PISTON AND CYLINDER WALLS SCORING

Most instances of piston & cylinder scoring can be traced to lack of oil, use of improper oil - fuel mixture, foreign particles in cylinder, heating caused by plugged cooling fins, or excessive carbon build-up in the cylinder exhaust ports.

Piston A has been used in an engine which has a correct fuel-oil mixture. Note there is no sign of scoring, the rings are free in their grooves, and the top of the piston shows dark discoloration which is normal.

Piston B was also used in an engine with the correct fuel mixture, but was scored after a few minutes or possibly several hours of operation. The top of the piston is dark in color, which is normal. Also, a film of oil is found in the ring grooves and on the inside of the piston which further indicates proper fuel-oil mix. Note the scoring is isolated to a particular area on the piston skirt. Scoring is always adjacent to either the intake or exhaust ports. This resulted from small particles of metal breaking away from an intake or exhaust port. This type of failure is covered by warranty.

Piston C is heavily scored all around the skirt. This piston was run in an engine with a lack of lubrication. The light color on the top of the piston and lack of oil inside the piston and ring grooves indicates lack of oil. This is not covered by warranty.

Lack of lubrication scoring will not always result in light coloration of the piston dome as the engine may have been run for some time with sufficient lubrication and consequently, the piston dome will be dark in color and resemble one which has been operating on proper fuel mix.

Piston D is scored as a result of carbon build-up. Accumulation of carbon and other deposits on the piston skirt. Particles of carbon breaking away from the exhaust ports, lodging between the piston skirt and cylinder results in scoring the piston and/or cylinder. This is not covered by warranty.

In most cases, the rings will be partially or completely frozen within the ring grooves, and the piston will be discolored.

Carbon scoring usually results from the use of a low grade oil or an excessive amount of oil in the mix or a lack of care and maintenance which is owner’s responsibility.
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SAFETY WARNING
BEFORE PROCEEDING WITH DIS-ASSEMBLY, DISCONNECT SPARK PLUG LEAD TO PREVENT ACCIDENTAL STARTING OF ENGINE. ALSO DRAIN ALL FUEL FROM TANK INTO AN APPROVED SAFETY CONTAINER AND STORE IN A WELL VENTED AREA.

NOTE

Keep assemblies intact whenever possible in tear down. Observe assembly tips. Refer to Torque Reference Guide (Section 16) for correct torque settings during reassembly.

1. Move fuel valve to the “OFF” position. Remove shroud mounting screws. Raise shroud slightly and disconnect the fuel and primer hoses from carburetor. Next disconnect the 2 switch leads from the CD pack.

2. Remove starter pull handle. Hold starter pulley to prevent release of spring tension. Pull starter rope down and out of air baffle. Tie a slip knot in the rope, then let knot go in against the rope retainer.

3. Remove five Phillips screws securing air baffle. Remove air baffle.

4. Remove carburetor air cleaner cover and the filter element. Remove two Phillips screws securing carburetor and remove carburetor.

NOTE

When removing carburetor be careful not to damage the governor air vane assembly.
5. Remove spark plug. Install piston stop tool no. 677389. Rotate flywheel counter clockwise until piston comes up against the stop. This stop will allow easy removal of flywheel nut.


7. To remove flywheel; use a soft headed (plastic or rawhide) hammer and strike the top of a thick flywheel fin. At the same time apply upward pressure with your hand at point opposite where hammer strikes. Loosen flywheel as shown. Examine flywheel for damage. Check keyway and hub for distortion or cracking.

8. Remove flywheel key. Use a pair of diagonal pliers to roll key out of crankshaft keyway.

NOTE
Correct installation of key is important.
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9. Remove shroud base.

10. With an Allen wrench loosen the socket set screw securing the starter. Remove the starter.

11. Remove the CD module.

12. Use a socket wrench to remove the two cap screws securing the CD mounting bracket. Remove the CD mounting bracket.

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13. Using a 1/2" socket wrench remove the four capscrews holding the crankcase halves together.

14. Turn short block so the side with the alignment pin faces you. Place a wide bit screwdriver in the slot next to the pin. Carefully split the crankcase by twisting the screwdriver bit.

15. Remove connecting rod capscrews, lock plates and rod cap. Discard the lock plates, never reuse them. Remove connecting rod needle bearings. Count them, there should be 33 needles. If they are to be reused, inspect for damage, wear, scoring, overheating, etc.

