Raymarine®

MAGNUM RADAR

Installation instructions

Trademark and patents notice

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Fair Use Statement

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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.

Contents

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 voltages
> This product may contain high voltages. Do NOT remove any covers or otherwise attempt to access internal components, unless specifically instructed in the documentation provided.

> ### Warning: Product grounding
> Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions provided.

> ### Warning: Radar scanner safety
> Before rotating the Radar scanner, ensure all personnel are clear.

	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.

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.

Transmitted power density levels

- A power density level of 10 W/m^2 is likely at distances of 34 cm or less from the radar scanner.

- A power density level of 100 W/m^2 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 commercial high-pressure washing. Raymarine will not warrant products subjected to high-pressure washing.

Disclaimer

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

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

EMC installation guidelines

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

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

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

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

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft (2 m).
  - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended, unless doing so is detailed in the installation manual.

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

Compass safe distance

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

When choosing a suitable location for the product you should aim to maintain the maximum possible distance from any compasses. Typically this distance should be at least 1 m (3 ft) in all directions. However for some smaller vessels it may not be possible to locate the product this far away from a compass. In this situation, when choosing the installation location for your product, ensure that the compass is not affected by the product when it is in a powered state.

Declaration of Conformity

FLIR Belgium BVBA declares that the radio equipment type Magnum Open Array radars, part numbers E70484, E70487, E70490, and E70491, are 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 following table:

Region	Website	Region	Website
AT	www.araplus.at	IT	www.erp-recycling.org/it-it
BE	www.recupel.be	LT	www.eei.lt
BG	www.greentech.bg	LU	www.ecotrel.lu, https://aev.gouvernement.lu/fr.html
CY	www.electrocyclosis.com.cy	LV	www.lze.lv
CZ	www.retela.cz	MT	http://www.greenpak.com.mt
DE	www.earn-service.com	NL	www.wecycle.nl
DK	www.elretur.dk	PL	www.electro-system.pl
EE	www.elektroonikaromu.ee	PT	www.amb3e.pt
ES	www.raee-asimelec.es	RO	www.ecotic.ro
FI	www.elker.fi	SE	www.el-kretsen.se
FR	www.ecologic-france.com, www.eco-systemes.fr	SI	www.zeos.si
GR	www.electrocycle.gr	SK	www.erp-recycling.sk
IE	www.weeeireland.ie	UK	www.wastecare.co.uk/compliance-services/weeecare

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.

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.

Multifunction display software version

To ensure optimum performance and compatibility with external devices, your multifunction display must be using the latest software version.

Visit www.raymarine.com to download the latest software.

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.

Chapter 2: Document and product information

Chapter contents

2.1 Document information

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

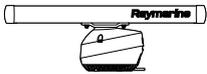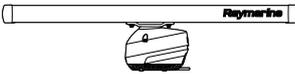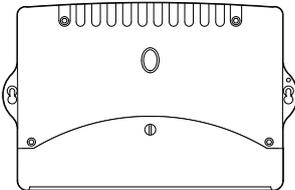The document includes information to help you:

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

This and other Raymarine product documents are available to download in PDF format from www.raymarine.com/manuals.

Applicable products

This document is applicable to the following products:

	Part no.	Name	Description
	T70408	4 kW Magnum Open Array Radar (4 ft array)	4 kW Magnum Open Array Radar scanner and VCM100 (E70484); 4 ft array (E70490). Supplied with a 15 m combined power-and-data cable with RayNet connector (A80229).
	T70412	12 kW Magnum Open Array Radar (4 ft array)	12 kW Magnum Open Array Radar scanner and VCM100 (E70487); 4 ft array (E70490). Supplied with a 15 m combined power-and-data cable with RayNet connector (A80229).
	T70410	4 kW Magnum Open Array Radar (6 ft array)	4 kW Magnum Open Array Radar scanner and VCM100 (E70484); 6 ft array (E70491). Supplied with a 15 m combined power-and-data cable with RayNet connector (A80229).
	T70414	12 kW Magnum Open Array Radar (6 ft array)	12 kW Magnum Open Array Radar scanner and VCM100 (E70487); 6 ft array (E70491). Supplied with a 15 m combined power-and-data cable with RayNet connector (A80229).
	E52091	VCM100 Voltage Converter Module	Power converter; required to provide power to the Magnum Open Array Radar scanner.

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 Txxxxx 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
Magnum Open Array Radar installation instructions Installation of a Magnum Open Array Radar scanner and connection to a wider system of marine electronics.	87324
Magnum Open Array Radar Mounting template Mounting diagram for surface mounting a Magnum Open Array Radar scanner.	87325
LightHouse™ 3 MFD Basic Operation Instructions Summarizes the operation of the Radar application for LightHouse™ 3-compatible multifunction displays.	81369
LightHouse™ 3 MFD Advanced Operation Instructions Details the operation of the Radar application for LightHouse™ 3-compatible multifunction displays.	81370
LightHouse™ 2 MFD Operation Instructions Details the operation of the Radar application for LightHouse™ 2-compatible multifunction displays.	81360
E-Series Networked Display Reference Manual Details the operation of E-Series Classic multifunction displays.	81244
C-Series Widescreen MFD User reference handbook Details the operation of C-Series Widescreen multifunction displays.	81312
E-Series Widescreen MFD User reference handbook Detail the operation of E-Series Widescreen multifunction displays.	81320
G-Series system MFD User Reference Details the operation of G-Series multifunction displays.	81276

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 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™ 2 MFD document number: 81360 • LightHouse™ 3 MFD document number: 81370

2.2 Parts supplied (pedestal and VCM100)

Parts illustrated are supplied in the pedestal box for the following part numbers: T70408, T70410, T70412, T70414
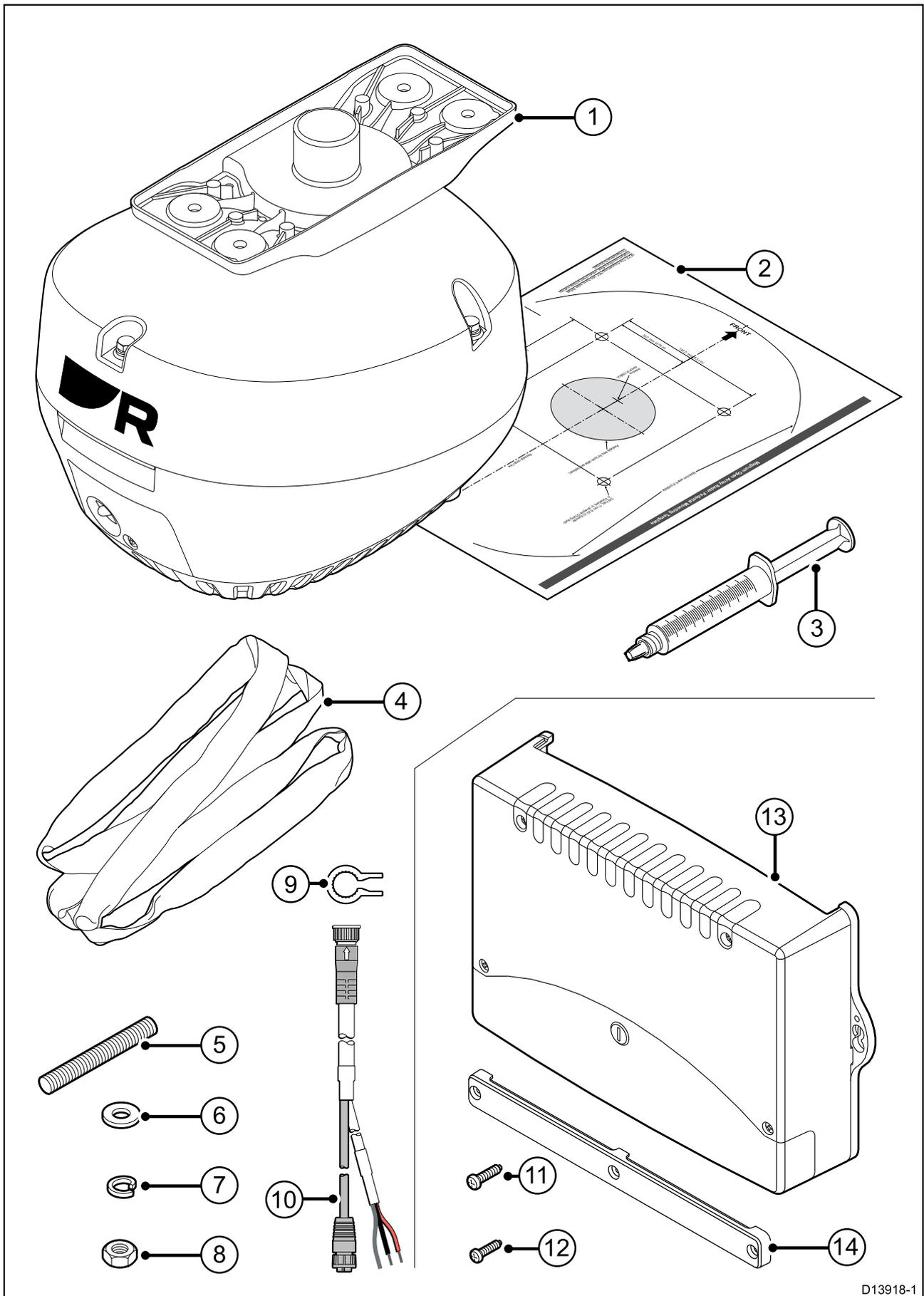
D13918-1

Item	Description	Quantity
1	Pedestal	1
2	Mounting template	1
3	Denso paste	1
4	Lifting sling	1
5	Stud	4
6	Plain washer	4
7	Spring washer	4
8	Nut	8
9	Cable tightening tool	1
10	Radar-to-'RayNet & power' cable (15 m)	1
11	VCM100 mounting screw	2
12	VCM100 cable clamp mounting screw	3
13	VCM100 Voltage Converter Module	1
14	VCM100 cable clamp	1

2.3 Parts supplied (antenna)

Parts illustrated are supplied in the antenna box for the following part numbers: T70408, T70410, T70412, T70414

D13945-1
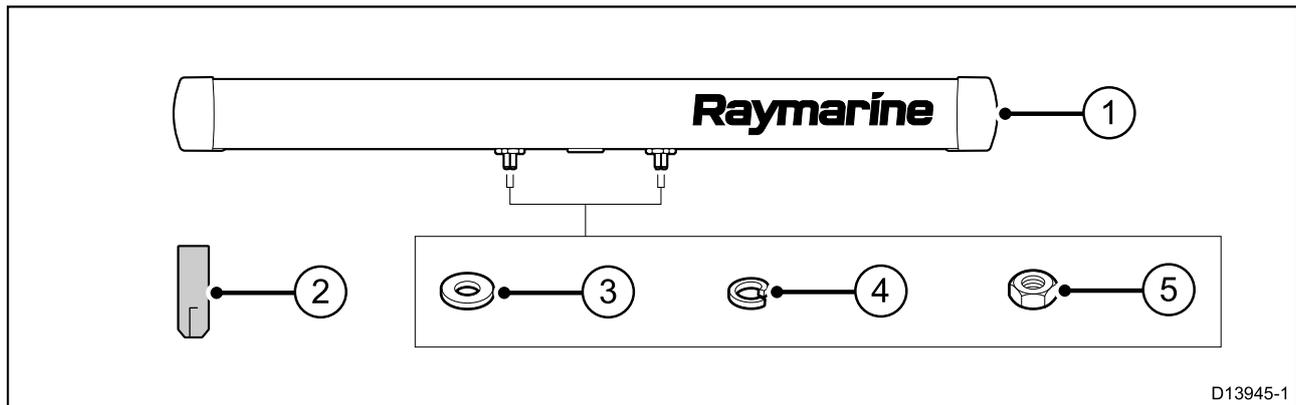
Item	Description	Quantity
1	Antenna (4 ft or 6 ft — 4 ft illustrated)	1
2	Threaded alignment guide	4
3	Plain washer	4
4	Spring washer	4
5	Nut	4

Note: The supplied nut and washer fixings are attached to the antenna studs when packaged.

2.4 Magnum Open Array Radar product overview

The Magnum™ Open Array Radar is a magnetron radar, utilizing narrow beamwidths and high power output to detect and resolve low reflectivity targets at ranges up to 96 nm. In conjunction with a compatible multifunction display, the Magnum™ scanner provides a map-like representation of an extended area around your vessel, enabling you to identify birds, weather, other vessels, and land features such as coastlines and hills.

