



FuelTech



PEAK AND HOLD

Low Impedance Injectors Driver Unit

Installation and Operation Guide

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1. Presentation

In modern electronic injection systems, the electro valves, better known as fuel injectors, are the parts responsible for injecting fuel into the engine.

The fuel injector is a solenoid that works as a valve, freeing or blocking the flow of fuel from the fuel line into the engine intake. The difference between the fuel pressure and the manifold pressure (or wherever the injector is located) makes the fuel to be atomized through the injector's orifice(s).

An injector may be fully open or closed. What determines the amount of fuel injected is the time the injector stays open and closed at each rotation cycle.

When the injection pulse is initiated, there is a short period of time in which the injector's needle has not yet opened mechanically for fuel flow, known as the injector "dead time".

Older fuel injectors as well as the modern high flow injectors feature a heavier internal moving system, which requires a greater electric effort to move the needle. Therefore, they have lower impedance (resistance of the small internal coil) and need a greater electric current to be driven. These injectors are the low impedance injectors and generally feature less than 7Ω .

Modern injectors as well as the low flow injectors have a simpler structure. Therefore, they need less energy to be driven and have relatively high impedance, with no need of actuation current control. A saturated high impedance fuel injector generally features between 7Ω and 20Ω .

The actuation of low impedance fuel injectors must be done through an active current control, in which a greater current with maximum power is applied until the needle opens mechanically ("peak" current). Then, the current is limited to 25% of its initial value as to maintain the injector open for the determined injection time (current to "hold" the injector open).

This control is necessary for several reasons:

- Applying full power during injector opening can decrease dead time, improving the response speed and ensuring linearity of the whole set of injectors.
- Limitation of the nominal current to a value of $\frac{1}{4}$ of the opening current is required to prevent the injector coil burn by excessive power, lowering heat and extending its useful life.
- Limitation of the nominal current is also very important in the injector closing, since the lower the energy stored in the coil, the shorter the time required to close the injectormechanically. With that is possible to achieve a fuel injection linearity even if it is working already with 70%, 80% of its capacity, when the available time to open and close is very little.
- When the coil is charged in excess, caused, for example, by a defective control of the “hold” current or when this control simply does not exist, the injector well before reaching 100% of its opening “lock open”, getting lost all ability to operate over the range of 70% opening.

This driver has an accurate current control that isn't modified due to variations of battery voltage, ensuring a perfect control under any situation or defect of the vehicle electrical system.

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2. Characteristics

Dimensions:

- Width: 4.7in. (115mm)
- Length: 3.7in. (93mm)
- Height: 1.4in. (35mm)
- Material: Aluminum and Plastic

Electrical specifications:

- 4 signal inputs
- 4 injector outputs

Version 8A/2A

- Peak Current: 8A (for any battery voltage)
- Hold Current: 2A (for any battery voltage)

Version 4A/1A

- Peak Current: 4A (for any battery voltage)
- Hold Current: 1A (for any battery voltage)

Version 2A/0.5A

- Peak Current: 2A (for any battery voltage)
- Hold Current: 0.5A (for any battery voltage)

3. Warranty terms

The use of this equipment implies the total accordance with the terms described in this manual and exempts the manufacturer from any responsibility regarding to product misuse.

Read all the information in this manual before starting the product installation.

This product must be installed and tuned by specialized auto shops and/or personnel with experience on engine preparation and tuning.

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Before starting any electric installation, disconnect the battery.

The inobservance of any of the warnings or precautions described in this manual might cause engine damage and lead to the invalidation of this product warranty. The improper adjustment of the product might cause engine damage.

This product does not have a certification for the use on aircrafts or any flying devices, as it has not been designed for such use purpose. In some countries where an annual inspection of vehicles is enforced, no modification in the original fuel injection system is permitted. Be informed about local laws and regulations prior to the product installation.



Important warnings for the proper installation of this product:

- *Always cut the unused parts of cables off – NEVER roll up the excess as it becomes an interference capturing antenna and it can result on equipment malfunction.*
- *The black wire in the cable MUST be connected directly to the battery's negative terminal, as well as each one of the sensors' ground wires.*
- *The black/white wire MUST be connected directly to the engine block or head. By doing so, many interference problems are avoided.*
- *To prevent possible samage to the module install the 4 mounts that come with the product.*

Limited warranty

All products manufactured by FUELTECH are warranted to be free from defects in material and workmanship for one year following the date of original purchase. Warranty claim must be made by original owner with proof of purchase from authorized reseller. This warranty does not include sensors or other products that FUELTECH carries but did not manufacture. If a product is found defective, such products will, at FUELTECH's option, be replaced or repaired at cost to FUELTECH. All products alleged by Purchaser to be defective must be returned to FUELTECH, postage prepaid, within one year warranty period.

This limited warranty does not cover labor or other costs or expenses incidental to the repair and/or replacement of products or parts. This limited warranty does not apply to any product which has been subject to misuse, mishandling, misapplication, neglect (including but not limited to improper maintenance), accident, improper installation, tampered seal, modification (including but not limited to use of unauthorized parts or attachments), or adjustment or repair performed by anyone other than FUELTECH.

