

ST60+ Compass Instrument

Owner's Handbook

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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: Navigational safety

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.

Product disposal



Waste Electrical and Electronic (WEEE) Directive

The WEEE Directive requires the recycling of waste electrical and electronic equipment.

Whilst the WEEE Directive does not apply to some of Raymarine's products, we support its policy and ask you to be aware of how to dispose of this product.

The crossed out wheellie bin symbol, illustrated above, and found on our products signifies that this product should not be disposed of in general waste or landfill.

Please contact your local dealer, national distributor or Raymarine Technical Services for information on product disposal.

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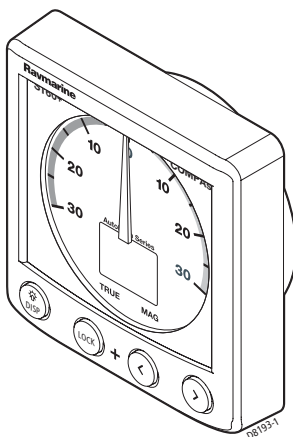
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Introduction

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+ Compass instrument. This instrument gives:

- True/Magnetic Course Heading.
- Current or Locked Heading.
- Course Over Ground (COG).
- Average Heading.



The ST60+ Compass instrument is constructed in a rugged weather proofed case. It provides a sensitive and stable, combined analog and digital display, to deliver accurate information under even the most demanding conditions.

The ST60+ Compass instrument provides Compass Heading, shown in digital form (numerals) plus (when in Locked mode) Steering Course Error to $\pm 30^\circ$ deviation of locked course heading, shown in analog form (pointer). The Compass instrument can be used either as a stand-alone unit, or as part of an integrated SeaTalk instrumentation system.

Data inputs

The ST60+ Compass instrument receives data either from an associated Flux Gate Compass transducer and/or from a SeaTalk instrumentation system.

SeaTalk

SeaTalk enables a number of compatible instruments to be interconnected and operate as a single, integrated navigational system.

Power and data in a SeaTalk system are fed via a single cable, so that instruments can be connected by plugging them into the network. SeaTalk is flexible enough to adapt to any number of compatible instruments without requiring a central processor. SeaTalk can also communicate with non-SeaTalk equipment, using the internationally-accepted National Marine Electronics Association (NMEA) protocol.

In a SeaTalk system, each instrument can be either a master or dedicated repeater unit. A master instrument is directly connected to a transducer (the device that provides the raw data), and provides data and control appropriate to its function, to all other equipment on the SeaTalk network. A repeater instrument is not directly connected to a transducer but displays information provided by other equipment in the SeaTalk network.

Stand alone operation

In Stand alone operation, the ST60+ Compass instrument is connected only to the relevant transducer and does not display information from, or provide information to, any other instruments.

Remote control

When connected to SeaTalk, the ST60+ Compass instrument can be controlled remotely by a SeaTalk Remote Keypad Unit, to provide instant remote access to the various display readouts from the ST60+ range of equipment.

Mounting options

A standard ST60+ instrument is surface-mounted at the required location. 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

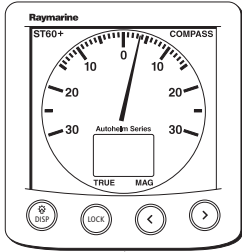
Unpack your ST60+ instrument and check that the following items are present:

- Item 1, ST60+ Compass instrument with standard bezel.

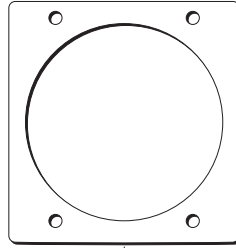
- Item 2, Fixing studs (2).
- Item 3, Thumb nuts (2).
- Item 4, Gasket.
- Item 5, Fluxgate Compass transducer.
- Item 6, SeaTalk interconnection cable.
- Item 7, Power cable.
- Item 8, Instrument Cover.
- Item 9, Owner's Handbook. The Warranty document and mounting templates are included in this Handbook.
- Item 10, Cue Card.

Spare spade terminals are also provided, to re-terminate the transducer cable if it has to be cut to facilitate installation.

Note: *Note: The above packing list is for an ST60+ Compass system. Where an instrument is purchased separately, the Fluxgate Compass transducer is not included.*



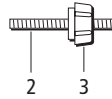
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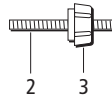


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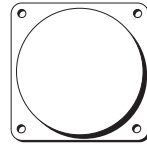
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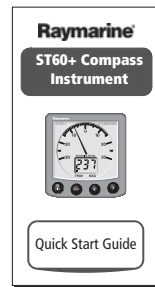
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Chapter 1: Operation

1.1 Getting started

This handbook describes how to operate, maintain and install the Raymarine ST60+ Compass instrument. The Compass instrument shows both compass heading and steering indication. Where GPS or similar positioning data is available from another instrument, Course Over Ground (COG) is calculated and can be used to provide a true course display.



WARNING: Calibration requirement

To ensure this product performs at its best on your boat, you MUST calibrate it before use, in accordance with the instructions in Chapter 4, Calibration. Do NOT use the product until you have successfully calibrated it.

Switching on and off

All the time that power is applied to the instrument, you can use the **disp** button to switch the instrument off and on as follows:

- To switch the instrument off, hold down the **disp** button for approximately 5 seconds. After this time, a switch off count down of 4 seconds occurs. Keep the **disp** button pressed during this period, to switch off the instrument.
- To switch the instrument back on, hold down the **disp** button for approximately 1 second.

When the power supply is switched off, none of the instrument buttons (including **disp**) has any effect.

- Notes:**
- (1) *Each time power to the instrument is switched on, the instrument is initially in the on condition. You do not need to use the **disp** button to switch the instrument on.*
 - (2) *When the instrument is on, the operation of the **disp** button will perform other operating functions, as described below.*

Calibration alert

If the CAL legend on the digital display flashes for the first 30 seconds after any power up, use the appropriate procedures in *Chapter 4, Calibration* to:

1. Apply the factory defaults.
2. Carry out the linearization procedure.

Displayed information

The ST60+ Compass instrument has a pointer and a digital display.

- In unlocked mode, the pointer is set to zero. In locked mode, the pointer shows the course error (i.e. the difference between the current heading and the locked course), up to a maximum $\pm 30^\circ$ deviation.
- The digital display function depends on operating mode. It can show:
 - True/Magnetic Course Heading, or
 - Locked Heading, or
 - Course Over Ground (COG), or
 - Average Heading.

Displayed information is either **TRUE** or **MAG**(netic) as indicated by a black square marker on the digital display, adjacent to the corresponding legend.

Note: *The TRUE and MAG indicators flash for 8 seconds after power is switched on. This is a function of the remote control system and can be ignored if remote control is not being used.*

Use with Sea Talk autopilot

If the ST60+ Compass instrument forms part of a system which includes a Sea Talk autopilot operating in Auto, Vane or Track mode, the ST60+ Compass instrument operates in Auto mode (see below).

