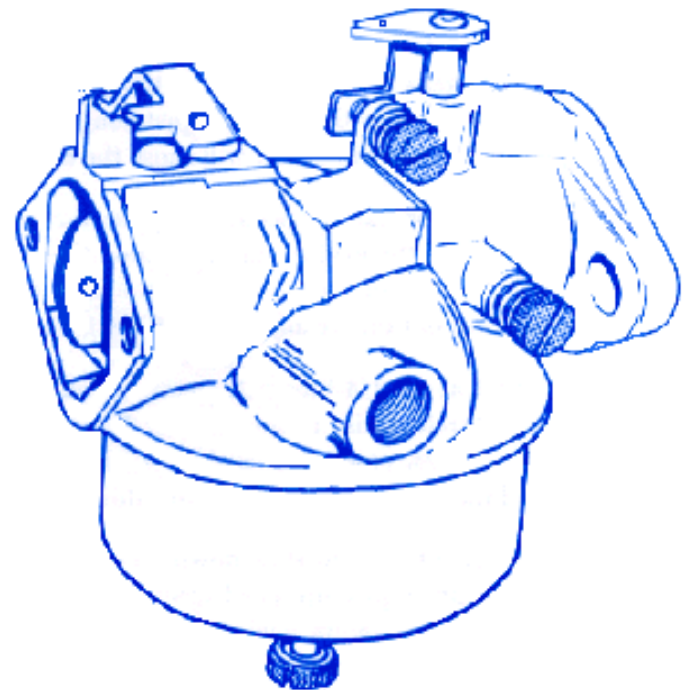


# Small Engine Carburetor Tips



A Guide to Small Engine  
Carburetor Service and  
Troubleshooting



# Carburetor Adjustments

## Comments

**About the techniques:** The techniques described in this booklet have been tried and tested over the years by small engine repair technicians and back-yard-mechanics alike.

I acknowledge that they may not be the ONLY techniques available for small engine carburetor troubleshooting and repair, and they may not be the best possible techniques, but they were chosen for this booklet because they have been proven to work in the vast majority of cases and they are the easiest to understand and to perform.

**The outcome:** As stated at the beginning of this booklet, there are so many different types of carburetors in use today that it would have taken volumes to address the issues, benefits, and shortcomings of each specific one.

I believe have done my best to provide you with a generic working knowledge of small engine carburetors, and to offer informed suggestions as to the nature of certain operations, problems, and remedial measures.

I sincerely hope that the final outcome of this booklet is one that has met your small engine needs.

For additional assistance, or to offer your comments and suggestions, please feel free to email me at:

Tekbook@attbi.com

# Small Engine Carburetor Tips

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There are several companies that manufacture carburetors for gasoline powered small engines, and there are many different models and styles of carburetors in use. In some cases the differences may be subtle, while in other cases the differences are drastic. Therefore, this booklet will approach the subject of small engine carburetor problems from a generic view.

This booklet will help you determine whether or not your small engine problem is in fact related to the carburetor, and provide instructions to remedy the most common carburetor problems.

The ***bowl and float*** style carburetor is the most common, and problematic, carburetor used on small engines. You will, therefore, find this style used in many of the illustrations throughout this booklet. While you may have a different style carburetor on your machine, the remedies described here-in will work with most any type of carburetor.

# Final Comments

# Carburetor Adjustments

## Idle Speed Adjustment

Turn the Idle Speed Adjustment screw until it “just” contacts the mechanical throttle linkage arm. This will prevent the engine from dropping below “stall” speed when you move the throttle to slow.

**You must now readjust the main valve**

# Carburetor Basics

# Carburetor Adjustments

## High Idle Adjustment

Allow the machine to run until it reaches normal operating temperature, then set the mechanical speed control (throttle) on the machine's handle to the fastest possible speed.

Begin turning the high Idle Valve screw inward (clockwise) until you hear the engine change speed.

If the engine begins to run slower, turn the screw in the other direction. The machine should begin to run faster.

Continue increasing the engine's speed (by turning the screw) until the engine either begins to sputter or begins to slow down again. Once this happens, return the screw to the position where the engine was running at its fastest speed.

This adjustment is complete.

## Low Idle Adjustment

Move the mechanical throttle to the engine's slowest speed and perform the same procedure on the low idle valve that you just used on the high idle valve, until you reach the slowest speed at which the engine continues to run smoothly without stalling.

NOTE: It may be necessary to back-off the mechanical idle speed adjustment screw first.

# Carburetor Adjustments

## Rule-of-Thumb

### If engine will not start

A general rule of thumb for all adjustable valves is to gently turn the valve inward (clockwise) until it seats, (DO NOT OVER-TIGHTEN) and then back the valve out (counter-clockwise) one full turn.

In many (if not most) cases, where the valve is not damaged and the ports are not obstructed, this will provide sufficient fuel to allow the small engine to start and run. If this fails, you may have to experiment with your particular machine by changing the number of turns anywhere from a low of one-half turn, to a high of two complete turns (it is not an exact science).

Fine tuning of these valves will be required once the machine can remain running on its own.

## Main Valve Adjustment

Once the engine can remain running on its own, adjust the main valve by turning it in either, or both, directions until the engine runs smoothly at all speeds.

This will have to be repeated after high and low idle adjustments are made.

# Carburetor Basics

Before we get started it is important for you to understand some simple and basic concepts about carburetors

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**Regardless of the type, style, or manufacturer, every carburetor, performs the same function:**

- 1) to mix fuel (gasoline) and oxygen (air) in the exact proportions needed to sustain combustion
- 2) To send that mixture to the combustion chamber where it is converted into energy to perform work.

**In order to accomplish the above, a carburetor requires two things:**

- 1) an adequate supply of fresh, clean fuel
- 2) an adequate supply of clean air

Removing, restricting, or contaminating either of these two, will impede, or prevent, your carburetor from performing its function.

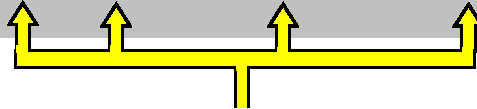
It's a fairly simple formula but one which can not be changed:

**Air + Fuel = Combustible mixture**

# Carburetor Basics

All small engines require these basic elements in order to operate:

**FUEL - AIR - COMPRESSION - SPARK**



**Remove any one of these and the engine won't run**

These basic elements are our main concern

- ♦ **FUEL** - Fresh, clean, gasoline of an octane rating recommended by the manufacturer.
- ♦ **AIR** - Mixes with fuel to make it combustible.
- ♦ **COMPRESSION** - Fuel and air mixture are compressed inside the engine.
- ♦ **SPARK** - Produced by the "spark plug". It ignites the compressed fuel and air mixture and forces the piston to turn the engine.

