HOMELITE®

Model 150 *Automatic* CHAIN SAW

Pictorial

SERVICE GUIDE

for the use of

HOMELITE DEALERS,
SERVICEMEN, INSTRUCTORS
and TRAINEES

PART NO. 24534

PRICE $2.00

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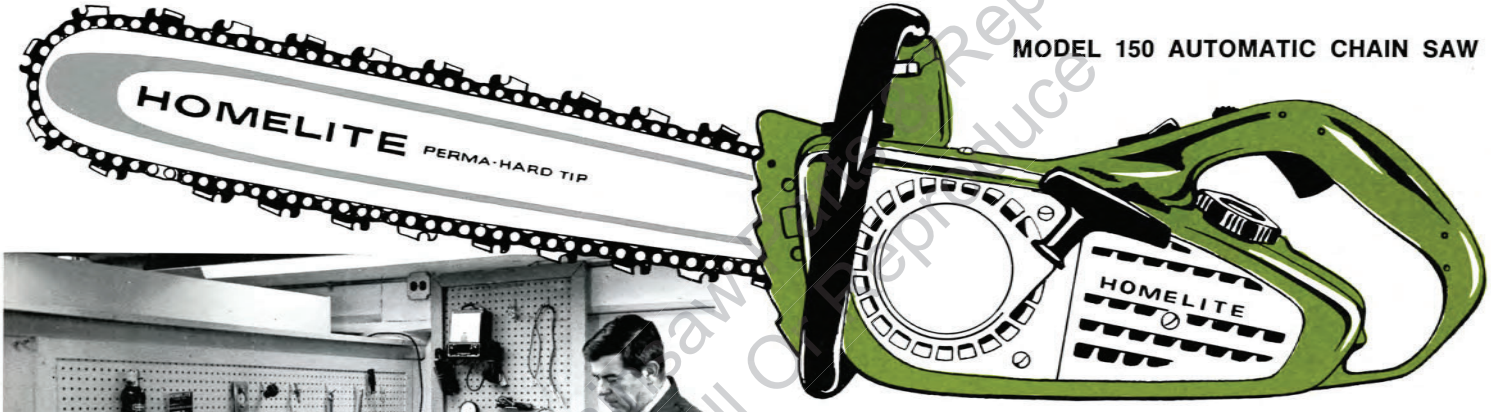
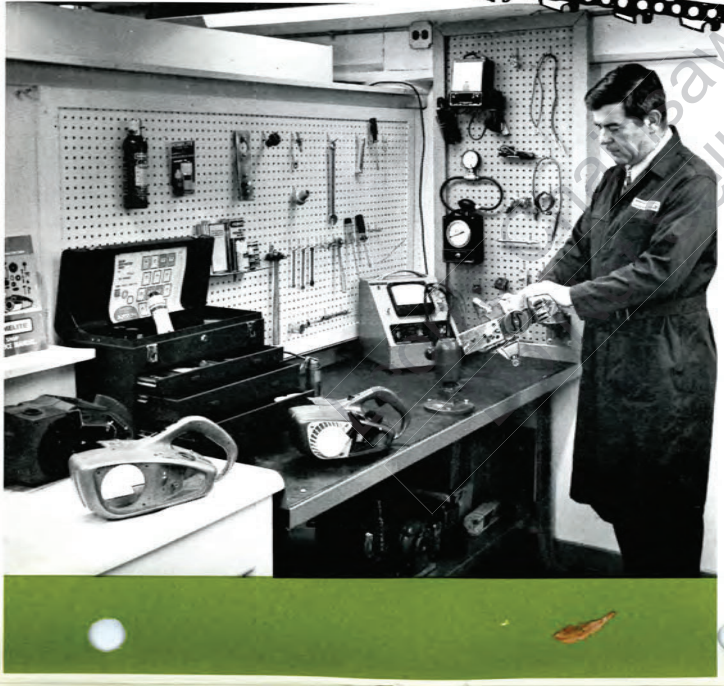
PLEASE TAKE NOTE This guide was prepared for professional servicemen, service instructors and trainees. Because production saws will not be the same as the pre-production saws shown in this manual, always rely on the Service Parts List rather than the Pictorial Guide for correct parts sequences.



MODEL 150 AUTOMATIC CHAIN SAW



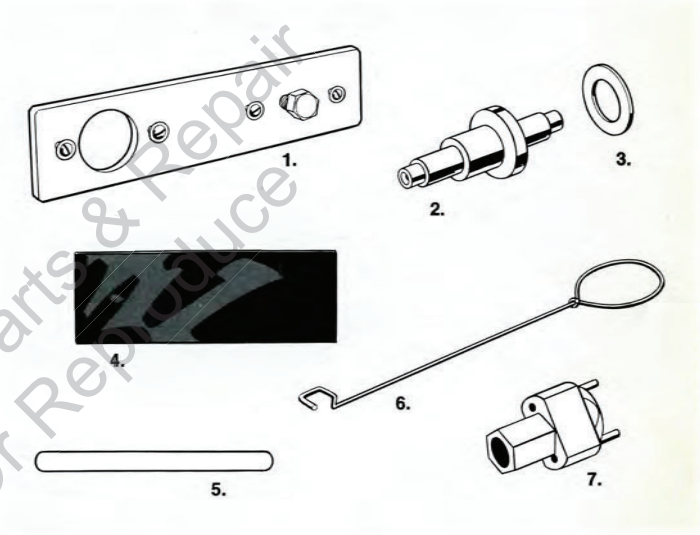
CHARACTERISTICS OF THE MODEL 150 THIRD PORT INDUCTION TYPE ENGINE

The starting speed must be quite high — 5700 to 8000 rpm. The average cutting speed is about 6500 rpm. However, maximum power occurs at about 8500 rpm. Idle speed must be at least 2500 rpm and should be made as high as possible without causing clutch engagement. In order to operate successfully in the maximum power *speed* range, it is essential that light cutting pressure be employed. In turn, this demands that the depth gauges of the 3/8 pitch chain be uniformly set at a relatively shallow depth (.025″ or .030″ max.) and that the cutters be correctly edged, contoured and SHARP.

SECTION ONE: SPECIAL DATA

MODEL 150 CHAIN SAW SPECIFICATIONS AND SERVICING

Engine type	2-cycle, air-cooled
Compression ratio	6.25:1
Bore and Stroke	1-9/16″ x 1-3/8″ (39, 69mm x 34, 93mm)
Displacement	2.64 cu. in. (43,3 cc)
Dry weight	9.06 lbs. (4,1 kg) less cutting attachments
Chain speed	43.76 ft/min. (13,4M/min.) per 100 rpm engine speed
Engine speed	8500 rpm at maximum H.P. 6500 rpm average cutting speed
Idle speed range	Just below clutch engagement speed (2500-2900 rpm)
Starting speed (throttle latched)	5700-5800 rpm
Ignition timing	Non-adjustable, 28° BTDC
Breaker point gap	.015″ (, 381mm)
Coil core-to-rotor air gap	.012″ (, 305mm)
Spark plug (original) (alternate)	Champion #DJ-7J or AC #CS45T CH-8 (gasket type)
Spark plug electrode gap	.025″ (,635mm)
Chain oil capacity	1/2 pt. (,237L)
Oil feed rate	10cc/min
Carburetor	HDC #3
Induction system	3rd port
Fuel tank capacity	1 pint (,47L)
Continuous operating time per filling	up to 30 minutes
Ratio regular gasoline to oil in fuel with PREMIUM HOMELITE 32:1 SAE-40 oil	32:1
With HOMELITE SAE-30 or other 2-cycle motor oil	16:1
Recommended gasoline	Regular, low lead, or non-leaded premium, 85 to 100 octane
Disapproved fuel ingredients	Leaded high-test gasolines; multi-grade and non 2-cycle engine oil products



SPECIAL TOOLS REQUIRED FOR 150 SERVICE

1. A-24544	Rotor Puller
2. 23756	Plug for wrist pin bearing
3. 24548	Plug Spacer
4. 24306	Shim (.0125″ black plastic)
5. 22486	Feeler Gauge (.015″ yellow plastic)
6. ———	Trigger Latch Inserting Tool
7. A-23696-A	Spanner Wrench (clutch)

Other Essential Tools, Fixtures and Paraphernalia for Use in Servicing the MODEL 150 Chain Saw

Threaded Hole Repair Packs
Sizes: 6-32, 8-32, 10-24, 14mm (spark plug)

Locquic® and Loctite® Sealant, #23488-B

Multi-Purpose Grease, #24551

Arbor press

Power-Arm

1 lb. plastic or leather mallet

Lightweight ball peen hammer

Electric drill and assortment of drills

3/8 ratchet with 3/8″ to 1/4″ adapter

1/4″ drive x 6″ extension

1/4″ drive x 1/4″ socket

3/8″ drive x 1″ socket

Torque wrench: 0 to 300 pound-inches (0-350 kg-cm)

Torque screwdriver or torque wrench: 0 to 60 pound-inches (0-70 kg-cm)

Screwdrivers: 1/8 and 5/16 blade sizes

Hex socket wrench set

RTV silicone rubber sealant (glass and ceramic sealant)

Epoxy repair kit

Slip-Joint pliers

Long nose pliers

Open end-box wrenches: 7/32″, 1/4″, 13/16″, 1″

Drifts: assortment including 1/16″

E-Z Out Screw Extractors

Reed tachometer

TESTING INSTRUMENTS

Pressure tester with hose adapters
Test tank or soap and water solution
Vacuum gauge and vacuum pump for vacuum test
Test light or volt/ohmmeter
Coil and Condenser Tester
Homemade seals and tests caps with fittings for tester hose connection.
Compressed air system with regulator set for 30 psi maximum pressure and/or parts cleaning tank.
Firing gap test plug

1. **Continuity test light (local supply).**
2. **Pocket type vibrating reed tachometer. (Burco Tools).**
3. **Epoxy repair kit (local supply).**
4. **Room temperature vulcanizing silicone rubber sealant (local supply).**
5. **LOCTITE Sealant. (HOMELITE 23488-B, includes Primer, item 5).**
6. **LOCQUIC Grade T Primer, apply to parts prior to Loctite.**
7. **Pressure Tester. (Burco Tools).**
8. **Awl (local supply).**
9. **Test fitting in plate, with gasket to fit cylinder exhaust (make in the shop).**
10. **Sealing plate and gasket to block off intake and pulse hole in cylinder during pressure test (make in the shop).**
11. **Test oil cap (drill out spare cap and install any suitable fitting for pressure tester).**
12. **Test fuel cap (remove duck bill valve, drill out cap and install fitting for pressure tester).**

Screw Torques

Each threaded fastener should be installed at its maximum holding power. The holding power depends on the length, diameter, number of threads to the inch, type of screw head, and material from which the screw is made, plus the material and number of threads in the nut or threaded hole. A few repairmen can tighten screws to the specification by the "feel". Most of us, however, should rely on the use of a torque wrench to be sure of torquing properly.

All torques are in pound-inches.
Loctite applications are marked*.

Figures in parentheses are equivalent torques in kilogram-centimeters

rotor nut	200	(230, 6)
spark plug (cold torque)	150	(173)
"S" clutch	100	(115, 3)
connecting rod cap screws	60	(69, 18)
10-24 pan head, cover-to-short block	45*	(*51, 89)
10-24 hex washer head (handle bar)	45*	(*51, 89)
8-32 socket head screws, crankcase-to-cylinder	40	(46, 12)
8-32 muffler screws	36	(41, 51)
8-32 at cylinder intake	36*	(*41, 51)
8-32 at sawdust shield	36*	(*41, 51)
8-32 cylinder and crankcase to oiler	36*	(*41, 51)
8-32 cylinder to crankcase	36*	(*41, 51)
8-32 oiler spring screw	36	(41, 51)
8-32 starter housing	36*	(*41, 51)
8-32 coil to oiler	30*	(*34, 59)
8-32 x 2" air deflector and carburetor to intake fitting	20	(23, 1)
#6 pan head, breaker box mounting	18*	(*20, 75)
#6 Plastite, junction block	18	(20, 75)
#6 condenser to oil tank	18*	(*20, 75)
#6 Plastite, ground terminal and breaker spring	8	(9, 22)

Miscellaneous Repairs

• SCRATCHED SEALING SURFACES • SCREWS BROKEN OFF IN HOLE • FATIGUED FASTENERS • WORN OR DISTORTED SCREW HEADS • ENLARGED OR STRIPPED-OUT THREADED HOLES • SCREWS LOOSENING UP REGULARLY

Porosity and Cracks and Scratches in Metal

LEAKS (See "Pressure Testing Section") through porous spots and small cracks in castings can often be sealed off by cleaning and roughing the surface in the area of suspected leakage and applying epoxy sealer over this area. When the epoxy has dried the part may be pressure-tested again for leakage.

Scratched sealing surfaces can be repaired with an application of RTV (room temperature-vulcanizing) silicone rubber sealant, marketed as "Glass and Ceramic Adhesive" (Dow-Corning), "Silicone Seal" (G.E.) and quite a few other names. This material can be recognized by the vinegar-like smell of the acetic acid coating agent.

Fatigued Fasteners, Worn or Distorted Heads of Screws

If any of the screws have been damaged through use of the wrong size screwdriver, or through wear, change them while you can still get them out easily. The screw heads on the bottom side of the saw are vulnerable.

For all except one installation, the fasteners which look to be in good condition may be reused. Connecting rod cap screws should not be reused.

Screws Loosening Up Regularly

The saw should not be operated if any fastener is loose or missing. If trouble is experienced in keeping some of the screws in tightly, clean them in LOCQUIC® Grade T primer and coat the threads with LOCTITE® Sealant prior to torquing them to the correct number of pound-inches. The Primer and Sealer are available from HOMELITE as Part No. 23488-B.

LOCTITE, in addition to helping to keep fasteners securely in place, can be used as a sealant to stop air leaks through threaded holes. More LOCTITE is needed to stop a leak than merely to secure a fastener.

Screws Broken Off in Holes

Sometimes the screws can be center-drilled and the broken portion screwed out with an appropriate size "EZ-OUT". However, it may not be possible to remove all broken screws, in which case a new casting is called for. If the hole is damaged or enlarged by removal of the screw, repair it by installing a threaded insert.

Threaded inserts for the repair of stripped holes are obtainable in several different brands and types. TAP-LOK® inserts which cut their own thread, are made by GROOV-PIN Corp., New Jersey. If TAP-LOK® inserts are obtained from sources other than HOMELITE, be sure to get the cadmium zinc-plated type intended for repairs in "group 2" metals, aluminum and magnesium. Stainless steel inserts tend to strip out the threads in light alloy metals as they cut them.

HELI-COIL MASTER THREAD REPAIR PACK

Recommended Multi-Purpose Grease

HOMELITE ALL-TEMP MULTI-PURPOSE GREASE is a wide temperature lubricant. It should be used to lubricate clutch and rotor nut bearings, starter rewind springs and sprocket-nose guide bar nose bearings as specified in these instructions.

TAP-LOK® INSERTS AVAILABLE FROM HOMELITE

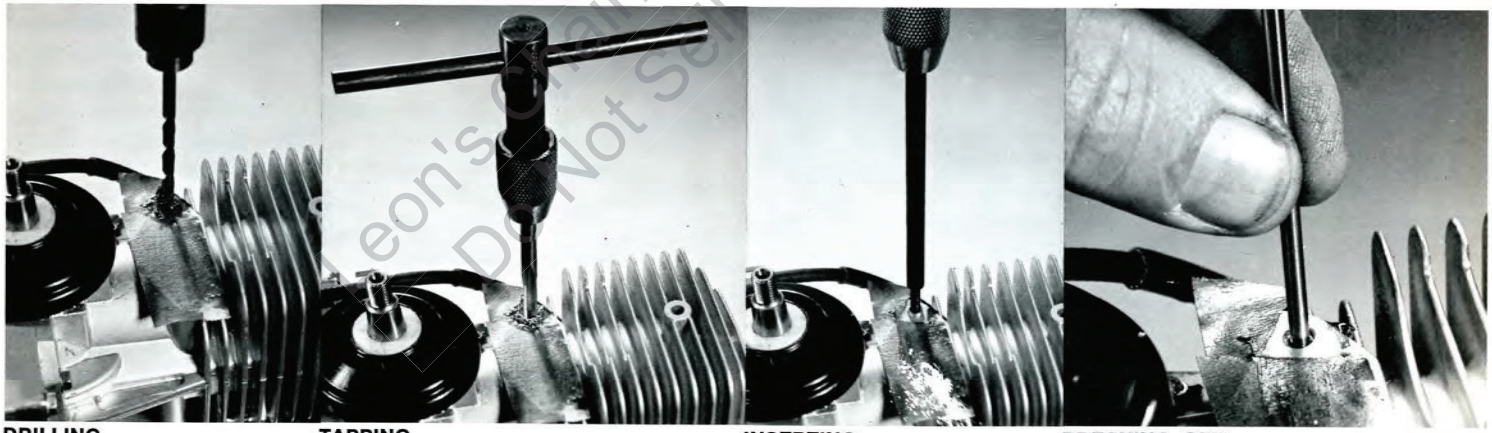
Part No.	Internal thread	External thread (self-tapping)	Length	Drill Size (Class 2 metals)
55183	8-32	1/4-32	21/64	#1 (.228″)
72489	10-32	19/64-24	3/8	Letter I (.272″)

HELI-COIL MASTER THREAD REPAIR PACKS
Heli-Coil Corp. — Shelter Rock Lane, Danbury, Conn. 06810

Each Pack Contains Tap		Inserts			Installation Tool	
Screw Size	Threads per inch	No. Inserts in pack	HELI-COIL number	HOMELITE number	Drill Size (drill not furnished) Aluminum	Mag. and Iron
6	32	30	4951-06SL		#25	#24
8	32	30	4951-2SL	23072	#17	#16
10	24	30	4951-3SL	23073	13/64	#5
14 x 1,25 mm	spark plug—3/8 reach		4953-14U	See Note*	Drill not required; use tap furnished	

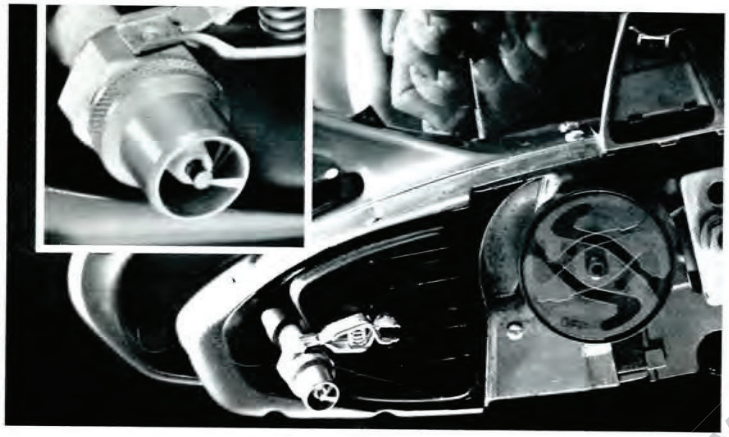
*NOTE: 14 x 1,25 mm spark plug; insert only: HOMELITE #72122.

