2-9 GENERAL CARBURETOR INFORMATION

Idle Mixture

All carburetors covered in this manual have an idle mixture screw with one exception -- the Amal (Carburetor "F") which has a preset mixture ratio and is not dependent on powerhead rpm.

The idle mixture screw always has a spring between the head and the carburetor body. The spring maintains tension on the screw head and prevents the setting from changing due to powerhead vibrations. Some idle mixture screws have a long, narrow shank, while others are short and narrow. All have a tapered, fairly pointed end. Except for the threaded end, the unit resembles a "needle" more than a "screw". For this reason, many shops and carburetor manufacturers identify the idle mixture screw as the idle mixture "needle". The terms are interchangeable in this manual.

High Speed Circuit

All carburetors covered in this manual have a high speed circuit. The main jet is associated with the high speed circuit. Some main jets are fixed. This means the fuel passing through is metered because it flows through an orifice (small hole) of a standard size. Main jets should be changed if the unit is to be operated higher than 3,000ft above sea level. An Appendix lists main jet sizes for various elevations.

If the carburetor being serviced is not listed in the table, the information was not available at press time. In such a case, a good rule to follow is: decrease the size of the main jet by 0.002" (0.05mm) for each 2,500 ft change above sea level.

Some carburetors have an adjustable high speed needle. This needle is used to synchronize the carburetor with the ignition system at W.O.T. (wide open throttle).

Idle Speed

All carburetors covered in this manual have an idle speed screw, commonly referred to as the idle "stop" screw, with one exception. The exception is the Walbro LMB carburetor used on the small single cylinder outboards. On this carburetor, an idle stop lever rotating the stator plate substitutes for the idle speed (stop) screw.

The idle speed screw is always found on linkage set apart from the carburetor. The screw controls powerhead rpm for an idle speed.

Choke and Throttle Plates

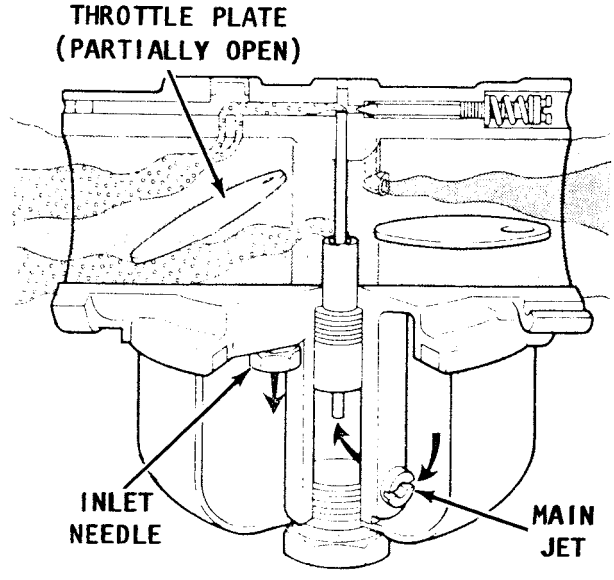
All carburetors are equipped with two plates in the carburetor throat. The first plate is considered a choke plate and the second (behind the first), a throttle shutter plate.

The function of these two plates is to restrict and control the flow of air through the throat at varying powerhead speed and demands. An example is starting a "cold" engine where the flow of air is restricted by the choke plate to enrich the fuel mixture for easier starting.

Detailed procedures to position these two plates in relation to the linkage for each carburetor covered in this manual is presented in Chapter 6. Check the Table of Contents for the carburetor being serviced.

2-10 SPECIFIC CARBURETOR INFORMATION

The following paragraphs give specific details for the carburetors covered in this manual. Detailed comprehensive service procedures for each carburetor are presented in Chapter 4. Tasks to synchronize each carburetor with the ignition system are listed in Chapter 6. Consult the Table of Contents for the carburetor being serviced.



Cross section drawing of a Tillotson WB carburetor depicting the flow of fuel and the positions of the throttle and choke plates at normal operating rpm range.

WALBRO LMB CARBURETOR "A"

The Walbro carburetor installed since 1978 and identified as Carburetor "A" throughout this manual, including the Appendix, has "Walbro" embossed on the carburetor body and the letters "LMB" embossed on the float bowl. This model carburetor has a single external idle mixture adjustment screw. Walbro carburetors installed on the 4hp model in 1976 and 1977 have a lever underneath the fuel bowl to change the high speed mixture. All other years have a fixed high speed jet in place of the lever.

Rotating the idle mixture adjustment screw counterclockwise, will decrease powerhead rpm and the air/fuel mixture is enriched, (insufficient air, too much fuel). At such a setting the powerhead will operate very roughly.

Rotating the idle mixture adjustment screw clockwise, will increase powerhead rpm up to a certain figure at which time the rpm will begin to decrease because the air/fuel mixture is too lean (too much air, insufficient fuel). At such a setting the powerhead will misfire.

