

EMS-2

Engine Monitoring System

Operating Manual – English 1.09



Introduction

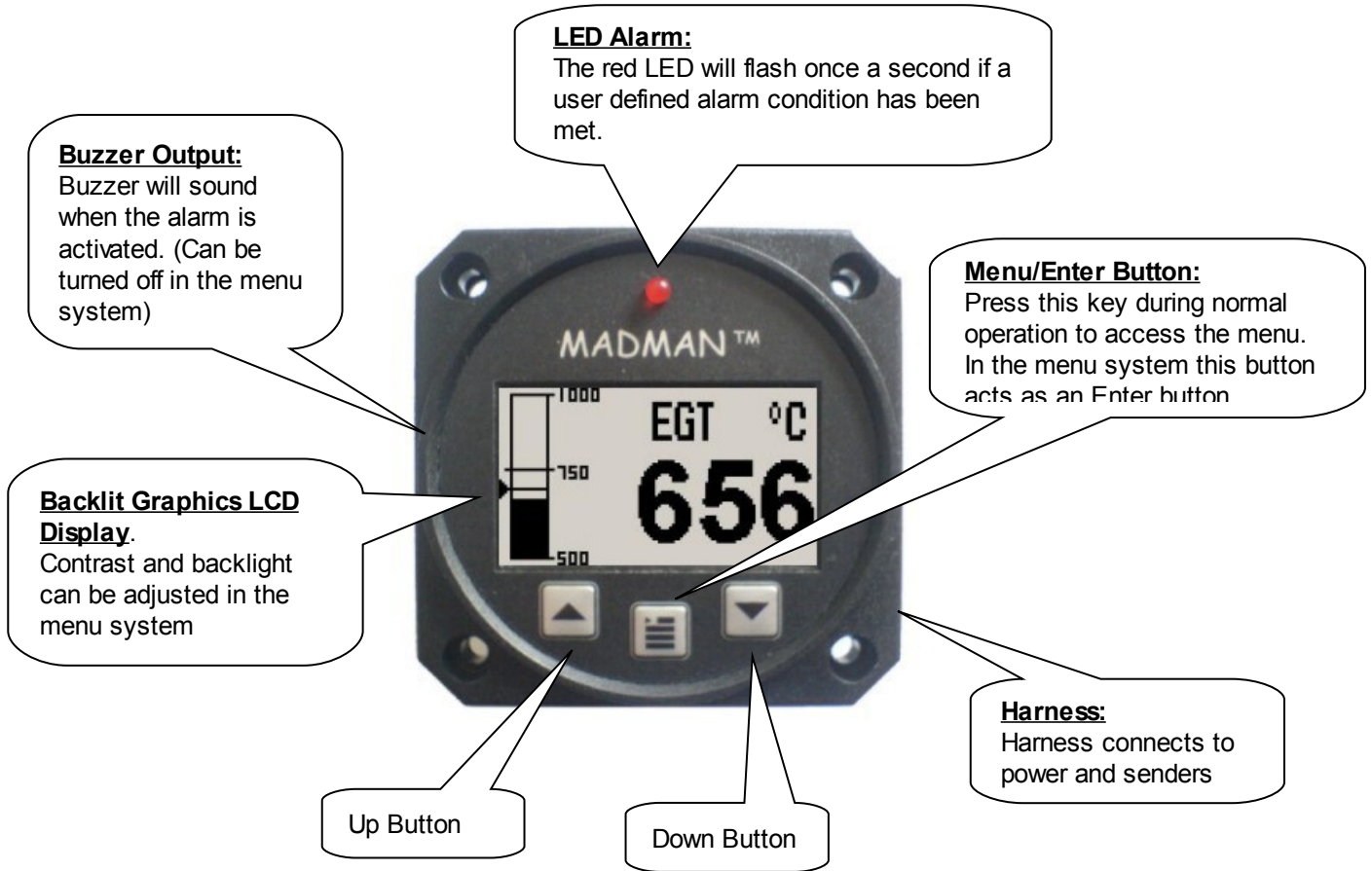
The EMS-2 is a multifunction engine information display and early warning engine monitoring system. It has been specifically designed to monitor crucial vehicle information, and in the event of any engine irregularities, it will alert the driver by the means of a visual and audible alarm.

With its array of advanced features, makes the EMS-2 an indispensable unit for the concerning vehicle owner. Costly maintenance bills can easily be avoided by the prevention of major engine problems before they can occur.

