

HOMELITE

HOMELITE A **Textron** DIVISION

Port Chester, New York

CONDENSED SERVICE DATA

Year Produced	Model
1962	460A1, 460A2
1963	460A1A, 460A2A

NOTE: Models A1 & A1A are equipped for 15-inch transom;
Models A2 & A2A for 20-inch transom.

TUNE-UP

Hp @ rpm	55 @ 5500
Bore—Inches	2.750
Stroke—Inches	2.50
Number of Cylinders	4
Compression Ratio	9:1
Compression Pressure @ Cranking Speed	110 Lb. Min.
Displacement—Cu. In.	59.4
Spark Plug	
Champion	J6
AC	C43
Auto-Lite	A42
Electrode Gap	0.025
Distributor Point Gap	0.020
Distributor Timing	8° BTC
Carburetor Make	Tillotson
Carburetor Adjustment	See Text
Firing Order	1-3-4-2
Intake Valve Clearance (Cold)	0.012 -0.014
Exhaust Valve Clearance (Cold)	0.015 -0.017

SIZES—CLEARANCES

Piston Rings	
Compression Ring Side Clearance	0.0025-0.004
Oil Ring Side Clearance	0.0000-0.0065
Compression Ring End Gap	0.012 -0.014
Oil Ring End Gap	0.036 -0.038
Piston Skirt Clearance	0.0033-0.0047

SIZES—CLEARANCES (CONT'D)

Piston Pin Diameter	0.6250-0.6252
Piston Pin Diametral Clearance in Bushing	0.0005-0.001
Wear Limit	0.002
Crankshaft Bearing Diameters	
Upper Main Bearing	1.499 -1.500
Other Main Bearings	1.374 -1.375
Crankpin	1.374 -1.375
Crankshaft Bearing Clearances	0.0005-0.003
Camshaft Bearing Diameter	0.6235-0.6240
Camshaft Bearing Clearance	0.0025-0.0035
Intake Valve Stem Diameter	0.3135-0.3140
Exhaust Valve Stem Diameter	0.3130-0.3135
Valve Face & Seat Angle	45°

TIGHTENING TORQUES

(All Values In Inch-Pounds Unless Noted)

Connecting Rod	300
Inlet & Exhaust Manifold	140
Flywheel	175 Ft.-Lbs.
Spark Plug	300
Main Bearing Caps	200
Oil Pan	160
Oil Pump Cover	90
Oil Pump Mounting Screws	150
Camshaft Bearing Caps	100
Camshaft Gear Nut	140

LUBRICATION

The four-cycle power head is lubricated by a pressurized oil system which uses a separate oil reservoir. Do not mix oil with the fuel. The oil sump should be drained and refilled with two quarts of a good grade detergent type automotive oil, SAE 30 every 100 hours of operation, and oil level checked daily. The lubricating system uses a cartridge type oil filter and the element should be renewed when oil is changed.

NOTE: The manufacturer also recommends that oil filter adapter be removed and gaskets renewed each 100 hours. Refer to RELIEF VALVE & FILTER, in POWER HEAD section.

Refer to Fig. H1 for location of oil reservoir drain (D) and oil level indicator (C) plugs. Filler cap is located under shroud on rear, port side of power head as shown at (F). The oil filter cartridge is located on starboard side of block and can be renewed after removing shroud.

The lower unit gears and bearings are lubricated by oil contained in the gear case. The best available grade of SAE 90 outboard gear oil should be used. Gearcase capacity is 12 ounces. Drain the gear housing every 100 hours by removing the drain plug (P) and bleed plug (B). Refill through drain plug hole (P) until the lubricant reaches level of bleed plug (B). Reinstall bleed and drain plugs securely, using new gaskets. Gearcase level should be checked each 25 hours of operation.

FUEL SYSTEM

The motor is equipped with two Tillotson model MD 120B carburetors which must be identically adjusted and synchronized. Each carburetor supplies the fuel mixture for two of the four cylinders. An automotive, diaphragm type fuel pump is mounted on camshaft cover (front) of engine and is driven by a camshaft lobe.

CARBURETOR. Refer to Fig. H2 for an exploded view of the carburetor. Normal initial setting for the idle mixture needle (13) is 1½ turns open from the closed position. Carburetor is equipped with a fixed high-speed jet. Idle mixture and speed adjustments should be checked under load after engine is at operating temperature, and both carburetors adjusted alike.

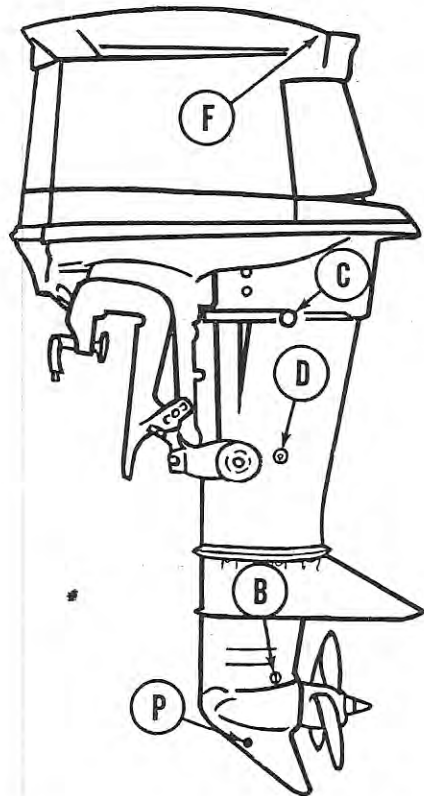


Fig. H1 — Port side view of the HOME-LITE Four-Cycle outboard motor showing drain and filler plug location for power head and lower unit.

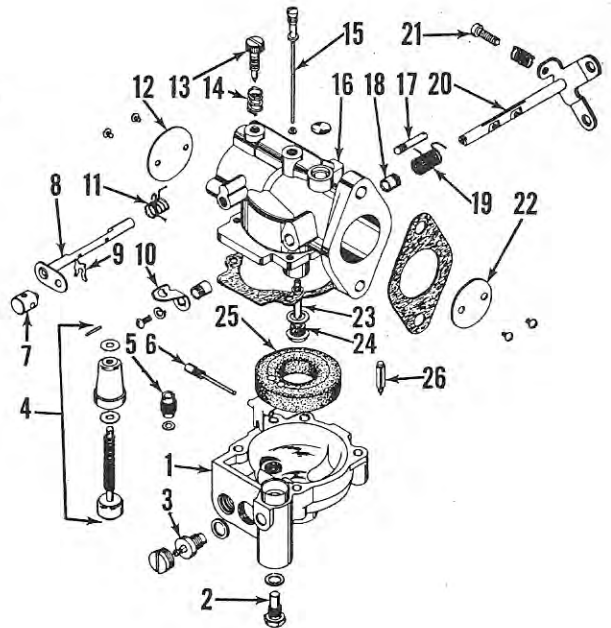
- B. Lower unit bleed plug
- C. Oil level indicator
- D. Oil reservoir drain plug
- F. Oil reservoir filler cap
- P. Lower unit drain & filler plug

To disassemble the carburetor, hold throttle in an open position and disconnect accelerator pump lever from throttle shaft; then, remove the four body screws and separate the float bowl from throttle body. Carburetor should be in an upright position when separated. Remove body gasket and pull the accelerator pump plunger assembly from float chamber.

Hold one hand over open portion of float bowl; invert the bowl, and shake the accelerator pump check valve (26) from float bowl. Save the check valve (26) for re-installation if it is serviceable. Remove

Fig. H2 — Exploded view of Tillotson carburetor used on all models.

1. Float bowl
2. Stop screw
3. Inlet needle valve
4. Accelerator pump
5. Inlet check valve
6. Float pivot
7. Choke swivel
8. Choke shaft
9. Retainer
10. Actuating lever
11. Choke return spring
12. Choke valve
13. Idle mixture valve
14. Spring
15. Idle tube
16. Carburetor body
17. Stop pin
18. Bushing
19. Throttle spring
20. Throttle shaft
21. Idle speed screw
22. Throttle valve
23. Main nozzle
24. Main jet
25. Float
26. Check valve



the accelerator pump assembly and the stop screw. Remove the float pivot screw (6) and withdraw the float assembly.

On the early carburetor, the choke return spring was located on starboard side of carburetor body opposite the choke lever. Remove and discard the spring, and install the new type spring (Homelite Part No. 90647C) on opposite (Port) side of carburetor body between the actuating lever and carburetor body.

To check the float level adjustment, remove and invert the float bowl. Do not forget to disconnect the accelerator pump; and to remove and save the accelerator pump check valve (26—Fig. H2). With bowl inverted and inlet needle valve closed, the lowest point of float at free end should project approximately 1/64-inch below gasket surface of bowl. Adjust by bending the vertical valve fork on float. Float must be removed to renew the inlet needle valve assembly (3). When installing float, make sure that slot in float lever engages groove in needle.

Carburetor model number and parts list is as follows:

Description	Homelite Part No.
Carburetor	A-90250
Repair kit	.90813A
Gasket set	.90812
Inlet needle and seat	.90808
Float	.31855
Idle adjustment needle	.71507
Idle tube	.90807
Main jet	.90809
Main nozzle	.90810

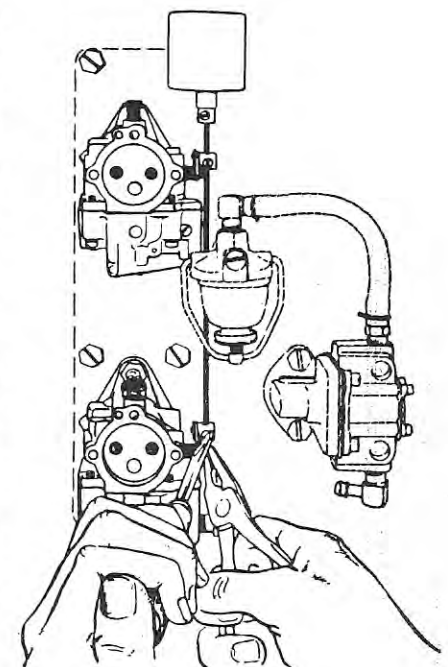


Fig. H3—Make sure choke solenoid opens and closes both choke valves equally and completely and that solenoid plunger operates on a vertical plane with no side pressure.

- Accelerator pump assy.90805-A
- Accelerator pump inlet valve.....55314
- Accelerator pump outlet valve.....56624

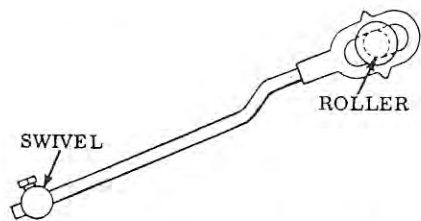


Fig. H4 — With bellcrank fully to rear, loosen swivel clamp and center the roller in throttle rod as shown. Refer to text.

SPEED CONTROL LINKAGE. To adjust the speed control linkage, back off the idle speed stop screws (21—Fig. H2) until they are free of stops and throttle valves can completely close. Loosen the clamp screw in swivel (Fig. H4), and make sure the throttle bellcrank on starboard side of mounting plate is rotated counter-clockwise as far as it will go. With lower carburetor throttle completely closed and bellcrank fully in counter-clockwise position, tighten the swivel clamp screw with roller (Fig. H4) centered in control slot of throttle rod (14—Fig. H5). Loosen the screw clamping the upper carburetor throttle lever to connecting link (13), make sure both throttle valves are completely closed; then retighten clamping screw. Turn each idle speed stop screw (IS) until they just contact the stop, then turn each screw an additional ¼-turn to establish the approximate idle speed.

To adjust the choke linkage, thread the choke cable (10) through the swivels in the two carburetor choke levers, insert the upper end into plunger of choke solenoid (9) and tighten the clamping screw. Grasp lower end of cable and pull the solenoid plunger down completely while holding upper carburetor choke lever open, then tighten the upper clamping screw. Push the solenoid plunger up to close the upper carburetor choke; hold lower carburetor choke closed, and with cable taut, tighten the lower clamping screw. Release the chokes and test the operation, making sure both chokes completely close and that the mechanism operates smoothly. Choke solenoid plunger must be centered above cable so there is no side pull when solenoid is activated. Cut off the free end of choke cable to prevent binding, if a new cable is installed or if the cable is too long.

FUEL PUMP. The diaphragm type fuel pump is mounted on forward side of camshaft cover and driven by a camshaft lobe. Refer to Fig. H6. Fuel pressure should be at least 1 pound when tested in the line (4) between fuel pump and strainer.

