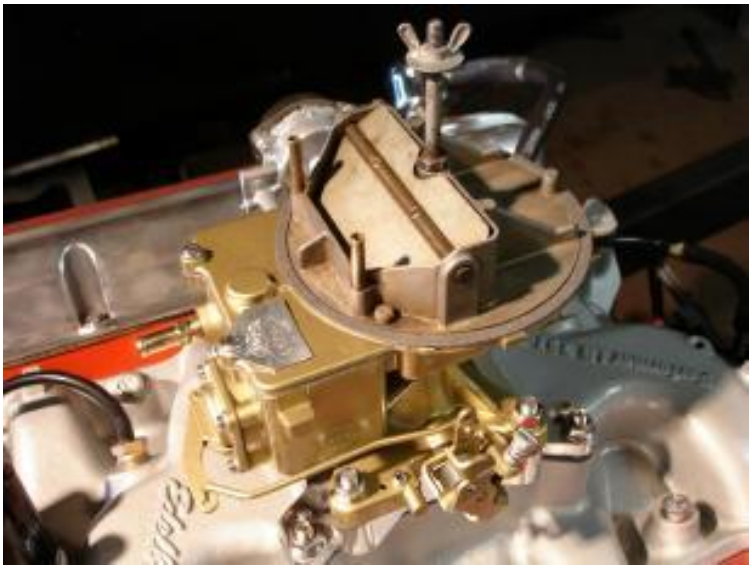


How to Diagnose and Repair Carburetor Problems

by Larry Carley copyright 2019 AA1Car.com

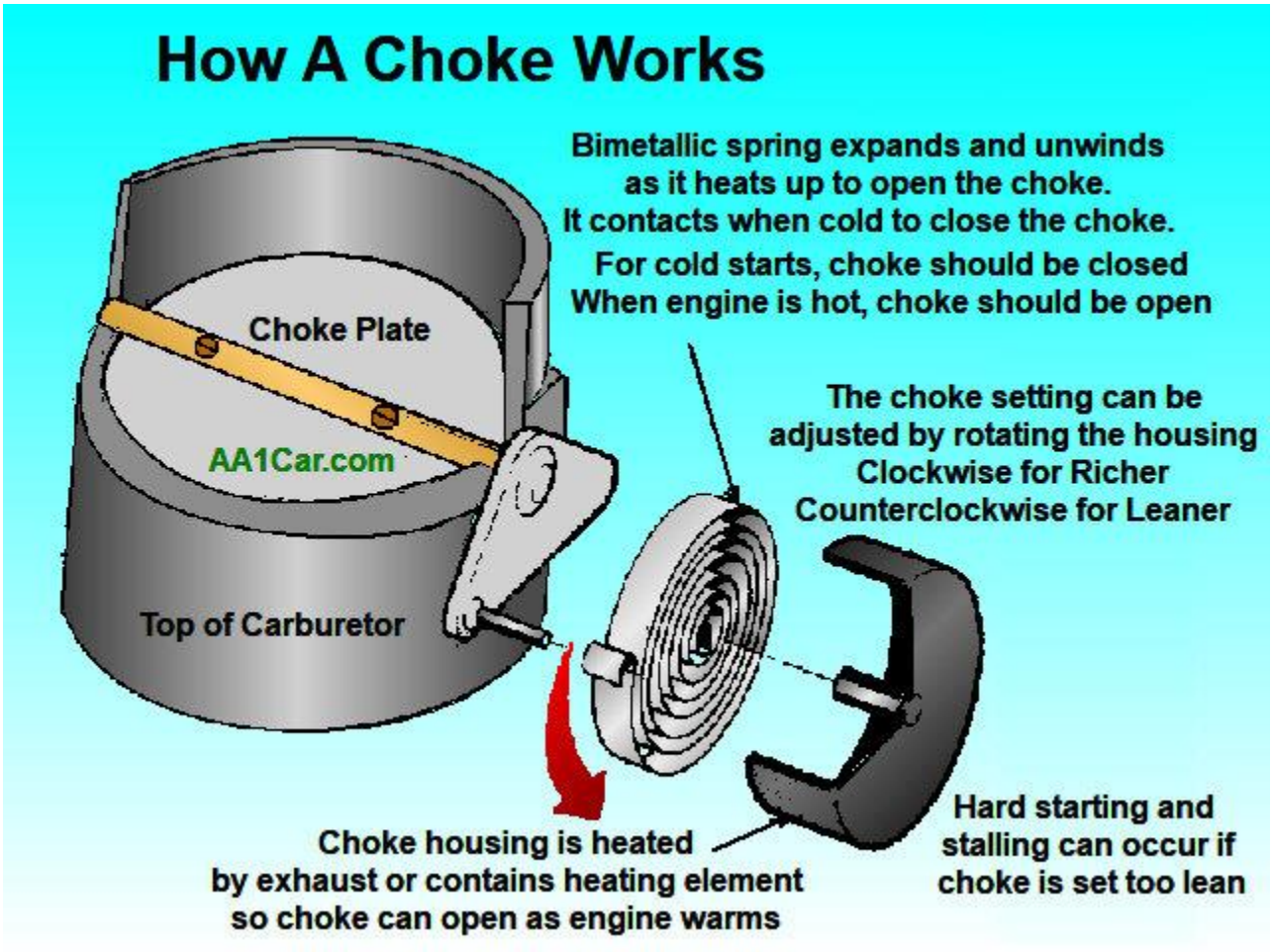
A carburetor uses intake vacuum to supply fuel to the engine. As air is pulled down through the throat of the carburetor by intake vacuum, fuel is siphoned from the carburetor's fuel bowl and mixed with the incoming air to form a combustible mixture. At idle, the fuel enters the carburetor throat through one or small small idle ports just above the throttle plate. At higher engine speeds, fuel is pulled through the main metering jets into the venturi (the narrowest part of the carburetor throat). The air/fuel mixture then flows down through the intake manifold and into the cylinders where it is burned to produce power.

