

SECTION 2 — ENGINE

TABLE OF CONTENTS

Engine	2-2
Removing Engine (Table of Contents)	2-2
Disassembling Engine (Table of Contents)	2-11
Cleaning and Inspecting Engine	2-44
Measuring Critical Components	2-49
1999 Engine Specifications (60 cc)	2-51
2000 Arctic Cat Engine Specifications	2-52
Assembling Engine (Table of Contents)	2-53
Assembly Schematics (Table of Contents)	2-99
Installing Engine (Table of Contents)	2-118
Troubleshooting Engine (Carbureted Models)	2-127
Troubleshooting Engine (EFI Models)	2-131
Engine Information (Table of Contents)	2-135

Engine

This engine servicing section has been organized into sub-sections which show a progression for the complete servicing of the Arctic Cat engine. For consistency purposes, this section shows a complete and thorough progression; however, for efficiency it may be preferable to remove the engine as a complete assembly, to remove and disassemble only those components which need to be addressed, and to service only those components. The technician should use discretion and sound judgment.

■ **NOTE:** Some photographs used in this section are used for clarity purposes only and are not designed to depict actual conditions.

Removing Engine Table of Contents

60 cc Model	2-2
Twin F/C Models	2-3
440 LC/500/580/600 Twin/700 cc Models	2-5
550 cc Models	2-7
Triple Models	2-9

Removing Engine (60 cc Model)

1. Remove the cap screw securing the hood cable to the engine.
2. Remove the two sheet metal screws securing the chain guard to the console and tunnel.

Fig. 2-1



A940

3. Disconnect the connecting link in the drive chain; then remove the drive chain.
4. Remove the cap screw and rubber mount securing the brake band to the brake assembly bracket. Account for a spacer and a washer.

Fig. 2-2



A951

5. Remove the brake band assembly.
6. Loosen the throttle cable set screw; then loosen the throttle cable jam nut and remove the throttle cable.

Fig. 2-3



A954

Fig. 2-4



A953

7. Disconnect the engine wiring harness from the main wiring harness.

Fig. 2-5



A957

8. From beneath the front end, remove the four cap screws securing the engine to the front end. Account for the washers and lock washers.

Fig. 2-6



A958

9. Remove the engine assembly.

Removing Engine (Twin F/C Models)

■ **NOTE:** If equipped with electric start, disconnect the battery.

1. Turn the gas tank shut-off valve to the CLOSED position.
2. Open the belt guard.
3. Remove the drive belt; then remove the plug from the belly pan.

■ **NOTE:** Before installing the clutch puller, apply oil to the threads of the puller and a small amount of grease to the tip of the puller.

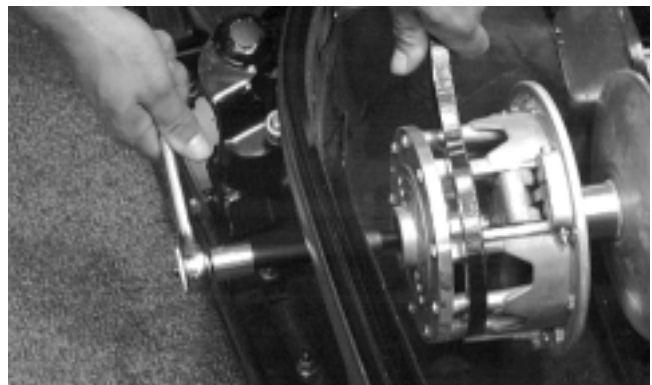
4. Remove the bolt and lock washers securing the drive clutch to the crankshaft; then using the Drive Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Drive Clutch Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller with a hammer. Repeat this procedure until the clutch releases.

Fig. 2-7



AF472D

Fig. 2-8

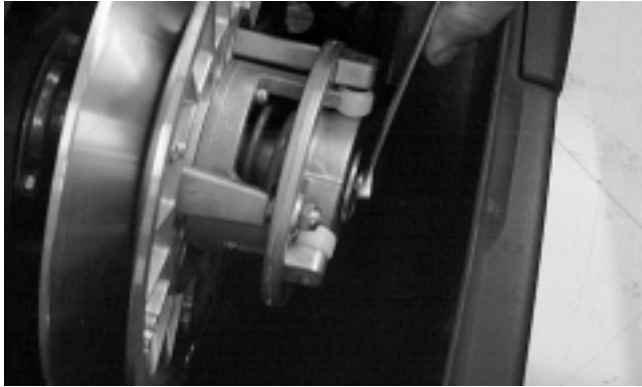


AF476D

5. Remove the clutch from the engine compartment.
6. Remove the cap screw and washer securing the driven pulley; then slide the pulley off the driven shaft. Account for and note the position of any alignment washers.

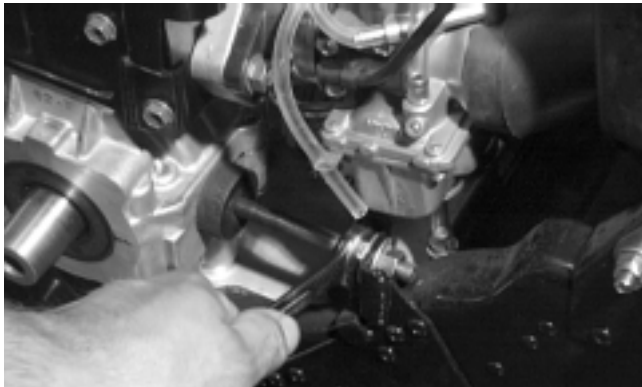
■ **NOTE:** If the driven pulley will not slide off the driven shaft, use the Driven Pulley Puller (p/n 0744-023) for removal.

Fig. 2-9



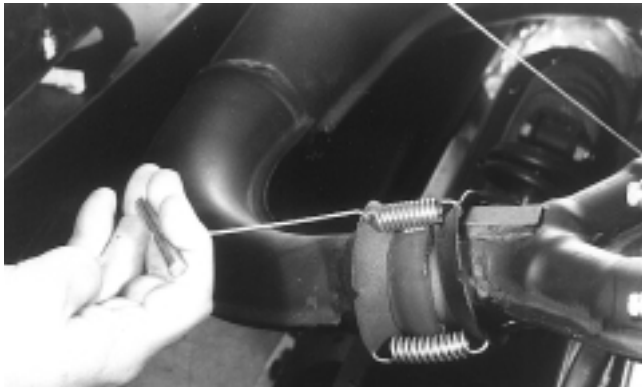
7. Remove the torque bumper. Account for any engine mount shims.

Fig. 2-10



8. Remove the springs securing the expansion chamber to the exhaust manifold and resonator; then remove expansion chamber.

Fig. 2-11



9. Remove the cap screws and lock washers securing the recoil starter; then remove the starter. Leave it in the engine compartment.

Fig. 2-12

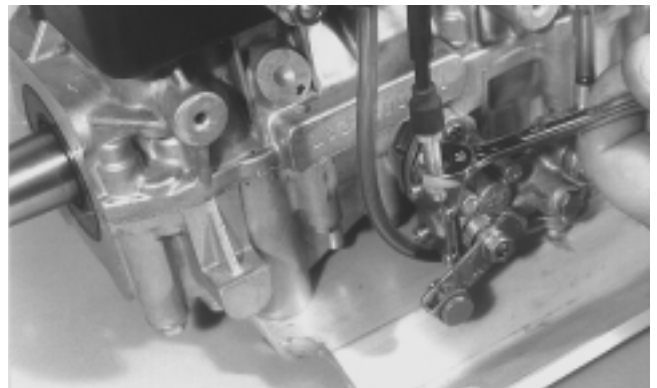


10. Disconnect the four-prong main wiring harness connector and the CDI unit wiring harness.
11. Disconnect the impulse hose from the crankcase.
12. Disconnect the spark plug caps.
13. Loosen the carburetor flange clamp(s). Remove the carburetor(s) from the intake flange(s) and carburetor boot(s). Place the carburetor(s) to the side in an upright position.

NOTE: If equipped with electric start, remove the lock nuts and washers securing the starter motor to the engine mounting bracket and remove the starter motor.

14. Disconnect the oil-injection cable from the oil-injection pump. Account for the E-clip and washer; then disconnect the oil supply hose from the pump and plug the hose to prevent leakage.

Fig. 2-13



NOTE: If equipped with electric start, remove the two lock nuts and washers securing the starter motor bracket; then remove the three remaining cap screws, washers, and lock washers securing the starter motor bracket and ground cable. Remove the starter motor bracket.

15. On the Bearcat models, remove the four cap screws securing the engine plate to the front end. Account for four washers, female mounts, and cup washers.

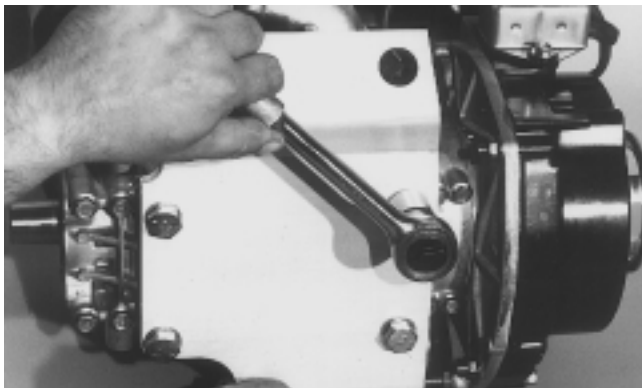
Fig. 2-14



AL201D

16. On the Bearcat models, lift the engine w/plate out of the engine compartment.
17. On the Bearcat models, remove the cap screws securing the plate assembly to the engine; then separate the engine and plate.

Fig. 2-15



AB007

18. On the Panther/Z models, remove the cap screws securing the engine to the front end. Account for washers, cap screws, and lock nuts.
19. On the Panther/Z models, lift the engine out of the engine compartment.
20. On the Panther/Z models, remove the cap screws, washers, and lock washers securing the engine mounting brackets to the engine; then remove the brackets.

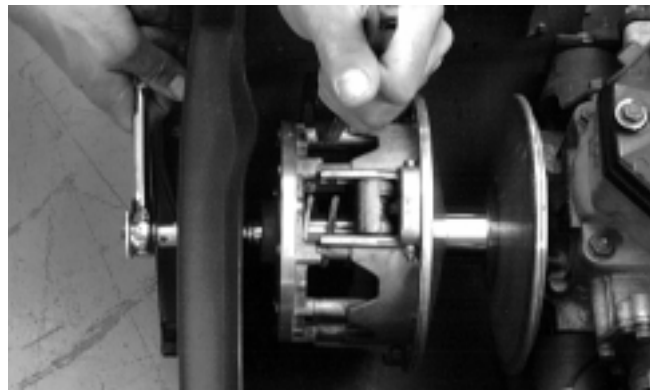
Removing Engine (440 LC/ 500/580/600 Twin/700 cc Models)

■NOTE: If applicable, disconnect the battery cables.

1. Turn the gas tank shut-off valve to the CLOSED position.

2. Remove all springs securing the expansion chamber(s) and remove the expansion chamber(s) from the engine compartment.
3. Open the belt guard; then remove the drive belt.
4. Remove the plug from the belly pan. Using a ½-in. 12-point socket, remove the cap screw and lock washer securing the drive clutch to the crankshaft; then using Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.

Fig. 2-16



AN380D

5. Remove the cap screw and washer securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a key, stub shaft, and alignment washers.

Fig. 2-17



AF120D

■NOTE: If the driven pulley is tight on the driven shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).

6. If applicable, remove the machine screw and washer securing the mounting plate (for the ignition coil and fuel pump) to the air-intake silencer.

Fig. 2-18



AN613D

■ **NOTE:** On the 700 cc models, lift the air-intake silencer; then move the silencer forward and out of the engine compartment.

7. Remove the screws securing the air-intake silencer; then move the silencer forward and out of the engine compartment.
8. Loosen the flange clamps securing the throttle body/carburetor to the flange; then remove the throttle body/carburetor. Place them to one side in an upright position.
9. On carbureted models, disconnect the impulse hose from the crankcase.

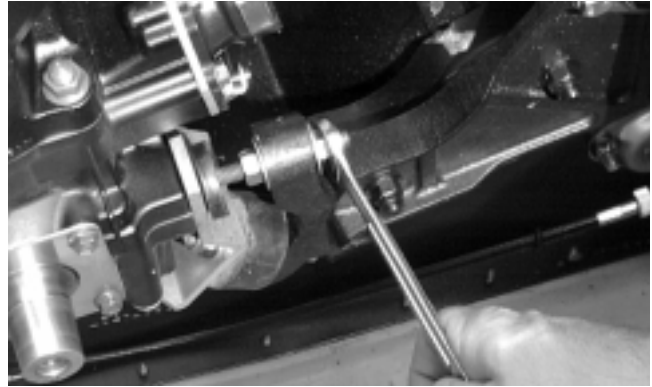
Fig. 2-19



AN385D

10. Loosen the engine torque bumper and remove the left rear engine nut and washer.

Fig. 2-20



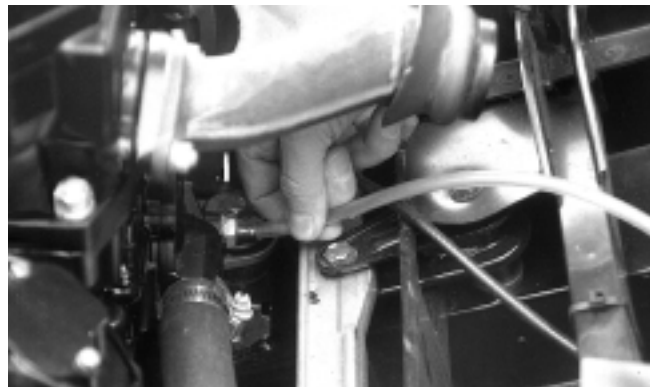
AN610D

11. Secure the hood with a tie-down strap; then remove the hood cable.
12. Remove the exhaust manifold from the engine. Account for nuts, washers, and gaskets.
13. Disconnect all electrical wires from the engine.
14. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the oil-injection pump. Disconnect the oil-supply hose from the pump and plug the hose to prevent oil drainage.
15. Remove the recoil starter from the engine. Leave it in the engine compartment.

■ **NOTE:** If applicable, disconnect the solenoid-to-starter motor cable from the starter motor.

16. Loosen the cap screws/lock nuts securing the engine mounting brackets to the front end.
17. Lift the engine up and attach a long piece of fuel hose to the engine coolant drain (located on the exhaust side of the engine). Route the hose 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.

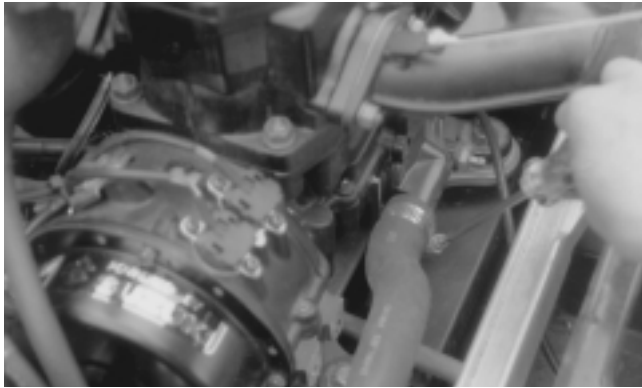
Fig. 2-21



AP058

18. Raise the engine up slightly; then loosen the clamp securing the supply hose to the water pump housing and remove the hose from the water pump. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.

Fig. 2-22



AN143

■ **NOTE:** Inspect the engine to ensure all wires, hoses, and cables have been removed.

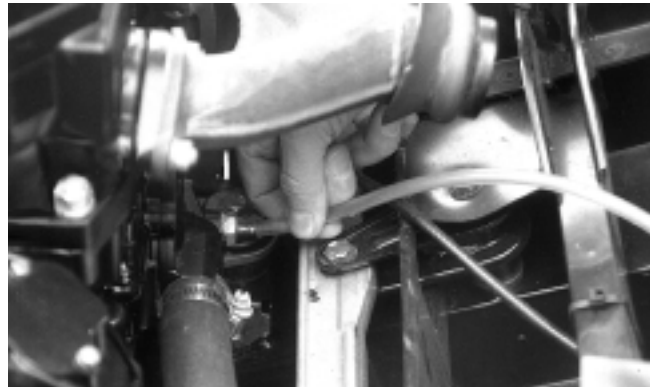
19. Lift the engine with mounting brackets out of the engine compartment.
20. Remove the cap screws securing the engine mounting brackets to the crankcase; then remove the brackets.

Removing Engine (550 cc Models)

1. Disconnect the battery cables making sure to disconnect the negative cable first.
2. Turn the gas tank shut-off valve to the CLOSED position.
3. Remove the cable tie and positive battery cable from the starter motor.
4. On the Wide Track, remove the two lock nuts securing the starter motor to the engine mounting bracket; then place the starter motor and end cap off to the side.
5. Remove the springs securing the expansion chamber to the exhaust manifold, front end, and resonator. Remove the expansion chamber and grafoil gasket.

6. Attach a long piece of fuel hose to the engine coolant drain (located on the exhaust side of the engine). Route the hose 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.

Fig. 2-23



AP058

7. Open the belt guard; then remove the drive belt.

■ **NOTE:** On the Wide Track, remove the machine screws securing the side panel to the belly pan; then remove the side panel. On the Panther 550 and ZL 550, remove the rubber plug from the belly pan.

Fig. 2-24

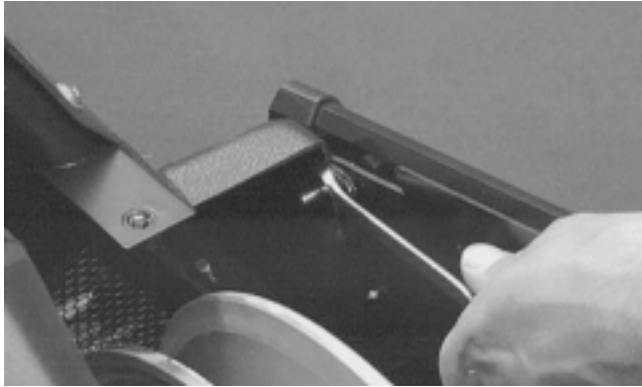


AM115D

8. Using a 1/2-in. twelve-point socket, remove the bolt and lock washer securing the drive clutch to the crankshaft. Using the Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and the Flywheel Pulley/Spanner Wrench (p/n 0144-310), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.

■ **NOTE:** On the Wide Track, remove the lock nut securing the belly pan and bumper to the bumper support tube; then remove the rear plug from the belly pan.

Fig. 2-25



AF459D

9. Remove the cap screw and washer securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a key and alignment washers.

Fig. 2-26



AF120D

■ **NOTE:** If the driven pulley is tight on the driven shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).

10. Loosen the flange clamp securing each carburetor to its flange; then remove the carburetors. Position the carburetors to one side in an upright position.

Fig. 2-27

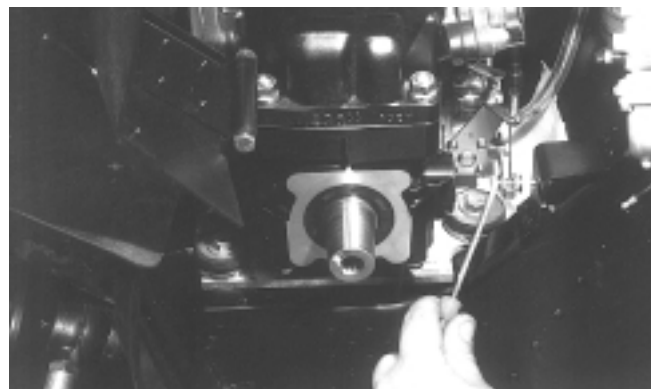


AJ172

11. Disconnect the impulse hose from the crankcase.

12. Remove the cable tie securing the engine and CDI wiring harnesses to the engine; then disconnect the main wiring harness from the engine and CDI wiring harnesses.
13. Remove the spark plug caps and the cable tie securing the temperature-gauge sender wire; then disconnect the sender wire.
14. On the Wide Track, remove the ground wire from the magneto housing.
15. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the pump. Disconnect the oil-supply hose from the pump and plug the hose to prevent oil drainage.

Fig. 2-28



AN009

16. Loosen the clamp securing the supply hose to the water pump housing; then remove the hose from the water pump. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.
17. Remove the four cap screws and lock washers securing the recoil starter; then remove the starter from the engine. Leave it in the engine compartment.

■ **NOTE:** On the Panther 550, account for the ground wire.

18. Support the hood; then remove the hood cable from the exhaust manifold.
19. Remove the mounting hardware securing the engine to the front end.

■ **NOTE:** On the Wide Track, account for shims and note their position on the left rear engine mount for assembly purposes.

Fig. 2-29

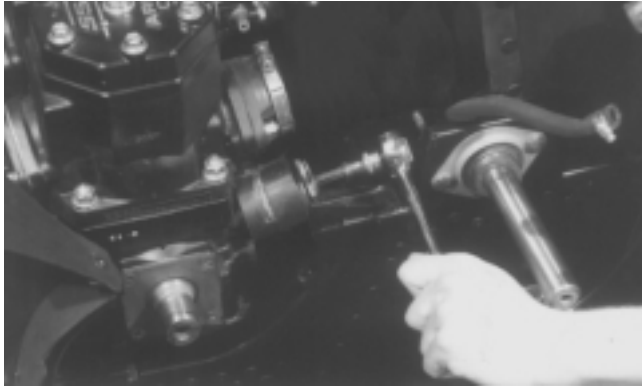
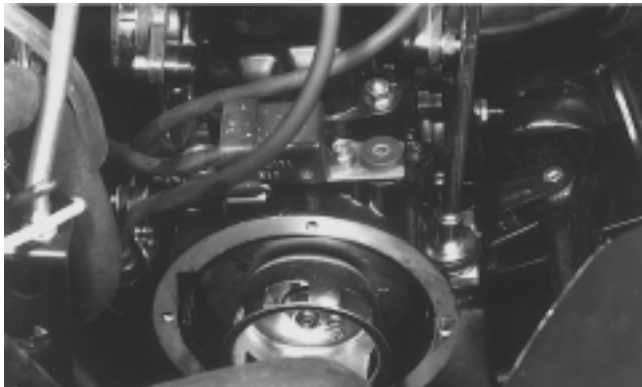


Fig. 2-30



20. Lift the engine with mounting brackets out of the engine compartment.

CAUTION

Do not use the starter motor shaft to lift the engine. Damage may occur.

21. Remove the engine mounting brackets.

Removing Engine (Triple Models)

1. Turn the gas tank shut-off valve to the CLOSED position.

Fig. 2-31



2. Secure the hood with a hold-down strap; then remove the hood cable.
3. Remove the springs securing the expansion chambers to the header pipes, the front end, and the resonator. Remove the expansion chambers and three grafoil gaskets.

■ **NOTE:** Number the expansion chambers before removing to aid in assembly.

4. Remove the cap screws securing the resonator. Account for and note the location of the engine ground cable with star washer, washers, bushings, spacers, and retaining nuts.
5. Attach a long piece of fuel hose to the engine coolant drain. Route the hose outside the engine compartment and into a container. Open the drain valve; then remove the coolant filler cap to vent the system. Once the coolant stops flowing, remove the hose and tighten the drain valve.

Fig. 2-32



6. Open the belt guard; then remove the drive belt.

7. Remove the plug from the belly pan; then using a 1/2 in. twelve-point socket, remove the bolt and lock washer securing the drive clutch to the crankshaft. Using the Drive Clutch Puller (p/n 0644-207) and an impact wrench or a breaker bar and Spanner Wrench (p/n 0644-136), tighten the puller. If the drive clutch will not release, sharply strike the head of the puller. Repeat this step until the clutch releases. Remove the drive clutch. If applicable, account for the two sleeves.

Fig. 2-33



AF472D

8. Remove the cap screw securing the driven pulley; then slide the driven pulley off the driven shaft. Account for a stub shaft, the location of all washers, and a key.

Fig. 2-34

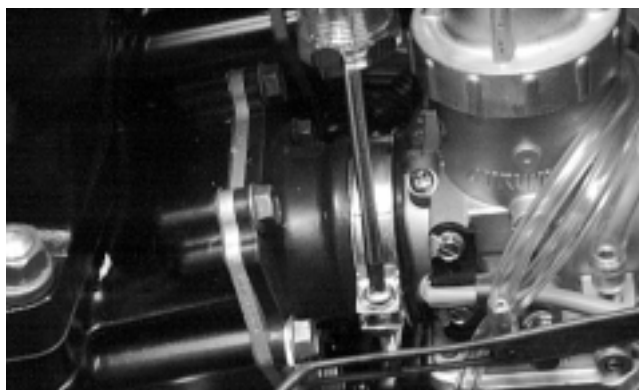


SC013D

■ **NOTE:** If the driven pulley is tight on the shaft, pull the driven pulley off using the Driven Pulley Puller (p/n 0744-023).

9. Label the carburetors. Loosen the flange clamp securing each carburetor to its flange; then remove the carburetors from the intake flanges. Position the carburetors to one side in an upright position.

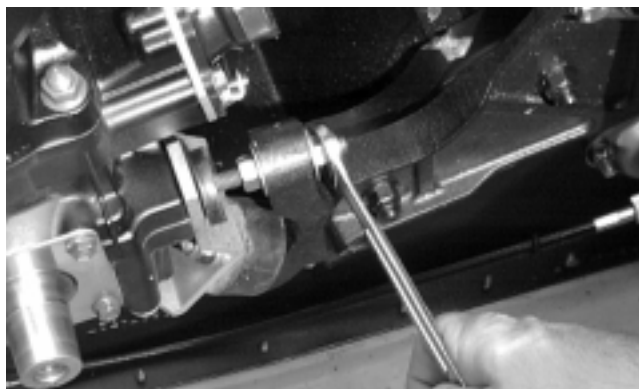
Fig. 2-35



AN614D

10. Disconnect the impulse hose from the crankcase.
11. Loosen the engine torque bumper; then remove the left-side rear engine nut and washer.

Fig. 2-36



AN610D

12. Disconnect the engine and timing sensor wiring harnesses from the main wiring harness. Remove the spark-plug caps from the spark plugs. Remove the cap screw securing the two ground wires to the magneto housing cover.
13. Remove the E-clip and washer securing the oil-injection cable; then disconnect the oil-injection cable from the oil-injection pump. Disconnect the oil-supply hose and the oil-output hose from the pump and plug the hoses to prevent oil drainage.

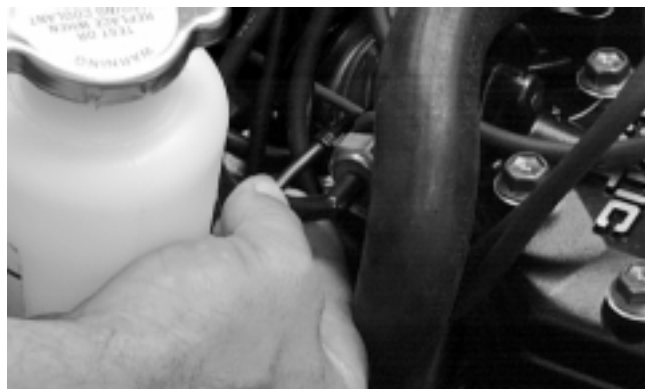
Fig. 2-37



AN392D

14. Loosen the clamp securing the coolant supply hose to the water pump housing; then remove the hose from the water pump. Loosen the clamp securing the hose to the thermostat cap; then remove the hose from the cap.
15. Disconnect the temperature-gauge sender wire.

Fig. 2-38



AJ663

16. Remove the cap screws securing the engine mounting brackets to the front end. Account for mounting hardware.
17. Lift the MAG-side of the engine. Remove the four cap screws and lock washers securing the recoil starter; then remove the starter from the engine. Leave it in the engine compartment.

Fig. 2-39



AN012

18. Lift the engine with engine mounting brackets out of the engine compartment.
19. Remove the mounting brackets from the crankcase.

Disassembling Engine Table of Contents

60 cc Model	2-11
F/C Models	2-16
440 LC/550 cc Models	2-19
500/580/600 cc Twin Models	2-22
700 cc Models	2-27
600 cc Triple Models	2-34
800/1000 cc Models	2-39

Disassembling Engine (60 cc Model)

2

FUEL TANK/CLUTCH

1. Remove the fuel supply hose from the carburetor body.

Fig. 2-40



A955

2. Loosen the machine screw securing the fuel tank bracket to the recoil starter housing; then remove the two machine screws securing the fuel tank bracket to the cylinder head and remove the fuel tank assembly.

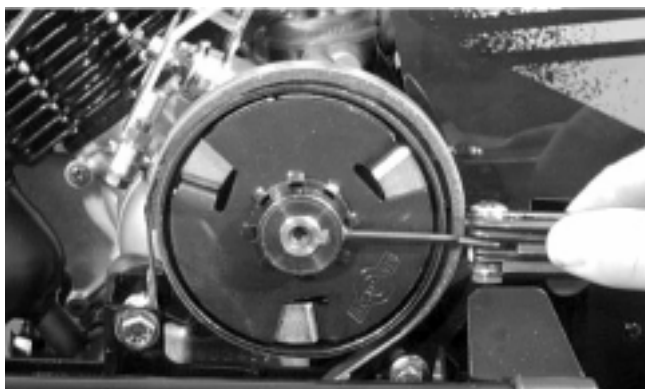
Fig. 2-41



A956

3. Loosen the set screw and remove the cap screw and washer securing the clutch to the engine primary shaft.

Fig. 2-42



A947

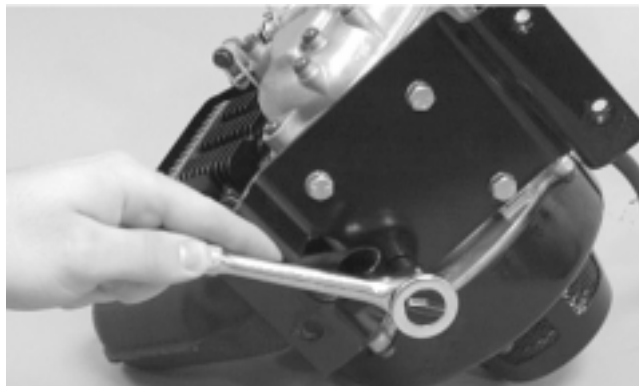
Fig. 2-43



A946

4. Using a wheel puller, remove the clutch assembly from the primary shaft.
5. Remove the four cap screws securing the engine plate to the crankcase.

Fig. 2-44

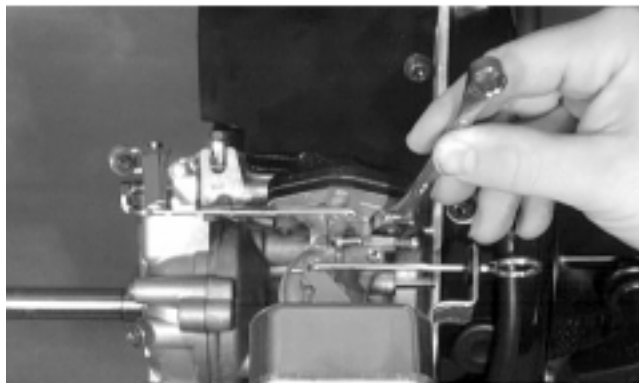


A900

FAN/CYLINDER HEAD

6. Remove the nuts and lock washers securing the carburetor. Slide the carburetor off intake studs; then disconnect the carburetor rod and rod spring.

Fig. 2-45



A779

7. Slide the gasket, insulator, and gasket off intake studs.
8. Remove the nuts and lock washers securing the muffler. Slide the muffler off the exhaust studs; then remove the exhaust gasket.

Fig. 2-46



A778

9. Remove the recoil starter.

10. Remove the screws securing the fan cover; then remove the cover.

Fig. 2-47



A775

11. Remove the cylinder head cowl.

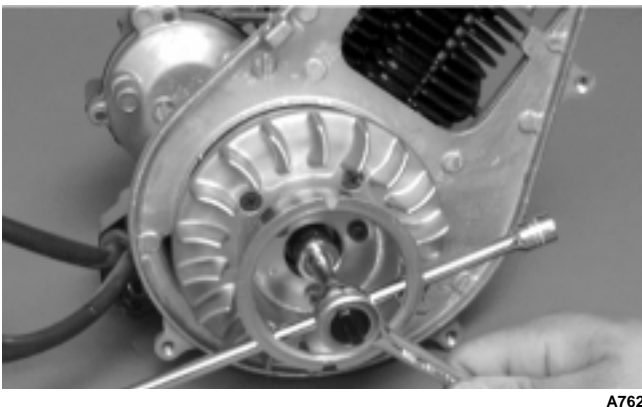
Fig. 2-48



A774

12. Using a flywheel holder (or a suitable substitute), remove the flywheel nut. Account for a lock washer and a washer.

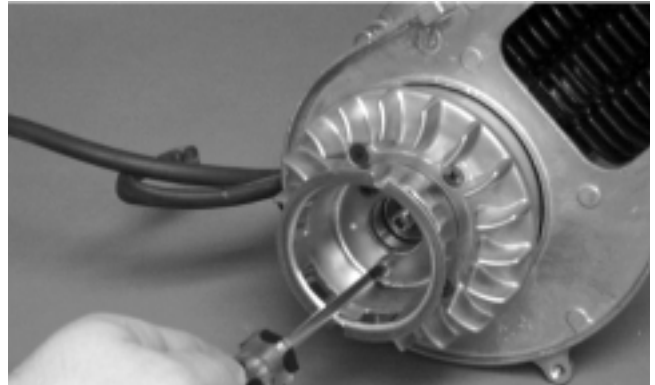
Fig. 2-49



A762

13. Remove the recoil starter pulley and spacer.

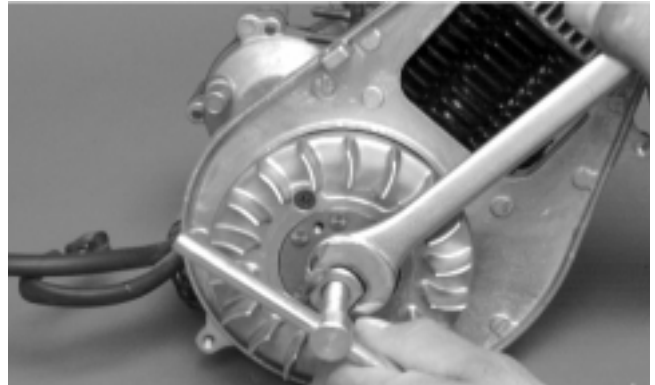
Fig. 2-50



A766

14. Using a flywheel puller, remove the flywheel. Account for the key.

Fig. 2-51



A761

15. Scribe a line on the stator plate and the crankcase for assembly purposes.

Fig. 2-52



A765

16. Remove the three screws securing the stator plate to crankcase.

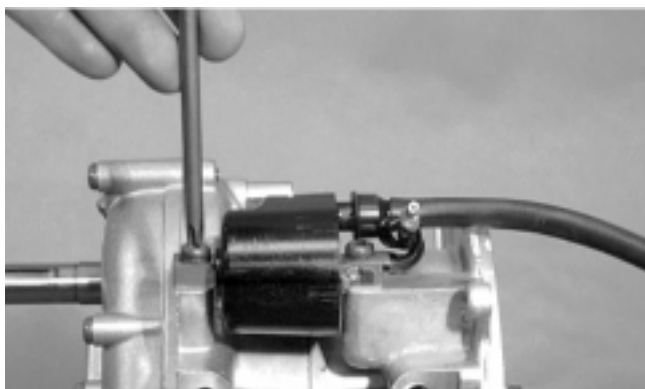
Fig. 2-53



A769

17. Disconnect the magneto lead from the ignition coil lead. Remove the screws securing the ignition coil; then remove the coil.

Fig. 2-54



A756

18. Remove the cylinder head nuts and washers; then lift the head off the cylinder studs.

Fig. 2-55



A939

19. Slide the head gasket off the cylinder studs.

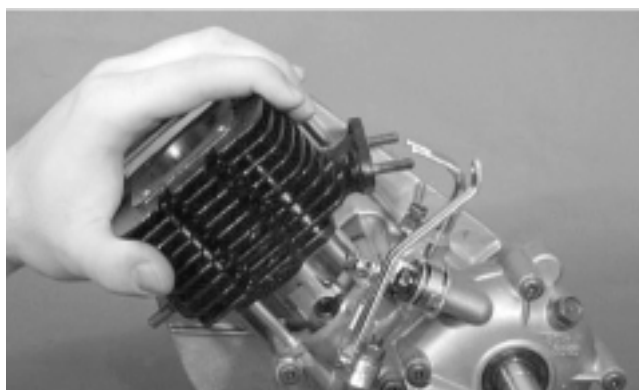
Fig. 2-56



A772

20. Slide the cylinder straight upward until free of the piston. Remove the base gasket.

Fig. 2-57



A771

21. Remove the piston pin circlips; then using the Piston Pin Puller (p/n 0644-328), remove the piston pin.

Fig. 2-58



A776

GEAR CASE/CRANKCASE

22. Using an impact screwdriver, remove the screws securing the gear case cover. Lift the cover off the crankcase.

Fig. 2-59

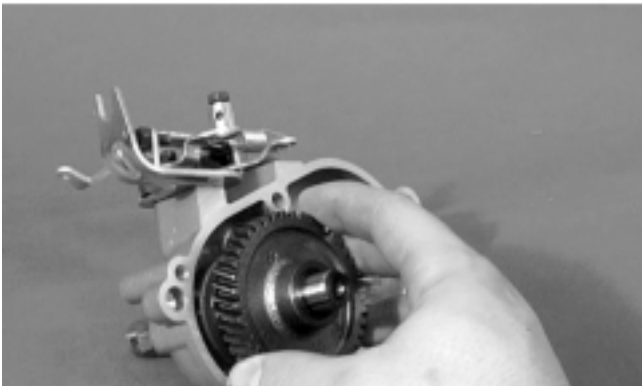


A755

23. Remove the cover gasket.

24. Remove the primary driven shaft and gear from the gear case.

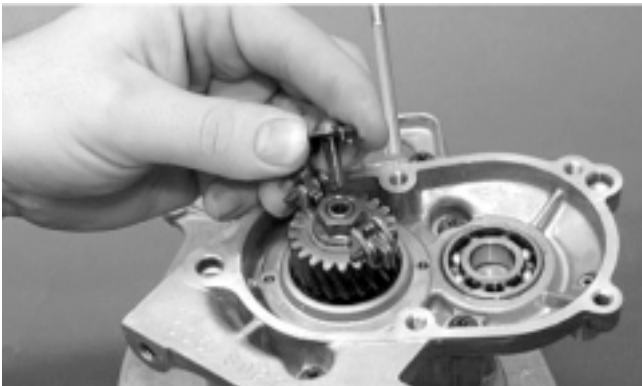
Fig. 2-60



A752

25. Remove the shifter from the end of the engine crankshaft.

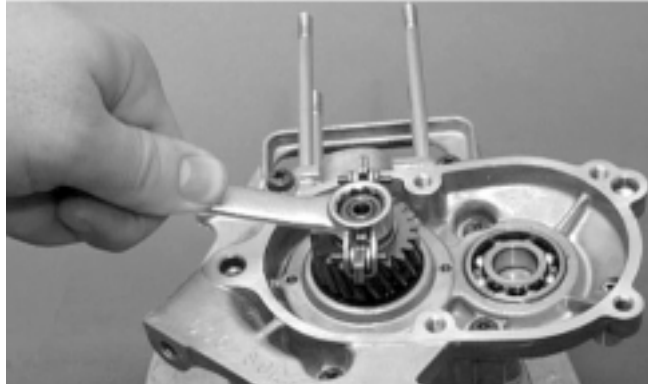
Fig. 2-61



A758

26. Remove the nut securing the primary drive gear and centrifugal to the crankshaft.

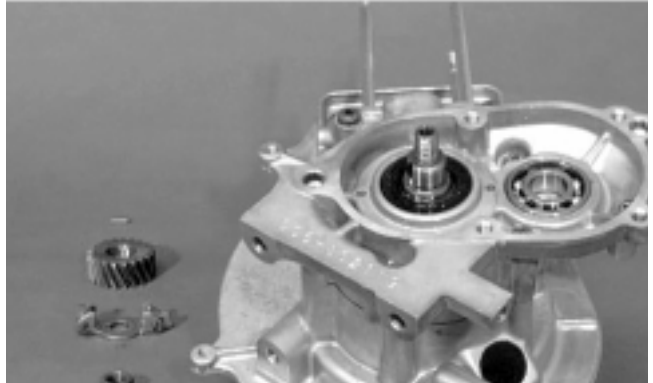
Fig. 2-62



A748

27. In order, remove the centrifugal, primary drive gear, and key from the crankshaft.

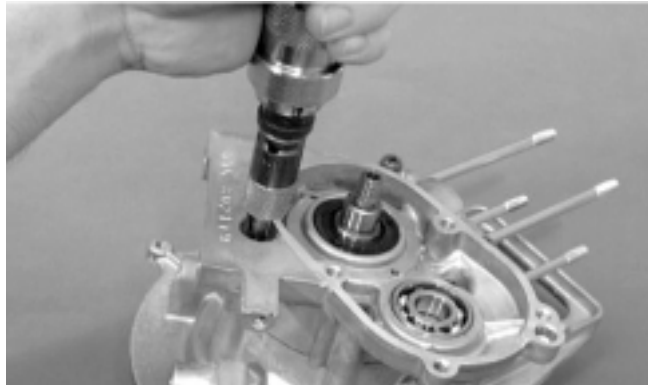
Fig. 2-63



A747

28. Using an impact screwdriver, remove the five screws securing the crankcase halves.

Fig. 2-64



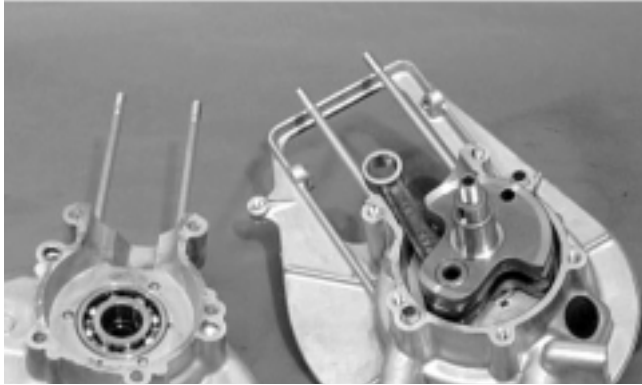
A745

29. Carefully separate the crankcase halves.

CAUTION

DO NOT use a chisel, screwdriver, or any other instrument to pry crankcase halves apart. Any damage to the crankcase sealing area will cause an air leak resulting in severe engine damage.

Fig. 2-65



A742

30. Remove the crankshaft from the crankcase.

Disassembling Engine (F/C Models)

1. Remove the four nuts and lock washers securing the exhaust manifold; then remove the exhaust manifold. Account for two gaskets.
2. Noting the location of the longer cap screws for assembly purposes, remove the 14 cap screws, lock washers, and washers securing the top and exhaust-side cooling shrouds.
3. Lift the top cooling shroud off the engine and slide the exhaust-side cooling shroud off the exhaust-manifold studs. Account for two exhaust-manifold shroud gaskets.

Fig. 2-66



AB014

4. Disconnect the two oil-injection hoses from their fittings on the intake manifold (single carburetor) or on the adapter plates (twin carburetor).

5. A. On the single carburetor model, remove the four nuts securing the intake manifold; then remove the manifold with flange from the engine. Account for two insulators. Discard the four gaskets.

- B. On the twin carburetor model, remove the four nuts, lock washers, and washers securing the intake flanges; then remove the flanges from the engine. Remove the six screws securing the adapter plates; then remove the adapter plates. Discard the two gaskets.

6. Remove the intake-manifold cooling shroud from the engine. Discard the two gaskets.

7. Using Flywheel Spanner Wrench (p/n 0144-007) to secure the crankshaft, remove the three cap screws and lock washers securing the starter pulley to the flywheel. Remove the starter pulley; then carefully pry the fan belt drive pulley from its seated position on the flywheel and remove.

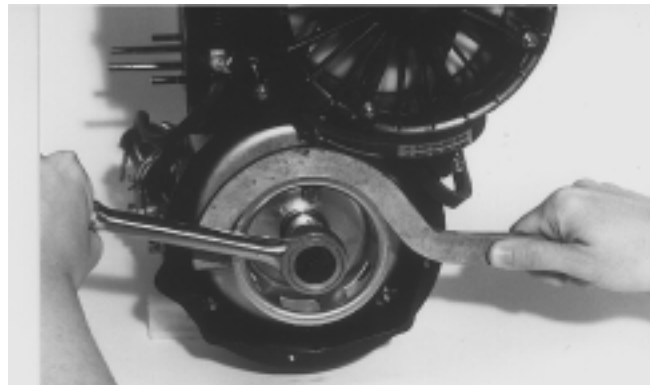
Fig. 2-67



AB020

8. Temporarily install the starter pulley on the flywheel with three cap screws. Using the flywheel spanner wrench to secure the crankshaft, loosen and remove the flywheel nut and washers.

Fig. 2-68



AB021

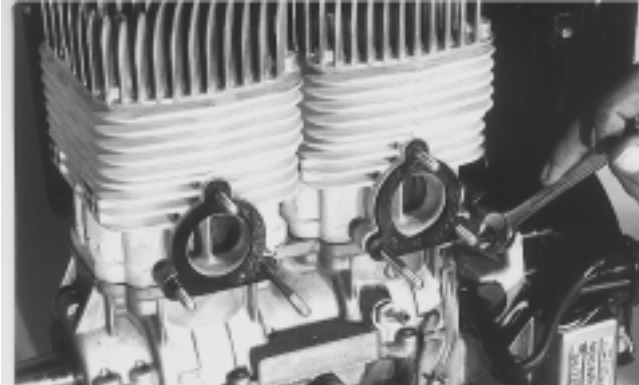
■ **NOTE:** If an impact wrench is being used, use of a flywheel spanner wrench will not be necessary.

9. Remove the cap screws securing the starter pulley to the flywheel and remove the pulley.

10. Remove the flange nuts securing the fan case to the crankcase; then remove the fan case.

■ **NOTE:** For further servicing of the axial fan components, see section 3.

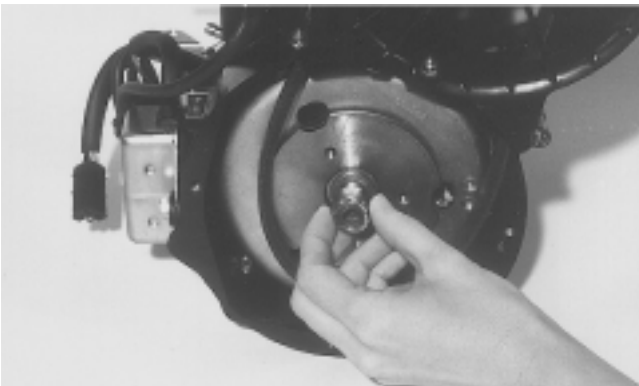
Fig. 2-69



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

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

Fig. 2-70

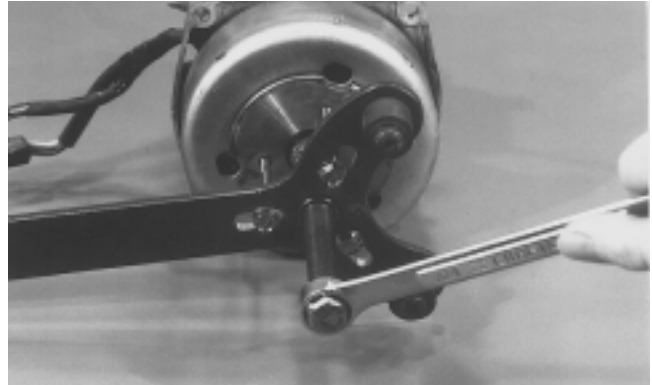


CAUTION

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.

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

Fig. 2-71

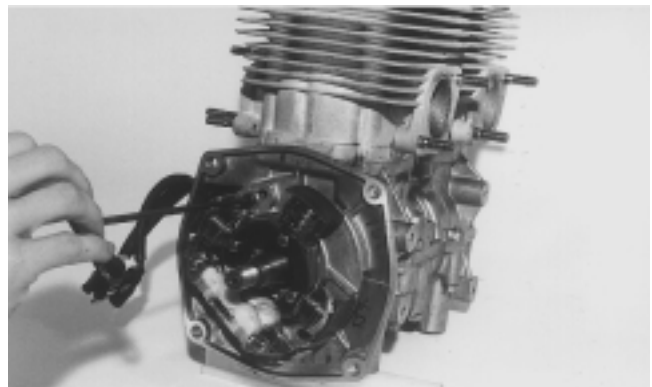


■ **NOTE:** To ensure the cleanliness of the flywheel magnets, place the flywheel (with the magnets facing upward) on a clean bench.

13. Scribe a reference line on the stator plate and crankcase to aid in assembly; then remove the two Allen-head cap screws, lock washers, and washers securing the stator plate.

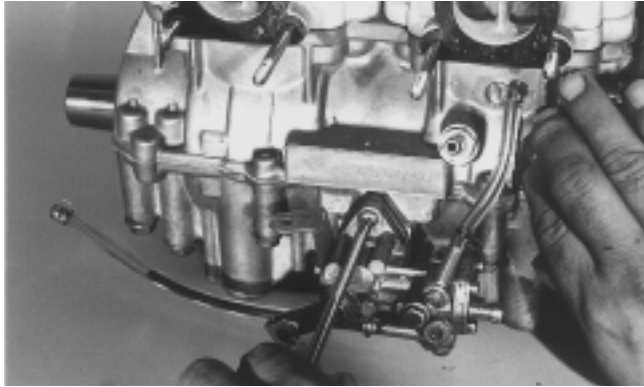
■ **NOTE:** The two stator plate Allen-head cap screws had Loctite applied to the threads during assembly. Before removing them, apply a sharp blow to the head of each screw to break the Loctite loose. If this isn't done, the screws can be very difficult to remove.

Fig. 2-72



14. Remove the stator plate from the engine.
15. Remove the screws, lock washers, and washers securing the oil-injection pump to the crankcase; then remove the pump, retainer, shim, and gear. Account for two gaskets.

Fig. 2-73



AB018

16. Remove the spark plugs.
17. Remove the eight nuts, lock washers, and washers securing the cylinder heads to the cylinders. Note the position of the different-sized nuts. Remove the heads and account for two gaskets.

Fig. 2-74



B563

18. Using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Discard the two gaskets.

⚠ CAUTION

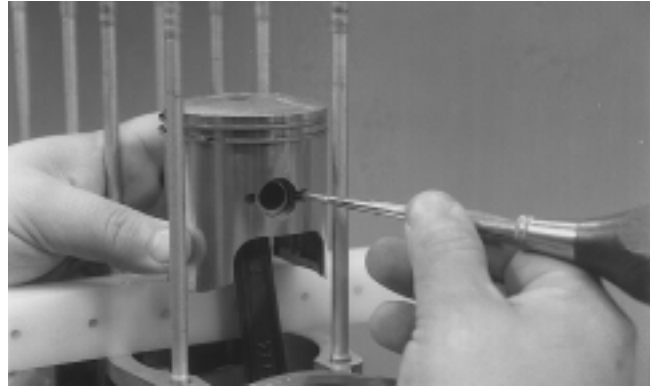
When removing a cylinder, make sure to support the pistons so they will not be damaged.

19. Using a felt-tipped marker, mark an M on the MAG-side head, cylinder, and piston and a P on the PTO-side head, cylinder, and piston.

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

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.

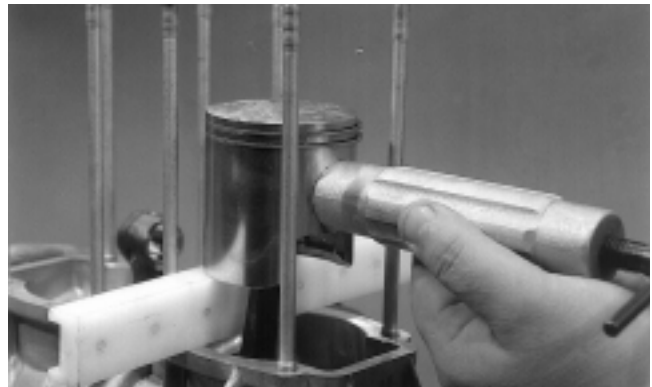
Fig. 2-75



A829

21. Using the Piston-Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

Fig. 2-76



A830

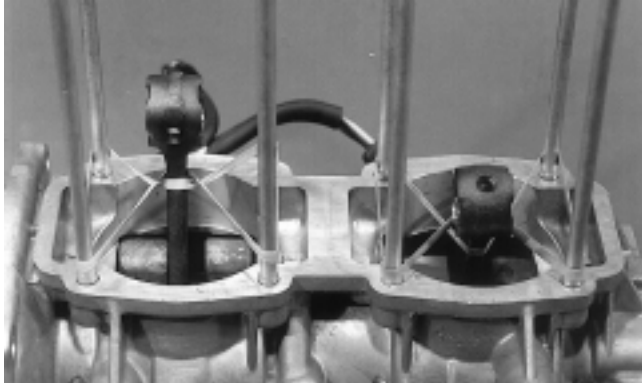
⚠ CAUTION

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

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

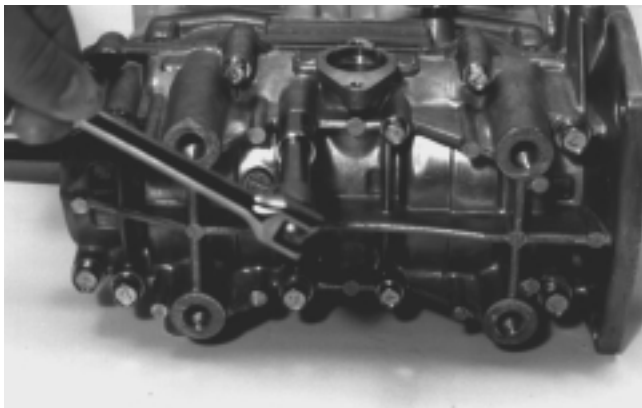
■ **NOTE:** Place rubber bands over the connecting rods and around the cylinder studs. This will keep the connecting rods from damaging the crankcase.

Fig. 2-77



23. Remove the cap screws securing the crankcase halves. Note the position of the different-sized cap screws.

Fig. 2-78



24. Separate the crankcase halves by installing two crankcase cap screws in diagonal corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic hammer, tap on each cap screw head until the halves separate. Remove the cap screws.

⚠ CAUTION

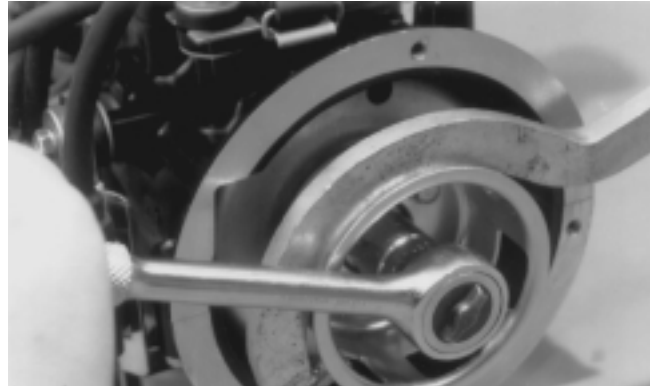
DO NOT drive any tool between the crankcase halves to separate the crankcase. Damage to the sealing surfaces will result.

25. Remove the rubber bands holding the connecting rods; then separate the crankcase halves. Account for the two dowel pins. Lift the crankshaft free from the crankcase half and slide the two crankshaft seals off the crankshaft. Account for the C-ring and five bearing dowel pins.

Disassembling Engine (440 LC/550 cc Models)

1. Using the spanner wrench to secure the flywheel, remove the flywheel nut, lock washer, and flat washer; then remove the three starter pulley cap screws and remove the pulley.

Fig. 2-79



2. Install the Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.

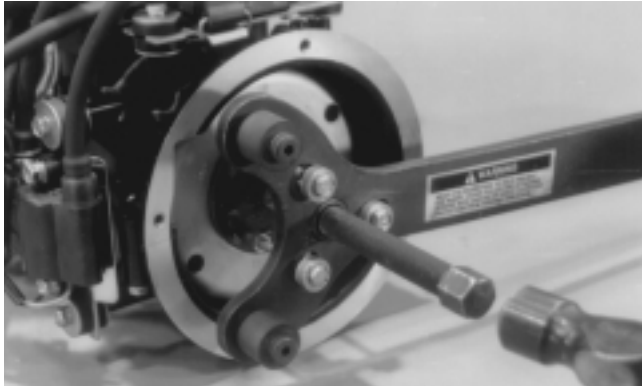
■ **NOTE:** A suitable substitute protective cap can be made by welding a 3 mm (1/8 in.) plate on one side of a spare flywheel nut.

3. Using the Flywheel Puller/Spanner Wrench (p/n 0144-310) or suitable substitute, remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a hammer, and tightening again. Repeat this procedure until the flywheel is free. Account for the key.

⚠ CAUTION

To prevent damage to 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.

Fig. 2-80

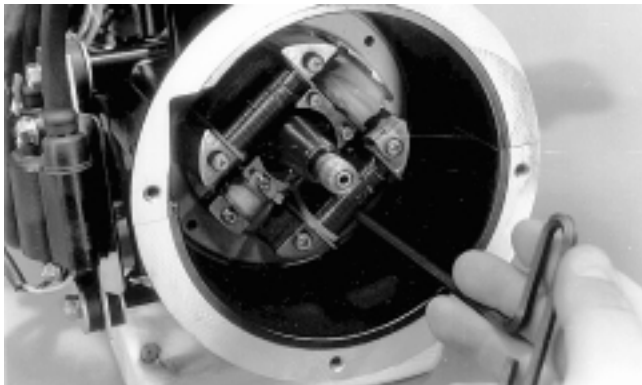


AN020

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

4. Scribe a line on the stator plate and magneto case to aid in assembly; then remove the two Allen-head cap screws, lock washers, and washers securing the stator plate. Remove the stator plate from the engine.

Fig. 2-81

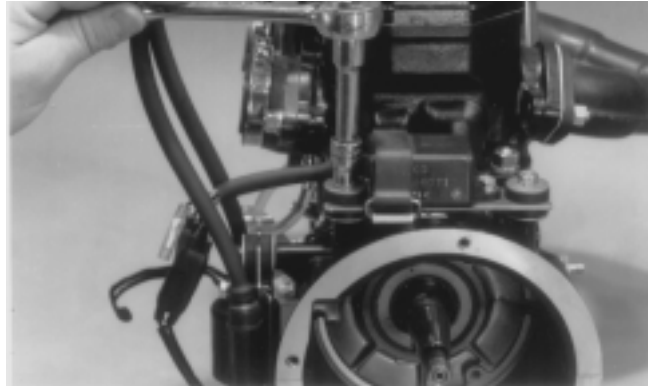


AN022

■ **NOTE:** The stator plate screws had Loctite applied to the threads during assembly. Using an impact driver, apply a sharp blow to the head of each screw to break the Loctite loose before removal.

5. On the 440 cc, remove the cap screws and washers securing the CDI unit and the external coil; then remove from the engine.

Fig. 2-82



AN024

6. Remove the four nuts and lock washers securing the exhaust manifold; then remove the manifold and account for the two exhaust gaskets.

7. Remove the three cap screws securing the thermostat cap; then remove the cap, gasket, and thermostat.

■ **NOTE:** The thermostat is of the lock-open type. If the thermostat is ever allowed to fully open, it will remain open and replacement will be necessary.

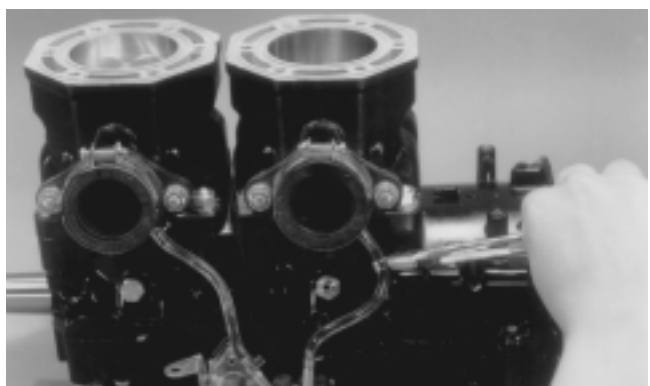
8. Remove the four cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard the gaskets.

9. Remove the spark plugs.

10. Remove the six cap screws and O-rings securing each head; then separate from the cylinder. Account for two large O-rings beneath each head.

11. Remove the oil-injection hose from each cylinder and the crankcase nozzle.

Fig. 2-83



AN032

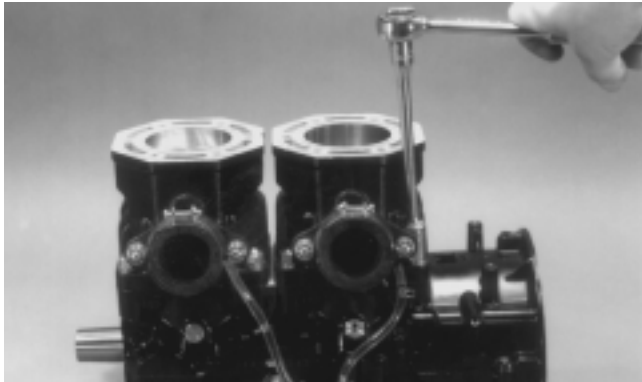
12. Remove the eight nuts, lock washers, and washers securing the cylinders to the crankcase; then using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Account for two gaskets.

⚠ CAUTION

When removing a cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

■ **NOTE:** The metal cylinder base gaskets may be reused. When reusing gaskets, they must be cleaned and sprayed with Copper Coat Gasket Sealant (p/n 0636-092) on each side.

Fig. 2-84

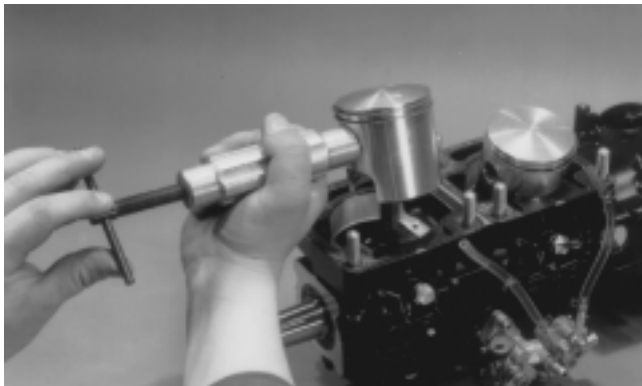


AN033

13. Remove the PTO-side piston-pin circlip from the PTO-side piston; then remove the MAG-side piston-pin circlip from the MAG-side piston.
14. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

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

Fig. 2-85



AN036

⚠ CAUTION

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

15. Lift the pistons clear of the connecting rods and remove the small-end connecting-rod bearings; then remove the piston rings. Keep each piston with its rings; keep each piston pin and bearing together as a set.

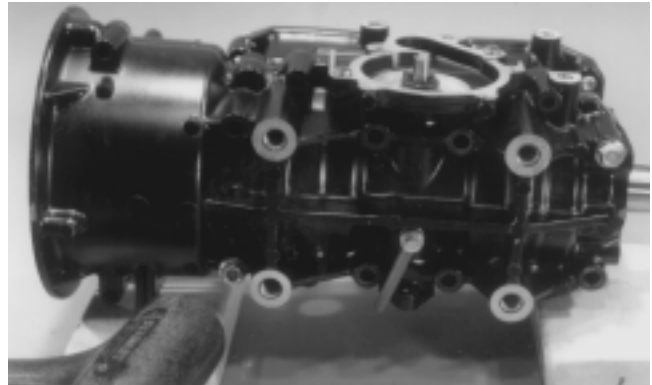
■ **NOTE:** Place rubber bands over the connecting rods and around the cylinder studs. This will prevent the connecting rods from damaging the crankcase.

16. Remove the two screws, lock washers, and washers securing the oil-injection pump to the crankcase. Remove the pump, retainer, and O-ring.
17. Remove the water pump cover. Account for the O-ring gasket.
18. Remove the cap screw securing the water pump impeller; then slide the impeller free of the shaft.
19. Using an impact driver, remove the screws securing the PTO-end plate to the crankcase; then remove the plate.
20. Position the crankcase (with its bottom side up) on two blocks of wood. Remove the fourteen cap screws securing the crankcase halves. Note the position of the different-sized cap screws.
21. 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. Remove the cap screws.

⚠ CAUTION

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

Fig. 2-86

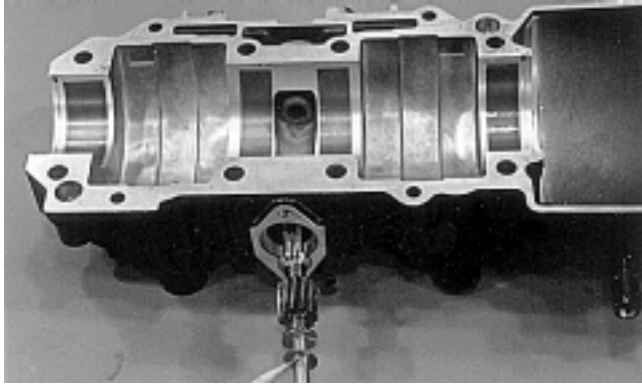


AN045

22. Lift the bottom half of the crankcase off the top half.

23. Lift the crankshaft free from the top half of the crankcase and slide the crankshaft oil seals off the crankshaft. Account for the C-ring. Remove the four bearing dowel pins.
24. Remove the oil-injection pump driveshaft from the lower crankcase half. Account for the thrust washer on the outer end of the shaft.

Fig. 2-87

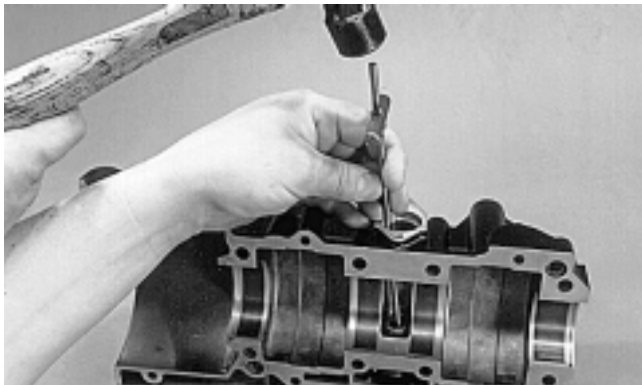


AN047

■ **NOTE:** Do not replace the inner seals unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084) and see Cleaning and Inspecting Engine in this section.

25. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the water pump seal from the crankcase.

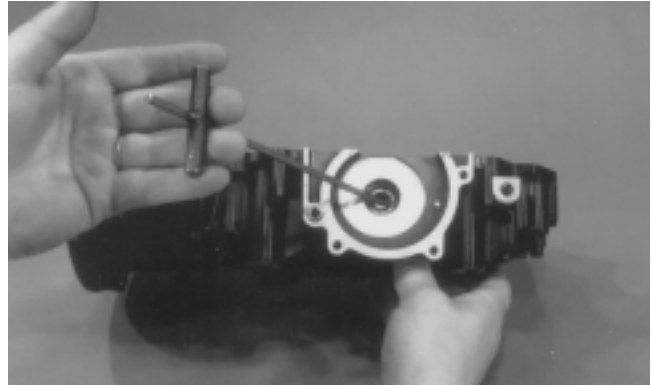
Fig. 2-88



AN049

26. Remove the snap ring securing the inner seal in the crankcase.
27. Using the hooked end of the tool, pull the inner seal free of the crankcase.

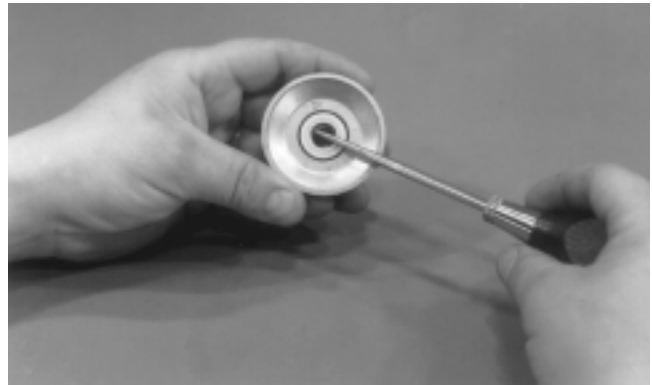
Fig. 2-89



AN050

28. Using a sharp, pointed tool, pry the seal ring from the backside of the water pump impeller.

Fig. 2-90



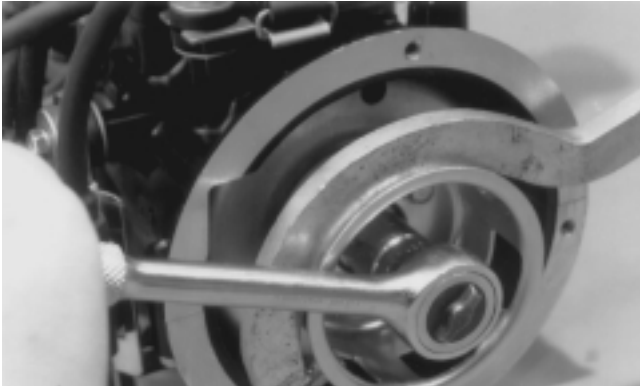
AN051

Disassembling Engine (500/580/600 cc Twin Models)

■ **NOTE:** On the 580 cc, remove the ignition timing sensor from the magneto housing.

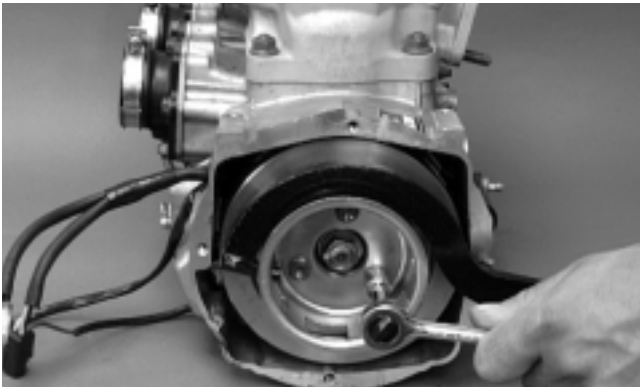
1. Using the spanner wrench to secure the flywheel, remove the flywheel nut, lock washer, and flat washer; then remove the three starter pulley cap screws and remove the pulley.

Fig. 2-91



AN015

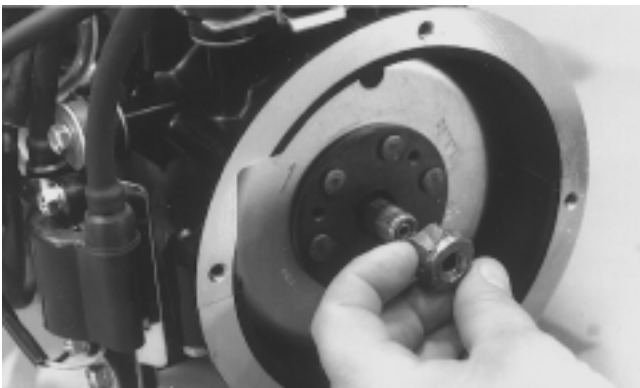
Fig. 2-92



AN407D

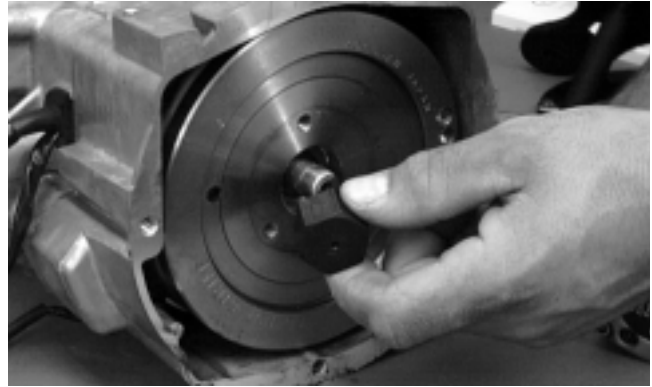
2. Install the Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.

Fig. 2-93



AN018

Fig. 2-94



AN408D

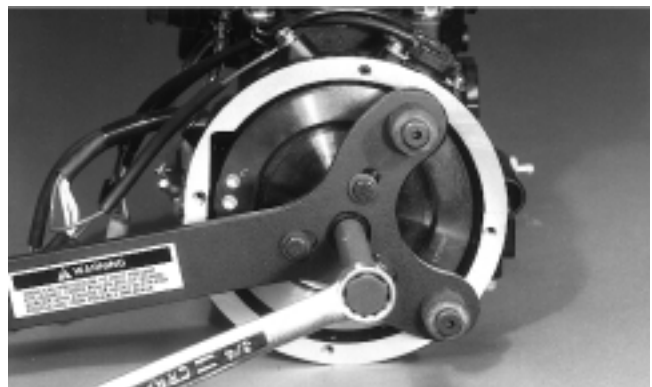
■ **NOTE:** A suitable substitute protective cap can be made by welding a 3 mm (1/8 in.) plate on one side of a spare flywheel nut.

3. Using the Flywheel Puller/Spanner Wrench (p/n 0144-310) or suitable substitute, remove the flywheel from the crankshaft by tightening the puller bolt, striking the head of the puller bolt with a hammer, and tightening again. Repeat this procedure until the flywheel is free. Account for the key.

CAUTION

To prevent damage to 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.

Fig. 2-95



AR105

Fig. 2-96

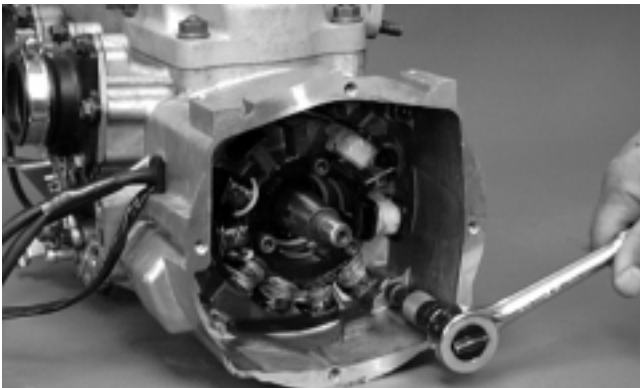


AN410D

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

4. On the 500 cc/600 cc, remove the four Allen-head cap screws securing the magneto case to the crankcase.

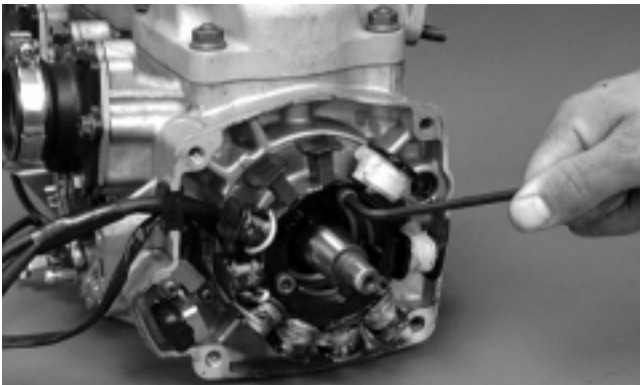
Fig. 2-97



AN412D

5. On the 500 cc/600 cc, remove the Allen-head cap screws securing the stator to the stator plate.

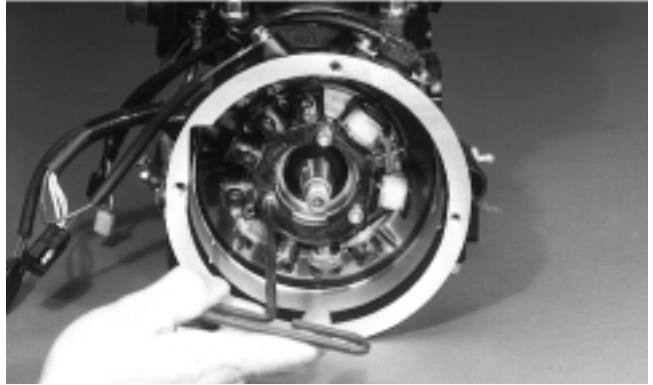
Fig. 2-98



AN413D

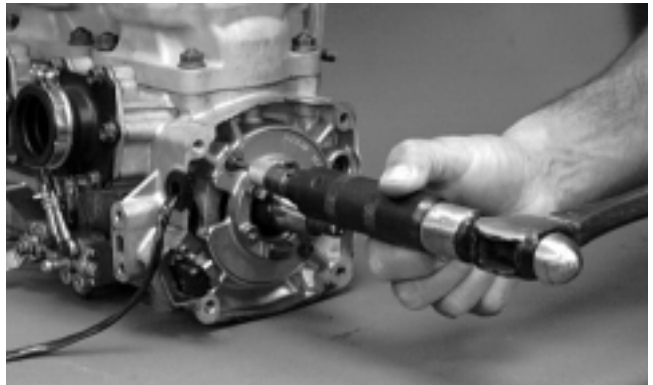
6. Remove the Allen-head cap screws securing the stator plate. Remove the stator plate from the engine.

Fig. 2-99



AR106

Fig. 2-100

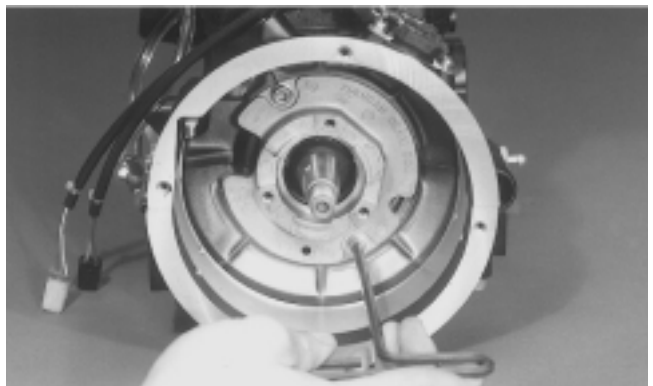


AN414D

■ **NOTE:** The stator plate screws had Loctite applied to the threads during assembly. Using an impact driver, apply a sharp blow to the head of each screw to break the Loctite loose before removal.

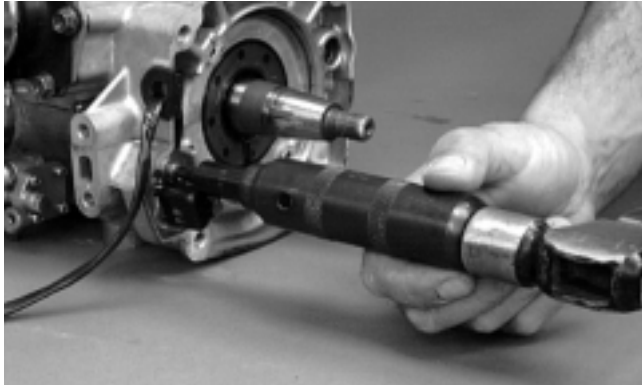
7. On the 580 cc, remove the Allen-head screws securing the stator base. On the 500 cc/600 cc, remove the ignition timing sensor.

Fig. 2-101



AR107

Fig. 2-102



AN415D

8. Remove the three cap screws securing the thermostat cap; then remove the cap, gasket, and thermostat.

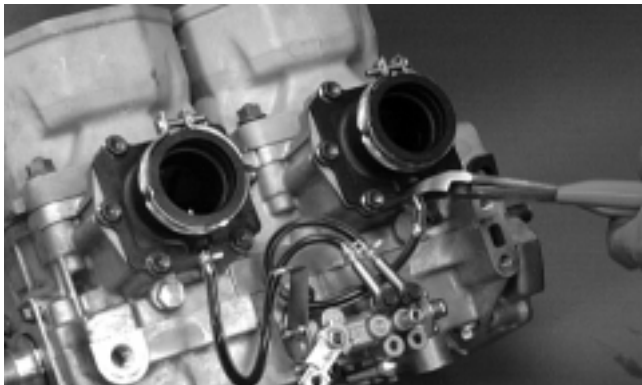
9. Remove the spark plugs.

■ **NOTE:** On the 580 cc, remove the cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard the gaskets.

10. Remove the cap screws with O-rings securing the cylinder head(s); then separate from the cylinders. Account for the O-rings.

11. Remove the oil-injection hose from each cylinder and the crankcase nozzle.

Fig. 2-103



AN420D

12. Remove the eight nuts (with lock washers and washers) securing the cylinders to the crankcase; then using a rubber hammer, gently tap the cylinders and remove from the crankcase by lifting them straight up off their studs. Account for gasket(s) and any alignment bushings.

CAUTION

When removing a cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

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

Fig. 2-104

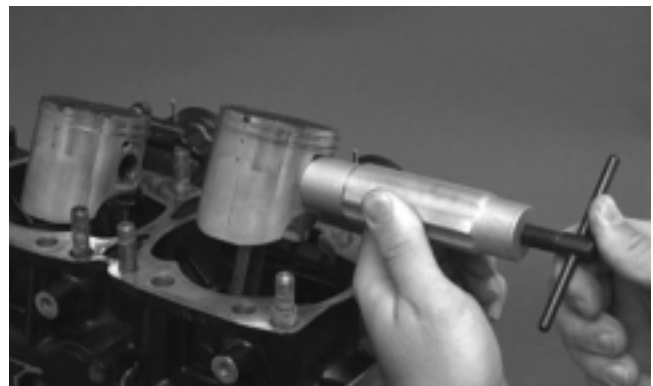


AN315D

14. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

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

Fig. 2-105



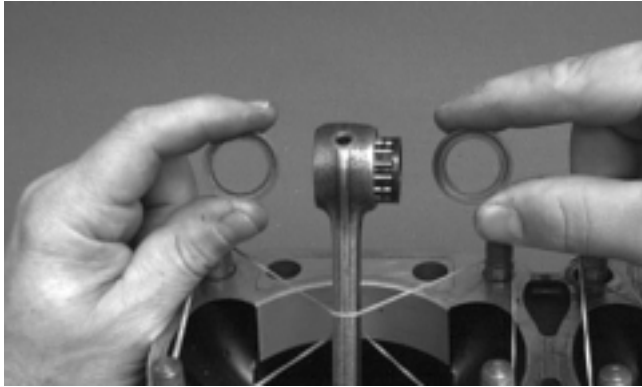
AN316D

CAUTION

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

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

Fig. 2-106

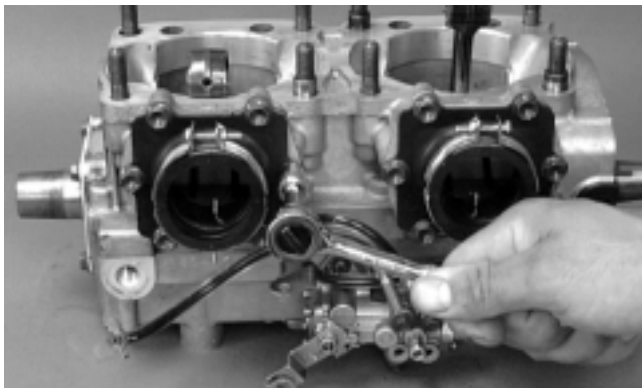


AN317D

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

16. On the 500 cc/600 cc, remove the intake manifolds and reed block assemblies.

Fig. 2-107



AN433D

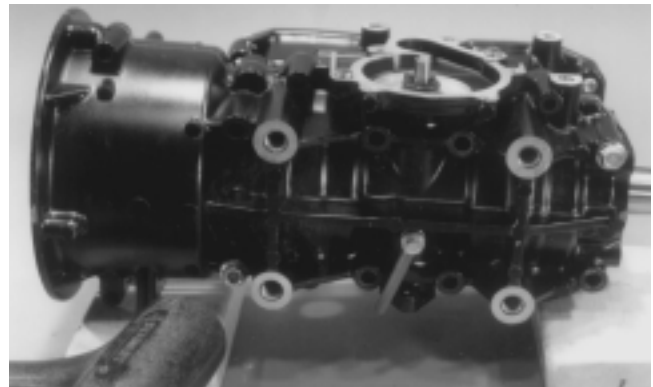
17. Remove either lower union cap screw securing the lower check valve assembly; then remove the two screws, lock washers, and washers securing the oil-injection pump to the crankcase. Remove the pump, retainer, and O-ring.
18. Remove the five screws securing the water pump cover to the crankcase and remove the cover. Account for the O-ring gasket.
19. Remove the cap screw securing the water pump impeller; then slide the impeller free of the shaft.
20. Remove the cap screws securing the PTO-end plate to the crankcase; then remove the plate.
21. Position the crankcase, with its bottom side up, on two blocks of wood. Remove the cap screws securing the crankcase halves.

22. 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. Remove the cap screws.

CAUTION

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

Fig. 2-108



AN045

23. Lift the bottom half of the crankcase off the top half.

CAUTION

Care must be taken to not allow the connecting rods to drop onto the sealing surface of the bottom case half.

24. Lift the crankshaft free from the top half of the crankcase and slide the crankshaft oil seals off the crankshaft. Account for the C-ring. Remove the bearing dowel pins.
25. Remove the oil-injection pump/water pump driveshaft from the lower crankcase half. Account for the thrust washer on the outer end of the shaft.

Fig. 2-109

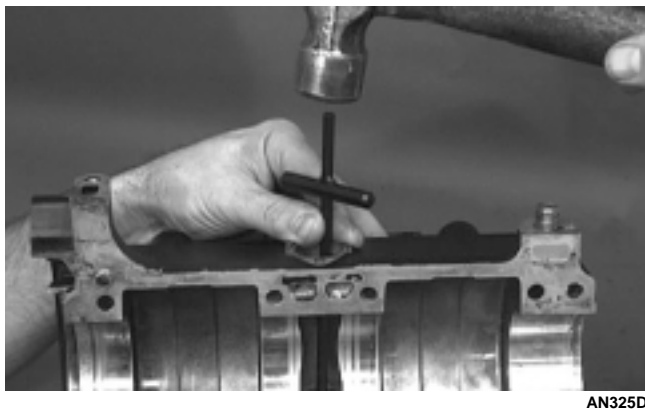


AN324D

■ **NOTE:** Do not replace the inner seals unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084).

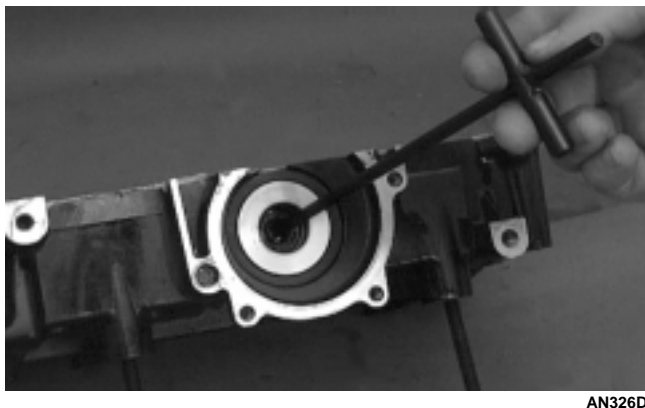
26. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the mechanical water pump seal from the crankcase.

Fig. 2-110



27. Using a pair of snap ring pliers, remove the snap ring securing the inner seal in the crankcase.
28. Using the hooked end of the tool, pull the inner seal free of the crankcase.

Fig. 2-111



29. Using the hooked end of the tool, pry the seal ring from the backside of the water pump impeller.

Fig. 2-112



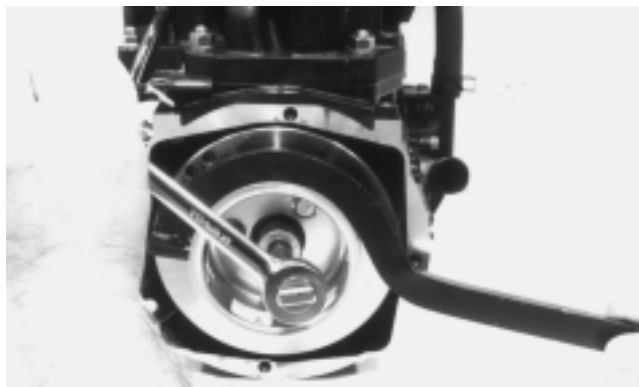
AN327D

Disassembling Engine (700 cc Models)

2

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

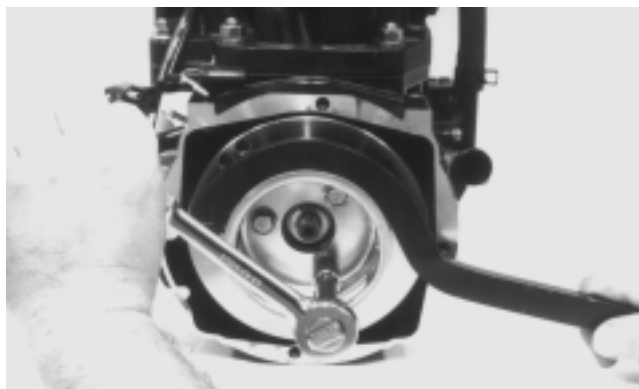
Fig. 2-113



AJ012

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

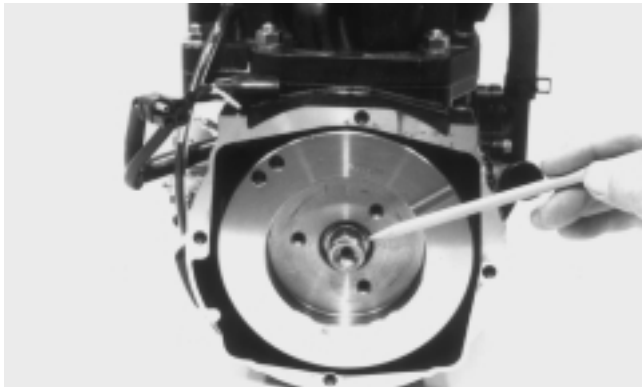
Fig. 2-114



AJ013

3. Install Protective Cap (p/n 0644-234) onto the end of the crankshaft.

Fig. 2-115



AJ014

■ **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

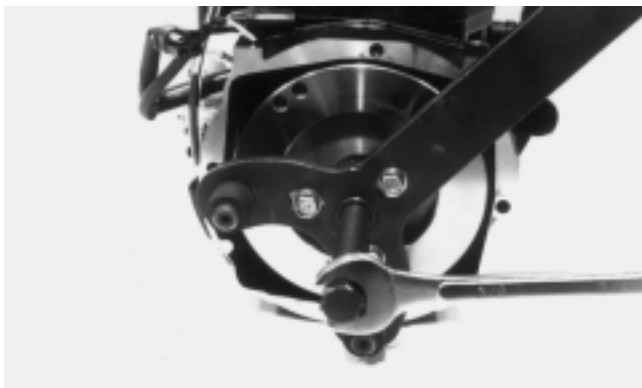
To prevent damage to the crankshaft, thread a protective cap onto the crankshaft. The puller must bottom on the cap and not on the crankshaft. Also, do not thread puller bolts more than 12.7 mm (1/2 in.) into the flywheel. Damage to the coils may result.

4. Using 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.

CAUTION

When installing Flywheel Puller (p/n 0144-310), it must be installed with its welded side facing outward or the puller will be damaged.

Fig. 2-116



AJ015

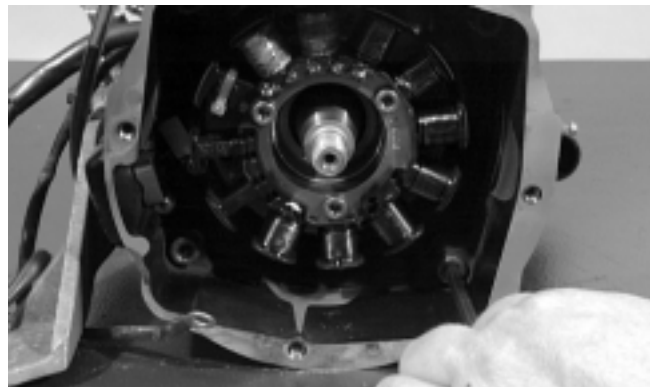
CAUTION

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.

5. Remove the cap screws securing the magneto housing to the crankcase; then remove the housing.

Fig. 2-117



AJ659

6. Remove the cap screws, lock washers, and washers securing the stator.

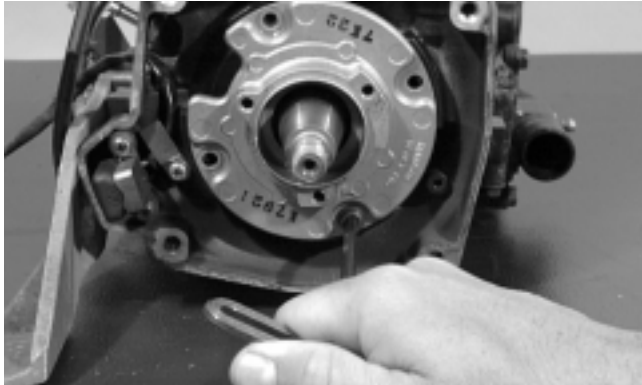
Fig. 2-118



AJ660

7. Remove the rubber grommet from the stator wiring harness. Slide stator free of the crankshaft and remove.
8. Remove the cap screws securing the stator backing plate. Remove the plate from the crankcase.

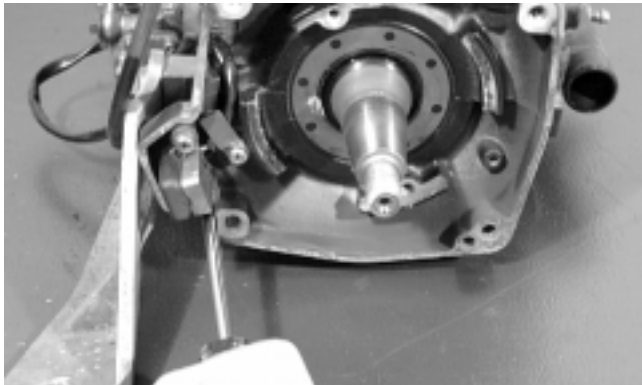
Fig. 2-119



AJ661

9. Remove the cap screws securing the ignition timing sensor; then remove the sensor from the engine.

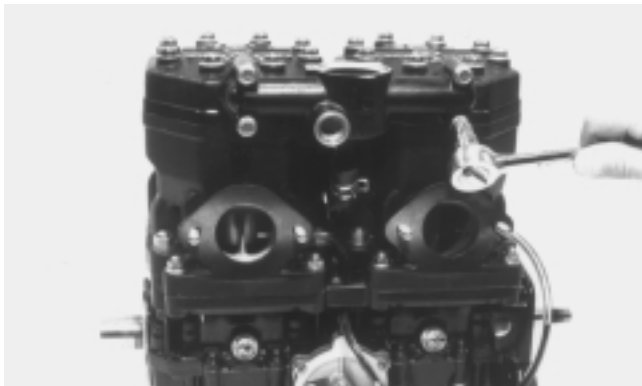
Fig. 2-120



AJ662

10. Remove the three cap screws securing the thermostat cap; then remove cap, rubber gasket, and thermostat.
11. Remove the cap screws securing the thermostat manifold to the cylinder heads. Remove the manifold and discard gaskets.

Fig. 2-121



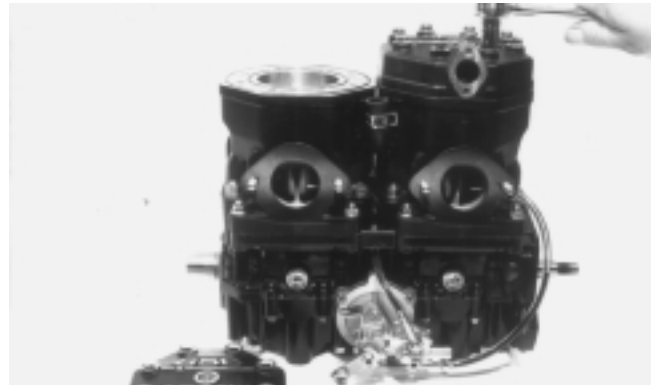
AJ022

12. Remove the spark plugs.

13. 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 components #1 and the PTO cylinder components #2.

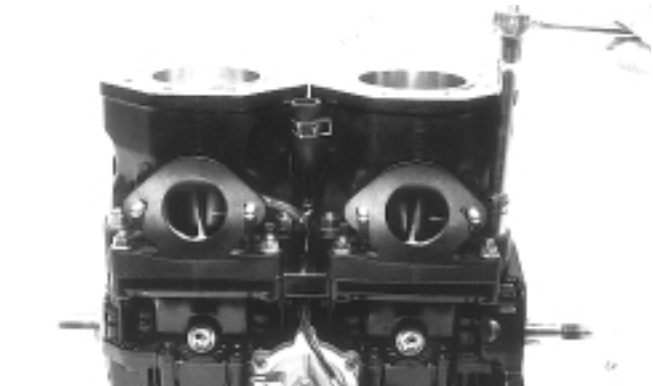
Fig. 2-122



AJ023

14. Remove the oil-injection hose from each cylinder nozzle.
15. 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. 2-123



AJ027

16. 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. 2-124



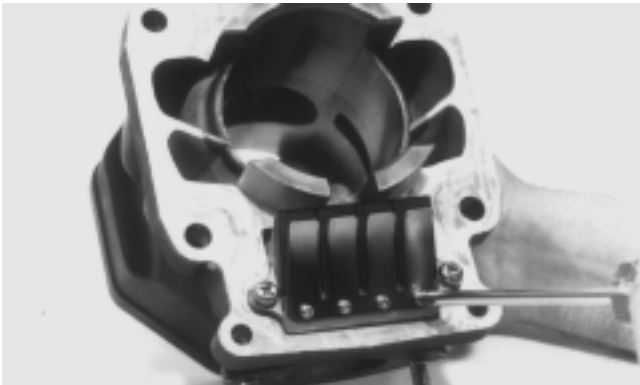
AJ028

⚠ 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.

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

Fig. 2-125



AJ058

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

18. 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. 2-126



AJ029

19. Using the Piston Pin Puller (p/n 0644-328), remove the piston pins from both pistons.

Fig. 2-127



AJ030

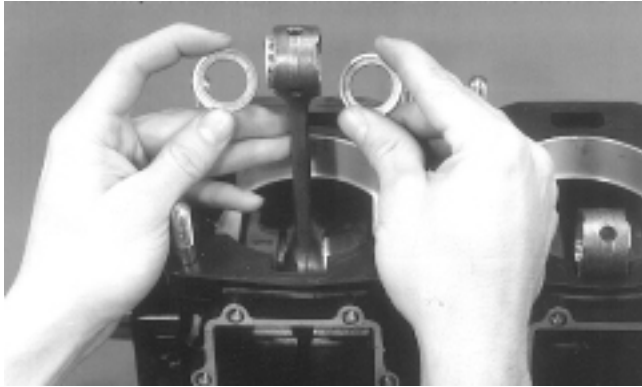
■ **NOTE:** For proper assembly, keep all MAG-side components and all PTO-side components separated. Assemble them on their proper sides.

⚠ 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.

20. 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, and bearing together as a set.

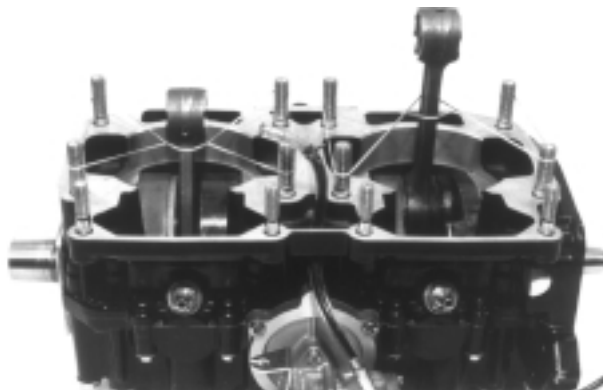
Fig. 2-128



AQ059

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

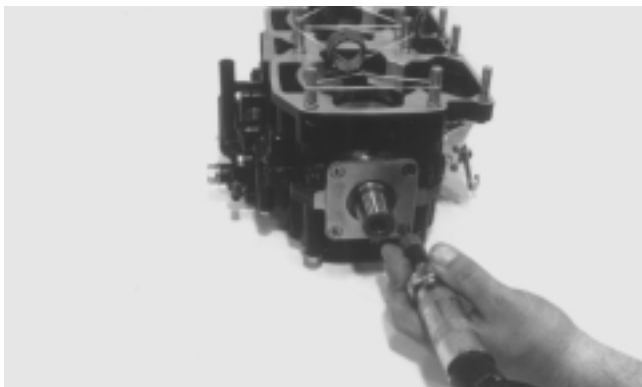
Fig. 2-129



AJ031

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

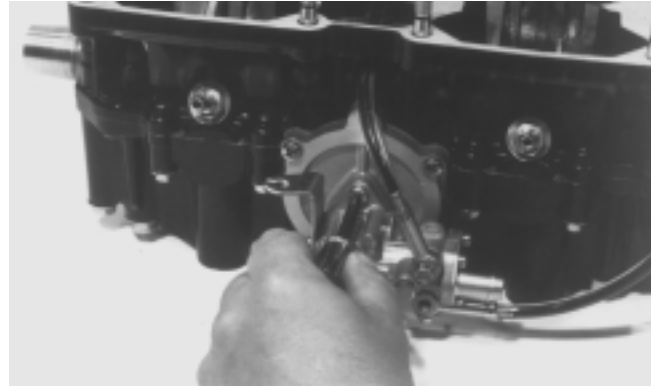
Fig. 2-130



AJ032

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

Fig. 2-131



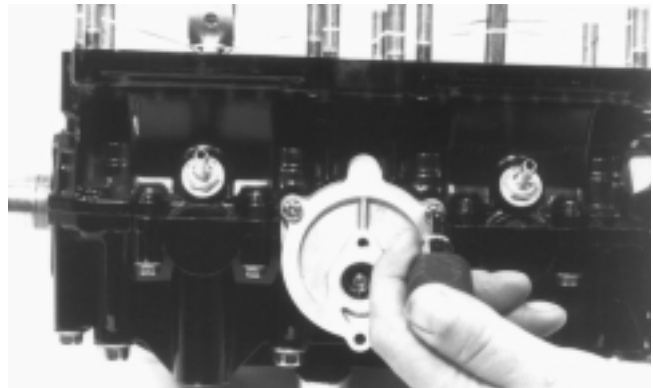
AJ035

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.

23. 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. 2-132



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.

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

Fig. 2-133

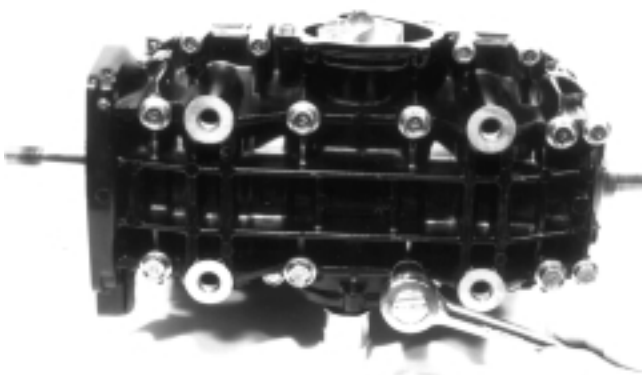


AJ033

■ **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.

25. 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. 2-134



AJ038

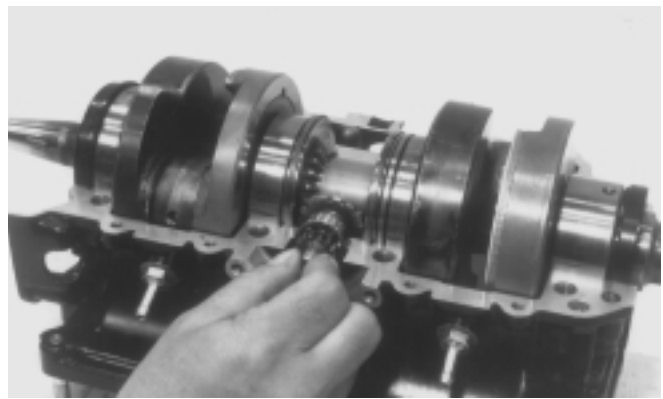
26. Separate the crankcase halves by installing two crankcase cap screws in opposite corners leaving the heads approximately 6 mm (1/4 in.) out. Using a plastic tipped hammer, tap on each cap screw head until the case halves separate; then remove the two cap screws. Remove the rubber bands and lift the 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.

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

Fig. 2-135



AJ041

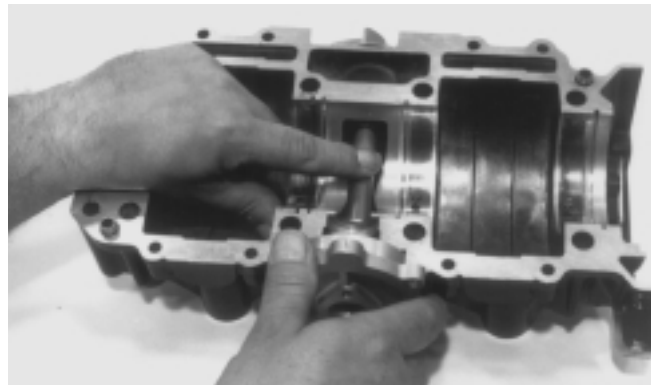
28. Lift the crankshaft free from the crankcase half and slide the crankshaft oil seals off the ends of the crankshaft. Account for the C-ring. Slide the bearing off the PTO-end of crankshaft. Remove the bearing dowel pins from the crankcase.

⚠ 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 tight against the crankcase, rotate the shaft. Bearing rotation must feel smooth.

Fig. 2-136

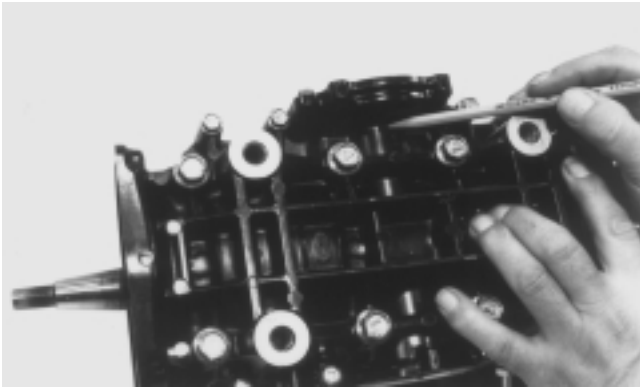


AJ044

- 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. 2-137

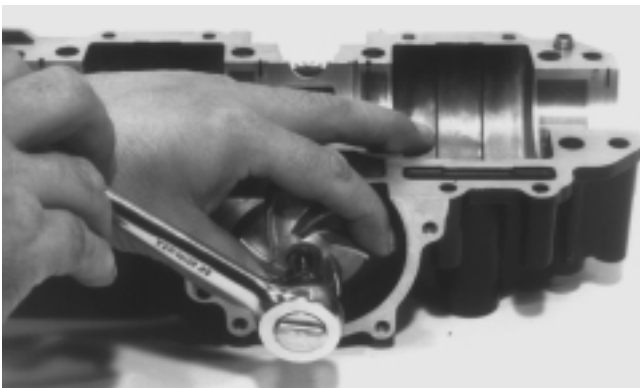


AJ045

■ **NOTE:** For instructions on bearing and seal replacement, see the appropriate **Assembling Engine** sub-section of this manual. Complete steps 29-35 only if there is a bad seal or shaft bearing.

29. Remove the cap screw securing the impeller to the shaft.

Fig. 2-138



AJ046

30. Slowly pull the shaft from the lower half of the crankcase.

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

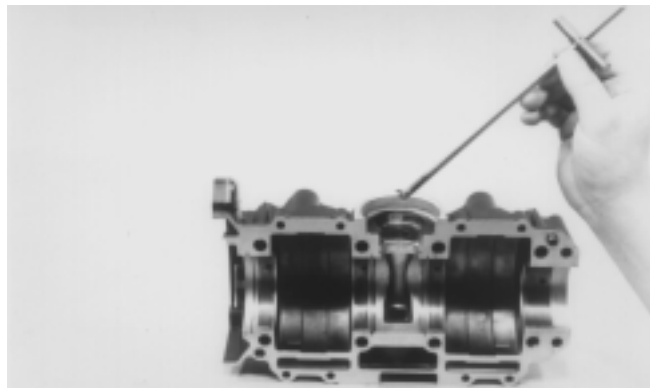
Fig. 2-139



AJ142

31. 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 back side of the metal case of the outer water pump seal.

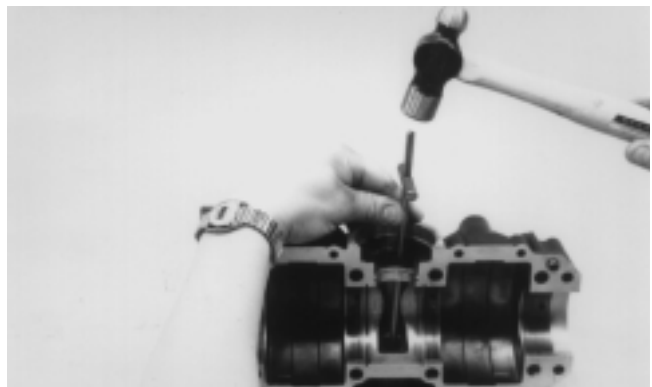
Fig. 2-140



AJ143

32. 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.

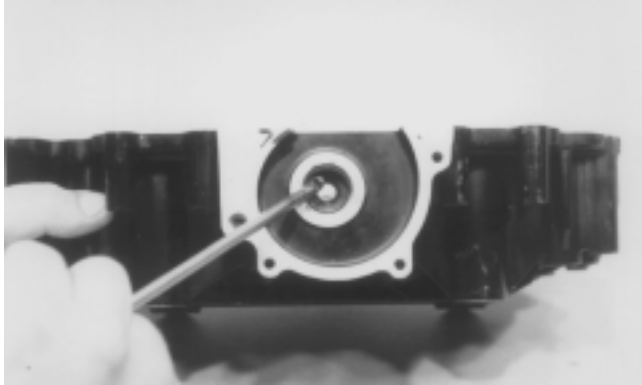
Fig. 2-141



AJ144

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

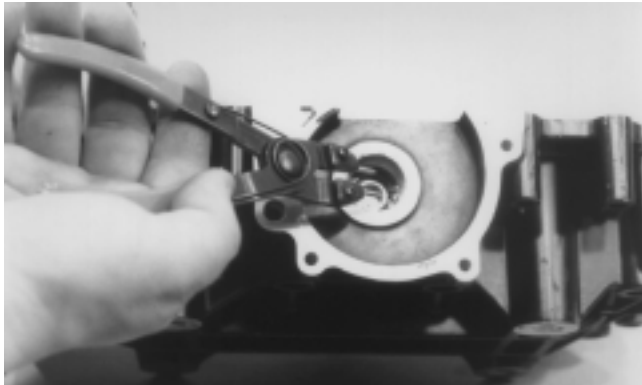
Fig. 2-142



AJ145

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

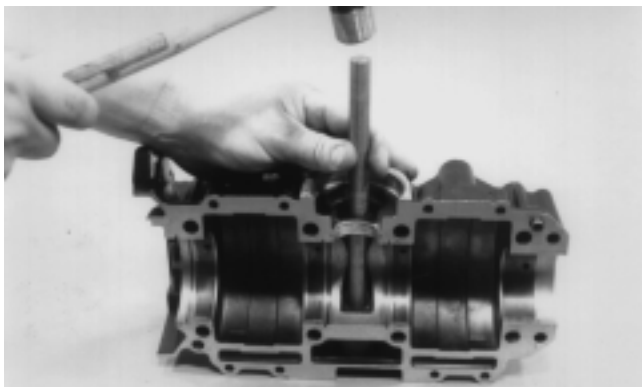
Fig. 2-143



AJ146

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

Fig. 2-144

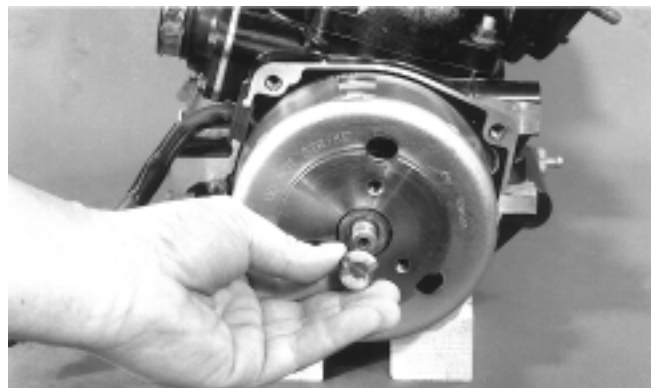


AJ147

Disassembling Engine (600 cc Triple Models)

1. Using an impact driver or a 6-mm hex wrench, remove the four cap screws securing the magneto housing to the crankcase.
2. Using a spanner wrench to secure the crankshaft, remove the cap screw, lock washer, and large flat washer securing the flywheel.
3. Remove the three cap screws securing the starter pulley to the flywheel.
4. To prevent damaging the crankshaft threads during the flywheel removal procedure, install a Crankshaft Protector Cap (p/n 0644-234) onto the end of the crankshaft.

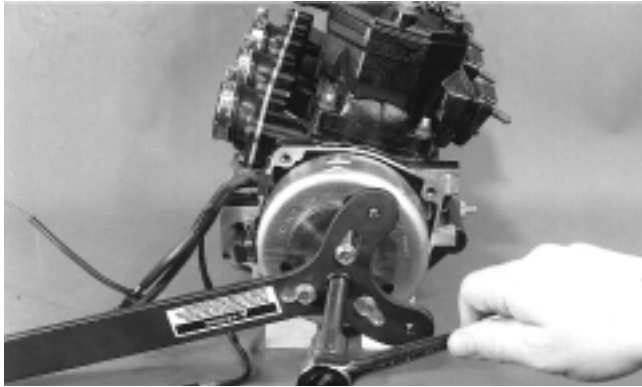
Fig. 2-145



AN162

5. Attach the flywheel puller to the flywheel using three 8-mm cap screws approximately 2 3/4 in. long. Thread each of the three cap screws evenly into the flywheel 1/2 in.
6. Tighten the center puller bolt against the crankshaft protector on the end of the crankshaft. Continue to tighten the puller bolt until the flywheel snaps free of the crankshaft taper. Remove the puller from the flywheel and place the flywheel, open side up, on a clean work bench. Account for the flywheel key.

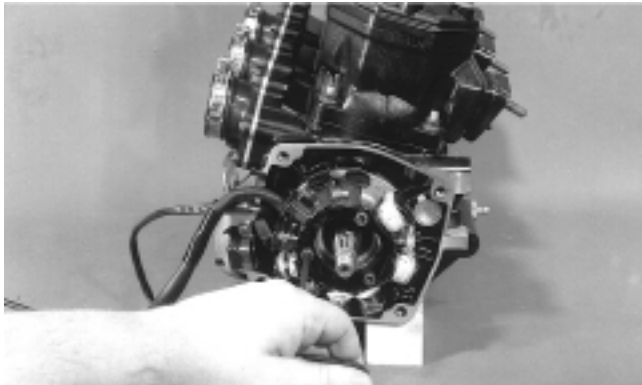
Fig. 2-146



AN161

7. Remove the three Allen-head cap screws securing the stator to the stator plate.
8. Remove the rubber grommet from the crankcase and slide the stator free of the crankshaft.

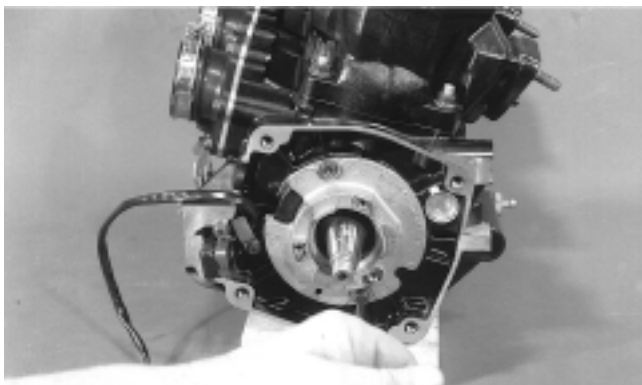
Fig. 2-147



AN160

9. Remove the two Allen-head cap screws securing the stator backing plate to the crankcase.

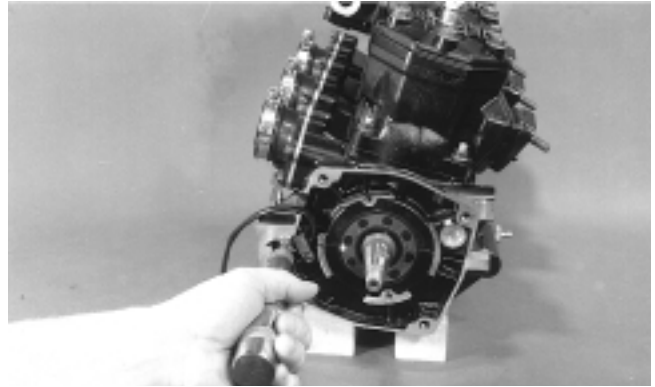
Fig. 2-148



AN158

10. Remove the two screws securing the timing sensor; then loosen the screw securing the wiring harness retainer tab. Remove the timing sensor from the crankcase.

Fig. 2-149



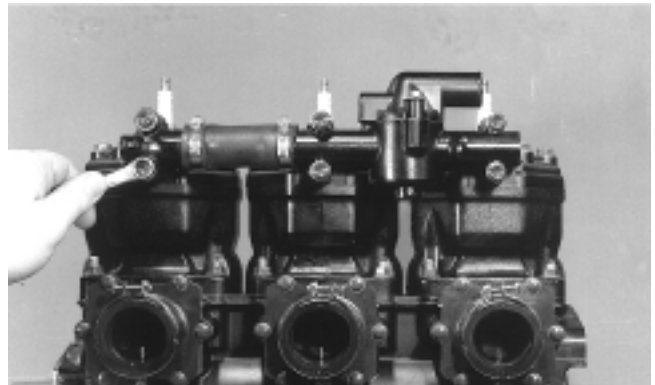
AN157

11. Remove the thermostat cover; then remove the thermostat from the water manifold.

NOTE: The thermostat is designed to open at 50°C (122°F). It should be checked for proper operation before installing (see Section 3).

12. Remove the water manifold assembly.

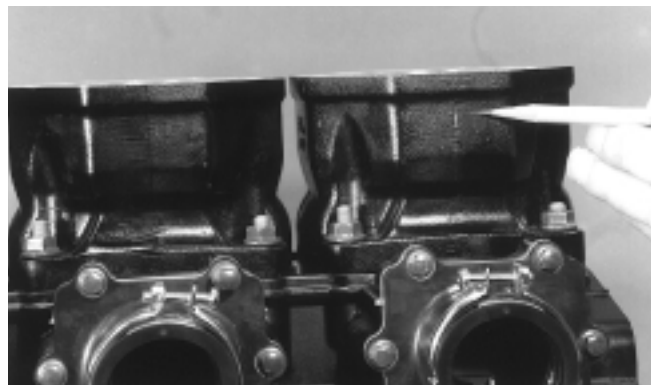
Fig. 2-150



AN156

13. Remove each cylinder head; then account for the two O-rings under each head.
14. For assembly purposes, number the three heads and cylinders using a marker. Start from the MAG-side.

Fig. 2-151



AN209

15. Remove the four nuts securing each cylinder to the crankcase; then carefully lift each cylinder straight up and free of the piston. Support the piston as the cylinder clears the piston to prevent the connecting rod from dropping against the crankcase and causing damage to the crankcase sealing surface. Account for two alignment dowel pins per cylinder.

Fig. 2-152



AN207

16. For assembly purposes, number the dome of each piston starting from the MAG-side; then remove the MAG-side circlip from each piston.

Fig. 2-153



AN242

17. Using Piston Pin Puller (p/n 0644-328), remove the piston pin from each piston. Remove the piston, piston pin bearing, and the two shim washers. Keep each piston, piston pin, and bearing together as a set.

Fig. 2-154

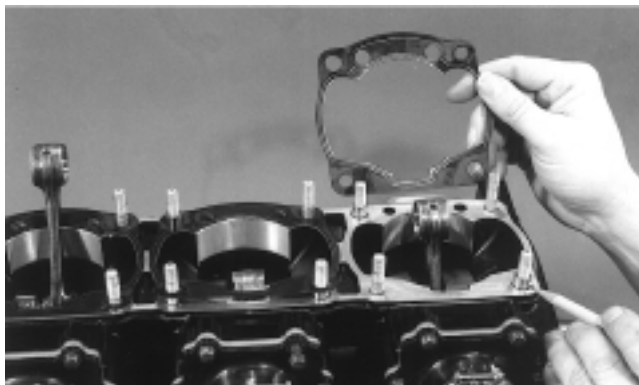


AN241

18. Remove the cylinder base gaskets from the crankcase. Note that the cylinder base gaskets are aligned with the same dowel sleeves which align the cylinders on the crankcase.

■ **NOTE:** If the cylinder base gaskets are not damaged, they can be reused.

Fig. 2-155



AN239

19. Remove the two screws securing the oil-injection pump to the crankcase. Slide the pump free of the crankcase. Account for the O-ring located around the pump inner flange.

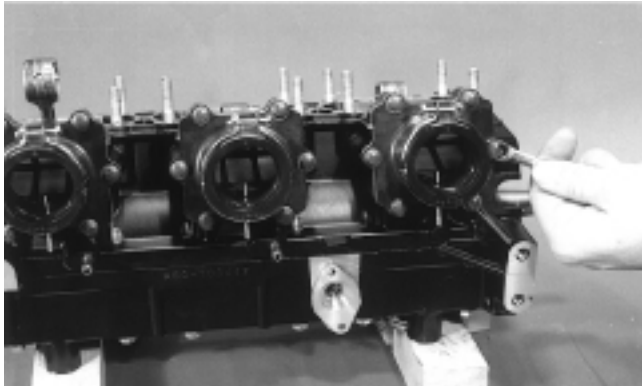
Fig. 2-156



AQ130D

20. Remove the six cap screws securing the intake flanges and reed valve assembly to the crankcase.

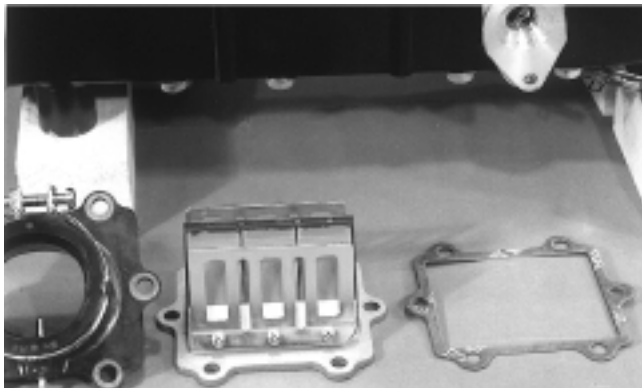
Fig. 2-157



AN237

21. Remove the intake flange and reed valve assembly. Be very careful not to damage the reed valve stops. Place the assembly on its flat side. Remove and discard reed valve assembly gasket.

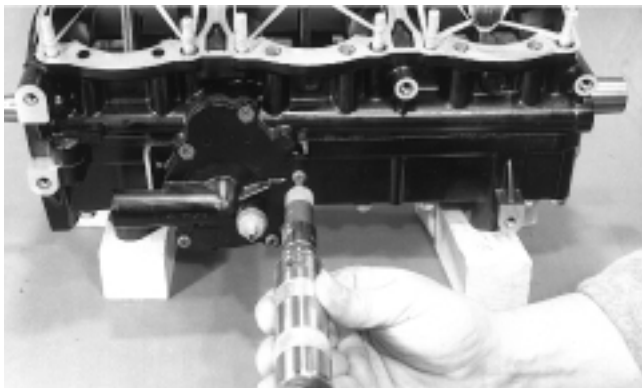
Fig. 2-158



AN236

22. Using an impact driver, remove the five screws securing the water pump cover to the crankcase and remove the cover. Account for the O-ring gasket.

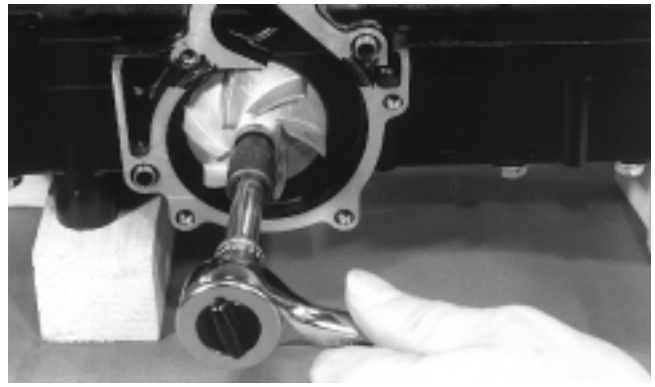
Fig. 2-159



AN234

23. Loosen the cap screw securing the water pump impeller until there is a 1/4-in. space between the cap screw flange and impeller.

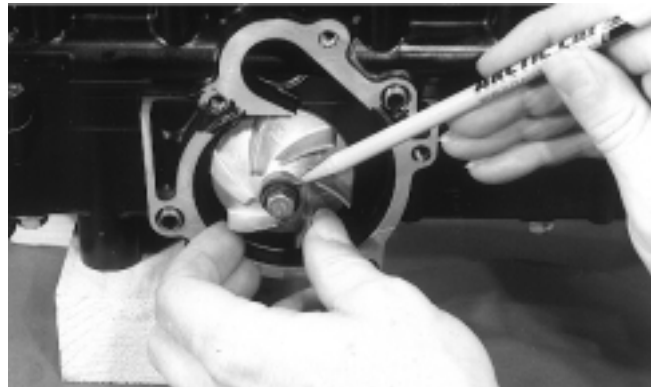
Fig. 2-160



AN233

24. Using a plastic hammer, gently tap on the head of the cap screw until the impeller is free of the shaft. Remove the cap screw and impeller.

Fig. 2-161



AN232

25. From the opposite side of the crankcase, remove the oil pump retainer and shaft. Account for the shaft thrust washer located between the retainer and shaft flange.

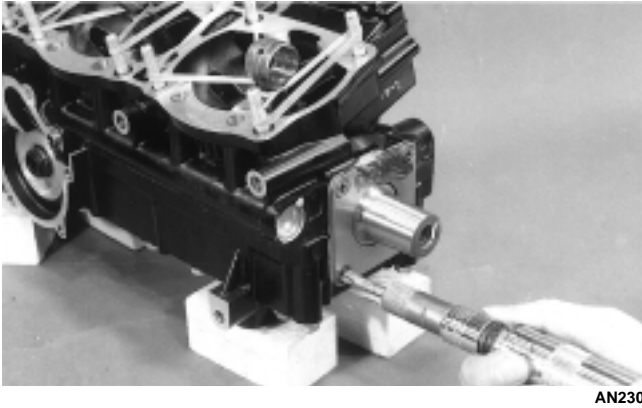
Fig. 2-162



AN231

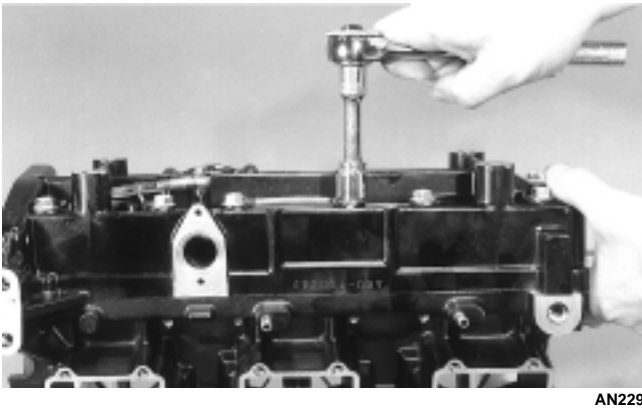
26. Using an impact driver, remove the four screws securing the seal protector plate to the end of the crankcase; then slide the plate free of the crankshaft.

Fig. 2-163



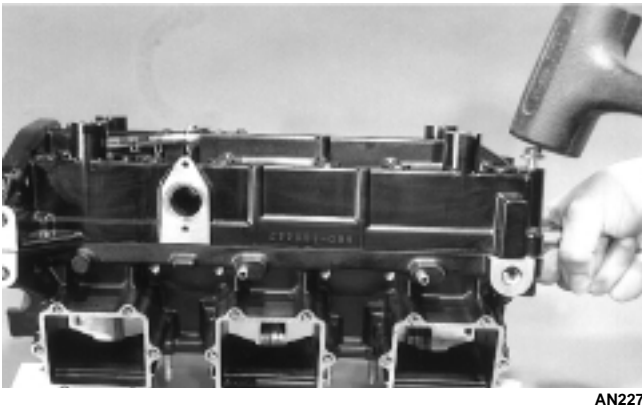
27. Remove the 14 cap screws securing the two crankcase halves together.

Fig. 2-164



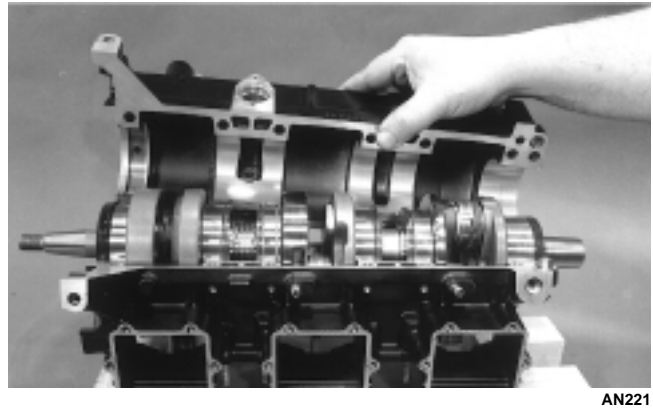
28. To separate the crankcase halves, start two of the crankcase cap screws into the crankcase at opposite corners. Thread the cap screws into the crankcase until a 6.4 mm (1/4 in.) space remains between the cap screw flange and the crankcase surface.
29. Set the crankcase on its side with the flat reed surfaces resting on the work bench. Using a hammer, strike the heads of the two cap screws alternately driving the two case halves apart.

Fig. 2-165



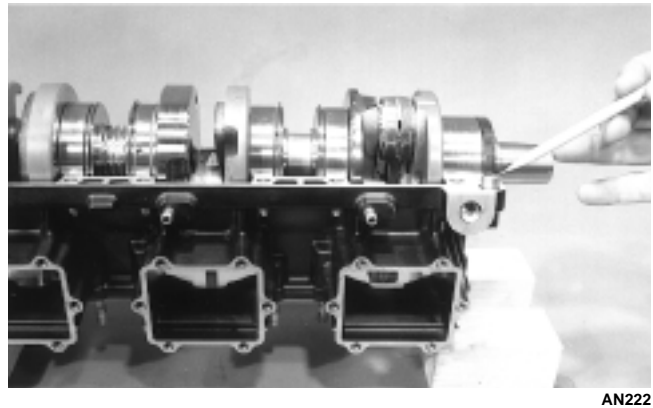
30. Once there is a 6.4 mm (1/4 in.) space between the two case halves, set the crankcase down on the work bench with its bottom side up. Remove the cap screws; then lift the bottom of the crankcase free of the engine.

Fig. 2-166



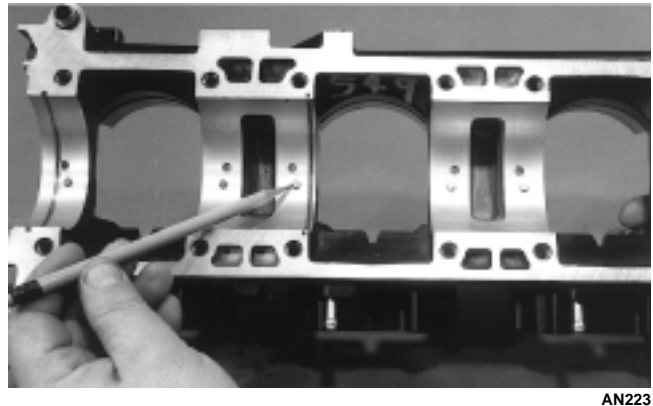
31. Grasp the crankshaft at either end and carefully lift it from the crankcase. Have a clean area ready to lay the crankshaft on once it has been removed. Account for the two crankcase dowel pins.

Fig. 2-167



32. With the crankshaft removed from the top half of the crankcase, remove the seven bearing retaining pins and the C-ring.

