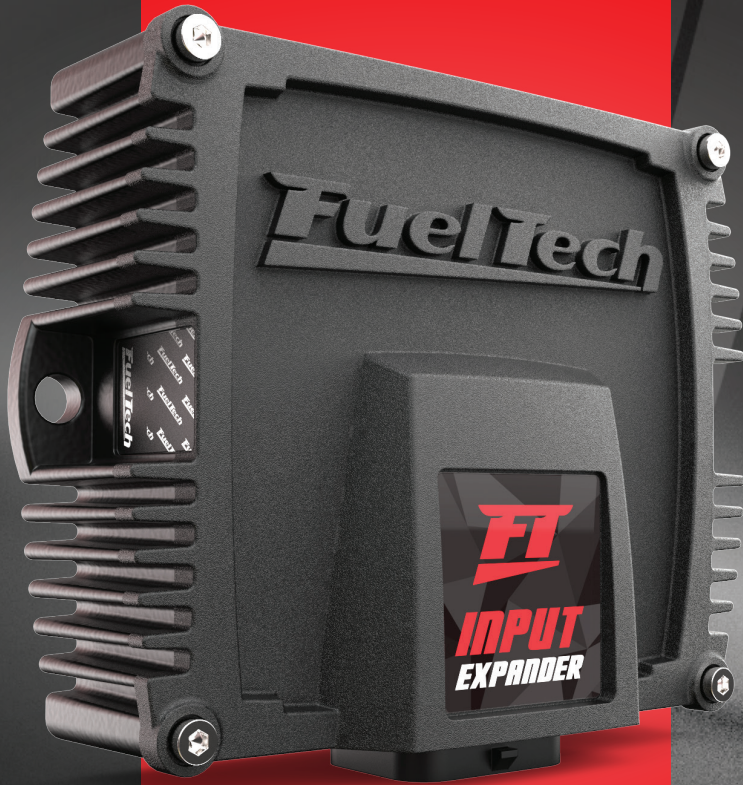


***FuelTech***



OWNER'S MANUAL

***FT INPUT  
EXPANDER***

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## 2. Presentation

The FT Input Expander is a module that has 24 input channels, separated in 20 digital and analog inputs (0-5V) used for reading temperature, pressure, button or switch positions and 4 differential inputs for magnetic or hall effect sensors used for reading frequencies such as wheel speed, gearbox and driveshaft RPM, fuel flow sensors, among others. All the readings are sent via the FTCAN 2.0 network to be stored in the internal memory of your Power FT ECU and displayed in its datalogger (the FT Input Expander has no internal memory).

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With the FT Input Expander your project is even more complete, it is totally compatible with other products of the Power FT lineup, and communication is completely performed via CAN network.

### 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 90 days 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.

Manual Version 1.0 – December/2020

## 4. Characteristics

- Sampling rate: 2 to 100Hz
- 20 digital and analog inputs (0-5V) for reading position, pressure, temperature, and buttons or switches.
- 4 differential inputs for magnetic or hall effect sensors for frequency readings such as wheel speed, transmission and driveshaft rotation, fuel flow sensors, among others.
- CAN communication with Power FT lineup (FTCAN 2.0).
- 34-way automotive connector.

