

**Now Includes  
Screen Designer**

# XTreme - EMS

**Universal Engine Monitoring System**

**Operating Manual – English 2.19**



## Introduction

The XTreme-EMS is a compact universal engine monitoring system. The XTreme-EMS, which fits a standard 3 1/8" (80mm) instrument panel hole, contains all the necessary functionality to replace several engine monitoring instruments.

All information is displayed in an easy to read format on a high resolution wide viewing angle 4.3" 1000cd/m2 sunlight readable color display. The Xtreme EMS allows for a custom display layout with user programmable bar style, height, width and screen offset. The custom display can be changed directly on the instrument or by using the Xtreme EMS Simulator and Screen designer software. The Xtreme EMS can be setup on the simulator after which the settings file can be saved to the SD card and later recalled into the physical instrument.

All engine sensors are connected to a RDAC (Remote data acquisition unit) which is normally mounted behind the firewall of the aircraft and then just a simple CAN communication link is necessary to connect the XTreme-EMS to the RDAC.

The XTreme-EMS light weight, small size and high level of functionality makes it an excellent choice for all types of non-certified aircraft.

# 1 Features

- 4.3" high resolution 480x272, sunlight readable, wide viewing angle, 1000cd/m2 TFT LCD display
- LED backlight (brightness can be adjusted for low light flying conditions)
- Fits standard 3 1/8" (80mm) aircraft instrument panel hole
- The Xtreme EMS allows for a custom display layout with user programmable bar style, height, width and screen offset. The custom display can be changed directly on the instrument or by using the Xtreme EMS Simulator and Screen designer software
- SD Card interface for data recording, user splash screens, checklists, graphic information pages, firmware upgrades and loading or saving of configuration and display screens
- Records maximum and minimum values of most displayed values
- Built in data recorder – records all engine data, GPS data (if available) to the SD card. Data is stored on the SD card in a .csv (Comma Separated Value) file. The recorded data can be imported into a spreadsheet type program or alternatively the data can be viewed using the free XTreme Data Viewer PC program.
- Includes a 100 entry automatic flight log (Records start date & time, flight time, pilot number, Hobbs time and maintenance time) which can be exported to SD card and can be imported into programs such as Microsoft Excel and Libre.
- User configurable start up (Splash) screen
- Configurable checklists
- Configurable graphic information displays using the free bitmap to MIF converter program
- Automatic or manual local magnetic variation
- Dual menu system for quick item selection and user setups
- Sunrise/Sunset calculator
- Firmware upgrades via SD Card
- 1 year limited warranty
- 2x RS232 communication ports (UL Power Interface / External GPS receiver)
- 1x CAN communication port (RDAC-XF / RDAC-XG / MAP / RDAC-CAN interface)
- Rotary control plus 5 independent buttons for easy menu navigation and user input
- External alarm switch output for an external indicator lamp etc
- Support for an external GPS receiver with dedicated GPS display
- Built in RTC (Real Time Clock)
- Wide input supply voltage range of 8 to 30V DC
- Built in voltage reversal and over voltage protection for harsh electrical environments
- Light weight design

## EGT / CHT

- Can measure up to 12 thermocouple channels
- EGT/CHT Temperatures can be displayed in °C or °F from -100°C to 1200°C (-148°F to 2192°F)
- High accuracy: Built in thermocouple linearization curves and cold junction compensation
- Includes a 250 second EGT/CHT trend graph display of each thermocouple channel
- Records maximum EGT/CHT temperature reached for each channel
- Includes an engine leaning feature
- Includes an engine cruise feature
- Special Rotax 912/914 engine monitor mode utilizing the standard built in Rotax NTC CHT probes

## RPM / Rotor RPM

- Single or dual RPM display screens
- Dedicated dual rotor / engine tachometer
- Includes a magneto check function
- RPM can be displayed in RPM or in percentage
- Records maximum RPM reached for each channel
- Programmable RPM labels

## **Fuel computer**

- Advanced fuel computer with various modes of operation
- Supports single or dual fuel tanks
- Supports one or two fuel flow senders, fuel level senders or fuel injectors
- Supports a single fuel pressure sender
- Differential fuel flow calculations are also supported for fuel return systems
- The Xtreme-EMS has the ability to connect to a NMEA enabled RS232 GPS receiver for range based calculations. It can also accept a manually entered estimate cruising speed if a GPS is not available.
- Standard automotive fuel level senders can be used, even with odd shaped tanks due to a comprehensive, multi-point calibration system
- Fuel flow can be displayed in L/hr or in G/hr
- Fuel level can be displayed in Litres or Gallons

## **Analog Inputs**

- 1x Oil pressure display
- 1x Oil temperature display
- 2x Auxiliary analog channel displays which are universal and can be configured to measure Pressure, Temperature, Current or a Generic sensor.
- Current measurement requires a MGL Avionics Closed Loop Current Sensor
- Pressure can be measured using standard automotive resistive senders (e.g. VDO 2, 5 and 10Bar), Rotax 4-20mA senders as well as voltage output pressure senders (e.g. UMA)
- Temperature can be measured using standard automotive resistive senders (e.g. VDO, Westach) as well as the MGL Avionics precision LM335 semiconductor sensor
- High accuracy: Built in linearization curves for common senders
- Analog channels can be programmed to a user defined curve for custom senders
- Supports the Rotax 4-20mA pressure sender as used in the 912/914 engines
- Temperatures can be displayed in °C or °F
- Pressure can be displayed in psi or bar
- Programmable pressure / temperature labels

## **Manifold Pressure**

- Manifold pressure can be displayed in millibar (mB) or in inches of Mercury ("Hg").
- Records maximum MAP reached in permanent memory
- MGL Avionics RDAC-XF MAP required

## **Timers**

- Displays both UTC (Zulu time) and local time
- Time is maintained by an internal lithium battery which can be replaced by the user
- Includes a settable Hobbs meter which is password protected
- Includes an engine running and flight timer
- Includes a programmable maintenance timer for scheduled routine engine maintenance
- Stopwatch timer

## **Volts**

- Can measure voltages up to 30V (compatible with both 12V and 24V aircraft supplies)
- Contains a programmable low/high voltage alarm to automatically detect alternator failures and bad batteries
- Records maximum and minimum Volts reached in permanent memory
- Programmable Volts label

## **OAT**

- OAT (Outside Air Temperature) display

## **Current**

- Uses the MGL Avionics Closed Loop Current Sensor to measure the aircrafts current load.
- Records maximum and minimum current reached in permanent memory

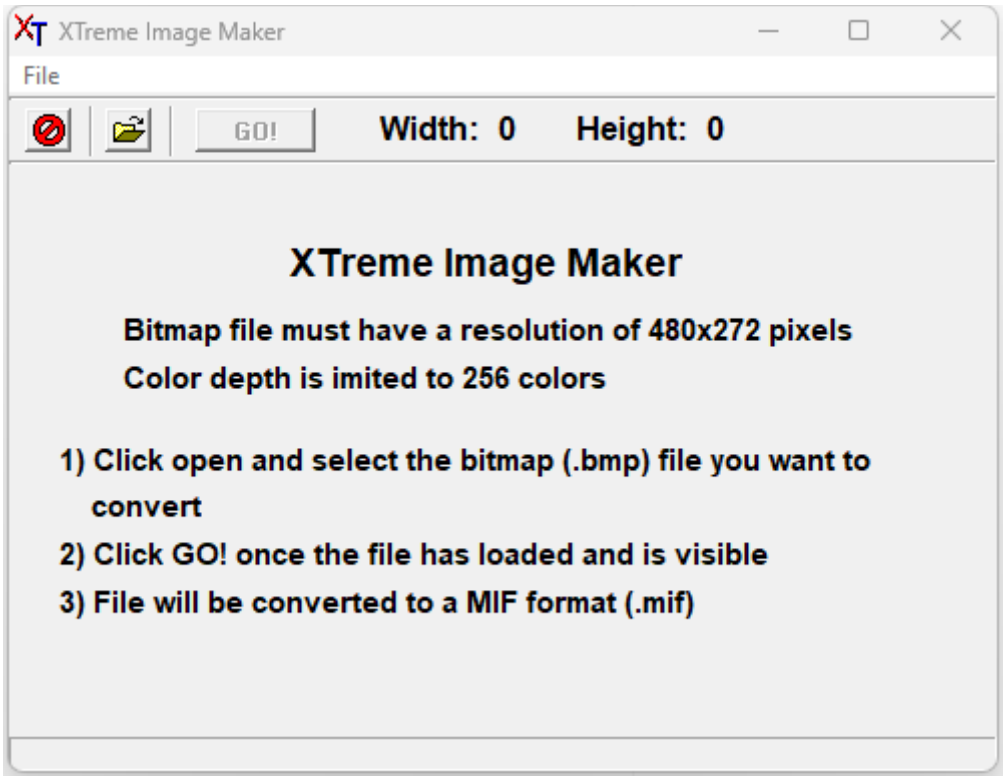
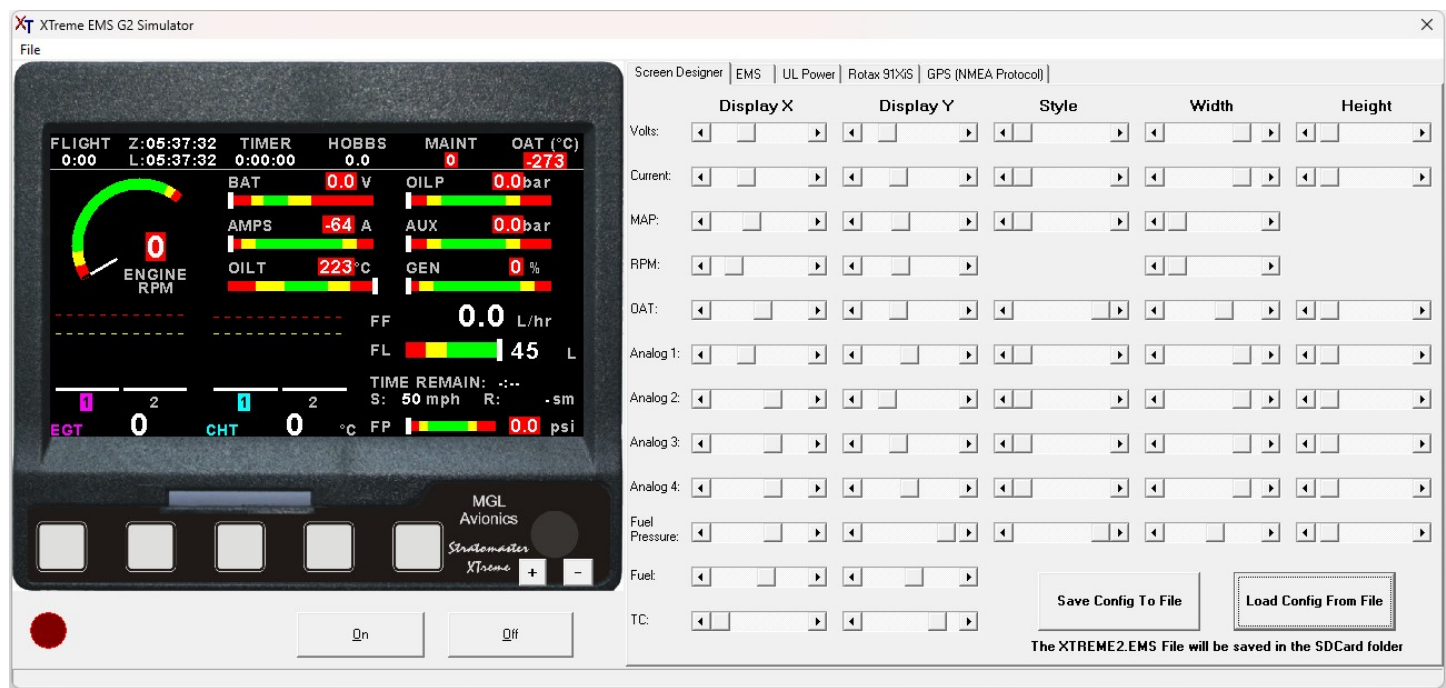
## **ULPower ECU Display**

- Displays engine information from the ULPower ECU (Engine Control Unit) via the RS232 port
- The Xtreme-EMS has a dedicated ULPower ECU display screen
- Displays warning messages from the ULPower ECU
- Supports the ULPower Aux box

## **Rotax 91Xis**

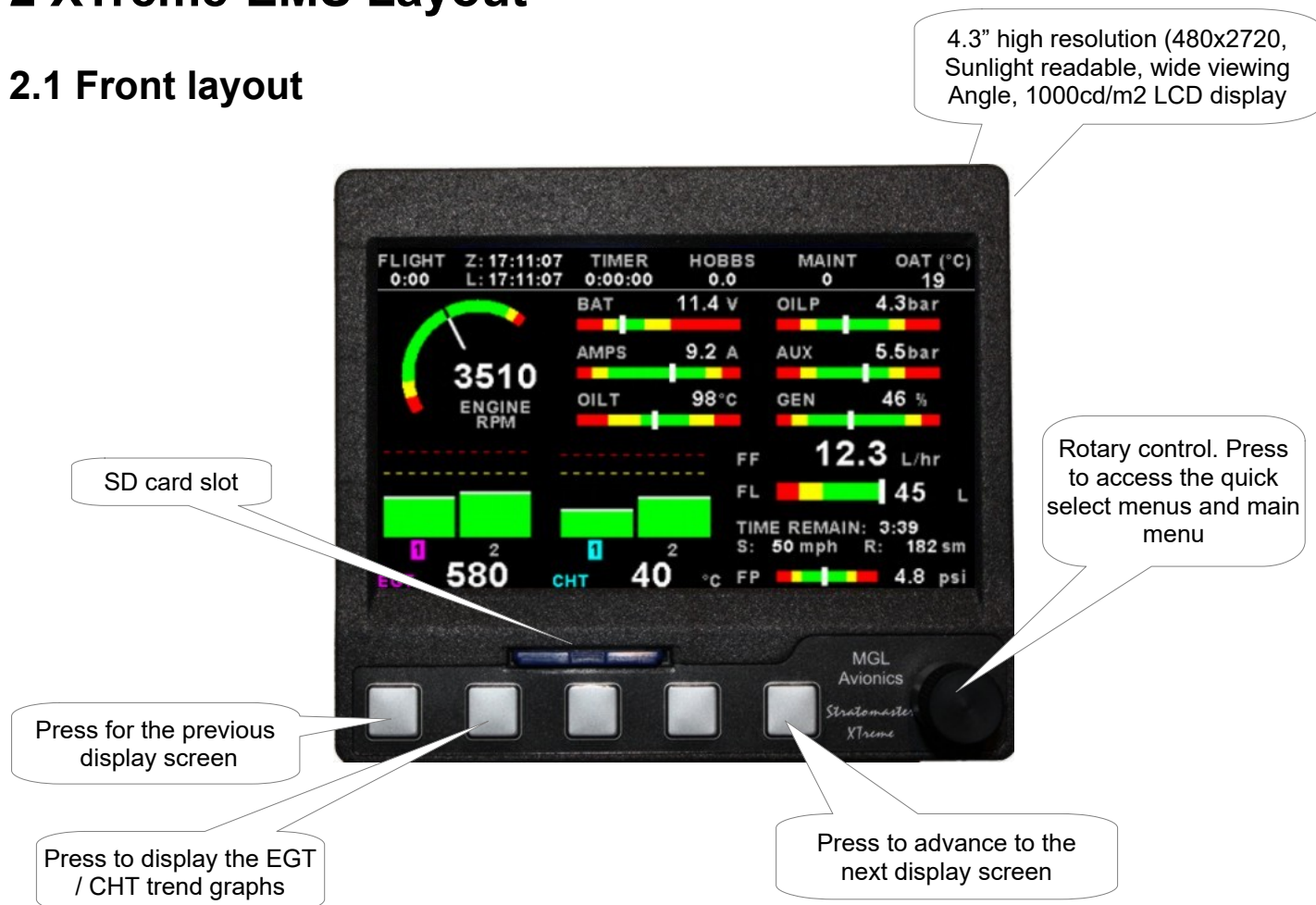
- The XTreme-EMS can connect to the Rotax 91XiS ECU directly or by using the MGL Avionics RDAC CAN 912iS
- Displays engine information from the Rotax 91XiS ECU
- The Xtreme-EMS has dedicated Rotax 91XiS display screens
- Displays Engine, Sensor and Device Status messages from the Rotax 9iXiS ECU





## 2 XTreme-EMS Layout

### 2.1 Front layout



### 2.2 Rear layout

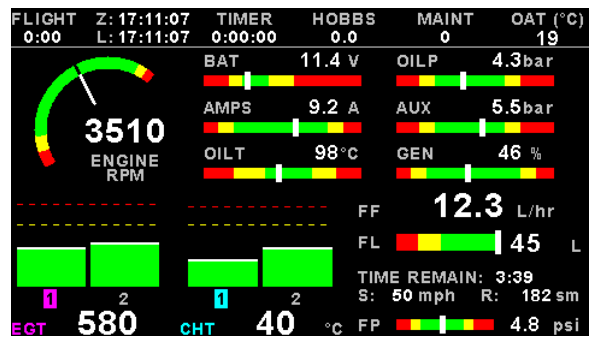




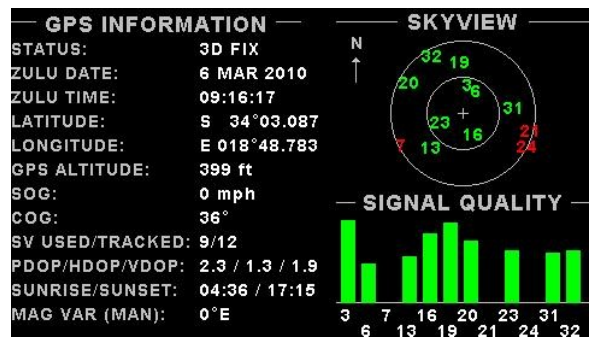
### 3 Display Screens

Press the left or right most soft keys to cycle through the display screens.

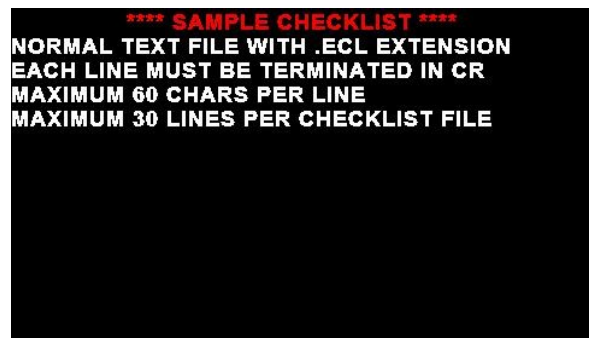
#### EMS DISPLAY



#### GPS DISPLAY (External GPS receiver required)

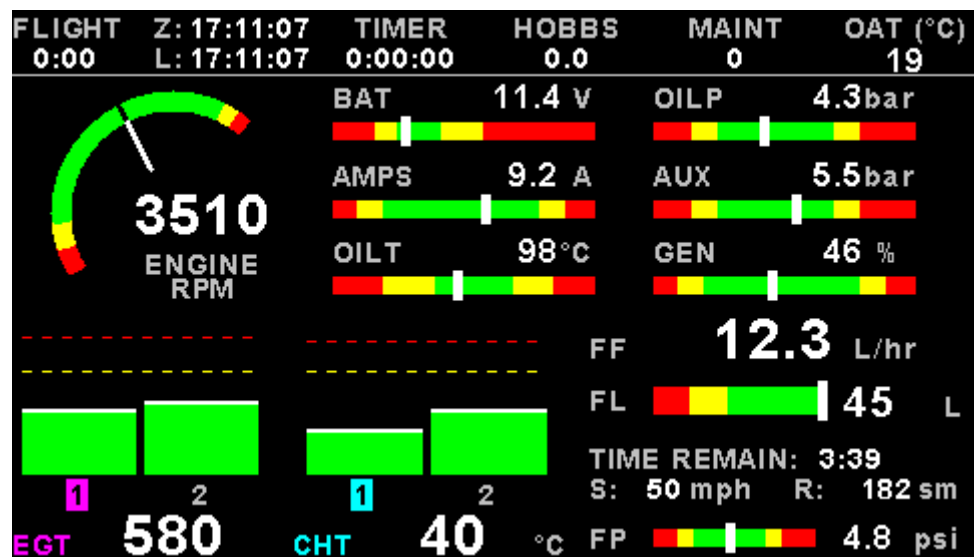


#### CHECKLIST / INFORMATION DISPLAY





### 3.1 EMS Display



#### 3.1.1 Information bar



##### **FLIGHT:**

The flight time is automatically reset to zero when a new flight is started (manual or automatic flight detection). The “:” will flash when a flight is active. The flight timer can be started in the quick select menu (Manual flight mode).

##### **ZULU:**

GMT or Zulu time display.

##### **LOCAL:**

Local time normally includes an offset from Zulu / GMT time. The time offset can be setup in the “TIMERS SETUP” menu.

##### **TIMER:**

The Timer can be configured in the quick select menu.

##### **HOBBS:**

The XTreme-EMS contains a password protected Hobbs timer. The Hobbs time can be set to the current known engine time in the “TIMERS SETUP” menu.

**MAINT (Maintenance Timer):**

This timer is set in engine hours and it will count down to zero when the engine RPM is greater then the “HOBBS MINIMUM RPM” value as set in the “TIMERS SETUP”. A good use for this function is to set the hours until your next spark plug change or engine inspection.

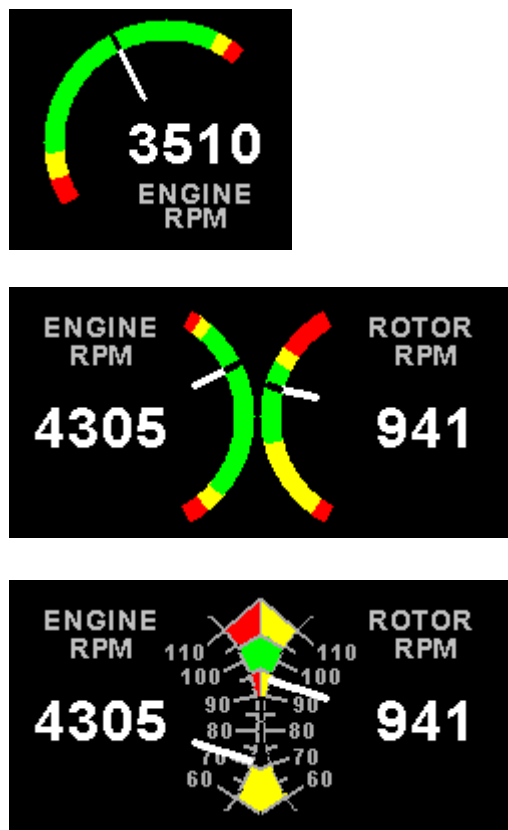
The purpose of this function is to assist you in determining remaining hours until maintenance will be required. It is not intended as a replacement for the aircraft's maintenance log. It is therefore important that the aircraft's maintenance log be maintained in the normal manner. You should further use your own discretion in performing maintenance earlier than indicated should any aircraft performance problems arise.

