

FuelTech



OWNER'S MANUAL

***LS470 V8
COMPLETE HARNESS***

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2. Presentation

The FuelTech LS Wiring Harness is the perfect link between the FuelTech FT470 VCU and all the sensors and actuators of an LS engine using FuelTech VisionFT software.

The harness has all the components needed to make a plug and play installation on a LS engine. It has all the relays and fuses needed for the system on a standard setup, a firewall grommet to hold and seal the harness and every connector has its own label. The insulation and connectors are humidity, heat and moisture resistant.

Specifications:

- 8 injector outputs EV1 (Jetronic/Minitimer)
- Coil outputs: The harness is ready for OEM LS3 coils
- Coils are setup on Wasted Spark mode
- FuelTech Peak and Hold Injector Driver external driver ready
- Connectors for 58x, 24x and external trigger (only one is used)
 - 24x sensor connector for SKU: 12560228 sensors
 - 58x sensor connector for SKU: 12585546 sensors
 - External crank trigger VR leads ready
- Connectors for both front and rear cam sync sensors (only one is used) - *CAM GEAR MUST BE SINGLE TOOTH ON 24X APPLICATIONS (USE LS2 STYLE GEAR: PN 12576407). In case of using the 58X crank trigger it is compatible with either single tooth or 4 tooth cam gear.
 - *Front cam sensor: AC Delco 12591720*
 - *Rear cam sensor: AC Delco 12561211*
- Connectors for stock electronic throttle body (88mm to 90mm) and pedal (drive by wire) and cable throttle (GM TPS – round 3-wire Connector)
- PEDAL: 2005 to 2013 Corvette style - GM 25835421
- TPS connector
 - *LS2 90mm - GM 12570790*
 - *LS7 90mm - GM 12605109*
 - *LSA/LS9 88mm - GM 12629992*
- Bosch wideband O2 sensor ready
- Stepper Motor IAC valve ready (original LS engine)
- GM Style intake air temperature sensor ready
- GM Style engine temperature sensor ready
- GM Style Flex Fuel sensor ready (sensor 5005100353 is sold separately)
- 2 pressure sensor ready for fuel and oil 0-5V sensor (FuelTech PS150 connector)
- 3x high output relays with fuses
- 2 extra connectors with 7 outputs for generic use
- Grommet for firewall (58 mm / 2.25")
- Dimensions (in package): 23.6" x 21.7"

3. Warnings and 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 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 tuning.

Before starting any electrical 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 products 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 vehicles, as it was not designed for such use or purpose.

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

Limited Warranty

All products manufactured by FUELTECH are warranted to be free from defects in material and workmanship for three months following the date of original purchase. Warranty claim must be made by original owner with proof of purchase from an 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 no cost. All products alleged by Purchaser to be defective must be returned to FUELTECH, postage prepaid, within the three-month 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 update releases.

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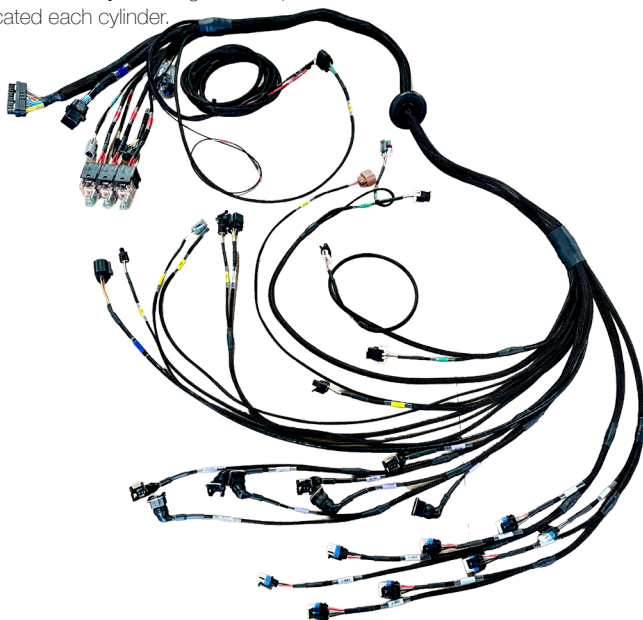
4. Overview

