WEST BEND

THE WEST BEND COMPANY
HARTFORD DIVISION
Hartford, Wisconsin

CONDENSED SERVICE DATA

Series Year Produced	12 hp	16, 18, 20 hp
1956	16902, 16912	.....
1957	16941, 16951	.....
1958	12801, 12802, 12811, 12812,	.....
1959	12901, 12902, 12911, 12912	16901, 16902, 16911, 16912
1960	12021	18001, 18011
1961	12101	18101, 18111
1962	12103	18103, 18113
1963	1230	2030, 2031

NOTE: COMMODORE Outboard Motor Models 103201 and 183201 are similar in design and construction to WEST BEND 12 and 20 hp motors. Service Procedures outlined in this section will also apply to Models 103201 and 183201 COMMODORE Motors.

TUNE-UP

Engine rpm	4000	4750
Bore—Inches	2⅜	$2\frac{7}{16}$
Stroke—Inches	2	2 9/64
Number of Cylinders	2	2
Displacement—Cu. In.	17.71	19.96
Compression @ Cranking Speed (average)	85 psi	See Note
Spark Plug		
Champion	H8J	J4J
Electrode gap	0.030	0.030
Magneto		
Point gap	0.020	0.020
Timing	See text	See text
Carburetor		
Make	Tillotson	Tillotson
Model	MD	MD
Adjustment	See text	See text
Fuel—Oil Ratio		
Before 1960	16:1	16:1
After 1959	24:1	24:1

NOTE: 16 hp Models—90 psi; 18 hp Models—110 psi.

SIZES—CLEARANCES

Piston Rings		
End gap	0.003-0.008	0.003-0.008
Side clearance	0.0025-0.0045	0.0025-0.0045
Piston to Cylinder		
Clearance	0.002-0.0035	0.002-0.0035

SIZES—CLEARANCES (Cont'd)

Piston Pin		
Diameter	0.56250-0.56265	0.56250-0.56265
Clearance (Rod)	0.0006-0.0012	0.0006-0.0012
Clearance (Piston)	0.0001-0.0006	0.0001-0.0006
Crankshaft Journal Diameters		
Upper & Lower Main	0.8120-0.8124	0.8120-0.8124
Center Main	0.9295-0.0298	0.9295-0.9298
Crankpin	0.8101-0.8104	0.8101-0.8104
Crankshaft Bearing Clearance		
All	Roller Brng.	Roller Brng.
Crankshaft End Play	0.003-0.006	0.003-0.006
Rod Side Clearance	0.015-0.025	0.015-0.025

TIGHTENING TORQUES

(All Values in Inch-Pounds)

Connecting Rod	110	110
Flywheel Nut	600	600
Cylinder Head	70	70
Spark Plug	264-276	264-276
Standard Screws		
No. 10-24	30	30
No. 10-32	35	35
No. 12-24	45	45
¼-20	70	70
$\frac{5}{16}$-18	160	160
⅜-16	270	270

LUBRICATION

The power head is lubricated by oil mixed with the fuel. On 1959 and earlier models, mix one half pint of two-cycle engine oil with each gallon of gasoline. On late models, the recommended ratio is one third (⅓) pint of oil per gallon of gasoline. Marine white or automotive 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 the 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.

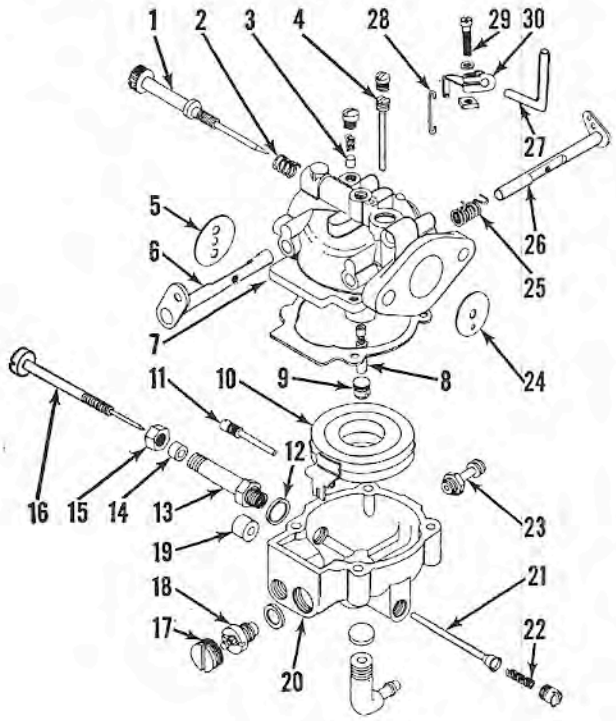


Fig. WB30 — Exploded view of Tillotson MD carburetor.