A fuel pump repair kit is available, consisting of diaphragm, diaphragm spring, valve discs, valve springs and gaskets. Always install the complete repair kit when fuel pump is overhauled. To disassemble the fuel pump mark the body halves for convenience in reassembly, remove the body

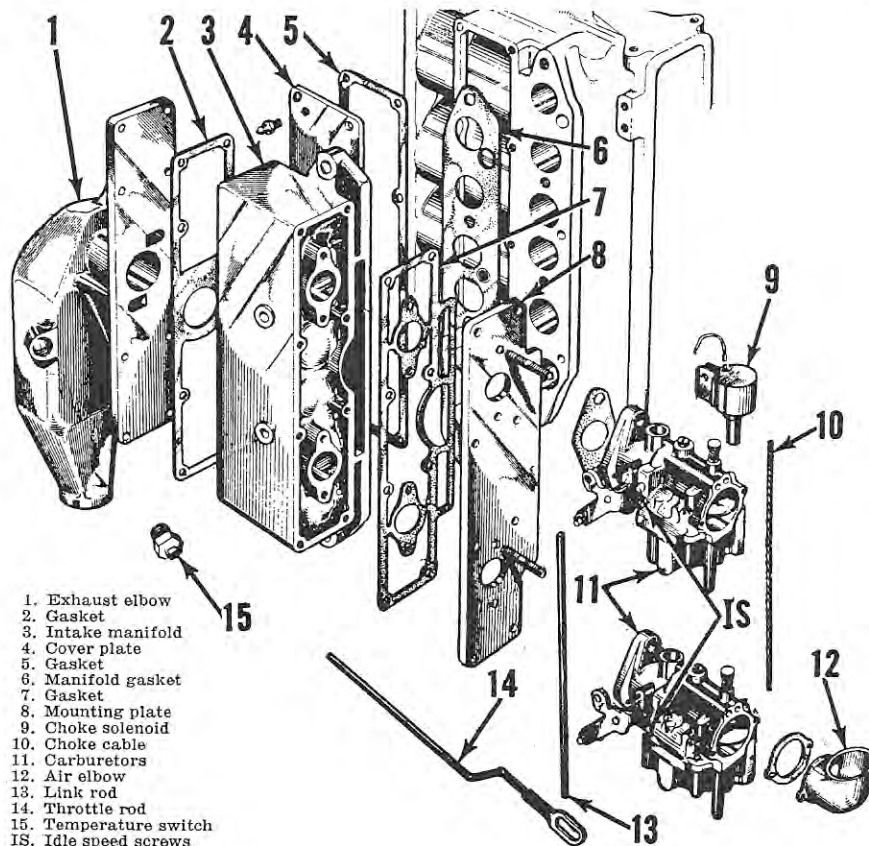


Fig. H5—Exploded view of intake and exhaust manifolds showing component parts.

screws and separate the two halves. Rotate the diaphragm 90° in either direction to unhook the connecting link, then remove diaphragm and spring. Remove the valve retainer screw and retainer, and lift out the two check valves. Clean the body halves in a suitable solvent and inspect for cracks or other damage.

To reassemble, place the large diaphragm spring over diaphragm push rod and insert push rod through slot in pump lever. Rotate diaphragm 90° to lock in place. Hold valve body with open side up and place one valve disc in the bore on "IN" side of valve body. Place a spring on the post on "OUT" side of body. Place the remaining valve spring on the installed disc and the remaining disc on the installed spring; then reinstall the valve gasket and retainer. After installing the pump, make sure elbow for inlet line (6) is pointed toward cam cover at 45° to permit fuel line to clear the engine cover. Loose ends of hose clamp should point to port side of motor.

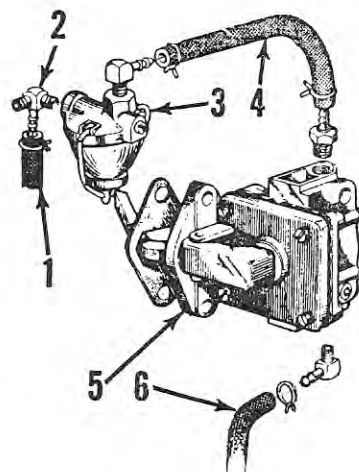


Fig. H6 — Partially exploded view of fuel pump and lines.

IGNITION

The motor is equipped with a battery ignition system, with an automatic centrifugal advance built into the distributor. Firing order is 1-3-4-2; with the lower cylinder of the power head being designated as No. 1.

- 1. Carburetor line
- 2. Elbow
- 3. Fuel strainer
- 4. Outlet line
- 5. Fuel pump
- 6. Inlet line

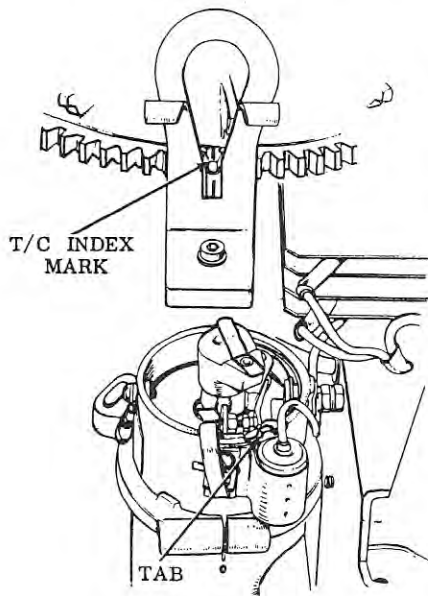


Fig. H7 — Front view of power head with engine cover removed showing timing marks. Refer to text for details of timing procedure.

DISTRIBUTOR. Breaker contact gap should be 0.017-0.022. Static timing is set at 8° BTC, with the maximum advance of 43° BTC occurring at approximately 4200 engine RPM. Timing marks are stamped on the flywheel ring gear teeth and align with an index mark on the lifting bracket as shown in Fig. H7. Timing can be checked and adjusted with a power timing light after removing engine cover. The 8° static timing mark is two ring gear teeth before TC; and the 43° timing mark is approximately 11 ring gear teeth before TC. NOTE: The end of the crankshaft is also affixed with a TC aligning mark. If the TC marks on flywheel and crankshaft do not align, remove the flywheel and align.

To remove the distributor, first remove distributor cap, leaving plug wires in cap. Scribe a line on the distributor body in line with split in distributor clamp for convenience in installation. Disconnect the distributor leads, loosen the clamp screw, and pull distributor from the clamp. Do not remove clamp from cylinder block.

The slotted distributor shaft is driven by a drive key which is pinned in the camshaft. To install the distributor, remove the No. 1 (Lower) spark plug and turn flywheel counter-clockwise until No. 1 piston is coming up on compression stroke and continue turning until the TC timing mark is aligned as shown in Fig. H7. Align the distributor rotor with the distributor cap alignment tab and insert distributor with rotor pointing forward and slightly to port as shown. Make sure distributor drive key enters slot in distributor shaft, align the previously affixed scribe marks and tighten clamp screw.

Rotate the flywheel clockwise approximately 1/8-turn; then counter-clockwise until the "8" marked flywheel tooth is centered in lifting bracket eye. Make sure distributor breaker contacts are properly gapped, the coil wires properly connected, and the ignition switch in the "ON" position. Loosen the distributor clamp screw and pull the high tension coil wire from center terminal of distributor cap. Hold free end of high tension lead about 1/8-inch from a suitable ground; rotate distributor body slightly clockwise, then slowly counter-clockwise until a spark occurs at the high tension lead. With distributor in this position, securely tighten the distributor clamp screw.

The distributor breaker contact kit supplied by the manufacturer includes a small tube of lithium base grease. When installing a new set of contacts, apply half the grease to breaker cam and use the other half to fill the space in the movable breaker contact arm where the spring is riveted to the nylon. Condenser capacity is 0.20-0.25 mfd.

SPARK PLUGS. Champion automotive type J6 spark plugs are factory installed as original equipment. Two-cycle plugs should not be substituted. The recommended spark plug electrode gap is 0.025 and plugs should be tightened to a torque of 300 inch-pounds, using new gaskets.

IGNITION RESISTANCE. On motors before Serial Number 1,400,000, a ballast resistor unit of 0.75 ohms capacity is connected in the primary circuit between battery and positive terminal of the coil. A second primary circuit wire is connected from the starter solenoid to the coil positive terminal which by-passes the resistor when the starter is activated, thus producing a hotter spark for starting.

On motors Serial Number 1,400,000 and up, a resistance lead is used instead of the resistor unit. This special lead has a built-in resistance of 1.8-2.0 ohms and another wire should not be substituted. The resistance lead has an orange color code for identification and should be connected between the orange terminal of the junction block and the positive terminal of the ignition coil. A second primary circuit wire is connected to the coil terminal with the resistance lead, and to the starter solenoid, to bypass the resistance lead for starting only.

On all motors, if starting is a problem and low ignition voltage is suspected, check for continuity of the resistor cut-out circuit as outlined in STARTER SOLENOID paragraph or renew the starter solenoid.

NEUTRAL SAFETY SWITCH. A neutral safety switch is located in the remote control unit to prevent starting the motor at high throttle speed setting, except when gearshift lever is in "NEUTRAL" position. Refer to ELECTRICAL SYSTEM section for details of construction and test procedure.

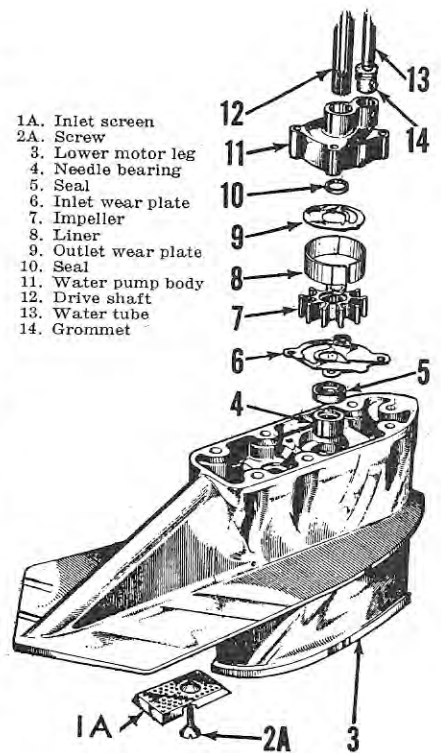


Fig. H10 — Exploded view of lower motor leg showing water pump and associated parts.

COOLING SYSTEM

WATER PUMP. A neoprene impeller type water pump is mounted in the lower motor leg and driven by the drive shaft. The flexible impeller blades operate in an offset housing, and deliver an approximately equal volume of water at slow or fast speeds. The impeller runs in a three-piece, stainless steel housing which is renewable. For service on the water pump, refer to LOWER MOTOR LEG, in LOWER UNIT section.

WATER PASSAGES. The cooling system inlet is located on the under surface of the anti-cavitation plate immediately above the propeller. At all speeds above slow idle, water should flow from the "Tell-Tale" water outlet on starboard side of motor. The inlet screen (1A—Fig. 10) has a lip extending downward on both sides and rear, which increases pump efficiency and prevents exhaust gases from entering cooling system.

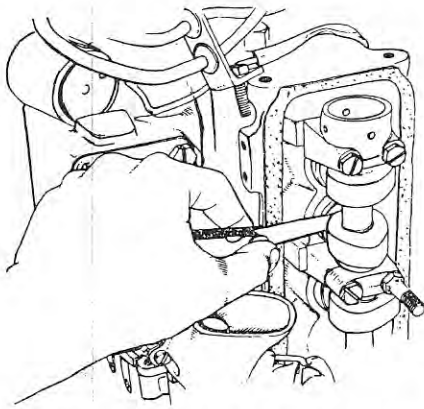


Fig. H11—When adjusting the valve tappet clearance, turn the camshaft until lobe is pointing away from cam follower as shown.

POWER HEAD

VALVE CLEARANCES. The valve clearance should be checked after the first 25 hours of operation and every 100 hours following. The clearance may be checked without removing power head from lower unit by removing the engine cover, distributor, fuel pump and camshaft cover. The carburetors may be removed for convenience, but removal is not required. On motors before Serial Number 1,400,000, it is necessary to loosen and swing aside the support straps for the electrical panel.

The recommended clearances are 0.012-0.014 for intake valves and 0.015-0.017 for the exhaust. Clearances are measured with engine cold, and should be made when each cam lobe in turn, points away from cam follower as shown in Fig. H11. The upper, lower and two center valves are exhaust valves.

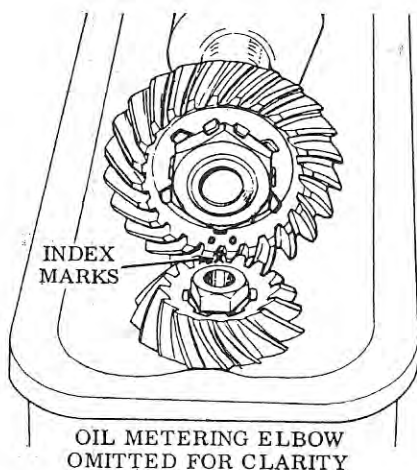


Fig. H12—To time the camshaft to the tower shaft, make sure the "X" mark on tower shaft gear is aligned between the two "O" marks on camshaft gear as shown.

Adjustment is made by varying the thickness of the cam follower spacer (12—Fig. H13), and can only be made after removing the camshaft. It is imperative, therefore, that all valve clearances be checked and recorded before adjustment is attempted. Spacers are available in thicknesses of 0.0895 to 0.1635 in increments of 0.0015. The last three digits of the part number indicate the nominal thickness of spacer.

The camshaft bearings are numbered from 1 to 5, starting with the lower bearing. To remove the camshaft, turn the flywheel until No. 1 (Lower) cylinder is at Top Center on the compression stroke and the camshaft timing marks are aligned as shown in Fig. H12. With timing marks aligned, loosen the bearing retaining screws evenly, one turn at a time, in the following order:

3-2-1-4-5. When spring pressure is relieved and all retaining screws are completely loosened, remove the camshaft and both halves of all camshaft bearings. Note and mark any camshaft bearings not already marked.

While referring to the previously recorded clearances, withdraw each cam follower (13—Fig. H13) in turn and withdraw the spacer (12); then, reinstall a spacer of the correct thickness to provide the proper valve clearance. Reinstall each cam follower before proceeding to next valve, to prevent mixing the followers.