The FuelTech LS Wiring Harness is a complete plug n' play wiring solution to be used with a FuelTech FT470 VCU. It is designed for systems with 8 staged injectors and 8 individual LS3 coils. It is already wired for FuelTech Peak and Hold driver for setups utilizing low impedance injectors. When using high impedance injectors, Peak and Holds are not needed. In this case two jumper harness 2001009505 (sold separately) is required.

The harness is a single piece with a rubber grommet (hole 58 mm / 2.25"). You will find the connections to all the units, the wires for power supply (+12V to battery, ground and power ground to battery and switched +12V input), relays and fuses. Check below to see all of the connectors and where they are connected:

- **FuelTech FT470 main connector:** Direct connection to FT470
- **CAN A:** 2 way connector in the harness close to the VCU in order to allow CAN communication.
- **CAN B:** Deutsch connector in the harness close to the VCU to allow a second CAN communication with a different protocol. Usually CAN B is used to communicate with stock GM CAN or other equipments.
- **FuelTech Peak and Hold Injector Driver:** This is the driver box needed to fire low impedance injectors. When the system uses high impedance injectors, one jumper harnesses are required 2001009505 (sold separately). If the Peak and Hold PRO or the jumper wires are not being used, the injectors will not fire.

- **3x 40A Relay:** The system has 3 relays to power everything. The Main Relay powers the VCU and all the sensors. There's a second relay that powers the Peak and Hold driver and the injectors. Also, there's a third relay that powers the coils.
- **Switched +12V wire:** This wire comes from the ignition switch and it turns the main relay on.
- **Power ground, battery ground and battery positive:** These wires are the system power supply and must be connected exactly as the following: Battery (+) goes straight to the battery's positive or kill switch. Battery (-) and power ground **MUST BE CONNECTED** to the battery's negative terminal.
- **Throttle position sensor:** The TPS measures the throttle position. The LS harness has a 3-way Metri-Pack connector and almost any 0-5V TPS can be used or Electronic throttle boby (drive-by-wire) (GM 25835421 - Corvette Style)
- **Fuel pressure sensor:** This input can be used to read fuel pressure using a FuelTech PS sensor or SSI P51 Packard sensor.
- **Oil pressure sensor:** This input can be used to read oil pressure using a FuelTech PS sensor or SSI P51 Packard sensor.
- **Crank Trigger Sensor (Hall and VR):** LS harness is ready for OEM 24x and 58x Hall-effect crank trigger sensors, as well as external VR crank trigger sensors.
- **Cam sync sensor (Hall effect):** LS Harness is ready for both front and rear cam sync OEM Hall Effect sensors **MUST BE SINGLE TOOTH ON 24X APPLICATIONS.** (USE CAM GEAR #12576407).
- **Flex Fuel Sensor:** GM style Flex fuel sensor ready (sensor 5005100353 sold separately).
- **Engine temperature sensor:** Ready for GM style CLT sensor.
- **Intake air temperature sensor:** Ready for GM style IAT sensor.
- **Bosch wideband sensor:** This harness is ready to use a Bosch LSU 4.2 Wideband Sensor.
- **Stepper Motor:** This harness supports the original LS engine stepper motor idle air control (IAC) valve.
- **8x fuel injectors outputs:** 8 injectors outputs (EV1 or EV6/EV14 or Nippon Denso) which allows sequential fuel injection and individual fuel cylinder trim.
- **8x ignition coils outputs:** 8 ignition outputs to use stock LS3 model coils. Coil connectors have labels indicated each cylinder.



