Cub Cadet
Power Equipment

SERVICE BULLETIN

*CODE:* CC-*297*

*DATE:* *March 14, 1995*

*SUBJECT: Keihin carburetors on Kohler CH18, CH20 & CH22 engines*
*Cub Cadet tractor models 2185, 1863, 1864, 2084 & 2284*

*PROBLEM:*

*Reports from the field indicate customers are experiencing erratic engine running conditions on the Kohler Command engines. Typical symptoms are a surging of the engine at high RPM's and stalling of the engine at idle.*

*After inspecting carburetors returned to us for the above reasons, we found the following conditions. The carburetors had an incorrectly installed or plugged slow jet part number KH-24-337-01.*

*SOLUTION:*

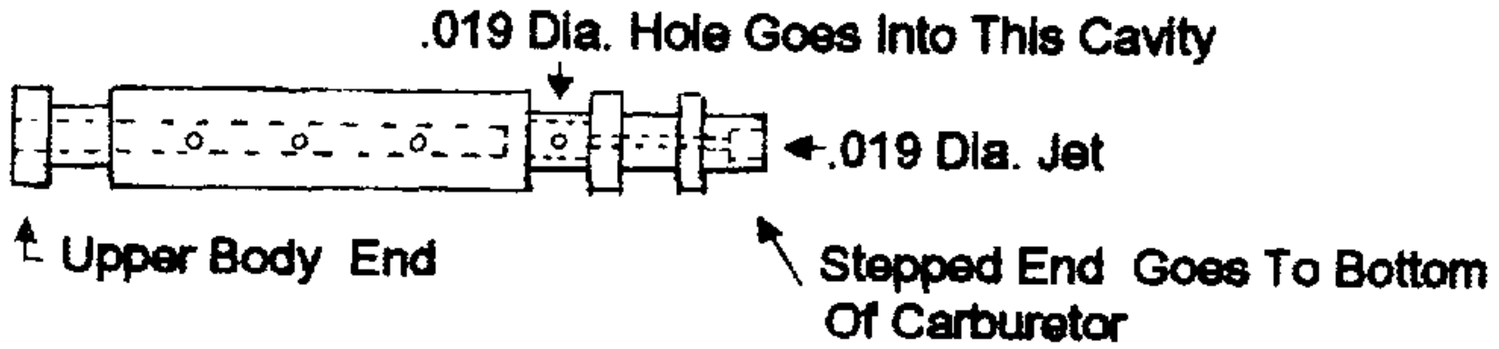
*Cleaning the slow jet completely as well as the rest of the carburetor is very important to resolve this situation. Before repairing carburetor, please read the attached Fuel System and Carburetor Troubleshooting Guide to aid in servicing.*

*After you remove and disassemble the carburetor, take special notice of the slow jet. Inspection of this jet is very critical. Carefully clean the jet thoroughly noting that the smaller end has a .019 diameter hole within the inside of the jet. (See figure below)*

*Install the slow jet into the carburetor upper body with the smaller stepped end facing outward. (To the bottom of carburetor)*

*After you reassemble and install the carburetor on the tractor, replace the fuel filter with part number KH-25-050-03 and test unit*

*As always, You should make an attempt to repair the carburetor before replacing.*




SLOW SPEED JET

*Circulate and initial*

| SERVICE MANAGER | PARTS MANAGER | SERVICE TECHNICIAN | SERVICE TECHNICIAN |
|---|---|---|---|
| | | | |

# Kohler Command Engine Carburetor & Fuel System Troubleshooting Guide

- Covers Keihin Carburetors used on Cub Cadet Tractor Models
  - 2185
  - 1863
  - 1864
  - 2084
  - 2284

**⚠ WARNING: Explosive Fuel**
*Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel. Never use gasoline as a cleaning agent.*

## Fuel Recommendations

### General Recommendations
Purchase gasoline in small quantities and store in clean, approved containers. A container with a capacity of 2 gallons or less with a pouring spout is recommended. Such a container is easier to handle and helps eliminate spillage during refueling.

- Do not use gasoline left over from the previous season, to minimize gum deposits in your fuel system and to ensure easy starting.
- Do not add oil to the gasoline.
- Do not overfill the fuel tank. Leave room for the fuel to expand.

### Fuel Type
For best results, use only clean, fresh, unleaded gasoline with a pump sticker octane rating of 87 or higher. In countries using the Research fuel rating method, it should be 90 octane minimum.