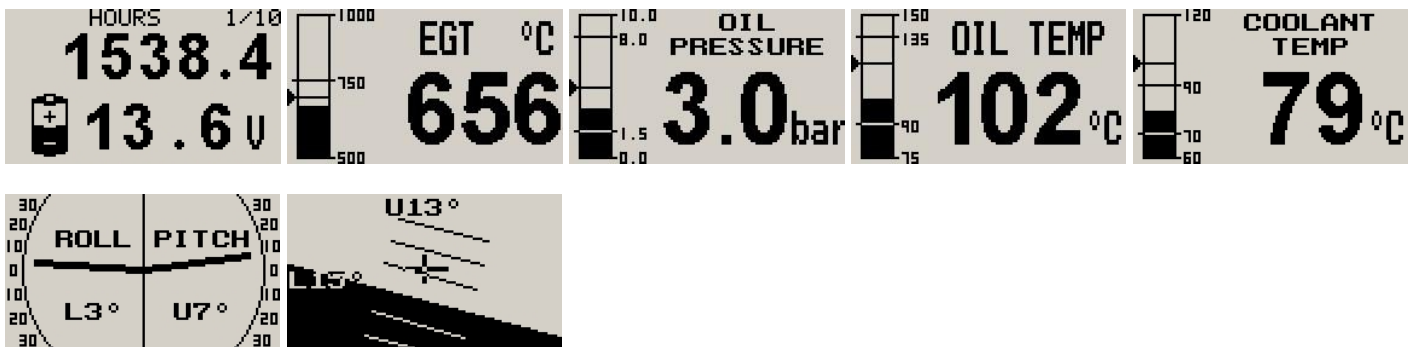
1 Features

- **Battery voltage display, the EMS-2 can measure voltages up to 30V (Can be used in 12V and 24V vehicles) and contains a programmable low/high voltage alarm to automatically catch alternator failures, drive belt failures and bad batteries**
- **Hour meter display to determine actual vehicle ignition on time with 1/10 hour resolution**
- **Built in service interval reminder based on vehicle ignition on time**
- **EGT (Exhaust gas temperature) monitoring with user settable high alarm**
- **Includes linearization of EGT K or J Type probes and is cold junction compensated for greater accuracy**
- **Pressure sender measurement with user settable high and low alarm. Pressure sender input can be from a Fuel, Oil, Manifold, Turbo Boost or an Auxiliary pressure sender.**
- **Oil Pressure warning alarm from oil pressure senders that have a switch output**
- **Oil temperature measurement with user settable high and low alarm**
- **Coolant temperature measurement with user settable high and low alarm**
- **Coolant level absence/presence detection by the means of AC signal probe excitation. The EMS-2 can use inexpensive probes such as stainless steel screws to determine the coolant level. The EMS-2 can also be used with float level type sensors. The Coolant level detection circuit also has a programmable debounce time to prevent false alarm messages when driving over rough terrain**
- **Selectable Fan control output for on/off temperature control**
- **Inclinometer**
- **All senders linearized for additional accuracy**
- **Each sensor display can be individually enabled or disabled**
- **Includes an audible alarm (The sound can be turned on/off e.g. for game viewing)**
- **Includes a visual alarm (Built in red LED turns on when an alarm condition occurs)**
- **External alarm output for remote indicators etc.**
- **Backlit graphics LCD with adjustable contrast**
- **On board voltage reversal and over voltage protection for harsh vehicle environments**
- **SMPS (Switch mode power supply) for use in both 12V and 24V vehicles**
- **Maximum values of all readings are recorded**
- **Easy to use menu system for user parameter setup**
- **1 year limited warranty**

2 EMS-2 Layout



3 Information Screens



The information display screens can be viewed by pressing the up or down keys in the normal run mode. The Unit can also be set up to scroll through the screens automatically. The EMS-2 will automatically jump to the information display screen that causes an alarm condition.

3.1 Battery Volts / Hour Meter Display



The EMS-2 can measure the vehicles battery voltages in the range of 8V to 30Vdc. The EMS-2 has built in over-voltage and reverse voltage protection and contains a programmable low/high voltage alarm to automatically catch alternator failures, drive belt failures and bad batteries. The voltage low/high alarm can be set in the sender setup menu.

The hour meter is a useful instrument to display actual ignition on time for routine maintenance. The Hour meter is displayed as hours and fractional minutes in 1/10 of an hour resolution (increments every 6 minutes). The hour meter can be reset to zero in the calibration menu.

Note:

If the supply voltage exceeds 30Vdc then a voltage over-range warning message is displayed.

The hour meter updates its internal minute counter every minute. If the unit is turned on and off for a period of less than a minute, then the hour meter will not increment its internal registers.

3.2 EGT (Exhaust Gas Temperature) / Pyrometer

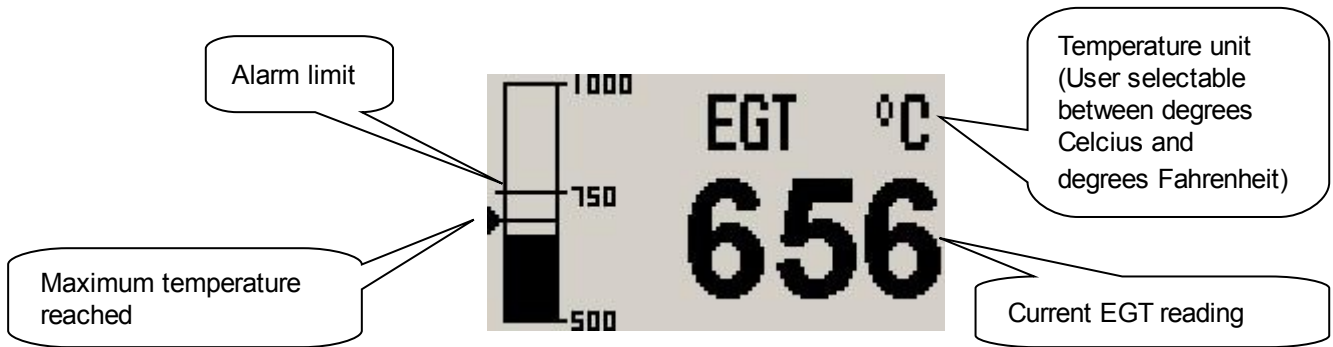
Few things will damage or kill a diesel engine like excessive exhaust gas temperatures, yet the EGT gauges are not standard equipment fitted by the diesel engine manufacturers and are only available as an after market add on unit.

The EMS-2 can alert the driver of any situations where the EGT gets to high which could cause irreparable engine and or turbo charger damage. The EGT can be affected by a too rich air/fuel mixture or an air intake problem. Air intake problems could include a blocked/partially blocked air intake, a dirty air cleaner, high water temperatures etc. The EMS-2 EGT gauge could also save on fuel costs as the EGT is directly related to the air/fuel mixture.

The EGT probe can be installed on the exhaust manifold or immediately after the turbo. It is recommended to install the EGT probe before the turbo as temperature differences of up to 200 °C between the inlet and outlet of the turbo has been measured under heavy loads.

