

# MERCURY

KIEKHAEFER CORP.

(General Offices)

Fond Du Lac, Wisc.

(Parts and Service Division)

Beaver Dam, Wisc.

## CONDENSED SERVICE DATA

### FOUR CYLINDER MODELS

Year Produced				
1955.....		Mk 55		
1956.....	Mk 30, 30H	Mk 55, 55H		
1957.....	Mk 30, 30H	Mk 55, 55H		
1958.....	Mk 30, 30H	Mk 55, 55H	Mk 58	
1959.....		Mk 35A	Mk 55A, 58A	
1960.....		Merc 300	Merc 400	
1961.....		Merc 350	Merc 400, 500	
1962.....			Merc 450, 500	
1963.....			Merc 500	Merc 650

#### TUNE-UP

Rated Horsepower.....	30	35 - 40	40 - 50	65
Rated rpm.....	5400	5500 - 5800	5500 - 5800	5200
Bore—Inches.....	2 7/64	2 7/16	2 9/16	2 7/8
Stroke—Inches.....	2 1/8	2 1/8	2 1/8	2.3
Displacement—Cu. In. ....	29.78	39.6	44	60
Firing Order .....		1 - 3 - 2 - 4		
Compression @ Cranking Speed.....	Not more than 15 psi variation between cylinders			

#### Spark Plug

Champion.....	J6J	J6J	J6J	J4J
AC.....	M44C	M44C	M44C	
Electrode gap.....	0.025	0.025	0.025	0.025

#### Magneto

Make.....	Kiekhäfer or FM			Kiekhäfer
Point gap.....	0.008 - 0.010	0.008 - 0.010	0.008 - 0.010	0.008 - 0.010
Timing.....	See Text	See Text	See Text	See Text

#### Carburetor

Make.....	Tillotson	Tillotson	Tillotson	Tillotson
Model.....	See Text	or Carter See Text	See Text	KC2A
Adjustment.....	See Text	See Text	See Text	See Text
Fuel—Oil Ratio.....	20:1	20:1	20:1	20:1

#### SIZES—CLEARANCES

Piston Rings	Publication Not Authorized by Manufacturer			
End gap.....				
Side clearance.....				
Piston Skirt Clearance.....				
Crankshaft Bearing Journal Diameter				
Upper main bearing.....				
Intermediate bearing.....				
Lower main bearing.....				
Crankpin.....				
Crankshaft Bearing Diametral Clearance				
Upper main bearing.....	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Intermediate bearing.....	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Lower main bearing.....	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Crankpin.....	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Piston Pin Diameter.....				
Clearance.....	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.

#### TIGHTENING TORQUES

(All Values In Inch-Pounds Unless Otherwise Noted)

Connecting Rod.....	180	180	180	180
Flywheel Nut.....	65 ft. - lb.	65 ft. - lb.	65 ft. - lb.	65 ft. - lb.
Reed Valves.....	35 - 40	35 - 40	35 - 40	35 - 40
Intermediate Main Bearing.....	150	See Text	See Text	See Text
Crankcase Screws.....	150	150	150	150
Cylinder Cover.....	60	60	60	60
Exhaust Cover.....	60	60	60	60
Intake Manifold .....	45 - 60	45 - 60	45 - 60	45 - 60
Spark Plug.....	180	180	180	180

**SIX CYLINDER MODELS**

Year Produced	Mk75E	Mk78E	Mk75A, 78A	Merc 800	Merc 800	Merc 850	Merc 1000	Merc 850, 1000
1957	Mk75E							
1958	Mk75E	Mk78E						
1959			Mk75A, 78A					
1960			Merc 600, 700	Merc 800				
1961			Merc 600, 700	Merc 800				
1962				Merc 850			Merc 1000	
1963							Merc 850, 1000	

**TUNE-UP**

Rated Horsepower	60	60 - 70	80 - 85	85 - 100
Rated rpm	5500	5500	5200	5200
Bore—Inches	2 $\frac{1}{8}$ "	2 $\frac{9}{16}$ "	2 $\frac{3}{4}$ "	2 $\frac{7}{8}$ "
Stroke—Inches	2 $\frac{1}{4}$ "	2 $\frac{1}{4}$ "	2 $\frac{1}{4}$ "	2.3
Displacement—Cu. In.	59.4	66	76	90
Firing Order	1 - 6 - 4 - 2 - 5 - 3		1 - 4 - 5 - 2 - 3 - 6	
Compression @ Cranking Speed	Not more than 15 psi variation between cylinders			

Spark Plug	J6J	J6J	J4J	J4J
Champion	J6J	J6J	J4J	J4J
AC				
Electrode gap	0.025	0.025	0.025	0.025
Distributor				
Make	Own	Own	Own	Own
Point gap	90° Dwell	90° Dwell	90° Dwell	90° Dwell
Timing	See Text	See Text	See Text	See Text
Carburetor				
Make	Tillotson	Tillotson	Tillotson	Tillotson
Model	See Text	See Text	See Text	See Text
Adjustment	See Text	See Text	See Text	See Text
Fuel—Oil Ratio	20:1	20:1	20:1	20:1

**SIZES—CLEARANCES**

Piston Rings				
End gap				
Side clearance				
Piston Skirt Clearance				
Crankshaft Bearing Journal Diameter				
Upper main bearing				
Intermediate bearing				
Lower main bearing				
Crankpin				
Crankshaft Bearing Diametral Clearance				
Upper main bearing	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Intermediate bearing				
Lower main bearing	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Crankpin	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.
Piston Pin Diameter				
Clearance	Roller Brng.	Roller Brng.	Roller Brng.	Roller Brng.

Publication Not Authorized by Manufacturer

**TIGHTENING TORQUES**

(All Values In Inch-Pounds Unless Otherwise Noted)

Connecting Rod	180	180	180	180
Flywheel Nut	65 ft.-lb.	65 ft.-lb.	85 ft.-lb.	85 ft.-lb.
Reed Valves	35 - 40	35 - 40	35 - 40	35 - 40
Intermediate Main Bearing			See Text	
Crankcase Screws	150	150	150	150
Cylinder Cover	60	60	60	60
Exhaust Cover	60	60	60	60
Intake Manifold	45 - 60	45 - 60	45 - 60	45 - 60
Spark Plug	180	180	180	180

**LUBRICATION**

The power head is lubricated by oil mixed with the fuel. If "Kiekhaefer Quicksilver" 2-cycle engine oil is used, one 12 ounce can should be mixed with each 2 gallons of gasoline, or one 30 ounce can with each 5 gallons of gasoline. If "Quicksilver" oil is not available, a good grade "Type MM," SAE 30 motor oil may be sub-

stituted by mixing ½-pint of oil with each gallon of fuel. Gasoline and oil should be thoroughly mixed. Marine white, automotive white, or light-aircraft gasoline is recommended. If not available, use a suitable "Regular" gasoline.

The lower unit gears and bearings are lubricated by oil contained in the gear case. Special "Quicksilver Outboard Gear Lubricant" or a non-channeling, waterproof, ma-

rine gear lubricant should be used. Gearcase is filled through the filler hole until lubricant reaches the level of the vent hole. NOTE: On most models, the plugs are located on port side of gearcase. If both plugs are the same height, the forward plug is the filler hole. If one plug is above the other, the LOWER plug is the filler hole. Lubricant should be maintained at level of vent plug.

**FUEL SYSTEM**

**CARBURETOR.** Tillotson carburetors are used on all models except some Mark 55H motors, which use Carter Type N carburetors. Two carburetors are used on four cylinder motors; three carburetors on six cylinder models. Refer to the appropriate following paragraphs for overhaul and adjustment procedures.

**Carter Model N-2537S:** Refer to Fig. M75. Initial setting is 1 1/4 turns open for both the idle adjusting needle (6) and high speed adjusting needle (16). Final adjustment must be made under load after operating temperature has been reached. Adjust the high-speed needle to provide the leanest setting which will permit full power and acceleration. Adjust the idle needle after high speed needle has been adjusted, to provide smooth operation under load at slow speeds. Clockwise rotation of the high speed adjusting needle leans the mixture. Clockwise rotation of the idle needle provides a richer mixture.

To disassemble the carburetor, scribe a line on the body and bowl to assure proper assembly, then remove the bowl nut and fuel bowl. To check and adjust the float level, invert the carburetor body with bowl removed, and measure the clearance between nearest edge of float and gasket surface of body flange. This clearance should be 11/64-inch with inlet needle seated. Adjust by bending lip of float.

When installing throttle valve (3), make sure the "C" trademark is toward idle port. Seat the valve by tapping lightly with a screwdriver and use new screws to secure the valve.

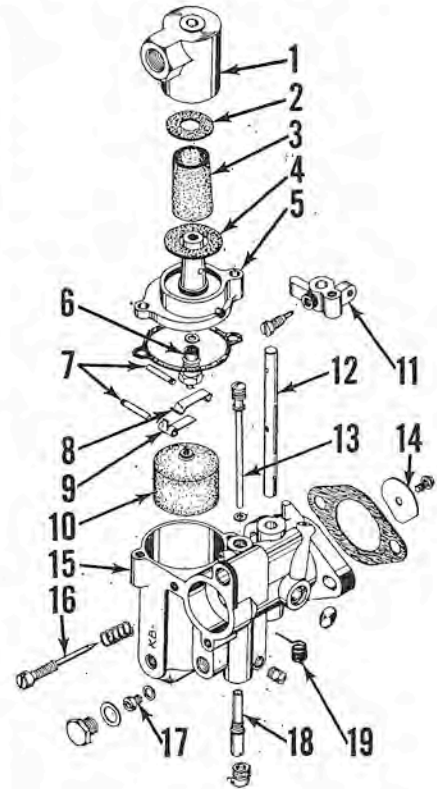
Carter parts numbers are as follows:

- Inlet needle & seat .....25-317S
- Main nozzle .....12-483
- Float & lever assembly .....21-163S
- Idle adjustment screw .....30A-70
- High speed adjusting needle .....37-74
- Throttle valve screw .....39-10

**Tillotson Carburetors:** Fig. M76 shows an exploded view of carburetor typical of that used on all models. Minor difference will be apparent upon examination. AJ-49A carburetors used on some early models do not use the fuel filter (1 through 4). Some early carburetors employ an adjustable high speed needle instead of the fixed jet (17).

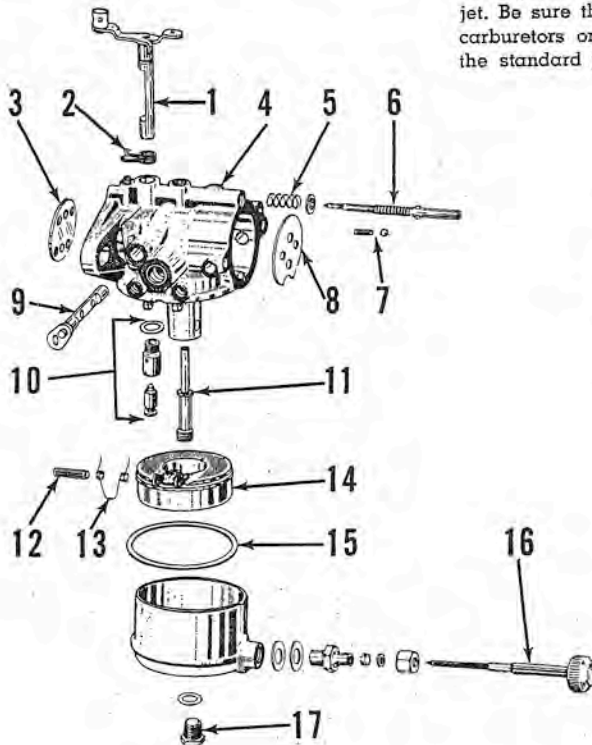
Initial setting for carburetors equipped with the high speed adjustment needle is one turn open from closed position for the idle needle (16); and 1 1/2 turns open for the high speed adjustment needle (which replaces the high speed jet 17). Run motor until operating temperature is reached, then shift to forward gear and open the throttle. Slowly turn the high speed adjustment needle clockwise until engine misses, then back needle out approximately 1/2-turn. Adjust the high speed needle for all carburetors in the same manner, for equal performance. After high speed needles have been properly adjusted, regulate the idle adjustment needles (16) for all carburetors until engine runs smoothly under load at slow speed. Turning idle mixture needle clockwise will lean the mixture.

