

## Harley Davidson CV Carburetor Upgrade

Harley Davidson started equipping models with the CV carburetor in 1989 and has utilized the same carb ever since. A CV carburetor (Constant Velocity) incorporates a vacuum operated slide that varies the venturi size within the carburetor, thus maintaining a constant velocity. The slide also holds a needle that when lifted by the opening slide varies the amount of atomized fuel delivered. This ingenious design is believed to have been developed by racers who altered British made carburetors and was eventually put into production by Keihin. Modifications to this reliable carb continue today in the form of race tuner kits, hybrid slides, and [Stage 1 Kits](#).



Due to the CV carburetor's stable metering characteristics, Harley then commissioned their own version to replace the aging butterfly style carburetors. The stock CV carburetor when properly tuned delivers more than adequate performance to any stock or slightly modified Harley while still maintaining good gas mileage.

A Harley CV carburetor by far outperforms its butterfly style predecessors, namely the Keihin, Zenith, and Bendix. This brings us to the subject of upgrading these older Harley "Soup Cans" to the newer CV style carb. Harley Davidson motorcycles prior to 1989 used a standard butterfly carburetor and are excellent candidates for upgrading to the newer CV carburetor. The upgrade is quite straight forward and for the majority of models only requires a [Flange Adapter](#) be fitted between the carb and the manifold.



Pre-1989 Harley's used a two bolt flanged manifold, whereas a CV carburetor simply slips onto a rubber boot and is held in place by the air cleaner's backing plate. Total conversion shouldn't cost more than 200 bucks... less if you can find a buddy with a spare CV carb in good condition.

A CV carb also requires the use of a dual throttle cable system where one cable operates the throttle (open) action and the other cable functions as the idle action in closing the

same throttle. Mid to pre 70's bikes used a single throttle cable configuration which should be upgraded. Though many have used the CV carb using a single cable the chance of the throttle not closing due to the cable binding makes this a risk not worth taking. If requiring an upgrade to a dual cable system there are several sources to do so including the dealer or [online](#).



Parts required to complete the CV carburetor upgrade:

- [CV Carburetor](#)
- [Flange Adapter](#)
- [Dual Throttle Cable Kit](#)
- [Stage 1 Jetting Kit](#) if using a used CV carb.

The carburetor for the conversion should be in known working condition (if used) and include a enricher (choke) cable. The choke utilized on a butterfly carburetor is different and therefore won't work for this conversion.

Step 1 - Unbolt the old carburetor from the manifold. Disconnect the fuel line and vacuum hoses. If the original dual cable setup is to be reused label them for reinstalling on the CV carburetor.

Step 2 - Loosely place the flange adapter on the carb and align with the manifold bolts. Mark where the adapter should be permanently aligned on the carb so that the carburetor is horizontally level. If using the press fit type of adapter a small amount of JB Weld should be applied to the adapter to affix to the carb. Press the adapter onto the carb and allow the adhesive to cure.

Step 3 - Attach the throttle cables to the carburetor. If upgrading from a single to double cable system this should be completed prior to this step. Attach the new choke (enricher) cable to the carb body.

Step 4 - Attach the fuel line with a new clamp. Connect the vacuum line from the VOES to the top-rear inlet. If the carb is equipped with a overflow coming from the bottom of

the bowl (this is NOT a vacuum port), direct a piece of vacuum hose down between the cylinders toward the bottom of the frame. Some prefer to plug this tube instead.

Step 5 - Pass the choke cable in between the cylinders and locate a mounting place on the left side of the engine to hold the choke knob. This may require a fabricated bracket or using one from a newer model Harley. Mount the CV carb to your current manifold using a new stock gasket. Recheck all hose connections and make sure the throttle operates smoothly without binding. Adjust the throttle cables as needed.



Step 6 - If using an aftermarket or S.E. air cleaner attach to the carb along with the breather bolts to each head. When using your stock air cleaner assembly it may require the holes on the backing plate to be re drilled in order to align with the three holes on the face of the carb.

