WEST BEND

THE WEST BEND COMPANY
HARTFORD DIVISION
Hartford, Wisconsin

CONDENSED SERVICE DATA

Series Year produced	80 hp
1961	80161, 80162
1962	80163, 80165
1963	8036, 8024

TUNE-UP

Engine rpm	4750
Bore—Inches	3⅛
Stroke—Inches	2¾
Number of Cylinders	4
Displacement—Cu. In.	84.36
Compression @ Cranking Speed (average)	120 psi
Spark Plug	
Champion	J4J
Electrode gap	0.030
Distributor	
Condenser capacity	0.28 Mfd.
Point gap	0.020
Timing	See text
Carburetor	
Make	Tillotson
Model	OM17A
Adjustment	See text
Fuel—Oil Ratio	24:1*

*See LUBRICATION.

SIZES — CLEARANCES

Piston Rings	
End gap	0.008-0.015
Side clearance	0.002-0.0045
Piston to Cylinder Clearance	0.005

SIZES—CLEARANCES (Cont'd)

Crankshaft Journal Diameters	
Upper & Lower Main	1.1245-1.1250
Intermediate Main	1.1391-1.1395
Crankpin	1.1391-1.1395
Crankshaft Bearing Clearances	
All	Roller brng.
Crankshaft End Play	0.0001-0.009
Rod Side Clearance	0.007-0.008

TIGHTENING TORQUES
(All Values in Inch-Pounds)

Connecting Rod	150
Flywheel Nut	840
Cylinder Head	270
Main Bearing Bolts	270
Spark Plug	264-276
Standard Screws	
No. 10-24	30
No. 10-32	35
No. 12-24	45
¼-20	70
5/16-18	160
⅜-16	270

LUBRICATION

The power head is lubricated by oil mixed with the fuel. One third (⅓) pint of two-cycle engine oil should be mixed with each gallon of gasoline. The amount of oil in the fuel may be reduced after motor is well broken in, provided the highest quality of Heavy-Duty Outboard Motor Oil is used. The minimum, recommended fuel-oil ratio is 48:1, or half the normally recommended amount of oil. If the amount of oil is reduced, it is extremely important that fuel and oil be thoroughly mixed, that idle mixture adjusting screws be carefully checked to make sure any error of adjustment is on the "Rich" side, and that the recommended High Speed Jets are used. Marine white gasoline is recommended; if not available, use a good grade of regular gasoline. Gasoline and oil should be thoroughly mixed, using a separate container, before filling fuel tank.

The lower unit gears and bearings are lubricated by oil contained in the gear case. Only West Bend "Customized" Gear Lubricant or other approved outboard gear lubricant should be used. The gear case should be drained and refilled every 100 hours or once each year, and fluid maintained at the level of upper (vent) plug hole.

To fill the gearcase, have the motor in upright position and fill through the lower plug hole in starboard side of gearcase until fluid reaches level of upper vent plug. Reinstall and tighten both plugs securely, using new gaskets if necessary, to assure a water tight seal.

FUEL SYSTEM

CARBURETOR. Tillotson, type OM carburetors are used. Refer to Fig. WB75. Normal initial setting is one turn open for idle mixture adjustment needle (3). Fixed jets (16) control high speed mixture. Idle mixture must be readjusted under load, after motor is warm, for best slow speed performance. Both carburetors must be adjusted as nearly as possible for equal performance.

To adjust the float, remove and invert the carburetor body (9). With body inverted and inlet needle valve closed, measure the distance (A—Fig. WB76). This distance should be 13/32-inch. Adjustment is made by bending the curved tang (1) which contacts inlet needle. NOTE: Do not attempt to adjust float height by pressing on the float. The inlet needle closes on a synthetic rubber seat, and accurate adjustment is not possible. After adjusting the closed position (A), adjust maximum float drop (B) to 7/8-inch by bending the straight tang (2).

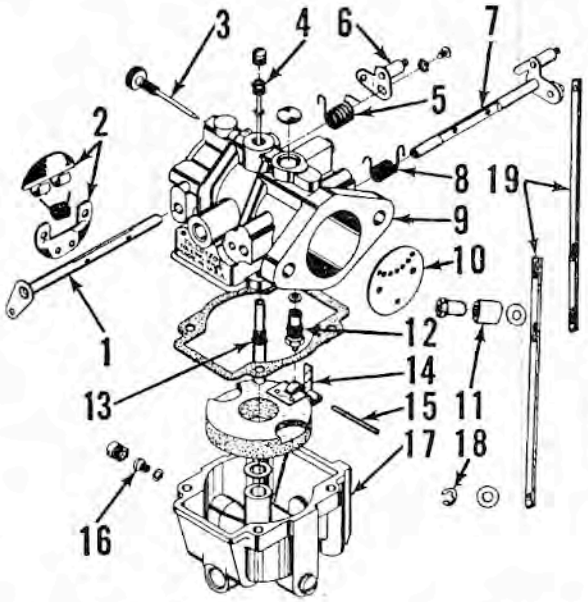


Fig. WB75 — Exploded view of Tillotson model OM carburetor and linkage used on Tiger Shark.

