

## SECTION 4 - FUEL SYSTEM & GOVERNOR

### CARBURETOR

These engines are equipped with a side draft, adjustable jet carburetor that was properly set at the factory and should not have to be reset. If black exhaust smoke is noted, check the air cleaner first - an apparent "overrich" mixture can actually be

due to a clogged air cleaner element. If element is replaced and black smoke continues, or if other conditions listed in the following table exist, adjust the carburetor immediately. An incorrect setting can lead to fouled spark plugs, overheating, excessive valve wear or other problems.

Condition	Possible Cause/Probable Remedy
<ol style="list-style-type: none"> <li>1. Black, sooty exhaust smoke, engine sluggish.</li> <li>2. Engine misses and backfires at high speed.</li> <li>3. Engine starts, sputters and dies under cold weather starting.</li> <li>4. Engine runs rough or stalls at idle speed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Mixture too rich - readjust main fuel screw.</li> <li>2. Mixture too lean - readjust main fuel screw.</li> <li>3. Mixture too lean - turn main fuel adjustment 1/4 turn counterclockwise.</li> <li>4. Idle speed too low or improper idle adjustment — readjust speed then idle fuel screw if needed.</li> </ol>

### To Adjust Carburetor:

*Carburetor adjustments should be made only after engine has warmed up.*

1. Stop engine, turn main fuel and idle fuel adjusting screws clockwise, until they bottom **lightly**.

**CAUTION:** Adjusting screw ends taper to critical needle valves which will be damaged if screws are turned in forcefully.

2. **Preliminary Settings—Main Fuel** - (Models KT17 and KT19) - turn main fuel adjusting screw counterclockwise 2-1/2 turns from bottom. (Model KT21) - turn main fuel adjusting screw counterclockwise 3 turns from bottom. **Idle Fuel** - (For all KT models) - turn idle fuel adjusting screw counterclockwise 1 to 1-1/4 turns from bottom.

3. **Final Setting—Main Fuel** - Start and run engine at half-throttle for 5-10 minutes to warm up. Turn main fuel adjusting screw clockwise from the preliminary setting until speed decreases and note position of the screw. Now turn the screw counterclockwise - the engine speed may first increase, then it will decrease as it is turned. Note the position of the screw when engine speed starts to decrease. Set the screw midway between the two points noted.

4. **Final Setting—Idle Fuel** - Allow engine speed to fall to idle or put throttle in Idle position. Make adjustment using the same procedure as Final Setting - Main Fuel in Step 3.
5. **Idle Speed Setting**—Run engine at half-throttle for 5-10 minutes to warm up. Allow engine speed to fall to idle, or put throttle in Idle position. Set engine speed to 1200 RPM ( $\pm$  75 RPM) by turning the idle speed screw clockwise or counterclockwise.

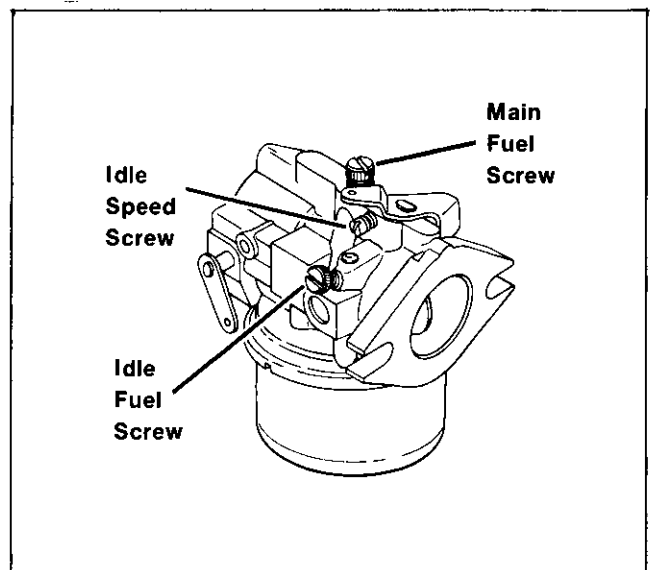


Figure 4-1. Carburetor Adjustments

## SECTION 4 FUEL SYSTEM AND GOVERNOR

### CARBURETOR RECONDITIONING

Difficulties with fuel systems usually originate from improper carburetor settings, or from dirt, gum or varnish in carburetor components. The necessity of cleaning will depend upon use and operating conditions. To clean thoroughly, it will be necessary to disassemble carburetor.

