Tuning Edelbrock Dual Quad Carburetors *(how to get the most out of your Edelbrock two fours)*

**This is a compilation of knowledge sourced from experience, automotive industry practices and technics*

Growing up in the muscle car and hot boat eras of the 60's and 70's, I've had my share of carbureted motors, many of them with multiple carbs. And I was fortunate enough to learn a little about tuning carburetors from some of the knowledgable ones way back then. Although it's getting a little harder to remember, lol.

Carburetors are actually very clever mechanical devises. A mixture of passageways, valves, pumps and linkages combined to mechanically manage the fuel supply into the motor. Devised from a time before EFI and unlike EFI with its electronic brain making adjustments, carburetors are completely mechanical requiring us to make the adjustments so they can operate within their design perimeters. While some may think their favorite carburetor is ready to run right out of the box. In reality with the possible exception of a few electronic controlled carburetors from the early smog era, there is no such thing as a pre-tuned, self adjusting, or ready to run out of the box carburetor. Luck may bring you one that runs "OK" on your motor out of the box, but for optimal performance, every carburetor requires tuning to match the motor it is installed on.

Unfortunately, tuning carburetors is probably the most feared and misunderstood part of owning them. The mystery and fear surrounding tuning carburetors is proliferated by horror stories and an abundance of erroneous information on how they function. And Edelbrock (aka Carter) seems to be one of the most misunderstood of all. However, once you know a little more about how carburetors work, they're really not scary to tune at all. And believe it or not, Edelbrock carburetors are one of the easiest to tune.

Keep in mind carburetors will never rival EFI, but with a little patience, knowledge and tuning, carburetors can provide impressive performance along with a ton of old school fun! AND, nothing says HOT ROD more than two fours set-tin on top of a motor. Plus, there is a lot of satisfaction in knowing you can tune your own carburetors! And contrary to popular believe, two four barrel carbs once tuned can run GREAT on the street without any troubles!

Though you will be learning to read your spark plugs for tuning, it is highly recommended a wideband AFR (air fuel ratio) gauge be also used for tuning and monitoring carburetors. The cost of a wideband AFR gauge is usually quickly recovered by the savings of tuning your carburetors with confidence and ease yourself.

Please read through the following material several times, there's a lot to absorb and can seem confusing, but often a subject will make better sense after reading through it a few times. While this is predominately aimed at Edelbrock Dual Quad set ups, most also applies to carburetors in general which may be helpful in other applications.

It is my sincerest hope that the following information will help de-mystify and simplify tuning your carburetors, giving you the ability to successfully tune and maintain your Edelbrock dual four barrel carburetors yourself without overly complex or complicated procedures. While there is a learning curve, once you get the hang of it it's a relatively straight forward process.

Be sure your motor is timed for high performance (see, IGNITION TUNING FOR HIGH PERFORMANCE, previously posted).

AND BE SAFE: Secure any loose clothing, wear safety glasses and any other safety gear necessary.

Remember fuel and hot motor surfaces do not get along! Be careful and have a BC fire extinguisher on hand at all times!

CLEANLINESS:

Please be sure the outside of your carburetors are clean, don't let any dirt/grime on the outside get into the inside. Usually you can clean the outside of your carburetors with any automotive car wash solutions without any damage to the finish surfaces, then rinse with warm water and wipe dry. Sometimes a stronger all purpose household type cleaner may be needed, however be aware stronger cleaners may dull/damage some finishes used on your motor's dress up parts and carburetors (check with the manufacturer for their recommendations).

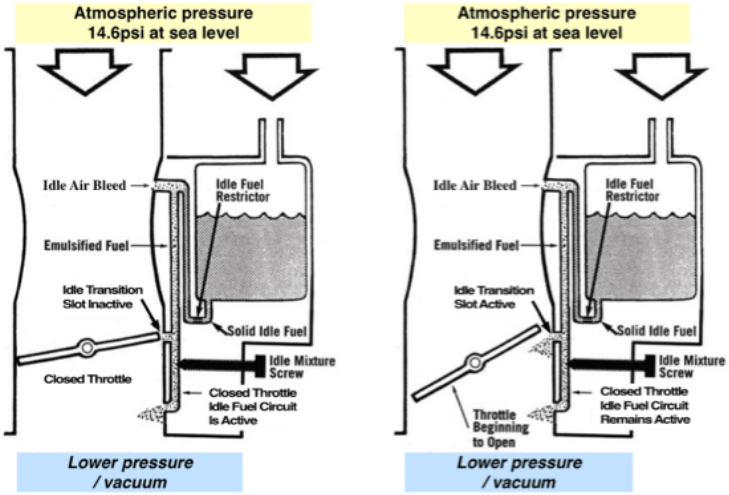
Before we start tuning, lets go over a few of the parts and components you will be working with to get a better understanding of what they are and what they do.

IDLE CIRCUIT:

The carburetor's idle circuit controls a great deal of drivability, often contributing all the way up to 2000rpm. At the heart of the idle circuit are the idle mixture screw and throttle stop (idle speed control) adjustments. Adjusting these correctly are essential to the carburetor's idle and off idle performance.

The idle circuit, is activated by below throttle blade pressure becoming less than the above throttle blade pressure. This differential of pressures causes a siphon action at the fuel bowl. Fuel is pushed by atmospheric pressure from the fuel bowl through the primary jets past the idle air bleeds where it's emulsified with air then into the idle restrictor, from the idle restrictor the fuel goes past the transition slot to the idle mixture screws and into idle port below the primary throttle blades. At idle the motor should be getting its fuel predominantly from the idle mixture screws.

The idle stop (idle speed), this is a fine tuning adjustment for idle speed and also controls the transition slots. The transition slots are important, their purpose is to provide additional fuel as the motor slightly accelerates off idle. At idle, the transition slots should only be slightly uncovered, usually only about 20 thousandth exposed below throttle (we'll go over this more a little later). When the throttle opens uncovering the transition slots they allow more fuel to be pulled into the motor, giving a smooth off idle throttle transition without hesitation. The motor operates off of the transition slots and idle mixture providing fuel to the motor above idle up to 2000rpm.



ACCELERATOR PUMP:

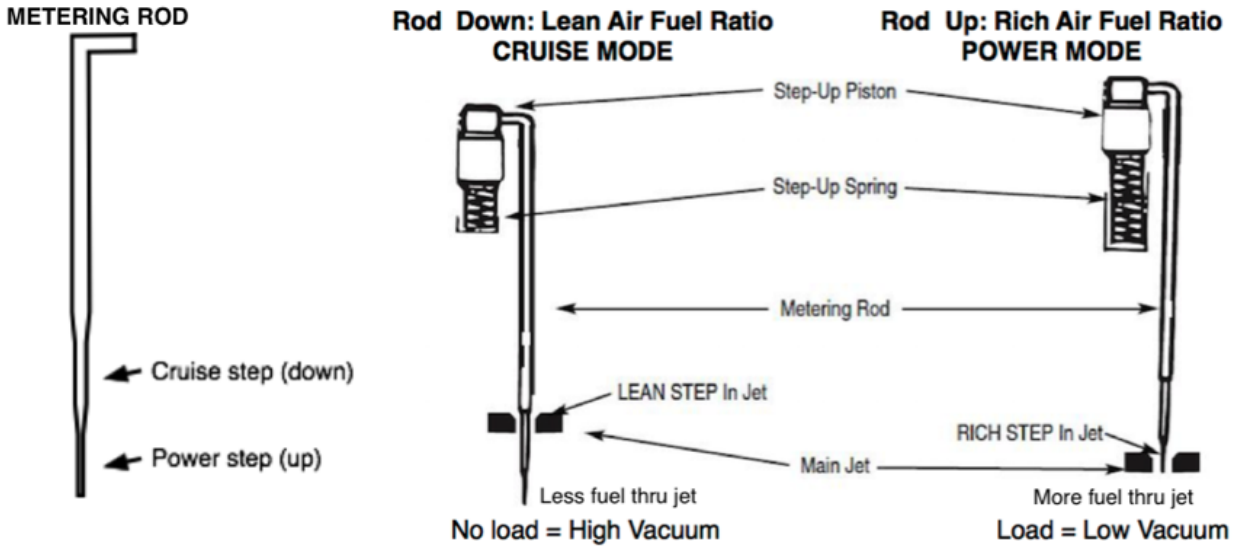
Let's take a look at how the accelerator pump works. The rate of pump action is determined by the relationship between the accelerator pump's linkage arms (ratio). The bottom arm is a fixed length, the top arm has three adjustment holes. The longest top arm setting is the furthest hole from linkage pivot and moves the upper arm in approximately a 1 - 1 ratio (< leanest). The middle hole shortens the upper arm by moving the linkage closer to the pivot and results in approximately a 1 - 1.25 ratio (normal). The top hole shortens the upper arm the most by moving the linkage even closer to the pivot and results approximately a 1 - 1.50 ratio (> richest). As the pump linkage is moved towards the pivot (richer) it increases the pump action by lengthening the stroke, the longer stroke raises the pump's plunger in the pump well allowing more fuel into the well. Coupled with the pump's plunger spring it allows the pump to supply a larger volume of fuel for a duration of time, providing an efficient easy to tune pump arrangement.

