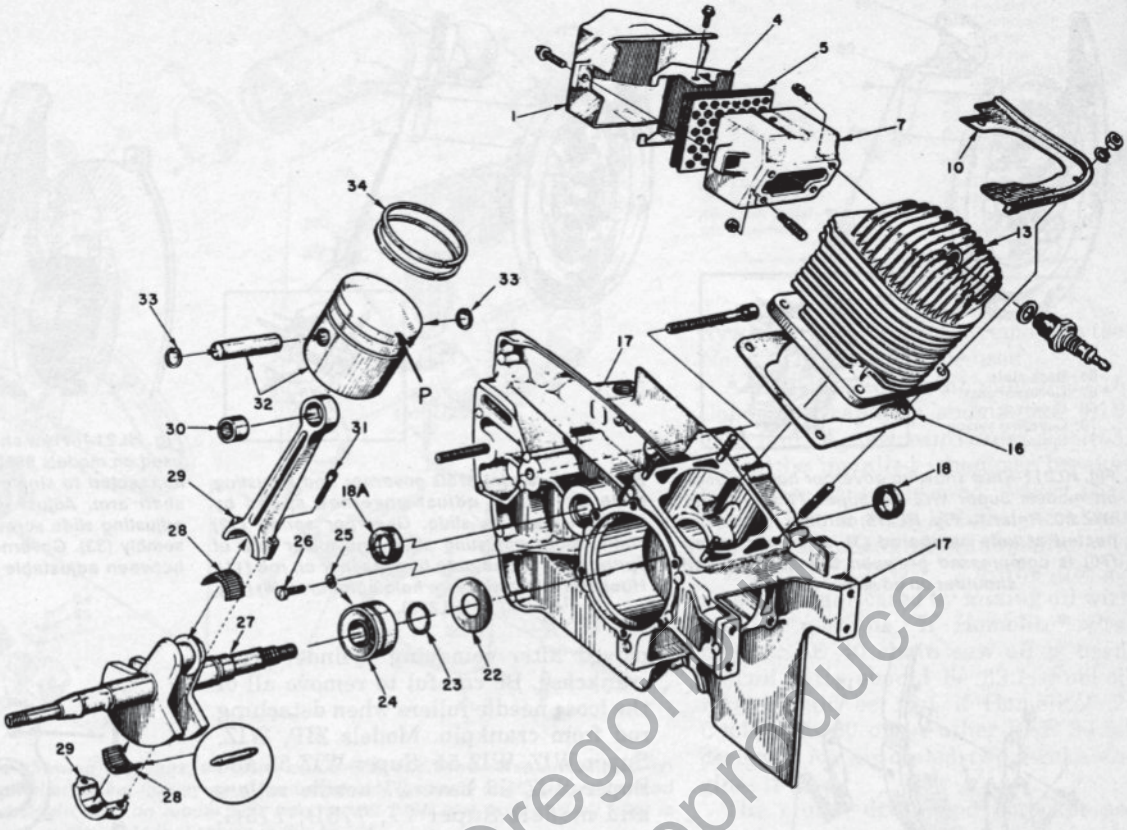


Fig. HL219–Exploded view of model 995G engine. Cylinder, crankshaft, connecting rod and piston installation of all other models are similar. Models ZIP and 775D are not fitted with crankcase crankshaft seal (18); crankcases on these models are fitted with a close fitting, non-renewable bronze oilite bushing. Note side of piston with ring retaining pin (P) is away from exhaust port (muffler) side of engine.

to rod. The caged needle roller piston pin bearing can be renewed by pressing old bearing out and new bearing in using Homelite tool No. 23372 on models 995D and 995G, or tool No. A-23809 for other models. Press on lettered end of bearing cage only.

Homelite recommends renewing the crankpin needle rollers at each overhaul. New needle rollers are supplied in a wax strip; wrap the strip around crankpin, then assemble connecting rod to cap on the crankpin. When reassembling engine after inspection, use light grease or beeswax to stick 16 rollers to rod and cap. Install piston and connecting rod assembly so that pinned ends of piston rings are away from exhaust port (muffler) side of engine.

On models ZIP, WIZ, Super WIZ, WIZ 55, Super WIZ 55 and Super WIZ 66, tighten the connecting rod cap screws to a torque of 55-60 inch-pounds. On models Super 77, 775D, 775G, Super WIZ 80, 995D and 995G, tighten rod cap screws to a torque of 70-80 inch-pounds. Wiggle rod and cap as the screws are tightened to align fracture mating surfaces.

PISTON, PIN AND RINGS. Piston can be removed from connecting rod after removing cylinder. Support the piston while removing and installing piston pin. Pin is retained in piston by a snap ring at each end of pin.

The aluminum alloy piston is fitted with two pinned piston rings. Ring width is 0.037 and end gap should be 0.070-0.080. Rings should be renewed if end gap exceeds 0.100. Minimum ring side clearance is 0.0025; maximum ring side clearance in ring groove is 0.004. Piston, pin and rings are available in standard size only.

Renew piston and pin, which are not available separately, if any of the following defects are noted: Visible up and down play of pin in piston bore, cracks in piston or hole in piston dome, scoring of piston accompanied by aluminum deposits in cylinder bore, piston ring locating pin worn to half of original thickness, or if side clearance of new ring exceeds 0.004. Refer to CYLINDER paragraph for information on removing aluminum deposits from cylinder bore.

Assemble piston to connecting rod or install piston and rod assembly so that ring locating pin side of piston is towards intake side of cylinder (away from exhaust ports). Always use new piston pin retaining snap rings.

CYLINDER. Cylinder bore is chrome plated; plating is light gray in color and does not have appearance of polished chrome. Because cylinder is honed after plating, the chrome bore looks much like the base metal of the aluminum cylinder. If plating has been penetrated by scoring or other causes, the aluminum exposed will appear as a bright area. These bright areas are usually, but not always, located at edges of cylinder ports. If further checking, as outlined in following paragraph, shows that chrome has been penetrated, the cylinder should be renewed.

In some instances, particles of metal from scored piston are deposited on the cylinder bore. This condition is indicated by a rough appearance and deposits can be removed using a rubber impregnated grinding wheel mounted in a ¼-inch electric drill. If a screwdriver will scratch the cleaned surface, chrome plating has been worn away and the cylinder should be renewed. Also, renew the cylinder if cracked or if more than three critical cooling fins are broken off.

When installing both a new piston and a new cylinder, clean and oil both parts and place piston in cylinder bore

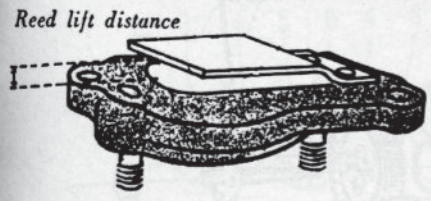


Fig. HL220–Reed lift distance should be 0.085 for model ZIP and 0.190 for WIZ and WIZ 55 with flat reed.

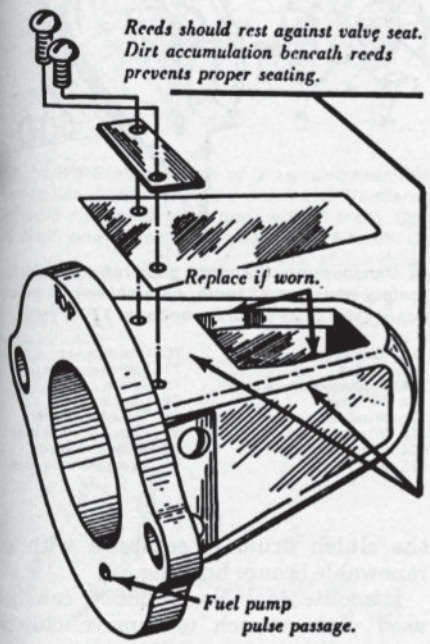
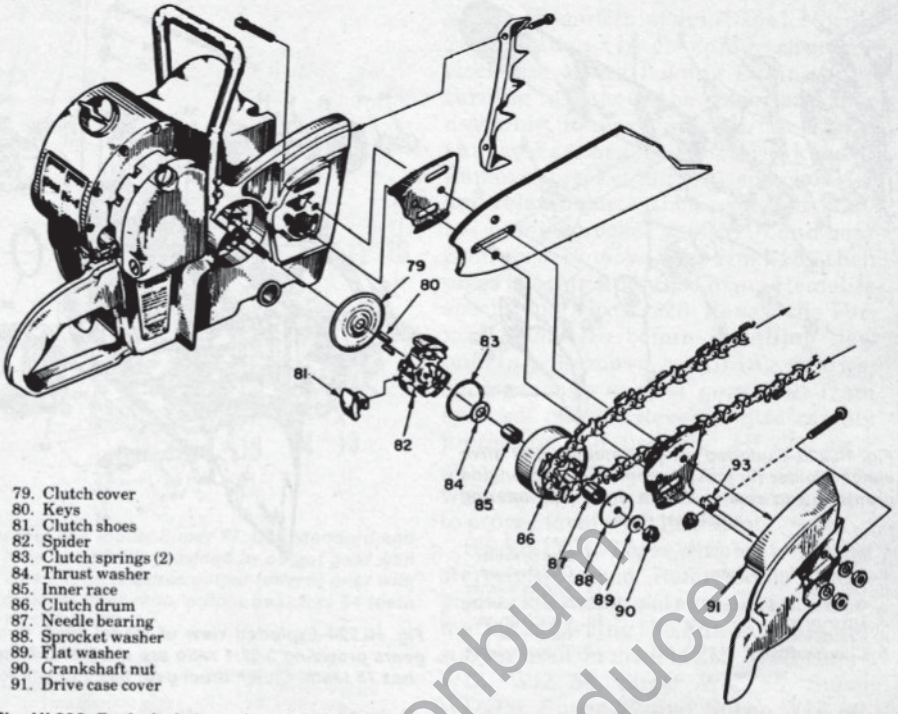


Fig. HL221–Inspection points for pyramid reed seat and reeds.



79. Clutch cover
80. Keys
81. Clutch shoes
82. Spider
83. Clutch springs (2)
84. Thrust washer
85. Inner race
86. Clutch drum
87. Needle bearing
88. Sprocket washer
89. Flat washer
90. Crankshaft nut
91. Drive case cover

Fig. HL222–Exploded view of model ZIP clutch assembly. Model 775D is similar except that six clutch shoes are used instead of three and spider is threaded to crankshaft instead of using keys (80).

without rings or connecting rod. The piston should fall freely when cylinder is turned up. If not, select a new piston or a new cylinder that will give this desired fit.

CRANKSHAFT, BEARINGS AND SEALS. The drive end of the crankshaft is supported in a ball bearing (24—Fig. HL219) which is retained in crankcase by two screws (26) and special washers (25) which engage groove in ball bearing outer race. Crankshaft is held in position by a snap ring (23) at outer side of bearing. The flywheel end crankshaft journal rotates in a caged needle roller bearing supported in magneto back plate (64—Fig. HL217).

To remove crankshaft, first remove cylinder, piston and connecting rod assembly, clutch spider and drum, flywheel (magneto rotor) and magneto back plate. Note: On models with governor, be sure to disconnect governor linkage before attempting to remove back plate. Remove the two bearing retaining screws (26) and washers (25), then bump or push crankshaft and bearing from crankcase. To remove ball bearing, remove snap ring (23) and press crankshaft from bearing.

Renew magneto end needle bearing if any roller shows visible wear or flat spot, or if rollers can be separated more than width of one roller. Renew drive end ball bearing if bearing is rough or has perceptible wear. Inspect crankshaft magneto end and crankpin journals and renew crankshaft if wear marks are visible. Also, renew crankshaft if tapered end fits loosely in magneto rotor or if keyway is enlarged. Crankshaft runout should not exceed 0.003.

New crankshaft seals and sealing gasket should always be installed when reassembling engine. Install new seal in crankcase (except on models ZIP and 775D) with lip of seal inward (towards main bearing position). Install ball bearing on crankshaft with retaining groove in outer race towards crankshaft throw, then install retaining snap ring. Soak new gasket in oil, then position gasket in crankcase. Install crankshaft and bearing using seal protector sleeve and jackscrew, then secure bearing in position using new special washers and screws. Install new seal in back plate with lip inward and install new needle roller bearing by pressing on lettered end. Then, using seal protector, install back plate with new gasket.

Homelite special tools for installing bearings, crankshaft seals and crankshaft are as follows:

Models 995D & 995G:
A-23137—Jackscrew, crankshaft and bearing.
23136—Jackscrew body.
23382—Spacer, crankshaft.
23373—Collar, crankshaft and bearing.
23383—Plate, shaft aligning.
22391—Plug, back plate bearing and seal.
23233—Plug, back plate seal installation.
23384—Plug, crankcase seal.
23422—Sleeve, crankshaft seal.

All models Except 995D & 995G:
A-23137—Jackscrew, crankshaft and bearing.
23136—Jackscrew body.
22820-1—Collar, crankshaft and bearing.
22812-1—Plate, shaft aligning.
23391-1—Plug, back plate bearing.
23233—Plug, back plate & crankcase seal.
23232—Sleeve, crankshaft seal.

CRANKCASE. With crankshaft and bearing removed, check bearing

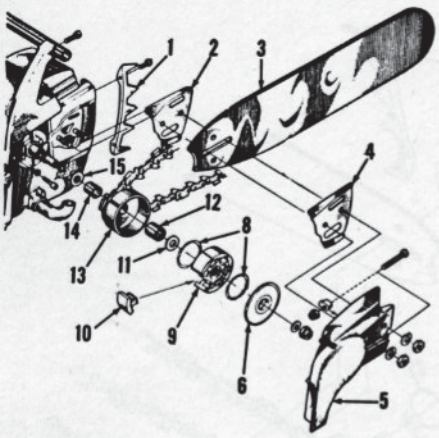


Fig. HL223–Exploded view of model 995D drive clutch. Spider (9) must be removed from engine crankshaft to service clutch drum (13), bearing and inner race.

1. Spike
2. Inner guide bar plate
3. Guide bar
4. Outer guide bar plate
5. Drive cover
6. Clutch cover
8. Clutch springs
9. Clutch spider
10. Clutch shoes
11. Thrust washer
12. Needle bearing
13. Clutch drum
14. Inner race
15. Thrust washer

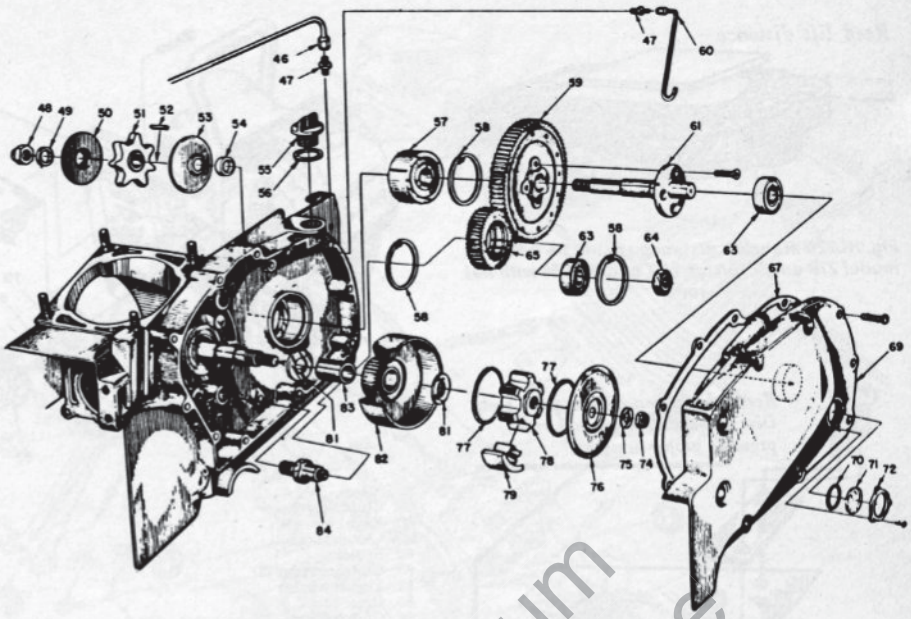


Fig. HL224–Exploded view of model 995G three-gear transmission. Standard gear ratio is 2.84:1; gears providing 3.57:1 ratio are available. Standard output gear has 71 teeth; optional output gear has 75 teeth. Clutch drum gear has 25 teeth for standard ratio or 21 teeth for optional 3.57:1 ratio.

47. Fitting
48. Sprocket shaft nut
49. Sprocket spacer
50. Sprocket washer
51. Sprocket
52. Sprocket key
53. Sprocket washer
54. Sprocket spacer
55. Filler cap
56. Gasket
57. Ball bearings
58. Snap rings
59. Driven (output) gear
61. Sprocket shaft
63. Ball bearing
64. Idler shaft nut
65. Idler gear
67. Gasket
69. Transmission cover
70. "O" ring
71. Window
72. Window plate
74. Crankshaft nut
75. Flat washer
76. Clutch cover
77. Clutch springs
78. Spider
79. Clutch shoes
81. Thrust washers
82. Clutch drum & gear
83. Bronze bushing
84. Idler gear stud shaft

bore. A lapped appearance indicates that the bearing outer race has been turning in the bore. If bearing fits loose in bore, renew the crankcase and/or bearing as necessary to obtain a tight fit. New ball bearing special retaining washers and screws should always be used when reassembling.

REED VALVE. The reed valve should be inspected whenever carburetor is removed. Model WIZ 55 prior to serial No. 2537288 and models ZIP and WIZ are equipped with a single reed valve; all other models are equipped with a pyramid reed type valve.

Single reed type valve should be renewed if reed has loosened or if reed and/or reed seating surface are worn or damaged. Reed lift should be checked as shown in Fig. HL220.

On pyramid reed type valve, individual reeds may be renewed. Refer to Fig. HL221 for inspection of the pyramid reed valve assembly.

CLUTCH. A shoe type clutch is used on all models and except on model ZIP, clutch rotor is threaded to engine crankshaft. Clutch spider on model ZIP is keyed and press fitted to crankshaft; use puller (Homelite tool No. A-23131) to pull spider from crankshaft. On models 775D, 995D and 995G, the rotor and crankshaft have left hand threads; lock engine from turning and turn rotor clockwise to remove. All other models have right hand threads.

On models ZIP and 775D, refer to Fig. HL222 for exploded view of clutch assembly. Exploded view of model 995D clutch is shown in Fig. HL223.

On gear drive models, the clutch is located inside the transmission cover; refer to Fig. HL224 for exploded view showing model 995G 3-gear transmission and to Fig. HL225 for exploded view of 2-gear transmission used on all other gear drive models.

Clutch shoes on direct drive models are of Oilite bronze. On gear drive models, the clutch shoes have 1/16-inch thick bonded Raybestos linings. Model ZIP is equipped with three clutch shoes; all other models have six clutch shoes. On models WIZ, Super WIZ, WIZ 55, Super WIZ 55 and Super WIZ 66, standard clutch shoes are ⅝-inch wide; optional heavy duty clutch shoes are ¾-inch wide. Standard and heavy duty clutch components are not individually interchangeable; also, a different gear case cover is required with heavy duty clutch.

On direct drive models, the clutch drum should be removed occasionally and the needle bearing cleaned and relubricated. A high temperature grease such as Homelite® ALL-TEMP Multi-Purpose Grease or equivalent should be used. Needle roller bearing should be renewed if rollers can be separated the width of one roller and clutch drum is otherwise serviceable. Press on lettered end of bearing cage only when removing and installing needle bearings. On gear drive models, the clutch drum is equipped with a renewable bronze bushing.

Homelite tool No. A-23696 can be used with wrench to remove clutch spider. When assembling clutch, be sure that end loops of springs are closed and are located at the center of a clutch shoe. If installing new clutch drum, wash off protective coating with petroleum solvent.

TRANSMISSION. Model 995G is equipped with a 3-gear transmission as shown in Fig. HL224. Other gear drive models have a 2-gear transmission as shown in Fig. HL225.

To service transmission, first drain oil from transmission case, then remove the screws retaining cover to case. Tap cover lightly, if necessary, to loosen gasket seal and remove the cover.

On model 995G, remove nut (74—Fig. HL224), lock washer and clutch cover (76), block engine from turning and unscrew clutch rotor (78) in a clockwise direction using Homelite tool No. A-23696. Remove clutch drum (82) and the two thrust washers (81). Unscrew nut (64) and remove idler gear (65) and bearing assembly. If necessary to renew bearing (63), remove snap rings (58) and press bearing from gear. Remove gear case vent tube, sprocket nut (48), sprocket (51) and related parts. Then, using soft mallet, bump

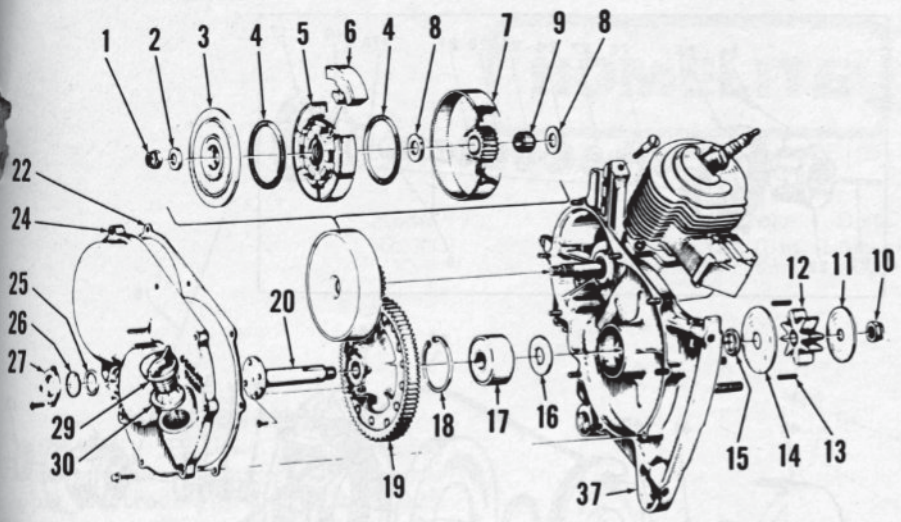


Fig. HL225–Exploded view of two-gear transmission for WIZ and model Super 77. One standard and two optional gear ratios are available. Standard gear ratio of 3.57:1 is provided by output gear with 75 teeth and clutch drum gear with 21 teeth. Optional 2.84:1 ratio requires output (driven) gear with 71 teeth and clutch drum gear with 25 teeth. On 2:1 optional gear ratio, output gear has 64 teeth and clutch drum gear has 32 teeth.

1. Crankshaft nut
2. Flat washer
3. Clutch cover
4. Clutch springs
5. Clutch spider
6. Clutch shoes
7. Clutch drum & gear
8. Thrust washers
9. Bronze bushing
10. Sprocket shaft nut
11. Sprocket washer
12. Chain sprocket
13. Sprocket keys
14. Sprocket washer
15. Sprocket spacer
16. Formica seal
17. Ball bearing
18. Snap ring
19. Driven (output) gear
20. Sprocket shaft
22. Gasket
24. Transmission cover
25. "O" ring
26. Window
27. Window plate
29. Filler cap
30. Gasket
37. Crankcase & gear case

using Homelite special tool No. A-23696, turn clutch spider counter-clockwise while holding engine from turning to remove the spider and shoe assembly. Remove clutch drum (7) and thrust washers (8) from crankshaft. Remove sprocket nut (10), sprocket (12) and related parts, then using soft mallet, bump sprocket shaft (20) and gear from case. Remove snap ring (18), then press bearing from case using Homelite special tool No. 23228. Renew the Formica seal (16) before installing new bearing. Remove retaining screws, then remove output gear (19) from sprocket shaft. Reverse disassembly procedure and use Fig. HL225 as a guide to reassemble. Reinstall cover with new gasket and fill transmission to proper level with lubricant.

STARTER. Three different types of starters are used. Refer to the appropriate following paragraph for information regarding the Fairbanks-Morse starter used on models ZIP, WIZ, Super WIZ, WIZ 55, Super WIZ 55, Super WIZ 66, Super 77 and Super WIZ 80, the ball drive starter used on models 775D and 775G or the over-running clutch type starter used on models 995D and 995G.

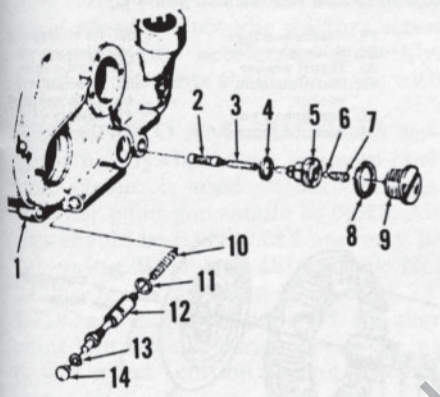


Fig. HL226–Exploded view of typical manual oil pump assembly.

1. Fuel tank
2. Oil filter
3. Oil line
4. Gasket
5. Valve seat
6. Check ball
7. Check valve spring
8. Gasket
9. Plug
10. Spring
11. "O" ring
12. Pump plunger
13. "O" ring
14. Button

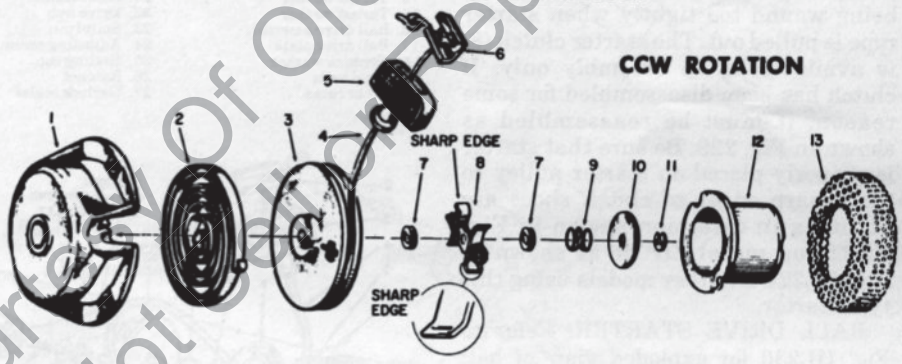


Fig. HL227–Fairbanks-Morse counter-clockwise rotation starter similar to that used on model ZIP. Refer to Fig. HL229, for assembly of friction shoe assembly (8) if unit has been disassembled. Note direction of sharp edge on shoes when reassembling starter. Refer to Fig. HL228 for legend.

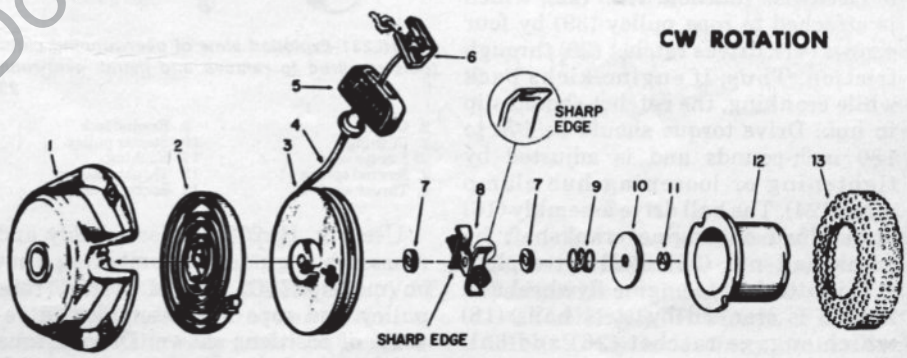


Fig. HL228–Exploded view of Fairbanks-Morse starter used on WIZ series and model Super 77. Fig. HL229 shows proper method of assembling friction shoe assembly if it has been disassembled for some reason; individual parts of friction shoe assembly are not available. Note direction for sharp edges of shoes when reassembling starter.

1. Cover
2. Rewind spring
3. Rope pulley
4. Starter rope
5. Handle grip
6. Grip insert
7. Brake washers
8. Friction shoe assy.
9. Brake spring
10. Retaining washer
11. Retaining ring
12. Starter cup
13. Starter screen

sprocket shaft from case. To remove ball bearing (57), remove retaining snap ring (58) and press bearing from case using Homelite special tool No. 23389. If bearing (63) remained in cover, heat cover slightly to free the bearing; otherwise, press sprocket shaft from bearing. Remove output gear from sprocket shaft after removing retaining screws. Reassemble by reversing disassembly procedure, reinstall cover with new gasket and fill to proper level with lubricant.

On all two-gear models, remove nut (1—Fig. HL225) from crankshaft, remove washer and clutch cover (3) and

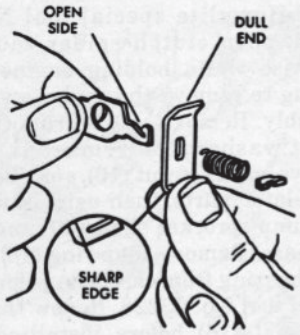


Fig. HL229–If Fairbanks-Morse starter friction shoe assembly is disassembled, be sure to reassemble as shown.

FAIRBANKS-MORSE STARTER. Refer to Fig. HL227 for exploded view showing counter-clockwise rotation starter used on model ZIP and to Fig. HL228 for clockwise rotation starter used on WIZ series of models and Super 77. When installing rewind spring, pulley and rope, spring should be pretensioned so that pulley will rewind all rope and pull rope handle lightly against starter housing. If spring is tensioned too tightly, or if starter rope is too long, spring can be damaged by being wound too tightly when starter rope is pulled out. The starter clutch (8) is available as an assembly only. If clutch has been disassembled for some reason, it must be reassembled as shown in Fig. 229. Be sure that starter is properly placed on starter pulley so that sharp edges of clutch shoes are pointing in direction shown in Fig. HL227 on model ZIP or as shown in Fig. HL228 for other models using this type starter.

BALL DRIVE STARTER. Refer to Fig. HL230 for exploded view of ball drive starter used on model 775G. Starter for model 775D is similar except for being counterclockwise instead of clockwise rotation. Hub (22), which is attached to rope pulley (39) by four screws (41), drives ratchet (26) through friction. Thus, if engine kicks back while cranking, the ratchet should slip in hub. Drive torque should be 170 to 180 inch-pounds and is adjusted by tightening or loosening hub clamp screw (24). The ball drive assembly (16) is retained on engine crankshaft by crankshaft nut (32). Ball drive plate (17) is attached to engine flywheel and engine is cranked by steel balls (18) which engage ratchet (26) and ball drive plate. When engine is running, centrifugal force disengages drive balls from ratchet and crankshaft turns in the needle bearings (28) in ratchet. Rewind spring (35) inner hook engages roll pin (23) carried in bores in ratchet and rope pulley.

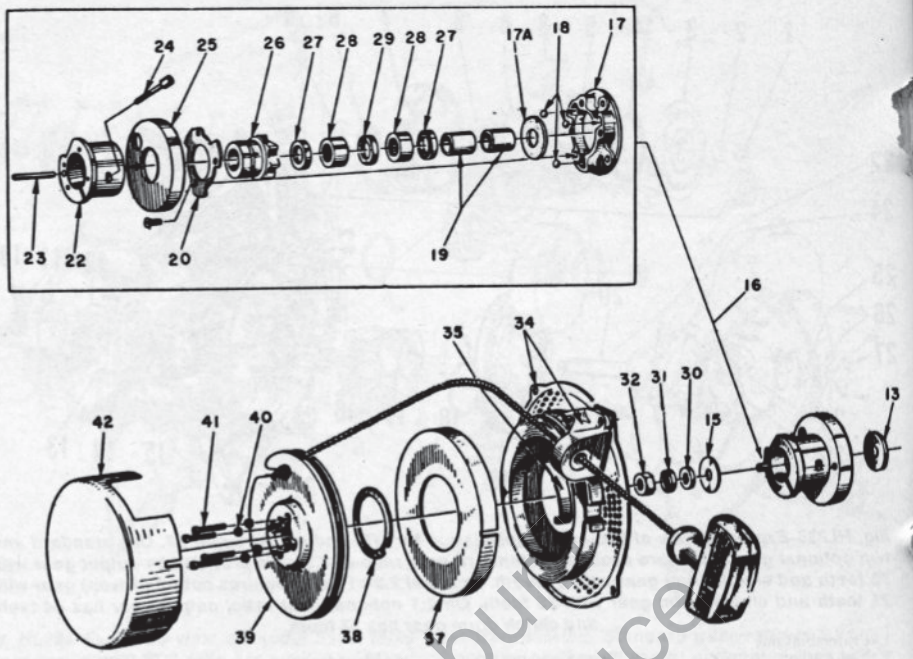


Fig. HL230–Exploded view of Homelite ball drive starter for model 775G. Starter for model 775D is similar except it is designed for counterclockwise rotation. Tension screw (24) should be adjusted so that hub (22) will drive ratchet (26) to crank engine, but ratchet will slip in hub if engine kicks back. Torque transmitted through hub and ratchet can be measured by locking engine, removing two opposite screws (41) from pulley and turning pulley with special key (Homelite tool No. A-22224) and inch-pound torque wrench. Torque should be 170-180 inch-pounds.

13. Thrust washer
15. Thrust washer
16. Ball drive assembly
17. Ball drive plate
17A. Formica washer
18. Steel balls
19. Inner races
20. Ball retainer
22. Drive hub
23. Spirol pin
24. Adjusting screw
25. Sealing cup
26. Ratchet
27. Garlock seals
28. Needle bearings
29. Felt wick
30. Thrust washer
31. Flat aluminum washer
32. Crankshaft nut
34. Screen & bracket
35. Rewind spring
37. Spring cover
38. Plastic shim
39. Rope pulley
40. Lock washers
41. Screws
42. Cover

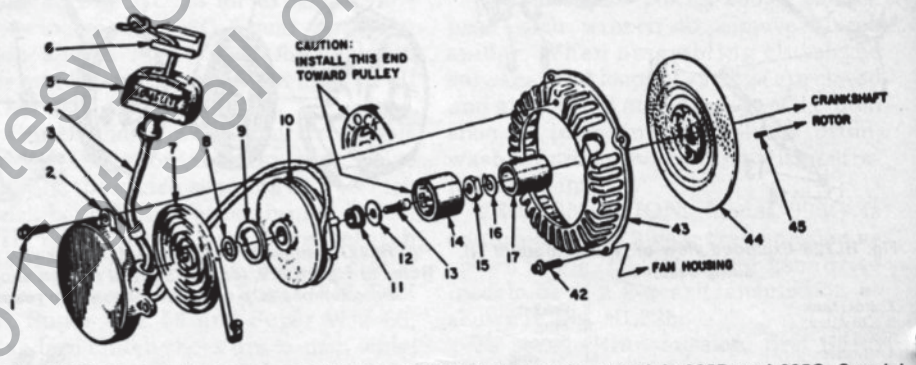


Fig. HL231–Exploded view of over-running clutch starter used on models 995D and 995G. Special tools required to remove and install over-running bearing (14) are puller (Homelite tool No. A-23679).

2. Cover
3. Bushing
4. Starter rope
7. Rewind spring
8. Thrust washer
9. Rewind lock
10. Starter pulley
11. Bushing
12. Thrust washer
13. Socket head screw
17. Inner race
14. Over-running bearing
15. Crankshaft nut
16. Lock washer
43. Mounting ring
44. Rotating screen
45. Dowel pin (race to rotor)

Use Fig. HL230 as disassembly and reassembly guide, remembering that on model 775D, rewind spring, rope pulley and rope are assembled in reverse of positions shown. Drive torque can be checked using torque wrench and special key (Homelite tool No. A-22224).

OVER-RUNNING CLUTCH STARTER. Refer to Fig. HL231 for exploded view of over-running clutch type starter used on models 995D and 995G. When starter pulley (10) is turned, over-running bearing (14) engages inner race (17) which is pinned to flywheel with pin (45).

Over-running bearing (14) is a press fit and can be removed using Homelite special tool No. A-23679. When installing new bearing, be sure end marked "LOCK" as shown in Fig. HL231 is towards rope pulley (10). Install bearing using plug, Homelite tool No. 23678.

HOMELITE®

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Model	Bore	Stroke	Displ.	Drive Type
XL, XL2	1-5/16 in.	1-3/16 in.	1.6 cu. in.	Direct
	33.34mm	30.16mm	26.2cc	

MAINTENANCE

SPARK PLUG. Recommended spark plug is a Champion DJ-7J. Spark plug electrode gap should be 0.025 inch.

CARBURETOR. A Walbro model HDC-15 diaphragm carburetor is used. Refer to Walbro section of SERVICE FUNDAMENTALS section for carburetor overhaul and exploded views.

High speed mixture is not adjustable. Initial adjustment of idle mixture screw is one turn open. Adjust idle mixture and idle speed screws so that engine idles just below clutch engagement speed. Adjust idle mixture screw so that engine accelerates smoothly. Final adjustments should be made with engine warm.

MAGNETO AND TIMING. A conventional flywheel type magneto ignition system is used on both models. Breaker point gap should be 0.015. Air gap should be 0.008-0.012 and may be set using Homelite shim stock No. 24306. Ignition timing is fixed at 23° BTDC and cannot be adjusted. Breaker point gap must be correct, however, as it will affect ignition timing if incorrect.

LUBRICATION. Model XL or XL2 chain saw engine is lubricated by mixing oil with the fuel. If Homelite Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used. Regular grade (about 90 octane) gasoline should be used.

Saw chain is lubricated by oil from an automatic oil pump. Recommended chain oil is Homelite® Bar and Chain Oil or clean SAE 30 oil. Dilute SAE 30 oil with kerosene if ambient temperature is below 40° F.

MUFFLER. Outer screen of muffler should be cleaned of debris every week or as required. Carbon should be removed from muffler and engine ports to prevent excessive carbon build-up and power loss. Do not allow loose carbon to enter cylinder and be careful not to damage exhaust port or piston.

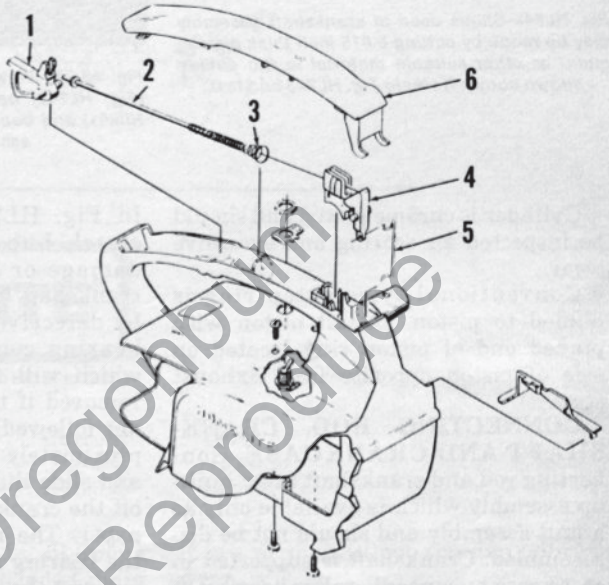


Fig. HL240–View showing dual trigger mechanism used on model XL2.

1. Rear trigger
2. Trigger rod
3. Spring
4. Front trigger
5. Throttle rod
6. Handle cover

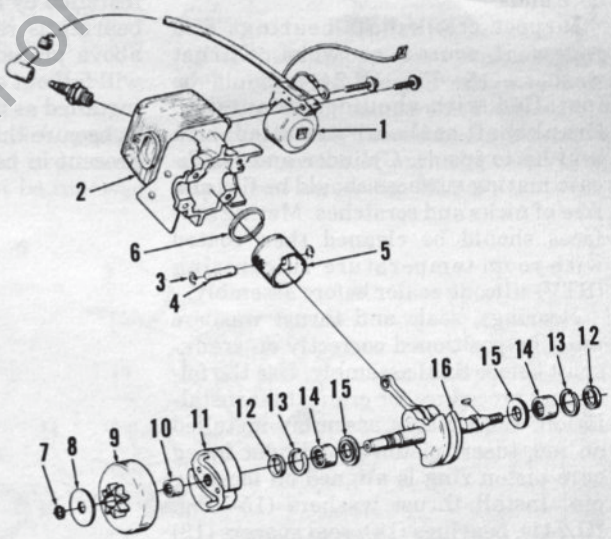


Fig. HL241–Exploded view of cylinder, crankshaft and clutch assemblies.

1. Ignition coil
2. Cylinder
3. Retainer
4. Piston pin
5. Piston
6. Piston ring
7. Snap ring
8. Washer
9. Clutch drum
10. Bearing
11. Clutch hub
12. Seal
13. Seal spacer
14. Bearing
15. Thrust washer
16. Crankshaft assy.

REPAIRS

TIGHTENING TORQUE VALUES. Tightening torque values are listed in following table. Note: Values given are average figures in inch-pounds. To obtain minimum or maximum values, reduce or increase given values by 10 per cent.

Flywheel nut	100
Clutch hub	100
Spark plug	150
Crankcase screws—socket hd.	35
Starter pulley screw	35
Carburetor retaining screws	35

CYLINDER, PISTON, PIN AND RINGS. Cylinder may be removed after unscrewing socket head capscrews in bottom of crankcase (6—Fig. HL244). Be careful when removing cylinder as crankshaft assembly will be loose in crankcase. Care should be taken not to scratch or nick mating surfaces of cylinder and crankcase.

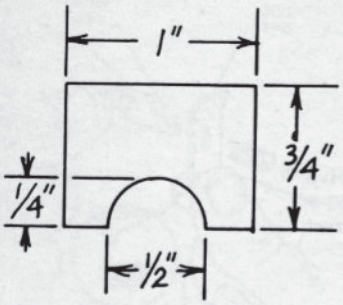


Fig. HL242–Shims used in crankshaft assembly may be made by cutting 0.015 inch thick plastic, metal or other suitable material in the outline shown above. Refer to Fig. HL243 and text.

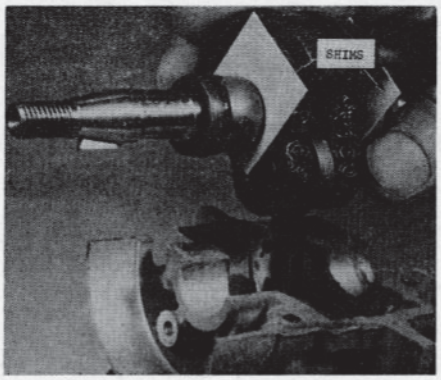


Fig. HL243–View showing placement of shims (Fig. HL242) between thrust washers (15–Fig. HL241) and bearings (14) for correct crankshaft assembly. Refer to text.

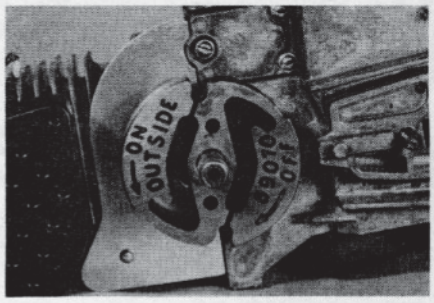


Fig. HL245–View of correct installation of clutch hub in drum.

Cylinder is chrome plated and should be inspected for scoring and excessive wear.

Conventional type piston ring is pinned to piston. Install piston with pinned end of piston ring located on side of piston opposite from exhaust port.

CONNECTING ROD, CRANKSHAFT AND CRANKCASE. Connecting rod and crankshaft are a built-up assembly which is available only as a unit assembly and should not be disassembled. Crankshaft is supported in crankcase by a needle roller bearing at both ends.

Inspect crankshaft bearings and renew if scored or worn. Thrust washers (15—Fig. HL241) should be installed with shoulder to outside. Crankshaft seals are installed with seal lip to inside. Cylinder and crankcase mating surfaces should be flat and free of nicks and scratches. Mating surfaces should be cleaned then coated with room temperature vulcanizing (RTV) silicone sealer before assembly.

Bearings, seals and thrust washers must be positioned correctly on crankshaft before final assembly. Use the following procedure for crankshaft installation: With piston assembly installed on rod, insert piston in cylinder being sure piston ring is aligned on locating pin. Install thrust washers (15—Fig. HL241), bearings (14), seal spacers (13) and seals (12) on crankshaft. Place 0.015 thick shims shown in Fig. HL242 between thrust washers and bearings as shown in Fig. HL243.

Gently push seals toward crankshaft counterweights until assemblies are snug. Remove shims and complete assembly being careful not to disturb position of thrust washers, bearings and seals.

CLUTCH. Clutch hub has left hand threads and must be installed as shown in Fig. HL245. Clean and inspect clutch hub, drum and bearing for damage or excessive wear. Inspect crankshaft for wear or damage caused by defective clutch bearing. Clutch bearing contains 21 needle rollers which will fall out when bearing is removed if the following procedure is not followed. Roll a tube of paper approximately the size of the crankshaft and slide the clutch drum and bearing off the crankshaft and on to the rolled paper. The roll of paper will prevent the bearing needle rollers from falling out and the drum and bearing can be installed by reversing the procedure. If bearing is removed without using the above procedure, the needle bearings will fall out and a new bearing must be installed as needle rollers are too small to be sure that all 21 needle rollers are present in bearing race. New bearings can be installed without using above procedure since wear has not yet loosened rollers.

AUTOMATIC CHAIN OIL PUMP. Models XL and XL2 are equipped with a crankcase pulse actuated automatic chain oiler pump. Crankcase pulses move diaphragm and plunger (5—Fig. HL244) to force oil out oil outlet. Inspect diaphragm (5) and gaskets (4) for leaks.

RECOIL STARTER. To service recoil starter, remove starter housing from saw. Pull starter rope and hold rope pulley with notch in pulley adjacent to rope outlet. Pull rope back through outlet so that it engages notch in pulley and allow pulley to completely unwind. Unscrew pulley retaining screw (7—Fig. HL246) and remove rope pulley being careful not to dislodge rewind spring in housing. Care must be taken if rewind spring is removed to prevent injury if spring is allowed to uncoil uncontrolled.

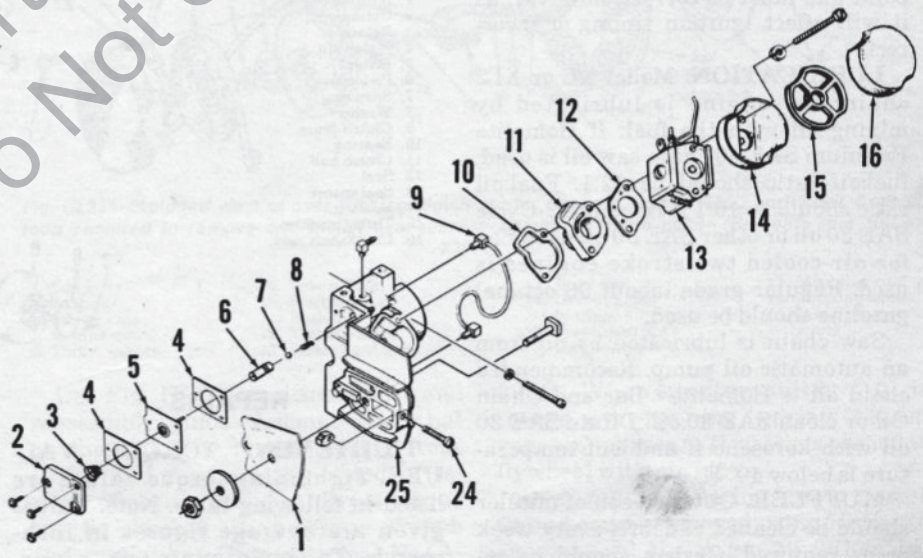


Fig. HL244–Exploded view of model XL-2 crankcase and oil pump assemblies. Model XL is similar.

1. Bar plate
2. Pump cover
3. Spring
4. Gasket
5. Diaphragm & plunger
6. Oil pump cylinder
7. Check ball
8. Spring
9. Oil line
10. Gasket
11. Intake manifold
12. Gasket
13. Carburetor
14. Filter housing
15. Retainer
16. Air filter
24. Chain Tension Adjusting Screw
25. Crankcase

Rewind spring is wound in clockwise direction in starter housing. Rope is wound on rope pulley in clockwise direction as viewed with pulley in housing. To place tension on rewind spring, pass rope through rope outlet in housing and install rope handle. Pull rope out and hold rope pulley so notch on pulley is adjacent to rope outlet. Pull rope back through outlet between notch in pulley and housing. Turn rope pulley clockwise to place tension on spring. Release pulley and check starter action. Do not place more tension on rewind spring than is necessary to draw rope handle up against housing.

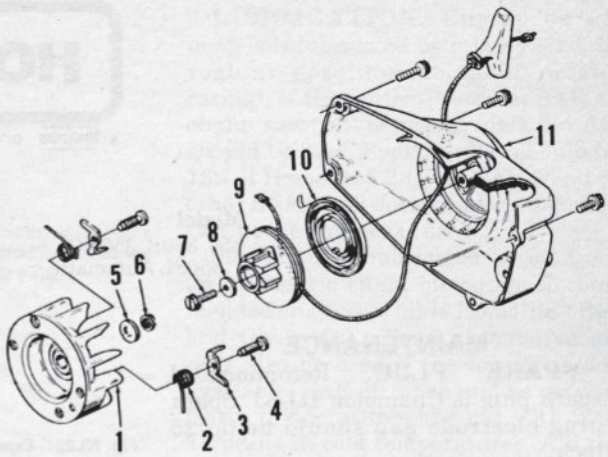


Fig. HL246–Exploded view of recoil starter.

1. Flywheel
2. Spring
3. Starter pawl
4. Pawl pin
5. Washer
6. Nut
7. Capscrew
8. Washer
9. Rope pulley
10. Rewind spring
11. Housing

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Volts	Current/ Cycles	Drive Type
110	115-120	AC/25-60	Gear

ELECTRICAL REQUIREMENTS

Model 110 electric saw is designed to be used on electrical circuits with 115-120 volt alternating current. If a portable power plant is used, power rating of plant should be no less than 3000 watts of alternating current up to 60 hz. (cycles per second).

Model 110 electric saw is double-insulated and does not require a ground wire. A two-wire extension cord is recommended but a three-wire cord may be used if ground wire is not connected to saw. A UL or similarly approved extension cord should be used. It is necessary that the correct wire gauge be matched to cord length and line current. Using an undersized cord may result in power loss and overheating.

MAINTENANCE

LUBRICATION. Rear bearing of motor should be lubricated after every ten hours of operation by adding oil in oil hole in center of air screen. Oil should be a good quality SAE 20 or SAE 30 oil.

The clutch drum bearing is lubricated by removing clutch and packing bearing with Homelite All-Temp Multi-Purpose Grease at periodic intervals. Bearing should be oiled after every 10 hours of operation with SAE 20 or SAE 30 oil.

Saw chain is lubricated by oil from a manual oil pump. Recommended chain oil is SAE 30 oil for temperatures above 40° F. and SAE 30 oil diluted with kerosene for temperatures below 40° F.

BRUSHES. Model 110 is equipped with brushes which will not contact commutator when brushes are excessively worn. Brushes must be renewed if saw motor will not run due to brush wear.

REPAIR

Overhaul information was not available from manufacturer at time of publication. Major component disassembly and reassembly procedures are evident after inspection of unit and referral to exploded view in Fig. HL247.

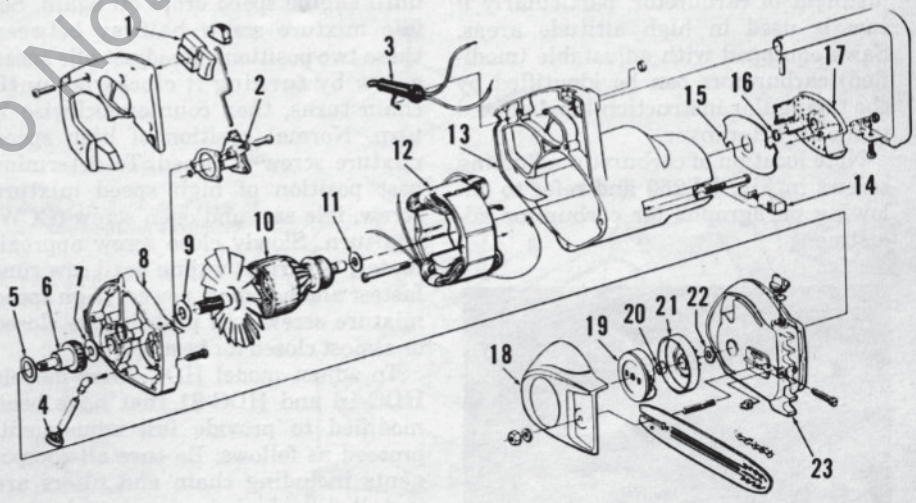


Fig. HL247–Exploded view of model 110 electric chain saw.

1. Switch
2. Manual oil pump
3. Power cord
4. Oil filter
5. Washer
6. Gear & spindle
7. Washer
8. Bearing plate
9. Bakelite washer
10. Armature & fan
11. Bakelite washer
12. Field assy.
13. Housing
14. Brushes
15. Radiator
16. Felt wick
17. Air screen
18. Clutch cover
19. Clutch hub assy.
20. Bearing
21. Clutch drum
22. Washer
23. Gear housing

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore Inches	Stroke Inches	Displ. Cu. In.	Drive Type
350, 350B, 350HG, 350SL Automatic	1.75	1.44	3.5	Direct

MAINTENANCE

SPARK PLUG. Recommended spark plug is Champion DJ-6J. Spark plug electrode gap should be 0.025 inch.

CARBURETOR. A Walbro model HDC-16, HDC-21 or HDC-23 diaphragm carburetor may be used. Refer to Walbro section of SERVICE FUNDAMENTALS section for Walbro carburetor overhaul and an exploded view of carburetor. A Tillotson HK-1A is offered as a replacement for the above carburetors. Components are not interchangeable but adjustment procedure for Walbro HDC-23 should be used when adjusting Tillotson HK-1A.

Correct carburetor adjustment procedure is determined by type of high speed fuel delivery system in carburetor. Model HDC-16 carburetors were originally designed with an 0.037 inch main jet in the circuit plate and the high speed adjustment needle was used to enrichen the high speed fuel mixture. Recent production of model 350 saws are equipped with model HDC-21 carburetors which have an 0.033 inch main jet in the circuit plate.

Model HDC-16 and HDC-21 carburetors may be modified to allow full adjustment of carburetor, particularly if saw is used in high altitude areas. Saws equipped with adjustable (modified) carburetors can be identified by the triangular instruction label affixed to the air filter cover.

Note location of carburetor adjusting screws in Fig. HL250 and refer to following paragraphs for carburetor adjustment.

Fig. HL250–View of carburetor idle speed screw (I), high speed mixture screw (H) and idle mixture screw (L).

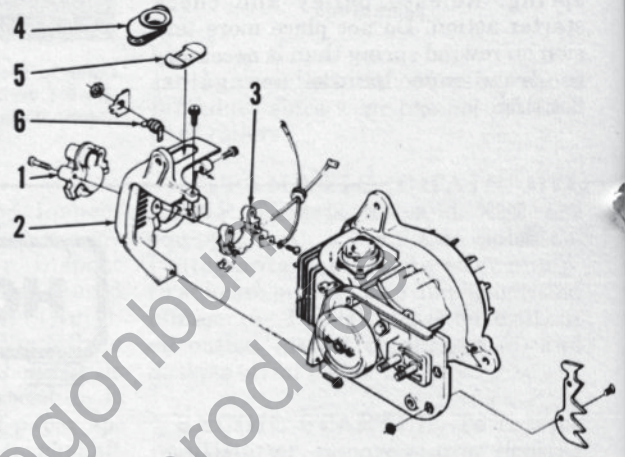


Fig. HL251–Exploded view of cylinder shield assembly. Heat exchanger (4) is used in place of plug (5) in cold weather to warm carburetor airbox.

1. Transformer
2. Cylinder shield
3. Transformer receptacle
4. Heat exchanger
5. Plug
6. Ignition switch

Model HDC-16 and HDC-21 carburetors with fixed main jets are adjusted as follows: Turn high speed adjusting screw fully clockwise until closed and turn idle mixture screw one turn open (counterclockwise). Start saw and allow to idle. If necessary, increase idle speed with idle speed screw until saw will idle without stalling. Turn idle mixture screw slowly clockwise and note where idle speed drops off. Turn idle mixture screw in opposite direction until engine speed drops off again. Set idle mixture screw halfway between these two positions. Readjust idle speed screw by turning it clockwise until chain turns, then counterclockwise ½ turn. Normal position of high speed mixture screw is closed. To determine best position of high speed mixture screw, idle saw and open screw (CCW) one turn. Slowly close screw approximately ⅛ turn at a time until saw runs fastest and has most power. High speed mixture screw will probably be closed or almost closed for best power.

To adjust model HDC-23 or models HDC-16 and HDC-21 that have been modified to provide full adjustment, proceed as follows: Be sure all components including chain and filters are installed and chain is properly tensioned and lubricated. Note: Engine must not be placed under load during adjustments and nothing should come in contact with chain. Initial settings are 1¼ turns open for high speed mixture screw and 1-3/16 turns open for idle mixture screw. Turn screw counterclockwise to open screw. Start engine and increase idle speed by turning idle speed screw if necessary to prevent stalling. Run engine under no load until it reaches operating temperature and then momentarily at full throttle to clear engine out. If necessary, turn idle speed screw counterclockwise until chain rotation stops. Turn idle mixture screw clockwise to find fastest engine speed. Squeeze trigger rapidly to check for smooth acceleration. If engine stumbles or hesitates, open idle mixture screw slightly but not beyond initial setting of 1-3/16 turns open. Engine should idle smoothly at lowest possible speed (approximately 2500-

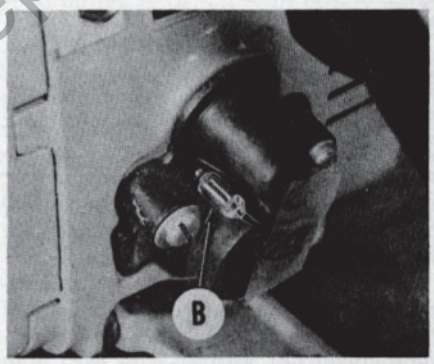


Fig. HL252–A neon bulb may be used to determine if ignition system is operating correctly. See text.

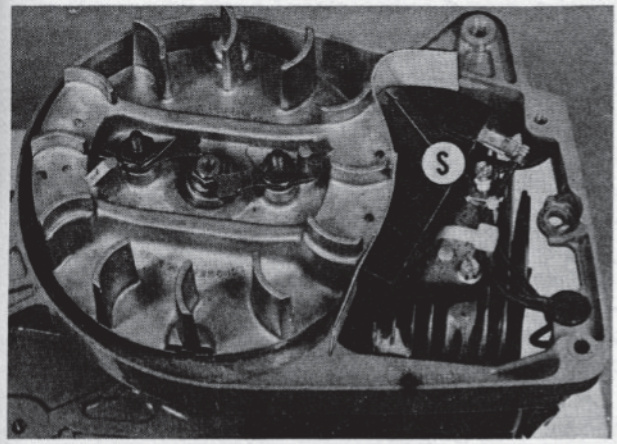


Fig. HL253–Insert shim stock (S) as indicated in text to set air gap.

2800 rpm) and not fluctuate when attitude of saw is changed.

Maximum no load speed of saws equipped with fully adjustable carburetors is 12,500 rpm and should be adjusted to operate in a no load range of 11,000-12,500 rpm. A tachometer is necessary to accurately adjust high speed mixture screw. If no load speed at full throttle is below 11,000 rpm, turn high speed mixture screw clockwise. Note: Final high speed mixture screw position should not be less than ⅞ turn open at altitudes below 5000 feet.

Components required to convert fixed main jet carburetors to fully adjustable are available from Homelite in kit A-12958.

A thin coat of suitable RTV silicone rubber sealant should be applied to both sides of intake gasket (6—Fig. HL257).