1. Choke shaft
2. Choke valve
3. Idle needle
4. Idle tube
5. Choke spring
6. Choke lever
7. Throttle shaft
8. Spring
9. Body
10. Throttle valve
11. Follower roller
12. Inlet needle & seat
13. Main nozzle
14. Float
15. Float shaft
16. High speed jet
17. Float bowl
18. Retainer
19. Tie bars

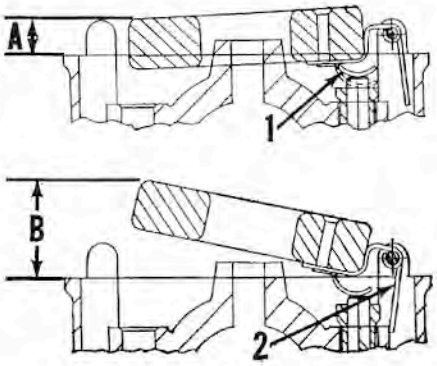


Fig. WB76—Adjust float height by bending tang (1) until distance (A) measures 13/32-inch. Adjust float drop by bending tang (2) until distance (B) measures 7/8-inch.

Tillotson parts list is as follows:

Model OM-14A

Repair kit	RK-469
Gasket set	GS-141
Inlet needle and seat	012259
High speed jet (0.082) Standard	012302
High speed jet (0.078) High Alt.	012313

Model OM-17A

Repair kit	RK-469
Gasket set	GS-141
Inlet needle & seat	012259
High speed jet (0.082) Standard	012302
High speed jet (0.078) High Alt.	84069

SPEED CONTROL LINKAGE. The speed control lever operates the vertical tower shaft which is connected by an arm and link to the breaker plate assembly. Throttle linkage is synchronized to tower shaft to open throttle as ignition timing is advanced. It is very important that throttle linkage be properly synchronized for best performance.

To synchronize the linkage, first make sure that ignition is properly timed as outlined in IGNITION paragraph. Back out the throttle stop screw (S—Fig. WB77) to allow the tower shaft to rotate fully to slow (clockwise) position. Check the sector gears on tower shaft and throttle quadrant to make sure they are properly synchronized to fully mesh in both the "Fast" and "Slow" positions. Ends of sector gear teeth must align to within 0.010. Adjust the alignment by turning the set screw on bottom side of tower shaft lower bearing to raise or lower the tower shaft. Loosen the set screw in throttle quadrant sector gear and move gear toward tower shaft, if necessary, to adjust the backlash to a minimum without binding.

Rotate tower shaft clockwise until follower roller (2—Fig. WB78) is centered on flat portion at forward end of quadrant (3) as shown. Loosen the two screws which clamp the upper and lower throttle tie bars (19—Fig. WB75) and allow both the upper and lower carburetor throttle valves to close: Tighten the upper clamp screw; then adjust lower clamp screw until cam follower roller (2—Fig. WB78) has a clearance (A) of 0.020 between roller and quadrant (3).

Check the synchronization of the two carburetors as follows: Connect a tachometer to engine and operate at 1500 rpm in "Neutral" gear. While watching tachometer and counting the turns, fully close the idle adjustment needle on the upper carburetor. Note and record the engine speed with idle needle closed. Reset the upper carburetor idle adjustment needle and repeat the procedure with the lower carburetor. With idle adjustment needle closed, engine speed should be equal within 150 rpm for both carburetors. If it is not, loosen the screws clamping the throttle tie bars (19—Fig. WB75) together, and change the adjustment to slightly open the throttle valve on the slow carburetor. NOTE: Throttle must again be synchronized with tower shaft as shown in Fig. WB78.

Reset the throttle stop screw (S—Fig. WB 77) with engine at operating temperature, until slow idle speed is 700-750 rpm in "Neutral;" or 600-650 rpm in "Forward" gear.

REED VALVES. The inlet reed valves are located on reed plate between inlet manifold and crankcase. The reed valve assembly should be checked every time carburetor is removed for service. An identical reed plate assembly is used for each carburetor.

The reed petals should seat very lightly against reed plate throughout their entire length. Reeds may stand open a maximum of 0.007. Check seating visually. Reed stop setting should be 11/64-inch when measured from end of stop to seating surface of reed plate as shown in Fig. WB79. Renew reeds if petals are broken, cracked, warped, rusted or bent. Never attempt to bend a reed petal or to straighten a damaged reed. Never install a bent or damaged reed. Seating surface of reed plate should be smooth and flat. When installing reeds or reed stop, make sure that petals are centered over the inlet holes in reed plate; and that reed stops are centered over petals.

