

FUEL SYSTEM

GASOLINE CARBURETOR

For correction of problems traced to the gasoline carburetor, use the appropriate procedures selected from the following sequence, referring to Figures 11 and 13.

Adjustment Under Load: Adjust the carburetor as follows when a full load can be applied.

1. Make sure the ignition system is working properly and that the governor is adjusted.
2. Start the engine and allow it to warm up. If the carburetor is so far out of adjustment that the engine will not start, close both needle valves gently to their seats. Then open each 1 to 1-1/2 turns, first the idle and then the main adjustment.
3. With no load applied to engine, turn the idle adjustment out until the engine speed drops slightly below normal. Then turn the needle in until the engine speed returns to normal.
4. Apply a full load to the engine and then carefully turn the main adjustment in until the speed drops slightly below normal. Turn the needle out until the engine speed returns to normal.

Adjustment Under "No Load" Conditions: When a load cannot be applied, adjust the carburetor as follows:

1. Perform steps 1 and 2 as given under Adjustment Under Load.

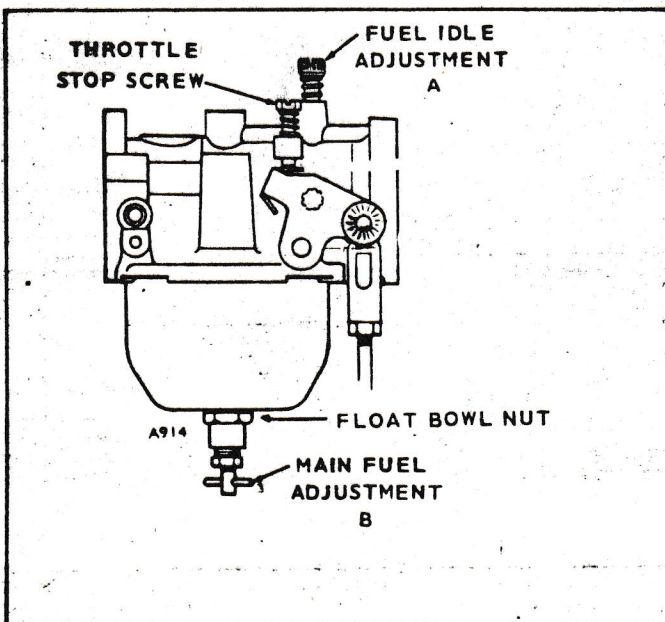


FIGURE 11. CARBURETOR ADJUSTMENTS

2. Pull out on the governor mechanism to slow the unit down to about 400-500 rpm.
3. Set the idle adjustment screw for even operation (so the engine is firing on both cylinders and is running smoothly).
4. Release the governor mechanism to allow the engine to accelerate. If the engine accelerates evenly and without a lag, the main adjustment is correct. If not, adjust the needle outward about 1/4 turn and again slow down the engine and release the mechanism. Continue until the engine accelerates evenly and without a time lag after releasing the governor.
5. With the carburetor and governor adjusted, set the throttle stop screw at the desired idle speed.

Float-Level Check: If the carburetor adjustment fails to provide satisfactory operation, remove the carburetor and check the float level as follows:

1. Remove the fuel line, air cleaner hose, governor linkage and choke wires.
2. Remove the two carburetor mounting nuts and remove the carburetor.
3. Unscrew the float bowl nut and remove the entire main fuel adjustment assembly from the float bowl.
4. Invert the carburetor and check that the float surface nearest the gasket is $1/8 \pm 1/16$ inch from the gasket. Bend the float tab as required to produce this spacing.

NOTE: If the carburetor utilizes an internally spring loaded fuel inlet valve, the float surface should be $1/8 \pm 1/16$ inch from the gasket with the full weight of the float compressing the spring in the needle.

5. Reassemble, install and test.
6. See Figure 12.

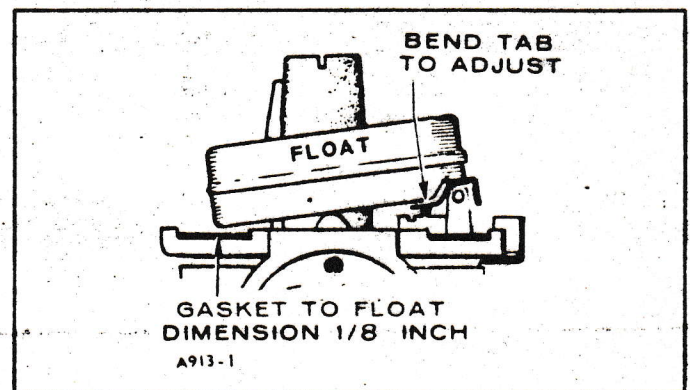


FIGURE 12. FLOAT LEVEL ADJUSTMENT

Carburetor Removal and Disassembly: Remove and disassemble the carburetor assembly as follows, referring to Figure 13.

1. Remove the fuel line, air cleaner hose, governor linkage, and choke wires.
2. Remove the two carburetor mounting nuts and remove the carburetor.
3. Remove the main jet assembly and bowl.
4. Remove the float pin and float.
5. Lift out the fuel inlet valve and unscrew the valve seat.
6. Remove the idle adjustment needle.
7. Remove the throttle plate screws and the plate, then pull out the throttle shaft.
8. Remove the choke plate screws and plate, then pull out the choke shaft.