HELI-COIL:



DRILLING **TAPPING** **INSERTING** **BREAKING OFF**

SECTION TWO: PRELIMINARY TESTING



Eyeballing the Unit

When a customer brings in a saw for repair, the trouble may be obvious. You make out a repair tag, give him his receipt and tell him when you will have his saw ready. If the trouble is not observable at a glance, listen to the customer's report of the performance or lack of performance, and then make these routine checks BEFORE DOING ANY TEAR-DOWN OF THE ENGINE:

1. Look for clogged filters, leaking lines, cracked castings . . . anything that might look "not quite right".
2. AS A PRECAUTION, pull the starter cord out slowly about two or three inches to make sure the piston is not seized up or the rotor bearing frozen. Also check the chain oil tank for oil and rotate the chain by hand to see whether the clutch turns freely.
3. If no discharge or low volume output from the chain oiler was reported, or if excessive smoke during operation was mentioned: remove the bar and chain and idle the engine for at least five minutes to check the oil discharge. If oiler failure is indicated, refer to the detailed oiler repair and oiler pressure testing sections for instructions.
4. If you find a specific trouble, turn to *that* topic in the Trouble-Shooting Section of this manual.
5. See if there *is* fuel in the tank. Smell the fuel. Pour some of it out into a glass and look at it. If it seems off-color or dirty, or doesn't smell like fresh fuel, try some of your own good fuel mix in the saw tank, but you'd better save a sample of the customer's fuel to show him. If the trouble was *bad fuel,* tell your customer about it when he comes in, and show him how to make good, properly mixed fuel.
6. Check the spark plug and also check the magneto for strong spark. If the plug is in less-than-perfect condition: clean it, gap it to .025″; BUT, if the trouble was "hard starting", try to start the saw after you've temporarily installed a plug *you know to be* in good firing condition. The magneto spark test is most reliably performed with a test spark plug having a test firing gap of .20″ (13/64″ or 5 mm); clamp the test plug to a grounded part of the saw and connect the high-tension lead to the plug.
7. BEFORE INSTALLING THE SPARK PLUG, look down through the hole to see how much "carbon" has deposited out on the piston dome. Also check the exhaust muffler. If the surfaces are dirty, the muffler (and spark arrestor, if used) may need cleaning. A dirty muffler and heavy deposits on the piston indicate need to check further to determine whether an overhaul should be done.
8. If the air filter is dirty, clean off the exterior surfaces around the filter before installing a clean air filter.
9. Check the fuel filter in the tank. If it feels hard it may be loaded with dirt. Don't bother cleaning a dirty fuel filter — always put in a new one.
10. If the saw doesn't want to start, go back to the "Preliminary Carburetor Adjustments" settings — HI needle out one turn and LO needle out 3/4 turn. If this is enough to coax the engine to run, see if the engine can be fine-tuned.

    NOTE: The method of fine-tuning this third port intake type engine differs from the method that would be used if the same carburetor were on a reed intake type engine.

    a) Make the idle speed (adjust idle speed screw) low enough that the chain does not turn at idle. This is your reference point for the following:

    b) After running the engine for 5 to 10 minutes to get it hot, turn the idle speed screw IN until the chain starts to turn, then OUT until the engine starts to falter, and finally, leave it HALF-WAY between these two positions.

    c) Experiment with the LO needle to find where the engine runs the *best.* By "best" we mean smoothest and fastest idling at this particular idle speed screw setting, because of proper mixture. At this "best" mixture, you may now find that the speed has shifted by as much as a couple of hundred rpm — reset with the idle speed screw to 2500-2900 rpm where it belongs. You may have to work alternately with the LO needle and *idle speed screw* several times to really fine-tune the idle.

    d) Now adjust the HI needle until the engine evens out at fastest rpm at WOT (wide open throttle) — no load: lean out until engine cannot accelerate from idle to WOT; begin to richen the mixture, a little at a time, until the engine accelerates smoothly at no load. IMPORTANT: from this point (where saw first accelerates) open the HI needle another 1/2 turn AND LEAVE IT SET THERE.
11. One more test may be tried during preliminary testing, or at any time an engine seems to want to run "lean" and not respond when the carburetor is adjusted more "rich": LOOSEN THE FUEL CAP TO SEE WHETHER THIS LETS THE ENGINE RUN BETTER; IF IT DOES, REFER TO "FUEL LINE AND TANK TEST #1" IN SECTION FOUR TO TEST THE VALVE. IF YOU HAVEN'T SPOTTED THE TROUBLE BY NOW, GO ON TO THE NEXT PHASES OF TESTING, FOR WHICH SOME DISASSEMBLING OF THE UNIT WILL BE NEEDED ALONG WITH SOME SPECIAL TEST EQUIPMENT AND PARAPHERNALIA.

SECTION THREE: MAGNETO TESTING

INTRODUCTION TO THIS SECTION

This information is specific for the model 150 Automatic chain saw magneto testing. The test values given were supplied by the magneto manufacturer. The procedures are based upon the instruction manuals supplied with the test instruments used in preparing this guide. For detailed testing procedures and analysis, refer to the instructions furnished with the particular test instrument you will be using. Always keep on hand a coil and condenser which you know to be in good operating condition. Use these as set-up components, checking questionable coils and condensers out against these.

The resistance values given in ohms may be used for any reliable instrument measuring dc resistance. Similarly, the condenser capacity figures of .15 to .19 microfarads (mfd) may be used with any reliable instrument designed for such tests.

NOTE: The primary continuity value of 2.7 ohms given for the Graham tester is a measurement of the *impedance* of the coil, not the dc resistance and should not be used for any volt/ohmmeter type of tester.

The MERC-O-TRONIC IGNITION ANALYZER Model 98 has solid state circuitry requiring no warm-up period. It operates on its own 12 volt battery for all coil tests, and must be plugged into a 110 volt power line for the condenser test series.

For reliable testing, a VOM (volt/ohmmeter) or VOA (volt/ohmmeter/ammeter) should be rated at 20,000 ohms per volt dc, because instruments operating on low battery power (one or two penlight cells) are not sensitive in the low ohms range.

The GRAHAM COIL AND CONDENSER TESTER Model 51P or 51RP operates on a 115 volt ac power line. This tester requires considerable warm-up time for the circuits containing vacuum tubes, but may be used as a VOM to measure dc resistance while the tester is warming up in "STAND-BY" position. In moist climates the warm-up period should be extended to drive out any moisture.

Regardless of the type instrument used, check the accuracy and the calibration frequently.

IMPORTANT: ALL COIL TESTS MUST BE MADE WITH THE COIL MOUNTED ON ITS LAMINATED CORE

TEST VALUES			
	VOM (volt/ohmmeter) 20,000 ohms per volt dc	GRAHAM Model 51 P Model 51 RP	MERC-O-TRONIC Model 98
COIL PRIMARY CONTINUITY	up to 1.6 ohms	2.7 ohms max. impedance	1.6 ohms (same as VOM)
SECONDARY CONTINUITY		9300 ohms max. resistance	
MAXIMUM SECONDARY			Scale Reading 55-65
COIL INDEX		75 max. (scale setting)	
COIL FIRING TEST (MINIMUM GAP TEST)		min. of 30 at 75 coil index.	good steady spark at 2.2 amperes, max.
GAP INDEX		62 max.	
CONDENSER CAPACITY		.15-.19 mfd	.15-.19 mfd
CONDENSER SERIES RESISTANCE		1 ohm	green block scale (not red section)
CAPACITOR LEAKAGE (insulation leakage test)		Min. 20 megohms at room temp.	needle deflection and return to zero according to tester instructions.

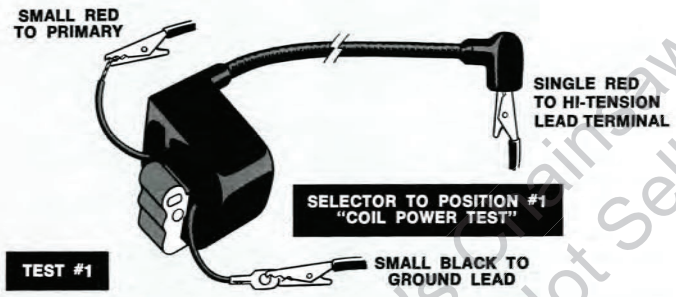
PRIMARY CIRCUIT TEST WITH VOM OR TEST LIGHT

HOOK-UP: Disconnect coil ground lead from the core. Connect one lead of tester to the insulated side of the switch terminal on the top rib of the cylinder. Connect other lead to the coil ground lead (or to any common engine ground).

TEST: For VOM resistance check, set meter for R x 1 (R times 1) and read the R x 1 scale up to the maximum of 1.6 ohms. For continuity check with a test light, rock the rotor back and forth so the magnets pass by the core legs and points open and close. The test light should go on and off, a rough indication of make-and-break circuitry.

COIL TEST SERIES WITH A MERC-O-TRONIC IGNITION ANALYZER MODEL 98

NOTE: ***DO NOT PLUG INTO POWER LINE DURING COIL TESTING.*** **Always make tests in this sequence. Do not skip around.**



TEST #1 for COIL POWER (Also known as "Coil Firing Test" and "Minimum Gap Test") AND TEST #2 for HI-SPEED POWER:

1. Pry off the breaker box cover with two screwdrivers. Put a piece of cardboard between the breaker points to insulate them.
2. Connect black test lead to the coil primary ground wire and the small red test lead to the coil primary lead (if disconnected) or to the insulated side of the switch terminal.
3. Connect single red test lead to the terminal of the spark plug wire.
4. When hook-up has been made, turn the current control knob to the extreme left. Turn selector switch to "POSITION #1, COIL POWER TEST". Slowly turn current control knob clockwise; observe scale #1 and watch for spark to occur across the 5mm electrode gap in the small window:
   a) The maximum amperage before which a strong, steady spark should occur is 2.2 on the #1 scale.
   b) A strong coil will begin to spark at about 1.1 amperes, spark steadily above 1.2 amperes, and the dial turn to the maximum before the needle reaches 2.2 amperes.
   c) A maximum reading (of 2.2 amperes or more before steady spark) introduces the possibility that the coil performance is marginal.
   d) No spark, weak spark, or intermittent spark by 2.2 amperes indicates a faulty coil.
5. Continue to turn the current control knob clockwise after steady spark occurs. If you can turn it all the way to the right and get steady spark, the coil output is good under simulated high-speed firing conditions.

TEST #3 — PROBING FOR COIL SURFACE INSULATION LEAKS:

WARNING: This test puts a severe strain on the coil, so it should be completed as rapidly as possible and the analyzer turned off. Do not let the probe linger at any point — play it lightly along the insulated surfaces of the high-tension lead and the coil.

1. Leave the small red and black test leads connected as in tests #1 and #2, but remove the single red test lead from the high-tension lead terminal.
2. Plug the test probe into the test probe jack on front panel of tester. Turn selector switch to position #1. Turn current control knob to "HI" position for maximum current reading on the meter.
   NOTE: Do not exceed the meter maximum reading of 2.2 amperes for this coil.
3. Play the test probe over the insulated surfaces.
   a) If there is no spark there is no leak.
   b) A faint spark or glow occurring around the coil during probing is a corona which does not indicate a defect.
   c) At a leak, sparks will jump to the probe.

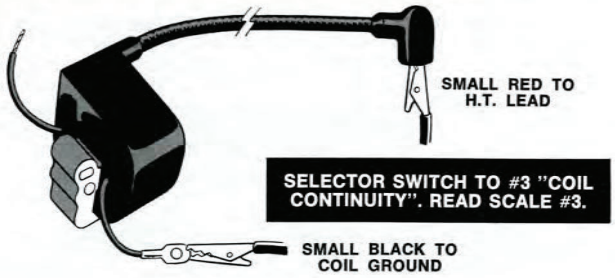
TEST #4 FOR COIL CONTINUITY (Tests Primary and Secondary)

1. Turn selector switch to "#3 COIL CONTINUITY" and clip the small red and black test leads together. Turn meter adjustment knob for scale #3 until the pointer lines up on the "SET" position on right end of scale #3.
2. Connect small black test lead to coil ground wire, and small red test lead to high-tension lead terminal.
3. The reading obtained should be between 7500 and 9300 ohms. An excellent coil usually gives a reading of about 8300 ohms during this test.

TEST #5 FOR COIL PRIMARY RESISTANCE

1. DO NOT CLIP TEST LEADS TOGETHER. Turn selector switch to "#2 DISTRIBUTOR RESISTANCE" for checking low *ohm* resistance values.

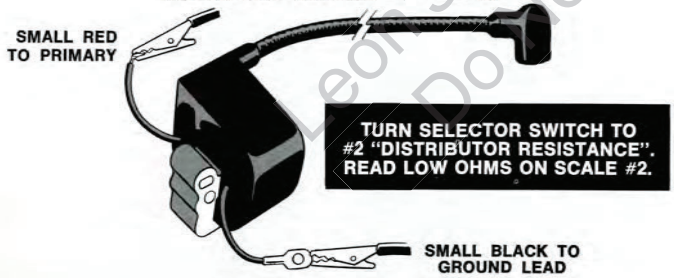
TEST #4 FOR COIL CONTINUITY (TESTS PRIMARY AND SECONDARY)



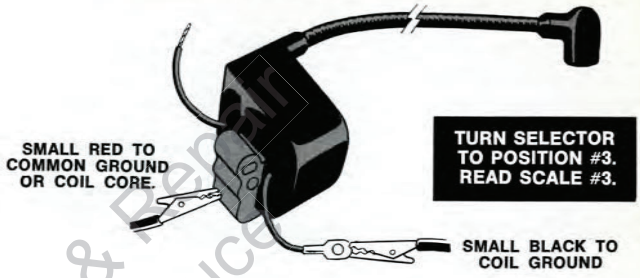
TEST #5 (Cont.)

2. Turn meter adjustment knob. Line up the pointer on the set position on right end of scale #2. This sets meter for low ohm values from 0 to 30 ohms.
3. Clip small red test lead to primary lead after disconnecting the lead from the junction block. Connect small black test lead to ground lead after disconnecting lead from coil core.
4. Read the RED figures on scale #2: The dc resistance of the windings should be the same as for the test with a VOM — up to 1.6 ohms.
   a) If considerably lower than 1.6 ohms, there is a short between some of the windings in the primary. A 10% short will lower the secondary output by as much as 1500 volts.
   b) Readings above 1.6 ohms indicate an open condition in the coil.

TEST #5 FOR COIL PRIMARY RESISTANCE
DO NOT CLIP TEST LEADS TOGETHER



TEST #6 FOR GROUNDED COIL



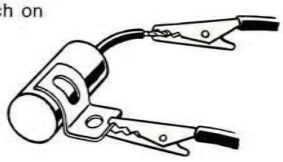
TEST #6 FOR GROUNDED COIL

1. Leave small black lead connected to coil ground wire as in test #5. Connect small red test lead to common ground (to unit).
2. Turn selector switch to position #3 and read scale #3.
   a) The pointer hand must be on the "ZERO" line at left end of scale #3.
   b) Any pointer movement (except for momentary deflection as selector knob is turned to position #3) indicates a ground.
3. If there is a needle deflection in step #2, disconnect the breaker arm spring from the terminal, and disconnect the primary coil wire from the junction block. If the meter pointer remains to the right, this part of the magneto is probably O.K. Check the condenser for a short and the breaker points for improper (grounded) assembly.

CONDENSER TESTS WITH THE MERC-O-TRONIC IGNITION ANALYZER

TEST #1 FOR CAPACITY (Plug into 115 volt-60 cycle outlet):

1. Remove condenser from the unit, plug analyzer into 115 volt-60 cycle outlet, and place selector switch on position "#4 CONDENSER CAPACITY".
2. Clip small red and black test leads together, depress red button and turn meter adjustment knob to line up pointer at set line on right end of scale #4. Unclip the test leads.
3. Connect small red test lead to condenser lead and small black to condenser mounting clamp.
4. Depress red button to obtain reading on scale #4. The reading must be within .15 and .19 mfd (microfarads) on scale #4.



TEST #2 FOR LEAKAGE:

1. Leave everything as it was at completion of test #1 EXCEPT turn the selector switch to position "#5 LEAKAGE AND SHORT".
2. Depress and hold red button for at least 15 seconds; read scale #5:
   a) The pointer will deflect to the right, but must return to within the range of the black bar at the left end of scale #5.
   b) Any readings to the right of the black bar indicate either a leaking or shorted condenser.

TEST #3 FOR SERIES RESISTANCE:

1. Disconnect leads from condenser, and turn selector switch to position "#6 CONDENSER SERIES RESISTANCE". Plug into a 115 volt, 60 cycle outlet.
2. Clip small red and black test leads together and adjust meter "set scale #6" to set line on right end of scale #6.
3. Reconnect small red test lead to condenser lead and small black lead to condenser mounting clamp.
4. Meter pointer must be within the green block at right end of scale #6 or slightly more to the right, *but not to the* left.
5. While testing, move and wiggle the condenser lead; any pointer movement may indicate a loose connection between condenser and lead.

THIS CONCLUDES THE TESTING SEQUENCE WITH THE MERC-O-TRONIC MODEL 98 ANALYZER.

COIL TEST SERIES WITH THE GRAHAM COIL CONDENSER TESTER MODEL 51P or 51RP

This tester plugs into a 115 volt, 60 cycle outlet and requires a warm up period with test selector knob set to "COIL STAND-BY".

TEST #1 FOR PRIMARY CONTINUITY:

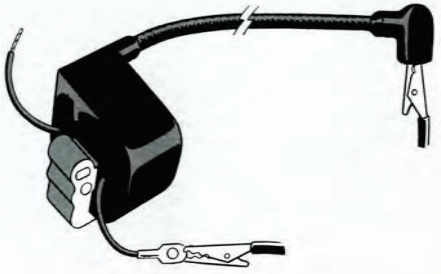
1. HOOK-UP:
   a) Disconnect ground lead from coil core to isolate the coil secondary during testing. Connect one lead of tester to insulated side of the ignition switch terminal. Connect other lead to any common engine ground.
   b) To test "off the unit", connect one lead to coil primary wire and the other to coil ground wire. *Do not test on a metal bench.*
2. Turn indicator dial to "PRIMARY CONTINUITY".
3. For test a) "on the unit": rock the rotor back and forth so the points open and close and the magnets pass by the core legs. The meter needle should deflect left and right from 0 to 100 as the points open and close, indicating that the breaker points are opening and closing.
4. For test b) "off the unit" the meter should read 2.7 ohms impedance. Note that the impedance or "ac ohms" is different from the resistance readings (dc ohms) which would be obtained with a VOM type of tester.

TEST #1 FOR PRIMARY CONTINUITY

TEST #2 FOR SECONDARY CONTINUITY:

1. HOOK-UP: With the coil off the unit and coil ground lead disconnected, attach test clips to the end of the high-tension lead and to the coil ground lead.
2. Put selector knob (middle dial) to "SECONDARY CONTINUITY".
3. Then maximum reading should be 9300 ohms, but can be 20% lower.