METERING RODS:

The metering rods are accessible through top of the carb by loosening and rotating their retainer plates. The metering rods use a small vacuum piston to pull the rod down and a spring to push the rod up in relationship with motor vacuum. High vacuum pulls the piston down, low vacuum allows the spring to push the piston up. The high/low vacuum relationship corresponds with motor demands, no/low motor load conditions (cruise) will have high vacuum, high motor load conditions (power) will have low vacuum.

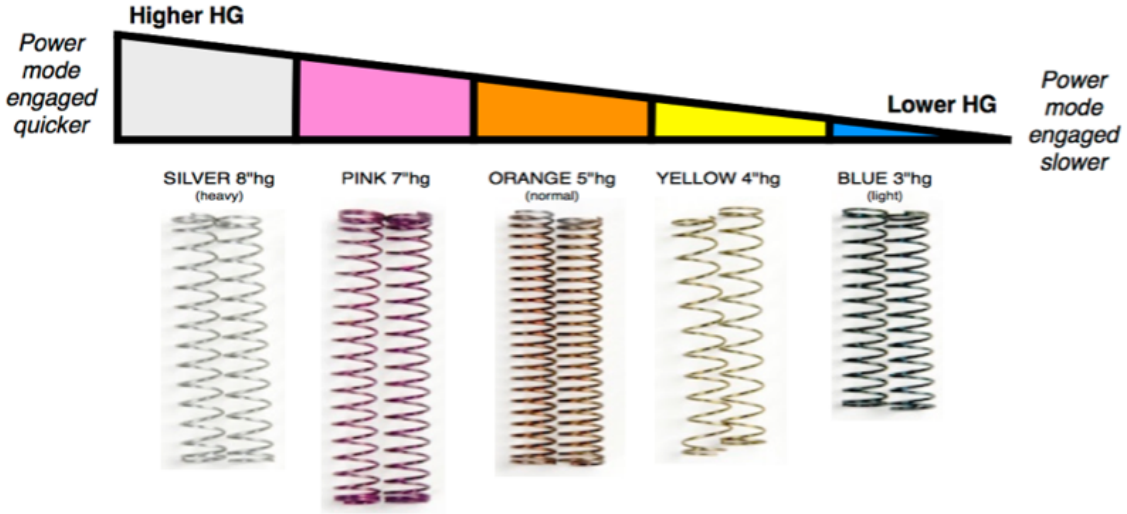
The metering rods are machined with two different diameter steps, smaller at the bottom (power step) and larger above (cruise step). When the motor is operating at cruise speeds there is no load on the motor and it produces high vacuum keeping the metering rods down in its cruise mode. In the cruise mode the larger diameter part of the rod is in the primary jet restricting the jet's area allowing less fuel through the jet into the primary boosters (lean). When the motor is under power (pulling/load) the vacuum is low allowing the spring to push the metering rod up into its power mode. In the power mode the smaller diameter part of the rod is in the primary jet allowing more fuel through the jet into the primary boosters (rich).

Different sized rods change primary overall jet sizing, changing a rod size on either step by one diameter size (.002) is equal to one half (1/2) of a jet size, making it easy to fine tune the jet mixture. When a jet change is slightly too rich or lean, a rod size change will usually get you where you need to be.



METERING STEP UP SPRINGS:

The metering springs are rated by the amount of vacuum (HG) required to compress the spring and hold the metering rod in the down position (they are <u>not</u> rated by weight or length). When vacuum decreases as the throttle opens the metering rod spring pushes the metering rod up out of its cruise position and into the power position increasing fuel into the motor. In the power mode the piston/rod is up (low vacuum spring pushes rod up), in the cruise mode the piston/rod is down (high vacuum compresses spring). The higher the HG rating of the spring in relationship with the vacuum present, the faster the rod will move up into the power mode and visa / versa. If air/fuel ratios (jetting) are correct, a higher HG spring in most cases will cure a stumble. 8hg (silver) is the heaviest spring, 3hg (blue) is the lightest. 5hg is normal (orange).



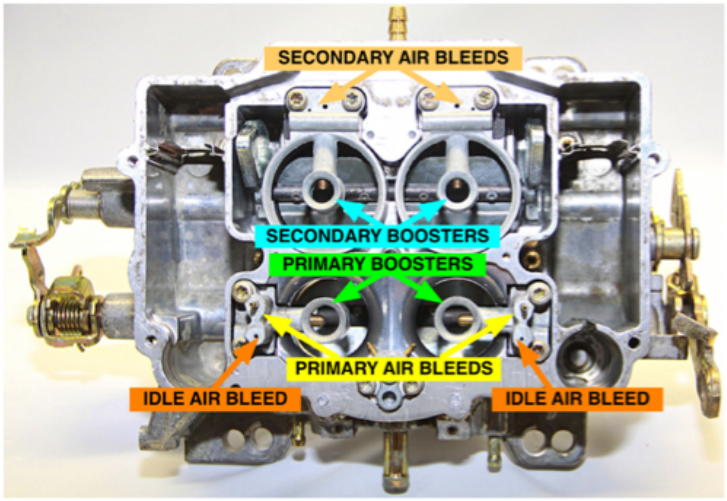
BOOSTERS & AIR BLEEDS:

It is important to understand what the air bleeds and booster are and what they do. This is a controversial subject, so I'll be brief.

Each four barrel carburetor has two primary boosters (in the front barrels) and two secondary boosters (in the rear barrels), and each booster has its own air bleed (the idle air bleeds for the idle mixture are also housed in the primary boosters). Looking down into the carburetors throats you will see the boosters (see picture below). The air bleeds are integral in the booster's housings.

The booster's purpose is to increase venturi action allowing fuel to be drawn from the bowl through the jets and dispense the fuel into the throttle bodies air stream as the throttle opens. The air bleed's purpose is to emulsify the fuel with air allowing the fuel to burn quickly in the motor.

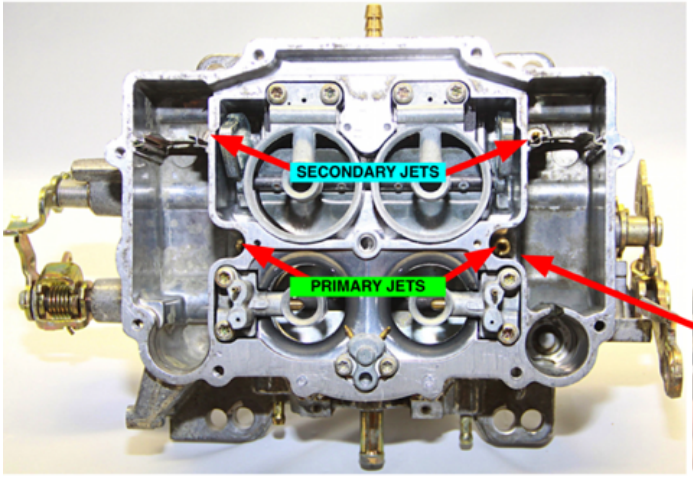
You will hear talk about the booster and air bleed modifications / alterations for better performance. Please use caution here, incorrectly modifying/altering the boosters/air bleeds can cause more problems than fixes. In most cases the factory calibrations are correct for the application and seldom are any modifications/alterations needed. **Modifying/altering air bleeds/boosters is strongly advised against,** any modifications/alterations if needed should be reserved for extreme conditions and performed by experienced carburetor gurus only.



JETS:

The jets control the fuel delivered to the boosters. The jets thread into the bottom of the fuel bowl snuggly, primary and secondary jets are the same thread base and are interchangeable, they are separated only by their orifice diameter size, be careful not to confuse their location and placement orientation. The size of the hole (orifice diameter) in the jet restricts the fuel's passage through the jet, the jets are numbered by size, smaller = leaner, larger = richer. The jets are located inside the carburetor's body and require removing the top to gain access to them. There are two primary jets located in the half round insets towards the middle of the carburetor body and there are two secondary jets located at the rear of the carburetor body behind the float baffles. A flat blade screwdriver large enough to fit completely across the jet slot is used to remove and install them. To get to the rear jets it usually requires pulling the fuel bowl baffles out, this is done by pulling the baffles straight up out of their retainer slots. Note the orientation of the baffle's float arm relief opening is upward with the offset towards the rear as in the photo below when re-installing.

The jets operate off of pressure differentials formed at the boosters as the throttle blades open, the air passing past the boosters creates a lower pressure under the boosters allowing the fuel to be pulled into the throttle bores.



