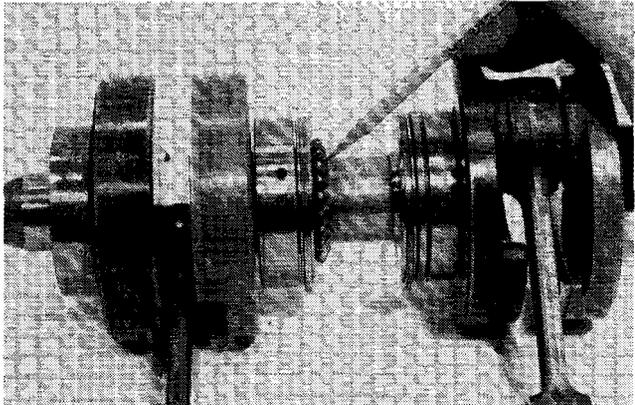
AJ074

4. Inspect the connecting-rod bearings by rotating them. Bearings must rotate freely and must not bind or feel rough. If a connecting-rod bearing must be replaced, the connecting rod and crank pin must also be replaced.

**NOTE: Lubricate bearings thoroughly prior to assembly.**

5. Inspect the crankshaft drive gear for wear or chipped teeth. If either condition is found, replace either the gear or the crankshaft assembly.

Fig. 2-53

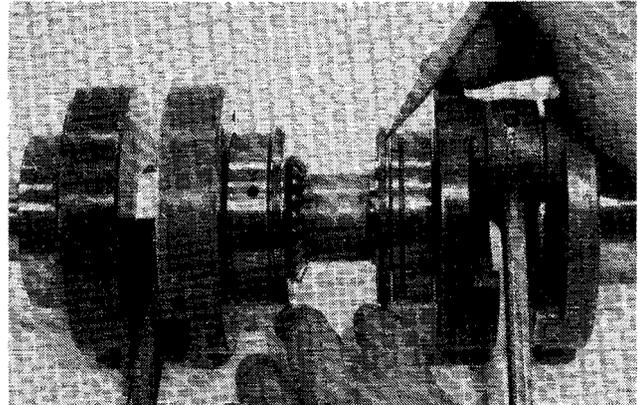


AJ070

**NOTE: The gear is replaceable only by completely disassembling the crankshaft. To disassemble the crankshaft, special tools and skills are required. It is recommended that you contact an experienced crankshaft rebuilder or the Arctco Service Department if you decide to rebuild a crankshaft.**

6. Visually inspect the two crankshaft sealing rings for wear or any signs of cracks. If either condition exists, replacement is required. See the preceding note concerning crankshaft gear replacement.

Fig. 2-54



AJ069

### Removing Outer Crankshaft Bearings

**⚠ WARNING**

A good pair of safety glasses must be worn when spreading bearings.

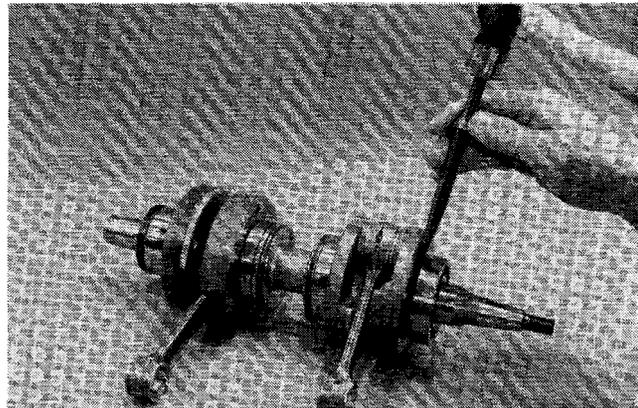
1. Place a bearing support (block of wood, etc.) beneath the bearing that is to be removed.

**⚠ CAUTION**

A bearing support must be positioned beneath the bearing that is to be removed to prevent crankshaft damage.

2. Drive a chisel or bearing splitter between the bearing race and counterweight until the bearing is spread far enough to install the jaws of the Crankshaft Bearing Remover.

