the ammeter reading will be a bit lower due to the self-regulating characteristics of the generating systems. Before disconnecting the ammeter, reconnect the red harness lead to the positive battery terminal and install the wing nut.

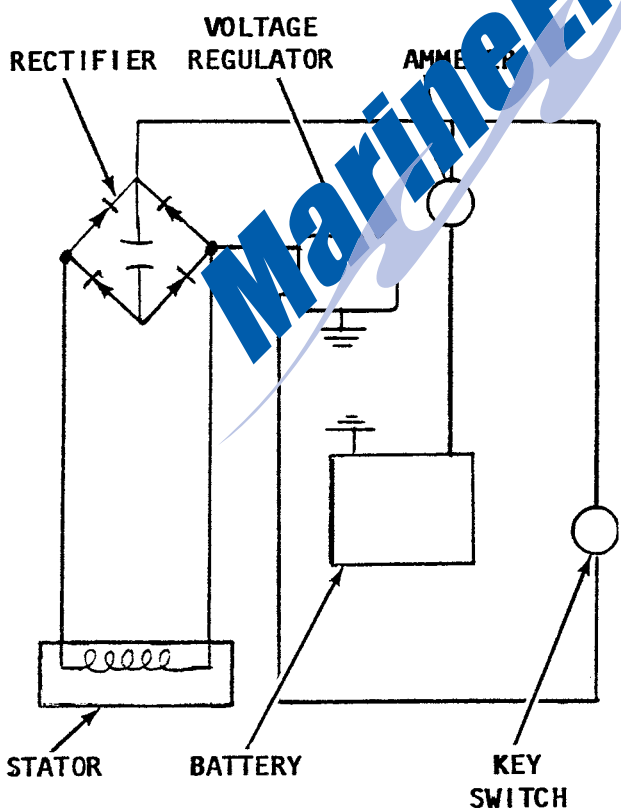
2-8 CARBURETOR ADJUSTMENTS

The carburetors used on the engines covered in this manual do not have either a high-speed nor a low-speed adjustment. Fixed non-adjustable orifices are installed. Detailed service procedures for the carburetor and these orifices are given in Chapter 4.

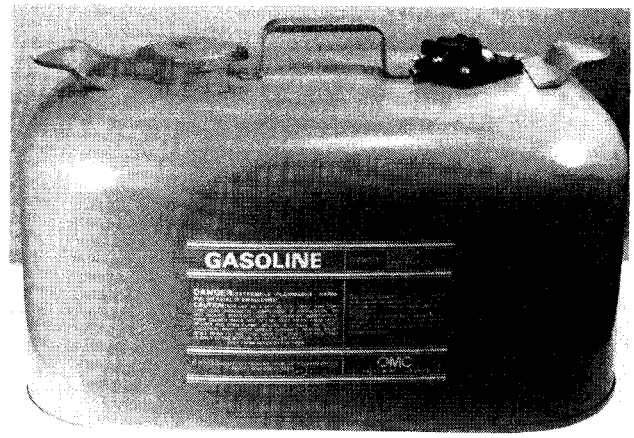
Fuel and Fuel Tanks

Take time to check the fuel tank and all of the fuel lines, fittings, couplings, valves, flexible tank fill and vent. If the fuel was not drained at the end of the previous season, make a careful inspection for gum formation. When gasoline is allowed to stand for long periods of time, particularly in the presence of copper, gummy deposits form. This gum can clog the filters, lines, and passageway in the carburetor.

If the condition of the fuel is in do[ubt], drain, clean, and fill the tank wit[h] fuel.



Wiring diagram for an alternator charging circuit.

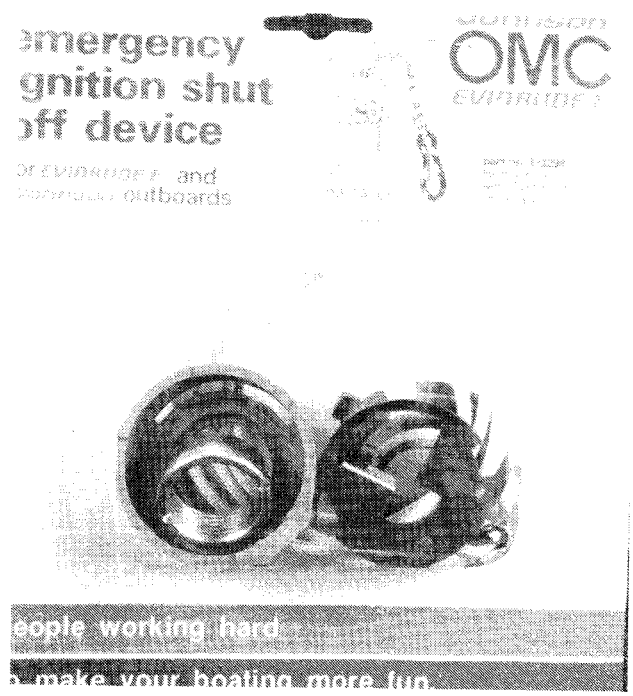


An OMC six-gallon fuel tank with the fuel line connected through a quick-disconnect fitting. Such a fitting is handy when the tank is removed from the boat for filling.