Though the basic operation of a carburetor is fairly simple, it also relies on a number of add-on devices for cold starting, idle control and emissions. Changes in emission regulations in the early 1980s made carburetors obsolete because they were unable to meet the new emission requirements. By the mid-1980s, carburetors were history on new production vehicles, having been replaced by throttle body and multiport electronic fuel injection systems.

Carburetor Problems

When a carburetor is clean and is working properly, the engine should start easily (hot or cold), idle smoothly, and accelerate without stumbling. The engine should get normal fuel economy and emissions should be within limits for the year of the vehicle.

Problems that are often blamed on a "bad" or "dirty" carburetor include hard starting, hesitation, stalling, rough idle, flooding, idling too fast and poor fuel economy. Sometimes it is the carburetor and sometimes it is something else. Carburetors can be tricky to rebuilt, and expensive to replace, so you want to be sure of your diagnosis before you touch this critical part.



A choke is necessary for cold starting to richen the Air/Fuel mixture and increase idle speed while the engine is warming up.

Hard Cold Starting Problems

Hard starting can be caused by a choke that fails to close and causes a rich fuel mixture when the engine is cold. But there's no need to rebuild or replace the carburetor if all

that's needed is a simple adjustment or cleaning of the choke mechanism and linkage. Chokes are very sensitive, and easily misadjusted (which is why the government required the auto makers to make choke and idle mixture adjustments "tamper-resistant" in the 1980s).

Inside the choke housing is a coiled bi-metal heat-sensing spring that contracts when it cools and expand (unwinds) when it gets hot. The spring opens and closes the choke plate on top of the carburetor. The spring is inside a black plastic choke housing on the top or side of the carburetor. The spring is heated by an electric heating element inside the cover and/or heat from the exhaust manifold that is siphoned up into the housing through a small metal tube. If the heating coil has burned out or is not receiving voltage, or the heat riser is plugged with rust, loose or missing, the choke will not warm up properly. This will cause the choke to say on all the time, or too long, making the engine run rich and idle too fast.

If the bi-metal choke spring is broken, the choke will never close. A cold engine needs a very rich mixture to start, so if the choke isn't working it will suck too much air. A broken choke will also prevent the engine from idling properly (no fast idle while it is warming up) which can cause it to stall until it reaches normal operating temperature.

If the shaft that opens and closes the choke is dirty, it may cause the choke to stick. The same goes for the choke linkage if it is dirty or damaged.

Even if the choke is defective, a choke repair kit or a new bimetal spring should be all that's necessary to eliminate the starting problem. Replacing the entire carburetor is unnecessary and is the same as replacing the engine because the water pump is bad.