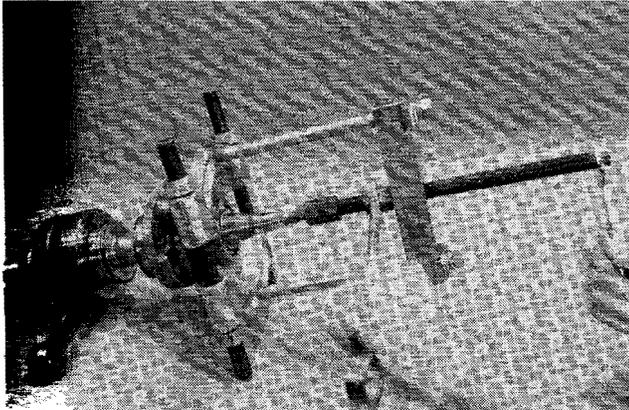
Fig. 2-55



AO007

- Place a protective cap on the end of the crankshaft; then using the Crankshaft Bearing Remover (p/n 0144-302), pull the bearing off the end of the crankshaft. Account for any shim(s).

Fig. 2-56



AO006

**NOTE:** When removing a MAG-side bearing from the crankshaft, thread either a protective cap or the flywheel nut onto the crankshaft to prevent damage to the crankshaft threads. Also, make sure to note the position of the dowel-pin hole.

- The PTO-side bearing may be removed by simply sliding the bearing off the PTO end.
- Inspect the crankshaft bearing area for wear. If any wear is noted, replace the crankshaft end.

### Installing Outer Crankshaft Bearings

**NOTE:** Steps 1-3 are for installing the MAG-side bearing.

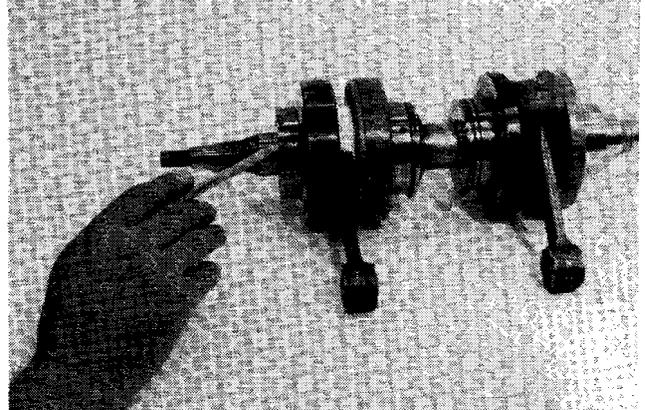
- Wrap a thick towel around the crankshaft; then secure the crankshaft vertically in a vise.
- Heat the bearing either by placing the entire bearing on a hot plate covered with oil or by squirting oil into the bearing and using a propane torch to heat the inner race of the bearing until a slight smoke is noted coming from the bearing.

**CAUTION**

DO NOT overheat the bearing.

- Place any shims removed during disassembly onto the crankshaft; then slide the bearing onto the crankshaft making sure the dowel-pin hole in the outer race is properly positioned and will align with its hole and pin in the crankcase.

Fig. 2-57



AJ072

- Lubricate the PTO-bearing rollers with a good snowmobile oil; then slide the bearing onto the PTO end of the crankshaft. Make sure the bearing dowel pin hole is positioned next to the crankshaft counterweight.

**NOTE:** There are two holes in the outer bearing race surface. The hole that is drilled through the bearing race is the bearing lubrication port and must be positioned outwards.

### PINION DRIVE

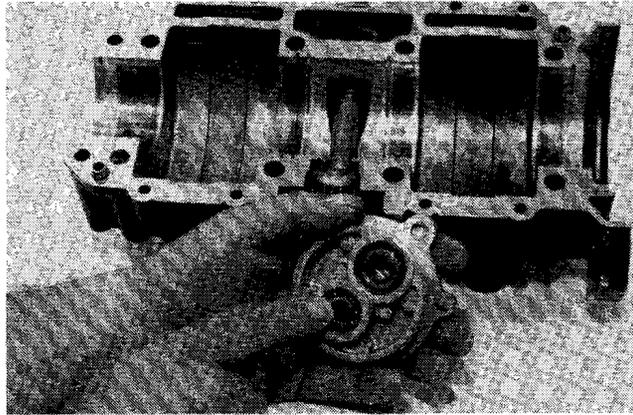
- Inspect the pinion gear teeth for wear, roughness, or chipping. Rotate the pinion bearing and check for roughness or binding. If either the pinion gear or bearing is defective, the pinion assembly must be replaced.

