ST40 Wind Instrument Owner's Handbook

Important information

WARNING

Although your ST40 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 Raytheon equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

The design and manufacture of Raytheon 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, the Raytheon policy of continuous product improvement may change product specifications without notice. Consequently, unavoidable differences may occur between the product and the handbook from time to time, for which Raytheon cannot accept liability.
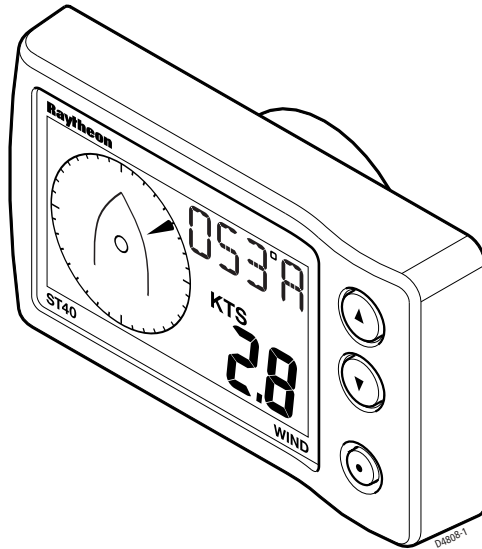
Contents

Preface

Thank you for purchasing a Raytheon product. We are sure your ST40 instrument will give you many years of trouble-free operation.

This instrument is designed to provide reliable performance, even under the most demanding conditions.

Parts supplied
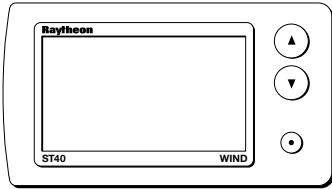
ST40 Wind instrument

Instrument Cover
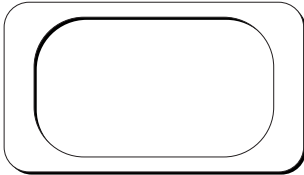
Gasket
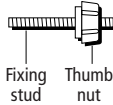
Fixing stud

Thumb nut
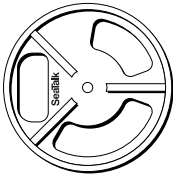
Clamping bracket
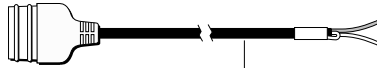
1 m (3 ft) power cable
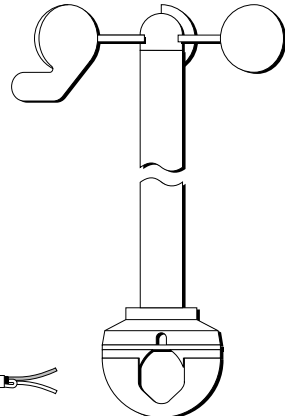
Rotavecta wind transducer

Owner's Handbook. Warranty document and fitting templates included in Handbook
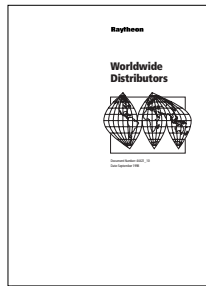
Worldwide Service Centre Handbook.
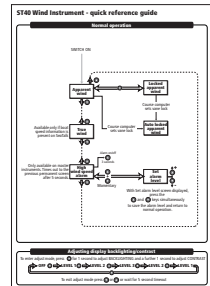
Quick Reference Guide

Note:
The items shown here are supplied for an ST40 Wind system. If an instrument is purchased separately, a transducer is not included. If any item is not present, contact your Raytheon Dealer.

D4752-2

Chapter 1: Operation

1.1 Introduction

Your ST40 Wind instrument:

- Provides apparent wind speed and direction information. Wind speed units can be either knots (KTS) or metres per second (M/S), as set during User calibration (see *Chapter 4, Calibration*).

- Provides true wind speed and direction information, if boat speed information is available on SeaTalk.

- Enables a locked apparent wind angle to be defined either manually, or automatically by a course computer. In this mode, the instrument shows the deviations from the locked wind angle and the direction to steer to achieve the locked wind angle.

CAUTION

Your instrument is calibrated to factory (default) settings when first supplied and must therefore be calibrated before use, to ensure optimum performance on your vessel. Do NOT use the instrument until the calibration procedures have been satisfactorily completed, using the procedures in *Chapter 4, Calibration*.

Coloured bezel and Desktop Mounting Bracket options are available for your ST40 instrument. Contact your Raytheon dealer for further information.

1.2 Operating procedures

Operating information is presented in flow chart form. The flow charts show the various operating screens and key presses necessary to carry out the various instrument functions. Key presses are momentary unless otherwise stated.

Silencing alarms

To silence an alarm (see the *Alarms* section, later in this chapter), momentarily press any one of the instrument keys.

NORMAL OPERATION

Switch on

Apparent wind

Locked apparent wind

Increase locked wind angle

Decrease locked wind angle

Course computer enters vane lock

Course computer enters vane lock

Auto locked apparent wind

True wind

If boat speed information (from SeaTalk) is not present, true wind information is not available and this screen is displayed

High wind speed alarm

Alarm on/off

3 seconds

Set high wind speed alarm threshold

Increase

Decrease

Momentary

With **Set high wind speed alarm threshold** screen displayed, press the ▲ and ▼ keys simultaneously to save the alarm level and return to normal operation.

Note: The **High wind speed alarm** screen is available only on master instruments. It is a temporary screen and will time-out to the previous permanent screen (**Apparent wind** or **True wind**) after 5 seconds.