#### Cleaning Carburetor

All parts should be carefully cleaned using a carburetor cleaner (such as acetone). *Follow cleaner manufacturer's warnings and instructions on its proper and safe use.*

**CAUTION:** Carburetor should not be submersed in cleaner or solvent, it may damage fiber and rubber seals.



Be sure all deposits are removed from bore, especially where throttle plate seats in casting. Blow out all passages with compressed air. Replace all worn and damaged parts. Always use new gaskets.

Carburetor repair kits are available from your Kohler parts supplier. Kits include a bowl retaining screw gasket, bowl ring gasket, float pin, bowl baffle gasket, and fuel inlet needle and seat.

#### Disassembly of Carburetor

(see Figure 4-2 for location of parts)

**WARNING:** *Disconnect and ground spark plug leads to eliminate electrical spark. When disconnecting fuel lines be sure to wipe up any spilled fuel and make sure no sources of heat, flame or sparks are near, as these can cause gasoline fumes to explode.*



1. Shut off fuel source.
2. Disconnect breather hose from carburetor intake elbow or from air cleaner base. (See Figure 8-39).
3. Remove air cleaner assembly.
4. Disconnect fuel line, governor linkage and choke linkage from carburetor.
5. Disconnect carburetor (with elbow attached) from manifold by removing two nuts. Separate carburetor from elbow by removing three screws.
6. Remove bowl retaining screw and bowl. (*Bowl may still contain gasoline—handle carefully.*)
7. Remove float pin, float, fuel inlet needle and seat. Check float for dents and leaks, also check for wear on float tabs or float hinge.
8. Remove baffle gasket and bowl gasket.

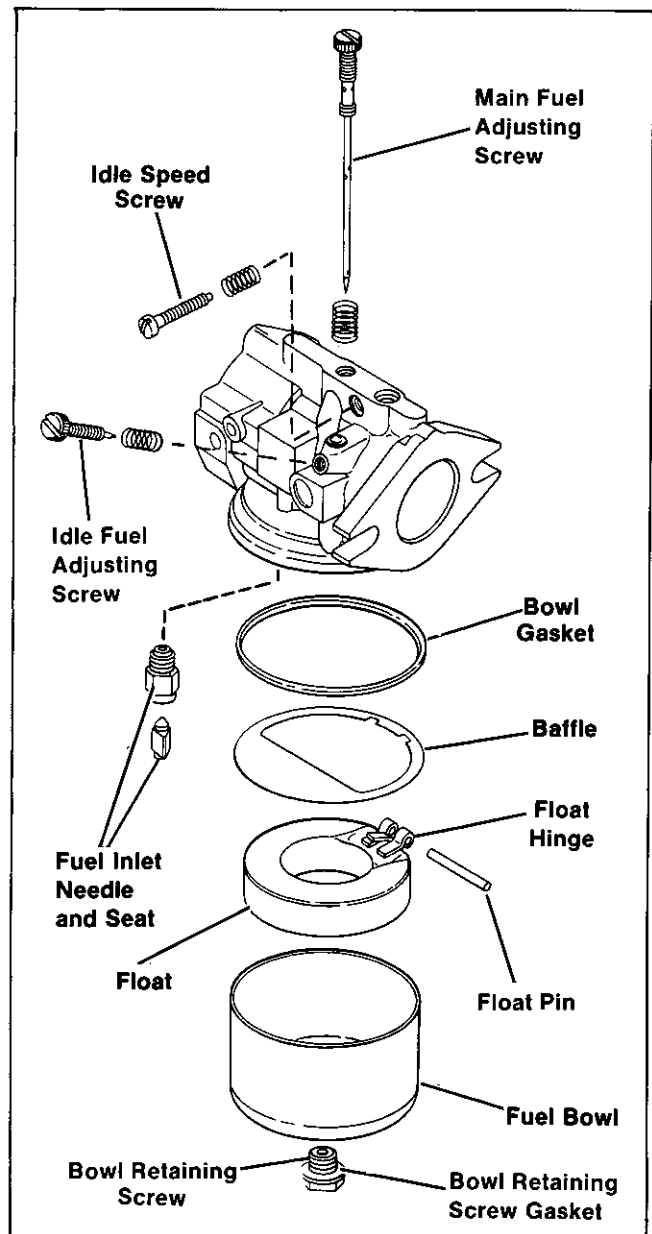


Figure 4-2. Side Draft Carburetor - Exploded View

9. Remove idle fuel adjusting screw, main fuel adjusting screw and springs.
10. If the throttle and choke shafts are worn, a repair kit is available. Refer to the Parts Manual for the part number of this kit.