**CAUTION**

If either the pinion assembly or the crankshaft is ever replaced, the pinion and crankshaft gear must be re-shimmed for proper alignment and backlash. Failure to do so will cause extensive engine damage. For the proper shimming instructions, see the Assembling Engine section of this manual.

- Inspect the two bearings found in the oil injection pump retainer. Rotate each bearing by hand. If either bearing feels rough or is binding, replace the bearing. Remove the bearings from the retainer using an inside puller.

Fig. 2-58

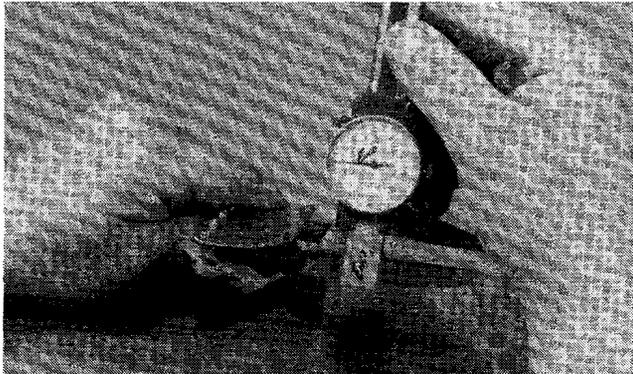


AJ050

### REED VALVES

1. Inspect the seats for cracks or wear.
2. Inspect the reeds for cracks.
3. Inspect the reed stopper height. Using a caliper, measure the distance from the seat to the bottom outer tip edge of the stopper. Measurement must not exceed specifications. If measurements are not within specifications, either bend or replace the reed stopper. See Assembling Engine section for instructions.

Fig. 2-59



AJ156

Reed Stopper Height	
mm	in.
8.8 ± 0.2	0.350 ± 0.008

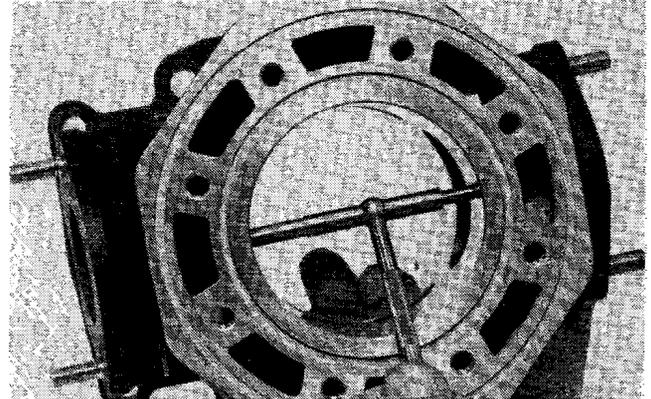
4. Inspect the reed-to-seat clearance. Using a feeler gauge, measure the clearance. Clearance must be less than 0.20 mm (0.008 in.). If clearance is not within specifications, replace the reed valve (see Assembling Engine section for instructions).

## Measuring Critical Components

### CYLINDER TRUENESS

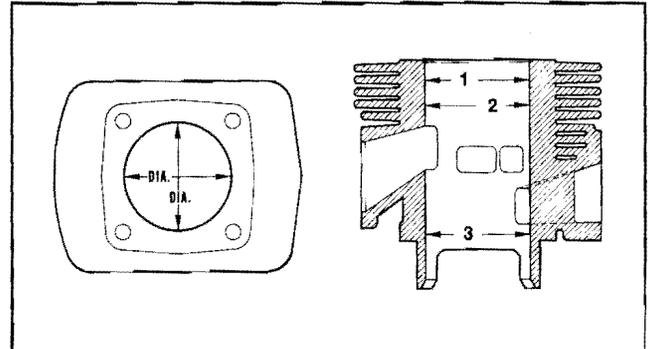
1. Measure each cylinder in the three locations shown from front to back and side to side for a total of six readings. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications listed.

