

# **ST60 Multi Instrument Owner's Handbook**

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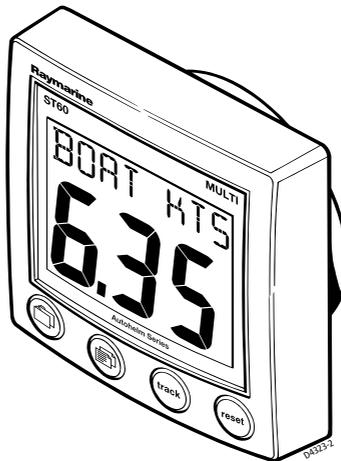
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# Introduction

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 navigational 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.



## WARNING

Although the ST60 Multi instrument is designed to give accurate and reliable performance, it should serve only as an aid to navigation and should never lead to the erosion of good seamanship. Always maintain a permanent watch and be aware of situations as they develop.

## EMC conformance

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

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

### Mounting options

If you do not want to surface mount your ST60 instrument, options are available for:

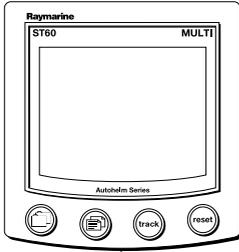
- Flush mounting. If you have ordered the flush mounting option a low-profile bezel and four fixing screws are also provided.
- Bracket mounting.

## Parts supplied

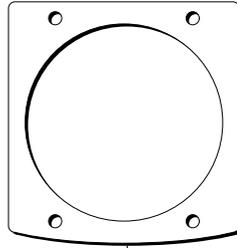
Unpack your ST60 instrument and check that the following items are present:

- 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, Worldwide Service Centre Handbook.
- Item 9, Cue Card.

Spare spade terminals are also provided.



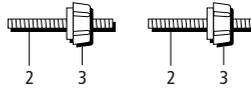
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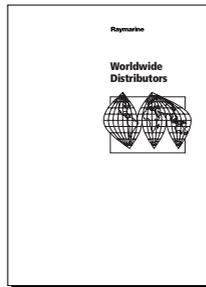
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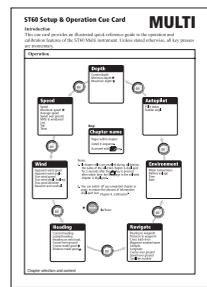
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# Chapter 1: Operation

## 1.1 Introduction

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

### Calibration requirement

The ST60 Multi instrument is calibrated to factory (default) settings when first installed and must therefore be calibrated before use, in accordance with the procedures in *Chapter 4, Calibration*, to ensure optimum performance on your vessel.

**Do NOT use the instrument until the calibration procedures have been satisfactorily completed.**

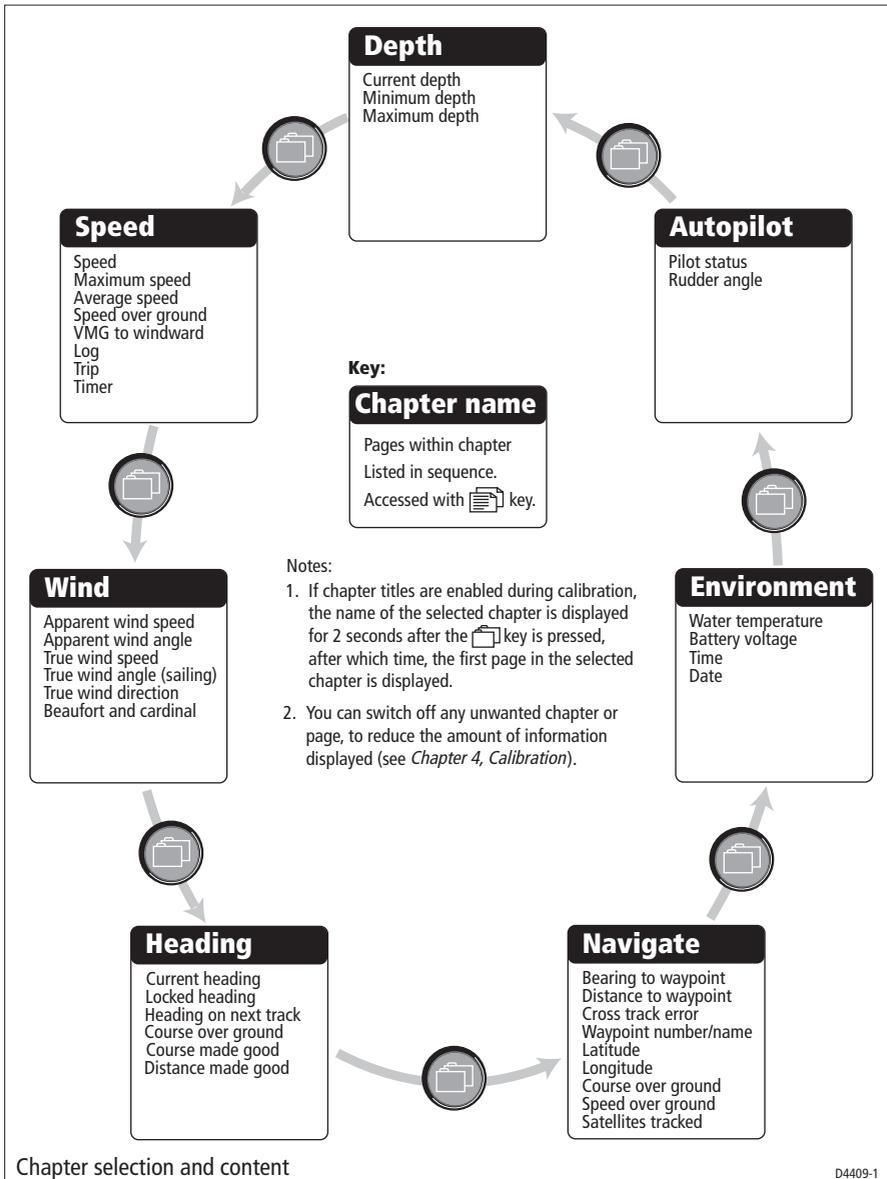
## 1.2 Normal operation

The information displayed on the ST60 Multi instrument is organised 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 following *Chapter selection and content* illustration. This illustration assumes a system where all information sources are available.