1. Idle mixture screw
2. Spring
3. Choke detent
4. Idle tube
5. Choke valve
6. Choke shaft
7. Body
8. Main nozzle
9. Plug
10. Float
11. Float shaft
12. Gasket
13. Packing gland
14. Packing
15. Nut
16. High speed needle
17. Plug
18. Inlet needle & seat
19. Drain valve button
20. Float bowl
21. Drain valve
22. Valve spring
23. Fitting
24. Throttle valve
25. Throttle spring
26. Throttle shaft
27. Cam follower
28. Link
29. Clamp screw
30. Follower arm

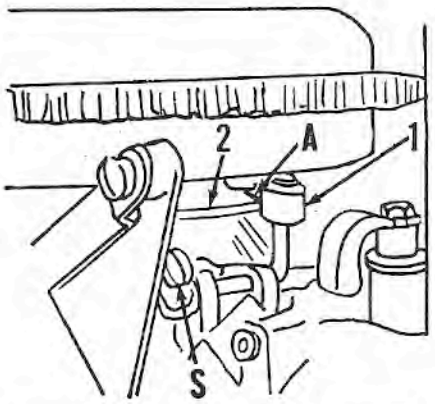


Fig. WB31—Schematic view of throttle linkage showing adjustments. Refer to text.

1. Cam follower
2. Throttle cam
A. Scribe line
S. Clamp screw

FUEL SYSTEM

CARBURETOR. Tillotson, type MD carburetors are used on all models. Refer to Fig. WB30. Normal initial setting is one turn open from the closed position for both the high speed adjustment needle (16) and the idle mixture needle (1). Carburetor must be readjusted under load, after motor is warm, for best high speed and low speed performance.

To adjust the float, remove and invert the fuel bowl assembly (20). 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 assembly (18). When installing float, make sure that slot in float lever engages groove in needle.

Tillotson model numbers and parts lists are as follows:

Model MD-89C

Repair kit	RK-163
Gasket set	GS-110
Inlet needle & seat	010461

Model MD-108A

Repair kit	RK-386
Gasket set	GS-110
Inlet needle & seat	010461

Model MD-112A

Repair kit	RK-421
Gasket set	GS-110
Inlet needle & seat	010461

Model MD-113A

Repair kit	RK-430
Gasket set	GS-105
Inlet needle & seat	010461

Model MD-113B

Repair kit	RK-455
Gasket set	GS-105
Inlet needle & seat	012216

SPEED CONTROL LINKAGE. The speed control lever or grip is connected to the magneto stator plate to advance or retard the ignition timing. Throttle linkage is synchronized to open the throttle as magneto timing is advanced. It is very important that the throttle linkage be properly synchronized for best performance.

To synchronize the linkage, refer to Fig. WB31. With the engine not running, loosen the clamping screw (S) in throttle control bellcrank. Move the speed control grip or lever until the scribe mark (A) on throttle cam (2) is aligned with roller on cam follower (1). Move cam follower until it just contacts cam at the scribe mark; then tighten screw (S). As speed control grip or lever is moved further to the "Fast" position, the throttle valve should start to open. Throttle link (28—Fig. WB30) should be hooked in the attaching hole nearest the axis of throttle shaft (26).

To install a control cable, refer to Fig. WB32. Attach one end of cable to cam pulley (1) in forward ball slot (A). Run cable over the rear idler pulleys, then enter control pulley (2) at bottom as shown. Wrap cable around control pulley 1½ turns, with last wrap in outside of cable groove, AWAY from center of motor. Pass cable over front of idler and below the previously installed cable on cam pulley to the ball slot (B).

To adjust the cable, loosen clamping screw (S). Fully advance stator plate (counter-clockwise). Turn speed control grip toward "Fast" position (clockwise) as far as it will go; then retighten screw (S). Speed control grip may be repositioned by loosening the clamping screw which attaches pinion to the speed control grip shaft.

To adjust the holding friction on the throttle control grip, refer to Fig. WB33. Turn the speed control grip until the set screw (A) is visible; loosen the set screw and turn the shaft nut in or out until lever will stay in position.