Fig. 2-60



AJ061

Fig. 2-61



0727-863

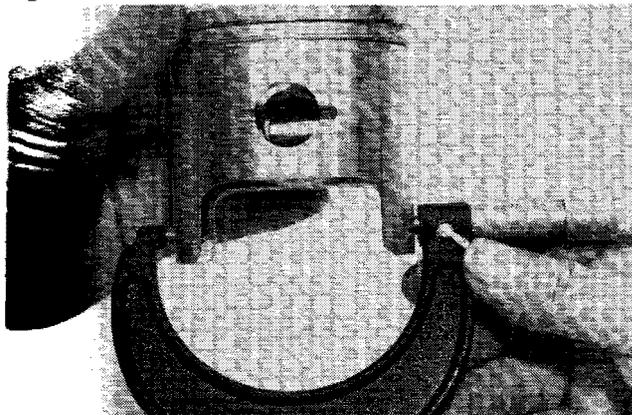
CYLINDER TRUENESS LIMIT	
mm	in.
0.10	0.004

### PISTON SKIRT/CYLINDER CLEARANCE

1. Measure each cylinder front to back 2.5 cm (1 in.) from the bottom of each cylinder.

2. Measure the corresponding piston diameter at a point 1 cm (0.394) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

Fig. 2-62



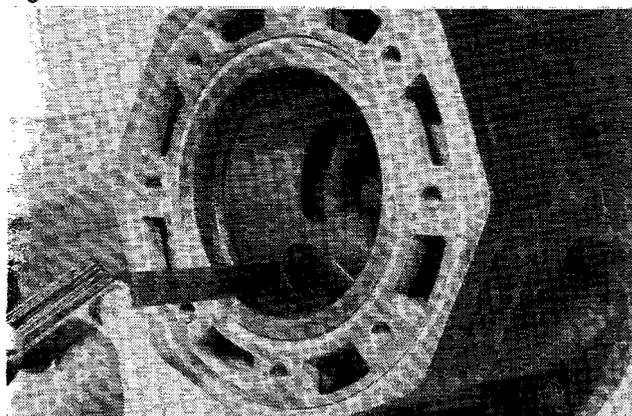
AJ063

PISTON SKIRT/CYLINDER CLEARANCE RANGE	
mm	in.
0.095-0.150	0.0037-0.0059

### PISTON-RING END GAP

1. Place each piston ring in the wear portion above the exhaust port of its respective cylinder. Use the piston to position each ring squarely in each cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must fall within specifications.

Fig. 2-63



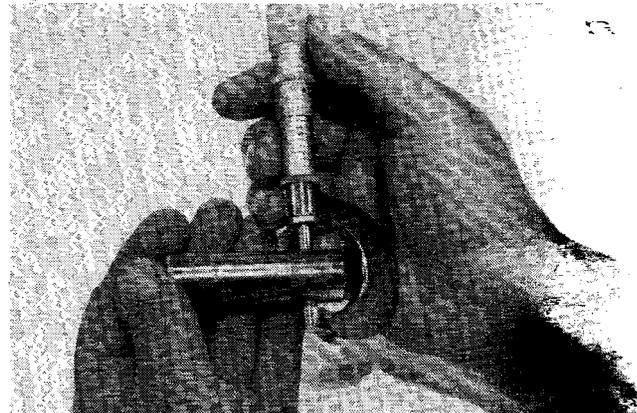
AJ068

PISTON-RING END GAP RANGE	
mm	in.
0.20-0.80	0.008-0.031

### PISTON PIN AND PISTON-PIN BORE

1. Measure the piston pin diameter in several places. If any measurement varies by more than 0.02 mm (0.001 in.), the piston pin and bearing must be replaced as a set.