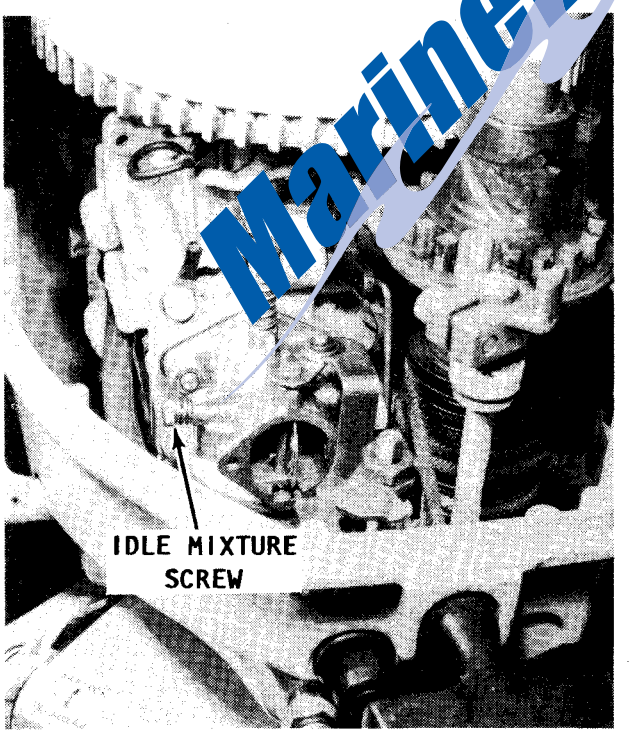
The idle speed screw (often referred to as the idle stop screw) is located inside of the tiller handle cl[illegible] the throttle grip. If the outboard is not equipped with a throttle grip, an idle stop lever on the starboard side of the support plate controls engine rpm at idle.

The main fuel jet on models since 1978 is located at the base of the float bowl and normally remains unchanged unless the outboard is operated in waters higher than 3,000ft (900 meters) above sea level. A table in the Appendix lists main jet sizes for operation at various elevations.

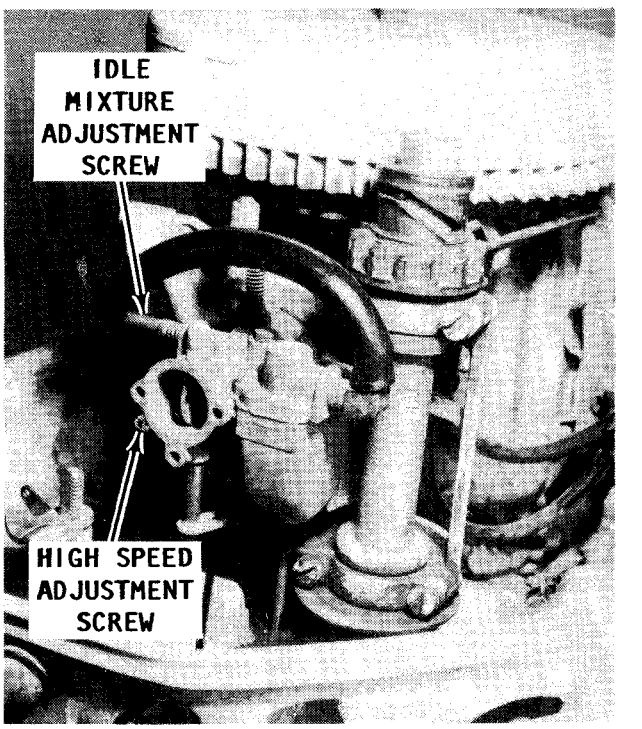
Comprehensive, detailed procedures to adjust the throttle pickup, idle mixture, and the idle speed on Carburetor "A" are presented in Section 6-5 of Chapter 6. Consult the Table of Contents for the carburetor being serviced.

TILLOTSON MT CARBURETOR "B"

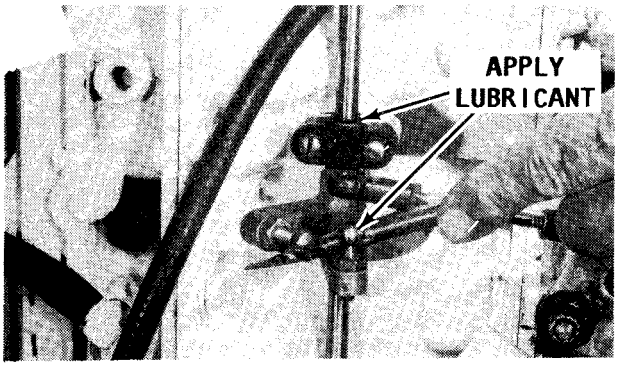
The Tillotson MT carburetor, identified as Carburetor "B" throughout this manual, including the Appendix, has "Tillotson" embossed on the fuel bowl cover and " MT" embossed on the fuel bowl. This carburetor has two external adjustment screws. Both screws are located on the starboard side of the carburetor. The upper-most screw is the idle mixture screw and is equipped with a spring. The lower screw is the high speed adjustment screw.