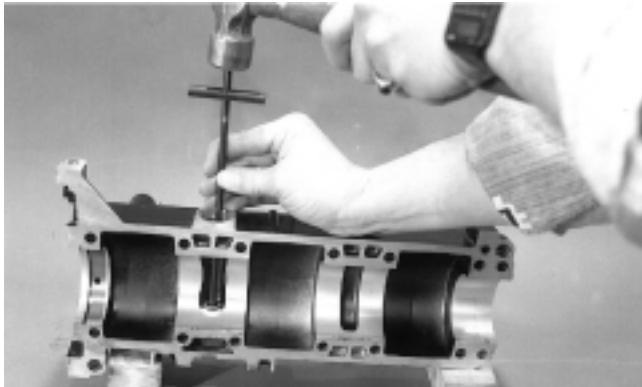
Fig. 2-168



■ **NOTE:** Do not replace the inner oil seal or mechanical seal unless the water pump shows signs of leaking coolant out of the small bleed hole in the bottom half of the crankcase. If a water pump seal is to be replaced, use the Water Pump Bearing and Seal Kit (p/n 0644-084).

33. Place the crankcase on the bench with the water pump side down. Using the long seal driver, drive the water pump seal from the crankcase.

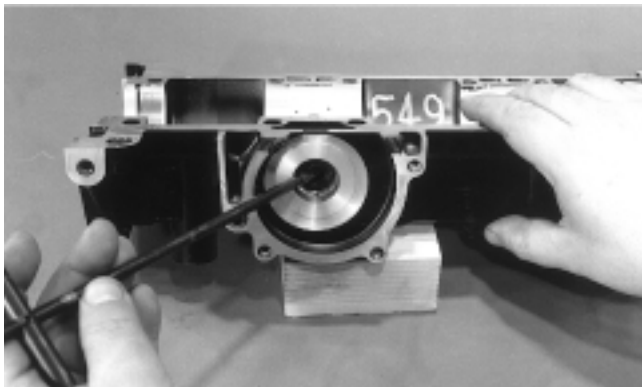
Fig. 2-169



AN226

34. Using a pair of snap ring pliers, remove the snap ring securing the inner seal in the crankcase.
35. Using the hooked end of the seal driver, pull the inner seal free of the crankcase.

Fig. 2-170



AN224

36. Using a sharp-pointed tool, pry the seal ring from the backside of the water pump impeller.

Fig. 2-171



AN051

Disassembling Engine (800/1000 cc Models)

2

1. Using an impact driver or a 6-mm hex wrench, remove the four cap screws securing the magneto housing to the crankcase. Account for the alignment dowels.
2. Using an impact driver, remove the five screws securing the water pump cover. Remove the cover and account for the O-ring seal and alignment dowels.

Fig. 2-172



AQ005

3. Secure the crankshaft using a spanner wrench; then remove the cap screw securing the water pump impeller.

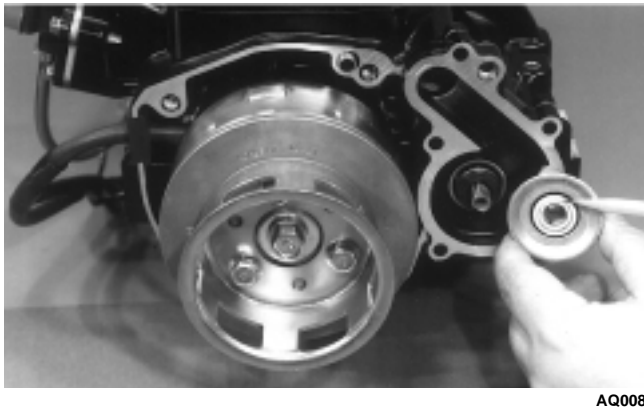
Fig. 2-173



4. Remove the water pump impeller from the counterbalance shaft.
5. With the impeller removed, check the condition of the seal on the back side. It must be free of any cracks, chips, or rough areas.

■ **NOTE:** If any rough areas are found, the seal ring can be removed using a small screwdriver. Simply pry the seal ring upward; then remove the rubber cup from beneath the seal ring.

Fig. 2-174



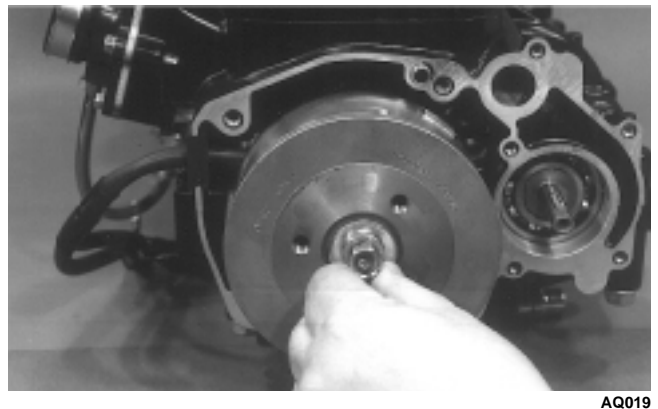
6. Remove the remaining water pump center and back section from the counterbalance shaft.
7. Inspect the front mechanical seal and rear seal surface for any rough areas. If the seals need replacement, see the appropriate Repairing Water Pump in Section 3.

Fig. 2-175



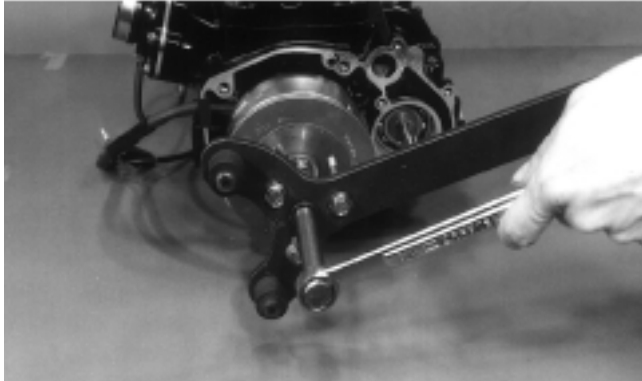
8. Using a spanner wrench to secure the crankshaft, remove the cap screw, lock washer, and large flat washer securing the flywheel.
9. Remove the three cap screws securing the starter pulley to the flywheel.
10. To prevent damaging the crankshaft threads during the flywheel removal procedure, use the Puller Insert (p/n 0644-179) on the end of the crankshaft.

Fig. 2-176



11. Attach the flywheel puller to the flywheel using three 8-mm cap screws approximately 2 3/4 in. long. Thread each of the three cap screws evenly into the flywheel 1/2 in.
12. Tighten the center puller bolt against the insert on the crankshaft. Continue to tighten the puller bolt until the flywheel snaps free of the crankshaft taper. Remove the puller from the flywheel and place the flywheel, open side up, on a clean work bench. Account for the flywheel key.

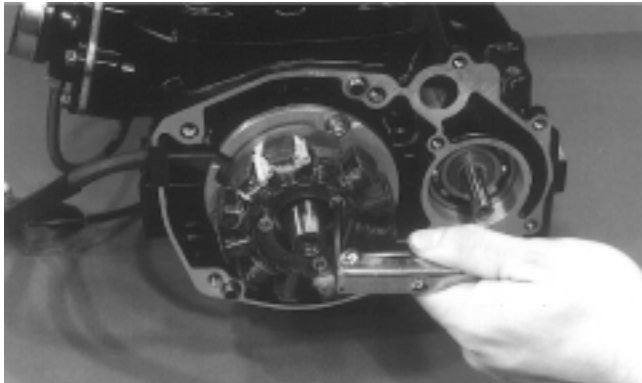
Fig. 2-177



AQ020

13. Remove the Allen-head cap screws securing the stator to the stator plate.
14. Remove the rubber grommet from the crankcase and slide the stator free of the crankshaft.

Fig. 2-178



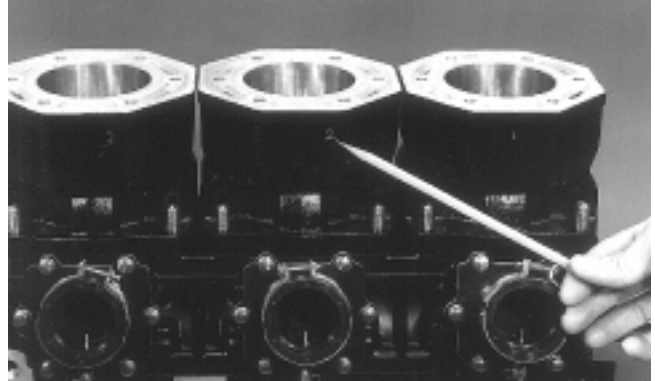
AQ021

15. Remove the three Allen-head cap screws securing the stator plate to the crankcase.
16. Remove the thermostat cover; then remove the thermostat from the water manifold.

■ **NOTE:** The thermostat is designed to open at 50°C (122°F). It should be checked for proper operation before installing (see Section 3).

17. Remove the water manifold assembly.
18. Remove the heads from the cylinders. Account for the two O-rings under each head.
19. For assembly purposes, number the three heads and cylinders. Start from the MAG-side.

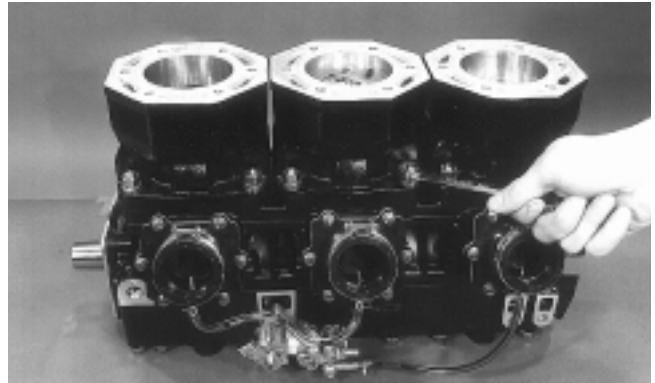
Fig. 2-179



AQ026

20. Remove the four nuts, lock washers, and flat washers securing each cylinder to the crankcase; then carefully lift each cylinder straight up and free of the piston. Support the piston as the cylinder clears the piston to prevent the connecting rod from dropping against the crankcase and causing damage to the crankcase sealing surface.

Fig. 2-180



AQ027

21. For assembly purposes, number the dome of each piston starting from the MAG-side; then remove the MAG-side circlip from each piston.

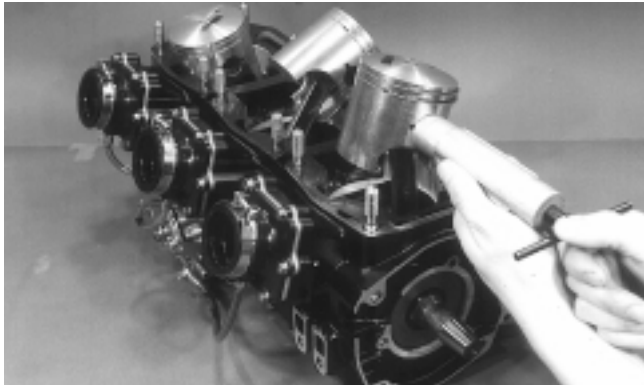
Fig. 2-181



AQ028

22. Using Piston Pin Puller (p/n 0644-328), remove the piston pin from each piston. Remove the piston, piston pin bearing, and the two shim washers. Keep each piston, piston pin, and bearing together as a set.

Fig. 2-182

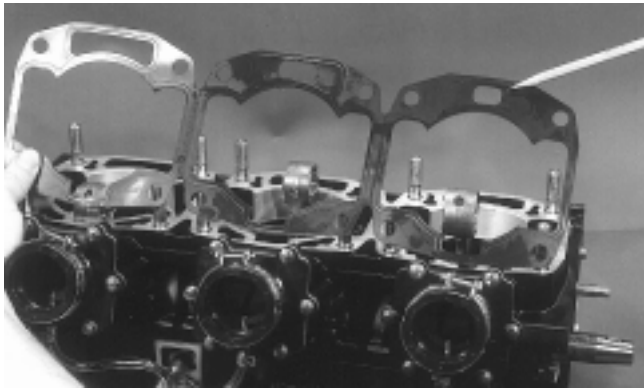


AQ029

23. Before lifting the cylinder base gasket from the crankcase, note how it is installed. The smaller of the three water passage holes must be positioned to the MAG-side of the crankcase when installing. Lift the gasket free of the crankcase.

■ **NOTE:** If the cylinder base gasket is not damaged, it can be reused.

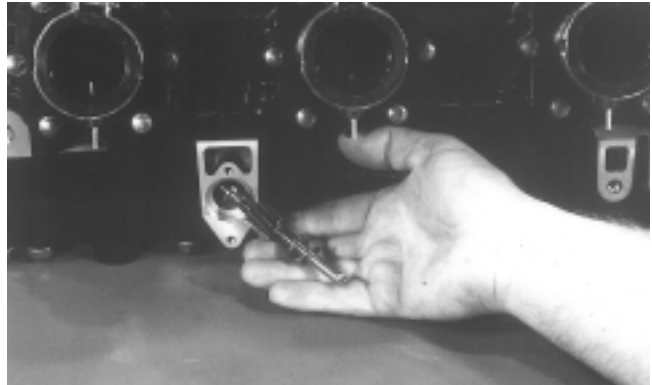
Fig. 2-183



AQ030

24. Remove the two screws securing the oil-injection pump to the crankcase. Slide the pump free of the crankcase. Account for the O-ring located around the pump inner flange.
25. Remove the pump retainer and shaft. Account for the shaft thrust washer.

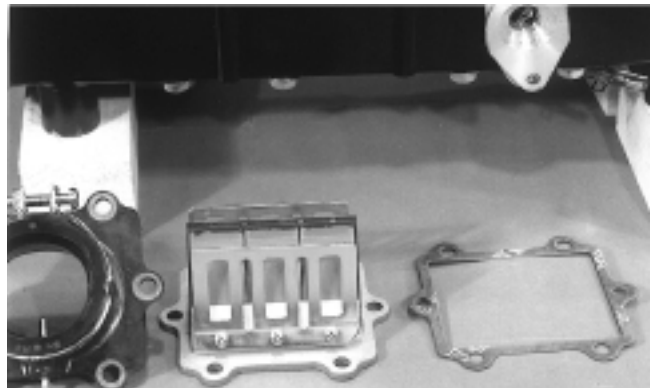
Fig. 2-184



AQ119

26. Remove the six cap screws securing the intake flanges and reed valve assembly to the crankcase.
27. Remove the intake flange and reed valve assembly. Be very careful not to damage the reed valve stops. Place the assembly on its flat side. Remove and discard the reed valve assembly gasket.

Fig. 2-185



AN236

28. Using an impact driver, remove the four screws securing the PTO-end plate to the end of the crankcase; then slide the plate free of the crankshaft.

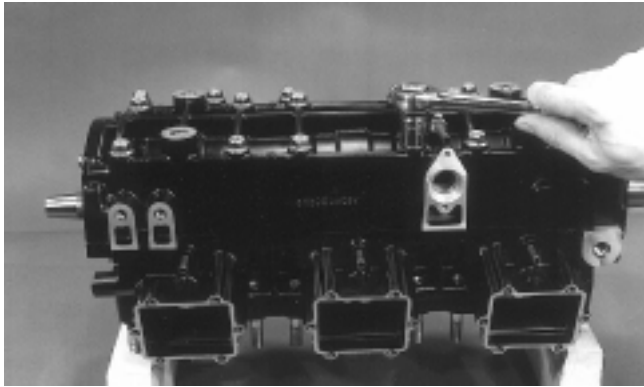
Fig. 2-186



AQ034

29. Remove the twenty cap screws securing the two crankcase halves together.

Fig. 2-187



AQ035

30. To separate the crankcase halves, start two of the crankcase cap screws into the crankcase at opposite corners. Thread the cap screws into the crankcase until a 6.4 mm (1/4 in.) space remains between the cap screw flange and the crankcase surface.

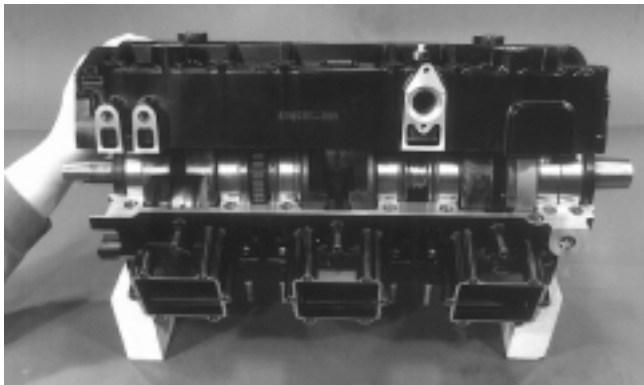
Fig. 2-188



AQ036

31. Set the crankcase on its side with the flat reed surfaces resting on the work bench. Using a plastic hammer, strike the heads of the two cap screws alternately driving the two case halves apart.
32. Once there is a 6.4 mm (1/4 in.) space between the two case halves, set the crankcase down on the work bench with its bottom side up. Remove the cap screws; then lift the bottom of the crankcase free of the engine.

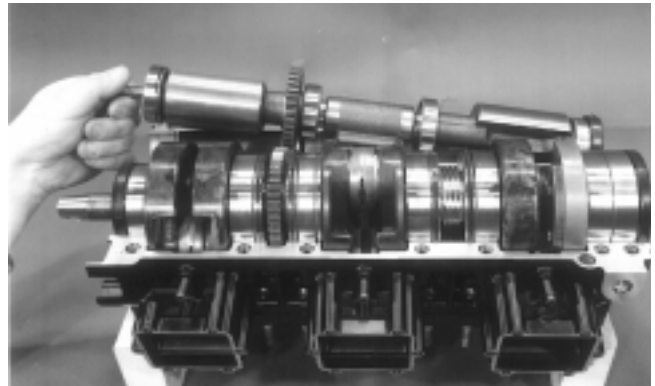
Fig. 2-189



AQ037

33. Remove the balancer shaft from the crankcase. Notice that it has a timing mark located on the side of the drive gear. This timing mark must be aligned with the crankshaft gear during assembly.

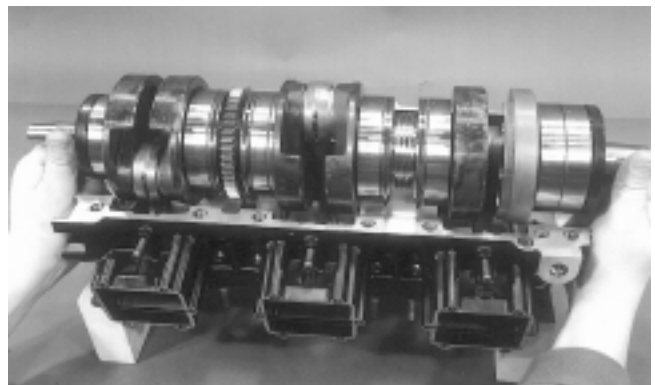
Fig. 2-190



AQ038

34. Remove the balancer shaft end seals from the crankcase.
35. Grasp the crankshaft at either end and carefully lift it from the crankcase. Have a clean area ready to lay the crankshaft on once it has been removed.

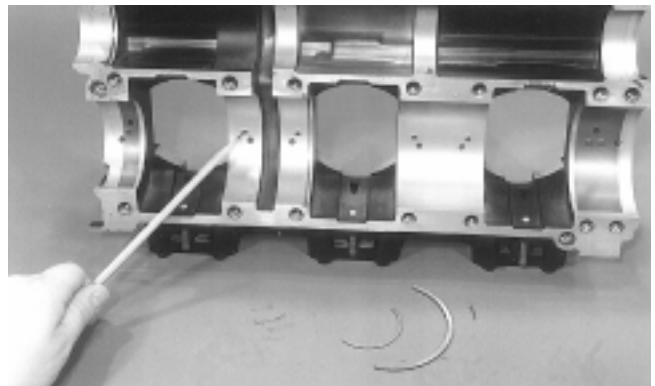
Fig. 2-191



AQ039

36. With the crankshaft removed from the top half of the crankcase, remove the seven bearing dowel pins and the two C-rings.

Fig. 2-192



AQ040

Cleaning and Inspecting Engine

■ **NOTE:** Whenever a part is worn excessively, cracked, 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.
3. Place the cylinder heads on a Surface Plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move each 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.

Fig. 2-193



AQ132D

⚠ CAUTION

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

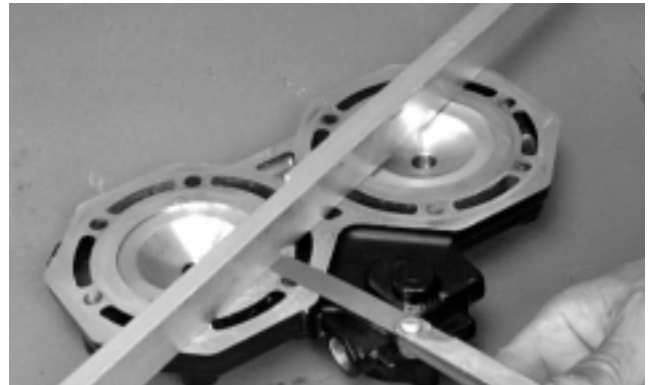
CYLINDER HEAD (500/600 cc)

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.
3. Inspect the cylinder head for flatness using a straightedge and a feeler gauge. Acceptable warpage must not exceed 0.05 mm (0.002 in.).

■ **NOTE:** If the warpage exceeds specification, resurface the cylinder head using procedures identified in step 6 in the Crankcase subsection of Cleaning and Inspecting Engine.

Fig. 2-194



AN426D

⚠ CAUTION

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

CYLINDERS

1. Using a non-metallic carbon removal tool, remove carbon buildup from the exhaust ports.
2. Wash the cylinders in parts-cleaning solvent.
3. Inspect the cylinders for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface with Ball Hone (p/n 0644-036) for the 600 cc or (p/n 0644-037) for the 800 cc or with #500 grit stones and honing oil.

Fig. 2-195



AN053

■ **NOTE:** To produce the proper 60° “crosshatch” pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight, petroleum-based oil. Thoroughly clean the 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.

4. Place the head surface of each cylinder on the surface plate 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.



CAUTION

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

PISTON ASSEMBLY

1. Using a non-metallic carbon removal tool, remove the carbon buildup from the dome of each piston.
2. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.



CAUTION

Improper cleaning of the ring-grooves by the use of 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. 2-196



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 worn piston rings or an out-of-round cylinder.

CRANKCASE

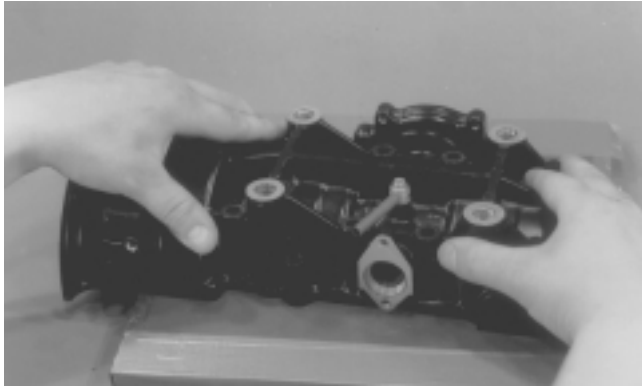
1. Wash the crankcase halves in parts-cleaning solvent.

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

2. Inspect the 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 in a pinking (sawtooth) 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 the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move each half in a figure eight motion. Inspect the sealing surfaces 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.

■ **NOTE:** Care must be taken not to remove an excessive amount of aluminum, or the crankcase will have to be replaced. If excessive aluminum is removed, too much pre-load will be exerted on the crankshaft bearings when assembled.

Fig. 2-197



AN060

⚠ CAUTION

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

**INTAKE MANIFOLD
INSULATORS (Single Carburetor)/
ADAPTER PLATES (Twin Carburetor)**

■ **NOTE:** For fan cooled models only.

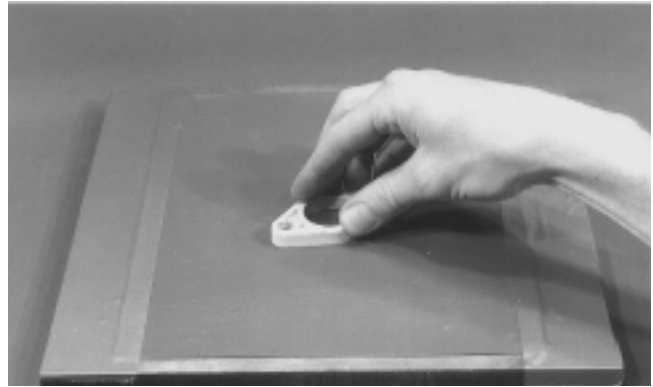
1. Inspect for cracks, scoring, pitting, imperfections, or warping.
2. Inspect the sealing surfaces for trueness by placing each on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move both sides in a figure eight motion. Inspect the sealing surface for any indication of high spots or warping. Correct high spots by continuing to move each side in a figure eight motion. Warped components must be replaced.

■ **NOTE:** On the twin carburetor model in order to inspect adapter plate trueness, it will be necessary to remove the studs.

⚠ CAUTION

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

Fig. 2-198

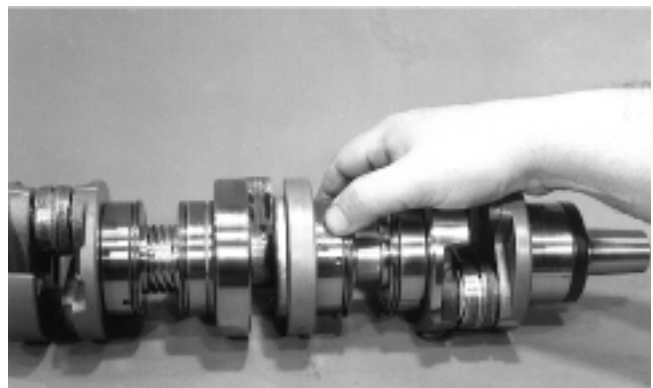


A932

CRANKSHAFT

1. Wash the crankshaft with bearings in parts-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.

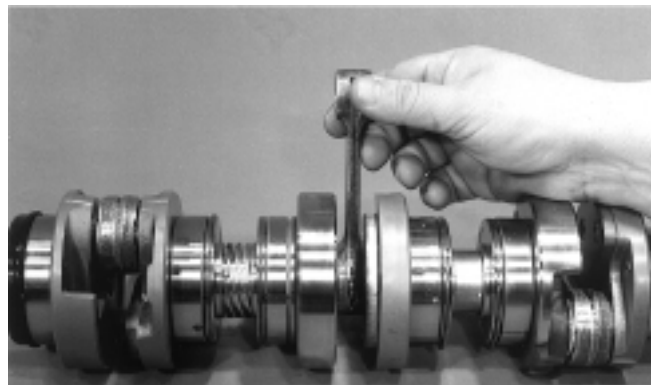
Fig. 2-199



AN218

3. Inspect the connecting-rod bearings by rotating them. The 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.

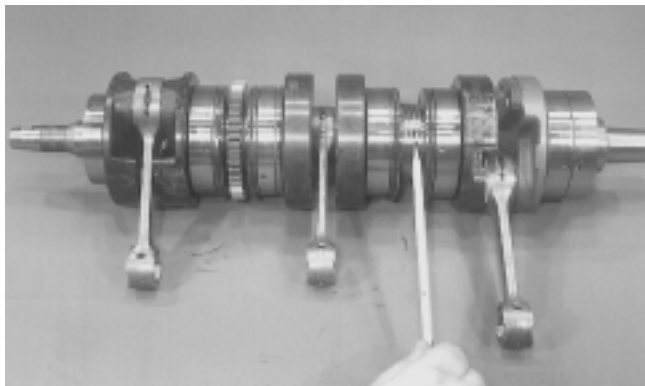
Fig. 2-200



AN217

4. Inspect the oil-injection pump drive gear for any signs of worn or chipped teeth. If either condition exists, replace the gear.

Fig. 2-201



AQ043

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

REMOVING OUTER CRANKSHAFT BEARINGS

⚠ **WARNING**

Safety glasses must be worn when spreading bearings.

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

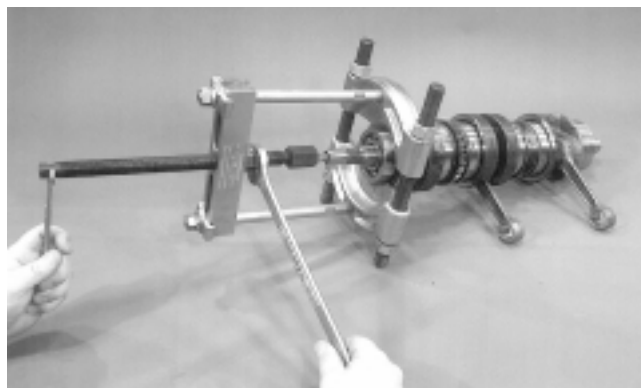
1. Place a bearing support (block of wood, etc.) beneath the MAG-side bearing.

⚠ **CAUTION**

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

2. Drive a chisel or bearing splitter between the bearing race and crankshaft counterweight until the bearing is spread far enough to install the jaws of the crankshaft bearing remover.
3. Place the protective cap on the crankshaft end; then using the Crankshaft Bearing Remover (p/n 0144-302), remove the bearing from the end of the crankshaft. Account for any shim(s). Note the position of the dowel pin hole.

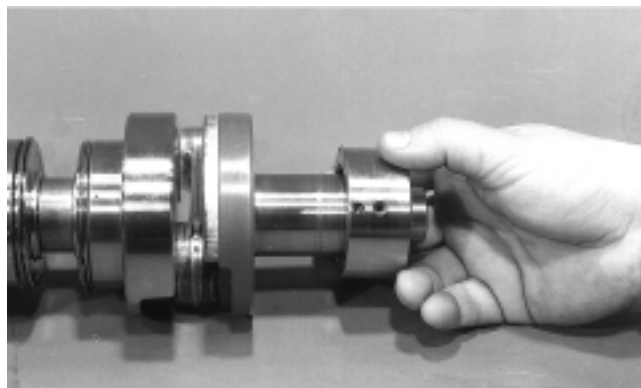
Fig. 2-202



AQ045

4. The PTO-side bearing may be removed simply by sliding the bearing off the PTO end.

Fig. 2-203



AN151A

5. Inspect the crankshaft bearing area for wear. If any wear is noted on either end, replace the crankshaft end.

INSTALLING OUTER CRANKSHAFT BEARINGS

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

1. Wrap a thick towel around the crankshaft; then secure the crankshaft vertically in a vise.
2. Heat the bearing either by placing the entire bearing in a pan of oil on a hot plate 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.

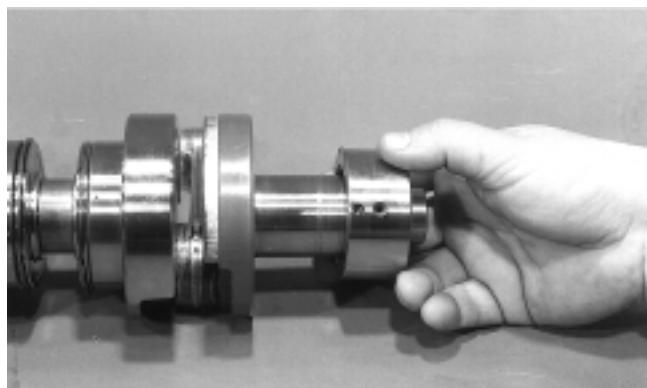
⚠ **CAUTION**

DO NOT overheat the bearing.

2

3. 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.
4. Slide the PTO-side bearing onto the PTO end making sure the dowel-pin hole will align with the hole and pin in the crankcase.

Fig. 2-204

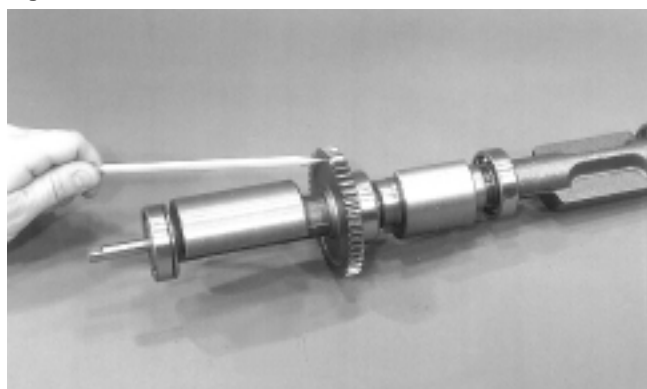


AN151A

BALANCER SHAFT (800/1000 CC)

1. Inspect the balancer shaft bearings by rotating them by hand. The bearings must rotate freely without binding or feeling rough. If either condition exists, replace the bearing. Inspect the balancer gear very closely for any chipped teeth or signs of wear. If either condition exists, replace the gear.

Fig. 2-205

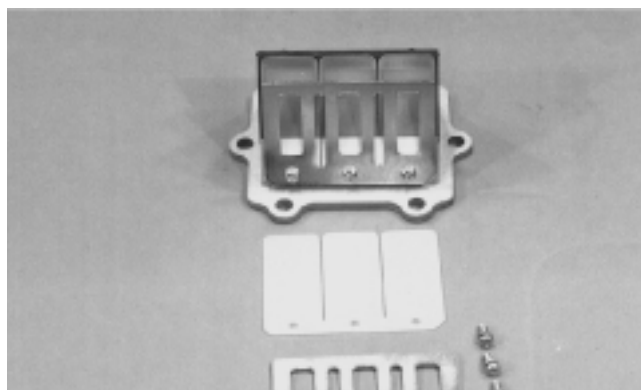


AQ044

REED ASSEMBLY

1. Inspect the reed valves, stoppers, and valve blocks for cracks or any deterioration.

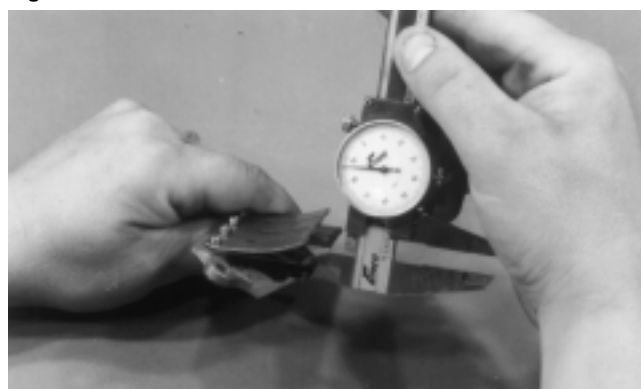
Fig. 2-206



AQ046

2. Wash the reed valves, stopper, and cage assembly in parts-cleaning solvent and blow dry.
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 measurement is not within specifications, either bend or replace the reed stopper.

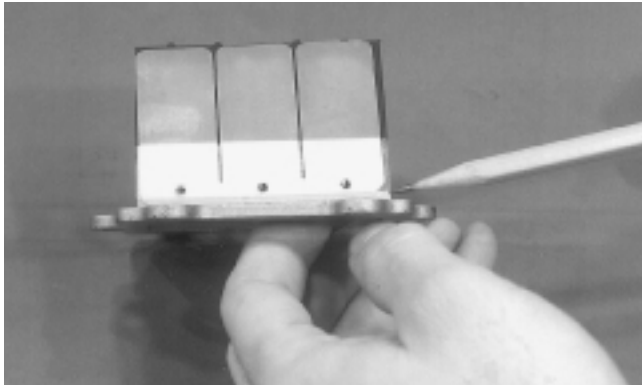
Fig. 2-207



AJ156

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.
5. To assemble, place the reed valves on the cage with its clipped corner positioned to the lower right hand corner of the cage. Place the reed stopper assembly into position and secure with the three screws coated with red Loctite #271.

Fig. 2-208



AQ047

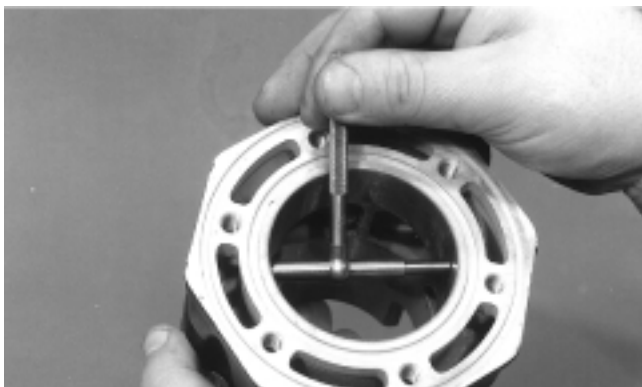
Measuring Critical Components

■ **NOTE:** Critical engine component specifications are on pages 51-52 of this section.

CYLINDER TRUENESS

1. Measure each cylinder in the three locations from front to back and side to side for a total of six readings.

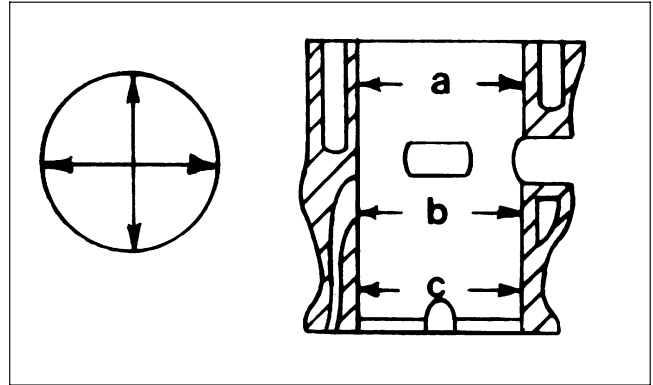
Fig. 2-209



AN302

2. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.

Fig. 2-210



0725-586

CYLINDER TRUENESS LIMIT (max)	
mm	in.
0.10	0.004

2

PISTON SKIRT/CYLINDER CLEARANCE

1. Measure each cylinder front to back about 2.5 cm (1 in.) from the bottom of each cylinder.
2. Measure the corresponding piston skirt diameter at a point 1 cm (0.394 in.) 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. 2-211

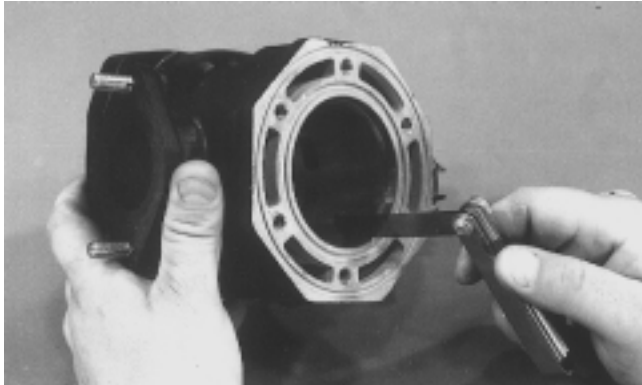


AC091

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 be within specifications.

Fig. 2-212



AN057

PISTON PIN AND PISTON-PIN BORE

1. Measure the piston pin diameter at each end and in the center. Acceptable piston pin measurement must be within specifications. 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. 2-213



AN056

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

Fig. 2-214



AC092

CONNECTING-ROD SMALL END BORE

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

Fig. 2-215



AN061

2. The diameter measurement must be within specifications.

CRANKSHAFT RUNOUT

1. Using the V Blocks (p/n 0644-022), support the crankshaft on the surface plate.

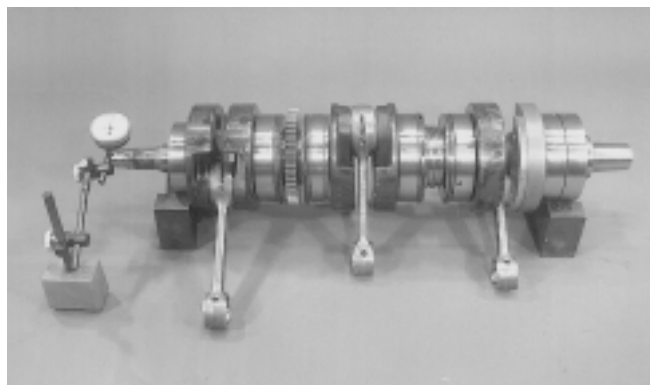
■ **NOTE:** The V blocks should support the crankshaft on the outer bearings.

2. Mount a dial indicator and base on the surface plate. Position the indicator contact point against the crankshaft distance F (PTO-end) from the crankshaft end. Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).

■ **NOTE:** For runout distance specifications, see pages 143-144 of this section.

3. Position the indicator contact point against the crankshaft distance D (MAG-end) from the crankshaft end. Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).

Fig. 2-216



AQ042

4. Position the indicator contact point against the crankshaft at point E (center). Zero the indicator and rotate the crankshaft slowly. Note the amount of crankshaft runout (total indicator reading).

5. If runout exceeds specifications at any of the checkpoints, the crankshaft must be either straightened or replaced.

CRANKSHAFT RUNOUT (max) (total indicator reading)	
mm	in.
0.05	0.002

1999 Engine Specifications (60 cc)

2

ITEM	SPECIFICATIONS
Model	AP06A2
Type	2 Cycle, Air-Cooled
No. of Cylinders	1
Bore x Stroke	41 x 45 mm (1.614 x 1.772 in.)
Displacement	59 cc (3.6 cu in.)
Compression Ratio	6.6:1
Cylinder Trueness (max)	0.1 mm (0.004 in.)
Piston Ring End Gap Range	0.1-0.8 mm (0.004-0.031 in.)
Piston Skirt/Cylinder Clearance Range	0.07-0.15 mm (0.0028-0.0059 in.)
Piston Pin Diameter Range	11.996-12.000 mm (0.4723-0.4724 in.)
Piston Pin Bore Diameter Range	12.000-12.010 mm (0.4724-0.4728 in.)
Connecting Rod Small End Diameter Range	16.003-16.011 mm (0.6300-0.6304 in.)
Crankshaft Runout (max)	0.05 mm (0.002 in.)
Crankshaft End Play Range	0.05-0.10 mm (0.002-0.004 in.)

Assembling Engine Table of Contents

60 cc Model	2-53
F/C Models	2-58
440 LC/550 cc Models	2-64
500/580/600 cc Twin Models	2-70
700 cc Models	2-76
600 cc Triple Models	2-85
800/1000 cc Models	2-92

Assembling Engine (60 cc Model)

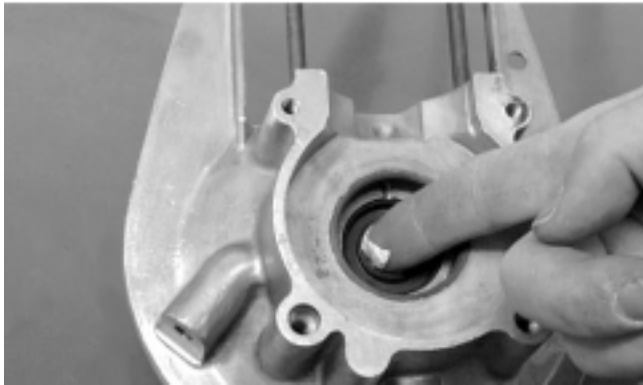
CRANKCASE/GEAR CASE

1. If the bearings were removed, install the bearings into the crankcase halves.
2. Using a seal installing tool, insert the seals into the crankcase halves.

■ **NOTE:** Make sure the spring side of seal is positioned toward the center of the crankshaft.

3. Apply grease to the inner lips of the seals.

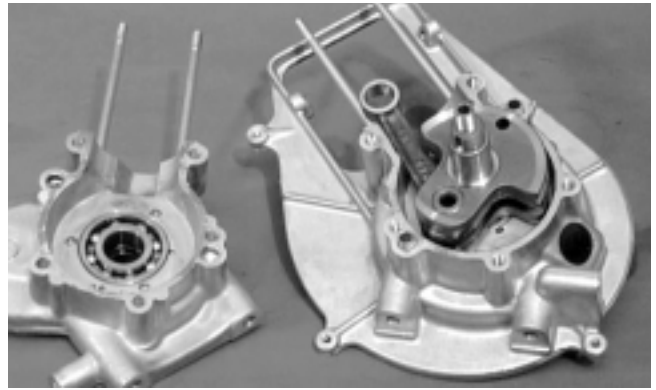
Fig. 2-217



A744

4. Press the crankshaft into MAG-end of case.

Fig. 2-218



A742

5. Apply High-Temp Sealant (p/n 0636-069) to one half of the crankcase.

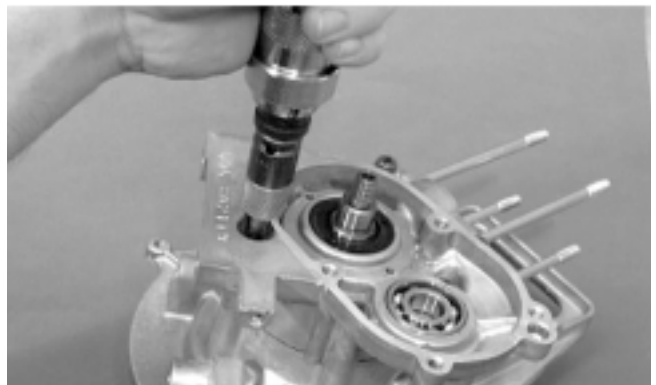
Fig. 2-219



A743

6. If removed, install crankcase dowel pins.
7. Apply blue Loctite #242 to the five crankcase cap screws; then assemble the crankcase. Tighten to 0.6-1 kg-m (4.5-7 ft-lb).

Fig. 2-220



A745

■ **NOTE:** Place a rubber band over the connecting rod to prevent the rod from damaging the crankcase if the crankshaft is accidentally rotated.

8. Install the key in the PTO-end of the engine crankshaft. Slide the drive gear onto crankshaft so the large beveled edge is positioned inward.

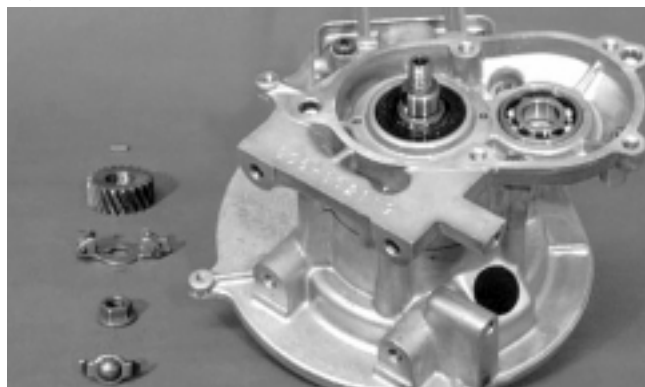
Fig. 2-221



A746

9. Place the centrifugal onto the PTO-end of crankshaft making sure the notch of the centrifugal aligns with keyway of the crankshaft.

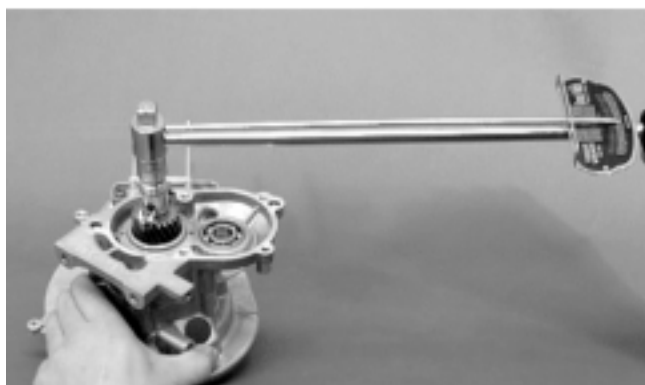
Fig. 2-222



A747

10. Secure the PTO-end crankshaft components by applying blue Loctite #242 to the nut, installing the PTO-end nut, and tightening the nut to 3-4 kg-m (22-29 ft-lb).

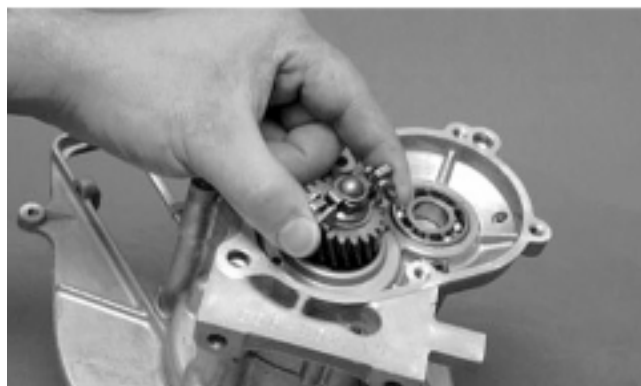
Fig. 2-223



A749

11. Install the shifter so the centrifugal weights are positioned against the shifter arms.

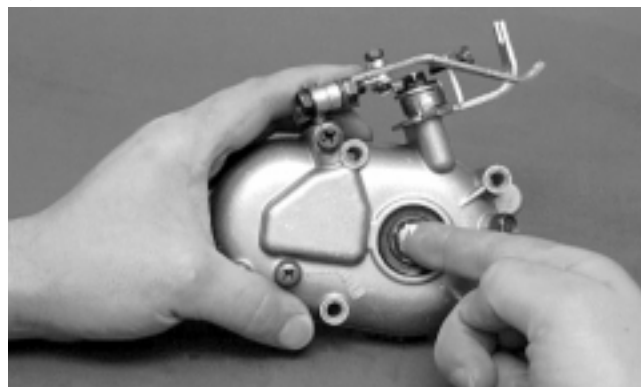
Fig. 2-224



A750

12. Install the bearing in the gear case housing. Apply grease to the inner lips of the seal; then place the seal into position.

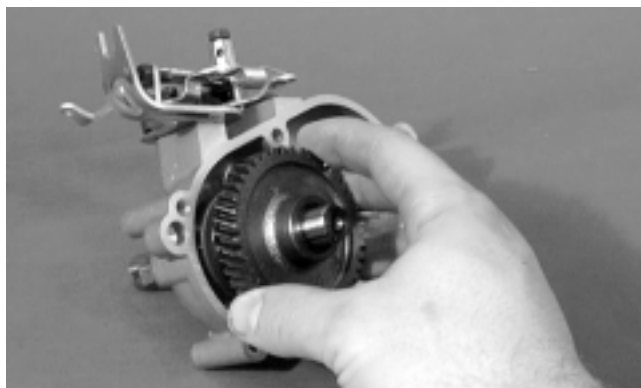
Fig. 2-225



A751

13. Install the primary driven shaft.

Fig. 2-226



A752

14. Apply High-Temp Sealant (p/n 0636-069) to both sides of the gear case gasket. Place the gasket against the crankcase.

Fig. 2-227



A753

15. Install the gear case cover with output shaft. Install the five screws; then tighten the screws with an impact screwdriver.

Fig. 2-228

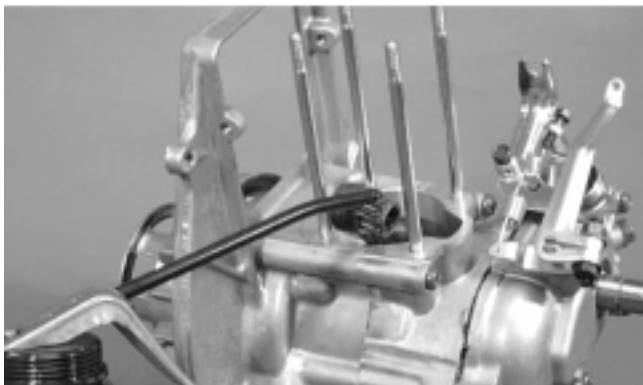


A755

CYLINDER HEAD/FAN

16. Place the bearing in the connecting rod small end. Apply Arctic Cat 50:1 Injection Oil to the bearing.

Fig. 2-229



A767

17. Install the piston rings. The letter near the ring end must be positioned upward. Make sure ring ends are positioned correctly over piston ring keepers.

Fig. 2-230



A736

18. Place the piston assembly onto the connecting rod. Make sure the arrow on dome of the piston points to the exhaust side of the engine.

Fig. 2-231



A768

19. Install the piston pin. Secure the piston pin with circlips.

Fig. 2-232



A776

■ **NOTE:** Make sure the open ends of the circlips are directed toward either the piston top or bottom.

20. Apply a thin coat of high temperature sealant to both sides of the cylinder base gasket; then install the base gasket.

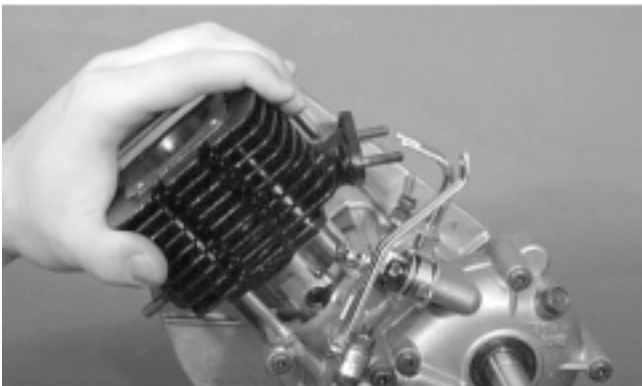
Fig. 2-233



A770

21. Using a piston holder to “square” the piston, compress the piston rings and install the cylinder. Do not force the cylinder. If cylinder binds, remove, check the position of the piston rings, and install.

Fig. 2-234



A771

22. Place the head gasket into position.

Fig. 2-235

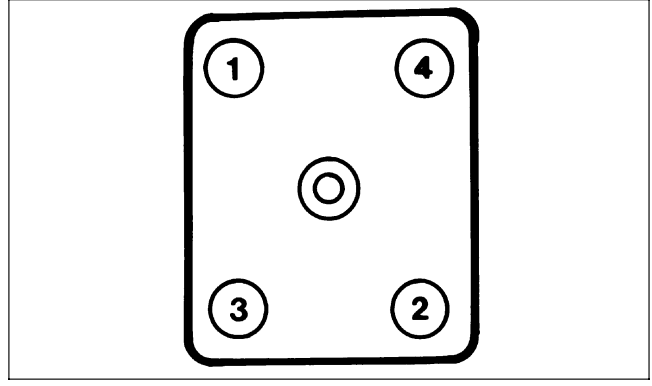


A772

23. Place the cylinder head into position. The head must be positioned so the cooling air flow is parallel to the fin pattern.

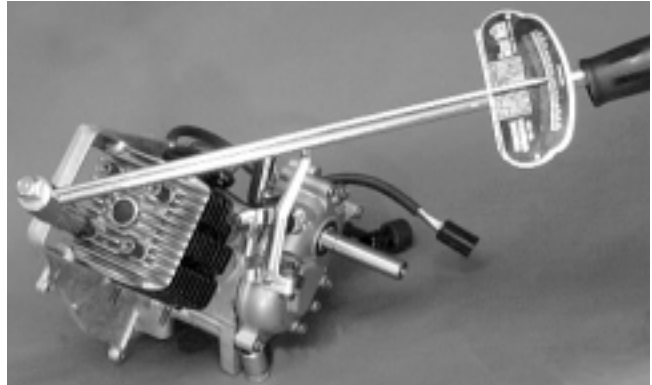
24. Tighten cylinder head nuts to 0.8-1.2 kg-m (6-9 ft-lb) using the pattern shown.

Fig. 2-236



725-318A

Fig. 2-237



A773

25. Place the ignition coil into position; then secure with two screws and lock washers. Connect the coil lead to the lead from the magneto.

Fig. 2-238



A757

26. When installing the stator plate, align the scribed marks made during disassembly. Apply red Loctite #271 to the three screws; then tighten the screws securely.

Fig. 2-239



A765

27. Place flywheel key into position.

28. Make sure the flywheel magnets are clean; then align the keyway of the flywheel with the key in the crankshaft. Place the flywheel on crankshaft.

29. Install starter pulley and spacer. Secure with three screws and tighten securely.

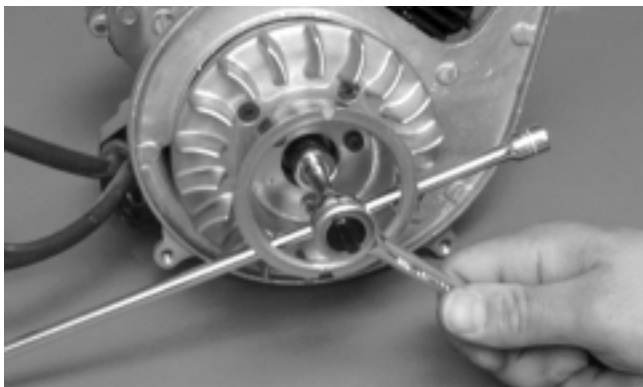
Fig. 2-240



A766

30. Install the flat washer, lock washer, and flywheel nut. Using a flywheel holder (or suitable substitute), tighten nut to 3-4 kg-m (22-29 ft-lb).

Fig. 2-241



A762

31. Install the cylinder head cowl and tighten securely.

Fig. 2-242



A774

32. Install the fan cover and secure with four screws. Make sure the high tension coil lead is secured by the upper rear screw.

Fig. 2-243



A775

33. Install recoil starter. Just before tightening the machine screws, pull the recoil rope and hold it to center the recoil; then tighten the screws securely.

NOTE: Do not tighten the machine screw used to secure the lower fuel tank assembly mount at this time.

Fig. 2-244



A788

34. Place the fuel tank assembly into position behind the loose recoil housing machine screw; then install the assembly to the cylinder head with two additional machine screws and lock washers. Tighten all recoil housing machine screws securely.

35. Install the exhaust gasket; then place the muffler onto the exhaust studs. Secure the muffler with two nuts and lock washers; then tighten nuts to 0.8-1.1 kg-m (6-8 ft-lb).

Fig. 2-245

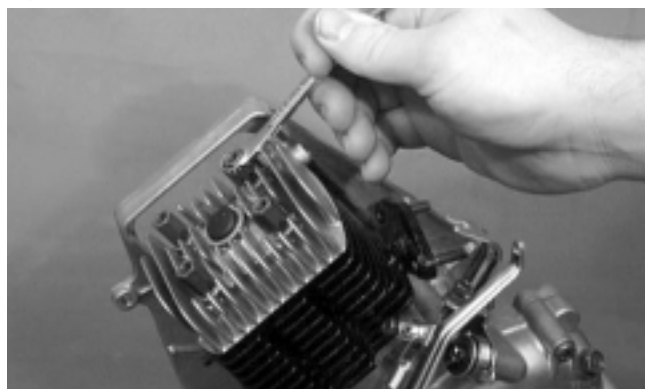


A778

36. Install the spark plug; then tighten to 2.5-2.8 kg-m (18-20 ft-lb).

37. In order, place a gasket, insulator, and gasket onto the intake studs.

Fig. 2-246

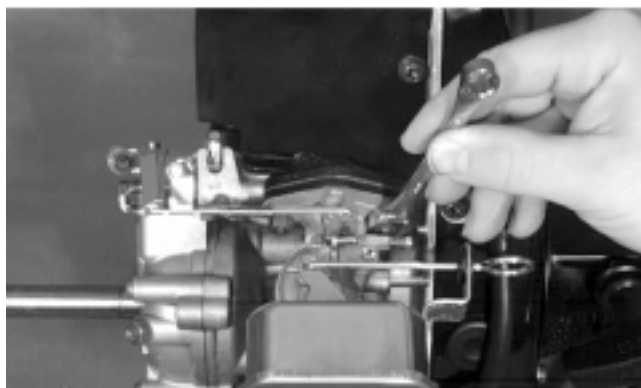


A777

38. Connect the carburetor rod and rod spring to the throttle control lever and the carburetor throttle plate.

39. Slide the carburetor onto the intake studs; then secure with two nuts and lock washers. Tighten nuts to 0.8-1.1 kg-m (6-8 ft-lb).

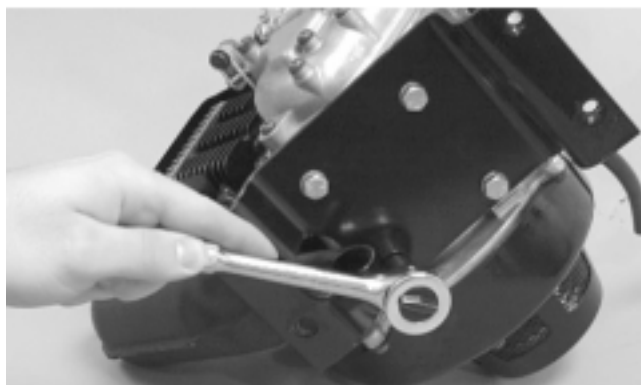
Fig. 2-247



A779

40. Place the engine onto the engine plate and secure with the four cap screws. Tighten to 4.2 kg-m (30 ft-lb).

Fig. 2-248



A900

Assembling Engine (F/C Models)

■ **NOTE:** The use of new gaskets and seals is recommended when assembling the engine.

■ **NOTE:** When the use of a lubricant is indicated, use Arctic Cat 50:1 Injection Oil.

1. Install the C-ring and the five dowel pins into the lower crankcase half.
2. Lubricate the inner lips of the crankshaft oil seals with grease; then slide the seals onto the crankshaft making sure the spring side of each seal faces the center of the crankshaft.

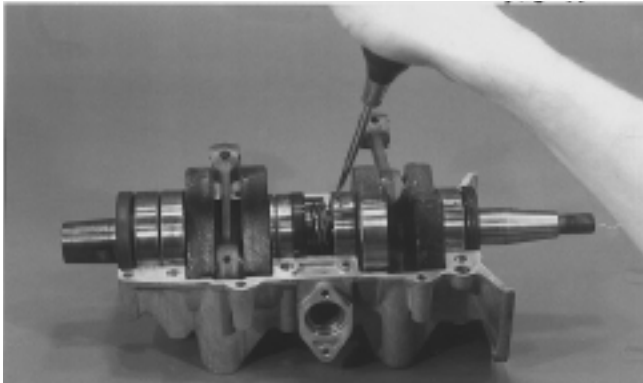
Fig. 2-249



AC087

3. Apply oil to the crankshaft bearings; then install the dowel pins, C-ring, and crankshaft into the lower crankcase half. Be sure the alignment hole in each bearing is positioned over its respective dowel pin in the crankcase; then seat the crankshaft.

Fig. 2-250



AB091

■ **NOTE:** Make sure the crankshaft center seal is properly positioned in the groove of the lower crankcase half.

■ **NOTE:** To check the bearing for proper position, place the point of a sharp tool into the dimple found in the bearing race. Strike the tool with the palm of the hand in either direction. If the bearing moves, it isn't positioned correctly and must be rotated until it drops onto the dowel pin.

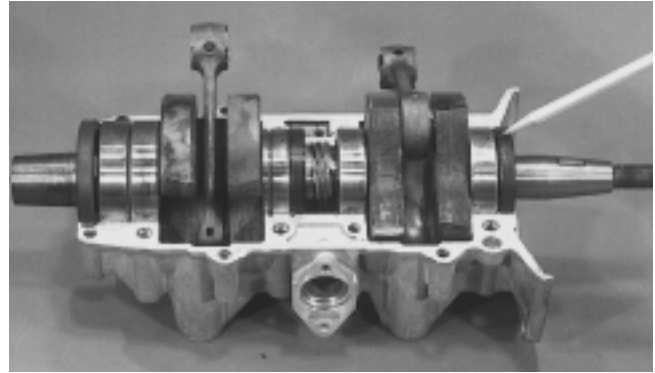


CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and engine damage will result.

4. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the crankcase sealing surfaces.
5. Assemble the crankcase halves making sure the crankcase alignment dowel pins are properly positioned and the end seal tab will not block the oil transfer port in the upper crankcase half.

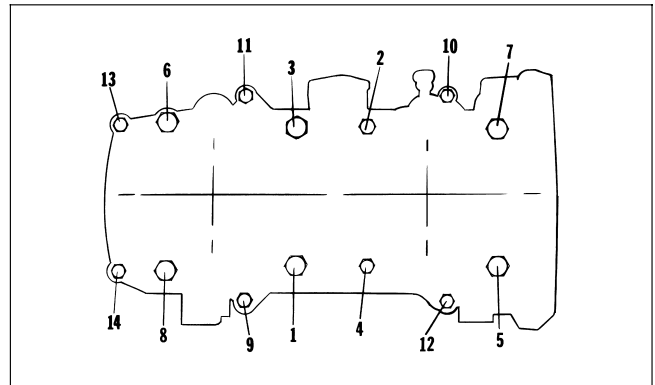
Fig. 2-251



AB092

6. Install the crankcase cap screws making sure the cap screws are in the corresponding-sized holes. Tighten in three steps the 8 mm cap screws to 1.8-2.8 kg-m (13-20 ft-lb) and the 6 mm cap screws to 0.8-1.2 kg-m (6-9 ft-lb) using the pattern shown.

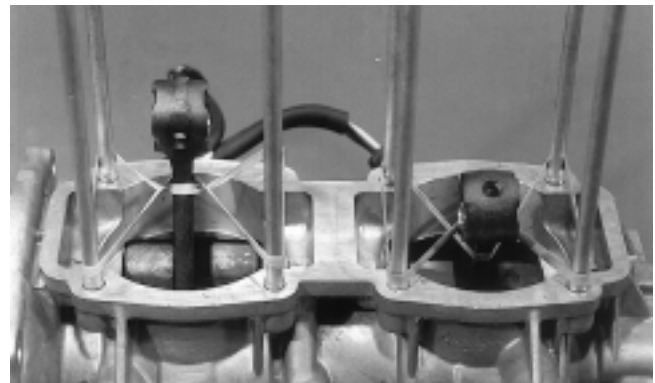
Fig. 2-252



0726-412

■ **NOTE:** Secure the connecting rods with rubber bands on the cylinder studs.

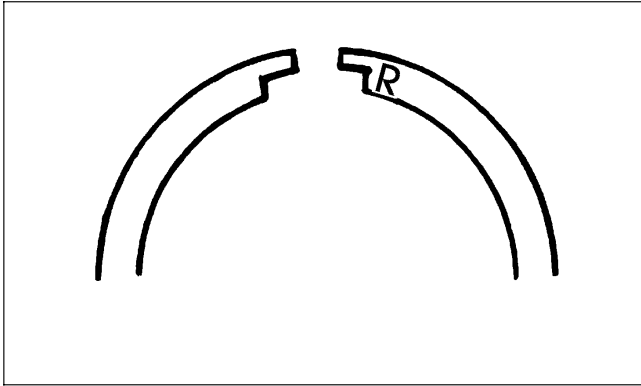
Fig. 2-253



B160

7. Install the piston rings on each piston so the letter on the top (inclined surface) of each ring faces the dome of the piston.

Fig. 2-254



726-306A

Fig. 2-255



AC088



CAUTION

Incorrect installation of the piston rings will result in engine damage.

8. Apply oil to the connecting-rod small-end bearings; then install the small-end bearings into the connecting rods.

■ **NOTE:** Apply oil to the piston pin before installing.

9. Place each piston over the connecting rod so the arrow on the piston dome points toward the exhaust port; then secure with a piston pin.

■ **NOTE:** The arrow is found either up inside the piston or on the dome top.