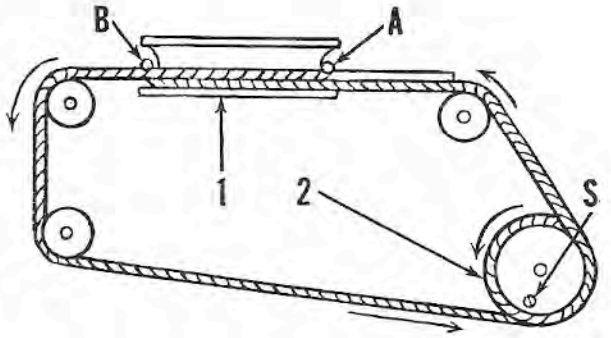


Fig. WB32 — Schematic view of speed control cable showing method of installation. Refer to text.

1. Magneto stator cam
2. Control pulley
A. Front ball slot
B. Rear ball slot
S. Clamping screw

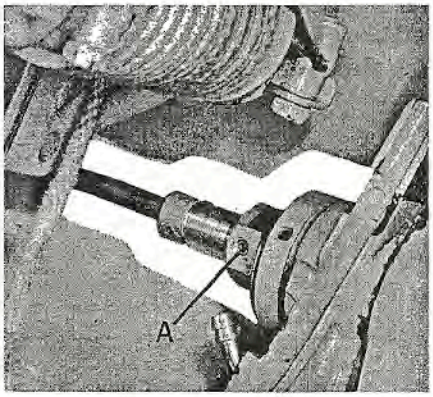


Fig. WB33—On some models speed control holding friction can be adjusted by loosening set screw (A) and tightening or loosening friction nut.

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 the carburetor is removed for service. The reed petals should seat very lightly against the reed plate throughout their entire length, with the least possible tension. Check seating visually. Reed stop setting should be $\frac{3}{16}$-inch for 1960 and later, 12 horsepower models; and all 18 and 20 horsepower models. The correct setting is ⅛-inch for all other models. See Fig. WB34.

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 the reed stops are centered over reed petals.

FUEL PUMP. A diaphragm type fuel pump is mounted on the side of powerhead cylinder block and ported to the upper crankcase. Pressure and vacuum pulsations from the crankcase are directed through the port (1—Fig. WB35) to the rear of diaphragm (2). When the powerhead piston moves upward in its cylinder, vacuum in the crankcase draws the diaphragm inward and fuel enters the pump through filter (6) and the inlet reed valve (4) in reed plate (3). As powerhead piston moves downward, pressure forces the diaphragm outward into fuel chamber, and fuel passes through the outlet reed valve into carburetor line (7).

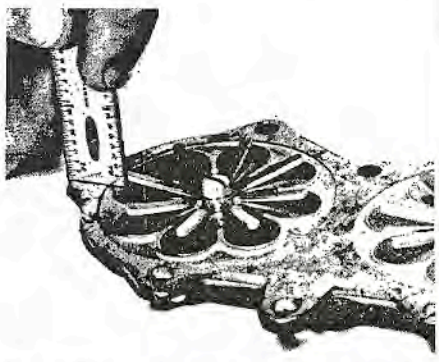
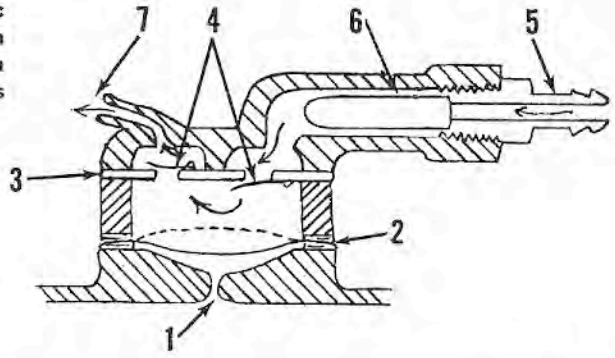


Fig. WB34 — When installing inlet reed valves, adjust reed stops to the recommended height. Refer to text.

Fig. WB35 — Schematic view of the diaphragm type fuel pump used on all models. Check valves are of the reed type.

1. Pressure port
2. Diaphragm
3. Reed plate
4. Check valves
5. Inlet fitting
6. Filter
7. Outlet



Defective or questionable parts should be renewed. Reeds (4) should seat lightly and squarely on reed plate (3). Diaphragm should be renewed if air leaks or cracks are found, or if deterioration is evident.

IGNITION

Breaker point gap should be 0.020 for each set of points, and can be adjusted after the flywheel is removed. Both sets of points must be adjusted exactly alike. NOTE: High point of breaker cam coincides with location of flywheel key. Align key with the contact point rub block when adjusting points.

