

# **ST60 Graphic Display**

## Operating Guide

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# Important information

## About the documentation

Welcome to the Raymarine ST60 Graphic Display.

The documentation for your ST60 Graphic Display is arranged so that you can install, commission and quickly use your Display, keeping to hand only the information necessary.

- **Installation Guide** - One easy-to-understand sheet guides you through the installation process. This sheet can be discarded once the installation is complete.
- **Commissioning Guide** - Describes how to connect and setup your ST60 Graphic Display.
- **Quick Start Guide** - Once your ST60 Graphic Display has been commissioned, this handy guide to the main operations enables you to use it right away.
- **Operating Guide** (this book) - Contains a detailed description of your ST60 Graphic Display's features and functions.

## Safety notices



### **WARNING: Product installation & operation**

This equipment must be installed and operated in accordance with the Raymarine instructions provided. Failure to do so could result in poor product performance, personal injury and/or damage to your boat. .



### **WARNING: Electrical safety**

Make sure you have switched off the power supply before you start installing this product.



### **WARNING: Navigation aid**

This unit is only an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions, and improper handling or use. It is the user's responsibility to exercise common prudence and navigational judgements. This unit should not be relied upon as a substitute for such prudence and judgement. Always maintain a permanent watch so you can respond to situations as they develop.

**CAUTION: Calibration requirement**

The ST60 Graphic Display is calibrated to factory (default) settings when first supplied. To ensure optimum performance on your boat, this product must be setup before use. Do NOT use the product until it has been setup using the procedures in *Chapter 2, Preparation for Use of the ST60 Graphic Display Commissioning Guide*.

**EMC conformance**

All Raymarine equipment and accessories are designed to the best industry standards for use in the recreational marine environment.

The design and manufacture of Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised.

**Product information**

To the best of our knowledge, the information in this book and other product documentation was correct when printed. However, our policy of continuous product improvement and updating may change product specifications without notice, so unavoidable differences may occur between the product and the information supplied with it.

Raymarine cannot accept liability for inaccuracies or omissions in any product documentation.

**Warranty**

To register your new Raymarine product, please take a few minutes to fill out the warranty card. It is important that you complete the owner information and return the card to the factory to receive full warranty benefits.

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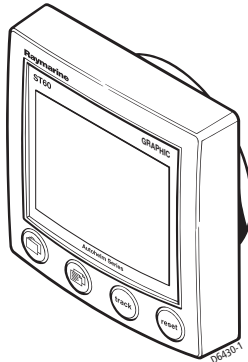
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# Chapter 1: Operation

## 1.1 Introduction

The Raymarine ST60 Graphic Display uses a high-quality dot-matrix screen to display wide a range of data, both from Raymarine via SeaTalk, and from other equipment via NMEA.

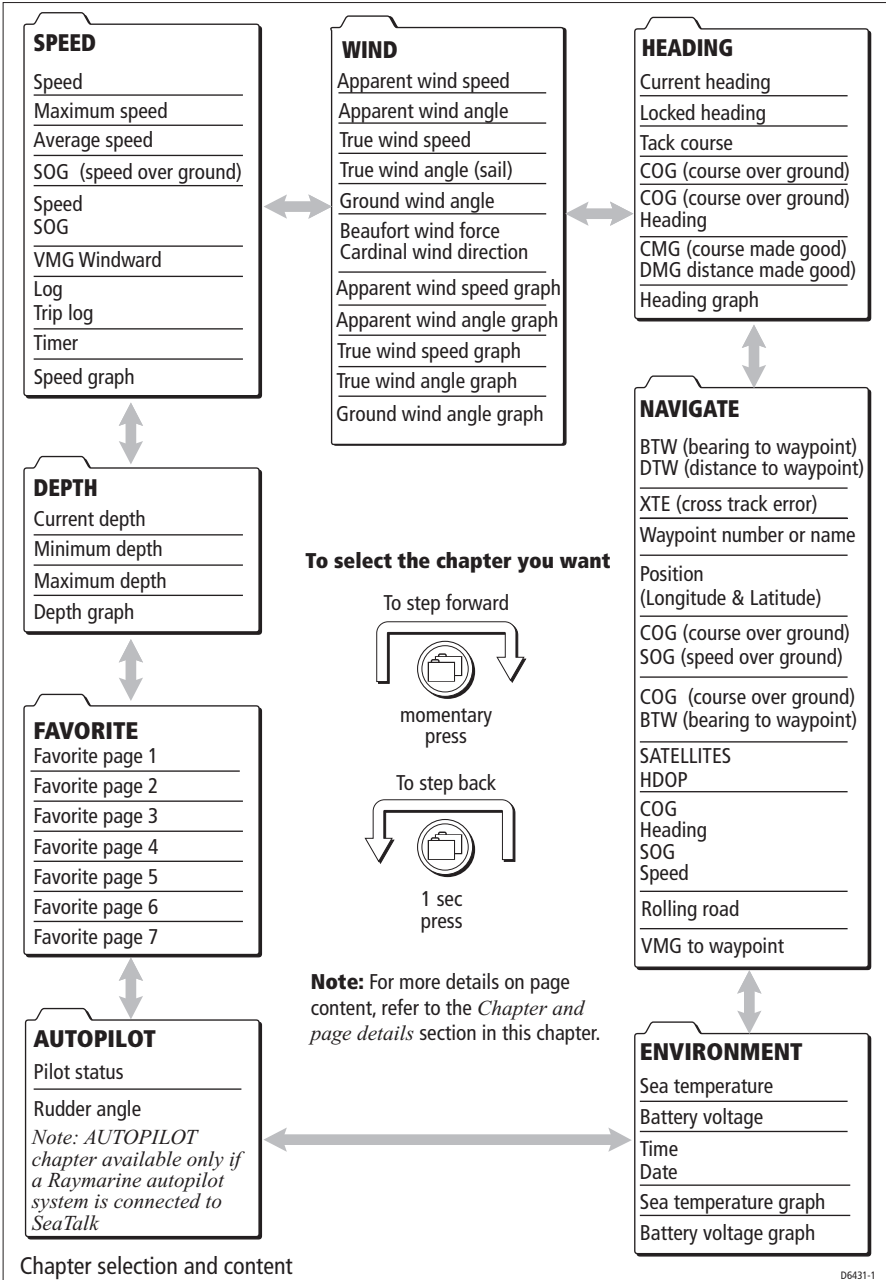
The ST60 Graphic Display can also supply SeaTalk data to NMEA 0183.