TEST #2 FOR SECONDARY CONTINUITY

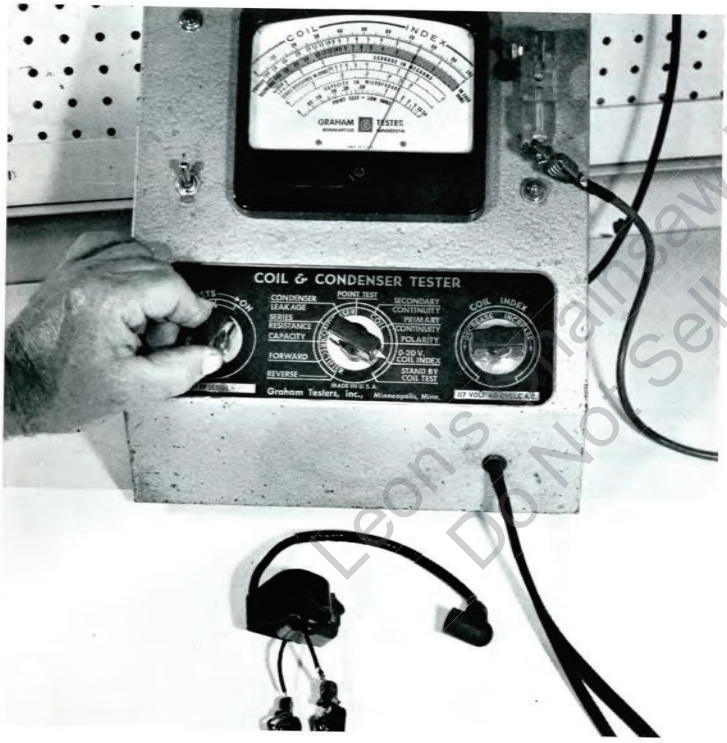


TEST #3 (This is a three-part test sequence)

CAUTION: DO NOT LET ANYONE TOUCH THE COIL DURING ANY OF THE FOLLOWING TESTS WITHOUT FIRST PUTTING CENTER DIAL POINTER TO "0-20V COIL INDEX".

1. For this series of tests, it is important to set the firing power of the primary to that necessary to generate the required *Secondary Open Voltage* required for valid testing. This happens to be 75 on the dial and is merely a reference number.

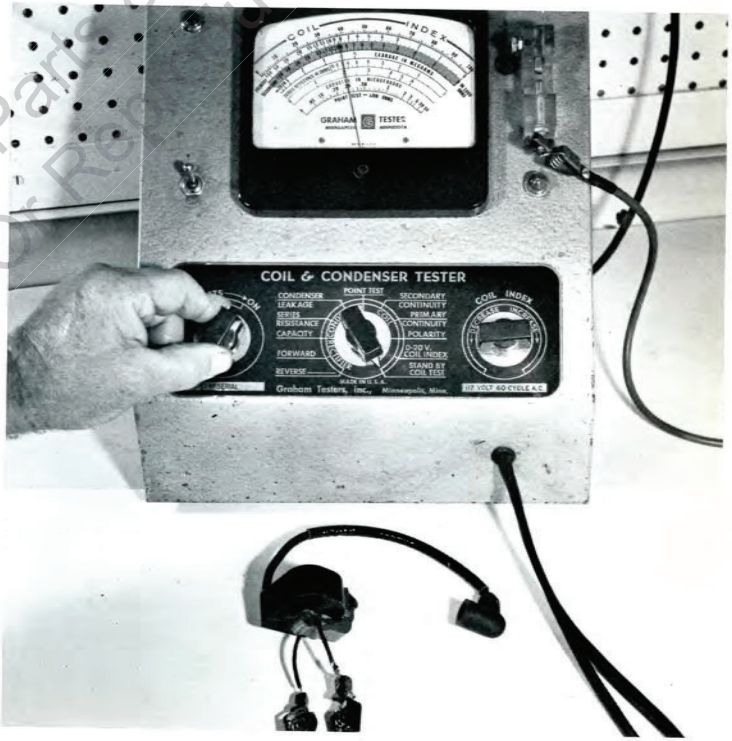
CAUTION: The COIL INDEX of 75 should never be exceeded while the coil is connected to the tester. Do not test on a metal bench.



2. HOOK-UP FOR COIL INDEX: Connect one test lead to the ground wire and the other test lead to the coil primary lead.
3. PROCEDURE: Point selector knob to "0-20 V. COIL INDEX". Turn "COIL INDEX" pointer to the "DECREASE" end of the dial. Hold "COIL TESTS" knob in the "ON" position and slowly turn the "COIL INDEX" knob toward "INCREASE" until needle points to 75 on the top line of the tester.

4. COIL FIRING TEST (OF COIL'S ABILITY TO FIRE AT MINIMUM ENERGIZATION): This test is also known as "MINIMUM COIL TEST". After setting to coil index of 75, turn selector knob from "0-20 V. COIL INDEX" to "STAND-BY COIL TEST". DO NOT TOUCH COIL! Turn "COIL TESTS" knob to "ON" and hold it there. The needle should deflect and hold steady. A reading of 30 is the specified minimum but an excellent coil may test as high as 38.

WARNING: Let go of "COIL TESTS" knob and return selector knob to "0-20 V. COIL INDEX" before touching coil or going on to the next phase of this test.



5. COIL FIRING TEST WITH TEST PROBE: With everything set as above, connect probe to terminal of tester. Turn selector knob from "0-20 V. COIL INDEX" to "STAND-BY COIL TEST". Now, insert the probe into the spark plug boot and turn the "COIL TESTS" knob to "ON".
   a) A continuous series of strong, blue sparks should be fired across the test gap of the meter.
   b) During test firing, the tester should show some reading on the dial but the value is unimportant. It is extremely significant, however, that the pointer hold steady, as any fluctuation indicates misfiring.
6. INSULATION LEAKAGE TEST: This is merely a continuation of preceding step #5 with the same hook-up and settings. Remove the test probe from the spark plug boot and play it along the insulated surfaces of the high-tension lead wire and the coil.
   a) If no sparks jump through the insulation to the probe, there is no leak.
   b) A blue halo or corona around the coil in the vicinity of the probe is not an indication of trouble and should be ignored.
   c) Any jumping spark indicates insulation leakage.
7. GAP INDEX OR MINIMUM GAP TEST: This test uses the same hook-up as the coil firing tests described previously (which see) except that the COIL INDEX SETTING (of 75 for the other tests) will now be *decreased* to zero prior to testing, and increased gradually to the minimum setting necessary for a spark to be fired across the test gap with no misses.

WARNING: NEVER INCREASE THE INDEX BEYOND 75, OR DAMAGE TO THE COIL MAY RESULT.

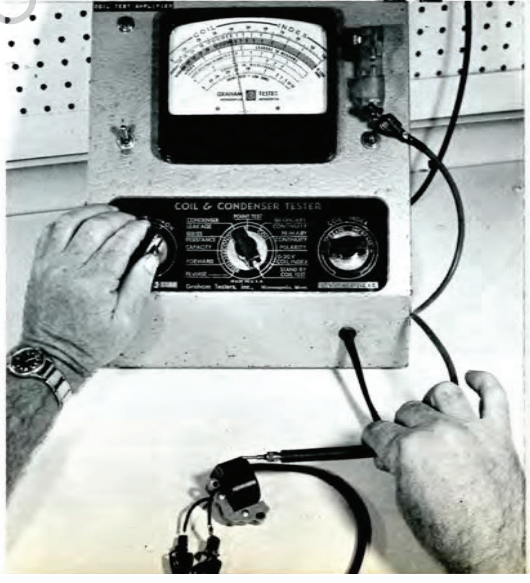
   a) This is the real "acid test" of the coil's ability to fire a strong spark, particularly at voltages induced in the secondary at engine cranking speeds.
   b) Whatever the meter reads when the spark first jumps without misfiring is the "GAP INDEX" of the individual coil. The specified gap index is 62. If higher, a new coil and core should be installed.

CONDENSER TESTS WITH GRAHAM TESTER

There are three tests, all to be made with the condenser off the engine. Connect one tester lead to the condenser lead, and the other tester lead to the condenser mounting bracket.

1. Turn selector (center knob) to "CONDENSER LEAKAGE" to test for an insulation leak. The tester at room temperature should read 20 or more megohms. If the reading is lower than 20 on the "LEAKAGE IN MEGOHMS" dial, there is a leak.
2. Turn selector knob to "SERIES RESISTANCE". The maximum resistance should be one ohm.
3. Turn the selector knob to "CAPACITY". The reading on the "CAPACITY IN MICROFARADS" scale of the tester should be .15-.19.

TEST #3 WITH TEST PROBE



TEST #3 FOR INSULATION LEAKAGE

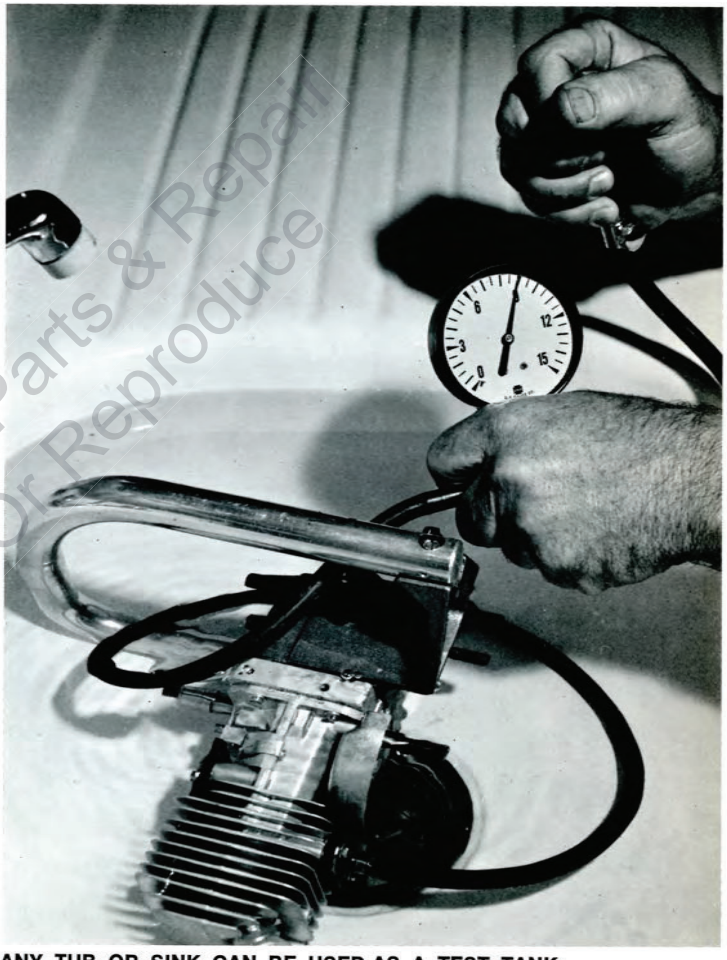
SECTION FOUR: PRESSURE TESTING

SYMPTOMS INDICATING POSSIBLE LEAKAGE:

1. Lean operation and low power which cannot be corrected by carburetor adjustment.
2. Excessive engine smoke.
3. Low chain oiler output.

SOAP BUBBLES DISCLOSE LEAK NEAR LOOSE SCREW.

UNDERWATER TEST SHOWS BUBBLES COMING FROM LEAKING SHAFT SEAL



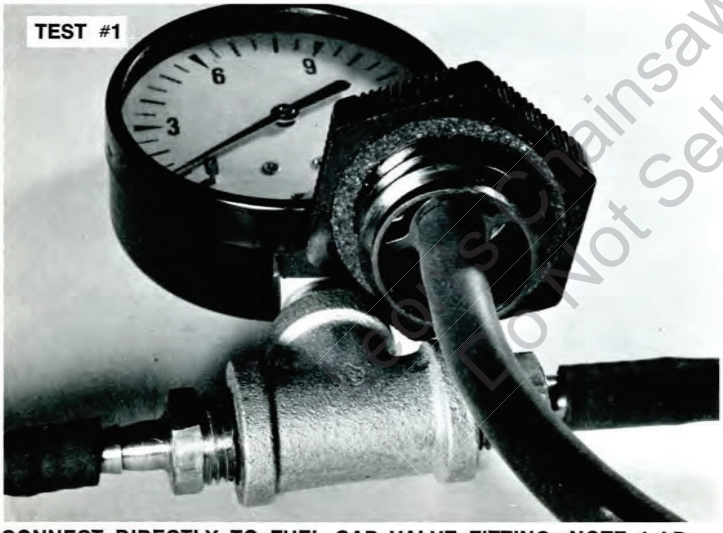
ANY TUB OR SINK CAN BE USED AS A TEST TANK.

This section includes both vacuum and pressure tests. When flexible tubing is being tested, positive pressure testing is more reliable an indicator than vacuum testing, because the tubing may collapse under a vacuum, sealing off the leak. Vacuum testing however can reliably indicate whether shaft seals leak. Seals may leak air into the crankcase whereas they will seal tightly when (positive) pressure is applied. Making a bubble test while the assembly or part is under positive pressure will pin-point a leak. When convenient to do so, the piece to be tested should be immersed in liquid. When immersion or dipping are impractical, paint the object with bubble pipe soap or plain soap and water solution in the areas of suspected leakage.

ALWAYS REMEMBER THAT AN AIR LEAK INTO THE ENGINE OR THE FUEL SYSTEM WILL RESULT IN LEAN OPERATION AND LOSS OF POWER.

FUEL LINE AND TANK TEST #1:

Apply hose of the pressure tester over the valve fitting in the fuel cap. Pump about 10 pounds (,70 kg/cm²) of pressure on the tester dial. If the pressure cannot be built up when the tester bulb is slowly squeezed, the valve is not working properly. Pressure should hold steady, even when as low as one pound.



CONNECT DIRECTLY TO FUEL CAP VALVE FITTING; NOTE 1 LB. PRESSURE ON DIAL

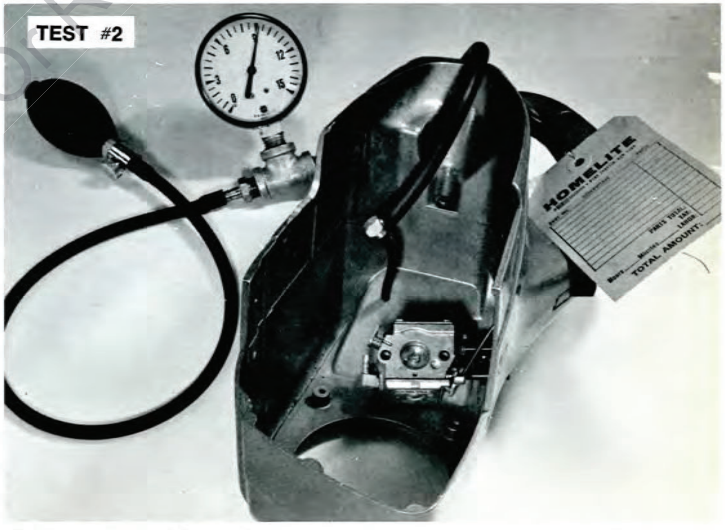
NOTE: Sometimes a valve will not function because of improper seating. To re-seat the valve, pull out the valve fitting with a pair of common slip-joint pliers and remove the valve. Assemble the valve in the fuel cap, start the fitting in place in the cap, and tap in place with hammer. If the valve still does not test satisfactorily, replace it.

FUEL LINE AND TANK TEST #2:

Always perform test #1 first, as this second test is valid only when the fuel cap relief valve is working properly. Using a piece of rubber or plastic tubing 5/16″ OD x 3/16″ ID to make the connection, connect the tester hose to the carburetor end of the fuel line. Pump about 9 pounds of pressure on the tester dial. If there is a rapid leak, check the connection between the tester and the fuel line first. Also tighten the fuel cap. If there is a leak between the cap and the tank, install a new fuel cap gasket. If there are no leaks in the exterior portion of the fuel tank or in the portion of the fuel line outside the tank, the test readings should be almost identical to those made in Test 1. However, possible leakage of the fuel line inside the tank should be investigated in Test 3.

FUEL LINE AND TANK TEST #3: (not illustrated)

Remove the fuel pick-up from the fuel line. Connect the pressure tester to one end of the line and plug the other end of the line. Pump pressure up to 10 psi (,70 kg/cm²) and observe the gauge. THE PRESSURE WILL HOLD STEADY if the line does not leak.



INLET CONNECTOR FROM DISCARDED CARBURETOR BODY (TILLOTSON HS4D) IS USED FOR FUEL LINE-TO-TESTER CONNECTION.

FUEL LINE AND TANK TEST #4:

Be sure the tank is completely empty before making these vacuum tests. Connect the vacuum tester to the fuel line. Close the fuel cap tightly and lower the tank pressure slowly by about 2″ hg (51mm mercury). The system should not leak. Relieve the vacuum to atmosphere and repeat the test, each time with tank in one of various positions including the vertical and nearly vertical upside-down positions. Try the same test at a 4″ hg (102mm hg) vacuum. Now, with the fuel line and tank under 4″ hg (mercury) vacuum, loosen the fuel cap; if the gauge does not drop sharply to zero, the fuel line is collapsing under vacuum.

CARBURETOR LEAKAGE TEST #1:

The carburetor fuel inlet circuit can be checked without removing the carburetor from the air box. Connect the tester to the fuel line (or, if carburetor has been removed, directly to the fuel pump inlet). Squeeze the bulb to put 5 psi (,352 kg/cm^2) on the tester dial. If gauge holds pressure, the fuel pump, inlet needle and seat, and the metering diaphragm are not leaking.

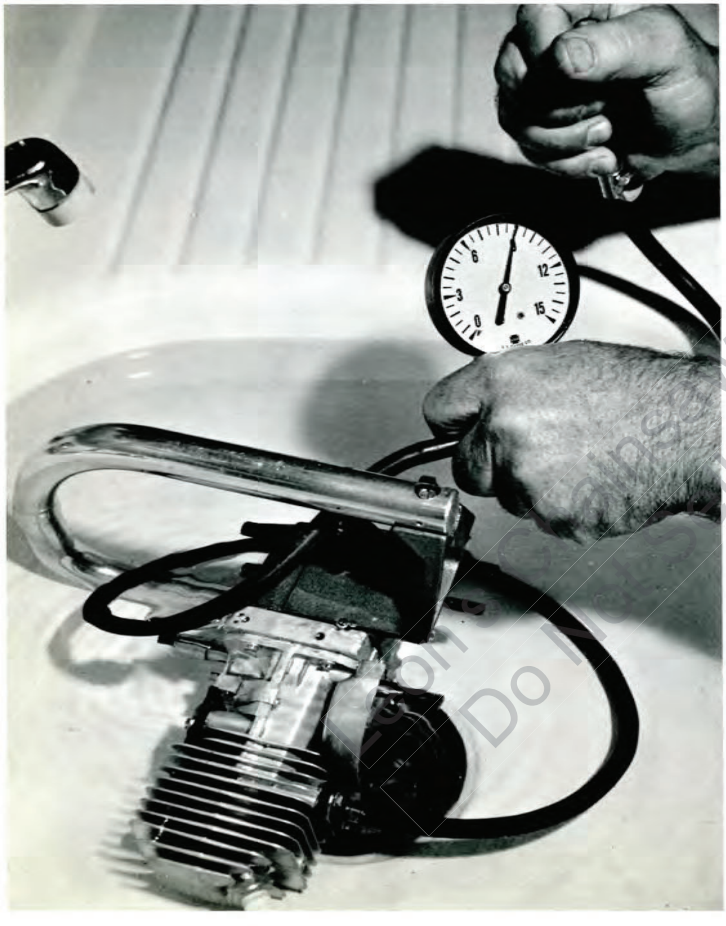
NOTE: A new or rebuilt carburetor will leak at the gaskets and diaphragms until the carburetor has been in use for a half-hour or more. The carburetor is built to sustain pressure at 10 psi (,70 kg/cm^2). If pressure does not hold, then immerse carburetor in a test tank and make a bubble test.

