Weber 32/36 Setup, Ch.1

October 8, 2012 SV3Power Reply

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Time to revisit some old-school tuning tricks! The Weber 32/36 DGV (DGEV, DGAV, etc) downdraft carb was at one time a very common basic performance mod used by lots of people on lots of different carbureted compact cars and trucks.

Electronic fuel injection (EFI) is now the rule and carburetors the exception. That leaves many people out in the cold when it comes to sorting out a downdraft Weber carb, but there are still a lot of people using DGVs on the old 2T-C, 3T-C, and 4A-C Corolla, Toyota 20R and 22R pickup and Celica, Datsun 510, and a handful of British sports cars like the MGB, Triumph Spitfire, etc. With that in mind I thought it would be nice to revisit the topic and break down the setup and jetting procedure step-by-step. By doing this, you can set up your carburetor to deliver the correct air-fuel ratio for your engine under the conditions in which you normally drive.

WARNING: Carburetor tuning involves disassembling a carburetor filled with gasoline. This presents a serious risk of fire. Have an appropriate fire extinguisher handy at all times!

For best results, you'll want to follow this guide in the order in which it was written. Often the success of any given step depends on the steps before it.

Before you begin to tune the carburetor, you must make sure that the engine itself is in good tune. There is no point trying to tune a carburetor on a sick engine! Make sure that the valves are adjusted properly and that the engine has good compression. Set the base ignition timing correctly. Be sure that the distributor's mechanical advance mechanism works properly, that the vacuum advance canister works as it should and is connected to ported vacuum. Verify that there are no vacuum leaks. If the engine has problems, fix them before you play with the carburetor. *Don't* try to tune around other problems!

Be sure that the carburetor is clean inside and not excessively worn. You need to be able to concentrate on setting the fuel mixture, not trying to work around other problems. Set the float level correctly, and have a carburetor rebuild kit or gasket set ready. Make sure you have no fuel leaks or other fire hazards.

All tuning should must be performed with the engine thoroughly warmed up to operating temperature. This requires that the car's thermostat and cooling system be in good condition. You'll also need to verify that the carburetor's choke system is working and adjusted as designed. That is not difficult, but is outside the scope of this article, as I am assuming you have done that before you begin tuning.

In tuning the DGV, you will be changing the *idle jet*, the *main jets*, and the *air correctors (*sometimes called *air jets).* A carburetor jet is a small part with a precisely sized hole made to allow a specific amount of fuel or air through it. Each jet is available is many different sizes to allow more or less fuel or air, thus allowing you to tune one basic carburetor to deliver the correct air-fuel mixture on a variety of different engines. Jets are typically made of brass and have a number stamped into them representing their size. Larger jets for the Weber DGV series have larger numbers; smaller jets have smaller numbers. Main jets and air correctors have a slot for a flat-bladed screwdriver machined into the top.

The *idle jet* is accessible from outside the carburetor, located high on the right side of the carburetor body, under a screw near the top of the float bowl. Some DGV-series carburetors use an electric solenoid to cut off the flow of fuel to the idle jet when the ignition is turned off, and this small solenoid is located directly over the idle jet. Unscrew the solenoid or screw to access the idle jet.

The *main jets* are located at the bottom of the float bowl, close to the venturis, toward the rear. The *air correctors* sit at the top of carburetor body, behind the float bowl. Both of these are located under the the float bowl lid, which covers the top of the entire carburetor body. Removing and replacing the float bowl lid is a bit of a hassle, but you will have to take the float bowl lid off to access the main jets and air correctors. In the course of tuning the carburetor the float bowl lid may have to be removed and reinstalled many times. Try not to lose the clip holding the choke arm to its linkage, but in case you lose it, you can get a pack of c-clips at a hobby shop that sells radio control models.

One final note: patience and attention to detail can produce a pretty good street setup, but to get it really right, a wideband oxygen sensor and gauge are really invaluable. If you use one, bring an assistant along to read the gauge and take notes as you drive. Make sure you calibrate the gauge correctly before use, or it may give inaccurate readings, which are worse than no readings at all.

Time to move on to Chapter Two and start tuning!

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At this point I am assuming you read and followed Chapter One in this series and are ready to start the tuning process itself. With this carburetor I like to start with the idle circuit. It is advantageous to tune the idle circuit first because, although it obviously controls idle mixture, the idle jet also influences fuel mixtures throughout the rest of the operating range. It makes sense to get it right first.