FUEL PUMP. A two-stage, diaphragm type fuel pump is used. Refer to Fig. WB80. Pressure and vacuum pulsations from the two lower powerhead crankcases are directed to the rear of diaphragm (5) through the hoses (1 & 3). When the lower powerhead piston moves upward in its cylinder, vacuum in the crankcase draws the primary fuel pump diaphragm upward and fuel enters pump through inlet hose (10), fuel bowl (13) and inlet check valve (6). As powerhead piston moves downward, pressure forces the diaphragm downward into fuel chamber, and fuel passes through outlet check valve (7) into secondary pump. When pressure from the lower crankcase is on hose (1), No. 3 piston is moving upward to form a vacuum in secondary pump vacuum hose (3). The combination of pressure in primary pump and vacuum in secondary pump causes secondary pump fuel

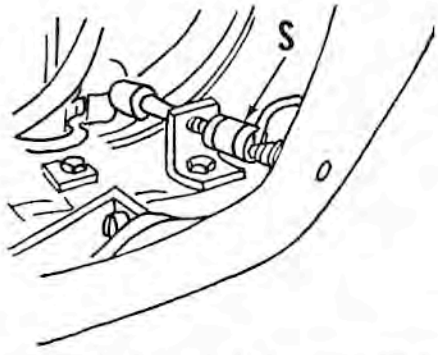


Fig. WB77—Slow speed stop screw (S) is located at front, starboard side of power head.

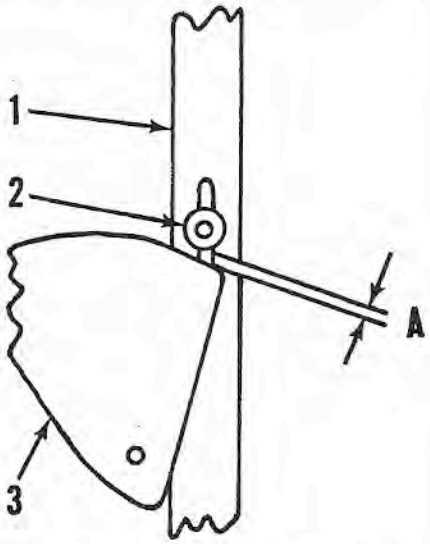


Fig. WB78—Schematic view of throttle control linkage. Refer to text for details of adjustment.

1. Tie bars
2. Follower roller
3. Throttle cam
A. Adjusting clearance

chamber to fill. Pressure from No. 3 crankcase moves the secondary pump diaphragm downward, forcing fuel out past outlet check valve (8) into carburetor line elbow (14).

Defective or questionable parts should be renewed. Check the diaphragm (5) for cracks, air leaks or other signs of deterioration.

IGNITION

Breaker point gap should be 0.020 for each set of points, and must be equal to within 0.0015. The ignition system consists of a separate coil, condenser and contact points for each of the four cylinders.

When installing an ignition coil, turn the No. 1 primary terminal toward cylinder block, and No. 15 primary terminal to outside. Attach the common (Blue) coil wire to the No. 1 primary terminal of each coil. Attach the condenser leads and appropriate color coded breaker point lead to outer (No. 15) terminal. Breaker point leads are color coded as follows:

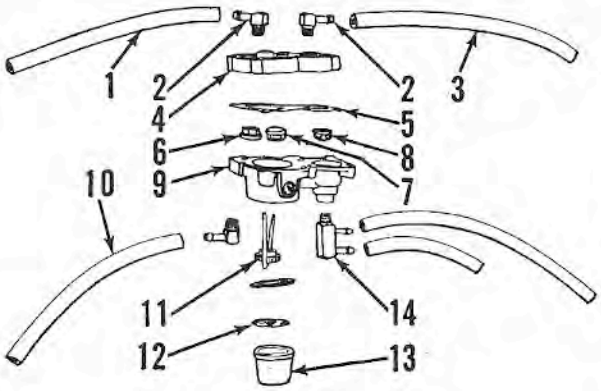
No. 1	cylinder	.....Red
No. 2	cylinder	.....Yellow
No. 3	cylinder	.....Orange
No. 4	cylinder	.....Green

Maximum advance of ignition system is 36°, and occurs at cruising range. At full throttle, the ignition is retarded 4° from maximum advance. To check the ignition advance, remove the flywheel and refer to Fig. WB81. Rotate the tower shaft counterclockwise until upper tower arm (2) and breaker plate link (3) are parallel. At this time, the timing marks (TM) on breaker plate and stator housing should be aligned as shown. If they are not, shorten or lengthen the breaker plate link (3).

If timing marks are not present, West Bend Timing Tool, T2938, will be required to find and mark the timing position. Install the special tool in No. 1 (top) cylinder spark plug hole and turn the crankshaft until piston is on top dead center. Screw outer portion of tool in or out until the first 80 H. P. scribe mark on plunger aligns with edge of outer barrel of tool. Turn the crankshaft counter-clockwise until the second 80 H. P. scribe mark on plunger aligns with barrel to establish the 36° BTDC crankshaft position. Connect one lead of a timing test light to the insulated contact of the No. 1 point set, ground the other lead, then move the breaker plate until points just break. NOTE: Points must be properly adjusted. Scribe a timing mark on the unmarked part for future use.