D4753-1

Backlighting and contrast adjustment

Hold down ⊙ for 1 second to enter Adjust Backlight mode

for 2 seconds to move through Adjust Backlight mode and enter Adjust Contrast mode

ADJUST BACKLIGHTING

During normal operation, press ⊙ for 1 second

The current backlighting level is displayed.

Select the required backlighting level then:

to adjust contrast,
press ⊙ for 1 second

to return to normal operation,
press ▼ or ▲
or wait for 5 second timeout

Normal operation

ADJUST CONTRAST

During normal operation, press ⊙ for 2 seconds

via Adjust Backlighting

The current contrast level is displayed.

Select the required contrast level then

press ▼ or ▲

or wait for 5 second timeout

Normal operation

D4856-1

1.3 Screen descriptions

Apparent and true wind screens

Boat heading

Wind direction with respect to boat heading. Either apparent or true.

Wind angle Either A (apparent) or T (true)

Wind speed Either apparent or true, as indicated above.

KTS
2.8
ST40   WIND

If apparent wind information is displayed, press ● to apply the current wind bearing as the locked heading

D4792-1

Locked apparent wind screen

Flashing segment indicates the divergence of the apparent wind from the locked wind angle

Locked wind angle

P = port, S = starboard. Relative direction of the locked wind angle

Apparent wind speed

Direction to steer indicator to achieve locked wind angle

Use ▲ or ▼ to change locked wind angle, as required.

Press ● to return to the **Apparent wind** screen

Note:
In auto lock mode, a similar screen is displayed with an **A LOCK** annunciator, to indicate that the locked wind angle is controlled by the course computer and cannot be changed manually.

D4793-1
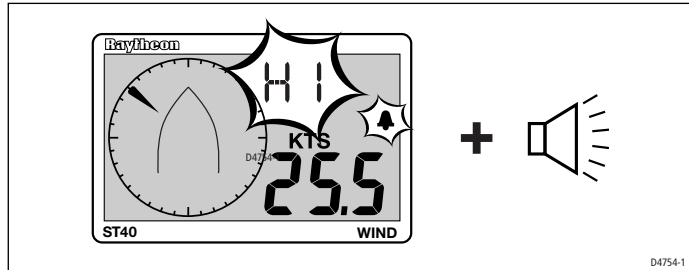
1.4 High wind speed alarm

The high wind speed alarm threshold is set up at the **Set high wind speed alarm threshold** screen and the alarm sounds if the alarm is switched on and the wind speed exceeds this threshold.

Indications

True wind

If boat speed information is available at the ST40 Wind instrument (from a SeaTalk bus), the alarm is triggered if TRUE wind speed exceeds the threshold.

Apparent wind

If boat speed information is not present, the alarm is triggered if the APPARENT wind speed exceeds the threshold.

Enabling/disabling alarm

You can enable or disable the high wind speed alarm function (i.e. switch it on or off) by selecting the **Set high wind speed alarm threshold** screen (see *Normal operation*) and holding down the ⌃ key for 3 seconds (toggle action).

Chapter 2: Maintenance and Fault Finding

2.1 Maintenance

Servicing and safety

- Raytheon equipment should be serviced only by authorised Raytheon service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user-serviceable parts in any Raytheon 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 affect on operation. In order to minimise these effects and enable you to get the best possible performance from your Raytheon 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 Raytheon dealer. We will use any 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.

- Always switch off the power to Raytheon equipment before working on it.

When requesting service, please quote equipment Type, Model Number, Serial 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 a small amount of condensation to form on the instrument window. This will not harm the instrument and will clear after the instrument has been switched on for a short period.

Periodically clean your ST40 instrument with a soft damp cloth. Do NOT use chemical or abrasive materials to clean the instrument.

Transducer

Refer to the Installation and Maintenance instructions supplied with the transducer.

Cabling

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

2.2 Fault finding

Preliminary procedures

If you appear to have a problem, first check the security of the connections at the rear of the instrument and reconnect any that are loose.

Changes in the electronic environment may adversely affect the operation of your ST40 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.

Fixing faults

All Raytheon products are subjected to comprehensive test and quality assurance programmes prior to packing and shipping. However, if a fault occurs, the following guidelines may help to identify and rectify the problem.
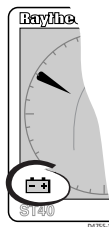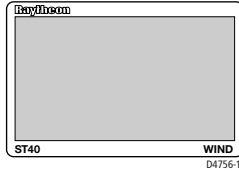
Low battery		**Action**
		Recharge your vessel's battery as soon as possible

Display blank

Raytheon

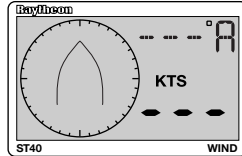ST40   WIND
                        D4756-1

Action

Check fuse/circuit breaker.

Check power supply.

Check SeaTalk cabling and connector security.

No wind information

Raytheon

--- --- --- A

KTS

ST40   WIND

OR

Raytheon

--- --- --- T

KTS

ST40   WIND
                        D4757-1
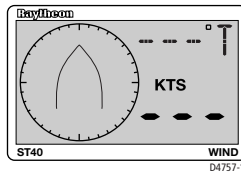
Action

Check the condition of the wind transducer cable and the security of the connections.

If apparrent (A) wind speed information is present but true (T) wind speed information is not, boat speed information may be missing.

