

Electronic fuel injection

Basic Information

When adding a HHO gas to the engine of an older carbureted truck, we will see immediate economies in fuel consumption.

However, this is not the case for some electronic fuel injected vehicles equipped with an engine control unit (ECU), because the fuel burned inside the cylinders has significantly improved, but the sensors continue expecting the same amount of un-burnt oxygen to come out of the exhaust of the engine.

This causes a signal to be fed back to the ECU, that give order to inject more fuel increasing the

Wish trucks we need to make changes in the sensors?

Normaly, the only trucks that need some modifications in order to increase fuel savings are modern diesels with Euro module IV and V.

air/fuel mixture (Richer), which counter acts the fuel gains you may be expectecting.

Components

An Electronic Control Unit (ECU) controls the internal combustion operation of the engine. The simplest ECUs only control the quantity of fuel injected into each cylinder per engine cycle. The more advanced ECUs also control the ignition timing, variable valve timing (VVT), the level of boost

maintained by the turbocharger, and other engine peripherals.

ECUs determine the quantity of fuel, ignition timing, and other parameters by monitoring the engine through sensors. In trucks the most important sensors are the MAP/MAF (airflow) and temperature sensors.



Mass Air Flow Sensor

For an engine with fuel injection, the ECU will set the quantity of fuel to inject based on a number of parameters.

For example: If the accelerator pedal is pressed further down, this will open the throttle body and allow more air to be pulled into the engine. The ECU will inject more fuel according to how much air is passing into the engine.

A mass air flow sensor (MAP or MAF) is used to find out the mass of air entering a fuel-injected internal combustion engine. **The mass air flow information is the most important one** and

necessary for the engine control unit (ECU) to balance and deliver the correct fuel mass to the engine.

Older Trucks

Before electronics, most engine parameters were fixed. A carburetor or injector pump determined the quantity of fuel per cylinder per engine cycle. Like mentioned before, when adding a HHO gas to these trucks we will see immediate improvements in fuel consumption.

There are no special devices or requirements to fit the HHO System to these trucks, **but to improve the fuel savings the injection rate of the fuel pump should be tuned to the new air/fuel mixture conditions.**

Euro I, II and III trucks

The ECU of your truck is like its brain using mapped data to work out the optimum control conditions for the engine. According to the day to day driving conditions the ECU builds a memory data base that helps it to decide the course of action that should be taken by the engine to ensure an ideal drive.

Even though you have made modifications in your car with the HHO system, the ECU still continues to get an input of the old data which is stored in its memory. This old data is no longer credible as it pertains to conditions that existed before the modification.

This is the reason why **ECU resetting is essential** for

optimum performance after any modification has been carried out in your truck. The ECU has to operate on the newly acquired data as this new data reflects the true conditions post modification.

Resetting the ECU is important because it has a memory bank for octane. This means that if you've been using lower octane fuel, the response of ECU will correspond to lower octane, with the booster matching lower octane performance.

The ECU response will continue to correspond to lower octane even though you have started using higher-octane fuel. This is because the ECU has not been reset for higher octane.

Thus even though higher octane is in actual use, the data in ECU memory still corresponds to that of lower octane. This mismatch affects performance.

To reset the ECU you simply have to unplug the negative battery cable connection. Theoretically it is best to leave it in this disconnected condition for as long as you can.

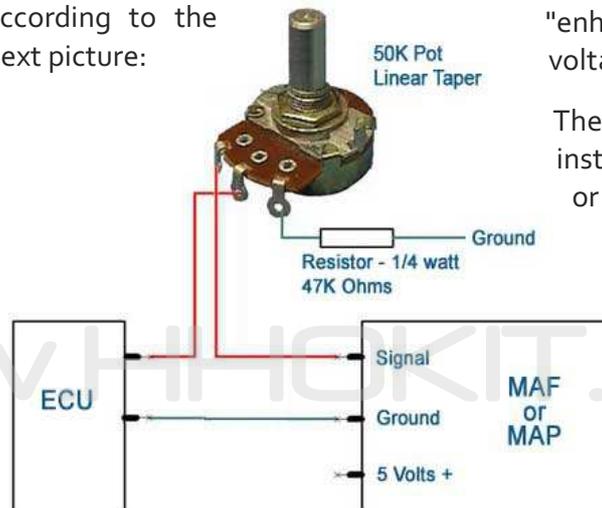
Practically leaving it disconnected overnight is more than enough. After having left the cable disconnected for sufficient time you have to connect back the cable. Start the car and keep it running so that it warms up. This would not take more than 10 minutes at the most in summers. Once you have done this you have accomplished the ECU resetting. Shut off the engine. You can now use your truck

whenever you feel like. ECU resetting is over.

