

FuelTech



FT500

V8 LS

WIRING HARNESS

OWNER'S MANUAL

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2. Presentation

The FuelTech LS Wiring Harness is the proper link between the FuelTech FT500 ECU and all of your sensors and actuators.

The harness has all the components needed to make a plug and play installation on an 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 oil resistant.

Specifications:

- 8 injector outputs (EV1 (Jetronic/Minitimer) or EV6/EV14 (USCAR) or Nippon Denso)
- Coil outputs: harness is setup for OEM coil harness (re-use your factory harness using stock plug)
- Coils are setup in WASTED SPARK mode
- 2 FuelTech Peak and Hold external drivers ready
- Plugs for both 58x and 24x crank triggers (only one is used)
 - 24x sensor connector: Delphi Metri-pack 150 829-12059595
- 58x sensor connector: Delphi Metri-pack 150 829-12129946
- Plugs for both front and rear cam sync sensors (only one is used) - *** TIMING GEAR MUST BE SINGLE TOOTH ON 24X APPLICATIONS AND FOR SEQUENTIAL TIMING ON 58X APPLICATIONS. USE LS2 STYLE GEAR: PN 12576407.
 - Front cam sensor: AC Delco 12591720
 - Rear cam sensor: AC Delco 12561211
 - 24x sensor connector: Delphi Metri-pack 150 829-12059595
- Connectors for stock electronic throttle body (88mm to 90mm) and pedal (drive by wire) and cable throttle (GM TPS – round 3-wire plug)
- PEDAL: 2005 to 2013 Corvette style - GM 25835421
- THROTTLE
- LS2 90mm - GM 12570790
 - LS7 90mm - GM 12605109
 - LSA/LS9 88mm - GM 12629992

- Dual FuelTech WB-Nano O2 ready (adapter to Alcohol O2 is sold separately for alcohol engines)
- Dual Bosch wideband O2 sensor ready (adapter to NTK lab sensor is sold separately for alcohol engines)
- GM Style intake air temperature sensor ready
- GM Style engine temperature sensor ready
- 2 pressure sensor ready for fuel and oil 0-5V sensor (FuelTech PS150 connector)
- 3x high output relays with fuses
- Extra connector with 7 inputs and 8 outputs for generic use
- Grommet for firewall

Dimensions (in package): 14" x 11" x 14"

Weight for LS HARNESS: 8 lbs 3oz

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 ECU 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 one year 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 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 update releases.

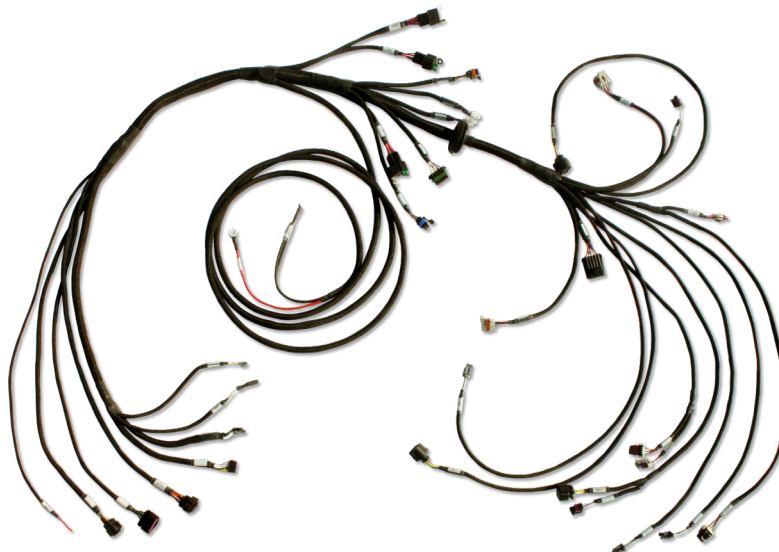
Manual version 1.0 – June/2017

4. Overview

The FuelTech LS Wiring Harness is a complete plug n' play wiring solution to be used with a FuelTech FT500 ECU. It is designed for systems with 8 staged injectors, 8 individual smart coils and FuelTech Dual Nano O2 to run sequential, semi-sequential or multipoint injection. It is already wired for 2 FuelTech Peak and Hold drivers for setups utilizing low impedance injectors. When using high impedance injectors, Peak and Holds are not needed. In this case a jumper harness (sold separately) is required.