SeaTalk information not being transferred between instruments

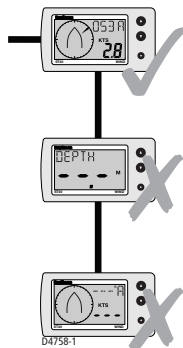For example, backlighting level changes implemented at one instrument do not affect other instruments

Action

Check security of SeaTalk connections between instruments.

Check condition of SeaTalk cables.

Isolate faulty instrument by disconnecting instruments one by one.

A group of SeaTalk instruments not working

0530
KTS
2.8
✓

DEPTH
M
✗

KTS
--- ---
✗

D4758-1

Action

Check the security of SeaTalk connectors between functioning and non-functioning instruments.

Assistance

If you are unable to rectify any problem, please contact your local Raytheon Dealer for assistance.

Chapter 3: Installation

This chapter describes how to install the ST40 Wind instrument, and associated Rotavecta wind transducer.

3.1 Planning your installation

Determine the best positions for both transducer and instrument, such that the *EMC installation guidelines* and the *Site Requirements* (below) are satisfied.

EMC installation guidelines

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

Their design and manufacture conform 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 recognised 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**:

- All Raytheon equipment and cables connected to it are:
    - At least 1 m (3 feet) 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 (7 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 is supplied from a different 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.

- Raytheon specified cables are 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 needs to be removed during installation it must be reassembled in the same position.

Suppression Ferrites

The following illustration shows typical cable suppression ferrites fitted to Raytheon equipment. Always use the ferrites supplied by Raytheon.

D3548-2
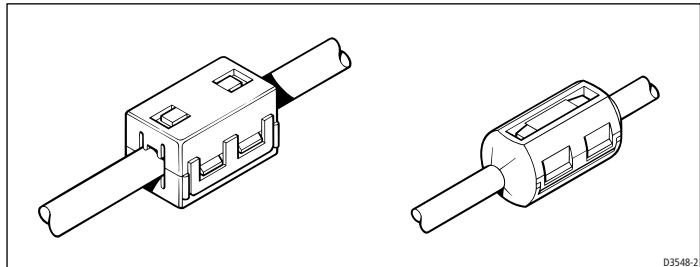
Connections to Other Equipment

If your Raytheon equipment is going to be connected to other equipment using a cable not supplied by Raytheon, a suppression ferrite MUST always be fitted to the cable close to the Raytheon unit.

Tools required

The tools required for fitting the standard ST40 instrument system are shown in the following illustration.
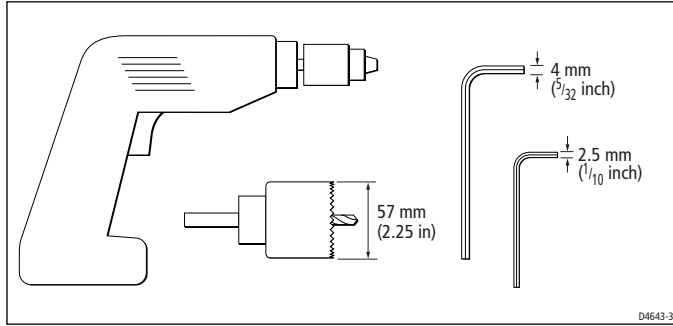
Note: *If you intend fitting a nonstandard transducer, extra tools may be required*

Site requirements

Rotavecta wind transducer

The Rotavecta wind transducer can be either mounted on a flat surface or clamped to a horizontal rail. Suitable rail diameters are from 23 mm ($^{29}/_{32}$ inch) to 25 mm (1 inch).

The Rotavecta must be fitted:

- As high as possible and away from any equipment which may shield the transducer or otherwise disturb the air flow.
- In a position which allows reasonable access for installation and servicing.

Instrument

Instrument dimensions
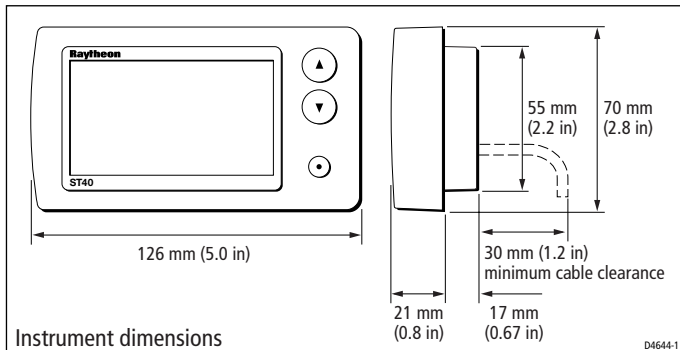
CAUTION:
The presence of moisture at the rear of the instrument could cause damage either by entering the instrument through the breathing hole or by coming into contact with the electrical connectors.

Each instrument must be positioned where:

• It is easily read by the helmsman or navigator

• 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

• The rear of the instrument is protected from water.

3.2 Procedures

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. If in doubt, seek advice from a reputable boat builder.