On carburetors employing the fixed main jet, high speed mixture adjustment may be made for special conditions by changing the size of jet (17). The standard jet should normally be used. If motor is operated at altitudes above 2500 feet, performance can usually be improved by installing a smaller jet. Be sure the same size jet is used in all carburetors on the motor. On most models, the standard jet is a part of the carburetor



**Fig. M76—Exploded view of Tillotson carburetor of the general type used on most models.**

- |                        |                    |
|------------------------|--------------------|
| 1. Strainer cover      | 11. Throttle lever |
| 2. Gasket              | 12. Throttle shaft |
| 3. Strainer            | 13. Idle tube      |
| 4. Gasket              | 14. Throttle valve |
| 5. Bowl cover          | 15. Body           |
| 6. Inlet needle & seat | 16. Idle needle    |
| 7. Shaft               | 17. High speed jet |
| 8. Secondary lever     | 18. Main nozzle    |
| 9. Primary lever       | 19. Spring         |
| 10. Float              |                    |



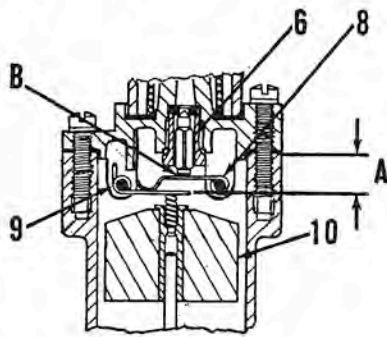
**Fig. M75—Exploded view of Carter carburetor used on some early models.**

- 1. Throttle shaft
- 2. Spring
- 3. Throttle valve
- 4. Body
- 5. Spring
- 6. Idle needle
- 7. Choke detent
- 8. Choke valve
- 9. Choke shaft
- 10. Inlet needle & seat
- 11. Main nozzle
- 12. Float shaft
- 13. Spring
- 14. Float
- 15. Gasket
- 16. High speed needle
- 17. Cap screw

repair kit, but optional jets must be obtained separately. NOTE: On KB models, the main jet is not listed as a part of the repair kit, and the required jets should be ordered. The standard jet is indicated in the parts lists.

On carburetors employing the fixed main jet, initial setting for the idle adjustment needle (16) is one turn open from the closed position. Idle needle must be adjusted under load to obtain smooth operation at slow speeds. Turning needle clockwise will lean the mixture.

The recommended fuel level is approximately 1/16-inch below gasket surface of float bowl. To adjust the float, remove bowl cover (5) and refer to Fig. M77. Invert the cover and, with inlet needle (6) closed, measure the distance between primary lever (9) and gasket surface of bowl cover as shown at (A). This distance should be 1/32-inch; if it is not, bend the curved tang on secondary lever (8) until correct measurement is obtained. After adjustment is made, bend the vertical tang on primary lever (9) to allow a maximum clearance (B) of 0.040, between the secondary lever (8) and inlet needle (6). The contact spring located in



**Fig. M77—Schematic view of float mechanism showing method of adjustment. Refer to text.**

- A. Closing adjustment
- B. Open adjustment
- 6. Inlet needle
- 8. Secondary lever
- 9. Primary lever
- 10. Float

center of float should extend 5/64-inch above top of float (10). Check to see that spring has not been stretched or damaged.

Tillotson model numbers and parts lists are as follows:

**Model AJ-49A**

Repair kit .....	RK-232
Gasket set .....	GS-107
Inlet needle & seat .....	.010400

**Model AJ-50A**

Repair kit .....	RK-313
Gasket set .....	GS-123
Inlet needle & seat .....	.010790
Filter element .....	.010741

**Model AJ-51A**

Repair kit .....	RK-313
Gasket set .....	GS-123
Inlet needle & seat .....	.010790
Filter element .....	.010741

**Model AJ-53A**

Repair kit .....	RK-313
Gasket set .....	GS-123
Inlet needle & seat .....	.010790
Filter element .....	.010741

**Model AJ-54A**

Repair kit .....	RK-394
Gasket set .....	GS-123
Inlet needle & seat .....	.010790
Filter element .....	.010741
Main fuel jet (0.055) Std. ....	.011722
Main fuel jet (0.053) .....	.011765
Main fuel jet (0.051) .....	.011764
Main fuel jet (0.049) .....	.011763

**Model AJ-55A**

Repair kit .....	RK-395
Gasket set .....	GS-123
Inlet needle & seat .....	.010790
Filter element .....	.010741
Main fuel jet (0.055) Std. ....	.010722
Main fuel jet (0.053) .....	.011765
Main fuel jet (0.051) .....	.011764
Main fuel jet (0.049) .....	.011763

**Model KA-2A**

Repair kit .....	RK-369
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.063) Std. ....	.011385
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) .....	.011395
Main fuel jet (0.057) .....	.011394

**Model KA-7A**

Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.081) Std. ....	.011482

**Model KA-8A**

Repair kit .....	RK-427
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.063) .....	.011385
Main fuel jet (0.061) Std. ....	.011396
Main fuel jet (0.059) .....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722

**Model KA-9A**

Repair kit .....	RK-428
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.063) .....	.011385
Main fuel jet (0.061) Std. ....	.011396
Main fuel jet (0.059) .....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722

**Model KA-10A**

Repair kit .....	RK-438
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.065) Std. ....	.011252
Main fuel jet (0.063) .....	.011385
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) .....	.011395

**Model KA-11A**

Repair kit .....	RK-452
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.065) Std. ....	.011252
Main fuel jet (0.063) .....	.011385
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) .....	.011395

**Model KA-12A**

Repair kit .....	RK-463
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.061) Std. ....	.011396
Main fuel jet (0.059) .....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722

**Model KA-13A**

Repair kit .....	RK-465
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) Std. ....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722
Main fuel jet (0.053) .....	.011765

**Model KA-14A**

Repair kit .....	RK-496
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.071) .....	.012645
Main fuel jet (0.069) Std. ....	.012515
Main fuel jet (0.067) .....	.011397
Main fuel jet (0.065) .....	.011252
Main fuel jet (0.063) .....	.011385

**Model KA-16A**

Repair kit .....	RK-496
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.071) .....	.012645
Main fuel jet (0.069) Std. ....	.012515
Main fuel jet (0.067) .....	.011397
Main fuel jet (0.065) .....	.011252
Main fuel jet (0.063) .....	.011385

**Model KA-17A**

Repair kit .....	RK-520
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) Std. ....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722
Main fuel jet (0.053) .....	.011765

**Model KA-18A**

Repair kit .....	RK-465
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) Std. ....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722

**Model KA-19A**

Repair kit .....	RK-465
Gasket set .....	GS-142
Inlet needle & seat .....	.011357
Filter element .....	.012107
Main fuel jet (0.061) .....	.011396
Main fuel jet (0.059) Std. ....	.011395
Main fuel jet (0.057) .....	.011394
Main fuel jet (0.055) .....	.011722

**Model KB-2A**

Repair kit .....	RK-429
Gasket set .....	GS-149
Inlet needle & seat .....	.010790
Filter element .....	.010741
Main fuel jet (0.055) Std. ....	.011722
Main fuel jet (0.053) .....	.011765
Main fuel jet (0.051) .....	.011764
Main fuel jet (0.049) .....	.011763

# Mercury

## Model KB-3A

Repair kit .....	RK-433
Gasket set .....	GS-149
Inlet needle & seat .....	010790
Filter element .....	012107
Main fuel jet (0.057) Std. ....	011394
Main fuel jet (0.055) .....	011722
Main fuel jet (0.053) .....	011765
Main fuel jet (0.051) .....	011764

## Model KC-1A

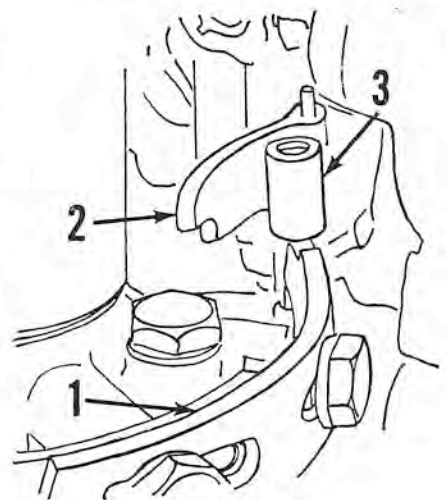
Repair kit .....	RK-510
Gasket set .....	GS-157
Inlet needle & seat .....	011357
Filter element .....	012107
Main fuel jet (0.073) .....	012447
Main fuel jet (0.071) Std. ....	012645
Main fuel jet (0.069) .....	012515
Main fuel jet (0.067) .....	011397

## Model KC-2A

Repair kit .....	RK-549
Gasket set .....	GS-157
Inlet needle & seat .....	011357
Filter element .....	012107
Main fuel jet (0.073) .....	012447
Main fuel jet (0.071) Std. ....	012645
Main fuel jet (0.069) Std. ....	012515
Main fuel jet (0.067) .....	011397

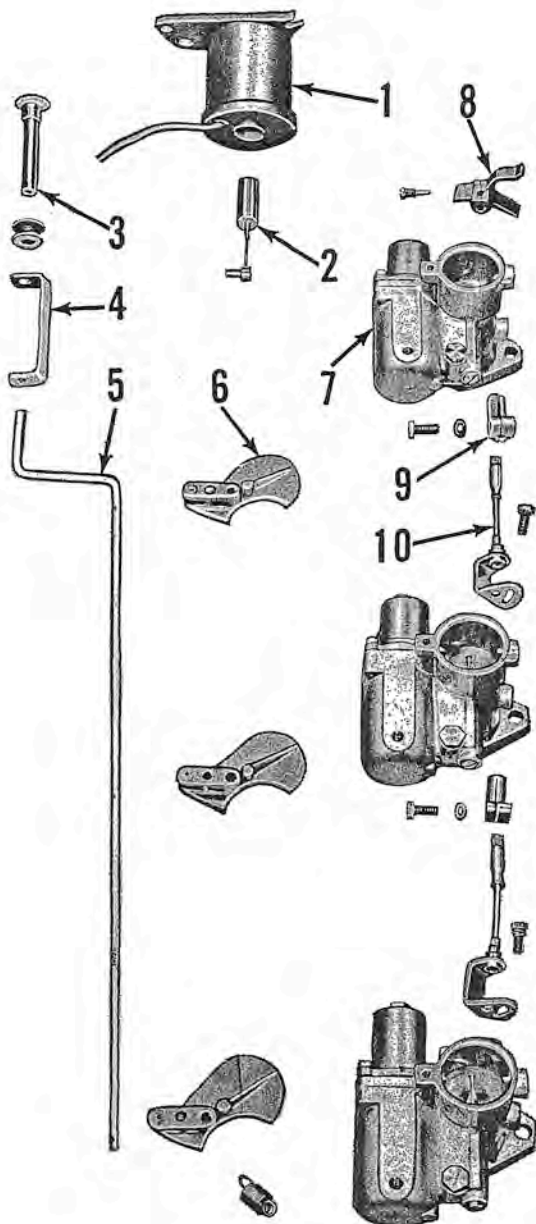
## Model KC-3A

Repair kit .....	RK-551
Gasket set .....	GS-157
Inlet needle & seat .....	011357
Filter element .....	012107
Main fuel jet (0.057) .....	011397
Main fuel jet (0.055) Std. ....	011722
Main fuel jet (0.053) .....	011765
Main fuel jet (0.051) .....	011764



**Fig. M79—Speed control mechanism used on Mark 30 & 55 series. Refer to text for details.**

1. Actuating bracket
2. Throttle pickup
3. Follower roller



**Fig. M78 — Carburetor connecting linkage used on six cylinder models. Four cylinder models are similar.**

1. Choke solenoid
2. Plunger
3. Choke button
4. Link
5. Choke rod
6. Choke valve
7. Carburetor
8. Cluster lever
9. Clamp
10. Pickup bracket

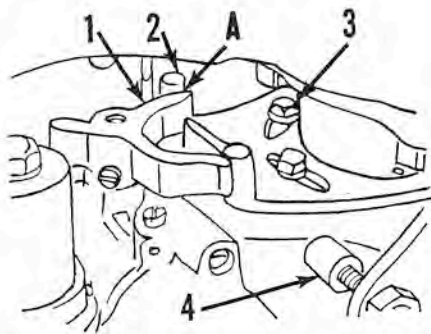
**SPEED CONTROL LINKAGE.** The speed control lever is directly attached to the magneto or distributor to advance or retard the ignition timing. The throttle valve is synchronized to open as the timing is advanced. It is extremely important that ignition timing and throttle valve opening be correctly synchronized to obtain satisfactory operation. When synchronizing the speed control linkage, first adjust the timing as outlined in the IGNITION section; then proceed as outlined in the appropriate following paragraphs:

**Mark 30 and 55 Series:** Make certain that magneto is properly timed and adjusted; then adjust carburetor to obtain a smooth idle speed of 600 rpm. Loosen the cap screws retaining the actuating bracket (1—Fig. M79) to magneto frame and slide the follower roller (3) away from throttle pick-up (2). With motor at operating temperature, shift to forward gear and move the speed control lever until engine speed increases to 1000-1100 rpm for Mark 30, 30E, 30H or Mark 55H with Tillotson carburetor; 1100-1200 rpm for Mark 55 and 55E; or 2000-2400 rpm for Mark 55H with Carter carburetor. With engine speeds as indicated, move actuating bracket (1) until follower roller (3) just touches throttle pick-up arm (2); then tighten the retaining screws.