Step 7 - Turn on the fuel petcock, engage the choke and start the engine. This may take a moment since the fuel bowl is empty. Adjust the idle and follow the tips under [Harley CV Carburetor Tuning](#) to get your bike fine tuned.

Congratulations, you've just upgraded your carburetor! Not only will you benefit from the same performance and reliability as newer Harley's, but think of how much you saved compared to the cost of a high-priced "super" carburetor kit.

Harley Davidson started equipping models with the CV carburetor in 1989 and has utilized the same carb ever since. A CV carburetor (Constant Velocity) incorporates a vacuum operated slide that varies the venturi size within the carburetor, thus maintaining a constant velocity. The slide also holds a needle that when lifted by the opening slide varies the amount of atomized fuel delivered. This ingenious design is believed to have been developed by racers who altered British made carburetors and was eventually put into production by Keihin. Modifications to this reliable carb continue today in the form of race tuner kits, hybrid slides, and [Stage 1 Kits](#).



Due to the CV carburetor's stable metering characteristics, Harley then commissioned their own version to replace the aging butterfly style carburetors. The stock CV carburetor when properly tuned delivers more than adequate performance to any stock or slightly modified Harley while still maintaining good gas mileage.

A Harley CV carburetor by far outperforms its butterfly style predecessors, namely the Keihin, Zenith, and Bendix. This brings us to the subject of upgrading these older Harley "Soup Cans" to the newer CV style carb. Harley Davidson motorcycles prior to 1989 used a standard butterfly carburetor and are excellent candidates for upgrading to the newer CV carburetor. The upgrade is quite straight forward and for the majority of models only requires a [Flange Adapter](#) be fitted between the carb and the manifold.



Pre-1989 Harley's used a two bolt flanged manifold, whereas a CV carburetor simply slips onto a rubber boot and is held in place by the air cleaner's backing plate. Total conversion shouldn't cost more than 200 bucks... less if you can find a buddy with a spare CV carb in good condition.

A CV carb also requires the use of a dual throttle cable system where one cable operates the throttle (open) action and the other cable functions as the idle action in closing the same throttle. Mid to pre 70's bikes used a single throttle cable configuration which should be upgraded. Though many have used the CV carb using a single cable the chance of the throttle not closing due to the cable binding makes this a risk not worth taking. If requiring an upgrade to a dual cable system there are several sources to do so including the dealer or [online](#).



Parts required to complete the CV carburetor upgrade:

- [CV Carburetor](#)
- [Flange Adapter](#)
- [Dual Throttle Cable Kit](#)
- [Stage 1 Jetting Kit](#) if using a used CV carb.

The carburetor for the conversion should be in known working condition (if used) and include a enricher (choke) cable. The choke utilized on a butterfly carburetor is different and therefore won't work for this conversion.

Step 1 - Unbolt the old carburetor from the manifold. Disconnect the fuel line and vacuum hoses. If the original dual cable setup is to be reused label them for reinstalling on the CV carburetor.

Step 2 - Loosely place the flange adapter on the carb and align with the manifold bolts. Mark where the adapter should be permanently aligned on the carb so that the carburetor is horizontally level. If using the press fit type of adapter a small amount of JB Weld should be applied to the adapter to affix to the carb. Press the adapter onto the carb and allow the adhesive to cure.

Step 3 - Attach the throttle cables to the carburetor. If upgrading from a single to double cable system this should be completed prior to this step. Attach the new choke (enricher) cable to the carb body.

Step 4 - Attach the fuel line with a new clamp. Connect the vacuum line from the VOES to the top-rear inlet. If the carb is equipped with a overflow coming from the bottom of the bowl (this is NOT a vacuum port), direct a piece of vacuum hose down between the cylinders toward the bottom of the frame. Some prefer to plug this tube instead.

Step 5 - Pass the choke cable in between the cylinders and locate a mounting place on the left side of the engine to hold the choke knob. This may require a fabricated bracket or using one from a newer model Harley. Mount the CV carb to your current manifold using a new stock gasket. Recheck all hose connections and make sure the throttle operates smoothly without binding. Adjust the throttle cables as needed.