10. Install the new circlips so the open end is directed either down or up.

Fig. 2-256



B324D

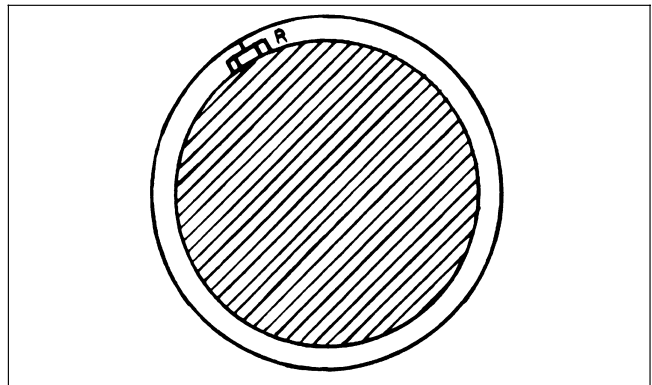


CAUTION

Make sure circlips are firmly seated and the open end is directed either down or up before continuing with assembly.

11. Install the cylinder base gaskets onto the crankcase making sure each gasket aligns with crankcase transfer passages.
12. Rotate each piston ring until the ring ends are properly positioned on each side of the ring keeper; then apply oil to the piston assemblies and cylinder bores. Remove the rubber bands from the connecting rods.

Fig. 2-257



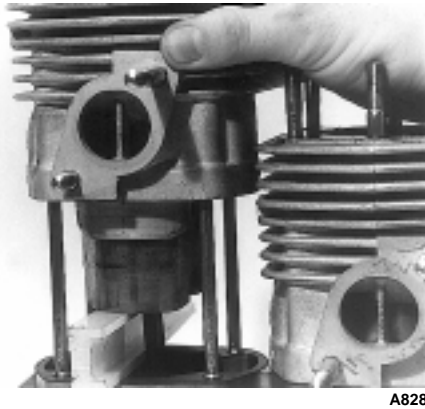
726-306B

■ **NOTE:** Apply a generous amount of oil to the surfaces of the pistons, rings, and cylinder bores.

■ **NOTE:** Inspect the cylinder-base gasket to ensure proper positioning.

13. For each piston, place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Remove the piston holder and seat the cylinder firmly onto the crankcase.

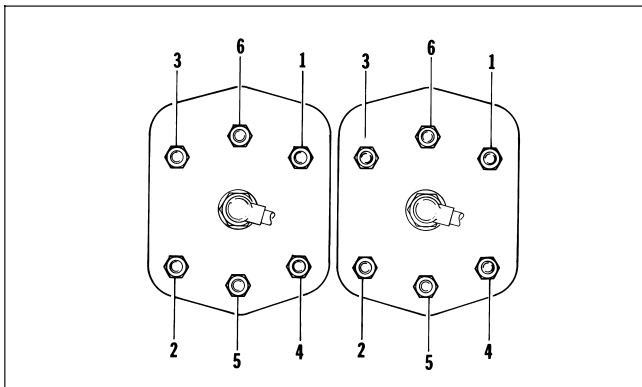
Fig. 2-258



A828

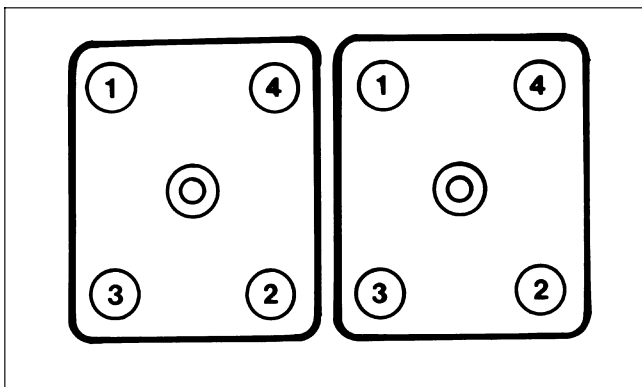
14. Place each cylinder head with gasket into position and install the eight nuts. **DO NOT TIGHTEN AT THIS TIME.**
15. Temporarily install the exhaust manifold and secure with four nuts and lock washers to “square” the cylinders. Tighten the manifold nuts to 1.8-2.2 kg-m (13-16 ft-lb).
16. With the exhaust manifold in place, tighten the cylinder head nuts in three steps to 1.8-2.8 kg-m (13-20 ft-lb) using the appropriate pattern.

Fig. 2-259



0728-514

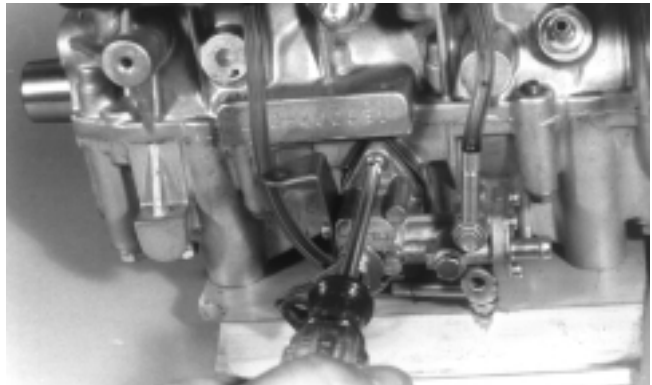
Fig. 2-260



0725-318

17. In order, install the gear, shim, gasket, retainer, gasket, and oil-injection pump. Secure with two screws, lock washers, and washers. Tighten to 0.7 kg-m (5 ft-lb).

Fig. 2-261



AB078

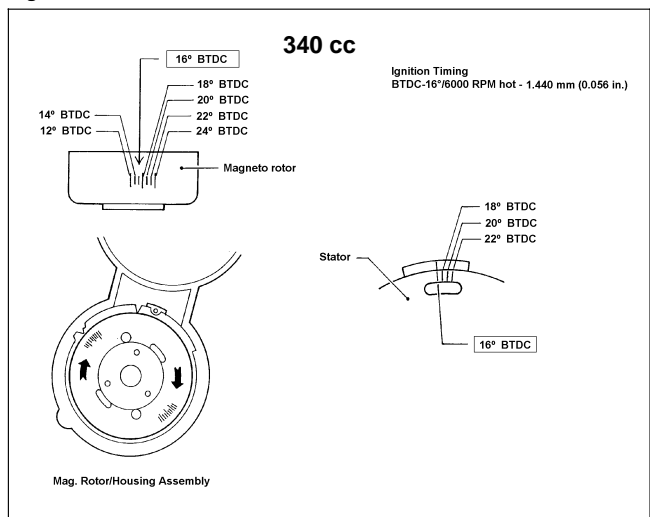
CAUTION

Be sure the gear is properly aligned with the slot of the oil-injection pump shaft. The injection pump will be damaged if these two components are not aligned.

■ **NOTE:** If removed, secure the ignition coil to the fan case.

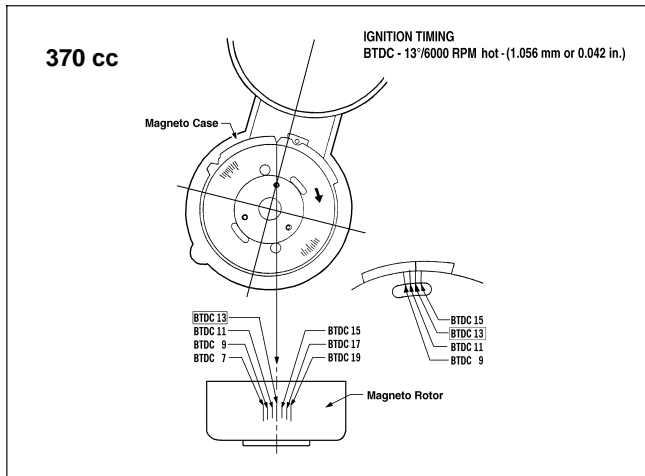
18. Align the reference marks made during disassembly; then secure the stator plate with two Allen-head cap screws (coated with red Loctite #271), lock washers, and washers.

Fig. 2-262



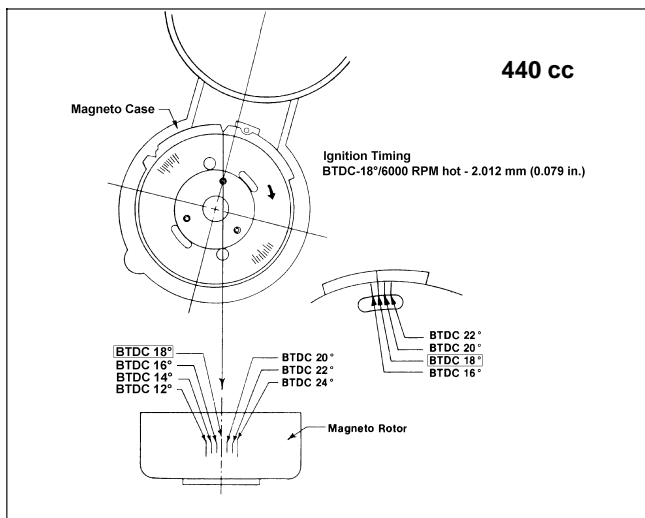
0729-651

Fig. 2-263



0734-489

Fig. 2-264

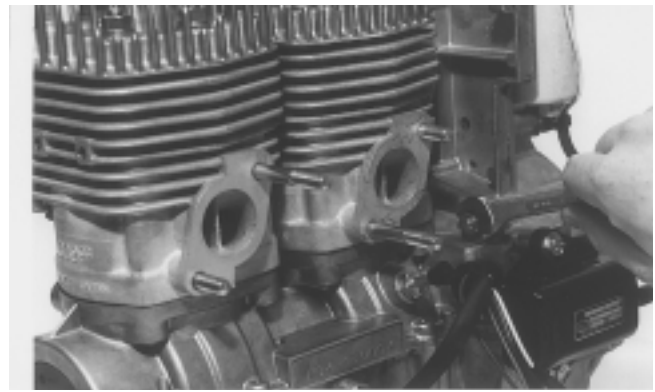


0726-863

■ **NOTE:** Before installing the flywheel, wipe the crankshaft and flywheel taper clean using a clean cloth.

19. Install the key in the crankshaft and slide the flywheel onto the crankshaft making sure the keyways match.
20. Place the fan case into position and secure with four nuts. Tighten the nuts to 1.8-2.2 kg-m (13-16 ft-lb).

Fig. 2-265



A814

21. On the 340 cc, apply a thin coat of High-Temp Sealant (p/n 0636-069) to both sides of the intake gaskets; then in order, install a gasket (one on each port), shroud, gasket (one on each port), insulator block (one on each port), gasket (one on each port), and intake manifold. Secure with four nuts (threads coated with red Loctite #271). Tighten nuts in three steps to 1.8-2.2 kg-m (13-16 ft-lb).

Fig. 2-266



A808

22. On the 370 cc, apply a thin coat of High-Temp Sealant (p/n 0636-069) to both sides of the intake gaskets; then in order, install a gasket (one on each port), shroud, gasket (one on each port), and intake manifold. Secure with four nuts (threads coated with red Loctite #271). Tighten nuts in three steps to 1.8-2.2 kg-m (13-16 ft-lb).
23. On the 440 cc, apply a thin coat of High-Temp Sealant (p/n 0636-069) to both sides of the intake gaskets and the front side of each adapter plate; then in order, install a gasket (one on each port), shroud, gasket (one on each port), and adapter plate (one on each port). Secure with six screws coated with red Loctite #271. Place the intake flanges into position and secure with nuts, lock washers, and washers.
24. Remove the exhaust manifold.
25. Install spark plugs and tighten to 2.5-2.8 kg-m (18-20 ft-lb).

26. Attach the oil-injection hoses to their fittings. Secure with clamps.

Fig. 2-267



AB095

27. Test the engine for air leaks (see Section 3).
28. Temporarily secure the starter pulley on the flywheel with three cap screws. Install the flywheel washer, lock washer, and nut. Apply red Loctite #271 to the crankshaft threads before installing the flywheel nut. Using a spanner wrench to secure the crankshaft, tighten the flywheel nut to 7-9 kg-m (50.5-65 ft-lb).

Fig. 2-268

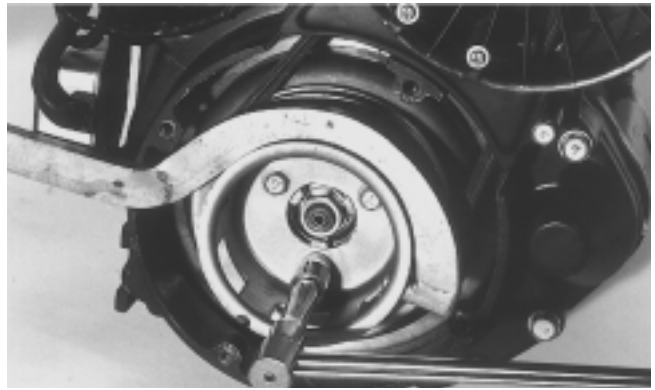


AB024

29. Remove the starter pulley. Position the fan belt drive pulley into the belt. Align the starter pulley holes with those in the belt pulley. Start one of the cap screws into the flywheel; then rotate the belt pulley and starter pulley in a counterclockwise direction.
30. When the pulley pivots on the cap screw, rock the pulleys backward or forward until the remaining cap screw holes align. Install the remaining two cap screws and tighten evenly to 0.8-1.2 kg-m (6-9 ft-lb).

■ **NOTE:** Apply red Loctite #271 to the threads of the cap screws before installing.

Fig. 2-269



AB040

31. Place an exhaust manifold gasket on each exhaust port making sure the metal side of the gasket faces the cylinder. Slide the exhaust-side cooling shroud onto the exhaust port studs; then place the upper cooling shroud into position and secure the shrouds with 14 cap screws noting the location of the longer cap screws from disassembling. Tighten to 0.4-0.7 kg-m (3-5 ft-lb). Connect the spark-plug caps.

Fig. 2-270



AB012

32. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the exhaust-manifold gasket; then place a gasket on each exhaust port making sure the metal side of each gasket faces away from the cylinder. Install the exhaust manifold, lock washers, and nuts and tighten to 1.8-2.2 kg-m (13-16 ft-lb).

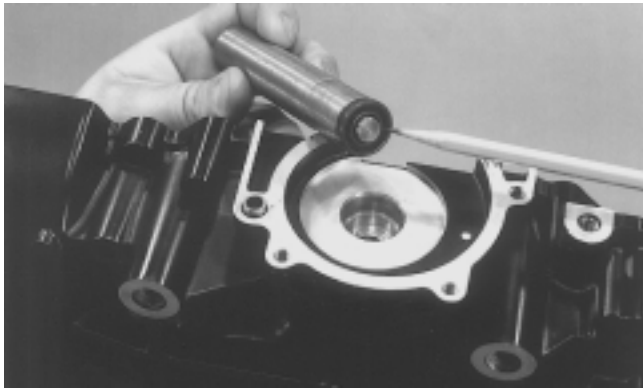
Assembling Engine (440 LC/550 cc Models)

■ **NOTE:** Arctic Cat recommends the use of new gaskets and end seals when assembling the engine.

1. Using the water pump bearing and seal driver, position the inner water pump shaft seal onto the seal driver and gently tap the seal down into position.

■ **NOTE:** Apply grease to the lips of the inner seal before installation.

Fig. 2-271



■ **NOTE:** The seal must be installed with its spring side towards the crankshaft.

- Using a small screwdriver, apply a thin coat of grease to the inner seal lips.
- Using a pair of snap ring pliers, install the snap ring securing the inner seal in the crankcase.
- Using the seal driver, carefully install the outer water pump seal. Gently tap the seal down into position until it seats itself against its flange.

Fig. 2-272



- Apply a thin coat of grease to the sealing surface of the oil-injection pump driveshaft; then place the Oil Seal Installation Tool (p/n 0644-219) at the end of the shaft. Twist the driveshaft clockwise as it is pushed through the oil and water pump seals; then remove the tool. Position the shim on the oil-injection pump end of the driveshaft.



CAUTION

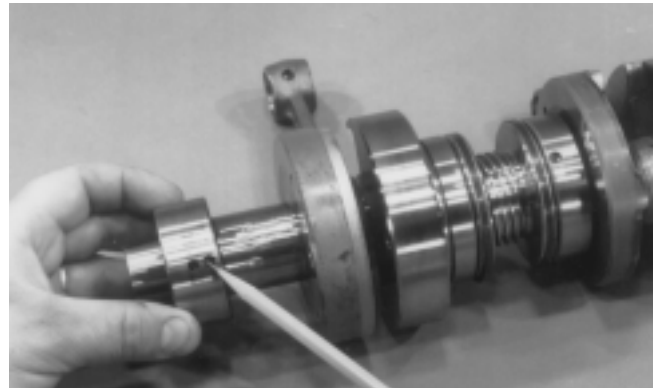
Be very careful not to damage the seals when installing the oil pump driveshaft. Be certain to use the seal installation tool. Twist the driveshaft clockwise as it enters the seal area and while it is being pushed through the seals.

- Position the upper crankcase half upside-down on two wooden blocks; then install the C-ring and four dowel pins.

- Place the PTO-side crankshaft bearing into position making sure the bearing dowel pin hole is positioned inward.

■ **NOTE:** The dowel pin hole is the hole that doesn't go entirely through the bearing case.

Fig. 2-273



- Lubricate the inner lips of the crankshaft oil seals with grease; then slide the seals onto the crankshaft making sure the spring side of each seal faces the center of the crankshaft.

■ **NOTE:** There is a MAG-side seal and a PTO-side seal.

- Apply oil to the crankshaft bearings; then install the crankshaft into the upper crankcase half. Be sure the alignment hole in each bearing is positioned over its respective dowel pin in the crankcase; then seat the crankshaft.

■ **NOTE:** To check the bearing for proper position, place the point of a sharp tool into the dimple found in the bearing race. Strike the tool with the palm of the hand in either direction. If the bearing moves, it isn't positioned correctly and must be rotated until it drops onto the dowel pin.

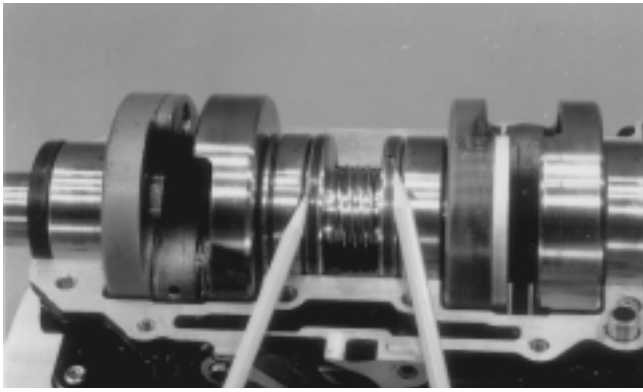


CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and engine damage will result.

- Position the two center seal rings with their end gaps 180° apart (up on one and down on the other).

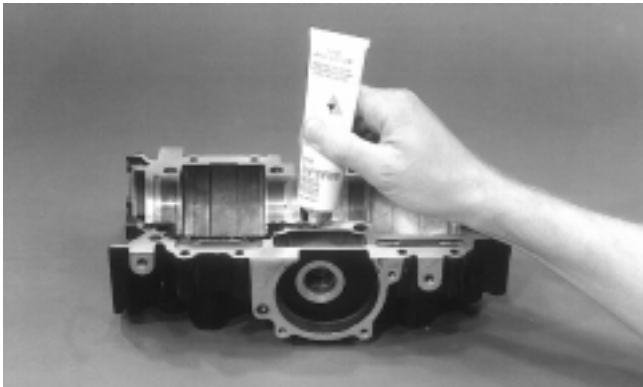
Fig. 2-274



AN083

11. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the bottom half of the entire crankcase sealing surface.

Fig. 2-275

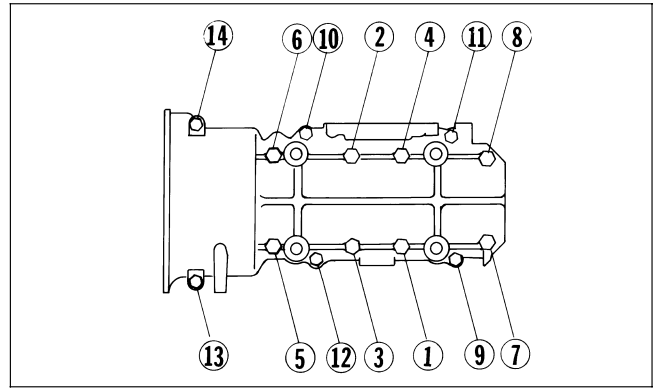


AQ127

■ **NOTE:** Use only High-Temp Sealant (p/n 0636-069) to seal the crankcase halves.

12. Assemble the crankcase halves making sure that the crankshaft gear and oil-injection pump driveshaft gears mesh. Rotate the crankshaft one full turn to align the crankshaft gear and pump driveshaft.
13. Install the 14 crankcase cap screws securing the crankcase halves making sure the cap screws are in the proper-sized holes. Tighten in three steps the 8 mm cap screws to 1.8-2.8 kg-m (13-20 ft-lb) and the 6 mm cap screws to 0.8-1.2 kg-m (6-9 ft-lb) using the pattern shown.

Fig. 2-276



0728-137

■ **NOTE:** Secure the connecting rods with rubber bands on the cylinder studs.

14. Install the oil-injection pump retainer O-ring and retainer.

Fig. 2-277



AN088

15. Install the O-ring/gasket and the oil-injection pump making sure the pump shaft and pump align. Secure with two screws and washers. Tighten the two screws to 0.7 kg-m (5 ft-lb).



CAUTION

Be sure the driveshaft is properly aligned with the slot of the oil-injection pump. The pump will be damaged if these two components are not aligned.

16. Position the rubber seal retainer and seal into the back side of the water pump impeller.

■ **NOTE:** The lined or marked side of the porcelain seal must face the rubber retainer.

17. Using both thumbs, press the seal into position making sure its marked side is positioned towards the rubber seal cup.

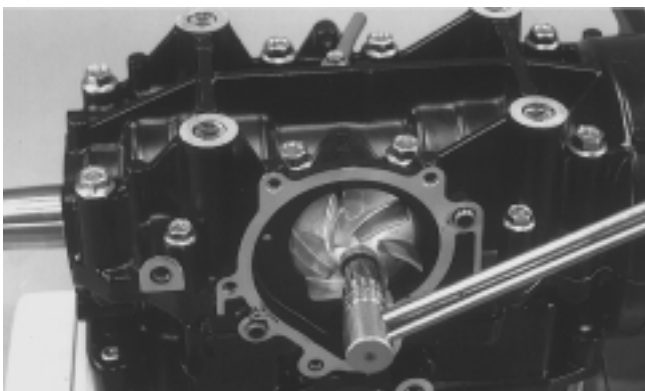
18. Apply a thin coat of grease to the seal outer surface.

19. Place the impeller into position and secure with a cap screw and washer. Be sure the rubber side of the washer is directed toward the impeller. Apply blue Loctite #242 to the threads of the cap screw and tighten to 0.8-1.2 kg-m (6-9 ft-lb).

CAUTION

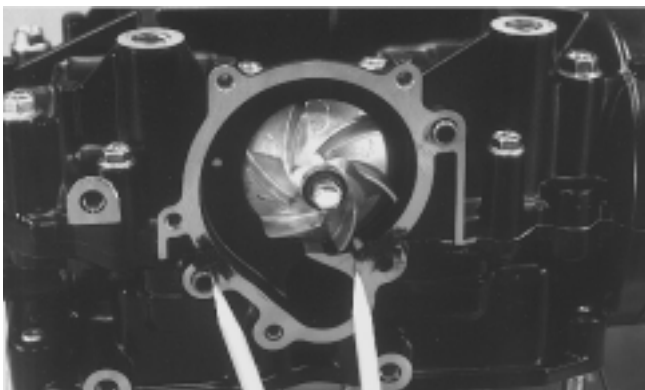
The rubber side of the washer (which secures the impeller) must be positioned toward the impeller. If installed incorrectly, a coolant leak will result.

Fig. 2-278



20. Apply sealant to the crankcase seam; then install the alignment pins into the crankcase.

Fig. 2-279



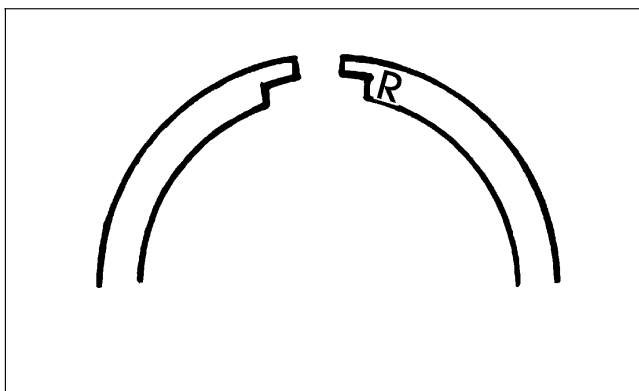
■ **NOTE:** Sealant is only required on the crankcase seam.

21. Position the O-ring into the water pump cover; then install the cover. Secure with five screws. Tighten securely.
22. Place the cylinder base gaskets into position on the crankcase.

■ **NOTE:** Be sure to spray a thin coat of Copper Coat Gasket Sealant (p/n 0636-092) onto the gasket if it is being reused.

23. Install the piston rings on each piston so the letter on the top (inclined surface) of each ring faces the dome of the piston.

Fig. 2-280



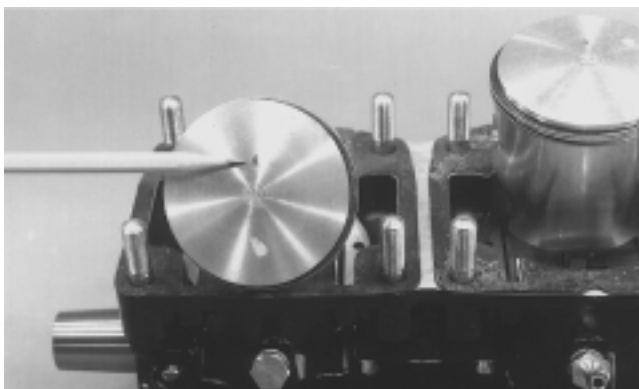
CAUTION

Incorrect installation of the piston rings will result in engine damage.

24. Apply oil to the connecting-rod small end bearings; then install the small-end bearings. Install a washer on each side of the connecting rod.
25. Place each piston over the connecting rod so the arrow on each piston will point toward the exhaust port; then secure with an oiled piston pin.

■ **NOTE:** The arrow is found either up inside the piston or on the dome top.

Fig. 2-281



26. Install the circlips so the open end is directed either up or down.

Fig. 2-282



AN102

CAUTION

Make sure the circlips are firmly seated and the open end is directed either up or down before continuing with assembly.

27. Rotate each piston ring until the ring ends are properly positioned on either side of the ring keeper; then apply oil to the piston assemblies and cylinder bores. Remove the rubber bands from the connecting rods.

28. In turn on each cylinder, place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Remove the piston holder and seat the cylinder firmly onto the crankcase.

■ **NOTE:** The cylinders should slide on easily. **DO NOT** force the cylinders on.

Fig. 2-283

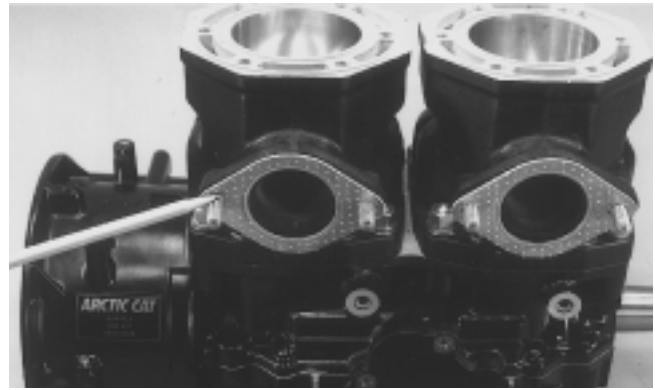


AN105

29. Secure each cylinder by installing the four nuts, washers, and lock washers. **DO NOT TIGHTEN AT THIS TIME.**

30. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to each exhaust port; then install the two exhaust gaskets with the metal sides facing out.

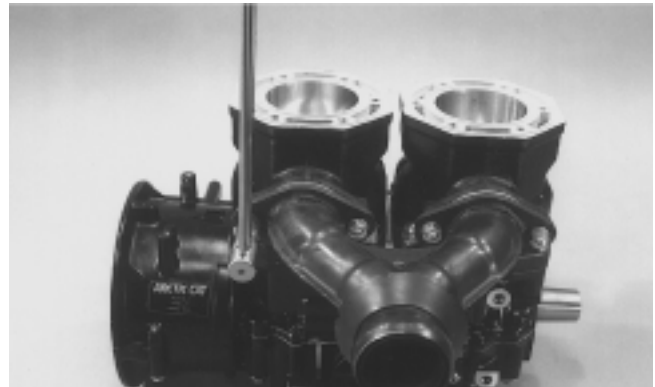
Fig. 2-284



AN106

31. Install the exhaust manifold and secure with four nuts and lock washers. Tighten the four nuts to 1.8-2.2 kg-m (13-16 ft-lb).

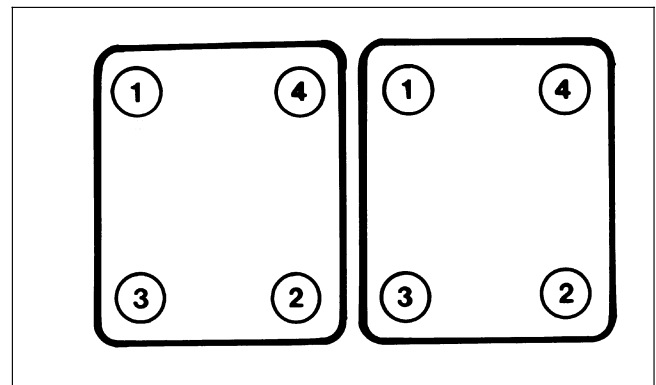
Fig. 2-285



AN107

32. With the exhaust manifold tightened, secure the cylinders by tightening the cylinder base nuts to 4-6 kg-m (29-43 ft-lb). Tighten the nuts in three steps using the pattern shown.

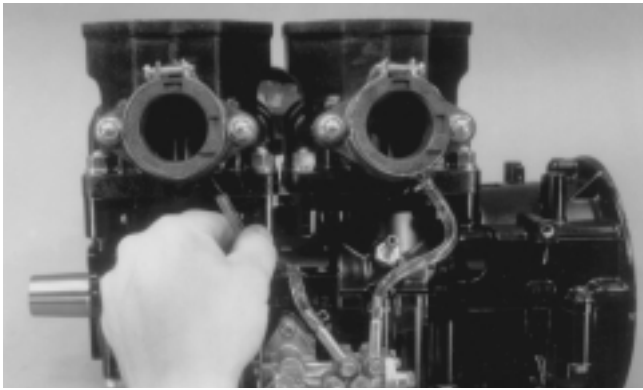
Fig. 2-286



725-318B

33. Install the two oil-injection hoses and secure with the clamps.

Fig. 2-287



AN111

34. Install the two cylinder O-rings on the top of each cylinder making sure they are correctly positioned in the grooves.

Fig. 2-288

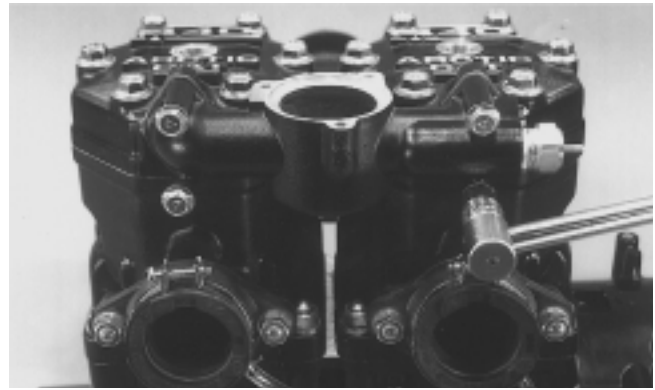


AN110

35. Place new O-rings onto each of the twelve head cap screws. Place four of these cap screws into one of the cylinder heads. Thread the spark plug in part way; then while holding the head above the cylinder, carefully start all four cap screws while observing the cylinder O-rings to make sure they remain in position. Slowly place the head into position on top of the O-rings. Start the remaining two cap screws being very careful not to move the cylinder head. Repeat the same procedure on the remaining head. **ONLY FINGER-TIGHTEN AT THIS TIME.**
36. Apply a thin coat of sealant to the two thermostat housing gaskets. Place the gaskets and housing into position and secure with four cap screws and washers. Tighten the four cap screws in a crisscross pattern to 0.7-1 kg-m (5-7 ft-lb).

■ **NOTE:** The thermostat housing cap screws must be tightened before tightening the cap screws securing the head. This will allow the gasket surfaces of the head to align with the housing and prevent any coolant leakage.

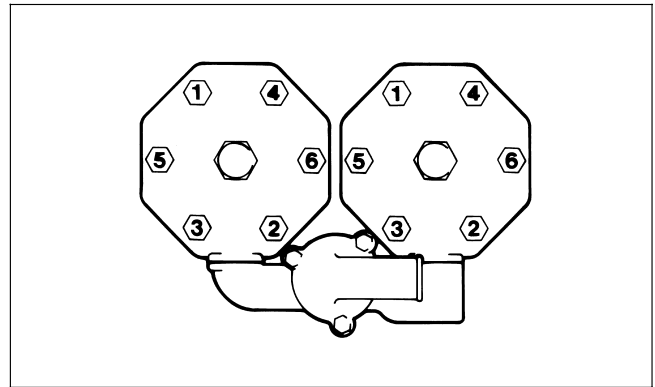
Fig. 2-289



AN113

37. Tighten the cap screws securing the head in three steps to 1.8-2.8 kg-m (13-20 ft-lb) using the pattern shown. Pressure test the engine (see Section 3).

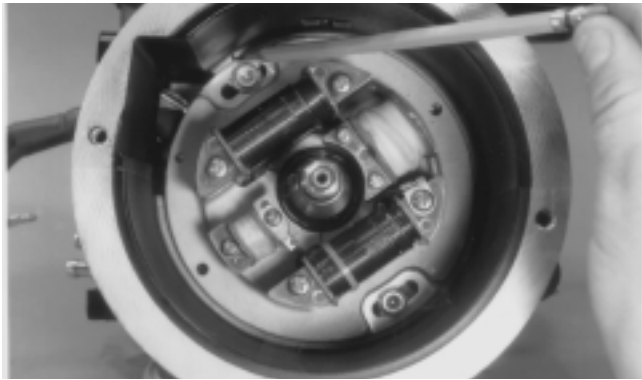
Fig. 2-290



0728-138

38. Place the thermostat, gasket, and cap into position. Secure the cap with three cap screws tightened to 0.7-1 kg-m (5-7 ft-lb).
39. On the 550 cc, place the PTO-end plate into position on the crankcase; then apply blue Loctite #242 to the screws and tighten securely.
40. Place the stator plate into position over the crankshaft end.
41. Install the lock washers and washers on the Allen-head cap screws; then apply blue Loctite #242 to the threads of the stator plate Allen-head cap screws and install. **DO NOT TIGHTEN AT THIS TIME.**
42. Align the stator plate with the alignment mark made during disassembly. Tighten both stator plate screws securely.

Fig. 2-291



AN118

Fig. 2-292

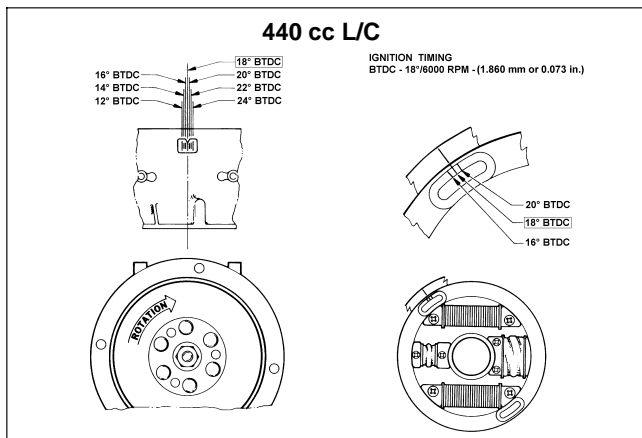
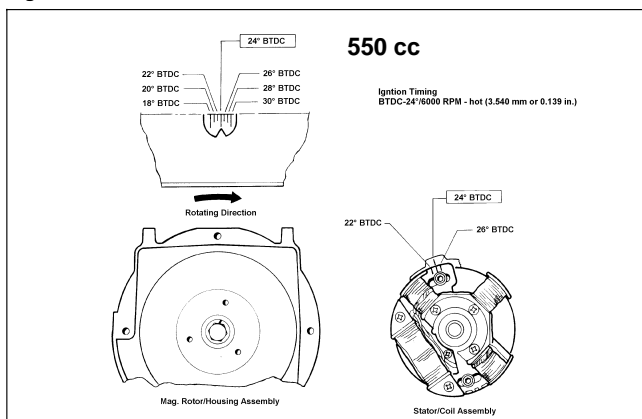


Fig. 2-293

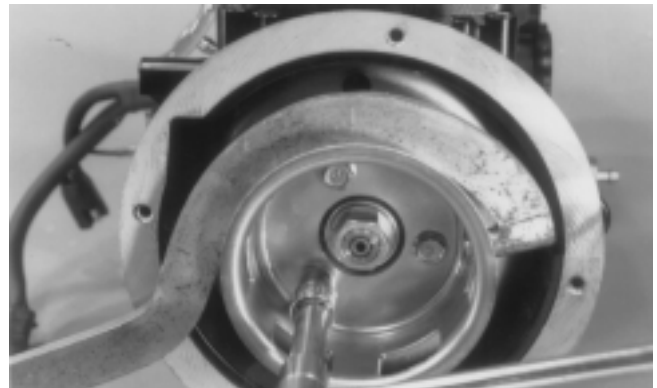


NOTE: Before installing the flywheel, be sure to wipe the crankshaft and flywheel tapers clean using a clean towel.

43. Install the key in the crankshaft and slide the flywheel onto the crankshaft making sure the keyways match; then finger-tighten the flywheel nut with large flat washer and lock washer. Apply red Loctite #271 to the threads of the flywheel nut.

44. Install the starter pulley; then secure the starter pulley with three cap screws and lock washers. Secure the pulley while using the spanner wrench and tighten the three cap screws evenly to 0.7-1 kg-m (5-7 ft-lb).

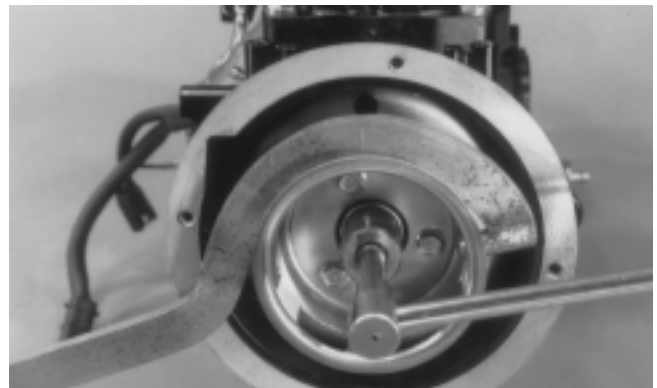
Fig. 2-294



AN121

45. Using the spanner wrench, tighten the flywheel nut to 7-9 kg-m (50.5-65 ft-lb).

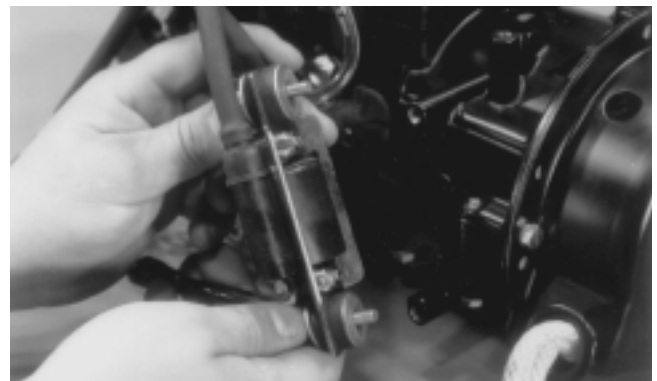
Fig. 2-295



AN122

46. On the 440 cc, place the CDI unit and external coil into position and secure with four cap screws and washers.

Fig. 2-296



AN124

47. Install the spark plugs and tighten to 2.5-2.8 kg-m (18-20 ft-lb). Connect the spark plug caps.

48. Place the engine mounting brackets into position on the crankcase and secure with the cap screws. Tighten the 440 cc to 2.4 kg-m (17 ft-lb). Tighten the 550 cc to 2.8-3.5 kg-m (20-25 ft-lb).

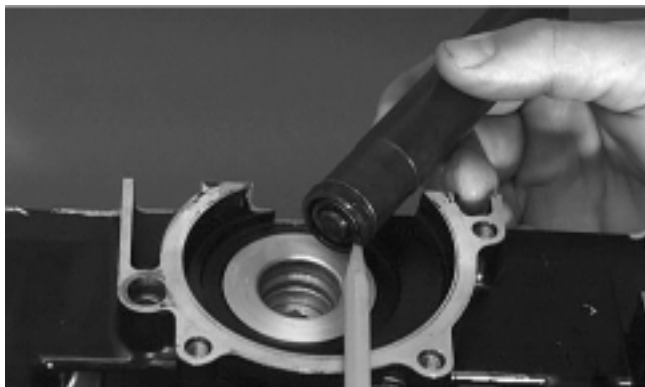
Assembling Engine (500/580/600 cc Twin Models)

■ **NOTE:** Arctic Cat recommends the use of new gaskets and end seals when assembling the engine.

1. Apply a thin coat of grease to the inner seal lips of the water pump seal.
2. Using the seal driver, position the inner water pump shaft seal onto the seal driver and gently tap the seal down into position.

■ **NOTE:** Grease must be applied to the lips of the inner seal before installation.

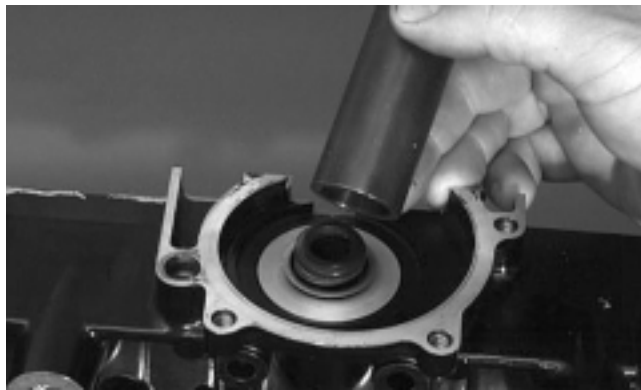
Fig. 2-297



■ **NOTE:** The seal must be installed with its spring side towards the crankshaft.

3. Install the snap ring securing the inner seal in the crankcase.
4. Using the seal driver, carefully install the outer water pump seal. Gently tap the seal down into position until it seats itself against its flange.

Fig. 2-298

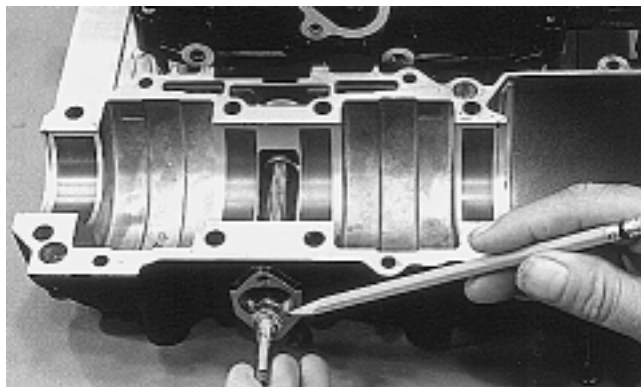


5. Apply a thin coat of grease to the sealing surface of the oil-injection pump/water pump driveshaft; then place the Oil Seal Installation Tool (p/n 0644-219) at the end of the shaft. Twist the driveshaft clockwise as it is pushed through the oil and water pump seals; then remove the tool. Position the shim on the oil-injection pump end of the driveshaft.

CAUTION

Be very careful not to damage the seals when installing the oil pump driveshaft. Be certain to use the seal installation tool. Twist the driveshaft clockwise as it enters the seal area and while it is being pushed through the seals.

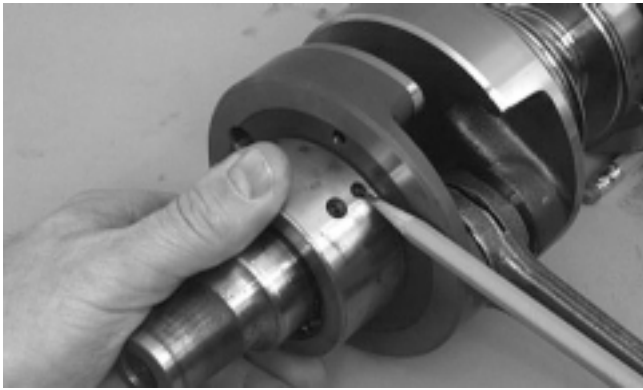
Fig. 2-299



6. Position the upper crankcase half upside-down on two wooden blocks; then install the C-ring and four dowel pins.
7. Place the PTO-side crankshaft bearing into position making sure the bearing dowel pin hole is positioned inward.

■ **NOTE:** The dowel pin hole is the hole that doesn't go entirely through the bearing case.

Fig. 2-300



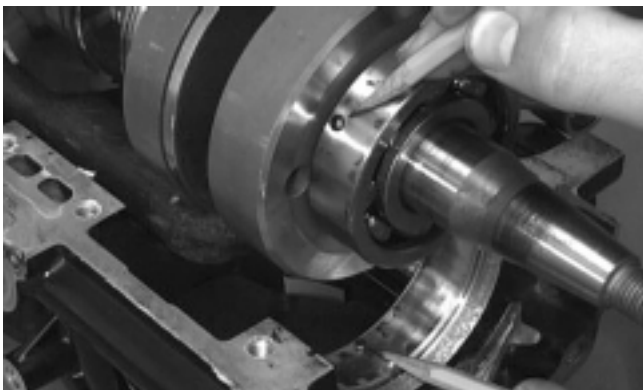
AN330D

8. Lubricate the inner lips of the crankshaft oil seals with grease; then slide the seals onto the crankshaft making sure the spring side of each seal faces the center of the crankshaft.

■ **NOTE:** There is a MAG-side seal and a PTO-side seal.

9. Apply oil to the crankshaft bearings; then install the crankshaft into the upper crankcase half. Be sure the alignment hole in each bearing is positioned over its respective dowel pin in the crankcase; then seat the crankshaft.

Fig. 2-301



AN331D

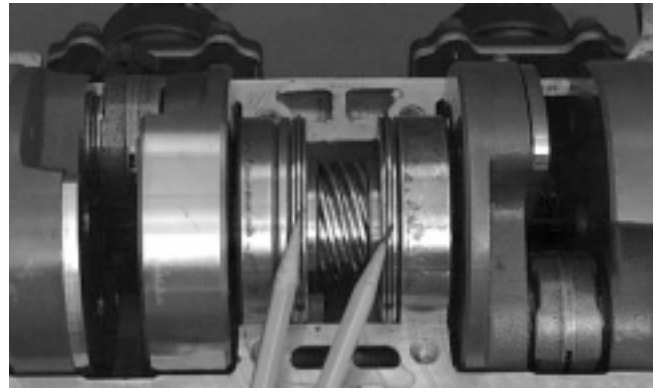
■ **NOTE:** To check the bearing for proper position, place the point of a sharp tool into the dimple found in the bearing race. Strike the tool with the palm of the hand in either direction. If the bearing moves, it isn't positioned correctly and must be rotated until it drops onto the dowel pin.

CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and severe engine damage will result.

10. Position the two center seal rings with their end gaps 180° apart (up on one and down on the other).

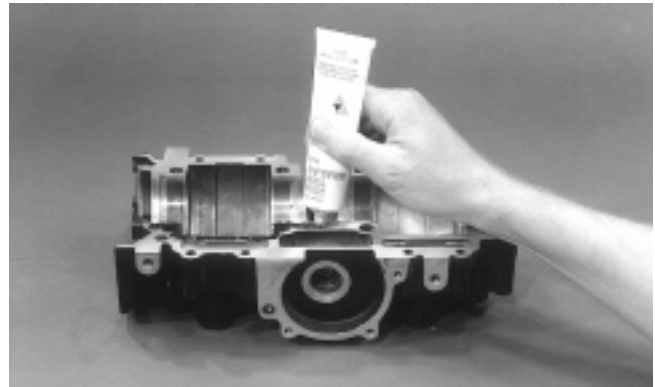
Fig. 2-302



AN083D

11. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the bottom half of the entire crankcase sealing surface.

Fig. 2-303

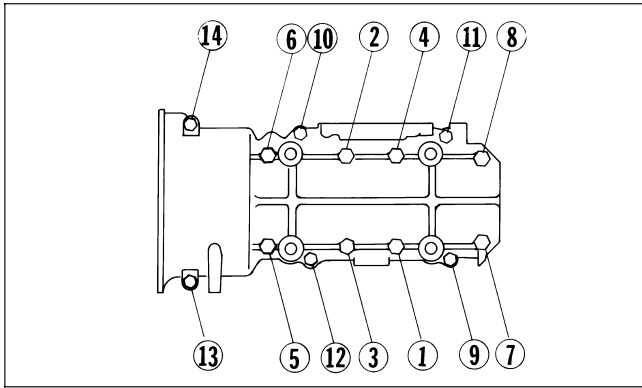


AQ127

■ **NOTE:** Use only Arctic Cat High-Temp Sealant (p/n 0636-069) to seal the crankcase halves.

12. Assemble the crankcase halves making sure that the crankshaft gear and oil-injection pump driveshaft gears mesh. Rotate the crankshaft one full turn to align the crankshaft gear and pump driveshaft.
13. On the 580 cc, install the 14 crankcase cap screws securing the crankcase halves making sure the cap screws are in the proper-sized holes. Tighten in three steps the 8 mm cap screws to 1.8-2.8 kg-m (13-20 ft-lb) using the pattern shown.

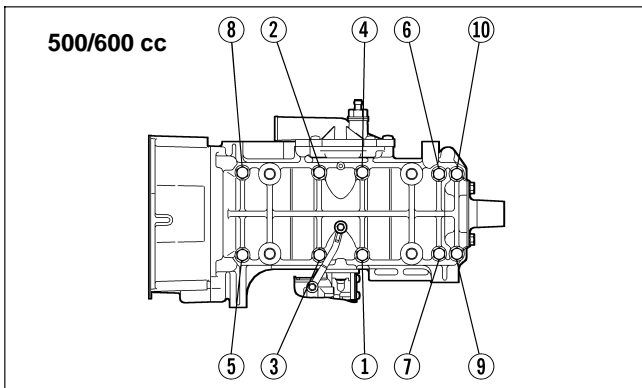
Fig. 2-304



0728-137

14. On the 500 cc/600 cc, install the crankcase cap screws (coated with blue Loctite #242) securing the crankcase halves. Tighten to 3-4 kg-m (22-29 ft-lb) using the pattern shown.

Fig. 2-305



0734-050

■ **NOTE:** Secure the connecting rods with rubber bands on the cylinder studs.

15. Install the oil-injection pump retainer O-ring and retainer.

Fig. 2-306



AN088D

16. Install the O-ring and the oil-injection pump making sure the pump shaft slot and pump driven gear shaft align. Secure with two screws (coated with blue Loctite #242) and washers. Tighten the two screws to 0.7 kg-m (5 ft-lb).

⚠ CAUTION

Be sure the oil-injection pump/water pump driveshaft is properly aligned with the slot of the oil-injection pump. The pump will be damaged if these two components are not aligned.

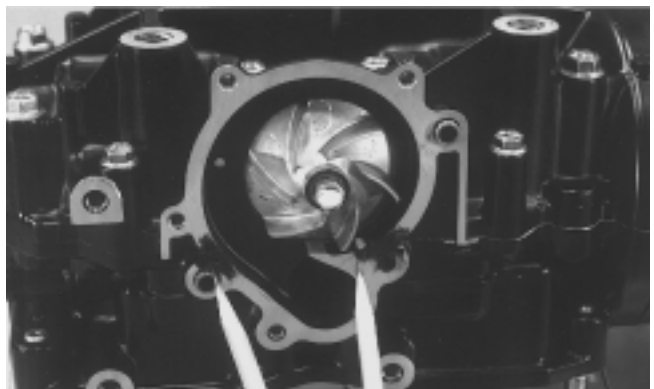
17. Position the rubber seal retainer and seal into the back side of the water pump impeller.
18. Using both thumbs, press the seal into position making sure its marked side is positioned towards the rubber seal cup; then apply a thin coat of grease to the seal outer surface.
19. Place the impeller into position and secure with a cap screw and washer. Be sure the rubber side of the washer is directed toward the impeller. Apply blue Loctite #242 to the threads of the cap screw and tighten to 0.8-1.2 kg-m (6-9 ft-lb).

⚠ CAUTION

The rubber side of the washer, which secures the impeller, must be positioned toward the impeller. If installed incorrectly, a coolant leak will result.

20. Apply high-temperature sealant to the crankcase/water pump cover seam; then install the alignment pins into the crankcase.

Fig. 2-307



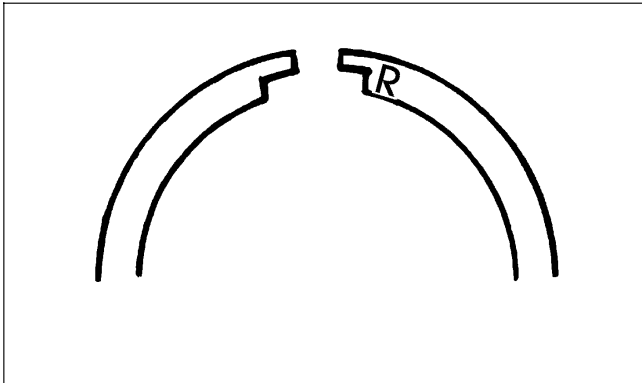
AN095

■ **NOTE:** Sealant is only required on the crankcase seam.

21. Position the O-ring into the water pump cover; then install the cover. Secure with five screws. Tighten to 1.1 kg-m (8 ft-lb).
22. On the 500 cc/600 cc, secure the intake manifolds, reed block assemblies, and gaskets with cap screws. Tighten to 1.1 kg-m (8 ft-lb).
23. Place the cylinder base gasket into position on the crankcase.

24. Install the piston rings on each piston so the letter on the top (inclined surface) of each ring faces the dome of the piston.

Fig. 2-308



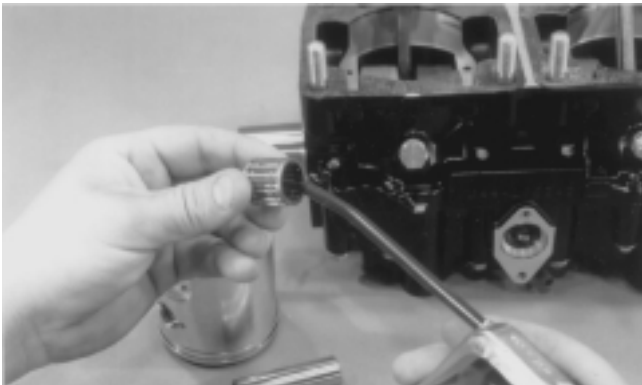
726-306A

CAUTION

Incorrect installation of the piston rings will result in engine damage.

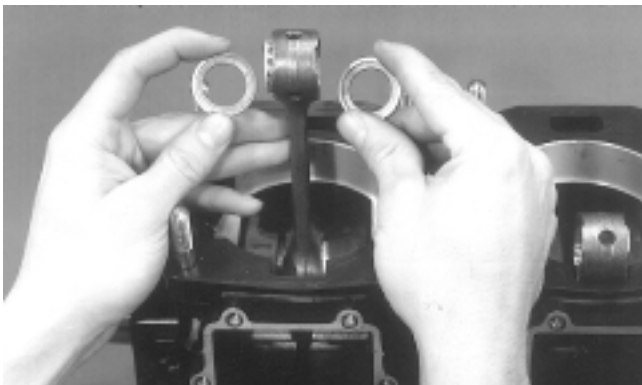
25. Apply oil to the connecting-rod small end bearings; then install the small-end bearings. Install a washer on each side of the connecting rod.

Fig. 2-309



AN100

Fig. 2-310

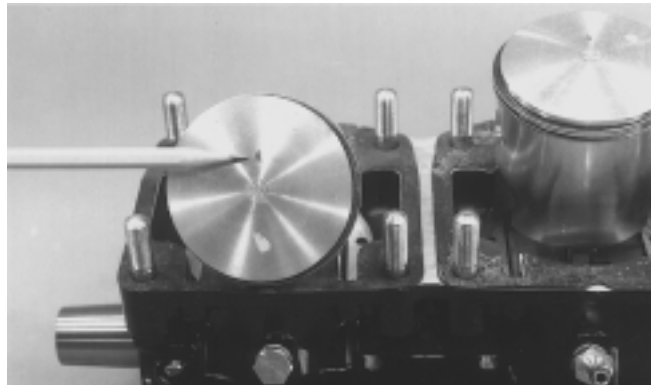


AQ059

26. Place each piston over the connecting rod so the arrow (or indicator dot) on each piston will point toward the exhaust port; then secure with an oiled piston pin.

NOTE: The arrow (or indicator dot) is found either up inside the piston or on the dome top.

Fig. 2-311



AN101

27. Install the new circlips so the open end is directed either up or down.

Fig. 2-312



B324D

CAUTION

Make sure the circlips are firmly seated and the open end is directed either up or down before continuing with assembly.

28. Rotate each piston ring until the ring ends are properly positioned on either side of the ring keeper; then apply oil to the piston assemblies and cylinder bores. Remove the rubber bands from the connecting rods.

29. In turn on each cylinder, place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Remove the piston holder and seat the cylinder firmly onto the crankcase.

NOTE: The cylinders should slide on easily. DO NOT force the cylinders on.

Fig. 2-313



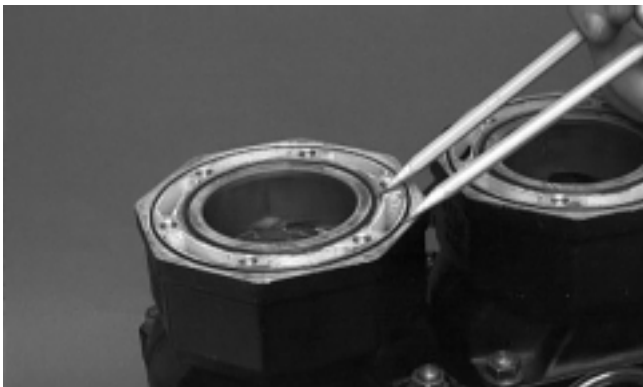
AN105D

30. Secure each cylinder by installing the four nuts, washers, and lock washers. **DO NOT TIGHTEN AT THIS TIME.**

■ **NOTE:** The cylinders will be tightened at the same time as the exhaust manifold is installed to assure proper cylinder to exhaust manifold alignment.

31. Install the oil-injection hoses and secure with the clamps; then place the lower check-valve assembly into position and secure with the gaskets and union cap screw. Tighten securely.
32. Install the two cylinder O-rings on the top of each cylinder making sure they are correctly positioned in the grooves.

Fig. 2-314



AN110D

33. Place new O-rings onto each of the head cap screws. Place four of these cap screws into one of the heads (on the 580 cc) or into the cylinder head (on the 500 cc/600 cc). Thread the spark plugs in part way; then while holding the head above the cylinder, carefully start all four cap screws while observing the cylinder O-rings to make sure they remain in position. Slowly place the head into position on top of the O-rings. Start the remaining cap screws being very careful not to move the cylinder head. **ONLY FINGER-TIGHTEN AT THIS TIME.**

■ **NOTE:** On the 580 cc, repeat the same procedure on the remaining head.

34. On the 580 cc, apply a thin coat of sealant to the two thermostat housing gaskets. Place the gaskets and housing into position and secure with four cap screws and washers. Tighten the four cap screws in a crisscross pattern to 0.7-1 kg-m (5-7 ft-lb).

■ **NOTE:** The thermostat housing cap screws must be tightened before tightening the cap screws securing the head. This will allow the gasket surfaces of the head to align with the housing and prevent any coolant leakage.

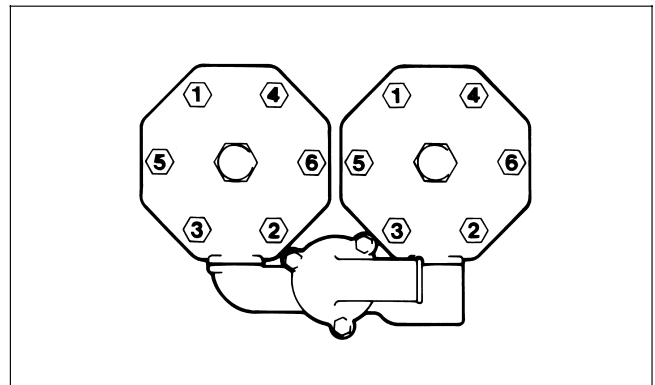
Fig. 2-315



AN146

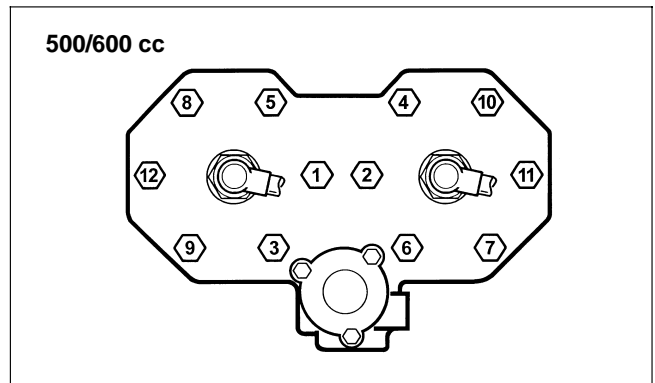
35. Tighten the cap screws securing the head in three steps to 1.8-2.8 kg-m (13-20 ft-lb) using the appropriate pattern shown.

Fig. 2-316



0728-138

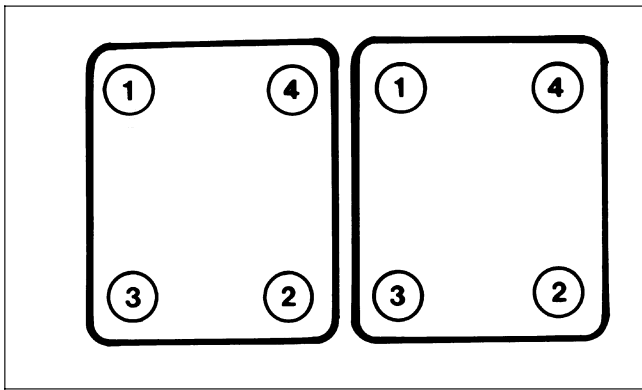
Fig. 2-317



0733-524

36. Place the thermostat, gasket, and cap into position. Secure the cap with three cap screws tightened to 0.7-1 kg-m (5-7 ft-lb).
37. Apply a thin coat of high-temperature silicone sealant to each exhaust port; then install the exhaust gaskets with the metal sides facing out.
38. Install the exhaust manifold and secure with four nuts and lock washers. Tighten the four nuts to 1.8-2.2 kg-m (13-16 ft-lb).
39. Tighten the spark plugs to 2.5 kg-m (18 ft-lb); then secure the cylinders by tightening the cylinder base nuts to 3-4 kg-m (22-29 ft-lb) in three steps using the pattern shown. Pressure test the engine (see Section 3).

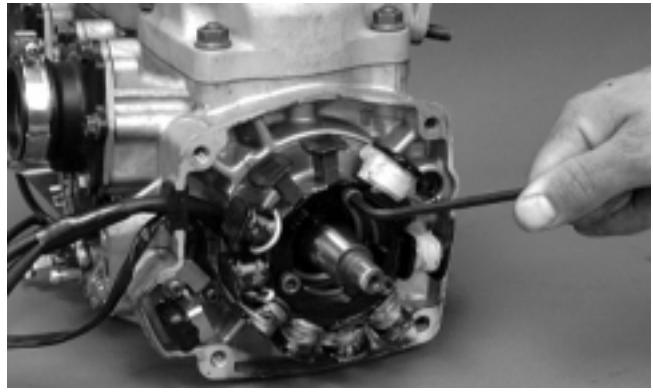
Fig. 2-318



725-318B

40. On the 500 cc/600 cc, secure the ignition timing sensor with screws coated with blue Loctite #242.
 41. Place the PTO-end plate into position on the crankcase; then apply blue Loctite #242 to the four screws and tighten to 1.1 kg-m (8 ft-lb).
- **NOTE:** On the 580 cc, position the stator base over the crankshaft end; then route the wires through the magneto housing and install the grommet.
42. On the 580 cc, secure the stator plate to the engine using the Allen-head cap screws coated with blue Loctite #242. Tighten to 1.1 kg-m (8 ft-lb).
 43. On the 500 cc/600 cc, secure the stator to the stator plate with the Allen-head cap screws coated with blue Loctite #242; then install the stator wires with a grommet into the crankcase.

Fig. 2-319



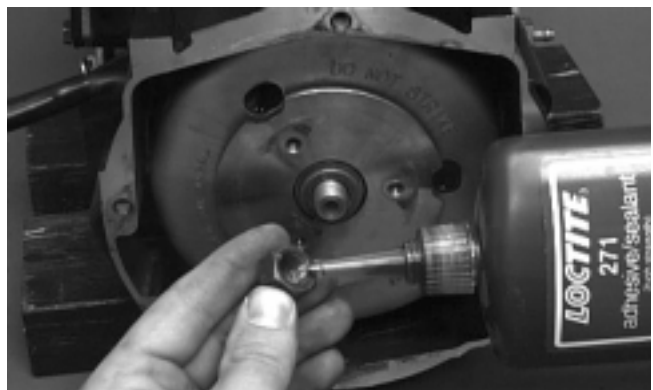
AN413D

44. On the 500 cc/600 cc, secure the magneto case to the crankcase using the Allen-head cap screws coated with blue Loctite #242. Tighten to 2.5 kg-m (18 ft-lb).
45. Install the key in the crankshaft and slide the flywheel onto the crankshaft making sure the keyways match.

■ **NOTE:** Before installing the flywheel, be sure to wipe the crankshaft and flywheel tapers clean using a clean towel.

46. Apply red Loctite #271 to the threads of the flywheel nut; then finger-tighten with a large flat washer, lock washer, and the nut. DO NOT TIGHTEN AT THIS TIME.