Fitting Rotavecta transducer

On flat surface   On rail

Rotavecta mounting options   D4833-1

Rail clamp details

Clamp screws

Gasket

Adaptor pieces

Grub screw

Clamping methods for different rail sizes

Rail diameter 23 mm (0.9 inch) or more but less than 25 mm (1.0 inch), use adaptor pieces

Rail diameter 25 mm (1.0 inch), do not use adaptor pieces

Using the Rotavecta rail clamp

D4834-1
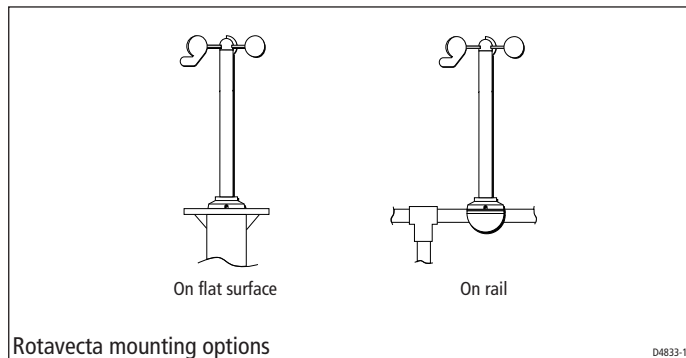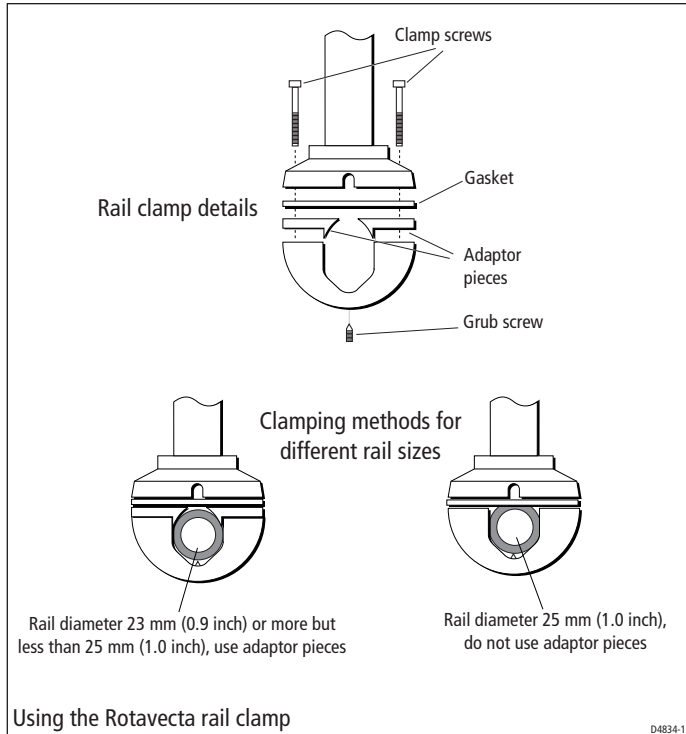
Running transducer cable

The Rotavecta transducer has a 20 m (65 ft) cable, fitted with spade terminals at the free end, for connection to the ST40 Wind instrument. Observing the following guidelines, run the cable to the instrument:

- If the cable has to be fed through the deck, always use a good quality 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.
- Wherever possible, route the cable away from fluorescent lights, engines, radio transmitting equipment, as these may cause interference.

Connections to the instrument

You can connect your instrument:

- Directly to the Rotavecta, transducer as a stand-alone master instrument. When connected in this manner, the instrument must be connected to a suitable power source using the 1 m (3 ft) power cable provided.

- As part of a SeaTalk system either as a repeater or, with a wind transducer also connected as a system master. To connect to SeaTalk, you will need an additional SeaTalk Interconnection Kit (Part No. E25028). When connected in this manner, power can be provided from the SeaTalk bus (e.g. from the autopilot).

You can also connect the instrument to both the Rotavecta transducer and SeaTalk. When thus connected, the instrument will be the master wind instrument for the SeaTalk system.

If it is necessary to fit spade connectors to the transducer cable, do so as shown in the following illustration. Prepare the cable, as at (a), and fit the spade connectors, as at (b). When fitting each spade connector, ensure that wire strands do not extend beyond the rear of the spade connector insulation.

Preparing wires for connection
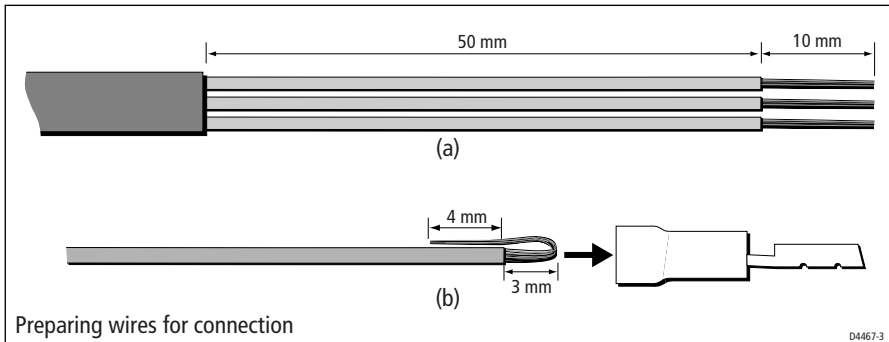
Stand-alone connections

CAUTION

Ensure that the power supply for each stand-alone ST40 instrument is protected by a 3 A fuse or circuit breaker.