The harness is a single piece with a rubber grommet. 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 FT500 main and auxiliary:** Direct connection to FT500, both connectors must be securely installed.
- **CAN A:** Plugged in the 4way connector in the back of the ECU in order to allow CAN communication with the Wideband Nano and other CAN products.
- **2x FuelTech Peak and Hold:** These are the driver boxes needed to fire low impedance injectors. When the system uses high impedance injectors, two jumper harnesses are required (sold separately). If the Peak and Hold or the jumper wires are not being used, the injectors will not fire.
- **FuelTech Dual WB-O2 Nano:** This connector goes to the FuelTech WB-O2 Nano unit. On the engine side, there is a connector for the O2 sensor.
- **3x 40A Relay:** The system has 3 relays to power everything. The Main Relay powers the ECU, WB-O2 Nano and all the sensors. There's a second relay that powers the peak and hold drivers and the injectors. Also, there's a third relay that powers the coils.
- **Switched +12V wire:** This wire goes to the ignition switch and it turns all the relays 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.
- **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 effect):** LS harness is ready for both 58x and 24x OEM Hall Effect 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 AND FOR SEQUENTIAL INJECTION ON 58X APPLICATIONS (USE CAM GEAR #12576407).
- **Engine temperature sensor:** Ready for GM style CLT sensor.
- **Intake air temperature sensor:** Ready for GM style IAT sensor.
- **2x Bosch wideband sensors;**
- **8x fuel injectors outputs:** 8 injectors outputs (EV1 connector) which allows sequential fuel injection and individual fuel cylinder trim.



5. Labels

All connectors have proper labels to identify each one. 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 – FT500 Aux connector, Nano connector, Extra Outputs, Extra Inputs, Signals outputs to stock ECU and coils connectors;

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

Black – FT500, Main connector, Battery (-), Power Ground;

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

6. Diagrams

6.1 FT500/FT500 Aux - Inputs/outputs

From		To			
Connector	Pin	Wire color	Connector	Pin	Function
FT500	24	Blue #1	PH odd cyl	5	Primary #1 injector
FT500	23	Blue #2	PH even cyl	5	Primary #2 injector
FT500	13	Blue #3	PH odd cyl	4	Primary #3 injector
FT500 Aux	6	Blue #4	PH even cyl	4	Primary #4 injector
FT500 Aux	8	Blue #5	PH odd cyl	2	Primary #5 injector
FT500	2	Blue #6	PH even cyl	2	Primary #6 injector
FT500	4	Blue #7	PH odd cyl	1	Primary #7 injector
FT500	6	Blue #8	PH even cyl	1	Primary #8 injector
FT500 Aux	1	White #1	Auxiliary	"E" accelerator / "A" EXTRA inputs	GPI W#1
FT500 Aux	5	White #2	Auxiliary	"B" EXTRA inputs	GPI W#2
FT500 Aux	7	White #3	Auxiliary	"B" accelerator / "C" EXTRA inputs	GPI W#3
FT500	9	White #4	Main	"C" oil	Oil pressure input
FT500	7	White #5	Main	"B" H2O	Engine temperature input
FT500	5	White #6	Main	"C" fuel / "F" EXTRA inputs	Fuel pressure input
FT500	3	White #7	Main	"B" IAT	Air temperature input
FT500 Aux	12	White #8	Auxiliary	"H" EXTRA inputs	GPI W#8
FT500 Aux	10	White #9	Auxiliary	"J" EXTRA inputs	GPI W#9
FT500 Aux	3	White #10	Auxiliary	"D" throttle body / "K" EXTRA inputs	GPI W#10
FT500	11	White #11	Main	"C" TPS / "F" throttle body	TPS input
FT500	18	Gray #1	Main	"G" coils odd / "F" coils even	Coils #1 and #6
FT500	16	Gray #2	Main	"C" coils odd / "G" coils even	Coils #5 and #8
FT500	14	Gray #3	Main	"B" coils odd / "C" coils even	Coils #7 and #4
FT500	12	Gray #4	Main	"F" coils odd / "B" coils even	Coils #3 and #2
FT500	10	Gray #5	Main	"A" EXTRA outputs	GPO G#5
FT500 Aux	2	Gray #6	Auxiliary	"B" EXTRA outputs	GPO G#6
FT500 Aux	4	Gray #7	Auxiliary	"C" EXTRA outputs	GPO G#7
FT500	1	Gray #8	Main	"D" EXTRA outputs	GPO G#8
FT500 Aux	13	Yellow #1	Auxiliary	"H" EXTRA outputs	GPO Y#1
FT500 Aux	14	Yellow #2	Auxiliary	"G" EXTRA outputs	GPO Y#2
FT500 Aux	15	Yellow #3	Auxiliary	"B" throttle body / "F" EXTRA outputs	GPO Y#3
FT500 Aux	16	Yellow #4	Auxiliary	"A" throttle body / "E" EXTRA outputs	GPO Y#4

