Fuel Smart

Hardwire Installation Instructions

Patents Pending
MADE IN USA

Thank you for purchasing a FuelSmart. This product has undergone many years of extensive engineering, development and testing. In addition, all units are manufactured in the USA on brand new, state of the art, very high speed robotic assembly equipment from “Assembleon” and “Essemtec AG” to ensure high accuracy and low manufacturing costs.

With proper installation by a factory trained installer, the unit will give many years of trouble free service and pay for itself many times over. If, at a later date, you decide to sell your vehicle, this unit may also increase your vehicle’s resale value or you may remove the unit and reinstall on a newer vehicle.

WARNING: *If the unit is installed incorrectly, your engine will not run properly, and cause **loss** of fuel economy and even possible engine component damage.* Although relatively simple in theory, this installation should NOT be done by any self-proclaimed auto mechanics or the like. If, in the unlikely event that you need to return the unit, DO NOT cut the wires from the unit as they are NOT replaceable and this will void the warranty. Any returns must be in the same exact condition as when they left the factory.

This manual is written for **professional electronics technicians only** and should be read **entirely** before starting installation. It is understood that automotive electrical wiring, DC circuits, voltmeter usage, crimping, soldering, fuel injection, fuel injector basics, and OBDll scanners, such as the Actron CP9125 Pocket Scan Code Reader are understood.

Before installing the unit, it is highly recommended to locate a service manual wiring diagram for your specific year and model vehicle to properly identify the correct wires and their corresponding colors to assure proper installation. Due to the multitude of vehicles, Fuel Smart Corp. has no way of knowing which color wire goes where, on each and every vehicle ever produced. Your local Fuel Smart Corp. distributor has been trained at the factory and may be able to assist you with a volt/ohm meter in determining which color wire is associated with the proper installation if a wiring diagram for your vehicle is unobtainable.

Overview

The innovative Fuel Smart unit uses patent pending proprietary circuitry with RISC based PIC microprocessor technology running at 5,000,000 instructions per second from “Microchip technology Inc.” and HITFET® - Fully Protected Fuel Injector Drivers from “Infineon Technologies AG” to provide the highest level of protection with over temperature, short circuit, over current, overvoltage and ESD protection. This proprietary hardware, plus patent pending artificial intelligence algorithms, will help improve your vehicle’s fuel economy at little or no noticeable changes in engine idle characteristics, based upon 1 of 4 user selectable fuel saving algorithms. The unit’s microprocessor does this by monitoring your brake light and throttle position sensor 100 times per seconds allowing instantaneous calculations of horsepower requirements and then intelligently interrupting the signal/wire that normally turns on each fuel injector. For example, when the

The microprocessor senses that you want to accelerate; it allows all fuel injectors to operate normally so there is never a loss of acceleration or power. When the microprocessor senses that you no longer want to accelerate, it only allows a certain number of fuel injectors to work and thus saves you fuel. The number of fuel injectors that are deactivated is based upon the *rate* of deceleration, engine rpm, unit settings, etc. This number is constantly changing to save you the maximum amount of fuel without turning on any check engine lights or causing the engine to excessively run rough. There is no noticeable engine running characteristics at higher engine or vehicle speeds. The only time you may notice a difference in engine idle quality is at low rpm and sitting at a red light, etc. However, the engine idle quality can be adjusted to suit your vehicle and your particular driving habits.

The amount of fuel that you will save is based upon many factors, such as the user selected algorithm, user selected time adjustment setting, braking time, throttle position sensor (TPS) deactivation, personal driving habits, vehicle type, road conditions, traffic conditions, head winds, tail winds, etc., etc.

In addition to adding a Fuel Smart unit, it is *always* a good idea to check for proper tire inflation, change your air filters, change your oil to a high quality synthetic such as Mobil 1, and have a tune up.

For ease of installation and trouble shooting, there are numerous LED indicators to acknowledge proper installation and operation, such as an indicator for proper power connection and an indicator to acknowledge when the unit is in fuel saving mode versus acceleration. There is also a led for each and every fuel injector input and a led for each and every fuel injector output so that you can verify that you have indeed installed the unit properly.

Mounting

The Fuel Smart unit is fully weather proof and can be conveniently mounted under the hood or on the inside of the vehicle for easier algorithm selection and adjustment. The unit's circuit board is completely permanently epoxy encapsulated, so moisture or vibrations will not harm the unit. However, it is recommended to mount the unit high to prevent excessive splashing etc. It is also imperative that the unit is NOT mounted by any high heat areas such as exhaust or this will **void the warranty**! There are two mounting flanges on the box, and the box may be fastened in any convenient location or orientation.

Circuits

There are multiple wires coming out of the Fuel Smart box. One set of wires goes to each of the injectors, the other identical set goes to the wires coming from the ECU.