Carburetor Assembly and Installation: Clean the components and repair or replace defective or worn parts. Use acetone or alcohol to dissolve gum deposits if carburetor cleaner is not effective. Soak the parts in carburetor cleaner, using it as directed by the manufacturer. Clean all carbon from the carburetor bowl, especially in the area of the throttle plate. Blow out clogged passages with compressed air. Check the needles, nozzle, and float for damage or fuel loading. Check the choke and throttle shafts. Reassemble and install as follows:

1. Install the throttle shaft and plate, using new screws and lock washers. Install with bevel mated to the carburetor body. If the plate is marked with the letter C, install it with the mark on the side toward the idle port when viewed from the flange end of the carburetor. To center the plate, back off the top screw, close the throttle lever and then set the plate by tapping it with a small screwdriver.
2. Install the choke shaft and plate. Center the plate in the same manner as the throttle plate (see step above). Use new screws and lock washers.
3. Install the fuel inlet valve seat and valve.
4. Install the float and float pin, adjusting the float as previously described.
5. Install the bowl ring gasket, bowl and bowl nut. Make sure that the bowl is centered in the gasket and tighten the main jet assembly securely. Turn in until it seats and back out to 1-1/2 turns.
6. Install the idle adjusting screw finger tight. Then back it out 1 to 1-1/2 turns.
7. Install the choke and adjust as previously described.
8. Install the carburetor on the engine and connect the gasoline inlet, governor mechanism, air cleaner hose, and choke wires.
9. Adjust the carburetor needle settings as described under Adjustments and check out the performance.

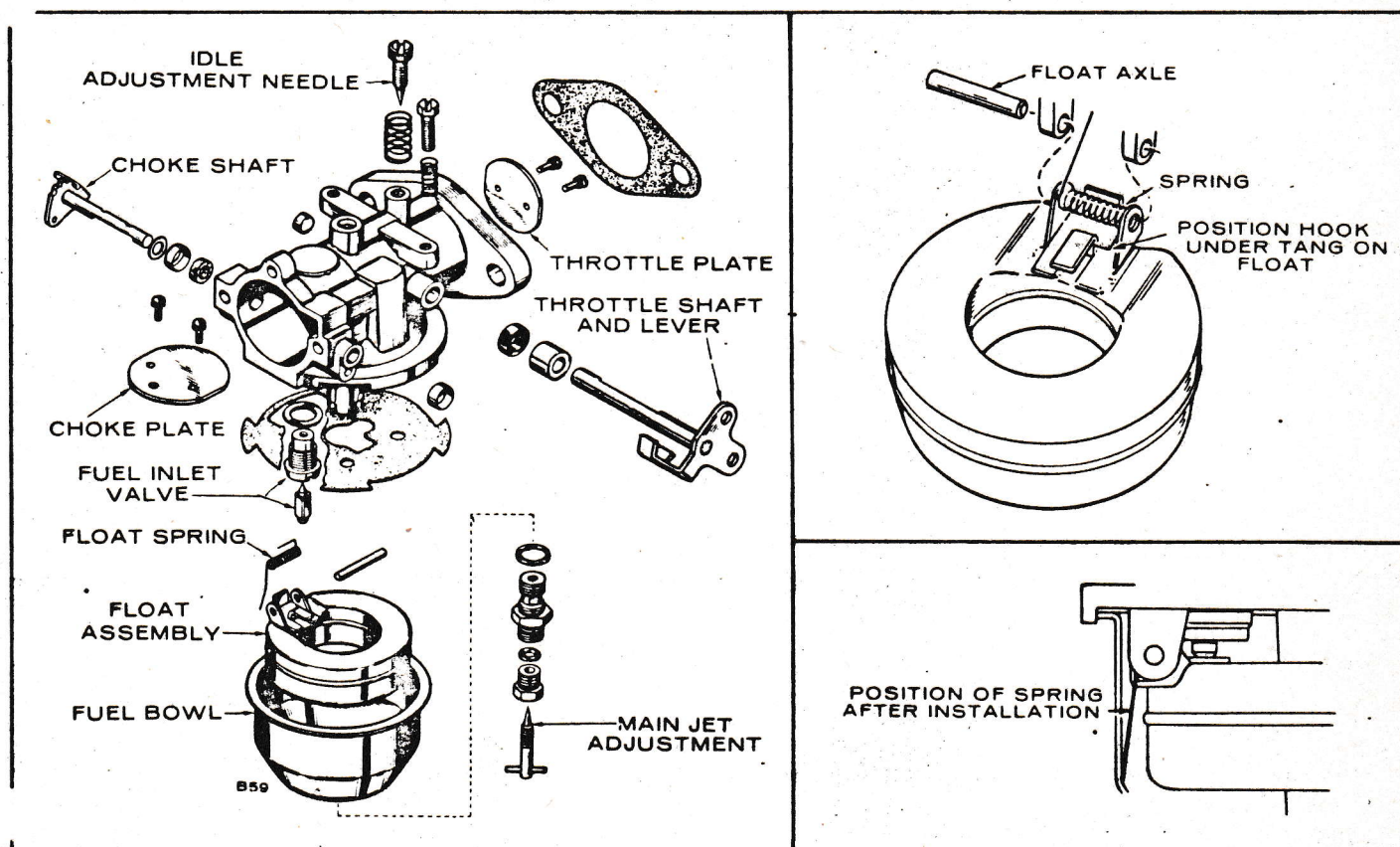


FIGURE 13. CARBURETOR ASSEMBLY

Complete Replacement: Complete replacement of the carburetor should be performed as follows:

1. Follow the previously given disassembly instructions as required for removal of the defective carburetor.
2. Replace the carburetor with a new unit, using attaching parts in good condition and making all the connections previously disengaged.
3. Adjust the needle settings as described under Adjustments.

FUEL PUMP

The engine uses a diaphragm-type fuel pump. If fuel does not reach the carburetor, check the fuel pump before dismantling it.

1. Disconnect the fuel line at the carburetor.
2. Crank the engine and observe whether fuel comes from the line at the carburetor.

WARNING Be sure to direct the fuel flow into a container so gasoline does not spill on ignition wires.

3. If there is enough fuel in the tank, and line does not have fuel flowing, the pump needs replacing.

Pump failure is usually caused by a leaking diaphragm, valve or valve gasket, a weak or broken spring or wear in the drive linkage. Gasoline diluted oil may also indicate a faulty pump.

NOTE: Always return the hand priming lever all the way inward so that lever does not prevent normal operation of fuel pump.

Fuel Pump Reconditioning: Reconditioning of the fuel pump should be as follows, referring to Figure 14.

1. Remove the fuel lines and mounting screws holding the pump to the engine.
2. Make an indicating mark with a file across a point at the union of the fuel pump bolt and cover. Remove the assembly screws and the upper pump body.
3. Turn the pump body over and remove the valve plate screw and washer. Remove the valve retainer, valves, valve springs, and valve gasket, noting their position. Discard the valve springs, valves and valve retainer gasket.
4. Clean the pump body thoroughly with a solvent and a fine wire brush.
5. Holding the pump cover with the diaphragm surface up, place the new valve gasket in the cavity. Assemble the valves in the cavity. Reassemble valve retainer. Lock in position by inserting and tightening the fuel pump retainer screw.
6. Place the pump body assembly in a clean work area and rebuild the lower diaphragm section.
7. Holding the mounting bracket, press down on the diaphragm to compress the spring under it, then turn the bracket 90 degrees to unhook the diaphragm so it can be removed.

8. Clean the mounting bracket with a solvent and a fine wire brush.
9. Replace the diaphragm operating spring, stand the new spring in the casting, and position the diaphragm. Press down on the diaphragm to compress the spring and turn it 90 degrees. This will reconnect the diaphragm.
10. Hold the bracket, place the pump cover on it (making sure the indicating file marks are in line) and insert the four attaching screws but do not tighten. With the hand on the mounting bracket only, push the pump lever to the limit of its travel and hold in this position while then tightening the four screws. This is important to prevent stretching the diaphragm.
11. Mount the fuel pump on the engine, using new mounting gaskets. Connect the fuel lines.

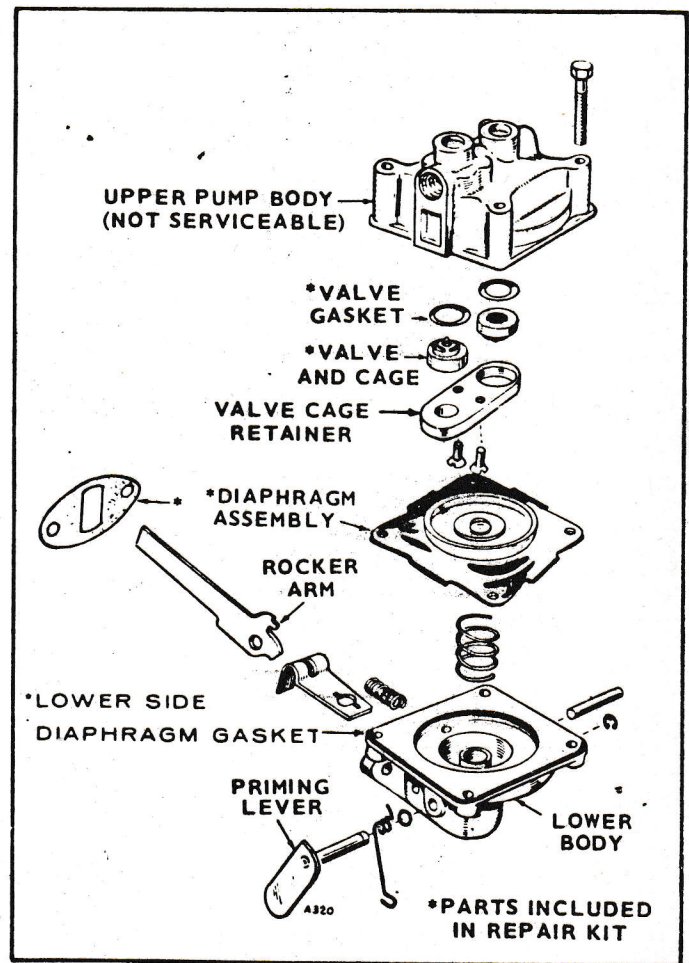


FIGURE 14. FUEL PUMP

THERMO-MAGNETIC CHOKE (Optional)

This choke uses a strip heating element and a heat sensitive bimetal spring to control the choke plate position. In addition to this, a solenoid is actuated during engine cranking, closing the choke all or part way, depending on ambient temperature. The bimetal is factory set to position the choke to the proper opening under any ambient condition.