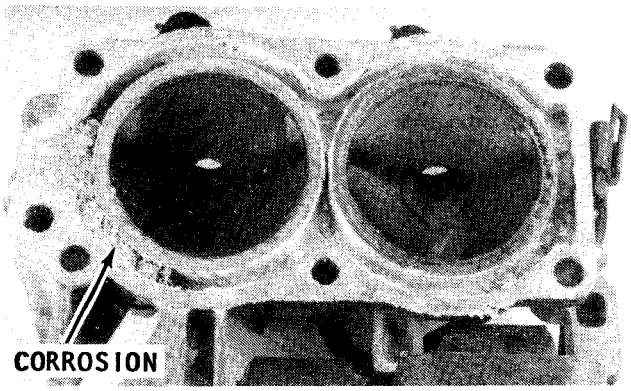
Fuel pres[sure] at the carburetor should be checked whe[n] a lack of fuel volume at the carbu[retor] suspected.

Rep[air] and Adjustments

[Use] detailed procedures to disassemble, [re]assemble, and adjust the carburetor, [see] the appropriate section in Chapter 4 for [the] carburetor type on the engine being [ser]viced.



Emergency ignition safety device. One end of the cord is secured to the ignition key and the other end attached to the helmsman's clothing. Should the man at the wheel be accidentally thrown overboard, the key will be ejected from the ignition and the engine immediately shut down.



Cylinder block water passages corroded, preventing proper circulation of coolant water.

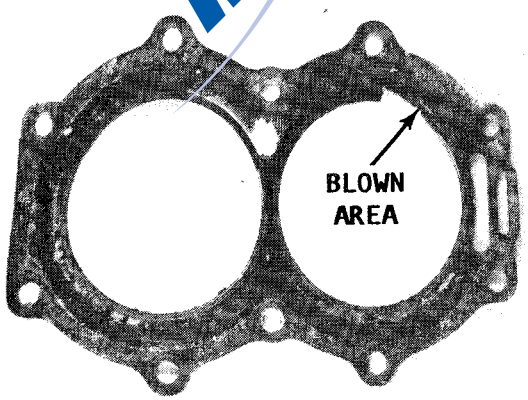
would be the driveshaft "frozen" with the crankshaft. In this case, a circular plug-type hole must be drilled and a torch used to cut the driveshaft. Let's assume the powerhead will come free on the first attempt.

The following procedures pickup the work after these preliminary tasks have been completed.

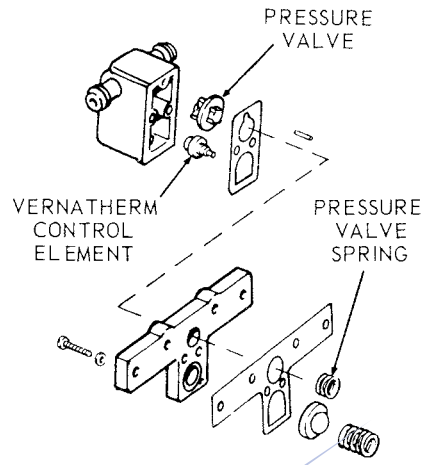
3-4 HEAD SERVICE

Usually the head/s is removed and an examination of the cylinders made to determine the extent of overhaul required. However, if the head/s has not been removed back out all of the head bolts and lift the head/s free of the powerhead.

A thermostat is installed in the [illegible] of all 3-cylinder and V6 engines. [illegible] gines, the thermostat is installed [illegible] Bakelite housing between the [illegible] heads just below the exhaust housing plate. The thermostat has three [illegible] a top, middle, and bottom. A [illegible] the thermostat with each [illegible] addition to the thermostat, the [illegible] has a thermostat



Blown head gasket, possibly caused by an overheating condition. The water can then find its way into the cylinder and cause further damage. The head gasket should be replaced as soon as possible, the engine run, and engine cleaner injected through the carburetor.