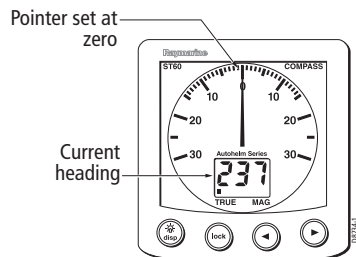
1.2 Operating modes

The ST60+ Compass instrument operates in either unlocked, locked or auto mode.

Unlocked mode

In unlocked mode, the digital display shows the current heading (true or magnetic) and the pointer is set to zero. The ST60+ Compass instrument always powers-up in the unlocked mode.

Not available when the instrument is in auto mode (see below).

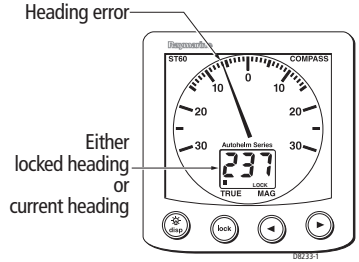


Locked mode

In locked mode, you set a fixed (locked) heading. A LOCK legend, plus either the locked heading or the current heading is displayed, depending on what has been set during User calibration, as the required display for locked mode.

The pointer shows the difference between the locked heading and the actual course being steered, i.e. heading error.

Not available when the instrument is in auto mode (see below).

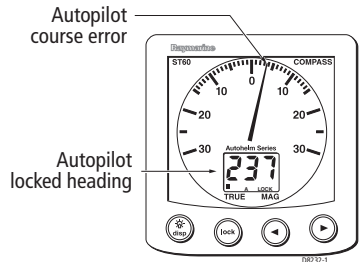


Auto mode

Auto mode is engaged automatically when the ST60+ Compass instrument is connected via SeaTalk to a compatible autopilot. In auto mode the ST60+ Compass instrument acts as a slave display to the autopilot. The digital display shows an 'A' and a LOCK legend, along with the autopilot locked heading.

The pointer shows the autopilot's course error.

In auto mode, all ST60+ Compass instrument button functions, except the ability to change display illumination, are disabled.



1.3 General operation

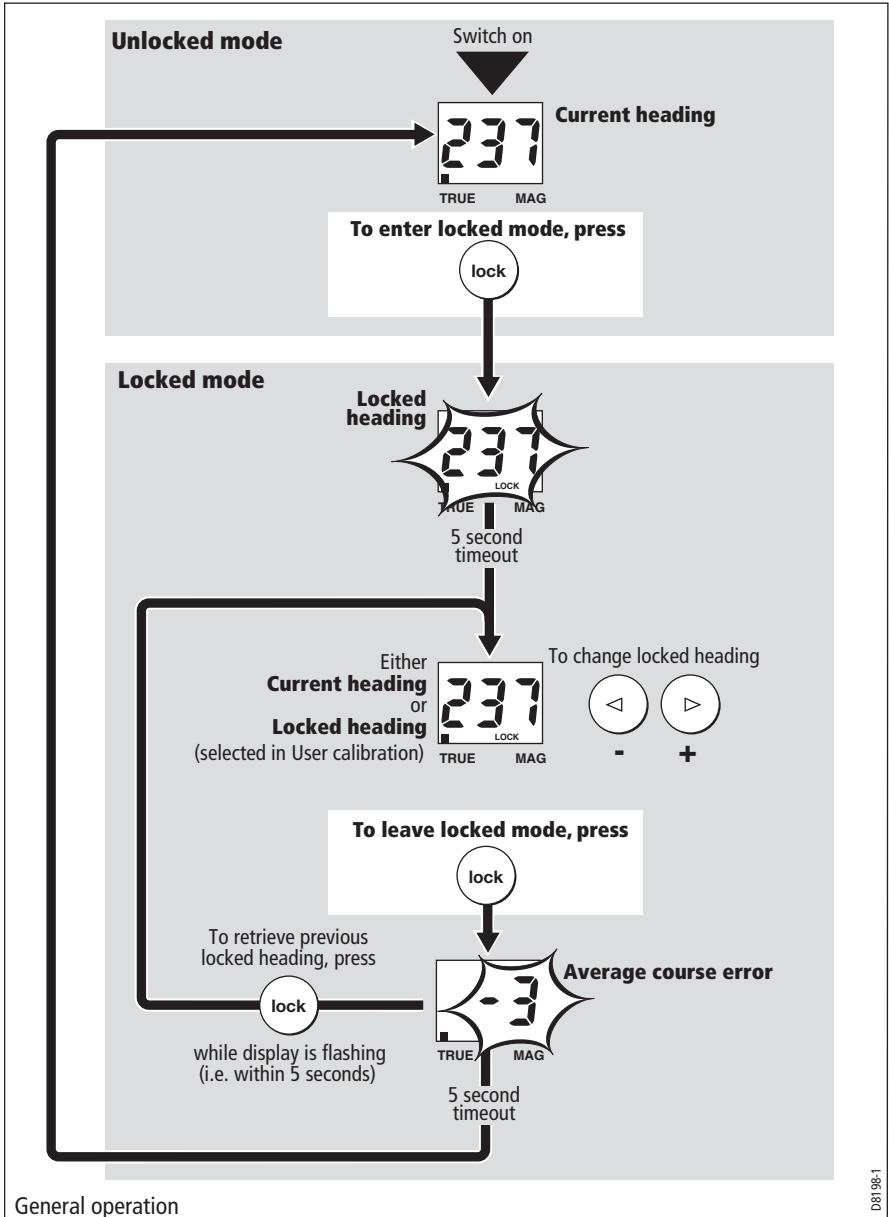
To switch between unlocked mode and locked modes, use the **lock** button.

When you enter locked mode (see the *General operation* illustration on page 4), the current heading is applied as the locked heading and flashes for 5 seconds. After this time, the heading display shows either the locked heading or the current heading, depending on what has been set up during User calibration, as the required display for locked mode (see *Chapter 4, Calibration*).

In lock mode, use the < and > buttons as necessary, to change the locked heading value.

To leave locked mode press the **lock** button. The average course error flashes on the digital display for 5 seconds. Errors to starboard are +ve and errors to port are -ve. If you press the **lock** button again while the average course error is flashing, you re-enter locked mode with the previously stored heading as the locked heading.

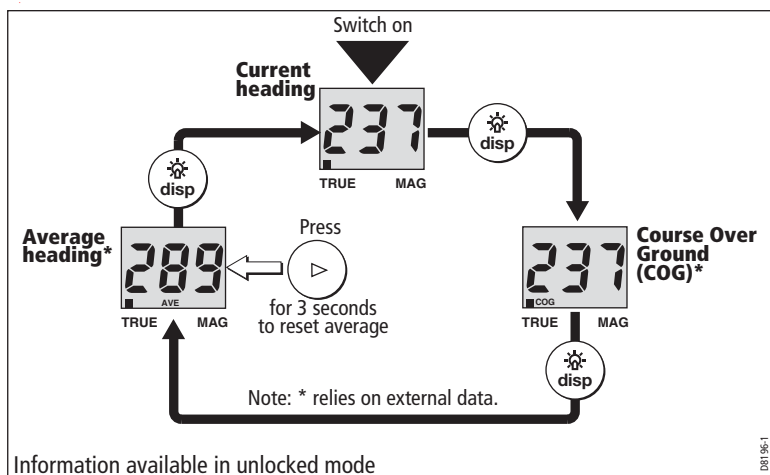
The average course error is reset to zero whenever the locked heading is changed.