Connections to a stand-alone instrument
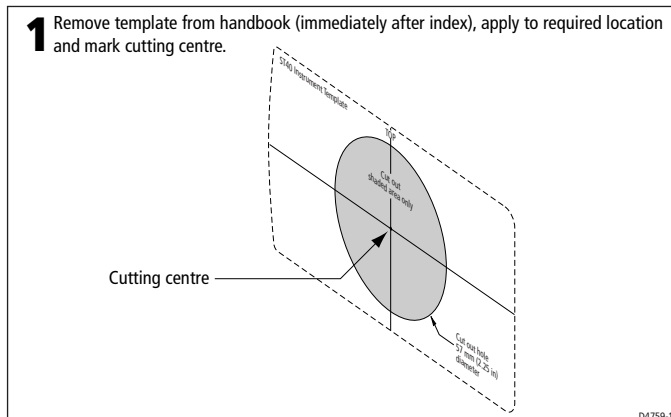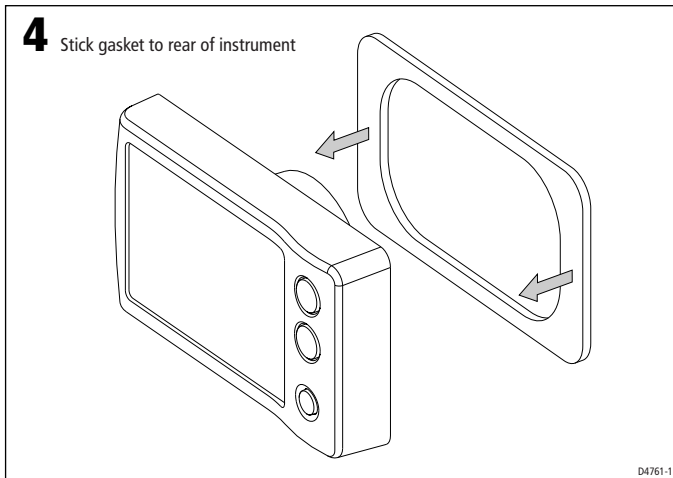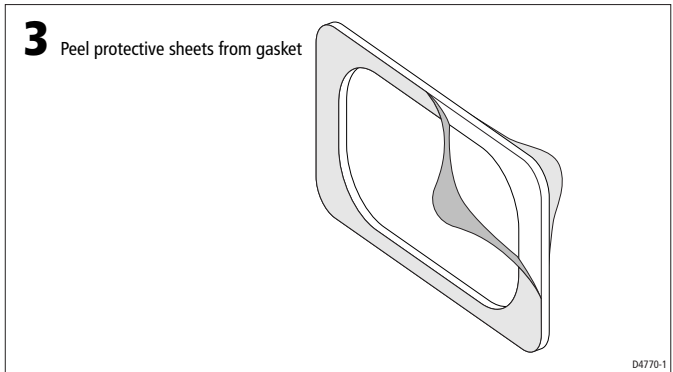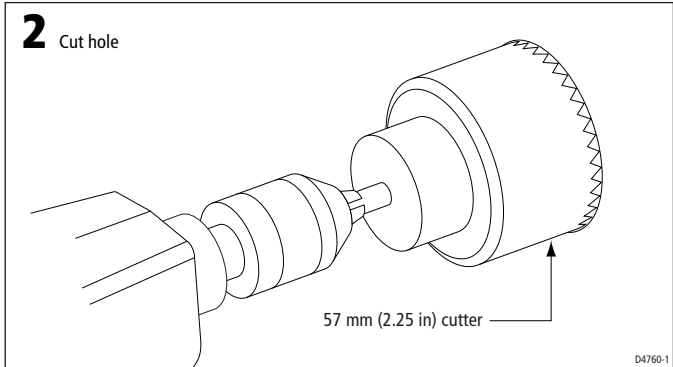
D4794-1
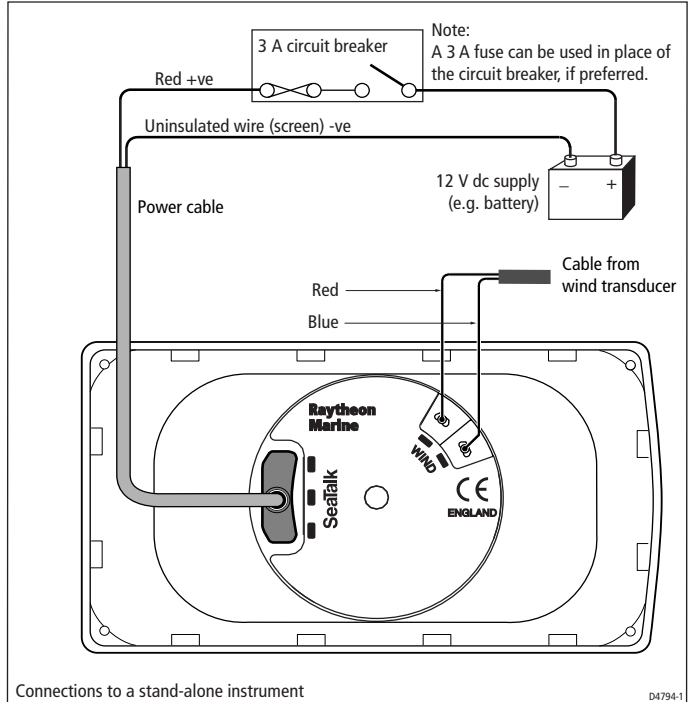
SeaTalk connections

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 or circuit breaker.
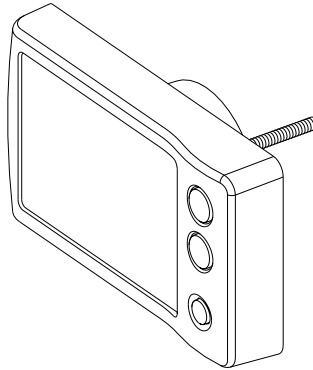