Fig. 2-320



AN120D

47. Place the starter pulley in position; then loosely secure the starter pulley with three cap screws (coated with red Loctite #271) and lock washers. Secure the pulley while using the spanner wrench and tighten the three cap screws evenly to 0.7-1 kg-m (5-7 ft-lb).

Fig. 2-321



AN121D

48. Using the spanner wrench, tighten the flywheel nut to 7-9 kg-m (50.5-65 ft-lb).

■ **NOTE:** On the 580 cc, place the ignition timing sensor into position and secure.

49. Place the engine mounting brackets into position on the crankcase and secure with the cap screws. Tighten to 2.4 kg-m (17 ft-lb).

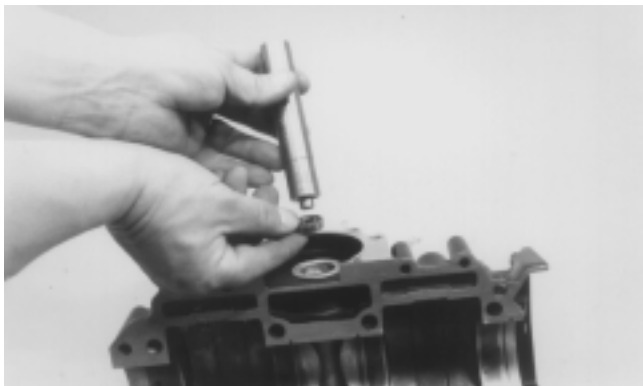
Assembling Engine (700 cc Models)

■ **NOTE:** Before starting engine assembly, all parts must be clean and all sealing surfaces free of any gasket sealant. Apply lightweight oil to all moving parts such as bearings, piston pin areas, piston skirts, piston rings, and the cylinder bores.

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

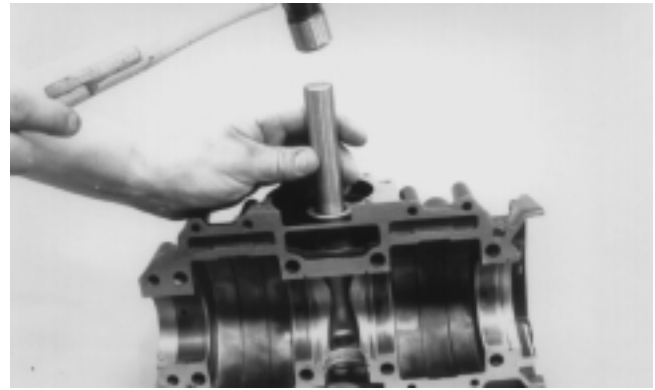
1. Using the Water Pump Bearing and Seal Kit (p/n 0644-084) and a hammer, place the water pump shaft bearing down into the bore and drive it into position. Seat the bearing against the rear shoulder of the bore.

Fig. 2-322



AJ148

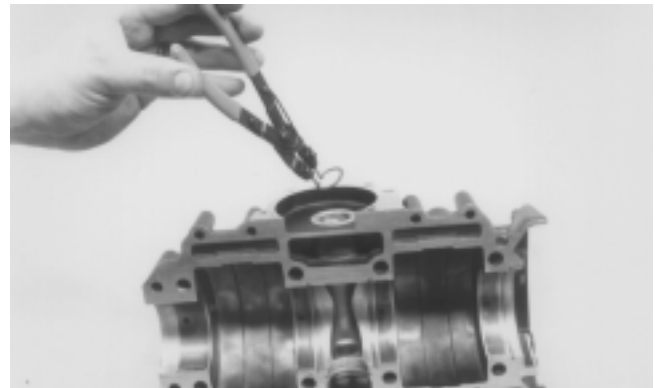
Fig. 2-323



AJ149

2. 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 with the sharp side out.

Fig. 2-324



AJ150

3. Apply grease to the inner lips of the small water pump shaft seal and position the seal in the crankcase bore with the spring side of the seal facing toward the bearing. Make sure the small spring located around the lip of the seal is properly positioned.

Fig. 2-325



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 tap 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. 2-326



AJ152

NOTE: Sealant may already be on the metal case; however, if no sealant is apparent, apply a thin, even coat of High-Temp Sealant (p/n 0636-069) to the outer metal case of the water pump seal.

Fig. 2-327



AJ153

- 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.

Fig. 2-328



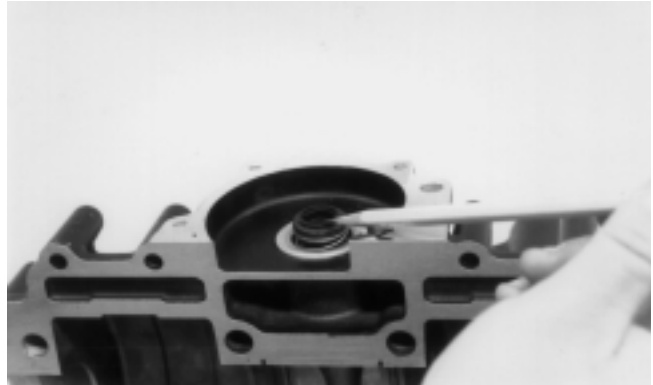
AJ154

- Wipe any excess sealant from the crankcase after the seal is properly seated.

CAUTION

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

Fig. 2-329



AJ155

- 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. 2-330



AJ090

CAUTION

Care must be taken 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 while slowly rotating the shaft clockwise as it enters the seal.

- Apply a coat of grease to the impeller sealing area on the back side of the impeller; then install the water pump impeller onto the shaft. Apply red Loctite #271 to the impeller bolt threads and tighten 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.

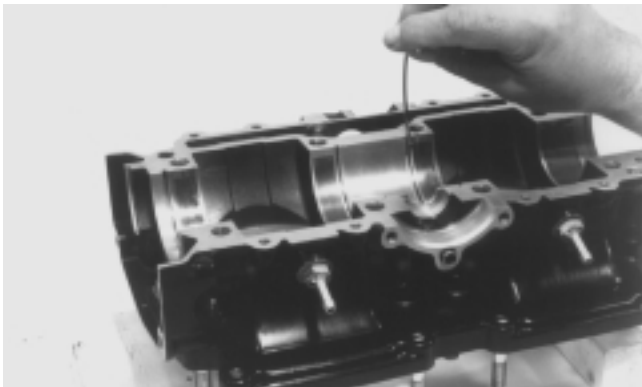
Fig. 2-331



AJ091

9. Set the top half of the crankcase upside down on the work bench with a 4 in. block of wood under each end.
10. Install the two C-rings (one for locating the pinion bearing and the other to locate the crankshaft assembly) in the upper crankcase half. Install the four crankshaft bearing dowel pins in the crankcase bearing areas.

Fig. 2-332



AJ095

11. Using Arctic Cat 50:1 Injection Oil, lubricate the PTO bearing and slide it onto the crankshaft.

CAUTION

The bearing oil hole must be positioned toward the outer end of the crankcase.

12. Lubricate the inner lips of the crankshaft oil seals with grease; then slide the seals onto the crankshaft making sure the spring side of each seal faces the center of the crankcase.

■ **NOTE:** There is a MAG-side seal and a PTO-side seal.

13. Apply Arctic Cat 50:1 Injection Oil to all of the crankshaft bearings; then install the crankshaft into the upper crankcase half. Be sure the alignment hole in each bearing is positioned over its respective dowel pin in the crankcase.

■ **NOTE:** Check all bearings by trying to rotate them to make sure they are being held in position by the dowel pin. Each bearing must drop onto the dowel pin. If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and engine damage will result.

CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and severe engine damage will result.

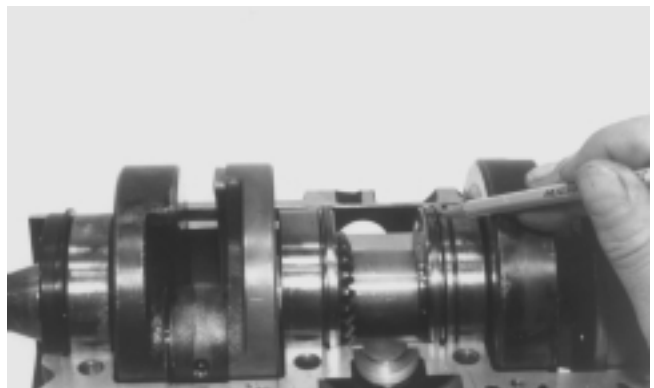
Fig. 2-333



AJ097

14. Rotate the crankshaft center seal rings so the end gaps of the two large rings are 180° apart, one end gap being positioned downward and the other upward; then seat the crankshaft.

Fig. 2-334

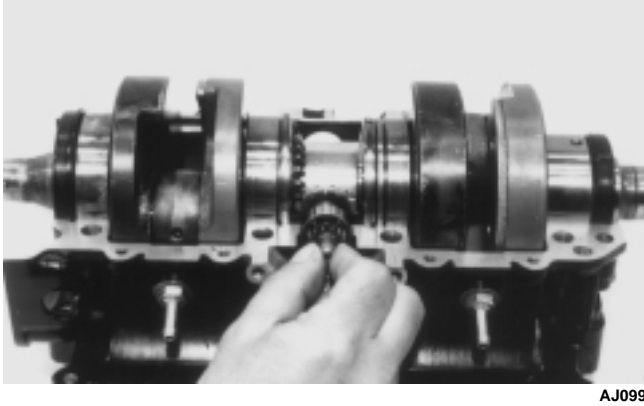


AJ098

■ **NOTE:** If a new pinion gear or crankshaft was installed, see **Shimming Pinion Gear** in this sub-section. Otherwise, proceed to step 15.

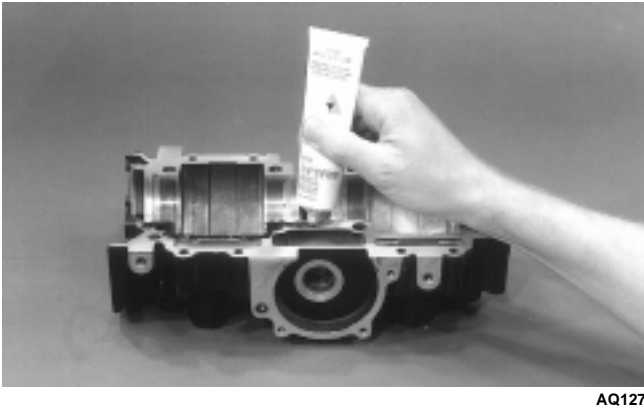
15. Install the shim washer(s) on the pinion shaft and set the pinion assembly into position in the top half of the crankcase. Be sure the pinion bearing is seated over its C-ring. Lubricate both the pinion and crankshaft gears using a generous amount of Arctic Cat 50:1 Injection Oil.

Fig. 2-335



16. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the lower crankcase sealing surfaces.

Fig. 2-336



CAUTION

Check to make sure the two crankcase half locating dowel pins are in position at opposite corners of the lower case half.

17. Assemble the crankcase halves making sure that the pinion gear and water pump gear mesh properly.
18. Install the 18 crankcase cap screws securing the crankcase halves making sure the proper-sized cap screws are in the proper holes. Tighten in three steps the 10 mm cap screw to 4.0 - 6.0 kg-m (29-43 ft-lb), 8 mm cap screws to 1.8 - 2.9 kg-m (13-20 ft-lb), and the 6 mm cap screws to 0.8 - 1.2 kg-m (6-9 ft-lb) using the pattern shown.

Fig. 2-337

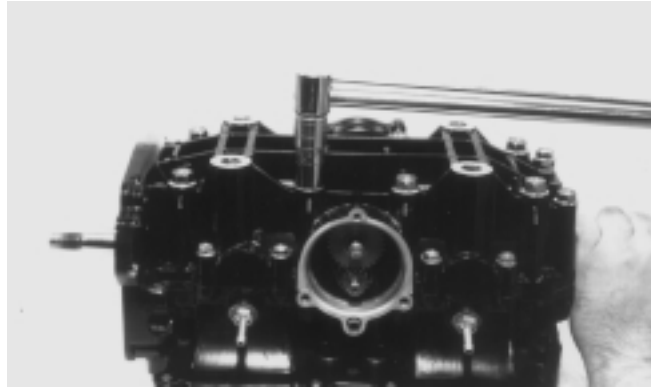
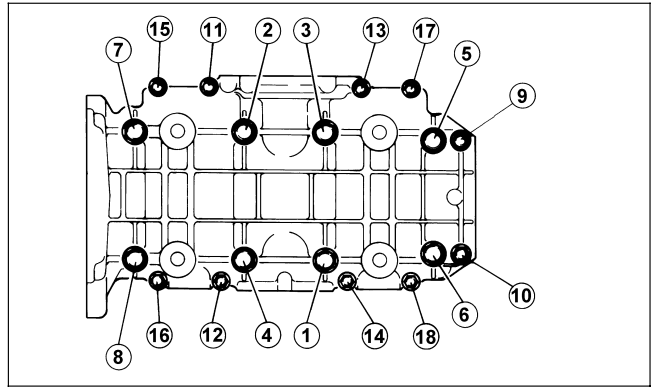


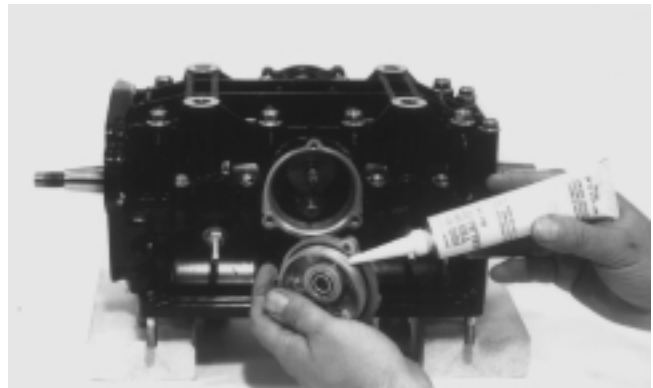
Fig. 2-338



■ **NOTE:** Secure the connecting rods with rubber bands on the cylinder studs.

19. Install the O-ring on the oil-injection pump retainer. Apply a thin coat of silicone sealant over the top of the O-ring. Apply a small amount of Arctic Cat 50:1 Injection Oil to each of the bearings in the retainer and rotate them by hand to spread the oil.

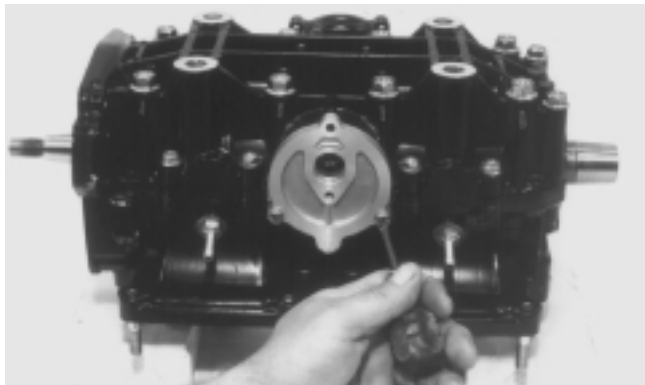
Fig. 2-339



■ **NOTE:** Before installing the oil-injection pump retainer, check the pinion gear backlash (see *Shimming Pinion Gear* in this sub-section).

20. Install the oil-injection pump retainer taking care to align the pinion and water pump shafts with their respective bearings. Press the retainer onto its dowel pin located in the top half of the crankcase. Install the screws and tighten to 0.8 - 1.2 kg-m (6-9 ft-lb). Tighten the screws evenly.

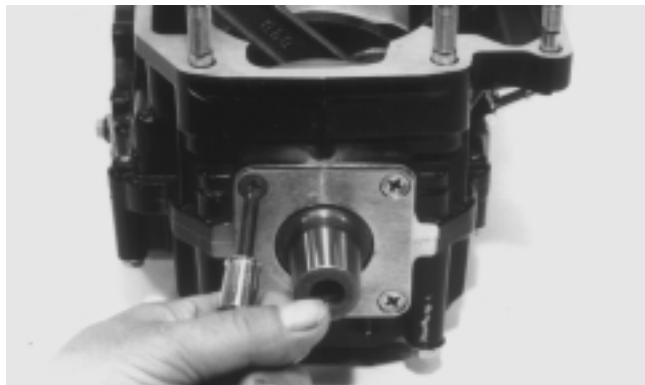
Fig. 2-340



AJ106

21. Place the end plate into position on the crankcase; then apply blue Loctite #242 to the four screws and tighten securely.

Fig. 2-341



AJ103

⚠ CAUTION

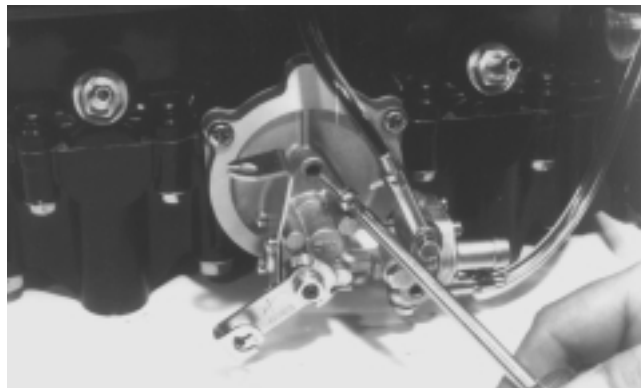
Make sure the slot of the oil-injection pump shaft is aligned with the shaft in the crankcase before installing the two oil pump mounting screws. If not aligned, the oil pump mounting flange will crack when the screws are tightened.

22. Apply a thin coat of silicone sealant to both sides of the oil pump gasket. Install the gasket and oil-injection pump. Secure with two screws and washers. Tighten the two screws to 0.7 kg-m (5 ft-lb).

⚠ CAUTION

The shorter screw must be installed in the top mounting hole of the oil pump or bearing damage will result.

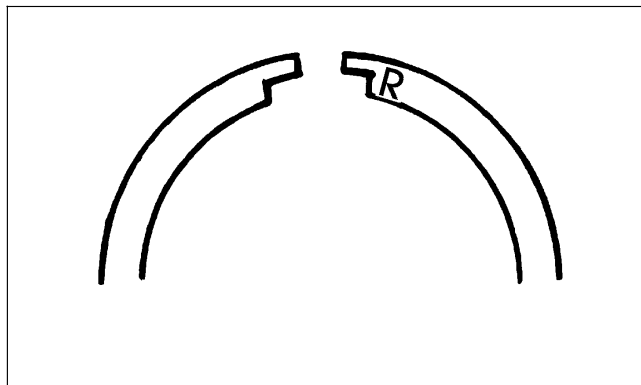
Fig. 2-342



AJ107

23. Install the piston rings on each piston so the letter on the top or inclined surface of each ring faces the dome of the piston.

Fig. 2-343



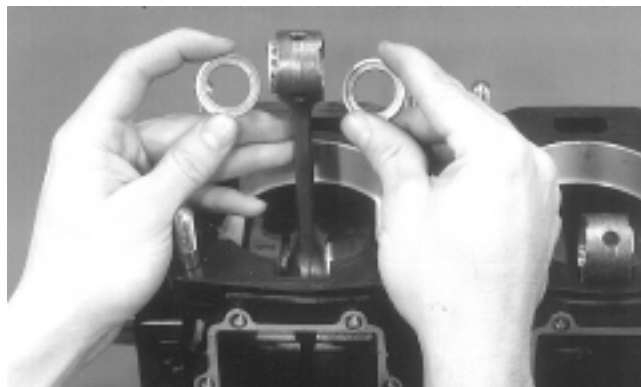
726-306A

⚠ CAUTION

Incorrect installation of the piston rings will result in engine damage.

24. Apply oil to the connecting-rod small end bearings; then install the small-end bearings and thrust washers.

Fig. 2-344



AQ059

25. Place each piston over the connecting rod so the arrow on each piston will point toward the exhaust port; then secure with a piston pin.

Fig. 2-345



AJ109

■ **NOTE:** The arrow is found up inside the piston.

26. Install the new circlips so the open end is directed either down or up.

Fig. 2-346



AJ110

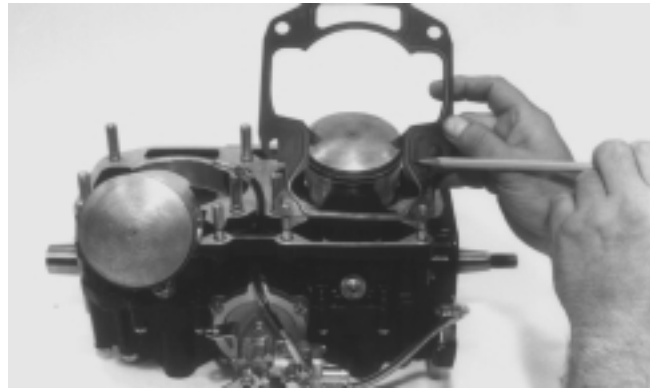


CAUTION

Make sure circlips are firmly seated and the open end is directed either down or up before continuing with assembly.

27. Apply a thin coat of Copper Coat Gasket Sealant (p/n 0636-092) to both sides of each cylinder-base gasket if the gaskets are being reused. If using new gaskets, it isn't necessary to apply copper coat. Install the gasket with the raised portion of the gasket positioned upward.

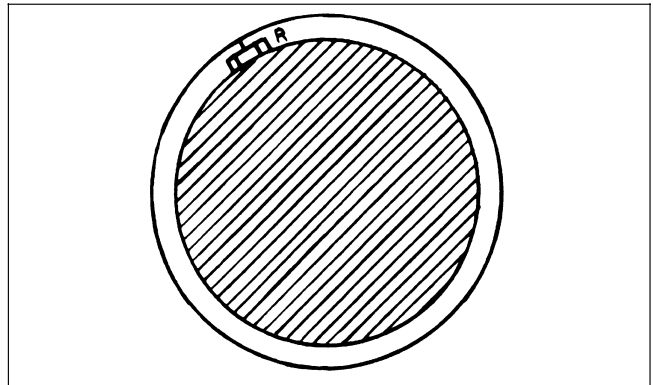
Fig. 2-347



AJ111

28. Rotate each piston ring until the ring ends are properly positioned on either side of the ring keeper; then apply oil to the piston assemblies and cylinder bores. Remove the rubber bands from the connecting rods.

Fig. 2-348

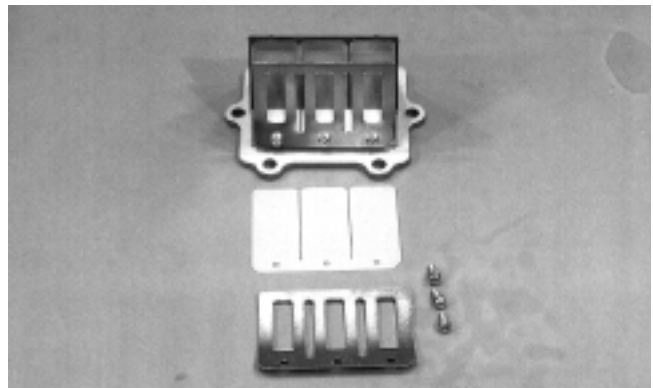


726-306B

■ **NOTE:** If the reed seats were removed, place each seat with new gasket into position on the cylinder, apply blue Loctite #242 to the screws, and tighten securely.

29. Place the reed valve (with the beveled corner positioned toward the lower right-hand corner) and stopper into position on the seat; then apply blue Loctite #242 to the screws and tighten securely.

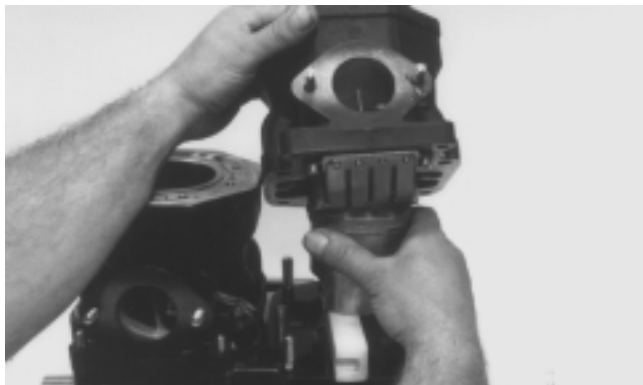
Fig. 2-349



AQ087

30. In turn on each cylinder, place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Remove the piston holder and seat the cylinder firmly onto the crankcase.

Fig. 2-350



AJ112

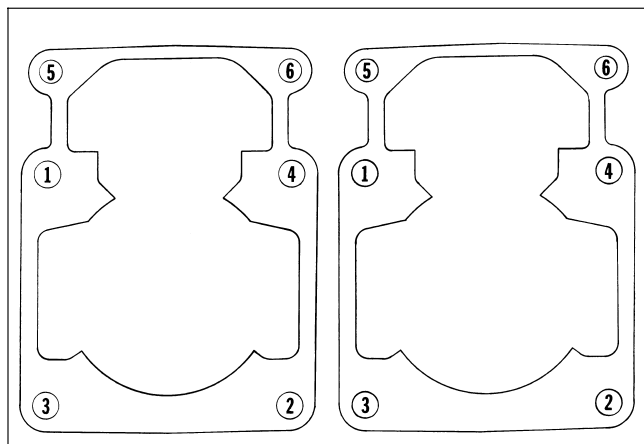


CAUTION

When installing the cylinders, care must be taken not to bend or damage the reed stopper.

31. Secure each cylinder by installing the six nuts, four washers, and lock washers. Tighten the 8 mm cylinder base nuts to 1.8 - 2.8 kg-m (13-20 ft-lb) and the 10 mm nuts to 4.0 - 6.0 kg-m (29-43.5 ft-lb). Tighten all the nuts in three steps using the pattern shown.

Fig. 2-351



0726-376

32. Place the O-rings into position on the top of each cylinder.

Fig. 2-352

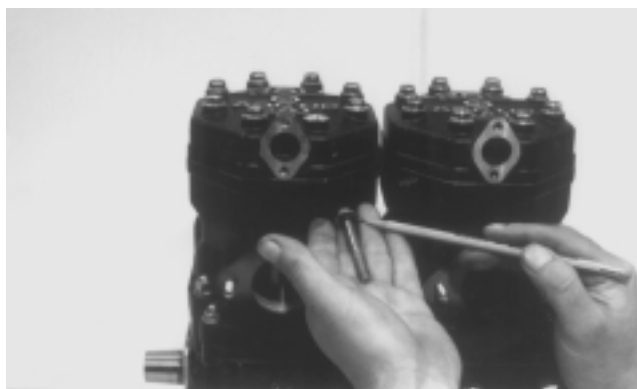


AJ118

■ **NOTE:** If reusing O-rings and they are slightly stretched, shrink the O-rings by cooling them (in a refrigerator for example) for a short period of time.

33. Check sealing surface to make sure the surface is clean; then set the cylinder heads in position. Slide an O-ring onto each of the 16 cap screws and start all the head cap screws. DO NOT TIGHTEN AT THIS TIME.

Fig. 2-353



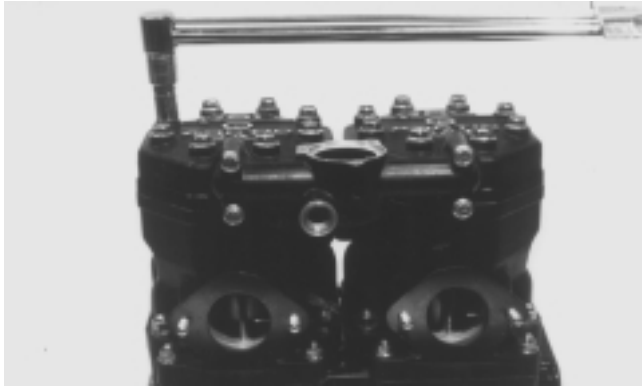
AJ119

34. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the two thermostat manifold gaskets. Place the gaskets and housing into position and secure with four cap screws and washers. Tighten the four cap screws in a crisscross pattern to 0.7 - 1.0 kg-m (5-7 ft-lb).

■ **NOTE:** The thermostat manifold cap screws must be tightened before tightening the head cap screws. This will allow the gasket surfaces of the head to align with the housing and prevent any coolant leakage.

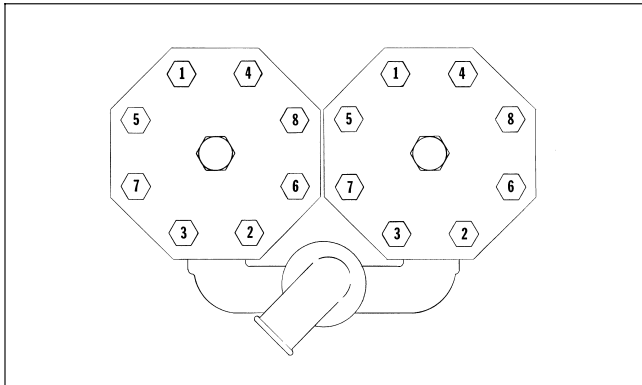
35. Tighten the head cap screws in three steps to 1.8 - 2.8 kg-m (13-20 ft-lb) using the pattern shown.

Fig. 2-354



AJ121

Fig. 2-355



0727-158

36. Install the oil-injection hose on each cylinder nozzle and secure with a hose clamp.
37. Test the engine for air leaks (see Section 3).
38. Place the thermostat with gasket and cap into position. Secure with three cap screws. Tighten to 0.7 - 1.0 kg-m (5-7 ft-lb).

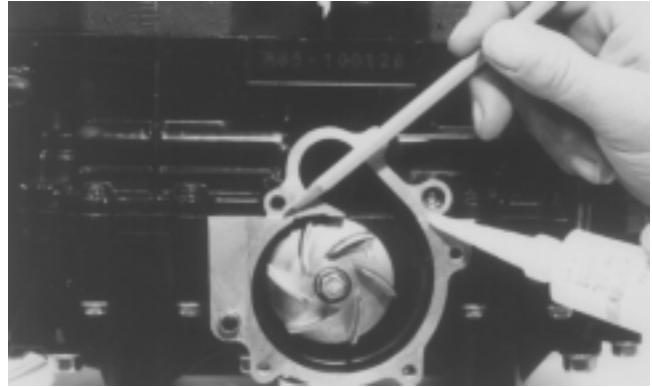
Fig. 2-356



AJ123

39. Apply a thin coat of silicone sealant to the crankcase water pump housing sealing surface.

Fig. 2-357



AJ115

40. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the water pump cover seal and position the O-ring into the cover. Carefully place the cover over the impeller and onto the crankcase. Secure with five cap screws. Tighten cap screws evenly to 0.7 - 1.0 kg-m (5-7 ft-lb).

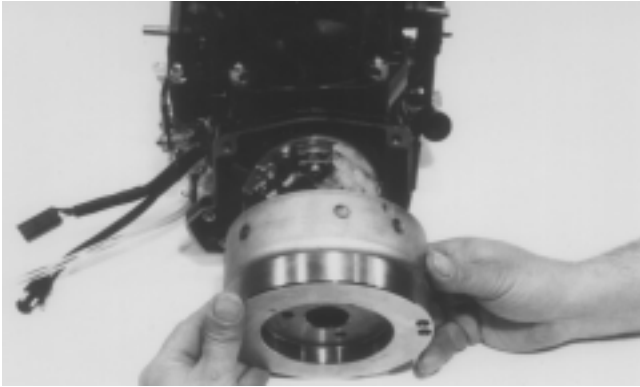
Fig. 2-358



AJ116

41. Install the trigger coil and secure to the crankcase using two screws and mounting bracket. Route wires out through grommet opening in the crankcase.
42. Install the stator backing plate and secure with four cap screws. Apply blue Loctite #242 to the threads of each cap screw before installation.
43. Route the stator wiring harness through the backing plate and install the rubber grommet around the harness.
44. Place the stator plate into position and secure with three screws coated with blue Loctite #242, lock washers, and washers.
45. Install the key in the crankshaft and slide the flywheel onto the crankshaft making sure the keyways align.

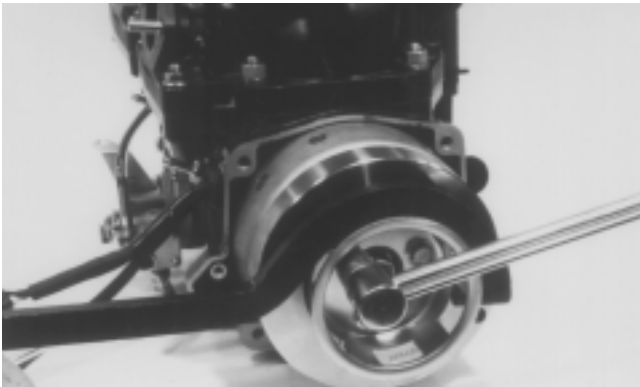
Fig. 2-359



AJ128

46. Apply blue Loctite #242 to the crankshaft threads; then install the flat washer, lock washer, and nut securing the flywheel. Tighten nut finger tight.
47. Place the starter pulley into position on the flywheel and secure with three cap screws coated with blue Loctite #242. Tighten the three cap screws evenly to 1.8 - 2.2 kg-m (13-16 ft-lb).

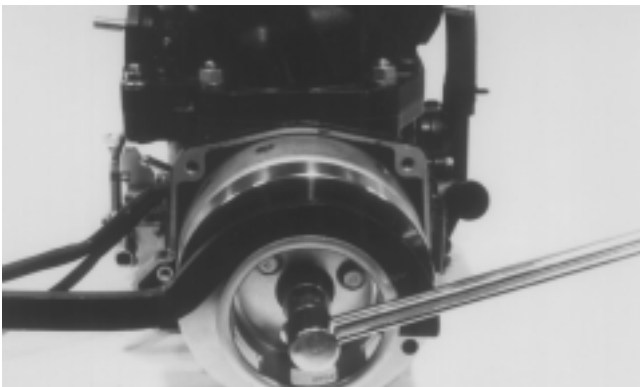
Fig. 2-360



AJ130

48. Using a spanner wrench, tighten the flywheel nut to 7.0 - 9.0 kg-m (50-65 ft-lb).

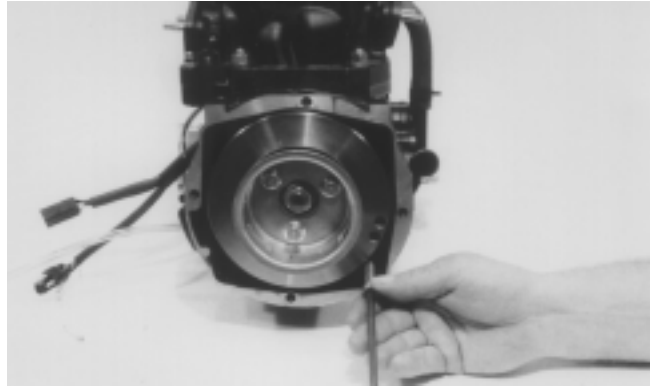
Fig. 2-361



AJ131

49. Place the magneto-case cover into position and secure with four Allen-head cap screws coated with blue Loctite #242. Tighten to 1.8 - 2.2 kg-m (13-16 ft-lb).

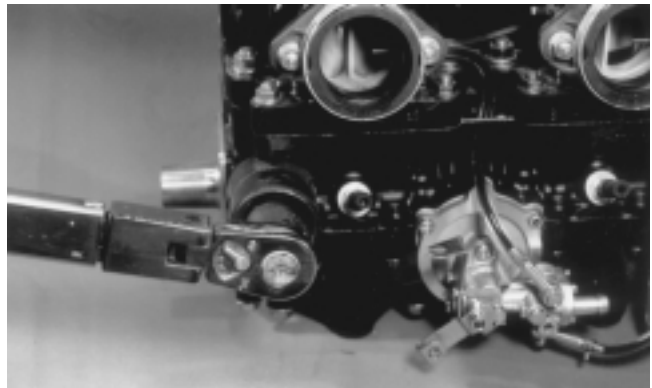
Fig. 2-362



AJ132

50. Place the front and right rear mounting brackets into position on the crankcase. Secure with cap screws coated with blue Loctite #242; then tighten the cap screws to 2.4 kg-m (17 ft-lb).
51. Secure the rear PTO-side engine mount to the crankcase. Tighten to 1.4 kg-m (10 ft-lb).

Fig. 2-363



AN138

SHIMMING PINION GEAR

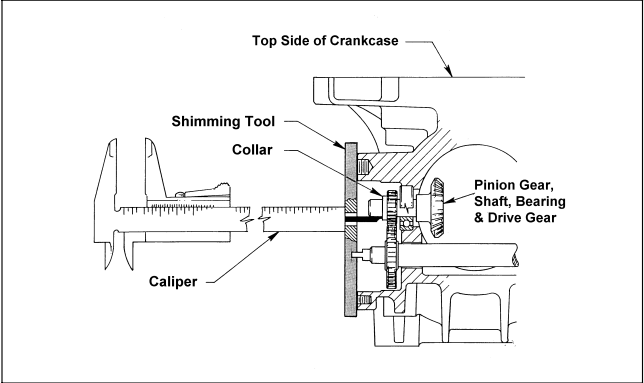
CAUTION

If either the crankshaft or pinion gear assembly has been replaced, pinion gear backlash must be checked.

■ **NOTE:** In order to check pinion gear backlash, a caliper and the Pinion Shimming Tool (p/n 0644-055) must be used.

1. Place the shimming tool against the oil-injection pump retainer seal surface. The center hole of the tool must be positioned just to one side of the pinion shaft.
2. Insert the measuring beam of the caliper through the hole of the tool and up against the shoulder of the pinion gear.

Fig. 2-364



0727-556

3. While holding the tool tight against the crankcase, read the caliper. Compare the reading to the following chart and select the appropriate shim or shims as necessary.

■ **NOTE:** If the required shim thickness is between 2.0 and 3.0 mm, use two of the shims to obtain the correct shimming thickness.

CALIPER READING	SHIM THICKNESS	CALIPER READING	SHIM THICKNESS
21.51 - 21.6	1.0	22.61 - 22.7	2.1
21.61 - 21.7	1.1	22.71 - 22.8	2.2
21.71 - 21.8	1.2	22.81 - 22.9	2.3
21.81 - 21.9	1.3	22.91 - 23.0	2.4
21.91 - 22.0	1.4	23.01 - 23.1	2.5
22.01 - 22.1	1.5	23.11 - 23.2	2.6
22.11 - 22.2	1.6	23.21 - 23.3	2.7
22.21 - 22.3	1.7	23.31 - 23.4	2.8
22.31 - 22.4	1.8	23.41 - 23.5	2.9
22.41 - 22.5	1.9	23.51 - 23.6	3.0
22.51 - 22.6	2.0		

Assembling Engine (600 cc Triple Models)

■ **NOTE:** Arctic Cat recommends the use of new gaskets and end seals when assembling the engine.

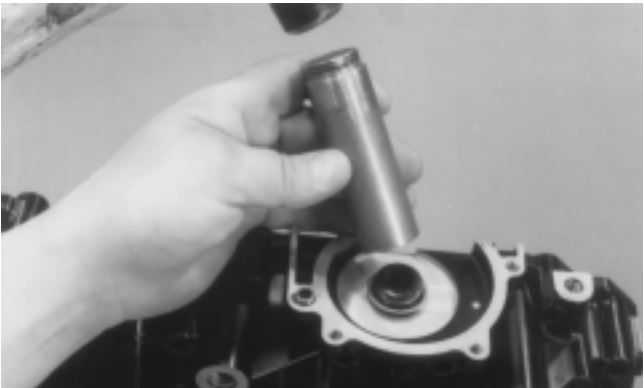
1. Using the Water Pump Bearing and Seal Kit (p/n 0644-084), position the inner water pump shaft seal onto the special seal driver and gently tap the seal down into position.

■ **NOTE:** The seal must be installed with its spring side towards the crankshaft.

2. Apply a thin coat of grease to the inner seal lips.
3. Using a pair of snap ring pliers, install the snap ring securing the inner seal in the crankcase.
4. Using the seal driver, carefully install the outer water pump seal. Gently tap the seal down into position until it seats itself against its flange.

2

Fig. 2-365

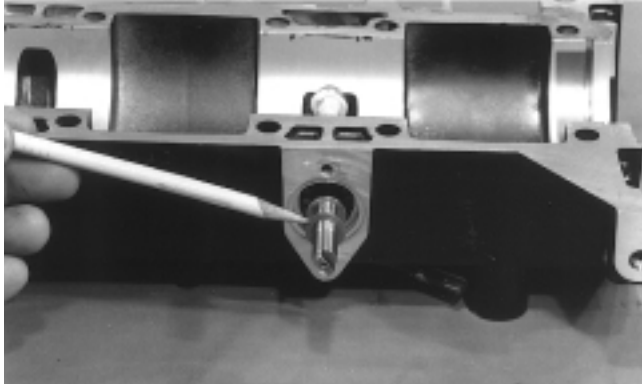


5. Apply a light coat of grease to the sealing surface of the oil-injection pump driveshaft; then install the Oil Seal Installation Tool (p/n 0644-219) at the end of the shaft. Twist the shaft clockwise as it is pushed through the oil-injection and water pump seals; then remove the tool. Position the shim on the oil-injection pump end of the driveshaft.

⚠ CAUTION

Be very careful not to damage the seals when installing the pump driveshaft. Be certain to use Oil Seal Installation Tool (p/n 0644-219).

Fig. 2-366

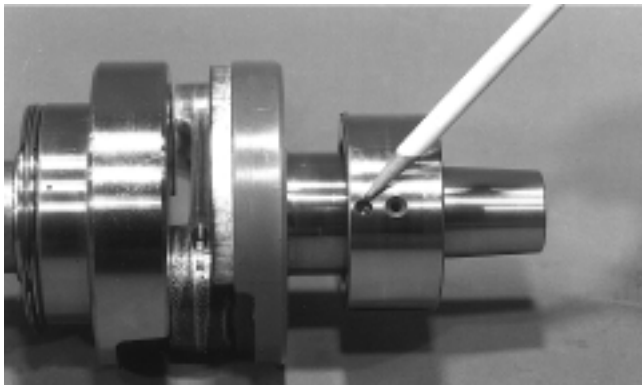


AN205

6. Position the upper crankcase half upside-down on two wooden blocks; then install the C-ring and dowel pins.
7. Place the PTO-side crankshaft bearing into position making sure the bearing dowel pin hole is positioned inward.

■ **NOTE:** The dowel pin hole is the hole that doesn't go entirely through the bearing case.

Fig. 2-367



AN152

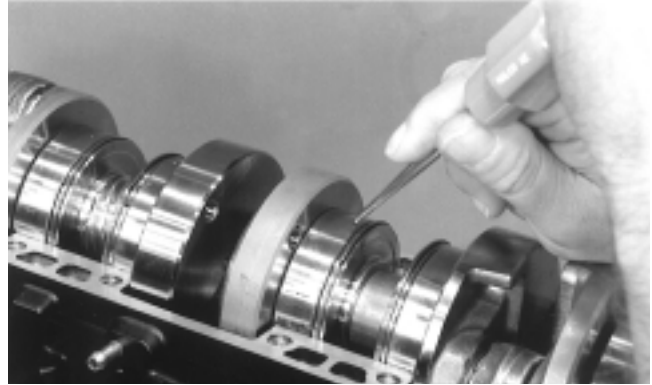
8. Lubricate the inner lips of the crankshaft end seals with grease; then slide the seals onto the crankshaft making sure the spring side of each seal faces the bearing on the crankshaft.

■ **NOTE:** There is a MAG-side seal and a PTO-side seal.

9. Apply oil to the crankshaft bearings; then install the crankshaft into the upper crankcase half. Be sure the alignment hole in each bearing is positioned over its respective dowel pin in the crankcase; then seat the crankshaft.

■ **NOTE:** To check the bearing for proper position, place the point of a sharp tool into the dimple found in the bearing race. Strike the tool with the palm of the hand in either direction. If the bearing moves, it isn't positioned correctly and must be rotated until it drops onto the dowel pin.

Fig. 2-368



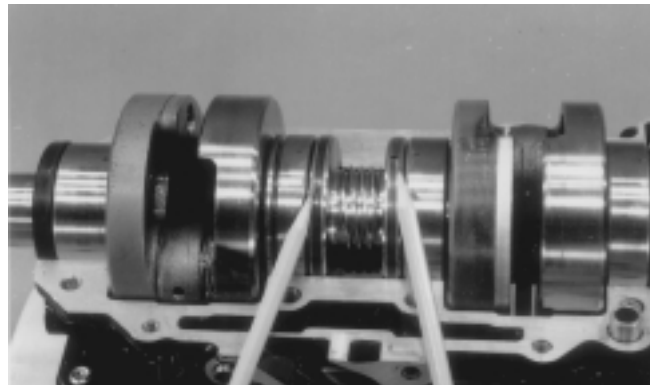
AN203

CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and severe engine damage will result.

10. The sealing rings must be located so none of the end gaps align. Rotate the rings to "stagger" the end gaps.

Fig. 2-369



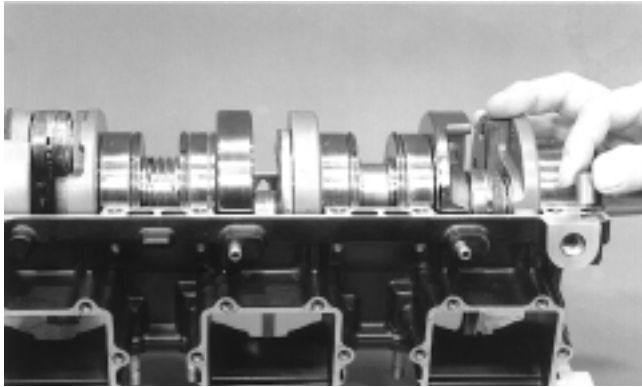
AN083

11. Apply a light coat of High-Temp Sealant (p/n 0636-069) to the entire sealing surface of the bottom half of the crankcase. Install the two dowel pins into the corners of the crankcase.

CAUTION

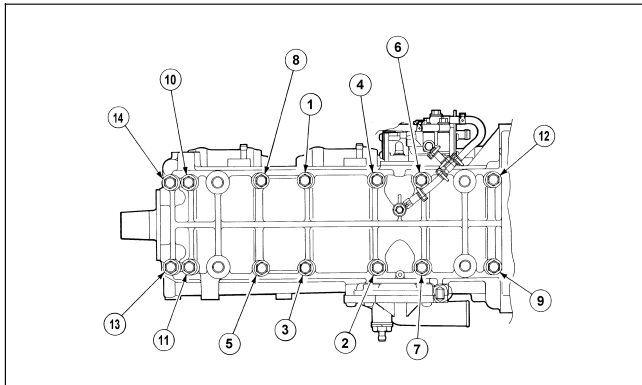
When installing the crankcase dowel pins, use the two long dowel pins. The six shorter pins must be used to align the cylinders.

Fig. 2-370



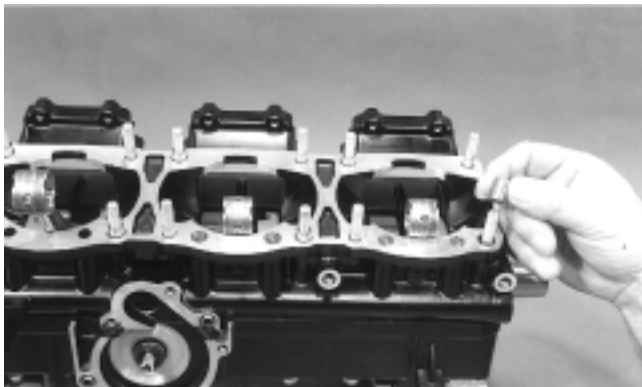
12. Place the bottom crankcase half into position and install the 14 crankcase cap screws. Tighten the cap screws evenly by hand starting in the center; then tighten the cap screws in three steps to 2.8 kg-m (20 ft-lb). Follow the pattern shown.

Fig. 2-371



13. Set the engine upright. On the appropriate crankcase cylinder mounting studs, position two dowel sleeves per cylinder. Install the cylinder base gaskets.

Fig. 2-372



■ **NOTE:** The cylinder base gaskets can be reused if not damaged. When reusing a gasket, coat each side with Copper Coat Gasket Sealant (p/n 0636-092).

14. Pre-oil the piston pin bearings and place into position in the connecting rods; then place a thrust washer on each end of the bearing. The flat side of each washer must face outward.

Fig. 2-373



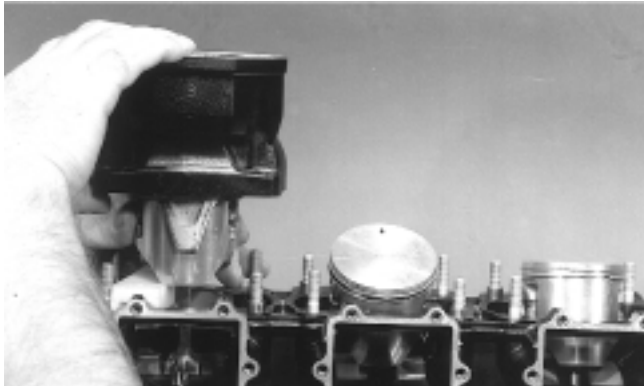
15. Place the piston over the connecting rod so the arrow on the piston dome will point towards the exhaust port of the cylinder; then apply a light coat of oil to the piston pin and install.

Fig. 2-374



16. Install the piston rings on the piston with their tapered side "up."
17. Secure the piston pin by installing new piston pin circlips. Install the circlip with the open end up.
18. Apply oil to the piston rings and pistons; then rotate the rings to correctly position them on either side of the locating pin in the ring groove. Place a short piece of wear strip under the piston to keep it square; then compress the piston rings with one hand and slide the cylinder down onto the piston.

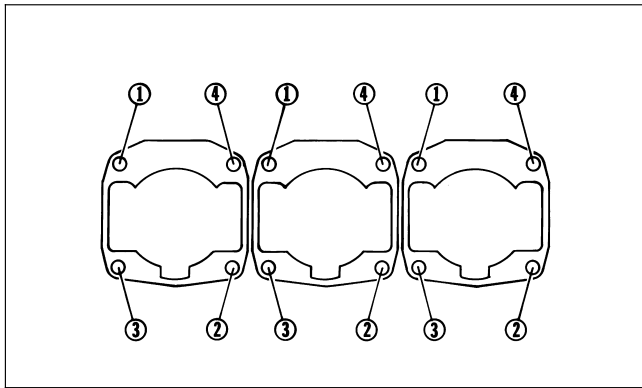
Fig. 2-375



AN190

19. Align the cylinder exhaust ports using a straight edge; then secure each cylinder base with four flanged nuts. In three steps, tighten the nuts to 1.8-2.8 kg-m (13-20 ft-lb).

Fig. 2-376



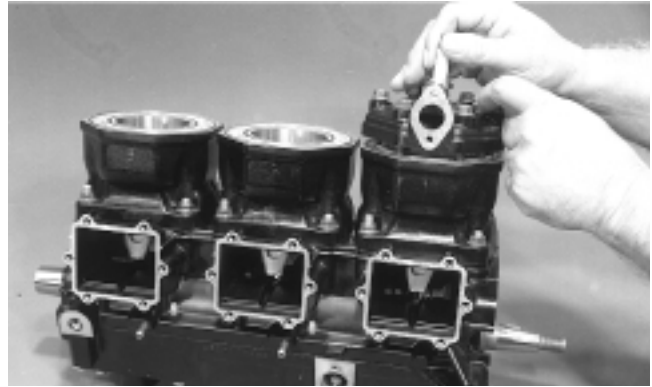
0729-585

20. Place the cylinder head O-rings into position on each cylinder.

■ **NOTE:** If reusing O-rings and they are slightly stretched, shrink the O-rings by cooling them (in a refrigerator for example) for a period of time.

21. Being very careful not to move the two O-ring seals, hold the cylinder head above the cylinder approximately 1/4 in. and start the cap screws into the cylinder; then check the O-rings for proper position and set the head carefully down onto the cylinder. Finger-tighten the cap screws at this time.

Fig. 2-377



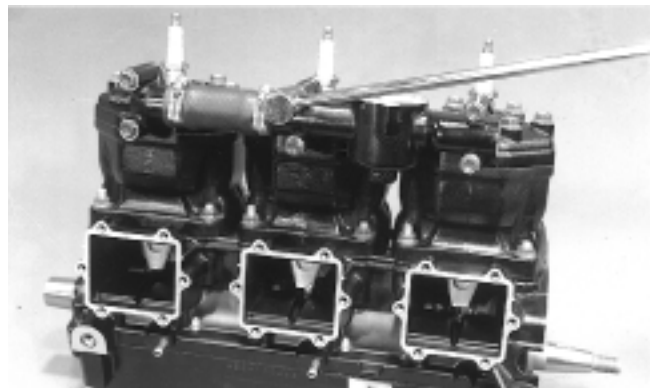
AN188

⚠ CAUTION

Be very careful not to move the cylinder heads once they are placed on top of the O-rings.

22. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the three water manifold gaskets. Place the gaskets and manifold into position and secure with six cap screws. Using a crisscross pattern, tighten to 0.7-1 kg-m (5-7 ft-lb).

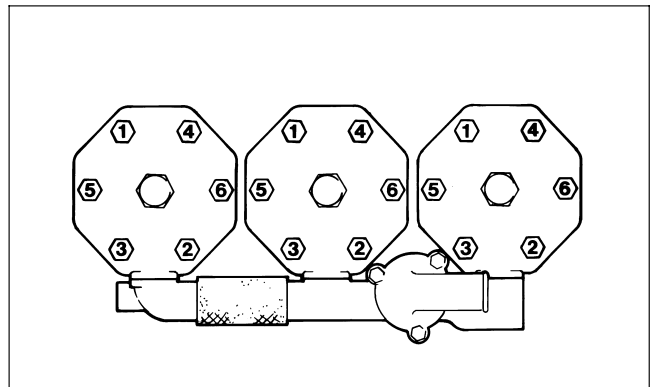
Fig. 2-378



AN187

23. Tighten the cylinder head cap screws in three steps using the pattern shown to 2-2.5 kg-m (14.5-18 ft-lb).

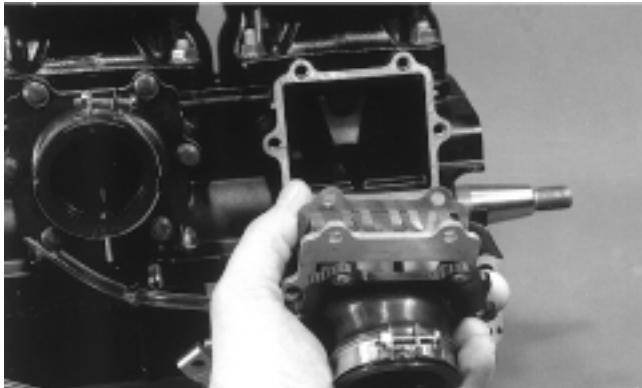
Fig. 2-379



0729-587

24. In turn for each cylinder, install the gasket, reed block assembly, and carburetor flange to the crankcase; then secure with six cap screws. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).

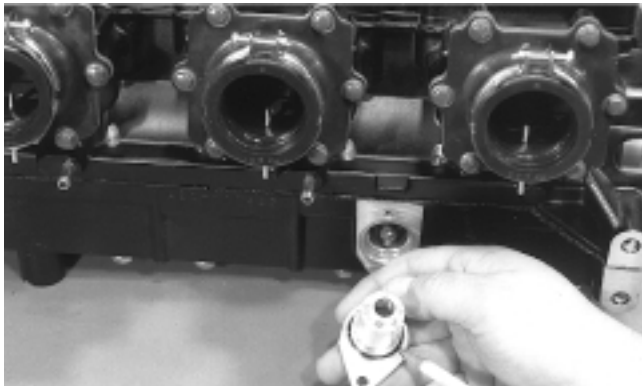
Fig. 2-380



AN213

25. Place the thrust washer on the outward end of the oil-injection pump driveshaft.
26. Apply a light coat of oil to the shaft adapter; then install the O-ring and slide the adapter into position on the pump driveshaft.

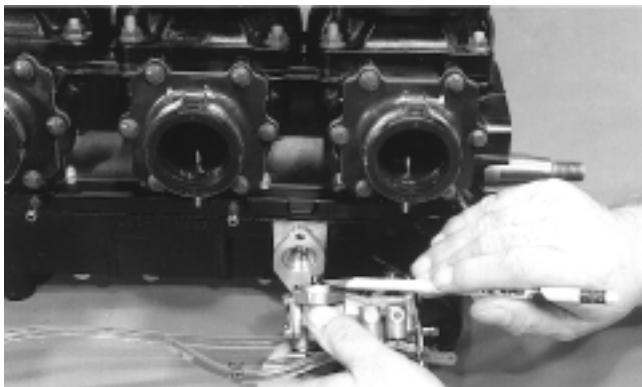
Fig. 2-381



AN184

27. Being careful to align the slot of the oil-injection pump shaft with the flat end of the oil-injection pump driveshaft, install the pump on the crankcase and secure with two screws.

Fig. 2-382



AN183

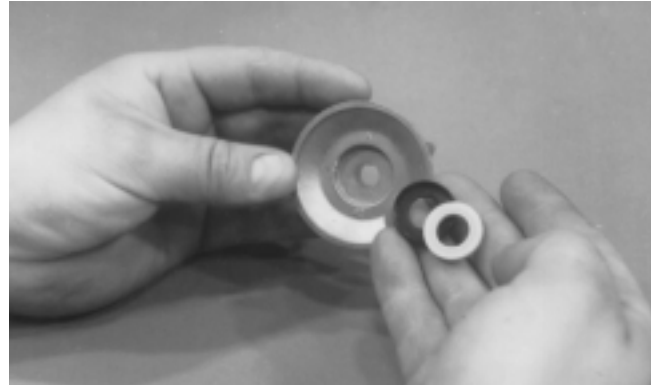
CAUTION

When installing the oil-injection pump, the pump driveshaft must align with the pump shaft or serious damage will result.

28. Position the rubber seal retainer and seal into the back side of the water pump impeller.

■ **NOTE: The lined or marked side of the porcelain seal must face the rubber retainer.**

Fig. 2-383



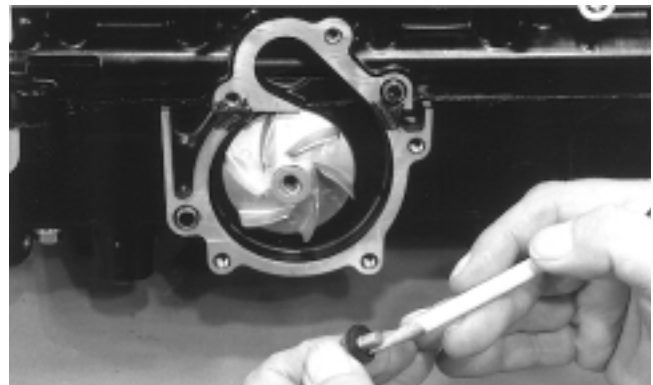
AN091

29. Using both thumbs, press the seal into position making sure its marked side is positioned towards the rubber retainer.
30. Apply a light coat of grease to the seal outer surface.
31. Place the impeller into position and secure with a cap screw and washer. Be sure the rubber side of the washer is directed toward the impeller.
32. Apply blue Loctite #242 to the threads of the cap screw and tighten to 0.8-1.2 kg-m (6-9 ft-lb).

CAUTION

The rubber side of the washer which secures the impeller must be positioned toward the impeller. If installed incorrectly, a coolant leak will result.

Fig. 2-384



AN181

33. Apply sealant to the crankcase seam; then install the alignment pins into the crankcase.

Fig. 2-385

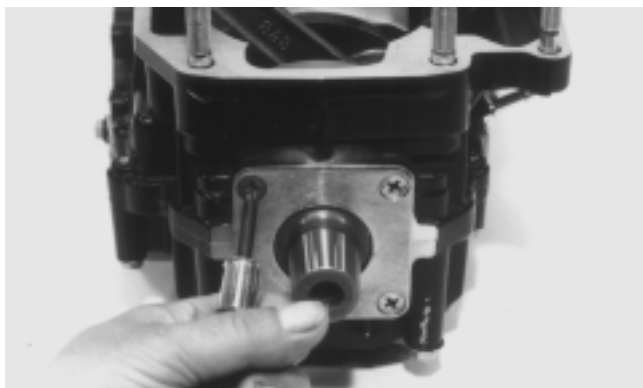


AN179

■ **NOTE:** Sealant is only required on the crankcase seam.

34. Position the O-ring into the water pump cover; then install the cover. Secure with five screws. Tighten securely.
35. Place the seal protector plate into position on the crankcase; then apply blue Loctite #242 to the four screws and secure.

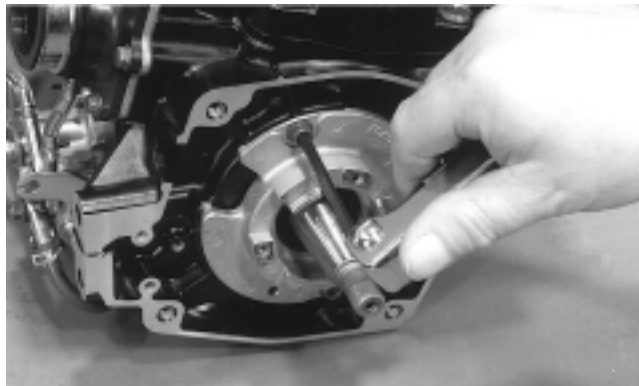
Fig. 2-386



AJ103

36. Install the stator plate with the large notch for the wiring harness in the 10 o'clock position; then secure with two cap screws.

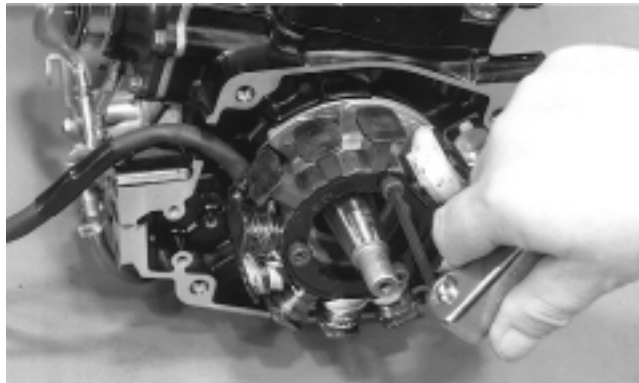
Fig. 2-387



AN170

37. Install the stator; then route the wiring harness through the crankcase housing and install the rubber grommet. Apply blue Loctite #242 to the threads of the three Allen-head cap screws and secure the stator to the stator plate.

Fig. 2-388



AN171

38. Set the timing sensor into position in the magneto housing. Apply blue Loctite #242 to the threads of the two screws and secure the timing sensor to the housing.

Fig. 2-389



AN172

39. Secure the timing sensor wiring harness to the magneto housing using the tab plate and screw. Apply blue Loctite #242 to the screw threads and tighten securely.

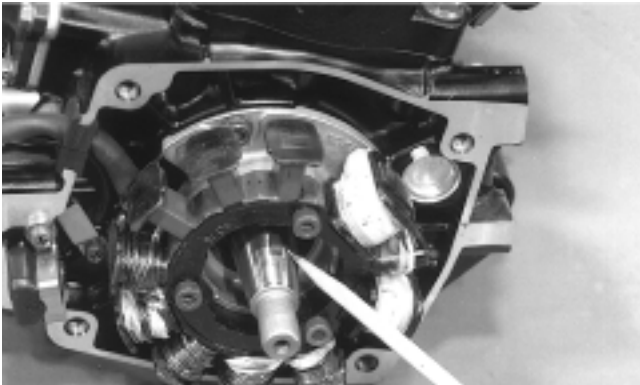
Fig. 2-390



■ **NOTE:** Wipe the flywheel and crankshaft taper with a clean cloth to remove any foreign material.

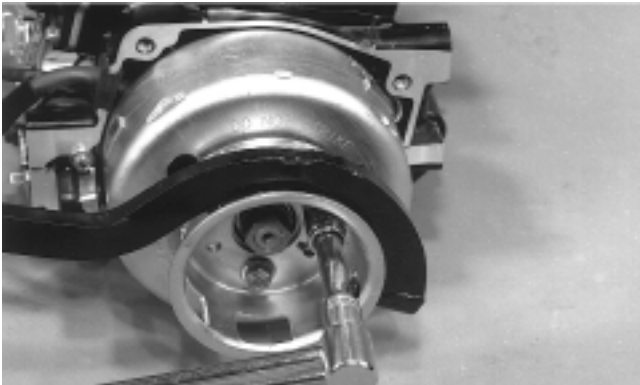
40. Install the flywheel key in the crankshaft; then slide the flywheel onto the crankshaft making sure the keyways align. Install, but do not tighten, the flat washer, lock washer, and flywheel nut.

Fig. 2-391



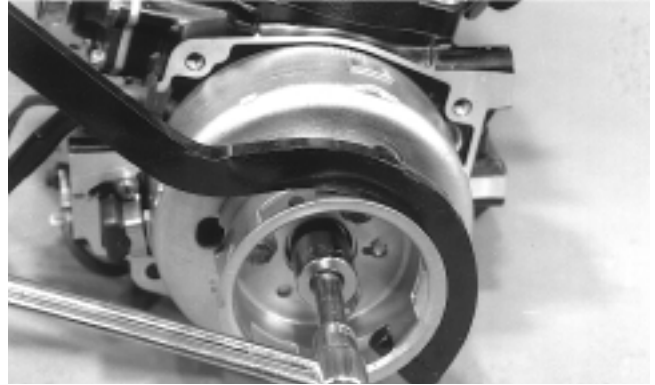
41. Install the starter pulley and secure with three cap screws. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).

Fig. 2-392



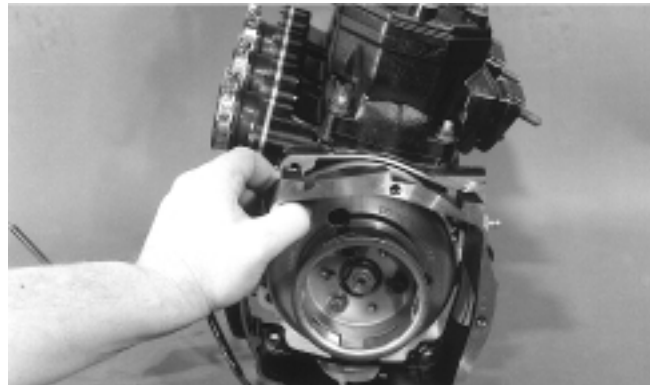
42. Tighten the flywheel nut to 7-9 kg-m (50.5-65 ft-lb).

Fig. 2-393



43. Install the magneto housing; then apply blue Loctite #242 to the four Allen-head cap screws and secure. Tighten to 1.8-2.2 kg-m (13-16 ft-lb).