#### Assembly of Carburetor

1. With carburetor casting inverted, install fuel inlet seat. Torque seat to 35 in. lbs.  
Install inlet needle, float, and float pin.

**NOTE:** Floats in current production carburetors have two tabs on the float hinge. Bend tab

"A" to set float level (Step 2). Bend tab "B" to set float drop (Step 3). See Figure 4-3.

For floats with tab "A" only, set float level (Step 2) - omit Step 3.

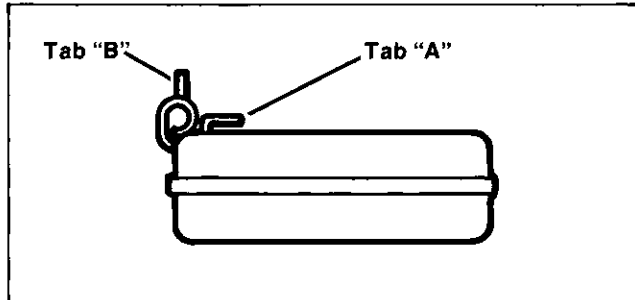


Figure 4-3. Float Tab Details

2. **Set float level.** Invert carburetor—with float resting lightly against inlet needle in its seat, there should be  $11/64"$  ( $\pm 1/32"$ ) clearance between machined surface of casting and free end of float (side opposite needle seat). Adjust by bending float tab "A" with a small screwdriver. See Figure 4-4.

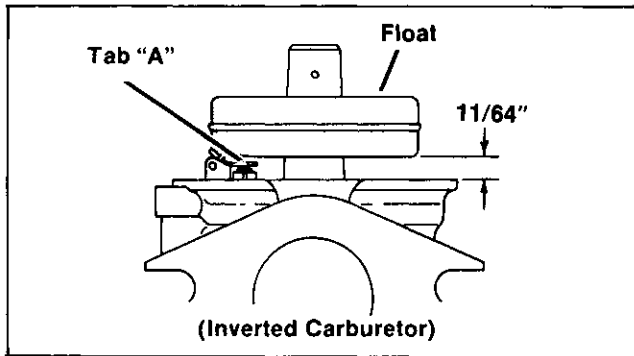


Figure 4-4. Setting Float Level

3. **Set float drop.** With carburetor in normal operating position, float drop should be limited to  $1-1/32"$  between machined surface of casting and free end of float. Adjust by bending float tab "B." See Figure 4-5.

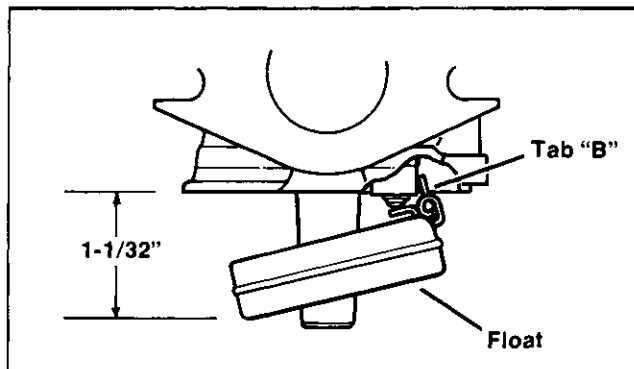


Figure 4-5. Setting Float Drop

4. **Check float clearance.** Invert carburetor—check clearance between float and float pin towers with a  $.010"$  feeler gauge. If feeler cannot be inserted or if there is interference between the float and towers, file the towers to achieve proper clearance. See Figure 4-6.