When installing the camshaft, fit the bearings in proper order on the shaft with correlation numbers facing spark plug side of block. Lubricate the bearings and cam followers liberally and fit the oil metering

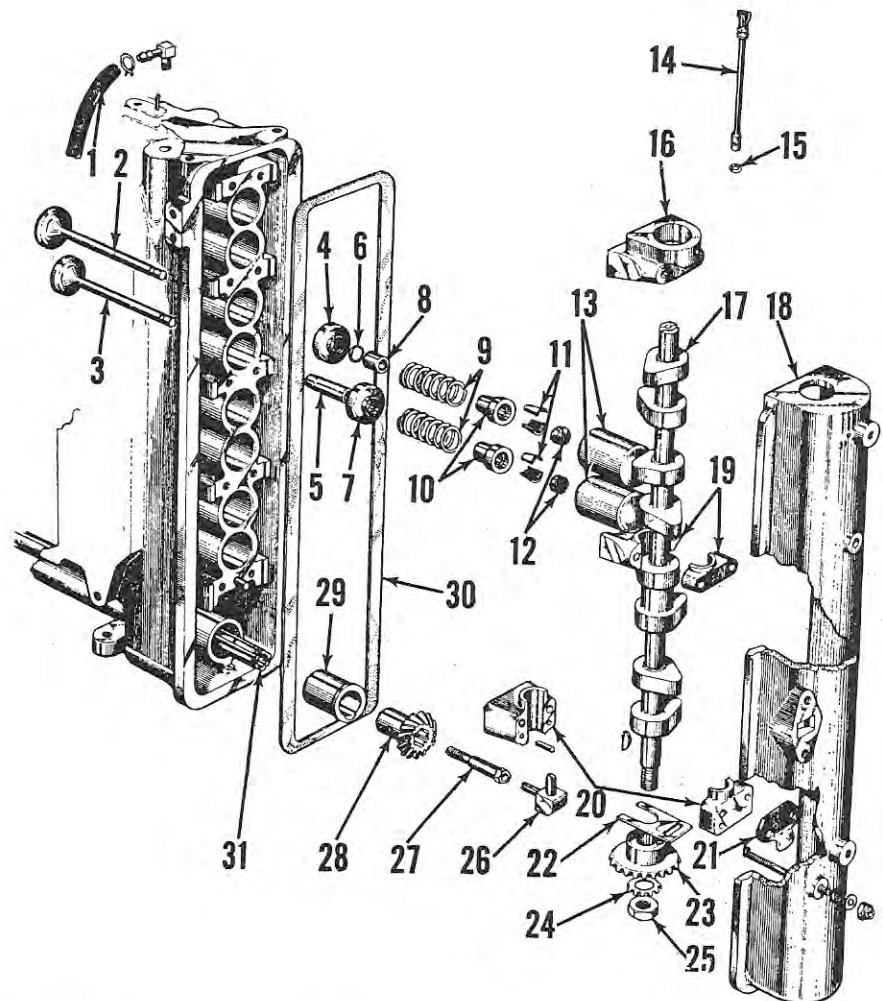


Fig. H13 — Exploded view of camshaft, valves and associated parts. An early model is shown. Tell-tale water line was moved to upper end of water jacket plate on manifold side of engine in late models.

- | | | | |
|------------------------|----------------------------|--------------------------|----------------------|
| 1. Water line | 11. Retainers | 17. Camshaft | 24. Tab washer |
| 2. Intake valve | 12. Spacers | 18. Camshaft cover | 25. Camshaft nut |
| 3. Exhaust valve | 13. Cam followers | 19. Intermediate bearing | 26. Elbow |
| 4. Intake valve spacer | 14. Drive key | 20. Lower bearing | 27. Adjuster |
| 5. Valve guide | 15. "O" ring | 21. Retainer | 28. Tower shaft gear |
| 6. "O" ring | 16. Upper camshaft bearing | 22. Thrust spacer | 29. Bushing |
| 7. Exhaust rotator | | 23. Camshaft gear | 30. Gasket |
| 8. Seal retainer | | | 31. Tower shaft |
| 9. Valve springs | | | |

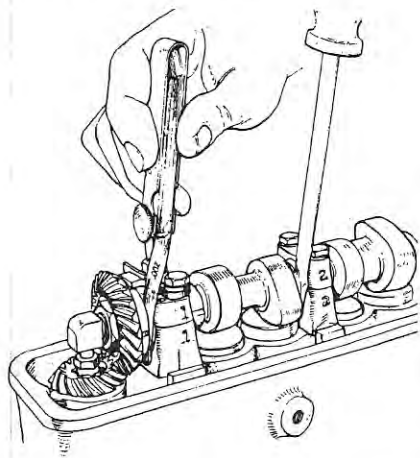


Fig. H14—To check the camshaft end play, take up the slack with a screwdriver as shown, then measure clearance with a feeler gage. Refer to text.

elbow (26) in camshaft and tower shaft adjuster (27). Make sure the timing marks are aligned as shown in Fig. H12. The cam cover mounting studs should be installed in spark plug side of No. 4 camshaft bearing and the manifold side of No. 1 bearing. Make sure the camshaft thrust spacer (22) and retainer (21) are in place when No. 1 bearing is installed. Tighten all bearing retaining screws finger tight, making sure the bearings are properly seated; then, tighten the retaining screws equally, a little at a time, in the following order: 1-4-3-2-5. After all bearings are seated, tighten all bearing screws to a torque of 100 inch-pounds. Recheck all valve clearances and timing marks before installing camshaft cover.

IMPORTANT: Proper alignment of the distributor drive depends on correct installation of camshaft cover. HOMELITE has designed a plug-type alignment tool, Part No. T-14603, to assist in proper alignment. Misalignment can be caused by too much gasket crush resulting from overtightening of the cover retaining nuts. Undertightening or careless gasket installation may cause oil leakage.

CAMSHAFT AND BEARINGS. The overhead camshaft is carried in five renewable bearings, and can be removed for service by following the procedures outlined in the preceding VALVE CLEARANCES paragraph.

Camshaft end play, and backlash of the upper timing gears is controlled by the selective thickness thrust spacer (22—Fig. H13) which is held in place by the retainer (21). To check the end play after the camshaft cover is removed, insert a screwdriver or other suitable pry between No. 2 camshaft bearing and No. 2 cam lobe as shown in Fig. H14. Use only enough pressure to remove all clearance between camshaft gear and thrust spacer as shown. Clearance should be 0.002-0.0035 and can be adjusted by removing the spacer (22—

Fig. H13) and installing a new one of the proper thickness. The spacer (22) is available in thicknesses from 0.0745 to 0.0990 in increments of 0.0015.

The five 0.6235-0.6240 camshaft journals should have a diametral clearance of 0.0025-0.0035 in the bearings. Renew camshaft and/or bearings if clearance is excessive or if bearing surfaces are scored. The camshaft is drilled to provide positive lubrication from the oil pump through the oil metering elbow (26).

The camshaft timing gear (23) is a press fit on camshaft; and is positively located by a Woodruff key and retained by nut (25) and tab washer (24). When removing the camshaft gear, break off the used tabs on washer (24) and use new tabs or a new washer when reinstalling. Press the gear fully on camshaft until it bottoms on shaft shoulder, install washer (24) and nut (25) and tighten nut to a torque of 140 inch-pounds.

The "O" ring (15) and distributor drive key (14) seal the upper end of camshaft oil passage. While the camshaft is out, grasp free end of distributor drive key and check for looseness or metal-to-metal contact which might indicate wear or damage to "O" ring. If excessive looseness or noise is detected, drive the dowel pin from its location in camshaft between 6th and 7th cam lobes, remove the distributor drive key and renew "O" ring (15).

Use compressed air to make sure oil passages in camshaft are open, and reinstall as outlined in preceding VALVE CLEARANCE paragraph. Check valve tappet gap and camshaft end play before installing camshaft cover.

CAMSHAFT COVER INSTALLATION. Before installing the camshaft cover, discard the old cover gasket (30—Fig. H13) and thoroughly clean gasket surfaces of block and cover. Coat gasket surfaces of block and cover with a suitable gasket cement. Carefully install gasket and cover, place the round vellumoid gaskets and washers over retaining studs, and install and tighten the self-locking retaining nuts until they just contact the cover. Insert the alignment tool (T-14603) in distributor mounting hole; and tighten the stud nuts equally, a little at a time, while rotating the alignment tool by hand. Stop tightening the nuts when alignment tool starts to bind; or, when a torque of 100 inch-pounds is reached on the stud nuts, which ever occurs first. Never tighten the stud nuts to more than 100 inch-pounds.

When installing the distributor, note Serial Number of motor and the construction of camshaft cover (18). Prior to Serial Number 1,384,582, the distributor bore in camshaft cover was of equal diameter through the thickness of the cover as shown in Fig. H13. The sealing "O" ring for the distributor housing to be used with this cover carries Homelite Part Number 90886-A. Effective with the given Serial Number, a new camshaft cover with a machined step for the "O" ring was installed. This new cover requires the use of a new "O" ring (Part No. 90999) which is not interchangeable with the old part. The early camshaft cover is

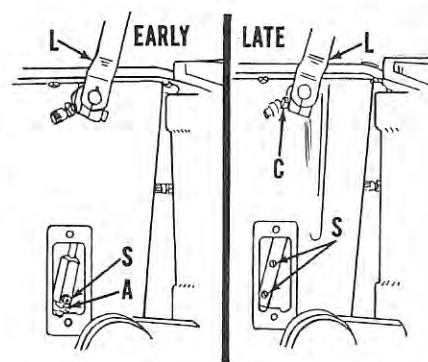


Fig. H15—Upper motor leg with shift linkage access plate removed. Models before Serial Number 1,400,000 are shown on left.

- A. Adjusting nuts
- C. Clamp screw
- L. Shift lever
- S. Clamp screws

no longer available for service, and the late cover and "O" ring may be installed on a motor in the early Serial Number range.

POWER HEAD R&R. To remove the complete power head, first remove the engine cover and rear shroud. Disconnect the carburetor linkage at the bellcrank, the fuel line at the fuel pump inlet, and the remote control electrical cable at the junction block. Disconnect the water inlet hose, the telltale water line; and the nut and clamp which secures oil pan lower flange to mounting plate. The power head is secured to lower unit by two socket head cap screws located on each side of mounting plate and two hex head cap screws on underneath side of mounting plate, just in front of lower unit upper leg. Attach a hoist to the power head lifting eye and raise the hoist to remove the slack. Remove the access plate from starboard side of lower unit upper leg and disconnect the shift linkage as shown in Fig. H15. **NOTE:** On early units, loosen the set screw (S) to allow the upper and lower shift links to separate. On late units remove the two slotted head screws which secure the two links.

Remove the six screws securing power head to lower unit mounting plate. Reach through the shift linkage access hole in starboard side of lower unit upper leg and, with padded pliers, grasp the drive shaft to make sure it remains in lower unit. While holding drive shaft, carefully lift the power head from the lower unit. **CAUTION:** Water pump is likely to be damaged if drive shaft is pulled upward with the power head. Also check to be sure that the oil pump inlet strainer is not damaged as power head is removed.

"O" rings are used to seal the exhaust opening and the opening between oil pan and oil reservoir in lower unit. The oil pump inlet tube and lower crankshaft seal retainer are also sealed with "O" rings. All "O" rings should be renewed when installing the power head.

Homelite

When installing the power head, coat the crankshaft splines liberally with grease and install the drive shaft coupling, pushing coupling well up into crankshaft lower seal retainer to hold it in place. Install the tapered drive shaft spring with large coils toward crankshaft. Apply a coating of grease around outside of crankshaft lower seal retainer and install the large sealing "O" ring. Place the "O" ring around exhaust opening in mounting plate. Thoroughly dry the upper end of the oil pump inlet tube and apply a coating of EC-847 cement (Manufactured by 3-M Co.), or equivalent, to "O" ring groove of oil inlet tube and to opening of oil reservoir in mounting plate; then place the appropriate "O" rings in position. Install the oil inlet tube in oil pump elbow with end of strainer offset toward crankshaft and carefully lower the power head into position, making sure that "O" rings, drive shaft coupling and coupling spring remain in their proper positions. Make sure the clutch dogs are engaged and turn the propeller as the power head is lowered, until the drive shaft splines are engaged.

When the power head is in position, install the four socket head cap screws finger tight through the sides of the mounting plate, then start the two hex head screws from lower side of plate. Before tightening any of the installed screws, install the clamp and retaining nut on the oil pan lower flange and tighten the nut to a torque of 40 inch-pounds. NOTE: Over-tightening may crack the flange. Tighten the two lower, hex head screws to a torque of 260 inch-pounds; then the four socket head screws to a torque of 285 inch-pounds. Complete the assembly by reversing the disassembly procedure.

VALVES AND SEATS. The cylinder head is an integral part of the cylinder block, and the valves can only be removed for service after removing the complete power head from lower unit; then, removing the crankshaft and the piston assemblies as outlined in the appropriate following paragraphs.

Special tools are required to efficiently remove and install the valves. These tools are available from Homelite under the following tool part numbers:

- T-14043—Valve Spring Compressor
- T-14064—Intake Valve Seal Installer
- T-14569—Compressor Strap
- T-14570—Valve Support Fixture

To remove the valves after pistons are out, remove the camshaft cover, camshaft, cam followers and spacers. Keep the cam spacers and followers together in their proper order as they are removed, to avoid unnecessary work in tappet adjustment when unit is assembled. Place the support fixture (T-14570) in No. 1 cylinder and attach the compressor strap (T-14569) on the threaded bosses on spark plug (port) side of block as shown in Fig. H16. With the support fixture in place, compress the spring and remove keepers on both valves in No. 1

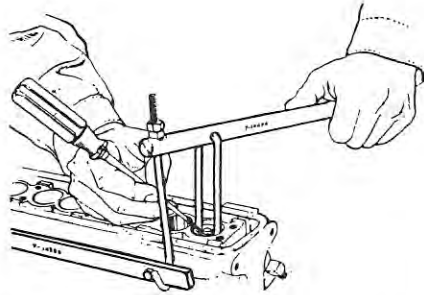


Fig. H16—Special tools are provided for removing the valve spring retainers as shown. Refer to text.

cylinder. Exhaust valves are equipped with positive type valve rotators (7—Fig. H13) which are located between the spring and cylinder block at HEAD end of valve. Intake valves use a valve spacer (4), and "O" ring stem seal (6) and a retainer (8) which are also located at cylinder end of spring. The retainer is a drive fit over end of valve guide. Keep the valves, springs and retainers identified so they can be installed in the proper order in the cylinder from which removed. Check for red paint marking on cylinder end of each valve spring which marks the close coiled end. Mark any springs not so marked, as they are removed. Remove the valves from the other cylinders by changing the position of the support fixture.

