

Connect the high-tension leads to the proper spark plugs.

42- Mount the engine in a test tank. Connect the fuel lines. Start the engine and follow the break-in procedures given after the caution.

CAUTION

Water must circulate through the lower unit to the powerhead anytime the powerhead is operating to prevent damage to the water pump in the lower unit. Just five seconds without water will damage the water pump impeller.

Break-in Procedures

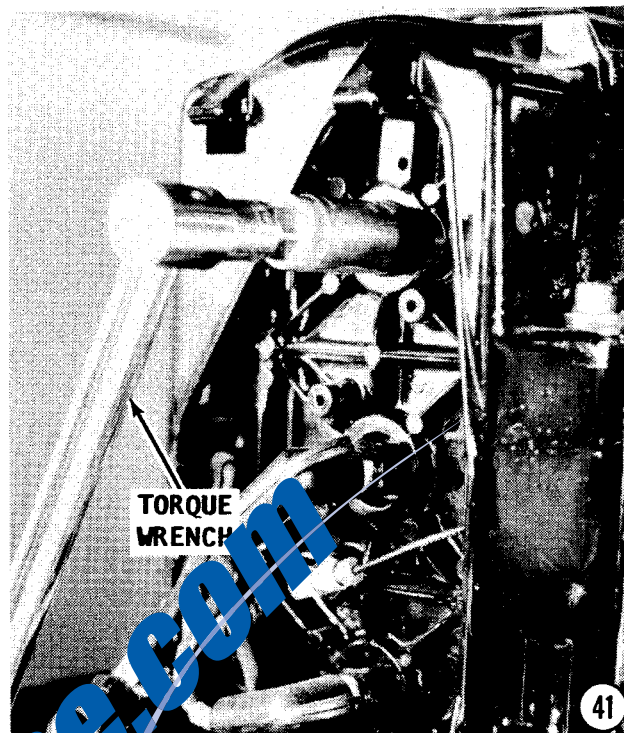
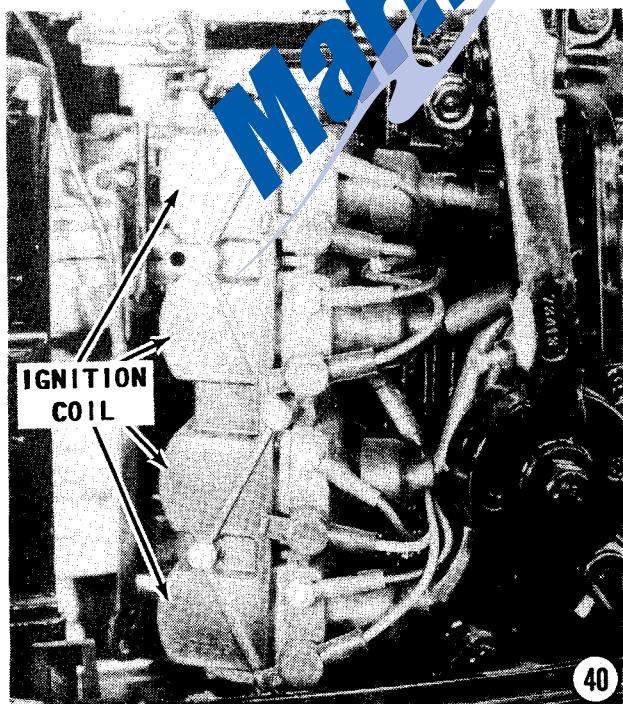
As soon as the engine starts, **CHECK** to be sure the water pump is operating. If the water pump is operating, a water mist will be discharged from the exhaust relief holes at the rear of the drive shaft housing.

During the first 10 hours of operation, **DO NOT** operate the engine at full throttle (except for **VERY** short periods). Perform the break-in as follows:

a- Operate at 1/2 throttle, approximately 2500 to 3500 rpm, for 2 hours.

b- Operate at any speed after that, **BUT NOT** at sustained full throttle, for another 8 hours of operation.