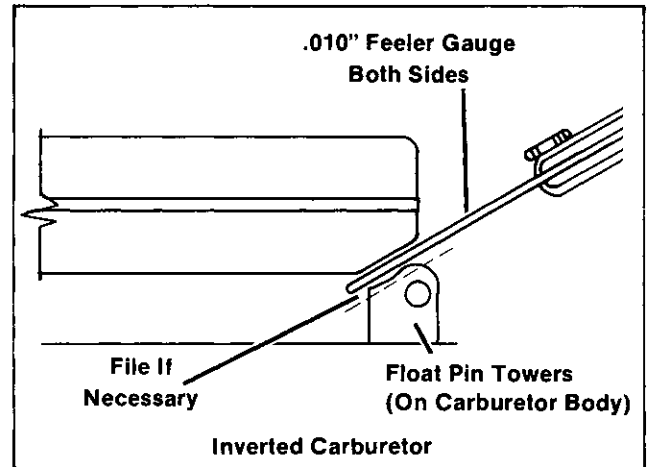


Figure 4-6. Checking Float Clearance

5. Install new bowl gasket and baffle gasket. Position baffle gasket so that the inner edge of gasket is against float pin towers.
6. Install fuel bowl—make sure it is centered on baffle gasket to form a good seal. Install bowl retaining screw and gasket. Torque screw to 50 in. lbs.
7. Install main fuel and idle fuel adjusting screws and springs. Turn in until needle bottoms **lightly**. Install idle speed adjusting screw and spring.
8. Connect carburetor to inlet elbow with three screws. Connect carburetor with inlet elbow to manifold with two nuts.
9. Connect fuel line, governor linkage and choke linkage to carburetor. (See Figure 4-7.)
10. Assemble air cleaner. (See Section 3.)
11. Connect breather hose to inlet elbow (early KT17 models only) or air cleaner base.
12. Turn fuel source back on.
13. Adjust carburetor as instructed under "To Adjust Carburetor."

## SECTION 4 FUEL SYSTEM AND GOVERNOR

### GOVERNOR SYSTEM

**WARNING:** *Never tamper with governor settings to increase the maximum speed of the engine. Overspeeding can cause equipment parts to exceed design limitations, resulting in component failures. Parts breaking under excess stress can become lethal missiles if thrown off by the equipment. Broken parts flying through the air can injure or kill.*

These engines are equipped with a centrifugal flyweight governor. The governor gear/flyweight mechanism is mounted within the crankcase and driven off a gear on the camshaft.

### Governor Operation

Centrifugal force causes the flyweights to move outward as speed increases and inward as speed decreases. As the flyweights move outward, they force the rod portion of the assembly to push outward. The rod, in turn, contacts a tab on the governor cross shaft causing it to rotate with changing speed. One end of the cross shaft protrudes through the side of the crankcase. Through external linkage, the action of the cross shaft is transmitted to the throttle (or butterfly) valve in the carburetor.

When the engine is at rest and the throttle is in the "Fast" position, the tension of the governor spring holds the throttle valve open. When the engine is operating (governor gear is turning), the force applied by the governor gear against the cross shaft tends to close the throttle valve. The governor spring tension and the force applied by the governor gear are in "equilibrium" during operation and hold the engine speed constant.

When a normal load is applied and engine (and governor) speed decrease, the tension of the governor spring rotates the governor arm to open the throttle valve wider. This admits more fuel and restores engine speed. (With the governor properly adjusted, this action takes place so rapidly, a reduction in speed is hardly noticed.) As speed reaches the governed setting, the tension of the governor spring and the force applied by the governor gear will again be in equilibrium, maintaining speed at a relatively constant level. For identification of the governor components mentioned above, see Figure 4-7.

Governed speed may be at a fixed point as on constant speed applications, or variable as determined by a throttle control.

