

FuelTech



OWNER'S MANUAL

FTSPARK

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2. Presentation

FTSPARK is a high energy capacitive ignition module that meets the highest levels of spark energy demand, being able to generate a spark with up to 600mJ (mJ=mili Joules) of energy and capable of firing sparks with 125 Amps of current in the primary coil. With these features, the FTSPARK generates a spark with approximately 5 times more energy and 10 times more current compared to a SparkPRO, ensuring a complete combustion in any condition, especially in extremely rich air fuel ratios.

FTSPARK Differentials:

- Compatible with rotary engines;
- Spark energy level adjustment between 400 mJ and 600 mJ through CAN network or analog input;
- High primary coil current of 230 Amps using MSD HVC2 coil or 125 Amps with FuelTech CDI Racing coil;
- CAN communication with FuelTech Power FT product line, for diagnostics and data logging;
- Anodized aluminum housing;
- Automotive connector with gold-plated terminals;
- Serial bus (1 wire) allows the use of only one ECU output to trigger all FTSPARK ignition outputs;
- 430V primary coil voltage, helping prevent electromagnetic interference;

3. Warranty terms

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

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

The oversight of any of the warnings or precautions described in this manual can cause engine damage and lead to warranty void of this product warranty.

Before starting any electrical installation, disconnect the battery.

This product is not certified for aeronautic purposes or any flying vehicles, as it has not been designed for such applications.

In some countries where an annual inspection of vehicles is enforced, no modification in the OEM ECU is permitted. Be informed about local laws and regulations prior to the product installation.



Important warning for proper installation of this product:

Always remove and insulate unused wires. NEVER roll up excess wiring as this may create an antenna that captures electromagnetic interference that may generate product malfunction.

Limited Warranty

This product warranty is limited to one year from the purchase date, only covering manufacturing defects and requiring purchase invoice presentation.

Damages caused by misuse of the unit are not covered by the warranty.

Warranty void analysis is done exclusively by FuelTech technical support team.



WARNING:

Warranty seal violation results in product warranty void.

4. Characteristics

- Dimensions: 4.92 x 6.0 x 1.9 in.;
- Weight: 32.8 oz;
- Body: Anodized aluminum and plastic;
- Maximum operating time with minimum power 400mJ: limited by the maximum operating temperature;
- Voltage supply required for full power: 14-19V. minimum voltage during cranking 8V;
- Maximum operating frequency: 670 Hz;
- Maximum Current Consumption:
 - FTSPARK-1 (1 coil): 20A / 30A / 40A to 4, 6 ,8 cylinders @ 10000rpm
 - FTSPARK-4 (4 coils): 20A @ 10000RPM
 - FTSPARK-6 (6 coils): 30A @ 10000RPM
 - FTSPARK-8 (8 coils): 40A @ 10000RPM

Wiring Harness

- FTSPARK-1 (1 coil): 14 wires
- FTSPARK-4 (4 coils): 23 wires
- FTSPARK-6 (6 coils): 29 wires
- FTSPARK-8 (8 coils): 35 wires

Wire harness length: 59 in. at power outputs connected to coils and 118 in. at the other cables.

Maximum piston engine speed (with 16V battery)

Cylinders	Sequential	Wasted spark / 2 Stroke
4	22.500 RPM	11.250 RPM
5	15.000 RPM	NOT COMPATIBLE
6	15.000 RPM	NOT COMPATIBLE
8	11.250 RPM	NOT COMPATIBLE

Maximum rotary engine speed (with 16V battery)

Rotors	Rotary	Units
2	11.250 RPM	1 x FTSPARK-4
3	15.000 RPM	2 x FTSPARK-4
4	11.250 RPM	2 x FTSPARK-4

5. Installation

Capacitive ignition systems require special installation care for correct operation. The vehicle's electrical system suffers high current and voltage demand from the FTSPARK ignition system. It is essential to follow the installation instructions in this manual.

5.1 Mounting

Mounting must be done using the rubber cushions. Always use the 4 spots available on the FTSPARK body.

The FTSPARK must be installed as far away from heating sources as possible (such as turbochargers and exhaust manifolds) because it generates a lot of heat by itself.

If installed on the engine bay, it must be mounted where air flows best.



IMPORTANT

- ***Always connect the power supply harness directly to the battery with a 50A fuse.***
- ***Do not use the chassis or engine block to ground the FTSPARK. Use the negative battery terminal.***

5.2 Power supply

Never Invert the FTSPARK power connections.

The FTSPARK power supply, as well as all other electric loads of the car, must pass through the master switch for safety reasons and the master switch must NEVER interrupt the battery ground, always the hot terminal.

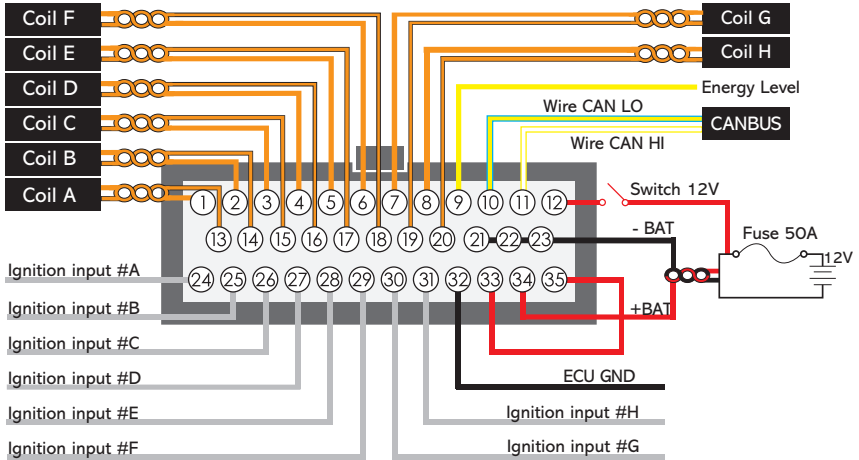
To turn the FTSPARK on and off use a 12V switch connected to the analog input on pin 12.

Do not connect the FTSPARK to a voltage booster, it demands current peaks of more than 100A and will cause the system to malfunction. Do not use the The FTSPARK on systems with over 20V power supply. Do not use FTSPARK on systems with power supply voltage over 20V.

