Simple MAP/MAF Enhancer

The Basics

First lets clarify some basics. MAP = Manifold Absolute Pressure. A MAP sensor measures the pressure in your intake manifold. MAF = Mass Air Flow. A MAF sensor measures the amount of air coming in to your engine. These devices are designed so similarly that a device that works for a MAP also works for a MAF. Further, their information to the ECU is used similarly, and therefore adjustments to these 2 types of sensor will have a similar result. In the early days of the HHO industry, the MAP sensor was often treated, and so you will see devices sold on Ebay called "MAP Enhancers". These could just as well be called MAP/MAF Enhancers because they will work on both.

Before we go too much further, we should clarify one point: The first sensors that need to be addressed are the oxygen sensors. The oxygen sensor(s) are the primary sensors that the computer uses to determine the air/fuel mixture. If you're unfamiliar with the theory of how increases in fuel combustion efficiency relate to the need to do sensor modifications, see our Documents Page and read the articles at the top of the list. If, after you have treated the oxygen sensors, you still haven't gotten your mileage gains, I recommend you use the HHO System Debug Checklist, and make sure you have corrected any problems you find in your earlier steps. Only if everything is found to be correctly installed and functioning should you install a MAF/MAP enhancer. The exception to this rule is diesel engines, which generally don't have oxygen sensors, but even if the do, will need a MAP/MAF Enhancer.

Most vehicles have a MAF ***or*** a MAP sensor, but not both. In these cases you will treat the sensor you have. Some vehicles have both a MAP and a MAF sensor. In these cases you are best off treating the MAF sensor alone. However, some vehicles that have both types of sensor respond better treating the MAP, so if your vehicle has both sensor types, and your treatment of the MAF hasn't gotten you results, try the treating the MAP instead. I wouldn't treat both of them. You want to make as little change to the sensors as possible to achieve the result of a lowered air/fuel ratio. Treating both sensors can get the ECU confused and unable to do it's job correctly. After all the information from these sensors is needed for the correct operation of the engine.

Two Types of Sensor

There are 2 types of each of these sensors. The most common is what I'll call a "voltage type" MAP or MAF. The voltage type communicates to the ECU by giving it a voltage, and this voltage tells the ECU what the MAP's current pressure reading is, or the MAF's current volume of air flow. The ECU gives a control voltage to the sensor of 5 volts. The sensor then gives back a fraction of that 5 volts that signifies it's current reading. The vast majority of all MAF and MAP sensors are of this type.

The other type of sensor is a frequency type. In this case the sensor communicates with the computer by means of a frequency. Both MAPs and MAFs sometimes use this method. The sensor is measuring the same thing as the voltage type, but instead of providing the ECU with a changing voltage, it provides a changing frequency. Ford used to use this type of MAP extensively in the 80s, but has since changed back to using voltage type. But you need to know about this type of sensor. The circuits described in this document will not work with a frequency type of MAP or MAF. Neither will the MAP enhancer you can get on Ebay. If you have a frequency type MAP or MAF you will need our Frequency MAP/MAF Enhancer. This is a device that can read a frequency and then provide a lower output frequency.

The best way to determine which type of sensor you have is to find the signal wire and measure it.

Finding the Signal Wire

Of course the easiest way to find the signal wire is to get a wiring diagram for your vehicle. This can tell you the exact wire, and it's color code, and save you some time. For resources on getting wiring diagrams for your vehicle, see our article: Wiring Diagrams. But if you don't have a wiring diagram, you can still find your signal wire by measuring it.

A MAP or a MAF will have 3 wires. One will by 5 volts, which powers the device and is supplied by the ECU. One will be ground, or 0 volts. So if you measure the 3 wires, just eliminate the 5 volt wire and the 0 volt wire, and the remaining wire is the signal wire.

This is slightly complicated by the fact that many MAF sensors today also include an Intake Air Temperature sensor in the same housing. In this case you'll have 5 wires going to the sensor. But it's OK, it's easy to find the correct wires you need. The temp sensor will have a ground wire and a signal wire. The signal wire will be up near 5 volts when the sensor is cold, but as it heats up that voltage gets lower. But a temp sensor's voltage will not change when you goose the engine, and that's how you can tell the difference. Also, if you unplug the sensor, and measure the signal wire on the computer side, it will read 5 volts.