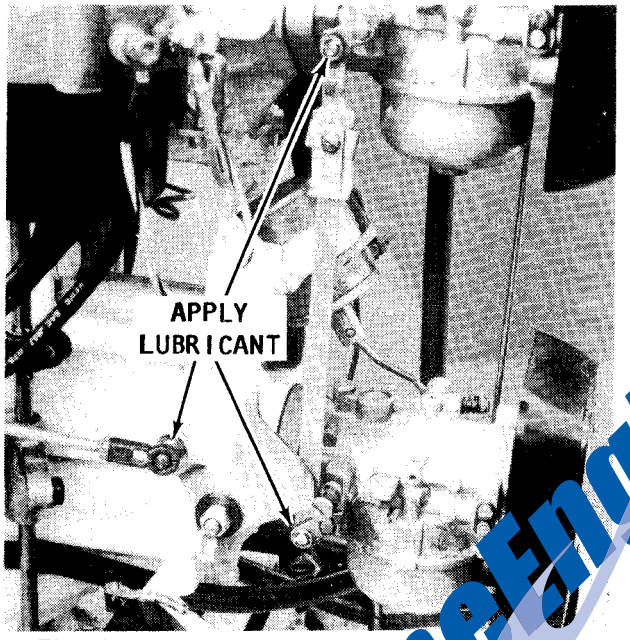
Carburetor "A" — Walbro LMB mounted on a 2-cylinder powerhead.



Carburetor "B" — Tillotson MT mounted on a 2-cylinder powerhead.

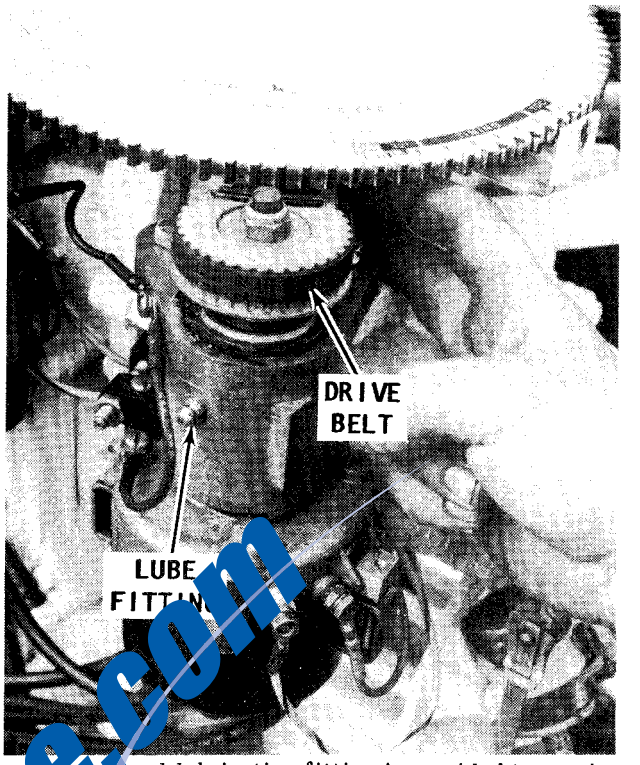


The tower shaft bearings and ball joints are a regular lubrication point.

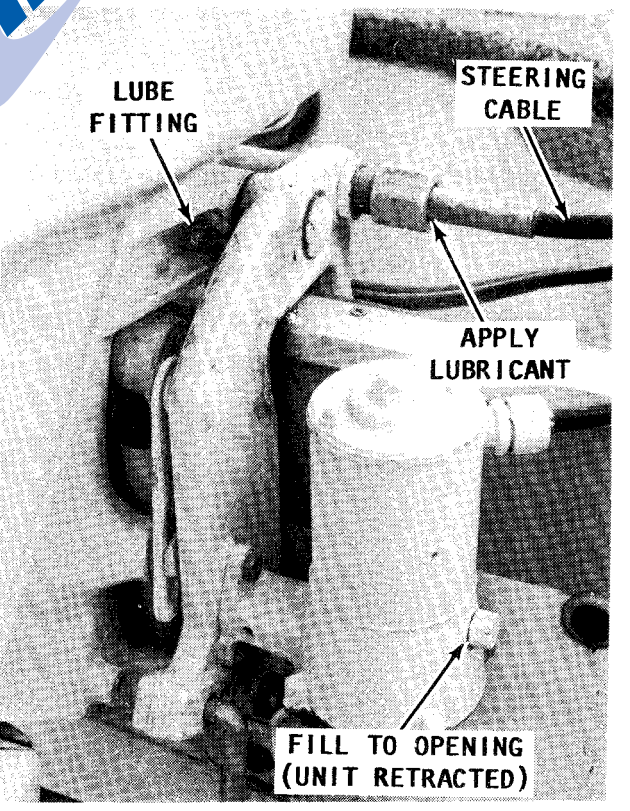


The tie bar pivot points and the [illegible] joint fittings require lubrication.