Other causes of hard starting include vacuum leaks, ignition problems (worn or dirty spark plugs, bad plug wires, cap, rotor, etc.), low compression, even a weak starter or battery.

Hard Hot Starting Problems

As for hot starting problems, the carburetor is seldom to blame. A hot start condition is usually the result of too much heat in the vicinity of the carburetor, fuel lines or fuel pump. Heat causes the fuel in the fuel lines, carburetor bowl or pump to boil. This creates a "vapor lock" condition which can make a hot engine hard to start. Replacing or rebuilding the carburetor wouldn't solve anything because the real culprit is heat. What needs to be done here is to reroute the fuel line away from sources of heat (like the exhaust manifold and pipe), and/or to insulate the fuel line by fabricating aheat shield or wrapping the fuel line with insulation.

Hot start problems can also be caused by excessive resistance in a starter, poor battery cable connections, or a faulty ignition module that acts up when it overheats.

Hesitation or Stumble When Accelerating

Hesitation is a classic symptom of a lean fuel mixture (too much air, not enough fuel) and can be caused by a dirty or misadjusted carburetor, or one with a weak accelerator pump or worn throttle shafts. Rebuilding or replacing the carburetor may be necessary.

The accelerator pump squirts and extra dose of fuel into the throat of the carburetor when the throttle opens. This helps offset the extra gulp of air that is sucked in until fuel flow through the metering circuits can catch up to the change in air velocity through the venturi (the narrow part of the carburetor throat). The accelerator pump may use a rubber diaphragm or a rubber cup on a piston to pump fuel through its discharge nozzles. If the diaphragm is torn or the piston piston seal is worn, the accelerator pump may not deliver it's normal dose of fuel. Or, if the discharge nozzles are plugged with dirt or fuel varnish deposits, it can restrict fuel flow.

The operation of the accelerator pump can be checked by removing the air filter, looking down into the carburetor, and pumping the throttle. You should see a jet of fuel squirt into each of the front venturis (barrels) of the carburetor. If no fuel squirts out, or the stream is very weak, or only one of the two discharge nozzles on a two-barrel or four-barrel carburetor are working, the accelerator pump circuit has a problem.

Fuel usually enters the accelerator pump past a one-way steel check ball. The ball lets fuel in, but is pushed back against its seat by pressure inside the pump when the throttle opens. If this check ball is stuck open, it acts like a pressure leak and prevents the accelerator pump from squirting fuel through the discharge nozzles. If the check ball is stuck shut, it will prevent fuel from entering the pump and there will be no fuel to pump through the discharge nozzles.

If the carburetor jets are coated with fuel varnish deposits, or there is dirt inside the fuel bowl, this can restrict the flow of fuel causing a lean condition. Cleaning the carburetor with carburetor cleaner can get rid of the dirt and varnish deposits to restore normal operation.

Air leaks elsewhere on the engine can also lean out the fuel mixture. Air can enter the intake manifold through loose or cracked vacuum hoses, emission hose or the PCV system. Vacuum leaks in the carburetor base gasket or insulator, intake manifold gaskets, power brake booster or other vacuum accessories can admit unwanted air. Air can even get into the manifold past badly worn valve guides and seals.

A defective EGR valve that fails to close at idle or when the engine is cold can be another cause of hesitation.

Other causes may include a defective distributor advance mechanism, a weak ignition coil, carbon tracks on the coil tower or distributor cap, bad plug wires, worn or dirty spark plugs that misfire when the engine is under load, or even an exhaust restriction.

Even bad gas can cause hesitation problems. So before the carburetor is rebuilt or replaced, these other possibilities need to be investigated an ruled out.