Step 6 - If using an aftermarket or S.E. air cleaner attach to the carb along with the breather bolts to each head. When using your stock air cleaner assembly it may require the holes on the backing plate to be re drilled in order to align with the three holes on the face of the carb.

Step 7 - Turn on the fuel petcock, engage the choke and start the engine. This may take a moment since the fuel bowl is empty. Adjust the idle and follow the tips under [Harley CV Carburetor Tuning](#) to get your bike fine tuned.

Congratulations, you've just upgraded your carburetor! Not only will you benefit from the same performance and reliability as newer Harley's, but think of how much you saved compared to the cost of a high-priced "super" carburetor kit.

## Harley Davidson Carburetor Performance Tuning

Tuning your Harley Davidson carburetor is simpler than most think and can be performed with a few common tools. This simple procedure is a great Harley tech tip that applies to all Harley carbs from 1989 to present that use the CV style [Harley Davidson carburetor](#) . Earlier models equipped with the older butterfly style carbs (pre-89 Evo's, Shovelheads, Pans, and Ironheads) are excellent candidates for upgrading to a modern [Harley carburetor](#) .

[Read more about how to upgrade your Harley carb](#)

Note: Before proceeding to [rejet your carburetor](#) it is recommended that you perform the following tuning procedure. Once the the mixture has been properly tuned there is often no need to rejet the carb.

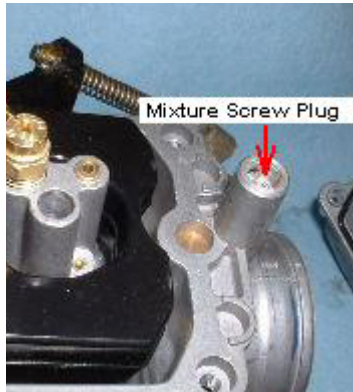
Preparing the carburetor for tuning will require removal from your Harley-Davidson's engine but this is easily accomplished. Begin by shutting off the petcock fuel valve and starting the engine to allow all fuel within the carburetor bowl to be emptied. Remove the aircleaner assembly including the backing plate which is attached to each head with a banjo bolt. This is a good time to inspect these bolts for obstructions in their passages. Remove the choke cable from it's mounting bracket on the opposite side of the bike.

The choke cable will stay attached to the carburetor during this procedure. Disconnect the fuel line from the fuel inlet on the carburetor or the opposite end connected to the fuel petcock, whichever is simpler to access. The hose is likely fastened using a special crimped clamp. This may be cut or pried off to remove since you won't be using it again. Be sure to have a new hose clamp available.

Next loosen both throttle cables from their adjusters located just beyond where they exit the throttle grip. A couple turns is usually all it takes to give you enough slack. If you count how many turns each adjuster is loosened then you can return them to the exact adjustment when reinstalling your carb. This is a good time to label each cable to avoid any confusion when reconnecting them to the carb's throttle cam. A simple "Top" and "Bottom" should suffice when tagging each cable.

Now that you have enough slack in the cables you can pull the carburetor away from the manifold. A Harley carb is only held to the manifold with a slip fit rubber boot. Gently rock or twist the carb back and forth as you pull it away from the engine. Remove the cables that you tagged and remove any vacuum hoses. If your model has multiple vacuum hoses it would be a good idea to label these as well.

With the carb removed, place upside down on a sturdy work surface. Do not remove the bowl at this point to prevent debris from entering the carburetor.



The CV style Harley carburetor has a small cylindrical tower protruding from the bottom rear of the spigot (behind the bowl). The tower is plugged with a soft metal insert covering the mixture screw. Gaining access to this screw is key to fine tuning and must be removed. The metal plug is very soft and only requires a household drill and 7/64" to 1/8" bit. Secure the carb in either a vise or by other means that will allow the carburetor to remain steady. Drill a hole into the plug making sure not to "punch" through too fast. You don't want to damage the mixture screw just below the plug. Allow the drill to slowly cut into the plug rather than push.

**Tip:** To keep from drilling too far into the plug, it has been suggested to wind electrical tape around your drill bit quite a few times about 3/16" from the tip. This will create a stop to keep the bit from drilling too deep.