For a quick test of magneto condition, remove the spark plugs and hold spark plug wire about ⅛-inch away from cylinder head. Have someone spin the motor and note the condition of spark. Although spark may not be visible in bright daylight, a distinct snap will be noted as spark jumps the gap. If spark is weak or erratic, adjust the points as outlined above. Be sure to note point condition. If spark is weak, although points are in good condition and properly adjusted; examine the point, condenser and coil wiring, and the insulation on the magneto coils. Look for broken or worn insulation or broken wires. Also check for loose or corroded connections. Renew any parts which are damaged or in poor condition.

COOLING SYSTEM

WATER PUMP. All motors are equipped with a rubber impeller water pump of the general type shown in Fig. WB36. The water pump is mounted in the lower unit drive shaft housing (upper gearcase). Impeller housing is offset with relation to the drive shaft as shown. The difference in displacement area between the flexing impeller blades causes water to be drawn into (IN) pump housing and forced upward (OUT) into power head. As speed increases, the impeller blades remain partially curved as shown by broken lines (HS) and the pump continues to operate by centrifugal action. Coolant volume is thus maintained at the level required for proper cooling regardless of engine speed.

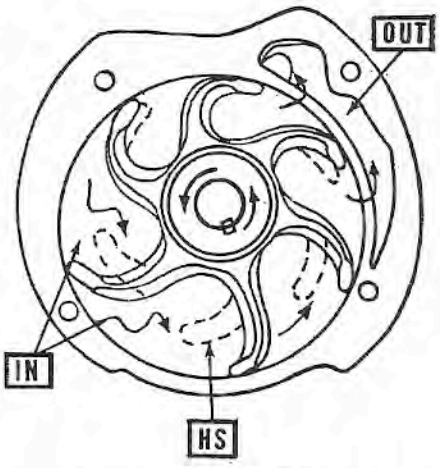


Fig. WB36—Schematic view of rubber impeller type water pump showing method of operation. The offset housing and flexing impeller blades causes pump to operate by positive displacement at slow speeds. At high speeds, impeller blades remain curved (HS) and pump operates by centrifugal action.

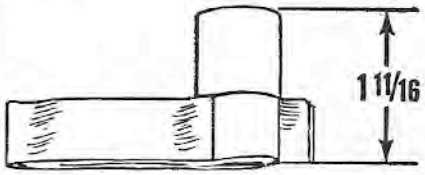


Fig. WB37 — When installing water pump housing seal, press retaining ferrule on housing until total height is 1 11/16-inch as shown

When cooling system problems are encountered, first 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.

One pump housing kit is being used to service all models from 5½ to 40 horsepower. This kit contains two water line seals and a retaining ferrule. When renewing the pump housing or seal, install the seal with the smallest inside diameter; then press the ferrule in place over seal until upper edge of ferrule is $1\frac{11}{16}$ inches from bottom of housing as shown in Fig. WB37.