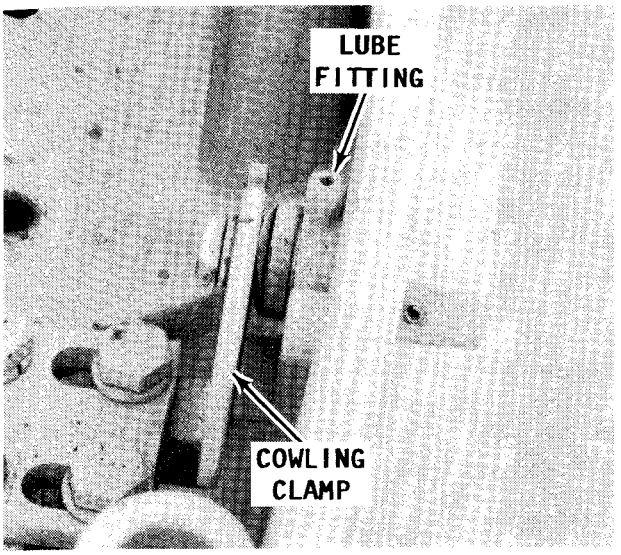
The choke link swivel joints and the choke plunger surface should receive lubrication when other points are serviced.



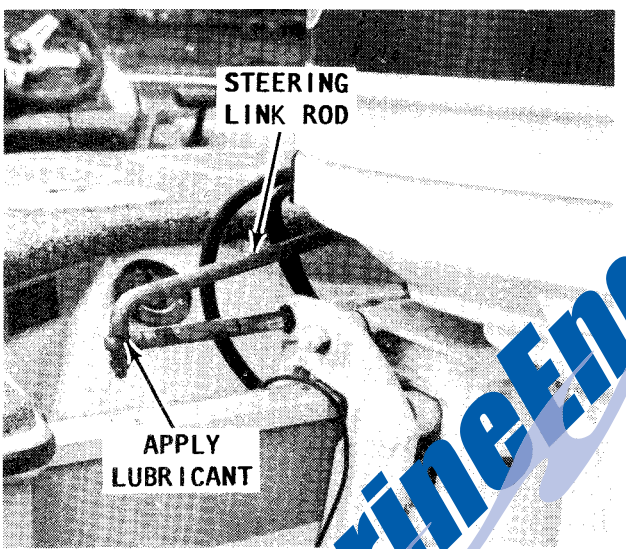
[illegible]rnal lubrication fitting is provided to service [illegible]butor shaft. At the same time, check the belt [illegible]ion.



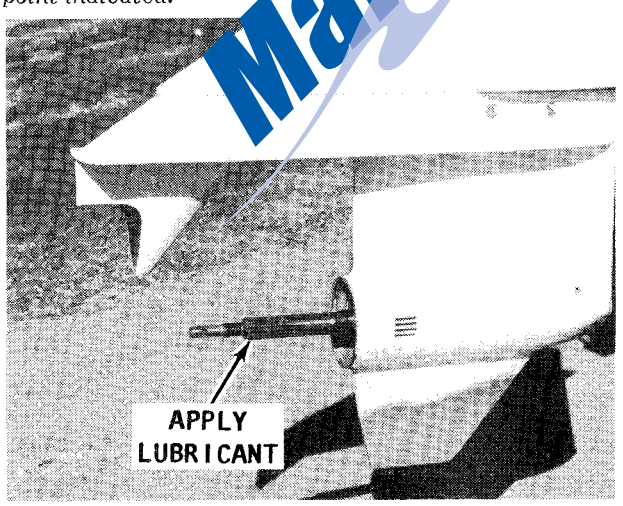
*The steering cable should receive lubrication at the point indicated. The swivel joint lubrication fitting is located inside the clamp bracket. Correct level for the trim/tilt hydraulic reservoir is to the bottom of the fill hole. The level should **ONLY** be checked when the outboard unit is in the full **DOWN** position.*



Location of the lubrication fitting for the cowling clamp.



Apply lubricant to the steering link rod joint, at the point indicated.



The splines of the propeller should always be coated with anti-seize lubricant, before the propeller is installed. Failure to apply adequate lubrication could cause the propeller to "freeze" to the shaft.

3-4 PRE-SEASON PREPARATION

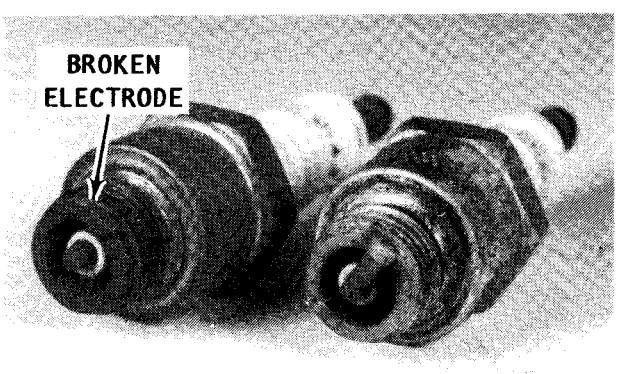
Satisfactory performance and maximum enjoyment can be realized if a little time is spent in preparing the outboard unit for service at the beginning of the season. Assuming the unit has been properly stored, as outlined in Section 3-12, a minimum amount of work is required to prepare the unit for use.

The following steps outline an adequate and logical sequence of tasks to be performed before using the outboard the first time in a new season.

1- Lubricate the outboard according to the manufacturer's recommendations. Refer to the lubrication chart. Remove, clean, inspect, adjust, and install the spark plugs with new gaskets (if they require gaskets). Make a thorough check of the ignition system. The check should include: the ignition coils, rotor assembly, condition of the wiring and the battery electrolyte level and condition.

