

## INTRODUCTION

Marine water cooled exhaust systems are designed to withstand temperatures of up to about 120°C. However the exhaust gases from the engine may reach in excess of 450°C. In order to protect the exhaust system it needs a continuous flow of cooling water from the engine, should this flow be interrupted by debris being sucked into the intake or by a problem with the water pump or simply forgetting to open the seacock then the exhaust temperature will start to rise immediately. Depending on the extent of the blockage the increased temperature can cause seriously damage the exhaust system and water lock. The engine water temperature and/or oil temperature alarms will eventually alert you, however there can be a considerable time lag especially if the engine has been started from cold which means that damage may already have been done.

In order to protect the exhaust components and provide the earliest possible warning you need measure the temperature INSIDE the exhaust. Systems which measure the outside temperature will inevitably be delayed as the heat has to make its way through the exhaust components.

This product uses a quality stainless steel in-exhaust probe containing a platinum wire sensor. The control unit allows the exhaust temperature to be monitored and the alarm point set to a temperature appropriate for your engine.

Note: Exhaust temperature alarms protect the exhaust system components not the engine; you will still need the engine water/oil temperature alarm.

## COMPONENTS



Hole size 22mm



Alarm buzzer



Kit Components

(Cables and connector box not shown)

## SENSOR INSTALLATION

The sensor has been designed so that it can be fitted without the need to dismantle any of the exhaust system components.

The clamp is suitable for exhaust hoses up to 6" diameter, cut the steel band to size making sure you leave enough overlap. Make sure the cut end has no burrs else it will be difficult to feed through the worm drive.

Assemble the sensor as shown, tighten the nuts firmly. No thread should protrude below bottom nut (see picture).

Select a point on the hose about 150mm or more downstream from the water injection point. Drill a 4mm hole avoiding the steel reinforcement rings (If you have a horizontal hose it is preferable to mount the sensor on the top). Push the sensor through the hole into the exhaust pipe and secure firmly.

The sealing O ring should make a good waterproof seal; if in doubt add a little silicon sealant.

Use a cable tie to secure the cable to the hose clamp as shown.

Type 'A' In-Hose



The sensor has been designed so that it can be fitted without the need to dismantle any of the exhaust system components.

Cut the steel band to size making sure you leave enough overlap, make sure the cut end has no burrs else it will be difficult to feed through the worm drive.

Assemble the sensor as shown in the picture, tighten the nut firmly.

Select a point on the riser about 150mm downstream from the water injection point and tighten the band to secure firmly.

Use a cable tie to secure the cable to the hose clamp for strain relief.

Type 'B' External



This sensor is intended for engine block temperature monitoring.

When choosing a position for the sensor you should find a location associated with the water circulation, i.e. thermostat, heat-exchanger, pipes, water-pump (not the sea water pump), these contain coolant water and therefore when the engine is running normally should remain well under the 200c display limit else the water would have already turned to steam and the alarm should be sounding. The sensor is an M8 ring that is designed to be held in place by an existing engine bolt.

Use a cable tie to secure the cable for strain relief.

**Note:**

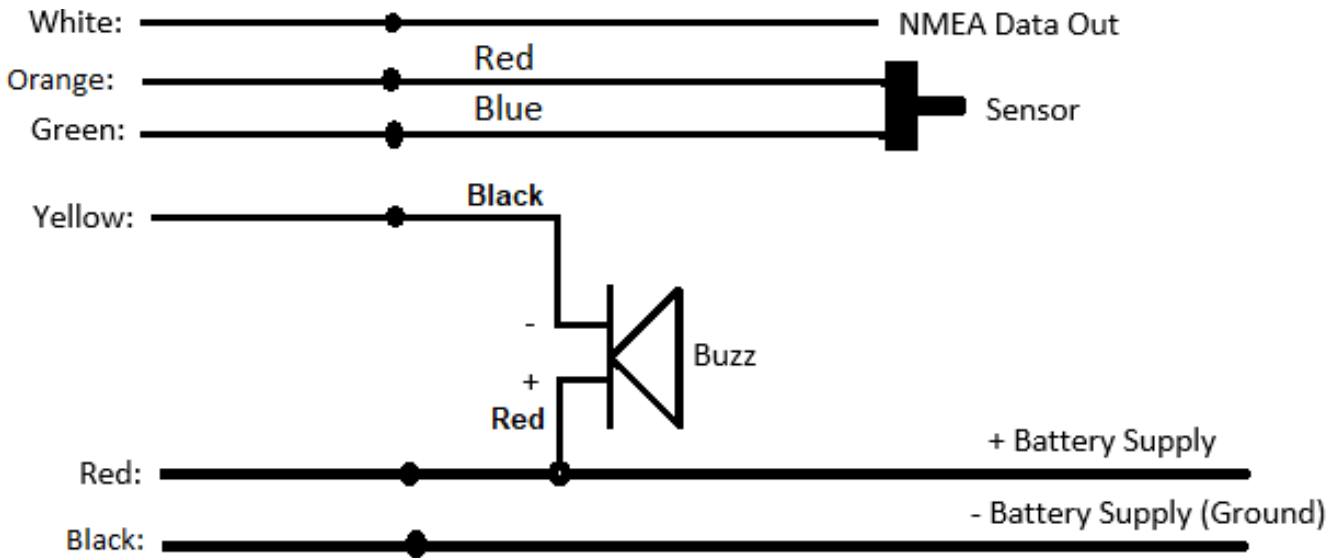
The maximum temperature that the displays can read is 200c although this is not the maximum that the sensors can withstand. There are parts of the engine which during normal operation can exceed these temperatures, for instance the exhaust manifold. The sensor must not be attached to any of these areas.