The parties hereto expressly agree that the purchaser's sole and exclusive remedy against FUELTECH shall be for the repair or replacement of the defective product as provided in this limited warranty. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as FUELTECH is willing and able to repair or replace defective goods.

FUELTECH reserves the right to request additional information such as, but not limited to, tune up and log files in order to evaluate a claim.

Seal violation voids warranty and renders loss of access to upgrade releases.

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4. Installation

For the installation, the electric cable must be disconnected from the module and the vehicle's battery. It is very important that the cable length is the shortest possible and that exceeding unused parts of wires are cut off. Never roll up the excess of any wire in the cable; by doing so, interference problems, which are very usual with any electronic device, are avoided.

The electric cable must be protected from contact with sharp parts on the vehicle's body that might damage the wires and cause short circuit. Be particularly attentive to wires passing through holes, and use rubber protectors or any other kind of protective material to prevent any damage to the wires. At the engine compartment, pass the wires through places where they will not be subject to excessive heat and will not obstruct any mobile parts in the engine. Always, when possible, use plastic insulation on cables.

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4.1 Electrical wiring connections

Wire color	Pin	Connection	Note
Red	3	Switched 12V supply	Connect this wire to the same 12V supply of the fuel injectors that will be controlled
Black/ White	8	Chassis / Block ground	Must be directly connected to chassis ground; Cannot be wired together with signal ground from the ECU
Blue	Channel 1 - 4 Channel 2 - 2 Channel 3 - 5 Channel 4 - 1	Injectors trigger input	Connected to fuel injectors output from EFI
Purple	Channel 1 - 9 Channel 2 - 7 Channel 3 - 10 Channel 4 - 6	Signal output - Negative pulse to fuel injectors	Important information below

The Peak and Hold Module is available in three versions. Below is a brief description about each model:

Peak and Hold 2A/0.5A:

Each output can drive one fuel injector with impedance above 3Ω (Injector Bosch 160lb/h).

It is possible to use as many outputs as necessary without compromising the other outputs; the module can control from 1 up to 4 fuel injectors.

Peak and Hold 4A/1A:

Each output can drive one fuel injector with impedance between 1Ω and 3Ω (Rochester mono-point and multi-point, MSD, Siemens and some factory injectors of some cars).

It is possible to use two fuel injectors with impedance above 3Ω connected in parallel on each channel. Using this module, up to 8 fuel injectors can be controlled.

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WARNING: Precision 550lb/h, Moran (all) and Billet Atomizer (all) require 8A/2A Peak and Hold driver!

Peak and Hold 8A/2A:

Each channel in this Peak and Hold module version drives one fuel injector with impedance below 1Ω .

This module can be used to control up to 8 fuel injectors (2 in parallel per channel, impedance between 1Ω and 3Ω).

It is also possible to drive up to 16 fuel injectors (4 in parallel per channel, impedance above 3Ω). In this case, Bosch 160lb/h fuel injectors must be used.

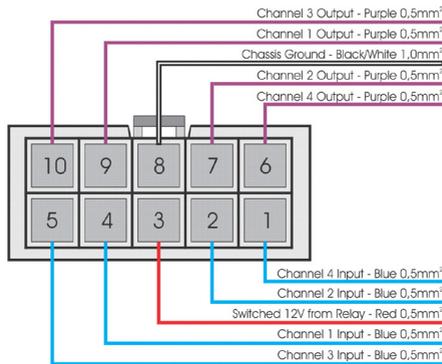
Peak and Hold 8A/2A can drive up to 4 Precision 550lb/h, Moran (all) or Billet Atomizer (all) injectors.

4.2 Controlling two or more fuel injectors per channel

The Peak and Hold modules 4A/1A and 8A/2A support the connection of more than one fuel injector per channel. To do so, it is important to follow some recommendations:

- Never connect fuel injectors with different impedance or of different models to the same output;
- The examples shown in chapter 5 can be used to connect high impedance fuel injectors.
- When connecting more than one fuel injector per channel, do it as shown in the diagrams in chapter 5. Do not change the number of fuel injectors per channel.

4.3 Electrical wiring diagram



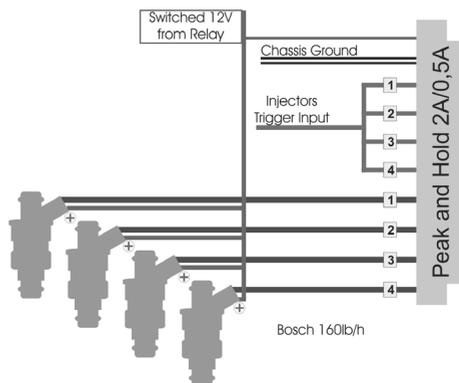
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5. Peak and Hold wiring examples

The examples below present some connection alternatives, but, when necessary, it is possible to use only one or two channels, leaving the other disconnected. 5-cylinder engines must use two Peak and Hold modules.

