

USER GUIDE FOR

DATALINE-X™

WIND

Stowe Marine Ltd.

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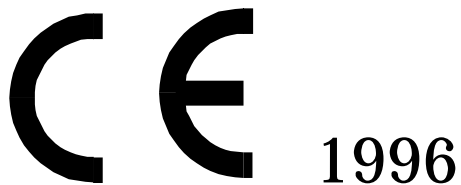
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Dataline-X Wind Manual, Part Number 05997SM, Issue 2, Dec 1995.

Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. The user must be familiar with the contents of the manual before attempting to operate or work on the equipment.

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1.1 The Dataline-X System

The Dataline-X System, as its name implies, uses a single cable to carry both power and data around the vessel to each instrument. This is done using a NMEA 0183 serial digital communication link, which is an established industry standard. Because of this, instruments from other manufacturers may be interfaced to the Dataline-X System - assuming that they have a NMEA output or input.

This User Guide describes the combined 360° Wind Angle and Wind Speed digital display, known as **Dataline-X WIND**, used within the Dataline-X System.

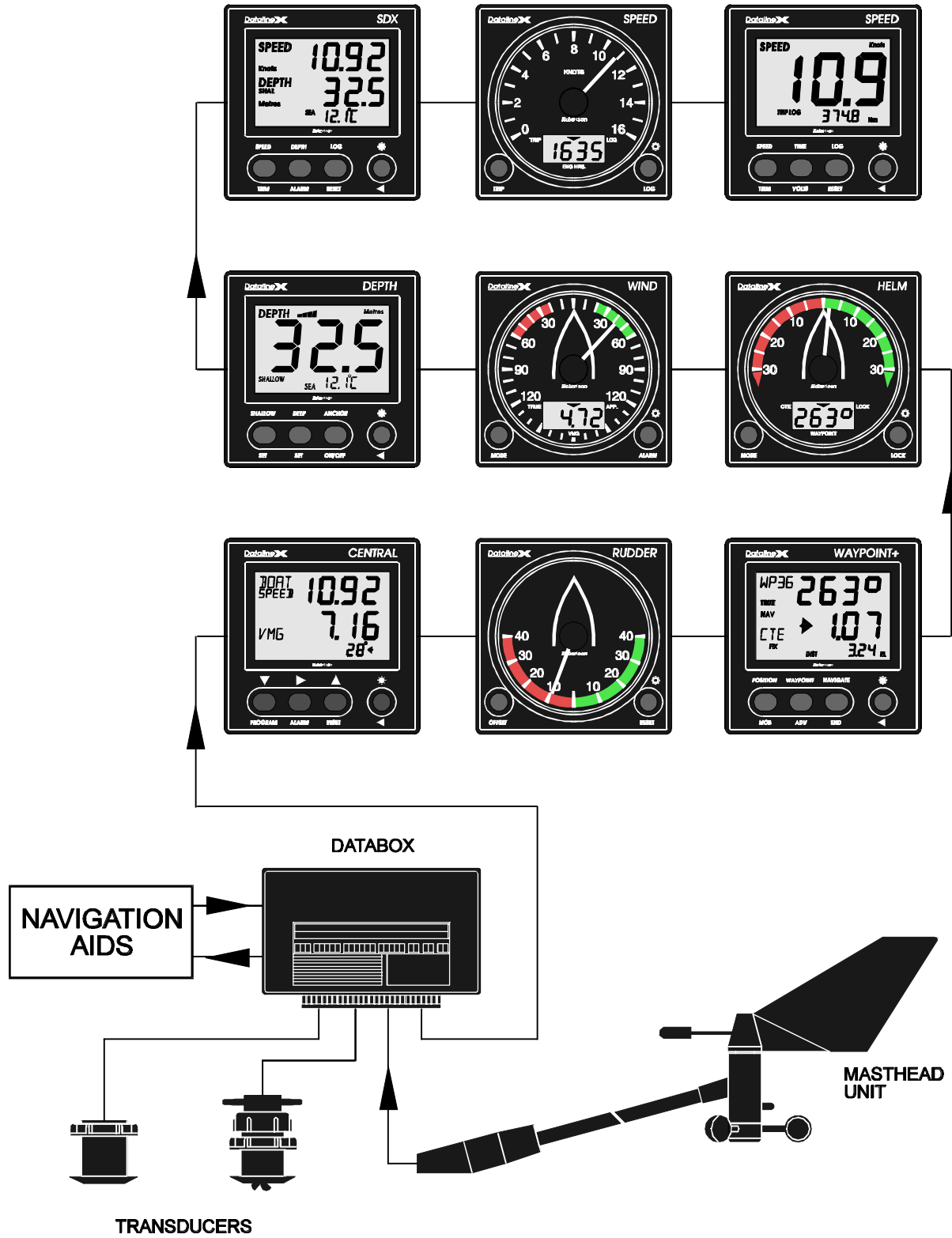


Figure 1.1 - Dataline-X System Diagram

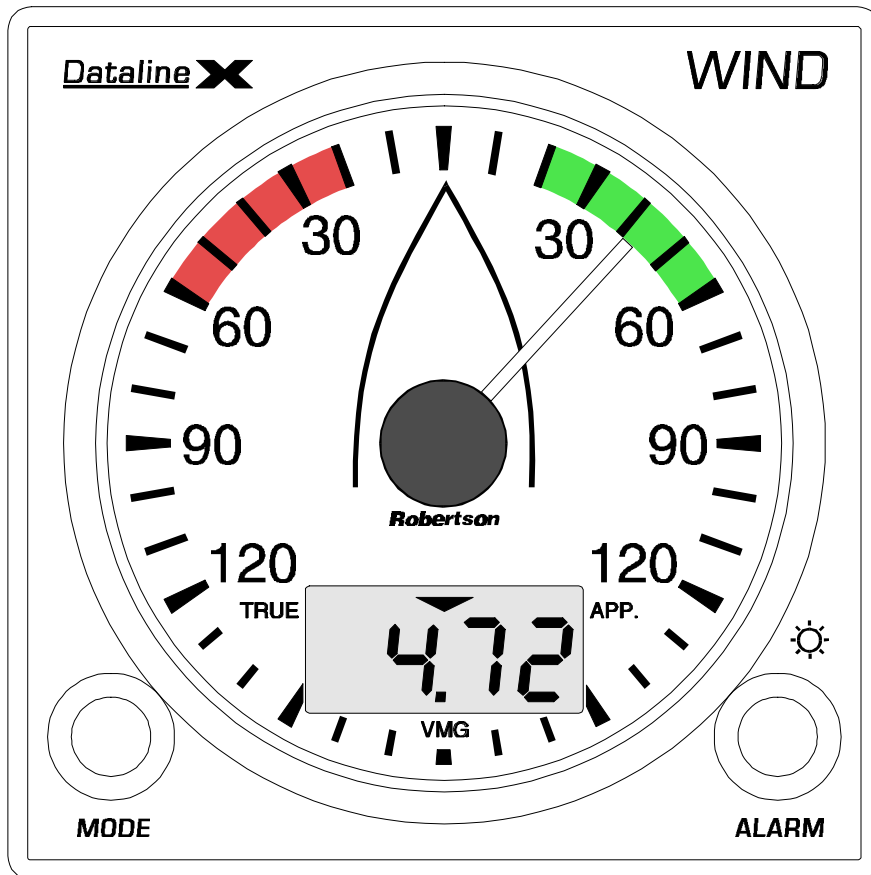


Figure 1.2 - Dataline-X 360° WIND Instrument

1.2 Dataline-X WIND SpecificationTrue and Apparent Wind Angle Functions

Wind Angle Display	0 to 180° Port / Stbd
Wind Angle Precision	1°
Wind Angle Damping	4 damping levels (default level 1)

True and Apparent Wind Speed Functions

Wind Speed Display	0 to 99.9 Knots
Wind Speed Units	Knots/Metres Per Second/Beaufort/KMH
Wind Speed Precision	0.1 Knots/Metres Per Second/KMH
Wind Speed Damping	Linked to Wind Angle Damping

High Wind Speed Alarms

True Wind Speed Alarms	Three Settable / Retained Alarms
Wind Speed Alarm Values	1 to 99 Knots
Wind Speed Alarm Units	Knots/Metres Per Second/Beaufort/KMH
Wind Speed Alarm Precision	1 Knot

Velocity Made Good (VMG) Functions

VMG Display	0 to 99.9 Knots
VMG Units	Knots/MPH/KMH
VMG Precision	0.1 Knots/MPH/KMH
VMG Damping	Linked to Wind Angle Damping

Magnetic Wind Direction Functions

Magnetic Wind Direction Display	0 to 359°
Wind Direction Precision	1°

Wind Direction Damping Linked to Wind Angle Damping

Additional Functions

System Calibration Facility

External High Wind Speed Alarm Drive

Display Backlighting Levels Seven levels plus Off

Display Backlighting Colours Three colours, (Red, Green, Yellow)

Display Backlighting Control Two independent lighting banks.