2- If a built-in fuel tank is installed, take time to check the gasoline tank and all fuel lines, fittings, couplings, valves, including the flexible tank fill and vent. Turn on the fuel supply valve at the tank. If the fuel was not drained at the end of the previous season, make a careful inspection for gum formation. If a six-gallon fuel tank is used, take the same action. 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 passageways in the carburetor. See Chapter 4, Fuel System Service.

3- Check the oil level in the lower unit by first removing the vent/oil level screw on



Remove, inspect, and clean each spark plug at the beginning of each season. The owner of the outboard unit, from which these plugs were removed, discovered one cause of the unit's poor performance.

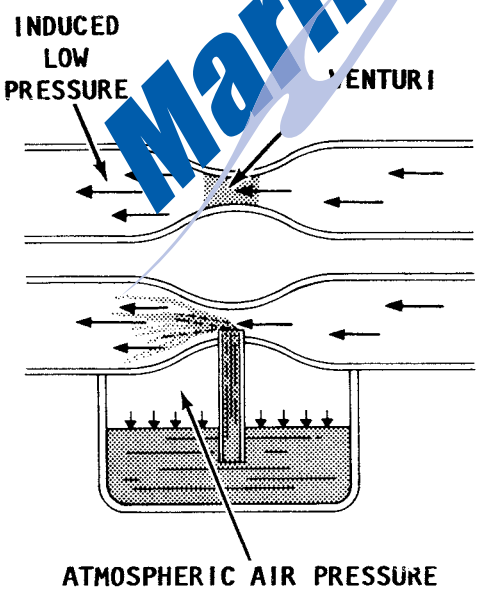
etor has more than one reservoir, the fuel level in each reservoir (chamber) is controlled by identical float systems.

Fuel level in each chamber is extremely critical and must be maintained accurately. Accuracy is obtained through proper adjustment of the float. This adjustment will provide a balanced metering of fuel to each cylinder at all speeds.

Following the fuel through its course, from the fuel tank to the combustion chamber of the cylinder, will provide an appreciation of exactly what is taking place. In order to start the engine, the fuel must be moved from the tank to the carburetor by a squeeze bulb installed in the fuel line. This action is necessary because the fuel pump does not have sufficient pressure to draw fuel from the tank during cranking before the engine starts.

After the engine starts, the fuel passes from the tank through the fuel filter, on to the fuel pump and finally to the carburetors. At the carburetor, the fuel passes through the inlet passage to the needle and seat, and then into the float chamber (reservoir). A float in the chamber rides up and down on the surface of the fuel. After fuel enters the chamber and the level rises to a predetermined point, a tang on the float lever closes the inlet needle and the flow of fuel into the chamber is cutoff. When fuel leaves the chamber as the engine operates the fuel level drops and the float tang allows the inlet needle to move off its seat and fuel once again enters the chamber. In this manner a constant reservoir of fuel is maintained in the chamber to satisfy the demands of the engine at all speeds.

A fuel chamber vent hole is located near the top of the carburetor body to permit atmospheric pressure to act against the fuel in each chamber. This pressure assures an adequate fuel supply to the various operating systems of the powerhead.



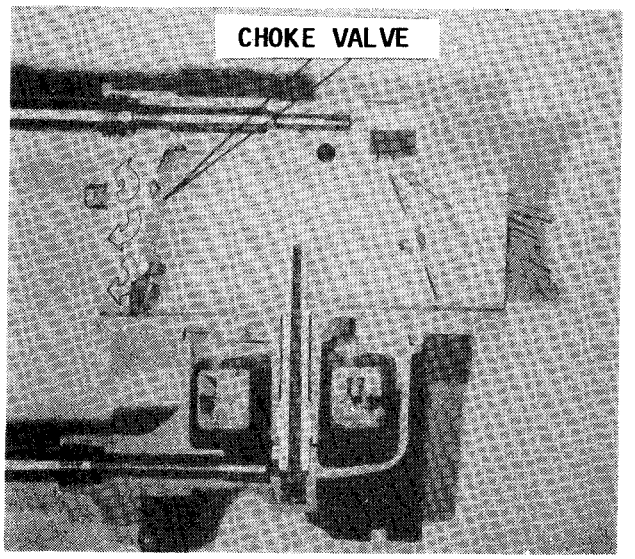
Air flow principle of a modern carburetor.

Air/Fuel Mixture

A suction effect is created each time the piston moves upward in the cylinder. This suction draws air through the throat of the carburetor. A restriction in the throat, called a venturi, controls air velocity and has the effect of reducing air pressure at this point.

The difference in air pressures at the throat and the fuel chamber, causes the fuel to be pushed out of metering jets extending down into the fuel chamber. When the fuel leaves the jets, it mixes with the air passing through the venturi. This fuel/air mixture should then be in the proper proportion for burning in the cylinders for maximum engine performance.

