SECTION 4 - FUEL SYSTEM

CARBURETOR

The K361 engine is equipped with a side draft, adjustable jet carburetor. It is adjusted in the factory and should not have to be reset. If, however, one of the following conditions is noted, readjust carburetor immediately as incorrect setting can lead to fouled spark plugs, overheating, excessive valve wear or other problems (see chart below).

CARBURETOR ADJUSTMENTS

If readjustment becomes necessary, stop the engine, then turn the MAIN and IDLE fuel adjusting screws all the way in, until they bottom lightly.

CAUTION: Do not force adjusting screws closed as damage to needle valves will result.

Main Fuel Adjustment

Preliminary setting – turn screw out 2-1/2 turns. Final setting – start engine and raise engine speed to maximum governed, no load speed. Turn screw in just until engine speed decreases and note the position of the screw. Now turn the screw out. The engine speed will first increase, but then decrease as screw is turned out. Note the position of screw when engine speed starts to decrease. Set the screw midway between the two points noted above. (For location of main fuel screw see Figure 4-1.)

Idle Speed Adjustment

Run engine at maximum governed, no load speed for a minimum of 30 seconds, then allow engine speed to fall to idle, or put throttle into idle position. Set engine speed to 1800 RPM ± 75 RPM or per engine spec., turning in or out on the idle speed screw. (See Figure 4-1 for location of idle speed screw.)

Idle Fuel Adjustment

Set the idle fuel mixture by turning the idle fuel screw out, from the closed position, 3/4 to 1 full turn. (For location of idle fuel screw see Figure 4-1.)

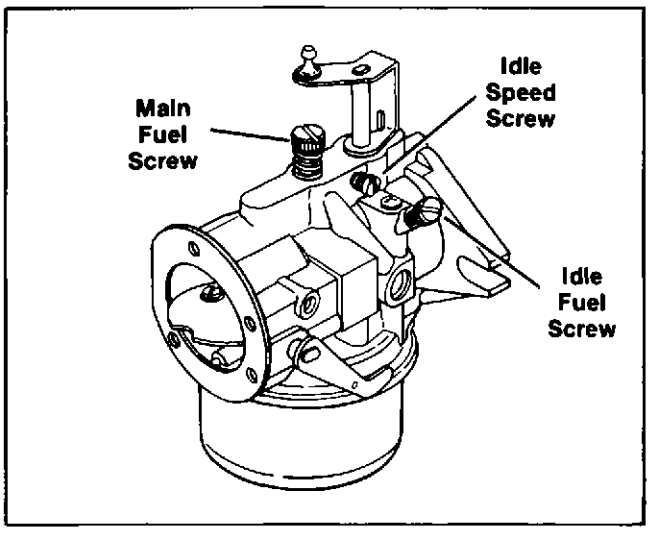

Figure 4-1. Carburetor Adjustments

CARBURETOR RECONDITIONING

Service difficulties with fuel systems usually originate from improper carburetor adjustment or dirt, gum or varnish in components. It will be necessary to completely disassemble carburetor to clean thoroughly. Normally only pre-season cleaning will be required; however, the frequency of cleaning will depend upon use and operating conditions.

All parts should be cleaned in a solvent. Gum is easily removed with acetone solvent. (NOTE: Always follow manufacturers' instructions when using cleaning solvents.) 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 for most carburetors. They include the bowl nut gasket (if required), bowl ring gasket, float pin, bowl baffle gasket and fuel inlet needle and seat.

Condition	Possible Cause/Probable Remedy
1. Black, sooty exhaust smoke, engine sluggish.	1. Mixture too rich – readjust main fuel screw.
2. Engine misses and backfires at high speed.	2. Mixture too lean – readjust main fuel screw.
3. Engine starts, sputters and dies under cold weather starting.	3. Mixture too lean – turn main fuel adjustment 1/4 turn counterclockwise.
4. Engine runs rough or stalls at idle speed.	4. Idle speed too low or improper idle adjustment – readjust speed, then idle fuel screw, if needed.
5. Erratic operation, engine starving for fuel.	5. Air horn gasket is improperly aligned or wrong gasket – realign or replace gasket. Shutdown control not functioning – replace solenoid.