Fig. WB80 — Exploded view of two-stage fuel pump used on Tiger Shark.

1. Pressure line
2. Fitting
3. Pressure line
4. Diaphragm cover
5. Diaphragm
6. Inlet check valve
7. Outlet check valve
8. Outlet check valve
9. Pump body
10. Inlet hose
11. Filter ball
12. Filter screen
13. Filter bowl
14. Outlet fitting



COOLING SYSTEM

WATER PUMP. All motors are equipped with a rubber impeller water pump of the type shown in Fig. WB82. The water pump is mounted in the lower unit drive shaft housing (upper gearcase).

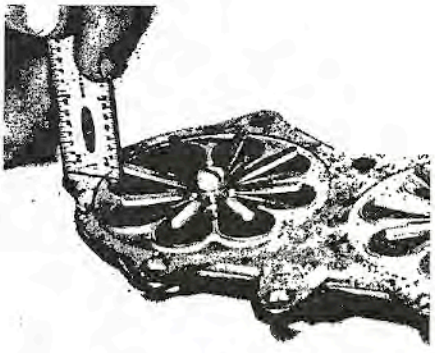


Fig. WB79 — When installing reed valves, adjust reed stop to 11/64-inch by measuring as shown.

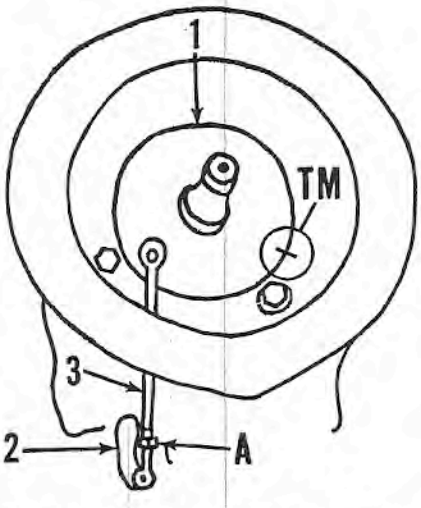


Fig. WB81 — Breaker plate timing marks (TM) should be aligned when link (3) and upper tower arm (2) are parallel as shown. Adjust with the adjusting yoke (A).

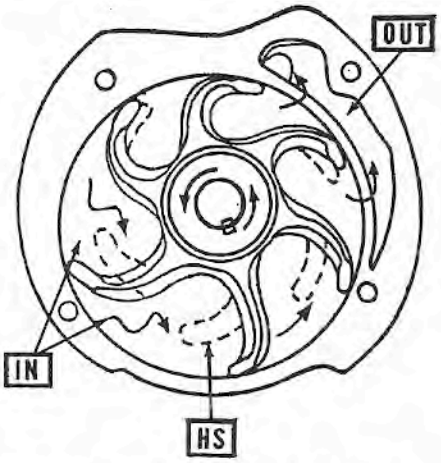


Fig. WB82—Schematic view of rubber impeller type water pump showing principle of operation. The offset housing and flexing impeller blades causes pump to operate by positive displacement at slow speeds. At high speeds, impeller blades remain curved (HS) and pump operates by centrifugal action.