5.3 Harness connections table

Pin	Wire	Tape	Function
1	Orange	COIL A (+)	Coil primary output. High voltage (Positive side)
2	Orange	COIL B (+)	
3	Orange	COIL C (+)	
4	Orange	COIL D (+)	
5	Orange	COIL E (+)	
6	Orange	COIL F (+)	
7	Orange	COIL G (+)	
8	Orange	COIL H (+)	
9	Yellow	Energy level	Energy level selection; (ground trigger) NOTE: If the FTSPARK is connected via the CAN network, it is not necessary to connect the pin.
10	Yellow/Blue	--	Wiring harness CANBUS CAN LOW
11	Yellow/White	--	Wiring harness CANBUS CAN HI
12	Red	Switched 12V	FTSPARK Switch ON/OFF
13	Orange/Black	COIL A (-)	Coil primary output. Wire 750V. Twisted. (Power ground side)
14	Orange/Black	COIL B (-)	
15	Orange/Black	COIL C (-)	
16	Orange/Black	COIL D (-)	
17	Orange/Black	COIL E (-)	
18	Orange/Black	COIL F (-)	
19	Orange/Black	COIL G (-)	
20	Orange/Black	COIL H (-)	
21	Black	-BAT	Power ground and leave Power Supply to positive wires
22	Black	-BAT	
23	Black	-BAT	
24	Gray	Ignition Input A	Ignition trigger input A or Serial bus (1 wire)
25	Gray	Ignition Input B	Ignition trigger input B
26	Gray	Ignition Input C	Ignition trigger input C
27	Gray	Ignition Input D	Ignition trigger input D
28	Gray	Ignition Input E	Ignition trigger input E
29	Gray	Ignition Input F	Ignition trigger input F
30	Gray	Ignition Input G	Ignition trigger input G
31	Gray	Ignition Input H	Ignition trigger input H
32	Black	GND to ECU	Grounding to battery. Trigger signal reference

33	Red	+BAT	Power supply for FTSPARK. Connect on battery positive or when main switch required.
34	Red	+BAT	
35	Red	+BAT	



Harness Connector Diagram



Main connector rear view displaying the pin numbers.

Specification of electrical wires

Function	Color / Wire Gauge
Ignition output (COILS)	Orange AWG 16 (1.5mm ²) isolation 750V
Ground ignition (COILS)	Orange/Black AWG 16 (1.5mm ²) isolation 750V
- BAT	Black AWG 16 (1.5mm ²) Isolation 300V
+ BAT	Red AWG 16 (1.5mm ²) Isolation 300V
Ignition input	Gray AWG 20 (0.5mm ²) Isolation 300V
Energy level	Yellow AWG 20 (0.5mm ²) Isolation 300V
12V	Red AWG 20 (0.5mm ²) Isolation 300V
ECU GND	Black AWG 20 (0.5mm ²) Isolation 300V

OBS: FTSPARK-1

The coil outputs #1 to #4 must be connected to AWG 3 (17.0mm²) gauge wire

5.4 Wiring harness installation

The main connector terminals must be crimped with appropriate pliers. Never solder terminals. Additional metal will cause electrical insulation problems inside the connector.

Plan the installation to avoid wiring joints on the wiring harness. If this is unavoidable, the twisted wires should continue to be braided in the extended part. Power outputs connected to the primary coil must use wires with a minimum 750V insulation.

5.5 Wiring Harness positioning

Never route the output cables that connect the coils (59 in. twisted orange cables) together with the other FTSPARK wires or other electrical wiring in the vehicle. The output cables that connect to the coils may induce a high amount of current in surrounding wires, which can cause malfunction in other systems of the vehicle and even damage inputs and outputs of other modules.

It's recommended to keep a distance of at least 4" between the ignition coils wiring and all other wiring harness parts. If this can't be done, the wiring should be covered with braided steel wiring sleeve.

5.6 Coils

Use only coils that are approved and tested by FuelTech. The vast majority of coils designed for inductive operation greatly reduces the performance of the FTSPARK. A good inductive coil is not guaranteed of similar performance when used with the FTSPARK.

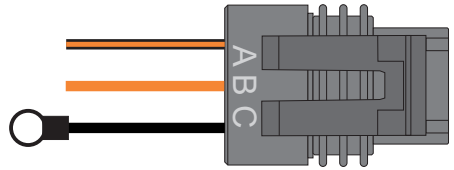
Some coils developed for use with OEM CDIs (nautical or motorcycle use) may damage the CDI because it can not absorb the peak power sent by FTSPARK.

Below is the list of coils recommended by FuelTech.

Model	Manufacturer
MSD-8232 CPC	MSD
MSD HVC2 (8261)	MSD
CDI Racing Coil	FuelTech

Racing CDI FuelTech and MSD-8232 coil wiring diagram

- A - Orange/Black wire (GND from FTSPARK);
- B - Orange wire (+12 pulse from FTSPARK);
- C - Coil GND (comes from MSD with a ring terminal from factory);



IMPORTANT

The C pin ring terminal must be bolted on the cylinder head as close as possible to the spark plug that it's going to fire.

5.7 Spark plug wires

Do not use spark plug wires without suppression or cables with suppressor terminals only. Use of RFI (radio frequency interference) spark plugs wire is required to ensure the proper operation of all electronic equipment on the vehicle.

Low resistance spark plug wires with suppressive characteristics are recommended.

5.8 Spark plugs

Using non-resistive spark plugs greatly increases spark energy with capacitive ignitions, however not all installations will function properly depending on the level of interference generated. In these cases using resistive spark plugs is mandatory.

Keep the spark plugs clean and free of oil or grease to prevent electrical insulation problems.

Spark plugs that do not allow GAP adjustment or surface discharge are designed for use only in naturally aspirated engines. For turbocharged engines keep the spark plug GAP always less than 0.02 in.



WARNING

Faults in the ignition system due to excessive GAP damage the coils and also FTSPARK. When the energy released by the ignition cannot find a path to be dissipated, it returns to the coil or to the output of the FTSPARK output.

6. FTSPARK control

FTSPARK has two operation modes. Individual triggering (using two or more ignition outputs) or through Serial bus (1 wire).

6.1 Individual triggering

For the Power FT product line, it is necessary to enable the FTSPARK option and select multiple outputs in the ignition settings. For older modules, it's necessary to select SparkPRO/3 wires option with a dwell time of 3 ms. Longer or shorter times may cause abnormal operation. The recommended voltage on input signals is 0V to low level and 5-14V to high level. Use ECU NEGATIVE (pin 32) connected to the sensor ground output of FT600 or battery negative in other situations as a reference for these triggering signals.