Sat Nav Output (via Databox)

General

Power Requirement 10 to 16V, 70 mA, (100 mA max with lighting)

Size 110 x 110 x 18 mm (above panel)

Mounting Hole Size 50 mm (2 inches)

Total Depth Below Panel Front 32 mm

Weight 225 grams

Environmental Rating IP65

Temperature Range 0°C to 70°C

Alternative Transducers

If any of the system transducers are not fitted to the Databox, but there is alternative speed, log, or sea temperature NMEA data being transmitted from another sensor to the Databox, then this alternative data will be used.

Note:

1. The values given relate to the display, the wind speed and angle transducer installed will determine the actual values for maximum wind speed, wind angle precision, etc.

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2.1 General Description

The display is divided into two sections, the pointer, and the LCD. Both are generally controlled by the MODE button.

2.1.1 The Dialplate

The pointer normally shows the 360° apparent or true wind angle, depending on the mode selected.

2.1.2 The LCD Display

The LCD normally shows one of the values below:

- Apparent Wind Speed.
- True Wind Speed.
- Wind Direction, (if a suitable heading or Course Over Ground data input is available).
- Velocity Made Good to Windward (VMG)

There are three arrows at the top of the LCD which show which data is being displayed at any one time. The right arrow points to **APP.** on the dialplate for 'Apparent Wind', the left arrow points to **TRUE** on the dialplate for 'True Wind', and the centre arrow points to **VMG** on the dialplate for 'Velocity Made Good'.

2.1.3 The Buttons

The word below the button indicates the main function for that button.

The MODE button changes the current display mode when it is pressed, cycling around all the available data displays. If this button is held down it sets the damping level for all the displayed data.

The ALARM button (this button has a * symbol above it) shows the current wind speed alarm value if the alarm is on, or 'OFF' if the alarm is off. If this button is held down it sets the lighting level.

When a function has been selected, a BEEP will be heard to confirm correct operation.

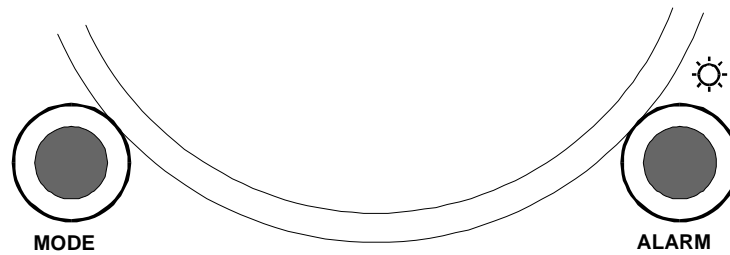


Figure 2.1 - The Buttons

2.2 Powering Up

When powering up the instrument, it will beep, the pointer will move to the top of the display, and will show all the LCD segments for approximately one second.

The display will then show the current operating values for Apparent Wind Speed and Angle.

2.3 The Data Displays

Pressing the MODE button cycles through the displays as below:

If there is no heading or course over ground input

<u>LCD</u>	<u>Pointer</u>
Apparent Wind Speed	Apparent Wind Angle
True Wind Speed	True Wind Angle
VMG	True Wind Angle
VMG	Apparent Wind Angle
Apparent Wind Speed	Apparent Wind Angle

If there is a heading or course over ground input

<u>LCD</u>	<u>Pointer</u>
Apparent Wind Speed	Apparent Wind Angle
True Wind Speed	True Wind Angle
Wind Direction	True Wind Angle
VMG	True Wind Angle
VMG	Apparent Wind Angle
Apparent Wind Speed	Apparent Wind Angle

Notes:

1. If there is no Wind Speed and Angle transducer fitted, but there are alternative NMEA Wind Speed and Angle inputs to the Databox, then this data will be used.
2. If there is no Boat Speed transducer fitted, but there is an alternative NMEA Boat Speed input to the Databox, then this data will be used.

2.3.1 Apparent Wind Angle and Apparent Wind Speed Display

This is the first display that is shown on power up. It is indicated by the right LCD arrow being lit, showing 'App.' for 'Apparent'.

The wind speed is shown in the selected units, Knots, Metres Per Second, Beaufort, or Kmh. All units except Beaufort are shown to one decimal place.

2.3.2 True Wind Angle and True Wind Speed Display

This display is indicated by the left LCD arrow being lit, showing 'True'.

The wind speed is shown in the selected units, Knots, Metres Per Second, Beaufort, or Kmh. All units except Beaufort are shown to one decimal place.

2.3.3 True Wind Angle and Wind Direction Display

This display is indicated by the left LCD arrow being lit, showing 'True' (Wind Angle), with the LCD showing a three figure number with a degree sign at the right side which is the wind direction. The wind direction given is referenced to Magnetic North.

If there is magnetic compass heading data available the Wind direction is calculated from this. In this case the wind direction given is the effective wind direction over the water. The display will be most accurate after a period on one heading, however it will respond rapidly to course changes.

If there is no magnetic compass heading data, but magnetic course over ground data is available then the Wind direction is calculated from the course over ground. In this case there is compensation for the tide, and the wind direction given is the effective wind direction over the ground. However the display will not be accurate after a course change, and will require a period on one heading before it is correct. (In addition, if the navigator used is a **GPS** then the American Defense Department Selective Availability position errors will degrade the accuracy of the wind direction.)

2.3.4 True Wind Angle and VMG Display

This display is indicated by the left LCD arrow being lit, showing 'True' (Wind Angle), with the centre LCD arrow also being lit, showing 'VMG'.

The VMG is shown in the selected units, Knots, Mph or Kmh. All units are shown to one decimal place.

Note: The VMG is shown as positive when heading upward, and negative when heading downward.

2.3.5 Apparent Wind Angle and VMG Display

This display is indicated by the right LCD arrow being lit, showing 'APP.' (Apparent Wind Angle), with the centre LCD arrow also being lit, showing 'VMG'.

The VMG is shown in the selected units, Knots, Mph or Kmh. All units are shown to one decimal place.

Note: The VMG is shown as positive when heading upward, and negative when heading downward.

2.3.6 The Display Damping

All of the displayed data is damped together with one of four damping levels. The damping level may be checked by pressing the MODE button and holding it down. The display will change to show the present damping level, as 'd1', 'd2', 'd3', or 'd4'. In order to change the damping level keep the button held down and the display will cycle through all four levels. Release the button at the desired damping level.

On power up damping level 1 is always selected.

2.4 The High Wind Speed Alarms

The Dataline-X Wind display has three high true wind speed alarms, either one, two, or all three of these can be used, and they can all be turned on or off as desired.

2.4.1 The Alarm Displays and Turning the Alarm ON or OFF

Pressing the ALARM button will show 'OFF' on the LCD if the Wind Speed Alarms are turned off, or the value of Wind Alarm 1 if the Wind Speed Alarms are turned on. After three seconds the LCD will return to the previous data display.

If there is only one wind alarm set then pressing the ALARM button again before the data display returns will change the alarm from off to on or vice versa. Thus repeated presses of the button will cycle the display between showing the alarm value, and 'OFF'.

If there is more than one wind alarm set then pressing the ALARM button before the data display returns will cycle through all the set alarm values, and 'OFF'. Thus to switch the alarm off, repeatedly press the button until 'OFF' is shown on the display. In order to simply check the alarm values and leave the alarm on then press the button to check each alarm value in turn, but ensure that the display is not finally left showing 'OFF'.