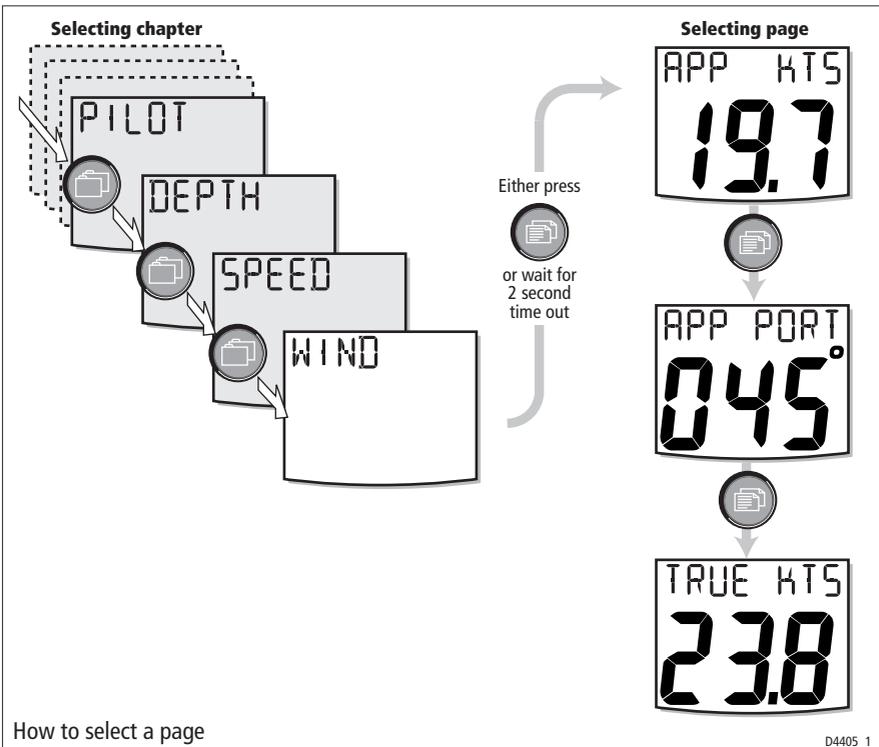
To display a particular page:

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 page 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.



## 1.3 Chapters and pages

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

### Depth chapter pages

Function	Title	Remarks
Current depth	-	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.
Minimum depth	MIN	Minimum depth since power up or last reset, in feet (FT) metres (M) or fathoms (FA). Press the <b>reset</b> key for 3 seconds, to reset.
Maximum depth	MAX	Maximum depth since power up or last reset, in feet (FT) metres (M) or fathoms (FA). Press the <b>reset</b> key for 3 seconds, to reset.

### Speed chapter pages

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

## Wind chapter pages

Function	Title	Remarks
Apparent wind speed	APP	Either knots (KTS) or metres per second (M/S).
Apparent wind angle	APP	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.
True wind speed	TRUE	Either knots (KTS) or metres per second (M/S).
True wind angle	TRU	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.
True wind direction	WIND	Shown in degrees. Shows either a MAG(netic) or TRU(e) indicator, depending on the selected bearing type.
Beaufort and cardinal	BFT	Shows the wind speed Beaufort scale value and wind direction as a cardinal compass point.

## Heading chapter pages

Function	Title	Remarks
Current heading	HDG	Displayed in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see <i>Chapter 4, Calibration</i> ).
Locked heading	LOCK	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.
Next tack	TACK	Shown in degrees.
Course over ground	COG	Shown in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see <i>Chapter 4, Calibration</i> ).
Course made good	CMG	Shown in degrees. Either TRU(e) or MAG(netic) depending on the value set during User calibration (see <i>Chapter 4, Calibration</i> ). Press the <b>reset</b> key for 3 seconds, to reset.
Distance made good	DMG	Shown in either kilometres (KM), statute miles (SM), or nautical miles (NM). Press the <b>reset</b> key for 3 seconds, to reset.

## Navigate chapter pages

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

## Environment chapter pages

Function	Title	Remarks
Water temperature	WATER	Displayed as either °C or °F.
Battery voltage	VOLTS	Supply voltage.
Time	-	Either 12- or 24-hour clock, as set during User calibration (see <i>Chapter 4, Calibration</i> ).
Date	-	Either USA or European format, as set during User calibration (see <i>Chapter 4, Calibration</i> ).

## Autopilot chapter pages

Function	Title	Remarks
Pilot status	-	Same function as pop up pilot display, but does not time out.
Rudder angle	RUDDER	In degrees either P(ort) or S(tarboard).

## 1.4 Using the track key

If your system includes a SeaTalk navigator, you can use the **track** key as follows:

1. To enter track mode, press the **track** key once.
2. To advance to the next waypoint, press the **track** key for 1 second.
3. To leave track mode, press the track key a third time.

## 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:

Message	Meaning
SHALLOW water*	
DEEP ALM	Deep water*
ANCHOR	Deep or shallow anchor*
WIND ALM	Wind speed*
LOW VOLT	The power supply voltage has fallen below the low voltage threshold
GUARD	Radar alarm
MARPA	Radar alarm
RAD FAIL	Radar alarm

\*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:

<b>Data</b>	<b>NMEA Header</b>
Depth	DBT
Heading, deviation and variation	HDG
Magnetic heading	HDM
Water temperature	MTW
Water speed and heading	VHW
Wind speed and angle	MWV

## 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:

Data	NMEA Header
Bearing and distance to waypoint	BWC
COG and SOG	VTG
Cross track error	XTE
Latitude and longitude	GLL
Navigational information	RMB
Time, date, lat, long, COG & SOG	RMC

## 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 the 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 the 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 and Fault Finding

## 2.1 Maintenance

### Servicing and safety

- Raymarine equipment should be serviced only by authorised Raymarine service engineers. 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.
- Always report any EMC related problem to your nearest Raymarine dealer. We will use any such information to improve our quality standards.

