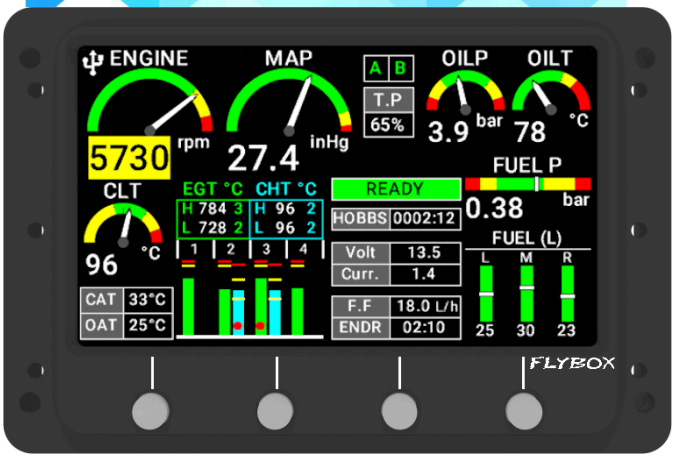
FLYBOX®



EngiMaster

Engine Information System

User Manual

User Manual, Safety Instructions and Warning Booklet

This product is not TSO'd and cannot be installed into traditional FAA Part 23 and similarly Type-Certificate Aircraft

Document U2023ENGMST
Revision#1.0, 11/2023
For firmware version 1.13

This booklet is suitable for printing in A5 format.

IMPORTANT NOTICE AND WARNINGS

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INTRODUCTION

INSTRUMENTS CONFIGURATION

OPERATING INSTRUCTIONS

TECHNICAL SPECIFICATIONS

WARRANTY

DISCLAIMER

Symbols used in the User Manual

NOTE: Used to highlight important information.

CAUTION: Used to warn the user, it indicates a potentially hazardous situation or improper use of the product.

WARNING: Used to indicate a dangerous situation that can cause personal injury or death if the instruction is disregarded.

FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING: These instructions must be provided to users before use, and retained for ready reference by the user. The user must read, understand (or have explained) and heed all instructions and warnings supplied with this product and with those products intended for use in association with it. Always keep a copy of the Installation and User Manual, Safety Instructions and Warning Booklet on the aircraft. In case of change of ownership, the Installation and User Manual, Safety Instructions and Warning Booklet must be delivered together with all of the other papers.

WARNING: Read the Installation and User Manual, Safety Instructions and Warning Booklet before installing the device on your aircraft and follow the procedure described therein.

WARNING: This device is intended to be installed on NON-TYPE CERTIFIED AIRCRAFT ONLY, as it does NOT require any air operator's certificate. Refer to your national aviation authorities to check if this device can be installed on your aircraft.

WARNING: It is the owner's responsibility to test this device before operating the aircraft and to make sure nobody is using it unless properly instructed and authorized to do so.

WARNING: Once the installation process is completed, it is extremely important to test the device before taking off to make sure it works properly. Therefore, we strongly suggest to double check all of the electronic instruments available on the aircraft and to turn them on to verify they function correctly.

WARNING: This device is operated through a software which from time to time can be updated and/or subject to change. Please, always refer to the Installation and User Manual, Safety Instructions and Warning Booklet for the last updated version of the software available on www.flyboxavionics.it

WARNING: It is the responsibility of the installer to properly install the device on the aircraft. In case of calibration, or any technical or functional customization of the device, the responsibility lies with the individual who carried out such operation.

WARNING: If this product is not used correctly, or it is subjected to additions or alterations, the effectiveness of this device may be considerably reduced.

WARNING: Alterations, additions, or repairs not performed by the instrument manufacturer or by a person or organization authorized by the manufacturer shall negate any warranty.

WARNING: The unit isn't waterproof. Serious damage could occur if the unit is exposed to water or spray jets.

WARNING: Installation and configuration of this instrument should only be carried out by trained and authorised professionals. See the Flyboxavionics website for a list of authorised installers.

NOTE: The consumer decides of his own free will if the purchased product is suitable and safe for his need. If the consumer does not agree with the notices contained in this Installation and user Manual, Safety Instructions and Warning Booklet, do not install this instrument in his aircraft.

NOTE: Flybox Avionics reserves the right to change or improve its products as well as terms, conditions, and notices under which their products are offered without prior notice.

NOTE: The Installation and User Manual, Safety Instructions and Warning Booklet will be updated annually if needed.

All changes or updates will be published on our website www.flyboxavionics.com in the "support" section.

NOTE: Check the website www.flyboxavionics.it periodically for software and manual updates.

NOTE: For some products, registration may be required to receive important news or information on available firmware updates or to receive security information.

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1.1 - Primary action after installation

WARNING: Do not fly until you have performed at least the actions indicated below:

1. **Choose aircraft type**: the first parameter to setup is the engine selection. It can be made by entering in the *Main menu → Configuration → Aircraft* as explained in chap *1.3.3 Configuration*

2. **Choose engine model**: the first parameter to setup is the engine selection. It can be made by entering in the *Main menu → Configuration → Engine* as explained in chap *1.3.3 Configuration*

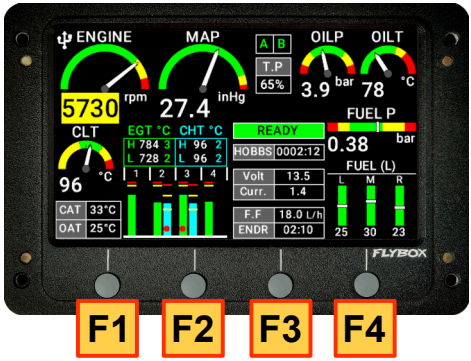
3. **Tank level sensors**: (if connected). It's indispensable to perform the calibration for all the tank level sensors connected to **EngiMaster**. Without performing calibration and settings no indication will be furnished. It is responsibility of the user to check during the first flights and over time the goodness of the calibration and therefore the instrument indications. The verification can be done in any moment, for example by simply checking the quantity put to fill the tank: if you know that the tank filled contain 40 liters and the **EngiMaster** indicate as remaining quantity 10.0 liter, you know that to fill the tank you must put approximately 30 liters. Of course keeping in mind that in ground the indications will be different that in flight because of the flight's attitude. This problem is present also in the traditional analog gauge indicators, but is more difficult to detect because of the non-numeric indication. Another verification is, in case of low remaining quantity (i.e. 4~5 liters), drain and measure it.

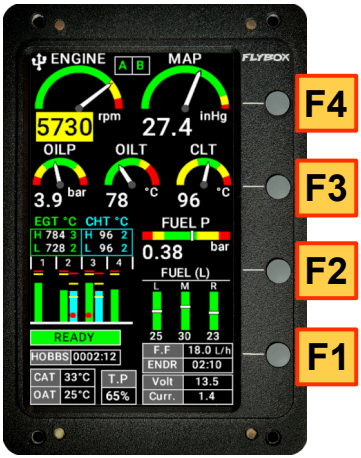
4. **Fuel computer**: (if installed). If it's installed the fuel flow transducer, BEFORE rely on informations provided by the fuel computer section you must:

   • Verify that the K-factor set in the **EngiMaster** is pertinent to the installed fuel flow transducer (for the *FT-60 Recube Flybox cod. 503030* is 68000).

   • Execute the fuel flow transducer calibration as explained in chapter *1.3.2.11 - Fuel computer section K-Factor calibration*. Without calibration the fuel computer informations may be wrong, even if the nominal K-factor is correct for the fuel flow transducer used.After calibration, the K-factor should have been calculated automatically and at best for every single installation. You must still check for some time if the remaining quantity indicated are reliable compared to the refuelling performed. For example, if the instrument indicate a remaining quantity of 35 liters and you know that the tanks capacity is 80 liters, filling the tanks should require approximately 45 liters; in case of much difference redo the calibration. Consider also that, during use, little errors accumulate and if you never fill the tanks you never “reset” all these errors.

1.2 - Panel indicators and commands





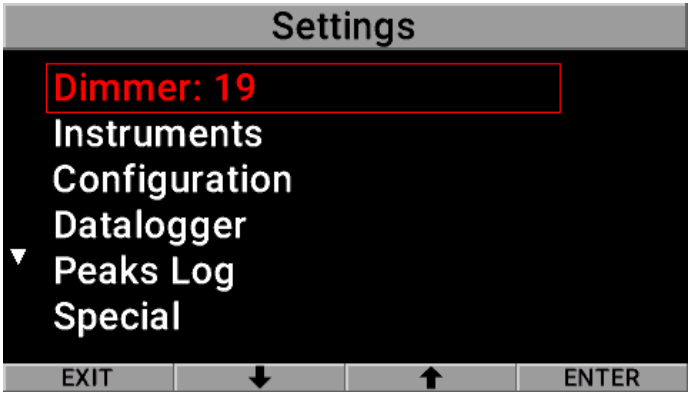
Pushbuttons are used to switch between different screens and navigate menus. When inside a menu, the meaning of the pushbuttons is always indicated.

1.3 - Instrument configuration

Before using the **EngiMaster** you need to configure it; read completely this chapter and follow step by step the sections to completely configure all the sensors, alarms and preferences available.

1.3.1 - Entering & Browsing the menus

To enter the main menu press and hold the F1 and F4 buttons for 3 seconds.

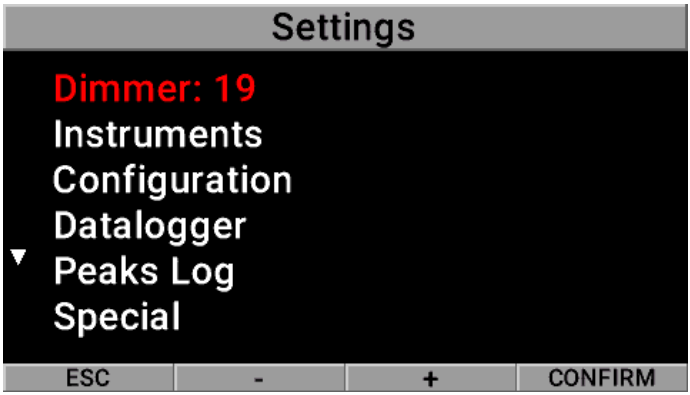


The labels near the button indicate their function within the menu.

For example, to change the display brightness:

- Select *Dimmer* by pressing on ENTER (F4); the border will start flashing, this means that the selected item is editable.

- To change the value press the -(F2) or +(F3) keys, to confirm press CONFIRM (F4).



- To return the value to the initial value, press ESC (F1)

This way of working is the same for editing all parameters inside the various menus.

1.3.1.1 - Common items description

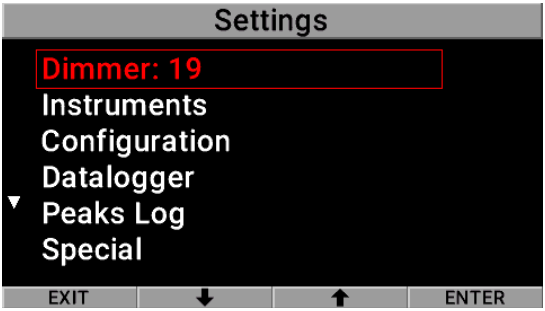
To avoid repetition, common menu items are described in the current section. Only functionality is described ,any other options will be specifically when required.