Disassembly of Carburetor - Side Draft (see Figure 4-2 for location of parts).

1. Remove carburetor from engine.
2. Remove bowl nut, gasket and bowl.
3. Remove float pin, float, needle and needle seat. Check float for dents, leaks and wear on float lip or in float pin holes.
4. Remove bowl ring gasket.
5. Remove idle fuel adjusting needle, main fuel adjusting needle and springs.
6. Do not remove choke and throttle plates and shafts. If these parts are worn, replace carburetor assembly.

Assembly of Carburetor - Side Draft (see Figure 4-2 for location of parts).

1. Install needle seat, needle, float and float pin.
2. Set float level. With carburetor casting inverted and float resting lightly against needle in its seat, there should be 11/64" plus or minus 1/32 of an inch clearance between machined surface of casting and free end of float (side opposite needle seat).
3. Adjust by bending lip of float with small screwdriver.
4. Install new bowl ring gasket, bowl baffle gasket, new bowl nut gasket (when required) and bowl nut. Tighten securely after making sure bowl is centered on gasket.

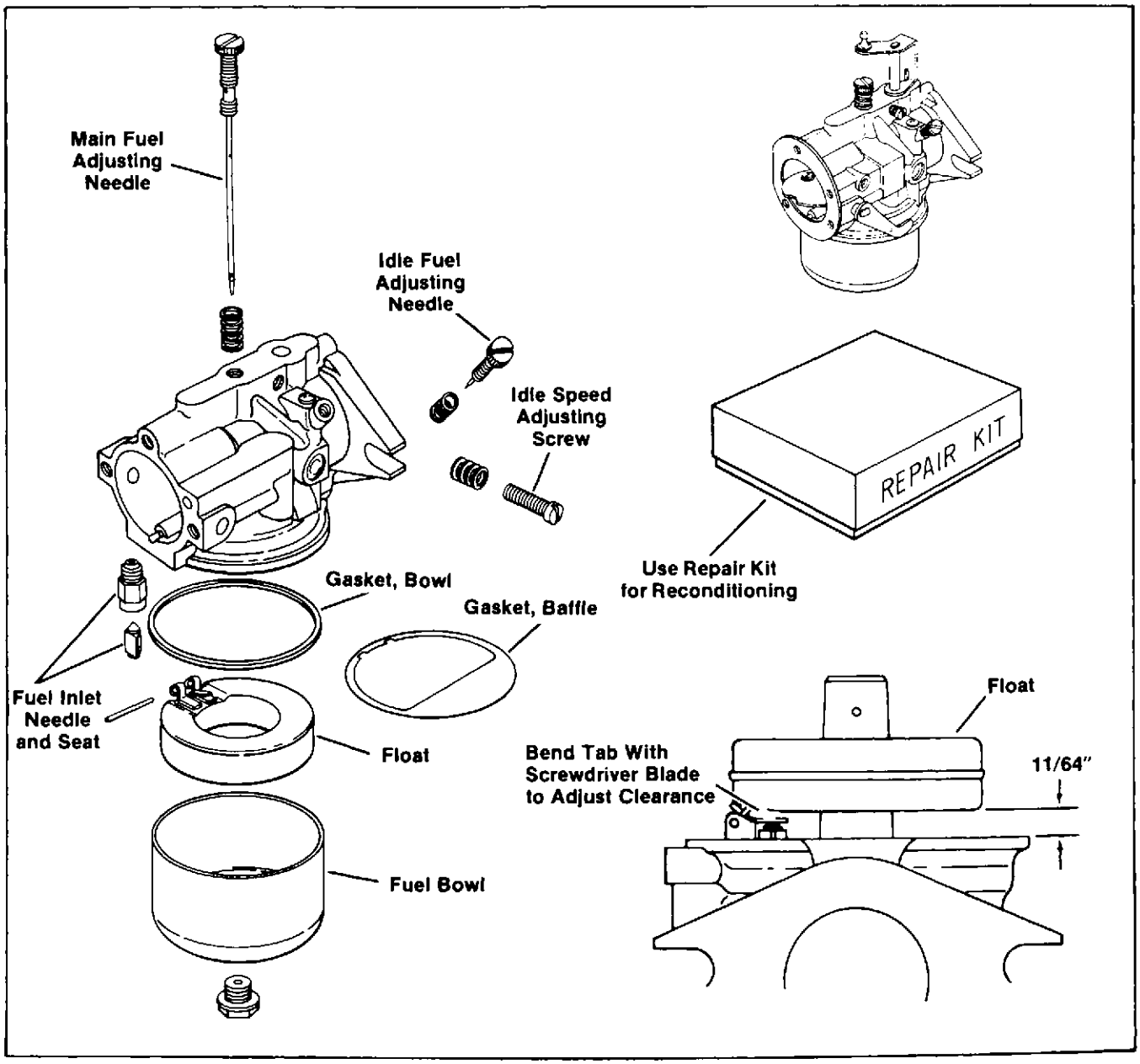

Figure 4-2. Side Draft Carburetor

5. Install main fuel adjustment needle and spring. Turn in until needle seats in nozzle and back out 2-1/2 turns.
6. Install idle fuel adjustment needle and spring. Back out approximately 3/4 to 1 full turn after seating lightly against jet.

CAUTION: Do not use force on adjustment needles.

AUTOMATIC CHOKE AND SHUTDOWN CONTROL

Some K361 engines are equipped with an optional Thermo-Electric Automatic Choke and Fuel Shutdown Solenoid. The automatic choke and shutdown solenoid function as follows:

Automatic Choke Function

The choke valve position is determined by two systems. First, a thermostatic (heat sensitive) spring positions the choke valve based on air temperature. Second, a rotary solenoid (electro magnet pulling on rotatable shaft) is engaged during cranking and operates through the thermostatic spring to close the choke further. When the cranking circuit is de-energized, the rotary solenoid disengages and the choke plate is returned to a position determined by the thermostatic spring. As the engine starts to run and warm up, the thermostatic spring is heated by a thermistor, which fully opens the choke valve. The full open valve position is maintained as the thermistor continues to heat the spring by its regulation of current flow. (See Figure 4-3 for additional automatic choke information.)

Automatic Choke Service Guide

WARNING: *Before working on or near the carburetor or choke area, or when checking choke operation, during cranking, always remove spark plug lead to prevent engine from starting accidentally and to avoid personal injury.*

Use this service guide to help maintain proper choke function.