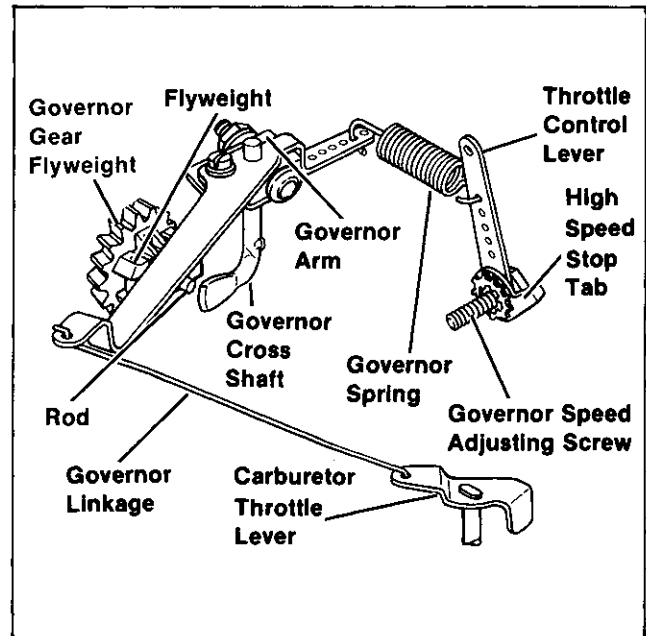


Figure 4-7. Governor Components

### Adjustments

Governors are adjusted at the factory and further adjustment should not be necessary. Governor adjustment may be indicated if engine speed surges with changing load, or if speed drops considerably when **normal** load is applied.

**Speed Adjustment** - Maximum allowable speed for these engines is 3600 RPM, no load. Check operating speed with a hand tachometer. Do not exceed this speed. If adjustment is necessary loosen the governor speed adjusting screw and pivot the high speed stop tab until desired speed setting is reached, then tighten the screw.

**Sensitivity Adjustment** - Governor sensitivity can be adjusted by repositioning the governor spring in the holes on the governor arm. If set too sensitive, speed surging will occur with change of load. If a big drop in speed occurs when normal load is applied, the governor should be set for greater sensitivity.

Normally, the governor spring is placed in the fifth hole from pivot of the governor arm and in the sixth hole from pivot on the throttle control lever. To make governor control more sensitive, increase governor spring tension by moving the spring end closer to the center of the governor arm. To allow broader governor control but less sensitivity, decrease spring tension by moving the spring toward the end of the arm.

**SERIES II**

**OPTIONAL THROTTLE AND CHOKE CONTROL**

Some Series II Engines are equipped with throttle and choke controls mounted to the intake manifold.