6.2 Serial bus triggering

In this mode, FTSPARK operates using signals present in IGNITION INPUT A only. This mode allows more outputs to be used in other features and reduces the quantity of harness wires. This mode is only available when the FTSPARK is connected to an ECU of the Power FT product line.



NOTES

- This serial protocol is not compatible with any other ECU, it's a FuelTech exclusive compatibility.
- The serial bus triggering can **NOT** be used for rotary engines.

6.3 Input signal trigger edge

All the FTSPARK units are designed to receive FALLING TRIGGER EDGE signal from the EFI, make sure you have your EFI settings for ignition output signal as falling edge to assure accurate ignition timing.

FTSPARK-1 with distributor has also the default of FALLING TRIGGER EDGE but in case of this unit being installed in conjunction with other EFI or timing controls which only can trigger the ignition box by RISING TRIGGER EDGE, the Ignition Input #B can be used instead of the Ignition Input #A

FTSPARK-1 only:

Use Ignition Input #A for FALLING TRIGGERED EDGE signal or

Use Ignition Input #B for RISING TRIGGERED EDGE signal



IMPORTANT

It is necessary to unlock the FTSPARK connector lock to pull the gray wire #24 and relocate it to #25 when using an unterminated blank harness without all the wires.

6.4 CAN network

The CAN network allows the ECU to select the energy level without the use of the energy level selection wire.

In addition, FTSPARK is capable of generating a series of CAN network diagnostics that are recorded by the ECU (FuelTech FT500 or higher).

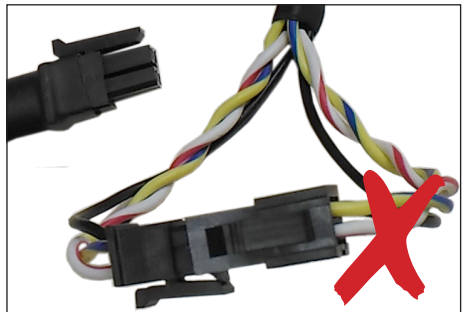
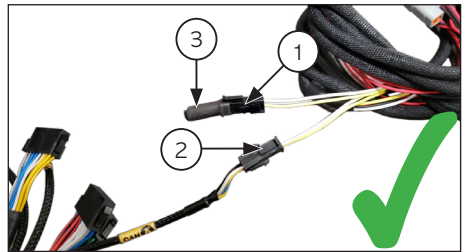
CAN Network connection

FTSPARK harness has 2 connectors for CAN network connection with FuelTech products.

- 1 - Female connector
- 2 - Male connector
- 3 - CAN terminator

Plug the male connector from the FTSPARK harness (2) to the female connector on the back of the ECU. In case you have other products that are already connected to the CAN network (WB-O2 Nano, for instance), then connect the male connector from FTSPARK to the female connector from the WB-O2 Nano. It may be necessary to remove the CAN terminator from the WB-O2 Nano harness.

The CAN terminator (3) must remain plugged to the female connector of the last equipment on the network. This helps to prevent noise on the CAN network.



Male connector from the FTSPARK (1) MUST NOT be plugged to the female connector on the same harness. CAN communication will work properly with this connection.

**WARNING**

When the CAN network is disconnected, the user loses the option of selecting the energy level through the MAP and visualizing all the diagnostics and measures that the ignition module is capable of performing.

Through the diagnostic panel it's possible to identify if the FTSPARK is connected. If it's not connected, product will operate normally (with energy set by the energy setting wire).

6.5 Energy level selection

Energy level may be selected by two ways: ENERGY LEVEL input ground trigger (pin 9, yellow cable), or through CAN network (values are set in the ECU's ignition energy table).

**IMPORTANT**

In order to run on 600mJ of energy when not connected to a FuelTech ECU through CAN network, the Energy level selection wire (pin #9 - yellow wire) must be connected to the battery negative.

If this wire is not connected, the FTSPARK will run on 400mJ only.

Operation without CAN network

Select energy level through ENERGY LEVEL input:

- 400 mJ: Do not connect ENERGY LEVEL input.
- 600 mJ: ENERGY LEVEL input must be connected to a ground or auxiliary output.

Operation with CAN network

When the CAN network is connected to a FuelTech ECU, the ENERGY LEVEL input is ignored and the energy level is set by the ECU via CAN.

**WARNING**

If the maximum internal operation temperature is exceeded, the FTSPARK thermal protection reduces power output to prevent hardware damage, regardless of user programming, which may cause abnormal ignition.

6.6 Wasted spark operation

The FTSPARK has 2 banks of capacitors that are alternately connected at the outputs. The first bank of capacitors fires the “odd” outputs, which are designated A, C, E and G, and the second bank fires the “even” outputs, designated B, D, F and H.

To obtain the maximum performance, the installation must always consider the sparks alternating the use of the capacitor banks, that is, 1 spark on one “odd” bank and the next on one “even” bank, and so on.

Doing so will allow the operation on rotary engines (which has the sparks timed very close to each other) and wasted spark on engines with up to 4 cylinders.



IMPORTANT

Only engines with 4 cylinders or less can use the wasted spark configuration. Engines with 5 to 8 cylinders must use sequential ignition.

6.7 Safety Features

The FTSPARK has many internal safety protections to avoid damage to the product in case of misuse or improper installation.

Every failure is automatically reset, that is, if the error is gone, the FTSPARK resumes operation normally.

Some protections require special attention.

The errors 41 and 43, which are related to a failure to charge the internal capacitors, prevent the FTSPARK from functioning if they occur 10 consecutive times. Normal operation is resumed when the error trigger signal is absent. Removing the power is not needed.

The error 22, related to operation while overheated, has 2 stages of protection. If the temperature is above 203 F, but less than 212 F, the energy is reduced to 400mJ, regardless of map table or external command. If the temperature goes beyond 212 F, a rev limiter of 3500 RPM is activated and remains until the temperature drops below 212 F.

6.8 Ignition delay time

The FTSPARK has a pre defined "Ignition delay" between processing the input signal and firing the ignition of 30uS (0.000030 second) that should be added to the existing ignition delay time set on the ECU when switching from another ignition system that has close to zero delay.

Typical ignition delay time of a complete ECU, ignition system, coil and spark wires are 70uS.

To confirm this setting on your system, lock the ignition timing advance to a fixed timing and check with a timing light that you have no timing change over the RPM range from idling to high RPM, this means that your "ignition delay" was set correctly.