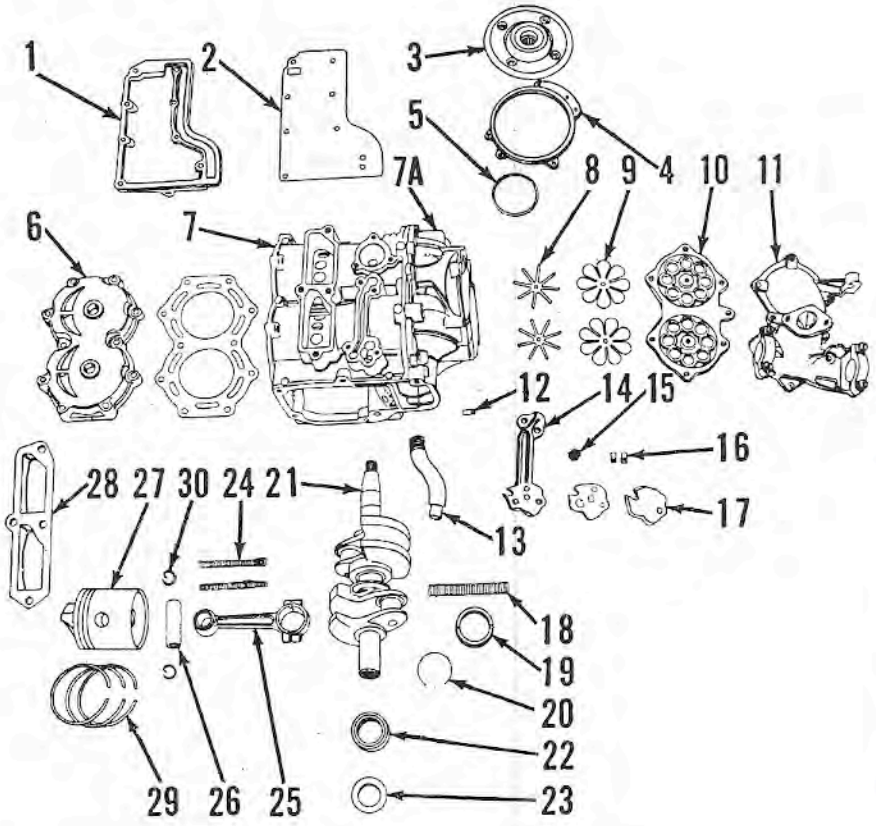


Fig. WB38—Exploded view of the power head of the general type used on all models. Shown is late model 12 horsepower.

1. Exhaust cover
2. Exhaust cover
3. Upper bearing cage
4. Stator ring
5. Cage seal
6. Cylinder head
7. Cylinder half
7A. Crankcase half
8. Reed stop
9. Reed petals
10. Reed plate
11. Inlet manifold
12. Drain valve
13. Water tube
14. Drain plate
15. Drain screen
16. Drain reed valve
17. Drain cover
18. Needle rollers
19. Outer race
20. Retaining ring
21. Crankshaft
22. Lower bearing
23. Lower seal
24. Needle rollers
25. Connecting rod
26. Piston pin
27. Piston
28. Transfer port cover
29. Piston rings
30. Retaining ring

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), intake silencer and control panel. Remove flywheel, starter, magneto and carburetor. Remove all interfering wiring and linkage, and as many screws as possible retaining inlet manifold, exhaust covers, transfer port covers, cylinder head, etc., before detaching power head from lower unit.

Remove the screws which secure the power head assembly to lower unit, and lift off the power head assembly. Refer to Fig. WB38.

Crankshaft and pistons can be removed after removing upper bearing cage (3); then removing crankcase front half (7A). Exhaust covers (1 & 2), cylinder head (6), transfer port cover (28) and crankcase drain plate (14) should be removed for cleaning and inspection if major repairs are to be performed. Pry lugs are provided adjacent to the retaining dowels, for removing the crankcase front half.

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 manifold 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.

Whenever power head is disassembled, it is recommended that all gasket surfaces, and mating surfaces without gaskets, be carefully checked for nicks and burrs and warped surfaces which might interfere with a tight seal. The cylinder head, head end of cylinder block, and some mating surfaces of manifolds and crankcase may be

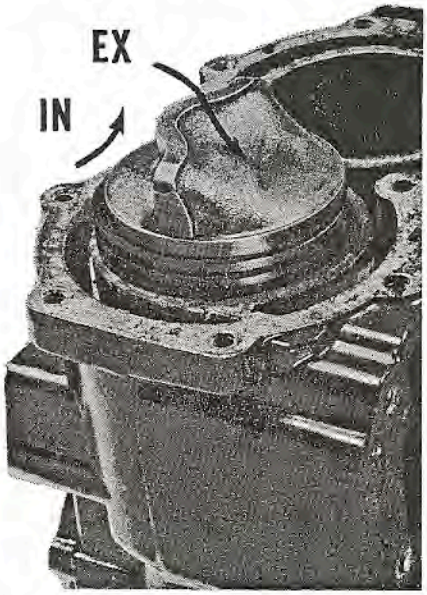


Fig. WB39 — Piston correctly installed in cylinder, showing relation of piston baffle to inlet and exhaust ports.

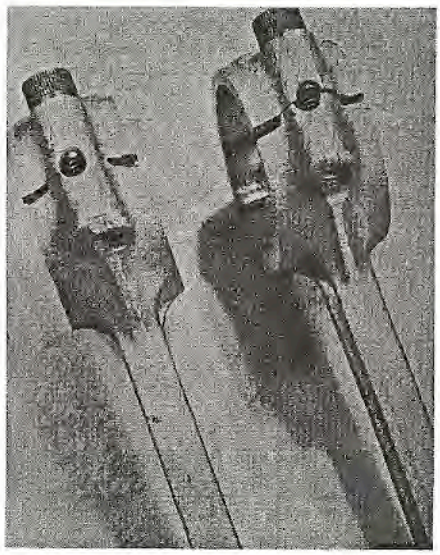


Fig. WB40—Assembled views of fractured connecting rod showing correct and incorrect cap installations.

checked, and lapped if necessary, to provide a smooth surface. Use a regular lapping block or a sufficiently large piece of smooth plate glass. Lay a sheet of No. 00 emery paper on the lapping block, then place the surface to be lapped on the emery paper. Apply very light pressure and use a figure-eight motion, checking frequently to determine progress. Do not remove any more metal than is necessary. Finish lap using lapping compound or worn emery paper. Thoroughly clean the parts with new oil on a clean, soft rag then wash with soapsuds and clean rags.