5. Labels

All connectors have proper labels for easy identification. It is labeled by color and description name. The colors are related to its functions:

Green – The green labels are related to the RPM sensors (Crank Trigger and Cam Sync);

Yellow – Input sensors such as TPS, Engine Temp, Air temp, Fuel Pressure, Oil Pressure, Back Pressure or any other 0-5V sensor, CAN port;

Blue – Exclusively to O2 sensors (NTK or Bosch);

White – Extra Outputs, Extra Inputs, Signals outputs to stock VCU and coils connectors;

Purple – Peak and Hold and fuel injectors (Primary bank);

Black – FT470 connector, Battery (-), Power Ground;

Red – Battery (+), Main and Injectors relays/fuses, 12V switch;

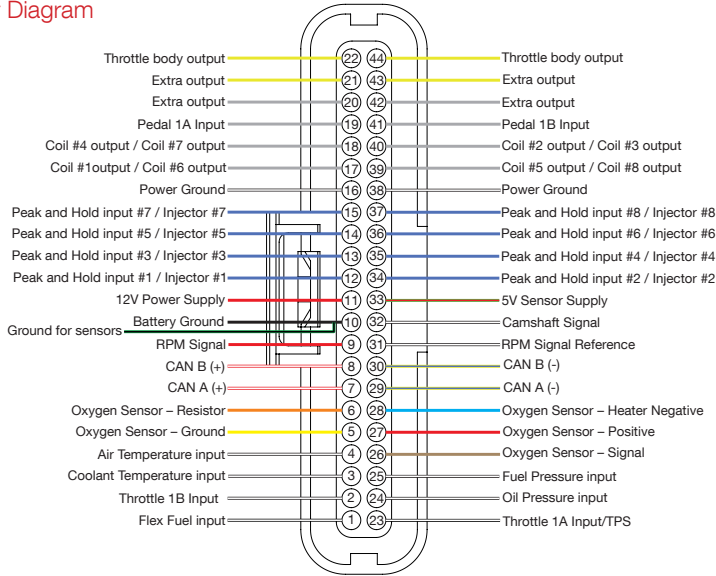
6. Connectors

6.1 FT470 connector - Inputs/outputs

From			To		Function
Connector	Pin	Wire color	Connector	Pin	
FT470	#01	White #1	Flex Fuel	3	Flex Fuel input
FT470	#02	White #3	Extra B	A	Extra output
			Throttle Body	D	Throttle 1B Input
FT470	#03	White #5	Coolant Temperature	2	Coolant Temperature input
FT470	#04	White #7	Air Temperature	2	Air Temperature input
FT470	#05	Yellow	O2	5	Ground
FT470	#06	Orange	O2	2	Resistor
FT470	#07	White/Red	CAN A	4	CAN A HIGH
FT470	#08	White/Red	CAN B	2	CAN B HIGH
FT470	#09	Red	Crank Signal	1C	Crank hall
				2C	
			Crank Flying lead	-	Crank VR
FT470	#10	Black	Ground	-	Ground
FT470	#11	Red	12V	-	12V supply
FT470	#12	Blue #1	Peak and Hold	26	Peak and Hold input #1 / Injector #1
FT470	#13	Blue #3	Peak and Hold	24	Peak and Hold input #3 / Injector #3
FT470	#14	Blue #5	Peak and Hold	21	Peak and Hold input #5 / Injector #5
FT470	#15	Blue #7	Peak and Hold	23	Peak and Hold input #7 / Injector #7
FT470	#16	Black/White	Power Ground	-	Power Ground
FT470	#17	Gray #1	Coil #1	C	Coil #1 output
	#17	Gray #1	Coil #6	C	Coil #6 output
FT470	#18	Gray #3	Coil #4	C	Coil #4 output
	#18	Gray #3	Coil #7	C	Coil #7 output