# Carburetor Adjustments

## High Idle Adjustment

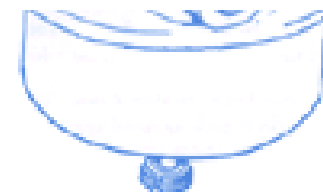
The High Idle Adjustment (usually indicated by the letter "H" stamped on the carb) is a valve that controls fuel flow when the engine is running at it's fastest speed. Turning the screw clockwise will case the machine to run slower. Counter-clockwise will make it run faster.

This must be adjusted BEFORE the low idle is adjusted and only when the machine's throttle (speed control) is set at the fastest setting.



## Main Valve

The main valve controls the flow of fuel from the bowl to the throat of the carburetor. Turning the screw clockwise restricts the flow of fuel. Counter-clockwise increases the flow of fuel.

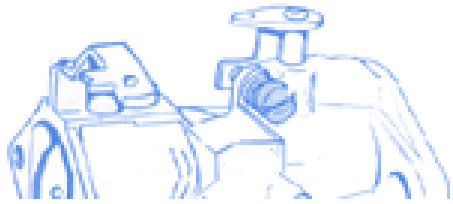




# Carburetor Adjustments

## Idle Speed Adjustment

As the name implies, the Idle Speed Adjustment controls the speed (in RPMs) at which the engine idles. It is a mechanical adjustment and not a fuel valve.



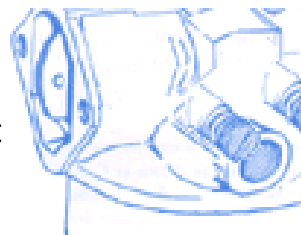
Tightening (turning clockwise) the screw will push the mechanical arm outward and make the machine idle faster, while turning it counter-clockwise (loosening) will cause the machine to idle slower. This adjustment simply determines how far the throttle linkage can move toward the *slow* position.

This must be adjusted AFTER the high and low idle valves (if present) are adjusted.

## Low Idle Adjustment

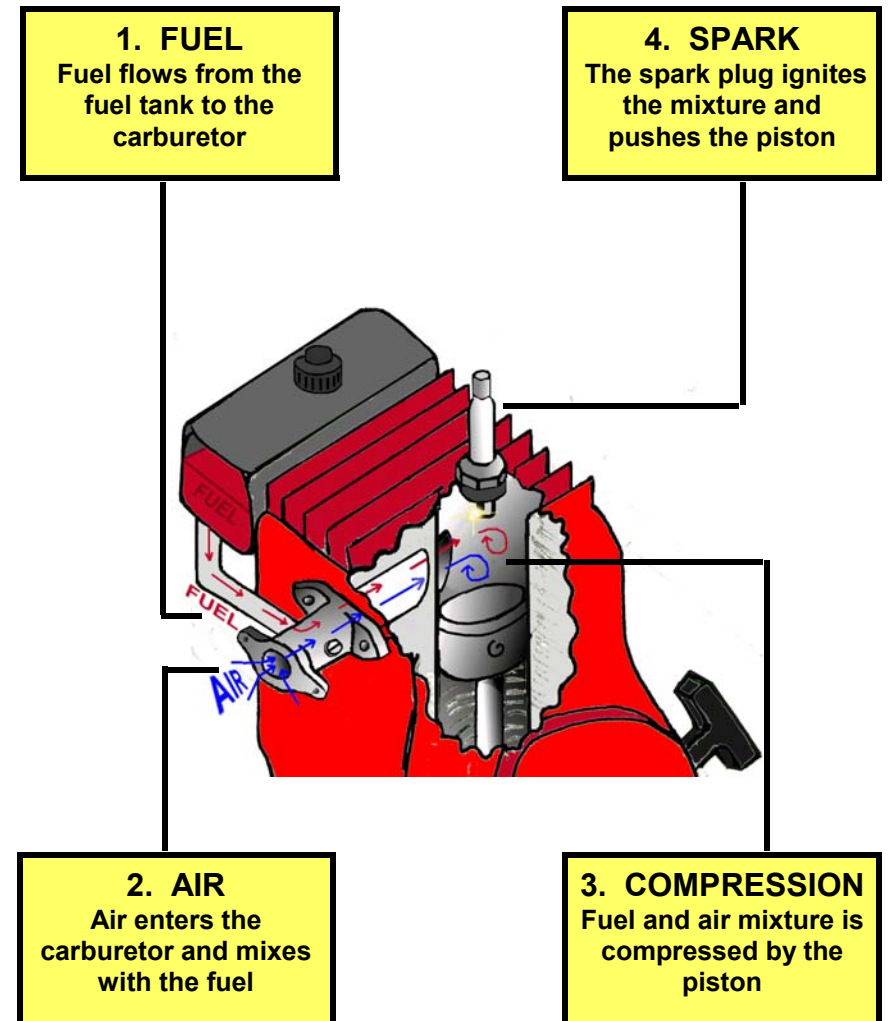
The Low Idle Adjustment (usually indicated by the letter "L" stamped on the carb) is a valve that controls fuel flow when the engine is at idle. Turning the screw clockwise will cause the machine to run slower. Counter-clockwise will make it run faster.

This is adjusted only when the machine's throttle (speed control) is set at the slowest setting.