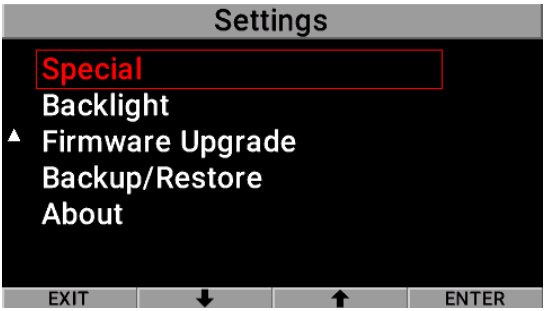
- **Enable:** enables or disables the visibility of the gauge on the display, can be YES or NO (default YES).
- **Filter:** assigns the strenght of the digital filter in a range from 1 to 100. If the measure is affected by noise, increase the value. If there is a delay between the input change and the measurement, the value should be decreased (default 10).
- **Unit:** assigns the measurement unit.
- **Upper Warning:** enable or disable the measurement check on exeeding the *High* threshold, can be YES or NO (default YES).
- **Lower Warning:** enable or disable the measurement check on exeeding the *Low* threshold, can be YES or NO (default YES).
- **Warning:** enable or disable the measurement check, can be YES or NO (default YES).
- **Aural enable:** if set to YES it plays an aural warning if *EngiMaster* audio line out is connected to an intercom. Can be YES or NO (default YES).
- **Aural repeat:** set how many times the aural message must be repeated. The range is 1 to 5 times (default 2).

- **Output:** you can choose to enable one of the two outputs available on *EngiMaster* when the alarm is activated, useful for example to turn on an alarm light on the cockpit. Set to zero to disable this function (default 0).

- **Delay:** set how many second the condition must persist before trigger the alarm (*default 0.5*).

1.3.2 - Main menu





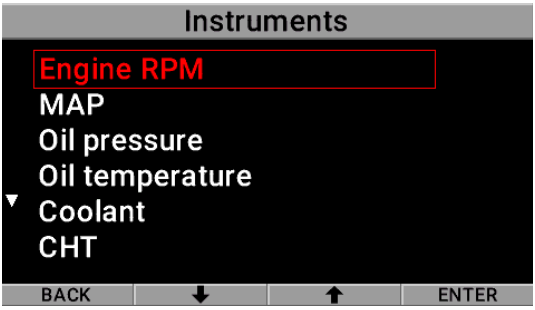
- **Dimmer**: display brightness adjustment can be a value between 1 and 19 (default 19).
- **Instruments**: enter the “Instruments” menu.
- **Configuration**: enter the “Configuration” menu.
- **Datalogger**: start the Datalogger Viewer functionality.
- **Peaks Log**: start the Peaks Log Viewer functionality.

- **Special**: enter the “Special Functions” menu.
- **Backlight**: enter the “Backlight” menu.
- **Backup & Restore**: starts the functionality for saving ,or restoring, instrument settings to USB flash drive.
- **About**: opens the screen with information about the instrument

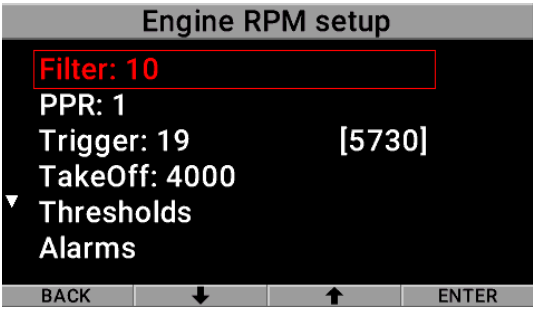
1.3.3 - Instruments menu

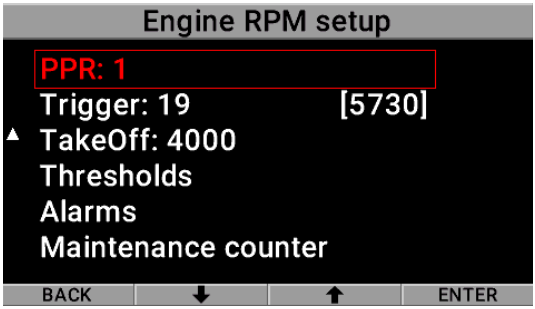
In this menu is possible to set parameters for all available measurement.

NOTE: Depending on the choice made on the aircraft type, some menu items may or may not be displayed (i.e. *Rotor* is not shown if the aircraft type is fixed wing).



1.3.3.1 - Engine RPM





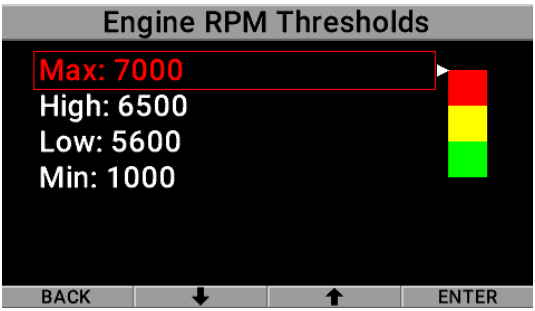
- **Filter:** as in chapter *1.3.1.1 - Common items description*
- **PPR (pulse per revolutions)**: this is the number of pulses the sensor counts for each revolution of the engine. This value doesn't affect the RPM calculation if the data is read from an ECU. It has a range from 1 to 200 (default 1)
- **Trigger:** set the electrical threshold for the RPM input. The number on the right is the actual reading of the

RPM, to check immediately while modifying the trigger value. For signal amplitude of 0~5 Volt set a value of 20.For signal amplitude of 0~12 Volt set a value of 27. For Rotax 912 engine tipically this parameter should not be changed, let the default value. It has a range from 0-31 (default 19).

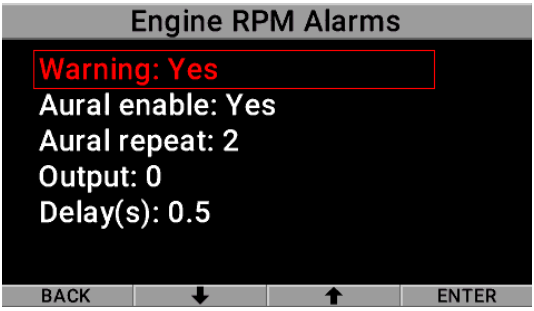
- **TakeOff:** set the RPM required to start the flight timer (the flight timer start automatically when the engine's RPM meets or exceeds this parameter for 30 seconds). It has a range from 0-6000 (default 4000).

Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



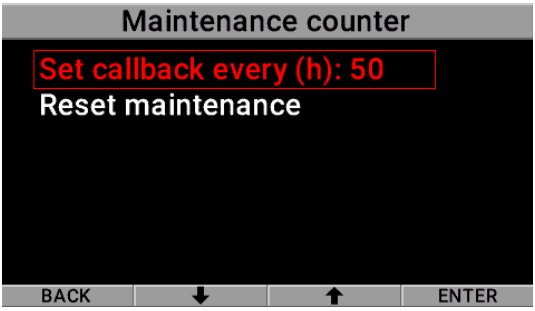
Alarms



- **Warning:** as in chapter *1.3.1.1 - Common items description*
- **Aural enable:**as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*
- **Delay:** as in chapter *1.3.1.1 - Common items description*

Maintenance counter

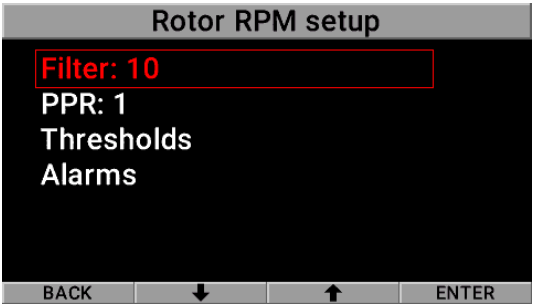
Set a counter to be notified to perform engine maintenance.



- **Set callback every (h):** assigns how many hours should pass before the maintenance alert should be displayed. Setting zero disables the function.
- **Reset maintenance:** resets the counter when the prompt is shown.

1.3.3.2 - Rotor RPM

This menu appears only if Aircraft type is *Rotorwing*

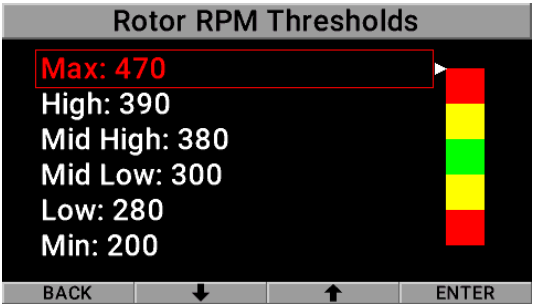


- **Filter:** as in chapter *1.3.1.1 - Common items description*

- **PPR (pulse per revolutions)**: this is the number of pulses the sensor counts for each revolution of the rotor. It has a range from 1 to 200 (default 1)

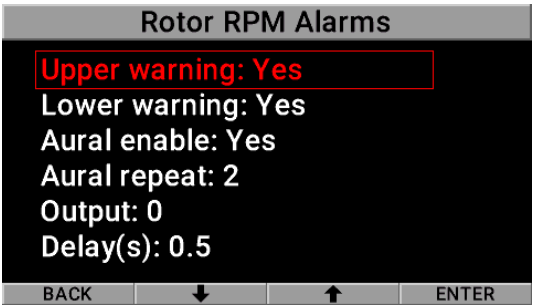
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



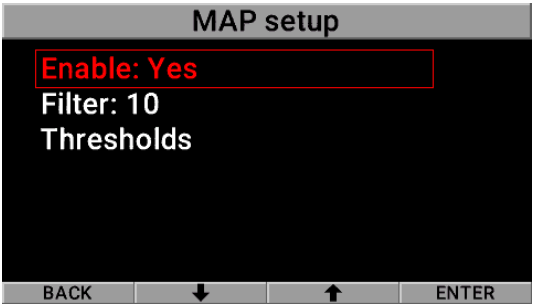
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

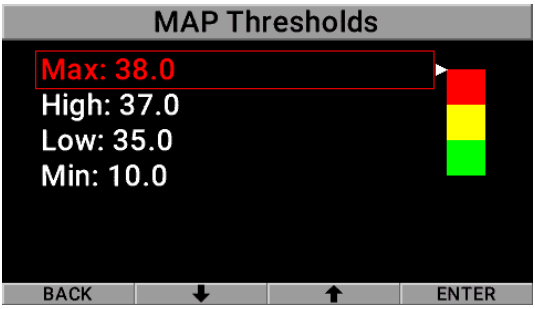
1.3.3.3 - MAP



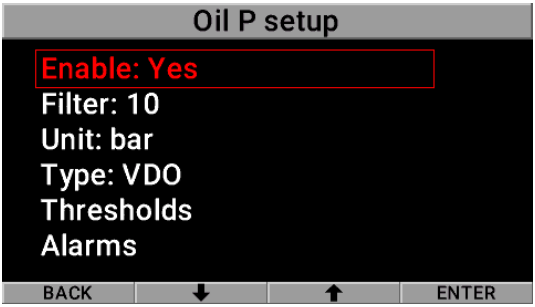
- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.

Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



1.3.3.4 - Oil pressure



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.