MAGNETO AND TIMING. A solid state ignition is used on all models. The ignition module is mounted adjacent to the flywheel while the high tension coil is mounted on the cylinder shield as shown in Fig. HL251 and covers the spark plug. The coil must be removed for access to the spark plug.

The ignition system is serviced by replacing the spark plug, ignition module, high tension coil or wires with new components. The ignition system can be checked by taping or glueing a neon lamp (#NE-2)to the high tension coil as shown in Fig. HL252. The leads of the lamp are not attached to the system. Pull the recoil starter handle and the lamp should flash with each revolution of the flywheel. It is helpful to compare the lamp flash on a saw with a good ignition system when analyzing the ignition system on a faulty saw. If the lamp flash is dim, irregular, or non-existent, check wires and connections, then renew ignition components by starting with the spark plug until the problem is corrected.

Air gap between ignition module and flywheel is adjustable. Adjust air gap by loosening module retaining screws and place 0.0125 in. (black) shim stock between flywheel and module as shown in Fig. HL253. Apply pressure against flywheel in direction of module to take up bearing play and tighten module screws. Remove shim stock.

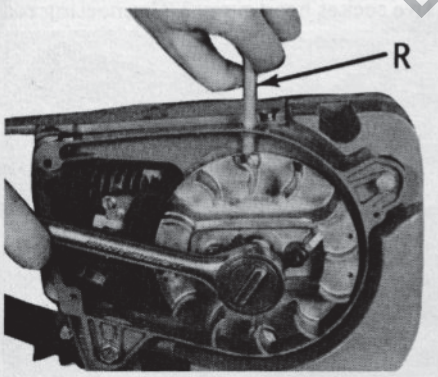


Fig. HL254–Removal of flywheel or clutch is facilitated by preventing flywheel rotation with a ¼ inch rod stuck through hole in back plate into notch in flywheel.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline (about 90 octane rating). If Homelite® Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used.

Saw chain is lubricated by oil from an automatic chain oil pump. Recommended chain saw oil is Homelite® Bar and Chain Oil. Clean automotive oil may also be used if the former is not available. SAE 30 oil should be used in warm temperatures and cut with 20% kerosene in cold temperatures. A light weight oil such as SAE 10 may also be used in cold temperatures.

A sprocket nose bar is used on all models and should be lubricated periodically each working day by removing chain and forcing a good quality grease such as Homelite® ALL-TEMP Multi-Purpose Grease through lube hole in nose of bar. Bar should be warm before applying grease. Force grease into nose of bar until dirty grease is forced out and fresh grease is evident.

Lubricate clutch needle bearing after every 100 hours of operation with Homelite® ALL-TEMP Multi-Purpose Grease.

MUFFLER. Muffler should be disassembled and periodically cleaned. Carbon should be removed from muffler and exhaust port to prevent excessive carbon build-up and power loss. Do not allow loose carbon to enter cylinder.

VIBRATION ISOLATORS. All models are equipped with cushion type vibration isolators (10—Fig. HL255) between powerhead and housing as-

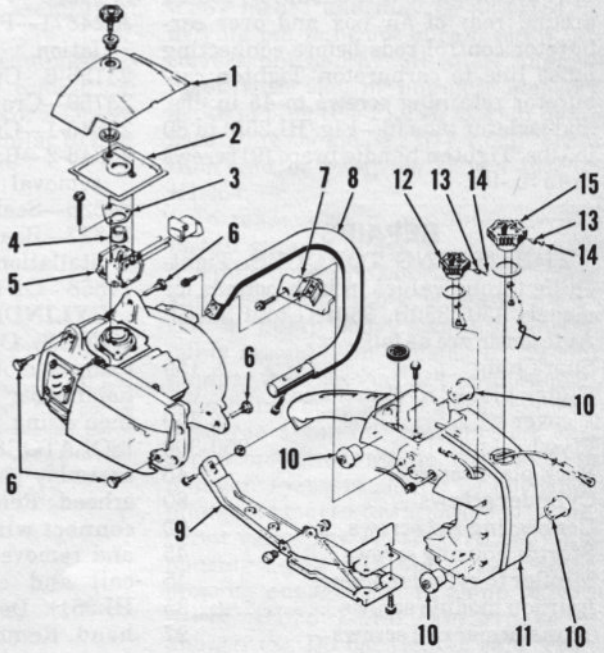


Fig. HL255–Exploded view of engine housing assembly.

1. Filter cover
2. Air filter
3. Spring plate
4. Flange bushing
5. Carburetor
6. Isolator pins
7. Handlebar bracket
8. Handlebar
9. Handle brace
10. Vibration isolators
11. Engine housing
12. Oil cap
13. Duckbill valve
14. Bronze filter
15. Fuel cap

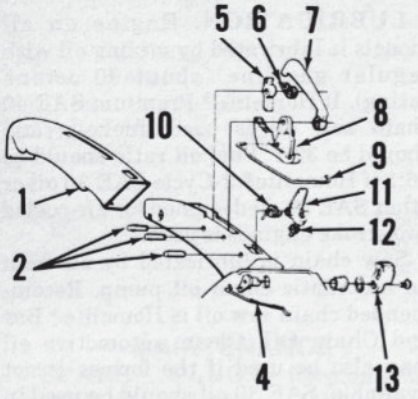


Fig. HL256–Exploded view of trigger assembly.

1. Handle grip
2. Dowel pin
4. Choke rod
5. Trigger lock lever
6. Spring
7. Trigger lock
8. Trigger
9. Throttle rod
10. Spring
11. Trigger latch
12. Screw
13. Choke knob

sembly (11). Isolators may be renewed as follows:

Remove air filter cover, filter, drive case cover and guide bar. Remove handle brace (9—Fig. HL255). Unscrew two screws securing carburetor and disconnect pulse line at rear of carburetor. Lift and angle carburetor and grommet on carburetor adjustment screws to gain access to two screws in floor of air box. Unscrew screws. Remove isolator pins (6) and lift upward on throttle grip and gently slide engine housing (11) free of powerhead until it is possible to remove rear isolators. Disconnect oil line (Fig. HL262) and slide housing further off powerhead for access to front isolators.

Reverse isolator removal procedure to reassemble saw. Apply a thin coat of RTV silicone rubber sealant to both sides of intake gasket (6—Fig. HL257). Carburetor pulse line should be routed around rear of air box and over carburetor control rods before connecting pulse line to carburetor. Tighten carburetor retaining screws to 45 in.-lbs. and isolator pins (6—Fig. HL255) to 80 in.-lbs. Tighten handle brace (9) screws to 45 in.-lbs.

REPAIRS

TIGHTENING TORQUES. Tightening torque values in inch-pounds for models 350, 350B, 350HG and 350SL Automatic are as follows:

Spark plug	150
Clutch plate, "S" clutch and cover	350
Flywheel nut	250-300
Back plate screws	45
Cylinder screws	80
Connecting rod screws	60
Starter housing screws	45
Muffler to cylinder screws	45
Ignition module screws	35
Transformer coil screws	27
Air deflector screws	45
Air box to carb connector screws	45
Carburetor mounting screws	45
Vibrator isolator pins	80
Starter pawl studs	60-70

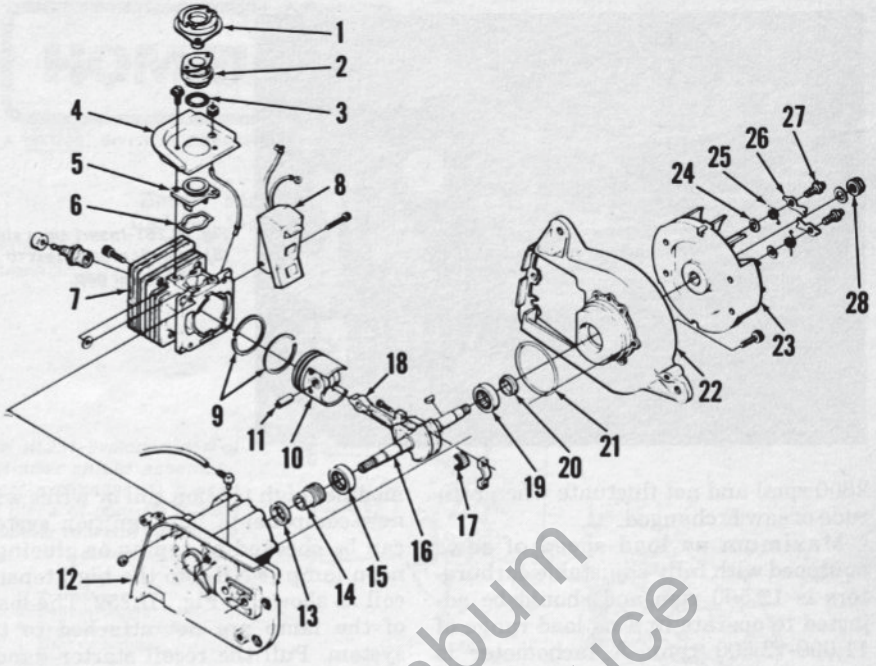


Fig. HL257–Exploded view of engine.

1. Carburetor flange
2. Connector
3. Garter spring
4. Air deflector
5. Intake manifold
6. Gasket
7. Cylinder
8. Ignition module
9. Piston rings
10. Piston & bearings
11. Piston pin
12. Crankcase
13. Seal
14. Oil pump worm gear
15. Roller bearing
16. Crankshaft
17. Needle bearing
18. Connecting rod
19. Roller bearing
20. Seal
21. "O" ring
22. Back plate
23. Flywheel
24. Lockwasher
25. Spring
26. Starter pawl
27. Pawl stud
28. Nut

HOMELITE SERVICE TOOLS. Listed below are Homelite tool numbers and descriptions for models 350, 350B, 350HG and 350SL Automatic.

Tool No. Description & Model Usage

A-23696-A—Clutch wrench ("S" clutch)
A-23934—Clutch wrench (3-shoe)
A-24290—Flywheel puller
A-24871—Piston pin removal & installation
23136-6—Crankcase seal removal
23759—Crankcase seal installation
23846-1—Crankcase bearing removal
23846-2—Backplate bearing & seal removal
24826—Seal installation plug
24827—Bearing & seal removal & installation
24868—Oil pump alignment plug

CYLINDER, PISTON, PIN AND RINGS. Cylinder can be removed using the following prodedure: Remove handle bar and chain guide bar and then using procedure in VIBRATION ISOLATORS section, remove housing assembly (11—Fig. HL255) from powerhead. Remove starter housing, disconnect wires from ignition module and remove high voltage transformer coil and cylinder shield (2—Fig. HL251). Detach muffler from powerhead. Remove intake manifold. Unscrew socket head screws retaining cylinder and remove cylinder.

Cylinder has chrome bore which should be inspected for excessive wear or damage. Piston is equipped with two piston rings and is available in standard size only. Piston pin is pressed in rod and rides in two needle roller bearings in piston. Piston and bearings are available only as a unit. Piston must be installed with side of piston indicated by arrow on piston pin boss marked "EXH" towards exhaust port. Refer to Fig. HL258.

CONNECTING ROD. Connecting rod may be removed after removing cylinder as previously outlined. Connecting rod is fractured type secured by two socket head screws. Connecting rod

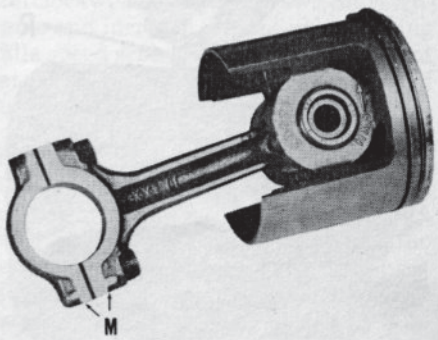


Fig. HL258–Alignment marks (M) on rod must match and arrow adjacent to "EXH" on piston pin boss must point towards exhaust port for proper installation of piston and connecting rod.

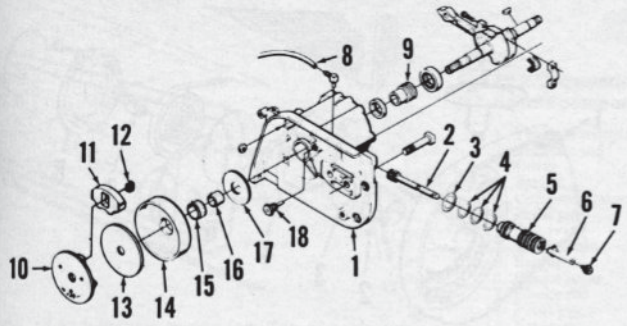


Fig. HL259–Exploded view of clutch and oil pump assemblies.

1. Crankcase
2. Oil pump plunger
3. "O" ring
4. "O" rings
5. Pump body
6. Adjusting lever
7. Sems screw
8. Oil line
9. Oil pump worm gear
10. Clutch hub
11. Clutch shoe
12. Spring
13. Washer
14. Clutch drum
15. Bearing
16. Bearing race
17. Washer
18. Cam screw

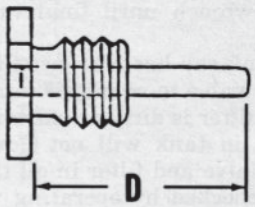


Fig. HL263–Depth (D) of cam screw pin in cam screw must be 0.553-0.557 when measured as shown above. Adjust pin depth by driving pin in or out of cam screw.

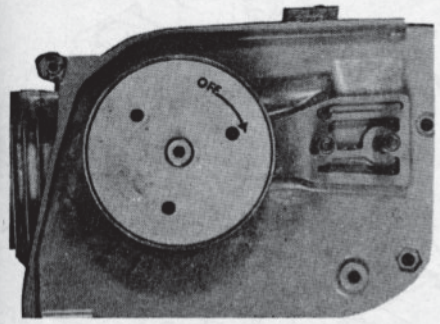


Fig. HL260–Clutch hub is removed by unscrewing clockwise as indicated on hub. Refer to Fig. HL254.

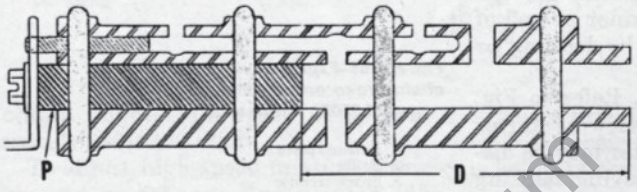


Fig. HL264–Plug (P) in pump bore must be 2.011-2.016 (D) from end of pump bore as shown above.

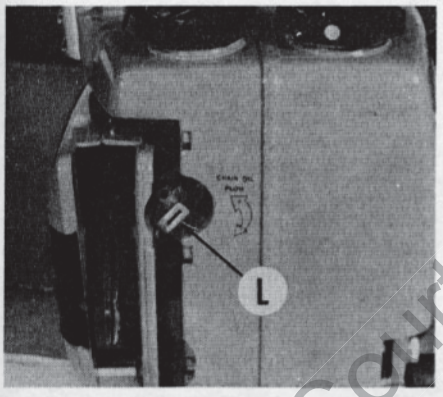


Fig. HL261–Oil pump output is adjusted by turning lever (L) counterclockwise to increase oil flow or clockwise to decrease oil flow.

rides on 25 loose needle bearings around crankpin. Marks (M—Fig. HL258) at big end of rod must be aligned and cap and rod properly mated during reassembly. Needle bearings may be held in place around crankpin with a suitable grease.

CRANKSHAFT, CRANKCASE AND SEALS. To disassemble crankcase, remove clutch as outlined in CLUTCH section and then remove starter housing and flywheel assemblies. Remove connecting rod as previously outlined. Unscrew screw securing back plate (22—Fig. HL257) to crankcase (12). Bearings and seals may be pressed out of back plate and crankcase using Homelite tools previously listed. Inspect crankshaft bearings, seals and "O" rings (21) for damage or excessive wear. Be sure "O" ring is properly seated during assembly of crankcase.

CLUTCH. Models are equipped either with the three shoe centrifugal clutch shown in Fig. HL259 or a 1-piece "S" configuration clutch similar to that shown in figure HL-153. Clutch may be removed by holding flywheel with a ¼ inch rod (Fig. HL254) and turning clutch hub clockwise as shown in Fig. HL260.

AUTOMATIC CHAIN OIL PUMP. All models are equipped with the plunger type pump shown in Fig. HL259. The pump is driven by a worm (9) on the engine crankshaft. Oil output is adjusted by turning adjusting lever shown in Fig. HL259. Turning adjusting lever counterclockwise will increase oil output.

To disassemble oil pump, remove side cover, clutch, chain and bar. Unscrew cam screw (P—Fig. HL262) and pull oil pump assembly out of housing. Clean and inspect components. Measure depth of cam screw pin as shown in Fig. HL263. Depth should be 0.553-0.557 inches and may be adjusted by driving pin in or out of cam screw. Incorrect pin depth will affect engagement with slot in plunger. Measure depth of plug (P—Fig. HL264) in pump bore. Plug should be 2.011-2.016 inches from end of pump as shown in Fig. HL264.

To reassemble pump, lubricate and install pump plunger (2—Fig. HL259) in pump body (5). Lubricate "O" rings and align cam groove in plunger with slot in pump body. Carefully install pump assembly in housing to prevent plunger from moving out of alignment with pump body slot. Check pump by inserting a suitable tool through cam screw hole to engage cam slot in plunger. Pressure should be felt when plunger is moved towards end of pump. Screw cam screw (P—Fig. HL262) into housing being sure pin in cam screw properly engages slot in pump body (5—Fig. HL259) and cam groove in plunger (2). Do not tighten cam screw

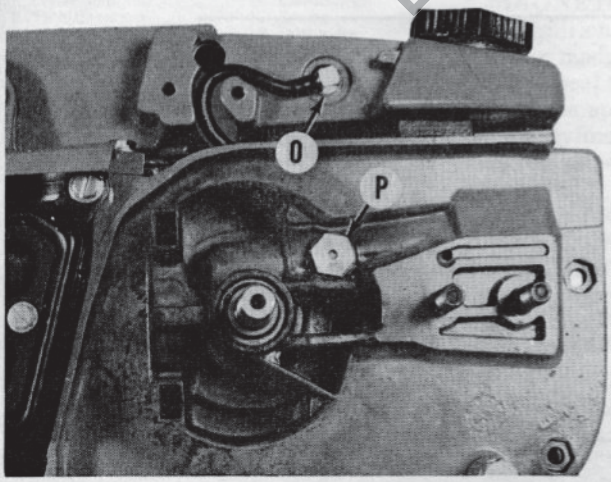


Fig. HL262–Oil line fitting (O) must be pointing towards 8 o'clock position and oil line routed as shown. Cam screw (P) must be installed carefully to insure proper meshing with cam in plunger (2–Fig. HL259).

with a wrench until final turns are reached.

Oil tank cap has a bronze filter and one-way valve to admit air into the oil tank. If filter is dirty or valve is defective, oil in tank will not flow to oil pump. Valve and filter in oil tank cap can be checked by operating with oil tank cap tight and then loose. If oil output is increased when cap is loose, filter and valve should be inspected.

Oil output fitting on oil tank should point in an 8 o'clock direction as shown in Fig. HL262 to properly route oil tube. Reduced oil output may also be due to a clogged oil strainer at end of oil tube in oil tank or by leaking or blocked oil lines.

RECOIL STARTER. Refer to Fig. HL265 for an exploded view of starter used on all models. Starter may be disassembled without removing housing (1) except to remove and install bushing (2).

To disassemble starter, unscrew cover (8) screws and allow cover to rotate until tension in rewind spring is relieved. Remove cover with spring (6), shield (5), and post (7). Untie knot in end of rope, remove rope handle and remove rope pulley (4) and rope. Inspect bushing (2) and remove housing (1) if it is necessary to remove bushing. Bushing is a press fit in housing.

If old bushing is to be retained, lubricate bushing with oil. Note direction spring (6) is wound in Fig. HL265. A new spring should be lightly lubricated on its edges with Homelite ALL-TEMP Multi-Purpose Grease or a suitable lithium base grease before installing spring in cover. Do not over-lubricate. Place spring post (7) in center of spring and snap shield (5) into cover (8). Install rope end through pulley and housing and install rope handle. Turn pulley clockwise until rope is wound on pulley. Install spring and cover assembly on housing but do not install cover screws. Be sure spring post (7) engages hole in pulley (4). To place tension on rewind spring, turn cover (8) clockwise until rope handle is held against housing (1). Do not turn cover excessively or spring may break when rope is pulled to its full length. Install cover screws and check starter operation.

Fig. HL265–Exploded view of recoil starter.

1. Starter housing
2. Bushing
3. Washer
4. Rope pulley
5. Washer
6. Rewind spring
7. Spring post
8. Cover

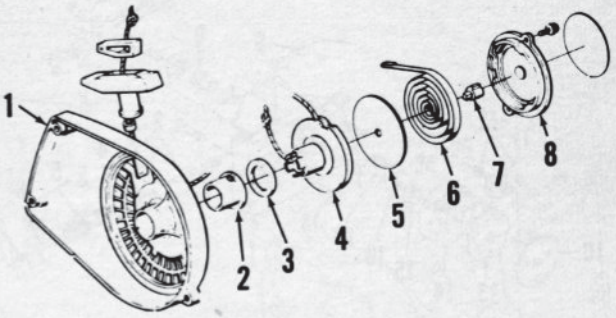
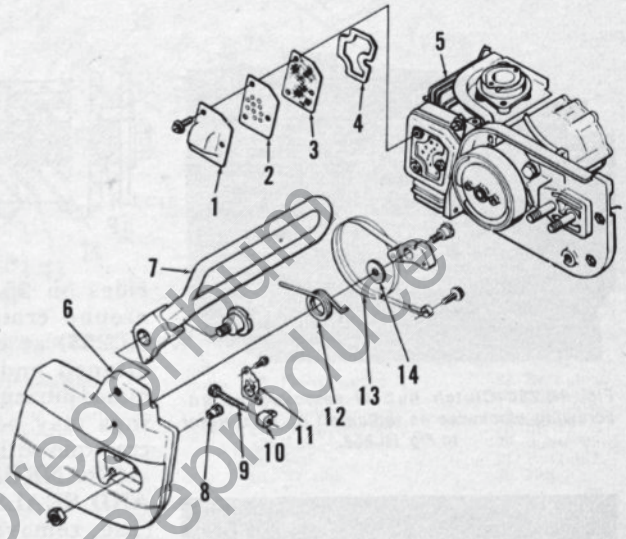


Fig. HL266–Exploded view of chain brake and muffler on model 350SL Automatic.

1. Exhaust plate
2. Baffle
3. Spark arrestor
4. Gasket
5. Powerhead
6. Drive cover
7. Brake lever
8. Guide bar adjuster
9. Chain tension adjusting screw
10. Pin
11. Gear cover
12. Spring
13. Chain brake band
14. Washer



CHAIN BRAKE. Model 350SL Automatic is equipped with a chain brake mechanism to stop saw chain motion in the event of kickback. In the event of kickback, the operator's left hand will force brake lever (7—Fig. HL266) forward and brake band (13) will wrap around the clutch drum to stop clutch drum rotation. Chain brake effectiveness may be checked by running chain saw with chain turning but not cutting. Push chain brake lever forward. Chain brake should stop chain instantly. If chain brake does not operate correctly, outer surface of clutch drum may be glazed. Remove glaze with emery cloth being sure to clean drum afterwards. Clutch drum and brake band must not be bent or nicked.

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore	Stroke	Displ.	Drive Type
650	2.125 in. 54 mm	1.720 in. 43.7 mm	6.1 cu.in. 100 cc	Direct

MAINTENANCE

SPARK PLUG. Recommended spark plug is Champion UCJ-4G gold palladium. A Champion CJ-4 spark plug is recommended if UCJ-4G plug is not available. Spark plug electrode gap should be 0.025 inch.

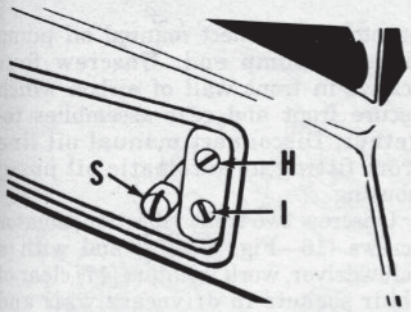


Fig. HL270–View showing location of carburetor high speed mixture screw (H), idle mixture screw (I) and idle speed screw (S).

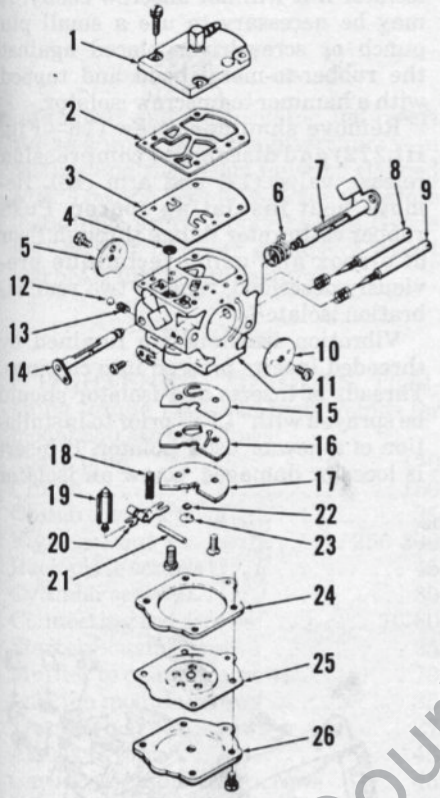


Fig. HL271–Exploded view of Walbro WB-2 carburetor used on model 650.

1. Fuel pump cover
2. Gasket
3. Pump diaphragm
4. Inlet screen
5. Choke plate
6. Throttle return spring
7. Throttle shaft
8. High speed mixture screw
9. Idle mixture screw
10. Throttle plate
11. Body
12. Choke detent ball
13. Spring
14. Choke shaft
15. Circuit check valve diaphragm
16. Circuit gasket
17. Circuit plate
18. Spring
19. Inlet valve
20. Diaphragm lever
21. Pin
22. Check valve screen
23. Retaining ring
24. Gasket
25. Metering diaphragm
26. Cover

CARBURETOR. Model 650 is equipped with a Walbro WB-2 diaphragm carburetor.

Initial adjustment of idle and high speed mixture screws is one turn open. Adjust idle speed screw so that engine idles at approximately 2400-2600 rpm. Adjust idle mixture screw to obtain maximum engine speed at idle. If necessary, readjust idle speed screw to obtain engine idle speed of approximately 2400-2600 rpm.

To adjust high speed mixture screw, proceed as follows: Run saw at idle until engine reaches operating temperature. Turn high speed mixture needle clockwise until engine will not accelerate cleanly when throttle is opened. Turn high speed mixture needle counterclockwise approximately ⅛-¼ turn. Check performance of saw. Engine should accelerate without hesitation and should not exceed 12,000 rpm at full throttle under no load. When high speed no load rpm has been adjusted within the correct range, maximum power should occur at desired cutting speed.

Model 650 is equipped with a trigger latch mechanism coupled to a compression release valve to aid engine starting. Starting speed is adjusted by turning slotted head adjustment screw (13—Fig. HL272) at top and front of saw handle. Turning screw clockwise raises starting speed while turning screw counterclockwise lowers starting speed. Adjust starting speed by latching trigger in start position, start engine and turn screw until desired engine speed is obtained. Stop engine and restart to check starting speed.

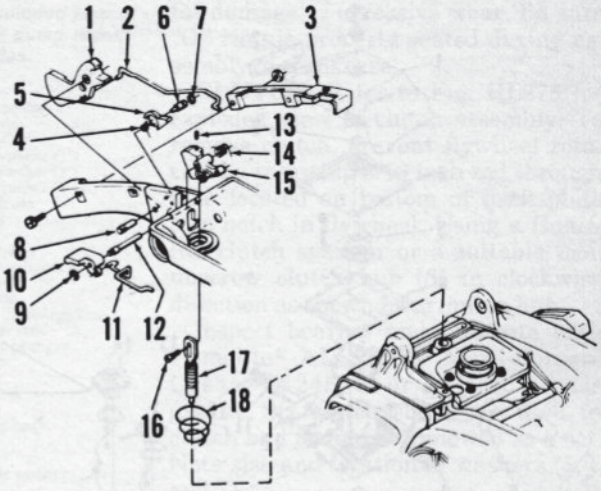


Fig. HL272–Exploded view of handle components.

1. Throttle trigger
2. Throttle rod
3. Cover
4. Spring
5. Compression release cam
6. Pivot pin
7. Snap ring
8. Trigger pin
9. Spring
10. Choke lever
11. Choke rod
12. Pivot pin
13. Set screw
14. Spring
15. Compression release arm
16. Shoulder screw
17. Compression release valve
18. Spring

MAGNETO AND TIMING. A solid state ignition is used on model 650. The ignition module is mounted adjacent to the flywheel while the high tension coil covers the spark plug and is mounted on the cylinder shield. The high tension coil must be removed for access to spark plug.

The ignition system is serviced by replacing the spark plug, ignition module, high tension coil or wires with new components. The ignition system can be checked by taping or gluing a neon lamp (#NE-2) to the high tension coil similar to method shown in Fig. HL 252 in model 350 section. The leads of the lamp are not attached to the system. When the recoil starter handle is pulled briskly, the lamp should flash with each revolution of the flywheel. It is helpful to compare the lamp flash on a saw with a good ignition system when analyzing the ignition system on a faulty saw. If the lamp flash is dim, irregular or non-existent, check wires and connections, then renew ignition components by starting with the spark plug until the problem is corrected.

High tension coil and leads may be checked by disconnecting wires at ignition module which lead from ignition module to coil receptacle and connecting an ohmmeter to end of wires. There should be continuity between wire ends. If continuity does not exist, disassemble rear of saw until access is possible to two coil receptacle leads and disconnect leads. Check continuity of each wire and terminal.

To check ignition switch and lead, connect one probe of ohmmeter to switch terminal and ground other probe to ignition module core. Check continuity of ignition switch and lead with switch in "RUN" and "STOP" positions. If continuity exists when switch is in "RUN" position, switch or lead is shorted and must be replaced. Continuity should exist with switch in "STOP" position. If continuity is not present in "STOP" position, check connection of switch lead and replace lead and switch if necessary.

Air gap between ignition module and flywheel is adjustable. Adjust air gap by loosening module retaining screws and place 0.015 inch (pink) shim stock between flywheel and module. Load crankshaft bearings during adjustment by applying pressure to flywheel in direction of ignition module.

LUBRICATION. Model 650 engine is lubricated by mixing oil with regular gasoline (about 90 octane rating). If Homelite® Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE

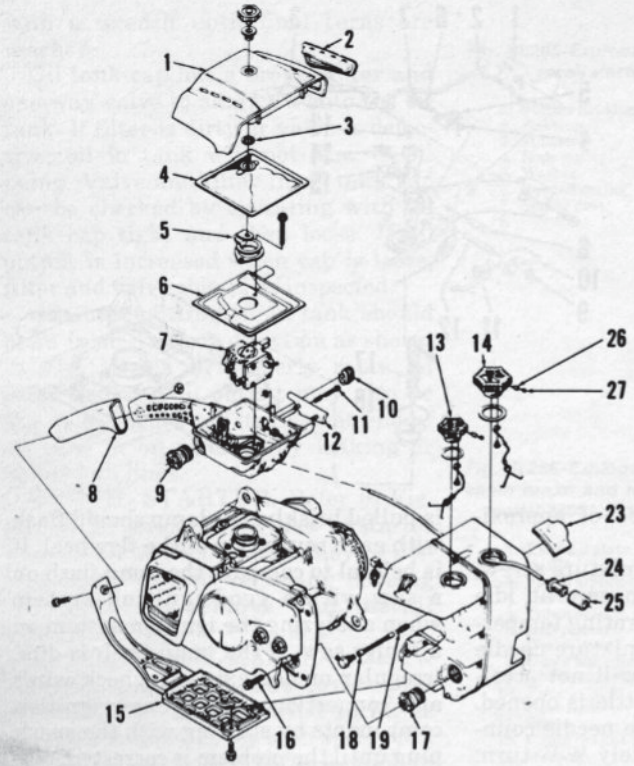


Fig. HL273–View of induction, fuel and oil assemblies.

1. Air filter cover
2. Air intake
3. Spring nut
4. Air filter
5. Air intake tube
6. Airbox shield
7. Carburetor
8. Handle grip
9. Rear vibration isolator
10. Grommet
11. Idle speed screw
12. Air deflector
13. Oil tank cap
14. Fuel tank cap
15. Handle brace
16. Vibration isolator screw
17. Front Vibration isolator
18. Oil Line
19. Oil pickup
23. Fuel tank bumper
24. Fuel pickup
25. Fuel filter
26. Check valve
27. Filter

30 oil designed for air-cooled two stroke engines is used.

Saw chain is lubricated by oil from an automatic or manual chain oil pump. Recommended saw chain oil is Homelite® Bar and Chain Oil. Clean automotive oil may also be used if the former is not available. SAE 30 oil should be used in warm temperatures above 40° F. and cut with 20% kerosene in cold temperatures. A light weight oil such as SAE 10 or SAE 5 may also be used in cold temperatures.

Automatic chain oil pump is designed to leave approximately 3 ounces of oil in oil tank when one tankful of fuel is consumed after oil and fuel tanks had been full.

A sprocket nose bar is used on model 650 and should be lubricated periodically by removing chain and forcing a good quality grease such as Homelite® ALL-TEMP Multi-Purpose Grease through lube hole in nose of bar. Bar should be warm before applying grease. Force grease into nose of bar until dirty grease is forced out and fresh grease is evident.

VIBRATION ISOLATORS. Model 650 is equipped with vibration isolators between engine and engine housing. Use the following procedure to remove vibration isolators:

Remove drive case cover, chain and bar, and bumper spikes. Remove throttle handle brace (15—Fig. HL273) and handlebar. Remove air filter cover and filter and disconnect choke rod from choke lever. Unscrew carburetor mounting screws and remove air intake tube (5). Lift metal shield (6) off airbox and pull carburetor free of adjustment needle grommet. Disconnect pulse line and fuel line from carburetor. Disconnect manual oil pump lines at pump end. Unscrew four screws in front wall of airbox which secure front and rear assemblies together. Disconnect manual oil line from fitting at automatic oil pump housing.

Unscrew two front vibration isolator screws (16—Fig. HL273) and with a screwdriver, work isolators (17) clear of their sockets in drivecase wall and back plate. Remove fuel and oil tanks and disconnect oil line from oil tank. Unscrew vibration isolators (17) from tank. Note: Do not continue twisting isolator if it will not unscrew easily. It may be necessary to use a small pin punch or screwdriver placed against the rubber-to-metal bond and tapped with a hammer to unscrew isolator.

Remove shoulder screw (16—Fig. HL272) and disconnect compression release valve (17) and arm (15). Remove heat insulating spacer. Push rubber carburetor flange through floor of airbox and using technique previously described, remove two rear vibration isolators.

Vibration isolators are retained by threaded inserts pressed into castings. Threads of inserts and isolator should be sprayed with "LPS" prior to installation of a new or used isolator. If insert is loose or damaged, screw an isolator

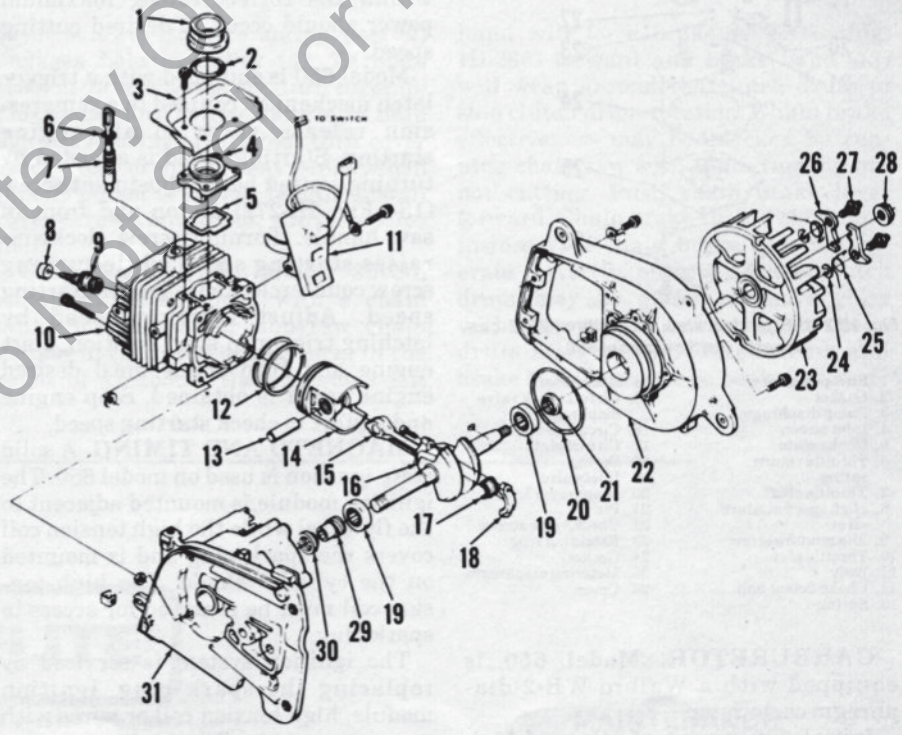


Fig. HL274–Exploded view of model 650 engine.

1. Rubber carb. flange
2. Garter spring
3. Air deflector
4. Intake manifold
5. Gasket
6. Snap ring
7. Compression relief valve
8. Grommet
9. Spark plug
10. Cylinder
11. Ignition module
12. Piston rings
13. Piston pin
14. Piston
15. Connecting rod
16. Crankshaft
17. Split cage bearing
18. Rod cap
19. Roller bearing
20. "O" ring
21. Seal
22. Back plate
23. Flywheel
24. Lockwasher
25. Spring
26. Starter pawl
27. Pawl stud
28. Nut
29. Oil pump worm
30. Seal
31. Crankcase

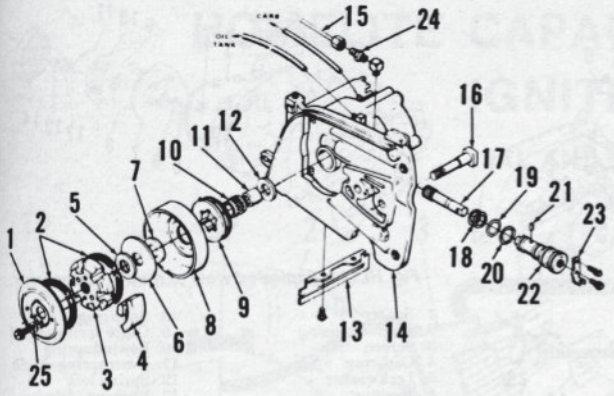


Fig. HL275–Exploded view of clutch and oil pump assemblies.

1. Cover
2. Clutch spring
3. Clutch hub
4. Clutch shoe
5. Thrust washer (1")
6. Thrust washer (2")
7. Thrust washer (1-⅛")
8. Clutch drum
9. Sprocket
10. Bearing
11. Bearing race
12. Thrust washer (1⅛")
13. Heat shield
14. Crankcase
15. Manual discharge line
16. Guide bar stud
17. Oil pump plunger
18. "O" rings
19. "O" ring
20. "O" ring
21. Cam pin
22. Oil pump body
23. Bracket
24. Fitting
25. Belleville washer

into insert and pull isolator and insert out as a unit. Both the insert recess in casting and the insert must be cleaned with Locquic Grade N Primer before installing insert. Apply Loctite Grade AA Sealant to outer surface of insert and press insert into casting.

REPAIRS

TIGHTENING TORQUES. Tightening torque values in inch-pounds for model 650 are as follows:

Spark plug	150
Clutch	180
Clutch cover screws	35
Flywheel nut	250-300
Back plate screws	45
Cylinder screws	80
Connecting rod screws	70-80
Starter housing screws	35
Muffler to cylinder screws	70
Ignition module screws	35
Transformer coil screws	27
Airbox to tank	45
Carburetor mounting screws	45
Vibration isolator screws	45
Starter pawl studs	80-90

HOMELITE SERVICE TOOLS. Listed below are Homelite tool numbers and descriptions for model 650.

Tool No. Description & Model Usage

A-23696-A—Clutch wrench
A-24851—Flywheel puller
A-24871—Piston pin tool
A-24876—Collar & plunger
A-24884—Compression valve seat reamer
22126—Hex socket key
22486—Feeler gauge (0.015 in. pink plastic)
22828—Retaining ring pliers
23136-6—Crankcase seal removal sleeve
23759—Crankcase & backplate seal assembly sleeve
23846-1—Crankcase bearing removal anvil
23846-2—Crankcase & backplate bearing removal anvil
24826-A—Seal installation plug
24827-A—Bearing & seal installation & removal plug

CYLINDER, PISTON, PIN AND RINGS. Cylinder has chrome bore which should be inspected for wear or damage. Piston and rings are available in standard sizes only. Piston pin is pressed in rod and rides in two needle roller bearings in piston. Piston and bearings are available as a unit assembly only.

Note that one piston pin boss is marked with an arrow and "EXH". Install piston with side indicated by arrow towards exhaust port.

CONNECTING ROD. Connecting rod is fractured type secured by two socket head screws. Connecting rod rides on a split caged needle bearing at big end. Marks at big end of rod must be aligned and cap and rod properly mated during assembly. Needle bearings may be held around crankpin with a suitable grease to aid in assembly.

CRANKSHAFT, CRANKCASE AND SEALS. Crankshaft is supported by roller bearings (19—Fig. HL274) in crankcase (31) and back plate (22). Bearings and seals may be pressed out of crankcase and backplate using Homelite tools previously listed. Inspect bearings, seals and "O" ring (20) for damage or excessive wear. Be sure "O" ring is properly seated during assembly of crankcase.

CLUTCH. Refer to Fig. HL275 for exploded view of clutch assembly. To remove clutch, prevent flywheel rotation by inserting 3/16 inch rod through hole located on bottom of back plate into notch in flywheel. Using a Homelite clutch spanner or a suitable tool, unscrew clutch hub (3) in clockwise direction as shown by arrow on hub.

Inspect bearing and lubricate with Homelite® ALL-TEMP Multi-Purpose Grease (#24551) or a lithium base grease. Six clutch shoes are used in clutch and should be renewed as a set. Note size and location of washers (5, 6 and 7).

AUTOMATIC CHAIN OIL PUMP. Model 650 is equipped with an automatic oil pump driven by worm (29—Fig. HL274) on crankshaft. Oil is pumped by plunger (17—Fig. HL276) as it reciprocates due to cam pin (21) located in cam groove (G). Oil enters pump through port (A) and passes around pump body (22) to enter plunger bore through port (B). Oil exits through ports (C, D and E) to saw chain. Oil may be pumped through port (F) and fitting (24) to manual oil pump. Oil is also routed through ports (H and J) to cam groove to reduce back pressure on oil plunger.

To disassemble automatic oil pump, unscrew oil pump bracket screw and gently withdraw oil pump body (22—Fig. HL275). Do not lose cam pin (21) which is loose in pump body. Remove pin (21) and slide pump plunger out of pump body. Inspect pump plunger, body and "O" rings for excessive wear or damage. An excessively loose fit between pump plunger and pump body will cause low pump output. Oil "O" rings before installation in grooves of pump body. "O" rings must be straight in grooves and not twisted. Oil "O" rings before inserting pump body and plunger assembly into pump housing.

If oil pump operates correctly but oil output is insufficient, disconnect and clean oil lines and fittings (Fig. HL275). Install outlet elbow in oil tank

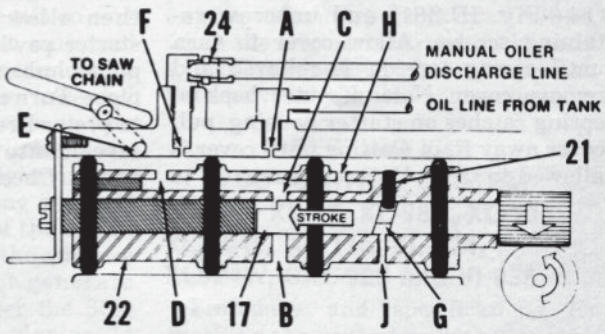


Fig. HL276–Cross-section of oil pump. Refer to text for operation.

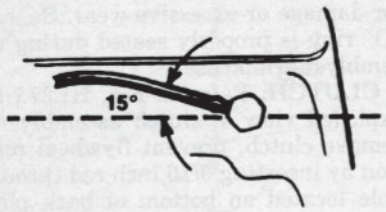


Fig. HL278–Oil line and fitting in oil tank must be angled 15° as shown above.

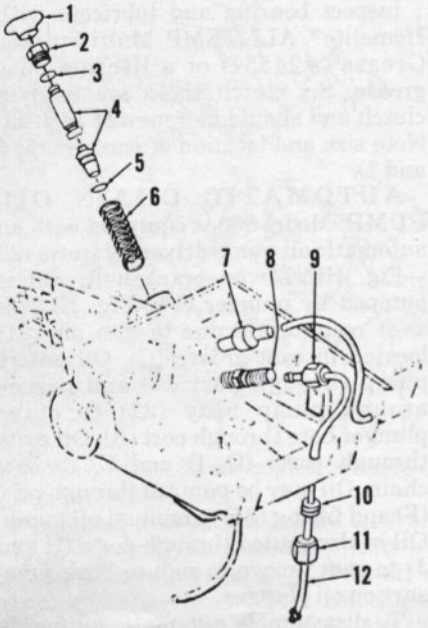


Fig. HL279–Exploded view of manual oil pump used on model 650. End of oil line (12) is connected to fitting (24–Fig. HL276). Oil line (12) must be disconnected from fitting and pulled into air box for removal.

1. Button
2. Plunger nut
3. "O" ring
4. Plunger assy.
5. "O" ring
6. Spring
7. Check valve
8. Check valve
9. Compression nut
10. Grommet
11. Compression nut

wall to provide an angle of 15° as shown in Fig. HL278. Elbow threads should be coated with thread sealant.

RECOIL STARTER. Refer to Fig. HL281 for an exploded view of starter assembly. Starter pawl components attached to flywheel are shown in Fig. HL274.

To disassemble starter, hold cover (14—Fig. HL281) and unscrew retaining screws. Allow cover to turn until spring tension is relieved and remove cover. Note: If outer hook of spring catches on starter housing, pull cover away from housing until cover is allowed to turn. Unscrew screw (4) to

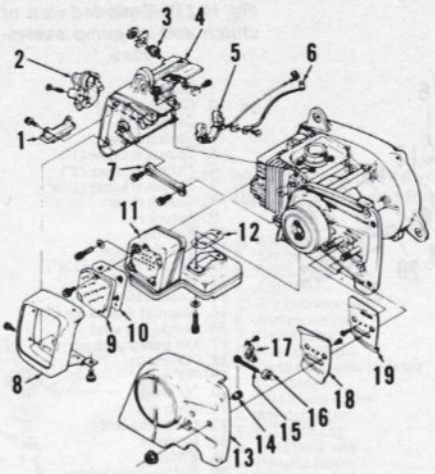


Fig. HL280–Exploded view of exhaust and chain tensioning assemblies.

1. Rear snubber
2. High tension coil
3. Ignition switch
4. Cylinder shield
5. Coil receptacle
6. Ground lead
7. Brace
8. Muffler shield
9. Muffler cap
10. Spark arrestor
11. Muffler
12. Gasket
13. Cover
14. Guide bar adjuster gear
15. Chain tension adjuster screw
16. Pin
17. Gear cover
18. Outer guide bar plate
19. Inner guide bar plate

separate rope pulley (7) from cover. Remove snap ring (8) for access to rewind spring. If starter pawl assemblies must be removed, unscrew housing screws and remove starter housing (2). Threaded inserts are available if stud holes are damaged in flywheel.

Clean and inspect components. Lubricate sides of rewind spring with a small amount of Homelite® ALL-TEMP Multi-Purpose grease or a lithium base grease. Do not oil spring. Install inner spring shield (11), rewind spring (10) and spring lock (12) in cover with spring wound as shown in Fig. HL282. Install outer spring shield (9—Fig. HL281) and snap ring (8). Insert bushings (6 and 13) in rope pulley (7) being sure knobs on bushings align with notches in pulley. Slide pulley onto post in cover and check to be sure splines on pulley engage splines in spring lock. Install and tighten capscrew (4) to 45 in.-lbs. Wind rope around pulley in clockwise direction as viewed from screw end of pulley. Set cover in housing. Pull rope handle and then allow rope to rewind so that starter pawls will be forced open and pulley hub can slide between them into place. Turn cover clockwise 2 or 3 turns to preload rewind spring, snap plastic screen into place and install cover screws. Check starter operation.

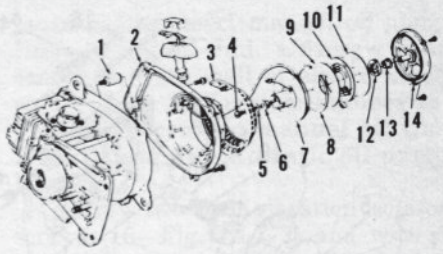


Fig. HL281–Exploded view of model 650 starter.

1. Spacer
2. Starter housing
3. Screen
4. Capscrew
5. Lockwasher
6. Bushing
7. Rope pulley
8. Snap ring
9. Outer spring shield
10. Rewind spring
11. Inner spring shield
12. Spring lock
13. Bushing
14. Cover

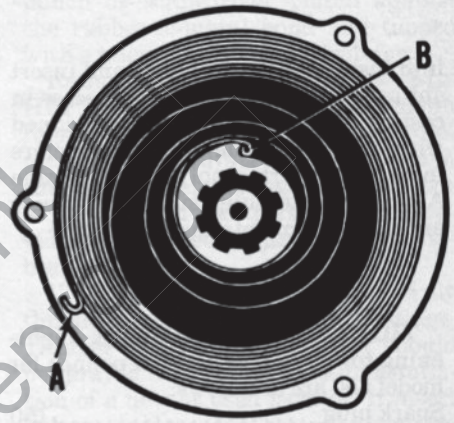


Fig. HL282–View of rewind spring installation in starter cover. Hook outer loop (A) of spring in notch as shown. Inner loop (B) of spring must be curved inward to engage notch of spring lock.

COMPRESSION RELEASE. Model 650 is equipped with a compression release to aid starting. A leaking compression release valve may be repaired by cleaning valve seat with Homelite Tool No. A-24884. This tool is designed to remove carbon without removing metal from valve seat. Piston must be at TDC and engine positioned with valve side down to prevent debris from entering cylinder.

Inspect valve stem for wear which may not allow valve to seat properly and renew valve if valve stem is excessively worn. Examine pin connecting valve link to stem and renew assembly if pin is worn or loose.

Install compression release valve with sharp side of snap ring (6—Fig. HL274) out. Push compression release valve and snap ring down into valve bore making sure snap ring fully engages snap ring groove.

HOMELITE CAPACITOR DISCHARGE (CD) IGNITION SYSTEM

(XL AND VI SERIES MODELS)

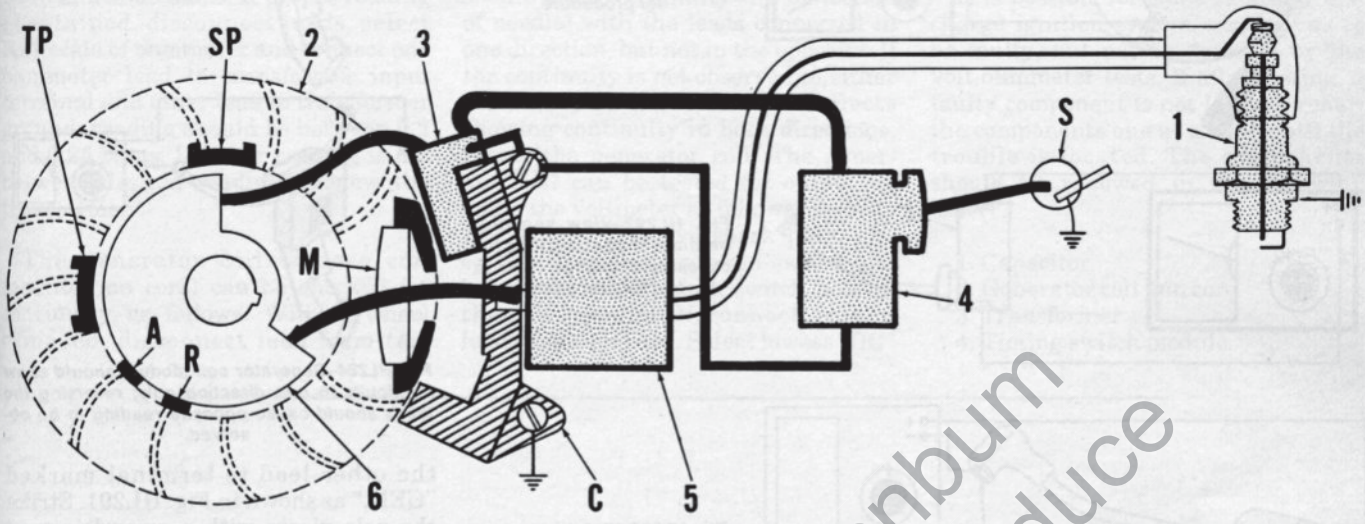


Fig. HL290–Schematic diagram of XL-104 CD ignition system. Electrical energy created by magnet (M) in flywheel (2) passing generator coil (3) and core (C) is stored in the capacitor (4) until SCR switch in timing module (6) is turned on by timing pole piece (TP) passing magnetic triggering device (A or R) in module. The capacitor will then discharge the stored electrical energy into the transformer (5) which builds up the voltage to fire the spark plug (1). SCR switch is actuated by retard magnetic triggering device (R) at cranking speeds and by advance triggering device (A) when engine is running. Safety pole piece (SP) will cause spark plug to be fired on exhaust stroke if engine is turned backwards. "ON-OFF" switch (S) is used to stop engine by grounding the capacitor.

OPERATING PRINCIPLES

The Homelite capacitor discharge ignition system used in several XL series and VI995 chain saw models and in the Multi-Purpose Saw models XL98 and XL98A generates alternating current which is rectified into direct current, the current is stored as electrical energy in a capacitor (condenser) and is discharged on timing signal into the transformer (coil) that steps up the voltage to fire the spark plug. Instead of using breaker points as in a conventional magneto, ignition timing is done by magnetically triggered solid state switch components. Refer to Fig. HL290 for schematic diagram of capacitor discharge ignition system. Ignition system components are as follows:

1. **SPARK PLUG**—A conventional Champion spark plug with a 0.025 inch firing gap.

2. **FLYWHEEL** (ROTOR)—The CD flywheel is slightly different from breaker ignition flywheels in that it has two pole pieces to trigger the solid state components. One pole piece triggers the switch for normal starting and operating ignition timing and the second pole piece is a safety device to prevent the engine from running backwards. The flywheel magnet passes the generator coil and core to generate electrical current.

3. **GENERATOR**—The generator is an alternator type similar to that used in a battery charging circuit. The generator coil module is a permanently sealed unit mounted on a core. The module generates electrical current to charge the capacitor.

4. **CAPACITOR**—The capacitor stores electrical energy which is discharged into the transformer on signal from the switch module.

5. **TRANSFORMER**—The transformer increases the voltage discharged from the capacitor to a voltage high enough to fire the spark plug. The transformer is mounted on the generator core and can be renewed separately.

6. **TIMING SWITCH MODULE**—The timing switch module, which is mounted on the backplate under the flywheel, consists of two magnetic devices which will trigger the silicon controlled rectifier (SCR) switch contained in the module. One magnetic device will trigger the switch for retarded timing at cranking speed and the second will trigger the switch for advanced timing when the engine is running. The advance triggering device is located 16 degrees ahead of the retard device. At cranking speed, the advance triggering device will not generate enough electricity to trigger the SCR switch, but the retard device is stronger and will trigger the SCR switch at cranking speed, thus allowing the electrical energy stored in the capacitor to be discharged into the transformer and fire the spark plug. When the engine is running, the increased speed at which the pole piece in the flywheel passes the advanced triggering device generates enough electrical energy to trigger the SCR switch, thus the capacitor is discharged into the transformer 16 degrees sooner than at cranking speed. When the pole piece passes the retard device, a triggering current is also created, but the capacitor has already been discharged and no ignition spark will occur. Should the engine be turned backwards far enough to charge the capacitor, a second "safety" pole piece in the flywheel will trigger the SCR switch and the spark plug will be fired when the engine exhaust port is open. Thus, when the engine is turned backwards, a "poof" may be heard from the exhaust but a power stroke will not be created.

TESTING THE CD IGNITION SYSTEM

Models XL-98, XL-98A, XL-104, XL-104E, XL-114, XL-924, XL924W, SXL-925 and VI-955

Procedure and specifications for checking the capacitor discharge igni-

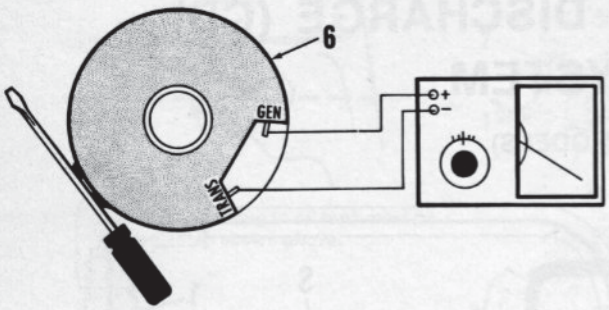


Fig. HL291–Checking the timing switch module using an ohmmeter; refer to text for procedure.

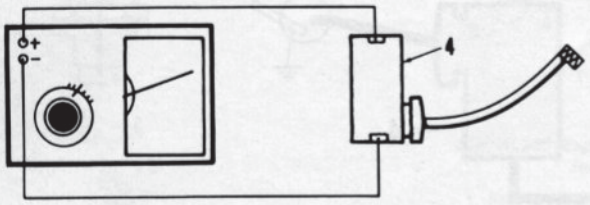


Fig. HL292–View showing ohmmeter connections for checking capacitor; refer to text for procedure.

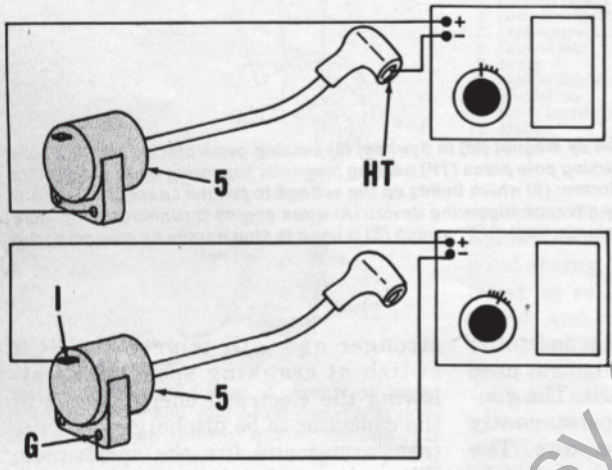


Fig. HL293–High tension coil of transformer should have between 2400 and 2900 ohms resistance; make ohmmeter connections as shown in top view. Resistance of input coil should be between 0.2 and 0.25 ohms with leads connected as shown in bottom view.