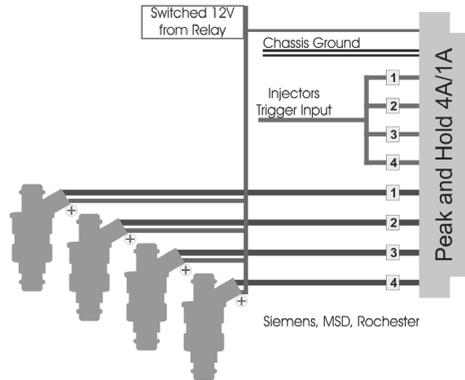
5.1 Peak and Hold 2A/0,5A – 4 Bosch 160lb/h injectors

In the example above, Bosch 160lb/h fuel injectors are used. Fuel injectors with impedance above 3 ohms (including high impedance fuel injectors) may be connected in the same manner.



5.2 Peak and Hold 4A/1A – 4 Siemens, MSD injectors

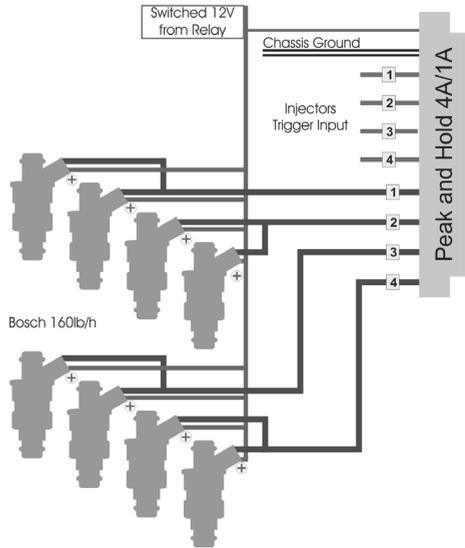
Wiring example of 4 fuel injectors with impedance between 1 and 3 ohms.



5.3 Peak and Hold 4A/1A – 6/8 Bosch 160lb/h injectors - (two injectors per channel)

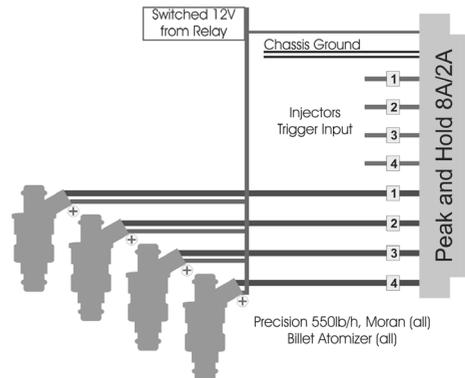
Control of 8 Bosch 160lb/h fuel injectors onto a Peak and Hold 4A/1A. The same wiring example can be used for fuel injectors with impedance above 3 ohms (including high impedance fuel injectors). In the example above, 4 fuel injectors are driven through Bank A and the other 4 are driven through Bank B. If necessary, it is possible to join all 4 Peak and Hold inputs to drive all the fuel injectors through one injection bank.

In 6-cylinder engines, it is possible to leave one Peak and Hold channel disconnected or use that channel to control supplementary fuel injectors through Bank B.



5.4 Peak and Hold 8A/2A – 4 Precision 550 lb/h, 4 Moran or 4 Billet Atomizer

These injectors are exceptions to the rule, as they have between 1 and 3 Ohms, but, must be connected using an 8A/2A Peak and Hold driver.



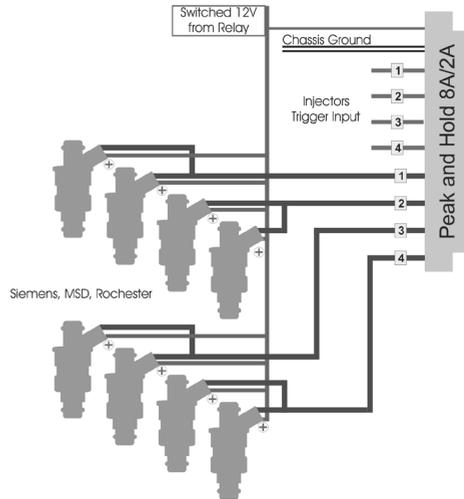
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5.5 Peak and Hold 8A/2A – 6/8 Siemens, MSD injectors - (two injectors per channel)

Connection of 8 fuel injectors (Siemens, MSD, Rochester) with a Peak and Hold 8A/2A. The same wiring example can be used for fuel injectors with impedance between 1 and 3 ohms and high impedance fuel injectors.

In the example above, 4 fuel injectors are controlled through Bank A and the other 4 are driven through Bank B. If necessary, it is possible to join all 4 Peak and Hold inputs to drive all the fuel injectors through one injection bank.

In 6-cylinder engines, it is possible to leave one Peak and Hold channel disconnected or use that channel to drive supplementary fuel injectors through Bank B.



5.6 Peak and Hold 8A/2A – 8/16 Bosch 160lb/h Injectors - (four injectors per channel)

In the example above, a Peak and Hold 8A/2A and Bosch 160lb/h fuel injectors are used. Fuel injectors with impedance above 3 ohms (including high impedance fuel injectors) may be connected in the same manner.

Observe that two channels are disconnected, but, if necessary, these channels can be used with an additional 4 fuel injectors connected to each one of them, controlled through any injection bank.