If you experience timing being retarded over RPM, you need to increase the "ignition delay".

As a reference number, on a sequential ignition setup with locked timing on ECU, if you are checking timing at 1,000 RPM and then at 9,000 RPM and timing is retarding 1 degrees over this range, you will need to add 20uS to the "ignition delay" on the ECU.

7. Recalibrating ignition and fuel map

The additional energy generated and precise ignition timing (related to short spark duration), generally require ignition map to be recalibrate when FTSPARK is installed to replace an inductive system.

The additional spark energy allows the engine to operate with richer mixtures before failure or loss of power. It's possible to take advantage of this and operate with a richer fuel map for the same power level, putting the engine in a safer range of operation avoiding all the problems that might occur when running with a lean mixture.

8. LED operation indicator

FTSPARK has a LED that allows to diagnose its basic operation. It's possible states are listed in the table below.

State	Diagnose
Off	No power input switched 12V
Lit Green	FTSPARK is on, no errors, waiting triggering pulses
Blinking Green	Triggering pulses on input, no errors, operating with standard energy (400mJ)
Blinking Orange	Triggering pulses input, no errors, operating with maximum energy (600mJ)
Fast/slow blinking Red	Failure detected. Displaying error code.

The FTSPARK can report a two-digit error code on the diagnostic LED. Slow blinks indicate the tens, dozens quick blinks indicate the unit. Example: 4 slow blinks followed 3 quick blinks. Error code 43.

Following is the list of errors currently reported by the FTSPARK.

Error Code	Diagnose	Solution
21	ECU is operating on wasted spark with wrong firing order.	When activating two outputs simultaneously, it's mandatory to trigger one even and one odd channel. Example: AB, CD, EF, GH. * A = 1 B = 2 C = 3 ... H = 8
22	FTSPARK has overheated	Increase the airflow around FTSPARK or turn it off so it can cool down to its normal operating temperature.
23	RPM trigger and Cam sync problem on FTSPARK-8 NON-EFI. The ignition signal (to B input) of 8 triggers or the cam sync signal (to C input) every 2 crank revolutions were not matching properly or the cam sync position is misaligned.	If this problem happened during an ignition limiter, please refer to the ignition timing controller unit instructions manual about how to set the ignition rev limiter as Legacy mode on MSD products or SmartDrop on Davis Profiler product and make sure it is running to the D input of the FTSPARK. If the problem happened during normal operation, revise the cam sync position.
31	Off Power Supply	Check the power supply circuit the FTSPARK, relays and fuses.
41	Hardware error. Over voltage on internal capacitors.	Contact FuelTech.
42	Hardware error. Internal voltage below minimum. FTSPARK switches off during this fault condition.	It may be caused by a power failure on FTSPARK or discharged battery.
43	Hardware error. FTSPARK can not charge the capacitors.	Probable output failure. Contact FuelTech.
44	Hardware error. FTSPARK has internal protection fuse ruptured	This fuse is not accessible and can not be replaced by the user. Contact FuelTech.

9. FTSPARK settings and operation

9.1 FTSPARK settings

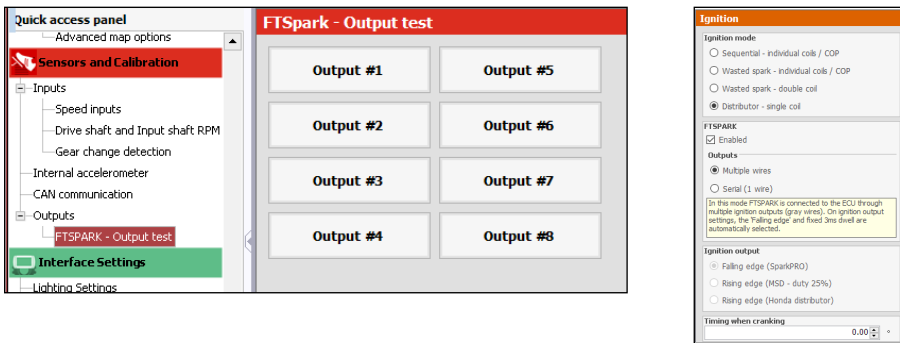
Through FTManager it's possible to configure the FTSPARK, to do so go to 'Engine Settings' then 'Ignition'.

Set FTSPARK to 'Enabled' then select the output.

Multiple wires: This mode will activate individual coil outputs.

Serial bus (1 wire): In this mode the connection with the FTSPARK is made on the IGNITION INPUT A (gray wire #1). All of the ignition signals will be sent through this connection.

When the multiplexed output is selected, it's possible to test the FTSPARK outputs using a "test function" on the FTManager. To do so, go to 'Sensors and Calibration' then 'Outputs' and select FTSPARK - Output test.



9.2 Ignition energy

On this MAPxRPM table it's possible to set the energy level of the FTSPARK.



9.3 Setup on piston engines with sequential ignition

Setup on engines with distributor

FTSPARK-1: Only output A is connected to the coil.

Setup sequential on engines with individual coils.

4 cylinders - FTSPARK-4	
Output	Cylinder
A	01
B	02
C	03
D	04

5 cylinders - FTSPARK-6	
Output	Cylinder
A	01
B	02
C	03
D	04
E	05
F	Not used

8 cylinders - FTSPARK-8	
Output	Cylinder
A	01
B	02
C	03
D	04
E	05
F	06
G	07
H	08

6 cylinders - FTSPARK-6	
Output	Cylinder
A	01
B	02
C	03
D	04
E	05
F	06

Setup wasted spark on engines with 4 cylinders

VW (1-3-4-2) / motorcycles (1-2-4-3)	
Output	Cylinder
A	01
B	04
C	03
D	02

FT (1-2-3-4) / VW Aircooled (1-4-3-2)	
Output	Cylinder
A	01
B	03
C	02
D	04

Subaru (1-3-2-4)	
Output	Cylinder
A	01
B	02
C	03
D	04

Setup on ROTARY engines.

The order must be altered so that the Leading and Trailing outputs of the same rotor are placed in sequence, as shown in the table below.



WARNING
The setup on the following table is mandatory on a ROTARY engine, because the “Trailing” and “Leading” coils will fire practically at the same time and they must be on different capacitor banks to ensure the maximum energy available.