When requesting service, please quote equipment Type, Model Number and, if possible, Software Release Issue. The Software Release Issue can be ascertained by means of the Intermediate Calibration facility, see *Chapter 4, Calibration*.

### 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 to the brightest setting.

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

### Cabling

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

## 2.2 Fault finding

### 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 (see *Chapter 3, Installation*) 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, use the following table to help identify and rectify the problem.

<b>Fault</b>	<b>Cause</b>	<b>Remedy</b>
Display blank	No power supply	Check power supply. Check SeaTalk cabling and connector security. Check fuse/circuit breaker.
No transfer of information between instruments (e.g. illumination levels).	SeaTalk cable or connector fault	Check security of SeaTalk connectors.  Check condition of SeaTalk cables.  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.

If you are unable to rectify a problem, contact the Raymarine Product Support Department or your own National Distributor, for assistance.

# Chapter 3: Installation

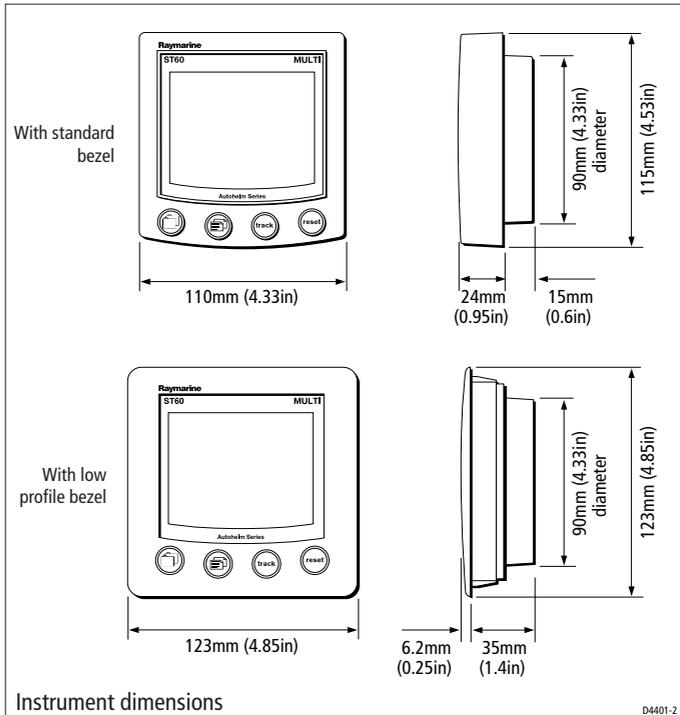
This chapter describes how to install the ST60 Multi instrument, and where supplied, the Auxiliary Alarm.

For advice, or further information regarding the installation of these products, 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 Guidelines* (below) are satisfied.

### Site requirements



**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 230 mm (9 in) from a compass
- It is at least 500 mm (20 in) from radio receiving equipment
- There is reasonable rear access for installation and servicing

**EMC guidelines**

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

Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that EMC 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 this product.

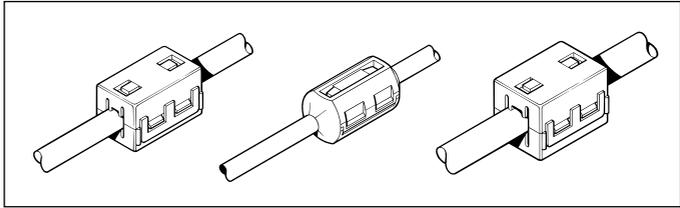
To minimise the risk of operating problems:

- All Raymarine equipment and cables connected to it should be:
  - At least 1 m (3 ft) 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 2 m (7 ft).
  - More than 2 m (6 ft) 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 should be supplied from a different battery than the one used for engine start. Voltage drops below 10 V in the power supply to our products can cause the equipment to reset. This will not damage the equipment, but will cause the loss of some information and can change the operating mode.

- Raymarine specified cables should be used at all times. Cutting and rejoining these cables can compromise EMC performance and so 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 has to be removed during installation it must be reassembled in the same position.

### Suppression ferrites

The following illustration shows the typical range of suppression ferrites fitted to Raymarine equipment. Always use the ferrites specified by Raymarine.



### Connections to other equipment

If your Raymarine equipment is going to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite **MUST** always be fitted to the cable close to 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 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 *Introduction* 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 provided in the kit.

## Fitting the instrument

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

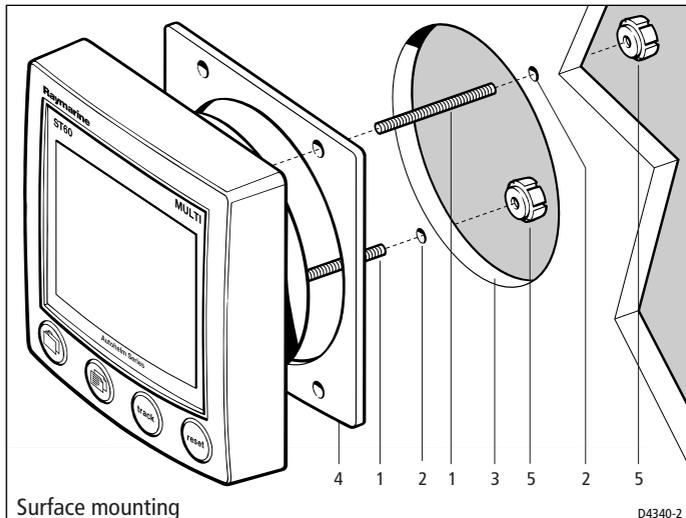
- Surface mounting. Gives a profile of approximately 24 mm.
- Flush mounting. Gives a profile of approximately 6 mm.
- Bracket mounting.