There are two wires for power and ground.
There is one wire that connects to the brake pedal and one wire to the Throttle Position Sensor (TPS).
There is one wire for a switch that allows you to "Deactivate" the unit if so desired.

LED Indicators

The following LEDs will illuminate with proper installation.

Green (Center Right) - This LED indicates that the internal power supply is functioning properly. Always On.

Green (Upper Edge) - This LED indicates that the unit is active. It is on when the brake pedal is pressed and the active time delay has not expired.

Green (near external wires) – Signal from the ECU to the injector – this will illuminate when the ECU enables the particular injector.

Red - There is a Red LED above each of the six Green LEDs that will illuminate when the vehicle is started and the fuel injector is activated. If any one of the 6 blue LEDs is not illuminating when the engine is started, this indicates an improper connection.

Wire and Color Codes

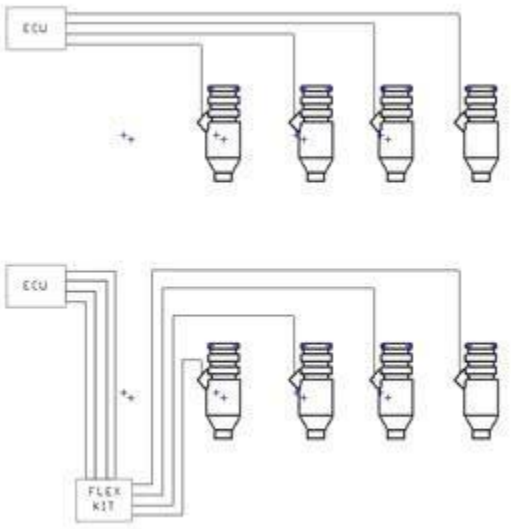
To use the wiring diagram shown below, place the box so that you are looking at the clear cover and can see the internal circuitry. There are three bundles of wires coming out of the bottom of the box. The **white striped wires** on the left and right side bundles will connect to the **injectors** and the **solid colored wires** on the left and right bundles will connect to the **injector signals** from the **ECU**.

Be careful to route the wires to not get caught in any moving parts such as the fan, belts, alternator, or steering column. Also, keep the unit away from excessive heat such as the exhaust manifolds.

Description	Color	Destination	Comments
+12V	Red	Fused ignition	Power only when key is on!
GND	Black	Ground	
Unit activation switch	White	Interior switch to GND	Must be grounded to activate.
Brake Pedal	Brown	Interior	+12 V when brake is pressed
Throttle Position Sensor	Grey	TPS output wire	Rising voltage when throttle is depressed
Bank 1			
Injector 1	TAN/white	Any Injector	Output
	TAN	ECU side of same Injector	Input
Injector 2	GREEN/white	Any Injector	Output
	GREEN	ECU side of same Injector	Input
Injector 3	PINK/white	Any Injector	Output
	PINK	ECU side of same Injector	Input
Injector 4	PURPL/white	Any Injector	Output
	PURPLE	ECU side of same Injector	Input
Injector 5	BLUE/white	Any Injector	Output
	BLUE	ECU side of same Injector	Input
Injector 6	LTGRN/white	Any Injector	Output
	LT GREEN	ECU side of same Injector	Input
Injector 7	ORAN/white	Any Injector	Output
	ORANGE	ECU side of same Injector	Input
Injector 8	YEL/white	Any Injector	Output
	YELLOW	ECU side of same Injector	Input

Connections

Each injector from the manufacturer has two wires connected to it. One is +12V power which is present whenever the key is in the RUN position. The other is the drive circuit to the injector itself.



IGNITION POWER (positive)

The RED wire from the Fuel Smart-6 has to only splice into one of the injector power feeds (the wire that is HOT whenever the key is in the run position) or to any other +12 volt fused wire that is hot when the key is turned on. This wire is referred to as the IGN signal. It is important to NOT connect to a constant power wire or the unit will stay on after the car is turned off and the battery will be drained and the car will not start!

GROUND (negative)

The Black wire must connect to a GOOD vehicle ground. This ground is very important since it carries the 1A injector pulse current. It must not connect to a weak ground. The ground lug at the battery, or strap from the battery to the body is best. DO NOT USE SKOTCHLOCK type devices for power or ground.

Injectors

Each wire is 3 ft. long. This is long enough to reach any circuit within the engine compartment.

Picking any injector, cut the signal wire at a convenient location. The signal wire will not have +12 volts when the key is turned on. A simple voltmeter check will determine which wire is +12 volts and which one is the signal wire. The +12 volt wire “should” be the same exact color to all injectors. The signal wire from the ECU to the injector “*should*” have a different color wire for each injector. IT IS VERY IMPORTANT TO NOT CONNECT THE SIGNAL WIRES FROM THE Fuel Smart to +12 VOLTS. This will void the warranty and damage your vehicle!