CARBURETOR LEAKAGE TEST #2:

Pump up above 10 psi (,70 kg/cm^2) on the gauge, then depress the carburetor metering diaphragm with a pencil point or pin. This should unseat the inlet needle, causing gauge to return immediately to zero. If this does not occur, the inlet mechanism is inoperative or the needle is stuck.

ENGINE AND CHAIN OILER TESTS

These tests are made together because of the common wall and pulse connection between the engine and the oil pump. Leakage through this common wall (the crankcase casting) can affect operation of either the engine or the oil pump or both.



HOOK-UP FOR ENGINE LEAKAGE TEST:

Homemade sealing plates and gaskets should be used to seal off the engine intake and the pulse hole to the carburetor. In addition, the exhaust should be sealed off in the same manner. One of these sealing plates should have a hose fitting installed for connection of the tester.

NOTE:

If the oil pump is left in place during pressure testing there will be a slight loss of air through the pulse passage into the pump and out the pump pick-up tube. However total leakage through all points in the oil pump system should not exceed 100 bubbles per minute. This source of leakage can be eliminated during engine testing, by removing the pump assembly and covering the pump diaphragm mounting flange with a gasket and pressure plate in place of the diaphragm and pump body.

1. ENGINE PRESSURE TEST:

Attach pressure tester to hose fitting, and pressurize the engine to 10-15 psi (,70-1,05 kg/cm²). A brand new assembly with new seals, should be able to hold 15 psi for an hour, and a rebuilt assembly for several minutes; but a leak not exceeding 1/2 pound per minute is acceptable. If the pressure drops rapidly, immerse the power head (remove magneto parts first) or the short block in a test tank, or paint the areas of suspected leakage with a soap and water solution. Bubbles will form at the site of a leak. Here are some possible sources of leaks along with suggested remedies:

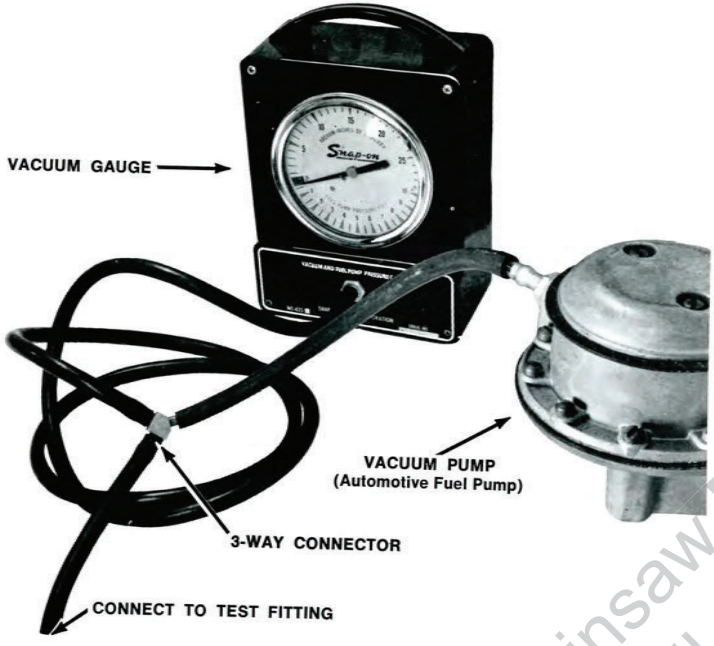
a) BETWEEN SEAL AND SHAFT: The seal could be installed backwards or be cocked (not square), worn out or damaged; the remedy is to install new seals properly.

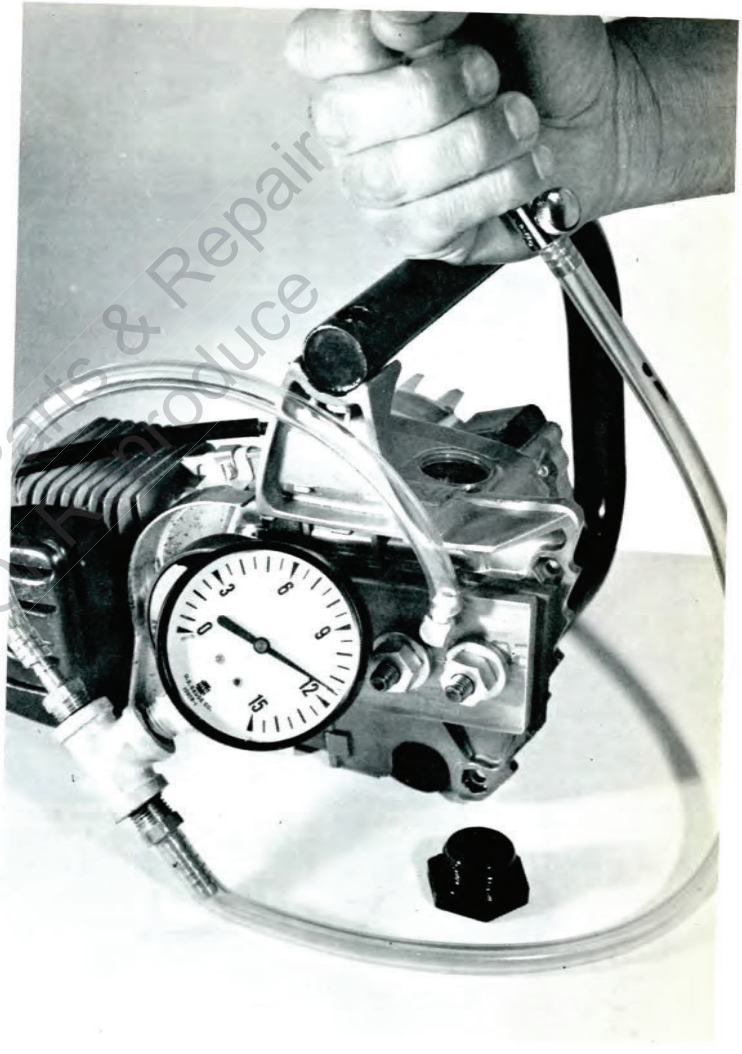
b) BETWEEN SEAL AND CASTING: Casting may have been scratched or seal not squared to casting during assembly; you may be able to fill scratches with RTV Silicone Sealant, and install a new seal while compound is still tacky.

c) BETWEEN MATING SURFACES OF MAJOR CASTINGS: Disassemble and clean off the sealing material. Scratches and digs may be filled with an epoxy cement and ground off leaving a smooth, flat mating surface. Spread a film of RTV silicone type sealant over both surfaces and fit them together. When dry, repeat pressure test to see whether leak has stopped.

d) THROUGH POROUS SPOTS AND CRACKS IN CASTING: Large cracks may be irreparable, small leaks may be repaired by degreasing and roughing the leaking area thoroughly, then sealing the surface with a coat of epoxy cement. Pressure test after cement has cured.

e) THROUGH THREADED HOLES AND PORES OF CASTING: Remove and clean screws in Locquic cleaner, then reassemble using a generous amount of Loctite "RED" sealer on screw threads. Sometimes this is enough to stop a leak. Otherwise, epoxy the casting as instructed above. Pressure test for leakage after reassembly.

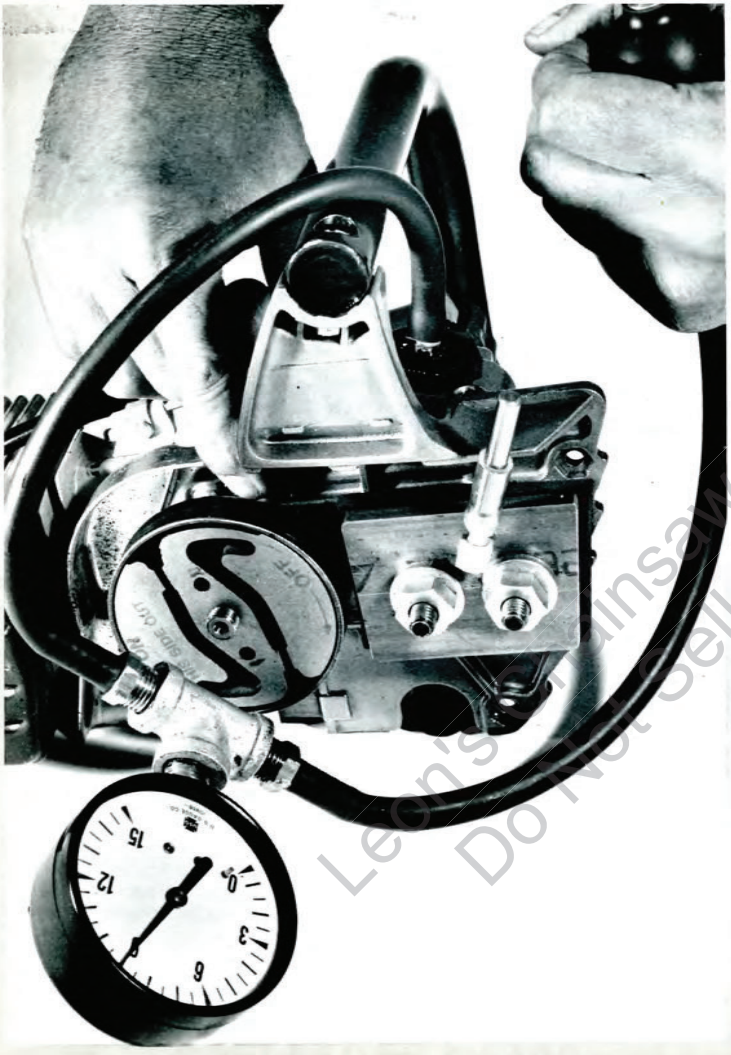




2. VACUUM TEST:

DO NOT IMMERSE ENGINE IN, OR PAINT IT WITH LIQUID DURING VACUUM TESTING.

Using a 3-way ("Y") connector, hook up both a vacuum pump and a vacuum gage to the hose fitting. Apply a vacuum of five inches of mercury (5″ hg, or 12,7 cm hg). This is roughly the equivalent of the negative pressure in the crankcase during the piston's upstroke. The gauge needle should either hold perfectly steady or move no faster than a minute hand moves around a watch dial. A slight loss of vacuum is permissible and understandable. Vacuum testing is more reliable than pressure testing of the sealing power of Garlock-type shaft seals which are designed primarily to keep air from leaking *into* the crankcase.



3. TEST WITH CHAIN OIL SYSTEM PRESSURIZED THROUGH DISCHARGE HOLE:

Closing the oil feed rate valve tightly, and pressurizing the system through the oil discharge hole in the guide bar pad tests the oil feed rate needle valve and the O-ring seal. With the valve closed, the pressure should hold quite steady. However, a slight leakage (specified as up to 100 bubbles per minute for factory test) through the discharge check ball and seat inside the pump body can be tolerated without significant change in output. In addition, at somewhere above 9 psi (,633 kg/cm²), the check ball will be unseated. If you can pump up enough pressure to unseat the ball, it proves that the passages on the discharge side of the pump are open. If the pressure drops at faster than the specified rate when the valve is closed, repressurize to 10 psi and look for the leak:

a) Moisten top of feed rate valve screw — bubbles will reveal a leak past the O-ring. Leakage here is of little importance except as it affects your testing.

b) Remove oil cap — look for bubbles coming from pump body, or from the depths of the tank which would indicate a faulty pick-up hose. Bubbles from pump body might indicate: a poor press-fit between the pump cylinder and pump body; an imperfect check ball or ball seat, or a distorted valve spring; also a porous pump body.

c) If you open the feed rate valve 1/4 turn, you should lose all pressure through the open valve.

4. TEST WITH CHAIN OIL SYSTEM PRESSURIZED THROUGH FITTING IN TEST OIL CAP:

Install the test cap tightly and connect the pressure tester to it. Leave the plate and gasket (used in test #3) over the discharge hole, but block the hose fitting with a piece of tubing and a plug. Also block the air vent at the top of the crankcase with your finger and be sure that the oil feed rate valve is closed. Pressurize the system to 10-15 psi (,70-1,05 kg/cm²).

a) If pressure is lost rapidly, there is a leak: from pump to either the engine or the outside wall of the tank (wash tank with soapy water and look for bubbles to disclose the leak); or through the pump and diaphragm into the engine via the pulse passage.

b) Unblock the discharge hole in the guide bar pad, and check whether there is a discharge of oil or foam: *If oil,* there may be a leaking ball check valve or imperfect seal between the inlet and dicharge sides of the pump. *If foam,* there may be a crack in the pick-up tube or a hole or crack in the pump housing.

NOTE: If pressure testing of the oil system indicates a possible internal leak, disassemble the chain oil system and continue inspection as in "CHAIN OIL SYSTEM REPAIR & REASSEMBLY" SECTION FIVE.

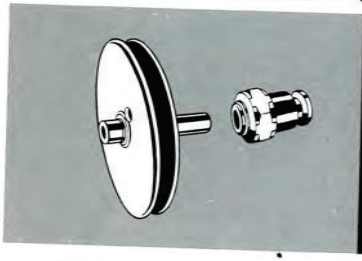
SECTION FIVE: POWER HEAD REPAIR

(Strip-Down, Inspection, and Reassembly)

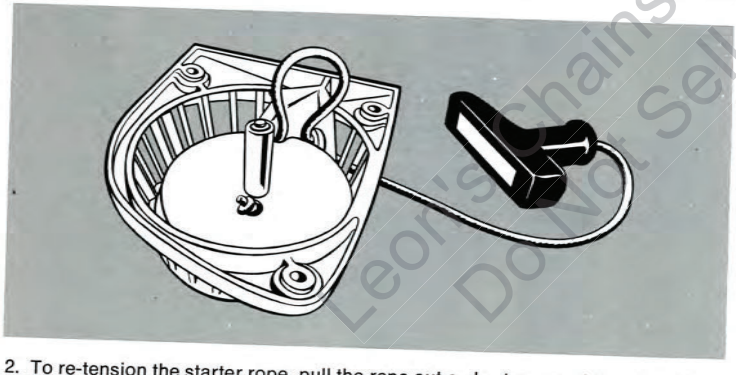
These instructions are arranged in an order facilitating rapid strip-down and reassembly of the entire engine. Where complete disassembly is not required, refer directly to the applicable main topics, such as "Starter Repair" or "Oil Pump Repair".

STARTER REPAIRS

1. Before removing starter, slide a screwdriver blade through the air intake slots to retain the pulley mechanism in the housing. Take out the three slotted, hex head screws and lift starter assembly off the saw.

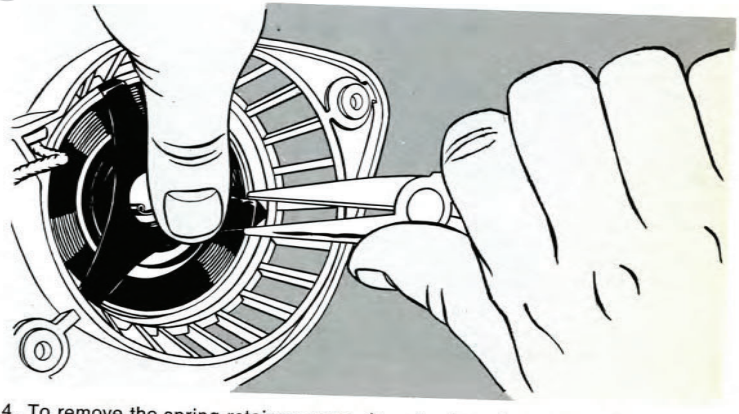


NOTE: Be careful not to let any dirt or sawdust fall into the starter clutch bearing inside the rotor nut on the engine shaft. Whenever the starter is removed, wipe the starter pulley shaft clean and lubricate it with a light film of HOMELITE ALL-TEMP *Multi-Purpose GREASE.* Do not over-grease as this could affect operation of the starter rotor nut bearing.



2. To re-tension the starter rope, pull the rope out a short way and hold the pulley from turning. Using the notch in pulley for clearance, pull the rope up between pulley and housing. Wind one or more extra turns onto the pulley and pull rope back into place so it will rewind when pulley is released. NOTE: Do not wind more turns on pulley than necessary to draw starter grip up against housing.

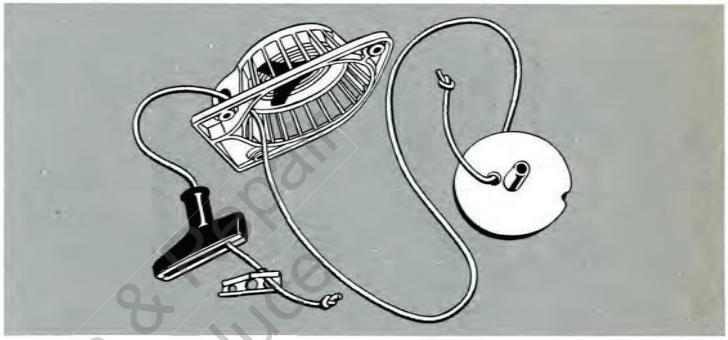
3. If the starter mechanism is to be replaced, pull rope up between pulley and housing and let pulley unwind slowly (or cut rope and unwind pulley if new rope is being installed). When all pretension is removed, lift out pulley as follows: Pull out and angle pulley just enough that you can see where inner spring loop engages the pulley. Then push pulley toward loop and angle it until pulley comes free.



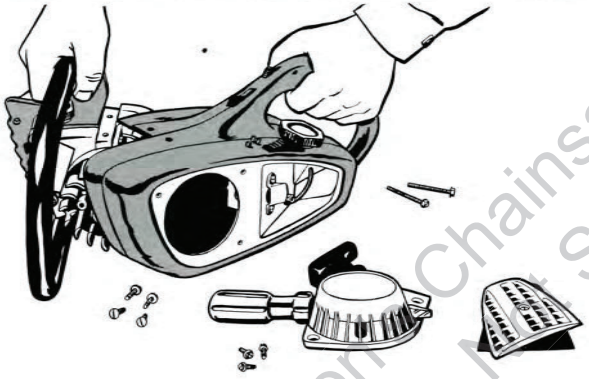
4. To remove the spring retainer, press down hard on the center and grasp one of the retainer legs as close to the end as possible (using long nose pliers as

shown). Pull this leg out of position, then free the other legs and lift out the retainer. Next, unhook and lift out the rewind spring. CAUTION: Tape or tie the spring coils together before disposing of the old spring. Install the new spring so the outer end points to the left when housing is as shown in the drawing. When installing the spring retainer, press the legs in a little to one side of the original assembly position in the housing.

5. Replace starter components as necessary. To install a new rope, thread rope through knot hole in pulley and tie a simple knot tightly in the pulley end. Pull rope so knot enters the knot hole, and trim off any excess past knot neatly. With pulley *shaft-side-up,* wind rope clockwise onto pulley. Line up inner spring loop with retaining groove of pulley and *angle, push* and *press* the pulley into position. (You can tell by fit and ability to get tension by rotating pulley whether spring is engaged.) Pass rope through hole in housing, thread rope through starter grip and grip insert. Knot end of rope and pull knot into insert. Draw insert into the grip. Tension starter as in paragraph 2 above. Altogether about 9 turns of tension are required.



TO REMOVE AND REASSEMBLE THE POWER HEAD AND ENGINE COVER ASSEMBLIES



1. Remove the air filter cover and the filter. Place a screwdriver blade through the air intake slots of the starter housing to retain the pulley mechanism inside the housing.
2. Remove the two 8-32 x 2″ slotted hex head screws. (If the carburetor is not to be removed from the engine cover, leave the two brass bushings and the air deflector in place; otherwise remove them.)
3. Using a 3/16″ or 1/4″ blade screwdriver, remove the four 10-24 pan head screws (two top and two bottom) holding the engine inside the engine cover.
4. Grasp the saw by its two handles — exert light pressure to pull/twist the engine out of the cover.