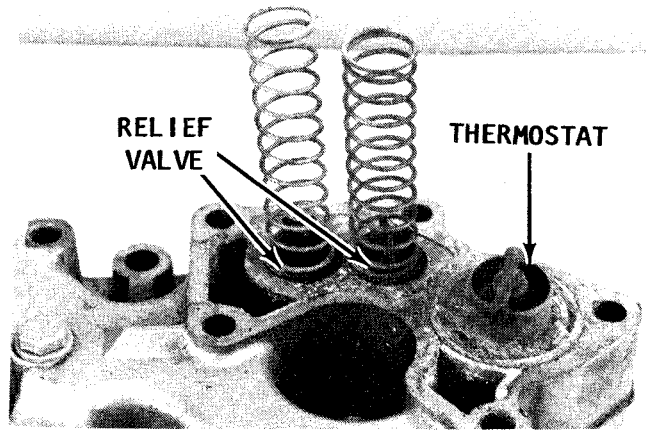
Thermostat installed on late model powerheads, mounted between the [illegible] on V4 engines only.

bypass valve. [illegible]ems are easily removed, inspected [illegible] cleaned.

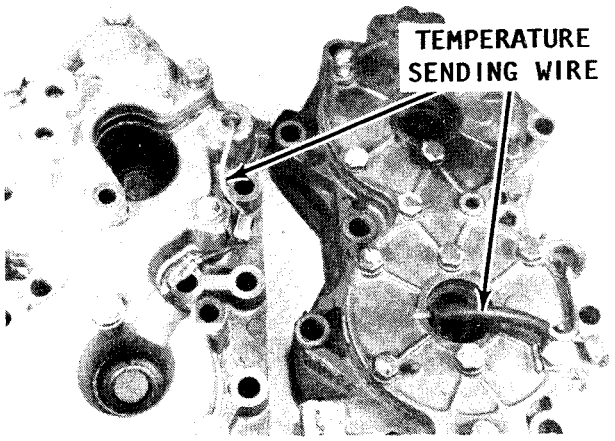
Normally, if a thermostat is not functioning properly, it is almost always stuck in the open position. An engine operating at too low a temperature is almost as much a problem as an engine running too hot. Therefore, during a major overhaul, good practice dictates to replace the thermostat and eliminate this area as a possible problem at a later date.

Lay a piece of fine sandpaper or emery paper on a flat surface (such as a piece of glass) with the abrasive side facing up. With the machined face of the head on the sandpaper, move the head in a circular motion to dress the surface. This procedure will also indicate any "high" or "low" spots.

Check the spark plug opening/s to be sure the threads are not damaged. Most marine dealers can insert a heli-coil into a spark plug opening if the threads have been damaged.



Thermostat installation on a 3-cylinder engine. Both springs are the same weight and control the relief valves.



A 3-cylinder head (left) and a V4 head (right). The water temperature sending unit wire is identified.

On many engines, a sending unit is installed in the head to warn the operator if the engine begins to run too hot. The light on the dash can be checked by turning the ignition switch to the **ON** position, and then ground the wire to the sending unit. The light should come on. If it does not, replace the bulb and repeat the test. On later model engines the light was replaced with a horn mounted in the shift box. This horn sounds if the engine overheats.

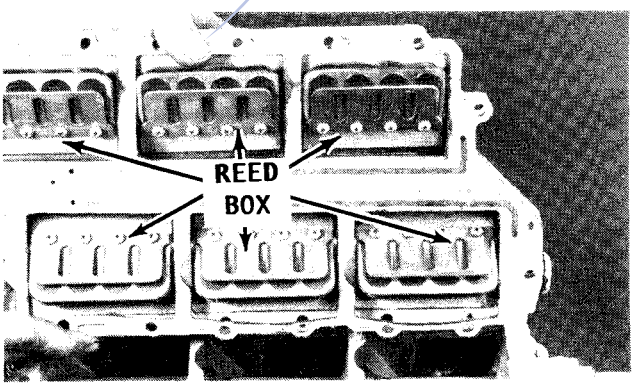
Head installation procedures are given in Section 3-23, Head Installation.

3-5 REED SERVICE

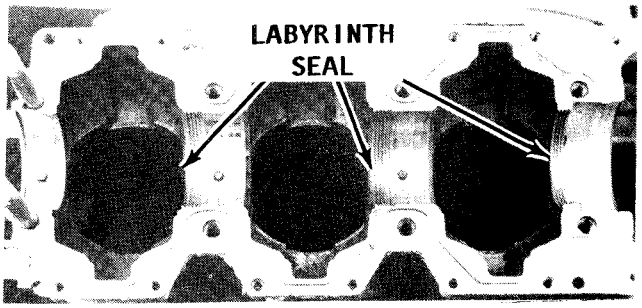
DESCRIPTION

Fuel Delivery

The fuel delivery m[illegible]ne of several types. All three-cyli[illegible]gines are equipped with three [illegible]s, one for each cylinder. V4 e[illegible]s h[illegible]e two carburetors, each with dou[illegible]rels, each barrel serving a single cyl[illegible]r. V6 engines have three double barrel carburetors, each barrel serving a single cylinder.