Fig. 2-64

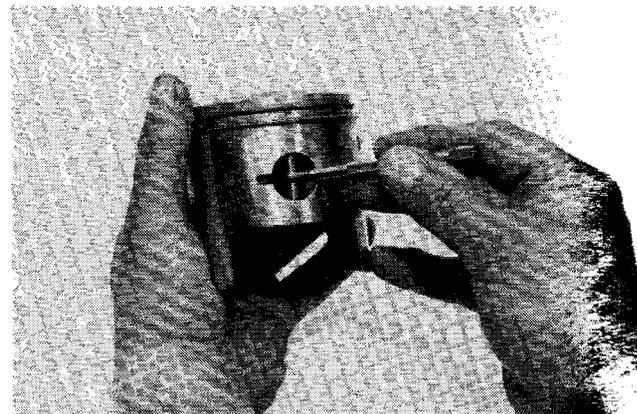


AJ065

PISTON PIN DIAMETER RANGE	
mm	in.
19.995-20.000	0.7872-0.7874

2. Insert a snap gauge into each piston-pin bore: then remove the gauge and measure it with a micrometer. Diameter must be within specifications. Take two measurement to ensure accuracy.

Fig. 2-65



AJ064

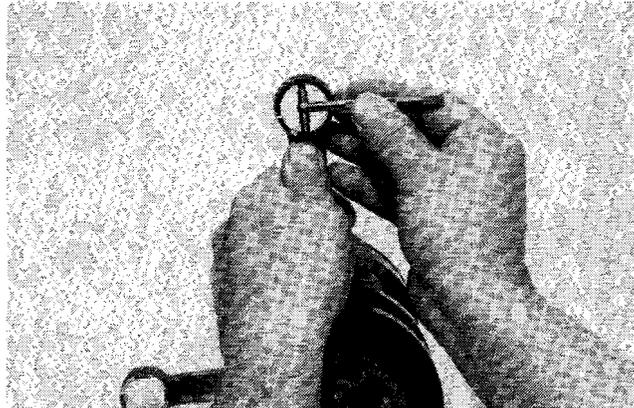
2

PISTON-PIN BORE DIAMETER RANGE	
mm	in.
20.002-20.010	0.7875-0.7878

### CONNECTING-ROD SMALL END

1. Insert a snap gauge into each connecting-rod small end bore; then remove the gauge and measure it with a micrometer. Diameter must be within specifications.

Fig. 2-66



CONNECTING-ROD SMALL END DIAMETER RANGE	
mm	in.
26.003-26.011	1.0237-1.0241

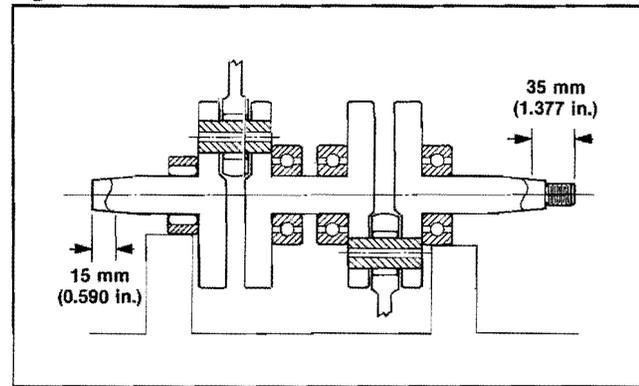
### CRANKSHAFT RUNOUT

1. Using a set of V-blocks, support the crankshaft on a surface plate.

**NOTE:** The V-blocks should support the crankshaft on a surface plate.

2. Mount a dial indicator having a magnetic base on the surface plate. Position the indicator contact point against the crankshaft 15.0 mm (0.590 in.) in from the PTO end of the crankshaft. Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).
3. Position the indicator contact point against the crankshaft 35.0 mm (1.377 in.) in from the MAG end of the crankshaft. Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).

Fig. 2-67



CRANKSHAFT RUNOUT (Total Indicator Reading)		
	mm	in.
Maximum	0.05	0.002

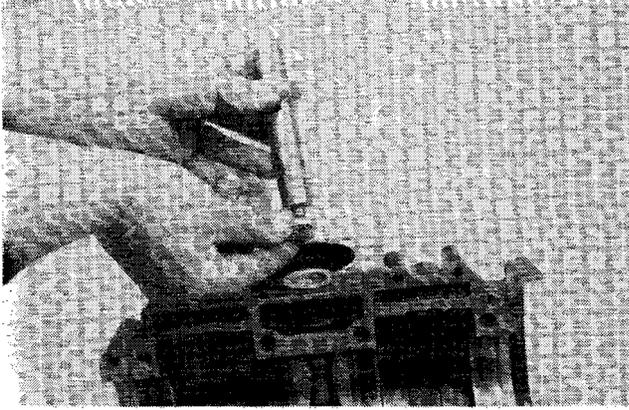
4. Position the indicator contact point against either center bearing. Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).
5. If runout exceeds specifications at either end or in the middle, the crankshaft must be either straightened or replaced.