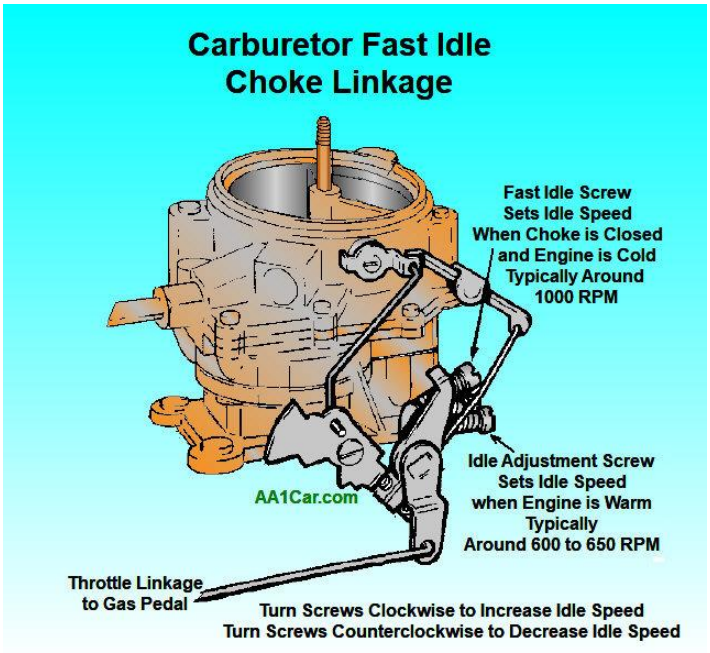
Hesitation Under Load

A hesitation, stumble or misfire that occurs when the engine is under load can be caused by a faulty **power valve** inside the carburetor. A carburetor uses intake vacuum to pull fuel through its metering circuits. As engine load increases and the throttle opens wider, intake vacuum drops. This can reduce the flow of fuel and make the fuel mixture go lean, so the power valve has a spring-loaded vacuum-sensing diaphragm that opens to increase fuel flow when vacuum drops. If the diaphragm has failed or the valve is clogged with dirt or fuel varnish deposits, it must be replaced. A new power valve is usually included with a carburetor rebuild kit.

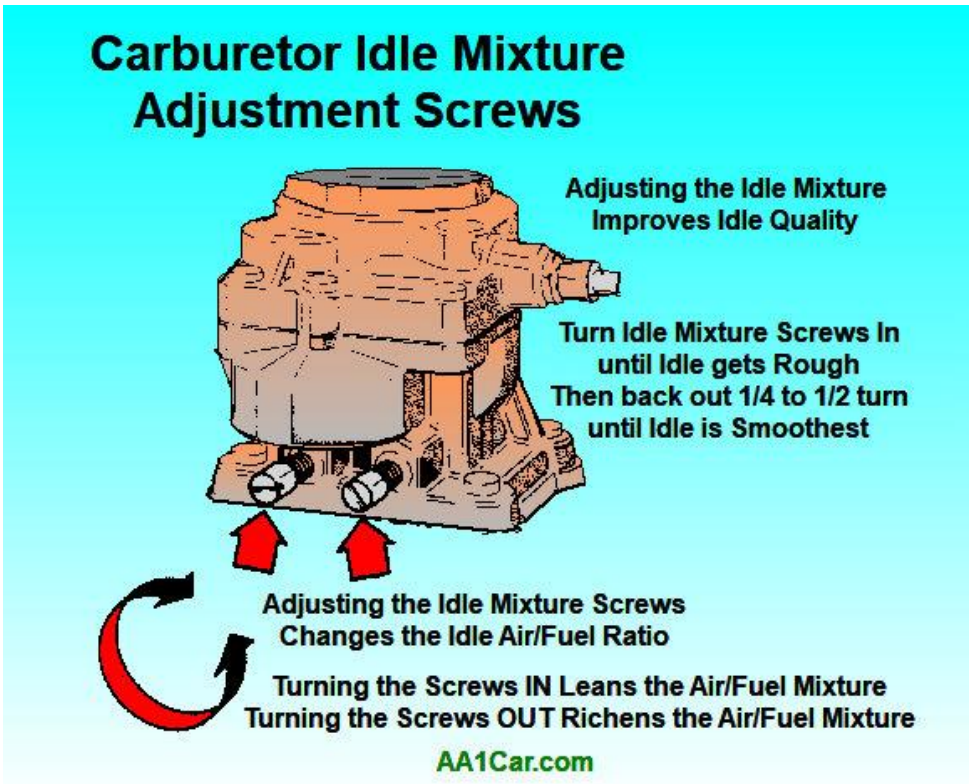
Hesitation or misfiring under load can also be caused by a weak ignition coil, or cracks in the coil or distributor cap, or bad spark plug wires.