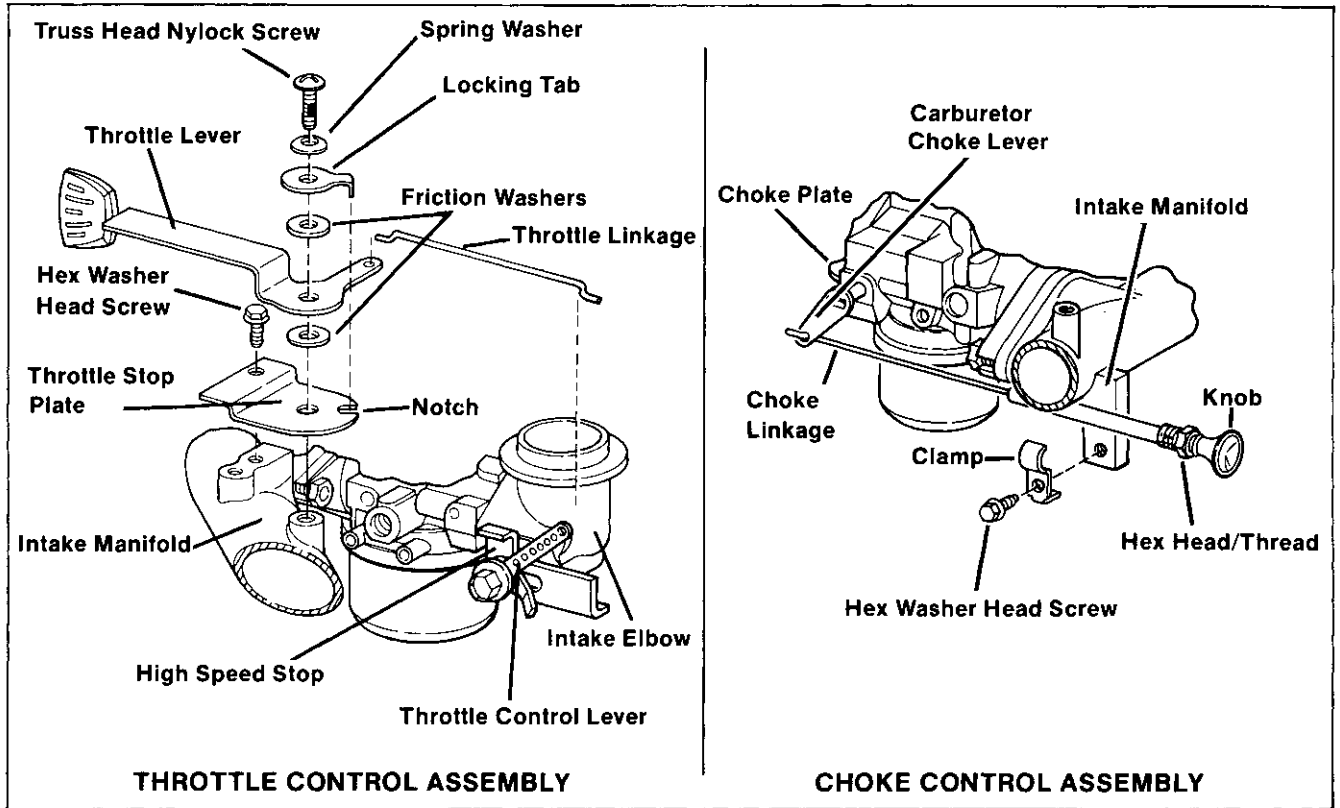


Figure 4-8. Engine Throttle And Choke Controls

**Disassembly**

1. Remove the 1/4-20x5/8" truss head nylock screw securing throttle control components to intake manifold. Remove the spring washer, locking tab, friction washers and throttle lever. Disconnect throttle linkage.
2. Remove the 10-24x3/8" hex washer head screw and throttle stop plate from intake manifold.
3. Remove the 10-24x3/8" hex washer head screw and clamp securing choke control assembly to intake manifold. Disconnect choke linkage from choke lever on carburetor.

**Assembly**

1. Install throttle stop plate to intake manifold. Secure with a 10-24x3/8" hex washer head screw.
2. Connect throttle linkage to throttle lever and throttle control lever (on carburetor intake elbow).

3. Install friction washers and throttle lever, locking tab, spring washer, and 1/4-20x5/8" truss head nylock screw. Make sure locking tab is positioned in the notch in throttle stop plate. See Figure 4-8.

Tighten the nylock screw enough to hold throttle lever in position while the engine is running. Do not overtighten the screw—the throttle lever should still operate smoothly.

4. Connect choke linkage to choke lever on carburetor. Loosely install choke control assembly to intake manifold with clamp and 10-24x3/8" hex washer head screw.

Adjustment: With choke knob against hex head/thread, move choke control assembly towards carburetor until choke plate is in the wide open position—tighten screw securely. See Figure 4-8.

## SECTION 4 FUEL SYSTEM AND GOVERNOR

### FUEL PUMP

These engines have a mounting pad and provision on the crankcase for a mechanically operated fuel pump. On applications with gravity feed systems, the pad is covered and the fuel pump is not used.

### Fuel Pump Operation

The mechanical pump operates off a cam on the camshaft. The fuel pump lever rides on the cam transmitting a pumping action to a diaphragm within the pump body as illustrated in Figure 4-9.

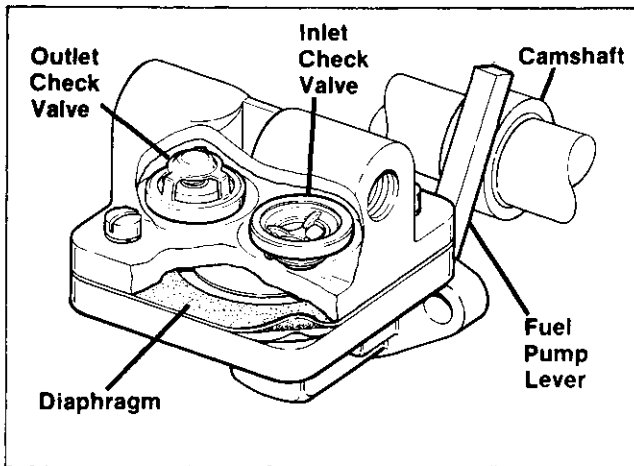


Figure 4-9. Fuel Pump Function

### Fuel Pump Check

**WARNING:** Before performing this check be sure to wipe up any spilled fuel and make sure no sources of heat, flame or sparks are near, as these can cause gasoline fumes to explode. Disconnect and ground spark plug leads to eliminate electrical spark.

1. Remove the fuel line at the carburetor and crank the engine. If no fuel comes out of fuel line check the fuel flow into pump (Step 2).
2. Remove the fuel line at the inlet side of the fuel pump and hold the line lower than the gas tank. If fuel flows freely from the fuel line the pump is faulty and should be replaced. Fuel pumps are not serviceable—replacement kits are available from your Kohler parts supplier.