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 centres for the fixing studs (1) and the aperture (3) that will take the rear casing of the instrument.
3. Drill out the two 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).

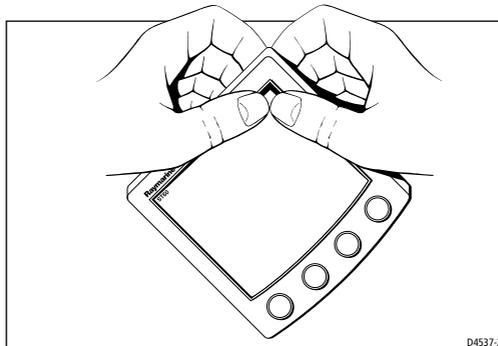
## Flush mounting

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

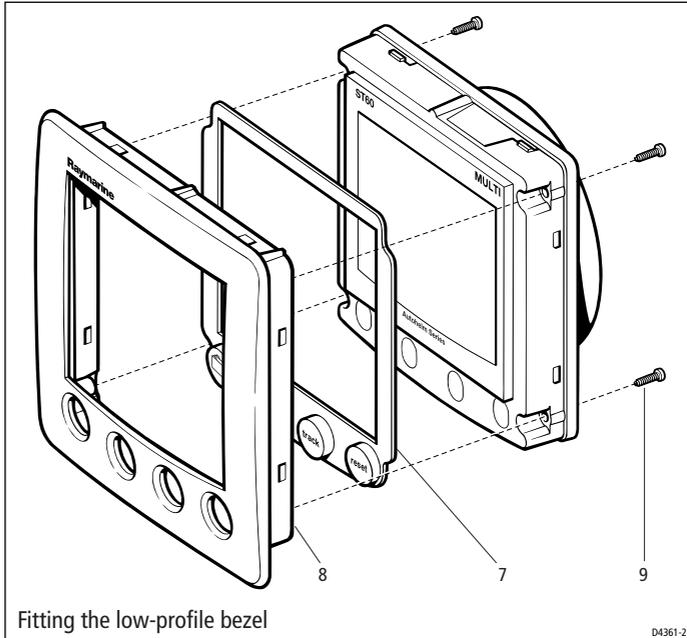
### Fitting the low-profile bezel

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 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.**

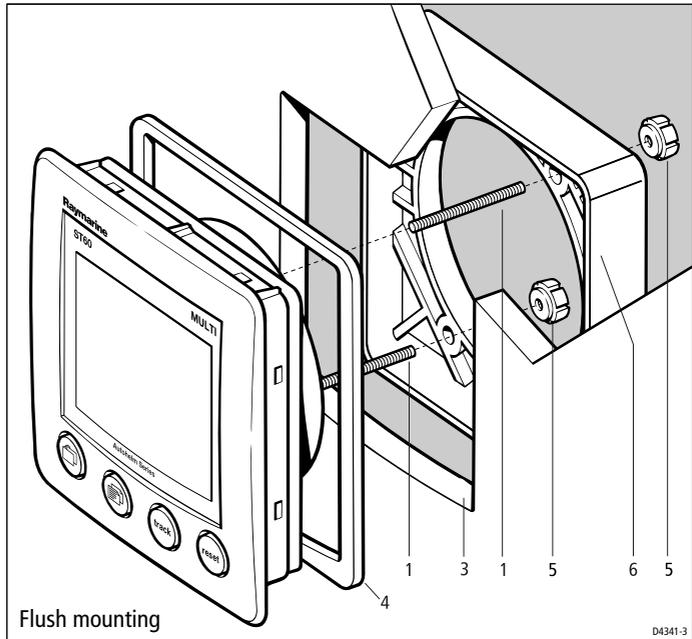
5. Using the four, self-tapping screws (9) provided, secure the instrument and bezel together. Fit the screws from the rear of the instrument and tighten them sufficiently to secure the instrument and bezel together. **DO NOT OVERTIGHTEN.**

### 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 3 mm and 20 mm thickness.

- 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.
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).

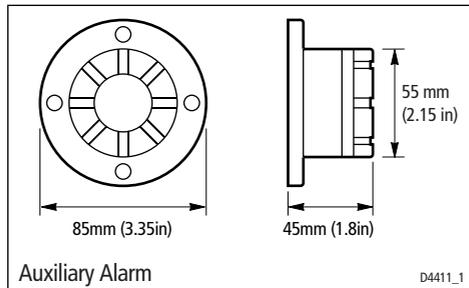


## Bracket Mounting

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.

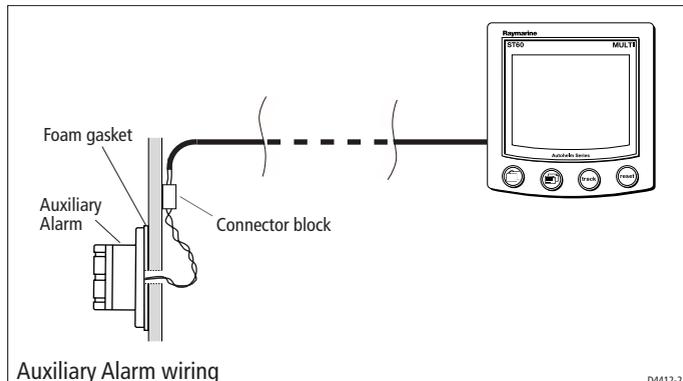
To bracket mount your ST60 instrument, do so in accordance with the Control Unit Mounting Bracket *Instruction Sheet*.

## 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 22 mm (7/8in) 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

### Introduction

The ST60 Multi instrument is connected to SeaTalk as a repeater, and derives its power directly from SeaTalk so that no separate power connection is 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 *Connection to ST60 Multi instrument* illustration).