Additional functions in unlocked mode

When operating in unlocked mode, you can use the **disp** button to show the following information on the digital display:

- Course over ground (COG). This is available if the ST60+ Compass Instrument is connected via SeaTalk system to a compatible GPS. If GPS information is not available, the digital display shows --- when COG is selected.
- Average heading. You can reset the average heading value by holding down the > button for 3 seconds.



Operating hints

Steering sense

When the pointer indicates an off course error, steer the vessel in the direction you want the pointer to move.

Man overboard/reciprocal course

If the vessel is turned through 110° or more when the ST60+ Compass Instrument is in lock mode, the ST60+ Compass Instrument automatically locks to the reciprocal of the original course (180° from the original). The digital display shows the reciprocal course and the pointer shows the course error from the reciprocal course.

The reciprocal course function is reversible, so that a second similar turn would lock onto the original locked course.

Note: *The Man overboard/reciprocal course feature is not available when operating in Auto mode.*

1.4 Display illumination

When the instrument is first powered up, the display illumination is set to its lowest (courtesy) level, to facilitate access to the buttons.

To adjust the level of display illumination:

1. Hold down the **disp** button for approximately one second, to enter the illumination-adjust mode.
2. There are four preset illumination levels from L0 to L3. Momentarily press the **disp** button to cycle through these levels until you reach the level you want. The selected level is transmitted to all other instruments on the SeaTalk bus.
3. Press any other button to leave the illumination-adjust mode.

Note: *The digital display will return to normal operation 7 seconds after the last button press.*

1.5 Remote control

When connected to SeaTalk, the ST60+ Compass instrument can be controlled remotely with a SeaTalk Remote Keypad. Remote control of an instrument is indicated by flashing TRUE/MAG indicators on the ST60+ Compass instrument digital display.

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 authorized Raymarine service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raymarine product.
- Some products generate high voltages, so never handle the cables/connectors when power is being supplied 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 inside of 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/or 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 Troubleshooting

Preliminary procedures

Changes in the electronic environment may adversely affect the operation of your ST60+ Compass instrument 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.

Fault location

All Raymarine products are subjected to comprehensive test and quality assurance programmes prior to packing and shipping. If a fault arises with the ST60+ Compass instrument, the following table may help to identify the probable cause and provide the most likely cure.

Fault	Cause	Remedy
Display blank.	No power supply.	Check power supply. Check SeaTalk cabling and connector security. Check fuse/circuit breaker.
Displayed heading differs from that shown in vessel's card compass.	Deviation present.	Check for presence of large amounts of iron in the vicinity. If none present, recalibrate as detailed in <i>Chapter 4 Calibration</i> .
No transfer of information between instruments or a group of instruments (e.g. illumination levels).	SeaTalk cabling fault.	Check security of SeaTalk connectors. Check the condition of SeaTalk cables. Disconnect instruments one by one, to isolate faulty instrument.

Technical support

Raymarine provides a comprehensive customer support service, on the world wide 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

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 world wide 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)

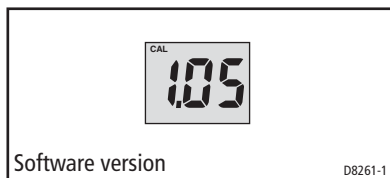
Help us to help you

When requesting service, please quote the following product information:

- Equipment type.
- Model number.
- Serial number.
- Software issue number.

To find out the software version number of your ST60+ Compass instrument:

1. During normal operation, hold down the **disp** and **lock** buttons for approximately 4 seconds, to display the software version.



2. Note the software version number, then hold down the **disp** and **true/app** buttons for approximately 2 seconds, to return to normal operation.

Chapter 3: Installation

This chapter describes how to install the ST60+ Compass instrument and associated Fluxgate Compass transducer. The transducer cable is connected to the rear of the instrument.

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

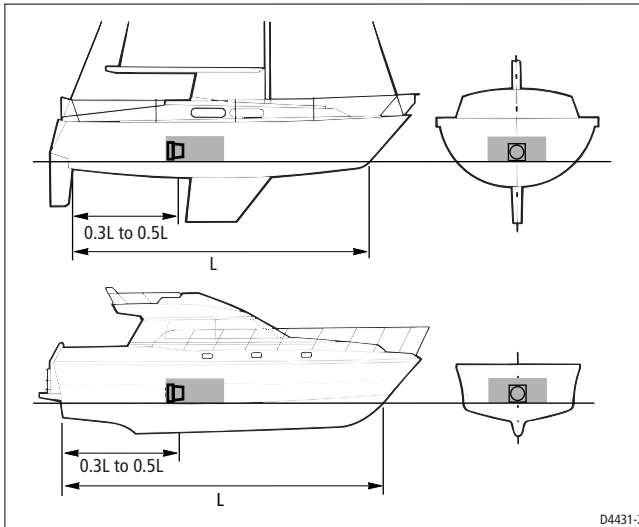
3.1 Planning your installation

Before starting the installation, spend some time considering the best positions for both transducer and instrument, such that the *Site requirements* and the *EMC installation guidelines* are satisfied.

Site requirements

Transducer

For optimum performance, the Fluxgate Compass transducer should be positioned as near as possible to the pitch/roll center of the vessel, as shown in the following illustration.



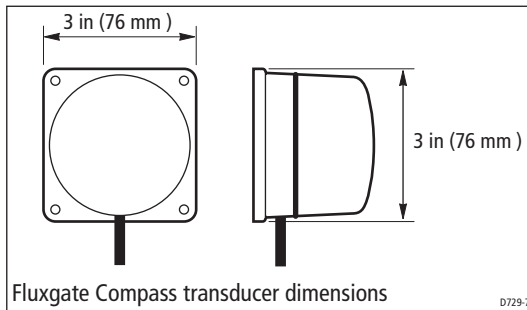
The Fluxgate Compass transducer must also be sited:

- At least 0.8 m (2 ft 6 in) away from the vessel's steering compass to avoid deviation in both compasses.
- On a bulkhead below deck.

Note: *On steel vessels the Fluxgate Compass transducer can be mounted above deck. When mounted above deck, performance may be impaired due to increased motion.*

- To allow reasonable access for installation and servicing.
- Away from any equipment or other installation which may shield the transducer or otherwise disturb the earth's magnetic field, e.g. large ferrous or magnetic items, communications equipment or cabling.
- On a vertical mounting surface. Where necessary, make up a suitable non-ferrous wedged packing piece to provide the necessary vertical surface.

