

## **Jetting and Tuning Downdraft and Sidedraft Weber Carbs.**

**An Overview and Short Course:** (This is currently a work in progress...I wanted to post what I had done so far..It will continue to grow as more time allows...Bookmark it and come back often and pass it along...)

Okay....This is going to be the Short Course in what you need to know to Tune and Jet your Weber Carbs successfully...This also applies to Mikuni, Solex, Etc....This is not specific info about specific cars or giving you magic jetting numbers. This is the process we use to tune a car when it is in our shop. I have over 25 years experience tuning these carbs and there is no magic to it. It is just a step by step process that once you get the hang of it you will be able to make your carbs work right every time. It involves more than just Jetting the carbs and in fact that step is the easiest....Following these steps and rules will also make it much easier when you are purchasing jets for your carb...This applies to a single 2 Barrel Downdraft 32/36 Carb or a set of Triple DCOE carbs or even a set of 4 Downdrafts on a V8 engine....The 2 books listed at the bottom of this page are invaluable tools for learning all the basics of your carbs and the various metered tuning pieces that are used in them. It is well worth the small investment in money and time to buy and read these books to help you better understand the carbs you spent all that money on.

I am not going to explain everything about these carbs. The Weber Factory Tuning manual has all the good technical information already written. This is the backyard mechanics guide to the basics you need to know to make your carbs run right....

**Step-1:** If you are having a problem with how the engine runs...Poor idle quality, stalling, etc then this is the first thing to do. **CHECK FOR VACUUM LEAKS !** This is particularly true of new installations where you just purchased and installed a conversion kit and you are having problems. You have to remember that most Weber conversion have been around for many years and have been installed on hundreds of cars and trucks. They work. The likelihood of having a defective carb out of the box is about like being hit by lightning. If you are having a problem on a new install it is most likely this problem or one of the steps below... See the Vacuum leak tech page for this info. **DO NOT OVERLOOK** this as a problem...This is the #1 problem with any Weber carb conversion.

\* Do a compression test..If the compression is off by more than 10% per hole you will have a really bad time tuning the carbs.

\* Always start with a fresh set of Spark Plugs. So not clean them...Start fresh. This will give you a good reading of fuel mixture and enable you to make a good judgement of what you need to do.

\* Set the Timing...Generally speaking you need a little more advance with a Weber than with the stock carb. A good place to start for most cars with Webers on pump gas is 12-14 Degrees advance at 1000 RPM idle and 36 Degrees total advance by 3000 RPM...This is not cast in stone and you need to make sure your car does not Detonate at these setting. If you get any detonation then you need to back off the timing...

**Step-2:** If you have a single carb you can skip this step...If you have multiple carbs then the 1st thing you need to do is make sure the carbs are Synchronized properly using a Correct Synch tool. This is **CRITICAL** to multiple carb performance...I don't care how good you think you are at synching a set of multiple carbs by ear (I'm very good and I'm not half as good as the tool is.) you are not close enough. The Synch tool will also alert you to other problems in the system like Bent throttle shafts, etc....**Linkage**...This cannot be stressed too highly. Badly designed or Worn linkage is the #1 cause of problems with Multiple carb systems. More people have given up on Dual and Triple carb systems because of linkage than any other problems combined. If the carbs are not hooked together in a fashion that has no

slop and allows minute adjustment between the carbs you are always going to have problems. Poor idle quality and "sticky high idle" problems are the most common symptom of this. A slight imbalance between the carbs at 1/3 throttle and up is not really noticeable to most people but a miniscule difference at idle will cause all sorts of problems. So in short...Get the carbs synched right FIRST. Repair or replace the linkage as needed to make them work together properly.

**Step-3:** Know what is in your carb NOW. Do not rely on a list on a website or a book that says what your carb might have come with. Actually remove the jets and chokes and check the sizes and WRITE THEM DOWN. Use this form to write it in so you know what you have. You cannot make jet decisions unless you know what you are starting with...

