

FuelTech



PRO24 DATALOGGER

24 Channel Datalogger
With Internal Accelerometer
Installation and Operation Guide

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1. Warnings and 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.

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.

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.

2. Presentation

FuelTech PRO24 Datalogger is a very efficient tool used for monitoring and tuning engines. It is compatible with any type of engine or equipment. It reads and stores data from any analog sensor with a 0-5V output signal, as well as frequency signals, which allows a detailed analysis of the engine operation and the vehicle's external information.

This equipment features 4 channels for capturing the engine's RPM signal, 16 analog configurable channels and one internal channel for battery voltage. Its highlight feature is the internal accelerometer, which allows the analysis of the car's frame movement in 3 axes (x, y and z), such as lateral acceleration, deceleration, etc.

Another important feature is the high-speed USB connection, which allows easy connection to any notebook or computer, eliminating the demand of serial adaptors and facilitating equipment operation, as external power is not necessary.

The Data and Graphs Analysis Software that comes with the equipment is very intuitive and easy to operate. It is an intelligent tool, and therefore, facilitates the tuning of any engine.

PRO24 Datalogger can be used to read many engine parameters, such as:

- Boost pressure before the cooler and in the engine.
- Oil pressure
- Exhaust pressure
- Break fluid pressure
- Coolant pressure
- Wastegate valve pressure
- Engine's inner pressure (crankcase)
- Throttle position (TPS)
- Intake air temperature
- Air temperature before and after the cooler
- Engine temperature
- Exhaust gases temperature
- Spark plug temperature
- Engine RPM
- Gearbox RPM
- Front/rear wheel speed
- Front/rear suspension travel
- Launch stage button (two-step)

Specifications:

- Sixteen (16) sensor inputs (0-5V).
- Four (4) RPM signal inputs.
- Battery voltage internal reading channel.
- Internal Accelerometer (monitoring axes x, y and z)

Dimensions: 3,54in. x 1,88in. x 1,25in.

3. PRO24 Datalogger Installation

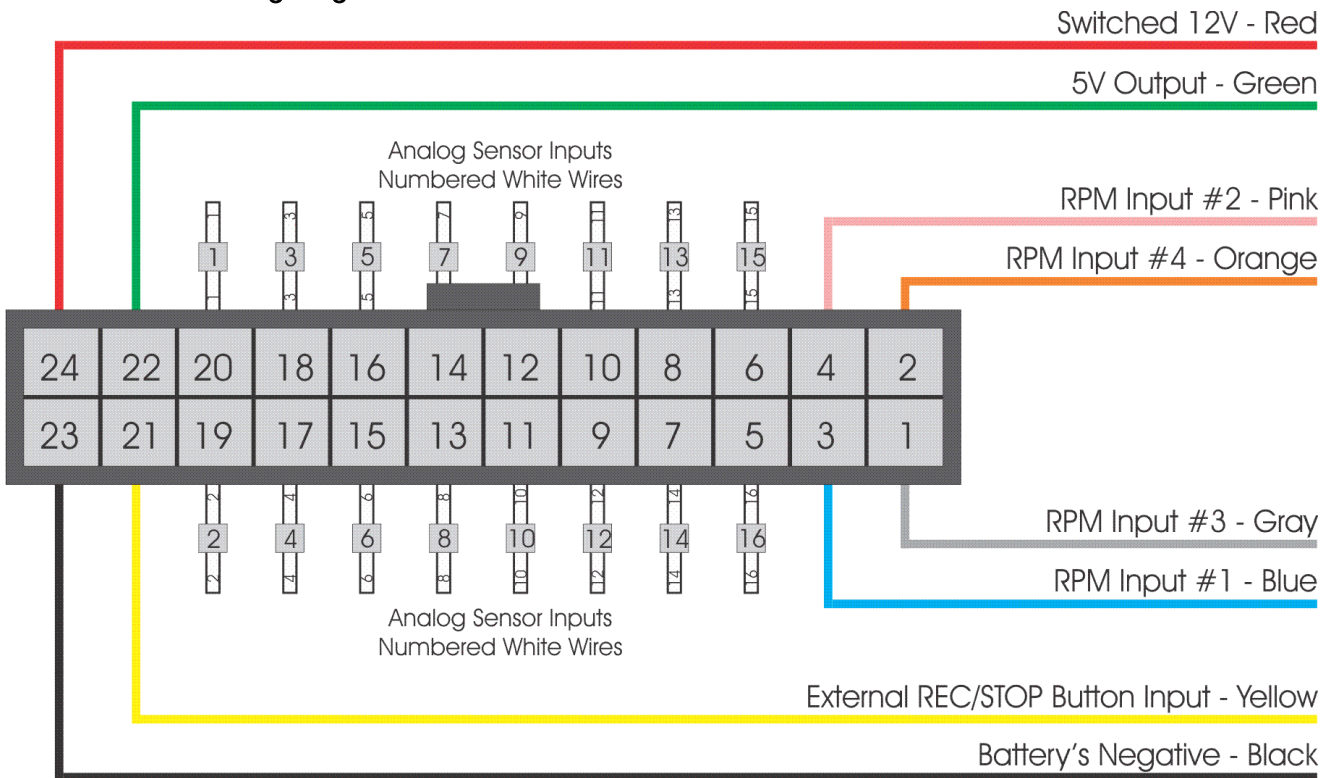
PRO24 Datalogger has a 24-way connector, which centralizes the sensors inputs, 5V output, power and the input for the external recording button. Each channel must be configured in accordance to the sensor that will be used.