Type 'C' Engine Bolt-on



**6 way cable connections**

- Red: + Battery Supply (+12v)
- Black: - Battery Supply (Ground)
- Orange: Temperature Sensor
- Green: Temperature Sensor
- Yellow: Alarm OUT (Buzzer) (shorts to ground when active)
- White: NMEA Data Out



The display requires a 22mm hole.

The sensor is connected to the Orange and Green wires as shown, it is not important which way round it is wired.

The buzzer is not waterproof and should therefore be mounted behind the panel or on top of the connector box. Please ensure you observe the +/- polarity. Note: When the alarm sounds the yellow wire is internally shorted to ground via a self-resetting 350mA fuse.

Power is connected to the display via the Red (+) and Black (-) wires, you may choose to include a fuse in the power line however the display includes internal self-resetting fuses on the power line and alarm output.

NMEA data output is available on the white wire. If you intend to use the NMEA please read the separate section, otherwise leave this unconnected and ensure it cannot come into contact with anything.

The unit has been supplied with a screw terminal block, please ensure you make good connections as a poor connection on the sensor wires can effect the reading available.

When you power up the unit the display will show the current alarm temperature, it first shows 'AL-' followed by the temperature in degrees 'c'. Example "AL-95c". The display will then show the highest recorded temperature, 'Hi-47c'. After a few seconds the display will clear and then begin to show current exhaust temperature.

If the display shows ""Err" then this indicates a temperature sensor error and you need to check the sensor wiring. Sensors should show a resistance of about 1100 ohms at 25c.

If the display shows "---" then it is in slave mode and unable to communicate with the master. This is not how the unit is shipped, please see menu section for setting the display modes.

Assuming the display is showing the temperature you can now test the alarm, this is done by reducing the alarm temperature below the exhaust temperature. Press the red button on the front of the display then release it. The display will now flash "AL-95c" (your temperature may show differently) . To change the alarm temperature press the button again and hold it in until the temperature flashes, then release the button. The temperature will continue to flash. Now each time you press the button the temperature will change, once it gets to 180 it will reset to 5. When finished don't touch the button for a few seconds, the display will show "End" and revert back to displaying the exhaust temperature.

If you have successfully set the alarm temperature below the exhaust temperature then the unit will alarm, the buzzer will operate and the display will flash "AL-xx" where xx represents the current exhaust temperature. To silence the alarm reset the alarm temperature back above the exhaust temperature.

If you ever need to check the sensor use an ohm meter or warm water, NEVER USE A FLAME

People are often surprised at how low the exhaust temperature is when the cooling system is working effectively, especially in cold northern waters. It is not uncommon for it to be below 50c.

Note: When the alarm sounds the temperature needs to drop 5c below the alarm temperature to turn off.

## Setting the alarm temperature

The unit is shipped with the alarm temperature set to 95c, however it is recommended that you adjust this to suit your particular engine.

It is important that you adjust the alarm temperature following the first trial with the engine running. If the temperature is set too high then the response to a cooling water loss will be slower than it needs to be and if set too low will possibly give false alarms when the engine is running hard.