MAINTENANCE TIMER  
HAS EXPIRED

A maximum of 999 hours can be entered as a maintenance interval. A reminder message will appear on startup when zero hours are remaining. The reminder message will automatically disappear after 10 seconds or if the pilot presses any key. Engine running time for the purpose of the maintenance timer is defined as the run time where the engine RPM is greater than the “HOBBS MINIMUM RPM” value as set in the “TIMERS SETUP”.

3.1.2 RPM / Rotor

The RPM / Rotor section will maximize the space according to which parameter RPM / Rotor is enabled. The RPM and Rotor parameters can be configured in the “EMS SETUP” menu.



### 3.1.2.1 Magneto Check Function

Activate the magneto check function in the sub-menu once you have reached your normal run-up RPM. The display will show the RPM deviation from when the magneto function was activated. Any RPM drops will be displayed as a negative RPM value, a positive reading indicates an increase in RPM.

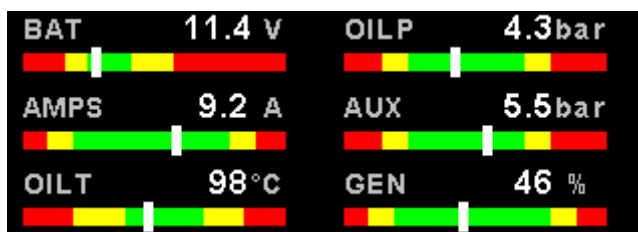


Switch the mag to left or right. The RPM should display a negative (drop in) RPM. Then switch the mags to "Both". The RPM reading should go back to zero or near zero. A problem should show up as an excessive drop in one mag and the return to zero or close to zero incorrectly.

The RPM display will return to the normal display after 60 seconds.

### 3.1.3 Volts, Current, OAT, Oil Temperature / Pressure and Auxiliary Analog Channels

Volts, Current, OAT, Oil Temperature, Oil Pressure and the 2 general purpose analog channels display settings can be customized.

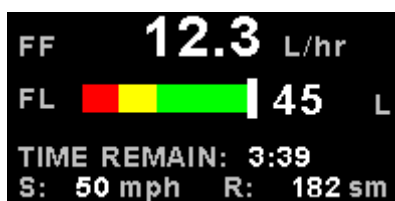


### 3.1.4 Fuel display section

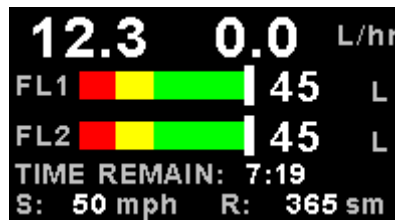
The XTreme-EMS supports dual fuel flow, dual fuel levels and a single fuel pressure. The fuel section will automatically try and maximize the display area according to the fuel parameters selected. The fuel parameters can be configured in the "FUEL SETUP" menu.

#### 3.1.4.1 Single fuel flow and calculated tank level (single tank)

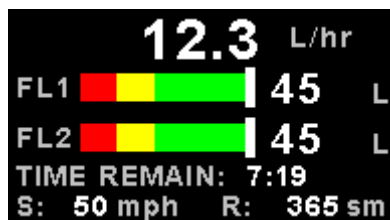
- Single fuel flow and fuel level sender (single tank)
- Differential fuel flow and calculated tank level (single tank)
- Differential fuel flow and fuel level sender (single tank)
- Summed fuel flow and calculated tank level (single tank)
- Summed fuel flow and fuel level sender (single tank)



### 3.1.4.2 Dual fuel flow and calculated tank levels (dual tank) Dual fuel flow and dual fuel level senders (dual tank)



### 3.1.4.3 Single fuel flow and dual fuel level senders (dual tank) Single fuel flow, single fuel level sender, single calculated tank Differential fuel flow and dual fuel level senders (dual tank) Differential flow, single fuel level sender, single calculated tank Summed fuel flow and dual fuel level senders (dual tank) Summed fuel flow, single fuel level sender, single calculated tank



### 3.1.4.4 Single/Differential/Summed fuel flow, single fuel level sender, single calculated tank

These modes are nice for multiple fuel tanks whereby one or more tanks are difficult to insert level senders in. Potential problems such as those listed below can easily be diagnosed by doing side by side comparisons between a calculated and physical tank.

- Leaks in the fuel system
- Uneven drain of interconnected tanks
- Malfunction of the level sender
- Malfunction of the flow sender

### 3.1.4.5 Single fuel flow only indicator

This mode is displayed if either fuel flow 1 or fuel flow 2 is selected and no fuel level senders are selected.



3.1.4.6 Dual fuel flow indicator

This mode is displayed if both fuel flow 1 and fuel flow 2 is selected and the fuel mode is selected for dual flow. Both fuel level senders are disabled.



3.1.4.7 Single tank level indicator

This mode is displayed if either fuel level 1 or fuel level 2 is selected. Both fuel flow senders are disabled.



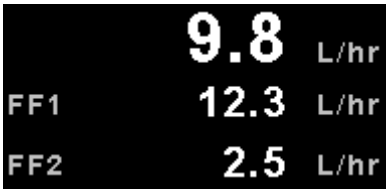
3.1.4.8 Dual tank level indicator

This mode is displayed if both fuel level 1 and fuel level 2 is selected. Both fuel flow senders are disabled.



3.1.4.9 Differential/Summed fuel flow

This mode is displayed if both fuel flow 1 and fuel flow 2 is selected and the fuel mode is selected for either differential or summed.



3.1.4.10 Calculated Fuel Tanks

Calculated fuel tanks will have the text “CALC” in the fuel bar to indicate that the fuel level is calculated from fuel flow and that it is not a physical measure of the fuel tank.



### 3.1.4.11 Fuel Pressure

The fuel pressure bar will be displayed when the fuel pressure has been enabled in the menu system.



### 3.1.4.12 Speed, Range and GPS Fix Status

The speed value will change color depending on the source of the information:

**White:** The XTreme-EMS is using the cruising speed for the range calculation

**Magenta:** The XTreme-EMS is using the GPS ground speed for the range calculation

### 3.1.5 MAP display

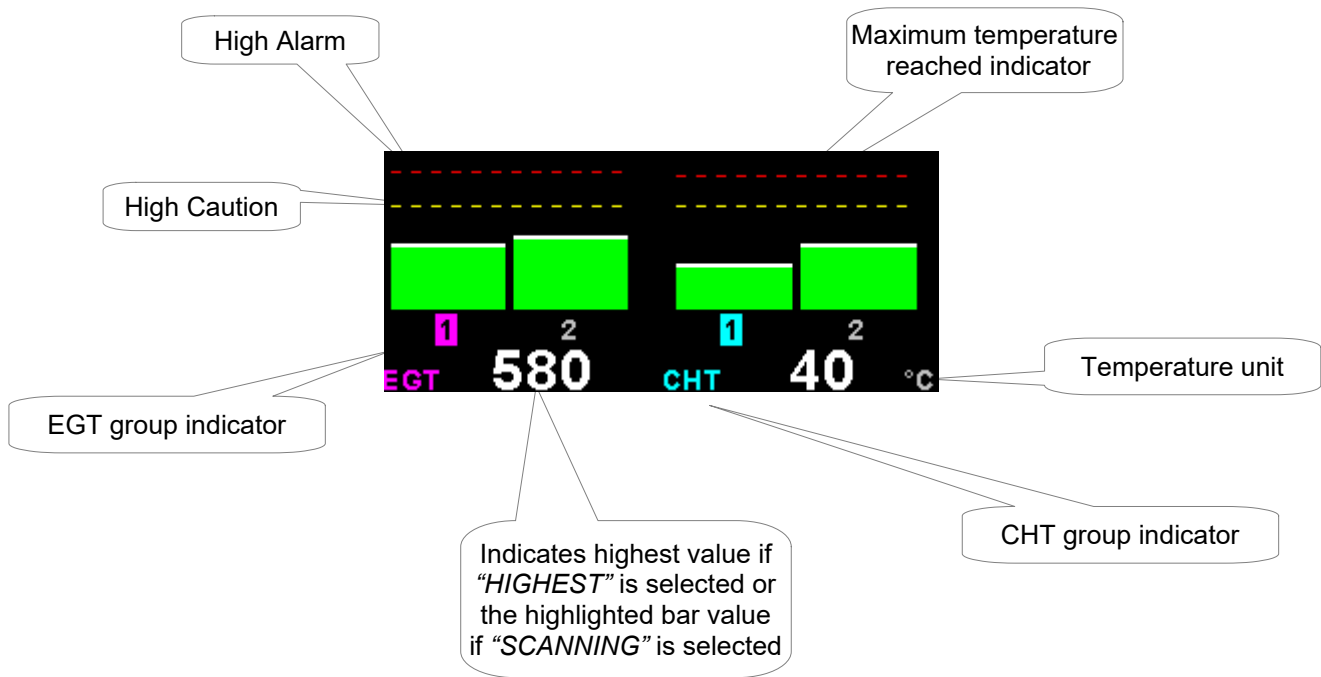
The MAP will be displayed when the MAP has been enabled in the menu system.



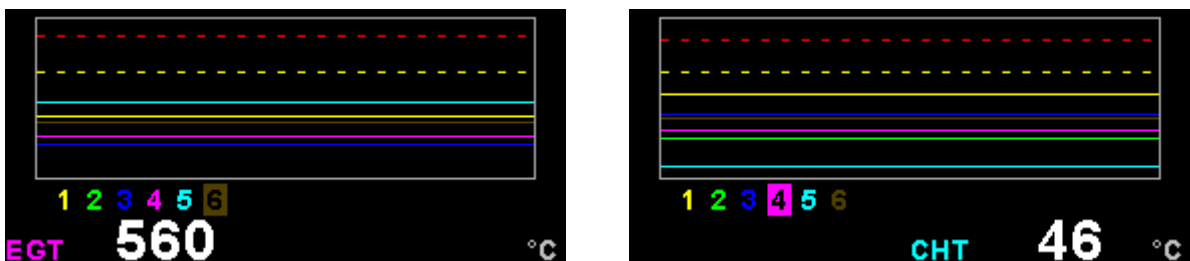
### 3.1.6 EGT / CHT display section

The XTreme supports up to 12 thermocouples for EGT / CHT. The EGT / CHT section will automatically try and maximize the display area according to the number of EGT / CHT selected. The EGT / CHT parameters can be configured in the “EGT SETUP” and “CHT SETUP” menu.

The EGT / CHT number will highlight to the indicated the temperature value if “HIGHEST” is selected. The EGT highlight color is magenta, and the CHT color is cyan.



### EGT / CHT Trend graph



The EGT / CHT trend displays can be accessed by pressing the 2<sup>nd</sup> left most button when the engine display screen is shown. The trend graph displays the last 250 seconds of EGT/CHT temperature readings.



### 3.2 EMS Quick Select Menu System

EXIT

START FLIGHT

FUEL REFILL

CRUISE SPEED

LEAN MODE

CRUISE MODE

FUEL TOTALS

TIMER

MIN/MAX

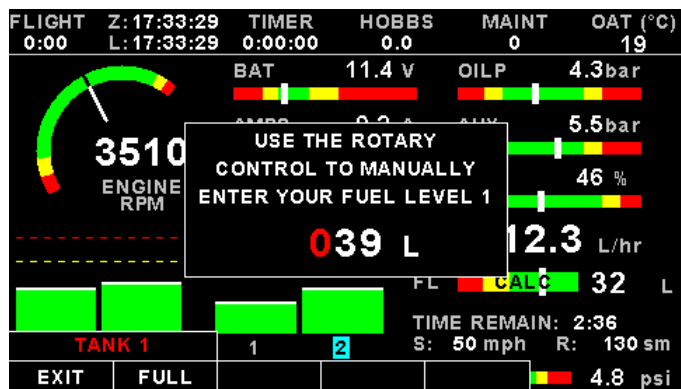
BACKLIGHT

MENU

Press the rotary control when the EMS screen is displayed to access the EMS quick select menu.

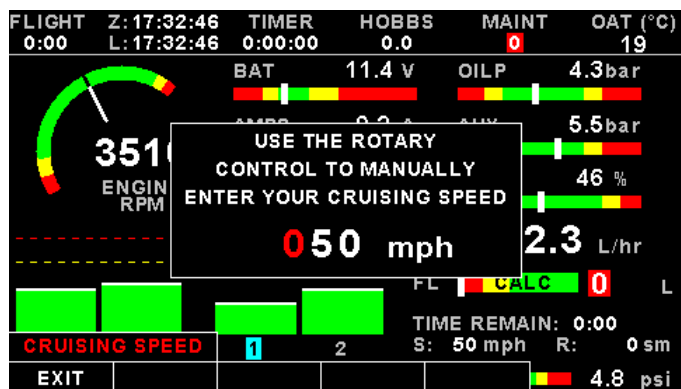
**START FLIGHT:**  
Select this option to manually start/stop a flight. This menu option is only shown if the XTreme-EMS is setup to select the manual flight option under the “*FLIGHT LOG*” setup menu. The ‘:’ will flash to indicate that a valid flight is in progress.

#### FUEL REFILL:



Select this menu option to refill a calculated fuel tank. Press the “*FULL*” soft key for a quick fill to the full reading in the tank setup menu. Press the “*EXIT*” soft key when done.

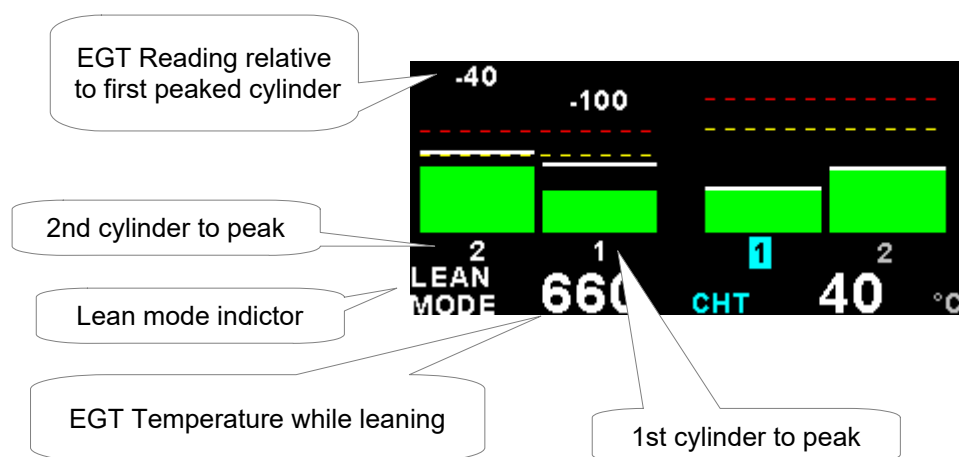
#### CRUISE SPEED:



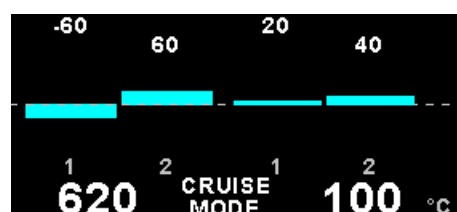
Select this menu option to enter your average cruising speed. If there is no GPS fix or no airtalk airspeed data available then the Xtreme-EMS will use the average cruising speed to calculate fuel range. It is advisable to enter your average cruising speed irrespective if you are using an external GPS receiver or not. If the GPS signal is lost during flight then the Xtreme-EMS automatically defaults to this value.

### LEAN MODE:

EGT information is also very useful for fuel mixture control. As the fuel mixture is leaned, so the exhaust gasses get hotter. This rise in temperature is a sign of increased combustion efficiency as the optimum mixture setting is approached. If the leaning progresses past a certain point however, the temperature will begin to drop. This temperature drop is the result of reduced energy output from the diminished fuel flow. The best operating mixture for aircraft engines is in the vicinity of this peak EGT reading. The XTreme-EMS has a special Leaning mode, which easily identifies the peak EGT condition allowing you to adjust your fuel mixture for best performance. Fuel mixture should be adjusted once you have decided on a suitable cruise power setting (typically 70%). Once leaning mode has been enabled, the "LEAN MODE" label is displayed at the bottom left of the EMS display to clearly differentiate it from the normal operating mode. As the fuel mixture is slowly leaned past the point at which the temperature begins to drop (by more than 10°C/15°F), the absolute EGT temperatures will change to show the EGT reading relative to this peak. The sequential order as each cylinder peaks is also shown as numeric text under the cylinder. Leaning mode can be canceled by pressing the soft key to "OFF" or by changing the display screen.

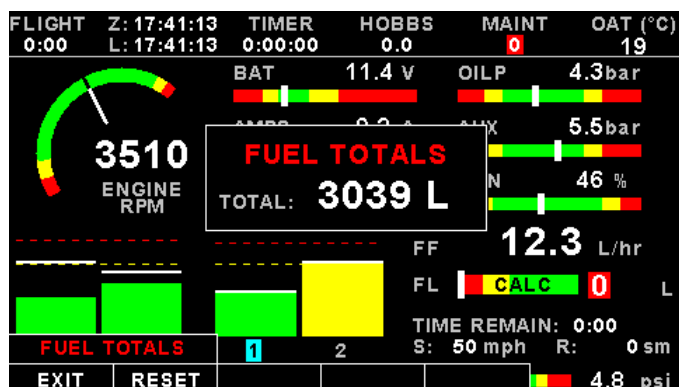


### CRUISE MODE:



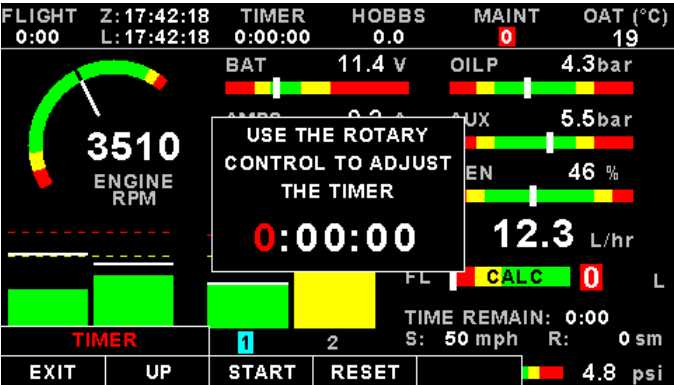
Once cruise mode has been enabled, the "CRUISE MODE" label is displayed at the bottom of the EMS display to clearly differentiate it from the normal operating mode. All EGT and CHT readings are immediately sampled as reference temperatures for the cruise. The display then shows EGT and CHT values relative to this reference temperature. Cruise mode can be canceled by pressing the soft key to "OFF".

### FUEL TOTALS:



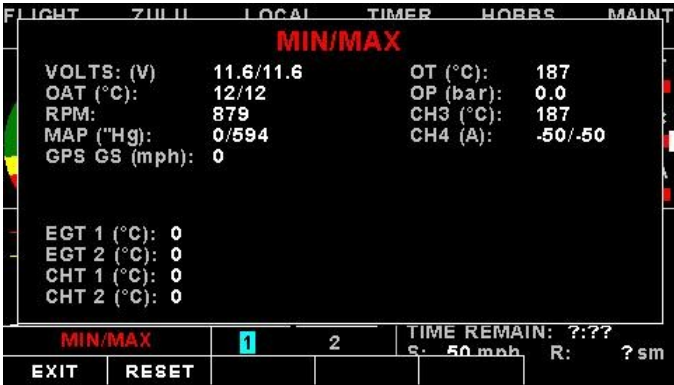
Select this menu option to display the fuel totals. Press the "RESET" soft key to reset the totalisers to zero. Press the "EXIT" soft key when done.

TIMER:



Select this menu option to configure the timer. Use the rotary control to adjust the timers reset value. Press the “UP/DOWN” soft key to select whether the timer must count up or down, the “START/STOP” soft key to start or stop the timer and the “ON/OFF” soft key to enable or disable the timer.

MIN/MAX:



Select this menu option to display the maximum and minimum captured values. Press the “RESET” soft key to reset the min/max values to the current values.

BACKLIGHT:



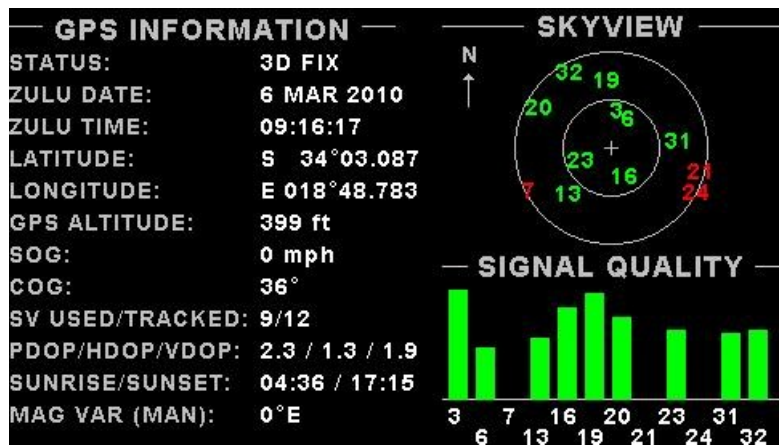
Select this menu option to adjust the backlight brightness level. This may be desirable during low light flying conditions. Use the rotary control to adjust the brightness level.

MENU:

Select this menu option to enter the main menu system.

### 3.3 GPS Display (External RS232 GPS receiver required)

The GPS page show the GPS information in an easy to read format. Sunrise/sunset times as well as the magnetic variation is shown.



### 3.4 GPS Quick Select Menu System



Press the rotary control when the GPS screen is shown to access the GPS quick select menu.

#### BACKLIGHT:



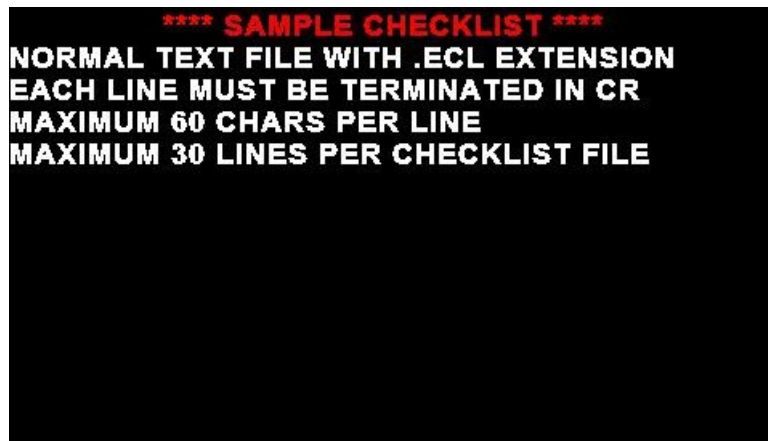
Select this menu option to adjust the backlight brightness level. This may be desirable during low light flying conditions. Use the rotary control to adjust the brightness level.

#### MENU:

Select this menu option to enter the main menu system.

## 3.5 Information/Checklist Display

The Information / Checklist page shows checklists and graphic information pages which are loadable from the SD card. The last checklist or graphic information page is automatically loaded as startup.