Six reed boxes mounted in the reed plate of a V6 powerhead.



A 3-cylinder engine block with the labyrinth seals to hold pressure and vacuum within each cylinder.

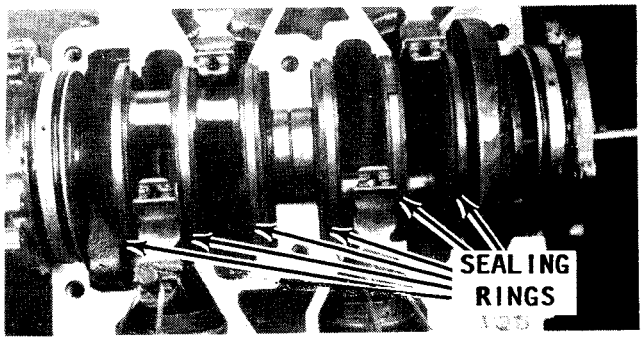
Cylinder Sealing

The three-cylinder engines covered in this manual are equipped with an upper seal and bearing, a lower seal and bearing, and two main bearin[illegible]between. A labyrinth seal is used at t[illegible]o center main bearings and just abo[illegible]bottom seal, to provide an effectiv[illegible]between the cylinders.

On t[illegible]nd V6 engines covered in this manual, a top and bottom seal is used with sea[illegible]gs around the crankshaft in the ce[illegible]between each cylinder, in each bank, [illegible]for pressure and vacuum. The V4 [illegible]ines use 6 rings and the V6 engines use 8 [illegible]ngs.

[illegible]ed Arrangement

On a three-cylinder engine, three sets of reeds are use, one for each cylinder. On a four-cylinder powerhead, four sets of reeds are installed, and the V6 powerhead has six sets of reeds. These reeds are installed on a reed plate with a reed box. Fuel is delivered to the reeds as described in the paragraph above, Fuel Delivery. The reed arrangement operates in much the same manner as the reed in a saxophone or other wind instrument. At rest, the reed is closed and seals the opening to which it is attached. In the case of an outboard engine, this opening is between the crankcase and the carburetor. The reeds are mounted in the intake manifold, just behind the carburetor.



V4 engine block with sealing rings to hold pressure and vacuum within each cylinder.

used for some time and fuel has remained in the carburetor, it is possible that varnish may have formed. Such a condition could be the cause of hard starting or complete failure of the engine to operate.

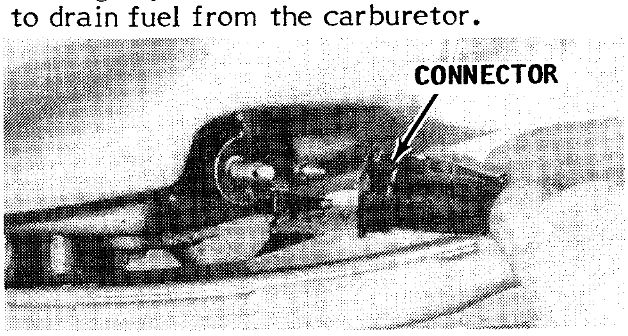
Fuel Problems

Many times fuel system troubles are caused by a plugged fuel filter, a defective fuel pump, or by a leak in the line from the fuel tank to the fuel pump. Aged fuel left in the carburetor and the formation of varnish could cause the needle to stick in its seat and prevent fuel flow into the bowl. A defective choke may also cause problems. **WOULD YOU BELIEVE,** a majority of starting troubles, which are traced to the fuel system, are the result of an empty fuel tank or aged fuel.

