RS150 GNSS Receiver

INSTALLATION INSTRUCTIONS

English (EN)
Date: 05-2016
Document number: 87271-1

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Software updates

Important: Check the Raymarine website for the latest software releases for your product.

www.raymarine.com/software

Product handbooks

The latest versions of all English and translated handbooks are available to download in PDF format from the website www.raymarine.com.
Please check the website to ensure you have the latest handbooks.

ENGLISH
Document number: 87271-1
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Contents

Chapter 1: Important information

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 recommends certified installation by a Raymarine approved installer. A certified installation qualifies for enhanced product warranty benefits. Contact your Raymarine dealer for further details, and refer to the separate warranty document packed with your product.

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).

Warning: Product grounding

Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions provided.

Warning: Positive ground systems

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

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: 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 *Technical specification* section for voltage rating.

Caution: Power supply protection

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

Caution: Product cleaning

When cleaning products:

- If your product includes a display screen, do NOT wipe the screen with a dry cloth, as this could scratch the screen coating.
- Do NOT use abrasive, or acid or ammonia based 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.

Water ingress

Water ingress disclaimer

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

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.

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.

Declaration of conformity

Raymarine UK Ltd. declares that this product is compliant with the essential requirements of EMC directive 2004/108/EC.

The original Declaration of Conformity certificate may be viewed on the relevant product page at www.raymarine.com.

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.

Warranty registration

To register your Raymarine product ownership, please visit www.raymarine.com 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.

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 (www.raymarine.com) to ensure you have the most up-to-date version(s) of the documentation for your product.

Chapter 2: Document and product information

Chapter contents

2.1 Document information

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

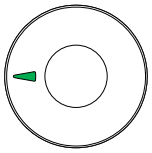
The document includes information to help you:

- 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.

Applicable products

This document is applicable to the following products:

	Part number	Name	Description
	E70310	RS150	**SeaTalkng** GNSS (GPS-/GLONASS) Receiver

Document illustrations

Your product 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.

Product documentation

The following documentation is applicable to your product:

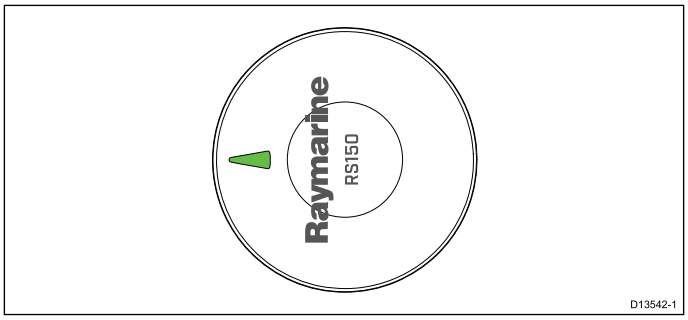
Description	Part number
RS150 Installation instructions Installation of a RS150 and connection to a wider system of marine electronics.	87271
RS150 Mounting template Mounting diagram for mounting a RS150.	87272

Operation instructions

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

2.2 RS150 product overview

The **RS150** is a **SeaTalkng©** Global Navigation Satellite Systems (GNSS) Receiver. The **RS150** provides position data to devices connected to the **SeaTalkng©** network. When used in conjunction with a **SeaTalk** and **SeaTalkng©** converter the **RS150** can also provide position data to **SeaTalk** devices.



The **RS150** has the following features:

- Compatible with GPS and GLONASS GNSS systems
- BeiDou and Galileo ready (supported by future software update)
- Pole or surface mountable
- 10Hz refresh rate
- NMEA 2000 compliant
- Low power consumption
- 12 V DC operation (24V protection)
- Waterproof to IPx6

Seatalkng®

SeaTalkng (Next Generation) is an enhanced protocol for connection of compatible marine instruments and equipment. It replaces the older **SeaTalk** and **SeaTalk²** protocols.

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

SeaTalkng is a proprietary extension to **NMEA 2000** and the proven CAN bus technology. Compatible **NMEA 2000** and **SeaTalk** / **SeaTalk²** devices can also be connected using the appropriate interfaces or adaptor cables as required.

Chapter 3: Planning the installation

Chapter contents

3.1 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.

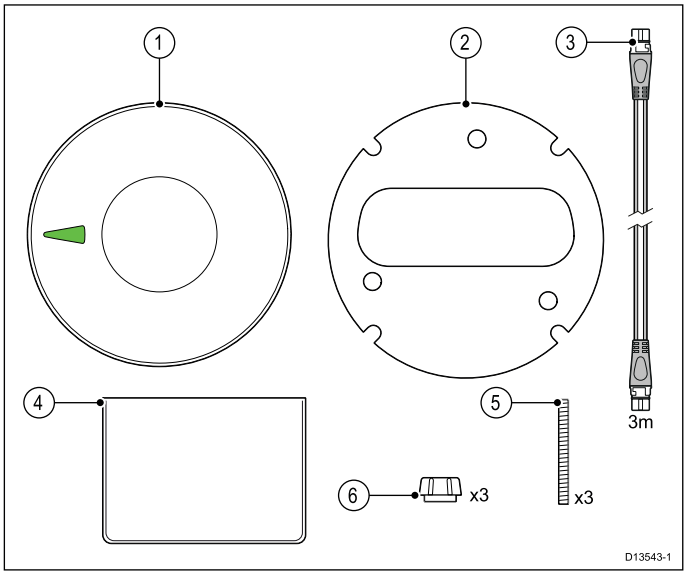
Schematic diagram

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.

3.2 Parts supplied

The following parts are supplied with your product.



1. Unit
2. Mounting seal
3. 3 m (9.84 ft) **SeaTalk**^{ng}® spur cable
4. Documentation
5. M4 x 40mm Threaded studs x 3 (used for surface mounting)
6. Finger nuts x 3 (used for surface mounting)

Unpack you 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.

3.3 Software updates

The software running on the product can be updated.

- Raymarine periodically releases software updates to improve product performance and add new features.
- You can update the software for your product using a connected and compatible multifunction display.
- Refer to www.raymarine.com/software/ for the latest software updates and the software update procedure for your product.
- 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

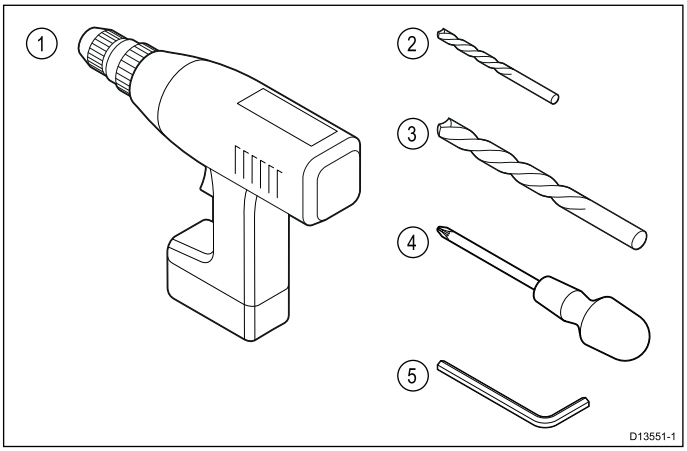
The software update process is carried out at your own risk. Before initiating the update process ensure you have backed up any important files.

Ensure that the unit has a reliable power supply and that the update process is not interrupted.

Damage caused by incomplete updates are not covered by Raymarine warranty.

By downloading the software update package, you agree to these terms.

3.4 Tools required for installation



1	Power drill
2	4 mm (11/64) drill bit (for fixing studs)
3	22 mm (for cable hole when surface mounting)
4	Pozi-drive screwdriver (only required for Pole mount installations)
5	Size 4 (2.5 mm) Hex Key (only required for Pole mount installations)

3.5 Warnings and cautions

Important: Before proceeding, ensure that you have read and understood the warnings and cautions provided in the Chapter 1 Important information section of this document.

3.6 Selecting a location

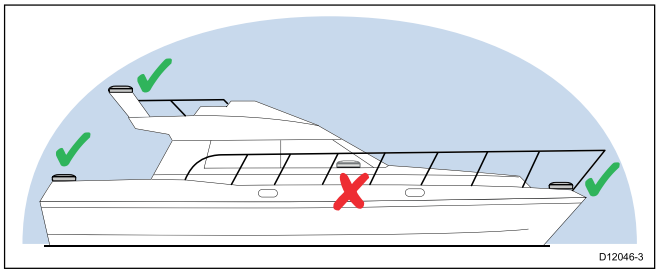
Warning: Potential ignition source

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).

GNSS Receiver location requirements

When planning the installation location, consider the following:

- The GNSS Receiver is waterproof, and appropriate for above decks mounting.
- Choose a location that provides the most unobstructed view of the sky in all directions:



- The GNSS Receiver must be mounted on a level horizontal surface.
- Do NOT mount the GNSS Receiver at the top of a mast.
- The GNSS Receiver should be mounted at least 1 m (3 ft) away from devices that may cause interference, such as motors, generators, VHF radio units and other transmitters / receivers.
- Ensure the GNSS Receiver is NOT mounted in the path of the beam emitted from Radar scanners.
- Safe from physical damage and excessive vibration.
- Away from any source of heat.
- Away from any potential flammable hazard, such as fuel vapors.

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 should aim to maintain the maximum possible distance from any compasses. Typically this distance should be at least 1 m (3 ft) in all directions. However 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 state.

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.

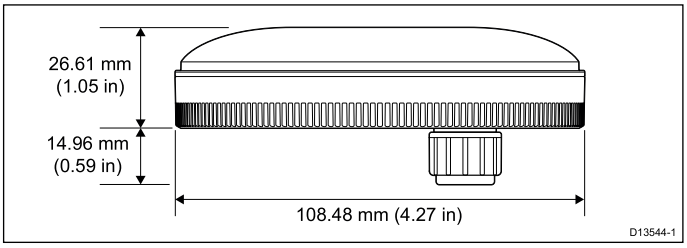
Note: In areas of extreme EMC interference, some slight interference may be noticed on the product. Where this occurs the product and the source of the interference should be separated by a greater distance.

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

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3 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 7 ft (2 m).
  - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The 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

3.7 Product dimensions



Chapter 4: Cables and connections

Chapter contents

4.1 General cabling guidance

Cable types and length

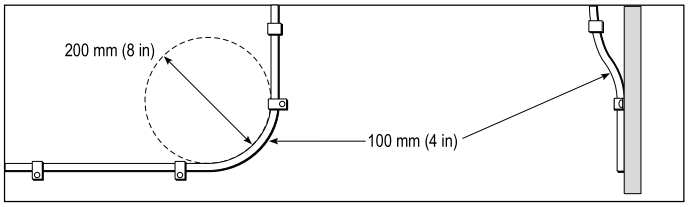
It is important to use cables of the appropriate type and length

- Unless otherwise stated use only standard cables of the correct type, supplied by Raymarine.
- Ensure that any non-Raymarine cables are of the correct quality and gauge. For example, longer power cable runs may require larger wire gauges to minimize voltage drop along the run.

Routing cables

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

- Do NOT bend cables excessively. Wherever possible, ensure a minimum bend diameter of 200 mm (8 in) / minimum bend radius of 100 mm (4 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 tie-wraps or lacing twine. Coil any extra 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,
- antennae.

Strain relief

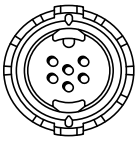
Ensure adequate strain relief is provided. Protect connectors from strain and ensure they will not pull out under extreme sea conditions.

Cable shielding

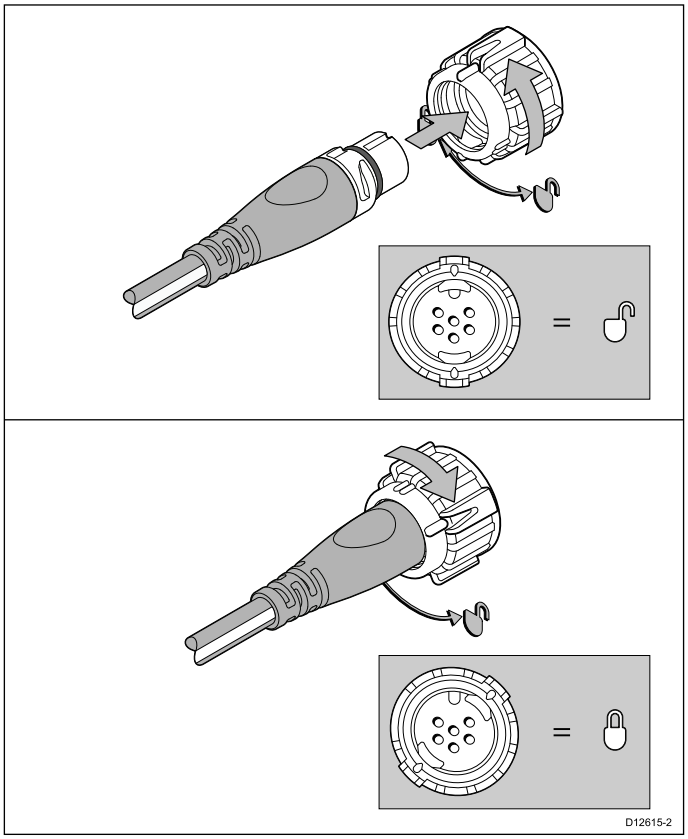
Ensure that all data cables are properly shielded that the cable shielding is intact (e.g. hasn't been scraped off by being squeezed through a tight area).

4.2 Connections overview

Your product includes the following connectors.

Connector	Qty	Connects to:	Suitable cables
	1	1. **SeaTalkng** backbone 2. **NMEA 2000** backbone	1. **SeaTalkng** spur cables 2. **SeaTalkng** to **DeviceNet** adaptor cable (A06045)

Connecting SeaTalkng® cables



1. Rotate the locking collar on the unit to the unlocked position.
2. Ensure the cable's connector is correctly oriented.
3. Fully insert the cable connector.
4. Rotate locking collar clockwise (2 clicks) until it is in the locked position.

SeaTalkng® product loading

The number of products that can be connected to a **SeaTalkng** backbone depends on the power consumption of each product and the physical overall length of the backbone.

SeaTalkng products have a Load Equivalency Number (LEN), which indicates the product's power consumption. The LEN for each product can be found in the product's Technical Specification.

4.3 SeaTalk^{ng}® power supply

Power is supplied to the product over the **SeaTalk^{ng}** backbone.

A **SeaTalk^{ng}** backbone requires one 12 V dc power supply, connected to the **SeaTalk^{ng}** backbone. This can be provided by:

- a battery (1), via the distribution panel,
- an Autopilot Control Unit (**ACU**)(2),
- an **SPX** course computer (2),
- for 24 V vessels a 5 amp, regulated, continuous 24 V dc to 12 V dc converter is required.

Note:

- (1) 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.
- (2) The **ACU-100** and **SPX-5** cannot be used to power the **SeaTalk^{ng}** backbone.

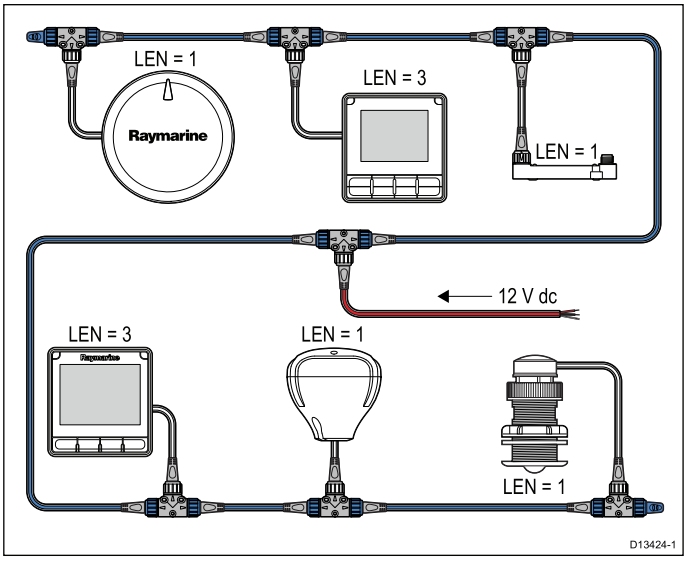
SeaTalk^{ng}® power connection point

Small systems

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

Large systems

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



In the example above the system has an overall LEN of 10, so the optimum connection point would be to have 5 LEN either side of the connection point.

In-line fuse and thermal breaker ratings

The **SeaTalk^{ng}®** network's power supply requires an in-line fuse or thermal breaker to be fitted.

In-line fuse rating	Thermal breaker rating
5 A	3 A (if only connecting one device)

Note:

- The suitable fuse rating for the thermal breaker is dependent on the number of devices you are connecting. If in doubt consult an authorized Raymarine dealer.

SeaTalk^{ng}® system loading

The maximum loading / LEN for a **SeaTalk^{ng}** system depends on the length of the backbone.

Loading type	Backbone length	Total LEN
Unbalanced	20 m (66 ft)	40
Unbalanced	40 m (131 ft)	20
Unbalanced	60 m (197 ft)	14
Balanced	60 m (197 ft) or less	100
Balanced	80 m (262 ft)	84
Balanced	100 m (328 ft)	60
Balanced	120 m (394 ft)	50
Balanced	140 m to 160 m (459 ft to 525 ft)	40
Balanced	180 m to 200 m (591 ft to 656 ft)	32

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.

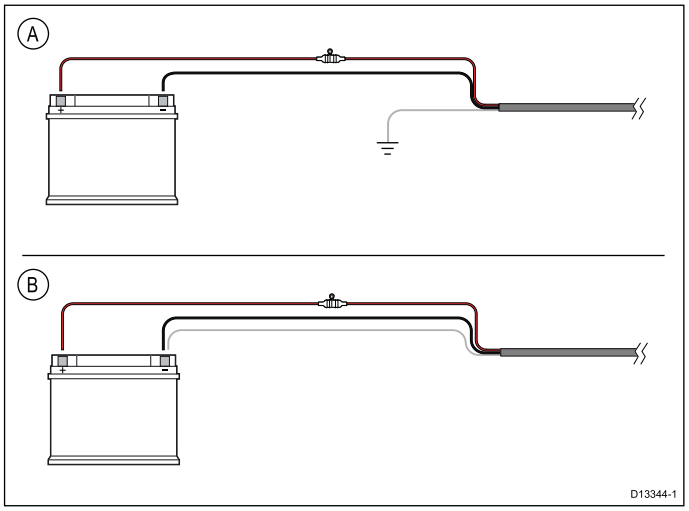
Important: When planning and wiring, take into consideration other products in your system, some of which (e.g. sonar modules) may place large power demand peaks on the vessel's electrical system.

Note: 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 — direct connection to battery

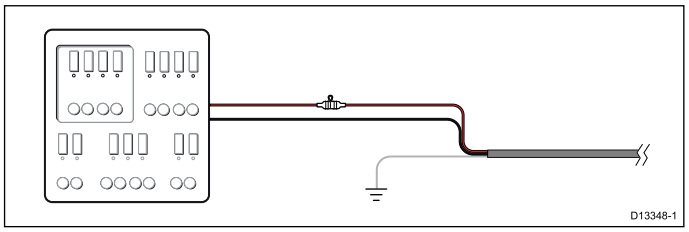
- **SeaTalk^{ng}®** power cables may be connected directly to the vessel's battery, via a suitably rated fuse or breaker.

- You MUST fit a suitably rated fuse or breaker between the red wire and the battery's positive terminal.
- Refer to the inline fuse ratings provided in the product's documentation.
- 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.



A	Battery connection scenario A: suitable for a vessel with a common RF ground point. In this scenario, if your product's power cable is supplied with a separate drain wire then it should be connected to the vessel's common ground point.
B	Battery connection scenario B: suitable for a vessel without a common grounding point. In this case, if your product's power cable is supplied with a separate drain wire then it should be connected directly to the battery's negative terminal.

Implementation — connection to distribution panel



- Alternatively, the **SeaTalk**^{ng}® power cable may be connected to a suitable breaker or switch on the vessel's distribution panel or factory-fitted power distribution point.
- The distribution point should be fed from the vessel's primary power source by 8 AWG (8.36 mm^2) 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 1 item of equipment shares a breaker, use individual in-line fuses for each power circuit to provide the necessary protection.
- In all cases, observe the recommended breaker / fuse ratings provided in the product's documentation.
- 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.

Important: Be aware that the suitable fuse rating for the thermal breaker or fuse is dependent on the number of devices you are connecting.

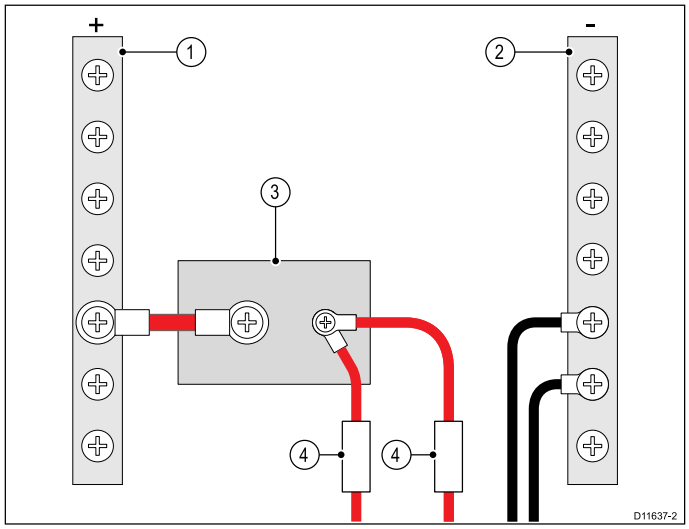
More information

Raymarine recommends 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
- ABYC E-11 AC & DC Electrical Systems on Boats
- ABYC A-31 Battery chargers and Inverters
- ABYC TE-4 Lightning Protection

Sharing a breaker

Where more than 1 piece of equipment shares a breaker you must provide protection for the individual circuits. E.g. by connecting an in-line fuse for each power circuit.



1	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker
4	Fuse

Where possible, connect individual items of equipment to individual circuit breakers. Where this is not possible, use individual in-line fuses to provide the necessary protection.

Warning: Product grounding

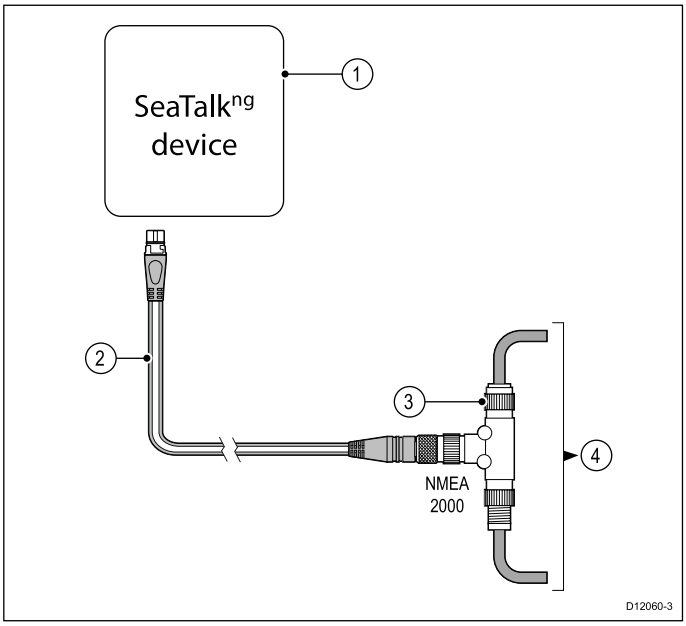
Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions provided.

Warning: Positive ground systems

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

4.4 NMEA 2000 network connection

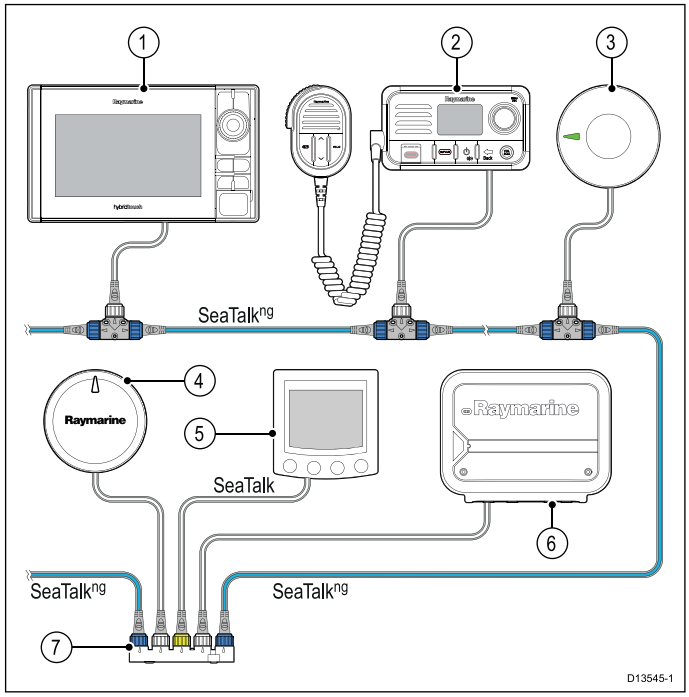
Your **SeaTalk^{ng}®** device can be connected to a **DeviceNet / NMEA 2000** network.



1. **SeaTalk^{ng}®** device
2. **SeaTalk^{ng}®** to **DeviceNet** adaptor cable (A06045)
3. **DeviceNet** T-piece
4. **NMEA 2000** backbone

4.5 SeaTalk^{ng}® network example

Your product provides data to other devices on the **SeaTalk^{ng}®** network.



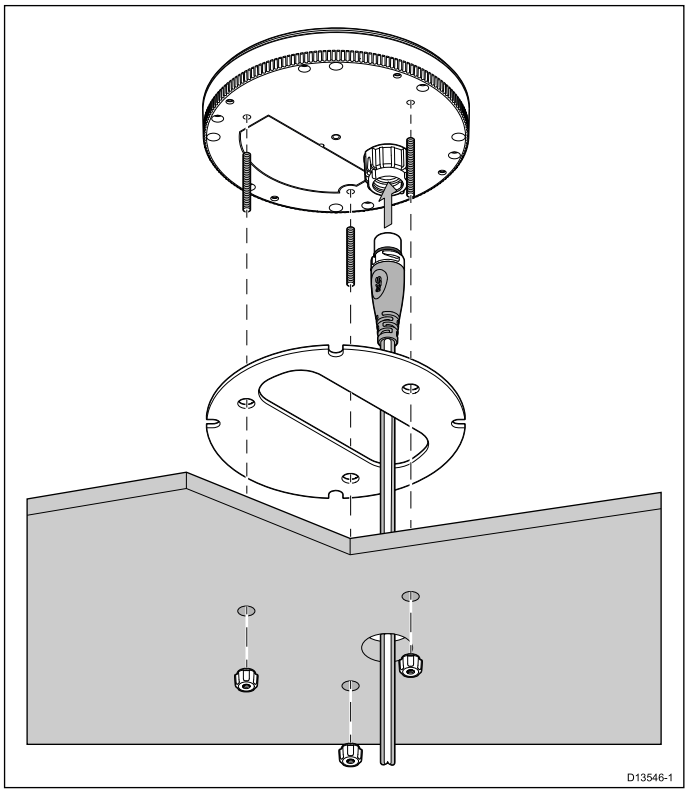
1. **SeaTalk^{ng}®** MFD
2. **SeaTalk^{ng}®** VHF Radio
3. **RS150** GNSS Receiver
4. **Evolution** EV sensor
5. **SeaTalk** Pilot controller
6. **ACU** (Actuator Control Unit)
7. **SeaTalk** to **SeaTalk^{ng}®** converter

Chapter 5: Installation

Chapter contents

5.1 Surface mounting

The unit can be mounted on a surface that is up to 28 mm (1.10 in) thick, approximately . To mount on a thicker surface longer studs will be required.

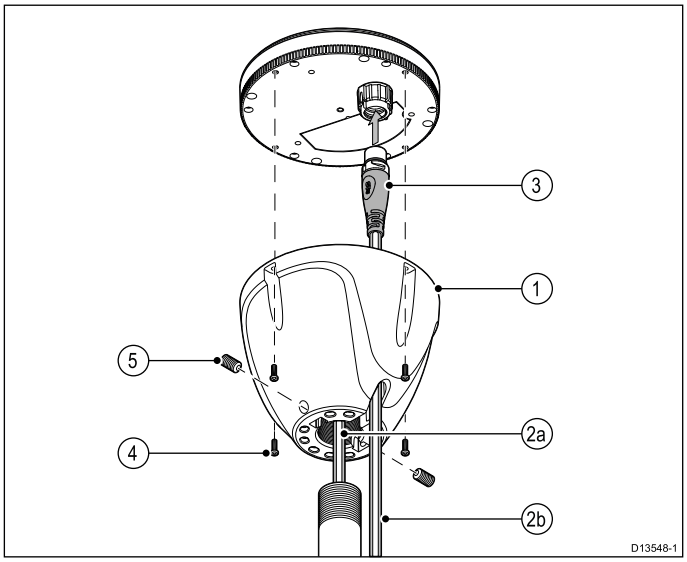


1. Ensuring correct orientation, affix the supplied mounting template to the mounting surface at the desired location.
2. Drill 3 x fixing holes and 1 x cable hole using drill bits of the size indicated on the template.
3. Place the waterproof gasket into position on the underside of the receiver.
4. Connect the supplied cable to an available **SeaTalk**^{ng} spur connection.
5. Route the other end of the cable through the cable hole and connect to the unit.
6. Screw the threaded studs into the underside of the receiver unit (these should be hand-tight only).
7. Position the unit so that the mounting studs pass through the holes in the mounting surface.
8. Secure the unit to the mounting surface using the thumb nuts provided. (these should be hand-tight only).

5.2 Pole mounting

The unit can be mounted using the optional Pole Mount Adaptor (A80370).

Pole mounting requires a Pole with a 1 inch 14 TPI thread:



1. Attach the Pole Mount Adaptor to the top of the pole.
2. Feed the supplied cable through either:
   - 2a) the center of the Pole Mount Adaptor and Pole, or
   - 2b) the cable exit hole.
3. Connect the supplied cable to an available **SeaTalk**^{ng} spur connection and then connect the other end of the cable to the connector on the unit and secure using the locking collar.
4. Ensuring correct orientation, Secure the unit to the Pole Mount Adaptor using the fixings provided.
5. Fix the unit's orientation by tightening the grub screws provided.

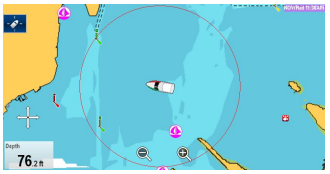
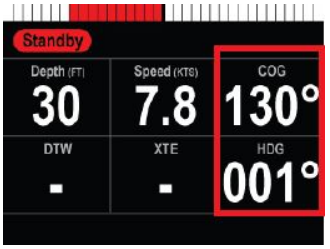
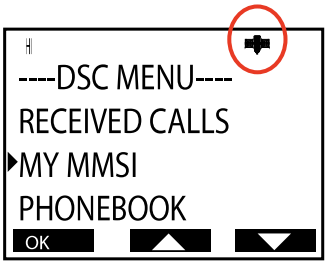
Note: The Pole Mount Adaptor may also be used to rail mount the unit using a 3rd party rail clamp with a 1 inch 14 TPI thread.

Chapter 6: System checks and troubleshooting

Chapter contents

6.1 Initial test

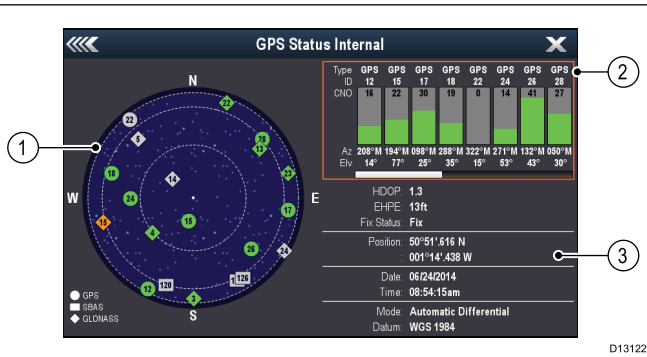
Once the unit is fully connected and installed, perform an initial power on test to verify correct operation.

Product type	Unit to use for verifying operation	Application(s) to use for verifying operation	Example screen
GNSS Receiver	MFD	Chart application (check the vessel position displayed on the chart against your actual proximity to a known charted object).	
	Instrument or pilot control head	Check that a position fix is displayed.	
	VHF radio	Check that a position fix is displayed.	

GPS Status

Products with an internal GPS receiver or GNSS (GPS/GLONASS) receiver can use the GPS status page to view the status of the available satellites that are compatible with your receiver.

The satellite constellations are used to position your boat in the Chart application. You can set up your receiver and check its status from the **GPS Set-up** menu. For each satellite, the screen provides the following information:



1. Sky view
2. Satellite status
3. Position and fix information

Sky view

Sky view is a visual representation that shows the position of navigation satellites and their type. Satellite types are:

- **Circle** — A circle identifies a satellite from the GPS constellation.
- **Square** — A square identifies an (SBAS) differential satellite.
- **Diamond** — A diamond identifies a satellite from the GLONASS constellation.

Satellite status area

The Satellite status area displays the following information about each satellite:

- **Type** — Identifies which constellation the satellite belongs to.
- **ID** — Displays the satellites identification number.
- **CNO** (Carrier-to-noise ratio) — Displays the signal strength of each satellite shown in the Sky view:
  - Grey = searching for satellite
  - Green = satellite in use
  - Orange = tracking satellite
- **Azimuth and Elevation** — Provides the angle of elevation and azimuth between the location of the receiver and the satellite.

Position and fix information

The following positional and fix information is provided:

- **Horizontal Dilution of Precision (HDOP)** — HDOP is a measure of satellite navigation accuracy, calculated from a number of factors including satellite geometry, system errors in the data transmission and system errors in the receiver. A higher figure signifies a greater positional error. A typical receiver has an accuracy of between 5 and 15 m. As an example, assuming a receiver error of 5 m, an HDOP of 2 would represent an error of approximately 15 m. Please remember that even a very low HDOP figure is NO guarantee that your receiver is providing an

accurate position. If in doubt, check the displayed vessel position in the Chart application against your actual proximity to a known charted object.

- **Estimated Horizontal Position Error (EHPE)** — EHPE is a measure of the estimated error of a position fix in the horizontal plane. The value displayed indicates that your position is within a circle radius of the stated size 50% of the time.
- **Fix status** — indicates the actual mode the receiver is reporting:
  - **Fix** — Satellite fix has been acquired.
  - **No Fix** — No satellite fix can be acquired.
  - **D Fix** — A differential beacon fix has been acquired.
  - **SD Fix** — A differential satellite fix has been acquired.
- **Position** — Displays the latitude and longitude position of your receiver.
- **Date / Time** — Displays the current date and time generated by the position fix in UTC format .
- **Mode** — Identifies wether the receiver is working in differential mode or non-differential mode.
- **Datum** — The receiver's datum setting affects the accuracy of the vessel position information displayed in the Chart application. In order for your receiver and MFD to correlate accurately with your paper charts, they must be using the same datum.

6.2 Troubleshooting

The troubleshooting information provides possible causes and corrective action required for common problems associated with marine electronics installations.

All Raymarine products are, prior to packing and shipping, subjected to comprehensive test and quality assurance programs. However, if you experience problems with the operation of your product this section will help you to diagnose and correct problems in order to restore normal operation.

If after referring to this section you are still having problems with your unit, please contact Raymarine Technical Support for further advice.

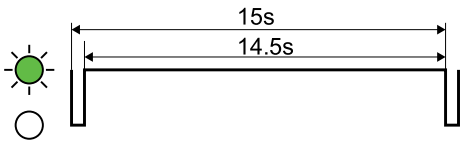
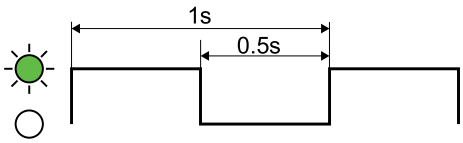
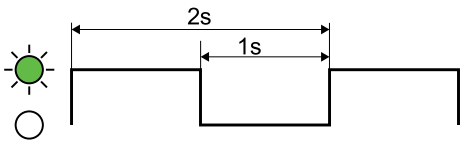
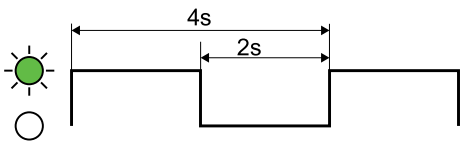
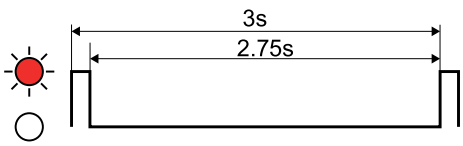
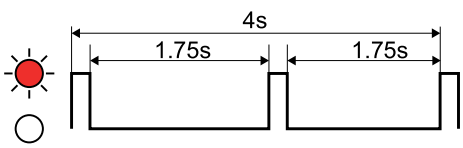
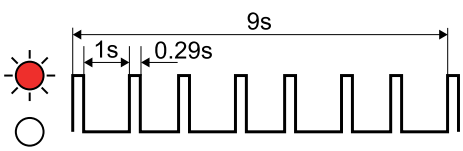
GNSS troubleshooting

Problems with the GNSS and their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
"No Fix" GNSS status icon is displayed.	Geographic location or prevailing conditions preventing satellite fix.	Check periodically to see if a fix is obtained in better conditions or another geographic location.
	GNSS connection fault.	Ensure that external GNSS connections and cabling are correct and fault free.
	External GNSS antenna in poor position. For example: • Below decks. • Close proximity to transmitting equipment such as VHF radio.	Ensure GNSS antenna has a clear view of the sky.
	GNSS installation problem.	Refer to the installation instructions.

Note: A GNSS Status screen is available within the display. This provides satellite signal strength and other relevant information.

LED Diagnostics

LED Sequence	LED Color	Status
	Green	• Bus healthy, no communication bus faults • All sensors connected and ready
	Green	• Sensors initializing
	Green	• GPS initializing (Can take up to 5 minutes at first use or after factory reset or software update)
	Green	• Compass linearizing
	Red	• No GPS Signal
	Red	• Bus not connected / fault
	Red	• Bus connected but not receiving data

Chapter 7: Maintenance

Chapter contents

7.1 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.

7.2 Routine equipment checks

Raymarine strongly recommends that you complete a number of routine checks to ensure the correct and reliable operation of your equipment.

Complete the following checks on a regular basis:

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

7.3 Product cleaning

Best cleaning practices.

When cleaning products:

- If your product includes a display screen, do NOT wipe the screen with a dry cloth, as this could scratch the screen coating.
- Do NOT use abrasive, or acid or ammonia based products.
- Do NOT use a jet wash.

Chapter 8: Technical support

Chapter contents

8.1 Raymarine product 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 the menus within your product.

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: http://www.raymarine.co.uk/display/?id=788.

Region	Telephone	E-mail
United Kingdom (UK), EMEA, and Asia Pacific	+44 (0)1329 246 932	emea.service@raymarine.com
United States (US)	+1 (603) 324 7900	rm-usrepair@flir.com

Web support

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

- **Manuals and Documents** — http://www.raymarine.com/manuals
- **FAQ / Knowledgebase** — http://www.raymarine.com/knowledgebase
- **Technical support forum** — http://forum.raymarine.com
- **Software updates** — http://www.raymarine.com/software

Telephone and e-mail support

Region	Telephone	E-mail
United Kingdom (UK), EMEA, and Asia Pacific	+44 (0)1329 246 777	support.uk@raymarine.com
United States (US)	+1 (603) 324 7900 (Toll-free: +800 539 5539)	support@raymarine.com
Australia and New Zealand	+61 2 8977 0300	aus.support@raymarine.com (Raymarine subsidiary)
France	+33 (0)1 46 49 72 30	support.fr@raymarine.com (Raymarine subsidiary)
Germany	+49 (0)40 237 808 0	support.de@raymarine.com (Raymarine subsidiary)
Italy	+39 02 9945 1001	support.it@raymarine.com (Raymarine subsidiary)
Spain	+34 96 2965 102	sat@azimut.es (Authorized Raymarine distributor)
Netherlands	+31 (0)26 3614 905	support.nl@raymarine.com (Raymarine subsidiary)
Sweden	+46 (0)317 633 670	support.se@raymarine.com (Raymarine subsidiary)
Finland	+358 (0)207 619 937	support.fi@raymarine.com (Raymarine subsidiary)
Norway	+47 692 64 600	support.no@raymarine.com (Raymarine subsidiary)
Denmark	+45 437 164 64	support.dk@raymarine.com (Raymarine subsidiary)
Russia	+7 495 788 0508	info@mikstmarine.ru (Authorized Raymarine distributor)

Viewing product information

With your MFD Homescreen displayed:

1. Select **Set-up**.
2. Select **Maintenance**.
3. Select **Diagnostics**.
4. Select **Select Device**.
5. Select the relevant product from the list.

The Diagnostics page is displayed.

8.2 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
	Video Gallery: • http://www.raymarine.co.uk/view/?id=2679
	Product Support videos: • http://www.raymarine.co.uk/view/?id=4952

Note:

- Viewing the videos requires a device with an Internet connection.
- Some videos are only available in English.

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

FAQs and Knowledge Base

Raymarine has produced an extensive set of FAQs and a Knowledge Base to help you find more information and troubleshoot any issues.

- http://www.raymarine.co.uk/knowledgebase/

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:

- http://forum.raymarine.com

Chapter 9: Technical specification

Chapter contents

9.1 Technical specification

Nominal supply voltage	12 V dc (Supplied by **SeaTalkng**)
Operating voltage range	9 V dc to 16 V dc (protected up to 32 V dc)
Power consumption	30 mA max.
Environmental	**Installation environment** • Operating temperature: -25 ºC to +55 ºC (-13 ºF to 131 ºF) • Storage temperature: -25 ºC to +70 ºC (-13 ºF to 158 ºF) • Relative humidity: max 93% • Waterproof to IPx6
Conformance	• Europe: 2004/108/EC • Australia and New Zealand: C-Tick, Compliance Level 2
Supported connection protocols	• SeaTalkng • NMEA 2000 (via DeviceNet adaptor)
LEN (refer to SeaTalkng Reference manual for more information)	1
Signal acquisition	Automatic
Channels	72
Sensitivity	-163 dBm (tracking), –147 dBm (acquisition)
GNSS compatibility	• GPS • GLONASS • Galileo ready (via future software update) • Beidou ready (via future software update)
Satellite Differential Type (SBAS)	• WAAS (United States) • EGNOS (Europe) • MSAS (Japan) • GAGAN (India)
Differential acquisition	Automatic
Position accuracy without SBAS (95%)	< 15 m
Position accuracy with SBAS (95%)	< 5 m
Speed accuracy (95%)	< 0.3 kt
Time to first fix from cold start	< 2 minutes (< 45 seconds typical)
Time to first fix from hot start	< 8 seconds
Geodetic Datum	WGS84

Chapter 10: Spares and accessories

Chapter contents

10.1 Accessories

The following accessories are available for the RS150.

Accessories

Item	Part number
Pole Mount Adaptor kit	A80370
6 m SeaTalkng white spur cable	A06072

10.2 SeaTalk^{ng}® cabling components

SeaTalk^{ng} cabling components and their purposes.

Connection / Cable	Notes
Backbone cable (various lengths)	The main cable carrying data. Spurs from the backbone are used to connect SeaTalk^{ng} devices.
T-piece connector	Used to make junctions in the backbone to which devices can then be connected.
Terminator	Required at either end of the backbone.
Inline terminator	Used to connect a spur cable directly to the end of a backbone; useful for longer cable runs.
Spur cable	Used to connect devices to the backbone. Devices may be daisy chained or connected directly to the T-pieces.
SeaTalk^{ng} 5–way connector	Used to branch, split, or make additional connections in SeaTalk or SeaTalk^{ng} networks.
Blanking plug	Inserted into unused spur connector positions in a 5-way connector or T-piece.

10.3 SeaTalkng® cables and accessories

SeaTalkng cables and accessories for use with compatible products.

Description	Part No	Notes
SeaTalkng starter kit	T70134	Includes: • 1 x 5 Way connector (A06064) • 2 x Backbone terminator (A06031) • 1 x 3 m (9.8 ft) spur cable (A06040) • 1 x Power cable (A06049)
SeaTalkng Backbone Kit	A25062	Includes: • 2 x 5 m (16.4 ft) Backbone cable (A06036) • 1 x 20 m (65.6 ft) Backbone cable (A06037) • 4 x T-piece (A06028) • 2 x Backbone terminator (A06031) • 1 x Power cable (A06049)
SeaTalkng 0.4 m (1.3 ft) spur	A06038	
SeaTalkng 1 m (3.3 ft) spur	A06039	
SeaTalkng 3 m (9.8 ft) spur	A06040	
SeaTalkng 5 m (16.4 ft) spur	A06041	
SeaTalkng 0.4 m (1.3 ft) elbow spur	A06042	
SeaTalkng 0.4 m (1.3 ft) backbone	A06033	
SeaTalkng 1 m (3.3 ft) backbone	A06034	
SeaTalkng 3 m (9.8 ft) backbone	A06035	
SeaTalkng 5 m (16.4 ft) backbone	A06036	
SeaTalkng 9 m (29.5 ft) backbone	A06068	
SeaTalkng 20 m (65.6 ft) backbone	A06037	
SeaTalkng to bare ends 1 m (3.3 ft) spur	A06043	
SeaTalkng to bare ends 3 m (9.8 ft) spur	A06044	
SeaTalkng Power cable	A06049	
SeaTalkng Terminator	A06031	
SeaTalkng T-piece	A06028	Provides 1 x spur connection
SeaTalkng 5–way connector	A06064	Provides 3 x spur connections
SeaTalkng backbone extender	A06030	
SeaTalk to SeaTalkng converter kit	E22158	Allows the connection of SeaTalk devices to a SeaTalkng system.
SeaTalkng Inline terminator	A80001	Provides direct connection of a spur cable to the end of a backbone cable. No T-piece required.
SeaTalkng Blanking plug	A06032	
ACU / SPX SeaTalkng spur cable 0.3 m (1.0 ft)	R12112	Connects an SPX course computer or an ACU to a SeaTalkng backbone.
SeaTalk (3 pin) to SeaTalkng adaptor cable 0.4 m (1.3 ft)	A06047	
SeaTalk to SeaTalkng spur 1 m (3.3 ft) spur	A22164	
SeaTalk2 (5 pin) to SeaTalkng adaptor cable 0.4 m (1.3 ft)	A06048	
DeviceNet adaptor cable (Female)	A06045	Allows the connection of NMEA 2000 devices to a SeaTalkng system.
DeviceNet adaptor cable (Male)	A06046	Allows the connection of NMEA 2000 devices to a SeaTalkng system.
DeviceNet adaptor cable (Female) to bare ends.	E05026	Allows the connection of NMEA 2000 devices to a SeaTalkng system.
DeviceNet adaptor cable (Male) to bare ends.	E05027	Allows the connection of NMEA 2000 devices to a SeaTalkng system.

Appendix A NMEA 2000 PGN support

The unit supports the following **NMEA 2000** PGNs.

PGN	Description	Transmit (Tx)	Receive (Rx)
59904	ISO Request		●
59932	ISO Acknowl-edgement	●	
60928	ISO Address Claim	●	●
65240	ISO Commanded address		●
126208	NMEA - Request group function		●
126208	NMEA - Command group function		●
126208	NMEA - Acknowledge group function	●	
126464	Transmission PGN list	●	
126464	Received PGN list	●	
126992	System Time	●	
126996	Product information	●	
129025	Position, rapid update	●	
129026	COG & SOG rapid update	●	
129027	Position delta high precision	●	
129029	GNSS position data	●	
129033	Time and date	●	
129044	Datum	●	●
129540	GNSS Satellites in view	●	
129542	GNSS pseudo range noise statistics	●	

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