### 3.5.1 Graphic information pages

The graphic information page allows you to display any type of image on the XTremes high resolution graphics display.

#### Creating your own graphic information pages

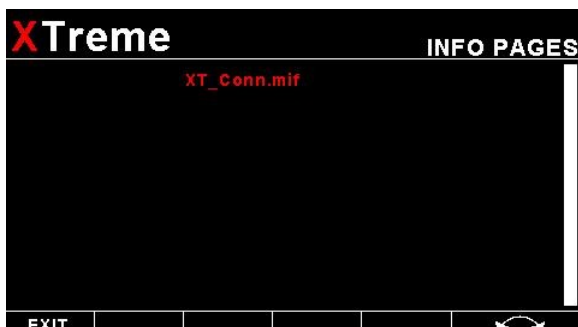
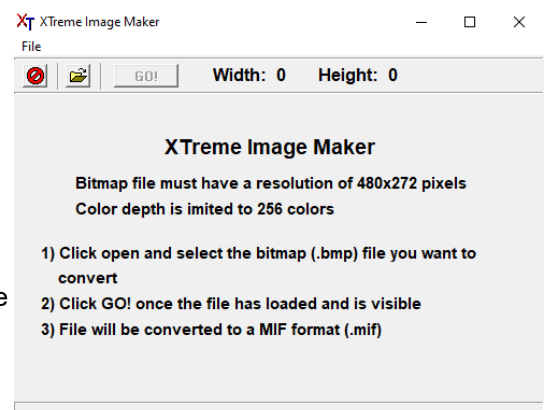
##### You will need:

- A bitmap picture of your choice (\*.BMP, 480x272 pixel resolution)
- The BMP to MIF converter tool can be downloaded free of charge from <http://www.mglavionics.co.za> or can be found on the XTreme-EMS distribution SD card).

The BMP to MIF program is used to convert images in Windows BMP format to MIF format. You can use this program to make your own startup screen (Splash screen) and graphic information pages. The color depth is limited to 256 colors.

Run the XTreme Image Maker program.

Load an image file (and remember the location), select the resolution as width (480) and height (272) and press the GO button. The new MIF image will be located in the same directory as the source (.BMP) file. Copy the created file (.MIF extension) to the Infopage directory on the SD card.



The graphic information file can then be loaded by pressing the rotary control and selecting "INFO PAGES". A window containing all the files with the .MIF extension is shown. Select the desired information page. The number of information pages that can be stored and displayed depends on the size of the SD card.

### 3.5.2 Checklists

A checklist file is simply a text file created in a word processing program and saved with a .ECL extension. The name of the file does not matter but we suggest calling it something familiar so you can easily identify it. The length of each text line must not be more then 60 characters and must be terminated with an Enter (CR). The line will automatically be truncated at the end of the right hand side of the screen. Each checklist file must not be more then 30 lines.



Copy the created file (.ECL extension) to the checklst directory on the SD card when you are complete. The checklist file can be loaded by pressing the rotary control and selecting “CHECKLISTS”. A window containing all the files with the .ECL extension will shown. Select the checklist you require. The number of checklists that can be stored and displayed depends on the size of the SD card.

## 3.6 Information/Checklist Quick Select Menu System



Press the rotary control when the Info/Checklist screen is shown to access the Info/checklist quick select menu.

### INFO PAGES:

This menu option selects a graphic information page to display. A window will open displaying all the files with the .MIF extension in the Infopage directory on the SD card. Press the rotary control over the file you wish to load as a graphic information page.

### CHECKLISTS:

This menu option selects a checklist to display. A window will open displaying all the files with the .XCL extension in the Checklst directory on the SD card. Press the rotary control over the file you wish to load as a checklist.

### BACKLIGHT:



Select this menu option to adjust the backlight brightness level. This may be desirable during low light flying conditions. Use the rotary control to adjust the brightness level.

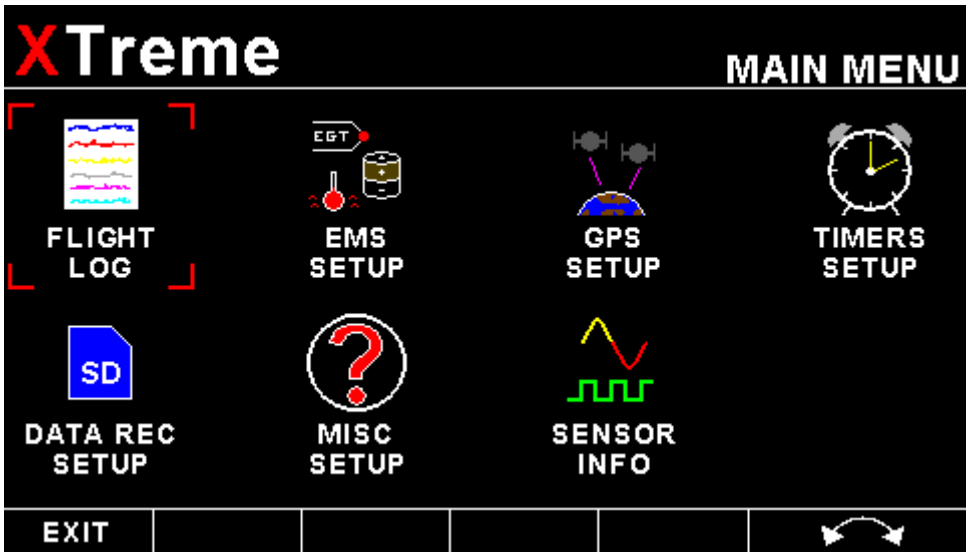
### MENU:

Select this menu option to enter the main menu system.

## 4 Main Menu System



To access the main menu system, press the rotary control knob, scroll down to the “MENU” option and press the rotary control knob again. Use the rotary control to navigate the menu system.



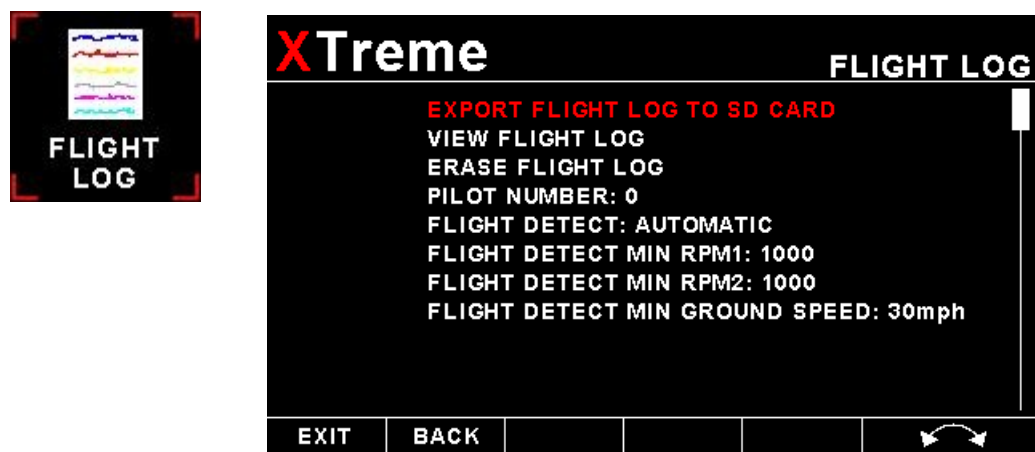
### 4.1 Menu Sub-Bar



Use the menu sub-bar for quick menu navigation. Select the soft key directly under the text to activate the softkey function. Some soft keys have a x1, x10, x100, x1000 assigned to them. This allows for faster incrementing and decrementing of the menu settings.



## 4.2 Flight Log

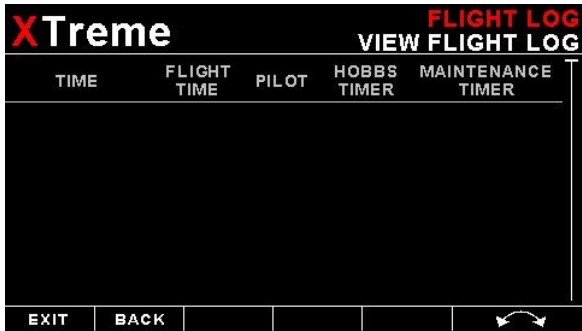


**NOTE:** The Flight log is stored in RAM and is updated every minute. If the power is turned off to the XTreme-EMS before the flight has ended then the flight information after the last minute update will be lost.

### **EXPORT FLIGHT LOG TO SD CARD:**

Use this function to export the current flight logs stored in the XTreme-EMS to a SD card. The exported filename is called XTFLIGHT.CSV. The exported flight log is exported in a CSV (Comma Separated Values) file format and can be imported into a spread sheet type program.

### **VIEW FLIGHT LOG:**



This allows the pilot to view the last 1000 recorded flights.

### **ERASE FLIGHT LOG:**

Use this function to erase the current flight log stored in the XTreme-EMS.

### **PILOT NUMBER:**

Select a pilot number under which the next flights will be logged. Every flight entry in the flight log has a pilot number associated to it.

### **FLIGHT DETECT:**

Select if you want the flight log to automatically “AUTOMATIC” start or if you want to manually “MANUAL” start and stop it.

The XTreme uses the following algorithm to determine if a flight is in progress (*"AUTOMATIC" mode*): If the ground speed is greater than the preset *"FLIGHT DETECT MIN GROUND SPEED"* value or the RPM 1 & 2 is greater than the preset *"FLIGHT DETECT MINIMUM RPM1 2"* value for a duration of 60 seconds or more, a flight is started with a logbook entry. The flight ends if ground speed or RPM falls below the preset value for 30 seconds.

The above algorithm ensures that touch-and-goes will not result in the end of a flight and a logbook entry.

***FLIGHT DETECT MINIMUM RPM1: (Automatic mode only)***

Enter the minimum RPM 1 threshold that will start a new flight log entry.

***FLIGHT DETECT MINIMUM RPM2: (Automatic mode only)***

Enter the minimum RPM 2 threshold that will start a new flight log entry.

***FLIGHT DETECT MINIMUM GROUND SPEED: (Automatic mode only, External GPS Required)***

Enter the minimum ground speed threshold that will start a new flight log entry.

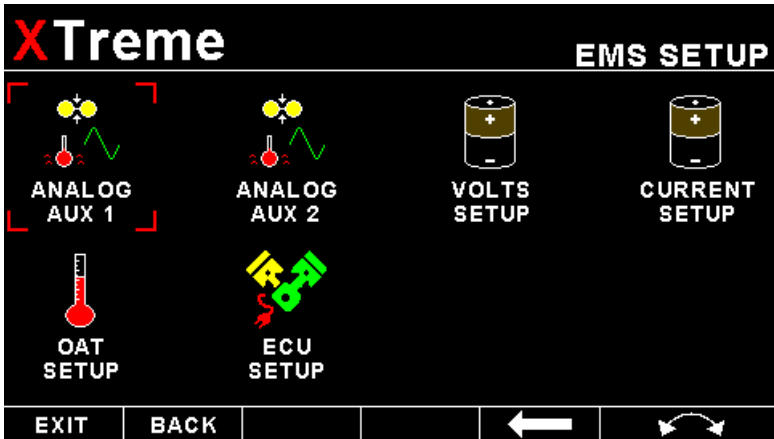
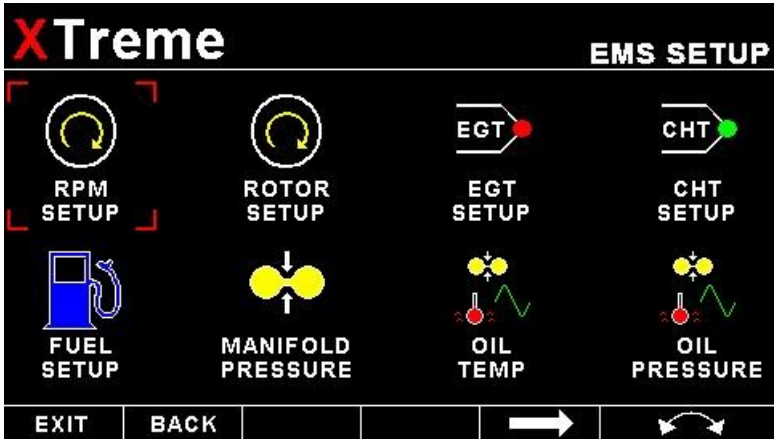
#### **4.2.1 Flight Log output file format .CSV (Comma Separated Values)**

The Xtreme-EMS will create a Comma Separated Values (.csv) file called XTFlight.csv in the root directory of the SD card.

Below is the format of the .CSV data

**Date, Time, Flight Time, Pilot Number, Hobbs Timer, Maintenance Timer**

4.3 EMS Setup



### 4.3.1 RPM 1 Setup



XTreme		EMS SETUP	
		RPM 1 SETUP	
RPM DISPLAY: RPM			
DISPLAY MAX: 6000			
DISPLAY MIN: 0			
HIGH ALARM: ON			
HIGH ALARM: 5800			
HIGH CAUTION: 5500			
LOW CAUTION: 1000			
LOW ALARM: OFF			
LOW ALARM: 500			
AVOID HIGH: 3500			
AVOID LOW: 3000			
EXIT	BACK		

AVOID ZONE: OFF			
PULSES/REV: 6.00			
INCREMENT: 1 RPM			
LABEL: ENGINE			
DISPLAY POSITION X: 80			
DISPLAY POSITION Y: 100			
DISPLAY ARC WIDTH: 7			
EXIT	BACK		

#### **RPM DISPLAY:**

Select if you want the RPM to be displayed in "RPM" or "PERCENT". If you do not want any RPM information then set this parameter to "OFF". If the RPM 2 is set to "RPM" or "PERCENT" then the engine RPM display will automatically be enabled.

#### **RPM 100% DISPLAY:**

Select the maximum value that you want the RPM to correlate to 100%.

#### **DISPLAY MAX:**

Select the maximum RPM that you want the RPM dial to show. This can give you increased display resolution.

#### **DISPLAY MIN:**

Select the minimum RPM that you want the RPM dial to show. This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the RPM high alarm.

#### **HIGH ALARM:**

Enter the RPM threshold for when the high alarm must be activated. Any RPM value above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the RPM value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the RPM value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the RPM low alarm.

***LOW ALARM:***

Enter the RPM threshold for when the low alarm must be activated. Any RPM value below this value will activate the alarm.

***AVOID HIGH:***

Enter the high RPM threshold for the Avoid band. This is the upper value of the orange band.

***AVOID LOW:***

Enter the low RPM threshold for the Avoid band. This is the lower value of the orange band.

***AVOID ZONE:***

Select to enable or disable the avoid orange band

***PULSES/REV:***

Enter the number of pulses per RPM. For engines with an uneven number of cylinders like three cylinder four stroke engines you can enter values containing fractions (usually 1.5 in this example). Most four stroke engines would generate one pulse for every two revolutions per cylinder. A four cylinder automotive four stroke engine would thus generate 2 pulses per revolution. A typical Rotax DCDI two stroke engine would generate 6 pulses per revolution. The well known Rotax 912/914 engine generates one pulse per revolution.

***INCREMENT:***

Select the step size between successive RPM values eg. if the RPM value is 4003 RPM and the "*RPM RESOLUTION*" is 5 then the actual value shown is 4005 RPM.

***LABEL:***

Enter a label to suit your RPM 1 channel so you can identify it easily.

***DISPLAY POSITION X:***

Select this X position of the RPM display

***DISPLAY POSITION Y:***

Select this Y position of the RPM display

***DISPLAY ARC WIDTH:***

Select the width of the arc bar.

### 4.3.2 RPM 2 Setup



**XTreme**
**EMS SETUP**  
**RPM 2 SETUP**

**RPM DISPLAY: RPM**  
 DISPLAY MAX: 1500  
 DISPLAY MIN: 0  
 HIGH ALARM: ON  
 HIGH ALARM: 1200  
 HIGH CAUTION: 1100  
 LOW CAUTION: 600  
 LOW ALARM: ON  
 LOW ALARM: 100  
 AVOID HIGH: 900  
 AVOID LOW: 800

EXIT   BACK

AVOID ZONE: OFF  
 PULSES/REV: 1.00  
 INCREMENT: 1 RPM  
 LABEL: ROTOR  
 STYLE: CLASSIC  
**POSITION: RIGHT**

EXIT   BACK

#### **RPM DISPLAY:**

Select if you want the RPM 2 to be displayed in “RPM” or “PERCENT”. If you do not want any RPM 2 information then set this parameter to off. If the RPM 2 is set to “RPM” or “PERCENT” then the engine RPM display will automatically be enabled.

#### **RPM 100% DISPLAY:**

Select the maximum value that you want the RPM to correlate to 100%.

#### **DISPLAY MAX:**

Select the maximum RPM that you want the RPM dial to show. This can give you increased display resolution.

#### **DISPLAY MIN:**

Select the minimum RPM that you want the RPM dial to show. This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the RPM high alarm.

#### **HIGH ALARM:**

Enter the RPM threshold for when the high alarm must be activated. Any RPM value above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the RPM value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the RPM value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the RPM low alarm.

## LOW ALARM:

Enter the RPM threshold for when the low alarm must be activated. Any RPM value below this value will activate the alarm.

## AVOID HIGH:

Enter the high RPM threshold for the Avoid band. This is the upper value of the orange band.

## AVOID LOW:

Enter the low RPM threshold for the Avoid band. This is the lower value of the orange band.

## AVOID ZONE:

Select to enable or disable the avoid orange band

## PULSES/REV:

Enter the number of pulses per RPM.

## INCREMENT:

Select the step size between successive RPM values eg. if the RPM value is 4003 RPM and the "RPM RESOLUTION" is 5 then the actual value shown is 4005 RPM.

## LABEL:

Enter a label to suit your RPM 2 channel so you can identify it easily.

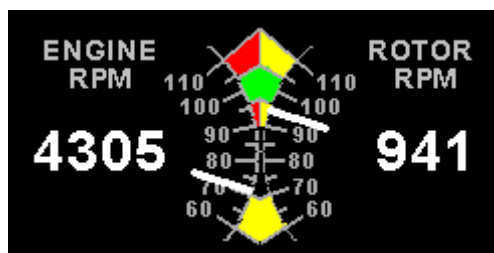
## STYLE:

Select this menu option to change the graphic style of the RPM 1 and RPM 2 display.

ARC Display



CLASSIC Display



## POSITION:

Select which side of the analog dials the RPM 1 / RPM 2 must be displayed on.



### 4.3.3 EGT/CHT Setup

EGT

EGT SETUP

XTreme

EMS SETUP

EGT SETUP

EGT CHANNELS: 2

TEMPERATURE UNIT: °C

DISPLAY MAX: 850°C

DISPLAY MIN: 400°C

HIGH ALARM: ON

HIGH ALARM: 800°C

HIGH CAUTION: 700°C

PROBE: K-TYPE

MODE: SCANNING

SCAN TIME: 1S

DISPLAY POSITION X: 0

EXIT

BACK

DISPLAY POSITION Y: 230

EXIT

BACK

X1

CHT

CHT SETUP

XTreme

EMS SETUP

CHT SETUP

CHT CHANNELS: 2

TEMPERATURE UNIT: °C

DISPLAY MAX: 150°C

DISPLAY MIN: 0°C

HIGH ALARM: ON

HIGH ALARM: 130°C

HIGH CAUTION: 100°C

PROBE: K-TYPE

MODE: SCANNING

SCAN TIME: 1S

DISPLAY POSITION X: 0

EXIT

BACK

DISPLAY POSITION Y: 230

EXIT

BACK

X1

- EGT / CHT CHANNELS:

Select the number of EGT or CHT channels you want to use. Choices are from 1 to 12. The temperature display will configure itself to make best possible use of the available display size. Please note that the minimum number of EGT & CHT channels that can be displayed is 1 and the maximum number of EGT and CHT channels that can be displayed is 12.

TEMPERATURE UNIT:

Select whether you want the temperature to be displayed in degrees Celsius (°C) or in degrees Fahrenheit (°F).

EGT / CHT DISPLAY MAX:

Select the maximum temperature that you want the EGT/CHT bargraph to show. This can give you increased display resolution.

EGT / CHT DISPLAY MIN:

Select the minimum temperature that you want the EGT/CHT bargraph to show. This can give you increased display resolution.

**HIGH ALARM:**

This enables or disables the EGT/CHT high alarm.

**HIGH ALARM:**

Enter the temperature threshold for when the high alarm must be activated. Any temperature above this value will activate the alarm.

**HIGH CAUTION:**

Enter the temperature value for the high caution.

**PROBE:**

Select if you are using a K-type, J-type or E-type thermocouple probe for the EGT/CHT group. All probes supplied by MGL Avionics are K-Type. J-types are sometimes used with American made CHT probes. All EGT probes are K-type. E-type probes are seldom used.

**MODE:**

A selection between "HIGHEST" or "SCANNING" can be selected. If "HIGHEST" is selected then the current highest thermocouple temperature is displayed. If "SCANNING" is selected then the unit will cycle through each thermocouple at the time specified in "SCAN TIME".

**SCAN TIME:**

Specify the time that each of the channels must be displayed for. This menu option is only shown if "SCANNING" is selected for the display mode.

**DISPLAY POSITION X:**

Select this X position of the EGT / CHT display area

**DISPLAY POSITION Y:**

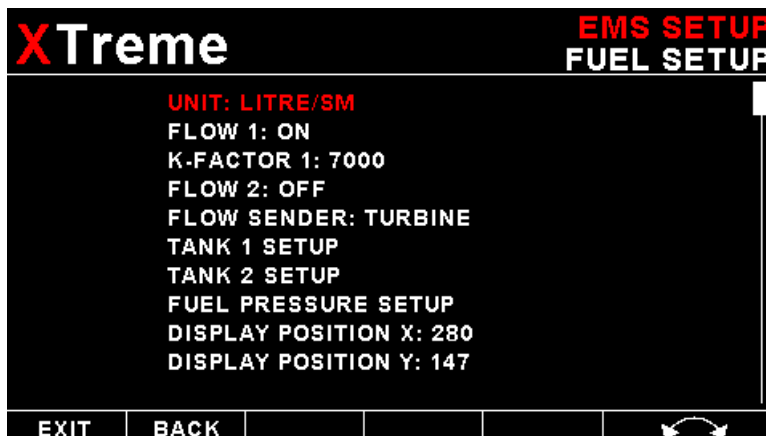
Select this Y position of the EGT / CHT display area

### 4.3.3.1 Special Rotax 912/914 probe mode

In this mode the RDAC AUX 1 and AUX 2 analog input channels become the Rotax CHT channel 1 and CHT channel 2 respectively. All CHT setups must still be done under the "CHT SETUP" menu.

The reason for using the NTC inputs is that the sensors Rotax use are standard NTC temperature probes and not of a thermocouple type.