The USB cable that connects the Datalogger to the computer cannot exceed 1,8m of length, as communication errors and glitches may occur with the use of a longer cable.

3.1 Electrical Wiring Table

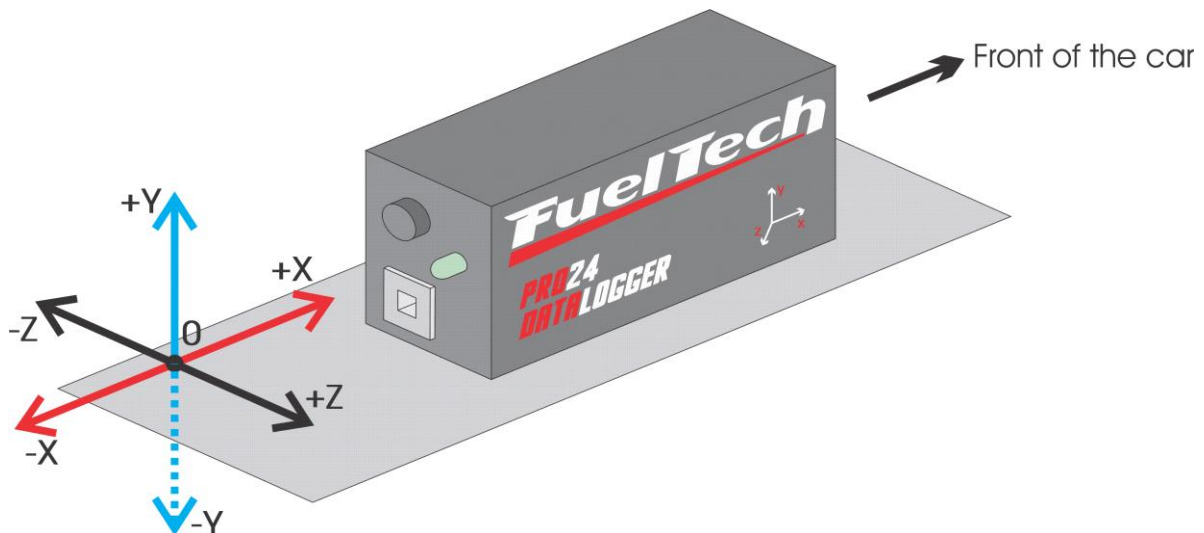
Cable Color	Pin	Connection	Note
Red	24	Switched 12V	The use of a 5A fuse is recommended.
Black	23	Battery's Negative Terminal	Must be connected directly onto the vehicle's battery.
Blue	3	RPM Signal Input #1	Examples of readings using RPM channels: <ul style="list-style-type: none"> - Engine RPM; - Transmission's primary axis RPM; - Front wheel speed; - Rear wheel speed. Note: The RPM channels #1 and #2 can only read Hall effect sensors. The RPM channels #3 and #4 can read Hall effect or magnetic sensors.
Pink	4	RPM Signal Input #2	
Gray	1	RPM Signal Input #3	
Orange	2	RPM Signal Input #4	
Numbered White Cables	20	Sensors Analog Input #1	These inputs must be connected to sensors with output signal of 0-5V, as listed in the chapter 4, in this manual. Examples of readings using analog channels: <ul style="list-style-type: none"> - Intake manifold pressure; - Engine oil pressure; - Fuel pressure; - Wastegate valve pressure; - Exhaust counter pressure; - "Blow By" - Crankcase counter pressure; - Brake fluid pressure; - Engine Coolant pressure; - Boost pressure before the cooler; - Engine temperature – coolant; - Air temperature before and after the cooler; - Exhaust gases temperature; - Lambda probe; - Suspension travel; - Two-Step operation.
	19	Sensors Analog Input #2	
	18	Sensors Analog Input #3	
	17	Sensors Analog Input #4	
	16	Sensors Analog Input #5	
	15	Sensors Analog Input #6	
	14	Sensors Analog Input #7	
	13	Sensors Analog Input #8	
	12	Sensors Analog Input #9	
	11	Sensors Analog Input #10	
	10	Sensors Analog Input #11	
	9	Sensors Analog Input #12	
	8	Sensors Analog Input #13	
	7	Sensors Analog Input #14	
6	Sensors Analog Input #15		
5	Sensors Analog Input #16		
Yellow	21	External REC/STOP Button Input	At each negative pulse on this input, PRO24 Datalogger starts or stops recording.
Green	22	5V Output	Must be used to power the sensors (TPS, temperature, etc.)