There must also be a viable route for the transducer cable to be routed to the instrument.



Instrument

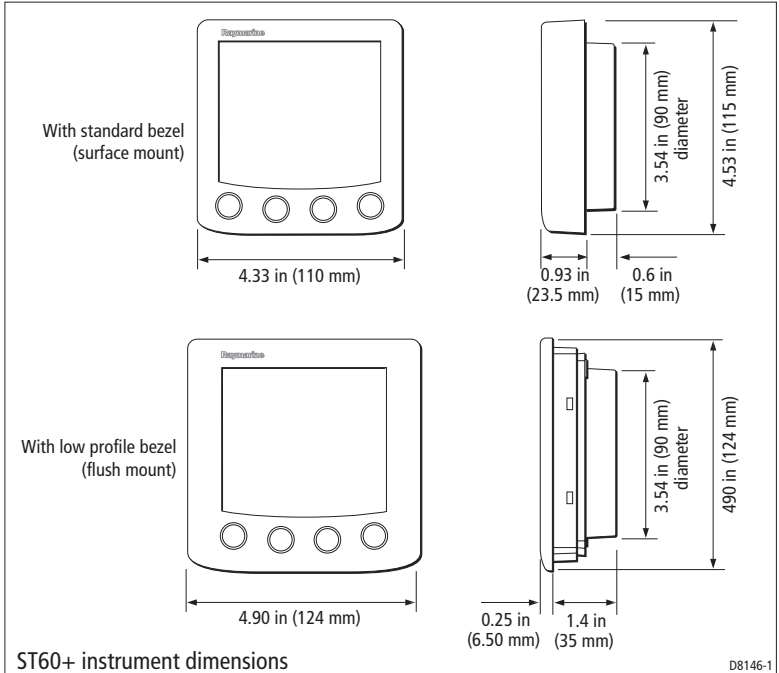
CAUTION: Keep the rear of the instrument dry

Keep the rear of instrument dry. Failure to observe this caution could result in damage if water enters the instrument through the breathing hole or comes 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.
- Protected against physical damage.
- At least 9 in (230 mm) from a compass.
- At least 20 in (500 mm) from radio receiving equipment.
- Reasonably accessible from the rear 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.

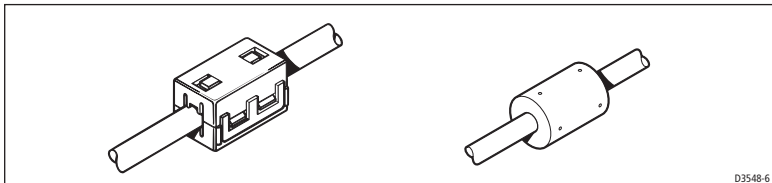
The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the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



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 practical to describe procedures for all possible installation scenarios, the procedures given here describe the broad requirements for installing an ST60 Compass instrument and its associated Fluxgate Compass Transducer. Adapt these procedures as appropriate, to suit your individual requirement.

CAUTION: Maintain structural safety

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+ instrument 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+ Compass 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.

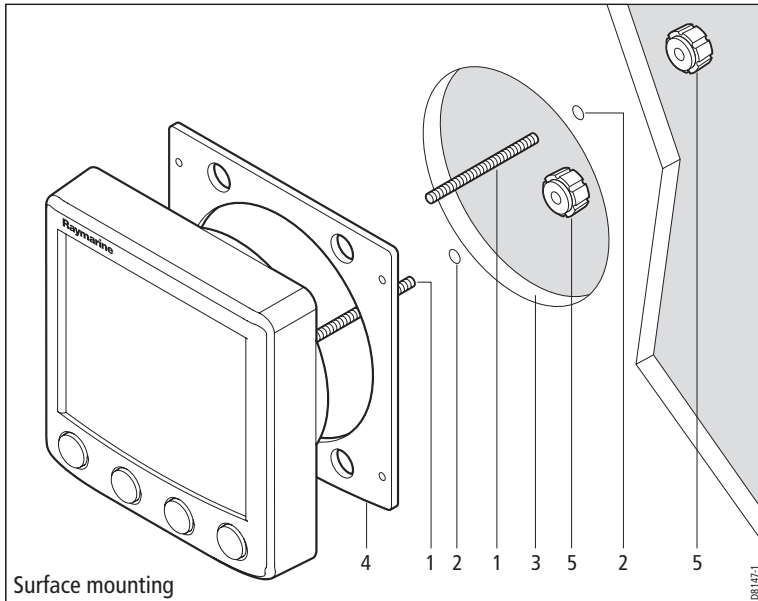
The ST60+ Compass instrument can also be mounted behind a panel with just the instrument dial and buttons visible.

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 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).

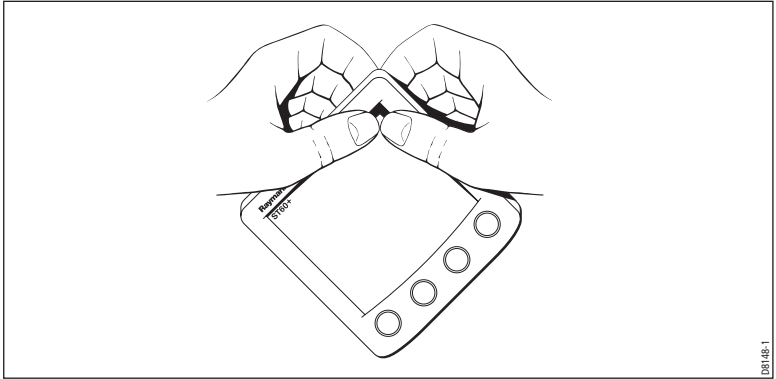
Flush mounting

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 flush mount bezel

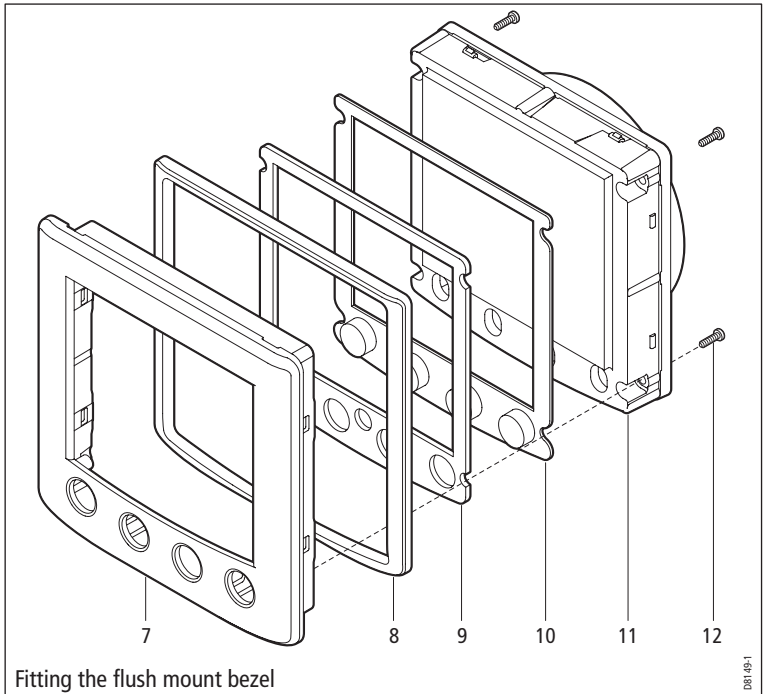
In order to flush-mount your ST60+ instrument, you must first replace the standard bezel with the flush mount bezel as follows:

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.