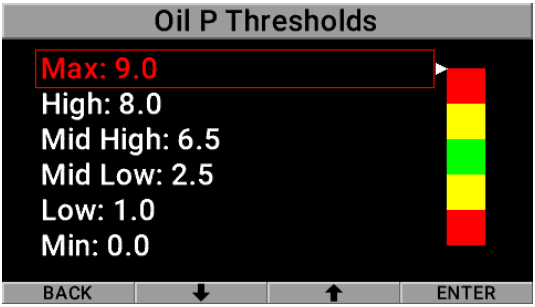
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *bar* or *psi* (default bar)

- **Type:**sets the probe type according to your electrical installation. Options available are:

Menu Label	*Description*
VDO (default)	Resistive sensor usually installed on Rotax 10bar fullscale
4-20	Sensor with 4-20mA current loop

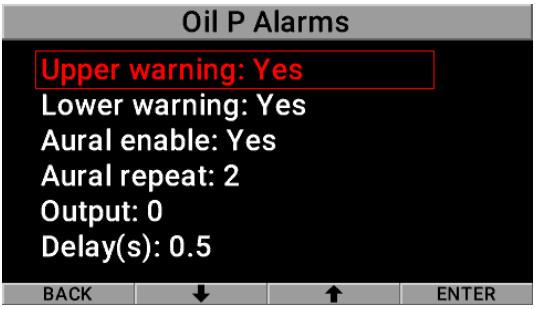
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



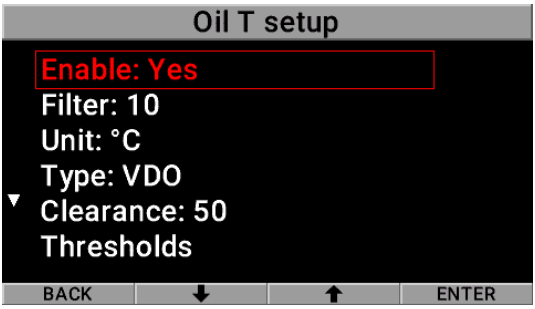
Alarms

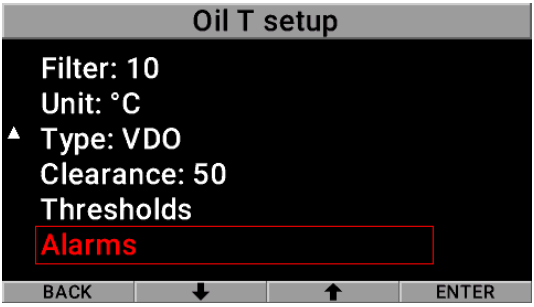
Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

1.3.3.5 - Oil temperature





- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *°C* or *°F* (default °C)

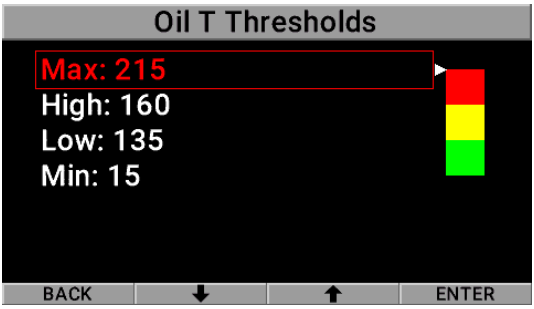
- **Type:**sets the probe type according to your electrical installation. Options available are:

Menu Label	*Description*
VDO (default)	Rotax VDO 323-057 150°C
P1K	PT1000 thermistor
TCJ	Thermocouple type J

- **Clearance:** assigns the temperature above which the ready motor condition can be triggered. (defaut 50°C - 122°F)

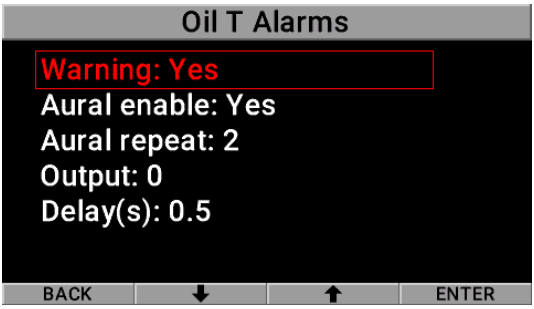
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



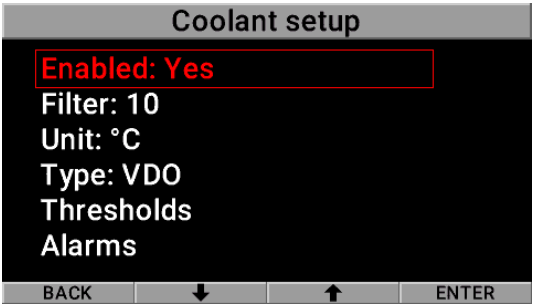
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold.



- **Warning:** as in chapter *1.3.1.1 - Common items description*
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*
- **Delay:** as in chapter *1.3.1.1 - Common items description*

1.3.3.6 - Coolant

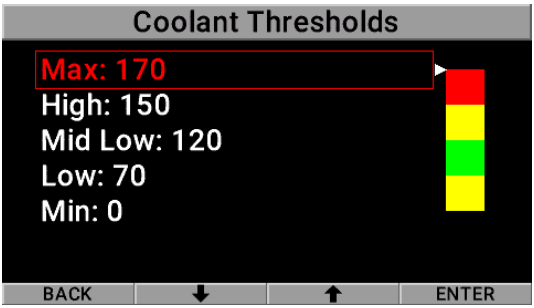


- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *°C* or *°F* (default °C)
- **Type:**sets the probe type according to your electrical installation. Options available are:

Menu Label	*Description*
TCJ	Thermocouple type J
VDO (default)	Rotax VDO 323-057 150°C

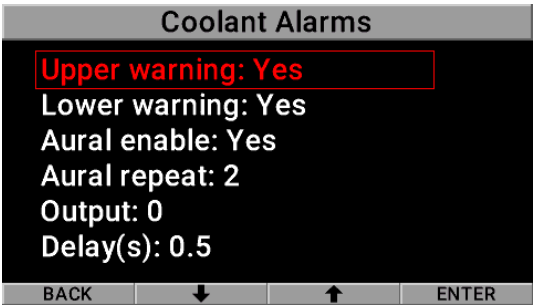
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



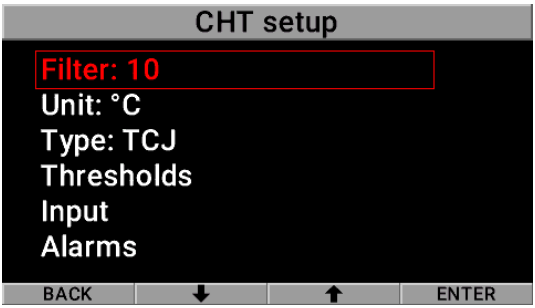
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

1.3.3.7 - CHT



- **Filter:** as in chapter *1.3.1.1 - Common items description*.

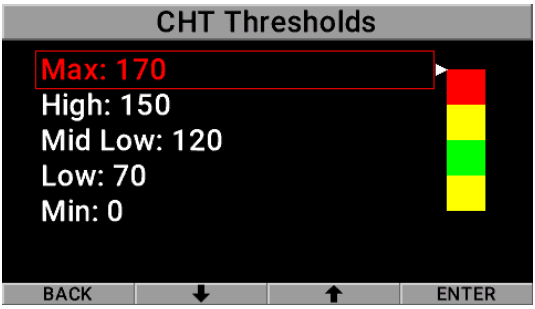
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *°C* or *°F* (default °C)

- **Type:**sets the probe type according to your electrical installation. Options available are:

Menu Label	*Description*
TCJ (default)	Thermocouple type J
VDO	Rotax VDO 323-057 150°C

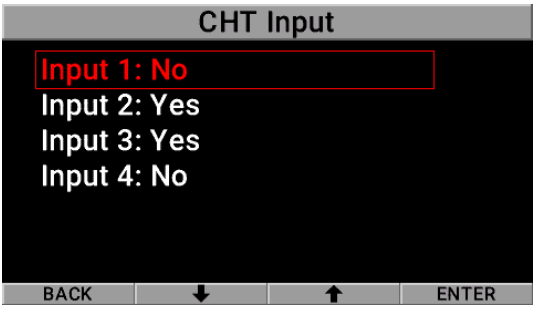
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



Input

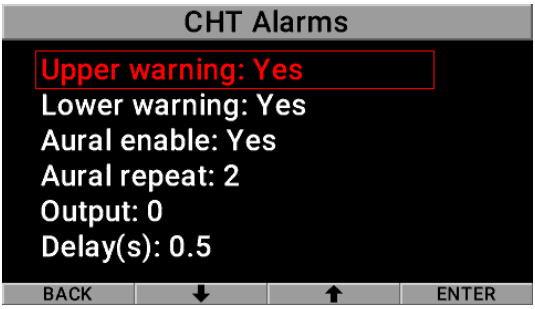
Enables or disables the reading of the signale from a specific input. Input may vary from 4 to 6 depending on the chosen *Engine Type.*



NOTE: Input number are directly associated to the cilynder number. Refer to the engine manufacturer manuals for cylinder numbering.

Alarms

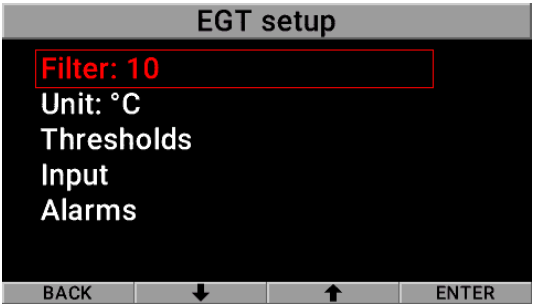
Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold.



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.

- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

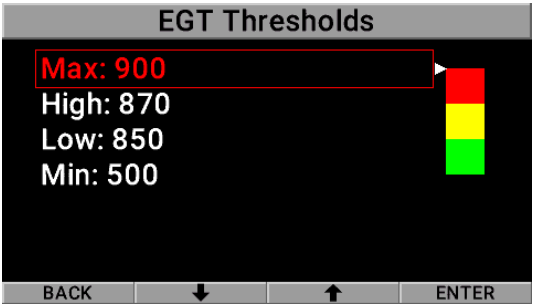
1.3.3.8 - EGT



- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *°C* or *°F* (default °C)

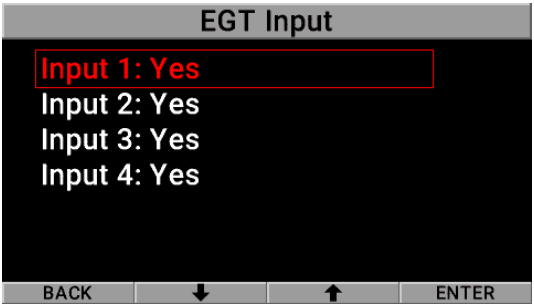
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



Input

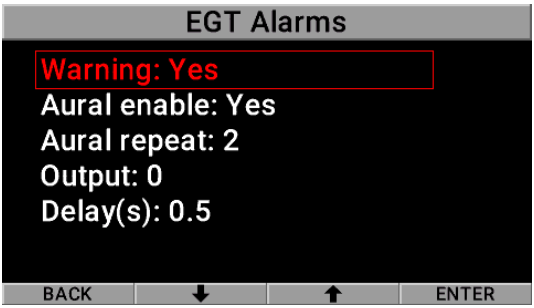
Enables or disables the reading of the signale from a specific input. Input may vary from 4 to 6 depending on the chosen *Engine Type.*



NOTE: Input number are directly associated to the cilynder number. Refer to the engine manufacturer manuals for cylinder numbering.

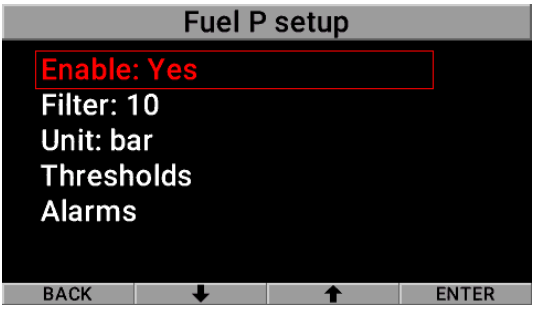
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold



- **Warning:** as in chapter *1.3.1.1 - Common items description*
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*
- **Delay:** as in chapter *1.3.1.1 - Common items description*

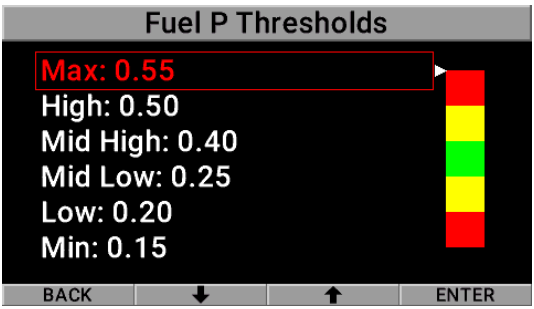
1.3.3.9 - Fuel pressure



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*.
  Option available are *bar* or *psi* (default bar)

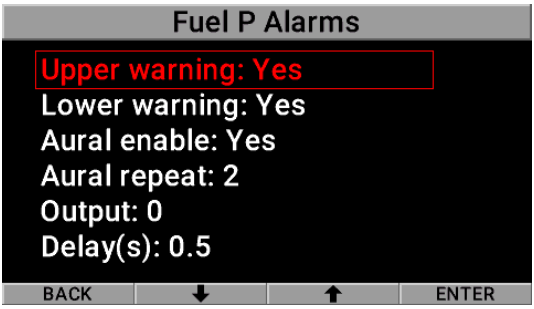
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



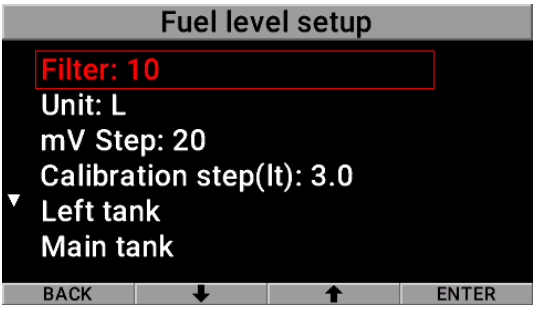
Alarms

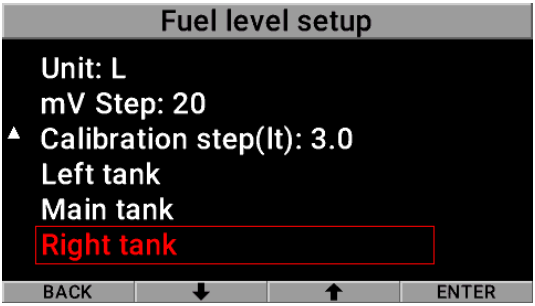
Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold.