NOTE: To avoid unnecessary wear of the threaded holes for the four engine cover screws mentioned above in paragraph #2, the engine and cover should be separated only when necessary to make repairs or thoroughly clean the engine's exterior.

5. To reassemble the engine in the engine cover: Slide the front right hand corners of the cover onto the engine block at top and bottom; push the cover as far forward into place as possible; angle the cover and jiggle it to slide it between the handle bar and the magneto coil. Now jiggle and push it past the magneto into place.

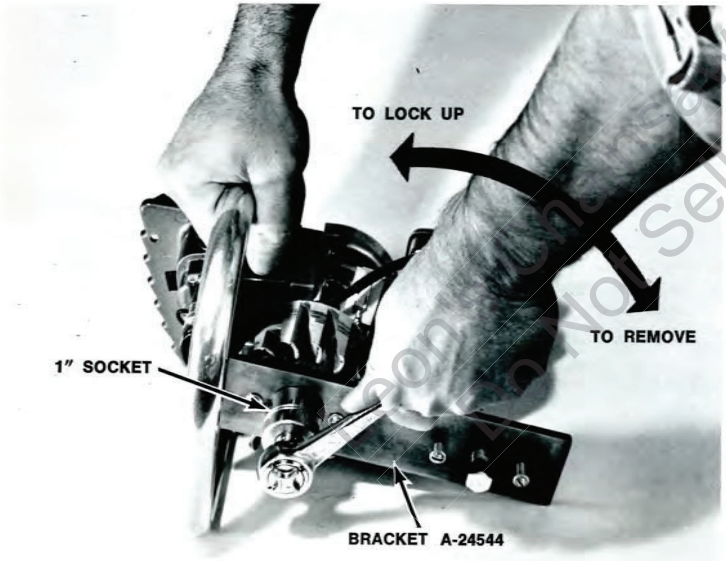
NOTE: The front outside corner of the coil insulation has been filed down for cover clearance. While the fact that the cover once was in place is proof that everything fits, in case of an extremely tight fit, it is possible to take off a *very slight amount more* of the insulation without damage to the coil.

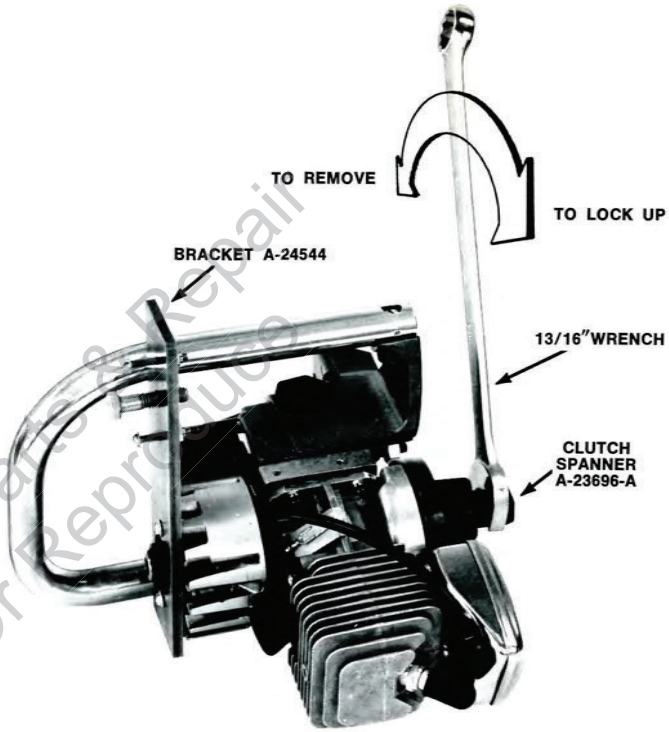
6. Whenever the cover is off the power head, thoroughly clean the whole power head and the cover assembly. Clean and grease the starter pulley shaft with MULTI-PURPOSE grease prior to reassembly of starter and cover on the engine.
7. To fasten the cover to the engine, start the top and bottom corners of the cover over the crankcase. Slide and twist the cover past the handle bar and magneto coil onto the power head. It may be necessary to guide the starter pulley back into the rotor nut. If this is difficult, remove the starter from the cover and, later, put it back on.
8. Clean and Loctite the four 10-24 pan head screws. Install the screws and tighten them to 45 pound-inches (51,9 kg/cm).

TO REMOVE OR REINSTALL CLUTCH AND CHAIN DRIVE SPROCKET, AND ROTOR NUT AND ROTOR

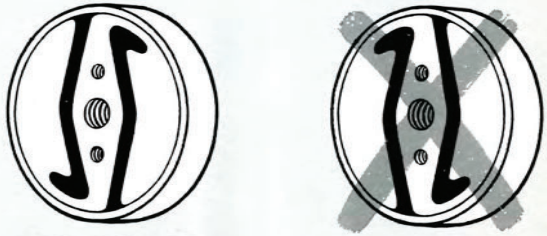
Whenever the clutch, rotor nut, or rotor are to be removed or installed, the Rotor Remover Bracket #A-24544 should be attached to the rotor as shown.

1. TO LOCK ROTOR PRIOR TO REMOVAL OR ASSEMBLY OF ROTOR NUT OR CLUTCH: Using the end with the large hole for clearance with head or rotor nut, attach the rotor remover bracket to the rotor.
2. TO REMOVE OR INSTALL CLUTCH: After locking rotor as above, spin the clutch off to the right (LH. thread) with CLUTCH SPANNER A-23696-A and a 13/16″ wrench, or use the same tools to install (turn left to spin on) the S-clutch. NOTE: Install clutch so the "S" configuration is correct-reading and not backwards like this: "Ƨ". Torque the clutch to 100 pound-inches (115,3 kg-cm). WARNING: Do not use an impact wrench in conjunction with the clutch spanner, as the shock of sudden impact may shatter the spanner pins.





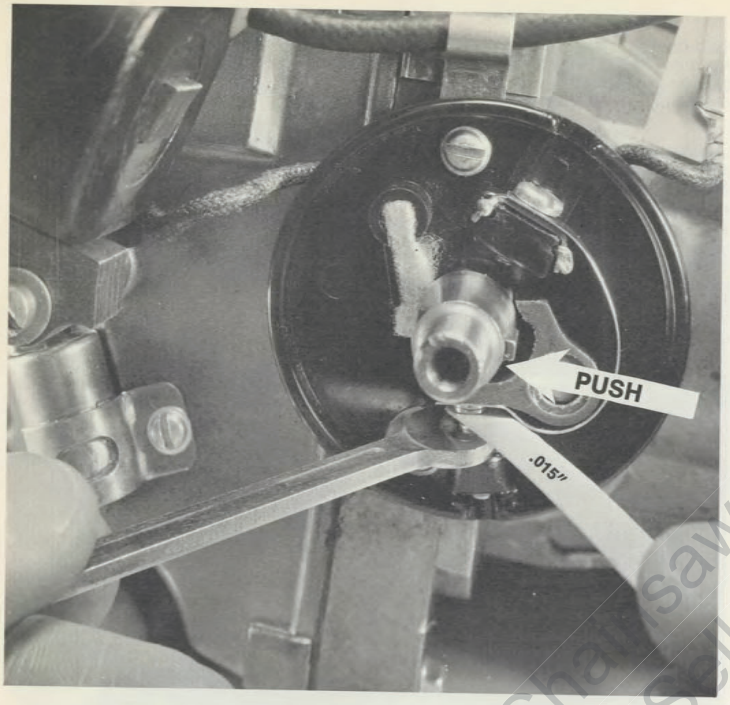
CLUTCH INSTALLATION



3. TO REMOVE ROTOR NUT AND ROTOR: Attach large hole end of rotor remover bracket to rotor. Use a 1″ wrench to start nut loose by turning wrench clockwise (L.H. thread nut). Remove tool and rotor nut. Attach jackscrew end of tool to rotor. Turn down on the jackscrew to break rotor loose from crankshaft taper. Remove rotor and the tool.
4. TO INSTALL ROTOR AND ROTOR NUT: Align rotor keyway with key in crankshaft. Push rotor onto shaft taper as far as possible by hand. Lock rotor from turning as in Step #1. Turning nut counterclockwise, install rotor nut and draw rotor securely onto shaft by torquing the nut to 200 pound-inches (230,6 kg-cm).

CLUTCH AND CHAIN DRIVE SPROCKET REPAIRS

1. Pull the power head out of the engine cover (page 21).
2. Remove the rotor nut and the clutch (see "Use of Special Tools . . ." page 22).
3. Remove the clutch drum and sprocket and the caged needle bearing and inner race. Then lift off the large thrust washer.
4. If necessary, take out the three pan head *Taptite* screws to remove the sawdust shield from the engine. NOTE: These are thread-forming screws. When *reinstalling* them they should be treated with *Loctite* to make sure they will stay in place.
5. DIAGNOSIS: If the clutch was either slipping too much, or engaging the chain during slow idling of the engine, it could be from burning and wear of the clutch contact surfaces, scored or out-of-round clutch drum, or a worn or dry clutch bearing. Installing the clutch wrong-side-out (the S configuration should not be backward) would also result in improper operation.
6. INSPECTION: The clutch parts should be renewed as necessary to restore proper clutching. When a new chain is being installed, we recommend changing the bearing as well as the clutch drum and sprocket. After degreasing and cleaning the caged needle bearing and race, inspect the needles. If they appear worn down and loose, or have any flat spots in them, replace both the bearing and the inner race. Check the crankshaft to be sure it is not worn where the inner race rides on it. This can occur if the clutch was loose for some time or the bearing dry or worn.
7. ASSEMBLY: Pack the needle bearings with a small amount of HOMELITE ALL-TEMP Multi-Purpose GREASE. Do not use so much grease that it could run out inside the clutch when engine is operating. Attach the sawdust shield with three pan head screws, *Loctited* and torqued to a minimum of 36 pound-inches (41,5 kg-cm). Slide the large washer, inner race and bearing, and the clutch drum and sprocket onto the shaft. Note that the "S" clutch configuration should read as an "S" and if the configuration looks like this, (Ƨ) turn it around. Spin the L.H. threaded clutch *counterclockwise* onto the shaft.
8. LOCK-UP: The clutch can be locked up at the correct torque of 100 pound-inches (115,3 kg-cm) at any time the magneto rotor is in place. If the magneto was disassembled, finish rebuilding the magneto, then assemble and torque up the clutch, rotor and rotor nut at the same time (see page 22).



IGNITION SYSTEM REBUILD

1. Testing procedures and test values for magneto and its components are given in SECTION THREE.
2. Remove the powerhead and remove the rotor nut and magneto rotor (see previous topics in SECTION FIVE).
3. Remove the spark plug. Pry off the felt-gasketed breaker box cover with your fingers. Do not lose the rotor (crescent) key from the key slot in the crankshaft.

NOTE: The magneto breaks down into two assembly groups: the breaker box and lead group on the engine, and the coil and core and condenser group on the chain oil tank. To disconnect one group from the other, it is necessary *only* to pull the high-tension lead out of the clamp at top of breaker box, and loosen the junction block screw to disconnect the lead coming from the breaker box.

4. The breaker box comes as an assembly including the leads, the ground terminal, the (fixed) contact screw (installed), the breaker arm, spring and felt wick, and the two #6 pan head mounting screws. Replace the assembly if the points are burnt, pitted, worn from arcing as a result of misalignment, or otherwise rendered beyond salvage by normal burnishing and cleaning. Always clean the contact surfaces by running a clean, lint- and oil-free piece of paper or cloth several times between the closed points, and then opening the points and snapping them together (pull back the breaker arm and release) several times. When mounting the breaker box on the engine, secure the high-tension lead clamp between box and crankcase with the top screw, and the ground terminal under the head of the bottom screw. Dress out the primary lead to the junction box and the switch lead to the insulated grounding tab on the cylinder.

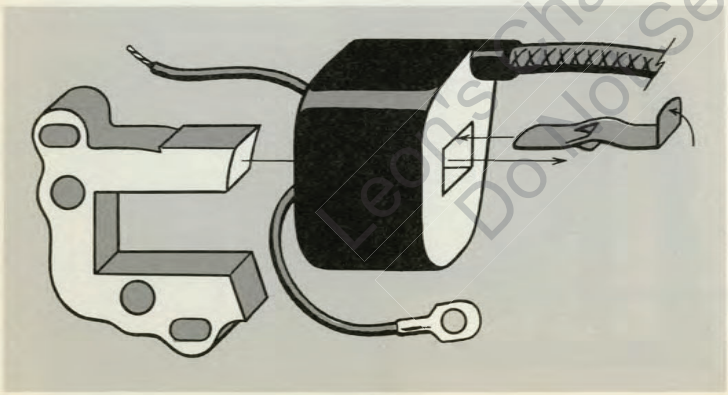
WARNING: NEVER TOUCH THE CONTACT SURFACES WITH YOUR FINGERS AS THE ACIDS AND SALTS IN FINGER PRINTS WILL ETCH THE SURFACES, CAUSING CORROSION AND ARCING.

5. Check alignment of the breaker points: Slight misalignment of these convexly contoured points probably will not result in a malfunction; but considerable misalignment might do so. If necessary, elongating the breaker box mounting holes in the correct direction will help you to align the points by indexing the breaker box. Torque the two mounting screws to a minimum of 18 pound-inches (20,75 kg-cm).

6. CONTACT POINT GAP SETTING 015″: Rotate the crankshaft until the breaker arm cam follower rests on the highest point of the cam—approximately 1/16″ past the breaking edge of the cam as shown. Using a 7/32″ timing wrench (open end) turn the contact screw one way or another to adjust the gap to .015″. IMPORTANT: Preload (take up the play in) the crankshaft supporting roller bearing by pushing the crankshaft toward the bottom leg of coil core. Otherwise, the breaker gap set for .015″ may diminish on the engine down-stroke. Check the gap with a .015″ plastic feeler gauge, our part no. 22486.

7. Snap the breaker box cover back on the breaker box.

8. To remove the coil and core, take out the two core mounting washer and screw sets. Loosening up the coil and core will leave the junction block free for removal.



9. Because they must be broken during disassembly, coil mounting wedges are supplied with replacement cores as well as coils. To take the coil off the core, break off the end of the wedge and slide the coil off the core.

10. TO ASSEMBLE A COIL ON A CORE: Hold the core so the legs are to the right and the notched core leg is on top. Hold the coil so the high-tension lead hole is at top right, and to the *rear* side with reference to the core. Start to slide the coil onto the notched core leg, and at the same time, slide the coil wedge, retaining tab-side-toward-notch, into place between coil and core leg. When coil goes all the way onto the leg and wedge locks in place (with tab in notch), the mounting is completed.

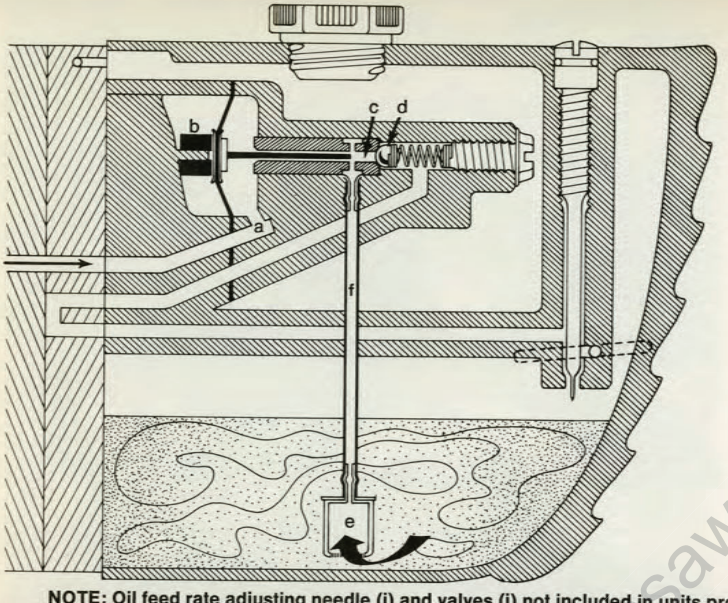
11. TO INSTALL HIGH-TENSION LEAD IN COIL: Leads are epoxied into the coils. Before a new lead can be installed, all the old epoxy should be cleaned out of the coil. The end of the lead should be square-cut. Push the lead onto the spike inside the high-tension lead hole in the coil. Seal the lead in the hole with epoxy cement, or RTV silicone sealant.

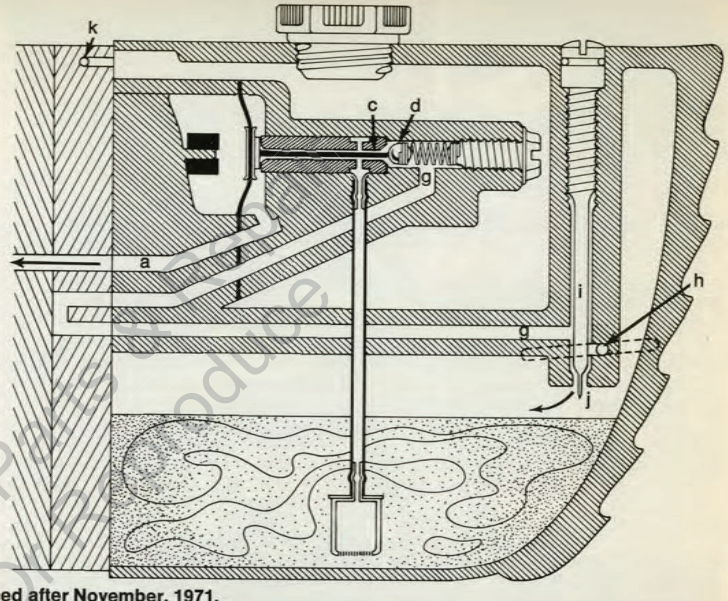
12. REASSEMBLY: Fasten the coil ground lead terminal underneath the washer on the bottom core mounting screw. Clamp the leads under the junction block screw head in the following order: Condenser, coil primary, breaker box. This order is important for good electrical continuity because the breaker box lead diameter differs from that of the other two leads. ATTENTION: Torque this #6 Plastite screw to 18 pound-inches (20,75 kg-cm).

13. CORE-TO-ROTOR AIR GAP: Whenever the coil and core mounting screws were loosened, the core-to-rotor air gap must be reset to .012″ (,305mm). This is done with the aid of a piece of .0125″ (,317mm) "black" plastic shim stock inserted between the rotor and the core legs of the coil.
    a) Loosen the core mounting screws. Rotate the rotor until the magnets are 180° away from the coil and core, and pull the coil away from the rotor.
    b) Insert the shim stock, then rotate the rotor until the magnets come around, drawing the core legs up against the shim stock.
    c) IMPORTANT: Preload the shaft bearings by pushing the crankshaft straight toward the bottom leg of the coil core. *If this is not done*, the air gap will shrink to much less than the desired .012″ and the core legs might actually contact the rotor during operation.
    d) While maintaining directional pressure on the crankshaft as in c), tighten the core-mounting screws to 30 pound-inches (34,59 kg-cm), and remove the shim stock.