2 rotors - FTSPARK-4	
Output	Rotor
A - UNIT #1	Leading rotor 1 (L1)
B - UNIT #1	Trailing rotor 1 (T1)
C - UNIT #1	Leading rotor 2 (L2)
D - UNIT #1	Trailing rotor 2 (T2)



NOTE
Engines with 3 and 4 rotors require two FTSPARK. In this configuration the information recorded by the Internal Datalogger will come from one of the FTSPARKs only.

3 rotors - 2 X FTSPARK-4	
Output	Rotor
A - UNIT #1	Leading rotor 1 (L1)
B - UNIT #1	Leading rotor 2 (L2)
C - UNIT #1	Leading rotor 3 (L3)
D - UNIT #1	-
A - UNIT #2	Trailing rotor 1 (T1)
B - UNIT #2	Trailing rotor 2 (T2)
C - UNIT #2	Trailing rotor 3 (T3)
D - UNIT #2	-

4 rotors - 2 X FTSPARK-4	
Output	Rotor
A - UNIT #1	Leading rotor 1 (L1)
B - UNIT #1	Leading rotor 2 (L2)
C - UNIT #1	Leading rotor 3 (L3)
D - UNIT #1	Leading rotor 4 (L4)
A - UNIT #2	Trailing rotor 1 (T1)
B - UNIT #2	Trailing rotor 2 (T2)
C - UNIT #2	Trailing rotor 3 (T3)
D - UNIT #2	Trailing rotor 4 (T4)

9.4 Datalogger channels

Discharge time: Each output has an individual monitoring channel for the discharging time on the coil, which allows to diagnose malfunctions on the coils, channels or harness. The discharge time of the capacitor is not related to spark time, a long discharge might indicate problems on the coil or harness and connector.

Supply voltage: shows the effective power received by the FTSPARK.

Supply voltage drop: shows the difference of the voltage supply between the FTSPARK and the ECU. In case this value is too high, there might be a problem on the power harness of the FTSPARK.

Capacitor voltage 1 and 2: FTSPARK has two banks of capacitors that are charged and discharged alternately on the outputs, allowing higher engine rotations and operation on ROTARY engines, the first bank of capacitors fires the outputs A-C-E-G and the second bank fires the outputs B-D-F-H.

Capacitor charge time 1 and 2: The monitoring of the charging time allows the diagnostic of a possible internal problem on the FTSPARK, power deficiency or RPM limit settings where the required charging time cannot be respected.

<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #1	63 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #2	64 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #3	61 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #4	67 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #5	58 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #6	75 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #7	58 us
<input checked="" type="checkbox"/>	FTSPARK - Discharge time output #8	72 us
<input checked="" type="checkbox"/>	FTSPARK - Supply voltage	16.283 V
<input checked="" type="checkbox"/>	FTSPARK - Supply voltage drop	0.000 V
<input checked="" type="checkbox"/>	FTSPARK - Ignition energy	610 mJ
<input checked="" type="checkbox"/>	FTSPARK - Internal temperature	20.0 °F
<input checked="" type="checkbox"/>	FTSPARK - #1 capacitor voltage	423.0 V
<input checked="" type="checkbox"/>	FTSPARK - #2 capacitor voltage	423.2 V
<input checked="" type="checkbox"/>	FTSPARK - #1 capacitor charge time	1189 us
<input checked="" type="checkbox"/>	FTSPARK - #2 capacitor charge time	1196 us

10. FTSPARK-8 NON-EFI:

The specific NON-EFI version is designed to convert a distributor type ignition system to distributor-less coil per cylinder keeping conventional control systems designed for distributor ignition control.

It distribute the spark to the 8 individual coils electronically instead of a mechanical distributor cap and rotor, by using a #1 cylinder reference as cam sync. Usually installed in replacement of the actual distributor being replaced. This signal have to come between 50 degrees and 70 degrees BTDC of cylinder #1 to reference the firing order.

The firing order must be taken in consideration to wire the coils being coil A as cylinder #1 then the following coils will be in firing order of your engine, check the table below for appropriate firing order wiring instructions:



NOTE

When using the FTSPARK with an MSD Grid, select the "Legacy output" for ignition cut. In this case, Network ignition mode must not be used.

Firing order to FTSPARK-8 NON EFI

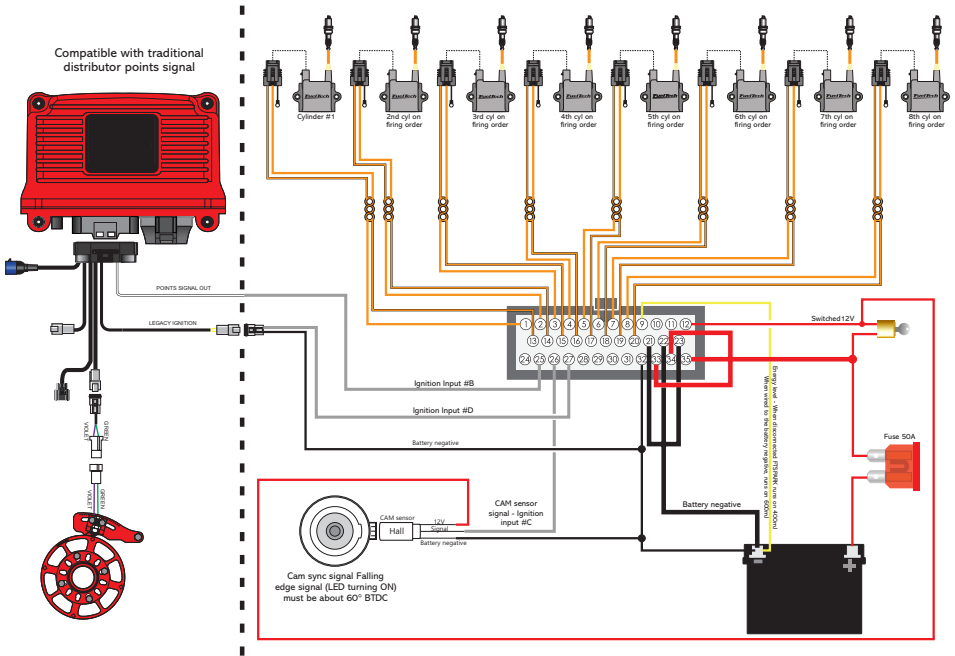
Chevrolet V8 (majority) SBC/BBC, Chrysler Big Block/HEM, Modern HEMI								
COIL	A	B	C	D	E	F	G	H
Cylinder	#1	#8	#4	#3	#6	#5	#7	#2