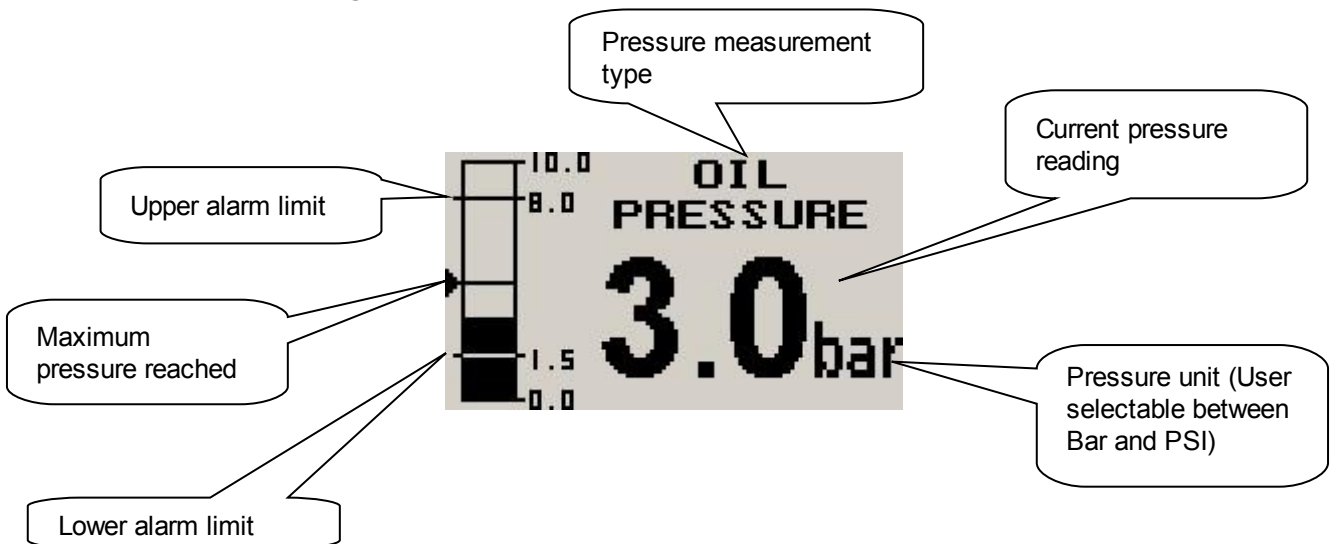
Under normal driving conditions the EGT may vary between 250 °C and 650 °C. For most vehicles the Alarm limit should be set to 720 °C. Please be aware that if pushing the engine hard or driving up a steep hill, could cause your EGT to exceed this temperature. If you have prolonged high EGT then it is recommended to immediately have it check out by a qualified mechanic.

Madmans custom built thermocouple EGT probes are specifically designed for automotive use. The Madmans EGT probes can handle temperatures up to 1300 °C



The EMS-2 can use K-Type or J-Type thermocouples to display the EGT temperature. The EMS-2 contains precision instrumentation electronic circuitry to amplify and linearise the thermocouple sensor. The EMS-2 also has built in cold junction compensation, to make the EGT reading as accurate as possible. The EGT parameters can be changed in the menu system.

3.3 Pressure Display

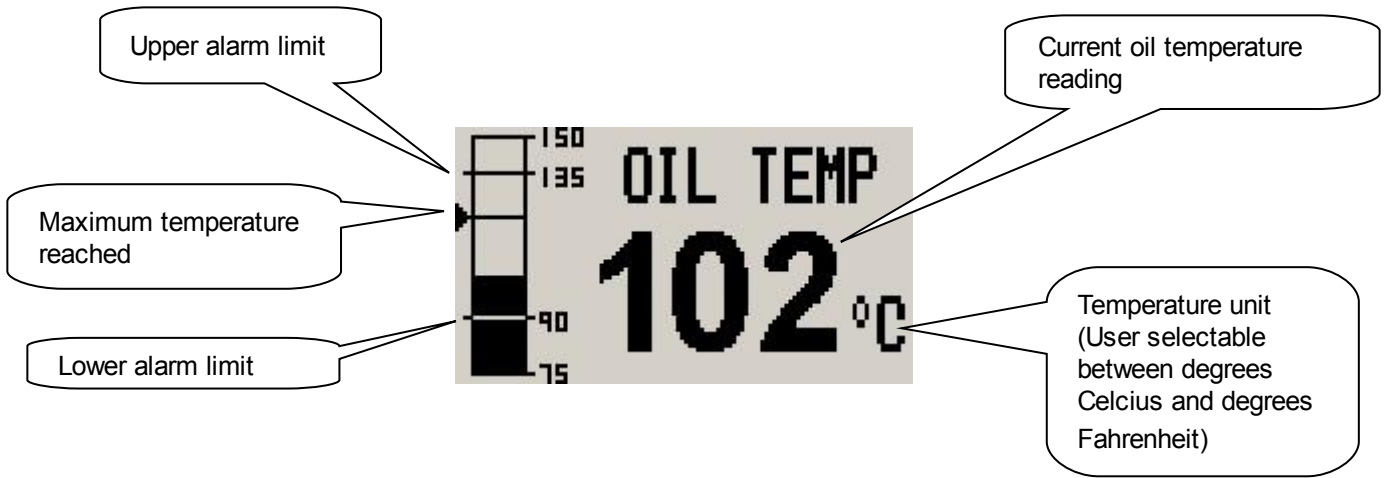


The EMS-2 uses standard automotive pressure senders to display the pressure. The EMS-2 can also be used to display a warning message for a switch type oil pressure sender. These senders can be a NO (Normally Open) or a NC (Normally Closed) type sender. The pressure sender parameters can be changed in the menu system. The EMS-2 supports up to 10 Bar VDO senders or a custom user definable pressure sender curve.