Mating surfaces of crankcase may be checked on the lapping block, and high spots or nicks removed, but the surface must not be lowered. If extreme care is

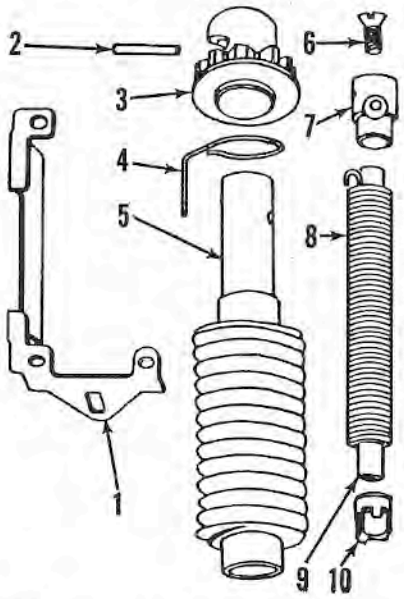


Fig. WB41—Exploded view of recoil starter of the type used.

1. Rope guide
2. Drive pin
3. Drive pinion
4. Pinion spring
5. Starter spool
6. Locking screw
7. Spring drive
8. Recoil spring
9. Guide post
10. Retainer

used, a slightly damaged crankcase may be salvaged in this manner. In case of doubt, renew the crankcase assembly.

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 working parts. If binding or locking is encountered, remove the cause before proceeding with the assembly.

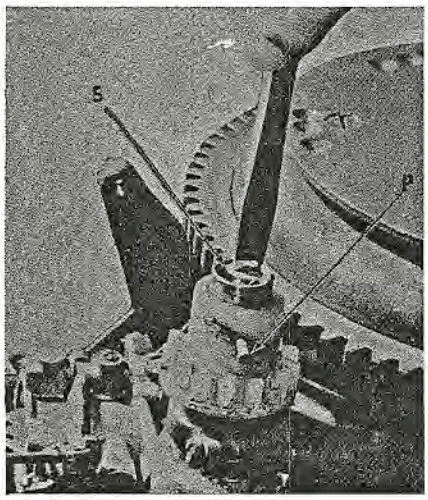


Fig. WB42—To disassemble the starter, first remove lock screw (S) and install the special tool before attempting to remove drive pin (P). Refer to text.

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 crankcase screws, tighten those next to the main bearings and dowels first. Refer to CONDENSED SERVICE DATA table for clearances and tightening torques.

PISTONS, PINS, RINGS & CYLINDERS. Piston is fitted with three rings which should be installed with the bevelled inner edge toward closed end of piston. Recommended ring end gap is 0.003-0.008, with a maximum wear limit of 0.015. Piston rings should have 0.0025-0.0045 side clearance in piston grooves, with a wear limit of 0.0055.

Piston skirt clearance should be 0.002-0.0035 when measured at widest part of skirt at right angles to piston pin. Renew the piston if skirt clearance exceeds 0.005. The maximum recommended out-of-round or taper for the cylinder is 0.002.

The full floating piston pin should have 0.0006-0.0012 clearance in connecting rod and 0.0001-0.0006 clearance in piston. Renew the parts if clearance exceeds 0.002 in rod or 0.0016 in piston bosses.

When installing piston in cylinder, the long, tapering side of baffle on piston head should be installed on port side of cylinder block toward the exhaust ports. 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 at crankpin end of connecting rod should be kept with each assembly and not intermixed if reused.

The forged steel connecting rods contain 30 loose needle bearing rollers at crankpin end on all motors produced before 1961. All later motors have a double row of loose needle bearings in each rod as shown at (24—Fig. WB38). The total number of loose rollers per rod in these motors is 60. Parting faces of rod and cap are not machined, but are fractured, as shown in Fig. WB40, to provide positive location. When installing cap, make sure the correlation marks are aligned; then shift cap back and forth slightly while tightening, until fractured sections are in perfect mesh. When properly installed, the parting line is practically invisible as shown in the left hand view. Rod side play on crankpin should be 0.015-0.025, with a wear limit of 0.040.