See Fuel Pump installation instructions in Section 8.

### OPTIONAL AUTOMATIC CHOKE AND SHUTDOWN CONTROL

Some KT17 engines on generator applications may be equipped with an optional Thermo-Electric Automatic Choke, and with a Fuel Shutdown Control.

### Automatic Choke Function

The choke is an integral part of the carburetor. The choke will close automatically from ambient air. Upon starting, the engine vacuum will partially open the choke. The bi-metal spring in the choke is electrically connected to the ignition coil and the current flowing through the bi-metal spring will heat to a point that the choke will open fully.

### Automatic Choke Adjustment

The choke unit (Figure 4-10) is set at the factory for average conditions. To readjust for local conditions, loosen the cover retaining screws and shift the cover in clockwise direction for richer setting or counterclockwise direction for leaner setting. Tighten the cover retainer screws.

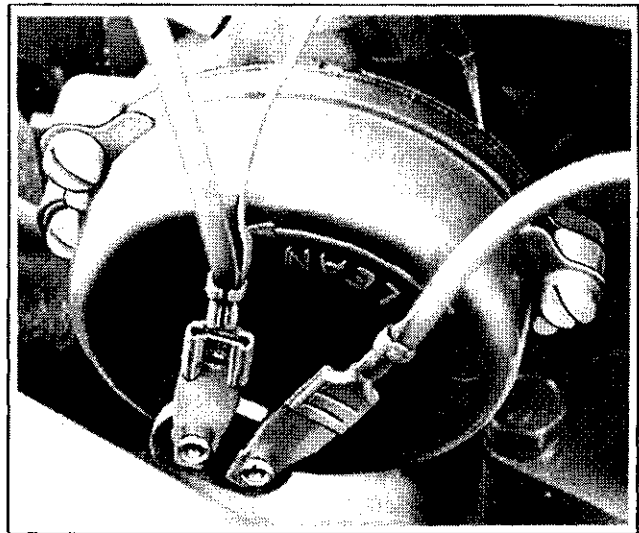


Figure 4-10. Automatic Choke.

**Automatic Choke Service Guide**

Problem	Causes	Solutions
<b>Choke Won't Close When Cranking</b>	Faulty lead to choke.	<ol style="list-style-type: none"> <li>1. Check for secure lead connections</li> <li>2. Make continuity check on lead. Replace if no continuity.</li> </ol>
	Faulty lead to ground.	<ol style="list-style-type: none"> <li>1. Check for secure lead connections.</li> <li>2. Make continuity check on lead. Replace if no continuity.</li> </ol>
	Poor adjustment.	<ol style="list-style-type: none"> <li>1. Adjust choke.</li> <li>2. Repair with kit or replace choke.</li> </ol>
<b>Choke Will Not Fully Open</b>	<ol style="list-style-type: none"> <li>1. Poor adjustment.</li> <li>2. Faulty choke.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust choke.</li> <li>2. Repair with kit or replace choke.</li> </ol>