The valve face and seat angle is 45 degrees for both intake and exhaust, and the manufacturer recommends finish lapping using valve grinding compound. Lap until there is a uniform smooth gray band around edge of seat, then thoroughly clean valves and seats with hot, soapy water until all valve grinding compound is removed. Valve heads must have at least $\frac{1}{32}$ -inch of margin after refacing, and any valve which fails to meet this test must be renewed. After valves have been refaced, grind approximately 0.005 from end of stem so that cam follower spacers of approximately the same thickness may be used.

NOTE: Under no circumstances must enough material be removed from tip of valve stem; or a thin enough cam follower spacer used, so that cam follower will contact the edge of valve spring retainer. After the recommended tappet clearance has been obtained, if spacer does not extend 0.002 above rim of retainer, renew or rework the parts concerned.

Reassemble by reversing the disassembly procedure, and adjust tappet clearance as outlined in the appropriate preceding paragraphs.

VALVE SPRINGS. Valve springs are interchangeable between intake and exhaust, and should test 58-62 lbs. when compressed to a length of $1\frac{3}{8}$ inches. Free length of new spring is approximately $1\frac{3}{4}$ inches.

OUTBOARD MOTORS

One end of valve spring has close damper coils, and is marked with red paint. Marked end should be installed toward head of valve in contact with rotocap or valve spacer. The close coils are difficult to detect. Unmarked springs should be checked using a small drill as a gage, and re-marked before installation.

VALVE GUIDES. Valve guides are interchangeable between intake and exhaust valves, and may be removed by pressing guide into cylinder using a suitable drift. Stem seal and retainer must be removed before attempting to remove intake valve guide. Install the new guide, tapered end toward cylinder, until top surface of guide extends $\frac{3}{4}$ -inch into cam follower bore. NOTE: This dimension is critical in the case of the inlet valve guides, because of the construction of the valve stem seal. Refer to Fig. H17.

Ream guides after installation to an inside diameter of 0.3155-0.3165. Install the intake valve spacers as shown in Fig. H17, then install "O" ring seal and retainer using the special tool (T-14064).

OIL PAN. To remove the oil pan after power head has been removed, first withdraw the oil inlet tube and screen; then unbolt and remove the pan. The oil pan contains a baffle which is bolted in place and can be removed for cleaning or service.

The oil pan gasket consists of two cork side strips and two curved end seals. When installing the oil pan, first thoroughly clean the gasket surfaces and coat the flange area of pan with EC-847 cement (Manufactured by 3-M Company), or equivalent, and place the side strips in position. Coat ends of side strips with cement and place the end seals in position, working from center to ends of grooves, until ends are even and firmly pressed into the cement. Coat the joints with additional cement to form an oil-tight seal, reinstall pan and tighten the retaining screws to a torque of 160 inch-pounds.

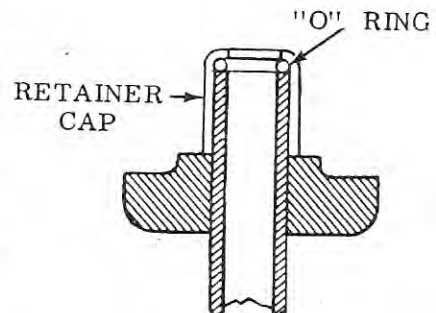


Fig. H17 — Cross section of intake valve guide showing installation of "O" ring stem seal and retainer. Be sure intake valve spacer is installed with rounded edge toward block.

OIL PUMP. The gear type oil pump can be removed for service after removing the oil pan and the two oil pump retaining screws.

The pump may be inspected without disassembly, by removing the pump cover as shown in Fig. H18. To disassemble the pump, press the drive pin out of the bronze gear (1), then press the driven gear and shaft assembly (3) out of drive gear and pump body. Bushings in pump body are not available for service. If bushings are worn, renew the body or the oil pump assembly.

Tighten the oil pump cover cap screws to a torque of 90 inch-pounds and the pump mounting screws to a torque of 150 inch-pounds when reinstalling.

RELIEF VALVE AND FILTER. The relief valve, filter and oil pressure sending switch are contained in an adapter located on starboard side of cylinder block. Refer to Fig. H19.

The oil pressure should be at least 30 psi at 5000 rpm. Pressure can be tested by removing oil pressure sending unit (9) and installing a suitable pressure gage.

The manufacturer recommends that after each 100 hours of engine operation, the adapter (5) be removed and cleaned, and the gasket (8) and "O" ring be renewed. To remove the oil filter adapter, first remove the engine cover and disconnect the wires from sending unit (9). Loosen the three mounting cap screws and tap the adapter with a soft hammer to free the gasket bond if it does not pull loose easily, then remove the cap screws and lift off the adapter housing.

Clean the gasket surfaces thoroughly, using care that none of the gasket material lodges in the oil passages. Place a new "O" ring in the chamfer in cylinder block, coat the gasket surface of block with a thin coat of EC-847 cement (3-M Company), or equivalent, then position the gasket over the "O" ring. Install the adapter assembly and

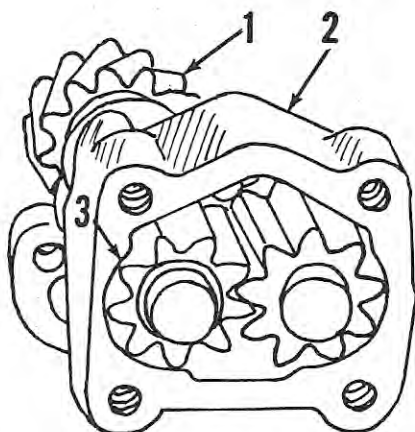
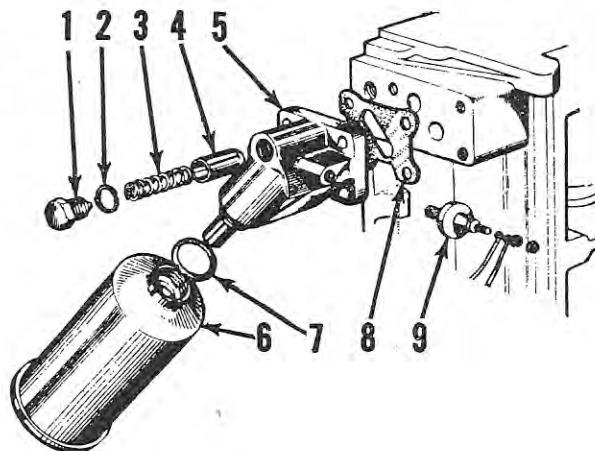


Fig. H18—Engine oil pump with cover removed. To further disassemble pump, drive out the pin which retains drive gear (1) to gear and shaft assembly (3). Refer to text.

Fig. H19—Exploded view of oil filter adapter housing, oil filter and oil pressure relief valve.

1. Plug
2. Gasket
3. Spring
4. Relief valve
5. Adapter housing
6. Filter unit
7. "O" ring
8. Gasket
9. Oil pressure sending unit



the three mounting cap screws finger tight. Tighten the two diagonally opposite cap screws to a torque of 80 inch-pounds, then tighten the third mounting screw to the same torque value.

The oil filter element (6) should be tightened by hand only. The sealing "O" ring (7) must be renewed whenever filter is removed. Coat the neck of adapter with a suitable cement when installing "O" ring.

The relief valve plunger (4) must be free in adapter bore, and must make full contact with its seat. A new relief valve spring (3) has a free length of 2½ inches. Spring should be renewed if bent, broken or distorted; or if it fails to measure at least 2.3 inches. Tighten the relief valve plug (1) to a torque of 160 inch-pounds when reinstalling.

CRANKSHAFT AND BEARINGS. To remove the crankshaft, it is first necessary to remove the complete power head from lower unit; then remove the oil pan and oil pump as outlined in the appropriate preceding paragraphs. Also remove the starter assembly, flywheel and alternator stator.

The main bearing studs pass through the crankcase webs and thread into the cylinder block. Secure the power head in a horizontal position with crankshaft up and remove the main bearing stud nuts, connecting rod cap screws and caps; and the lower main bearing seal retainer (31—Fig. H20). The upper main bearing cap is also secured with two socket head cap screws which must be removed.

The crankshaft assembly with oil pump drive gear and crankshaft timing gear installed, can now be lifted from the power head.

The renewable, precision type main and connecting rod bearing inserts are available in undersizes of 0.005 and 0.010, as well as standard. The crankshaft is drilled for pressure lubrication of main and connecting rod bearings.

The crankshaft timing gear is a slip fit on crankshaft splines. The gear must be properly timed when engine is assembled and the correct assembly position is marked

on the crankshaft splines. Before removing the timing gear, refer to Fig. H21, and if not marked, scribe a line on the crankshaft spline which aligns with the "X" timing mark on gear tooth as shown.

NOTE: If the proper assembly position is not marked, the "X" marked timing gear tooth must be installed to most nearly align with the center of the No. 1 (lower) crankpin.

Crankshaft thrust is downward only because of vertical operating position of shaft and pressure of timing gears. End thrust is controlled by the thrust bearing (28—Fig. H20) and the selective thickness spacer washer (27). The spacer washer (27) contains an internal notch which fits over a small peg in crankshaft timing gear (26), thus limiting wear to the mating surfaces of spacer (27) and thrust bearing (28). The spacer (27) is available in thicknesses of 0.0940 to 0.1315 in increments of 0.0015. The recommended clearance is 0.002-0.0035 when measured with a feeler gage as shown in Fig. H22.

Crankshaft main bearings should have a diametral clearance of 0.0005-0.003 on crankshaft journals. If journals are worn or out-of-round 0.004 or more, the shaft should be renewed or reground to the next smaller undersize.

When installing the crankshaft, make sure crankshaft timing gear is correctly installed on shaft splines as shown in Fig. H21; and mesh the "X" marked crankshaft gear tooth between the two "O" marked teeth on tower shaft gear as shown in Fig. H23. Place five new "O" rings in chamfers on MANIFOLD ONLY side of main bearing caps and install caps with correlation marks on crankcase and bearing caps aligned.

NOTE: If correlation marks are not present, align the locating notches for the bearing inserts.

Use a flat washer under each stud nut and run the nuts down to bearing but do not tighten. **NOTE:** Discard any locknut which can be run all the way down with the fingers; it has lost its locking ability. Install and tighten the two cap screws in upper bearing finger tight. Install the connecting rod caps, making sure that bearing

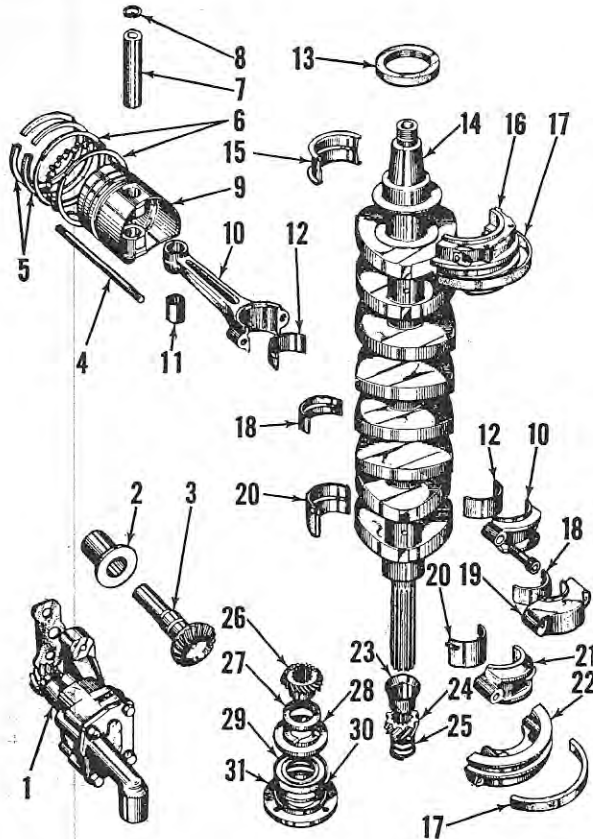


Fig. H20—Exploded view of crankshaft, bearings, pistons, connecting rods and associated parts.

1. Oil pump
2. Tower shaft bushing
3. Tower shaft and gear
4. Main bearing stud
5. Compression rings
6. Oil control ring
7. Piston pin
8. Retaining ring
9. Piston
10. Connecting rod
11. Piston pin bushing
12. Bearing insert
13. Oil seal
14. Crankshaft
15. Bearing insert
16. Upper bearing cap
17. Oil pan end seal
18. Bearing insert
19. Bearing cap
20. Bearing insert
21. Bearing cap
22. End seal cap
23. Spacer
24. Oil pump drive gear
25. Spring
26. Crankshaft timing gear
27. Spacer
28. Thrust bearing
29. Oil seal
30. "O" ring
31. Thrust bearing retainer

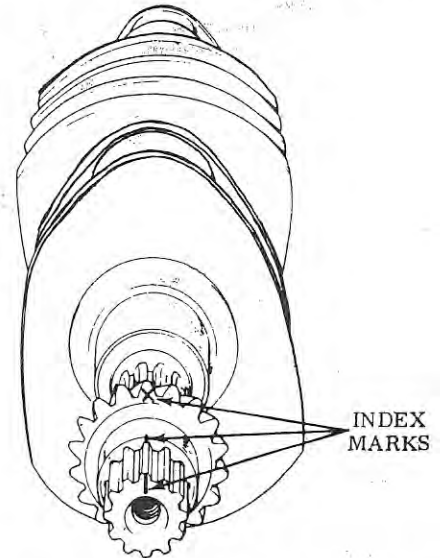


Fig. H21 — If the crankshaft timing gear is removed for other service, scribe a line on the spline nearest the gear timing mark as shown. If crankshaft is not marked, align the marked tooth with center line of No. 1 crankpin for proper valve timing.

locating notches of rod and cap are on spark plug side. Tighten the connecting rod cap screws finger tight.