Euro IV and V trucks

Besides resetting the onboard computer, In these modern trucks we have to make changes in the signal coming from the MAF.

For that we use a small electronic box called the MAF Enhancer, that is basically a potentiometer - variable resistor - which varies its value by turning the knob according to the next picture:



The Mass Air flow Sensor is a little though expensive device installed in your intake manifold. It has 5 Volts or 12 Volts coming in, and it simply senses the vacuum in the manifold and reduces this incoming voltage by a certain factor. In other words it reduces the supply voltage to a direct-current voltage in the range of 15% to 60% of the supply voltage (depending on the design these numbers will vary), and this varying (but non-pulsing) signal is then sent back to the computer.

The arrangement of resistors simply takes this already reduced, signal - and reduces it further.

Too much reduction kills the engine; it will simply shut off. Yet if you control it correctly, you can lean down the mixture from the balance of ingredients which is factory set at 14.7:1 (14.7 parts of air to 1 part petrol) - down to 20:1, maybe even 50:1.

INSTALLING AND TUNING

The tuning procedure calls for clockwise and counter-clockwise rotation of the knob. The idea is that turning knob will "enhance" or "reduce" the voltage.

The Enhancer can be installed on the dashboard or sit on the console, or under the bonnet if it can be fitted in a dry position. To eliminate the work and possible damage to the dashboard, and to enable better control, place the

box beside the driver's seat. This makes tuning quite effortless.

Locate the wires connected to the MAF sensor. There will be one for the positive supply voltage, usually 5 or 12 volts. **The signal will be the wire with the weaker voltage and will change with RPM when the engine is started.**

There will also be a ground wire. You can solder or crimp these with electrical wire connectors.

If you cannot locate the sensor or the wires, or you're not sure, please find a auto-electrician to install it. **DO NOT IMPROVISE OR**

GUESS - you may damage your computer.

To find the MAF Sensor Signal Wire, use a Circuit Tester. Use the Tester to locate the ground with 0 volts and the supply voltage of 5 volts. The remaining wire is the MAF Signal wire.

Now cut the wire, and join the 2 red cables from the "enhancer". The third connection, the black cable with the "earth lug" already attached, needs attaching to bodywork to make the earth. Secure cables with cable ties supplied.

TUNING ON THE ROAD

Turn the knob all the way to "rich" (The Dial should point to minimum on the scale or all the

DO THE NEXT STEP WITH CARE - JUST IN CASE YOUR ENGINE STOPS UNEXPECTEDLY.

way anticlockwise). Make sure your HHO Generator is operational. Warm up the engine and drive a while before experimenting with the knob.

1 Now, start turning the knob clockwise; the mixture will turn leaner and leaner until the car stalls or bucks as you drive. Back the knob off slightly after the bucking and chugging.

2 Keep the danger of overheating in mind. If your HHO Plus Generator device is non-operational, temporarily set the enhancer at or near original factory setting (rich).

3 Set points can change from one petrol station's fuel to another, weather conditions, cold engine, etc. The differences are not large, but if you're on the edge, then the car will buck or vibrate, and you'll need to change the set point a bit. Remember that this is a simple device.

NOTE: When this device turns on for the first time, sometimes the "check engine light" comes on and this needs resetting with a ScanGauge-II or an OBD-2 Connector (1996 cars or newer). When this has been done if your connections are correct, it will stop off.

MAXIMIZE BENEFITS

You will get improved reductions straight away. How much is dependant on your HHO generator performance. The better performance you get from this, the more lean your truck, but don't overwork the engine by leaning it too much - play around until you find the PERFECT BALANCE point. The way you drive also has quite an influence, if you need fast acceleration, you will not be able to "lean" it out as much, as driving normal.