Pry the plug out using a pick or awl. You can also thread a sheet metal screw into the drilled hole and use this to pull the plug out. Now that the plug is removed clean the area around the mixture screw so no metal fragments remain. At this point there are two methods for adjusting the mixture.

**Adjustment Method:** Using a small flat head screwdriver turn the screw clockwise until it gently seats. **DO NOT OVER TIGHTEN AS THIS WILL DAMAGE THE NEEDLE SCREW.** Count how many turns it takes to reach the closed position. Mark the screwdriver if needed to properly count each turn. Now turn the screw out counter clockwise stopping at a 1/4 turn beyond that which you originally counted. For example, if you turned the screw in 1-1/2 turns then unscrew it 1-3/4 turns. This is your base starting point and alone will allow your idle mixture to be slightly richer than the factory's EPA setting. In many cases this will be the ideal setting.



As an alternative to adjusting the mixture screw with a screwdriver, many prefer using an [EZ-Just mixture screw](#) to ease adjustments and fine tuning.

If the mixture screw has been reset by the dealer or previous owner (evident by the plug already being removed), turn the screw clockwise until it seats. Now turn the screw outward 2 turns to establish a starting point. The same procedure applies if using an EZ-Just screw.

Reinstall the carburetor back on your bike by reversing the steps taken during removal. Be sure to replace the fuel hose clamp and vacuum lines. It may be a matter of dexterity but I prefer to install the cables before pushing the carb back onto the manifold. Make certain the carb firmly seats back onto the manifold boot. Test the throttle for binding and



smooth operation. Double check each hose and connection.

The air cleaner assembly **MUST** be installed prior to starting the engine, not only to hold the carburetor in place but to prevent having the carb backfire in your face while tuning. Start the engine as normal and bring up to operating temperature prior to fine tuning. Let the bike idle for no more than 5 minutes. The modified carburetor should allow your bike to run well enough for a mild test run around the block to speed up the warm-up process.

With the engine warmed up and at idle you may now fine tune the idle mixture screw for optimal performance. Acquainting yourself with the adjustment screw location at the bottom rear of the carburetor prior to running the engine is advised, which also prevents burning your hands. You will need a small screw driver for adjusting the screw unless an EZ-Just has been installed. With the engine idling slow (no more than 900 rpm), turn the screw inward (clockwise) **SLOWLY** until the engine starts to stumble. You are working with the screw upside down so check to make sure you are turning the screw clockwise or inward.

**Note:** Be careful not to allow the screw to fall out as there is a very small spring, washer, and o-ring that will fall out as well. These items known as the *mixture screw packing* are not available from the dealer or manufacturer, however if you should lose these parts there is an aftermarket replacement kit available. Contact [Contact Harley Performance](#) for availability.

If the engine will not idle on its own during this procedure, adjust the idle set screw on the throttle side of the carburetor until it idles correctly. Now turn the mixture screw outwards (counter-clockwise) until the engine begins to run smoothly, then add 1/8 of a turn. Maintain proper idle speed and repeat the adjustment each time you adjust the idle speed. Blip the throttle a couple of times and observe the results. If the engine responds quickly with a smooth blast and no backfiring through the carburetor, you have your idle mixture right. If backfiring occurs through the carburetor then adjust the idle mixture screw out another 1/8 turn. Normally, the mixture screw should only require 2 to 3 turns. Anything above 4 turns indicates the pilot jet is too small.

Twin Cam Harley engines have a mixture screw sweet spot approximately 2 to 2-1/8 turns out from seat, whereas Big Twin Evo and Sportsters can require up to 3 turns. Adjusting the mixture screw out to far will result in an overly rich fuel mixture in the low RPM range. Avoid tuning too rich, thus leading to poor gas mileage and fouled plugs. Set this just beyond the point of backfiring (coughing) for optimum performance.