### 4.3.4 Fuel Setup



#### **UNIT:**

Select your desired units for distance and fuel quantity. The following options are available:

L/sm: Liters and statute miles

G/sm: U.S. Gallons and statute miles

L/nm: Liters and nautical miles

G/nm: U.S. Gallons and nautical miles

L/km: Liters and kilometer

G/km: U.S. Gallons and kilometers

#### **FLOW 1 / FLOW 2:**

This enables or disables the Flow 1 display.

#### **K-FACTOR 1 / K-FACTOR 2:**

The K-Factor is the number of pulses generated by the fuel flow sender for one liter of fuel. The dual range fuel flow sender supplied by MGL Avionics has a K-Factor of 7000 in the low flow mode (jet installed) and 1330 for the high flow mode (no jet installed). The Flowsan 201A-6 has a K-Factor of 8454. You can use the K-Factor to calibrate your fuel flow sender. See the RDAC manual for more details on how to calibrate and install the fuel flow sender.

#### **FLOW SENDER:**

Select if you want to measure fuel flow using a turbine fuel flow sender or by using fuel injectors.

#### **FLOW MODE:**

If both fuel flow senders are selected then select if they are operating on individual fuel tanks (dual) or if they are operating in a supply/return type fuel system (differential).

#### **TANK 1 SETUP / TANK 2 SETUP:**

Select this menu item to setup the fuel level for fuel tank 1 / fuel tank 2. See below for more details.

#### **FUEL PRESSURE SETUP:**

Select this menu item to setup the fuel pressure

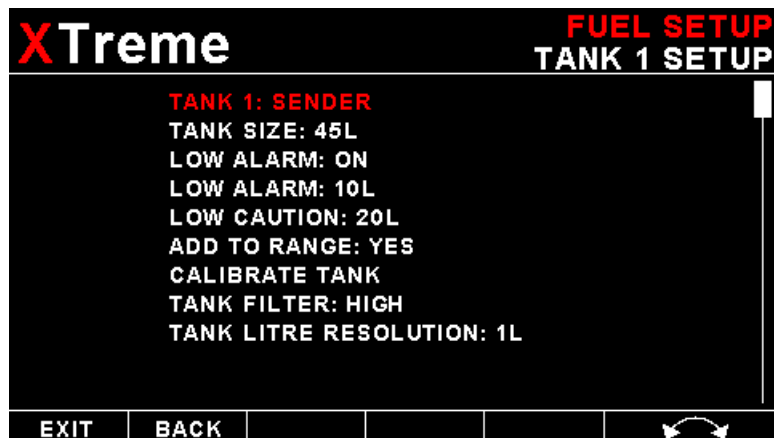
#### **DISPLAY POSITION X:**

Select this X position of the fuel display area

#### **DISPLAY POSITION Y:**

Select this Y position of the fuel display area

**TANK 1 SETUP / TANK 2 SETUP** (Only tank 1 setup is shown, follow the same steps for tank 2 setup)



**XTreme** **FUEL SETUP**  
**TANK 1 SETUP**

**TANK 1: SENDER**  
TANK SIZE: 45L  
LOW ALARM: ON  
LOW ALARM: 10L  
LOW CAUTION: 20L  
ADD TO RANGE: YES  
CALIBRATE TANK  
TANK FILTER: HIGH  
TANK LITRE RESOLUTION: 1L

EXIT BACK ↺

### **TANK 1 / TANK 2:**

Select if the fuel tank has a physical fuel level sender connected to it or if the Xtreme must use a calculation based virtual fuel tank. If you do not want any fuel level information then set this parameter to off.

### **TANK SIZE:**

Enter the size of the fuel tank in your system. It is recommended to choose a size that is slightly less than the actual size so you can compensate for sender inaccuracies and give you a measure of reserve fuel.

### **LOW ALARM:**

This enables or disables the fuel level low alarm.

### **LOW ALARM:**

Enter your desired minimum fuel value that you would like to trigger the fuel low alarm.

### **LOW CAUTION:**

Enter the fuel level value for the low fuel caution.

### **ADD TO RANGE:**

Select if this fuel tank adds to the range based calculations

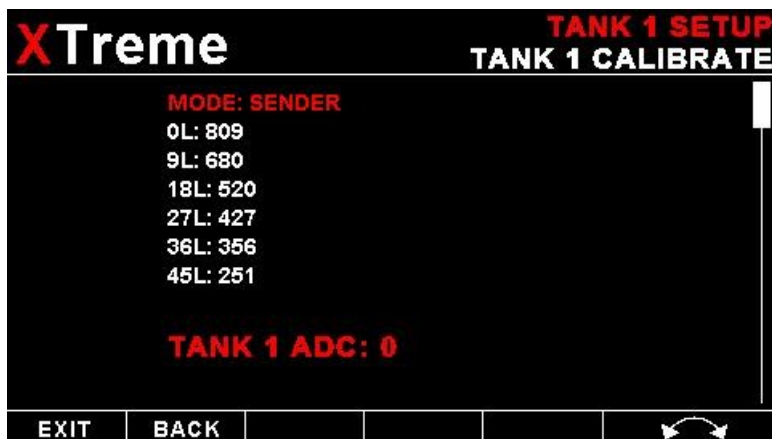
### **CALIBRATE TANK:**

The fuel level sender needs to be calibrated before it can be used with this system. The calibration allows the system to learn the shape of your tank as well as any errors your fuel level sender or installation has.

Regardless of your use of a fuel flow sender, you can install a fuel level sender into your fuel tank. These level senders are inexpensive and are available as after market replacement fittings from a car spares outlet.

Be aware that some makes of cheap level senders can prove troublesome, as the lever arms tend to be sticky. This prevents the floats from floating on the surface of the fuel at all times. As a consequence, this will lead to incorrect fuel level indication.

## Adjusting calibration points automatically



Select “SENDER” for the “MODE” menu item. Once you have installed a fuel level sender into your tank, make sure the float can travel all the way from empty to full position without hindrance of any kind. The calibration procedure should be carried out with your aircraft in flight attitude. This means you need to lift the tail if you have a tail-dragger or lift the nose wheel if you have a weightshift trike.

### Calibration procedure

- Start the calibration procedure with an empty tank.
- Add five liters of fuel (our reserve quantity) using a suitable measure. Make sure the measure is suitably accurate. This is now the “level sender reading at 0 Lt” position. Move the highlight to this position and wait until the sender reading has stabilized (You will see the sender reading at the top line). This could take up to a minute so have patience.

ENSURE THAT THE FLOAT IS NOT SUBMERGED AND IS FLOATING ON TOP OF THE FUEL LEVEL.

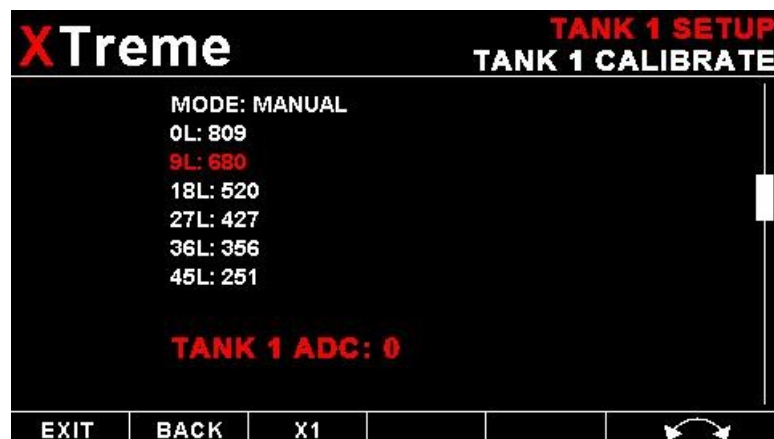
Should this number not react to changes of your level sender position, then you have a problem. Please check your wiring according to the installation section of this manual. You should expect the number to change in the region of at least 20 to 60 counts per calibration position. If the number does not change with fuel level or only changes a very small amount – check your installation. Something is not right!

- If you see the number changing then everything is well. Once it has stabilized and the highlight is on the 0 L position, press the rotary control to transfer the reading from the sender to the calibration point.
- Now you are ready for the next step. Add the required amount of fuel to get to the next level (In our case 9 Lt – this is 20% tank capacity). Once done, wait for the reading to stabilize and press the rotary control again after you have moved the highlight to the “9 L” position.
- Proceed in a similar MANNER until you have reached the last calibration position at 100% tank capacity.

You are done!

The instrument uses the 6 calibration points to work out a correction curve that takes into account the tolerances of your fuel level sender and the shape of your fuel tank. This results in an incredibly accurate and usable fuel level display that far exceeds that available from ordinary dial type gauges.

## Adjusting calibration points manually

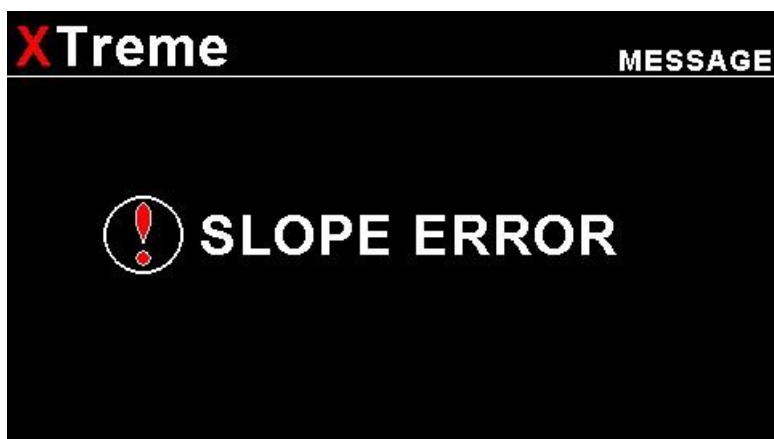


You may want to set individual calibration points manually. For example you may find that your fuel level is over reading at a specific fuel level. Correcting the tank level reading for this area can be simply done by adjusting the calibration point. You can do this by moving the float level with your hands to the desired position and then performing the calibration as outlined above, or you can use the manual option.

Select "MANUAL" for the "MODE" menu item. Then highlight the point you want to change manually and press the rotary control. Use the rotary control to adjust the value. Press the rotary control when done.

**Note:** The calibration positions may be edited by using the rotary control. This allows you, in theory, to copy calibration settings from one instrument to another. We however recommend that you do go through the calibration procedure even if the two aircraft are identical in all respects. Tolerances do exist and the calibration cancels these out. Accurate fuel level displays are a vital safety factor for an aircraft and a very useful feature for peace of mind during cross county flights.

## Notes on Slope error



Sender value is a value determined by the XTreme. It is used to calculate fuel level, fuel endurance estimate and current range estimate. The fuel tank setup sender value can either increase in value as fuel is added or decrease in value if fuel is added. This is dependent on the type of fuel level sender used. However should the second reading be larger than the first reading all readings will have to be larger than the previous readings. Likewise should the second reading be smaller than the first reading all readings will have to be smaller than the previous reading.

If this is not the case the wording "SLOPE ERROR" will be displayed. This could happen when fuel was removed instead of added between steps, no fuel was added between steps or when the fuel level sender was moved in the wrong direction e.g. moving the fuel level sender manually when it is not inserted in to the fuel tank. Determine the cause of the error if you should get a slope error message. If you do not know the cause of your error it is best to start from scratch. It should be remembered that accuracy in the fuel tank calibration is extremely important to enable your XTreme to display the correct data.

***TANK FILTER:***

Select the damping factor for the fuel level. A selection of "*NONE*", "*LOW*", "*MED*" or "*HIGH*" can be made.

***TANK LITRE RESOLUTION:***

Select the resolution of the tank if Litres is selected. 0.1L or 1L resolution.



**FUEL PRESSURE SETUP: (MGL Avionics RDAC-XF / MAP Required)**  
Select this menu item to setup the fuel pressure input.

XTreme

EMS SETUP

FUEL PRESSURE SETUP

FUEL PRESSURE DISPLAY: ON

TYPE: VOLTAGE

SENDER: 0.5-4.5V

PRESSURE @ 0.5V: 0.0 psi

PRESSURE @ 4.5V: 10.0 psi

PRESSURE UNIT: psi(0.1)

DISPLAY MAX: 10.0 psi

DISPLAY MIN: 0.0 psi

HIGH ALARM: ON

HIGH ALARM: 8.0 psi

HIGH CAUTION: 7.0 psi

EXIT

BACK

LOW ALARM: ON

LOW ALARM: 1.5 psi

DISPLAY STYLE: HORIZONTAL 2

DISPLAY POSITION X: 320

DISPLAY POSITION Y: 258

DISPLAY BAR WIDTH: 80

DISPLAY BAR HEIGHT: 8

EXIT

BACK

**FUEL PRESSURE DISPLAY:**  
This enables or disables the fuel pressure display on the EMS display screen

**TYPE:**  
Select if you are using a resistive, voltage or a current output pressure sender.

**If the “RESISTIVE” pressure sender is selected**

**SENDER:**  
Select what type of resistive pressure sender you are using. Select “VDO” for VDO / resistive senders, “USER” for a custom sender.

**MODEL:**  
Select which VDO pressure sender you are using. A selection between a VDO 2, 5 or 10 Bar can be selected.

**If the “VOLTAGE” pressure sender is selected**

**Sender:**  
Select the type of voltage sender you are using. Select “UMA” for UMA senders, “0.5-4.5V” for voltage senders, or “USER” for a custom voltage sender.

**Model:**  
For UMA senders select the UMA model number.

**If the “CURRENT” pressure sender is selected**

**Sender:**

Select the type of current sender you are using. Select "4-20mA" for Rotax 912/914 4-20mA sender or "USER" for a custom 4-20mA sender.

**Pressure @ 4mA:**

Enter the pressure specified at 4mA output.

**Pressure @ 20mA:**

Enter the pressure specified at 20mA output.

**Menu options for all sender types****If the "USER" pressure sender is selected****CALIBRATE SENDER:**

If the sender type is set to "USER", then use this menu option to calibrate your pressure sender. See section 4.4.9 for more information.

**PRESSURE UNIT:**

Select whether you want to display the pressure in Bar, PSI or PSI(0.1). The PSI(0.1) is for low range pressure senders e.g. UMA 7PSI.

**DISPLAY MAX:**

Select the maximum pressure that you want the oil pressure bargraph to show. This can give you increased display resolution.

**DISPLAY MIN:**

Select the minimum pressure that you want the oil pressure bargraph to . This can give you increased display resolution.

**HIGH ALARM:**

This enables or disables the pressure high alarm.

**HIGH ALARM:**

Enter the pressure threshold for when the high alarm must be activated. Any pressure above this value will activate the alarm.

**HIGH CAUTION:**

Enter the pressure value for the high caution. This is the lower value of the upper yellow band.

**LOW CAUTION:**

Enter the pressure value for the low caution. This is the upper value of the lower yellow band.

**LOW ALARM:**

This enables or disables the pressure low alarm.

**LOW ALARM:**

Enter the pressure threshold for when the low alarm must be activated. Any pressure below this value will activate the alarm.

***DISPLAY STYLE:***

Select the fuel pressure display style, Horizontal bar 1 / Vertical bar or Horizontal bar 2.

***DISPLAY POSITION X:***

Select this X position of the fuel pressure display.

***DISPLAY POSITION Y:***

Select this Y position of the fuel pressure display.

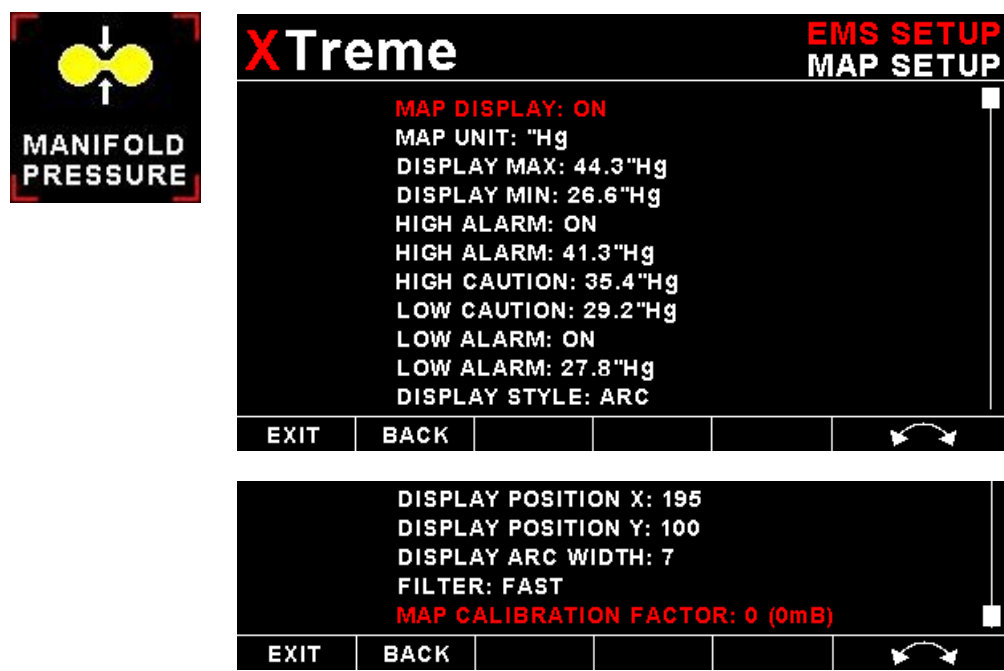
***DISPLAY BAR WIDTH:***

Select the width of the bar.

***DISPLAY BAR HEIGHT:***

Select the height of the bar.

### 4.3.5 Manifold Setup (MGL Avionics RDAC-XF MAP required)



#### **MAP DISPLAY:**

This enables or disables the manifold pressure display on the EMS displays screens

#### **MAP UNIT:**

Select if you want the manifold pressure displayed in mB (millibars) or "Hg (inches of mercury).

#### **MAP DISPLAY MAX:**

Select the maximum pressure that you want the manifold bargraph in the EMS displays to show. This can give you increased display resolution.

#### **MAP DISPLAY MIN:**

Select the minimum pressure that you want the manifold bargraph in the EMS display to show. This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the manifold pressure high alarm.

#### **HIGH ALARM:**

Enter the pressure threshold for when the high alarm must be activated. Any pressure above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the pressure value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the pressure value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the manifold pressure low alarm.

**LOW ALARM:**

Enter the pressure threshold for when the low alarm must be activated. Any pressure below this value will activate the alarm.

**DISPLAY STYLE:**

Select the MAP display style, ARC or Text display.

**DISPLAY POSITION X:**

Select this X position of the MAP display

**DISPLAY POSITION Y:**

Select this Y position of the MAP display

**DISPLAY ARC WIDTH:**

Select the width of the arc bar.

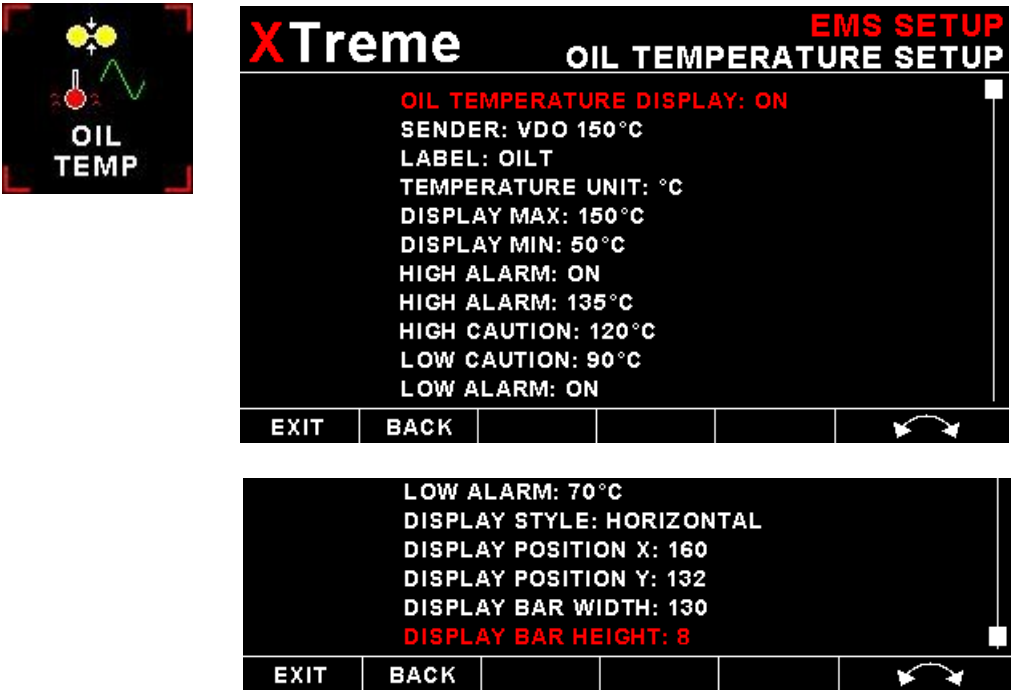
**FILTER:**

This function can be used to select the signal filter time constant. Selections are "NONE", "FAST" or "SLOW". This selection influences the rate at which your manifold pressure can change its reading.

**MAP CALIBRATION FACTOR:**

The sender in the RDAC is shipped uncalibrated. To calibrate the manifold pressure, compare and adjust the calibration factor until the manifold reading is the same as the pressure value in brackets. The pressure value in brackets is the barometer reading built into the Xtreme. The manifold pressure can only be calibrated in mB.

### 4.3.6 Oil Temperature Setup



**OIL TEMPERATURE DISPLAY:**  
This enables or disables the oil temperature display

**SENDER:**  
Select what type of sender you are using.  
Select "VDO 120C" or "VDO 150C" for a VDO resistive sender, "WESTACH" for Westach thermistor type senders, "MGL" for a MGL NTC resistive temperature sender, "LM335" for a MGL precision temperature sender or "USER" for a custom sender.

The XTreme has a built in linearization curve for a standard 50°C to 150°C VDO resistive sender, Westach senders and the MGL NTC resistive sender.

**If the sender is set to "USER"**

**CALIBRATE SENDER:**  
If the sender type is set to "USER", then use this menu option to calibrate your temperature sender. See section 4.4.9 for more information.

**If the sender type is set to "LM335"**

**CAL:**  
If the sender type is set to LM335, then use this menu option to calibrate your LM335 precision temperature sender. If recalibration is required then adjust the value using the rotary control until the temperature matches the reference ambient temperature. Please note that the LM335 can only be calibrated in degrees Celsius irrespective if the XTreme is setup to display temperature in Fahrenheit.

## Menu options for all sender types

***LABEL:***

Enter a label to suit your temperature channel so you can identify it easily.

***TEMPERATURE UNIT:***

Select whether you want the temperature to be displayed in degrees Celsius (°C) or in degrees Fahrenheit (°F).

***DISPLAY MAX:***

Select the maximum temperature that you want the oil temperature bargraph to show. This can give you increased display resolution.

***DISPLAY MIN:***

Select the minimum temperature that you want the oil temperature bargraph to show. This can give you increased display resolution.

***HIGH ALARM:***

This enables or disables the temperature high alarm.

***HIGH ALARM:***

Enter the temperature threshold for when the high alarm must be activated. Any temperature above this value will activate the alarm.

***HIGH CAUTION:***

Enter the temperature value for the high caution. This is the lower value of the upper yellow band.