Now, how do you make sure your MAP is a voltage type, and not a frequency type? You will need to watch the voltage as you make changes to the engine's RPMs. The best way is to goose the engine. The voltage will change dramatically on either a MAP or a MAF if it is voltage type. You will see a small change in DC voltage for a frequency type device too, but the changes will be slight, like tenths of a volt. Whereas the changes on a voltage type will be much more dramatic. Changes of over a volt indicate a voltage type MAP or MAF.

Tip: You can steal a straight pin from your wife's sewing box and push it through the insulation of the wire you want to test. Make sure you get into the conductor (wire) inside. This will be much easier than scraping away the insulation to test the wire.

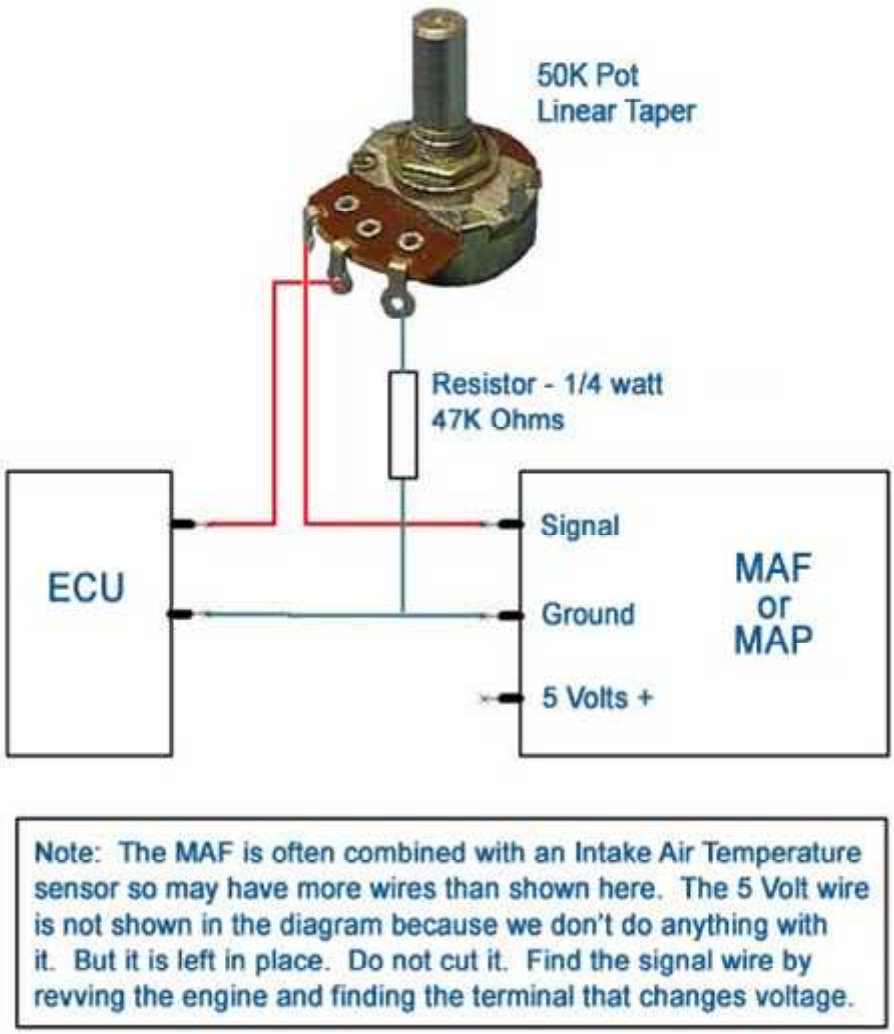
Even if you find your signal wire using a diagram, you should still test it before proceeding. You must make sure that you see a voltage change when you rev the engine, and that the voltage drops back down when the engine slows back down again. If you see this phenomena, you can proceed to install the circuit. If you don't see this phenomena, then you have the wrong wire, or an incompatible sensor type. Do not try to use this circuit unless you find a signal wire that matches this phenomena. The biggest single cause of failure for any sensor modification project is to mis-identify the signal wire. So it's best to be absolutely sure.