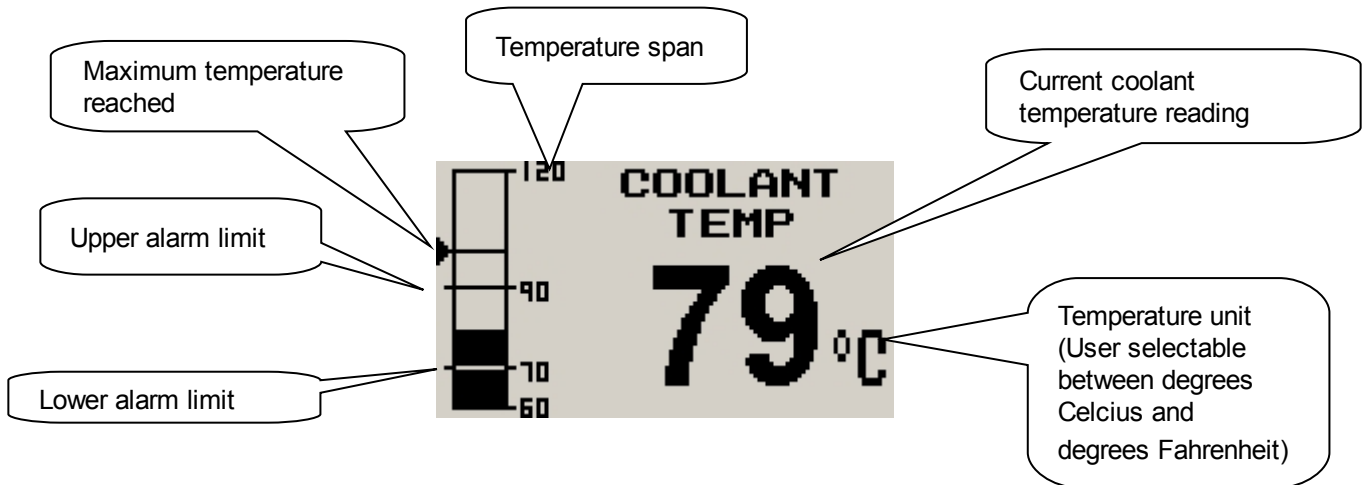
This message is displayed when there is an oil pressure alarm from the switch on the oil pressure sender

3.4 Oil Temperature Display



The EMS-2 uses standard automotive temperature senders to display the oil temperature. The oil temperature parameters can be changed in the menu system. The EMS-2 oil temperature VDO reading is linearized for a VDO part number 323-801-009-001D temperature sender. A custom user sender can also be used.

3.5 Engine Coolant Temperature Display



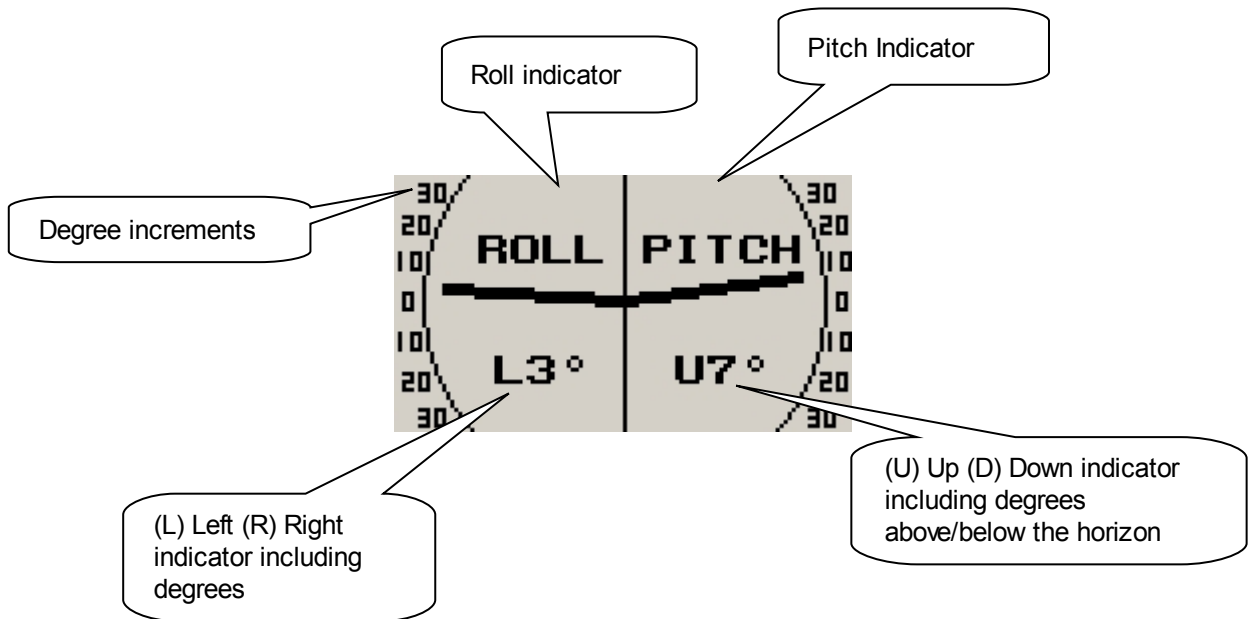
The EMS-2 uses standard automotive engine coolant temperature senders to display the coolant temperature. The coolant temperature parameters can be changed in the menu system. The EMS-2 can also be used to display a warning message for a switch type float level coolant sender (These senders must be of a NO (Normally Open) type). The coolant level switch must connect to the vehicles negative supply terminal when the coolant level is ok. The EMS-2 also contains fail safe coolant temperature and Coolant level inputs to alert the user when the sender has been disconnected or faulty. The EMS-2 oil temperature VDO reading is linearized for a VDO part number 323-801-009-001D temperature sender. A custom user sender can also be used.



This message is displayed when there is a coolant level problem.