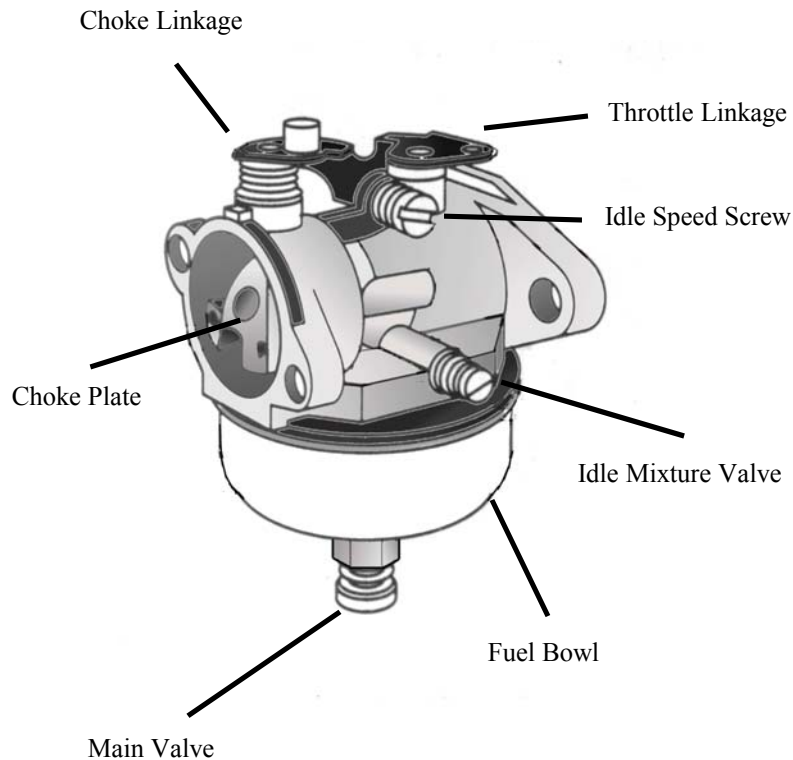
# Carburetor Basics

## How It Works

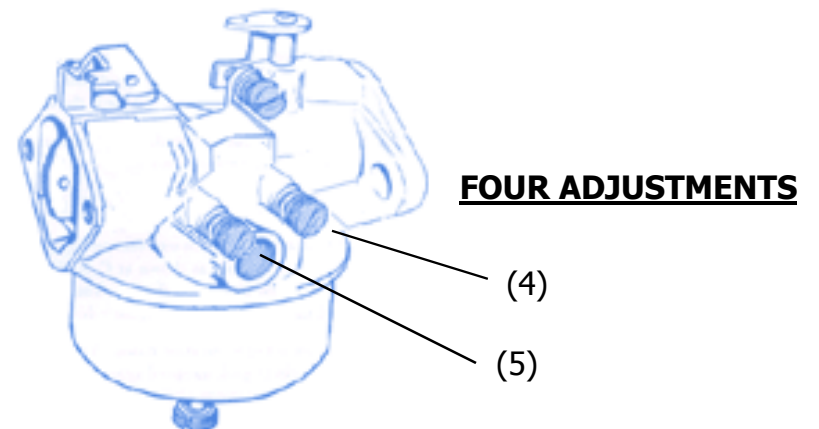
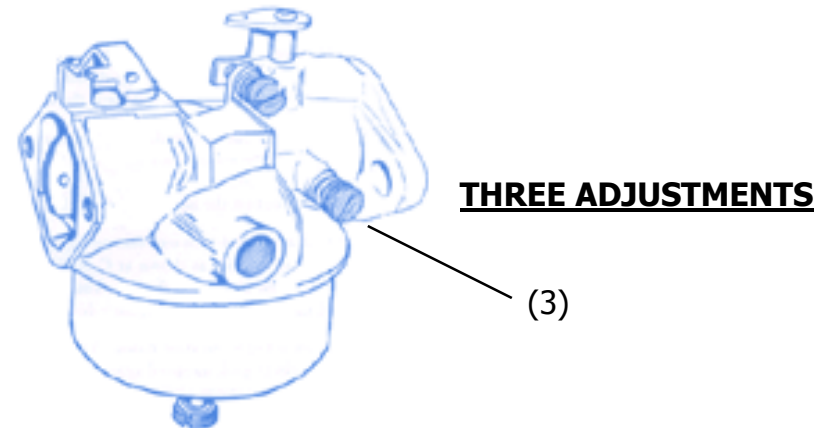
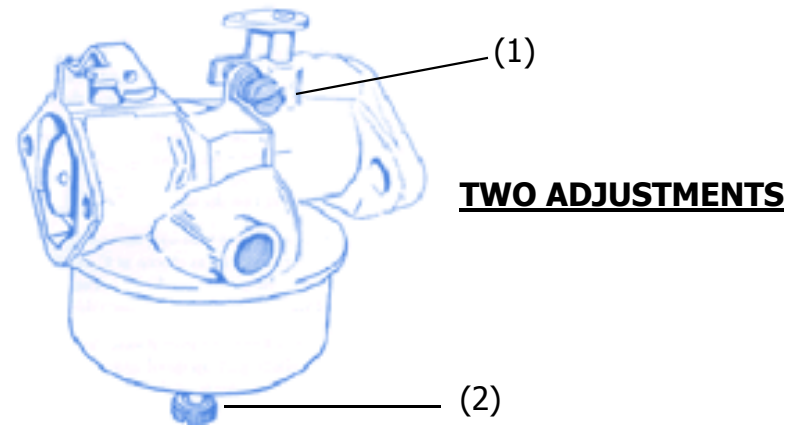


# Carburetor Basics

The carburetor is the heart of the small engine. The drawing below represents the most common design: a basic "bowl and float" type carburetor with adjustable valves. The carburetor on your machine may be somewhat different and may not include a bowl, but many of the other parts will be basically the same and in approximately the same location.



# Carburetor Adjustments



# Carburetor Adjustments

There is no gauge with which a small engine carburetor can be properly adjusted, nor is there a chart, table, or diagram I can provide that will assist you in properly adjusting it.

The art of adjusting a small engine carburetor comes from training and experience. A small engine technician adjusts more by feel and sound than by manufacturer's specs and this is something that comes only from experience.

That being said, I will provide you with some very basic, "rule of thumb" techniques. I do not guarantee that they will make your machine run smoothly (or even correctly).

Some small engine carburetors have no adjustable features at all. Of those that do have adjustable features, most have two adjustments, some have a third, and others may have a fourth. These are:

## **TWO ADJUSTMENTS**

Idle speed adjustment (1)  
Main Valve (2)

## **THREE ADJUSTMENTS**

(1) and (2) plus:  
Mixture Valve (3)

## **FOUR ADJUSTMENTS**

(1) and (2) plus:  
High Idle Valve (4)  
Low Idle (5)

# Carburetor Maintenance

# Carburetor Adjustments

# Carburetor Maintenance

## Preventive Maintenance

Before we get into solving your carburetor problems, let's take a few minutes to talk about preventing them.

While it is the most important part of a small engine, the carburetor is often, unfortunately, the most neglected part. Hidden behind (or beneath) the air filter, the carburetor is truly "out of sight, out of mind"... until something goes wrong.

A good program of regular maintenance can help insure that your carburetor performs as intended, and may help avoid costly repairs.

Here are some simple suggestions to keep your carburetor functioning smoothly:

- 1) Keep the carburetor covered: removing the housing that covers the carburetor (usually the air filter housing) can allow dust, (and other foreign particles) and water to enter the carburetor
- 2) Lubricate the carburetor: the occasional use of a good quality spray lubricant, applied lightly to all moving parts and to the linkage, will insure smooth operation
- 3) Clean the exterior of the carburetor frequently: Sawdust, grass clippings, grease, and grime can interfere with the linkage.
- 4) Clean the inside of the carburetor: an occasional shot of carburetor cleaner directly into the throat of the carburetor will go a long way toward avoiding potential problems.

# Carburetor Maintenance

## Preventive Maintenance

### Gasoline

As stated earlier, your carburetor requires an adequate supply of fresh fuel (gasoline) in order to perform properly.

Gasoline has a relatively short, useful, life span. If you have ever pumped your own gas on a hot summer day, you have seen the vapors rising from the spout. It is actually these vapors which are the most combustible component of the fuel.

Gasoline begins to evaporate almost the instant you purchase it. The older it gets, the more of it's highly combustible vapors it loses. As more and more vapors are lost, the gasoline becomes less and less combustible. Old, stale, gasoline which has lost all of it's vapors is said to have "turned to varnish".