Unleaded gasoline is recommended, as it leaves less combustion chamber deposits. Leaded gasoline may be used in areas where unleaded is not available and exhaust emissions are not regulated. Be aware however, that the cylinder head will require more frequent service.

### Gasoline/Alcohol blends
Gasohol (up to 10% ethyl alcohol, 90% unleaded gasoline by volume) is approved as a fuel for Kohler engines. Other gasoline/alcohol blends are not approved.

### Gasoline/Ether blends
Methyl Tertiary Butyl Ether (MTBE) and unleaded gasoline blends (up to a maximum of 15% MTBE by volume) are approved as a fuel for Kohler engines. Other gasoline/ether blends are not approved.

### Fuel Filter
Most engines are equipped with an in-line filter. Visually inspect the filter periodically and replace when dirty with a genuine Kohler filter.

## Carburetor

### General
These engines are equipped with fixed main jet carburetors manufactured by Keihin to Kohler specifications. Most have automatic chokes and fuel shut-off solenoids. Keihin carburetors with accelerator pump features are standard on CH22-CH25 models and are furnished as an option on other CH applications where improved performance is required during periods of rapid acceleration. Both types are almost identical except for the accelerator pump parts shown in the inset in Figure 5-5. Most information in the following pertains to both type carburetors–differences are pointed out or shown wherever pertinent.

## Fuel Pump

### General
These engines are equipped with an external fuel impulse pump  The pumping action is created by the oscillation of positive and negative pressures within the crankcase. This pressure is transmitted to the impulse pump through a rubber hose connected between the pump and the valve cover or crankcase. The pumping action causes the diaphragm on the inside of the pump to pull fuel in on its downward stroke and to push it into the carburetor on its upward stroke. Two check valves prevent fuel from going backward through the pump.

### Performance
Minimum fuel delivery rate must be 7.5 L/hr. (2 gal /hr.) with a pressure at .3 psi and a fuel lift of 18" from carburetor inlet. A 1.3 L/hr. (.34 gal./hr.) fuel rate must be maintained at 5 Hz.

**Fuel System Tests**

When the engine starts hard, or turns over but will not start, it is possible that the problem is in the fuel system. To find out if the fuel system is causing the problem, perform the following tests.

## Troubleshooting – Fuel System Related Causes

| Test | Conclusion |
|---|---|
| 1. Check the following:<br>a. Make sure the fuel tank contains clean, fresh, proper fuel.<br>b. Make sure the vent in fuel tank is open.<br>c. Make sure the fuel valve is open. | |
| 2. Check for fuel in the combustion chamber.<br>a. Disconnect and ground spark plug leads.<br>b. Close the choke on the carburetor.<br>c. Crank the engine several times.<br>d. Remove the spark plug and check for fuel at the tip. | 2. If there **is** fuel at the tip of the spark plug, fuel is reaching the combustion chamber.<br><br>If there is **no** fuel at the tip of the spark plug, check for fuel flow from the fuel tank (Test 3). |
| 3. Check for fuel flow from the tank to the fuel pump.<br>a. Remove the fuel line from the inlet fitting of fuel pump.<br>b. Hold the line below the bottom of the tank. Open the shutoff valve (if so equipped) and observe flow. | 3. If fuel **does** flow from the line, check for faulty fuel pump (Test 4).<br><br>If fuel **does not** flow from the line, check for clogged fuel tank vent, fuel pickup screen, in-line filter, shutoff valve, and fuel lines. |
| 4. Check the operation of fuel pump.<br>a. Remove the fuel line from the inlet fitting of carburetor.<br>b. Crank the engine several times and observe flow. | 4. If fuel **does** flow from the line, check for faulty carburetor. (Refer to the "Carburetor" portions of this section.)<br><br>If fuel **does not** flow from the line, check for clogged fuel line. If the fuel line is unobstructed, the fuel pump is faulty and must be replaced. |