Fig. 2-394



44. Install the thermostat with its rubber seal and thermostat cover. Secure with three cap screws. Tighten to 0.7-1 kg-m (5-7 ft-lb).

Fig. 2-395

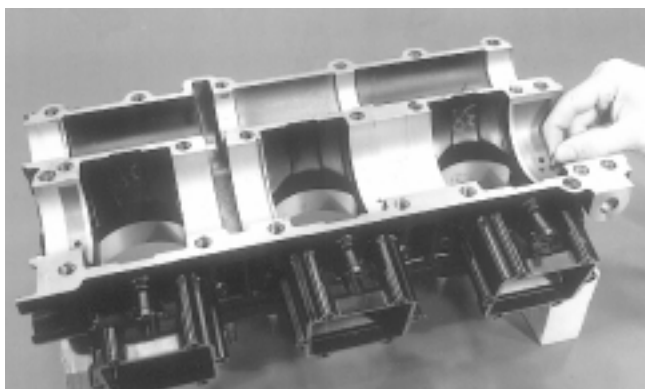


45. Pressure test the engine (see Section 3).

Assembling Engine (800/1000 cc Models)

1. Set the top half of the crankcase on the work bench with a wooden block under each end; then install the seven bearing locating pins into the crankcase.

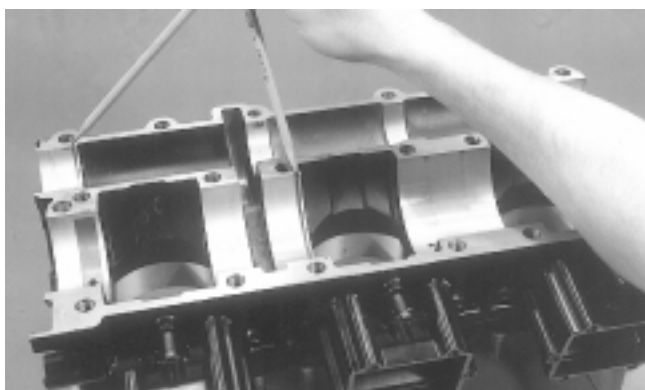
Fig. 2-396



AQ048

2. Install the two C-clips into the crankcase.

Fig. 2-397



AQ049

3. Apply bearing grease to the lips of the end seals.

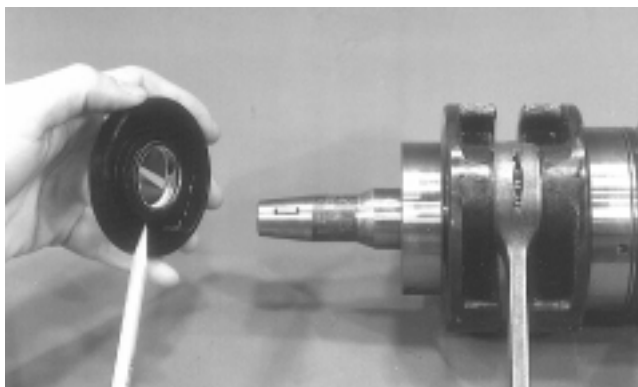
Fig. 2-398



AQ050

4. Install the two end seals onto the crankshaft with the spring side facing the bearing.

Fig. 2-399

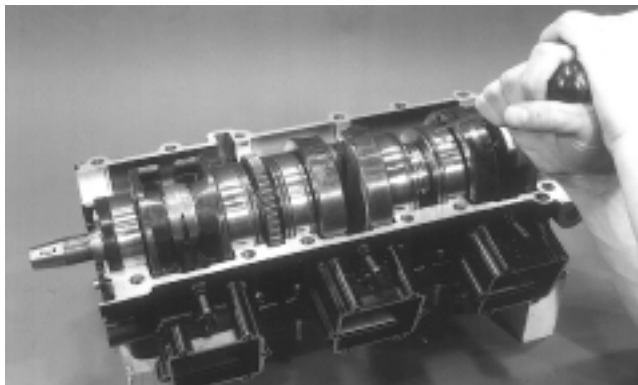


AQ051

5. Set the crankshaft into the crankcase. Rotate each bearing until its hole in the outer race drops onto the locating pin. Check each bearing to make sure it is properly positioned.

NOTE: To check the bearing for proper position, place the point of a sharp tool into the dimple found in the bearing race. Strike the tool with palm of the hand in either direction. If the bearing moves, it isn't positioned correctly and must be rotated until it drops onto the pin.

Fig. 2-400



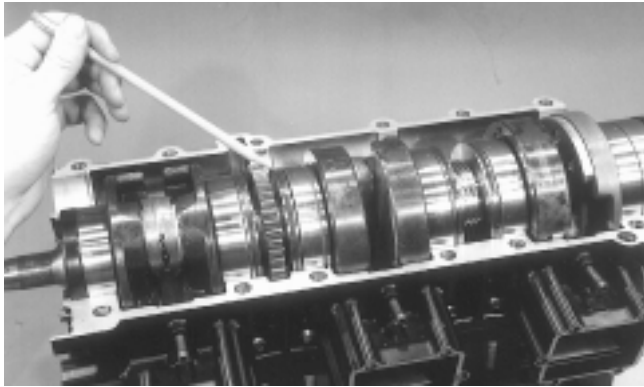
AQ052

⚠ CAUTION

If the bearings are not properly seated during assembly, the crankcase halves will not seal tightly and severe engine damage will result.

6. The sealing rings must be located so none of the end gaps align. Rotate the rings to "stagger" the end gaps.

Fig. 2-401

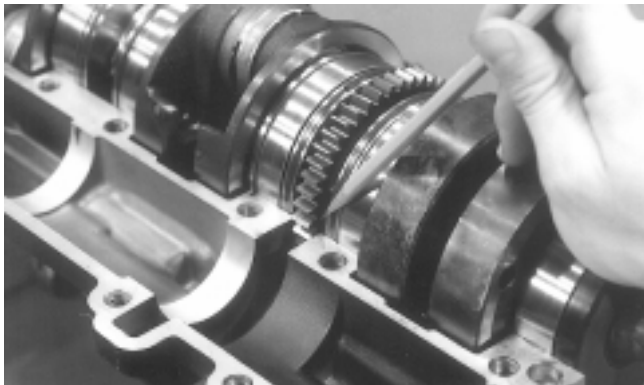


AQ053

7. Rotate the crankshaft while observing the timing mark on the side of the gear. Align the timing mark with the parting surface of the crankcase.

■ **NOTE:** Before installing the balancer shaft, pack the bearings with grease. It is recommended that Arctic Cat Low-Temp Grease (p/n 0636-593) be used for this purpose.

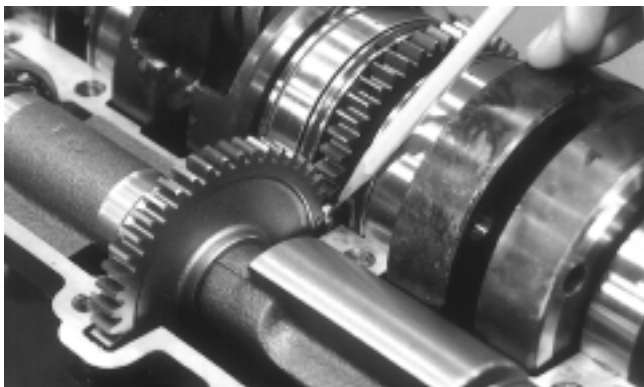
Fig. 2-402



AQ054

8. Locate the timing mark on the balancer shaft gear; then set the shaft into position aligning its timing mark with the timing mark of the crankshaft gear.

Fig. 2-403

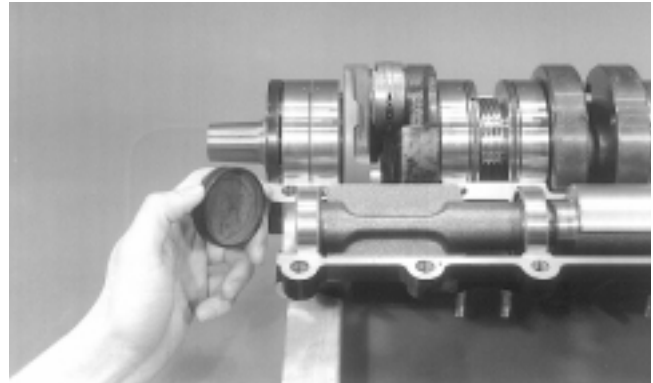


AQ055

9. Set the balancer shaft seal into position against the bearing.

■ **NOTE:** Using Arctic Extreme 50:1 Injection Oil, pre-oil the crankshaft and balancer shaft bearings at this time.

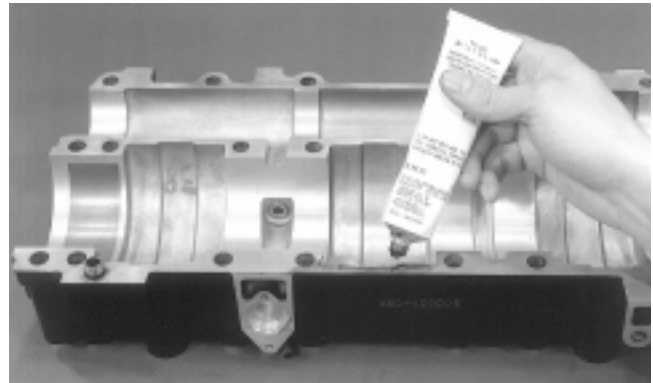
Fig. 2-404



AQ056

10. Apply a light coat of High-Temp Sealant (p/n 0636-069) to the sealing surface of the bottom half of the crankcase. Make sure the entire surface is coated evenly.

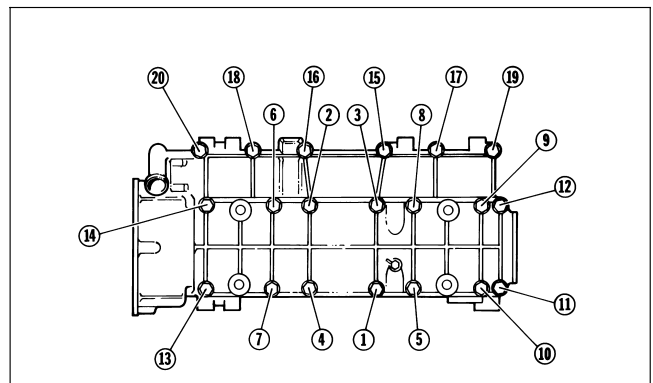
Fig. 2-405



AQ057

11. Place the bottom crankcase half into position and install the twenty crankcase cap screws. Tighten the cap screws evenly by hand starting in the center. Tighten the cap screws in three steps to 4 kg-m (29 ft-lb). Follow the pattern shown.

Fig. 2-406



0729-590

12. Set the engine upright. Install the cylinder base gasket making sure the small water passage hole is positioned to the MAG-side.

■ **NOTE:** The cylinder base gasket can be reused if not damaged. When reusing a gasket, coat each side with Copper Coat Gasket Sealant (p/n 0636-092).

CAUTION

The cylinder base gasket must be installed with the small water passage hole located to the MAG-side of the crankcase or engine damage will result.

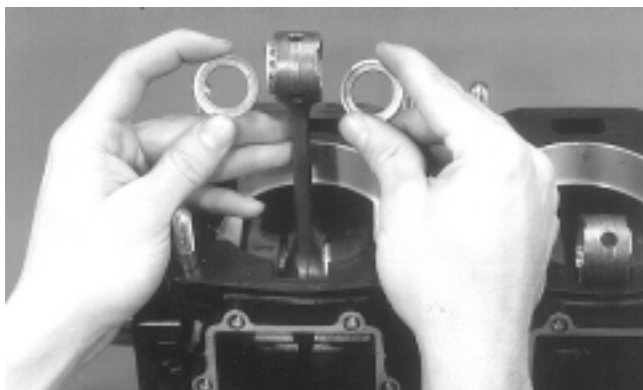
Fig. 2-407



AQ030

13. Pre-oil the piston pin bearings and place into position in the connecting rods; then place a thrust washer on each end of the bearing. The flat side of each washer must face outward.

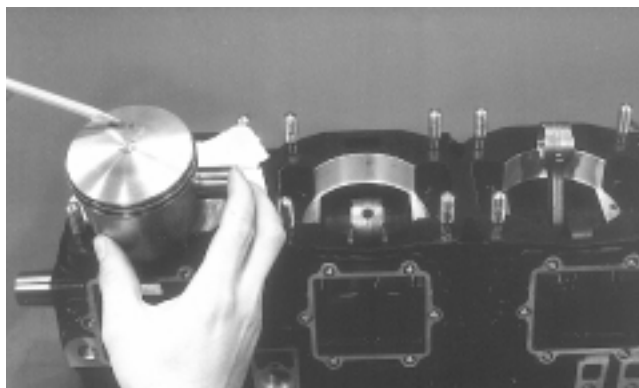
Fig. 2-408



AQ059

14. Place the piston over the connecting rod so the arrow on the piston dome will point towards the exhaust port of the cylinder; then apply a light coat of oil to the piston pin and install.

Fig. 2-409



AQ060

15. Install the piston rings on the piston with their tapered side "up."

16. Secure the piston pin by installing new piston pin circlips. Install the circlip with the open end up.

Fig. 2-410



AQ080

17. Apply oil to the piston rings; then rotate the rings to correctly position them on either side of the locating pin in the ring groove. Place a short piece of wear strip under the piston to keep it square; then compress the piston rings with one hand and slide the cylinder down onto the piston.

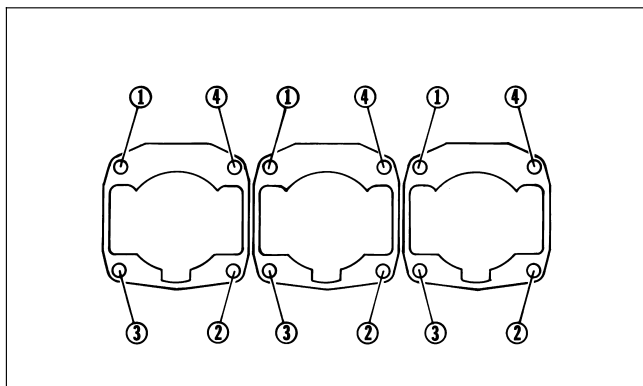
Fig. 2-411



AQ061

18. Align the cylinder exhaust ports using a straight edge; then secure each cylinder base with four washers, lock washers, and nuts. In three steps tighten the nuts to 4-6 kg-m (29-43 ft-lb). Use the pattern shown.

Fig. 2-412

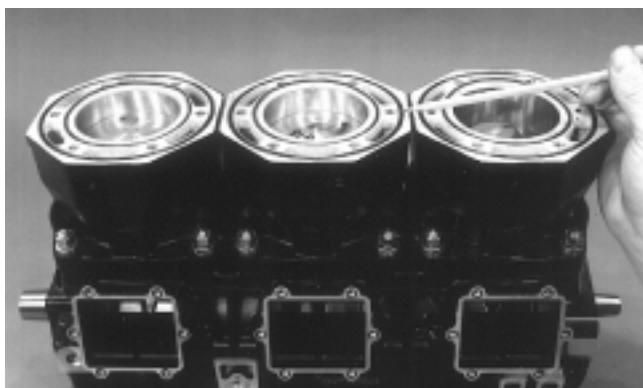


0729-585

19. Place the cylinder head O-rings into position on each cylinder.

■ **NOTE:** If reusing O-rings and they are slightly stretched, shrink the O-rings by cooling them (in a refrigerator for example) for a period of time.

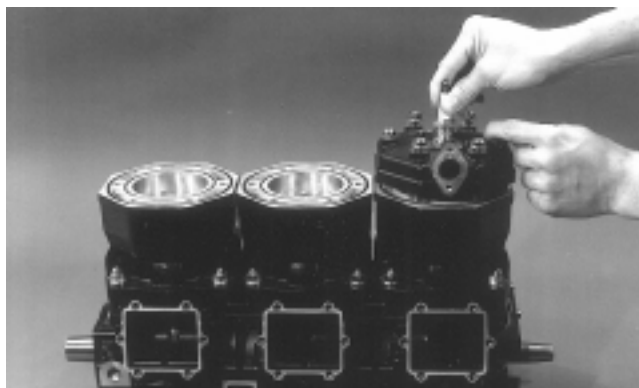
Fig. 2-413



AQ063

20. Being very careful not to move the two O-ring seals, hold the cylinder head above the cylinder approximately 1/4 in. and start the cap screws into the cylinder; then check the O-rings for proper position and set the head carefully down onto the cylinder. Finger-tighten the cap screws at this time.

Fig. 2-414



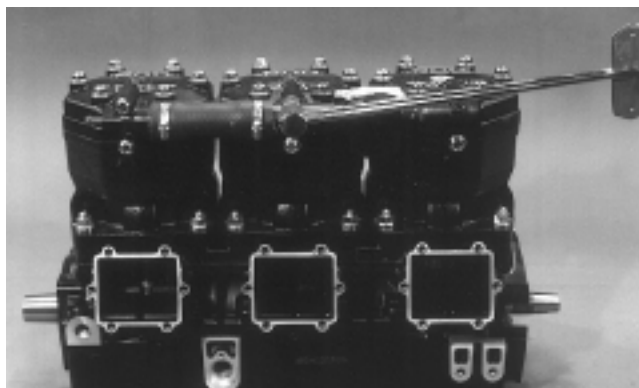
AQ064

⚠ CAUTION

Be very careful not to move the cylinder heads once they are placed on top of the O-rings.

21. Apply a thin coat of High-Temp Sealant (p/n 0636-069) to the three water manifold gaskets. Place the gaskets and manifold into position and secure with six cap screws. Using a crisscross pattern, tighten to 0.7-1 kg-m (5-7 ft-lb).

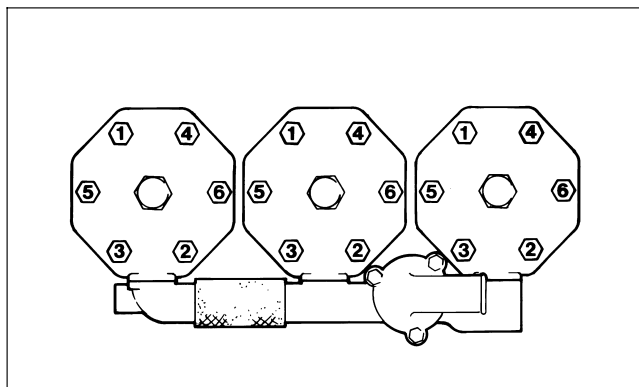
Fig. 2-415



AQ065

22. Tighten the cylinder head cap screws in three steps using the pattern shown to 2-2.5 kg-m (14.5-18 ft-lb).

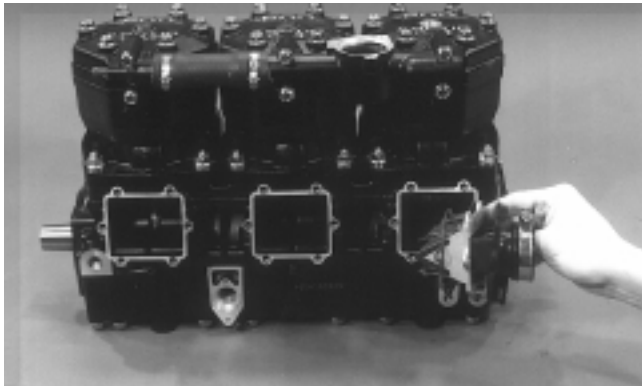
Fig. 2-416



0729-587

23. In turn for each cylinder, install the gasket, reed assembly, and carburetor flange to the crankcase; then secure with six cap screws. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).

Fig. 2-417



AQ066

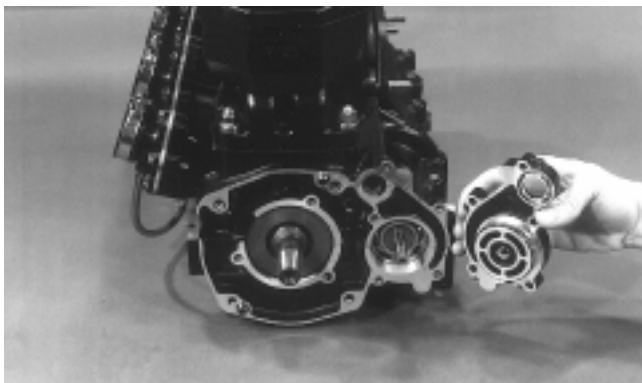
24. Place the thrust washer on the outward end of the oil-injection pump driveshaft. Lubricate the shaft and install into the crankcase.
25. Apply a light coat of oil to the shaft adapter; then install the O-ring and slide the adapter into position on the oil-injection pump driveshaft.
26. Being careful to align the slot of the oil-injection pump shaft with the flat end of the oil-injection pump driveshaft, install the pump on the crankcase and secure with two screws.

CAUTION

When installing the oil-injection pump, the pump driveshaft must align with the pump shaft or serious damage will result.

27. Place the PTO-end plate into position on the crankcase; then apply blue Loctite #242 to the four screws and secure.
28. Place the water pump housing into position on the crankcase. Make sure the two O-ring seals on the backside are in their proper position.

Fig. 2-418

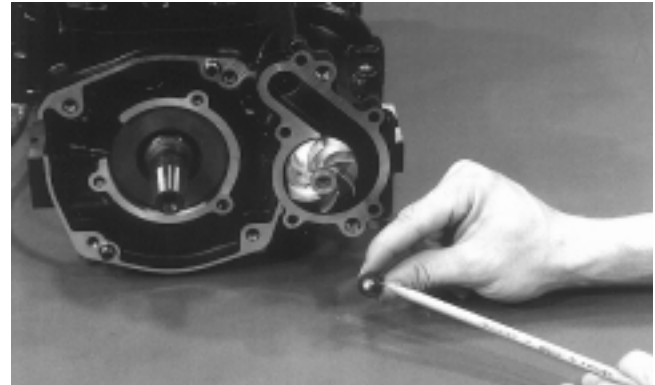


AQ068

29. Install the water pump impeller. Apply blue Loctite #242 to the threads of the impeller cap screw; then install the washer and cap screw. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).

■ **NOTE:** The rubber side of the washer must be toward the impeller.

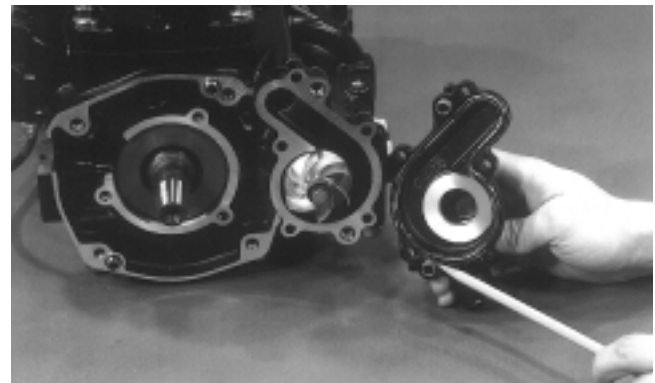
Fig. 2-419



AQ069

30. Install the alignment pins in the water pump cover and apply a low-temperature grease to the cover O-ring seal.

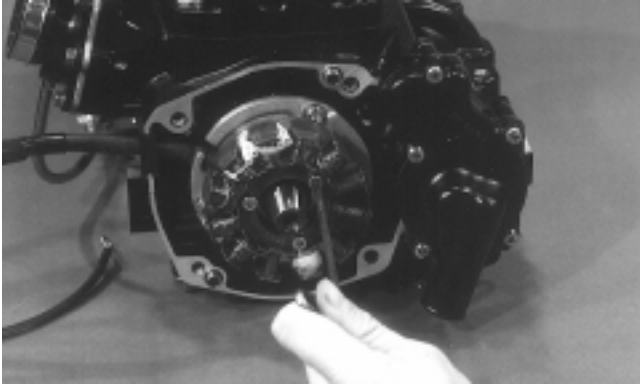
Fig. 2-420



AQ070

31. Place the water pump cover into position and secure.
32. Install the stator plate with the notch for the wiring harness in the 10 o'clock position; then secure.
33. Install the stator; then route the wiring harness through the stator plate and crankcase housing and install the rubber grommet.
34. Apply blue Loctite #242 to the threads of the three Allen-head cap screws and secure the stator to the stator plate.

Fig. 2-421

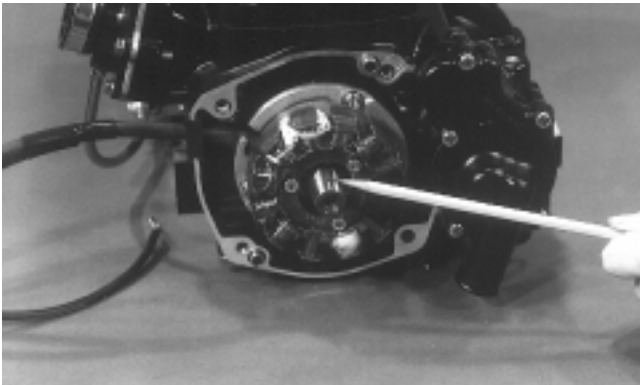


AQ073

■ **NOTE:** Wipe the flywheel and crankshaft taper with a clean cloth to remove any foreign material.

35. Install the flywheel key in the crankshaft; then slide the flywheel onto the crankshaft making sure the keyways align. Install, but do not tighten, the flywheel cap screw.

Fig. 2-422

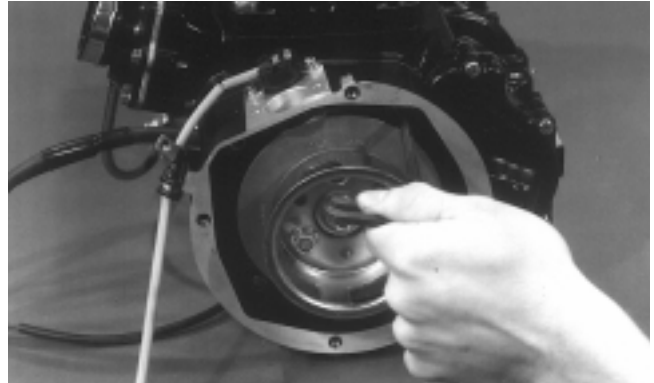


AQ074

36. Install the starter pulley and secure with three cap screws. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).
37. Tighten the flywheel cap screw to 4 kg-m (29 ft-lb).

38. Install the magneto housing; then apply blue Loctite #242 to the four Allen-head cap screws and secure. Tighten to 1.8-2.2 kg-m (13-16 ft-lb).

Fig. 2-423



AQ076

39. Install the thermostat with its rubber seal and thermostat cover. Secure with three cap screws. Tighten to 0.7-1 kg-m (5-7 ft-lb).

Fig. 2-424








AQ079

40. Cap the MAG-side impulse fitting. Secure with a clamp.
41. Pressure test the engine (see Section 3).

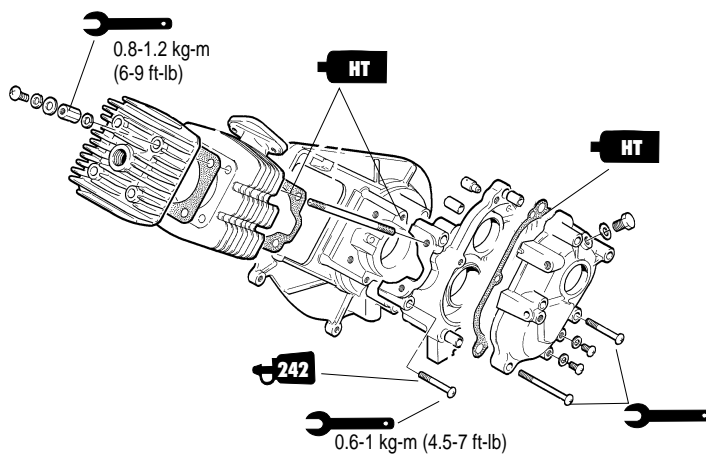
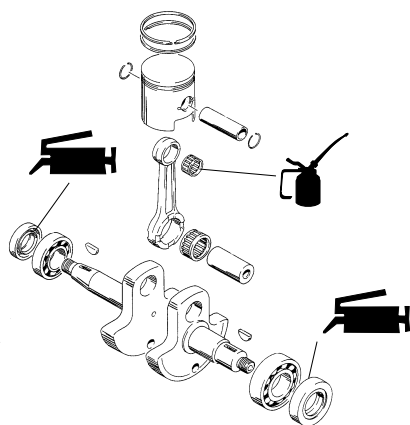
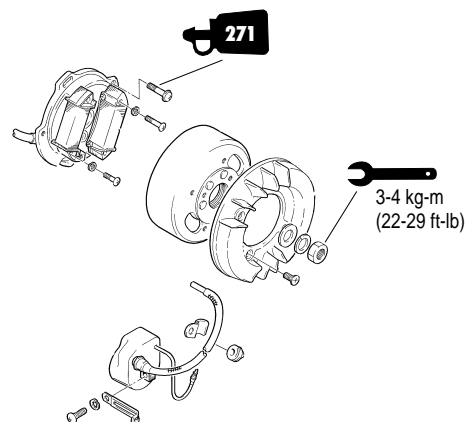
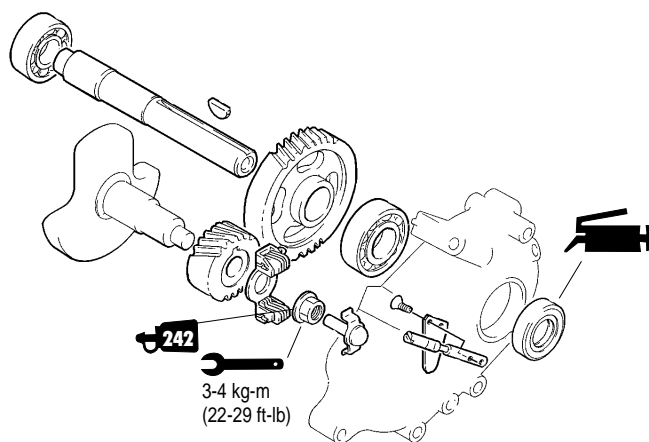
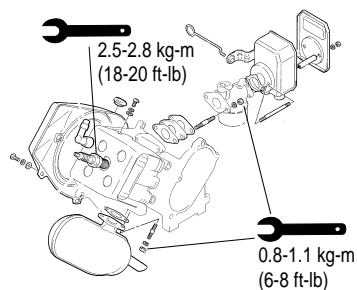
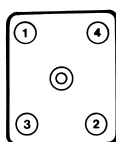
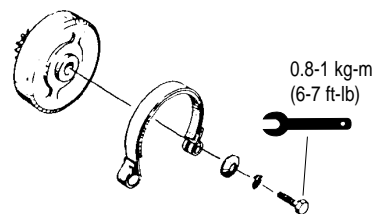
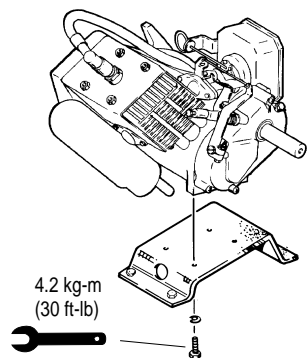
Assembly Schematics Table of Contents

60 cc	2-100
340 cc	2-101
370 & 440 cc F/C	2-102
440 cc L/C	2-104
500 & 600 cc	2-106
550 cc	2-108
580 cc	2-110
700 cc	2-112
600 cc Triple	2-114
800 & 1000 cc	2-116

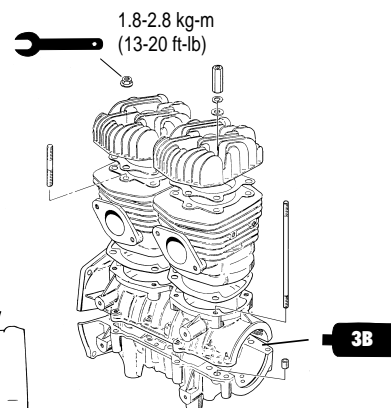
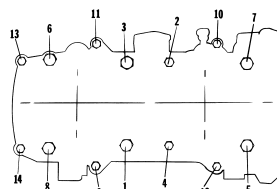
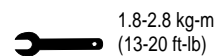
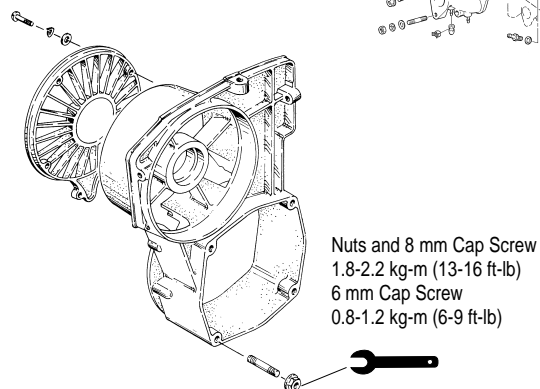
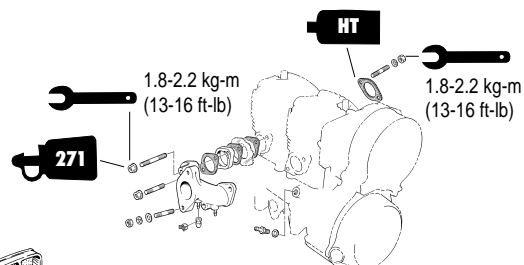
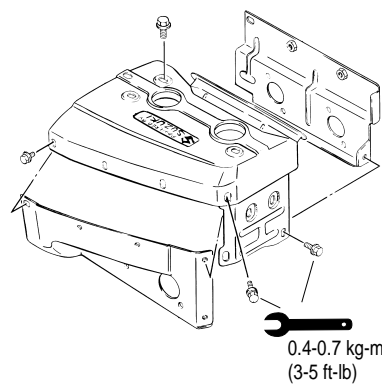
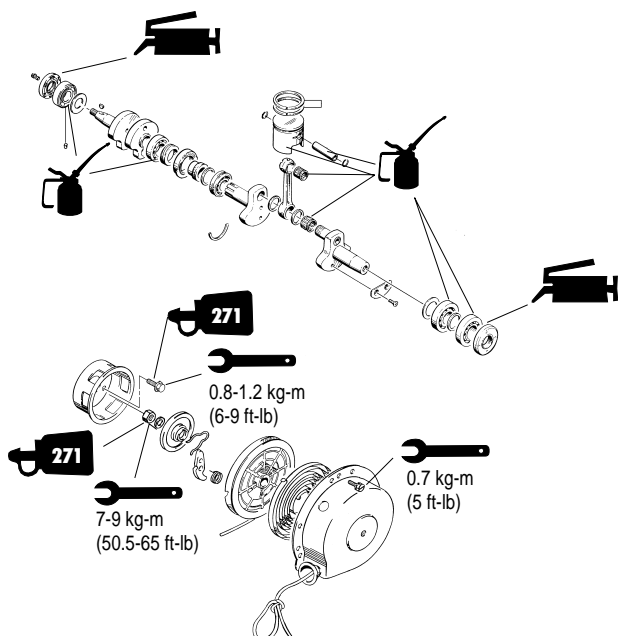
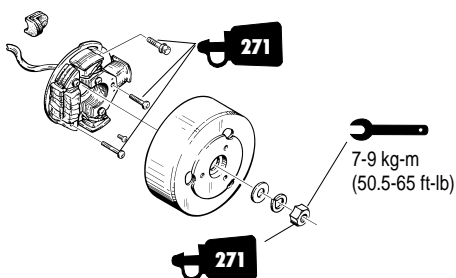
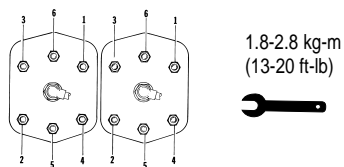
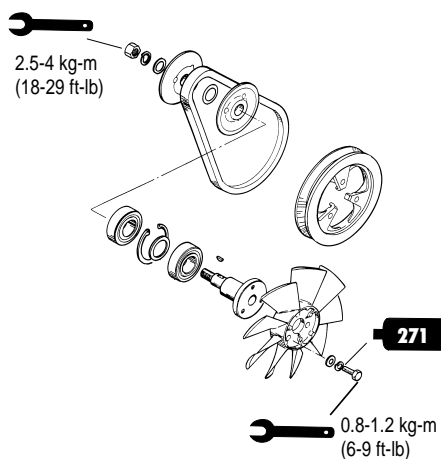
Listed in the table below are symbols indicating special instructions and other important information necessary for proper servicing. Please note the definition for each symbol. These symbols are used throughout this two-volume set.

SYMBOL	DESCRIPTION
	Torque control required
	243 - apply blue Loctite #243 (p/n 1048-028) 270 - apply green Loctite #270 (p/n 1048-030)
	Lubricate with Arctic Cat 50:1 Injection Oil (p/n 0636-286)
	Lubricate with Arctic Cat Low Temp Grease (p/n 0636-593)
	3B - Three Bond Sealant (p/n 0636-070) HT - High-Temp Sealant (p/n 0636-069) AS - Anti-Seize Thread Compound (p/n 0678-146)

60 cc

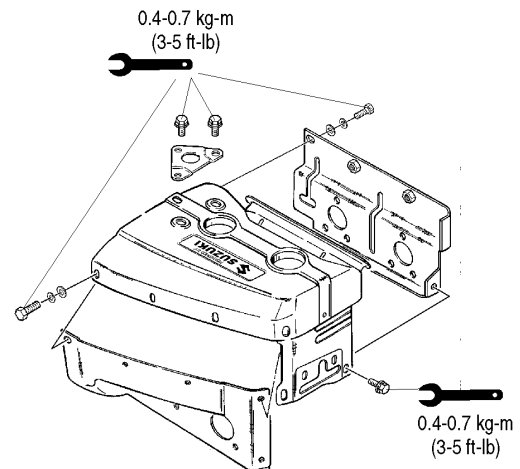
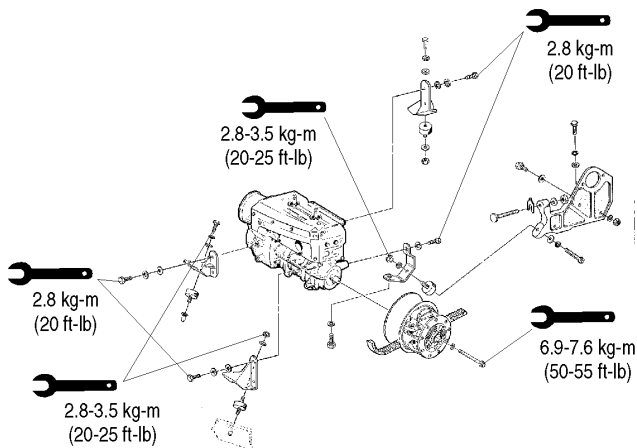
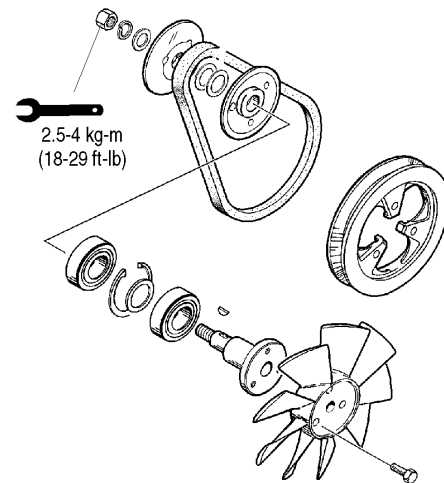
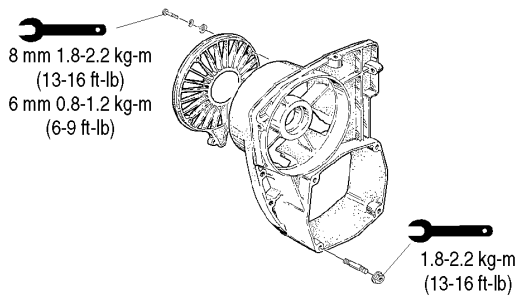
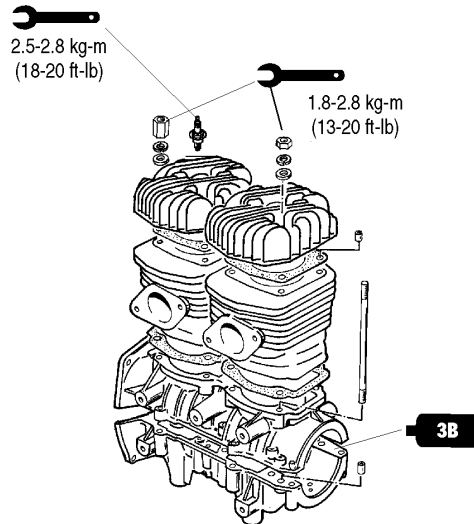
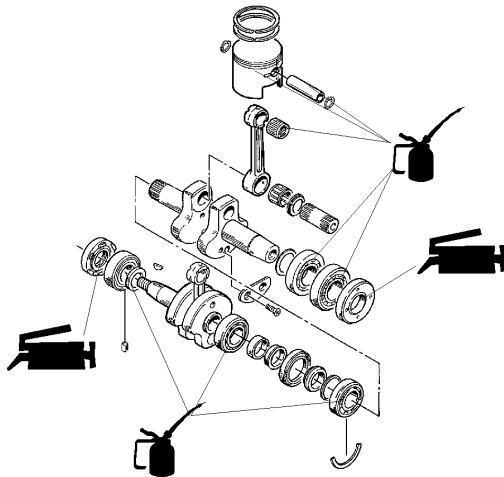


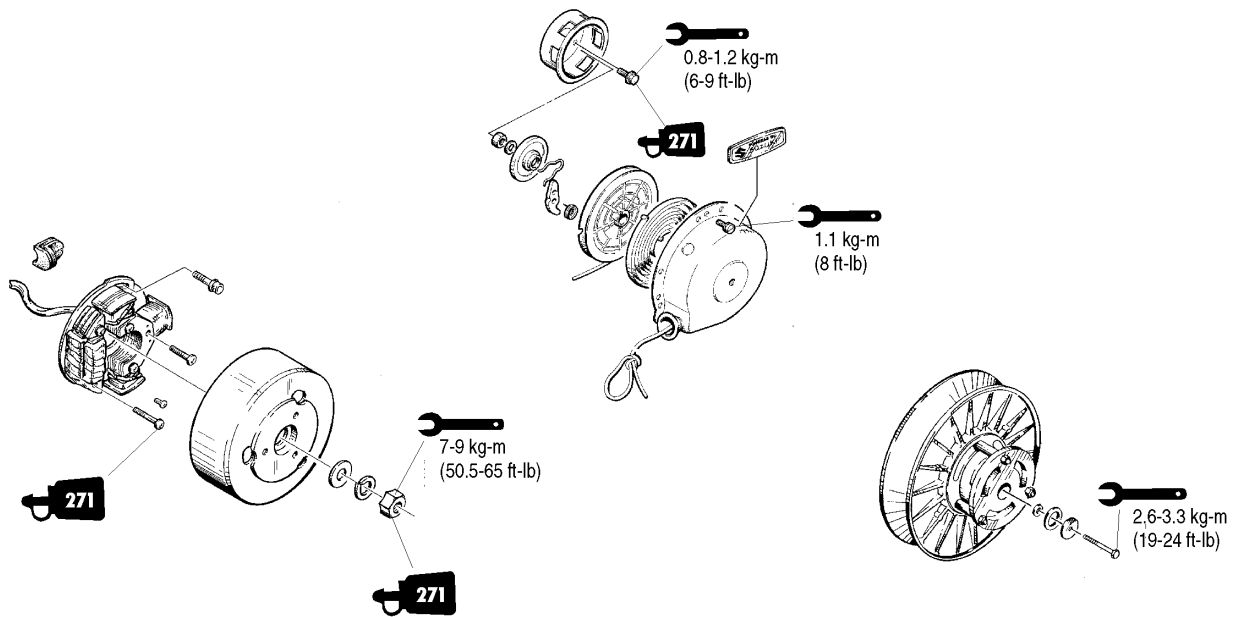
340 cc



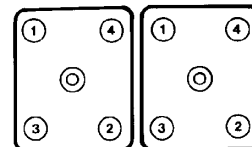
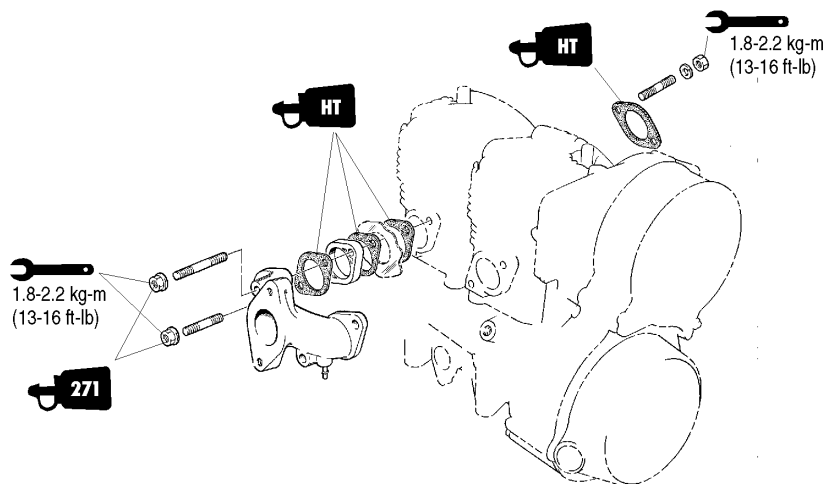
2

370 & 440 cc F/C

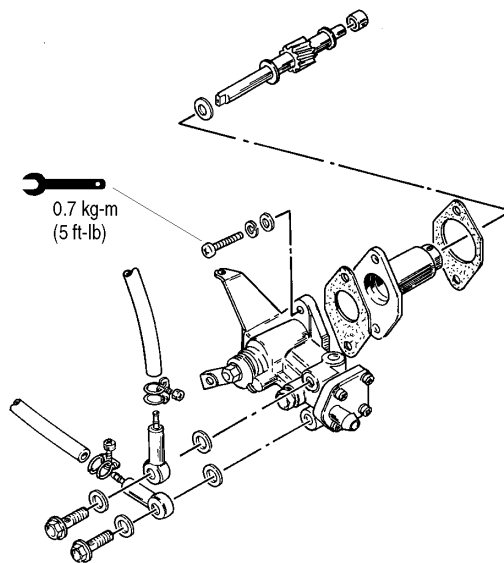
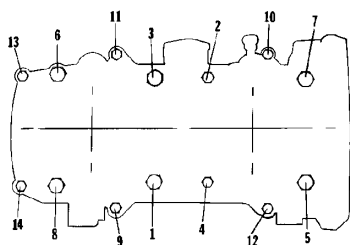




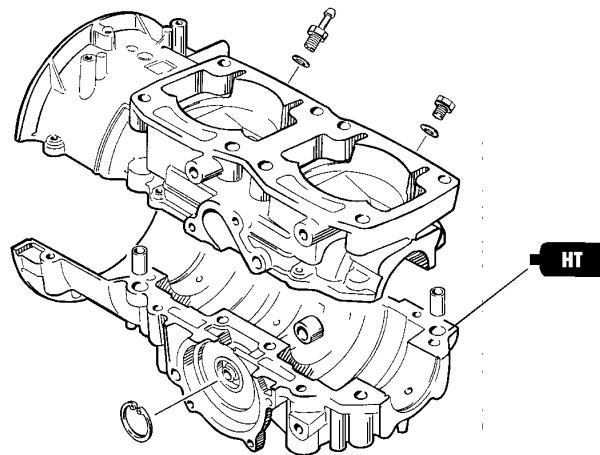
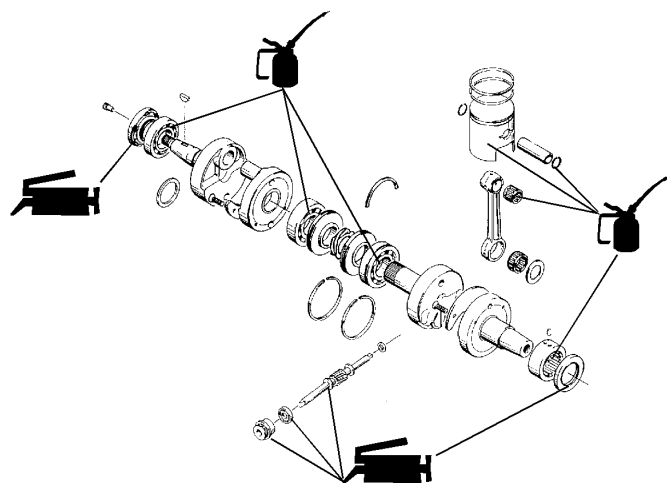
2



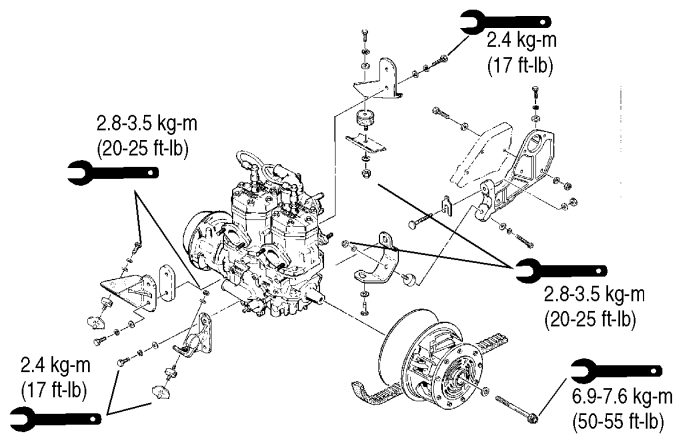
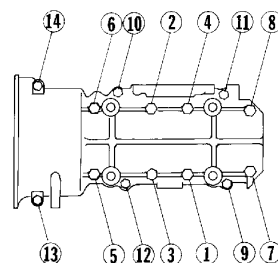
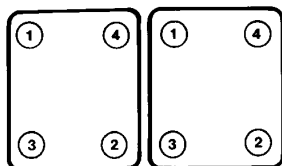
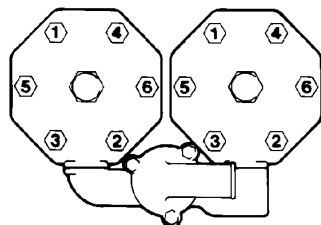
6 mm 0.8-1.2 kg-m
(6-9 ft-lb)
8 mm 1.8-2.8 kg-m
(13-20 ft-lb)

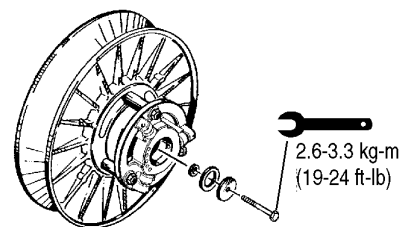
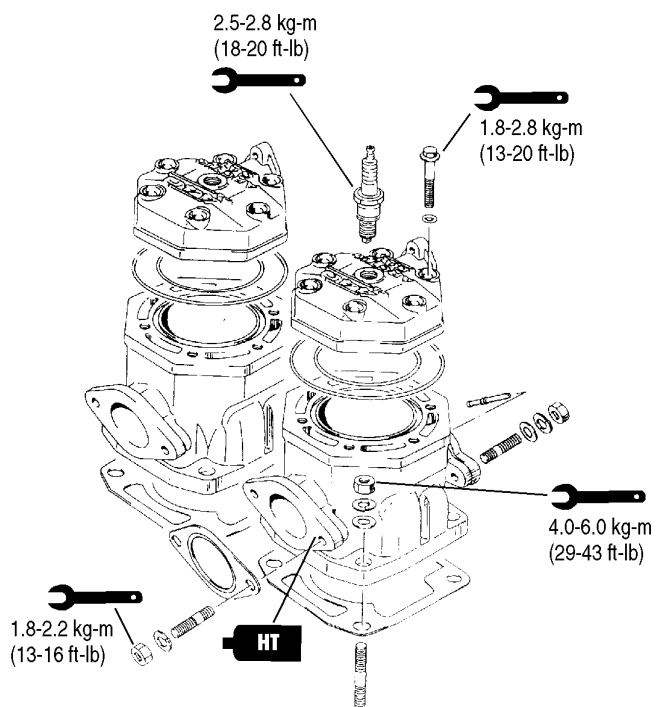


440 cc L/C

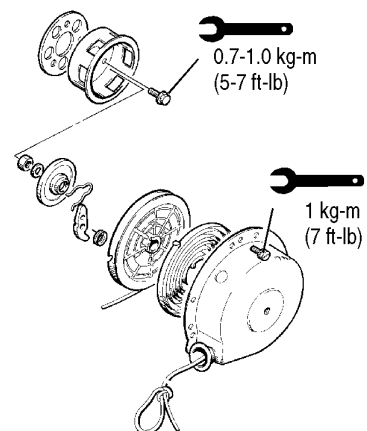
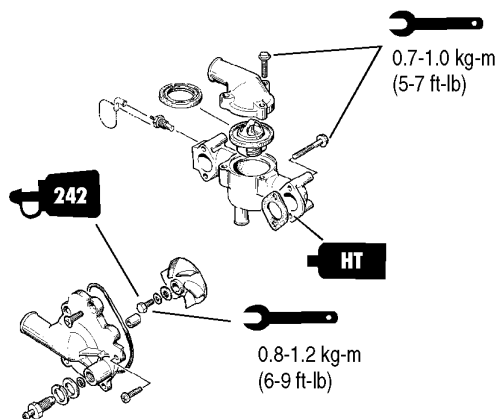
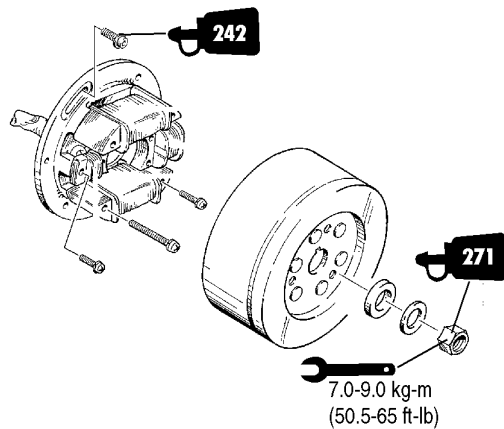


8 mm 1.8-2.8 kg-m
(13-20 ft-lb)
6 mm 0.8-1.2 kg-m
(6-9 ft-lb)



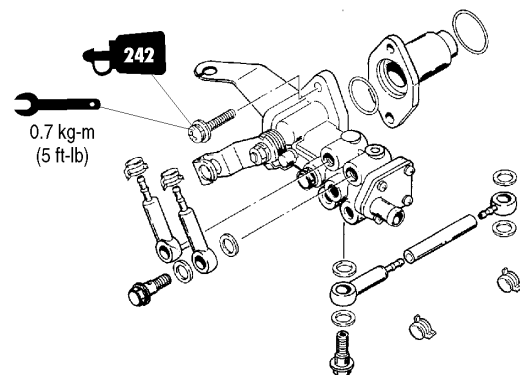
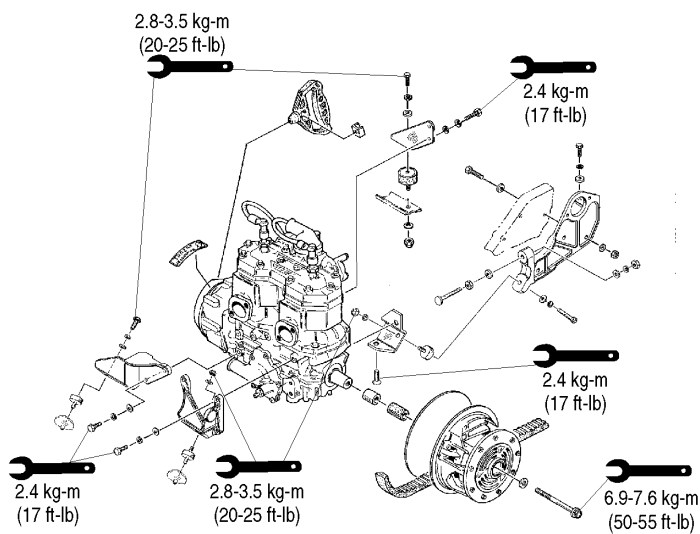
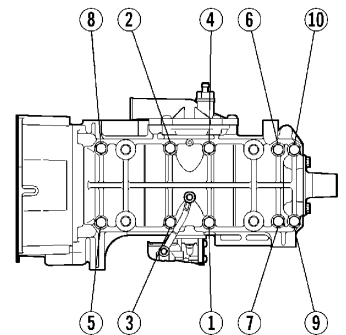
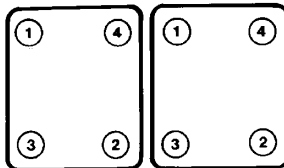
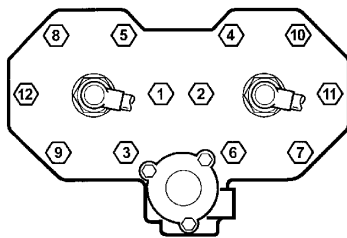
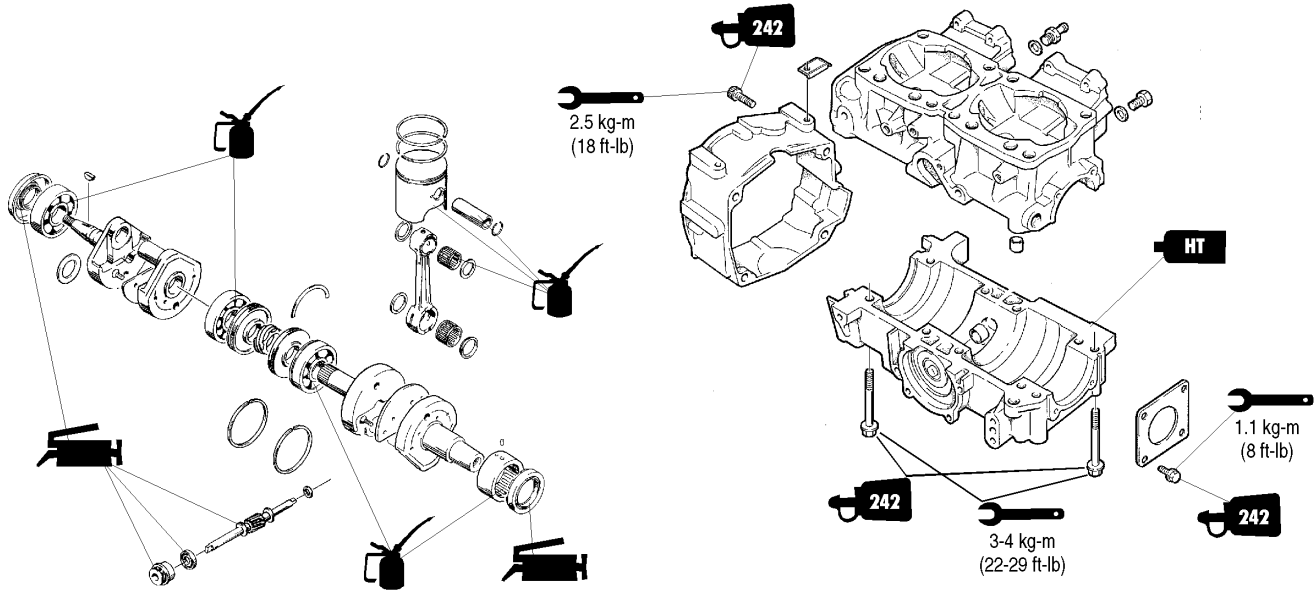


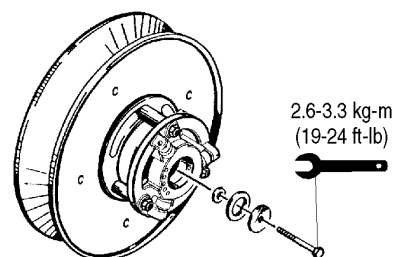
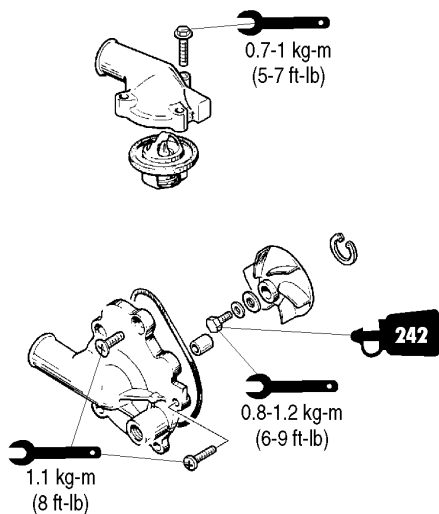
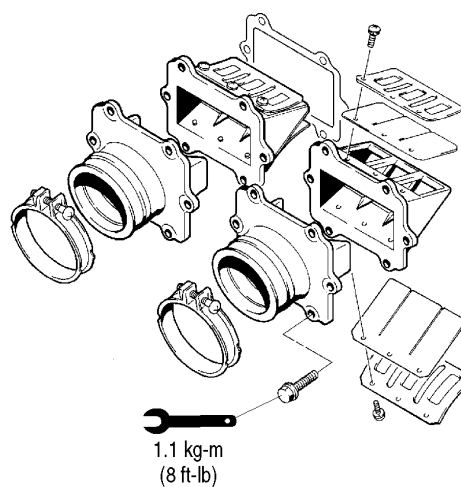
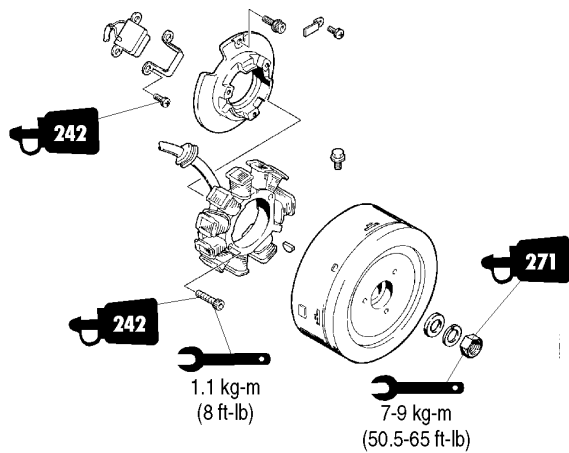
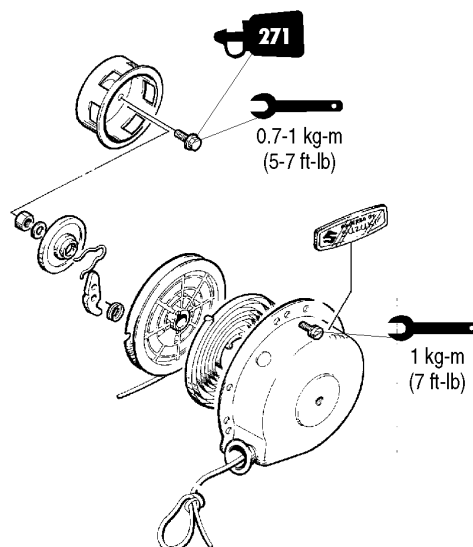
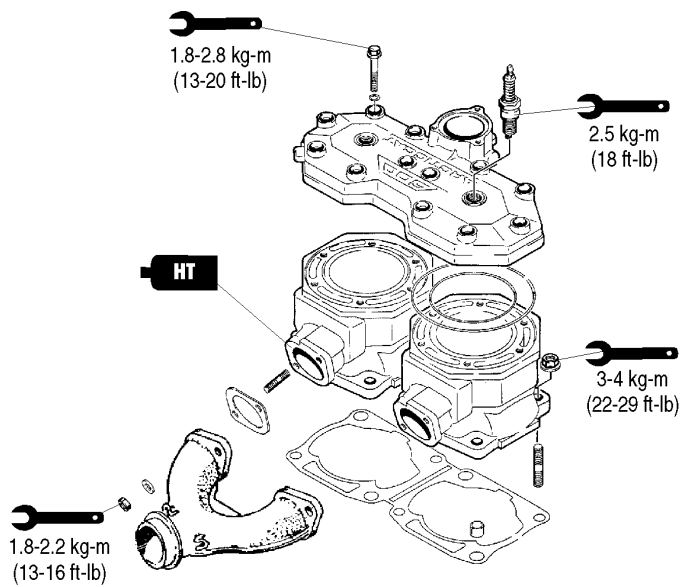
2



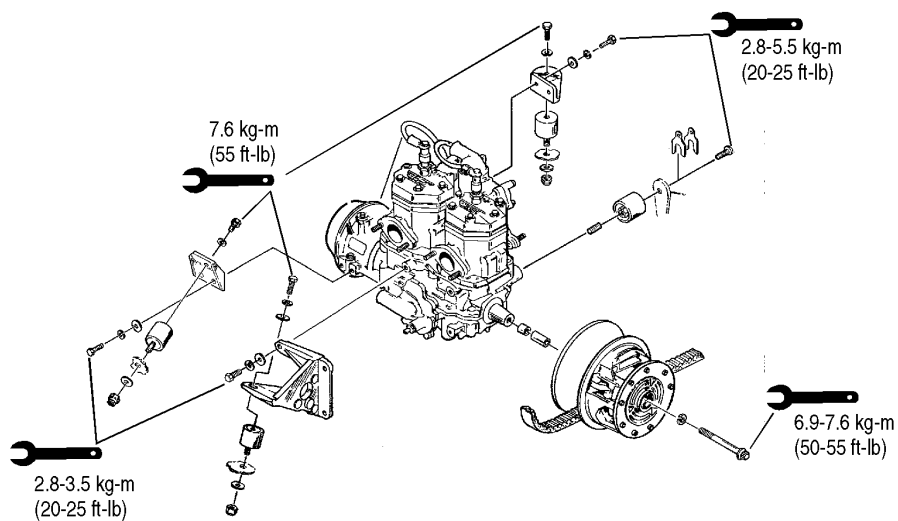
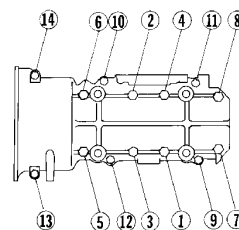
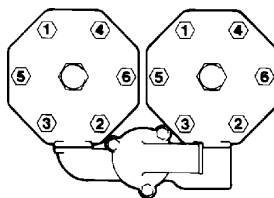
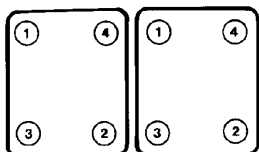
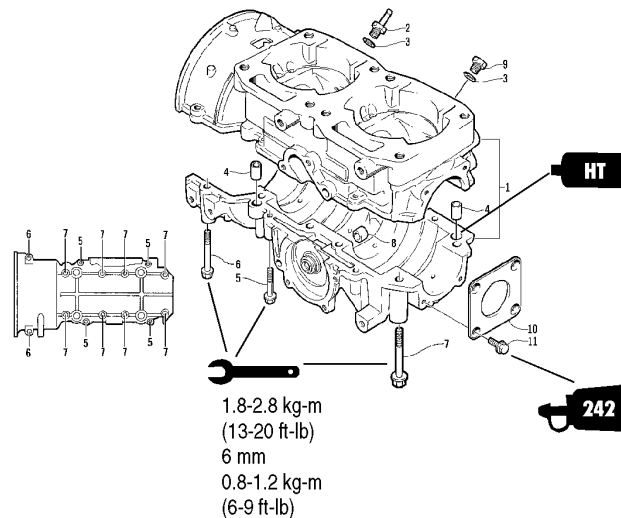
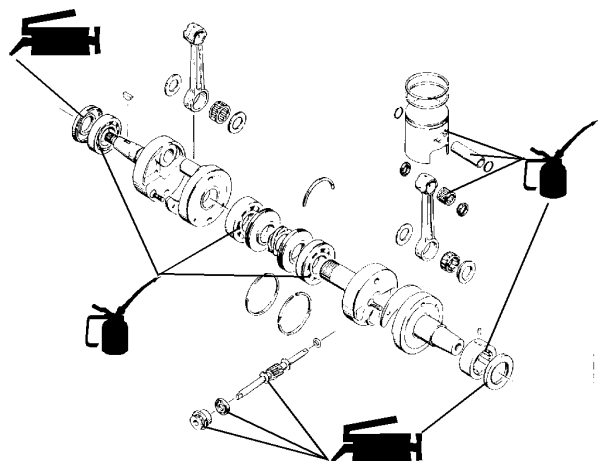
500 & 600 cc