*Varnish* is a brownish residue left in fuel cans, fuel tanks, carburetors, and fuel lines, once the gasoline has completely evaporated. However, long before the vapors have completely evaporated, the fuel will reach a point where it is extremely difficult (or impossible) to burn.

You could, in all reality, have a full tank of gas, but your small engine will not run!

Most small engines are designed to use REGULAR unleaded gasoline (unless otherwise noted in your owners manual)

# Carburetor Service and Repair

## The Float Assembly

### To Remove The Needle Valve

After taking photo or drawing picture, locate the retaining wire on the needle valve. Observe the direction of it's position and how it wraps around the valve and proceeds under the lip of the float.

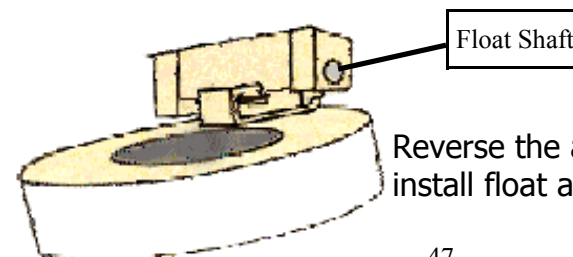
The next step will remove the retaining wire and allow the needle valve to drop out of position... BE PREPARED TO CATCH IT!

While supporting the float, use needle-nose pliers to gently remove the retaining wire. The needle valve will now drop out of position (you may have to lower the float a bit to make room for the valve to drop out. Place valve and wire in a safe place.

Carburetor cleaner and a very fine wire can be used to clean the needle valve fuel jet (port)

### To Remove The Float

Once the needle valve is removed, the float can be removed by pushing the float shaft out with an awl or other small tool. This will allow the float to drop out.



Reverse the above steps to re-install float and needle valve

# Carburetor Service and Repair

## The Float Assembly

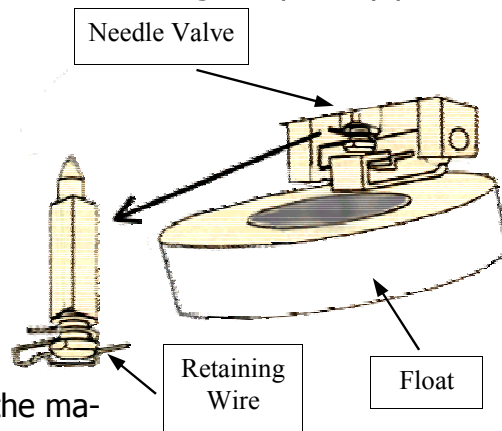
It is for good reason that I have by-passed the float assembly in the previous chapter. Although the float can become defective and the needle valve can become clogged, the float assembly is a very tricky item to work on and should only be repaired or replaced by a trained small engine technician.

However, in the interest of providing information to those who feel they have the ability to undertake this chore, I provide the following, generic information.

With the bowl removed (as instructed in the previous chapter) inspect the float, for damage, especially pin-holes.

Also note any liquid that may be inside the float. There should be NONE!

Leaks can sometimes be detected by gently heating the float (once removed from the machine) and then submersing it in water. If bubbles rise the float is defective.



### **If the float or needle valve must be removed:**

I highly recommend taking a very close-up photo, or drawing a detailed picture of the float and valve before removing. This will provide a reference to correctly reassemble the float, valve, and retaining wire.

# Carburetor Maintenance

## Preventive Maintenance

### Gasoline

It is also important to note that, unless otherwise noted in your owners manual, gasoline mixed with oil is to be used only in 2-cycle engines of the type used on chain saws, string trimmers, and some (smaller) lawn mowers.

Most machines however, use 4-cycle engines which have a separate oil reservoir and require no additives to the fuel.

### Gasoline Stabilizer

Because gasoline can break-down and leave behind the residue referred to as **varnish**, using gasoline that has been in your machine, or in storage, for more than two months is not recommended.

Machines that must be stored "ready for immediate use" (such as emergency generators), and for the seasonal storage of your machine, fuel should be treated with a **gasoline stabilizer** to prevent *varnishing*.

**Gasoline Stabilizer** is a liquid product that is added to gasoline to extend the life of the fuel and insure long term freshness. It is available at most auto parts dealers and where small-engine powered machines are sold. Instructions for proper mixing will be included with the stabilizer.

# Carburetor Maintenance

## Preventive Maintenance

### Air Filters

We mentioned earlier that the second component required by your carburetor is an adequate supply of clean air. In order to insure that the air reaching your carburetor remains clean, the manufacturer installed an air filter specifically designed to filter out foreign particles while allowing the proper amount of air to reach the carburetor.

Not all 4-cycle small engines will have an air filter, since air filters are designed for engines used in dusty areas (like lawnmowers and chainsaws), but those that do, will have one of three types: "paper element", "foam filter", or "two-stage filter" consisting of a paper element surrounded by a foam filter.

Chainsaws, and other 2-cycle machines, may have a flat filter (made of a thin, cloth-like, fabric), a cartridge style filter, or a plastic cone shaped filter made of fine mesh.

It is very important that these filters remain on the machine, and that you KEEP THEM CLEAN.

Most manufacturers recommend that you clean or replace the filter after every 20 hours of use. Machines used in dusty areas, such as chainsaws and chippers, should have the filter changed much more often.

# Carburetor Service and Repair

## Purging the Fuel System

### Step #7: Reassembling the Fuel System

1. Reattach the fuel tank (if removed)
2. Replace fuel filter
3. Reconnect all fuel lines (replacement with new lines is recommended) making sure that all hose clamps are tight.
4. Insure that fuel shut-off (if equipped) it turned to the ON position
5. Fill fuel tank with clean, fresh gasoline of at least 87 octane. **Watch for leaks and tighten clamps and nuts as needed.**
6. Replace oil drain plug and refill oil supply. (If unsure of oil requirement, 10W30 automotive motor oil will suffice in warm climates)
7. Install new spark plug and reconnect plug wire

**Now reassemble the fuel system, fill with a small amount of fresh gasoline, and attempt to start the engine. If engine will not start go to next section.**



# Carburetor Service and Repair

## Purging the Fuel System

### Step #6b: Reassembling the Carburetor

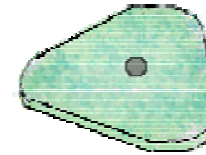
#### If you have removed the main valve part-by-part

1. Line up the valve (center it) over the hole in the bottom of the retaining nut. Make sure to replace parts in the reverse order from which they came out if valve consisted of more than one part
2. Carefully thread the valve back into the retaining nut by hand.
3. Make finger tight.
4. Using appropriate tool (screw driver, or wrench) slowly turn the valve clockwise (tighten) until it seats. DO NOT OVER TIGHTEN
5. When valve is seated, begin to slowly turn the valve counter-clockwise the exact number of turns that you recorded earlier
6. The slot (or scratch) on the head of the valve should align perfectly with the scratches you made earlier on the bowl.
7. A minor adjustment can be expected at this time but if alignment is off by more than 1/8 turn remove the valve and repeat above.