2.4.2 Alarm Sounding

The alarms are system wide, and are sounded by all the Wind and Tack displays on the system. When an alarm sounds all of these displays will beep, and they will flash a warning message as below:

Wind Speed Alarm 1 Sounding (no others set) = 'HIGH'

Wind Speed Alarm 1 Sounding (others set) = 'HI 1'

Wind Speed Alarm 2 Sounding = 'HI 2'

Wind Speed Alarm 3 Sounding = 'HI 3'

If there is an external alarm connected then this will be sounded at the same time.

In order to cancel a sounding alarm press any button on any of the Wind or Tack displays.

2.5 To Set Display Backlighting

1. Press the ALARM button and hold. The display backlighting will change from 0 to level 7, then level 6, then level 5, and so on to level 0. If the button is still held, the level will then increase back to 7 again.
2. At the desired display backlighting, release the ALARM button. This will set the lighting on ALL displays on the Dataline-X system, which are in the same Lighting Bank. The Dataline-X system has two lighting banks, so that the internal lighting on a power boat may be set differently to that on the flybridge, or the cockpit lighting may be set differently to the chart table or mast display lighting on a yacht. All displays are supplied set to bank 1. (See Part 4 for the bank set-up information.).

Note: On some Dataline Systems (not Dataline-X) only lighting levels 0, 3, 5 and 7 are available

2.6 Compass Sensor Error Displays

If the Dataline-X Wind display is used with a Dataline Compass Sensor then a number of Compass Error displays may be seen if there is a fault with the sensor. These will be shown instead of the normal Magnetic Wind Direction display, and can be cancelled by pressing either button. If an error is seen then the compass sensor should not be used for navigation until the error has been corrected.

The error messages consist of a display of 'Err' and a number which identifies the nature of the error, as below:

'Err4' = Memory Error, contact your dealer for advice.

'Err6' = Battery Voltage is below 11 Volts.

If any other errors are seen (and the compass sensor is not in auto deviation compensation mode - See Part 4) consult your dealer for advice.

2.6 Demonstration Mode

The Demonstration Mode allows the user to familiarize himself/herself with all the functions of the instrument with the device removed from the system. Demonstration software within the instrument produces realistic values for the display.

A +12V power supply will be required to be connected as follows:

0V to the BLACK (far right) terminal.

+12V to the RED (far left) terminal.

To enter the Demonstration Mode, press the ALARM button whilst applying power to the instrument.

To leave the Demonstration Mode, switch off and re-apply power.

Notes:

1. The display will leave demonstration mode if any data is received.
2. The display can be set to automatically enter 'Shop' demonstration mode every time it is powered up. (See Part 4 for further details.)

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- 3.1 General
- 3.2 Installation
- 3.3 Choosing the Cable Routes
- 3.4 Securing the Cable

3.1 General

The instrument head is fully waterproof and can, therefore, be installed on deck or below. The connections should be protected from water penetration and should, if possible, allow rear access to remove the desiccant pack, if required. The position selected should, in the first instance, meet the requirements of the helmsman, or crew.

The selected surface for the instrument head must be flat and even to within 0.5 mm.

Before installation, note the Serial Number of the unit and keep it in a safe place.

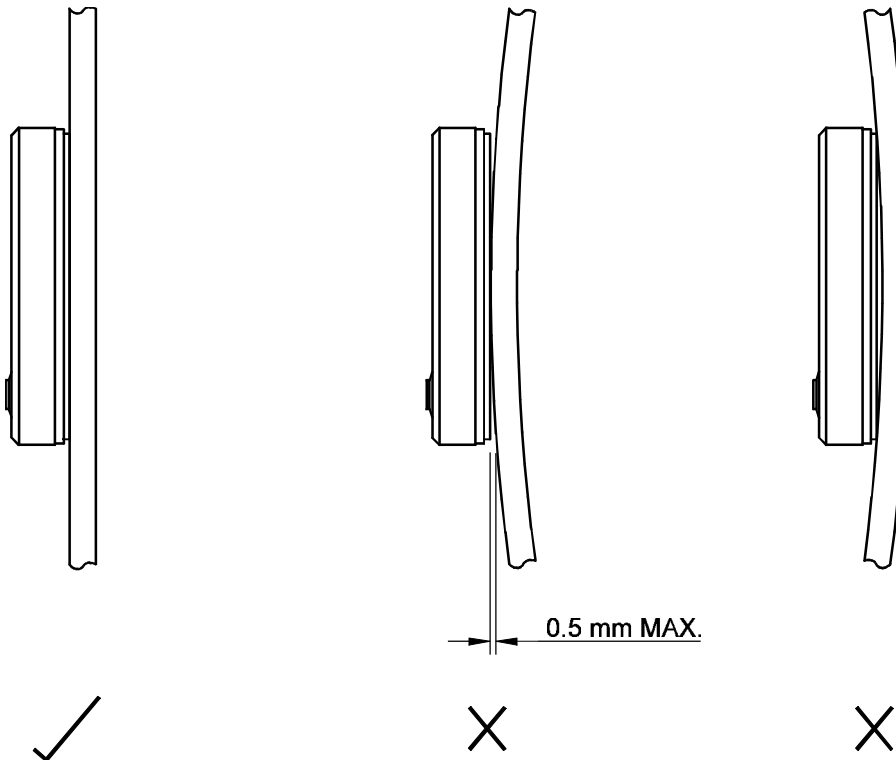


Figure 3.1 - Installation

3.2 Installation

1. Carefully position the self-adhesive template provided on the surface where the instrument is to be mounted.
2. Drill a small pilot hole first, and then check the location on the other side of the panel or bulkhead to confirm suitability.
3. Open out the pilot hole to 50 mm (2 ins.) using a cutter in a hand-held brace, or electric drill.
1. Drill the four fixing holes using a 2.5 mm (3.32 ins.) drill.

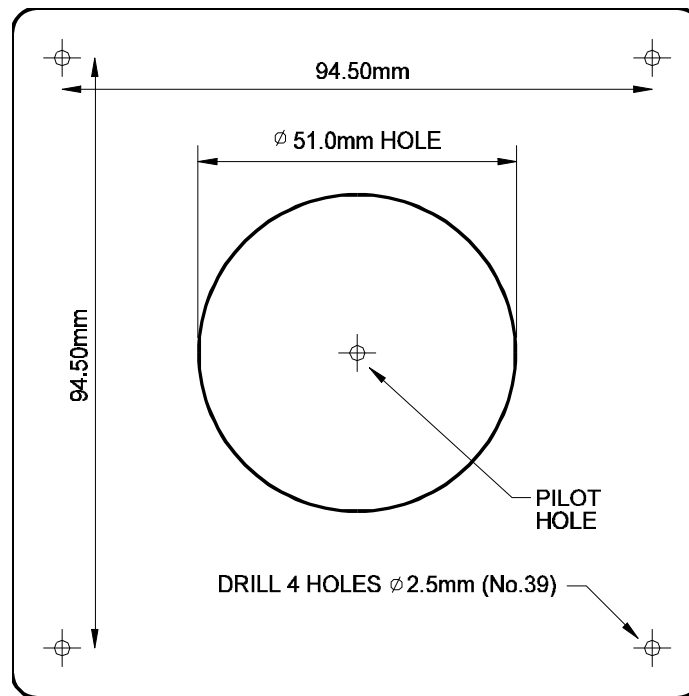


Figure 3.2 - Mounting Details (Not To Scale)

2. The instrument should next be wired into the system. The wiring should be carried out as in the 'Choosing the Cable Routes' and 'Securing the Cable' Sections below.
 - a. If the instrument is being connected to a Dataline-X system, then connect it to the Dataline wire. This can normally be done simply by using the 'Dataplug' connector and cable supplied to connect the display to the Databox or to any adjacent display.

If the cable routing cannot be made with the Dataplug connector attached, then simply disconnect it from the cable. The cable may then be run through holes of down to 6 mm (0.25 ins.) diameter before reconnecting the Dataplug connector, making sure that the colours are correctly wired to the terminals. The correct positions for the different coloured wires are shown on the rear label of the instrument.

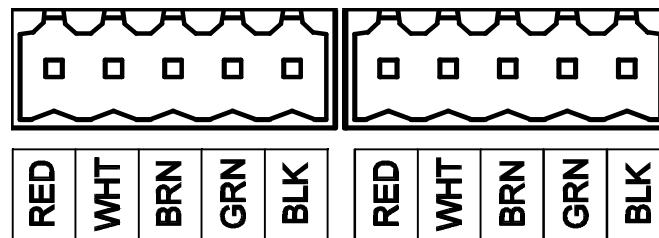
- b. If the instrument is being connected to another instrument system then the connections are as below:

Red = +12V Power In (Fused 1A).