Stalling

An engine can stall when cold if the fast idle speed is not set high enough. It may also stall when it has warmed up if the idle speed is set too low, if the idle the fuel mixture is too lean, if the fuel is contaminated with water (or too much alcohol), or if the if there is not enough fuel pressure to keep the carburetor bowl filled. Adjusting the fast idle, regular idle speeds and/or idle mixture adjustments can often eliminate a hot or cold stalling problem.



The fast idle linkage increases idle speed when the engine is cold so it will not stall. Adjusting the choke for a richer setting may solve the problem.



If the Idle Mixture adjustment screws are adjusted too lean, the engine may stall.

Stalling can also be caused by air and vacuum leaks in the carburetor itself (leaky gaskets and seals) between the carburetor base plate and intake manifold (bad base gasket), or in any of the vacuum hoses that connect to the carburetor or intake manifold. If air is being sucked into the engine though a vacuum lea,k, it will lean out the Air/Fuel mixture causing a rough idle and stalling. The cure is to locate and repair the vacuum leak.

Stalling can also be casued by a dirty carburetor. If the jets or idle circuit inside the carburetor are dirty or gummed up with fuel varnish, they won't flow enough fuel causing the Air/Fuel mixture to be too lean. Cleaning the carburetor with carburetor cleaner and/or running some Sea Foam or a similar solvent through the carburetor may solve the problem. If not, the carburetor may have to be disassembled for a thorough cleaning, and rebuilt with new gaskets and seals..

If adjusting, cleaning or replacing a carburetor fails to elimiante a stalling problem, the underlying cause is likely a weak fuel pump, plugged fuel filter or fuel line, or bad gas (too much water or alcohol).

The carburetor may have to be replaced if the throttle shafts are worn and leaking air, or the carburetor housing is warped or damaged.

On vehicles with computer-controlled idle speed, an inoperative or defective idle speed control (ISC) motor can make an engine stall. The ISC motor controls idle speed using inputs from the engine computer. If the ISC motor is receiving voltage and is properly grounded but does not change position, the motor is burned out and needs to be replaced. The motor may have failed because a vacuum leak caused it to overtax itself in a vain attempt to compensate for the unwanted air.

Rough Idle

A rough idle condition is usually caused by an overly lean fuel mixture that results in lean misfire. A common cause of idle problems is air leaks between the carburetor and intake manifold (tighten the carburetor base bolts or replace the gasket under the carburetor), air leaks in vacuum lines or the PCV system or EGR valve. Other carburetor-related causes include an idle mixture adjustment set too lean (back out the idle mixture adjustment screw one quarter of a turn at a time until he idle quality improves), or a dirty idle mixture circuit (which may require cleaning and rebuilding the carburetor).

Other possible causes of a rough idle include a defective charcoal canister purge control valve that is not closing and is leaking fuel vapors back into the carburetor, excessive compression blowby (worn rings or cylinders), weak or broken valve springs, or ignition misfiring due to worn or dirty spark plugs, bad plug wires or a weak ignition coil.

Idles Too Fast

This type of idle problem usually caused by the automatic choke. If the choke is sticking, the engine will stay at fast idle too long. Inspect the choke and choke linkage, and clean or repair as needed.

There is a separate **fast idle adjustment screw** on the choke linkage that controls engine speed while the engine is warming up. The tip of the screw rests against a cam that slowly rotates as the choke opens during engine warm up. Turn this screw counterclockwise to decrease the fast idle speed, or clockwise to increase fast idle speed.

A high idle speed can also be caused by vacuum leaks that allow air to enter the manifold (leaky PCV hose, power steering booster hose or other large vacuum hose). Another cause may be a defective ISC motor stuck in the extended (high idle speed) position.

Flooding

This is a problem that is usually (but not always) the carburetor's fault. The carburetor may flood if dirt enters the needle valve and prevents it from closing. With no way to

shut off the flow of fuel, the bowl overflows and spills fuel into the carburetor throat or out the bowl vents. A flooded engine may not start because the plugs are wet with fuel.

WARNING: *Flooding can be a very dangerous situation because it creates a serious fire hazard if fuel spills out of the carburetor onto a hot engine.*

A carburetor can also flood if the float inside the fuel bowl is set too high or develops a leak and sinks (this applies to hollow brass or plastic floats primarily). If all that is needed is a new float, there is no real need to replace the entire carburetor. Floats are not part of a rebuild kit, so if new gaskets are also needed, a rebuild kit will have to be purchased, too.