D13946-1
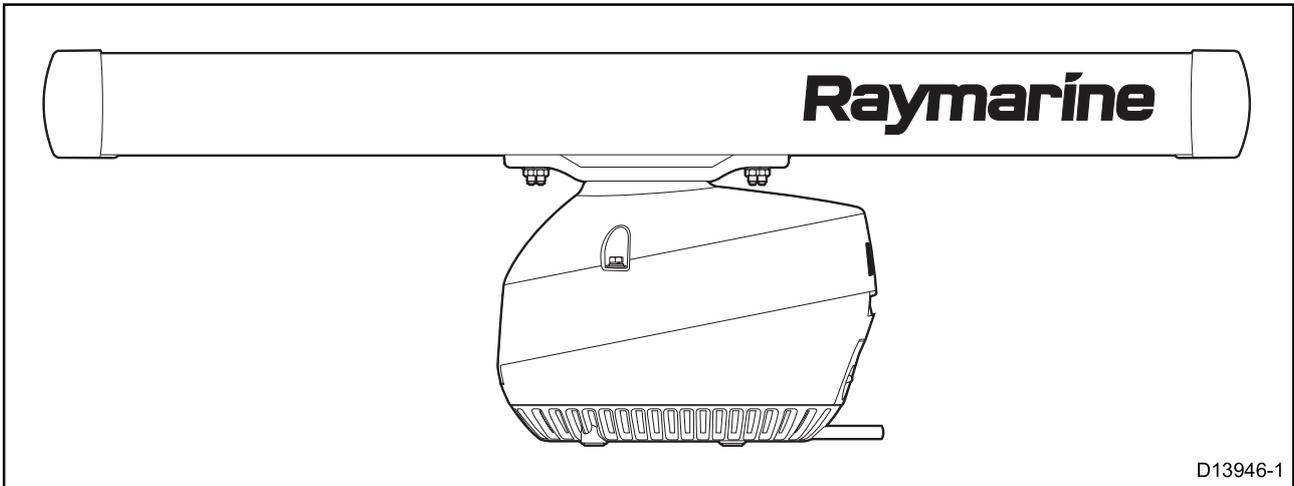
The Magnum™ Open Array Radar includes the following features:

- Range performance up to 96 nm (12 kW variant; dependent on installation location).
- Narrow horizontal beam widths for enhanced target separation.
- "Bird mode" for bird detection up to 12 nm.
- Weather detection.
- Radar image display and control via Raymarine multifunction display.
- Real-time heading display (requires position-data source in system).
- Relative-motion "true trails" (requires position-data source in system).
- Automatic MARPA for target tracking and collision avoidance.
- 48 RPM scanner rotation.
- Data connection via RayNet cable.
- 12 V or 24 V operation (with supplied VCM100 power converter)
- Waterproof to IPX 6.

Multiple radar scanners

You can use a **maximum of two radar scanners** at any one time, per networked system.

For example, you can install, and simultaneously use:

- A Magnum Open Array radar, and a Quantum Radome radar.
- Two Magnum Open Array radars.
- A Magnum Open Array radar, and an HD/SHD Digital Open Array radar.

Note: You can use **only one Quantum radome** at any one time, per networked system.

For important information about how to position multiple radar scanners to avoid interference between the scanners, see **Radar scanner location requirements**.

Chapter 3: Planning the installation

Chapter contents

3.1 Installation checklist

Installation includes the following activities:

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

Schematic diagram

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

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

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 3.3 **Multifunction display compatibility** for a list of compatible multifunction displays.

- Optional MARPA data source. See **MARPA / Auto acquisition data source requirements** for more information.

MARPA / Auto acquisition data source requirements

Use of the MARPA/Auto acquisition 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).

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).

3.3 Multifunction display compatibility

Compatible multifunction displays

This product is compatible with both LightHouse™-powered Raymarine multifunction displays, and legacy Raymarine multifunction displays.

> **Note:** Some features of the Magnum Open Array Radar may not be available with certain multifunction displays and software. See **Magnum radar feature compatibility** for more information.

LightHouse™ MFDs:
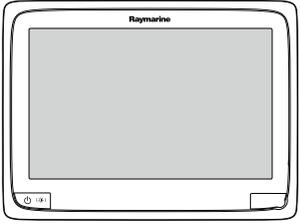
	Product variants		Product variants
	a Series		eS Series
	c Series		gS Series
	e Series		Axiom
	Axiom Pro / Pro-S		Axiom XL
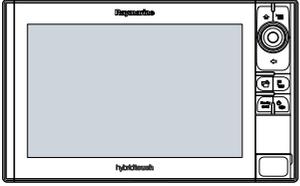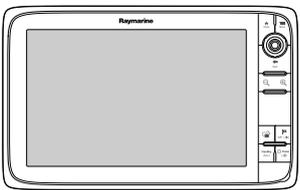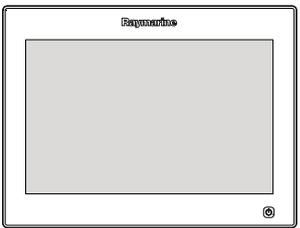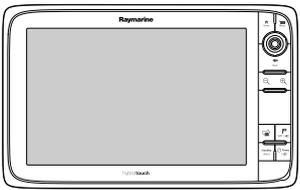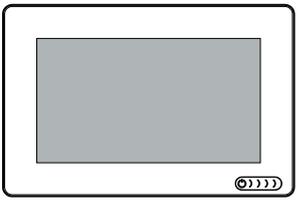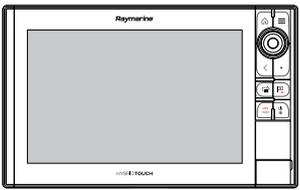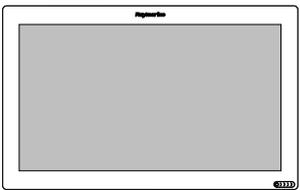
Legacy MFDs
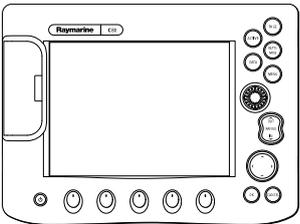
	Product variants		Product variants
	E-Series Classic E80, E120		C-Series Widescreen C90W, C120W, C140W
			E-Series Widescreen E90W, E120W, E140W
	G-Series GPM400		
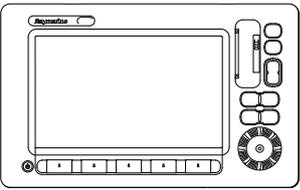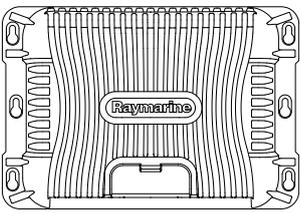
Lighthouse MFD software requirements

To use this product with a Raymarine LightHouse™ MFD, ensure that your MFD is running the required version of the software.

MFD software	Required version
LightHouse™ 2	R17 or later
LightHouse™ 3	3.3 or later

Note:
The latest MFD software can be obtained by visiting www.raymarine.com/software.

Magnum radar feature compatibility

Some features of the Magnum Open Array Radar are available only with the latest multifunction displays, running a recent version of LightHouse™ software.

The following table shows which new radar features are available for each supported MFD.

MFD	Software version	Real-time heading	Automatic MARPA	True Trails	96 nm range scale	Improved bird mode
E-Series Classic	v5.69	✖	✖	✖	✖	✖
C-Series Widescreen	v2.35	✖	✖	✖	✖	✖
E-Series Widescreen	v2.65	✖	✖	✖	✖	✓
G-Series	v4.66	✖	✖	✖	✖	✓
aSeries, cSeries, eSeries	LightHouse 2 (R17 or higher)	✖	✖	✖	✖	✓
eS-Series, gS-Series	LightHouse 2 (R17 or higher)	✖	✖	✖	✖	✓
	LightHouse 3 (3.3)	✓	✖	✖	✖	✓
	LightHouse 3 (3.4 or higher)	✓	✓	✓	✓	✓
Axiom, Axiom Pro, Axiom XL	LightHouse 3 (3.0 to 3.3)	✓	✖	✖	✖	✓
	LightHouse 3 (3.4 or higher)	✓	✓	✓	✓	✓

3.4 Typical system examples

The Magnum Open Array Radar scanner can be connected to a variety of equipment as part of your marine electronics system.

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 how to connect the products, refer to the Chapter 4 **Cables and connections** section.

- For information on available cables and accessories, refer to the Chapter 10 **Spares and accessories** section.

Radar connected using RayNet switch
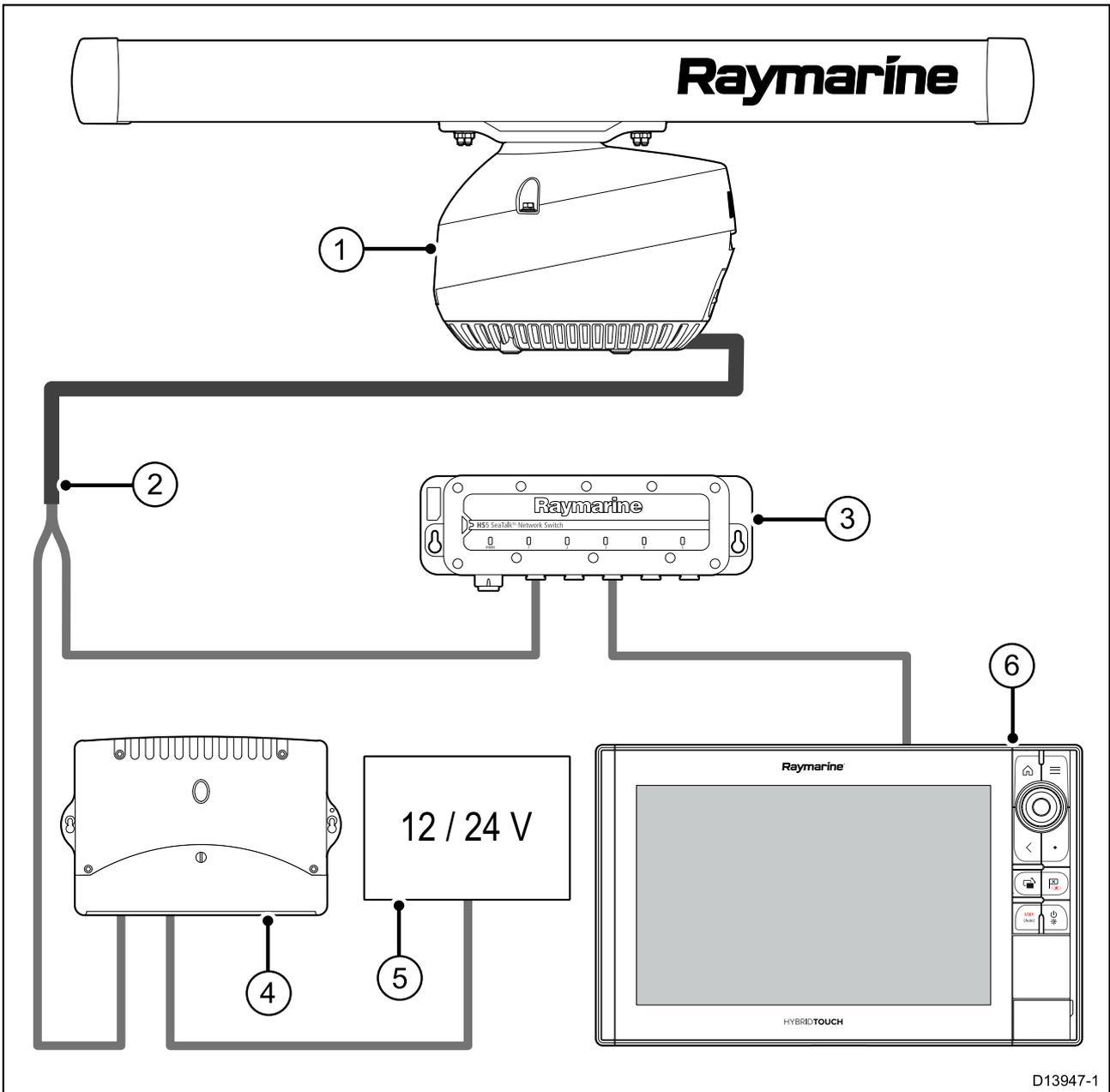
D13947-1

Note: Some power connections are omitted from this illustration. The network switch and multifunction display each require a dedicated power connection.