White = NMEA Signal In (A / + / Positive).

Brown = Wind Alarm Output (30mA).

Green = NMEA Reference In (B / - / Negative).



Black = 0V Power In.

Figure 3.3 - Electrical Connections

6. Check that the instrument functions correctly.
7. Temporarily disconnect the Dataplug connectors and coat the terminals and wires with silicone grease or petroleum jelly. These products will not harm the instrument.
8. Make sure the 'dovetail' lugs are free from grease and securely located into the rear of the instrument when replacing the Dataplugs.
9. Secure the instrument using the four, No 4 self-tapping screws provided. Ensure that the sealing gasket is correctly located.
10. Replace the front cover, the installation of the instrument is complete.

CAUTIONS

DO NOT OVER-TIGHTEN FIXING SCREWS.

DO NOT USE SEALING COMPOUND ON THE INSTRUMENT BACK.

DO NOT USE WD40 OR ANY SOLVENT ON ANY PART OF THE INSTRUMENT.

3.3 Choosing the Cable Routes

After you have decided on the system and started to mount the components of the Dataline-X System, the next step in the installation process is to route the cables between the various parts of the system and to the power supply. When routing the cables, choose the most direct paths while avoiding the following hazards:

- Sharp bends or kinks in the cable
- Hot surfaces (exhaust manifolds or cooking equipment)
- Rotating or reciprocating equipment
- Sharp or abrasive surfaces
- Door and window jambs
- Corrosive fluids or gases

3.4 Securing the Cable

After the ideal cable routing has been established, use tie-wraps, 'P' - clips or other fixings to secure the cables along the routings.

Notes:

1. To prevent chafing add protection for the cable jackets where the cables pass through bulkheads, or past sharp edges.
2. Secure the cable near to the terminals for strain relieving.
3. Secure the cable ends with enough slack to allow for easy connection.
4. Cut any spare wire ends to an appropriate length.

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- 4.2 Calibration Mode
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- 4.14 Test Mode Entry Screen
- 4.15 Shop Demo Mode Setting
- 4.16 Leaving Calibration Mode

4.1 System Calibration

After installation, the system may be calibrated to take into account the physical position of and type of transducers installed. Additionally, such things as display units and precision may be selected.

4.2 Calibration Mode

To enter Calibration Mode:

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. For each successive press of the ALARM button, the display will step through the calibration menu. To step through backwards, press the MODE button.
3. The menu function may be changed immediately by pressing both buttons together, or this may cause the value to flash, depending on the function.
4. The MODE and ALARM buttons may be used to decrement or increment values, which are flashing. When the value is correct, press both buttons together again to save it.
5. Selecting the Calibration Mode End Screen and pressing both buttons together will return the instrument to its normal working mode.

The following calibration functions are available:

- Lighting Colour (select Yellow, Red or Green)
- Lighting Bank (select Bank One or Bank Two)*
- LCD Contrast (select Level 1 or Level 2)
- Automatic Wind Angle Calibration (select)*
- Manual Wind Angle Calibration (value entry, $\pm 180^\circ$)*
- Wind Speed Alarm 1 Setting (value entry, 1 to 99 Knots)
- Wind Speed Alarm 2 Setting (value entry, Off, or 1 to 99 Knots)
- Wind Speed Alarm 3 Setting (value entry, Off, or 1 to 99 Knots)

- Wind Speed Units (select, Knots, Metres/Sec, Beaufort, or KMH)
- VMG Units (select, Knots, MPH or KMH)
- Automatic Compass Deviation Compensation (select or deselect)*
- Test Mode entry screen (select, On, Off)
- Shop Demo Mode Selection (select On, Off)

The options marked with '*' perform no function if the display is not part of the Dataline-X system.

4.3 Lighting Colour Selection

This function enables the colour of the backlighting on the display to be set to Yellow, Red, or Green. This is independent of all other displays.

1. Press both buttons together, and hold for more than 3 seconds.
2. The display should indicate the current lighting colour as either 'rEd', 'Grn', or 'YEL', and will light to show this.
3. Press both buttons together to the desired colour, 'rEd' (Red), 'Grn' (Green) or 'YEL' (Yellow).
4. Return to the main display by pressing the MODE button once to select the Calibration Mode End Screen, and then pressing both buttons together.

4.4 Lighting Bank Selection

The Dataline-X instrument system can have two separate banks of instruments. Setting the lighting level on one display will set all the other displays in that bank to the same level, but will not effect any displays in the other bank. For instance, the lighting level can be independently controlled for:

1. The cockpit and chart table displays of a yacht.
2. The cockpit and mast displays on a yacht.
3. The cabin and flybridge of a motor yacht.

This is independent of the display colour, so that displays in the same bank may have different colours if desired.

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button once until the LCD indicates '-1-' (or '-2-').
3. Select the required lighting bank, either 1 or 2, by pressing both buttons together.
4. Return to the main display by pressing the MODE button twice to select the Calibration Mode End Screen, and then pressing both buttons together.

4.5 LCD Contrast Setting

The LCD on Dataline-X Series instruments can be set to one of two or more contrast levels to best suit the viewing angle of the particular installation. This display has two contrast levels.

The default level (level 2) is suitable for a wide range of viewing angles and will probably not require alteration. However, if viewing the display from above, the contrast level may be lowered to level 1 to reduce the 'ghosting' of the parts of the display which are turned off. The lighting is illuminated when setting the contrast to highlight the display.

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button twice until the LCD indicates the current contrast level as 'LCd2' (or 'LCd1').
3. Select the required LCD contrast level, either 1 or 2, by pressing both buttons together.
4. Return to the main display by pressing the MODE button three times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.6 Automatic Wind Angle Calibration

The Dataline-X instrument system can be automatically corrected for errors in the mounting of the wind angle sensor. In order to do this simply head the vessel directly into the wind, and then operate the automatic calibration function. Any error in the wind angle will be corrected to zero the display.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button three times until the pointer shows the current apparent wind angle, and the LCD indicates 'Auto'.
3. Select automatic wind angle calibration by pressing both pushbuttons together. The LCD will start to flash 'Auto'.
4. Head the vessel directly into the wind, and then press both buttons together again. The LCD will now flash the required wind angle offset.
5. Press both buttons together to save the wind angle offset. The corrected apparent wind angle will be shown on the pointer.
6. Return to the main display by pressing the MODE button five times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.7 Manual Wind Angle Calibration

Errors in the apparent wind angle display can be corrected manually by entering the required offset.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button four times until the pointer shows the current apparent wind angle, and the LCD indicates 'CAL?'.
3. Select manual wind angle calibration by pressing both pushbuttons together. The LCD will start to flash the current wind angle offset.
4. Increase the wind angle offset to starboard using the ALARM button.
5. Increase the wind angle offset to port using the MODE button.

6. Press both buttons together to save the wind angle offset. The corrected apparent wind angle will be shown on the pointer.
7. Return to the main display by pressing the MODE button five times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.8 High Wind Speed Alarm One Setting

Wind Speed Alarm One can be set to any whole value in Knots between 1 and 99. It is always valid, and is simply controlled On or Off by the Alarm On / Off Setting (See Part 2).

Note that the alarm is shown in the selected wind speed units, and so if Knots are not selected then the changes that are seen will not be in single units.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button five times until the LCD indicates 'AL1?'.
3. Press both pushbuttons together to start to set the alarm value, the current value will be shown flashing.
4. Increase the alarm value using the ALARM button.
5. Decrease the alarm value using the MODE button.
6. Press both buttons together to save the alarm value.
7. Return to the main display by pressing the MODE button six times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.9 High Wind Speed Alarm Two Setting

Wind Speed Alarm Two can be set to any whole value in Knots between 1 and 99. It can also be set to be invalid and thus to not be used. If the alarm is invalid then the value is shown as four dashes, '----'. In order to make the alarm invalid reduce its value to below one Knot. If the value is set to be valid then it is controlled On or Off by the Alarm On / Off Setting together with the other alarms. (See Part 2).