## Power supply connections

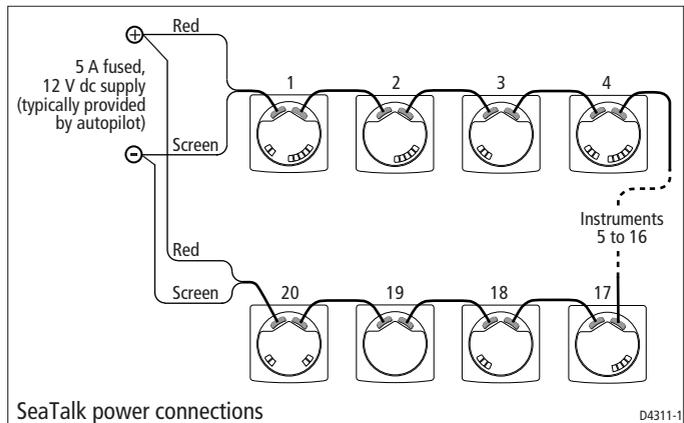
### CAUTION

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:

Cable run	No. of instruments	Power connections
Up to 10 m	13 maximum	1
	26 maximum	2
Up to 20 m	7 maximum	1
	13 maximum	2





# Chapter 4: Calibration

## 4.1 Introduction

The ST60 Multi instrument is set up with factory-programmed default settings, so in order to optimise 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 as 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.
- In some installations, it may not be possible to prevent the equipment from being affected by external influences. Although this will not damage the equipment, it can lead to spurious resetting action, or momentarily may result in faulty operation.

## 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 water temperature 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  and  keys together, for approximately 2 seconds so that the User calibration entry screen is displayed.
3. Press the  key to proceed with the calibration procedure. During calibration, refer to the *User calibration* flow diagram (*sheets 1 and 2*), use the  key to move 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:

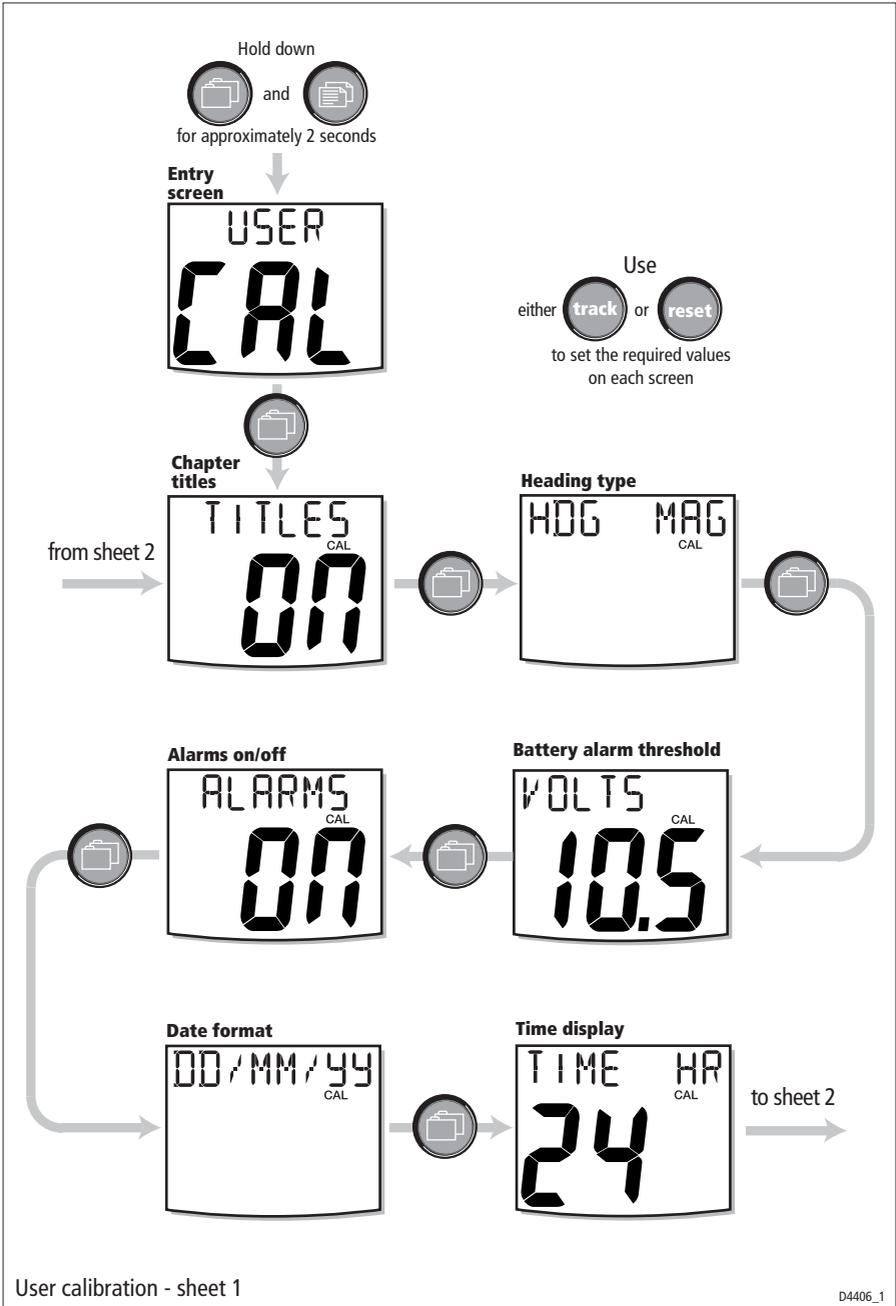
- Pop up pilot alarms.
- External alarms, provided this option is fitted and enabled (see *Select NMEA or Auxiliary Alarm*).