Item	Description
1	Magnum Open Array Radar scanner
2	Radar to "RayNet & Power" cable (supplied)
3	HS5 RayNet network switch
4	VCM100 power converter
5	Power supply
6	Axiom Pro multifunction display

Radar connected directly to RayNet multifunction display
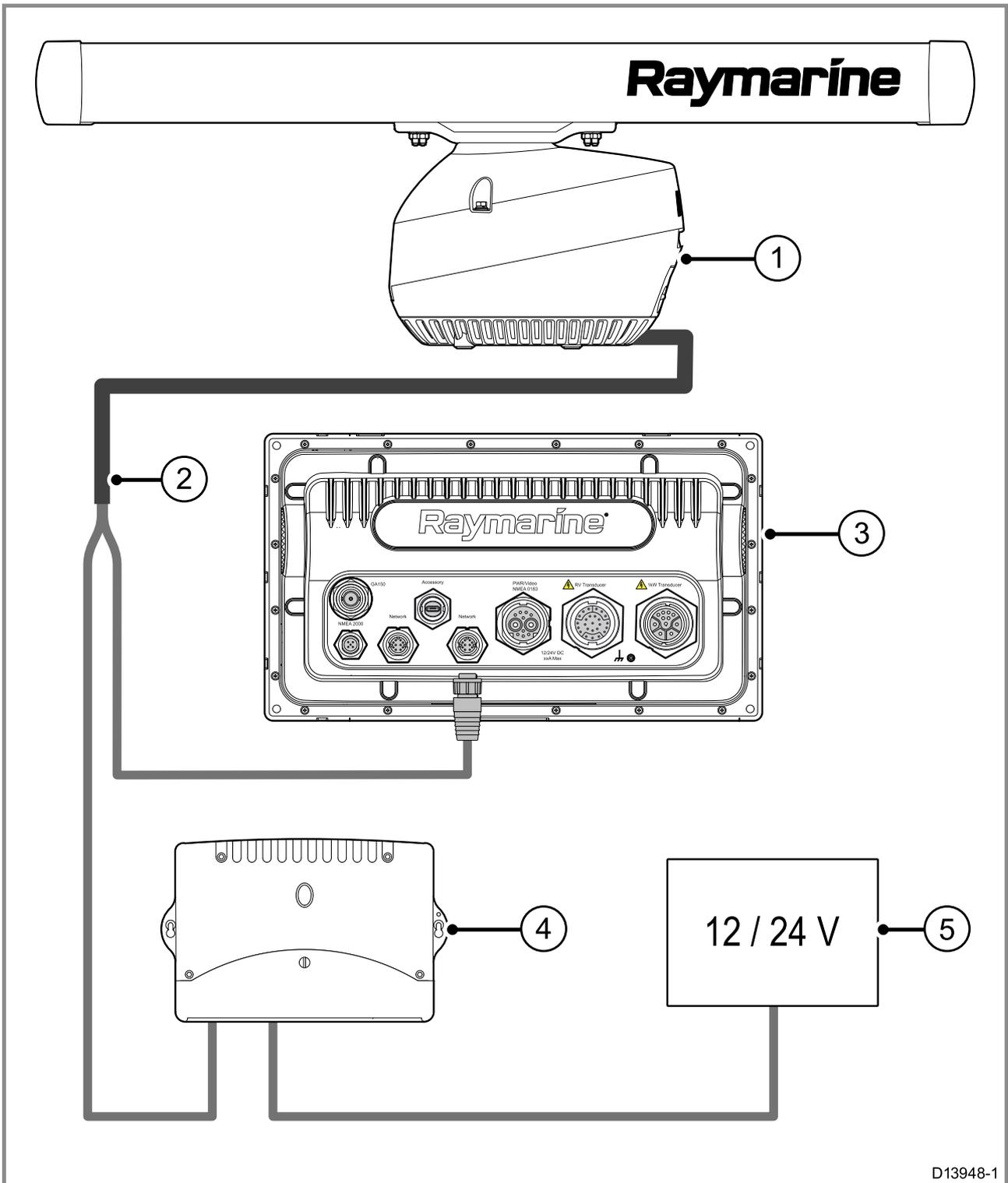
D13948-1

Note: Some power connections are omitted from this illustration. The network switch and multifunction display each require a dedicated power connection.

Item	Description
1	Magnum Open Array Radar scanner
2	Radar to "RayNet & Power" cable (supplied)
3	Axiom Pro multifunction display
4	VCM100 power converter
5	Power supply

Radar connected using SeaTalk ʰˢ switch
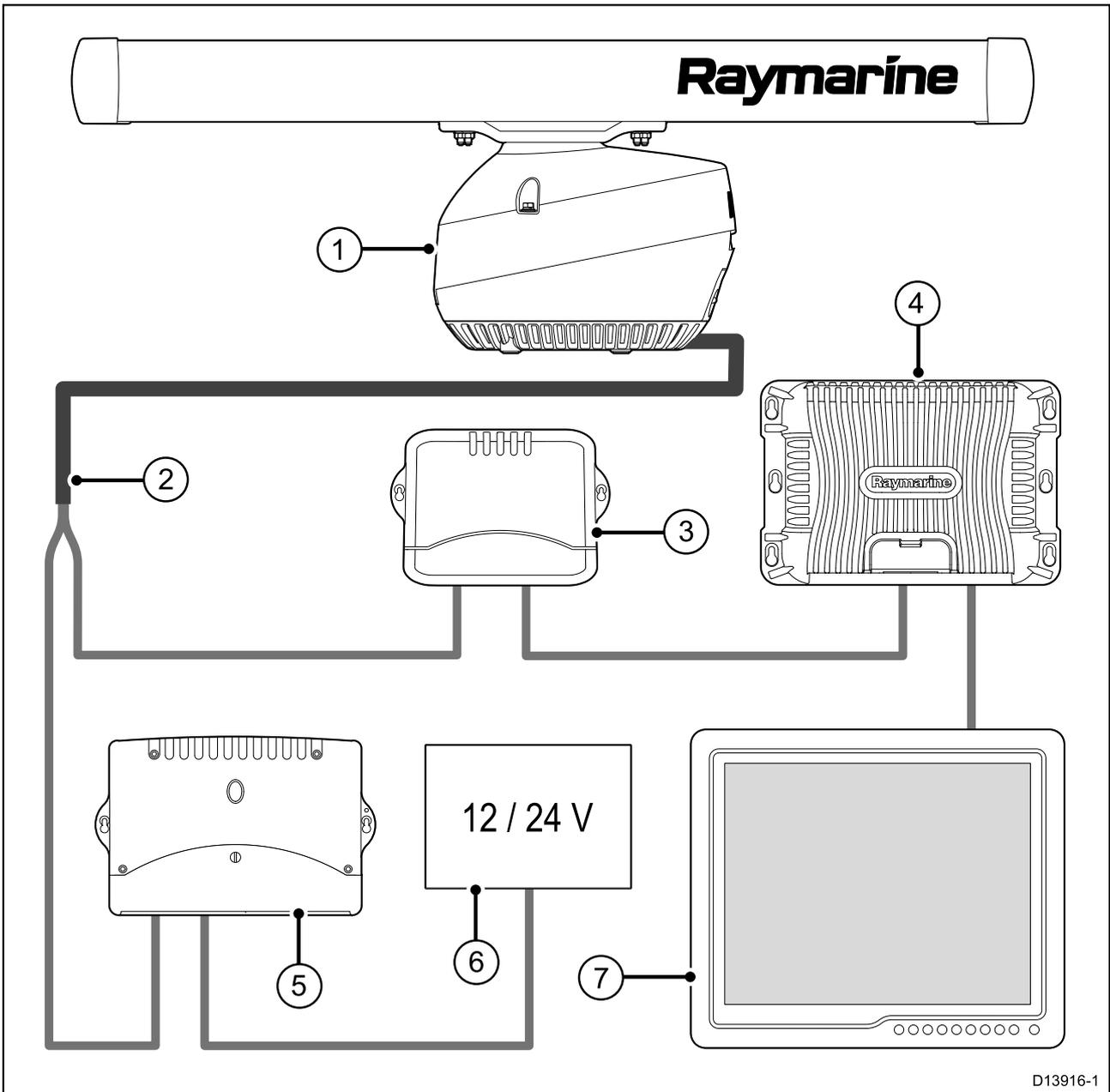
D13916-1

Note: Some power connections are omitted from this illustration. The network switch, processor, and display each require a dedicated power connection.

Item	Description
1	Magnum Open Array Radar scanner
2	Radar to "RJ45 & Power" cable (available separately)
3	SeaTalk ʰˢ switch
4	GPM400 G-Series processor
5	VCM100 power converter
6	Power supply
7	G-Series display

Radar connected directly to legacy multifunction display
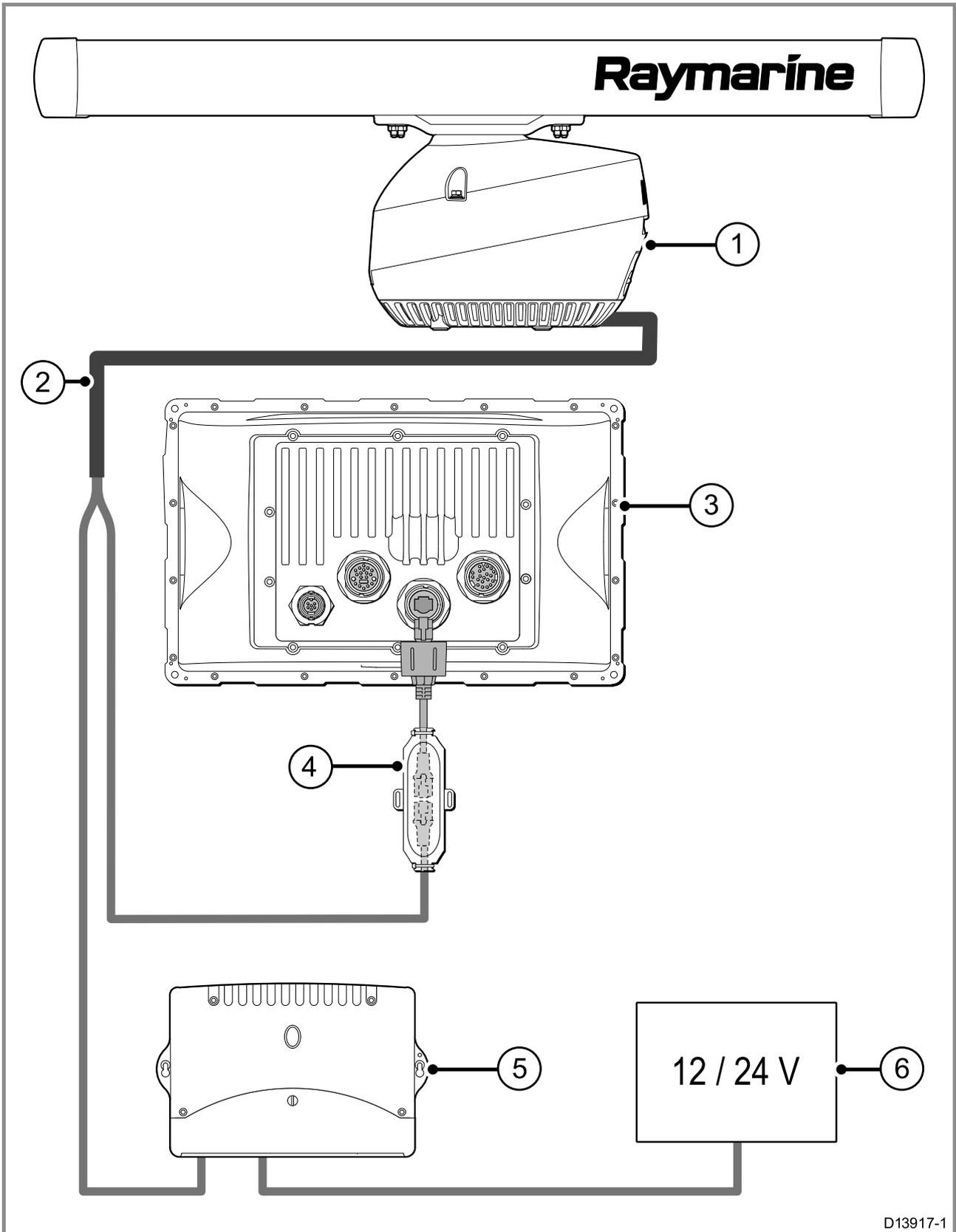
D13917-1

Note: Some power connections are omitted from this illustration. The multifunction display requires a dedicated power connection.

Item	Description
1	Magnum Open Array Radar scanner
2	Radar to "RJ45 & Power" cable (available separately)
3	Multifunction display

Item	Description
4	Crossover coupler
5	VCM100 power converter
6	Power supply

3.5 Tools

Tools required for installation
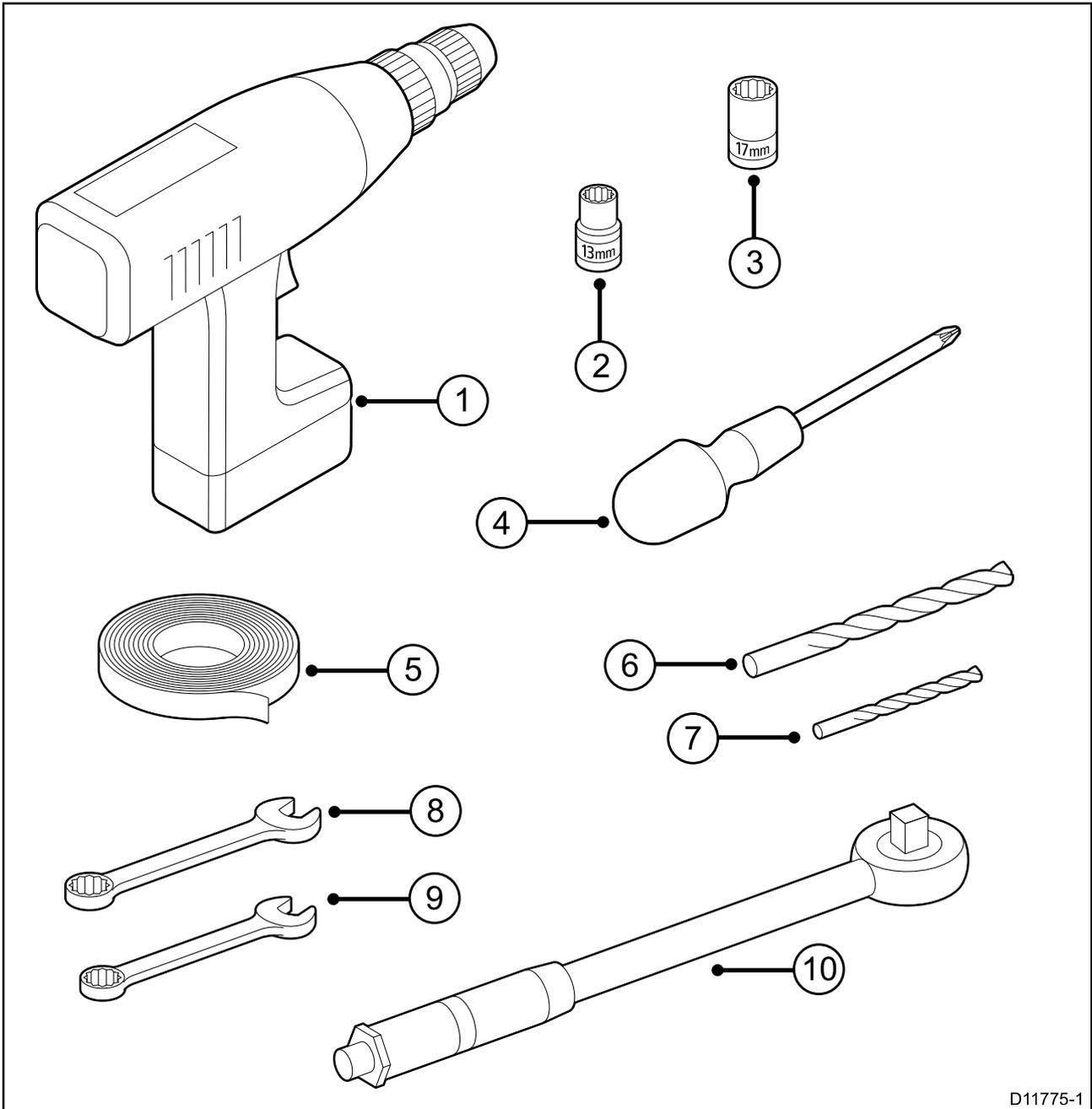
D11775-1