Using a torque wrench, tighten the main bearing stud nuts to a torque of 200 inch-pounds in the following order: 1-5-2-4-3. (The lower bearing being designated as No. 1). Tighten the connecting rod cap screws to a torque of 300 inch-pounds, and the socket head cap screws in upper main bearing and drive end seal cap (22—Fig. H20) to a torque of 85 inch-pounds. Tighten the alternator stator retaining screws to a torque of 25 inch-pounds, the flywheel retaining nut to a torque of 175 foot-pounds, and the lifting bracket cap screw (if removed) to a torque of 250 inch-pounds.

CRANKCASE, TOWER SHAFT AND CYLINDER BLOCK. The camshaft is driven by a tower shaft and two sets of bevel timing gears. The tower shaft is located at lower end of cylinder block and runs in renewable bushings at right angles to crankshaft and camshaft.

To remove the tower shaft, it is first necessary to remove both the camshaft and crankshaft as outlined in the appropriate preceding paragraphs. Hold the tower shaft from turning; then loosen and remove the adjusting screw (27—Fig. H13) from camshaft end of tower shaft. Tower shaft upper gear (28) can now be withdrawn, and tower shaft (31) removed from crankcase end of block assembly.

Tower shaft bushings (29—Fig. H13 and 2—Fig. H20) are a press fit in cylinder block and crankcase, and are flanged as shown. Diametral clearance of tower shaft in the two bushings should be at least 0.001. Renew the shaft and/or bushings if clearance exceeds 0.003. Bushing removal will be facilitated by the use of the special Homelite tower shaft bushing tool (Part No. T-14571). When installing the bushing in crankcase, align the oil metering hole in bushing with oil passage in casting. Make sure bushing is not cocked. Install the upper (camshaft end) bushing with the oil metering groove toward outer end of block away from the valves. Each bushing should be pressed into its bore until the flange contacts the casting.

When installing the tower shaft, align the oil metering hole in camshaft drive gear (28—Fig. H13) with the hole in shaft. Block the tower shaft from turning and place two 0.002 pieces of shim stock (or feeler gages) 180° apart between the flange of bearing (29) and the gear (28). Install the adjusting screw (27) and tighten to a torque of 120 inch-pounds to establish the required 0.002 tower shaft end play.

NOTE: One method of holding the tower shaft from turning when making the adjustment is to delay the installation of camshaft drive gear and tower shaft adjusting screw until after crankshaft is reinstalled. Place a soft wedge between the gear on tower shaft (3—Fig. H20) and oil pump drive gear (24) to position the tower shaft.

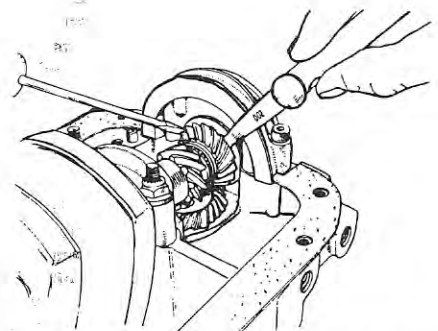


Fig. H22—To measure the crankshaft timing gear clearance, pry gear away from lower bearing and use a feeler gage as shown.

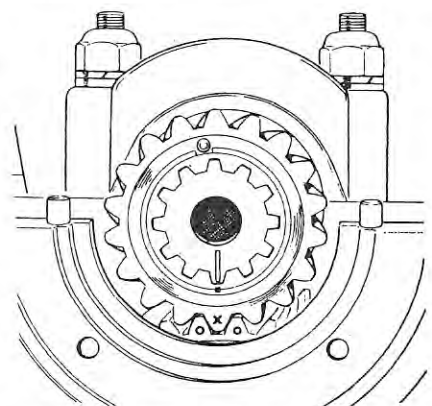


Fig. H23 — Crankshaft must be correctly timed to tower shaft gear as shown, during installation of crankshaft.

1. Side cover
2. Camshaft cover
3. Cylinder block
4. Flywheel cover
5. Lifting hook
6. Flywheel assembly
7. Alternator stator
8. Breather assembly
9. Oil pan
10. Oil pickup strainer

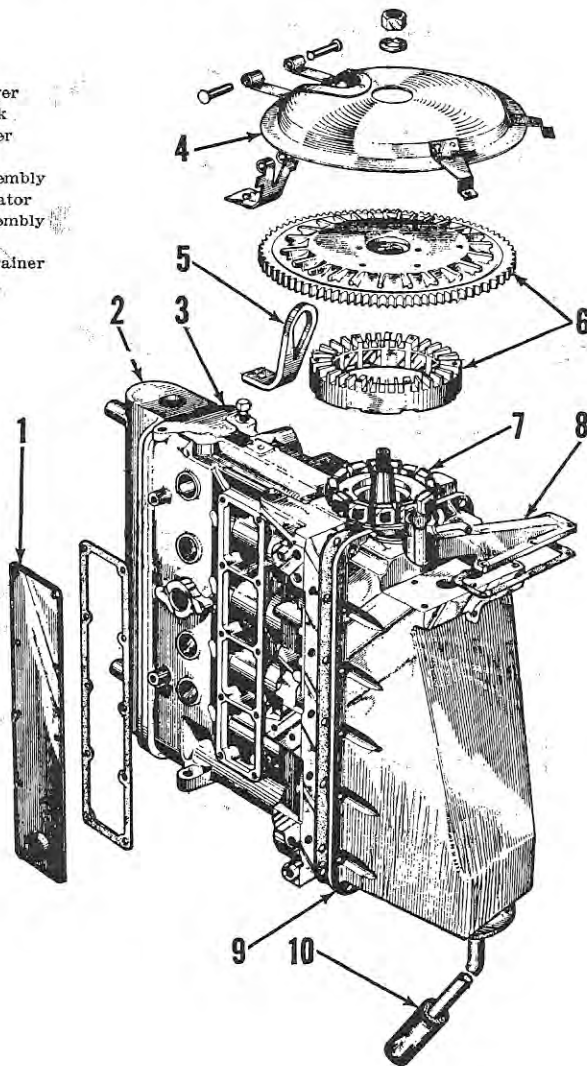


Fig. H24—Exploded view of port side of power head showing principal components.

Hold the assembly from turning by fitting a 3/4-inch, 12 point box end wrench over crankshaft splines.

When installing crankshaft and camshaft, be sure to time the gears and adjust backlash as outlined in the paragraphs covering service on the shafts.

The cylinder block and crankcase can be separated after removing the tower shaft and the nut from one locating stud at tower shaft (lower) end of cylinder block. The main bearing studs pass through the crankcase webs and thread into the cylinder block, thus rigidly supporting the assembly when crankshaft and main bearing caps are installed. The joint between cylinder block and crankcase is sealed with a paper type gasket. In addition, "O" rings are placed around the main bearing studs on manifold side of engine in the joint between crankcase and cylinder block and between crankcase and main bearing caps. Make sure the "O" rings in BOTH locations are renewed

whenever crankcase is disassembled from block. NOTE: Crankcase must be removed before pistons can be removed from cylinder block.

CONNECTING ROD AND PISTON UNITS.

The piston and connecting rod assemblies can be withdrawn from lower end of cylinders after removal of the crankshaft, tower shaft and crankcase as outlined in previous paragraphs. Make sure pistons are marked for reassembly in the correct cylinder, as they are removed.

The piston has a tapered crown and should be installed in cylinder with low side of crown toward spark plug. The connecting rod must be installed on piston so that bearing locating notches in rod and cap are on same side of the assembly as low side of piston crown.

Connecting rods are color coded red, yellow or green according to weight and the color code of all four rods should be matched during assembly. Tighten connecting rod

cap screws to a torque of 300 inch-pounds when power head is reassembled.

PISTON RINGS AND CYLINDERS. The aluminum alloy, cam ground pistons are available in standard size and in undersizes of 0.010 and 0.020. Recommended piston skirt clearance is 0.0033-0.0047 when measured 90° from piston pin.

The two cast iron compression rings should have an end gap of 0.012-0.014 in cylinders, and should be installed on pistons with punch mark facing crown (closed end) of piston. Recommended side clearance for compression rings is 0.0025-0.004.

The oil control ring consists of two thin chrome segments and an expander spacer. End gap of chrome segments should be 0.036-0.038. When installing oil control ring, end gaps of the two segments should be located 180° apart and so that neither gap aligns with ends of expander. Be sure that ends of expander butt together and do not overlap. Side clearance of segmented oil control ring should not exceed 0.0065. End gaps of compression rings should be 180° apart and in line with piston pin ends.

Cylinder walls should be de-glazed with a rigid hone, being careful to remove any ridge at upper end of ring travel, but making sure valve seats or spark plug threads are not damaged. If cylinders are worn more than 0.002, they should be rebored and the next oversize pistons and rings installed. Valves and, in some cases, main bearing studs must be removed before cylinders are rebored. Tighten the main bearing studs to a torque of 140 inch-pounds if they are removed.

PISTON PINS. The 0.6250-0.6252 piston pins have a recommended clearance of 0.0005-0.001 in the connecting rod bushing. Renew the piston pin and/or rod bushing if clearance exceeds 0.002.

To remove the piston pin, remove the Truarc retaining rings (8—Fig. H20) at each end of piston pin and heat piston assembly in boiling water for at least 5 minutes, then drive out the pin using Homelite pin punch (T-145479) or equivalent, and a soft faced hammer.

To renew the connecting rod bushing (11), press out the old bushing and press new bushing into rod, making sure that split in bushing is at least 90° from oil hole in rod. Drill the oil hole in new bushing and ream the bushing to an inside diameter of 0.6257-0.6260.

Heat piston in boiling water for 5 minutes and insert the pin through rod and piston, making sure low side of piston crown and the locating notches for bearing inserts are on same side of the assembly. The manufacturer has designed a piston pin assembly guide (Part No. T-14578) to use with the piston pin punch (T-14579) to properly align piston and rod during assembly. Use NEW piston pin retaining rings (8) during reassembly and rotate each ring with a pointed tool after installation to be sure ring is properly seated. Flat side of retaining ring should face the cylinder wall, with gap toward open end of piston.

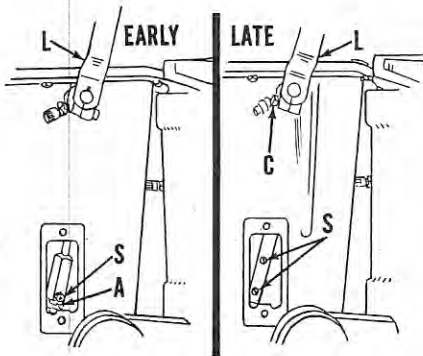


Fig. H25—Upper motor leg with shift linkage access plate removed. Models before Serial Number 1,400,000 are shown on left.

- A. Adjusting nuts
- C. Clamp screw
- L. Shift lever
- S. Clamp screws

LOWER UNIT

PROPELLER AND DRIVE PIN. Protection for the motor and propeller is provided by a cushioning clutch built into the propeller hub. The motor uses a 1/4 by 1 1/4-inch stainless steel drive pin to secure propeller hub to shaft.

A right hand rotation, 11 1/2-inch propeller is available in either a two-blade or three-blade design. Two-blade propellers are available in 15-inch, 16-inch or 17-inch pitch. Three-blade propellers are provided ranging in pitch from 9-inches to 14-inches.

LOWER MOTOR LEG AND WATER PUMP. The lower motor leg can be detached from the upper leg for service on the water pump, without removing gearcase from lower leg. Before attempting to detach the unit, remove the access plate from starboard side of upper motor leg and loosen the clamp screw (S—Fig. H25) on early models; or remove the two screws (S) on late models; to separate the shift linkage. Loosen the six socket head cap screws retaining lower motor leg to upper leg. Remove two screws on each side of leg, and back the two remaining screws out about 1/8-inch. The water pump will be damaged if drive shaft (12—Fig. H26) is permitted to remain with the power head and upper motor leg. Working through access hole where shift linkage was disconnected, make sure that drive shaft is free in power head coupling splines. Remove the two remaining securing screws and withdraw the lower leg with drive shaft in place.

Remove the screws retaining water pump housing (11) to lower motor leg. After cleaning the shaft, lift the housing straight up off upper end of drive shaft. In most cases the impeller will be withdrawn with drive shaft; if it is not, remove the impeller then withdraw the drive shaft from lower unit pinion.

Inspect the impeller for cracks or wear and renew if necessary. The impeller is driven by

a Woodruff key in the drive shaft on late models. Renew the stainless steel liner (8) and wear plates (6 and 9) if worn or scored, and the pump body (11) if cracked or otherwise damaged. Renew the seals (5 and 10). Remove inlet screen (1A) and thoroughly flush inlet passages of lower motor leg with a pressurized stream of water.

When installing the liner (8), invert the pump body so that pump cavity is uppermost. Install the outlet wear plate (9) with locating tab on plate in locking notch of body, and outlet port open to elongated slot of plate. Install liner with crimped end to left and fitting in locking notch of body. Place drive shaft in position in lower motor leg and install lower wear plate over drive shaft, making sure screw holes are aligned. Coat the impeller and exposed surfaces of liner and wear plates liberally with water pump grease. Insert impeller in body cavity with a clockwise rotating motion.

