KOHLER engines

SERVICE MANUAL
OHC 16,18 HP
Horizontal Crankshaft

OHC

Crankshaft (Cont.)

Flywheel End Main Bearing Journal

O.D. - New	45.021/45.041 mm (1.7725/1.7735 in.)
O.D. - Max. Wear Limit	44.95 mm (1.7696 in.)
Max. Taper	0.02 mm (0.0008 in.)
Max. Out-of-Round	0.02 mm (0.0008 in.)

PTO End Main Bearing Journal

O.D. - New	45.021/45.041 mm (1.6107/1.6116 in.)
O.D. - Max. Wear Limit	44.95 mm (1.7696 in.)
Max. Taper	0.02 mm (0.0008 in.)
Max. Out-of-Round	0.02 mm (0.0008 in.)

Connecting Rod Journal

O.D. - New	31.948/31.966 mm (1.2578/1.2585 in.)
O.D. - Max. Wear Limit	31.93 mm (1.2571 in.)
Max. Taper	0.02 mm (0.0008 in.)
Max. Out-of-Round	0.02 mm (0.0008 in.)

Crankshaft T.I.R.

PTO End, Crank in Engine	0.015 mm (0.0006 in.)
Entire Crank, in V-Blocks	0.010 mm (0.0004 in.)

Cylinder Bore

Cylinder Bore I.D.

New	
TH16	73.006/73.031 mm (2.8742/2.8752 in.)
TH18	75.025/75.050 mm (2.9537/2.9547 in.)
Max. Wear Limit	
TH16	73.07 mm (2.8767 in.)
TH18	75.09 mm (2.9563 in.)
Max. Out-of-Round	0.13 mm (0.005 in.)
Max. Taper	0.13 mm (0.005 in.)

Electric Starter

Starter Mounting Fastener Torque	7.9 N·m (70 in. lb.)

Timing Belt

Belt Tensioner Mounting Screw Torque	7.3 N·m (65 in. lb.)
Belt Tension Torque	3.4/4.5 N·m (30/40 in. lb.)

Fan/Flywheel

Fan Fastener Torque	9.9 N·m (88 in. lb.)
Flywheel Retaining Screw Torque	66.4 N·m (49 ft. lb.)

Governor

Governor Cross Shaft to Crankcase

Running Clearance	0.013/0.075 mm (0.0005/0.0030 in.)

Governor Cross Shaft O.D.

New	7.975/8.012 mm (0.3140/0.3154 in.)
Max. Wear Limit	7.96 mm (0.3134 in.)

Cylinder Leakdown Test

A cylinder leakdown test can be a valuable alternative to a compression test. By pressurizing the combustion chamber from an external air source, you can determine if the valves or rings are leaking, and how badly.

Kohler Part No. 25 761 05 is a relatively simple, inexpensive leakdown tester for small engines. The tester includes a quick disconnect for attaching the adapter hose, and a holding tool.

Leakdown Test Instructions

1. Run engine for 3-5 minutes to warm it up.
2. Remove spark plug(s) and air filter from engine.
3. Rotate crankshaft until piston (of cylinder being tested) is at top dead center of compression stroke. You will need to hold the engine in this position while testing. The holding tool supplied with the tester can be used if the PTO end of the crankshaft is accessible. Slide the holding tool onto the crankshaft and adjust the set screw to fit in the key slot. Install a 3/8" breaker bar into the square hole of the holding tool, so it is perpendicular to both the holding tool and crankshaft PTO. If the flywheel end is more accessible, you can use a breaker bar and socket on the flywheel nut/screw to hold it in position. You may need an assistant to hold the breaker bar during testing. If the engine is mounted in a piece of equipment, you may be able to hold it by clamping or wedging a driven component. Just be certain that the engine cannot rotate off of TDC in either direction.
4. Install the adapter into the spark plug hole, but do not attach it to the tester at this time.
5. Connect an air source of at least 50 psi to the tester.
6. Turn the regulator knob in the increase (clockwise) direction until the gauge needle is in the yellow "set" area at the low end of the scale.
7. Connect tester quick-disconnect to the adapter hose while firmly holding the engine at TDC. Note the gauge reading and listen for escaping air at the carburetor intake, exhaust outlet, and crankcase breather.
8. Check your test results against the table below:

Leakdown Test Results

Air escaping from crankcase breather	Defective rings or worn cylinder walls.
Air escaping from exhaust system	Defective exhaust valve.
Air escaping from carburetor	Defective intake valve.
Gauge reading below 25% leakage	Piston rings and cylinder in good condition.
Gauge reading 25% - 50% leakage	Engine is still usable, but there is some wear present. Customer should start planning for overhaul or replacement.
Gauge reading above 50% leakage	Rings and/or cylinder have considerable wear. Engine should be reconditioned or replaced.