Note: The alarm is shown in the selected wind speed units, and so if Knots are not selected then the changes that are seen will not be in single units.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button six times until the LCD indicates 'AL2?'.
3. Press both pushbuttons together to start to set the alarm value, the current value will be shown flashing.
4. Increase the alarm value (or make it valid if it is invalid) using the ALARM button.
5. Decrease the alarm value using the MODE button, (if it is already at the minimum value then it will be made invalid).
6. Press both buttons together to save the alarm value.
7. Return to the main display by pressing the MODE button seven times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.10 High Wind Speed Alarm Three Setting

Wind Speed Alarm Three can be set to any whole value in Knots between 1 and 99. It can also be set to be invalid and thus to not be used. If the alarm is invalid then the value is shown as four dashes, '----'. In order to make the alarm invalid reduce its value to below one Knot. If the value is set to be valid then it is controlled On or Off by the Alarm On / Off Setting together with the other alarms. (See Part 2).

Note: The alarm is shown in the selected wind speed units, and so if Knots are not selected then the changes that are seen will not be in single units.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the ALARM button seven times until the LCD indicates 'AL3?'.
3. Press both pushbuttons together to start to set the alarm value, the current value will be shown flashing.
4. Increase the alarm value (or make it valid if it is invalid) using the ALARM button.

5. Decrease the alarm value using the MODE button, (if it is already at the minimum value then it will be made invalid).
6. Press both buttons together to save the alarm value.
7. Return to the main display by pressing the MODE button eight times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.11 Wind Speed Units Selection

Displayed apparent and true wind speed units may be set to either Knots, Metres Per Second, Beaufort or Kilometres Per Hour.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the MODE button six times until the LCD shows both the right and left arrows, (for 'APP.' and 'TRUE' wind speed) and the present wind speed units as 'SPd1', (or 'SPd2', 'SPd3', or 'SPd4').
3. Select the required wind speed units by pressing both pushbuttons together, the units are as below:

'SPd1' = Knots

'SPd2' = Metres Per Second

'SPd3' = Beaufort

'SPd4' = Kilometres Per Hour

4. Return to the main display by pressing the ALARM button five times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.12 Velocity Made Good Units Selection

Displayed Velocity Made Good units may be set to either Knots, Miles Per Hour or Kilometres Per Hour. (This will be the same as the systems setting for boat speed.)

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.

2. Press the MODE button five times until the LCD shows the down arrow, (for 'VMG') and the present VMG units as 'SPd1', (or 'SPd2', or 'SPd3').

3. Select the required VMG units by pressing both pushbuttons together, the units are as below:

'SPd1' = Knots

'SPd2' = Miles Per Hour

'SPd3' = Kilometres Per Hour

4. Return to the main display by pressing the ALARM button four times to select the Calibration Mode End Screen, and then pressing both buttons together.

4.13 Automatic Compass Deviation Compensation

This function is only of use if the system is using a Dataline Compass Sensor.

This sensor can automatically compensate for magnetic deviation. In order to compensate the compass first select the auto deviation compensation screen in the Wind Displays Calibration mode, and then command the Compass Sensor to perform its Automatic Deviation Correction Calculation. When the Sensor has started the process the vessel should be slowly steered in a number of circles until the sensor signals that the process has been finished. This will normally take up to four rotations.

1. Press both pushbuttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the MODE button four times until the LCD shows 'HdG' and a number or letter. The number or letter indicates the status of the Compass Sensor, as below:

'HdG0' = The Compass Sensor is Not Deviation Compensated.

'HdGc' = The Compass Sensor is already Compensated.

'HdG4' = Memory Error, contact your dealer for advice.

'HdG6' = Battery Voltage is below 11 Volts.

3. If any other number is seen then this is another error, so consult your dealer for advice.

4. If the LCD shows 'HdGc' then the compass sensor is already compensated. However if it needs to be compensated again due to movement of metal or magnetic objects in its vicinity then press both buttons. The LCD will show 'Hdg ', and then after a short time it should show 'HdG0' to indicate that the sensor is no longer compensated and is ready to be compensated again.
5. If the LCD shows 'HdG0' then it is not compensated, and is ready to be compensated, so continue with the steps below.
6. Place the vessel in a position where it can be swung through a full 360 degrees.
7. Align the vessel to approximately 270 degrees. It must not be at a heading of below 180 degrees.
8. Press both buttons. The LCD will show 'HdG ', and then after a short time it should change to 'HdGi' to show that the process has been initiated. If it is desired to stop the process press both buttons again.
9. Begin swinging the vessel, either by hand or by motoring circles. The rate of rotation is not critical, but about one minute per revolution is suitable. During this process the LCD will change to show 'HdGr', indicating that the calibration process is running. If at any time the LCD shows a number after 'HdG' then an error has occurred, as below:
 - 'HdG1' = Upon initiating the procedure the heading was less than 180 degrees, restart the procedure with a heading of approximately 270 degrees.
 - 'HdG2' = The speed of rotation is too slow, restart the procedure making sure that the speed of rotation is faster.
 - 'HdG4' = Memory Error, contact your dealer for advice.
 - 'HdG6' = Battery Voltage is below 11 Volts.
12. If any other number is seen then this is another error, so consult your dealer for advice.
13. After a number of rotations the LCD will change to show 'HdGc', indicating that the calibration is complete.

14. Return to the main display by pressing the ALARM button three times to select the Calibration Mode End Screen, and then pressing both buttons together.
15. If possible check the compass against known compass points. If a constant heading error is found then consult your dealer.

4.14 Test Mode Entry Screen

The Test Mode will test all the display functions (See Part 5 for further details).

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the MODE button three times, until the LCD shows 'tEST'.
3. Press both buttons together to start to set Test Mode On, the current value, 'OFF', will be shown flashing.
4. Select Test Mode On by pressing either button on its own, the LCD will show 'ON' flashing.
5. Press both buttons together to start Test Mode.

If it is decided not to start Test Mode then press either button to change the LCD back to flashing 'OFF', then press both buttons to return to showing 'tEST'. Return to the main display by pressing the ALARM button twice to select the Calibration Mode End Screen, and then pressing both buttons together.

4.15 Shop Demo Mode Setting

The instrument can be set to always power up in demonstration mode by setting 'Shop Demo' Mode On (this function is for use by dealers only).

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the MODE button twice, until the LCD shows 'SHOP'.
3. Press both buttons together to start to change the Shop Demo mode setting, the current value, 'OFF' (or 'ON'), will be shown flashing.
4. Select Shop Demo Mode On (or Off) by pressing either button on its own, the LCD will show 'ON' (or 'OFF') flashing.

5. Press both buttons together to save the Shop Demo Mode setting.
6. Return to the main display by pressing the ALARM button once to select the Calibration Mode End Screen, and then pressing both buttons together.

Note: After power up, the instrument will always return from Shop Demo Mode to showing data if any data is received.

4.16 Leaving Calibration Mode

To return to the main display from Calibration Mode the Calibration Mode End Screen has to be selected.

1. From any Calibration Mode menu screen press either the MODE or the ALARM button repeatedly until the LCD shows 'End?'. This is the Calibration Mode End Screen.
2. Return to the main display by pressing both buttons together.

CONTENTS

- 5.1 General
- 5.2 Test Mode
- 5.3 Fault Finding Chart

5.1 General

This instrument has been tested before shipment. However, installation conditions and procedures are outside the control of the manufacturer and can sometimes produce faults. The following check list is provided to assist the user in diagnosing such faults and suggests remedial action to be taken. The built in Test Mode will also help diagnose faults. For additional assistance, call your local dealer.

5.2 Test Mode

The Test Mode will test all the display functions.

1. Press both buttons together, and hold for more than 3 seconds, until 'rEd', 'Grn', or 'YEL' is shown on the display.
2. Press the MODE button three times, until the LCD shows 'tEst'.
3. Press both buttons together to start to set Test Mode On, the current value, 'OFF', will be shown flashing.
4. Select Test Mode On by pressing either button on its own, the LCD will show 'ON' flashing.
5. Press both buttons together to start Test Mode.

If it is decided not to start Test Mode then press either button to change the LCD back to flashing 'OFF', then press both buttons to return to showing 'tEst'. Return to the main display by pressing the ALARM button twice to select the Calibration Mode End Screen, and then pressing both buttons together.