Item	Description
1	Power drill
2	13 mm socket
3	17 mm socket
4	Screwdriver ("Pozidrive" head)
5	Adhesive tape
6	11 mm drill bit
7	3 mm drill bit
8	17 mm spanner
9	13 mm spanner
10	Torque wrench

Chapter 4: Cables and connections

Chapter contents

4.1 General cabling guidance

Cable types and length

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

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

Routing cables

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

- Do NOT bend cables excessively. Wherever possible, ensure a minimum bend diameter of 200 mm (8 in) / minimum bend radius of 100 mm (4 in).
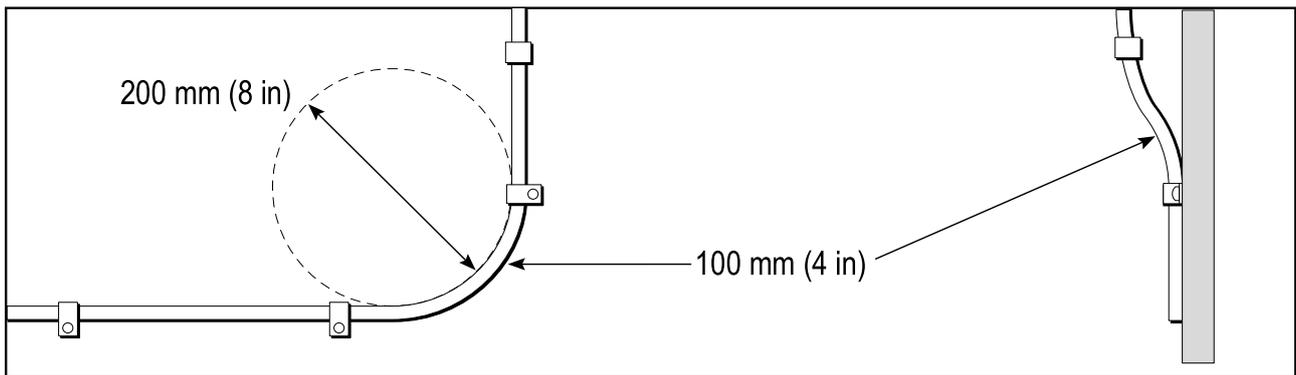
- Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Do NOT run cables through bilges or doorways, or close to moving or hot objects.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.
- Where a cable passes through an exposed bulkhead or deckhead, use a suitable watertight feed-through.
- Do NOT run cables near to engines or fluorescent lights.

Always route data cables as far away as possible from:

- other equipment and cables,
- high current carrying AC and DC power lines,
- antennas.

Strain relief

Ensure adequate strain relief is provided. Protect connectors from strain and ensure they 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 all cables are properly shielded and that the cable shielding is undamaged.

4.2 Radar scanner connection

Connector	Connects to:	Suitable cables
	• RayNet (or SeaTalk hs) network or device • 12V / 24V power supply	A 15 metre Radar-to-'RayNet & Power' cable (part no. A80229) is supplied with the Magnum scanner. Different lengths of cable, and extension cables, are also available. If you need to connect to a SeaTalk hs network or device, Radar-to-'RJ45 & Power' cables are also available. Refer to Chapter 10 **Spares and accessories** for more information.

The combined power-and-data connector is located on the underside rear of the scanner, as shown in the following illustration.
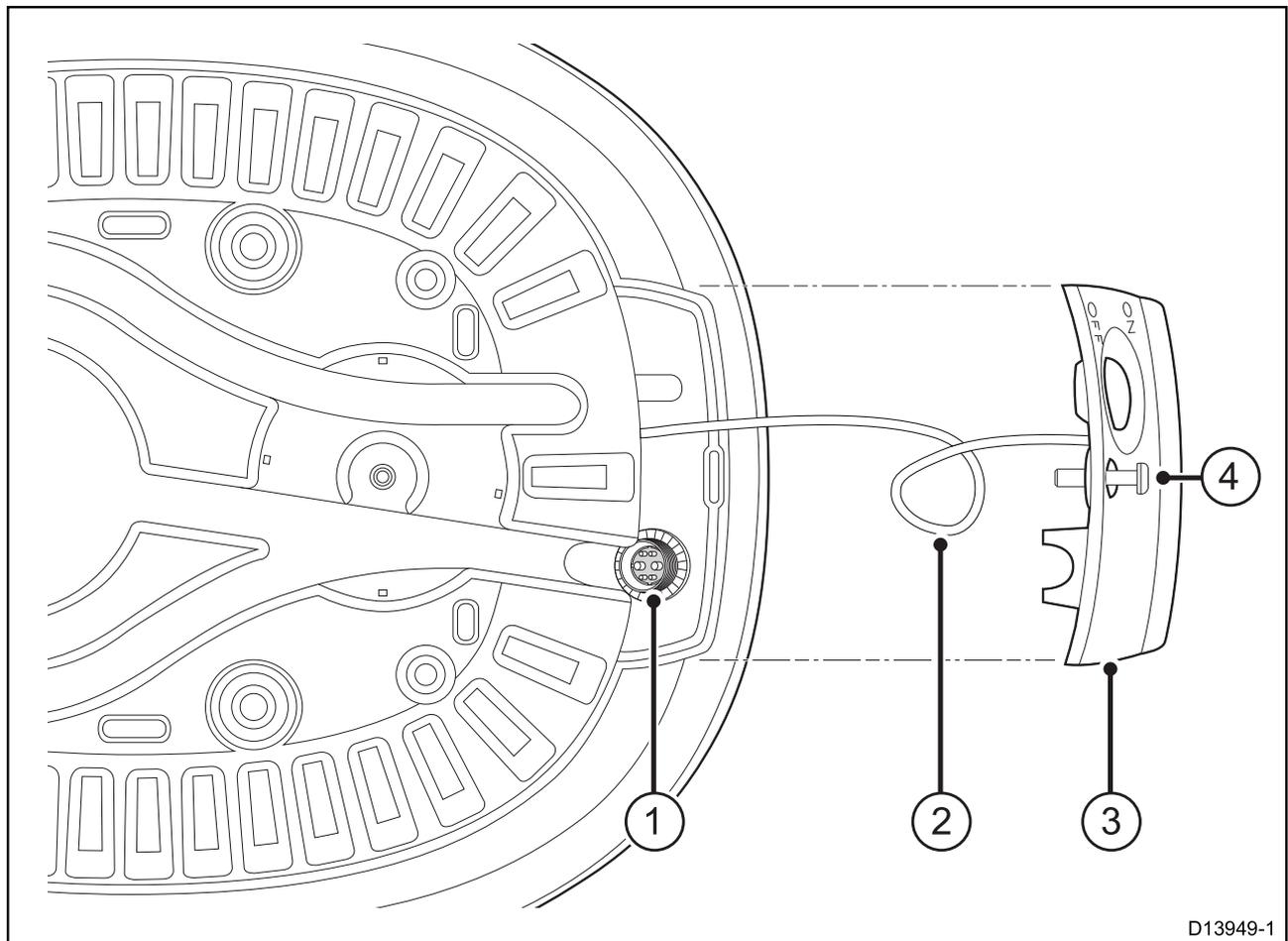
D13949-1

Item	Description
1	Power-and-data connector
2	Lanyard
3	Rear panel
4	Rear-panel retaining screw

Note: To access the connector, you must remove the rear panel. See **Making the connection to the radar** for more information.

Cable routing options

You can route the combined power-and-data cable away from the radar in several ways.

The routing options allow for the cable to exit the radar in three different positions — the option you choose will depend on the radar mounting location.

1. **Rear-horizontal cable exit** — if the radar is mounted on an extended flat surface, and the cable cannot be routed through the surface.

2. **Rear-vertical cable exit** — if the radar is mounted on a truncated flat surface that does not extend far beyond the rear of the flat radar base, and the cable cannot be routed through the surface.

3. **Base cable exit** — if the radar is mounted on a flat surface, and the cable can be routed through the surface.

The following illustrations show how to route the cable for each option.

1. Rear-horizontal cable exit (radar mounted to extended flat surface)
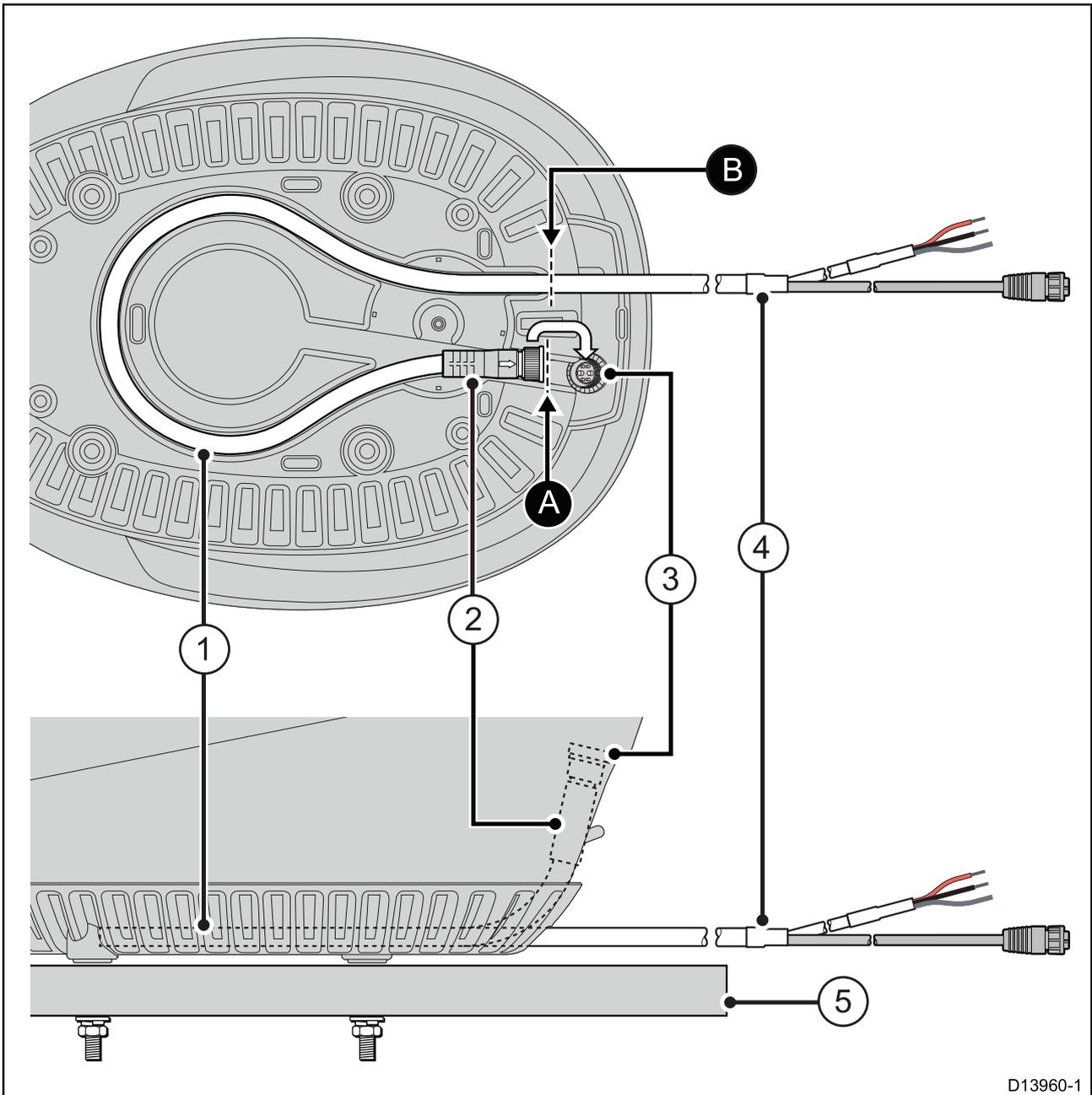
D13960-1

Note: Illustration shows the radar with the rear cover removed. See **Making the connection to the radar** for further information.

