

Raymarine®



QUANTUM™ 2

Installation instructions

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Software updates



Check the Raymarine website for the latest software releases for your product.
www.raymarine.com/software

Product documentation



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

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Contents

Chapter 1 Important information	9
Certified Installation.....	9
Transmitted power density levels.....	10
IEEE statement	10
ICNIRP Guidelines.....	10
Water ingress	11
Disclaimer	11
EMC installation guidelines	11
Compass safe distance	11
Declaration of Conformity.....	12
Connections to other equipment.....	12
Product disposal	12
Open source license agreements	12
Warranty registration	12
IMO and SOLAS	12
Radar licensing.....	12
FCC Notice - Radar	13
MSIP Warning Statement for Radio Devices (Korea only)	13
Technical accuracy	13
Operation instructions.....	13
Retain your Wi-Fi passcode	13
Chapter 2 Document and product information.....	15
2.1 Document information	16
Applicable products.....	16
Document illustrations	16
Product documentation	16
LightHouse 3 MFD Operation instructions.....	17
2.2 Parts supplied	17
2.3 Product overview	18
Multiple Quantum Radar scanners.....	18
Doppler Radar overview	18
Chapter 3 Planning the installation	21
3.1 Installation checklist.....	22
Schematic diagram	22
Warnings and cautions	22
3.2 Required additional components	22
Doppler data source requirements.....	22
Radar target acquisition data source requirements.....	23
Operation instructions	23
Retain your Wi-Fi passcode	23

3.3 Multifunction display compatibility	23
Compatible multifunction displays	23
Incompatible multifunction displays	24
3.4 Multifunction display software requirements	25
Software updates	25
3.5 Tools required	25
3.6 Typical systems	26
3.7 Product dimensions	29
3.8 Location requirements	30
Shadow areas and false echoes	30
Radar scanner mounting angle	31
Multiple Radar scanners — location requirements	32
3.9 Quantum Wi-Fi only installation requirements	32
Wi-Fi Signal Reflection	34
Wireless location requirements	35
Pre-installation site survey — Wi-Fi Analyzer	36
Pre-installation site survey — Raymarine app	37

Chapter 4 Cables and connections..... 39

4.1 General cabling guidance	40
Cable types and length	40
Cable routing	40
Strain relief	40
Circuit isolation	40
Cable shielding	41
Suppression ferrites	41
4.2 Connections overview	41
Typical cable routing scenarios	42
Cable routing — platform mount	42
Cable routing — pole mount	45
Making connections	47
4.3 Power connection	47
In-line fuse and thermal breaker ratings	48
Power distribution	48
4.4 Network connection	51

Chapter 5 Mounting..... 55

5.1 Mounting pre-requisite: "breather" holes	56
5.2 Mounting the scanner	56
Multiple Quantum Radar scanners	60
Multiple Radar scanners — location requirements	60
5.3 Radar scanner protection — sailing vessels	61

Chapter 6 System checks and troubleshooting	63
6.1 Post installation procedures	64
Mechanical checks	64
Connecting to a Radar scanner over RayNet	64
Powering on a Quantum Radar.....	64
Pairing with a Quantum Radar using Wi-Fi.....	64
MFD access point connection when connected to Quantum Wi-Fi.....	65
Standby and sleep modes for Wi-Fi connections	66
Retain your Wi-Fi passcode	66
Operation instructions	66
Doppler data source requirements.....	66
Radar target acquisition data source requirements.....	67
Bearing alignment.....	67
Heading alignment	67
6.2 Troubleshooting	68
Troubleshooting procedure.....	69
Doppler troubleshooting.....	71
Multiple Quantum Radars — more information.....	71
Retain your Wi-Fi passcode	71
Wi-Fi troubleshooting.....	72
Chapter 7 Maintenance	75
7.1 Maintenance.....	76
7.2 Unit cleaning instructions	76
Chapter 8 Technical support	77
8.1 Raymarine product support and servicing	78
8.2 Operation instructions	79
8.3 Viewing product information (LightHouse™ 3)	79
Chapter 9 Technical specification	81
9.1 Technical specification	82
Chapter 10 Spares and accessories	85
10.1 Quantum Radar accessories	86
10.2 Network hardware	86
10.3 Network cable connector types.....	87
10.4 RayNet to RayNet cables and connectors.....	88
10.5 RayNet to RJ45 adapter cables	89

Chapter 1: Important information

Certified Installation

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: 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: 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 *Technical specification* section for voltage rating.



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.

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.



Warning: High voltage

This product contains high voltage. Do NOT remove covers or attempt to access internal components, unless specifically instructed in the documentation provided.



Warning: Radio frequency radiation hazard

The radar scanner transmits electromagnetic energy at microwave frequencies which can be harmful, particularly to the eyes. Do NOT look at the scanner from close range. Ensure personnel are clear of the scanner when it is powered on.

For safety reasons, the radar must be installed above head height, out of range of personnel.



Warning: Quantum Wi-Fi connection

During installation there will usually be structure that affects the Wi-Fi signal. Before using the Radar for navigation, ensure you test the reliability of your Wi-Fi connection in open waters and away from any other vessels or structure.

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.

Caution: Doppler “wagon-wheeling” effect

- There are limits to the maximum relative speed that the radar scanner can measure when processing Doppler targets. When the target is moving at high speeds these limits can result in a stroboscopic visual effect known as “wagon-wheeling” or “aliasing”.
- “Wagon-wheeling” refers to an optical illusion similar to that seen in some movies, where wagon wheels appear to occasionally rotate backwards. When using Doppler radar the effect occurs when the target is moving fast and the frequency of the transmit pulses, when the target is illuminated by the radar, is insufficient to distinguish whether the target is moving towards or away from the vessel.
- The result of this visual effect is that the direction of target returns from high speed vessels may be displayed incorrectly. Consequently, the displayed target colors may be inverted, with targets colored red when they should be green, and vice versa:
 - When the target's speed is more than 60 knots Speed Over Ground (SOG), or the relative speed between your vessel and the target is greater than 120 knots, the target colors may be inverted as follows:
 - ◆ Approaching objects are highlighted in green.
 - ◆ Receding objects are highlighted in red.

Transmitted power density levels

- A power density level of 10 W/m² does not occur at any point.
- A power density level of 100 W/m² does not occur at any point.

IEEE statement

IEEE C95.1 – 2005 – Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

ICNIRP Guidelines

When properly installed and operated, the use of this Radar conforms to: ICNIRP Guidelines 1998 - International Commission on Non-Ionising Radiation Protection: Guidelines for limiting exposure to time-varying electric, magnetic and electro-magnetic fields (up to 300 GHz) 1998.

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.

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.

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 (3.3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).
 - More than 2 m (6.6 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The 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.

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 (3.3 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.

Declaration of Conformity

FLIR Belgium BVBA declares that the radio equipment type Quantum 2 Doppler radome radar scanner, part number E70498, is in compliance with the Radio Equipment Directive 2014/53/EU. The original Declaration of Conformity certificate may be viewed on the relevant product page at www.raymarine.com/manuals.

Connections to other equipment

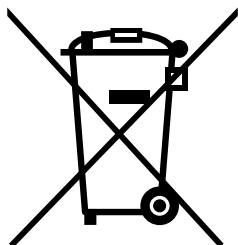
Requirement for ferrites on non-Raymarine cables

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.

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: www.raymarine.eu/recycling.



Open source license agreements

This product is subject to certain open source license agreements. Copies of the license agreements can be found on the Raymarine website: www.raymarine.com/manuals/.

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.

Radar licensing

Installation and operation of this radar may be subject to individual licensing of the equipment, operator or vessel. You are strongly advised to check with the requirements of the licensing authority of your national administration. In case of any difficulties, contact your local Raymarine dealer.

FCC Notice - Radar

Changes or modifications to this equipment not expressly approved in writing by Raymarine Incorporated could violate compliance with FCC rules and void the operator's authority to operate the equipment.

MSIP Warning Statement for Radio Devices (Korea only)

- 제작자 및 설치자는 해당 무선설비가 전파혼신 가능성이 있으므로 안전 인명과 관련된
- 서비스는 할 수 없음을 사용자 설명서 등을 통하여 운용자 및 사용자에게 충분히 알릴 것
- 법에 의해 전 방향 전파 발사 및 동일한 정보를 동시에 여러 곳으로 송신하는 점-대-다지점 서비스에의 사용은 금지되어 있습니다.

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.

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: www.raymarine.com/manuals.

Retain your Wi-Fi passcode

To connect to the Radar using Wi-Fi (wireless), you will need to know the unit's **SSID**, and **Passcode**.

Both the SSID and Passcode are provided on the serial number label on the underside of the unit, and on spare serial number labels supplied in the box. You may wish to make a separate note of this information and keep in a secure location. You should also keep the Radar scanner packaging in a safe place for future reference.

The following information is applicable only to Quantum units running software version 1.62 or later, and Quantum Doppler units running software version 2.43 or later:

In the event that you misplace the SSID and Passcode before the initial pairing, you can power on your Quantum unit and determine the SSID by reviewing all available Wi-Fi networks, using a smartphone, tablet or laptop PC. An unpaired Quantum unit will advertise its SSID periodically in a 10-second cycle. This may take up to 3 minutes.

Once you've obtained the SSID, the next step is to contact [p.78 — Raymarine product support](#), who can then provide you with the passcode associated with your SSID.

Chapter 2: Document and product information

Chapter contents

- [2.1 Document information on page 16](#)
- [2.2 Parts supplied on page 17](#)
- [2.3 Product overview on page 18](#)

2.1 Document information

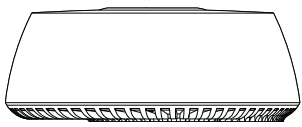
This document contains important information related to the installation of your Raymarine product. The document includes information to help you:

- 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/manuals.

Applicable products

This document is applicable to the following products:

	Part number	Name	Description
	E70498	Quantum™ 2 Doppler Q24D Radome	Quantum™ 2 Doppler Radar scanner with RayNet and Wi-Fi connections. Supplied with a 10 m power cable.

Special bundle and promotional products

From time to time, Raymarine may supply certain products as special “bundle”, “package”, or “promotional” variants.

These bundles typically include additional accessories such as cables, and usually have a Txxxx part number. For these bundle variants, the provided parts supplied and part numbers may differ slightly from those stated in this document. However, the core supplied product and its features will remain the same as those described in this document. To ensure that you are using the correct documentation for your product, please:

- Refer to the product’s core model number, which can be found listed on the label on the rear or underside of your product, or accessed from any Raymarine multifunction display via the Diagnostics page. Ensure that the number matches one of those listed in the “Applicable products” section of your product documentation.
- Alternatively, contact the place of purchase and request the information. You may need to provide the product’s serial number, which can be found on the product packaging and also on the label on the rear or underside of the unit.

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.

Product documentation

The following documentation is applicable to your product:

Description	Part number
Quantum™ 2 Doppler Radome Installation instructions (this document) Installation of a Quantum™ 2 Doppler Radar scanner and connection to a wider system of marine electronics.	87342
Quantum™ Radome Mounting template Mounting diagram for surface mounting a Quantum™ Radar scanner.	87257
LightHouse™ 3 MFD Advanced Operation Instructions Details the operation of the Radar application for multifunction displays running LightHouse™ 3 software.	81370

LightHouse 3 MFD Operation instructions

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

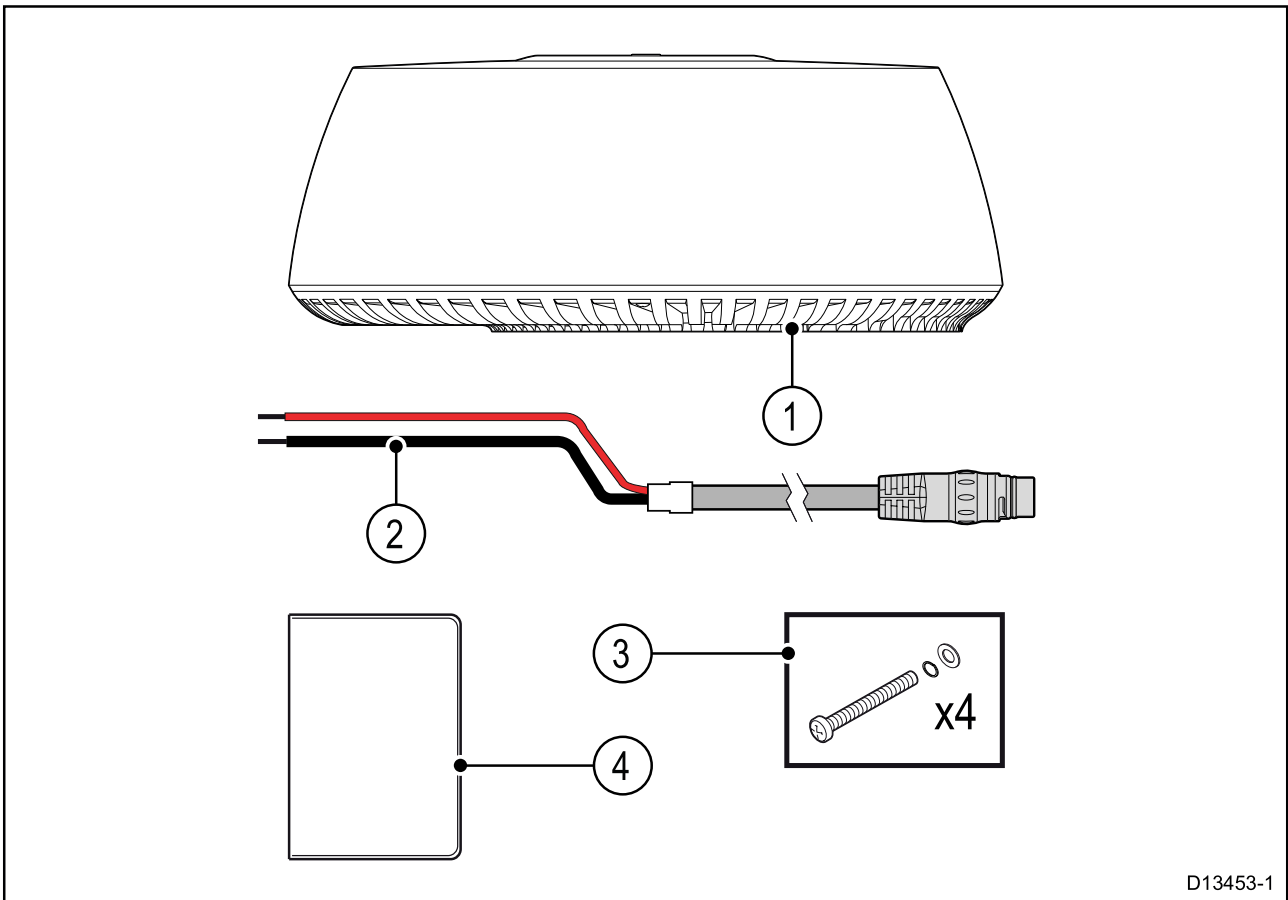


All product documentation is available to download from the Raymarine website: www.raymarine.com/manuals

- LightHouse™ 3 MFD Advanced Operation instructions document number: 81370

2.2 Parts supplied

The following items are supplied with your product.



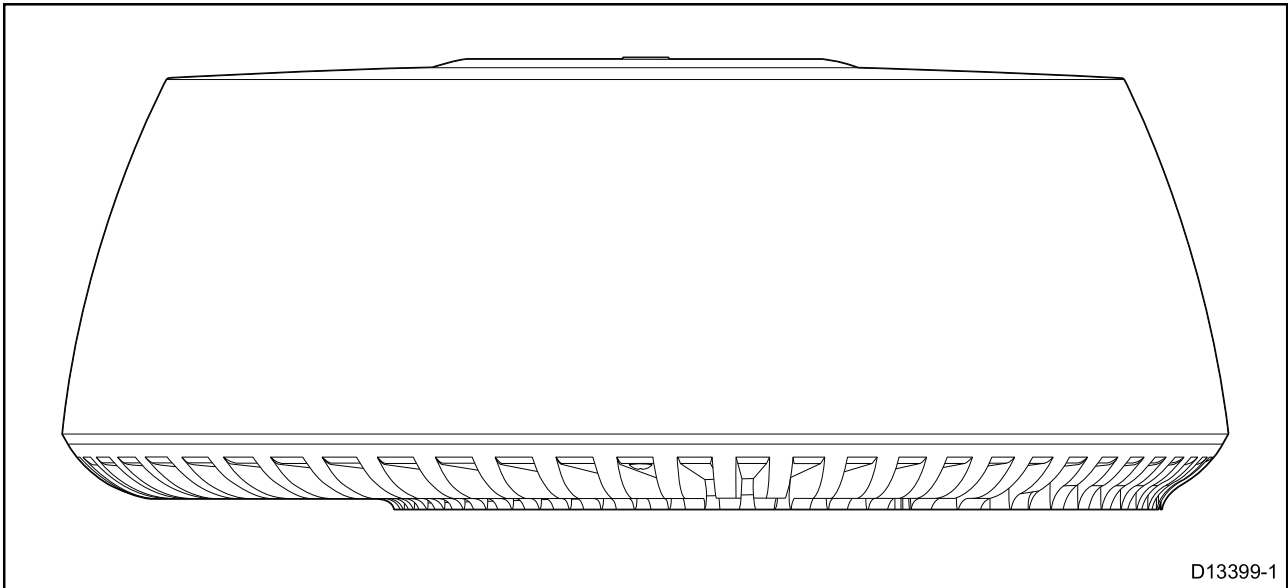
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Item	Description	Quantity
1	Quantum™ Radome	1
2	10 m (32.8 ft.) Power cable	1
3	M8 mounting bolts with spring washers and flat washers	4
4	Documentation pack (including mounting template)	1

Note: The list of parts supplied with your Quantum™ variant may differ slightly from the list provided here. Please be aware that, from time to time, Raymarine may supply certain products as special “bundle”, “package”, or “promotional” variants, which may contain different accessories compared to the core product variants described in this document. Refer to [Special bundle and promotional products](#) for more information.

2.3 Product overview

The Quantum™ 2 Doppler Radome is a compact, solid-state Radar scanner, utilizing Doppler technology for target tracking, CHIRP pulse compression for improved range resolution, and Wi-Fi connectivity for easier installation. In conjunction with a compatible multifunction display, the Quantum™ 2 Doppler scanner provides a map-like representation of the area around your vessel, enabling you to identify other vessels, buoys, and land features such as coastlines and hills.



The Quantum™ 2 Doppler Radome has the following features:

- Solid-state technology (no magnetron) for improved efficiency, and rapid start-up.
- Range performance up to 24 nm (dependent on installation location).
- Doppler target tracking technology.
- CHIRP pulse compression for improved target range resolution, and reduced background noise.
- Wireless data connection via Wi-Fi, or wired connection via RayNet cable.
- Radar image display and control via Raymarine multifunction display.
- 24 RPM scanner rotation.
- Low power consumption.
- 12 V or 24 V operation.
- Waterproof to IPX 6.

Multiple Quantum Radar scanners

Only 1 (one) Quantum™ Radar scanner can be used at any one time, per networked system.

If you have more than one Quantum™ Radar scanner installed on your vessel and want to use them at the same time, the multifunction displays to which the scanners are connected must NOT be networked together. This applies to Quantum™ scanners connected either wired or wirelessly.

For more information, refer to: [p.71 – Multiple Quantum Radars – more information](#)

Doppler Radar overview

Doppler Radar technology makes it easier to track moving targets with significant ground speed exceeding 3 knots.

Typically Doppler Radar works best with objects that are moving directly towards or away from the vessel. Doppler Radar can highlight only those targets that are moving relative to the vessel (e.g. other boats, but not land or buoys, for example).

Doppler Radar works by transmitting a microwave signal which is then reflected off a desired moving target at a distance. By analyzing how the object's motion has altered the frequency of the returned signal, the Doppler Radar can interpret the variation to provide highly accurate measurements of a target's direction of travel, relative to the Radar scanner.

Doppler Radar technology is particularly beneficial in a marine environment, where poor weather conditions and visibility can make target tracking difficult. Additionally, it is not always easy to interpret the information displayed by traditional Radar technology. With the integration of Doppler information, the process of matching on-screen radar returns with real-world objects becomes a much simpler task.

Chapter 3: Planning the installation

Chapter contents

- 3.1 Installation checklist on page 22
- 3.2 Required additional components on page 22
- 3.3 Multifunction display compatibility on page 23
- 3.4 Multifunction display software requirements on page 25
- 3.5 Tools required on page 25
- 3.6 Typical systems on page 26
- 3.7 Product dimensions on page 29
- 3.8 Location requirements on page 30
- 3.9 Quantum Wi-Fi only installation requirements on page 32

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.

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.

3.2 Required additional components

This product forms part of a system of electronics and requires the following additional components for full operation.

- Compatible Raymarine multifunction display. Refer to [p.23 – Compatible multifunction displays](#) for a list of compatible multifunction displays.
- Optional data cable. Refer to [p.85 – Spares and accessories](#) for suitable cables and adaptors for existing cable installations. (The Quantum™ scanner is Wi-Fi-enabled, and can be operated without a fixed data cable.)
- Use of the Doppler Radar features requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng® or NMEA 0183). For more information refer to: [p.22 – Doppler data source requirements](#).
- Use of the MARPA Radar features requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng® or NMEA 0183). For more information refer to: [p.23 – Radar target acquisition data source requirements](#).

Doppler data source requirements

Use of the Doppler Radar features requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng® or NMEA 0183).

Required data sources

Data type	Example data source
COG (Course Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
SOG (Speed Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).

Recommended data source

Data type	Example data source
HDG / HDT (True Heading)	Compass or Autopilot sensor providing Fastheading data (e.g. Evolution EV-1 / EV-2).

Note: A Heading data source is not essential for Doppler operation. However it will improve the performance of Doppler mode at slower speeds (< 15 knots), when tide set and leeway are present.

Radar target acquisition data source requirements

Radar target acquisition requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng® or NMEA 0183).

Data type	Example data source
COG (Course Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
SOG (Speed Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
HDG / HDT (True Heading)	Compass or Autopilot sensor providing Fastheading data (e.g. Evolution EV-1 / EV-2).

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: www.raymarine.com/manuals.

Retain your Wi-Fi passcode

To connect to the Radar using Wi-Fi (wireless), you will need to know the unit's **SSID**, and **Passcode**.

Both the SSID and Passcode are provided on the serial number label on the underside of the unit, and on spare serial number labels supplied in the box. You may wish to make a separate note of this information and keep in a secure location. You should also keep the Radar scanner packaging in a safe place for future reference.

The following information is applicable only to Quantum units running software version 1.62 or later, and Quantum Doppler units running software version 2.43 or later:

In the event that you misplace the SSID and Passcode before the initial pairing, you can power on your Quantum unit and determine the SSID by reviewing all available Wi-Fi networks, using a smartphone, tablet or laptop PC. An unpaired Quantum unit will advertise its SSID periodically in a 10-second cycle. This may take up to 3 minutes.

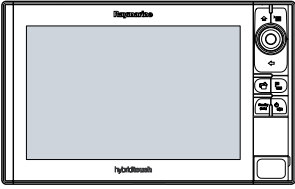
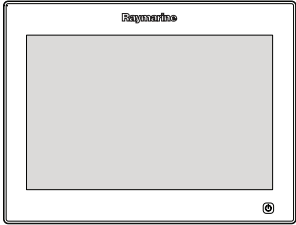

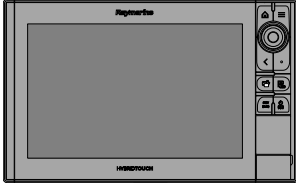

Once you've obtained the SSID, the next step is to contact [p.78 — Raymarine product support](#), who can then provide you with the passcode associated with your SSID.

3.3 Multifunction display compatibility

Compatible multifunction displays

This product is compatible only with Raymarine multifunction displays running LightHouse™ 3 software, version 3.4 or later.

LightHouse™ 3 MFDs:

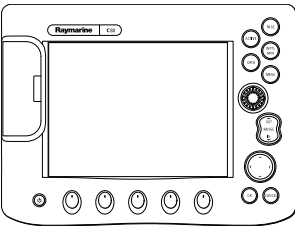
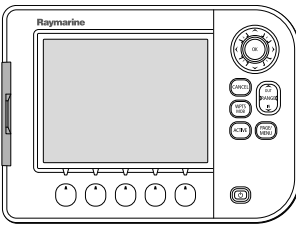
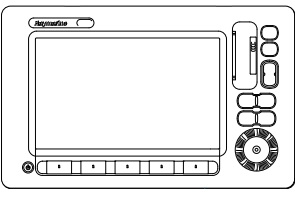
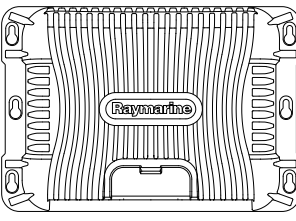
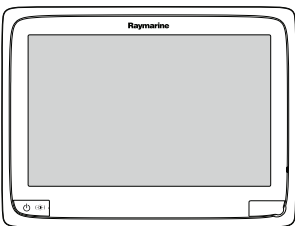
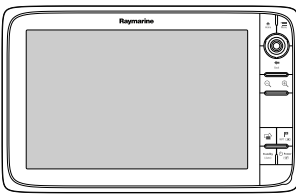
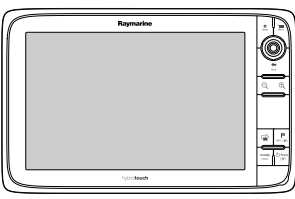
	Product variants		Product variants
	* eS Series		* gS Series
	Axiom		Axiom Pro / Pro-S
	Axiom XL		

* MFDs running existing LightHouse 2 software MUST be upgraded to LightHouse 3, version 3.4 or later.

Incompatible multifunction displays

This product is NOT compatible with the following legacy Raymarine multifunction displays.

Legacy MFDs

	Product variants		Product variants
	C-Series Classic C70, C80, C120		A-Series Classic A50, A50D, A57D, A70, A70D
	E-Series Classic E80, E120		
	C-Series Widescreen C90W, C120W, C140W		G-Series GPM400
	E-Series Widescreen E90W, E120W, E140W		
	a Series LightHouse MFD		c Series LightHouse MFD
	e Series LightHouse MFD		

3.4 Multifunction display software requirements

The operation of this product requires that your MFD is running Raymarine LightHouse™ 3 software.

MFD software	Required version
LightHouse™ 3	3.4 or later

Note:

- The latest MFD software can be obtained by visiting www.raymarine.com/software.
- The website also includes information on how to upgrade your product software.

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 an incomplete update is not covered by Raymarine warranty.

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

Software updates

The software running on the product can be updated.