Test Mode

The display will go through six tests. In order to move on to the next test, press the MODE button. In order to leave test mode, press the ALARM button.

First the LCD will light all the segments and the pointer will return to the zero position. The LCD will then blank.

Pointer Test

The LCD will then show the software code version, and after a few seconds the pointer will start to move backwards and forwards through its whole movement. This will be repeated until a button is pressed.

LCD Segments Test

After the pointer test, the display will show 'tSt2', and start the LCD test. This will light every one of the segments on the LCD one by one. They will then be turned off one by one until they are all off again. This will be repeated until a button is pressed.

LCD Contrast Test

After the LCD Segment test, the display will show 'tSt3' and start to swap between the two LCD contrast levels, showing 'LCd' and the contrast level. This will continue until a button is pressed.

Lighting Test

After the LCD Contrast Test, the display will show 'tSt4' and start to cycle through the various lighting levels and colours. There are four red lighting levels (r8, r4, r2, r1), three green levels (G4, G2, G1) and three yellow levels (L4, L2, L1). This will continue until a button is pressed.

NMEA Input Test

After the lighting test, the display will show 'tSt5' and start to monitor its NMEA input. It will show 'IN' and a count of the successful inputs up to five, when it will automatically step onto the next test.

If the display is receiving NMEA data, the count should happen without any actions on the user's part. If the display is powered up on its own, then its NMEA input (White) may be connected to the 12V power (Red) five times to simulate an input.

NMEA Output Test

After the NMEA Input test, the display will show 'tSt6' and step onto the NMEA output test. If the display is connected to a Databox, then it will automatically transmit messages to the Databox and monitor the NMEA input for correct replies. This will count up from 1 to 5 while showing 'OUT'. (A failure here could be a wiring or Databox problem, however.) If the display is not on a Databox, then its NMEA Output (Brown) should be connected to the NMEA Input (White) and the display will transmit directly to itself.

After a successful test, the display will automatically step on to the next test.

Button Test

After the NMEA Output test, the display will show 'tSt7', then test the two buttons, prompting with the button number. After a successful test of both buttons, the display will automatically return to normal mode.

The buzzer should beep on every button test.

5.3 Fault Finding Chart

This chart assumes that the instrument is part of a Dataline-X instrument system. If it is connected to another instrument system then perform the equivalent checks on that system.

General Display and Communications Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
All instruments have blank displays.	No 12V Power Supply.	<p>Check that the ships instrument system fuse(s) or circuit breaker(s) are not blown / tripped.</p> <p>Check the power supply wiring to the Databox.</p> <p>Check the 2.5A fuse inside the Databox. (This is the leftmost of the two fuses inside the Databox when it is viewed with the connectors at the lower edge, with the top cover removed. In order to remove the top cover to the Databox first remove the four screws in its corners.)</p> <p>Check the power supply wiring from the Databox to the instruments (the Red and Black 'Dataline' wires).</p> <p>Check for the Dataline-X instruments powering up, if not connected to the Databox, but directly to the power supply.</p> <p>Contact your dealer.</p>

<p>One or more, but not all, instruments have blank displays.</p>	<p>There is no 12V power supply to the affected instrument (s).</p>	<p>Check the power supply wiring to the affected instrument(s) (the Red and Black 'Dataline' wires). This is almost certainly the problem if more than one instrument is not functioning.</p> <p>Contact your dealer.</p>
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<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
<p>All instruments always show '----', with the pointers of analogue instruments at their zero positions.</p>	<p>No data is reaching any of the instruments.</p>	<p>Check that the battery voltage at the Databox Power Input terminals is greater than 10V.</p> <p>Check the signal wiring from the Databox to the instruments (the White and Green 'Dataline' wires). (If the lighting on any instrument can be controlled from another instrument then this is not the problem.)</p> <p>Contact your dealer.</p>
<p>One or more, but not all, instruments always show '----', with the pointers of analogue instruments at their zero positions.</p>	<p>No data is reaching the affected instrument(s).</p>	<p>Check the signal wiring to the affected instrument(s) (the White and Green 'Dataline' wires). This is almost certainly the problem if more than one instrument is affected. (If the lighting on any affected instrument can be controlled from another instrument then this is not the problem.)</p> <p>Contact your dealer.</p>
<p>All instruments show question marks on their display after they are used to set the lighting level, and the lighting level soon returns to Off, but other data is correct.</p> <p>Or:</p> <p>All instruments show question marks after setting any other data values.</p>	<p>The lighting level or other data is not reaching the Databox.</p>	<p>Check the return signal wiring to the Databox (the Brown 'Dataline' wire).</p> <p>Contact your dealer.</p>
<p>One or more instruments show question marks on their display after they are used to set the lighting level, and the lighting level soon returns to the previous level, but other data is correct, and other instruments can set the lighting level correctly.</p> <p>Or:</p> <p>One or more instruments show question marks after setting any other data values.</p>	<p>The lighting level or other data is not reaching the Databox from the affected instrument(s).</p>	<p>Check the return signal wiring from the affected instruments to the Databox (the Brown 'Dataline' wire).</p> <p>Contact your dealer.</p>

Wind Display Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
There are no Wind Speed or Wind Angle displays, or these displays always show '----'.	<p>The wind transducer is not fitted to the mast head connector.</p> <p>The wind transducer is not connected to the Databox properly.</p> <p>50mA Quick Blow 20mm fuse has blown.</p>	<p>Check, and fit the transducer if necessary.</p> <p>Check the wind transducer's connections to the Databox (especially the Green, White and Yellow 'Wind' wires).</p> <p>Check that the wind transducer cable is not damaged.</p> <p>If there is a connector at the foot of the mast check that it is not corroded and is making good contact.</p> <p>Replace the fuse.</p> <p>Contact your dealer.</p>
The Wind Speed displays always show '0.0', but the Wind Angle displays are shown.	<p>The anemometer rotor is seized.</p> <p>The wind transducer is not connected to the Databox properly.</p>	<p>Check the anemometer rotor and have the wind transducer serviced if necessary.</p> <p>Check the wind transducers connections to the Databox (especially the Red, Blue and Black 'Wind' wires).</p> <p>Make the checks as for 'no wind speed or wind angle displays' above.</p>
The Wind Speed is too low, when it was previously correct.	<p>Worn anemometer rotor.</p> <p>Damaged anemometer rotor or transducer body.</p>	<p>Check the anemometer rotor and oil the rotor bearings or have the wind transducer serviced if necessary.</p> <p>Check that the rotor and transducer are not damaged.</p> <p>Make other checks as for 'always showing 0.0' above.</p>
The Wind Speed is too high or erratic, when it was previously correct.	Damaged wiring causing intermittent contact.	Make checks as for 'always showing 0.0' above.
The Wind Speed has always been too low or too high.	The wind transducer may be poorly sited.	<p>Check the transducer location.</p> <p>Contact your dealer.</p>

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
The Wind Angle displays are incorrect.	The wind transducer is not connected to the Databox properly.	<p>Check the wind transducer's connections to the Databox (especially the Green, White and Yellow 'Wind' wires).</p> <p>Check that the wind transducer cable is not damaged.</p> <p>If there is a connector at the foot of the mast check that it is not corroded and is making good contact.</p> <p>Contact your dealer.</p>
The Wind Angle has always been incorrect.	The wind transducer is not calibrated.	<p>Calibrate the wind transducer. (Using another instrument.)</p> <p>Make checks as for 'the wind angle displays are incorrect' above.</p>

Speed and Temperature Display Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
There are no Boat Speed or Sea Temperature displays, or these displays always show '----'.	The speed transducer is not connected to the Databox properly.	<p>Check the speed transducer's connections to the Databox (especially the White and Yellow 'Speed' wires).</p> <p>Check that the speed transducer cable is not damaged.</p> <p>Contact your dealer.</p>