Typical SeaTalk connections

D4826-1
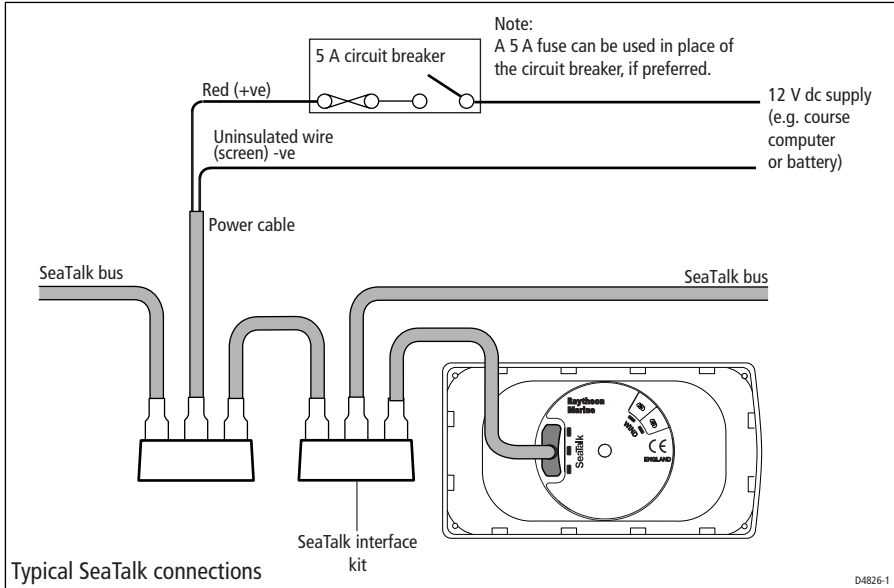
Fitting the instrument

Fit your ST40 instrument as shown in the following illustrations.

D4759-1

2 Cut hole

57 mm (2.25 in) cutter

D4760-1

3 Peel protective sheets from gasket

D4770-1

4 Stick gasket to rear of instrument

D4761-1

5 Screw stud into instrument

D4819-1

6 Feed cables through clamping bracket, connect cables then secure instrument with bracket and thumb nut
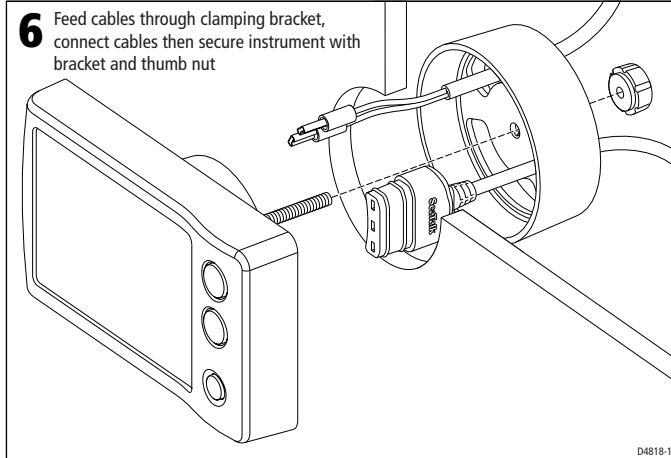
D4818-1

Desktop Mounting Bracket

An optional Desktop Mounting Bracket (Part No. E25024) enables you to mount your ST40 instrument in locations where other forms of mounting are impractical.
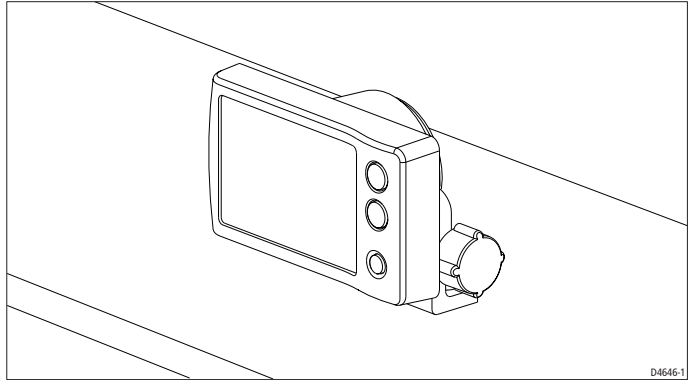
To bracket mount your ST40 instrument, do so in accordance with the *Instruction Sheet*, which is included with the Desktop Mounting Bracket.

3.3 Calibration requirement

Once installation is complete and before you use your instrument, carry out the calibration procedures detailed in *Chapter 4, Calibration*.

Chapter 4: Calibration

4.1 Introduction

The procedures in this Chapter must be carried out before the equipment is used operationally, to optimise the performance of the instrument with the vessel.

Calibration information is presented in flow chart form. The flow charts show the various calibration screens and key presses necessary to carry out calibration. All key presses are momentary unless otherwise stated.

EMC conformance

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

## 4.2 User calibration

User calibration enables you to:

- Set the wind angle and speed response values. Use higher response values for rapid updates in reasonable weather conditions (for example, when you are trying to maintain a locked course). Use lower response values in squally conditions to damp out unstable readings.
- Set the required wind speed units, either KTS (knots) or M/S (metres per second).
- Linearise and align the wind transducer.