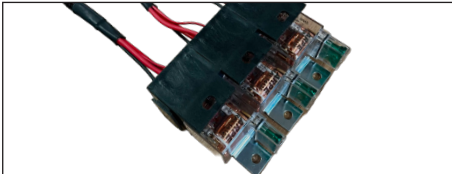
From			To		Function
Connector	Pin	Wire color	Connector	Pin	
FT470	#19	Gray #5	Extra B	B	Extra output
			Pedal	B	Pedal 1A Input
FT470	#20	Gray #7	Extra A	E	Extra output
FT470	#21	Yellow #1	Stepper Motor	1	Stepper motor 1A
			Extra A	C	Extra output
FT470	#22	Yellow #3	Stepper Motor	3	Stepper motor 2A
			Throttle body	B	Throttle body output
FT470	#23	White #2	Throttle body/TPS	C	Throttle 1A Input/TPS
FT470	#24	White #4	Oil Pressure	C	Oil Pressure input
FT470	#25	White #6	Fuel Pressure	C	Fuel Pressure input
FT470	#26	Brown	O2	1	Signal
FT470	#27	Red	O2	6	12V
FT470	#28	Blue	O2	4	Heater Negative
FT470	#29	Yellow/Blue	CAN A	3	CAN A LOW
FT470	#30	Yellow/Blue	CAN B	1	CAN B LOW
FT470	#31	White	Crank Flying lead	-	Crank VR reference
FT470	#32	White	Camshaft	C	Camshaft Signal
				A	
FT470	#33	Green/Red	5V	-	5V
FT470	#34	Blue #2	Peak and Hold	25	Peak and Hold input #2 / Injector #2
FT470	#35	Blue #4	Peak and Hold	11	Peak and Hold input #4 / Injector #4
FT470	#36	Blue #6	Peak and Hold	22	Peak and Hold input #6 / Injector #6
FT470	#37	Blue #8	Peak and Hold	10	Peak and Hold input #8 / Injector #8
FT470	#38	Black/White	Power Ground	-	Power Ground
FT470	#39	Gray #2	Coil #5	C	Coil #5 output
			Coil #8	C	Coil #8 output
FT470	#40	Gray #4	Coil #2	C	Coil #2 output
			Coil #3	C	Coil #3 output
FT470	#41	Gray #6	Pedal	E	Pedal 1B Input
			Extra B	C	Extra output
FT470	#42	Gray #8	Extra A	F	Extra output
FT470	#43	Yellow #2	Extra A	D	Extra output
			Stepper Motor	2	Stepper motor 1B
FT470	#44	Yellow #4	Throttle Body	A	Throttle body output
			Stepper Motor	4	Stepper motor 2B

Connector Diagram



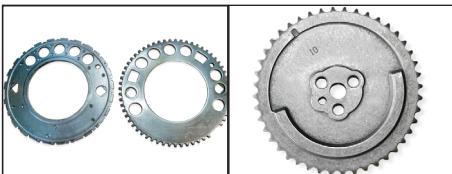
6.2 Relays and Fuses

All relays available in the LS Harness are fuse protected. Their max current is 40A. There is a main relay for the FuelTech units such as VCU, O2 conditioner, one relay for the injectors and another relay for the coils.



6.3 Crank Trigger and Cam Sync sensor

The LS harness is ready to run on OEM 58x or 24x hall effect sensor crank trigger and OEM front and rear cam sync sensors.



Crank Trigger

OEM crank trigger should be plug and play. There are two 3-way Metri-Pack 150. For 24X for sensor SKU: 12560228 and 58X for sensor SKU: 12585546

Sensor	Sensor pin/wire	Harness wire
24X and 58X	A	RPM signal
	B	Battery's negative
	C	Switched 12V

Cam Sync sensor

OEM cam sync sensor should be plug and play. There are two 3-way Metri-Pack 150 for either front (12591720) or rear (12561211) camshaft sensors.