14. After a last minute check to see that all leads appear properly connected and dressed down, snap the breaker box cover in place on the box and connect the switch ground lead flag terminal to the switch tab on the rib of the cylinder.

15. Install the rotor and the rotor nut, torquing the nut to 200 pound-inches (230,6 kg-cm).





NOTE: Oil feed rate adjusting needle (i) and valves (j) not included in units produced after November, 1971.

INTAKE: ON DOWNSTROKE, POSITIVE PULSE PRESSURE APPLIED TO PLUNGER DIAPHRAGM THROUGH PULSE CHANNEL (a) distends the diaphragm in direction of bumper (b) causing low pressure in pump cavity (c). Check ball (d) remains seated. Oil is drawn through the pick-up screen (e) up the rubber tubing (f) into the intake chamber (c).

DISCHARGE AND BY-PASS: ON THE UPSTROKE, NEGATIVE PULSE PRESSURE TRANSMITTED TO THE PLUNGER DIAPHRAGM distends the diaphragm, driving the plunger to unseat the check ball (d). Oil in chamber (c) is pumped out through discharge route (g) and is discharged through hole (h) in guide bar mounting pad. If the feed rate adjusting needle valve (i) is opened (counterclockwise), oil will flow through the by-pass channel (j) back into the reservoir, thus reducing the rate of flow. There is a tank vent hole at (k).

AUTOMATIC CHAIN OILER REPAIR

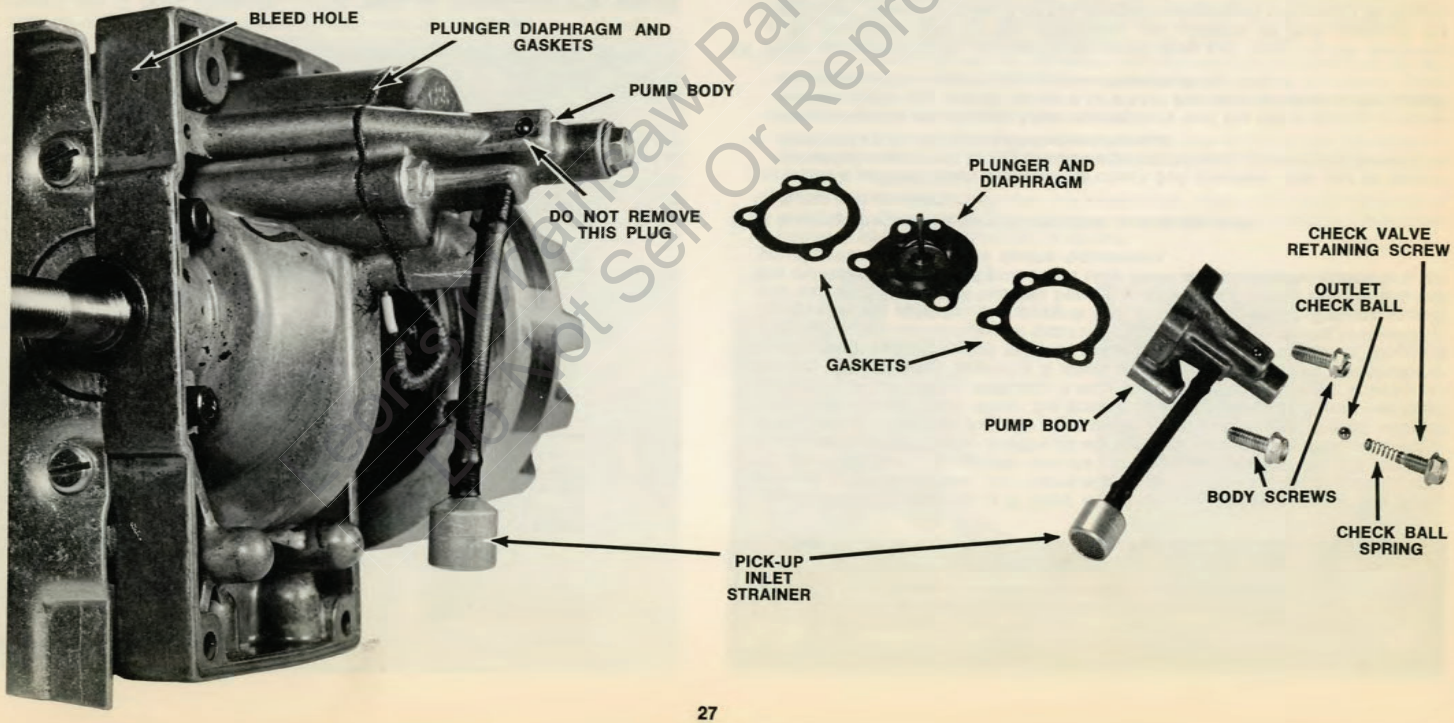
NOTE: The chain oil tank may be removed from the powerhead without removal of either the clutch or the magneto. But, because of the short block fastening screws are inside the oil tank, it is best to strip down to the short block now if the short block is to be opened up. Always test the oiler output (page 7) and make pressure tests for suspected leaks in the oil system if the reason for oil tank removal is oil system trouble.

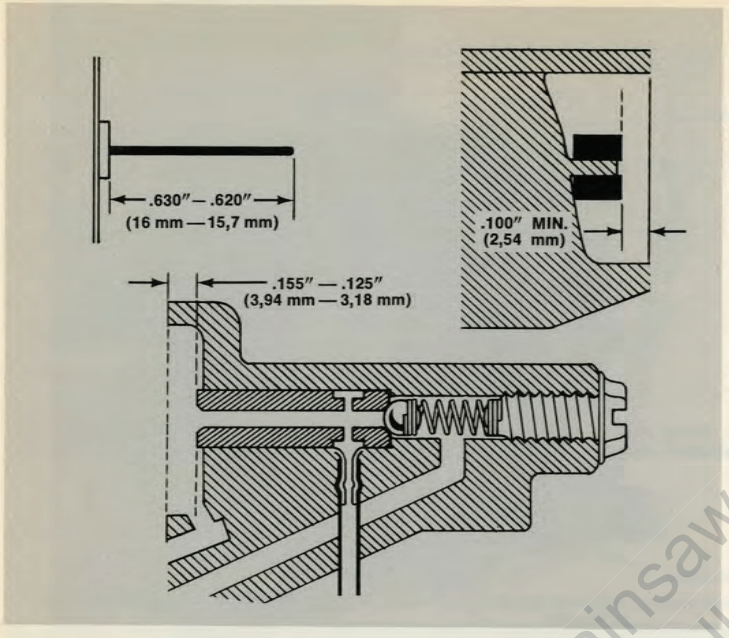
1. Remove the powerhead from the engine cover (page 21).
2. Remove the chain oil filler cap and drain the oil tank.
3. Do either a) or b) as required for service:
   a) Remove clutch and rotor (see page 22) and disassemble the magneto components from the crankcase and oil tank.
   b) Leave the clutch and rotor on the powerhead, but disconnect the hi-tension lead from the spark plug, pull the lead out of the clip (behind rotor) and loosen the junction block screw to disconnect the lead coming from the breaker box.

4. Remove the four hex washer head screws, two on top and two on underside of the crankcase. Lift the short block off the oil tank.
5. Remove the oil pump by removing the two hex head screws. Lift out the pump plunger (and diaphragm) assembly from the pump body. Check the diaphragm and the "dry" side of the pump diaphragm chamber: If oily, there is a leak in the diaphragm or casting.
6. Take out the screw in the end of the pump body, and carefully remove the discharge valve spring and check ball from the body.
7. Remove the oil pick-up screen and flexible line.
8. LOOK FOR OBSTRUCTIONS: These include dirt and chips of metal, and sometimes incorrectly drilled connecting passages. Another obstruction to check is an excess of RTV Silicone rubber (used in sealing crankcase to the cylinder) which may have run into the chain oil discharge channel in the crankcase.
   a) Blow air through the discharge hole in the guide bar mounting pad and both watch and feel for air to emerge at the end of the oil passage in the side wall leading to the crankcase.

WARNING: NEVER USE AIR in the shop at pressures exceeding 30 psi. A pressure regulator set to 30 psi or below should always be included in any air system used for cleaning and repair in any workshop. At pressures above 30 psi, air directed at human tissue can penetrate the skin, entering the blood stream.

   b) Spray "Inhibisol" or a similar low-toxicity degreasing solvent through all passages of the pump body. Degreasing will help to dislodge any dirt and chips. Blow air through the inlet fitting — see above *warning* about maximum safe air pressure — plug the other three holes with your fingers (as you would finger a flute) so that air comes out alternately from the three holes.
9. Check the pump inlet screen and the pick-up tube. If the rubber is deteriorated and is kinked or cracked, or split at the ends so that it cannot stay connected, replace it. See that the screen is clean and open.





10. CHECK THE PUMP COMPONENTS FOR PROPER CONDITION AND DIMENSIONAL RELATIONSHIPS: For full output it is necessary not only that there be full travel of the pump plunger, but also that the plunger not overshoot the annular intake groove and port, blocking intake:
    a) If the rubber bumper is riding high on the stud, or if the diaphragm mounting flange on the crankcase was faced off, there may be insufficient clearance between the mounting face and the bumper and stud. Make sure the bumper is down "home" on the stud. If the clearance between the bumper and stud and flange face is less than .100″, grind down both bumper and stud to provide a minimum clearance of .100″ (2,54 mm).
    b) If there is a leaky diaphragm, the "dry" side of the diaphragm and the chamber walls will be oily instead of dry.
    c) The plunger, which must be absolutely tight in the collar at the diaphragm end, must also slide freely in and out of the pump cylinder. The length of the plunger measured from the collar to the end of the plunger must be within .630″–.620″ (16 mm–15,7 mm).
    d) Measure the distance from the mounting face of the pump body to the top of the pump cylinder. This should be between .155″ and .125″ (3,94 mm–3,18 mm) for a full stroke without interference with either the intake port or the discharge check ball.

NOTE: It is more difficult and less revealing to measure the cylinder position relative to the floor of the chamber. The outer face of the cylinder will normally vary between *plus* .035″ (0,90 mm) and *minus* .015″ (0,38 mm) from the chamber floor, a spread of .050″ (0,52 mm).

11. Low output will also result if there is excessive leakage between the pump plunger and the cylinder, or if there is porosity in the casting, or an improper press fit between the cylinder and the casting. This type of leak will show up particularly when the saw and the oil are hot from operation and the oil accordingly low in viscosity. Actually, it may be most practical to install another pump that doesn't leak. When the trouble is a poor press fit due to improper assembly or machining methods, it may be possible to repair the leak by removing the cylinder, applying a small amount of RTV (room temperature-vulcanizing) sealant to the cylinder walls (not too much for fear of clogging the inlet ports) and allowing at least 24 hours for curing following reassembly. To remove the cylinder, put a check ball in the pump (leave the spring out) and use an 8-32 x 1-1/4″ socket head cap screw against the ball to jack out the cylinder. NOTE: This procedure may mark and distort the check ball, so you'd better put in a spare during reassembly.

12. A leaking check valve may be reseated to stop the leak:
    a) Support the cylinder.
    b) Insert a perfect check ball into the check ball chamber, and use an appropriate diameter drift to tap the ball against the seat, contouring the seat to that of the ball. Remove and discard this ball.
    c) Drop in a new check ball. After making sure that the valve spring is undistorted, attach the end of it to an 8-32 x 1/2″ hex washer head screw, install and tighten the screw to 36 pound-inches (41,51 kg-cm).

13. When reassembling the plunger in the pump body and fastening the assembly to the mounting face on the crankcase, use gaskets on both sides of the diaphragm. Fasten with two 8-32 hex washer head screws torqued to 36 pound-inches (41,51 kg-cm).

14. If the "short block" is to be serviced, do this before reassembling the oil tank to the crankcase. If there is no further work to be done on the unit, the oil tank should now be reassembled and secured to the crankcase. (Make installation in reverse of the order used in disassembly, and use the following screw torques:

Cylinder to crankcase	36 pound-inches (41,51 kg-cm) plus Loctite.
Crankcase to oil tank	36 pound-inches (41,51 kg-cm) plus Loctite.

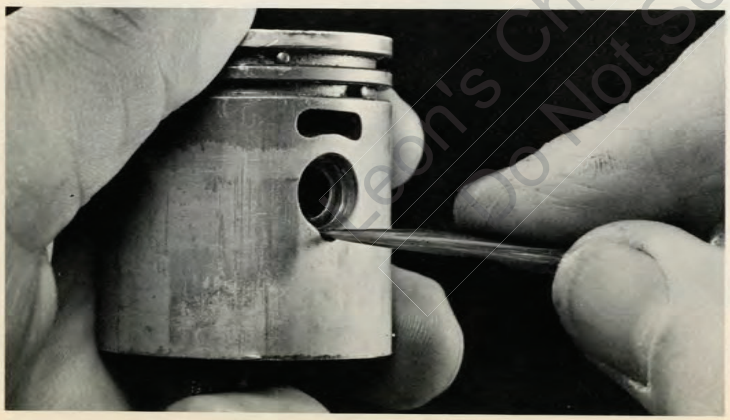
IMPORTANT NOTICE:

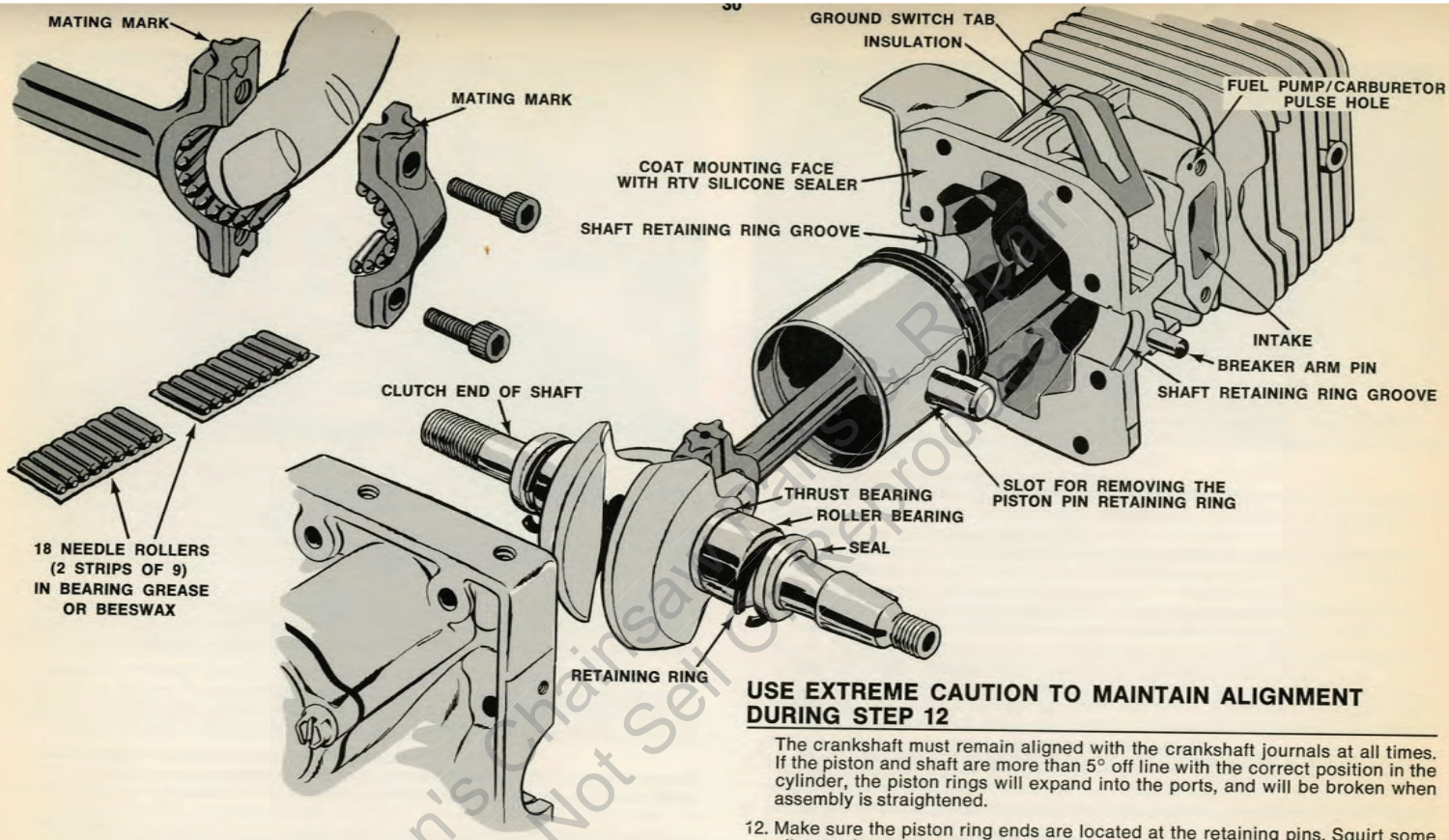
To prevent contact of the rotor with the high-tension lead, push and hold the tank as far toward the clutch side of the engine as possible, while the tank-fastening screws are being tightened.

ENGINE "SHORT BLOCK" SERVICE

NOTE: The engine "short block" can be replaced as a complete assembly ready for installation in the saw. It can also be disassembled and repaired. The cylinder and crankcase, however, are replaced only as a matched set.

1. After disassembling saw down to the "short block", i.e. cylinder and crankcase, open engine up by taking out the two hex head screws through the cylinder flange and the four 8-32 hex socket head screws on the oil reservoir side of the crankcase. Hold the crankshaft and pull the cylinder off the crankcase.
2. The whole piston, rod and crankshaft assembly may now be lifted out of the crankcase.
3. Any time the "short block" is opened for overhaul, the thrust bearings, main roller bearings, rubber seals, and needle bearings and the connecting rod cap screws at the crankthrow should be renewed.
4. The dome section of the cylinder can be rendered serviceable by scraping off the deposits carefully, PROVIDED the cylinder walls (which should not be cleaned) are in good condition. Check walls for scoring, chrome pick-up, aluminum deposits, flaking, chipping and wear of the aluminum surfaces.
5. Check the piston for scoring. Remove the old piston rings carefully. Make sure that both of the piston ring retaining pins are in tightly. If ring grooves of piston are full of carbon, clean out the grooves carefully with the sharp end of a broken ring.
6. Using a sharp awl or pick at the removal slot provided at the bottom of the piston pin hole on the intake side, pick out the wire retaining ring. (NOTE: There is no such slot on the exhaust side because the retaining ring on that side is not intended to be removed.) Then use a small diameter pin or rod to push the piston pin out of the piston. Although the assembly is not designed to be a tight press fit, the piston pin should fit snugly in the piston.
7. If the needles in the connecting rod wrist pin bearing are worn flat or can be separated with a pencil point more than the width of one needle, the bearing should be replaced. This requires the following special tools and procedure to avoid damaging the new bearing.
   a) Place connecting rod over a fixture that will support the connecting rod around the bearing, but let bearing slide through.
   b) Center fixture and rod on an arbor press and press out the bearing with the wide shouldered end of plug #24294. Install new bearing with the *other* end of the same plug plus spacer #24548 which is required for sinking the bearing into the bore to the right depth.
8. Install the piston rings on the piston with the open ends straddling the locating pins.
9. First, lay out the crankshaft, connecting rod and piston parts to note the assembly relationships, and then assemble as follows:
   a) Install the connecting rod to the piston by pressing in the piston pin *closed-end-first* from the intake side (the side with the two piston ring locating pins) of the piston. Install the wire snap-ring with its open end in any position except the *down* position (with reference to the piston travel).
   b) The connecting rod and the 18 needles at the crankpin journal must be assembled so the mating marks of the connecting rod pieces are mated. (This is a one-piece rod, fractured apart to permit needle bearing assembly.) The rod will not fit if the assembly is not mated.
   c) The assembly must be done so that the intake side of the piston (the side on which the open ends of the piston rings butt against the pins) is toward the intake or magneto side of the engine.
   d) When the 18 needle bearings are assembled, there can be no binding or roughness. The connecting rod cap screws must be tightened to a minimum torque of 60 pound-inches (69,18 kg-cm).