Initially run the engine until it is up to its normal working temperature, then switch the display off then back on and record what it says was the highest recorded temperature. (It displays the highest temperature during the first few seconds after switch on, example 'H-57') Now add 20 to this value and use it as the alarm temperature, for instance if it says 'Hi-57' set the alarm temperature to 77

Note: When the alarm sounds the exhaust temperature must fall 5°C below the alarm temperature for the alarm to turn off.

**See function menu for details on how to adjust the alarm temperature.**

## Function Menu

The display has a simple 5 function menu that gives the following options:-

1. Displays/Sets the current alarm temperature.
2. Displays/Sets brightness.
3. Displays/Sets Port-Starboard.
4. Display/Sets the display mode.
5. Clears highest recorded temperature.

To access menu functions use the button on the front of the display. Press it once for option 1, twice for option 2 etc. As you press the button you will see the display scroll through the various options. "AL-95c", "br-50", "PS-Po", "Fn-0", "Clr"

To change a menu option press and hold the button for a few seconds until the display starts to blink.

Example: Changing the display brightness; Press the button twice and the display will show "br-50" where 50 is the current brightness value. Now hold the button in until the "50" blinks then release the button. Now each time you press the button the brightness value will increment until it reaches 100 where it will return to 5. Once you have set the required value release the button and wait a few seconds until the display shows "End" then returns to displaying the exhaust temperature. If you turn the unit off before waiting the new setting will not be saved.

The above method works for all functions except "CLR" which does not have a value. To clear the highest recorded temperature simply hold the button until the "CLR" changes to "0c". Release the button and wait for the display to return to normal operation

**Option '1'** Displays/Sets the current alarm temperature.

Press the button once for option '1', the display will show the current alarm temperature "Al-95". Now hold the button until the 95 starts to blink then release the button. You can now adjust the alarm temperature, each time you press the button it will increment, when it reaches 180c it will return to 5c. When finished wait for the display to show "End" and return to normal operation.

**Function '2'** Displays/sets brightness.

Press the button twice for option '2', the display will show the current brightness level "br-40". Now hold the button until the 40 starts to blink then release the button. You can now adjust the brightness, each time you press the button it will increment, when it reaches 100 it will return to 5. When finished wait for the display to show "End" and return to normal operation.

**Function '3'** Displays/Sets Port-Starboard.

The purpose for this is option will be made clear in the section on NMEA and slave displays, for now this section will just describe how to change the setting. Press the button three times for option '3', the display will show the current setting "PS-Po". This indicates that the Port/Starboard setting is currently set to "Port". If it were starboard to would show "PS-Stb". To change this hold the button until the "po" starts to blink then release the button. You can now switch between Port and Starboard by pressing the button. When finished wait for the display to show "End" and return to normal operation.

**Function '4'** Displays/Sets current operation mode.

The purpose for this is option will be made clear in the section on NMEA and slave displays, for now this section will just describe how to change the setting. Press the button four times for option '4', the display will show the current setting "F-0". This indicates that the current mode is '0', available values are from 0 to 2. To change this hold the button until the "F-0" starts to blink then release the button. You can now increment the value, "F-1", "F-2" and back to "F-0". When finished wait for the display to show "End" and return to normal operation.

### Function '5' Clear highest temperature

The display keeps a record of the highest recorded temperature and it stores this even when turned off. This value helps you determine the correct level for the alarm temperature. To clear the highest recorded temperature back to zero press the button 5 times for option '5'. Then hold the button in until the display reads "0c". Now wait for the display to show "End" and return to normal

## NMEA

The displays output NMEA data containing the current exhaust temperature in centigrade on the white wire, the data format is as follows:-