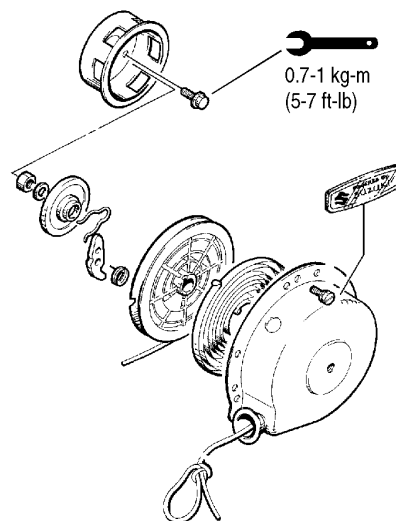
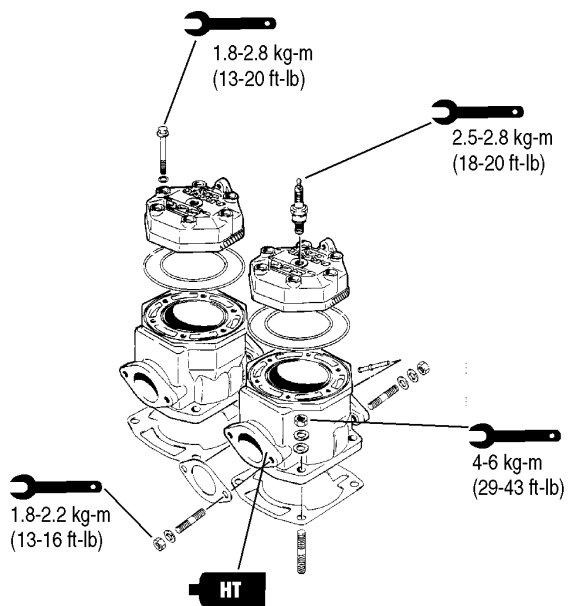
2



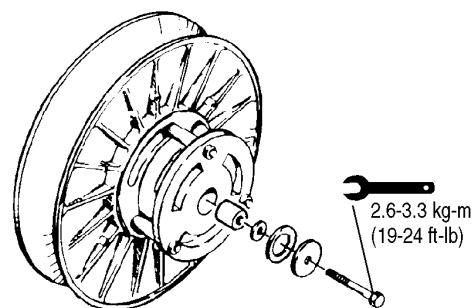
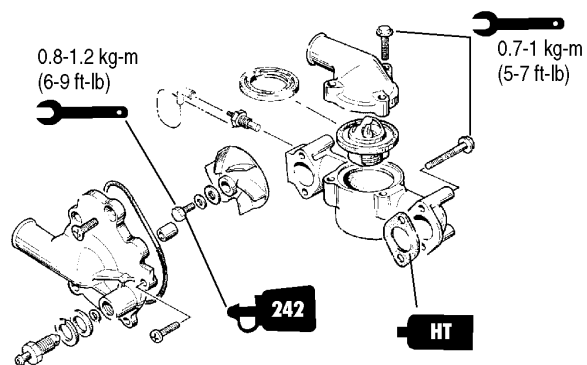
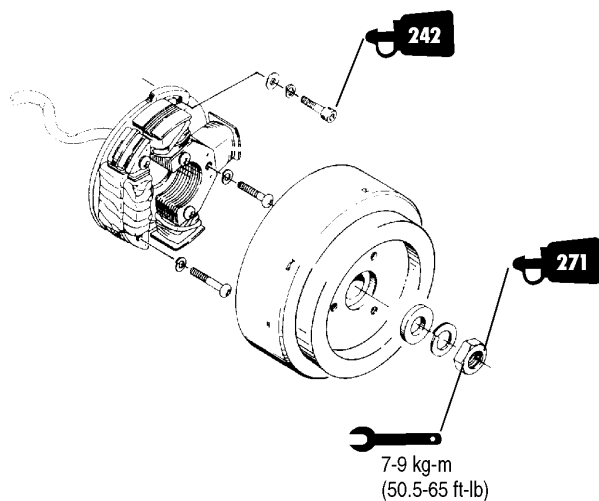


550 cc

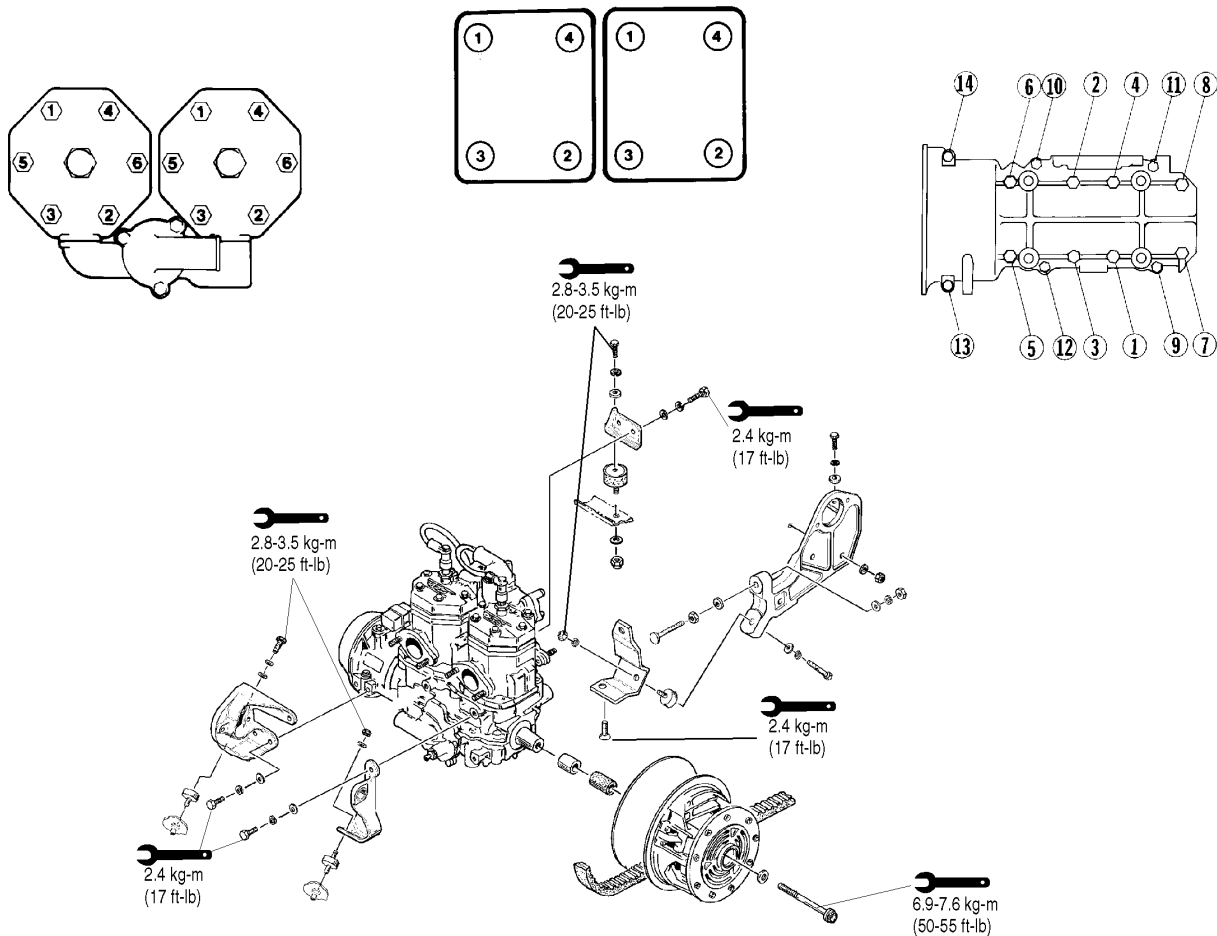
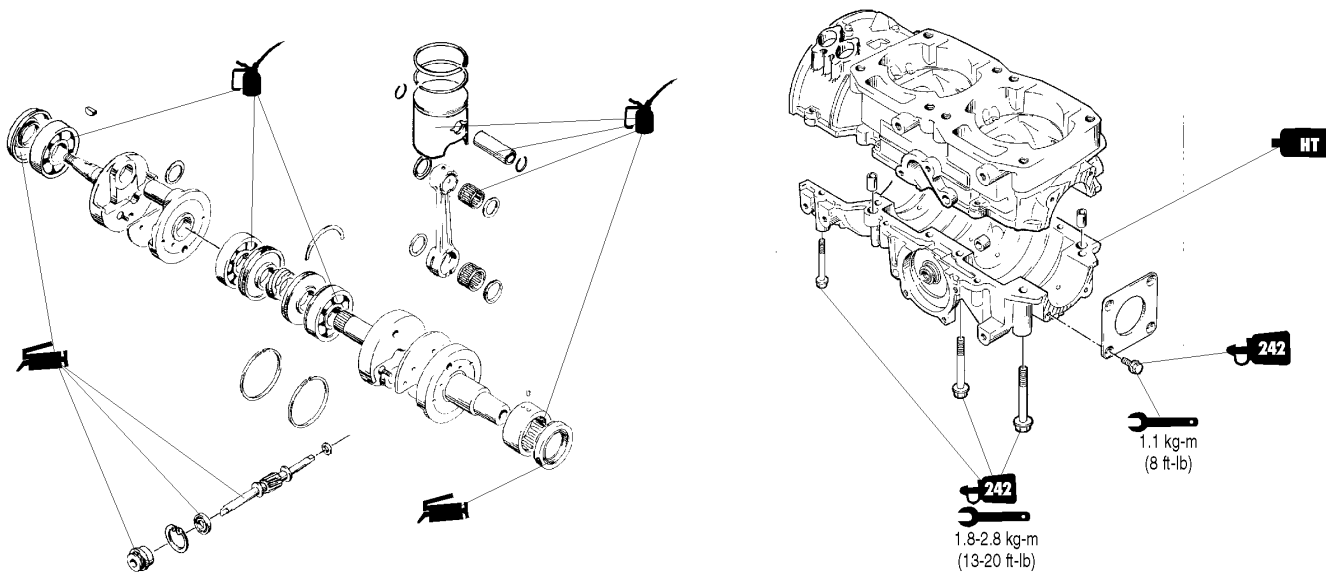


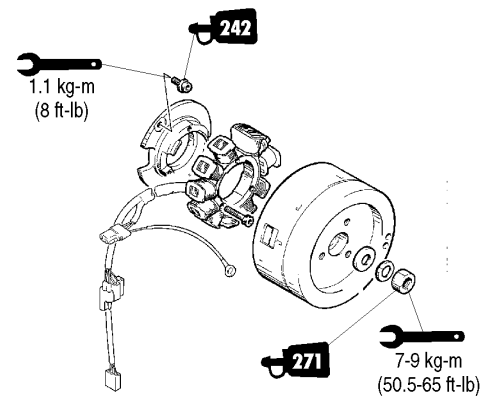
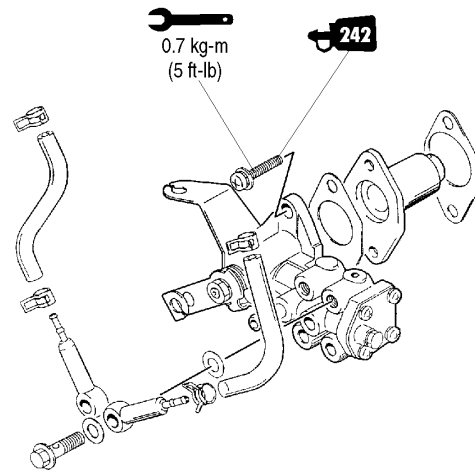
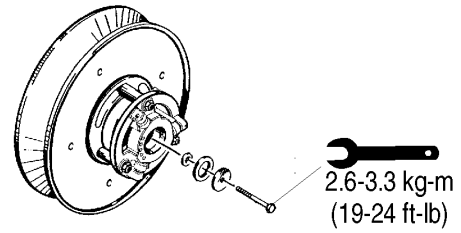
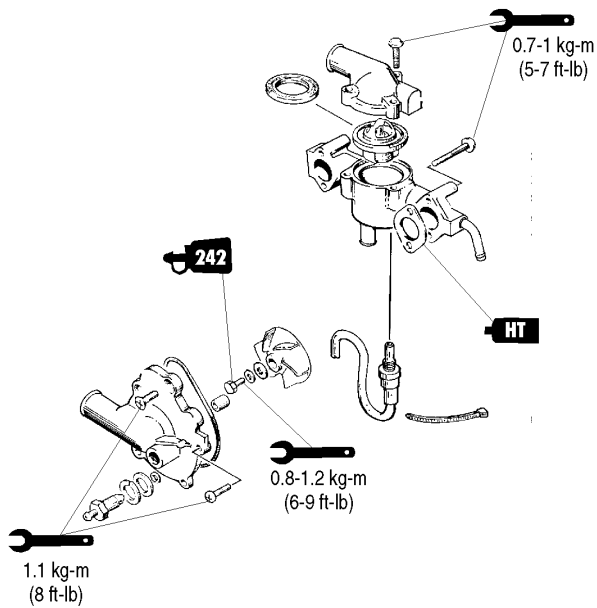
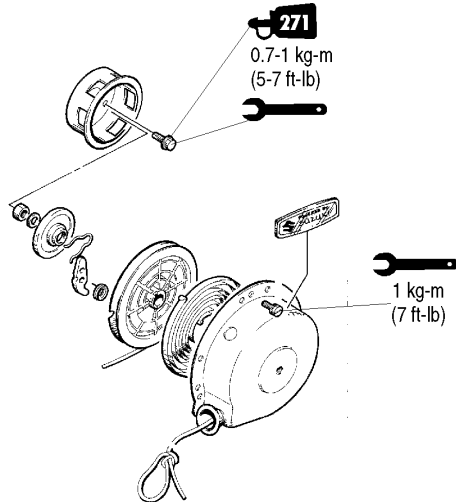
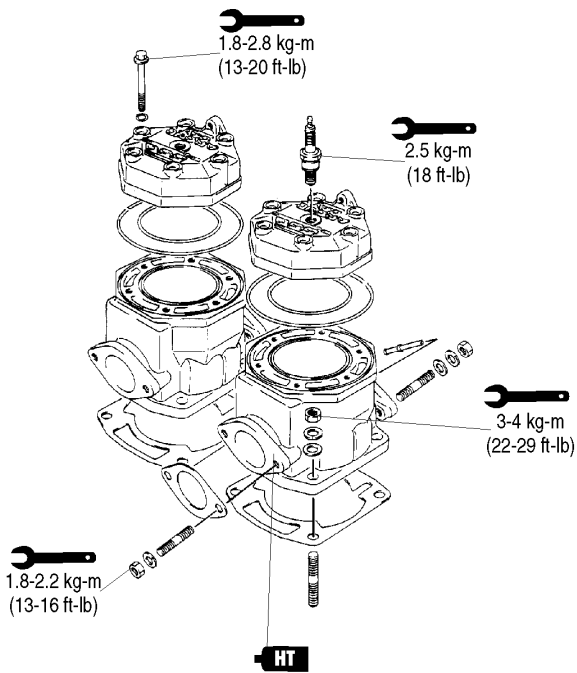


2

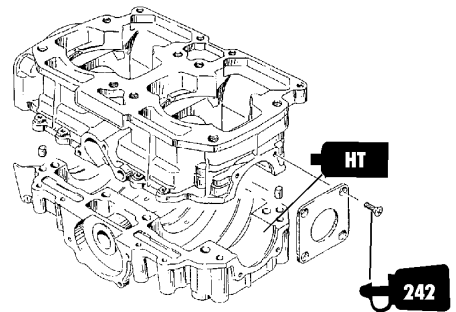
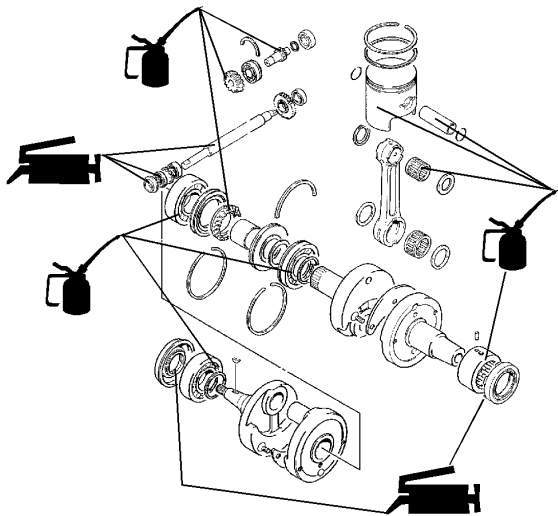


580 cc

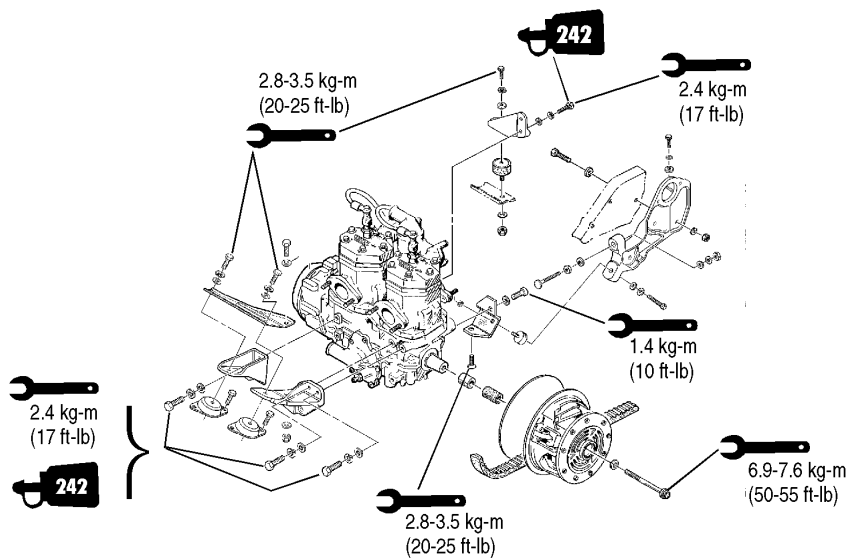
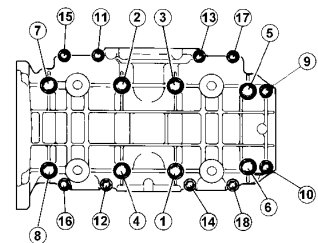
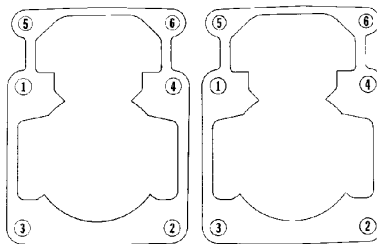
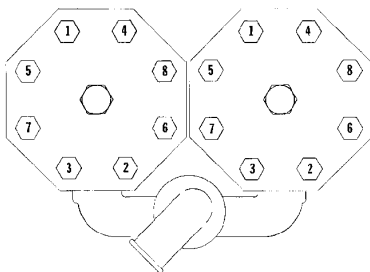


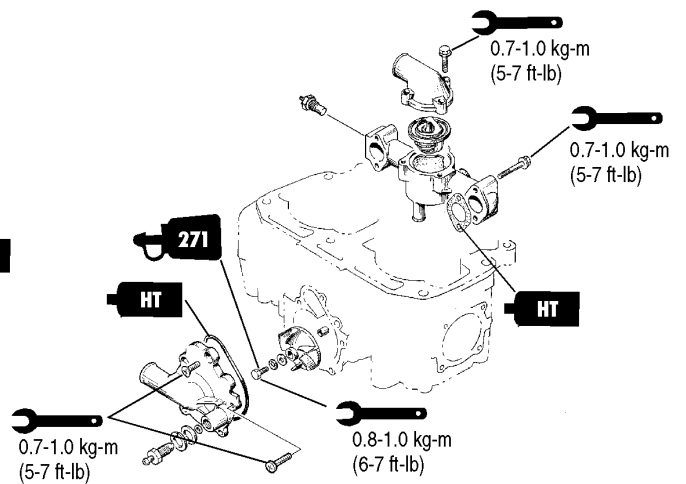
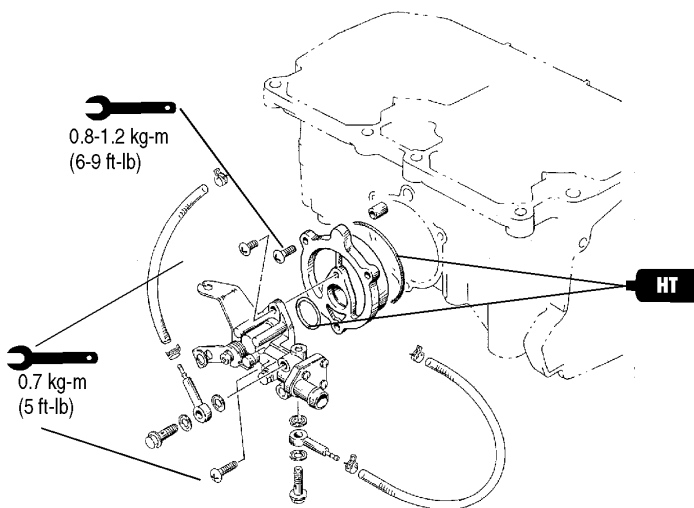
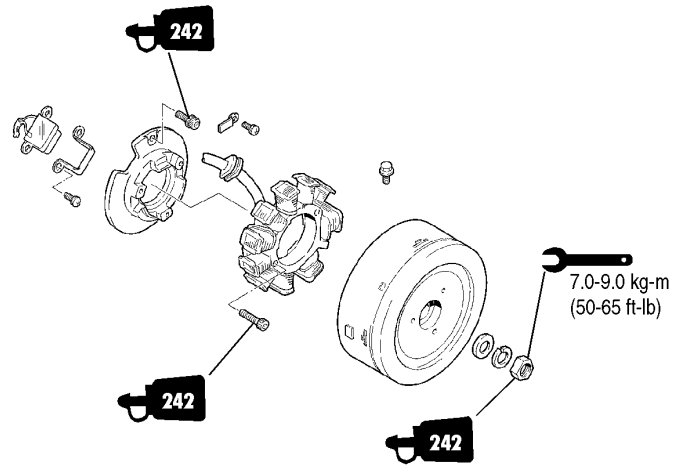
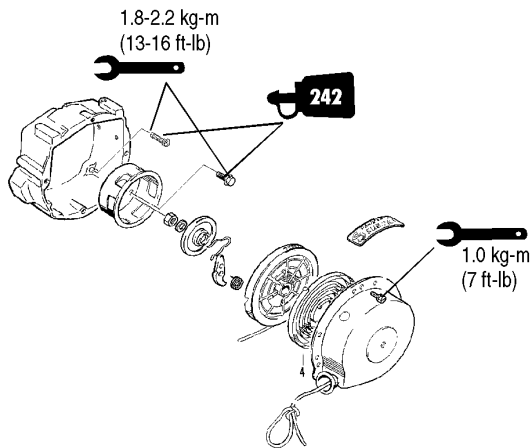
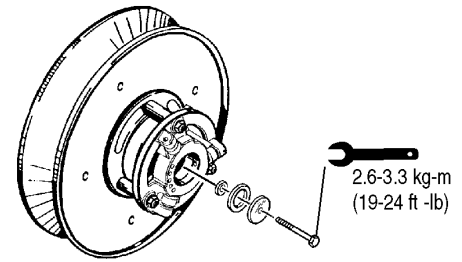
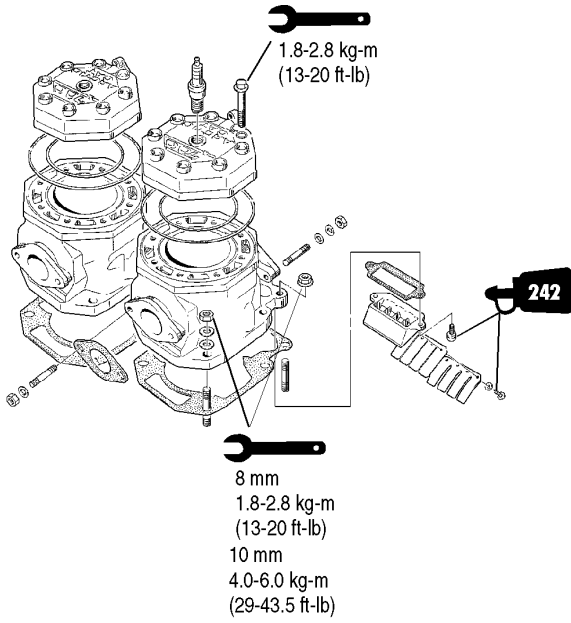


700 cc



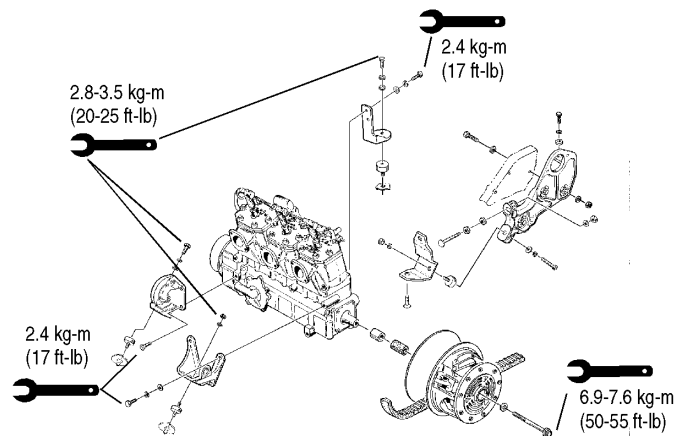
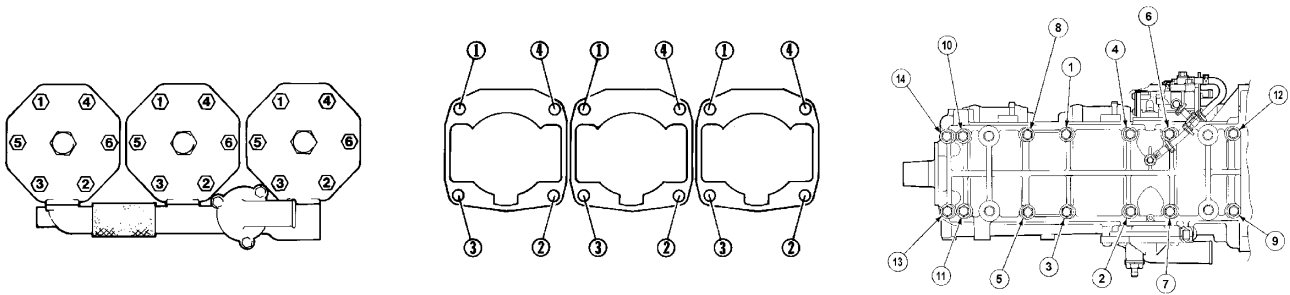
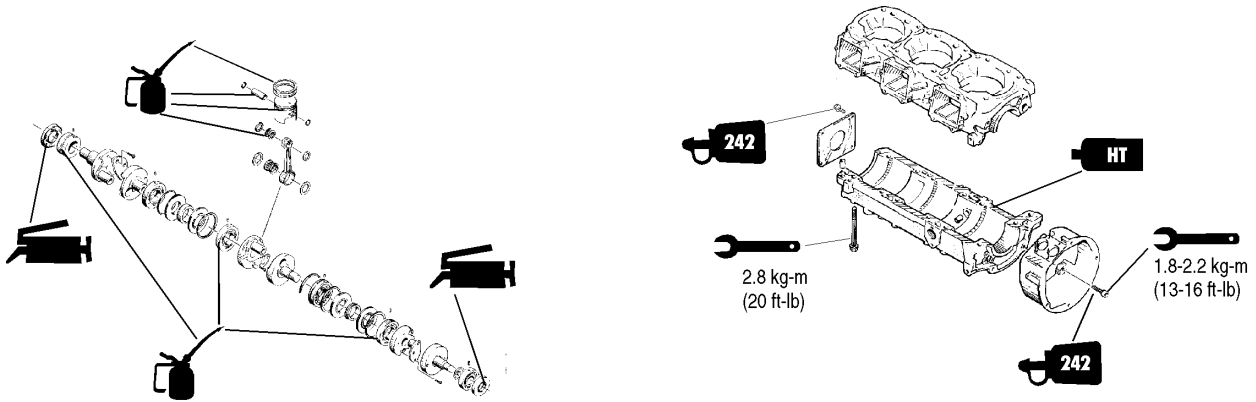
10 mm 4-6 kg-m
(29-43 ft-lb)
8 mm 1.8-2.9 kg-m
(13-20 ft-lb)
6 mm 0.8-1.2 kg-m
(6-9 ft-lb)

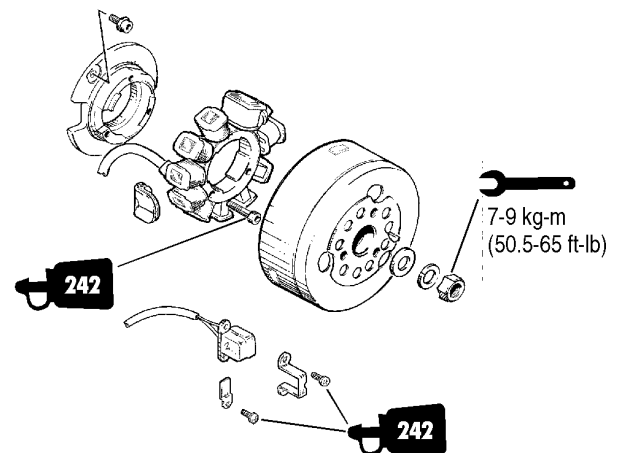
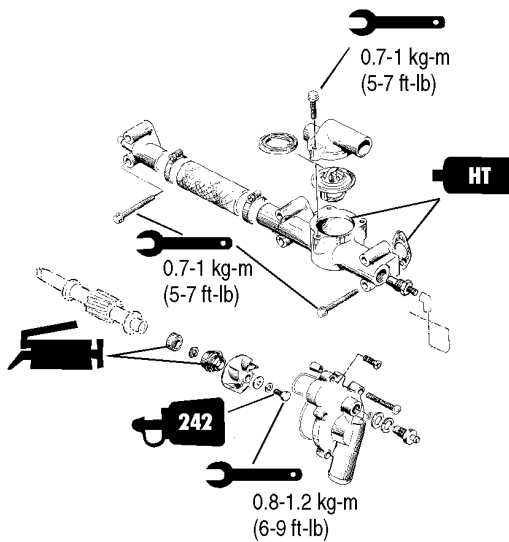
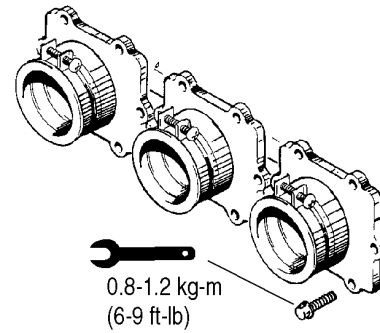
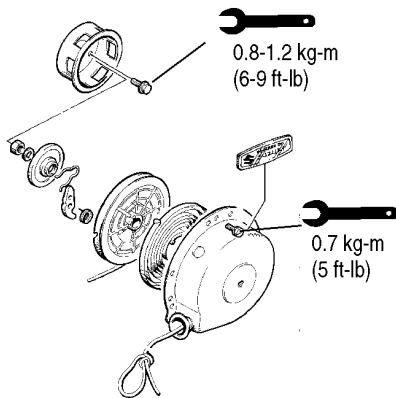
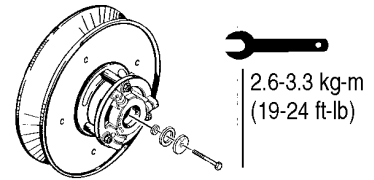
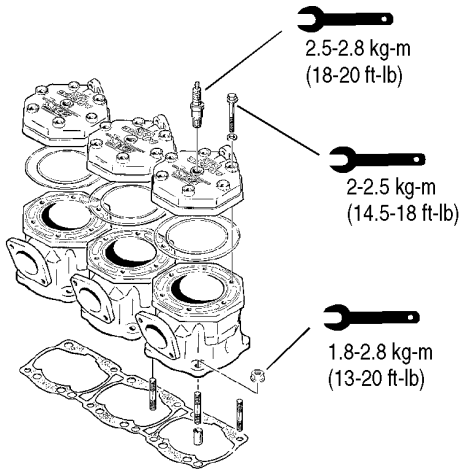




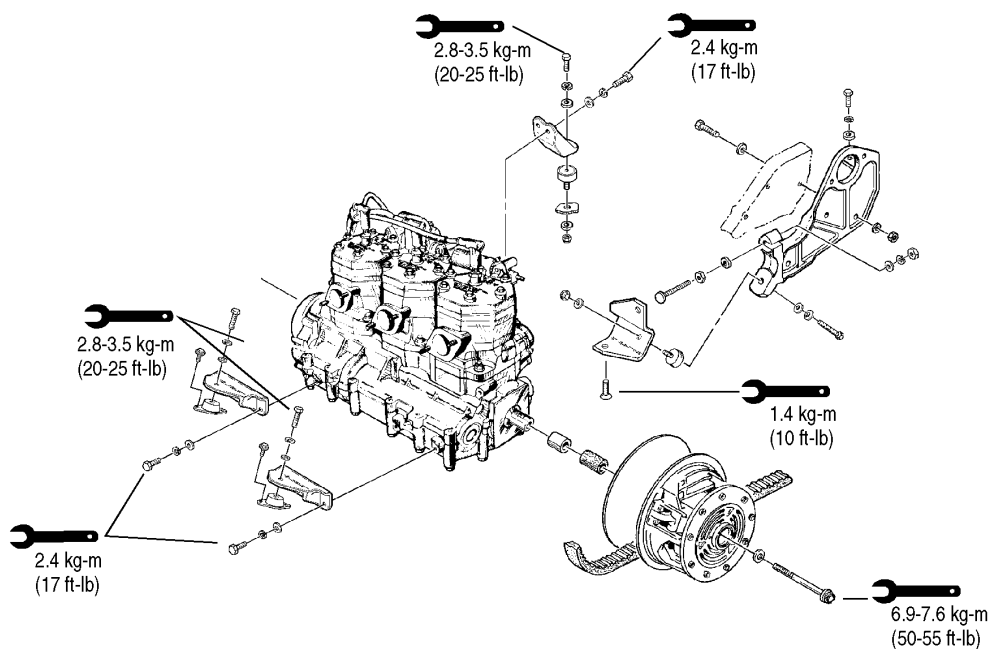
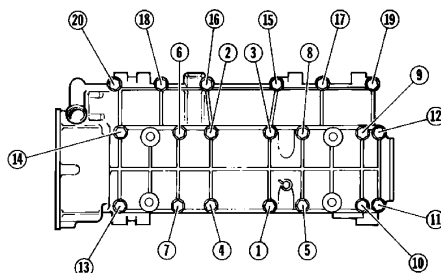
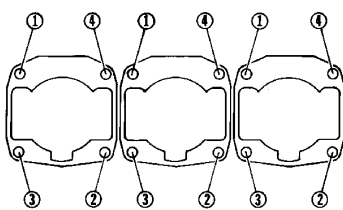
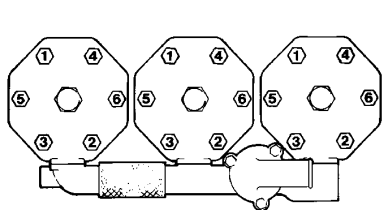
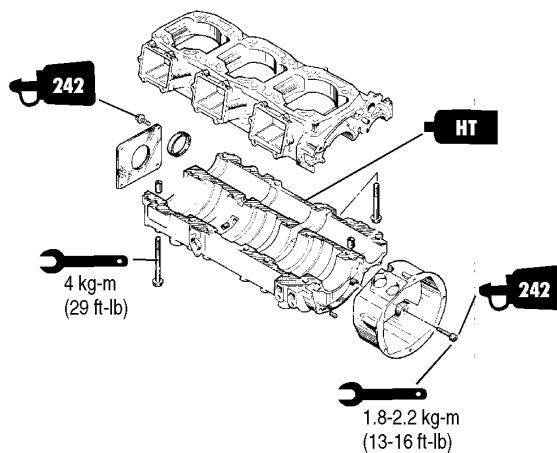
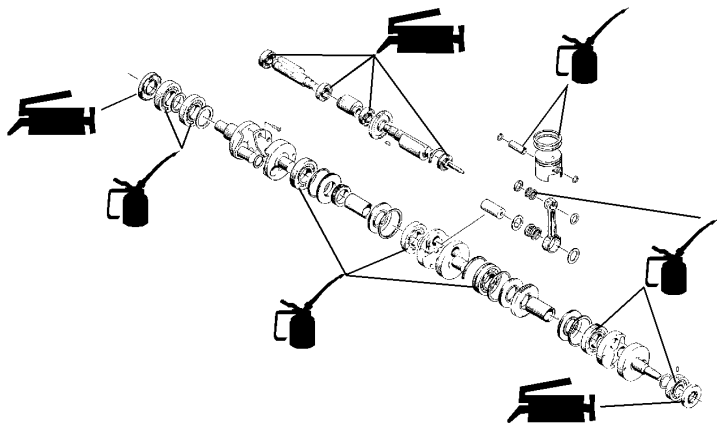
600 cc

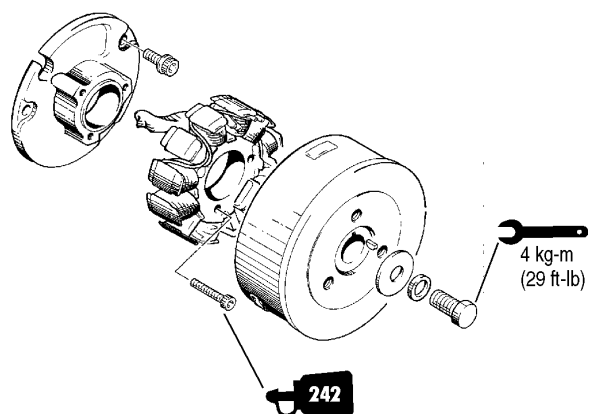
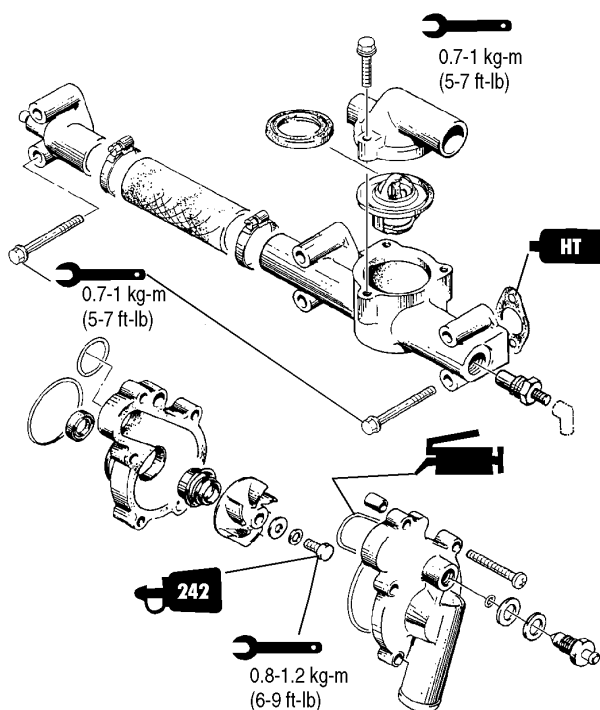
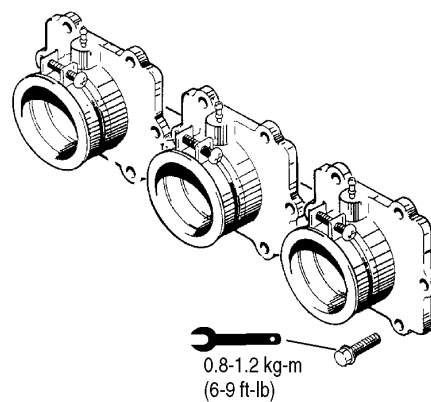
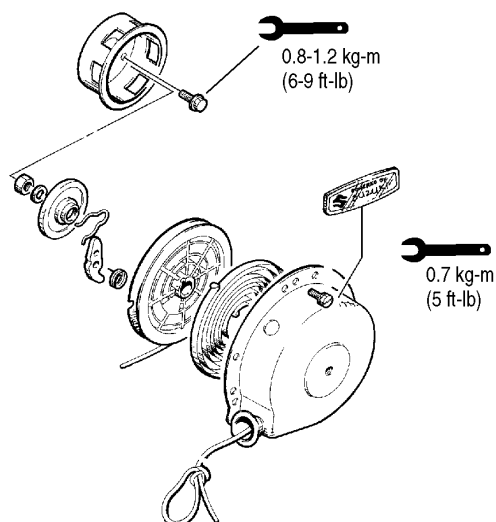
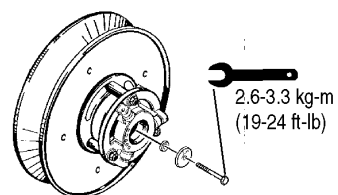
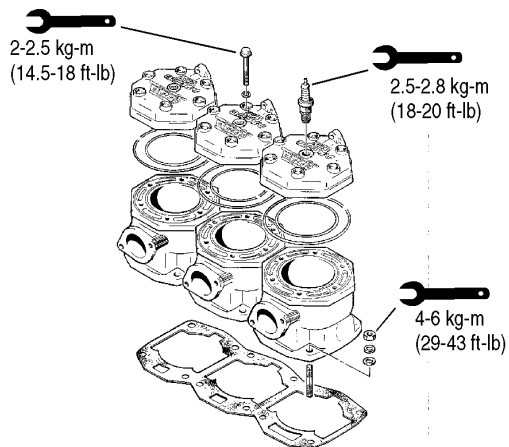
3 CYLINDER





800 & 1000 cc





2

Installing Engine Table of Contents

60 cc Model	2-118
Twin F/C Models	2-119
Twin L/C Models	2-122
Triple Models	2-124

Installing Engine (60 cc Model)

1. Place the engine assembly into position on the front end.
2. Connect the engine wiring harness to the main wiring harness.

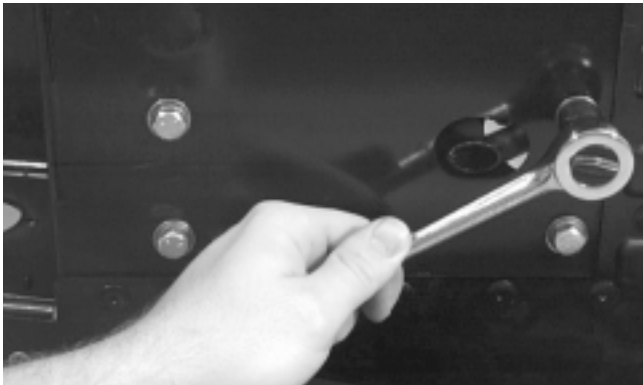
Fig. 2-425



A957

3. Install the four cap screws, washers, and lock washers securing the engine to the front end. Do not tighten at this time.

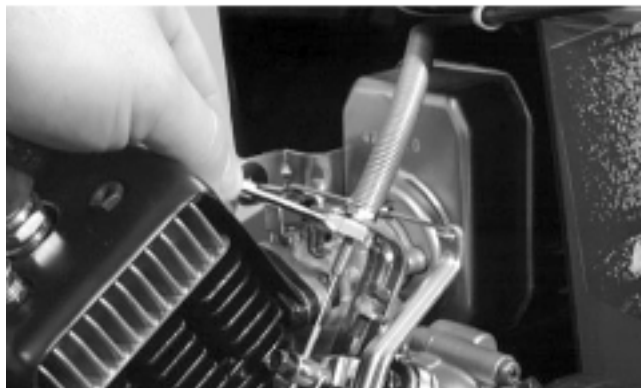
Fig. 2-426



A958

4. Attach the throttle cable.

Fig. 2-427



A953

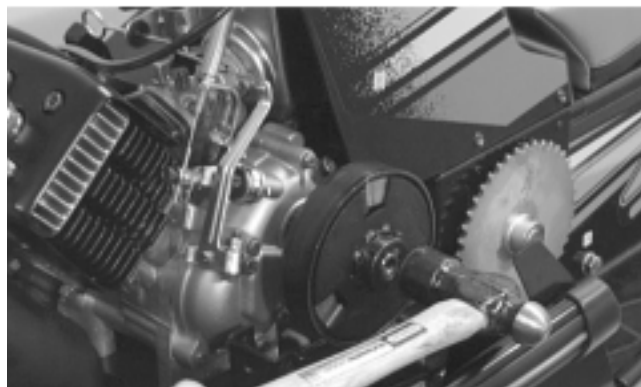
Fig. 2-428



A954

5. Align the clutch key with the primary shaft keyway; then using a hammer, gently drive the clutch onto the primary shaft.

Fig. 2-429



A895

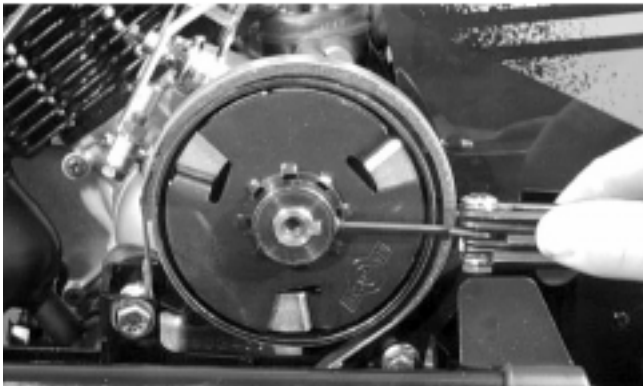
6. Secure the clutch with a washer and cap screw tightened to 0.8-1 kg-m (6-7 ft-lb); then tighten the set screw.

Fig. 2-430



A946

Fig. 2-431



A947

7. Install the drive chain making sure the spring lock is seated properly.
8. Align the drive and driven sprockets; then from beneath tighten the engine mounting cap screws to 2.1-2.8 kg-m (15-20 ft-lb).
9. Install the brake band assembly and brake cable.

Fig. 2-432



A951

10. Install the chain guard.

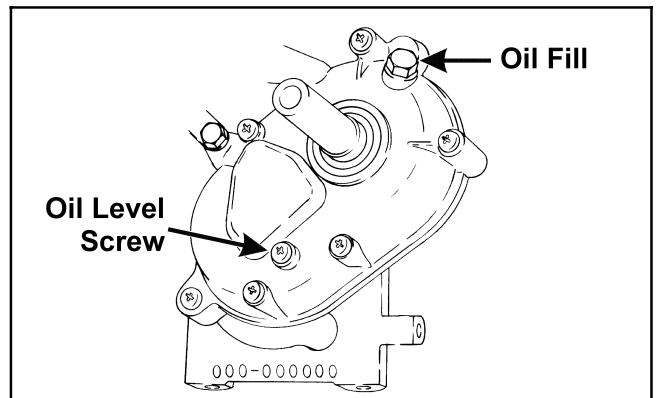
Fig. 2-433



A940

11. Using the cap screw, secure the hood cable to the engine.
12. Remove the oil fill plug located on the top of the gear case cover.
13. Remove the oil level screw from the lower side of the gear case cover.
14. Add SAE #10W-30 oil into the fill hole until oil flows out oil level hole.

Fig. 2-434



0726-196

15. Install the oil level screw and the oil fill plug.

Installing Engine (Twin F/C Models)

1. On the Panther/Z models, place each engine mounting bracket onto the engine. Secure with cap screws, washers, and lock washers. Tighten to 2.8 kg-m (20 ft-lb).
2. On the Panther/Z models, place the engine assembly into position in the engine compartment. Secure the engine to the front end with the cap screws, washers, and lock nuts. Tighten to 2.8-3.5 kg-m (20-25 ft-lb).

Fig. 2-435



AL201D

Fig. 2-436



AL200D

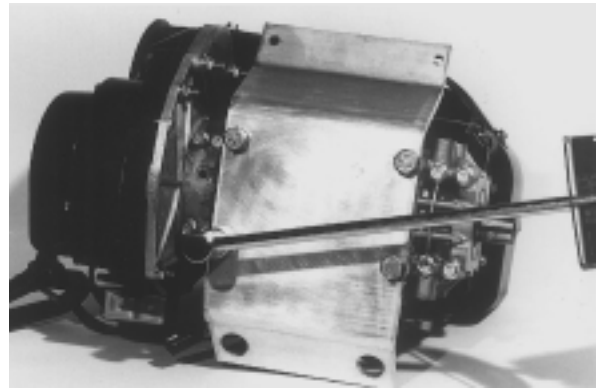
Fig. 2-437



AL199D

3. On the Bearcat models, apply red Loctite #271 to the threads of the four engine plate mounting cap screws. Place the plate into position on the engine and secure with four cap screws and lock washers. Tighten to 7.6 kg-m (55 ft-lb).

Fig. 2-438



AB063

4. On the Bearcat models, place the engine with plate assembly into position in the engine compartment; then making sure the female mounts and cup washers are properly positioned, secure the engine plate with cap screws and washers. Tighten to 2.8-3.5 kg-m (20-25 ft-lb).

Fig. 2-439



AL201D

5. Connect the oil-supply hose to the oil-injection pump; then bleed the system (see Section 4).

■ **NOTE:** If equipped with electric start, place the starter motor bracket on the crankcase and install the front two and lower rear cap screws, lock washers, and washers. Place the starter motor into position and secure with two washers and lock nuts.

6. Connect the oil-injection cable to the oil-injection pump control arm and secure the cable mounting pin with a nylon washer and E-clip.
7. Place the carburetor(s) into position making sure the boot(s) are properly positioned and secure with the flange clamp(s).

Fig. 2-440



■ **NOTE:** At this point, check oil-injection system synchronization (see Section 4).

8. Connect the impulse hose to the crankcase, the main wiring harness, the CDI unit wiring harness, and the spark plug caps.
9. Place the recoil starter into position and secure with four cap screws and lock washers. Tighten to 0.7 kg-m (5 ft-lb) on the Bearcat models or to 1.1 kg-m (8 ft-lb) on the Panther/Z models.

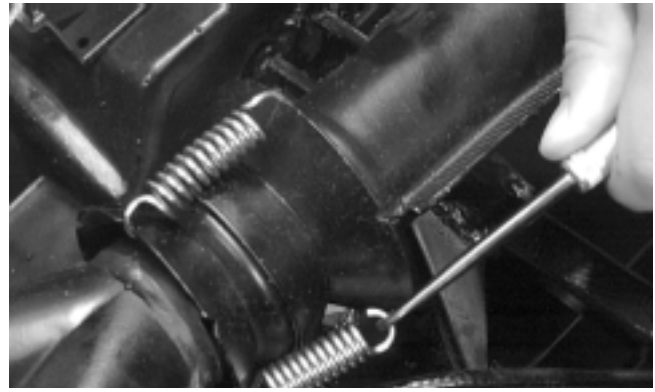
■ **NOTE:** If equipped with electric start, secure the battery ground cable with the rear cap screw.

Fig. 2-441



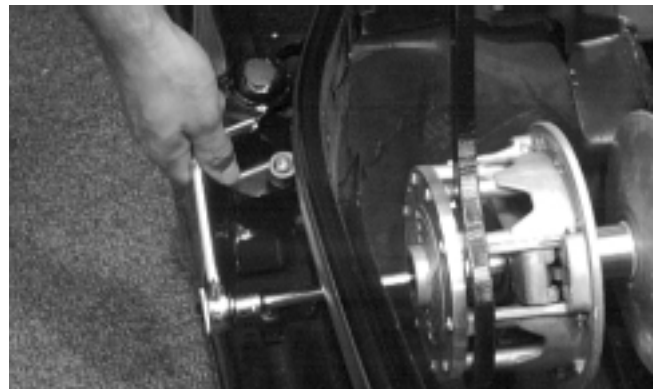
10. Place the expansion chamber and grafoil gasket into position and secure with springs.

Fig. 2-442



11. On the Panther/Z models, place the engine mount shims into position between the torque bumper and engine mounting bracket; then tighten the torque bumper jam nut.
12. On the Bearcat models, install and adjust the torque bumper to allow a clearance between the engine and the torque bumper of 1.5 mm (0.060 in.); then secure the adjustment by tightening the jam nuts.
13. Place the drive clutch into position on the crankshaft; then install the lock washer and bolt. Tighten the clutch bolt to 6.9-7.6 kg-m (50-55 ft-lb).

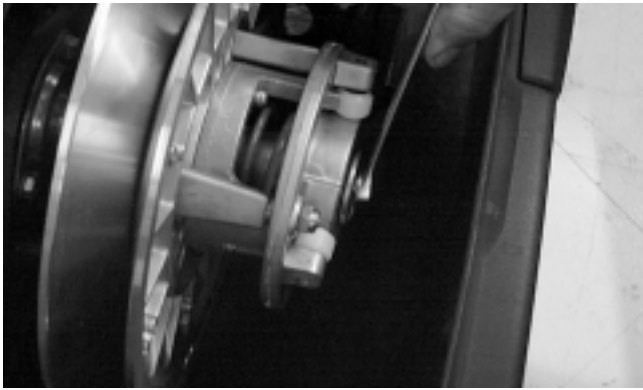
Fig. 2-443



■ **NOTE:** Apply a coat of Anti-Seize Thread Compound (p/n 0678-146) to the keyway end of the driven shaft.

14. Install the driven pulley and alignment washers. Secure with a cap screw and washer tightened to 2.6-3.3 kg-m (19-24 ft-lb).

Fig. 2-444



SC013D

■ **NOTE:** At this point, check drive clutch/driven pulley alignment (see Section 8).

15. Install the drive belt and secure the belt guard. Install the plug in the belly pan.

■ **NOTE:** If equipped with electric start, connect the battery.

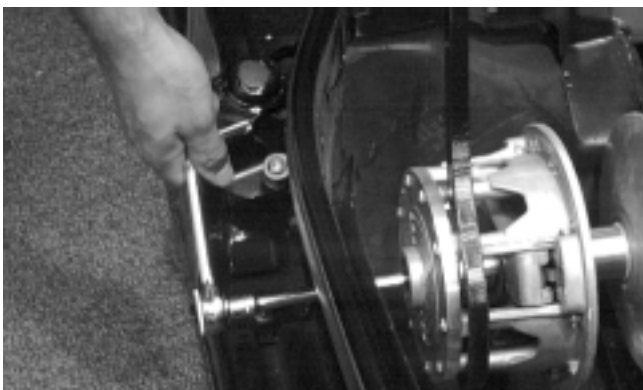
16. Turn the gas tank shut-off valve to the OPEN position.

17. Check the ignition timing.

18. Place the rear of the snowmobile up on a safety stand. Start engine and allow to warm up. Adjust engine idle to 1500 RPM and check all safety switches for proper operation.

19. Test drive the snowmobile; then tighten the clutch bolt to 6.9-7.6 kg-m (50-55 ft-lb).

Fig. 2-445



AF477D



CAUTION

If the engine had a major overhaul or if any major part was replaced, proper engine break-in procedures must be followed.

Installing Engine (Twin L/C Models)

1. Place the engine into the engine compartment; then place the coolant supply hose on the water pump and secure with the clamp.

■ **NOTE:** On the Wide Track, place the shims in their proper position on the left rear engine mount (as noted during removal).

2. Secure the right-side front and rear and left-side front engine mounts to the front end making sure the mounts are properly positioned. Tighten the cap screws and nut to 2.8-3.5 kg-m (20-25 ft-lb).

■ **NOTE:** On the 550 cc models, tighten the cap screws (w/lock nuts on the Panther) to 7.6 kg-m (55 ft-lb).

3. On all models except the 550 cc, adjust the torque bumper to allow a clearance between the engine and the torque bumper of 1.78 mm (0.070 in.); then secure the adjustment by tightening the jam nuts.

Fig. 2-446



AN610D

4. On the 500/600 cc, secure the hood cable and ground wire to the magneto housing with the machine screw tightened to 1.1 kg-m (8 ft-lb).

5. On the 550/580 cc, attach the hood cable to the exhaust manifold and the ground wires to the magneto housing.

6. Secure the rear ground wires to the magneto housing with the machine screw tightened to 1.1 kg-m (8 ft-lb).

7. Place the coolant return hose into position on the thermostat housing and secure with the clamp.

8. Place the recoil starter into position and secure the starter with four cap screws and lock washers. Tighten to 1 kg-m (7 ft-lb).

9. Connect all electrical wires.

■ **NOTE:** Use cable ties to secure the wiring harnesses as necessary.

10. Connect the oil-injection cable to the oil-injection pump and secure; then connect the oil-supply hose to the pump and secure with the clamp. Bleed the oil-injection system (see Section 4).

Fig. 2-447



11. On carbureted models, connect the impulse hose to the crankcase.

■ **NOTE:** On the 700 cc, install the air-intake silencer.

Fig. 2-448

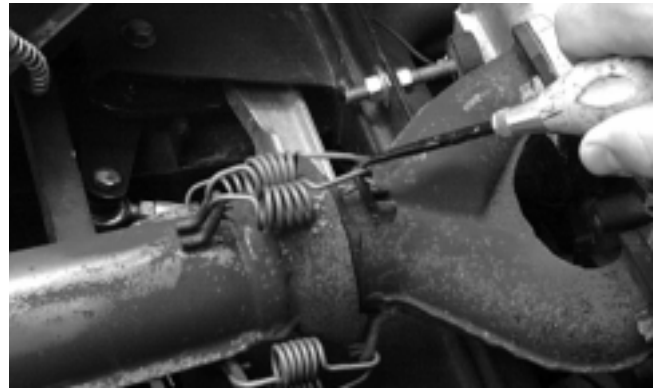


12. Place the carburetors/throttle bodies into position and secure with the flange clamps. Synchronize the oil-injection system (see Section 4).

■ **NOTE:** On the Wide Track, place the starter motor and end cap into position and secure with the lock nuts. Tighten securely.

13. Place the expansion chamber and grafoil gaskets into position and secure to the exhaust manifold, front end, and resonator with the springs.

Fig. 2-449

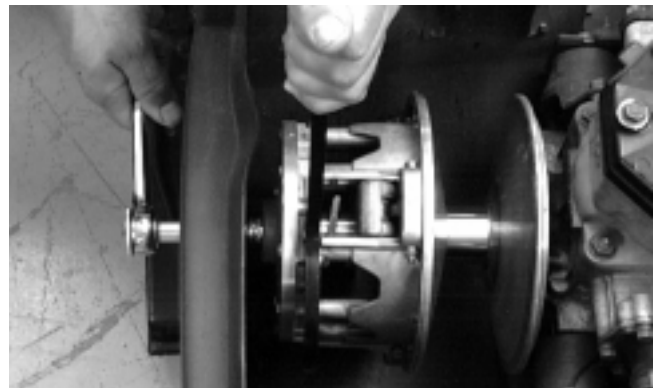


■ **NOTE:** When installing the three exhaust manifold springs, the long hook portion of the spring must be attached to the exhaust manifold or premature spring failure will result.

■ **NOTE:** Before installing the drive clutch, be sure to wipe both the crankshaft taper and clutch mounting taper clean using a clean towel.

14. Place the drive clutch into position on the crankshaft making sure the two sleeves are properly positioned and secure with the bolt and lock washer. Tighten to 6.9-7.6 kg-m (50-55 ft-lb).

Fig. 2-450



■ **NOTE:** On the Wide Track, secure the side panel to the belly pan with the existing machine screws.

■ **NOTE:** Apply a coat of Anti-Seize Thread Compound (p/n 0678-146) to the keyway end of the driven shaft.

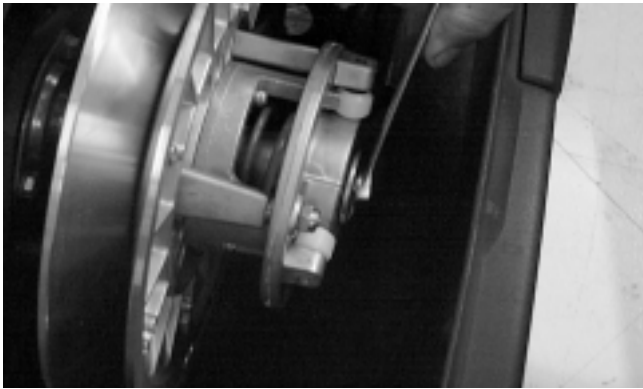
15. Install the driven pulley, key, stub shaft, and alignment washers. Secure with a cap screw and washer. Tighten to 2.6-3.3 kg-m (19-24 ft-lb).

Fig. 2-451



AF120D

Fig. 2-452



SC013D

16. Check drive clutch/driven pulley alignment (see Section 8).

17. Install the drive belt. Check belt deflection. Secure the belt guard.

Fig. 2-453



AN379D

■ **NOTE:** On the Wide Track, secure the belly pan and bumper to the bumper support tube with a lock nut; then install the rear belly pan plug.

18. Fill the cooling system (see Section 3).

19. On models equipped w/electric start, connect the positive cable to the starter motor; then secure with the washers and nut making sure the cable is directed toward the PTO-side of the engine. Secure the positive cable with a long cable tie.

20. On models equipped w/electric start, connect the cables to the battery making sure to connect the positive cable first.

21. Turn the gas tank shut-off valve to the OPEN position.

22. Start engine and verify ignition timing.

23. Test drive or run the snowmobile and recheck the coolant level after 5-6 minutes. Tighten the drive clutch to 7.6 kg-m (55 ft-lb).

CAUTION

If the engine had a major overhaul or if any major component was replaced, proper engine break-in procedures must be followed. If the proper engine break-in procedures are not followed, severe engine damage may result.

Installing Engine (Triple Models)

1. Secure the engine mounting brackets to the crankcase. Tighten the cap screws securing the front and right-side rear brackets to 2.4 kg-m (17 ft-lb). Tighten the rear PTO-side engine mount to 1.4 kg-m (10 ft-lb).

2. Place the engine assembly in the engine compartment. Place the recoil starter into position and secure with four cap screws and lock washers. Tighten to 0.7 kg-m (5 ft-lb).

Fig. 2-454



AN150

3. Place the resonator into position; then secure with the cap screws, washers, bushings, spacers, and retainer nuts.

■ **NOTE:** On models equipped with electric start, make sure the battery ground cable and star washer are properly positioned.

4. Connect the temperature-gauge sender wire.

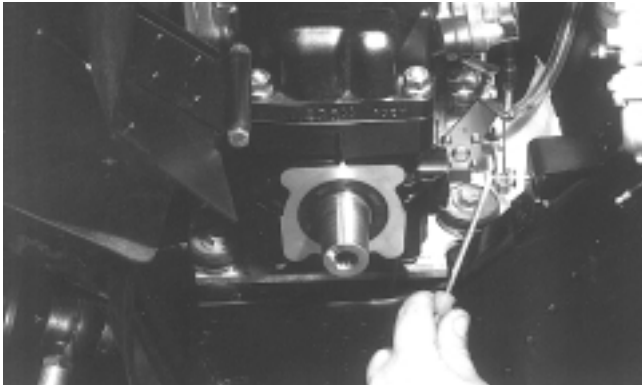
Fig. 2-455



AJ159

5. Place the coolant hoses into position and secure with the clamps.
6. Connect the cable to the oil-injection pump and secure with the nylon washer and E-clip; then connect the oil-supply and oil-output hoses and secure with the clamp. Bleed the oil-injection pump (see Section 4).

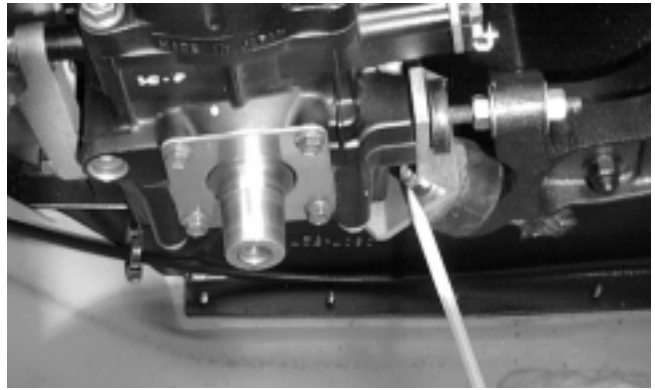
Fig. 2-456



AN009

7. Connect the impulse hose to the crankcase.
8. Secure the right-side front and rear and left-side front engine mounts to the front end making sure the mounts are properly positioned. Tighten the cap screws and nut to 2.8-3.5 kg-m (20-25 ft-lb).