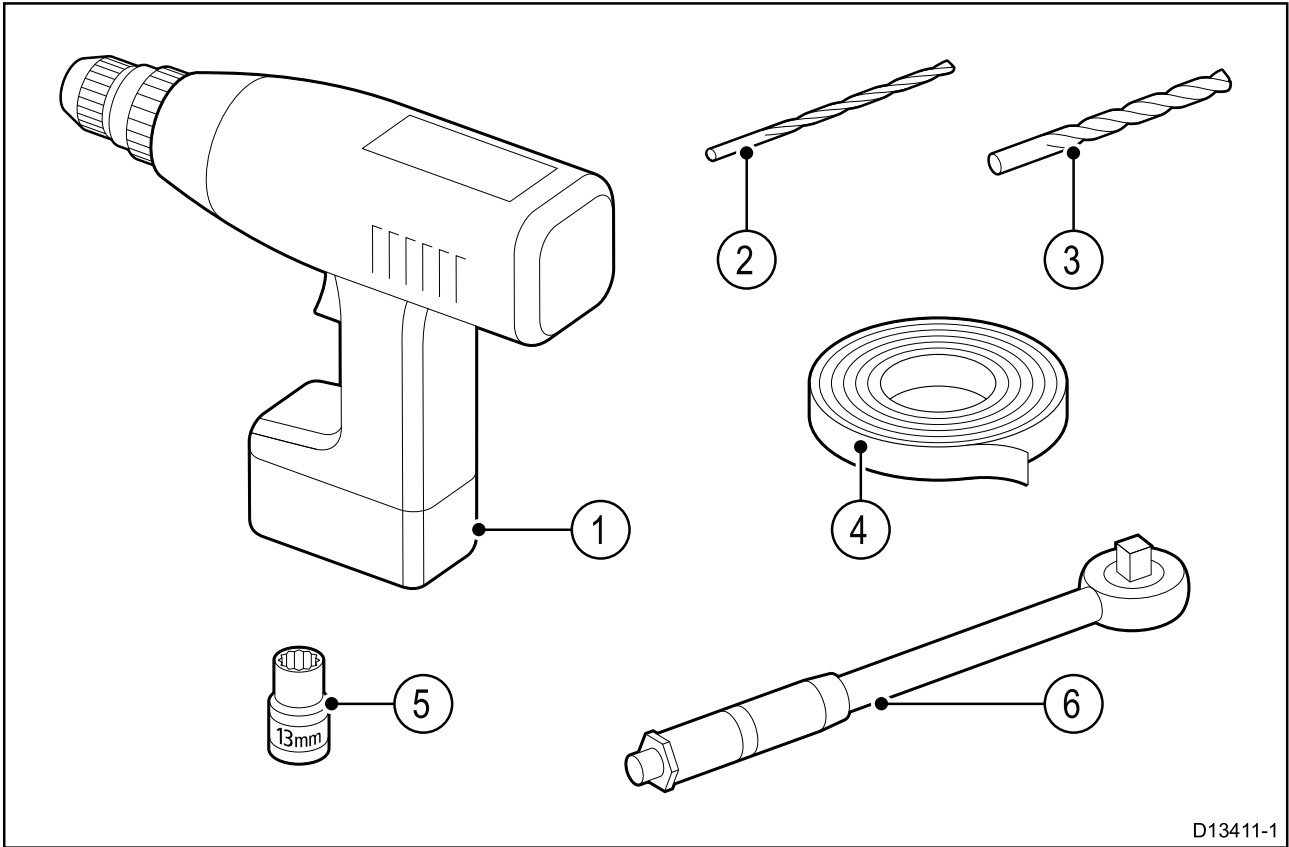
- Raymarine periodically releases software updates to improve product performance and add new features.
- The software on many products can be updated using a connected and compatible multifunction display (MFD).
- Refer to www.raymarine.com/software/ for the latest software updates and the software update procedure for your specific product.

Important:

- To prevent potential software-related issues with your product, always follow the relevant update instructions carefully and in the sequence provided.
- If in doubt as to the correct procedure for updating your product software, refer to your dealer or Raymarine technical support.

3.5 Tools required

Product installation requires the following tools:



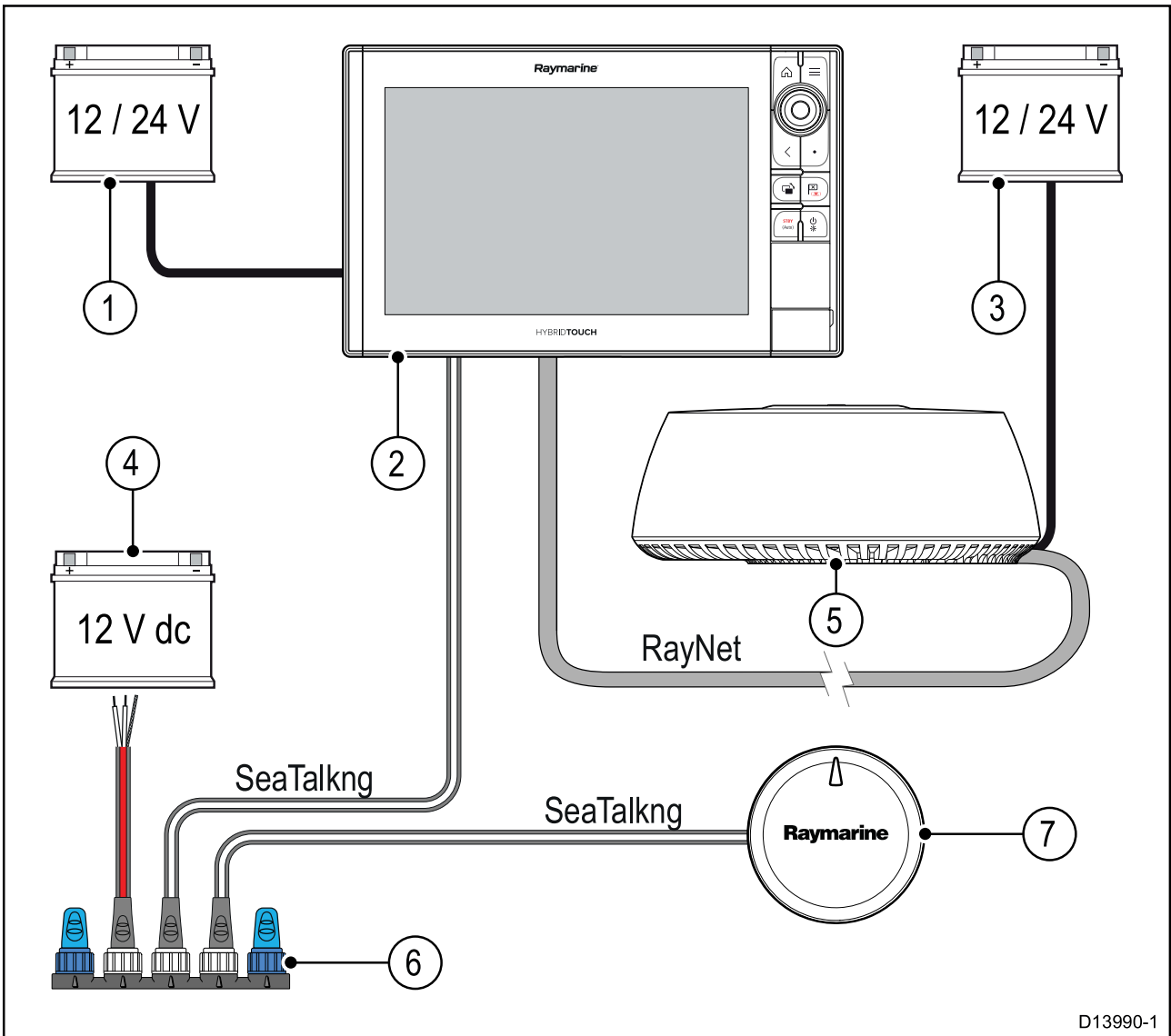
D13411-1

Item number	Description	Quantity
1	Power drill	1
2	3 mm drill bit	1
3	10 mm drill bit	1
4	Adhesive tape	1
5	13 mm socket	1
6	Torque wrench	1

3.6 Typical systems

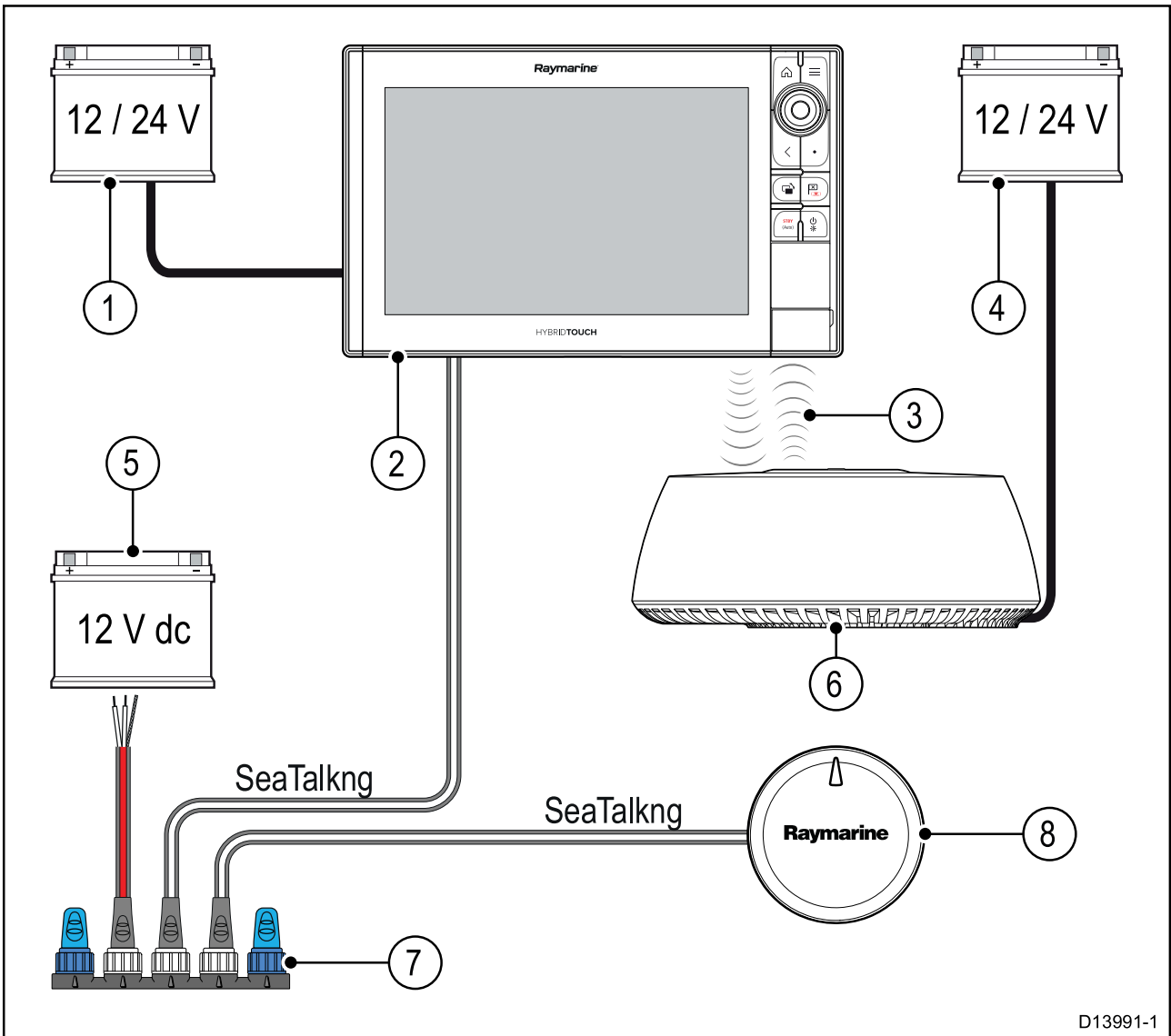
Note: The following illustrations show the various products that can be connected in a typical system. These systems are shown as an example only and may differ from your planned installation. For information on available cables and accessories, refer to: [p.85 — Spares and accessories](#).

Example: basic Radar system (wired data connection)



Item	Description
1	Power supply for multifunction display.
2	Multifunction display.
3	Power supply for Radome.
4	Power supply for SeaTalkng [®] bus (MUST be 12 V only).
5	Quantum™ 2 Doppler Radome.
6	SeaTalkng [®] bus (e.g. 5-way conector or backbone).
7	Evolution EV-1 / EV-2 (required for Doppler and MARPA features).

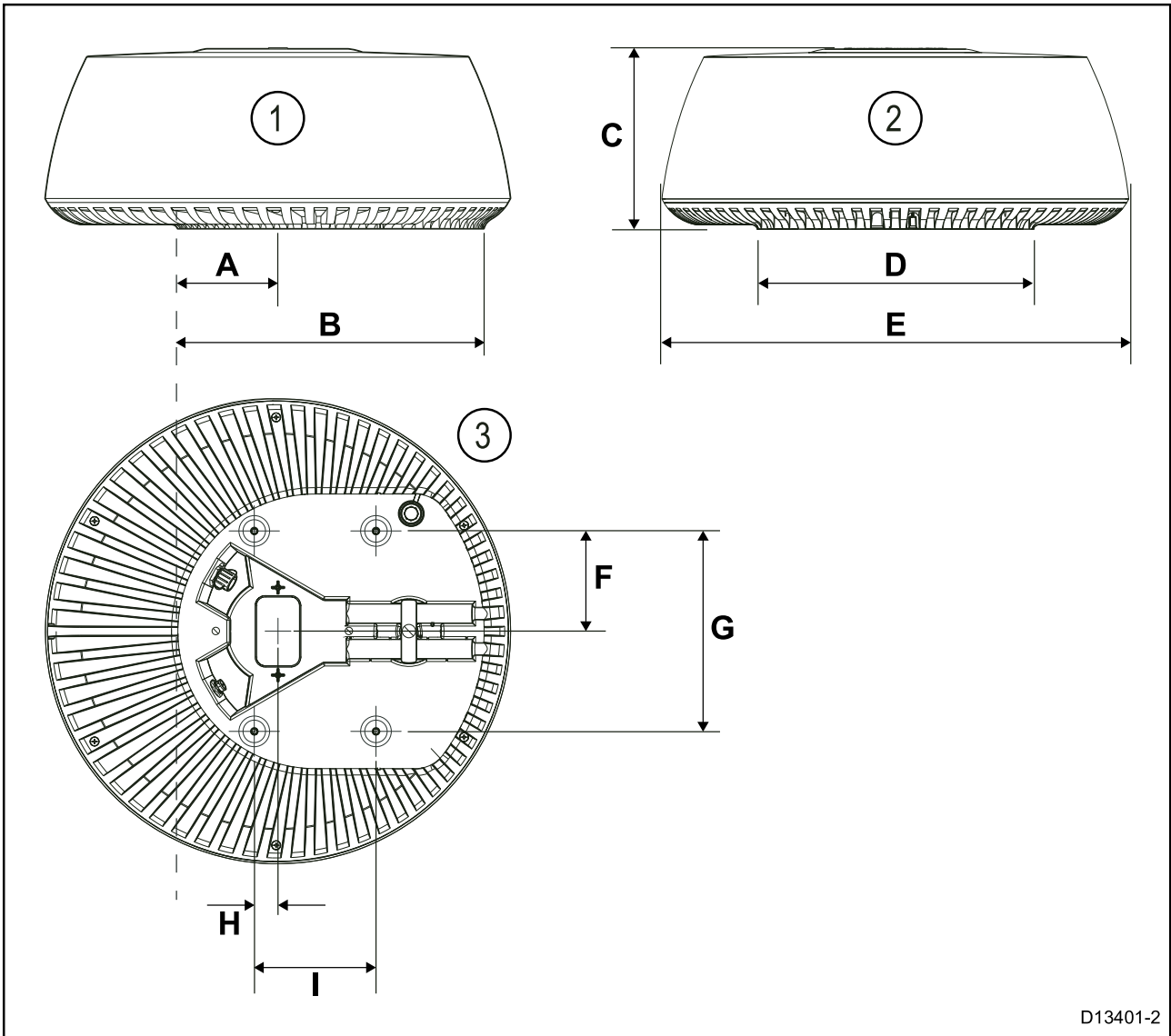
Example: basic Radar system (wireless data connection)



D13991-1

Item	Description
1	Power supply for multifunction display.
2	Multifunction display.
3	Wi-Fi data link (from Radome to MFD).
4	Power supply for Radome.
5	Power supply for SeaTalkng® bus (MUST be 12 V only).
6	Quantum™ 2 Doppler Radome.
7	SeaTalkng® bus (e.g. 5-way connector or backbone).
8	Evolution EV-1 / EV-2 (required for Doppler and MARPA features).

3.7 Product dimensions



D13401-2

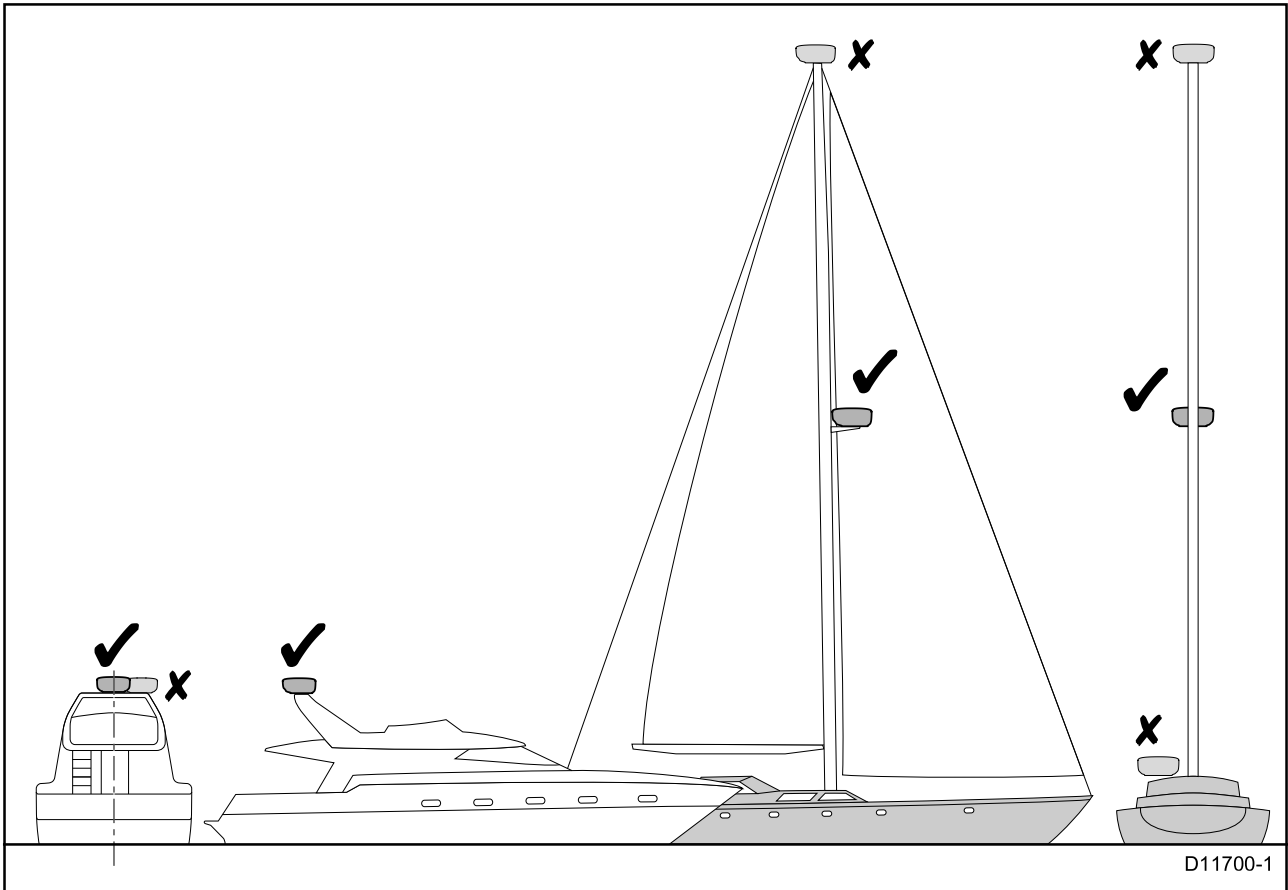
1. Side view of scanner.
2. Rear view of scanner.
3. Underside view of scanner.

Dimension	Measurement	Description
A	116.0 mm (4.57 in.)	Distance from centerline of scanner to front of mounting base.
B	355.0 mm (13.98 in.)	Distance from rear of mounting base to front of mounting base.
C	209.5 mm (8.25 in.)	Height of radar scanner.
D	319.5 mm (12.58 in.)	Mounting base width (rear of unit).
E	541.0 mm (21.30 in.)	Width of scanner.
F	116.5 mm (4.59 in.)	Distance from centerline to rear mounting hole.
G	233.0 mm (9.17 in.)	Distance between mounting holes.

Dimension	Measurement	Description
H	27.5 mm (1.08 in.)	Distance from centerline to front mounting hole.
I	141.5 mm (5.57 in.)	Distance between front and rear mounting holes.

3.8 Location requirements

The optimum height for the Quantum™ scanner is a location that is high enough above the waterline to give a long range line-of-sight to the horizon, but not so high as to be adversely affected by the vessel's pitching and rolling.



The scanner must also be mounted where it is:

- Above head height.
- Easily accessible.
- As near as possible to the vessel's centerline.
- On a rigid and stable platform, capable of securely supporting the scanner under seagoing conditions.
- Clear of large objects such as the flybridge, large engine stacks, searchlights, horns, masts etc. (see [p.30 – Shadow areas and false echoes](#) for additional information).
- Clear of heat and fumes.
- At least 1 m (3 ft) from a magnetic compass or other scanners.

Shadow areas and false echoes

Mount the Radar scanner away from large structures or equipment, such as engine stacks, searchlights, horns, or masts. These objects may cause shadow areas and false echoes. For example, if you mount the Radar scanner on a mast, echoes from other targets may be reflected from

the mast. Wet sails may also cause shadow areas, so Radar performance may be reduced in the rain. It is particularly important to avoid shadow areas near the bow. Raising or even lowering the Radar scanner may help to reduce these effects.

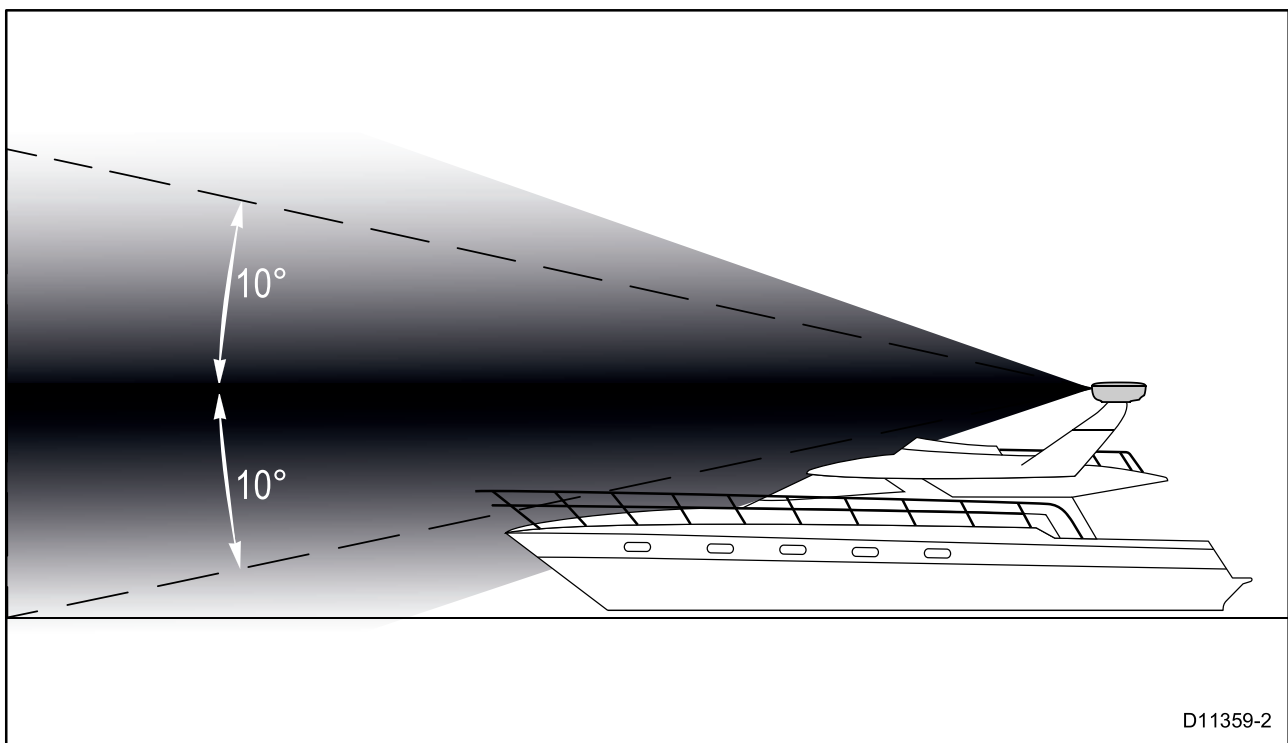
In shadow areas beyond the obstruction there will be a reduction of the beam intensity. There may be a blind sector if the beam intensity is not sufficient to obtain an echo from an object. This may occur even at close range. For this reason the angular width and relative bearing of any shadow area must be determined at installation.

You may be able to detect shadow areas or false echoes on your multifunction display. For example, sea clutter can be used as a good indicator of blind arcs. Dark sectors on the Radar display indicate possible shadowed areas. This information should be posted near the display unit and operators must be alert for targets in these blind areas.

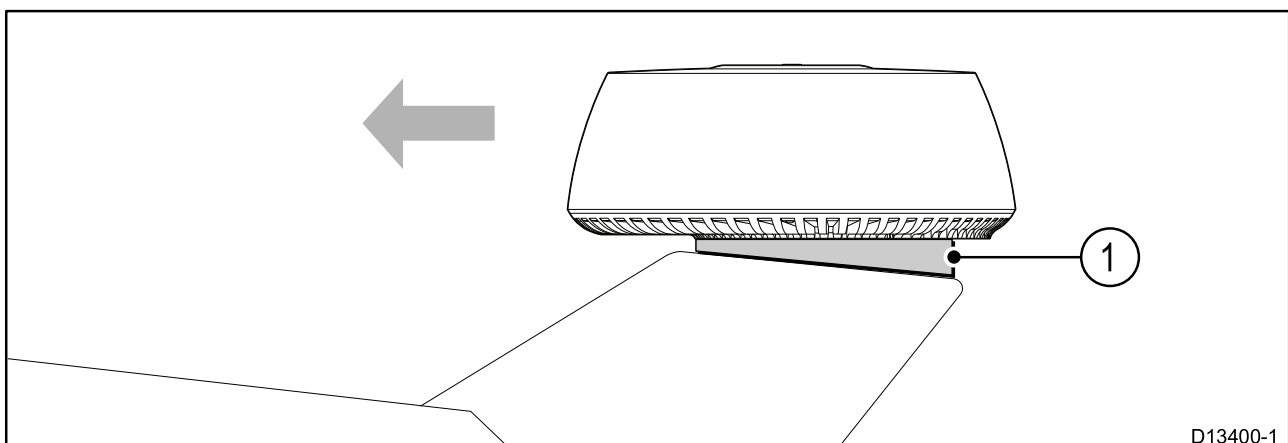
Radar scanner mounting angle

Ensure the Radar scanner rotates parallel to the water line.

The Radar beam from the Radar scanner is approximately 20° wide in the vertical direction, to give good target detection even when your vessel pitches and rolls.



Planing hull vessels, and some displacement hull vessels, adopt a higher bow angle when the vessel is at cruising speed. This may raise the Radar's main radiation angle, and can cause poor detection of nearby targets. It may be necessary to compensate for the bow rise to ensure optimum target detection. This can be achieved by fitting a wedge or washers between the mounting platform and the base of the Radar scanner, so that the Radar beam remains parallel to the water line when the vessel's bow rises at cruising speed.



Item	Description
1	Wedge or washers

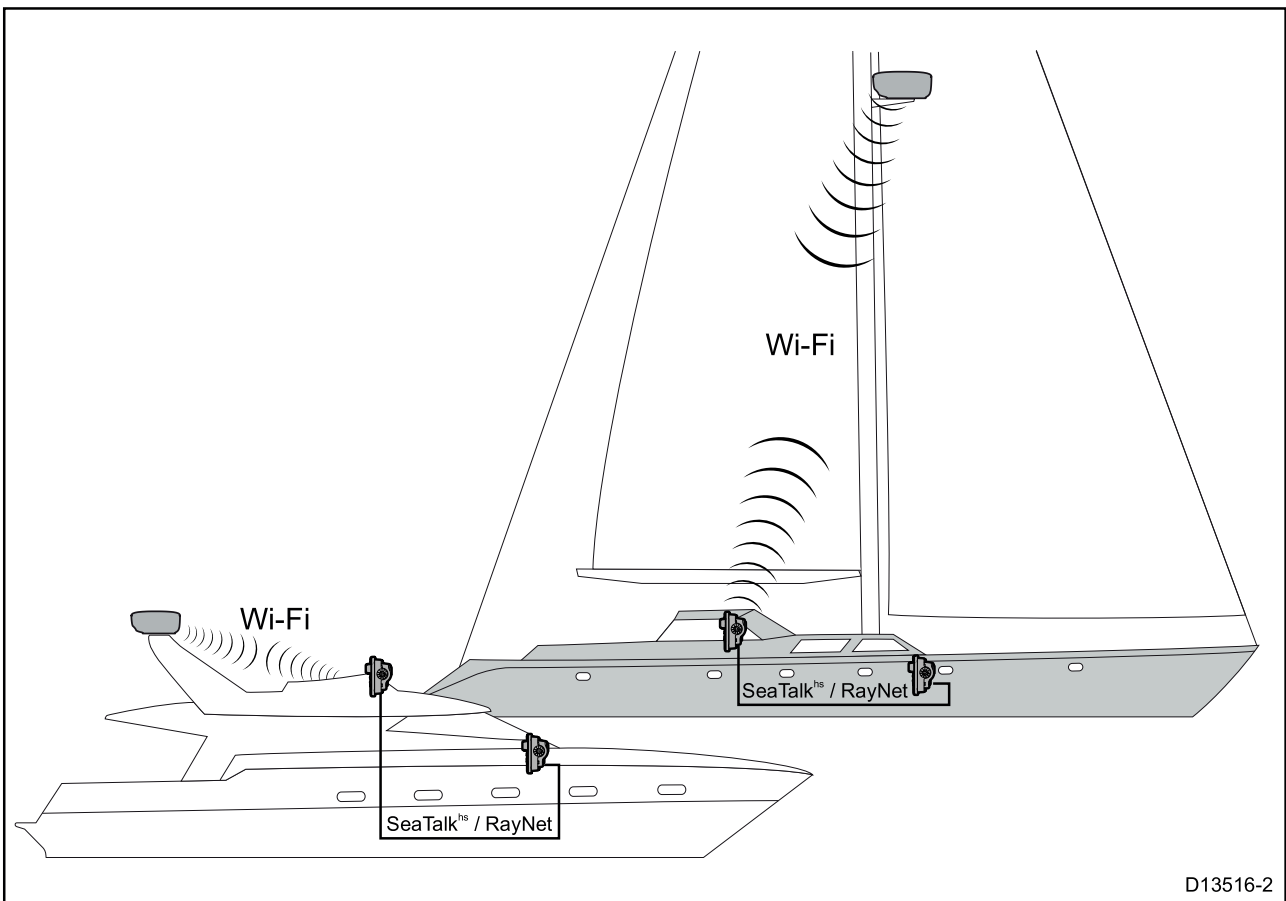
Multiple Radar scanners – location requirements

Important location considerations when installing multiple radar scanners on the same vessel.

- Scanners should be mounted above each other, vertically separated by at least 0.5 m (1.6 ft). This applies to all installation locations on the vessel.
- Multiple scanners should be mounted in a way that minimizes interference between the vertical beamwidths of the 2 scanners.
- In all cases, you should aim to achieve as much physical separation as possible, to minimize any potential interference.

3.9 Quantum Wi-Fi only installation requirements

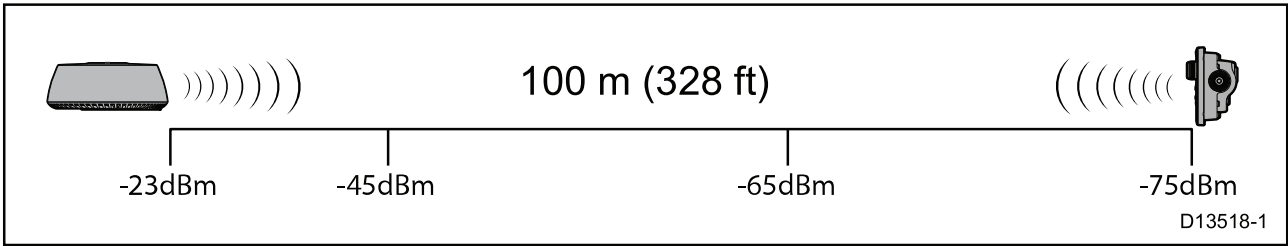
Whilst the Wi-Fi performance has been tested and proven in many different installation scenarios, the requirements below must be taken into consideration before choosing a location for the Quantum™ Radar.



In systems with multiple MFDs, the Radar should be connected to the MFDs that are located closest to it, or to the MFDs with the clearest line of sight to the Radar.

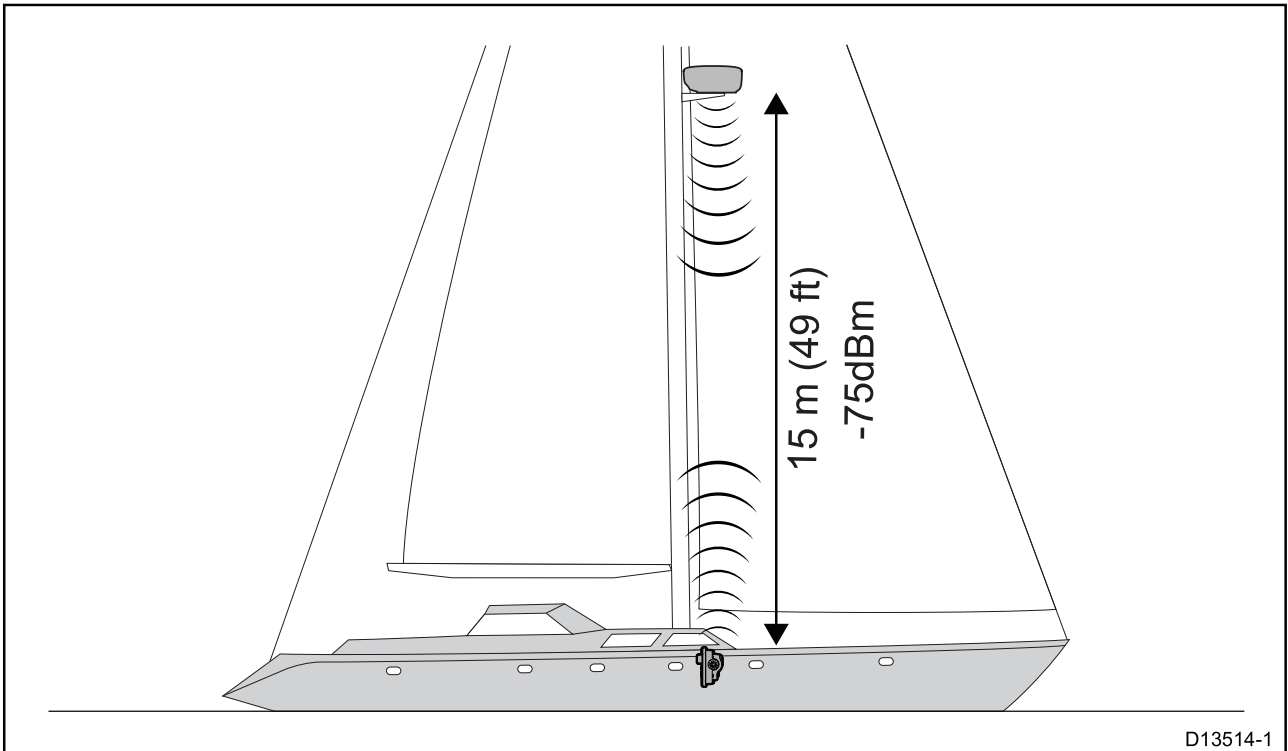
The maximum distance between MFD and Radar will vary depending on the installation environment (i.e. obstructions and interference).

Example 1 – Open air, line-of-sight in optimum conditions



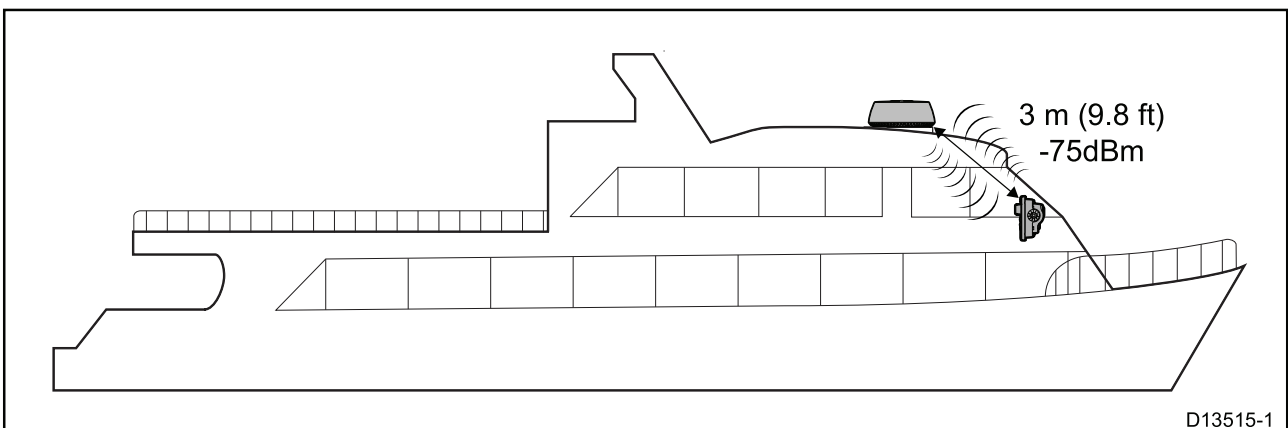
In optimum open air, clear line-of-sight conditions a reliable connection is possible at distances up to 100 m (328 ft). However, there are many factors that can influence this, so a pre-installation site survey should always be performed. For reliable Wi-Fi performance the signal strength should be better than -75dBm . The closer the signal is to zero the better the Wi-Fi performance will be (e.g. -40dBm is better than -75dBm). You can assess the potential signal strength at the desired location during the Pre-installation Site Survey using a Wi-Fi Analyzer app on your smart device.

Example 2 – Signal passing through Fiberglass coach roof



In the example above the maximum distance with acceptable Wi-Fi performance is 15 m (49 ft), due to the heavy fiberglass coach roof that the signal has to pass through.

Example 3 – Signal passing through heavy structure



In the example above the maximum distance with acceptable Wi-Fi performance is 3 m (9.8 ft), due to the metal roof that the signal has to pass through.

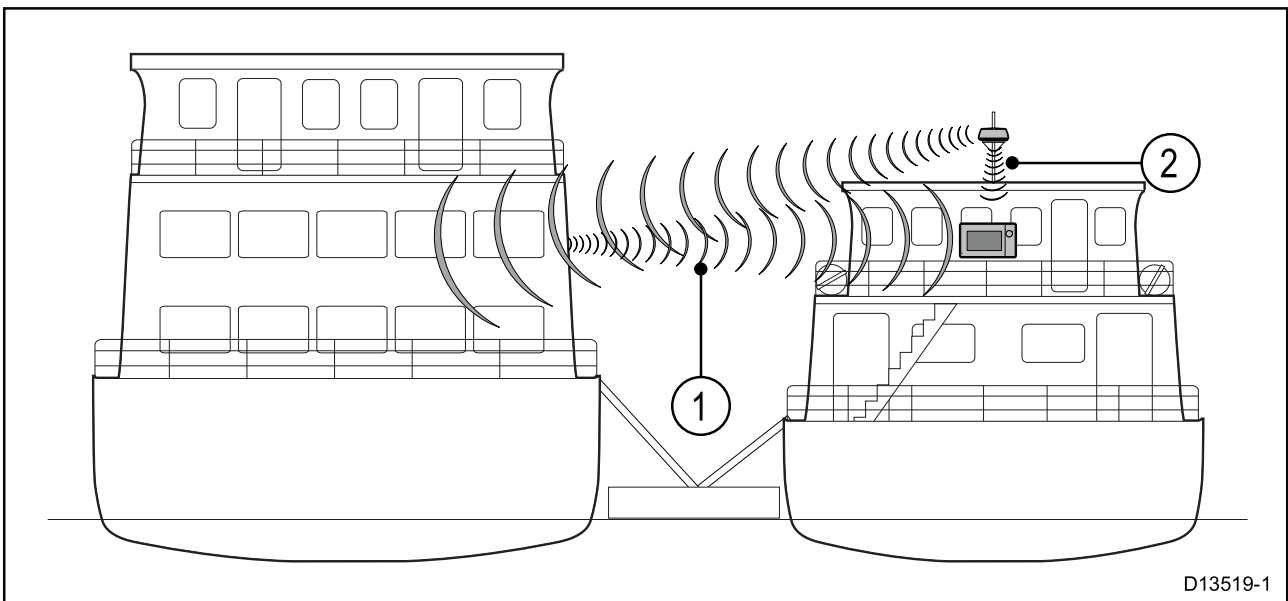
Obstacles in the direct line of sight between the Radar and MFD will further impact Wi-Fi Performance. The impact of each obstacle is usually minimal, however the effect is cumulative. Obstacles can include but are not limited to:

- **Vessel structure** — Where the Wi-Fi signal passes through a vessel bulkhead or a coach roof, the Wi-Fi performance will be impacted. Depending on the material and thickness of the structure the impact may be severe; for example, a thick steel bulkhead may completely block the Wi-Fi signal.
- **Radar mounting** — The type of installation can impact performance; for example, mounting on a solid steel platform will have a greater impact on performance than mounting on a bar-style mount.
- **Electrical equipment and other objects** — Any object in the direct line-of-sight between the Radar and MFD can impact Wi-Fi performance. Electrical, electronic and electromagnetic devices will have a greater impact than furniture.
- **MFD installation** — MFD installation can also impact Wi-Fi performance; for example, if the MFD is surface mounted in a steel construction dash, the Wi-Fi performance will be impacted.

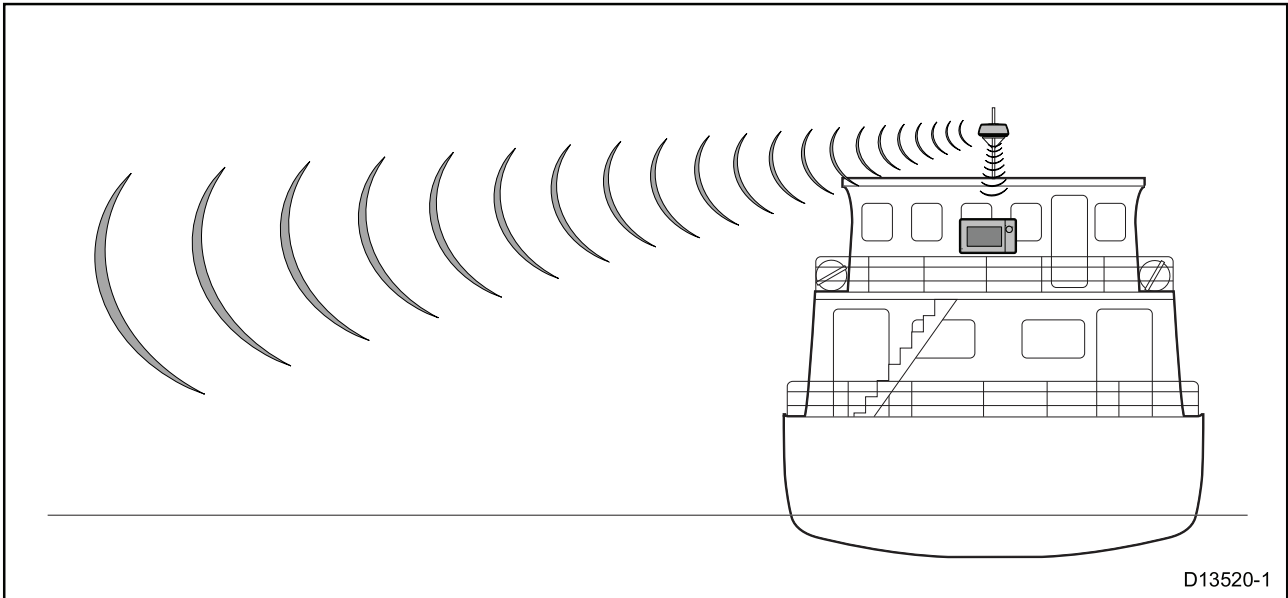
Wi-Fi Signal Reflection

When establishing a location for your Quantum Radar, that will be connected using a Wi-Fi connection, it is important to consider the effects your surroundings can have on the Wi-Fi signal. The Wi-Fi signal will reflect or ‘bounce’ off nearby objects which may create an easier path for the signal to take, whilst your connection may appear reliable it may quickly degrade when you take your vessel out into open water.

Example



1. In this example the Wi-Fi signal is bounced off a nearby vessel and back through the windows on the bridge, this provides an easier path than passing through the metal roof.
2. In this example the Wi-Fi signal is reduced when passing through the metal roof. This, however may be the only path the signal can take when out in open water.



Warning: Quantum Wi-Fi connection

During installation there will usually be structure that affects the Wi-Fi signal. Before using the Radar for navigation, ensure you test the reliability of your Wi-Fi connection in open waters and away from any other vessels or structure.

Wireless location requirements

A number of factors can influence wireless performance. It is important to ensure you test the connection performance at the desired location before installing wireless-enabled products.

Distance

The distance between wireless products should always be kept to a minimum. Do not exceed the maximum stated range of your wireless product (maximum range will vary for each device).

Wireless performance degrades over distance, so products farther away will receive less network bandwidth. Products installed close to their maximum wireless range may experience slow connection speeds, signal dropouts, or not being able to connect at all.

Line of sight

For best results the wireless product should have a clear, direct line of sight to the product it will be connected to. Any physical obstructions can degrade or even block the wireless signal.

The construction of your vessel can also have an impact on wireless performance. For example, metal structural bulkheads and roofing will reduce — and in certain situations — block the wireless signal.

If the wireless signal passes through a bulkhead containing power cables this can also degrade wireless performance.

Reflective surfaces such as metal surfaces, some types of glass and even mirrors can drastically affect performance or even block the wireless signal.

Interference and other equipment

Wireless products should be installed at least 1m (3 ft) away from:

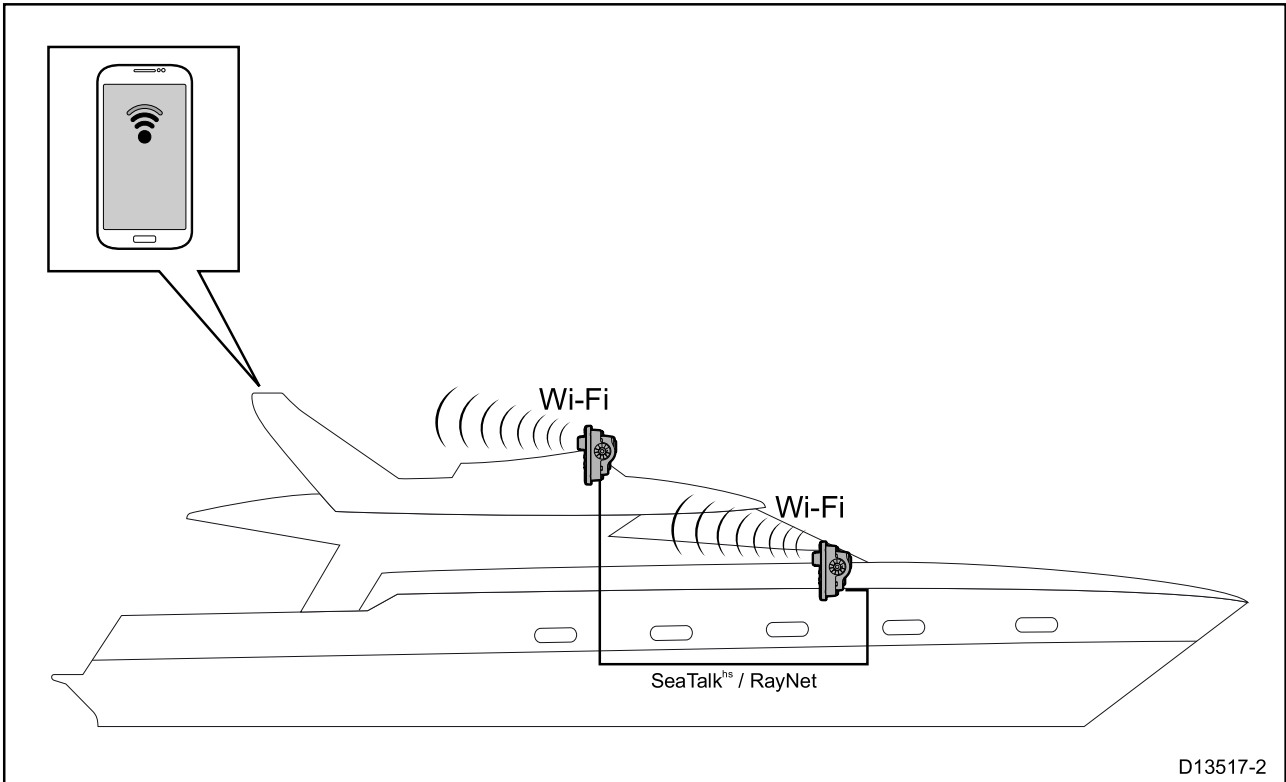
- Other wireless-enabled products.
- Transmitting products that send wireless signals in the same frequency range.
- Other electrical, electronic or electromagnetic equipment that may generate interference.

Interference from other people's wireless devices can also cause interference with your products. You can use a third-party wireless analyzer tool / smartphone app to assess the best wireless channel to use (e.g. a channel not in use or one used by the least number of devices).

Pre-installation site survey — Wi-Fi Analyzer

Before installing a Quantum Radar, that will be connected using Wi-Fi, a site survey should be performed to ensure the Wi-Fi Signal strength is sufficient to maintain a reliable connection.

It is recommended that you perform the site survey using a smart device and a Wi-Fi Analyzer app (e.g. Wi-Fi Analyzer by Farproc for android devices).



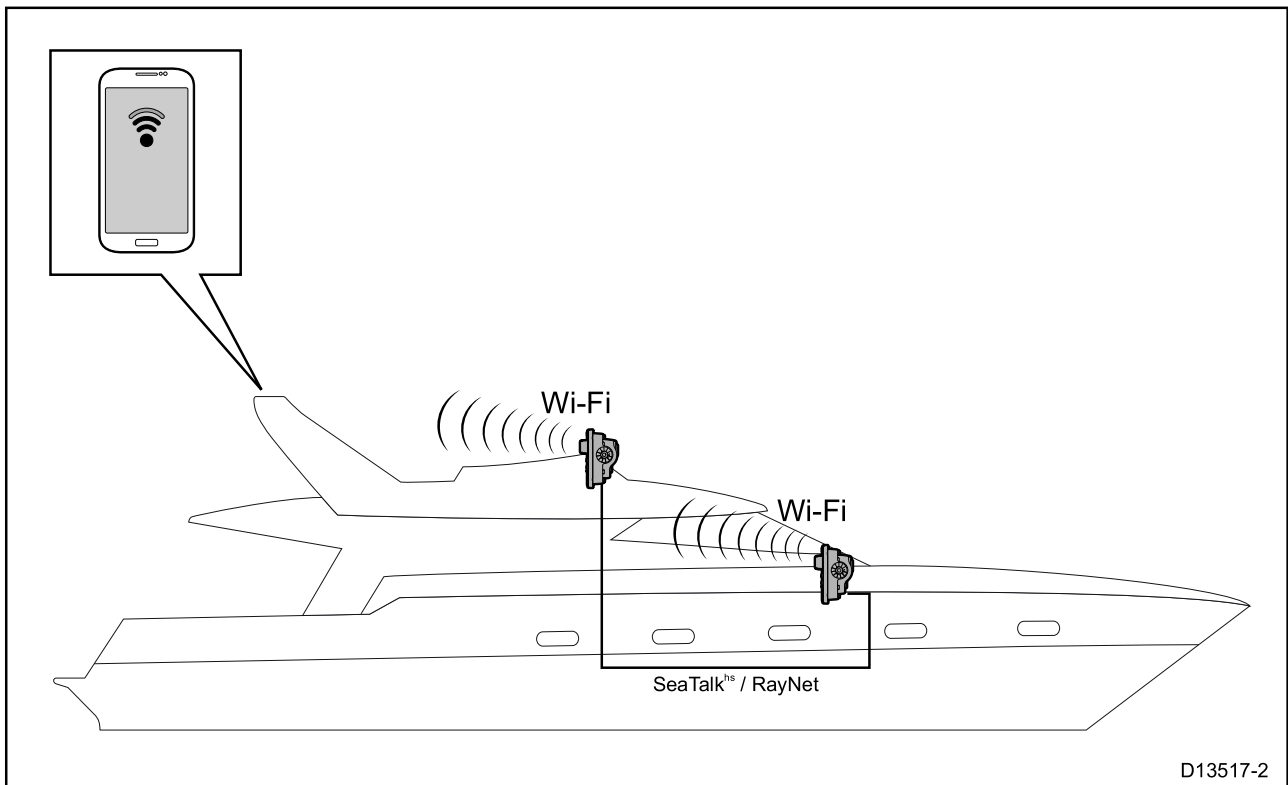
1. Install the Wi-Fi Analyzer app on your smart device.
2. Enable your MFDs Wi-Fi connection: (**Homescreen > Set-up > Wireless connection > Wi-Fi > Wi-Fi: On**)
3. Make a note of the MFDs Wi-Fi Name (**Homescreen > Set-up > Wireless connection > Wi-Fi > Wi-Fi Sharing > Wi-Fi Name**).
4. Go to the location you have chosen for your Radar.
5. Open the Wi-Fi Analyzer app on your smart device and scan available networks.
6. Establish the signal strength of your MFDs Wi-Fi network at the intended install location.

For reliable Wi-Fi performance the signal strength should be better than -75dBm , the closer the signal is to zero the better the Wi-Fi performance will be (e.g. -40dBm is better than -75dBm).

7. If you have a weak or intermittent signal then you will need to investigate further, please refer to the Wi-Fi location requirements guide to help establish what may be causing the problem.
8. For networks with multiple MFDs, repeat steps 2 to 7 for each MFD in your network.

Pre-installation site survey — Raymarine app

You can also use Raymarine apps such as **RayControl** or **RayView** to assess the reliability of the Wi-Fi connection at the desired installation location.

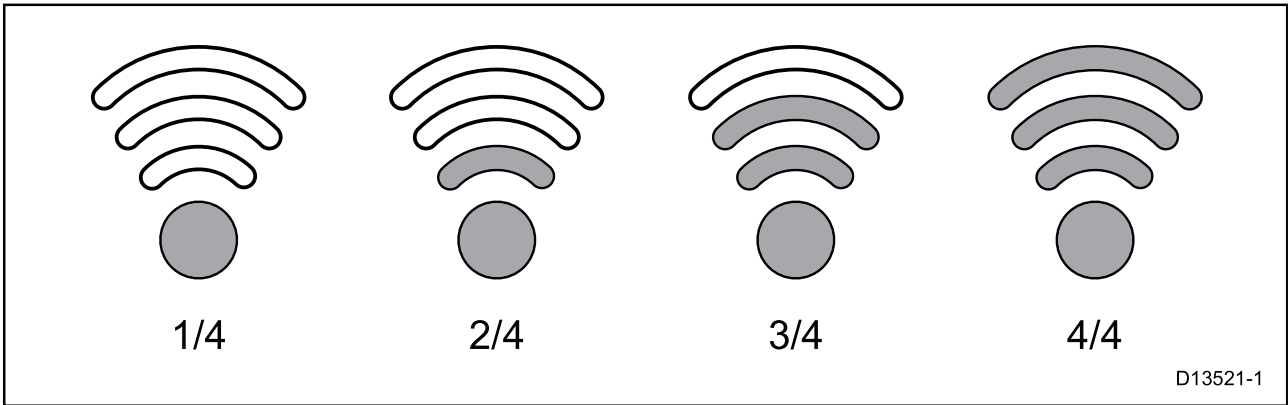


1. Enable your MFDs Wi-Fi connection: (**Homescreen > Set-up > Wireless connection > Wi-Fi > Wi-Fi: On**)
2. Enable 'Viewing only' or 'Remote control' from the Mobile apps menu: (**Homescreen > Set-up > Wireless connection > Wi-Fi > Wi-Fi Sharing > Mobile apps**).
3. Make a note of the MFDs Wi-Fi Name (**Homescreen > Set-up > Wireless connection > Wi-Fi > Wi-Fi Sharing > Wi-Fi Name**).
4. Go to the location you have chosen for your Radar.
5. Using your smart device, search for available Wi-Fi networks.
6. Find your MFDs network and check the signal strength reported by your device.
7. If you have a strong signal strength, open a Raymarine mobile app such as **RayView** or **RayControl** and check functionality at the desired location. If you do not experience any performance issues running the app then you can proceed with the installation.
8. If you have a weak or intermittent signal then you will need to investigate further, please refer to the Wi-Fi location requirements guide to help establish what may be causing the problem.
9. For networks with multiple MFDs, repeat steps 1 to 9 for each MFD in your network.

Wi-Fi signal strength

Wi-Fi signal strength is measured in decibel-milliwatts (dBm). The signal strength of the network you are currently connected to is usually represented graphically by a Wi-Fi symbol.

The signal strength range represented by each filled bar is determined independently by each device manufacturer. However, in general the performance will be similar.



- **1/4** — Unable to maintain a connection, usually accompanied by very poor connection speed (**LightHouse™** MFD: -150dBm or worse).
- **2/4** — Intermittent disconnects and reconnects, usually accompanied by a slow connection speed (**LightHouse™** MFD: -80dBm to -149dBm).
- **3/4** — Reliable connection with good connection speed (**LightHouse™** MFD: -70dBm to -79dBm).
- **4/4** — Reliable connection, excellent connection speed (**LightHouse™** MFD: -55dBm or better).

Chapter 4: Cables and connections

Chapter contents

- [4.1 General cabling guidance on page 40](#)
- [4.2 Connections overview on page 41](#)
- [4.3 Power connection on page 47](#)
- [4.4 Network connection on page 51](#)

4.1 General cabling guidance

Cable types and length

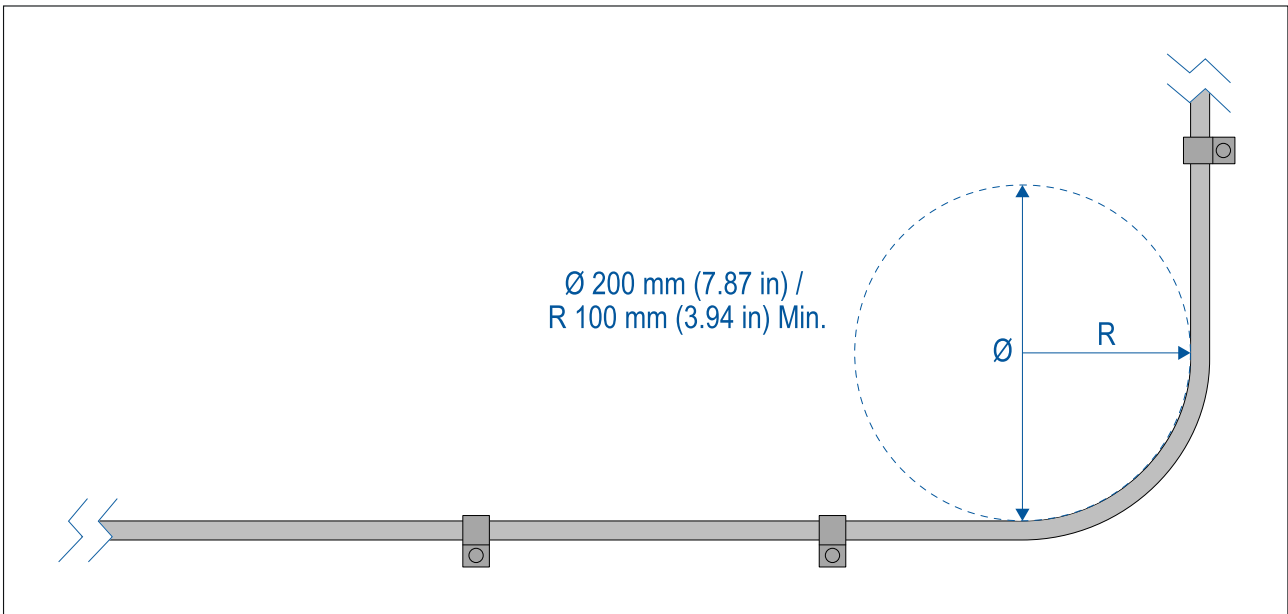
It is important to use cables of the appropriate type and length.

- 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.

Circuit isolation

Appropriate circuit isolation is required for installations using both AC and DC current:

- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use an isolated power supply when using a 3rd party audio amplifier.
- Always use an RS232/NMEA converter with optical isolation on the signal lines.

- Always make sure that PC's or other sensitive electronic devices have a dedicated power circuit.

Cable shielding

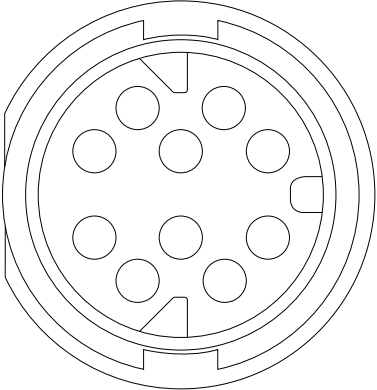
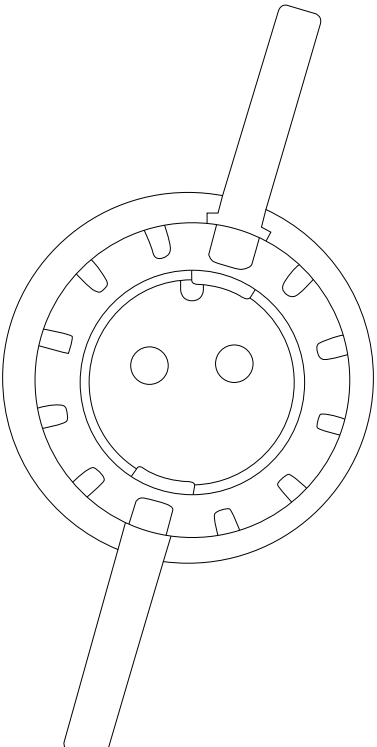
Ensure that cable shielding is not damaged during installation and that all cables are properly shielded.

Suppression ferrites

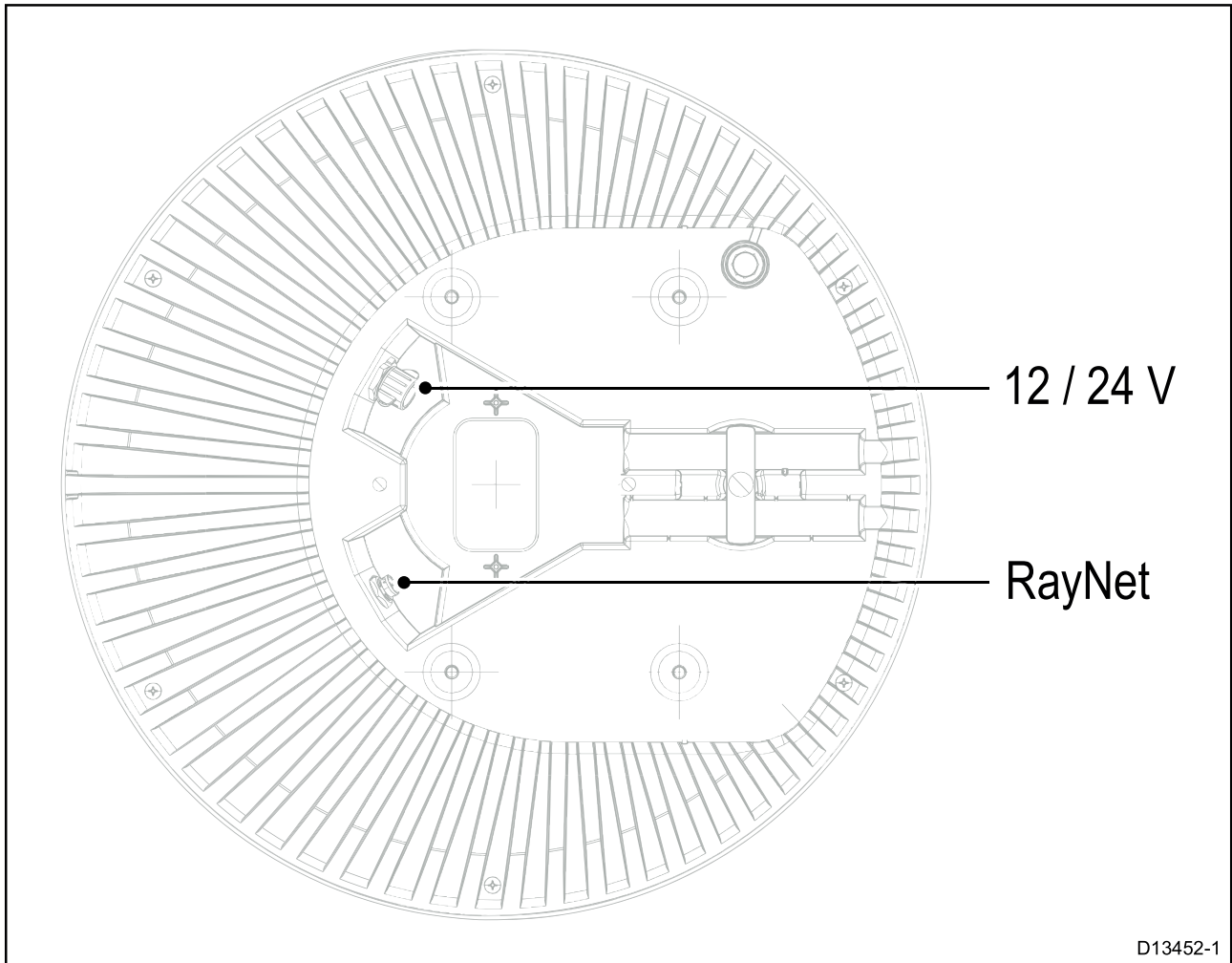
- Raymarine cables may be pre-fitted or supplied with suppression ferrites. These are important for correct EMC performance. If ferrites are supplied separately to the cables (i.e. not pre-fitted), you must fit the supplied ferrites, using the supplied instructions.
- If a ferrite has to be removed for 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.

4.2 Connections overview

Use the following information to help you identify the connections on your product.

Connector	Connects to:	Suitable cables
	RayNet network or device. Not required if connecting using Wi-Fi.	Refer to p.85 — Spares and accessories
	12 V / 24 V power supply.	Supplied with your product.

The power and data connections are located on the underside of the scanner unit, as shown in the following illustration.



Typical cable routing scenarios

There are 4 typical cable routing scenarios.

Note: The routing options described and illustrated in this section assume that a physical data connection is used between your Radar scanner and multifunction display (MFD). However, if the scanner is connected to your MFD via Wi-Fi, a physical RayNet connection is not required.

1. Cable routing for a scanner mounted on a platform, using separate cables for the power and data connection.
2. Cable routing for a scanner mounted on a platform, using the combined power and data cable from an existing Raymarine Digital Radar scanner installation. For this, the **A80308** Y-adapter accessory is required (not supplied with the scanner).
3. Cable routing for a scanner mounted on a pole, using separate cables for the power and data connection.
4. Cable routing for a scanner mounted on a pole, using the combined power and data cable from an existing Raymarine Digital Radar scanner installation. For this, the **A80308** Y-adapter accessory is required (not supplied with the scanner).

Cable routing — platform mount

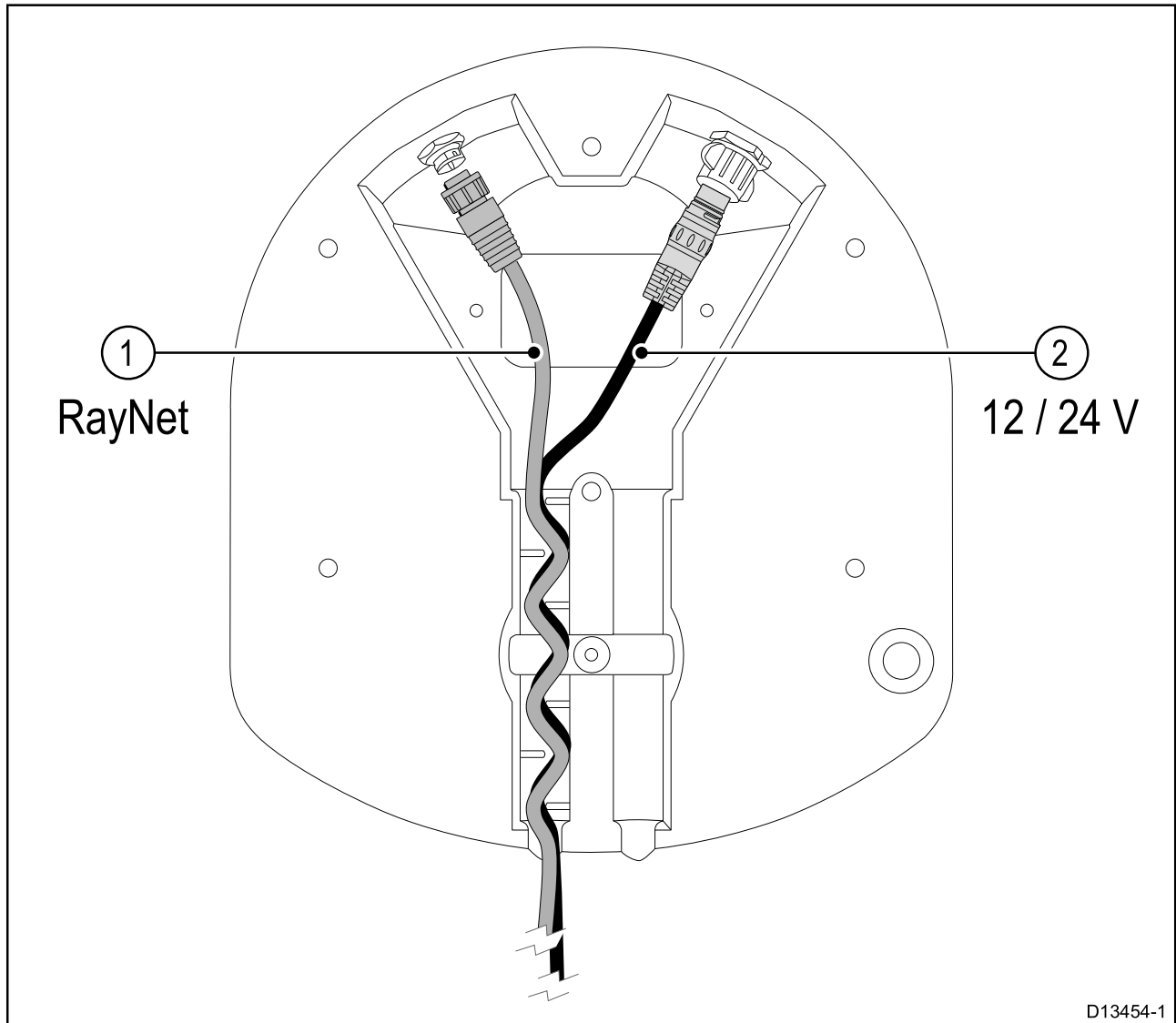
There are 2 typical cable routing scenarios for platform mount installations.

- Using separate power and data cables.
- Using an existing combined power / data cable from an older Raymarine Digital radar scanner. In this scenario, the **A80308** Y-adapter accessory is required (not supplied with the scanner).

Using separate power and data cables

Note: The routing options described and illustrated in this section assume that a physical data connection is used between your Radar scanner and multifunction display (MFD). However, if the scanner is connected to your MFD via Wi-Fi, a physical RayNet connection is not required.

The following drawing illustrates the cable routing for a scanner mounted on a platform, using separate cables for the power and data connections.

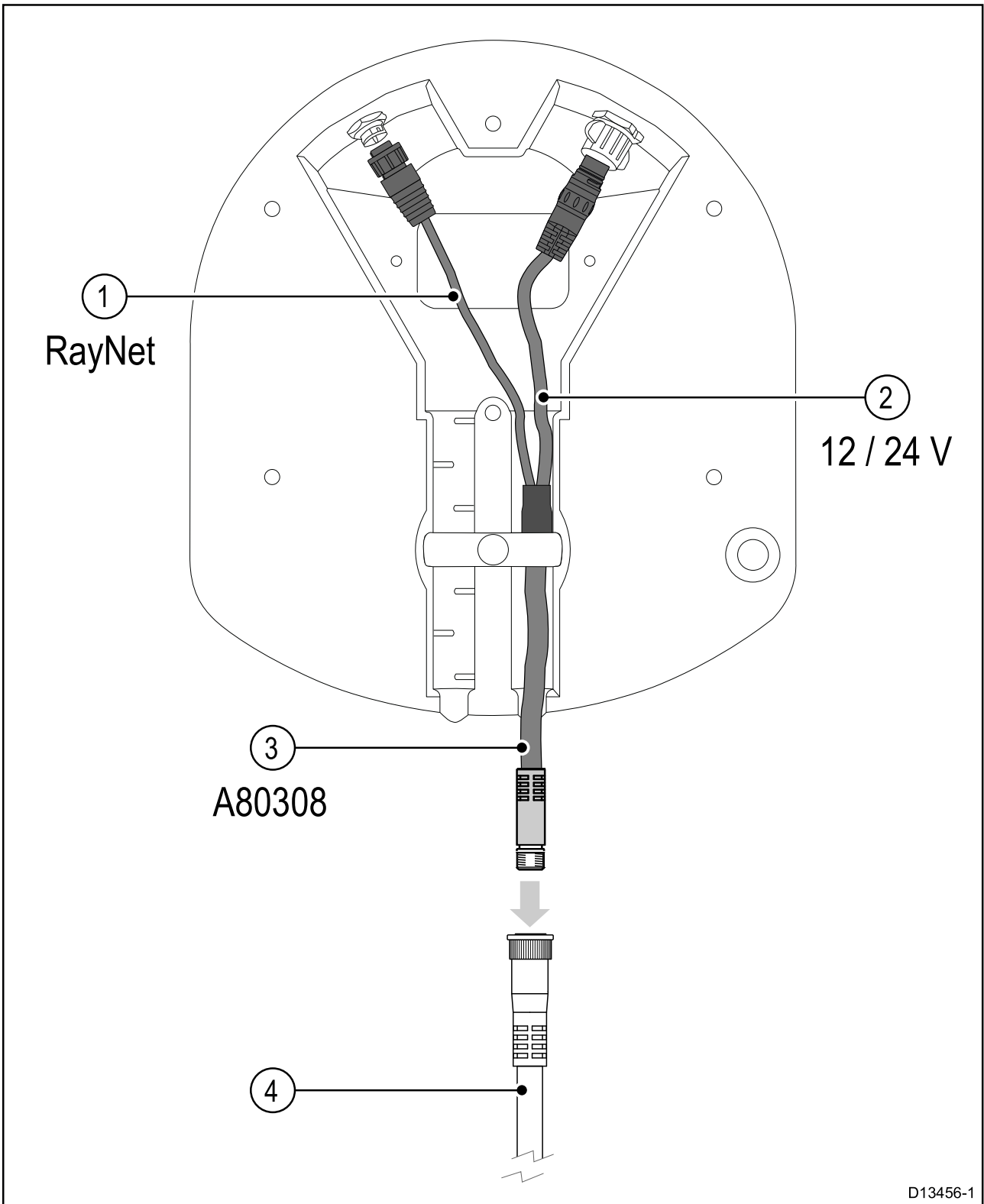


1. RayNet data connection.
2. 12 V / 24 V power connection.

Note:

- A separate power cable is supplied with all Quantum™ Radar variants.
- Not all Quantum™ radar variants are supplied with a RayNet cable. Refer to [p.15 — Document and product information](#)
- Refer to [p.88 — RayNet to RayNet cables and connectors](#) for information on suitable accessory RayNet cables.

Using an existing combined power / data cable from an older Raymarine Digital Radar



D13456-1

Note: The Y-adapter cable is actually white. For clarity, it is shown in the above drawing in different colors.

1. RayNet data connection. This cable is part of the **A80308** Y-adapter accessory cable.
2. 12 V / 24 V power connection. This cable is part of the **A80308** Y-adapter accessory cable.
3. **A80308** Y-adapter accessory cable (not supplied with the scanner).
4. Existing combined Digital Radar power / data cable.

Cable routing — pole mount

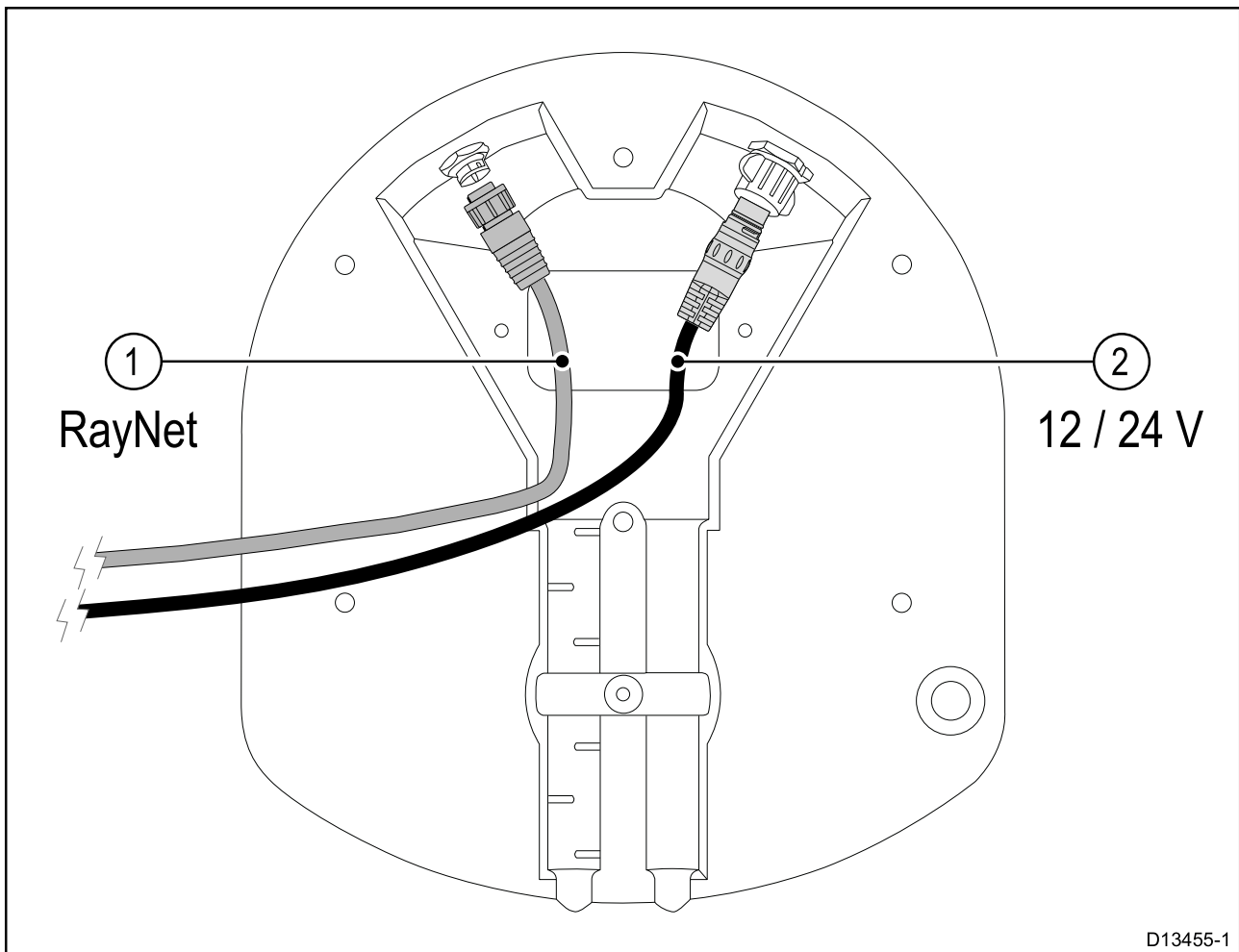
There are 2 typical cable routing scenarios for pole mount installations.

- Using separate power and data cables.
- Using an existing combined power / data cable from an older Raymarine Digital Radar scanner. In this scenario, the **A80308** Y-adaptor accessory is required (not supplied with the scanner).

Using separate power and data cables

Note: The routing options described and illustrated in this section assume that a physical data connection is used between your Radar scanner and multifunction display (MFD). However, if the scanner is connected to your MFD via Wi-Fi, a physical RayNet connection is not required.

The following drawing illustrates the cable routing for a scanner mounted on a platform, using separate cables for the power and data connection.

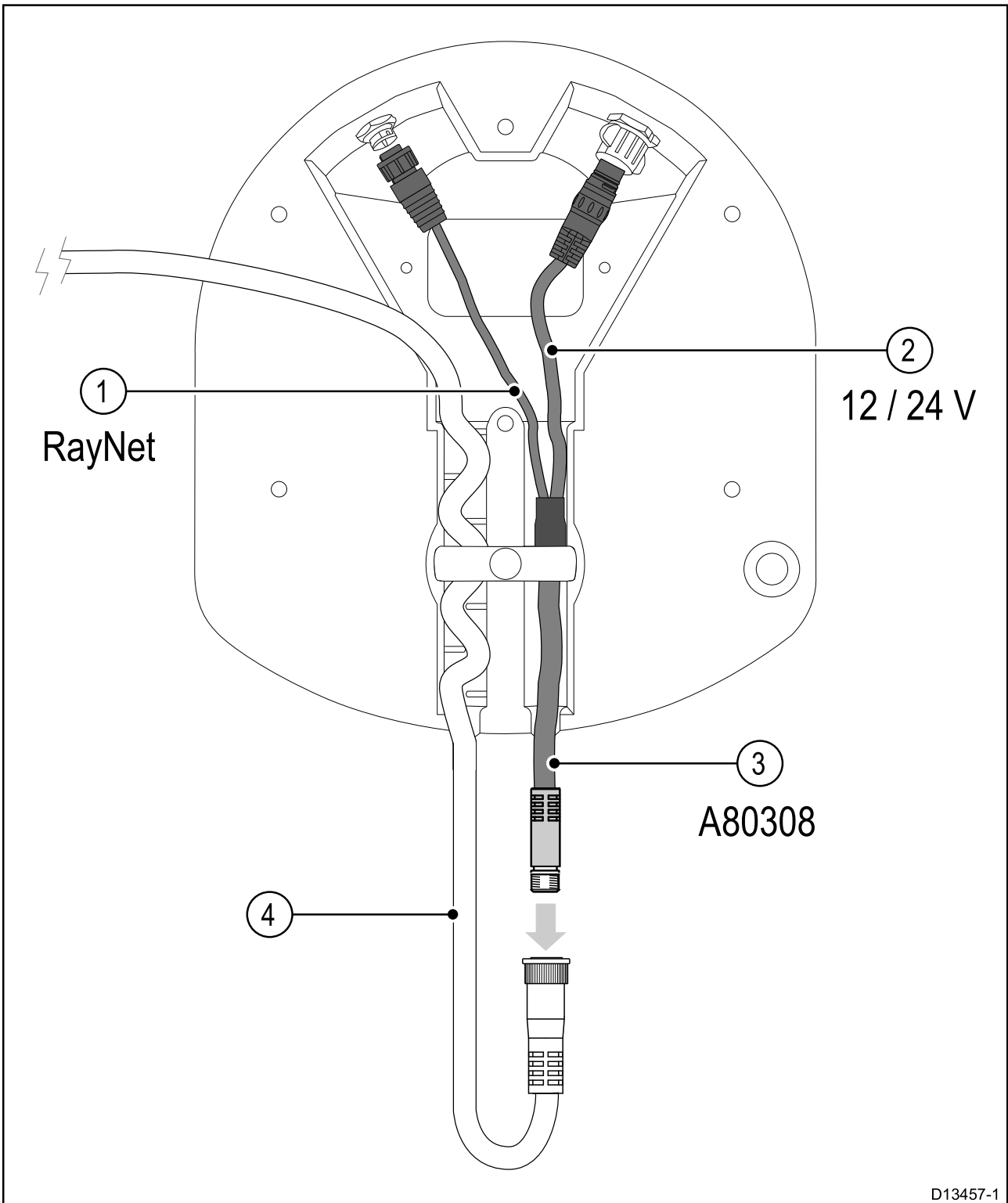


1. RayNet data connection.
2. 12 V / 24 V power connection.

Note:

- A separate power cable is supplied with all Quantum™ Radar variants.
- Not all Quantum™ radar variants are supplied with a RayNet cable. Refer to [p.15 — Document and product information](#) for more information.
- Refer to [p.88 — RayNet to RayNet cables and connectors](#) for information on suitable accessory RayNet cables.

Using an existing combined power / data cable from an older Raymarine Digital Radar



D13457-1

Note: The Y-adapter cable is actually white. For clarity, it is shown in the above drawing in different colors.

1. RayNet data connection. This cable is part of the **A80308** Y-adapter accessory cable.
2. 12 V / 24 V power connection. This cable is part of the **A80308** Y-adapter accessory cable.
3. **A80308** Y-adapter accessory cable (not supplied with the scanner).
4. Existing combined Digital Radar power / data cable.

Making connections

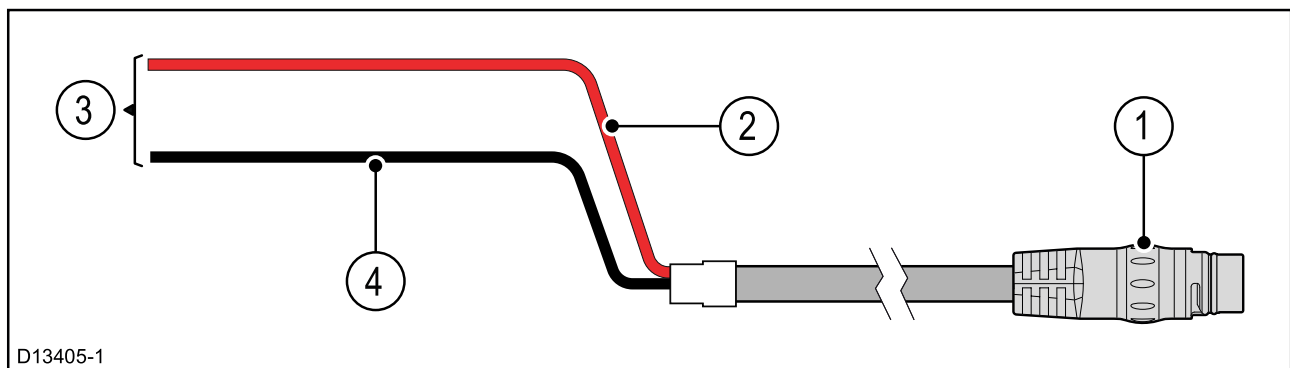
Follow the steps below to connect the cable(s) to your product. If you intend to use the scanner's Wi-Fi functionality to connect to your multifunction display, you need only connect a power cable to the scanner.

Note: If your vessel is already fitted with a combined power / data Digital Radar cable, you can use a Y-adaptor (part number A80308) to connect the existing cable-end to the scanner's connectors.

1. Ensure that the vessel's power supply is switched off.
2. Ensure that the multifunction display being connected to the scanner has been installed in accordance with the installation instructions supplied with that device.
3. Ensure the power connector locking collar on the scanner is in the unlocked position.
4. Route the power cable and optional data cable within the scanner base, as shown in the cable routing illustrations in this section. Cable routing depends on whether you mount the scanner on a platform or on a pole, and on whether you are using a Y-adaptor to connect to an existing combined power / data Digital Radar cable.
5. Ensure that the power cable connector is orientated so that the notch lines up with the guide in the connector.
6. Push the power cable connector all the way into the scanner's power connector.
7. Rotate the locking collar clockwise until it is in the locked position (2 clicks).
8. Push the optional data cable fully onto the corresponding connector on the scanner.
9. If you are using a Y-adaptor, make the final connection between the adapter and the existing combined power / data Digital Radar cable.

Note: When switching from a Wi-Fi connection to a wired connection for the Quantum Radar, you may encounter a connection issue if the Wi-Fi connection is established before the wired adaptor completes its initialization procedure. To resolve this issue, upgrade your Quantum unit to the latest software version, and then power cycle the unit.

4.3 Power connection



Note: A Y-adaptor cable (part number A80308) is available for existing installations that already use a combined power/data cable from a Digital or HD Color Radome. The Y-adaptor splits the existing combined cable into the separate data and power connectors used by the scanner.

Item	Description	Connects to:
1	Power cable.	Product's power connector.
2	Red cable (positive)	Power supply's positive terminal.
3	Connection to 12 V / 24 V power supply.	Power supply.
4	Black cable (negative)	Power supply's negative terminal.

In-line fuse and thermal breaker ratings

The following in-line fuse and thermal breaker ratings apply to your product:

In-line fuse rating	Thermal breaker rating
5 A	3 A

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.
- Your product's power cable may have an in-line fuse fitted, if not then you must add an in-line fuse / breaker to the positive wire of your product's power connection.



Warning: Grounding not required

This product is fully insulated and does NOT require separate grounding.

Power distribution

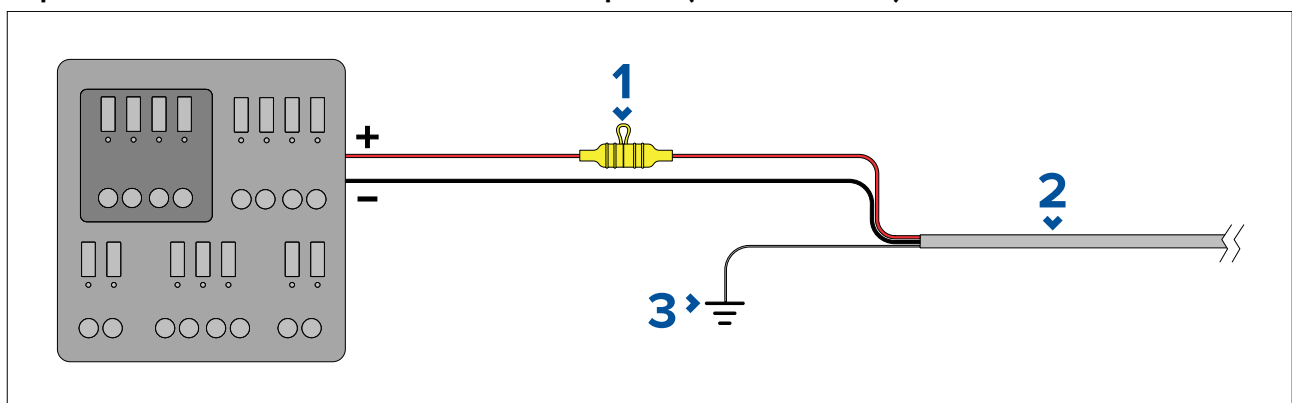
Recommendations and best practice.

- The product is supplied with a power cable, either as a separate item or a captive cable permanently attached to the product. Only use the power cable supplied with the product. Do NOT use a power cable designed for, or supplied with, a different product.
- Refer to the *Power connection* section for more information on how to identify the wires in your product's power cable, and where to connect them.
- 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 dealer or a suitably qualified professional marine electrician.

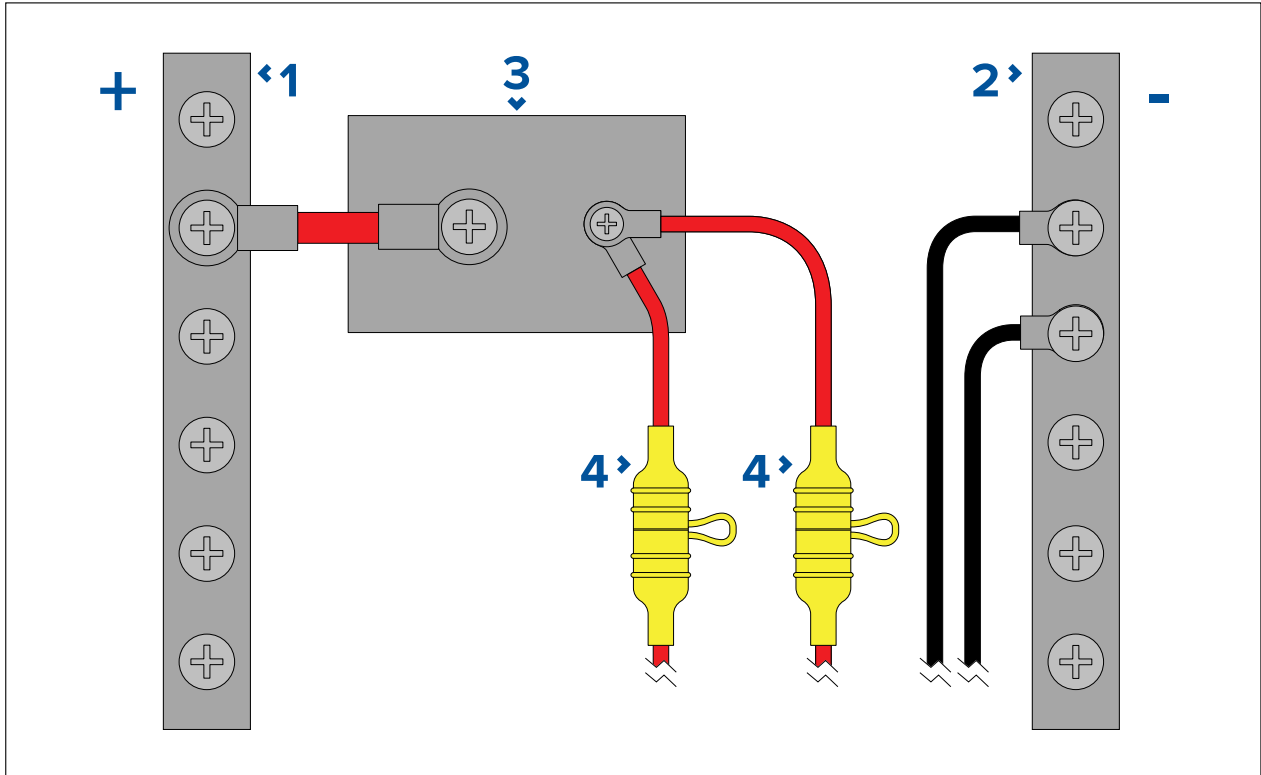
Implementation – connection to distribution panel (Recommended)



1	Waterproof fuse holder containing a suitably-rated inline fuse must be fitted. For suitable fuse rating, refer to: <i>In-line fuse and thermal breaker ratings</i> .
2	Product power cable.
3	Drain wire connection point.

- It is recommended that the supplied power cable is 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 mm²) 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.

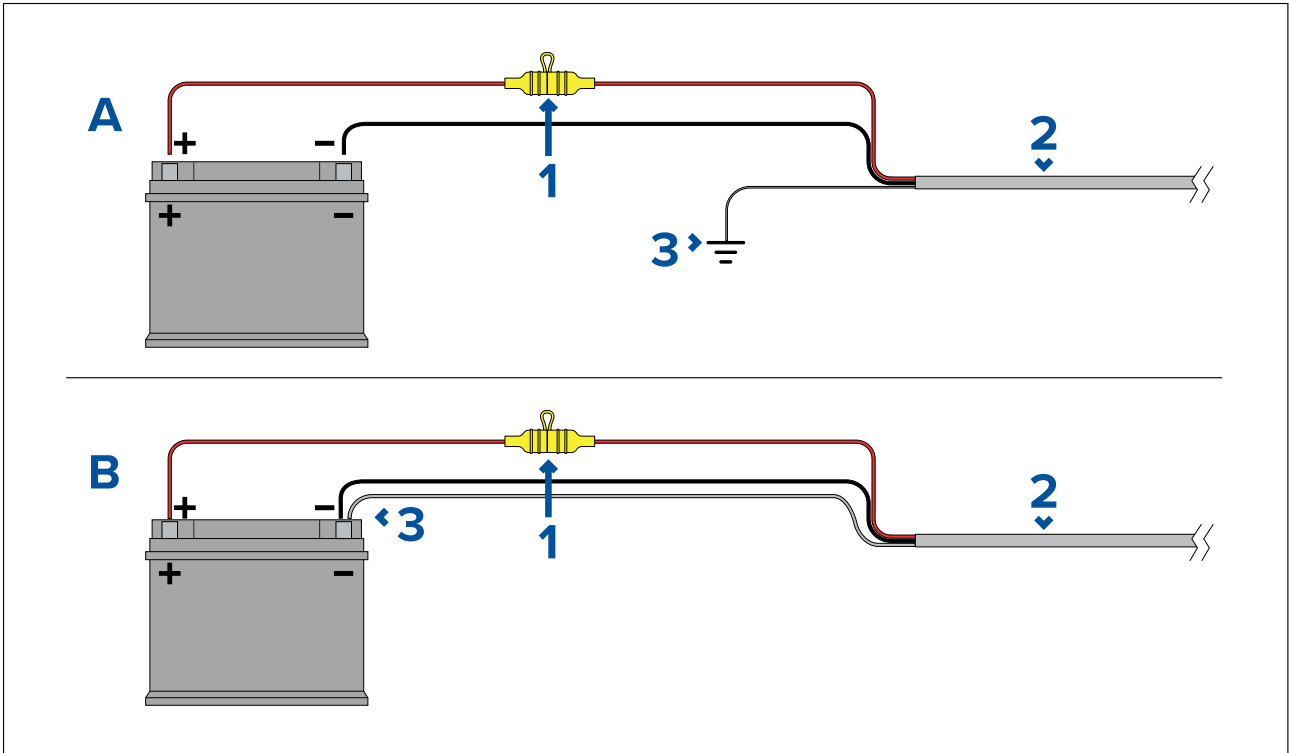


1	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker
4	Waterproof fuse holder containing a suitably-rated inline fuse must be fitted. For suitable fuse rating, refer to: <i>In-line fuse and thermal breaker ratings</i> .

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 supplied with your product may be connected directly to the vessel's battery, via a suitably rated fuse or breaker.
- The power cable supplied with your product may NOT include a separate drain wire. If this is the case, only the power cable's red and black wires need to be connected.
- If the power cable is NOT supplied with a fitted inline fuse, 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 supplied with your product, ensure you observe the dedicated *Power cable extensions* advice provided in the product's documentation.



1	Waterproof fuse holder containing a suitably-rated inline fuse must be fitted. For suitable fuse rating, refer to: <i>In-line fuse and thermal breaker ratings</i> .
2	Product power cable.
3	Drain wire connection point.

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.

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.

Power cable extension

If you need to extend the length of the power cable supplied with your product, ensure you observe the following advice:

- The power cable for each unit in your system should be run as a separate, single length of 2-wire cable from the unit to the vessel's battery or distribution panel.
- Ensure that the extension cable is of a sufficient gauge for the supply voltage and the total load of the device and the length of the cable run. Refer to the following table for typical **minimum** power cable wire gauges.

Cable length in meters (feet)	Wire gauge in AWG (mm ²) for 12 V supply	Wire gauge in AWG (mm ²) for 24 V supply
<8 (<25)	16 (1.31 mm ²)	18 (0.82 mm ²)
16 (50)	14 (2.08 mm ²)	18 (0.82 mm ²)
24 (75)	12 (3.31 mm ²)	16 (1.31 mm ²)
>32 (>100)	10 (5.26 mm ²)	16 (1.31 mm ²)

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.

Important: 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.)

Grounding

Ensure that you observe any additional grounding advice provided in the product's documentation.

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



Warning: Grounding not required

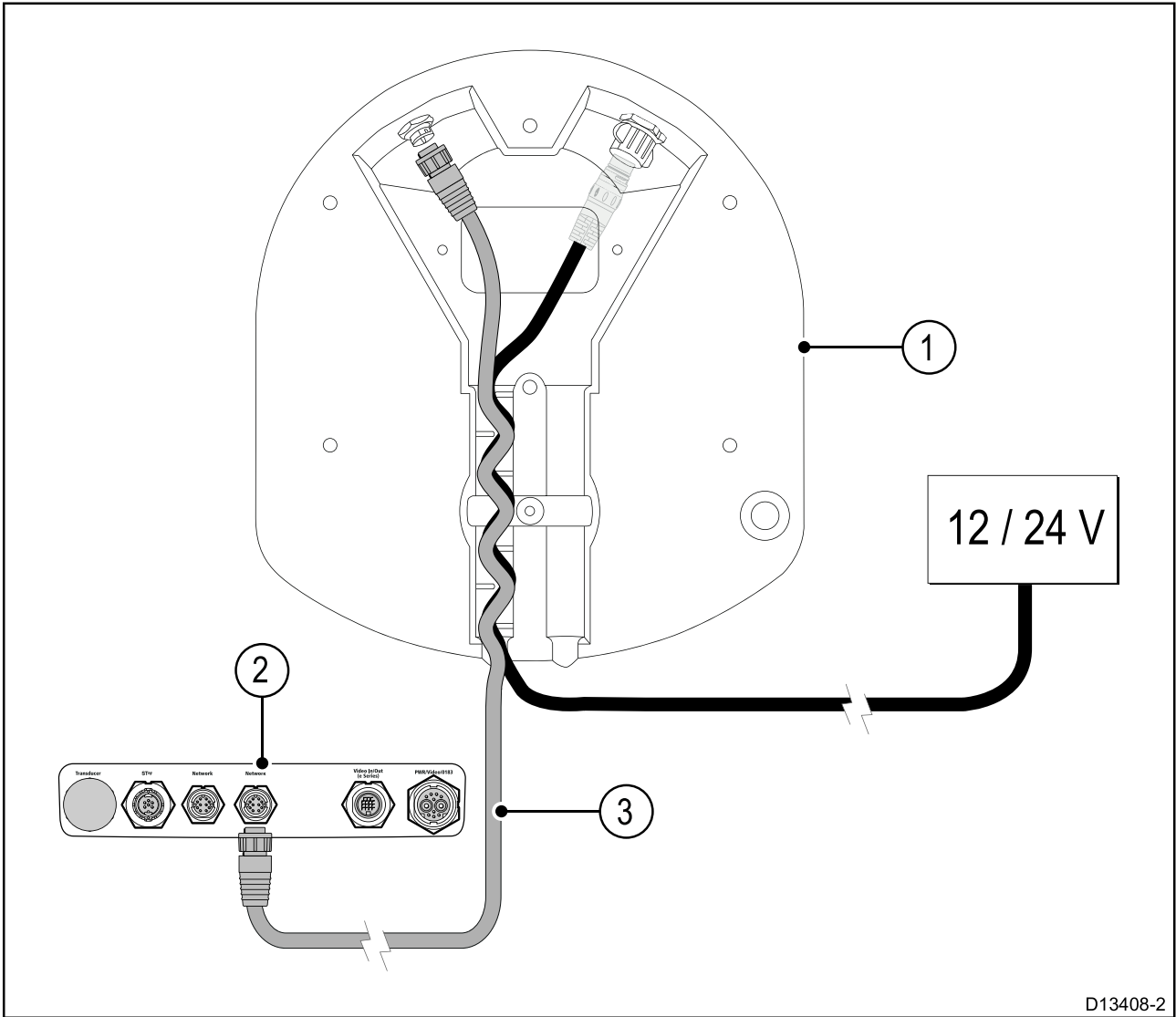
This product is fully insulated and does NOT require separate grounding.

4.4 Network connection

The scanner must be connected to a compatible Raymarine multifunction display (MFD), either via Wi-Fi, or via a physical RayNet cable connection. Once connected, the multifunction display can show Radar echo data.

Wired (RayNet) multifunction display connection

Scanner connected to a multifunction display using a RayNet cable.

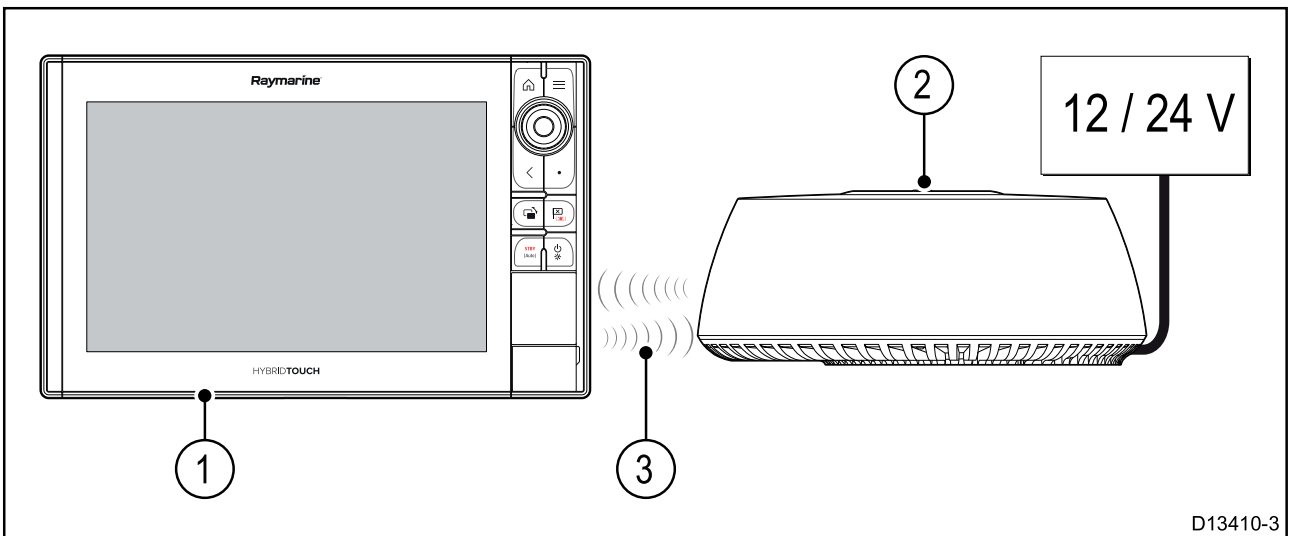


D13408-2

Item	Description
1	Quantum™ Radome (for clarity, only the connections area of the underside of the unit is shown here).
2	Connector panel of compatible Raymarine multifunction display (for clarity, only the connections area of the unit is shown here).
3	RayNet data cable.

Wi-Fi multifunction display connection

Scanner connected to a multifunction display using Wi-Fi.



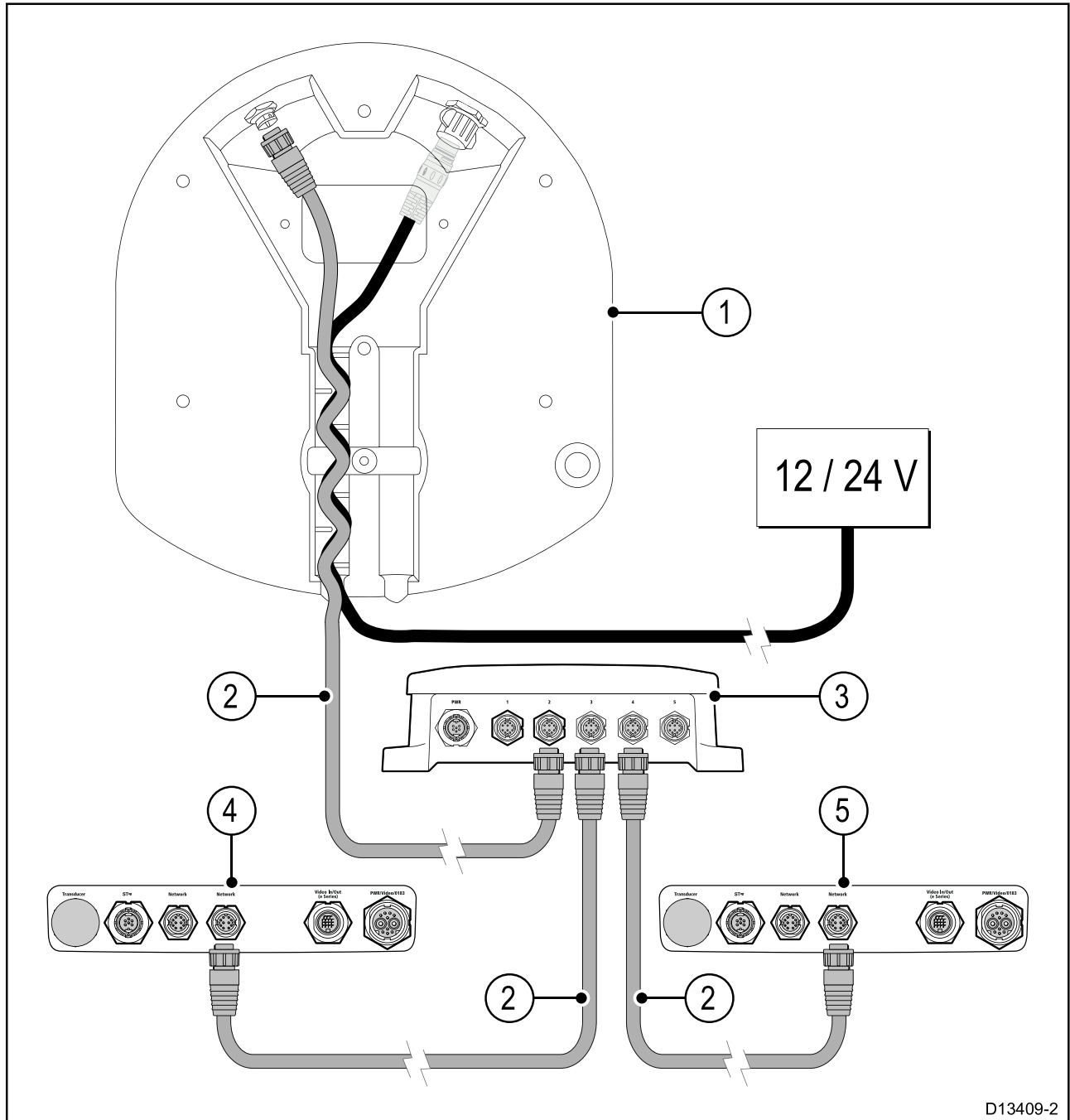
D13410-3

Item	Description
1	Compatible Raymarine multifunction display with Wi-Fi capability.
2	Quantum™ Radome.
3	Wi-Fi datalink.

Refer to [p.63 — System checks and troubleshooting](#), and to your MFD documentation for further information about setting up the Wi-Fi connection between your MFD and the Quantum™ scanner.

Multiple multifunction display configuration

A Raymarine network switch can be used to connect the unit to more than 1 multifunction display.



Item	Description
1	Quantum™ radome (for clarity, only the connections area of the underside of the unit is shown here).
2	RayNet cable.
3	RayNet network switch.

Item	Description
4	Connector panel of compatible Raymarine multifunction display (for clarity, only the connections area of the unit is shown here).
5	Connector panel of additional compatible Raymarine multifunction display (for clarity, only the connections area of the unit is shown here).

For details on available network hardware and cables refer to [p.85 — Spares and accessories](#).

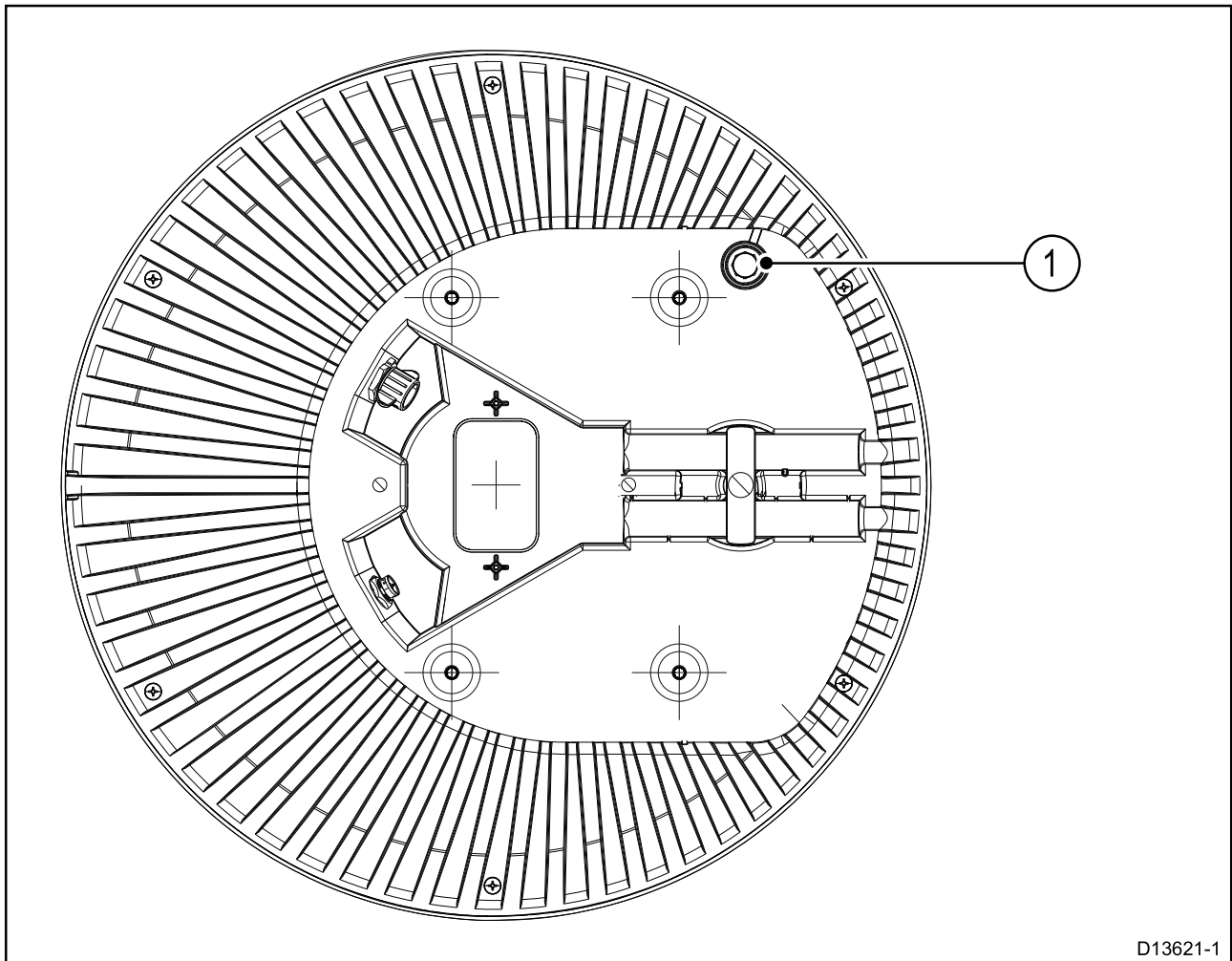
Chapter 5: Mounting

Chapter contents

- 5.1 Mounting pre-requisite: "breather" holes on page 56
- 5.2 Mounting the scanner on page 56
- 5.3 Radar scanner protection — sailing vessels on page 61

5.1 Mounting pre-requisite: "breather" holes

The base of the unit features a "breather", a series of small holes which allow air to circulate between the underside of the unit and the mounting surface.



1. Location of "breather" holes.

Ensure that the breather is not blocked in any way. Examples of obstacles to airflow include sealant and paint.

If necessary, use additional washers to allow a small gap between the underside of the unit and the mounting surface, for airflow.

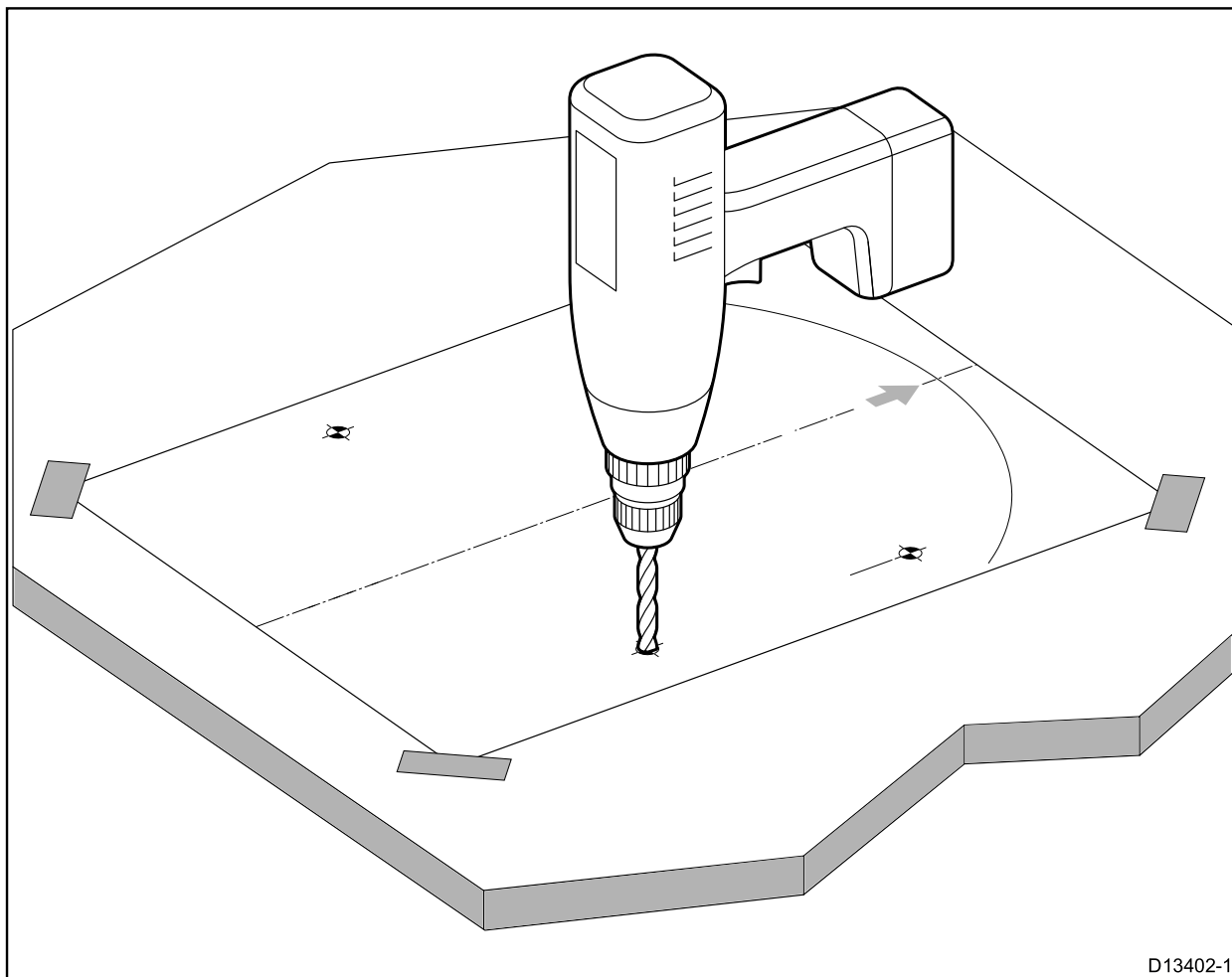
5.2 Mounting the scanner

Use a mounting location that:

- Is robust enough to support the Quantum™ scanner, under seagoing conditions.
- Meets the requirements described under *Scanner Position*.

Then:

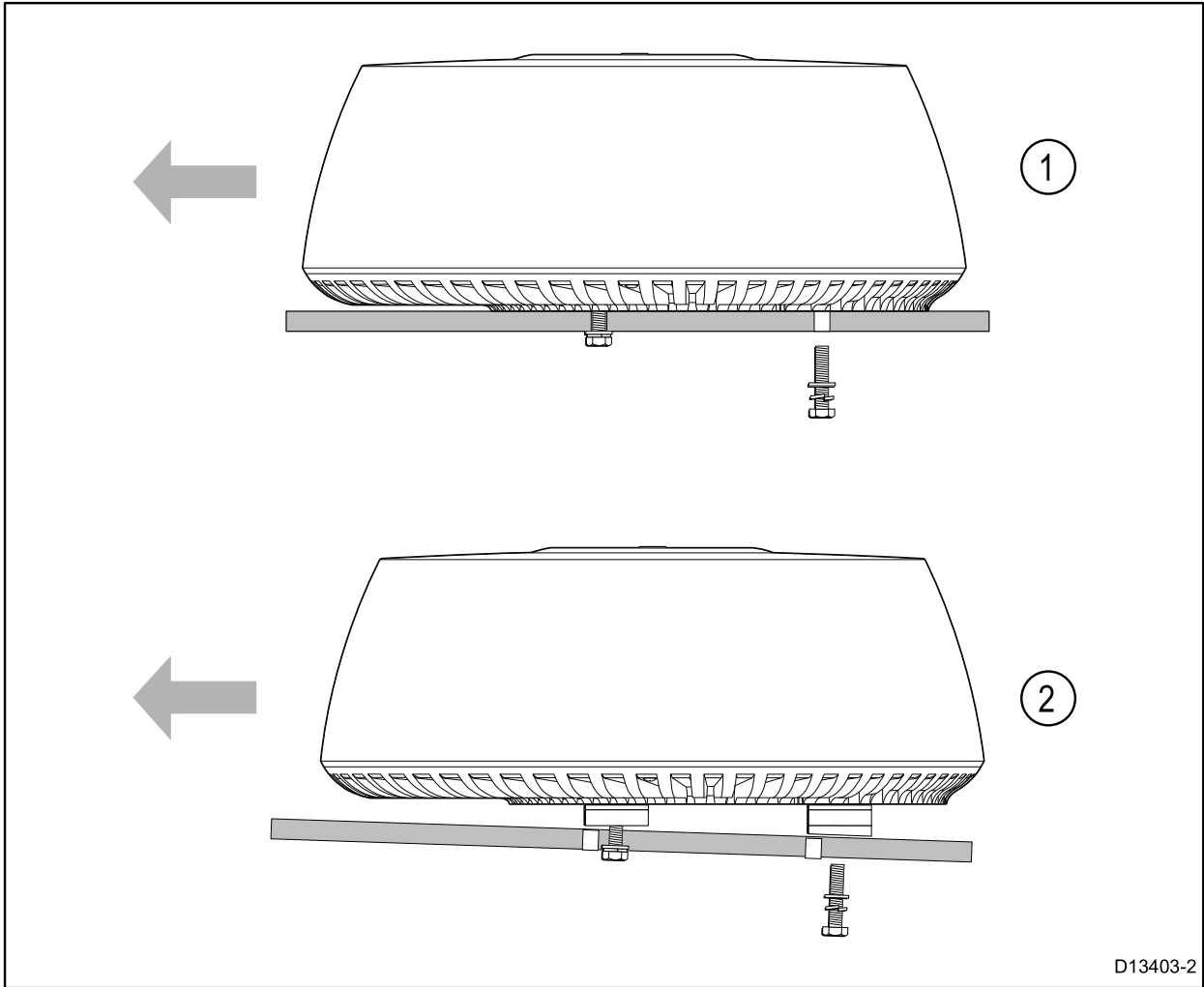
1. Tape the template to the mounting platform, ensuring that the arrow on the template is pointed towards the front of the vessel.



D13402-1

2. Drill 3 mm pilot holes in the four positions shown on the template.
3. Drill out the pilot holes to 10 mm diameter.

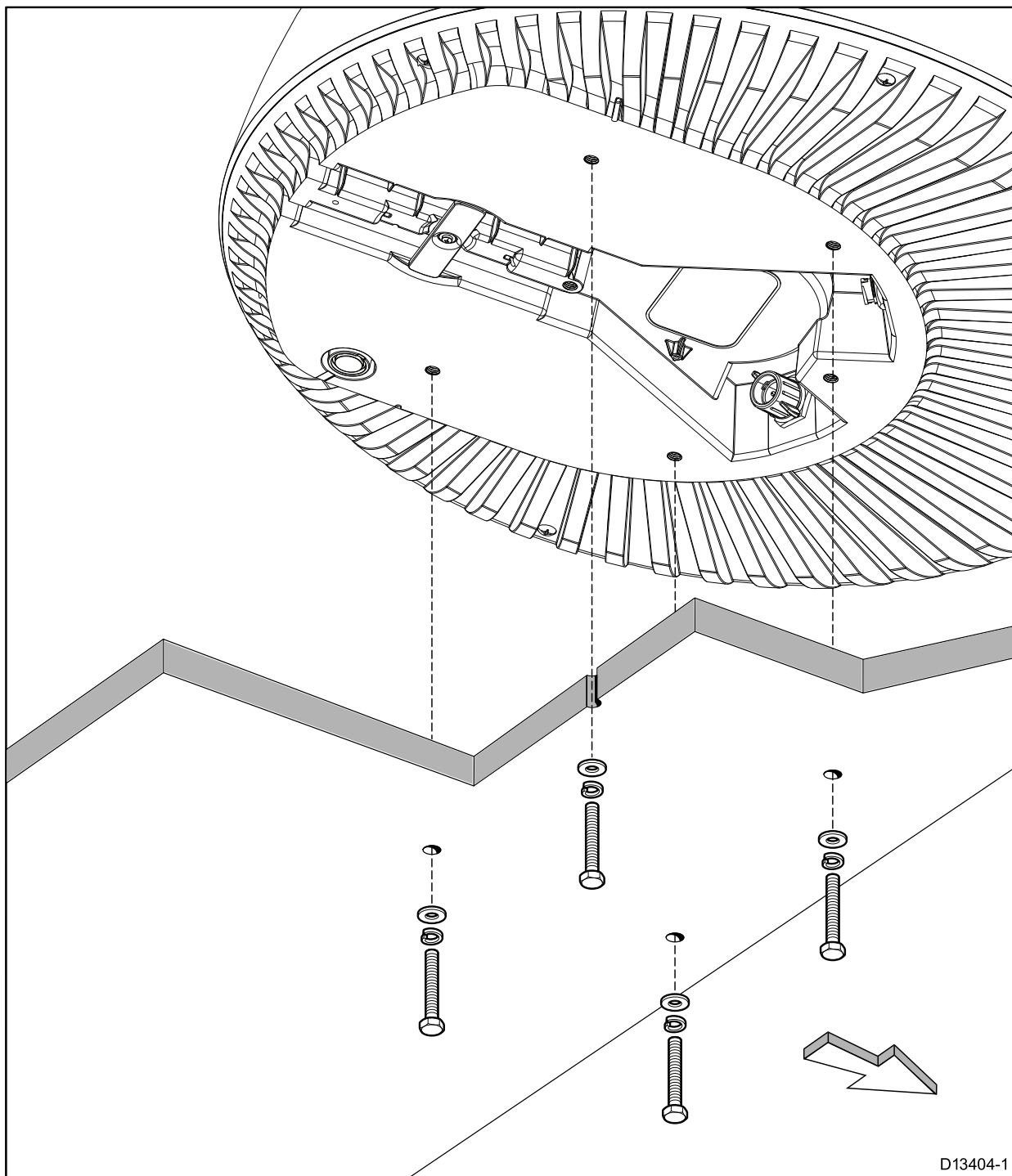
4. Place the Quantum™ scanner in position. If you are fitting it on a planing vessel, shim the rear of the scanner, so that the beam points slightly down in the forward direction when the boat is at rest, to compensate for the bow rising at cruising speed



Item	Description
1	Mounting platform, non-planing boat (level install)
2	Mounting platform, planing boat (typical planing angle shown)

5. Before securing the scanner to the mounting platform, connect the power cable (and optionally a data cable), ensuring that all cables are routed appropriately. Refer to [p.41 – Connections overview](#) for further information about making connections, and cable routing.
6. Ensuring that the bolts have a **minimum** insertion in the scanner base of 16 mm (0.63 in.), and a **maximum** of 22 mm (0.87 in.) (allowing for washers), secure the scanner with the 4 bolts, flat

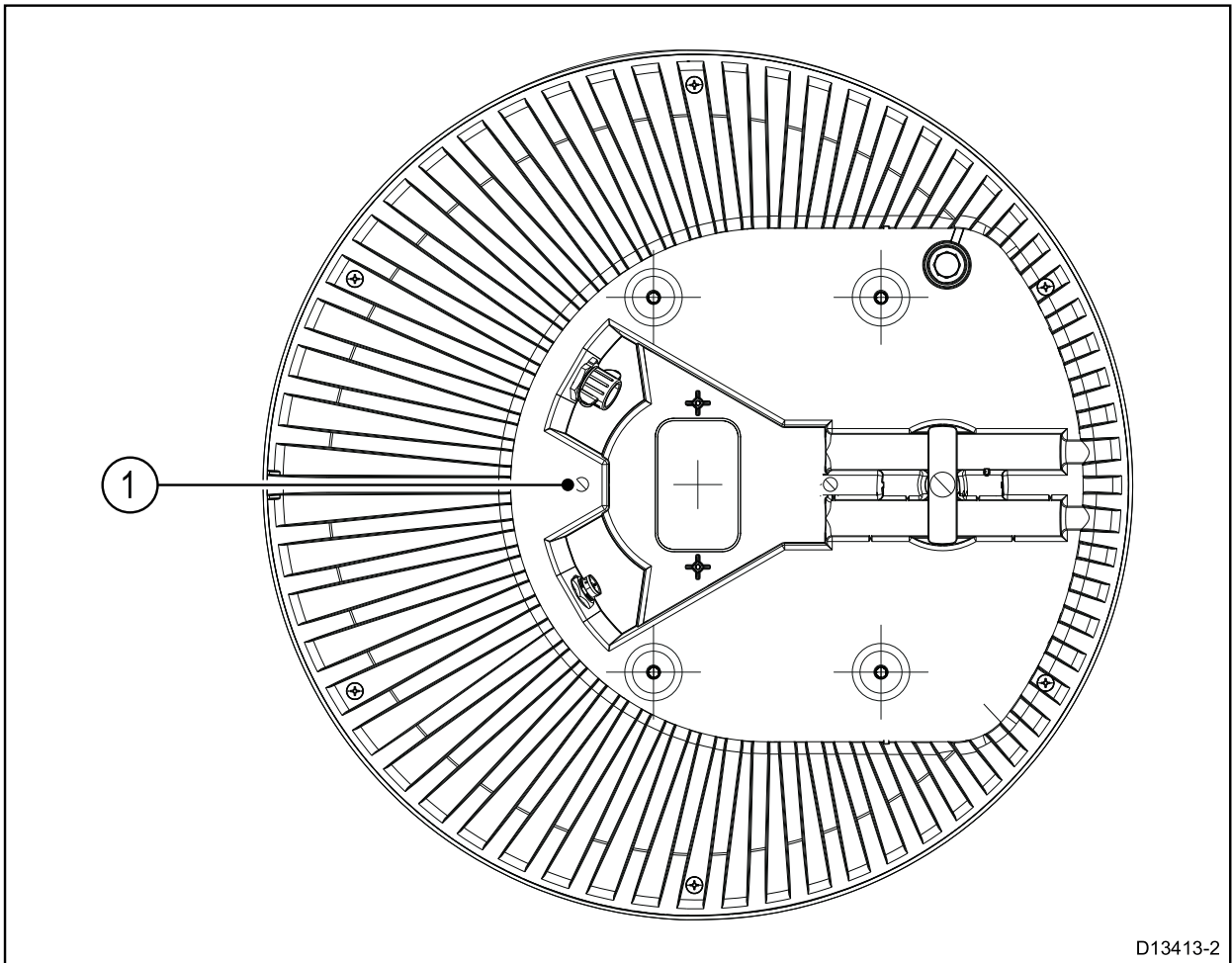
washers and spring washers provided, as illustrated. If necessary, use appropriate shims or extra washers to limit the length of bolt entering the scanner base.



D13404-1

7. Tighten the bolts to a torque of 15 N·m (11 lbf-ft).

8. Attach a safety lanyard (not supplied) to your vessel, and secure the free end to the scanner using the attachment point shown in the following illustration:



Item	Description
1	Safety lanyard attachment point.

Note: If you are installing the Radar scanner on a sailing vessel, additional protection for the Radar scanner may be required. Refer to [p.61 — Radar scanner protection — sailing vessels](#).

Multiple Quantum Radar scanners

Only 1 (one) Quantum™ Radar scanner can be used at any one time, per networked system.

If you have more than one Quantum™ Radar scanner installed on your vessel and want to use them at the same time, the multifunction displays to which the scanners are connected must NOT be networked together. This applies to Quantum™ scanners connected either wired or wirelessly.

For more information, refer to: [p.71 — Multiple Quantum Radars — more information](#)

Multiple Radar scanners — location requirements

Important location considerations when installing multiple radar scanners on the same vessel.

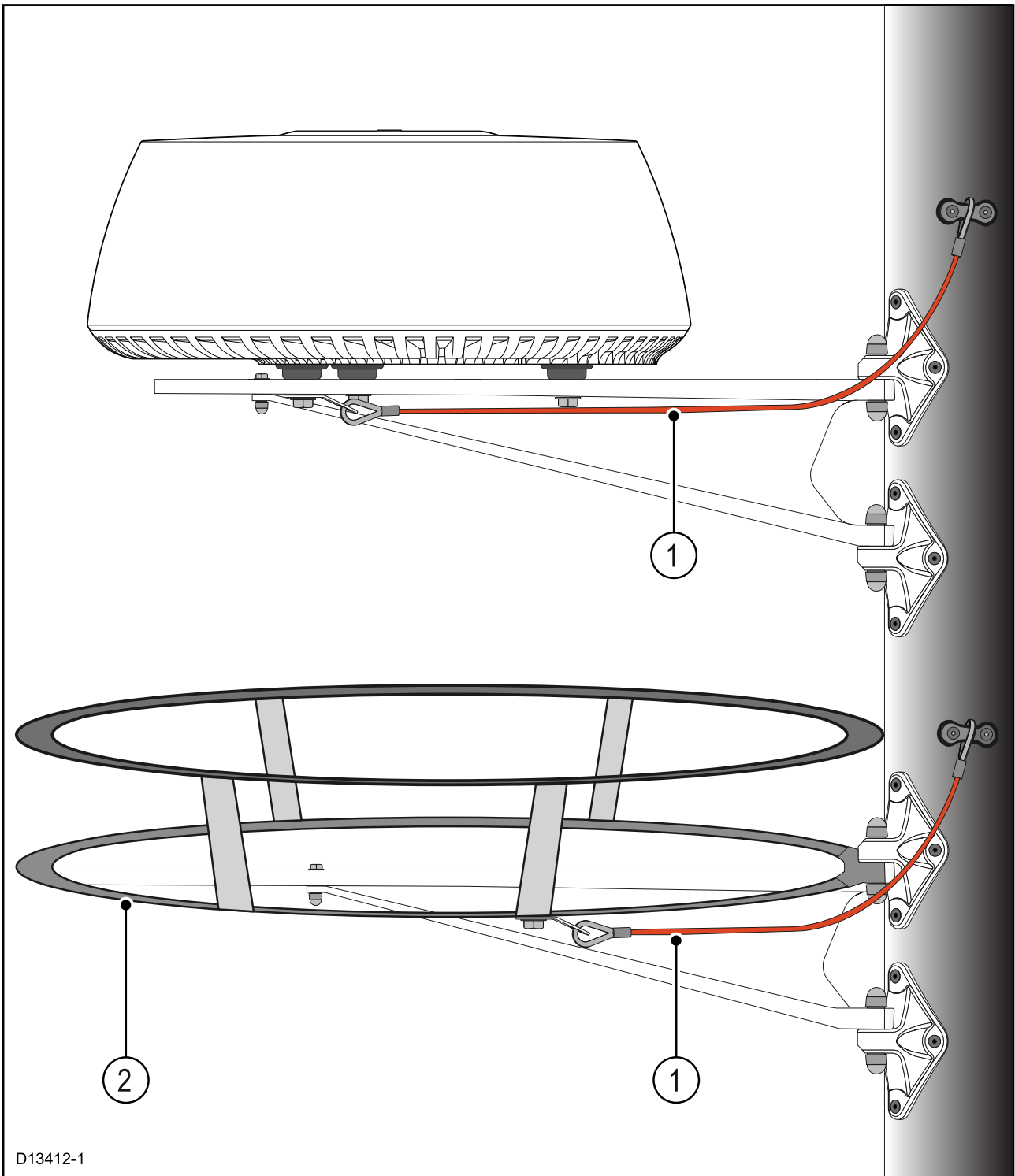
- Scanners should be mounted above each other, vertically separated by at least 0.5 m (1.6 ft). This applies to all installation locations on the vessel.
- Multiple scanners should be mounted in a way that minimizes interference between the vertical beamwidths of the 2 scanners.
- In all cases, you should aim to achieve as much physical separation as possible, to minimize any potential interference.

5.3 Radar scanner protection — sailing vessels

Additional considerations apply when installing the Radar scanner on a sailing vessel.

- When mounting the Radar scanner unit onto the mast, check that the unit is not fouled by the sails, especially when tacking.
- Depending on the type of sailing vessel and the design of the sailplan, a Radar scanner guard should be attached to the mast if the sails or rigging contact either the Radar scanner unit or the mounting bracket. Without a proper Radar guard, serious damage can result to the Radar mounting bracket and the Radar itself. In extreme cases, such damage could result in the Radar scanner unit being pulled off the mast. Therefore, it is recommended that a Radar scanner guard should be mounted additionally and separately to the Radar scanner mounting bracket.
- To prevent the risk of the Radar scanner unit falling after it has been damaged, the security lanyard supplied with the mast bracket **MUST** be secured properly to the mast and to the Radar scanner unit, according to the instructions provided with the bracket. If a safety lanyard is not supplied with the mounting bracket, contact your local dealer for appropriate parts. Do **NOT** attach other equipment to either the Radar scanner unit or the bracket.
- Raymarine strongly recommends that you check the condition and security of the bracket mounting feet, the security lanyard(s), the Radar scanner guard, and the Radar scanner unit itself, on a yearly basis (or more frequently depending on environmental applications). Any fittings should be replaced as appropriate.

The following illustration shows an example of an installation featuring a Radar scanner fitted to a typical mounting bracket, a Radar guard attached to the mast (separately to the Radar mounting bracket), and safety lanyards:



D13412-1

1. Example of a typical safety lanyard.
2. Example of a typical Radar scanner guard, attached to the mast independently of the Radar mounting bracket.

Note: The Radar guard shown in the illustration above is provided as an example only. The exact design and positioning of the Radar guard is wholly dependent on the nature of your vessel, sailplan, and installation environment. For example, for some vessels it is appropriate to locate the guard above the Radar scanner; for other vessels, it may be more appropriate to fit it below the scanner. Raymarine does not supply Radar guards but recommends that you select a guard that is attached directly to the mast and is completely separate to the Radar mounting bracket. It may be necessary to have a Radar guard custom designed to suit your specific vessel and installation environment. Please contact your local dealer for further advice.

Chapter 6: System checks and troubleshooting

Chapter contents

- [6.1 Post installation procedures on page 64](#)
- [6.2 Troubleshooting on page 68](#)

6.1 Post installation procedures

Before using the product, carry out the following:

- Mechanical checks.
- Switch on and initial setup.

Mechanical checks

Before switching on the product:

- Ensure that:
 - All securing bolts are fully tightened and the appropriate mechanical locking washers are in place.
 - All connections are securely made.
 - All connecting cables and wires are secured and protected as necessary.
- Ask your local Raymarine authorized installer to check the installation.

Connecting to a Radar scanner over RayNet

Once you've made all the relevant power and data connections as described in the *Cables and connections* section, you can use the Radar application on a compatible display to conduct further initial tests.

For detailed instructions on how to conduct the initial tests, refer to the *Radar application* chapter of the Operations handbook for your display.

Powering on a Quantum Radar

With the radar scanner in a powered off state, and connected to a compatible multifunction display (MFD):

1. On the MFD, launch the Radar application.
A message box is displayed indicating that a Radar scanner is off or “not connected”.
2. Select **On** from the onscreen message box.
The Radar will power up in Standby mode.
3. Once the Radar has powered up, select **Tx** to start the Radar transmitting.

Radar returns will now be displayed onscreen.

Pairing with a Quantum Radar using Wi-Fi

If your Radar scanner supports a Wi-Fi connection, you can connect to a **LightHouse™** MFD which also supports Wi-Fi. During pairing, the Wi-Fi credentials of all MFDs with Wi-Fi switched on are sent to the Quantum Radar. At subsequent power cycles the Quantum Radar will automatically connect to the MFD with the strongest signal.

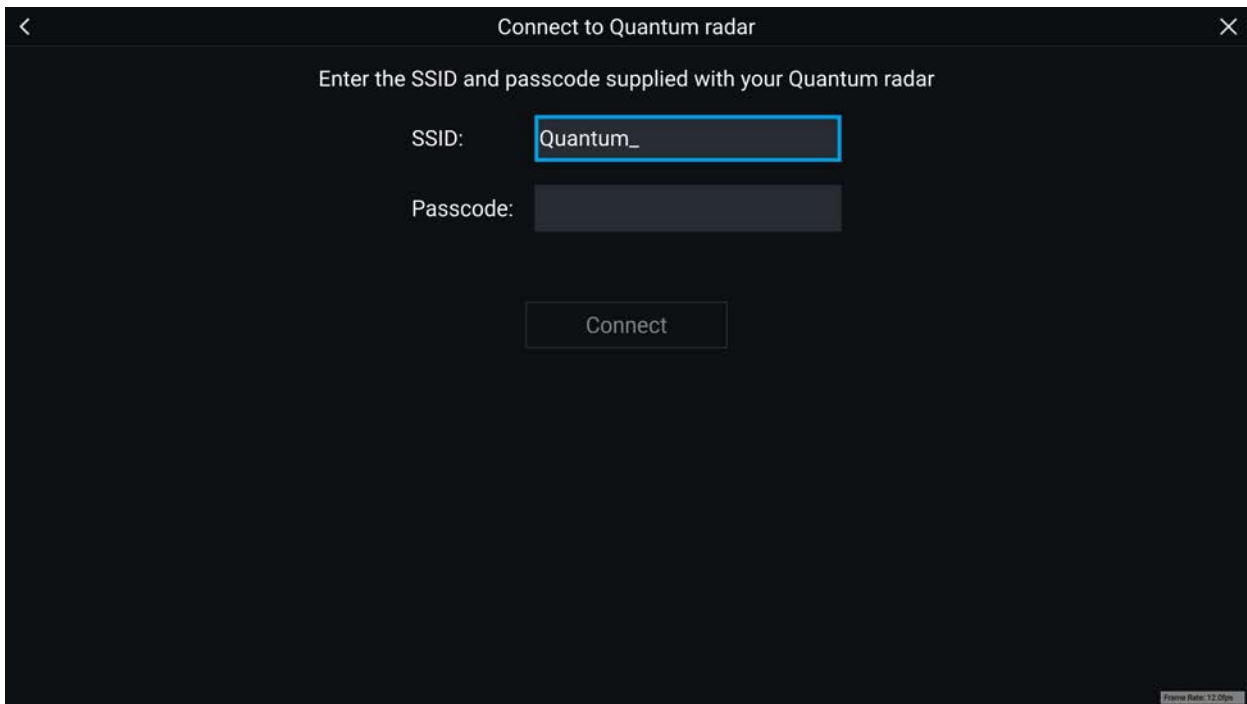
Note:

1. During initial set up you will have 60 minutes (for Quantum Doppler software versions 2.43 or later) or 10 minutes (for earlier Quantum Doppler software versions) in which to connect the Radar to your MFD. After this time, if no connection is made, the Radar will automatically go to Sleep. If this occurs, power cycle the Radar to bring it out of Sleep mode and establish a connection.
2. Networked MFDs that only have their Wi-Fi enabled after the initial pairing period, will send Wi-Fi credentials to the Radar when their Wi-Fi is switched on.

1. Apply power to your MFD(s).
2. Power on and then enable the Wi-Fi connection to the MFDs which have the strongest signal, as identified during the [p.36 — pre-installation site survey](#). Usually these will be the MFDs closest to and / or with the clearest line of sight to the Radar).
3. Apply power to your Radar scanner.
4. Select **Quantum Radar** from the settings menu on the MFD:
 - i. On LightHouse 3 MFD: **Homescreen > Settings > This display (tab) > Pair with Quantum**.
5. If prompted, select **OK** to enable your MFD's Wi-Fi connection.

6. Enter the passcode (e.g. 901589£5) in the **Passcode** field.
Refer to [p.66 – Retain your Wi-Fi Passcode](#) for details on locating your SSID and Passcode.

LightHouse 3 connection screen:



Important:

- Ensure that the SSID and Passcode are entered exactly as shown on the serial number label that was supplied with the Radar.
- The SSID is always made up of the word “**Quantum**”, followed by an underscore “_”, followed by the product’s 7 digit **serial number**, (e.g. **Quantum_1234567**).

7. Select **Connect**.

The initial connection can take up to 2 minutes to complete. If the connection does not complete within 2 minutes, power cycle the Radar and repeat Steps 4 to 7.

8. Select **OK** from the Successful Connection pop-up.
9. Open a Radar application page.
10. Check that the reported Radar on the power / transmit pop-up is the Radar that you have just paired with.
11. If the correct Radar is reported, select **Tx** (Transmit).
12. If the reported Radar is not the Radar scanner you just paired with, select the correct Radar from the Radar application menu: **Menu > Select Radar:** and then select **Tx** (Transmit).

The Radar image can be displayed on all networked MFDs.

MFD access point connection when connected to Quantum Wi-Fi

Depending on you MFD variant, you may be restricted from connecting your MFD to a Wi-Fi access point, if a Quantum Radar that is connected using Wi-Fi is currently transmitting on the system.

a, c, e, gS Series and **Axiom** MFDs CANNOT connect to a Wi-Fi access point if there is a transmitting Wi-Fi connected Quantum Radar in the system. To connect these MFDs to a Wi-Fi access point the Quantum Radar must be placed in Standby mode first.

eS Series and **Axiom Pro** MFDs CAN connect to a Wi-Fi access point at the same time as being connected to a transmitting Wi-Fi connected Quantum Radar.

Standby and sleep modes for Wi-Fi connections

The radar scanner has 2 modes which may initially prevent you from successfully pairing the radar to an MFD via Wi-Fi, in the event that the Wi-Fi connection between the 2 devices is lost. These modes are part of the scanner's normal operation, but it's important to understand how these modes can potentially impact the pairing process.

- **Sleep mode** — If the connection to the MFD is lost while the scanner is in **Standby** mode, the scanner will switch to Sleep mode within 30 minutes. When the connection to the MFD is restored, return the scanner to Standby mode using the **Power up Radar** option on the MFD's Shortcut screen, accessible by momentarily pressing the MFD's Power button.
- **Standby mode** — If the connection to the MFD is lost while the scanner is in **Transmit** mode, the scanner will switch to Standby mode within 5 seconds. When the connection to the MFD is restored, return the scanner to Transmit mode using the **Radar: Tx** option on the MFD's Shortcut screen.

For a full description of all the Radar modes and associated on-screen status symbols, refer to the *Radar scanner status symbols* topic in the *Radar application* chapter of your MFD's Operations handbook.

Retain your Wi-Fi passcode

To connect to the Radar using Wi-Fi (wireless), you will need to know the unit's **SSID**, and **Passcode**. Both the SSID and Passcode are provided on the serial number label on the underside of the unit, and on spare serial number labels supplied in the box. You may wish to make a separate note of this information and keep in a secure location. You should also keep the Radar scanner packaging in a safe place for future reference.

The following information is applicable only to Quantum units running software version 1.62 or later, and Quantum Doppler units running software version 2.43 or later:

In the event that you misplace the SSID and Passcode before the initial pairing, you can power on your Quantum unit and determine the SSID by reviewing all available Wi-Fi networks, using a smartphone, tablet or laptop PC. An unpaired Quantum unit will advertise its SSID periodically in a 10-second cycle. This may take up to 3 minutes.

Once you've obtained the SSID, the next step is to contact [p.78 — Raymarine product support](#), who can then provide you with the passcode associated with your SSID.

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: www.raymarine.com/manuals.

Doppler data source requirements

Use of the Doppler Radar features requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng[®] or NMEA 0183).

Required data sources

Data type	Example data source
COG (Course Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
SOG (Speed Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).

Recommended data source

Data type	Example data source
HDG / HDT (True Heading)	Compass or Autopilot sensor providing Fastheading data (e.g. Evolution EV-1 / EV-2).

Note: A Heading data source is not essential for Doppler operation. However it will improve the performance of Doppler mode at slower speeds (< 15 knots), when tide set and leeway are present.

Radar target acquisition data source requirements

Radar target acquisition requires the following data sources to be available on your system (e.g. connected to your multifunction display, via SeaTalkng® or NMEA 0183).

Data type	Example data source
COG (Course Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
SOG (Speed Over Ground)	GPS or GNSS receiver (MFD internal receiver or external receiver).
HDG / HDT (True Heading)	Compass or Autopilot sensor providing Fastheading data (e.g. Evolution EV-1 / EV-2).

Bearing alignment

The Radar bearing alignment ensures that Radar objects appear at the correct bearing relative to your vessel's bow. You should check the bearing alignment for any new installation.

Checking alignment

Align the bow with a stationary object between 0.25 and 2 NM away.

Reduce the gain to make the target as small as possible on the screen.

Note the position of the object on the Radar screen. If the target is not under the ship's heading marker (SHM), then bearing alignment adjustment is required.

Adjusting alignment

Adjust the **Bearing alignment** setting until the target object appears under the SHM.

Bearing alignment setting can be accessed from the **Installation** tab: **Menu > Installation > Bearing alignment**.

Note: Heading (HDG) is displayed in the Radar application. Please be aware that bearing alignment refers to the **relative** bearing of **targets** to the vessel's bow using visual checks / traditional means.

Heading alignment

For systems with a compass providing heading data, it is important to ensure correct heading alignment.

Correct alignment ensures that the heading data provided by the compass matches the actual heading of the vessel. You should check the heading alignment for any new installation.

Checking alignment

Open the Chart application on the MFD and enable the Radar layer: **Menu > Settings > Layers**.

While the vessel is stationary (e.g. tied to a dock), orient the vessel's bow to a known bearing. Examples include:

- navigational range markers;
- a correctly calibrated fluid-filled compass onboard the vessel;
- other fixed marks from which an accurate heading can be obtained.

Alternatively, another option for checking heading alignment is to align the compass to the Course Over Ground (COG) data provided by a GPS receiver, while your vessel is underway in calm conditions where there is no tide.

Use the Radar and Chart displays to confirm the heading alignment. The on-screen icon representing your vessel should be oriented in exactly the same direction as the known bearing (e.g. navigational range marker).

Adjusting alignment

If the heading alignment is incorrect it may be necessary to re-calibrate the compass.

It is also possible that the compass is affected by sources of magnetic interference (such as marine pontoons, high current carrying cables, or electric motors). In this case it will be necessary to re-linearize the compass to compensate for magnetic interference. In extreme cases it may be necessary to re-locate the compass away from sources of magnetic interference.

For instructions on how to re-calibrate and/or re-linearize the compass, consult the compass manual.

6.2 Troubleshooting

The troubleshooting information provides possible causes and corrective action required for common problems associated with 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 in order 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 Product Support contact details.

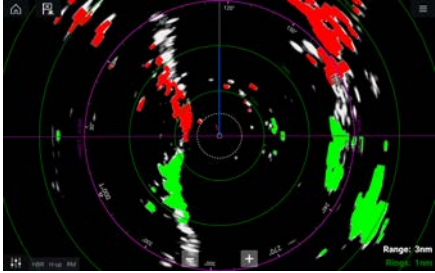
Troubleshooting procedure

Use the following table to identify problems and remedial actions.

Symptom	Action
<p>No connection can be made to the scanner.</p>	<p>Ensure the data cable (if used) is connected at both ends and is in good condition.</p> <p>If using a Wi-Fi (wireless) connection to the scanner unit, check that you have entered the correct Wi-Fi passcode for the SSID that matches your scanner. Both the SSID and Wi-Fi passcode are provided on the scanner packaging, and are also shown on the serial number label on the underside of the unit. For more information, refer to: p.71 – Retain your Wi-Fi passcode.</p> <p>If the scanner unit has shut down, awaken it by using the Power Up Radar option in the Shortcut screen, accessible on your MFD by momentarily pressing the MFD's power key. The Radar unit will shut down within 60 minutes if a wireless (Wi-Fi) connection can't be made to a multifunction display unit (MFD).</p> <p>Ensure power supply thermal breaker has not tripped or fuse has not blown. If necessary, reset breaker or replace fuse ONCE ONLY. If breaker keeps tripping or fuse keeps blowing, contact a Raymarine authorized dealer for assistance.</p> <p>Ensure power supply maintains the correct voltage when the system is switched on.</p> <p>Ensure all products in the system have the correct software. Refer to www.raymarine.com/software for the latest software updates and the software update procedure for your product.</p> <p>If the Quantum™ Radome is connected to the multifunction display (MFD) via a SeaTalk^{hs} or RayNet network switch, ensure that:</p> <ul style="list-style-type: none"> • All relevant equipment is correctly connected to the network switch. • The network switch power supply is satisfactory. • The network switch is in good condition. • Network cables are securely connected and in good condition.
<p>Connection problems when switching from a wireless (Wi-Fi) to a wired (RayNet) connection.</p>	<ol style="list-style-type: none"> 1. Upgrade MFD to latest software. 2. Upgrade Quantum radar to latest software. 3. Disable the MFD's Wi-Fi connection (refer to the MFD operations manual for instructions). 4. Power cycle the Quantum radar. 5. Open the Radar app on the MFD and confirm that the Radar is transmitting. 6. Re-enable the MFD's Wi-Fi connection. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Note: For the latest software, refer to: www.raymarine.com/software</p> </div>

Symptom	Action
	<p>Note: If at some point in the future you decide to revert to the wireless (Wi-Fi) connection, refer to the pairing procedure: .</p>
<p>Displayed bearing is different to the true bearing.</p>	<p>Carry out the bearing alignment procedure described in the MFD Operations manual.</p> <p>Note: Heading (HDG) is displayed in the Radar application on the multifunction display (MFD). Please be aware that bearing alignment refers to the relative bearing of targets to the vessel's bow using visual checks / traditional means.</p>
<p>“Failed to update wired adaptor” error during Quantum software update</p>	<p>Note: The following information does NOT apply to the Wi-Fi-only Quantum variant (E70344).</p> <p>A small number of Quantum units fail to retain the unit’s serial number in the onboard memory. While this does not affect the normal operation or performance of the radar in any way, it is necessary to fix the issue for warranty and servicing purposes:</p> <ul style="list-style-type: none"> • If your MFD is running LightHouse 3, you can fix this issue by upgrading your Quantum unit to the latest available software version. Then power cycle the Quantum unit. • If your MFD is running LightHouse 2, return the Quantum unit to Raymarine Service to have the serial number restored.

Doppler troubleshooting

Symptom	Example	Action
Doppler coloration is incorrect.	In the following example, stationary targets such as land are colored red or green when under way. 	<ol style="list-style-type: none"> 1. Check bearing alignment, as described in this document and the MFD Operations manual. 2. At low speeds (< 15 knots) and if a source of Heading data is available on the system, the compass alignment may be incorrect. Check the compass alignment, as described in the manual for the relevant Heading (compass) device.

Multiple Quantum Radars — more information

Only 1 (one) Quantum™ Radar scanner can be powered at any one time, per networked system.

- It is possible to have 1 Quantum™ + 1 NON-Quantum Raymarine Digital radar scanner powered at the same time, on the same networked system.
- It is NOT possible to have 2 Quantum™ Radar scanners connected via Wi-Fi powered at the same time, on the same networked system, or a single standalone display. While it is technically possible to power up 2 Quantum™ radar scanners connected via Wi-Fi separately to 2 standalone (non-networked) displays, or 2 displays which each belong to a different RayNet network, this configuration is NOT recommended. There may be Wi-Fi radio interference between 2 Quantum™ radars operating at the same time.
- It is NOT recommended to have 2 Quantum™ Radar scanners connected via RayNet powered at the same time, on the same networked system. However, it is possible to have 2 Quantum™ radar scanners connected via RayNet separately to 2 standalone (non-networked) displays, or 2 displays which each belong to a different RayNet network.
- It is NOT possible to have 2 Quantum™ Radar scanners powered at the same time, where one is connected via RayNet, and the other is connected via Wi-Fi, on the same networked system, or single standalone display. However, it is possible to have 2 Quantum™ radar scanners powered in this configuration if they are connected separately to 2 standalone (non-networked) displays, or 2 displays which each belong to a different RayNet network.

Retain your Wi-Fi passcode

To connect to the Radar using Wi-Fi (wireless), you will need to know the unit's **SSID**, and **Passcode**.

Both the SSID and Passcode are provided on the serial number label on the underside of the unit, and on spare serial number labels supplied in the box. You may wish to make a separate note of this information and keep in a secure location. You should also keep the Radar scanner packaging in a safe place for future reference.

The following information is applicable only to Quantum units running software version 1.62 or later, and Quantum Doppler units running software version 2.43 or later:

In the event that you misplace the SSID and Passcode before the initial pairing, you can power on your Quantum unit and determine the SSID by reviewing all available Wi-Fi networks, using a smartphone, tablet or laptop PC. An unpaired Quantum unit will advertise its SSID periodically in a 10-second cycle. This may take up to 3 minutes.

Once you've obtained the SSID, the next step is to contact [p.78 — Raymarine product support](#), who can then provide you with the passcode associated with your SSID.

Wi-Fi troubleshooting

Before troubleshooting problems with your Wi-Fi connection, ensure that you have followed the Wi-Fi location requirements guidance provided in the relevant installation instructions and performed a power cycle/reboot of the devices you are experiencing problems with.

Cannot find network

Possible cause	Possible solutions
Wi-Fi not currently enabled on devices.	Ensure Wi-Fi is enabled on both Wi-Fi devices and rescan available networks.
Some devices may automatically turn off Wi-Fi when not in use to save power.	Power cycle / reboot devices and rescan available networks.
Device not broadcasting.	<ol style="list-style-type: none"> 1. Try to enable broadcasting of the device's network using the Wi-Fi settings on the device you are trying to connect to. 2. You may still be able to connect to the device, when it is not broadcasting, by manually entering the device's Wi-Fi Name / SSID and passphrase in the connection settings of the device you are trying to connect.
Devices out of range or signal being blocked.	Move devices closer together or, if possible remove the obstructions and then rescan available network.

Cannot connect to network

Possible cause	Possible solutions
Some devices may automatically turn off Wi-Fi when not in use to save power.	Power cycle/reboot devices and retry the connection.
Trying to connect to the wrong Wi-Fi network	Ensure you are trying to connect to the correct Wi-Fi network, the Wi-Fi network's name can be found in the Wi-Fi settings on the broadcasting device (the device that you are trying to connect to).
Incorrect network credentials	Ensure you are using the correct passphrase, the Wi-Fi network's passphrase can be found in the Wi-Fi settings on the broadcasting device (the device that you are trying to connect to).
Bulkheads, decks and other heavy structure can degrade and even block the Wi-Fi signal. Depending on the thickness and material used it may not always be possible to pass a Wi-Fi signal through certain structures	<ol style="list-style-type: none"> 1. Try repositioning the devices so the structure is removed from the direct line of sight between the devices, or 2. If possible use a wired connection instead.
Interference being caused by other Wi-Fi enabled or older Bluetooth enabled devices (Bluetooth and Wi-Fi both operate in the 2.4 GHz frequency range, some older bluetooth devices may interfere with Wi-Fi signals.)	<ol style="list-style-type: none"> 1. Change the Wi-Fi Channel of the device you are trying to connect to and retry the connection. You can use free Wi-Fi analyzer apps on your smart device to help you choose a better channel (channel with least traffic). 2. Temporarily disable each wireless device in turn until you have identified the device causing the interference.

Possible cause	Possible solutions
<p>Interference caused by other devices that use the 2.4GHz frequency See list below of some common devices that use the 2.4GHz frequency:</p> <ul style="list-style-type: none"> • Microwave ovens • Fluorescent lighting • Cordless phones / baby monitors • Motion sensors 	<p>Temporarily switch off each device in turn until you have identified the device causing the interference, then remove or reposition the offending device(s).</p>
<p>Interference caused by electrical and electronic devices and associated cabling could generate an electromagnetic field which may interfere with the Wi-Fi signal.</p>	<p>Temporarily switch off each item in turn until you have identified the device causing the interference, then remove or reposition the offending device(s).</p>

Connection extremely slow and or keeps dropping out

Possible cause	Possible solutions
<p>Wi-Fi performance degrades over distance so products farther away will receive less network bandwidth. Products installed close to their maximum Wi-Fi range will experience slow connection speeds, signal drop outs or not being able to connect at all.</p>	<ul style="list-style-type: none"> • Move devices closer together. • For fixed installations such as a Quantum Radar, enable the Wi-Fi connection on an MFD installed closer to the device.
<p>Interference being caused by other Wi-Fi enabled or older Bluetooth enabled devices (Bluetooth and Wi-Fi both operate in the 2.4 GHz frequency range, some older bluetooth devices may interfere with Wi-Fi signals.)</p>	<ol style="list-style-type: none"> 1. Change the Wi-Fi Channel of the device you are trying to connect to and retry the connection. You can use free Wi-Fi analyzer apps on your smart device to help you choose a better channel (channel with least traffic). 2. Temporarily switch off each device in turn until you have identified the device causing the interference, then remove or reposition the offending device(s).
<p>Interference from devices on other vessels. When in close proximity to other vessels, for example, when moored up in a marina, many other Wi-Fi signals may be present.</p>	<ol style="list-style-type: none"> 1. Change the Wi-Fi Channel of the device you are trying to connect to and retry the connection. You can use free Wi-Fi analyzer apps on your smart device to help you choose a better channel (channel with least traffic). 2. If possible, move your vessel to a location with less Wi-Fi traffic.

Network connection established but no data

Possible cause	Possible solutions
<p>Connected to the wrong network.</p>	<p>Ensure that your devices is connected to the correct network.</p>
<p>Device software incompatibility</p>	<p>Ensure both devices are running the latest available software.</p>
<p>It may be possible that the device has become defective</p>	<ol style="list-style-type: none"> 1. Try updating software to a later version, or 2. try reinstalling the software. 3. Obtain new replacement device.

Mobile application running slowly or not at all

Possible cause	Possible solutions
Raymarine app not installed	Install mobile app from relevant app store.
Raymarine app version not compatible with MFD software	Ensure mobile app and MFD software are latest available versions.
Mobile apps not enabled on MFD	Enable “Viewing only” or “Remote Control” as required in the Mobile Apps setting on your MFD.

Wi-Fi connection recovery

You should use the SSID and Passcode supplied with your Radar to pair the Radar with your MFD. In the event that the original SSID and Passcode cannot be located follow the steps below to try and re-connect to your Radar.

1. The Radar will store the Wi-Fi credentials (SSID and passphrase) of the last 10 devices it has been paired with, this means that you can use the Wi-Fi credentials from a MFD that has previously been paired with the Quantum Radar. Enter the MFD’s Wi-Fi Name and Wi-Fi Passphrase on the Quantum Radar pairing page and try to connect. The MFD’s Wi-Fi Name (SSID) and Passphrase is located in the Wi-Fi menu: **(Homescreen > Set-up > System Set-up > Wireless Connections > Wi-Fi > Wi-Fi Sharing)**
2. The following information is applicable only to Quantum units running software version 1.62 or later, and Quantum Doppler units running software version 2.43 or later: In the event that you misplace the SSID and Passcode before the initial pairing, you can power on your Quantum unit and determine the SSID by reviewing all available Wi-Fi networks, using a smartphone, tablet or laptop PC. An unpaired Quantum unit will advertise its SSID periodically in a 10-second cycle. This may take up to 3 minutes. Once you’ve obtained the SSID, the next step is to contact [p.78 — Raymarine product support](#), who can then provide you with the passcode associated with your SSID.

Chapter 7: Maintenance

Chapter contents

- [7.1 Maintenance on page 76](#)
- [7.2 Unit cleaning instructions on page 76](#)

7.1 Maintenance

Once a year:

1. Power-off the Radar.
2. Remove one of the antenna-securing bolts and associated washers.
3. Clean the bolt and washers.
4. Ensure that the passage to the "breather" from the side of the unit is clear of sealant or paint, or other obstacles. For more information on the "breather", refer to: [p.56 – Mounting pre-requisite: "breather" holes](#)
5. Replace the bolt and associated washers.
6. Repeat steps 1 to 5 for all antenna-securing bolts.
7. Tighten all antenna-securing bolts to a torque of 15 N·m (11 lbf·ft).

Periodically, carry out these other maintenance tasks, with the Radar powered off:

- Ensure the antenna is firmly attached to the mounting surface.
- Check that any connected cables are in good condition and securely attached.
- Examine all cables for signs of chafing, cuts or other damage.



Warning: High voltage

This product contains high voltage. Do NOT remove covers or attempt to access internal components, unless specifically instructed in the documentation provided.

7.2 Unit cleaning instructions

The unit does not require regular cleaning. However, if you find it necessary to clean the unit, please follow the steps below:

1. Ensure power is switched off.
2. Wipe unit clean with a damp cloth.
3. If necessary, use a mild detergent solution to remove grease marks.

Chapter 8: Technical support

Chapter contents

- 8.1 Raymarine product support and servicing on page 78
- 8.2 Operation instructions on page 79
- 8.3 Viewing product information (LightHouse™ 3) on page 79

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 diagnostic pages of the connected MFD.

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	Contact
United Kingdom (UK), EMEA, and Asia Pacific	<ul style="list-style-type: none">• E-Mail: emea.service@raymarine.com• Tel: +44 (0)1329 246 932
United States (US)	<ul style="list-style-type: none">• E-Mail: 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** — <http://forum.raymarine.com>
- **Software updates** — <http://www.raymarine.com/software>

Worldwide support

Region	Contact
United Kingdom (UK), EMEA, and Asia Pacific	<ul style="list-style-type: none">• E-Mail: support.uk@raymarine.com• Tel: +44 (0)1329 246 777
United States (US)	<ul style="list-style-type: none">• E-Mail: support@raymarine.com• Tel: +1 (603) 324 7900 (Toll-free: +800 539 5539)
Australia and New Zealand (Raymarine subsidiary)	<ul style="list-style-type: none">• E-Mail: aus.support@raymarine.com• Tel: +61 2 8977 0300
France (Raymarine subsidiary)	<ul style="list-style-type: none">• E-Mail: support.fr@raymarine.com• Tel: +33 (0)1 46 49 72 30
Germany (Raymarine subsidiary)	<ul style="list-style-type: none">• E-Mail: support.de@raymarine.com• Tel: +49 (0)40 237 808 0
Italy (Raymarine subsidiary)	<ul style="list-style-type: none">• E-Mail: support.it@raymarine.com• Tel: +39 02 9945 1001
Spain (Authorized Raymarine distributor)	<ul style="list-style-type: none">• E-Mail: sat@azimut.es• Tel: +34 96 2965 102
Netherlands (Raymarine subsidiary)	<ul style="list-style-type: none">• E-Mail: support.nl@raymarine.com• Tel: +31 (0)26 3614 905

Region	Contact
Sweden (Raymarine subsidiary)	<ul style="list-style-type: none"> E-Mail: support.se@raymarine.com Tel: +46 (0)317 633 670
Finland (Raymarine subsidiary)	<ul style="list-style-type: none"> E-Mail: support.fi@raymarine.com Tel: +358 (0)207 619 937
Norway (Raymarine subsidiary)	<ul style="list-style-type: none"> E-Mail: support.no@raymarine.com Tel: +47 692 64 600
Denmark (Raymarine subsidiary)	<ul style="list-style-type: none"> E-Mail: support.dk@raymarine.com Tel: +45 437 164 64
Russia (Authorized Raymarine distributor)	<ul style="list-style-type: none"> E-Mail: info@mikstmarine.ru Tel: +7 495 788 0508

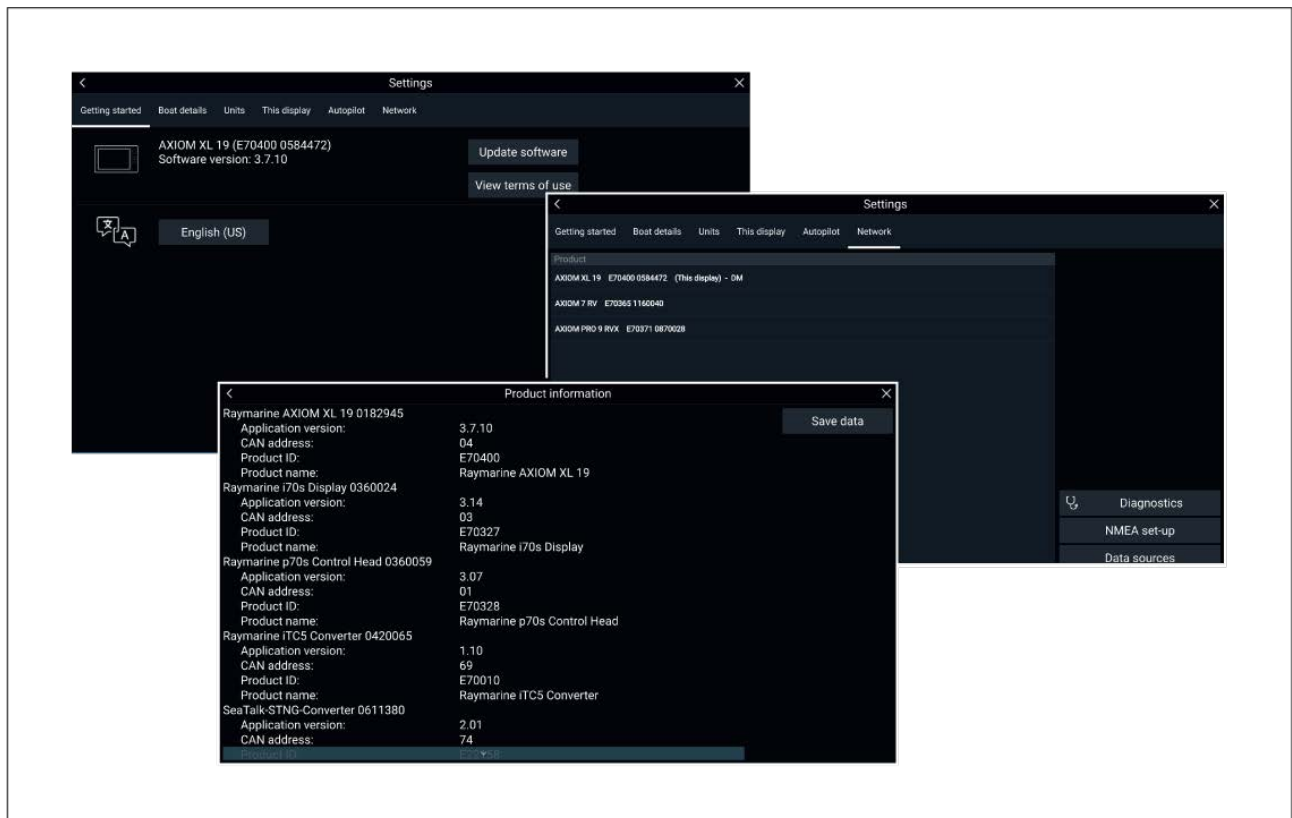
8.2 Operation instructions

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: www.raymarine.com/manuals.

8.3 Viewing product information (LightHouse™ 3)

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



1. Select **Settings**, from the Homescreen.

The **Getting started** menu contains hardware and software information for your MFD.

2. You can view further information about your MFD, or view information about products networked using SeaTalkhs® and SeaTalkng® / NMEA 2000, by selecting the **Network** tab, then:

- i. to display detailed software information and your MFD's network IP address, select your MFD from the list.
- ii. to display detailed diagnostics information for all products, select **Product info** from the **Diagnostics** pop over menu.

Chapter 9: Technical specification

Chapter contents

- [9.1 Technical specification on page 82](#)

9.1 Technical specification

Approvals

Approvals:	Certification:
USA:	47CFR FCC Part 2 & Part 80 Certificate of Approval
Canada:	RSS238 Iss. 1 Technical Acceptance Certificate
European Union & EFTA:	Radio Equipment Directive 2014/53/EU Certificate of Opinion
Australia/New Zealand:	ACMA Declaration of Conformity Compliance level 3

General

Dimensions:	
Diameter:	541.0 mm
Height:	209.5 mm
Weight:	5.6 kg
Supply voltage:	Either 12 V dc or 24 V dc nominal Minimum: 10.8 V dc Maximum: 31.2 V dc
Power consumption:	Transmit mode (maximum): 17 W Standby mode: 7 W Sleep mode (applies only to radars connected via Wi-Fi): 2 W
Environmental:	
Waterproof to:	IPX6
Operating temperature range:	-10°C to +55°C
Storage temperature range:	-25°C to +70°C
Additional storage conditions:	Store upright; do not block vents on underside
Humidity:	Up to 95% at 35°C
Maximum wind speed:	100 kts
Range scales:	1/16, 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, and 24 nautical miles

Transmitter

Type:	X-band solid-state transmitter with pulse compression technology
Transmit frequency:	9354 MHz to 9446 MHz
Peak power output:	20 W
Duplexer:	Circulator
Pulse widths (3 dB):	40 ns to 14.7µs
Chirp lengths:	400 ns to 22 µs
Pulse repetition frequency:	920 Hz to 5900 Hz
Chirp bandwidth:	Up to 32 MHz
Standby mode:	Scanner rotation - OFF Scanner transmission - OFF Wi-Fi link - ON

Receiver

IF frequency:	26 MHz
Noise figure:	Less than 4 dB

Antenna

Type:	Patch Array
Beamwidth (nominal)	Horizontal: 4.9° Vertical: 20°
Polarization:	Horizontal
Rotation speed:	24 rpm nominal

Doppler

Target tracking	Tracking of 25 simultaneous Radar targets.
Target filtering	True Motion mode identifies only those objects that are moving relative to the vessel.

Chapter 10: Spares and accessories

Chapter contents

- 10.1 Quantum Radar accessories on page 86
- 10.2 Network hardware on page 86
- 10.3 Network cable connector types on page 87
- 10.4 RayNet to RayNet cables and connectors on page 88
- 10.5 RayNet to RJ45 adapter cables on page 89

10.1 Quantum Radar accessories

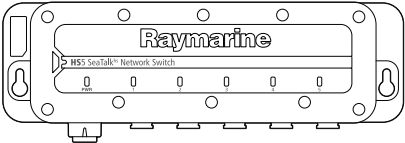
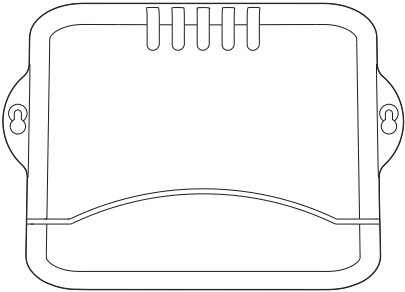
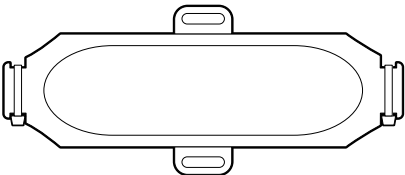
The following accessories are available for the Quantum™ Radar scanner:

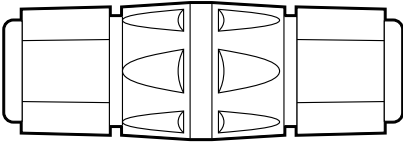
Accessories

Item	Part number
10 m (32.8 ft.) Quantum™ power cable	A80309
15 m (49.2 ft.) Quantum™ power cable	A80369
5 m (16.4 ft.) Quantum™ data cable	A80274
10 m (32.8 ft.) Quantum™ data cable	A80275
15 m (49.2 ft.) Quantum™ data cable	A80310
25 m (82.0 ft.) Quantum™ data cable	A80311
Quantum™ Y-adapter cable	A80308
RayNet cable joiner	A80162

Note: For more information on additional RayNet cables and adapters, refer to [p.88 — RayNet to RayNet cables and connectors](#) and [p.89 — RayNet to RJ45 adapter cables](#).

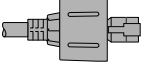

10.2 Network hardware

Item	Part number	Notes
HS5 RayNet network switch 	A80007	5–port switch for network connection of multiple devices featuring RayNet connectors. Equipment with RJ45 SeaTalk ^{hs} connectors can also be connected using suitable adapter cables.
RJ45 SeaTalk ^{hs} network switch 	E55058	8–port switch for network connection of multiple SeaTalk ^{hs} devices featuring RJ45 connectors.
RJ45 SeaTalk ^{hs} crossover coupler 	E55060	<ul style="list-style-type: none"> Enables direct connection of RJ45 SeaTalk^{hs} devices to smaller systems where a switch is not required. Enables the connection of RJ45 SeaTalk^{hs} devices to a HS5 RayNet network switch (in conjunction with suitable adapter cables). Enables 2 RJ45 SeaTalk^{hs} cables to be connected together to extend the length of the cabling. Recommended for internal installations. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Important: Do NOT use crossover devices for POE (Power Over Ethernet) connections.</p> </div>

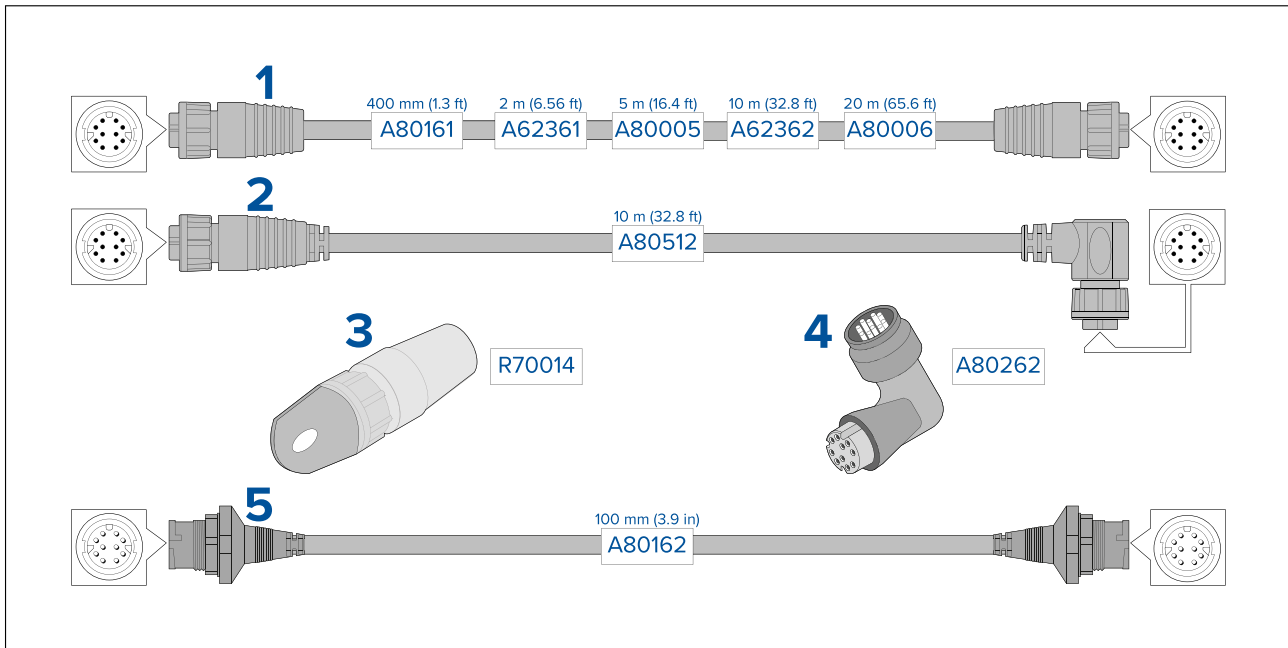
Item	Part number	Notes
Ethernet RJ45 coupler 	R32142	<ul style="list-style-type: none"> • Enables direct connection of RJ45 SeaTalk^{hs} devices to smaller systems where a switch is not required. • Enables the connection of RJ45 SeaTalk^{hs} devices to a HS5 RayNet network switch (in conjunction with suitable adapter cables). • Enables 2 RJ45 SeaTalk^{hs} cables to be connected together to extend the length of the cabling. Recommended for external installations.

10.3 Network cable connector types

There are 2 types of network cable connector — RayNet, and RJ45 SeaTalk^{hs}.

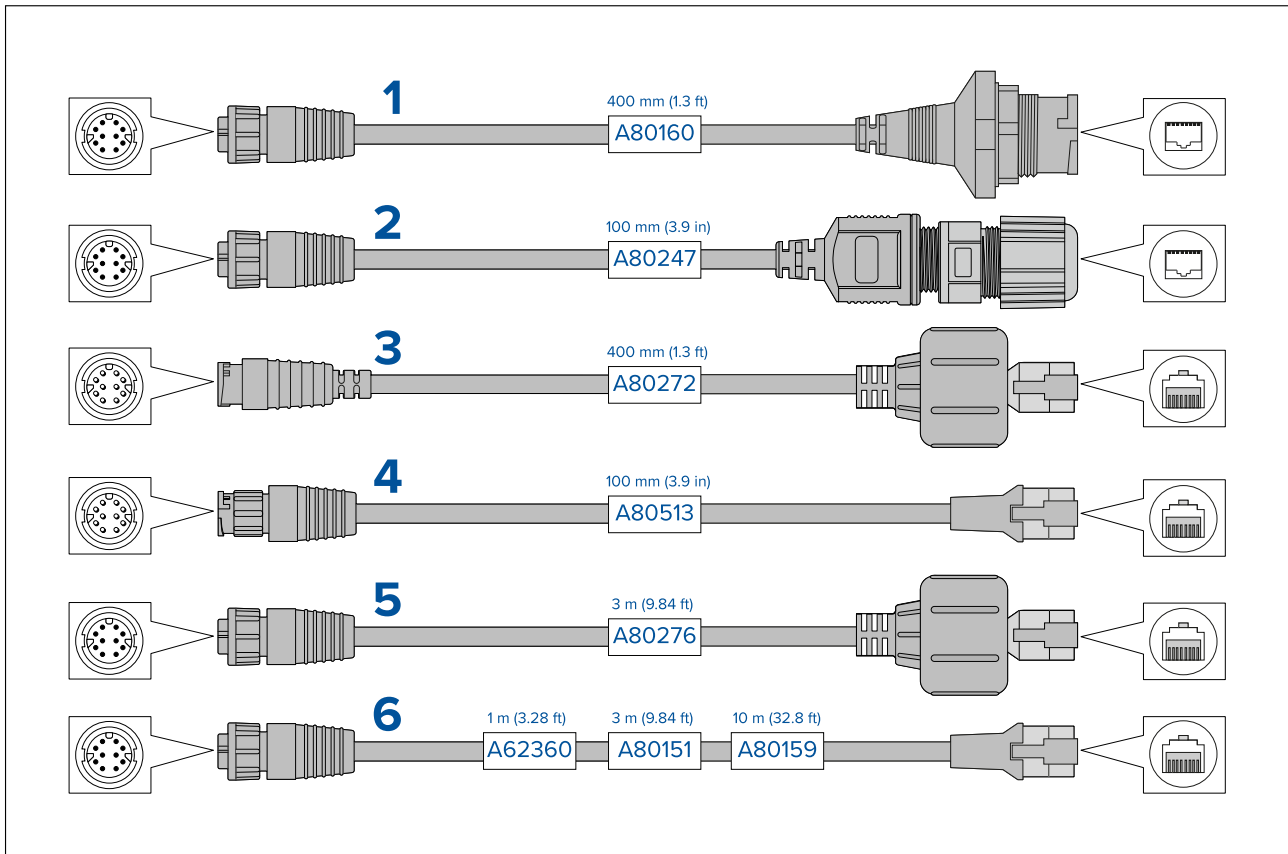
	RJ45 SeaTalk^{hs} connector.
	RayNet connector.

10.4 RayNet to RayNet cables and connectors



	Description
1	Standard RayNet connection cable with a RayNet (female) socket on both ends.
2	Right-angle RayNet connection cable with a straight RayNet (female) socket on one end, and a right-angle RayNet (female) socket on the other. Suitable for connecting at 90° (right angle) to a device, for installations where space is limited.
3	RayNet cable puller (5 pack).
4	RayNet to RayNet right-angle coupler / adapter. Suitable for connecting RayNet cables at 90° (right angle) to devices, for installations where space is limited.
5	Adapter cable with a RayNet (male) plug on both ends. Suitable for joining (female) RayNet cables together for longer cable runs.

10.5 RayNet to RJ45 adapter cables



	Description
1	Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) socket on the other end accepting the following cables with an RJ45 SeaTalk^{hs} waterproof locking (male) plug: <ul style="list-style-type: none"> • A62245 (1.5 m). • A62246 (15 m).
2	Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 socket on the other end, along with a locking gland for a watertight fit.
3	Adapter cable with a RayNet (male) plug on one end, and an RJ45 SeaTalk^{hs} waterproof (male) plug on the other end.
4	Adapter cable with a RayNet (male) plug on one end, and an RJ45 SeaTalk^{hs} (male) plug on the other end.
5	Adapter cable with a RayNet (female) socket on one end, and an RJ45 SeaTalk^{hs} waterproof (male) plug on the other end.
6	Adapter cable with a RayNet (female) socket on one end, and an RJ45 SeaTalk^{hs} (male) socket on the other end.

Index

A

Accessories	86
Network adapter cables	89
Network cables	88
Network hardware	86
RayNet cables	88
Auto acquisition	
Data source requirements	23, 67

C

Cable	
Bend radius	40
Protection	40–41
Routing	40
Security	40
Strain relief	40
Cable routing (pole mount)	45
Chart	
Heading alignment	67
Cleaning	76
Compass safe distance	11
Compatible displays	24
Connections	
Battery	49
Distribution panel	48
General cabling guidance	40
Network switch	53
RayNet	51
Wi-Fi	52, 64
Contact details	78

D

Diagnostics	79
Dimensions	29
Documentation	
Operation instructions	13, 23, 66, 79
Doppler	
Data source requirements	22, 66
Overview	18
Technical Specification	83
Troubleshooting	71

E

Electromagnetic Compatibility	11
EMC, <i>See</i> Electromagnetic Compatibility	

F

Fuse rating	48
-------------------	----

I

Installation	
Best practice	51
Checklist	22
Mounting	56
Multiple radar scanners	71
Schematic diagram	22

Tools required	26
Wireless considerations	10, 32, 35
Interference	11
<i>See also</i> Compass safe distance	
IP address	80

L

Location requirements	
Wi-Fi	32
Wireless	35

M

Maintenance	10
MARPA	
Data source requirements	23, 67

O

Operation instructions	13, 23, 66, 79
------------------------------	----------------

P

Parts supplied	17
Power	
Battery connection	49
Connection	47
Distribution	48
Distribution panel	48
Fuse and breaker ratings	48
Grounding	48, 51
Sharing a breaker	49
Power cable extension	50
Product information	79
Product overview	18
Product recycling (WEEE)	12
Product support	78

R

Radar	
Bearing alignment	67
Heading alignment	67
Radar, required additional system components	22
RayNet	
cables	88–89

S

Service Center	78
Servicing	10
Software requirements	25
Software updates	25

T

Technical specification	81
Technical support	78
Thermal breaker rating	48
Troubleshooting	68–69
Typical system examples	26

U

Upgrading, *See* Software updates

W

Warranty	78
WEEE Directive	12
What's in the box	17
Wireless	
Interference	35



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