FUEL FLOATS:

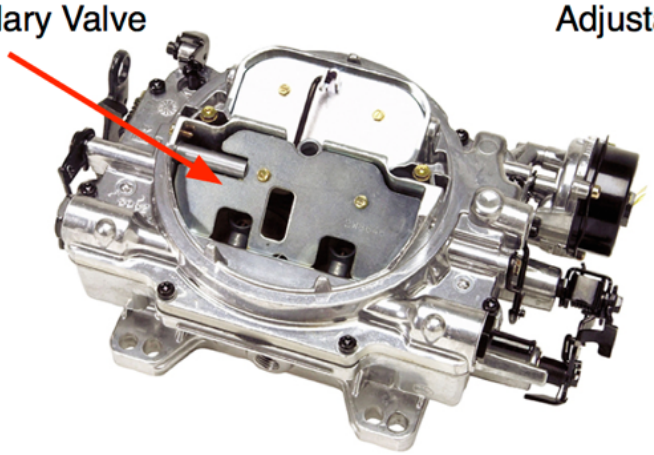
The fuel floats control the fuel level inside the carburetor's fuel bowls by working a fulcrum arm against the fuel inlet needle valve. As the fuel rises in the bowl it pushes the float upwards against the needle valve closing the inlet fuel supply. As the bowl empties the float drops downward and opens the needle valve allowing fuel to re-enter the bowl. The height of the float determines when the fuel shuts off, the drop of the float determines when the fuel is allowed to re-enter the bowl. Always set the floats to the manufacturers specifications.

AIR VALVE SECONDARY:

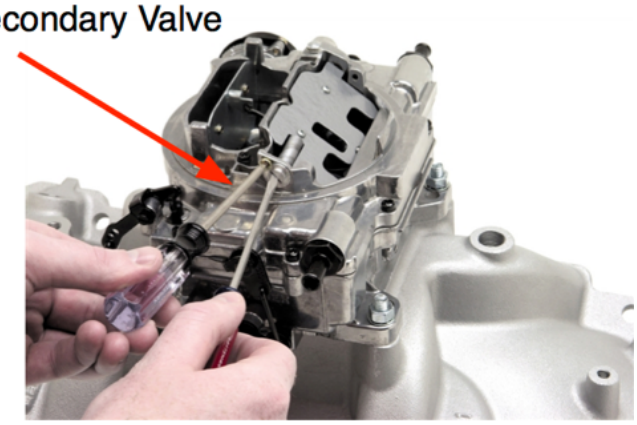
This is a very clever design that is misunderstood and often confused with vacuum secondaries. The secondaries on these carbs are actually mechanical (open with the throttle linkage), unlike a vacuum secondary that opens with vacuum only. The secondary air valve on Edelbrock carburetors controls the inrush of air through the secondaries by restricting the air flow momentarily until enough air flow is established to pull fuel through the boosters, mitigating the lean condition that would be caused by the throttle opening to fast. The air valve also has a small fuel enrichment nozzle of its own placed just under the edge of the air valve to add fuel and further eliminate any lean conditions before the boosters can operate. When adjusted correctly, the secondaries are quick to operate without hesitation or stumble.

The AVS comes in two different forms, a weighted (non-adjustable) and a spring loaded (adjustable). The spring loaded adjustable feature is helpful on small cubic inch motors, especially with dual quads. Tightening the spring slightly can often eliminate a flat spot that occurs if the secondaries open too quickly.

Secondary Valve



Adjustable Secondary Valve

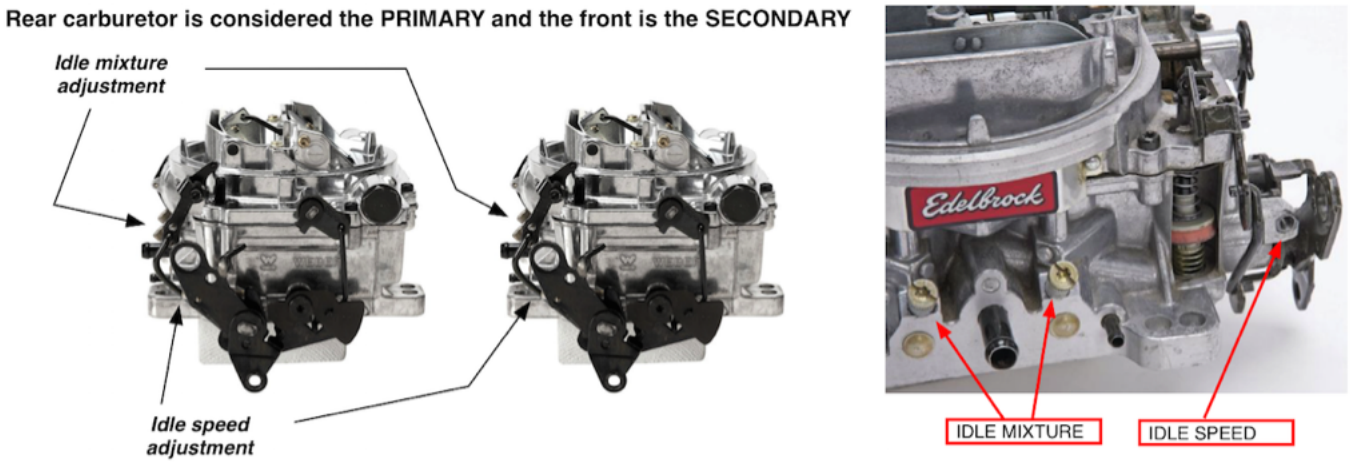


Before we get started adjusting and tuning your carburetors, it is highly recommended your motor and ignition system be in optimal operating condition. Often problems attributed to poor carburetor performance are actually caused by other issues.

Block your tires, set your brake and place your transmission in park (neutral if manual transmission), it's time to get started.

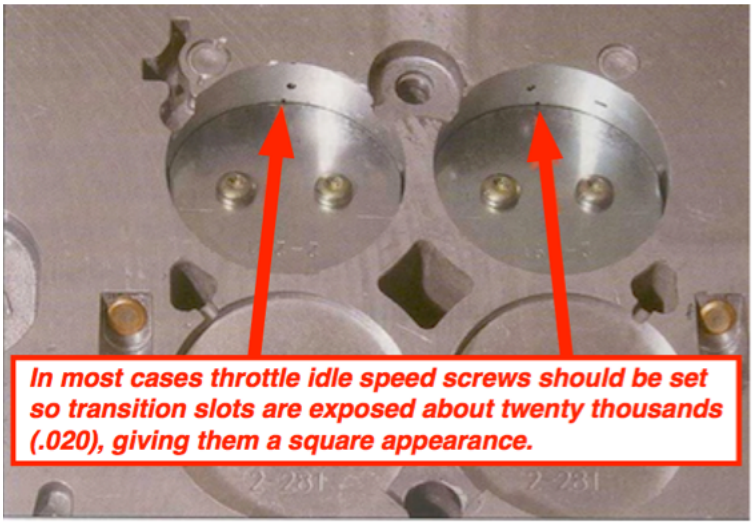
PRE-ADJUSTING THE CARBS:

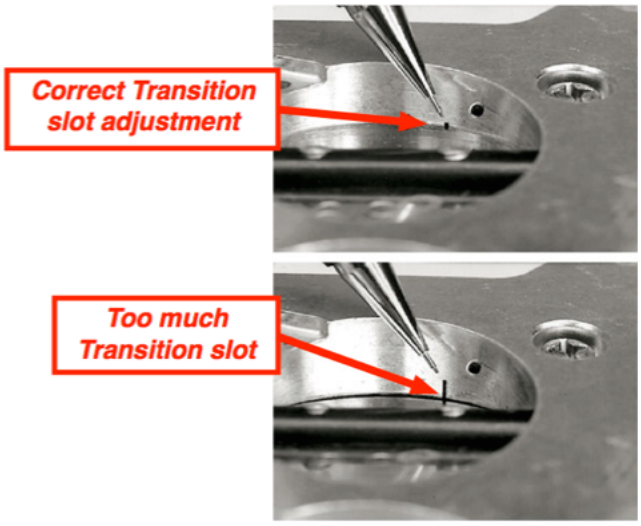
A. **Idle Mixture;** with the motor **off**, pre-adjust the idle mixture on both carbs by gently seating each mixture screw (turn inward till it slightly bottoms), then back them out 1 and 1/2 turns (1-1/2).



TIP; when using dual quads, always use the rear carb as the primary carburetor. The position of the rear carb on the manifold places the primary throttle position closer to the center of the manifold, allowing it to cover all the cylinders better at idle and part throttle.

B. **Idle Stops;** with the motor off, pre-adjust the idle stop (idle speed) by backing off the idle speed screws on both carbs until it does not touch the throttle stop tab, then slowly turn it inward until it just slightly touches the tab, then 1/4 turn more. If your carbs are off, turn them over and view the transitional slots at the primary throttle blades, the transitional slots should be exposed approximately twenty thousands (.020), forming a square box like opening at the front edge of the primary throttle blades. If the transitional slots are over exposed the idle circuit will not function correctly, causing tuning issues and stumbles.





THROTTLE PEDAL LINKGE ADJUSTMENTS:

On the street I prefer progressive linkage, it gives a little more cruise economy and off idle throttle response. Which ever you choose (progressive or 1:1), it is important to be sure your linkage is allowing the carbs to completely open by your throttle pedal. You'd be surprised how many people miss this step and lose a lot of horsepower underfoot.