The crankshaft upper main bearing is a part of bearing cap (3—Fig. WB38). The center main bearing consists of 34 loose needle rollers (18), which are contained in a split outer race (19). The bearing race is separated by fracturing, and is held together by the retaining ring (20). When assembling, work the two halves of bearing race back and forth slightly until the fracture lines mesh, then install the retaining ring. The lower main bearing is of the caged roller type.

Recommended crankshaft end play is 0.003-0.006, with a wear limit of 0.011. Oversize and undersize parts are not available.

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

MANUAL STARTER

Fig. WB41 shows an exploded view of the recoil starter assembly. Starter pinion (3) engages a starter ring gear on the flywheel. (See Fig. WB42).

To disassemble the starter, first remove the engine cover, then remove screw (S—Fig. WB42) in top of starter shaft. NOTE: This screw locks pin (P) in place. Thread the special "T" handle tool (West Bend, T3139) in threaded hole from which screw (S) was removed. Tighten the tool until it bottoms; then turn tool handle slightly counter-clockwise to relieve recoil spring tension, and push out pin (P). Allow the tool and starter drive (7—Fig. WB41) to turn clockwise to unwind the recoil spring (8). Pull up on tool to remove the recoil spring and components. Guide post (9) and spring retainer (10) can be lifted out after recoil spring is removed.

Recoil spring, pinion (3) or associated parts can be renewed at this time. To renew the starter rope, remove the clamps retaining spool (5) to the starter bracket; then remove the spool. Thread rope through hole in lower end of spool (5) and install the hooked retainer approximately ½-inch from end of rope. Pull tight, then fully wind the rope in spool grooves and reinstall the spool. With recoil spring and drive pinion (3) installed, use the "T" handle tool to wind the recoil spring counter-clockwise eight (8) turns. Align the holes in pinion (3), spool (5) and spring drive (7); then install the drive pin (2). Remove the tool and secure the pin with the locking screw (6). Recoil spring cavity should be partially filled with lubriplate or similar grease when reassembling.

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.

Twelve horsepower models before 1959 use a $\frac{3}{16}$ x $1\frac{1}{16}$ inch stainless steel shear pin, manufacturers part number 16046. All other models use a $\frac{3}{16}$ x $1\frac{5}{16}$ inch stainless steel pin, part number 16049. Twelve horsepower models are equipped with a 8½ inch diameter, 8 inch pitch, three blade

1. Shift rod
2. Water pump housing
3. Top plate
4. Impeller
5. Back plate
6. Oil seal
7. Drive shaft housing
8. Inlet water tube
9. Inlet screen
10. Drive pinion
11. Shift cam
12. Gearcase housing
13. Forward gear
14. Thrust washer
15. Roll pin
16. Clutch dog
17. Shift plunger
18. Spring
19. Propeller shaft
20. Thrust washer
21. Reverse gear
22. Bearing
23. Bearing cage
24. "O" ring
25. Seal
26. Snap ring