## Assembling Engine

**NOTE:** Complete steps 1-8 only if the water pump has been disassembled.

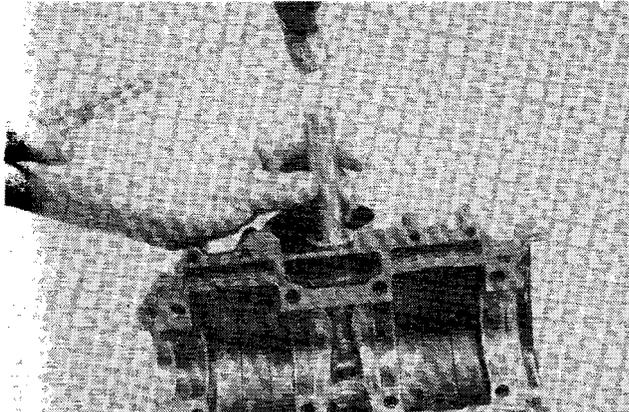
1. Using the bearing installation tool from the Water Pump Rebuilding & Bearing Kit and a hammer, place the water pump shaft bearing down into the bore and drive it into position. Seat the bearing against the rear shoulder of the bore.

Fig. 2-68



AJ148

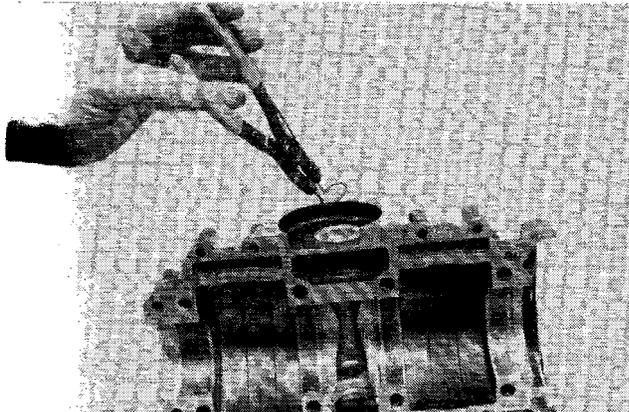
Fig. 2-69



AJ149

- Using a pair of snap ring pliers, install the snap ring which secures the water pump shaft bearing. Make sure the snap ring is seated firmly in the snap ring groove.

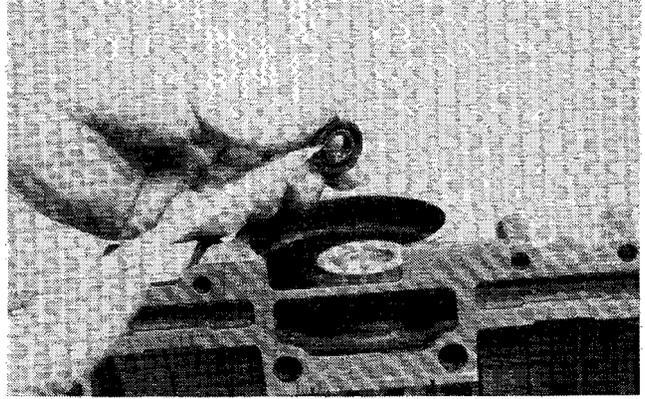
Fig. 2-70



AJ150

- Apply grease to the inner lips of the small water pump shaft seal. Position the seal on the seal driver with the spring side of the seal facing outward. Make sure the small spring located around the lip of the seal is properly positioned.

Fig. 2-71



AJ151

**⚠ CAUTION**

When positioning the seal on the driver, check to make sure the small spring is still in position around the lip of the seal.