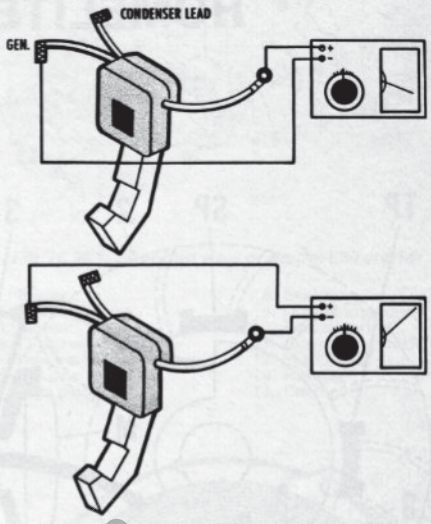


Fig. HL294–Generator coil module should show continuity in one direction only; reversing the leads should cause opposite reading to be observed.

tion system with a Graham or Merc-O-Tronic tester were not available at time of publication, but a number of tests to indicate condition of the ignition system components can be made using a volt-ohmmeter, preferrably a Triplett or Monarch. To make the volt-ohmmeter tests, refer to Figs. HL291 through HL295 and proceed as follows:

Turn the ignition switch to "ON" position, disconnect lead terminal from spark plug and insert a screw into the terminal. Hold terminal insulating boot to position the screw head ¼-inch from engine ground and observe for spark while pulling the starter rope. If a spark is observed, the magneto can be considered OK; if no spark is observed, proceed as follows:

CAUTION: Discharge capacitor by switching ignition to "OFF" position or by touching the switch lead to ground if disconnected from switch.

Remove fan housing and flywheel and thoroughly inspect to see that all wires are properly connected and that there are no broken or loose connections. If all wires are secure and in place, make the following tests: Note: Except where rotor is required to be in place during the generator coil test, components may be tested on or off the unit.

Select Rx1 scale of ohmmeter and connect one lead of ohmmeter to timing switch module marked "TRANS." and the other lead to terminal marked "GEN." as shown in Fig. HL291. Strike the pole pieces with a screwdriver as shown; the ohmmeter needle should show a deflection and remain deflected until the leads are disconnected. If no deflection is noted, reverse the leads and again strike pole pieces with screwdriver. If no needle deflection is noted with ohmmeter leads connected in either manner, renew the switch module.

To check capacitor, select Rx1000 scale of ohmmeter and disconnect ignition switch lead or turn switch to "ON" position. Connect negative (black) lead of ohmmeter to capacitor terminal used for generator coil lead connection and the positive (red) lead to capacitor ground lead terminal. An instant deflection of needle should occur; if not, reverse ohmmeter leads. If no deflection of ohmmeter needle occurs with leads connected in either direction, renew the capacitor.

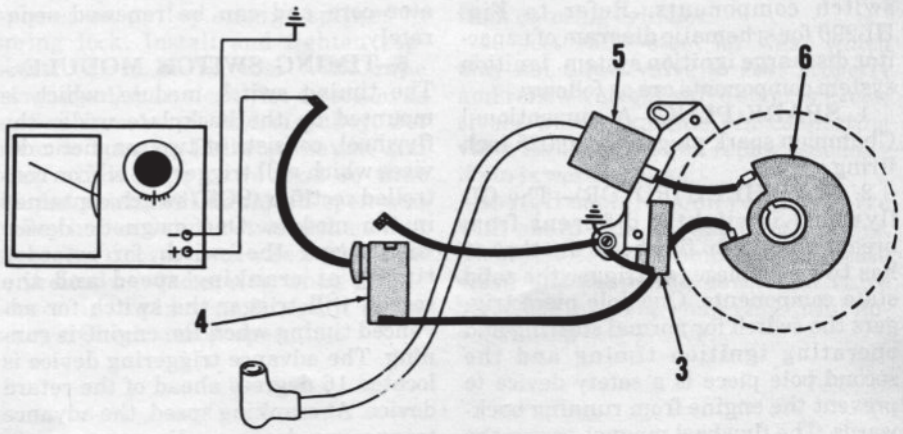


Fig. HL295–Testing output of generator with voltmeter; refer to text for procedure; minimum output should be 4 volts.

Again using Rx1000 scale of ohmmeter, test transformer by connecting either lead of ohmmeter to transformer high voltage lead and other ohmmeter lead to transformer ground; the resulting reading should be between 2400 and 2900 ohms. If proper reading is obtained, disconnect leads, select Rx1 scale of ohmmeter and connect one ohmmeter lead to transformer input terminal and other lead to transformer ground; reading should be between 0.2 and 0.25 ohms. If either reading is not between desired readings, renew the transformer.

The generator coil (square coil mounted on core) can be checked for continuity as follows: With flywheel removed, disconnect lead from terminal marked "GEN." on switch module. Select Rx1 scale of ohmmeter and connect one lead of ohmmeter to ground and other lead to the lead disconnected from switch module; then, reverse the leads. The ohmmeter should show continuity (by deflection of needle) with the leads connected in one direction, but not in the opposite. If the continuity is not observed in either direction, or if the needle deflects showing continuity in both directions, renew the generator coil. The generator coil can be tested for output by using the voltmeter as follows: Refer to Fig. HL295. Remove spark plug, disconnect lead from ignition switch and bring lead out through switch hole in throttle handle. Disconnect ground lead from capacitor. Select lowest "DC" scale on voltmeter. Connect positive (red) lead of voltmeter to switch wire and the negative (black) lead to engine ground. Spin engine by pulling firmly on starter rope. A minimum of 4 volts should be observed on voltmeter.

It is possible for some capacitor discharge ignition system components to be faulty, but not be detected by the volt-ohmmeter tests. If after testing, a faulty component is not located, renew the components one at a time until the trouble is located. The components should be renewed in the following order:

1. Capacitor
2. Generator coil and core
3. Transformer
4. Timing switch module.

HOMELITE®
A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore Inches	Stroke Inches	Displ. Cu. In.
250, 270	2½	1⅝	8.0

The model 250 and 270 engines are used as a power source for centrifugal pumps, diaphragm type pumps, air blowers and generators. The pump, blower or generator must be at least partly disassembled to service some engine components.

MAINTENANCE

SPARK PLUG. Recommended spark plug is a Champion J6J for use on engine powering generator or centrifugal pump; a Champion UJ12 is recommended for use on diaphragm type pump engine. A Champion HO-8A (platinum tip) or UJ-11-G (gold paladium tip) spark plug may be substituted. Electrode gap is 0.025.

CARBURETOR. A Tillotson HS-45A carburetor is used on earlier engines while later models use a Tillotson model HS45C carburetor; refer to exploded view of carburetor in Fig. HL1. Note: As engine speed is controlled by governor plate on rotary inlet valve, there are no governor linkage connections to throttle shaft. Throttle shaft has spring loaded detent to hold shaft in wide open position. Generator engine is not fitted with throttle control knob. Carburetor is accessible after removing air cleaner cover (1—Fig. HL2).

Later model carburetor is fitted with a main nozzle check ball which allows use of larger mesh inlet screen (6—Fig. HL1) and provides easier adjustment of fuel mixture. The check ball assembly will be in the same bore as the small body channel welch plug (22), retaining ring (23) and screen (24), and will replace these parts.

When disassembling, slide diaphragm assembly towards adjustment needle side of carburetor body to disengage diaphragm from fuel inlet control lever. To remove welch plugs, carefully drill through plugs with a small diameter drill and pry plugs out with a pin. Caution should be taken that drill bit just goes through welch plug as deeper drilling may seriously damage carburetor. Note channel screen (24) (early model carburetor) and screen retaining ring (23) which are accessible after removing welch plug (22).

Inlet control metering lever (15) should be flush with metering chamber floor of carburetor body. If not, bend diaphragm end of lever up or down as required so that lever is flush.

Normal adjustment of low speed fuel mixture needle (marked "L" on carburetor body) is ¾-turn open and main mixture adjusting needle (marked "H" on carburetor body) should be opened one full turn. On pump or blower engine, back idle speed adjusting screw out until carburetor throttle plate will close fully, then slowly turn screw in until it just contacts pin on throttle shaft, then turn screw in an additional 1½ turns.

Start engine and allow to warm up before making final carburetor adjustments. With carburetor throttle shaft in high speed detent position and engine running under load, adjust main (H) fuel needle for smoothest running. Note: On generators, there is no external control for throttle, thus no need to make idle adjustments. Move throttle shaft to idle speed position and

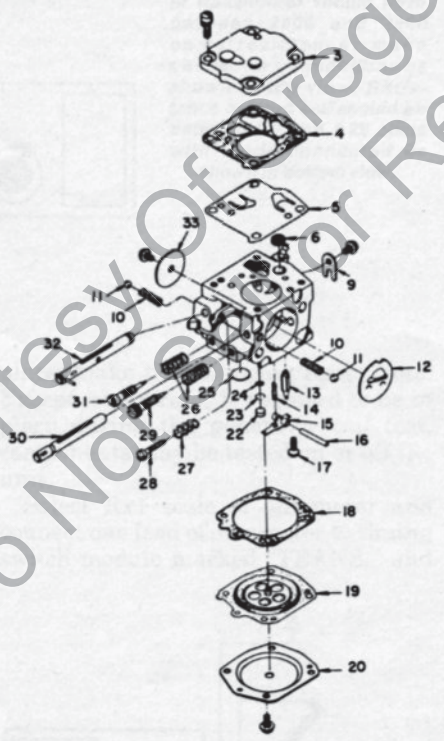


Fig. HL1–Exploded view of Tillotson carburetor used on model 250 and 270.

3. Fuel pump cover
4. Fuel pump gasket
5. Fuel pump diaphragm
6. Inlet screen
9. Throttle shaft clip
10. Shaft detent springs (2)
11. Shaft detent balls
12. Choke shutter
13. Inlet needle
14. Inlet tension spring
15. Inlet control lever
16. Inlet pinion pin
17. Inlet pinion pin retaining screw
18. Diaphragm gasket
19. Metering diaphragm
20. Diaphragm cover
22. Welch plug
23. Retaining ring for (24)
24. Body channel screen
25. Welch plug
26. Adjusting needle springs
27. Idle speed screw spring
28. Idle speed screw
29. Main adjusting needle
30. Choke shaft
31. Idle adjusting needle
32. Throttle shaft
33. Throttle shutter

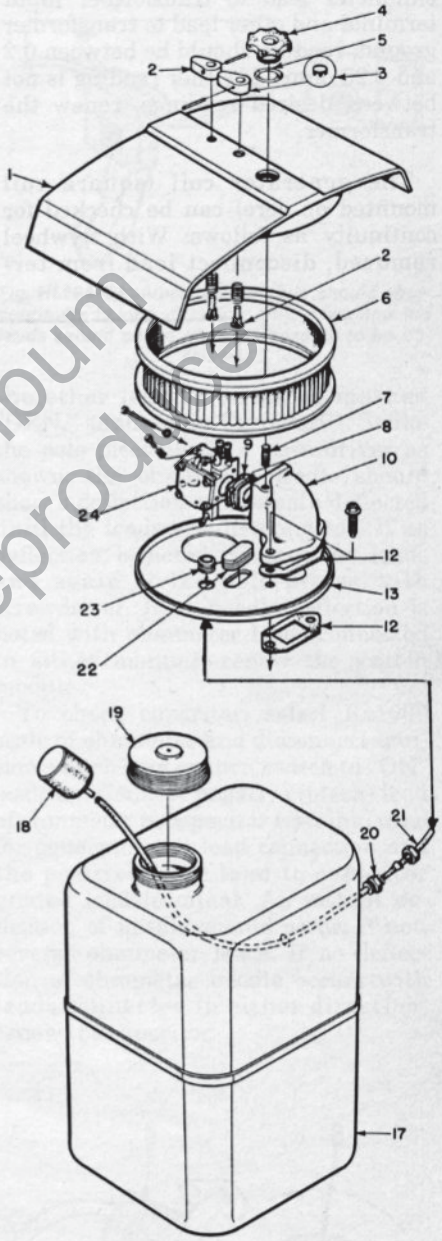


Fig. HL2–Exploded view of air intake and fuel system. Refer to Fig. HL1 for exploded view of carburetor (24). Control lever and shaft (2) is not used for throttle on generator engine and hole is covered by plug (3).

1. Air filter cover
2. Control shaft assemblies
3. Plug (generator only)
4. Cover retaining nut
5. Nylon washer
6. Air filter element
7. Stud
8. Gasket
9. Spacer
10. Intake manifold
12. Crankcase gasket
13. Air filter mounting plate
17. Fuel tank
18. Fuel filter
19. Fuel filler cap
20. Fitting
21. Fuel line
22. Governor adjusting hole plug
23. Grommet
24. Carburetor assembly

adjust idle fuel needle (L) for smoothest idle. Adjust idle speed stop screw to desired idle speed. If engine will not accelerate from idle speed to full throttle without hesitation, open idle fuel needle an additional ⅛-turn.

GOVERNOR. The governor is a part of the rotary inlet valve; refer to Fig. HL3. As engine speed increases, centrifugal force pivots governor plate on pivot pin (P) against tension of spring (S). The governor plate then closes the opening in rotary valve and thus throttles the engine. Maximum governed engine speed is controlled by tension of governor spring, which is adjusted by turning screw (A).

To check and adjust engine speed, proceed as follows: First, bring engine to normal operating temperature and adjust carburetor for highest speed and best performance obtainable, then check engine speed with tachometer. Refer to the following chart for correct governed speed:

	No Load rpm	Full Load rpm
Generator	3750	3600
Centrifugal Pump	3900-4000	3400-3600
Diaphragm Pump	2800-3000	2800-3000
Blower	3750-3800	3400-3600

If adjustment is necessary, stop engine and remove air filter cover and rubber plug (22—Fig. HL2) from air filter base (13). Remove brass plug from engine crankcase through opening in filter base and turn engine so that adjusting screw (A—Fig. HL3) is accessible. Then, as shown in Fig. HL4, turn adjusting screw clockwise to increase speed or counterclockwise to decrease speed. One turn of the screw will change governed speed approximately 100 RPM. Reinstall brass plug, rubber plug and air filter cover, then recheck engine speed; readjust if necessary.

IGNITION AND TIMING. Breaker points, condenser and ignition coil are accessible after removing engine flywheel (magneto rotor). A hole is provided in magneto back plate and inner face of flywheel so that a pin may be inserted to hold flywheel from turning. Unscrew flywheel nut and remove flywheel using Homelite puller No. AA-22560, or equivalent.

To adjust breaker point gap, turn engine so that leading edge of breaker cam is about ⅛-inch past breaker point cam follower, then adjust point gap to 0.020.

NOTE: On earlier models, removal of flywheel (magneto rotor) will also require removal of the fan housing (17—Fig. HL8). Fan housing and magneto back plate are integral on later models; removing starter and starter adapter plate will permit access to remove magneto rotor. Also, service crankshafts may have **two keyways** for breaker cam and magneto rotor. The second keyway (painted red) is at 2 o'clock position (when considering cylinder at 12 o'clock position) for use with one-piece fan housing and back plate **only** when breaker points are located **above** crankshaft. On early engines with two-piece fan housing and back plate, breaker points are mounted **below** crankshaft (opposite cylinder). The breaker cam and rotor must be positioned in same keyway. The later one-piece fan housing and back plate may be installed on earlier models by tapping the two drilled stator mounting holes and mounting magneto stator (armature and coil) in original position. When both new crankshaft and fan housing/back plate are used, remount magneto stator in new position, use **red** keyway for installing cam and rotor and mount starter using new

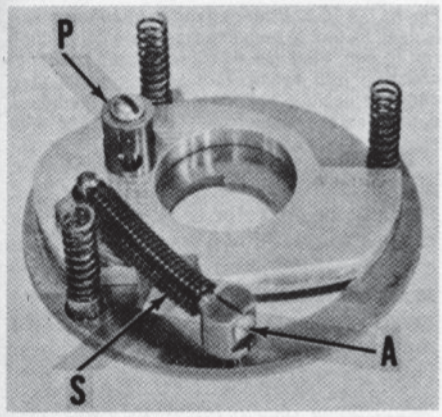


Fig. HL3–View of rotary intake valve and governor assembly. Governor plate pivots on post (P) to close off valve opening in rotary valve plate to govern engine speed. Speed at which plate closes the opening is regulated by tension of governor spring (S) which is adjusted by turning screw (A).

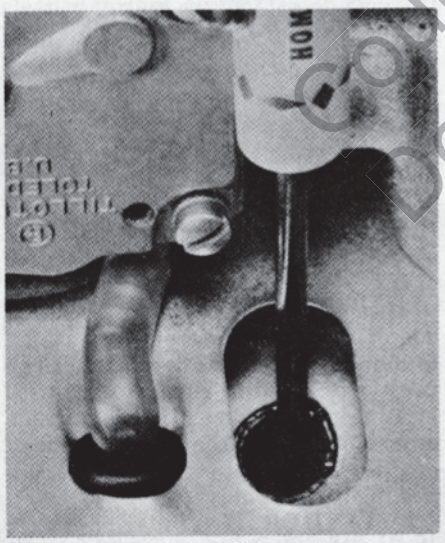


Fig. HL4–Access to governor spring adjusting screw (A–Fig. HL3) is gained by removing air filter cover, rubber plug (22–Fig. HL2) and the brass plug from engine crankcase. Then, turn engine so that screw can be turned with screwdriver as shown.

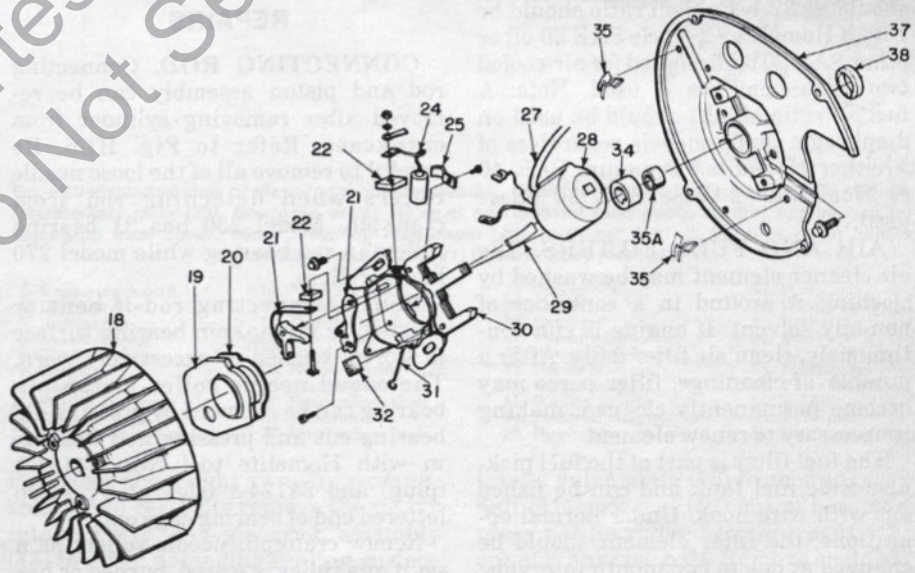


Fig. HL5–Exploded view of model 250 magneto assembly. Model 270 is similar. Magneto components are accessible after removing flywheel; refer to text. A zinc flywheel (magneto rotor) should be used on diaphragm pump engine; other model 250 engines use aluminum flywheel.

18. Flywheel
19. Breaker box cover
20. Gasket
21. Breaker points
22. Terminal connection
24. Condenser
25. Condenser clamp
27. High tension lead
28. Ignition coil
29. Coil wedge
30. Stator & armature assy.
31. Breaker box cover spring
32. Cam wiper felt
34. Breaker cam
35. Wire retaining clips
35A. Felt seal
37. Back plate
38. Felt seal

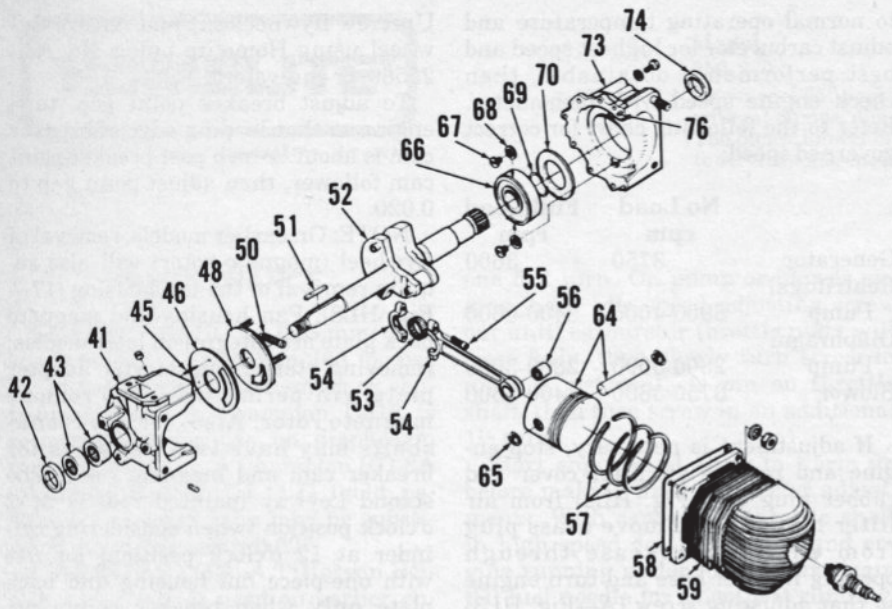


Fig. HL6–Exploded view of engine. Crankshaft end play is controlled by ball bearing (66). Three different crankshafts are used; shaft shown is for diaphragm pump. Crankshaft for generator has tapered end with threaded counterbore for armature retaining bolt. Crankshaft for other applications has externally threaded end.

41. Crankcase half
42. Crankshaft seal
43. Needle roller bearings
45. Dowel pins
46. Intake valve wear plate
48. Intake valve & governor assy.
50. Governor spring
51. Cam & flywheel key
52. Crankshaft (diaphragm pump)
53. Needle bearing rollers (31)
54. Connecting rod & cap
55. Socket head screws
56. Needle roller bearing
57. Piston rings
58. Gasket
59. Cylinder
64. Piston & piston pin
65. Snap rings
66. Roller bearing
67. Bearing retaining screws
68. Bearing retaining washers
69. Snap ring
70. Bearing gasket
73. Crankcase half
74. Crankshaft oil seal
76. Dowel pin

adapter plate. New magneto leads, retaining clips and rivets will be required also.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline. If Homelite® Premium SAE 40 oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used. Note: A fuel:oil ratio of 32:1 should be used on diaphragm pump models regardless of whether Homelite® Premium SAE 40 or Homelite® 2-Cycle SAE 30 oil is used.

AIR AND FUEL FILTERS. The air cleaner element may be washed by sloshing it around in a container of non-oily solvent. If engine is run continuously, clean air filter daily. After a number of cleanings, filter pores may become permanently clogged, making it necessary to renew element.

The fuel filter is part of the fuel pick-up inside fuel tank and can be fished out with wire hook. Under normal operations, the filter element should be changed at one to two month intervals. If engine is run continuously, or fuel is dirty, the filter may need to be changed weekly, or more often if necessary.

CARBON. Carbon should be cleaned from exhaust ports at 100 to 200 hour intervals. Remove muffler, crank piston to top dead center and use a wooden or plastic scraper to remove carbon deposits. Avoid scratching piston or damaging edge of port. Note: For easy access to exhaust port, stand engine on recoil starter end.

REPAIRS

CONNECTING ROD. Connecting rod and piston assembly can be removed after removing cylinder from crankcase. Refer to Fig. HL6. Be careful to remove all of the loose needle rollers when detaching rod from crankpin. Model 250 has 31 bearing rollers in rod bearing while model 270 has 23 rollers.

Renew connecting rod if bent or twisted, or if crankpin bearing surface is scored, burned or excessively worn. The caged needle roller piston pin bearing can be renewed by pressing old bearing out and pressing new bearing in with Homelite tool Nos. 24131-1 (plug) and 24124-1 (sleeve). Press on lettered end of bearing cage only.

Renew crankpin needle rollers as a set if any roller is scored, burned or has flat spots. Stick needle roller set to crankpin with heavy grease or beeswax. Using a 10-32 threaded rod or headless screw, position connecting rod cap so that mating boss on cap and connecting rod will align when pinned

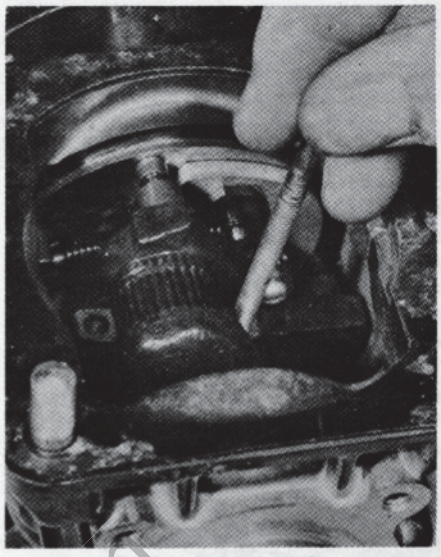


Fig. HL7–A 10-32 threaded rod or headless screw is used as tool to help in assembling connecting rod to cap. Stick the 31 loose needle rollers to crankpin with beeswax or heavy grease, then carefully position cap so that when assembled, pinned side of piston is towards intake side (upper side) of engine.

side of piston is on the intake (upper) side of engine; refer to Fig. HL7. Slide connecting rod down over threaded rod or screw, then install socket head screw in opposite side of rod and cap and remove the installation tool. Install remaining socket head screw and tighten both screws to a torque of 32 inch-pounds.

PISTON, PIN AND RINGS. Piston assembly is accessible after removing cylinder assembly from crankcase. Always support piston when removing or installing piston pin. Piston is of aluminum alloy and is fitted with three pinned piston rings.

If piston ring locating pin is worn to half the original thickness, or if there is any visible up and down play of piston pin in piston bosses, renew piston and pin assembly. Inspect piston for cracks or holes in dome and renew if any such defect is noted. Slight scoring of piston is permissible, but if rough surfaces are accompanied by deposit of aluminum on cylinder wall, renew piston.

Always use new piston pin retaining snap rings when reassembling piston to connecting rod. Fit new piston rings in grooves, aligning ring end gaps with locating pin. Be sure locating pin side of piston is away from exhaust side of engine when installing piston and connecting rod assembly.

CYLINDER. Cylinder bore is chrome plated; the plating is light gray in color and does not have the appearance of polished chrome. Renew cylinder if any part of chrome plated bore is worn through; usually, the worn

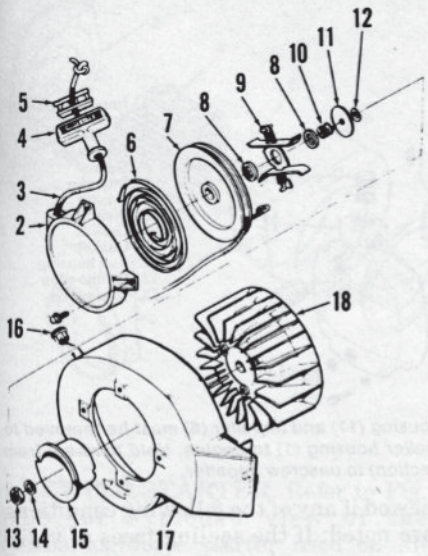


Fig. HL8–Exploded view of Fairbanks-Morse rewind starter. Starter cup (15) has rope notches so that engine can be started with starter assembly removed. Early type fan housing (17) is shown; later fan housing and magneto back plate (37–Fig. HL5) are integral.

2. Cover & bushing assy.
3. Starting cord
4. Starting cord grip
5. Insert
6. Rewind spring
7. Starter pulley
8. Fiber washer
9. Friction shoe assembly
10. Brake spring
11. Brake retaining washer
12. Snap ("E") ring
13. Flywheel nut
14. Lock washer
15. Starter cup
16. Engine stop switch
17. Blower housing
18. Flywheel (magneto rotor)

area is bright as the aluminum is exposed. In some instances, particles from the aluminum piston may be deposited on top of chrome plating. This condition is usually indicated by rough, flaky appearance and deposits can be removed by using a rubber compound buffing wheel on a ¼-inch electric drill. If a screwdriver can be run over the cleaned surface without leaving marks, the cylinder is suitable for further service. If screwdriver scratches surface, renew cylinder.

Lubricate piston, rings and cylinder bore. Compress rings, then slide cylinder down over piston. Tighten cylinder retaining nuts evenly and securely.

CRANKSHAFT, BEARINGS AND SEALS. To remove crankshaft, engine must first be removed from blower, pump or generator. Refer to exploded view of appropriate unit in Fig. HL9, HL10, HL11, HL12 or HL13 for required disassembly. Then refer to Figs. HL5 and HL6 and proceed as follows:

Remove flywheel, magneto assembly and magneto back plate. Remove and discard felt seals (35A & 38—Fig. HL5) from backplate (37). Remove "O" ring oil slinger (not shown) from crankshaft. Remove cylinder, piston and connecting rod assembly, then separate crankcase halves (41 & 73—Fig. HL6).

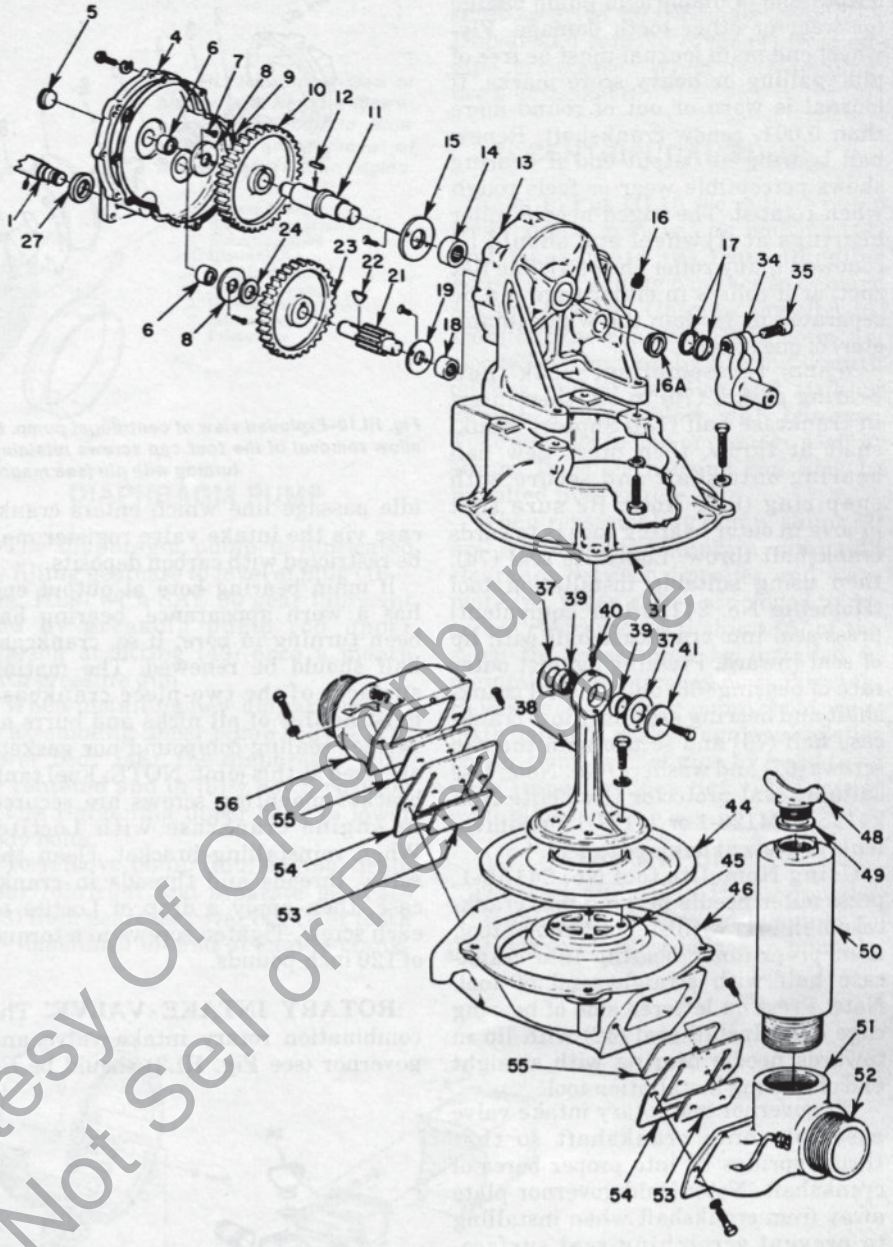


Fig. HL9–Exploded view of diaphragm pump assembly. Gear teeth on engine crankshaft (1) engage intermediate gear (23). Gearcase cover (4) must be removed from pump so that engine can be separated from cover. When installing diaphragm (44), push rod (38) all the way down before installing upper body (31) to lower body (46) bolts.

1. Engine crankshaft
4. Gearcase cover
5. Bearing cap
6. Needle bearing
8. Thrust washer
9. Gasket
10. Pump gear
11. Shaft & key assy.
12. Key
13. Gearcase assembly
14. Needle bearing
15. Thrust washer
16. Oil filter plug
16A. Bearing cap
17. Garlock seals
18. Needle bearing
19. Thrust washer
21. Intermediate shaft
22. Woodruff key
23. Intermediate gear
24. Spacer
34. Crank
35. Cap screw
37. Thrust washers
38. Pump rod assembly
39. Needle bearings
40. Grease fitting
41. Washer
44. Pump diaphragm
45. Diaphragm cap
46. Pump body
48. Wing plug
49. Gasket
50. Standpipe
51. Suction fitting
52. Pipe nipple
53. Valve weight
54. Valve
55. Valve plate
56. Discharge fitting

Pull governor weight away from crankshaft, then carefully remove the rotary intake valve and governor assembly (48) to avoid damaging sealing surface of crankshaft. Remove two screws (67) and washers (68) retaining ball bearing (66) in crankcase half (73) and remove shaft and bearing. Tape shaft to prevent scratching sealing surface, then remove snap ring (69) and pull bearing (66) from crankshaft. Remove intake valve plate (46) from crankcase half (41), pry seal (42) out of bore and press needle roller bearing cages (43) out of crankcase half. Remove seal (74) from opposite half. Note: Remove bearings from crankshaft and flywheel side crankcase half only if renewal is indicated.

Renew crankshaft if it has damaged threads, enlarged keyways, or if run out exceeds 0.003. Inspect drive gear on

output end of diaphragm pump engine for wear or other tooth damage. Flywheel end main journal must be free of pits, galling or heavy score marks. If journal is worn or out of round more than 0.001, renew crankshaft. Renew ball bearing at output end if bearing shows perceptible wear or feels rough when rotated. The caged needle roller bearings at flywheel end should be renewed if any roller shows visible flat spot, or if rollers in either cage can be separated more than the width (diameter) of one roller.

When reassembling, soak new bearing gasket (70) in oil, then insert in crankcase half (73). Support crankshaft at throw, then press new ball bearing onto shaft and secure with snap ring (69). Note: Be sure that groove in outer bearing race is towards crankshaft throw. Lubricate seal (74), then using suitable installation tool (Homelite No. 24120-1 or equivalent) press seal into crankcase half with lip of seal inward. Pressing against outer race of bearing (66) only, install crankshaft and bearing assembly into crankcase half (73) and secure with the two screws (67) and washers (68). Note: Use suitable seal protector (Homelite Nos. 24125-1, 24126-1 or 24127-1, or equivalent) to prevent damage to seal.

Using Homelite tool No. 24155-1, press outer needle bearing into crankcase half (41) with stepped end of tool, then press inner bearing into crankcase half with straight end of tool. Note: Press on lettered side of bearing cage only. Install seal (42) with lip in towards needle bearing with straight end of bearing installation tool.

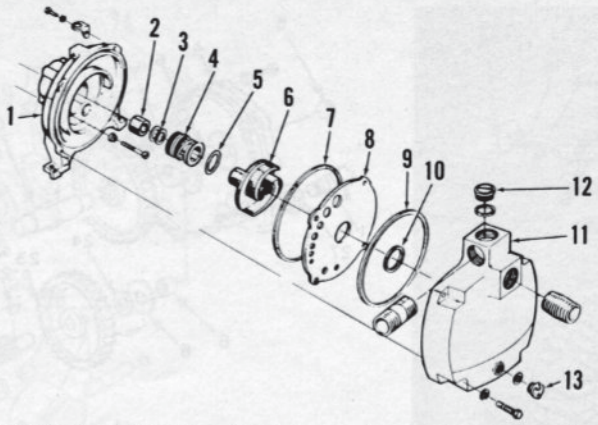
Fit governor and rotary intake valve assembly onto crankshaft so that thrust springs fit into proper bores of crankshaft. Note: Hold governor plate away from crankshaft when installing to prevent scratching seal surface. Lubricate all parts thoroughly and insert intake valve plate (46) in crankcase half (41) so that it is properly positioned on dowel pins and intake opening. Using seal protector (Homelite No. 24121-1 or equivalent), assemble the crankcase half over crankshaft and governor assembly, hold assembly together against thrust spring pressure and install crankcase cap screws. Tighten cap screws to a torque of 80 inch-pounds. Insert new felt seal (38—Fig. HL5) in bore of magneto back plate, place new "O" ring oil slinger on crankshaft and install back plate. Tighten backplate retaining cap screws to a torque of 80 inch-pounds. Complete reassembly by reversing disassembly procedure.

CRANKCASE. Be sure that all passages through crankcase are clean. The idle passage line which enters crankcase via the intake valve register may be restricted with carbon deposits.

If main bearing bore at output end has a worn appearance, bearing has been turning in bore. If so, crankcase half should be renewed. The mating surfaces of the two-piece crankcase must be free of all nicks and burrs as neither sealing compound nor gaskets are used at this joint. NOTE: Fuel tank bracket mounting screws are secured in engine crankcase with Loctite. When reinstalling bracket, clean the screw threads and threads in crankcase, then apply a drop of Loctite to each screw. Tighten screws to a torque of 120 inch-pounds.

ROTARY INTAKE VALVE. The combination rotary intake valve and governor (see Fig. HL3) should be renewed if any of the following conditions are noted: If the sealing faces of valve or governor plate are worn or scored enough to produce a ridge; if spring post is loose or extended to valve seating surface; or, if governor pivot point has started to wear through the surface of valve. Maximum allowable clearance between governor plate and intake valve plate is 0.006. The governor spring and/or governor spring adjusting screw may be renewed separately from the assembly.

Slight scoring of valve face may be corrected by lapping on a lapping plate using a very fine abrasive. Lapping motion should be in the pattern of a figure eight to obtain best results. Slight scoring of the Formica wear plate is permissible. Homelite recommends soaking a new Formica plate in oil for 24 hours prior to installation.



1. Impeller housing
2. Spacer
3. Shims
4. Seal assy.
5. Shim
6. Impeller
7. Gasket
8. Wear plate
9. Gasket
10. Gasket
11. End housing
12. Primer plug
13. Drain plug

Fig. HL10–Exploded view of centrifugal pump. End housing (11) and impeller (6) must be removed to allow removal of the four cap screws retaining impeller housing (1) to engine. Hold flywheel from turning with pin (see magneto section) to unscrew impeller.

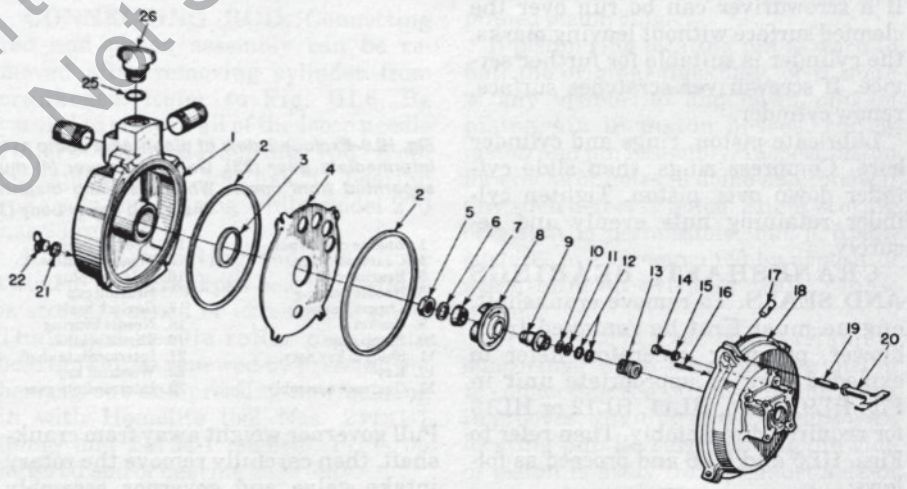


Fig. HL11–Exploded view of trash pump. End housing and impeller must be removed from impeller housing to allow housing to be unbolted from engine. Model 270 uses a spacer in place of washers (12).

1. End housing
2. Gasket
3. Gasket
4. Wear plate
5. Impeller nut
6. Washer
7. Tapered bushing
8. Impeller
9. Impeller hub
10. Shim (0.010, as required)
11. Shim (0.015, as required)
12. Spacer washers
13. Seal assembly
14. Screws
15. Sealing washers
16. Spiral pin
17. Pivot pin
18. Impeller housing
19. Studs
20. Wing nuts

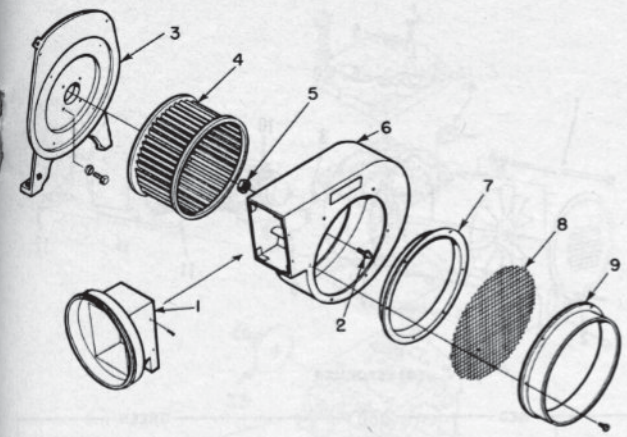


Fig. HL12–Exploded view of blower unit. Remove blower housing and rotor to allow unbolting and removal of blower plate (1) from engine.

1. Blower outlet
2. Slotted head screws
3. Mounting plate
4. Blower rotor
5. Elastic stop nut
6. Blower housing
7. Blower inlet venturi
8. Inlet screen
9. Inlet collar

REWIND STARTER. Refer to Fig. HL8 for exploded view of the Fairbanks-Morse starter used on all applications. In an emergency in case of rewind starter failure, remove starter assembly and wind rope around starter cup (15) to start engine.

Refer to exploded view for proper reassembly of starter unit. Hook end of starter rope in notch of pulley and turn pulley five turns counterclockwise, then let spring wind rope into pulley for proper spring pre-tension.

To remove starter cup, insert lock pin through hole in magneto back plate and hole in flywheel to hold flywheel from turning, then unscrew retaining nut.

DIAPHRAGM PUMP

The diaphragm pump is lubricated by filling gearcase to level of plug (16—Fig. HL9) with SAE 90 gear lubricant and by greasing pump rod upper bearing at fitting (40) once a month with pressure gun.

When installing new diaphragm (44) or assembling upper pump body (31) to lower body (46), the diaphragm must be centered and in fully down position before tightening upper body to lower body bolts.

To remove pump from engine, drain gear lubricant and separate gearcase (13) from gearcase cover (4). Gear teeth are machined on end of engine crankshaft to drive intermediate gear (23). Unbolt and remove cover (4) from engine crankcase. When reassembling, use new gasket (9).

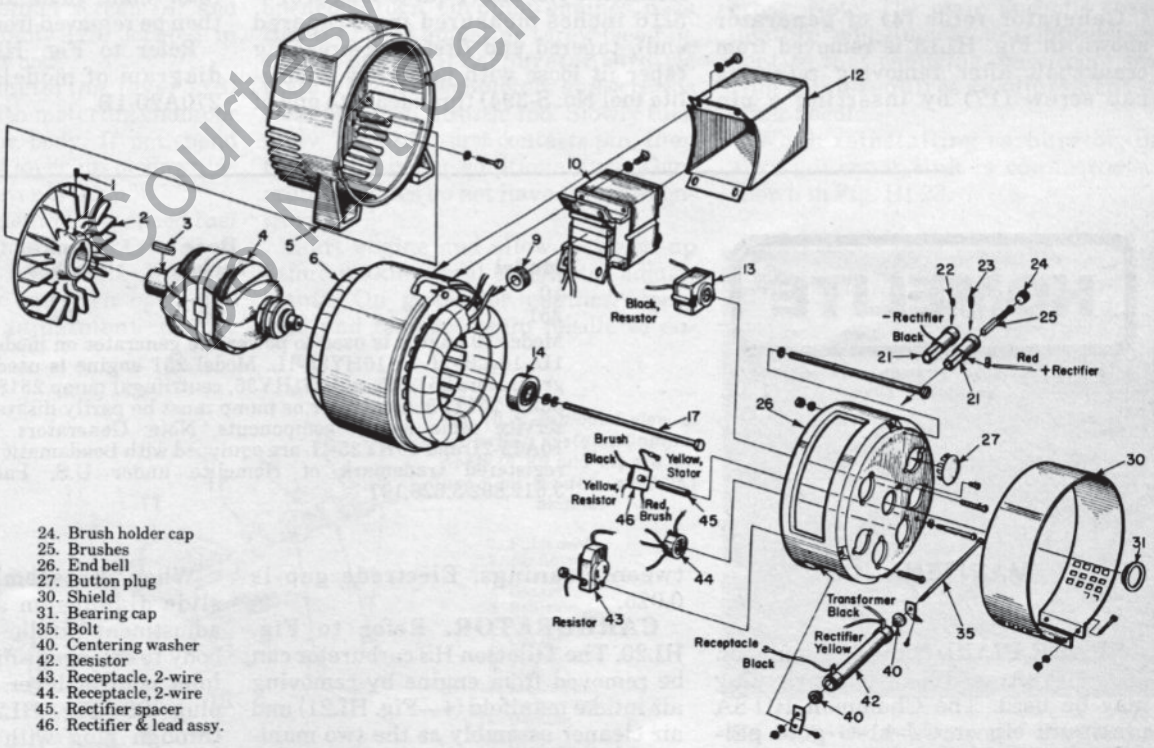
CENTRIFUGAL PUMP

Refer to Fig. HL10. To remove pump from engine, remove end housing (11) and wear plate (8) from impeller housing (1), taking care not to damage sealing gaskets. Unscrew impeller (6) from engine crankshaft in counterclockwise direction by placing wrench on hex end of impeller and striking wrench a sharp blow with hammer. Take care not to lose or damage seals or shims. Impeller housing can now be unbolted from engine.

When reassembling pump, shims (3) are available to maintain minimum clearance between impeller and wear plate (8). When shims are added to decrease clearance, seal shims (5) of the same thickness must be installed to maintain proper tension on seal spring. Before reassembling pump, hold wear plate (without gasket) against impeller housing and turn engine by hand to be sure impeller does not rub against wear plate.

TRASH PUMP

The trash pump (Fig. HL11) impeller (8) is mounted on tapered bushings so that if a solid object lodges in pump to



1. Set screw
2. Fan
3. Key
4. Generator rotor
5. End bell
6. Generator stator
9. Grommet
10. Transformer
12. Transformer box
13. Receptacle, 3-wire
14. Ball bearing
21. Brush holder
22. Set screw
23. Set screw
24. Brush holder cap
25. Brushes
26. End bell
27. Button plug
30. Shield
31. Bearing cap
35. Bolt
40. Centering washer
42. Resistor
43. Receptacle, 2-wire
44. Receptacle, 2-wire
45. Rectifier spacer
46. Rectifier & lead assy.

Fig. HL13–Exploded view of generator unit. Through bolt (17) retains generator rotor (4) on tapered end of engine crankshaft. After removing rotor and fan (2) assembly from engine crankshaft, fan housing end bell (5) can be unbolted from engine crankcase.

block the impeller, shaft rotation will not halt immediately.

To remove pump from engine, remove end housing (1) and wear plate (4), then unscrew impeller retaining nut (5) and remove impeller (8), taking care not to damage or lose seal and shims (10, 11 & 12). Unbolt and remove impeller housing (18) from engine.

When reassembling pump, use shims (10 & 11) of total thickness as required to maintain minimum clearance between impeller and wear plate. Shims are placed between shoulder on crankshaft and impeller hub (9). Install seal shims of same total thickness along with spacer washers (12) to maintain seal spring tension. Model 270 is equipped with a spacer in place of washers (12).

GENERATOR

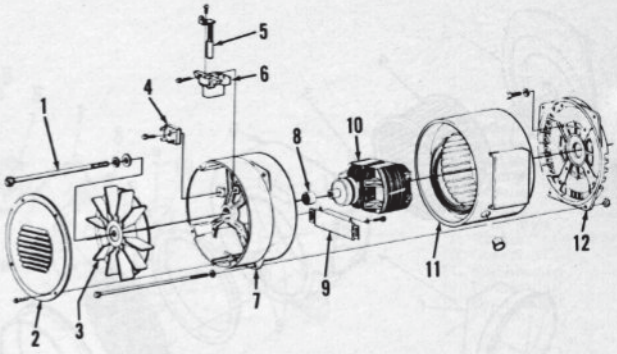
Two generators have been used as shown in exploded views in Figs. HL13 and HL14. Care should be taken in disassembly of the generator that any leads disconnected are identified so they may be reconnected properly. Also, if brushes are to be reinstalled, they should be identified so they can be installed in same location and position from which they were removed. Carefull disassembly is necessary to avoid damage to wiring or insulation.

Generator rotor (4) of generator shown in Fig. HL13 is removed from crankshaft after removing retaining cap screw (17) by inserting a pin (Homelite No. 22271 cut to length of 4-5/16 inches measured from tapered end), tapered end first, and breaking taper fit loose with jackscrew (Homelite tool No. S-394) threaded into end of rotor shaft. Generator end bell (5) can then be removed from engine.

Refer to Fig. HL15 for schematic diagram of models 270A20-1A and 270A20-1B.

Fig. HL14–Exploded view of generator used on models 270A20-1A, 270A20-1B and 270A20-1C.

1. Screw
2. Cover
3. Fan
4. Rectifier
5. Brush
6. Brush holder
7. Brush head
8. Roller bearing
9. Resistor
10. Rotor
11. Stator & housing
12. End bell



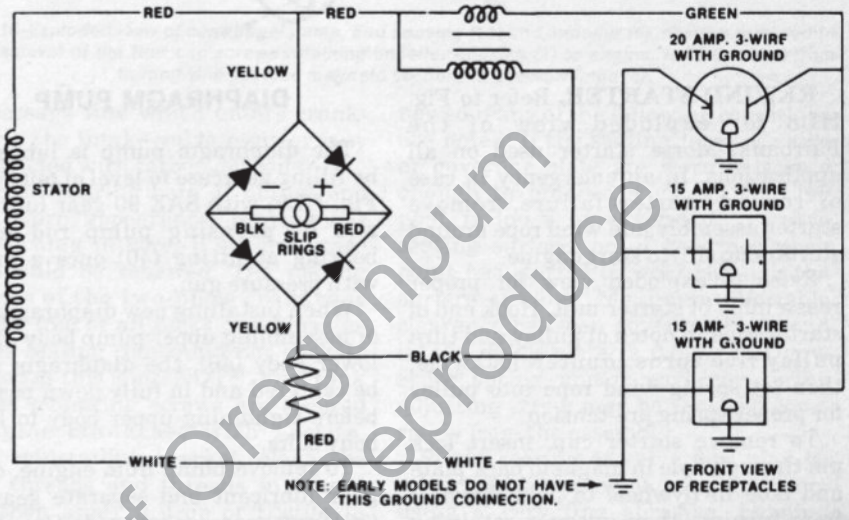


Fig. HL15–Schematic of generator models 270A20-1A, 270A20-1B and 270A20-1C.

HOMELITE®
A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore Inches	Stroke Inches	Displ. Cu. In.
10	2¾	3⅛	12.62
251	2¾	3⅛	12.62

Model 10 engine is used to power the generator on models 10A35-1L, 10A35-2L or 10HY35-1L. Model 251 engine is used to power generators 251A35 and 251HY35, centrifugal pump 251S3 or trash pump 251TP3. Generator or pump must be partly disassembled to service some engine components. Note: Generators 10A35-1L, 10A35-2L and 10HY35-1L are equipped with Loadamatic which is a registered trademark of Homelite under U.S. Patent Nos. 3,612,892/3,626,197.

MAINTENANCE

SPARK PLUG. Either a Champion J6J, HO-8A or UJ-11-G spark plug may be used. The Champion HO-8A platinum tip or UJ-11-G gold palladium tip plug will provide longer service as well as longer intervals between cleanings. Electrode gap is 0.025.

CARBURETOR. Refer to Fig. HL20. The Tillotson HS carburetor can be removed from engine by removing air intake manifold (4—Fig. HL21) and air cleaner assembly as the two manifold bolts also retain carburetor and reed valve assemblies.

When disassembling carburetor, slide diaphragm assembly towards adjustment needle side of carburetor body to disengage diaphragm from fuel inlet control lever. To remove welch plug (29—Fig. HL20), carefully drill through plug with a small diameter drill and pry plug out with a pin. Caution should be taken that drill bit just

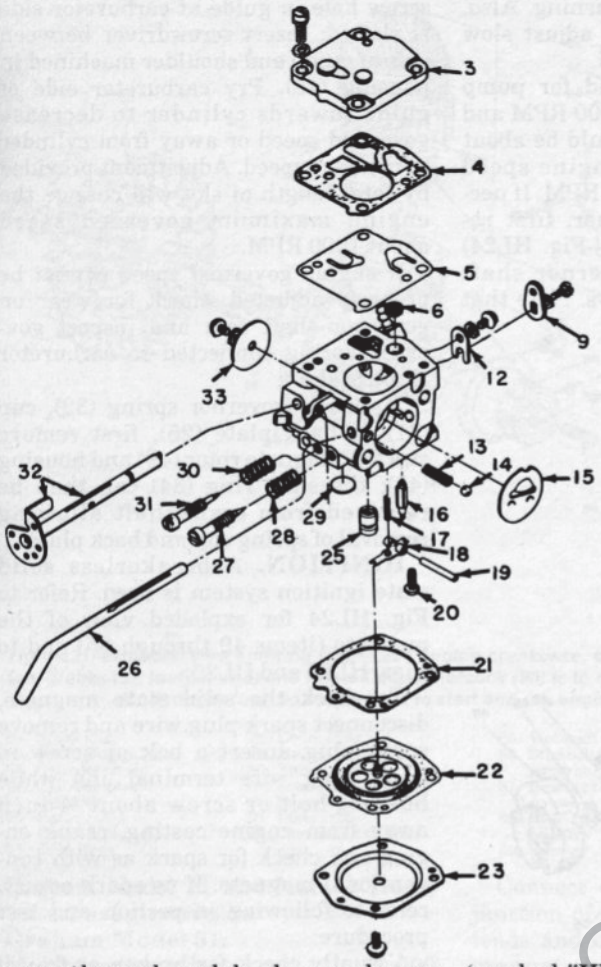


Fig. HL20–Exploded view of Tillotson Series HS carburetor used on model 251 engine. Note that carburetor is shown inverted from actual position on engine.

3. Fuel pump cover
4. Fuel pump gasket
5. Fuel pump diaphragm
6. Inlet channel screen
9. Governor spring arm
12. Throttle shaft clip
13. Choke detent spring
14. Choke dentent ball
15. Choke shutter
16. Inlet needle valve
17. Inlet lever spring
18. Inlet control lever
19. Lever pinion pin
20. Pinion pin retaining screw
21. Diaphragm gasket
22. Metering diaphragm
23. Diaphragm cover
25. Nozzle check valve
26. Choke shaft
27. Main adjusting needle
28. Main needle spring
29. Welch plug
30. Idle fuel needle spring
31. Idle adjusting needle
32. Throttle shaft
33. Throttle shutter

goes through welch plug as deeper drilling may seriously damage carburetor. Note channel screen (6) and check valve assembly (25) located in bores of carburetor body.

Inlet control metering lever (18) should be flush with metering chamber floor of carburetor body. If not, bend diaphragm end of lever up or down as required so that lever is flush.

Normal adjustment of low speed fuel mixture needle (marked "LO" on air inlet manifold or needle nearest throttle shaft) is one turn open and main mixture adjustment needle (marked "HI" on air inlet manifold or needle nearest choke shaft) should be opened ¾-turn. On pump engines, back the idle speed adjusting screw (see Fig. HL22) out until carburetor throttle plate will close completely and screw is clear of pin on throttle rod. Slowly turn screw in until it just contacts pin, then turn screw in one additional turn. Generator engines do not have throttle control rod.

Start engine and allow to warm up before making final carburetor adjustments. On generator engines, apply load and readjust main needle so engine runs best, then remove load and adjust idle needle for smoothest operation. Refer to GENERATOR section for idle adjustment on models with Loadamatic. On pump engines, pump water with throttle control rod pushed all the way in and readjust main mixture needle so engine runs best. Then, lift suction hose out of water, pull throttle rod out and adjust low idle speed for smoothest running. If necessary, readjust idle speed screw to obtain a slow idle speed of 1800-2500 RPM. CAUTION: Do not adjust low idle speed higher than 2500 RPM; higher idle speed will result in damage to governor. Note: The main and idle speed mixture adjustments are interdependent so that changing one needle setting often requires readjustment of other needle.

When reinstalling carburetor, be sure governor link is connected as shown in Fig. HL23.

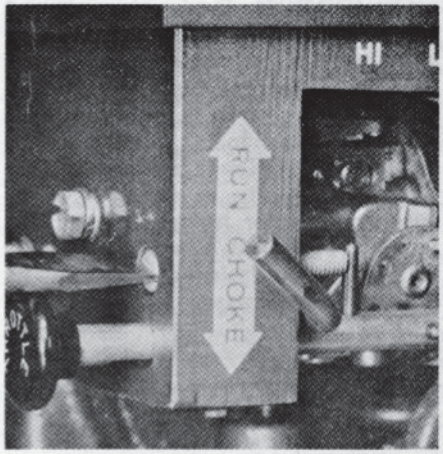


Fig. HL22–Adjusting idle speed screw. Throttle rod friction screw is just visible at under side of air intake manifold. Idle speed must not be adjusted to above 2500 RPM.

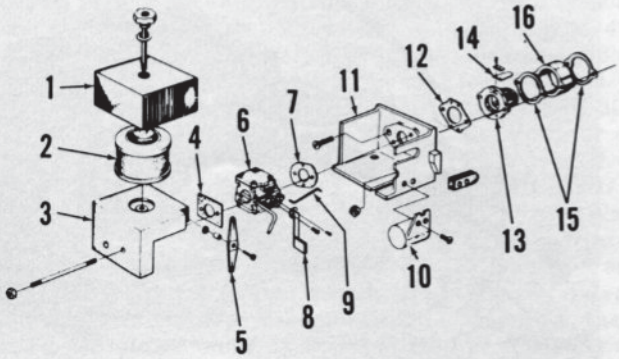


Fig. HL21–Exploded view of induction system. Components (8, 10 and 11) are not used on models with 251 engine.

1. Filter cover
2. Air filter
3. Intake manifold
4. Gasket
5. Bellcrank
6. Carburetor
7. Gasket
8. Throttle arm
9. Link
10. Loadamatic® electromagnet
11. Housing
12. Gasket
13. Reed valve seat
14. Reed valve
15. Gasket
16. Spacer

Fig. HL23–View showing proper installation of governor bellcrank and links. Generator engine not equipped with throttle (idle control) rod is shown.

GOVERNOR. Engine is equipped with a flyweight type governor mounted on engine crankshaft; refer to Fig. HL24 for exploded view showing governor unit. External governor linkage is shown in Fig. HL23.

CAUTION: Never move governor linkage manually, or exert any pressure on lever or linkage to increase engine speed. Working governor linkage manually, even momentarily, may cause damage to governor cup and cam due to friction and burning. Also, on pump engines, do not adjust slow idle speed above 2500 RPM.