## 1.2 What information can I see?

The exact information available for display depends on what data is available and on how the display has been set up.


Information on the ST60 Graphic Display is organized in groups or 'chapters', and within each chapter, the different types of information are presented as pages. The ST60 Graphic Display chapters and pages are shown in the following *Chapter selection and content* illustration. This illustration assumes a system where all information sources are available and all pages are enabled.






### 1.3 How can I display the information I want?

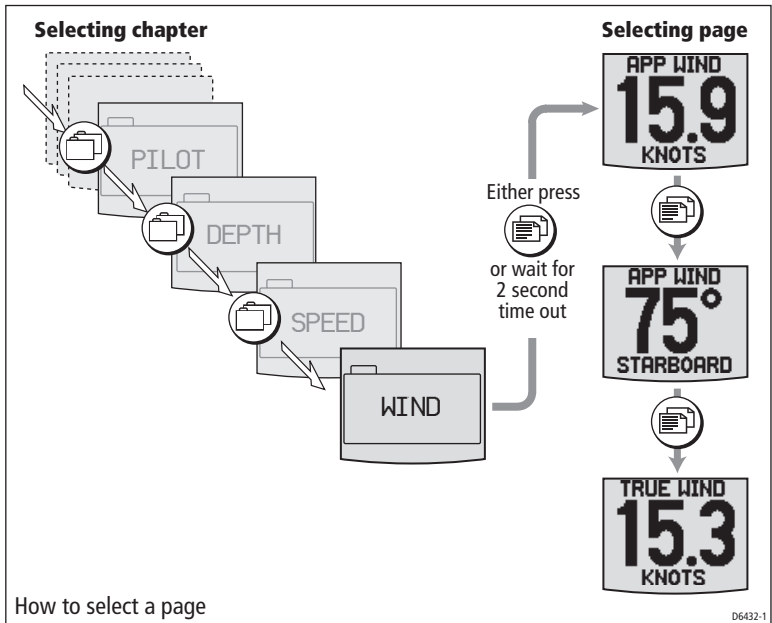
To see the information you want, refer to the *Chapter selection and content* diagram above, to determine the location of the information you need (i.e. which chapter and page it is in), then:

1. Press the  button the necessary number of times, to select the required chapter. If the chapter title facility is enabled (see *How can I customize my display?*), the name of each chapter is briefly displayed when it is first selected.

**Note:** Although most chapter names are displayed in full, the Environment chapter is abbreviated to *ENVIRONS* and the Autopilot chapter is abbreviated to *PILOT*.

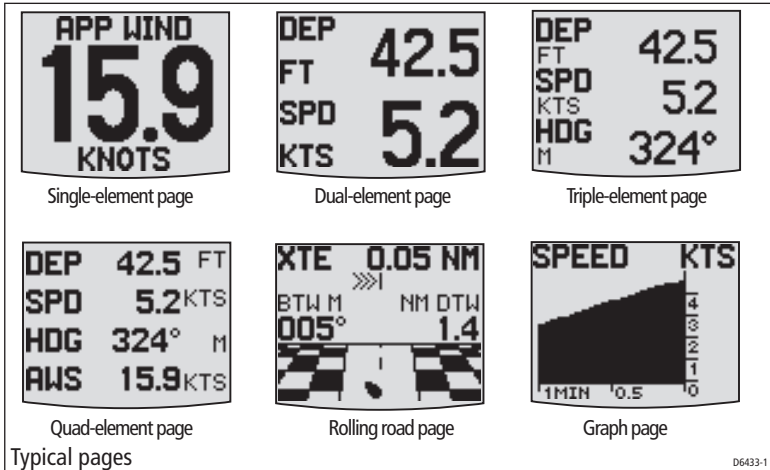
2. With the appropriate chapter selected, use the  button to select the required page.

The manner in which information is accessed is shown in the following illustration This shows (as an example) how to display true wind speed information.



### How is data presented?

The ST60 Graphic Display pages show either 1, 2, 3 or 4 data elements in alphanumeric form. In addition, single-element pages can also show graphic information, such as a rolling road.



### Rolling road

The rolling road is a representation of your vessel’s position with respect to a waypoint, and a steer bar shows the direction you should steer to achieve the required course. The number of arrows in the steer bar is proportional to the amount of cross track error; each arrow represents 0.05 nm of error.

The direction of the roll indicates whether you are moving towards or away from the waypoint. A small boat graphic indicates the attitude of your boat with respect to the waypoint.

Cross track error (XTE) information, bearing to waypoint (BTW) information and distance to waypoint (DTW) information are displayed with the rolling road.

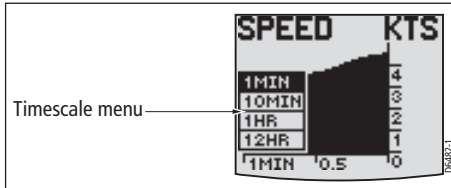
### Graphs

You can see the history of some information by displaying it as a graph, of data against time. Refer to the *Chapter selection and content* illustration above and the following tables to see where to find the various graphs.

## Changing graph timescales

You can change the timescale of each graph. To do this:

1. With the graph displayed, hold down the **reset** button for 1 second, so that the timescale menu is displayed.



2. Use the **reset** button to select the timebase value you want.
3. Hold down the **reset** button for 1 second, to return to the normal display.

## Chapter and page details

This section lists all the available pages along with titles and salient points.

**Note:** *The units in which SeaTalk data is displayed, are derived from SeaTalk. The units in which NMEA data is displayed, and the choice of magnetic or true bearing information, are determined during User calibration. See How can I customize my display? on page 14.*

## Depth chapter

| Page          | Remarks  |
|---------------|--|
| DEPTH         | Current depth, displayed in either FEET, METERS or FATHOMS. An up arrow is displayed if the sea-bed is rising, and a down arrow is displayed if the sea-bed is falling. If the depth echo is lost, the title is LAST DEPTH and the last valid depth reading is shown flashing. |
| MIN DEPTH     | Minimum depth since power up or last reset, in either FEET, METRES or FATHOMS. Hold down the <b>reset</b> button for 3 seconds, to reset.  |
| MAX DEPTH     | Maximum depth since power up or last reset, in either FEET, METERS or FATHOMS. Hold down the <b>reset</b> button for 3 seconds, to reset.  |
| DEPTH (graph) | Depth information in either FEET, METERS or FATHOMS, displayed against time, as a graph.   |