10. Position the crankshaft, bearings and seals in the crankcase. Note that the open sides of the seals go toward the inside of the engine. Press the shaft retaining rings into the ring grooves. This is best done by putting the split ends of rings downward. Try to align the seals as square to the shaft and flush to the outside of the crankcase as possible, because cocked seals will leak.

11. Although there is no cylinder gasket, the sealing surfaces of crankcase and cylinder were coated with a film of RTV (room temperature-vulcanizing) type silicone sealer, available in tubes at supermarkets, drug stores or "5 and 10" stores. Wipe the old sealant off the surfaces, spread a very thin, smooth coating of new sealant over them and prepare to complete the assembly.

USE EXTREME CAUTION TO MAINTAIN ALIGNMENT DURING STEP 12

The crankshaft must remain aligned with the crankshaft journals at all times. If the piston and shaft are more than 5° off line with the correct position in the cylinder, the piston rings will expand into the ports, and will be broken when assembly is straightened.

12. Make sure the piston ring ends are located at the retaining pins. Squirt some oil onto the cylinder walls. Push the piston into place in the cylinder. Make sure nothing has slipped out of place or become cocked in the crankcase. Align cylinder with crankcase, fit together and fasten as follows:
    a) Install the four sets of #8 flat washers and 8-32 x 1″ socket head cap screws, tightening them down alternately to final torque of 40 pound-inches (46,12 kg-cm).
    b) Loctite the two 8-32 hex washer head screws and install them in the two bottom holes of the cylinder mounting flange. Tighten these screws to 36 pound-inches (41,51 kg-cm).
    c) The four 8-32 x 1-1/4″ hex washer head screws which go through the crankcase to the oil tank, should be installed when the tank is being assembled to the crankcase.

SECTION SIX: ENGINE COVER AND CARBURETOR REPAIRS

THE ENGINE COVER PARTS GROUP CONSISTS OF:

1. The four 10-24 pan head screws, cover-to-powerhead.
2. The air filter screw, cover, and filter.
3. The carburetor mounting screws, flanged bushings and air deflector.
4. The carburetor and carburetor spacer.
5. The choke button, spring and choke rod.
6. The fuel cap and gasket.
7. The engine cover (service) assembly consisting of the bonded-together 2-piece cover, switch parts, trigger parts, trigger latch parts, fuel line and pick-up assembly and a hi-tension lead clip.

NOTE: The starter assembly is considered separate from either the power head or cover parts groups, but is covered at the start of SECTION FIVE, "POWER HEAD REPAIR".

TOOLS AND MATERIALS FOR ENGINE COVER REPAIRS

1/16" and 3/32" drifts
9/64" hex key
1/4" socket, ratchet and 6" extension.
3/8 drive torque wrench or screwdriver—0 to 60 pounds.
Long nose and slip joint pliers.
7" cutting pliers or scissors.
Pop rivet gun and rivets.
Epoxy compound for repair of tank leaks.
Trigger latch installation tool.
Ball peen hammer.
Carburetor repair kits and gasket sets.

FUEL SYSTEM DIAGNOSIS

Exclusive of excessive smoking due to leaking of chain oil into the engine, and rich operation (too much fuel) which is caused only by carburetor faults or a need for mixture adjustment, fuel system troubles narrow down to lean operation, for which there are many causes. Those external to the carburetor are: inoperative valve in fuel cap, leaking fuel line, plugged fuel filter or crimped or collapsing fuel line, or an air leak through a casting or one of the seals into the engine. For testing and repair of all fuel troubles, see "PRESSURE TESTING AND LEAKAGE REPAIRS", page 14, and "HDC Carburetor Service", page 31.

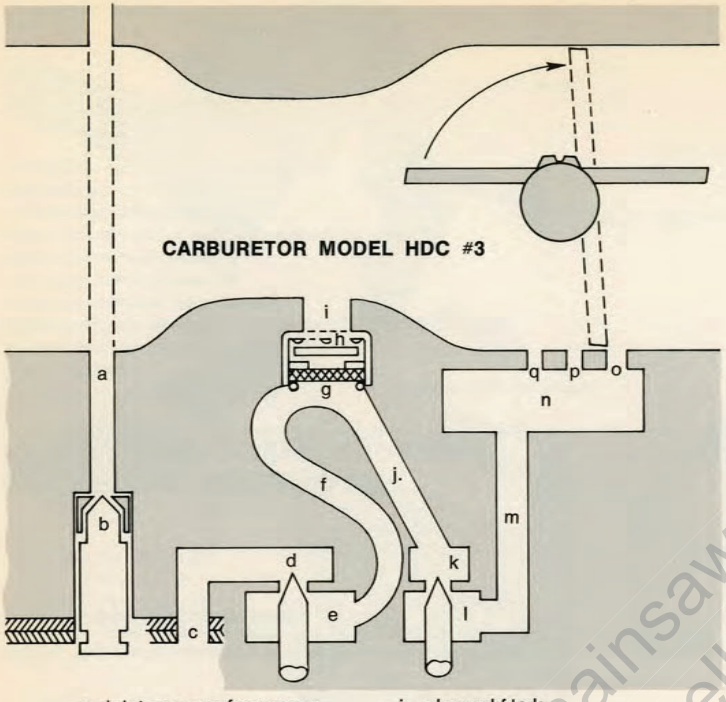
HDC CARBURETOR SERVICE

REMOVAL OF CARBURETOR: Pull out the air deflector and flanged bushings holding the intake manifold gasket and carburetor in place; after disconnecting the fuel line at the carburetor, pull down and angle the carburetor to unhook it from the throttle rod; as this is done, the choke rod will come free of the carburetor also. If the choke rod and brass detent clip fall off the choke button, they may be put back during carburetor installation.

DISASSEMBLY OF CARBURETOR: Unscrew the large cover screw and lift off the fuel pump cover. Remove the pump gasket and the diaphragm. Remove four screws and external tooth lock washers. Lift off the metering diaphragm cover. Remove the metering diaphragm and gasket. A circuit plate having a positioning tab is visible. The plate holds down the inlet needle. lever and spring assembly. Remove two flat head circuit plate screws and lift off the plate. Remove the inlet needle, lever and spring. Remove the thick, black circuit gasket, exposing all fuel passages and idle ports. Remove the HI and the LO fuel needle and spring assemblies.

Normally, it will never be necessary to remove the screen-retaining rings and the screens covering the limiting jet or the main jet check valve. If the throttle shaft is to be replaced, remove the screw and the throttle valve (butterfly); also the screw and the throttle stop. Pull the throttle shaft and lever assembly out of the carburetor body. Do not lose the throttle-return spring.

If the choke friction spring and ball, or the choke shaft or valve need replacement, remove choke valve from the shaft. With your finger, cover the hole through which the choke shaft can be seen. Then pull out the shaft. Remove the ball and the spring from the hole.



a. inlet passage from pump
b. inlet needle
c. fuel take-off
d. main needle seat
e. main needle well
f. main channel
g. main jet screen
h. main check valve
i. main jet
j. channel f to k
k. idle needle seat
l. idle needle well
m. idle fuel channel
n. idle port
o. idle (discharge) port hole
p. idle (air bleed) port hole
q. idle (air bleed) port hole

CLEANING AND INSPECTION: For best results, soak the body and the metal parts in a regular solvent, not a "carburetor cleaner" solution. Cracked gaskets, and torn, frayed or porous diaphragms must be replaced. If the carburetor has been in service for a long period, it is best to renew all the gaskets and diaphragms anyway. The carburetor is not repairable if it has a damaged or worn out inlet needle valve seat, or limiting jet.

Inspect the inlet needle, lever and spring. Look for needle wear at the tip and also at the lever contact area. Replace worn parts. Make sure the limiting jet is clean and open by blowing through the limiting jet with the throttle in open position. Examine the three fine screens. They should be open and perfectly clean. The choke friction ball should be perfectly round.

SERVICE PROCEDURE FOR FLOODED CARBURETORS

a) Diaphragm lever too high — lever should be set flush with bottom flange of carburetor.
b) Dirt under inlet needle valve — remove and clean.
c) Circuit gasket leaking — replace.
d) Metering lever spring not seated in dimple in metering lever — assemble properly.
e) Fuel pump diaphragm leaking — replace.

SERVICE PROCEDURE FOR LEAN CARBURETORS

a) Metering Lever too low — set flush with bottom flange of carburetor.
b) Dirt in idle channels — remove circuit gasket; clean channels.
c) Leaky metering diaphragm — replace diaphragm.
d) Pulse line from crankcase to carburetor plugged — remove obstruction.
e) Leaky manifold gaskets — replace gaskets.
f) Fuel pump diaphragm check valves worn — replace fuel pump diaphragm.

REBUILDING THE CARBURETOR

NOTE: The manufacturer calls for 6-1/2" pound-inches (7.5 kg-cm) of torque on all outside screws (except pump cover screw) during assembly.

Drop the friction spring and ball into the hole that crosses the choke shaft bore. Push the shaft into place in the bore. Work the choke lever to see that the friction device holds the choke in the open and closed position. The edges of the choke valve are beveled to fit the carburetor barrel. Install the choke valve on the shaft with one valve screw. Make sure the valve closes off the barrel perfectly and does not stick or bind when the lever is worked.

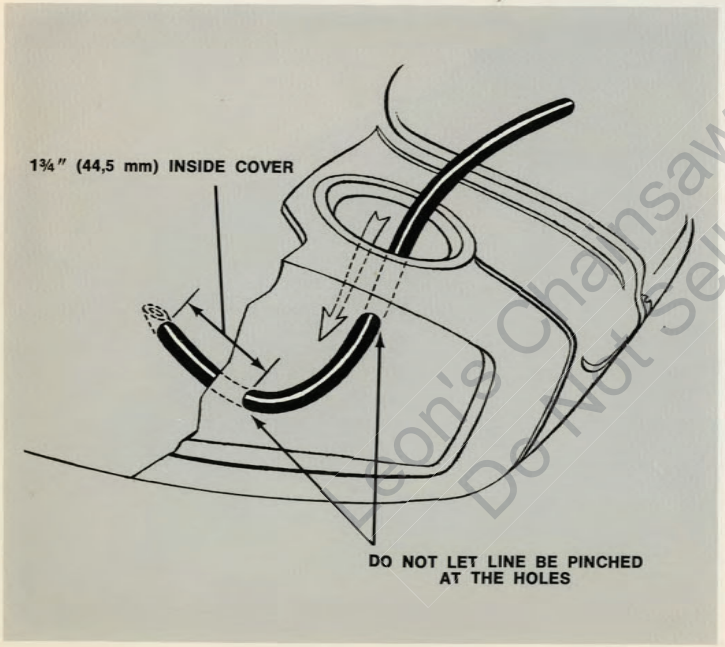
If previously removed, slide the throttle return spring onto the throttle shaft. The hooked end should engage the notch in the shaft lever. Push the shaft into the body. Engage the straight end of the spring in the slot in the body. Assemble the throttle stop to the end of the shaft with one screw (the same as the valve screws). The stop should come in contact with the adjustment screw. The throttle valve has beveled edges to fit the carburetor barrel. Assemble the throttle valve to the shaft with the remaining valve screw. Be sure there is no binding and that the fit is perfect.

Turn the carburetor over. Drop the inlet needle valve into the valve seat. Locate the (inlet) metering lever spring in the spring recess of the chamber. Position the circuit gasket in the carburetor fuel chamber. Fit the lever under the fulcrum pin of the circuit plate. NOW, locate the spring on the dimple of the lever and slide the fork of the lever onto the needle while installing the circuit plate. Hold down the plate and check action of the needle, lever and spring assembly. Fasten the plate in place with two flat head screws. Be sure the spring has not come off the dimple. Assemble the metering diaphragm gasket, diaphragm and the cover (in that order) to the carburetor with four external tooth lockwasher and screw assemblies. Assemble a fuel pump gasket, a pump diaphragm and the pump cover (in that order) to the body with the large cover screw. The carburetor should be tested for leaks (see SECTION FOUR, "PRESSURE TESTING"). Install and adjust the carburetor for proper performance.

FUEL TANK AND FUEL LINE REPAIRS

1. Refer to "PRESSURE TESTING", SECTION FOUR to test the fuel system for leakage. Cracks and porosity of the tank casting, or leaks between the bonded halves of the tank, may sometimes be repaired with epoxy cement, applied after the tank has been cleaned and dried and the surface properly prepared.

2. Cut one end of the fuel line back at a 45° angle. Oil this end of the line and thread it from inside the fuel tank through the small hole, then back through the other hole (as shown) into the carburetor mounting side of the cover. Cut the 45° end off squarely. Pull the line through until there is 1¾" (44, 5mm) of line inside the carburetor compartment. Adjust so that the portion of line between the two holes is curved gracefully, and not taut or crimped at the holes. Attach the pick-up filter assembly to the tank end of the line and drop it into the tank.



FUEL CAP RELIEF VALVE REPAIR

Repairs are covered along with pressure testing in SECTION FOUR.

SWITCH LINKAGE REPAIR

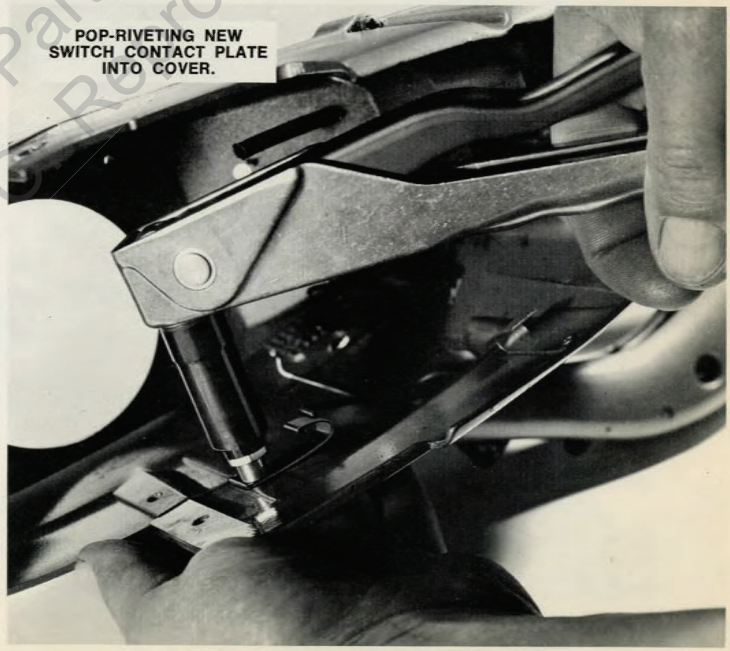
If the stop switch control button, spring, rod or contact plate require replacement, proceed as follows:

a) Remove the switch spring: either wedge a screwdriver between the spring and mounting boss on one side, or use long nose pliers to compress the spring for removal.

b) Unhook the switch rod and remove the switch.

c) To install a new contact plate: grind and punch or spin-off the old rivet; assemble a new plate in place with a rivet, pop rivet (installation illustrated) or a screw and nut assembly.

d) Position the switch button in the handle and secure by installing the spring. Hook up the switch rod from the contact plate to the button.



1.

2.

6.

REPLACEMENT OF TRIGGER PARTS GROUP

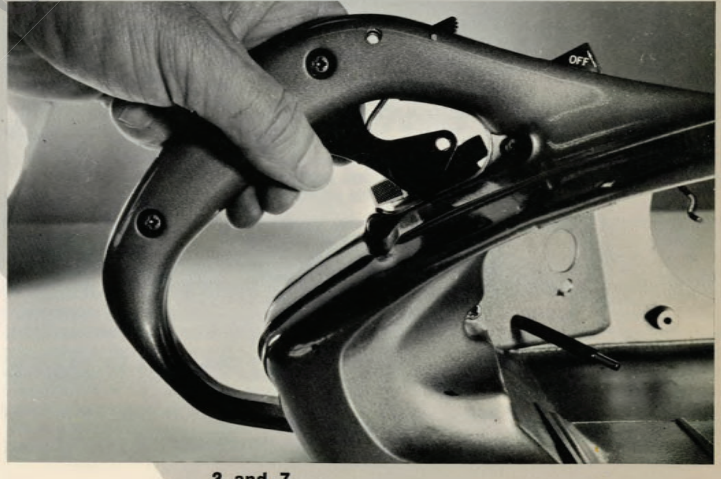
Study the series of trigger-service photographs carefully, as the key positions or steps required during both disassembly and assembly are illustrated and numbered.

1. Support the handle on a block or anvil while you use a hammer and an 8-32 screw or .1850″ max. dia. (4, 69 mm) drift to drive out the trigger pin from left side to right side.

2. Push the trigger up into the handle slot.

3. Hold the rear of the trigger in the slot and use a pointed instrument to push the trigger gently, as far as possible toward the rear of the handle slot, and pick the front end out of the slot.

4. With one finger, push the rear of the trigger into the slot as far as possible without forcing.



3. and 7.

5. Grasp trigger at fulcrum or pivot point and pivot the trigger (counterclockwise from side photographed) so that the trigger rod can be unhooked.

6. Let go, and the trigger will usually fall out by itself, although you may speed things up by jiggling the trigger or rod.

NOTE: On early production runs of triggers, the slots warped closed as they cooled out of the mold. A too-closed slot will impede assembly and disassembly of the trigger rod. The slot can be opened up by spreading with a screwdriver, and reset by heating moderately and allowing to cool.

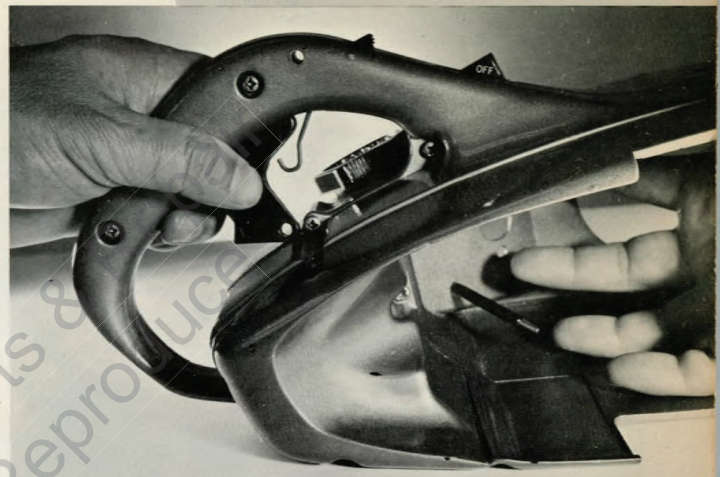
7. Insert rear of trigger into handle slot, and hook the rod up to the trigger.