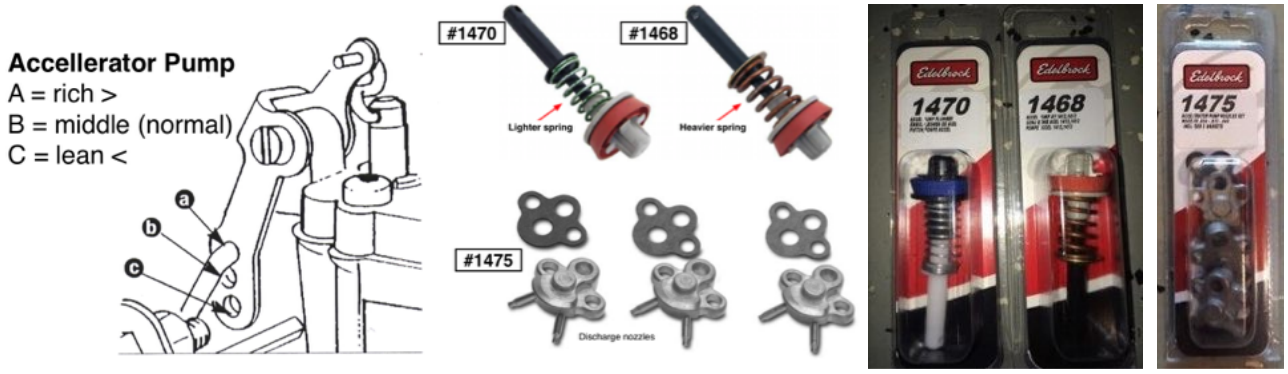
With the motor **OFF**, have someone sit in the car (or use a pedal pusher), push and hold the throttle pedal all the way to the floor. Wearing safety glasses, look down into the carbs and be sure the throttle blades are all opened completely, adjust the pedal as needed to completely open the carburetor throttle blades.

If you are using vacuum advance, disconnect the advance hose and plug the vacuum port at carburetor until carbs are completely tuned. All tuning procedures that require the motor to be running are done with the motor at normal operating temperature with the choke off (choke fully opened).

ACCELERATOR PUMP ADJUSTMENTS:

Adjusting the accelerator pump can eliminate acceleration stumbles caused by momentary lean conditions, however low or slow ignition timing can also cause stumbles, first be sure your ignition timing is correct. A stumble at initial throttle opening is usually caused by a lean accelerator pump setting, richening the arm setting usually corrects this (middle hole is normal). Usually this adjustment is all that is needed.

For advanced tuning Edelbrock has 3 different discharge nozzles available to fine tune the accelerator pump circuit. Increasing the nozzle size will increase the fuel delivered through the nozzle And, a little known trick is, Edelbrock carbs use two different plunger pumps. On smaller CFM carbs they use a lighter tension spring, while larger CFM carbs use a heavier tension spring. These plungers are interchangeable and can be substituted when necessary to further tune the accelerator circuit. The lighter (weaker) spring delivers less initial fuel with a longer duration (length of time), the heavier (stronger) spring delivers more initial fuel with a shorter duration.

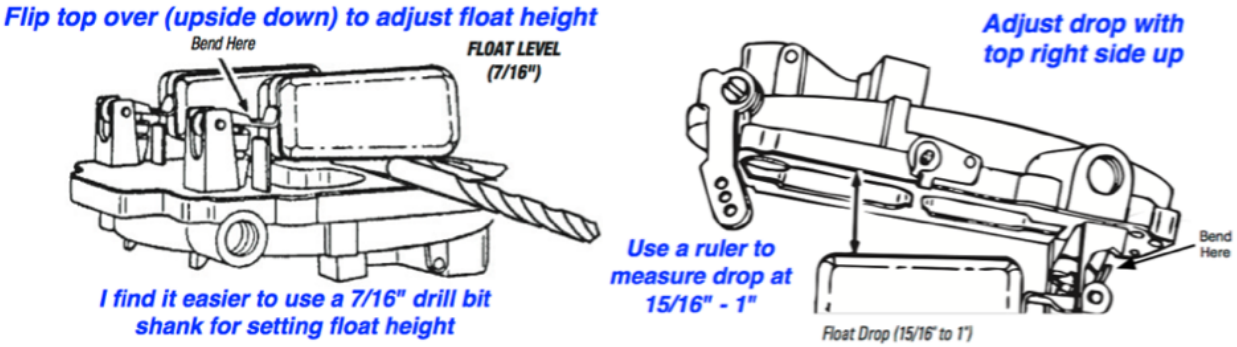


TIP; when working on linkages with small clips, a strong magnet attached to the side of a small screwdriver or needle nose pliers will make it much less likely to loose the clip.

FLOAT LEVEL ADJUSTMENTS:

CAUTION: to avoid damage to the metering rods they must be taken out prior to removing or replacing the carburetor top.

Believe it or not, one of the most common troubles associated with carbs is incorrect float level settings and you'd be surprised how many knowledgable people get this wrong. Edelbrock carburetors are especially susceptible to this because their design places the fuel bowl vent low in the top horn area, allowing high fuel levels to spill into the throttle opening easily. A high or even slightly high float setting can cause flooding and stalls, especially during deceleration and/or braking. An incorrect float drop setting can cause the bowl to fill too slowly and not be able to keep up with the fuel demand causing the motor to sputter and lose power at mid to high RPMs. Incorrect float levels are one of the most common mistakes made with Edelbrock carbs. It is important that you set the floats to manufacturer specifications.



TIP; If after setting floats correctly and your carburetors leak fuel at the top, you probably have high fuel pressure.

FUEL PRESSURE REQUIREMENTS:

The needle seat fulcrum design in Edelbrock carburetors are sensitive to high fuel pressure. Too much fuel pressure will force fuel past the needle seat causing fuel leaks, flooding and no end to tuning troubles. Edelbrock recommends you not exceed 6.5 psi fuel pressure, however I've found anything above 5 psi fuel pressure can cause troubles. Most carburetor rated electric pumps exceed 7 psi and most mechanical pumps commonly exceed 8+ psi. I strongly recommend you install a fuel pressure regulator and set fuel pressure at no more than 5 psi.

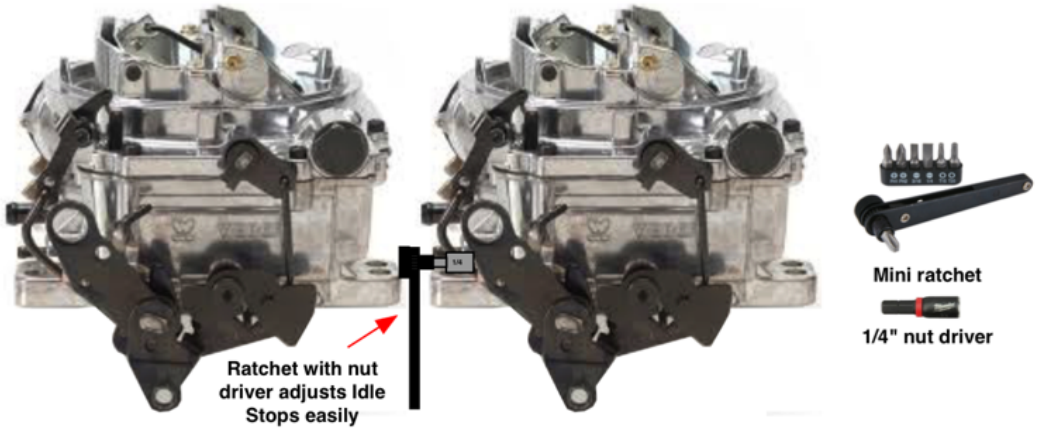
Not using a fuel pressure regulator set at 5psi max, is the #1 cause of carburetor troubles.

TIP; if your motor runs too rich, fouling plugs and can not be leaned out by the mixture screws or other means, check your fuel pressure and float levels.

SYNCING THE CARB'S IDLE SPEED:

With the motor idling at normal operating temperature and the choke off, adjust the idle speed on both carbs to achieve your lowest possible idle speed. If hunting is present (idle speed is slowly increasing and decreasing), adjust idle speed on one carb until hunting is eliminated. Once the carbs are synchronized, adjust idle speed to the lowest possible idle speed by slowly adjusting both carb idle speed screws equally.

Note; automatic transmissions require a neutral idle speed 200-400rpm higher to compensate for the transmission's drag when in gear. To prevent overexposure of the transition slot, ignition timing can be used to increase idle speed without effecting the carburetors. In some cases with automatic transmissions the vacuum advance can be manipulated to reduce this (see, CLASSIC CARBURETED CARS WITH AUTOMATIC TRANSMISSIONS IDLE SPEED WOES, previously posted).