***LOW CAUTION:***

Enter the temperature value for the low caution. This is the upper value of the lower yellow band.

***LOW ALARM:***

This enables or disables the oil temperature low alarm.

***LOW ALARM:***

Enter the temperature threshold for when the low alarm must be activated. Any temperature below this value will activate the alarm.

***DISPLAY STYLE:***

Select the oil temperature display style, Horizontal bar or Vertical bar.

***DISPLAY POSITION X:***

Select this X position of the oil temperature display.

***DISPLAY POSITION Y:***

Select this Y position of the oil temperature display.

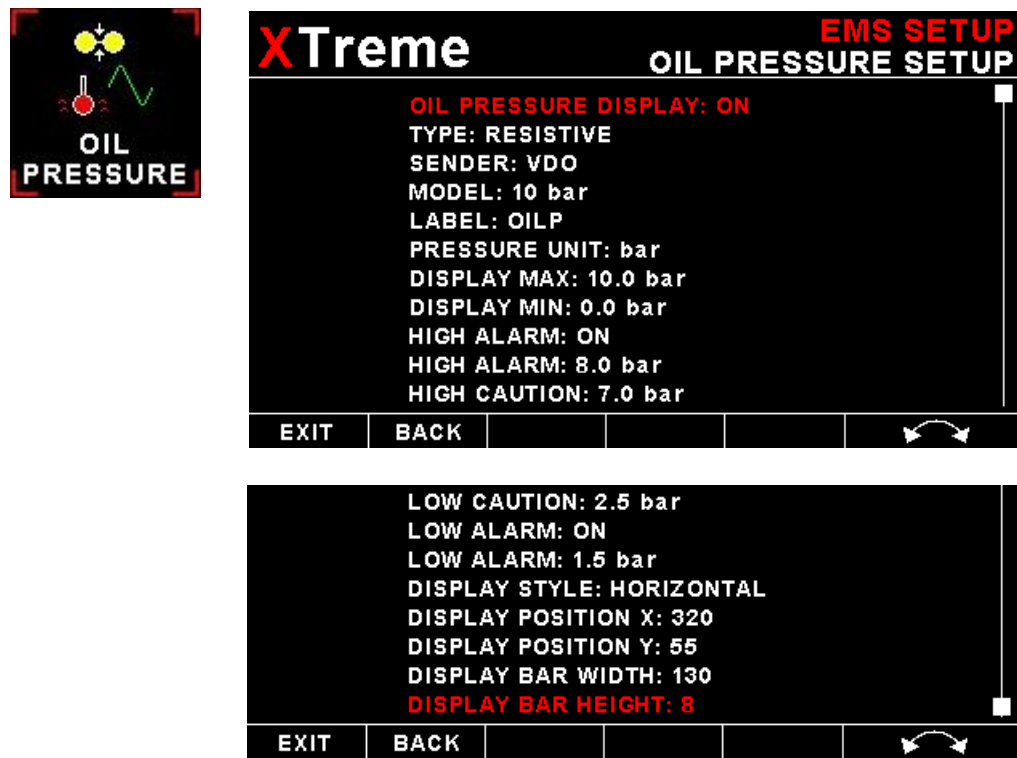
***DISPLAY BAR WIDTH:***

Select the width of the bar.

***DISPLAY BAR HEIGHT:***

Select the height of the bar.

### 4.3.7 Oil Pressure Setup



**OIL PRESSURE DISPLAY:**  
This enables or disables the oil pressure display

**TYPE:**  
Select if you are using a resistive, voltage or current output pressure sender.

#### If the “RESISTIVE” pressure sender is selected

**SENDER:**  
Select what type of resistive pressure sender you are using. Select “VDO” for VDO / resistive senders, “USER” for a custom sender.

**MODEL:**  
Select which VDO pressure sender you are using. A selection between a VDO 2, 5 or 10 Bar can be selected.

#### If the “VOLTAGE” pressure sender is selected

**Sender:**  
Select the type of voltage sender you are using. Select “UMA” for UMA senders, “0.5-4.5V” for voltage senders, or “USER” for a custom voltage sender.

**Model:**  
For UMA senders select the UMA model number.



## If the “CURRENT” pressure sender is selected

### **Sender:**

Select the type of current sender you are using. Select “4-20mA” for Rotax 912/914 4-20mA sender or “USER” for a custom 4-20mA sender.

### **Pressure @ 4mA:**

Enter the pressure specified at 4mA output.

### **Pressure @ 20mA:**

Enter the pressure specified at 20mA output.

## Menu options for all sender types

### If the “USER” pressure sender is selected

#### **CALIBRATE SENDER:**

If the sender type is set to “USER”, then use this menu option to calibrate your pressure sender. See section 4.4.9 for more information.

#### **LABEL:**

Enter a label to suit your pressure channel so you can identify it easily.

#### **PRESSURE UNIT:**

Select whether you want to display the pressure in Bar, PSI or PSI(0.1). The PSI(0.1) is for low range pressure senders e.g. UMA 7PSI.

#### **DISPLAY MAX:**

Select the maximum pressure that you want the oil pressure bargraph to show. This can give you increased display resolution.

#### **DISPLAY MIN:**

Select the minimum pressure that you want the oil pressure bargraph to . This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the pressure high alarm.

#### **HIGH ALARM:**

Enter the pressure threshold for when the high alarm must be activated. Any pressure above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the pressure value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the pressure value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the pressure low alarm.

**LOW ALARM:**

Enter the pressure threshold for when the low alarm must be activated. Any pressure below this value will activate the alarm.

**DISPLAY STYLE:**

Select the oil pressure display style, Horizontal bar or Vertical bar.

**DISPLAY POSITION X:**

Select this X position of the oil pressure display.

**DISPLAY POSITION Y:**

Select this Y position of the oil pressure display.

**DISPLAY BAR WIDTH:**

Select the width of the bar.

**DISPLAY BAR HEIGHT:**

Select the height of the bar.

### 4.3.8 Auxiliary Analog 1, 2 Setup



The analog AUX 1,2 channels on the RDAC are general purpose channels that can be used for pressure, temperature, current or as a generic analog input sensor.

**MODE:**

Select the function for the analog channel. Options are “PRESSURE”, “TEMPERATURE”, “CURRENT”, “GENERIC” or “OFF”.

If the “PRESSURE” mode is selected:

XTreme

EMS SETUP  
ANALOG AUX 1

MODE: PRESSURE  
TYPE: RESISTIVE  
SENDER: VDO  
MODEL: 10 bar  
LABEL: AUX  
PRESSURE UNIT: bar  
DISPLAY MAX: 10.0 bar  
DISPLAY MIN: 0.0 bar  
HIGH ALARM: ON  
HIGH ALARM: 8.0 bar  
HIGH CAUTION: 7.0 bar

EXIT

BACK

LOW CAUTION: 2.5 bar  
LOW ALARM: ON  
LOW ALARM: 1.5 bar  
DISPLAY STYLE: HORIZONTAL  
DISPLAY POSITION X: 320  
DISPLAY POSITION Y: 94  
DISPLAY BAR WIDTH: 130  
DISPLAY BAR HEIGHT: 8

EXIT

BACK

**TYPE:**

Select if you are using a resistive, 4-20mA or 0-5V output pressure sender.

If the “RESISTIVE” pressure sender is selected

**SENDER:**

Select what type of resistive pressure sender you are using. Select “VDO” for VDO / resistive senders, “USER” for a custom sender.

**MODEL:**

Select which VDO pressure sender you are using. A selection between a VDO 2, 5 or 10 Bar can be selected.

## If the “VOLTAGE” pressure sender is selected

### **Sender:**

Select the type of voltage sender you are using. Select “UMA” for UMA senders, “0.5-4.5V” for voltage senders, or “USER” for a custom voltage sender.

### **Model:**

For UMA senders select the UMA model number.

## If the “CURRENT” pressure sender is selected

### **Sender:**

Select the type of current sender you are using. Select “4-20mA” for Rotax 912/914 4-20mA sender or “USER” for a custom 4-20mA sender.

### **Pressure @ 4mA:**

Enter the pressure specified at 4mA output.

### **Pressure @ 20mA:**

Enter the pressure specified at 20mA output.

## Menu options for all sender types

## If the “USER” pressure sender is selected

### **CALIBRATE SENDER:**

If the sender type is set to “USER”, then use this menu option to calibrate your pressure sender. See section 4.3.9 for more information.

### **LABEL:**

Enter a label to suit your temperature channel so you can identify it easily.

### **PRESSURE UNIT:**

Select whether you want to display the pressure in Bar, PSI or PSI(0.1). The PSI(0.1) is for low range pressure senders e.g. UMA 7PSI.

### **DISPLAY MAX:**

Select the maximum pressure that you want the bargraph to show. This can give you increased display resolution.

### **DISPLAY MIN:**

Select the minimum pressure that you want the bargraph to show. This can give you increased display resolution.

### **HIGH ALARM:**

This enables or disables the pressure high alarm.

***HIGH ALARM:***

Enter the pressure threshold for when the high alarm must be activated. Any pressure above this value will activate the alarm.

***HIGH CAUTION:***

Enter the pressure value for the high caution. This is the lower value of the upper yellow band.

***LOW CAUTION:***

Enter the pressure value for the low caution. This is the upper value of the lower yellow band.

***LOW ALARM:***

This enables or disables the pressure low alarm.

***LOW ALARM:***

Enter the pressure threshold for when the low alarm must be activated. Any pressure below this value will activate the alarm.

***DISPLAY STYLE:***

Select the pressure display style, Horizontal bar or Vertical bar.

***DISPLAY POSITION X:***

Select this X position of the pressure display.

***DISPLAY POSITION Y:***

Select this Y position of the pressure display.

***DISPLAY BAR WIDTH:***

Select the width of the bar.

***DISPLAY BAR HEIGHT:***

Select the height of the bar.

If the “*TEMPERATURE*” mode is selected:

XTreme		EMS SETUP	
		ANALOG AUX 1	
<b>MODE: TEMPERATURE</b> SENDER: VDO 150°C LABEL: AUX TEMPERATURE UNIT: °C DISPLAY MAX: 150°C DISPLAY MIN: 50°C HIGH ALARM: ON HIGH ALARM: 135°C HIGH CAUTION: 120°C LOW CAUTION: 90°C LOW ALARM: ON			
EXIT	BACK		↔
LOW ALARM: 70°C DISPLAY STYLE: HORIZONTAL DISPLAY POSITION X: 320 DISPLAY POSITION Y: 132 DISPLAY BAR WIDTH: 130 <b>DISPLAY BAR HEIGHT: 8</b>			
EXIT	BACK		↔

### SENDER:

Select what type of sender you are using.

Select “VDO” for a VDO resistive sender, “WESTACH” for Westach thermistor type senders, “MGL” for a MGL NTC resistive temperature sender, “LM335” for a MGL precision temperature sender or “USER” for a custom sender.

The XTreme has a built in linearization curve for a standard 50°C to 150°C VDO resistive sender, Westach senders and the MGL NTC resistive sender.

If the sender type is set to “USER”

### CALIBRATE SENDER:

If the sender type is set to “USER”, then use this menu option to calibrate your pressure sender. See section 4.3.9 for more information.

If the sender type is set to “LM335”

### CAL:

If the sender type is set to LM335, then use this menu option to calibrate your LM335 precision temperature sender. If recalibration is required then adjust the value using the rotary control until the temperature matches the reference ambient temperature. Please note that the LM335 can only be calibrated in degrees Celsius irrespective if the XTreme is setup to display temperature in Fahrenheit.

## Menu options for all sender types

### LABEL:

Enter a label to suit your temperature channel so you can identify it easily.

### TEMPERATURE UNIT:

Select whether you want the temperature to be displayed in degrees Celcius (°C) or in degrees Fahrenheit (°F).

**DISPLAY MAX:**

Select the maximum temperature that you want the bargraph to show. This can give you increased display resolution.

**DISPLAY MIN:**

Select the minimum temperature that you want the bargraph to show. This can give you increased display resolution.

**HIGH ALARM:**

This enables or disables the temperature high alarm.

**HIGH ALARM:**

Enter the temperature threshold for when the high alarm must be activated. Any temperature above this value will activate the alarm.

**HIGH CAUTION:**

Enter the temperature value for the high caution. This is the lower value of the upper yellow band.

**LOW CAUTION:**

Enter the temperature value for the low caution. This is the upper value of the lower yellow band.

**LOW ALARM:**

This enables or disables the temperature low alarm.

**LOW ALARM:**

Enter the temperature threshold for when the low alarm must be activated. Any temperature below this value will activate the alarm.

**DISPLAY STYLE:**

Select the temperature display style, Horizontal bar or Vertical bar.

**DISPLAY POSITION X:**

Select this X position of the temperature display.

**DISPLAY POSITION Y:**

Select this Y position of the temperature display.

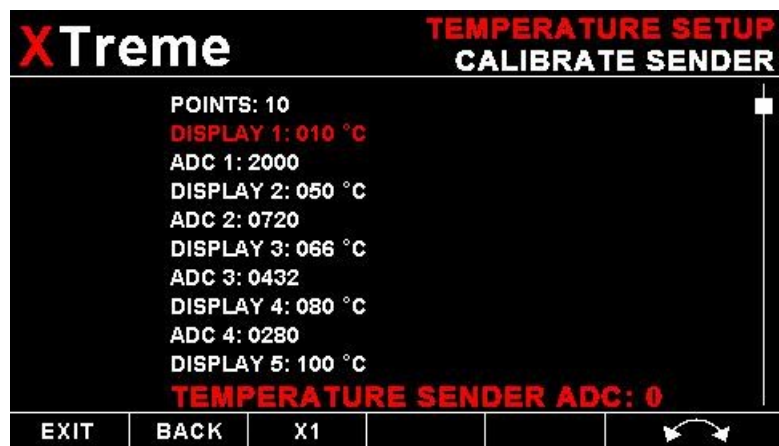
**DISPLAY BAR WIDTH:**

Select the width of the bar.

**DISPLAY BAR HEIGHT:**

Select the height of the bar.

### 4.3.9 Calibrating the user defined Pressure, Temperature or Generic Senders



1. Enter the number of points that you want to calibrate.
2. Enter the display reading that you want to show when the sender is at that actual display reading.
3. Enter the ADC (analog to digital converter) reading that corresponds to this display reading. The ADC reading is shown at the bottom of the display if you are applying the actual stimulus from the temperature or pressure sender. You can also manually enter this value if the ADC value is known or pre-calculated.
4. Continue entering display and ADC values until all the points have been entered.
5. Verify the above calibration by checking the temperature/pressure display versus the actual applied sender stimulus.



If the “**CURRENT**” mode is selected: (MGL Avionics Closed Loop Current Sensor required)

XTreme		EMS SETUP	
		ANALOG AUX 1	
MODE: CURRENT			
DISPLAY MAX: 50A			
DISPLAY MIN: -50A			
HIGH ALARM: ON			
HIGH ALARM: 40A			
HIGH CAUTION: 30A			
LOW CAUTION: -30A			
LOW ALARM: ON			
LOW ALARM: -40A			
ZERO CURRENT SENSOR			
CURRENT SENSOR GAIN: 315 360A (0)			
EXIT	BACK		

DISPLAY STYLE: HORIZONTAL			
DISPLAY POSITION X: 320			
DISPLAY POSITION Y: 132			
DISPLAY BAR WIDTH: 130			
DISPLAY BAR HEIGHT: 8			
EXIT	BACK		

#### **DISPLAY MAX:**

Select the maximum current that you want the bargraph to show. This can give you increased display resolution.

#### **DISPLAY MIN:**

Select the minimum current that you want the bargraph to show. This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the current high alarm.

#### **HIGH ALARM:**

Enter the current threshold for when the high alarm must be activated. Any current above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the current value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the current value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the current low alarm.

#### **LOW ALARM:**

Enter the current threshold for when the low alarm must be activated. Any current below this value will activate the alarm.

#### **ZERO CURRENT SENSOR:**

Select this function to indicate to the Xtreme-EMS that zero current is flowing through the MGL Avionics Closed Loop Current sensor. This is best done with the MGL Closed Loop Current sensor disconnected from the main current supplying conductor.

***CURRENT SPAN CALIBRATION:***

Adjust the gain factor until the current is reading correctly. It will be best if a multimeter can be inserted in series with the current supplying conductor and the gain calibration adjusted until the XTreme-EMS matches that of the multimeter. Please see the MGL Avionics Closed Loop Current Sensor documentation for more information.

***DISPLAY STYLE:***

Select the current display style, Horizontal bar or Vertical bar.

***DISPLAY POSITION X:***

Select this X position of the current display.

***DISPLAY POSITION Y:***

Select this Y position of the current display.

***DISPLAY BAR WIDTH:***

Select the width of the bar.

***DISPLAY BAR HEIGHT:***

Select the height of the bar.

If the “*GENERIC*” mode is selected:

**XTreme**

**EMS SETUP**  
**ANALOG AUX 1**

**MODE: GENERIC**  
**CALIBRATE SENDER**  
**LABEL: GEN**  
**UNIT LABEL: %**  
**DECIMAL PT: XXX**  
**DISPLAY MAX: 100 %**  
**DISPLAY MIN: 0 %**  
**HIGH ALARM: ON**  
**HIGH ALARM: 90 %**  
**HIGH CAUTION: 80 %**  
**LOW CAUTION: 20 %**

EXIT

BACK

**LOW ALARM: ON**  
**LOW ALARM: 10 %**  
**DISPLAY STYLE: HORIZONTAL**  
**DISPLAY POSITION X: 320**  
**DISPLAY POSITION Y: 132**  
**DISPLAY BAR WIDTH: 130**  
**DISPLAY BAR HEIGHT: 8**

EXIT

BACK

### ***CALIBRATE SENDER:***

Use this menu option to calibrate your generic analog input sender. See section 4.3.9 for more information.

### ***LABEL:***

Enter a label to suit your generic analog input channel so you can identify it easily.

### ***UNIT LABEL:***

Enter a unit label to suit your generic analog input channel.

### ***DECIMAL POINT:***

Enter the display decimal point position.

### ***DISPLAY MAX:***

Select the maximum input that you want the bargraph to show. This can give you increased display resolution.

### ***DISPLAY MIN:***

Select the minimum input that you want the bargraph to show. This can give you increased display resolution.

### ***HIGH ALARM:***

This enables or disables the high alarm.

### ***HIGH ALARM:***

Enter the threshold for when the high alarm must be activated. Any input above this value will activate the alarm.

### ***HIGH CAUTION:***

Enter the value for the high caution. This is the lower value of the upper yellow band.

### ***LOW CAUTION:***

Enter the value for the low caution. This is the upper value of the lower yellow band.

**LOW ALARM:**

This enables or disables the low alarm.

**LOW ALARM:**

Enter the input threshold for when the low alarm must be activated. Any temperature below this value will activate the alarm.

**DISPLAY STYLE:**

Select the generic display style, Horizontal bar or Vertical bar.

**DISPLAY POSITION X:**

Select this X position of the generic display.

**DISPLAY POSITION Y:**

Select this Y position of the generic display.

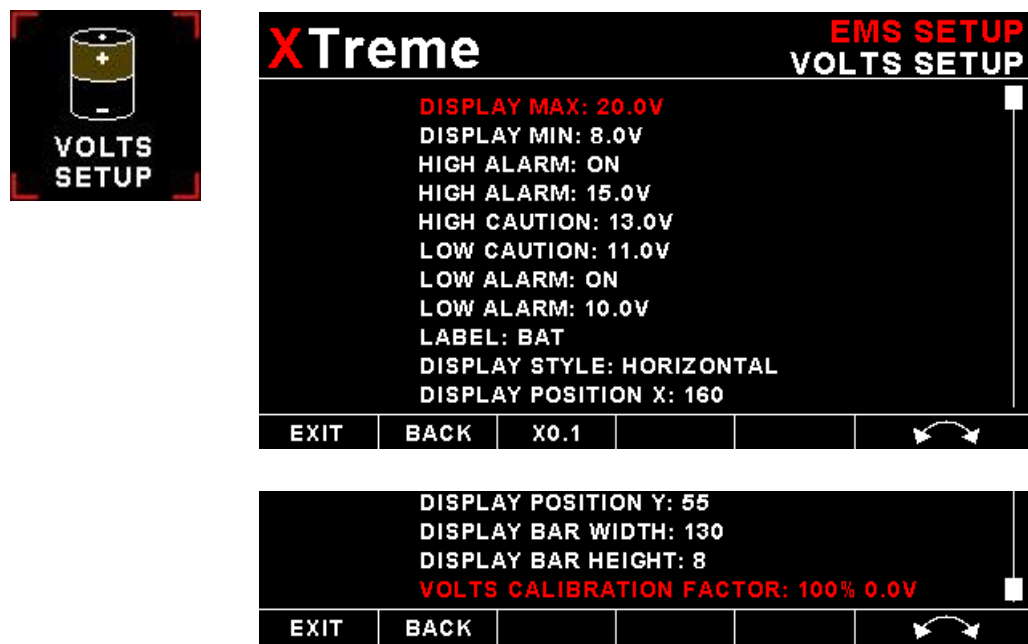
**DISPLAY BAR WIDTH:**

Select the width of the bar.

**DISPLAY BAR HEIGHT:**

Select the height of the bar.

### 4.3.10 Volts Setup



#### ***VOLTS DISPLAY MAX:***

Select the maximum value that you want the volts bargraph in the EMS display to show. This can give you increased display resolution.

#### ***VOLTS DISPLAY MIN:***

Select the minimum value that you want the volts bargraph in the EMS display to show. This can give you increased display resolution.

#### ***HIGH ALARM:***

This enables or disables the volts high alarm.

#### ***HIGH ALARM:***

Enter the voltage threshold for when the high alarm must be activated. Any voltage above this value will activate the alarm.

#### ***HIGH CAUTION:***

Enter the voltage for the high caution. This is the lower value of the upper yellow band.

#### ***LOW CAUTION:***

Enter the voltage for the low caution. This is the upper value of the lower yellow band.

#### ***LOW ALARM:***

This enables or disables the volts low alarm.

#### ***LOW ALARM:***

Enter the voltage threshold for when the low alarm must be activated. Any voltage below this value will activate the alarm.

#### ***LABEL:***

Enter a label so you can identify it easily.

#### ***DISPLAY STYLE:***

Select the Volts display style, Horizontal bar or Vertical bar.

***DISPLAY POSITION X:***

Select this X position of the Volts display

***DISPLAY POSITION Y:***

Select this Y position of the Volts display

***DISPLAY BAR WIDTH:***

Select the width of the bar.

***DISPLAY BAR HEIGHT:***

Select the height of the bar.

***VOLTS CALIBRATION FACTOR:***

Measure the battery voltage with a multimeter and then adjust this value to match that of the multimeters volts reading.