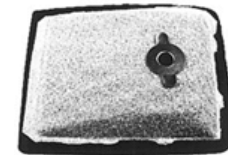
# Service and Maintenance

## Typical Air Filter Styles

### Two-Cycle Filters

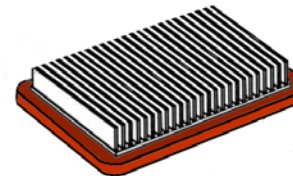


Fabric Style

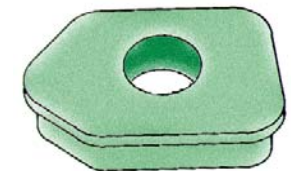


Cartridge Style

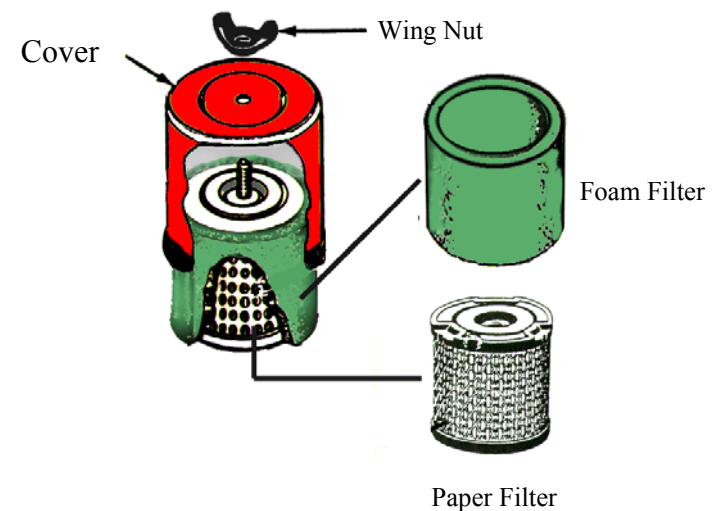
### 4-Cycle Paper Filter



### 4-Cycle Foam Filter



### 4-Cycle Two Stage Filter



# Carburetor Service and Repair

## Purging the Fuel System

### **Step #5: Cleaning the Carburetor**

With the main valve removed, once again spray large amounts of carburetor cleaner directly into the throat of the carburetor.

Cleaner should easily flow through the carburetor, into the bowl, and drain through the main valve assembly hole or through the hole in the retaining nut.

When cleaner is flowing easily in this manner you can begin to reassemble the carburetor and fuel system.

### **Step #6a: Reassembling the Carburetor**

#### **If you have removed the main valve as a complete assembly**

1. Line up the assembly (center it) over the hole in the bottom of the carburetor bowl
2. Carefully thread the assembly back into the bowl by hand, watching to make sure that the head of the valve turns exactly the same amount as the retaining nut.
3. Make finger tight.
4. Place wrench over the retaining nut and slowly turn clockwise (tighten) again making sure that valve and nut turn exactly the same amount.
5. Tighten until nut is snug but do not over tighten.

# Carburetor Service and Repair

## Purging the Fuel System

4. Once valve can be turned, hold the retaining nut firmly in place and gently begin to turn the valve CLOCKWISE (tighten) carefully counting the number or turns (or fractions of turns) until the valve "SEATS". The valve is seated when the tip of the valve contacts the metal. DO NOT OVER TIGHTEN AS THIS WILL FLATTEN THE TIP OF THE VALVE.
5. Write down the number of turns it took to reach the seated position. Example: "one and one-eighth turns" or "two, half turns", or "one half turn and one eighth turn" etc. When you replace the valve this is the exact amount that you will loosen the valve from the seated position to return it to its original position.
6. With the number of turns recorded, return machine to up-right position. Hold retaining nut firmly in place and begin to turn the valve counterclockwise (loosen) until it can be removed from the assembly. **The valve may have more than one part, so be careful when removing the valve so as to "catch" all parts as they come out of the assembly. Lay all parts in an area where they will be undisturbed and place them in the order in which they came out of the assembly.**
7. Fuel should now be draining from the machine and it should not be necessary to remove the retaining nut.

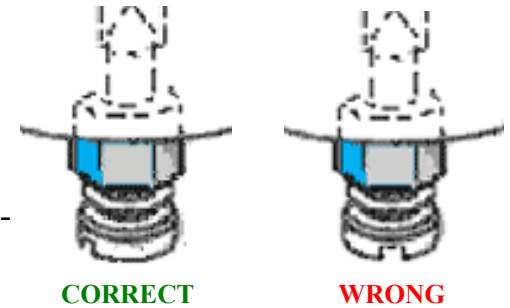
NOTE: If your carburetor has a bowl but no nut or bolt on the bottom, the entire bowl will unscrew from the bottom of the carburetor. Do this carefully, as described.

# Carburetor Troubleshooting

# Carburetor Service and Repair

NOTE: The next step will remove the entire valve assembly and may cause the bowl to become detached from the carburetor. It is very important that you do not let the bowl drop from the carburetor as this may dislodge the float, needle valve, and retaining wire

9. Place a small container under the valve assembly and continue to turn the nut counter-clockwise until the valve assembly is removed from the bowl, and fuel is flowing freely into the container through the hole.



10. Go to Step 5

## Step #4c: Cleaning the Carburetor

If the head of the valve does not move exactly the same amount as the retaining nut, it will be necessary to remove the main valve assembly part-by-part. **This procedure is not recommended for the novice**

1. With machine upside-down, and scratches in place for reference, place the correct size wrench on the retaining nut and hold it firmly in place.
2. Slowly attempt to turn the head of the valve 1/4 turn in the CLOCKWISE direction (tightening)
3. If valve will not move, hold the head of the valve firmly in place and loosen the retaining nut by turning it counter-clockwise 1/4 turn at a time until it is loose enough to allow the valve to turn.

# Carburetor Service and Repair

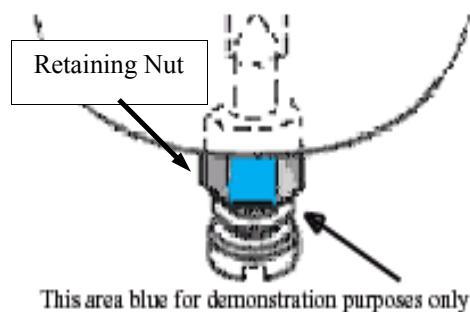
## Purging the Fuel System

surface of the bowl, on both sides of the slotted head of the valve to indicate it's exact position. (If head is not slotted, make scratches on both sides and across the top of the head in one straight line).

6. Place the proper size wrench over the retaining nut.

**Do not use a socket as you must be able to see the head of the valve**

7. While closely watching the head of the valve, turn the retaining nut 1/4 turn counter-clockwise.



NOTE: the head of the valve must turn exactly the same amount as the retaining nut in order to maintain it's position when you retighten. If this does not happen, return the nut and head to their original positions and jump to step #4c.