Coat the mating surfaces of lower motor leg (3) and water pump housing (11) with a thin coat of non-hardening cement such as Permatex No. 2, being extremely careful not to get any sealant inside the pump or on the working parts. Make sure impeller drive key is in place in the drive shaft and slip the impeller and pump housing down over the drive shaft with water outlet facing forward. Coat threads of the

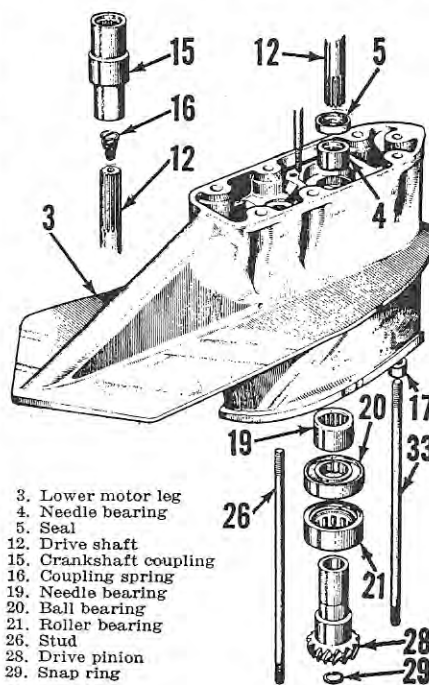


Fig. H27—Lower motor leg showing drive shaft, bearings and seals.

body screws with grease and tighten to a torque of 60 inch-pounds. If grommet (14) is loose in pump body or on outlet tube, renew the grommet.

To renew the drive shaft bearings, it will first be necessary to detach the gearcase from lower motor leg as outlined in the appropriate subsequent paragraph.

Assemble by reversing the removal procedure. Be sure drive shaft and water tube are properly positioned, and that shift lever coupling is engaged in early models. Tighten the attaching cap screws to a torque of 250 inch-pounds and adjust shift linkage as follows:

On all models push down on shift link by reaching through access hole in upper leg and turning propeller shaft make sure clutch dogs are fully engaged in forward gear. The shift lever (L—Fig. H25) should be centered between the alignment notches on flange of upper leg. On early models, adjust by loosening the set screw (S) to properly position the lever. (Note: It may sometimes be necessary to back off the two adjusting nuts "A"). With lever properly positioned, tighten the set screw, then lock the nuts (A) against bottom of coupling.

On late models, position the lever (L) by loosening the clamp screw (C) and moving lever on shaft. Tighten clamp screw (C) to a torque of 80 inch-pounds.

GEAR CASE. To remove the gear case and associated parts it is first necessary to detach lower motor leg from upper leg as outlined in the previous paragraph, and remove the water pump and drive shaft. Remove the nuts from retaining studs (26

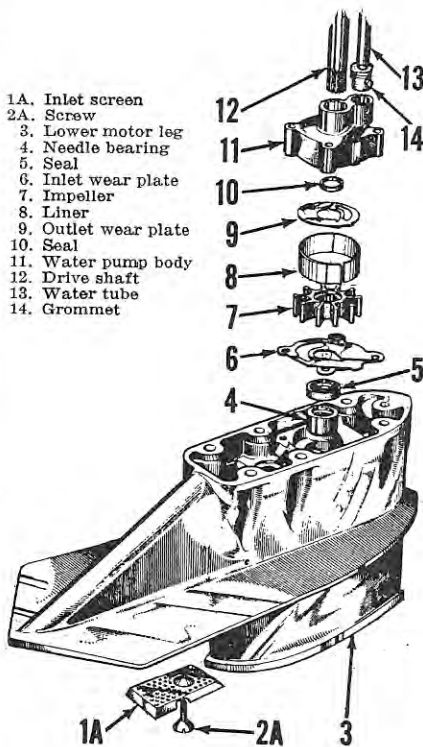


Fig. H26 — Exploded view of lower motor leg showing water pump and associated parts.

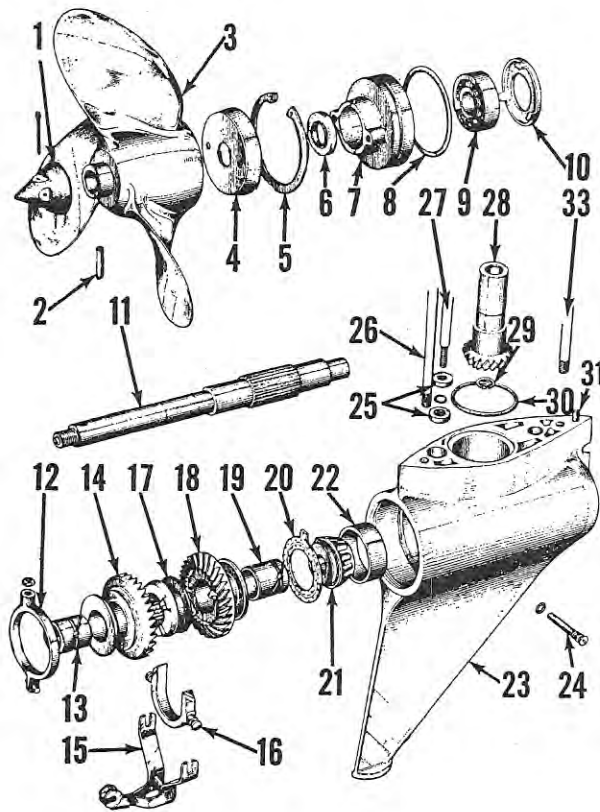


Fig. H28—Exploded view of lower unit gear case and associated parts. An early model is pictured. Except for minor details, late models are similar in appearance.

- | | | |
|---------------------|---------------------|--------------------|
| 1. Propeller nut | 12. Shift connector | 23. Gear case |
| 2. Drive pin | 13. Gear bushing | 24. Shift pivot |
| 3. Propeller | 14. Forward gear | 25. Seal assembly |
| 4. Weed guard | 15. Shift fork | 26. Stud |
| 5. Snap ring | 16. Shift yoke | 27. Shift rod |
| 6. Oil seal | 17. Clutch dog | 28. Drive pinion |
| 7. Bearing housing | 18. Reverse gear | 29. Snap ring |
| 8. "O" ring | 19. Gear bushing | 30. "O" ring |
| 9. Ball bearing | 20. Thrust washer | 31. Locating dowel |
| 10. Thrust ring | 21. Bearing cone | 32. Stud |
| 11. Propeller shaft | 22. Bearing cup | |

& 33—Fig. H27) and separate the gear housing from lower leg. NOTE: The 1/4-inch diameter dowel pin (31—Fig. H28) was not used in some early motors. Holes are provided for installation in all housings; if dowel is not in place, it should be installed before reassembly.

To disassemble the gear case, drain the housing and remove propeller. Clamp the skeg of housing in a protected vise, remove "O" ring (30); then remove drive pinion (28) and bearings by pulling upward. If pinion is difficult to remove, protect the outside of pinion with a rag or other soft material; clamp pinion in the jaws of vise-grip pliers and tap pliers with a hammer while rotating the pinion.

Remove the weed guard (4) and snap ring (5), using No. 7 Truarc, heavy duty snap ring pliers. Bearing housing (7) is an interference fit in gear case, and should be removed with the special Homelite puller

(T-14577) or equivalent. Reaching through rear opening, loosen the locknut on lower end of shift rod (27), and hold locknut with a wrench while unscrewing shift rod from the nut and the connector (12). Lift the shift rod straight upward out of seal (25) and remove connector (12) and nut from housing. Remove the shift fork pivot screw (24), shift fork (15) and yoke (16); then withdraw the propeller shaft, gears and bearings from gear case.

Forward and reverse gears (14 and 18) are interchangeable, but should be marked and reinstalled in the same position if reused. The bushings (13 and 19) should have an inside diameter of 1.000 and an outside diameter of 1.187. If the combined wear of inside and outside diameters exceeds 0.002, renew the bushing. The front bushing (19) has the annular oil groove and oil holes offset toward front end of bushing and must not be reversed. The rear bushing may be

installed either end forward. The front bearing cone (21) is a press fit on propeller shaft, and must be removed before front bushing (19) can be removed. The drive pinion (28) and gears (14 and 18) are available individually, but all should be renewed if one of the gears is not serviceable. The bearing cup (22) can be removed with an internal expanding puller and slide hammer after heating the housing in boiling water. Reheat the housing and install bearing cup with a piloted arbor such as Homelite Part Number T-14573, until it bottoms. Care must be used to be sure that the cup is not cocked in bore.

Two methods of preventing the propeller shaft from turning inside the inner race of bearing (9) exist: On motors before Serial Number 1,400,000, a small dowel pin in shaft fits into a notch in front end of bearing inner race. Later models use a tolerance ring which is installed in a machined groove in the shaft. If the bearing pin is damaged, file pin flush with shaft, drill a new 0.106 hole 3/8-inch deep using a No. 36 drill; and install a replacement pin with a brass or plastic drift. Scribe a line from the pin to end of shaft at propeller nut threads, to use as a guide when reassembling.

Reassemble the gear case as follows: Install front bushing (19) and bearing cone (21) on front end of shaft, making sure annular oil groove of bushing is to the front as shown. Clamp the skeg of gear case (23) in a soft-jawed vise with open end up and insert propeller shaft in housing. Using Fig. H28 as a guide, install thrust washer (20) and reverse gear (18). Dimpled wearing surface of thrust washer must face the gear, and tab must fit notch in housing. Partially assemble clutch dog (17), shift yoke (16) and fork (15), place in gear case and secure with pivot pin (24). Install forward gear (14) and bushing (13).

Install snap ring (29) in bottom of drive pinion (28) if it was removed or if parts were renewed, then install pinion and roller bearing (21—Fig. H27) in gear case. Tap the bearing very gently if it does not seat easily. Install pinion shaft ball bearing (20) with open side down toward pinion gear.

Lubricate the threads of shift rod (27—Fig. H28) to protect the sealing "O" ring, very gently insert shift rod into housing and start the locknut on threaded end. When a full thread is obtained on locknut, position the connector (12) in gear case and fully thread shift rod into connector. With offset upper end of lower shift rod directly to the right, lock in position with the locknut. Check the position by temporarily installing the lower motor leg over shift rod, drive shaft and retaining studs, and adjust as required.

Install rear bearing (9) and thrust washer (10) in bearing housing (7), if they were removed. Do not install rear seal (6). On early models, the locating notch in inside of bearing (9) must be toward open end of bearing housing (7). On late models which use the tolerance ring, the lettered end of bearing should be visible when installed. Lubricate the "O" ring (8) and position it in groove in bearing housing; then carefully install

the assembly over the propeller shaft and into gearcase. The bearing notch must be aligned with the previously scribed line on propeller shaft on early models. Carefully work the bearing housing into gearcase until snap ring (5) can be installed. Do not use force. If the bearing housing cannot be fully inserted by hand, remove the housing and realign the bearing pin on older models; or check for other interference. Install the seal (6), weed guard (4) and propeller (3) and check for proper operation of shift mechanism before assembly to motor. Tighten the gearcase retaining stud nuts to a torque of 275 inch-pounds.

UPPER LEG AND TRANSOM MOUNT. The upper motor leg may be detached from power head mounting plate for access to upper shift rod, oil sump, and exhaust relief valve. To split the motor between upper leg and mounting plate, first drain oil reservoir and remove the two hex bolts securing lower shock mounts to upper leg.

Disconnect water inlet hose from water tube and remove the clamp securing oil pan lower flange. Remove the shift linkage access plate from starboard side of upper leg and the 13 screws securing upper leg to mounting plate. Reach through shift linkage access hole with padded pliers to make sure that drive shaft remains with lower unit, and pull lower unit straight down from power head. **NOTE:** The water pump may be damaged if drive shaft is pulled upward when removing lower unit.

Shift shaft, shift arms or bushing may be renewed if damaged or worn. Inspect the exhaust relief valve for broken spring, damaged cup or loose rivets or bolts. The exhaust relief valve is riveted to upper leg. If service is required on riveted unit, drill out the rivets and reinstall using two No. 6-32 x 1/4-inch stainless steel screws and nuts.

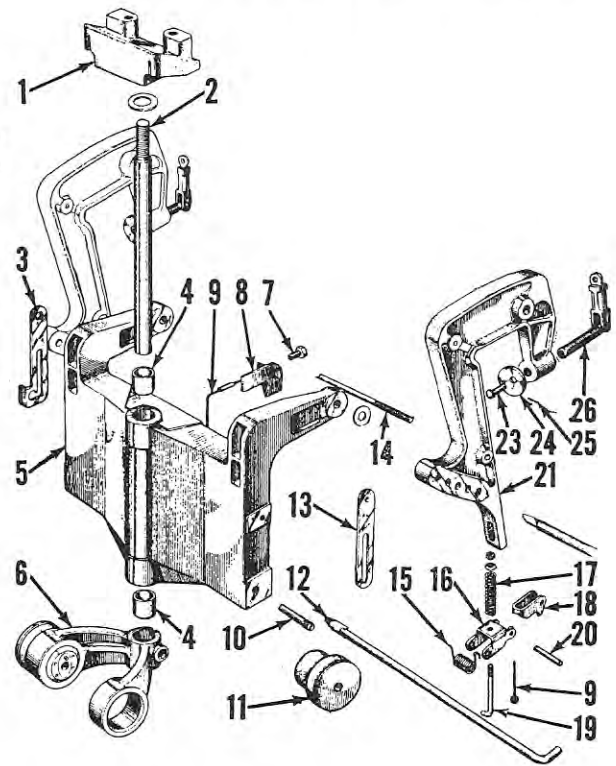
Assemble by reversing the disassembly procedure. Coat upper surface of gasket with EC-847 cement (3M Company) and secure gasket to mounting plate. Make sure both gasket surfaces are clean. Tighten the 13 securing hex screws to a torque of 100 inch-pounds and the oil pan flange clamp nut to a torque of 40 inch-pounds. **NOTE:** Over-tightening may crack the flange. Tighten the shock mount hex bolts to a torque of 550 inch-pounds.

The rubber shock mounts dampen the vibration between motor and boat. Shock mounts should be renewed if looseness is noted between transom mount and upper leg or if rubber is cracked. If lower shock mounts only are to be renewed, remove one at a time by removing the securing bolt and withdrawing mount from yoke. Tighten the bolt to 550 inch-pounds when reinstalling.

If upper shock mount is to be renewed, first remove the complete power head as outlined in POWER HEAD section. Remove the large nut at upper end of pivot pin, the two upper shock mount cap screws, and the two lower shock mount bolts;

Fig. H29—Exploded view of transom mount and associated parts.