Choke Adjustment: If adjustment of the bimetal is needed, it must be made at ambient temperature. Do not attempt adjustments until engine has been shut down for at least one hour. Loosen the screw which secures the choke body assembly. Refer to Figure 15. Rotating the choke body clockwise richens and counter-clockwise leans the choking effect. For ambient temperatures above 85°F, the choke should be fully opened. For ambient temperatures below 25°F, the choke should be opened 1/4 inch with the solenoid not engaged. Tighten the screw that secures the choke body.

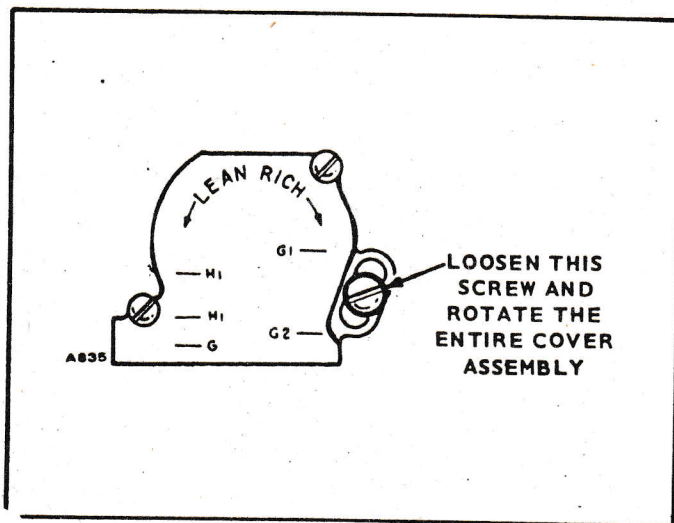


FIGURE 15. THERMO-MAGNETIC CHOKE

If the choke will not close, check for binding, incorrect adjustment, or incorrect assembly of the bimetal and heater assembly. If the choke will not open after the engine starts, check for heating. The choke bimetal should be warm to the touch within a minute or two after starting.

To disassemble the choke, refer to Figure 16.

If the heater assembly will not heat properly, check for broken heater wire, high resistance connections or broken lead wires to the bimetal and heater assembly. With the element at room temperature, check the heater resistance with an ohmmeter. The resistance should be about 37.8 to 46.2 ohms for a 12 volt system. If the heater is defective, replace. There must be slack in the lead wires between the choke body and the bimetal and heater assembly. When the start button is engaged, the solenoid should cause the spring loaded lever to contact the solenoid core. If this does not occur, check for broken lead wires or a defective solenoid core.

The solenoid coil should have a resistance of 2.09 to 2.31 ohms in a 12 volt system.

Assembly: Refer to Figure 16. When assembling the thermomagnetic choke, connect the bimetal and heater assembly as follows:

1. Lead tagged G to ground terminal in coil solenoid.
2. Lead tagged H to either of the H1 terminals on the solenoid core.