8. If valve and nut are turning exactly the same amount on each turn, flip the machine back to the up-right position and continue to next step.

# Carburetor Troubleshooting

## Is It The Carburetor?

I can't begin to tell you how many machines have come into my shop with the owner insisting the problem was with the carburetor, only to find out later that it wasn't.

There can be many reasons why a small engine powered machine won't start, runs rough, or stalls, that have absolutely nothing to do with the carburetor.

Let's set aside the two most common problems; bad fuel and a dirty air filter... did you know that an engine that starts, runs fine until it warms up, and then stalls (but will restart after cooling down) probably has a bad condenser? Or that a machine that backfires (or leaks fuel) through the muffler may have a stuck exhaust valve? And a hairline crack in a spark plug is enough to keep your engine from starting. In addition, many people don't even realize that their (older model) machines have *ignition points*, which can produce many problems that may be mistaken for a bad carburetor.

So how do you narrow down the field to identify a real carburetor problem?

Well, there are of course the obvious signs:

- The carburetor is visibly broken
- Fuel is leaking from it
- The moving parts don't move

If none of these conditions exist then it gets a bit harder.

# Carburetor Troubleshooting

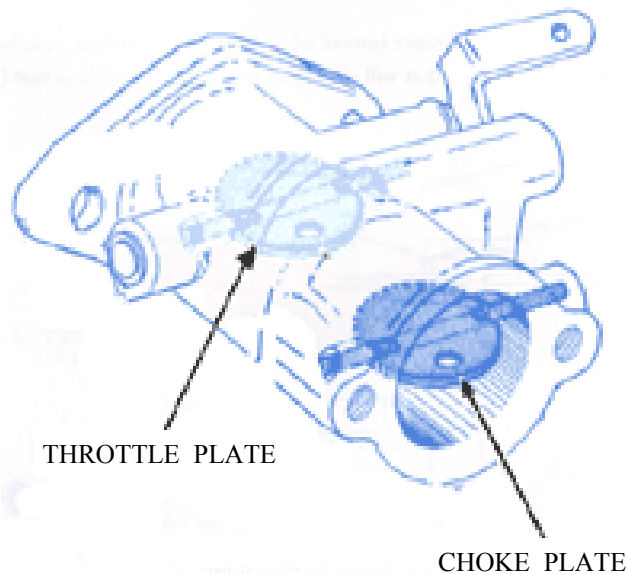
## Is It The Carburetor?

You will recall that a small engine requires four elements in order to run: Air, Fuel, Compression, and Spark. In order to narrow it down to the carburetor you must first make sure your engine has all four elements.

Lets start with the air since that is the easiest to test, but make sure to run all four tests!

If you've removed the air filter, and no one has shoved a sock in the carburetor (don't laugh. It happened!) then you know nothing is obstructing the flow of air to the carburetor.

Now look down into the carburetor throat as you move the choke and throttle levers to see if the choke and throttle plates are opening.



# Carburetor Service and Repair

## Purging the Fuel System

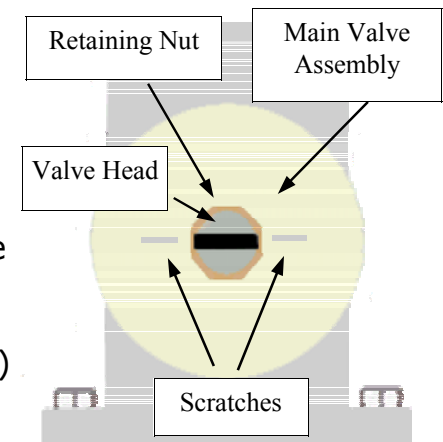
### Step #4b: Cleaning the Carburetor

Now that you are familiar with the internal parts of the bowl- type carburetor it is time to get back to cleaning it.

As mentioned earlier, it will be necessary to drain any fuel or carburetor cleaner that has collected in the bowl.

This can sometimes be accomplished without removing the bowl.

1. Drain the fuel tank and fuel lines completely.
2. Drain all oil out of the crankcase. (Very important to let ALL oil drain as it is now contaminated by carburetor cleaner and because we will be turning the machine upside down which could cause oil to leak everywhere).
3. If you can clearly see, and access, the bottom of the carburetor bowl, jump to # 4, otherwise carefully turn the machine upside down. It may be necessary to use wooden blocks to brace the machine solidly.
4. Locate the main (mixing) valve assembly.
5. Using a scratch awl, nail, or other sharp object, make a scratch on the



*Bowl viewed from bottom*

# Carburetor Service and Repair

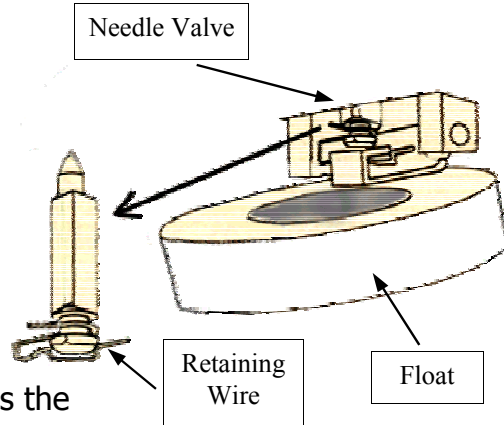
## Purging the Fuel System

### Float Assembly

The float assembly consists of a Float (usually made of brass or plastic) and a Needle Valve.

Located inside the bowl, the float is usually a donut shaped device that is hinged to allow it to move up and down.

The purpose of the float is to rise and fall on top of a small supply of gasoline that pools in the bowl. As the float rises and falls on the fuel, it moves a needle valve up and down.



The needle valve controls the amount of fuel allowed to enter the bowl. As the level of the fuel being used from the bowl decreases, the float drops, lowers the needle valve and allows more fuel to enter the bowl. Conversely, when the bowl is full of fuel, the float rises, raising the needle valve, and shutting of the supply of fuel to the bowl.

The needle valve is held in place by a very fine (almost hair-like) retaining wire.

Extreme care must be taken if removing the bowl to avoid allowing the float to drop completely. If the float drops too far, the needle valve can drop completely out of it's position and the retaining wire may fall off.

# Carburetor Troubleshooting

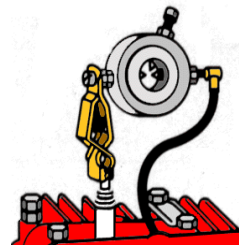
## Is It The Carburetor?

If the air filter is off, the throat is unobstructed, and the choke and throttle plates are opening, air is reaching the combustion chamber.

Okay, lets jump to spark.

**WARNING:** The electrical system on a small engine can develop up to 20,000 VOLTS. The following test must be performed with extreme care. Failure to follow instructions fully may result in electrical shock!