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

1.3.3.10 - Fuel levels



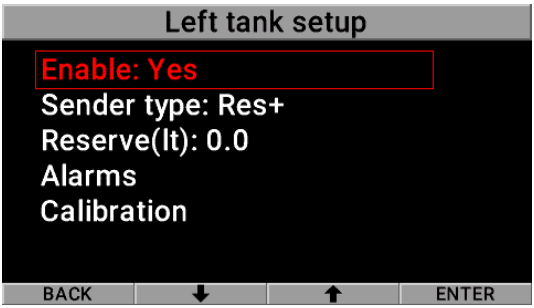


- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*. Option available are *L* or *usg* (default L)
- **mV Step:** minimum thresold to detect fuel sensor movements (default 20, it is preferable to leave this value unchanged).

- **Calibration step:** with this parameter it's possible to choose the fuel quantity to add at each calibration step. Choose a proper value considering the tanks capacity and how many calibration steps you want to execute. For example with a 40 liters tank and “Calibration fuel step”set to 2 it's required 40 / 2 = 20 calibration steps. Consider also that the maximum number of calibration steps that is possible to store in memory for every tank is 50. The “Cal. steps” parameter is used for all the tanks calibrations, don’t modify it once you have choosed a value. It has a range from 1 to 5L (default 3L).

Tanks setup

Selecting the *Left tank*, *Main tank* or *Right tank* menu items takes you to the individual tank settings submenus. The menu items are the same for all tanks, so to avoid repetition only one of the three will be explained.



- **Enable:** as in chapter *1.3.1.1 - Common items description*.

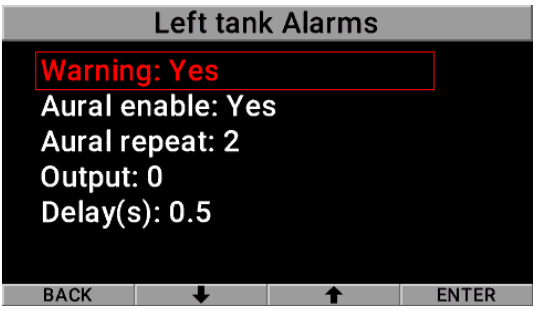
- **Sender type**: selects the type of level sensor. Option available are:

Menu Label	*Description*
Res+ (default)	Resistive fuel sensors that increase resistance as you add fuel.
Res-	Resistive fuel sensors that decrease resistance as you add fuel.
Cap	Capacitive with output between 0 and 5 volts.

- **Reserve:** set the amount of fuel below which is activated the alarm of low fuel level for the selected tank. Range from 0 to 50L (default 0)

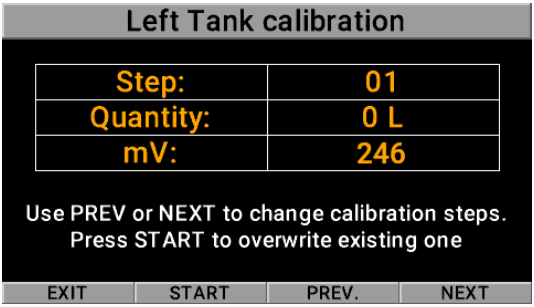
Alarms

Configure the measurement checking system to trigger an alarms if the measure drop below the *Reserve* value.



- **Warning:** as in chapter *1.3.1.1 - Common items description*
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*
- **Delay:** as in chapter *1.3.1.1 - Common items description*

Calibration



NOTE: if no calibrations have been made for this tank, a message indicating that there are no calibration data will appear.

NOTE: Calibration must be performed with the aircraft in flight attitude so you will need to raise or lower the tail depending on whether it is, a taildragger or a tricycle.

Empty the tank so that only the unusable fuel remain in the tank.

To reach the maximum accuracy in the calibration, It's important that the fuel quantity is exactly measured.

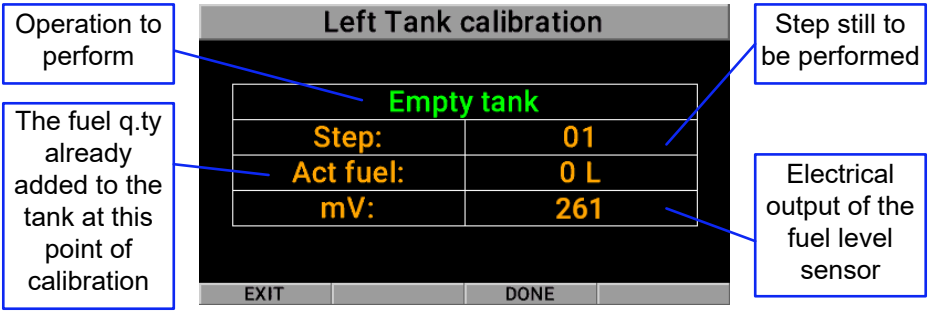
A good practice to make the float stabilize on the fuel is to give a shake to the plane. This can sometimes overcome the friction of some floats that tend to be sticky.

Calibration is divided into several calibration steps, in each step a predetermined amount of fuel (x liters) will be added to the tank.

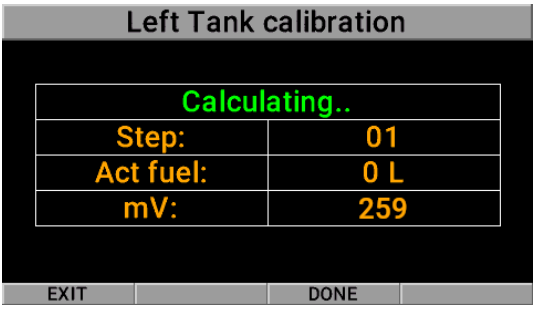
After confirming the calibration function, the screen above will appears.

Press *EXIT* (F1) to quit the calibration procedure.

Press *START* (F2) to start a new calibration, this screen will appear.

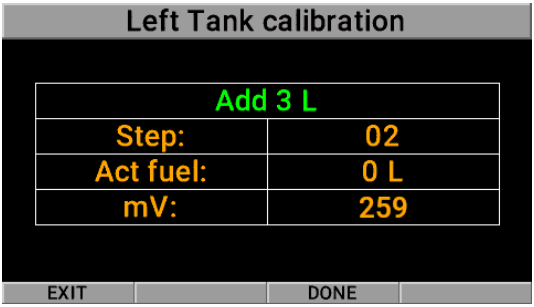


Step 1: Check that the tank is empty, wait for the mV indication to be stable and press *DONE* (F3) to proceed to the next step.



At this step the actual fuel is 0 L.

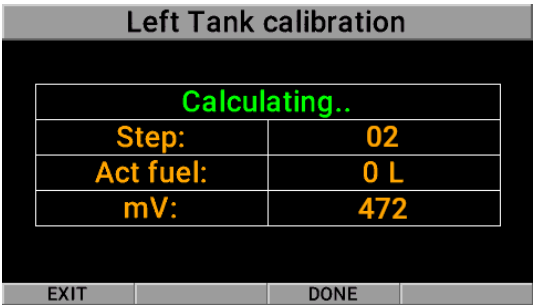
After *DONE* has been pressed, the microcontroller will calculate the mV average value for few seconds, then the screen below will appear. Now you are ready for the next step.



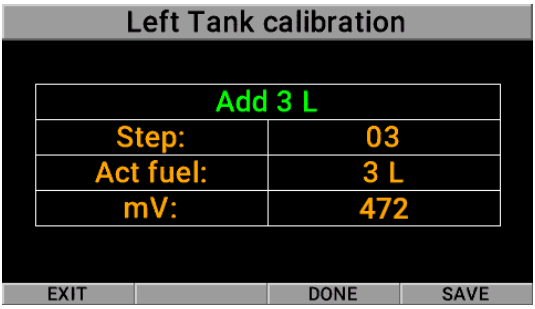
In the example, the *Calibration step* value is set to 3 liters

Step 2: Now add the fuel indicated in the green field (it's the same quantity choosen in the *Calibration step* parameter).

Step 3: Wait for the new mV indication to be stable and proceed to the next step by pressing *DONE*. If there are no problems in your system, what you'll see is the following.



The microcontroller will calculate the average value for few seconds, during which you will see the screen as above, before moving on to this screen.

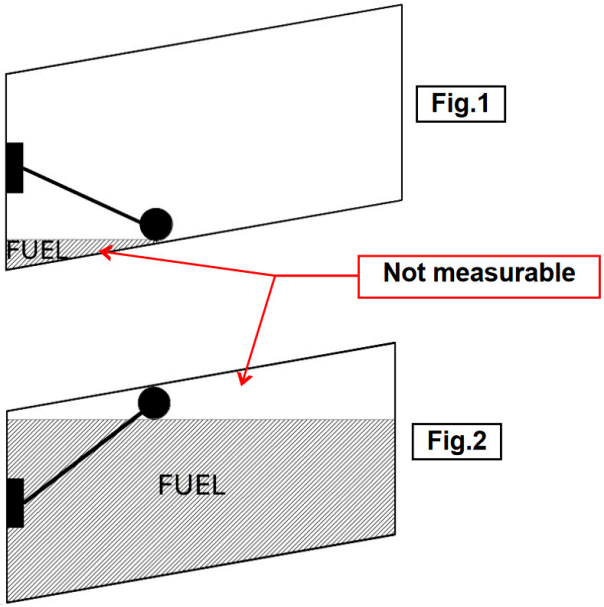


Next steps: repeat step #2 and step #3 until tank is completely filled. When the tank is filled: press *DONE* to confirm the last calibration step and then press *SAVE* to end the calibration. You will be asked for a confirmation.

NOTE: A common problem for many fuel level sensors is that they can't completely measure the tank capacity, so one or both of this conditions can occur:

- As you add fuel to an empty tank it takes a certain amount of fuel before the fuel sensor starts moving from the bottom.