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#### Dimensions

- Height: 4.52 in
- Width: 3.54 in
- Depth: 1.77 in

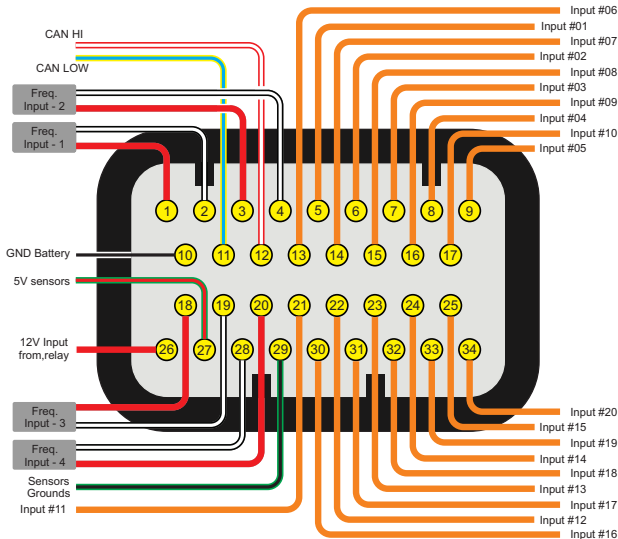
#### Package content

- FT Input Expander
- Owner's Manual

#### Electrical Specifications

- Power: 9V to 30V

### 4.1 Connector



## 4.2 Harness connections

Pin	Wire Color	Function	Descriptions
1	Red	Freq Input - 1	Shielded Cable for RPM and Speed Reading – Frequency 1
2	White		
3	Red	Freq Input - 2	Shielded Cable for RPM and Speed Reading – Frequency 2
4	White		
5	Orange #1	Input #1	Sensors Inputs
6	Orange #2	Input #2	
7	Orange #3	Input #3	
8	Orange #4	Input #4	
9	Orange #5	Input #5	
10	Black	Battery ground	Must be connected directly to the battery's negative terminal. Must not be connected to the engine block or chassis
11	Yellow/Blue	CAN LOW (-)	Connected to the CAN network of a PowerFT ECU
12	White/Red	CAN HI (+)	
13	Orange #6	Input #6	Sensors Inputs
14	Orange #7	Input #7	
15	Orange #8	Input #8	
16	Orange #9	Input #9	
17	Orange #10	Input #10	
18	Red	Freq Input - 3	Shielded Cable for RPM and Speed Reading – Frequency 3
19	White		
20	Red	Freq Input - 4	Shielded Cable for RPM and Speed Reading – Frequency 4
21	Orange #11	Input #11	Sensors Inputs
22	Orange #12	Input #12	
23	Orange #13	Input #13	
24	Orange #14	Input #14	
25	Orange #15	Input #15	
26	Red	12V input from relay	Connected to pin 87 of the main relay
27	Green/Red	5V sensors	5V Power for sensors
28	White	Freq Input - 4	Shielded Cable for RPM and Speed Reading – Frequency 4
29	Green/Black	Sensor ground	Sensor ground
30	Orange #16	Input #16	Sensors Inputs
31	Orange #17	Input #17	
32	Orange #18	Input #18	
33	Orange #19	Input #19	
34	Orange #20	Input #20	

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## 5. Installation

Installation must be done with the harness disconnected from the Input Expander and with the battery disconnected from the vehicle. It is very important that the wiring harness is as short as possible and any unused wire must be cut. Never roll any leftover wire in the harness. This will avoid any interference issues, common in any electronic equipment.

The harness must be protected from contact with sharp parts of the body and frame that may damage it and cause a short circuit. Watch out especially when going through holes, always use rubber grommets or similar protections. In the engine bay, route the wires away from excessive heat and any moving parts. Insulate the wiring harness whenever possible.

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### 5.1 CAN Network

The CAN network allows the ECU to access the FT Input Expander's channels. In addition, data reading is fully integrated through the FT Manager software.

#### CAN Network Connection

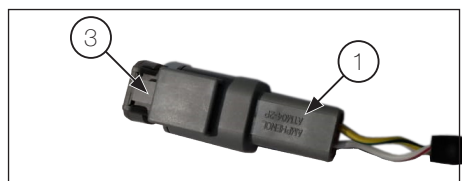
The FT Input Expander harness has 2 exclusive connectors for the CAN network connection with other FuelTech products.

- 1 - Female Connector
- 2 - Male Connector
- 3 - Terminator

Plug the male connector (2) into the female connector of the ECU. In case you have more than one equipment connected to the CAN network, it is necessary to remove such equipment's CAN terminator and plug the Input Expander's male connector (2) into this equipment's female connector.