3.2 Electrical Wiring Diagram



3.3 Mounting the PRO24 Datalogger

The internal accelerometer in the PRO24 Datalogger can be fully calibrated, independent of the position in which the equipment is mounted on the vehicle's body. However, FuelTech suggests that PRO24 Datalogger is mounted in the same position as shown in the image below in order to facilitate the understanding of the graphs generated.



Therefore, axis X represents longitudinal acceleration; axis Y represents vertical impulses; and axis Z represents lateral acceleration.

The module must be well mounted and fixed to the vehicle's body using the adhesive tape supplied with the product. The incorrect fixation may result in vibrations that will generate errors in the internal accelerometer readings.

3.4 Suggestions of Monitored Sensors

As PRO24 Datalogger features many channels, find below a list with suggestions of useful readings that may be monitored:

	Monitored Signal	Connection / Sensor Used
RPM Signal Input #1	Engine RPM	Tachometer output or Hall distributor signal
RPM Signal Input #2	Transmission RPM	Hall sensor reading the gear in the transmission's primary axis
RPM Signal Input #3	Front wheel speed	Hall or magnetic sensor (from ABS, for example)
RPM Signal Input #4	Rear wheel speed	Hall or magnetic sensor (from ABS, for example)
Sensors Analog Input #1	Lambda	WB-O2 Datalogger or WB-O2 Slim's 0-5V analog output
Sensors Analog Input #2	Boost pressure	FuelTech's ECU MAP output
Sensors Analog Input #3	Fuel pressure	PS-10B sensor
Sensors Analog Input #4	Oil pressure	PS-10B sensor
Sensors Analog Input #5	Two-Step button operation	Share with FuelTech ECU
Sensors Analog Input #6	Exhaust counter pressure	PS-10B sensor
Sensors Analog Input #7	Intake air temperature	Share with FuelTech ECU
Sensors Analog Input #8	Engine temperature	Share with FuelTech ECU
Sensors Analog Input #9	BoostController pressure	BoostController's MAP sensor
Sensors Analog Input #10	TPS Sensor	Share with FuelTech ECU
Sensors Analog Input #11	Front suspension	Suspension Travel Sensor
Sensors Analog Input #12	Rear suspension	Suspension Travel Sensor
Sensors Analog Input #13	Exhaust gases temperature – cylinder 1	Use four FuelTech ETM1 modules, connecting one to each channel.
Sensors Analog Input #14	Exhaust gases temperature – cylinder 2	
Sensors Analog Input #15	Exhaust gases temperature – cylinder 3	
Sensors Analog Input #16	Exhaust gases temperature – cylinder 4	

4. Sensors used with the PRO24 Datalogger

4.1 FuelTech PS-10B Pressure Sensor

FuelTech PS-10B is a high precision sensor responsible for general pressure readings (fuel, oil, boost, exhaust counter pressure, brake fluid, intake manifold, coolant, boost pressure before the cooler, engine's inner pressure (crankcase), Wastegate valve pressure, etc.).

It can be purchased online (www.fueltechusa.com) or from FuelTech dealers (check the website to locate the dealer nearest to you). To use the PS-10 sensor, power it with 12V and connect its signal output to any channel on the PRO24 Datalogger.

Find some information about **FuelTech PS-10 sensors** below:

- Connection: 1/8" NPT
- Pressure Range: 0 to 145psi
- Power Voltage: 8 to 30V
- Accuracy (including nonlinearity, hysteresis, and repeatability): +/- 0.5% at maximum readings range.
- Electric Connector: 3-way AMP Superseal (FuelTech Code 1014)

FuelTech PS-10B Sensor wiring:

- Pin 1: Battery's Negative
- Pin 2: Output Signal 1 to 5V
- Pin 3: Switched 12V



Electrical Connections – Sensor View

4.2 Air Temperature Sensor

The sensor that must be used for the measurement of air temperature is the Delphi / NTK (3.3kΩ at 20°C) standard.

It is recommended to use a sensor model similar to the ones used by the Fiat lines, which has a metal structure and can be fixed to a nut welded to the intake manifold or at the pressurization.

It must be connected along with a FuelTech ECU to operate properly.