Maximum no-load speed for pump engines should be 3800-3900 RPM and for generator engines, should be about 3750 RPM; generator engine speed under load should be 3600 RPM. If necessary to readjust governor, first remove the cover plate (43—Fig. HL24) and slightly loosen governor shaft guide (36) retaining screws. Note that screw hole in guide at carburetor side is slotted; insert screwdriver between side of guide and shoulder machined in housing (45). Pry carburetor side of guide towards cylinder to decrease governed speed or away from cylinder to increase speed. Adjustment provided by total length of slot will change the engine maximum governed speed about 1000 RPM.

If engine governed speed cannot be properly adjusted, check for wear on governor shaft cam and inspect governor spring connected to carburetor throttle shaft.

To renew governor spring (32), cup (31) or back plate (25), first remove starter, magneto rotor (49) and housing (45); the snap ring (34) can then be removed from crankshaft allowing removal of spring cup and back plate.

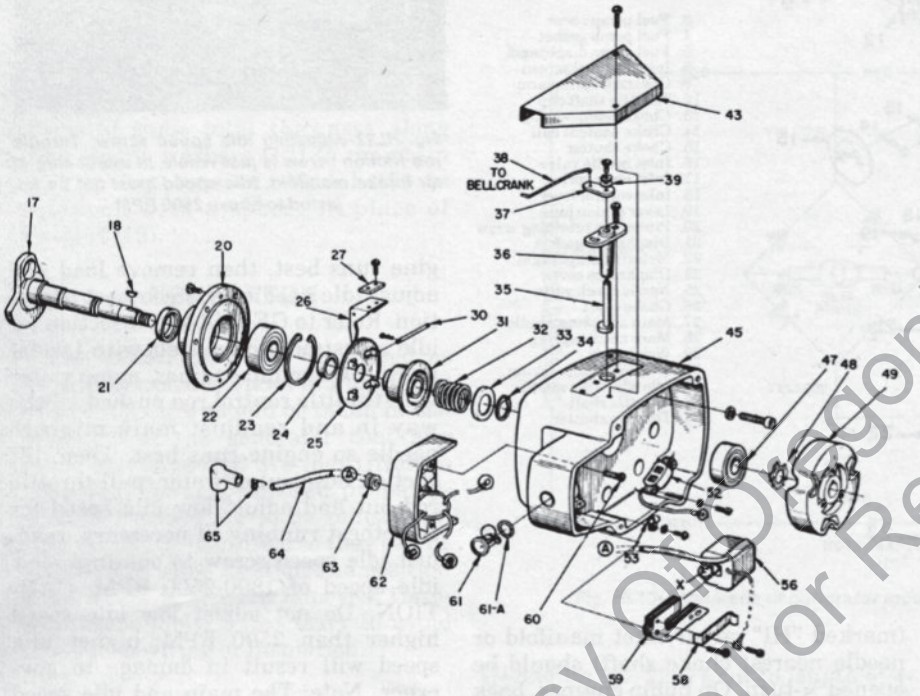


Fig. HL24–Exploded view showing magneto end of crankshaft (17), governor and magneto assemblies. The housing (45) retaining socket head screws can be removed by working through notches in outside of magneto rotor (49) allowing all parts to be removed as a unit after removing governor linkage and disconnecting spark plug wire.

17. Crankshaft, magneto end
18. Woodruff key
20. Bearing housing
21. Crankshaft seal
22. Bearing
23. Snap ring
24. Spacer
25. Governor back plate
26. Governor weight arm
27. Governor weight
30. Weight pivot pin
31. Governor cup
32. Governor spring
33. Spring retainer
34. Snap ring
35. Governor camshaft
36. Camshaft guide
37. Governor arm
38. Bellcrank link
39. Flat washer
43. Governor linkage cover
45. Magneto housing
47. Bearing
48. Loading spring
49. Magneto rotor
52. Magneto trigger coil
53. Lead clamp
56. Ignition coil
58. Coil spring clip
59. Armature core
60. Cover retaining screw
61. Stop switch
61A. "O" ring
62. Magneto cover assembly (includes condenser and solid state switchbox)
63. Grommet
64. Spark plug wire
65. Spark plug terminal

IGNITION. A breakerless solid state ignition system is used. Refer to Fig. HL24 for exploded view of the magneto (items 49 through 65) and to Figs. HL25 and HL26.

To check the solid state magneto, disconnect spark plug wire and remove spark plug. Insert a bolt or screw in spark plug wire terminal and while holding bolt or screw about ¼-inch away from engine casting, crank engine and check for spark as with conventional magneto. If no spark occurs, refer to following inspection and test procedure:

Visually check for broken or frayed wires which would result in open circuit or short. Be sure stop switch is not permanently grounded. Inspect magneto rotor (49—Fig. HL24), trigger coil (52) and the switch box, condenser and magneto cover assembly (62) for visible damage.

To test magneto components, remove starter assembly, magneto cover and disconnect leads as shown in Fig. HL26, then proceed as follows:

To test ignition coil, refer to test instrument instructions; readings for

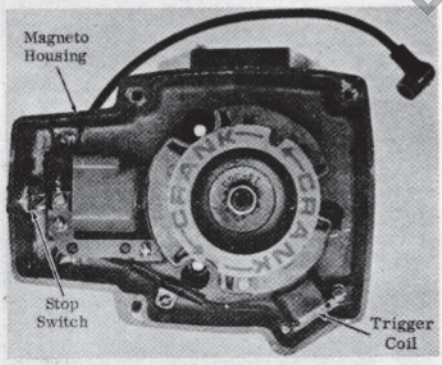
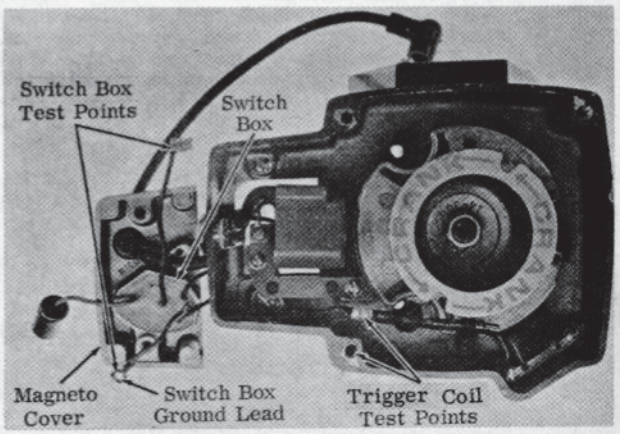


Fig. HL25–View of magneto assembly with rewind starter assembly removed. Armature to magneto rotor air gap and trigger coil to rotor air gap should be adjusted using a 0.0075 thick plastic shim.

Fig. HL26–View showing magneto leads disconnected for testing purposes. Condenser must not touch any other part of the unit. Refer to text for procedure and specifications.



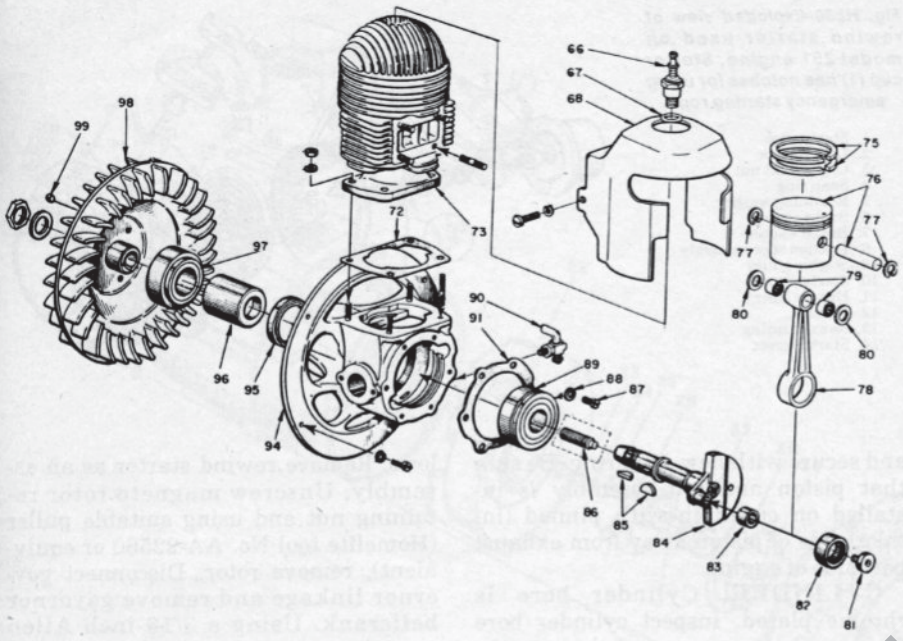


Fig. HL27–Exploded view showing model 251 engine crankcase, cylinder, rod and piston assembly, fan, crankshaft (output end) and related parts. Petcock (90) is to drain crankcase should it become flooded with fuel; do not attempt to start and run engine with petcock open.

66. Spark plug
67. Spark plug gasket
68. Cylinder shield
72. Cylinder gasket
73. Cylinder
75. Piston rings
76. Piston & pin assy
77. Snap rings
78. Connecting rod
79. Needle bearings
80. Thrust washers
81. Crankpin screw
82. Roller bearing
83. Inner race
84. Crankshaft (output end)
85. Woodruff keys
86. Stud bolts (251S3 pump only)
87. Bearing retaining screws
88. Bearing retaining washers
89. Bearing
90. Petcock
91. Crankcase gasket
94. Crankcase
95. Oil seal
96. Spacer
97. Bearing
98. Fan
99. Cork plug

Graham Model 51 and Merc-O-Tronic testers are given below:

Graham Model 51:

Maximum secondary	10,000
Maximum primary	1.7
Coil index	65
Maximum coil test	20
Maximum gap index	65

Merc-O-Tronic

Operating amperage	1.3
Minimum primary resistance	0.6
Maximum primary resistance	0.7
Minimum secondary continuity	50
Maximum secondary continuity	60

If ignition coil does not meet test specifications, renew using correct part number coil. Do not substitute a coil of other specifications with the solid state ignition system. If coil tested ok, check switch box as follows:

With leads and condenser disconnected as shown in Fig. HL26, connect one ohmmeter lead to one switch box test point (flag terminal or ground lead) and other ohmmeter lead to remaining switch box test point. The ohmmeter reading should be either between 5 to 25 ohms or from one megohm to infinity. When ohmmeter test leads are reversed, the opposite reading should be observed. If these ohmmeter readings are not observed, renew magneto cover and switch box assembly. If ignition coil and switch box both test ok, check trigger coil as follows:

Connect ohmmeter positive lead to junction of switch box and trigger coil leads and ohmmeter negative lead to magneto housing (see "Trigger Coil Test Points" in Fig. HL26). It is not necessary to disconnect trigger coil lead from switch box lead. The ohmmeter reading should be 22 to 24 ohms.

To check condenser, stick a pin through the condenser lead to provide a contact point, then test condenser using standard procedure to check series resistance, short and capacitance. Condenser capacitance should be 0.16-0.20 mfd.

If either the switch box or condenser tested faulty, renew the complete condenser, switch box and magneto cover assembly.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline. If Homelite® Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used.

AIR AND FUEL FILTERS. The air cleaner element may be washed in a detergent and water solution or by sloshing it around in a container of non-oily solvent. After a number of cleanings, the filter pores may become permanently clogged, making it necessary to renew element.

The fuel filter is a part of the fuel pick-up inside fuel tank and can be fished from tank filler opening using a wire hook. Under normal operations, the filter element should be changed at intervals of from one to two months. If engine is run continuously or fuel is dirty, filter may need to be changed weekly or at shorter intervals.

CARBON. The carbon should be cleaned from exhaust ports at 100 to 200 hour intervals. Remove muffler, crank piston to top dead center and use a wooden or plastic scraper to remove carbon deposits. Avoid scratching piston or damaging edges of port.

REPAIRS

CONNECTING ROD. Connecting rod lower end is fitted with a roller bearing (82—Fig. HL27) which rides on a renewable inner race (83). To remove piston and connecting rod assembly from crankshaft (84) crankpin, first remove cylinder and the magneto housing and crankshaft rotor end assembly. Place a block of wood between crankshaft throw and crankcase to keep crankshaft from turning, then unscrew crankpin screw (81) (counterclockwise) with ⅜-inch Allen wrench. If renewal of inner race is indicated, remove race from crankpin. Usually, race will slide off of pin; however, it may be necessary to pry race from crankpin with screwdrivers.

To renew crankpin needle roller bearing in the connecting rod, press old bearing out using plug (Homelite tool No. 24120-1), supporting rod on sleeve (Homelite tool No. 24118-1). Install new bearing by supporting rod on sleeve (Homelite tool No. 24124-1) and pressing bearing in with same plug as used to remove old bearing. Shouldered face of sleeve (24124-1) will properly position bearing so that it protrudes equally from each side of rod.

To renew piston pin bearings, support rod on sleeve (Homelite tool No. 24124-1) and press bearings out with plug (24131-1). New bearings are installed separately from opposite ends of bore. Support rod on sleeve (24124-1) and using straight end of plug (24131-1) (end with recessed face), press new bearing in (press on lettered side of cage only) until shoulder of plug seats against rod. Turn rod over and press other new bearing into rod in same manner. When properly installed, recessed faces of piston pin thrust washers will clear protruding bearing races and will contact connecting rod.

When reinstalling connecting rod and bearing inner race, thoroughly lubricate all parts and tighten connecting rod cap screw to a torque of 50

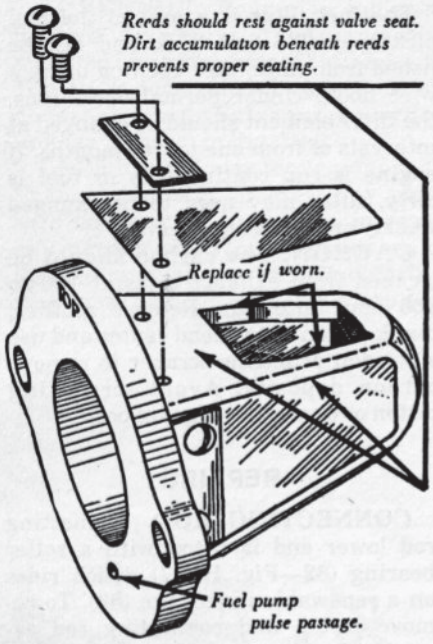
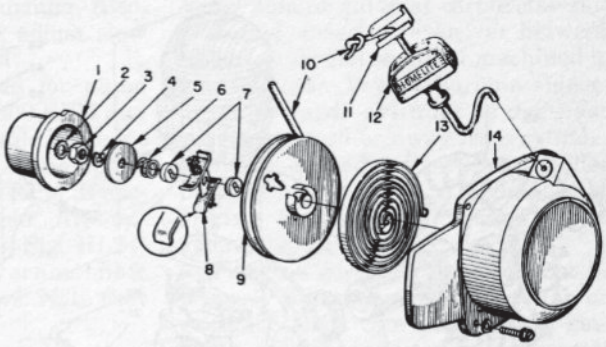


Fig. HL29–View showing reed valve assembly with one valve reed removed. Inspect seat and reeds as noted and be sure fuel pump pulse passage is open.

Fig. HL30–Exploded view of rewind starter used on model 251 engine. Starter cup (1) has notches for using emergency starting rope.

1. Starter cup
2. Lock washer
3. Crankshaft nut
4. Snap ring
5. Retaining washer
6. Brake spring
7. Brake washer
8. Friction shoe assembly
9. Starter pulley
10. Starter rope
11. Handle insert
12. Handle
13. Rewind spring
14. Starter cover



ft.-lbs. Note: Locate connecting rod on crankpin so that oil hole in upper end of rod will be towards intake side of engine. Piston should be assembled to connecting rod so that piston ring locating pin will be to same (intake) side of assembly as oil hole in rod.

PISTON, PIN AND RINGS. Piston is accessible after removing cylinder from crankcase. Always support piston while removing or installing piston pin. Piston should be renewed if ring side clearance, measured with new ring installed in top groove, exceeds 0.004. Also, renew piston if piston skirt to cylinder bore clearance exceeds 0.007 when measured with new or unworn cylinder. Inspect piston ring locating pin and renew piston if pin has worn to half of its original thickness. Piston pin should be a snug push-fit to light press-fit in piston. Piston, pin and rings are available in standard size only. Homelite recommends that piston rings be renewed whenever engine is disassembled for service.

When reassembling piston to connecting rod, insert new snap ring in exhaust side (opposite ring locating pin) side of piston. Lubricate all parts and place piston, exhaust side down, in holding fixture. (Note: A used cylinder sawed in half makes a good holding fixture.) Press pin into upper (intake) side of piston, then insert connecting rod and thrust washers into piston with oil hole in rod up and recessed sides of washers next to piston pin bearings in rod. press pin on through the assembly and secure with new snap ring. Be sure that piston and rod assembly is installed on crankpin with pinned (intake) side of piston away from exhaust port side of engine.

CYLINDER. Cylinder bore is chrome plated. Inspect cylinder bore for excessive wear and damage to chrome surface of bore. A new cylinder must be installed if chrome is scored, cracked or the base metal underneath exposed.

CRANKSHAFT, BEARINGS AND SEALS. The two-piece crankshaft can be serviced as two separate parts. Refer to following paragraphs for crankshaft service.

CRANKSHAFT, MAGNETO END. To service the shaft, bearings, seal or governor components, proceed as follows: Remove rewind starter as an assembly. Unscrew magneto rotor retaining nut and using suitable puller (Homelite tool No. AA-22560 or equivalent), remove rotor. Disconnect governor linkage and remove governor bellcrank. Using a 3/16-inch Allen wrench, remove the six socket head screws retaining magneto housing to crankcase and remove housing and shaft assembly. Remove the two screws retaining bearing housing (20—Fig. HL24) to magneto housing (45) and separate shaft and bearing assembly from housing (45). Bearing (47) can be renewed at this time. Remove snap ring (34), retainer (33) and governor spring (32) and pry governor back plate (25), with weights, from shaft (17). Remove spacer (24), support bearing

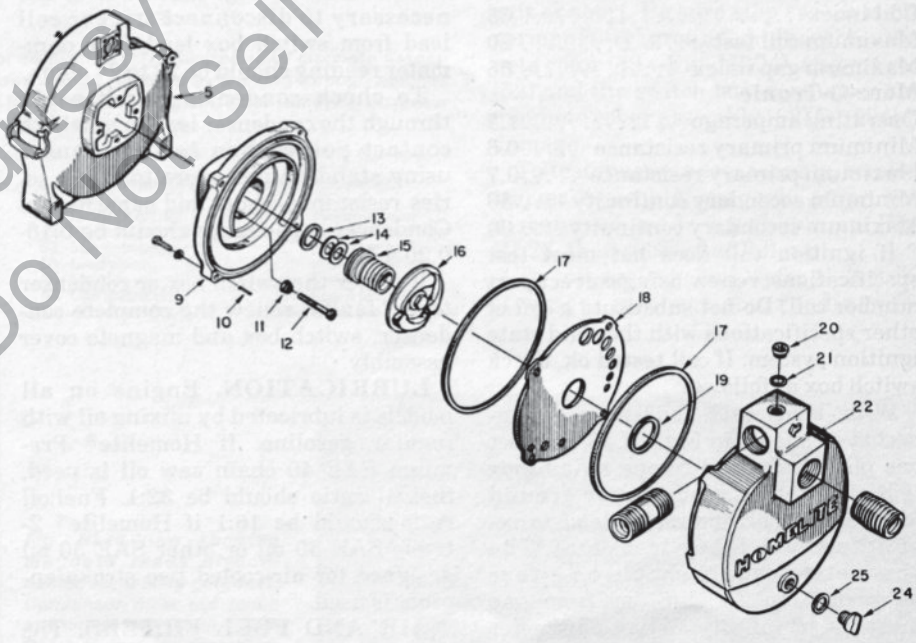


Fig. HL31–Exploded view of model 251S3 pump assembly. Impeller (16) threads onto stud (86–Fig. HL27) threaded into output end of crankshaft. Use shims (14) as required to maintain 0.020-0.030 clearance between impeller and wear plate (18).

5. Engine fan housing
9. Impeller housing
10. Spirol pin
11. Sealing washer
12. Cap screws (to fan housing)
13. Washer
14. Shims (1/32 & 0.010)
15. Seal assembly
16. Impeller
17. Gaskets
18. Wear plate
19. Gasket
20. Primer plug
21. Gasket
22. End housing
24. Drain plug
25. Gasket

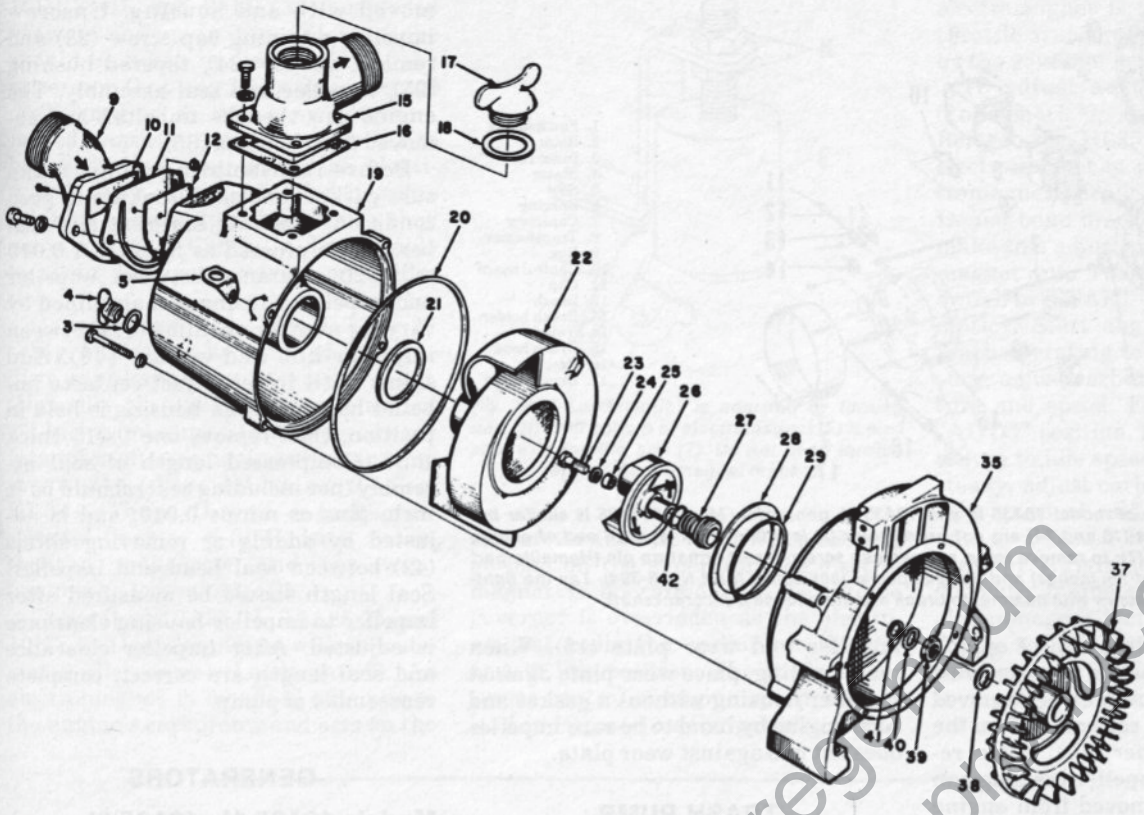


Fig. HL32–Exploded view of model 251TP3 pump assembly. Impeller screw (23) threads into end of engine crankshaft. Impeller is not solidly connected to engine crankshaft and can slip on tapered bushing (25) and end of crankshaft should a solid object become lodged between impeller and housing.

housing (20) and press shaft from housing. Remove crankshaft seal (21) and snap ring (23), then press bearing (22) from housing.

To assemble magneto end shaft and bearing assembly, proceed as follows: Install new seal (21) in housing with lip of seal towards crankcase side. Lubricate seal and insert shaft through seal and housing. Support flat inner end of shaft and press bearing (22) down over shaft and into housing until bearing inner race is seated against shoulder on shaft. Then, support housing and press bearing outer race into housing so that retaining snap ring (23) can be installed. Place spacer (24) on shaft, then drive or press governor back plate onto shaft against spacer. Install governor cup, spring, spring retainer and snap ring. Attach bearing housing to magneto housing with the two screws, then reinstall shaft, bearing housing and magneto housing to crankcase using new gasket.

CRANKSHAFT, OUTPUT END. First, remove magneto end crankshaft, bearing and magneto housing assembly as described in preceding paragraph. Remove cylinder and piston and connecting rod unit, then proceed as follows:

Remove the crankcase, output crankshaft end and blower rotor (fan) as an assembly from pump or generator; refer to exploded views of pump and generator units shown in this section. Remove fan retaining nut and washer and the two crankshaft bearing retaining screws (87—Fig. HL27) and washers (88). Support magneto (open) end of crankcase, then press crankshaft (84) from fan and crankcase. Remove the three corks (99), if so equipped, from fan, insert jackscrews into the tapped holes and push bearing (97) from fan inner hub. Remove screws and reinstall corks. Corks keep threads clean but are not necessary for operation. Support outer race of bearing (89) and press shaft out of bearing. Remove spacer (96) and crankshaft seal (95) from crankcase.

To reassemble, proceed as follows: Press new seal into crankcase with lip towards inside (away from fan). Support outer hub of fan, then press new bearing (97) onto fan inner hub. Press new inner bearing (89) into crankcase with retaining groove in outer race properly positioned. Support bearing inner race with sleeve, then press crankshaft into bearing. Install bearing retaining screws and washers. Place spacer (96) in position on crankshaft, then carefully press fan onto shaft making sure that keys and keyways are aligned. Install fan retaining washer and nut securely. Complete reassembly by installing connecting rod and piston, cylinder and magneto end assembly.

CRANKCASE. To renew crankcase, follow procedures as outlined in previous paragraph "CRANKSHAFT. OUTPUT END".

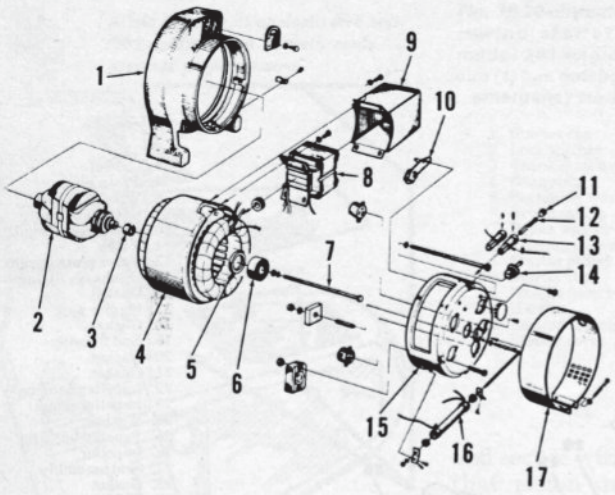
REED INTAKE VALVE. Engine is equipped with a pyramid reed valve assembly shown in Fig. HL21. The reed valve should be inspected whenever carburetor is removed. Refer to Fig. HL29 for inspection points. When installing new reeds on pyramid seat, thoroughly clean all threads and apply Loctite to threads on screws before installing. Be sure reeds are centered before tightening screws.

REWIND STARTER. Refer to Fig. HL30 for exploded view. In an emergency in case of rewind starter failure, engine can be started by removing starter and winding a rope around starter cup (1).

CENTRIFUGAL PUMP

Model 251S3

To remove pump from engine, remove end housing (22—Fig. HL31) taking care not to damage gaskets. Unscrew impeller clockwise by placing wrench on hex portion and striking wrench a sharp blow with hammer. Note: The impeller is mounted on a



1. Fan housing
2. Rotor
3. Inner race
4. Stator
5. Seal
6. Bearing
7. Capscrew
8. Transformer
9. Box
10. Control board
11. Cap
12. Brush
13. Brush holder
14. Switch
15. Brush head
16. Resistor
17. Brush shield

Fig. HL33–Exploded view of model 10A35-IL and 10A35-2L generator. Model 251A35 is similar but Loadamatic® components (10 and 14) are not used. Rotor (2) is retained on tapered end of engine crankshaft by cap screw (7); to remove rotor, remove cap screw, insert armature pin (Homelite part No. 22271 cut to length of 7¾ inches) and thread special jack screw (part No. S-394). Tap the tightened jack screw with hammer to break armature loose from crankshaft.

stud bolt threaded into end of engine crankshaft; the impeller may unscrew off of the stud or stud may be removed with impeller. Take care not to lose the shims (14) or washer (13). After removing impeller, impeller housing can be unbolted and removed from engine fan housing (5).

Before assembling pump, lubricate seal seat and seal head with oil and make sure gaskets are in good condition. Shims (14) are used as required to maintain minimum clearance between impeller and wear plate (18). When reassembling, place wear plate against impeller housing without a gasket and turn engine by hand to be sure impeller does not rub against wear plate.

TRASH PUMP

Model 251TP3

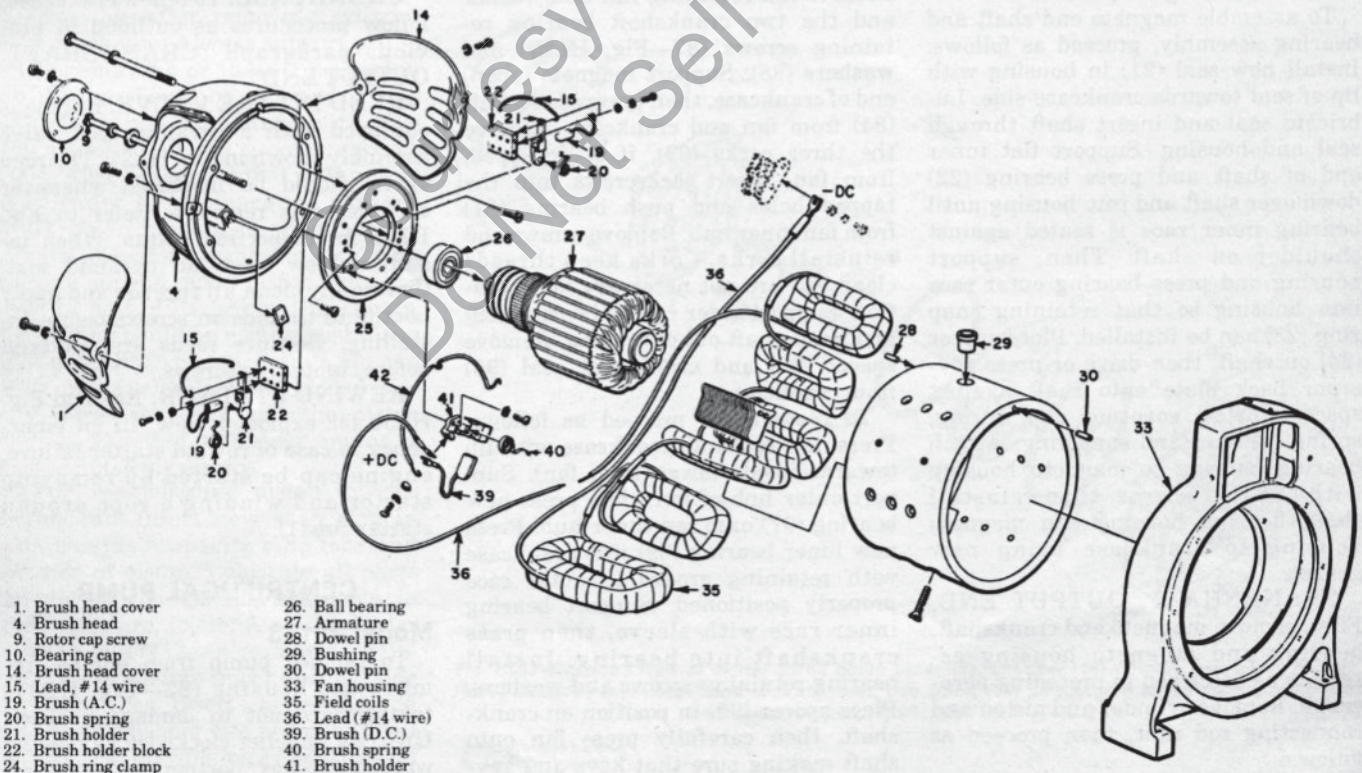
Refer to Fig. HL32. To remove pump, first remove end housing (19) from pump body and fan housing (35). Remove impeller housing (22) if not removed with end housing. Unscrew impeller retaining cap screw (23) and remove washer (24), tapered bushing (25), impeller and seal assembly. The engine can then be unbolted and removed from housing (35).

Before reassembling pump, make sure gaskets and shaft seal are in good condition, lubricate seal seat and seal head, then proceed as follows: A 0.010 to 0.020 clearance between impeller and impeller housing is maintained by varying number of shims (41) between impeller hub and washer (40). Add shims until impeller just contacts impeller housing when housing is held in position, then remove one 0.015 thick shim. Compressed length of seal assembly (not including seat) should be ⅞ inch, plus or minus 0.010, and is adjusted by adding or removing shims (42) between seal head and impeller. Seal length should be measured after impeller to impeller housing clearance is adjusted. After impeller clearance and seal length are correct, complete reassembly of pump.

GENERATORS

Models 10A35-1L, 10A35-2L, 10HY35-1L, 251A35 and 251HY35-1

Exploded view of model 10A35-1L, 10A35-2L and 251A35 generators is shown in Fig. HL33 and model



1. Brush head cover
4. Brush head
9. Rotor cap screw
10. Bearing cap
14. Brush head cover
15. Lead, #14 wire
19. Brush (A.C.)
20. Brush spring
21. Brush holder
22. Brush holder block
24. Brush ring clamp
25. Brush ring
26. Ball bearing
27. Armature
28. Dowel pin
29. Bushing
30. Dowel pin
33. Fan housing
35. Field coils
36. Lead (#14 wire)
39. Brush (D.C.)
40. Brush spring
41. Brush holder
42. Lead (#14 wire)

Fig. HL34–Exploded view of model 251HY35-1 generator assembly. Cap screw (9) retains generator rotor (27) to engine crankshaft.

10HY35-1L and 251HY35-1 exploded view is shown in Fig. HL34. Care should be taken in disassembly of the generator that any leads disconnected are identified so that they be reconnected properly. Also, if brushes are to be reinstalled, they should be identified so they can be installed in same location and position from which they were removed. Carefully disassemble to avoid damage to wiring or insulation.

Generator rotor (5—Fig. HL33 or 27—Fig. HL34) can be removed from engine crankshaft by inserting a pin (Homelite No. 22271 cut to a length of 7¾ inches measured from tapered end) into rotor after removing retaining cap screw (14—Fig. HL33 or 9—Fig. HL34). Then, thread a jackscrew (Homelite No. S-394) into rotor, tighten jackscrew and tap with hammer to loosen taper fit.

Generators 10A35-1L, 10A35-2L and 10HY35-1L are equipped with an automatic idle control (Loadamatic®). An electromagnet is mounted adjacent to the engine's carburetor and acts on the carburetor throttle arm. When there is no load on the generator, the electromagnet is energized and the engine governor is overridden as the electromagnet pulls the carburetor throttle arm to idle position. The governor resumes control of engine speed when a load is imposed on the generator. The electromagnet is deenergized and the throttle arm is released to be controlled by the governor.

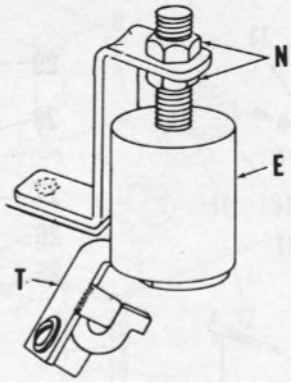


Fig. HL35–Loadamatic® is adjusted by turning nuts (N) until bottom of electromagnet (E) is parallel with throttle arm (T). Do not bend throttle arm or electromagnet bracket.

To adjust automatic idle control (Loadamatic®), proceed as follows: Refer to Fig. HL35 and adjust height of electromagnet to place bottom of electromagnet parallel with throttle arm. Do not bend bracket or throttle arm to make this adjustment. Tighten electromagnet nuts. Position generator toggle switch to "START" to disengage Loadamatic®. Start engine and allow it to reach operating temperature. If necessary, adjust carburetor for proper mixture and speed. Flip toggle switch to "AUTO" position. Engine speed should reduce to idle speed. If idle speed is not steady, adjust carburetor idle mixture. Idle speed should be 2400-2600 rpm and is adjusted by loosening electromagnet. Raising electromagnet will decrease engine speed while lowering electromagnet increases engine speed. Apply a light load to generator and then remove it. Engine speed should increase to governed speed and then return to idle after the load is removed.

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore Inches	Stroke Inches	Displ. Cu. In.
8	2¾	2⅛	12.62
9	2¾	2⅛	12.62
20	2⅜	1½	6.63
23	2¼	2⅛	8.45
24	2⅝	2⅛	11.50
35	2-7/16	1½	7.0
36	2¼	2⅛	8.45

This section covers Homelite 2-cycle engines used on various pumps and generators. The unit model number (such as pump model number 8S3-1 or generator model 9A115-1) also indicates engine model number (which would be model 8 and model 9 respectively). The pump or generator must be at least partially disassembled to perform certain engine service operations.

CAUTION: Centrifugal type pumps should not be operated without water in pump. Water is necessary for lubrication of the pump seal while engine is running. Cap suction side of pump and fill pump with water before starting engine when pump is assembled.

MAINTENANCE

SPARK PLUG. Recommended spark plug for all except 36S2 and 8S3-1 pumps is Champion HO-8A or UJ-11-G. Models 36S2 and 8S3-1 require a Champion UJ-22 spark plug. Model J6 or J6J Champion plugs can be substituted for HO-8A or UJ-11-G; but will be more susceptible to fouling and electrode erosion. Electrode gap for all models should be 0.025.

CARBURETORS. Tillotson Series MD and MT float type carburetors and Homelite carburetors have been used; refer to appropriate exploded view in Fig. HL40 or Fig. HL41, or to the cross-sectional view in Fig. HL43.

On some models, flow from fuel tank to carburetor is by gravity with tank mounted above carburetor. With Tillotson carburetors and fuel tank mounted below carburetor, a diaphragm type fuel pump is used as shown in Fig. HL42. On models equipped with Homelite carburetor, fuel tank is pressurized.

On all carburetors, clockwise rotation of fuel mixture adjustment needles leans the mixture. NOTE: Later models with MT carburetor are not equipped with a throttle disc or shaft.

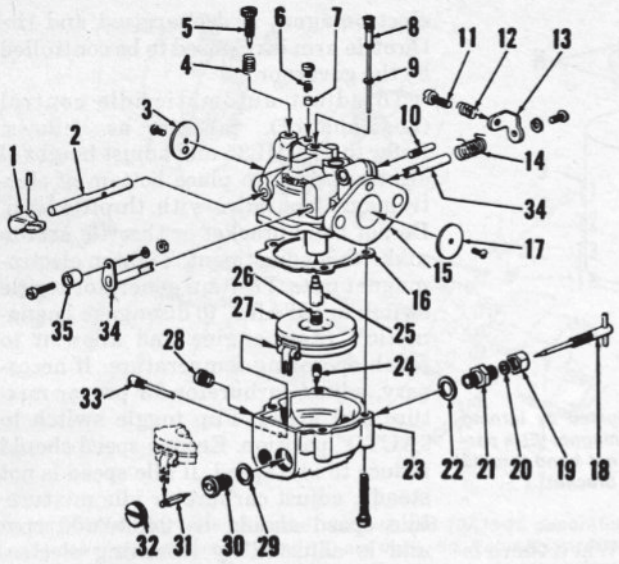


Fig. HL40–Exploded view of typical Tillotson Series MD carburetor as used on some Homelite pump models.

1. Choke lever
2. Choke shaft
3. Choke disc
4. Spring
5. Idle fuel screw
6. Spring
7. Choke friction pin
8. By-pass tube
9. Gasket
10. Throttle stop pin
11. Idle speed screw
12. Spring
13. Throttle stop lever
14. Throttle return spring
15. Carburetor body
16. Gasket
17. Throttle disc
18. Main fuel needle
19. Packing nut
20. Packing
21. Packing gland
22. Gasket
23. Fuel bowl
24. Fuel bowl plug
25. Main nozzle
26. Main nozzle plug
27. Float
28. Bowl drain plug
29. Gasket
30. Inlet valve seat
31. Inlet valve needle
32. Plug
33. Float pin
34. Throttle shaft
35. Roller

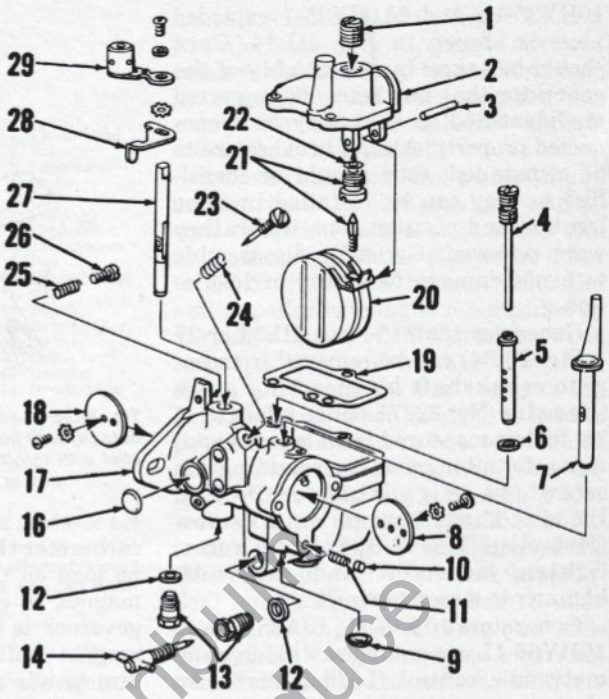


Fig. HL41–Exploded view of typical Series MT Tillotson float type carburetor as used on some Homelite pump and generator models.

1. Pipe plug
2. Float bowl cover
3. Float pin
4. By-pass tube
5. Main nozzle
6. Gasket
7. Choke shaft
8. Choke disc
9. Expansion plug
10. Choke friction pin
11. Spring
12. Gasket
13. Packing nut
14. Main fuel needle
16. Expansion plug
17. Carburetor body
18. Throttle disc
19. Gasket
20. Float
21. Inlet valve assy.
22. Gasket
23. Idle fuel needle
24. Spring
25. Spring
26. Idle stop screw
27. Throttle shaft
28. Throttle stop lever
29. Throttle lever

Normal idle needle (5—Fig. HL40) setting for Tillotson MD carburetors is ¼-turn open; main (high speed) needle (18) setting is 1¼-1½ turns open. Float setting with fuel bowl assembly held in upside down position should be 1/32-inch from the lowest point of float at free end, to rim of fuel bowl.

Normal idle needle (23—Fig. HL41) setting for Tillotson MT carburetors is ¾-turn open; main (high speed) needle (14) setting is 1-turn open. Float setting, with the float bowl cover assembly (2) inverted, should be 1-13/32-inch as measured from the top of the float (20) to the gasket surface of the float bowl cover.

Normal mixture adjustment needle (32—Figs. HL43 and HL44) setting for the Homelite carburetor is 1½ turns open. Carburetor operates by pressurizing the fuel tank and loss of tank pressure will prevent carburetor from operating properly.

GOVERNOR. All are equipped with rotary type inlet valves. The governor is a centrifugal type and is an integral part of the rotary inlet valve as indicated in Fig. HL45. On models so equipped, Formica wear plate (15—Fig. HL50) is pinned to the engine crankcase with opening in wear plate in register with intake opening in crankcase. On all models, the inlet opening in the valve plate (IV—Fig. HL45) is controlled by the combination

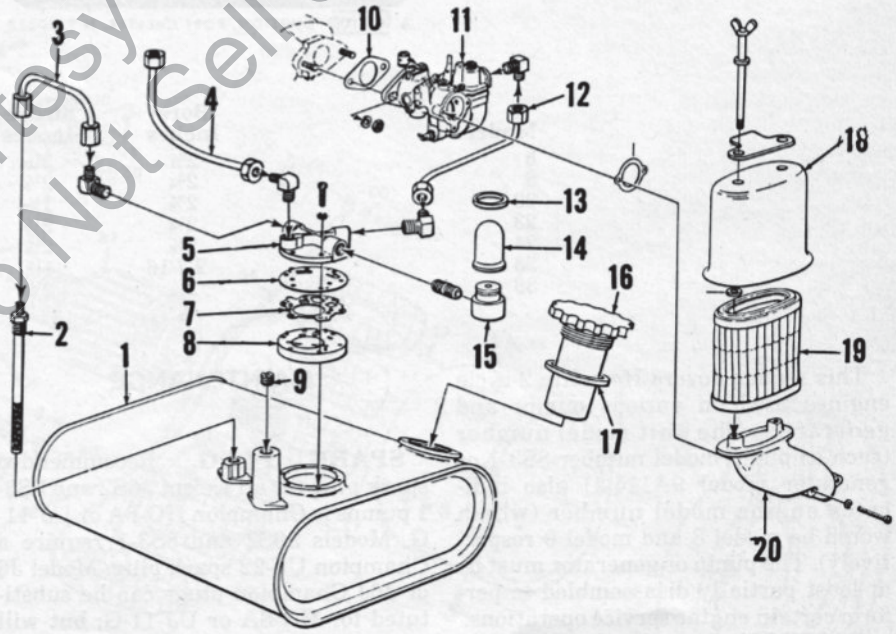


Fig. HL42–Exploded view of fuel system on models using Tillotson float type carburetor. Exploded view of carburetor is shown in Fig. HL41. Actuating primer bulb (14) will pump fuel into carburetor float bowl.

1. Fuel tank
2. Fuel filter
3. Pump suction line
4. Pump pulse line
5. Pump body
6. Pump diaphragm
7. Gasket
8. Diaphragm cover
9. Pipe plug
10. Gasket
11. Carburetor assy.
12. Fuel line
13. Ring
14. Priming bulb
15. Adapter
16. Filler cap
17. Gasket
18. Air cleaner cover
19. Element
20. Adapter

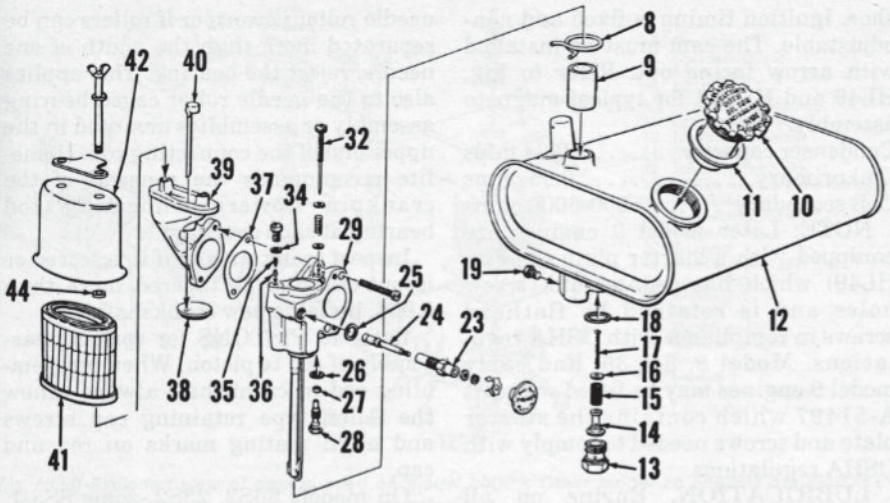


Fig. HL43–Exploded view of fuel system on models equipped with Homelite carburetor. Refer to Fig. HL44 for cross-sectional views of carburetor assembly. Fuel tank is pressurized to force fuel upward into carburetor.

8. Hose clamps
9. Adapter hose
10. Fuel cap
11. Gasket
12. Fuel tank
13. Filter plug
14. Filter adapter
15. Screen
16. Washer
17. Screw
18. Gasket
19. Drain plug
23. Plunger tube
24. Primer plunger
25. Gasket
26. Gasket
27. Sleeve
28. Jet
29. Carburetor body
32. Fuel needle
34. Gasket
35. Spring
36. Priming valve
37. Gasket
38. Carburetor cover
39. Adapter
40. Vent tube
41. Filter element
42. Air filter cover
44. Washer

shutter and governor weight (GW) which when the engine is stationary, is held in the open position by spring (GS). When engine speed exceeds the designed limit, centrifugal force acting on the weight overcomes the opposing spring pressure and partially covers the manifold opening and thus throttles the engine. As the throttled engine slows down, centrifugal force diminishes and the spring again uncovers the opening to restore engine speed.

GOVERNOR ADJUSTMENT. On later production engines equipped with adjustable governor (Fig. HL45) or on earlier engines in which adjustable

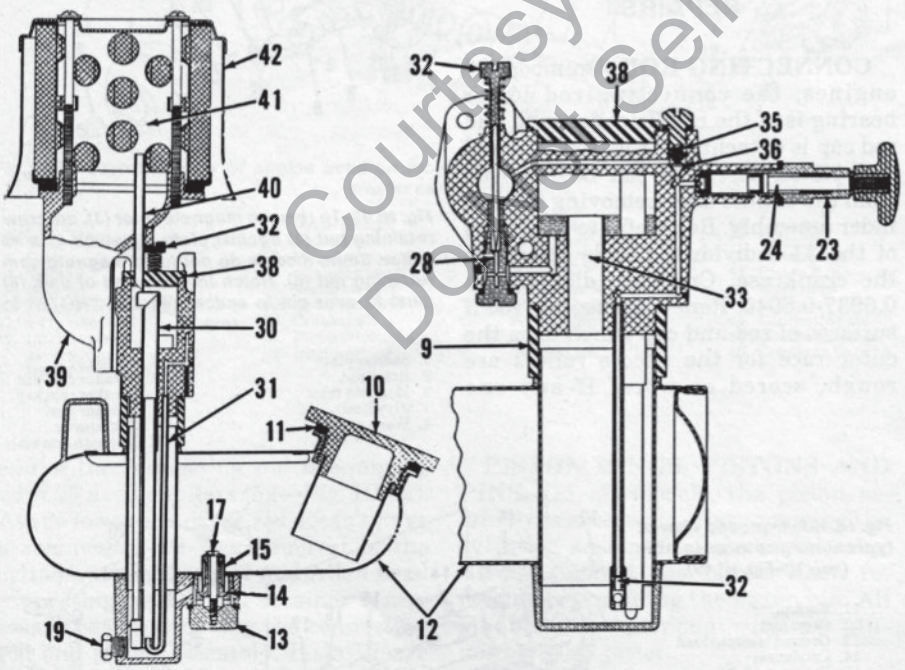


Fig. HL44–Cross-sectional view of Homelite carburetor. Refer to Fig. HL43 for additional legend and exploded view of complete fuel system.

3. Priming tube and foot valve
30. Feed tube
31. Pressure tube
33. Overflow tube

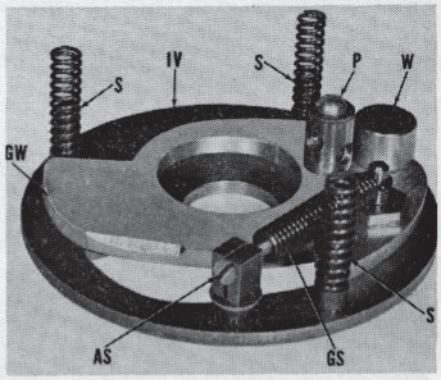


Fig. HL45–View of late production rotary inlet valve and governor assembly. Early production units did not have adjusting screw (AS) and engine governed speed was non-adjustable.

AS. Adjusting screw
GS. Governor spring
GW. Governor weight & plate assy.
IV. Intake valve plate
P. Pivot post
S. Springs
W. Weight

governor has been installed, engine governed speed may be adjusted as follows:

First, bring engine to normal operating temperature and adjust carburetor for highest speed and best performance obtainable. Then, on model 35 engine, remove drain petcock (DP—Fig. HL46) on muffler side of front-half crankcase; on models 8, 9 and 9-A, disconnect pulse line (L—Fig. HL47) (above drain petcock) and unscrew the 90° elbow (E); or, on model 20 engine, remove slotted head brass plug (P—Fig. HL48) in front half of crankcase.

Turn adjusting screw (AS—Fig. HL45) clockwise to increase no-load speed, or counterclockwise to decrease no-load speed as required. One turn of the adjusting screw will change engine no-load governed speed approximately 100 RPM. Accurately adjust generator engine no-load speed to 3750 RPM.

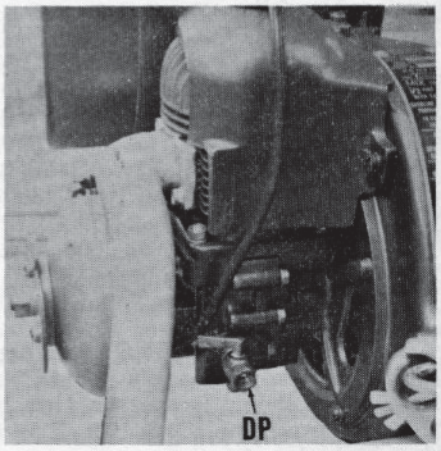


Fig. HL46–Governor adjusting screw (see Fig. HL45) is accessible on model 35 engines after removing drain petcock (DP).

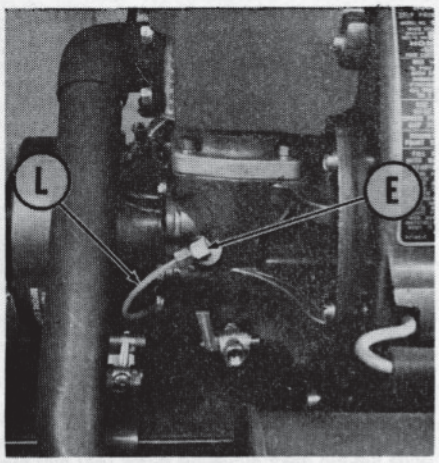


Fig. HL47–On engine models 8 and 9, governor adjusting screw (see Fig. HL45) is accessible after removing pulse line (L) and elbow (E).

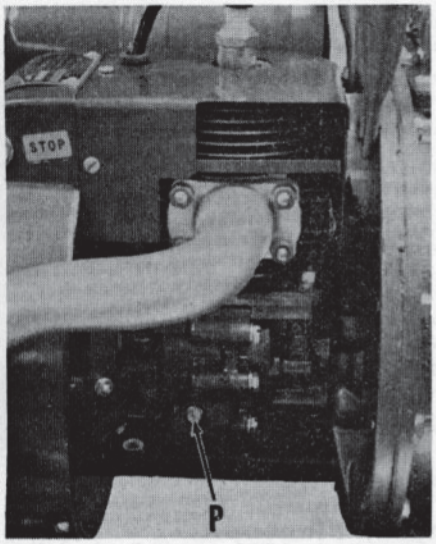


Fig. HL48–On engine model 20, governor adjusting screw (see Fig. HL45) is accessible after removing slotted head plug (P).

Recommended no-load engine governed RPM for the various pump applications is as follows:

Pump Model	No-Load RPM
20S1½-1A	3900-4000
20DP-3	2850-2950
35S2-1	2850-2950
8S3-1, 9S3-1	2850-2950
8S3-1P, 9S3-1P	4200-4300*
36S2	2650-2750
All other pumps	3800-3900

*3850 RPM at 60 psi pump pressure

IGNITION & TIMING. Breaker point gap on all models should be 0.020. Gap should be measured when breaker arm rub block is ⅛-inch past breaking edge of cam.

Breaker spring tension should be 14-21 oz. as measured at center of breaker shoe. Ignition timing is fixed and non-adjustable. The cam must be installed with arrow facing out. Refer to Fig. HL49 and HL49A for typical magneto assembly.

Condenser capacity .....0.34 mfds
Coil primary ..... 0.95 ohms
Coil secondary ..... 5500-6000 ohms

NOTE: Later model 9 engines are equipped with a starter plate (1—Fig. HL49) which has countersunk screw holes and is retained by flathead screws in compliance with OSHA regulations. Model 8, 35, 36, and early model 9 engines may be fitted with Kit A-51497 which contains the starter plate and screws needed to comply with OSHA regulations.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline. If Homelite® Premium SAE 40 oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used. Note: A fuel:oil ratio of 32:1 should be used on diaphragm pump models regardless of whether Homelite® Premium SAE 40 or Homelite® 2-Cycle SAE 30 oil is used.

CLEANING CARBON. Carbon deposits should be cleaned from the exhaust ports and muffler at regular intervals. When scraping carbon be careful not to damage the finely chamfered edges of the exhaust ports.

REPAIRS

CONNECTING ROD. On model 20 engines, the connecting rod lower bearing is of the needle roller type and rod cap is detachable from rod. The rod and piston assembly can be removed from the engine after removing the cylinder assembly. Be careful to avoid loss of the 31 individual needle rollers in the crankcase. Crankpin diameter is 0.6937-0.6940. Renew connecting rod if surfaces of rod and cap which form the outer race for the needle rollers are rough, scored or worn. If any one needle roller is worn or if rollers can be separated more than the width of one needle, reject the bearing. This applies also to the needle roller caged bearing assembly or assemblies mounted in the upper end of the connecting rod. Homelite recommends the renewal of the crankpin (lower) connecting rod bearing at each overhaul.

Inspect crankpin and if it is scored or is out-of-round cr tapered more than 0.001, install a new crankshaft.

Refer to PISTONS for correct reassembly of rod to piston. When reassembling rod to crankshaft always renew the Allen type retaining cap screws and align mating marks on rod and cap.

On models 36S2, 23S2, some 8S3-1, 8S3-1P and 8S3-1R and all 9S3-1, 9S3-1P and 9S3-1R (Refer to 42—Fig. HL52), the connecting rod lower bearing is of the double track ball bearing type. To remove the connecting rod, it is necessary to remove the cylinder, timer bracket and the connecting rod retaining Allen head screw (43); then, with the use of special pullers, remove the connecting rod and bearings. Renew bearing if it feels lumpy when rotated or has perceptible wear.

On models 24S3, 24S3-1P and some 8S3-1, 8S3-1P and 8S3-1R, the lower

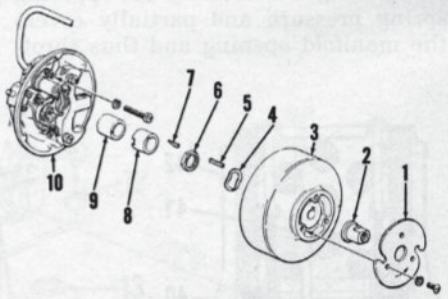


Fig. HL49–To remove magneto rotor (3), unscrew retaining nut (2) against plate (1) which acts as puller. Some models do not have magneto cam retaining nut (6). Notch in inner end of cam (8) must fit over pin in spacer (9). See "NOTE" in text.