Ford 302, 355, 390, 429, 460								
COIL	A	B	C	D	E	F	G	H
Cylinder	#1	#5	#4	#2	#6	#3	#7	#8

Ford 351, 400, Modular and Porsche 928								
COIL	A	B	C	D	E	F	G	H
Cylinder	#1	#3	#7	#2	#6	#5	#4	#8

Chevrolet LS								
COIL	A	B	C	D	E	F	G	H
Cylinder	#1	#8	#7	#2	#6	#5	#4	#3

Diagram to FTSPARK-8 NON EFI - MSD



WARNING

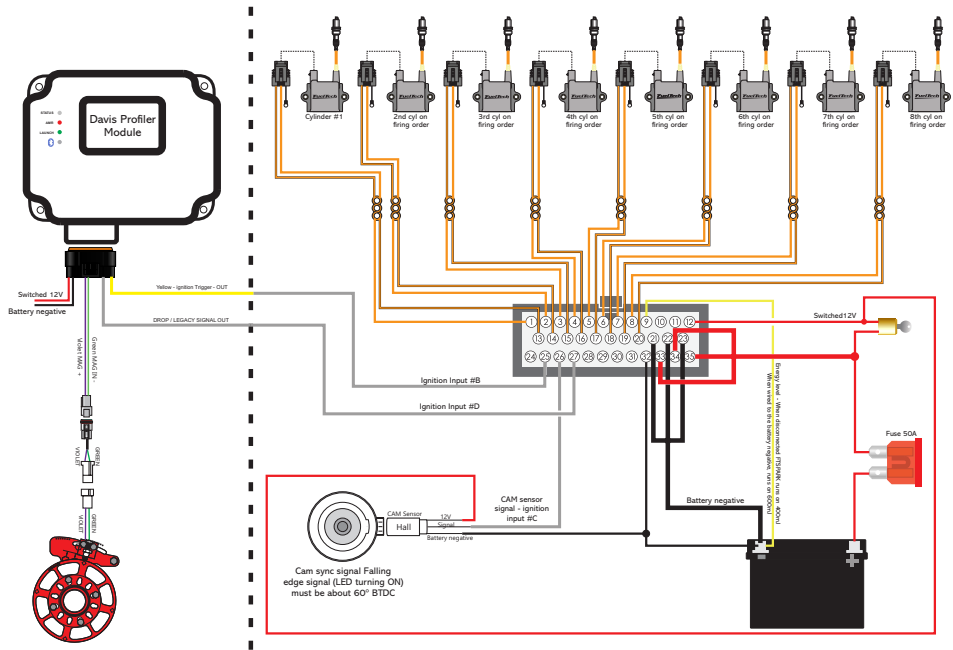
Ignition signal must contain all trigger pulses, should never receive a trigger signal cut from the device that is controlling ignition timing, the ignition cut must be exclusively through the Legacy ignition cut input on FTSPARK-8 NON-EFI at pin 27 by grounding when ignition cut is desired and open collector or 5/12v when no cut required.



IMPORTANT

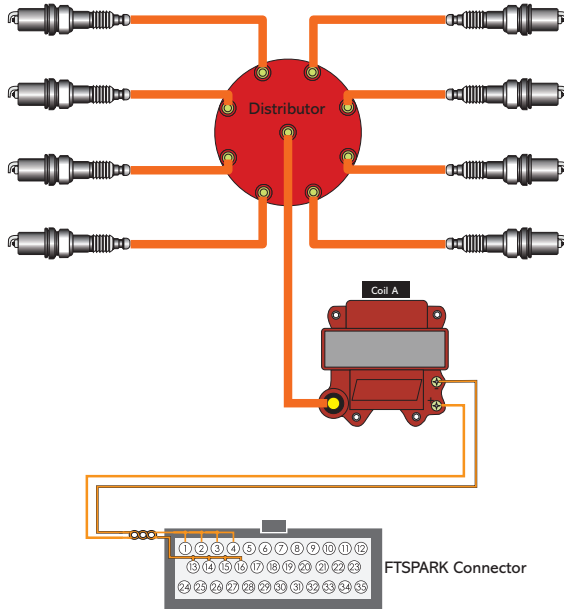
Any interruption on trigger signal or cam sync not being received every 8 trigger pulses will cause the unit to enter wrong trigger fail safe mode and will shut engine off to prevent wrong firing order.

Diagram to FTSPARK-8 NON EFI - DAVIS PROFILER

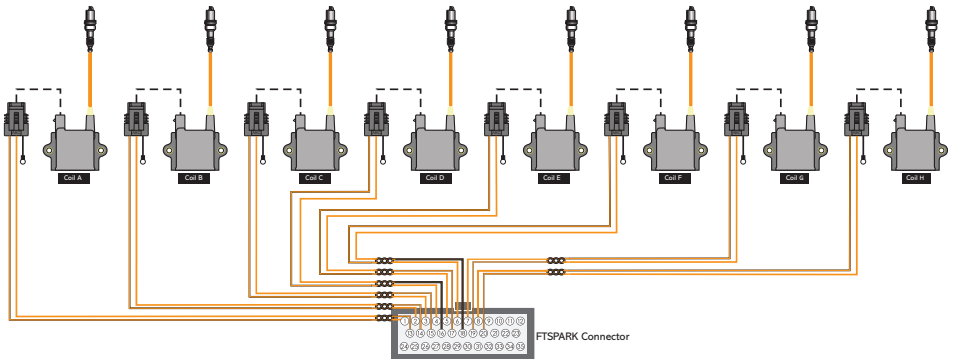


11. Diagrams

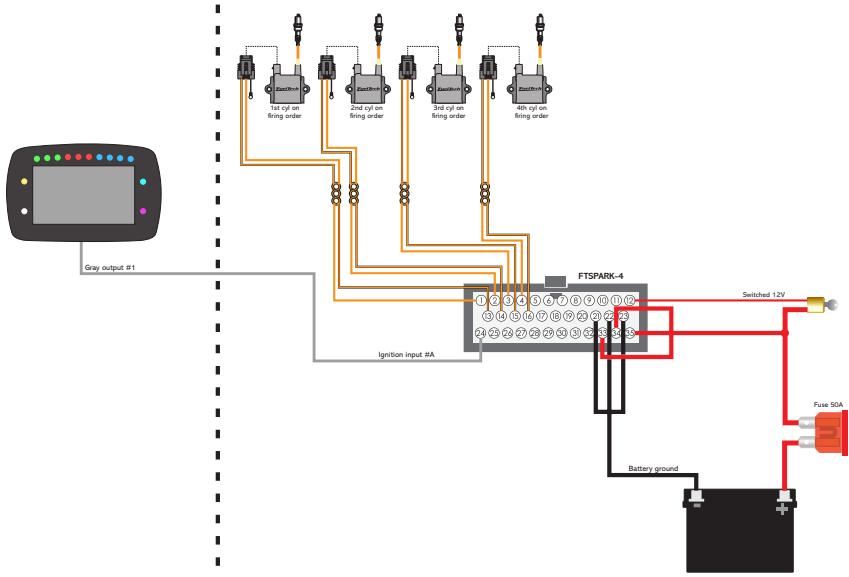
11.1 - MSD HVC2 (8261) Coil with distributor