## Date format

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

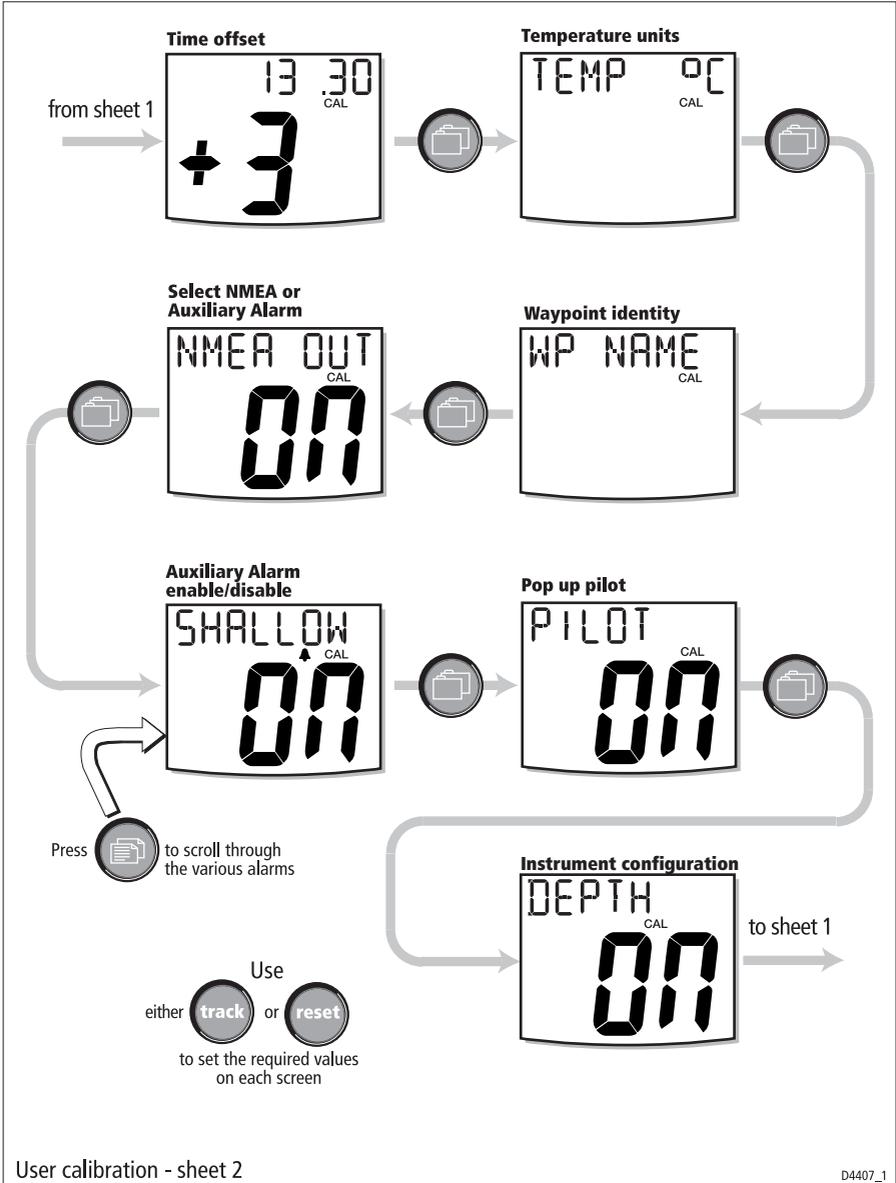
## Time format

You can select either 12-hour or 24-hour time format.



### Time offset

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



## Temperature units

You can select either Centigrade (°C) or Fahrenheit (°F). If the temperature units have been defined elsewhere on SeaTalk, this screen is not displayed.

## 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.

ON = alarm enabled, OFF = alarm disabled.

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

Title	Alarm function
SHALLOW	Shallow alarm
DEEP ALM	Deep alarm
ANCHOR	Anchor alarm
WIND ALM	High true wind speed
WATCH	Watch alarm
OFF CRS	Off course alarm
WND CHNG	Wind change alarm
LOW BATT	Low battery
AUTO REL	Auto release
WPT ADVN	Waypoint advance

continued ...

Title	Alarm function
DRV STOP	Drive stopped
NO XTE	No NMEA
HIGH XTE	Large cross track error
NMEA ERR	NMEA data error
NO CU	No control unit
RADAR	Guard, MARPA, radar failure

## 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.

Title	Page	Chapter
DEPTH	Current Depth	Depth
DPTH MIN	Minimum Depth	Depth
DPTH MAX	Maximum Depth	Depth
SPEED	Boat Speed	Speed
SPD MAX	Maximum Speed	Speed
SPD AVG	Average Speed	Speed

continued ...

<b>Title</b>	<b>Page</b>	<b>Chapter</b>
SPD SOG	SOG	Speed
SPD VMG	VMG to Windward	Speed
SPD LOG	LOG	Speed
SPD TRIP	Trip	Speed
SPD TIMR	Timer	Speed
WND ASPD	Apparent Wind Speed	Wind
WND AANG	Apparent Wind Angle	Wind
WND TSPD	True Wind Speed	Wind
WND TANG	True Wind Angle	Wind
WND GRND	True Wind Direction (Ground)	Wind
WND BF	Beaufort/Cardinal	Wind
HEADING	Current Heading	Heading
HDG LOCK	Locked Heading	Heading
HDG TACK	Next Tack	Heading
HDG COG	COG	Heading
HDG CMG	Course Made Good	Heading
HDG DMG	Distance Made Good	Heading
NAV BTW	Bearing to Waypoint	Navigate
NAV DTW	DTW	Navigate
NAV XTE	XTE	Navigate
NAV WPT	WP Name/Number	Navigate
NAV LAT	Latitude	Navigate
NAV LON	Longitude	Navigate
NAV COG	COG	Navigate

continued ...

Title	Page	Chapter
NAV SOG	SOG	Navigate
NAV SATS	Stats	Navigate
ENV TEMP	Sea Temperature	Environment
ENV VOLT	Battery Voltage	Environment
NAV TIME	Time	Environment
NAV DATE	Date	Environment
PLT STAT	Status	Pilot
PLT RUDD	Rudder Angle	Pilot

## 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.



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  and  keys together for approximately 12 seconds, to select the Dealer calibration entry page (see *Dealer calibration* diagram). Then press the **track** and **reset** keys together, to start the calibration.