Sensor	Sensor Pin/Wire	Harness wire
Front cam sync sensor	A	Switched 12V
	B	Battery's negative
	C	Cam signal
Rear cam sync sensor	A	Cam signal
	B	Battery's negative
	C	Switched 12V

6.4 External Crank Trigger

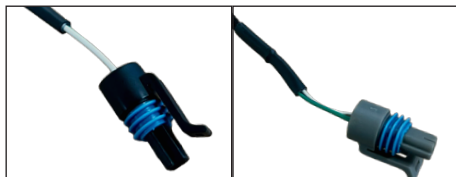
The harness also contemplates option for an external aftermarket crank trigger in case of not using the stock model. Flying leads for a VR sensor are available to be crimped with enough length to reach the front of the motor. The red wire is VR signal and the white wire is VR reference.

Wire Color	Function
White	Crank VR Reference
Red	Crank VR Signal

6.5 Coolant Temperature and Air Temperature

The LS Wiring Harness has 2 temperature inputs. One input is for the engine coolant temperature (H₂O) and the other one is for the intake air temperature (AIR). Both sensors are GM style and uses Metri-Pack 150.2-way connectors.

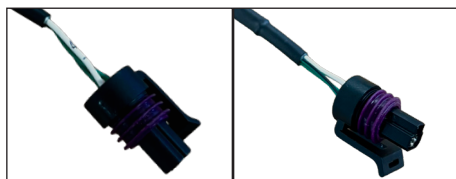
- Pin A: Sensor Ground;
- Pin B: Signal output.



6.6 Oil and Fuel Pressure

The oil and fuel pressure sensor connector are designed for the PS-150, PS-300 and PS-1500 sensors; ranging from 150 to 1500 psi, with a Packard style 3-way connector. It has 5V, sensor ground and signal wires.

- Pin A: Sensor ground (green/black);
- Pin B: 5V supply (green/red);
- Pin C: Signal output (white).



6.7 Flex Fuel Sensor

The LS harness is compatible with GM Style Flex Fuel sensor (5005100353 sold separately). It will provide ethanol content and fuel temperature to the VCU, allowing to use Flex Fuel compensations.

- Pin 1: Switched +12V (red)
- Pin 2: Sensor Ground (green/black)
- Pin 3: Signal output (white)



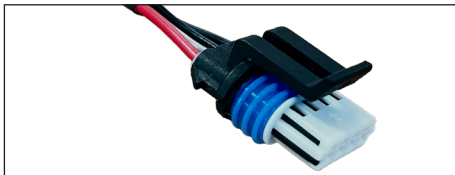
6.8 Injectors

The LS Wiring Harness has 8 injector outputs available (primary bank). The injector connectors are EV1 and wired for sequential operation.



6.9 Coils

The LS470 harness is designed to use stock LS3 model coils. Coil connectors have labels indicated each cylinder.



6.10 Extra Connectors

The auxiliary connectors provide available inputs for general-purpose use.



NOTE

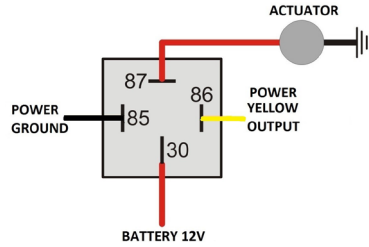
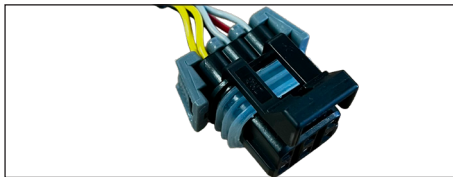
The following pins are shared between sensors/actuators and the Extra connectors. These pins must be used only for one purpose, be sure if they are not being used in the installation before using the Extra pins.

Extra A

Pin	FT470 Outputs	Function/Sensor
A	Switched +12V	12V
B	Ground	Ground
C	Yellow #1	Available / Stepper motor
D	Yellow #2	Available / Stepper motor
E	Gray #7	Available
F	Gray #8	Available

Extra B

Pin	FT470 Outputs	Function/Sensor
A	White #3	Available / Drive by wire
B	Gray #5	Available / Pedal
C	Gray #6	Available / Pedal
D	Green/Red	5V
E	Green/Black	Sensor Ground
F	Red	12V



There are some relays with a built-in diode, like Hella 003437101.