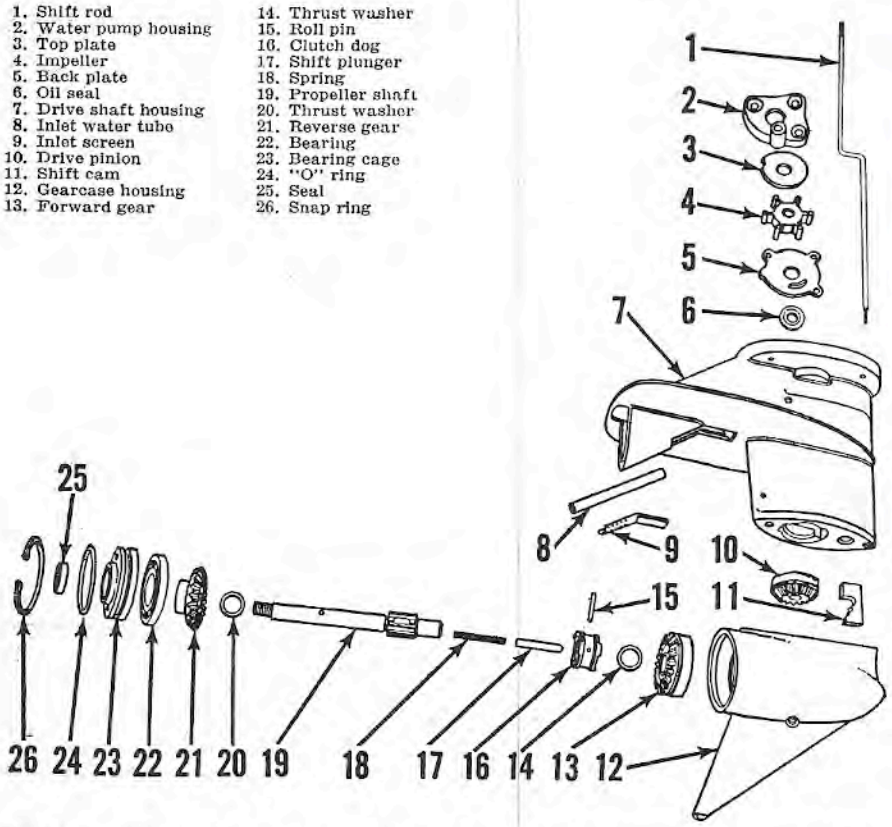


Fig. WB43—Exploded view of lower unit gearcase, drive shaft housing and associated parts.

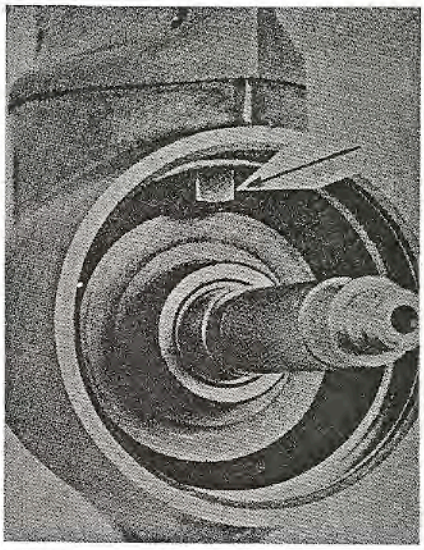


Fig. WB44—Lower unit gearcase with propeller shaft bearing cage removed. Stud nut (arrow) must be removed before gearcase can be detached from driveshaft housing.

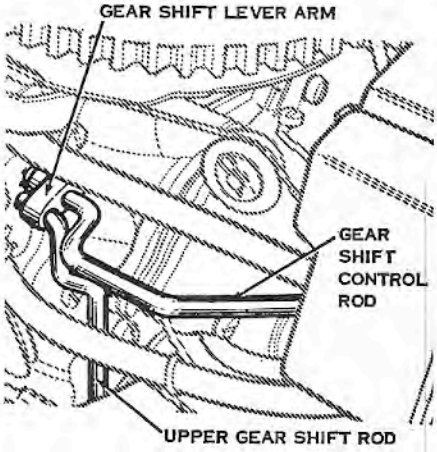


Fig. WB45—Adjust the gear shift rod coupling until the gear shift control rod is horizontal in the neutral position.

propeller. Sixteen and 18 horsepower models use an 8½ x 8½ inch, three blade prop. The normal direction of rotation is clockwise for all models.

R&R AND OVERHAUL. Refer to Fig. WB43. Loosen the locknut on the shift rod coupling, located behind swivel bracket, below the power head. Remove the shift rod coupling turnbuckle to disconnect the shift rod; then unbolt and remove the driveshaft housing (upper gearcase) and gearcase from motor leg. Turn shift rod (1) counter-clockwise to clear the water pump housing; then disassemble and remove the water pump assembly.

Remove the propeller and shear pin. Remove any burrs or rust from exposed end of propeller shaft. Remove snap ring (26), thread two screws in threaded holes of propeller shaft bearing cage (23); and remove the cage, using a puller.

To detach lower gearcase (12) from drive shaft housing (7), unscrew and remove shift rod (1). Housings are secured by a socket head cap screw at the front, and the stud nut INSIDE the case as shown by arrow, Fig. WB44.

Propeller shaft, gears, bearings and shift mechanism can be removed after housings are separated. An internal expanding puller and slide hammer may be required to remove the front gear (13—Fig. WB43). In some cases, gear may be removed by heating gearcase housing with a torch, then jarring open end on a block of wood to dislodge the gear and bearing assembly. When installing front gear and bearing assembly, assemble the bearing cage (23), without "O" ring (24) over rear of propeller shaft; install thrust washer (14) and gear assembly (13) on front of shaft; then use the propeller shaft as a piloted driver.

Backlash and mesh position of the gears are not adjustable.

Assemble by reversing the disassembly procedure. Adjust the gear shift rod coupling until gear shift control rod (Fig. WB45) is horizontal in the neutral position, then check to see that forward and reverse gears engage fully.