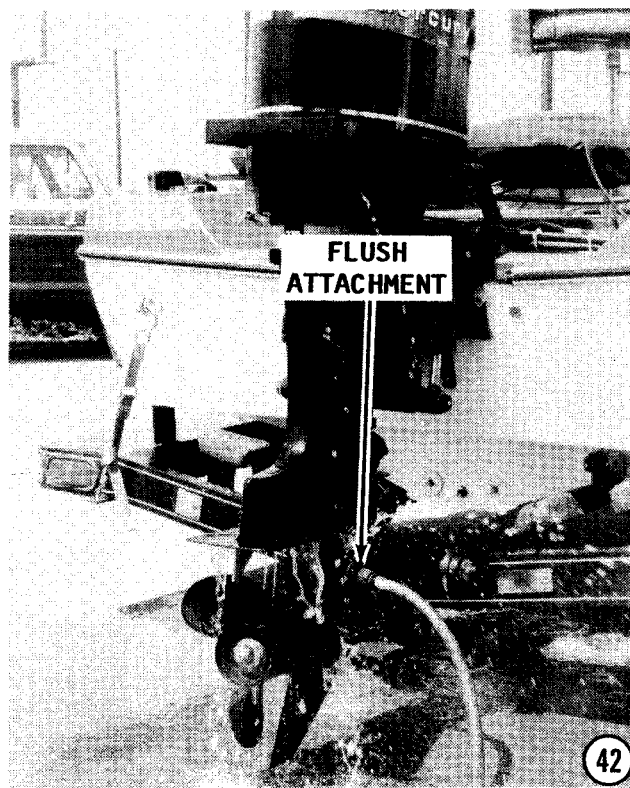
c- Mix gasoline and oil during the break-in period, total of 10 hours, at a ratio of 25:1.



d- While the engine is operating during the initial period, check the fuel, exhaust, and water systems for leaks.

e- Refer to Chapter 6 for synchronizing procedures.

After the test period, disconnect the fuel line. Remove the engine from the test tank. Install the engine cowl.



3-3 POWERHEAD SERVICE REDESIGNED MODEL

This Section describes the complete service of Mercury redesigned 3-, and 4-cylinder powerheads, as follows:

50hp	3-cyl.	1991 & On
60hp	3-cyl.	1991 & On
70hp	3-cyl.	1987-1989
75hp	3-cyl.	1990 & On
80hp	3-cyl.	1987-1989
90hp	3-cyl.	1987 & On
100hp	4-cyl.	1988 & On
115hp	4-cyl.	1989 & On

ADVICE

Before commencing any work on the powerhead, an understanding of two-cycle engine operation will be most helpful. Therefore, it would be well worth the time to study the principles of two-cycle engines, as outlined briefly in Section 3-1 of this chapter. A Polaroid, or equivalent instant-type camera is an extremely useful item, providing the means to accurately record the arrangement of parts and wire connections **BEFORE** the disassembly work begins. Such a record is most valuable during the assembly work.

In order to obtain the maximum benefits from the overhaul work, the instructions outlined in this section for removal, disassembly, assembling and operation should



Photograph of a "classroom" type cutaway redesigned larger bore block used on some 3- and 4-cylinder powerheads since 1988. The block and head are cast in one piece. Only the cylinder and exhaust covers are removable to gain access to the water jacket surrounding the cylinders.

be followed in the sequence given. If complete disassembly is not required, begin the assembling sequence at that point, after following the Cleaning and Inspecting procedures for the items disassembled. Cleaning and Inspecting procedures are given at the end of the chapter beginning on Page 3-66.

Complete disassembly of the powerhead is usually not necessary to perform some tasks, such as one or more of the following:

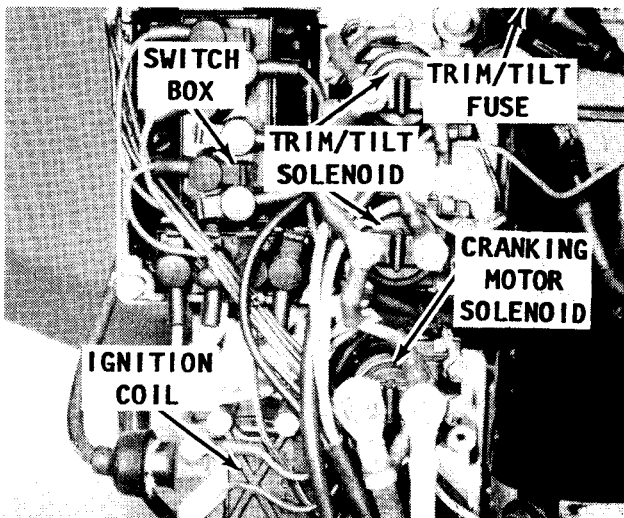
- a- To inspect the cylinder walls and pistons.
- b- Minor repairs on supporting components. Example, the ignition system, carburetors, and the reed blocks.
- c- Operational check of the thermostat and temperature sender.