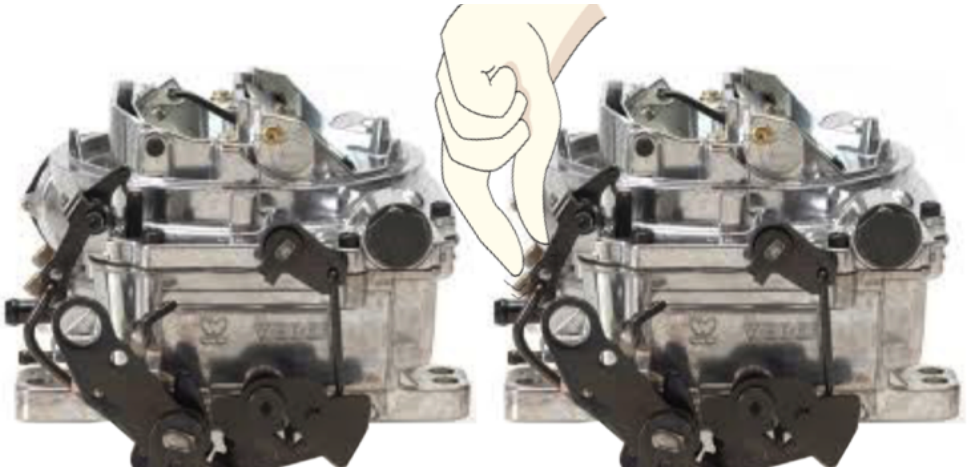


TIP; the carburetor idle speed adjustment is a fine adjustment, if your motor needs additional idle speed initial ignition timing can be adjusted to increase idle speed without effecting the carburetors performance (see, IGNITION TUNING FOR HIGH PERFORMANCE).

WARNING; no matter what you hear or are told, do not drill your throttle blades to increase idle speed, once this is done there is no going back. If more idle speed is needed adjust initial ignition timing first, if even more is needed try moving your vacuum advance to manifold vacuum. If more idle speed is still needed, there are other non permanent methods to increase idle speed using vacuum source tricks.

ADJUSTING THE CARB'S IDLE MIXTURE:

With the motor idling at normal operating temperature and lowest possible idle speed, adjust one carb at a time, one mixture screw at a time. Using your tach and a vacuum gauge noting the idle speed and idle vacuum, slowly adjust one mixture screw inward/outward until the highest idle speed and vacuum is achieved, then decrease by 20-50rpm. Re-adjust idle speed to the original starting point by slowly decreasing idle speed screws on both carbs equally. Do each mixture screw the same way, re-adjusting the idle speed as needed on both carbs equally until all mixture screws have been set on both carbs. Write down your vacuum gauge reading at idle for future reference. If you're using a wideband AFR gauge shoot for 13 - 13.5 AFR.



TIP; with dual carbs, it is easier to access the rear carb's idle mixture screws with the air cleaner removed, using your fingers reaching down between the carbs.

Establishing a tuning baseline and learning how to read your plugs:

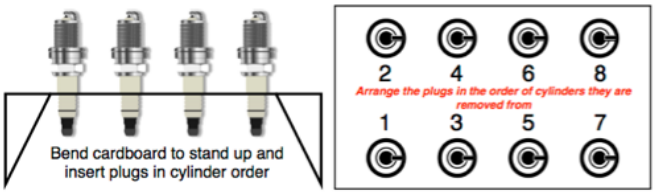
While I highly recommend using a wideband AFR gauge to tune your carbs, you should know how to read your spark plugs and recognize mixture motor symptoms.

Install a new set of spark plugs, take the car out for a short drive, using an AFR gauge note AFR gauge readings. Start off slow, slightly accelerating from idle, next rump on it and pull to the side of the road, write down what occurred (hesitation, bog, exc.). Now, take it for a steady cruise at highway speeds above 2500rpm, after a few minutes of steady speeds with a few slight speed changes up and down in speed, pull over and write down what you experienced (surges, exc.) and note AFR readings.

- Did it hesitate or stumble as you come off idle with slow acceleration?
- Does it cruise steady at highway (cruise) speeds?
- Did it surge, pulsate or shudder at steady highway (cruise) speeds?
- Did it surge, pulsate or shudder when slightly giving it gas at highway (cruise) speeds?
- Does it take off smoothly when accelerating from cruise?
- When accelerating to WOT does it stumble or fall on its face?

Write everything down on paper in detail, this is your carburetor tuning baseline that adjustments will be made from. And, keep a separate log of tuning changes as you go through the process (see page 17). *IMPORTANT; *If your cruise speeds are below 2200rpm, see NOTE at top of page 16.*

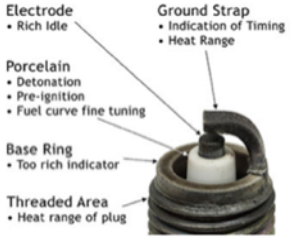
Pull the plugs keeping them in order of the cylinders they came out of (use a piece of cardboard or a spark plug rack to keep the plugs in cylinder order). Look at the end of each plug, at both the ground strap and thread base, the color and condition at the plug thread base will tell you the cruise mixture. Black / sooty is rich (black/wet is way rich), white / ashy is lean (clean is way lean). Write down what your spark plugs look like on your baseline sheet.



TIP; take photos of your plugs so you can compare improvements.

READING THE PLUG BASE RING, for the cruise mode, on the base ring you want to see a tan to gray color encircling the entire metal base ring face. If the color is black it is too rich. If the color is white or no color it is too lean. Do not read the porcelain tip, use the metal base ring for this. If the color is correct but it does not form a full circle on the base ring, it is slightly lean and/or plug is too hot (see ground strap). If the color is correct but it goes down onto more than three threads at the base ring, it is slightly rich and/or plug is too cold (see ground strap).

READING THE GROUND STRAP, at the ground strap you want to see a very slight color change in the strap metal at the bend's center or slightly past center towards the end. A color change too close to the end of the strap indicates too cold of a plug and/or not enough timing (if timing is correct adjust plugs heat range). A color change too close to the base ring indicates too hot of a plug and/or too much timing (if timing is correct adjust plugs heat range).



NOTE: black or silver specks on the porcelain tip of spark plug are early indications of detonation. Denotation is caused when the cylinder is firing too early and fighting the upwards movement of the piston, it sometimes can be heard as a rattle/pinging noise. Detonation is usually caused by lean mixtures and or too much timing. Detonation is BAD for the motor and must not be allowed!

Starting with the IDLE, did it hesitate or stumble when accelerating slowly off idle? Check throttle stop (speed) adjustment for over exposed transition slot (see page 5), adjust throttle stop and increase idle mixture slightly to eliminate off idle hesitation/ stumble.

CRUISE (steady highway speed), was the cruise smooth or did it surge, pulsate or shudder at steady or slight acceleration? Smooth is good, surging/pulsating/shuddering indicates a lean mixture. Adjusting the metering rods and primary jetting will correct this.

Accelerating (Wide Open Throttle), did it stumble or fall on its face? Stumbles and falling on its face are caused by temporary lean conditions. Adjusting accelerator pump, power mode and jetting will correct this. Slow Lethargic acceleration usually means to rich, adjusting secondary jets will correct this.

JET AND ROD ADJUSTMENTS:

CAUTION: to avoid damage to the metering rods they must be taken out prior to removing or replacing the carburetor top.

Do not be intimidated by the following procedures, you can do this.

Adjusting the air fuel ratio (AFR/jetting) is a very important procedure for a properly operating carburetor. It is not difficult to do, but it is time consuming and why it is expensive to have it done. It is something you're not likely to get correct immediately and it can become a little frustrating. Most likely you will be changing rods and jets numerous times, be patient, seldom does anyone get it right the first go around or two.

You're about to get very familiar with your carburetors and AFR tuning. Using a wideband AFR gauge/meter makes tuning carburetors easy and is worth the investment. Tuning carburetors by reading spark plugs is a proven old school method that's been in practice for years, however it is tricky and has a learning curve. **A wideband AFR gauge will pay for itself.**

TIP; make one change (pair of rods or jets in both carbs) at a time keeping a written log of the changes you make, noting the effect of each change, good or bad (see page 17 for a data log).

Before you start adjusting jets and rods, understand that primary jetting and power mode influences the WOT (wide open throttle) jetting, but WOT jetting does not influence the primary jetting and power mode. Making it important that you adjust the primary jets and power mode in both carbs before WOT adjustments.

Always do both carbs together equally, any changes to one is mirrored in the other. The exception to this is the front (secondary) carburetor with dual quads, the power step on the metering rods on the front carb's will be two stages richer than the primary (rear) carburetors power rod step. This is done to compensate for the manifolds carburetor placement to cylinder layout and minimize any lean conditions related to it (more on this shortly).

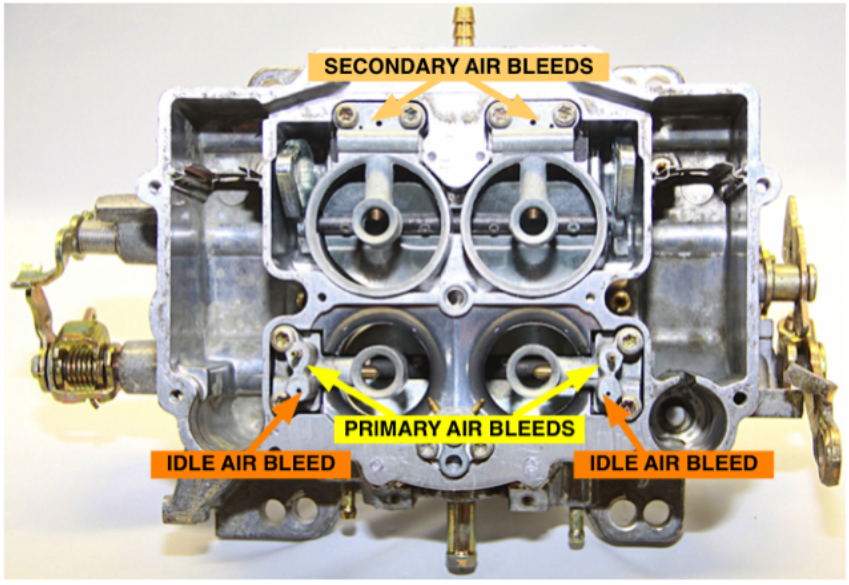
Learning to recognize lean/rich mixture symptoms in your motor is an important part of owning carburetors, see page 16 for an explanation of these condition. A wideband AFR gauge is great for monitoring and tuning carburetors, and is a highly recommended gauge or meter to have. However, paying attention to how your car drives and learning to read your spark plugs can be very effective. I read my spark plugs on a regular basis even with a AFR gauge. Reading the plugs will give you valuable information about each cylinder that the AFR gauge is not able to tell you.