## Speed chapter

| Page          | Remarks   |
|---------------|---|
| SPEED         | Boat speed, displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).   |
| MAX SPEED     | Maximum speed since power up or last reset, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS). Hold down the <b>reset</b> button for 3 seconds, to reset to the current speed.   |
| AVG SPEED     | Average speed since power up or last reset, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).   |
| SOG           | Speed over ground, displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).  |
| SPD<br>SOG    | Dual page showing Speed and Speed over ground   |
| VMG TO WIND   | Velocity made good to windward, displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).   |
| LOG<br>TRIP   | Dual page showing the boat log (total distance covered since the system was installed) and the trip log (distance covered since power up or last reset). Distances are shown in kilometers (KM), or nautical miles (NM).  |
| RACE TIME     | Either a count-down timer which shows time remaining to zero (race start) or a count-up timer which shows current count-up time (after race start), in either seconds (S), minutes (M) or hours (H). This information is repeated from SeaTalk. You can control the timer from the master timer instrument on SeaTalk (typically ST60 Speed or ST290 digital instrument). You cannot control the timer from the ST60 Graphic Display. |
| SPEED (graph) | Speed information in kilometers per hour (KMH), meters per second (M/S), or knots (KTS), displayed against time, as a graph.  |

## Wind chapter

| Page              | Remarks  |
|-------------------|--|
| APP WIND (speed)  | Apparent wind speed, in either kilometers per hour (KMH), meters per second (M/S), or knots (KTS)                                      |
| APP WIND (angle)  | Apparent wind angle, in degrees. Shows a STARBOARD indicator when the boat is on a starboard tack and a PORT indicator on a port tack. |
| TRUE WIND (speed) | True wind speed, in either kilometers per hour (KMH), meters per second (M/S), or knot (KTS).  |
| TRUE WIND (angle) | True wind angle, in degrees.   |

| <b>Page</b>        | <b>Remarks</b>  |
|--------------------|---|
| GROUND WIND        | Direction of wind over ground, in degrees, either MAG(netic) or TRU(e).   |
| WIND FORCE         | Wind speed as a Beaufort scale value and wind direction as a cardinal compass point.  |
| A WIND (graph)     | Apparent wind speed in either kilometers per hour (KMH), meters per second (M/S), or knots (KTS), displayed against time, as a graph. |
| A WIND ANG (graph) | Apparent wind angle information in degrees, displayed against time, as a graph.   |
| T WIND (graph)     | True wind speed in either kilometers per hour (KMH), meters per second (M/S), or knots (KTS), displayed against time, as a graph.     |
| T WIND ANG (graph) | True wind angle in degrees, displayed against time, as a graph.   |
| WIND DIR (graph)   | Ground wind direction in degrees, displayed against time, as a graph. Shown as either T(rue) or M(agnetic).                           |

## Heading chapter

| <b>Page</b>   | <b>Remarks</b>   |
|---|--|
| HEADING   | Current heading, in degrees, either TRUE or MAG(netic).  |
| HEADING   | Shows whether the heading is LOCKED or UNLOCKED.   |
| TACK COURSE   | Next tack heading, in degrees, either TRUE or MAG(netic).  |
| COG   | Course over ground, in degrees, either TRUE or MAG(netic).   |
| COG<br>HDG  | Dual page showing course over ground and current heading   |
| CMG<br>DMG  | Dual page showing course made good, in degrees, true (T) or magnetic (M), and distance made good, in either kilometers (KM), statute miles (SM), or nautical miles (NM). |
| <b>Note:</b> <i>To reset CMG and DMG, hold down <b>reset</b> for 3 seconds.</i> |  |
| HEADING (graph)   | Heading angle in degrees, displayed against time, as a graph. Shown as either T(rue) or M(agnetic).  |

## Navigate chapter

| Page                     | Remarks   |
|--------------------------|---|
| BTW<br>DTW               | Dual page showing bearing to waypoint, in degrees, ether TRUE or MAG(netic), and distance to waypoint, in kilometers (KM), statue miles (SM), or nautical miles (NM).   |
| XTE                      | Cross track error in kilometers (KM), statue miles (SM), or nautical miles (NM). A steering bar shows the direction to steer. The number of arrows in the bar is proportional to the amount of cross track error.   |
| WAYPOINT                 | Waypoint number and name displayed.   |
| POSITION                 | Current latitude and longitude.   |
| COG<br>SOG               | Dual page showing course over ground, in degrees, either TRUE or MAG(netic), and speed over ground, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).   |
| COG<br>BTW               | Dual page showing course over ground, and bearing to waypoint, in degrees, either TRUE or MAG(netic)  |
| SATELLITES<br>HDOP       | Dual page showing GPS information. Number of satellites tracked and horizontal dilution of position.  |
| COG<br>HDG<br>SOG<br>SPD | Quad page showing: <ul style="list-style-type: none"> <li>• Course over ground, in degrees, either TRUE or MAG(netic).</li> <li>• Current heading, in degrees, either TRUE or MAG(netic).</li> <li>• Speed over ground, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).knots (KTS).</li> <li>• Current speed through the water, in kilometers per hour (KMH), miles per hour. (MPH), or knots (KTS).</li> </ul> |
| Rolling road             | Rolling road graphic along with XTE, steer bar, BTW and DTW.  |
| VMG TO WP                | Velocity made good towards waypoint   |

## Environment chapter

| Page              | Remarks   |
|-------------------|---|
| SEA TEMP          | Sea temperature in either °C or °F.   |
| BATTERY           | Battery voltage.  |
| TIME & DATE       | Current time, as either 12- or 24-hour clock, set during User calibration (see <i>How can I customize my display?</i> on page 14, below).<br>Current date, in either USA or European format, as set during User calibration (see <i>How can I customize my display?</i> on page 14, below). |
| SEA TEMP (graph)  | Sea temperature, displayed against time, as a graph. Shown in either °C or °F.  |
| BATT VOLT (graph) | Battery voltage, displayed against time, as a graph.  |

## Autopilot chapter


| Page           | Remarks  |
|----------------|--|
| PILOT (status) | Autopilot current status. Either standby (STBY), AUTO mode, VANE mode or track (TRK) mode. |
| RUDDER         | Rudder angle, in degrees either P(ort) or S(tarboard).                                     |

## Favorite chapter

See *How can I easily access information I use most often?* below.

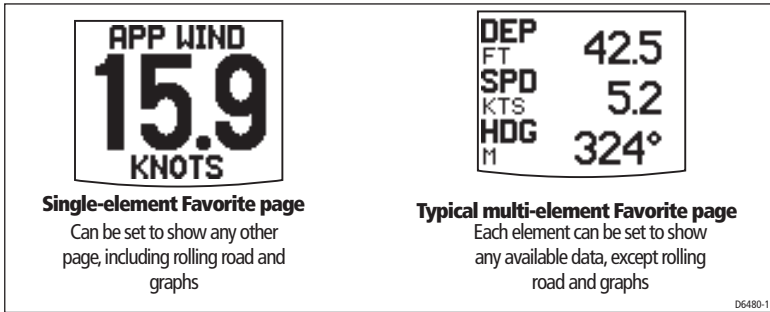
## How can I easily access information I use most often?

A FAVORITE chapter enables you to group together, information you use most often. You can include information from any other chapter as a page in the Favorite chapter, up to a maximum of seven Favorite pages.

To see the Favorite pages, use the  button to select the FAVORITE chapter and the  button to select the required Favorite pages.

You can set up each Favorite page in any one of the following formats:

- Single element. You can set a single element Favorite page to show any page from any other chapter, including rolling road, graphs and existing double, triple and quad-element pages.
- Multi-element pages. On multi-element Favorite pages you can set the data in each element individually, to create your own dual, triple and quad-element Favorite pages. You cannot include the rolling road or graphs on multi-element pages.




## Setting up Favorite pages



As there are seven Favorite pages, you may like to use these to display data from each of the other chapters. So for example, on Favorite page 1, you could show selected data from the Depth chapter, Favorite page 2 could show selected Speed data, and so on.

To setup the data you want on each Favorite page:

1. With the FAVORITE chapter displayed, select the page you want to set up.
2. Hold down the **track** and **reset** buttons for approximately 2 seconds, to enter the Favorite page setup mode.
3. Use the **reset** button to show the format you want, i.e. single element, dual element, triple element or quad element. One element is highlighted (white text on a black background), to show that is selected for adjustment.
4. If you have chosen a multi-element page, use the **track** button to move the highlight to the page element you want to set up.
5. Use the  button to cycle to the data you want.
6. If you want to set up another element on this page, repeat steps 4 and 5.
7. Hold down the **track** and **reset** buttons for approximately 2 seconds, to leave the Favorite page setup mode.
8. Repeat the above procedure for all Favorite pages you want to set up.

Refer to *How can I customize my display?* later in this chapter, for details of how to set up:

- How many Favorite pages are displayed.
- Whether Favorite pages roll around automatically or you select them manually.



## 1.4 What is the track button for?

If your system includes a SeaTalk autopilot working in conjunction with a track plotter, you can operate the track plotter in track mode, as follows:

1. Press the **track** button once, so the track plotter enters track mode.
2. In track mode, to pbt a track to the next waypoint, hold down the **track** button for 1 second.
3. To leave track mode, press the **track** button again.

## 1.5 How can I tell what my autopilot is doing?

If a Raymarine Autopilot is connected to SeaTalk, you can use the Autopilot chapter to show the current pilot status. You can also set the ST60 Graphic Display to show the autopilot status, on pop-up pages, whenever the autopilot status changes, (see *How can I customize my display?*, below).

Examples of instances when a pilot pop-up can occur are:

- Engage autopilot
- Disengage autopilot
- Change of course
- Enter track mode
- Enter vane mode

Autopilot pop-up pages have a border to distinguish them from the other pages, and are displayed for 5 seconds.

## 1.6 What alarm messages can be displayed?

The ST60 Graphic Display supports a range of SeaTalk alarm signals and responds with an internal buzzer and an appropriate on-screen alarm message.

In addition to this, the ST60 Graphic Display can also provide external alarm signals for the Auxiliary Alarm option.

The range of available alarms depends on:

- What data is available on SeaTalk.
- Which alarms are enabled during User calibration (see *How can I customize my display?* below).

## Internal alarms

The internal alarms are as follows:

| Message                                   | Meaning   |
|---|---|
| ANCHOR ALARM (with current depth)         | Deep or shallow anchor alarm  |
| SHALLOW ALARM (with current depth)        | Shallow water alarm   |
| DEEP ALARM (with current depth)           | Deep water alarm  |
| HIGH WIND ALARM (with current wind speed) | High wind speed alarm   |
| RADAR ALARM                               | Radar guard zone alarm  |
| LOST FIX ALARM                            | Lost fix alarm  |
| LOW BATTERY ALARM (with current voltage)  | The battery voltage has fallen below the specified low-voltage level. |

## External alarms

An optional Auxiliary Alarm can be fitted at a convenient remote position, to give a loud, audible indication if any one of a range of alarms occurs. This option is particularly useful for situations where high ambient noise may make it difficult to hear the instrument's internal alarm (e.g. aboard a power boat).

**Note:** *An Auxiliary Alarm cannot be used if the **NMEA OUT** port is being used for NMEA data.*

## What must I do if an alarm occurs?

If an alarm occurs, investigate the cause immediately and if possible, take appropriate action to remove the cause of the alarm. If an alarm message is displayed, use this to guide your course of action.

## Silencing internal alarms



You can silence an internal alarm by pressing any one of the ST60 Graphic Display front panel buttons. Remember though, that removing the alarm sound does not remove the cause of an alarm. If the alarm condition persists, the alarm will recur.

## Silencing external alarms

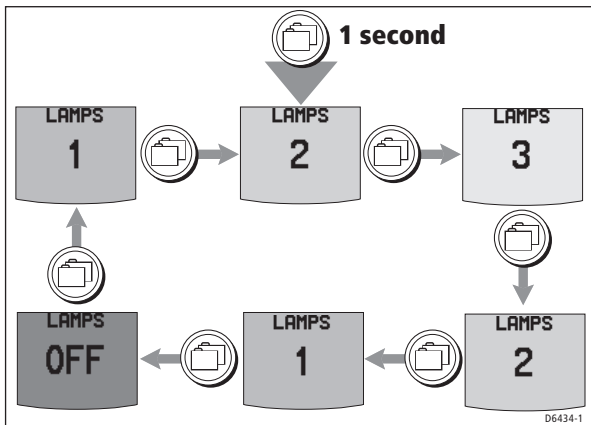
Most external alarms can be silenced only at the alarm-initiating device e.g. autopilot, GPS or master instrument. Exceptions to this are the LOST FIX ALARM and the LOW BATTERY ALARM, which can be silenced by pressing any of the ST60 Graphic Display front panel buttons.

### 1.7 How do I adjust the display backlighting?

When the instrument is first powered up, the display backlighting is set to its lowest (courtesy) level, to facilitate initial access to the buttons. To adjust the level of backlighting:



1. Hold down the  button for approximately 1 second, to enter the backlighting-adjust mode.
2. There are four preset backlighting levels. Momentarily press the  button to cycle through these levels until you reach the level you want.
3. Press any other button to leave the backlighting-adjust mode.

**Note:** *The display will time out to normal operation 5 seconds after the last button press.*

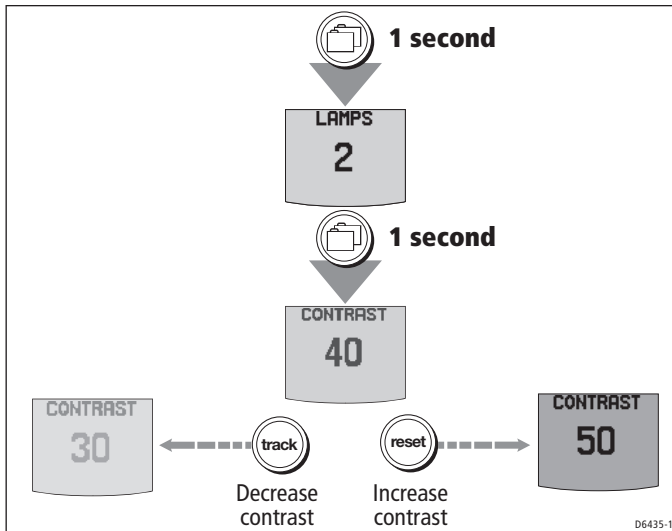


## 1.8 How do I adjust the display contrast?

To adjust the display contrast:

1. Hold down the  button for approximately 1 second, to enter backlighting-adjust mode.
2. While in backlighting-adjust mode, hold down the  button for approximately 1 second, to enter the contrast-adjust mode.
3. Use the **track** or **reset** button to set the contrast to the required level.
4. Press the **page** button to leave the contrast-adjust mode.

**Note:** The display will time out to normal operation 5 seconds after the last button press.



## 1.9 Can I remotely control my ST60 Graphic Display?

The ST60 Graphic Display does not support the SeaTalk remote control facility. You can only control the display with the front panel buttons.

## 1.10 How can I customize my display?



A User calibration facility enables you to:

- Set the Favorite page rollover period, or switch the rollover off.
- Switch chapter titles on or off.



- Set whether headings are displayed in true or magnetic form.
- Set the voltage at which a battery alarm will occur.
- Enable/disable individual local alarms.
- Set the date format.
- Set the time format.
- Set the instrument time to local time.
- Select the units in which temperature, speed, trip, depth and wind speed from NMEA are displayed.
- Select the function of the display **NMEA OUT** connector. This is either
  - A remote alarm output for the Auxiliary Alarm (NMEA OFF).or
  - NMEA output signals.
- Enable/disable individual remote alarms.
- Enable/disable the pilot pop up display.
- Configure the instrument to display specific pages.

## Procedure

To carry out the required setup procedure:

1. Hold down the  and  buttons for approximately 2 seconds so that the User calibration entry screen is displayed.

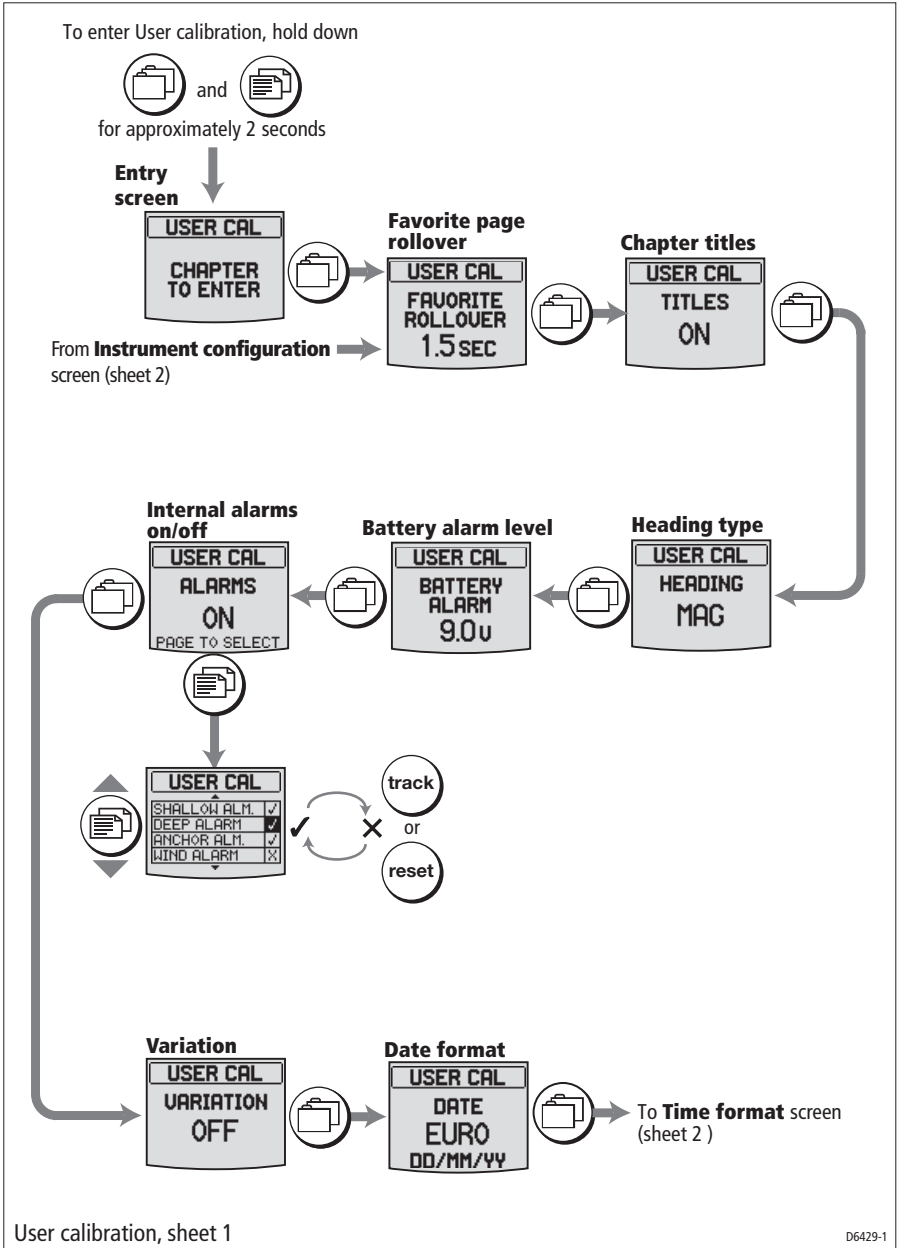
**Note:** *The User calibration entry screen will time out to the main display after 7 seconds.*

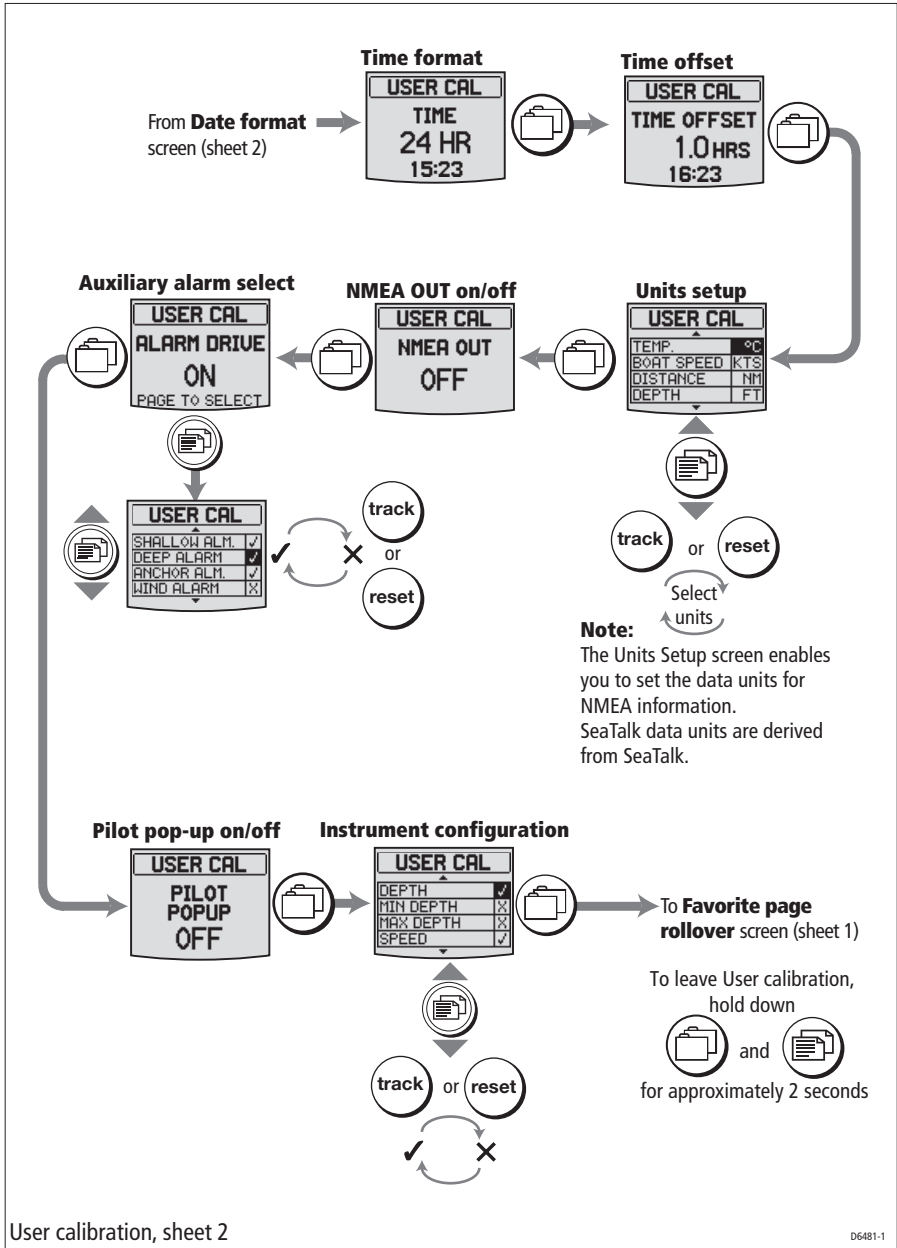
2. Press the  button to enter User calibration.
3. Referring to the *User calibration* diagram below, use the  button to cycle to the required screen, then set the required values as described below.

## Favorite page rollover

Use the **track** or **reset** button to set the required Favorite page rollover period, from 0.5 s to 20 s. Press the **track** button to reduce the rollover period and the **reset** button to increase it.

If you want to be able to select Favorite pages manually as for other chapters, use the **track** button to reduce the value of the rollover until OFF is displayed.





## Chapter titles

Use the **track** and **reset** buttons to select either:

- ON so that each chapter title is briefly displayed when the chapter is selected during normal operation,
- or
- OFF if you do not want chapter titles to be displayed.

## Heading type

Use this to define how heading values are displayed. Use the **track** and **reset** buttons to select either magnetic (MAG) or true (TRUE). If a variation value is not available on SeaTalk, then MAG is selected permanently.

## Battery alarm threshold

Use the **track** and **reset** buttons to set the required voltage alarm threshold, in the range 9 V to 14 V. Press the **track** button to reduce the level and the **reset** button to increase it.



The recommended value is 10.5 VOLTS.

If you want to switch off the battery alarm, Press the **track** button to reduce the level until OFF is displayed.

## Internal alarms on/off

Use the **track** or **reset** button to set the internal ALARMS OFF if you do not want the ST60 Graphic Display to give alarm indications. Otherwise, set it ON.

If you have set the ALARMS ON, set the individual internal alarms as follows:


1. Press the  button to display the list of alarms. The first alarm is highlighted, to indicate you can adjust it.
2. Use the **track** or **reset** button to either enable (✓) or disable (✗) the highlighted alarm.
3. Use the  button to move the highlight to each alarm in turn, and either enable or disable it, as described in step 2.


**Note:** *External alarms (see Auxiliary Alarm select below) will occur, irrespective of the internal alarm settings.*



## Variation

If an external magnetic variation value is available from SeaTalk or NMEA, this will be used by the ST60 Graphic Display.

If an external variation input is not available, use the  button to set VARIATION ON, then use the **track** and **reset** buttons to set the correct magnetic variation value.

If you do not want to display the variation value, use the  button to set VARIATION OFF.

## Date format

Use the **track** or **reset** button to select the required date format. Either United States (MM/DD/YY) or European (DD/MM/YY).

## Time format

Use the **track** or **reset** button to select either 12-hour or 24-hour time format.

## Time offset

Use the **track** or **reset** button to apply an appropriate offset to set your system time to local time. You can set any offset in the range -12 hours to +12 hours, in half-hour increments. The time with the offset applied is shown at the bottom of the screen.


## Units setup

The units in which SeaTalk data is displayed, are determined by the respective master instruments. However, as the ST60 Graphic Display can also display NMEA data, the Units setup screen enables you to set the units for this data.

You can set:

- TEMP. (temperature) units to either °C or °F.
- BOAT SPEED units to either knots (KTS), kilometers per hour (KMH) or miles per hour (MPH).
- DISTANCE units to either nautical miles (NM), kilometers (KM) or statute miles (SM).
- DEPTH units to either feet (FT), fathoms (FA) or metres (M).
- WIND SPEED units to either knots (KTS) or metres per second (M/S).

### Setting units

With the *Units setup* screen displayed, use the  button to move to each data type in turn and for each, use the **track** or **reset** button to select the required unit.

### NMEA OUT on/off

The NMEA OUT on/off screen enables you to set which function the **NMEA OUT** connector provides. This is either:

- NMEA data out.  
or
- Alarm signals for the Auxiliary Alarm.


If want to output NMEA data, use the **track** or **reset** button to select ON. If you want to output alarm signals to the Auxiliary Alarm, select OFF.

### Auxiliary Alarm select

Use the ALARM DRIVE screen to determine which alarms you want to sound at the Auxiliary Alarm.

**Note:** *The **NMEA OUT** function must be OFF, to enable the Auxiliary Alarm to be used.*

Use the **track** or **reset** button to set the ALARM DRIVE OFF, if you do not want any alarms to sound at the Auxiliary Alarm. Otherwise, set it ON .

If you have set the ALARM DRIVE ON, use the  button to move to each alarm in turn and for each, use the **track** or **reset** button to either enable (✓) or disable (✗) the alarm.


### Pilot pop-up

Use the **track** or **reset** button to set the PILOT POPUP either ON or OFF, as required.

### Instrument configuration

You can streamline the operation of the instrument by defining which pages are available for display on a day-to-day basis, and switching off pages you do not wish to see.

Use the Instrument configuration page to define which pages are available during normal operation, as follows:

1. Use the  button to cycle through the pages. Each page is identified by a coded title, as detailed in the table below.
2. As each page is displayed, use the **track** and **reset** buttons to toggle the page ON or OFF.

| <b>Title</b> | <b>Page affected</b>              | <b>Chapter</b> |
|--------------|-----------------------------------|----------------|
| DEPTH        | Current depth                     | Depth          |
| MIN DEPTH    | Minimum depth                     | Depth          |
| MAX DEPTH    | Maximum depth                     | Depth          |
| DEPTH GRAPH  | Depth graph                       | Depth          |
| SPEED        | Boat speed                        | Speed          |
| MAX SPEED    | Maximum speed                     | Speed          |
| AVG SPEED    | Average speed                     | Speed          |
| SOG          | Speed over ground                 | Speed          |
| SPD & SOG    | Speed and speed over ground       | Speed          |
| VMG TO WIND  | Velocity made good to windward    | Speed          |
| TRIP LOG     | Log and trip log                  | Speed          |
| RACE TIMER   | Race timer                        | Speed          |
| SPEED GRAPH  | Speed graph                       | Speed          |
| A WIND SPEED | Apparent wind speed               | Wind           |
| A WIND ANGLE | Apparent wind angle               | Wind           |
| T WIND SPEED | True wind speed                   | Wind           |
| T WIND ANGLE | True wind angle                   | Wind           |
| GROUND WIND  | True wind direction (over ground) | Wind           |
| WIND FORCE   | Beaufort/cardinal                 | Wind           |
| AWS GRAPH    | Apparent wind speed graph         | Wind           |
| AWA GRAPH    | Apparent wind angle graph         | Wind           |
| TWS GRAPH    | True wind speed graph             | Wind           |



| <b>Title</b>  | <b>Page affected</b>                         | <b>Chapter</b> |
|---------------|--|----------------|
| TWA GRAPH     | True wind angle graph                        | Wind           |
| GWD GRAPH     | Ground wind angle graph                      | Wind           |
| HEADING       | Current heading                              | Heading        |
| LOCKED HDG    | Locked heading                               | Heading        |
| TACK COURSE   | Tack heading                                 | Heading        |
| COG           | Course over ground                           | Heading        |
| HDG & COG     | Course over ground and heading               | Heading        |
| CMG & DMG     | Course made good and distance made good      | Heading        |
| HEAD GRAPH    | Heading graph                                | Heading        |
| BTW & DTW     | Bearing to waypoint and distance to waypoint | Navigate       |
| XTE           | Cross track error                            | Navigate       |
| WAYPOINT      | Waypoint identity                            | Navigate       |
| POSITION      | Latitude/longitude                           | Navigate       |
| COG & SOG     | Course over ground and speed over ground     | Navigate       |
| COG & BTW     | Course over ground and bearing to waypoint   | Navigate       |
| GPS INFO      | Satellites and HDOP                          | Navigate       |
| TIDE INFO     | COG, heading, SOG and speed                  | Navigate       |
| ROLLING ROAD  | Rolling road                                 | Navigate       |
| VMG TO WP     | Velocity made good towards waypoint          | Navigate       |
| SEA TEMP      | Sea temperature                              | Environment    |
| BATTERY       | Battery voltage                              | Environment    |
| TIME & DATE   | Time and date                                | Environment    |
| S. TEMP GRAPH | Sea temperature graph                        | Environment    |
| VOLTS GRAPH   | Battery voltage graph                        | Environment    |
| PILOT STATUS  | Pilot status                                 | Pilot          |
| RUDDER ANGLE  | Rudder Angle                                 | Pilot          |
| FAVORITE 1    | Favorite page 1                              | Favorite       |

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| <b>Title</b> | <b>Page affected</b> | <b>Chapter</b> |
|--------------|----------------------|----------------|
| FAVORITE 2   | Favorite page 2      | Favorite       |
| FAVORITE 3   | Favorite page 3      | Favorite       |
| FAVORITE 4   | Favorite page 4      | Favorite       |
| FAVORITE 5   | Favorite page 5      | Favorite       |
| FAVORITE 6   | Favorite page 6      | Favorite       |
| FAVORITE 7   | Favorite page 7      | Favorite       |

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## **Leaving User calibration**

Hold down the  and  buttons for 2 seconds, to save your settings, exit User calibration and resume normal operation.



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# Chapter 2: Maintenance & Troubleshooting

## 2.1 Maintenance

### Servicing and safety

- Raymarine equipment should be serviced only by authorised Raymarine service technicians. They will ensure that servicing procedures and replacement parts used will not affect performance. There are no user-serviceable parts in any Raymarine product.
- Some products generate high voltages, and so never handle the cables/connectors when power is being applied to the equipment.
- When powered up, all electrical equipment produces electromagnetic fields. These can cause adjacent pieces of electrical equipment to interact with one another, with a consequent adverse effect on operation. In order to minimise these effects and enable you to get the best possible performance from your Raymarine equipment, guidelines are given in the installation instructions, to enable you to ensure minimum interaction between different items of equipment, i.e. ensure optimum Electromagnetic Compatibility (EMC).
- Always report any EMC-related problem to your nearest Raymarine dealer. We use such information to improve our quality standards.
- In some installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to spurious resetting action, or momentarily may result in faulty operation.

### Instrument

Certain atmospheric conditions may cause condensation to form on the instrument window. This will not harm the instrument and can be cleared by increasing the illumination setting to Level 3.

### Cleaning

**Do not use chemical or abrasive materials to clean your instrument. Do not wipe the instrument with a dry cloth as this could cause scratches.**

Periodically clean your ST60 Graphic Display with a soft damp cloth.

## Cabling

Periodically examine all cables for chafing or other damage to the outer shield and, where necessary, replace and re-secure.

## 2.2 Troubleshooting

### Preliminary procedures

Changes in the electronic environment may adversely affect the operation of your ST60 equipment. Typical examples of such changes are:

- Electrical equipment has recently been installed or moved aboard your vessel.
- You are in the vicinity of another vessel or shore station emitting radio signals.

If you appear to have a problem, first ensure that the EMC requirements are still being met before further investigating the problem.

### Fixing faults

Some data types may not be supported by your system and therefore will not be displayed on your ST60 Graphic Display. If you think that data is missing, ensure that your system supports this data before assuming that a fault exists.

All Raymarine products are subjected to comprehensive test and quality assurance programmes prior to packing and shipping. However, if a fault occurs, the following table may help to identify and rectify the problem.

| <b>Fault</b>   | <b>Cause</b>                     | <b>Remedy</b>   |
|--|----------------------------------|---|
| Display blank  | No power supply                  | Check power supply.<br>Check SeaTalk cabling and connector security<br>Check fuse/circuit breaker   |
| No transfer of information between SeaTalk instruments (e.g. illumination levels). | SeaTalk cable or connector fault | Check security of SeaTalk connectors.<br>Check condition of SeaTalk cables.<br>Isolate faulty instrument by disconnecting instruments one by one. |
| Failure of a group of SeaTalk instruments.   | SeaTalk cable or connector fault | Check the security of SeaTalk connectors between functioning and non-functioning instruments  |



## Technical support

Raymarine provides a comprehensive customer support service, on the world wide web and by telephone help line.

Our web address is **www.raymarine.com**

Telephone numbers are:



- For the United States of America:  
+1 800 539 5539 Ext. 2444  
or  
+1 603 881 5200 Ext. 2444
- For the UK, Europe, the Middle East and the Far East:  
Telephone: +44 (0)23 9271 4713  
Fax: +44 (0)23 9266 1228

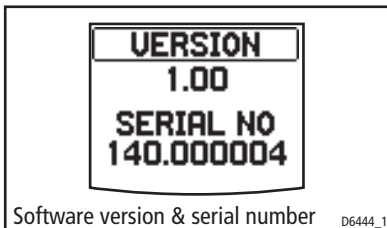
## Help us to help you



When requesting assistance, please quote as much of the following information as possible:

- Equipment type.
- Product code.
- Serial number.
- Software version number.

To find out the software version number and serial number of your ST60 Graphic Display:

1. During normal operation, hold down the  and  buttons for approximately 4 seconds, to display the VERSION screen.



2. Note the software version number and serial number, then hold down the  and  buttons for approximately 2 seconds, to return to normal operation.



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# Glossary

|            |  |
|------------|--|
| <b>APP</b> | Apparent                                     |
| <b>AVE</b> | Average                                      |
| <b>AWA</b> | Apparent Wind Angle (relative to the vessel) |
| <b>AWS</b> | Apparent Wind Speed                          |
| <b>BTW</b> | Bearing To Waypoint                          |
| <b>CMG</b> | Course Made Good                             |
| <b>COG</b> | Course Over Ground                           |
| <b>DMG</b> | Distance Made Good                           |
| <b>DTW</b> | Distance To Waypoint                         |
| <b>EMC</b> | Electro Magnetic Compatibility               |
| <b>ETA</b> | Estimated Time of Arrival                    |
| <b>GPS</b> | Global Positioning System                    |
| <b>HDG</b> | Heading                                      |
| <b>KM</b>  | Kilometer(s)                                 |
| <b>KMH</b> | Kilometers per hour                          |
| <b>KTS</b> | Knot(s)                                      |
| <b>LAT</b> | Latitude                                     |
| <b>LCD</b> | Liquid Crystal Display                       |
| <b>LON</b> | longitude                                    |
| <b>LTR</b> | Liter(s)                                     |
| <b>M</b>   | Magnetic                                     |

---

|                 |   |
|-----------------|---|
| <b>MAG</b>      | Magnetic  |
| <b>MOB</b>      | Man Overboard   |
| <b>MPH</b>      | Miles per hour  |
| <b>NM</b>       | Nautical mile(s)  |
| <b>Response</b> | The sensitivity of an instrument, to data changes.  |
| <b>RF</b>       | Radio Frequency   |
| <b>SeaTalk</b>  | Raymarine proprietary communication system which links products, to provide a single, integrated system sharing power and data. |
| <b>SM</b>       | Statute mile(s)   |
| <b>SOG</b>      | Speed Over Ground   |
| <b>SPD</b>      | Speed   |
| <b>T</b>        | True  |
| <b>TTG</b>      | Time To Go  |
| <b>TWA</b>      | True Wind Angle relative to the vessel, taking into account the speed of the vessel.  |
| <b>TWD</b>      | True Wind Direction.  |
| <b>TWS</b>      | True Wind Speed.  |
| <b>VMG</b>      | Velocity Made Good.   |
| <b>WP</b>       | Waypoint  |
| <b>XTE</b>      | Cross Track Error   |

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