DB148-1

3. Referring to the *Fitting the flush mount bezel* illustration, insert the panel seal (8) in the corresponding recess on the back of the flush mount bezel (7).
4. Place the instrument (11) face upwards on a flat surface, then place the rubber keypad (10) in position around the display window (i.e. so that each button outline is located over its associated button on the instrument).



Fitting the flush mount bezel

DB149-1

5. Place the keypad seal (9) in position on the keypad (i.e. so that the holes in the seal accept the appropriate keypad buttons).
6. Place the assembled flush mount bezel and panel seal, in position on the instrument, so that the rubber keys are correctly located in the holes on the bezel, then clip the bezel and instrument together.

CAUTION: Use the correct screws

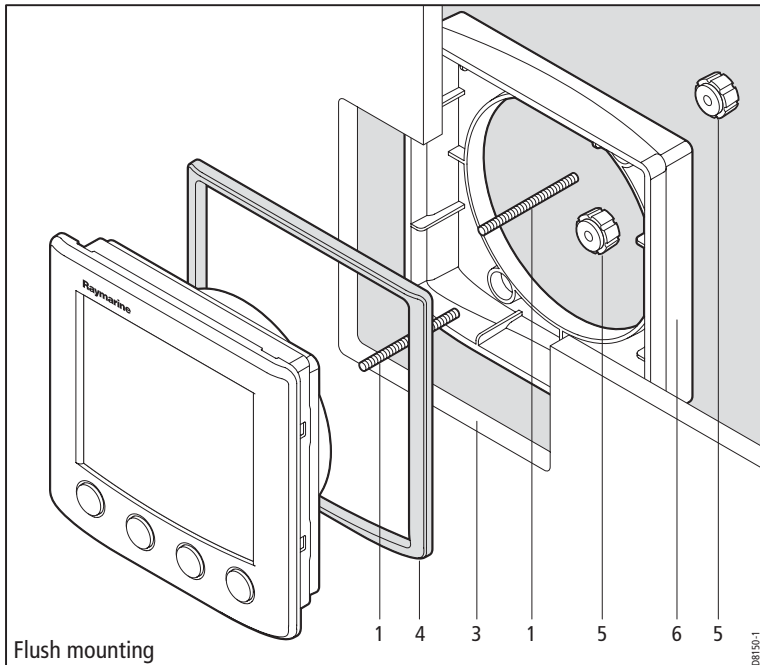
It is essential that only screws of the correct size are used to secure the instrument to the bezel. Failure to observe this caution could result in damage to both the instrument and the bezel.

7. Using the four, self-tapping screws (12) 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 flush mount bezel as described under *Fitting the flush mount 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.
 - There is sufficient space behind the location to accommodate the rear of the instrument and connectors.
3. Apply the template flush mount (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.

Fitting transducer

If you are fitting an ST60+ Compass instrument and wish to use it as a stand alone instrument, you need to fit a Fluxgate Compass transducer.

Note: *If the ST60+ Compass instrument is to form part of a system which includes a SeaTalk autopilot, the ST60+ Compass instrument does not need its associated Fluxgate Compass transducer to operate as a slave to the autopilot. However, if the Fluxgate Compass transducer is fitted, the instrument will operate as a master.*

Installation

Determine a suitable position for the Fluxgate Compass transducer, as described under *Site requirements*.

If you are not sure of the magnetic suitability of the chosen location, carry out a survey of the site as follows:

1. Temporarily fix a simple hand bearing compass at the intended location.
2. Swing the vessel through 360° while at the same time observing differences between the hand bearing compass and the vessel's main steering compass.
3. If there are no differences, greater than 10° on any heading, then the site is suitable for the Fluxgate Compass transducer.

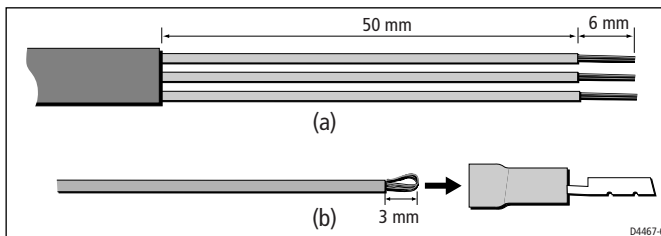
Using the self-tapping screws provided, mount the Fluxgate Compass transducer vertically on a suitable bulkhead, so that the connecting cable is downmost.

Running transducer cable

General

The manner in which you run the cable from the Fluxgate Compass transducer will depend on the locations of the transducer and instrument. The following guidelines are provided:

- 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.
- Although the transducer cable is fitted with spade connectors for direct connection to the rear of the instrument, it may be necessary to remove these to facilitate installation e.g. if you want incorporate a junction box in the cable run or if the cable has to be routed through narrow apertures. Extra spade connectors are provided, to replace any that are removed when running the cable. 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.



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Connecting the instrument

Introduction

The ST60+ Compass instrument can be connected to SeaTalk as a repeater instrument.

The ST60+ Compass instrument can also be connected:

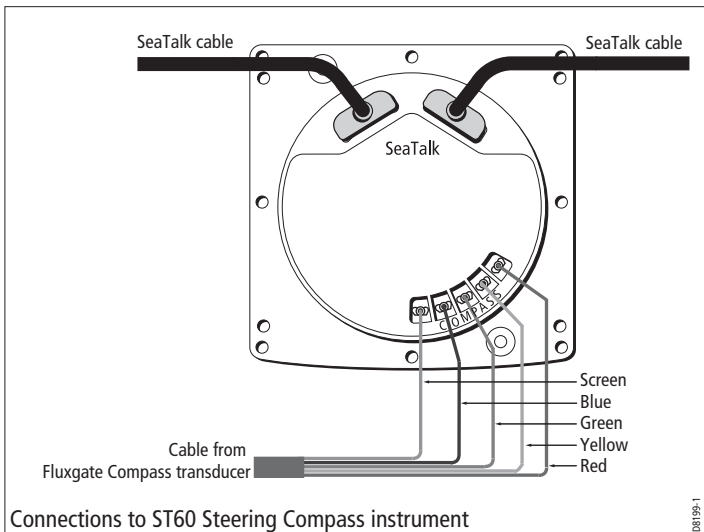
- As a stand-alone instrument connected directly to the Fluxgate Compass transducer.
- To fulfil both slave (repeater) and master roles by being connected both to the Fluxgate Compass transducer and to SeaTalk.