<p>The Boat Speed display always shows '0.0', but the Sea Temperature display is shown.</p>	<p>The speed transducer is not installed in the hull fitting.</p> <p>The speed transducer is not connected to the Databox properly.</p> <p>Jammed paddle wheel.</p> <p>Damaged paddle wheel or transducer body.</p>	<p>Check, and replace the blanking plug with the transducer if necessary.</p> <p>Check the speed transducers connections to the Databox (especially the Red, Blue and Black 'Speed' wires).</p> <p>Check that the speed transducer cable is not damaged.</p> <p>Clean the paddle wheel and transducer as required.</p> <p>Check that the paddle wheel and transducer is not damaged, and that there are not 'holes' at the end of any of the paddle wheels vanes.</p> <p>Contact your dealer.</p>
<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
<p>The Boat Speed is too low, when it was previously correct.</p>	<p>Dirty paddle wheel or hull.</p> <p>Damaged paddle wheel or transducer body.</p> <p>The paddle wheel is not aligned fore / aft within the skin fitting.</p>	<p>Clean the paddle wheel and / or the hull as required.</p> <p>Check that the paddle wheel and transducer is not damaged, and that there are not 'holes' at the end of any of the paddle wheels vanes.</p> <p>Check, and if necessary turn the transducer within the skin fitting so that the cross pin is aligned with the centre line of the vessel.</p> <p>Make other checks as for 'always showing 0.0' above.</p>
<p>The Boat Speed has always been too low or too high.</p>	<p>The speed transducer is not calibrated.</p>	<p>Calibrate the speed transducer. (Using another instrument.)</p> <p>Make other checks as for 'the speed is too low when it was previously correct' above.</p>
<p>The Boat Speed is too low or too high and cannot be corrected by calibrating the speed transducer.</p>	<p>The hull form produces exceptionally low or high water speed over the paddle.</p>	<p>Check the siting of the speed transducer.</p> <p>Contact your dealer.</p>
<p>The Boat Speed is different on each tack.</p>	<p>The hull form and transducer siting produces different water flow rates over the paddle wheel on each tack.</p>	<p>Turn the speed transducer slightly so that the cross pin is not aligned directly fore / aft, and recheck for the same speed display on both tacks. Repeat this until the correct angle is found for the same reading on each tack, and then recalibrate the transducer. (Using another instrument.)</p>

<p>The Sea Temperature display is incorrect.</p>	<p>The speed transducer is not connected to the Databox properly.</p>	<p>Check the speed transducers connections to the Databox (especially the White and Yellow 'Speed' wires).</p> <p>Check that the speed transducer cable is not damaged.</p> <p>Check that the Sea Temperature is in fact incorrect by comparing with another temperature sensor.</p> <p>Contact your dealer.</p>
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Heading and Autopilot Display Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
<p>There are no Heading or Wind Direction displays.</p>	<p>The required data is not being received from the Heading Sensor or Autopilot.</p>	<p>Check that the Heading Sensor is turned on.</p> <p>Check the Heading Sensor NMEA output specification against the instruments input specification. (See Appendix A).</p> <p>Check the Heading Sensor power supply wiring.</p> <p>Check the signal wiring from the Heading Sensor to the Databox.</p> <p>Check that the Heading Sensor is driving other remote displays correctly.</p> <p>Contact your dealer.</p>
<p>There is no Autopilot Set Course display, even though the Heading display is working.</p>	<p>The required data is not available from the Autopilot.</p>	<p>Check the Autopilot NMEA output specification against the instruments input specification. (See Appendix A).</p> <p>Make checks as for 'no heading or wind direction displays' above.</p> <p>Contact your dealer.</p>

<p>All Headings are incorrect, by the same amount.</p> <p>Note :</p> <p>When checking a Compass ensure that the check is against a deviated magnetic card compass, or against magnetic bearings, or against a good hand held compass held well away from any magnetic or ferrous objects.</p>	<p>The Heading Sensor is not aligned correctly.</p>	<p>Consult the manufacturers instructions.</p>
<p>Some or all Headings are incorrect, by different amounts.</p> <p>Note :</p> <p>When checking a Compass ensure that the check is against a deviated magnetic card compass, or against magnetic bearings, or against a good hand held compass held well away from any magnetic or ferrous objects.</p>	<p>The Heading Sensor hasn't been deviation compensated.</p> <p>Magnetic or ferrous objects have been moved into or away from the vicinity of the Heading Sensor.</p> <p>The location of the Sensor is unsuitable.</p>	<p>Recalibrate the Sensor.</p> <p>Check for possible objects that may affect the Sensor, e.g., a portable radio. If the change is permanent then recalibrate the Sensor.</p> <p>Check that the location of the Sensor is suitable, if not then resite it.</p> <p>Contact your dealer.</p>

Navigation Display Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
There are no Navigation displays, even though the Navigation Receiver is working.	The required data is not being received from the Navigation Receiver	<p>Check that the Navigation Receiver has a position fix.</p> <p>Check that the Navigation Receiver's NMEA output is set-up correctly.</p> <p>Check the Navigation Receiver's NMEA output specification against the instrument's input specification. (See Appendix A).</p> <p>Check the signal wiring from the Navigation Receiver to the Databox.</p> <p>Check that the Navigation Receiver is driving other remote displays correctly.</p> <p>Contact your dealer.</p>
There are no Waypoint Data displays, even though the Course Over Ground display is working.	The required data is not available from the Navigation Receiver.	<p>Check that the Navigation Receiver has a destination Waypoint.</p> <p>Make other checks as for 'no navigation displays', above.</p>
There is no Cross Track Error display, even though the Waypoint and Course Over Ground displays are working.	The required data is not available from the Navigation Receiver.	<p>Check that the Navigation Receiver is in Navigate Mode.</p> <p>Make other checks as for 'no waypoint displays', above.</p>
Rhumb Line/Great Circle selection changes independently, and/or the desired data is not shown, even though the other format is available.	Data of the required format is not being transmitted by the Navigation Receiver.	<p>Check that the Navigation Receiver is set to the same navigation mode, and is set up to transmit the correct navigation format.</p> <p>Contact your dealer.</p>
True / Magnetic Course Over Ground and Waypoint Bearing data is not shown, even though the other format is available.	Data of the required format is not being transmitted by the Navigation Receiver.	<p>Check that the Navigation Receiver is set to the same navigation mode, and is set up to transmit the correct navigation format.</p> <p>Contact your dealer.</p>

Other Faults

<u>Condition</u>	<u>Probable Cause</u>	<u>Action</u>
The external alarm does not sound.	<p>The alarm is not turned on, or the values are not as desired.</p> <p>The external alarm sounder is not connected to the Databox properly.</p> <p>The external alarm sounder is not suitable.</p> <p>The external alarm sounder is not working.</p>	<p>Check that the desired alarm is turned on and has the correct value.</p> <p>Check the alarms' connections to the Databox.</p> <p>Check that the alarm sounder does not require more current or a higher voltage than is available.</p> <p>Check with the alarm sounder driven directly from a suitable power supply.</p> <p>Contact your dealer.</p>
There are missing Engine Hour or Battery Voltage displays, or the Engine Hour counts don't work, or these displays always show '----'.	<p>The engine hour / sat nav set ups are incorrect.</p> <p>The engine hour / battery voltage inputs are not connected to the Databox properly.</p>	<p>Check the set up, and correct if necessary. (Using another instrument.)</p> <p>Check the connections to the Databox, and correct if necessary.</p> <p>Check that the engine inputs are active when the engines are turned on.</p> <p>Contact your dealer.</p>
Condensation forms inside the instrument.	Slight internal moisture.	Turn the lights to Level 7 and leave on until cleared.

CONTENTS

- 6.1 General Maintenance
- 6.2 Annual Maintenance
- 6.3 Removal of Instrument
- 6.4 Return for Service

6.1 General Maintenance

The instrument head will require no maintenance apart from occasional cleaning. Do this using fresh water and a mild soap solution (not a detergent).

CAUTION

DO NOT USE ANY ABRASIVES, CHEMICAL CLEANERS, PETROL OR DIESEL TO CLEAN THIS UNIT.

6.2 Annual Maintenance

1. Check all connections to the instrument and, if necessary, cover with silicone grease or petroleum jelly.

6.3 Removal of Instrument

1. If rear access is possible unplug the Dataplug connectors from the rear of the instrument. If the connection needs to be made up then the two wires may be joined using one of the connectors as a terminal block.
2. Remove the outer cover. This can be done by squeezing the instrument sides between finger and thumb and applying an upward pressure. At the same time, place a flat-bladed screwdriver between the bulkhead (or panel) and the cover, and carefully rotate.
3. Remove the cover and the four corner fixing screws.