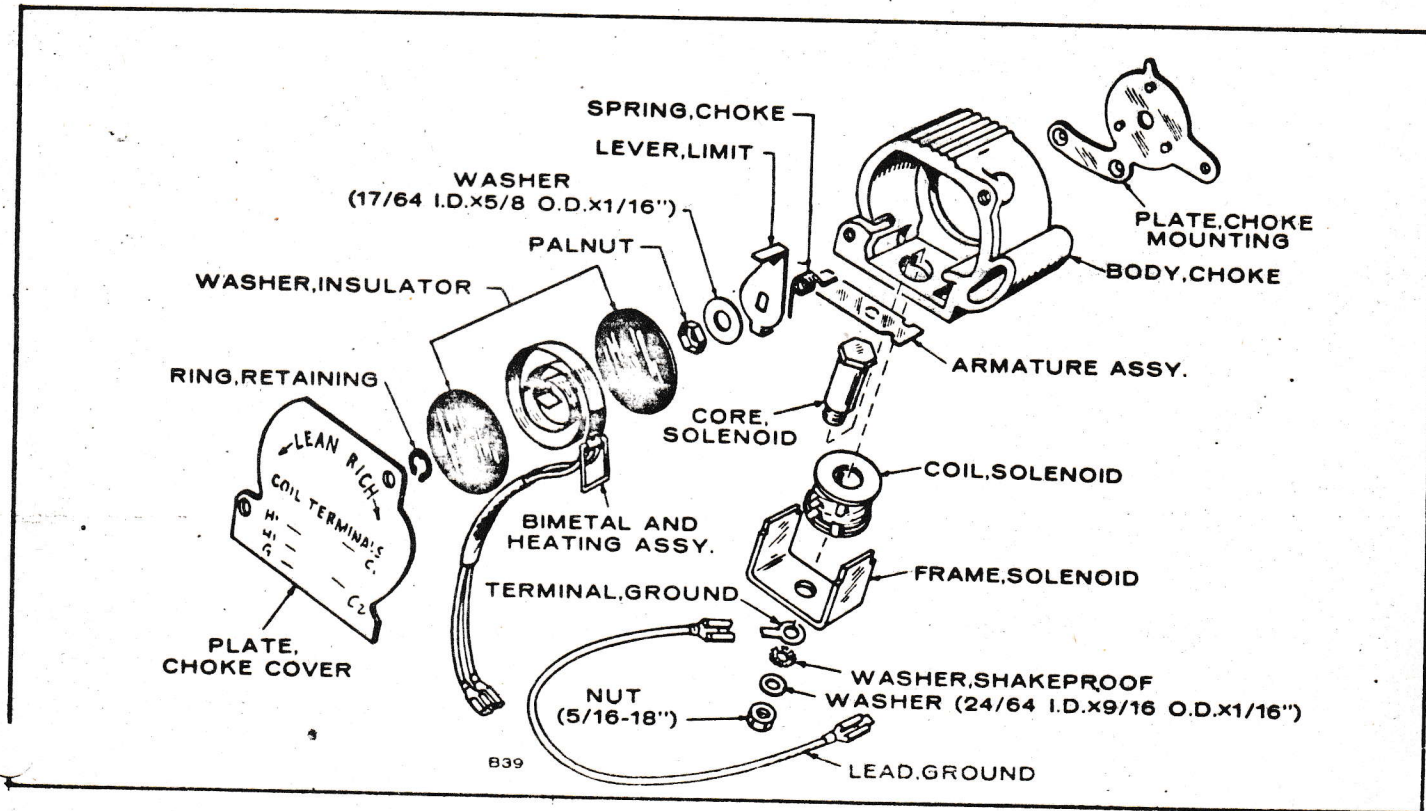


FIGURE 16. CHOKE ASSEMBLY

GASEOUS FUEL CARBURETOR

For correction of problems traced to a gaseous fuel carburetor perform the following:

1. Clean or replace the air cleaner.
2. Inspect hoses, replacing defective units, and securing all connections.
3. Clean the dry fuel filter (if present).
4. Check the regulator and carburetor for proper adjustment as described later in this section.

Gas Regulator Adjustment: This regulator was factory adjusted to lock-off at a pressure of 4 oz. (7" water column). The regulator will operate satisfactorily at incoming pressures of from 2 to 4 oz. If your gas supply pressure is within these limits, no regulator adjustment is required. If your gas supply pressure is under 2 oz., the regulator will not operate. If your gas supply pressure is between 4 and 8 oz., install an appliance regulator set for 2 oz. ahead of the regulator, or adjust the regulator as follows and reference to Figure 17.

WARNING

A soap bubble placed over the regulator outlet will not accurately test for regulator closing. The soap bubble's resistance when multiplied by the greater area of the regulator diaphragm, is enough to shut off this very sensitive demand type regulator.

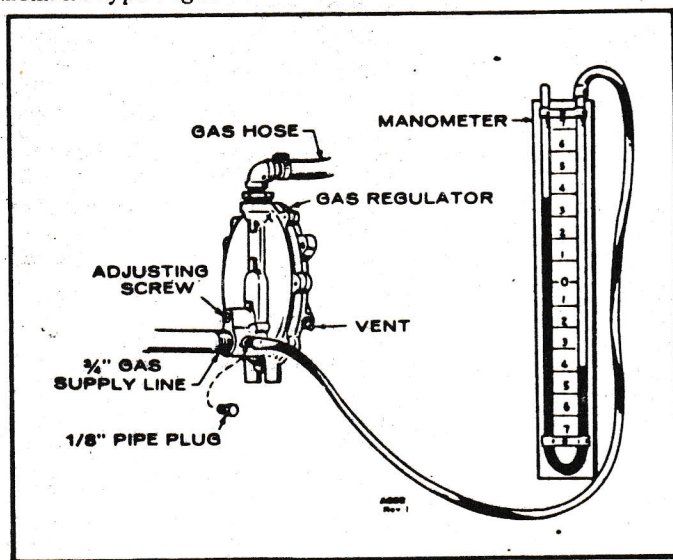


FIGURE 17. TESTING WITH MANOMETER

1. Refer to Figure 17.
2. Connect a manometer which reads up to 14" water column to the regulator's plugged test hole near inlet. Turn gas on and energize the solenoid valve.
3. Turn regulator lock-off adjusting screw inward just far enough so that the manometer reading remains constant when you repeatedly cover and uncover the regulator outlet with your hand. Failure to lock off indicates too high incoming pressure or dirty regulator valve and seat.
4. Close the gas supply line valve. Remove manometer. Bleed air from gas supply line. Install test-hole plug in regulator. Open gas supply line valve. See that vent fitting is installed.

5. With a clamp on each end, secure the hose between the regulator outlet nipple and the carburetor inlet.
6. Operate the engine to assure quick starting results.