### User calibration on/off

Press the **track** and **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  key to display and set the next.

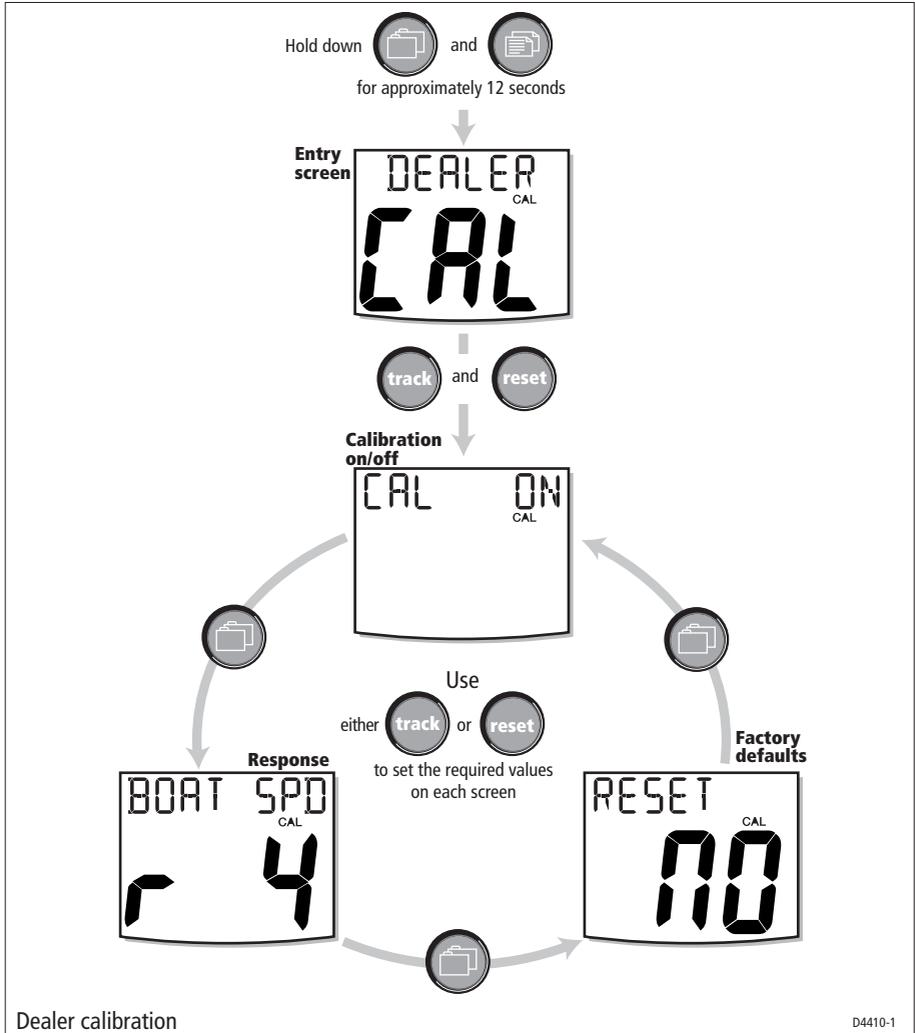
For each response function, use the **track** (decrement) and **reset** (increment) keys to set the required value. Response values are from 1 to 15.

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

Title	Response function
BOAT SPD	Speed
DEPTH	Depth
HEADING	Heading

continued ...

Title	Response function
WIND ANG	Wind angle
WIND SPD	Wind speed
VMG	Velocity made good
COG/SOG	Course over ground and speed over ground



## Factory defaults

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

If you have selected YES, the factory defaults will be applied when you exit this screen.

## Leaving Dealer calibration

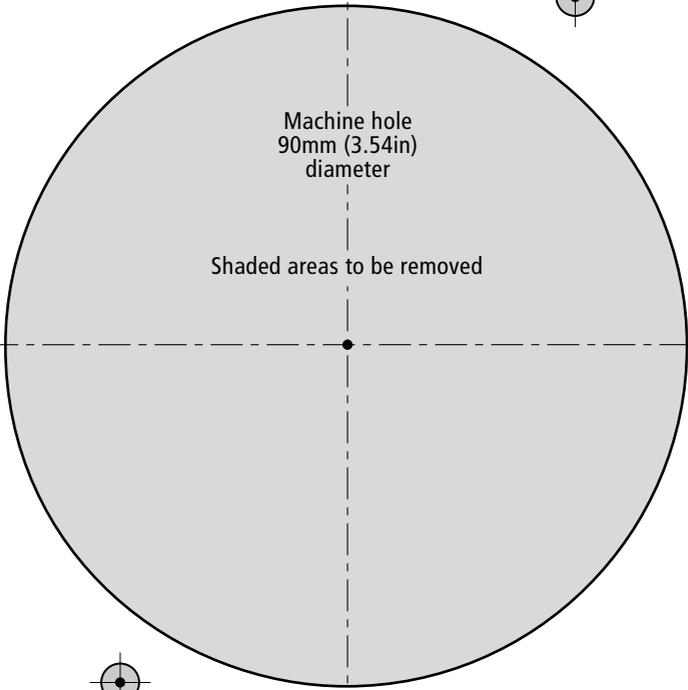
Hold down the  and  keys for 2 seconds to save your settings, exit Dealer calibration and resume normal operation.