**Other Four-Cylinder Models:** First make certain that magneto is properly timed and adjusted. With the engine not running, slowly move the speed control lever toward the "Fast" position until magneto advance stop just touches the crankcase. Refer to Fig. M80. Loosen the screws (3) securing the throttle actuator assembly to economizer collar; then move the actuator plate until 0.015 clearance (A) exists between follower (2) and throttle cluster lever (1). Tighten the attaching screws. Move the speed control lever to "Fast" position and adjust the full throttle stop screw (4) to allow throttle lever (1) 1/64-inch travel to full open throttle position.

# OUTBOARD MOTORS

Mercury



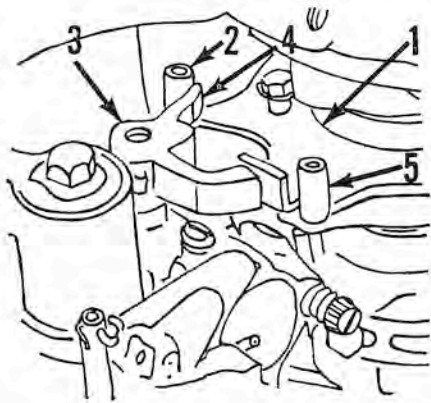
**Fig. M80—Throttle control mechanism used on late four cylinder models.**

1. Cluster finger
2. Pickup pin
3. Adjusting cap screw
4. Full throttle stop screw
- A. Adjustment clearance

Move speed control lever fully to "Slow" position and adjust the idle limiter screw (opposite full throttle stop screw 4) until the recommended slow idle speed of 525 rpm is obtained.

**Mark 75, 75A, 78 and 78A:** First make certain that the distributor is properly timed and adjusted. On Mark 75 and 75A, fully retard the throttle and, with throttle valve closed, loosen the set screw (S—Fig. M82) in throttle valve cluster (3). Move the cluster (3) on throttle valve shaft until a clearance (A) of  $\frac{3}{16}$ -inch exists between pickup finger and No. 1 pickup pin (5). On later models, the cluster is automatically positioned by the set screw.

On all models, slowly move the speed control lever in the "forward" position (engine not running) until the magneto advance stop just touches the crankcase. Refer to Fig. M81. Loosen the screws securing the throttle actuator assembly (1) to sector gear;



**Fig. M81—Throttle control mechanism used on early six cylinder models.**

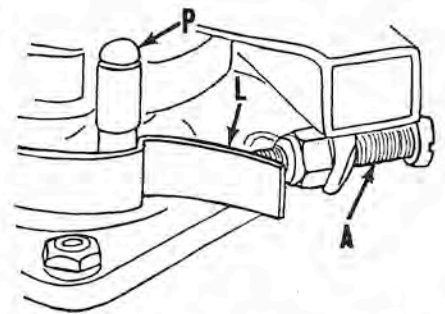
1. Actuator assembly
2. Pickup pin
3. Cluster lever
4. Pickup finger
5. No. 1 pickup pin

then move the plate until  $\frac{1}{16}$ -inch clearance exists between pickup finger (4) and pickup pin (2). Secure advance plate in this position.

On older models, move the speed control lever slightly toward "Slow" position and check the adjustment of the latch spring as shown in Fig. M83. Hold the speed control sector and move the distributor body counter-clockwise toward the advance stop. Note the clearance between latch spring (L) and sector pin (P) while torque is applied. The spring should latch over the pin with no more than  $\frac{1}{64}$ -inch clearance between pin and latch spring. Adjust by loosening the screws retaining latch (L) to distributor. After the adjustment is made, move control lever until distributor advance stop contacts the crankcase; then adjust the screw (A) until latch (L) is unhooked from pin (P).

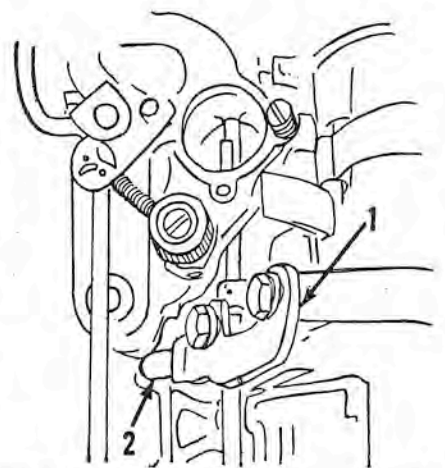
Synchronize the reverse throttle mechanism with motor in operation as follows: Loosen the screws which retain the reverse throttle lever (1—Fig. M84) to the sector gear and move the lever as far as possible away from throttle reverse pickup (2). Advance the distributor in the "Reverse" direction until engine speed is 1000 rpm. Move the lever (1) until it just touches reverse pickup (2) and tighten the screws. Limit the maximum reverse speed to 4000 rpm or less by moving the lever stop on the lower cowl.

**Merc 600, 700 and 800 Direct Reversing:** First make certain that distributor is properly timed and adjusted. To synchronize the forward throttle refer to Fig. M85. With the engine not running, move the speed control lever until distributor pilot just touches the maximum advance stop screw. Loosen the screws (S) attaching pickup plate (2) to the sector gear and move the plate until the nylon covered pickup pin (5) is not touching the cluster finger (6); then bend pickup tab (3) in or out until a No. 48 twist drill (0.076 gage) can just be inserted between port side of throttle valve and carburetor barrel as shown at (D). Remove the drill or gage. Move the speed control lever



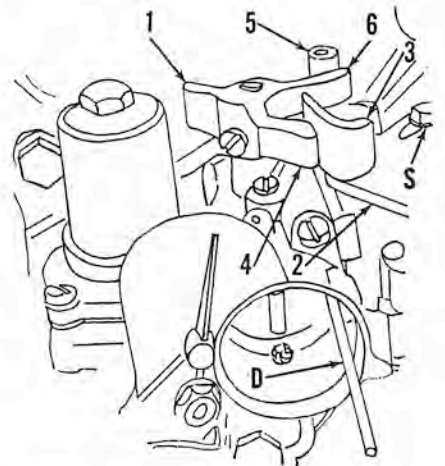
**Fig. M83—Latch spring adjustment is required on some early models.**

- A. Adjusting screw
- L. Latch
- P. Sector pin



**Fig. M84—Reverse throttle pickup adjustment used on older models.**

1. Reverse lever
2. Reverse pickup finger



**Fig M85—Forward throttle control mechanism used on late models. Refer to text for method of adjustment.**

1. Cluster lever
2. Pickup plate
3. Pickup tab
4. Pickup finger
5. Pickup pin
6. Pickup finger
- D. Drill (gage)
- S. Attaching screw

**Fig. M82—Cluster lever (3) must be adjusted on throttle shaft on some early models. Refer to text.**

- A. Clearance
- S. Set screw
3. Cluster finger
5. No. 1 pickup pin

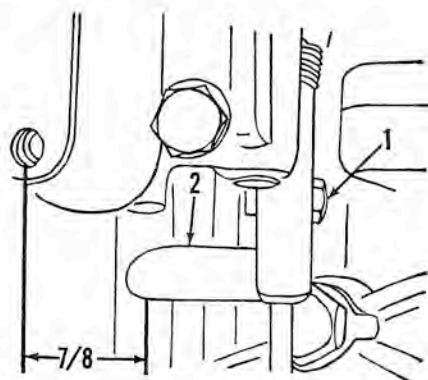


Fig. M86—Reverse pickup finger adjustment used on some models. Refer to text.

1. Clamp screw
2. Reverse pickup finger

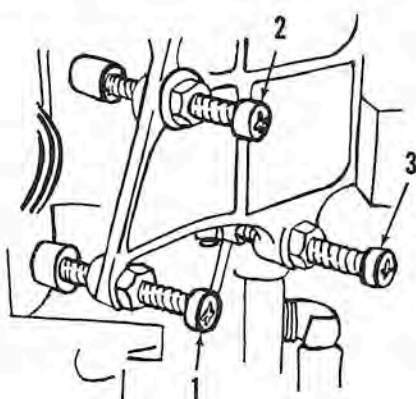


Fig. M87B — View of stop bracket showing location of throttle stop screws.

1. Spark advance stop
2. Throttle stop
3. Idle stop

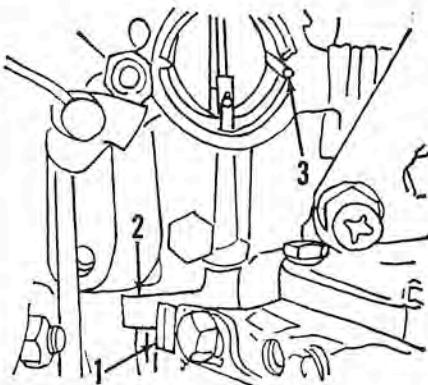


Fig. M87—Reverse throttle pickup adjustment used on Merc 800.

1. Pickup stop
2. Pickup finger
3. Drill (gage)

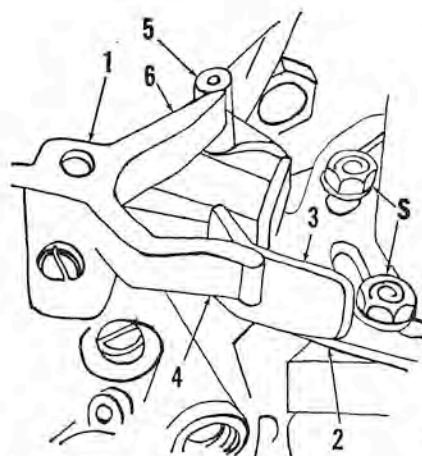


Fig. M87A — With distributor in intermediate advance position, loosen screws (S) and reposition pickup plate (2) until tab (3) just touches cluster finger (4).

1. Carburetor cluster
2. Pickup plate
3. Pickup tab
4. Cluster finger
5. Pickup pin
6. Cluster finger
- S. Cap screws

to retard the ignition until spark occurs at 0.030 (inches) before TDC of piston.

**NOTE:** This intermediate timing advance position can be determined using Mercury Timing Gage 91-31161A1 for gear shift models; or 91-30290A1 for direct reversing models. Thread timing gage into No. 4 (from top) spark plug hole on Merc 600 or 700 models; or No. 3 spark plug hole for Merc 800 models. Make sure that center plunger of gage fits into notches of threaded outer body. Turn flywheel until the piston strikes gage; then thread gage out until crankpin will pass over center while in contact with gage plunger. Rotate flywheel counter-clockwise; then without moving threaded outer gage body, depress center plunger and turn plunger 1/4-turn. Rotate flywheel clockwise until piston crown strikes the plunger. Attach one lead of a timing test light to the No. 1 Coil Primary (White) Lead of Terminal Block, and ground the other test lead. Retard the distributor (clockwise) until test bulb lights; then move to the advance direction (counter-clockwise) until test bulb just goes out.

With the intermediate timing position determined, move the pickup plate (2) until the tab (3) just touches the cluster finger (4) and tighten the attaching screws. Again move the speed control lever until distributor pilot just touches the maximum advance stop screw; then bend the nylon covered pickup pin (5) until 0.000-0.015 clearance exists between pickup finger (5) and cluster finger (6).

To synchronize the reverse throttle, proceed as follows:

On Merc 600 and 700, make sure that throttle valves are closed; then loosen clamp screw (1—Fig. M86) and position reverse pickup finger (2) so that leading edge is approximately 7/8-inch in front of carburetor float bowl as shown. Loosen the screws attaching the reverse pickup stop to

the distributor sector gear and adjust the reverse timing until points break at 0.030 (inches) before Top Dead Center of the piston.

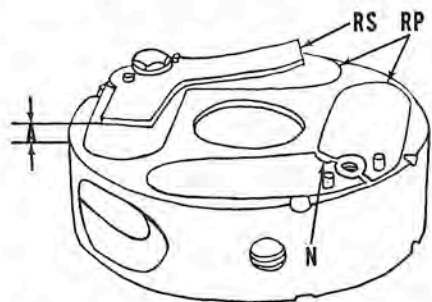
**NOTE:** Proceed as previously outlined for determining intermediate advance; except rotate flywheel clockwise from top dead center, then counter-clockwise to the advance REVERSE position. Move distributor COUNTER-CLOCKWISE until test bulb lights; then CLOCKWISE to the timing position. ...

When intermediate timing position has been determined, move the reverse pickup stop to just contact reverse finger (2) and tighten the attaching screws.

On Merc 800 direct reversing motors refer to Fig. M87. The reverse pickup lever (1) should be moved to the end of slot away from pickup finger (2) and the retaining screw tightened and safety wired. If correctly adjusted, this lever should not be moved. Move the speed control lever toward "Fast" (reverse) direction until distributor contacts the maximum (reverse) stop. Loosen the screw which clamps the reverse pickup lever to throttle shaft. Manually open the carburetor throttle until a No. 40 (0.098) drill bit can be inserted between throttle valve and port side of carburetor barrel as shown at (3). With drill bit holding throttle valve open, move the pickup finger (2) on throttle shaft until it contacts pickup stop (1) and tighten the clamping screw. Remove the drill.

