



# AR200

Augmented Reality Sensor

Software version: **v1.33**

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## INSTALLATION INSTRUCTIONS

English (en-US)

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# CHAPTER 1: IMPORTANT INFORMATION

## Safety warnings



### Warning: Ensure safe navigation

This product is intended only as an aid to navigation and must never be used in preference to sound navigational judgment. Only official government charts and notices to mariners contain all the current information needed for safe navigation, and the captain is responsible for their prudent use. It is the user's responsibility to use official government charts, notices to mariners, caution and proper navigational skill when operating this or any other Raymarine product.



### Warning: Product installation and operation

- This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your vessel and/or poor product performance.
- Raymarine highly recommends certified installation by a Raymarine approved installer. A certified installation qualifies for enhanced product warranty benefits. Register your warranty on the Raymarine website: [www.raymarine.com/warranty](http://www.raymarine.com/warranty)



### Warning: Switch off power supply

Ensure the vessel's power supply is switched OFF before starting to install this product. Do NOT connect or disconnect equipment with the power switched on, unless instructed in this document.



### Warning: Potential ignition source

This product is NOT approved for use in hazardous/flammable atmospheres. Do NOT install in a hazardous/flammable atmosphere (such as in an engine room or near fuel tanks).

## Product warnings



### Warning: Positive ground systems

Do not connect this unit to a system which has positive grounding.



### Warning: Power supply voltage

Connecting this product to a voltage supply greater than the specified maximum rating may cause permanent damage to the unit. Refer to the product's information label for the correct voltage.



### Warning: Product grounding

Before applying power to this product, it MUST be correctly grounded, in accordance with the instructions provided.



### Caution: Power supply protection

When installing this product ensure the power source is adequately protected by means of a suitably-rated fuse or thermal circuit breaker.

### **Caution: Product cleaning**

When cleaning products:

- Switch off power supply.
- Use a clean damp cloth to wipe clean.
- Do NOT use: abrasive, acidic, ammonia, solvent or other chemical based cleaning products.
- Do NOT use a jet wash.

### **Caution: Service and maintenance**

This product contains no user serviceable components. Please refer all maintenance and repair to authorized Raymarine dealers. Unauthorized repair may affect your warranty.

Third-party hardware, such as converters, adapters, routers, switches, Access Points etc., provided by third parties, may be made available directly to you by other companies or individuals under separate terms and conditions, including separate fees and charges. Raymarine UK Ltd or its affiliates have not tested or screened the third-party hardware.

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### **Water ingress**

Water ingress disclaimer

Although the waterproof rating capacity of this product meets the stated water ingress protection standard (refer to the product's *Technical Specification*), water intrusion and subsequent equipment failure may occur if the product is subjected to high-pressure washing. Raymarine will not warrant products subjected to high-pressure washing.

### **Suppression ferrites**

- Raymarine cables may be pre-fitted or supplied with suppression ferrites. These are important for correct EMC performance. If ferrites are supplied separately to the cables (i.e. not pre-fitted), you must fit the supplied ferrites, using the supplied instructions.
- If a ferrite has to be removed for any purpose (e.g. installation or maintenance), it must be replaced in the original position before the product is used.

## **Regulatory notices**

### **Declaration of conformity**

Raymarine UK Ltd declares that the following products are in compliance with the EMC Directive 2014/53/EU:

- AR200 Augmented Reality Sensor, part number E70537.

The original Declaration of Conformity certificate may be viewed on the relevant product page at [www.raymarine.com](http://www.raymarine.com).

### **Disclaimer**

Raymarine does not warrant that this product is error-free or that it is compatible with products manufactured by any person or entity other than Raymarine.

Raymarine is not responsible for damages or injuries caused by your use or inability to use the product, by the interaction of the product with products manufactured by others, or by errors in information utilized by the product supplied by third parties.

- Use only ferrites of the correct type, supplied by Raymarine or its authorized dealers.
- Where an installation requires multiple ferrites to be added to a cable, additional cable clips should be used to prevent stress on the connectors due to the extra weight of the cable.

## Connections to other equipment

Requirement for ferrites on non-Raymarine cables:

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.

For more information, refer to your third-party cable manufacturer.

## Warranty registration

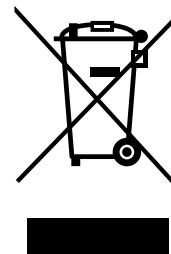
To register your Raymarine product ownership, please visit <https://bit.ly/rym-warranty> and register online.

It is important that you register your product to receive full warranty benefits. Your unit package includes a bar code label indicating the serial number of the unit. You will need this serial number when registering your product online. You should retain the label for future reference.

## Product disposal

Dispose of this product in accordance with the WEEE Directive.

The Waste Electrical and Electronic Equipment (WEEE) Directive requires the recycling of waste electrical and electronic equipment which contains materials, components and substances that may be hazardous and present a risk to human health and the environment when WEEE is not handled correctly.



Equipment marked with the crossed-out wheeled bin symbol indicates that the equipment should not be disposed of in unsorted household waste. Local authorities in many regions have established collection schemes under which residents can dispose of waste electrical and electronic equipment at a recycling center or other collection point. For more information about suitable collection points for waste electrical and electronic equipment in your region, refer to the Raymarine website: <https://bit.ly/rym-recycling>

## IMO and SOLAS

The equipment described within this document is intended for use on leisure marine boats and workboats NOT covered by International Maritime Organization (IMO) and Safety of Life at Sea (SOLAS) Carriage Regulations.

## Technical accuracy

To the best of our knowledge, the information in this document was correct at the time it was produced. 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. As a result, Raymarine cannot accept liability for any differences between the product and this document. Please check the Raymarine website (<https://bit.ly/raymarine-home>) to ensure you have the most up-to-date version(s) of the documentation for your product.

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# CHAPTER 2: DOCUMENT INFORMATION

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- 2.1 Applicable products — page 12
- 2.2 Document information — page 12
- 2.3 Document illustrations — page 12
- 2.4 Product documentation — page 12

## 2.1 Applicable products

This document is applicable to the AR200 Augmented reality sensor , part number E70537.



## 2.2 Document information

This document contains important information related to the installation of your Raymarine® product.

The document includes information to help you:

- Plan your installation and ensure you have all the necessary equipment.
- Install and connect your product as part of a wider system of connected marine electronics.
- Troubleshoot problems and obtain technical support if required.

This and other Raymarine® product documents are available to download in PDF format from [www.raymarine.com/manuals](http://www.raymarine.com/manuals)

## 2.3 Document illustrations

Your product and if applicable, its user interface may differ slightly from that shown in the illustrations in this document, depending on product variant and date of manufacture.

All images are provided for illustration purposes only.

## 2.4 Product documentation

The following documentation is applicable to your product:

### Applicable documents

Document	Description	Link
<b>87372</b>	AR200 Installation instructions (This document)	<a href="http://www.bit.ly/ar200-docs">www.bit.ly/ar200-docs</a>
<b>87170</b>	Deck and bracket mounting template	<a href="http://www.bit.ly/ar200-docs">www.bit.ly/ar200-docs</a>

### Related documents

Document	Description	Link
<b>81406</b>	LightHouse 4 Advanced Operation Instructions	<a href="http://www.bit.ly/LH4-docs">www.bit.ly/LH4-docs</a>
<b>81370</b>	LightHouse 3 Advanced Operation Instructions	<a href="http://www.bit.ly/LH3-docs">www.bit.ly/LH3-docs</a>
<b>81300</b>	SeaTalk NG Reference Guide	<a href="http://www.bit.ly/STNG-docs">www.bit.ly/STNG-docs</a>

# CHAPTER 3: SOFTWARE DETAILS

## CHAPTER CONTENTS

- 3.1 Applicable software version — page 14
- 3.2 New software features and improvements — page 14
- 3.3 Software updates — page 14

## 3.1 Applicable software version

Product software is updated regularly to add new features and improve existing functionality.

This document has been updated to reflect the following software version:

Software name	Applicable software version
AR200	v1.33

Check the website for the latest software:

**AR200 software download link**

<https://bit.ly/ar200-download>

## 3.2 New software features and improvements

The following new features have been added to version **v1.33** of the AR200.

### AR200 v1.33 new features:

- Added support for a new LED indicator ‘Switch off’ setting which can be toggled via a networked LightHouse 4 multifunction display (running software version v4.6.74 or later). For more information, refer to:  
[p.60 — Switching off sensor LEDs](#)
- Added support for a new LED indicator ‘Find me’ setting which can be toggled via a networked LightHouse 4 multifunction display (running software version v4.6.74 or later). For more information, refer to:  
[p.60 — Find me](#)

## 3.3 Software updates

Raymarine regularly issues software updates for its products, which provide new and enhanced features and improved performance and usability. It's important to ensure that you have the latest software for your products by regularly checking the Raymarine website for new software releases.

To check for the latest software updates and the software update procedure for your specific product(s) refer to: <https://bit.ly/rym-software>

Unless otherwise stated, software updates for Raymarine products are performed using a Raymarine MFD/chartplotter.

- Where applicable, you should always backup your user data and settings before performing a software update.
- To update SeaTalk NG products you must use the datamaster MFD/Chartplotter which is physically connected to the SeaTalk NG backbone.
- Ethernet (RayNet) products can be updated from any MFD/Chartplotter on the same network as the product to be updated.
- In order to perform a software update, any connected Autopilot or Radar must be switched to Standby.
- The MFD’s/Chartplotter’s “Check online” feature is only available when connected to the Internet.

### Note:

If in doubt as to the correct procedure for updating your product software, refer to your dealer or Raymarine technical support.

### Caution: Installing software updates

- The software update process is carried out at your own risk. Before initiating the update process ensure you have backed up any important files.
- Ensure that the product(s) has a reliable power supply and that the update process is not interrupted.
- Damage caused by an incomplete update is not covered by Raymarine warranty.
- By downloading the software update package, you agree to these terms.

# CHAPTER 4: PRODUCT AND SYSTEM OVERVIEW

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- 4.2 System examples — page 17
- 4.3 Required additional components — page 17

## 4.1 AR200 product overview

The AR200 is an *Augmented Reality Sensor* consisting of a GNSS (GPS) receiver and an Attitude and Heading Reference System (AHRS) sensor.

When combined with a compatible IP or Thermal camera and an Axiom-Series display running LightHouse 3 v3.7.70, or later or a Axiom 2-Series display running LightHouse 4 v4.0.70, or later; the AR200 enables the ClearCruise® Augmented Reality feature.

ClearCruise® Augmented Reality overlays data objects (such as waypoints, AIS targets and charted objects) onto a live camera feed being shown on your display. This enhances your situational awareness by allowing you to quickly see the position of these objects relative to your camera's field of view..



The AR200 provides position, heading, pitch and roll data to compatible displays that are on the same SeaTalk NG/NMEA 2000 network.

### Product features:

- Enables the ClearCruise® Augmented Reality feature on compatible displays.
- Includes a 9-axis AHRS (Attitude and Heading Reference System) sensor.
- Compatible with GPS, and GLONASS GNSS satellite constellations.

- Automatic calibration.
- Pole, Rail, Surface or Bulkhead mountable (mounting kits available).
- Can be used as a source of GNSS (GPS) position and Heading data for other devices in your network. For more information, please refer to the Multiple Data Sources (MDS) information in your display's *Advanced operation instructions* document.
- 10 Hz refresh rate.
- NMEA 2000 compliant.
- Low power consumption.
- 12 V DC operation (protected up to 32 V DC), via the SeaTalk NG/NMEA 2000 network.
- Waterproof to IPx6, IPx7.

## SeaTalk NG

SeaTalk NG (*Next Generation*) is an enhanced protocol for connection of compatible marine instruments and equipment. It replaces the older SeaTalk 1 and SeaTalk 2 protocols.

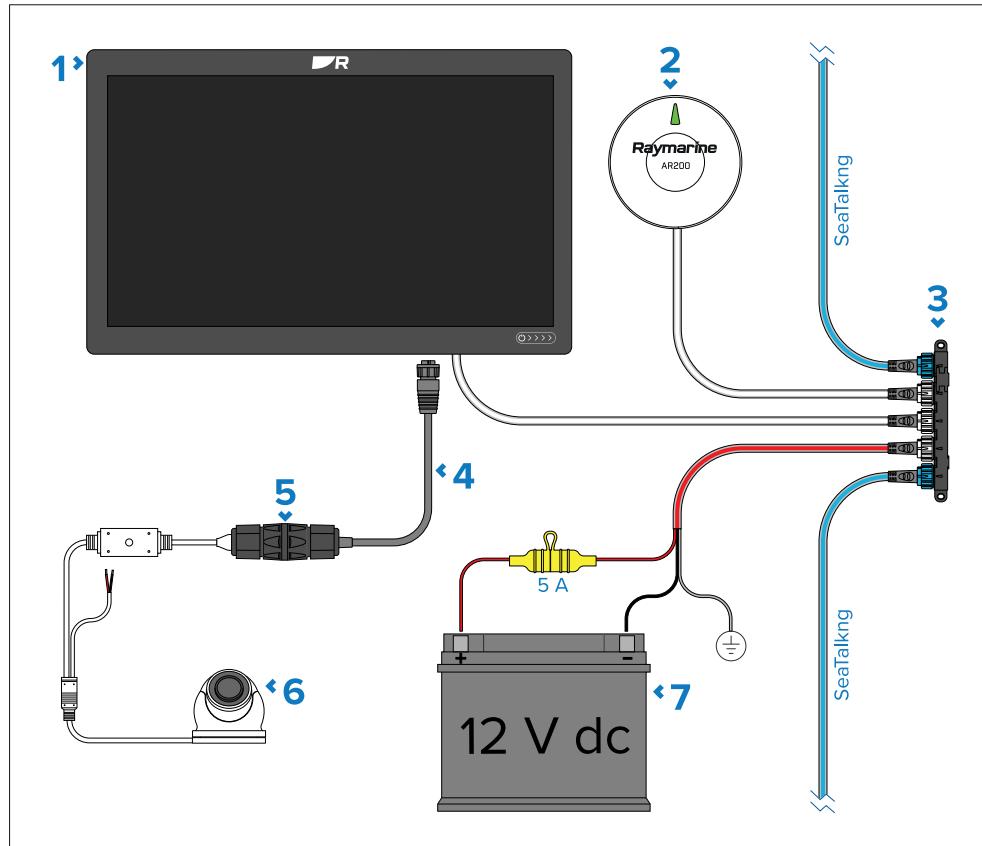
SeaTalk NG utilizes a single backbone which compatible equipment connects to using a spur. Data and power are carried within the backbone. Devices that have a low power draw can be powered from the network, although high current equipment will need to have a separate power connection.

SeaTalk NG is a proprietary extension to NMEA 2000 and the proven CAN bus technology. Compatible NMEA 2000, SeaTalk 1 and SeaTalk 2 devices can also be connected using the appropriate interfaces or adaptor cables as required.

## 4.2 System examples

Below is a typical system example showing the components and connections required to enable ClearCruise® Augmented Reality on your system.

### CAM300 and Axiom 2 XL system example



1. Axiom 2 XL display (Power sourcing equipment providing PoE (Power over ethernet) to the CAM300 camera).
2. AR200 sensor.
3. SeaTalkng network.
4. RayNet (female) to RJ45 (male) adapter cable (part number: A62360).
5. RJ45 to RJ45 waterproof coupler (part number: 4115028).

6. CAM300.

7. 12 V dc power supply connection (powering the SeaTalkng network).

#### Note:

- In the above example the camera is being powered by the display using PoE. If the display does not support PoE an alternative power connection for the camera is required, using either a PoE injector (part number: 4113746) or the camera's power cable connection.
- The display also requires its own power source, this is not shown in the system example.

## 4.3 Required additional components

The AR200 forms part of the ClearCruise® Augmented Reality System and requires the following additional components to enable the Augmented Reality features on your system.

#### Required components for Augmented Reality (IP cameras)

- Axiom-Series display running LightHouse 3 v3.7.70 or later, or
- Axiom 2-Series display running LightHouse 4 v4.1.140 or later.
- IP camera (CAM300, CAM210IP or CAM220IP).

#### Required components for Augmented Reality (M-Series cameras)

- Axiom-Series or Axiom 2-Series display.
- M-Series camera (M100-Series, M200-Series or M300-Series).
- M100-Series and M200-Series cameras require Axiom-Series displays to be running LightHouse 3 v3.9.46 or later.
- M300-Series cameras require Axiom-Series displays to be running LightHouse 3 v3.10.42 or later.
- All M-Series cameras require Axiom 2-Series displays to be running LightHouse 4 v4.1.140 or later.

#### Important:

Cameras utilizing ClearCruise® Augmented Reality are subject to an unstable image on rough waters.

#### Recommended components

- An AIS receiver / transceiver is required to overlay AIS targets on the live camera feed.
- Compatible detailed electronic cartography is required to overlay charted objects on the live camera feed.

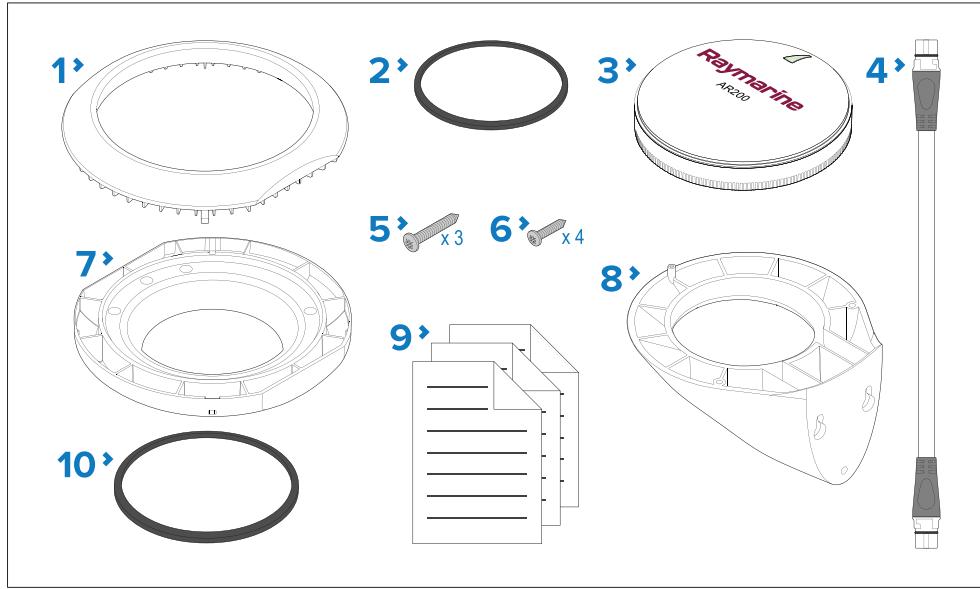
# CHAPTER 5: PARTS SUPPLIED

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- 5.1 Parts supplied — page 20

## 5.1 Parts supplied

The following parts are supplied with your product.



1. Mounting tray top.
2. Small sealing ring.
3. AR200.
4. 6 m (19.69 ft) SeaTalk NG (White) cable.
5. 3 x large bulkhead bracket fixings (Pan head pozi DIN7981 ST 3.9x22 C Z A4 Stainless steel).
6. 4 x small surface mount fixings (Pan head pozi DIN7981-ST 2.9x13 C Z A4 Stainless steel).
7. Mounting tray bottom.
8. Bulkhead bracket.
9. Documentation.
10. Large sealing ring.

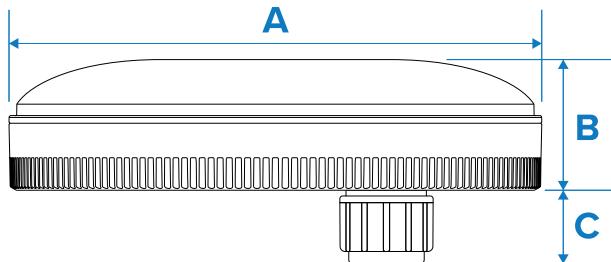
Unpack your product carefully to prevent damage or loss of parts, check the box contents against the list above. Retain the packaging and documentation for future reference.

# CHAPTER 6: PRODUCT DIMENSIONS

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## 6.1 Product dimensions

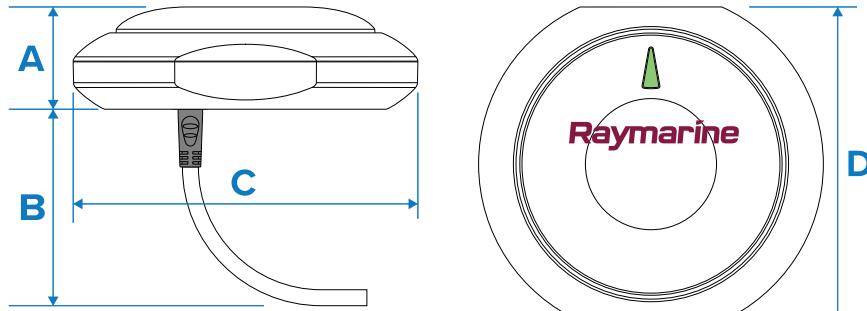


### Dimension

- A** 108.48 mm (4.27 in)
- B** 26.61 mm (1.05 in)
- C** 14.96 mm (0.59 in)

## 6.2 Product dimensions with Mounting tray

The following dimensions apply when surface mounting using the *Mounting tray*.



### Dimension

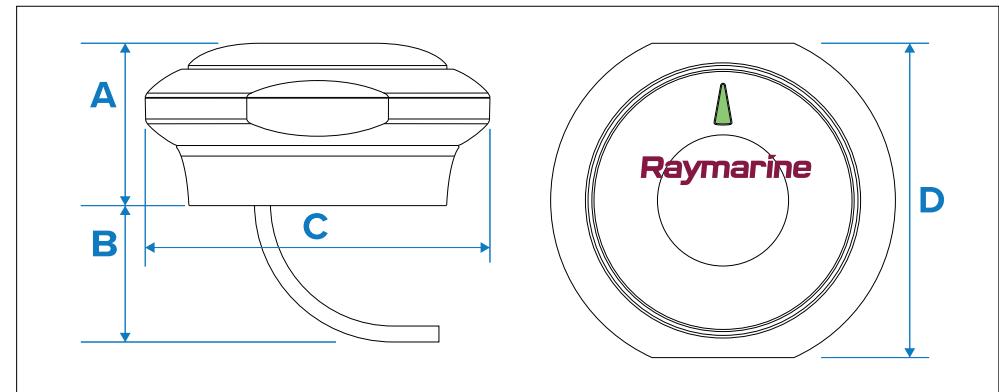
- A** 41.57 mm (1.64 in)
- B** 90.00 mm (3.54 in)

## Dimension

- C** 140.40 mm (5.53 in)
- D** 128.00 mm (5.0 in)

## 6.3 Product dimensions with Mounting tray and Riser

The following dimensions apply when surface mounting using the *Mounting tray* and *Riser* supplied in the *Deck mounting kit*.

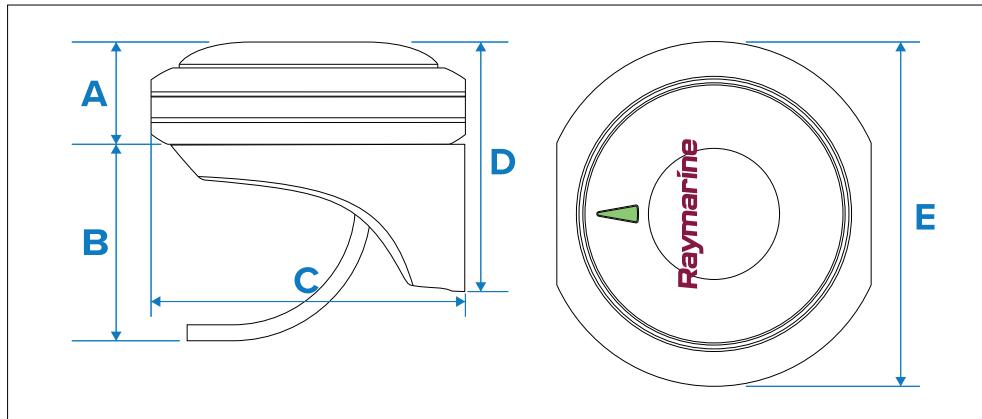


### Dimension

- A** 66.07 mm (2.60 in)
- B** 65.50 mm (2.58 in)
- C** 140.40 mm (5.53 in)
- D** 128.00 mm (5.0 in)

## 6.4 Product dimensions with Mounting tray and Bulkhead bracket

The following dimensions apply when bulkhead mounting using the *Mounting tray* and the *Bulkhead bracket*.



### Dimension

**A** 41.57 mm (1.64 in)

**B** 90.00 mm (3.54 in)

**C** 128.00 mm (5.0 in)

**D** 101.57 mm (4.00 in)

**E** 140.40 mm (5.53 in)

# CHAPTER 7: LOCATION REQUIREMENTS

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## 7.1 Warnings and cautions

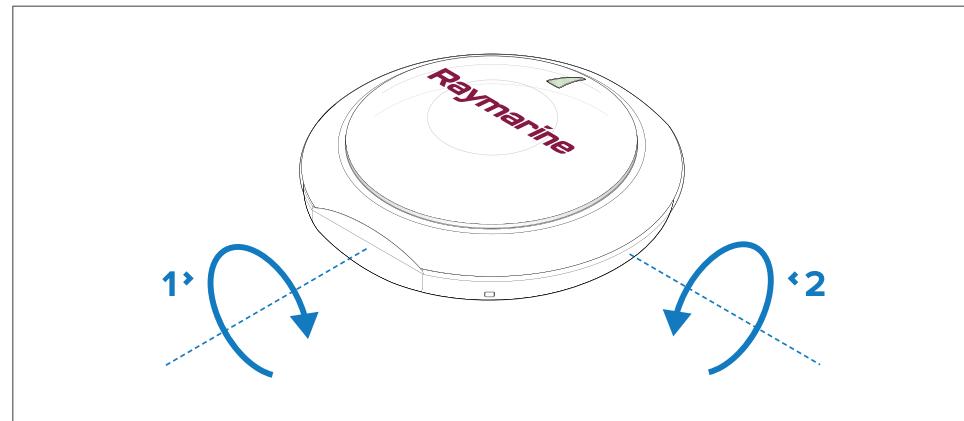
### Important:

Before proceeding, ensure that you have read and understood the warnings and cautions provided in the following section of this document:  
[p.8 — Important information](#)



### Warning: Potential ignition source

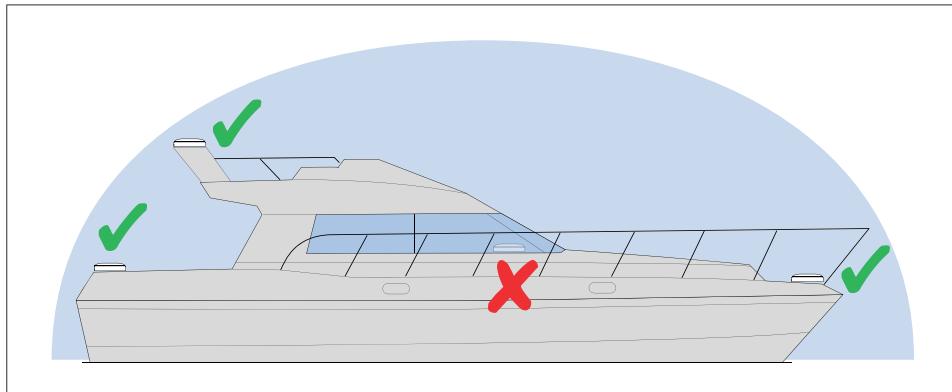
This product is NOT approved for use in hazardous/flammable atmospheres. Do NOT install in a hazardous/flammable atmosphere (such as in an engine room or near fuel tanks).



## 7.2 Location requirements

The installation location must take into account the following requirements:

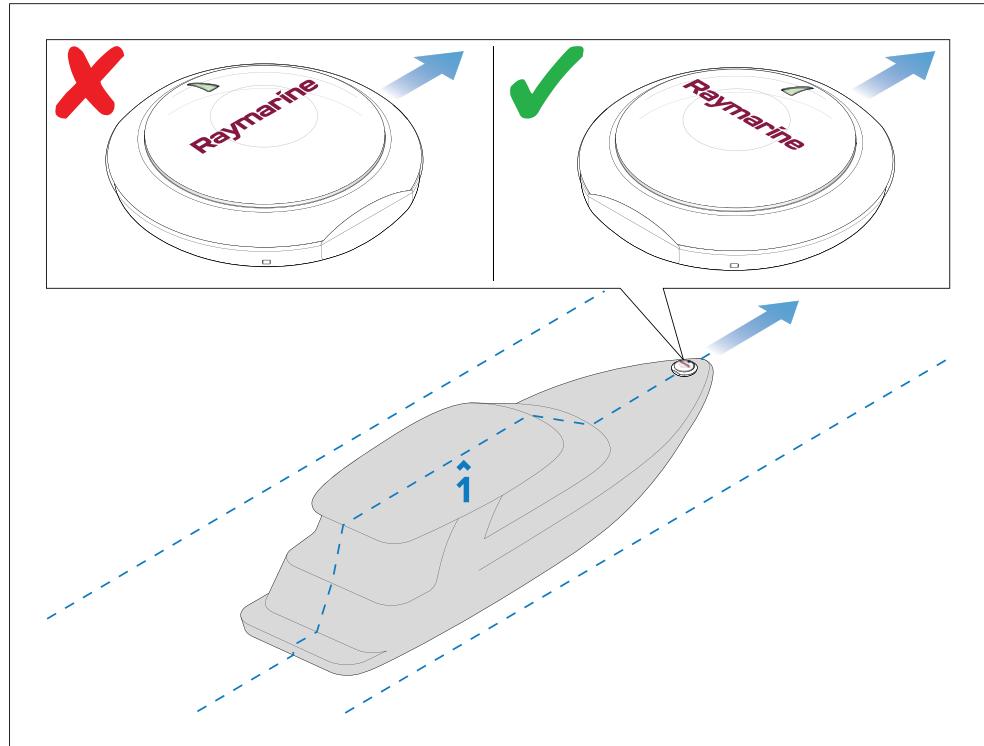
- The unit should be installed above decks.
- Choose a location that provides the most unobstructed view of the sky in all directions:



- The unit must be mounted on a horizontal and level surface. The installed unit must be level within **5°** of pitch and **5°** of roll (compared with the vessel's neutral position when at rest and normally laden).

1. Roll (Rotation side to side)
2. Pitch (Rotation front to back)

- The unit can be mounted on a vertical surface such as a bulkhead or mast etc, using the supplied bulkhead bracket.
- Do NOT mount on top of a mast.
- The unit location must be at least 1 m (3 ft.) away from sources that can cause interference, such as compasses, electrical cables, motors, generators, VHF radio units and other transmitters / receivers.
- Ensure the unit is NOT mounted in the path of the beam emitted from Radar scanners.
- Choose a location where the unit will be safe from physical damage and excessive vibration.
- Choose a location where the unit will not be subjected to a load or force.
- Mount away from any source of heat or potential flammable hazards, such as fuel vapor.
- The unit should be mounted in a location where the diagnostics LED is viewable.
- The unit must be mounted with the LED 'arrow' on the top of the unit pointing forwards, in parallel alignment with the centerline (longitudinal axis) of the vessel.



1. Vessel centerline (longitudinal axis)

### 7.3 RF interference

Certain third-party external electrical equipment can cause Radio Frequency (RF) interference with GNSS (GPS), AIS or VHF devices, if the external equipment is not adequately insulated and emits excessive levels of electromagnetic interference (EMI).

Some common examples of such external equipment include LED lighting (e.g.: navigation lights, searchlights and floodlights, interior and exterior lights) and terrestrial TV tuners.

To minimize interference from such equipment:

- Keep it as far away from GNSS (GPS), AIS or VHF products and their antennas as possible.

- Ensure that any power cables for external equipment are not entangled with the power or data cables for these devices.
- Consider fitting one or more high frequency suppression ferrites to the EMI-emitting device. The ferrite(s) should be rated to be effective in the range 100 MHz to 2.5 GHz, and should be fitted to the power cable and any other cables exiting the EMI-emitting device, as close as possible to the position where the cable exits the device.

### 7.4 Compass safe distance

To prevent potential interference with the vessel's magnetic compasses, ensure an adequate distance is maintained from the product.

When choosing a suitable location for the product you must aim to maintain a distance of at least 1 m (3.3 ft) in all directions from any compasses.

For some smaller vessels it may not be possible to locate the product this far away from a compass. In this situation, when choosing the installation location for your product, ensure that the compass is not affected by the product when it is in a powered on state.

### 7.5 EMC installation guidelines

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations, to minimize electromagnetic interference between equipment and minimize the effect such interference could have on the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

#### Note:

In areas of extreme EMC interference, some slight interference may be noticed on the product. Where this occurs the product and the source of the interference should be separated by a greater distance.

For **optimum** EMC performance we recommend that wherever possible:

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3.28 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 (6.6 ft).
  - More than 2 m (6.56 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 product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended, unless doing so is detailed in the installation manual.

**Note:**

**Where constraints on the installation prevent any of the above recommendations**, always ensure the maximum possible separation between different items of electrical equipment, to provide the best conditions for EMC performance throughout the installation.

## Suppression ferrites

- Raymarine cables may be pre-fitted or supplied with suppression ferrites. These are important for correct EMC performance. If ferrites are supplied separately to the cables (i.e. not pre-fitted), you must fit the supplied ferrites, using the supplied instructions.
- If a ferrite has to be removed for any purpose (e.g. installation or maintenance), it must be replaced in the original position before the product is used.
- Use only ferrites of the correct type, supplied by Raymarine or its authorized dealers.
- Where an installation requires multiple ferrites to be added to a cable, additional cable clips should be used to prevent stress on the connectors due to the extra weight of the cable.

## Connections to other equipment

Requirement for ferrites on non-Raymarine cables:

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.

For more information, refer to your third-party cable manufacturer.

# CHAPTER 8: INSTALLATION

## CHAPTER CONTENTS

- 8.1 Installation checklist — page 29
- 8.2 Tools required for installation — page 29
- 8.3 Mounting options — page 30
- 8.4 Bulkhead mounting — page 30
- 8.5 Surface mounting — page 32
- 8.6 Surface mounting using the Riser — page 33
- 8.7 Releasing the product from the mounting tray — page 35
- 8.8 Pole or rail mounting — page 35

## 8.1 Installation checklist

Installation includes the following activities:

### Installation Task

1. Plan your system.
2. Obtain all required equipment and tools.
3. Site all equipment.
4. Route all cables.
5. Drill cable and mounting holes.
6. Make all connections into equipment.
7. Secure all equipment in place.
8. Power on and test the system.

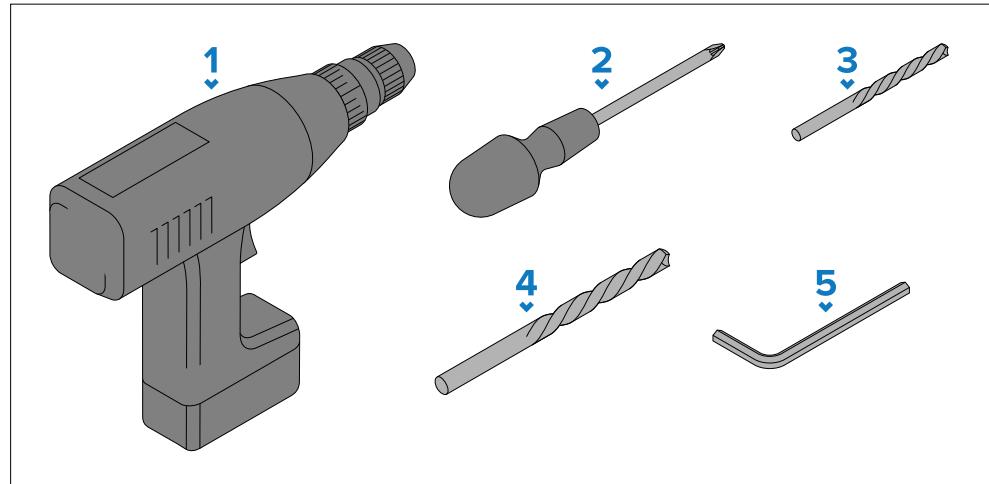
### Schematic diagram

A schematic diagram is an essential part of planning any installation. It is also useful for any future additions or maintenance of the system. The diagram should include:

- Location of all components.
- Connectors, cable types, routes and lengths.

## 8.2 Tools required for installation

The following tools are required for installation:



### Description

**1** Power drill.  
**2** Pozi-drive screwdriver.  
**3** Suitable size drill bit (for Mounting tray and Bulkhead bracket mounting).

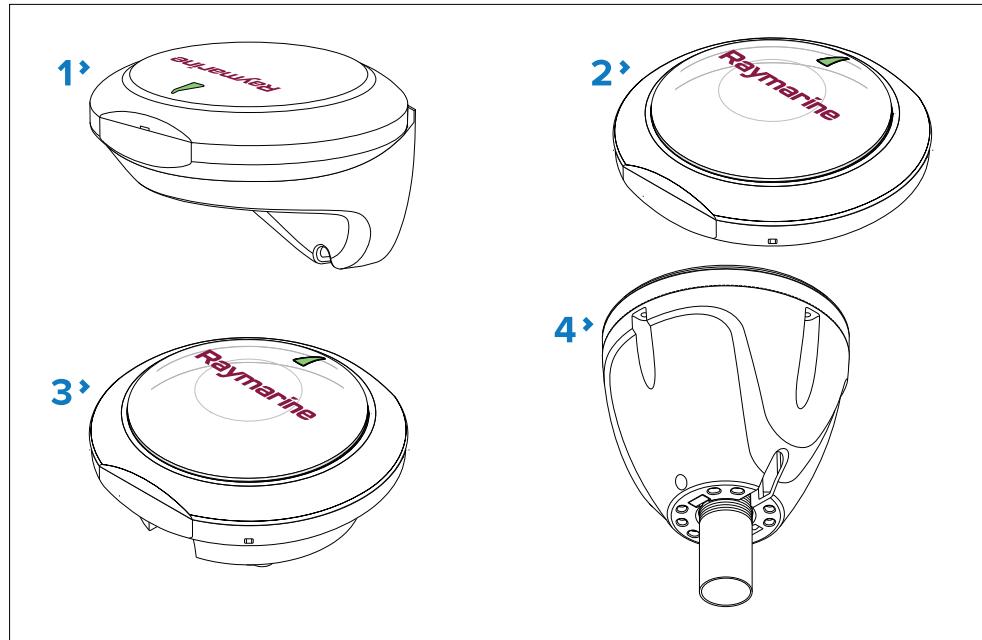
### Note:

Drill bit size is dependent on the type of material the unit is to be mounted on.

**4** 12 mm (15/32") drill bit (if required, for cable hole).  
**5** Size 4 (2.5 mm) Hex Key (only required for Pole mount installations).

## 8.3 Mounting options

Several mounting options are available.

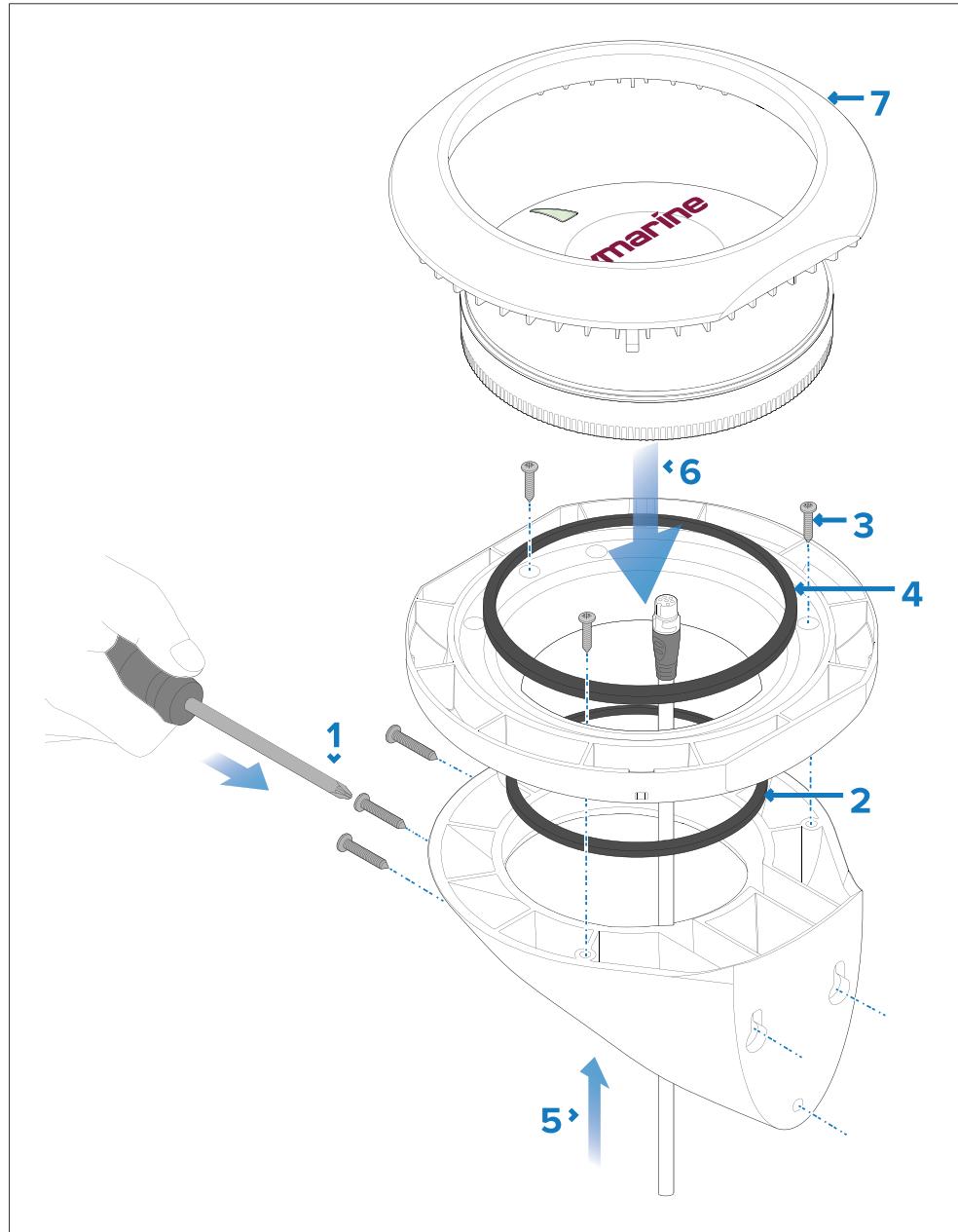


1. Bulkhead mounting using the supplied Mounting tray and Bulkhead bracket. Refer to: [p.30 — Bulkhead mounting](#)
2. Surface mounting using the supplied Mounting tray. Refer to: [p.32 — Surface mounting](#)
3. Surface mounting on riser using the Deck mounting (Clamshell/Riser) kit. (part number: A80437). Refer to: [p.33 — Surface mounting using the Riser](#)
4. Pole/rail mounting using the Pole/rail mounting adaptor kit (part number: A80370). Refer to: [p.35 — Pole or rail mounting](#)

## 8.4 Bulkhead mounting

The supplied *Mounting tray* and *Bulkhead bracket* can be used to mount your product horizontally on a vertical bulkhead.

Ensure that the chosen location meets the product's location requirements, for details refer to: [7.2 Location requirements](#)

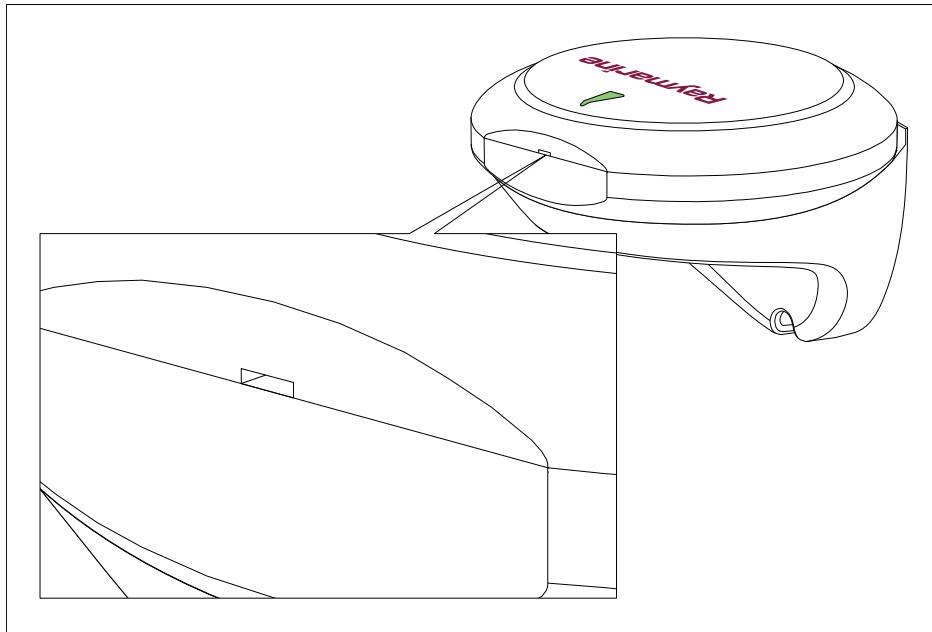


1. Use the supplied Bracket mounting template (Document number: 87170) to drill 3 pilot holes in the vertical mounting surface. Secure the mounting bracket to the surface using the supplied screws.
2. Place the small sealing ring in the groove located on the bottom of the Mounting tray.
3. Secure the tray to the bracket using 3 of the 4 supplied small screws, in the positions indicated in the illustration above.
4. Place the large sealing ring into the groove on the upper side of the Mounting tray.
5. Pull the SeaTalk NG cable up through the center of the bracket and tray. Plug in the cable connector on the underside of the unit and secure by rotating the locking collar clockwise 2 clicks.
6. Insert the unit into the mounting tray, ensuring the tabs in the Mounting tray are slotted into the grooves around the edge of the unit.

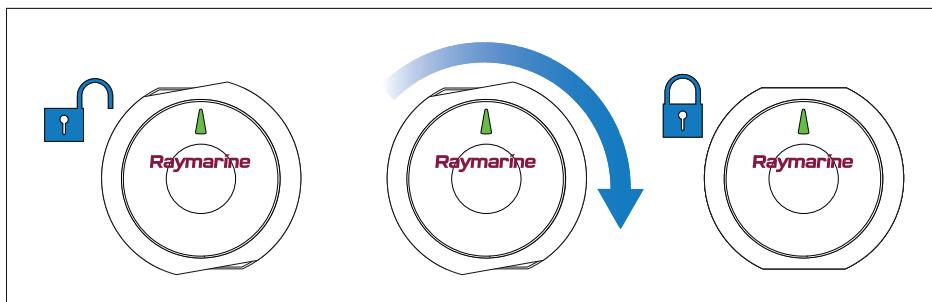
**Important:**

The unit must be mounted with the LED 'arrow' on the top of the unit pointing forwards, in parallel alignment with the centerline (longitudinal axis) of your vessel.

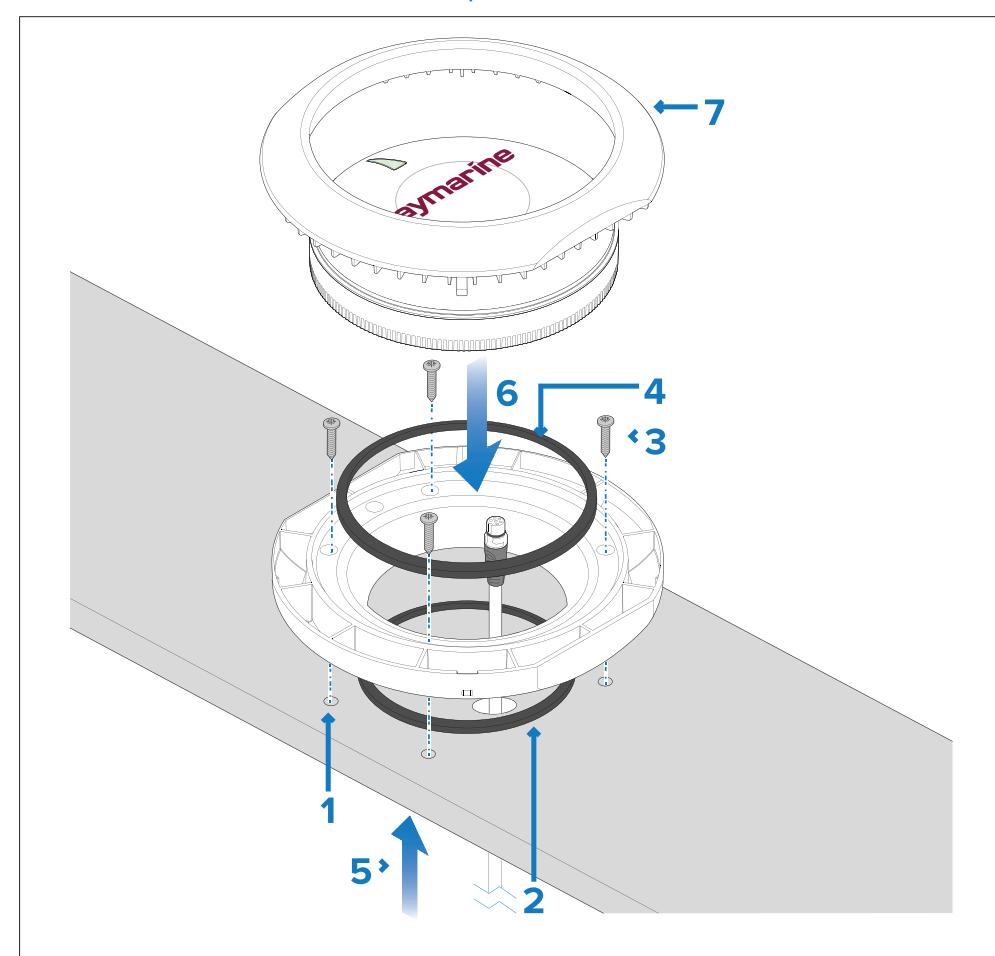
- Orientate the Mounting tray top so that the release hole is pointing forwards so that it will be accessible once mounted.



- Place the Mounting trim over the unit slightly offset, and then twist the Mounting trim clockwise until it locks into position.



Ensure that the chosen location meets the product's location requirements, for details refer to: [7.2 Location requirements](#)



- Using the supplied Mounting tray template (87170), drill 4 holes in the mounting surface, plus a 12 mm ( $15/32$ ") hole for the SeaTalk NG cable.
- Place the small sealing ring in the groove located on the bottom of the mounting tray.
- Secure the tray to the mounting surface using the 4 x fixings, supplied.
- Place the large sealing ring into the groove on the upper side of the Mounting tray.

## 8.5 Surface mounting

The supplied *Mounting tray* can be used to mount your product on a flat, horizontal surface.

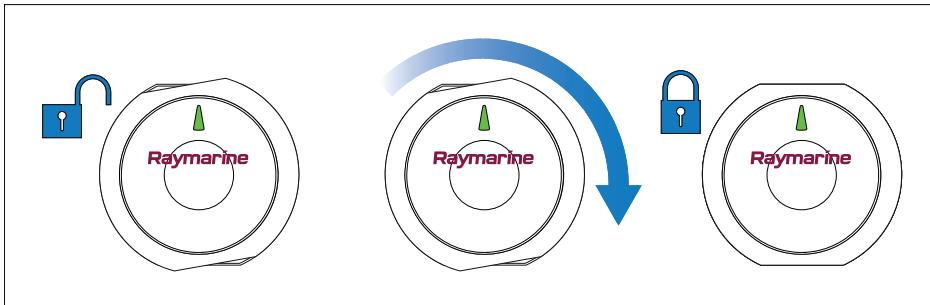
The Bulkhead bracket is not required for this type of installation.

5. Pull the SeaTalk NG cable up through the hole in the mounting surface and the Mounting tray. Plug in the cable connector on the underside of the unit and secure by rotating the locking collar clockwise 2 clicks.
6. Insert the unit into the Mounting tray, ensuring the tabs in the tray are slotted into the grooves around the edge of the unit.

**Important:**

The unit must be mounted with the LED 'arrow' on the top of the unit pointing towards the vessel's bow and be in parallel alignment with the centerline (longitudinal axis) of your vessel.

7. Place the Mounting tray top over the unit slightly offset, and then twist the Mounting tray top clockwise until it locks into position.

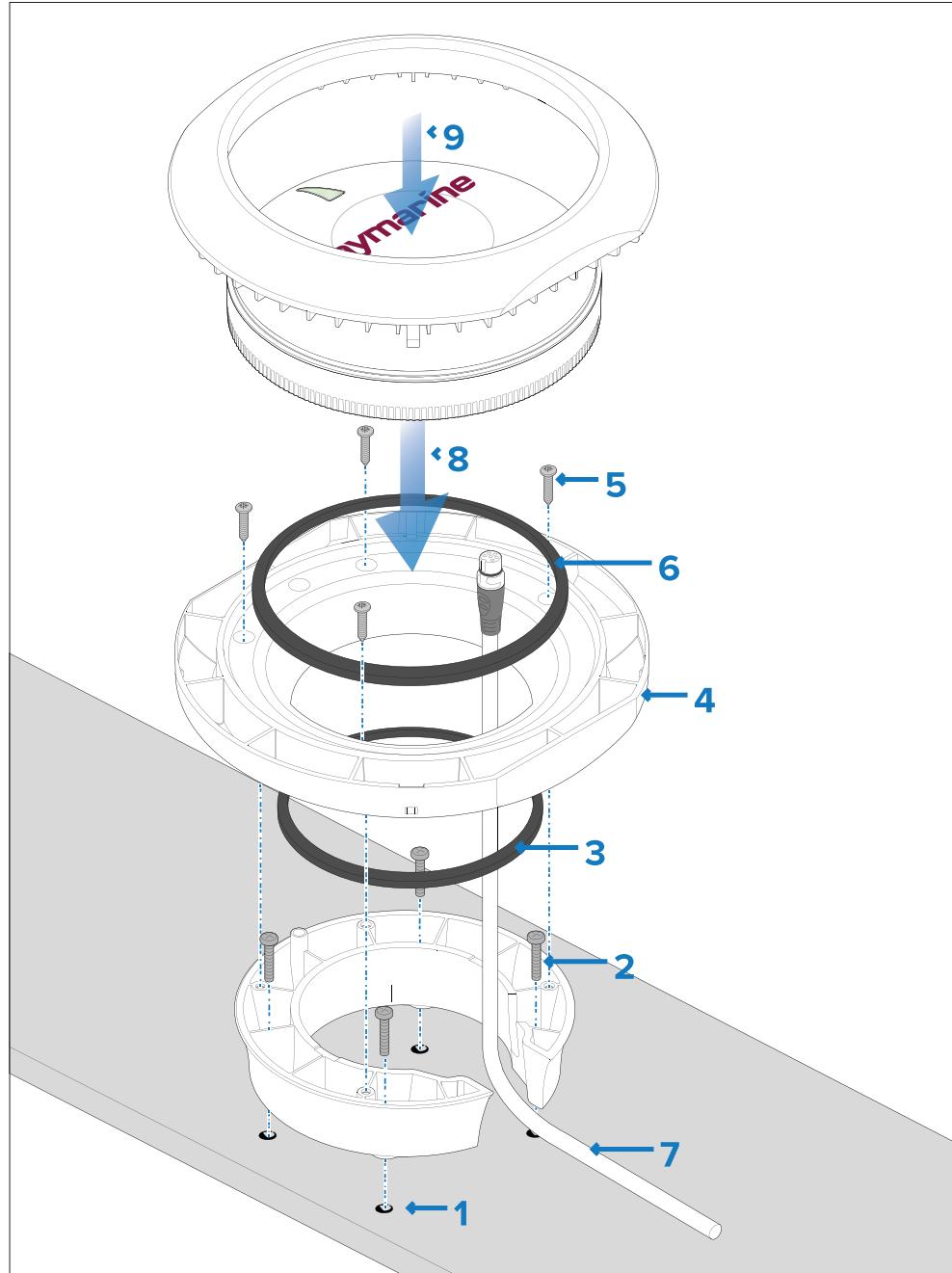


## 8.6 Surface mounting using the Riser

The *Riser* that is supplied in the *Deck mounting kit* (part number: A80437) can be used to raise the product from the mounting surface.

The bulkhead bracket cannot be used with the using the Riser.

Ensure that the chosen location meets the product's location requirements, for details refer to: [7.2 Location requirements](#)

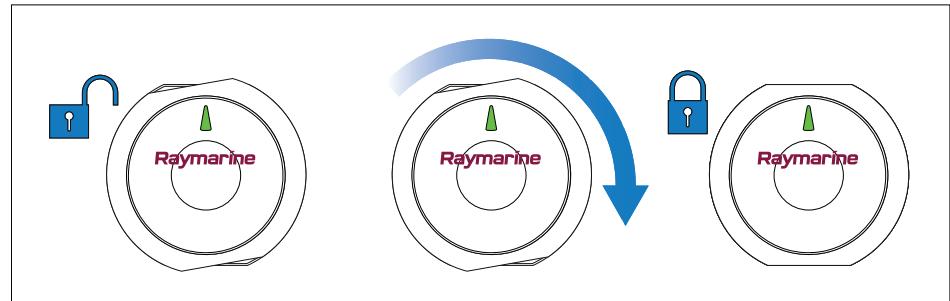


1. Use the mounting template supplied with the *Deck mounting kit* to drill 4 holes in the mounting surface.
2. Secure the Riser to the mounting surface using 4 x supplied fixings.
3. Place the small sealing ring in the groove located on the bottom of the mounting tray.
4. Position the Mounting tray on top of the Riser.
5. Secure the Mounting tray to the Riser using 4 x supplied fixings.
6. Place the large sealing ring into the groove on the upper side of the Mounting tray.
7. Pull the SeaTalk NG cable up through the Riser and Mounting tray. Plug in the cable connector on the underside of the unit and secure by rotating the locking collar clockwise 2 clicks.
8. Insert the unit into the Mounting tray, ensuring the tabs in the Mounting tray are slotted into the grooves around the edge of the unit.

**Important:**

The unit must be mounted with the LED 'arrow' on the top of the unit pointing towards the vessel's bow and be in parallel alignment with the centerline (longitudinal axis) of your vessel.

9. Place the Mounting tray top over the unit slightly offset, and then twist the Mounting tray top clockwise until it locks into position.

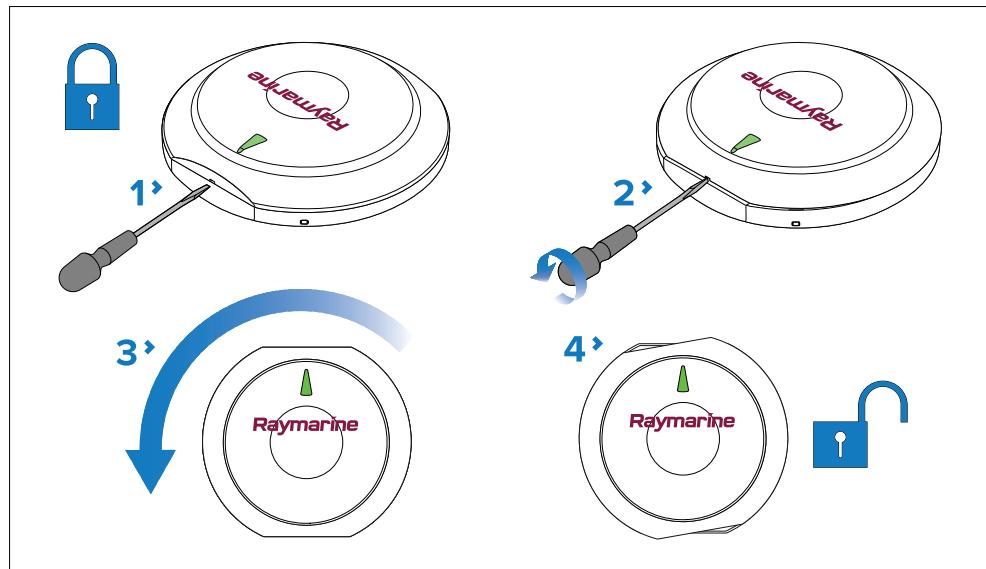


## 8.7 Releasing the product from the mounting tray

Follow the steps below to release the product from the mounting tray.

### Important:

To help prevent scratching the product, cover the tip of your screwdriver with a small piece of insulation tape.



1. Insert the end of a small flat blade screwdriver (or similar tool) into the release hole located on the flat edge of the mounting tray.
2. Twist the screwdriver 90°, so that there is a small gap between the top and bottom pieces of the mounting tray.
3. With the screwdriver in place, twist the mounting trim counter-clockwise approximately 10°.
4. You should now be able to lift the top away from the product.

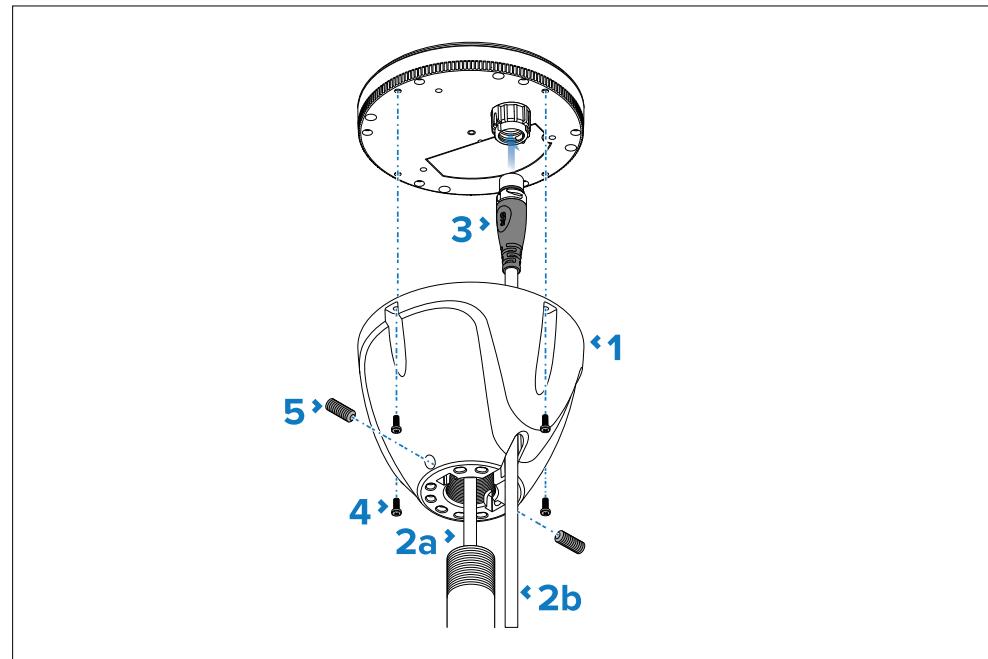
## 8.8 Pole or rail mounting

The *Pole mount kit* (part number: A80370) can be used to mount your product on a pole or rail.

### Note:

A pole or rail mount with a 1 inch 14 TPI thread is required.

Ensure that the chosen location meets the product's location requirements, for details refer to: [p.24 — Location requirements](#)



1. Screw the Pole mount adaptor on to the pole.
2. Feed the SeaTalk NG cable through either:
  - a) the center of the pole and Pole mount adaptor, or:
  - b) the cable exit hole in the Pole mount adaptor.
3. Connect the cable to the connector on the underside of the product, and secure using the locking collar. Connect the other end of the cable to an available SeaTalk NG spur connection.

4. Ensuring correct orientation, secure the product to the Pole mount adaptor using the supplied fixings.
5. Fix the product's orientation by tightening the grub screws.

*The grub screws and their captive nuts are supplied fitted to the adaptor.*

## **Adjusting pole mount alignment**

If the product you are mounting includes a heading sensor, you must ensure that the unit is orientated correctly. If the alignment is not correct it can be adjusted.

1. Loosen the grub screws slightly.
2. Twist the unit until the desired alignment is achieved.

*The Product's LED should be facing the bow and be parallel with the centerline of the vessel.*

3. Re-tighten the grub screws to secure the product in position.

# CHAPTER 9: CABLES AND CONNECTIONS — GENERAL INFORMATION

## CHAPTER CONTENTS

- 9.1 General cabling guidance — page 38
- 9.2 Connections overview — page 38
- 9.3 System examples — page 39

## 9.1 General cabling guidance

### Cable types and length

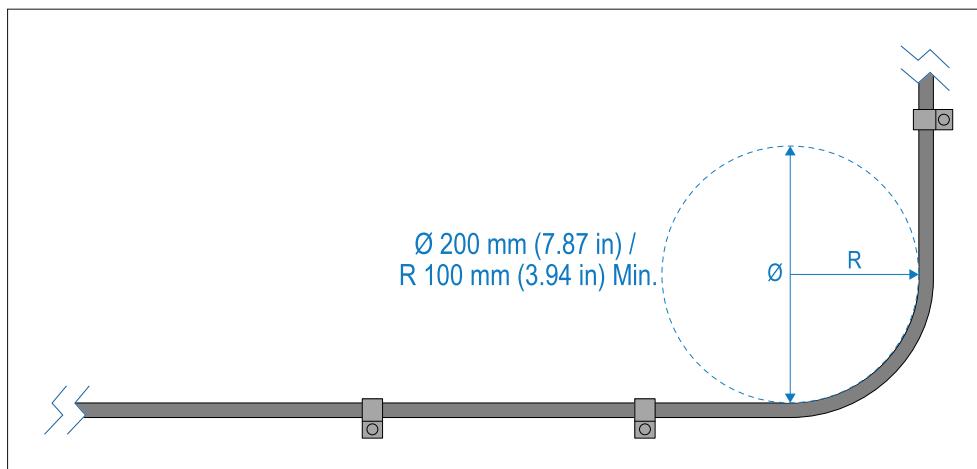
It is important to use cables of the appropriate type and length.

- Unless otherwise stated only use cables supplied by Raymarine.
- Where it is necessary to use non-Raymarine cables, ensure that they are of correct quality and gauge for their intended purpose. (e.g.: longer power cable runs may require larger wire gauges to minimize voltage drop along the run).

### Cable routing

Cables must be routed correctly, to maximize performance and prolong cable life.

- Do NOT bend cables excessively. Wherever possible, ensure a minimum bend diameter ( $\emptyset$ ) of 200 mm (7.87 in) / minimum bend radius (R) of 100 mm (3.94 in).



- Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Do NOT run cables through bilges or doorways, or close to moving or hot objects.
- Secure cables in place using cable clips or cable ties. Coil any excess cable and tie it out of the way.
- Where a cable passes through an exposed bulkhead or deckhead, use a suitable watertight feed-through.

- Do NOT run cables near to engines or fluorescent lights.
- Always route data cables as far away as possible from:
  - Other equipment and cables.
  - High current carrying AC and DC power lines.
  - Antennas.

### Strain relief

Use adequate strain relief for cabling to ensure that connectors are protected from strain and will not pull out under extreme sea conditions.

### Cable shielding

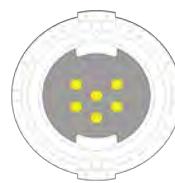
Ensure that cable shielding is not damaged during installation and that all cables are properly shielded.

#### Important:

Be aware that some **third-party** cables and adaptors (for example, certain Ethernet cables using RJ45 connectors) are not always shielded. To prevent breaks in cable shielding continuity and potential grounding issues, special attention is required to ensure that any cables, extension cables, adaptors, or other signal-coupling devices (such as multi-way connectors, junction boxes, terminal blocks etc.) used in cable runs **maintain all shield connections throughout the cable run**.

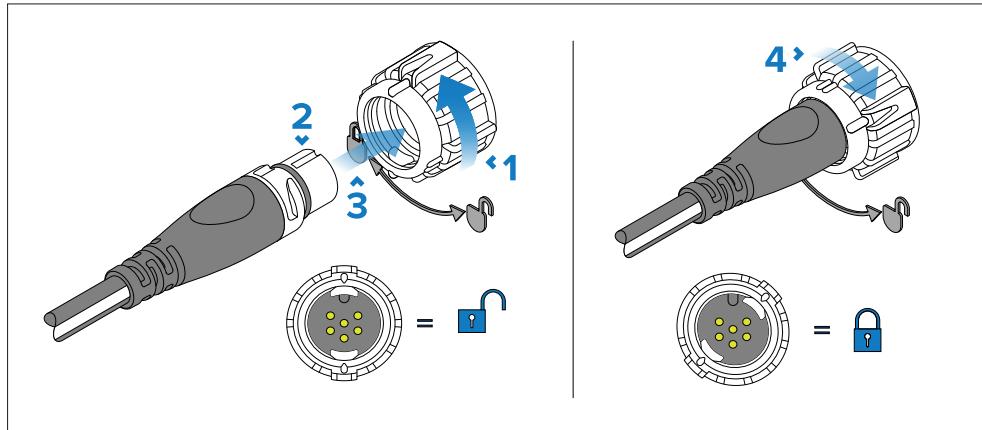
## 9.2 Connections overview

Your product is supplied power and data using the SeaTalk NG connector located on the underside of the unit.

Connector	Connection options
	<ul style="list-style-type: none"><li>SeaTalk NG backbone using a SeaTalk NG spur cable.</li><li>NMEA 2000 backbone using SeaTalk NG to DeviceNet adaptor cable (A06045)</li><li>SeaTalk 1 backbone using a SeaTalk 1 to SeaTalk NG adaptor cable (A06073)</li></ul>

For a list of available cables, refer to: [p.73 — Spares and accessories](#)

## Connecting SeaTalk NG cables



1. Rotate your product's SeaTalk NG connector locking collar counter clockwise, so that the connector is in the unlocked position.
2. Ensure the cable's connector is correctly oriented (groove pointing up).
3. Fully insert the cable connector.
4. Rotate the locking collar clockwise (2 clicks) until it is in the locked position.

## SeaTalk NG product loading

The number of products that can be connected to a SeaTalk NG backbone depends on the current draw of each product and the physical length of the backbone cabling.

NMEA 2000 Load Equivalency Numbers (LEN) are used to express the amount of current that is drawn from SeaTalk NG products (**1 LEN = 50 mA**). The LEN for each product can be found in the product's *Technical Specification*.

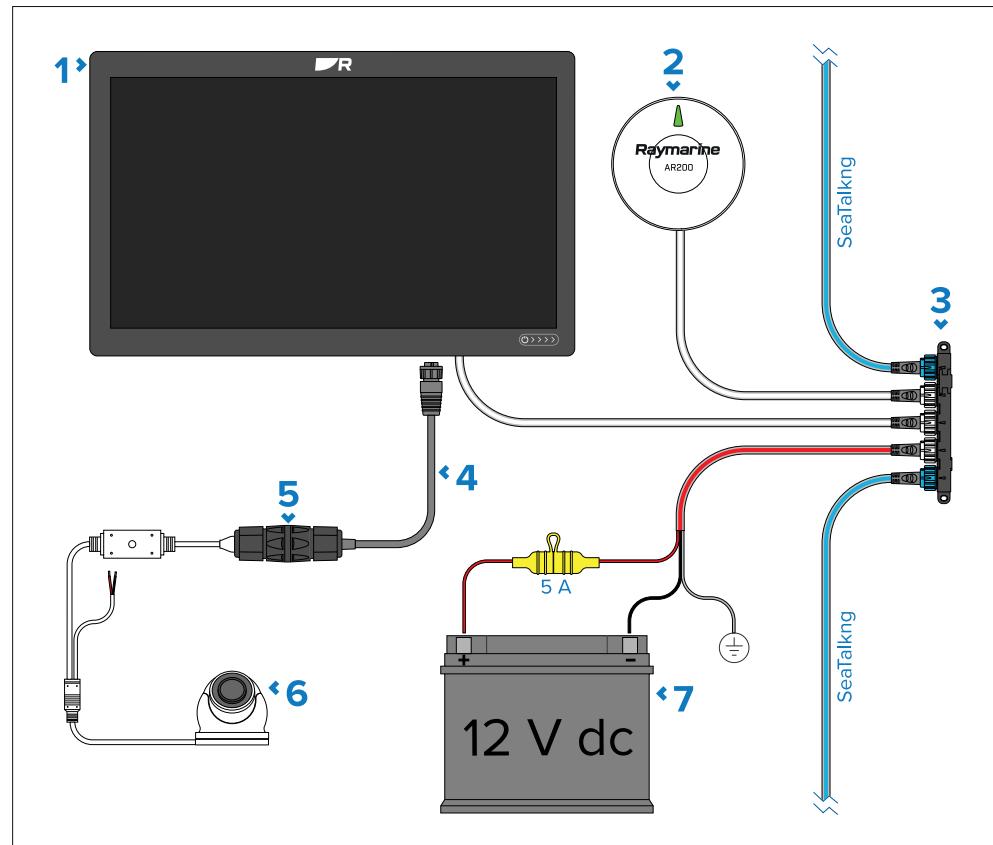
Products which have a dedicated power supply connection that are connected to the SeaTalk NG backbone will still have an LEN rating. This is because the product's NMEA 2000/SeaTalk NG internal transceiver will still be powered by the SeaTalk NG backbone.

LENs are used to determine the power connection point for the SeaTalk NG backbone.

## 9.3 System examples

Below is a typical system example showing the components and connections required to enable ClearCruise® Augmented Reality on your system.

### CAM300 and Axiom 2 XL system example



1. Axiom 2 XL display (Power sourcing equipment providing PoE (Power over ethernet) to the CAM300 camera).
2. AR200 sensor.
3. SeaTalk NG network.
4. RayNet (female) to RJ45 (male) adapter cable (part number: A62360).
5. RJ45 to RJ45 waterproof coupler (part number: 4115028).
6. CAM300.

7. 12 V dc power supply connection (powering the SeaTalk NG network).

**Note:**

- In the above example the camera is being powered by the display using PoE. If the display does not support PoE an alternative power connection for the camera is required, using either a PoE injector (part number: 4113746) or the camera's power cable connection.
- The display also requires its own power source, this is not shown in the system example.

# CHAPTER 10: POWER CONNECTIONS

## CHAPTER CONTENTS

- 10.1 SeaTalk NG power supply — page 42
- 10.2 SeaTalk NG power cables — page 42
- 10.3 SeaTalk NG product loading — page 43
- 10.4 SeaTalk NG power connection point — page 43
- 10.5 SeaTalk NG system loading — page 44
- 10.6 Power distribution — SeaTalk NG — page 44
- 10.7 Power connection via Autopilot Control Unit (ACU-Series) — page 46

## 10.1 SeaTalk NG power supply

Your product is supplied power via the SeaTalk NG backbone (or the NMEA 2000 backbone if applicable).

A SeaTalk NG backbone requires a single 12 V dc power supply. Power can be supplied to the SeaTalk NG backbone by one of the following methods:

- <sup>(1)</sup> Direct connection to a 12 V dc battery using an inline 5 amp fuse.
- Connection to a 12 V dc distribution panel using a 3 amp thermal breaker.
- <sup>(2)</sup> Connection to the SeaTalk NG connector of an ACU-Series Autopilot Control Unit (not ACU-100 or ACU-150), or an SPX-Series course computer (not SPX-5).
- For 24 V vessels, connection must be via a 5 amp, regulated, continuous 24 V dc to 12 V dc converter.

### Note:

- <sup>(1)</sup> The battery used for starting the vessel's engine(s) should NOT be used to power the SeaTalk NG backbone, as this can cause sudden voltage drops when the engines are started.
- <sup>(2)</sup> The ACU-100, ACU-150 or SPX-5 cannot be used to power the SeaTalk NG backbone.
- The course computer SeaTalk NG connector includes a power switch that must be in the On position to provide power to the backbone.



### Warning: 12 Volt dc only

This product must ONLY be connected to a 12 V dc power source.

## Inline fuse and thermal breaker ratings

The SeaTalk NG network's power supply requires a suitably-rated inline fuse or thermal breaker to be fitted.

Inline fuse rating	Thermal breaker rating
5A	3A (refer to note below)

### Note:

The suitable fuse rating for the thermal breaker is dependent on:

1. How many devices you have connected to your SeaTalk NG network, and;
2. How many devices are sharing the same thermal breaker that your SeaTalk NG network is connected to.

## 10.2 SeaTalk NG power cables

The following SeaTalk NG power cables can be used to connect the backbone to your chosen **12 V dc** power supply:

### Direct connection cables



1. Standard (straight) SeaTalk NG power cable, 2 m (6.6 ft) (part number: **A06049**).
2. Elbow (right-angled) SeaTalk NG power cable, 2 m (6.6 ft) (part number: **A06070**).

### Wiring

- **+ Red (positive) wire** — connects to the battery or distribution panel positive terminal. A waterproof fuse holder with 5 A inline fuse (not supplied) must be fitted to this red wire.
- **- Black (negative) wire** — connects to battery or distribution panel negative terminal.
- **Drain wire** — connects to the vessel's RF common ground point (if available), or the battery's negative (-) terminal.

## Autopilot Control Unit connection cable



1. ACU-Series/SPX-Series autopilot to SeaTalk NG spur cable, 0.3 m (1.0 ft) (part number **R12112**). Connects the course computer to the SeaTalk NG backbone. This connection can also be used to provide 12 V dc power to the SeaTalk NG backbone.

## 10.3 SeaTalk NG product loading

The number of products that can be connected to a SeaTalk NG backbone depends on the current draw of each product and the physical length of the backbone cabling.

NMEA 2000 Load Equivalency Numbers (LEN) are used to express the amount of current that is drawn from SeaTalk NG products (**1 LEN = 50 mA**). The LEN for each product can be found in the product's *Technical Specification*.

Products which have a dedicated power supply connection that are connected to the SeaTalk NG backbone will still have an LEN rating. This is because the product's NMEA 2000/SeaTalk NG internal transceiver will still be powered by the SeaTalk NG backbone.

LENs are used to determine the power connection point for the SeaTalk NG backbone.

## 10.4 SeaTalk NG power connection point

The point along the backbone where the power connection should be made is based on the length of the backbone.

### Note:

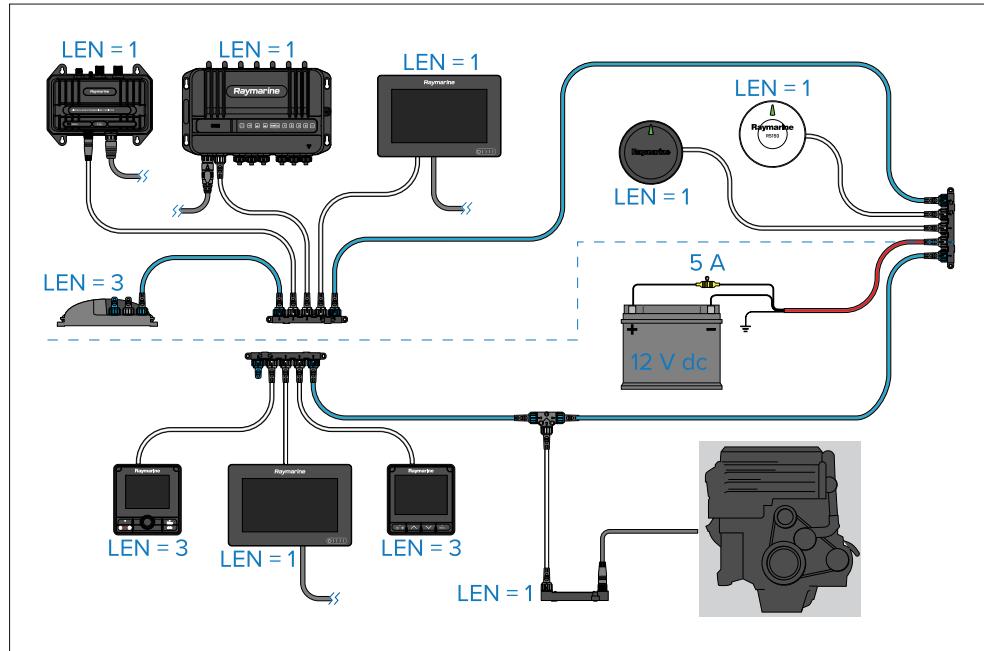
- A 12 V dc power supply must be connected to a *white* spur SeaTalk NG connection on the backbone.
- Do NOT connect the power connection to a *blue* SeaTalk NG backbone connector.
- **With the exception of** the iTC-5 and the backbone itself, do NOT connect the power supply directly to a product's *white* SeaTalk NG spur connector.

### Small systems

If the backbone length is 60 m (197 ft) or less, the power connection may be made at any point in the backbone.

### Large systems

If the backbone length is greater than 60 m (197 ft), the power connection should be made at a point that creates a balanced current draw from each side of the backbone. Load Equivalency Numbers (LEN) are used to determine the power connection point for the system.



In the example above, the system has an overall LEN of 16, so the optimum connection point would be to have a loading of 8 LEN either side of the connection point.

## 10.5 SeaTalk NG system loading

The maximum loading (LEN) for a SeaTalk NG system depends on the length of the backbone.

### Unbalanced system loading:

- Backbone Length:** 0 m (0 ft) to 20 m (66 ft) — **Maximum LEN:** 40
- Backbone Length:** > 20 m (66 ft) to 40 m (131 ft) — **Maximum LEN:** 20
- Backbone Length:** > 40 m (131 ft) to 60 m (197 ft) — **Maximum LEN:** 14

### Balanced system loading:

- Backbone Length:** 0 m (0 ft) to 60 m (197 ft) — **Maximum LEN:** 100
- Backbone Length:** > 60 m (197 ft) to 80 m (262 ft) — **Maximum LEN:** 84
- Backbone Length:** > 80 m (262 ft) to 100 m (328 ft) — **Maximum LEN:** 60
- Backbone Length:** > 100 m (328 ft) to 120 m (394 ft) — **Maximum LEN:** 50

- Backbone Length:** > 120 m (394 ft) to 160 m (525 ft) — **Maximum LEN:** 40
- Backbone Length:** > 160 m (525 ft) to 200 m (656 ft) — **Maximum LEN:** 32

## 10.6 Power distribution — SeaTalk NG

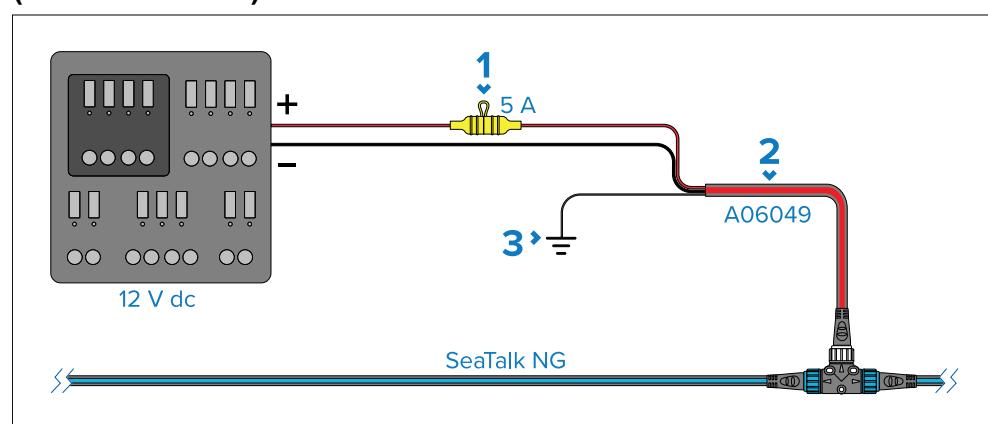
Recommendations and best practice.

- Only use approved SeaTalk NG power cables. Do NOT use a power cable designed for, or supplied with, a different product.
- See below for more information on implementation for some common power distribution scenarios.

### Important:

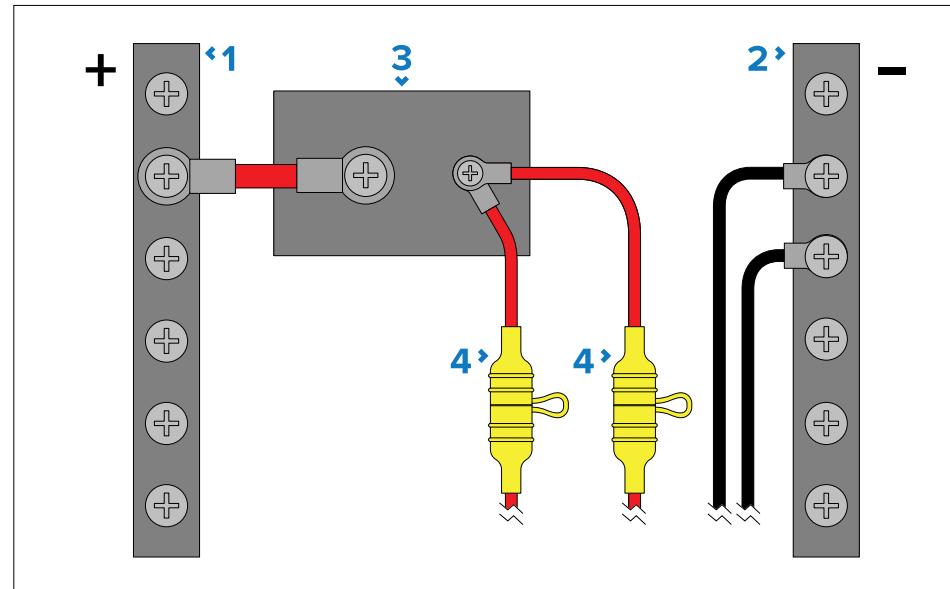
- When planning and wiring, take into consideration other products in your system, some of which (e.g. sonar modules) may place large power demand peaks on the vessel's electrical system, which may impact the voltage available to other products during the peaks.
- The information provided below is for guidance only, to help protect your product. It covers common vessel power arrangements, but does NOT cover every scenario. If you are unsure how to provide the correct level of protection, please consult an authorized Raymarine dealer or a suitably qualified professional marine electrician.

### Implementation — connection to distribution panel (recommended)



1. Waterproof fuse holder with 5 A inline fuse must be fitted (not supplied).
2. SeaTalk NG power cable.
3. RF Ground connection point for drain wire.

- Ideally, the SeaTalk NG power cable should be connected to a suitable breaker or switch on the vessel's distribution panel or factory-fitted power distribution point. It is recommended that a 5 A inline fuse is fitted to the red (positive) wire of the SeaTalk NG power cable.
- The distribution point should be fed from the vessel's primary power source by 8 AWG (8.36 mm<sup>2</sup>) cable.
- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than one item of equipment shares a breaker, use individual in-line fuses for each power circuit to provide the necessary protection.



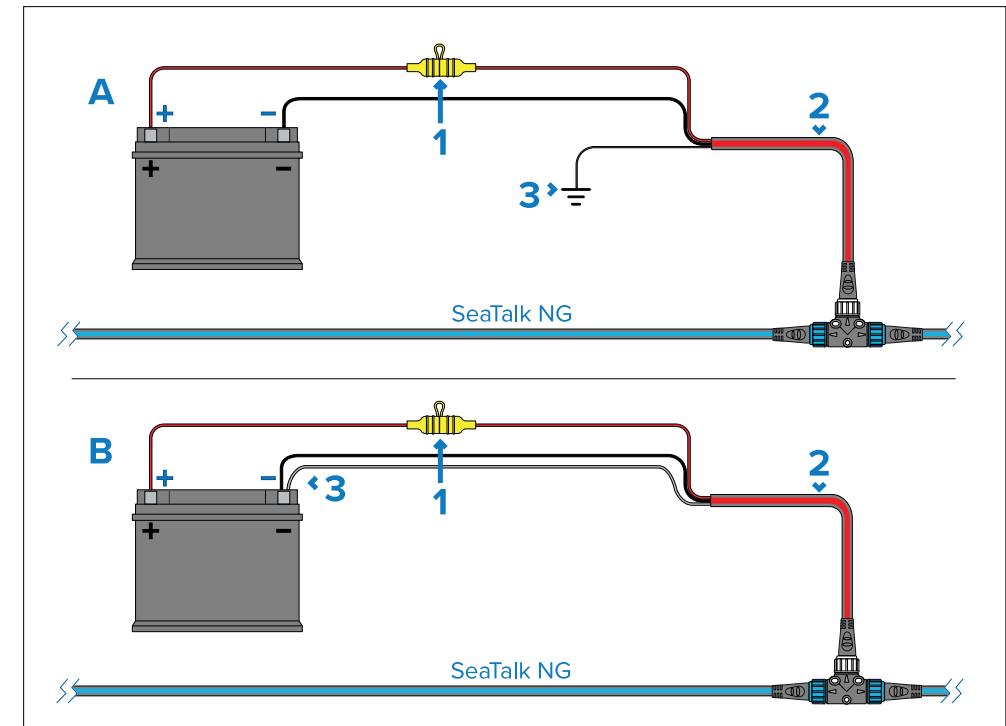
1. Positive (+) bar
2. Negative (-) bar
3. Circuit breaker
4. Waterproof fuse holder with 5 A inline fuse must be fitted (not supplied).

### Important:

Observe the recommended fuse / breaker ratings provided in the product's documentation, however be aware that the suitable fuse / breaker rating is dependent on the number of devices being connected.

### Implementation — direct connection to battery

- Where connection to a power distribution panel is not possible, the power cable may be connected to the vessel's battery.
- You **MUST** fit a 5 A inline fuse between the red wire and the battery's positive terminal.
- If you need to extend the length of the power cable, ensure you use suitably rated cable and that sufficient power (12 V dc) is available at the SeaTalk NG backbone's power connection.



1. Waterproof fuse holder with 5 A inline fuse must be fitted (not supplied).
2. SeaTalk NG power cable.

3. Connection point for drain wire.

#### **Battery connection scenario A:**

Suitable for a vessel with a common RF ground point. In this scenario, the power cable's drain wire should be connected to the vessel's common RF ground point.

#### **Battery connection scenario B:**

Suitable for a vessel without a common RF ground point. In this scenario the power cable's drain wire should be connected directly to the battery's negative terminal.

### **SeaTalk NG Power cable extension**

If you need to extend the length of the SeaTalk NG power cable, ensure you use suitably-rated cable, and that sufficient power is available at the SeaTalk NG backbone's power connection point:

- For power cable extensions, a **minimum** wire gauge of 16 AWG (1.31 mm<sup>2</sup>) is recommended. For cable runs longer than 15 m (49.2 ft), you may need to consider a thicker wire gauge (e.g. 14 AWG (2.08 mm<sup>2</sup>), or 12 AWG (3.31 mm<sup>2</sup>)).
- To ensure power cables (including any extension) are of a sufficient gauge, ensure that there is a continuous **minimum** voltage of **10.8 V dc** at the end of the cable where it enters the product's power connector, even with a fully flat battery at 11 V dc. (Do not assume that a flat battery is at 0 V dc. Due to the discharge profile and internal chemistry of batteries, the current drops much faster than the voltage. A "fully flat" battery still shows a positive voltage, even if it doesn't have enough current to power your device.)

#### **Important:**

Be aware that some products in your system (such as sonar modules) can create voltage peaks at certain times, which may impact the voltage available to other products during the peaks.

### **More information**

It is recommended that best practice is observed in all vessel electrical installations, as detailed in the following standards:

- BMEA Code of Practice for Electrical and Electronic Installations in Boats
- NMEA 0400 Installation Standard

- ISO 13297: Small craft — Electrical systems — Alternating and direct current installations
- ISO 10133: Small craft — Electrical systems — Extra-low-voltage d.c. installations
- ABYC E-11 AC & DC Electrical Systems on Boats
- ABYC A-31 Battery chargers and Inverters
- ABYC TE-4 Lightning Protection



#### **Warning: Product grounding**

Before applying power to this product, it **MUST** be correctly grounded, in accordance with the instructions provided.



#### **Warning: Positive ground systems**

Do not connect this unit to a system which has positive grounding.

## **10.7 Power connection via Autopilot Control Unit (ACU-Series)**

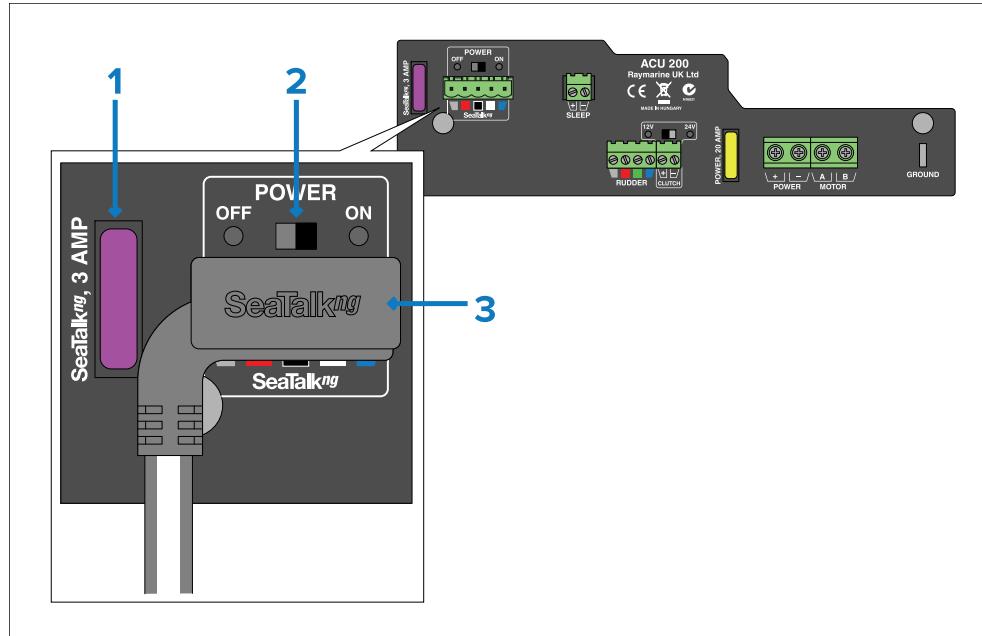
The SeaTalk NG backbone can be supplied 12 V dc power from a compatible Raymarine Autopilot Control Unit (ACU-Series).

#### **Important:**

The SeaTalk NG backbone must have a single power supply connection. If your SeaTalk NG backbone is supplied power directly from a battery or distribution panel, then you must ensure that the SeaTalk NG power switch on your ACU-Series is switched Off.

#### **Note:**

ACU-100, ACU-150 and SPX-5 autopilot control units cannot supply power to the SeaTalk NG backbone.



1. Fuse for SeaTalk NG power supply.
2. Power switch for SeaTalk NG power supply:
  - a. Select the *[OFF]* position if your SeaTalk NG backbone is supplied power directly from a battery or distribution panel.
  - b. Select the *[ON]* position if your SeaTalk NG backbone is supplied power by the ACU-Series.
3. ACU-Series/SPX-Series autopilot to SeaTalk NG spur cable (part number: R12112).

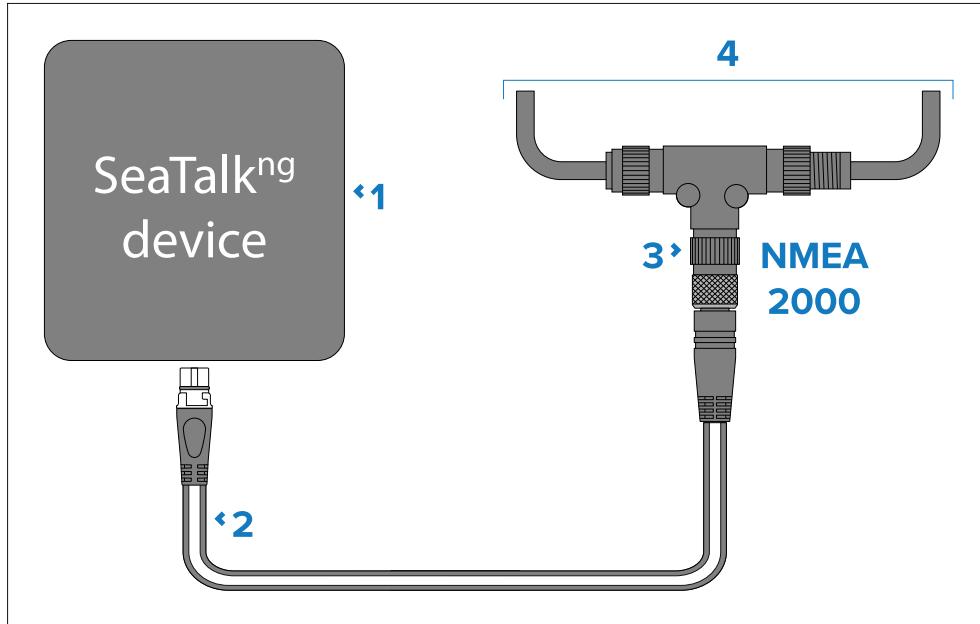
# CHAPTER 11: NMEA 2000 CONNECTION

## CHAPTER CONTENTS

- [11.1 NMEA 2000 network connection — page 49](#)

## 11.1 NMEA 2000 network connection

Your SeaTalk NG device can be connected to a DeviceNet / NMEA 2000 network.



1. SeaTalk NG device.
2. SeaTalk NG to DeviceNet (male) adapter cable (A06078, A06074, A06076, or A06046).
3. DeviceNet T-piece.
4. NMEA 2000 backbone.

# CHAPTER 12: SETUP AND CALIBRATION

## CHAPTER CONTENTS

- 12.1 Camera setup — page 51
- 12.2 AR200 Calibration (Linearization) — page 54

## 12.1 Camera setup

Before using the Augmented Reality features, it's important to correctly install and setup your compatible camera.

Refer to your camera's installation manual to determine the correct physical installation and connections for using the camera as part of an Augmented Reality system.

A number of additional camera-related settings and calibrations must be completed in the Video app before Augmented Reality features can be used:

- Camera height above the waterline.
- Camera direction.
- Camera horizontal field of view [not required for cameras which auto assign their field of view].
- Horizon calibration.

### Note:

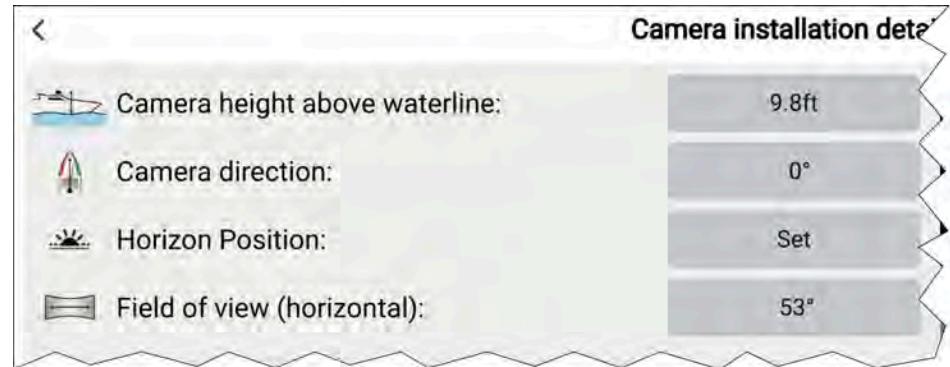
- The camera's height above the waterline and camera's view direction need to be physically measured for accurate camera installation.
- The camera's horizontal field of view can be found in your camera's installation manual specification.

## Fixed camera calibration

Fixed mount cameras require calibration for Augmented Reality to function correctly.

1. For first time setup, either:
  - i. Select *[Enter details]* from the notification when the Video app is opened.
  - ii. Select *[Enter details]* from the *[ClearCruise]* settings menu: *[Menu > Settings > ClearCruise]*.
  - iii. Select *[Configure]* from the *[Camera setup]* settings menu: *[Settings > Camera Setup > Camera Installation > Configure]*.

The *[Camera installation]* details page is displayed.



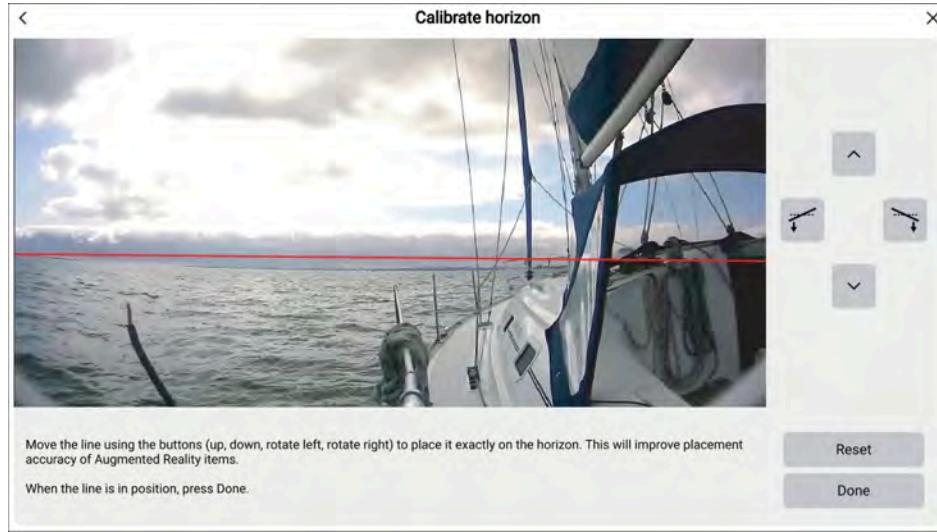
2. The *[Camera Installation]* page contains camera installation options which all need to be completed correctly.
3. Adjust the values of *[Camera height above waterline]*, *[Camera direction]* and *[Field of view (horizontal)]* by selecting the field for each settings and using the arrows to adjust the value..

Setting	Options
<i>[Camera height above waterline]</i>	<ul style="list-style-type: none"><li>• 0m to 50m</li><li>• 0ft to 165ft</li></ul>
<i>[Camera direction]</i>	<ul style="list-style-type: none"><li>• 0° (Forward) (default)</li><li>• 0° to 180° (Port)</li><li>• 0° to 180° (Starboard)</li></ul>
<i>[Field of view]</i>	<ul style="list-style-type: none"><li>• 30° to 120°</li><li>• [CAM210IP – 53°]</li><li>• [CAM220IP – 93°]</li><li>• [CAM300 – 90° recommended]</li></ul>

### Important:

Incorrect physical camera installation and incorrect installation settings could result in an inaccurate Augmented Reality overlay.

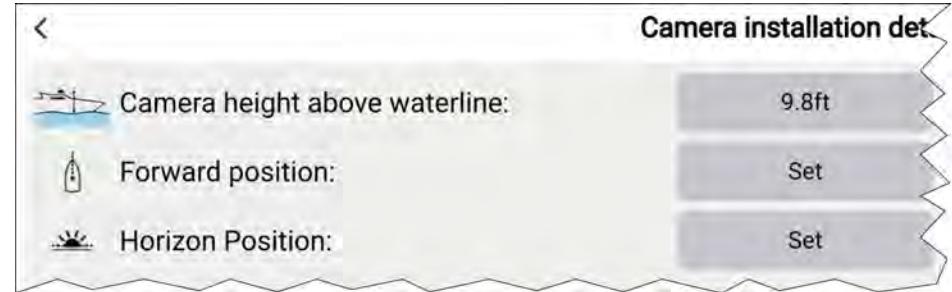
4. Select *[Horizon position]*.  
The *[Calibrate horizon]* page is displayed.



5. Use the *[Up]*, *[Down]*, *[Rotate left]* and *[Rotate right]* buttons to align the red line with the horizon.
6. Select *[Done]*.

#### Important:

Calibrating the horizon correctly is essential for accurate Augmented Reality overlay. Calibrating on calm water and in clear sight of the horizon is recommended.



2. Select the *[Camera height above waterline]* field and adjust the value using the arrows.

Menu item	Options
<i>[Camera height above waterline]</i>	<ul style="list-style-type: none"> <li>• <i>0m to 50m</i></li> <li>• <i>0ft to 165ft</i></li> </ul>

#### Important:

Incorrect physical camera installation and incorrect installation settings could result in an inaccurate Augmented Reality overlay.

3. Select the *[Set]* button for *[Forward position]*.  
The *[Set forward position]* page is displayed.

## Pan and Tilt camera calibration

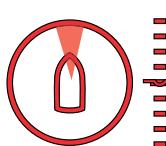
Pan and Tilt cameras require calibration for Augmented Reality to function correctly.

1. For first time setup, either:
  - i. Select *[Enter details]* from the notification when the Video app is opened.
  - ii. Select *[Enter details]* from the *[ClearCruise]* settings menu: *[Menu > Settings > ClearCruise]*.
  - iii. Select *[Configure]* from the *[Camera setup]* settings menu: *[Settings > Camera Setup > Camera Installation > Configure]*.

The *[Camera installation details]* page is displayed.



4. Use the touchscreen to adjust the camera's direction so that the vertical line is positioned directly forward, parallel to your vessel's forward position.

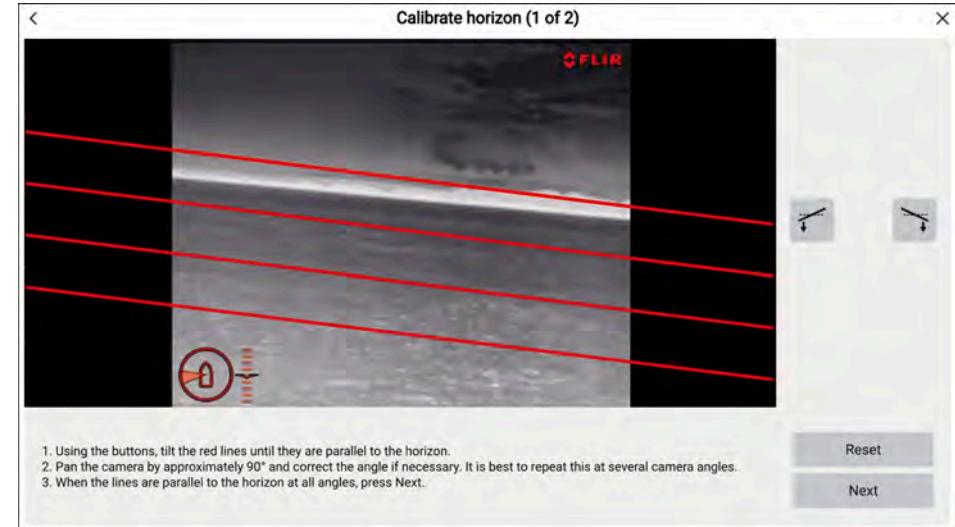


**Important:**

- *Calibrating the camera's forward position is essential for accurate Augmented Reality overlay when the camera pans and tilts. Calibrating on calm water and with a clear view of the front of your vessel is recommended.*
- *Certain cameras display a camera direction indicator, which can help identify when the camera is facing directly forward.*

5. Select **[Save]**.
6. Select **[Horizon position]**.

The **[Calibrate horizon (1 of 2)]** page is displayed.



7. Using the buttons, tilt the red lines until they are parallel to the horizon.
8. Pan the camera by approximately 90° and correct the angle if necessary.
9. Repeat the previous step until you have panned at least 360° and the lines are parallel on each subsequent pan of the camera.
10. Select **[Next]**.

The **[Calibrate horizon (2 of 2)]** page is displayed.



11. Use the buttons to move the red line up and down until it is placed exactly on the horizon.
12. Select *[Done]*.

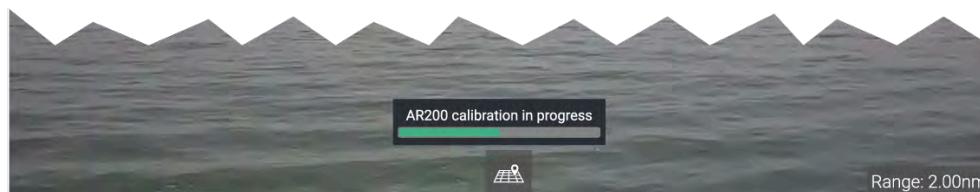
**Important:**

Calibrating the horizon correctly is essential for accurate Augmented Reality overlay. Calibrating on calm water and in clear sight of the horizon is recommended.

## 12.2 AR200 Calibration (Linearization)

To enable accurate placement of Augmented Reality (AR) flags on the camera's video feed, the AR200's AHRS sensors need to compensate for local magnetic fields, as well as the Earth's magnetic fields.

Calibration is achieved using an automatic linearization process. The linearization process starts automatically after your vessel has turned approximately 100°, when travelling at a speed of between 3 to 15 knots. The linearization process requires no user input, however at least a 270° turn is required before linearization can be completed. The duration of the linearization process can be decreased by completing a full 360° turn, when travelling at a speed of between 3 to 15 knots. The linearization process can also be restarted at anytime.



In the Video app the Linearization progress bar is displayed when linearization is in progress. The bar is filled to indicate completeness, and will turn Red if the process is paused or otherwise interrupted.

The time taken to complete the linearization process will vary according to the characteristics of the vessel, the AR200's installation location, and the levels of magnetic interference present at the time linearization is performed.

Magnetic interference can be caused by objects onboard your vessel, such as:

- Speakers

- Electronic equipment
- Electrical cabling
- Metal bulkhead or hull

Magnetic interference can also be caused by external objects in close proximity to your vessel, such as:

- Metal hulled vessels
- Underwater electrical cables
- Marine pontoons

### Magnetic deviation

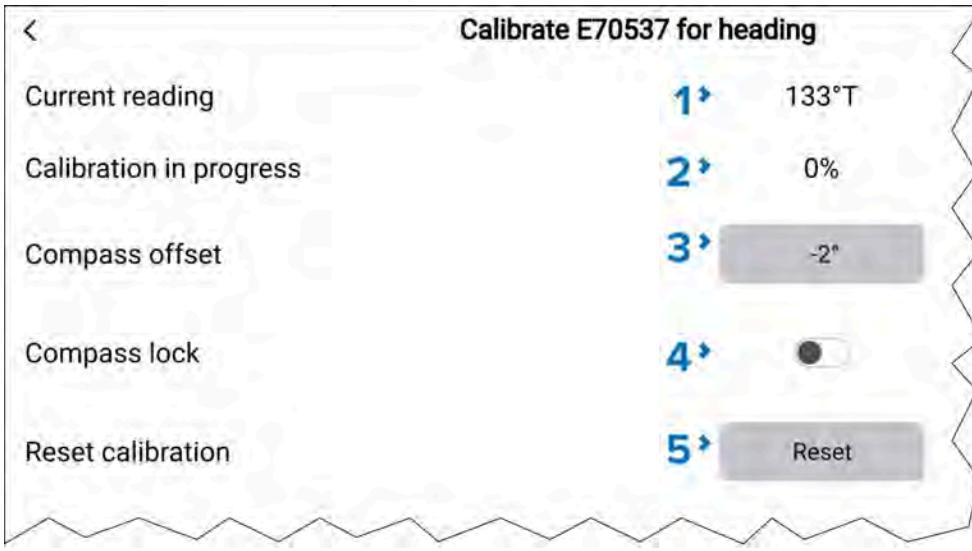
Magnetic deviation is the error induced in a compass caused by interference from local magnetic fields.

The automatic linearization process results in a deviation value being set for your AR200. If Augmented Reality flags in the Video app are not aligned with their onscreen objects, or the compass is out of alignment, you should check the AR200's current calibration settings. For instructions on how to do this, refer to the following section: [p.54 — AR200 calibration settings](#)

### AR200 calibration settings

The calibration settings page provides access to the AR200's compass calibration options.

The AR200 calibration settings can be accessed by selecting *[Calibrate]* from the AR200's pop-over menu on the Network settings page: *[Homescreen > Settings > Network > AR200 > Calibrate]*.



Description	
<b>1</b>	<i>[Current reading:]</i> The current heading reported by the AR200.
<b>2</b>	<i>[Calibration in progress:]</i> While linearization is in progress the progress percentage is displayed.  <i>[Maximum deviation at last calibration:]</i> If calibration is complete then the maximum deviation reported during the last linearization process is shown.
<b>Important:</b> If the <i>[Maximum deviation at last calibration]</i> is 45° or above, it is recommended that the AR200 unit is moved and re-installed in a location which is subject to less magnetic interference.	

Description	
<b>3</b>	<i>[Compass offset]</i> Once the linearization process has completed, it is possible that the heading value may be slightly out of alignment. This is common where installation space is limited and the AR200 is not properly aligned with your vessel's longitudinal axis. In this case, it is possible to manually adjust the Compass offset.
<b>4</b>	<i>[Compass lock]</i> When enabled, the Compass lock prevents the continual monitoring and adaptation of the compass linearization process. For more information, refer to: <a href="#">p.55 — Compass lock</a> .
<b>5</b>	<i>[Reset calibration]</i> You can reset your AR200's current linearization settings by selecting <i>[Reset calibration]</i>

## Continual monitoring and adaptation

To ensure optimum performance, after the initial linearization process is complete the unit continues to monitor and adapt the compass linearization to suit current conditions.

If the conditions for linearization are less than ideal, the automatic linearization process temporarily pauses until conditions improve again. The following conditions can cause the linearization process to temporarily pause:

- significant magnetic interference is present
- vessel speed too slow or too fast
- rate-of-turn too slow or too fast

## Compass lock

Once you are satisfied with the compass accuracy, you can lock the setting to prevent the system from completing a further automatic linearization in the future.

This feature is particularly useful for vessels in environments that are exposed to strong magnetic disturbances on a regular basis (such as offshore wind farms or very busy rivers, for example). In these situations it may be desirable to use the Compass lock feature to disable the continuous linearization process, as the magnetic interference may build a heading error over time.

**Note:**

The compass lock may be released at any time, to allow the compass continual monitoring and adaptation to re-commence. This is particularly useful if planning a long voyage. The earth's magnetic field will change significantly from one geographical location to another, and the compass can continually compensate for the changes, ensuring you maintain accurate heading data throughout the voyage.

# CHAPTER 13: SYSTEM CHECKS AND TROUBLESHOOTING

## CHAPTER CONTENTS

- 13.1 Augmented Reality (AR) initial test — page 58
- 13.2 GNSS (GPS) check — page 58
- 13.3 Troubleshooting — page 59

## 13.1 Augmented Reality (AR) initial test

With the AR200 sensor and a compatible IP camera successfully installed, you can perform an initial check of your Augmented Reality system.

### Note:

Displays must be running:

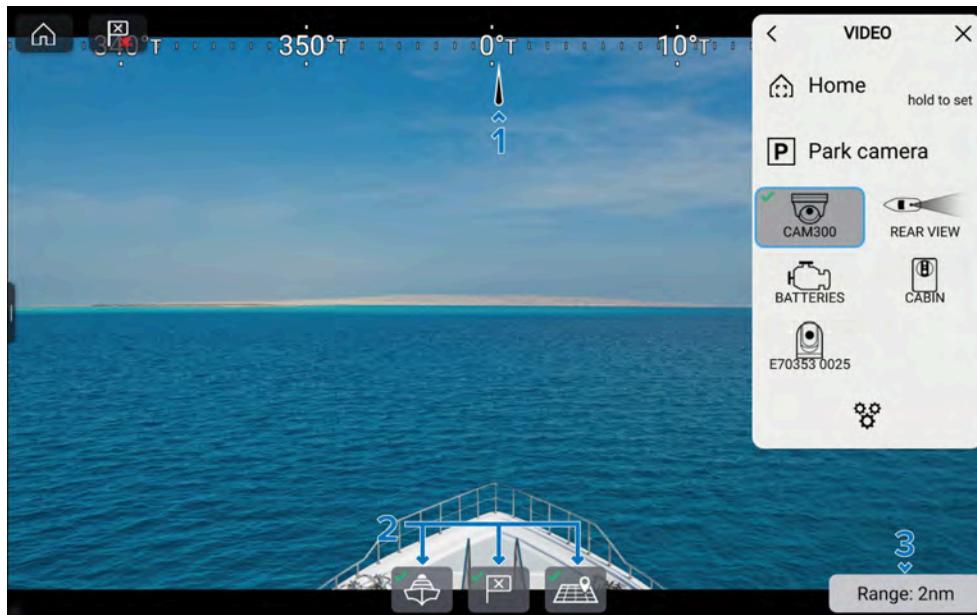
- LightHouse 3 v3.7.70 or later.
- LightHouse 4 v4.0.70 or later

1. Select the *[Video]* app icon from the Homescreen.

2. Select the *[Menu]* icon.

3. Select your Augmented Reality compatible IP camera.

When you select the relevant camera, in addition to the video feed being displayed v4.0.70ClearCruise® AR features are also displayed onscreen.



1. Compass bar and heading indicator.

2. AR Object (AIS, Waypoint and Chart object) flag toggle options.

3. AR Object detection range.

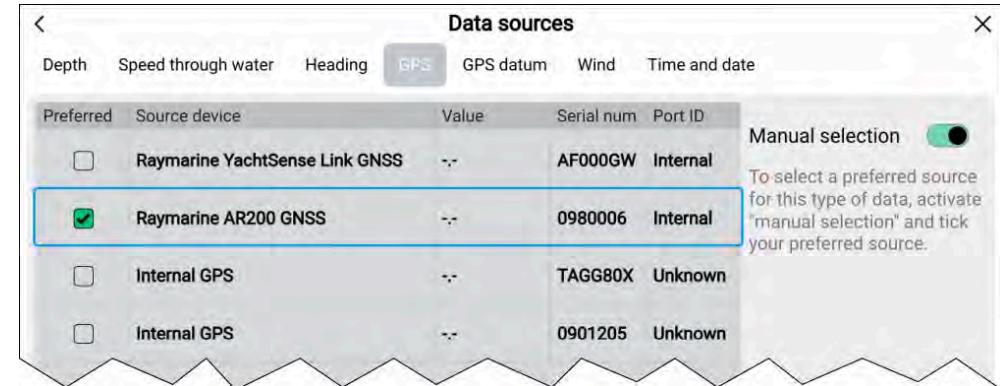
### Note:

If the AR features are not displayed, ensure that the *[AUGMENTED REALITY]* toggle switch is enabled in the *[ClearCruise]* settings menu: *[Menu > Settings > ClearCruise > AUGMENTED REALITY]*.

## 13.2 GNSS (GPS) check

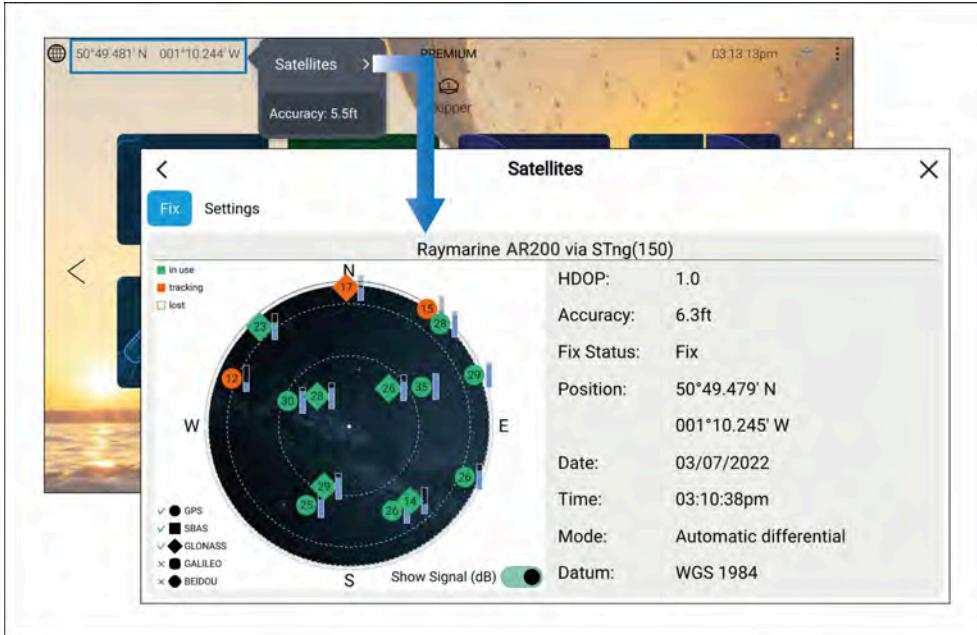
If you intend to use the AR200 as your system's main GNSS (GPS) receiver, you may need to manually select it from the *[Data sources]* menu.

The Data sources menu can be accessed from your Data master display: *[Homescreen > Settings > Network > Data sources > GPS]*.



To choose the AR200 as your preferred source for GNSS (GPS) position data, select *[Raymarine AR200 GNSS]* from the list of devices, and then select *[Always use this device]* from the Pop-over options. This will make the AR200 the preferred source for GNSS (GPS) position data.

Once selected, a tick is placed in the *[Preferred]* column and the *[Manual selection]* toggle switch will be enabled. If your AR200 has a position fix, position accuracy is displayed in the *[Value]* column.



When a valid position fix is achieved, your vessel's latitude and longitude position is displayed on the Homescreen in the top left corner. Fix details can be viewed by selecting the current position coordinates and selecting *[Satellites]* from the Pop-over options.

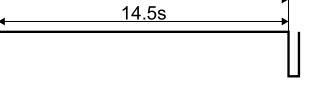
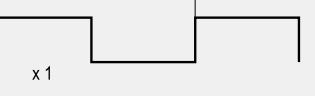
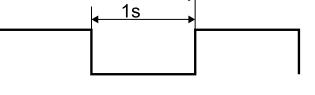
## 13.3 Troubleshooting

The troubleshooting section provides possible causes and the corrective action required for common problems that are associated with the installation and operation of your product.

Before packing and shipping, all Raymarine products are subjected to comprehensive testing and quality assurance programs. If you do experience problems with your product, this section will help you to diagnose and correct problems to restore normal operation.

If after referring to this section you are still having problems with your product, please refer to the *Technical support* section of this manual for useful links and Raymarine technical support contact details.

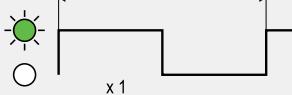
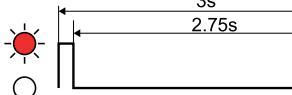
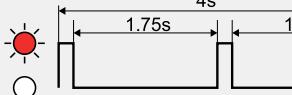
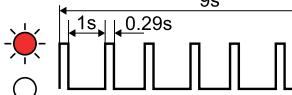
### LED Diagnostics

LED indication	Status and required action
  	<p>Green LED is off once every 15 seconds.</p> <ul style="list-style-type: none"> <li>• All sensors connected and ready.</li> <li>• Bus healthy, no communication faults</li> </ul> <p>No action required.</p>
  	<p>Green LED flashes on and off once every second.</p> <p>All sensors are initializing.</p> <p>No action required.</p>
  	<p>Green LED flashes on and off once every 2 seconds.</p> <p>GNSS (GPS) initializing</p>

#### Note:

Can take up to 5 minutes at first use or after factory reset or software update.

No action required.

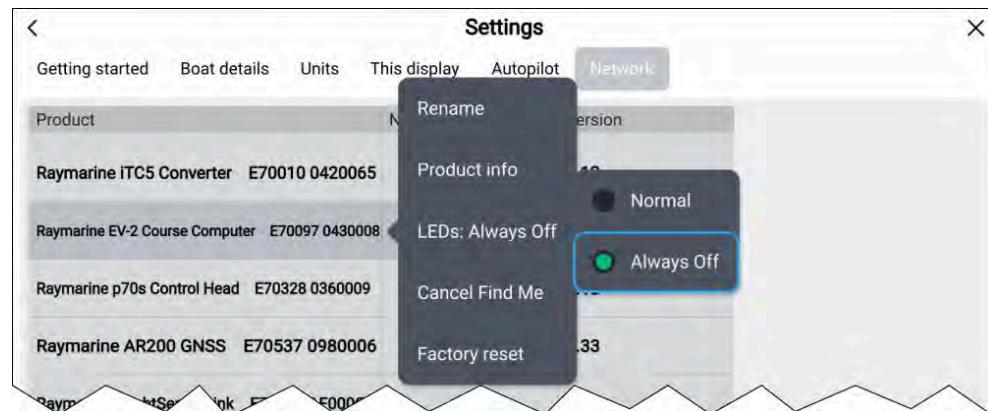
LED indication	Status and required action
 	Green LED flashes on and off once every 4 seconds. Compass linearizing. Refer to: <a href="#">p.54 – AR200 Calibration (Linearization)</a>
 	Red LED flashes on once every 3 seconds. No GNSS (GPS) signal. User actions: <ol style="list-style-type: none"><li>1. Try power cycling the system.</li><li>2. Ensure there is a clear view of the sky.</li><li>3. Check for interference from other devices.</li><li>4. Check installation location. Refer to <a href="#">p.24 – Location requirements</a></li></ol>
 	Red LED flashes on twice every 4 seconds. Cannot send data. User actions: <ol style="list-style-type: none"><li>1. Check condition of Bus cabling.</li><li>2. Ensure bus is correctly terminated.</li><li>3. Ensure bus has correct voltage.</li><li>4. Replace device.</li></ol>
 	Red LED flashes on 7 times every 9 seconds. Devices are not receiving data. User actions: <ol style="list-style-type: none"><li>1. Check condition of Bus cabling.</li><li>2. Ensure bus is correctly terminated.</li><li>3. Ensure bus has correct voltage.</li><li>4. Replace device.</li></ol>

## Switching off sensor LEDs

To assist users who wish their vessel to “go dark” (i.e. not emit any visible light), the LED indicators present on SeaTalk NG position sensors can be switched off. Supported devices: RS150, EV-1, EV-2 and AR200).

### Note:

The *[Always Off]* feature may not be available for devices running older software versions. Ensure that you obtain the latest available software for your position sensors.



1. Open the *[Network]* settings menu: *[Homescreen > Settings > Network]*.
2. Select the relevant sensor from the network list.
3. Select *[LEDs:]*.
4. Select *[Always Off]*.

The status LED on the selected device will now be switched off, and will remain off until this setting is reverted to *[Normal]*, or the *[Find Me]* feature is enabled.

## Find me

The *[Find me]* feature assists you in finding the physical installation location of a specific Raymarine SeaTalk NG position sensor (i.e.: RS150, EV-1, EV-2, or AR200).

The *[Find me]* feature works by making the selected device’s status LED flash continuously for 5 minutes, giving you time to search the vessel to determine the device’s physical location. The feature works even if the device’s LEDs have been switched to *[Always off]*.

The *[Find Me]* flash sequence will be visibly different than normal LED status sequences in that both the red and green LEDs will flash on and off at the same time, twice every second for 5 minutes.

#### Note:

The *[Find me]* feature may not be available on devices running older software versions. Ensure that you obtain the latest available software for your position sensors.



To initiate the *[Find Me]* feature for a specific SeaTalk NG device, locate the device name in the *[Network]* settings menu, and then select *[Find Me]* from the device's pop-over menu.

Once *[Find Me]* has been activated, its menu option will change to *[Cancel Find Me]* until 5 minutes has elapsed.

Selecting *[Cancel Find Me]* at any time within the 5 minute timeframe will stop the LED flashing and return the device to its previous LED state.

## GNSS (GPS) troubleshooting

Problems with the GNSS (GPS) and their possible causes and solutions are described here. Your position fix coordinates are displayed in the status area located in the top left corner of the Homescreen.

### No position fix

[System checks and troubleshooting](#)

Possible causes	Possible solutions
Display installation location (e.g.: installed below decks or in close proximity to equipment which may cause interference).	Connect an external passive GNSS (GPS) antenna such as the GA200 to the display GPS antenna connection.
Internal GNSS (GPS) receiver disabled.	When using your product's internal GNSS (GPS) receiver, ensure that it is enabled in the relevant settings menu. To access the relevant menu, select the status area located in the top left corner of the Homescreen and select <i>[Satellites]</i> and then select the <i>[Settings]</i> tab, locate the Internal GPS option and ensure it is enabled.
External GNSS (GPS) receiver connection fault.	When using an external GNSS (GPS) receiver, ensure that connections are secure and that the cabling is free from damage.
External GNSS (GPS) receiver or antenna location (e.g.: installed below decks or in close proximity to equipment which may cause interference).	Ensure the GNSS (GPS) receiver or antenna has a clear unobstructed view of the sky. Refer to the documentation supplied with your external receiver / antenna and ensure location requirements have been adhered to.
Geographic location or prevailing conditions preventing satellite fix.	Check periodically to see if a fix is obtained in better conditions or another geographic location.

## Augmented Reality (AR) Troubleshooting

### AR options not available in Video app

Possible causes	Possible solutions
Wrong camera selected.	Ensure that the correct AR-compatible camera has been selected in the Video app menu.
Compatible camera not detected.	<ol style="list-style-type: none"><li>1. Ensure your camera is AR compatible.</li><li>2. Ensure your camera is correctly installed and networked to your MFD.</li></ol>
AR200 not detected.	Ensure your AR200 is correctly installed and on the same network as the MFD from which you are using the AR features.
Incorrect LightHouse software version.	Ensure that your MFD is running LightHouse 3 v3.7.70 or later, or LightHouse 4.
AR options turned off.	The Compass bar, AIS, Waypoint and Chart object flags can be enabled and disabled from the <i>[ClearCruise] settings page ([Video app &gt; Menu &gt; Settings &gt; ClearCruise])</i> . Ensure relevant options are enabled.

**Note:**  
For AIS flags to be displayed, compatible AIS hardware must be operational and connected to the same network as your MFD.

### AR flags do not appear directly above on-screen targets

Possible causes	Possible solutions
AIS update rate	Depending on the classification of the target's AIS hardware, transmitted position updates may be sent up to 3 minutes apart and therefore the flag may appear up to 3 minutes behind the actual onscreen target.
Camera Field of View (FOV) set incorrectly.	Ensure that the FOV setting reflects your camera's horizontal FOV. Check your camera's documentation for FOV specifications.

Possible causes	Possible solutions
AR200 interference	If your AR200 is installed in a location which includes a source of magnetic interference large enough to affect AR flag placement, you may need to re-install the AR200 in a different location.
Deviation too high	<ol style="list-style-type: none"><li>1. Reset the AR200 calibration by selecting <i>[Reset]</i> from the AR200 calibration page: <i>[Homescreen &gt; Settings &gt; Network &gt; Data sources &gt; Heading &gt; Raymarine AR200 Attitude &gt; Calibrate]</i>.</li><li>2. If the problem persists, you may need to move your AR200 to a location with less magnetic interference.</li></ol>

# CHAPTER 14: OPERATION

## CHAPTER CONTENTS

- [14.1 Operation instructions — page 64](#)

## 14.1 Operation instructions

For detailed operation instructions for your product, refer to the documentation that accompanies your display.

Document	Description	Link
<b>81406</b>	LightHouse 4 Advanced Operation Instructions	<a href="http://www.bit.ly/LH4-docs">www.bit.ly/LH4-docs</a>
<b>81370</b>	LightHouse 3 Advanced Operation Instructions	<a href="http://www.bit.ly/LH3-docs">www.bit.ly/LH3-docs</a>

# CHAPTER 15: MAINTENANCE

## CHAPTER CONTENTS

- 15.1 Service and maintenance — page 66
- 15.2 Routine equipment checks — page 66
- 15.3 Product cleaning — page 66

## 15.1 Service and maintenance

This product contains no user serviceable components. Please refer all maintenance and repair to authorized Raymarine dealers. Unauthorized repair may affect your warranty.

## 15.2 Routine equipment checks

It is recommended that you perform the following routine checks, on a regular basis, to ensure the correct and reliable operation of your equipment:

- Examine all cables for signs of damage or wear and tear.
- Check that all cables are securely connected.

## 15.3 Product cleaning

Best cleaning practices.

When cleaning products:

- Switch off power supply.
- Use a clean damp cloth to wipe clean.
- Do NOT use: abrasive, acidic, ammonia, solvent or other chemical based cleaning products.
- Do NOT use a jet wash.

# CHAPTER 16: TECHNICAL SUPPORT

## CHAPTER CONTENTS

- 16.1 Raymarine technical support and servicing — page 68
- 16.2 Learning resources — page 69
- 16.3 Operation instructions — page 69

## 16.1 Raymarine technical support and servicing

Raymarine provides a comprehensive product support service, as well as warranty, service, and repairs. You can access these services through the Raymarine website, telephone, and e-mail.

### Product information

If you need to request service or support, please have the following information to hand:

- Product name.
- Product identity.
- Serial number.
- Software application version.
- System diagrams.

You can obtain this product information using diagnostic pages of the connected display.

### Servicing and warranty

Raymarine offers dedicated service departments for warranty, service, and repairs.

Don't forget to visit the Raymarine website to register your product for extended warranty benefits: <https://www.raymarine.com/en-us/support/product-registration>

### **United Kingdom (UK), EMEA, and Asia Pacific:**

- E-Mail: [emea.service@raymarine.com](mailto:emea.service@raymarine.com)
- Tel: +44 (0)1329 246 932

### **United States (US):**

- E-Mail: [rm-usrepair@flir.com](mailto:rm-usrepair@flir.com)
- Tel: +1 (603) 324 7900

### Web support

Please visit the "Support" area of the Raymarine website for:

- **Manuals and Documents** — <http://www.raymarine.com/manuals>
- **Technical support forum** — <https://raymarine.custhelp.com/app/home>
- **Software updates** — <http://www.raymarine.com/software>

### Worldwide support

### **United Kingdom (UK), EMEA, and Asia Pacific:**

- Help desk: <https://raymarine.custhelp.com/app/home>
- Tel: +44 (0)1329 246 777

### **United States (US):**

- Help desk: <https://raymarine.custhelp.com/app/home>
- Tel: +1 (603) 324 7900 (Toll-free: +800 539 5539)

### **Australia and New Zealand (Raymarine subsidiary):**

- E-Mail: [aus.support@raymarine.com](mailto:aus.support@raymarine.com)
- Tel: +61 2 8977 0300

### **France (Raymarine subsidiary):**

- E-Mail: [support.fr@raymarine.com](mailto:support.fr@raymarine.com)
- Tel: +33 (0)1 46 49 72 30

### **Germany (Raymarine subsidiary):**

- E-Mail: [support.de@raymarine.com](mailto:support.de@raymarine.com)
- Tel: +49 40 237 808 0

### **Italy (Raymarine subsidiary):**

- E-Mail: [support.it@raymarine.com](mailto:support.it@raymarine.com)
- Tel: +39 02 9945 1001

### **Spain (Authorized Raymarine distributor):**

- E-Mail: [sat@azimut.es](mailto:sat@azimut.es)
- Tel: +34 96 2965 102

### **Netherlands (Raymarine subsidiary):**

- E-Mail: [support.nl@raymarine.com](mailto:support.nl@raymarine.com)
- Tel: +31 (0)26 3614 905

### **Sweden (Raymarine subsidiary):**

- E-Mail: [support.se@raymarine.com](mailto:support.se@raymarine.com)
- Tel: +46 (0)317 633 670

### **Finland (Raymarine subsidiary):**

- E-Mail: [support.fi@raymarine.com](mailto:support.fi@raymarine.com)
- Tel: +358 (0)207 619 937

### **Norway (Raymarine subsidiary):**

- E-Mail: [support.no@raymarine.com](mailto:support.no@raymarine.com)
- Tel: +47 692 64 600

#### Denmark (Raymarine subsidiary):

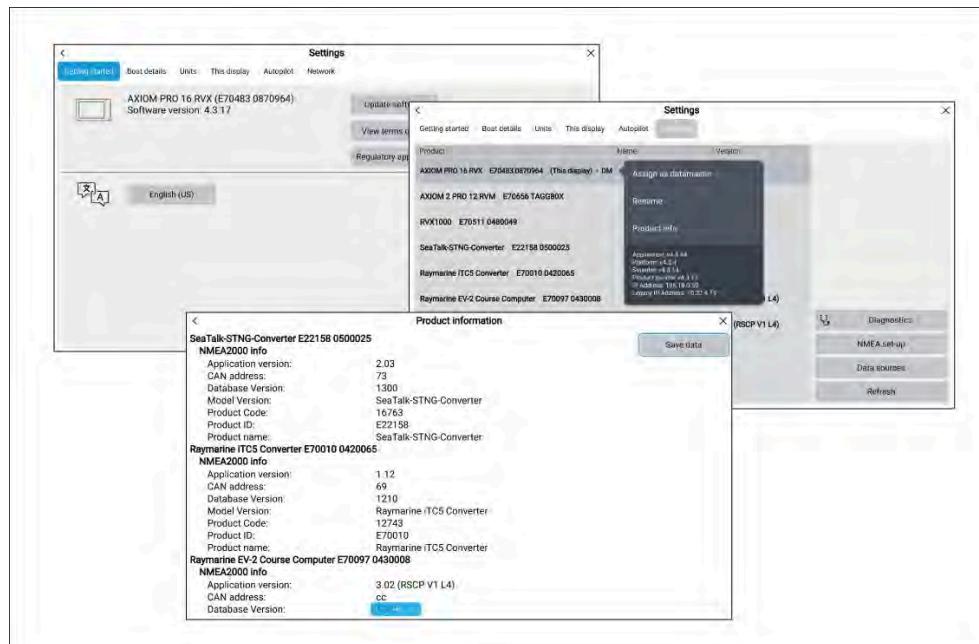
- E-Mail: [support.dk@raymarine.com](mailto:support.dk@raymarine.com)
- Tel: +45 437 164 64

#### Russia (Authorized Raymarine distributor):

- E-Mail: [info@mikstmarine.ru](mailto:info@mikstmarine.ru)
- Tel: +7 495 788 0508

## Viewing product information

Use the *[Settings]* menu to view hardware and software information about your display, and connected products.



1. Select *[Settings]* from the Homescreen.

The *[Getting started]* menu contains hardware and software information for your display.

2. You can view further information about your display, or view information about products networked using SeaTalk HS and SeaTalk NG / NMEA 2000, by selecting the *[Network]* tab, then:
  - i. to display detailed software information and your display's network IP address, select your display from the list.
  - ii. to display detailed diagnostics information for all products, select *[Product info]* from the *[Diagnostics]* pop over menu.

## 16.2 Learning resources

Raymarine has produced a range of learning resources to help you get the most out of your products.

### Video tutorials

*Raymarine official channel on YouTube*

- <http://www.youtube.com/user/RaymarineInc>

### Training courses

Raymarine regularly runs a range of in-depth training courses to help you make the most of your products. Visit the Training section of the Raymarine website for more information:

- <http://www.raymarine.co.uk/view/?id=2372>

### Technical support forum

You can use the Technical support forum to ask a technical question about a Raymarine product or to find out how other customers are using their Raymarine equipment. The resource is regularly updated with contributions from Raymarine customers and staff:

- <https://raymarine.custhelp.com/app/home>

## 16.3 Operation instructions

For detailed operation instructions for your product, refer to the documentation that accompanies your display.

All product documentation is available to download from the Raymarine website: <https://bit.ly/rym-docs>

# CHAPTER 17: TECHNICAL SPECIFICATION

## CHAPTER CONTENTS

- 17.1 Power specification — page 71
- 17.2 Environmental specification — page 71
- 17.3 GNSS (GPS) receiver specification — page 71
- 17.4 AHRS specification — page 71
- 17.5 Conformance specification — page 72

## 17.1 Power specification

Specification
<b>Nominal supply voltage:</b> 12 V dc (Supplied by the SeaTalk NG network.)
<b>Operating voltage range:</b> 9 V dc to 16 V dc (protected up to 32 V dc)
<b>Power consumption:</b> 30 mA Max.
<b>LEN (Load Equivalency Rating):</b> 1

## 17.2 Environmental specification

Specification
<b>Operating temperature range:</b> -25 °C to +55 °C (-13 °F to 131 °F)
<b>Storage temperature range:</b> -25 °C to +70 °C (-13 °F to 158 °F)
<b>Relative humidity:</b> 93%
<b>Water ingress protection:</b> IPx6, IPx7

## 17.3 GNSS (GPS) receiver specification

Specification
<b>Signal acquisition:</b> Automatic
<b>Channels:</b> Simultaneously track up to 28 satellites.
<b>Operating frequency:</b> 1574 MHz to 1605 MHz
<b>Update rate:</b> 10 Hz
<b>Sensitivity:</b> <ul style="list-style-type: none"><li>Cold start = -147 dBm</li><li>Re-acquisition = -160 dBm</li><li>Tracking = -164 dBm</li></ul>
<b>GNSS (GPS) satellite system compatibility:</b> <ul style="list-style-type: none"><li>GPS</li><li>GLONASS</li><li>Galileo ready</li><li>Beidou ready</li></ul>

Specification	
<b>Satellite Differential Type (SBAS):</b>	<ul style="list-style-type: none"><li>WAAS (United States)</li><li>EGNOS (Europe)</li><li>MSAS (Japan)</li><li>GAGAN (India)</li><li>QZSS ready (Japan)</li></ul>
<b>Differential acquisition:</b>	Automatic
<b>Position accuracy without SBAS (95%):</b>	< 15 m
<b>Position accuracy with SBAS (95%):</b>	< 5 m
<b>Speed accuracy (95%):</b>	< 0.3 kt
<b>Time to first fix from cold start:</b>	< 2 minutes (< 60 seconds typical)
<b>Time to first fix from hot start:</b>	< 45 seconds
<b>Geodetic Datum:</b>	WGS-84
<b>Antenna:</b>	Internal

## 17.4 AHRS specification

Specification	
<b>AHRS:</b>	<ul style="list-style-type: none"><li>3-Axis digital accelerometer</li><li>3-Axis digital compass</li><li>3-Axis MEMS Gyro digital angular rate sensor</li></ul>
<b>Magnetic compass accuracy:</b>	<ul style="list-style-type: none"><li>Static = <math>\leq 1^\circ</math> RMS</li><li>Dynamic = <math>\leq 3^\circ</math> RMS</li></ul>
<b>Pitch, Roll and Yaw accuracy:</b>	$\leq 1^\circ$
<b>Heading, Pitch, Roll and Rate of Turn update rate:</b>	10 Hz

## 17.5 Conformance specification

### Specification

**EMC Directive:** 2014/30/EU

**Australia and New Zealand** Level 2

**C-Tick compliance:**

**RoHS Directive:** 2011/65/EU

**WEEE Directive:** 2012/19/EU

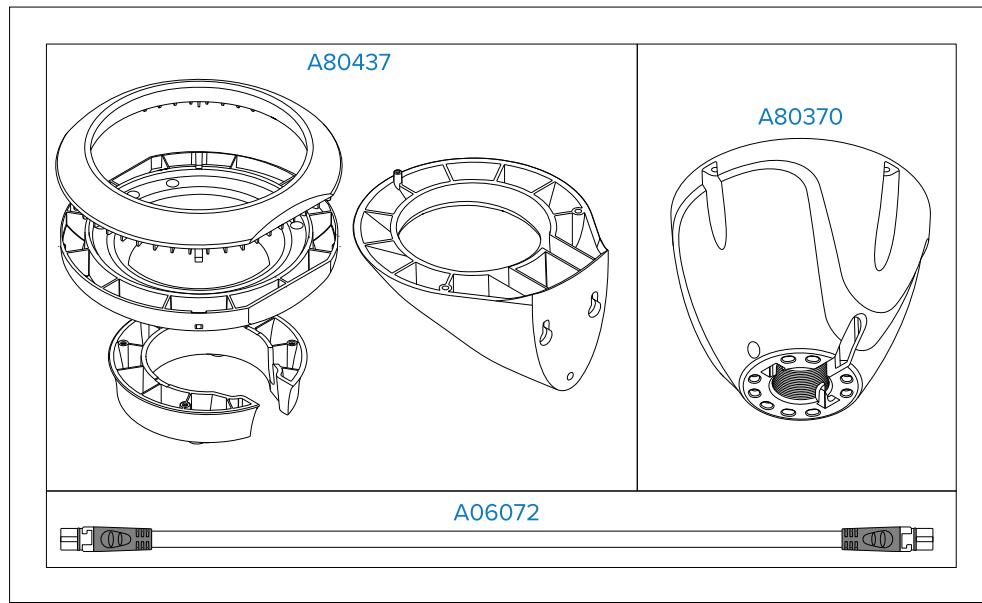
# CHAPTER 18: SPARES AND ACCESSORIES

## CHAPTER CONTENTS

- 18.1 Accessories — page 74
- 18.2 SeaTalk NG cables and accessories — page 74

## 18.1 Accessories

The following accessories are available:



Part	Description
A80437	Deck mounting (Clamshell / Riser) kit.
A80370	Pole / rail mounting adaptor kit.
A06072	6 m (19.69 ft) SeaTalk NG white spur cable.

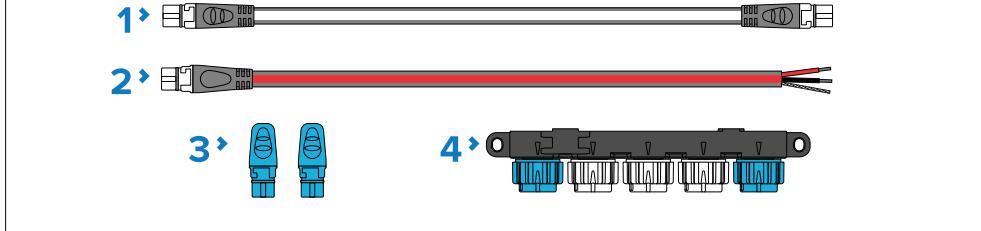
## 18.2 SeaTalk NG cables and accessories

SeaTalk NG cables and accessories for use with compatible products.

### SeaTalk NG kits

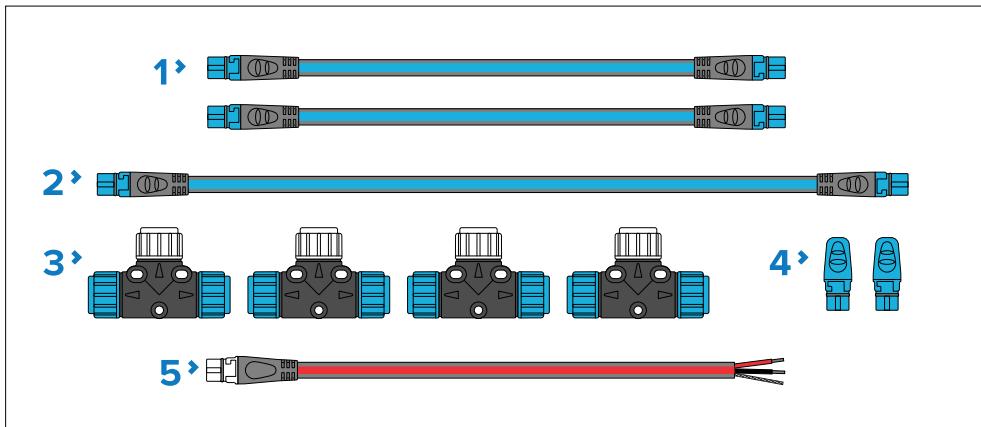
SeaTalk NG kits enable you to create a simple SeaTalk NG backbone.

**Starter kit (part number: T70134)** consists of:



- 1 x Spur cable 3 m (9.8 ft) (part number: **A06040**). Used to connect device to the SeaTalk NG backbone.
- 1 x Power cable 2 m (6.6 ft) (part number: **A06049**). Used to provide 12 V dc power to the SeaTalk NG backbone.
- 2 x Backbone terminators (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.
- 1 x 5-Way connector (part number: **A06064**). Each connector block allows connection of up to 3 SeaTalk NG devices. Multiple connector blocks can be 'daisy chained' together.

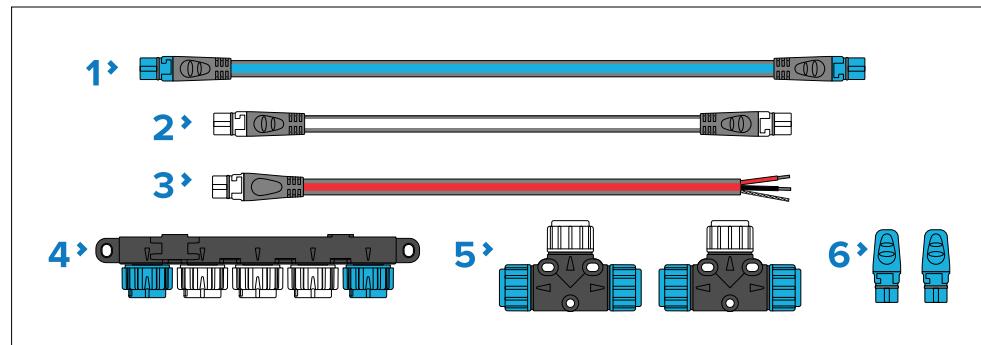
**Backbone kit (part number: A25062)** consists of:



- 2 x Backbone cables 5 m (16.4 ft) (part number: **A06036**). Used to create and extend the SeaTalk NG backbone.
- 1 x Backbone cable 20 m (65.6 ft) (part number: **A06037**). Used to create and extend the SeaTalk NG backbone.

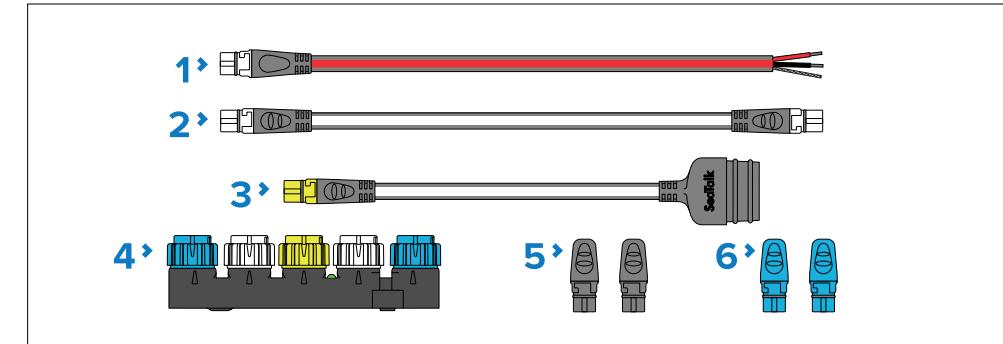
3. 4 x T-piece (part number: **A06028**). Each T-piece allows connection of one SeaTalk NG device. Multiple T-pieces can be 'daisy chained' together.
4. 2 x Backbone terminators (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.
5. 1 x Power cable 2 m (6.6 ft) (part number: **A06049**). Used to provide 12 V dc power to the SeaTalk NG backbone.

**Evolution-Series autopilot cable kit (part number: R70160)** consists of:



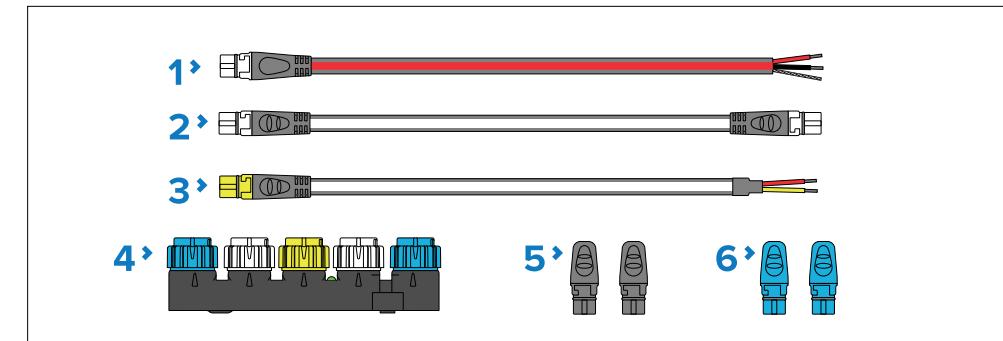
1. 1 x Backbone cable 5 m (16.4 ft) (part number: **A06036**). Used to create and extend the SeaTalk NG backbone.
2. 1 x Spur cable 1 m (3.3 ft) (part number: **A06040**). Used to connect device to the SeaTalk NG backbone.
3. 1 x Power cable 2 m (6.6 ft) (part number: **A06049**). Used to provide 12 V dc power to the SeaTalk NG backbone.
4. 1 x 5-Way connector (part number: **A06064**). Each connector block allows connection of up to 3 SeaTalk NG devices. Multiple connector blocks can be 'daisy chained' together.
5. 2 x T-pieces (part number: **A06028**). Each T-piece allows connection of one SeaTalk NG device. Multiple T-pieces can be 'daisy chained' together.
6. 2 x Backbone terminators (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.

**SeaTalk 1 to SeaTalk NG converter kit (part number: E22158)** consists of:



1. 1 x Power cable 2 m (6.6 ft) (part number: **A06049**). Used to provide 12 V dc power to the SeaTalk NG backbone.
2. 1 x Spur cable 1 m (3.3 ft) (part number: **A06039**). Used to connect a device to the SeaTalk NG backbone.
3. 1 x SeaTalk 1 (3 pin) to SeaTalk NG adapter cable 0.4 m (1.3 ft) (part number: **A22164**). Used to connect SeaTalk 1 devices to the SeaTalk NG backbone via the SeaTalk 1 to SeaTalk NG converter.
4. 1 x SeaTalk 1 to SeaTalk NG converter (part number: **E22158**). Each converter allows connection of one SeaTalk 1 device and up to 2 SeaTalk NG devices.
5. 2 x Spur blanking plugs (part number: **A06032**). Used to cover unused spur connections in 5-way blocks, T-piece connectors and SeaTalk 1 to SeaTalk NG converter.
6. 2 x Backbone terminators (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.

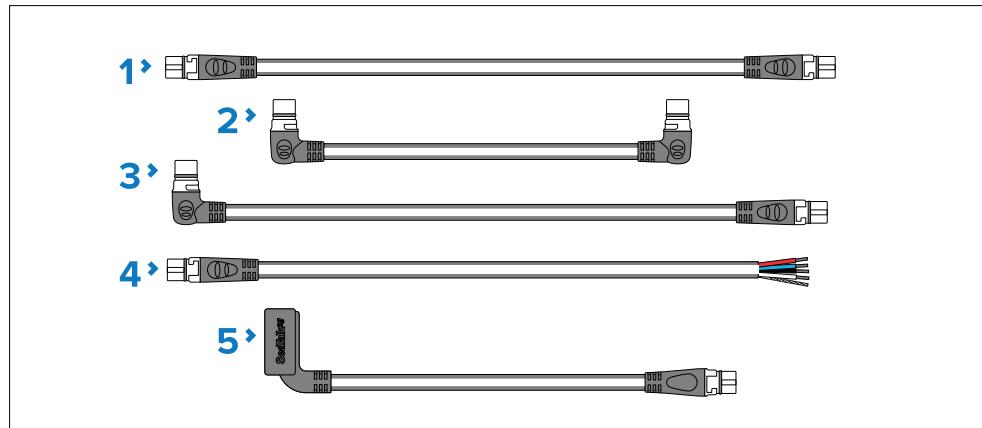
**NMEA 0183 VHF 2-wire to SeaTalk NG converter kit (part number: E70196)** consists of:



- 1 x Power cable 2 m (6.6 ft) (part number: **A06049**). Used to provide 12 V dc power to the SeaTalk NG backbone.
- 1 x Spur cable 1 m (3.3 ft) (part number: **A06039**). Used to connect a device to the SeaTalk NG backbone.
- 1 x NMEA 0183 VHF stripped-end (2-wire) to SeaTalk NG adapter cable 1 m (3.3 ft) (part number: **A06071**). Used to connect an NMEA 0183 VHF radio to the SeaTalk NG backbone via the NMEA 0183 to SeaTalk NG converter.
- 1 x SeaTalk 1 to SeaTalk NG converter (part number: **E22158**). Each converter allows connection of one SeaTalk 1 device and up to 2 SeaTalk NG devices.
- 2 x Spur blanking plugs (part number: **A06032**). Used to cover unused spur connections in 5-way blocks, T-piece connectors, and the SeaTalk 1 to SeaTalk NG converter.
- 2 x Backbone terminators (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.

### SeaTalk NG spur cables

SeaTalk NG spur cables are required to connect devices to the SeaTalk NG backbone.



1. SeaTalk NG spur cables:
  - Spur cable 0.4 m (1.3 ft) (part number: **A06038**).
  - Spur cable 1 m (3.3 ft) (part number: **A06039**).
  - Spur cable 3 m (9.8 ft) (part number: **A06040**).
  - Spur cable 5 m (16.4 ft) (part number: **A06041**).

2. Elbow (right-angled) to elbow (right-angled) spur cable 0.4 m (1.3 ft) (part number: **A06042**). Used in confined spaces where a straight spur cable will not fit.
3. Elbow (right-angled) to straight spur cable 1 m (3.3 ft) (part number: **A06081**). Used in confined spaces where a straight spur cable will not fit.
4. SeaTalk NG to stripped-end spur cables (connects compatible products that do not have a SeaTalk NG connector, such as transducer pods):
  - SeaTalk NG to stripped-end spur cable 1 m (3.3 ft) (part number: **A06043**)
  - SeaTalk NG to stripped-end spur cable 3 m (9.8 ft) (part number: **A06044**)
5. ACU-Series / SPX-Series autopilot to SeaTalk NG spur cable 0.3 m (1.0 ft) (part number **R12112**). Connects the course computer to the SeaTalk NG backbone. This connection can also be used to provide 12 V dc power to the SeaTalk NG backbone.

### SeaTalk NG backbone cables

SeaTalk NG backbone cables are used to create or extend a SeaTalk NG backbone.

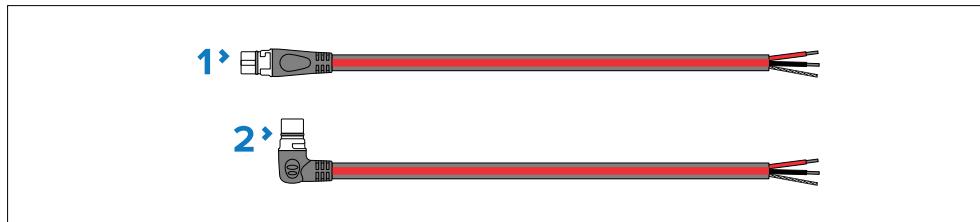


1. Backbone cables:
  - Backbone cable 0.4 m (1.3 ft) (part number: **A06033**).
  - Backbone cable 1 m (3.3 ft) (part number: **A06034**).
  - Backbone cable 3 m (9.8 ft) (part number: **A06035**).
  - Backbone cable 5 m (16.4 ft) (part number: **A06036**).
  - Backbone cable 9 m (29.5 ft) (part number: **A06068**).
  - Backbone cable 20 m (65.6 ft) (part number: **A06037**).
2. SeaTalk NG to DeviceNet (female) Backbone cable 0.4 m (1.3 ft) (part number: **A80675**)

3. SeaTalk NG to DeviceNet (male) Backbone cable 0.4 m (1.3 ft) (part number: **A80674**)

### SeaTalk NG power cables

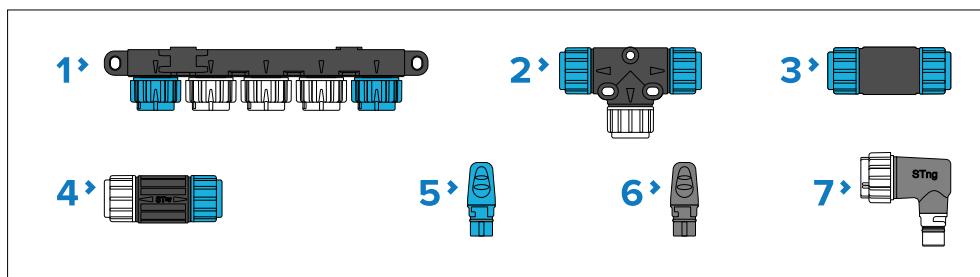
SeaTalk NG power cables are used to provide the SeaTalk NG backbone with a single 12 V dc power source. The power connection must include a 5 amp inline fuse (not supplied).



1. Power cable (straight) 2 m (6.6 ft) (part number: **A06049**).
2. Elbow (right-angled) power cable 2 m (6.6 ft) (part number: **A06070**).

### SeaTalk NG connectors

SeaTalk NG connectors are used to connect SeaTalk NG devices to the SeaTalk NG backbone and to create and extend the backbone.

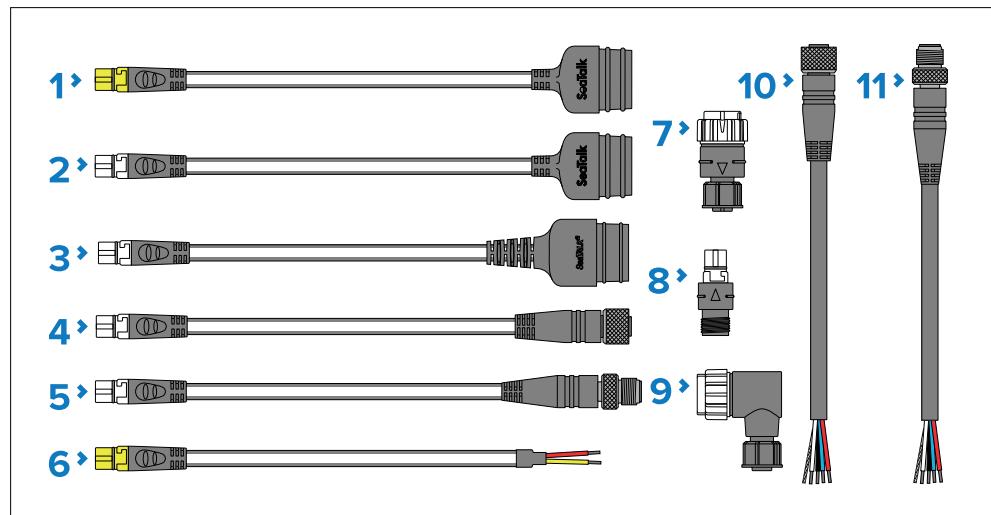


1. 5-Way connector (part number: **A06064**). Each connector block allows connection of up to 3 SeaTalk NG devices. Multiple connector blocks can be 'daisy chained' together.
2. T-piece (part number: **A06028**). Each T-piece allows connection of one SeaTalk NG device. Multiple T-pieces can be 'daisy chained' together.
3. Backbone extender (part number: **A06030**). Used to connect 2 backbone cables together.
4. Inline terminator (part number: **A80001**). Used to connect a spur cable and SeaTalk NG device at the end of a backbone instead of a backbone terminator.

5. Backbone terminator (part number: **A06031**). Terminators must be fitted to both ends of the SeaTalk NG backbone.
6. Spur blanking plug (part number: **A06032**). Used to cover unused spur connections in 5-Way blocks, T-piece connectors, or the SeaTalk 1 to SeaTalk NG converter.
7. Elbow (right-angled) spur connector (part number: **A06077**). Used in confined spaces where a straight spur cable will not fit.

### SeaTalk NG adaptors and adaptor cables

SeaTalk NG adaptor cables are used to connect devices designed for different CAN Bus backbones (e.g.: SeaTalk 1 or DeviceNet) to the SeaTalk NG backbone.



1. SeaTalk 1 (3 pin) to SeaTalk NG converter cable 1 m (3.3 ft) (part number: **A22164 / A06073**). Can be used to connect a SeaTalk 1 device to a SeaTalk NG backbone via the SeaTalk 1 to SeaTalk NG converter, or to connect a SeaTalk NG product directly to a SeaTalk 1 network.
2. SeaTalk 1 (3 pin) to SeaTalk NG adaptor cable 0.4 m (1.3 ft) (part number: **A06047**). Can be used to connect a SeaTalk 1 device to a SeaTalk NG backbone via the SeaTalk 1 to SeaTalk NG converter, or to connect a SeaTalk NG product directly to a SeaTalk 1 network.
3. SeaTalk 2 (5 pin) to SeaTalk NG adaptor cable 0.4 m (1.3 ft) (part number: **A06048**). Used to connect SeaTalk 2 devices or networks to a SeaTalk NG backbone.

4. SeaTalk NG to DeviceNet (female) adaptor cables connect NMEA 2000 devices that use a DeviceNet connector to the SeaTalk NG backbone, or connects SeaTalk NG devices to an NMEA 2000 network. The following cables are available:
  - SeaTalk NG to DeviceNet (female) adaptor cable 0.4 m (1.3 ft) (part number: **A06045**).
  - SeaTalk NG to DeviceNet (female) adaptor cable 1 m (3.3 ft) (part number: **A06075**).
5. SeaTalk NG to DeviceNet (male) adaptor cables. Connect NMEA 2000 devices that use a DeviceNet connector to the SeaTalk NG backbone, or connect SeaTalk NG devices to an NMEA 2000 network. The following cables are available:
  - SeaTalk NG to DeviceNet (male) adaptor cable 0.1 m (0.33 ft) (part number: **A06078**).
  - SeaTalk NG to DeviceNet (male) adaptor cable 0.4 m (1.3 ft) (part number: **A06074**).
  - SeaTalk NG to DeviceNet (male) adaptor cable 1 m (3.3 ft) (part number: **A06076**).
  - SeaTalk NG to DeviceNet (male) adaptor cable 1.5 m (4.92 ft) (part number: **A06046**).
6. NMEA 0183 stripped-end (2-wire) to SeaTalk NG adapter cable 1 m (3.3 ft) (part number: **A06071**). Used to connect an NMEA 0183 VHF radio to the SeaTalk NG backbone via the NMEA 0183 to SeaTalk NG converter.
7. SeaTalk NG (male) to DeviceNet (female) adaptor (**A06082**\*).
8. SeaTalk NG (female) to DeviceNet (male) adaptor (**A06083**\*).
9. SeaTalk NG (male) to DeviceNet (female) elbow (right-angled) adaptor (**A06084**\*).
10. DeviceNet (female) to stripped-end adaptor cable (0.4 m (1.3 ft)) (part number: **E05026**).
11. DeviceNet (male) to stripped-end adaptor cable (0.4 m (1.3 ft)) (part number: **E05027**).

**Important:**

\* Do NOT connect the A06082, A06083, or A06084 adaptors directly to a backbone. Only connect as part of a **spur** connection between backbone and device.

## Appendix A NMEA 2000 PGN support

Supported standard NMEA 2000 PGNs are listed below. Raymarine and other proprietary PGNs are not listed.

### Administration PGNs

PGN	Description	Transmit	Receive
59392	ISO Acknowledge	●	
59904	ISO Request		●
60160	ISO Transport Protocol, Data Transfer	●	
60416	ISO Transport Protocol, Connection Management — BAM Group Function	●	●
60928	ISO Address Claim	●	●
65240	ISO Commanded Address		●
126208	NMEA — Request Group Function		●
126208	NMEA — Command Group Function		●
126208	NMEA — Acknowledge Group Function	●	
126464	PGN Transmit and Receive List	●	●

### Data PGNs

PGN	Description	Transmit	Receive
126992	System Time	●	
126993	Heartbeat	●	
126996	Product Information	●	
126998	Configuration Information	●	
127250	Vessel Heading	●	
127251	Rate Of Turn	●	
127257	Attitude	●	
129025	Position, Rapid Update	●	
129026	COG & SOG Rapid Update	●	
129029	GNSS Position Data	●	

PGN	Description	Transmit	Receive
129033	Time and Date	●	
129044	Datum	●	●
129539	GNSS DOPs	●	
129540	GNSS Satellites In View	●	
129542	GNSS Pseudo Range Noise Statistics	●	
129547	GNSS Pseudo Range Error Statistics	●	

## Appendix B AR200 Software release history

The list below is a cumulative list of the new features introduced in subsequent releases of the AR200 software, since the initial release (v1.28; October 2019).

**This list includes *new features* only. It does NOT include software maintenance items, such as bug fixes or performance improvements.**

To download the software, and view the complete list of all software updates, including new features, bug fixes, and performance improvements, visit:

**AR200 software download link**

<https://bit.ly/ar200-download>

### AR200 v1.33 new features:

(Software release date: *February 2024*)

- Added support for a new LED indicator ‘Switch off’ setting which can be toggled via a networked LightHouse 4 multifunction display (running software version v4.6.74 or later). For more information, refer to:  
[p.60 – Switching off sensor LEDs](#)
- Added support for a new LED indicator ‘Find me’ setting which can be toggled via a networked LightHouse 4 multifunction display (running software version v4.6.74 or later). For more information, refer to:  
[p.60 – Find me](#)

### AR200 v1.32 new features:

(Software release date: *December 2022*)

- Software update to support internal component changes.

### AR200 v1.31 new features:

(Software release date: *August 2020*)

- Increased resolution of the position data when the AR200 is being used at higher Latitudes.

### AR200 v1.28 new features:

(Software release date: *October 2019*)

- Initial release.

## Appendix C Document change history

Document revision and (Date)	Changes
87372 Rev 3 (08–2024) Software version: v1.33	<ul style="list-style-type: none"> <li>Added software details chapter.</li> <li>Updated to include details and requirements for Axiom 2-Series displays.</li> <li>Updated system example.</li> <li>Added compatible cartography to recommended components list.</li> <li>Added additional product dimensions for Mounting tray, Bulkhead bracket and Riser.</li> <li>Added mounting options section.</li> <li>Added pole mounting details.</li> <li>Updated connections overview.</li> <li>Added NMEA 2000 connection chapter.</li> <li>Updated <i>Setup and calibration</i> and <i>System checks and troubleshooting</i> chapters to bring inline with the latest LightHouse 4 version.</li> <li>Updated LED diagnostics to include required user actions.</li> <li>Added details for switching the LED off and the Find me feature.</li> <li>Added images of accessories.</li> <li>Removed “Position delta high precision (PGN 129027)” from supported PGN list.</li> <li>Added software and document release history to appendix.</li> </ul>
87372 Rev 2 (12–2021) Software version: v1.31	<ul style="list-style-type: none"> <li>Updated to bring inline with latest styling standards.</li> <li>Expanded Product overview.</li> <li>Updated required additional component details.</li> <li>Updated document structure to latest standards.</li> <li>Added procedure for mounting using the Riser.</li> <li>Added new Setup and calibration details.</li> </ul>
87372 Rev 1 (10–2018) Software version: v1.28	<ul style="list-style-type: none"> <li>Initial release.</li> </ul>



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