Gas Carburetor Adjustment:

1. Adjust the main gas adjusting screw (M) on the carburetor, depending upon the type of gas used. For 800 BTU gas turn to approximately six turns open. For 1,100 BTU gas turn to 3-1/2 turns open. For propane gas, turn to approximately three turns open. Turn the idle screw (N) to two turns open. These settings are preliminary ones, to permit starting the engine.

For starting an engine manually, the gas should have a BTU rating above 800 BTU per cubic foot. The temperature should be above 30°F (-1°C) to permit sufficient cranking speed to be developed. Too low a cranking speed would prevent proper intake vacuum for starting. Load should be disconnected, or reduced to the minimum.

2. Allow the engine to thoroughly warm up. When operating temperature is reached, make final carburetor adjustments. Apply a full load and turn the carburetor main gas adjusting screw (M) in (clockwise) until the engine begins to lose speed from lack of fuel. Slowly back out the main adjusting screw (counterclockwise) until the engine will carry the full load smoothly. Remove all load and adjust the small slotted idle adjusting screw (N) in the same manner. Check the operation at various loads. Make any necessary governor adjustments as given in following section.

When operating on gas fuel of approximately 800 BTU rating, some loss in power output may be evident. However, full power should be developed if using a gas rated at 1,100 BTU or higher. Gas fuel usually is clean burning, which means that carbon removal and valve grinding services may not have to be performed as frequently as with gasoline fuel.

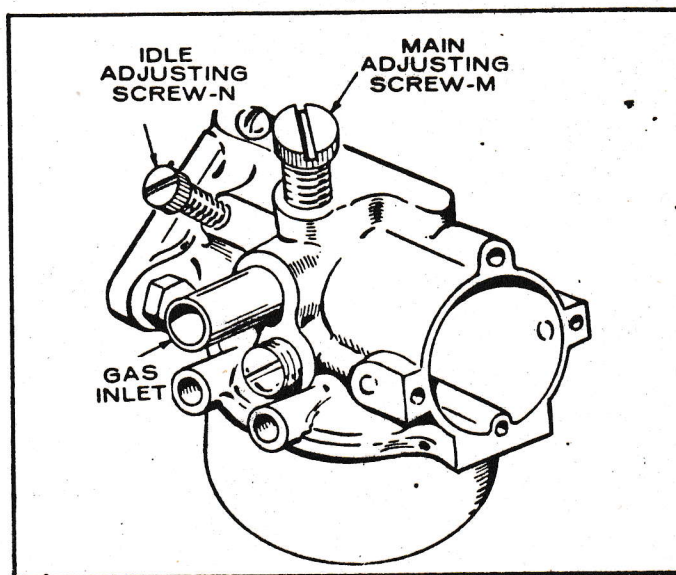


FIGURE 18. GAS CARBURETOR ADJUSTMENT

GOVERNOR SYSTEM

GOVERNOR ADJUSTMENT

Where engine speed is governor controlled, the governor is set at the factory to allow a nominal engine speed of 2400 rpm at no load operation (unless another speed is specified when the engine is ordered). Proper governor adjustment is one of the most important factors in maintaining the power and speed desired from the engine.

Before making governor adjustment, run the engine about 15 minutes to reach normal operating temperature.

It is difficult to determine if, after long usage, the governor spring has become fatigued. If, after properly making all other adjustments, the regulation is still erratic, install a new spring (Figure 19).

A tachometer for checking engine speed is required for accurate governor adjustment.

Check the governor arm, linkage, throttle shaft and lever for binding or excessive wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor.

Excessive looseness will cause a hunting condition and regulation will be erratic. Work the arm back and forth several times by hand while the engine is idle. If either of these conditions exist, determine the cause and adjust or replace parts as needed.

Procedure:

1. Adjust the carburetor main jet for the best fuel mixture at full load operation.
2. Adjust the carburetor idle needle with no load connected.
3. Adjust the length of the governor linkage.
4. Check the governor linkage and throttle shaft for binding or excessive looseness.
5. Adjust the governor spring tension for nominal engine speed at no load operation.
6. Check the rpm drop between no load and full load operation and adjust the governor sensitivity as needed.
7. Recheck the speed adjustment.
8. Set the carburetor throttle stop screw.