Fuel Shut-off Solenoid

Some carburetors are equipped with an optional fuel shut-off solenoid. The solenoid is installed in place of the bowl retaining screw. The solenoid has a spring-loaded pin that retracts when 12 volt current is applied to the lead. The pin blocks the main fuel jet and prevents fuel from entering the carburetor when it is extended.

Below is a simple test made with the engine off that can determine if the solenoid is functioning properly:

1. Shut off the fuel and remove the solenoid from the carburetor. When the solenoid is loosened and removed, gas will leak out of the carburetor. Have a container ready to catch the fuel.

2. Attach a wire between the solenoid ground lead terminal and a battery ground with alligator clips.

⚠ CAUTION
Do this test away from any fuel/vapors to prevent an accident.

3. Insert a bare 1/4" male spade terminal into the terminal end of the power lead. Touch the exposed terminal to the positive (+) post of the battery.

4. If pin retracts, the solenoid is good.

Adjustments

General

The carburetor is designed to deliver the correct fuel-to-air mixture to the engine under all operating conditions. Fuel mixture settings are set at the factory and are not adjustable.

NOTE: Carburetor speed adjustment should be made only after the engine has warmed up.

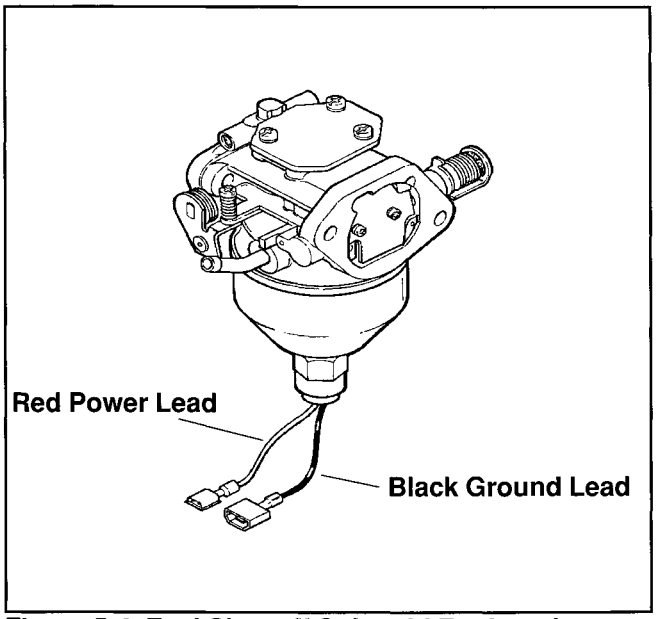


Figure 5-4. Fuel Shut-off Solenoid Equipped Carburetor.

Low Idle Speed Adjusting Screw

To adjust the carburetor idle speed, see Figure 5-5 and follow these steps:

1. Start the engine and run at half throttle for 5 to 10 minutes to warm up. The engine must be warm before making final settings. Check that the throttle and choke plates can fully open.

   NOTE: The carburetor has a self-relieving choke. Choke plate and shaft assembly is spring loaded. Check to make sure plate moves freely and is not binding and affecting idle fuel delivery.

Section 7
Retractable Starter

WARNING: Spring Under Tension!
Retractable starters contain a powerful, recoil spring that is under tension. Always wear safety goggles when servicing retractable starters and carefully follow instructions in this section for relieving spring tension.

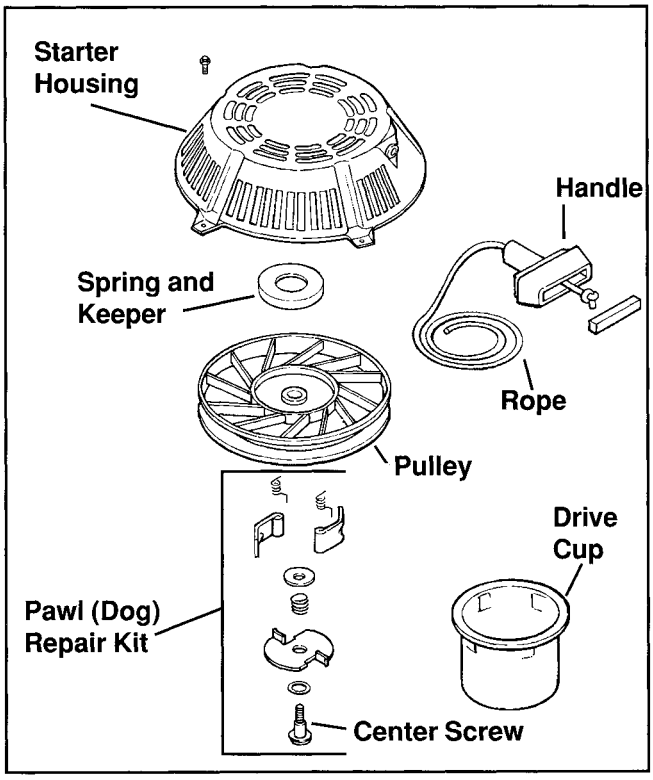


Figure 7-1. Retractable Starter – Exploded View.