In order to obtain the proper air/fuel mixture for all engine speeds, some models have high and low speed jets. These jets have adjustable needle valves which are used to compensate for changing atmospheric conditions. In almost all cases, the high-speed circuit has fixed high-speed jets and are not adjustable.



Choke valve location in the carburetor venturi. The choke valve is always located in front of the venturi to restrict air flow and assist cold powerhead startup.

A throttle valve controls the flow of air/fuel mixture drawn into the combustion chambers. A cold powerhead requires a richer fuel mixture to start and during the brief period it is warming to normal operating temperature. A choke valve is placed ahead of the metering jets and venturi. As this valve begins to close, the volume of air intake is reduced, thus enriching the mixture entering the cylinders.

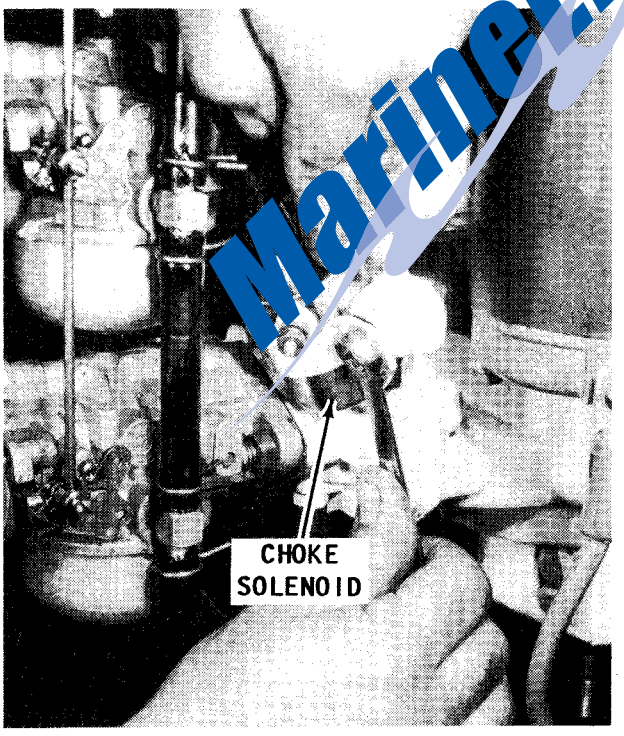
When this choke valve is fully closed, a very rich fuel mixture is drawn into the cylinders.

The throat of the carburetor is usually referred to as the "barrel". Carburetors with single, double, or four barrels have individual metering jets, needle valves, throttle and choke plates for each barrel. Single and two barrel carburetors are fed by a single float and chamber.

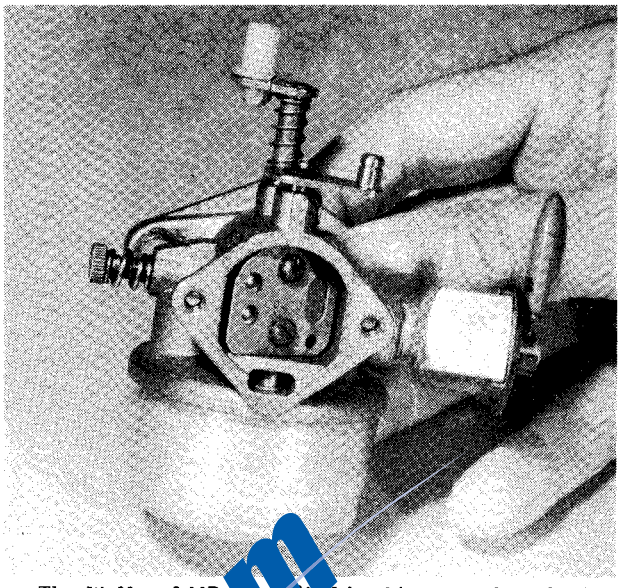
4-3 CARBURETOR MODELS

GENERAL INFORMATION

For identification and reference purposes, the six carburetors installed on the outboard units covered in this manual are listed in the following short table with the section of this chapter where service procedures will be found.



Correct positioning of the electric choke solenoid is essential to ensure proper movement of the choke plate.

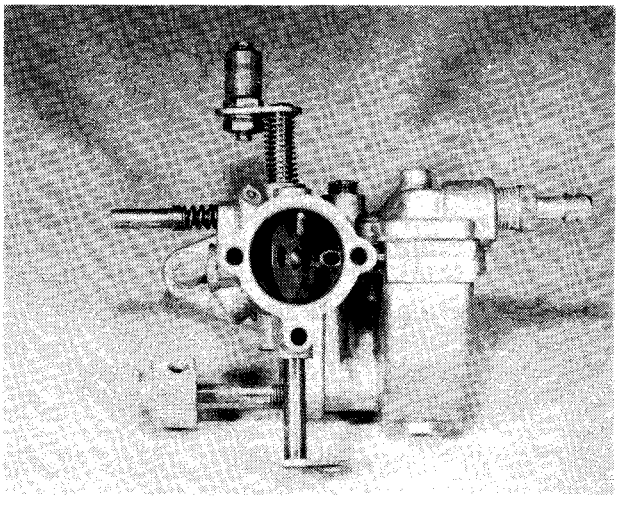


The Walbro LMB identified in this manual as Carburetor "A". Service procedures are outlined in Section 4-7.