1. Upper shock mount
2. Pivot pin
3. Tilt latch
4. Bushings
5. Pivot bracket
6. Lower yoke
7. Knob
8. Bracket
9. Actuating cable
10. Screw
11. Lower shock mount
12. Positioning rod
13. Tilt latch
14. Tie bar rod
15. Hold down spring
16. Reverse lock bracket
17. Reverse lock spring
18. Reverse latch
19. Hook bolt
20. Catch bolt
21. Transom clamp
23. Clamp pin
24. Clamp cup
25. Retaining pin
26. Clamp screw



then, remove lower unit from transom mount assembly. When reinstalling, coat the upper pivot pin washer with grease, place washer on pivot pin then install upper mount. Tighten the upper pivot pin nut to a torque of 600 inch-pounds and the four shock mount bolts to a torque of 550 inch-pounds.

The lower shock mount yoke (6—Fig. H29) has a built-in angle to compensate for motor torque, and must be installed with clamp nut on starboard side of motor if removed. Tighten the pivot pin clamp screw to a torque of 275 inch-pounds.

The reverse lock compression spring (17) should be adjusted to an assembled length of 2 1/8-2 1/4 inches by tightening or loosening the nut at upper end of hook bolt. If lower unit can be pulled rearward by hand at this setting, renew the spring and/or catch (18).

Refer to the appropriate wiring diagram for location of terminals. Make sure leads do not touch each other and that neither lead touches motor, then start the motor. With engine running at 4000 rpm, connect a 0-150 V. AC voltmeter to the two disconnected leads. Reading should be approximately 100 volts. If motor is equipped with a voltage regulator, also connect the meter between the disconnected yellow (8) lead and the middle (9) terminal on regulator. Meter should register approximately 100 volts.

If unable to obtain a reading from both of the tests, stop the engine and disconnect all three stator leads on models with regu-

ELECTRICAL SYSTEM

ALTERNATOR. A flywheel type alternator-generator is used. The alternator rotor is balanced to the flywheel and is only available for service as an assembly which includes flywheel. Alternator stator is mounted to upper bearing housing and can be renewed after removing flywheel. Tighten the stator retaining cap screws to a torque of 25 inch-pounds and the flywheel retaining nut to a torque of 175 foot-pounds. Note the alignment of timing marks on flywheel and crankshaft when installing flywheel. Refer to the appropriate wiring diagram when connecting the alternator leads.

To test the alternator, disconnect the stator leads No. 7 (Black) and No. 8 (Yellow).

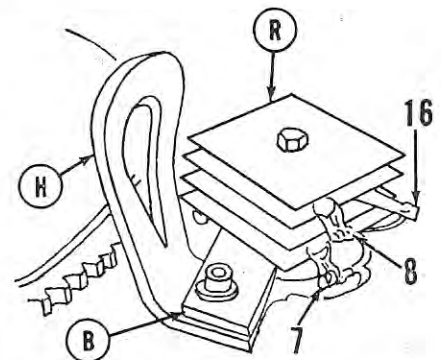


Fig. H30 — Alternator rectifier on late models.

- | | |
|-----------------------|--------------------------|
| B. Mounting bracket | 7. AC terminal |
| H. Lifting hook | 8. AC terminal |
| R. Rectifier assembly | 16. DC positive terminal |

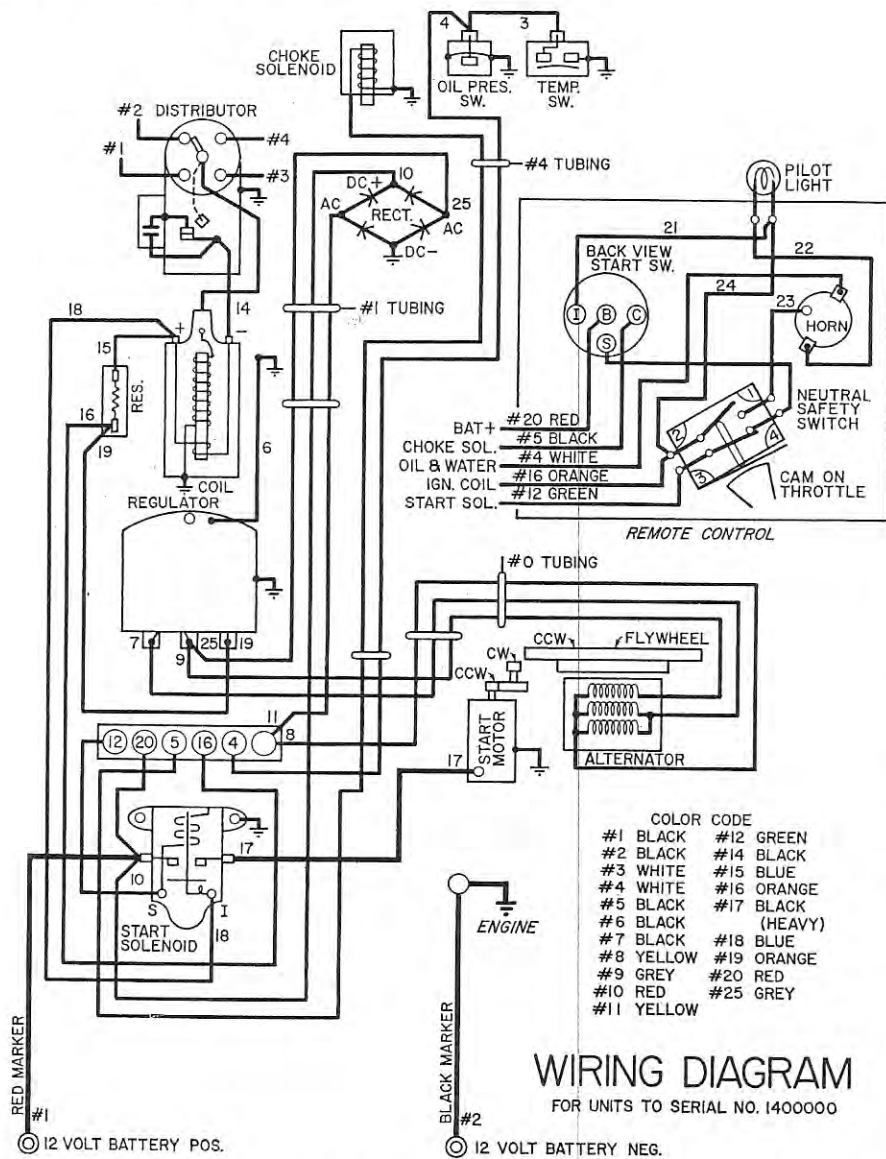


Fig. H31 — Wiring diagram used on early motors. These units may be quickly identified by the vertical electrical panel on forward, port side of power head which carries most of the electrical units.

lator; or both leads on models without regulator. Use an ohmmeter or continuity light to test the circuits without removing the stator from engine. There should be continuity between any two of the leads, but none between any of the leads and a good ground. Continuity between any of the leads and the ground would indicate a short circuit; while lack of continuity between any two leads is an indication of an open circuit. In either case, renew or repair the stator.

DC OUTPUT. On engines equipped with a voltage regulator, the DC output at 3000 engine rpm should be 4-5 amperes with a fully charged battery; or 12-15 amperes with a low battery.

On engines not equipped with a regulator, the DC output should be 4-7 amperes at 3000 engine rpm and 7-10 amperes at 5500 rpm.

Output can be tested by disconnecting the red (10) lead from starter solenoid and connecting an ammeter in the circuit.

RECTIFIER. The rectifier is used to convert the AC current produced by the alternator, into Direct Current. If alternator is in good condition and no DC current is registered, check the rectifier as follows:

Disconnect the three leads from the rectifier. NOTE: Early motors have soldered connections. Use only a soldering iron and the minimum amount of heat when connecting or disconnecting rectifier leads. Also, use soft, rosin core, electrical solder when reconnecting. Do not use acid core solder. With a file, remove paint on rectifier mounting bracket (B—Fig. H30) until bright metal shows. Mentally designate the bracket (B) and center terminal (16) as DC terminals and the upper (8) and lower (7) terminals as AC terminals.

Using an ohmmeter, touch one test probe to either of the AC terminals and the other probe to each of the DC terminals in turn. The ohmmeter reading should be 4-10 ohms when touching one of the DC terminals, and infinity when touching the other. If a zero reading is obtained in either of the tests, or if duplicate readings are obtained in both tests, renew the rectifier.

Move the probe to the other AC terminal and repeat the test. The results should be identical to the first series of tests. Reverse the test probes and repeat both series of tests. The readings should be as indicated, but reversed. The DC terminal which previously registered at infinity should now register 4-10 ohms and vice versa.

A zero reading in any test indicates a short circuit. Infinity reading indicates an open circuit.

VOLTAGE REGULATOR. All models before Serial Number 1,400,000 were equipped with a voltage regulator. The voltage regulator is an optional accessory on later models, the alternator output being reduced by disconnecting one lead as indicated in wiring diagram.

To check the voltage regulator, connect an ammeter in series with the No. 10 (red) lead from starter solenoid to rectifier. Connect the positive lead of a 0-20 DC Voltmeter to the right-hand (orange) terminal on the voltage regulator and ground the other lead. With engine running at approximately 3000 rpm, the regulator should produce a charge of 4-5 amperes at 14.0-14.5 volts; and 12-15 amperes when voltage drops to 12.0-12.5 volts. Alternator and battery should be in good condition when making the test. If regulator does not operate within the limit specified, renew the unit.

ACCESSORY INSTALLATION. To install an accessory voltage regulator on a motor not so equipped, refer to the late model Wiring Diagram and proceed as follows:

Select a convenient location and mount the regulator unit. Disconnect the black (7) lead at rectifier AC terminal. Turn back the sleeve over the alternator leads to expose the short (grey) alternator lead (9) shown in Wiring Diagram. Solder a piece of wire of sufficient length to reach regulator, to the exposed wire, and install a ring terminal to free end. Solder a second piece of wire to the disconnected rectifier lead (7). This wire must also be of sufficient length to easily reach the regulator. Install a ring terminal on free end of this lead. Cut off a third piece of wire of sufficient length to reach from rectifier to regulator, install a ring terminal to one end and a flag terminal to the other. Attach flag terminal to rectifier terminal from which the black lead (7) was previously disconnected. The fourth wire must be of sufficient length to reach from the junction block to the regulator, and must have a ring terminal installed on each end. Connect the wires as shown by broken lines in the Wiring Diagram.

STARTER. The starting motor assembly contains a gear reduction unit as shown in Fig. H33. When removing the starter for service on any of the components, it is not

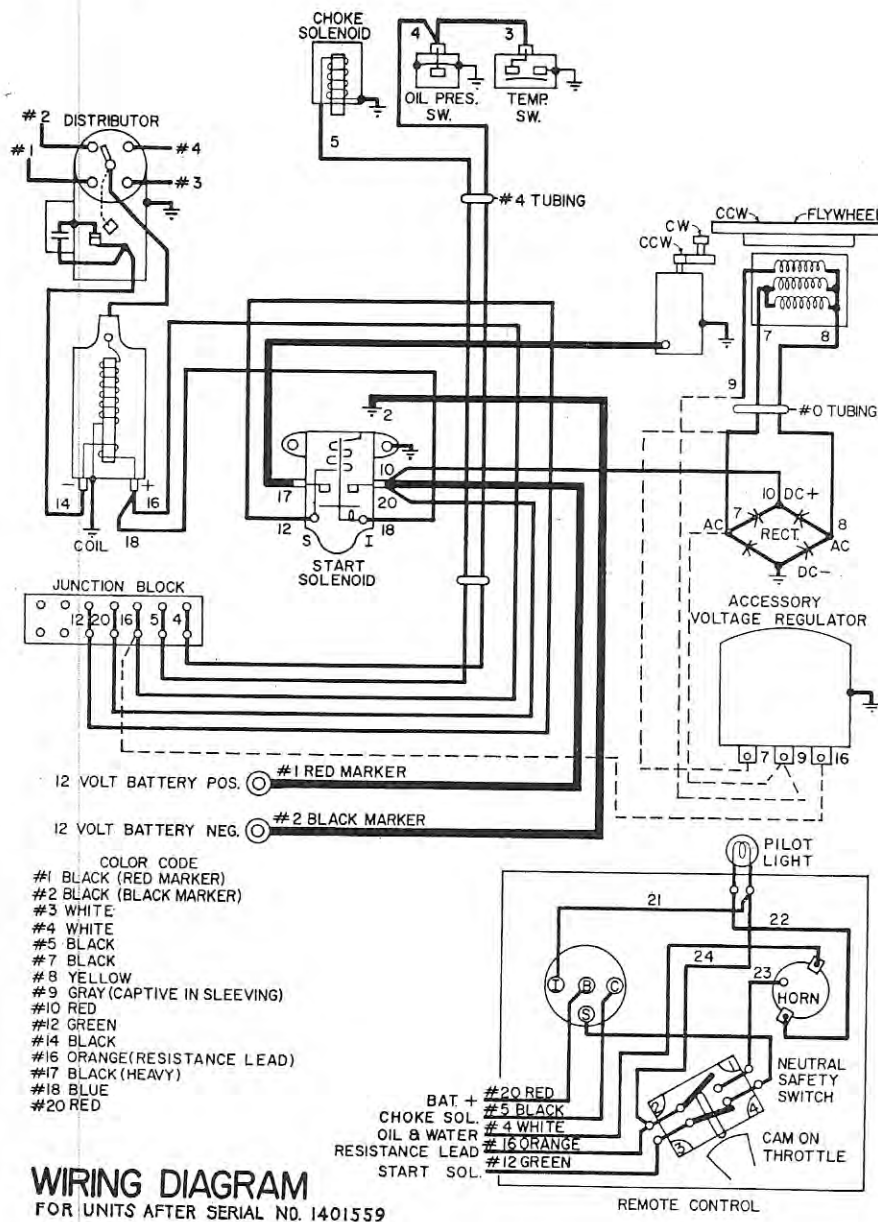


Fig. H32—Wiring diagram of late models.

normally recommended that the mounting bracket (7) be detached from the engine block.