To start with, you will need to locate the *idle speed screw* and the *idle mixture screw*. The idle speed screw is the one that pushes against the linkage on the back of the carb. The idle mixture screw is mounted horizontally on the base of the carburetor, on the right side, assuming the float bowl is mounted toward the front of the car.

With engine at operating thoroughly warmed up and choke disengaged, set the idle to your desired speed via the *idle speed screw*. Once your idle speed is where you want it, slowly turn the *idle mixture screw* in and out until you find the fastest idle speed. If you have a vacuum gauge, you can also adjust the idle mixture screw until you find the highest intake manifold vacuum reading.

Now give the engine a moderate rev to clear out any residual fuel in the intake tract, and readjust the idle speed screw as necessary to get back to your preferred idle speed. Again adjust the idle mixture screw as necessary to achieve the highest idle speed or manifold vacuum. Repeat the process until adjusting the idle mixture screw no longer increases idle speed or manifold vacuum, then set idle is to your preferred speed via the idle speed screw.

Next, with the engine idling, turn the idle mixture screw in (clockwise) about 1/4 turn. If engine speed drops significantly, bring the idle speed back up to your desired RPM by turning the idle speed screw. This condition is called *lean best idle*. If you are using a wideband oxygen sensor, look for a reading around 15.0:1 here.

Shut off the engine. Gently turn the idle mixture screw clockwise, counting the number of turns until it is fully seated. Be gentle; you only want to turn the screw until it has reached the end of its travel. Record the number of turns until the screw is seated. With a correctly sized idle jet, the idle mixture screw should be about 1-3/4 to 2 turns out at lean best idle. If it is less than 1-3/4 turns out, your idle jet is too big. If it is more than two turns out, the idle jet is too small.

The reason the idle jet size is so critical is that it also handles progression from idle to low speed. The idle jet needs to be big enough to feed a little fuel to the progression holes right below the throttle plate as the throttle starts to open, but not so big that it makes this transition overly rich. A lean progression creates a stumble or hesitation off idle. An overly rich progression runs lazy, wastes fuel, and stinks.

Take the time to try different idle jets and note the difference each one makes. When your lean best idle setting is achieved with the idle mixture screw between 1-3/4 turns and 2 turns off the seat, you have the right idle jet. Again give the engine a bit of a rev to clean out any fuel. Revisit the idle speed screw and idle mixture screw to verify that lean best idle occurs with the idle mixture screw between 1-3/4 turns and 2 turns off the seat.

With the correct idle jet chosen, you have created a solid foundation on which to tune. You can now move on to the primary and secondary circuits. To do this you will change the change the primary and secondary main jets as well as primary and secondary air correctors. We will take those on in Chapter Three.

Weber 32/36 Setup, Ch.3

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Assuming you read the introduction in Chapter One and followed the idle circuit setup guide in Chapter Two, it's time to move on to the primary and secondary circuits. Again we want to do this in the correct order, as each circuit progressively affects the fuelling, and thus the way the engine runs. In other words, you want to set the idle circuit up before playing with the primary circuit. By the same token, you need to dial the primary circuit in before you mess with the secondary circuit.

The DGV series is a progressive two-barrel carburetor, meaning that the primary 32mm butterfly opens first when you move the linkage (or press the accelerator), followed by the secondary 36mm butterfly as you continue to open the throttle. You can feel the increased resistance when the linkage starts to open the secondary butterfly. This resistance makes it clear whether you are operating on the primary barrel only or have started to open the secondary.

The primary and secondary circuits are each metered by a *main jet* and an *air corrector*, sometimes called an *air jet*. The main jet is used to set basic fuel flow volume. The air corrector is used to adjust that fuel volume as airflow through the venturi increases with increased engine speed and load. A larger main jet passes more fuel and produces a richer mixture. In contrast, air correctors (air jets) meter air, rather than fuel; a larger air corrector produces a *leaner* mixture.

You will have to change these parts in order to achieve the correct air-fuel ratio for your particular engine's needs and your operating conditions. The Weber DGV also uses some other calibrated part, such as *emulsion tubes*, but most street engines do not require that those be changed. There is also an idle jet on the secondary barrel, but it doesn't really have much influence and can typically be left alone.