## Troubleshooting - Carburetor Related Causes

| Condition | Possible Cause/Probable Remedy |
|---|---|
| 1. Engine starts hard, runs roughly or stalls at idle speed. | 1. Low idle fuel mixture/speed improperly adjusted. Adjust the low idle speed tab, then adjust the low idle fuel needle. |
| 2. Engine runs rich (indicated by black, sooty exhaust smoke, misfiring, loss of speed and power, governor hunting, or excessive throttle opening). | 2a. Clogged air cleaner Clean or replace.<br>b. Choke partially closed during operation. Check the choke lever/ linkage to ensure choke is operating properly.<br>c. Low idle fuel mixture is improperly adjusted. Adjust low idle fuel needle.<br>d. Float level is stuck too high. Separate carburetor air horn from carburetor body, adjust float per steps 4 and 5 on page 5 6.<br>e. Dirt under the fuel inlet needle. Remove needle; clean needle and seat and blow with compressed air.<br>f. Bowl vent or air bleeds plugged. Remove low idle fuel adjusting needle. Clean vent, ports, and air bleeds. Blow out all passages with compressed air<br>g. Leaky cracked or damaged float. Submerge float to check for leaks. |
| 3. Engine runs lean (indicated by misfiring, loss of speed and power, governor hunting or excessive throttle opening). | 3a. Low idle fuel mixture is improperly adjusted. Adjust low idle fuel needle.<br>b. Float level is stuck too low. Separate carburetor air horn from carburetor body, adjust float per steps 4 and 5 on page 5.6.<br>c. Idle holes plugged; dirt in fuel delivery channels. Remove low idle fuel adjusting needle. Clean main fuel jet and all passages; blow out with compressed air. |
| 4. Fuel leaks from carburetor. | 4a. Float level stuck too high. See Remedy 2d.<br>b. Dirt under fuel inlet needle. See Remedy 2e.<br>c. Bowl vents plugged. Blow out with compressed air.<br>d. Carburetor bowl gasket leaks. Replace gasket. |

**Troubleshooting Checklist**
When the engine starts hard, runs roughly or stalls at low idle speed, check the following areas before adjusting or disassembling the carburetor.

- Make sure the fuel tank is filled with clean, fresh gasoline.
- Make sure the fuel tank cap vent is not blocked and that it is operating properly.
- Make sure fuel is reaching the carburetor. This includes checking the fuel shut-off valve, fuel tank filter screen, in-line fuel filter, fuel lines and fuel pump for restrictions or faulty components as necessary.
- Make sure the air cleaner base and carburetor are securely fastened to the engine using gaskets in good condition.
- Make sure the air cleaner element is clean and all air cleaner components are fastened securely.
- Make sure the ignition system, governor system, exhaust system, and throttle and choke controls are operating properly.

If the engine is hard-starting or runs roughly or stalls at low idle speed, it may be necessary to adjust or service the carburetor.

## Fuel Shut-off Solenoid

Some carburetors are equipped with an optional fuel shut-off solenoid. The solenoid is attached in place of the fixed main jet screw to the flywheel side of the carburetor. The solenoid has a spring loaded pin that retracts when 12 volt is applied to the lead. The pin blocks the main fuel jet and prevents fuel from entering the carburetor when it is extended.

Below is a simple test made with engine off that can determine if the solenoid is functioning properly:

1. Shut off fuel and remove the solenoid from the carburetor.*

2. Attach a wire between the solenoid bracket and a battery ground with alligator clips.

3. Touch the male terminal of the solenoid lead to the positive post of the battery.

4. If pin retracts, the solenoid is good.

*NOTE: When solenoid is removed, gas will leak out of the carburetor. Shutoff the fuel and use a rag to catch fuel already in the line.

## Carburetor Adjustments

### General

The fixed main jet carburetor is designed to deliver the correct fuel-to-air mixture to the engine under all operating conditions. The high idle is set at the factory and cannot be adjusted. The low idle fuel adjusting needle is also set at the factory and normally does not need adjustment.

NOTE Carburetor adjustments should be made only after the engine has warmed up

### Low Idle Fuel Adjusting Needle

To adjust the carburetor idle speed, see Figure 5-2 and follow these steps.

1. With the engine **stopped,** turn the low idle adjusting needle in **(clockwise)** until it bottoms **lightly**.

   NOTE. The tip of the idle fuel adjusting needle is tapered to critical dimensions. Damage to the needle and the seat in the carburetor body will result if the needle is forced.