POWERHEAD REMOVAL

The following procedures are accompanied by a series of captioned illustrations which show the sequential steps.

Disconnect the engine battery cables from the battery terminals. Disconnect the fuel line from the fuel tank. Remove the front engine cowling cover. Remove the port and starboard halves of the engine cowling. Separate the electrical extension harness connectors. Disconnect the remote control cables from the powerhead.

STOP, and carefully observe the wiring and hose connections before proceeding. Because there are so many different powerheads and the arrangement is slightly different on each, it is not possible to illustrate



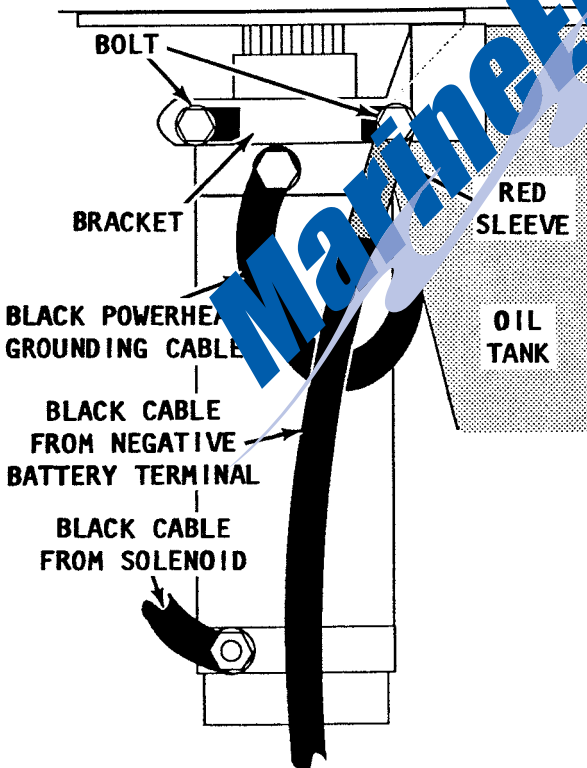
Take time to study and TAG any wire leads disconnected from the ignition plate and surrounding electrical components. The tags will help ensure the leads are reconnected to the proper terminals.

each and every one. Even if they were shown, the reader would not be able to identify the powerhead being serviced. Therefore, **TAKE TIME** to make notes and tag the wire leads and hoses. You may elect to follow the practice of many professional mechanics by taking a series of photographs of the powerhead, one from the top, and a couple from the sides showing the wiring and arrangement of parts.

50hp and 60hp Powerheads Only

Disconnect both leads from the battery. Disconnect the first Black cable from the lower terminal on the cranking motor. Disconnect the second large Black cable from the upper terminal on the cranking motor. Remove the two bolts securing the cranking motor bracket, the third large Black cable and the oil injection tank to the powerhead. Remove the bracket and cranking motor from the powerhead.

Disconnect the high tension leads from the spark plugs. **ALWAYS** use a pulling and twisting motion as a precaution against damaging the connection. Remove the spark plugs.