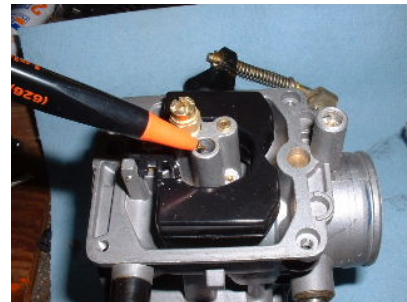
Take your newly tuned bike for a ride and note how it idles and responds off idle. If you experience any coughing through the carburetor, adjust the mixture out another 1/8 of a turn. Black smoke seen from the exhaust at idle or a feeling of sluggishness off idle indicates you may have set the mixture too rich. If your bike is now idling steady and responds well from a start then you are all set. If your engine still runs lean you should move on to [rejetting your carburetor](#). The same stock Harley Davidson carburetor has

been used on all production bikes from 1989 to 2006 due to its reliability and ability to adapt to different conditions. With just the right amount of tuning there's no reason why you can't have some of the same performance gains advertised by the major racing carb manufacturers. [Stage 1 modification kits](#) are available for those who wish to take their carb to the next level of performance.

## Harley Carburetor Jetting

Harley carburetor jetting should only be performed after completing the fine tuning procedure described under [Performance Tuning](#) and your Harley is still running too lean. A good rule of thumb is to replace the Pilot Jet first and only replace the Main Jet once the engine's idle and midrange are satisfactorily tuned. The Main Jet is only used at 3/4 to full throttle and has no effect on the idle or midrange mixture. Main jet replacement should be reserved until after the slow idle jet is replaced and mixture is tuned unless a lean condition is apparent during full throttle. Harley carburetor jetting can be accomplished with minimal mechanical knowledge.

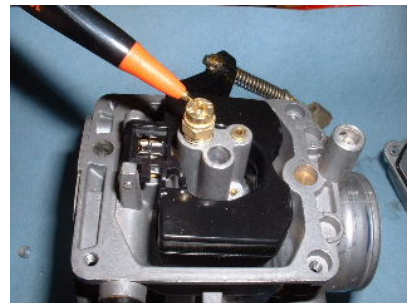
Tools to perform this task include just a simple set of screwdrivers. You will also need an assortment of jets or a [Stage 1 kit](#). Remove the 4 screws securing the bowl to the base of the carburetor and remove the bowl. Using a narrow 1/8" flat head screwdriver unscrew the Pilot Jet from within the orifice pictured. The jet size is stamped into the top of the jet (i.e. 42). Be careful not to strip the head of the jet.



Pilot Jet location

With a flat head screwdriver unscrew the Main Jet from the brass needle jet holder (aka Emulsion Tube).

Note the jet size stamped into the top of the jet (i.e. 165). There is no need to remove the emulsion tube unless required for cleaning. I don't recommend "Power Tubes" as they change the mixture and ability to tune with stock jets.



Main Jet

Replace the Pilot Jet with one size larger. This of course assumes that you are starting out with the stock jet size. Harley Davidson Pilot Jets for CV Carburetors are normally sold in sizes 40, 42, 45, 48, 50, and higher. A [Stage 1 Carb Kit](#) will normally offer you a proper range of jets for your particular model. If your stock jet was a #42 the next size larger will be #44 or #45. Only increase the jet sizing one size at a time to avoid an overly rich idle. An [EZ-Just mixture screw](#) will also assist in fine tuning once you have the correct jetting.



Pilot and Main Jets

Only replace the Main Jet with one size larger after properly tuning your slow/idle jet settings. Main Jets are sized incrementally by 5, so if your stock jet was a #175 the next

size larger will be #180. you should only increase the jet sizing one size at a time. Avoid installing jets that are too rich as this will create a sluggish feeling at full throttle as well as contribute to plug fouling.

Many Twin Cam models (except California) are already appropriately jetted with a main jet that will allow for a good starting point for tuning. As mentioned, proper mixture adjustment is key to proper jetting and should be performed first.

Reinstall the bowl making sure to align the accelerator pump shaft and rubber boot. Install the carburetor back onto the bike and perform the tuning procedure as described under [Carburetor Tuning](#).

As you can see, Harley carburetor jetting is a fairly simple procedure that under most conditions will yield greater performance when requiring a richer fuel mixture.

**Enjoy the Ride!**