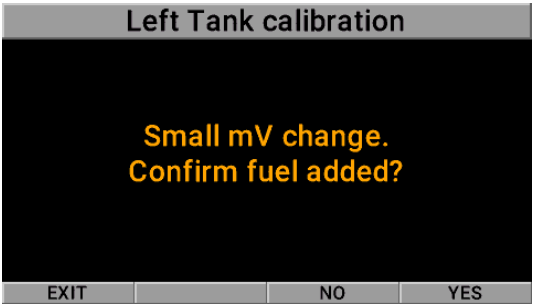
- As you drain fuel to a filled tank it takes a certain amount of fuel before the fuel sensor starts moving from the top



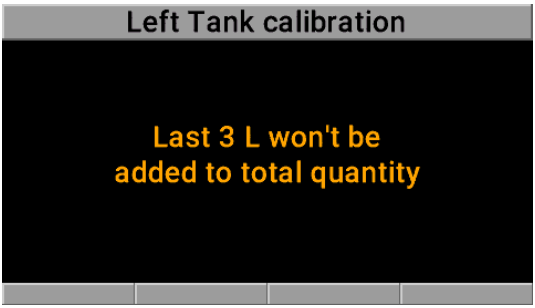
NOTE: <u>This is not a problem of the instrument but a situation that can occur if the sensor travel does not cover the entire fuel travel from botton to top.</u>

If one of these conditions occurs during the calibration, *EngiMaster* notices that the fuel sensor doesn't produce an electrical change and asks the user if fuel is already

added for that calibration step:



If you are sure to have already added the fuel, confirm on *YES* otherwise press *NO* to go back to previous calibration step.

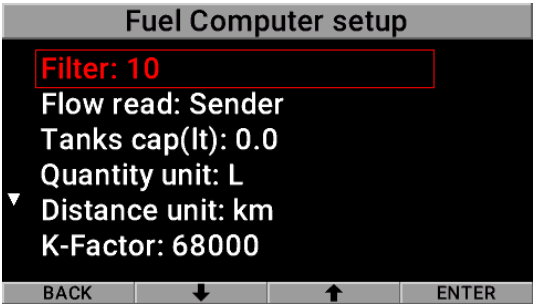


NOTE: Consider that all fuel additions that will not give any sensor movement will not be counted.

This calibration procedure is also identical for the *Main Tank* and *Right Tank*

1.3.3.11 - Fuel computer

NOTE: This item is available only if the *Fuel computer activation key cod. 661000* has been purchased and the function has been activated as indicated in the chapter *1.3.7 - Fuel Computer Activation.*



- **Filter:** as in chapter *1.3.1.1 - Common items description*.

- **Flow read:** (enabled only if Rotax914 engine is selected) sets the fuel flow reading mode. It has two options:

Menu Label	*Description*
Calculated	It use an internal algorithm to estimate the fuel flow.
Sender (Default)	It reads the signal from the flow sender connected to the remote module.

- **Tanks cap:** set the total capacity on-board as the sum of all the usable fuel in all tanks. (range 0-150lt, 0-40 gal).

- **Quantity unit:** assing the measurement unit for the quantity indications. Option available are *L* or *usg* (default L).

- **Distance unit:** assing the measurement unit for distance (used for *Range* indication). Option available are *km* or *NM* (default km).

- **K-Factor:** the K-factor of a fuel flow transducer is the number of electric pulses for 1 gallon of fuel flown (if you have the K-factor in liters you must multiply this value by 3.78 before set *K-Factor* parameter in the instrument). If you are using the *RED-CUBE FT-60 flow sensor Flybox code 503030*, make sure the K-factor is 68000. If you are using another kind of Fuel Flow sensor, make sure about his compatibility of the electrical signals of amplitude and frequency and follows the manufacturer instructions to set the right *K-Factor* value. The K-Factor can be manually modified or automatically calculated with the *K-Factor calibration* function. It's recommended also to execute the K-factor calibration as soon as possible to have the maximum accuracy.

K-Factor calibration

NOTE: it's recommended to perform the calibration right after installing the instrument.

1- With the aircraft in level attitude, fill the tank/s of fuel; note that in the step #4 it's required to refill the tank/s at the exact level reached here.

2- Turn-on the instrument and select ***FILLED*** when asked for the fuel quantity.

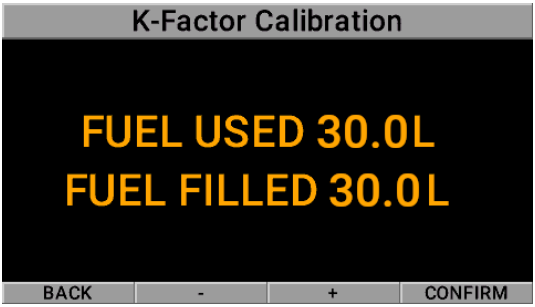
3- Burn at least 1/2 of fuel in the tank/s: a greater amount

of burned fuel will increase the accuracy, and you can do this step in more flights: at the beginning of each flight you must not add fuel in the tank/s and you must select ***NO REFUEL*** when asked after turning on the instrument.

4- Fill the tank/s with the exact same level reached in the step#1, accurately measuring the quantity of fuel added in the tank/s.

5- Turn on EngiMaster and select ***NO REFUEL*** (even though you have refilled it's required to select ***NO REFUEL***).

6- Enter *menu→Instruments→Fuel Computer→K-Factor Calibration*, the following screen will appear:

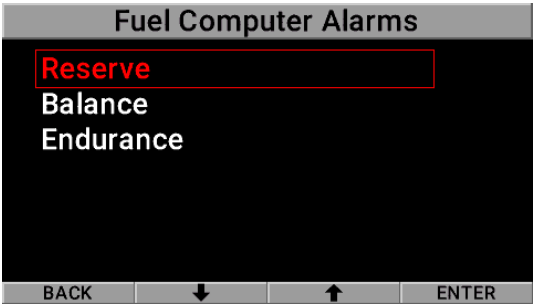


7- In the *FUEL FILLED* field, now insert the exact quantity of fuel you have added and measured in step #4; probably it doesn't correspond exactly to the *FUEL USED* because this is the measurement from the transducer not yet calibrated and it's showed for reference only. To insert the value push the + or - button then press on *CONFIRM* to calculate the new value. Push *BACK* if you want to exit without saving.

8- As soon as confirmed, the display will briefly show the newly calculated K-factor and return to the Fuel Computer menu. The transducer is now calibrated and the K-factor is automatically stored in memory.

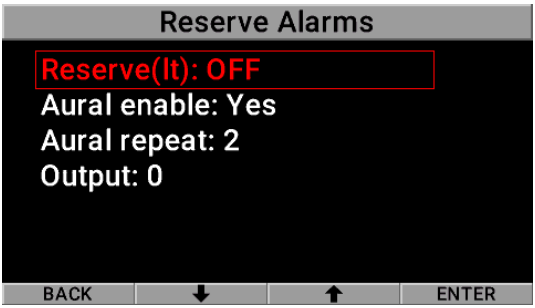
During later refuelling, it will be important to check that thefuel computer indication is correct. If the indication is very far from reality you can re-calibrate or manually change the *K-Factor.*

Alarms



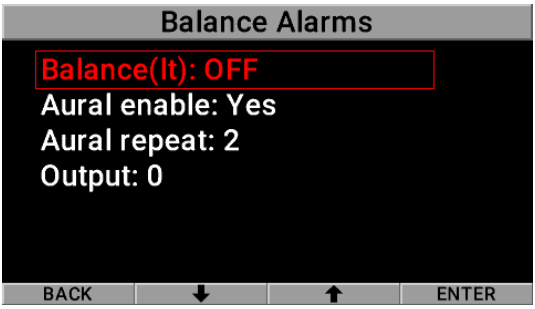
Configure the measurement checking system to trigger alarms for *Reserve*, *Balance*, *Endurance* conditions.

Reserve



- **Reserve:** set the fuel quantity for the *Reserve Alarm*. When the remaining quantity (*REMAIN*) is below this setpoint, the alarm is activated (range: 1 to max of Tank capacity, default *OFF*).
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*

Balance



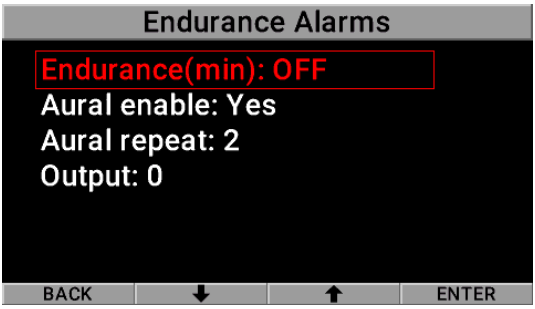
- **Balance:** set the fuel quantity for the Balance Alarm. Every time the quantity of fuel used equals this value, EngiMaster will activate an alarm showing *TANK SWITCH* on the display. This function is useful to keep balanced two wing tanks, switching from one to the other after using a certainquantity of fuel (range: 1 to max of Tank capacity, default *OFF*).

- **Aural enable:** as in chapter *1.3.1.1 - Common items description*

- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*

- **Output:** as in chapter *1.3.1.1 - Common items description*

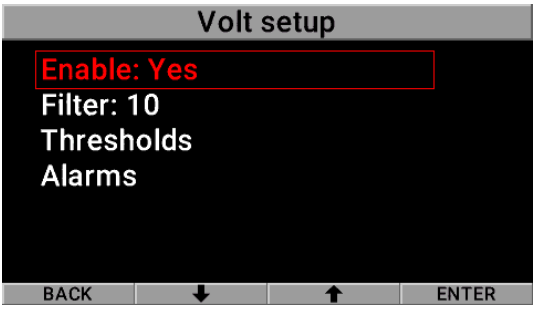
Endurance



- **Endurance:** set the minimum time, in minutes, for the *Endurance Alarm*. When the endurance time (END.) is below this setpoint the alarm is activated (range: 0~1000min, default *OFF*).
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*

NOTE: leaving the value of the items *Reserve*, *Balance*, *Endurance* to OFF, the corresponding alarm will not be activated.

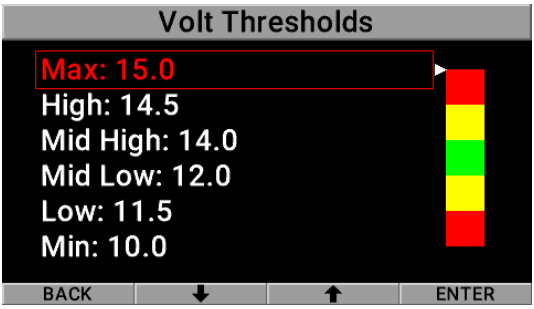
1.3.3.12 - Volt



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.

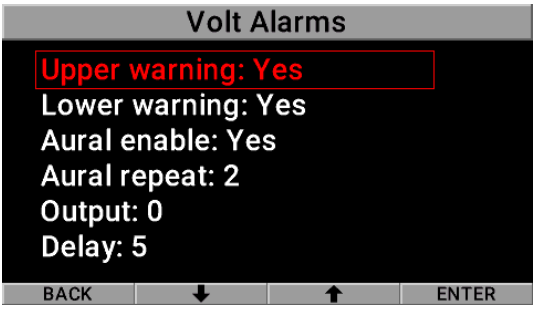
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



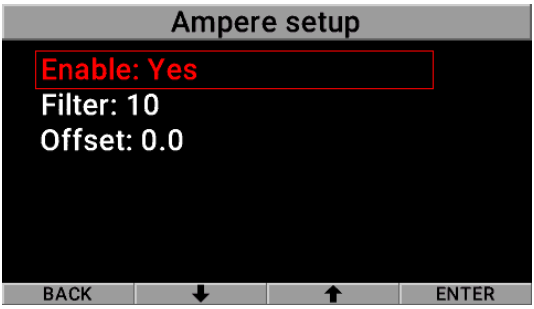
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold or drop below the *Low* threshold.



- **Upper Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Lower Warning:** as in chapter *1.3.1.1 - Common items description*.
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*.
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*.
- **Delay:** as in chapter *1.3.1.1 - Common items description*.

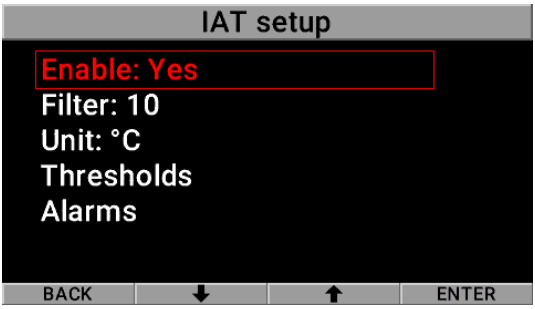
1.3.3.13 - Ampere



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Offset:** automatically assigns the offset value when calibrating the current sensor. Refer to installation manual for the calibration procedure.