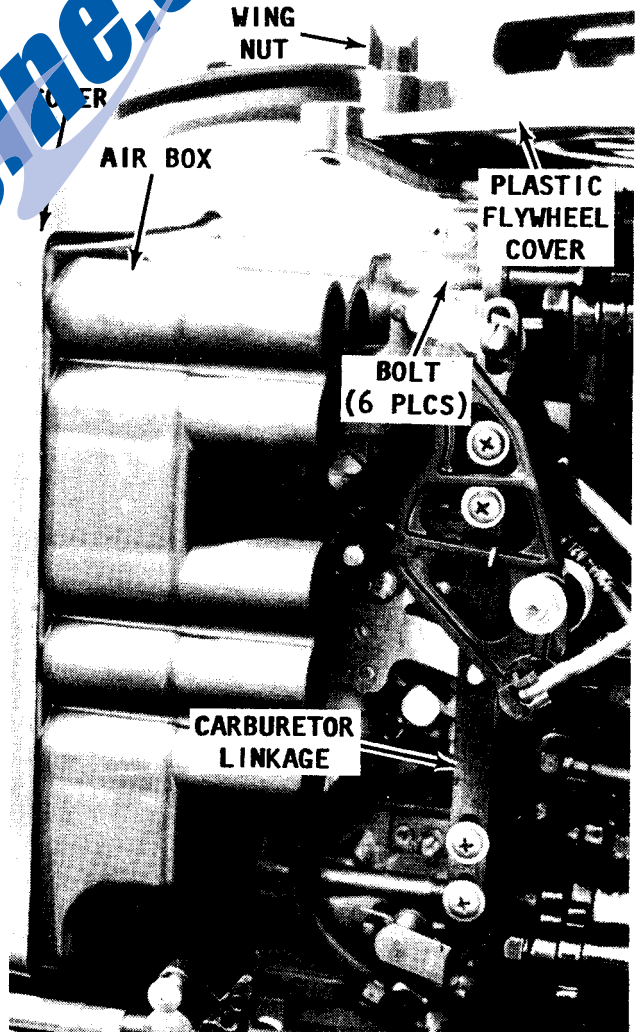


Identification of the three Black cables connected to the cranking motor on a 50hp or 60hp powerhead since 1991. One of the bracket securing bolts also secures the oil tank to the powerhead.

Remove the six bolts securing the cover to the electrical box. The ignition switch-box, ignition coil, fuse, starter solenoid, and rectifier/regulator are all mounted inside the electrical box. All these electrical components will be removed as an assembly when the box is removed. Disconnect the White/Black, Purple, Brown, and White leads between the electrical box and the stator and trigger assembly. Next, disconnect the wiring harness connector.

Locate the low oil warning module secured to the inside of the lower powerhead cover and disconnect the following leads: Tan, Purple, two Light Blue leads and a Black ground eye lead. Remove the two bolts securing the module to the cover and remove the module.

Remove the securing hardware and lift out the electrical box with all electrical components undisturbed.



The three carburetors, air box with cover, linkage and fuel lines are removed from the powerhead as an assembly.

Disconnect the Blue/White, Green/White, and Red/Black leads at the trim switch located on the side of the lower powerhead cover.

Remove the four screws securing the cover to the air box. Remove the six long bolts securing the three carburetors to the intake manifold. The carburetors are held together as an assembly by the two forward straps, throttle and choke linkage and fuel lines.

Disconnect the fuel supply line and the primer line, if equipped. Disconnect the fuel line between the enrichener valve and the fitting on the fuel bowl of the top carburetor, and the line between the valve and the fitting at the base of the oil pump. Lift off all three carburetors, as an assembly, with linkage and fuel lines between the carburetors still intact.

Disconnect the two Light Blue leads from the low oil sensor, located at the base of the oil tank, at their quick disconnect fittings. If the oil tank contains oil, make arrangements to plug the oil line once it is pulled free of the fitting, to prevent oil from spilling into the lower powerhead cover. Snip the tie wrap from the oil supply line, from the tank, at the oil inlet to the pump. Ease the line free of the fitting on the pump and lift out the oil tank.

Disconnect the oil outlet line between the pump and the 2 psi check valve to the fuel pump. Remove the retaining bolts and remove the oil pump from the powerhead.

Snip the tie wrap from the inlet, outlet, and pulse lines of the fuel pump. Remove the two screws and screws securing the pump to the powerhead. Lift off the pump.

Remove the top bolt securing the barrel retainer over the control cable barrels. Swing the retainer down to clear both barrels.

Remove the locknuts and washers securing the throttle and shift cable ends to the throttle lever and shift actuator stud. Slide the cables and barrels away from the barrel receptacles cast into the block and lift both cables clear.