To Remove Starter

1. Remove the five hex. flange screws securing the starter to blower housing. See Figure 7-2.

2. Remove the starter.

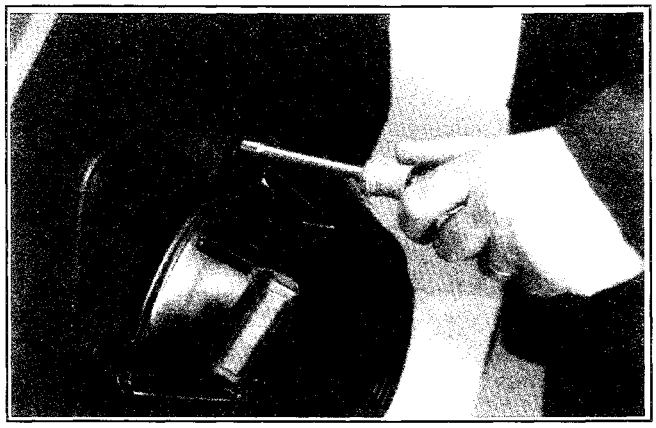


Figure 7-2. Removing Retractable Starter.

To Install Starter

1. Install the retractable starter and five hex. flange screws to blower housing. Leave the screws slightly loose.

2. Pull the starter handle out until the pawls engage in the drive cup. Hold the handle in this position and tighten the screws securely.

Rope Replacement

The rope can be replaced *without* complete starter disassembly.

1. Remove the starter from the engine blower housing.

2. Pull the rope out approximately 12" and tie a temporary (slip) knot in it to keep it from retracting into the starter. See Figure 7-3.

Troubleshooting CD Ignition Systems

The CD ignition systems are designed to be trouble free for the life of the engine. Other than periodically checking/replacing the spark plugs, no maintenance or timing adjustments are necessary or possible. Mechanical systems do occasionally fail or break down, however, so the following troubleshooting information is provided to help you get to the root of a reported problem.

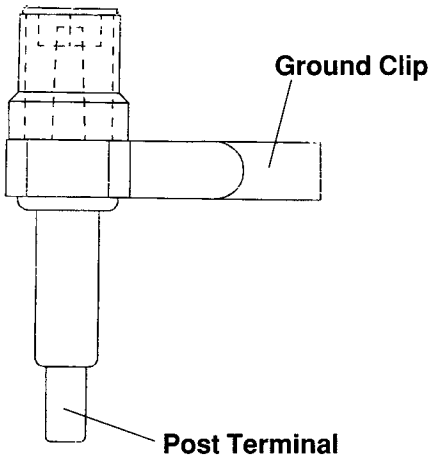
WARNING: Electrical Shock!

Never touch electrical wires or components while the engine is running. They can be sources of electrical shock.

Reported ignition problems are most often due to poor connections. Before beginning the test procedure, check all external wiring. Be certain all ignition-related wires are connected, including the spark plug leads. Be certain all terminal connections fit snugly. Make sure the ignition switch is in the run position.

NOTE: The CD ignition systems are sensitive to excessive load on the kill lead. If a customer complains of hard starting, low power, or misfire under load, it may be due to excessive draw on the kill circuit. Disconnect any auxiliary kill wires or safety switches connected to the kill circuit and operate the engine to determine if the reported problem is gone.

Testing Procedure

Test	Conclusion
1. Test for spark on both cylinders with Kohler ignition tester, Part No. 24 455 02. Disconnect one spark plug lead and connect it to the post terminal of the tester. Connect the clip to a good ground, **not** to the spark plug. Crank the engine and observe the tester spark gap. Repeat the procedure on the other cylinder. Remember to reconnect the first spark plug lead.  	1. If one side is not firing, check all wiring, connections, and terminations on that side. If wiring is okay, replace ignition module and retest for spark. If the tester shows spark, but the engine misses or won't run on that cylinder, try a new spark plug. If neither side is firing, check for shorted kill lead, or faulty ignition switch.

3. Install the drive end cap over the drive shaft. Make sure the match marks on the end cap and starter frame are aligned. See Figure 8-17. The small notch in the edge of the end cap, adjacent to the match mark, will engage a small tang inside the end of the starter frame.