Flooding can also be caused by excessive fuel pressure forcing fuel past the needle valve. Flooding may also be caused by excessive heat in some instances. A heat riser valve on a V6 or V8 engine that sticks shut may create a hot spot under the intake manifold that causes the fuel in the carburetor bowl to boil over and flood the engine.

Poor Fuel Economy

Don't blame the carburetor if the real problem is a lead foot on the accelerator pedal , or the engine has low compression, retarded ignition timing or an exhaust restriction (plugged converter). But if nothing else is wrong, the carburetor may have a misadjusted or heavy float, or the wrong metering jets (too large).

The float setting determines the fuel level in the bowl, which in turn affects the richness of the Air/Fuel mixture. A float that is set too high or has become saturated with fuel (a problem that continues to plague many foam plastic floats today), allows the fuel level to rise and richen the fuel mixture. To diagnose this condition, the float level needs to be checked and the float weighed to determine if it has become fuel saturated. If the float is heavy, it needs to be replaced.

With electronic feedback carburetors, a sluggish or dead oxygen sensor can make the fuel mixture run rich. So too can a defective coolant sensor that never allows the feedback system to go into closed loop. Scanning for fault codes and checking the operation of the feedback system can rule out these possibilities.

If the carburetor has been replaced recently with a used carburetor or a carburetor off another engine, the jets may not be calibrated correctly for the new application. Bigger jets flow more fuel and richen the fuel mixture. Installing smaller sized jets may restore the proper air/fuel mixture and good fuel economy.

One way to tell if the fuel mixture is too rich or too lean is to examine the spark plugs. If the plugs have heavy black, sooty carbon deposits on the electrodes, the fuel mixture is too rich. If the mixture is too lean, the ceramic insulator around the center electrode may be yellowish or blistered in appearance. An overly lean air/fuel mixture is bad because it can cause engine-damaging preignition and detonation.

Rebuild or Replace Carburetor

If the carburetor needs work, it can be rebuilt with a kit or replaced with a new or remanufactured carburetor. Replacement carburetors are expensive, and may cost from $200 to $600 or more depending on the application and type of carburetor.

Cleaning and rebuilding an older one or two barrel carburetor is a relatively simple job. A four barrel is a little more difficult. More complicated carburetors such as those with a variable-venturi or electronic feedback controls and tamper-resistant adjustments can be very difficult to rebuild, and may require the skills of an expert. It is often easier and less risky to replace a more complicated carburetor than to attempt a rebuild.