1. Starter plate
2. Rotor nut
3. Magneto rotor (flywheel)
4. Wave washer
5. Rotor key
6. Breaker cam nut
7. Breaker cam key
8. Breaker cam
9. Cam spacer
10. Magneto assembly

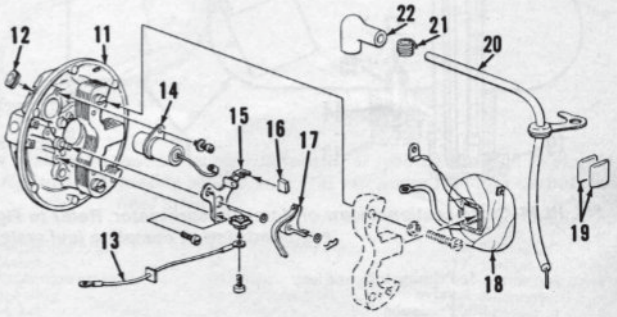
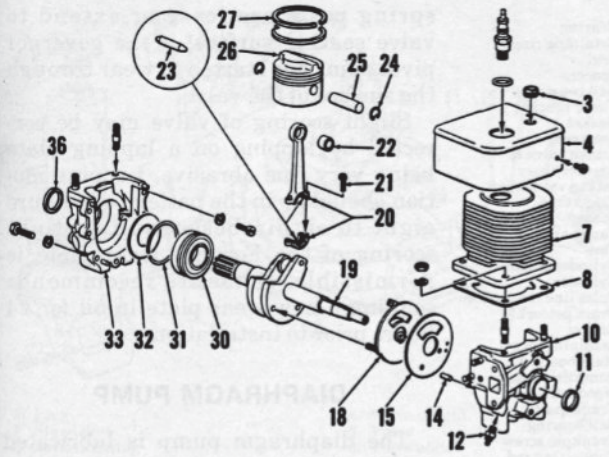


Fig. HL49A–Exploded view of typical magneto assembly (see 10–Fig. HL49).

11. Back plate
12. Grommet
13. Ground (switch) lead
14. Condenser
15. Breaker point base
16. Cam wiper felt
17. Breaker point arm
18. Ignition coil
19. Coil wedges
20. Spark plug wire
21. Terminal
22. Spark plug boot



3. Grommet
4. Cylinder shield
7. Cylinder
8. Gasket
10. Crankcase front half
11. Crankshaft seal
12. Idle line connector
14. Dowel pin
15. Intake valve plate
18. Intake valve & governor assy.
19. Crankshaft
20. Connecting rod assy.
21. Allen screws
22. Bearing
23. Needle rollers (31)
24. Snap rings
25. Piston pin
26. Piston
27. Piston rings
30. Main bearing
31. Snap ring
32. Gasket
33. Rear crankcase half
36. Crankshaft seal

Fig. HL50–Exploded view of engine used on model 20DP3. Other model 20 engines are similar in construction.

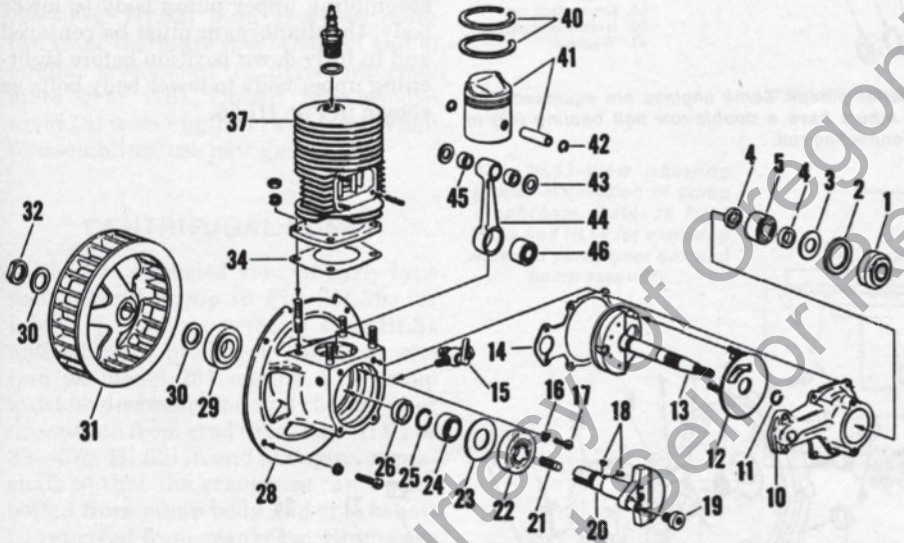


Fig. HL51–Exploded view of engine used on model 36S2 pump; engine used on 23S2 pump is of similar construction.

1. Bearing
2. Seal retaining ring
3. Seal
4. Spacers
5. Bearing
10. Timer bracket
11. Snap ring
12. Intake valve & governor assy.
13. Intake valve shaft
15. Drain petcock
16. Lockwasher
17. Main bearing retaining screw
18. Woodruff keys
19. Crankpin screw
20. Crankshaft
21. Pump drive stud
22. Main bearing
23. Gasket
24. Spacer
25. Snap ring
26. Spacer
28. Crankcase
29. Fan bearing
30. Washer
31. Fan
32. Fan nut
34. Gasket
37. Cylinder
40. Piston rings
41. Piston & pin
42. Snap rings
43. Washers
44. Connecting rod
45. Needle bearings
46. Crankpin bearing

end of the connecting rod is equipped with 25 needle rollers (52—Fig. HL52). As the lower end of the rod doesn't have a removable rod cap, removal of the cylinder, timer bracket and Allen head connecting rod bearing retainer is necessary before removing the connecting rod and piston assembly. Install large washer (54) with tapered side of hole toward pump and small washer (51) with tapered side toward inlet valve. Race (53) should be heated to 180° F. to aid in assembling to crankpin.

PISTON RINGS, PISTONS AND PINS. On all models, the piston assembly is accessible after removing the cylinder assembly from crankcase. Always support the piston when removing or installing the piston pin. All models are equipped with an aluminum alloy piston.

Piston ring end gap should be 0.105 to 0.115 on piston with ring locating pin and 0.008 to 0.020 on models with unpinned rings. Side clearance of piston ring in groove should be 0.0025-0.004. Clearance between piston skirt and cylinder bore, measured at right angle to piston pin, should be 0.002-0.005 on models with 2¼ inch bore and 0.004-0.007 on other models.

On all models, reject the pin and the piston if there is any visible up and down play of pin in the piston bosses. Neither the piston nor the pin are available separately.

Install new needle roller bearing assemblies to upper end of connecting rod if any of the rollers have slight flat spots or are pitted. Do likewise if rollers can be separated more than the thickness of one roller.

Inspect piston for cracks and for holes in dome of same and reject if any are found. Slight scoring of piston walls is permissible, but if rough surfaces are accompanied by a deposit of aluminum on cylinder walls, reject the piston. Refer to CYLINDER for methods of removing such deposits.

If piston ring locating pins in piston grooves are worn to half their normal thickness, reject the piston.

When piston and rings unit is assembled to connecting rod, the side of the piston which has the piston ring locating pins should be on the intake (away from exhaust side) side of the cylinder. Always use new piston pin retaining snap rings when reassembling piston to connecting rod. All wearing parts of the engine are supplied as replacements in standard size only.

CYLINDER. Cylinder bore is chrome plated. Inspect chrome bore for excessive wear and damage to chrome surface of bore. A new cylinder must be installed if chrome is scored, cracked or the base metal underneath exposed.

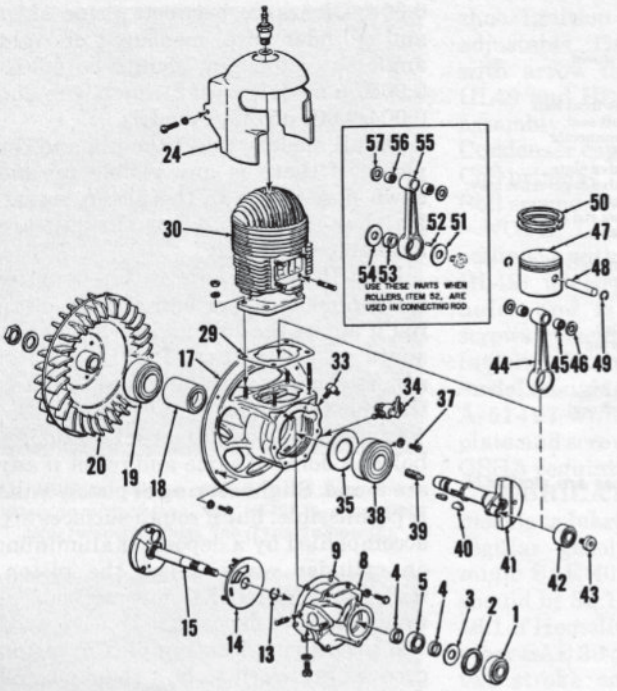
CRANKSHAFT, BEARINGS AND SEALS. If shaft has damaged threads or enlarged keyways or if run out exceeds 0.003, reject the shaft. Journals for roller type bearings must be free of pits, galling or heavy score marks. If they are out of round or worn more than 0.001 reject the shaft.

If any needle roller shows wear or any visible flat spot, or if rollers can be separated more than the width (or diameter) of one roller, reject all of the rollers. If annular ball bearing feels "lumpy" when rotated, or has perceptible wear, reject the bearing.

Suitable pullers, pushers and mandrels (available from Homelite) should be used in removing and installing main and connecting rod bearings.

Crankshaft seals must be maintained in first class condition because crankcase compression leakage through seals causes a loss of power.

Centrifugal pumps must be disassembled to remove crankshaft from



1. Bearing
2. Retaining ring
3. Seal
4. Spacers
5. Ball bearing
8. Timer bracket
9. Gasket
13. Snap ring
14. Intake valve & governor assy.
15. Intake valve shaft
17. Crankcase
18. Spacer
19. Fan bearing
20. Fan
24. Cylinder shield
30. Cylinder
33. Pulse line connection
34. Drain petcock
35. Gasket
37. Retaining screw
38. Main bearing
39. Pump drive stud
40. Woodruff keys
41. Crankshaft
42. Ball bearing
43. Crankpin screw
44. Connecting rod
45. Needle bearings
46. Washers
47. Piston
48. Piston pin
49. Snap rings
50. Piston rings
51. Washer
52. Needle rollers (25)
53. Inner race
54. Washer
55. Connecting rod
56. Needle bearings
57. Washers

Fig. HL52–Exploded view of engine used on 8S3 series pumps. Some engines are equipped with needle roller crankpin bearings (see inset) while others have a double-row ball bearing (42) in crankpin end of connecting rod.

crankcase; refer to CENTRIFUGAL PUMPS paragraph.

CRANKCASE. Be sure that all passages through the crankcase are clean. This is especially true of the idle passage line (in the front half crankcase) which enters the crankcase via the intake valve register. This passage is sometimes restricted by carbon deposits which can be cleaned with a piece of wire. The same holds true of the passage for the fuel tank pressure line (on models with pressurized fuel tank) or the actuator line on pump equipped engines.

If main bearing bores are worn, indicating that the bearing has been turning in the crankcase, the bearing and/or the crankcase should be rejected. On models so constructed, the mating surfaces of two-piece crankcase (Fig. HL50) must be free of all nicks and burrs as neither sealing compound nor gaskets are used at this joint.

Always use new bearing seals when reassembling engine.

ROTARY VALVE. The combination rotary type inlet valve and governor (Fig. HL45) should be rejected if any of the following conditions are encountered during inspection:

The sealing faces of valve are scored or worn enough to produce a ridge; if spring posts are loose or extend to valve seating surface; if the governor pivot point has started to wear through the surface of the valve.

Slight scoring of valve may be corrected by lapping on a lapping plate using very fine abrasive. Lapping motion should be in the pattern of a figure eight to obtain best results. Slight scoring of the Formica wear plate is permissible. Homelite recommends soaking a new wear plate in oil for 24 hours prior to installation.

DIAPHRAGM PUMP

The diaphragm pump is lubricated by filling gearcase to level of plug (25—Fig. HL53) with SAE 90 gear lubricant and by greasing pump rod upper bearing once a month with pressure gun through fitting in upper end of rod.

When installing new diaphragm or assembling upper pump body to lower body, the diaphragm must be centered and in fully down position before tightening upper body to lower body bolts as shown in Fig. HL55.

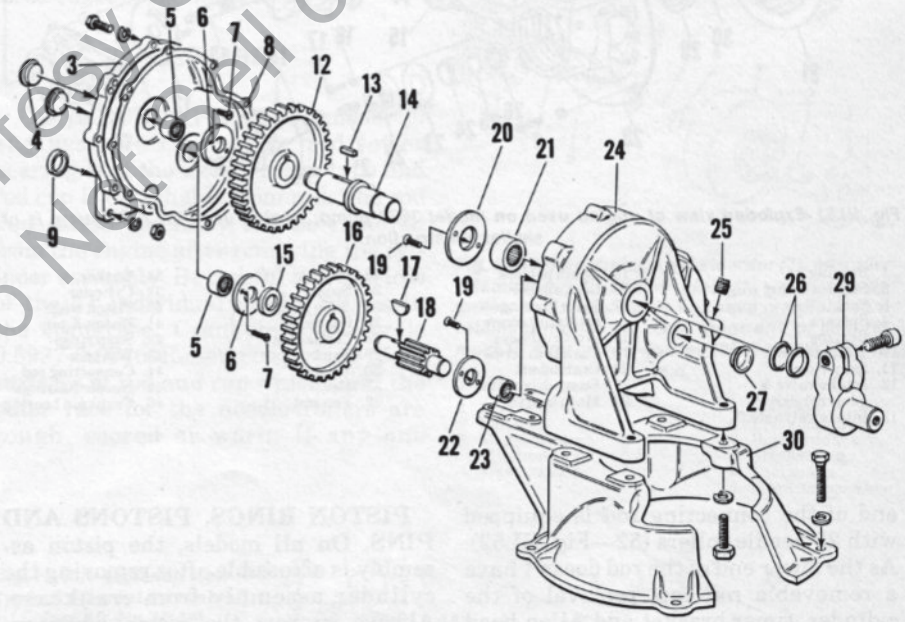
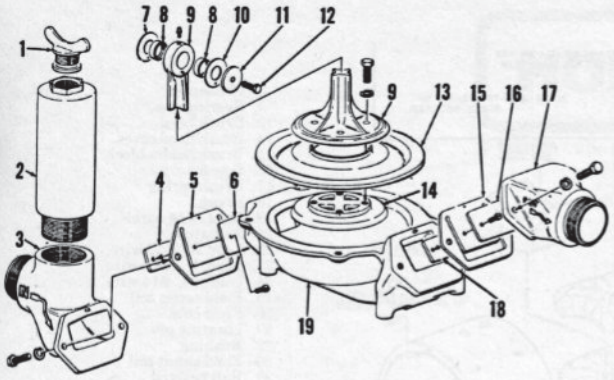


Fig. HL53–Exploded view of drive gear case for diaphragm type pump; refer to Fig. HL54 for exploded view of the pump assembly. Pinion machined on rear end of engine crankshaft engages the intermediate gear (16); pinion on shaft (18) drives crank gear (12). Guard A-51135 is available to cover pump rod and crank.

3. Gear case cover
4. Bearing caps
5. Needle bearings
6. Thrust washers
7. Retainer screws
8. Gasket
9. Crankshaft seal
12. Pump crank gear
13. Key
14. Pump crank shaft
15. Spacer
16. Intermediate gear
17. Woodruff key
18. Intermediate shaft
19. Retainer screws
20. Thrust washer
21. Needle bearing
22. Thrust washer
23. Needle bearing
24. Gear case
25. Filler plug
26. Seals
27. Bearing cap
29. Pump crank
30. Pump upper body



1. Plug
2. Stand pipe
3. Suction fitting
4. Valve weight
5. Valve
6. Valve plate

Fig. HL54–Exploded view of diaphragm type pump assembly. Pump upper body is (30–Fig. HL53). Refer to Fig. HL55 for pump assembly information.

7. Thrust washer
8. Needle bearings
9. Pump rod
10. Thrust washer
11. Washer
12. Cap screw
13. Pump diaphragm
14. Diaphragm cap
15. Valve
16. Valve plate
17. Discharge fitting
18. Valve weight
19. Pump lower body

To remove pump from engine, drain gear lubricant and separate gearcase (24—Fig. HL53) from gearcase cover (3). Gear teeth are machined on end of engine crankshaft to drive intermediate gear (16). Unbolt and remove cover (3) from engine crankcase. When reassembling, use new gasket (8).

CENTRIFUGAL PUMP

Refer to exploded view of early type centrifugal pump in Fig. HL56; for later type pumps, refer to Fig. HL31 and HL32 in preceding Homelite section on model 251 engine. The pump must be disassembled and the impeller unscrewed from stud (21—Fig. HL51 or 39—Fig. HL52) in end of engine crankshaft so that the crankcase can be unbolted from pump body and crankshaft be removed from crankcase. Shims are used between impeller and end of crankshaft to maintain minimum clearance between impeller and wear plate (10—Fig. HL56); two shims are normally used. Remove shims if impeller rubs against wear plate when reassembling engine.

If necessary to renew pump seals, proceed as follows: Apply a thin coat of shellac to plain side of ceramic ring (15) and press new washer (16) against ring. Then, apply a thin coat of shellac on washer and press the washer and ceramic ring, washer side in, against and into recess of pump body. Slide seal (14) over hub of impeller with hy-car side of seal towards impeller. Thread impeller onto stud that is screwed into end of crankshaft.

Place the assembled impeller housing (9, 10 and 12) over impeller and in proper engagement with pin (18), press against housing and turn engine. If impeller rubs, remove impeller and discard shim or shims as required from between impeller and crankshaft so that rubbing condition is eliminated. Install assembled impeller housing, then install pump end plate (4) with new gasket (8) and one or two new gaskets (7) as required so that end plate holds impeller housing securely against pump body. Note: End plate should rock slightly before being tightened.

TRASH PUMP

Trash pump used on the models in this section is the same as the pump shown in Fig. HL32. Refer to TRASH PUMP in model 251 section for overhaul of trash pump.

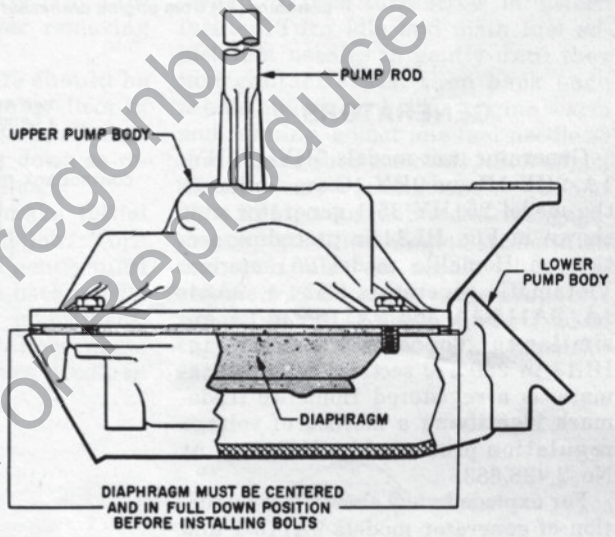


Fig. HL55–View showing proper installation of pump diaphragm. Refer to Figs. HL53 and HL54 for exploded views of pump gear box and pump assembly.

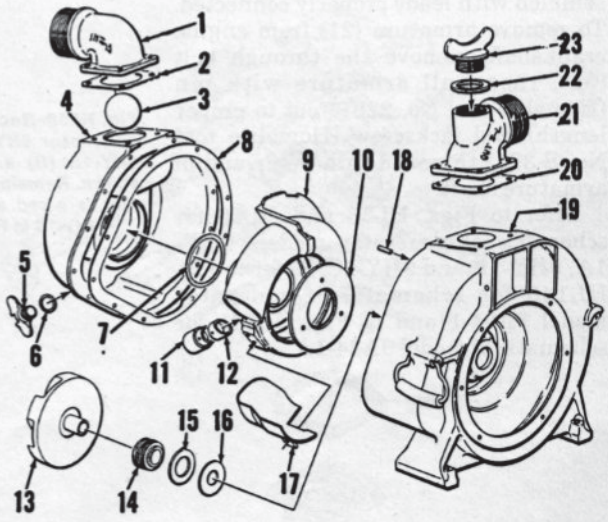
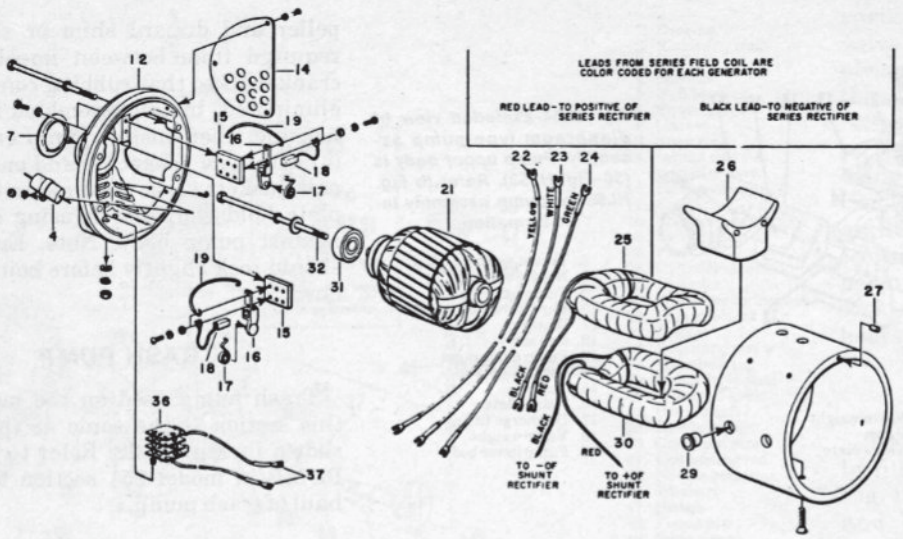


Fig. HL56–Exploded view of early type centrifugal type pump assembly. Pump impeller (13) is mounted on engine crankshaft. Pump seals (14, 15 & 16) are the later ceramic type; earlier pumps with rubber seal may be converted by installing new impeller (13). Refer to Figs. HL31 and HL32 in preceding section for views of later type pumps.

1. Suction fitting
2. Gasket
3. Check ball
4. End plate
5. Drain plug
6. Gasket
7. Gasket
8. Gasket
9. Impeller housing
10. Wear plate
11. Priming tube
12. Auxiliary priming tube
13. Impeller
14. Seal
15. Ceramic ring
16. Washer
17. Baffle
18. Locating pin
19. Pump body
20. Gasket
21. Discharge fitting
22. Gasket
23. Priming filler plug



4. Condenser
7. Bearing cap
12. Brush head
14. Brush head cover
15. Brush holder block
16. Brush holder
17. Brush spring
18. Brush
19. Lead (#14 wire)
21. Armature
22. Lead 20" #10 wire
23. Lead, 16" #10 wire
24. Lead, 24" #14 wire
25. Field series coil
26. Field pole
27. Locating pin
29. Bushing
30. Field shunt coil
31. Ball bearing
32. Armature bolt
36. Shunt rectifier
37. Leads, 8" #20 wire

Fig. HL57–Exploded view showing construction of model 9A115-1 and 9A115/230-1 generator units. It will be necessary to remove armature (21) from engine crankshaft to service crankshaft seal, bearing and crankcase.

GENERATORS

Generator unit models 9HY-1, 9HY-1A, 9HY-1B and 9HY-1C are similar to the model 251HY 35-1 generator unit shown in Fig. HL34 in preceding section on Homelite model 251 engine. Voltamatic generators 9A34-1, 9A34-1A, 9A115-1A and 9A115/230-1A are similar to generator shown in Fig. HL13 in 250/270 section. Note: Voltamatic is a registered Homelite trademark identifying a method of voltage regulation protected by U.S. Patent No. 3,428,883.

For exploded view showing construction of generator models 9A115-1 and 9A115/230-1, refer to Fig. HL57. Identify each generator lead as it is disconnected so that the unit may be reassembled with leads properly connected. To remove armature (21) from engine crankshaft, remove the through bolt (32), then pull armature with pin (Homelite tool No. 22271 cut to proper length) and jackscrew (Homelite tool No. S-394) threaded into outer end of armature shaft.

Refer to Figs. HL58 and HL59 for schematic of generator models 9HY-1A, 9HY-1B and 9HY-1C. Refer to Fig. HL140 for schematic of generator model 9A34-1 and to Fig. HL141 for schematic of model 9A34-1A.

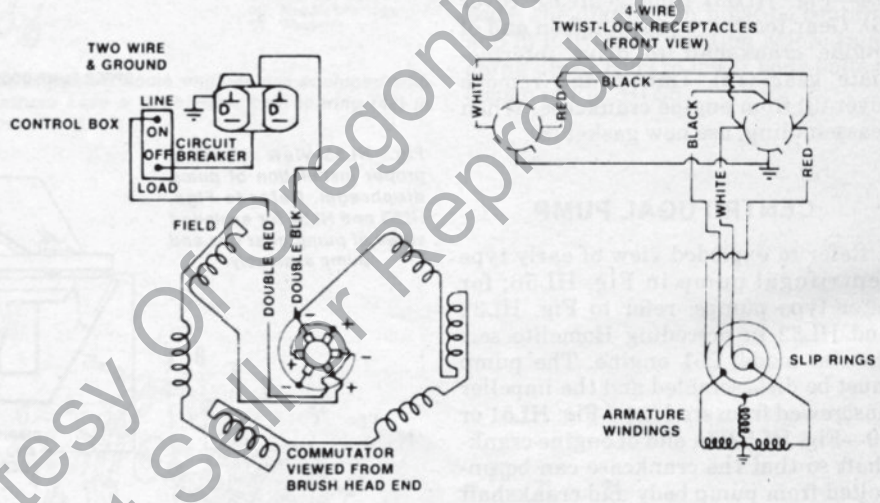


Fig. HL58–Schematic of 9HY-1C generator. Refer to Fig. HL59 for schematic variations for generators 9HY-1A and 9HY-1B.

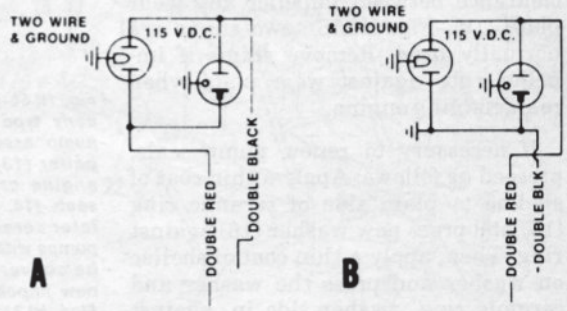


Fig. HL59–Receptacles on generator 9HY-1A (A) and 9HY-1B (B) are wired as shown. Remainder of generator is wired as shown for 9HY-1C in Fig. HL58.

HOMELITE®
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Model	Bore Inches	Stroke Inches	Displ. Cu. In.	Reed Type
XL-12	1¾	1⅜	3.3	Flat
Super XL	1-13/16	1⅜	3.55	Pyramid

This section covers service of Homelite model XL-12 and Super XL engines that are used in the following Homelite tools and equipment.

XL Brushcutter
XL100 Circular Saw
XL120 Circular Saw
XLA115 Generator
XLS1½-1 Centrifugal Pump

MAINTENANCE

SPARK PLUG. A Champion TJ-8J spark plug or equivalent is used in generator, XL-100 saw and brushcutter application; for extended plug life, a Champion UTJ-11P platinum tip spark plug may be used. On model XL-120 circular saw, use Champion CJ-6 or equivalent spark plug. A Champion CJ-8 spark plug is recommended for model XL100A. For pump application, use a Champion TJ-6J or equivalent spark plug. Set electrode gap to 0.025 for all engine applications.

CARBURETOR. Refer to Fig. HL60 for exploded view of Tillotson HS diaphragm type carburetor with integral fuel pump used on XL-12 and Super XL engines. Carburetor is accessible after removing air box cover (Fig. HL61). NOTE: If early type cover gasket becomes damaged when air box cover is removed, install new gasket as follows: Carefully remove old gasket from air box and be sure that surface is free of all dirt, oil, etc. Apply "3M" or Homelite No. 22788 cement to new gasket and carefully place gasket, adhesive side down, on lip around air box chamber. On later engines, gasket is bonded to filter element; install new filter element if either gasket or filter is damaged.

When disassembling carburetor, slide the diaphragm assembly towards adjustment needle side of carburetor body to disengage diaphragm from fuel inlet control lever. To remove welch plugs, carefully drill through large plug (27—Fig. HL60) with a ⅛-inch drill or through small plug (24) with a 1/16-inch drill and pry plugs out with a pin inserted through the drilled hole. Caution should be taken that the drill just goes through the welch plug as deeper drilling may seriously damage the carburetor. Note channel screen (26) and screen retaining ring (25) which are accessible after removing welch plug (24).

Inlet control lever (17) should be flush with metering chamber floor of carburetor body. If not, bend diaphragm end of lever up or down as required so that the lever is flush.

On generator engine, make initial carburetor adjustment as follows: Turn fuel adjustment needle in gently until it just contacts seat, then back needle out 1¼ turns. For final adjustment, apply load to generator to allow engine to warm up, then slowly turn needle in until engine speed starts to drop. Correct final setting is ⅛-turn open from this point.

On brushcutter, turn idle speed stop screw in until it just contacts throttle lever tab, then turn screw in ¾-turn further. Turn idle and main fuel adjustment needles in gently until they just contact seats, then back each needle out ⅝-turn. With engine warm and running, adjust idle fuel needle so that engine runs smoothly, then adjust idle stop screw so that engine runs at 2600 RPM, or just below clutch engagement speed. Check engine acceleration and open idle fuel needle slightly if engine will not accelerate properly. Adjust main fuel needle under load so engine will neither slow down or smoke excessively.

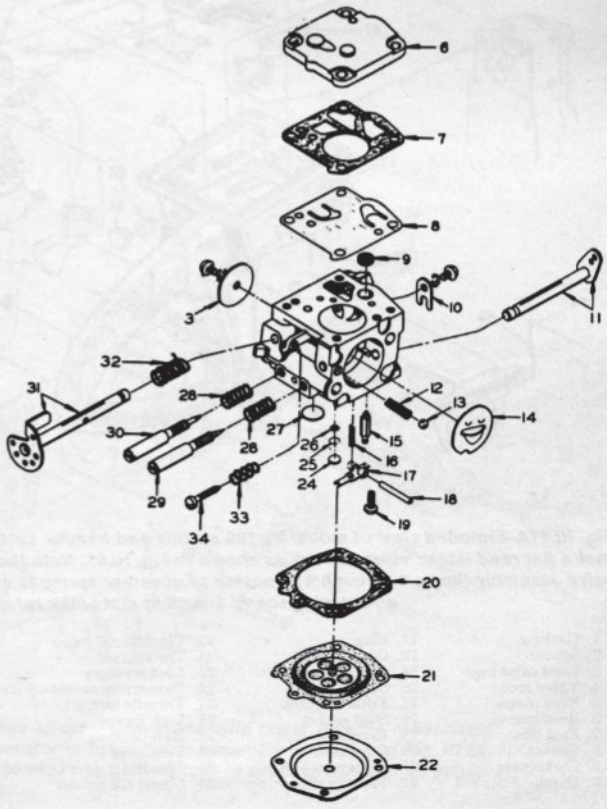
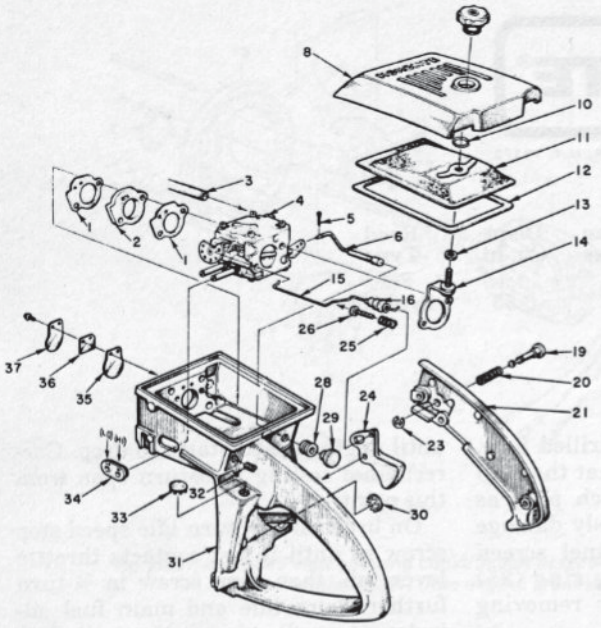


Fig. HL60–Exploded view of typical Tillotson series HS carburetor used on XL-12 and Super XL engines. Carburetor used on generator engine does not have idle fuel mixture adjustment needle (30). On some models, idle speed adjustment screw (34) is located in air box casting and is adjustable without removing cover (8–Fig. HL61).

3. Throttle disc
6. Pump cover
7. Gasket
8. Pump diaphragm
9. Inlet screen
10. Throttle shaft clip
11. Choke shaft & lever
12. Detent spring
13. Choke detent ball
14. Choke disc
15. Inlet needle
16. Spring
17. Diaphragm lever
18. Lever pin
19. Pin retaining screw
20. Gasket
21. Diaphragm
22. Diaphragm cover
24. Welch plug
25. Retaining ring
26. Channel screen
27. Welch plug
28. Springs
29. Main fuel needle
30. Idle fuel needle
31. Throttle shaft & lever
32. Throttle spring
33. Idle speed screw spring
34. Idle speed adjustment screw



1. Gaskets
2. Spacer
3. Fuel line
4. Carburetor assembly
5. Cotter pin
6. Choke rod
8. Air filter cover
10. Retaining ring
11. Air filter element
12. Gasket
13. Gasket
14. Mounting bracket
15. Throttle rod
16. Throttle rod boot
19. Throttle lock pin
20. Spring
21. Handle cover
23. Retaining ring
24. Throttle trigger
25. Spring
26. Idle speed screw (external)
28. Grommet
29. Choke button
30. Plug
31. Air box housing
32. Headless screw
33. Plug
34. Adjusting needle grommet
35. Reed valve
36. Reed back-up
37. Reed stop

Fig. HL61–Exploded view of handle and air box assembly used on early XL100 saw; model XL120 handle and air box assembly is shown in Fig. HL61A. Late model XL-100 has air vane governor similar to that shown in Fig. HL61A. Refer to Figs. HL62 and HL63 for differences in brushcutter, generator and pump air box construction.

On pump engine, set idle stop screw so that it does not interfere with full travel of throttle stop lever. Open idle fuel adjustment needle one turn and leave needle at this setting; all adjustment should be made with main needle. Open main fuel adjustment needle one turn for initial adjustment, be sure pump is filled with water and start engine. Pump water until engine is at full operating temperature, then turn main fuel needle in slowly until engine begins to lose speed under load. Correct final adjustment is ⅛-turn open from this point.

On circular saw, turn idle speed stop screw in until it just contacts throttle stop lever plus ¾-turn additional. Open both the idle fuel needle and the main fuel needle one turn each. With engine warm and running, adjust idle speed stop screw so that engine runs at just below clutch engagement speed, or about 2600 RPM. Check engine acceleration and open idle fuel needle slightly if engine does not accelerate properly on initial adjustment. Adjust main fuel needle with engine under load so that engine runs at highest practicable speed obtainable without excessive smoke.

GOVERNOR. The early XL100 Circular Saw engine is nongoverned.

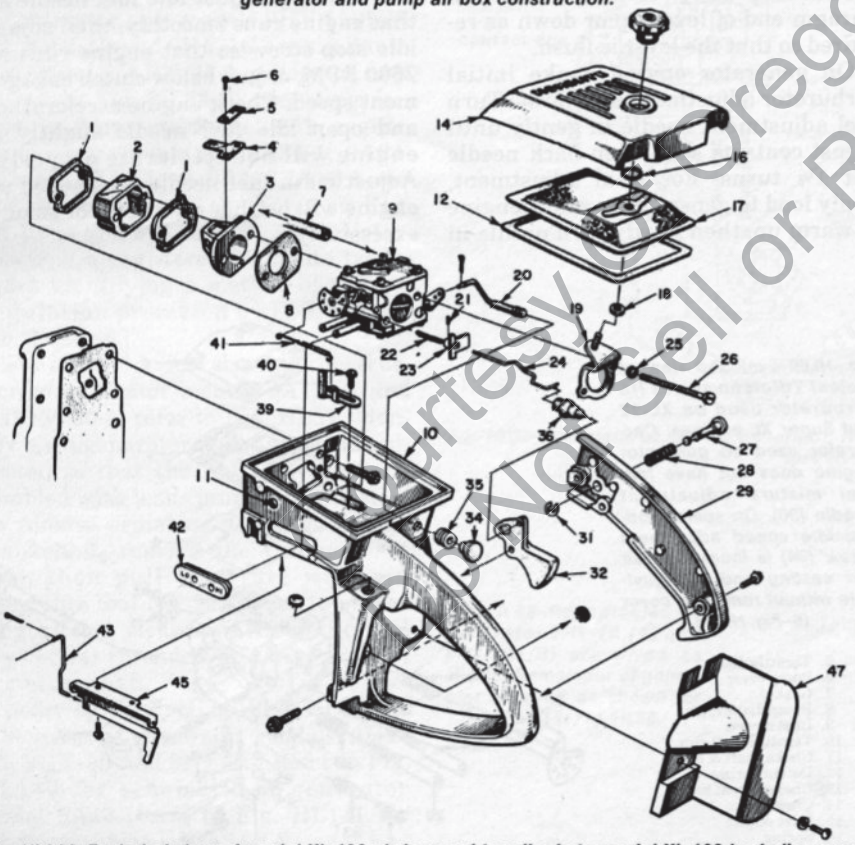


Fig. HL61A–Exploded view of model XL-120 air box and handle. Late model XL-100 is similar except that a flat reed intake valve is used as shown in Fig. HL61. Note the Super XL engine pyramid reed valve assembly (items 1 through 6). Tension of governor spring is adjusted by loosening screw (40) and moving speed adjusting plate (39); refer to text.

1. Gaskets
2. Spacer
3. Reed valve seat
4. Valve reeds
5. Reed plates
6. Reed screws
7. Fuel line
8. Gasket
9. Carburetor
10. Handle & air box
11. Plug
12. Cover gasket
14. Air box cover
16. Snap ring
17. Filter element
18. Stud gasket
19. Bracket & stud
20. Choke rod
21. Set screw
22. Throttle rod spring
23. Throttle rod collar
24. Throttle rod
25. Lock washers
26. Carburetor mounting screws
27. Throttle lock pin
28. Lock spring
29. Handle cover
31. Snap ring
32. Throttle trigger
34. Choke rod button
35. Grommet
36. Choke rod boot
39. Speed adjusting plate
40. Plate retaining screw
41. Governor spring
42. Adjusting needle grommet
43. Governor link
45. Governor air vane
47. Muffler shield

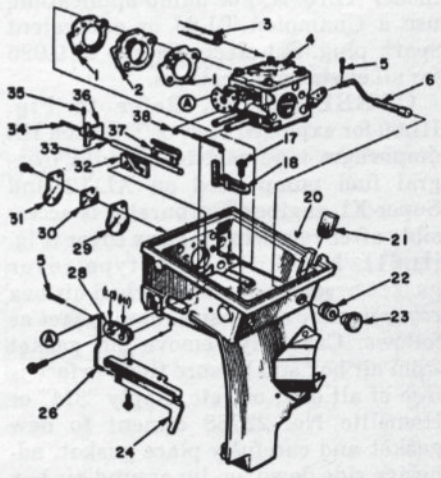


Fig. HL62–Exploded view of air box assembly used on brushcutter; pump air box is similar except that throttle control parts (items 32 through 37) are not used. Air filter cover and element as shown in Fig. HL61 are used.

1. Gaskets
2. Spacer
3. Fuel line
4. Carburetor assy.
5. Cotter pins
6. Choke rod
17. Screws (2)
18. Adjusting plate
20. Air box
21. Felt plug
22. Grommet
23. Choke button
24. Governor air vane
26. Governor link
28. Adjustment needle grommet
29. Reed valve
30. Reed back-up
31. Reed stop
32. Clamp spacer
33. Throttle cable casing
34. Throttle cable
35. Set screw
36. Collar
37. Clamp
38. Governor spring

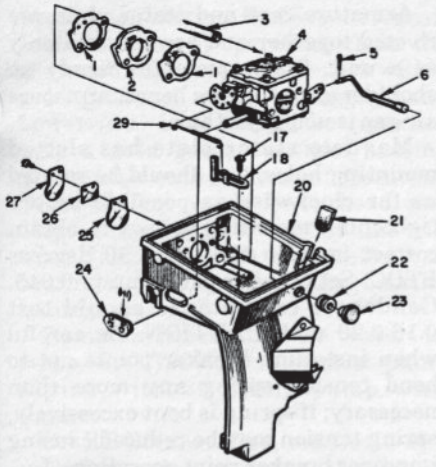


Fig. HL63–Exploded view of XLA115-1 generator engine air box assembly. Mechanical governor parts are shown in exploded view of generator in Fig. HL70.

1. Gaskets
2. Spacer
3. Fuel line
4. Carburetor assy.
5. Cotter pin
6. Choke rod
17. Screws (2)
18. Adjustment plate
20. Air box
21. Felt plug
22. Grommet
23. Choke button
24. Adjustment needle grommet
25. Reed valve
26. Reed back-up
27. Reed stop
29. Throttle opening spring

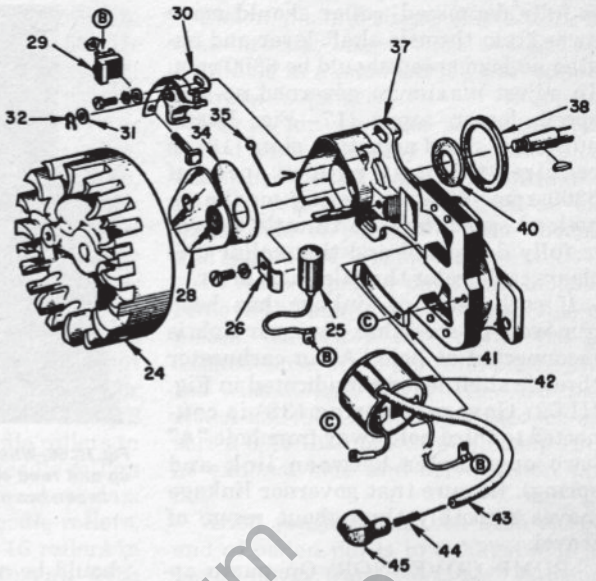


Fig. HL64–Exploded view of the flywheel type magneto. Connect condenser and low tension leads as indicated by letters "B" and "C".

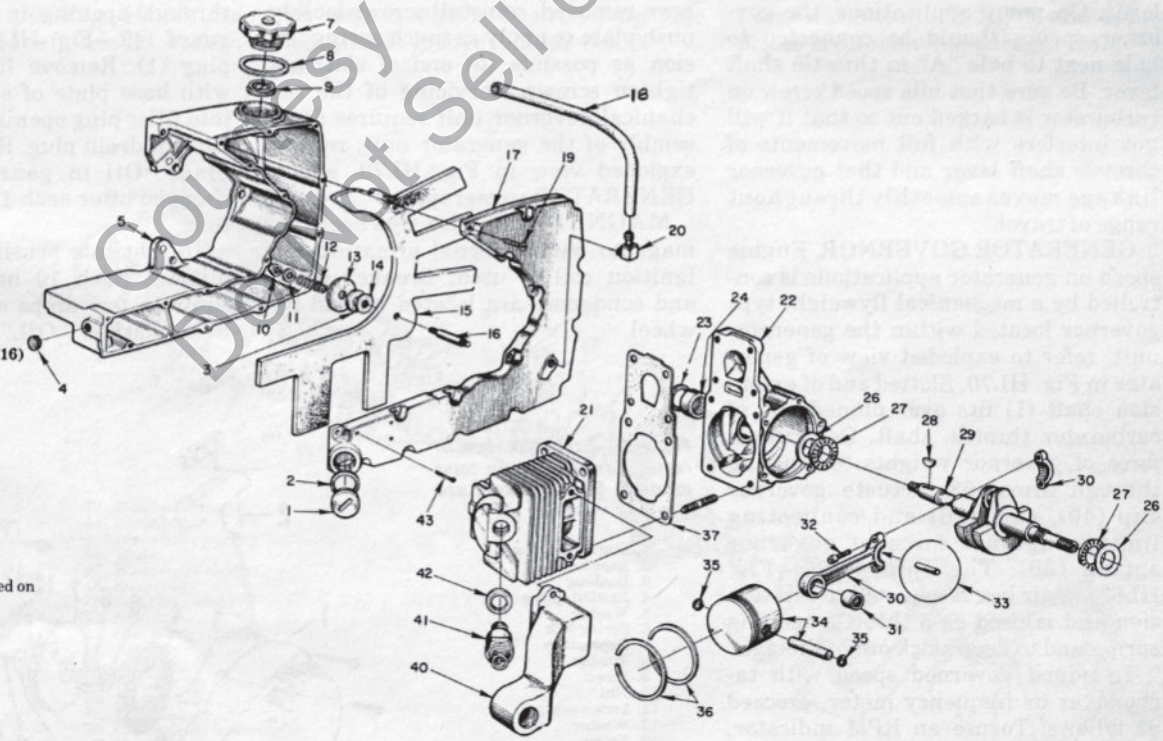
24. Flywheel
25. Condenser
26. Condenser clamp
28. Breaker box cover
29. Terminal block
30. Breaker point set
31. Washer
32. Pivot post clip
34. Gasket
37. Plate and armature assy.
38. Gasket
40. Felt seal
41. Coil retaining clip
42. Ignition coil assy.
43. High tension wire
44. Connector spring
45. Spark plug boot

Refer to appropriate following paragraph for information on other units which are equipped with governors.

CIRCULAR SAW GOVERNOR. Refer to exploded view of air box and handle assembly in Fig. HL61A. To adjust governed speed, loosen screw (40) and move slotted speed adjusting plate (39) to obtain desired maximum speed, then tighten screw. Maximum governed no-load speed should be 5000 rpm.

BRUSHCUTTER GOVERNOR. The engine used in Brushcutter application is equipped with an air-vane type governor; refer to Fig. HL62. Air vane (24) is connected to throttle shaft through link (26) and is balanced by tension of spring (38). When throttle trigger (62—Fig. HL71) is fully depressed, collar (36—Fig. HL62) on remote control cable moves away from throttle shaft lever allowing governor to control engine speed.

To adjust governor using vibrating reed or electronic tachometer, proceed as follows: With engine warm and running and throttle trigger released, adjust position of collar on remote control cable so that engine slow idle speed is 2500 rpm, or just below clutch engagement speed. Then when throttle trigger



1. Plug
2. Gasket
3. Felt washer
4. Plug
5. Fuel tank
7. Fuel cap
8. Gasket
9. Valve
10. Nut
11. Flat washer
12. Compression spring
13. Wick washer
14. Gasket
15. Fuel pick-up wick
16. Fuel pick-up stud
17. Fuel tank cover
18. Fuel line
19. Round head screws (16)
20. Fuel line elbow
21. Cylinder
22. Crankcase
23. Seal
24. Needle bearing
26. Thrust bearing race
27. Needle thrust bearing
28. Flywheel key
29. Crankshaft
30. Connecting rod
31. Needle bearing
32. Rod cap screws
33. Crankpin rollers (28)
34. Piston & pin assy.
35. Snap rings (only one used on late models)
36. Piston rings
37. Gasket
40. Manifold
41. Spark plug
42. Spark plug gasket

Fig. HL65–Exploded view of early XL-12 engine assembly. Later models are similar. Crankcase side cover, needle roller main bearing and the crankshaft seal are a part of the circular saw, pump, generator or brushcutter assembly as shown in Fig. HL68, HL69, HL70, or HL71. Saw, pump, generator or brushcutter must be disassembled to gain access to crankshaft; refer to appropriate unit paragraph.

is fully depressed, collar should move away from throttle shaft lever and engine no-load speed should be 6300 rpm. To adjust maximum governed no-load speed, loosen screw (17—Fig. HL62) and move speed adjusting plate (18) as required to obtain no-load speed of 6300 rpm. When adjusting maximum no-load speed, be sure throttle trigger is fully depressed and that collar (36) clears carburetor throttle shaft lever.

If carburetor or linkage has been removed, be sure that governor link is reconnected at hole "A" in carburetor throttle shaft lever as indicated in Fig. HL62. Governor spring (38) is connected to third hole away from hole "A" (two open holes between link and spring). Be sure that governor linkage moves smoothly throughout range of travel.

PUMP GOVERNOR. On pump applications, engine is equipped with air-vane type governor as shown in Fig. HL62; however, no control linkage is used (items 32 through 37).

With engine running under no load (CAUTION: Be sure pump housing is filled with water), engine speed should be 6400 to 6600 rpm. If not, loosen screw (17) and move speed adjusting plate (18) as necessary so that engine governed speed is 6500 rpm.

If carburetor has been removed or linkage has been disconnected, be sure that governor link (26) is reconnected in hole "A" in carburetor throttle shaft lever. On pump applications, the governor spring should be connected to hole next to hole "A" in throttle shaft lever. Be sure that idle speed screw on carburetor is backed out so that it will not interfere with full movements of throttle shaft lever and that governor linkage moves smoothly throughout range of travel.

GENERATOR GOVERNOR. Engine speed on generator applications is controlled by a mechanical flyweight type governor located within the generator unit; refer to exploded view of generator in Fig. HL70. Slotted end of extension shaft (1) fits over pinned end of carburetor throttle shaft. Centrifugal force of governor weights (64) acting through arms (63) actuate governor cup (40), cam (16) and connecting linkage against force of governor spring (39). The spring (29—Fig. HL63) in air box is adjusted to full tension and is used as a throttle opening spring and to keep slack out of linkage.

To adjust governed speed with tachometer or frequency meter, proceed as follows: To use an RPM indicator, remove receptacle housing (52—Fig. HL70) to gain access to end of generator shaft. With engine at operating temperature, governed no-load speed

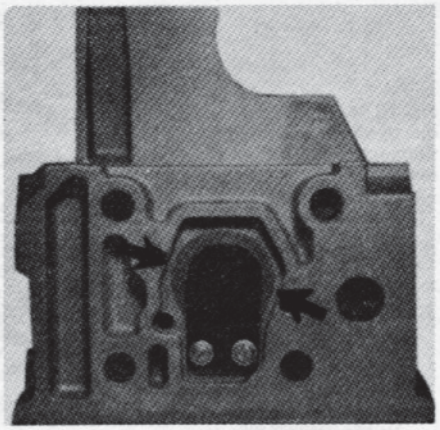


Fig. HL66–When installing reed valve, reed back-up and reed stop, be sure reed is centered between two points indicated by black arrows.

should be approximately 3750 rpm, or a reading of 63 cycles per second should be indicated on frequency meter. If engine speed or cycles per second is not as specified, loosen the two screws clamping governor shaft guide (10) to bearing housing (13) and move guide towards engine to increase speed, or towards generator to decrease speed. Note: Only one mounting hole of governor shaft guide is slotted and guide pivots on opposite screw. Tighten screws when proper speed is obtained.

If carburetor has been removed, reconnect throttle opening spring as indicated in Fig. HL63. If plate (18) has been removed, reinstall screws loosely, push plate to apply as much spring tension as possible (to end of slot) and tighten screws. Servicing of the mechanical governor unit requires disassembly of the generator unit; refer to exploded view in Fig. HL70, and to GENERATOR paragraph.

MAGNETO. A Wico flywheel type magneto with external armature and ignition coil is used. Breaker points and condenser are located behind flywheel.

Armature core and stator plate are riveted together and are serviced only as a unit. Stator plate fits firmly on shoulder of crankcase; hence, armature air gap is non-adjustable.

Magneto stator plate has slotted mounting holes, and should be rotated as far clockwise as possible before tightening mounting screws to obtain correct ignition timing of 30 degrees BTDC. Set breaker point gap to 0.015. Condenser capacitance should test 0.16-0.20 mfd. CAUTION: Be careful when installing breaker points not to bend tension spring any more than necessary; if spring is bent excessively, spring tension may be reduced causing improper breaker point operation.

LUBRICATION. The engine on all models is lubricated by mixing oil with regular gasoline. Fuel:oil ratio should be 32:1 when Homelite® SAE 40 Premium Motor Oil is mixed with fuel. Fuel:oil ratio should be 16:1 if Homelite® SAE 30 2-Cycle oil or another good grade of oil designed for air cooled two stroke engines is used.

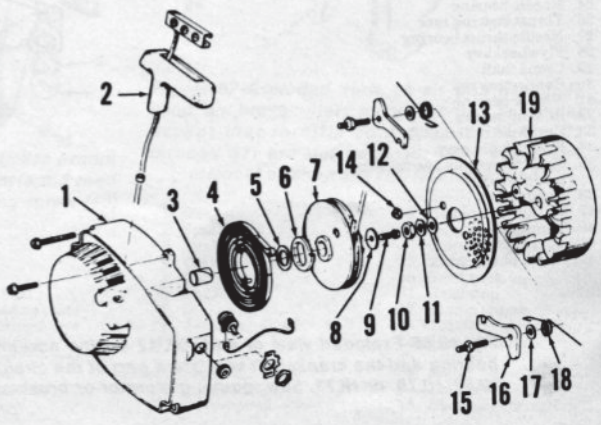
Lubricate generator by removing receptacle cover (52—Fig. HL70) from end of generator and applying 4 or 5 drops of oil to the felt washer (47) after each 200 hours of operation.

Gear case of circular saw must be filled to proper level with SAE 90 gear oil (Homelite part no. 55291-C) as follows: Remove saw blade and working through opening in retractable blade guard (49—Fig. HL68), remove drain plug (1). Remove filler plug (9) and with base plate of saw level, pour oil into filler plug opening until it starts to run out drain plug. Reinstall plugs and blade. Oil in gear case should be changed after each 100 hours of operation.

To lubricate brushcutter, proceed as follows: Each 10 hours of operation, squirt a few drops of SAE-30 oil into hole marked "OIL" on underside of

Fig. HL67–Exploded view of recoil starter used on later models. Early models are similar.

1. Starter housing
2. Rope handle
3. Bushing
4. Rewind spring
5. Washer
6. Spring lock
7. Rope pulley
8. Washer
9. Screw
10. Nut
11. Lock washer
12. Washer
13. Screen
14. Lock nut
15. Stud
16. Pawl
17. Washer
18. Spring
19. Flywheel



upper head casting. Remove driveshaft each 50 hours of operation, clean the shaft and lubricate it full length with a good grade of wheel bearing grease. Lower gear head should be repacked with a good grade of wheel bearing grease after each 50 hours of operation. Note: Do not wash lower head and bearing housing in solvent as this will wash lubricant from the sealed ball bearings, causing premature bearing failure.

Pump is lubricated by water in pump. CAUTION: Do not start pump engine without filling pump with water.

CARBON. Muffler, manifold and cylinder exhaust ports should be cleaned periodically to prevent loss of power through carbon build up. Remove muffler and scrape free of carbon; a bent wire can be inserted through hole in housing pump and generator mufflers to clean outer shell. With muffler or manifold removed, turn engine so that piston is at top dead center and carefully remove carbon from exhaust ports with a wooden scraper. Be careful not to damage chamfered edges of exhaust ports or to scratch piston. Do not run engine with muffler removed.

REPAIRS

CONNECTING ROD. Connecting rod and piston assembly can be removed after removing cylinder from crankcase. Refer to Fig. HL65. Be careful to remove all needle rollers when detaching rod from crankpin. Early models have 28 loose needle rollers while later models have 31 needle rollers.

Renew connecting rod if bent or twisted, or if crankpin bearing surface is scored, burned or excessively worn. The caged needle roller piston pin bearing can be renewed by pressing old bearing out and pressing new bearing in with Homelite tool No. 23756. Press on lettered end of bearing cage only.

It is recommended that the crankpin needle rollers be renewed as a set whenever engine is disassembled for service. On early models with 28 needle rollers, stick 14 needle rollers in the rod and remaining 14 needle rollers in rod cap with light grease or beeswax. On late models with 31 needle rollers, stick 16 rollers in rod and 15 rollers in rod cap. Assemble rod to cap with match marks aligned, and with open end of piston pin towards flywheel side of engine. Wiggle the rod as cap retaining screws are being tightened to align the fractured mating surfaces of rod and cap.

PISTON, PIN AND RINGS. The piston is fitted with two pinned compression rings. Renew piston if scored, cracked or excessively worn, or if ring side clearance in top ring groove exceeds 0.0035.

Recommended piston ring end gap is 0.070-0.080; maximum allowable ring end gap is 0.085. Desired ring side clearance in groove is 0.002-0.003.

Piston, pin and rings are available in standard size only. Piston and pin are available in a matched set, and are not available separately.

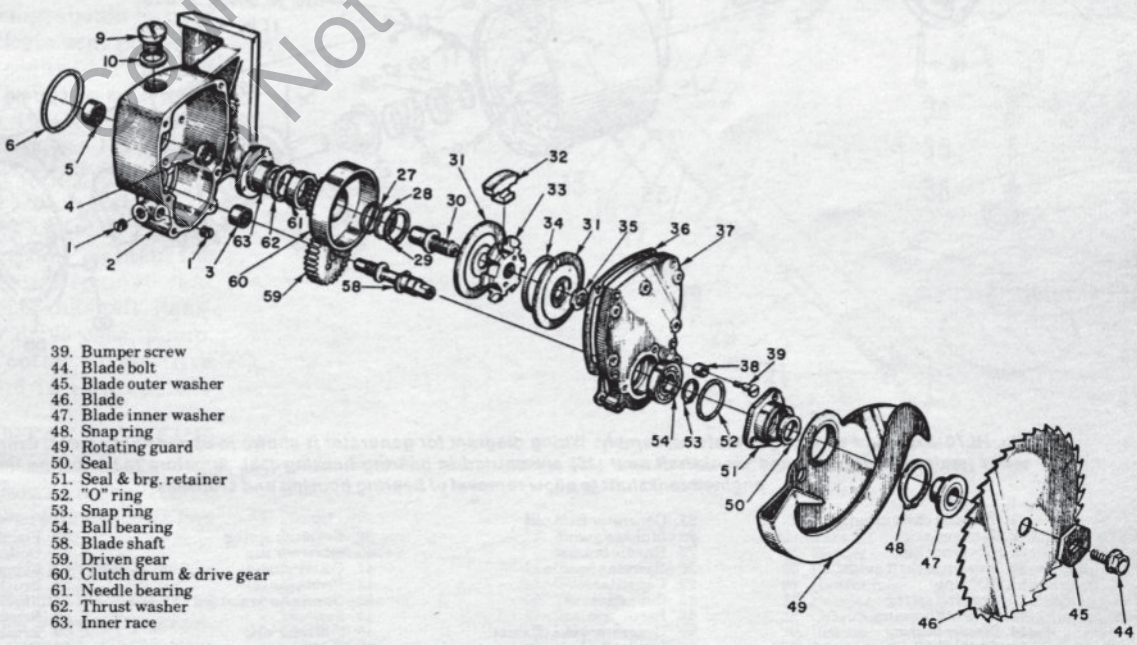
Piston pin has one open and one closed end and may be retained in piston with snap rings or a Spirol pin. A wire retaining ring is used on exhaust side of piston on some models and should not be removed.

To remove piston pin on all models, remove the snap ring at intake side of piston. On piston with Spirol pin at exhaust side, drive pin from piston and rod with slotted driver (Homelite tool No. A-23949). On all other models, insert a 3/16-inch pin through snap ring at exhaust side and drive piston pin out.

When reassembling, be sure closed end of piston pin is to exhaust side of piston (away from piston ring locating pin). Install Truarc snap ring with sharp edge out.