**Merc 700, 800, 850, 1000, Full Gear Shift:** First make sure that distributor is properly timed and adjusted. Correct synchronization requires that an intermediate timing advance position of 0.015 (inches for piston crown before TDC) be determined. This is most conveniently done by using the special Mercury Timing Gage (Part No. 91-31161A1) and a continuity timing light. Make sure center plunger of gage is seated in notches of threaded outer case and thread the gage into No. 4 spark plug hole for Merc 700; or No. 3 spark plug hole for other models. Turn flywheel until the respective piston is in approximately Top Dead Center position, then thread the gage in or out until crankshaft will rock over TDC while piston crown is in contact with gage plunger. Rotate crankshaft counter-clockwise; then, without moving threaded portion of gage, depress center plunger and turn plunger 1/4 turn. Rotate flywheel clockwise until piston crown strikes the plunger. Attach one lead of timing test light to the No. 1 Coil Primary (White) lead of Terminal Block, and ground the other test lead. Retard the distributor (clockwise) until test bulb lights; then move in the advance direction until test bulb just goes out.

Refer to Fig. M87A. With distributor in previously established intermediate advance position, loosen the cap screws (S) securing pickup plate (2) to distributor body, and move the plate until the tab (3) just touches the cluster finger (4). Tighten the cap screws. Move the control lever to advance timing until the maximum timing advance screw

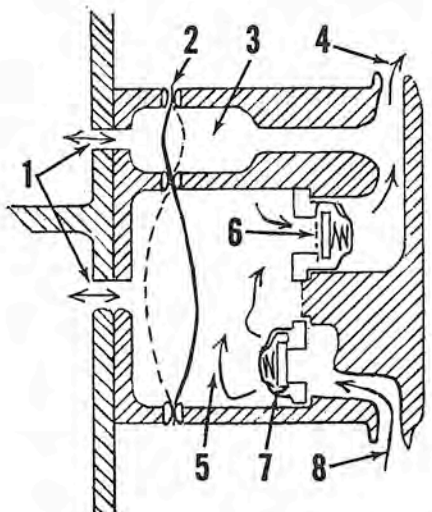


**Fig. M88—Intermediate main bearing showing inlet reed valves. Reed petals (RP) are right and left hand units. When installing reed petals, place the reed with the cut-out notch (N) on the left as shown. Adjust free height of reed stop (RS).**

just touches distributor body and bend the nylon covered pickup pin (5) until a clearance of 0.0000-0.015 exists between pickup pin and cluster finger (6).

Move the speed control lever fully to "Fast" position and adjust the full throttle stop screw (2—Fig. M87B) to allow the throttle shaft 1/64-inch travel to full open position. Adjust the idle stop screw (3) to obtain an idle speed of 500 rpm in forward gear with motor at operating temperature.

**REED VALVES.** The inlet reed valves are located on the crankshaft second and fourth main bearing assemblies on four cylinder models; and on the second, fourth and sixth main bearings on six cylinder models. Each

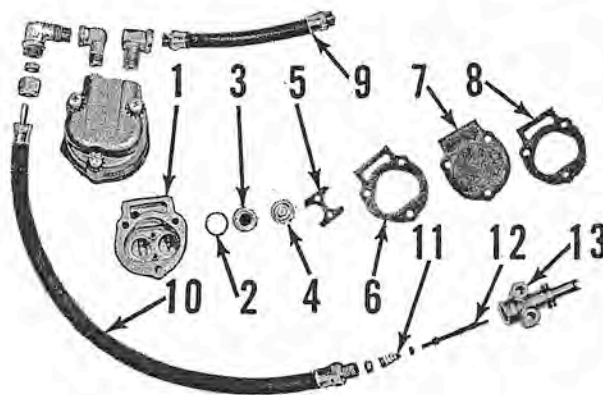


**Fig. M89—Schematic view of diaphragm type fuel pump. Pump body mounts on side of cylinder block and is ported to two crankcases as shown. Six cylinder models use two fuel pumps.**

- |                    |                       |
|--------------------|-----------------------|
| 1. Pressure ports  | 5. Main fuel chamber  |
| 2. Diaphragm       | 6. Outlet check valve |
| 3. Booster chamber | 7. Inlet check valve  |
| 4. To carburetor   | 8. Fuel inlet         |

**Fig. M90—Exploded view of fuel pump and associated parts.**

1. Pump body
2. Valve gasket
3. Outlet check valve
4. Inlet check valve
5. Retainer
6. Gasket
7. Diaphragm
8. Gasket
9. Outlet hose
10. Inlet hose
11. Spring
12. Adapter valve
13. Adapter



reed valve unit supplies fuel mixture from one of the carburetors to the two adjoining cylinders.

Reed petals (RP—Fig. M88) should be perfectly flat and have no more than 0.007 clearance between free end of reed petal and seating surface of center main bearing. The reed stop (RS) must be carefully adjusted to  $\frac{3}{16}$ -inch on Merc 650 and 1000; and  $\frac{5}{16}$ -inch on other models. This clearance is measured between end of stop and seating surface of reed plate as shown at (A). Seating surface of bearing must be smooth and flat, and may be refinished on a lapping plate after removing reed stops, reed valves and dowels. Do not attempt to bend or straighten a reed petal to modify performance or to salvage a damaged reed. Never install a bent reed. Lubricate the reed valve units with "Quick-silver" Multipurpose Lubricant or a light distributor cam grease when reassembling.

Each reed valve unit has eight reeds which are right-hand and left-hand units, and are available only as a matched set. When installing reed valves, place the reed petal with the cut-out notch (N) to the left as shown. Crankshaft must be removed before reed valve units can be serviced.

**FUEL PUMP.** Diaphragm type fuel pumps are used. Two fuel pumps are used on six cylinder models. Pressure and vacuum pulsations from the crankcases alternate to pull fuel from the supply tank and supply the carburetor. Most of the work is performed by the main supply chamber (5—Fig. M89). Vacuum in the crankcase pulls the diaphragm (2) downward causing fuel to be drawn through inlet line (8), past inlet check valve (7) into main pump chamber (5). The alternate pressure forces diaphragm out and fuel leaves the chamber through outlet check valve (6). The booster pump chamber (3) serves to dampen the action of the larger, main pump chamber (5), and increase the maximum potential fuel flow.

When overhauling the fuel pump, use Fig. M90 as a guide. All defective or questionable parts should be renewed.

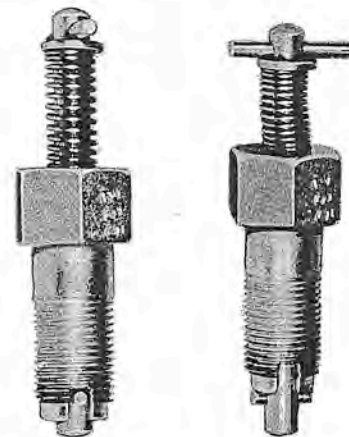
## IGNITION

Four cylinder models use a belt driven magneto. Six cylinder models use a V-belt driven distributor. Refer to the appropriate following paragraphs.

**MAGNETO.** Breaker point gap should be 0.008-0.010; or to 54° dwell if equipment is available. Breaker point spring tension should be 33-37 ounces, measured from curve of breaker arm next to rubbing block.

A quick test of magneto condition can be made by removing high tension wire from one spark plug with engine running. Spark should jump a  $\frac{3}{16}$ -inch gap at idle speed.

To install the magneto drive belt, remove the flange plate on top of magneto pulley; then remove the flywheel using a puller. Turn the magneto pulley until the arrow cast into top of pulley points toward crankshaft as shown in Fig. M91. When installation is complete, flywheel and magneto timing marks must be toward each other and on the axis of a line connecting the crankshaft and magneto shaft as shown at (TM). The magneto shaft has a blind spline which aligns with a similar spline in magneto pulley shaft.



**Fig. M90A — Recommended timing gage showing adjusting position (left) and advance timing position (right). Refer to text.**



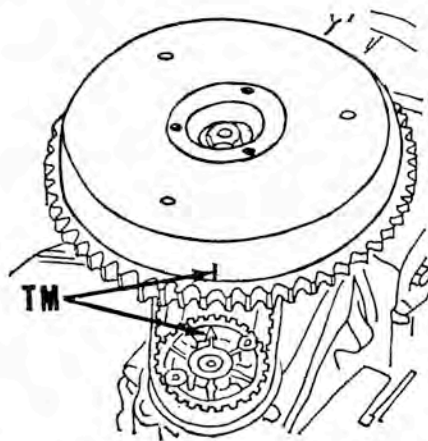


Fig. M91—When timing the magneto or distributor; or installing a new timing drive belt, timing marks (TM) must be aligned as shown.

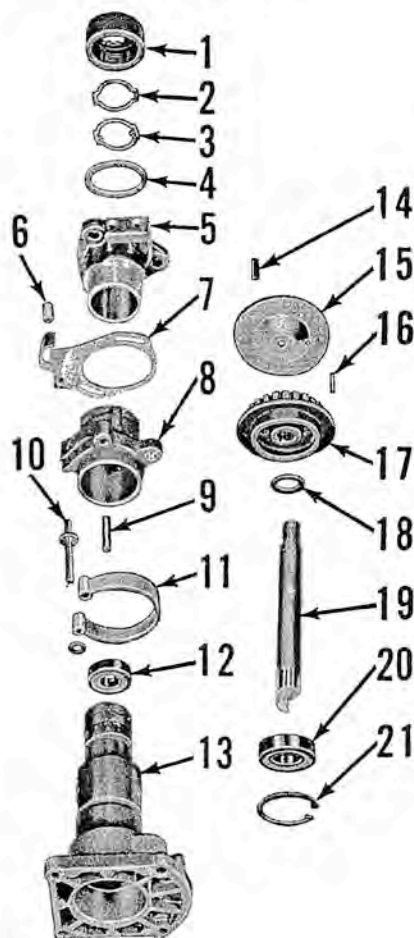


Fig. M92—Exploded view of distributor mounting bracket and drive mechanism used on some models. Others, including magnetos, are similar.

- |                      |                    |
|----------------------|--------------------|
| 1. Cap               | 12. Ball bearing   |
| 2. Wave washer       | 13. Pilot assembly |
| 3. Tab washer        | 14. Key            |
| 4. Thrust washer     | 15. Flange plate   |
| 5. Adaptor           | 16. Key            |
| 6. Nylon pin         | 17. Drive pulley   |
| 7. Actuator assembly | 18. Thrust washer  |
| 8. Advance collar    | 19. Drive shaft    |
| 9. Retainer pin      | 20. Ball bearing   |
| 10. Terminal pin     | 21. Snap ring      |
| 11. Retard spring    |                    |

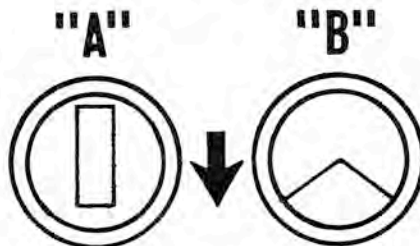


Fig. M93—To install and time the distributor on direct reversing models, turn the drive tang until the offset end of tang faces forward as shown at (A). On gearshift models, cut-out notch should be facing forward as shown in view (B). Align pulley timing marks as shown in Fig. M91.

**DISTRIBUTOR.** Distributors are equipped with two sets of alternate firing breaker points. Motor is equipped with two coils; each of which is connected to its own set of points and completing a separate ignition system for three of the motor's six cylinders. The contact points must be adjusted to 90° dwell period and a 60° alternate opening position; using the Mercury Distributor Point Dwell and Synchronizing Plate 91-30356A1 or a distributor stroboscope.

To install the distributor drive belt, remove the distributor pulley flange plate (15—Fig. M92); then remove the flywheel using a puller. Turn the distributor pulley until the arrow cast into top of pulley points toward crankshaft as shown in Fig. M91. Install drive belt and flywheel with timing marks aligned as shown at (TM).

To install the distributor to the drive pulley and housing, align drive end of distributor shaft as shown in Fig. M93. NOTE: The arrow indicates direction of boat travel in forward gear.

Firing order is 1-4-5-2-3-6 for Merc 800, 850 or 1000; or 1-6-4-2-5-3 for other models.

**TIMING.** Maximum timing advance is 32½° BTDC for Merc 650, Merc 1000 and the 1963 (90 cu. in.) Merc 850. Maximum advance for Mark 30H and Mark 55H is 40½° BTDC; and for all other four and six cylinder models, 34½° BTDC.