CAUTION: after calibrating the sensor, do not press *ENTER* on this value again as it would replace the previous one. <u>If this happens it will be necessary to repeat the calibration procedure.</u>

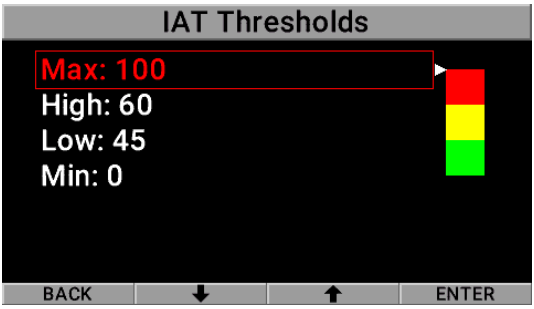
1.3.3.14 - IAT



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*. Option available are *°C* or *°F* (default °C)

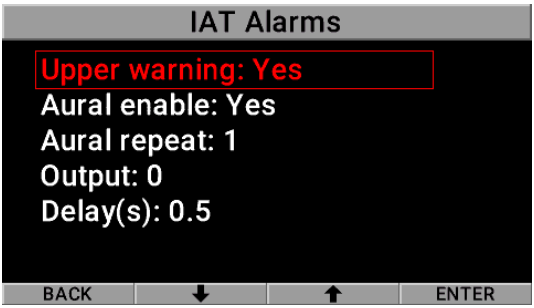
Thresholds

Assigns the outer limits of the indicator and the ranges of the various thresholds (example yellow range, red range).



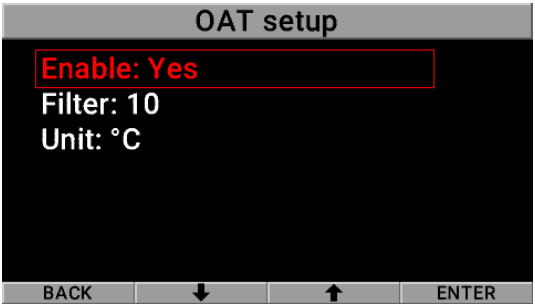
Alarms

Configure the measurement checking system to trigger an alarms if the measure exceed the *High* threshold.



- **Warning:** as in chapter *1.3.1.1 - Common items description*
- **Aural enable:** as in chapter *1.3.1.1 - Common items description*
- **Aural repeat:** as in chapter *1.3.1.1 - Common items description*
- **Output:** as in chapter *1.3.1.1 - Common items description*
- **Delay:** as in chapter *1.3.1.1 - Common items description*

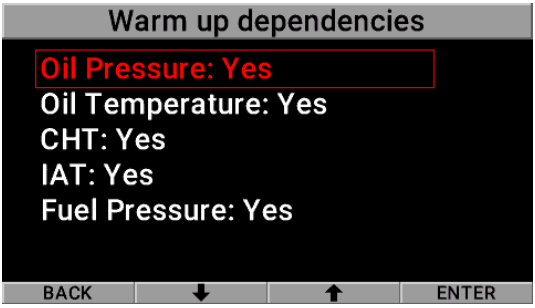
1.3.3.15 - OAT



- **Enable:** as in chapter *1.3.1.1 - Common items description*.
- **Filter:** as in chapter *1.3.1.1 - Common items description*.
- **Unit:** as in chapter *1.3.1.1 - Common items description*. Option available are *°C* or *°F* (default °C)

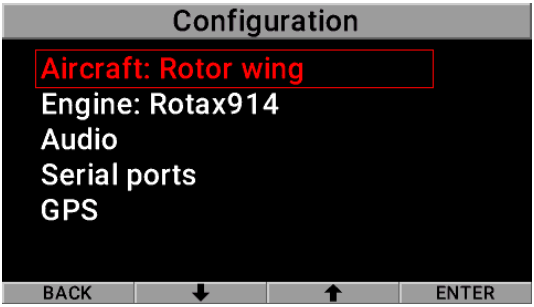
1.3.3.16 - Warmup dependendencies

Assigns which parameters should affect the logic for the Warmup/Ready indicator.

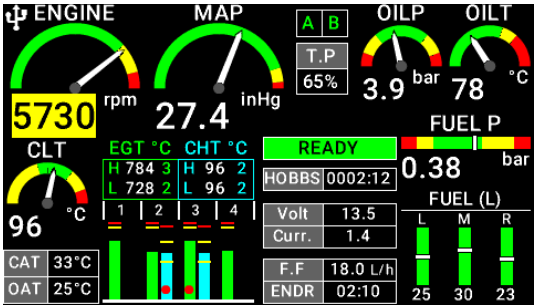


- **Oil Pressure:** if YES is selected, the value must be in green arc to be considered valid.
- **Oil Temperature:** if YES is selected, the value must be above the *Clearance* value to be considered valid.
- **CHT:** if YES is selected, the value of all active sensors must be in green arc to be considered valid.
- **IAT:** if YES is selected, the value must be in green arc to be considered valid.
- **Fuel Pressure:** if YES is selected, the value must be in green arc to be considered valid.

1.3.4 - Configuration

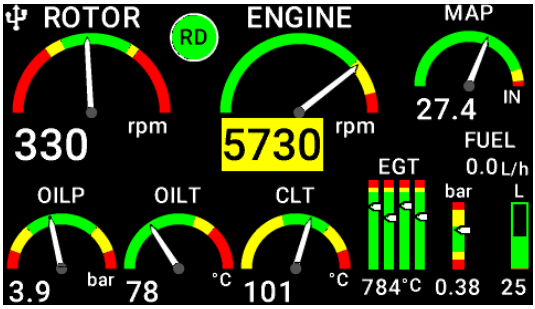


- **Aircraft:** select the type or aircraft. It can be Rotor wing or Fixed-wing (deafult). This settings will affect all the pages of the devices by showing additional information and changing the layout.



Example of interface and layout for Fixed-Wing aircraft

Example of interface and layout for Rotorwing aircraft

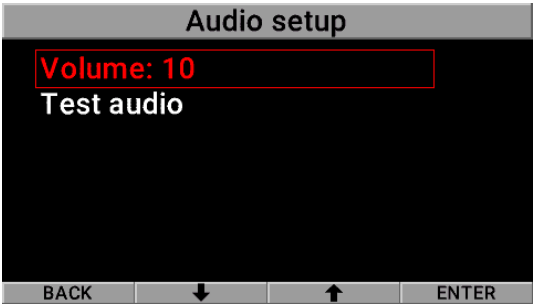


- **Engine:** select the engine model. Thi settings affect where some data will be read (from remote module or ECU). Available options are:

Menu Label	*Description*
Other	Engine not listed
Rotax 912 (default)	
Rotax 914	
Rotax 912iS	
Rotax 915iS	

- **Cylinder:** select how many cylinders has the engine. This item is enabled only if *Engine* is set to *Other.* It's possible to select 4 (default) or 6. It affect the EGT and CHT gauges.

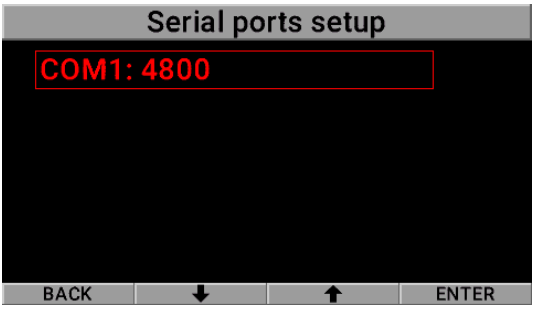
1.3.4.1 - Audio



- **Volume:** increase or decrease the volume of the audio output.

- **Test audio:** used to play an aural message. This can be usefull to verify if the connection with the intercom has been properly made.

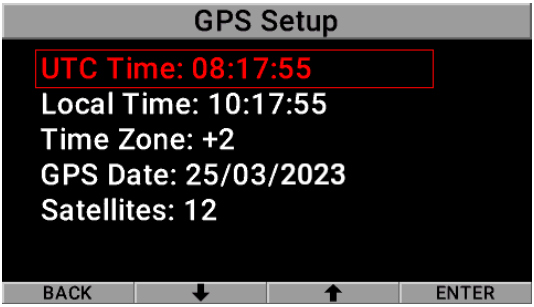
1.3.4.2 - Serial port



- **COM1:** assing the baudrate at the COM1 serial port. Options availables are:

Baudrate
4800
9600 (default)
19200
38400
57600
115200

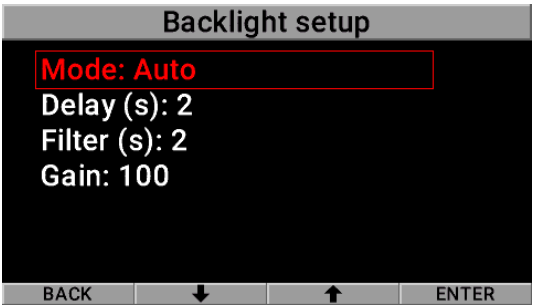
1.3.4.3 - GPS



The current submenu displays the time data (UTC date and time) read from GPS, with the corresponding number of satellites in view and the local time calculated according to the time zone. It is then possible to check the functionality of the serial port, and the GPS fix, directly from this screen.

- **Time zone:** this is the only editable value in the submenu and ranges from -12 to +13. Changing it varies the *Local Time* in real time.

1.3.5 - Backlight



- **Mode:** select the way to change display backlight. Options are *Auto* or *Manual* (default). *Manual* mode allow to vary the light intensity by changing the *Dimmer* paramater. *Auto* need that the external light sensor (*cod. 105800*) must be installed into EngiMaster.

- **Delay:** assigns the delay time between the detection of the change in ambient light and the start of the change in display brightness. It has a range from 0 to 10s (*default 2*).

- **Filter:** assigns how long the change in display light should occur. It has a range from 1 to 10s (*default 2*).

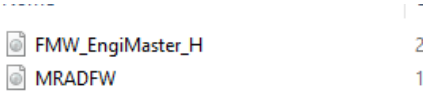
- **Gain:** adjusts the minimum brightness value. It works between 1 and 100% *(default 100*)

1.3.6 - Firmware upgrade

This menu is used for upgrading the firmware versions of the *EngiMaster* and the connected remote module, using a USB 2.0 flash drive.

If you have received the upgrade files for the *EngiMaster* and/or remote module, copy them in the root folder of a USB 2.0 flash drive.

NOTE: If you received the bundle in zip format, unzip the content (without folder creation) in the root folder. The image below shows how will look the folder.



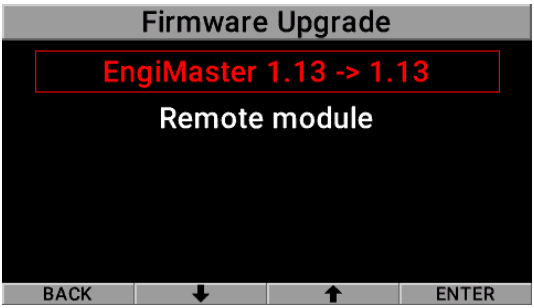
NOTE: *FMW_EngiMaster_H* is the upgrade file for the horizontal mount version. If you have the vertical version you must have the file named *FMW_EngiMaster_V* inside the USB drive

CAUTION: DON'T RENAME THE FILE OR CHANGE EXTENSION, otherwise the system won't be able to recognize them.

You can then check or upgrade by following this procedure:

1. From the *Settings* menu, select *Firmware Upgrade*.
2. Insert the USB 2.0 flash drive with the upgrade files to the rear connector.

3. If the files are correctly recognized the upgrade list will populate as in the next image.



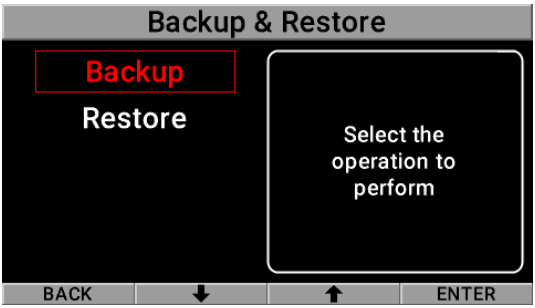
4. Select if you want to upgrade the *EngiMaster* or the *Remote module* and then push *ENTER* to start the upgrade.