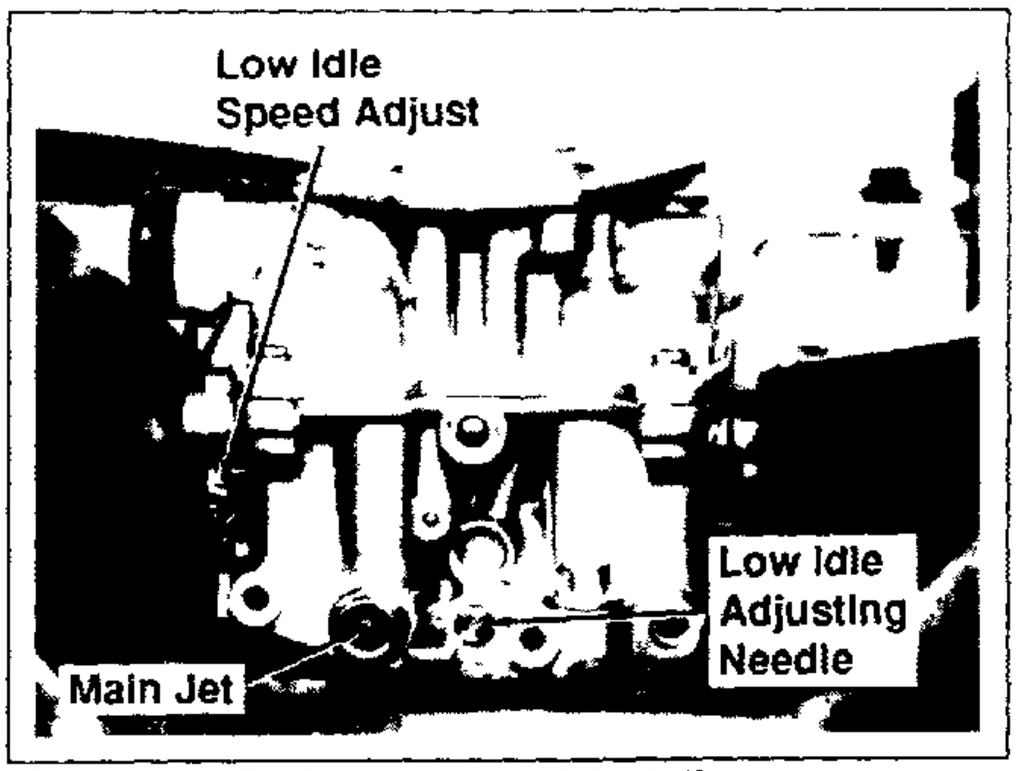



**Figure 5-2. Carburetor Low Idle Adjustment.**

2. Now turn the adjusting needle out **(counterclockwise)** 1-1/2 turns.

3. Start the engine and run at half-throttle for 5 to 10 minutes to warm up. The engine must be warm before making final settings. Check that the throttle and choke plates can fully open.

   NOTE: The carburetor has a self-relieving choke. Choke plate and shaft assembly is spring loaded. Check to make sure plate moves freely and is not binding and affecting idle fuel delivery.

4. Place the throttle control into the "idle" or "slow" position. Turn the low idle speed adjusting screw in or out to obtain a low idle speed of 1200 RPM (± 75 RPM). Check the speed using a tachometer.

NOTE: The actual low idle speed depends on the application Refer to the equipment manufacturer's recommendations. The low idle speed for basic engines is 1200 RPM. To ensure best results when setting the low idle fuel needle, the low idle speed should be 1200 RPM (± 75 RPM)

5. Turn the low idle fuel adjusting needle in (slowly) until engine speed decreases and then back out approximately 3/4 turn to obtain the best low speed performance.

6. Recheck the idle speed using a tachometer and readjust the speed as necessary.

**Float**

It is not necessary to remove the carburetor from the engine to check and adjust the float.

1. Remove the air cleaner and breather hose. Refer to Section 9 - "Disassembly."

2. Disconnect the fuel line from the carburetor. See Figure 5-3.

3. Clean dirt and debris from exterior of carburetor.

4. Remove the four screws holding the two carburetor halves together. Carefully lift the carburetor air horn assembly off the carburetor body and disconnect choke linkage.