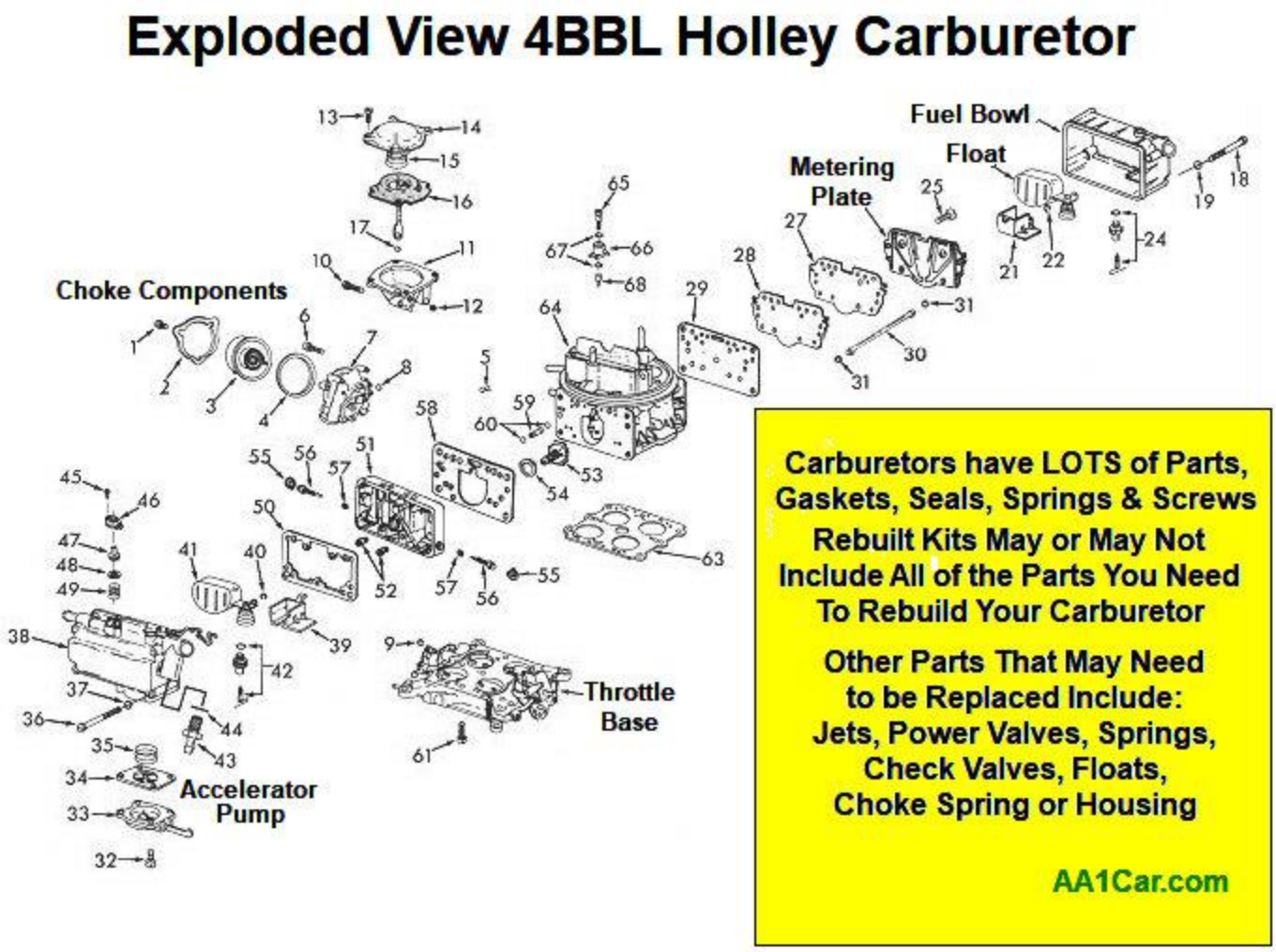
If the carburetor has worn throttle shafts that are leaking air, or any of the castings are cracked, warped or damaged, the carburetor cannot be rebuilt and must be replaced. The only alternative here is if you have a second carburetor you can cannibalize for parts to salvage and repair the first carburetor.

Whether you are rebuilding or replacing a carburetor, you first need to identify it. Year, make, model and engine size may not be enough information to find the correct carburetor kit or replacement carburetor. There is usually a small metal ID tag on the carburetor that will tell the exact model number and calibration of the unit.

Time to Upgrade to Fuel Injection?

Another option to consider if your carburetor needs to be replaced is to upgrade to Fuel Injection. It doesn't cost much more than a new carburetor and you get easier starting, smoother running and even some extra horsepower. There are various aftermarket bolt-on Throttle Body Fuel Injection systems that are relatively easy to install and are "self-tuning." They do require adding an oxygen sensor to the exhaust system for feedback fuel mixture control, but most do not require any special computer skills for tuning. The system "learns" the best settings as you drive and makes the necessary adjustments so you get good cold idle smoothness, great throttle response, and usually better fuel economy and performance than what you had before.

Of course, if you want to keep your fuel system 100 percent original, than upgrading to an aftermarket fuel injection system would not be an option.



Holley 4160C

Carburetor Rebuilding Tips

Before you take a carburetor apart, find an assembly diagram in a service manual for reference. Carburetor kits may or may not include an assembly diagram and instructions. Here is a good source of carburetor kits and rebuild information: Carburetor Factory.

Also note where various vacuum hoses and lines connect to the carburetor. If necessary, draw a picture of the hose connections, or place a piece of masking tape on each hose and write on the tape which hose goes where.

Lay the parts out on a clean work bench, paper or metal tray. Pay attention to how the parts came apart (especially linkages) so you can remember how to reassemble the parts when you put the carburetor back together. Watch out for small steel check balls that can be easily overlooked or lost.

When cleaning carburetor parts, use carburetor cleaner or a solvent that will not damage plastic and soft metal parts. Wear rubber gloves to avoid skin contact with the cleaner or solvent. Follow use instructions for the cleaner or solvent, and use in a well ventilated area. Avoid breathing the fumes.