ST60 Surface Mount Template

TOP

Drill 5mm (3/16in) diameter



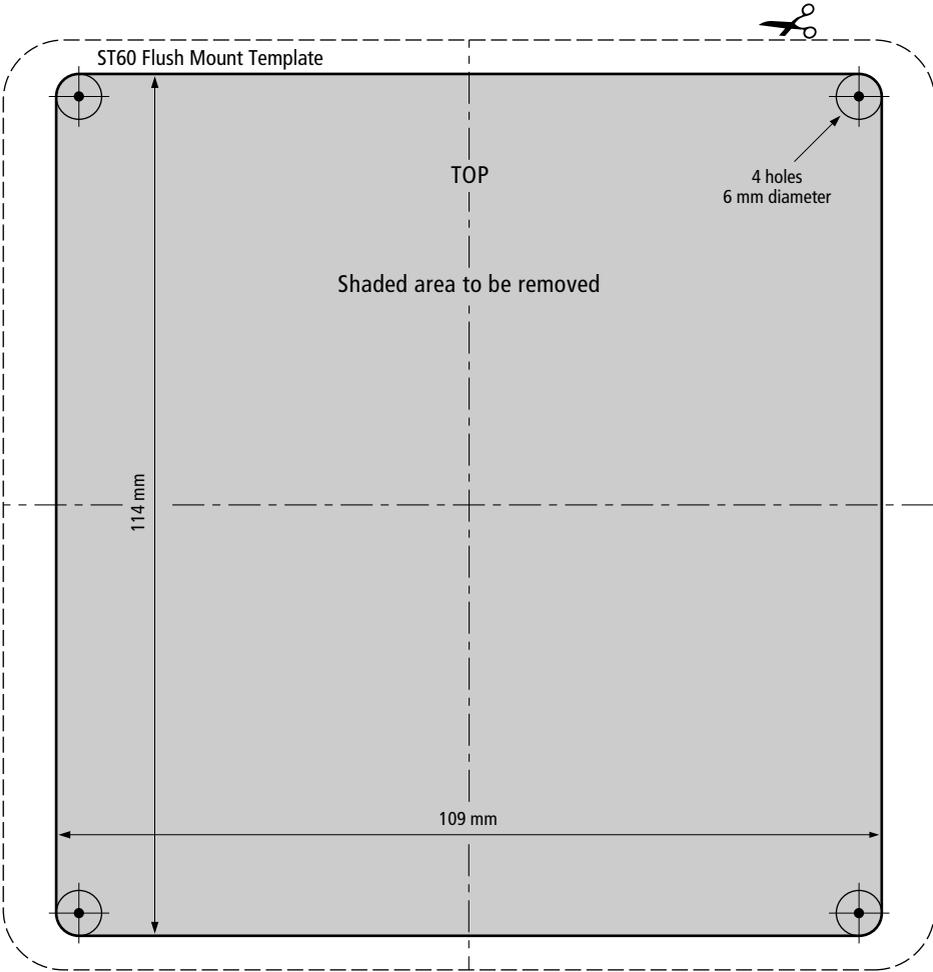
Machine hole  
90mm (3.54in)  
diameter

Shaded areas to be removed



Drill 5mm (3/16in) diameter







# Limited Warranty Certificate

Raymarine warrants each new Light Marine/Dealer Distributor Product to be of good materials and workmanship, and will repair or exchange any parts proven to be defective in material and workmanship under normal use for a period of 2 years/24 months from date of sale to end user, except as provided below.

Defects will be corrected by Raymarine or an authorized Raymarine dealer. Raymarine will, except as provided below, accept labor cost for a period of 2 years/24 months from the date of sale to end user. During this period, except for certain products, travel costs (auto mileage and tolls) up to 100 round trip highway miles (160 kilometres) and travel time of 2 hours, will be assumed by Raymarine only on products where proof of installation or commission by authorized service agents, can be shown.

## Warranty Limitations

Raymarine Warranty policy does not apply to equipment which has been subjected to accident, abuse or misuse, shipping damage, alterations, corrosion, incorrect and/or non-authorized service, or equipment on which the serial number has been altered, mutilated or removed.

Except where Raymarine or its authorized dealer has performed the installation, it assumes no responsibility for damage incurred during installation.

This Warranty does not cover routine system checkouts or alignment/calibration, unless required by replacement of part(s) in the area being aligned.

A suitable proof of purchase, showing date, place, and serial number must be made available to Raymarine or authorized service agent at the time of request for Warranty service.

Consumable items, (such as: Chart paper, lamps, fuses, batteries, styli, stylus/drive belts, radar mixer crystals/diodes, snap-in impeller carriers, impellers, impeller bearings, and impeller shaft) are specifically excluded from this Warranty.

Magnetrons, Cathode Ray Tubes (CRT), TFT Liquid Crystal Displays (LCD) and cold cathode fluorescent lamps (CCFL), hailer horns and transducers are warranted for 1 year/12 months from date of sale. These items must be returned to a Raymarine facility.

All costs associated with transducer replacement, other than the cost of the transducer itself, are specifically excluded from this Warranty.

Overtime premium labor portion of services outside of normal working hours is not covered by this Warranty.

Travel cost allowance on certain products with a suggested retail price below \$2500.00 is not authorized. When/or if repairs are necessary, these products must be forwarded to a Raymarine facility or an authorized dealer at owner's expense will be returned via surface carrier at no cost to the owner.

Travel costs other than auto mileage, tolls and two (2) hours travel time, are specifically excluded on all products. Travel costs which are excluded from the coverage of this Warranty include but are not limited to: taxi, launch fees, aircraft rental, subsistence, customs, shipping and communication charges etc. Travel costs, mileage and time, in excess to that allowed must have prior approval in writing.

**TO THE EXTENT CONSISTENT WITH STATE AND FEDERAL LAW:**

**(1) THIS WARRANTY IS STRICTLY LIMITED TO THE TERMS INDICATED HEREIN, AND NO OTHER WARRANTIES OR REMEDIES SHALL BE BINDING ON RAYMARINE INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

**(2) Raymarine shall not be liable for any incidental, consequential or special (including punitive or multiple) damages.**

All Raymarine products sold or provided hereunder are merely aids to navigation. It is the responsibility of the user to exercise discretion and proper navigational skill independent of any Raymarine equipment.

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Stick barcode label here

Purchased from

Purchase date

Dealer address

Installed by

Installation date

Commissioned by

Commissioning date

Owner's name

Mailing address

This portion should be completed and retained by the owner.