1.   Cable routed through channel in radar base.

2.   Cable plug.

3.   Power-and-data connector.

4.   Combined power-and-data cable.

5.   Mounting surface.

Note: When laying the cable between the power supply/network connections and the cable's rear exit point from the radar, ensure that approximately 650 mm (26 in) of cable is available for routing within the radar base to the power-and-data connector. This length of cable is shown between the dashed lines (A—B) on the preceding illustration.

2. Rear-vertical cable exit (radar mounted to truncated flat surface)
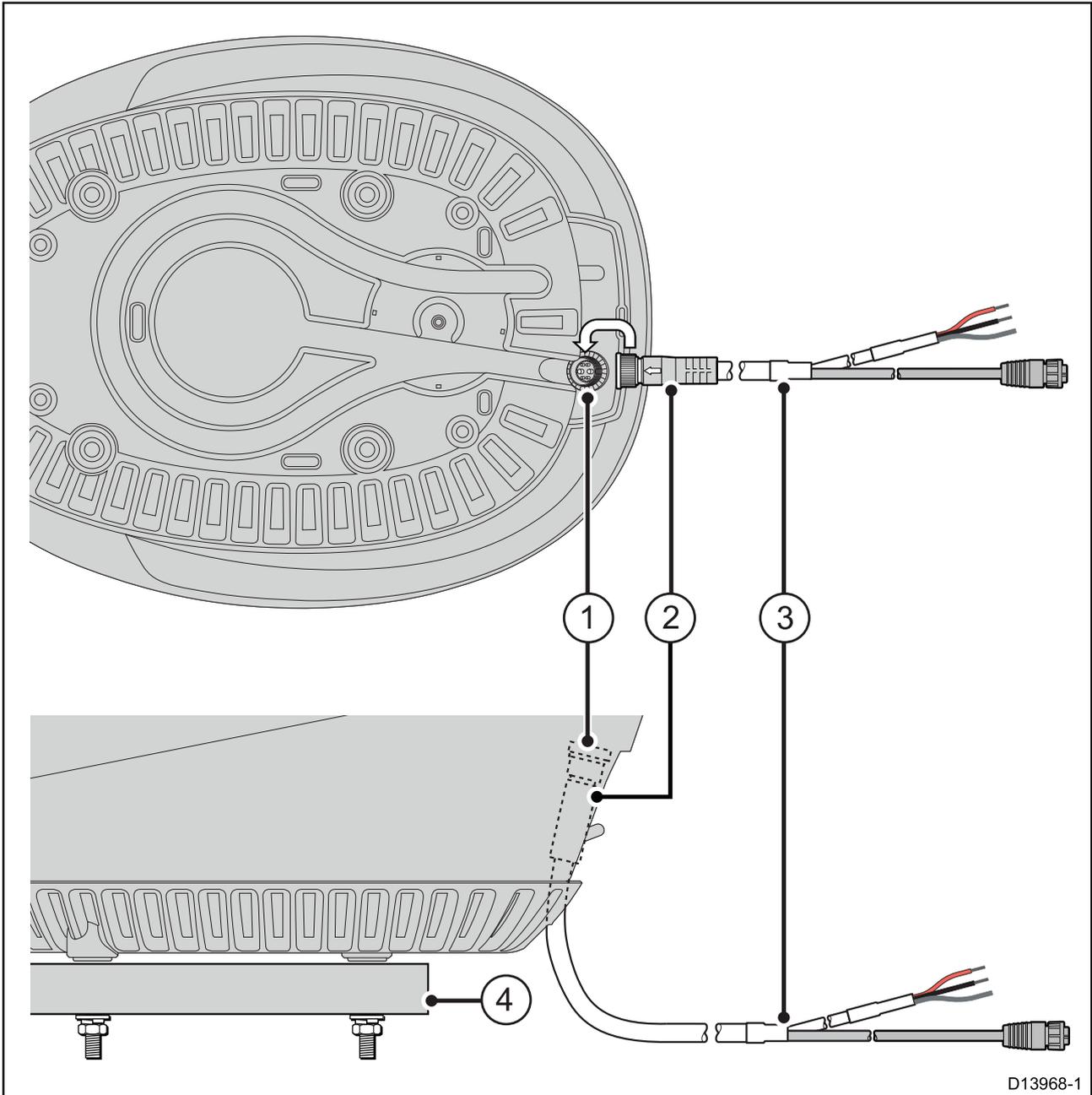
D13968-1

Note: Illustration shows the radar with the rear cover removed. See **Making the connection to the radar** for further information.

1. Power-and-data connector.
2. Cable plug.
3. Combined power-and-data cable.
4. Mounting surface.

3. Base cable exit (radar mounted to flat surface)
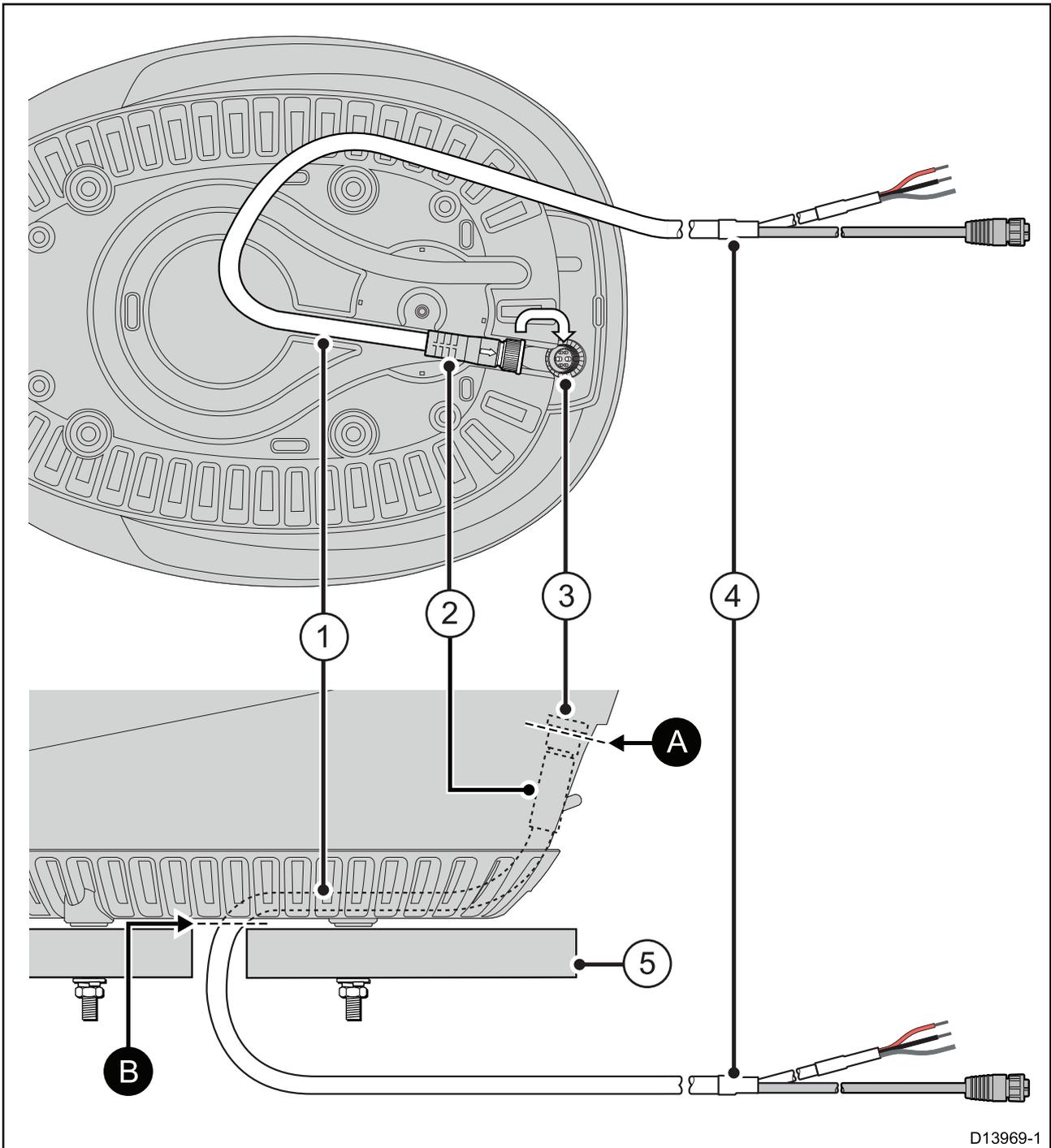
D13969-1

Note: Illustration shows the radar with the rear cover removed. See **Making the connection to the radar** for further information.

1. Cable routed through channel in radar base.
2. Cable plug.
3. Power-and-data connector.
4. Combined power-and-data cable.
5. Mounting surface.

Note: When laying the cable between the power supply/network connections and the cable's bottom exit point from the radar, ensure that approximately 255 mm (10 in) of cable is available for routing within the radar base to the power-and-data connector. This length of cable is shown between the dashed lines (A—B) on the preceding illustration.

Making the connection to the radar

Follow the steps below to connect the combined power-and-data cable to the radar.

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. Loosen the rear-panel retaining screw, and carefully pull the rear panel away from the rear of the scanner.

   The retaining screw is permanently attached to the rear panel to prevent loss, and the rear panel remains attached to the scanner with a lanyard. Do not attempt to detach the lanyard, or to completely remove the retaining screw from the rear panel.

4. If necessary, route the combined power-and-data cable within the scanner base, as shown in the cable routing illustrations in this section. Cable routing depends on the mounting location you choose for your scanner.
5. Ensure that the arrow on the power-and-data cable connector is aligned with the red triangular mark on the radar scanner connector.
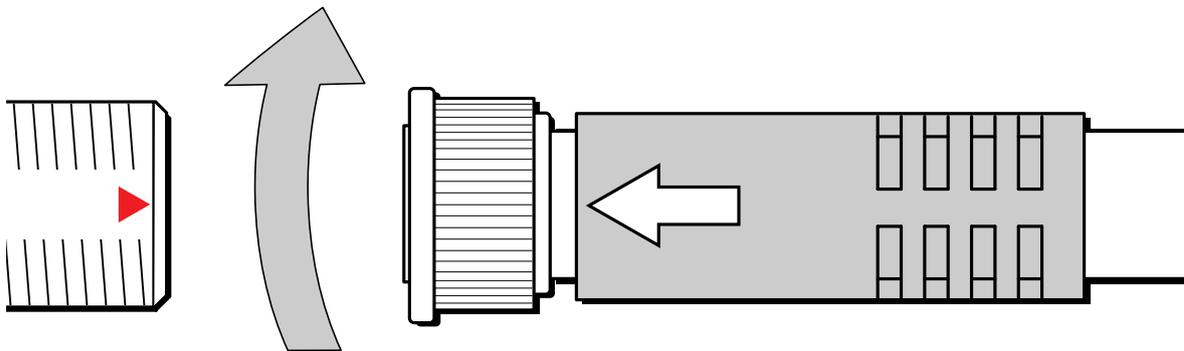
6. Carefully push the cable plug onto the scanner's connector, and hand-tighten the collar.
7. Use the plastic tool provided to fully tighten the collar. Do NOT use a wrench or any other tool, as this may damage the connector.