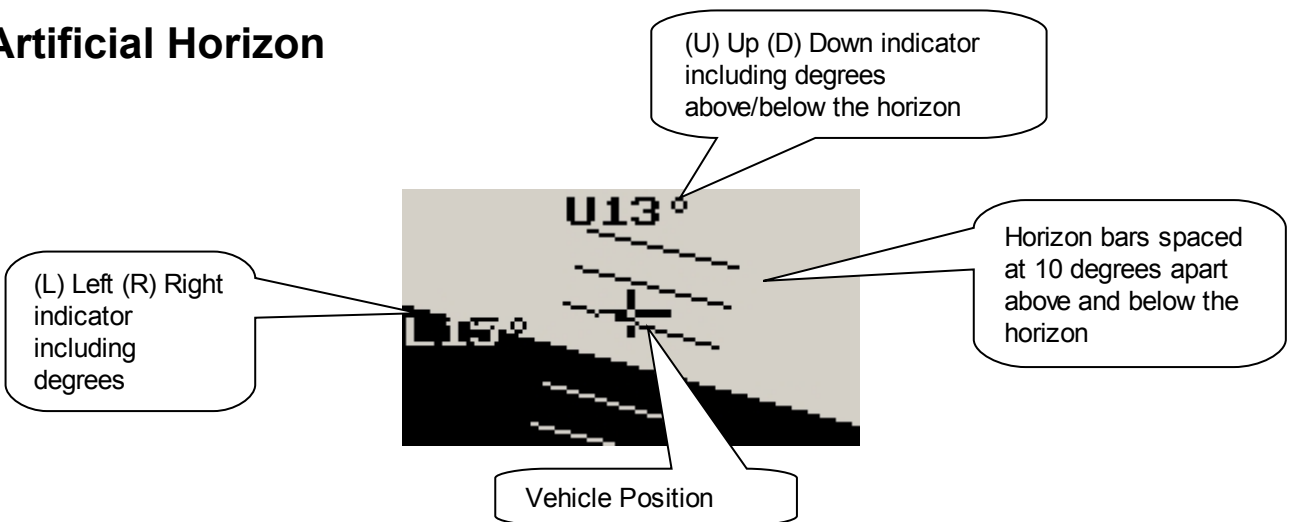
The coolant level has a programmable “debounce” time. This means that the level alarm from the coolant level switch must be activated for at least the programmed time before an alarm is activated. This prevents false alarm messages when driving over rough terrain. The EMS-2 also has a programmable coolant level threshold which allows the user to fine tune the trigger point. The programmable time and threshold can be setup under the Sender Setup menu

3.6 Inclinometer Display



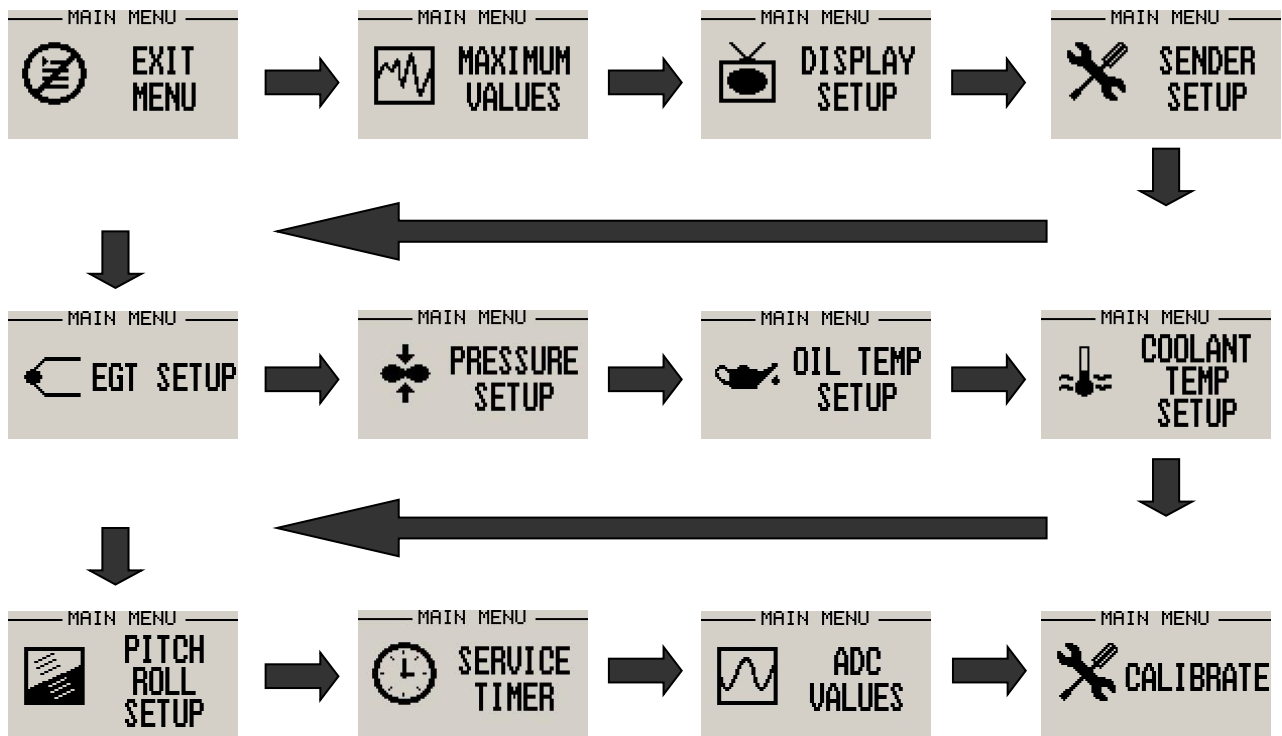
The left dial indicates the ROLL (left/right movement) of the vehicle, and the right side the pitch (up/down movement) of the vehicle. The horizon calibration in the menu system must be done at the time of installation to align the sensors to the horizon.

3.7 Artificial Horizon



The artificial horizon display shows the current attitude of the vehicle in relation with the horizon. The horizon calibration in the menu system must be done at the time of installation to align the sensors to the horizon.

4 Menu System



Use the up, down or menu keys to navigate through the menu system. The ADC values and calibrate menus are only available when powering up the unit with the menu key pressed.

WARNING: The EMS-2 must not be operated by the driver when the vehicle is moving. All setups must be done prior to driving the vehicle.