Carburetor A	Walbro LMB-- 4-7
Carburetor B	Tillotson MT -- 4-8
Carburetor C	Tillotson MD -- 4-9
Carburetor D	Tillotson CO, Tillotson TC, Tillotson WB -- 4-10
Carburetor E	Walbro WE -- 4-11
Carburetor F	Amal -- 4-12

The Tillotson WB and the Tillotson TC are identical, except on the TC, the inlet needle seat is removable and on the WB it is not.

To identify the carburetor to be serviced, simply compare the unit in hand with the accompanying illustrations.



The Tillotson MT identified in this manual as Carburetor "B". Service procedures are outlined in Section 4-8.

plate. There should be little or no evidence of movement.

Inspect the stator plate oil seal and the O-ring on the underside of the plate.

SPECIAL WORDS

FLYWHEEL MAGNETS

The outer ends of any magnet are called poles. One end is the north pole and the other end is the south pole. The magnetic field surrounding a magnet is concentrated around these two poles.

Some flywheel magnets are fairly long and curved around the outer perimeter of the underside of the flywheel. Others are short and are mounted around the center hub, depending on the location of the coils mounted on the stator. Magnets are usually installed in pairs with the north pole of one adjacent to the south pole of its neighbor and so on. In this manner continuous magnetic field surrounds the inside of the flywheel.

If a flywheel is accidently dropped, not only could the teeth be damaged, but the impact will weaken the magnetic strength of all the magnets housed in the flywheel. If one or more of the magnets should break or fracture, two new magnetic poles will be created. A long magnet with two poles will become two short magnets with four poles. The new poles will possess only half the magnetic strength of an original pole. The overall magnetic field will be reduced. The new field of the shorter magnet will not extend to cover the area of the flywheel.

Because the operating principle of the magneto depends upon the rotating magnetic field cutting across the primary windings of the ignition coil, the voltage produced by the coil could be seriously decreased.

Much more serious consequences apply to CD type ignition systems. Trigger coils evenly spaced around the perimeter of the stator plate are energized by the concentrated magnetic field at the magnet poles. If new poles are suddenly created, the trigger will receive conflicting signals from the magnets and may even attempt to fire the cylinder twice in one revolution.

All these reasons require the flywheel to be handled with **CARE.**

INSTALLATION

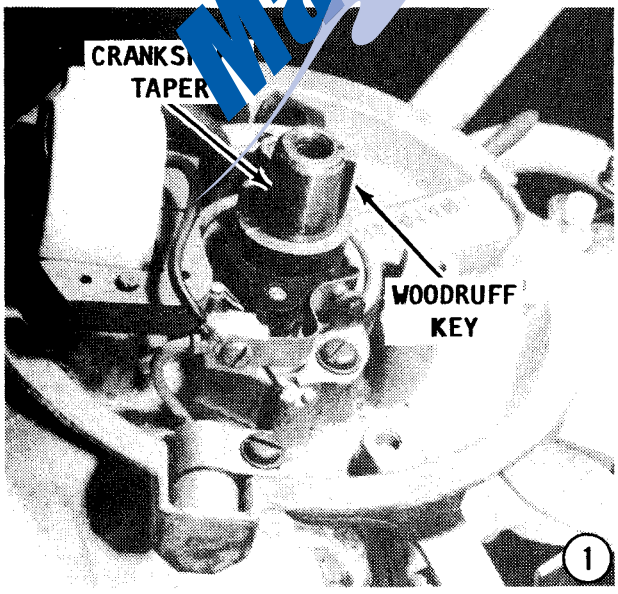
Flywheel Installation
Model 3.5hp through Model 30hp

1- Check to be sure the flywheel magnets are free of any metal parts. Place the Woodruff key in the crankshaft keyway. A small dab of grease will help hold the key in place while the flywheel is installed. Check to be sure the inside taper of the flywheel and the taper on the crankshaft are clean of dirt or oil, to prevent the flywheel "walking" on the crankshaft while the powerhead is operating, especially at high rpm.

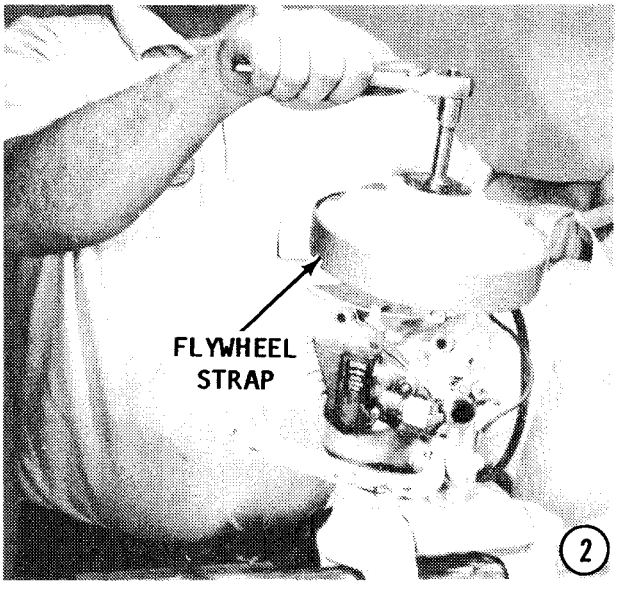
Slide the flywheel down over the crankshaft with the keyway in the flywheel aligned with the key on the crankshaft.