Fiat Nº 75.479.76,
MTE-5053 ou IG901

4.3 Engine Temperature Sensor

The sensor that must be used for the measurement of engine temperature is the Delphi / NTK (3.3kΩ at 20°C) standard.

In cars with air cooling system, this sensor can be placed in the engine oil, as the fluid represents the temperature in which the engine works.

It must be connected along with a FuelTech ECU to operate properly.



Fiat Nº 026.906.161.12,
MTE-4053 ou IG802

4.4 Exhaust Gas Temperature Sensor

The PRO24 Datalogger can be used to graphically show the values read from a thermocouple. Therefore, it is necessary to use the FuelTech Thermocouple conditioner ETM-1.

When using a Type K Thermocouple of special construction it is possible to monitor any temperature (spark plug, turbine, exhaust, etc.).

The electrical wiring diagram for the FuelTech ETM-1 is as follows:

Pin	Connection	Note
1	Switched Positive (12V)	Must be connected to the PRO24 Datalogger positive terminal.
2	Battery's Negative Terminal	Must be connected directly onto the vehicle's battery.
3	Output Signal	Must be connected to one of FuelTech PRO24 Datalogger's analog sensor inputs.
4	Yellow Thermocouple (+)	Thermocouple Positive Signal
5	Red Thermocouple (-)	Thermocouple Negative Signal

4.5 Lambda Sensor

PRO24 Datalogger can read and record a channel with lambda value. To do so, a wideband lambda conditioner with a 0-5V output signal, proportional to the lambda value, must be used. Conventional lambda sensors may also be used, but must be connected directly to an analog channel on the PRO24 Datalogger.

Lambda (λ) is the relation between the quantity of air taken in by the engine and the ideal air quantity. It represents the air-fuel ratio in the exhaust gas derived from combustion, no matter the type of fuel used. A lambda equal to "1" corresponds to the stoichiometric ratio, i.e., when there is neither an excess of fuel nor air.

In Mathematical terms: $\text{Lambda Factor} = \text{quantity of air taken in} / \text{ideal air quantity}$.

Therefore:

- **Lambda less than 1** = rich mixture (theoretically, with more fuel than oxygen). It indicates unburned fuel in the exhaust gas.

- **Lambda greater than 1** = lean mixture (theoretically, with more oxygen than fuel). It indicates unburned oxygen in the exhaust gas.

- **Lambda equal to 1** = stoichiometric mixture (theoretically balanced), lambda with lowest pollutant emission. For gasoline, it means 14.7 parts of air to 1 part of fuel.

Maximum power is reached with slightly rich mixtures. The table below shows some air-fuel ratios **suggested** for engine adjustment, but which cannot be guaranteed for all cases.

Engine Type	Fuel	Lambda Maximum Power
Aspirated	Gasoline	0.86 to 0.90
	Ethanol	0.84 to 0.86
	Methanol	0.80 to 0.84
Turbo (Low Pressure)	Gasoline	0.82 to 0.88
	Ethanol	0.80 to 0.85
	Methanol	0.76 to 0.82
Turbo (High Pressure)	Gasoline	0.80 to 0.82
	Ethanol	0.74 to 0.80
	Methanol	0.68 to 0.78

For maximum thrift, a lambda around 1.05 λ is recommended in situations of low and medium engine load (never in maximum load under the risk of engine damage caused by lean mixture).

For the lowest emissions level, the stoichiometric value (1.00 λ) is recommended.

4.6 Suspension Travel Sensor

This travel sensor must be installed at the suspension and it informs the movement of the vehicle's body through the Datalogger software. It works as a TPS sensor and it is very useful to improve the tuning of suspension system as a whole.

Contact FuelTech for information on how to purchase this sensor.

The electrical wiring diagram of the suspension position sensor is as follows:

Cable Color	Function	Connection
Yellow	Signal output	Must be connected to an analog channel on the PRO24 Datalogger.
Brown	Battery's Negative Terminal	Must be connected to the battery's negative terminal.
Blue	5V Input	Must be connected to the PRO24 Datalogger's 5V output.

5. FuelTech Datalogger Software Installation

Do not connect the PRO24 Datalogger module to the computer before concluding all steps for the software installation.

Check FuelTech's website frequently to look for Datalogger software updates.

1. Run FuelTech Datalogger Installation application from the file "SetupDatalogger_xxx.exe", found on the Installation CD, in case it is not executed automatically when the CD is inserted. If your computer does not have the .NET Framework Package installed, the system will show an alert message and will proceed with the installation of such application before continuing the installation of the Datalogger software;
2. Now, you have reached the starting point of the Datalogger software installation. Click on "Find..." to change the location where the software will be installed, or click on "Install" to use the standard directory (C:\Program Files\FuelTech\FuelTech Datalogger);
3. Then, click on "Finish" to end the installation and start the program.