**Step-4:** Make Sure your Ignition system is working properly. Remember...A Weber carb is always a performance upgrade and is designed to deliver more fuel and air and make more HP than the stock carb did. This means you need to have adequate spark to burn the extra fuel or you will have problems tuning and jetting your carbs. This is especially true of old British cars and cars that have point type ignition systems. A lack of spark or weak spark will make it impossible to tune the carbs properly or to their maximum potential. This is especially true of all multiple carb installations. You cannot hang multiple carbs on any engine without an increase in spark output and even hope to burn the extra fuel being delivered. A good electronic Ignition system to replace points and the addition of an MSD unit and good coil and wires are the best way to go. See our Ignition tech page for more details.

**Step-5:** Make sure that your Fuel Delivery is right....Once again, you cannot tune carbs that do not have adequate or proper fuel delivery. See our Fuel pump Tech Page for this information. Do not ignore this step.

**Step-6:** Okay...Now that you have everything else sorted out ( Right ? You did do all that other boring stuff didn't you ? ) you can actually start tuning the carbs...The good news is that you probably made the car run good enough by doing those other steps that there is not alot else to do..... If your car is still not running properly or you feel that you should have more power (Be realistic about that. A 4 cylinder 2.0 with a 32/36 is only going to make about 120-125 HP max so don't expect miracles.) then it is time to jet and tune the carb(s) You need to establish if you are running lean or rich. There is no way around this. There are a few easy ways to establish this and it is important to know otherwise you cannot get different jets to cure the problem. You can be running Rich at idle and Lean on the main circuit and Vice Versa...You need to do a plug check....Unless you have access to a 3 Gas or 4 Gas analyzer or Smog Machine to do your tuning then reading the plugs is the next best thing..Another good option is to install a Halmeter AF30 Air Fuel Ratio Gauge to help you with tuning. It is fast and accurate and will take alot of the guesswork out of it. This is a particularly valuable tool for cars that get track use so that you make sure you do not lean out and put a hole in a piston...

You need to check your spark plugs to see if you running rich or lean. White plugs are lean and Black plugs are Rich. Ideally you want the ceramic part of the plug a nice Dark Tan to medium Brown color with a slightly darker ring right at the base of the threads of the plug. A new set of plugs may take a few minutes to get some color on it...

#### Idle Mixture and Fuel Mixture:

There are alot of theories about setting idle mixture adjustment on a Weber carb to determine Rich or Lean jetting....A Weber will run correctly with the mixture screws from 1/2 turn to 3 turns out...The late style DCOE carbs with the extra Air Bleed Screws on the top take 2.5 to 3 turns to operate correctly...So you cannot say that because it is 1/2 turn out that you need smaller jets....You need to find what is right for that particular engine...An engine with a strong vacuum signal will draw more fuel in with less turns of the screw than an engine with a weak vacuum signal will...This is the kind of thing that throws the "certain number of turns" theory out the window..

The Mixture screw and idle circuit is CRITICAL to the overall driveability of the car. It does not just control idle but the entire low speed running and part throttle transition. The mixture screw lets in an ALREADY MIXED volume of Fuel and Air to the engine. This is not an Air Screw. The more you open it the more mixed fuel and air enters the engine. Clockwise is Leaner and Counter-Clockwise is Richer.

The mixture screw is very easy to set whether it be a downdraft, sidedraft or multiple sidedrafts. Start with the screw or screws out 1.5 turns....Start the car and let it warm up. Set the Idle SPEED to approx 900-1000 RPM..Make sure multiple carbs are synchronized...Turn the mixture screws in until the idle starts to stumble and get rough...On a sidedraft with 2 screws do them each a little at a time....Then back

them out until the best idle quality is achieved. This is a very simple operation...The car should idle well and small adjustments leaner (Turning them in) should make the idle drop off. Opening the screws more should make it a bit richer but it should still idle. Assuming you have no vacuum leaks this is a very simple process. If you cannot get a good adjustment on these screws and you have to open the idle speed screws quite a bit to get the engine to idle there is a good chance you have a Vacuum Leak and you need to fix it.

#### Specific Information on Mixture Screw Setting for:

32/36 DGV, DGEV Carbs. If you have to open the mixture screw more than 2 turns on a 32/36 DGV or 38 DGES your idle jets are too small...If you have to shut them below 1/2 turn they are too big....