6.2 Nano WB O2 #1

From		To			
Connector	Pin	Wire color	Connector	Pin	Function
Nano WB O2 #1	1	Red	O2 Sensor left	6	IP+
Nano WB O2 #1	2	Yellow	O2 Sensor left	5	VS-
Nano WB O2 #1	3	Brown	O2 Sensor left	1	VS+
Nano WB O2 #1	4	Red	Main relay	87	Switched +12V from relay
Nano WB O2 #1	5	Yellow/Red	-	-	
Nano WB O2 #1	6	White/Red	CAN male/female	4	CAN HI
Nano WB O2 #1	7	Orange	O2 Sensor left	2	IA
Nano WB O2 #1	8	Green	O2 Sensor left	3	H+
Nano WB O2 #1	9	Blue	O2 Sensor left	4	H-
Nano WB O2 #1	10	Black/White	Power ground	-	Power ground
Nano WB O2 #1	11	Black	Signal ground	-	Signal ground
Nano WB O2 #1	12	Yellow/Blue	CAN male/female	3	CAN LO

6.3 Nano WB O2 #2

From		To			
Connector	Pin	Wire color	Connector	Pin	Function
Nano WB O2 #2	1	Red	O2 Sensor right	6	IP+
Nano WB O2 #2	2	Yellow	O2 Sensor right	5	VS-
Nano WB O2 #2	3	Brown	O2 Sensor right	1	VS+
Nano WB O2 #2	4	Red	Relay	87	Switched +12V from relay
Nano WB O2 #2	5	Yellow/Red	-	-	
Nano WB O2 #2	6	White/Red	CAN male/female	4	CAN HI
Nano WB O2 #2	7	Orange	O2 Sensor right	2	IA
Nano WB O2 #2	8	Green	O2 Sensor right	3	H+
Nano WB O2 #2	9	Blue	O2 Sensor right	4	H-
Nano WB O2 #2	10	Black/White	Power ground	-	Power ground
Nano WB O2 #2	11	Black	Signal ground	-	Signal ground
Nano WB O2 #2	12	Yellow/Blue	CAN male/female	3	CAN LO

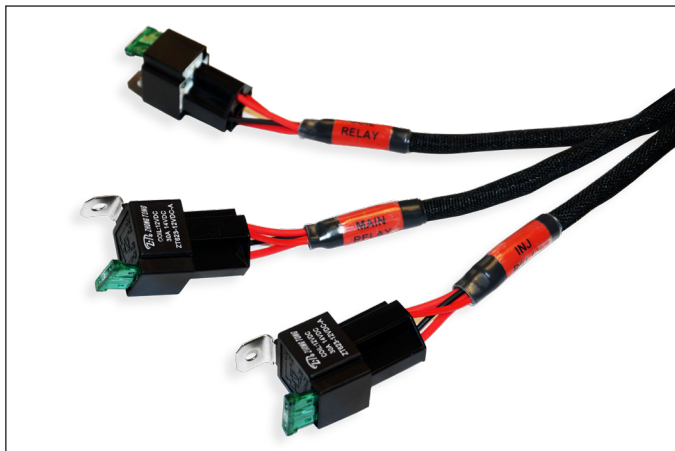
6.4 INJECTOR female

From		To			
Connector	Pin	Wire color	Connector	Pin	Function
Injector female	A	Purple	PH odd cyl	10	Injector #1
Injector female	B	Purple	PH even cyl	10	Injector #2
Injector female	C	Purple	PH odd cyl	9	Injector #3
Injector female	D	Purple	PH even cyl	9	Injector #4
Injector female	E	Purple	PH odd cyl	7	Injector #5
Injector female	F	Purple	PH even cyl	7	Injector #6
Injector female	G	Purple	PH odd cyl	6	Injector #7
Injector female	H	Purple	PH even cyl	6	Injector #8
Injector female	J	Red	PH odd/even cyl	3	Switched +12V from relay
Injector female	K	Red	PH odd/even cyl	3	Switched +12V from relay