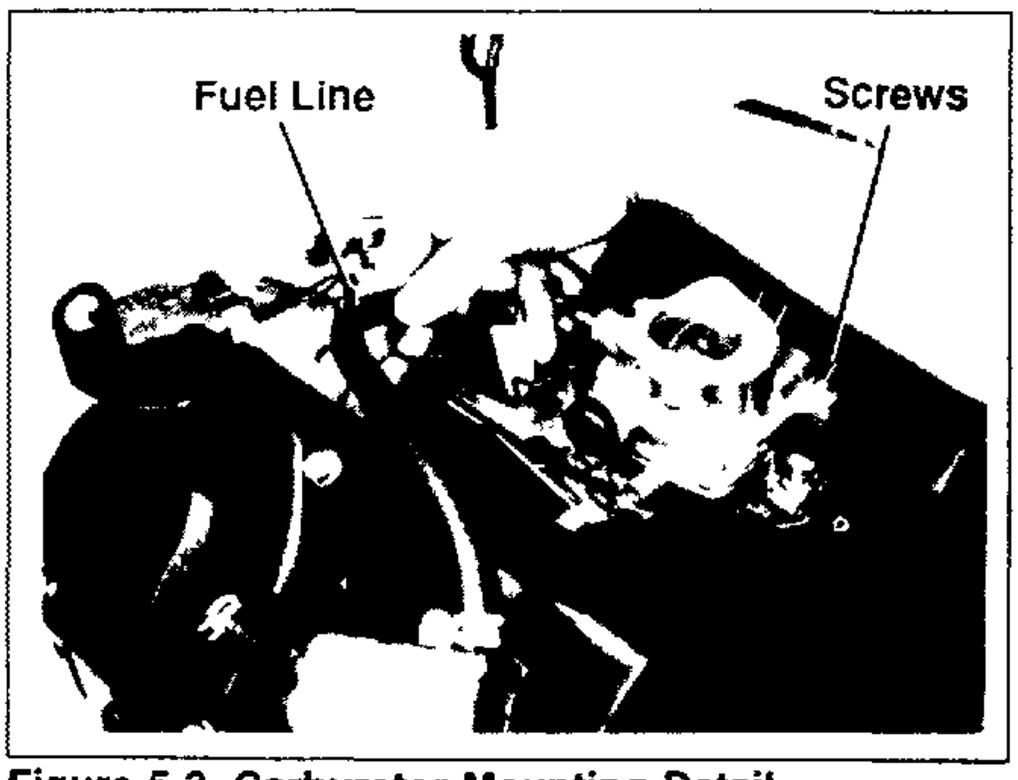



**Figure 5-3. Carburetor Mounting Detail.**

5 Hold the carburetor air horn so that the float assembly hangs vertically and rests lightly against the fuel inlet needle The fuel inlet needle should be fully seated but the needle tip should not be depressed See Figure 5-4

NOTE The fuel inlet needle tip is spring loaded. Make sure float assembly rests against the fuel inlet needle without depressing the tip

6. The correct float height adjustment is 22 mm ( 86 in ) measured from the float bottom to the air horn casting Adjust the float height by carefully bending the tab

NOTE: Be sure to measure from the casting surface, not the rubber gasket surface.

7. If proper float height adjustment cannot be achieved, check to see if the fuel inlet needle is dirty, obstructed or worn. Remove the brass screw and float assembly to remove the fuel inlet needle.