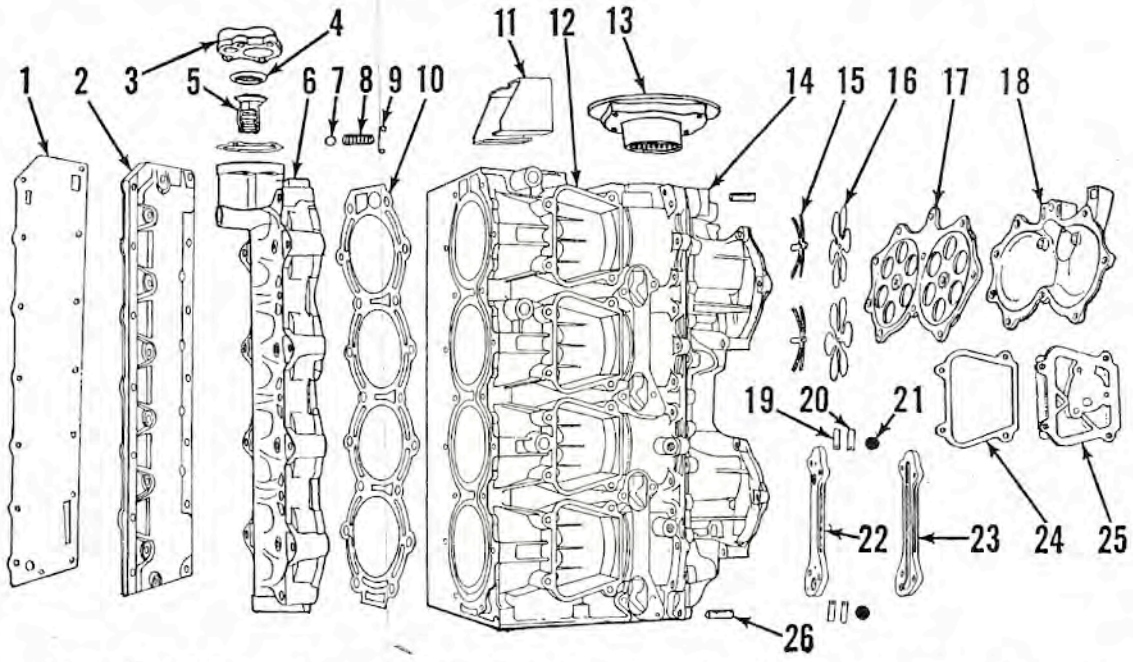


Fig. WB83—Exploded view of powerhead cylinder, crankcase and associated parts used on Tiger Shark models.

1. Exhaust cover
2. Exhaust cover
3. Thermostat cover
4. Grommet
5. Thermostat
6. Cylinder head
7. Thermostat check valve
8. Valve spring
9. Retainer
10. Gasket
11. Latch bracket
12. Cylinder half
13. Upper bearing cage
14. Crankcase half
15. Reed stop
16. Reed petals
17. Reed plate
18. Inlet manifold
19. Reed stop
20. Reed petal
21. Drain screen
22. Drain reed plate
23. Drain valve cover
24. Gasket
25. Transfer port cover
26. Dowel

When cooling system problems are encountered, first check the thermostat to see that it is operating. Check the water inlet for plugging or partial stoppage, then if not corrected, remove the lower unit gearcase and check the condition of water pump, water passages and sealing surfaces.

THERMOSTAT. Motors are equipped with a cooling system thermostat which is mounted in the cylinder head and used to control the coolant temperature. To remove the thermostat, remove the cover (3—Fig. WB83) and withdraw the thermostat (5).

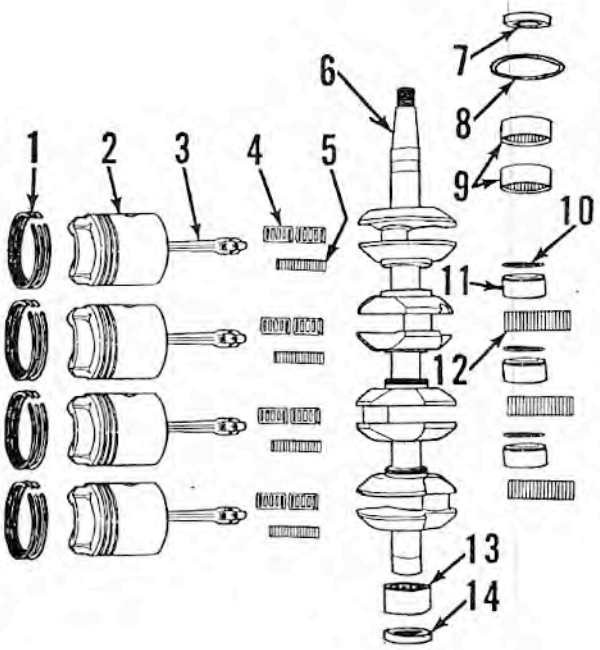


Fig. WB84 — Crankshaft, pistons and associated parts used on Tiger Shark.

1. Piston rings
2. Pistons
3. Connecting rods
4. Bearing cage
5. Needle rollers
6. Crankshaft
7. Chankshaft seal
8. Sealing ring
9. Upper bearings
10. Retainer
11. Outer race
12. Needle rollers
13. Lower bearing
14. Crankshaft seal

POWER HEAD

R&R AND DISASSEMBLE. To overhaul the power head, clamp the motor on a stand or support and remove the engine cover (shroud), coil & bracket assembly, flywheel, alternator stator and breaker plate. Remove the fuel pump, carburetors and inlet manifolds and disconnect all interfering wiring and linkage. Remove the cylinder head and transfer port and exhaust covers if major repairs are required.

Remove the rear exhaust cover from motor leg for access to rear mounting stud; then disconnect and remove cylinder block assembly from lower unit.

Crankshaft and pistons can be removed after removing upper bearing cage (13—Fig. WB83); then removing crankcase front half (14). Exhaust covers (1 & 2), transfer port covers (25), crankcase drain covers (23) and reed plates (22) should be removed for cleaning and inspection. Pry lugs are provided adjacent to retaining dowels (26), for removing crankcase front half.