7. Connectors

7.1 Relay and Fuses

All relays available in the LS Harness are fuse protected. Their max current is 30A followed by a 30A fuse. There is a main relay for the FuelTech units such as ECU, O2 conditioner, one relay for the injectors and another relay for the coils.



7.2 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: #829-12059595 and 58X: #829-12129946

Sensor	Sensor pin/wire	Harness wire
24X and 58X	A	Red wire from 2-core shielded cable
	B	Battery's negative
	C	Switched 12V

Cam Sync sensor

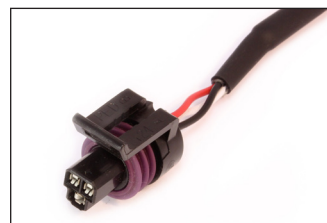
OEM cam sync sensor should be plug and play. The connector is a 3-way Metri-Pack 150 #829-12059595

Sensor	Sensor Pin/Wire	Harness wire
Front cam sync sensor	A	Switched 12V
	B	Battery's negative
	C	Black wire from 1-core shielded cable
Rear cam sync sensor	A	Black wire from 1-core shielded cable
	B	Battery's negative
	C	Switched 12V

7.3 TPS

TPS is a potentiometer that informs the throttle position. FT500 can read almost any 0-5V TPS. The LS harness uses a 3-way Metri-pack 150.

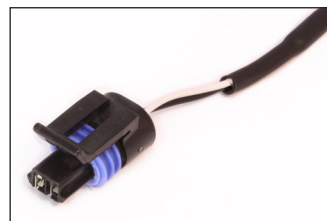
- Pin A: 5V Supply (green/red);
- Pin B: signal ground (black);
- Pin C: signal output (white).



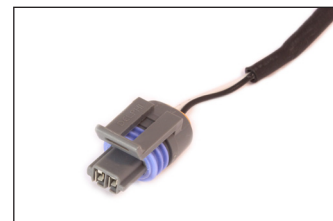
7.4 H2O and Air Temperature

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

- Pin A: signal output;
- Pin B: battery's negative.



H2O



Air

7.5 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 a 5V ground and signal.

- Pin A: battery's negative (black);
- Pin B: 5V supply (green/red);
- Pin C: signal output (white).



7.6 Injectors

The LS harness has 8 injector outputs available in 1 bank with three different connectors options: EV1 (Jetronic/Minitimer), EV6/EV14 (USCAR), and Nippon Denso. It also features the OEM sub-harness connector, in case you want to re-use the existing sub-harness.



7.7 Extra Connectors

There are two extra connectors with all the unused inputs and outputs. One of them features 8 outputs (4 yellow and 4 gray) and the other has 7 generic inputs (white color), a 5v output, a switched +12V and a signal ground.

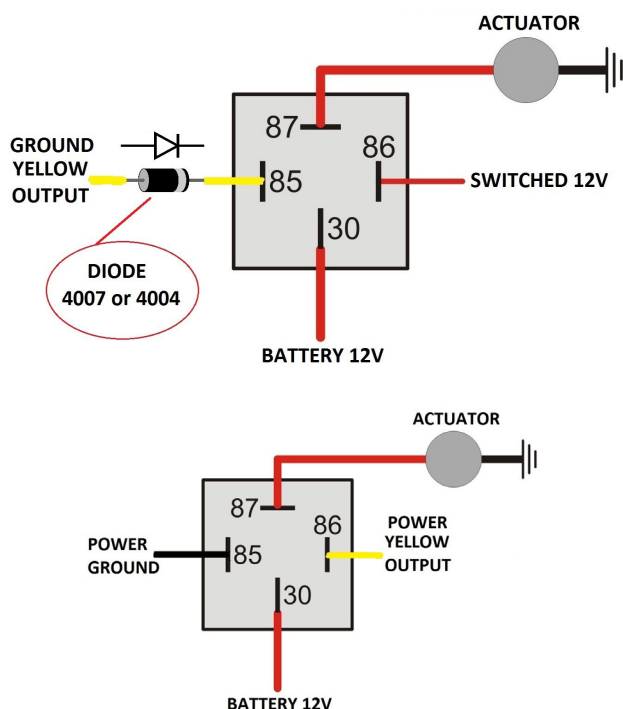
Extra Outputs Pinout		
Pin	FT500 Outputs	Function/Sensor
A	Gray #5	
B	Gray #6	
C	Gray #7	
D	Gray #8	
E	Yellow #4	
F	Yellow #3	
G	Yellow #2	
H	Yellow #1	