The MAP MAF Enhancer Circuit

There's only 2 parts. Here's some Radio Shack part numbers that you can use:

Pot: 50K Linear Taper Potentiometer, Radio Shack #271-1716
Resistor: 47K Ohm Resistor, Radio Shack #271-1342 or #271-1131

Note: The resistor and pot values don't have to be exact. Just try to keep their values in roughly the same proportions as the ones I've shown. These values aren't particularly special. I wouldn't use less than about 10K on the pot, and the resistor should be approximately the same value as the pot. On some vehicles, this combination of pot and resistor can be too sensitive, such that very tiny movements on the pot make large changes in air/fuel ratio. You can make the device less sensitive by using a larger resistor. Double the resistor size or even triple it, and you will find the device is much less sensitive.



Cut the signal wire and connect the sensor side of the cut to one of the outside pot terminals. Connect the pot's center terminal to the computer side of the cut. See the diagram.

Note: If you have a preference for which way the pot turns when you are leaning the air/fuel mix, then you'll need to select which outside terminal to use by doing the following: Turn the pot all the way (until it stops) in the direction you want to be the **least** effect. In other words, if you want to turn the pot clockwise to make the mix leaner, then turn the pot counter-clockwise all the way. Now measure the resistance between the center terminal and the 2 outside terminals one at a time. One of these outside terminals will show no resistance to the center terminal. That will be the terminal you want to use on the signal wire.

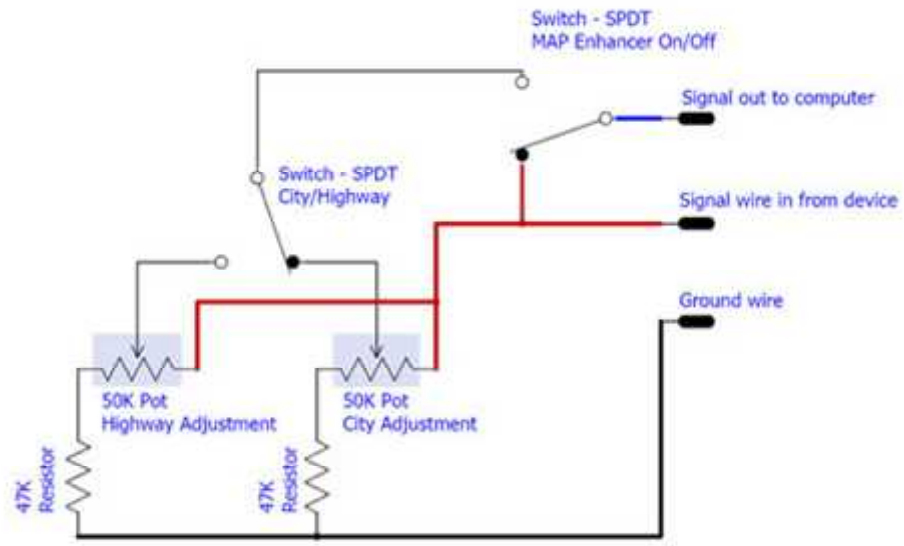
The other outside terminal connects to ground, via the resistor. I recommend you use the ground that the sensor is using as per the diagram. You don't cut the ground wire. It must stay connected to the ECU. Instead, you'll tap into that circuit, as per the diagram.

That's all there is to it. To set the pot, first turn the pot all way towards least effect. There will be almost no resistance between the ECU and the sensor on the signal wire. This is the stock setting, with no change in the sensor's signal. Then start your car. You can now gradually turn the pot and you will eventually notice that the idle runs slower and eventually rougher. Back off on the pot until the engine is running smooth again. Also test the car on the road and make sure you're not losing power. If you are, then you need to back off the pot some more until these symptoms disappear.

Dual Edge MAP Enhancer

If you want to get fancier, you can build the popular Dual Edge MAP Enhancer. Again, despite the name, this circuit works just as well on a MAF sensor. This is the same design as above, but has 2 of these

circuits, and includes a switch to switch between them. That way you can set up one circuit for highway driving and the other for city driving. A switch is used to switch between the 2 circuits. This design also can switch between stock MAP/MAF signal and enhanced signal. This is the exact same circuit that you will find in virtually all of the MAP Enhancers you see being sold on Ebay and around on the internet. The diagram for this design is shown here:



If you're not well versed in electronic schematic diagrams, there are only 3 different types of device used here. I think the resistors are self explanatory. You also have the pots and switches. The pots have 3 terminals. The center terminal in the diagram is the center terminal on the pot too. Similarly with the switches, the center terminal in the diagram is the center terminal on the switch. Make sure you get SPDT switches. If you don't know what what a pot or an SPDT switch it, then google it. These are simple devices that are described very well in many internet documents.