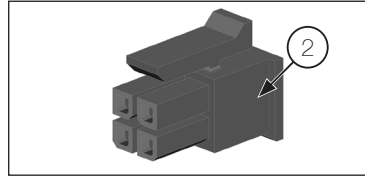
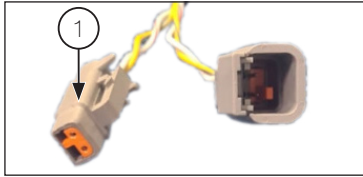
The terminator (3) must always be installed in the female connector of the last equipment connected to the CAN network, this reduces possible noise levels captured by the CAN network.

The male connector (1) must NOT be plugged into the female connector (2) of the same Harness. If this is done, the FT Input Expander CAN Network will not work.



## 5.2 Connect the FT Input Expander to FT450

To connect a FT Input Expander to a FT450 ECU the harness has to be modified, removing the connector (1) out of the FT Input Expander, replacing it by a micro fit connector (2). The micro fit is sold separately and can be found at fueltech.net by "CAN A Connector kit – Male".



### NOTE

*Be careful when crimping the wires for connector (2), it assembles in only one position.*

*Wires colors must match at both FT450 and FT Input Expander sides.*

## 6. FT Input Expander map

The inputs configured in FT Input Expander will be recorded directly in the module, and will be completely independent of the map recorded in the ECU. On the ECU map the inputs can be set as either the reading comes from the ECU itself or if it comes through the CAN network.

Therefore, despite being independent maps, it is necessary to inform the ECU which channels will come from FT Input Expander and to do this automatically, it is necessary that the ECU map is open in the FT Manager before opening the FT Input Expander map.

After making the desired configurations, just save the settings in the FT Input Expander and at that moment a message will be displayed, allowing that the configuration of the inputs on the ECU map is done automatically. Finally, remember to save the updated map to the ECU.

The FT Input Expander identification file has an extension (.ftie) that is different from an ECU map file.

## 7. Configuring the FT Input Expander

After the electrical installation is completed and the CAN network is connected, you can configure the FT Input Expander inputs. There are two types of configuration, one for analog / digital inputs and one for frequency readings such as the RPM and speed channels.

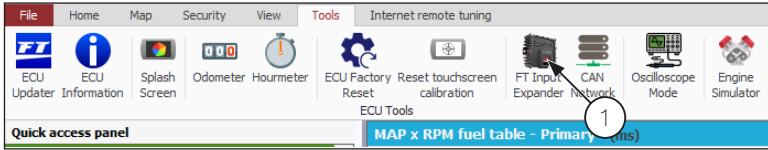


# FT Input Expander

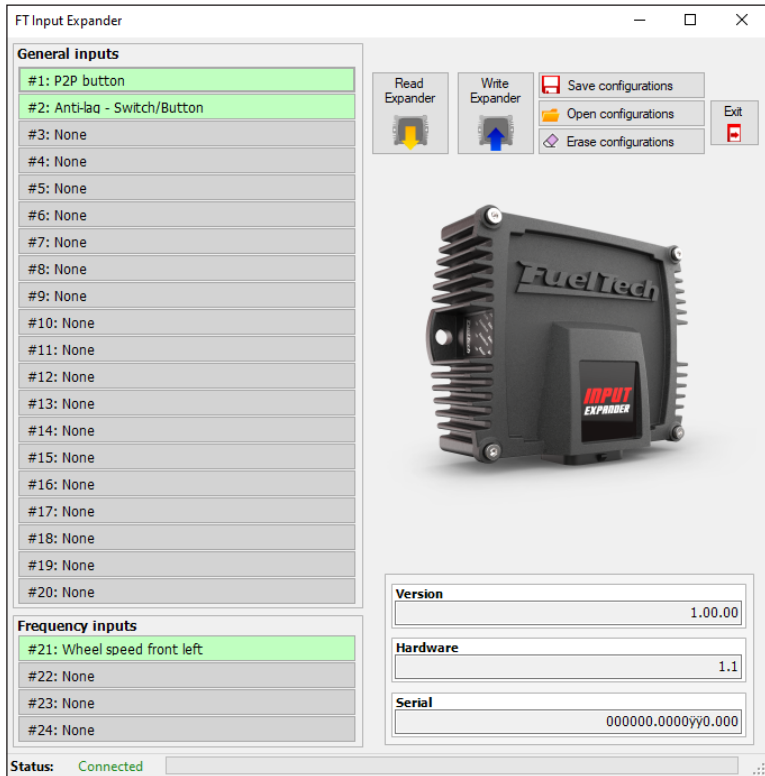
## 7.1 Analog / Digital Inputs

To configure the analog / digital channels, perform the following steps:

- a - Access the FTManager Software and open the map you want to expand the inputs or create a new map if necessary.
- b - Access the **“Tools”** menu and click on the **“FT Input Expander”** icon (1).



- c- When clicking on FT Input Expander, the channel configuration screen will be shown. It is separated in two groups, **“General Inputs”** for configuration of the channels with analog / digital reading and also **“Frequency Inputs”**.



## Configuring General Inputs

- d - In the General Inputs group, click on the channel to be configured.
- e - The channel configuration screen in FT Input Expander is very similar to the screen on the FT Manager under “*Sensors and Calibration / Inputs*”, with a single difference which is the “*Sampling rate*” field. This parameter is responsible for the frequency that the information is sent via the CAN network.  
It is divided into 4 options: 2, 10, 50 and 100 Hz.
- f - Click on the “OK” button to save the configuration.



### NOTE

The FT Input Expander records at sample rates of up to 100Hz. If you need to monitor information with rates up to 200Hz, use a channel from your Power FT ECU itself.

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### Input #3 configuration:

**Input enabled**

**Channel name**

Measure  
EGT Cyl #01

Sampling rate  
50 Hz

Decimal places  
1 (Min: -3200,0 Max: 3200,0)

**Offset**

Offset type  
Disabled

Offset value  
0

**Digital filter**

Digital filter enabled

Filter frequency  
50

**Input sensor**

**Default**  
FuelTech ETM-1

**Custom**

Signal type  
Analog

Enabled pullup

Averagepoints  
63

**Digital sensor setup**

Digital options  
Higher level

Hi level  
0.000 v

Lo level  
0.000 v

Invert output signal

Interpolationtable

Voltage	Value
0.000	32.000
5.000	1832.000

**Fill values**

## Configure Hall and VR sensors for frequency input

**Hall:** Use the white wire for signal reference and the red wire must be disconnected. In this case, it is necessary to feed the sensor with positive and negative