4. Pull the instrument free from the surface, being careful not to strain the wiring if the connectors have not yet been removed.
5. If they are not yet removed, unplug the Dataplug connectors from the rear of the case, and make up the cable if necessary.

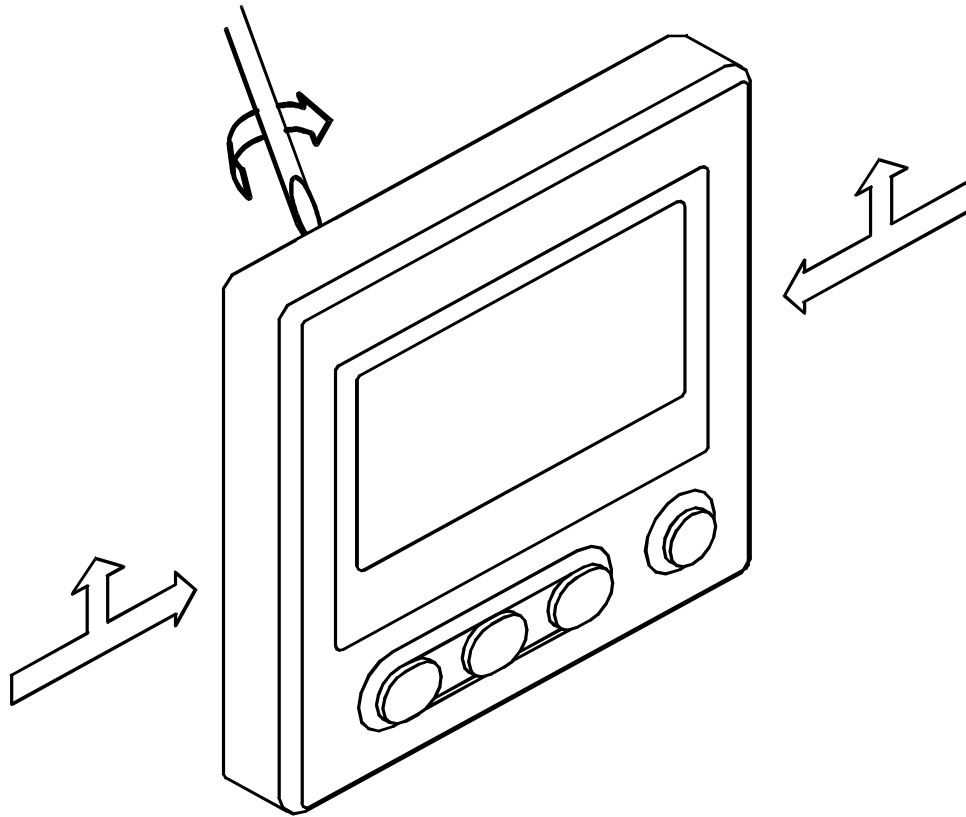


Figure 6.1 - Removal of Instrument

6.4 Return for Service

Please ensure that an instrument that is believed to be faulty is correctly installed, the wiring is in good condition and correct, that all connections are secure, and that a 12V supply is present at its power input terminals.

Should the unit have to be returned to your dealer, adequate packing must be used. Please ensure that your name, telephone number, return address, a clear fault description, and if possible a copy of the receipt of purchase are included with any returned equipment. Simrad Ltd. and their representatives are not responsible for any equipment lost in transit.

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Please quote the instrument's serial number in all correspondence. This may be found on the rear of the instrument.

The NMEA 0183 messages that are received by the WIND display are as below:

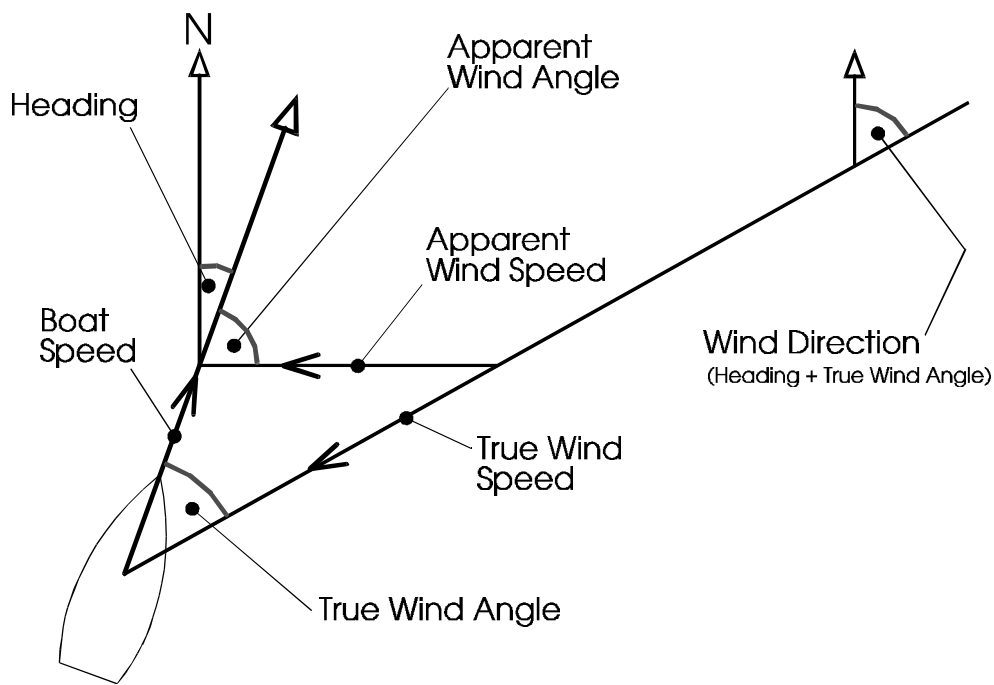
VWR = Apparent Wind Speed and Angle

VHW = Boat Speed (Knots Field)

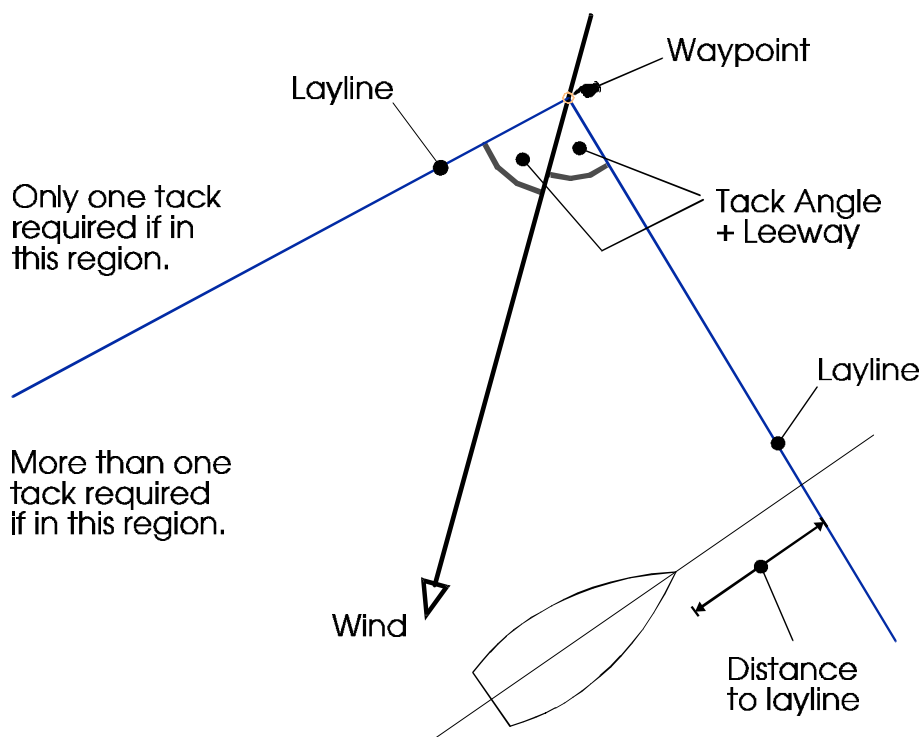
VHW = Heading (Magnetic)
HDM

VTG = Course Over Ground (Magnetic)

—



Apparent + True Wind and Wind Direction



Note:

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The Tack Display does not allow for the tide in the calculation of the distance to Layline. This may make the distance incorrect in some situations.