Instruments connected to SeaTalk derive their power directly from SeaTalk and 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.

Signal connections

Make the necessary connections to your ST60+ instrument (see the *Connection to ST60+ Compass instrument* illustration).



Power supply connections

CAUTION: Protect the power supply

Ensure that the 12 V power supply for the instrument is protected by a suitably rated fuse or protective circuit breaker.

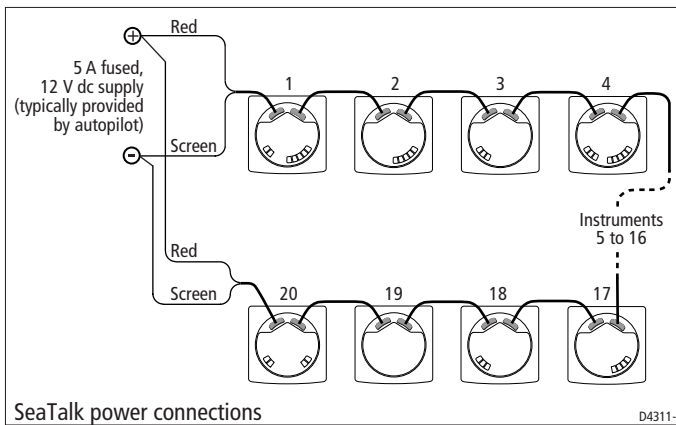
SeaTalk systems

Ensure that the power supply for the SeaTalk bus is protected by a 5 A fuse or circuit breaker.

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

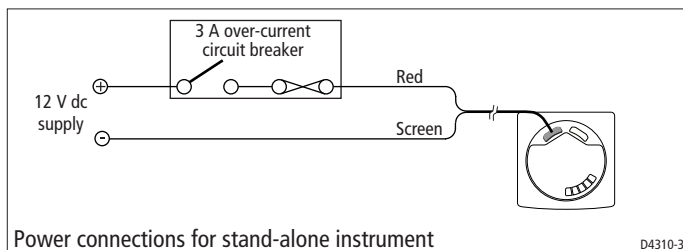


Stand alone instruments

Stand-alone instruments are not connected to SeaTalk and therefore need to be connected to an alternative 12 V power source. Power cables are available in 2 m and 9 m lengths.

To fit a power cable:

1. Ensure the intended power source is switched off.



2. Run the power cable from the instrument to a suitable 12 V dc power source.
3. If the cable has not already been trimmed at the power supply end:
 - i. Cut the cable to length and trim back an appropriate amount of the outer sheath.
 - ii. Cut back and insulate the yellow wire.
4. Connect the screen to the power supply 0 V terminal.
5. Connect the red wire, via a 3 A fuse or protective circuit breaker, to the power supply +12 V terminal.
6. Insert the power cable connector into one of the SeaTalk connectors at the rear of the instrument.

3.3 Switching on

Switch on the power to your ST60+ instrument. When the power is on, you can use the **disp** button to switch the instrument on and off as described in *Chapter 1, Operation*.

Use the procedure in *Chapter 1, Operation* to set the backlighting to the level you want.



WARNING: Calibration requirement

To ensure this product performs at its best on your boat, you MUST calibrate it before use, in accordance with the instructions in *Chapter 4, Calibration*. Do NOT use the product until you have successfully calibrated it.

EMC conformance

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

Chapter 4: Calibration

4.1 Introduction

The ST60+ Compass 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 button presses and the resulting displays. If a parameter is adjustable, adjustment instructions are given at the appropriate point on the diagram.

4.2 User calibration

The User calibration procedures (see the *User calibration* flow chart) enable you to carry out:

- Linearization and heading alignment.
- Locked heading display selection.
- Variation setting.
- True/Magnetic display selection.

Note: *User Calibration is possible only if it is enabled (default) in Dealer Calibration.*

To carry out a User calibration:

1. Hold down the **disp** and **lock** buttons together for approximately 2 seconds to select the Calibration entry screen.
2. Use the **disp** button to cycle from screen to screen and use the < and > buttons to set the required values at each screen.

Linearization

The Fluxgate Compass transducer must be linearized to compensate for deviation. Linearization should be carried out in calm conditions, preferably in flat water.

Note: *If linearization has already been performed, press the **disp** button momentarily to bypass the linearization process and carry on to the Heading alignment screen without disturbing the current deviation settings.*

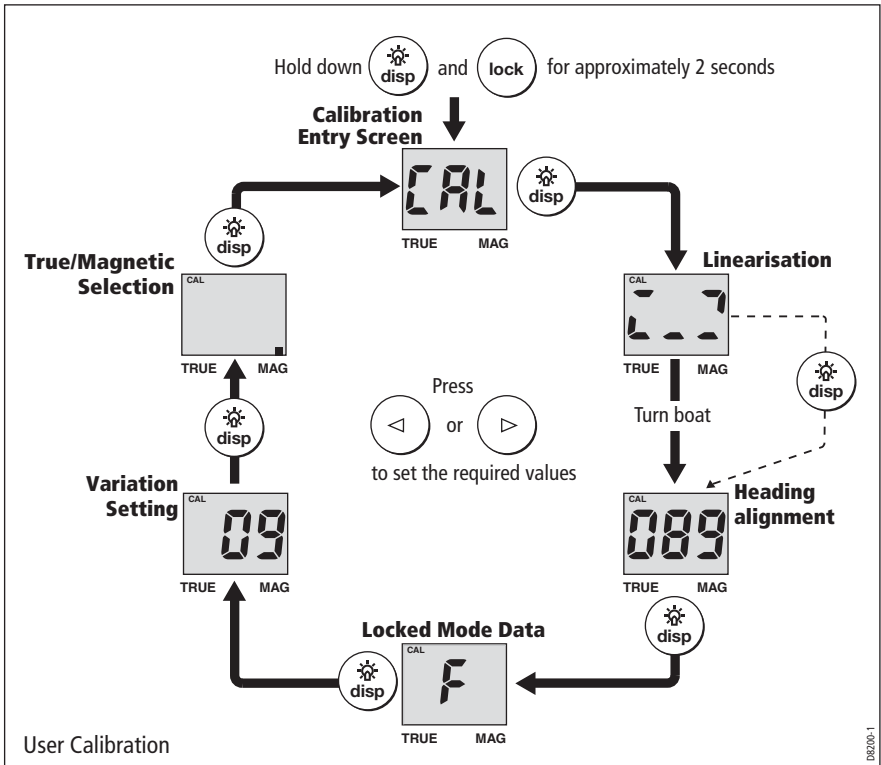
When the Linearization screen is first selected, the outer segments of the LCD cycle to indicate that linearization has started.

To proceed with the linearization, slowly turn the vessel in a circle, so that the speed is kept below 2 knots and so that it takes at least 3 minutes to complete 360°. If the vessel is turning too quickly, the buzzer will sound and a SLO message will flash on the digital display. If this occurs, slow down the vessel's rate of turn.