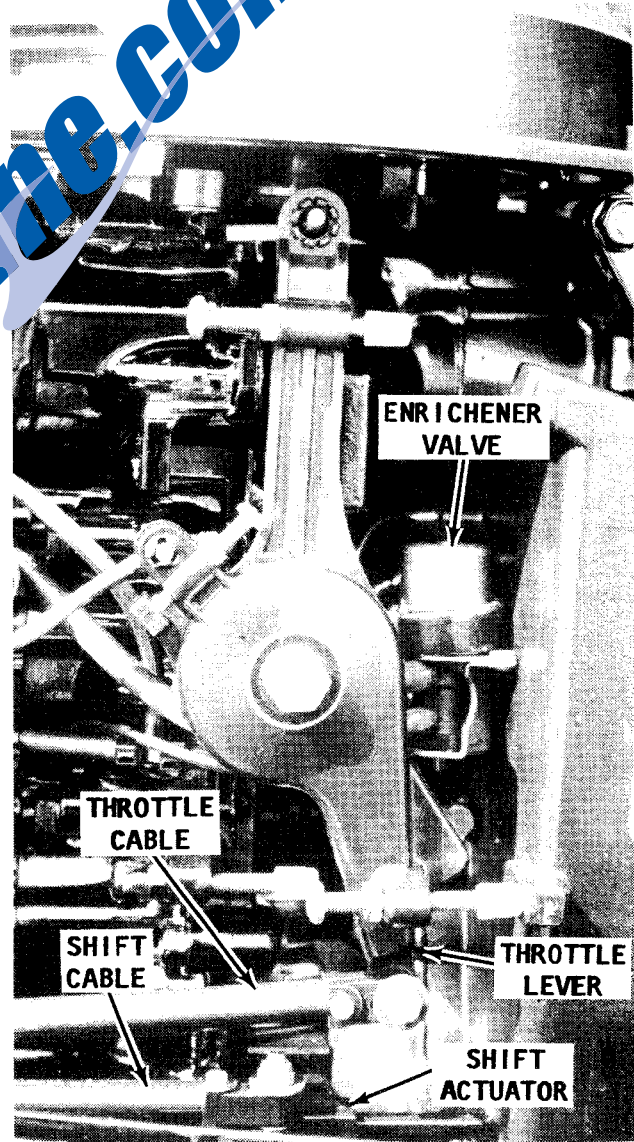
Make a final check to make sure no other leads or attachments will impede the removal of the powerhead.

Remove the four bolts securing the lower powerhead cover to the intermediate housing, and remove the cover.

Next, remove the six bolts securing the powerhead to the intermediate housing.

Remove the three wing nuts securing the plastic flywheel cover to the powerhead. Remove the plastic cap from the end of the crankshaft. Thread a lifting eye onto the end of the crankshaft as far as it will go. Using a suitable hoist, lift the powerhead assembly clear of the intermediate housing. Remove all traces of the base gasket.

Mount the powerhead onto some type of stand, to facilitate easy access to all parts. **NEVER** attempt to mount the powerhead in a stand secured in a vise. Such an attempt will only lead to damage of the powerhead and possible personal injury. Remove the lifting eye from the crankshaft.



Fuel system and control cable components on the portside of a 60hp powerhead.

CHECK REWIND OPERATION

SLOWLY pull the starter rope outward. The pawls must move to the engaged position as the pawl retainer plate begins to turn. If the pawls fail to engage, check the alignment or replace the wavy washers between the pawls. Again, extend the rope to its full length and allow it to rewind. The rope should rewind smoothly without catching. **NEVER** release the rope from the fully extended position.

If the rewind mechanism catches, but fails to rewind, the sheave shaft and its wavy washer are not correctly aligned. The unit **MUST** be disassembled to correct the condition.

Once the rewind operation is satisfactory, proceed to the next step.

15- Bend two tabs of the tab washer up against the flats of the retaining nut. Use tabs opposite each other. Bend one other tab down into the recess of the rewind housing. Install the rewind starter onto the powerhead and secure the legs with the screws and lockwashers.