NOTE

This Harness is compatible with Cable throttle using a TPS or Electronic Throttle body.

6.11 TPS

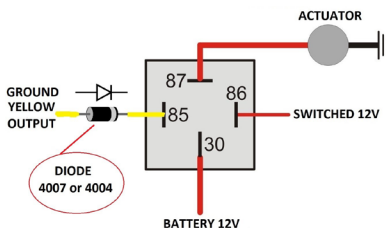
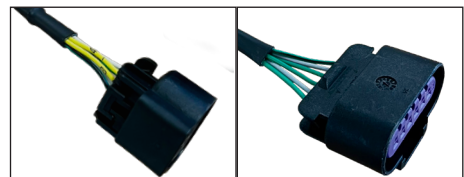
TPS is a potentiometer that informs the throttle position. FT470 can read almost any 0-5V TPS. The LS harness uses a 3-way Metri-pack 150.

- Pin A: 5V Supply (green/red);
- Pin B: Sensor Ground (green/black);
- Pin C: Signal Output (white).



6.12 Electronic throttle body (Drive-by-wire)

The LS harness also has plug and play connections for the OEM electronic throttle body and pedal. The connections are:



Electronic throttle body	
A	Yellow #04 - Throttle 1A Motor
B	Yellow #03 - Throttle 1B Motor
C	Ground Sensors - Green/Black
D	White #03 - Throttle 1B
E	5V supply - Green/red
F	White #02 - Throttle 1A

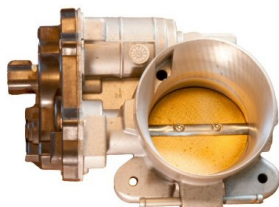
Electronic pedal	
A	Ground Sensors - Green/Black
B	Gray #05 - Pedal 1A
C	5V supply – Green/red
D	5V supply – Green/red
E	Gray #06 - Pedal 1B
F	Ground Sensors - Green/Black



LS2 90mm - GM #12570790



LS7 90mm - GM #12605109



LSA/LS9 88mm - GM #12629992

Pedal – 2005 to 2013 Corvette Style – GM 25835421



NOTE

When temperature sensors are shared, the voltage pull-up on the FuelTech VCU must be disabled.

6.13 Stepper Motor

Connector intended for the original LS engine stepper motor idle air control (IAC) valve. Set the stepper motor to 260 steps in the software configuration.

Pin	Wire Color	Function/Sensor
1	Yellow #1	Stepper motor 1A
2	Yellow #2	Stepper motor 1B
3	Yellow #3	Stepper motor 2A
4	Yellow #4	Stepper motor 2B



7. Standard Sensors

7.1 Fuel and Oil Pressure

FuelTech PS-150/300/1500 is a high precision sensor responsible for general pressure readings (fuel, oil, boost, exhaust back pressure, etc.)

It can be purchased Online at www.fueltech.net or from an authorized FuelTech dealer (check the website to locate the dealer nearest to you).

FuelTech PS-150/300/1500 senso below:

- Connection: 1/8" - 27NPT
- Pressure Range: 0 to 150/300/500/1500/3000psi
- Power Voltage: 5V
- Output Scale: 0.5-4.5V
- Electric Connector: 3-way Metri-pack 150
 - Pin A: Battery's Negative
 - Pin B: 5V supply
 - Pin C: Output signal



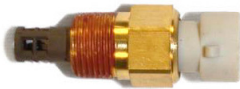
FuelTech part numbers:

- 5005100020 - 0-150 psi sensor
- 5005100021 - 0-300 psi sensor
- 5005100217 - 0-500 psi sensor
- 5005100022 - 0-1500 psi sensor
- 5005100220 - 0-3000 psi sensor

7.2 Intake Air Temperature

With this sensor, the VCU can monitor the intake air temperature and perform real time compensations. One of its pins is connected to the battery negative, the other to the white #7 wire.