Check for a worn throttle shaft. The hole in the base casting can become worn over time, allowing air to be sucked in past the shaft. This will lean out the fuel mixture, possible causing lean misfire, hesitation or stumbling problems. If the throttle shaft hole is worn, it can be fixed by removing the throttle shaft, drilling out the hole to oversize and installing a steel or brass sleeve to restore normal clearances.

Another problem to watch out for is a bad float inside the fuel bowl. If the float is brass, shake it to see if there is any liquid inside. A small hairline crack in the seam can allow fuel to seep into the float, causing it to sink and flood the engine with too much fuel. Many carburetors also have plastic floats instead of brass. Some plastics soak up fuel over time like a sponge, making them too heavy. This causes the float to ride too low in the fuel bowl and flood the engine with too much fuel. The fix for a bad float or a heavy float is to replace it with a new one (f you can find a replacement).

Carburetor Installation Tips

Clean the carburetor mounting surface on the intake manifold (do NOT allow any dirt or gasket debris to fall down inside the manifold), and install a new base gasket under the carburetor (never reuse the old gasket because they almost always leak). Gasket sealer may be applied to the base gasket to reduce the chance of air leakage, but do NOT use RTV silicone because it dissolves when exposed to gasoline.

Tighten the carburetor base mounting nuts or bolts evenly so the gasket is clamped firmly in place. Do NOT over-tighten the fasteners as doing so may warp or crack the carburetor base plate.

When reconnecting the fuel line and any other fittings (EGR, PCV) to the carburetor, be careful not to cross-thread the fittings, and do NOT over-tighten as doing so can strip the treads in the soft casting.

Install a new fuel filter to protect the carburetor from dirt.

Do NOT forget to reattach the throttle return spring(s) on the throttle linkage. The last thing you want is a runaway engine when you start it up. If the springs are old and rusty, appear to be stretched or are weak, replace them with new springs. Also test the throttle linkage to make sure the throttle opens all the way when the gas pedal is floored, and that nothing binds or rubs against the linkage that might cause it to stick.

When installing the air cleaner, do NOT over-tighten the nut that holds the air cleaner in place as this can distort and damage the carburetor casting.

Inspect all rubber fuel hoses and clamps. Replace any hose that is hard, brittle, mushy, cracked or leaking. New clamps are also recommended. Worm-screw clamps are usually the best. Ring style clamps lose tension with age, and can be permanently deformed if they are over-expanded during removal.

Double check all the fuel line, vacuum and emission hose connections, the throttle linkage and return spring, then start the engine. Recheck again for any leaks or other problems.

Carburetor Adjustment Tips

Adjust the idle speed and idle mixture adjustment screws after the engine reaches normal operating temperature. Set the idle speed to specifications (typically 600 to 650 rpm), and adjust the idle mixture screws for smoothest idle. Turn each idle mixture screw in until the engine starts to stumble, then back it out about 1/4 to 1/2 turn.

The automatic choke may have to be adjusted if the engine does not start easily. The choke should be fully closed on a cold engine, and open all the way once the engine warms up. Small adjustments go a long ways, and it may take several trial-and-error adjustments of the choke housing to get it right.

If the engine hesitates or stumbles when accelerating, the accelerator pump linkage or cam may require some adjustment to increase the volume of fuel squirted into the engine when the throttle opens. The accelerator pump linkage or cam usually has several adjustment settings, so try the next higher setting if it needs more fuel.

If you are installing a performance carburetor, the main metering jets that come in the carburetor may or may not give you the best air/fuel mixture. The best performance is usually achieved with a slightly rich mixture. Jet sizes are usually indicated with a number stamped on the side of the jet. Installing slightly larger sized jets will flow more fuel and richen the mixture. If the carburetor is running too rich, then switching to slightly smaller sized jets may give better performance. Replacing the main metering jets usually requires removing the top of the carburetor or the fuel bowls. Some racing carburetors have jets that can be replaced without disassembly.

More Carburetor Articles:

Air/Fuel Ratios

Honda Keihin Carburetor Repair

Mechanical Fuel Pumps

Bad Gasoline Can Cause Performance Problems

Bad Gas Update 2006

Fuel Filters

Check Your Air Filter

Click Here for More Automotive Technical Articles