### 4.3.11 Current Setup (MGL Avionics RDAC-XF / MAP / RDAC-XG required)



XTreme		EMS SETUP
CURRENT SETUP		
CURRENT DISPLAY: ON		
DISPLAY MAX: 50A		
DISPLAY MIN: -50A		
HIGH ALARM: ON		
HIGH ALARM: 40A		
HIGH CAUTION: 30A		
LOW CAUTION: -30A		
LOW ALARM: ON		
LOW ALARM: -40A		
ZERO CURRENT SENSOR		
CURRENT SENSOR GAIN: 315 -25A (1229)		
EXIT	BACK	

DISPLAY STYLE: HORIZONTAL		
DISPLAY POSITION X: 160		
DISPLAY POSITION Y: 94		
DISPLAY BAR WIDTH: 130		
DISPLAY BAR HEIGHT: 8		
EXIT	BACK	

This menu options is only used if you have a MGL Avionics RDAC-XF / MAP / RDAC-XG and MGL Avionics closed loop current sensor.

#### **CURRENT DISPLAY:**

Select to enable or disable the current bar graph.

#### **DISPLAY MAX:**

Select the maximum current that you want the bargraph to show. This can give you increased display resolution.

#### **DISPLAY MIN:**

Select the minimum current that you want the bargraph to show. This can give you increased display resolution.

#### **HIGH ALARM:**

This enables or disables the current high alarm.

#### **HIGH ALARM:**

Enter the current threshold for when the high alarm must be activated. Any current above this value will activate the alarm.

#### **HIGH CAUTION:**

Enter the current value for the high caution. This is the lower value of the upper yellow band.

#### **LOW CAUTION:**

Enter the current value for the low caution. This is the upper value of the lower yellow band.

#### **LOW ALARM:**

This enables or disables the current low alarm.

**LOW ALARM:**

Enter the current threshold for when the low alarm must be activated. Any current below this value will activate the alarm.

**ZERO CURRENT SENSOR:**

Select this function to indicate to the Xtreme-EMS that zero current is flowing through the MGL Avionics Closed Loop Current sensor. This is best done with the MGL Closed Loop Current sensor disconnected from the main current supplying conductor.

**CURRENT SPAN CALIBRATION:**

Adjust the gain factor until the current is reading correctly. It will be best if a multimeter can be inserted in series with the current supplying conductor and the gain calibration adjusted until the Xtreme-EMS matches that of the multimeter. Please see the MGL Avionics Closed Loop Current Sensor documentation for more information.

**DISPLAY STYLE:**

Select the Current display style, Horizontal bar or Vertical bar.

**DISPLAY POSITION X:**

Select this X position of the Current display

**DISPLAY POSITION Y:**

Select this Y position of the Current display

**DISPLAY BAR WIDTH:**

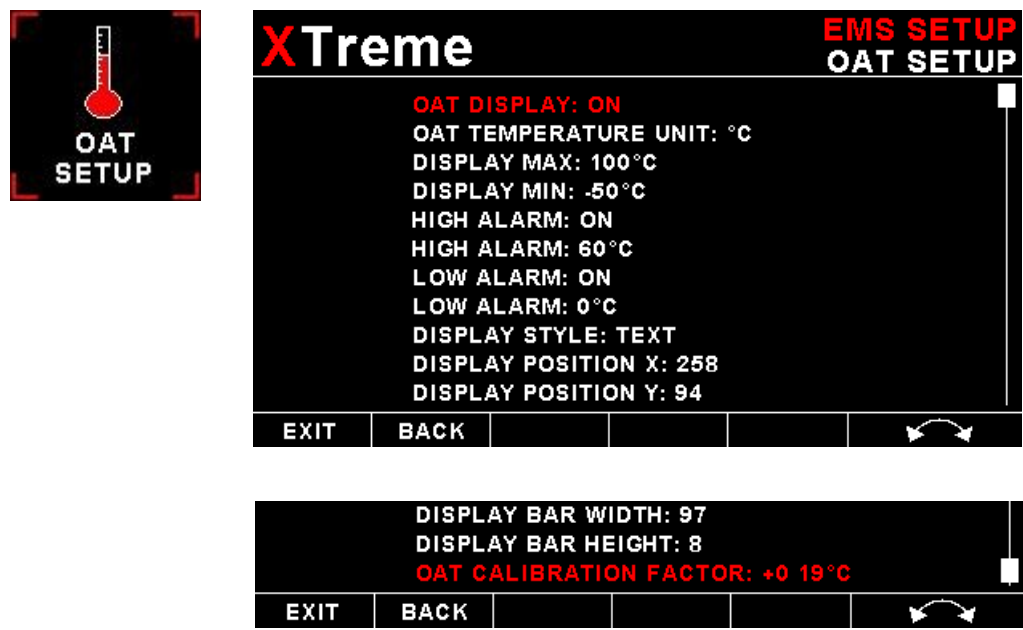
Select the width of the bar.

**DISPLAY BAR HEIGHT:**

Select the height of the bar.



### 4.3.12 OAT Setup



- OAT DISPLAY:**  
Select to enable or disable the OAT display.
- OAT TEMPERATURE UNIT:**  
Select whether you want the OAT to be displayed in degrees Celsius (°C) or in degrees Fahrenheit (°F).
- OAT DISPLAY MAX:**  
Select the maximum temperature that you want the OAT bargraph in the EMS display to show. This can give you increased display resolution.
- OAT DISPLAY MIN:**  
Select the minimum temperature that you want the OAT bargraph in the EMS display to show. This can give you increased display resolution.
- HIGH ALARM:**  
This enables or disables the OAT high alarm.
- HIGH ALARM:**  
Enter the temperature threshold for when the high alarm must be activated. Any temperature above this value will activate the alarm.
- LOW ALARM:**  
This enables or disables the OAT low alarm.
- LOW ALARM:**  
Enter the temperature threshold for when the low alarm must be activated. Any temperature below this value will activate the alarm.
- DISPLAY STYLE:**  
Select the OAT display style, Horizontal bar, Vertical bar or Text display.
- DISPLAY POSITION X:**  
Select this X position of the OAT display

***DISPLAY POSITION Y:***

Select this Y position of the OAT display

***DISPLAY BAR WIDTH:***

Select the width of the bar.

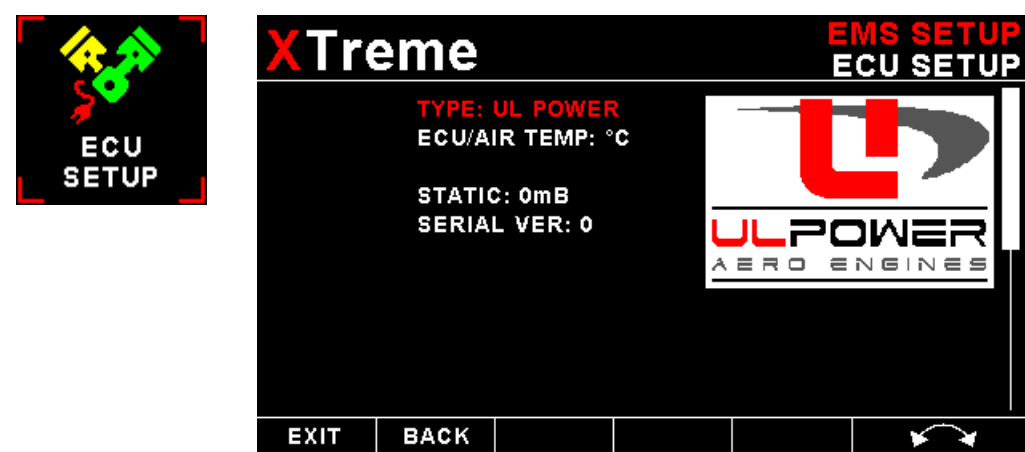
***DISPLAY BAR HEIGHT:***

Select the height of the bar.

***OAT CALIBRATION FACTOR:***

During the factory calibration a factor has been determined and entered here that will give you an accurate OAT reading. If you find this value is incorrect then adjust the calibration factor until the XTremes OAT matches that of a precision thermometer. Calibration can only be done in Celcius (°C).

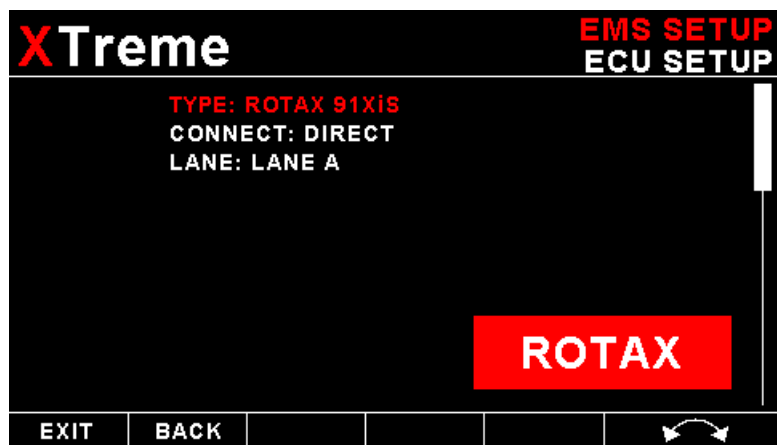
### 4.3.13 ECU Setup



**Type:**  
Select the ECU that is connected to the Xtreme-EMS. Select “NONE” for standard functionality, “ROTAX 91Xis” or “UL POWER”.

#### 4.3.13.1 ROTAX 91XIS Setup

The Rotax 91Xis can be connected to the Xtreme-EMS either by direct connection or by using the MGL Avionics RDAC CAN 91Xis.



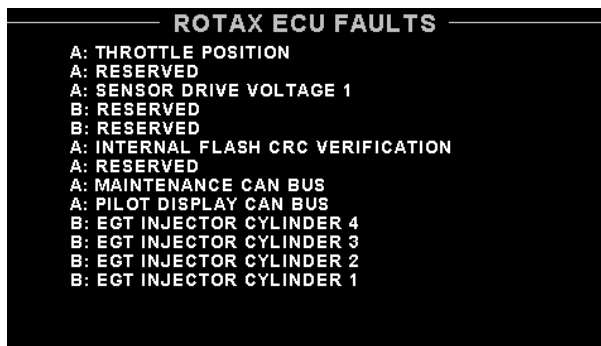
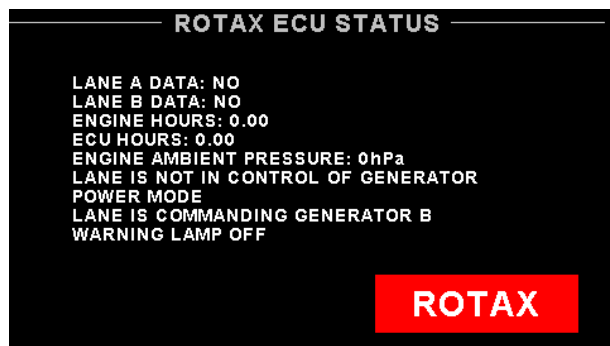
**Connect:**  
Select if the Rotax 91Xis ECU is connected to the Xtreme-EMS by direct connection or by using the MGL Avionics RDAC CAN 912is.

**Lane: (Direct connection only)**  
Select the lane that you want the data to be displayed from.

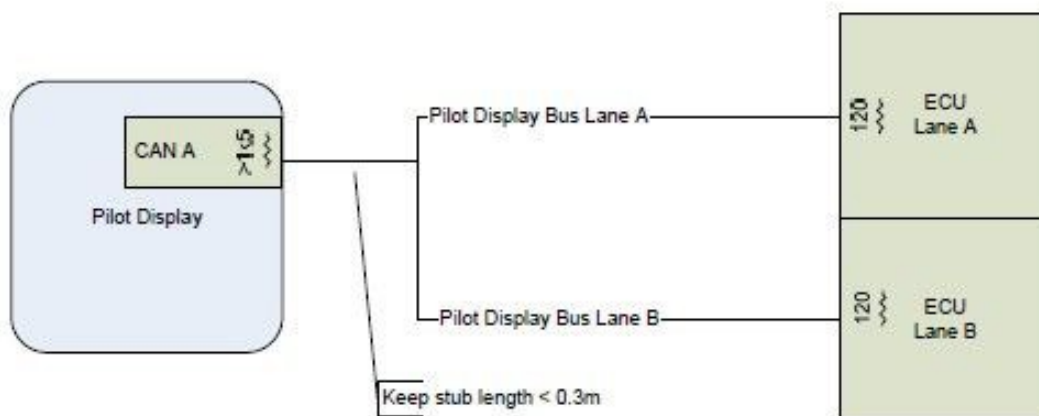
The Rotax 91XiS ECU Oil temperature is mapped to the Xtreme-EMS Oil Temp Setup, Rotax 91XiS ECU Oil Pressure to the Oil Pressure Setup and the Rotax 91XiS ECU Coolant temperature to the XTreme-EMS Coolant Temp Setup. These channels need to be setup accordingly

The Rotax ECU transmits various status messages. These can be observed in the Rotax ECU status and Rotax ECU faults main display pages.

Fuel Flow K-Factor 1 must be set to 3500.



## Rotax 91XiS Direct Connection



As shown on this diagram, connect the CAN bus ECU lanes A and B together and then connect to the Xtreme-EMS CAN inputs.

Do NOT add CAN termination resistors to this connection as both ECUs have these built in.

## RDAC CAN Rotax 912iS Connection

The XTreme-EMS must be setup as follows:

### RPM 1:

PULSES/REV: 1.0

### Fuel Flow:

K-FACTOR 1: 14000

FLOW SENDER: TURBINE

### Manifold Air Pressure:

MAP CALIBRATION FACTOR: 0

### Oil Temperature:

SENDER: LM335

CAL: 0

### Oil Pressure:

TYPE: RESISTIVE

SENDER: USER

CALIBRATE SENDER:

POINTS: 2

DISPLAY 1: 0.0 bar

ADC 1: 0000

DISPLAY 2: 10.0 bar

ADC 2: 4095

### Coolant Temperature:

This is remapped to ANALOG AUX1

FUNCTION: TEMPERATURE

SENDER: LM335

CAL: 0

### EGT 1,2,3,4

EGT CHANNELS: 4

### Throttle Position:

0-100%. This can be viewed on the main display page

### Engine Ambient Pressure:

This can be viewed on the Rotax ECU status page

### Fuel Level senders:

This is setup as normal in the fuel setup menu

### Fuel pressure sender:

This is setup as normal in the fuel setup menu

### DC current input:

This is setup as normal in the current setup menu.



Please see the RDAC-CAN documentation for installation and usage.

## **Rotax 912iS recommended settings:**

### **Engine RPM:**

0 to 1500 RPM: Red  
 1500 to 1800 RPM: Yellow  
 1800 to 5500 RPM: Green  
 >5800 RPM: Red

### **MAP:**

0 to 200 mBar: Yellow  
 200 to 1100 mBar: Green  
 1100 to 1150 mBar: Yellow  
 >1150 mBar: Red

### **Oil Pressure:**

0 to 1.5 Bar: Red  
 1.5 to 3.0 Bar: Yellow  
 3.0 to 5.0 Bar: Green  
 5.0 to 7.0 Bar: Yellow  
 >7 Bar: Red

### **Oil Temperature:**

<50 °C: Yellow  
 50 to 110 °C: Green  
 110 to 130 °C: Yellow  
 >130 °C: Red

### **Fuel Pressure:**

0 to 2.6 Bar: Red  
 2.6 to 2.7 Bar: Yellow  
 2.7 to 3.5 Bar: Green  
 3.5 to 3.8 Bar: Yellow  
 >3.8 Bar: Red

### **Coolant Temperature:**

<50 °C: Yellow  
 50 to 110 °C: Green  
 110 to 120 °C: Yellow  
 >120 °C: Red

### **EGT Temperature:**

<900°C: Green  
 900 to 950 °C: Yellow  
 >950 °C: Red

### 4.3.13.2 ULPower ECU Setup

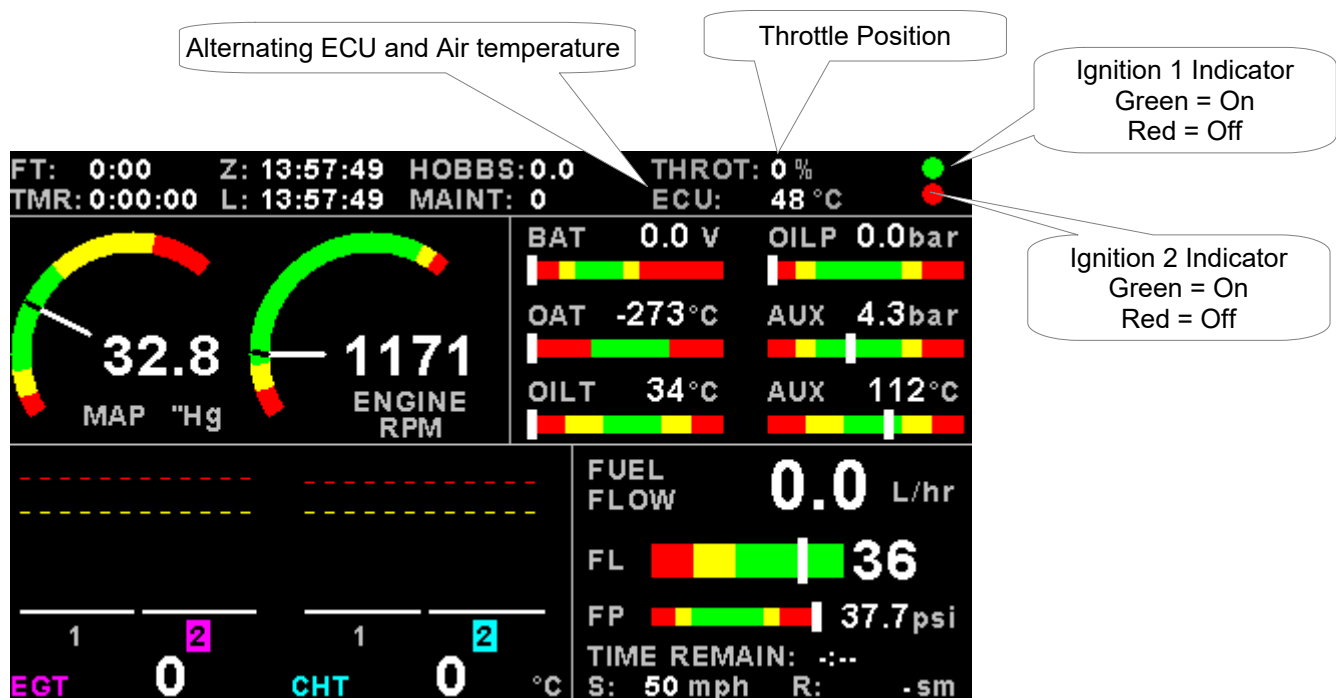
Connect the ULPower Engine to the XTreme-EMS using the RS232 port 1. The MGL Avionics RDAC can be used to measure CHT, EGT and MAP. The Xtreme-EMS also supports the ULPower Aux box.

#### ECU/AIR TEMP:

Select whether you want the temperature to be displayed in degrees Celcius (°C) or in degrees Fahrenheit (°F).

#### ULPower display screen

A dedicated display screen will be shown when the ULPower is selected for the ECU type.



#### Warning Messages from the ULPower ECU:

ECU COMMS ERROR

The ECU COMMS ERROR message is shown if there is no communication received from the ULPower ECU.

AIR TEMP SENSOR FAULT

THROTTLE POSITION  
SENSOR FAULT

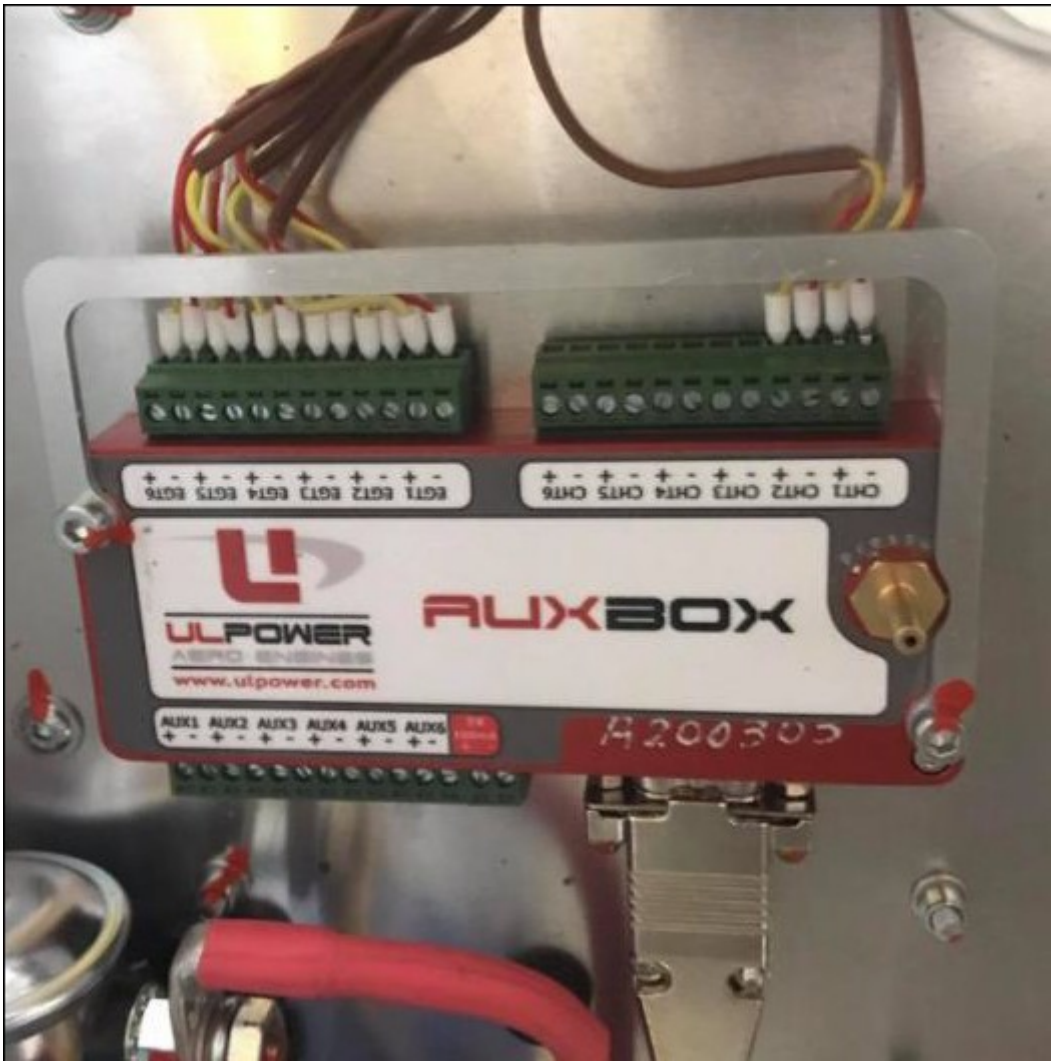
MAP SENSOR FAULT

OIL TEMP SENSOR FAULT

POS-/SYNC SENSOR FAULT

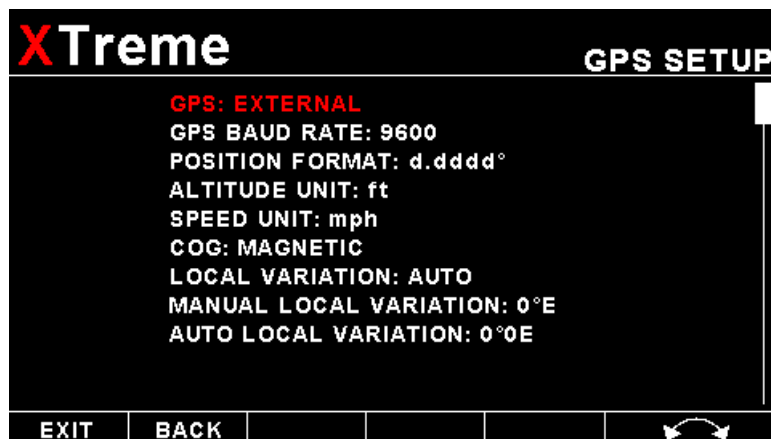
ULPower recommended settings:

- Oil Pressure:** max 8 bar (115psi) - normal 2 to 5 bar (30 – 75 psi) above 2000rpm - minimum 0.7 bar
- Oil Temperature:** Max 120°C (248°F) - Min 50°C (122°F) - Normal between 80°C and 100 °C (175°F – 212°F)
- Fuel Pressure:** max 3.8 bar (55psi) - normal 3 bar (43,5 psi) - minimum 2.4 bar (35 psi)
- MAP:** Max 1.1 bar (33 inch/kg) – Min. 0.3 bar (9 inch/kg)
- EGT:** max 860°C (1580°F) - Min. 400°C (700°F) - Normal between 700°C and 800°C (129°F – 1470°F)
- CHT:** max 180°C (356F°) - Max. continuous 160°C (320°F) - Min. 50°C (125°F)





## 4.4 GPS Setup



### **GPS:**

Select "OFF" to disable the GPS information screen or select "EXTERNAL" if you have an external NMEA compatible GPS connected to the XTreme-EMS.