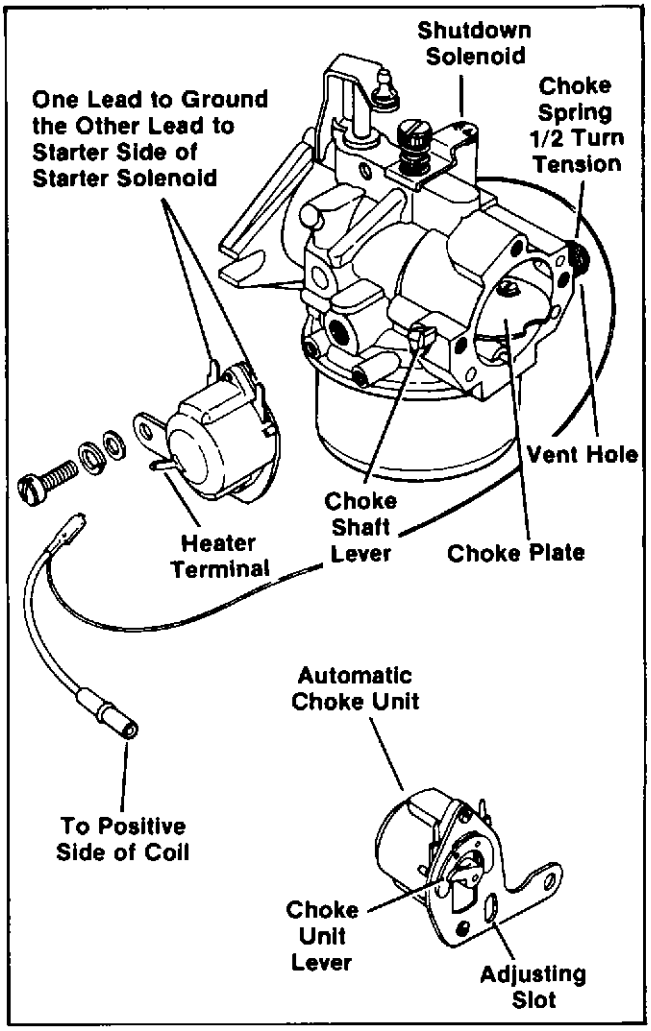

Figure 4-3. Carburetor With Thermo-Electric Automatic Choke and Shutdown Solenoid

Problem	Causes	Solutions
Choke Won't Close When Cranking	1. Faulty lead wires or terminals.	1. Change lead wires or replace choke.
	2. Air cleaner gasket interference with choke shaft lever.	2. Reposition flat of gasket to provide clearance for choke shaft lever.
	3. Open circuit in solenoid winding.	3. Check continuity with ohmmeter between the two solenoid terminals. Replace choke unit if open circuit.
	4. Choke lever lacks sufficient travel or smooth movement.	4. Manually move choke lever to fully closed. Replace if choke does not move freely.
Choke Will Not Fully Open	1. Choke spring not properly adjusted.	1. Remove spring and, with choke wide open, wind up spring 1/2 turn.
	2. Choke shaft fails to move freely.	2. Replace carburetor.
	3. Faulty choke adjustment.	3. Adjust choke.

Choke Unit Replacement and Adjustments (see Figure 4-3).

1. Position the choke unit on the two mounting screws so that it is slightly loose.
2. Hold the choke plate in the wide open position.
3. Rotate the choke unit clockwise on the carburetor (viewed from the choke side) with a slight pressure until it can no longer be rotated. Make sure the choke shaft lever is below the choke unit lever.
4. While holding the choke unit in the above position, tighten the two mounting screws. (NOTE: With engine not running and before any cranking, the choke valve will be closed 5° to 10° at a temperature of about 75° F. As the temperature decreases the choke valve will close even more.)
5. Check choke function by removing the spark plug lead and cranking the engine. The choke valve should close a minimum of 45° at a temperature about 75° F. The valve will close more at lower temperatures.

Engine Shutdown Control - Function

The engine shutdown control is a device which prevents the engine from "running on" after the ignition is turned off. This is accomplished by a solenoid-operated valve which is energized when the ignition is turned on, causing the valve to open. In this open position, normal bowl venting is permitted from the air cleaner to the air space above the fuel in the bowl. When the ignition is turned off the valve closes and normal bowl venting is prohibited and no fuel will flow. The engine shutdown control has only one wire and it is connected to the positove (+) terminal on the ignition coil.

In order to make the control effective, the throttle lever should not be in the OFF or IDLE position when the ignition switch is turned off.

Shut-down Control - Test

Disconnect shut-down control from carburetor body by loosening the main fuel adjusting screw so the bracket that holds the control can be shifted from it. Do not disconnect the lead wire from the ignition coil. Pull the shut-down control (solenoid and plunger) out of the carburetor and ground the case of the solenoid on the carburetor or other convenient engine surface. Hold the plunger approximately 1/4" in front of the solenoid, then turn ignition switch to "ON". Release the plunger. If the plunger is drawn into the solenoid, the shut-down control is functioning properly. The solenoid is faulty and must be replaced if the plunger is not drawn in. Refer to Figure 4-4 for identification of parts.