4.1 Exiting the menu system

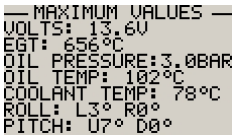


Press the menu button when you see the exit menu screen to exit the menu. The EMS-2 will also exit the menu if no key is pressed within 30 seconds.

4.2 Maximum Values



The Maximum Values menu item displays the maximum values that were reached. Press the up or down buttons to reset the maximum values.

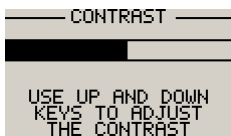


Note: The maximum values are stored in non-volatile memory and are recalled on power-up.

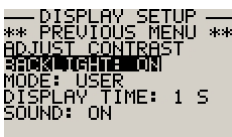
4.3 Display Setup



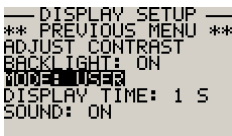
Display parameters can be setup here



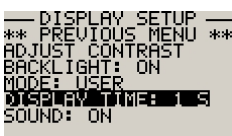
Select this menu option to adjust the display contrast.



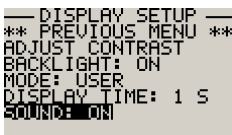
Select this menu option to turn the backlight on or off



This menu option allows the user to either toggle the information screens manually using the up or down keys or automatically (set by the display time).



The user can change the time in auto mode that the information screens are displayed. A time of 1, 3, 5, 10, 15, 30, 60 seconds can be selected

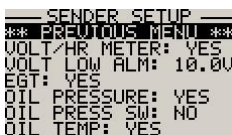


The sound of the audible alarm can be turned on of off.

4.4 Sender Setup



This menu option allows the user to individually enable or disable which sensors are connected to the EMS-2 unit.



Select "YES" to enable the sender, "NO" to disable the sender. When the Sender is disabled, it will not be shown in the information screens.

```

----- SENDER SETUP -----
** PREVIOUS MENU **
VOLT/HR METER: YES
VOLT LOW ALM: 10.0V
VOLT HIGH ALM: 15.0V
EGT: YES
OIL PRESSURE: YES
OIL PRESS SW: NO
    
```

Enter the volts low alarm value that must be reached in order for the alarm to be activated.

```

----- SENDER SETUP -----
** PREVIOUS MENU **
VOLT/HR METER: YES
VOLT LOW ALM: 10.0V
VOLT HIGH ALM: 15.0V
EGT: YES
OIL PRESSURE: YES
OIL PRESS SW: NO
    
```

Enter the volts high alarm value that must be reached in order for the alarm to be activated.

```

----- SENDER SETUP -----
EGT: YES
OIL PRESSURE: YES
OIL PRESS SW: NO
OIL TEMP: YES
COOLANT TEMP: YES
COOLANT LEVEL: NO
COOLANT SW TIME: 3
COOLANT SENSITIVITY: 3
    
```

The level alarm from the coolant level switch must be activated for longer then the coolant switch time before an alarm is activated. This prevents false alarm messages when driving over rough terrain.

```

----- SENDER SETUP -----
OIL PRESSURE: YES
OIL PRESS SW: NO
OIL TEMP: YES
COOLANT TEMP: YES
COOLANT LEVEL: NO
COOLANT SW TIME: 3
COOLANT SENSITIVITY: 3
    
```

The triggering threshold of the coolant level detector can be set. This can prevent false activation due to slime etc in the header tank.

4.5 EGT (Exhaust Gas Temperature) Setup

```

----- MAIN MENU -----
< EGT SETUP
    
```

The EGT Setup menu item allows the user to adjust the EGT properties.

```

----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

Set the range of the EGT sender. The range can be set from 400°C (752°F) to 1200°C (2192°F)

```

----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

This allows the user to zoom into the top half of the bargraph resulting in a higher display resolution. This option set to "ON" is recommended.

```

----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

Adjust the setpoint when the alarm must be activated.

```

----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

This allows the user to turn the alarm on or off.

```

----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

Select whether the EGT sender connected to the EMS-2 is a K-Type or a J-Type probe.

```

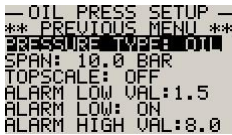
----- EGT SETUP -----
** PREVIOUS MENU **
SPAN: 1000°C
TOPSCALE: ON
ALARM VALUE: 750°C
ALARM ON/OFF: ON
PROBE: K-TYPE
TEMPERATURE UNIT: °C
    
```

Select whether all the temperature readings are displayed in degrees Celcius or degrees Fahrenheit.

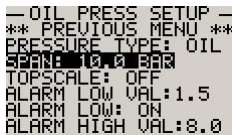
4.6 Pressure Setup



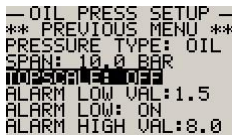
The pressure setup menu item allows the user to adjust the pressure sender properties.



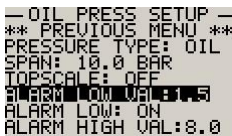
Select what the pressure sender is measuring, you can select between manifold pressure, oil pressure, fuel pressure, turbo boost pressure or auxiliary pressure.



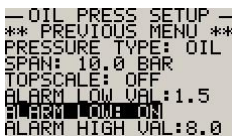
Set the range of the pressure sender. The range can be set from 1 Bar to 10 Bar.



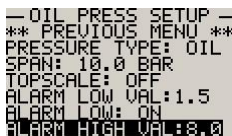
This allows the user to zoom into the top half of the bargraph resulting in a higher display resolution. This option set to "ON" is recommended.



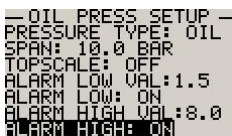
Use this to set the alarm low setpoint.



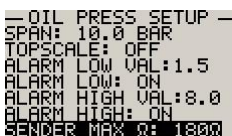
Select whether to use the alarm low setting.



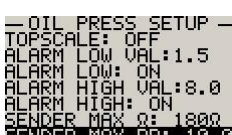
Use this to set the alarm high setpoint.



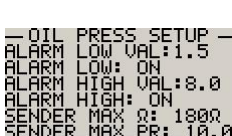
Select whether to use the alarm high setting.



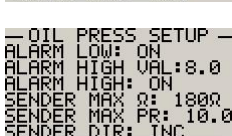
Enter the maximum spanistance of your pressure sender. Common VDO pressure senders are typically 180 Ohms.



Enter the maximum pressure for your pressure sender. If you are using a VDO 10 bar pressure sender then enter in 10.0, if you are using a VDO 5 bar, then enter in 5.0, If you are using a VDO 2 bar then enter in 2.0.



Select whether your pressure sender increases resistance with pressure or decreases resistance with pressure. VDO senders normally increase resistance with pressure.



Select whether you want to display the pressure in Bar or PSI.