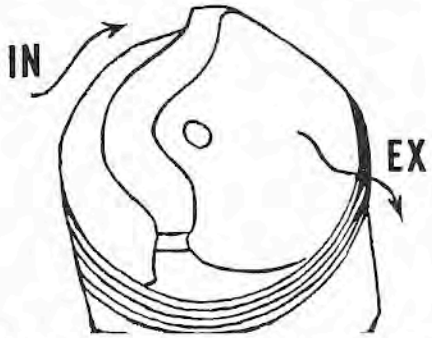


Fig. WB85—Piston baffle is designed to insure proper scavenging. Piston must be installed as indicated, with relation to inlet and exhaust ports.

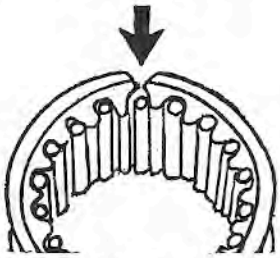


Fig. WB86—When installing needle bearing cages, make sure beveled ends are indexed as shown by arrow.

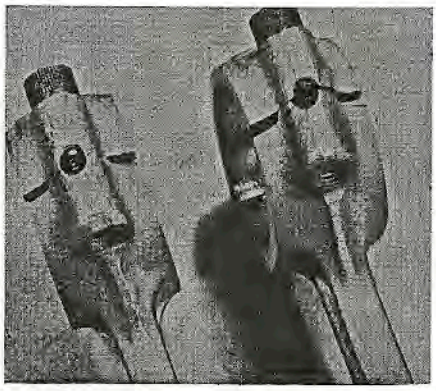


Fig. WB87 — Assembled views of fractured connecting rod showing correct and incorrect cap installation.

Engine components are now accessible for removal and overhaul as outlined in the appropriate following paragraphs. Assemble as outlined in the ASSEMBLY paragraph.

ASSEMBLY. When reassembling, make sure all joint and gasket surfaces are clean, free from nicks and burrs and hardened cement or carbon. Because of the two-cycle design, crankcase and inlet manifolds must be completely sealed against both vacuum and pressure. Exhaust manifold and cylinder head must be sealed against water leakage and pressure. Mating surfaces of exhaust areas between power head and motor leg must form a tight seal.

PISTONS, PINS, RINGS & CYLINDERS. Piston is fitted with three rings which should be installed with the beveled inner edge toward closed end of piston.

Piston, pin and connecting rod are available for service only as a complete assembly. Do not attempt to disassemble the piston and connecting rod. When installing piston in cylinder, the long, tapering side of baffle on piston head should be installed to port side of cylinder block, toward the exhaust ports. Refer to Fig. WB85. All friction surfaces should be lubricated with new engine oil when assembling.

CONNECTING RODS, BEARINGS & CRANKSHAFT. Before detaching connecting rods from crankshaft, make certain that rod and cap are properly marked for correct assembly to each other and in the correct cylinder. The loose needle bearings and cages at crankpin end of connecting rod should be kept with the assembly and not interchanged. The bearing cages have a beveled edge which must be assembled together as shown by arrow, Fig. WB86.

Parting faces of rod and cap are not machined, but are separated by fracturing to provide positive location. When installing cap, make sure the correlation marks are aligned; then shift cap back and forth slightly while tightening, until fracture sections are in perfect mesh as shown in left hand view, Fig. WB87. When properly installed, the parting line is practically invisible as shown.

Whenever power head is disassembled, it is recommended that all gasket surfaces, and mating surfaces without gaskets, be carefully checked for nicks and burrs or warped surfaces which might interfere with a tight seal. Check all surfaces carefully and use a stone or fine emery cloth to remove slight damage.

Inspect the thermostat check valve ball (7—Fig. WB83) and spring (8), located in lower surface of cylinder head. Inspect also the crankcase drain reed petals (20) and reed plates (22), for wear or damage.

A heavy, non-fibrous grease should be used to hold loose needle bearings in position during assembly. All friction surfaces should be lubricated with new engine oil. Check frequently as power head is being assembled, for binding or locking of the moving parts. If binding or locking is encountered, remove the cause before proceeding with the assembly.

Gasket and sealing surfaces should be lightly and carefully coated with a non-hardening gasket cement. Make sure entire surface is coated, but avoid letting excess cement squeeze out into crankcase, bearings, or other passages. When installing cylinder head, exhaust covers or crankcase front half, start with the center retaining screws and work each way toward top and bottom. Refer to CONDENSED SERVICE DATA table for clearances and tightening torques.

The crankshaft upper main bearing consists of two identical caged needle roller bearings (9—Fig. WB84). The intermediate main bearings consist of 18 loose needle rollers (12), a split outer cage (11) and a retaining ring (10). The outer cage is separated by fracturing as previously described for the connecting rod. When assembling the bearings, install the retaining ring groove toward bottom of crankshaft, and work the cage halves back and forth slightly until fractured parting lines mesh; then install the retaining ring. The lower main bearing (13) is of the caged roller type.

When assembling, follow the procedures outlined in the ASSEMBLY paragraph. Tightening torques are listed in the CONDENSED SERVICE DATA table.