Fig. 2-457

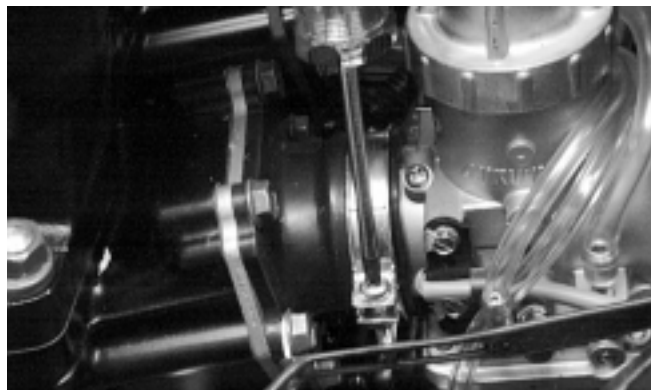


AN611D

9. Adjust the torque bumper to allow a clearance between the engine and the torque bumper of 1.78 mm (0.070 in.) on the 1000 cc or 1.5 mm (0.060 in.) on the 600/800 cc; then secure the adjustment by tightening the jam nuts.

10. Place the carburetors into position and secure with the flange clamps. Synchronize the oil-injection pump (see Section 4).

Fig. 2-458



AN614D

11. Connect the main wiring harness, ignition timing sensor wiring harness, and the spark-plug caps. Secure the two brown ground wires to the magneto housing with a cap screw.

Fig. 2-459



AQ125

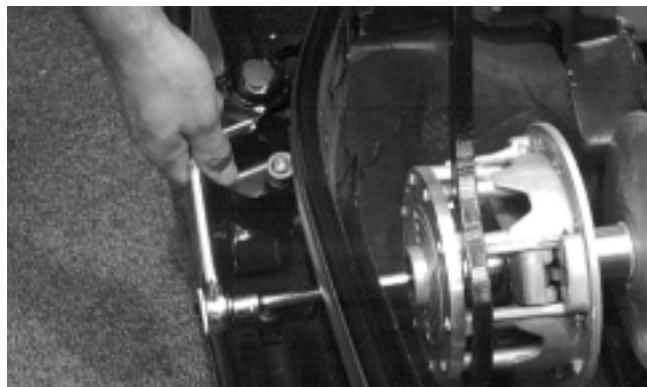
12. In order, place the expansion chambers and grafoil gaskets into position. Secure the expansion chambers to the header pipes and resonator with the springs. Secure the expansion chambers to the front end with the long spring.

13. Connect the hood cable to the cable hook; then secure the hook.

■ **NOTE:** Before installing the drive clutch, be sure to wipe both the crankshaft taper and clutch mounting taper clean using a clean towel.

14. Place the drive clutch into position on the crankshaft making sure the two sleeves are properly positioned (see Section 8) and secure with the clutch bolt and lock washer. Tighten to 6.9-7.6 kg-m (50-55 ft-lb). Install the belly pan plug.

Fig. 2-460



AF477D

■ **NOTE:** Apply a coat of Anti-Seize Thread Compound (p/n 0678-146) to the keyway end of the driven shaft.

15. Install the driven pulley, stub shaft, key, and washers (see Section 8). Secure with a cap screw. Tighten to 2.6-3.3 kg-m (19-24 ft-lb).

Fig. 2-461



SC013D

16. Check drive clutch/driven pulley alignment (see Section 8).

17. Install the drive belt. Check belt deflection (see Section 8). Secure the belt guard.

18. Fill the cooling system (see Section 3); then install the coolant filler cap.

19. Bleed the oil-injection system (see Section 4).

20. Turn the shut-off valve to the OPEN position.

21. Check ignition timing.

22. Test drive the snowmobile and recheck the coolant level after 5-10 minutes. Retighten the drive clutch to 7.6 kg-m (55 ft-lb).



CAUTION

If the engine had a major overhaul or if any major component was replaced, proper engine break-in procedures must be followed. If the proper engine break-in procedures are not followed, severe engine damage may result.

Troubleshooting Engine (Carbureted Models)

2

Problem: Engine Does Not Start (No Spark at Spark Plugs)	
Condition	Remedy
1. Ignition switch malfunctioning—not in RUN position	1. Replace ignition switch—turn switch to RUN position
2. Wiring harness shorting	2. Repair—replace wiring harness
3. Emergency stop switch knob in DOWN position—malfunctioning	3. Move knob to UP position—replace throttle switch
4. Throttle/ignition monitor switch (TM-style) adjusted too loose—malfunctioning	4. Adjust (tighten) throttle cable—replace throttle switch
5. Throttle/ignition monitor switch (VM-style) adjusted too tight—malfunctioning	5. Adjust (loosen) throttle cable—replace throttle switch
6. Carburetor safety switches (VM-style) adjusted incorrectly—malfunctioning	6. Adjust—replace carburetor safety switches
7. Spark plugs fouled—damaged	7. Clean—gap —replace spark plugs
8. Spark-plug caps damaged—leaking—shorting	8. Replace spark-plug caps
9. High tension wires/coil loose—grounded—faulty	9. Service—replace high tension wires/coil
10. CDI unit faulty	10. Replace CDI unit
11. Charge coil (1) faulty	11. Replace coil
12. Charge coil (2) faulty	12. Replace coil
13. Flywheel magnets weak	13. Replace flywheel
14. Flywheel key sheared	14. Replace key
Problem: Engine Does Not Start (No Fuel at Cylinders)	
Condition	Remedy
1. Gas tank empty	1. Fill tank
2. Shut-off valve closed	2. Open shut-off valve
3. Fuel hose broken—pinched	3. Replace—service hose
4. Gas-tank vent—hose obstructed	4. Remove obstruction—replace vent—hose
5. In-line fuel filter obstructed—damaged	5. Remove obstruction—replace in-line fuel filter
6. Fuel pump malfunctioning—faulty	6. Replace—repair—clean fuel pump
7. Impulse hose cracked—broken—pinched—disconnected	7. Replace—connect impulse hose
8. Carburetors adjusted incorrectly—dirty—damaged	8. Troubleshoot — clean—replace carburetors
9. Primary compression (crankcase) absent	9. Repair—replace damaged—worn engine components

Problem: Engine Does Not Start (Fuel Does Not Ignite)	
Condition	Remedy
1. Carburetor-to-cylinder air leak 2. Carburetors adjusted incorrectly—dirty—damaged 3. Gasoline contaminated 4. Engine flooded 5. Secondary compression (cylinder) low 6. Choke cable(s) adjusted improperly	1. Replace—service gaskets—intake flanges—connect oil delivery hose—service intake ports 2. Troubleshoot—clean—replace carburetors 3. Clean tank—entire fuel system 4. Troubleshoot carburetors—clean—replace air-intake silencer—clear engine by pulling recoil several times —install new spark plugs —try restarting engine 5. Repair—replace damaged—worn engine components 6. Check and adjust choke cable(s)
Problem: Engine Does Not Idle	
Condition	Remedy
1. Carburetors adjusted incorrectly—dirty—damaged 2. Fuel pump malfunctioning—faulty 3. Impulse hose cracked—broken 4. Air-intake silencer obstructed—damaged	1. Troubleshoot—clean—replace carburetors 2. Replace—repair—clean fuel pump 3. Replace impulse hose 4. Remove obstruction—replace air-intake silencer
Problem: Engine Loses Power	
Condition	Remedy
1. Gas-tank vent—hose obstructed 2. Fuel hose cracked—broken—pinched 3. In-line fuel filter obstructed—damaged 4. Carburetors adjusted incorrectly—dirty—damaged—loose 5. Muffler obstructed—disconnected—damaged 6. Air-intake silencer obstructed—disconnected—damaged 7. Exhaust ports carboned 8. Spark plugs fouled—damaged 9. High tension wires/coil loose—faulty 10. Spark-plug caps leaking—shorting 11. Ignition timing adjusted incorrectly 12. Primary and secondary compression low 13. Charge coil (1) faulty 14. Charge coil (2) faulty 15. CDI unit faulty 16. Oil-injection pump malfunctioning—adjusted incorrectly	1. Remove obstruction—replace vent—hose 2. Replace—service fuel hose 3. Remove obstruction—replace in-line fuel filter 4. Troubleshoot—tighten—clean—replace carburetors 5. Remove obstruction—connect—replace muffler 6. Remove obstruction—connect—replace air-intake silencer 7. Clean exhaust ports 8. Clean—gap—replace spark plugs 9. Service—replace high tension wires/coil 10. Replace spark-plug caps 11. Time ignition 12. Repair—replace damaged—worn engine components 13. Replace coil 14. Replace coil 15. Replace CDI unit 16. Replace—bleed—adjust oil-injection pump

Problem: Engine Overheats	
Condition	Remedy
1. Spark plug heat range too hot	1. Install lower heat-range spark plugs
2. Coolant low—absent	2. Add coolant
3. Carburetors adjusted incorrectly—jetted incorrectly—dirty	3. Troubleshoot—clean carburetors—jet correctly
4. Carburetor-to-cylinder air leak	4. Replace—repair gaskets—intake flanges—service intake ports
5. Heat exchangers —no snow for cooling	5. Select new trail—install ice studs to chew up hard packed snow and ice
6. Rings/grooves carboned	6. Clean—replace rings—pistons
7. Exhaust ports obstructed	7. Remove obstruction
8. Muffler obstructed	8. Remove obstruction
9. Gas/air mixture incorrect	9. Replace jets—adjust jet needle E-clip position
10. Oil-injection pump malfunctioning—adjusted incorrectly	10. Replace—bleed—adjust oil-injection pump
11. Primary compression (crankcase) low—absent	11. Repair—replace damaged—worn engine components
12. Ignition timing adjusted incorrectly	12. Time ignition
13. Gasoline octane too low	13. Use 87 minimum octane gasoline
14. Water pump—thermostat damaged—faulty	14. Replace—rebuild water pump—replace thermostat
Problem: Engine Backfires	
Condition	Remedy
1. Throttle/ignition monitor switch adjusted incorrectly	1. Adjust throttle cable free-play—service spring
2. Spark plugs fouled—damaged	2. Clean—gap—replace spark plugs
3. Spark plug heat range too hot	3. Install lower heat-range spark plugs
4. High tension wires/coil shorting	4. Service—replace high tension wires/coil
5. Carburetor-to-cylinder air leak	5. Repair—replace gaskets—intake flanges—service intake ports
6. Carburetors adjusted incorrectly—dirty—damaged—loose	6. Troubleshoot—tighten carburetors
7. Gas/air mixture incorrect—too lean	7. Adjust jetting
8. Oil-injection pump malfunctioning—adjusted incorrectly	8. Replace—bleed—adjust oil-injection pump
Problem: Engine Four-Cycles (Floods Excessively)	
Condition	Remedy
1. Carburetors adjusted incorrectly—dirty—damaged	1. Troubleshoot—clean carburetors
2. Gas/air mixture incorrect	2. Adjust jetting
3. Oil-injection pump malfunctioning—adjusted incorrectly	3. Replace—bleed—adjust oil-injection pump
4. Air-intake silencer obstructed	4. Remove obstruction

Problem: Engine Stops Gradually	
Condition	Remedy
<ol style="list-style-type: none"> 1. In-line fuel filter obstructed—damaged 2. Fuel hose obstructed—broken—pinched 3. Head gasket(s) burned out 4. Cylinder head loosening 5. Spark plugs loose 6. Impulse hose cracked 7. High tension wires/coil faulty 8. Float bowl vent hose (TM-style) obstructed—kinked—damaged 	<ol style="list-style-type: none"> 1. Remove obstruction—replace in-line fuel filter 2. Remove obstruction—replace—repair fuel hose 3. Replace head gasket(s)—service cylinders—head 4. Tighten cylinder head cap screws 5. Tighten spark plugs 6. Replace impulse hose 7. Service—replace high tension wires/coil 8. Service—replace float bowl vent hose
Problem: Engine Stops Suddenly	
Condition	Remedy
<ol style="list-style-type: none"> 1. In-line fuel filter obstructed—damaged 2. Fuel hose obstructed—broken—pinched 3. CDI unit faulty 4. Ignition coil faulty 5. Charge coil (1) faulty 6. Charge coil (2) faulty 7. Gas-tank vent—hose obstructed—damaged 8. Engine seized 9. Throttle/ignition monitor switch faulty—throttle cable adjusted incorrectly 	<ol style="list-style-type: none"> 1. Remove obstruction—replace in-line fuel filter 2. Remove obstruction—repair—replace fuel hose 3. Replace CDI unit 4. Replace ignition coil 5. Replace coil 6. Replace coil 7. Remove obstruction—replace vent—hose 8. Overhaul engine 9. Replace throttle control—adjust throttle cable free-play—adjust—connect—replace carburetor safety switches (VM-style)
Problem: Engine Fails to Stop (Continues to Run, Even with All Switches Off)	
Condition	Remedy
<ol style="list-style-type: none"> 1. CDI unit shorted to ground 2. Main wiring harness four-prong connector disconnected 	<ol style="list-style-type: none"> 1. Replace CDI unit 2. Connect four-prong connector

Troubleshooting Engine (EFI Models)

2

Problem: Engine Does Not Start (No Spark at Spark Plugs)

Condition	Remedy
1. Ground connections dirty—loose	1. Check all ground connections—clean and tight
2. Throttle/ignition monitor switch malfunctioning— ignition switch not on	2. Replace faulty switch—turn switch on
3. Wiring harness shorting—disconnected	3. Repair—replace—connect wiring harness
4. Emergency stop switch in DOWN position—malfunctioning	4. Move switch to UP position—replace throttle control
5. Throttle/ignition monitor switch malfunctioning	5. Adjust throttle cable tension—replace throttle body assembly
6. Spark plugs fouled—damaged	6. Clean—replace spark plugs
7. Spark-plug caps damaged—leaking—shorting	7. Replace spark-plug caps
8. High tension leads/coil loose—grounded—faulty	8. Service—replace high tension leads/coil
9. CDI unit faulty	9. Replace ECU
10. Ignition timing sensor faulty	10. Replace sensor
11. ECU faulty	11. Replace ECU

Problem: Engine Does Not Start (No Fuel at Cylinders)

Condition	Remedy
1. Gas tank empty	1. Fill tank
2. Injector dropping resistor faulty	2. Replace dropping resistor
3. Fuel pressure regulator faulty	3. Replace regulator—hose
4. Gasoline contaminated	4. Replace gasoline
5. Fuel pump faulty	5. Service—replace fuel pump—connections—wires
6. Fuel hose broken—pinched	6. Replace—service hose
7. Gas-tank vent—hose obstructed	7. Remove obstruction—replace vent—hose
8. Pick-up valve(s) obstructed—damaged	8. Remove obstruction—replace pick-up valve(s)
9. Primary compression absent	9. Repair—replace damaged—worn engine components
10. ECU faulty	10. Replace ECU

Problem: Engine Does Not Start (Fuel Does Not Ignite)	
Condition	Remedy
<ol style="list-style-type: none"> 1. ECU LED trouble code 2. Spark absent 3. Primary compression low 4. Secondary compression low 5. Engine flooded 6. Gasoline contaminated 	<ol style="list-style-type: none"> 1. Service—replace problem component 2. Check for spark—see No Spark at Spark Plugs sub-section 3. Service engine 4. Service engine 5. Clear engine (hold throttle full-open) 6. Clean tank and entire fuel system
Problem: Engine Does Not Idle	
Condition	Remedy
<ol style="list-style-type: none"> 1. ECU LED trouble code 2. Throttle position sensor idle adjustment incorrect 3. Injector(s) faulty 4. Fuel pressure regulator faulty 5. Air-intake silencer obstructed 	<ol style="list-style-type: none"> 1. Service—replace problem component 2. Adjust idle RPM to specifications 3. Replace injector(s) 4. Replace regulator— hose 5. Clean air-intake silencer
Problem: Engine Loses Power or Runs on One Cylinder	
Condition	Remedy
<ol style="list-style-type: none"> 1. Sensor faulty 2. Spark plug fouled 3. External coil faulty 4. Gas tank vent — hose obstructed 5. Secondary compression low 6. CDI unit faulty 7. Fuel pressure regulator faulty 8. Pick-up valve(s) obstructed — out of position 9. Oil-injection pump malfunctioning—adjusted incorrectly 10. Throttle bodies out of synchronization 11. Injector faulty 12. Dropping resistor faulty 	<ol style="list-style-type: none"> 1. Check LED for trouble code—repair—replace problem circuit or sensor 2. Replace spark plugs 3. Service — replace coil 4. Service — replace vent hose 5. Service engine 6. Replace ECU 7. Replace regulator 8. Replace—relocate pick-up valve(s) 9. Replace—bleed—adjust oil-injection pump 10. Replace throttle bodies from a similar engine—if problem is corrected, replace the original assembly 11. Replace injector 12. Test resistor—replace as necessary

Problem: Engine Overheats

Condition	Remedy
1. Spark plug heat range too hot	1. Install lower heat-range spark plugs
2. Coolant low — absent	2. Add coolant
3. Heat exchanger obstructed	3. Remove obstruction
4. Intake flange to cylinder air leak	4. Replace — seal intake flange(s)
5. Drive system (drive clutch — driven pulley — track — drive belt) adjusted incorrectly — worn — damaged	5. Troubleshoot — adjust drive system
6. Rings/grooves carboned	6. Clean — replace rings — pistons
7. Exhaust ports obstructed	7. Remove obstruction
8. Expansion chamber obstructed	8. Remove obstruction
9. Oil-injection pump malfunctioning — adjusted incorrectly	9. Replace — bleed — adjust oil-injection pump
10. Primary compression low — absent	10. Repair — replace damaged — worn engine components
11. Gasoline octane too low	11. Use 87 minimum octane gasoline
12. Water pump — thermostat damaged — faulty	12. Replace water pump — thermostat

Problem: Engine Backfires

Condition	Remedy
1. LED trouble code	1. Service — replace problem component
2. Throttle/ignition monitor switch adjusted incorrectly	2. Adjust throttle cable tension — service spring
3. Spark plugs fouled — damaged	3. Clean — replace spark plugs
4. High tension leads/coil shorting	4. Service — replace high tension leads/coil
5. CDI unit faulty — damaged	5. Replace ECU
6. Fuel mixture lean	6. Repair fuel regulator — injector(s)
7. Oil-injection pump malfunctioning — adjusted incorrectly	7. Replace — bleed — adjust oil-injection pump

Problem: Engine Four-Cycles (Floods Excessively)

Condition	Remedy
1. LED trouble code	1. Service — replace problem component
2. Fuel pressure too high	2. Replace regulator — hose
3. Injector faulty	3. Replace injector
4. Throttle position sensor faulty	4. Replace throttle body assembly
5. Air-intake silencer obstructed	5. Remove obstruction

Problem: Engine Stops Suddenly	
Condition	Remedy
1. Gas tank empty	1. Fill tank
2. Spark absent	2. See No Spark at Spark Plugs sub-section
3. LED trouble code	3. Service — replace problem component
4. CDI relay faulty	4. Replace CDI relay
5. Fuel filter(s) obstructed	5. Replace filter(s)
6. Fuel pressure low	6. Replace regulator — hose
7. Fuel pump faulty	7. Service — replace fuel pump
8. Fuel pump relay faulty	8. Replace relay
9. Gas tank vent hose obstructed	9. Service vent hose
10. ECU faulty	10. Replace ECU
11. Fuel hose obstructed—broken—pinched	11. Remove obstruction—repair—replace fuel hose
12. CDI unit faulty	12. Replace ECU
13. Ignition coil faulty	13. Replace ignition coil
14. Engine seized	14. Overhaul engine
15. Throttle/ignition monitor switch — throttle cable tension faulty—adjusted incorrectly	15. Replace throttle control—adjust throttle cable
Problem: Engine Fails to Stop (Continues to Run, Even with All Switches Off)	
Condition	Remedy
1. CDI unit shorted to ground	1. Replace ECU
2. Engine wiring harness connections wet	2. Clean — dry connections

Engine Information Table of Contents

2000 Arctic Cat Engine Specifications	2-136
2000 Arctic Cat Engine Torque Specifications	2-137
Torque Conversions	2-137
2000 Engine Torque Patterns	2-138
Piston Replacement Guide	2-139
Engine Piston Travel Versus Crank Angle Chart	2-140
Cylinder Head Volume Tests	2-141
Cylinder Head Volume Specifications	2-142
Crankshaft Runout Specifications	2-143
Crankshaft Repair	2-144
Exhaust Gas Temperature	2-145
Exhaust Gas Temperature Probe Location . .	2-146

2000 Arctic Cat Engine Specifications

ITEM	120 cc	340 cc	370 cc	440 cc (F/C)	440 cc (L/C)	500 cc Carb	500 cc EFI	550 cc	580 cc EFI	600 cc EFI	600 cc Carb (Triple)	600 cc Carb (Twin)	700 cc	800 cc	1000 cc
Engine Model Number	N/A	AG34A8	AA37A2	AS44A3	AL44L9	AS50L4	AT50L4	CB55L1	AD58L4	AD60L4	AA60L6	AE60L4	AB70L8	AA80L6	AA10L3
Displacement — cc — cu. in.	119 7.3	339 20.68	367 22.41	431 26.3	436 26.60	497 30.3	497 30.3	550 33.56	580 35.42	599 36.54	594 36.24	599 36.54	700 42.71	794 48.45	999 60.96
No. of Cylinders	1	2	2	2	2	2	2	2	2	2	3	2	2	3	3
Bore — mm — in.	60 2.4	60 2.362	60 2.362	65 2.559	68 2.677	71 2.800	71 2.800	73.4 2.890	75.4 2.968	78 3.071	66.5 2.618	78 3.071	81 3.19	72 2.835	81 3.19
Stroke — mm — in.	42 1.7	60 2.362	65 2.559	65 2.559	60 2.362	62.7 2.469	62.7 2.469	65 2.559	65 2.559	62.7 2.469	57 2.240	62.7 2.469	68 2.677	65 2.559	64.6 2.54
Compression Ratio	N/A	6.8:1	6.3:1	6.5:1	6.5:1	6.74:1	6.74:1	6.6:1	6.5:1	6.55:1	6.4:1	6.55:1	6.0:1	6.5:1	6.4:1
Cooling System	Fan Cooled	Fan Cooled	Fan Cooled	Fan Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled	Liquid Cooled
Gasoline Octane (min)	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
Fuel Mixture	N/A	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection	Oil Injection
Ignition Timing degrees — mm — in.	Fixed	16 ^① 1.440 0.056	13 ^① 1.056 0.042	18 ^① 2.012 0.079	18 ^① 1.860 0.073	24 ^④ 3.390 0.133	24 ^④ 3.390 0.133	24 ^① 3.540 0.139	30 ^② 5.459 0.215	20 ^⑤ 2.371 0.093	27 ^② 3.884 0.153	24 ^③ 3.390 0.133	27 ^② 4.625 0.182	12 ^⑥ 0.886 0.035	16 ^② 1.556 0.061
Spark Plug (NGK)	BPR6ES	BR9EYA	BR9EYA	BR9EYA	BR9EYA	BR10EYA	BR9EYA	BR9EYA	BR9EYA	BR9EYA	BR9EYA	BR9EYA	BR10ES	BR9EYA	BR9EYA
Spark Plug Gap — mm — in.	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031	0.7-0.8 0.028-0.031
Lighting Coil Output	N/A	12V/185W	12V/185W	12V/185W	12V/215W	12V/210W	12V/175W	12V/180W	12V/175W	12V/175W	12V/210W	12V/210W	12V/200W	12V/185W	12V/185W
Ignition Type	Transistorized	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI	CDI/NOI
Piston Skirt/Cylinder Clearance Range — mm — in.	0.020-0.120 0.0008-0.0047	0.060-0.150 0.0024-0.0059	0.060-0.150 0.0024-0.0059	0.080-0.150 0.0031-0.0059	0.115-0.150 0.0045-0.0059	0.083-0.150 0.0033-0.0059	0.083-0.150 0.0033-0.0059	0.095-0.150 0.0037-0.0059	0.095-0.150 0.0037-0.0059	0.083-0.150 0.0033-0.0059	0.085-0.150 0.0034-0.0059	0.083-0.150 0.0033-0.0059	0.095-0.150 0.0037-0.0059	0.095-0.150 0.0037-0.0059	0.095-0.150 0.0037-0.0059
Piston Ring End Gap Range — mm — in.	0.20-0.70 0.0079-0.0280	0.15-0.80 0.006-0.031	0.15-0.80 0.006-0.031	0.15-0.83 0.006-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033	0.20-0.80 0.008-0.031	0.20-0.83 0.008-0.033	0.20-0.83 0.008-0.033
Cylinder Trueness Limit (max) — mm — in.	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004	0.1 0.004
Piston Pin Diameter Range — mm — in.	14.980-14.995 0.5898-0.5904	15.995-16.000 0.6297-0.6299	17.995-18.000 0.7085-0.7087	15.995-16.000 0.6297-0.6299	17.995-18.000 0.7085-0.7087	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	17.995-18.000 0.7085-0.7087	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874	19.995-20.000 0.7872-0.7874
Piston Pin Bore Diameter Range — mm — in.	15.006-15.030 0.5908-0.5917	15.998-16.006 0.6298-0.6302	17.998-18.006 0.7086-0.7089	15.996-16.004 0.6298-0.6301	17.998-18.006 0.7086-0.7089	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	18.002-18.008 0.7087-0.7090	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878	20.002-20.010 0.7875-0.7878
Connecting Rod Small End Bore Diameter Range — mm — in.	15.006-15.030 0.5908-0.5917	21.003-21.011 0.8269-0.8272	23.003-23.011 0.9056-0.9059	21.003-21.011 0.8269-0.8272	23.003-23.011 0.9056-0.9059	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	23.003-23.011 0.9056-0.9059	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241	26.003-26.011 1.0237-1.0241
Connecting Rod Radial Play Range — mm — in.	0.015-0.070 0.0006-0.0028	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012	0.02-0.03 0.0008-0.0012
Crankshaft Runout (t.i.r.) — mm — in.	0.10 0.004	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002	0.05 0.002
Crankshaft End Play Range — mm — in.	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004	0.05-0.10 0.002-0.004
Reed Stopper Height — mm — in.	N/A	N/A	N/A	N/A	N/A	9.4 - 9.8 0.370 - 0.385	9.4-9.8 0.370-0.385	N/A	N/A	9.4 - 9.8 0.370 - 0.385	9.3 - 9.9 0.366 - 0.389	9.4 - 9.8 0.370 - 0.385	8.6 - 9.0 0.338 - 0.354	6.7 - 7.3 0.263 - 0.287	9.3 - 9.9 0.366 - 0.389

① @ 6000 RPM - Engine warm

② @ 4000 RPM

③ @ 3250 RPM

④ @ 3500 RPM

⑤ @ 5000 RPM

⑥ @ 1800 RPM

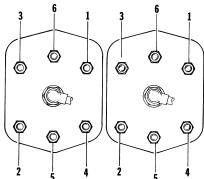
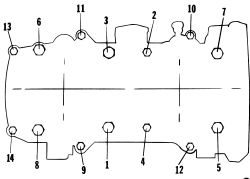
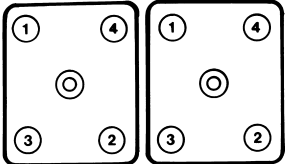
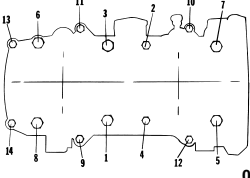
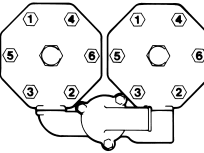
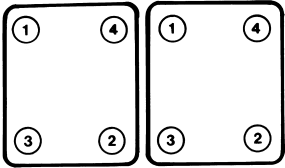
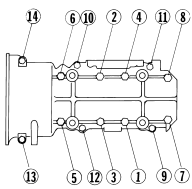
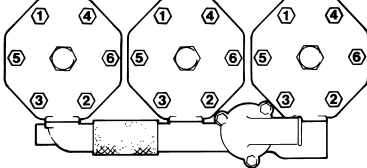
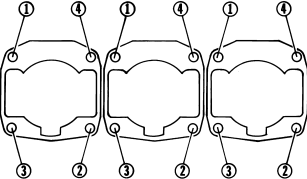
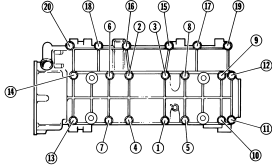
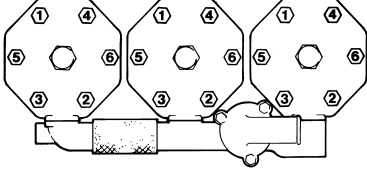
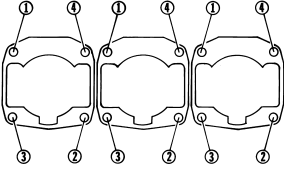
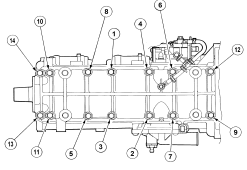
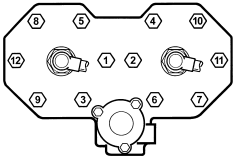
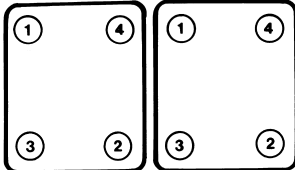
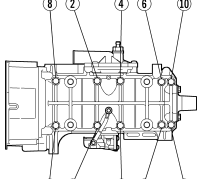
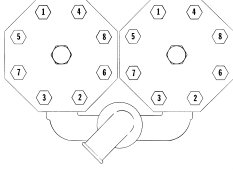
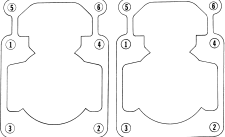
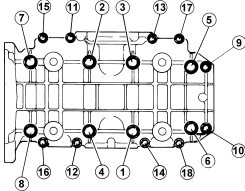
2000 Arctic Cat Engine Torque Specifications

Model		60 cc	340 cc	370 cc/ 440 cc (F/C)	440 cc (L/C) Lightweight	ZR 440 Sno-Pro	550 cc	580 cc EFI	500 cc	600 cc EFI	600 cc (Carb-Twin)	600 cc (Carb-Triple)	700 cc	800 cc	1000 cc
Cylinder Head	ft-lb kg-m	6-9 0.8-1.2	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	14.5-18 2.0-2.5	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8
Cylinder Base 10 mm	ft-lb kg-m	N/A	N/A	N/A	21.5-29 3.0-4.0	21.5-29 3.0-4.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0	13-20 1.8-2.8	22-29 3.0-4.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0
Flywheel	ft-lb kg-m	22-29 3.0-4.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	50.5-65 7.0-9.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0
Intake Manifold or Flange	ft-lb kg-m	N/A	13-16 1.8-2.2	6-8.5 0.8-1.2	13-16 1.2-2.2	13-16 1.2-2.2	13-16 1.2-2.2	13-16 1.8-2.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	13-16 1.8-2.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2
Exhaust Manifold & Intake Flange	ft-lb kg-m	6-8 0.8-1.1	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2
Flywheel Housing	ft-lb kg-m	N/A	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2	13-16 1.8-2.2
Crankcase 6 mm	ft-lb kg-m	4.5-7 0.6-1	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	6-8.5 0.8-1.2	N/A	N/A
8 mm	ft-lb kg-m	N/A	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	13-20 1.8-2.8	N/A	N/A
10 mm	ft-lb kg-m	N/A	N/A	N/A	N/A	29-43.5 4.0-6.0	N/A	N/A	29-43.5 4.0-6.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0	N/A	29-43.5 4.0-6.0	29-43.5 4.0-6.0	29-43.5 4.0-6.0
Spark Plug	ft-lb kg-m	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8	18-20 2.5-2.8
Drive Clutch	ft-lb kg-m	6-7 0.8-1.0	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6	50-55 6.9-7.6

TORQUE CONVERSIONS

ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m
1	0.1	11	1.5	21	2.9	31	4.3	41	5.7	51	7.1	61	8.4	71	9.8	81	11.2	91	12.6
2	0.3	12	1.7	22	3.0	32	4.4	42	5.8	52	7.2	62	8.6	72	10.0	82	11.3	92	12.8
3	0.4	13	1.8	23	3.2	33	4.6	43	5.8	53	7.3	63	8.7	73	10.1	83	11.5	92	12.9
4	0.6	14	1.9	24	3.3	34	4.7	44	6.1	54	7.5	64	8.9	74	10.2	84	11.6	94	13.0
5	0.7	15	2.1	25	3.5	35	4.8	45	6.2	55	7.6	65	9.0	75	10.4	85	11.8	95	13.1
6	0.8	16	2.2	26	3.6	36	5.0	46	6.4	56	7.7	66	9.1	76	10.5	86	11.9	96	13.3
7	1.0	17	2.4	27	3.7	37	5.1	47	6.5	57	7.9	67	9.3	77	10.7	87	12.0	97	13.4
8	1.1	18	2.5	28	3.9	38	5.3	48	6.6	58	8.0	68	9.4	78	10.8	88	12.2	98	13.6
9	1.2	19	2.6	29	4.0	39	5.4	49	6.8	59	8.2	69	9.5	79	10.9	89	12.3	99	13.7
10	1.4	20	2.8	30	4.2	40	5.5	50	6.9	60	8.3	70	9.7	80	11.1	90	12.5	100	13.8

2000 ENGINE TORQUE PATTERNS

ENGINE SIZE	CYLINDER HEAD	CYLINDER BASE	CRANKCASE
340 cc	 0728-514	N/A	 0726-412
370 cc 440 cc F/C	 0725-318	N/A	 0726-412
440 cc L/C 550 cc 580 cc	 0728-138	 725-318B	 0728-137
800 cc 1000 cc	 0729-587	 0729-585	 0729-590
600 cc (Triple)	 0729-587	 0729-585	 0731-342
500 cc 600 cc (Twin)	 0733-524	 725-318B	 0734-050
700 cc	 0727-158	 0726-376	 0727-491

Piston Replacement Guide

ENGINE SIZE	YEAR	PISTON	RING	PISTON & RING SET
340 cc (F/C & F/A)	1976-2000	3005-130 3002-761	3004-825 3002-740	3005-472
370 cc	1999-2000	3005-447	3004-448 3004-825	3005-476
440 cc (F/C & F/A)	1980-2000	3005-342 3005-156 3004-530	3002-742	3005-474
440 cc F/C (Z)	1995-1998, 2000	3005-342 3005-156 3004-530 3002-927 3002-835	3002-742 3002-076	3005-586 3005-474
440 cc F/C (Z)	1999	3005-342	3005-530	3005-684
440 cc (L/C)	1978-2000	3005-384 3005-177 3003-885 3003-840 3003-477 3002-596	3002-738	3005-586 3005-475
440 cc (ZR)	1991-1995	3004-515 3003-974	3003-989	3003-993 3003-831
440 cc (ZR)	1996-1998	3005-356 3005-254 3005-095 3004-954	3004-768	3005-370
440 cc (Sno-Pro)	1998	3005-356	3004-768	3005-178
500 cc F/C (48 hp)	1976-1988	3002-856 3002-646	3002-324 3002-073	3005-683
500 cc F/C (56 hp)	1986-1988 1989-1990	3003-210 3003-547	3002-324 3003-548	3004-817
500 cc	1980-1985	3002-876	3002-324	3005-685
500 cc (Twin)	1998-2000	3005-250 3005-122	3005-123	3005-173
530 cc	1986-1991 Single Ring Option	3003-687 3003-303 3003-328	3003-304 3004-528	3005-686
550 cc (EFI & CARB)	1991-1992	3004-122 3003-927 3003-758	3003-760	3005-229 3003-887
550 cc (EFI & CARB)	1993-2000	3005-407 3004-684 3004-062	3003-760	3005-437 3004-198
580 cc (EFI & CARB)	1993-2000	3005-436 3005-187 3004-542 3004-542 3004-066	3004-067	3004-075
600 cc (Twin)	1998-2000	3005-438	3003-714	3005-445
600 cc (Triple)	1995-2000	3005-388 3005-031 3004-767	3004-768	3005-627
650 cc	1988-1990	3003-828	3003-714	3005-687
700 cc (CARB)	1991-1993	3005-382 3004-920 3003-754	3003-822	3005-228 3003-888
700 cc (EFI & CARB)	1994-1996, 1999-2000	3005-382 3004-920 3004-143	3003-822	3004-325
800 cc	1995-2000	3004-738	3004-528	3004-762
900 cc	1993-1997	3004-936 3004-078	3004-079	3004-086
1000 cc	1998-2000	3005-218	3003-822 3005-219	3005-220
60 cc	1990-1999 1976-1989	3002-476 3002-476	3003-683 3002-477	3004-909 (+.0040 in.)

NOTE: The top part number in each case is the latest part. Those part numbers listed below the top number are also good replacement parts.

ENGINE PISTON TRAVEL VERSUS CRANK ANGLE CHART

When using any of the charts below, first know the engine stroke and timing in degrees; then select the proper chart and read across from the degree figure to find timing in either mm or inches.

	600 cc (Triple)		340 cc F/C - 440 cc Lightweight L/C		500 cc - 600 cc (Twin)		ZR 440		1000 cc		370 cc F/C - 440 cc F/C - 550 cc - 580 cc		800 cc		700 cc	
	57mm stroke		60mm stroke		62.7mm stroke		63mm stroke		64.6mm stroke		65mm stroke		65mm stroke		68mm stroke	
Degree BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC	mm BTDC	Inches BTDC
5	0.137	0.005	0.120	0.005	0.150	0.006	0.151	0.005	0.153	0.006	0.157	0.006	0.155	0.006	0.163	0.006
6	0.197	0.007	0.180	0.007	0.216	0.009	0.218	0.008	0.221	0.009	0.226	0.009	0.222	0.009	0.234	0.009
7	0.268	0.010	0.300	0.011	0.295	0.012	0.296	0.011	0.300	0.012	0.308	0.012	0.303	0.012	0.319	0.012
8	0.350	0.014	0.360	0.014	0.384	0.015	0.387	0.015	0.392	0.015	0.402	0.016	0.395	0.015	0.417	0.016
9	0.443	0.017	0.480	0.018	0.486	0.019	0.489	0.019	0.496	0.020	0.508	0.020	0.500	0.019	0.527	0.020
10	0.546	0.021	0.600	0.023	0.600	0.024	0.603	0.023	0.612	0.024	0.627	0.025	0.616	0.024	0.650	0.025
11	0.661	0.026	0.720	0.028	0.725	0.029	0.729	0.028	0.740	0.029	0.757	0.030	0.745	0.029	0.786	0.030
12	0.785	0.031	0.840	0.033	0.862	0.034	0.867	0.034	0.879	0.035	0.901	0.035	0.886	0.035	0.935	0.036
13	0.921	0.036	0.960	0.037	1.011	0.040	1.017	0.040	1.031	0.041	1.056	0.042	1.039	0.041	1.096	0.043
14	1.067	0.042	1.140	0.044	1.171	0.046	1.178	0.463	1.195	0.047	1.223	0.048	1.203	0.047	1.270	0.050
15	1.223	0.048	1.320	0.051	1.343	0.053	1.351	0.053	1.370	0.054	1.403	0.055	1.380	0.054	1.456	0.057
16	1.390	0.055	1.440	0.056	1.526	0.060	1.535	0.060	1.556	0.061	1.594	0.063	1.568	0.062	1.655	0.065
17	1.567	0.061	1.680	0.066	1.720	0.068	1.730	0.068	1.755	0.069	1.797	0.071	1.768	0.069	1.866	0.073
18	1.755	0.069	1.860	0.073	1.926	0.076	1.937	0.076	1.965	0.077	2.012	0.079	1.979	0.078	2.089	0.082
19	1.952	0.077	2.100	0.080	2.143	0.084	2.155	0.084	2.186	0.086	2.238	0.088	2.202	0.086	2.324	0.091
20	2.160	0.085	2.280	0.089	2.371	0.093	2.384	0.093	2.418	0.095	2.476	0.097	2.436	0.096	2.571	0.101
21	2.377	0.093	2.520	0.099	2.609	0.103	2.624	0.103	2.662	0.105	2.725	0.107	2.681	0.105	2.830	0.111
22	2.604	0.102	2.760	0.108	2.859	0.113	2.875	0.113	2.916	0.115	2.986	0.118	2.938	0.115	3.101	0.122
23	2.841	0.112	3.000	0.118	3.119	0.123	3.137	0.123	3.182	0.125	3.257	0.128	3.205	0.126	3.383	0.133
24	3.088	0.121	3.240	0.127	3.390	0.133	3.409	0.134	3.458	0.136	3.540	0.139	3.484	0.137	3.677	0.144
25	3.344	0.132	3.540	0.139	3.671	0.145	3.692	0.145	3.745	0.147	3.834	0.151	3.773	0.148	3.982	0.156
26	3.609	0.142	3.840	0.151	3.962	0.156	3.985	0.156	4.042	0.159	4.138	0.163	4.072	0.160	4.298	0.169
27	3.884	0.153	4.080	0.160	4.264	0.168	4.288	0.168	4.350	0.171	4.453	0.175	4.382	0.172	4.625	0.182
28	4.168	0.164	4.380	0.172	4.576	0.180	4.602	0.181	4.668	0.184	4.778	0.188	4.703	0.185	4.963	0.195
29	4.461	0.175	4.740	0.186	4.897	0.193	4.925	0.193	4.996	0.197	5.114	0.201	5.033	0.198	5.312	0.209
30	4.763	0.187	5.040	0.198	5.228	0.206	5.258	0.207	5.334	0.210	5.459	0.215	5.374	0.211	5.671	0.223

CYLINDER HEAD VOLUME TESTS

CYLINDER HEAD VOLUME (Squish-Gap Method)

To check the squish gap, a micrometer and a heavy piece of solder will be needed.

1. Remove the spark plugs from the engine.
2. Insert the solder piece down through the spark plug hole and push it up against the inner cylinder bore towards the MAG-side of the engine.
3. Pull the recoil rope and crank the engine over several times while the solder is being held firmly in place.
4. Remove the solder from the cylinder. Using the micrometer, measure the very end of the squeezed solder piece. Record the reading.

■ **NOTE:** If the solder hasn't been squeezed by the piston, a larger piece of solder must be used. Repeat procedure.

5. Using the opposite end of the solder piece, insert it down through the spark plug hole towards the PTO-side of the engine. Push on the solder until it contacts the inner cylinder bore.
6. Pull the recoil rope and crank the engine over several times. Remove the solder from the cylinder and measure the squeezed end with a micrometer. Record reading and refer to the chart.

■ **NOTE:** Measure from PTO to MAG-side of the piston to accurately measure the squish gap. Never measure across piston, exhaust to carburetor side, as the piston will rock and the reading won't be accurate.

Readings may vary from side to side. Make sure the smaller reading is within the specifications listed.

CYLINDER HEAD VOLUME (CYLINDER HEAD INSTALLED METHOD)

To check the cc volume, a measuring tool called a buret will be needed. It is capable of measuring a liquid in cc volumes.

1. Fill buret with 10W engine oil.
2. Remove the spark plugs from the cylinders.
3. Run piston up to TDC (Top Dead Center).
4. Insert buret into spark plug hole and open buret valve. Run oil into the spark plug hole until it reaches the top of the spark plug hole. Turn off the buret valve.
5. Check the buret scale to see how much oil has been used to fill the combustion chamber. From the total amount, subtract 2.2 cc. Compare the findings with the chart.

■ **NOTE:** The above procedure will work fine on a new engine. Engines with many hours of use, may require a small change in the procedure. In step 3, remove the cylinder head. Wipe a small amount of heavy grease around the outer diameter of the piston to seal space between the piston and cylinder bore. Replace head and tighten to specification; then continue with steps 4 and 5.

CYLINDER HEAD VOLUME (FLAT PLATE METHOD)

The third method of checking for proper combustion chamber volume will require a 1/8 in. or 3/16 in. thick piece of plexiglass, some heavy grease, and a buret.

The plexiglass piece must be flat and also large enough to cover the entire gasket surface of the cylinder head. Using a 3/16 in. drill bit, drill two holes through the plexiglass piece. Locate the holes one inch apart inside the combustion chamber area (towards center of piece).

1. Remove the cylinder head from the engine. Clean all carbon from the combustion chamber area.
2. Position the cylinder head squarely in a vise with its gasket surface up. Leave the spark plug in place and grip the metal portion of the spark plug for holding the cylinder head.
3. Apply a light coat of grease to the gasket surface of the head. Squeeze the piece of plexiglass firmly down onto the gasket surface. The grease will act as a sealant between the two pieces.
4. Using a buret filled with light oil, fill the combustion chamber through either of the two holes drilled in the plexiglass. Continue to fill the combustion chamber until the fluid appears at the bottom of the second hole. Stop filling procedure and take a reading off the buret as to how much fluid was used. The specification found in the chart includes the spark plug volume, so there won't be any need to subtract from the reading.

CYLINDER HEAD VOLUME SPECIFICATIONS

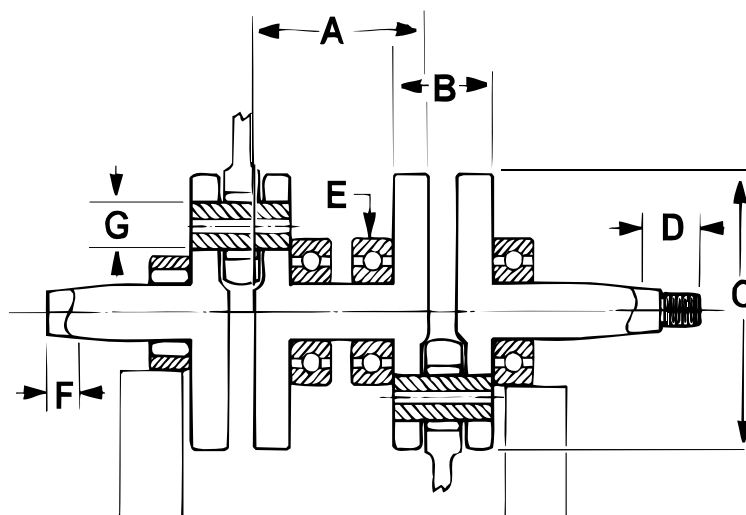
ENGINE TYPE		SQUISH - GAP		HEAD INSTALLED VOLUME (CC)	FLAT PLATE VOLUME (CC)
340 cc	1990-2000	mm in.	1.70 - 2.99 .067 - .118	16.6 - 20.1	19.5
370 cc	1999-2000	mm in.	2.27 - 2.95 .089 - .116	19.1 - 22.0	24.3 - 25.1
440 cc	1999 Z	mm in.	.91 - 2.2 .036 - .087	20.5 - 25.8	24.9
440 cc F/C	1984-2000	mm in.	1.39 - 1.87 .055 - .074	20.4 - 26.4	25.2
440 cc F/C	2000 Z (Sno-Pro)	mm in.	2.3 .090	17.8 - 19.4	24.2
500 cc F/C	1985-1990 Cougar	mm in.	1.67 - 2.79 .066 - .110	24.5 - 30.6	28.8
440 cc L/C (L/W)	1990 Pantera, Prowler 1992-1991 Cougar, Cheetah Touring	mm in.	1.32 - 2.15 .052 - .085	23.6	27
440 cc L/C (STD)	1989 El Tigre, Pantera	mm in.	1.19 - 2.00 .047 - .079	16.0 - 20.2	21.9
530 cc (DT)	1990-91 El Tigre EXT	mm in.	1.42 - 2.15 .056 - .085	26.8	33
530 cc	1986-1989 El Tigre 6000	mm in.	1.49 - 1.98 .059 - .078	21.3 - 22.8	30.5
650 cc	1988-1990	mm in.	1.52 - 1.98 .060 - .078	27.7 - 29.5	39.3
700 cc	1991-1995 (Carb) 1999-2000	mm in.	1.76 - 2.32 .069 - .091	29.6 - 33.4	43.2
700 cc	1991-1996 (EFI)	mm in.	1.93 - 2.18 .076 - .086	32.4 - 35.7	45.6
440 cc L/C (L/W)	1996 Jag, Panther 1997-1999 ZL	mm in.	1.29 - 2.15 .051 - .084	21.2	25.7
440 cc L/C (L/W)	1991-1993 Prowler Special	mm in.	1.52 - 2.15 .060 - .085	20.4	26.3
440 cc (L/W)	1991-1992 Prowler, Pantera 1993 Prowler, 1993-94 Cougar	mm in.	1.29 - 2.13 .051 - .084	21.2	25.7
550 cc	1993-2000	mm in.	1.52 - 2.00 .060 - .079	27.7 - 29.9	33.7 - 34.7
580 cc	1993-2000	mm in.	1.47 - 2.01 .057 - .079	25.3	35.5
900 cc	1993-1997 Thundercat	mm in.	1.78 - 2.15 .070 - .085	23.3 - 28.5	36.4
440 cc L/C (L/W)	1994 Prowler EFI	mm in.	1.29 - 2.15 .051 - .084	21.2	25.7
440 cc L/C	1994 ZR	mm in.	1.52 - 2.16 .060 - .085	20.4	26.3
800 cc	1995-2000	mm in.	1.46 - 2.01 .057 - .079	22.4	31.3
600 cc	1995-2000 (Triple)	mm in.	1.00 - 1.59 .039 - .062	17.4 - 19.5	18.5
440 cc	1997 ZR	mm in.	.94 - 1.67 .037 - .066	16 - 18	17.2
440 cc	1995-1996 ZR	mm in.	1.52 .060	17.7 - 19.7	15.7 - 17.7
440 cc	1998 ZR (Consumer Model)	mm in.	1.09 - 1.82 .043 - .072	16.6 - 18.6	17.8
500 cc	1998 -2000 (Twin)	mm in.	1.3 .051	19.4 - 21.9	20.8
600 cc	1998 -2000 (Twin)	mm in.	1.48 .058	26.9 - 29.6	28.4
1000 cc	1998 - 2000	mm in.	1.99 .078	28.4 - 31.7	37.7

■ **NOTE:** For accurate reading when using the head installed volume method, subtract 2.2 cc from the total amount of fluid used.

CAUTION

The above specifications are not intended to be used for engine modification. Reducing the head volume to the smaller specification could cause piston detonation problems which is not a warranty situation.

CRANKSHAFT RUNOUT SPECIFICATIONS

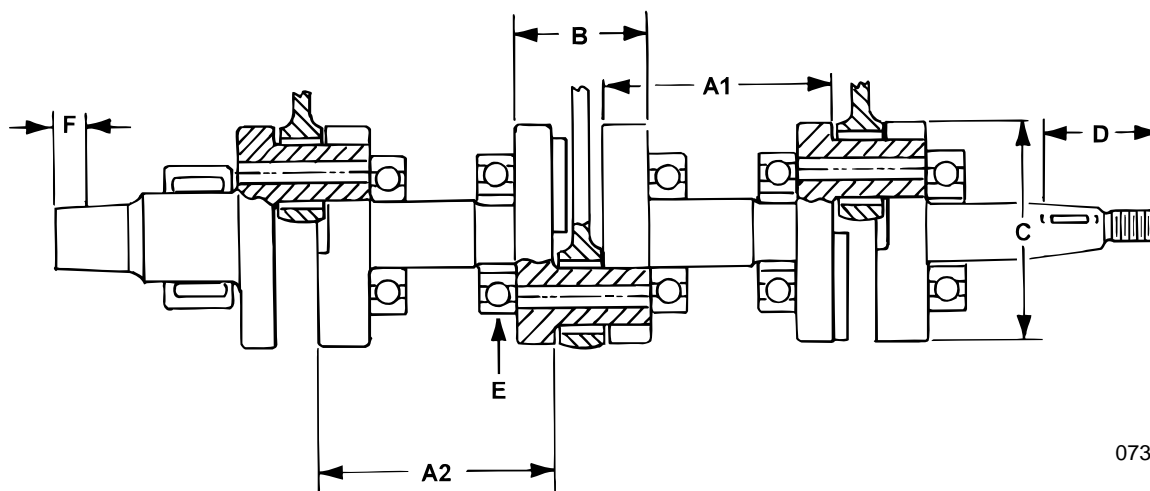


728-144A

Model	Bore X Stroke	A	B	C	G	Runout D, E, F Point	
370 F/C* 440 F/C-CI AF44A AK44A	mm (in.)	60 X 65* 65 X 65	100 ± 0.15 (3.937 ± 0.0006)	55 ± 0.15 (2.165 ± 0.006)	100 (3.937)	22 (.866)	(± .002)
							D 35 (1.377)
							F 22 (.866)
550 L/C-E AH50L	mm (in.)	70 X 65	103 ± 0.02 (4.055 ± 0.0007)	60 ± 0.02 (2.362 ± 0.0007)	102 (4.015)	24 (.944)	(± .002)
							D 30 (1.181)
							F 10 (.393)
60 F/C AA06A	mm (in.)	41 X 45	— —	34 ± 0.02 (1.339 ± 0.001)	74 (2.913)	16 (.629)	(± .002)
							D 32.5 (1.279)
							F 26 (1.023)
340 F/C-CI AF34A	mm (in.)	60 X 60	93 ± 0.15 (3.661 ± 0.006)	53 ± 0.15 (2.087 ± 0.006)	94 (3.701)	22 (.866)	(± .002)
							D 35 (1.377)
							F 15 (.590)
500 F/C-CCI AL50A	mm (in.)	70 X 65	103 ± 0.02 (4.055 ± .0007)	55 ± 0.02 (2.165 ± 0.0007)	100 (3.937)	22 (.866)	(± .002)
							D 35 (1.377)
							F 15 (.590)
500 F/C-E AM50A	mm (in.)	70 X 65	103 ± 0.02 (4.055 ± .0007)	55 ± 0.02 (2.165 ± 0.0007)	100 (3.937)	22 (.866)	(± .002)
							D 35 (1.377)
							F 15 (.590)
440 L/C-CI AH44L	mm (in.)	68 X 60	103 ± 0.02 (4.055 ± .0007)	60 ± 0.2 (2.362 ± 0.007)	102 (4.015)	24 (.944)	(± .002)
							D 30 (1.181)
							F 10 (.393)
530 L/C AA53L	mm (in.)	72 X 65	103 ± 0.02 (4.055 ± 0.008)	60 ± 0.2 (2.362 ± 0.008)	102 (4.015)	24 (.945)	(± .002)
							D 30 (1.181)
							F 10 (.393)
650 L/C 700 L/C*	mm (in.)	78 X 68 81 X 68*	130 ± 0.15 (5.118 ± .006)	64 ± 0.15 (2.520 ± 0.006)	116 ± 0.2 (4.567 ± 0.007)	28 (1.102)	(± .002)
							D 35 (1.377)
							F 15 (.590)
440 L/C-LW AJ44L	mm (in.)	68 X 60	108.5 ± 0.15 (4.271 ± 0.006)	55 ± 0.15 (2.165 ± 0.006)	95 ± 0.4 (3.740 ± .015)	22 (.866)	(± .002)
							D 30.5 (1.200)
							F 10 (.393)
550 L/C 580 L/C	mm (in.)	73.4 X 65	112.5 ± 0.15 (4.409 ± 0.006)	60 ± 0.15 (2.362 ± 0.006)	106 (4.174)	26 (1.024)	(± .002)
							D 30 (1.181)
							F 5 (.197)
440 L/C-LWR	mm (in.)	68 X 60	109.5 ± 0.15 (4.311 ± 0.006)	60 ± 0.15 (2.362 ± 0.006)	106 (4.173)	24 (0.945)	(± .002)
							D 30 (1.181)
							F 5 (.197)
440 L/C-ZR AR44L1	mm (in.)	66.5 X 63	114 ± 0.16 (4.48 ± 0.006)	66.5 ± 0.15 (2.62 ± 0.006)	106 (4.173)	26 (1.024)	(± .002)
							D 30 (1.181)
							F 5 (.197)
500 L/C 600 L/C*	mm (in.)	71 X 62.7 78 X 62.7*	114 ± 0.15 (4.88 ± 0.006)	66.5 ± 0.15 (2.62 ± 0.006)	105.8 - 106 (4.165 - 4.173)	30 (1.2)	(± .002)
							D 30 (1.181)
							F 5 (.197)

NOTE: Measure in from the shaft end the specified amount when checking runout at points D-F. When checking runout in the center, place indicator on center of bearing as shown at Point E. Maximum runout at any of the 3 measuring points is ±0.05 mm (0.002 in.).

CRANKSHAFT RUNOUT SPECIFICATIONS (cont)



0731-579

Model	Bore X Stroke	A	B	C	G	Runout D, E, F Point	
600 L/C (Triple Cyl)	mm (in.)	66.5 X 57	A1 102.8 ± 0.15 (4.047 ± 0.006) A2 105.3 ± 0.15 (4.145 ± 0.006)	58 ± 0.15 (2.303 ± 0.006)	99 ± 0.15 (3.897 ± 0.006)	26 (1.023)	(± .002)
							D 30 (1.181)
							F 15 (.590)
800 L/C	mm (in.)	72 X 65	A1 & A2 124.4 ± 0.015 (4.897 ± 0.006)	64 ± 0.15 (2.519 ± 0.006)	112 ± 0.15 (4.409 ± 0.006)	30 (1.181)	(± .002)
							D 5 (.197)
							F 15 (.590)
900 L/C	mm (in.)	76 X 65	A1 & A2 124.4 ± 0.15 (4.897 ± 0.006)	64 ± 0.15 (2.519 ± 0.006)	112 ± 0.15 (4.409 ± 0.006)	30 (1.181)	(± .002)
							D 5 (.197)
							F 15 (.590)
1000 L/C	mm (in.)	81 X 64.6	124.4 ± 0.15 (4.900 ± 0.006)	64 ± 0.15 (2.520 ± 0.006)	111.8 - 112 (4.402 - 4.409)	26 (1.0236)	(± .002)
							D 30 (1.181)
							F 5 (0.197)

■ **NOTE:** Measure in from the shaft end the specified amount when checking runout at points D-F. When checking runout in the center, place indicator on center of bearing as shown at Point E. Maximum runout at any of the 3 measuring points is ±0.05 mm (0.002 in.).

CRANKSHAFT REPAIR

For those who have crankshaft work sent out to another shop, it is advisable to provide them with this information.

To use the specifications on pages 6-5 and 6-6, first refer to the drawing. Find the letter which indicates the specification and then refer to the chart below the illustration. Be sure to note the proper engine column. Specifications are called out in both millimeters and inches.

■ **NOTE:** For the past several years, we have always given the proper location for checking crankshaft runout as the very edge of the straight portion of the shaft where the oil seal makes contact. From the drawings on the pages 6-5 and 6-6, note that Suzuki has called out three check points: At either end, out on the taper as shown, and also on the center bearing race. The crankshaft is still supported on the outer bearings using V blocks. The maximum runout shouldn't exceed 0.05 mm (0.002 in.).

■ **NOTE:** Engines that have a crankshaft failure during the warranty period must have the crankshaft replaced and not repaired.

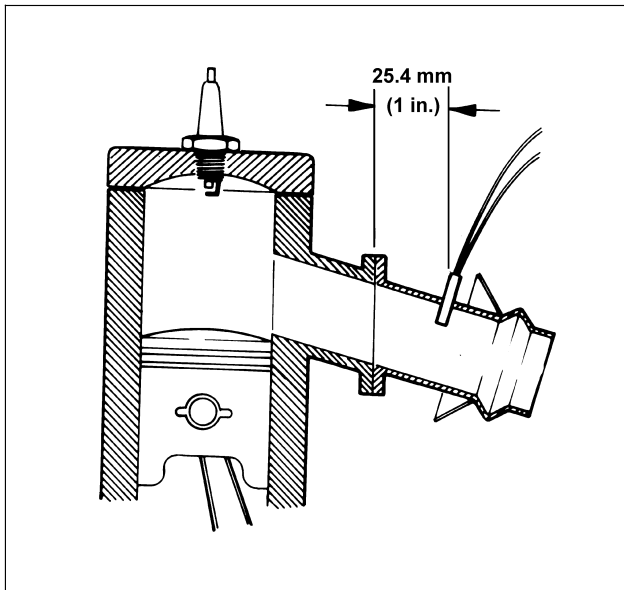
EXHAUST GAS TEMPERATURE

MODEL	PROBE LOCATION**		NORMAL		PRE-IGNITION	
	in.	mm	°F	°C	°F	°C
Wildcat (89-96), ZR 700 (94-95, 99-2000) Powder Special 700 (99-2000)	1**	25.4	1120	604	1180	638
El Tigre 6000 (87-89)	1**	25.4	1200	649	1300	705
El Tigre EXT (90-91)	1**	25.4	1160	627	1250	677
El Tigre EXT (89)	1**	25.4	1105	596	1200	649
Prowler (90-94)	1**	25.4	1150	621	1250	677
Pantera (90-92)	1**	25.4	1150	621	1250	677
EXT 550 EFI (93), Prowler (95), Pantera (93-94)	1**	25.4	1150	621	1250	677
Jag Z (92-94), Z 440 (95-2000), Bearcat 440 (95-2000)	1**	25.4	1086	586	1100	593
Prowler Special (91-92), ZR 440 (94-98)	1**	25.4	1150	621	1250	677
Jag 440 (86-89)	1**	25.4	1112	600	1200	649
Cougar (88-90)	1**	25.4	1230	666	1250	677
Cougar (91-94), ZL 440 (97-2000) Jag & Panther L/C (96)	1**	25.4	1150	621	1250	677
Panther (88)	1**	25.4	1230	666	1300	705
EXT 550 (91-93), Bearcat 550 (95-2000), Cougar (95-98), Cheetah 550 (94), Panther 550 (99-2000)	1**	25.4	1150	621	1250	677
Jag 440 F/C (90-2000)	1**	25.4	1150	621	1250	677
Panther 440 F/C (89-2000)	1**	25.4	1150	621	1250	677
EXT 580 Z (93), ZR 580 (94-97), EXT 580 (95-98), Pantera 580 (95-2000)	1**	25.4	1150	621	1250	677
Thundercat 900 (93-97), ZRT 800 (95-2000), Pantera 800 (99-2000)	5**	127	1230	666	1300	705
ZRT 600 (95-2000) (3 cyl), Triple Touring 600 (99-2000)	2.5**	63.5	1200	649	1350	732
ZL 500 (98-2000), ZR 500 (98-2000), Powder Special 500 (99-2000)	3.937*	100*	1055	568	1100	593
Powder Special 600 (99-2000), ZL 600 (99-2000), ZR 600 (98-2000)	3.937*	100*	1115	602	1200	649
Thundercat 1000 (98-2000)	3.937*	100*	1175	635	1250	677
Z 370 (99-2000)	1**	25.4	1086	586	1100	593

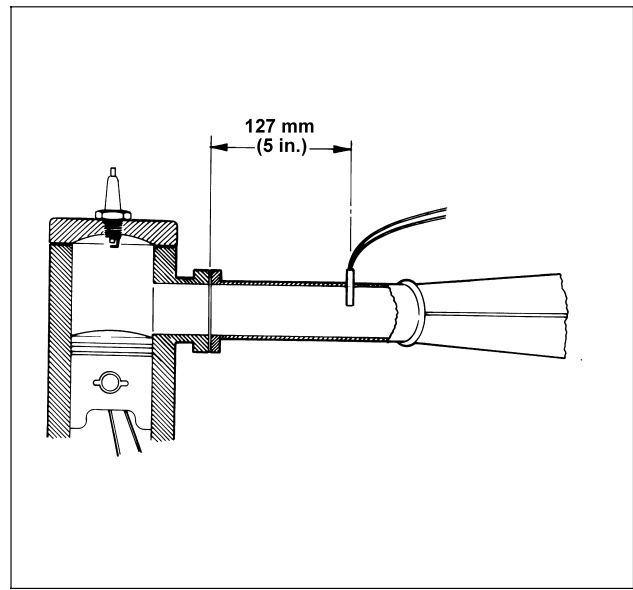
* Measuring from the piston skirt out.

** Probe location measured down the exhaust manifold from the gasket surface of the flange.

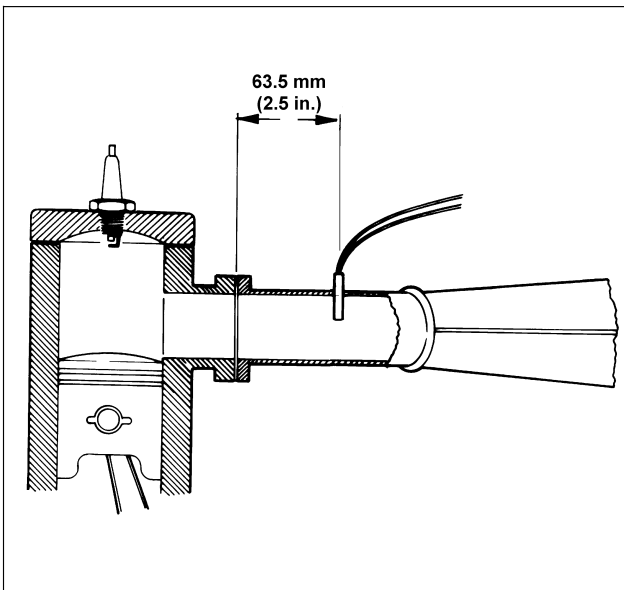
EXHAUST GAS TEMPERATURE PROBE LOCATION



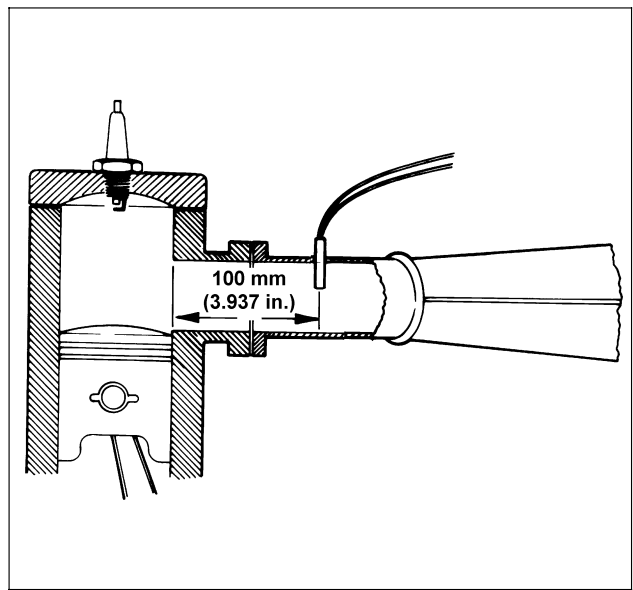
0730-217



0730-216



730-216A



730-216B

■ **NOTE:** Refer to Exhaust Gas Temperature chart (page 2-145) for specific MODEL designation and PROBE LOCATION specifications.