NOTE; all the screws and fasteners used on carburetors are snug tighten only, do not over tighten the top or metering rod cover screws. ***Fuel line sealants must be rated for gasoline, do not use plumbing type sealants or thread tapes.***

CLEANING AIR BLEEDS:

Believe it or not, a lot of poor carburetor performance issues are caused by clogged air bleed passages inside the carb, these passages are small and can clog easily by rosin deposits from the fuel. I strongly recommend cleaning your carburetors air bleeds every 6 months. And, when the top is off for jet changes is always a good time to clean the air bleed passages.

- The primary / secondary air bleeds can usually be cleaned by spraying carburetor cleaner through the air bleed passages at the top of the carb, followed up with a little compressed air (see below for air bleed locations).
- The idle air bleeds can usually be cleaned by removing the idle mixture screws and spraying carburetor cleaner through the idle mixture screw holes up and out the passages at the top of the carb, followed up with a little compressed air. Re-install the idle mixture screws and re-adjust the idle mixture (see page 8 for idle mixture adjustments).



CAUTION, some carburetor cleaners can dull Dura-Shine and other finishes, cover and protect the finish when cleaning.

CRUISE MODE ADJUSTMENTS:

CRUISE MODE jetting is a very important procedure and MUST be done**, an overly lean mixture at CRUISE will yield poor performance and overheating with possible motor damage, an overly rich mixture will waste fuel. **Yes, you can do this!

You will be adjusting the metering rod's CRUISE step and primary jets only at this stage. The rods are accessible through the top by loosening and rotating their retainer plates out of the way. Accessing the jets will require removing the top to get to them. Using an AFR gauge shoot for 14.5 to 15 AFR at cruise and read the plugs. If the gauge occasionally reads 15.5 it's OK as long as the plugs show good color (I do not advise AFR higher than 15.5 at cruise). A vacuum gauge is also useful when adjusting the cruise mode by noting the changes in vacuum and shooting for the highest vacuum at cruise speed as you make changes. And, always read the plugs.

TIP; while the rod size will change jetting, more than four rod size changes indicates a jet change may be needed.

If your plugs read lean install one size smaller rod # at the cruise step in both carbs (smaller diameter allows more fuel > richer). If the plug reads rich install one size larger rod # cruise step rod set in both carbs (larger diameter allows less fuel < leaner).

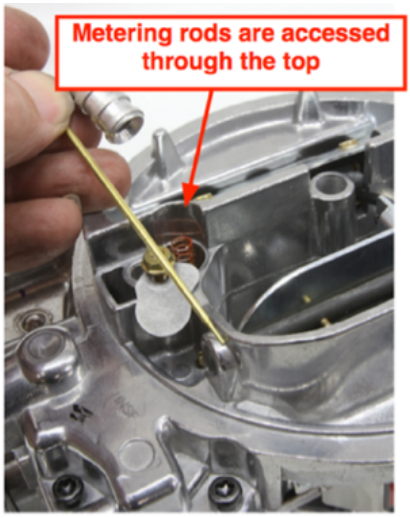
Test drive it again and write down the changes in the way it drives at cruise speed. Read the plugs. Still lean, install one size smaller rod # at the cruise step in both carbs. If rich install one size larger rod # cruise step rod set in both carbs.

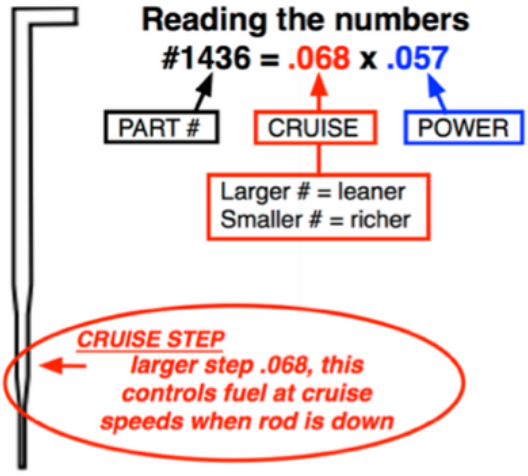
Test drive it again and write down the changes in the way it drives at cruise speed. Read the plugs. Still lean, install one size smaller rod # at the cruise step in both carbs. If rich install one size larger rod # cruise step rod set in both carbs.

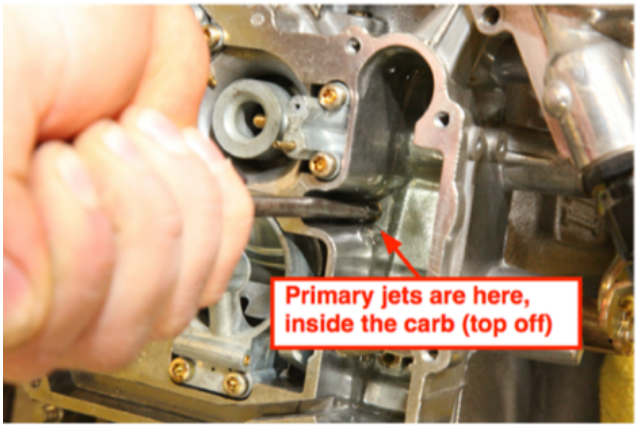
Test drive it again and write down the changes in the way it drives at cruise speed. Read the plugs. Still lean, install one size larger primary jet and go back one size larger rod # at the cruise step in both carbs. If still rich install one size smaller primary jet and go back one size smaller rod # at the cruise step in both carbs.

Continue this process until a favorable cruise with no surging/pulsating/shuddering is present at cruising speeds and the plugs show a tan to gray color at the base ring (complete circle), with a slight color change on the ground strap at or near the bend on the tip side. Do not use the porcelain insulator to judge this, with todays fuels the insulator will usually be white unless the motor is burning oil or an extreme lean or rich condition is present. Remember to write down the rod size changes, it will be important for next steps and future references.

TIP; when changing jets a small set of needle nose pliers will make it easy to place the jet over its hole, then turn the jet counterclockwise with your screwdriver (backwards) a couple turns (this will center the jet in its threads), then turn clockwise to tightening (when the jet's threads are aligned they will require several full turns before seating).







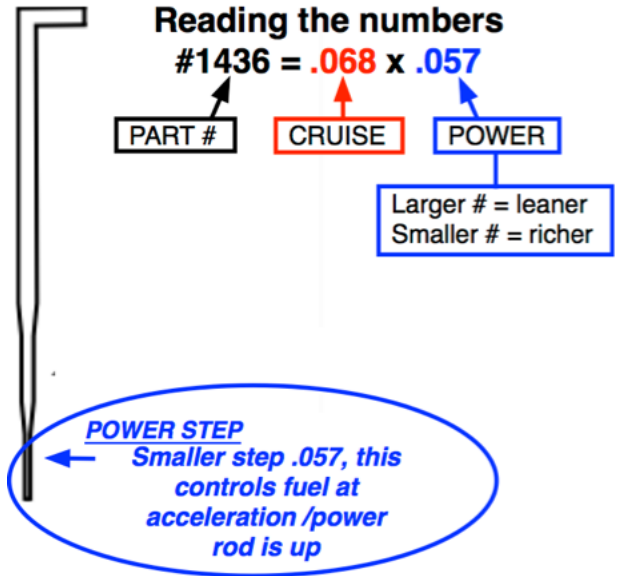
POWER MODE ADJUSTMENTS:

POWER MODE jetting is an extremely important procedure and MUST be done, *a lean mixture at POWER can damage your motor! An overly rich mixture will cause poor acceleration and lack power / performance.* ***Yes, you can do this!***

Take the car out, starting at steady low speed (about 1500RPM) and accelerate hard using the primary throttle blades only to about 4000 - 4200RPM. Using a wideband AFR gauge shoot for 12.0 to 12.5 AFR (see page 16) and read the plugs.