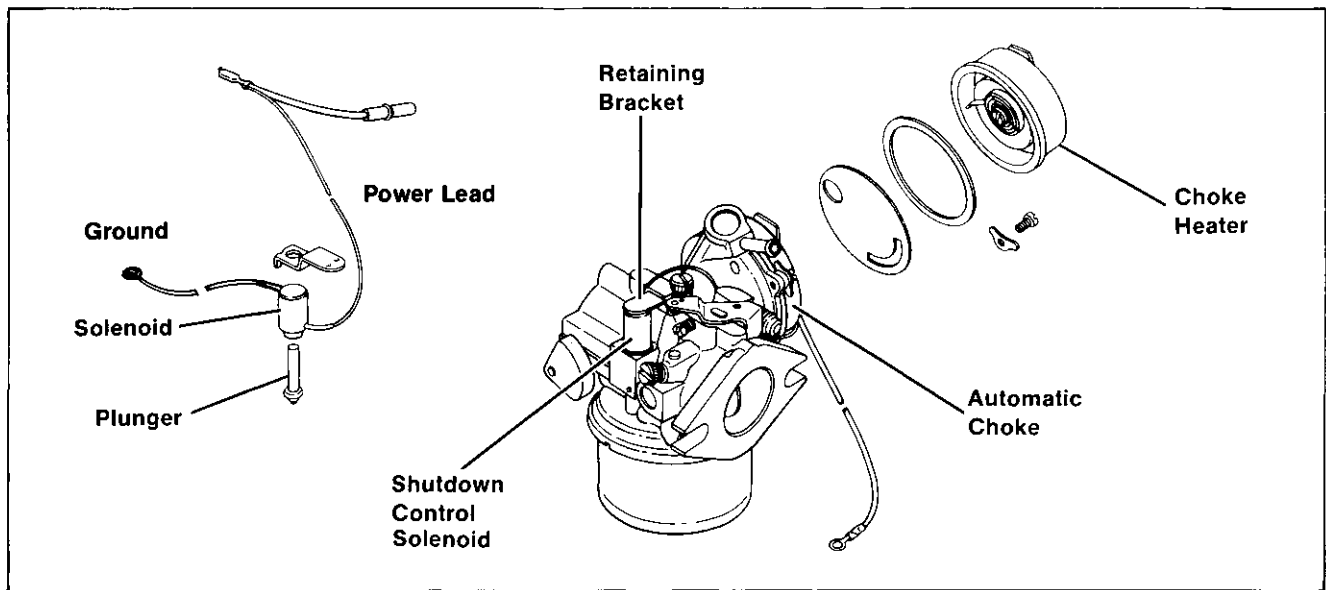


Figure 4-11. Engine Shutdown Control And Automatic Choke

**Automatic Choke Inspection**

1. Disconnect the high tension leads from spark plugs so the engine will not start.
2. Remove the air cleaner cover, element and base.
3. Push the start switch on the controller to the start position and hold for five seconds. The choke should fully close and release when the start switch is released.
4. If the choke does not function properly (Step 3) see Service Guide.

**Automatic Choke Service**

**Choke Unit Replacement** (see Figures 4-10 And 4-11).

1. Position the choke unit on the two mounting screws so that it is slightly loose.
2. Rotate the choke unit clockwise on the carburetor (viewed from the choke side) with a slight pressure until the choke valve is positioned 4 to 6 degrees towards the closed position.
3. While holding the choke unit in the above position, tighten the two mounting screws
4. This adjustment must be accomplished at an ambient temperature of 70-75° F.

## SECTION 4 FUEL SYSTEM AND GOVERNOR

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### Shutdown Control Function

The engine shutdown control device is a solenoid and plunger mounted on the carburetor which prevents the engine from “running on” after the ignition is turned off. See Figure 4-11. When the switch is in the start position, battery current thru the solenoid holds the plunger and continues to hold it while the engine is running. When the switch is moved to the stop position the solenoid de-energizes and drops the plunger into a porting in the carburetor to stop all flow of fuel.

The engine shutdown control has two lead wires on it — a ground lead from the top of the shutdown solenoid and a power lead from the bottom of the solenoid. The power lead is wired into the (+) side of the ignition coil.

### Shutdown Control Inspection

1. Make sure the solenoid has a secure electrical connection and good contact with the retaining bracket (ground).
2. Check for stuck plunger. Replace if damaged.
3. Check for defective solenoid with an ohmmeter or multimeter. Solenoid resistance is approximately 20 ohms.

### Shutdown Control Test

Refer to Figure 4-11 for identification of parts.

1. Remove shutdown control (solenoid and plunger) from carburetor body by loosening the main fuel adjusting screw so the bracket holding the control can be shifted. Do not disconnect the lead wires.
2. Pull the shutdown control out of the carburetor.
3. Hold the plunger approximately 1/4” away from the solenoid. Turn the ignition switch to “ON” and release the plunger.

If the plunger is drawn into the solenoid, the shutdown control is functioning properly.

If the plunger is not drawn into the solenoid, the solenoid is faulty and must be replaced.

As a temporary fix, until a replacement solenoid can be obtained, the plunger can be removed from the shutdown control and the solenoid reinstalled minus the plunger.\*

After replacing solenoid, reset main fuel adjusting screw according to procedures under “To Adjust Carburetor”.

\*The removal of the plunger will not affect normal carburetor function; however, to prevent unfiltered air from entering the carburetor, the defective solenoid must be reinstalled over shutdown control vent hole, after the plunger has been removed.