Rotate the flywheel **CLOCKWISE** and verify the flywheel does not contact any part of the magneto or any part of the wiring.

Thread the flywheel bolt onto the crankshaft. Prevent the flywheel from rotating



1



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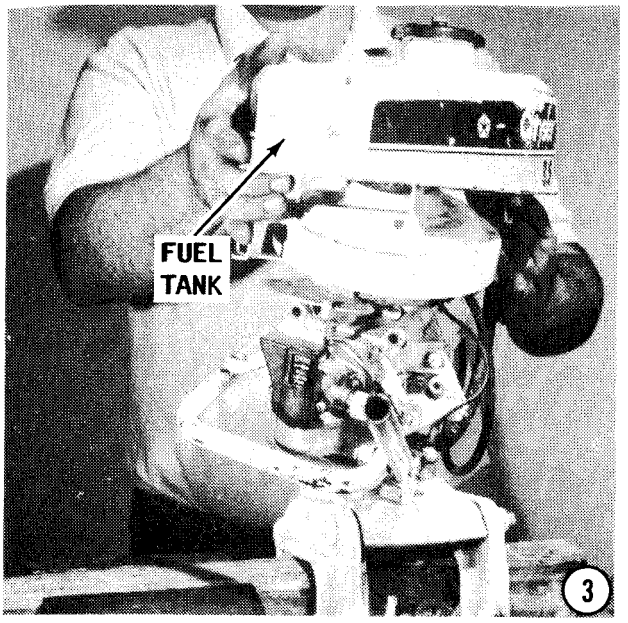


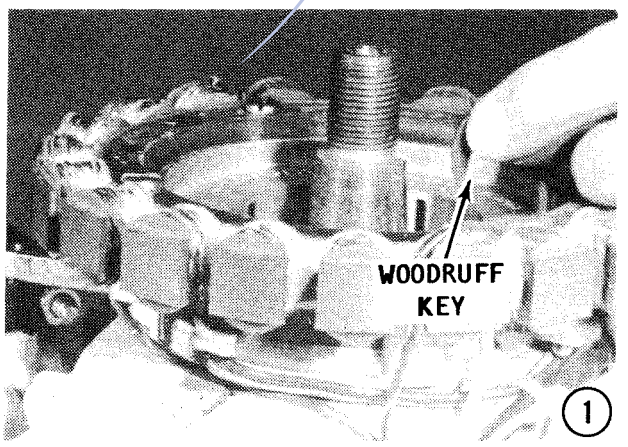
with a holding tool, flywheel strap, or other suitable device and tighten the bolt to the torque value given in the Appendix.

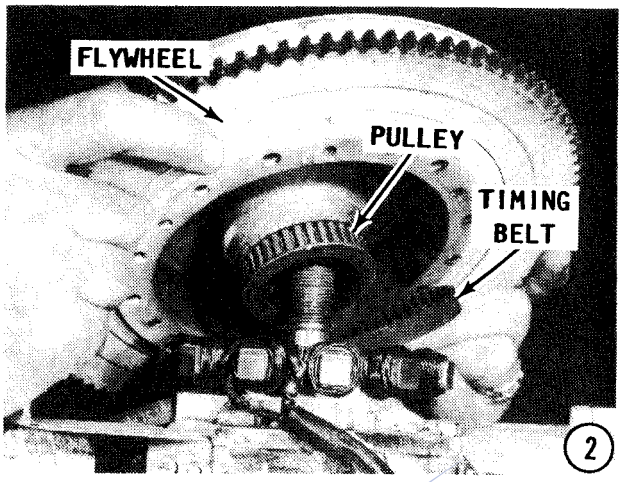
2- Install the hand starter, or electric cranking motor with the attaching hardware. Make the necessary electrical connections to the cranking motor.

3- Install the fuel tank, if the tank was removed. Install the spark plugs and tighten them to a torque value of 150 in lb (17 N-m). Connect the battery leads to the [illegible] terminals, if a battery is used. Install the cowling.

Flywheel Installation
Models 35hp and Large

1- Install the Woodruff key into the crankshaft. A [illegible] grease will help hold the key in place while the flywheel is installed.





Units With Timing Belt

2- Units equipped with a timing belt: pull a large loop of belt inside the stator ring. This loop will allow the pulley to fit inside the belt after the flywheel is lowered.

All Units

Lower the flywheel over the crankshaft with the Woodruff key indexing into the slot in the flywheel.

Units With Timing Belt

Units equipped with a timing belt: rotate the distributor pulley until the embossed curved line follows the arc of the flywheel teeth. Hold this position and slide the timing belt over the distributor pulley.

Models With Spark Control Rod

Models equipped with a rod connecting the trigger housing with the towershaft: the housing should move freely within the limits of travel for the towershaft. If any binding is felt, remove the flywheel and check in-