The advance timing mark is not indicated on flywheel on most models. The manufacturer recommends that the special timing gage (See Fig. M90A) designed for the motor be used. This gage is threaded into No. 1 (top) spark plug hole on four cylinder models; No. 3 spark plug hole on Merc 800, 850 and 1000; or No. 4 spark plug hole on other models. Make sure that center plunger of gage fits into notches of threaded, outer body as shown in left hand view. Turn flywheel until piston is at top dead center, then thread the gage in or out until crankpin will pass over center while piston is in contact with gage plunger. Rotate flywheel counter-clockwise; then without mov-

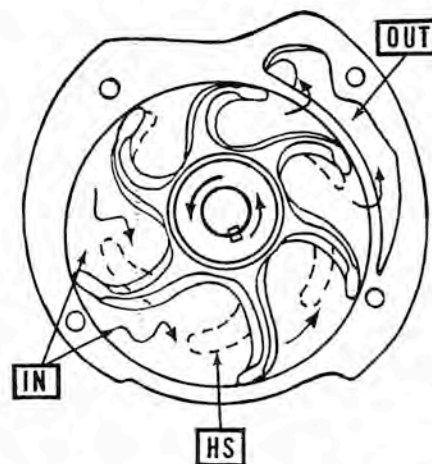


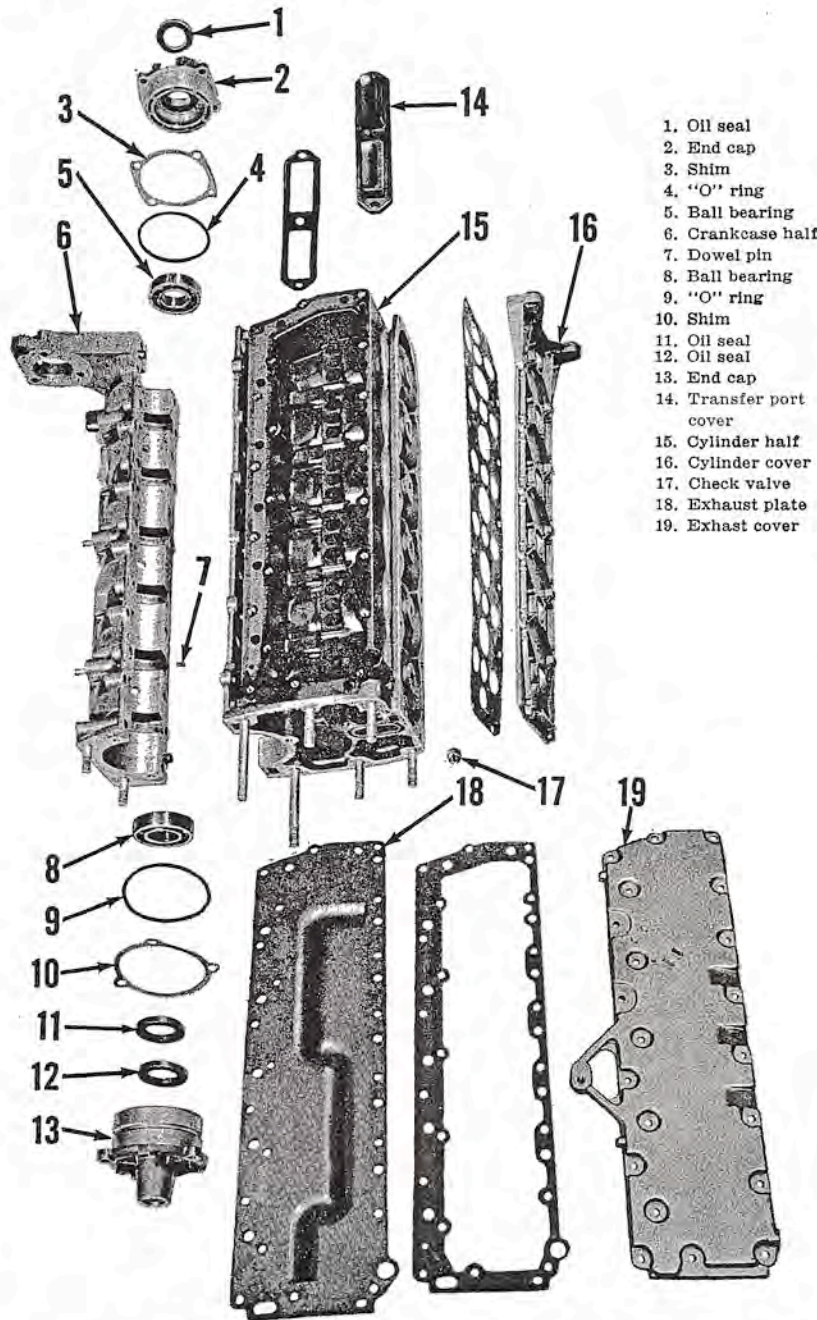
Fig. M94—Schematic view of rubber impeller type water pump. Flexing of impeller blades in offset housing causes water to be drawn through inlet ports (IN) and forced into power head through outlet ports (OUT). At high speeds, blades remain curved as shown by broken lines (HS) and pump becomes a centrifugal pump.

ing threaded outer gage body, depress center plunger and turn ¼-turn. Rotate flywheel until piston strikes the plunger to establish crankshaft position for maximum advance timing. NOTE: If a protractor is used to scribe a degree mark on flywheel for timing purposes, be sure to check for proper TDC position. The timing mark inscribed in the flywheel is for magneto or distributor INSTALLATION purposes only. The No. 1 piston is 20° ATDC on most models when magneto or distributor timing marks are aligned.

With the advance timing position established, connect a continuity test light to the No. 1 Coil Primary (White) Lead on distributor models, or to primary ground terminal on magneto models. Attach the other test lead to a suitable ground. Rotate the magneto or distributor body clockwise until points are closed as indicated by continuity light, then counter-clockwise until points just open. Limit magneto or distributor advance at this point by means of the spark advance stop screw (1—Fig. M87B) on models so equipped; or by sliding magneto stop bracket against crankcase.

## COOLING SYSTEM

**WATER PUMP.** The rubber impeller type water pump is contained in the lower unit gearcase housing and can be removed after removing the gearcase. The pump housing is offset in relation to the driveshaft or propeller shaft as shown in Fig. M94. The water pump on direct reversing models contains a valve which permits reversal of water pump rotation without affecting water flow.



1. Oil seal
2. End cap
3. Shim
4. "O" ring
5. Ball bearing
6. Crankcase half
7. Dowel pin
8. Ball bearing
9. "O" ring
10. Shim
11. Oil seal
12. Oil seal
13. End cap
14. Transfer port cover
15. Cylinder half
16. Cylinder cover
17. Check valve
18. Exhaust plate
19. Exhaust cover

Fig. M95—Exploded view of crankcase and associated parts used on six cylinder models. Four cylinder models are similar.

When cooling system problems are encountered, first check the water inlet for plugging or partial stoppage, then if not corrected, remove the gearcase housing as outlined in LOWER UNIT section and examine the water pump, water tubes and seals. The water inlet is located on the anti-cavitation plate immediately above the propeller.

**POWER HEAD**

**R&R AND DISASSEMBLE.** To remove the power head assembly, first remove the top and side cowling, remove the electric starter assembly; then disconnect all interfering

wiring and linkage. Remove the stud nuts which secure the power head to lower unit, jar power head on exhaust side with heel of hand to loosen gasket; then lift off the power head. Place power head on a suitable stand and remove the flywheel, magneto or distributor, alternator-generator and the carburetors. Exhaust manifold cover plates, cylinder block cover plate and transfer port cover plates should be removed for cleaning and inspection.

Remove the upper and lower crankcase end caps by using a suitable puller attached to threaded holes in caps. Remove the main bearing locking bolts from front

crankcase half, remove the flange bolts; then remove crankcase front half by inserting screwdriver in the recesses provided on side flanges. Use extra care not to spring the parts or to mar the machined, mating surfaces. The crankcase half (6—Fig. M95) and cylinder assembly (15) are matched and align bored, and are available only as an assembly.

Crankshaft, pistons, bearings and connecting rods may now be removed for service as outlined in the appropriate following paragraphs. When assembling, follow the procedures outlined in the ASSEMBLY paragraph.

**ASSEMBLY.** Because of the two-cycle design, crankcase must be completely sealed against both vacuum and pressure. Exhaust manifold and water passages must be sealed against water leakage. Whenever power head is disassembled, it is recommended that all gasket surfaces be carefully checked for nicks and burrs which might interfere with a tight seal. Machined sealing surfaces without gaskets should be similarly checked. Slight damage can sometimes be remedied by lapping the surfaces on a lapping block using No. 00 emery paper. Remove only the high spots without lowering the surface. If parts are warped, sprung or excessively damaged, renew the parts.

All gasket and sealing surfaces should be lightly and carefully coated with an impervious liquid sealer such as Mercury Gasket Sealer Compound (92-28804). Surface must be completely coated, using care that excess sealer does not squeeze out into bearings, crankcase or other passages. Lubricate all bearing and friction surfaces thoroughly with engine oil. Loose needle bearings may be held in place during assembly by using a light, non-fibrous grease.

Check the assembly by turning the crankshaft after each step to check for binding or locking which might indicate improper assembly. Remove the cause before proceeding. After piston and crankshaft assembly is installed and secured, rotate the shaft until each piston ring in turn appears in one of the exhaust ports, then check by pressing on ring with a blunt tool. Ring should spring back when released; if it does not, a broken or binding ring is indicated, and the trouble should be corrected.

The recommended crankshaft end play of 0.008-0.012 is controlled by means of shims (3 & 10—Fig. M95) placed under each crankcase end cap. Shims are available in thicknesses of 0.002, 0.003, 0.005 and 0.010, and a shim pack of approximately equal thickness should be used under each end cap. To check the end play, temporarily install the crankshaft and end caps on the cylinder block, omitting the sealing rings (4 & 9).

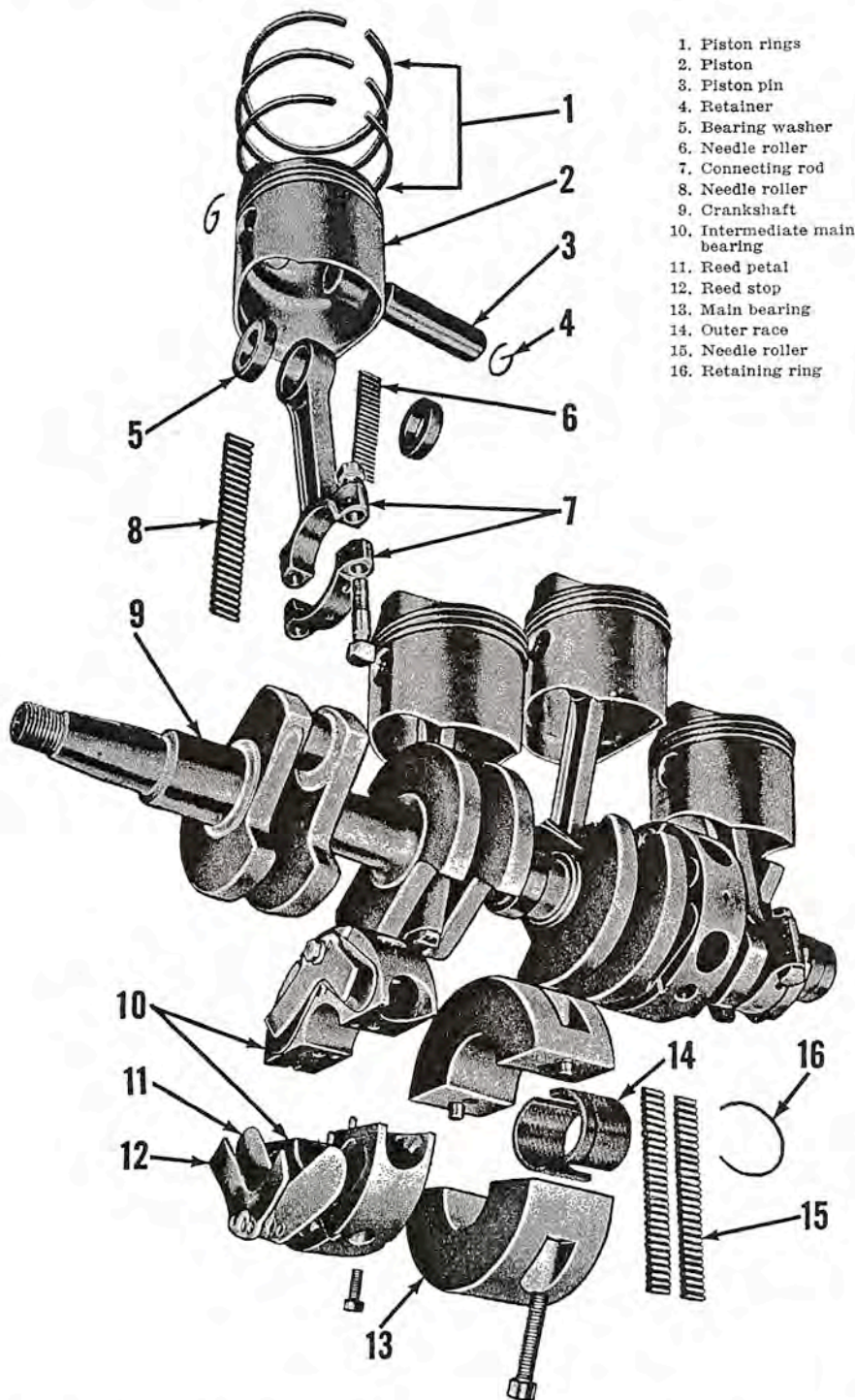


Fig. M96—Exploded view of crankshaft and associated parts used on four cylinder models. Six cylinder models are similar.

