# Frequency Type MAP/MAF Installation

These are the instructions are for our new Frequency MAP/MAF Enhancer, or "MAPe" (MAP enhancer) for short. Before proceeding you should have a look at our article, "MAP/MAF Enhancer Basics" on starting on page three of this document. It has a good deal of information about MAP and MAF sensors, the different types that exist and how to find the signal wire you'll need for the installation.

Our Frequency type MAPe will also work on voltage type devices. But you still need to determine which type you have. The link above will help you with that.

Once you have your signal wire, its very important to know if you have a frequency or voltage based signal wire. By measuring for DC volts, you can't really eliminate a frequency device. A DC meter will still show a DC voltage on an A/C signal. It kind of averages the voltages out. Usually it will even show you changes to the "DC" voltage when you goose the engine. So the bottom line is that the best way to find out if its a frequency type device is with a frequency function on your meter. I

If you don't have a frequency function on your meter, but have already purchased our MAPe, you can also set it up for frequency usage, then hook it up. The green LED will only light up if its a frequency type device. It will light up almost instantly. If its voltage type, the green LED won't light up. Don't worry, it won't hurt the device to test it in this way. If the green LED doesn't light up, then you can hook it up as a voltage type device and it will work.

Once you have found the signal wire, then you will cut it, and run the 2 ends into the MAPe. The diagram below will show which terminal to use for the sensor wire, and which to use for the computer wire. Note that there are different terminals for frequency type or analog type signal wires. You must use the correct terminals for the type of signal you are trying to handle. Note that the MAPe can only be used for one device. It can't be used for both a frequency MAP and an analog MAF at the same time. Only one set of terminals will work, and that is based on the positions of the switches (see below).
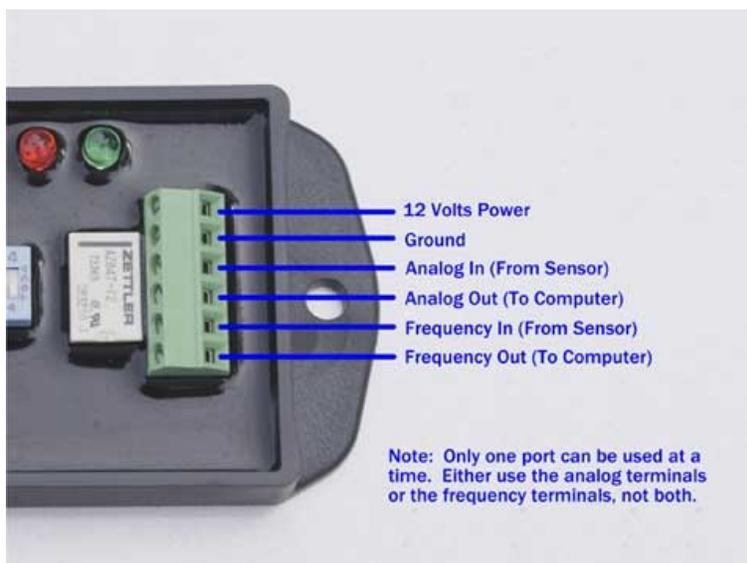


*Note there are different terminals for frequency type or analog type signal wires*

## Setting the Switches

The image below shows the switch that is used to configure the Frequency MAP/MAF Enhancer. The list below shows the functions:

1. 1. Used to switch between different types of voltage signals - see below for details.
2. 2. On for voltage type signals, off for frequency type signals.
3. 3. Not used.
4. 4. Not used.
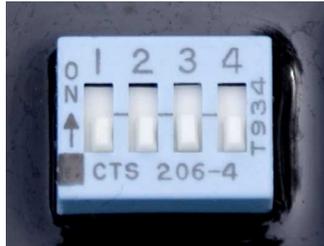


For frequency applications, all 4 switches should be in the "off" position..

For analog applications, switch position 2 must be on. That is vital. In nearly all applications switch position 1 will be off. However there is a relatively rare circumstance where switch position 1 will need to be on.

Switch position 1 rare exceptions: Most analog voltage applications require that the output voltage be lowered in order to lean the mix. In that case switch position 1 should be "Off". Rarely, some analog voltage MAP/MAF devices work in the opposite way. To work with these devices, put switch position 1 into the "On" position. This will cause the voltages to be higher when the pot positions are increased, rather than lower.

## Setting the MAPe

Frequency Mode: When setting the MAPe in frequency mode, start with Pot B at zero (all the way counter-clockwise). Make your adjustments using Pot A only. The more you go clockwise, the more frequency adjustment there will be. If you turn Pot A all the way to maximum and still need more adjustment, then use Pot B. Leave Pot A at maximum and start adjusting Pot B.

Analog Voltage Mode: Set pot B at its midpoint. Get a rough adjustment using Pot A. You can do that by ear. After you have gotten roughly the correct adjustment, use Pot B for fine tuning your adjustment. Pot B is 10 times more sensitive than Pot A, and is used for fine tuning only. Anytime you are going to change the position of Pot A, I recommend putting Pot B at it's center position so you will have maximum flexibility for fine tuning.

We are assuming you are using some type of combustion enhancement technology, such as an HHO system. There are many types of these including fuel warmers, fuel vaporizers, water mist injections systems, gas cracking chemical additives, systems that improve the respiration of the engine, etc. Any of these technologies may need an electronic enhancer to get the full mileage gains that the technology can provide. However, we don't recommend using this device, or any other type of electronic enhancer by itself. It will cause the engine to run out of spec, and this can be detrimental to the environment and to the health of your vehicle. But coupled with a valid and working combustion enhancement technology, you can reap rich rewards in reduced fuel costs and a reduced environmental impact of your vehicle.

With that in mind, as with any electronic enhancement, you will be going for the best fuel mileage. That's how you'll determine the final setting for your new MAPe. Do a rough setting as described above, and then drive for a tankful. Keep track of the amount of gas used to till the tank, and the mileage driven on the odometer. Note whether you mileage improved or got worse. If it improves keep adjusting in the same direction. If it gets worse, adjust back in the opposite direction. After you've tweaked it a few times, you will find the sweet spot that gives you the best fuel mileage.

As with any of our products, if you have trouble with this device, contact [support@hydrogenmonkey.com](mailto:support@hydrogenmonkey.com). We will be happy to help you however we can to be successful with your project.

# Understanding Your MAP/MAF Sensor

## 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, 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 like often with Fords. 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.

Don'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 Sensors

There are two 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. Frequency sensors will not work with 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 reads 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.

As with any of our products, if you have trouble with this device, contact support@hydrogenmonkey.com. We will be happy to help you however we can to be successful with your project.