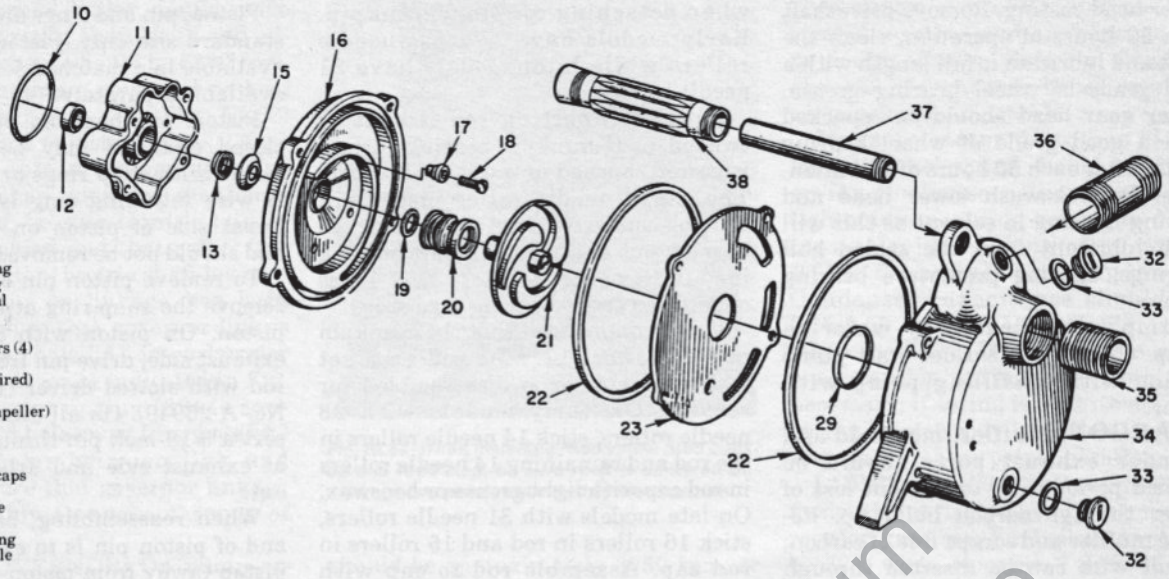
CRANKSHAFT. The crankshaft is supported in two caged needle roller bearings and crankshaft end play is controlled by a roller bearing and hardened steel thrust washer at each end of the shaft. Refer to Fig. HL65. On generator, crankshaft end play is taken up by a loading spring (12—Fig. HL70).

To remove crankshaft, it will be necessary to disassemble the circular saw drive case, pump, generator or brushcutter upper drive housing. Refer to Figs. HL68 through HL71 and appropriate accompanying paragraphs.



1. Drain plugs
2. Drive case
3. Needle bearing
4. Crankshaft seal
5. Needle (main) bearing
6. "O" ring
9. Filler plug
10. Gasket
27. Phenolic washer
28. Steel washer
29. Snap ring
30. Extension shaft (clutch adapter)
31. Clutch covers
32. Clutch shoes (3)
33. Clutch spider
34. Clutch springs (2)
35. Nut
36. Cover gasket
37. Drivecase cover
38. Guard bumper
39. Bumper screw
44. Blade bolt
45. Blade outer washer
46. Blade
47. Blade inner washer
48. Snap ring
49. Rotating guard
50. Seal
51. Seal & brg. retainer
52. "O" ring
53. Snap ring
54. Ball bearing
58. Blade shaft
59. Driven gear
60. Clutch drum & drive gear
61. Needle bearing
62. Thrust washer
63. Inner race

Fig. HL68–Exploded view of circular saw drive case assembly. Drive case (2) carries crankshaft needle roller bearing (5) and crankshaft seal (4). "O" ring (6) seals drive case to engine crankcase.



10. "O" ring
11. Bearing housing
12. Needle bearing
13. Crankshaft seal
15. Water slinger
16. Back plate
17. Sealing washers (4)
18. Screws (4)
19. Shims (as required)
20. Seal assembly
21. Pump rotor (impeller)
22. Gaskets
23. Wear plate
29. Gasket
32. Drain & filler caps
33. Gaskets
34. Pump end plate
35. Inlet fitting
36. Discharge fitting
37. Carrying handle
38. Rubber grip

Fig. HL69–Exploded view of centrifugal pump assembly. Pump rotor (21) must be unscrewed from engine crankshaft and back plate (16) be removed to allow removal of bearing housing (11) and engine crankshaft. Bearing housing retains crankshaft needle roller bearing (12) and crankshaft seal (13).

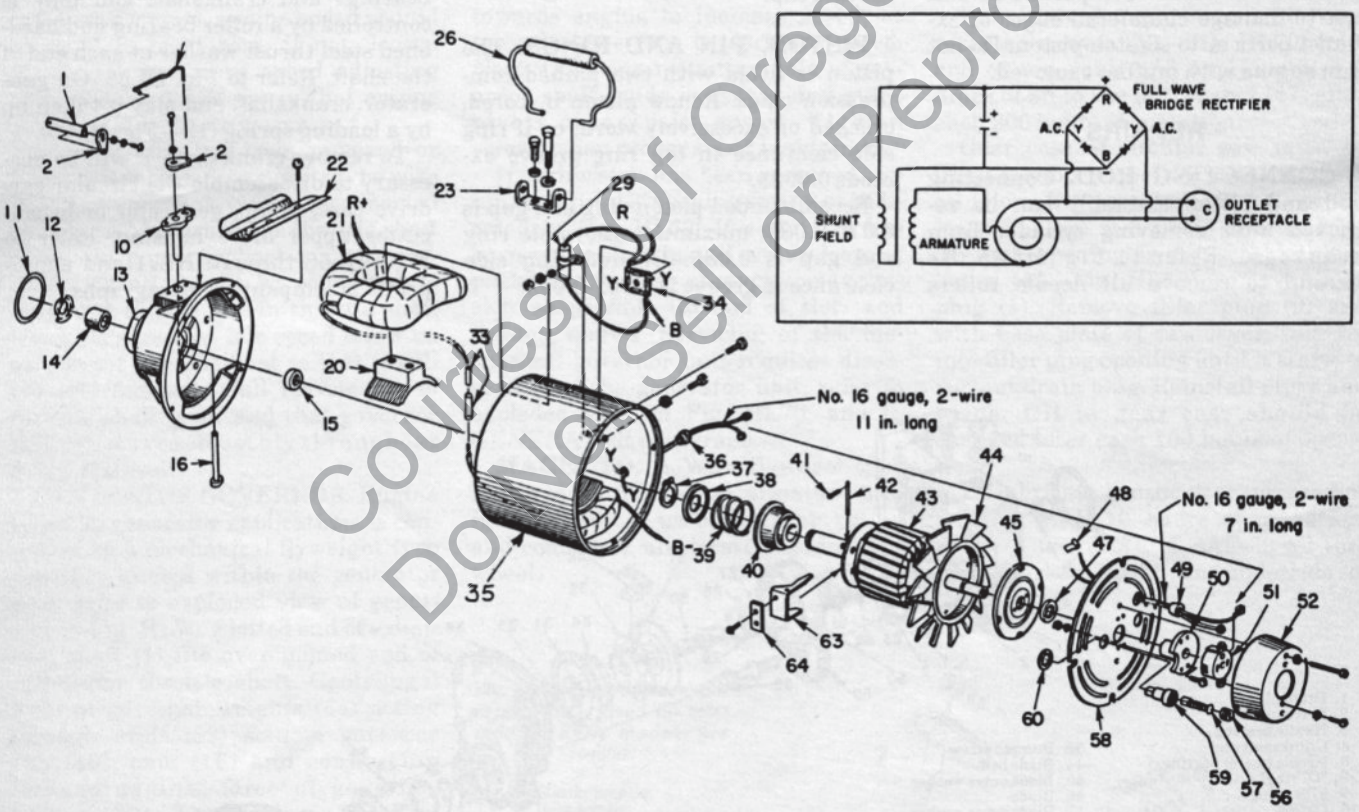


Fig. HL70–Exploded view of generator assembly. Wiring diagram for generator is shown in upper right corner. Crankshaft needle roller (main) bearing (14) and crankshaft seal (15) are carried in bearing housing (13). Armature (43) must be unscrewed from engine crankshaft to allow removal of bearing housing and crankshaft.

1. Throttle shaft extension
2. Linkage arms
6. Governor link
10. Governor shaft guide
11. "O" ring
12. Loading spring
13. Bearing housing
14. Needle bearing
15. Crankshaft seal
16. Governor cam & shaft
20. Generator field pole
21. Generator field coil
22. Linkage guard
23. Handle bracket
26. Carrying handle
29. Capacitor
33. Connector
34. Rectifier
35. Generator yoke (frame)
36. Insulating bushing
37. Snap ring
38. Centering washer
39. Governor spring
40. Governor cup
41. Cotter pins (4)
42. Pivot pins (2)
43. Generator armature
44. Fan
45. Collector ring
47. Felt washer
48. Brush holder clip
49. Insulating bushing
50. Flanged Oilite bushing
51. Outlet receptacle
52. Receptacle housing
56. Brush holder cap
57. Brush
58. Brush head
59. Brush holder
60. Holder retaining ring
63. Governor arms (2)
64. Governor weights (2)

CYLINDER. The cylinder bore is chrome plated. Renew the cylinder if chrome plating is worn away exposing the softer base metal.

CRANKCASE, BEARING HOUSING AND SEALS. CAUTION: Do not lose bearing housing-to-crankcase screws. New screws of same length must be installed in place of old screws. Refer to parts book if correct screw length is unknown.

The needle roller main bearings and crankshaft seals in crankcase and bearing housing can be renewed using Homelite tool Nos. 23757 and 23758. Press bearings and seals from crankcase or bearing housing with large stepped end of tool No. 23757, pressing towards outside of either case.

To install new needle bearings, use the shouldered short end of tool No. 23757 and press bearings into bores from inner side of either case. Press on lettered end of bearing cage only.

To install new seals, first lubricate the seal and place seal on long end of tool No. 23758 so that lip of seal will be towards needle bearing as it is pressed into place.

To install crankshaft, lubricate thrust bearings (27—Fig. HL65) and place on shaft as shown. Place a hardened steel thrust washer to the outside of each thrust bearing. Insert crankshaft into crankcase being careful not to damage seal in crankcase. Place a seal protector sleeve (Homelite tool No. 23759) on crankshaft and large "O" ring or gasket on shoulder of bearing housing. Note: On early production, crankcase was sealed to drivecase with an "O" ring; however, use of "O" ring has been discontinued and a gasket, rather than an "O" ring, should be used on all models. Lubricate seal protector sleeve, seal and needle bearing and assemble bearing housing to crankshaft and crankcase. Use **NEW** bearing housing retaining screws. Clean the screw threads and apply Loctite to threads before installing screws. Be sure the screws are correct length; screw length is critical. Tighten the screws alternately and remove seal protector sleeve from crankshaft. Reassemble circular saw drive case, pump, generator or brush cutter upper drive housing as outlined in appropriate paragraph.

FLAT REED INTAKE VALVE. The reed valve is attached to the carburetor air box as shown in Fig. HL66, and is accessible after removing air box from crankcase.

Check the reed seating surface on air box to be sure it is free of nicks, chips or burrs. Renew valve reed if rusted, pitted or cracked, or if it does not seat flatly against its seat.

The reed stop is curved so that measurement of reed lift distance is not practical. However, be sure that reed is centered over opening in air box and reed stop is aligned with reed.

NOTE: If air box has been removed to service reed valve (35—Fig. HL61 or 4—Fig. HL61A), inspect gasket between air box and crankcase. If gasket is damaged and cylinder is not being removed for other purposes, it is suggested that the exposed part of the old gasket be carefully removed and the new gasket be cut to fit between the air box and crankcase. Also, refer to note in CARBURETOR paragraph in MAINTENANCE section.

REWIND STARTER. To disassemble starter, refer to exploded view in Fig. HL67 and proceed as follows: Pull starter rope out fully, hold pulley (11) and pry rope knot from pulley. Let pulley rewind slowly. Hold pulley while removing screw (14) and washer (13). Turn pulley counterclockwise until disengaged from spring, then carefully lift pulley off starter post. Turn open side of housing down and rap housing sharply against top of work bench to remove spring. CAUTION: Be careful not to dislodge spring when removing pulley as spring could cause injury if it should recoil rapidly.

Install new spring with loop in outer end over pin in blower housing and be sure spring is coiled in direction shown in Fig. HL67. Install pulley (11), turning pulley clockwise until it engages spring and secure with washer and screw. Insert new rope through handle and hole in blower housing. Knot both ends of the rope and harden the knots with heat or cement. Turn pulley clockwise eight turns and slide knot in rope into slot and keyhole in pulley. Let starter pulley rewind slowly.

Starter pawl spring outer ends are hooked behind air vanes on flywheel in line with starter pawls when pawls are resting against flywheel nut. Pull starter rope slowly when installing blower housing so that starter cup will engage pawls.

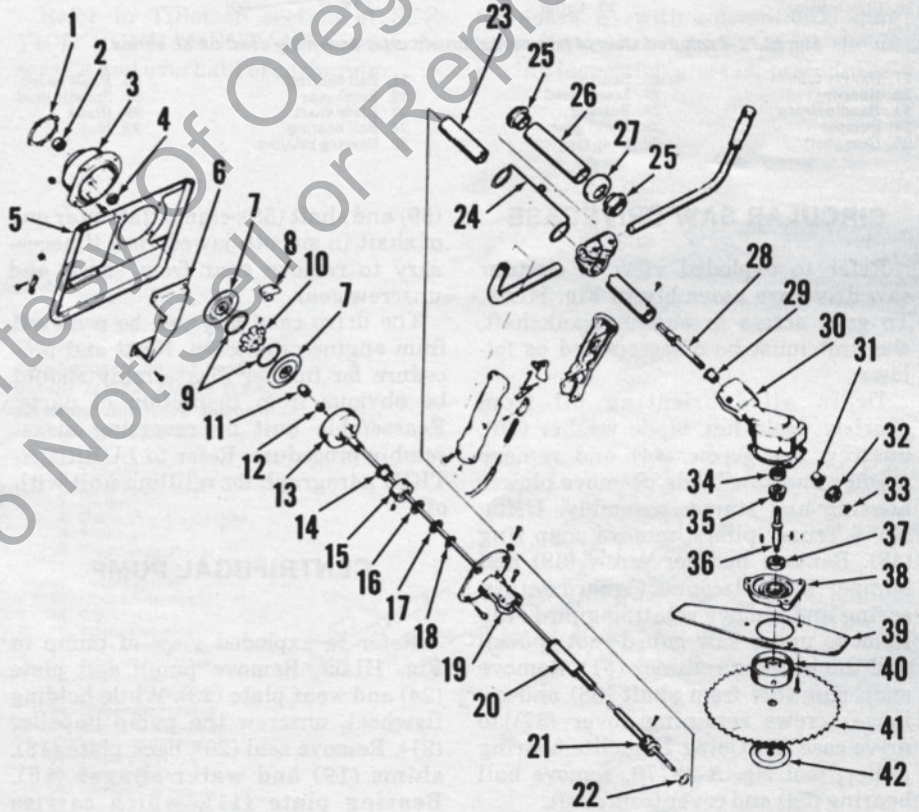


Fig. HL71–Exploded view of early type brushcutter assembly. Refer to Fig. HL72 for later brushcutter.

1. Gasket
2. Needle roller bearing
3. Bearing housing
4. Seal
5. Frame assy.
6. Exhaust deflector
7. Clutch cover
8. Clutch shoe
9. Clutch spring
10. Clutch hub
11. Spacer
12. Nut
13. Driveshaft & clutch drum
14. Flanged bearing
15. Collar
16. Thrust washer
17. Spacer
18. Snap ring
19. Upper head
20. Shaft casing
21. Split bushing
22. "O" ring
23. Tube
24. Hanger
25. Collar
26. Hanger tube
27. Bumper
28. Gear shaft
29. Bearing
30. Lower head
31. Bearing
32. Bevel gear
33. Snap ring
34. Ball bearing
35. Bevel gear
36. Blade shaft
37. Ball bearing
38. Bearing retainer
39. Blade guard
40. Spindle head
41. Blade
42. Nut

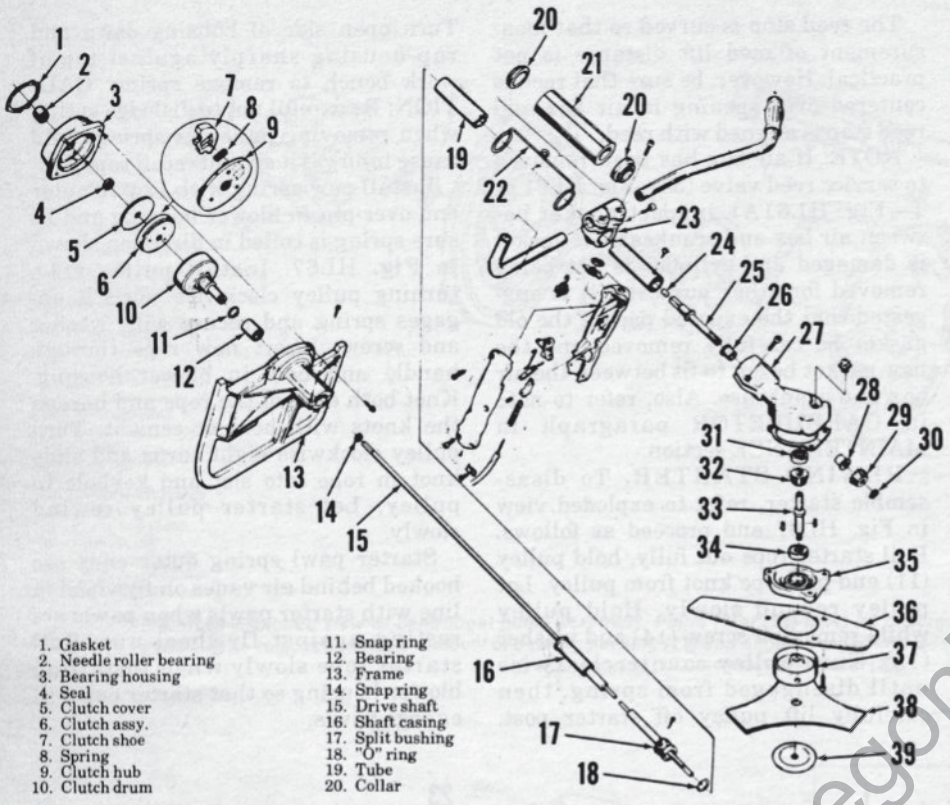


Fig. HL72–Exploded view of late model brushcutter assembly used on XL series.

21. Hanger tube
22. Hanger
23. Handle clamp
24. Bumper
25. Gear shaft
26. Bearing
27. Lower head
28. Bearing
29. Bevel gear
30. Snap ring
31. Ball bearing
32. Bevel gear
33. Blade shaft
34. Ball bearing
35. Bearing retainer
36. Blade guard
37. Spindle head
38. Blade
39. Nut

CIRCULAR SAW DRIVECASE

Refer to exploded view of circular saw drivecase assembly in Fig. HL68. To gain access to engine crankshaft, the unit must be disassembled as follows:

Drain all lubricating oil from gearbox. Hold hex blade washer (45), unscrew cap screw (44) and remove washer and saw blade. Remove blower housing and starter assembly. Using No. 6 Truarc pliers, remove snap ring (48). Remove bumper screw (39) and bumper (38), disconnect guard return spring and remove rotating guard (49). Remove upper saw guard (not shown) and the bearing retainer (51). Remove snap ring (53) from shaft (58) and remove screws retaining cover (37) to drive case (2). Using Homelite bearing puller, tool No. A-23778, remove ball bearing (54) and cover from shaft.

While holding flywheel with Homelite tool #A-23761, remove nut (35), clutch cover (31) and unscrew clutch rotor using Homelite tool No. A-23696. Remove extension shaft (30) from crankshaft with a socket head screw (Allen) wrench. Remove snap ring (29) and pull clutch drum (60) from flanged bushing (63). Withdraw driven gear (59) and shaft (58); clamp flat outer end of shaft in smooth jawed vise, if necessary to remove gear from shaft, and unscrew gear.

The drive case can now be removed from engine crankcase. Need and procedure for further disassembly should be obvious from inspection of parts. Reassemble unit by reversing disassembly procedure. Refer to LUBRICATION paragraph for refilling unit with oil.

CENTRIFUGAL PUMP

Refer to exploded view of pump in Fig. HL69. Remove pump end plate (34) and wear plate (23). While holding flywheel, unscrew the pump impeller (21). Remove seal (20), back plate (16), shims (19) and water slinger (15). Bearing plate (11), which carries crankshaft needle roller bearing (12) and seal (13) can then be removed.

When reassembling unit, use all new seals and gaskets. Shims (19) are available in thicknesses of 0.010 and 0.015; install shims to provide minimum clearance between impeller (21) and wear plate (23) without causing impeller to rub against the plate.

Refill pump assembly with water before attempting to start engine. Water in pump is necessary to lubricate pump seal (20).

GENERATOR

Refer to exploded view of the generator unit in Fig. HL70. To gain access to the engine governor unit or engine crankshaft, proceed as follows:

Remove two outside screws holding receptacle cover (52) to brush head (58) and move receptacle assembly aside. Remove brush holder caps (56) and brushes, taking particular care to note position and location of brushes so that they may be reinstalled in same position and location. Remove brush head (58), bearing (50) and felt washer (47). Remove screws retaining collector ring (45) and remove collector ring from fan. Remove fan (44), from armature (43) taking care not to lose the Woodruff key (not shown). Unbolt generator yoke (35) from bearing housing (13) and slide yoke from armature. Using a strap wrench, unscrew the armature from engine crankshaft while holding engine flywheel. Procedure and need for further disassembly is obvious from inspection of unit. After reassembly check adjustment of governor as outlined in GOVERNOR paragraph.

BRUSHCUTTER

To gain access to crankshaft bearing housing (3—Fig. HL71 or HL72), or engine crankshaft, proceed as follows:

On early models, unbolt upper head (26—Fig. HL71) from bearing housing and remove brushcutter unit and frame (5). While holding engine flywheel, remove nut (12), spacer (11) and outer clutch cover; then unscrew clutch hub (10) from engine crankshaft. Remove inner clutch cover. Bearing housing can now be removed from engine crankcase. Note: Some early models have a flexible driveshaft instead of the rigid driveshaft shown in Fig. HL71. To remove nut (42) from blade shaft, insert a ¼ inch steel rod in hole in spindle head (40) to hold shaft from turning.

On later models, unscrew capscrews securing frame (13—Fig. HL72) to bearing housing (3) and separate brushcutting unit from engine. Remove snap ring (11) and clutch drum (10). Rotate clutch hub in counterclockwise direction to remove clutch assembly. Bearing housing can now be removed from engine as previously outlined. To remove nut (39) from blade shaft, insert a ¼ inch steel rod in hole in spindle head (27) to prevent shaft from turning.

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Model	Bore Inches	Stroke Inches	Displ. Cu. In.
XL-88, XL-98, XL-98A, XLS2-1, XLS2-1A	2 1/16	1½	5.0

This section covers service of the model XL-88, XL-98 and XL-98A Multi-Purpose saw and XLS2-1 and XLS2-1A pump. The saw may be equipped with either an abrasive wheel or carbide tipped wheel. Caution should be taken that abrasive wheels installed on this unit are rated for spindle speeds of 5000 rpm or higher.

MAINTENANCE

SPARK PLUG. A Champion model CJ-6 spark plug is used. For heavy duty operation, a Champion HO-8A platinum tip or UJ-11-G gold palladium tip spark plug can be used, though it will be necessary to pull the plug wire further out of the retaining clip in air box. Set electrode gap to 0.025 on all models.

CARBURETOR. All models are equipped with a Tillotson model HS diaphragm carburetor. Refer to Figs. HL75 and HL76 for exploded views of carburetor. Carburetor used on model XL-98A (See Fig. HL76) has a fixed main jet (19) and a governor valve (6) which is designed to maintain a governed speed of about 5000 rpm. Neither main jet nor governor valve is adjustable. Carburetor on model XLS2-1A does not have adjustable idle or high speed mixture screws.

Initial carburetor adjustment on saw models is one turn open for idle mixture and high speed mixture screw, if so equipped. Adjust idle mixture screw and idle speed screw to obtain smooth idle with engine warm and running at 2400-2600 rpm which should be just below clutch engagement speed. Adjust high speed mixture screw, on models so equipped, to obtain optimum engine performance at cutting speed with saw under normal load. Do not adjust mixture screws too lean as engine damage may result.

To adjust carburetor on XLS2-1 pump models, turn idle and high speed mixture screws until they are 1½ turns open. Start engine and allow to run until warm. Adjust high speed mixture screw for highest pumping speed obtainable then turn high speed mixture screw ⅛ turn counterclockwise. Note: Governor is designed to limit maximum no-load speed to 6400 rpm. Adjust idle mixture screw by pulling throttle button all the way out and turn idle mixture screw to obtain highest and smoothest idle speed. Turn idle speed screw to obtain idle speed of approximately 3000 rpm. Adjustment of one mixture screw will require checking adjustment of remaining mixture screw as operation of mixture needles is related.

Refer to Tillotson section of SERVICE FUNDAMENTALS section for service and overhaul of carburetor.

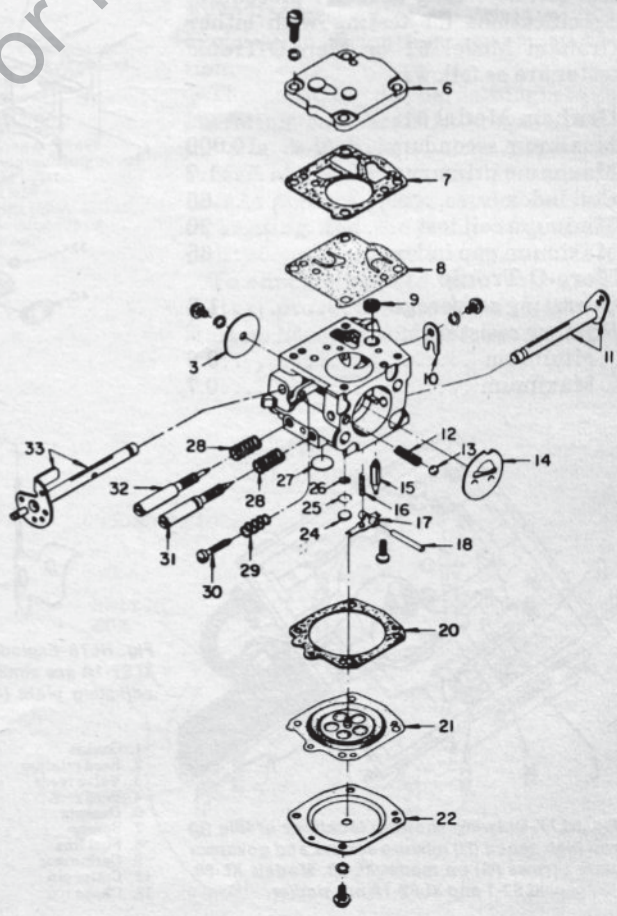

Fig. HL75–Exploded view of Tillotson series HS carburetor used on all models except XL-98A. Model XLS2-1A does not have mixture needles (29 & 30).

3. Throttle plate
6. Diaphragm cover
7. Gasket
8. Fuel pump diaphragm
9. Filter screen
10. Throttle shaft clip
11. Choke shaft
12. Detent spring
13. Choke detent ball
14. Choke plate
15. Inlet valve needle
16. Inlet lever spring
17. Inlet control lever
18. Lever hinge pin
19. Pin retainer screw
20. Diaphragm gasket
21. Metering diaphragm
22. Diaphragm cover
24. Welch plug-3/16
25. Retainer ring
26. Channel screen
27. Welch plug-11/32
28. Mixture needle springs (2)
29. Main fuel needle
30. Idle fuel needle
31. Throttle shaft
32. Throttle spring
33. Idle speed screw spring
34. Idle speed screw

MAGNETO. (MODEL XL-88) Model XL-88 is equipped with a Wico breakerless solid state magneto; refer to exploded view of magneto in Fig. HL80.

To check the solid state magneto, disconnect spark plug wire, turn ignition switch on and crank engine while holding terminal about ¼-inch away from ground (engine casting) and check for spark as with conventional magneto. If no spark occurs, refer to the following inspection and test procedure:

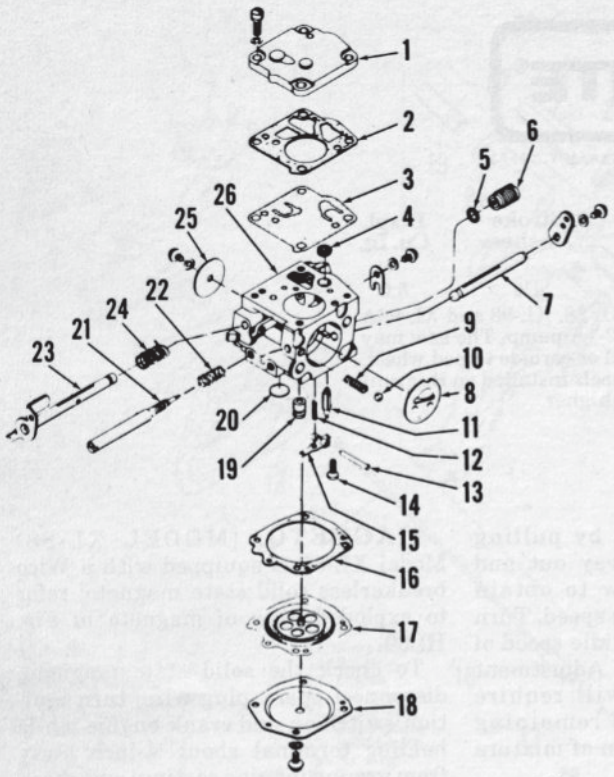

Fig. HL76–Exploded view of Tillotson model HS carburetor used on model XL-98A. Note governor valve (6). There is no high speed mixture needle on this carburetor.

1. Diaphragm cover
2. Gasket
3. Fuel pump diaphragm
4. Filter screen
5. Gasket
6. Governor valve
7. Choke shaft
8. Choke plate
9. Spring
10. Choke detent ball
11. Inlet valve needle
12. Inlet lever spring
13. Lever pin
14. Screw
15. Inlet control lever
16. Diaphragm gasket
17. Metering diaphragm
18. Diaphragm cover
19. Main jet
20. Welch plug
21. Idle mixture screw
22. Spring
23. Throttle shaft
24. Spring
25. Throttle plate
26. Body

Visually inspect rotor (flywheel) for damage. Check for broken or frayed wires.

To test the ignition coil, disconnect the wires at insulating sleeve (39) and test coil according to tester procedure. Specifications for testing with either Graham Model 51 or Merc-O-Tronic tester are as follows:

Graham Model 51:

Maximum secondary	10,000
Maximum primary	1.7
Coil index	65
Minimum coil test	20
Maximum gap index	65

Merc-O-Tronic

Operating amperage	1.3
Primary resistance:	
Minimum	0.6
Maximum	0.7
Secondary continuity:	
Minimum	50
Maximum	60

Renew the ignition coil if found faulty and again check for spark. If no spark then occurs or if ignition coil checked OK, proceed as follows:

Remove the flywheel and again check for broken or frayed wires. If no defect is noted, remove the screw attaching condenser to magneto back plate and be sure condenser is not touching back plate or other ground. Push a pin through the condenser lead and using condenser tester, check for short, series resistance and capacitance; condenser capacitance should be 0.16-0.20 mfd. If condenser is faulty, renew the switch box and condenser assembly (26). If condenser tested OK, proceed as follows:

Disconnect coil primary at insulating sleeve (39) and disconnect

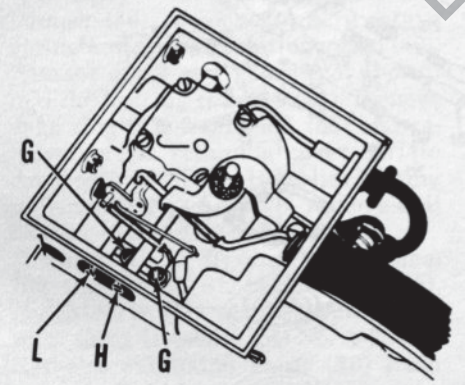

Fig. HL77–Drawing showing locations of idle (L) and high speed (H) mixture screws and governor plate screws (G) on model XL-88. Models XL-98, XLS2-1 and XLS2-1A are similar.

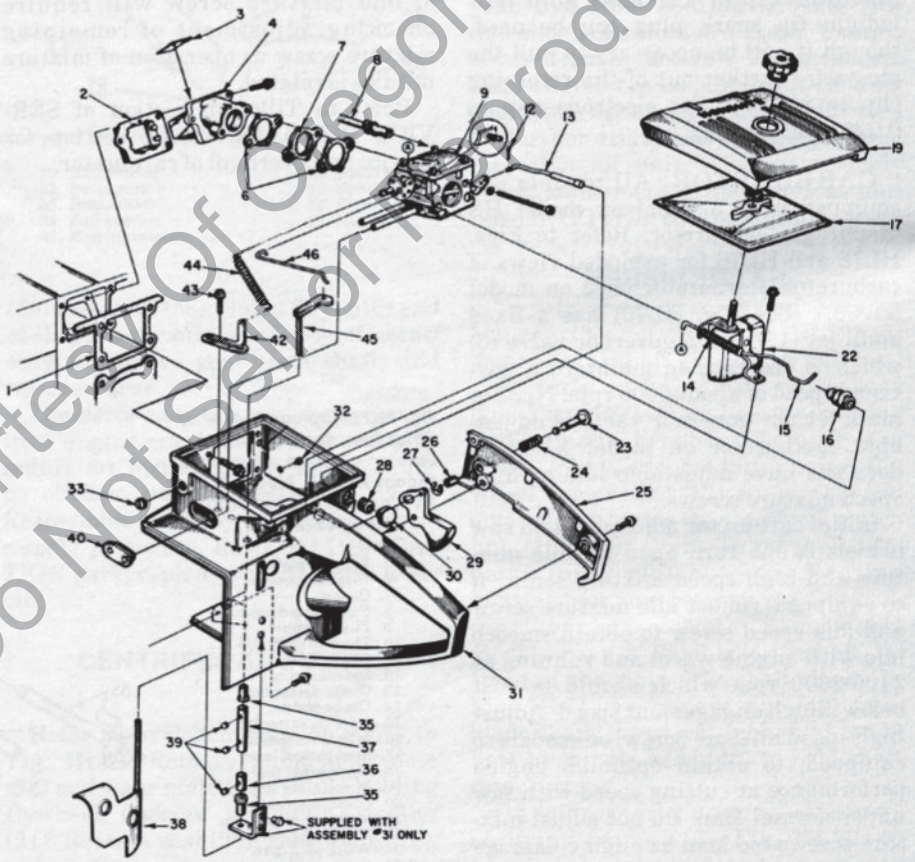

Fig. HL78–Exploded view of model XL-88 air box and handle assembly. Models XL-98, XLS2-1 and XLS2-1A are similar. Governed speed is adjusted by loosening screw (43) and moving slotted speed adjusting plate (42). Reed retainer (2) should be installed in engine intake port, then install reed seat (4) with reeds (3).

1. Gasket
2. Reed retainer
3. Valve reeds
4. Reed seat
6. Gaskets
7. Spacer
8. Fuel line
9. Carburetor
12. Cotter pin
13. Choke rod
14. Return spring
15. Throttle rod
16. Boot
17. Filter element
19. Air filter cover
22. Air deflector
23. Throttle lock pin
24. Throttle lock spring
25. Handle cover
26. Nylon bushing
27. Snap ring
28. Grommet
29. Throttle trigger
30. Choke button
31. Handle & air box
32. Plug
33. Plug
35. Bushing
36. Collar
37. Coupling
38. Air vane & shaft
39. Set screws
40. Grommet
42. Speed adjusting plate
43. Adjusting plate screw
44. Governor spring
45. Governor arm & shaft
46. Carburetor link

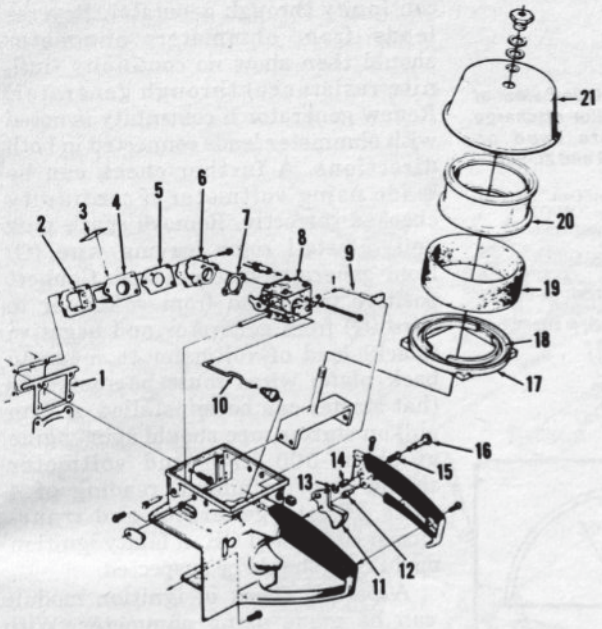

Fig. HL79–Exploded view of air box assembly used on model XL-98A.

1. Gasket
2. Reed retainer
3. Reed petal
4. Reed seat
5. Gasket
6. Intake manifold
7. Gasket
8. Carburetor
9. Choke button
10. Throttle rod
11. Throttle trigger
12. Pin
13. Snap ring
14. Nylon bushing
15. Lock spring
16. Throttle lock
17. Air cleaner base
18. Gasket
19. Filter element
20. Filter mount
21. Filter cover

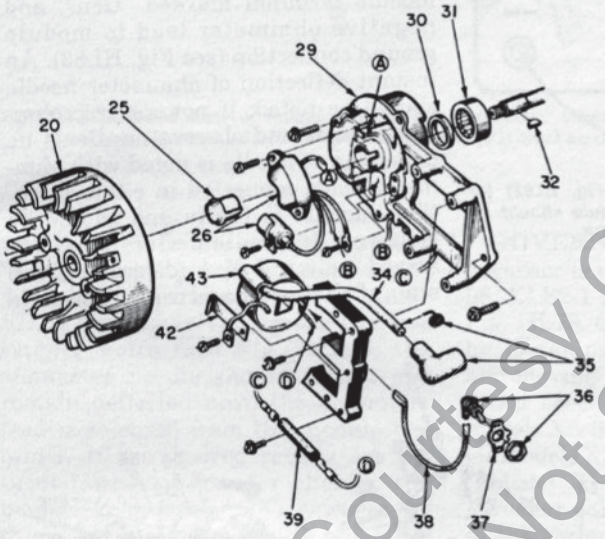

Fig. HL80–Exploded view of the solid state (breakerless) magneto used on model XL-88. Trigger switch and condenser (26) are available as assembly only. The trigger coil is molded into back plate (29).

20. Flywheel (rotor)
25. Dust cap
26. Trigger switch & condenser
29. Back plate & trigger coil
30. Crankshaft seal
31. Roller bearing
32. Woodruff key
34. Spark plug wire
35. Spark plug terminal
36. Magneto grounding switch
37. "ON-OFF" plate
38. Ground lead
39. Insulating sleeve
42. Coil retaining clip
43. Ignition coil

switch box ground lead from back plate (See Fig. HL81). Remove the screw attaching condenser to back plate and be sure condenser is insulated from any ground. Be sure the switch box ground lead and ignition coil lead are not touching anything and connect leads of an ohmmeter to the two leads. Meter should read either between 1 megohm and infinity or between 5 and 25 ohms; with ohmmeter leads reversed, reading should be opposite that of preceding test. That is, if first reading obtained was 5-25 ohms, second reading should be 1 megohm to infinity. If ohmmeter readings are not as specified, renew the switch box and condenser assembly. If switch box tested OK, test trigger coil as follows:

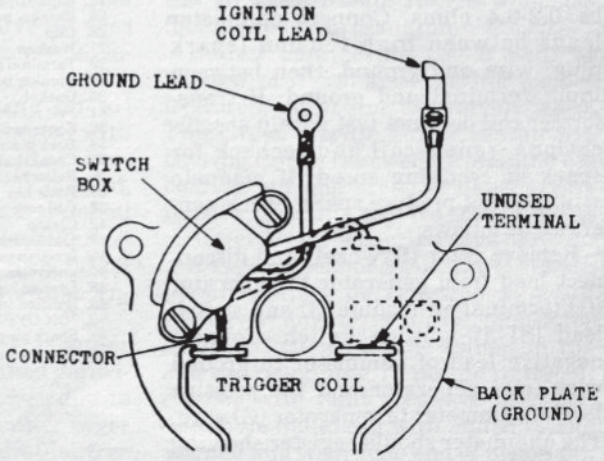

Fig. HL81–Drawing showing points for ohmmeter test lead connections for checking solid state magneto trigger coil, condenser and switch box. Refer to text for procedure and specifications.

Connect one ohmmeter lead to connector between switch box and trigger coil and other ohmmeter lead to back plate (ground). Reading should be either between 0 to 85 ohms or between 85 to 150 ohms. Reverse the leads; second reading on ohmmeter should be opposite first reading. That is, if first reading was in specified range of 0-85 ohms, second reading should be within range of 85-150 ohms. Then, connect the ohmmeter leads to unused terminal of trigger coil and to magneto back plate. Ohmmeter reading should then be 20 to 26 ohms. If trigger coil does not test within specifications, renew the magneto back plate and trigger coil assembly.

When reassembling magneto, check back plate and remove any sharp edges, especially where wires may contact the back plate. Be sure all leads are in place as shown in Fig. HL81. Be sure the back plate is clean and check all screws for tightness. If there is any doubt about the strength of the rotor (flywheel) magnets, install a new flywheel; be sure to remove "keeper" plates from new flywheel before installing it.

(MODELS XL-98, XL-98A). Models XL-98 and XL-98A are equipped with the capacitor discharge ignition system shown in Fig. HL82. Refer to CAPACITOR DISCHARGE IGNITION SYSTEM section of this manual for explanation of ignition system operation.

The capacitor discharge magneto is operating satisfactorily if spark will jump a ⅜-inch gap when engine is turned at cranking speed. If magneto fails to produce spark, service consists of locating and renewing inoperative unit; no maintenance is necessary.

To check magneto with volt-ohmmeter, proceed as follows: Remove starter housing and disconnect wire

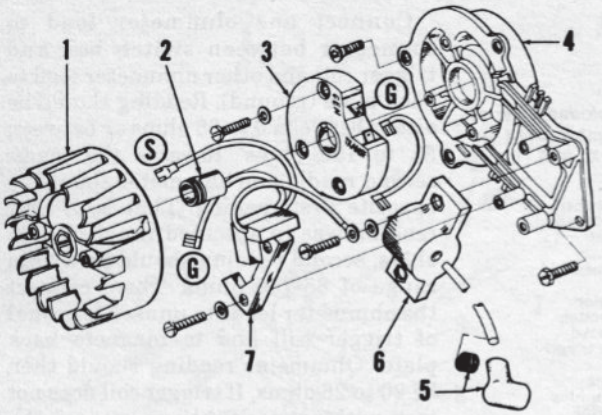

Fig. HL82–Exploded view of Phelon capacitor discharge type magneto used on models XL-98 and XL-98A.

G. Connector to "Gen." terminal
S. Connector to "ON-OFF"
1. Magneto rotor (flywheel)
2. Dust cap
3. Ignition module
4. Back plate
5. High tension wire & terminal
6. Transformer coil
7. Generator coil & armature

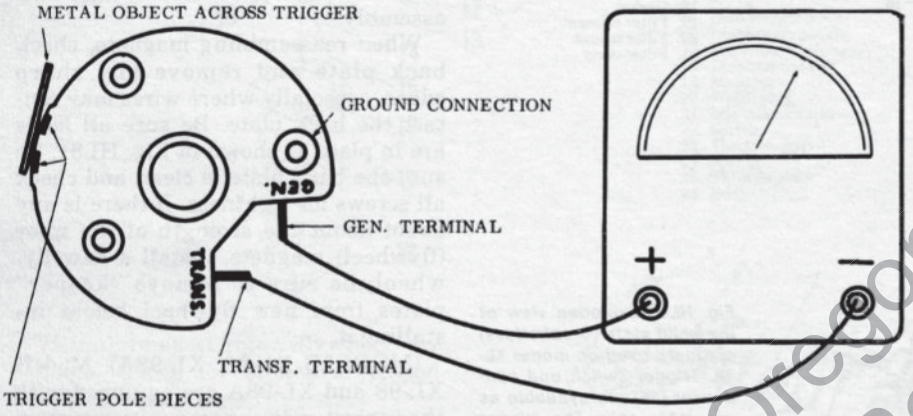

Fig. HL83–Drawing showing volt-ohmmeter connections to ignition module (3–Fig. HL82) for checking module. It should be noted that this is not a conclusive test and module should be renewed in event of spark failure when other magneto components test OK.

from ignition switch. Check to be sure there is no continuity through switch when in "ON" position to be sure a grounded switch is not cause of trouble and inspect wiring to be sure it is not shorted. CAUTION: Be sure that storage capacitor is discharged before touching connections; flip ignition switch to "OFF" position or ground switch lead (S).

Resistance through secondary (high tension) winding of transformer coil should be 2400 to 2900 ohms and resistance through primary winding should be 0.2-0.4 ohms. Connect ohmmeter leads between high tension (spark plug) wire and ground, then between input terminal and ground. If transformer coil does not test within specifications, renew coil and recheck for spark at cranking speed. If magneto still does not produce spark, check generator as follows:

Remove rotor (flywheel) and disconnect lead from generator to generator (G) terminal on module (3) and switch lead (S) at ignition switch. Connect negative lead of ohmmeter to ground wire from generator and the positive lead of ohmmeter to generator (G) wire. The ohmmeter should register showing continuity through generator. Reverse leads from ohmmeter; ohmmeter should then show no continuity (infinite resistance) through generator. Renew generator if continuity is noted with ohmmeter leads connected in both directions. A further check can be made using voltmeter if continuity checked correctly. Remove spark plug and reinstall rotor leaving wire (G) from generator disconnected. Connect positive (red) lead from voltmeter to wire (G) from generator and negative (black) lead of voltmeter to magneto back plate; wires must be routed so that starter can be reinstalled. A firm pull on starter rope should spin engine at about 500 RPM and voltmeter should show minimum reading of 4 volts. If both generator and transformer coil tested OK, a faulty ignition module (3) should be suspected.

A partial check of ignition module can be made using ohmmeter. With ohmmeter set to R X 1000 scale, connect positive (red) lead of ohmmeter to module terminal marked "Gen." and negative ohmmeter lead to module ground connection (see Fig. HL83). An instant deflection of ohmmeter needle should be noted; if not, reverse ohmmeter leads and observe needle. If no deflection of needle is noted with ohmmeter leads connected in either direction, module is faulty and should be renewed. If needle deflection is observed, select R X 1 (direct reading) scale of ohmmeter and connect positive

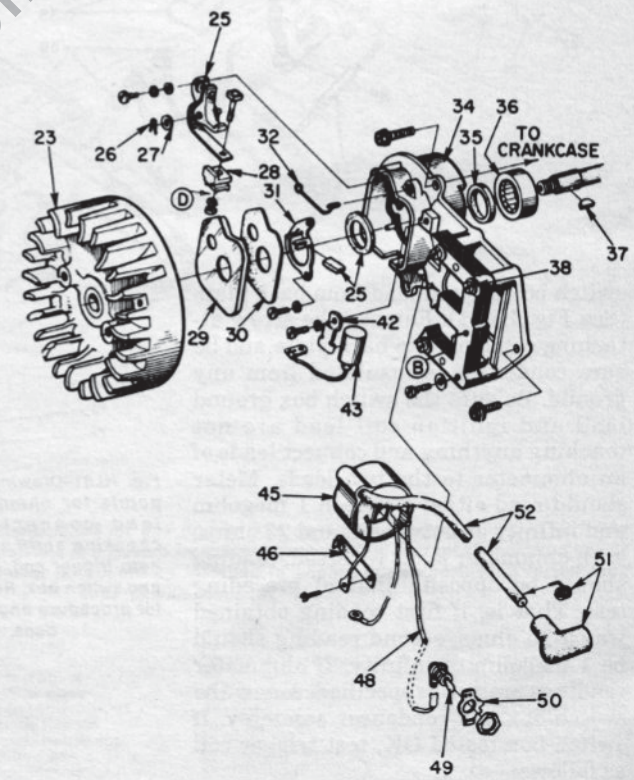

Fig. HL84–Exploded view of conventional flywheel type magneto used on models XLS2-1 and XLS2-1A. Coil clip retaining screw location is shown by letter "B". Condenser lead and ignition coil primary lead are attached to terminal block (28) at "D".

23. Rotor (flywheel)
25. Breaker point set
26. Clip
27. Washer
28. Terminal block
29. Breaker box cover
30. Gasket
31. Felt retainer
32. Cover spring clip
34. Back plate
35. Crankshaft seal
36. Roller bearing
37. Rotor key
38. Coil core (armature)
42. Clamp
43. Condenser
45. Ignition coil
46. Coil retaining clip
48. Ground lead
49. Ignition switch
50. "ON-OFF" plate
51. Spark plug terminal
52. Spark-plug wire

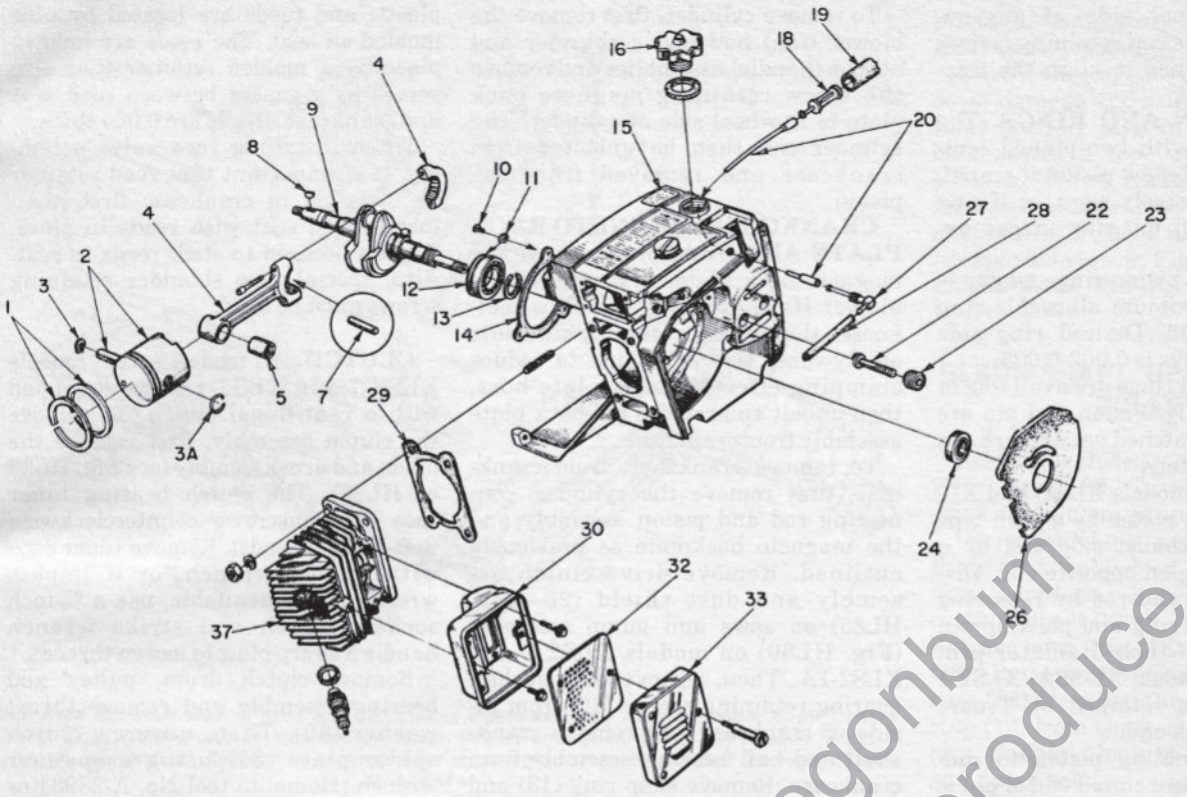

Fig. HL85–Exploded view of model XL-88 engine assembly; other models are similar. Magneto back plate (29–Fig. HL81) carries magneto end of crankshaft. Model XL-88 saw arm stud retainers (23) must be unscrewed to remove the captive studs (22); do not attempt to uncrew the studs.

(red) lead to module terminal marked "Gen." and place negative (black) lead against terminal marked "Trans." Place a screwdriver across the two trigger poles (see Fig. HL83); the ohmmeter needle should deflect and remain deflected until the ohmmeter lead is released from the module terminal. If the desired results are obtained with ohmmeter checks, the module is probably OK; however, as this is not a complete check and other magneto components and wiring check OK, renew module if no ignition spark can yet be obtained.

(MODELS XLS2-1, XLS2-1A). Models XLS2-1 and XLS2-1A are equipped with a conventional flywheel magneto ignition system as shown in Fig. HL84. Breaker points and condenser are accessible after removal of starter housing, flywheel and breaker box cover. Adjust breaker point gap to 0.015. Condenser capacity should test 0.18-0.22 mfd. Ignition timing is fixed at 30° BTDC. After reinstalling flywheel, check armature air gap which should be 0.005-0.007. To adjust air gap, turn flywheel so that magnets are below legs of armature core and place plastic shim (Homelite part No. 23987) between armature and magnets. Loosen then tighten armature retaining screws and remove shim.

GOVERNOR. An air vane type governor is used on models XL-88, XL-98, XLS2-1 and XLS2-1A as shown in Fig. HL78. Governed speed is adjusted by loosening screws (43—Fig. HL78) and moving plate (42). Maximum governed speed should be 5000 rpm for models XL-88 and XL-98 and 6400 rpm for models XLS2-1 and XLS2-1A.

Model XL-98A is equipped with a governor valve (6—Fig. HL76) located in the carburetor. At the desired governed speed, the governor valve will open and allow additional fuel into the engine. This excessively rich fuel mixture will prevent engine overspeeding. Governed speed should be 5000 rpm and is not adjustable. If valve (6) does not function properly, it must be renewed as a unit.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline. If Homelite® Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used.

CARBON. Muffler and cylinder exhaust ports should be cleaned periodically to prevent loss of power due to carbon build up. Remove muffler cover and baffle plate and scrape muffler free of carbon. With muffler cover removed, turn engine so that piston is at top dead center and carefully remove carbon from exhaust ports with wooden scraper. Be careful not to damage the edges of exhaust ports or to scratch piston. Do not attempt to run engine with muffler baffle plate or cover removed.

REPAIRS

CONNECTING ROD. Connecting rod and piston assembly can be removed after removing cylinder from crankcase. Be careful to remove all of the 28 loose needle rollers when detaching rod from crankpin.

Renew connecting rod if bent or twisted, or if crankpin bearing surface is scored, burned or excessively worn. The caged needle roller piston pin bearing can be renewed by pressing old bearing out and pressing new bearing in with Homelite tool No. 23955. Press on lettered end of bearing cage only.

It is recommended that the crankpin needle rollers be renewed as a set whenever engine is disassembled for service. Stick 14 needle rollers in rod and the remaining 14 needle rollers in rod cap with light grease or beeswax. Assemble rod to cap with match marks aligned and with open end of piston pin

towards flywheel side of engine. Wiggle the rod as cap retaining screws are being tightened to align the fractured surfaces.

PISTON, PIN AND RINGS. The piston is fitted with two pinned compression rings. Renew piston if scored, cracked or excessively worn, or if ring side clearance in top ring groove exceeds 0.0035.

Recommended piston ring end gap is 0.070-0.080; maximum allowable ring end gap is 0.085. Desired ring side clearance in groove is 0.002-0.003.

Piston, pin and rings are available in standard size only. Piston and pin are available as a matched set and are not available separately.

Piston pin on models XL-88 and XL-98 is retained in piston by a wire type snap ring on exhaust side and by a Truarc snap ring on opposite end. Disassemble piston and rod by removing the Truarc snap ring and pushing pin out with a 3/16-inch diameter pin. Piston pin on models XL-98A, XLS2-1 and XLS2-1A is retained by Truarc snap rings at each end.

When reassembling piston to connecting rod, be sure closed end of pin is towards exhaust port. Install piston pin retaining Truarc snap rings with sharp side out. Rotate snap ring to be sure it is secure in retaining groove, then turn gap toward closed end of piston.

CRANKSHAFT. Flywheel end of crankshaft is supported in a roller bearing in magneto back plate and drive end is supported in a ball bearing located in crankcase. End play is controlled by the ball bearing.

Renew the crankshaft if the flywheel end main bearing or crankpin bearing surface or sealing surfaces are scored, burned or excessively worn. Renew the ball bearing if excessively loose or rough. Also, reject crankshaft if flywheel keyway is beat out or if threads are badly damaged.

CYLINDER. The cylinder bore is chrome plated. Renew cylinder if chrome plating is worn away exposing the softer base metal.

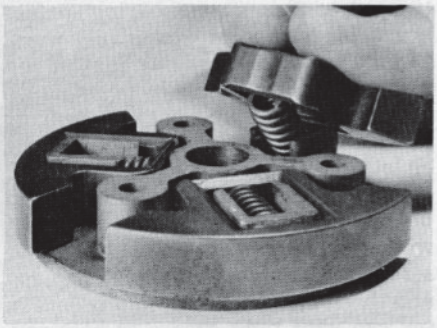

Fig. HL86–Installing shoes and springs on clutch spider plate.

To remove cylinder, first remove the blower (fan) housing, carburetor and air box (handle) assemblies and remove the screw retaining magneto back plate to flywheel side of cylinder. The cylinder can then be unbolted from crankcase and removed from the piston.

CRANKCASE, MAGNETO BACK PLATE AND SEALS. To remove the magneto back plate, first remove the blower (fan) housing and flywheel. Loosen the cylinder retaining stud nuts on flywheel side of engine to reduce clamping effect on back plate boss, then unbolt and remove the back plate assembly from crankcase.

To remove crankshaft from crankcase, first remove the cylinder, connecting rod and piston assembly and the magneto backplate as previously outlined. Remove drive clutch assembly and dust shield (26—Fig. HL85) on saws and pump assembly (Fig. HL89) on models XLS2-1 and XLS2-1A. Then, remove the two ball bearing retaining screws (10) from inside of crankcase and remove crankshaft and ball bearing assembly from crankcase. Remove snap ring (13) and press crankshaft from bearing if necessary.

REED VALVES. The pyramid type reed valve seat is made of "Delrin" plastic and reeds are located by pins molded on seat. The reeds are held in place by a molded retainer that also serves as a gasket between reed seat and crankcase. Reeds are 0.004 thick.

When installing reed valve assembly, it is important that reed retainer be installed in crankcase first, then install reed seat with reeds in place. Oil can be used to stick reeds to seat. Also, special type shoulder retaining screws must be used.

CLUTCH. All models except models XLS2-1 and XLS2-1A are equipped with a centrifugal clutch. To remove the clutch assembly, first remove the blade and arm assembly (see Fig. HL87 or HL88). The clutch bearing inner race (27) unscrews counterclockwise (left-hand threads). Remove inner race with impact wrench, or if impact wrench is not available, use a ¾-inch socket wrench and strike wrench handle a sharp blow to loosen threads.

Remove clutch drum, pulley and bearing assembly and remove thrust washer (30). Then, unscrew clutch spider plate (31) using a spanner wrench (Homelite tool No. A-23934 or equivalent) in counterclockwise direction. Remove clutch cover (34).