As a temporary fix, the plunger can be removed from the shut-down control and the solenoid reinstalled (minus plunger), until a replacement solenoid can be obtained. (NOTE: Do not discard plunger, as it must be reused with replacement solenoid.)* After replacing solenoid reset main fuel adjusting screw according to specification (see "Carburetor Adjustments" Section 4).

**The removal of the plunger will not affect normal carburetor function; however, it is important to reinstall defective solenoid over shut-down control vent hole, after plunger removal, to prevent unfiltered air from entering the carburetor.*

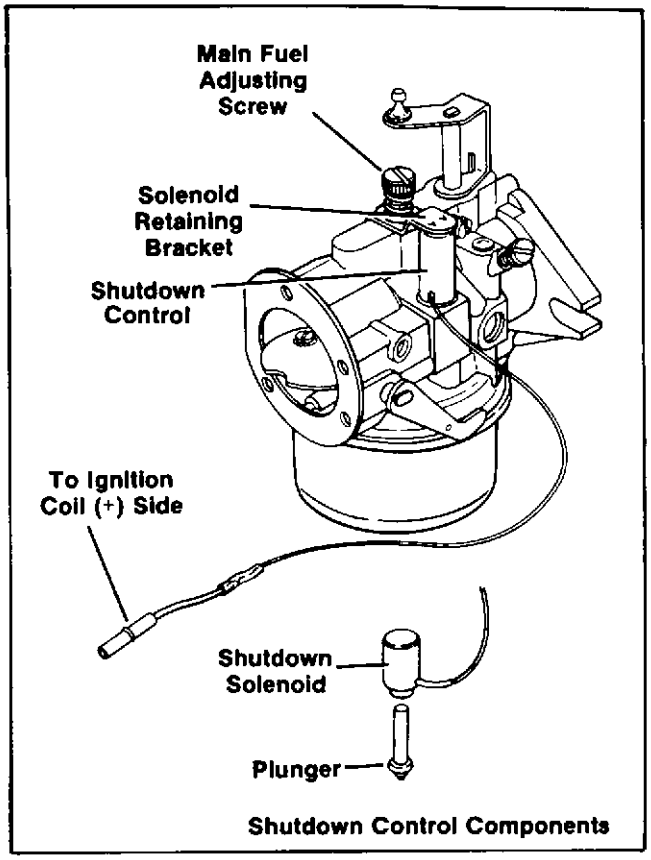

Figure 4-4. Engine Shutdown Control

FUEL PUMP

The K361 has a mounting pad and provision on crankcase for a mechanically operated fuel pump. On some 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 and transmits this mechanical action to a diaphragm within the pump body (see Figure 4-5). Some mechanical pumps have an external lever for priming.

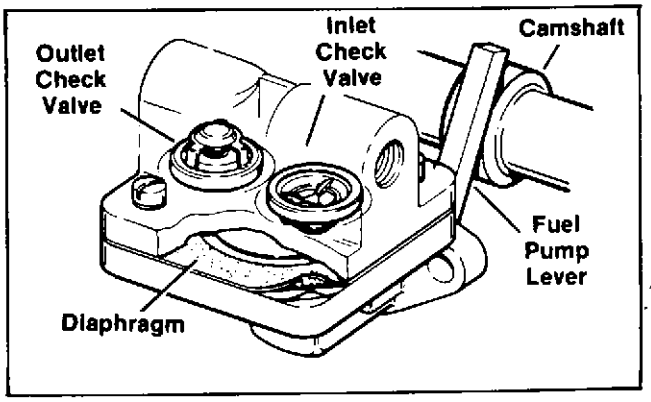

Figure 4-5. Fuel Pump Function

Fuel Pump Check

WARNING: *When performing this test 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.*

To check the operation of the fuel pump disconnect the spark plug lead. 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. This can be done by removing the fuel line at the inlet side of the fuel pump and holding the line lower than the gas tank. If fuel flows freely from the fuel line the pump is faulty and should be replaced.

The replacement fuel pumps are of a thermoplastic design which effectively insulates and prevents fuel from vaporizing inside the pump. The pumps are interchangeable with the metal pumps and are available in kit form. The kits include the pump, new mounting gasket and two flat washers.