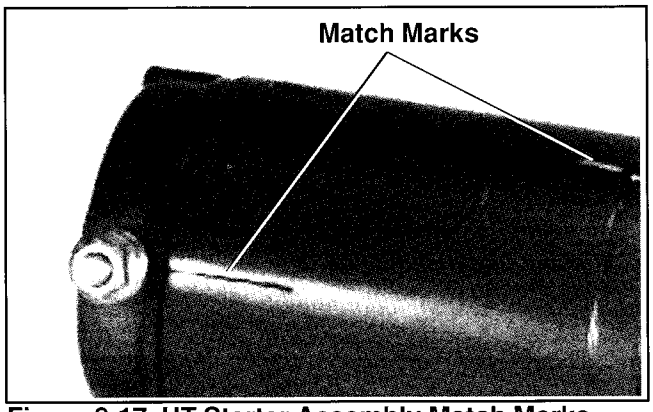


Figure 8-17. UT Starter Assembly Match Marks.

4. Install the brush holder tool to keep the brushes in the pockets of the commutator end cap.

5. Align the terminal stud on the commutator end cap with the long scribe mark on the starter frame. Hold the drive end and commutator end caps firmly to the starter frame. Remove the brush holder tool.

6. Install the thru bolts and tighten securely.

7. Lubricate the drive shaft with Kohler electric starter drive lubricant. Install the drive pinion, dust cover spacer, anti-drift spring, spring retainer, retaining ring, and dust cover. Refer to "UT Starter Drive Service" on page 8.13.

Solenoid Shift Electric Starter

This subsection covers the solenoid shift electric starter. Much of the information in the preceding subsection relates to this starter, therefore it is not repeated here. Please use the exploded view (Figure 8-18) for reference during the disassembly and assembly procedure.

Operation

When power is applied to the starter, the electric solenoid moves the drive pinion out onto the drive shaft and into mesh with the flywheel ring gear. When the pinion reaches the end of the drive shaft it rotates the flywheel and cranks the engine.

When the engine starts and the start switch is released the starter solenoid is deactivated, the drive lever moves back, and the drive pinion moves out of mesh with the ring gear into the retracted position.

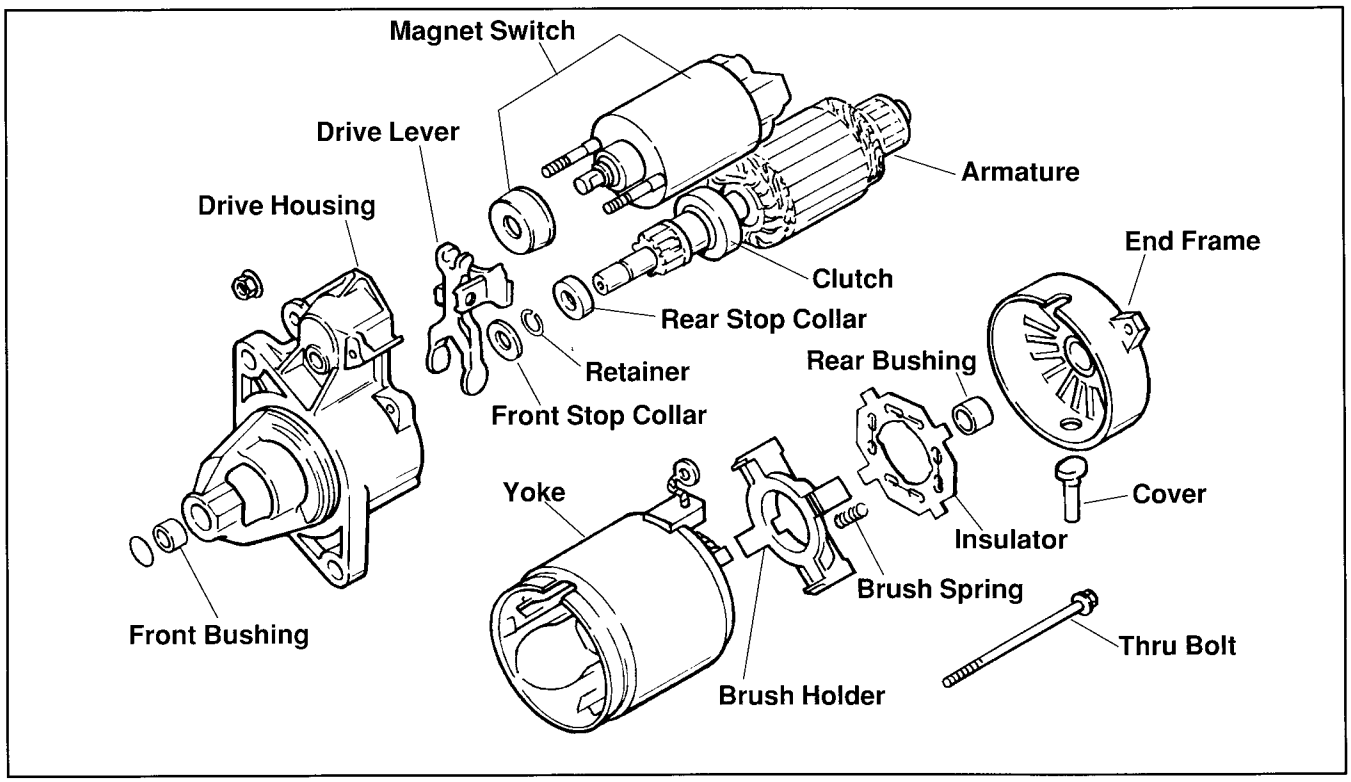


Figure 8-18. Exploded View of Solenoid Shift Starter.

Remove Electric Starter

1. If the engine is equipped with a cranking solenoid, disconnect all leads, remove the two hex. flange mounting screws, and remove the solenoid. See Figure 9-11.

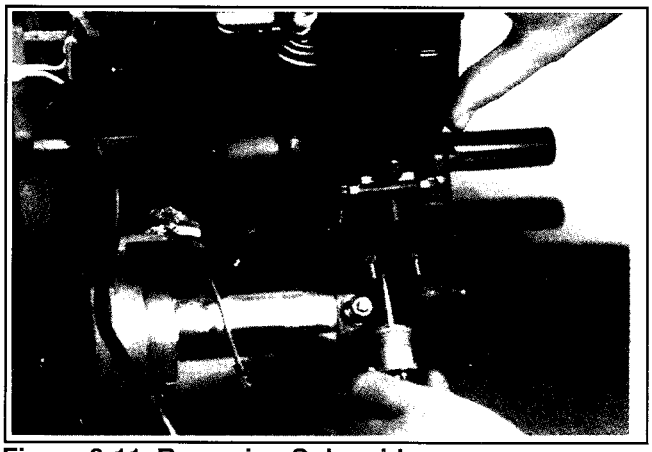


Figure 9-11. Removing Solenoid.

2. The starter thru bolts are also the mounting bolts. Tape the end caps to the frame to prevent them from separating when the bolts are loosened.

3. Remove the top 3/8" mounting screw as shown in Figure 9-12.

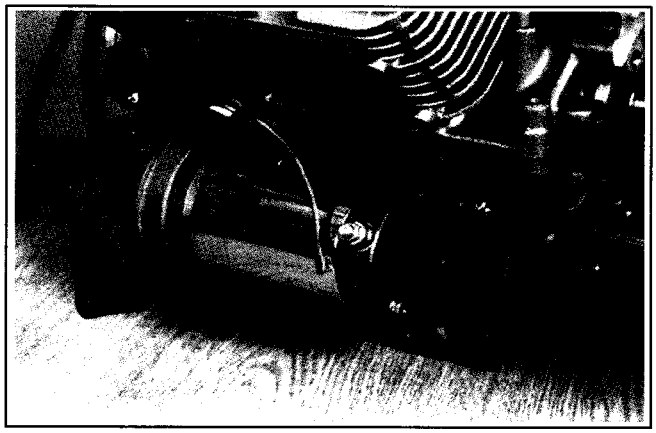


Figure 9-12. Removing Starting Motor.

4. Loosen the bottom 3/8" mounting screw just enough to remove the starting motor. Do not completely remove the mounting screw from starter.

Remove Side Baffles

1. Remove the single screw holding the side baffle to the #2 cylinder and remove the baffle. See Figure 9-13.

Figure 9-13. Removing #2 Side Baffle.

2. To remove the #1 side baffle, loosen the two screws holding the wire connector and slide the connector off.

3. Remove the side baffle from the #1 cylinder. See Figure 9-14.

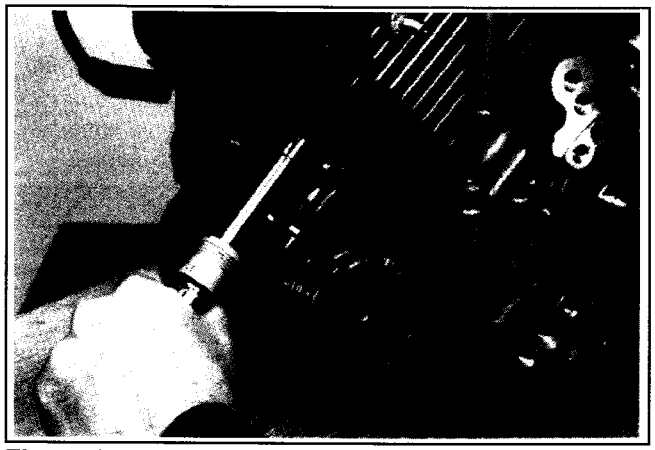


Figure 9-14. Removing #1 Side Baffle.

Remove Ignition Modules

1. Turn the flywheel magnet away from the ignition modules.

2. Disconnect the white "kill" leads.

Remove Crankshaft

1. Lift the crankshaft assembly straight up out of the crankcase half. See Figure 9-54.

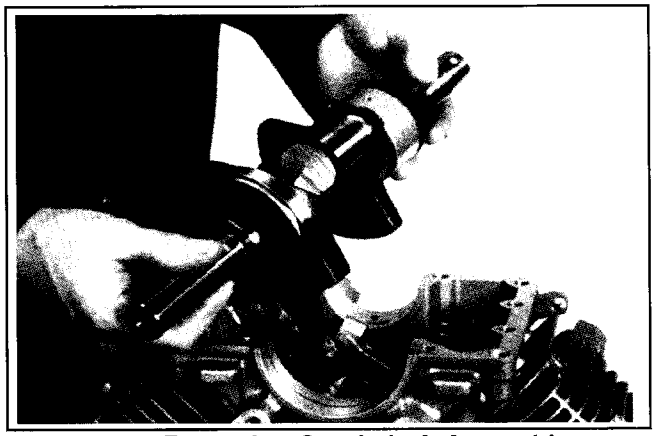


Figure 9-54. Removing Crankshaft Assembly.

2. Place crankshaft on workbench for further disassembly.

3. Loosely reassemble rod caps to the correct connecting rod to keep them as sets.

Crankshaft Disassembly

1. The belt drive sprocket has a low interference fit onto the crankshaft. If it will not slide off, heat the gear slightly with a propane torch until it expands and loosens, then remove it with a shop towel or glove. See Figure 9-55.

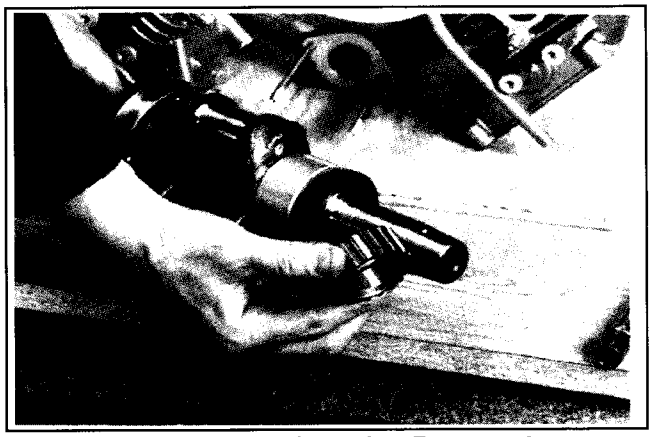


Figure 9-55. Belt Drive Sprocket Removed.

2. Use a pliers or side cutter to remove the sprocket key from the crankshaft.

3. Remove the oil seal and sleeve bearing from the front end of the crankshaft. Discard the oil seal. See Figure 9-56.

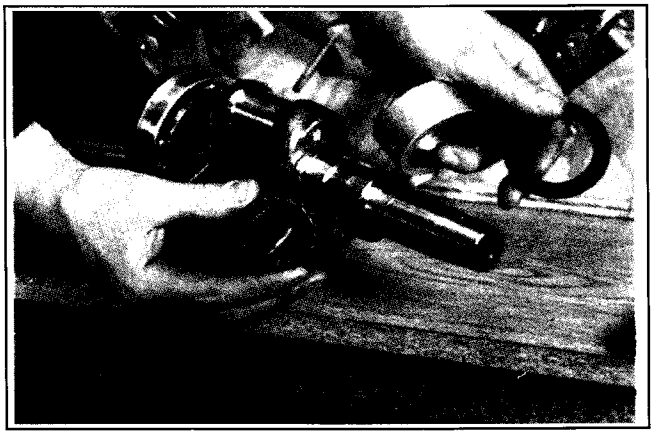


Figure 9-56. Sprocket, Oil Seal, and Sleeve Bearing Removed.

4. Remove the oil seal and ball bearing from PTO end of crankshaft. Use puller or press to remove bearing. TH18 engines have an additional snap ring on crankshaft to lock ball bearing in position. It must be removed to remove bearing. Discard the oil seal. See Figure 9-57.

   NOTE: Snap ring must stay on bearing.

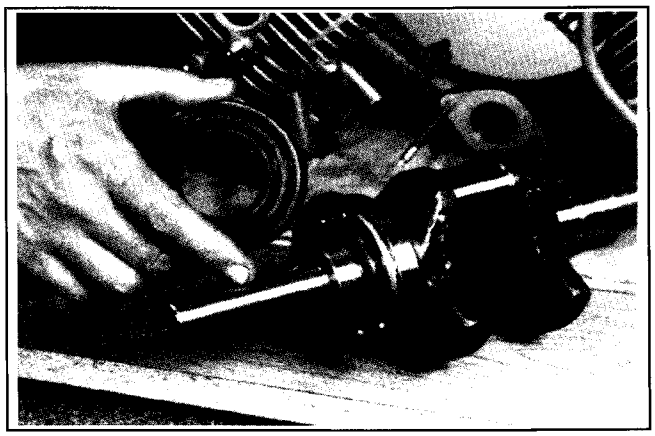


Figure 9-57. Oil Seal Removed From PTO End.

Ring failure is usually indicated by excessive oil consumption and blue exhaust smoke. When rings fail, oil is allowed to enter the combustion chamber where it is burned along with the fuel. High oil consumption can also occur when the piston ring end gap is incorrect because the ring cannot properly conform to the cylinder wall under this condition. Oil control is also lost when ring gaps are not staggered during installation.

When cylinder temperatures get too high, lacquer and varnish collect on the pistons causing the rings to stick, which results in rapid wear.

Scratches on the rings and pistons are caused by abrasive material such as carbon, dirt, or pieces of hard metal.

Detonation damage occurs when a portion of the fuel charge ignites spontaneously from heat and pressure shortly after ignition. This creates two flame fronts which meet and explode to create extreme hammering pressures on a specific area of the piston. Detonation generally occurs from using low octane fuels.

Preignition or ignition of the fuel charge before the timed spark can cause damage similar to detonation. Preignition damage is often more severe than detonation damage. Preignition is caused by a hot spot in the combustion chamber from sources such as: glowing carbon deposits, blocked fins, improperly seated valve, or wrong spark plug.

Replacement pistons are available in STD bore size only. Replacement pistons include new piston ring sets and new piston pins.

Service replacement piston ring sets are also available separately in STD bore size only. Always use new piston rings when installing pistons. **Never reuse old rings.**

Some important points to remember when servicing piston rings:

1. The bore must be deglazed before service ring sets are used. Use **only** a ball hone for deglazing or renewing crosshatch. Do not use any other type. Do not allow the balls to contact the combustion chamber surfaces.

2. If the bore is good, and the old piston is within wear limits and free of score or scuff marks, the old piston may be reused.

3. Remove old rings and clean up grooves. **Never reuse old rings.**

4. Before installing the rings on piston, place the top two rings, each in turn, in its running area in cylinder bore and check end gap (see Figure 10-9). Top ring end gap is **0.180/0.380 mm (0.0071/0.0150 in.)**. Middle ring end gap is **0.180/0.440 mm (0.0071/0.0173 in.)** for TH16 and **0.180/0.450 mm (0.0071/0.07177 in.)** for TH18.

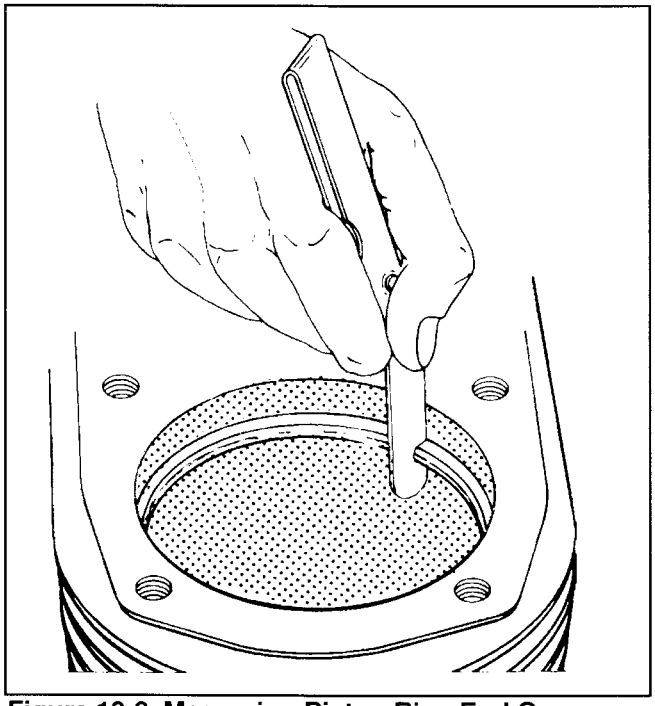


Figure 10-9. Measuring Piston Ring End Gap.

6. Lay a straight edge or surface plate vertically across the bosses on the PTO face of the crankcase to check alignment between the upper and lower halves. Tap or shift the lower half as necessary to bring it into correct alignment.

7. Torque all crankcase retaining fasteners to **24.4 N·m (216 in. lbs.)** in the sequence shown in Figure 11-13.

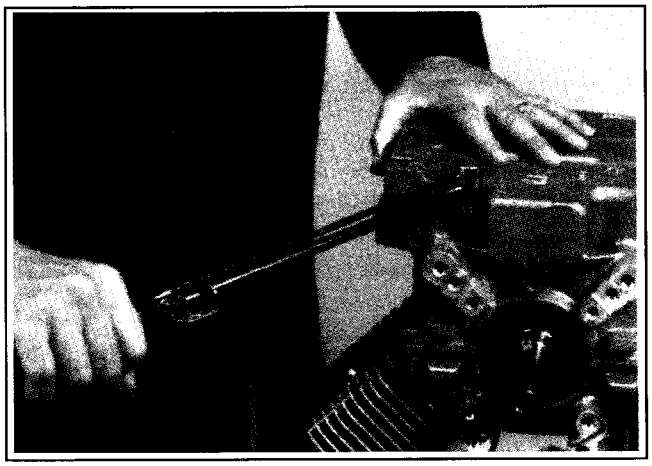


Figure 11-15. Tighten Crankcase Halves to Torque.

Stator Wire Routing

1. Route wiring so that leads are in 10 o'clock position. See Figure 11-16.

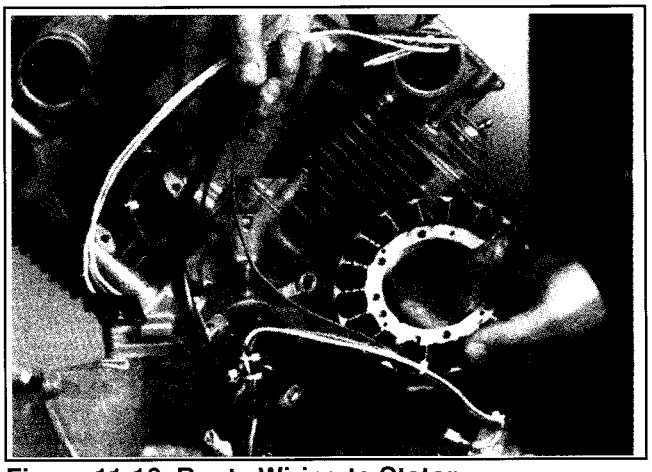


Figure 11-16. Route Wiring to Stator.

2. Install the two stator mounting screws but do not tighten them at this time. The stator will have to be removed later when installing the timing belt. See Figure 11-17.

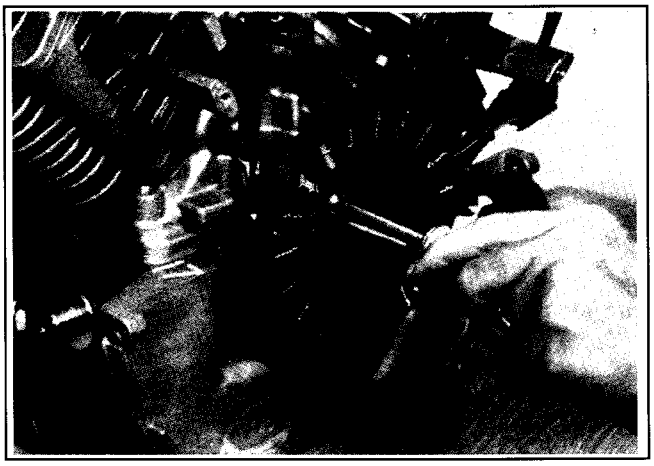


Figure 11-17. Loosely Install Stator Mounting Screws.

Install Crankcase Breather

1. Install a new breather grommet in crankcase. See Figure 11-18.

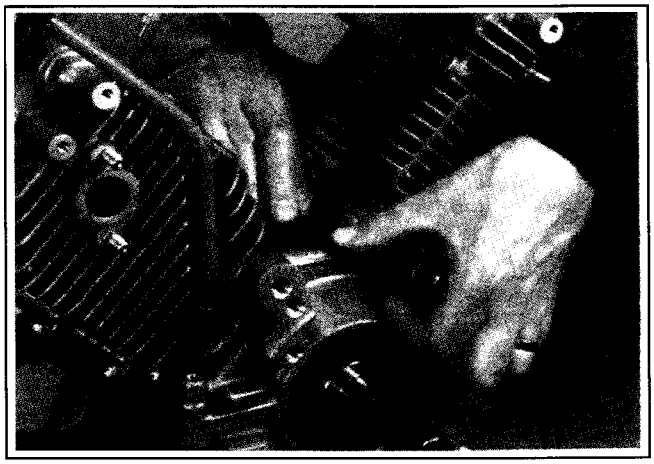


Figure 11-18. Installing New Grommet in Crankcase.

2. Install breather reed and reed retainer in breather housing and secure with hex. flange screw. Tighten screw to **4.0 N·m (35 in. lbs.)** torque. See Figure 11-19.