Inspect clutch drum and pulley for excessive wear or scoring. Inspect all

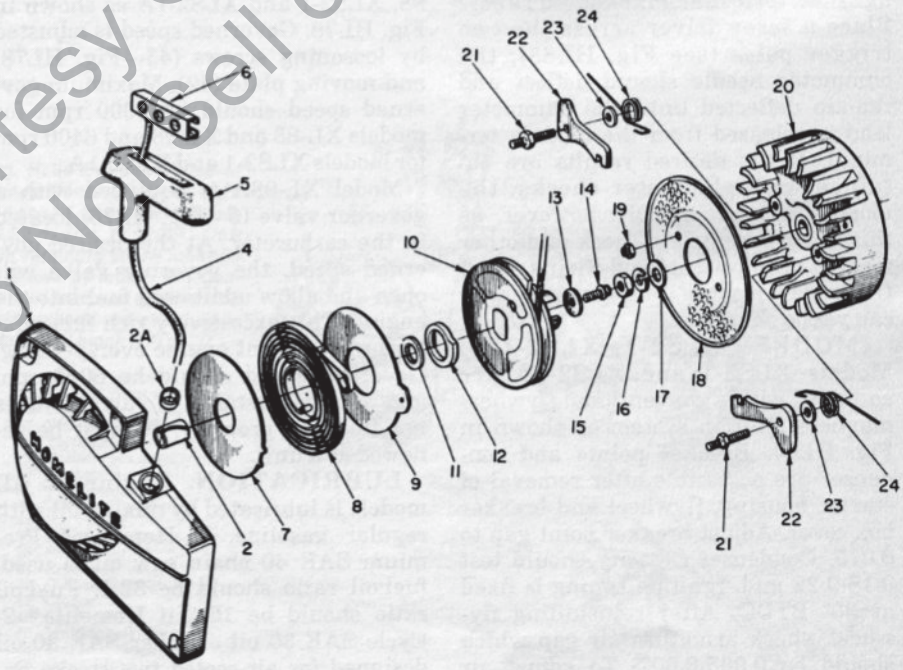

Fig. HL87–Exploded view of typical rewind starter assembly and engine flywheel.

1. Starter housing
2. Bushing
2A. Rope bushing
4. Starter rope
5. Hand grip
6. Insert
7. Inner spring shield
8. Rewind spring
9. Outer spring shield
10. Pulley & cup assy.
11. Bushing
12. Spring lock
13. Washer
14. Cap screw
15. Flywheel nut
16. Lock washer
17. Flat washer
18. Rotating screen
19. Self-locking nuts
20. Flywheel (magneto rotor)
21. Shoulder studs
22. Starter pawls
23. Washers
24. Pawl springs

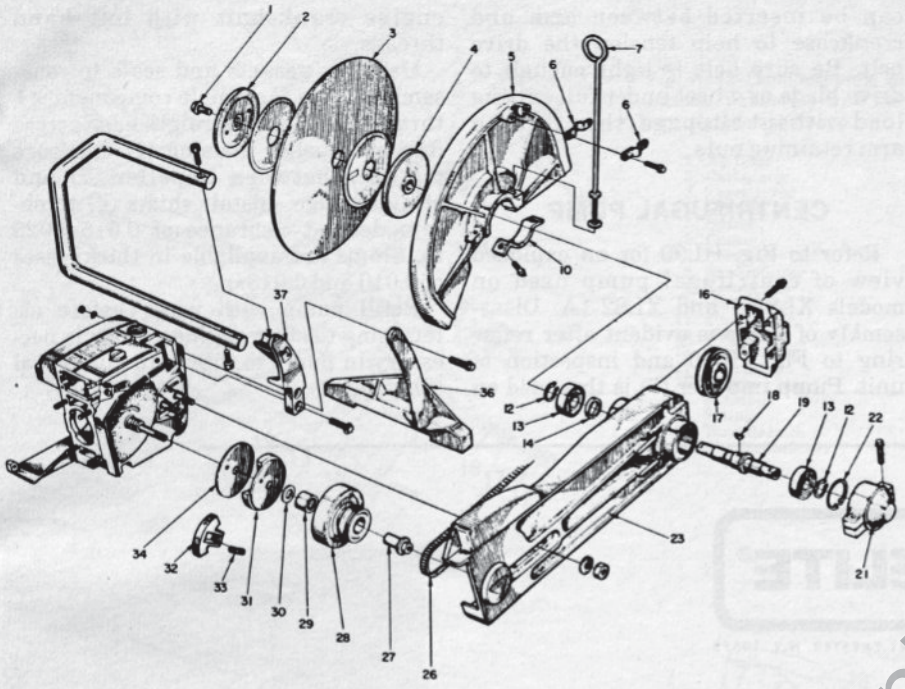

Fig. HL88–Exploded view of drive arm and cutting wheel assembly used on model XL-88. Cutting wheel or saw blade can be mounted on either side of arm. Shaft guard (21) is used to cover opposite end of shaft. Belt can be renewed after removing arm from engine and the cap (16) from end of arm.

1. Cap screw
2. Outer blade washer
3. Cutting wheel
4. Inner washer
5. Guard
6. Clamps
7. Eye or hook bolt
10. Guard clamp
12. Snap ring
13. Ball bearing
14. Spacer
16. Arm cap
17. Driven pulley
18. Woodruff key
19. Blade shaft
21. Shaft guard
22. Snap ring
23. Arm
26. Drive belt
27. Clutch bearing race
28. Clutch drum & pulley
29. Needle bearing
30. Thrust washer
31. Spider plate
32. Clutch shoes
33. Clutch springs
34. Clutch cover
36. Saw support
37. Handle bar bracket

needle bearing rollers for scoring, excessive wear or flat spots, and renew bearing if such defect is noted. Bearing is excessively worn if rollers can be separated more than the width of one roller.

Pry clutch shoes from spider plate with screwdriver. To install new shoes and/or springs, refer to Fig. HL86. Reinstall clutch by reversing removal procedure. Lubricate needle roller bearing in clutch drum with a small amount of Homelite® ALL-TEMP Multi-Purpose Grease or a high temperature grease such as Texaco Unitemp #500 or Humble (Esso) Nebula EP1. Note: The bearing should be cleaned and repacked after each 45 to 50 hours of operation.

REWIND STARTER. Refer to Fig. HL87 for exploded view of rewind starter. To disassemble starter after removing housing and starter assembly from engine, proceed as follows:

Pull rope out a short distance, hold rope and pry retainer (6) from hand grip. Untie knot in end of rope, then allow pulley to rewind slowly. Remove hex head screw (14) and remove rope pulley. CAUTION: Be careful not to dislodge spring (8) while removing pulley as the rapidly uncoiling spring could cause injury.

Check all starter parts for wear or other damage and renew as necessary. Rope bushing (2A) in housing should be renewed if rope notch is worn in bushing. When reassembling starter, lubricate starter post lightly and install spring without lubrication. Refer to exploded view in Fig. HL87 for reassembly guide. Pre-wind the spring 2 to 4 turns.

BLADE SHAFT, BEARINGS AND PULLEY

Refer to exploded view of unit in Fig. HL88 or HL89. To renew the blade drive mechanism, proceed as follows:

On model XL-88, unbolt and remove the arm assembly from engine. Remove shaft guard (21—Fig. HL88), blade or cutting wheel (3) and blade guard (5). Remove arm cap (16) and drive belt (26). Remove the large internal snap ring (22) from arm and external snap ring (12) from shaft at opposite side of arm. Support the arm and press shaft and outer bearing out towards outside of arm. Remove the driven sheave from arm. Press bearing from inner side of arm. Remove snap ring retaining outer bearing to shaft, then press shaft from bearing.

To disassemble blade drive on models XL-98 and XL-98A, remove

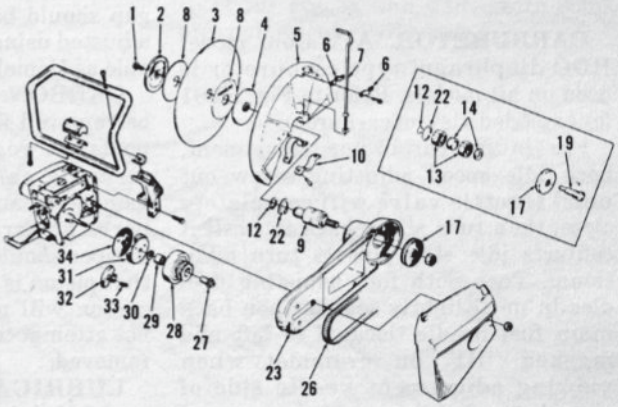

Fig. HL89–Exploded view of clutch and cutting wheel assembly used on model XL-98A. Blade shaft assembly on model XL-98 is shown in inset. Refer to Fig. HL88 for parts identification except for: 8. Spacer; 9. Bearings & shaft.

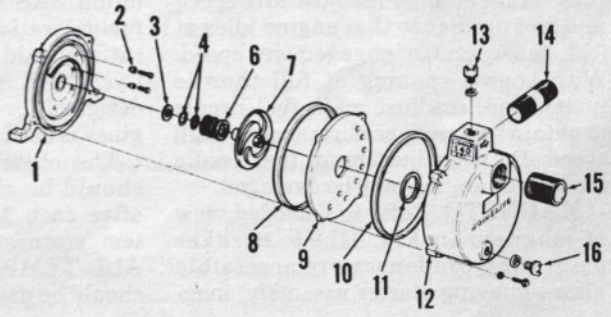

Fig. HL90–Exploded view of centrifugal pump used on models XLS2-1 and XLS2-1A.

1. Impeller housing
2. Seal washer
3. Washer
4. Shims
6. Seal
7. Impeller
8. Gasket
9. Wear plate
10. Gasket
11. Gasket
12. End housing
13. Fill plug
14. Discharge fitting
15. Inlet fitting
16. Drain plug

blade arm from engine and detach drive cover and components (1 thru 8—Fig. HL89) as well as clamp (10). Remove driven pulley (17) and drive belt (26). Note that pulley on model XL-98 is retained by a nut while blade shaft (19) holds pulley (17) in position and shaft must be removed with pulley. Remove snap rings and press bearings out of blade arm.

To reassemble, reverse disassembly procedure. Place belt over drive pulley on engine, then mount arm to engine crankcase. A wrench with tapered handle (Homelite tool No. A-24085) can be inserted between arm and crankcase to help tension the drive belt. Be sure belt is tight enough to drive blade or wheel under full cutting load without slippage, then tighten arm retaining nuts.

CENTRIFUGAL PUMP

Refer to Fig. HL90 for an exploded view of centrifugal pump used on models XLS2-1 and XLS2-1A. Disassembly of pump is evident after referring to Fig. HL90 and inspection of unit. Pump impeller (7) is threaded on engine crankshaft with left hand threads.

Use new gaskets and seals to reassemble pump. Assemble components (1 thru 7) and place a straight edge across face of impeller housing (1). Measure distance between impeller (7) and straight edge. Install shims (4) to obtain desired clearance of 0.015-0.025 in. Shims are available in thicknesses of 0.010 and 0.015 in.

Refill pump with water before attempting to start engine. Water is necessary in pump to lubricate pump seal (6).

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

Model	Bore Inches	Stroke Inches	Displ. Cu. In.
EZ-10, Chipper	1.4375	1.3	2.1

MAINTENANCE

SPARK PLUG. A Champion DJ-6J spark plug with tapered seat is used; no gasket is required. Adjust electrode gap to 0.025.

CARBURETOR. A Walbro model HDC diaphragm type carburetor is used on all models. Refer to Fig. HL91 for exploded view of carburetor.

For initial carburetor adjustment, back idle speed adjusting screw out until throttle valve will completely close, then turn screw back in until it contacts idle stop plus ½ turn additional. Turn both fuel adjusting needles in until lightly seated, then back main fuel needle (located to left and marked "HI" on grommet when viewing adjustment needle side of throttle handle) out about one turn and back idle ("LO") needle out about ¾-turn. Start engine, readjust idle speed and fuel needles so that engine idles at just below clutch engagement speed. With engine running at full throttle under load, readjust main fuel needle to obtain optimum performance at high speed. Do not adjust main fuel needle too lean as engine may be damaged.

MAGNETO. Refer to exploded view of magneto in Fig. HL94. Breaker points and condenser are accessible after removing starter assembly, magneto rotor (flywheel) and breaker box cover.

Condenser capacity should test approximately 0.2 mfds. Adjust breaker points to 0.015. After reinstalling magneto rotor (flywheel), check magneto armature core to rotor air gap. Air gap should be 0.008-0.012 and can be adjusted using plastic shim stock available as Homelite part No. 24306.

CARBON. Carbon deposits should be removed from muffler and exhaust ports at regular intervals. When scraping carbon, be careful not to damage chamfered edges of exhaust ports or scratch piston. A wooden scraper should be used. Turn engine so that piston is at top dead center so that carbon will not fall into cylinder. Do not attempt to run engine with muffler removed.

LUBRICATION. Engine on all models is lubricated by mixing oil with regular gasoline. If Homelite® Premium SAE 40 chain saw oil is used, fuel:oil ratio should be 32:1. Fuel:oil ratio should be 16:1 if Homelite® 2-Cycle SAE 30 oil or other SAE 30 oil designed for air-cooled two stroke engines is used.

The clutch needle roller bearing should be cleaned and relubricated after each 100 hours of use. A high temperature grease such as Homelite® ALL-TEMP Multi-Purpose Grease should be used.

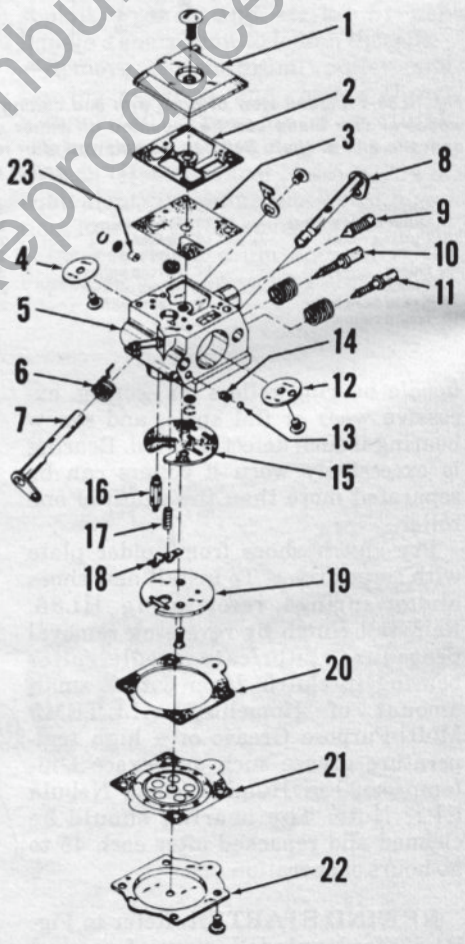

Fig. HL91–Exploded view of Walbro model HDC carburetor.

1. Pump cover
2. Gasket
3. Fuel pump diaphragm & valves
4. Throttle plate
5. Body
6. Return spring
7. Throttle shaft
8. Choke shaft
9. Idle speed screw
10. Idle mixture screw
11. High speed mixture screw
12. Choke plate
13. Choke friction ball
14. Spring
15. Gasket
16. Fuel inlet valve
17. Spring
18. Diaphragm lever
19. Circuit plate
20. Gasket
21. Metering diaphragm
22. Cover
23. Limiting jet

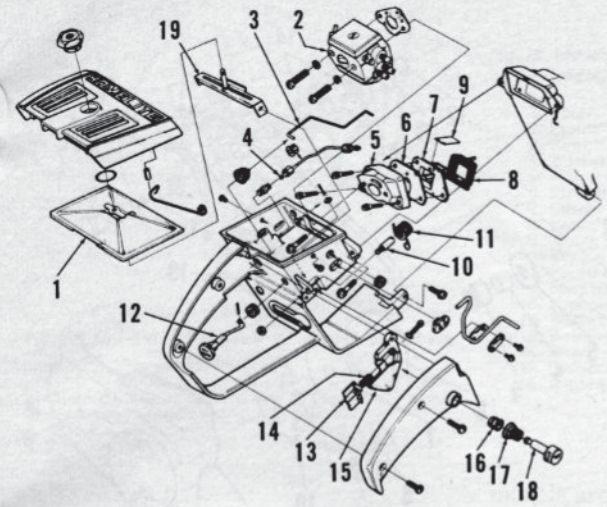

Fig. HL92–Exploded view of handle assembly and related assemblies.

1. Air filter
2. Carburetor
3. Throttle rod
4. Oil line
5. Spacer
6. Gasket
7. Reed valve seat
8. Reed retainer
9. Reed petals
10. Spring post
11. Spring
12. Choke rod
13. Throttle stop
14. Spring
15. Trigger
16. Bushing
17. Spring
18. Throttle latch
19. Air filter bracket

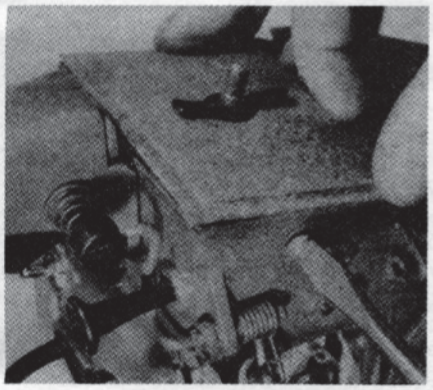

Fig. HL93–Before tightening screws retaining air filter bracket (19–Fig. HL92) in throttle handle, place air filter element on bracket stud and align filter with edges of air box.

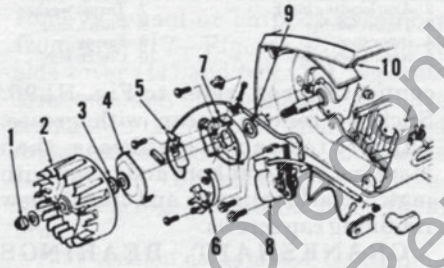

Fig. HL94–Exploded view of ignition assembly. Felt seal (3) is cemented to breaker box cover (4).

1. Nut
2. Flywheel
3. Felt seal
4. Box cover
5. Condenser
6. Breaker points
7. Breaker box
8. Ignition coil
9. Felt seal
10. Fuel tank

REPAIRS

TIGHTENING TORQUES. Recommended minimum tightening torques are listed in the following table; all values are in inch-pounds. To find maximum torque value, add 20 percent to given value.

6/32 Compression release clamp	20
6/32 Compression release post nut	20
6/32 Breaker box	20
6/32 Breaker point adjustable arm	20
6/32 Condenser	20
8/32 Air filter bracket	25
8/32 Connecting rod	55
8/32 Throttle handle cover	35
8/32 Rewind spring cover	35
8/32 Intake manifold (reed spacer)	20
8/32 Coil assembly	20
8/32 Fuel tank	35
10/32 Main bearing retainer screws	50
10/32 Muffler body	50
10/32 Starter housing	50
10/32 Carburetor	20
10/32 Starter pawl studs	50
10/32 Handle bar	50
12/24 Throttle handle	80
12/24 Fuel tank to crankcase	75
12/24 Drivecase	75
¼-28 Cylinder nuts	100
5/16-24 Rotor (flywheel) nut	150
14mm Spark plug	120
Clutch hub	180

SPECIAL SERVICE TOOLS. Special service tools which may be required are listed as follows:

Tool No. Description & Model Usage

24299—Anvil, crankshaft installation.
24300—Sleeve, crankshaft bearing.
24294—Plug, needle bearing assembly.
24292—Plug, seal removal.
24298—Plug, bearing and seal.
24320—#3 Pozidriv screwdriver bit.
A24290—Bracket, rotor remover.
A-24060—Wrench, clutch spanner.
A-24309—Jackscrew, crankshaft and bearing.
23136-1—Body for A-24309.
24295—Bearing collar for A-24309.
24291—Sleeve, drivecase seal.
24297—Sleeve, crankcase seal.

CYLINDER. The cylinder can be unbolted and removed from crankcase after removing starter housing and throttle handle. Be careful not to let piston strike crankcase as cylinder is removed.

The cylinder bore is chrome plated and cylinder should be renewed if the chrome plating has worn through exposing the softer base metal. Also inspect for cracks and damage to compression release valve bore.

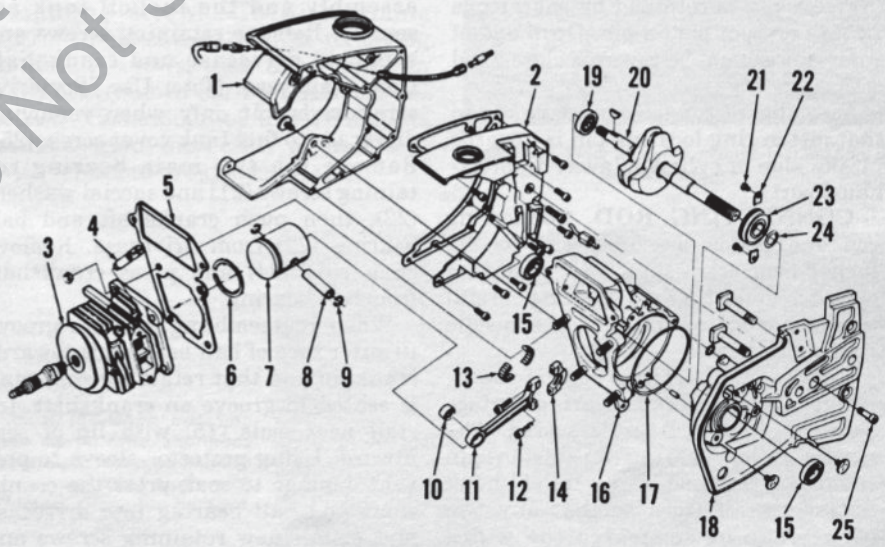

Fig. HL95–Exploded view of typical engine assembly.

1. Fuel tank
2. Oil tank
3. Cylinder
4. Compression release valve
5. Gasket
6. Piston rings
7. Piston
8. Piston pin
9. Pin retainer
10. Needle bearing
11. Connecting rod
12. Capscrew
13. Bearing rollers (28)
14. Connecting rod cap
15. Seal
16. Crankcase
17. "O" ring
18. Drivecase
19. Roller bearing
20. Crankshaft
21. Screw
22. Bearing retainer
23. Ball bearing
24. Snap ring

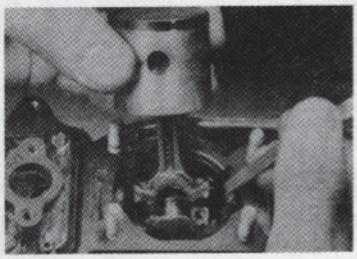

Fig. HL96–Installing piston and connecting rod assembly using locally made tool to hold rod cap in position. Tool can be made from flat strip of metal. Using grease, stick 14 rollers in cap and 14 rollers in rod; make sure that match marks on rod and cap are aligned.

Fig. HL97–Roller type main bearing used at flywheel end of crankshaft is marked on one side, "PRESS OTHER SIDE". Be sure to observe this precaution when installing bearing in crankcase.

PISTON, PIN AND RINGS. Model EZ-10 and Chipper piston has one Head land type ring. Piston ring should be renewed if ring end gap exceeds 0.016 inch; desired ring end gap is 0.006-0.016 inch. The base side of the ring has a cut-out at the end gap to fit the ring locating pin in piston ring groove.

Piston pin is retained by snap rings at both ends of piston pin. Open end of snap ring should be towards closed end of piston.

Assemble piston to connecting rod so that piston ring locating pin is towards intake side of cylinder (away from exhaust port).

CONNECTING ROD. Connecting rod and piston assembly can be detached from crankshaft after removing cylinder; refer to Fig. HL95. Be careful to remove all of the 28 loose needle bearing rollers.

Renew connecting rod if bent, twisted or if crankpin bearing surface shows visible wear or is scored. The needle roller bearing for piston pin should be renewed if any roller shows flat spot or if worn so that any two rollers can be separated the width equal to thickness of one roller and if rod is otherwise serviceable. Press on lettered side of bearing cage only when removing and installing bearing.

The crankpin needle rollers should be renewed at each overhaul. To install connecting rod, refer to Fig. HL96. Stick 14 rollers in cap with grease. Support rod cap in crankcase, then place rod over crankpin and to cap with match marks aligned and install new retaining cap screws.

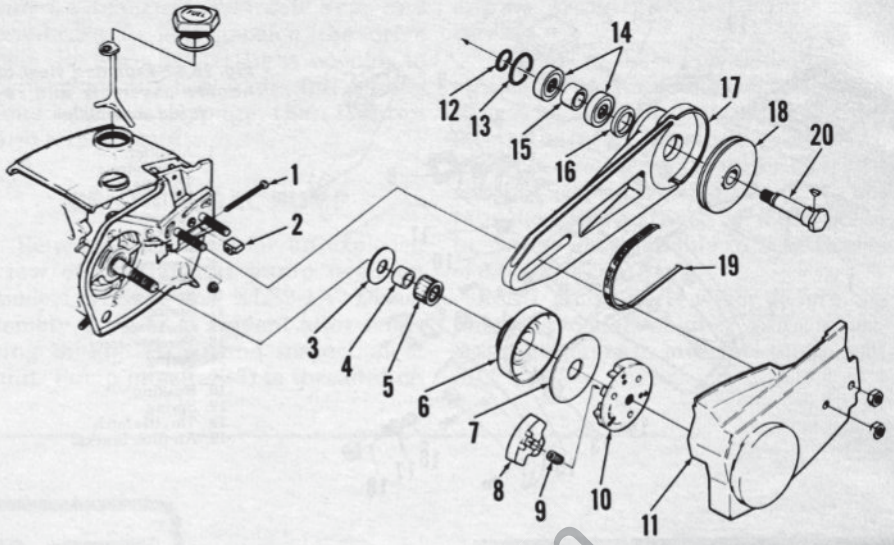

Fig. HL98–Exploded view of clutch and wheel arm assemblies.

1. Belt tension screw
2. Arm locating block
3. Thrust washer
4. Inner race
5. Needle bearing
6. Clutch drum
7. Thrust washer
8. Clutch shoe
9. Spring
10. Clutch hub
11. Side cover
12. Snap ring
13. Snap ring
14. Ball bearing
15. Spacer
16. Spacer
17. Wheel arm
18. Driven pulley
19. Belt
20. Shaft

CRANKSHAFT, BEARINGS AND SEALS. Crankshaft is supported by a roller bearing (19—Fig. HL95) mounted in crankcase bore and by a ball bearing (23) mounted in drivecase (18).

To remove crankshaft, first remove blade arm, clutch assembly, starter housing, magneto rotor, throttle handle, cylinder, piston and connecting rod assembly and the fuel/oil tank assembly. Remove retaining screws and separate drivecase and crankshaft from crankcase. Note: Use "Pozidriv" screwdriver bit only when removing drivecase to fuel tank cover screw (25). Remove the two main bearing retaining screws (21) and special washers (22), then push crankshaft and ball bearing (23) from drivecase. Remove snap ring (24) and press crankshaft from ball bearing.

When reassembling, be sure groove in outer race of ball bearing is towards crankpin and that retaining snap ring is seated in groove on crankshaft. Install new seals (15) with lip of seal inward. Using protector sleeve to prevent damage to seal, press the crankshaft and ball bearing into drivecase and install new retaining screws and washers. Assemble crankcase to crankshaft and drivecase using new "O" ring (17) and protector sleeve to prevent damage to crankcase seal. Be sure bar studs are in place before installing fuel tank.

COMPRESSION RELEASE. When throttle lock is pushed in, a lever connected to throttle lock lifts away from compression release valve (4—Fig. HL95). When engine is cranked, compression forces valve open and compression is partly relieved through port in cylinder. Squeezing throttle trigger after engine is running releases throttle lock, allowing spring (11—Fig. HL92) to snap lever against release valve, closing the valve.

Service of compression release valve usually consists of cleaning valve seat and port in cylinder as carbon may gradually fill the port.

When overhauling engine, cylinder should be inspected for any damage to compression release port.

PYRAMID REED VALVE. A "Delrin" plastic pyramid type reed intake valve seat and four reeds are used.

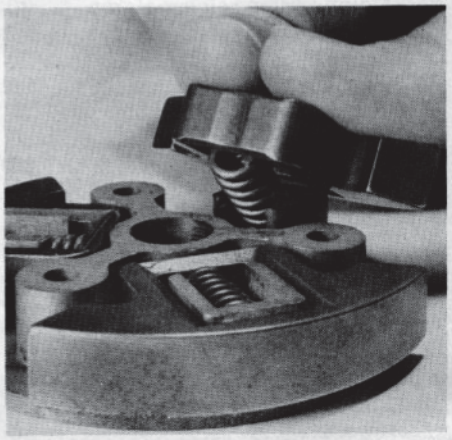

Fig. HL99–Although clutch shown above is not used on model EZ or Chipper, easy method of clutch spring and shoe installation is shown.

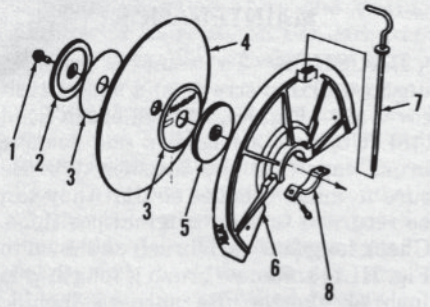

Fig. HL100–Exploded view of model EZ wheel assembly.

1. Capscrew
2. Outer wheel washer
3. Spacer
4. Wheel
5. Inner wheel washer
6. Guard
7. Hook bolt
8. Clamp

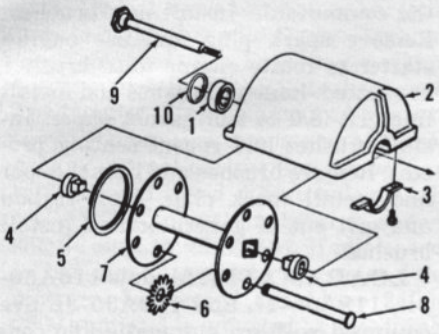

Fig. HL101–Exploded view of cutting assembly on Chipper.

1. Bearing
2. Guard
3. Clamp
4. Insert
5. Retainer
6. Cutters
7. Hub
8. Cutter pin
9. Shaft
10. Snap ring

Reeds are retained on pins projecting from the reed seat by a moulded retainer. Inspect reed seat, retainer and reeds for any distortion, excessive wear or other damage.

To reinstall, use a drop of oil to stick each reed to the plastic seat, then push reed retainer down over the seat and reeds. Then install the assembly in crankcase; never install retainer, then attempt to install reed seat and reeds.

CLUTCH. Refer to Fig. HL98 for exploded view of the shoe type clutch. The clutch hub (10) is threaded to crankshaft; turn clutch hub in clockwise direction to remove from crankshaft.

If clutch slips with engine running at high speed under load, check clutch shoes for excessive wear. If clutch will not release (cutting unit is driven at normal idle speed), check for broken or weak clutch springs.

Refer to Fig. HL99 for easy method of installing clutch shoes and springs on clutch hub.

CUTTING WHEEL AND CHIPPER. Model EZ-10 is equipped with an abrasive wheel (4—Fig. HL100) for cutting while Chipper models are equipped with the chipping device shown in Fig. HL101. The abrasive wheel or chipper is attached to the drive assembly shown in Fig. HL98.

To disassemble drive mechanism, remove wheel or chipper assembly from arm (17—Fig. HL98). Remove side cover (11) and belt (19). Separate arm assembly from engine. Remove snap rings (12 and 13), shaft (20) and driven pulley (18). Inspect components (14, 15 and 16) and remove if necessary. Bearings (14) are a press fit in arm.

Belt tension is adjusted by turning adjusting screw (1) with side cover (11) retaining nuts loosened to allow arm (17) to move. Belt tension should be adjusted so that belt is tight enough to prevent slippage under load.

REWIND STARTER. Exploded view of rewind starter is shown in Fig. HL102. Starter can be removed as a complete unit by removing housing retaining screws. To disassemble starter, hold cover (7) while removing retaining screws, then allow cover to turn slowly until spring tension is released. Remainder of disassembly is evident from inspection of unit and with reference to exploded view.

Fig. HL102–Exploded view of recoil starter.

1. Stud
2. Spring
3. Pawl
4. Washer
5. Nut
6. Flywheel
7. Cover
8. Spring shield
9. Spring lock
10. Rewind spring
11. Spring shield
12. Snap ring
13. Rope pulley
14. Washer
15. Bushing
16. Screen
17. Starter housing
18. Rope handle

Refer to Fig. HL103 to correctly install starter dogs on flywheel. Rewind spring is wound in clockwise direction in cover (7—Fig. HL102). When installing a new starter rope, knot rope ends as shown in Fig. HL104, pull the knots tight and coat with Duxseal (Homelite part No. 24352). Before installing cover (7—Fig. HL103) retaining screws, turn cover to pull rope handle against starter housing, then continue turning cover three turns to properly tension the rewind spring.

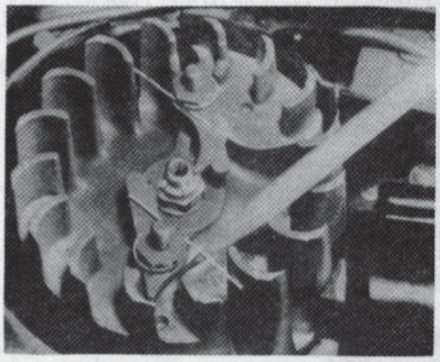

Fig. HL103–View showing proper installation of pawl springs.

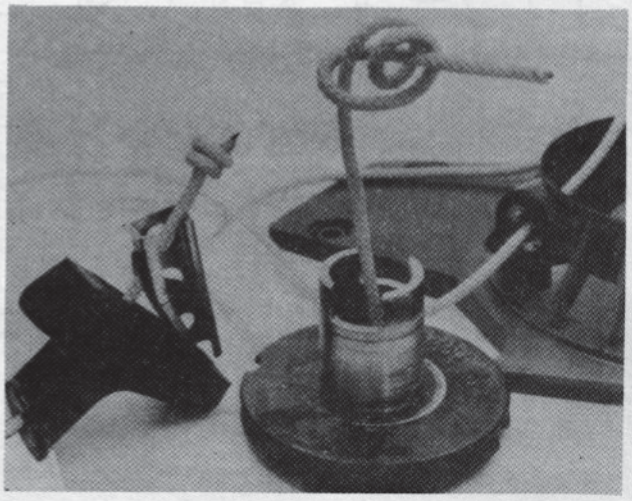

Fig. HL104–When installing new starter rope, knot ends as shown. Seal rope holes in pulley and coat knots with Duxseal (Homelite part No. 24382)

HOMELITE®
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VOLTAMATIC® AC GENERATORS

(WITH FOUR STROKE ENGINES)

Generator Model	Engine Make	Engine Model	Volts	Hz	Kilowatts
112A15-1	B&S	100232	115	60	1.5
113A25-1	B&S	146432	115	60	2.5
116A50-2	B&S	243431	115/230	60	5.0
116A50-2L	B&S	243431	115/230	60	5.0
118A35-1	Wisc.	S8D	115	60	3.5
118A35-2	Wisc.	S8D	115/230	60	3.5
119A35-1	B&S	200431	115	60	3.5
119A35-1L	B&S	200431	115	60	3.5
119A35-2	B&S	200431	115/230	60	3.5
119A35-2L	B&S	200431	115/230	60	3.5

The Homelite generators in this section are a rotating field type and produce alternating current. The generator is driven by the engine shown above. Refer to appropriate engine service manual for maintenance and overhaul of engine. All of the above generators are equipped with Voltamatic voltage control to regulate voltage. NOTE: Voltamatic is a registered trademark of Homelite and is covered by U.S. Patent No. 3,428,883. Generator models 116A50-2L, 119A35-1L and 119A35-2L are equipped with Loadamatic which is covered by U.S. Patent Nos. 3,612,892 and 3,626,197. Loadamatic is a registered trademark of Homelite.

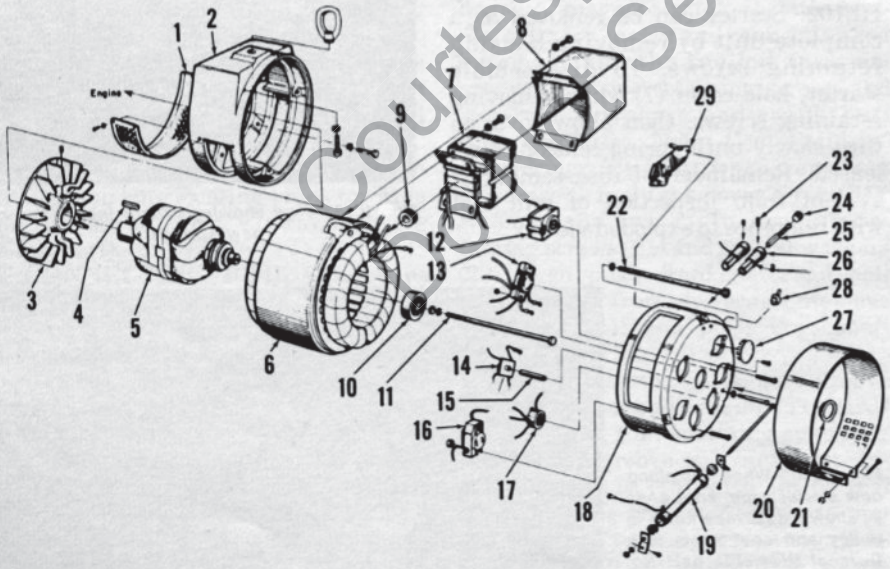

Fig. HL110–Exploded view of typical AC generator covered in this section. Switch (28) and control board assembly (29) are used on Loadamatic® models only.

1. Shield
2. End bell
3. Fan
4. Key
5. Rotor
6. Stator
7. Transformer
8. Cover
9. Grommet
10. Ball bearing
11. Bolt
12. Receptacle (115v)
13. Receptacle (230v)
14. Rectifier
15. Roll pin
16. Receptacle (115v)
17. Receptacle (115v)
18. Brush head
19. Resistor
20. Shield
21. Bearing cap
22. Bolt
23. Set screw
24. Cap
25. Brush
26. Brush holder
27. Plug
28. Loadamatic® switch
29. Loadamatic® control board

MAINTENANCE

BRUSHES. To remove brushes, unscrew clamp screws and slide brush cover (20—Fig. HL 110) off brush head (18). Unscrew set screws and remove brush caps (24) and brushes (26). Be sure to mark brushes so that they can be returned to their original positions. Check length of each brush as shown in Fig. HL111. Renew brush if length is 5/8 inch or shorter. Be sure to include length of projections for brush springs when measuring brush length.

If new brushes must be installed, use the following procedure: Wrap the commutator with a medium grit (4/0 to 6/0) piece of garnet paper which will fit the commutator. Install new brushes. Remove spark plug and use engine starter to rotate engine until brushes are seated. Remove brushes and install fine grit (8/0 to 9/0) garnet paper. Install brushes and repeat seating process. Remove brushes and garnet paper and install spark plug. Blow carbon and grit out of generator and install brushes.

LOADAMATIC. Models 116A50-2L, 119A35-1L and 119A35-2L are equipped with an automatic idle control (Loadamatic®). An electromagnet

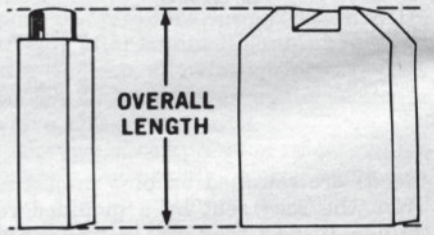

Fig. HL111–Measure length of brushes as shown.

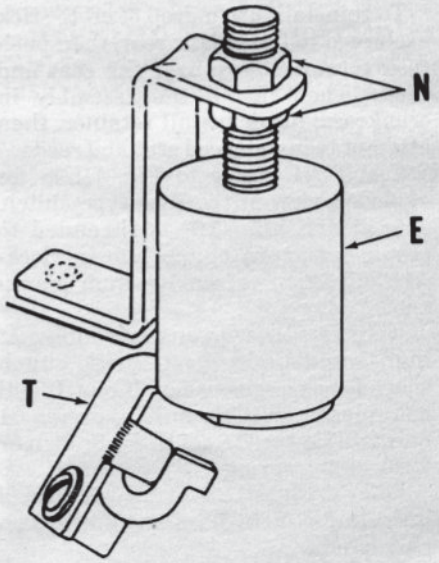

Fig. HL112–Loadamatic® is adjusted by turning nuts (N) until bottom of electromagnet (E) is parallel with throttle arm (T). Do not bend throttle arm or electromagnet bracket.

is mounted adjacent to the engine's carburetor and acts on the carburetor throttle arm. When there is no load on the generator, the electromagnet is energized and the engine governor is overridden as the electromagnet pulls the carburetor throttle arm to idle position. The governor resumes control of engine speed when a load is imposed on the generator. The electromagnet is deenergized and the throttle arm is released to be controlled by the governor.

To adjust automatic idle control (Loadamatic®), proceed as follows: Refer to Fig. HL 112 and adjust height of electromagnet to place bottom of electromagnet parallel with throttle arm. Do not bend bracket or throttle arm to make this adjustment. Tighten electromagnet nuts. Position generator toggle switch to "START" to disengage Loadamatic. Start engine and allow it to reach operating temperature. If necessary, adjust carburetor for proper mixture and speed. Flip toggle switch to "AUTO" position. Engine speed should slow to idle speed. If idle speed is not steady, adjust carburetor idle mixture. Idle speed should be 2400-2600 rpm and is adjusted by loosening electromagnet nuts and altering position of electromagnet. Raising electromagnet will decrease engine speed while lowering electromagnet increases engine speed. Apply a light load to generator and then remove it. Engine speed should increase to governed speed and then return to idle after the load is removed.

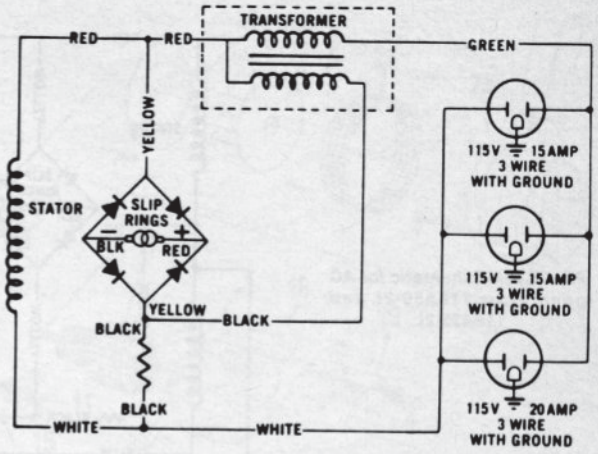

Fig. HL113–Schematic for AC generators 112A15-1, 113A25-1, 118A35-1 and 119A35-1.

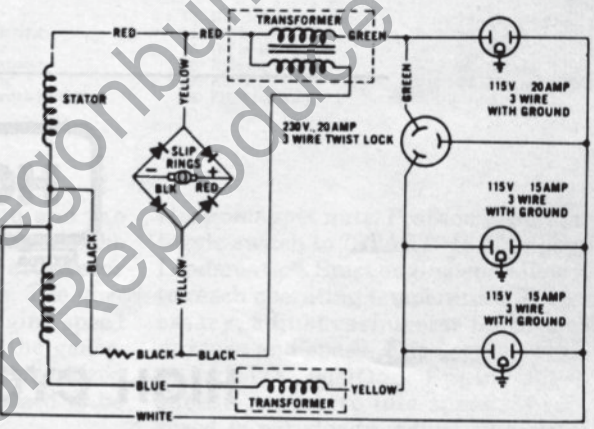

Fig. HL114–Schematic for AC generators 116A50-2, 118A35-2 and 119A35-2.

OVERHAUL

DISASSEMBLY AND REASSEMBLY. Refer to Fig. HL110 for an exploded view of generator and to appropriate schematic in Fig. HL113, HL114, HL115 or HL116. Be sure to mark wiring so that it may be correctly connected for reassembly. Wires should be handled carefully to prevent damage to wire, insulation and connections. Generator rotor (5—Fig. HL110) has a taper fit with engine crankshaft and should be removed with a suitable tool.

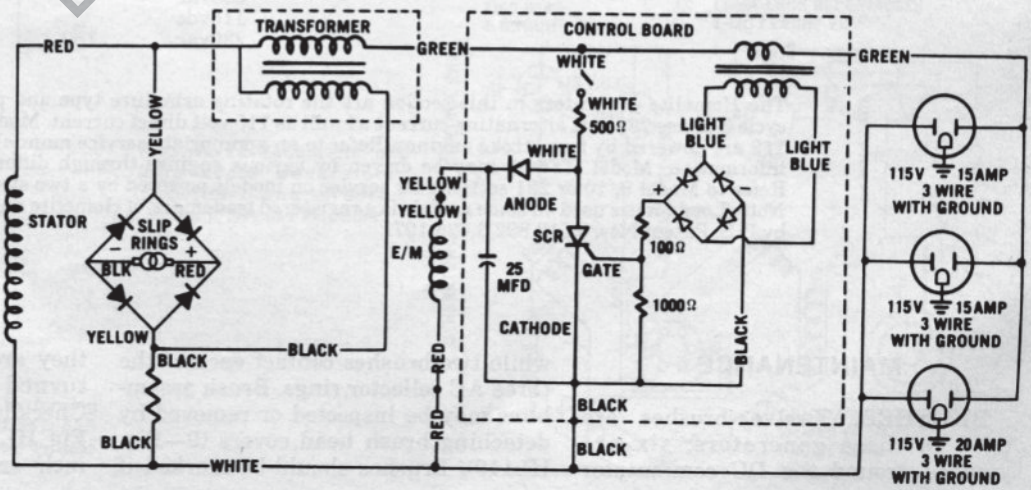

Fig. HL115–Schematic for AC generator 119A35-1L.

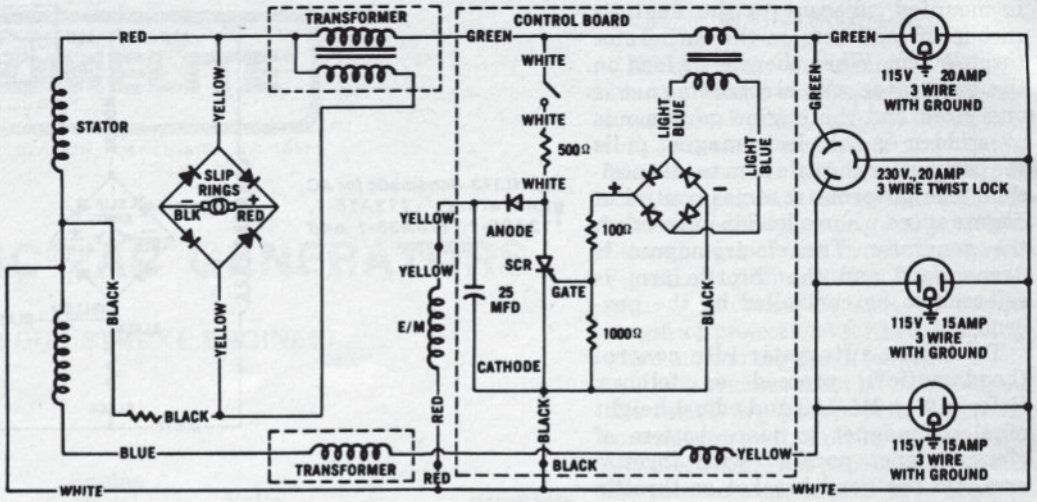

Fig. HL116–Schematic for AC generators 116A50-2L and 119A35-2L.

HOMELITE®

A textron DIVISION, PORT CHESTER, N.Y. 10573

HIGH CYCLE GENERATORS

(WITH FOUR STROKE ENGINES)

Generator Model	Engine Make	Engine Model	Volts	Hz	Kilowatts
115HY40-1	B&S	233431	115vdc		2.5
			230vac	180	4.0
119HY35-1	B&S	200431	115vdc		2.5
			230vac	180	3.5
119HY35-2	B&S	200431	115vdc		2.5
			230vac	180	3.5
119HY35-2A	B&S	200431	115vdc		2.5
			230vac	180	3.5
119HY35-2B	B&S	200431	115vdc		2.5
			230vac	180	3.5
HY50-1	—	—	115vdc		2.5
			230vac	180	5.0

The Homelite generators in this section are the rotating armature type and provide 180 cycle 3-phase 230 volt alternating current as well as 115 volt direct current. Models 115 and 119 are powered by four stroke engines. Refer to an appropriate service manual for service information. Model HY50-1 may be driven by various engines through different drives. Refer to Model 9, 10 or 251 sections for service on models powered by a two stroke engine. Note: Loadamatic used on some models is a registered trademark of Homelite and is covered by U.S. Patent Nos. 3,612,892/3,626,197.

MAINTENANCE

BRUSHES. Twelve brushes are used in these generators; six are grouped around the DC commutator while two brushes contact each of the three AC collector rings. Brush assemblies may be inspected or removed by detaching brush head covers (9—Fig. HL119). Brushes should be marked if they are removed so they can be returned to their original positions. Check length of each brush as shown in Fig. HL117. Renew brush if length is ⅝ inch or shorter. Be sure to include

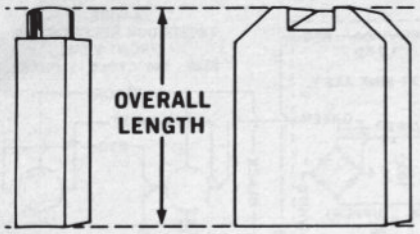

Fig. HL117–Measure brush length as shown.

length of projections for brush springs when measuring brush length.

If new brushes are required, use the following installation procedure: Wrap the commutator or collector ring with a medium grit (4/0 to 6/0) piece of garnet paper which will fit the commutator or collector ring. Install new brushes. Remove spark plug and use engine starter to rotate engine until brushes are seated. Remove brushes and install fine grit (8/0 to 9/0) garnet paper. Install brushes and repeat seating process. Remove brushes and garnet paper and install spark plug. Blow carbon and grit out of generator and install brushes.

LOADAMATIC®. Generator models 119HY35-2 and 119HY35-2A are equipped with an automatic idle control (Loadamatic®). A kit is available to add Loadamatic® to model 119HY35-1. An electromagnet is mounted adjacent to the engine's carburetor and acts on the carburetor throttle arm. When there is no load on the generator, the electromagnet is energized and the engine governor is overridden as the electromagnet pulls the carburetor throttle arm to idle position. The governor resumes control of engine speed when a load is imposed on the generator. The electromagnet is deenergized and the throttle arm is released to be controlled by the governor.

To adjust automatic idle control (Loadamatic®), proceed as follows: Refer to Fig. HL118 and adjust height of electromagnet to place bottom of electromagnet parallel with throttle arm. Do not bend bracket or throttle arm to make this adjustment. Tighten electromagnet nuts. Position generator toggle switch to "START" to disengage Loadamatic®. Start engine and allow it to reach operating temperature. If necessary, adjust carburetor for proper mixture and speed. Flip toggle switch to "AUTO" position. Engine speed should reduce to idle speed. If idle speed is not steady, adjust carburetor idle mixture. Idle speed should be 2400-2600 rpm and is adjusted by loosening electromagnet nuts and altering position of electromagnet. Raising electromagnet will decrease engine speed while lowering electromagnet increases engine speed. Apply a light

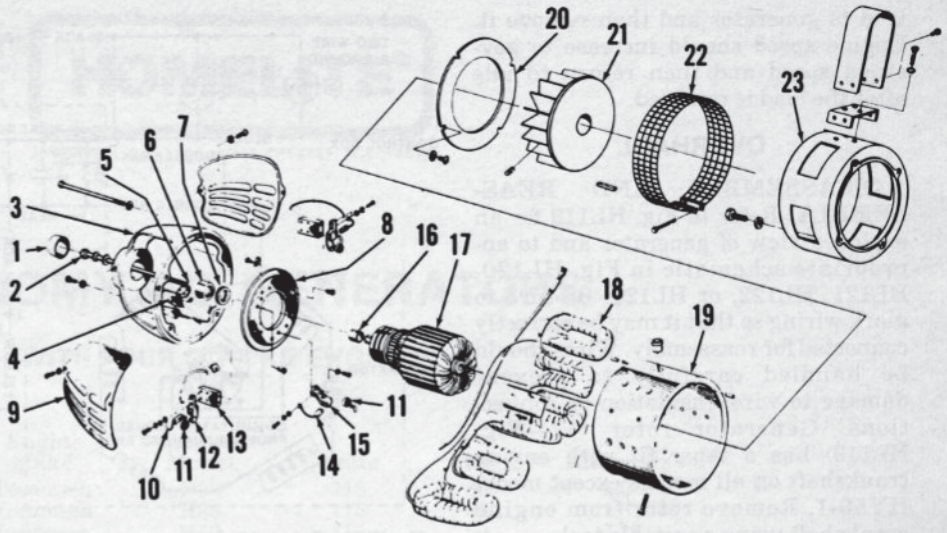

Fig. HL119–Exploded view of typical high cycle generator.

1. Bearing cap
2. Bolt
3. Brush head
4. Transistor base
5. Transistor
6. Bearing
7. Seal
8. Brush ring
9. Cover
10. AC brush
11. Spring
12. AC brush holder
13. Brush holder block
14. DC brush
15. DC brush holder
16. Bearing race
17. Rotor
18. Field coil assy.
19. Housing
20. Baffle
21. Fan
22. Screen
23. Mounting ring

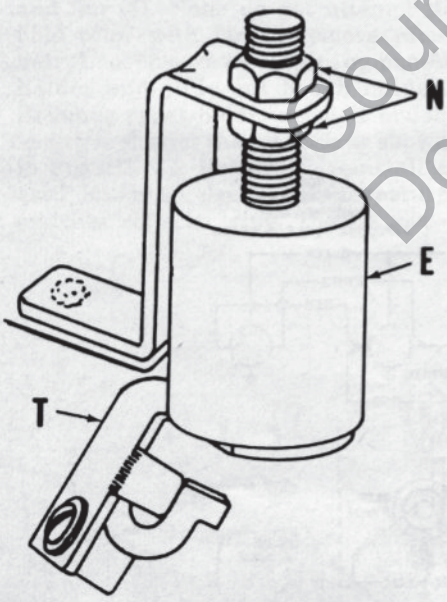

Fig. HL118–Loadamatic® is adjusted by turning nuts (N) until bottom of electromagnet (E) is parallel with throttle arm (T). Do not bend throttle arm or electromagnet bracket.

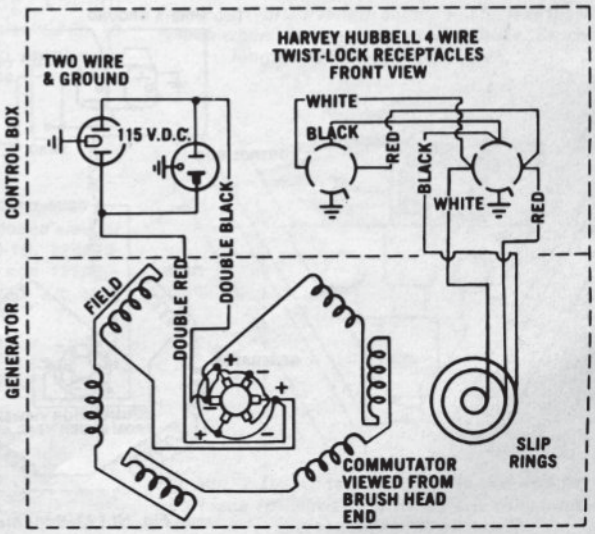

Fig. HL120–Schematic of high cycle generators 119HY35-1 and HY50-1. Model 115HY40-1 is similar.

load to generator and then remove it. Engine speed should increase to governed speed and then return to idle after the load is removed.

OVERHAUL

DISASSEMBLY AND REASSEMBLY. Refer to Fig. HL119 for an exploded view of generator and to appropriate schematic in Fig. HL120, HL121, HL122, or HL123. Be sure to mark wiring so that it may be correctly connected for reassembly. Wires should be handled carefully to prevent damage to wire, insulation or connections. Generator rotor (17—Fig. HL119) has a taper fit with engine crankshaft on all models except model HY50-1. Remove rotor from engine crankshaft using a suitable tool.

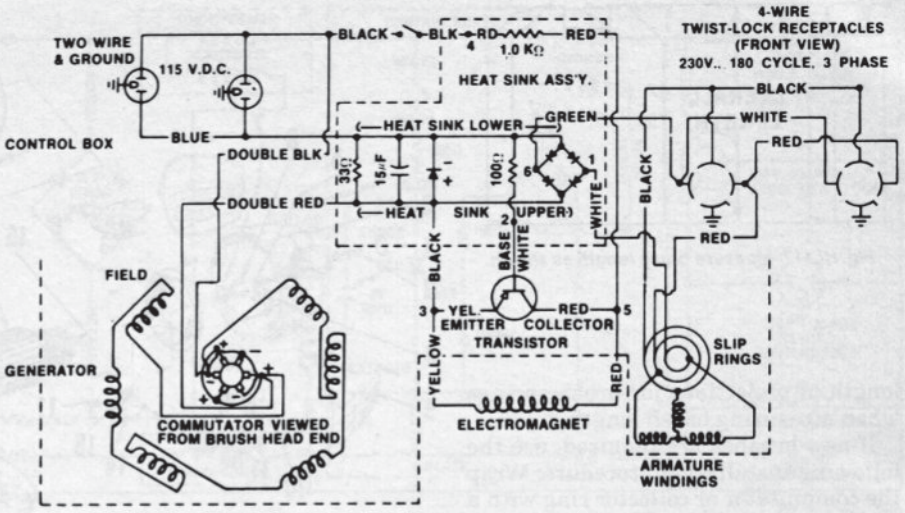

Fig. HL121–Schematic of high cycle generator 119HY35-1 with Loadamatic® and model 119HY35-2.

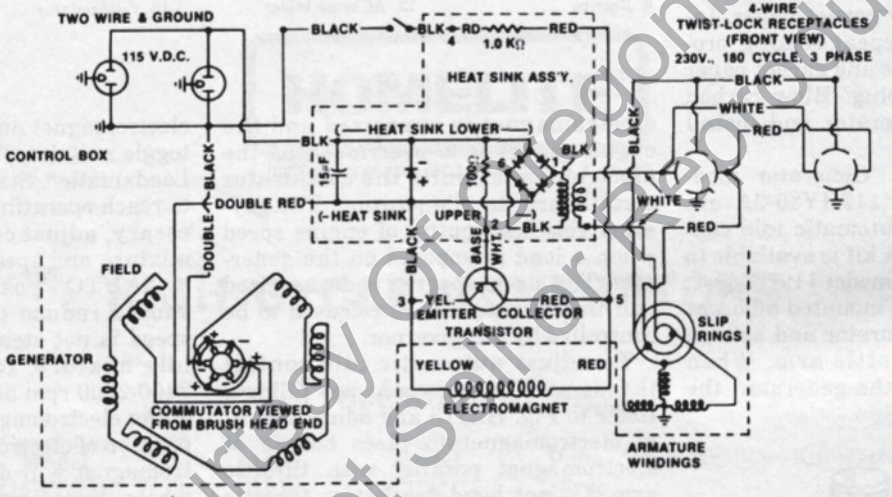

Fig. HL122–Schematic of high cycle generator 119HY35-2A.