Keep turning until the heading alignment screen is displayed. Linearization is now complete .

Note: *If you want to move from the linearization screen to the heading alignment screen without carrying out the linearization procedure, press the **disp** button.*

Note the pointer reading which shows the amount of deviation corrected. If this reading exceeds 15°, the Fluxgate Compass transducer should be re-sited.



Heading alignment

Carry out heading alignment as follows:

1. Align the vessel with a known bearing; preferably a transit bearing.
2. Use the < and > buttons to adjust the value on the ST60+ Compass instrument digital display until it corresponds to the known bearing.

Locked mode data

The locked mode data screen enables you to select which heading is selected as the normal operating display in locked mode. This can be either:

- The locked or 'fixed' heading.

or

- The live or 'current' heading.

Use the < and > buttons as necessary, to select the required heading. Select:

- F for Fixed heading.
- C for Current heading.

Variation setting

A positive value indicates easterly and a negative value westerly. If the variation has not been set, or the data is not available, the digital display shows a series of dashes.

Changes to variation must be accepted before a TRUE heading can be selected, (see *True/magnetic selection* below).

If the ST60+ Compass instrument is connected to SeaTalk and a value for variation is present on SeaTalk (e.g. from an autopilot), this is accepted as the value for the instrument. If a value is not present on SeaTalk, or if the instrument is not connected to SeaTalk, use the < and > buttons to set the appropriate value.

True/magnetic selection

Use this option to select either MAG (netic) or TRUE as the heading display default (indicated by the black square adjacent to either MAG or TRUE, as appropriate).

If the ST60+ Compass instrument is used in a system without a SeaTalk compatible Autopilot, or it is being used independently, set the digital display to MAG.

True headings cannot be displayed if variation data is not available.

Leaving User calibration

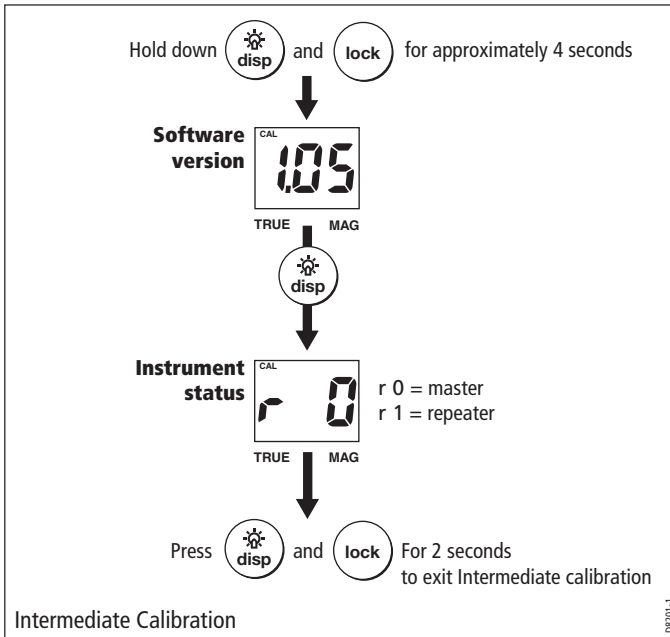
Press the disp and lock buttons for 2 seconds, to save your changes, exit User calibration and return to normal operation.

4.3 Intermediate calibration

The Intermediate calibration procedures (see the *Intermediate calibration* flow chart) enable you see:

- Software version.
- Master/Repeater status.

To access the intermediate calibration information, hold down the **disp** and **lock** buttons together for approximately 4 seconds.



Software version number

This screen shows the software version number. This information is normally required when requesting parts or repairs.

Master/repeater status

Press the **disp** button from the software version screen to enter the Master/ Repeater Status screen.

The display shows either:

- r0 to indicate a master instrument, i.e. connected to a transducer
- or
- r1 to indicate a repeater instrument, i.e. using data from SeaTalk.

Leaving Intermediate calibration

Press the **disp** and **lock** buttons for 2 seconds, to exit Intermediate calibration and return to normal operation.

4.4 Dealer calibration

Dealer calibration enables the following parameters to be set:

- User calibration on/off.
- Pointer response.
- Heading display response.
- Boat show mode on/off.

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 **disp** and **lock** buttons together for approximately 12 seconds to select the Dealer calibration entry screen (see *Dealer calibration* flow chart). Then press the < and > buttons simultaneously, to start the calibration sequence.

User calibration on/off

Controls access to the User calibration. Access can be either enabled (UC1) or disabled (UC0), as required.

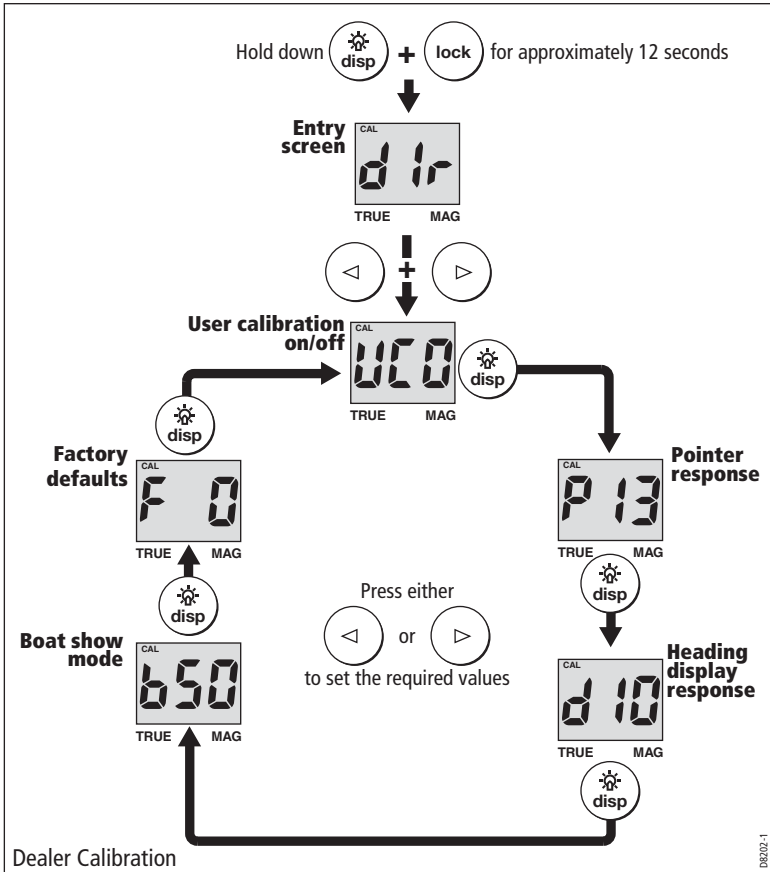
Use the < and > buttons to set the value you want.

Note: *If the access to User calibration is disabled, then only the software version screen will be available in Intermediate calibration; the instrument status screen will not be displayed.*

Pointer response

The pointer response value determines how the pointer responds to changes in data inputs. The higher the value, the more sensitive the pointer to data changes. The range is from P1 to P15 .