15

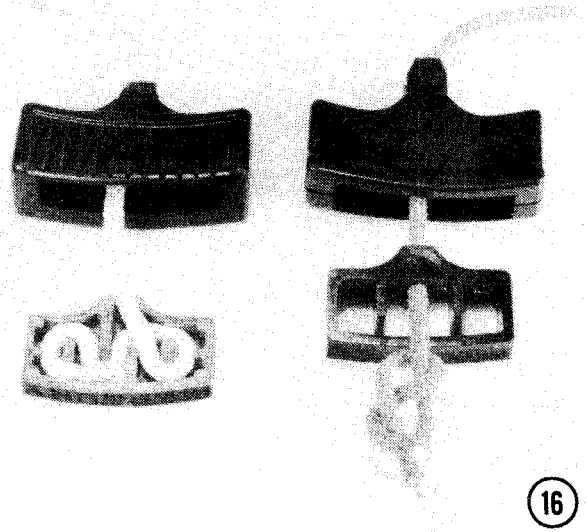
Attach the shift interlock actuator cable securing screw and the retainer clip, as shown in the accompanying illustration.

If the choke handle shaft passes through the top of the cowl, feed it through and make the connection to the lower portion of the shaft with the cotter pin.

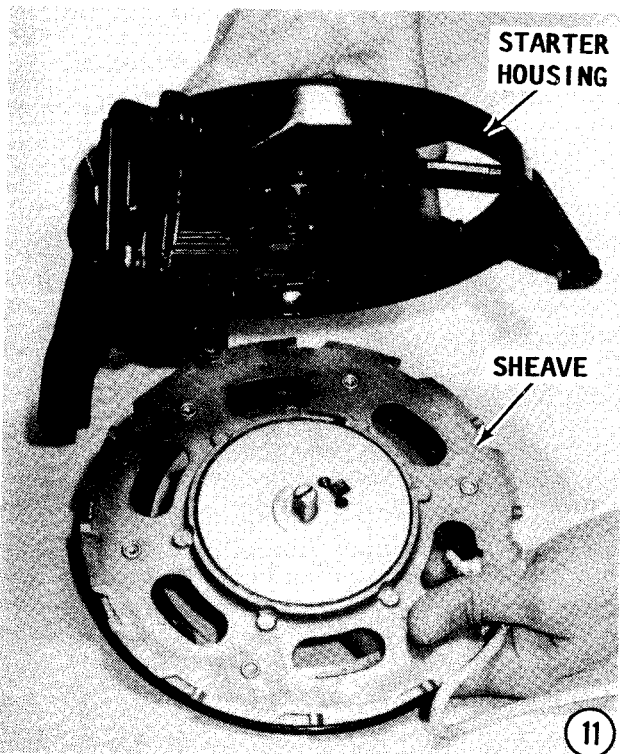
16- Feed the rope through the top cowl and install the rope retainer. Two styles of retainer are used on this model rewind starter. Secure the one handle with a figure "8" knot in the end of the rope, as shown.



14



16



11- Hold the starter housing with one hand. With the other hand, hold the sheave assembly together, then lift the assembly up and into the housing with the sheave shaft indexed through the hole in the starter housing. Feed the rope through the rope guide. Tie a figure "8" knot in the rope about 1' (30cm) from the end. Push the sheave assembly into the rewind drum.

12- Support the sheave assembly with one hand. Slide a **NEW** tab washer over the threaded portion of the sheave shaft with



the cupped side of the washer facing **DOWN**. Thread the left-hand sheave shaft retaining nut onto the shaft in a **LEFT-HAND (COUNTERCLOCKWISE)** direction until it is just **FINGER-TIGHT**, at this time.