Power up the instrument then follow the procedure in the *User calibration* flow diagram.
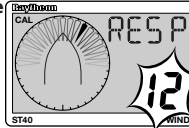
USER CALIBRATION

During normal operation

hold down ▼ and ⦿ for approximately 2 seconds

Entry screen
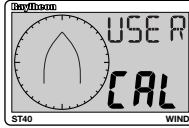
USER CAL

ST40   WIND
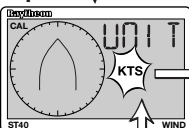
Note:
If there is no key activity when the **Entry screen** is displayed, calibration will time out to normal operation after 5 seconds,

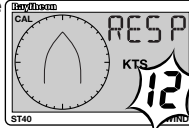**Align transducer**

CAL   023°5   AdJ

ST40   WIND
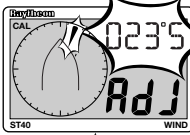
Increase value ▲

Decrease value ▼

Set wind angle response

CAL   RESP   12

ST40   WIND

15 (fast) ▲

1 (slow) ▼

When linearisation successful

(1 second)

Set wind speed response

CAL   RESP   KTS   12

ST40   WIND

15 (fast) ▲

1 (slow) ▼

Start linearisation ▲

Bypass linearisation ⦿

Linearise transducer

CAL   TURN

ST40   WIND

2 turns minimum

Set wind speed units

CAL   UNIT   KTS

ST40   WIND   M/S

▲
▼
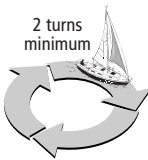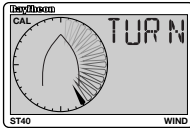
Repeater   Master

If the wind speed is outside of the range suitable for transducer linearisation, the legend **SPd** is displayed on the **Linearise transducer** screen.

To save your settings and return to normal operation from any screen,

hold down ▼ and ⦿ for approximately 2 seconds

D4764-1

4.3 Intermediate calibration

Intermediate calibration enables you to:

- Check the instrument software version.
- Check the instrument status - either master (shown as RPTR NO) or repeater (shown as RPTR YES). You cannot change this.

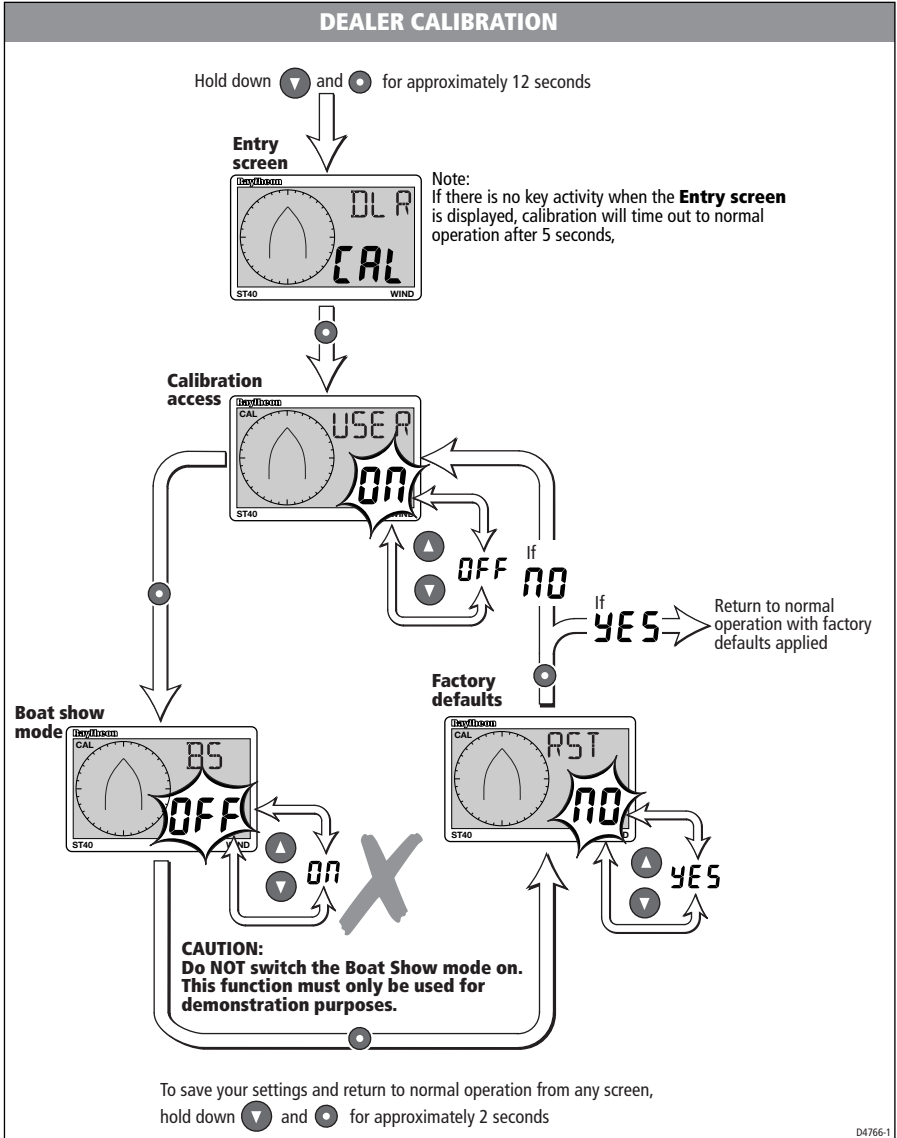Follow the procedure in the *Intermediate calibration* flow diagram.
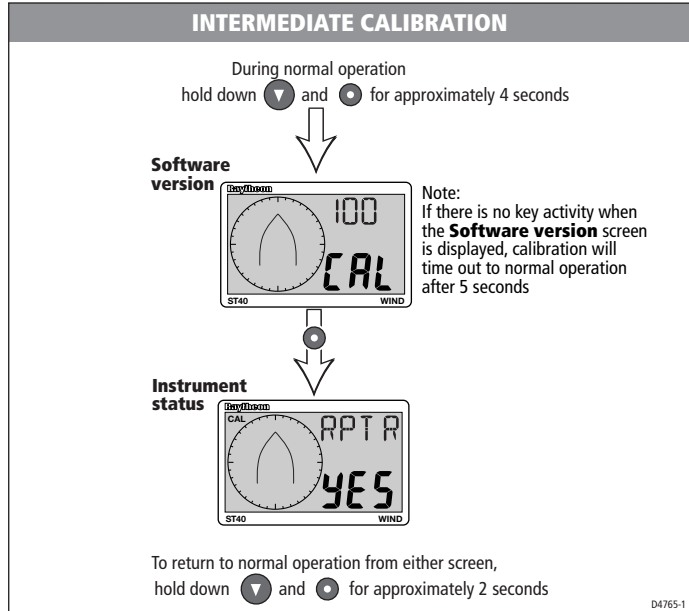
4.4 Dealer calibration