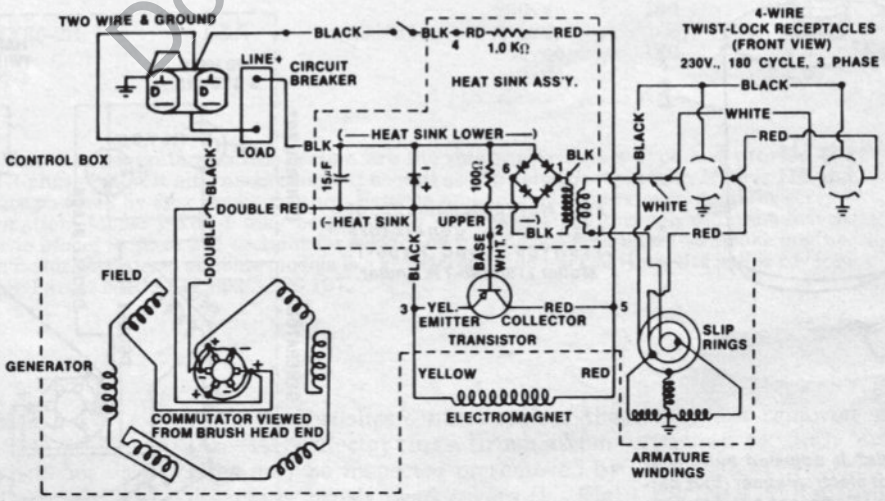

Fig. HL123–Schematic of high cycle generator 119HY35-2B.

HOMELITE®
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ECONOMY AC GENERATORS

(WITH FOUR STROKE ENGINES)

Generator Model	Engine Make	Engine Model	Volts	Hz	Kilowatts
124A10-1	Tecumseh	H30	115	60	1.0
125A15-1	Tecumseh	H35	115	60	1.5
126A22-1	Tecumseh	H50	115	60	2.25
127A30-1	Tecumseh	H70	115	60	3.0
128A10-1	Tecumseh	H30	120	60	1.0
128A10-1B	Tecumseh	H30	120	60	1.0
129A15-1	Tecumseh	H35	120	60	1.5
129A15-1B	Tecumseh	H35	120	60	1.5
130A22-1	Tecumseh	H50	120	60	2.25
130A22-1B	Tecumseh	H50	120	60	2.25
130A22-1C	Tecumseh	HS50	120	60	2.25
131A30-1	Tecumseh	H70	120	60	3.0
131A30-1B	Tecumseh	H70	120	60	3.0

The Homelite generators in this section are a rotating field type and produce alternating current. The generator is driven by the engine shown above. Refer to appropriate engine service manual for maintenance and overhaul of engine.

MAINTENANCE

BRUSHES. Brush length and condition should be checked after every 1000 hours of operation. Brushes can be inspected after removing brush head cover (1—Fig. HL130), rotor bolt (2) and fan (3). Note: do not attempt to hold rotor with fan to remove rotor bolt. Loosen screws retaining brush holder and slide out brush holder. Brushes must be renewed if brush length is shorter than ⅜ inch as shown in Fig. HL131. Be sure to reinstall a used brush so that brush curvature matches collector ring. During reassembly, fan must be mounted squarely on rotor shaft. Tighten rotor bolt to 120-140 in.-lbs.

Disassemble brush holder to install new brushes. Insert new brushes in brush holder so curvature of brush will match curvature of collector ring. Seating new brushes is not required as they are manufactured with correct curvature. Note on models 124A10-1, 125A15-1, 126A22-1 and 127A30-1 that the red wire to the brush holder should be connected to the brush closest to the rotor bearing. On all other models, red and black wires to brushes should be connected as shown

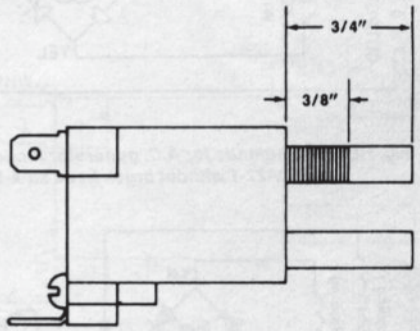


Fig. HL 131–Brush length should not be less than ⅜ inch when measured as shown above. Brush length of a new brush is ¾ inch.

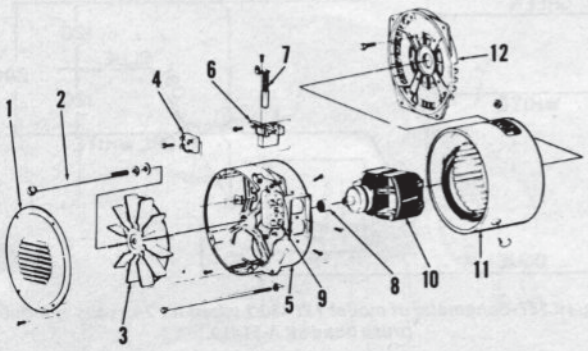


Fig. HL130–Exploded view of models 128A10-1B, 129A15-1B, 130A22-1B and 131A30-1B. Other models are similar.

1. Cover
2. Bolt
3. Fan
4. Rectifier
5. Brush head
6. Brush holder
7. Brush
8. Bearing
9. Receptacle
10. Rotor
11. Stator & housing
12. End bell

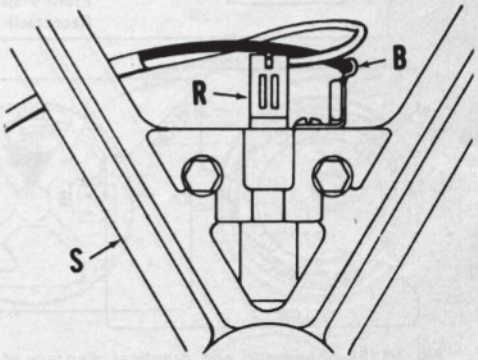


Fig. HL132–On models indicated in text, red (R) and black (B) wires to brushes are connected and routed as shown.

in Fig. HL132 and wires must be routed behind rotor support to prevent interference with fan.

OVERHAUL

DISASSEMBLY AND REASSEMBLY. Refer to Fig. 130 for an exploded view of generator and to appropriate schematic. Be sure to mark wiring so that it may be correctly connected for reassembly. Wire should be handled carefully to prevent damage to wire, insulation or connections. Generator rotor (10—Fig. HL130) has a taper fit with engine crankshaft and should be removed with a suitable tool.

BRUSH HEAD KIT. Brush head kit A-51450 is available as a direct replacement for the brush head assembly on models 128A10-1B, 129A15-1B, 130A22-1B, 130A22-1C and 131A30-1B. Brush head kit A-51450 also supersedes brush head #53753-2 on models 128A10-1, 128A10-1A, 129A15-1, 129A15-1A, 130A22-1, 130A22-1A, 131A30-1 and 131A30-1A. Schematics for these models include installation of the brush head kit. Note: Installation of brush head kit must include installation of Ground Terminal and Label Kit A-51202 if not previously installed. Alternator must be grounded with #8 ground wire to a suitable ground source.

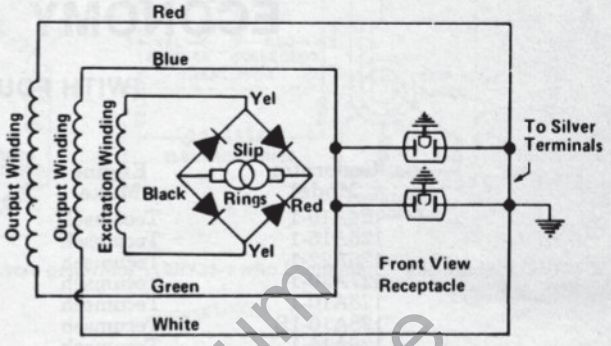
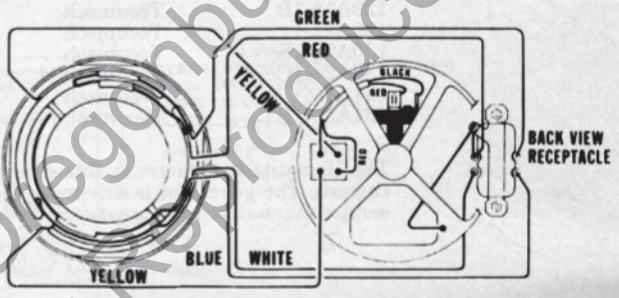


Fig. HL135–Schematic and practical diagram of models 131A30-1, 131A30-1A and 131A30-1B with brush head kit A-51450 installed.



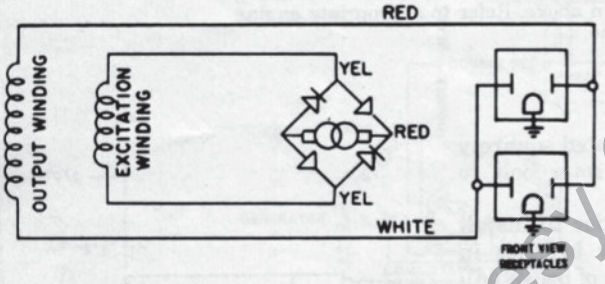


Fig. HL133–Schematic for A.C. generator models 128A10-1, 129A15-1 and 130A22-1 without brush head kit A-51450 installed.

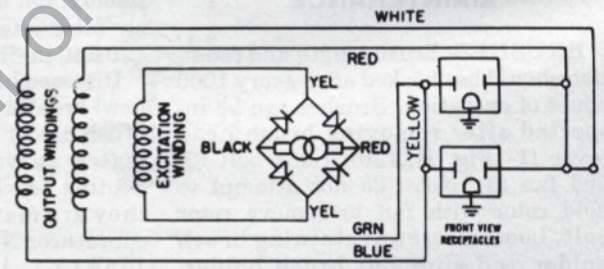
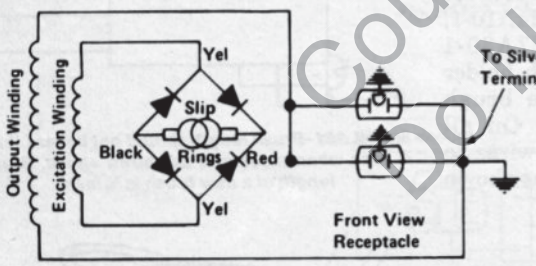


Fig. HL136–Schematic of model 131A30-1 wired for 120 volts without brush head kit A-51450.



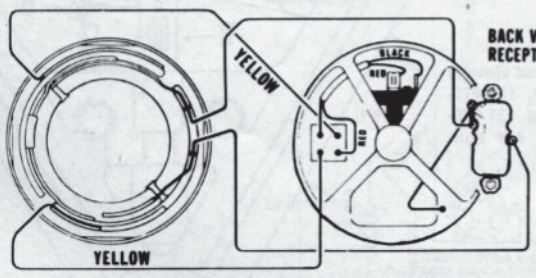


Fig. HL134–Schematic and practical diagram of models 128A10-1, 128A10-1A, 128A10-1B, 129A15-1, 129A15-1A, 129A15-1B, 130A22-1, 130A22-1A, 130A22-1B and 130A22-1C with brush head kit A-51450 installed.

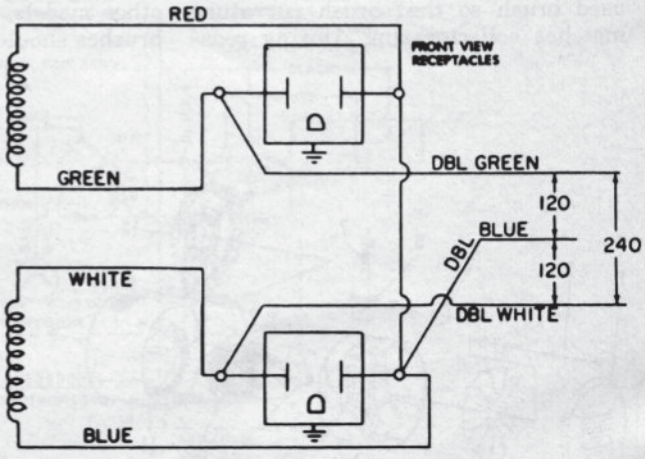


Fig. HL137–Schematic of model 131A30-1 wired for 240 volts without brush head kit A-51450.

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HEAVY DUTY VOLTAMATIC® AC GENERATORS

(WITH FOUR STROKE ENGINES)

Generator Model	Engine Make	Engine Model	Volts	Hz	Kilowatts
151A15-1	B&S	100232	120	60	1.5
151A15-1A	B&S	100232	120	60	1.5
151A15-1B	B&S	100232	120	60	1.5
151A25-1	B&S	170432	120	60	2.5
152A27-1A	B&S	170432	120	60	2.75
153A35-1	B&S	190432	120	60	3.5
153A35-1A	B&S	190432	120	60	3.5
154A20-1	B&S	130232	120	60	2.0
155A50-1	B&S	243431	120	60	5.0
155A50-1A	B&S	243431	120	60	5.0

The Homelite generators in this section are a rotating field type and produce alternating current. The generator is driven by a four stroke engine. Refer to appropriate service manuals for service information. Heavy Duty Voltamatic Generators powered by two stroke engines are covered in Model 9 and 270 sections. All of the above generators are equipped with Voltamatic voltage control to regulate voltage. NOTE: Voltamatic is a registered trademark of Homelite and is covered by U.S. Patent No. 3,428,883. Generator models 116A50-2L, 119A35-1L and 119A35-2L are equipped with Loadamatic which is covered by U.S. Patent Nos. 3,612,892 and 3,626,197. Loadamatic is a registered trademark of Homelite.

MAINTENANCE

BRUSHES. Brush length and condition should be checked after every 1000 hours of operation. Brushes can be inspected after removing brush head cover (1—Fig. HL138), rotor bolt (2) and fan (3). Note: Do not attempt to hold rotor with fan to remove rotor bolt. Loosen screws retaining brush holder and slide out brush holder. Brushes must be renewed if brush length is shorter than ⅜ inch as shown in Fig. HL139. Be sure to reinstall a used brush so that brush curvature matches collector ring. During reassembly, fan must be mounted squarely on rotor shaft. Tighten rotor bolt to 120-140 in.-lbs.

Disassemble brush holder to install new brushes. Insert new brushes in brush holder so curvature of brush will match curvature of collector ring. Seating new brushes is not required as they are manufactured with correct curvature. Red and black wires to brushes should be connected as shown in Fig. HL140 and wires must be routed behind rotor support to prevent interference with fan.

LOADAMATIC. Some models may be equipped with a kit which provides automatic idle control (Loadamatic®). An electromagnet is mounted adjacent to the engine's carburetor and acts on the carburetor throttle arm. When there is no load on the generator, the electromagnet is energized and the engine governor is overridden as the electromagnet pulls the carburetor throttle arm to idle position. The governor resumes control of engine speed

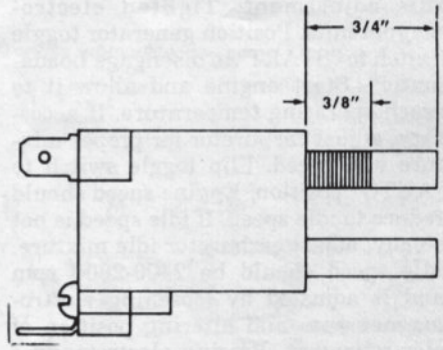

Fig. HL139–Brush length should not be less than ⅜ inch when measured as shown above. Brush length of a new brush is ¾ inch.

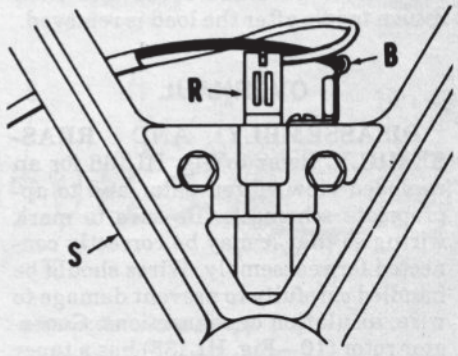

Fig. HL140–Red (R) and black (B) wires to brushes are connected and routed as shown.

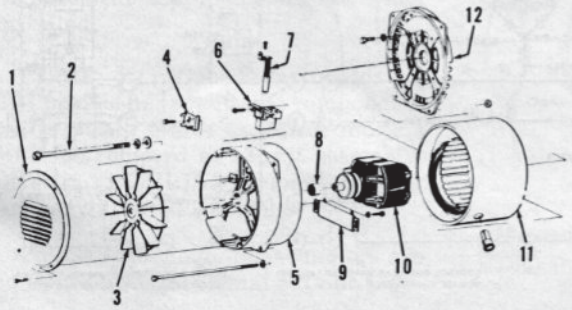

Fig. HL138–Exploded view of model 152A27-1A. Other models are similar.

1. Cover
2. Bolt
3. Fan
4. Rectifier
5. Brush head
6. Brush holder
7. Brush
8. Bearing
9. Resistor
10. Rotor
11. Stator & housing
12. End bell

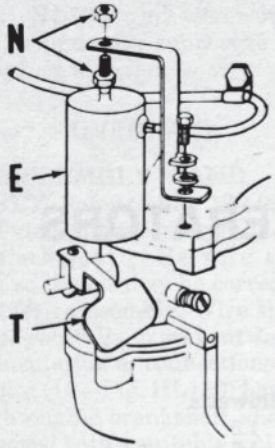

Fig. HL141–Loadamatic® is adjusted by turning nuts (N) until bottom of electromagnet (E) is parallel with throttle arm (T). Do not bend throttle arm or electromagnet bracket.

when a load is imposed on the generator. The electromagnet is deenergized and the throttle arm is released to be controlled by the governor.

To adjust automatic idle control (Loadamatic®), proceed as follows: Refer to Fig. HL141 and adjust height of electromagnet (E) to place bottom of electromagnet parallel with throttle arm (T), by turning nuts (N). Do not bend bracket or throttle arm to make this adjustment. Tighten electromagnet nuts. Position generator toggle switch to "START" to disengage Loadamatic®. Start engine and allow it to reach operating temperature. If necessary, adjust carburetor for proper mixture and speed. Flip toggle switch to "AUTO" position. Engine speed should reduce to idle speed. If idle speed is not steady, adjust carburetor idle mixture. Idle speed should be 2400-2600 rpm and is adjusted by loosening electromagnet nuts and altering position of electromagnet. Raising electromagnet decreases engine speed while lowering electromagnet increases engine speed. Apply a light load to generator and then remove it. Engine speed should increase to governed speed and then return to idle after the load is removed.

OVERHAUL

DISASSEMBLY AND REASSEMBLY. Refer to Fig. HL138 for an exploded view of generator and to appropriate schematic. Be sure to mark wiring so that it may be correctly connected for reassembly. Wires should be handled carefully to prevent damage to wire, insulation or connections. Generator rotor (10—Fig. HL138) has a taper fit with engine crankshaft and should be removed with a suitable tool.

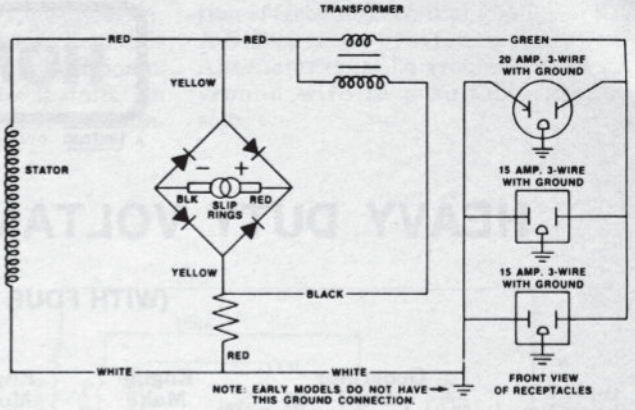

Fig. HL142–Schematic of models 151A15-1 and 151A15-1A.

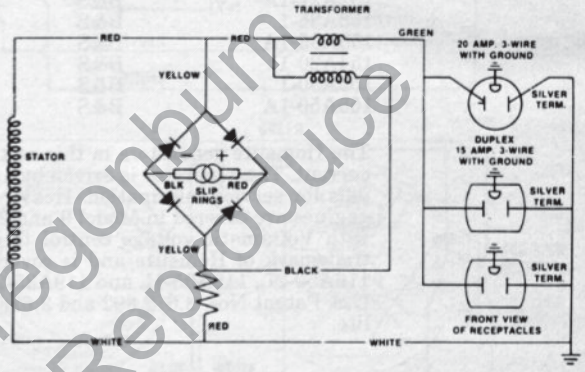

Fig. HL143–Schematic of models 151A15-1B and 154A20-1.

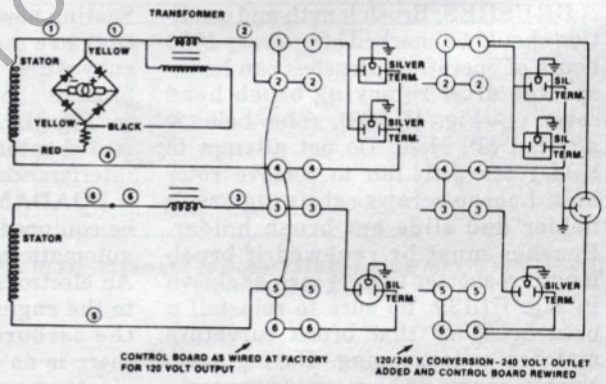

Fig. HL144–Schematic of models 152A25-1, 153A35-1 and 155A50-1.

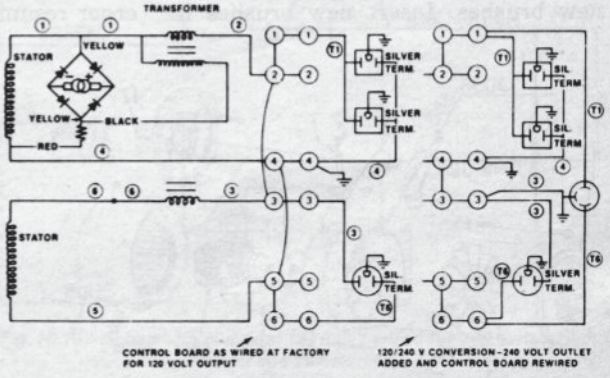

Fig. HL145–Schematic of models 152A27-1A, 153A35-1A and 155A50-1A.

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SUBMERSIBLE PUMPS

Pump Model	Volts	Amps	Cycle	Phase	GPH
LSP2-115/1-1	115	16	60	1	7,500
LSP2-220/1-1	230	8	60	1	7,500
SP2-115/1-1&1A	115	18	60	1	9,000
SP2-220/50/1-1&1A	220	12	50	1	7,500
SP2-220/1-1&1A	230	9	60	1	9,000
SP2-220/3-1&1A	230	6	60	3	9,000
SP2-380/3/50-1&1A	380	5	50	3	7,500
SP3-220/3-1, 1A&1B	230	15	60	3	18,500
SP3-440/3-1, 1A&1B	440	8	60	3	18,500

MAINTENANCE

LUBRICATION. All models are equipped with a transparent oil fill plug to indicate oil level. Oil should be changed after 200 hours of operation or after ten days of continuous usage. Recommended oil is clean SAE 30 oil or Texaco "Regal E" Turbine oil. Oil capacity of LSP2 models is approximately 8 oz. while oil capacity of SP2 and SP3 pumps is approximately 14 oz.

REPAIRS

IMPELLER & OIL SEALS. A new pump impeller should be installed if vanes are excessively worn or damaged. Install shims behind impeller to provide 0.015 inch clearance between impeller and wear plate (2—Fig. HL150), impeller housing (3—Fig. HL151) or strainer (2—Fig. HL152).

Oil seals shown in Figs. HL150, HL151 or HL152 should be renewed if oil is contaminated with dirt or water. Be sure seal is properly aligned when installed.

PUMP MOTOR. Pump motor on SP3 models has renewable components while pump motor on other models must be renewed as a unit assembly. Refer to Fig. HL151 for view of motor components on SP3 models.

Pumps with single phase motors are equipped with a thermal cut-out (14—

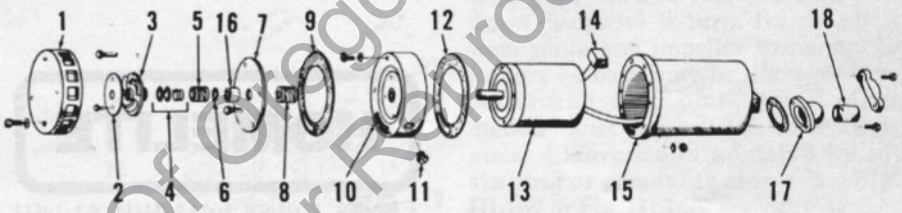

Fig. HL150–Exploded view of SP2 series submersible pumps.

1. Strainer
2. Wear plate
3. Impeller
4. Grit seal
5. Oil seal
6. Shim
7. Seal plate
8. Oil seal
9. Gasket
10. Frame plate
11. Oil fill plug
12. Gasket
13. Motor
14. Thermal cut-out
15. Case
16. Spacer
17. Outlet flange
18. Outlet fitting

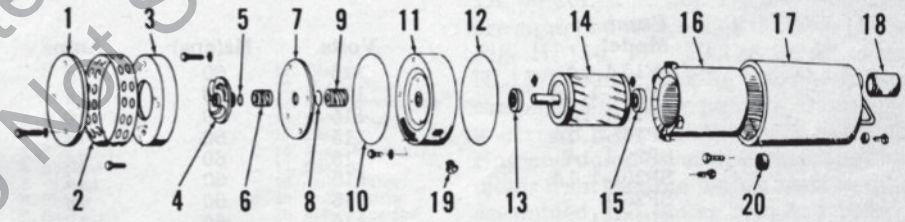

Fig. HL151–Exploded view of SP3 series submersible pumps.

1. Strainer plate
2. Strainer
3. Impeller housing
4. Impeller
5. Shim
6. Oil seal
7. Seal plate
8. Retainer
9. Oil seal
10. Quad ring
11. Frame plate
12. Quad ring
13. Ball bearing
14. Rotor
15. Ball bearing
16. Motor case
17. Pump case
18. Outlet fitting

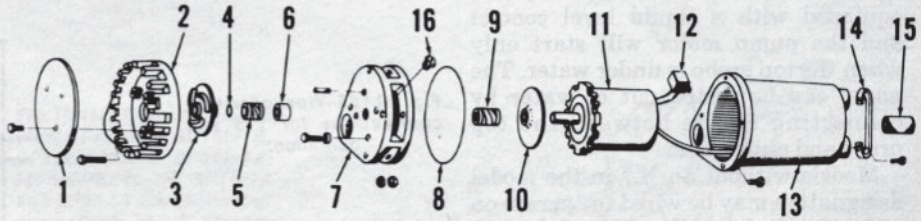

Fig. HL152–Exploded view of LSP2 series submersible pumps.

1. Strainer plate
2. Strainer
3. Impeller
4. Shim
5. Oil seal
6. Spacer
7. Frame plate
8. Quad ring
9. Oil seal
10. Seal seat
11. Motor
12. Thermal cut-out
13. Pump case
14. Handle
15. Outlet fitting

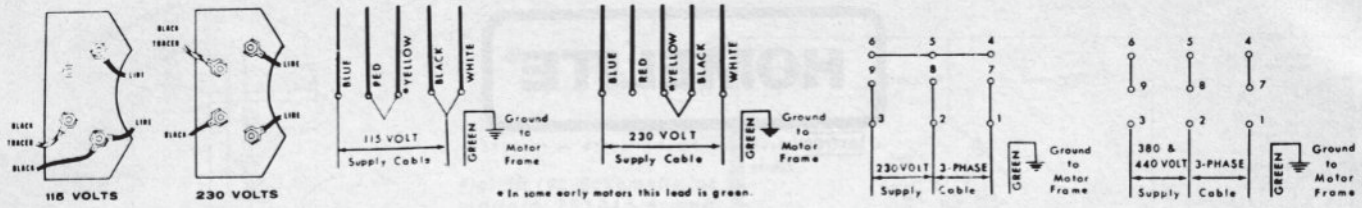

Fig. HL153–Use the above diagrams for checking pump wiring. If motor is not wired as shown, refer to diagram on cover plate of motor.

Fig. HL150 or 12—Fig. HL152), which opens the circuit if an overload occurs. Pumps with three phase motors are equipped with fuses in the control box for circuit protection.

Three phase motors will rotate in either direction and should be checked to insure proper wiring. Hold pump with strainer down and start motor briefly. Pump should twist sharply counterclockwise if wired correctly. If direction of rotation is wrong, disconnect and interchange any two live leads.

Refer to Fig. HL153 for wiring diagrams. If motor is not wired as shown, refer to diagram on cover plate of motor.

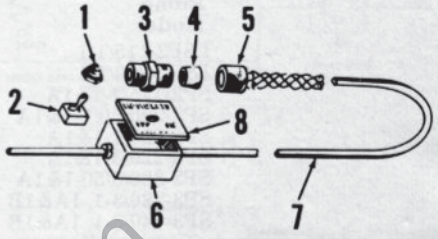

Fig. HL154–View of switch box used on all models.

1. Boot
2. Switch
3. Body & nut
4. Bushing
5. Collar
6. Switch box
7. Cable

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SUBMERSIBLE PUMPS

Pump Model	Volts	Hz(cps)	Amps	Phase	GPH
SP15-1, 1A	115	60	8	Single	5000
SP15L-1, 1A	115	60	8	Single	3000
SP16-1, 1A	115	60	10	Single	4600
SP16L-1, 1A	115	60	10	Single	4600
SP20-1, 1A	115	60	14	Single	7400
SP20L-1, 1A	115	60	14	Single	7400
SP25-1	115	60	18	Single	9000
SP25L-1	115	60	18	Single	9000

OPERATION

Models with an "L" in the model designation, such as SP20L-1, are equipped with a liquid level control and the pump motor will start only when the top probe is under water. The pump can be tested out of water by connecting a wire between the top probe and pump cover.

Models without an "L" in the model designation may be wired to operate on 230 volts. Refer to Fig. HL155 for 115 volt wiring schematic. Pumps with an "L" model designation cannot be operated on 230 volts as level control is designed to operate on 115 volts only.

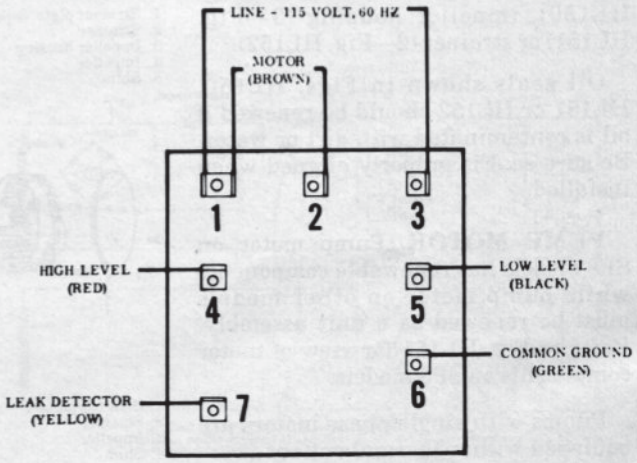

Fig. HL155–View of wiring connections for 115 volt operation.

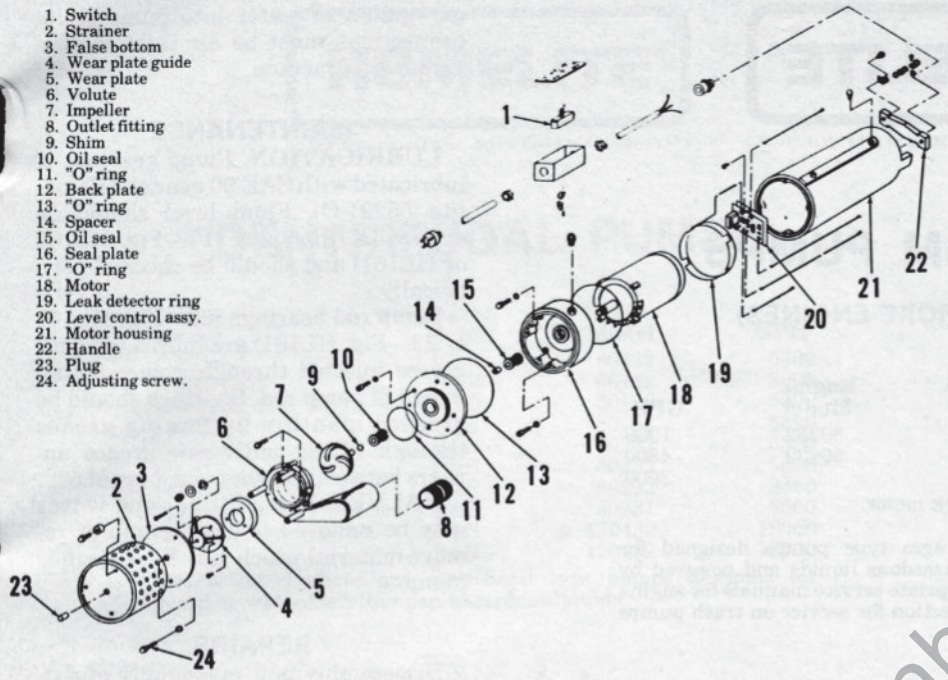

Fig. HL156–Exploded view of models SP15-1, SP15L-1, SP16-1, SP16L-1, SP20-1 and SP20L-1. Components (19 & 20) are used only on models SP15L-1, SP16L-1 and SP20L-1.

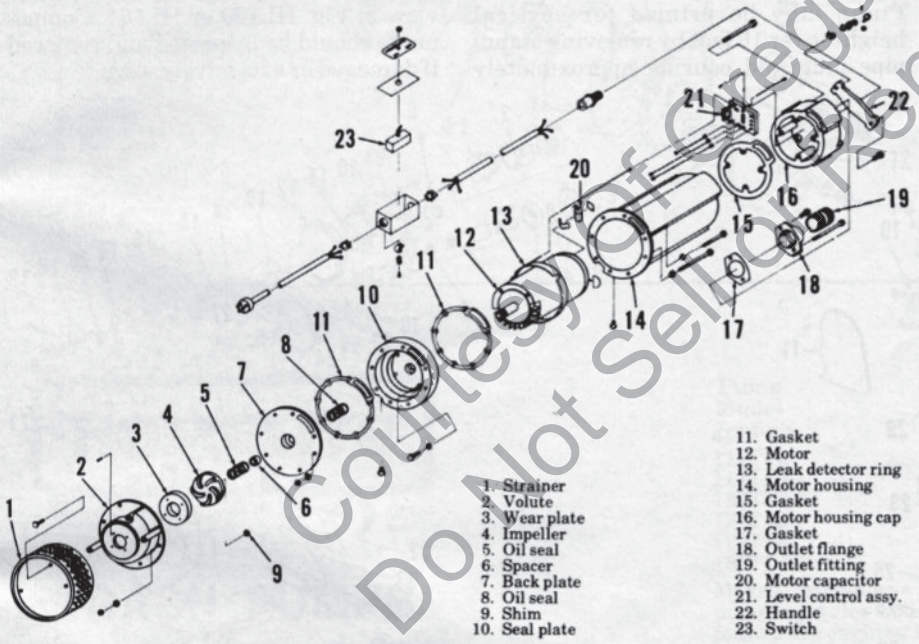

Fig. HL157–Exploded view of model SP25L-1. Model SP25-1 is similar but components (13, 15, 16 and 21) are not used.

MAINTENANCE

LUBRICATION. All models are equipped with a transparent oil fill plug to indicate oil level. Oil should be changed after every 500 hours of operation or after one month of continuous operation. Recommended oil is clean SAE 30 non-detergent oil. Oil capacity is 20 ounces for models SP15-1, SP15L-1, SP16-1, SP16L-1, SP20-1 and SP20L-1; 23 ounces for models SP15-1A, SP15L-1A, SP16-1A and SP16L-1A; and 48 ounces for models SP25-1 and SP25L-1.

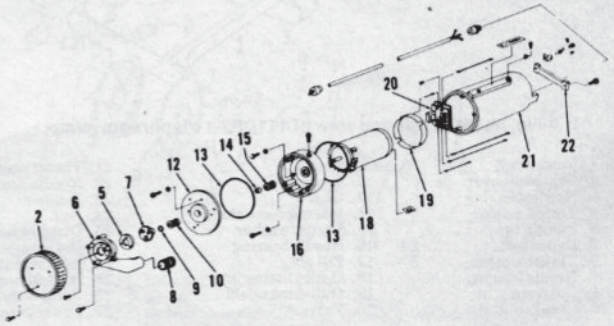

Fig. HL158–Typical exploded view of models SP15L-1A, SP16L-1A and SP20L-1A. Models SP15-1A, SP16-1A and SP20-1A are similar but components (19 & 20) are not used. Refer to Fig. HL156 for parts identification.

REPAIRS

IMPELLER AND OIL SEALS. Pump impeller should be renewed if excessively worn or damaged. Desired clearance between impeller and wear plate (5—Fig. HL156, Fig. HL158 or 3—Fig. HL157) is 0.015 inch and is obtained by installing shims (9).

Oil seals should be renewed if oil is contaminated with dirt or water. Be sure seal is properly aligned when installed. If inner seal is worn excessively, motor should be inspected to determine if water has entered motor case and damaged motor.

PUMP MOTOR. Pump motor must be renewed as a unit assembly. Starter capacitor and thermal protector are renewable as separate components on some models.

Clearance between impeller and wear plate on models SP15-1, SP15L-1, SP16-1, SP16L-1, SP20-1, and SP20L-1 is adjusted by removing plug (23—Fig. HL156) and turning adjusting screw (24) with pump running. Slowly turn adjusting screw counterclockwise until wear plate contacts impeller then turn screw clockwise ¼ turn. Do not allow wear plate and impeller to remain in contact as both may be damaged. Impeller and wear plate on all other models must have 0.015 inch clearance. Clearance is adjusted by installing or removing shims (9—Fig. HL157 or Fig. HL158).

All models are equipped with a thermal overload detector to protect the pump motor from overheating.

LEAK DETECTOR. Models SP15L-1, SP15L-1A, SP16L-1, SP16L-1A, SP20L-1, SP20L-1A and SP25L-1 are equipped with a leak detector (19—Fig. HL156, Fig. HL158 or 13—Fig. HL157). Water leaking into the motor compartment of the pump will conduct a current between the leak detector ring and pump cover disconnecting the motor from the line. Pump must be disassembled and water removed before motor will operate.

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DIAPHRAGM PUMPS

(WITH FOUR STROKE ENGINES)

Pump Model	Engine Make	Engine Model	GPH
111DP2-1	B&S	80232	1900
111DP3-1	B&S	80232	4800
DP3-1A	*	....	3000

*Designed for operation with electric motor.

Models listed above are diaphragm type pumps designed for pumping water and other non-hazardous liquids and powered by four stroke engines. Refer to appropriate service manuals for engine service. Refer to Model 9 or 270 section for service on trash pumps powered by two stroke engines.

OPERATION

Total suction lift of diaphragm pumps in this section is 25 feet. Pumps are self-priming up to a lift of 15 feet. Pump may be primed for vertical heights over 15 feet by removing standpipe plug and pouring approximately one gallon of water into pump. Inlet connections must be air tight to prevent loss of vacuum.

MAINTENANCE

LUBRICATION. Pump gearcase is lubricated with SAE 90 gear oil (Homelite 55291-C). Fluid level should be even with filler plug (17—Fig. HL160 or HL161) and should be checked periodically.

Pump rod bearings (29—Fig. HL160 or 22—Fig. HL161) are lubricated with grease injected through grease fitting in end of pump rod. Bearings should be greased monthly by forcing grease through fitting until new grease appears between bearing and journal.

VALVES. Pump fittings and valves may be removed to clean pump or remove material which may have clogged pump.

REPAIRS

Disassembly and reassembly of diaphragm pump is evident after inspection of unit and referral to exploded view in Fig. HL160 or HL161. Components should be inspected and renewed if damaged or excessively worn.

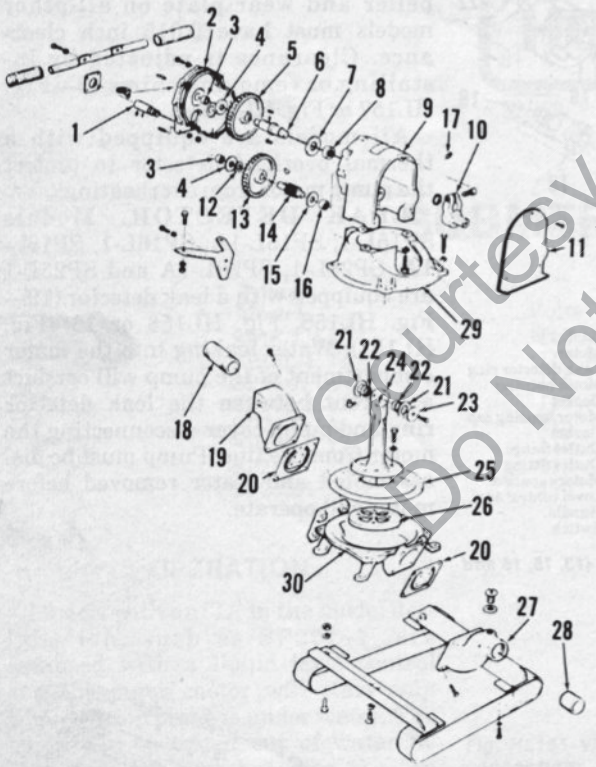

Fig. HL160–Exploded view of 111DP2-1 diaphragm pump.

1. Input shaft
2. Gearcase cover
3. Needle bearing
4. Thrust washer
5. Pump gear
6. Driveshaft
7. Thrust washer
8. Needle bearing
9. Gearcase
10. Crank
11. Shield
12. Spacer
13. Gear
14. Intermediate shaft
15. Thrust washer
16. Needle bearing
17. Fill plug
18. Outlet fitting
19. Outlet manifold
20. Valve
21. Thrust washer
22. Needle bearing
23. Washer
24. Rod
25. Diaphragm
26. Diaphragm cap
27. Inlet manifold
28. Inlet fitting
29. Pump body
30. Lower housing

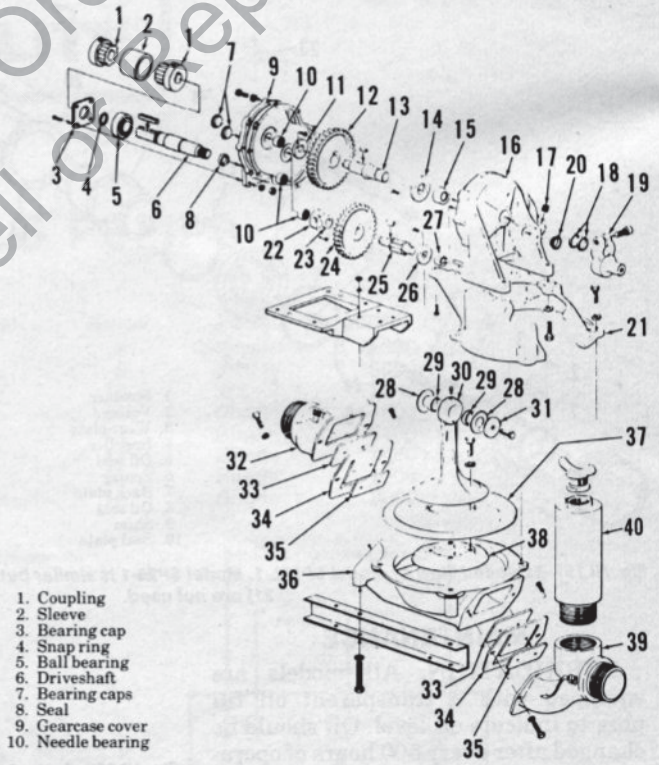

Fig. HL161–Exploded view of model DP3-1A diaphragm pump. Model 111DP3-1 is similar.

1. Coupling
2. Sleeve
3. Bearing cap
4. Snap ring
5. Ball bearing
6. Driveshaft
7. Bearing caps
8. Seal
9. Gearcase cover
10. Needle bearing
11. Thrust washer
12. Pump gear
13. Driveshaft
14. Thrust washer
15. Needle bearing
16. Gearcase
17. Fill plug
18. Seal
19. Crank
20. Bearing cap
21. Pump housing
22. Thrust washer
23. Spacer
24. Gear
25. Intermediate shaft
26. Thrust washer
27. Needle bearing
28. Thrust washer
29. Needle bearing
30. Rod
31. Washer
32. Outlet manifold
33. Valve plate
34. Valve
35. Valve weight
36. Lower housing
37. Diaphragm
38. Diaphragm cap
39. Inlet manifold
40. Standpipe

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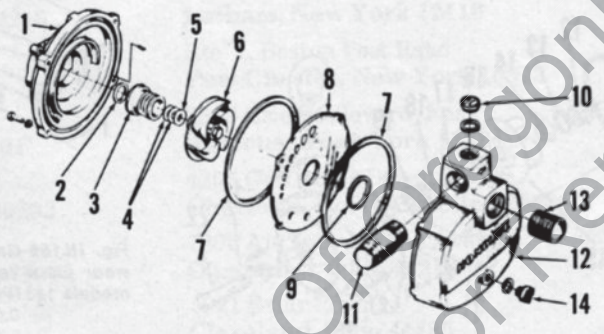
CENTRIFUGAL PUMPS

Pump Model	Engine Make	Engine Model	GPH
110S1½-1	B&S	80232	5500
110SU1½-1	B&S	60132	5000
110SU1½-1A	B&S	60132	5000
110S1½-2	B&S	80232	5500
111S1½-1	B&S	80232	5500
111S1½-2	B&S	80232	5500
111S2-1	B&S	80232	9000
111SU2-1	B&S	80231	8500
113S3-1	B&S	170432	18000
120S3-1	B&S	170432	18000

Models listed above are centrifugal type pumps designed for pumping water and other non-hazardous liquids.

Fig. HI162–Exploded view of model 113S3-1 centrifugal pump. Other models are similar.



1. Impeller housing
2. Slinger
3. Seal assy.
4. Shims
5. Spacer
6. Impeller
7. Gasket
8. Wear plate
9. Gasket
10. Fill plug
11. Outlet fitting
12. End housing
13. Inlet fitting
14. Drain plug

OPERATION

All pumps are self-priming type but pump must be filled with water during operation as seals are lubricated by fluid being pumped. Inlet connections must be air tight to prevent loss of vacuum and a reduction in pump efficiency.

REPAIRS

DISASSEMBLY AND REASSEMBLY. Disassembly and reassembly of pump is evident after inspection of unit and referral to exploded view in Fig. HL162. Care should be taken not to damage gaskets during disassembly. Impeller must be turned counterclockwise for removal. Unscrew impeller by placing wrench on hex end of impeller and striking wrench sharply with a hammer. Take care not to damage or lose shims or seals.

Install sufficient shims (4—Fig. HL162) to obtain clearance between impeller (6) and wear plate (8) of 0.020-0.030 in. on model 120S3-1 and 0.015-0.025 in. on all other models. Before reassembling pump, hold wear plate (without gasket) against impeller housing and turn engine over by hand to be sure impeller does not rub against wear plate.

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TRASH PUMPS

(WITH FOUR STROKE ENGINES)

Pump Model	Engine Make	Engine Model	GPH
45TP3-1	B&S	170432	21,600
112TP2	B&S	130232	11,500
117TP3-1	Wisc.	S-7D	21,600
120TP3-1	B&S	17432	21,600
121TP2-1	B&S	130232	11,500
123TP4	Wisc.	S-12D	36,500
160TP4-1	B&S	326431	36,500

Models listed above are centrifugal type trash pumps designed for pumping water and other non-hazardous liquids and powered by four stroke engines. Refer to appropriate service manuals for engine service. Refer to previous Model 9, 251 and 270 sections for trash pumps powered by two stroke engines.

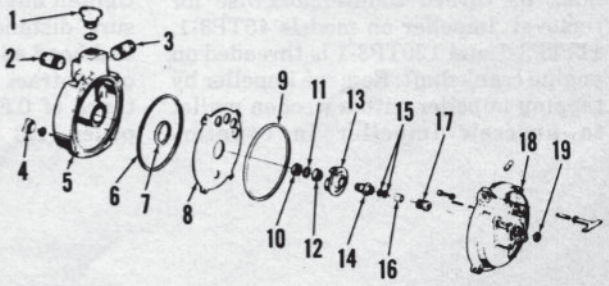
OPERATION

All pumps are self-priming but pump must be filled with water during operation to prevent damage to seals as seals are lubricated by fluid being pumped. Inlet connections must be air tight for efficient pump operations.

REPAIRS

DISASSEMBLY AND REASSEMBLY. Disassembly of pump is

Fig. HL165–Exploded view of model 121TP2-1 trash pump. Model 112TP2 is similar but washers are used in place of spacer (16).



1. Fill plug
2. Inlet fitting
3. Outlet fitting
4. Drain plug
5. End housing
6. Gasket
7. Gasket
8. Wear plate
9. Gasket
10. Nut
11. Washer
12. Tapered bushing
13. Impeller
14. Impeller hub
15. Shims
16. Spacer
17. Seal assy.
18. Impeller housing
19. Slinger

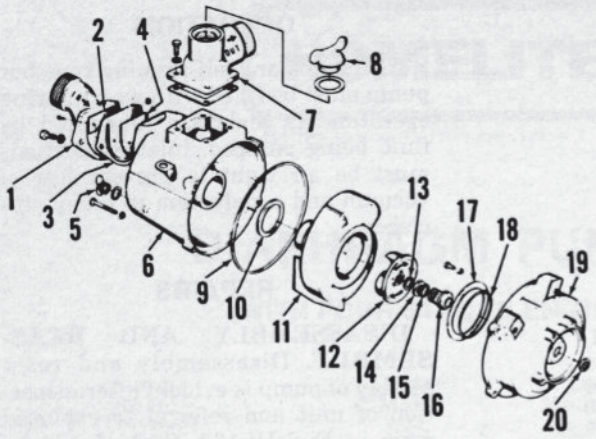


Fig. HL166–Exploded view of model 45TP3-1, 117TP3-1 or 120TP3-1 trash pump.

1. Inlet manifold
2. Valve plate
3. Valve
4. Valve plate
5. Drain plug
6. End housing
7. Outlet manifold
8. Fill plug
9. Gasket
10. Gasket
11. Impeller housing
12. Impeller
13. Shim
14. Nut
15. Shim
16. Seal assy.
17. Gasket
18. "O" ring
19. Back plate
20. Slinger

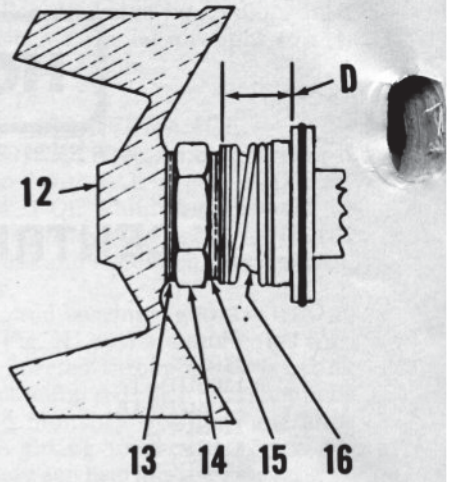


Fig. HL168–Seal seat to head distance (D) 0n models 45TP3-1, 117TP3-1 and 120TP3-1 should be 0.865-0.885 inch. Refer to text.

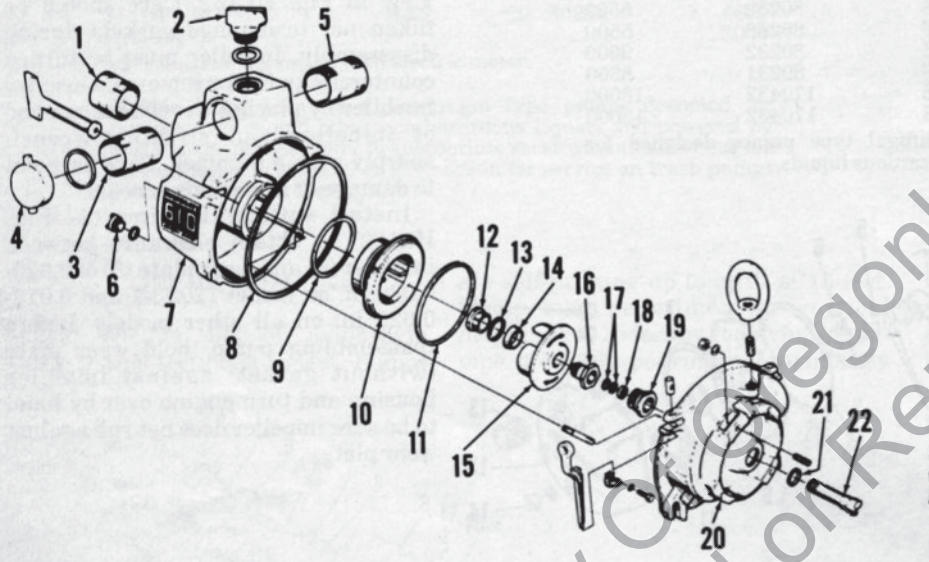


Fig. HL167–Exploded view of model 123TP4 trash pump. Model 160 TP4-1 is similar.

1. Inlet fitting
2. Fill plug
3. Outlet fitting
4. Cap
5. Outlet fitting
6. Drain plug
7. End housing
8. Gasket
9. Gasket
10. Wear plate
11. Gasket
12. Nut
13. Washer
14. Tapered bushing
15. Impeller
16. Impeller hub
17. Shims
18. Washer
19. Seal assy.
20. Impeller housing
21. Slinger
22. Engine crankshaft

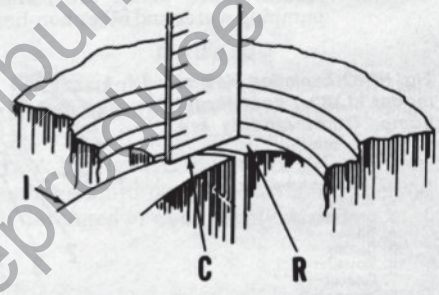


Fig. HL169–Gap (C) between impeller (I) and wear plate recess (R) in impeller housing of models 123TP4 and 160TP4-1 should be 0.005-0.015 inch. Refer to text.

evident after inspection of unit and referral to exploded view in Fig. HL165, HL166 or HL167. Impeller on models 112TP2, 121TP2-1 and 123TP4 is resiliently mounted on a plastic bushing that allows the impeller to slip slightly when a solid object jams the impeller. This stalls the engine gradually, avoiding damage to the unit.

Impeller hub (14—Fig. HL165) is threaded on engine crankshaft and must be turned counterclockwise for removal. Impeller on models 45TP3-1, 117TP3-1 and 120TP3-1 is threaded on engine crankshaft. Remove impeller by tapping impeller with a wooden mallet to unscrew impeller in counterclockwise direction. It may be necessary to pry wear plate (10—Fig. HL167) out of end housing on model 123TP4. Note locating notch in wear plate and corresponding locating boss in end housing.

To properly locate impeller on engine crankshaft of models 45TP3-1, 117TP3-1 and 120TP3-1, use the following procedure: Install components (14 thru 20 Fig. HL166) on engine crankshaft, tighten nut (14) to 50 ft.-lbs., and measure distance between seal (16) seat and head as shown in Fig. HL168. Add or subtract shims (15) to obtain distance of 0.865-0.885 inch. Install impeller (12) and sufficient number or thickness of shims (13) so that impeller just touches impeller housing. Remove 0.015 inch from shim pack to obtain proper impeller clearance. Shims (13 & 15) are available in thicknesses of 0.010, 0.015 and 0.032 inch.

Proper impeller location on model 123TP4 is determined as follows: Install components (15 thru 21—Fig. HL167) on engine crankshaft and measure depth of impeller vane adjacent to wear plate recess of impeller housing (20) as shown in Fig. HL169. Install shims (17—Fig. HL167) to obtain a depth of 0.005-0.015 inch. Shims are available in thicknesses of 0.010-0.015 inch.

Proper location of impeller on models 112TP2 and 121TP2-1 is determined by shims (15—Fig. HL165) which are available in thicknesses of 0.010 and 0.015 inch. There should be 0.020-0.030 inch clearance between impeller and wear plate (8).

HOMELITE AUTHORIZED FACTORY BRANCHES

(Arranged Alphabetically by States)

When communicating with any of the establishments listed below, insert the name "Homelite" before the listed address, except those in Canada and Europe.

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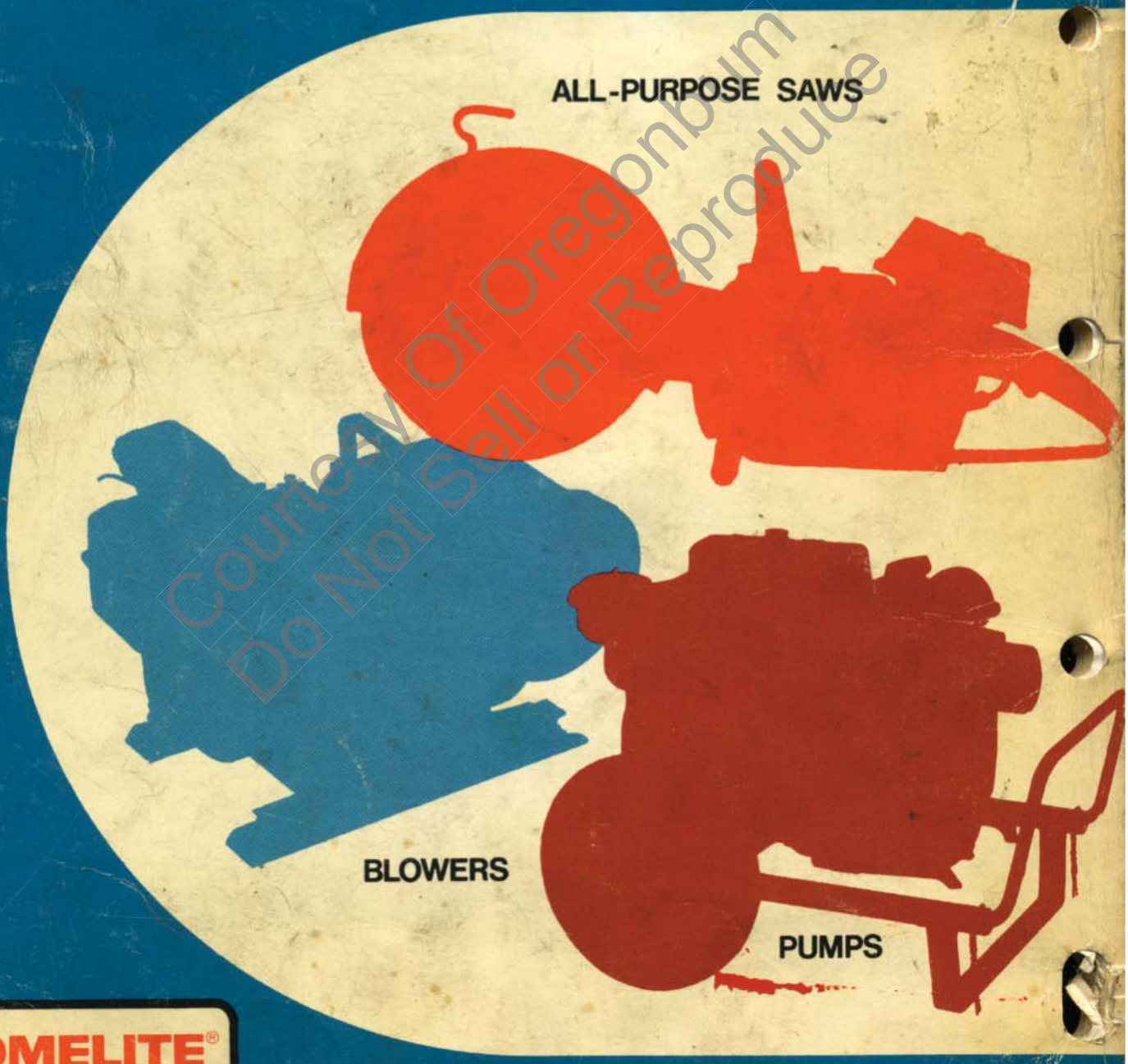

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