LOWER UNIT

PROPELLER AND DRIVE PIN. Shear pin protection is carefully engineered for each unit. Protection depends on shear pin material as well as size. Although, in an emergency, the shear pin may be replaced by one of any available material, the correct shear pin should be installed as soon as possible to insure maximum performance and protection. Spare shear pins should always be carried.

All motors use a $\frac{5}{16}$ x 1 39/64-inch stainless steel shear pin, manufacturer's part number 16180. Propellers are selected for best performance under applicable operating conditions.

R&R AND OVERHAUL. To remove the lower unit gearcase and drive shaft housing from lower motor leg, loosen the locknut (B—Fig. WB91) on upper shift rod, and disconnect the coupling (C). Remove the screws and stud nut retaining the driveshaft housing (upper gearcase) to motor leg and remove the complete lower unit drive assembly. Refer to Fig. WB88.

Disassemble and remove the water pump (28) through 32). Remove the propeller and shear pin, and remove any rust or burrs from exposed end of propeller shaft. Remove the two stud nuts retaining gearcase housing (42) to driveshaft (upper gearcase) housing (40). Disconnect and remove the upper shift linkage; then remove the lower unit gearcase, propeller shaft and associated parts. Drive shaft, drive pinion (38) and bearings will remain in the driveshaft housing.

Remove the two screws retaining the propeller shaft bearing cage (6) to gearcase, rotate the cage slightly, then tap on ears of cage with a soft hammer to remove the cage. Propeller shaft and associated parts may now be withdrawn. NOTE: Shift arm yoke (27) will be free to drop when propeller shaft is removed. Do not lose the yoke. Slip the forward gear and bearing assembly (22) from the propeller shaft.

To disassemble the shift clutch assembly, pry the retaining ring (20) out of its groove with a screwdriver or similar tool. NOTE: Detent ball and spring (17) will be released when retaining ring is moved from groove. Catch the detent assembly to prevent loss. Drive out the roll pin (16) and withdraw the clutch dog (19) and shift shaft (23). Reverse gear (13) and bearing cone (10) can be removed from propeller shaft at the same time using a press. Keep the thrust washers (14 and 21) with their respective gears. The washers are similar but not interchangeable.

Drive gear backlash is controlled by means of shim pack (8) installed between bearing cup (9) and bearing cage (6). Backlash adjustment is correct if the distance (A—Fig. WB89) measures 2.886-2.888. Shims are available in thicknesses of

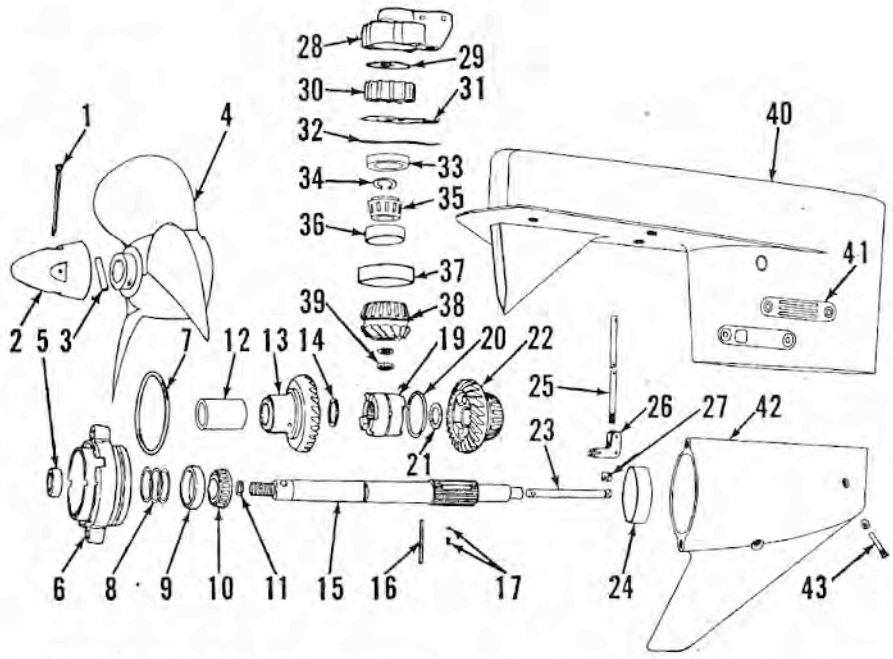


Fig. WB88—Exploded view of lower unit gearcase, drive shaft housing and associated parts.