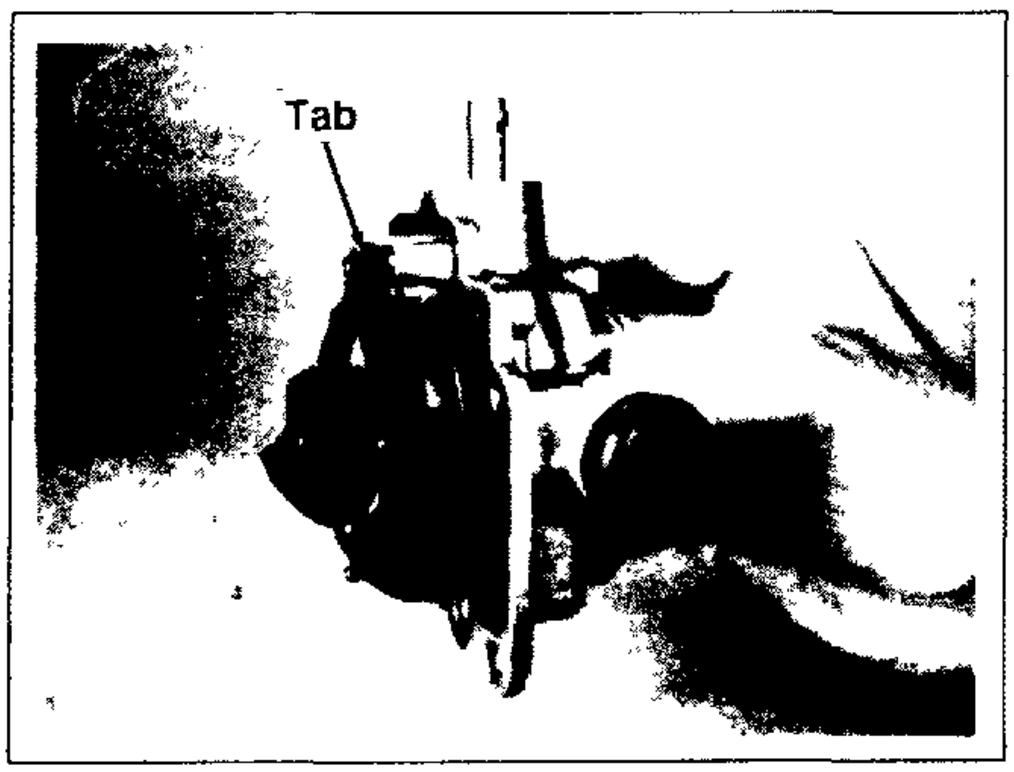



**Figure 5-4. Carburetor Float Adjustment.**

8. Once proper float height is obtained, carefully lower the carburetor air horn assembly onto the carburetor body connecting choke linkage. Install the four screws Torque screws to **1.7 N·m (15 in. lb.)** See Figure 5-3.

9. Connect the fuel line.

10. Install the breather hose and air cleaner assembly following the steps in Section 11 – "Reassembly "

**Disassembly**
Disassemble the carburetor using the following steps. See Figure 5-5

1. Remove the air cleaner, breather hose and carburetor Refer to Section 9 - "Disassembly."

2. Remove the four screws and carefully separate the air horn assembly from the carburetor body.

3. Loosen the screw securing the float assembly to the air horn and remove the float, float shaft and fuel inlet needle.

4. Remove the slow jet from the carburetor body.

   NOTE: The main jet is a fixed jet and can be removed if required. Fixed jets for high altitude are available.

5. Remove the black cap on the end of the choke shaft only if it is necessary to inspect and clean the shaft spring.
6. Remove the low idle speed adjusting screw and spring from the carburetor body.

7. In order to clean the "off-idle" vent ports and bowl vent thoroughly, use a good carburetor solvent (like Gumout™). Blow clean compressed air through idle adjusting needle hole. Be careful to use a suitable shop rag to prevent debris from hitting someone.

8. Remove the performed rubber gasket only if it is to be replaced. If it is removed for any reason, replace it.

## Inspection/Repair

Carefully inspect all components and replace those that are worn or damaged.

- Inspect the carburetor body for cracks, holes and other wear or damage.

- Inspect the float for cracks, holes, and missing or damaged float tabs. Check the float hinge and shaft for wear or damage.

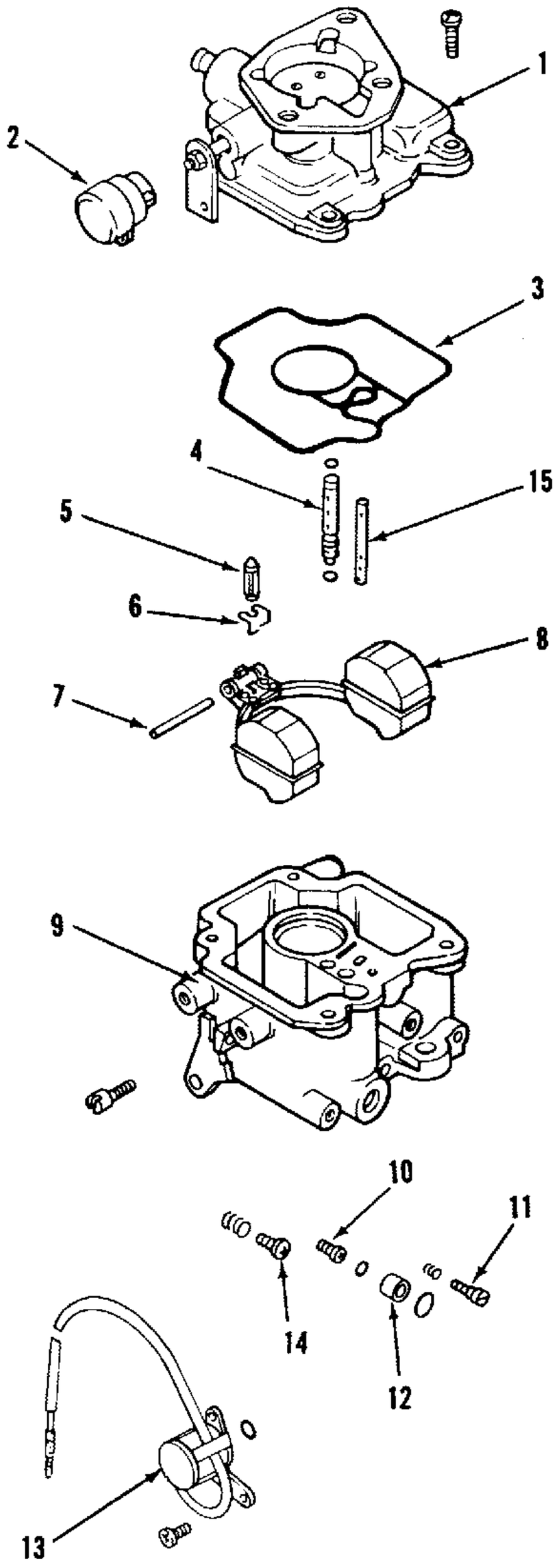
- Inspect the fuel inlet needle and seat for wear or damage.