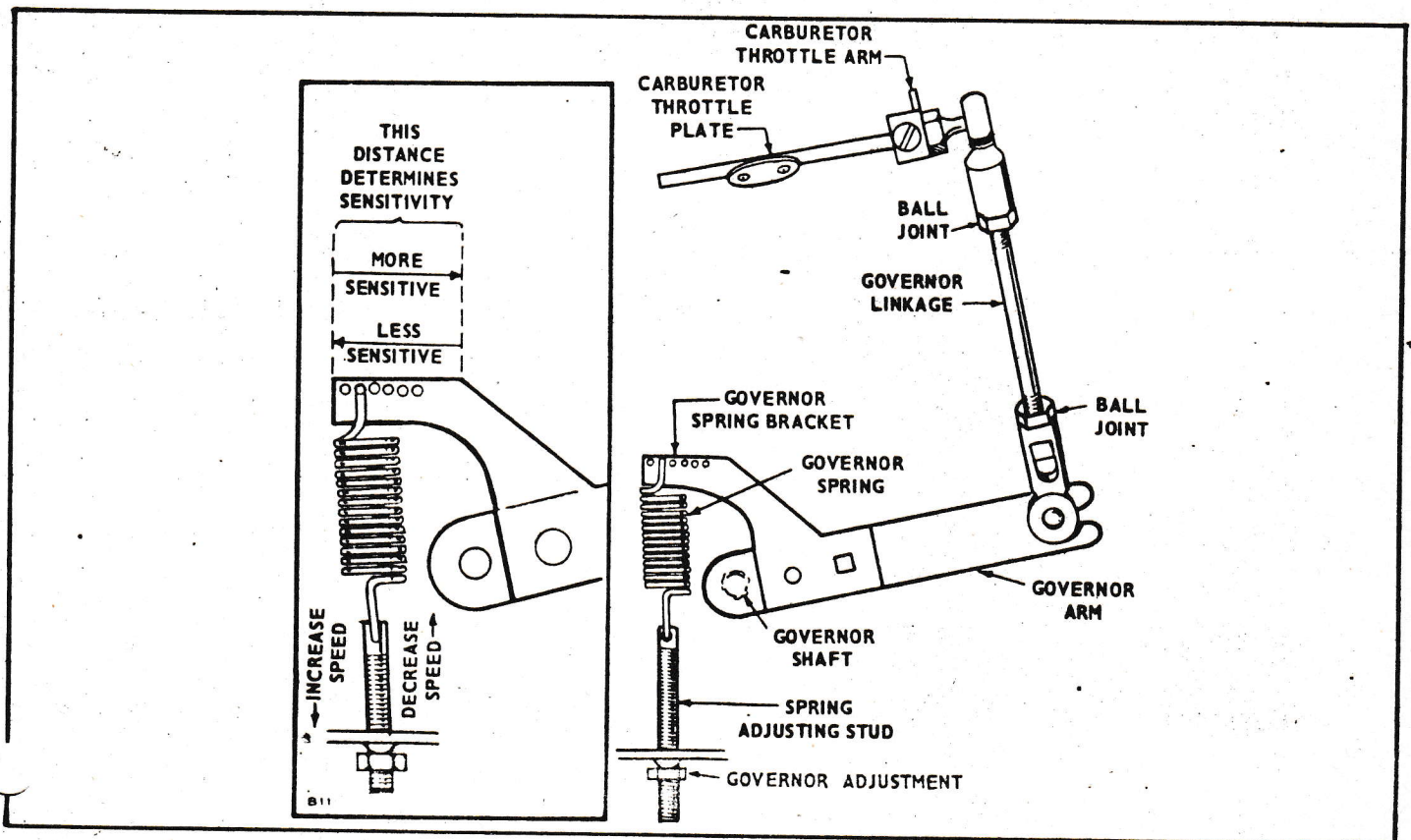


FIGURE 19. GOVERNOR ADJUSTMENTS

Linkage: The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle arm is adjusted by rotating the ball joint housing. Adjust the length so that with the engine stopped and tension on the governor spring, the stop on the carburetor throttle lever is 1/32 inch from the carburetor stop boss. This setting allows immediate control by the governor after starting and synchronizes travel of the governor arm and the throttle shaft.

Speed Adjustment: The speed at which the engine operates is determined by the tension applied to the governor spring. Increasing spring tension increases engine speed. Decreasing spring tension decreases engine speed. The no load speed of the engine should be slightly higher than the speed requirements of the connected load. For example: If the connected load is to turn at 3510rpm, set the no load speed of the engine at about 3600rpm. Check speed with a tachometer.

If a speed adjustment is needed, turn the speed adjusting nut in to increase the speed or out to decrease the speed (Figure 19).

Sensitivity Adjustment: The engine speed drop from no load to full load should be not less than 100rpm. Check the engine speed with no load connected and again after connecting full load. Do not exceed 4000 rpm at no load.

The sensitivity of the governor depends upon the position of the arm end of the governor spring. A series of holes in the governor arm provides for adjustment. To increase sensitivity, move the spring toward the governor shaft. To decrease sensitivity, move the spring toward the linkage end of the governor arm.

If the setting is too sensitive, a hunting condition (alternate increase and decrease in engine speed) will result. If the setting is not sensitive enough, the speed variation between no load and full load conditions will be too great. Therefore, the correct sensitivity will result in the most stable speed regulation without causing a surge condition.

Always recheck the speed adjustment after a sensitivity adjustment. Increasing sensitivity will cause a slight decrease in speed and will require a slight increase in the governor spring tension.