`$XDR,C,25.0,C,SM010A,*xx <CR> <LF>` where xx is the checksum

`$--MTW,25.0,C,*xx <CR> <LF>` where xx is the checksum

**4800 baud, No parity, 1 stop**

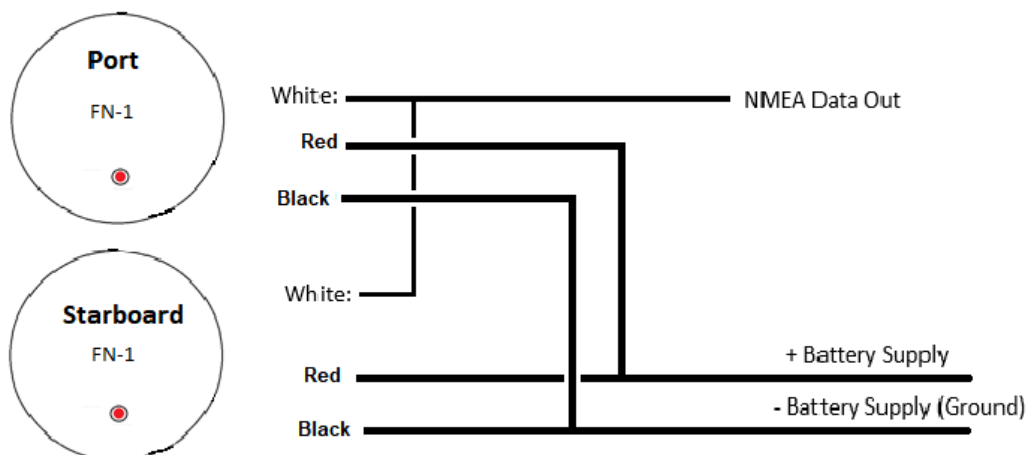
**In a twin engine configuration you do not need to wire the displays together unless you intend to make use of the built in NMEA multiplexer.** When connecting two units together they should both be connected to the same power supply so that they are on at the same time. It is important that the ground connection (negative battery) for each display is tied together and taken from the same point.

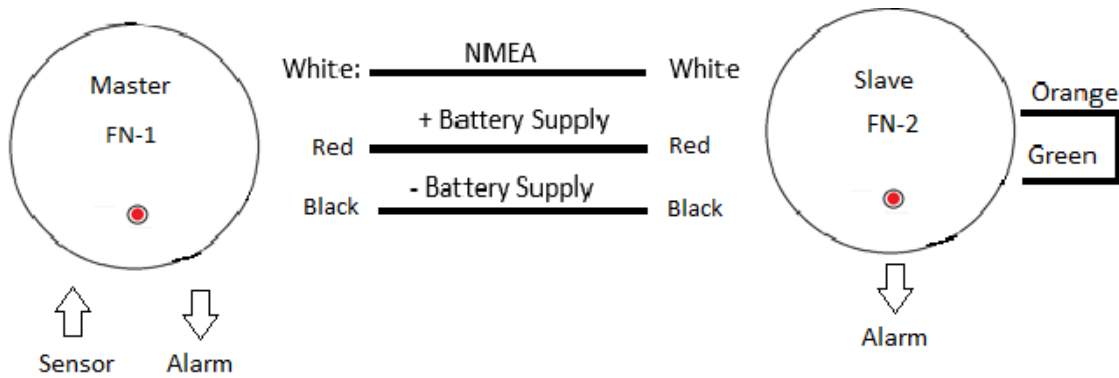
Connect the white wire from both displays together, the displays monitor each other so as to share the same line, this provides the multiplex functionality without having to have a separate multiplexer box.

When installing twin engine displays it is important that one is set to Port and the other to Starboard, also both units should have their function set to 'FN-1' see menu for details

Port engine data will appear as SM010A where Starboard data will be SM010B.

All other connections, alarm, sensor etc. remain the same as described previously.





You may connect an additional displays to work as a slave, slave displays do not directly connect to the temperature sensor but instead get their information from the 'Master' via the NMEA (white wire). When wiring a slave display use a three core cable to connect the two displays together, that way they get their power and ground connection from the same point.

The Orange and Green wires (sensor) on the slave display should be shorted together.

The master must be set to "Fn-1" and the slave to "Fn-2" (see Function Menu section on how to do this)

## Dual engine with slave displays

If you have dual engines and are not using the NMEA output for connecting to other instrumentation then both engines can be wired separately as shown above. If you are using NMEA then you must connect the white wire from both engines together and ensure that the gauges used for the port engine are set to port and the starboard engine set to starboard (see Function Menu section on how to do this)

### Specifications

**Supply Voltage:** 7 – 20v DC, 20mA (no alarm) (24v systems supplied with a converter)

**Sensor Temperature range:** -20 - + 250°C (0-199°C read range)

**Temperature probe:** A4 Marine grade stainless steel with platinum wire sensor 5.0mtr cable.

**Calibration:** +/- 1°C

**Alarm range:** 5 - 180°C user adjustable

**NMEA:** NMEA 0183 Integrated Instrumentation standard.

**Alarm Output:** Ground connection, 350mA max, internal self-resetting fuse

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*Designed and Manufactured in the United Kingdom*