Use the removed shims in the trial installation. Install and tighten the end cap retaining screws. Tap the crankshaft each way with a plastic hammer; then measure the clearance between ball bearing inner race and thrust face of crankshaft using a feeler gage. Determine the shims to be added or removed; then equalize the shim pack thickness on final assembly.

Tighten the crankcase exhaust cover and cylinder cover cap screws by first tightening the center screws, then tightening screws evenly working toward top of power head. When upper half is tightened, again start at the center and tighten screws alternately toward bottom of power head. Tightening torques are given in the CONDENSED SERVICE DATA table.

1. Piston rings
2. Piston
3. Piston pin
4. Retainer
5. Bearing washer
6. Needle roller
7. Connecting rod
8. Needle roller
9. Crankshaft
10. Intermediate main bearing
11. Reed petal
12. Reed stop
13. Main bearing
14. Outer race
15. Needle roller
16. Retaining ring

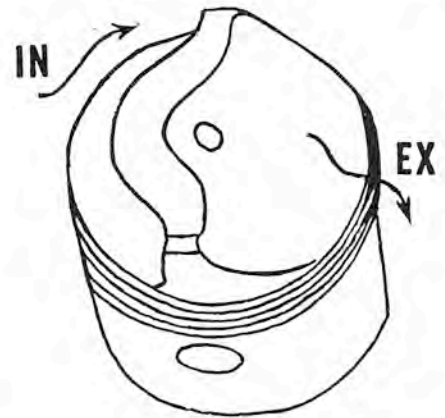


Fig. M97—Piston crown is designed to improve scavenging efficiency. Be sure piston is installed as indicated, with relation to inlet and exhaust ports.

**PISTONS, PINS, RINGS AND CYLINDERS.** Before detaching connecting rods from crankshaft, make sure that rod and cap are properly identified for correct assembly to each other and in the correct cylinder.

Each piston is fitted with three rings which are interchangeable in the ring grooves and are pinned in place in the piston.

Piston pin is pressed in piston bosses and secured with retaining rings. Piston end of connecting rod is fitted with 25 loose needle bearings in Merc 800, 850 & 1000; and 22 loose needle rollers in other models. The needle rollers use the connecting rod bore and the piston pin as bearing races. When assembling, install bearing washers and needle bearings in piston end of connecting rod using light non-fibrous grease to hold them in place, then install and center the piston pin using Mercury tool (91-24263). Piston must be installed so that sharp, vertical side of deflector will be to starboard (intake) side of cylinder block. See Fig. M97.

Assemble the connecting rod and piston assemblies, together with the main bearing units to the crankshaft; then install the complete assembly in cylinder half of block. On four cylinder models No. 2 and No. 3 piston should be started into cylinders first. On six cylinder models No. 2 and No. 4 pistons should be started first. Use the Mercury Ring Compressor Kit (91-28819A2), if available; or carefully compress each ring with the fingers if kit is not available. Thoroughly lubricate pistons and rings during assembly. Pistons and rings are available in 0.015 oversize.

**CONNECTING RODS, BEARINGS AND CRANKSHAFT.** Upper and lower ends of crankshaft are carried by a ball bearing. The second and fourth main bearings (10—Fig. M96) on four cylinder models; or the second, fourth and sixth main bearings on six cylinder models also contain the inlet reed valves. The third main bearing (13) on

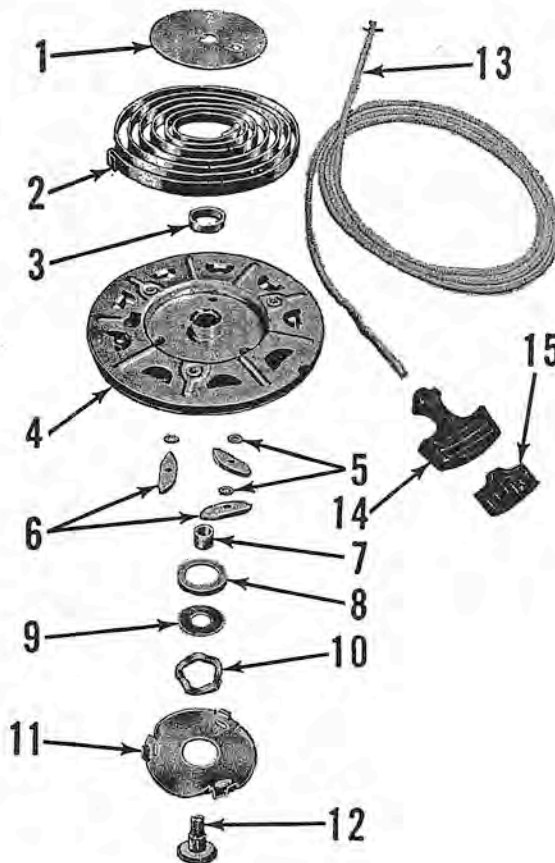


Fig. M98—Exploded view of recoil starter used on models so equipped.

1. Retainer
2. Recoil spring
3. Bushing
4. Sheave
5. Wave washer
6. Pawl
7. Spacer
8. Retainer
9. Washer
10. Wave washer
11. Plate
12. Sheave shaft
13. Cable
14. Handle
15. Anchor

four cylinder models; or the third and fifth main bearings on six cylinder models; each contain two rows of 28 loose needle rollers (15) which ride in a split type outer race (14), held together by a retaining ring (16).

The connecting rod for Merc 800, 850 and 1000 rides in 25 loose needle rollers at piston end and 30 loose needle rollers at crankpin end. On other models, the connecting rod contains 22 loose needle rollers at piston end and 25 loose needle rollers at crankpin end. Check rod for alignment, using Mercury Alignment Tool (91-28441A1), or by placing rod on a surface plate and checking with a light.

If bearing surface of rod and cap is rough, scored, worn or shows evidence of overheating, renew the connecting rod. Inspect crankpin and main bearing journals. If scored, out-of-round or worn, renew the crankshaft. Check the crankshaft for straightness using a dial indicator and vee-blocks.

Inspect and adjust the reed valves as outlined in REED VALVE paragraph, and reassemble as outlined in ASSEMBLY paragraph.

#### MANUAL STARTER

Refer to Fig. M98 for a starter of the general type used on models so equipped. To disassemble the starter, remove the top cowl; then remove the screw and trim cap

from top to cowl. Insert a screwdriver in slot in top of sheave shaft (12) and loosen the shaft nut (left hand thread). Allow the shaft and screwdriver to turn clockwise until recoil spring (2) is completely unwound. Pry the anchor (15) out of starter handle (14) and remove the anchor and handle. Remove the nut from upper end of sheave shaft (12), invert the assembly; and remove the parts, making sure that recoil spring (2) remains in housing recess as sheave (4) is removed. Protect hands with cotton gloves or a cloth, grasp recoil spring (2), remove spring and allow it to unwind slowly to prevent personal injury.

Lubricate the parts with Multipurpose Lubricant and assemble by reversing the disassembly procedure. Make sure that pawls (6) are all installed the same way, with flat radius to outside. Install wave washer retainer (9) with cup end up and make sure the tab in spring retainer (1) engages slot in sheave shaft (12). Loosely install the shaft nut, pull free end of cable through cowl and install handle (14) and anchor (15). After handle is installed, turn sheave shaft (12) counter-clockwise with a screwdriver until cable handle is pulled against top cowl; then turn shaft an additional 1¼ turns and tighten the shaft nut.

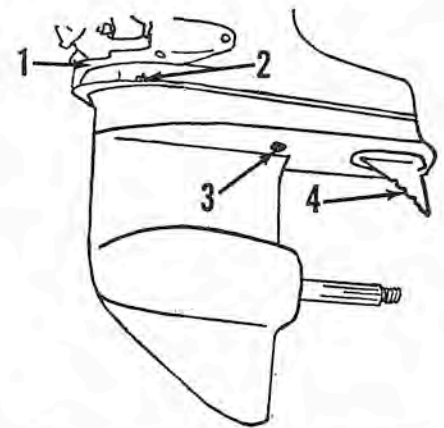


Fig. M99—View of typical lower unit showing location of attaching screws securing gearcase housing. Refer to text for details.

#### LOWER UNIT

**PROPELLER AND DRIVE CLUTCH.** Protection for the motor is provided by a special cushioning clutch built into the propeller hub. Propeller is splined to the shaft. No adjustment is possible on the propeller or cushioning clutch. Various pitch propellers are provided, and propeller should be selected for best performance under applicable conditions. Propellers other than those designed for the motor must not be installed.

**R&R AND OVERHAUL.** Lower units are divided into two main types; the gear shift type used on early models, late four cylinder motors; and late six cylinder Full Gear Shift motors; and the straight drive type used on direct reversing motors. Direct drive models are further subdivided into standard-rotation and counter-rotation types which are designed to be paired for twin-motor installation.

Most service on the lower unit can be performed by detaching the gearcase housing from the driveshaft housing. When removing the housing check carefully at the locations shown in Fig. M99, to make sure that all securing cap screws or stud nuts are removed. On some early motors the gearcase housing was secured by two studs. On some later units, securing studs will be found at all of the indicated locations. NOTE: On motors equipped with trim tab on water intake as shown at (4), remove the intake by removing plug and screw on top side of anti-cavitation plate; then check for cap screw under water intake. On models not equipped with propeller hub exhaust, the cap screw on trailing edge will be found in exhaust outlet.

Remove the housing plugs and drain the housing. Secure the gearcase in a vise between two blocks of soft wood with pro-

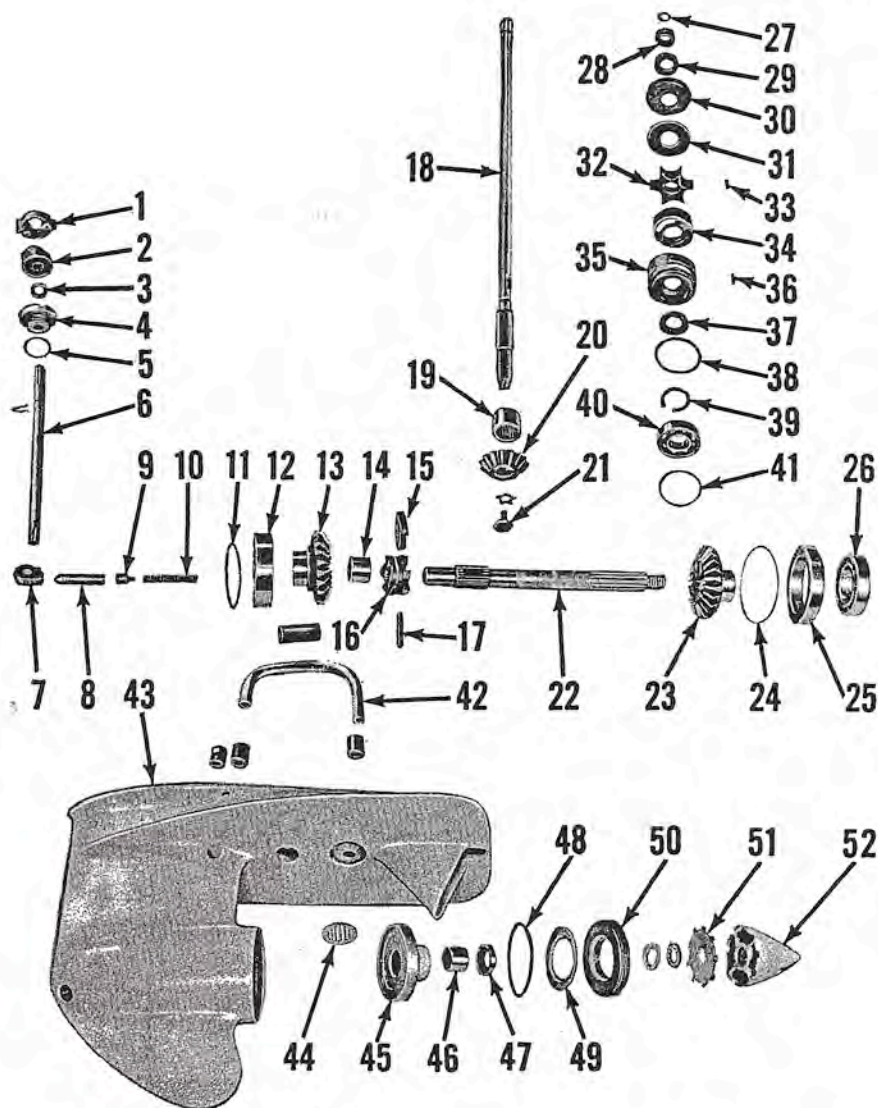


Fig. M100—Exploded view of gearcase assembly used on Four Cylinder models.