38 DGES. If you have to open the mixture screw more than 2 turns on a 32/36 DGV or 38 DGES your idle jets are too small...If you have to shut them below 1/2 turn they are too big....Also the 38 DGES can be a little tricky because you are idling on both barrels at the same time. You have 2 mixture screws and they will not be set the same on most cars. This is because the plenum type manifold that they are on distributes fuel unevenly. By having 2 mixture screws you are delivering fuel from 2 places in the intake manifold. The Mixture screw closest to the engine will no doubt need to be in much farther than the outer mixture screw. This is Okay. I do not recommend Stagger jetting the idle circuit on a 38 DGES (In other words, do not use 2 different size idle jets even though you need to adjust the screws differently. This can cause part throttle drivability issues.)

DCOE Series and IDF / IDA. On a DCOE or multiple DCOE's you should be between 3/4 turn and 1.5 turns out for all older model DCOE's (DCOE 2, 9, 18, etc.) and 2 1/4 to 3 turns out for late style DCOES (151 and 152 with air bleed screws under the white caps.)

Idle Jets and tuning the idle circuit: Very Simply..The bigger the number the richer the jet. A 50 Idle jet is a .5mm fuel hole. On the DCOE and IDA series carbs they have 2 numbers on them like 50F8. The 50 refers to the .5mm fuel hole and the F8 Refers to the Air Bleed hole in the side. A DGV, DFV, DGES mix the air internally in the carb and do not have these air bleed holes in the idle jet. In a DCOE you are actually tuning the Air and Fuel for the idle circuit with the idle jets. This is a little more tricky but not too bad...Basically you can tune just about any car in the world with an F8 or an F9 idle jet. ( YES there are exceptions to this and I am well aware of them so don't send me nasty e-mails saying that your Mini only runs on F6 idles. This is a basic tuning primer and there is no need to get into vehicle specific problems.) The F8 is Leaner (Has a larger Air hole) than the F9...Sooooooo. You can have a 50F8 and a 50F9 and both have the same amount of fuel but the 50F9 has a richer MIXTURE (Less Air to the same volume of fuel.) Generally speaking you should start with an F8 and play with the fuel size until you get close then experiment with an F9 to see if that works any better...

IDF carbs are similar to the DGV and DFV series in that the air is mixed internally. There is no F Number to deal with. The IDA carbs have no Air Bleed Hole but do have an F number to identify this feature. It is an F10. The Air Bleed for the IDA carb is in the Idle Jet holder and it is metered similar to the DCOE. For those of you with multiple IDA or Rotary engines running a single 48 IDA you usually know what you are doing so I won't go into all the details on this.,..

Idle jets are in .5 steps...50,55,60,65 etc. The bigger the Idle jet number the richer the jet. 1 step in idle jet size can make a HUGE difference. Do not go up or down more than 1 step at a time when tuning the idle circuit.

#### Choke Tubes and the Main Circuit:

Okay...So now your car should idle correctly, the carbs are synched, the timing is set, everything is good....Time to get the main circuit right. Drive the car. It should come off of idle good and transition to the main circuit smoothly...If it falls on its face and will not take any throttle or runs better if you back off the then you could have a few different problems depending the type of carb. Before you blame the carb make sure you have the Fuel delivery right and the Spark Timing. If you do not have enough advance you will have this problem and it will have nothing to do with the carb tuning.

#### 32/36 DGV, DGEV, DFV and DFEV

These carbs have fixed venturis so the choke size is not an issue. The pump jets are also not a problem. Do not mess with them. If you have a flat spot or hesitation when you first take off then it is likely that the idle circuit is too lean. If you know you have the idle circuit right then the primary main jet is too small. Increase the main jet size 2 steps at a time. (150 main is a 1.5mm hole...Main jets are in steps of 5. eg: 150, 155,160,etc.) Keep checking the plugs after driving it for a few minutes (Do not let it idle when checking

the spark plug color for the main jets. Drive the car above 2000-3000 RPM for a few minutes then shut the engine off before letting it idle then check the plugs. If the car then transitions fine but hesitates or falls on it face when the secondary is opened you need to work on the Secondary main jet....