- Inspect the tip of the low idle fuel adjusting needle for wear or grooves.

- The choke plate is spring loaded. Check to make sure it moves freely on the shaft.

  NOTE: The choke and throttle plate assemblies are staked and matched to the shafts at the factory. They are ot serviceable items.

Always use new gaskets when servicing or reinstalling carburetors. Repair kits are available which include new gaskets and other components. These kits are described below.




1. Carburetor Upper Body (Choke)
2. Automatic Choke
3. Body Gasket (Formed Rubber)
4. Slow Speed Jet
5. Inlet Needle Valve
6. Clip
7. Float Pin
8. Float Assembly (Kit)
9. Carburetor Lower Body (Throttle)
10. Main Jet
11. Idle Fuel Adjusting Needle
12. Solenoid Seat
13. Fuel Shut-off Solenoid (Kit)
14. Idle Speed Adjusting Screw
15. Jet (Accelerator Pump Carb. only)
16. Accelerator Pump Cover
17. Diaphragm
18. Diaphragm Spring
19. O-Ring
20. Rubber Boot
21. Bushing
22. Return Spring

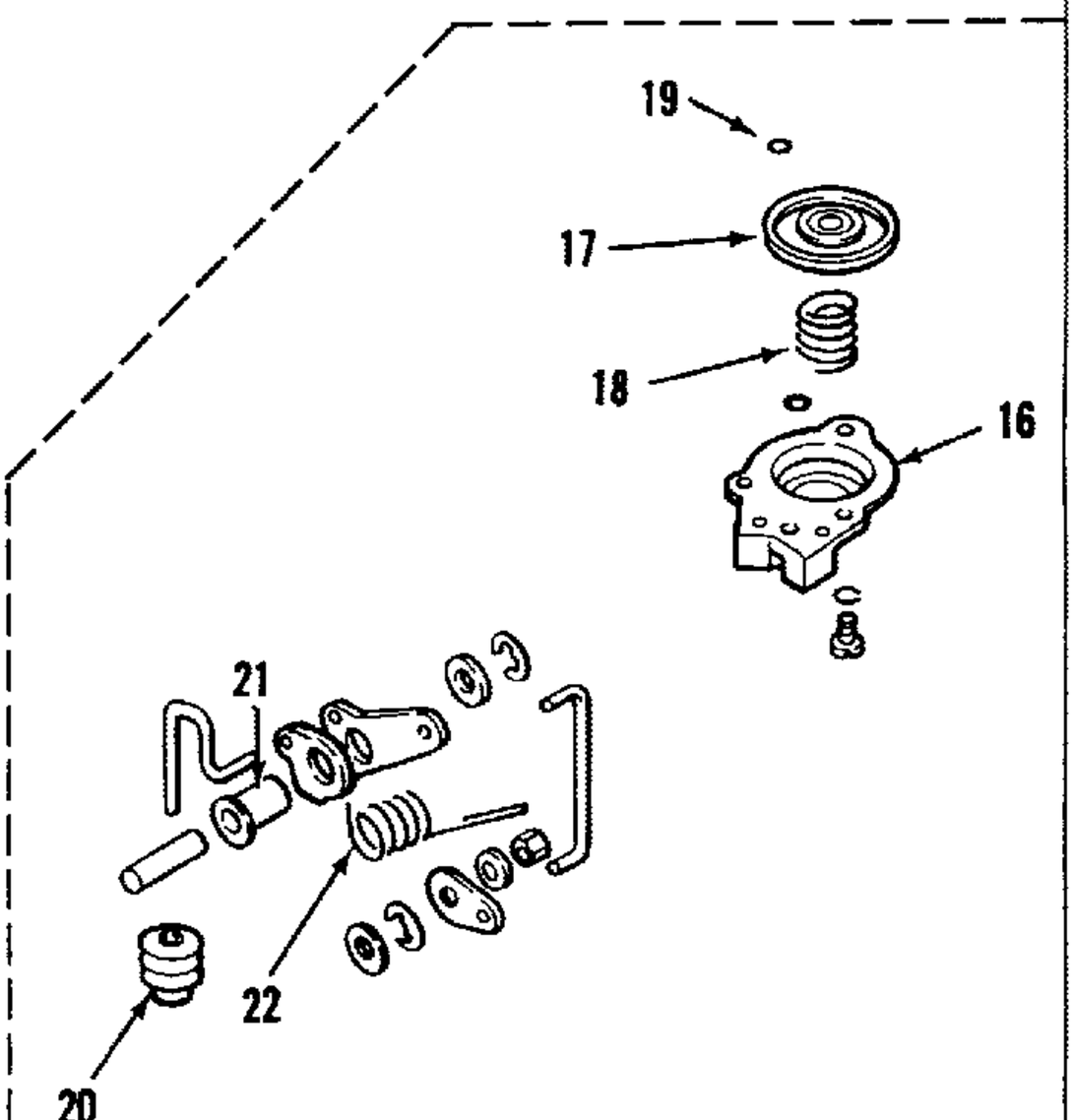



**Figure 5-5. Carburetor - Exploded View.**

Components such as the throttle and choke shaft assemblies, throttle plate, choke plate, low idle fuel needle, and others, are available separately.

Always refer to the Parts Manual for the engine being serviced to ensure the correct repair kits and replacement parts are ordered.

**Carburetor Repair Kit Contains:**

| Qty. | Description |
|---|---|
| 1 | Carburetor Body Gasket |
| 4 | Carburetor Body Screw |
| 1 | Idle Needle Spring |
| 2 | Slow Jet O-Ring |
| 1 | Main Jet O-Ring |
| 1 | Solenoid O-Ring |
| 1 | Solenoid O-Ring |