1. Cotter pin
2. Propeller nut
3. Shear pin
4. Propeller
5. Oil seal
6. Bearing cage
7. Sealing ring
8. Shims
9. Bearing cup
10. Bearing cone
11. Seal
12. Gear bushing
13. Reverse gear
14. Thrust washer
15. Propeller shaft
16. Roll pin
17. Detent
19. Clutch dog
20. Retaining ring
21. Thrust washer
22. Forward gear
23. Shift shaft
24. Bearing cone
25. Lower shift rod
26. Shift pivot
27. Shift yoke
28. Water pump body
29. Top plate
30. Impeller
31. Back plate
32. Gasket
33. Oil seal
34. Retaining ring
35. Bearing cone
36. Bearing cup
37. Bearing cup
38. Drive pinion
39. Adjusting nut
40. Driveshaft housing
41. Water inlet
42. Gearcase housing
43. Pivot shaft

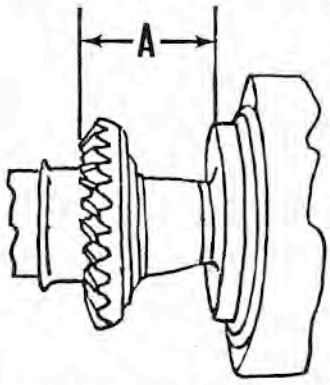


Fig. WB89—Drive gear backlash is correct if distance (A) measures 2.887 inches. Refer to text.

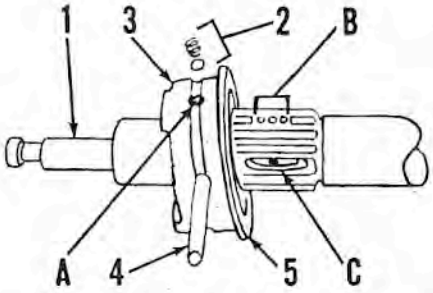


Fig. WB90—Assembling shift mechanism to propeller shaft. Refer to text.

1. Shift shaft
2. Detent
3. Clutch dog
4. Cross pin
5. Retaining ring
A. Detent hole
B. Detents
C. Shift slot

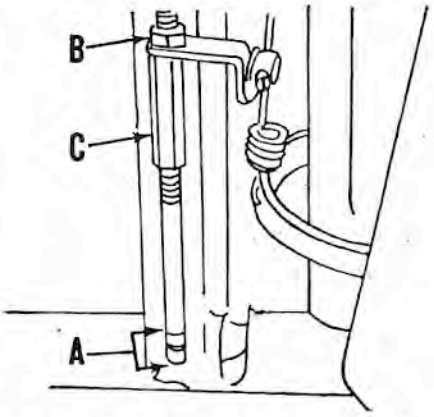


Fig. WB91 — To adjust the shift linkage, scribe a line on intermediate shift rod in "Forward," "Neutral" and "Reverse" positions (A). Equalize by loosening locknut (B) and threading connecting turnbuckle (C) in or out.

0.006, 0.007 and 0.010. The required shim pack thickness can be measured using the special Shim Selector Tool J-9362, available from Kent-Moore Organization, Inc., 28635 Mound Road, Warren, Mich.

After backlash has been adjusted, the propeller shaft bearings must be adjusted by varying the thickness of front thrust washer (21—Fig. WB88). The bearings should be adjusted to approximately zero end play, and must be within the limits of 0.001 pre-load to 0.005 end play. Thrust washers are available in thicknesses of 0.059, 0.065, 0.068, 0.071, 0.074 and 0.077. To measure the bearing adjustment, assemble the propeller shaft, reverse gear (13) and bearing cone (10). Assemble the bearing cage, omitting the sealing ring (7). Install the propeller shaft assembly, thrust washer (21) and gear assembly (22) in gearcase (42) and measure end float with a dial indicator.

To assemble the propeller shaft, refer to Fig. WB90. Install the retaining ring (5) on one end of clutch dog (3) and assemble to propeller shaft, making sure the detent hole (A) is aligned with detents (B) in shaft splines. Insert the shift shaft (1) and align the pin hole with slotted hole (C) in propeller shaft. Align the cross pin hole in clutch dog and insert cross pin (4) through clutch dog (3), slotted hole (C) and pin hole in shift shaft (1). Drive the cross pin into position. Install the detent ball and spring (2) in detent hole (A), and hold in place with screwdriver or punch until secured by retaining ring (5).

To reassemble the gearcase, install the shift rod (25—Fig. WB88) and shift pivot (26); and secure with pivot shaft (43). Install the shift arm yoke (27) in front slot of shift shaft (23) and insert the assembled propeller shaft, making sure the tabs on shift yoke (27) engage the fork slots in shift pivot (26).

When assembling the drive shaft, drive pinion and bearings in driveshaft housing (40), tighten the adjusting nut (39) finger tight and back off to the first castellation; then install the cotter pin.

After completing the assembly, adjust the shift rod coupling by referring to Fig. WB 91. Install the locknut (B) and reverse lock arm on upper shift rod; then install the coupling turnbuckle (C) to its approximate original position. Move the shift lever to "Forward," "Neutral" and "Reverse" positions, and mark the location where intermediate shift rod emerges from motor leg as shown at (A). The distance between the three scribe marks must be equal. If it is not, adjust by turning the turnbuckle (C) as required; then tighten the locknut (B).