Use the < and > buttons to set the value you want.



Heading display response

The heading display response value determines how the digital display responds to changes in data inputs. The higher the value, the more sensitive the display to data changes. The range is from d1 to d15 .

Use the < and > buttons to set the value you want.

Boat show mode

CAUTION: Do NOT enable Boat Show Mode
Do NOT enable Boat Show Mode. This must be used only for demonstration purposes.

Ensure that Boat Show Mode is set to bS0 (disabled). If necessary, use either the < button or the > button to achieve this.

Factory defaults

You can use this screen to reset the operating parameters to the factory default values. Use the < and > buttons 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.

To retain the current values, ensure that the display shows NO.

If you want to apply the factory defaults, change the display to YES. If you do this, the values you have set up will be overwritten by the factory defaults when you leave this screen.

Leaving Dealer calibration

Hold down the **disp** and **lock** buttons for 2 seconds, to save your changes, exit Dealer calibration and resume normal operation.

Glossary

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

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

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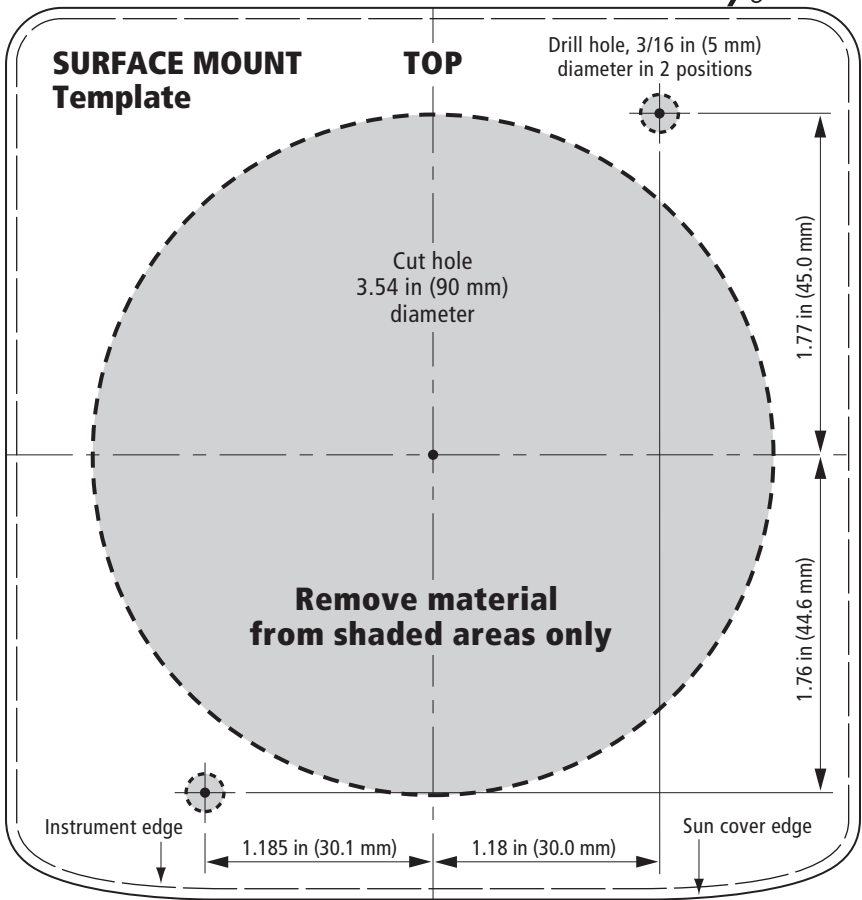
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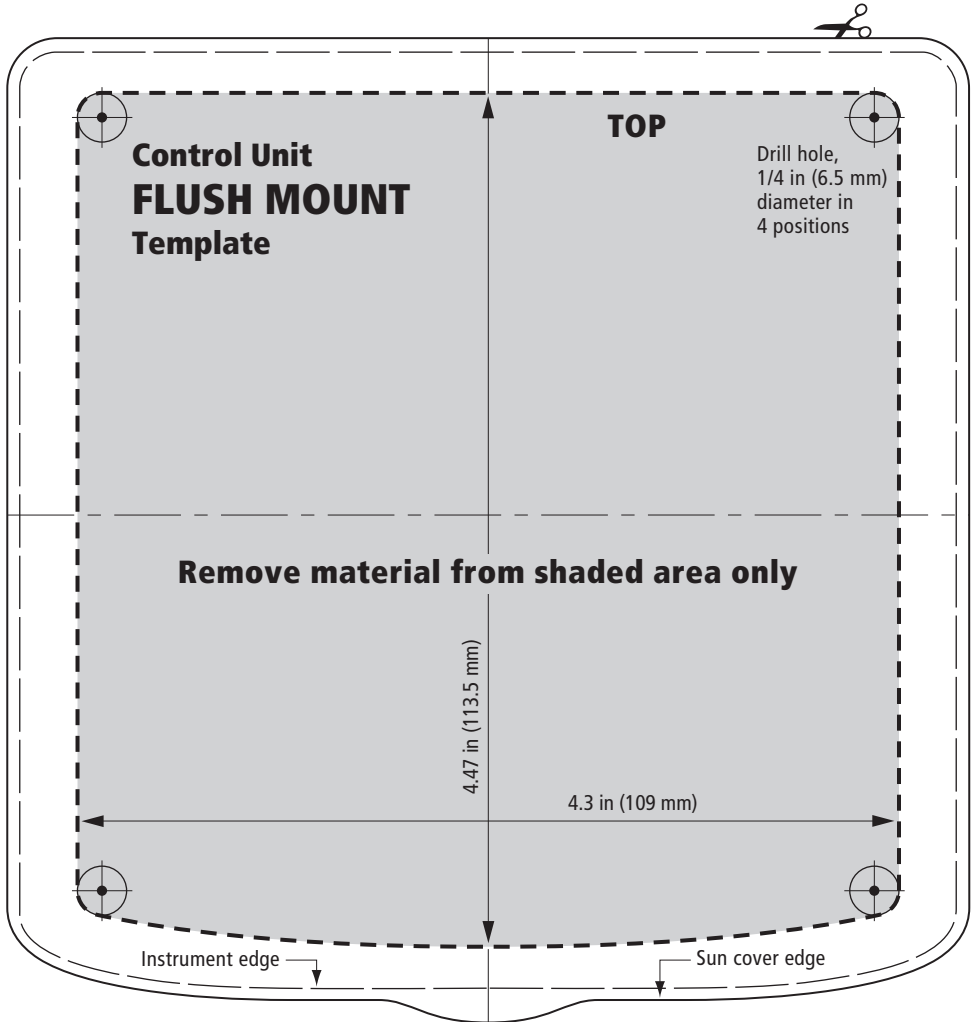
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**SURFACE MOUNT template for
ST60+ Instruments**



**FLUSH MOUNT template for
ST60+ Instruments**