Part numbers: FuelTech 5005100015 or GM 25036751



7.3 Engine Temperature

This sensor is very important for a good running engine, as varying engine temperatures dramatically affect an engine's fuel and timing requirements.

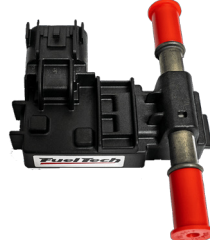
Place this sensor near the engine head, reading the engine coolant temperature.

Part numbers: FuelTech 5005100016 or GM 12146312



7.4 Flex fuel sensor

GM Style Flex Fuel sensor to read ethanol percentage and fuel temperature, apply FuelTech Flex Fuel compensations FuelTech 5005100353.



7.5 Bosch LSU 4.2 Wideband O2 Sensor

Bosch LSU 4.2 is a pretty popular wideband O2 sensor that connects directly to the FT470.

Part numbers: FuelTech 3022000965.



8. Peak and Hold Injector Driver - External Injector Driver

The FuelTech Peak and Hold Injector Driver is designed to control the current on low impedance injectors. It has 8 current configurable outputs and in the LS470 Harness will run one injector per channel. The wiring harness goes with a Peak and Hold Injector Driver jumper on the connector for cases where the injector driver is not required.

The following table shows how to configure the channels according to the injector model.

Peak and Hold Injector Driver Gen-2	
Pin	To
1	Injector #6
2	Injector #7
3	Injector #8
4	Injector #4
5	Injector #3
6	Injector #2
19	Injector #1
20	Injector #5

Brand / Model	PEAK current	HOLD current
Bosch 160lb/h	2A	0,5A
Bosch 160lb/h (2 injectors per channel)	4A	1A
Bosch 160lb/h (4 injectors per channel)	8A	2A
Siemens 220-225lb/h	4A	1A
Siemens 220-225lb/h (2 injectors per channel)	8A	2A
Precision 550lb/h	8A	2A
Moran and Billet Atomizer	8A	2A
FT Injector 320lb/h, 520lb/, 720lb/h, 820lb/h and 1020lb/h	8A	2A

9. Troubleshooting

Issue	Solution
FT470 Unit doesn't turn on	1. Check battery voltage
	2. Check power and ground cables
	3. Check Switched 12V cable
	4. Check VCU harness cables
FT470 doesn't read cranking	1. Check crank trigger and cam sync connections
	2. Check sensor gap
	3. Check diagnostic panel for RPM signal
FT470 reads RPM but engine doesn't start	1. Check if there is spark and injector pulse
	2. Check fuel pressure
	3. Check crank trigger alignment and TPS calibration
	4. Check if outputs are activated and properly configured
	5. Check the O2 sensor reading
Engine runs but doesn't idle	1. Check TPS calibration
	2. Check timing with a timing light
	3. Check TPS idle table and adjustment
	4. Check O2 sensor reading
Engine spits & sputters	1. Check O2 sensor reading
	2. Check ignition calibration and firing order
VCU won't communicate to PC	1. Ensure your software version is compatible with your FT470 firmware version
	2. Check if read and write buttons get colored when FT470 is connected

FuelTech

USA

FuelTech USA
455 Wilbanks Dr.
Ball Ground, GA
30107, USA
Phone: +1 678-493-3835
info@fueltech.net
www.FuelTech.net

BRASIL

FuelTech Ltda
Av. das Indústrias, 864
Bairro Anchieta
CEP 90200-290
Porto Alegre, RS, Brasil
CNPJ 05.704.744/0001-00
Fone: +55 (51) 3019-0500
info@fueltech.com.br
www.FuelTech.com.br

EUROPE

FuelTech Europe B.V.
Amsterdam, Netherlands
sales@fueltecheurope.com
+31203698181



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