1. Carefully remove the spark plug and connect it to an approved spark plug tester (available in most automotive stores).
2. Shift gears (if equipped) to **neutral**,
3. Inspect spark plug wire for cracks and look into rubber boot and make sure the connection is not broken,
4. Keep hands and body parts away from the spark plug, the tester, and all moving parts. Pull the starter rope or engage the electric starter, and watch to see if the plug is sparking (firing).
5. If plug fires, reconnect and go to next page.
6. If no spark, take machine to a service technician as this could indicate a problem with the magneto, points, condenser or other areas of the electrical system.





# Carburetor Troubleshooting

## Is It The Carburetor?

Since you made it to this page we will assume you have air and spark. Now lets check for compression.

In order to get an accurate measurement of compression in your engine, a small-engine compression tester should be used. However, this tool would be used so rarely by the average small engine owner that it may not justify the expense.

The method I am about to suggest is an old favorite of the back-yard handyman.

1. Check to make sure that all parts driven by the engine are securely connected and bolts are tight. This is especially important on lawnmower blades. **A missing or loose blade can imitate a compression problem.**
2. Shift gears (if equipped) to **neutral**.
3. Disconnect the ignition wire from the spark plug.
4. Pull starter handle slowly. After a few inches you should feel significant resistance. If little (or no) resistance is felt, repeat step one and try again.

If you still feel no resistance, this may indicate a compression problem in the engine. Have the machine checked by a service technician.

# Carburetor Service and Repair

## Purging the Fuel System

The tensioning spring maintains tension on the valve to prevent engine vibrations from turning it out of adjustment.

Even the slightest adjustment will change the way the engine runs!

Not all bowl style carburetors have an exposed main valve, some will have the main valve on the inside of the bowl, and other may employ an automatic type main valve.

Do not be concerned if your bowl style carburetor looks somewhat different from these pictures. If there is a bowl, the following instructions will still apply.

If there is no bowl present on your carburetor, you can skip past this chapter.



# Carburetor Service and Repair

## Purging the Fuel System

Before proceeding with the next step it is imperative that you understand the inner workings of the bowl type carburetor.

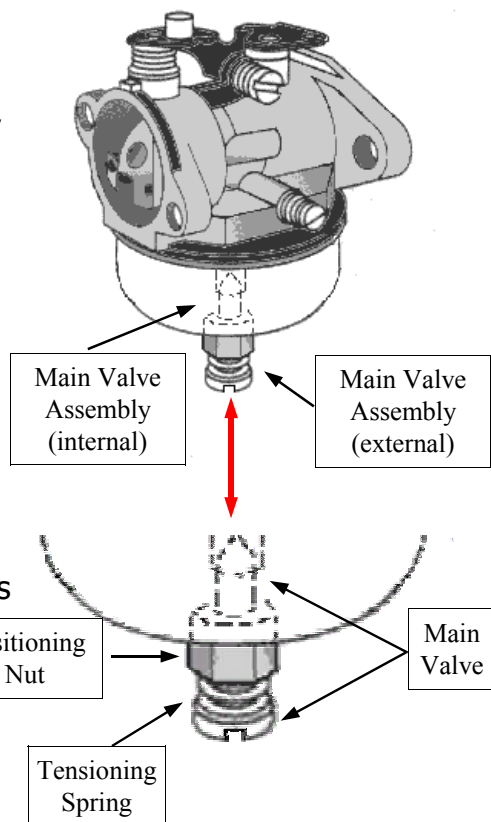
The two internal parts that we will be concerned with are the **Main Valve Assembly** and the **Float Assembly**

### Main Valve Assembly

The main valve assembly consists of a pointed screw (the valve), a positioning nut, and may, or may not, include a tensioning spring

The main valve adjusts the amount of fuel that is allowed to leave the bowl and mix with air inside the carburetor.

The positioning nut holds the valve assembly in place against the bottom of the bowl and (in some cases) locks the valve in place.



# Carburetor Troubleshooting

## Is It The Carburetor?

Okay, we have Air, Spark, and Compression. Only one thing left to check... FUEL

This is a relatively easy test. Just four steps.

1. Disconnect the spark plug wire and remove the spark plug.
2. Go have lunch! By removing the spark plug you have exposed the combustion chamber to the atmosphere. This will allow any fuel still in the chamber to evaporate, but it will take time. Give it about an hour, then sniff near the spark plug hole for gasoline fumes. If fumes are found, go have coffee. Repeat until no fumes are detected
3. With spark plug still out, pull the starter rope several times (or engage electric starter for about 30 seconds)
4. Sniff for the strong presence of Gasoline fumes. If fumes are now detected, fuel is reaching the combustion chamber. If not, your problem is definitely carburetor related.

You're probably asking why we didn't just try this first.

Quite often a persistent machine owner can create additional problems by repeatedly trying to make a machine start that doesn't want to. If we only checked for fuel, we might have concentrated all our efforts on the carburetor while there could have actually been other problems as well.

# Carburetor Service and Repair

## Purging the Fuel System

### Step #4a: Cleaning the Carburetor

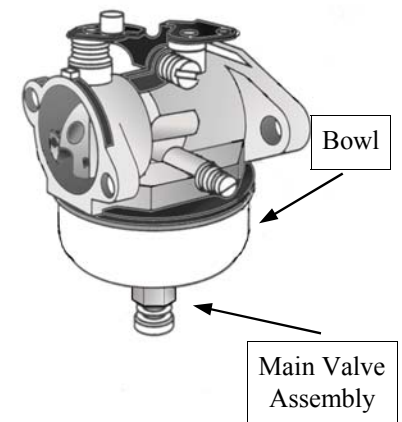
Cleaning the carburetor may require disassembly which is a complicated process and to which I have dedicated the next several pages.

Failure to correctly follow these steps will result in improper adjustment of the main valve which will cause your engine to malfunction or prevent it from starting.

This procedure is not recommended for the novice.

If you have a bowl type carburetor, similar to the one pictured at the right, it may be necessary to drain old fuel and/or carburetor cleaner from the bowl.

On the following pages you will find the step-by-step instructions to accomplish this, but this process is **not recommended for the novice.**



# Carburetor Service and Repair

## Purging the Fuel System

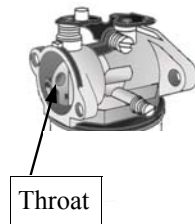
It is important to remember that you are not just trying to rinse out the fuel system. You are attempting to dissolve varnish which has taken months to develop and has adhered to the internal surfaces of your fuel system (much like paint). The varnish may also be blocking very fine fuel ports, jets, and needle valves. Do not rush this process! It may take hours to dissolve enough of this varnish to start your engine.

### Step #4: Cleaning the Carburetor

Carburetor disassembly can be very tricky, depending upon the type of carburetor on your machine. Unless you have extensive knowledge of carburetors, it is not recommended that you attempt to remove it. We will first attempt to clean it without disassembly.