8. Push the rear of trigger up into the rear of the slot.

9. Push the front of the trigger up into the front of the slot.

10. Line up the trigger hole with the pin holes in the handle. Hold trigger with a drift pin or 8-32 screw inserted from the left side of the handle. Drive the *Groov Pin* into place from the clutch side of the handle.

4. and 5.



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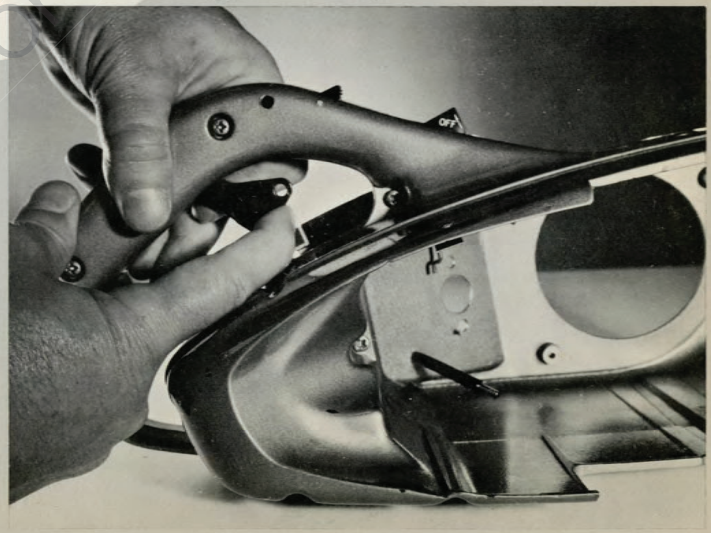
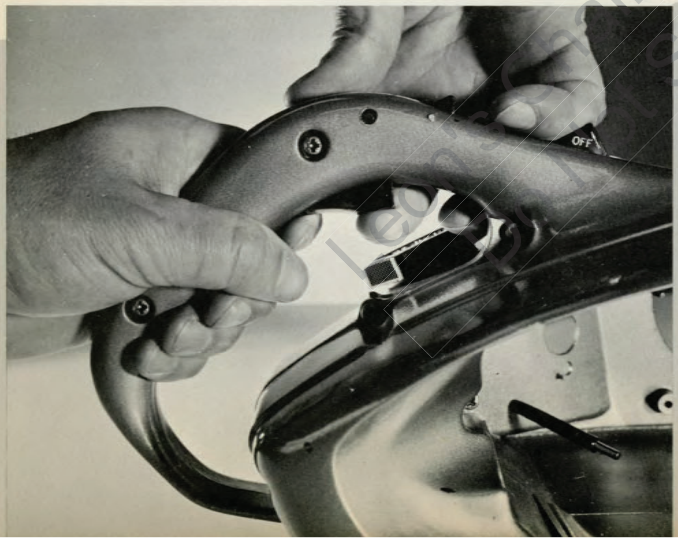
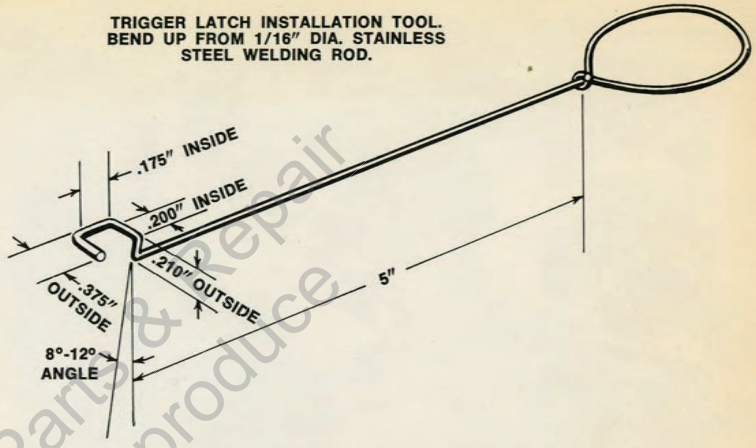
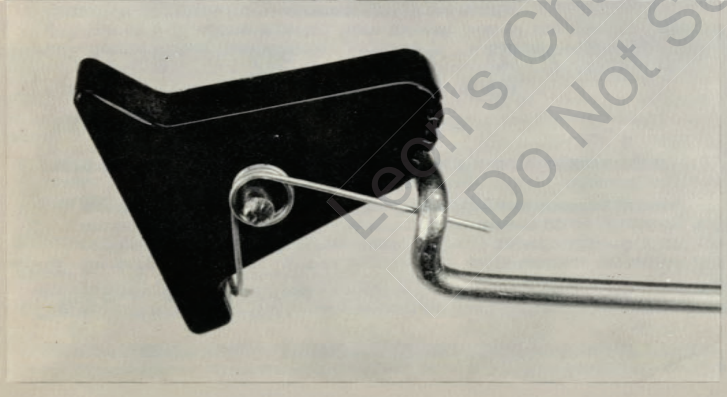


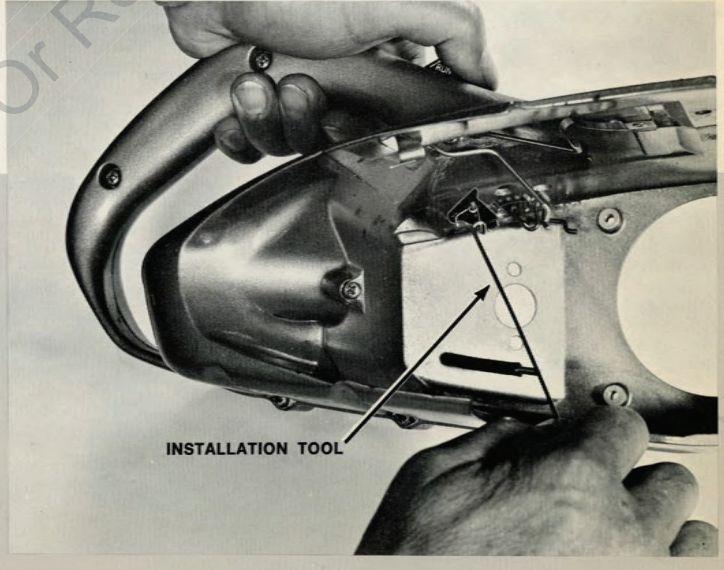
9.



TRIGGER LATCH INSTALLATION TOOL.
BEND UP FROM 1/16" DIA. STAINLESS
STEEL WELDING ROD.

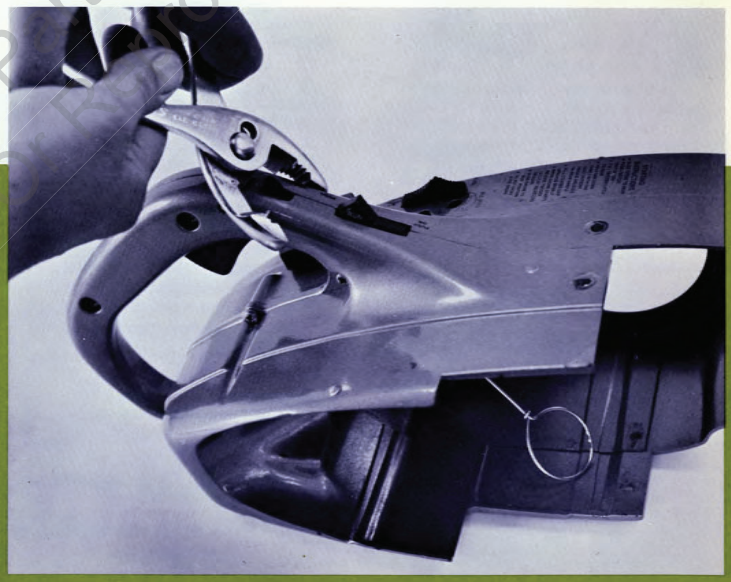






TRIGGER LATCH REPLACEMENT

1. Use a 1/16″ diameter (1,59 mm) pin or drift to tap the latch pin from the clutch side into the interior of the handle, thus freeing up the trigger latch and torsion spring. Shake the pin, latch and spring out onto the work bench.
2. The trigger latch installation tool can be bent up from 1/16″ diameter (1,59 mm) welding rod. Be careful to get all the bends and dimensions just right.
3. Assemble the latch on the tool, add the spring and bend the end of the spring under the tool as in the close-up photograph.
4. Start the trigger and spring assembly up through the neck of the handle. To get it past the switch mechanism, angle the latch and flip the switch button slowly.
5. When the latch is almost in position, squeeze the trigger while gently catching the tip of the latch in the slot; let go of the trigger and pull the tool forward.
6. Catch the tip of the tool in the pin hole in right side of handle, THEN jam the trigger latch button *lightly* with a small screwdriver blade. Press the pin into place with one steady motion. When you are sure that the pin has started into the trigger pin hole, press it into place with slip-joint pliers and remove the screwdriver blade.
7. **REASSEMBLY:** In general, install all control components in reverse of the order of disassembly. In particular, assemble the choke control button in the slot with the *arrow* towards the area. Put the brass detent spring in place with the split end forward and retain it by sliding the choke push rod into the choke button hole. NOTE: The push rod must fit *all* the way across both sides of the spring. If the spring does not have enough tension to keep the rod from falling loose, bend it for more tension.
8. **TO INSTALL CARBURETOR:** Hook the choke rod into the carburetor choke lever, hook the carburetor throttle lever to the throttle rod, and angle carburetor so the adjustments slide into their slots in the engine cover. Now slide the carburetor spacer (see drawing for orientation) between carburetor and engine cover. Install the air deflector and the two flanged bushings to hold spacer and carburetor in place. THE COVER ASSEMBLY IS NOW READY FOR ATTACHMENT TO THE ENGINE.



SECTION SEVEN: TROUBLE SHOOTING CHECK LIST

SAW WILL NOT START

1. No Fuel or Wrong Ingredients in the Fuel:
   a) Is tank full of fuel?
   b) Is the fuel fresh and of the proper mixture and ingredients?
   c) Are you using stale "winter formula" gasoline in the springtime?
   d) Is engine flooded? (See page 32.)
2. Faulty Carburetor (page 32)
   a) Are mixture needles set properly?
   b) Could carburetor inlet needle be stuck, diaphragm inoperative, fuel pump diaphragm faulty?
   c) Could pulse line to fuel pump be blocked?
   d) Could carburetor be plugged with dirt?
3. Faulty Spark Plug
   Will engine start if you change to a new plug?
4. Faulty Ignition System
   a) Does the test for spark show weak spark, strong spark, or no spark at all?
   b) Is the spark plug wire in good condition with terminal properly installed inside boot? Is the insulation cracked or dirty?
   c) Are all of the magneto wires clean, unfrayed and properly connected? Could the insulation under the ground switch terminal be out of place?
   d) Can you feel a strong magnetic attraction as you pass a screwdriver blade past the flywheel magneto at close range?
   e) Are the points properly gapped to .015? And are they clean and unpitted? (Page 24.)
   f) Is the rotor-to-coil core air gap properly adjusted to .012"? (Page 24.)
   g) If you can find no trouble during visual examination of the assembly or components:
   How does the coil test on a meter? How does the condenser test on a meter? (Section Three.)

SAW STARTS AND RUNS BUT LOSES SPEED OR DIES OUT

1. If Saw Does This at High Speed Without a Load:
   a) Is vent valve in fuel cap plugged?
   b) Is fuel filter in tank plugged or fuel line crimped or kinked going through the casting wall holes?
2. If Saw Does This Only When a Cutting Load is Applied:
   a) Is fuel line leaking air?
   b) Is the carburetor needle adjustment too "lean" for a cutting load?
   c) Is the fuel pump damaged, the pulse hole to the carburetor fuel pump partly plugged, the carburetor dirty or leaking air around the fuel supply mechanisms? Is the inlet lever adjusted too low?
   d) Are there any cracks or porous spots in engine walls? Does engine show an air leak when pressure-tested?
3. If Saw Runs Lean Only in Certain Position:
   Is there enough fuel line inside tank for the pick-up to reach all corners?

SAW RUNS RICH

a) Have you got idle speed and HI and LO needles set right?
b) Is idle speed set for 2500-2900 rpm?
c) Is the circuit plate gasket leaking?
d) Are the mixture needles and seats in good condition, or are they worn or damaged?
e) Are the passageways and ports in the carburetor clean? Is there dirt in the carburetor's second and third idle port holes?

SAW FLOODS

a) Is there dirt under the inlet needle valve? (Page 32.)
b) Is the inlet lever set too high? Or has the spring slipped off the seating dimple of the lever?

ENGINE RUNS TOO HOT

1. Clogged Air Cooling Screen or Cooling Passages, Surfaces:
   a) Are the cylinder fins covered with sawdust, mud, or grime?
   b) Can the air get in through the intake to the rotor fan?
   c) Can the air flow from the intake past the cylinder fins and out?
2. Stale or Wrong Gasoline in Fuel:
   a) Are you using "winter formula" gasoline in mixing fuel for spring and summer conditions?
   b) Will fueling saw with recommended mix restore normal operation?
3. "Lean" Operation:
   a) Is the fuel formula correct and the fuel thoroughly mixed?
   b) Can the saw carry a cutting load? If not, will it carry a load after you have opened up the HI needle a bit?
   c) Have you checked for air leaks? (See "Saw Starts and Runs but Loses Speed or Dies Out".)
4. Ignition:
   a) Do you have the correct point gap of .015"?
   b) Do you have the correct heat range plug? Are the plug electrodes gapped to .025"?

ENGINE MISFIRES

1. Fuel:
   Does saw choke up from too much fuel at high speed?
2. Spark Plug:
   a) Will cleaning plug, filing electrodes, gapping to .025", restore normal operation?
   b) Will a new spark plug restore normal operation?
3. Spark:
   a) Have you tested the spark?
   b) Are there any ignition wire leaks or intermittent shorts or open circuits?
   c) Have you tested the magneto? The coil? The condenser?
   d) Are the points clean, still good? Properly aligned and gapped? Does the breaker arm spring have original shape and tension?
   e) What is the coil-to-fly wheel air gap?

ENGINE CANNOT BE ADJUSTED TO IDLE SMOOTHLY

(Engine cannot idle smoothly.)

1. Carburetor Adjustment:
   a) How do the needles look?
   b) Is there any dirt in the carburetor? Or does it leak at some point?
   c) What idle speed are you adjusting to? Is it at least 2500 rpm? Is it as high as can be made without causing chain to rotate?
   d) Have you adjusted the mixture after setting the speed, and fine-tuned for speed and mixture several times? Do you have one needle too far open, and the other not open enough?
2. Clutch Trouble:
   a) Does the chain rotate even though idle speed is sufficiently low and engine does not "hunt" or oscillate?
   b) What is the condition of the clutch, drum and needle bearing? Is the drum scored or out-of-round?
   c) Could the needle bearing be in need of grease? Was high-temperature grease used? Is there grease and dirt in the clutch drum?
3. Ignition:
   Could the engine be misfiring enough times to cause idle speed changes?

ENGINE RUNS AFTER SWITCH IS TURNED OFF

1. Faulty Switch Ground Connections:
   a) Any loose or frayed wires?
   b) Is insulation between switch ground terminal and cylinder rib doing its job?
   c) Does the grounding linkage of the switch make ground continuity with the grounding terminal, or does the circuit remain open with switch off?
2. Preignition or Dieseling:
   Is there flashing or carbon on the inside of the firing chamber or on bottom of spark plug that glows and causes ignition despite grounding of the magneto to prevent spark?

ENGINE LACKS POWER

1. Improper Fuel/Air Mixture:
   a) Is the air filter clean and unplugged?
   b) Are there any air leaks in the fuel system or engine?
   c) Is the carburetor mixture adjusted correctly?
   d) Is the fuel fresh and correctly made from proper ingredients?
2. Restricted Exhaust:
   Could the exhaust port and muffler be loaded?
3. Compression:
   a) How long since engine was overhauled?
   b) Could there be worn down or scored cylinder and piston? Or worn, broken or stuck piston rings? Is there much carbon visible on piston as seen through spark plug hole and exhaust port?
   c) Does the engine smoke excessively, indicating "blow-by"?
4. Chain Drag:
   a) Is binding of chain slowing engine and causing clutch slippage?
   b) Are there any burrs on guide bar rails resulting in binding?
   c) Is chain sharp and filed to proper angles? Does it want to run off to one side? Are depth gauges properly and uniformly lowered and contoured?
   d) Is tension so loose that chain chatters?

THE CLUTCH SLIPS OR GRABS

1. Feed Pressure and Cutting Technique:
   a) Is the clutch overheated?
   b) Was the chain maintained in dull condition requiring heavy feed pressure to cut?
   c) Is the guide bar bent or the rails burred, causing binding?
   d) Has the chain been too tight on the bar?
   e) Are the clutch shoes glazed from cutting at low rpm or from bearing grease on inside of clutch drum?
2. Worn Clutch:
   a) Does the bearing need to be greased? Are the needles or the inner bearing race worn?
   b) Is the clutch worn down, dirty or scored?
   c) Is the clutch drum dirty, scored, bent, or cracked?
   d) Is the clutch properly assembled?

CHAIN DOES NOT FEED WILLINGLY

1. Chain Condition:
   a) Are the chain drive link tangs sharp enough to clean out the bar groove, or is the groove full of sawdust and dirt?
   b) Are the chain teeth sharp, and the depth gauges lowered to correct depth and filed to proper contour?
   c) Is the chain tension correct or too tight?
   d) Are any of the chain connecting links stiff?
   e) Are the bottoms of the tie straps worn so that they bind excessively on the bar?
2. Guide Bar and Sprockets:
   a) Is the bar groove clean and open all the way around?
   b) Is the bar straight?
   c) Is the sprocket nose bearing turning freely and properly lubricated?
   d) Are the bar rails parallel, of equal height, and not burred?
   e) Is the clutch slipping under load inside the sprocket and drum?

SAW DOES NOT CUT STRAIGHT

1. Chain trouble:
   a) Are the teeth on one side damaged, or duller, or sharpened to different angle than those on the other side?
   b) Are the depth gauges filed to varying depths, or depth gauge contours non-uniform?
2. Bar trouble:
   a) Are the bar rails spread? Or of uneven height?
   b) Is the bar groove worn near the bottom, allowing chain to drift to one side or the other?

CHAIN CHATTERS

1. Tension too low.
2. Depth gauges too high.
3. Sprocket teeth badly worn.
4. Chain badly stretched and now out-of-pitch with sprocket.

SAW CUTTING NICELY SUDDENLY RUNS RICH, SMOKES AND STALLS OUT:

Keep your body and clothing clear of the saw's air intake area during cutting.

OIL PUMP DOES NOT PUMP ENOUGH OIL

1. Faulty feed rate adjustment:
   a) Is the oil feed rate needle turned in for maximum rate or backed out?
2. What thickness of oil is being used? Could the oil need thinning, as required to make it flow in cold weather?
3. Does the oil discharge hole in the guide bar mounting pad need to be cleaned out?
4. Faulty Pump:
   a) Is the oil pick-up screen clogged?
   b) Is the oil line inside tank, collapsed, deteriorated or leaking air?
   c) Does the pump diaphragm or gasket leak? And does the plunger move freely in the pump cylinder or bind up?
   d) What is the condition of the oil pump check valve seat, ball, and spring?
   e) Have you blown out the oil passageways in the pump and oil reservoir?
   f) Have you tested the oil pump system for air leaks?
   g) Does oil flow when valve is opened, but not flow when valve is closed tightly? Could the flow with valve open be due to gravity feed and not to the pumping action?

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