- |                     |                     |                    |                     |
|---------------------|---------------------|--------------------|---------------------|
| 1. Reverse lock cam | 14. Needle bearing  | 27. "O" ring       | 40. Ball bearing    |
| 2. Reverse lock cam | 15. Retaining ring  | 28. Slinger        | 41. Shim            |
| 3. Oil seal         | 16. Clutch dog      | 29. Oil seal       | 42. Inlet tube      |
| 4. Bushing          | 17. Cross pin       | 30. Cover          | 43. Gearcase        |
| 5. "O" ring         | 18. Drive shaft     | 31. Outlet plate   | 44. Water inlet     |
| 6. Shift shaft      | 19. Needle bearing  | 32. Impeller       | 45. Bearing carrier |
| 7. Shift cam        | 20. Drive pinion    | 33. Drive pin      | 46. Needle bearing  |
| 8. Shift plunger    | 21. Cap screw       | 34. Insert         | 47. Oil seal        |
| 9. Slide            | 22. Propeller shaft | 35. Cartridge      | 48. "O" ring        |
| 10. Spring          | 23. Reverse gear    | 36. Key            | 49. Washer          |
| 11. Shim            | 24. Shim            | 37. Oil seal       | 50. Gearcase cover  |
| 12. Ball bearing    | 25. Adaptor ring    | 38. "O" ring       | 51. Tab washer      |
| 13. Forward gear    | 26. Ball bearing    | 39. Retaining ring | 52. Propeller nut   |

PELLER up. Wedge a piece of wood between propeller blade and anti-cavitation plate to hold propeller; then remove propeller nut and propeller.

Overhaul the unit as outlined in the appropriate following paragraphs.

**Gear Shift Type:** Measure and record the backlash in forward and reverse gears before disassembling the gearcase. To disassemble the gearcase after the propeller

is removed, clamp the housing in a protected vise and remove the gearcase cover (50—Fig. M100 or 62—Fig. M101) with a suitable spanner wrench such as 91-22119 for four cylinder models; or 91-30291A1 for six cylinder models. Grasp the propeller shaft in the vise and remove shaft and bearings by tapping housing off with a soft mallet. Forward gear (13—Fig. M100 or 24—Fig. M101) will remain in housing. On four cylinder models, remove the adaptor ring

(25—Fig. M100) and save the shims (24). Shims control the backlash of reverse gear (23).

Clutch dog can be removed from propeller shaft by removing the retaining ring; then applying slight pressure on shift plunger while cross pin is removed.

To disassemble the drive shaft, the water pump must first be removed. On four cylinder models, remove the water pump cover (30—Fig. M100) using Mercury tool 91-22119

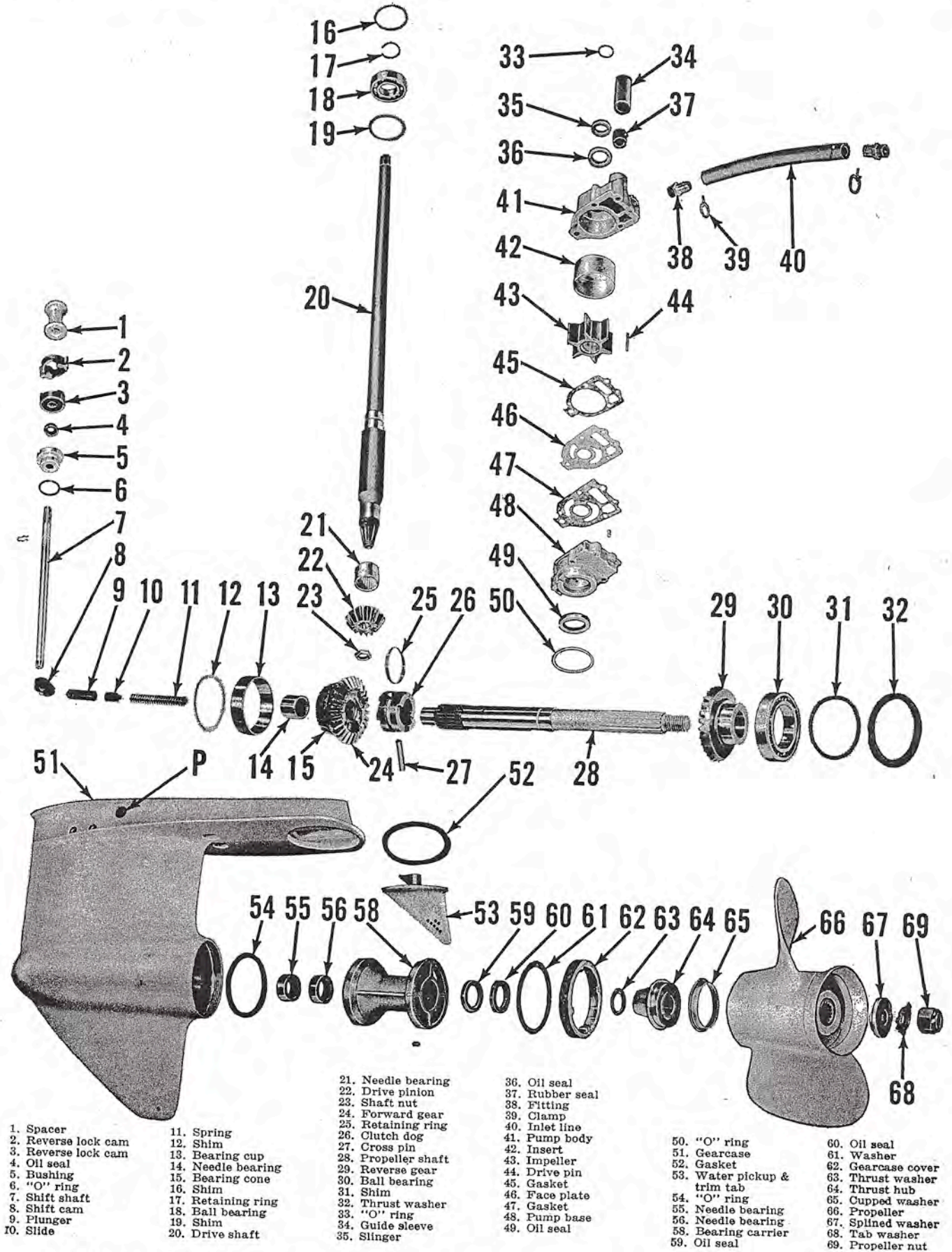


Fig. M101—Exploded view of lower unit gearcase and associated parts used on six cylinder, full gear shift models.

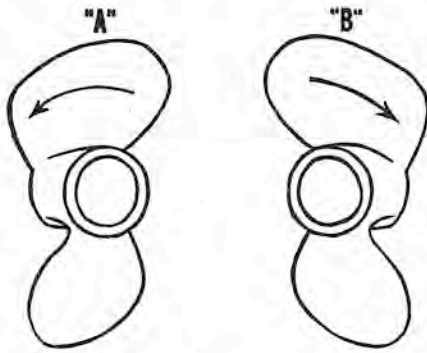


Fig. M102—Before disassembling the direct drive lower unit, check to see if it is Standard Rotation (A) or Counter Rotation (B).

or a suitable spanner wrench. Lift off the outlet plate (31); then remove impeller (32) by prying it out with two screwdrivers. Remove the impeller drive pin (33). Removal of the water pump cartridge (35) requires the use of Mercury Cartridge Removal Tool (91-22118A1) or equivalent, to pull the cartridge.

On six cylinder models, disassemble pump as removed, using Fig. M101 as a guide. The flushing plug must be removed from plug hole (P) before pump base (48) can be withdrawn.

To remove the drive shaft, remove the retaining screw (21—Fig. M100) or nut (23—Fig. M101). Clamp the drive shaft in a protected vise and tap the housing downward with a soft mallet. Remove and save the shim pack (41—Fig. M100 or 19—Fig. M101) located under the drive shaft ball bearing. These shims control the mesh position of drive pinion. On six cylinder motors, shims (19—Fig. M101) are identical to shims (16) above the bearing which control shaft end play. The two shim packs should not be mixed.

The forward gear (24—Fig. M101) on six cylinder models can be removed after drive shaft and drive pinion have been removed. Forward gear (13—Fig. M100) on four cylinder models can usually be removed after drive shaft is out by jarring open end of gearcase on a wooden block.

If any of the major components are renewed, or if incorrect before disassembly, the backlash must be checked and adjusted. On four cylinder models install forward gear (13—Fig. M100) and bearing (12) using the same thickness shims (11) as were removed. Temporarily install drive shaft (18) and bearing (40) using the removed shim pack (41). Install pinion (20) and retaining screw (21); then tighten screw. Backlash should be 0.003-0.005 and ends of teeth on gear (13) and pinion (20) should be even and fully meshed. Adjust backlash by disassembling; then adding or removing shims (11). If mesh position was incorrect, add or remove shims (41). Shims are available in thicknesses of 0.002, 0.003, 0.005 and 0.010.

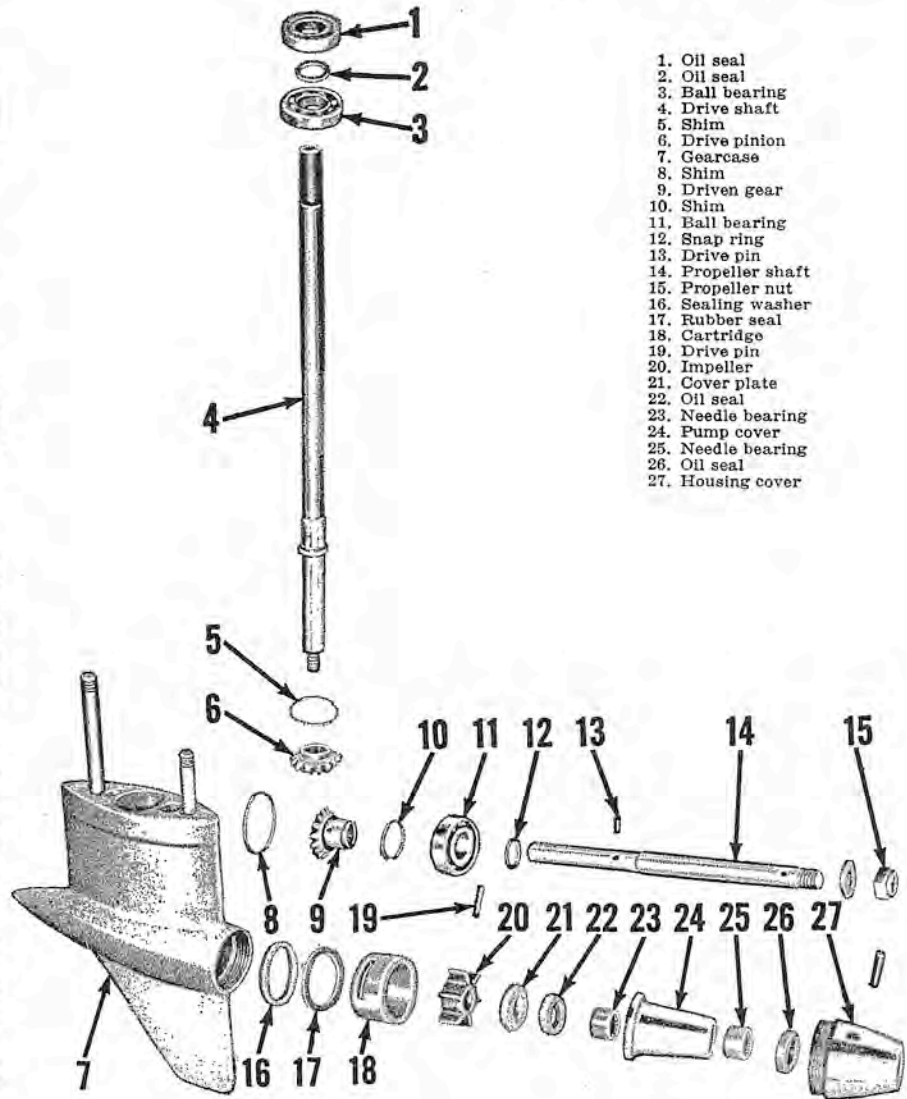


Fig. M103—Exploded view of "Quicksilver" gearcase and associated parts used on older models.

On six cylinder models make a trial assembly by installing bearing cup (13—Fig. M101) and shims (12); then forward gear (24) and bearing cone (15). Install drive shaft (20) and bearing (18) using the removed shim pack (19); then install pinion (22) and nut (23). Tighten the driveshaft nut. Insert the stripped propeller shaft (28) through forward gear to hold it in position; then check the backlash. Adjust to 0.003-0.005 by adding or removing shims (12). Adjust mesh position by means of shims (19). Shims are available in thicknesses of 0.002, 0.003, 0.005 and 0.010.

When adjustment is complete, reassemble by reversing the disassembly; then measure backlash of the reverse gear. Adjust to 0.003-0.005 by means of shims (24—Fig. M100 or 31—Fig. M101). NOTE: Adding shims in four cylinder models will INCREASE backlash.

On six cylinder units, add sufficient quantity and thickness of shims (16—Fig. M101) to bring the assembled height flush with seating surface of water pump base (48). This measurement can best be determined by installing additional shims, then measuring the resulting gap with a feeler gage.