Spray large amounts of carburetor cleaner directly into the throat of the carburetor. Be prepared to catch leakage.

While spraying, continuously move throttle and choke to insure that all internal parts move and allow the cleaner to penetrate into all areas of the carburetor.



If carburetor is equipped with a primer bulb, pump the bulb as well.

Try starting the engine.

# Carburetor Service and Repair

# Carburetor Service and Repair

## It Tests OK But Won't Start

**Bad fuel** is the number one reason why small engines fail to start, especially when attempting to start your engine for the first time of the season. Thousands of dollars are wasted each year on unneeded carburetor repairs simply because the fuel went bad during storage.

As previously described, gasoline can break-down over time and leave behind a by-product known as *varnish* in your fuel system.

Fuel stored for as little as sixty days may have evaporated enough of the combustible vapors to make the remaining fuel non-combustible (depending upon temperature and climate).

In this section we will cover how to purge your fuel system of bad gasoline and varnish. It is very important that you use proper safety procedures during these steps since gasoline can be very dangerous!

### **WARNING:**

Gasoline vapors are heavier than air, they will drop to the floor and spread, unnoticed, in all directions. Any ignition source, such as the pilot flame of a furnace, water heater, or clothes dryer, can cause these vapors to ignite. or **explode!**

Always perform these steps **OUTDOORS!**

# Carburetor Service and Repair

## Purging the Fuel System

If your machine is equipped with a fuel filter, remove the filter and purchase a new one.

When all of the old fuel has finished draining from the carburetor, place the end of the fuel line into the container and open the shut-off (or unclamp the line) to drain the tank. You may have to tilt the machine again to drain the tank.

### **Step #3: Cleaning the Tank**

Depending upon your machine, the fuel tank may be a separate item easily located and removed, or it may be built into the plastic cowl on top of the engine. Still other fuel tanks are mounted directly onto the carburetor (usually directly beneath the carburetor).

The best method to purge your fuel system is to remove the fuel tank, however, if your tank is difficult to remove, or is mounted to the carburetor, you may leave the tank in place. The following instructions will work with either set-up.

Close the fuel line shut-off or clamp the fuel line again. Spray, or pour approximately one-half cup of carburetor cleaner (or automotive varnish remover) into the fuel tank. Swirl liquid to coat entire inside surface of tank. Let liquid remain in tank for at least one hour, swirling occasionally, then drain the tank as in the previous step. Repeat this process at least twice.

# Carburetor Service and Repair

## Purging the Fuel System

### Step #1: Spark Plug and Combustion Chamber

Carefully disconnect the spark plug wire and remove the spark plug from the machine. Purchase a new plug but **do not** install it yet.

Spray a liberal amount of carburetor cleaner directly into the spark plug hole to begin dissolving varnish from the combustion chamber.

**NOTE: Carburetor cleaner may seep down past the rings and into the oil supply. It will be necessary to drain and change the oil before starting the engine.**

### Step #2: Draining the Fuel

We are about to disconnect the fuel line and fuel tank. Please be aware that there may still be fuel in the system and be prepared to catch any fuel that leaks out, into an adequately sized, empty container. Fuel may leak from both, the fuel line and the carburetor!

If your machine is equipped with a fuel line shut-off, turn it to the **off** position or clamp the fuel line so that it does not leak.

From the carburetor end of the fuel line, carefully disconnect the fuel line from the carburetor and allow to drain into a container. You may have to tilt the machine to get all old fuel out of the carburetor and fuel line.

# Carburetor Service and Repair

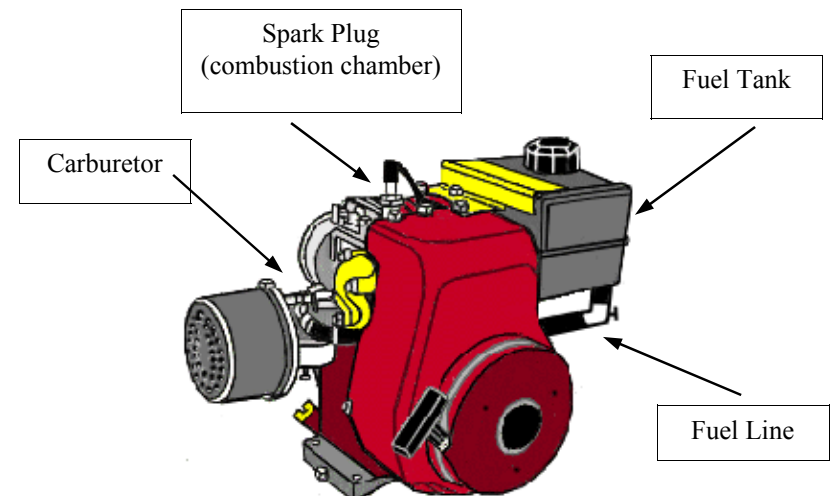
## Purging the Fuel System

Your fuel system consists of three major components:

- ◆ **Fuel Tank**
- ◆ **Fuel Line (including the filter)**
- ◆ **Carburetor**

In addition, you must also consider the **Spark Plug** and the **Combustion Chamber** when purging varnish from your machine.

Each of these must be completely purged of varnish and cleaned thoroughly before fresh fuel is added.



# Carburetor Service and Repair

## DETOUR!

Before we get into the difficult and intricate task of tearing down your fuel system to purge it of bad fuel, we're going to take a slight detour and try a simpler method first.

Many times, the amount of varnish that has accumulated in the fuel system is not so great that it requires a complete tear-down of the fuel system. In these cases it is sometimes possible to "dissolve" enough of the varnish to get the engine running again. Continued operation will flush out any remaining varnish, and a good maintenance program will prevent it from reoccurring.

Before proceeding to a complete fuel system tear-down, try these steps:

1. Drain all fuel from the machine
2. Spray large amounts of carburetor cleaner directly into the carburetor
3. Remove and replace spark plug
4. Change oil
5. Clean or replace air filter
6. Fill fuel tank with fresh gasoline
7. Now try to start the engine...

# Carburetor Service and Repair

## DETOUR!

Remember, you are trying to dissolve varnish by forcing fresh gasoline throughout the entire fuel system. This is not going to happen in a matter of seconds or even minutes.

It may take up to an hour or more of constantly trying to start the engine before enough of the fresh gasoline reaches all the places where varnish may have accumulated, and have adequate time to dissolve the varnish and open the passages.

This is especially true of the fuel ports and jets: fine passages where fuel must flow unimpeded.

If, at any time during this process, you experience fuel leaking from the carburetor or the exhaust, if you experience "back-firing" through the carburetor or the exhaust, if the engine continuously sounds like it is about to start but won't, or if the engine emits any strange sounds (especially metallic sounds) stop immediately. This machine may have serious problems that will only be compounded by continuing to attempt to start it.

If none of the above occur, but the engine still will not run, proceed to the next chapter to begin purging the fuel system.