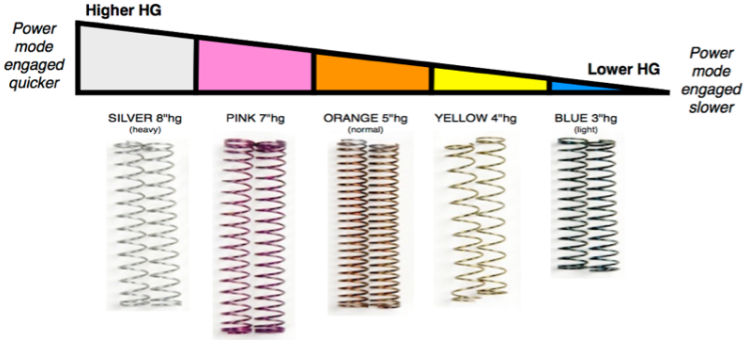
Are there any flat spots (hesitation) or surging when accelerating? Flat spots and/or surging indicates a lean mixture, this is where the metering rod's POWER step (small end) comes into play. Remember your rods are stepped, CRUISE step is a little larger and POWER step is a little smaller. Decreasing the diameter on the POWER step of the rod will allow more fuel during acceleration, when vacuum drops allowing the spring to move the metering rod up into its power step. The power step is designed to richen the mixture at the boosters under load, tuning the power step richer will remove surging and hesitations.

If it accelerated sluggishly, this is a sign of a rich mixture, increase the power step diameter size one step (leaner) at time until acceleration is no longer sluggish, then richen the power step until it starts to lose power and lean it back two steps. Test drive, if any flat spots or surging is detected richen one step. Take it out again and accelerate steadily using the primary throttle blades only up to about 4000RPM. Pull over and read the plugs, when the Power mode is adjusted the plugs will show a dark brown to slightly black color on the base ring of the plug. You want the power mode to be slightly rich.



***IMPORTANT**: To prevent detonation and possible motor damage, it is better to have the power mode set slightly richer rather than lean. And with dual quads it is necessary to adjust the front carb's POWER step rods two stages richer (smaller diameter) than the rear carb's power step, this is necessary to prevent a lean condition at the center cylinders due to the manifold's arrangement with dual quads. I.e. if the rear (primary) carb's power rod # = 57, the front (secondary) carb's power rod # = 52.*

After the power step has been adjusted, any slight transitional hesitation (flat spot at first acceleration) can usually be eliminated by using a heavier spring at the metering rods, sometimes it only requires a heavier springs at the primary carb. Experiment with the springs, the springs change the timing of the circuit (how soon or late it comes in). Be sure to write down the springs you have installed, once installed over time it becomes difficult to distinguish their colors and your notes will be beneficial.



Never use a heavier metering spring than you have vacuum at idle.

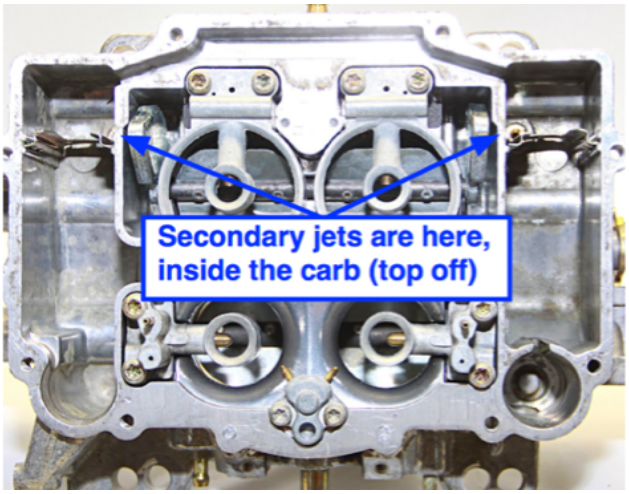
TIP; Stumbles at acceleration that can't be eliminated by pump or ignition timing adjustments usually are an indication of lean jetting, adjustments to the jets, metering rods and step up springs will usually correct.

WOT (wide open throttle) ADJUSTMENTS:

WOT jetting is an extremely important procedure and MUST be done, *a lean mixture at WOT can damage your motor! An overly rich mixture will cause poor acceleration and lack power / performance.* ***AND, YES, you can do this!***

Take your car out to a safe place and open it up (WOT) and maintain for a few seconds, using a wideband AFR gauge shoot for 11.5 to 12 AFR (see page 16), as quickly as possible bring it to a stop off to the side of the road (try not to idle motor any longer than necessary), remove the plugs and read them (see below, reading plugs at WOT). This procedure often requires installing another set of plugs to get back home where you can read the plugs safely.

- **If the plugs show lean,** richen the secondary jets (increase their size) until performance starts to drop off, then lean the jets back two sizes smaller, read the plugs and adjust as needed staying on the slightly rich side for WOT jetting.
- **If the plugs show rich,** lean the secondary jets (decrease their size) until performance is gained, then richen until performance starts to drop off, and lean the jets back two sizes smaller, read the plugs and adjust as needed staying on the slightly rich side for WOT jetting.

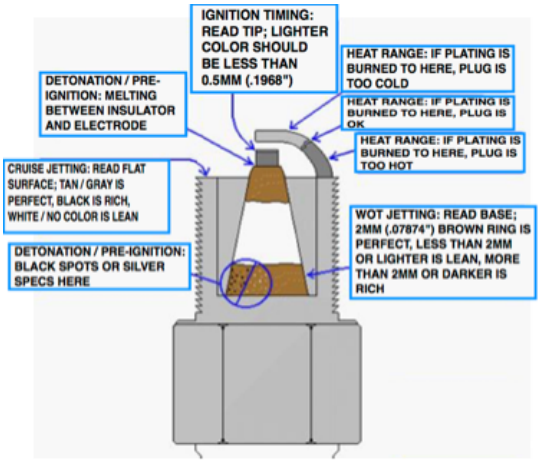


After adjustments are made, install a new set of plugs and repeat test drive, read the plugs again, it is very important to get WOT jetting correct. With dual quads in most cases, the secondary jets will be smaller than the traditional single quad setting, usually several sizes smaller than the primary jets. Remember WOT jetting is a combination of secondary and primary jetting along with power mode metering. Always adjust WOT slightly rich.

TIP; If you cannot hear your dual carbs howl when accelerating under WOT, your air cleaner may be too small and adversely effecting WOT performance and tuning.

READING PLUGS AT WOT:

It's a little trickier to read as the WOT fuel ring is deep inside the plug where the porcelain meets the plug base and hard to see. A 10X jeweler's loupe with a strong focused light will help you to see this area of the plug. But often, this requires disassembling (destroying) the plugs to see the WOT fuel ring. Be prepared and have a few extra sets of plugs on hand just in case. Destroying a couple of sets of spark plugs is far cheaper than a motor.



If you see any black or silver specs on the porcelain insulator material, this is an indication of detonation (you do not want this), make sure your POWER mode and WOT mixtures are correct (richen if needed) and check ignition timing (lower total timing a degree or two if needed), see, IGNITION TUNING FOR HIGH PERFORMANCE.

HOW TO DISASSEMBLE THE SPARK PLUG:

A. Bend the ground strap back out of the way.
B. Cut, file or grind the crimp where the base metal meets the outside of the plug's porcelain insulator.
C. Gently tap the electrode end of the plug, dislodging the porcelain out of the metal base.

Be careful try not to break the porcelain, if the crimp has been completely removed it should tap out easily.

Occasionally after jet changes the idle mixture will require re-adjusting, check and adjust if needed.

All done? **Great!**

If you are using vacuum advance, reconnect it now to the rear (primary) carb. If your idle speed increases too much to adjust down by the carburetors idle stops, change your vacuum advance from manifold to a ported source. Dual carbs often require ported (timed) vacuum to allow them to idle at a lower speed. Continue to read your plugs on a regular basis and monitor AFR, adjust the jetting when needed. And always write down the changes for future references.

Now it's time to take your car out and run it through its paces. You should now have a crisp throttle response with no bogs or hesitations and steady cruise speeds without any surging, along with better fuel economy.

Here are few of the most commonly overlooked things that can effect carburetor/motor performance:

1. ***Fuel pressure; this is the #1 cause of carburetor troubles.*** Carburetors operate at low pressure. High pressure does not help a carburetor, but rather is detrimental to their operation. Regardless of the type of fuel pump you use, I highly recommend a fuel pressure regulator set at no more than 5psi. *In my opinion, higher pressure than 5psi on any carburetor is asking for trouble.*
2. ***Float level; this is the #2 cause of carburetor troubles.*** Contrary to popular believe high float levels will not make your carburetor operate better, in fact in most cases on the street it is quite the opposite. High float levels can cause leaks, flooding, overly rich mixture and stalls. While some carburetor designs are more sensitive than others, *for street use there is no benefit in any carburetor having float levels set higher than manufacturers specifications.*
3. ***Ignition timing and components; this is common cause of carburetor troubles.*** Though not a carburetor issue, it is often attributed to the carburetor. Incorrect ignition timing, worn ignition components and wires can make a motor run poorly and lacking power. Check and set your timing and timing curve to match your motor, replace any worn/damaged ignition components. *In most cases the factory ignition timing and curve specifications does not apply to a high performance motor and requires re-configuring (see, IGNITION TUNING FOR HIGH PERFORMANCE, previously posted).*
4. ***Heat soak; also a common cause of carburetor troubles.*** Carburetor heat soak can boil the fuel from the carburetor bowls making it hard to start when warmed up. To minimize heat soak, use a phenolic or wood spacer under the carb, it doesn't need to be tall a 1/4" to 1/2" spacer will usually insulate and help minimize heat soak. Also, overheated fuel lines can vapor lock shutting off fuel to the carburetor. *Route fuel lines away from and below heat sources (heat rises), keep braided stainless fuel lines further from heat sources as stainless holds heat.*
5. ***Air and Fuel filters; another cause of carburetor troubles.*** A dirty/clogged air or fuel filter can effect AFR and performance drastically. Keep filters cleaned/changed regularly. *If you can't hear your carburetors howl as they suck air at WOT, your air cleaner is probably too small and adversely effecting performance and tuning.*
6. ***Fuel supply; an often overlooked cause of carburetor troubles.*** Make sure your fuel supply (pump and fuel lines) can provide adequate fuel flow to keep up with your motors needs. *An inadequate fuel supply can starve your motor of fuel, causing the motor to cut out and even stall while accelerating under power and WOT.*

TIP; occasionally your carburetors may develop poor idle and throttle response issues. Usually this is caused by the idle mixture air bleed passages becoming clogged by rosin deposits from the fuel. These passages are small and can clog easily, usually this is a simple fix, see page 10 for details on cleaning air bleeds.