As a reminder, the *main jets* are inside the float bowl, down at the bottom, toward the rear. The *air correctors* are at the top of carburetor body, just behind the float bowl. Both are located under the the float bowl lid, which covers the top of the entire body. You will have the float bowl lid off and on several times in the course of changing main jets and air correctors.

That's enough theory. Let's move on to tuning. The first thing we are going to look at is the *primary main jet*. This jet typically affects the fuelling from right off idle to halfway through the RPM range that you encounter without getting into the secondary barrel. Be careful to confine your tuning to low engine speeds only for now. Higher engine speeds begin to bring the influence of the primary air corrector into play.

A smaller number on the jet indicates a smaller hole drilled through it, and that means less fuel passes through the jet. In other words, *smaller* means *leaner* where main jets are concerned. Basically, you want to select the smallest (leanest) primary main jet that will run smoothly at low engine speeds on the primary barrel only. Continue experimenting with leaner primary main jets until the engine bucks or surges at low speeds and low throttle settings, such as cruising slowly around the neighborhood or maneuvering around a parking lot. Once you encounter bucking or surging, go up one or two sizes on the primary main jet. Our goal is to keep the air-fuel ratio just rich enough to be smooth and driveable. Anything richer than that is simply wasted fuel. We can stay relatively lean here and not put the engine in any danger since it is not under any significant load.

With the primary main jet chosen, you can move on to the *primary air corrector,* which admits air to emulsify the fuel (mixes it into a froth, more or less) as air velocity through the carb increases. The air corrector's influence on the mixture increases as engine speed and airflow increase. In other words, the main jet sets the base fuel delivery on that barrel, and the air corrector trims the fuel delivery at higher engine speeds.

What you want to do is select the largest (leanest) primary air corrector that will run smoothly through the higher engine speeds when on the primary barrel only. On the primary, the engine will still not be under massive load, so you can stay fairly lean and still be safe. Verify that the car will cruise smoothly at high speeds and doesn't surge, ping, or detonate when climbing hills or using normal acceleration on the primary throttle. If you're using a wideband you can look for air-fuel ratios around stoichiometric, somewhere between 14.5:1 and 15.5:1 at steady cruise, and 13.5:1 or 14.0:1 under light acceleration and moderate load.

At this point, the vehicle should be smooth and responsive on the primary barrel under any conditions. Once the primary side is sorted you can address the secondary, but the primary side MUST be sorted first.

Moving on, the secondary circuit is calibrated in much the same way as the primary, but it's important to remember how the secondary side of the carburetor is used. Most normal driving is done on the primary barrel, with the secondary being opened only for heavy loads or maximum acceleration. For that reason you're going to want progressively richer air-fuel ratios when the secondary is open then you would when driving on the primary barrel only.

Secondary tuning also starts with the main jet. This time choose the smallest* size *secondary main jet* that provides smooth performance as the secondary starts to open, and *midway through the RPM band*, with the secondary barrel open. This is a good time to start paying attention to the wideband, if you have it, to monitor the air-fuel ratio. If the secondary is open, you generally want to see an air-fuel ratio between 12.5:1 and 13:1, going richer as speeds and loads increase. If you do not have access to a wideband oxygen sensor and air-fuel ratio gauge, proceed very carefully through leaner secondary main jets. At the first sign of surging, hesitation, detonation or pinging, go back up at least two sizes richer on the secondary main jet.

Finally, take a look at the *secondary air corrector* and choose the largest* size that provides smooth performance through the *upper portion of the RPM range* with the secondary throttle open. Be aware that we are now deep into a potential minefield. It is entirely possible to destroy your engine if you run it too lean under heavy load. Buying or borrowing a wideband oxygen sensor is practically mandatory if you want to establish the correct air-fuel mixture. As you did with the secondary main jet, go back at least two sizes richer (smaller number) on the secondary air corrector if you experience any surging, hesitation, detonation or pinging in the RPM and load band we are testing in.

***Please understand that tuning for WOT (wide open throttle) air-fuel ratios without a wideband oxygen sensor and air-fuel ratio gauge is very risky. In the days of leaded fuel, you could read the spark plugs to get an idea of how rich or lean the engine was, but that's much tougher with unleaded gas. If you cannot afford to buy a wideband system, consider borrowing or renting one from a friend.**

And there you have it – DGV tuning step by step. Not exactly cutting-edge technology, but sometimes it's worthwhile to revisit things, and these are still popular and viable carburetors on a whole lot of older cars. Have fun and be safe!