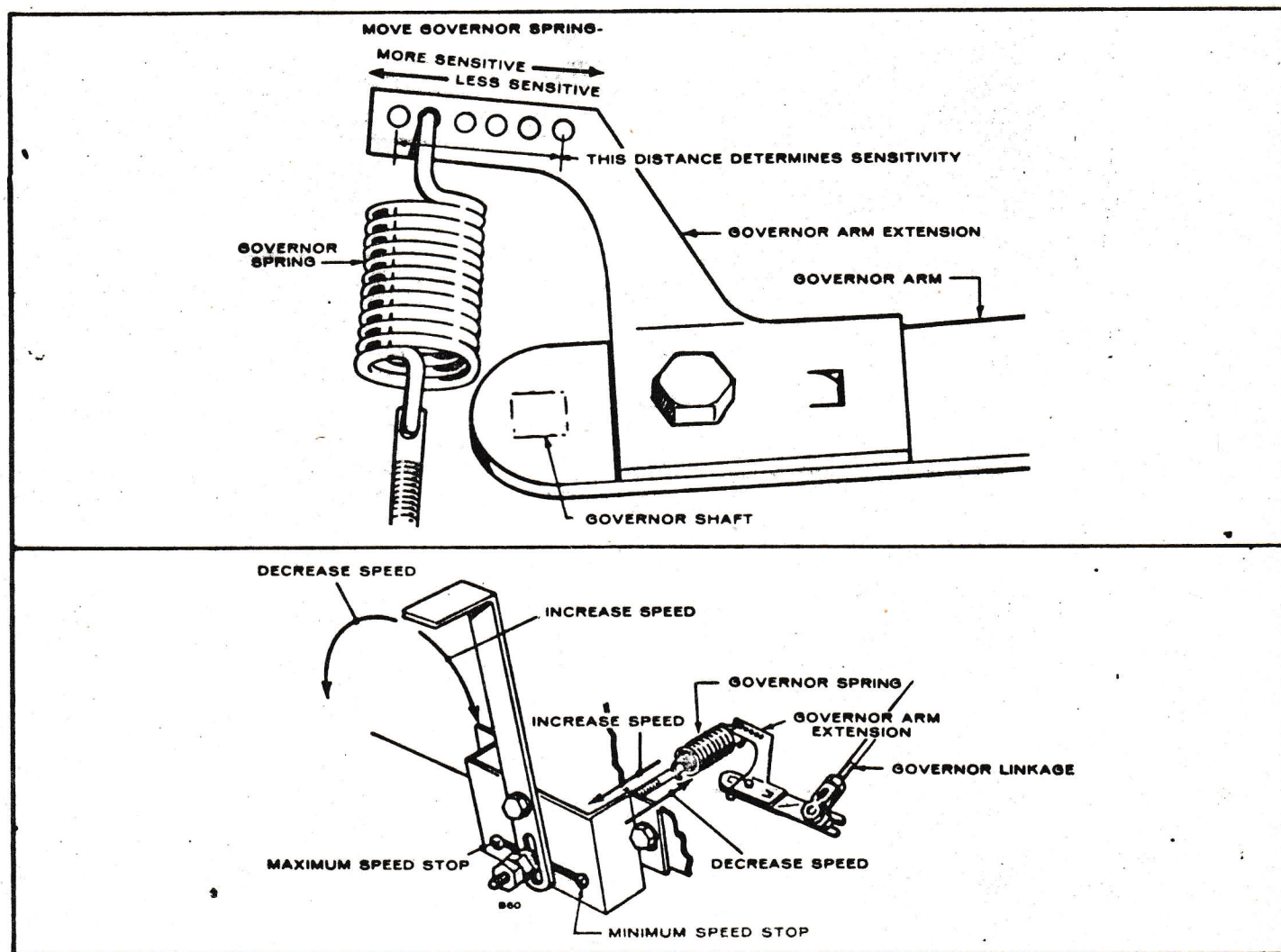


FIGURE 20. VARIABLE SPEED GOVERNORS

Variable Speed Governor Adjustments: These engines are adapted for use where a wide range of speed settings is desired. The design of the variable speed governors gives an automatic increase in sensitivity when the speed is increased and the result is good stability at all speeds.

To adjust the variable speed governors, refer to Figure 20 and the following:

1. Run the engine and make necessary carburetor adjustments.
2. Adjust the throttle stop screw on the carburetor to allow a recommended minimum idling speed of 900 rpm. A lower minimum does not assure smooth operation under load.
3. Adjust the tension of the governor spring for minimum speed. For the control with the control arm, shift the lever to minimum speed with no load and adjust the spring tension for approximately 1500 rpm.

For the control with the control knob and slide (NHC engines with mounted engine controls), pull back the knob and slide and set at the first notch (low speed). Adjust speed to approximately 1500 rpm (or the desired low speed) at no load by turning the knob as required.

4. Adjust the sensitivity while operating at minimum speed to attain the smoothest no load to full load operation as follows:

To decrease sensitivity (allow more speed drop from no load to full load operation) move the governor spring outward into a different groove or hole in the extension arm.

To increase sensitivity (closer regulation by the governor which permits less speed drop from no load to full load operation) move the governor spring inward into a different groove or hole in the extension arm.

5. Apply a full load and shift the variable control to maximum speed — moving the control arm to the right or shifting the control knob and slide to the second notch. For the governor control with the control arm, set the screw in the bracket slot to stop lever travel at the desired maximum full load speed position. For the control with the control knob and slide, increase or decrease speed by turning the knob as required.

Approximately 3000 rpm is the recommended maximum full load speed for continuous operation. The speed must agree with the load requirements.