D13995-2
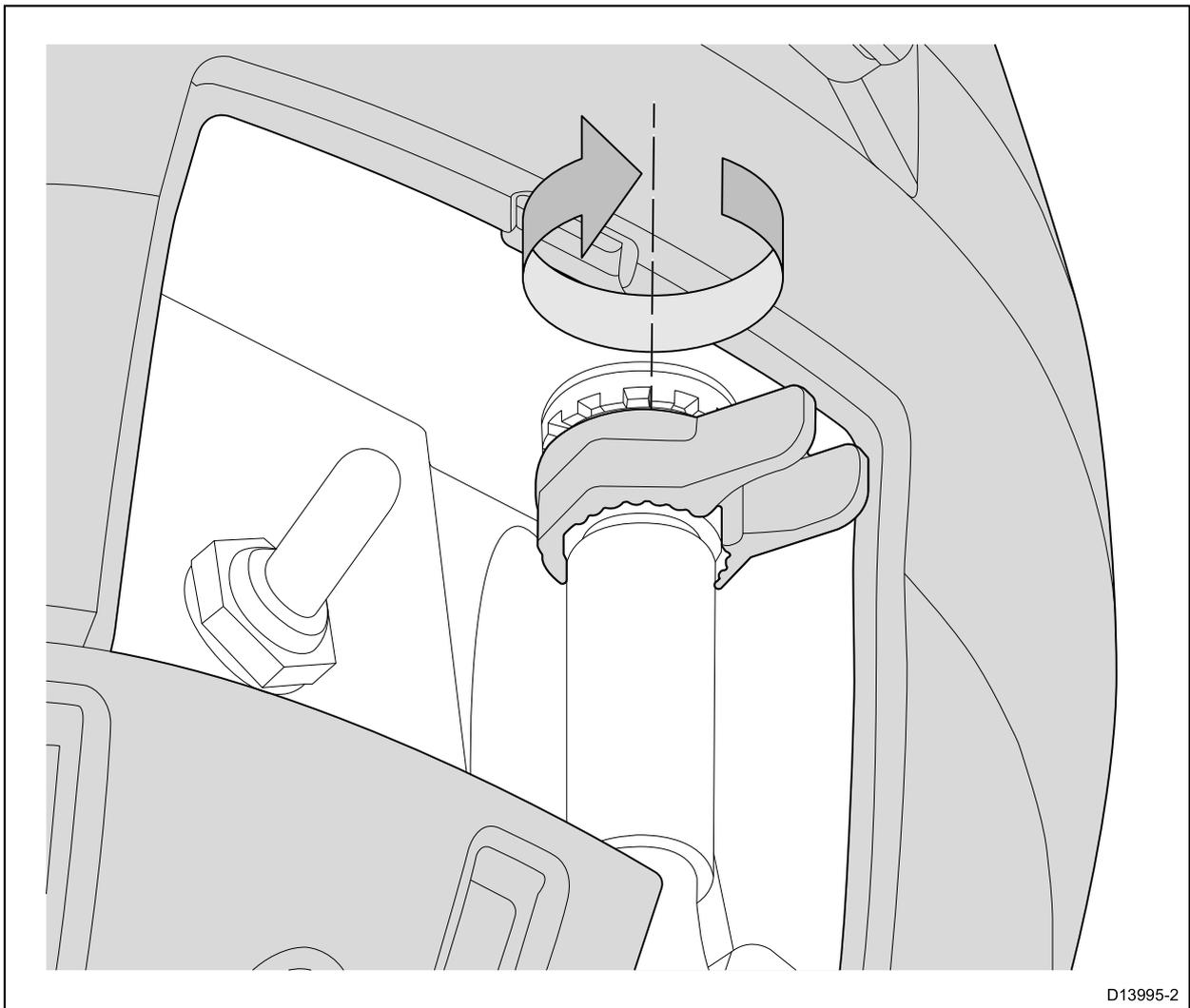
8. Grease the retaining screw with the supplied Denso paste.
9. Replace the rear panel, and tighten the retaining screw.

Note: If the cable plug is disconnected after initial installation, Raymarine recommends that before reconnecting, you lightly coat the connector thread with water-repellent grease.

4.3 Power connections

The Magnum Open Array Radar scanner is powered via the supplied VCM100 Converter Module.
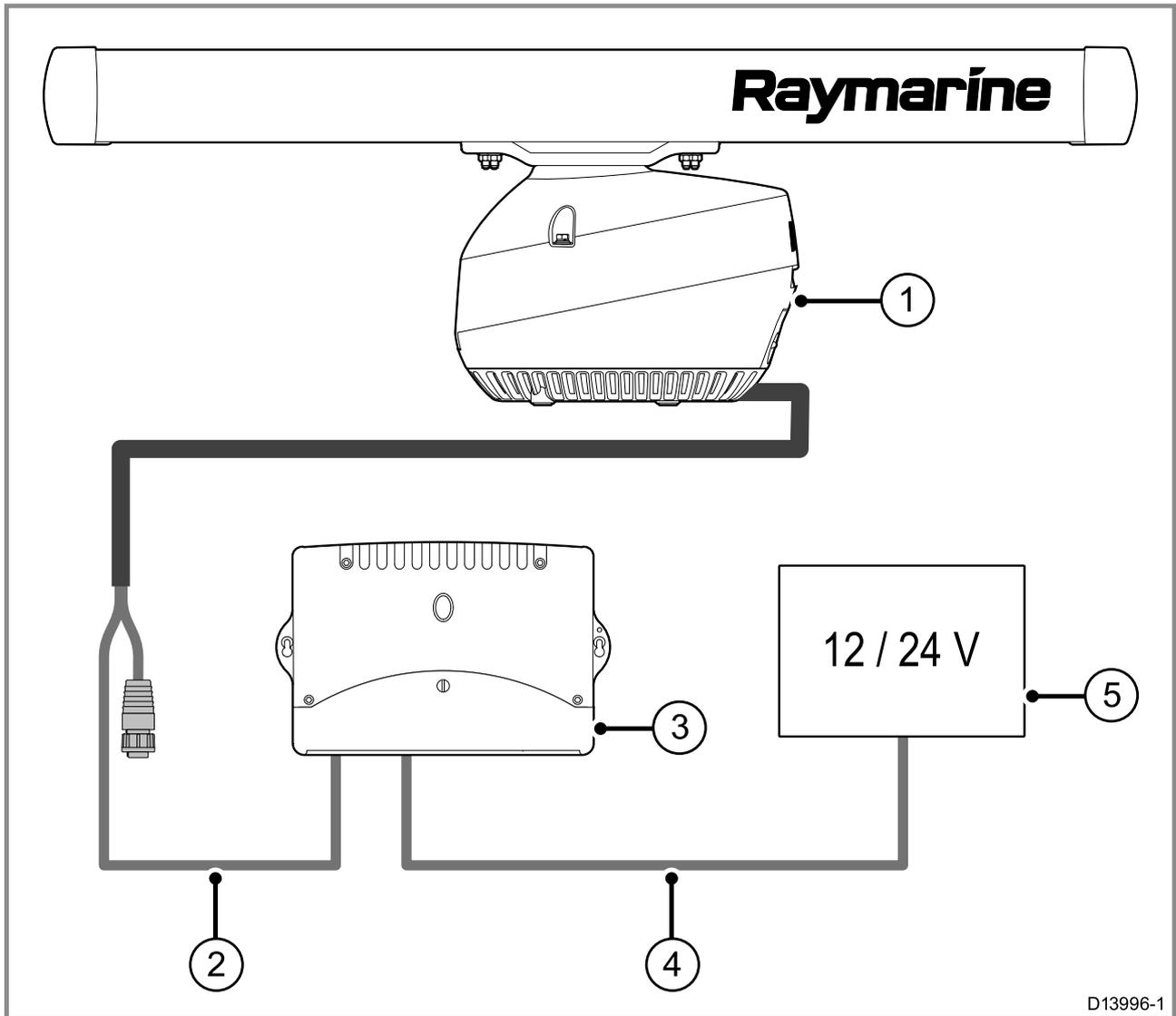
D13996-1

Item	Description
1	Magnum Open Array Radar scanner
2	Power component of Radar to "RayNet & Power" cable (supplied)
3	VCM100 power converter
4	Power cable from vessel power supply to VCM100 (power cable not supplied)
5	Vessel power supply

The Magnum Open Array Radar is intended for use on ships' DC power systems operating at 12 or 24 Volts DC.

- All power connections must be made via the VCM100 Voltage Converter Module.

- The radar scanner must NOT be connected directly to a battery.

- The radar scanner must be connected directly to the VCM100 only.

- Only one radar scanner must be connected per VCM100 unit. Each radar scanner in your system requires a dedicated VCM100 unit.

- The power connection between the radar scanner and the VCM100 must be via an official Raymarine combined power-and-data cable (a 15 m combined power-and-data cable with RayNet connector, A80229, is supplied with part numbers T70408/10/12/14).

- Do NOT cut and re-join any part of the combined power-and-data cable. A range of cable lengths and cable extensions is available for longer cable runs (see 10.1 **Magnum Radar accessories**).

Note: The maximum length for the combined power-and-data radar cable (including all extensions) is 25 m (82 ft).

- The radar scanner must be connected to the POWER OUT terminals of the VCM100.
- The screen (drain) strands of the radar scanner's combined power-and-data cable must be connected to one of the VCM100 SCREEN terminals.

The following diagram illustrates the power connections of the combined power-and-data cable.

Note: For older installations connecting to a SeaTalk ^{HS} network, combined power-and-data cables with an RJ-45 data connector are available. The power connections are identical for both types of cable.

D13979-1
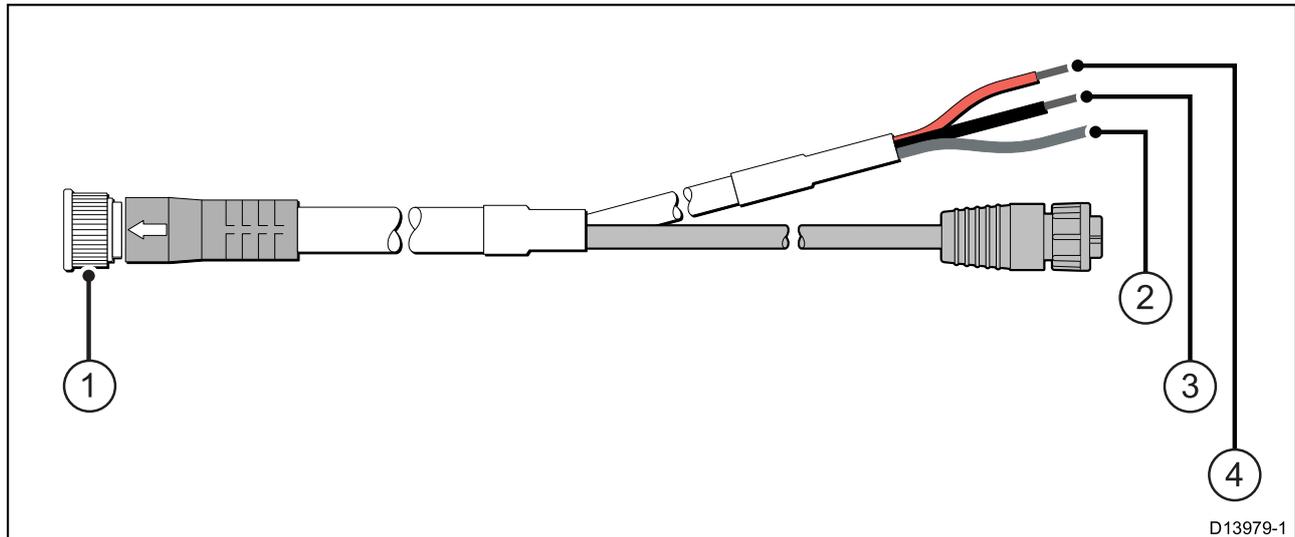
Item	Description
1	Combined power-and-data connector.
2	Screen (drain) strands — connect to one of the SCREEN terminals of the VCM100.
3	Black wire — connect to the negative POWER OUT terminal of the VCM100.
4	Red wire — connect to the positive POWER OUT terminal of the VCM100.

⚠️ **Warning: Positive ground systems**

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

VCM100 power connections

VCM100 power and grounding requirements.

The VCM100 is intended for use on ships' DC power systems operating from 12 to 24 Volts DC.

- The VCM100 must be connected to a battery isolator switch, or a DC distribution panel.
- The battery isolator switch or DC distribution panel must be connected to the POWER IN terminals of the VCM100.
- Do NOT connect additional power switches to the cable providing the power feed to the VCM100.
- All power connections between the VCM100 and the power source must have appropriate fuse protection.
- All power connections must be of high quality to minimize resistance and to remove the risk of accidental shorts.
- The VCM100 SCREEN terminals must be connected to your vessel's RF ground system.
- Do NOT connect the radar scanner or the VCM100 to a positively-grounded power system.

The following diagram illustrates the power connections of the VCM100.
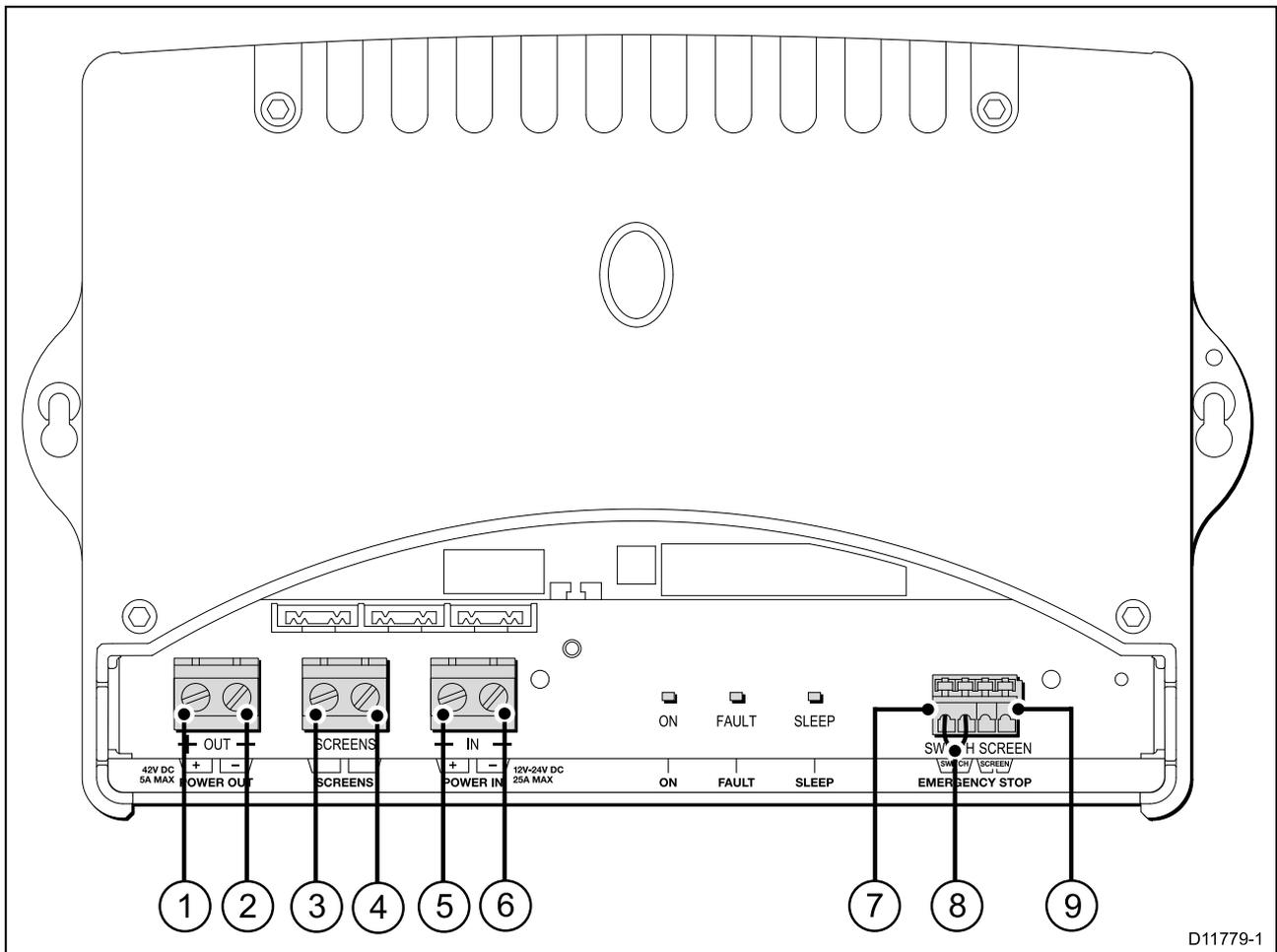
D11779-1