Crimp OR solder a wire from the Fuel Smart to the appropriate wire to the injector. IT IS EXTREMELY IMPORTANT TO MAKE SURE THE CONNECTIONS ARE GOOD. Make sure to use good crimps with heat shrink tubing. The connection must be solid. Ideally, solder the connection then cover with heat shrink tubing.

Now connect the properly matching wire (see chart) to the ECU side of the wire (the ECU side is the wire that goes back into the bundle and connects to the ECU, not the injector).

Repeat the above steps for each of the remaining injector wires.

Brake Pedal Switch

There is a single brown wire coming from the center bundle that must be connected to the brake pedal switch. This wire should be a 0 volts when the brake pedal is off and at about +12 V or more (the battery voltage) when the brake pedal is pressed.

Testing

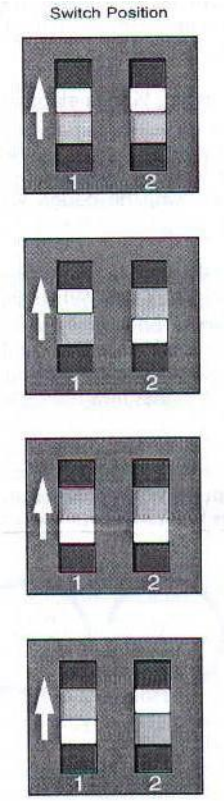
Start the vehicle and verify that a “check engine” light is not illuminated. You can verify that all of the circuits are functioning by visually inspecting the LEDs. You will see the green and blue LEDs for each injector briefly flash at the same time while the engine is running. If any of the circuits are not wired correctly, the engine will have a noticeable miss with the unit disabled. If the signal from the ECU to any injector is not wired correctly, the Green LED for that injector will either be off (non-blinking) and its corresponding Blue LED will also be off.

It is recommended that you hook up only one fuel injector, start the engine as a test and then proceed with the remaining fuel injectors after you have determined that your connections (ins and outs) are correct. This will prevent you from installing the entire unit, and discovering that a mistake has been made and having to redo all the connections. If one cylinder is improperly connected, a rough idle or check engine will come on.

Adjusting- The Fuel Smart unit comes equipped with a fuel savings timer adjustment and 4 proprietary algorithms to allow you to adjust the software for

your particular driving habits, road conditions, vehicle age, etc. No one particular setting works best for all applications, vehicles or drivers. The unit comes from the factory preset at the “mostly lower” dip switch position setting and the timing adjustment set to 50%. This is by no means ideal for all applications and therefore may require some experimenting to obtain optimal fuel savings.

Fuel Smart Algorithm Selection Switches



11 **Both switches up algorithm**
High RPM

10 **First up, second down algorithm**
Mostly higher RPM

1 **Both switches down algorithm**
Low RPM

2 **First down, second up algorithm**
Mostly lower RPM

In addition, there is a timer adjustment directly above the switches. This adjustment is used to determine the length of time that the unit will be in fuel savings mode until it resets, clears all cylinders and then determines if it should go back into fuel savings mode again. This timer is used to eliminate the check engine light from turning on and/or eliminate lean misfires. By turning the adjustment clockwise, the unit will stay in fuel savings mode for a longer period of time, however the risk of a check engine light turning on is increased. If the adjustment is turned counterclockwise, the unit will enter fuel savings mode for less time, but more often, before it returns to normal engine operation. The unit never stays in fuel savings mode for longer than 60 seconds at a time, at which time it exits this mode, allows the engine to run with all cylinders for approximately 15-20 seconds and then re-enters fuel savings mode if the brake is still depressed or the microprocessor has determined that the TPS is still not calling for additional power. The unit will continuously run through this loop until the brake is released or the TPS voltage has increased.

Troubleshooting Guide

Problem	Probable Cause/Solution
Unit not lighting	Bad electrical connections. Ground installed on painted or rusty surface. Wired backwards.
Unit not activated	Switch is not activated. Switch has a bad ground.
Rough Idle when unit is not “ON/Activated”	Incorrect wiring of one or more fuel injectors.
Excessive Rough Idle when unit is “ON/Activated”	Change Algorithm selection, low and lower RPM setting will cause rougher idle than high or higher rpm settings.
Check engine light on when unit is “ON/Activated”	Reduce timer adjustment by turning counter clockwise and/or change Algorithm selection. Depending on vehicle manufacturer, Low or lower rpm settings tend to turn on check engine light more often than high or higher rpm setting i.e., Ford works better with low and GM works better with High settings.
No noticeable fuel savings	Improper Algorithm selection and/or timer adjustment. No one particular setting works best for all applications, vehicles or drivers.
Check engine light on when unit is “Deactivated/OFF”	Improper wiring Most like cause is one or more of the input and output wires to the injectors are backwards or connected to wrong side of injector.