If an external GPS is used then it must output the following NMEA sentences

- GGA - Global positioning system fix data
- RMC – Recommended minimum specific GNSS data
- GSA – GNSS DOP and active satellites
- GSV – GNSS satellites in view

### **GPS BAUD RATE:**

Select the baud rate to match the external GPS receiver you are using.

### **POSITION FORMAT:**

Select the display format of the GPS latitude and longitude.

### **ALTITUDE UNIT:**

Select the unit of the GPS altitude display.

### **SPEED UNIT:**

Select the unit of the SOG display.

### **COG:**

Select if you want the COG to be related to true or magnetic north.

### **LOCAL VARIATION:**

Select "AUTO" to allow the XTreme-EMS to automatically calculate the local variation or "MANUAL" for manual local variation input.

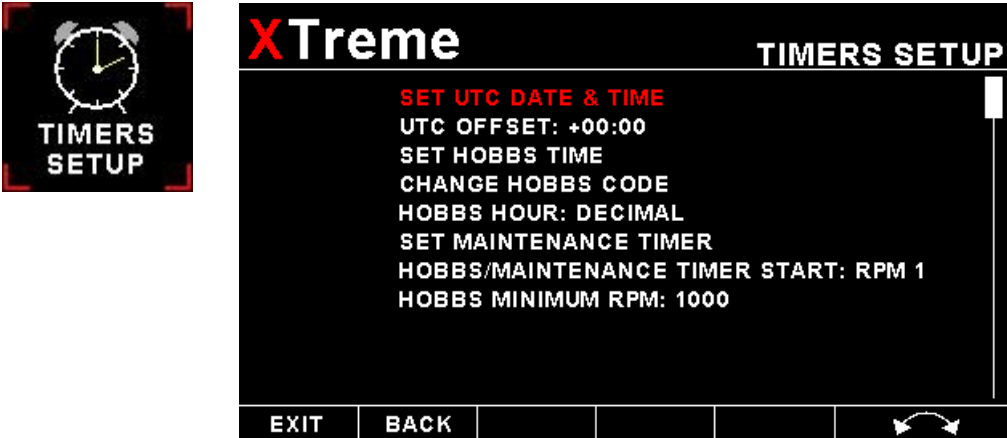
### **MANUAL LOCAL VARIATION:**

This item allows the pilot to manually enter his local variation.

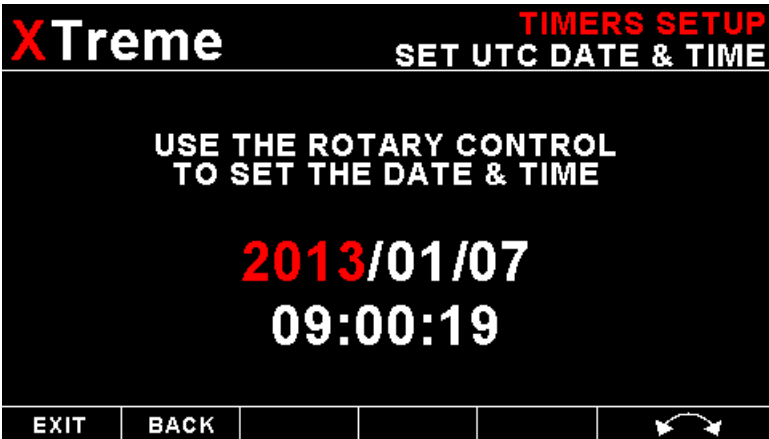
### **AUTO LOCAL VARIATION:**

This item displays the calculated local magnetic variation. The XTreme-EMS will calculate the local variation every 10 minutes if a valid 2D or 3D GPS fix is obtained.

4.5 Timers Setup



SET UTC DATE & TIME:

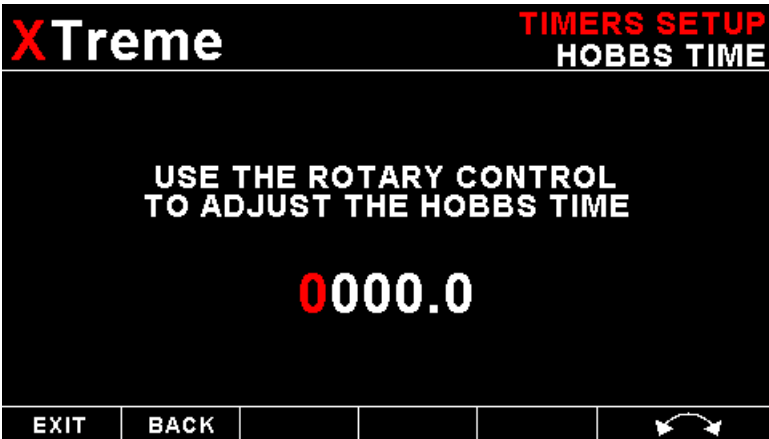


Use the rotary control to set the UTC date & time in the internal RTC.

UTC OFFSET:

Enter the UTC offset for your location. The UTC offset can be adjust in half an hour increments.

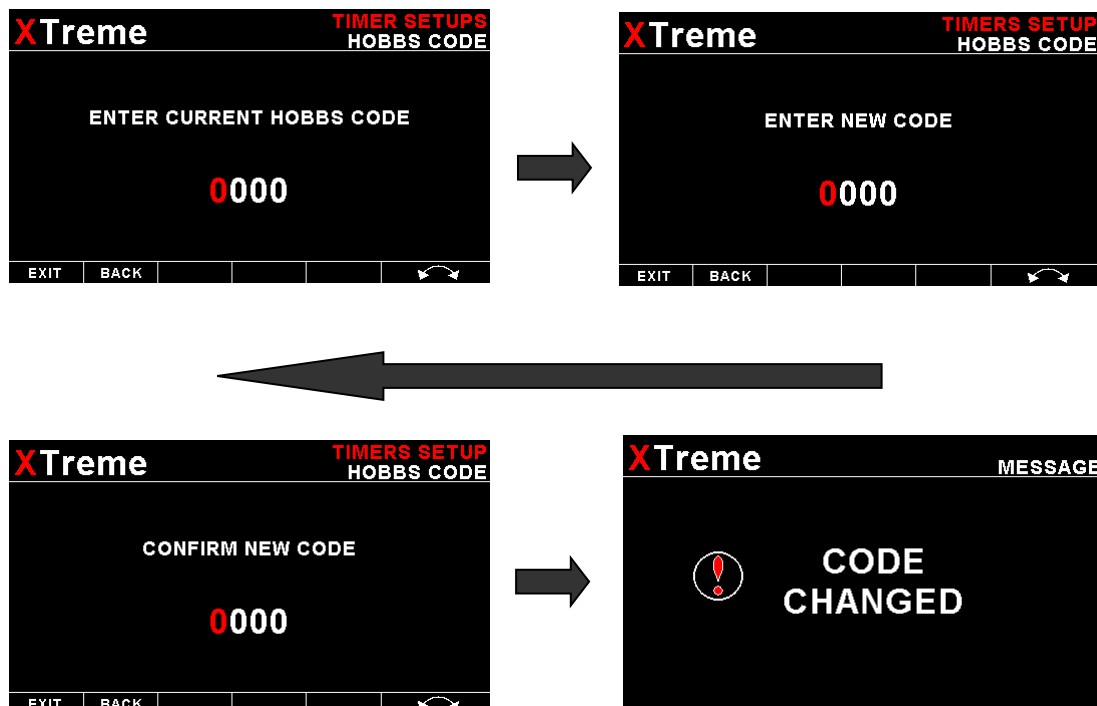
SET HOBBS TIME:



This function allows you to set the engine Hobbs meter to any value. Typically, you would use this function to set the Hobbs meter to the current known engine time. Use the rotary control to change the value. Press the rotary control to accept and exit the menu option. If the Hobbs code is set to another value beside zero, then the pilot will be prompted to enter the Hobbs access code before allowing him to change the Hobbs time. This feature is useful for charted and flying school planes.

### CHANGE HOBBS CODE:

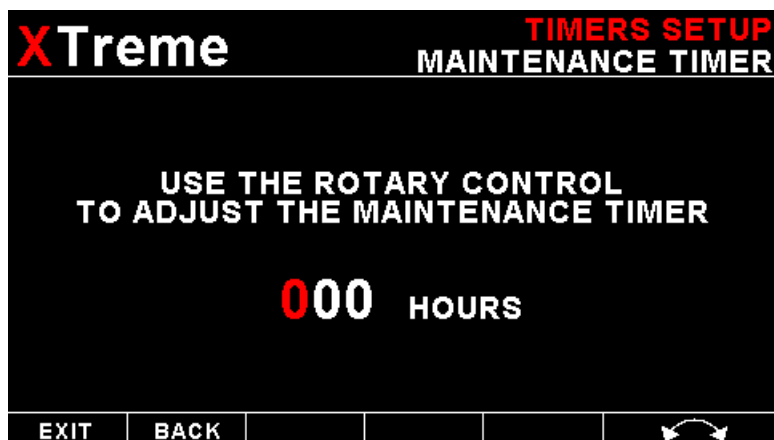
This menu option allows you to change the Hobbs access code. You will first be prompted to enter the current code followed by entering in a new code followed by re-entering the new code. If the new code and the re-entered code is the same, then the Hobbs access code will be changed. Default code is 0000.



### HOBBS HOUR:

Select if you would like the hour to be displayed in decimal fractions or minutes.

### SET MAINTENANCE TIMER:



These timers allow you to keep track of engine maintenance interval. Set the timer when you have serviced your engine. A typical time might be 50 hours. This function allows you to set an engine maintenance timer. This timer is set in engine hours and it will count down to zero when the engine RPM is greater then the "HOBBS MINIMUM RPM". A good use for this function is to set the hours until your next spark plug change or engine inspection. Use the rotary control to change the value.

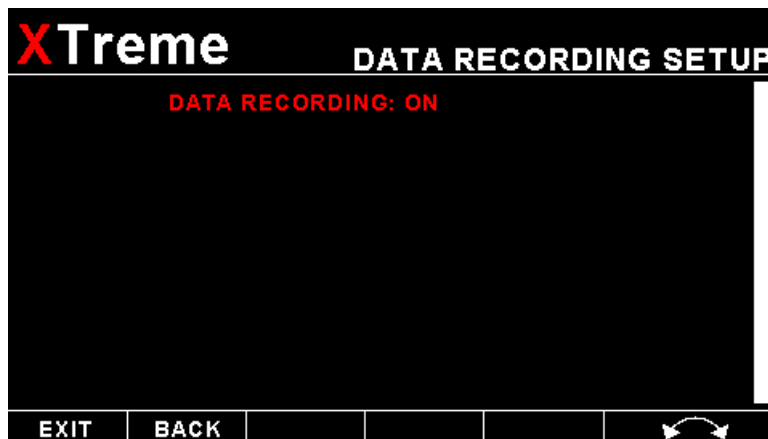
### HOBBS/MAINTENANCE TIMER START:

Select what source will start the Hobbs and Maintenance timers. A selection between Power, RPM 1 or RPM 2 can be made

### HOBBS MINIMUM RPM:

Enter the RPM limit in which the Hobbs timer/Maintenance timer must start incrementing

## 4.6 Data Recording Setup



The XTreme-EMS has the ability to act as a black box recorder, recording flight data directly onto an inserted SD card for later playback and investigation. Data is logged to a SD card in a Comma Separated Values (.CSV) file that can easily be opened in a spreadsheet or text viewer type program. The recorded data can also be viewed in the free Xtreme Data Viewer PC program.

The XTreme-EMS records the engine data as well as the GPS data (If an external GPS receiver is available) once per second only WHEN A VALID FLIGHT IS DETECTED (AUTOMATIC OR MANUAL FLIGHT DETECT MODE).

### **DATA RECORDING ON:**

Selecting "ON" will enable the data recording functionality.

## Output file format .CSV (Comma Separated Values)

The Xtreme-EMS will create a Comma Separated Values (.csv) file with the date as the filename. A new file is created every time the date changes. The file is created in the root directory of the SD card.

Below is the format of the .CSV data

Date & Time:

Hobbs Minutes:	Hobbs time in minutes
Maintenance Time:	Maintenance time in hours
Volts:	Volts in V
RPM 1:	RPM 1 value
RPM 1 (%):	RPM 1 value in percentage
RPM 2:	RPM 2 value
RPM 2 (%):	RPM 2 value in percentage
Oil Temperature:	Temperature in Degrees C
Oil Pressure:	Pressure in psi
Aux 1 Channel Type:	0=Off
	1=Pressure
	2=Temperature
	3=Current

	4=Generic
Aux 1 Channel Value:	Pressure in psi
	Temperature in Degrees C
	Current in A
	Generic in user units
Aux 2 Channel Type:	0=Off
	1=Pressure
	2=Temperature
	3=Current
	4=Generic
Aux 2 Channel Value:	Pressure in psi
	Temperature in Degrees C
	Current in A
	Generic in user units
Manifold Pressure:	Manifold pressure in mBar
Current:	Current in A
CJC:	Cold junction temperature in Degrees Celsius
TC1:	Thermocouple channel 1 in Degrees Celsius
TC2:	Thermocouple channel 2 in Degrees Celsius
TC3:	Thermocouple channel 3 in Degrees Celsius
TC4:	Thermocouple channel 4 in Degrees Celsius
TC5:	Thermocouple channel 5 in Degrees Celsius
TC6:	Thermocouple channel 6 in Degrees Celsius
TC7:	Thermocouple channel 7 in Degrees Celsius
TC8:	Thermocouple channel 8 in Degrees Celsius
TC9:	Thermocouple channel 9 in Degrees Celsius
TC10:	Thermocouple channel 10 in Degrees Celsius
TC11:	Thermocouple channel 11 in Degrees Celsius
TC12:	Thermocouple channel 12 in Degrees Celsius
Fuel Flow 1:	Fuel Flow 1 in Liters per Hour
Fuel Flow 2:	Fuel Flow 2 in Liters per Hour
Fuel Level 1:	Fuel Level 1 in Liters
Fuel Level 2:	Fuel Level 2 in Liters
Fuel Pressure:	Fuel pressure in psi
OAT:	OAT temperature in Degrees Celsius
Latitude:	Latitude in decimal degrees. Negative is South
Longitude:	Longitude in decimal degrees. Negative is West
SOG:	GPS speed in mph
COG:	GPS Coarse over ground in degrees
Altitude:	GPS Altitude in feet

## 4.6.1 XTreme Data Viewer PC program

The recorded data file can be viewed using the free XTreme Data Viewer PC program. The program can be downloaded from the MGL Avionics website.



## 4.7 Miscellaneous Setup



### AIRCRAFT REGISTRATION:



Enter your aircraft registration. A maximum of 8 characters can be entered. The aircraft registration is displayed on the start up (Splash) screen.

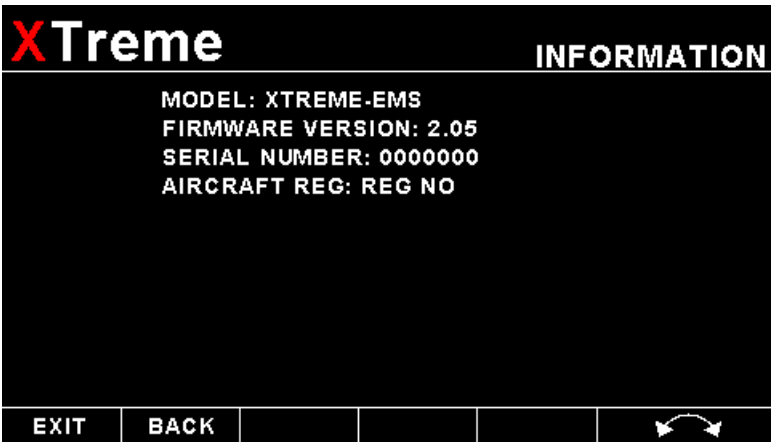
### SAVE SETTINGS TO SD CARD:

Select this option to save all the XTreme-EMS settings to the SD card. This is useful when setting up the instrument on the PC simulator and then later transferring the settings on the instrument itself. A file called "XTREME2.EMS" will be created in the root directory of the SD card. This function is also used to save your settings during firmware upgrades.

### RECALL SETTINGS FROM SD CARD:

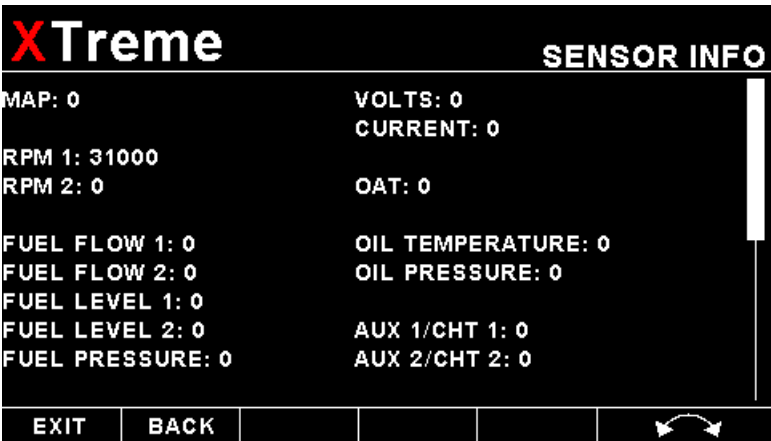
Select this option to recall all the XTreme-EMS settings from the SD card. This is useful when setting up the instrument on the PC simulator and then later transferring the settings to the instrument itself. The settings will be loaded from a file called "XTREME2.EMS" in the root directory of the SD card. This function is also used to recall your settings after a firmware upgrade.

**INFORMATION:**  
This displays information about the Xtreme-EMS unit.



4.8 Sensor Information

These values are mainly used for debugging purposes.





## 5 Startup (Splash) Screen

### Creating your own Startup (Splash) Screen:

#### You will need:

- A bitmap picture of your choice (\*.BMP, 480x272 pixel resolution)
- The BMP to MIF converter tool (can be downloaded free of charge from <http://www.mglavionics.co.za> or can be found on the XTreme SD card).

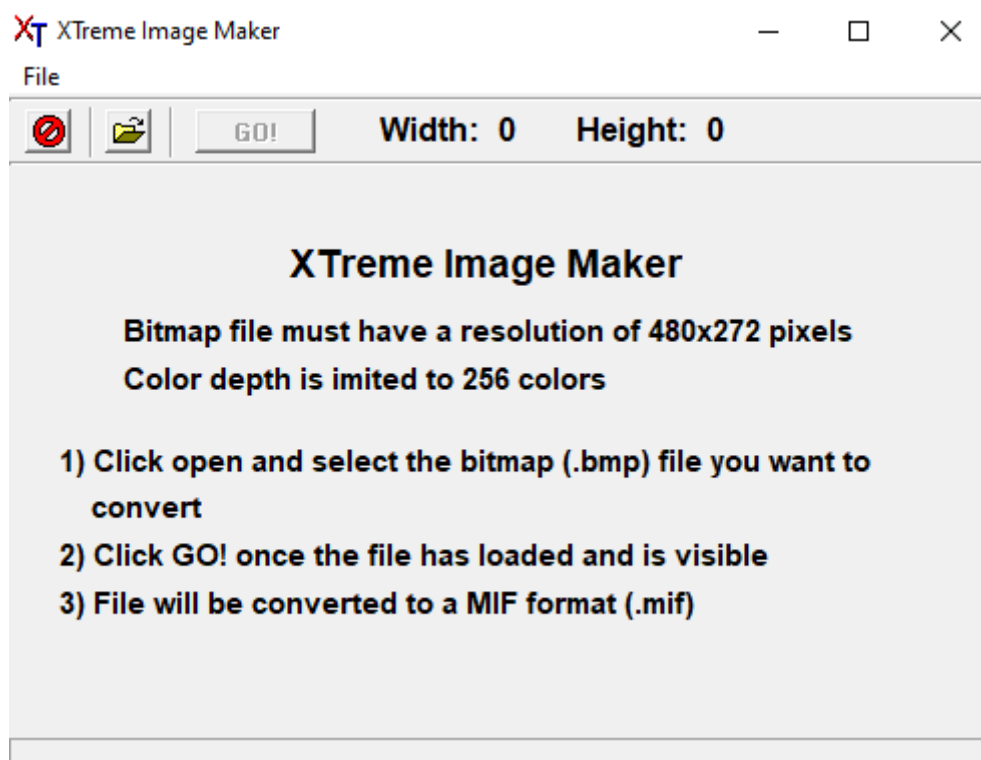
The BMP to MIF program is used to convert images in Windows BMP format to MIF format. You can use this program to make your own startup screen (Splash screen) and graphic information display screens. The color depth is limited to 256 colors.

Run the XTreme Image Maker program.

Load an image file (and remember the location), select the resolution as width(480) and height (272) and press the process button. The new MIF image will be located in the same directory as the source (BMP) file.

If the original file was not named Splash.BMP, rename the new \*.MIF file to Splash.MIF, and copy the Splash.MIF file into the root directory of your SD card.

The picture will be displayed when the unit is powered up.