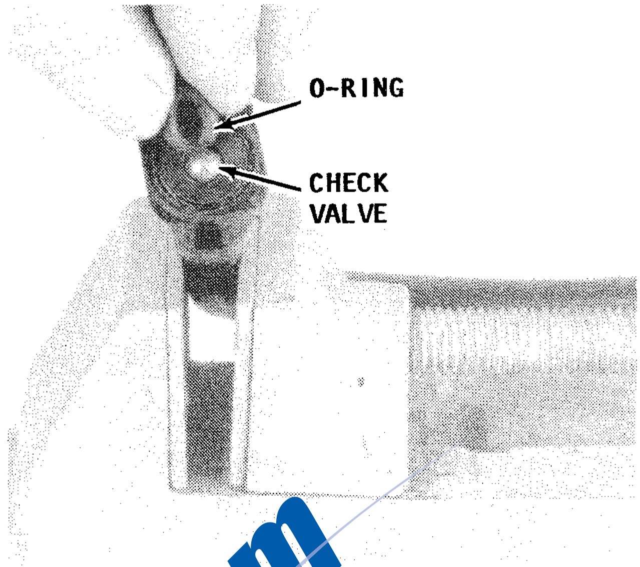
Fuel will begin to sour in three to four months and will cause engine starting problems. Therefore, leaving the motor sitting idle with fuel in the carburetor, lines, or tank, during the off-season, usually results in very serious problems. A fuel additive such as Sta-Bil or OMC 2+4 Fuel Conditioner may be used to prevent gum from forming during storage or prolonged idle periods.

For many years there has been the wide-spread belief that simply disconnecting the fuel line at the engine or at the tank and then running the engine until it stops is the proper procedure before storing the engine for any length of time. Right? **WRONG.**

First, it is **NOT** possible to remove all fuel in the carburetor by operating the engine until it stops. Considerable fuel is trapped in the float chamber, other passages, and in the line leading to the carburetor. The **ONLY** guaranteed method of removing **ALL** fuel, is to take the time to remove the carburetor and drain the fuel. On all engines using high-speed orifice carburetors, the high-speed orifice plug can be removed to drain fuel from the carburetor.



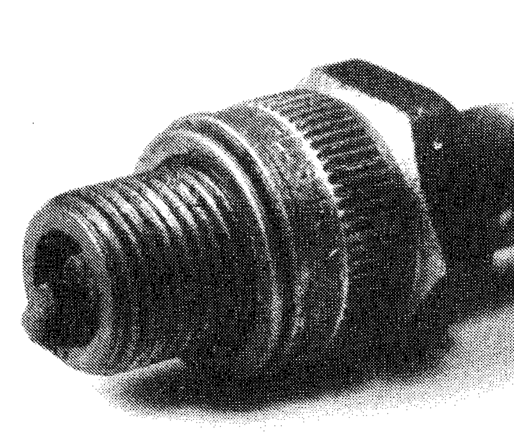
Female fuel line connector ready to be mated with the male portion of the connector.



*Fuel connector with the **O**-ring visible. The **O**-rings have a relatively short life and **MUST** be replaced at regular intervals as explained in the text.*

Secondly, if the engine is operated with the fuel supply disconnect at the "quick-disconnect" until it stops, the fuel and oil mixture inside the engine is removed, leaving bearings, pistons, rings, and other parts without any protective lubricant.

The **proper procedure** involves: disconnecting the fuel line at the tank; operating the engine until it begins to run **ROUGH;** then stopping the engine, which will leave some fuel/oil mixture inside the engine; and finally removing or draining the carburetor. By disconnecting the fuel supply, all **SMALL** passages are cleared of fuel, even though some fuel is left in the carburetor. A light oil should be put in the combustion chamber as instructed in the **Owner's Manual.** On all


Fouled spark plug, possibly caused by operator's habit of over-choking or a malfunction holding the choke closed. Either of these conditions will deliver a too-rich fuel mixture to the cylinder.

engines using high-speed orifice carburetors, the high-speed orifice plug can be removed to drain fuel from the carburetor.

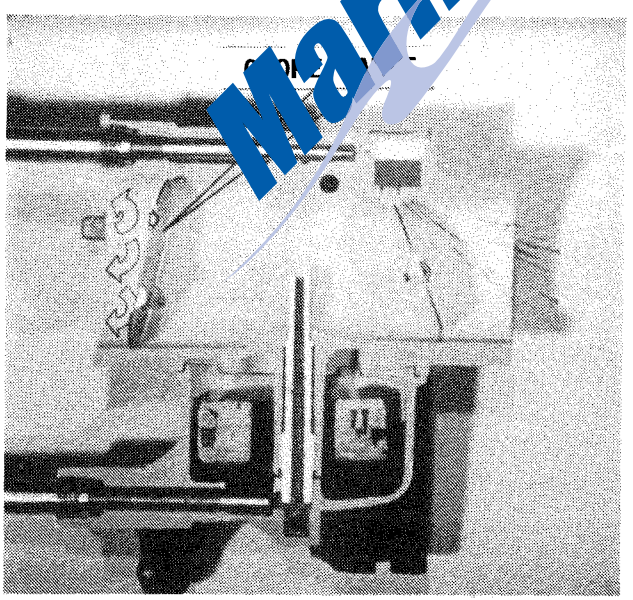
Choke Problems

When the engine is hot, the fuel system can cause starting problems. After a hot engine is shut down, the temperature inside the fuel bowl may rise to 200°F and cause the fuel to actually boil. All carburetors are vented to allow this pressure to escape to the atmosphere, However, some of the fuel may percolate over the high-speed nozzle.