5. Wait until the firmware upgrade is completed then turn off the power and remove the flash drive.

NOTE: Before the firmware upgrade the *EngiMaster* automatically perform a backup of the settings on the USB flash drive. *If there is already a backup file on the USB flash drive, it will be overwritten so before upgrading the firmware move it in another location if you want to keep it.*

1.3.7 - Backup & Restore

This menu is used to save or restore all the settings and calibrations of your EngiMaster.



Backup: Insert a USB flash drive in the USB rear connector on the EngiMaster and then push *ENTER* with this item selected to save all the settings on the USB 2.0 flash drive.

The filename of the backup is *EngiMasterBackup.bin.*

NOTE: It's recommended to perform the backup right after finishing to set the instrument and copy the *EngiMasterBackup.bin* file in a safe place to have the opportunity to recall the settings if needed.

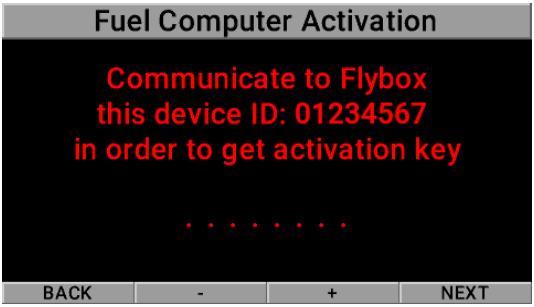
Restore: Insert the USB flash drive where you have previously performed the backup (or manually copy the backup file *EngiMasterBackup.bin* in a USB 2.0 flash drive) and then push *ENTER* with this item selected to restore all the settings on the *EngiMaster*.

NOTE: all current parameters will be overwritten after the restore

1.3.8 - Fuel Computer Activation

If you purchased the optional fuel computer key for your *EngiMaster*, follow this procedure to activate it:

1. Enter the menu→Special→Fuel Computer Activation. The following screen will appear.



2. Write down the ID code that appears and communicate it to your Flybox® dealer.

3. After you have received the activation key code from your Flybox® dealer you can reenter in this screen and insert the received key. (Use + or - to increase or decrease the digit, then push *NEXT* to confirm)

4. If the code is correct the EngiMaster shows on display *"Fuel Computer Activated!"*.

5. Push on *CONFIRM* then push on *BACK* to exit this screen.

WRITE DOWN HERE THE ACTIVATION DATA:

S/N(1):	
ID:	
KEY:	

NOTE: (1) The serial number can be seen on the label on the back of EngiMaster.

2.0 - Using EngiMaster

EngiMaster is organized in 4 monitoring screens:

- **Page 1:** Engine main data
- **Page 2:** Timers
- **Page 3:** Fuel computer
- **Page 4:** Cameras

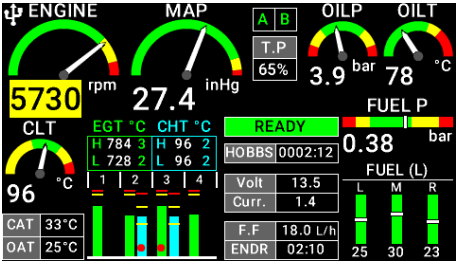
After power-on the EngiMaster shows the main engine data page (Page1). To switch between the four pages use pushbuttons, every page is directly associated to them.

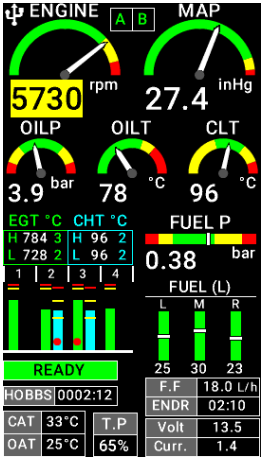
NOTE: Fuel computer (Page 3) must be purchased and activated as explained in chapter *1.3.7 - Fuel Computer Activation.*

NOTE: in this manual is presented the full version of the pages but your EngiMaster may differ depending on the optionals and sensors installed in your aircraft.

2.1 - Page 1: Engine main data

Airplane version





On this page all the important engine data are clearly displayed in both graphical and numerical indications. The green, yellow and red zones of the various gauges is completely customizable as explained in *chapter 1.3 “Instruments configuration”*; when a measurement is on a yellow or red zone the corresponding numerical indication change it’s background color to yellow or red.

Available parameters are:

- **Engine rpm:** graphical and numerical indication.
- **MAP:** graphical and numerical indication, expressed in *inches of mercury*.

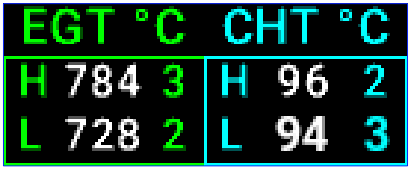
- **Oil pressure:** graphical and numerical indication, expressed in *bar* or *psi* depending on user settings.

- **Oil temperature:** graphical and numerical indication, expressed in *°C* or *°F* depending on user settings.

- **Coolant temperature:** graphical and numerical indication, expressed in *°C* or *°F* depending on user settings.

- **Fuel pressure:** graphical and numerical indication, expressed in *bar* or *psi* depending on user settings.

- **EGT and CHT**: graphical and numerical indication, expressed in *°C* or *°F* depending on user settings. An indication of the hottest and coldest is provided within the gauge, with also the associated cylinder numbering.



- **Fuel levels:** graphical and numerical indication, expressed in *L* or *GAL* depending on user settings. The fuel level indications here are obtained by reading the fuel level sensors installed in your aircraft and connected to the *EngiMaster*. The indications are approximated, do not solely rely on *EngiMaster* to determine the fuel available in the tanks but always refer to primary instrument installed in your aircraft.

- **OAT:** numerical indication, expressed in *°C* or *°F* depending on user settings.

- **CAT:** numerical indication, expressed in *°C* or *°F* depending on user settings.

- **Voltage:** numerical indication, expressed in *Volt.*

- **Ammeter:** numerical indication, expressed in *Ampere.*

- **Fuel flow (F.F):** numerical indication, expressed in *L/h* or *Gal/h* depending on user settings. This indicator is visible only if Fuel computer function has been purchased and activated.

- **Endurance (ENDR.):** numerical indication, expressed in *hh:mm.* This indicator is visible only if Fuel computer function has been purchased and activated.

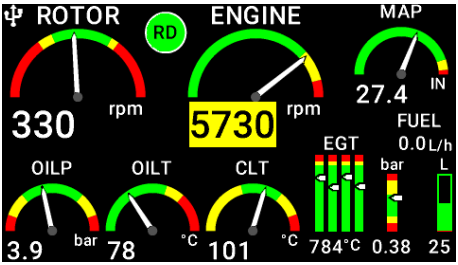
- **Engine status indicator:** this is a useful indicator that should be checked before takeoff. When the essential measurements, set as in chapter *1.3.2.16 - Warmup dependendencies*, are not in a safe area the indicator shows “WARMUP” in red background; When all the measures becomes in its safe zone the indicatorchange state to “READY” in green background, that automatically disappear 30 seconds after take-off.

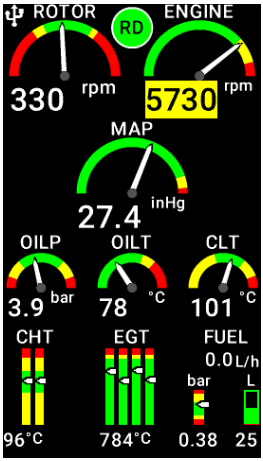
- **Hobbs:** numerical indication of the engine running time.

- **Throttle position (TP):** numerical indication of the position of the throttle, expressed in percentage. This gauge is visible only for electronic injected engine.

- **Lane status:** indicates if the ECU lane are working properly (A or B in green). If one is missing the relative ID became red. This gauge is visible only for electronic injected engine.

Rotorcraft version





On this page all the important engine data are clearly displayed in both graphical and numerical indications. The green, yellow and red zones of the various gauges is completely customizable as explained in *chapter 1.3 "Instruments configuration"*; when a measurement is on a yellow or red zone the corresponding numerical indication change it's background color to yellow or red.

Available parameters are:

- **Engine rpm:** graphical and numerical indication.
- **Rotor rpm:** graphical and numerical indication.
- **MAP:** graphical and numerical indication, expressed in *inches of mercury*.
- **Oil pressure:** graphical and numerical indication, expressed in *bar* or *psi* depending on user settings.

- **Oil temperature:** graphical and numerical indication, expressed in *°C* or *°F* depending on user settings.

- **Coolant temperature:** graphical and numerical indication, expressed in *°C* or *°F* depending on user settings.

- **Fuel pressure:** graphical and numerical indication, expressed in *bar* or *psi* depending on user settings.

- **EGT**: graphical and numerical indication, expressed in *°C* or *°F* depending on user settings. The value below the gauge indicate the hottest.

- **CHT**: graphical and numerical indication, expressed in *°C* or *°F* depending on user settings. The value below the gauge indicate the hottest.

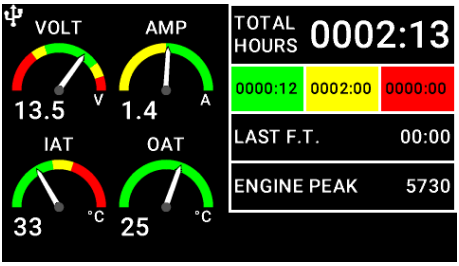
- **Fuel levels:** graphical and numerical indication, expressed in *L* or *GAL* depending on user settings. The fuel level indications here are obtained by reading the fuel level sensors installed in your aircraft and connected to the *EngiMaster*. The indications are approximated, do not solely rely on *EngiMaster* to determine the fuel available in the tanks but always refer to primary instrument installed in your aircraft.

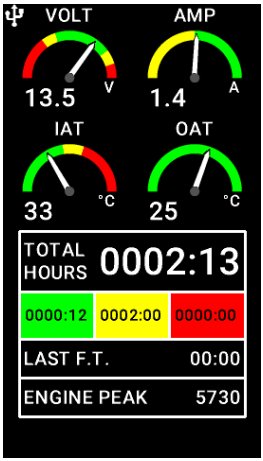
- **Fuel flow:** numerical indication, expressed in *L/h* or *Gal/h* depending on user settings. This indicator is visible only if Fuel computer function has been purchased and activated.

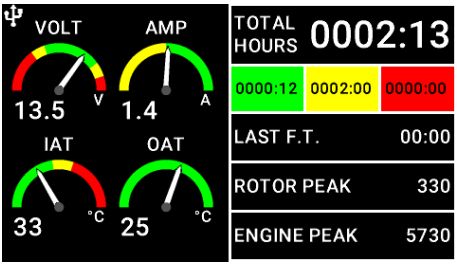
- **Engine status indicator:** this is a useful indicator that should be checked before takeoff. When the essential measurements, set as in chapter *1.3.2.16 - Warmup dependendencies*, are not in a safe area the indicator shows “WARMUP” in red background; When all the

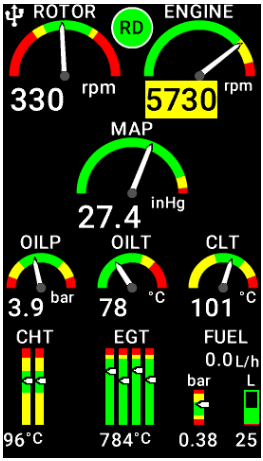
measures becomes in its safe zone the indicatorchange state to “READY” in green background, that automatically disappear 30 seconds after take-off.