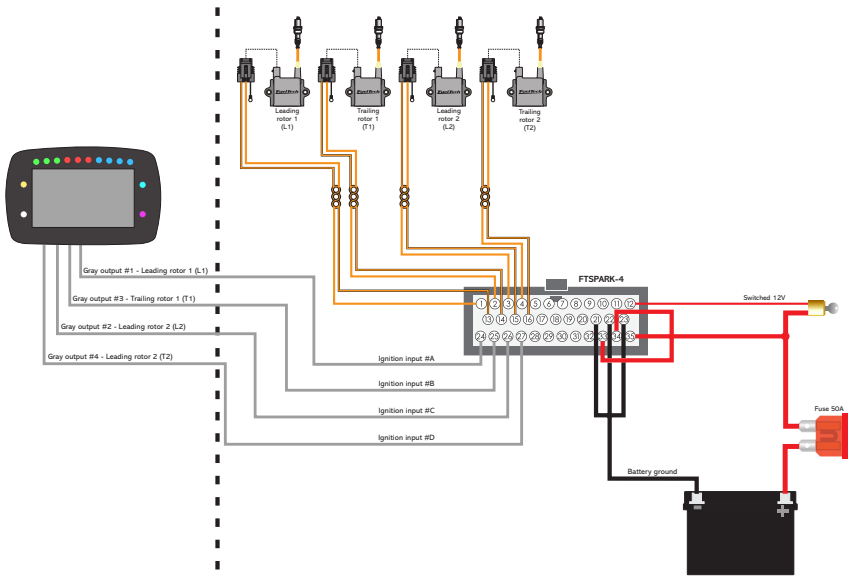
11.2 - FuelTech CDI Racing Coil



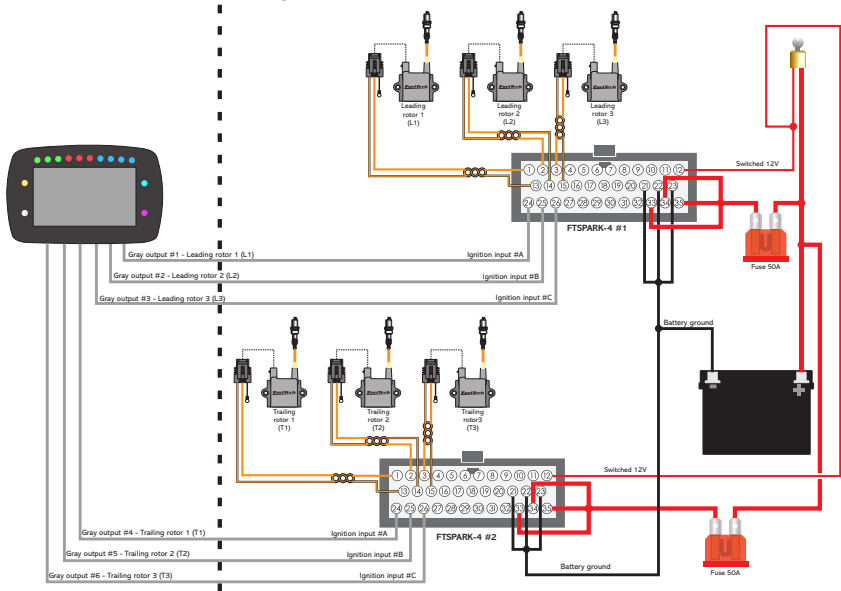
11.3 - Four Cylinder with serial bus connection (1wire - Power FT Only)



11.4 - Two Rotors with individual coils



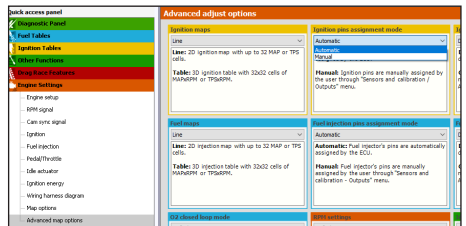
11.5 - Three Rotors using two FTSPARK-4



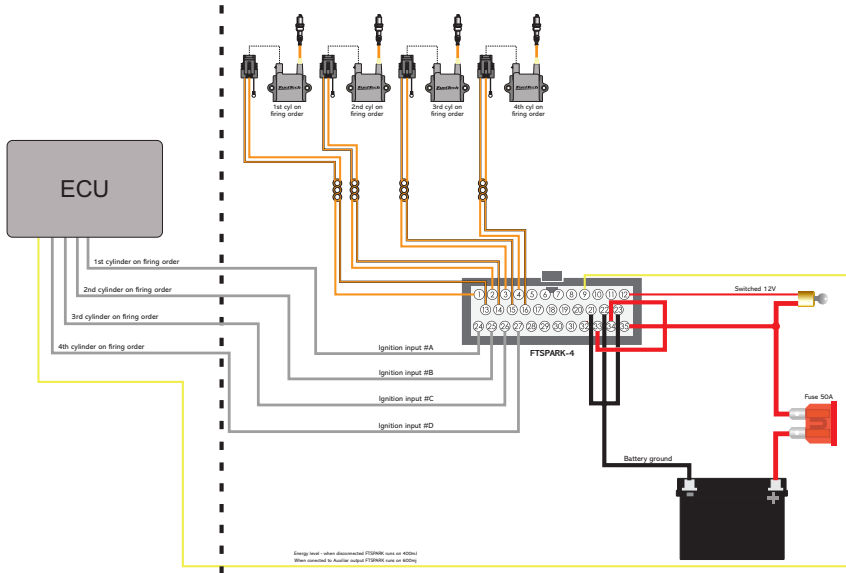
Ignition pins assignment

After FTSPARK installation, follow the steps below if changes on the ignition outputs are needed:

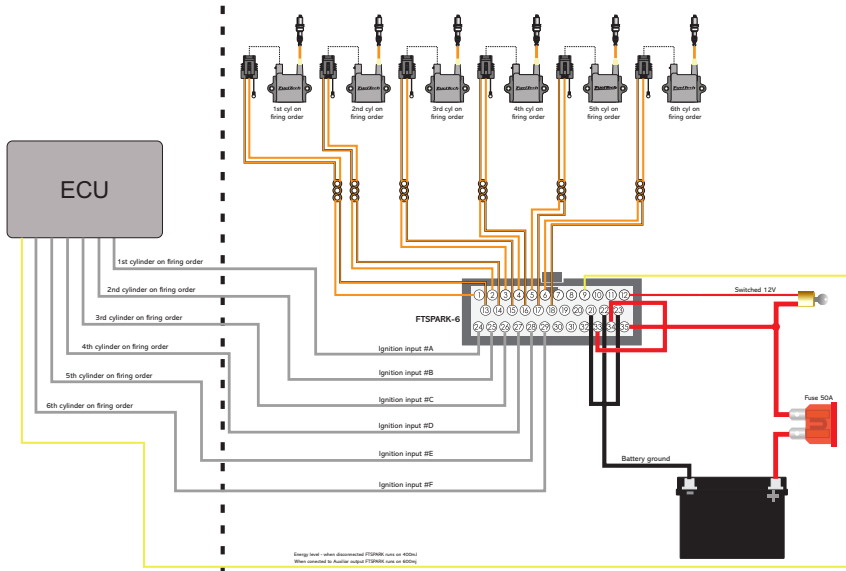
- 1 - Open the map on FTManager
- 2 - Click on “Sensors and calibration / Outputs”
- 3 - Check which gray outputs are set as ignition outputs. If you need to change output order, proceed to step 4
- 4 - Click on “Engine settings / Advanced map options”
- 5 - Click on “Ignition pins assignment mode and change it from “Automatic” to “Manual”
- 6 - Return to the “Sensors and calibration / outputs” menu and change the ignition outputs according to your installation

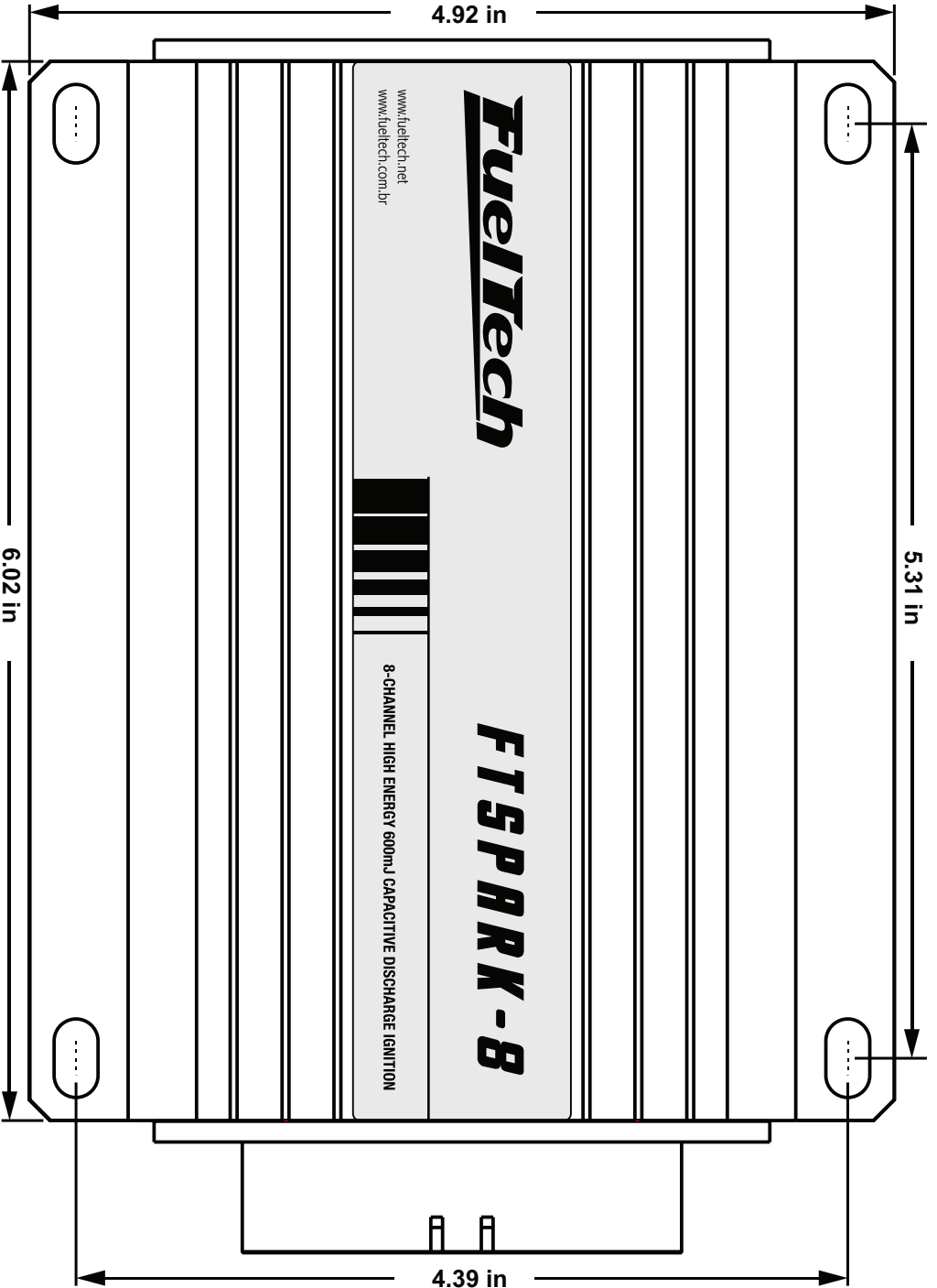


11.6 - FTSPARK-4 connection with third party ECU



11.7 - FTSPARK-6 connection with third party ECU





FuelTech

455 Wilbanks Dr.
Ball Ground, GA, 30107, USA

Phone: +1 678-493-3835
Toll Free: +1 855-595-3835

E-mail: info@FuelTech.net
www.FuelTech.net

 FuelTechUSA