If the choke should stick in the open position, the engine will be hard to start. If the choke should stick in the closed position, the engine will flood making it **VERY** difficult to start.

In order for this raw fuel to vaporize enough to burn, considerable air must be added to lean out the mixture. Therefore, the only remedy is to remove the spark plugs; ground the leads; crank the engine through about 10 revolutions; clean the plugs; install the plugs again; and start the engine.

If the needle valve and seat assembly is leaking, an excessive amount of fuel may enter the intake manifold in the following manner: after the engine is shut down, pressure left in the fuel line will force fuel past the leaking needle valve. This extra fuel will raise the level in the bowl and cause fuel to overflow into the intake manifold.



The choke plays a most important role during engine start and in controlling the amount of air entering the carburetor, under various load conditions.

A continuous overflow of fuel into the intake manifold may be due to a sticking inlet needle or to a defective float which would cause an extra high level of fuel in the bowl and overflow into the intake manifold.

Procedures to troubleshoot the "primer choke system" are given at the end of this chaper.

FUEL PUMP TESTS

CAUTION: Gasoline will be flowing in the engine area during this test. Therefore, guard against fire by grounding the high-tension wire to prevent it from sparking.

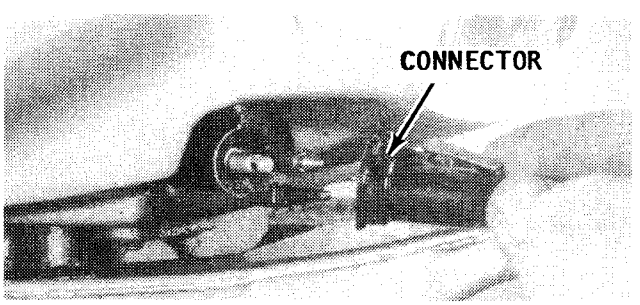
Testing System with Squeeze Bulb

An adequate quality method is to ground each spark plug lead. Disconnect the fuel line at the "quick-disconnect" at the engine. Place a suitable container over the end of the fuel line to catch the fuel discharged. Insert a small screwdriver into the end of the line to open the check valve, and then squeeze the primer bulb and observe if there is satisfactory fuel flow from the line.

If there is no fuel discharged from the line, the check valve in the squeeze bulb may be defective, or there may be a break or obstruction in the fuel line.

If there is a good fuel flow, remove the fuel lines at the carburetors and connect the "quick-disconnect" at the engine. Crank the engine. If the fuel pump is operating properly, a healthy stream of fuel should pulse out of the line.

Continue cranking the engine and catching the fuel for about 15 pulses to determine if the amount of fuel decreases with each pulse or maintains a constant amount. A decrease in the discharge indicates a restriction in the line. If the fuel line is plugged, the fuel stream may stop. If there is fuel in the fuel tank but no fuel flows out



Insert a small screwdriver into the end of the fuel line to open the check valve, as described in the text.