| 1 | Solenoid O-Ring |
| 1 | Inlet Needle Clip |
| 1 | Inlet Needle |
| 1 | Inlet Needle Valve |

**Float Kit Contains:**

| Qty. | Description |
|---|---|
| 1 | Carburetor Body Gasket |
| 1 | Float Screw |
| 1 | Float Assembly |
| 1 | Float Shaft |

**High Altitude (1500 Meter) Kit Contains:**

| Qty. | Description |
|---|---|
| 1 | Main Jet Screw O-Ring |
| 1 | Main Jet |

**High Altitude (3000 Meter) Kit Contains:**

| Qty. | Description |
|---|---|
| 2 | Slow Jet O-Ring |
| 1 | Main Jet Screw O-Ring |
| 1 | Main Jet |
| 1 | Slow Jet |

**Solenoid Assembly Kit Contains:**

| Qty. | Description |
|---|---|
| 2 | Solenoid Screw |
| 1 | O-Ring |
| 1 | O-Ring |
| 1 | O-Ring |
| 1 | Solenoid Assembly |
| 1 | Solenoid Seat |

**Accelerator Pump Kit Contains:**

| Qty. | Description |
|---|---|
| 1 | Cover |
| 1 | Diaphragm |
| 1 | Return Spring |
| 2 | O-Rings |
| 1 | Boot |
| 1 | Bushing (Pad Pump Lever) |

## Reassembly

Reassemble the carburetor using the following steps. See Figure 5-5.

1. Assemble fuel inlet needle to the float tab. Install the float, float shaft and inlet needle to the air horn. Tighten the screw. Check float height using the procedure found previously in the "Adjustments" subsection.

2. Install the slow jet with the stepped end facing out. Make sure jet is fully seated.

3. Install the low idle adjusting needle and spring.

4. Assemble the air horn and carburetor body using the four screws. Tighten screws to **1.7 N·m (15 in. lb.)**.

5. Install the carburetor on the engine following the procedures in Section 11 - "Reassembly."