A good option to playing around with your 32/36 Weber jetting is to just get one of our Custom Performance Jetting Kits....We offer these for all Single 32/36 DGV and DGEV applications operating from Sea Level to approx 4000 Ft...Above 4000 Ft you start having more altitude problems and the vehicle needs to be tuned as outlined here. Another good option is to install a Halmeter AF30 Air Fuel Ratio Gauge to help you with tuning. It is fast and accurate and will take alot of the guesswork out of it. This is a particularly valuable tool for cars that get track use so that you make sure you do not lean out and put a hole in a piston...

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### DCOE, IDF or IDA

Here we go....This is the real tricky part. I feel that Sidedraft DCOE , IDF and IDA carbs are easy to tune but you have to have a real feel for Rich and Lean and understand how the carb works. To get a good understanding of this I cannot recommend too highly to get the Weber Factory Tuning manual and really understand what each component does. That said this is the real Cliff Notes version of tuning the power circuit of these carbs.

Choke Tube or Main Venturi size is the basis for everything in tuning DCOE, IDA and IDF carbs. If you get the Venturis wrong you will never get it running right. Too big and you will always have a flat spot that you cannot tune...Too small and it will always run rich and not make any power. If you have poor throttle response at low RPM

This is a guideline only to get you started or to make sure you are not totally out of range making it very difficult to tune. There are many of you running cars successfully with choke sizes outside this range so don't e-mail me about it. The difficulty in tuning these types of cars is that there are many combinations that work well depending on the engine and the state of tune. That is why everything is tunable. You can tailor the carbs to suit your needs, driving style, engine, location, weather and altitude conditions, etc.....

Here is a very basic chart of what venturi sizes you need to popular vehicles and engine sizes for STREET USE...All out race engines are a totally different story. Use the engine size and HP rating to estimate what you need for your car or engine if it is not listed.

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Engine / Car	Approximate HP	Carb or Carbs	Starting Choke Tube Size
Datsun Z 2.8 - 3.0	250-280	Triple 45 DCOE	36mm
Datsun Z 2.4 - 2.8	200-250	Triple 40 DCOE	34mm
BMW 2002	130-140	Dual 40 DCOE	34mm
BMW 2002	150-160	Dual 45 DCOE	36mm
BMW 2002	130-140	Single 45 DCOE	36mm

<b>BMW 2002</b>	<b>120-130</b>	<b>Single 40 DCOE</b>	<b>32mm</b>
<b>Toyota 22R</b>	<b>140-150</b>	<b>Dual 45 DCOE</b>	<b>34mm</b>
<b>Toyota 4AGE</b>	<b>130-140</b>	<b>Dual 40 DCOE</b>	<b>34mm</b>
<b>Porsche 914 2.0</b>	<b>120-130</b>	<b>Dual 40 IDF</b>	<b>32mm</b>
<b>Porsche 914 1.8</b>	<b>110-115</b>	<b>Dual 40 IDF</b>	<b>30mm</b>
<b>Mazda RX7</b>	<b>Stock Engine</b>	<b>Single 48 IDA</b>	<b>42mm</b>
<b>Mazda RX7</b>	<b>Street or Bridge Port</b>	<b>Single 48 IDA</b>	<b>44mm</b>

Do not try to choke down a DCOE carb that is too large to try and cure a problem...you will just create more problems....A 45 DCOE should NEVER need less than a 34mm choke to run properly. If it does then the carbs are too large or you have another problem...A 40 DCOE can use as small as a 28mm choke tube but chances are the performance will not be good with anything smaller than a 30mm choke....I have found that a correctly sized 40 DCOE application should always start with a 30mm choke and go up to a 34mm max....Bigger or smaller than that and you probably have either the wrong size carbs or another problem that is causing you to tune outside of this range...This same info applies to IDF carbs as well...

**Main Jets:**

**Air Corrector Jets**

**Emulsion Tubes:**

**Pump Jets and Pump Bleed Backs:**

**Pump Rods:**

## **Haynes Weber Carb Manuals**

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## **Weber Factory Tuning Manual**

This is the factory tuning manual with all the calibrated parts specifications, circuit diagrams, etc. This is the book to have if you really want to know how a Weber carb works and what all the pieces do.

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