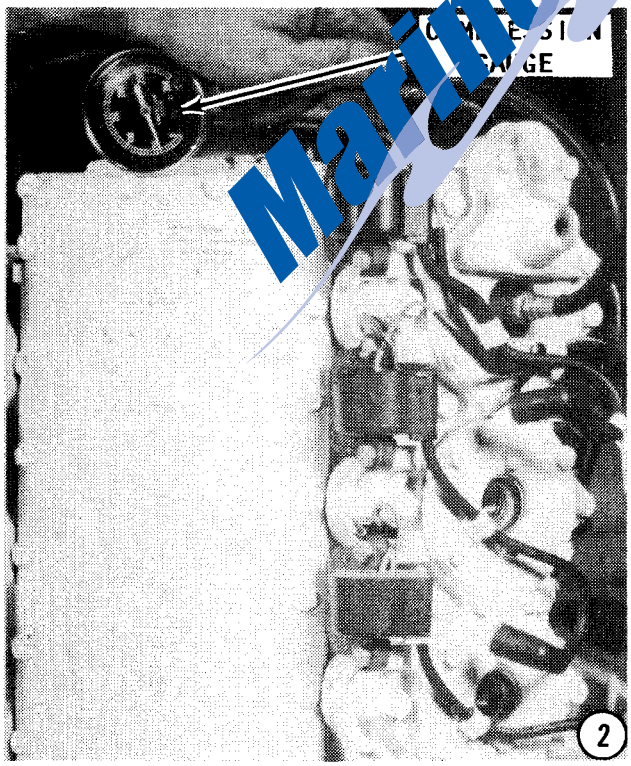
Spark Plugs

3- Check the plug wires to be sure they are properly connected. Check the entire length of the wire/s from the plug/s to the coils. If the wire is to be removed from the spark plug, **ALWAYS** use a pulling and twisting motion as a precaution against damaging the connection.

4- Attempt to remove the spark plug/s by hand. This is a rough test to determine if the plug is tightened properly. You should not be able to remove the plug without using the proper socket size tool. Remove the spark plug/s and keep them in order. Examine each plug and evaluate its condition as described in Section 5-2.

If the spark plugs have been removed and the problem cannot be determined, but the plug appears to be in satisfactory condition, electrodes, etc., then replace the plugs in the spark plug openings.

A conclusive spark plug test should always be performed with the spark plugs installed. A plug may indicate satisfactory spark when it is removed and tested, but under a compression condition may fail. An example would be the possibility of a person being able to jump a given distance on the ground, but if a strong wind is blowing, h distance may be reduced by half. The sa is true with the spark plug. Unde compression in the cylinder, the sp be too weak to ignite the fuel prop



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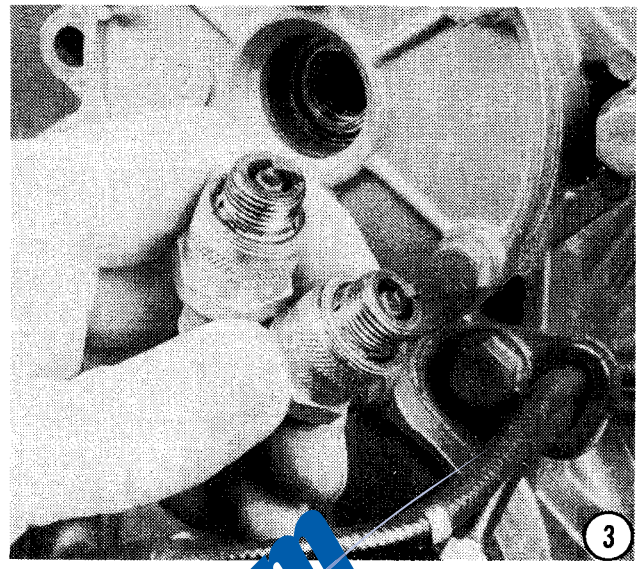
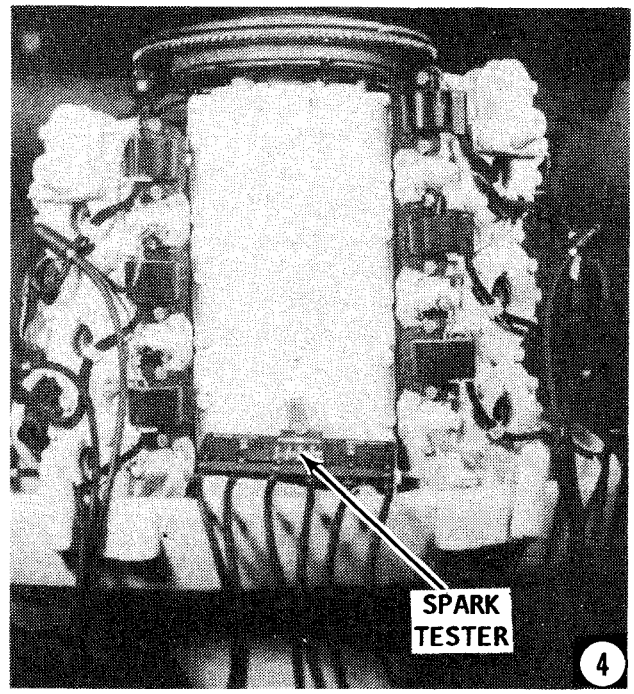

3

Therefore, t the spark plug under compression, it in the engine and tighten it proper torque value. Another rea for testing for spark with the plugs i tall is to duplicate actual operating c ns regarding flywheel speed. If th el is rotated with the pull cord w the plugs removed, the flywheel will uch faster because of the no-com- condition in the cylinder, giving the E indication of satisfactory spark.