2.2 - Page 2: Timers







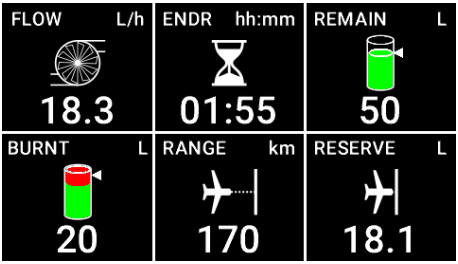


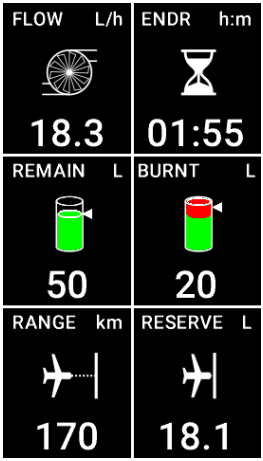
Available information are:

- **Voltage:** graphical and numerical indication.
- **Ammeter:** graphical and numerical indication.
- **IAT:** graphical and numerical indication of the manifold/ intake air temperature, expressed in °C or *°F,* depending on user settings.
- **OAT:** graphical and numerical indication of the outside air temperature, expressed in °C or *°F,* depending on user settings.
- **TOTAL HOURS:** total time accumulated by the engine. This time is further divided in total time accumulated in green, yellow and red zones.
- **LAST F.T:** duration of the last flight. This counter is reset when the engine is started, and starts to increase when the *TakeOff* menu item (*Chapter 1.3.2.1 - Engine RPM*) is exceeded for 30 seconds.
- **ENGINE PEAK:** maximum RPM peak reached by the engine during its life.
- **ROTOR PEAK:** maximum rotor peak reached during its life. (*Only for rotorcraft*)

2.3 - Page 3: Fuel Computer

NOTE: this page must be purchased and activated as explained in chapter *1.3.7 - Fuel Computer Activation.*





Before using the fuel computer section you must be sure to have already set the following parameters:

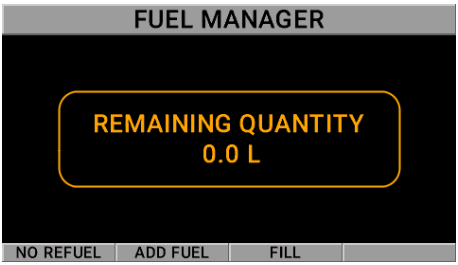
1. Set the measurement unit for ***Quantity*** and ***Distance***.

2. Set the ***Tanks cap.***

3. Set the ***K-Factor*** of your sender. (Not necessary for fuel injected engine).

As explained in chapter *1.3.2.11 - Fuel computer*.

At every startup of the instrument you will be asked if refueling has been done, one the following options must be selected:



NO REFUEL: Select this option if you have not refuelled the tank.

ADD FUEL: Select this option if you have added fuel to the tank(on the next screen that appears you can insert the exact amount of fuel added).

FILLED: Select this option if you have filled the tank; the display will show the quantity that has been added to reach the full level. Before using this option you must have already set the tank/s capacity in the fuel computer setup.

NOTE: If you need to correct a wrong fuel quantity add, select *ADD FUEL* and insert a negative value.

Now the fuel computer is ready to operate, the available indications are:

FUEL FLOW: according to the selected unit of measure the flow is indicated in liters per hour (L/h) or gallons per hour (gal/h).

REMAINING FUEL: display the fuel remaining in the tank/s. According to the selected unit of measure the quantity is indicated in liters (L) or gallons (gal).

WARNING: the remaining fuel displayed here is not a measurement of the fuel in the tank, but it is calculated from the initial quantity entered by the user and the burned quantity measured by the fuel flow transducer (or measured by the ECU for fuel injected engines).

BURNED FUEL: display the fuel burned from the starting. According to the selected unit of measure the flow is indicated in liters (L) or gallons (gal).

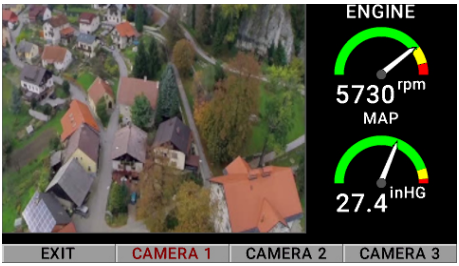
ENDURANCE: display the time to empty, calculated considering the fuel remaining and the actual fuel flow. If it is not possible to calculate the time to empty (for example when the engine is not running) the display shows “--:--”

RANGE: display the range calculated considering the fuelremaining, the actual fuel flow and the ground speed from GPS. If the display shows *WAITING GPS RMC* it means that the GPS is not connected, turned off or it don't have the fix. If it is not possible to calculate the range (for example when the engine is not running) the display shows “- - - -”.

RESERVE: Display the fuel remaining at destination; the destination is intended as the approaching GPS

waypoint. If the number is negative it means that there is not enough fuel to reach the destination. To enable this indication you must connect an external GPS and enable the “RMB” sentence on it. If the display shows *WAITING GPS RMB* it means that the GPS is not connected, turned off or it don't have the fix. If it is not possible to calculate the reserve (for example when the engine is not running) the display shows “--.--”

2.4 - Page 4: Cameras



Available parameters are:

- **Engine rpm:** graphical and numerical indication.
- **Rotor rpm:** graphical and numerical indication.
- **MAP:** graphical and numerical indication, expressed in *inches of mercury*.

It’s possible to switch between camera input by pressing the button associated with the camera. Pressing *EXIT* will bring back to the last viewed page.

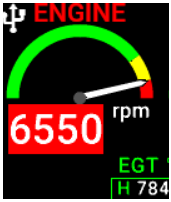
NOTE: if instead of the video appears the text *NO SIGNAL* means that the camera could be off or not connected correctly.

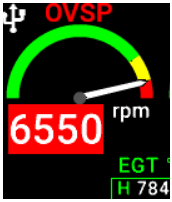
3.0 - Alarms

EngiMaster continuously monitor all the sensors and when a measurement exceed its setpoint, either the probe/ sensor making the measurement disconnects, the corresponding alarm is activated (if enabled by the user).

An alarm condition is indicated in this ways:

- The gauge header will turn red, displaying the corresponding error message.





In these images you can see how sequentially the warning *ENGINE OVSP* (Overspeed) is composed.

- If one of the two alarm outputs has been enabled it will be turned on.

- If audio is connected and enabled a voice message will be played

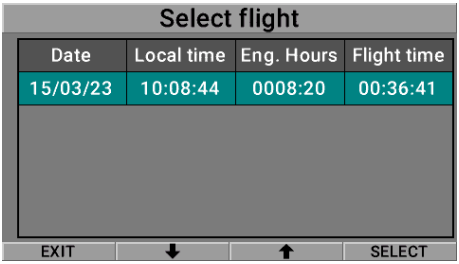
4.0 - Datalogger

The datalogger is a useful data recording tool that permits later viewing in both graphical or numerical representation. It also allow the download of the data in a USB flash drive.

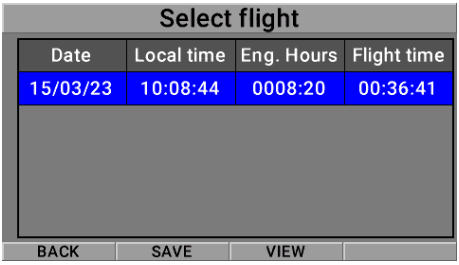
Data are organized in separate recording sessions, each time the engine is started a new recording session will be initiated.

The memory can store 200 hours of data, with a sample rate of 1 second. Older data are automatically erased to make room for the new ones. Datalogger menu is the list of all recorded flight sorted by date (recent flights are at the top of the list). The date, local time, engine hours and duration (flight time) are visible for each flight.

NOTE: date and time are only available if a GPS has been connected and a fix has been made.

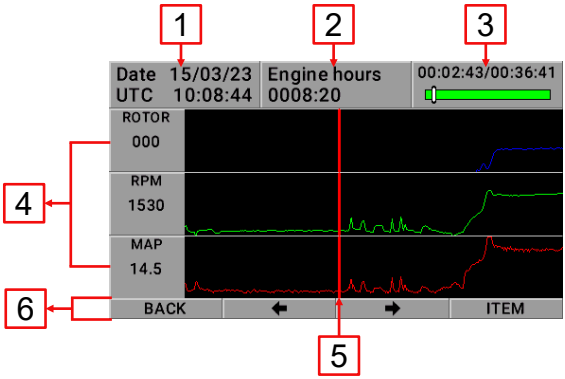


Use the arrows (*F2* and *F3* push buttons) to scroll through the list. Then pressing *SELECT* the chosen flight will become highlighted.



- **BACK:** return to the list scroll.
- **SAVE:** begin the write operation on the external USB drive.
- **VIEW:** open the flight in view mode.

View mode allows you to view charts of the data recorded in the selected flight. The interface will look like the image below:



1. **Date and time:** date and time referred to the cursor position (5).

NOTE: the date and time indications is read from an external GPS, if connected; if no GPS is connected to the *EngiMaster*, these indications will not be available.

2. **Engine hours:** total accumulated engine hourmeter referred to the cursor position (5).

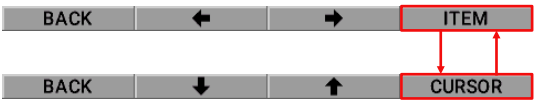
3. **Progress indicator:** as you scroll through the flight, the progress indicator let's you see at which point of the entire flight you are pointing with the cursor.

4. **Graphics and numerics data:** 3 charts per page on horizontal version and 5 charts for the vertical, divided in more pages.

5. **Cursor:** the cursor permits to analyze the flight throughout its duration. All numerical values are relative to the actual position of the cursor. Push the arrow button (*F2* of *F3*) to move the button, keep pressed the button to move faster.

6. **Pushbutton functions:**

- **BACK:** return to the flight list selection.



- **ARROWS**: allows to move the cursor through every record of the flight. Or scroll the item when the mode item (F4) is selected.

- **ITEM/CURSOR:** switch between the scrolling mode

The datalogger records all measurements displayed in the *EngiMaster* screens. The charts displayed therefore depend on what measurements the user has set in the instruments settings.

5.0 - Technical specifications

- Graphic TFT LCD with backlight and coated glass, 4.3”.
- Powder painted aluminium case.
- Dimensions: 124.9 x 83.5 x 17.8 mm. (body)
- Weight: 200 g.
- Supply voltage: 10 ~ 30 V=.
- Power supply: ~3 W
- Operating temperature range: -20 ~ +70°C.
- Humidity: 90% max (without condensation).
- Communication through 2 CAN bus and 1 RS232
- USB port: for USB 2.0

Display cleaning

To clean the display use the supplied smooth cloth, slightly moistened with cleaner. Use a cleaner that is specified as safe for anti-reflective coatings.

CAUTION: Avoid any chemical cleaners or solvents that can damage the display anti-reflective coating or plastic components. Do not use cleaners containing ammonia. Do not spray water or cleaner directly onto the display.

One Year Warranty:

Product support and warranty information can be found at www.flyboxavionics.it.
Flybox® warrants this Product to be free from defects in materials and workmanship for 12 months from date of delivery. The inactivity of the Products determined by periods of repair does not involve the extension of the warranty period.
This warranty covers only defects in material and workmanship found in the products under normal use and service when the product has been properly installed and maintained. This warranty does not cover failures due to abuse, misuse, accident, improper maintenence, failures to follow improper instructions or due to unauthorized alterations or repairs or use with equipments with which the Products is not intended to be used. Flybox®, after verification of the complaint and confirmation that the defect is covered by warranty, at its sole discretion, will either replace or repair the Products at no costs for the customer. Alterations, additions, or repairs not performed by the manufactuter shall negate any warranty. This warranty doesn't cover cosmetic or incidental damages. Shipping costs, taxes, custom fee, any other duties and any costs incurred while removing, reinstalling or troubleshooting the Products, shall be at customer's charge.
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Date	Revision	Description
November 2023	1.0	First release

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Important

Do not send your instrument for repair until you have filled out the request form on the support page at www.flyboxavionics.it. After filling out the form you will receive an authorization email with the RMA number.

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