Item	Description
1	POWER OUT (Positive) — connect to the RED wire of the power and data digital cable.
2	POWER OUT (Negative) — connect to the BLACK wire of the power and data digital cable.
3	SCREEN — connect to the bare screen (drain) strands of the power and data digital cable.
4	SCREEN — connect to your vessel's RF ground system.
5	POWER IN (Positive) — connect to the positive terminal of the DC distribution panel or battery isolator switch.
6	POWER IN (Negative) — connect to the negative battery terminal.
7	EMERGENCY STOP (Switch) — if you have the optional VCM100 emergency stop button, remove the wire bridging link from the VCM100 EMERGENCY STOP terminals, and connect the emergency stop button SWITCH wire to the VCM100 EMERGENCY STOP SWITCH terminal.
8	EMERGENCY STOP wire bridging link— only remove if fitting the optional emergency stop button.
9	EMERGENCY STOP (Screen) — if you have the optional VCM100 emergency stop button, remove the wire bridging link from the VCM100 EMERGENCY STOP terminals, and connect the emergency stop button SCREEN (drain) wire to the VCM100 EMERGENCY STOP SCREEN terminal.

VCM100 power cable extension

The power cable can be extended for longer cable runs between the VCM100 and your vessel's DC distribution panel or battery isolator switch.

If you need to extend the power cable, use a splash proof junction box. The junction box should provide a terminal strip with sufficient space for power connections. The terminal strip should be a minimum of 30 Amp rating for power cores. It is essential that both power cores and the screen (drain) are connected and that the connection is of very low resistance as considerable power passes through this connection.

The following table provides recommended total power cable lengths and gauges. These figures relate to the maximum round-trip length of power cables from the battery or DC distribution panel to the VCM100. Exceeding these lengths may cause unreliable operation.

AWG (American Wire Gauge)	mm²	Maximum distance (12 volt supply)	Maximum distance (24 volt supply)
7	10.55	15 m (49.2 ft.)	55 m (180.4 ft.)
8	8.36	10 m (32.8 ft.)	40 m (131.2 ft)
10	5.26	8 m (26.2 ft.)	32 m (104.9 ft.)
11	4.17	6 m (19.6 ft.)	24 m (78.7 ft.)

Note: If the required extensions result in unacceptably large diameter cables, use two or more smaller gauge wires to achieve the required copper wire cross-section. For example, using two pairs of 2 mm² cables is equivalent to using two single 4 mm² cables.

VCM100 screen (drain) wire extension

The screen (drain) wire can be extended for longer cable runs between the VCM100 and your vessel's RF ground system.

Extensions to the screen (drain) wire should use an 8 mm braid or AWG 10 (5.26 mm²) multi-stranded cable.

Circuit breaker and fuse ratings

Battery isolator switch, thermal breaker, and fuse ratings.

All power connections between the VCM100 and its power source must be protected by a thermal circuit breaker or fuse, fitted close to the power connection. The connection from the output of the VCM100 to the digital radar does not require a fuse or circuit breaker.

If you do not have a thermal circuit breaker or fuse in your power circuit (fitted to the DC distribution panel, for example), you MUST fit an in-line breaker or fuse to the positive wire of the power cable.

The following table provides suitable ratings for battery isolator switches, circuit breakers, and fuses.

Power supply	Device	4 kW scanner	12 kW scanner
12 volt	Isolator switch	30 amps (minimum rating)	30 amps (minimum rating)
	Thermal breaker	15 amps	15 amps
	Fuse	20 amps	20 amps
24 volt	Isolator switch	15 amps (minimum rating)	15 amps (minimum rating)
	Thermal breaker	8 amps	8 amps
	Fuse	10 amps	10 amps

4.4 Product grounding

Important safety information for connections to ground.

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

VCM100 grounding requirements

These grounding requirements are applicable for Raymarine equipment supplied with a separate drain wire or screen, including the VCM100 power converter supplied with your Magnum radar scanner.

> **Note:** The Magnum radar scanner is not grounded directly, but is connected to ground VIA the VCM100 power converter. These grounding requirements apply to the VCM100 power converter:

- The VCM100 power cable drain conductor (screen) must be connected to a common ground point.
- It is recommended that the common ground point is a bonded ground, i.e. with the ground point connected to battery negative, and situated as close as possible to the battery negative terminal. If a bonded ground system is not possible, a non-bonded RF ground may be used.

Bonded ground system (preferred)
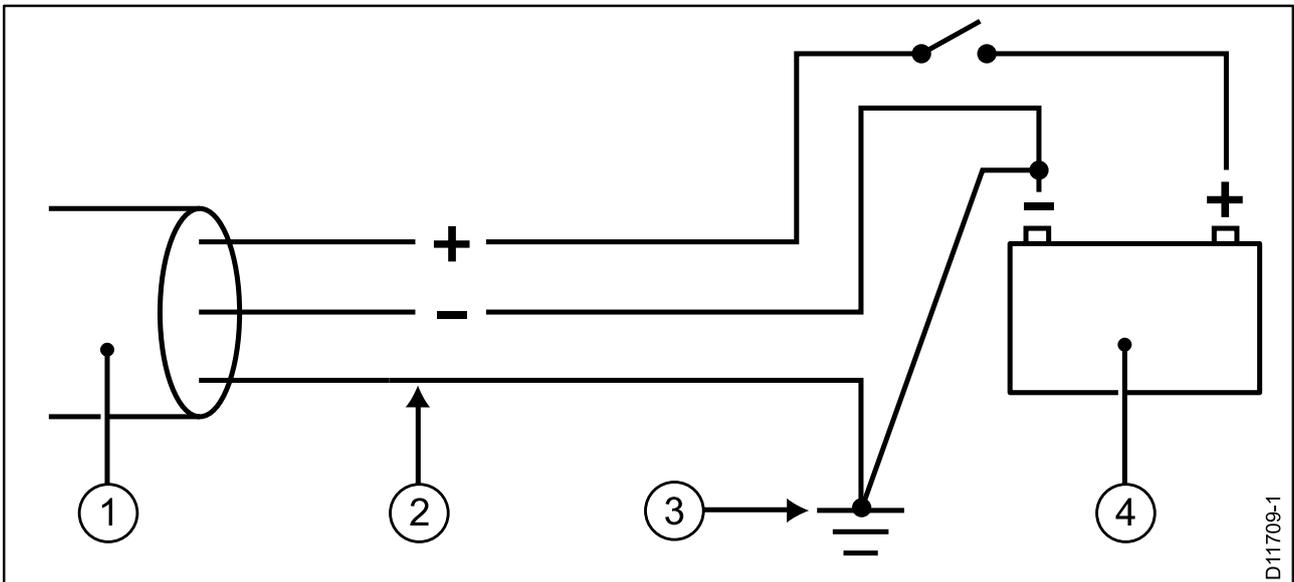
RF ground system (alternative)
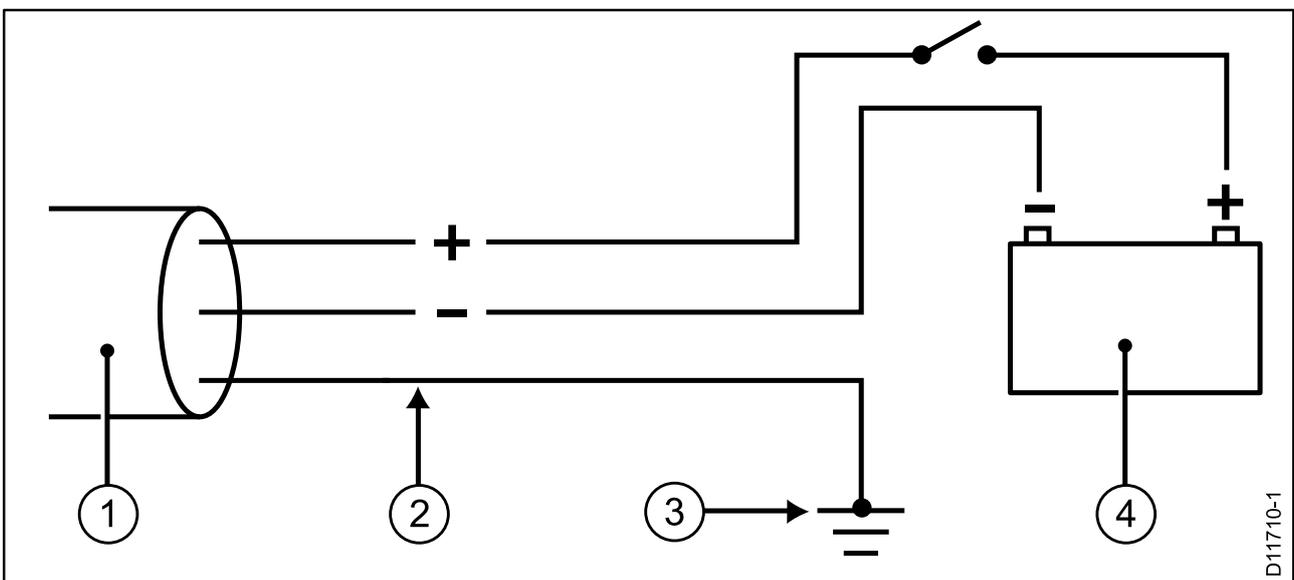
1. Power cable to VCM100.
2. VCM100 drain (screen).

3. Bonded (preferred) or non-bonded RF ground.

4. Power supply or battery.

Implementation

If several items require grounding, they may first be connected to a single local point (e.g. within a switch panel), with this point connected via a single, appropriately-rated conductor, to the boat's common ground. The preferred minimum requirement for the path to ground (bonded or non-bonded) is via a flat tinned copper braid, with a 30 A rating (1/4 inch) or greater. If this is not possible, an equivalent stranded wire conductor maybe used, rated as follows:

- for runs of <1 m (3 ft), use 6 mm² (#10 AWG) or greater.

- for runs of >1 m (3 ft), use 8 mm² (#8 AWG) or greater.

In any grounding system, always keep the length of connecting braid or wires as short as possible.

Important: Do NOT connect this product to a positively-grounded power system.

References

- ISO10133/13297

- BMEA code of practice

- NMEA 0400

4.5 Data connections

You can connect your Magnum Open Array Radar to a range of Raymarine MFDs, either directly, or via a network switch. Cables are available for making connections to either Raynet networks, or older SeaTalk hs networks.

In all cases, the Magnum Open Array Radar must be connected to using an official Raymarine combined power-and-data cable.

Do NOT cut and re-join any part of the combined power-and-data cable. A range of cable lengths and cable extensions is available for longer cable runs (see 10.1 **Magnum Radar accessories**).