**Direct Drive Types:** Direct drive type lower units have no shifting mechanism or clutches. The direction of travel is reversed by reversing direction of rotation of the engine. On late models, the propeller shaft may rotate in either the standard (counter-clockwise) direction as shown in view "A" (Fig. M102) or clockwise as in the counter-rotation unit shown in view "B". Refer to Fig. M102 to determine the type of unit being serviced.

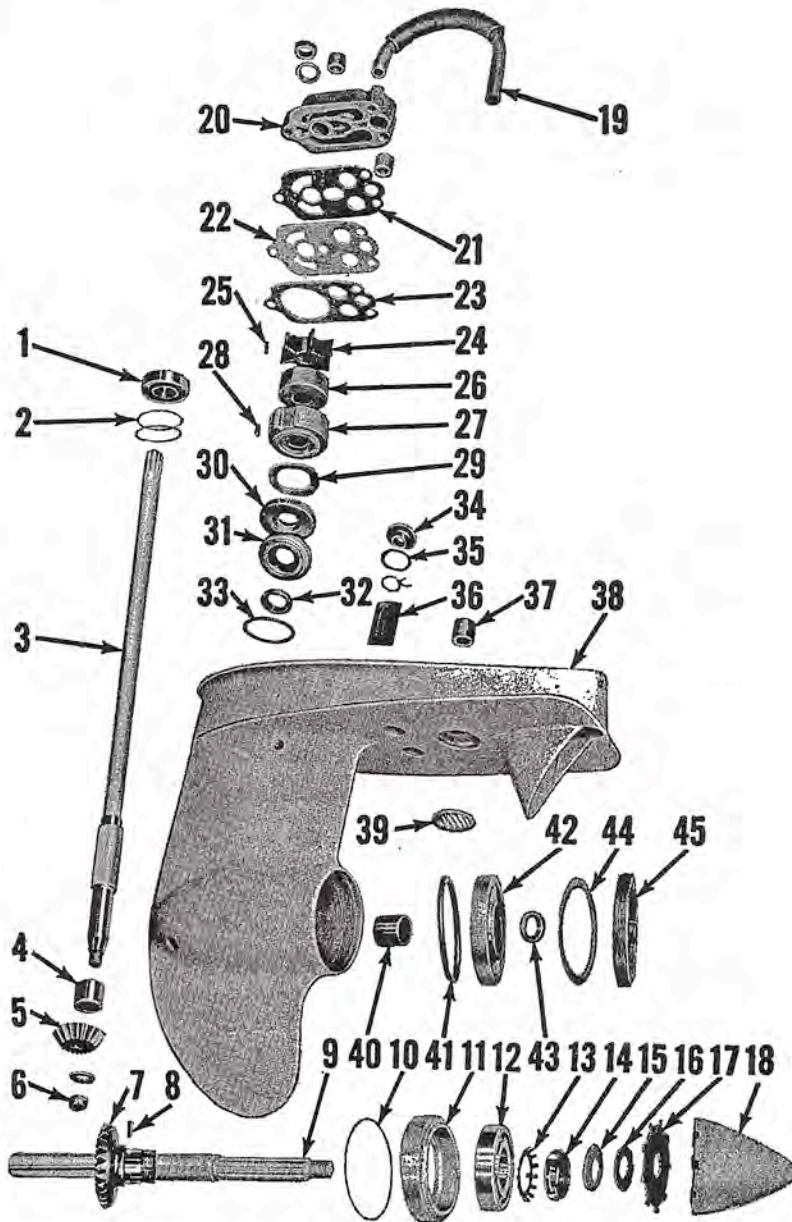


Fig. M104—Exploded view of Standard Rotation gearcase and associated parts used on direct reversing models, Illustrated is Merc 600 unit. Refer also to Fig. M105.

- |                    |                    |                     |
|--------------------|--------------------|---------------------|
| 1. Ball bearing    | 16. Splined washer | 31. Carrier         |
| 2. Shim            | 17. Tab washer     | 32. Oil seal        |
| 3. Drive shaft     | 18. Propeller nut  | 33. "O" ring        |
| 4. Needle bearing  | 19. Water tube     | 34. Valve adaptor   |
| 5. Drive pinion    | 20. Pump cover     | 35. Shim            |
| 6. Shaft nut       | 21. Gasket         | 36. Water valve     |
| 7. Driven gear     | 22. Face plate     | 37. Rubber seal     |
| 8. Drive pin       | 23. Gasket         | 38. Gearcase        |
| 9. Propeller shaft | 24. Impeller       | 39. Water inlet     |
| 10. Shim           | 25. Drive pin      | 40. Needle bearing  |
| 11. Adaptor ring   | 26. Insert         | 41. "O" ring        |
| 12. Ball bearing   | 27. Cartridge      | 42. Bearing carrier |
| 13. Tab washer     | 28. Key            | 43. Oil seal        |
| 14. Bearing nut    | 29. Wave washer    | 44. Washer          |
| 15. Washer         | 30. Cover          | 45. Housing cover   |

QUICKSILVER UNIT. Refer to Fig. M103. The water pump is housed on and driven by the propeller shaft as shown. Gearcase cover cone (27) has a left hand thread. Remove cover cone using Mercury tool 91-24117 or equivalent. Lift off cover (24) and remove impeller (20) by prying out with screwdrivers. Remove water pump cartridge (18) using Mercury puller 91-24120. Secure propeller shaft (14) in a protected vise and tap housing (7) from shaft with a soft mallet. Remove nut from lower end of drive shaft (4) then remove the shaft by tapping on housing (7) to free the pinion and bearing.

Assemble by reversing the disassembly procedure. Adjust the backlash to 0.003-0.005 by adding or removing shims (8); then adjust propeller shaft to minimum end play by adding or removing shims (10). Shims (8) are available in thicknesses of 0.002, 0.003, 0.005 and 0.010; shims (10) in thicknesses of 0.003, 0.005 and 0.010.

STANDARD ROTATION UNIT. Refer to Fig. M104. Measure and record the gear backlash before disassembling the gearcase.

To remove the propeller shaft, clamp the housing in a protected vise and remove the gearcase cover (45) using the appropriate Mercury Gearcase Cover Tool or a suitable spanner wrench. Gearcase cover is secured by a left-hand thread. Grasp propeller shaft in a vise and remove shaft assembly by tapping housing (38) from shaft with a soft mallet. NOTE: On Merc 800 models, the bearing carrier is similar to that shown at (31—Fig. M105). Carrier can only be partially removed without first removing dowel locating pin (32).

Disassemble the propeller shaft by removing the snap ring and shims (early models); or the nut (14—Fig. M104) (late models); then pressing bearing off gear (7). Check to see if nut (14) is right-hand or left-hand thread. Nut is stamped "LH" if secured with left-hand thread.

After bearing is removed, withdraw the pin (8) and press gear (7) from shaft. The pin is normally a loose fit, and is retained by the bearing. If pin cannot be jarred out, remove by inserting a small punch in hole on opposite side of gear and shaft. On early models without extra hole, the pin must be drilled out if excessively tight.

To disassemble the drive shaft, remove the water pump stud nuts and disassemble the water pump as it is removed. Remove nut (6) from lower end of drive shaft, secure upper end of shaft in a protected vise, then tap gearcase from shaft using a soft mallet.

Shims (2) control the mesh position of the drive pinion. Mesh position can be determined by making a trial installation of drive shaft and bearing, using the removed shim pack. Install drive pinion (5) and install and tighten the retaining nut (6). Assemble propeller shaft gear (7) to shaft (9); insert the assembly without bearing into gearcase and check for full engagement of gear teeth. Add or remove shims (2) as required.



Install adaptor ring (11), bearing (12), washer (13) and nut (14) on propeller shaft and tighten and secure the nut. Install the assembly in gearcase using the shims (10) which were removed. Tap the shaft securely into place and check the backlash; which should be 0.003-0.005. If backlash is not correct, add or remove shims (10) as required. Shims are available in thicknesses of 0.002, 0.003, 0.005 and 0.010 on Merc 800 models; and 0.002, 0.003 and 0.005 on other models.

When assembling the water pump, check the neoprene water valves (36) to be sure they are in good condition. Install the adaptors (34) so that flat sides are together, using a sufficient quantity of shims (35) to bring top surface of adaptors even and flush with top of housing. Shims are available in thicknesses of 0.003, 0.005 and 0.010.

**COUNTER-ROTATION UNIT.** Refer to Fig. M105. Service and adjustment procedures are similar to that of Standard Rotation Units covered in the preceding paragraph. Follow the procedures outlined in the preceding paragraph except for the following differences.

Propeller shaft cannot be withdrawn until after driveshaft is removed. After removing the housing cap (39), withdraw bearing carrier (31—Fig. M105 or 42—Fig. M104) using Mercury tool 91-27780 for Merc 700 and 800 models; or 91-29456A3 for other models. Bend down the locking tabs on washer (14—Fig. M105); then remove nut (15) using Mercury tool 91-29925A1 for Merc 700 and 800; or 91-28953 for other models. Remove ball bearing (13) and adaptor (12) using Mercury puller 91-29456A3. If puller is not available, jar the end of propeller shaft sharply on a block of wood to dislodge the bearing.

After bearing has been removed, remove the drive shaft as outlined for Standard Rotation Units; then withdraw the propeller shaft. Adjust the gear backlash by adding or removing shims (8). **NOTE:** Adding shims will **DECREASE** the backlash on Counter-Rotation units.

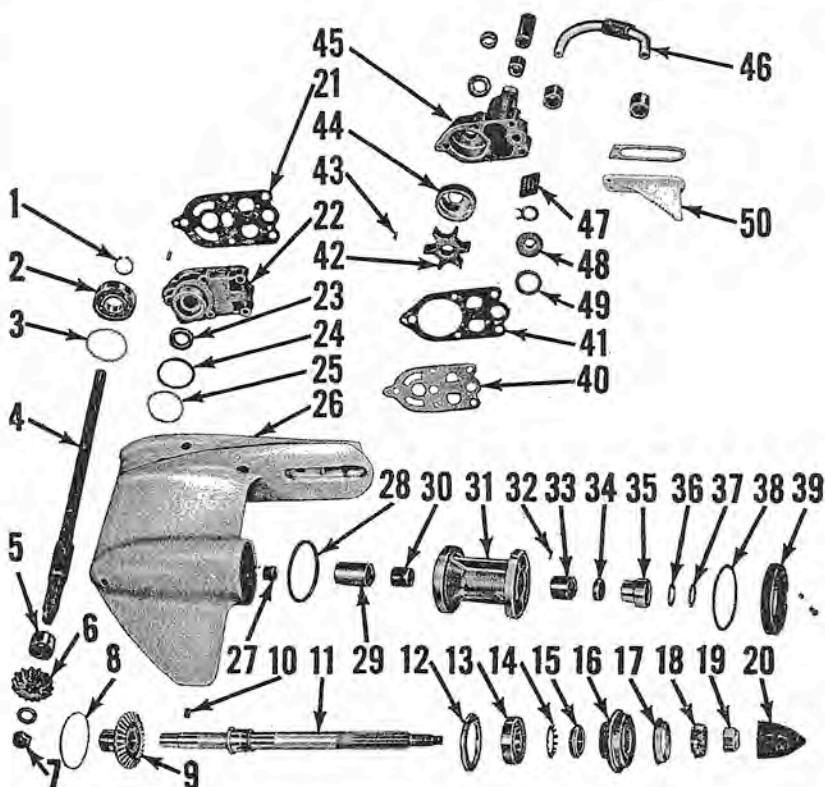


Fig. M105—Exploded view of Counter Rotation gearcase and associated parts used on direct reversing models. Illustrated is Merc 800 unit. Refer also to Fig. M104.

- |                     |                     |                    |
|---------------------|---------------------|--------------------|
| 1. Snap ring        | 18. Cupped washer   | 35. Sealing sleeve |
| 2. Ball bearing     | 19. Propeller nut   | 36. "O" ring       |
| 3. Shim             | 20. Cap             | 37. "O" ring       |
| 4. Drive shaft      | 21. Gasket          | 38. Washer         |
| 5. Needle bearing   | 22. Pump cover      | 39. Housing cover  |
| 6. Drive pinion     | 23. Oil seal        | 40. Facing plate   |
| 7. Shaft nut        | 24. "O" ring        | 41. Gasket         |
| 8. Shim             | 25. Shim            | 42. Impeller       |
| 9. Driven gear      | 26. Gearcase        | 43. Drive pin      |
| 10. Drive pin       | 27. Needle bearing  | 44. Insert         |
| 11. Propeller shaft | 28. "O" ring        | 45. Pump body      |
| 12. Washer          | 29. Spacer          | 46. Inlet line     |
| 13. Ball bearing    | 30. Needle bearing  | 47. Water valve    |
| 14. Tab washer      | 31. Bearing carrier | 48. Valve adaptor  |
| 15. Bearing nut     | 32. Locating pin    | 49. Shim           |
| 16. Thrust hub      | 33. Needle bearing  | 50. Water inlet    |
| 17. Cupped washer   | 34. Oil seal        |                    |