## 6 Screen Designer / Parameter Settings

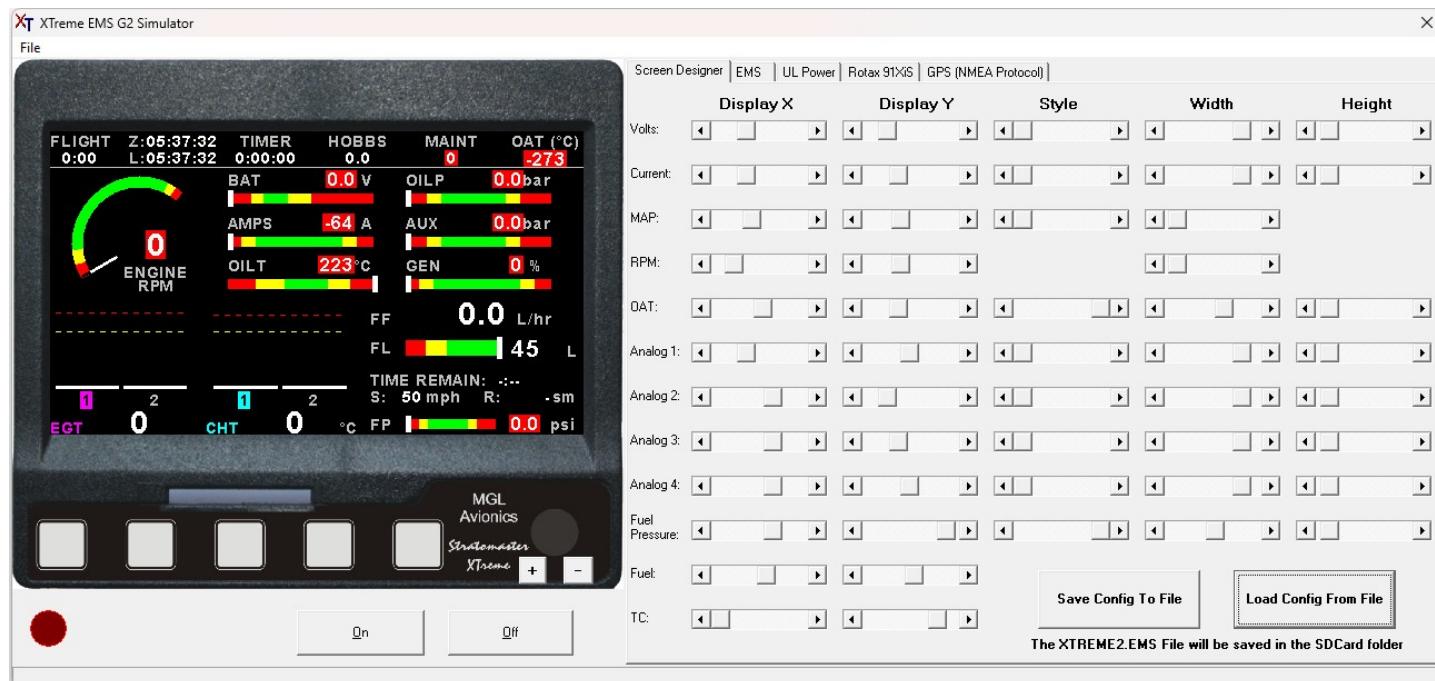
This section will describe how to configure your display and settings on the PC and transfer it to the XTreme EMS.

- 1) Download or run the XTEMSSimulator.exe file found on the SD Card in the software folder.
- 2) Run the XTreme EMS Simulator Software
- 3) Click the On button
- 4) You can now configure all the parameters of the XTreme EMS including the positioning of the indicators.
- 5) Once the XTreme EMS has been configured. Click on the “Save Config To File” button on the Screen Designer tab.

The Filename must be called “XTREME2.EMS”

Save the file to the physical SD Card

- 6) Insert the SD card into the XTreme
- 7) Enter the menu system and navigate to the “MISC SETUP” and then click “RECALL SETTINGS FROM SD CARD”
- 8) The XTreme EMS should now be configured exactly the same as the XTreme EMS on the PC.



## 7 Loading factory default settings

Press and hold the left and right most soft keys simultaneously on power up to load default factory settings. The following message will be displayed:

**LOADING DEFAULT  
SETTINGS**

## 8 Alarm condition

**VOLTS LOW**

If an alarm condition occurs the following will happen:

- The item causing the alarm condition will flash on the screen
- An alarm warning message will be displayed on the screen
- An external alarm switch will close

The alarm warning message and switch closure will remain until any button is pressed or until the condition(s) that activated the alarm no longer exist.

The alarm output can be used to switch an external alarm indicator. The external alarm switch is an open collector transistor switch to ground with a maximum rating of 0.5A DC. It is possible to wire the alarm contacts of several Stratomaster instruments in parallel should this be desired.

To avoid false activation of the alarms, the alarm function is only active 10 seconds after the instrument has powered up.

## 9 Cleaning

The unit should not be cleaned with any abrasive substances. The screen is very sensitive to certain cleaning materials and should only be cleaned using a clean, damp cloth.

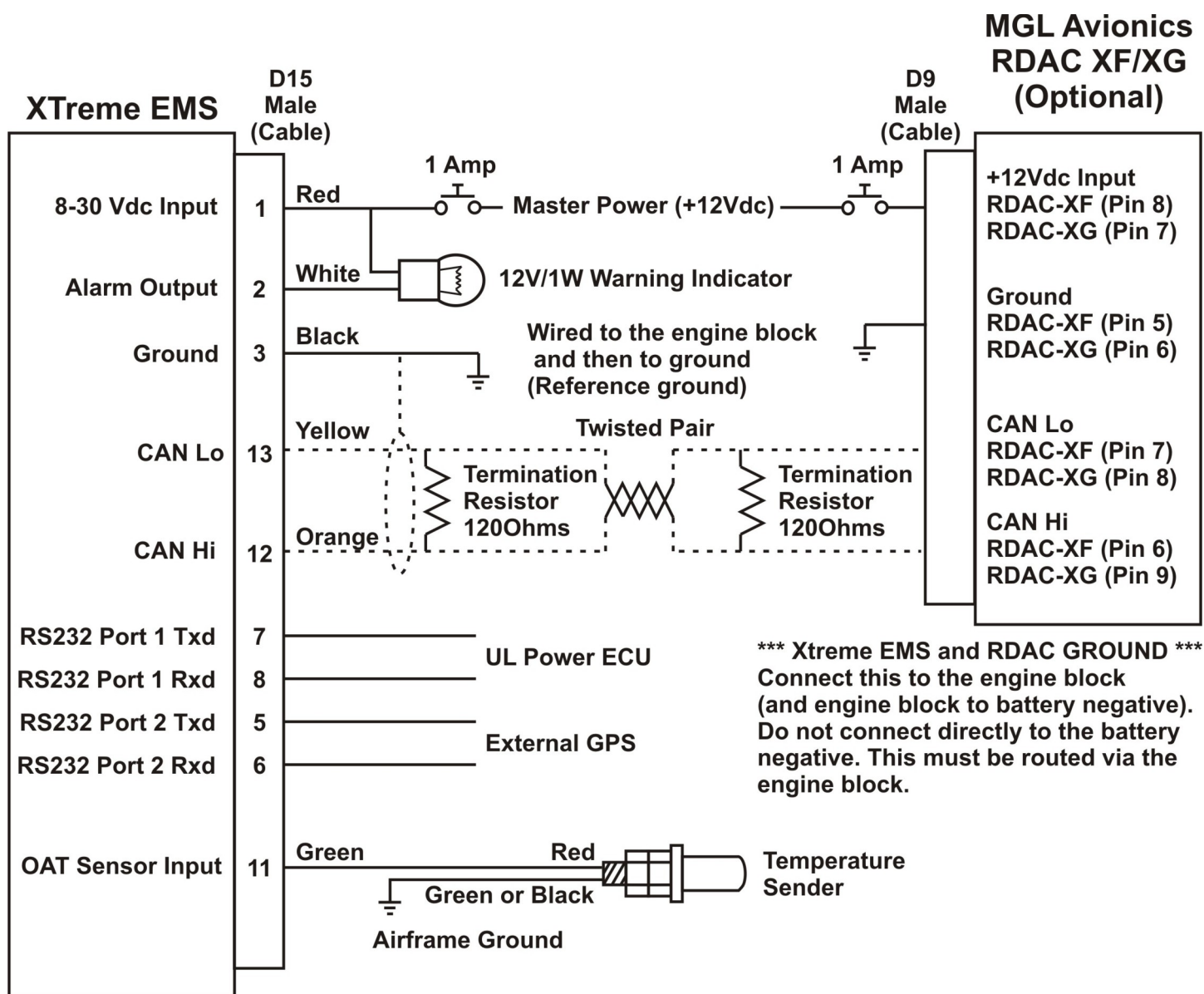
**Warning:** The XTreme-EMS is not waterproof. Serious damage could occur if the unit is exposed to water and/or spray jets.

## 10 Specifications

<b>Operating Temperature Range</b>	-10°C to 50°C (14°F to 122°F)
<b>Storage Temperature Range</b>	-20°C to 80°C (-4°F to 176°F)
<b>Power Supply</b>	8 to 30Vdc SMPS (switch mode power supply) Built in 33V over voltage and reverse voltage protection
<b>Current Consumption</b>	Approx. 150mA @ 13.8V
<b>Power Consumption</b>	Approx. 2W
<b>Display</b>	4.3" 480x272 pixel active matrix TFT LCD 1000 cd/m2 Sunlight readable Anti-glare coating LED backlight is front panel user adjustable
<b>Dimensions</b>	Fits standard 3 1/8" (80mm) instrument hole See section 12 for dimensional drawings
<b>Internal ADC resolution</b>	10 bits (Volts, OAT)
<b>Enclosure</b>	Black ABS flame retardant Front mounting Rear of enclosure fits a standard 3 1/8" (80mm) instrument hole See dimension drawing below
<b>Weight</b>	Approx. 310 grams (Xtreme-EMS and cable)
<b>Alarm contact current rating</b>	Open collector transistor switch to ground Maximum rating 0.5A DC
<b>Non-volatile memory storage</b>	100000 write cycles
<b>Volts</b>	
<b>Voltage measurement range</b>	Up to 32Vdc
<b>Voltage resolution</b>	0.1V
<b>OAT Probe</b>	
<b>OAT Temperature Sender type</b>	Semiconductor LM335 (STMicroelectronics)
<b>RTC</b>	
<b>Internal battery type</b>	CR2032

# 11 Installation

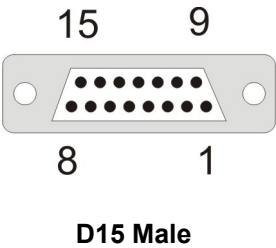
## 11.1 Connection Diagram



The use of an external 1A fuse is recommended. Connect the supply terminals to your aircraft's power supply. The XTreme-EMS can be used on both 12V and 24V without the use of any pre-regulators. Ensure that the supply voltage will not drop below 8V during operation as this may result in incorrect readings.

Please see RDAC documentation for installation and usage.

## 11.2 Cable connections

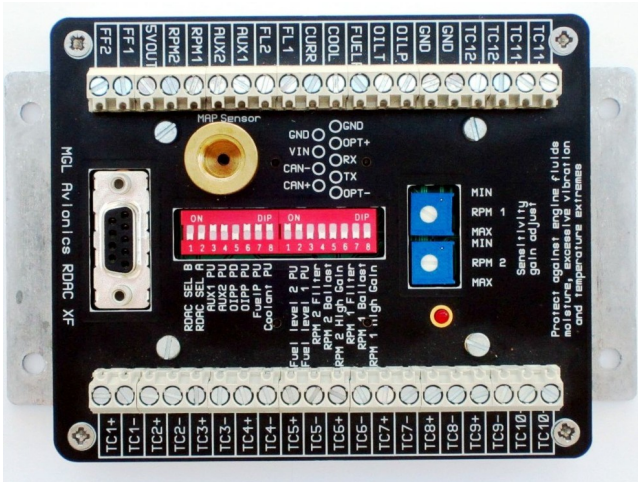


DB 15 Pin	Color	Function
1	Red	8-30Vdc power
2	White	Alarm Output
3	Black	Ground
5	NC	RS232 Port 2 Transmit
6	NC	RS232 Port 2 Receive
7	NC	RS232 Port 1 Transmit
8	NC	RS232 Port 1 Receive
11	Green	OAT Probe
12	Orange	CAN High
13	Yellow	CAN Low
14	NC	No Connection
15	NC	No Connection

NC = Not Connected

The XTreme-EMS has a D15 Female connector. The connecting cable must have a D15 male connector attached to it.

## 11.3 MGL Avionics RDAC-XF, RDAC-XF MAP and RDAC-XG



RDAC-XF / RDAC-XF (MAP)



RDAC-XG

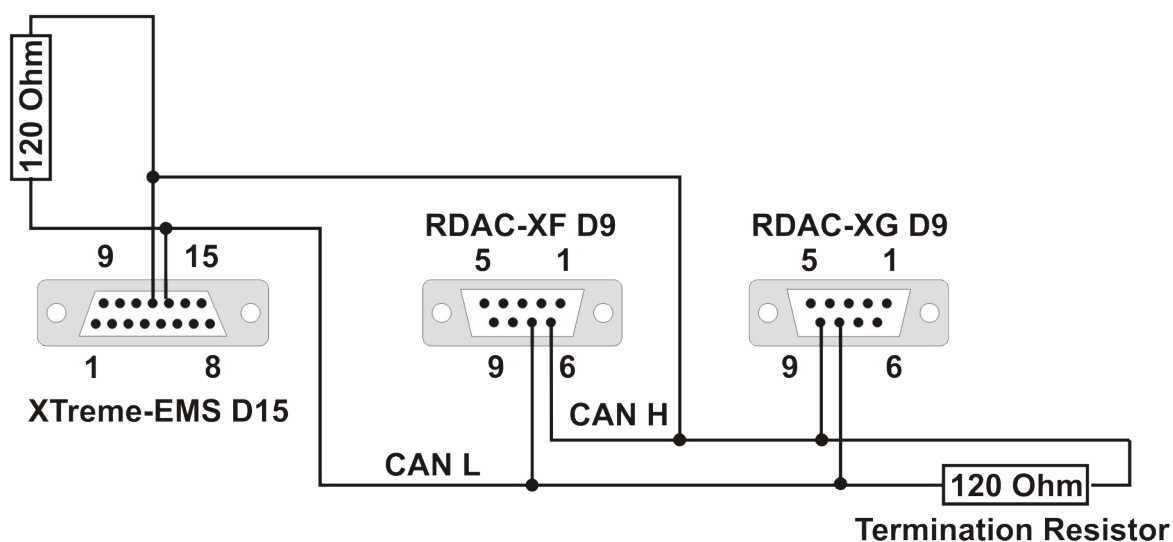
Please see the RDAC-XF / RDAC-XG documentation for installation and usage.



### 11.3.1 Connecting the RDAC-XF / RDAC-XG / RDAC-CAN to the XTreme-EMS

Observe the polarity of the two CAN wires. One of the lines is called "CAN L" and the other "CAN H". It is recommended that a twisted pair wire is used for this connection using two wire colors for ease of identification. The CAN bus must be terminated at each end with a 120 ohm resistor. Connections from equipment into the CAN bus (other than the ends) must only use short stubs into the bus (maximum length of a stub should not exceed 20cm if possible). It is okay to use only a single resistor of value 120 ohms if the total length of the CAN bus is not more than two meters (6 feet).

#### Termination Resistor



### 11.4 OAT Probe



Connect the OAT probe red wire to the Xtreme EMS OAT Probe input (Green wire) and the OAT Probe black or green wire to ground.

## 12 Firmware upgrades

The XTreme-EMS firmware can be upgraded in the field to the latest version via the SD card. This will keep your XTreme-EMS up to date with bug fixes and new features.

The name of the firmware file must be called XT2EMS.FW and it must reside in the root directory of the SD card. When the XTreme-EMS powers up it will first look at the SD card to see whether the file exists, if it does then it will prompt the user to upgrade the firmware. Use the soft keys at the bottom to select whether to upgrade to the new firmware or to exit the firmware upgrade feature. The XTreme-EMS also provides a soft key to delete the XT2EMS.FW file from the SD card to avoid removing the SD card and deleting it with a PC.

If the file does not exist, then the firmware upgrade function is bypassed and the XTreme-EMS' main program is executed. Please check <http://www.mglavionics.co.za/XTreme.html> regularly for the latest firmware releases.



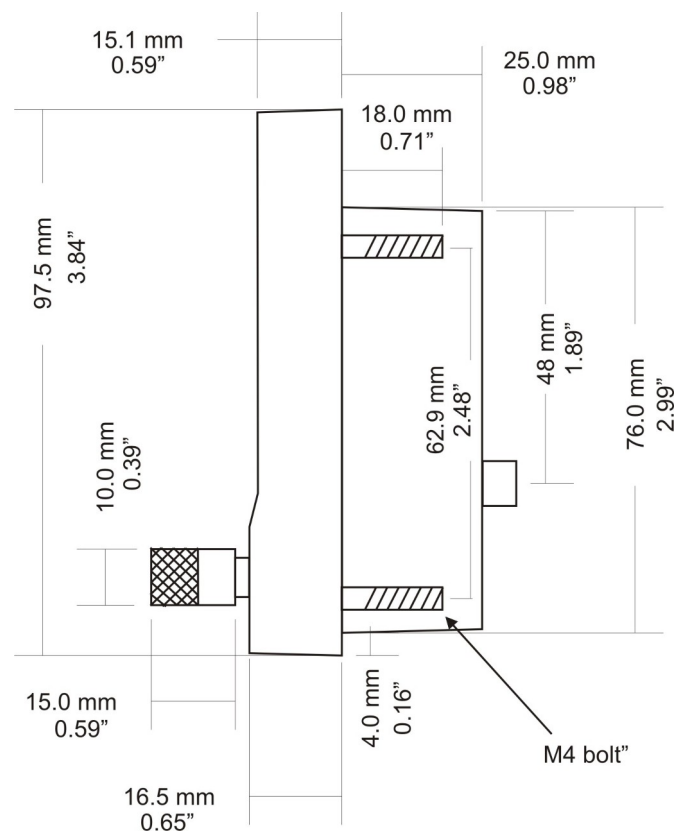
### Steps to follow when upgrading firmware:

- 1) Save the current settings to a SD card using the “*SAVE SETTINGS TO SD CARD*” function in the Miscellaneous menu section.
- 2) Load the new firmware as described above.
- 3) Load factory default settings as outlined in section 6 of this manual.
- 4) Recall the saved settings from SD card by using the “*RECALL SETTINGS FROM SD CARD*” function in the Miscellaneous menu section.
- 5) Verify all settings.

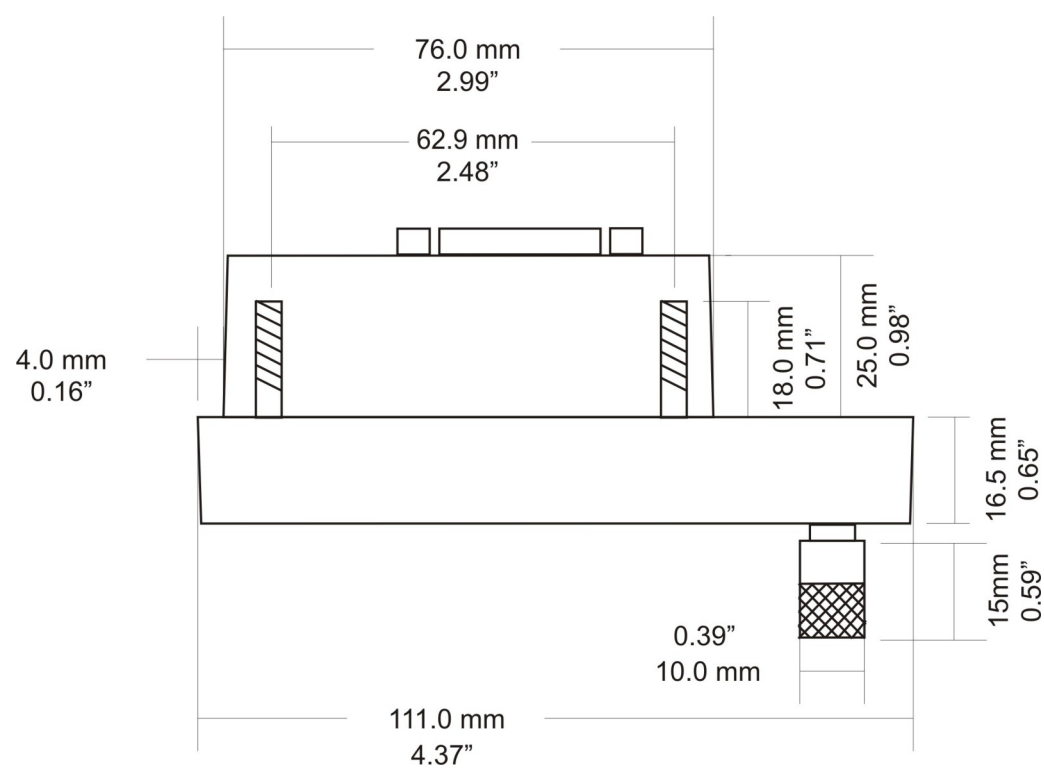




13.2 Side view



13.3 Top view



## 14 Warranty

This product carries a warranty for a period of one year from date of purchase against faulty workmanship or defective materials, provided there is no evidence that the unit has been mishandled or misused. Warranty is limited to the replacement of faulty components and includes the cost of labor. Shipping costs are for the account of the purchaser.

**Note:** Product warranty excludes damages caused by unprotected, unsuitable or incorrectly wired electrical supplies and or sensors, and damage caused by inductive loads.

## 15 Disclaimer

Operation of this instrument is the sole responsibility of the purchaser of the unit. The user must make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction.

This instrument is not certified by the FAA. Fitting of this instrument to certified aircraft is subject to the rules and conditions pertaining to such in your country. Please check with your local aviation authorities if in doubt. This instrument is intended for ultralight, microlight, home built and experimental aircraft. Operation of this instrument is the sole responsibility of the pilot in command (PIC) of the aircraft. This person must be proficient and carry a valid and relevant pilot's license. This person has to make themselves familiar with the operation of this instrument and the effect of any possible failure or malfunction. Under no circumstances does the manufacturer condone usage of this instrument for IFR flights.

### **IMPORTANT NOTICE:**

You must make your own determination if the products sold by MGL Avionics are safe and effective for your intended applications. MGL Avionics makes no representations or warranties as to either the suitability of any of the products we sell as to your particular application or the compatibility of any of the products we sell with other products you may buy from us or anywhere else, and we disclaim any warranties or representations that may otherwise arise by law. Also, we offer no specific advice on how to install any of the products we sell other than passing along anything that may have been provided to us by the manufacturer or other issues. If you are in need of further information or guidance, please turn to the manufacturer, FAA Advisory Circulars and guidance materials, the Experimental Aircraft Association, or other reputable sources.

**Continuing development sometimes necessitates specification changes without notice.**