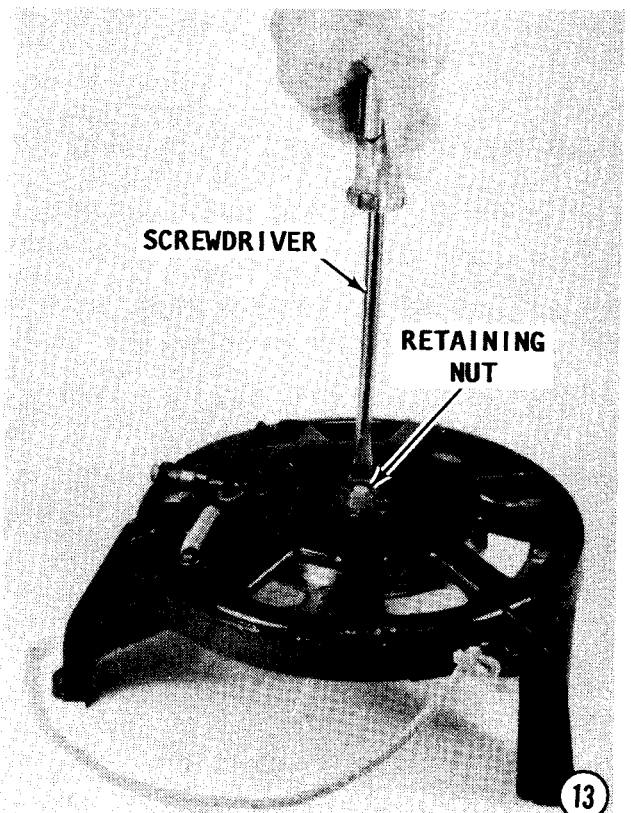
ADJUSTING REWIND SPRING TENSION

13- Insert a large blade screwdriver into the slot of the sheave shaft. Hold the retaining nut with the proper size wrench and at the same time rotate the shaft with the screwdriver **COUNTERCLOCKWISE** until the figure "8" knot in the rope rests against the rope guide. Continue to rotate the shaft through **TWO** full turns after the knot is against the rope guide. The correct tension has now been placed on the rewind spring.

14- Hold the tension on the spring with the screwdriver in the shaft slot and at the same time tighten the retaining nut securely with a **WRENCH** -- left-hand thread -- tight-**COUNTERCLOCKWISE**.

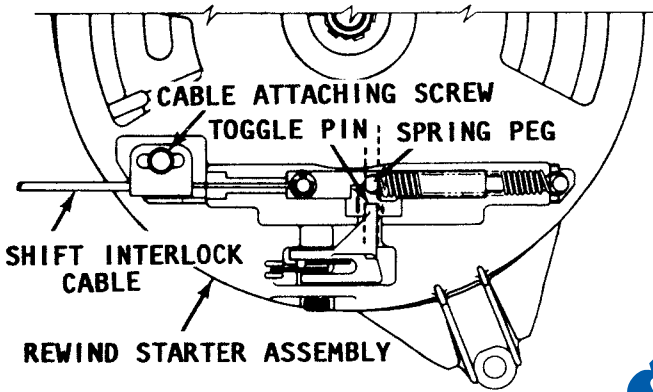
CAUTION WORDS

DO NOT bend the tabs on the washer up against the retaining nut until **AFTER** the rewind operation has been checked.



SHIFT INTERLOCK ADJUSTMENT

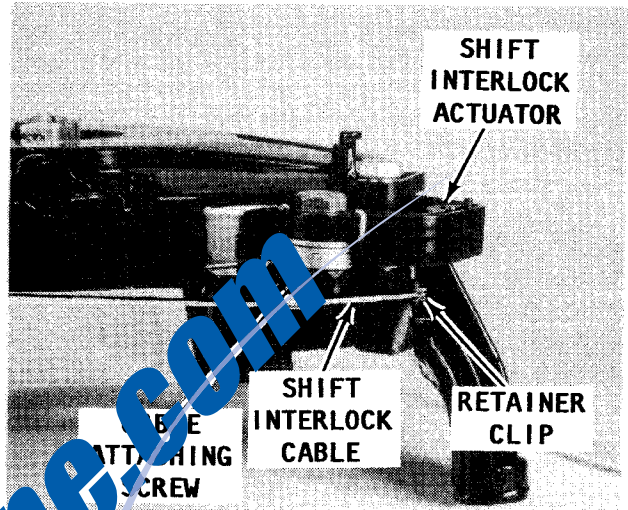
Secure the cable attaching screw to the side of the rewind housing, but **DO NOT** tighten it at this time. Hook the interlock cable over the peg on the interlock actuator with a flat washer and cotter pin. **BE SURE** the control handle is in the **NEUTRAL** position. Adjust the cable until the interlock actuator is positioned on the rise of the interlock cam. Tighten the cable attaching screw to hold this position.