Dealer calibration enables you to set:

- User calibration on/off.
- Boat show mode on/off.

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

Follow the procedure in the *Dealer calibration* flow diagram.

DEALER CALIBRATION

Hold down ▼ and ● for approximately 12 seconds

Entry screen

DLR CAL

Note:
If there is no key activity when the **Entry screen** is displayed, calibration will time out to normal operation after 5 seconds,

Calibration access

USER ON

OFF   If **NO**

If **YES** → Return to normal operation with factory defaults applied

Boat show mode

BS OFF

ON

Factory defaults

RST NO

YES

CAUTION:
Do NOT switch the Boat Show mode on. This function must only be used for demonstration purposes.

To save your settings and return to normal operation from any screen, hold down ▼ and ● for approximately 2 seconds

D4766-1

Instrument Specification

Supply voltage:	10 V dc to 16 V dc.
Current consumption (12 V supply):	25 mA typical. 60 mA with maximum backlighting.
Operating temperature:	0°C to +70°C.
Interfaces:	SeaTalk.
Overall dimensions:	126 mm x 70 mm x 38 mm (5.00 inches x 2.80 inches x 1.55 inches).
Boss diameter:	55 mm (2.20 inches).
Wind speed range:	0 to 60 knots.
High true wind speed alarm:	5 knots to 50 knots.
Wind angle	180° port to 180° starboard.
Approvals: **CE - conforms to**	89/336/EC(EMC), EN60945.

Glossary

EMC   Electromagnetic compatibility.

KTS   Knots.

M   Metres.

M/S   Metres per second.

Response   The rate at which an instrument responds to changes in wind speed and direction. Values are from 1 (slow response) to 15 (fast response).

SeaTalk   SeaTalk is a proprietary Raytheon system which links different compatible products, to provide a single, integrated navigational system. SeaTalk can also communicate with non-SeaTalk equipment using the internationally-accepted National Marine Electronics Association (NMEA) protocol. Contact your Raytheon dealer for details.

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ST40 Instrument Template

TOP

Cut out
shaded area only

Cut out hole
57 mm (2.25 in)
diameter

D4800-1

Limited Warranty Certificate

Raytheon Marine Company 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 Raytheon Marine Company or an authorized Raytheon dealer. Raytheon Marine Company 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 and travel time of 2 hours, will be assumed by Raytheon Marine Company only on products where proof of installation or commission by authorised service agents, can be shown.

Warranty Limitations

Raytheon Marine Company 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 Raytheon Marine Company 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 Raytheon Marine Company 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 Raytheon Marine Company 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 Raytheon Marine Company 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 RAYTHEON MARINE COMPANY INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABLE OR FITNESS FOR A PARTICULAR PURPOSE.

(2) Raytheon Marine Company shall not be liable for any incidental, consequential or special (including punitive or multiple) damages.

All Raytheon Marine Company 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 Raytheon equipment.

Raytheon

Factory Service Centers

United States of America

Raytheon Marine Company
Recreational Products
22 Cotton Road, Suite 280
Nashua, NH 03063-4219, USA

Telephone +1 603 881 5200
Fax +1 603 864 4756
www.raymarine.com

Sales & Order Services
Telephone +1 800 539 5539 Ext. 2333 or
              +1 603 881 5200 Ext. 2333

Technical Support
Telephone +1 800 539 5539 Ext. 2444 or
              +1 603 881 5200 Ext. 2444

Product Repair Center
Telephone +1 800 539 5539 Ext. 2118

UK, Europe, Middle East, Far East

Raytheon Marine Company
Recreational Products
Anchorage Park, Portsmouth
PO3 5TD, England

Telephone +44 (0)23 9269 3611
Fax +44 (0)23 9269 4642
www.raymarine.com

Customer Support
Telephone +44 (0)23 9271 4713
Fax +44 (0)23 9266 1228
Email techsupra@rmeltd.co.uk

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.