Extra Inputs Pinout		
Pin	FT500 Outputs	Function/Sensor
A	White #1	
B	White #2	
C	White #3	
D	Signal ground	
E	5V supply	
F	White #6	
G	Switched +12V	
H	White #8	
J	White #9	
K	White #10	

Yellow outputs are HALF BRIDGE or PUSH PULL type outputs. This means that they can feed 5A both by negative or positive side. They are important and necessary to control Electronic drive-by-wire throttle (DC motors) and stepper motor 4 wire idle control valves. They also can be used to control any type of LO SIDE or HI SIDE actuator (LO SIDE means the ECU will switch ground to activate the device, HI SIDE means the ECU will switch 12V to active the device).

Since it can feed 12V power at 5A, if wired to a relay activating it by ground (from the FuelTech) when turned off, it senses the 12V through the relay coil and feeds back power to the ECU. In this case, it is necessary to run a diode in series (1N4004 or 1N4007) like the following schematic to avoid this issue.

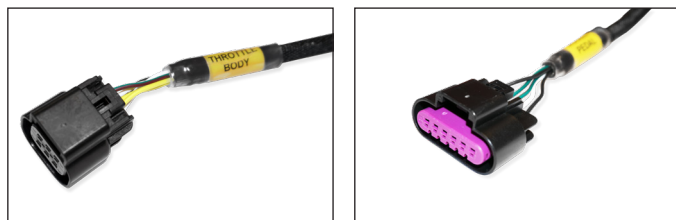
Both ways of wiring this output are described in the following diagrams:



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

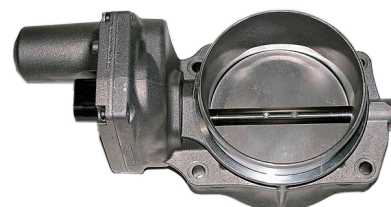
7.8 Electronic throttle body (Drive-by-wire)

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



Electronic throttle body	
A	Motor 1 – Yellow #4
B	Motor 2 – Yellow #3
C	5V supply – Green/red
D	TPS #2 – White #10
E	Signal ground – Black
F	TPS #1 – White #11

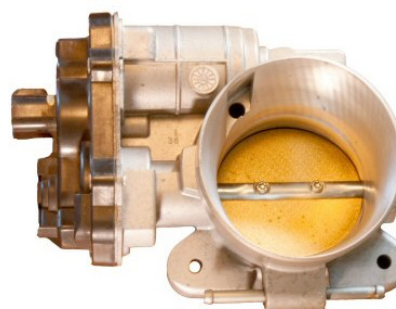
Electronic pedal	
A	Signal ground – Black
B	Pedal #1 – White #3
C	5V supply – Green/red
D	5V supply – Green/red
E	Pedal #2 – White #1
F	Signal ground – Black



LS2 90mm - GM #12570790



LS7 90mm - GM #12605109



LSA/LS9 88mm - GM #12629992

Pedal – 2005 to 2013 Corvette Style – GM 25835421



7.9 Signal Outputs to stock ECU

The LS Harness has a output connector that shares the signal from the sensors between the FT500 and the stock ECU, the mating connector to wire to the stock ECU is sold separately.



Pin	Outputs
A	Pedal1
B	Pedal2
C	Coolant Temp
D	Oil Pressure
E	Camshaft signal
F	Crank signal

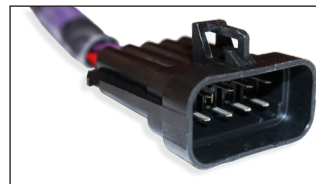


NOTE:

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

7.10 Injectors Connectors

The LS Harness has a 10 way Injector sub-connector that will be connected to the injector sub-harness (EV1/EV6/Denso) and then plugged to the injectors itself.