```

— OIL PRESS SETUP —
ALARM HIGH VAL: 8.0
ALARM HIGH: ON
SENDER MAX Q: 180Q
SENDER MAX PR: 10.0
SENDER DIR: INC
PRESSURE UNIT: BAR
PRESSURE SWITCH: NC
    
```

If you are using an oil pressure sender with a switch then select if the switch is normally open (NC) or normally closed (NO)

```

— OIL PRESS SETUP —
ALARM HIGH: ON
SENDER MAX Q: 180Q
SENDER MAX PR: 10.0
SENDER DIR: INC
PRESSURE UNIT: BAR
PRESSURE SWITCH: NC
PRESS SENDER: VDO
    
```

Select what sender type you are using. Select VDO for VDO pressure senders, or User for a custom sender.

```

— OIL PRESS SETUP —
SENDER MAX Q: 180Q
SENDER MAX PR: 10.0
SENDER DIR: INC
PRESSURE UNIT: BAR
PRESSURE SWITCH: NC
PRESS SENDER: USER
CALIBRATE SENDER
    
```

If the sender type is set to user, then use this menu option to calibrate your oil temperature sender.

4.7 Oil Temperature Setup

```

— MAIN MENU —
OIL TEMP
SETUP
    
```

The Oil temperature setup menu item allows the user to adjust the oil temperature sender properties.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

Set the range of the oil temperature sender. The range can be set from 20°C to 180°C.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

This allows the user to zoom into the top half of the bargraph resulting in a higher display resolution. This option set to “ON” is recommended.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

Use this to set the alarm low setpoint.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

Select whether to use the alarm low setting.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

Use this to set the alarm high setpoint.

```

— OIL TEMP SETUP —
** PREVIOUS MENU **
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
    
```

Select whether to use the alarm high setting.

```

— OIL TEMP SETUP —
SPAN: 150Q
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
PRESS SENDER: VDO
    
```

Select what sender type you are using. Select VDO for VDO senders or User for a custom sender. The EMS-2 has a built in linearized curve for a VDO 323-801-009-001D temperature sender.

```

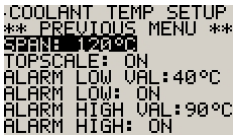
— OIL TEMP SETUP —
TOPSCALE: ON
ALARM LOW VAL: 70Q
ALARM LOW: ON
ALARM HIGH VAL: 135Q
ALARM HIGH: ON
SENDER TYPE: USER
CALIBRATE SENDER
    