A spark tester capable of testing for spark while cranking and also while the engine is operating, can be purchased from your local marine dealer or automotive parts house. An inexpensive tester will give the same information as a more costly unit.



4

5-6
TYPE I CAPACITOR DISCHARGE (CD) FLYWHEEL MAGNETO

65 HP — 1972 AND 1973
70 HP — 1974 THRU 1978
75 HP — 1974 THRU 1978
85 HP — 1973 THRU 1977
115 HP — 1973 THRU 1977
140 HP — 1977
150 HP — 1978
175 HP — 1977 AND 1978
200 HP — 1976 THRU 1978
235 HP — 1978

DESCRIPTION

READ AND BELIEVE. A battery installed to crank the engine **DOES NOT** mean the engine is equipped with a battery-type ignition system. A magneto system uses the battery only to crank the engine. Once the engine is running, the battery has absolutely no affect on engine operation. Therefore, if the battery is low and fails to crank the engine properly for starting, the engine may be cranked manually, started, and operated. Under these conditions, the key switch must be turned to the **ON** position or the engine will not start by hand cranking.

A magneto system is a self-contained unit. The unit does not require assistance from an outside source for starting or continued operation. Therefore, as previously mentioned, if the battery is dead or the engine may be cranked manually and the engine started.

The capacitor discharge (CD) magneto ignition system consists of the flywheel and ring gear assembly, the coil and sensor assembly installed under the flywheel; a Power Pack installed on the starboard side of the powerhead and three ignition coils mounted at the rear of the powerhead on 3-cylinder engines. On V4 engines, the powerpack is installed at the rear of the engine with four coils, two on the port side and two on the starboard side. On the V6 engines, a powerpack is installed port and starboard, with three coils port and starboard. An alternator stator and charge coils assembly is installed directly under the flywheel. The spark plugs might be considered a part of the ignition system.

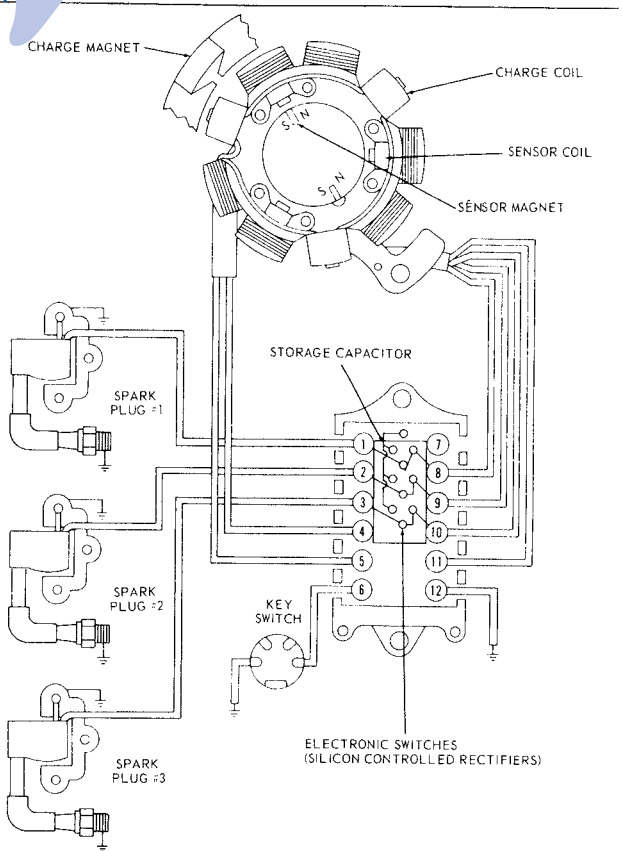
Repair of these components is not possible. Therefore, if troubleshooting indicates a part unfit for further service, the entire assembly must be removed and replaced in order to restore the outboard to satisfactory performance. As an example the coil and coil wire leading to the spark plug is one assembly. If the coil or wire is found to be faulty the coil and wire must be replaced as an assembly.

Before performing maintenance work on the system, it would be well to take time to read and understand the introduction information presented in Section 5-1 thru 5-4, at the beginning of this chapter, the Description at the start of this section, and the Theory of Operation in the following paragraphs.

THEORY OF OPERATION

This system generates approximately 30,000 volts which is fed to the spark plugs without the use of a point set or an outside voltage source.

To understand how high voltage current is generated and reaches a spark plug, imagine the flywheel turning very slowly. As the flywheel rotates, flywheel magnets induce current in the alternator stator and also



Functional diagram of a typical Type I capacitor discharge (CD) flywheel magneto ignition system.