To remove the starting motor, first remove the socket head cap screws retaining drive housing (1) to bracket, and lift off the drive housing with Bendix Drive unit (4) and jackshaft installed. Disconnect the starter lead, remove the nuts from upper ends of the two through-bolts and remove the starting motor from lower side of bracket (7).

Disassemble the starter motor by removing the through-bolts, end plates and armature assembly. Renew the end plates if bushings are worn. Renew brushes if they are oil soaked or less than 1/4-inch long; and the springs if brush tension is less than 50 ounces. Renew armature and/or fields if shorted or if any of the circuits are open. Adjust armature end play to 0.005 by renewing thrust washer.

To service the Bendix Drive, remove only the drive housing. Clamp lower end of jackshaft (5) in a soft-jawed vise and remove nut on upper end of shaft. Clean all parts in a suitable solvent and renew any which are damaged or worn. Lubricate the helix of Bendix Drive with a light oil and use a suitable grease on jackshaft and bushings. Tighten the nut on upper end of jackshaft to a torque of 25 ft.-lbs. when reassembling.

STARTER SOLENOID. Trouble in the solenoid usually consists of an open or shorted coil or burned or corroded contacts. In either case the solenoid should be renewed.

The starter solenoid also contains the cut-out switch for the ignition resistor or resistance wire. To check the continuity of the cut-out switch, disconnect the wire from the "T" terminal on solenoid. Use a continuity tester or test light and check for continuity

between "T" terminal and either of the heavy solenoid terminals when the starting motor is activated. If there is no continuity, the ignition resistance cut-out circuit is not working, and the solenoid must be renewed.

IGNITION SWITCH. The ignition switch is located in the remote control unit and includes the activating switches for the starter solenoid and the choke solenoid. Continuity of the three circuits can be checked with a continuity tester. There should be continuity between the "B" terminal and each of the other terminals when the key is turned to proper position to activate that circuit.

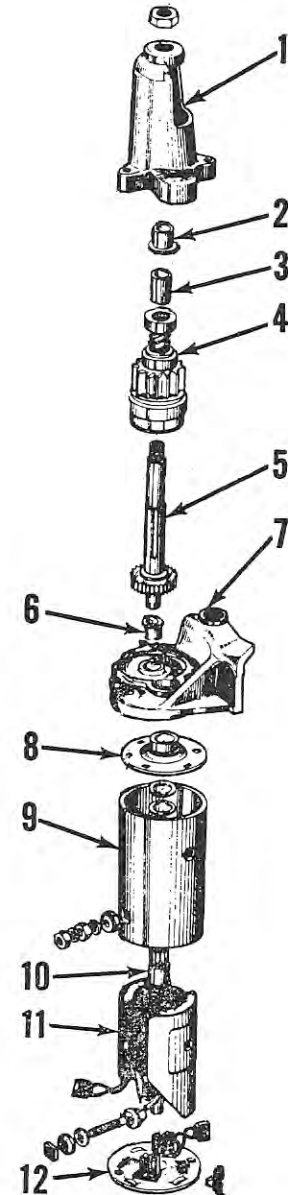


Fig. H33 — Exploded view of the gear reduction starting motor used on all 1962-1963 units.

- | | |
|------------------|---------------------|
| 1. Drive housing | 7. Mounting bracket |
| 2. Bushing | 8. Drive end plate |
| 3. Sleeve | 9. Frame |
| 4. Drive unit | 10. Armature |
| 5. Jackshaft | 11. Field coils |
| 6. Bushing | 12. Brush end plate |

Fig. H34—Exploded view of remote control unit mechanism showing main components. Little service is required on remote control, and most parts are not available separately.

1. Throttle cable
2. Shift cable
3. Clamp
4. Swivel clamp
5. Throttle crank
6. Auxiliary lever
7. Interlock assembly
8. Neutral switch cam
9. Actuator
10. Main control lever
11. Warning horn
12. Neutral safety switch
13. Bracket
14. Bracket
15. Shift lever

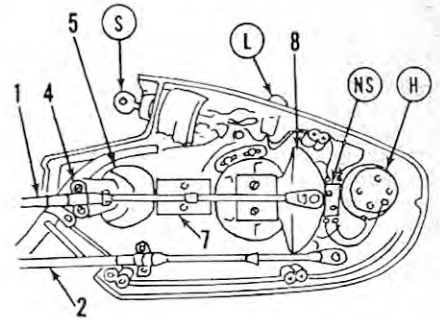
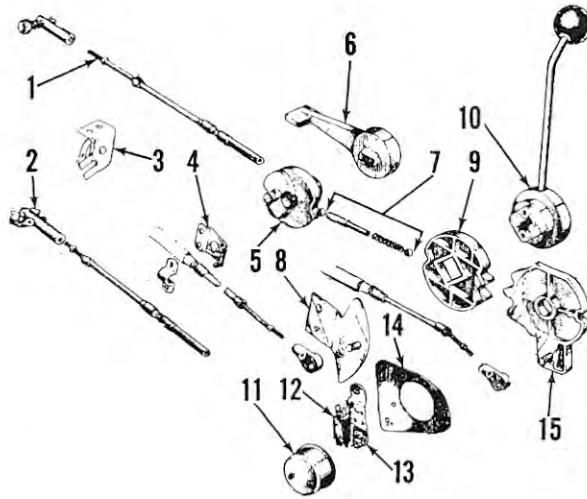


Fig. H35 — Remote control unit with cover removed showing location of components. Refer to Fig. H34 for legend except for the following.

- H. Warning horn
- L. Warning light
- S. Ignition switch
- NS. Neutral switch

NEUTRAL SAFETY SWITCH. A neutral safety switch is located in the remote control unit which prevents activation of the starting circuit when in gear with open throttle. Starting circuit may be activated in "NEUTRAL" position with any throttle setting by using the auxiliary throttle lever; or in "AHEAD" or "ASTERN" positions at idle speed setting only.

To test the safety switch with switch removed, check for continuity between terminals 1 and 2; and between terminals 3 and 4. There should be continuity between terminals 1 and 2 only when button on side of switch is not depressed; and continuity between terminals 3 and 4 only when button on side of switch is depressed.

Install the safety switch by placing the main control lever in "NEUTRAL" position and installing switch with the button on side of switch on contact with control lever cam. Move switch toward control lever until button is fully depressed, then tighten the bracket retaining screws. Connect the wiring as indicated in the appropriate wiring diagram.

CHOKE SOLENOID. The choke solenoid must be aligned so that the solenoid plunger is directly above and in line with both choke swivels. Side pressure on the plunger when activated might cause it to stick.

If the choke solenoid does not operate properly, disconnect the solenoid lead and touch a jumper wire to positive battery cable terminal of starter solenoid and to choke solenoid terminal. If solenoid is actuated, check the starter switch and wiring for continuity; if solenoid was not actuated, renew the unit.

WARNING SYSTEM. The motor is equipped with a warning light and warning horn to alert the operator if temperature should become too high or oil pressure too low.

To check the warning system, turn the ignition switch on. With engine not running and the main control lever in "NEUTRAL" position, the warning light on the remote

control unit should light up. Move the main control lever fully to "AHEAD" or "ASTERN" positions with ignition switch on, and the horn should also sound. If neither the horn nor light are activated, ground the terminal of the oil pressure sensing switch on filter housing and repeat the test. If warning system now works, renew the oil pressure switch. If warning system does not work, refer to the appropriate wiring diagram and check the continuity of the appropriate switches and wiring.

To test the temperature switch, remove the unit from exhaust elbow. Place the switch and a thermometer in a pan of oil and heat the oil. At an oil temperature of approximately 250° F., check the continuity between switch terminal and threaded portion of switch. There should be continuity at 225°-250° F. but no continuity at 190°-210° F. If continuity is not as indicated, renew the switch unit.

REMOTE CONTROL UNIT

The remote control unit contains a single control lever which controls the shifting mechanism and throttle setting. A second lever controls throttle setting only. An interlock connects the two levers so that throttle lever can be moved only when master control lever is in "NEUTRAL" position; or the master lever moved only when throttle lever is in "SHIFT" position. The control unit also contains the starting and ignition switch, and the switch for the choke solenoid, the warning light and horn, and the neutral safety switch.

Refer to Fig. H34 for an exploded view of the main components of the control mechanism. The outer housing of throttle control cable assembly (1) is connected to the auxiliary throttle lever (6) by means of the crank (5) and swivel (4). The inner cable is connected to the neutral switch cam (8) on master control lever (10). In the idle position, the housing swivel is directly aft of its pivot as shown, and the cable actuat-

ing pin is directly forward of main control lever axis. The throttle is advanced any time the maximum distance between housing swivel and cable pin is decreased. The auxiliary throttle lever advances the throttle by moving the housing toward the cable actuating pin. The shift cable (2) is attached to shift lever (15) which is connected to the master lever by a gear and slide mechanism. When the master control lever is moved from the neutral position, the throttle cable actuating pin moves in a vertical direction, having little effect on throttle setting. The gear teeth on actuator (9) moves the shift lever (15) either forward or rearward until clutch dogs in lower unit are completely engaged; at which time, the gear teeth become unmeshed and the slide of actuator (9) locks shift lever in position. Further movement of the master control lever advances the throttle by moving the throttle cable actuator pin toward the housing swivel. The interlock assembly (7) is fitted between crank (5) and actuator (9) and is of sufficient length that neither lever can be moved unless interlock is in the detent notch of the other lever.

Very little service is required on the remote control unit, and except for the cable assemblies and electrical switches and wiring, parts are not available except in the complete unit.

Control cables are interchangeable for shift mechanism and throttle except for the end connectors. Cables are available in lengths from 8 to 20 feet in increments of one foot. To determine the correct cable for an installation, measure from the point where remote control unit is to be fastened, to center-line of mounted engine, following all bends. Add 1½-2 feet to the measured distance and procure a cable of the nearest length. Both cables should be the same length. Thread the forward fittings on either end of both cables 12 full turns (¾-inch), tighten locknuts, and attach to the

two pins of remote controls. Clamp forward end of throttle cable housing in swivel (4) and forward end of shift cable housing to remote control housing as shown in Fig. H35.

On the throttle cable, thread the proper terminal on engine end of cable and attach housing clamp to forward edge of engine mounting plate. Make sure master control lever is in "NEUTRAL" position and auxiliary lever in "SHIFT" position. Pull throttle

bellcrank forward until it stops, and adjust terminal until it fits freely over pin in throttle bellcrank. Attach the cable and tighten the terminal locking nut.

The shift cable travel is slightly greater than the travel of lever on the motor, to slightly preload the cable when shift dogs are engaged. This preload should be approximately equal at either end of cable travel. Attach shift cable housing to clamp

approximately below throttle bellcrank. Move the master control lever on remote control unit to full "AHEAD" position and align shift lever between the alignment notches on flange of upper motor leg. Thread the terminal on shift cable until pin of terminal aligns with slotted hole of lever; then shorten shift cable three full turns, to preload the linkage. Rotate terminal pin 90° to lock in place.

HOMELITE FACTORY BRANCHES

(Arranged in alphabetical order by states)

These firms carry extensive stocks of repair parts. Contact them for name and address of nearest franchised servicing dealer who may have the parts you need.

When communicating with any of the establishments listed below, insert the name "Homelite" before the listed address, except those in Canada.

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727 Airport Blvd.
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1575 Carr Street
Denver 15, Colorado

755 West Putnam Ave.
Byram, Connecticut

164 East Service Road
Hartford 1, Connecticut

1426 June Street
Jacksonville, Florida

198 - 14th St., N.W.
Atlanta 13, Georgia

3820 W. North Avenue
Stone Park, Illinois
(Mailing address: P. O. Box 35,
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1818 W. 16th Street
Indianapolis 7, Indiana

3209 Old Minden Rd.
Bossier City, Louisiana

3940 Veterans Highway
Metairie, Louisiana

Park Street
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2414 Aisquith Street
Baltimore 18, Maryland

144 Western Ave., P. O. Box 186
Allston 34, Massachusetts

616 East State Fair
Detroit 3, Michigan

30425 Stephenson Highway
Madison Heights, Mich.

1547 Godfrey Ave., S.W.
Grand Rapids 9, Michigan

814 North Prior Ave.
St. Paul 4, Minnesota

2401 Troost Avenue
Kansas City 8, Missouri

6265 Clayton Ave.
St. Louis 10, Missouri

1433 So. 13th Street
Omaha 8, Nebraska

39 River Road
North Arlington, New Jersey

122 Amboy Avenue
Woodbridge, New Jersey

740 New Loudon Road
Albany, New York

1650 William St.
Buffalo 6, New York

4135 West Henrietta Road
Rochester 23, New York

2518 Erie Boulevard East
Syracuse 3, New York

2640 Freedom Drive
Charlotte, North Carolina

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7806 Anthony Wayne Ave.
Cincinnati 16, Ohio

15728 Industrial Parkway
Cleveland 35, Ohio

2714 Nebraska Avenue
Toledo 7, Ohio

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Oklahoma City 19, Oklahoma

3436 S.E. Milwaukie Ave.
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126 Frankstown Road
Altoona, Pennsylvania

6100 Allentown Blvd.
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385 Lincoln Highway
Malvern, Pennsylvania

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810 Ridge Avenue
Pittsburgh 33, Pennsylvania

555 West 5th Ave.
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Terry Machinery Co. (Ont.) Ltd.
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Terry Machinery Co. Ltd.
1240 Laurentien Boulevard
St. Laurent, Quebec

Terry Machinery Co. (Que.) Ltd.
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Quebec City, Quebec