Detailed drawing of an early model rewind starter with the interlock cable installed on top.

Shift the control handle into the **FORWARD** position and try to pull the handle outward. The attempt should fail.

Shift the handle back into the **NEUTRAL** position and again pull on the handle. The rope should rewind normally.



Later model rewind starters are equipped with a shift interlock cable mounted on the side of the starter housing. Early models have the cable mounted on the top of the housing. The interlock cable of both models is secured in the same manner.

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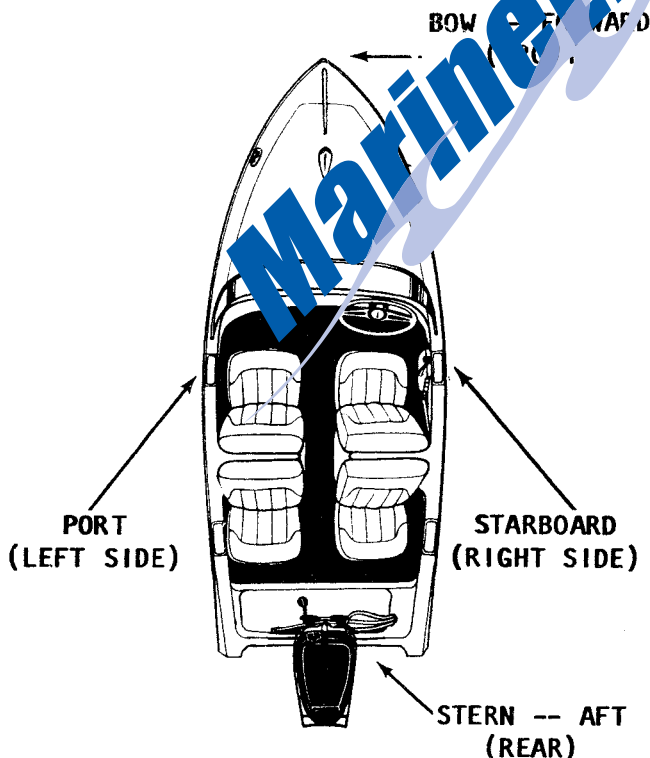
12

MAINTENANCE

12-1 INTRODUCTION

GOOD WORDS: The authors estimate 75% of engine repair work can be directly or indirectly attributed to lack of proper care for the engine. This is especially true of care during the off-season period. There is no way on this green earth for a mechanical engine, particularly an outboard motor, to be left sitting idle for an extended period of time, say for six months, and then be ready for instant satisfactory service.

Imagine, if you will, leaving your automobile for six months, and then expecting to turn the key, have it roar to life, and be able to drive off in the same manner as a daily occurrence.



Common terminology used throughout the world for reference designation on boats of all sizes. These are the terms used in this book.

It is critical for an outboard engine to be run at least once a month, preferably, in the water, but if that is not possible, then a flush attachment must be connected to the lower unit.

CAUTION: Water must circulate through the lower unit of the engine any time the engine is run to prevent damage to the water pump in the lower unit. Just five seconds without water will damage the water pump.

NEVER, AGAIN NEVER, operate the engine at high speed with a flush device attached. The engine, operating at high speed without such a device attached, would **RUNAWAY** from lack of load on the propeller, causing extensive damage.

At the same time, the shift mechanism should be operated through the full range several times and the steering operated from hard-over to hard-over.

Only through a regular maintenance program can the owner expect to receive long life and satisfactory performance at minimum cost.

The material presented in this chapter is divided into five general areas.

1- General information every boat owner should know.

2- Maintenance tasks that should be performed periodically to keep the boat operating at minimum cost.

3- Care necessary to maintain the appearance of the boat and to give the owner that "Pride of Ownership" look.

4- Winter storage practices to minimize damage during the off-season when the boat is not in use.

In nautical terms, the front of the boat is the **bow**; the rear is the **stern**; the right side, when facing forward, is the **starboard** side; and the left side is the **port** side. All directional references in this manual use this terminology. Therefore, the direction