

Tuning of Weber carburetors

All Weber carburetors have four circuits.

Idle
Cross-over
High Speed
Accelerator

Idle and Cross-over - These circuits are inter-connected, in that the Idle jet is responsible for the fuel supply for both circuits. It provides fuel to the idle mixture screw (responsible for idle supply up to about 1500 RPM), and the crossover ports, which are hidden behind the throttle butterfly and come into play as soon as the throttle is opened. The idle jets work because of the vacuum created by the running engine, and the crossover ports discharge fuel because the incoming air literally "sucks" the fuel into the air-stream. The cross-over ports provide additional fuel in this critical phase. If the idle jet is too small, then there is insufficient fuel to satisfy the needs of both the idle jet and cross-over ports, as both circuits are active simultaneously. If the fuel supply is not sufficient, then the "sudden" rush of air when you open the throttle butterflies, will cause the carburetor to go lean and the engine will stumble. Of course once the butterfly is fully open, the vacuum on the intake tract drops, and the motor is running on the main jet and air corrector jets only. The crossover ports and the mixture screw have done their job and are no longer active, at least until you close the throttle and it all starts again.

If the idle mixture jet is correctly sized, then the idle mixture screw should provide a stable idle when it is 2-3 turns from being fully closed (seated on the seat) at an ideal speed of 1000-1200 RPM. Be careful when you screw it fully in, on the seat, so as not to damage anything. If it takes more than 2-3 turns on the idle mixture screw to get the engine to idle, you need to change the idle jet to the next larger size. It probably has a 45 in it now. I would change it to 50, or perhaps even a 55. Then you can back off the idle speed screw and you will then have to reset the idle mixture screw and it should come back to 2-3 turns from fully closed. This should get rid of the stumble at 1500-2000 RPM.

High Speed Running – Once the engine is past 2500 RPM it should be running on the main circuit. The makeup of the main circuit metering consists of a Main Jet, Emulsion Tube, and Air Correction Jet. Fuel enters into the emulsion tube, through the Main Jet, from the bottom end; and air enters through the Air Correction Jet at the top of emulsion tube. After the fuel/air is mixed (emulsified), it passes through the holes in the side of the Emulsion Tube into the "well area" surrounding the emulsion tube. Fuel from here is supplies to the secondary venturi (choke) and the air rushing through the secondary venturi draws the emulsified air/fuel mixture into the air-stream.

Accelerator Pump – Just as the cross-over ports helped with the transition from idle, the Accelerator Pump is there to provide a momentary increase in fuel when the throttle is suddenly opened. This shot of fuel keeps the engine from going lean under high load conditions.

Rules of Thumb

- 1) A one step increase/decrease for FUEL JETS is considered to be 5. So going from 120 to 125 would be a one step increase.

- 2) A one step increase/decrease for AIR CORRECTION JETS is considered to be 20. So going from a 180 to 200 would be one step increase.
- 3) An increase in fuel jet size will make the carburetor RICHER, whereas a increase in air correction jet size will make the carburetor LEANER.
- 4) A change in main fuel jet will affect fuel mixture over the entire RPM range.
- 5) A change in main air correction jet will have greater effect above 5000 RPM.

Here is one tuning example. We have a motor that is running rich at all RPM, but actually becomes somewhat leaner over 5000 RPM. In addition, it stumbles when coming off idle.

- 1) Increase idle jet one size. Re-adjust Idle screw and Idle speed so that the motor is running at around 1200 RPM on the idle circuit ONLY.
- 2) Decrease main jet size by one step of 5 (maybe a second reduction may be required).
- 3) Decrease air correction jet by ½ step. This would be 20.

So we have added more fuel in the idle stage to help with low RPM stumble. Next we reduced the overall fuel supplied to the emulsion tube and this will lean out the carburetor over the entire RPM range. Finally we have REDUCED the size of the air correction jet by 20.

Finally, I would look at the effect of the Accelerator Pump Jet. If the engine REALLY goes rich whenever the accelerator pump is actuated, then you will have to inspect the "bleed valve" in the float bowl. If it does not have an orifice (which could be the case) then you may need one with a small orifice (say 30) to allow some of the fuel surge created by the accelerator pump will be returned to the float bowl instead of going into the engine.

Just in case you do not have the right jets, get on the Internet and go to www.mcmaster.com or some equivalent company and order an assortment of miniature drill bits and a "Pin Vise". I would order drill bits from 1 to 2.5 millimeters in .05mm steps, or some 30 drill bits, and a .30, .45, .50, and a .55mm drill bit as well. You are now equipped to deal with any jet in any carburetor (except those that use needles, but that is another story). They should be between \$1 and \$2 dollars each. Make a little holder from a block of wood and label each of the drill bit by its size.

All Weber jets are measured in metric increments. A 125 jet has a hole 1.25mm, and a 130 jet has a hole 1.30mm. As you can see, as a last resort you can make your own jets. If you need to go smaller, then a soldering iron and some regular, soft solder will close the hole, and then you can re-drill it for whatever size you need. The drill bits are also your "gauge" as you can with the butt end measure any jet orifice to determine it's size.

As far as high speed running is concerned a good rule of thumb is to start with 125 Mains and 175 Air Correction jets (a numerical spread of 50 is another one of those "rules of thumb") if you have no idea where to start. I like F11 emulsion tubes for DCOE carburetors, but regardless of the type of carburetor, the emulsion tube is the LAST thing that you fine tune, and ONLY if absolutely necessary. The engine should at least run on this combination. Next I recommend that you use a Air/Fuel meter to monitor high speed fuel situation. The key number is 13:1. Yes, a stoichiometric mixture would be 14.7:1, and this is fine if you are tuning to pass a smog test, or for ultimate fuel economy, but it is much too lean for any competition motor. Of course if the Air/Fuel meter reads 10:1, then you are much too rich. Be careful, you need to test the entire RPM range, as it could be that slow running is OK but wide open throttle is too lean, or vice-versa. If you do not have an A/F meter (also known as a Lambda meter), then you have to use a bit of intuition.

If the engine misses at high RPM, then it is entirely likely that the main jet is too small, particularly if the exhaust pipe is very light in color (white to very light grey). The engine is leaning out at high RPM and if this situation persists, then you will do major damage. You can have the same miss if the engine is grossly too rich, except that the tailpipe will now be black and it will be spewing large amounts of black smoke (unburnt fuel), and will foul the spark. If you are standing behind such a car, it will not be long before your eyes begin to water.

Tuning Weber carburetors is as much an art as it is a science, as every now and then you will have an engine that needs something totally different, but this is VERY rare.