16. Remove crankshaft, bearing and seal assemblies from crankcase. Remove bearings and seals from crankshaft. Discard seals, never reuse them.

Inspect main bearings for damage, wear, freedom of movement etc. Replace if questionable.

17. Remove piston and connecting rod assembly from cylinder.

**NOTE**

The top ring can fall off the piston during handling.

Remove both rings and inspect for wear damage or sticking. Always replace if they are questionable.

Thoroughly clean crankcase sealing surfaces with Lawn-Boy Engine Tuner Part No. 610738.
The intake plugs do not have to be removed. If removed, apply Lawn-Boy nut and screw lock Part No. 682301 to the outside surface of them. Use special tool #609964 to reinstall them.

The photo above illustrates the difference between the connecting rods from the "D" and "F" series engines. Note that the "D" series rod is slightly shorter than the "F" series connecting rod. These connecting rods are not interchangeable between the two engines.

The photo below illustrates the difference between the crankshafts from the "D" series engine and the "F" series engine. The crankshafts for the "D" series engine are longer than the crankshafts for the "F" series engines and are not interchangeable.

The photo below illustrates the difference between the piston and rings for the "D" and "F" series engines.

The ring grooves in the piston for the "F" series engine are closer to the top of the piston. The top ring...
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groove in the "F" series piston is narrower than the top groove in the "D" series piston. The piston and ring assemblies are not interchangeable.

The illustration below shows the principal of the pressure back top ring.

The illustration below compares the pressure back ring with a regular compression ring.

CHECKING REED ASSEMBLY

Exercise care in handling reeds, so as not to distort them. Bent or distorted reeds must be replaced.

NOTE

DO NOT USE COMPRESSED AIR TO CLEAN REED VALVES.

Check for excessive clearance between reed tip and reed seat. Maximum allowed clearance .015 inch. Use an "L" shaped wire type feeler gauge to check this clearance.

Reeds must be installed with rough edge away from seat.

In the reassembly of the connecting rod and cap, the mating marks have to be together. Also the dovetail ends of the liners have to be mated as shown below.

NOTE

If the connecting rod or liners are not assembled correctly, an engine failure will occur.

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With a pair of compression type pliers #303857 remove the wrist pin retaining rings.

The retainer ring opening should face the piston dome or bottom of skirt. This will help to eliminate rings from popping out during operation.

NOTE

The retainer rings have a beveled side and a flat side. When installed, the flat side should face away from wrist pin.

Using special tool #602884 drive wrist pin out.
Check piston, wrist pin, connecting rod, bearings etc. for wear and damage. Replace any worn, damaged or questionable parts.

Reassemble piston, wrist pin and connecting rod by reversing disassembly procedure.

Install the piston rings onto the piston. The ring with the bevel must be installed in the top groove with the bevel to the top of the piston.

Stagger ring gaps (ends) as shown. Assemble special ring compressor tool part #609967 in crankcase.

Apply oil to piston rings, wrist pin and cylinder sleeve. Carefully slide piston and rings into cylinder.

NOTE

Top ring can come off piston during handling.

Install piston stop part #677389 in cylinder. This will prevent piston and ring assembly from going too deep into cylinder.

NOTE

If piston goes too deep into cylinder the top ring can drop off of the end of cylinder sleeve and become impossible to remove without damage occurring.

NOTE

The word "BTM" is diecast in the skirt of the piston; when installed in cylinder, it must face down towards exhaust ports.

Install liners into the connecting rod and cap. Make sure the dovetail matches up.

Wipe the connecting rod throw of crankshaft dry. Replacement needle bearings part #677963 (33 needles) are attached to a card. They are secured to
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the card with clear plastic. To remove them, use a knife to cut the plastic along each side and across each end. Carefully peel the plastic from the strip without disturbing the bearings. They are stuck together with a substance on the lower side. Pick the strip up and lay on your index finger with the substance up. Wrap them onto the crankshaft throw. They should stick and remain in place. Use care in handling so none of the bearings fall off and into the cylinder.

If old needles are re-installed, apply a coating of OMC needle bearing assembly grease on the rod and cap. Place 17 needles in the rod cap and 16 in the rod.

Lubricate and assemble main bearings on upper and lower crankshaft journals, lettered end out. Lay crankshaft and main bearing assembly in crankcase guiding connecting rod over needle bearings.

NOTE

DO NOT DISTURB NEEDLE BEARINGS. Install connecting rod caps. Align the assembly marks on the connecting rod and cap. Install lock plates and cap screws on connecting rod. Hold lock plates with square tabs out and tighten screws finger tight.

Torque connecting rod screws to 20 inch pounds. Check if crankshaft turns freely or if there is any grinding noise from the needle bearings.

If crankshaft movement is okay, tighten them to 40 inch pounds torque. Rotate crankshaft again to check freedom of assembly. If okay, tighten to 60 inch pounds. Bend lock tabs up against heads of screws.

Lubricate wrist pin, main and connecting rod bearings with oil. Position both main bearings.

NOTE

Be sure dowels on bearings are positioned in notches of cylinder and crankcase.
Apply a few drops of Lawn-Boy gasket maker #682302 to crankcase cover sealing surface.

Smooth sealant over entire surface with your finger. Final appearance of applied sealant should be very (paper) thin.

**NOTE**

KEEP BEARINGS AND SEALS FREE OF SEALANT.

Position alignment hole in crankcase cover over alignment pin in crankcase. Install crankcase cover.

Tighten cap screws finger tight. Alternately torque cap screws to 60 inch pounds. Rotate crankshaft to check freedom of assembly. Complete torquing of cap screws to 100 to 120 inch pounds. Check for freedom.
Install upper and lower crankshaft seals using special tool part #608976.

Assemble CD mounting bracket.

Install starter assembly. Tighten ALLEN set screw.

Install shroud mounting base.

Thoroughly clean crankshaft taper and flywheel hub. Check key for burrs and install in crankshaft. Refer to page 8-3 for correct positioning. Install flywheel lockwasher and nut. Torque flywheel nut 31 to 33 foot pounds.

Install CD pack and set air gap .010 inch.

Install carburetor and check freedom of air vane movement.

Guide end of starter rope through hole in air baffle.

Install air baffle and recheck freedom of air vane. If interference occurs, reposition air baffle and/or shroud mounting base.

Assemble starter pull handle on rope. Tie an overhand knot in end of rope.

Before attaching engine shroud, guide starter rope and handle through hole in shroud. Assemble primer hose and fuel line to carburetor. Reconnect switch leads to CD Pack and slide both switch leads under the retaining clip on the air baffle.

NOTE

Failure to secure these switch leads would possibly permit them to become damaged or cut by the starter assembly.

Using the test plug check for spark. Install spark plug. Do not attach spark plug lead until you are ready to test.

Remove engine from holding fixture. Assemble the muffler plate to the engine using a new exhaust gasket. The two (2) short screws located in holes near exhaust outlet and 2 long ones in other holes. Refer to Section 16 for torque requirements.

Reinstall muffler and crankshaft support to mower. Use special tool part no. 609968 to correctly align crankshaft support.

SAFETY WARNING

WHEN REASSEMBLING MUFFLER COVER, ASSEMBLE FASTENERS (SCREWS) WITH FINGERS TO ENGAGE PREVIOUSLY FORMED THREADS. DO NOT FORCE REINSTALLATION AS THE SCREW WILL FORM A NEW SET OF WEAKER THREADS WHICH MAY EVENTUALLY STRIP AND THE SCREW MAY BECOME A THROWN OBJECT. TORQUE TO 140-170 INCH LBS.
NOTE:

OMC Ultra-Loc part no. 388517 or Loctite #271 should be applied to threads of all fasteners (screws, nuts) located under blade housing.

Reinstall adapter hub, blade stiffener (washer on 20” and 21” models), blade and blade nut. Torque blade nut to 50 ft. lbs. Replace spark plug and re-connect high-tension lead.

For testing, move the unit to a well ventilated area. Place fuel in tank, open valve, prime the carburetor (one or two strokes), and start the engine. Permit it to run and warm up (3 to 5 minutes) before making adjustments. At high speed (normal) it should run between 3100-3300 R.P.M. Adjust the governor if necessary to obtain the correct engine speed. Refer to Section 4 for governor adjusting.

⚠ SAFETY WARNING

DO NOT PERMIT IT TO OPERATE ABOVE 3300 R.P.M. HIGH ENGINE SPEED (BLADE SPEED) INCREASES POTENTIAL HAZARD OF THROWN FOREIGN OBJECTS WHEN STRUCK BY CUTTING BLADE.