- Using the seal driver, gently drive the seal down into position against the snap ring. Check the seal after the first couple of taps to make sure it is started straight.

Fig. 2-72



AJ152

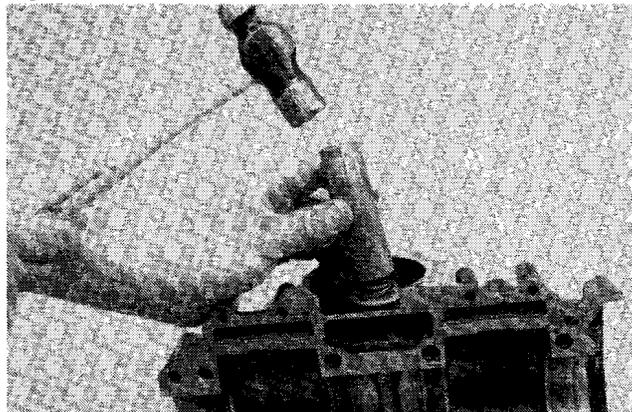
- Apply a thin, even coat of silicone sealer (p/n 0636-069) to the outer metal case of the water pump seal.



AJ153

6. Using the water pump seal driver, gently drive the seal into position in the crankcase bore. The seal is properly seated when its metal flange is tight against the crankcase. Wipe any excess sealer from the crankcase after the seal is properly seated.

Fig. 2-74



AJ154

**CAUTION**

After the seal has been installed, closely examine the seal surface to make sure it hasn't been damaged.

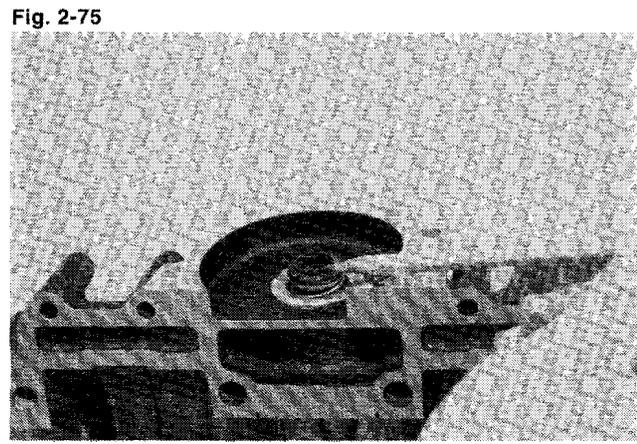
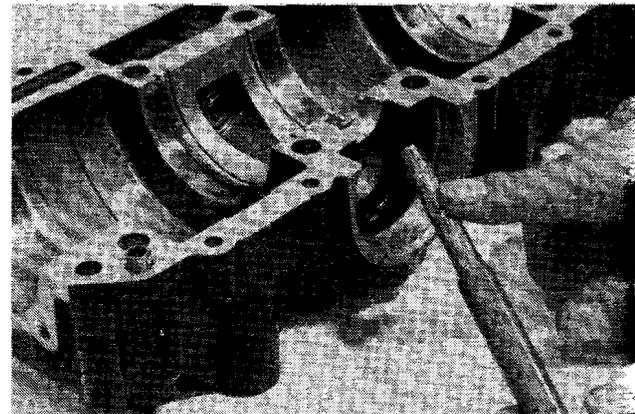


Fig. 2-75

AJ155

7. Apply a light coat of grease to the smooth, machined portion of the water pump shaft; then while slowly rotating the shaft as it enters the bearing and seal area, gently push the shaft into position.

Fig. 2-76



AJ090

**CAUTION**

Care must be used when installing the water pump shaft or the small spring could be forced out of its position on the inner seal. Slowly push the well-greased shaft through the inner seal, slowly rotating the shaft clockwise as it enters the seal.

8. Apply a coat of grease to the impeller sealing area on the backside of the impeller; then install the water pump impeller onto the shaft. Apply Red LOCTITE to the impeller bolt threads and torque to 0.8-1.0 kg-m (6-7 ft-lb).

**NOTE:** When installing the washer on the impeller bolt, the rubber side must face the impeller. If installed incorrectly, coolant will leak from the crankcase bleed hole.