Edelbrock dual quad carburetor sets #1803/#1804, *come factory equipped with;*

- *Rear carb = 1803 (electric choke), Primary jets .086, Secondary jets .077; Metering Rods - .065 x .057;*
- *Front carb =1804 (manual choke), Primary jets .086, Secondary jets .077; Metering Rods - .065 x .052;*
- *Step-Up Spring - orange (5" Hg).*

In most cases with dual quads on small blocks (under 400cid) motors the factory jetting will be rich. The Edelbrock recommended tuning kits #1486 usually do not have the smaller rods and jets for tuning the smaller motors. Buying the parts individually is usually a better choice. Unfortunately, Edelbrock is no longer supporting the smaller rods and jets needed for tuning to match smaller motors and these parts are getting harder to find. Because metering rods and jets can get expensive, I suggest you establish a baseline first (page 9), then purchase what you need in the direction your baseline shows (lean or rich).

TIP; a wideband AFR gauge/meter is an extremely useful tool for adjusting and monitoring your carburetors. While there is an initial investment, the cost is usually offset quickly by the savings of doing it yourself with confidence and accuracy. I highly recommend using a wideband AFR gauge/meter combined with reading your spark plugs.

PARTS YOU MAY NEED *(these are suggestions only, always establish a baseline before buying parts, see page 9)*

METERING SPRINGS (average $10.95set)

- set of metering springs

METERING RODS (average $6.95ea)

LEANER
- .070 x .057 < leaner cruise (than factory equipped)
- .070 x .052 < leaner cruise, > richer power (than factory equipped)
- .068 x .052 < leaner cruise, > richer power (than factory equipped)
- .068 x .057 < leaner cruise (than factory equipped)

✦ **.065 x .057 = factory equipped rods rear (primary) carb**

✦ **.065 x .052 = factory equipped rods front (secondary) carb**

RICHER
- *.065 x .047 > richer power (than factory equipped)*
- *.065 x .037 > richer power (than factory equipped)*
- *.063 x .047 > richer cruise, > richer power (than factory equipped)*
- *.063 x .037 > richer cruise, > richer power (than factory equipped)*

JETS PRIMARY (average $5.25ea)

LEANER
- .082 < leaner than factory equipped primaries
- .083 < leaner than factory equipped primaries
- .085 < leaner than factory equipped primaries

✦ **.086 = factory equipped jets primaries**

RICHER
- *.088 > richer than factory equipped primaries*
- *.089 > richer than factory equipped primaries*
- *.090 > richer than factory equipped primaries*

JETS SECONDARY

LEANER
- .072 < leaner than factory equipped secondaries
- .075 < leaner than factory equipped secondaries
- .076 < leaner than factory equipped secondaries

✦ **.077 = factory equipped jets secondaries**

RICHER
- .080 > *richer than factory equipped secondaries*
- .082 > *richer than factory equipped secondaries*
- .083 > *richer than factory equipped secondaries*

MISC.

- Several sets of spark plugs
- Carburetor spray cleaner *(cleaning air bleeds)*
- Linkage rod retainer clip #62-56 *(I call these Jesus clips, because that's what I scream when they fly across the garage, keep some handy you will need them)*

SUGGESTED PART SOURCES *(these are only suggested sources, there are many other part sources you may prefer)*

http://www.carburetor-parts.com/Carter-AFB-Metering-Rods-Jets_c_644.html

https://www.summitracing.com/search/part-type/carburetor-metering-rods/brand/summit-racing?N=4294868827%2B400304&SortBy=Default&SortOrder=Ascending&ibanner=SREPD1

http://www.carburetion.com/Carter4.htm

IMPORTANT; unlike EFI, carburetors are less efficient at lower rpm. Caution should be used when operating carburetors at cruise speeds below 2000 rpm. Low rpm cruise speeds can cause the carburetor to operate on its idle circuit in a rich AFR condition causing poor gas mileage and tuning issues. Carbureted motors cruise more efficiently above 2000rpm.

RECOMMENDED AFR VALUES TO TARGET FOR CARBURETOR FUELING MODES: *(street use on pump gas)*

- ***IDLE / LIGHT CRUISE: 13 to 13.5 AFR: (usually idle to 1500-2000RPM)***

  When you start your vehicle we refer to this as being in IDLE condition. When you shift into gear and drive at a low mph we refer to this as being a LIGHT CRUISE. Your carburetor is operating on the idle/transition circuit up to about 2000RPM.
- ***CRUISING: 14.5 to 15.5 AFR: (usually 2000 to 3500RPM)***

  Usually most of the time you spend driving your vehicle you will be within the CRUISE zone driving down the hi-way. This condition is the most wide open for preference based on two factors. If you prefer better GAS MILEAGE, run a little leaner mixture. If performance minded, run a little richer mixture. Usually at about 2000RPM the throttle blades have opened enough to transition out of the idle circuit and start pulling fuel through the primary boosters. Usually between 2200-3500RPM at steady throttle you will be operating in the cruise mode.
- ***POWER: 11.5 to 12.2 AFR: (usually 1500 to 4000RPM under acceleration)***

  Usually when you're accelerating from cruise speeds without using full throttle. Operating through the primary boosters and power/metering circuits. The increased load produces less vacuum opening the power/metering circuit enriching the booster's fuel supply for increased power.
- ***FULL THROTTLE / HIGH RPMS 11.5 to 12.2 AFR: (Wide Open Throttle)***

  Driving full out prolonged within a gear will bring you into your FULL THROTTLE zone. This condition is where the peak horsepower value is obtained. Your carburetor is operating through the boosters and in the power mode, all throttle blades wide open.

AFR Values & Characteristics for Carbureted Four Stroke Engines (engine fully warm)

- ❖ **6.0 AFR - Rich Burn Limit (WARNING!)**
- ❖ 9.0 AFR - Black Smoke / Low Power (caution)
- ➡ ***11.5 AFR - Best Rich Torque at Wide Open Throttle***
- ➡ ***12.2 AFR - Safe Best Power at Wide Open Throttle***
- ➡ ***13.3 AFR - Best Idle***
- ➡ ***14.6 AFR - Stoichiometric (stoich) IDEA CRUISE***
- ➡ ***15.5 AFR - Lean Cruise***
- ◉ 16.5 AFR - Lean Cruise Limit (caution)
- ◉ **18.0 + AFR - Carbureted Lean Burn Limit (WARNING!)**

Lean Conditions - Common Side Affects

- ◉ Hotter Engine Temperatures
- ◉ Hesitation in Throttle Response and surging / pulsating / shuddering
- ◉ Detonation / Pinging
- ◉ Engine Damage

Rich Conditions - Common Side Affects

- ❖ Deceleration Pop / Backfiring
- ❖ Lethargic Throttle Response (low torque)
- ❖ Excess Carbon Build-up (sooty pipes)
- ❖ Fuel Smell from the Exhaust
- ❖ Engine Flooding
- ❖ Shortened Engine Life

TIP; read your plugs often, reading the plugs will give you valuable information about the health of your motor at the individual cylinder level, alerting you to repairs sometimes before any damage occurs.

Final Note;
As you get more experienced with carburetors, please pass your knowledge on to others and help erase the mystery, fear and abundance of erroneous information surrounding carburetor tuning.

Hopefully I've given you enough information (and a few tricks) to tune and enjoy your carburetors, without getting overly complicated. It was not my intent for this to become a long winded book, it just seemed to keep growing, apologies for any indiscretions.

Stay tuned my friends, there's more under the hood!

Enjoy!

Edelbrock Carburetor Data Log

In order to get the most from your Edelbrock carburetor purchase, please complete and mail the enclosed warranty card. Also, you may want to record your calibration settings in the table below and keep it with your vehicle records.

Model #: _____ Purchase Date: _____

DATE	ROD	PRI. JET	SEC. JET	STEP-UP SPRING	PUMP DRIVE LINK LOCATION	PUMP CLUSTER	NEEDLE AND SEAT	REFERENCE CHART LOCATION #

Comments: