ST60 Multi Instrument Owner’s Handbook

Document number: 81039-4
Date: 1 April 2004
Preface

Important information

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 personal injury, damage to your boat and/or poor product performance.

WARNING: Electrical safety
Make sure you have switched off the power supply before you start installing this product.

WARNING: Although we have designed this product to be accurate and reliable, many factors can affect its performance. Therefore, it should serve only as an aid to navigation and should never replace commonsense and navigational judgement. Always maintain a permanent watch so you can respond to situations as they develop.

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.

Handbook information

To the best of our knowledge, the information in this handbook was correct when it went to press. However, Raymarine cannot accept liability for any inaccuracies or omissions it may contain.

In addition, our policy of continuous product improvement may change specifications without notice. Therefore, Raymarine cannot accept liability for any differences between the product and the handbook.
Preface

Contents

Preface ................................................................. i

Important information ........................................... i
Safety notices ........................................................... i
EMC conformance ................................................... i
Handbook information .......................................... i

Contents ............................................................... iii

Introduction ............................................................ vii
Data inputs .............................................................. vii
Remote control ......................................................... viii
Options ................................................................. viii
Auxiliary alarm ......................................................... viii
Mounting options .................................................... viii
Parts supplied ........................................................ viii

Chapter 1: Operation .................................................. 1

1.1 Introduction ....................................................... 1
1.2 Normal operation ................................................. 1
Finding the information you want ................................ 1
1.3 Chapters and pages ............................................... 4
Depth chapter pages .............................................. 4
Speed chapter pages .............................................. 4
Wind chapter pages .............................................. 5
Heading chapter pages ......................................... 5
Navigate chapter pages ......................................... 6
Environment chapter pages .................................... 6
Autopilot chapter pages ........................................ 7
1.4 Using the track key ............................................... 7
1.5 Alarms .............................................................. 7
Internal alarms ...................................................... 7
Auxiliary Alarm option ........................................... 8
1.6 Operating with NMEA .......................................... 8
SeaTalk to NMEA 0183 .......................................... 8
NMEA to SeaTalk ................................................ 9
1.7 Display settings ................................................ 9
Illumination .......................................................... 9
Contrast .............................................................. 10
1.8 Pop-up Pilot ....................................................... 10
1.9 Remote control ................................................ 10
Preface

Date format ................................................................. 28
Time format .............................................................. 28
Time offset ............................................................ 30
Units setup ............................................................. 31
Setting units ......................................................... 31
Waypoint identity .................................................... 31
Select NMEA or auxiliary alarm ......................... 31
Auxiliary alarm enable ......................................... 31
Pop-up pilot ............................................................ 32
Instrument configuration ....................................... 32
Leaving User calibration ......................................... 34
4.3 Intermediate calibration ..................................... 34
4.4 Dealer calibration ............................................. 35
User calibration on/off .......................................... 35
Response settings ................................................. 35
Factory defaults .................................................... 37
Leaving Dealer calibration ..................................... 37
Introduction

Thank you for purchasing a Raymarine product. We are sure your ST60 instrument will give you many years of trouble-free operation.

This handbook describes how to install and use the Raymarine ST60 Multi instrument. This instrument provides a wide range of accurate depth information, on a high quality Liquid Crystal Display (LCD). The instrument is constructed in a rugged weather-proofed case to provide reliable performance, even under the most demanding conditions.

Data inputs

SeaTalk enables a number of compatible instruments to operate as a single, integrated navigational system. Instruments in a SeaTalk system are linked by means of a single cable, which feeds both power and data. Instruments can therefore be added to the system by plugging them into the network. SeaTalk is flexible enough to adapt to any number of compatible instruments without requiring a central processor.

When connected to SeaTalk, the ST60 Multi instrument repeats information provided by other equipment in the SeaTalk network.

The ST60 Multi instrument can also provide data communication between the internationally-accepted National Marine Electronics Association (NMEA) systems and SeaTalk.
Remote control
When connected to SeaTalk, the ST60 Multi instrument can be controlled remotely by a SeaTalk Remote Keypad Unit, to provide instant remote access to the various display readouts.

Options

Auxiliary alarm
An Auxiliary Alarm (Raymarine Part No. Z035) can be connected to the ST60 Multi instrument and set to respond to various system alarms. This provides an additional audible alarm at a much higher volume than the internal alarm.

Mounting options
If you do not want to surface mount your ST60 instrument, options are available for:
- Flush mounting. If you have ordered the flush mounting option a low-profile bezel and four fixing screws are provided.
- Bracket mounting.

Parts supplied
Unpack your ST60 instrument and check that the following items are present:
- Item 1, ST60 Multi instrument fitted with standard bezel for surface mounting.
- Item 2, Fixing studs (2).
- Item 3, Thumb nuts (2).
- Item 4, Gasket.
- Item 5, SeaTalk interconnection cable.
- Item 6, Instrument Cover.
- Item 7, Owner’s Handbook. A Warranty document and fitting templates are included in this Handbook.
- Item 8, Cue Card.
Spare spade terminals are also provided.
Chapter 1: Operation

1.1 Introduction

This handbook describes how to operate, maintain and install the Raymarine ST60 Multi instrument.

CAUTION: Calibration requirement
The ST60 Multi instrument is calibrated to factory (default) settings when first supplied. To ensure optimum performance on your boat, this product must be calibrated before use. Do NOT use the product until it has been calibrated using the procedures in Chapter 4, Calibration.

1.2 Normal operation

The information displayed on the ST60 Multi instrument is organized in groups or 'chapters', and within each chapter, the different types of information are presented as pages. The availability of pages on your ST60 Multi instrument depends on:

• What information is available from SeaTalk. This handbook assumes all data sources are available.
• Which pages are enabled during Instrument configuration (see Chapter 4, Calibration). This handbook assumes all pages are enabled.

Finding the information you want

The disposition of the ST60 Multi chapters and pages, is shown in the Chapter selection and content illustration, below. This illustration assumes a system where all information sources are available.
Chapter selection and content

**Speed**
- Speed
- Maximum speed
- Average speed
- Speed over ground
- VMG to windward
- Log
- Trip

**Wind**
- Apparent wind speed
- Apparent wind angle
- True wind speed
- True wind angle (sailing)
- True wind direction
- Beaufort and cardinal

**Depth**
- Current depth
- Minimum depth
- Maximum depth

**Autopilot**
- Pilot status
- Rudder angle

**Environment**
- Water temperature
- Battery voltage
- Time
- Date

**Navigate**
- Bearing to waypoint
- Distance to waypoint
- Cross track error
- Waypoint number/name
- Latitude
- Longitude
- Course over ground
- Speed over ground
- Satellites tracked

**Heading**
- Current heading
- Locked heading
- Heading on next track
- Course over ground
- Distance made good

**Key:**
- Pages within chapter
- Listed in sequence.
- Accessed with key.

**Notes:**
1. If chapter titles are enabled during calibration, the name of the selected chapter is displayed for 2 seconds after the key is pressed, after which time, the first page in the selected chapter is displayed.
2. You can switch off any unwanted chapter or page, to reduce the amount of information displayed (see Chapter 4, Calibration).
Chapter 1: Operation

To display a particular page:

1. Refer to the Chapter selection and content diagram to determine the location of the information you need (i.e. which chapter it is in), then press the key the necessary number of times, to cycle to the required chapter. If the chapter title facility is enabled (see Chapter 4, Calibration), 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 ENVIRO and the Autopilot chapter is abbreviated to PILOT.

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

The manner in which information is accessed is illustrated in the following example, which shows how to display true wind speed information.

![Diagram showing how to select a page](image-url)
### 1.3 Chapters and pages

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

#### Depth chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current depth</td>
<td>-</td>
<td>Displayed in either FEET, METRES or FATHOMS. An up arrow is displayed if the sea-bed is rising, and a down arrow is displayed for sea-bed falling. If the depth echo is lost, the last valid depth reading is shown and LAST flashes.</td>
</tr>
<tr>
<td>Minimum depth</td>
<td>MIN</td>
<td>Minimum depth since power up or last reset, in feet (FT) meters (M) or fathoms (FA). Press the reset key for 3 seconds, to reset.</td>
</tr>
<tr>
<td>Maximum depth</td>
<td>MAX</td>
<td>Maximum depth since power up or last reset, in feet (FT) meters (M) or fathoms (FA). Press the reset key for 3 seconds, to reset.</td>
</tr>
</tbody>
</table>

#### Speed chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat speed</td>
<td>BOAT</td>
<td>Displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>MAX</td>
<td>Maximum speed since power up or last reset, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS). Press the reset key for 3 seconds, to reset.</td>
</tr>
<tr>
<td>Average speed</td>
<td>AVG</td>
<td>Average speed since power up or last reset, in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).</td>
</tr>
<tr>
<td>Speed over ground</td>
<td>SOG</td>
<td>Displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).</td>
</tr>
<tr>
<td>Velocity made good</td>
<td>VMG</td>
<td>Displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).</td>
</tr>
<tr>
<td>Log</td>
<td>LOG</td>
<td>Total distance covered since the system was installed, in kilometers (KM), statute miles (SM), or nautical miles (NM).</td>
</tr>
<tr>
<td>Trip</td>
<td>TRIP</td>
<td>Distance covered since power up or last reset, in kilometers (KM), statute miles (SM), or nautical miles (NM).</td>
</tr>
<tr>
<td>Count up timer</td>
<td>TIMER</td>
<td>Shows current count-up time in either seconds (S), minutes (M) or hours (H).</td>
</tr>
<tr>
<td>Count-down timer</td>
<td>RACE START</td>
<td>Shows time remaining to zero in seconds (S) or minutes (M).</td>
</tr>
</tbody>
</table>
# Wind chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent wind speed</td>
<td>APP</td>
<td>Either knots (KTS) or meters per second (M/S).</td>
</tr>
<tr>
<td>Apparent wind angle</td>
<td>APP</td>
<td>Shown in degrees. Shows a STBD indicator when the boat is on a starboard tack and a PORT indicator when the boat is on a port tack.</td>
</tr>
<tr>
<td>True wind speed</td>
<td>TRUE</td>
<td>Either knots (KTS) or meters per second (M/S).</td>
</tr>
<tr>
<td>True wind angle</td>
<td>TRU</td>
<td>Shown in degrees. Shows a PORT indicator when the boat is on a starboard tack and a STBD indicator when the boat is on a port tack.</td>
</tr>
<tr>
<td>True wind direction</td>
<td>WIND</td>
<td>Shown in degrees. Shows either a MAG(netic) or TRU(e) indicator, depending on the selected bearing type.</td>
</tr>
<tr>
<td>Beaufort and cardinal</td>
<td>BFT</td>
<td>Shows the wind speed Beaufort scale value and wind direction as a cardinal compass point.</td>
</tr>
</tbody>
</table>

# Heading chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current heading</td>
<td>HDG</td>
<td>Displayed in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see Chapter 4, Calibration).</td>
</tr>
<tr>
<td>Locked heading</td>
<td>LOCK</td>
<td>Shown in degrees. When the locked heading is controlled by an autopilot or when a Steering Compass is locked on, the legend AUTO is displayed.</td>
</tr>
<tr>
<td>Next tack</td>
<td>TACK</td>
<td>Shown in degrees.</td>
</tr>
<tr>
<td>Course over ground</td>
<td>COG</td>
<td>Shown in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see Chapter 4, Calibration).</td>
</tr>
<tr>
<td>Course made good</td>
<td>CMG</td>
<td>Shown in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see Chapter 4, Calibration). Press the reset key for 3 seconds, to reset.</td>
</tr>
<tr>
<td>Distance made good</td>
<td>DMG</td>
<td>Shown in either kilometers (KM), statute miles (SM), or nautical miles (NM). Press the reset key for 3 seconds, to reset.</td>
</tr>
</tbody>
</table>
### Navigate chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing to waypoint</td>
<td>BTW</td>
<td>Displayed in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see Chapter 4, Calibration).</td>
</tr>
<tr>
<td>Distance to waypoint</td>
<td>TW</td>
<td>In kilometers (KM), statute miles (SM), or nautical miles (NM)</td>
</tr>
<tr>
<td>Cross track error</td>
<td>XTE</td>
<td>Shown in the currently selected distance units. A steering bar at the top of the screen comprises arrows that show the direction to steer. Each arrow represents 0.05 nm of error, i.e. the number of arrows in the bar is proportional to the amount of cross track error.</td>
</tr>
<tr>
<td>Waypoint see number/name</td>
<td>WP</td>
<td>Number or name displayed, depending on the choice made in User calibration (see Chapter 4, Calibration). Cross track error (XTE) is shown by the large characters.</td>
</tr>
<tr>
<td>Latitude</td>
<td>LAT</td>
<td>Current latitude.</td>
</tr>
<tr>
<td>Longitude</td>
<td>LON</td>
<td>Current longitude.</td>
</tr>
<tr>
<td>Course over ground</td>
<td>COG</td>
<td>Shown in degrees. Either TRU(e) or MAG(netic), as set during User calibration (see Chapter 4, Calibration).</td>
</tr>
<tr>
<td>Speed over</td>
<td>SOG</td>
<td>Displayed in kilometers per hour (KMH), miles per hour (MPH), or knots (KTS).</td>
</tr>
<tr>
<td>Satellites tracked</td>
<td>SATS</td>
<td>Current satellite count.</td>
</tr>
</tbody>
</table>

### Environment chapter pages

<table>
<thead>
<tr>
<th>Function</th>
<th>Title</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water temperature</td>
<td>WATER</td>
<td>Displayed as either °C or °F.</td>
</tr>
<tr>
<td>Battery voltage</td>
<td>VOLTS</td>
<td>Supply voltage.</td>
</tr>
<tr>
<td>Time</td>
<td>-</td>
<td>Either 12- or 24-hour clock, as set during User calibration (see Chapter 4, Calibration).</td>
</tr>
<tr>
<td>Date</td>
<td>-</td>
<td>Either USA or European format, as set during User calibration (see Chapter 4, Calibration).</td>
</tr>
</tbody>
</table>
1.4 Using the track key

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 key once, so the track plotter enters track mode.
2. In track mode to plot a track to the next waypoint, press the track key for 1 second.
3. To leave track mode, press the track key again.

1.5 Alarms

Internal alarms

The ST60 Multi instrument responds to alarm signals by sounding an internal buzzer and by flashing the appropriate alarm message at the top of the screen alternately with the normal top line of the current display. The alarm messages are as follows:

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHALLOW</td>
<td>Shallow water. See Note below.</td>
</tr>
<tr>
<td>DEEP ALM</td>
<td>Deep water. See Note below.</td>
</tr>
<tr>
<td>ANCHOR</td>
<td>Deep or shallow anchor. See Note below.</td>
</tr>
<tr>
<td>WIND ALM</td>
<td>Wind speed. See Note below.</td>
</tr>
<tr>
<td>LOW VOLT</td>
<td>The power supply voltage has fallen below the low voltage threshold</td>
</tr>
<tr>
<td>GUARD</td>
<td>Radar alarm</td>
</tr>
<tr>
<td>MARPA</td>
<td>Radar alarm</td>
</tr>
<tr>
<td>RAD FAIL</td>
<td>Radar alarm</td>
</tr>
</tbody>
</table>
Note: If a depth alarm occurs while a page in the depth chapter is displayed, or a wind alarm occurs while a page in the wind chapter is displayed, the screen will revert to the first page of the respective chapter.

To cancel an alarm, press any one of the ST60 Multi front panel keys.

**Auxiliary Alarm option**

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). The range of alarms sounded by the Auxiliary Alarm depends on:

- What data is available on SeaTalk.
- Which alarms are enabled during User calibration (see Chapter 4, Calibration).

If the Auxiliary Alarm sounds, check your instruments to see which one is showing an alarm indication, and take the appropriate action.

Note: An Auxiliary Alarm cannot be fitted if the NMEA output port is being used.

### 1.6 Operating with NMEA

The ST60 Multi instrument can provide data communication between SeaTalk and NMEA when the appropriate connections are made, and supports NMEA 0183 compatible products.

**SeaTalk to NMEA 0183**

Data from SeaTalk is transmitted to the NMEA output port every 2 seconds. The data types and NMEA headers are:

<table>
<thead>
<tr>
<th>Data</th>
<th>NMEA Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>DBT</td>
</tr>
<tr>
<td>Heading, deviation and variation</td>
<td>HDG</td>
</tr>
<tr>
<td>Magnetic heading</td>
<td>HDM</td>
</tr>
<tr>
<td>Water temperature</td>
<td>MTW</td>
</tr>
<tr>
<td>Water speed and heading</td>
<td>VHW</td>
</tr>
<tr>
<td>Wind speed and angle</td>
<td>MWV</td>
</tr>
</tbody>
</table>
Chapter 1: Operation

NMEA to SeaTalk

The ST60 Multi instrument decodes certain data from NMEA when available, and if the respective data is not already present on SeaTalk, transmits the decoded data to SeaTalk. The data types and NMEA headers are:

<table>
<thead>
<tr>
<th>Data</th>
<th>NMEA Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>XTE, Waypoint identifier, Bearing &amp; distance to waypoint</td>
<td>APB</td>
</tr>
<tr>
<td>Bearing &amp; distance to waypoint</td>
<td>BWC</td>
</tr>
<tr>
<td>Bearing &amp; distance to waypoint rhumb line</td>
<td>BWR</td>
</tr>
<tr>
<td>Latitude and longitude</td>
<td>GLL</td>
</tr>
<tr>
<td>Time, latitude, longitude, satellites tracked &amp; HDOP</td>
<td>GGA</td>
</tr>
<tr>
<td>Cross track error</td>
<td>MWV or XTE</td>
</tr>
<tr>
<td>Navigational information</td>
<td>RMB</td>
</tr>
<tr>
<td>Time, date, lat, long, COG &amp; SOG</td>
<td>RMC</td>
</tr>
<tr>
<td>COG and SOG</td>
<td>VTG</td>
</tr>
</tbody>
</table>

1.7 Display settings

Illumination

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

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

Note: The display will also return to normal operation 7 seconds after the last key press.
**Contrast**

To adjust the display contrast:

1. Hold down the key for approximately two seconds, to enter the contrast-adjust mode.
2. There are four preset contrast settings. Momentarily press the key to cycle through these settings until you achieve optimum display quality.
3. Press any other key to leave the contrast-adjust mode.

Note: The display will also return to normal operation 7 seconds after the last key press.

### 1.8 Pop-up Pilot

A Pop-up Pilot facility enables instruments connected to SeaTalk to constantly monitor any changes to the autopilot mode and to the course settings. If one of these parameters changes, the new value is immediately displayed on the ST60 instrument for 5 seconds, after which time the display reverts to the previous display.

This facility can be enabled or disabled during User calibration (see Chapter 4, Calibration).

### 1.9 Remote control

When it is connected to SeaTalk, the ST60 Multi instrument can be controlled remotely with a SeaTalk Remote Keypad Unit. Remote control of an instrument is indicated by a REMOTE legend on the display, to indicate that the keypad has control.

Details on how to use the remote control facility can be found in the SeaTalk Remote Keypad Owner’s Handbook.
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 minimize 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.

Periodically clean your ST60 instrument with a soft damp cloth. Do NOT use chemical and abrasive materials to clean the instrument.

Transducer

Refer to the Installation and Maintenance instructions supplied with the transducer.
Cabling
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 Multi instrument. If you think that some 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.

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

Raymarine provides a comprehensive customer support service, on the worldwide web and by telephone help line. Please use either of these facilities if you are unable to rectify a problem.

**World wide web**

Please visit the Customer Support area of our web site at:
- [www.raymarine.com](http://www.raymarine.com)

As well as providing a comprehensive Frequently Asked Questions section and servicing information, the web site gives e-mail access to the Raymarine Technical Support Department and a details of the locations of Raymarine agents, worldwide.

**Telephone help line**

If you do not have access to the worldwide web, please call our help line.

**In the USA**, call:
- +1 800 539 5539, extension 2444 or
- +1 603 881 5200 extension 2444

**In the UK, Europe the Middle East or the Far East**, call:
- +44 (0) 23 9271 4713 (voice)
- +44 (0) 23 9266 1228 (fax)

**Help us to help you**

When requesting service, please quote the following product information:
- Equipment type.
- Model number.
- Serial number.
- Software issue number.

The Software issue number can be ascertained by means of the Intermediate Calibration facility, see Chapter 4, Calibration.
Chapter 3: Installation

This chapter describes how to install the ST60 Multi instrument, and when supplied, the Auxiliary Alarm.

For advice, or further information regarding the installation of this equipment, please contact the Raymarine Product Support Department or your own National Distributor.

3.1 Planning your installation

Before starting the installation, spend some time considering the best position for the equipment, such that the Site Requirements and the EMC installation guidelines (below) are satisfied.

Site requirements

![ST60 instrument dimensions](image-url)
CAUTION:
The presence of moisture at the rear of the instrument could cause damage either by entering the instrument through the breathing hole or by coming into contact with the electrical connectors.

ST60 instruments can be fitted either above or below deck, provided the rear of the instrument is sited where it is protected from contact with water.

Each instrument must also be positioned where:
- It is easily read by the helmsman
- It is protected against physical damage
- It is at least 9 in (230 mm) from a compass
- It is at least 20 in (500 mm) from radio receiving equipment
- There is reasonable rear access for installation and servicing

EMC installation guidelines

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

Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For optimum EMC performance, it is recommended that wherever possible:
- Raymarine equipment and cables connected to it are:
  - At least 3 ft (1 m) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft (2 m).
  - More than 7 ft (2 m) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
  - The equipment is supplied from a separate battery from that used for engine start. Voltage drops below 10 V in the power supply to our products, and starter motor transients, can cause the equipment to reset. This will not dam-
age the equipment, but may cause the loss of some information and may change the operating mode.

- Raymarine specified cables are used. Cutting and rejoining these cables can compromise EMC performance and must be avoided unless doing so is detailed in the installation manual.
- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation it must be reassembled in the same position.

**Suppression ferrites**

The following illustration shows typical cable suppression ferrites used with Raymarine equipment. Always use the ferrites supplied by Raymarine.

![Suppression ferrite illustration](image)

**Connections to other equipment**

If your Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite MUST always be attached to the cable near the Raymarine unit.

### 3.2 Procedures

As it is not possible to describe procedures for all possible installation scenarios, the procedures given here describe the broad requirements for installing depth transducers and the ST60 Multi instrument. Adapt these procedures as appropriate, to suit your individual requirement.

**CAUTION:**

Where it is necessary to cut holes (e.g. for cable routing and instrument mounting), ensure that these will not cause a hazard by weakening critical parts of the vessel’s structure.

**Unpacking**

Unpack your ST60 equipment and check that the items described in the *Preface* are present.
Each ST60 instrument is supplied with a standard bezel for surface mounting. Optional mounting kits are available for flush mounting and bracket mounting the instrument. If you have ordered the flush mounting option a low-profile bezel and four fixing screws are also provided.

**Fitting the instrument**

The ST60 Multi instrument can be installed using one of a number of different mounting options:

- Surface mounting. Gives a profile of approximately 0.95 in (24 mm).
- Flush mounting. Gives a profile of approximately 0.25 in (6 mm).
- Bracket mounting.

The ST60 instruments can also be mounted behind a panel with just the instrument dial and keys visible.

**Surface mounting**

To surface mount your ST60 instrument (see the Surface mounting illustration):

1. Ensure that:
   - The selected location is clean, smooth and flat.
   - There is sufficient space behind the selected location to accommodate the rear of the instrument and connectors.
2. Apply the surface mount template (supplied at the rear of this handbook) to the selected location and mark the centers for the fixing studs (1) and the aperture (3) that will take the rear casing of the instrument.
3. Drill out the two 0.2 in (5 mm) fixing stud clearance holes (2).
4. Cut out the clearance hole (3) then remove the template.
5. Peel off the protective sheet from the self-adhesive gasket (4) then stick the gasket into position on the rear of the instrument.
6. Screw the two fixing studs into the threaded sockets on the rear of the instrument.
7. Mount the assembled instrument, studs, bezel and gasket into the panel. Secure from behind with the thumb nuts (5).

Flush mounting

The Flush Mounting Kit uses a low-profile bezel to reduce the fitted profile of the instrument, to approximately 0.25 in (6 mm) above the panel fascia.

Fitting the low-profile bezel

In order to flush-mount your ST60 instrument, you must first replace the standard bezel with the low-profile bezel as follows:
1. Hold the instrument in both hands with the display towards you.
2. Using both thumbs, gently press an upper corner of the instrument from the bezel, then remove the bezel from the instrument. Retain the rubber keypad which is released when the bezel is removed.
3. Referring to the Fitting the low-profile bezel illustration, place the instrument face upwards on a flat surface and place the rubber keypad (7) in position around the display window (i.e. so that each key outline is located over its associated key on the instrument).
4. Snap the low-profile bezel (8) in position over the instrument, so that the rubber keys are correctly located in the holes on the bezel.

CAUTION: It is essential that only screws of the correct size are used to secure the instrument to the bezel. Failure to observe this caution could result in damage to both the instrument and the bezel.

5. Using the four, self-tapping screws (9) provided, secure the instrument and bezel together. Fit the screws from the rear of the instrument and tighten them sufficiently to secure the instrument and bezel together. DO NOT OVERTIGHTEN.

Flush mounting procedure
Flush mount your instrument (see the Flush mounting illustration) as follows:

1. Assemble the ST60 instrument and low-profile bezel as described under Fitting the low-profile bezel.

2. Ensure that:
   - The panel on which you intend to mount the instrument is between 0.12 in (3 mm) and 0.78 in (20 mm) thickness.
   - The selected location is clean, smooth and flat.
Chapter 3: Installation

- There is sufficient space behind the selected location to accommodate the rear of the instrument and connectors.

3. Apply the flush mount template (supplied at the rear of this handbook) to the selected location and mark out the aperture into which the assembled instrument and bezel will sit.
4. Cut out the aperture (3) for the assembled instrument and bezel and remove the template.
5. Peel off the protective sheet from the self-adhesive gasket (4) then stick the gasket into position on the rear of the bezel.
6. Screw the two fixing studs (1) into the threaded sockets on the rear of the instrument.
7. Mount the assembled instrument, studs, bezel and gasket into the panel.
8. Locate the flush mount bracket (6) onto the fixing studs and secure the assembly to the panel with the thumb-nuts (5).

Bracket mounting

A Control Unit Mounting Bracket (Part No. E25009) enables you to mount your ST60 instrument in locations where other forms of mounting are impractical. Although this provides a useful alternative method for securing your instrument,
it is only suitable for use in positions where the instrument will not be exposed to water.

To bracket mount your ST60 instrument, do so in accordance with the Control Unit Mounting Bracket Instruction Sheet.

### Auxiliary alarm option

The Auxiliary Alarm is waterproof and can be mounted on a panel either above or below deck, as follows:

1. Drill a 7/8 in (22 mm) diameter hole through the mounting panel as shown.
2. Place the foam seal in position on the back of the Auxiliary Alarm.
3. Feed the two-way connector block and connecting wires through the drilled hole.
4. Place the Auxiliary Alarm in position with the foam seal between it and the mounting surface, and secure it using the four self-tapping screws (supplied).
5. Connect a 2-core cable to the connector block and run the other end of the cable to the rear of the ST60 Multi instrument. The manner in which you run
the cable will depend on the locations of the Auxiliary Alarm and instrument, but however you run the cable, observe the following guidelines:

- If the cable has to be fed through the deck, always use a proprietary deck gland.
- Where cables are fed through holes, always use grommets to prevent chafing.
- Secure long cable runs so they do not present a hazard.

Connecting the instrument

Types of connection

The ST60 Multi instrument is connected to SeaTalk as a repeater, and derives its power directly from SeaTalk so that a separate power connection is not necessary. Where a SeaTalk system includes an autopilot, the power for the system is provided by the autopilot.

A range of Raymarine SeaTalk extension cables is available to connect separated instruments. These cables are supplied with a SeaTalk connector fitted to each end. A junction box can be used to join cables.

Connection options

Connection to SeaTalk is mandatory.

The NMEA connectors can remain without any connections or can be used in one of two ways:
- You can connect for communication to and from NMEA (see Chapter 1, Operation for details of the functions supported).
- If the Auxiliary Alarm option is fitted, the NMEA OUT terminals provide the alarm signals to the buzzer.

Signal connections

Make the necessary connections to your ST60 instrument (see the Connections to ST60 Multi instrument illustration).
Use crimped spade terminals to connect to the NMEA connectors. In order to ensure a secure connection when fitting spade connectors, prepare the cable as at (a) in the following illustration, then fold back the wire strands and insert into the spade connector as at (b). Ensure the wire strands do not extend beyond the rear of the spade connector insulation, then crimp the connector to the wire.
Power supply connections

CAUTION:
When instruments are connected to SeaTalk, ensure that the power supply for the SeaTalk 12 V line is protected by a 5 A fuse.

Systems with a large number of instruments on the SeaTalk bus may require connections to the power supply from each end of the system (‘ring-main’ style), to maintain sufficient voltage throughout the system.

This requirement depends on the total length of the cable run and the total number of instruments in the system, as follows:

<table>
<thead>
<tr>
<th>Cable run</th>
<th>No. of instruments</th>
<th>Power connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10 m</td>
<td>13 maximum</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>26 maximum</td>
<td>2</td>
</tr>
<tr>
<td>Up to 20 m</td>
<td>7 maximum</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>13 maximum</td>
<td>2</td>
</tr>
</tbody>
</table>

SeaTalk power connections
Chapter 4: Calibration

4.1 Introduction

The ST60 Multi instrument is set up with factory-programmed default settings, so in order to optimize the performance of the instrument on board a particular vessel, the procedures in this Chapter must be carried out immediately after the completion of installation, and before the equipment is used for navigational purposes.

Where practicable, the calibration procedures are presented diagrammatically to show the sequence of key presses and the resulting displays. Adjustment instructions are given where applicable.

EMC conformance

Always check the installation before going to sea to make sure that it is not affected by radio transmissions, engine starting etc.

4.2 User calibration

The User calibration procedures enable you to:

- Switch chapter titles on or off.
- Set which type of heading (true or magnetic) is displayed.
- Set the voltage at which a battery alarm will occur.
- Switch alarms on or off.
- Set the date format.
- Set either 12 hour or 24 hour clock.
- Apply an offset to the clock time.
- Select data units.
- Select waypoint identification (name or number).
- Select remote buzzer (NMEA OFF) or NMEA output (NMEA ON).
- Enable/disable individual alarms (for Auxiliary Alarm).
- Enable/disable the pop up pilot display.
- Configure the instrument to display specific pages.
Procedure
To carry out a User calibration:
1. Power up the ST60 Multi instrument.
2. Press the \( \text{ } \) and \( \text{ } \) keys 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.
3. Press the \( \text{ } \) key to proceed. During calibration, refer to the User calibration diagram, carry out the calibration procedure. Use the \( \text{ } \) key to cycle from screen to screen and the track and reset keys to set the required values.

Chapter titles
Select either ON so that each chapter title is displayed when it is selected, or OFF if you do not want chapter titles to be displayed.

Heading type
Use this to define how headings are displayed, either magnetic (MAG) or true (TRUE). If a variation value is not available, then MAG is selected permanently.

Battery alarm threshold
The recommended setting is 10.5 VOLTS.

Alarms on/off
Determines whether or not the ST60 Multi instrument will give alarm indications. The following alarms will occur irrespective of the setting here:
- Pop up pilot alarms.
- External alarms, provided this option is fitted and enabled (see Select NMEA or auxiliary alarm on page 31).

Date format
You can set either United States (MM/DD/YY) or European (DD/MM/YY) date formats.

Time format
You can select either 12-hour or 24-hour time format.
Hold down and for approximately 2 seconds

Use either track or reset to set the required values on each screen

User calibration - sheet 1
**Time offset**

You can apply an offset from -12 hours to +12 hours in 1 hour increments, to set your system time to local time. The time with the offset applied is shown at the top right of the screen.
Chapter 4: Calibration

**Units setup**
You can use the Units Setup screen to set:
- Temperature (TEMP) units to either °C or °F.
- Speed (SPD) units to either knots (KTS), kilometers per hour (KMH) or miles per hour (MPH).
- TRIP distance units to either nautical miles (NM), kilometers (KM) or statute miles (SM).
- DEPTH units to either feet (FT), fathoms (FA) or meters (M).
- WIND speed units to either knots (KTS) or meters per second (M/S).

**Setting units**
With the Units Setup screen displayed, use the key to display each data type in turn and for each, use the track or reset key to select the required unit.

**Waypoint identity**
Determines whether waypoints are identified by name (WP NAME) or by number (WP NO).

**Select NMEA or auxiliary alarm**
If the ST60 Multi is connected to NMEA, select ON. If the Auxiliary Alarm option is fitted select OFF, to enable the Auxiliary Alarm.

**Auxiliary alarm enable**
If the Auxiliary Alarm option is fitted, use this screen to determine which alarms you want to sound at the Auxiliary Alarm. The screen heading shows which alarm you are setting, and when you have set one alarm, press the key to display and set the next alarm.

<table>
<thead>
<tr>
<th>Title</th>
<th>Alarm function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHALLOW</td>
<td>Shallow alarm</td>
</tr>
<tr>
<td>DEEP ALM</td>
<td>Deep alarm</td>
</tr>
<tr>
<td>ANCHOR</td>
<td>Anchor alarm</td>
</tr>
<tr>
<td>WIND ALM</td>
<td>High true wind speed</td>
</tr>
</tbody>
</table>
Pop-up pilot

Switches the pop-up pilot function on and off.

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 key 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 keys to toggle the page ON or OFF

<table>
<thead>
<tr>
<th>Title</th>
<th>Alarm function</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATCH</td>
<td>Watch alarm</td>
</tr>
<tr>
<td>OFF CRS</td>
<td>Off course alarm</td>
</tr>
<tr>
<td>WND CHNG</td>
<td>Wind change alarm</td>
</tr>
<tr>
<td>LOW BATT</td>
<td>Low battery</td>
</tr>
<tr>
<td>AUTO REL</td>
<td>Auto release</td>
</tr>
<tr>
<td>WPT ADVN</td>
<td>Waypoint advance</td>
</tr>
<tr>
<td>DRV STOP</td>
<td>Drive stopped</td>
</tr>
<tr>
<td>NO XTE</td>
<td>No NMEA</td>
</tr>
<tr>
<td>HIGH XTE</td>
<td>Large cross track error</td>
</tr>
<tr>
<td>NMEA ERR</td>
<td>NMEA data error</td>
</tr>
<tr>
<td>NO CU</td>
<td>No control unit</td>
</tr>
<tr>
<td>RADAR</td>
<td>Guard, MARPA, radar failure</td>
</tr>
</tbody>
</table>

Title | Page | Chapter
------|------|-------
DEPT  | Current Depth | Depth
DPTH MIN | Minimum Depth | Depth
# Chapter 4: Calibration

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPTH MAX</td>
<td>Maximum Depth</td>
<td>Depth</td>
</tr>
<tr>
<td>SPEED</td>
<td>Boat Speed</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD MAX</td>
<td>Maximum Speed</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD AVG</td>
<td>Average Speed</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD SOG</td>
<td>SOG</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD VMG</td>
<td>VMG to Windward</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD LOG</td>
<td>LOG</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD TRIP</td>
<td>Trip</td>
<td>Speed</td>
</tr>
<tr>
<td>SPD TIMR</td>
<td>Timer</td>
<td>Speed</td>
</tr>
<tr>
<td>WND ASPD</td>
<td>Apparent Wind Speed</td>
<td>Wind</td>
</tr>
<tr>
<td>WND AANG</td>
<td>Apparent Wind Angle</td>
<td>Wind</td>
</tr>
<tr>
<td>WND TSPD</td>
<td>True Wind Speed</td>
<td>Wind</td>
</tr>
<tr>
<td>WND TANG</td>
<td>True Wind Angle</td>
<td>Wind</td>
</tr>
<tr>
<td>WND GRND</td>
<td>True Wind Direction (Ground)</td>
<td>Wind</td>
</tr>
<tr>
<td>WND BF</td>
<td>Beaufort/Cardinal</td>
<td>Wind</td>
</tr>
<tr>
<td>HEADING</td>
<td>Current Heading</td>
<td>Heading</td>
</tr>
<tr>
<td>HDG LOCK</td>
<td>Locked Heading</td>
<td>Heading</td>
</tr>
<tr>
<td>HDG TACK</td>
<td>Next Tack</td>
<td>Heading</td>
</tr>
<tr>
<td>HDG COG</td>
<td>COG</td>
<td>Heading</td>
</tr>
<tr>
<td>HDG CMG</td>
<td>Course Made Good</td>
<td>Heading</td>
</tr>
<tr>
<td>HDG DMG</td>
<td>Distance Made Good</td>
<td>Heading</td>
</tr>
<tr>
<td>NAV BTW</td>
<td>Bearing to Waypoint</td>
<td>Navigate</td>
</tr>
<tr>
<td>NAV DTW</td>
<td>DTW</td>
<td>Navigate</td>
</tr>
<tr>
<td>NAV XTE</td>
<td>XTE</td>
<td>Navigate</td>
</tr>
<tr>
<td>NAV WPT</td>
<td>WP Name/Number</td>
<td>Navigate</td>
</tr>
<tr>
<td>NAV LAT</td>
<td>Latitude</td>
<td>Navigate</td>
</tr>
</tbody>
</table>
Leaving User calibration

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

4.3 Intermediate calibration

Intermediate calibration enables you to check the software version number. To do this, hold down the  and  keys together for 4 seconds. The software VERSION page is then displayed.

![SOFTWARE VERSION](image)

Hold down the  and  keys for 2 seconds, to exit Intermediate calibration and resume normal operation.
4.4 Dealer calibration

The Dealer calibration procedures enable the following parameters to be set:
- User calibration on/off.
- Response settings for speed, depth heading wind angle, wind speed, VMG, course over ground and speed over ground.

Dealer calibration also gives access to the Factory defaults screen. This enables you to re-apply the factory settings if you want to reset the instrument to a known operating condition.

To commence Dealer calibration, hold down the \( \text{track} \) and \( \text{reset} \) keys together for approximately 12 seconds, to select the Dealer calibration entry page (see Dealer calibration diagram). Then press the \( \text{track} \) and \( \text{reset} \) keys together, to start the calibration.

User calibration on/off

Press the \( \text{track} \) and \( \text{reset} \) keys to toggle the User calibration either ON or OFF as required. With OFF selected, User calibration and Intermediate calibration are both disabled.

Response settings

The response values determine how often displayed information is updated. A low number provides a smooth response and a high number a much livelier response. The screen title shows which response you are setting, and when you have set one response, press the \( \text{F4} \) key to display and set the next.

For each response function, use the \( \text{track} \) (decrement) and \( \text{reset} \) (increment) keys to set the required value. Response values are from 1 to 15.

The screen titles and associated response functions are displayed in the following sequence:

<table>
<thead>
<tr>
<th>Title</th>
<th>Response function</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOAT SPD</td>
<td>Speed</td>
</tr>
<tr>
<td>DEPTH</td>
<td>Depth</td>
</tr>
<tr>
<td>HEADING</td>
<td>Heading</td>
</tr>
<tr>
<td>WIND ANG</td>
<td>Wind angle</td>
</tr>
<tr>
<td>WIND SPD</td>
<td>Wind speed</td>
</tr>
</tbody>
</table>
### Table: Title Response function

<table>
<thead>
<tr>
<th>Title</th>
<th>Response function</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMG</td>
<td>Velocity made good</td>
</tr>
<tr>
<td>COG/SOG</td>
<td>Course over ground and speed over ground</td>
</tr>
</tbody>
</table>

**Diagram:**

- **Entry screen**
  - Dealer calibration

- **Calibration on/off**
  - Hold down and for approximately 12 seconds

- **Response**
  - Use either track or reset to set the required values on each screen

- **Factory defaults**
  - Reset
Chapter 4: Calibration

**Factory defaults**

You can use this screen to reset the operating parameters to the factory default values. Use the **track** and **reset** keys to make the required selection.

Note that the selection you make at this screen will be applied when you exit the screen, so be sure you make the correct selection.

If you want to apply the factory defaults, ensure the display shows **YES**, but if you want to retain the current values, ensure that the display shows **NO**.

**Leaving Dealer calibration**

Hold down the **** and ** keys for 2 seconds to save your settings, exit Dealer calibration and resume normal operation.
Machine hole 90mm (3.54in) diameter

Shaded areas to be removed

Drill 5mm (3/16in) diameter
Shaded area to be removed

ST60 Flush Mount Template

TOP

4 holes
6 mm diameter

114 mm

109 mm