7.11 Coils connectors

There are 2 coils connectors, even (Right) and odd (Left – Driver side) which must be connected to the stock coil harness of the engine.



8. Standard Sensors

8.1 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 sensor below:

- Connection: 1/8" - 27NPT
- Pressure Range: 0 to 150/300/1500psi
- 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
- 5005100022 - 0-1500 psi sensor

8.2 Intake Air Temperature

With this sensor, the ECU 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



8.3 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.

On water cooled engines, place this sensor near the engine head, reading the water temperature. On air cooled engines, install this sensor reading the engine oil temperature. One of its pins is connected to the battery negative, the other to the white #5 wire.

Part numbers: FuelTech 5005100016 or GM 12146312



8.4 Bosch LSU 4.2 Wideband O2 Sensor

Bosch LSU 4.2 is a pretty popular wideband O2 sensor used with the WB-O2 Nano.

Part numbers: FuelTech 3022000965 or Bosch 17014



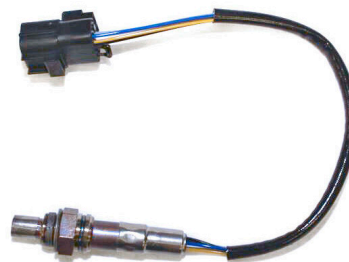
8.5 NTK Wideband O2 Sensor (for alcohol engines)

The NTK laboratory wideband O2 sensor is recommended for engines running alcohol.

This sensor must be used with the FuelTech Alcohol O2 module. Adapters for both sensors and WB-O2 unit will be required (sold separately)

NTK sensor requires free-air calibration. Check Alcohol O2 manual for further instructions.

To purchase NTK sensor, contact FuelTech Part number #5005100011



9. O2 Reading

9.1 FuelTech WB-O2 Nano

There are dual FuelTech WB-O2 Nano connectors built into the harness. Each WB-O2 Nano has one connector with 12-way Molex MX120G connector. FuelTech WB-O2 Nano does not require free-air calibration. For further information, check FuelTech WB-O2 Nano manual.



9.2 Alcohol O2 (for alcohol engines)

FuelTech offers a special conditioner for engines running alcohol, the FuelTech Alcohol O2. A simple adapter harness makes this unit plug and play on the WB-O2 Nano connections.

A special NTK laboratory sensor is required by the Alcohol O2. Contact FuelTech in order to purchase the sensors and adapters to plug on the FuelTech LS harness.



10. Peak and Hold - External Injector Driver

Peak and Hold drivers are designed to control the current on low impedance injectors and they are not needed when using high impedance injectors.

The FuelTech Peak and Hold has 4 outputs and in the LS Wiring Harness will run one injector per channel. There are 3 different versions of Peak and Hold available to fire different injectors, according to the resistance of the injector. The only differences between the versions are the peak current and the hold current.

Considering one injector per channel application:

2A/0.5A – Bosch 1600cc, Ford Racing 1600cc
 4A/1A – Siemens Deka 225lb/h, Precision 225lb/h
 8A/2A – Precision 550lb/h, Billet Atomizer, Moran

Some earlier Moran injectors require a 4A/1A driver. Contact FuelTech tech support to confirm correct Peak and Hold drivers before purchasing.

When using high impedance injectors without Peak and Hold drivers, jumpers wires (sold separately, part number 2001000071) must be connected to the Peak and Hold plugs in the harness. If the jumper wires are not being used then the injectors won't fire since there will be no continuity between the FT500 and injectors.



11. Troubleshooting

Issue	Solution
FT500 Unit doesn't turn on	1. Check battery voltage
	2. Check power and ground cables
	3. Check Switched 12V cable
	4. Check ECU harness cables
FT500 doesn't read cranking	1. Check crank trigger and cam sync connections
	2. Check sensor gap
	3. Check diagnostic panel for RPM signal
FT500 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
ECU won't communicate to PC	1. Ensure your software version is compatible with your FT500 firmware version
	2. Check if read and write buttons get colored when FT500 is connected

12. FuelTech Latest Manuals and Software

You can access all updated manuals and software at the FuelTech website:

www.fueltech.net/manuals

www.fueltech.net/software



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