Some important points regarding the non-metallic bodied pumps are as follows:

1. FUEL FITTINGS: Apply small amount of Permatex 300 or Hercules GRIPP sealant on threads, then turn fittings into pump 5 full turns and continue in same direction until required position is attained.
2. Use *only* the gasket provided in the kit. If a thick insulating gasket was used with the metal pump, discard it. It is not only unnecessary, but could cause distortion of the flange while tightening the mounting capscrews.
3. Make sure the flat washers provided in the kits are installed next to the flange to prevent the lockwasher from damaging the flange. The lockwashers and mounting screws from the old pump can be reused with the new pump, but make sure the screws are tightened to 70 in. lbs. - overtightening can also damage the flange.

GOVERNOR SYSTEM

The K361 engine is equipped with a centrifugal flyweight mechanical 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 with increase in speed and inward with decreasing speed. As the flyweights move outward, they force the rod portion of the assembly to push outward. Tension of the governor spring pulls the flyweights back inward with decrease in engine speed. 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 butterly) valve in the carburetor. When the engine is at rest with throttle in "Fast" position, the tension of the governor spring should hold the throttle valve in open position.

When a normal load is applied and engine (and governor) speed tends to decrease, the resulting rotation of the cross shaft acts against the governor spring to open the throttle valve wider which, in turn, admits more fuel and restores engine speed. With governor properly adjusted, this action takes place so rapidly that a reduction in speed is hardly noticed. As speed again reaches governed setting, the shaft rotates to either open or close the throttle valve to maintain speed at a relatively constant level (see Figure 4-6).

Governed speed may be at a fixed point as on constant speed type settings or variable as determined by the throttle lever on variable speed type governor settings.

Adjustments

Governors are adjusted at the factory and further adjustment should not be necessary unless governor arm or linkage works loose and becomes disconnected. Governor readjustment may be indicated if engine speed surges or hunts with changing load or if speed drops considerably when *normal* load is applied.

Speed Adjustment

Maximum allowable speed under load for the K361 is 3600 RPM, no load speed is 3800 RPM. Check operating speed with a hand tachometer. Do not exceed this speed. If adjustment is necessary, tighten or loosen the governor speed adjusting screw until proper engine speed is attained (see Figure 4-6).

Sensitivity Adjustment

Governor sensitivity can be adjusted by repositioning the governor spring in the holes on the governor arm and throttle control lever. 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 third hole from the bottom on the governor arm and in the second hole from the top on the throttle control lever. To make governor control more sensitive, increase governor spring tension by moving the spring end upward in governor arm. Conversely, decreasing spring tension by moving the spring end downward in governor arm allows broader governor control, but less sensitivity.

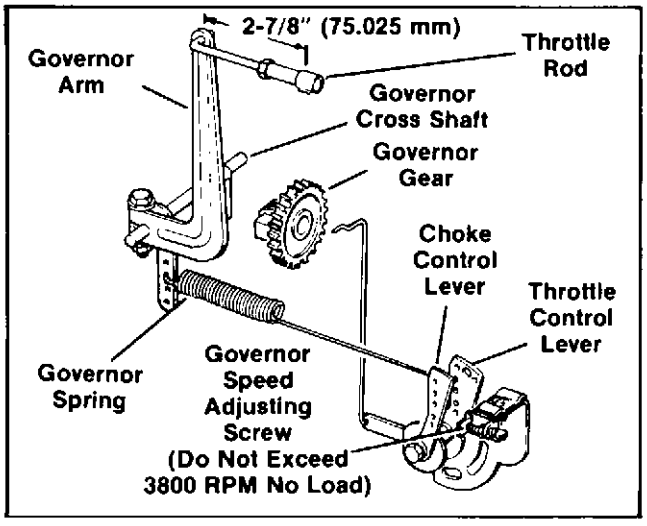

Figure 4-6. Governor Components (Automatic Choke Models Will Not Have Choke Control Lever)