**VR:** Use the white wire for signal reference and the red wire for sensor power

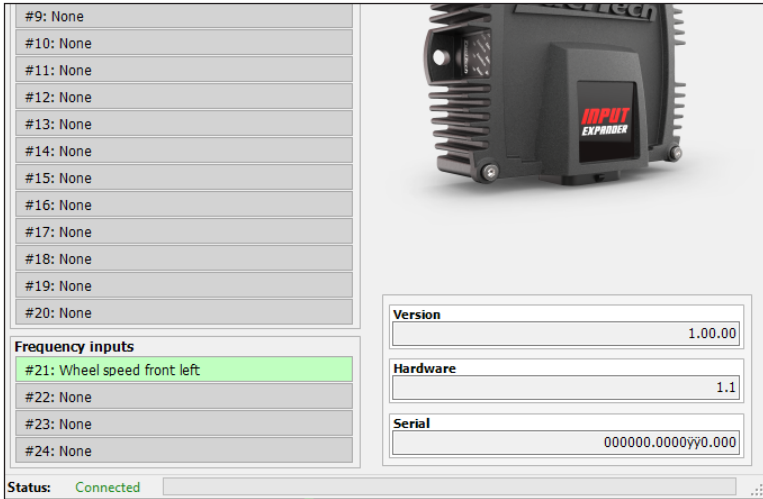
# FT Input Expander

## Configure Frequency Inputs

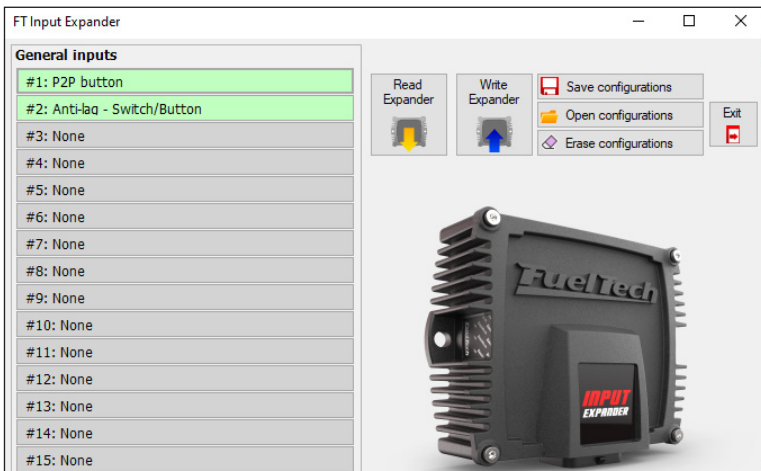
- g - In the “*Frequency Inputs*” tab it is possible to configure 4 channels for reading speed or RPM, but each kind of input requires additional configurations

**For example:** To configure the turbo RPM it is necessary to inform the number of blades and divisions in the turbocharger so that the reading is correct.

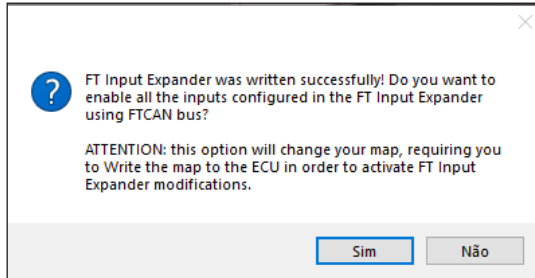
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- h - After configuring the channels, it is necessary to save the information in the FT Input Expander by clicking on the “*Write Expander*” button.

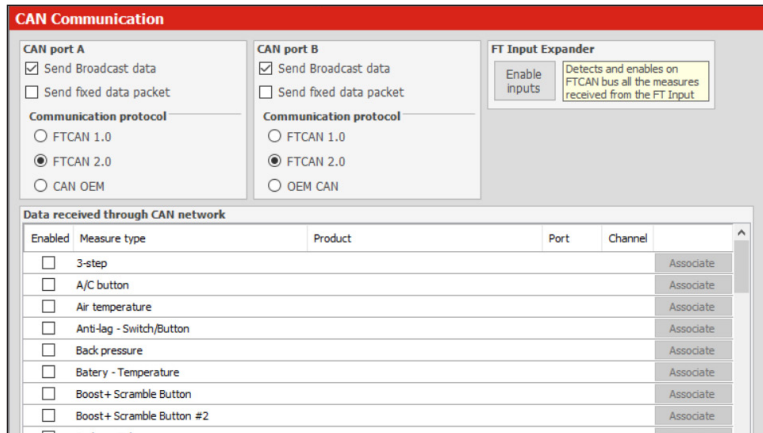


- i - After writing the channels to the FT Input Expander, it is necessary to enable them in the CAN network, just click on the “Yes” button on the message and the FTManager will update the map automatically. If you click “No”, the association will be manual.



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- j - If the option selected in the previous step was “No”, it is necessary to access the “CAN Communication” menu within “Sensors and Calibration” and click on the option “Enable inputs”.



## Configure Hall and VR sensors for frequency input

**Hall:** Use the red wire for the signal and the white wire should be disconnected. In this case, it is necessary to feed the sensor with positive and negative

**VR:** Use the white wire for signal reference and the red wire for the signal

## 8. Troubleshooting

- ECU is not reading data from FT Input Expander
  - Make sure the FT Input Expander has the correct map (See item 7 of this manual).
  - Make sure to send the map to the FT Input Expander (See item 7 of this manual).
  - Make sure that the map of the ECU has the inputs enabled via the CAN Network (See item 7 of this manual).

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- FT Input Expander is not communicating with FTManager
  - Check the electrical connection of the module.
  - Check the connection of the CAN network connectors.

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