```

If the sender type is set to user, then use this menu option to calibrate your oil temperature sender.

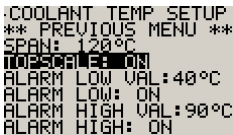
4.8 Coolant Temperature Setup



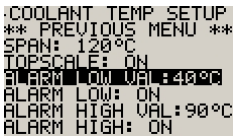
The Coolant temperature setup menu item allows the user to adjust the coolant temperature sender properties.



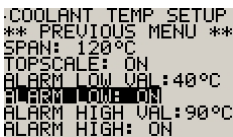
Set the range of the coolant temperature sender. The range can be set from 20°C to 150°C.



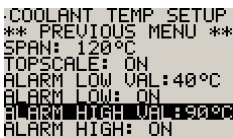
This allows the user to zoom into the top half of the bargraph resulting in a higher display resolution. This option set to "ON" is recommended.



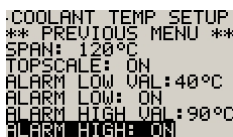
Use this to set the alarm low setpoint.



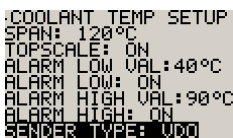
Select whether to use the alarm low setting.



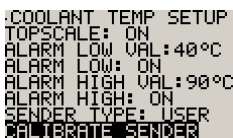
Use this to set the alarm high setpoint.



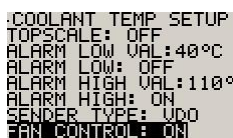
Select whether to use the alarm high setting.



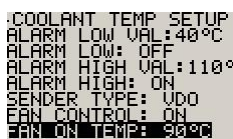
Select what sender type you are using. Select VDO for VDO senders or User for a custom sender. The EMS-2 has a built in linearized curve for a VDO 323-801-009-001D temperature sender



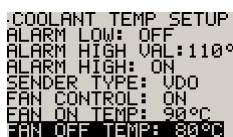
If the sender type is set to user, then use this menu option to calibrate your coolant temperature sender.



Select whether you want the external contact to operate off the alarms or as a Fan control output for on/off temperature control



Select the fan control output temperature that the external contact must close.



Select the fan control output temperature that the external contact must open.

4.9 Pitch / Roll Setup



The user must align the sensors with the horizon once the unit is installed in the vehicle. To do this, the user needs to select this menu option when the vehicle is on a flat surface.

4.10 Service Timer



This will reset the hour meter to zero



Enter the next time in hours that the EMS-2 must remind you that a service is due. The service reminder message will appear for 5 seconds after the unit has switch on if the hour meter hours are greater/equal then the service hour setting.

5 Alarms

The alarm sound can be turned on or off in the display setup menu. This might be favorable for example during game viewing. Please note that the alarm sound only becomes active 30 seconds after power is applied to the EMS-2.

The alarm output on the power connector is of a transistor open collector type. When it is turned on it will connect the alarm output to ground. Maximum current through alarm output should not exceed 250mA. The EMS-2 will automatically jump to the information display screen that is causing the alarm.

6 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 EMS-2 is not waterproof, serious damage could occur if the unit is exposed to water and or spray jets.

7 Specifications

Operating Temperature Range	-10°C to 50°C (14°F to 122°F)
Storage Temperature Range	-20°C to 80°C (-4°F to 176°F)
Humidity	<85% non-condensing
Power Supply	8 to 30Vdc SMPS (Switch mode power supply) with built in 33V over voltage and reverse voltage protection
Current Consumption	approx. 42mA @ 13.8V (backlight on/off)
Display	114x65 graphics LCD display. Contrast and backlight is user configurable
ADC	12bit over sampled successive approximation
Alarm	Red LED as well as audible and an open collector transistor output.
EGT probe	The EMS-2 supports both K-Type or J-Type thermocouple probes
EGT compensation	K-Type and J-Type probe linearization with build in precision internal temperature reference
Pressure sender	Sensor range 50 to 1000 ohms. Support for VDO pressure senders up to 10Bar. User defined linearizer function built in as standard
Oil Pressure switch	NO (Normally Open) or NC (Normally Closed) oil pressure senders supported
Oil Temperature sender	VDO 323-801-009-001D. User defined linearizer function also available
Coolant Temperature sender	VDO 323-801-009-001D. User defined linearizer function also available
Coolant level switch	2.5KHz AC signal
Alarm Contact	Transistor open collector, Max current = 250mA
Dimensions	60mmx60mmx61mm (2.36"x2.36"x2.40") (See attached dimensional drawing)
Enclosure	2.25" ABS, black in color, front or rear mounting
Non-volatile memory storage	100000 write cycles

8 Installation

DIY installation can be done but it is recommended that a professional automotive installer installs the EMS-2.

The use of an external 1A fuse is recommended. Please ensure that the supply voltage will not drop below 8V during operation as this may result in incorrect readings. Be sure to install a reference connection between the ground terminal of the instrument and the engine block. If the engine block is not connected to a good reference, readings may show large errors. This reference connection must not be used as a ground line for other current users. A straight, good quality connection is required that is not shared with anything else.

Warning: Do not install the unit in direct sunlight as this could cause the unit to exceed the operating temperature and can cause damage to the unit.

8.1 Senders that are grounded to the engine block

Single wire senders require that their mounting arrangement (thread) has a very good electrical contact with the engine block. Avoid the use of any sealant or tapes as these may cause a bad electrical connection.

Further to this it is very important that the engine block has a good electrical connection to the negative supply terminal of the EMS-2. Any voltage drop caused by other equipment on the ground wire will cause incorrect readings. The best way to ensure a good connection is to wire a single connection between the EMS-2 ground wire to the engine block. Don't wire this anywhere else and do not allow any other equipment to use this wire as a current return path.

8.2 Temperature Senders

The EMS-2 has a built in linearization curve for the VDO 323-801-009-001D Temperature sender. The EMS-2 is unique in that it also provides support for a custom sensor.

Most NTC senders require a single wire connection to the EMS-2. The sender is grounded via the engine block. The ground terminal of the gauge input should be connected to the engine block. Some NTC senders have two wires. In this case it is not required that the sender housing itself is connected to the engine block.

8.3 Pressure Senders

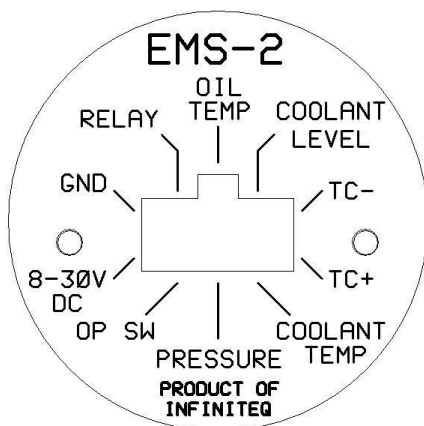
The EMS-2 has built in linearization curves for a standard VDO 10 Bar pressure sender. The EMS-2 has been designed to be as flexible as possible to cater for different sensor manufacturers. The EMS-2 supports pressure senders that increase resistance with pressure as well as decrease resistance with pressure. The EMS-2 also provides support for a custom user definable pressure sensor.

Oil pressure senders can have either one or two wires. One of the connections is the actual pressure analog voltage, the other is a simple NO/NC switch. It is up to the user which method of monitoring the pressure they would prefer to install. The EMS-2 can even be configured to support both configurations, i.e. Analog pressure readings as well as the oil pressure switch alarm.

8.4 Extending leads of probes and senders

Thermocouple leads as used with the EGT probes can be extended either with ordinary copper cable or with special thermocouple extension cable. The choice of either depends on your desired accuracy. If it is possible in your installation to ensure that both ends of a copper extension cable will be at the same temperature (or very close), then it is quite possible to use the copper cable. In most open-air installations this will be the case. Should this not be possible or you require best possible accuracy at all times, you can obtain a special thermocouple extension cable. This cable is made from the same metals as your probes cable but uses ordinary plastic sleeving to save costs. In either case, ensure that the cable is not routed close to sources of electromagnetic interference of any kind. The voltages present in this cable are very small and are subject to changes applied by external fields. This can lead to false temperature indications.

8.5 EMS-2 Rear panel and connector layout



Connector Layout	
Red	8 – 30 VDC
Black	Ground
Purple	Relay Contact
White	- EGT probe (Red probe lead)
Orange	+ EGT probe (Yellow probe lead)
Yellow	Oil temperature sender
Gray	Pressure sender input
Blue	Pressure switch
Green	Coolant temperature sender
Brown	Coolant level switch

9 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 of misuse or evidence that the unit has been mishandled. 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.

10 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.

The manufacturer reserves the right to alter any specification without notice

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