The following diagram illustrates the data connection options for the combined power-and-data cable. For any given Magnum radar installation, you will use one or other of these cables:
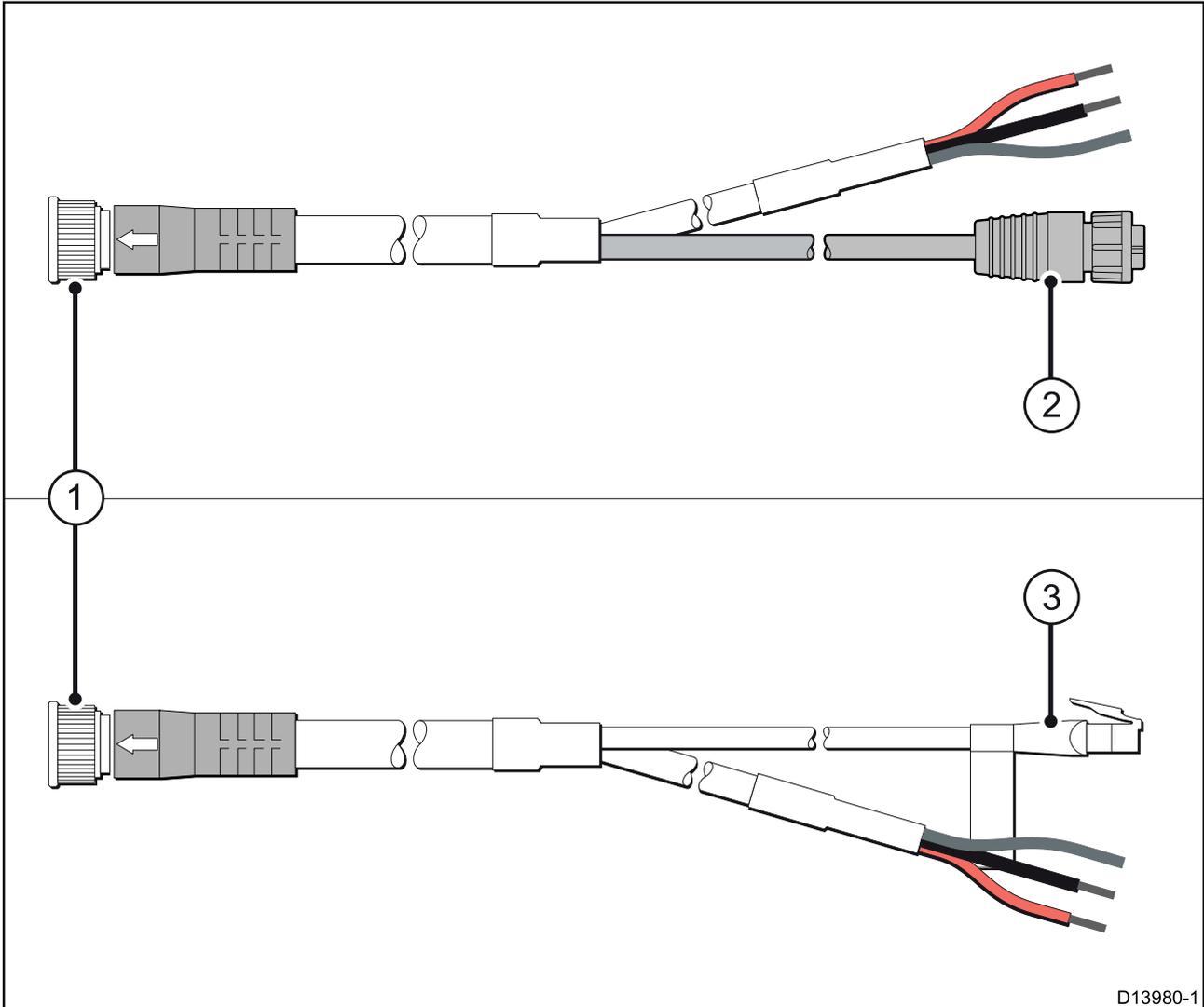
D13980-1

Item	Description
1	Combined power-and-data connector.
2	Raynet data connector.
3	RJ-45 data connector (for SeaTalk hs networks).

Section 3.3 **Multifunction display compatibility** provides further information on suitable MFDs.

Example connections for both Raynet and SeaTalk hs networks are illustrated in 3.4 **Typical system examples**.

RayNet data connections:

- You can connect your radar directly to to a-, c-, e-, eS-, and gS-Series displays, and also to Axiom, Axiom Pro, and Axiom XL displays, using a RayNet connection. A crossover coupler is not required.

- You can connect your radar to a wider RayNet network, using an HS5 RayNet network switch.

SeaTalk hs data connections:

- For connections to a C-Series Widescreen multifunction display, a SeaTalk ^{hs} switch or crossover coupler must be used.

- For connections to a G-Series system, a SeaTalk ^{hs} switch must be connected between the radar scanner and the GPM400 processor module.

- For connections to a non-networked E-Series multifunction display, a SeaTalk ^{hs} crossover coupler must be used. An E-Series network containing more than a single connection requires a SeaTalk ^{hs} switch.

- Additional SeaTalk ^{hs} cables may be required for connections between the combined power-and-data cable and a SeaTalk ^{hs} switch or crossover coupler.

4.6 Radar cable extension

If required you can use a Raymarine radar extension cable.
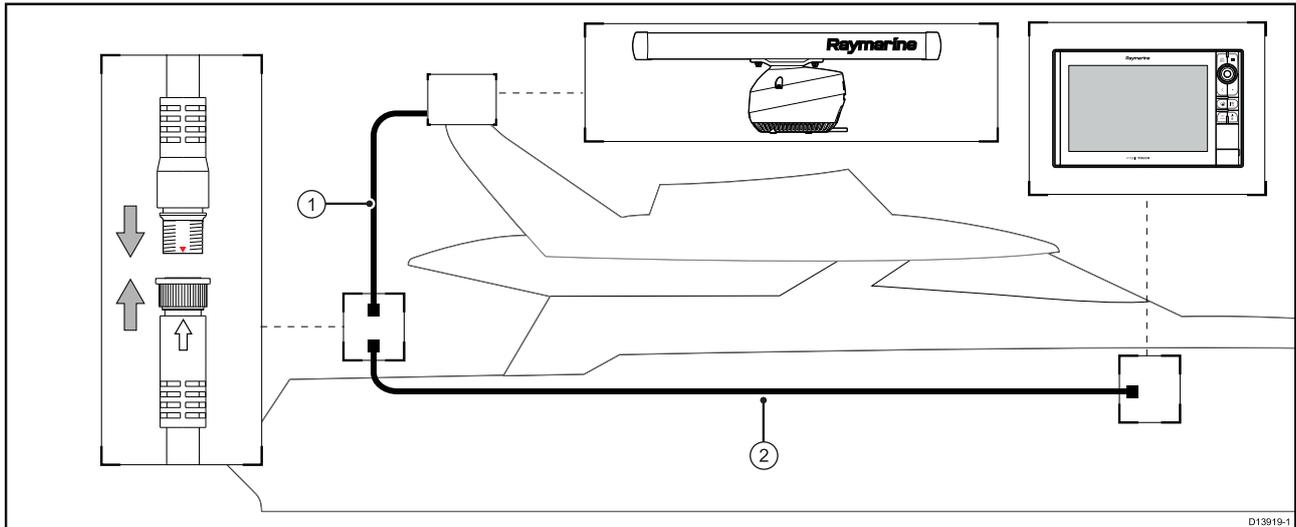
1. Power-and-data radar extension cable.
2. Combined power-and-data radar cable.

Note: The extension cable connects to the radar scanner.

Note: The maximum length for the combined power-and-data radar cable (including all extensions) is 25 m (82 ft).

Note: The power connections on the combined power-and-data radar cable MUST be connected to the VCM100 Voltage Converter Module (NOT shown in the diagram above).

For **RayNet** networked systems, a RayNet HS5 network switch is required between the combined power-and-data cable, and the MFD. These connections are NOT shown in the illustration.

For **SeaTalk ʰˢ** networked systems, a SeaTalk ʰˢ switch is required between the combined power-and-data cable, and the MFD. For non-networked SeaTalk ʰˢ connections, a crossover coupler is required for directly connecting to the MFD. These connections are NOT shown in the illustration.

4.7 Radar cables

For longer cable runs, a range of extensions is available for data cables, and combined power-and-data radar cables.

> **Note:** The maximum length for the combined power-and-data radar cable (including all extensions) is 25 m (82 ft).

Radar scanner to RayNet switch

Combined power-and-data radar cables for RayNet systems

Cable	Part number	Notes
5 m (16.4 ft) Radar to "RayNet & Power" cable	A80227	
10 m (32.8 ft) Radar to "RayNet & Power" cable	A80228	
15 m (49.2 ft) Radar to "RayNet & Power" cable	A80229	
25 m (82.0 ft) Radar to "RayNet & Power" cable	A80230	

RayNet switch to display unit

RayNet network cables

Cable	Part number	Notes
0.4 m (1.3 ft) RayNet network cable	A80161	
2 m (6.5 ft) RayNet network cable	A62361	
5 m (16.4 ft) RayNet network cable	A80005	
10 m (32.8 ft) RayNet network cable	A62362	
20 m (65.6 ft) RayNet network cable	A80006	

RayNet hardware

To connect the radar to a RayNet network you will need to include:

Cable	Part number	Notes
RayNet HS5 network switch	A80007	5-port switch for network connection of multiple RayNet devices.

Radar scanner to SeaTalk hs switch (or crossover coupler)

Combined power-and-data radar cables for SeaTalk hs systems

Cable	Part number	Notes
5 m (16.4 ft) Radar to "RJ45 & Power" cable	A55076D	
10 m (32.8 ft) Radar to "RJ45 & Power" cable	A55077D	
15 m (49.2 ft) Radar to "RJ45 & Power" cable	A55078D	
25 m (82.0 ft) Radar to "RJ45 & Power" cable	A55079D	

SeaTalk ʰˢ switch (or crossover coupler) to display unit

SeaTalk ʰˢ network cables

Cable	Part number	Notes
1.5 m (4.9 ft) SeaTalk ʰˢ network cable	E55049	
5 m (16.4 ft) SeaTalk ʰˢ network cable	E55050	
10 m (32.8 ft) SeaTalk ʰˢ network cable	E55051	
20 m (65.6 ft) SeaTalk ʰˢ network cable	E55052	

SeaTalk ʰˢ hardware

To connect the radar to a SeaTalk ʰˢ multifunction display you will need to include one of the following:

Cable	Part number	Notes
SeaTalk ʰˢ switch	E55058	8–way hub for network connection of multiple SeaTalk ʰˢ devices.
SeaTalk ʰˢ coupler	E55060	Coupler for connection of a single SeaTalk ʰˢ device.

Extension cables

Cable	Part number	Notes
2.5 m (8.2 ft) Radar extension cable	A92141D	One male radar connector; one female radar connector.
5 m (16.4 ft) Radar extension cable	A55080D	One male radar connector; one female radar connector.
10 m (32.8 ft) Radar extension cable	A55081D	One male radar connector; one female radar connector.

Chapter 5: Location and mounting

Chapter contents

5.1 Selecting a location

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

VCM100 location requirements

When selecting a mounting location it is important to consider a number of factors.

Ventilation

- Ensure that equipment is mounted in a compartment of suitable size.

- Ensure that ventilation holes are not obstructed. Allow adequate separation of equipment.

Mounting surface

Ensure equipment is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.

Cables

Ensure the unit is mounted in a location which allows proper routing and connection of cables:

- Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.

- Use cable supports to prevent stress on connectors.

- The maximum length of cable between the battery and the VCM100 should not normally exceed 19.6 ft. (6 M). All power cable lengths should be kept as short as possible.

Water ingress

The VCM100 is splashproof, and suitable for mounting below decks only.

Electrical interference

Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters/receivers.

Magnetic compass

Mount the VCM100 at least 3 ft (1 m) away from a magnetic compass.

Power supply

Select a location that is as close as possible to the vessel's DC power source. This will help to keep cable runs to a minimum.

Radar scanner location requirements

When selecting a location it is important to consider a number of factors.

Horizontal position

The radar scanner should be positioned as near as possible to your vessel's centerline.

Height

The radar scanner should normally be mounted as high as practical above the waterline:

- Mount the scanner above head height out of range of personnel, to avoid mechanical danger and minimize exposure to electromagnetic radiation.

- Radar operates at the line-of-sight, so a high mounting position gives better long range performance.

- Surrounding large objects, in the same horizontal plane, can interfere with the radar signal and cause blind areas or shadow sectors and false targets on the radar display (see below).

Do not mount the radar scanner so high that it is affected by the pitching and rolling of the vessel.

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.

Access

The radar scanner should be easily accessible to allow maintenance to be carried out safely. Sufficient clearance must be allowed to fully open the scanner unit for maintenance and service.

Mounting platform

The radar scanner must be mounted on a rigid and stable platform. The platform must be capable of supporting the mass and inertia of the radar scanner under seagoing conditions. The platform should not twist (causing bearing errors) or be subject to excessive vibration or shock.

The platform must be free-draining, to prevent the pooling of water beneath the radar scanner.

The mounting site must be clear of the following:

- Ropes.
- Moving rigging.
- Heat.
- Fumes.
- People.

Magnetic compass

Mount the radar scanner at least 1 m away from a magnetic compass.

Multiple radar scanners

If two radar scanners are installed at different locations in a dual radar system, care should be taken to allow for the difference in position of the radars when switching between the two on your multifunction display. This is especially noticeable at short ranges on larger vessels.

To reduce possible interference between radar scanners in a dual radar system:

- Maximise the spacing between the scanners.
- If possible, locate the scanners so that they are aligned vertically, one directly above the other, with a minimum of 2 metres vertical separation.
- If the scanners can't be aligned one directly above the other, locate each scanner the same distance from the bow your vessel. Interference is more likely if the scanners are installed one in front of the other, even when separated vertically.

Cables

- All cables should be adequately clamped and protected from physical damage and exposure to heat. Avoid running cables through bilges or doorways, or close to moving or hot objects.
- Where a cable passes through an exposed bulkhead or deckhead, use a watertight feed-through.

Radar scanner dimensions
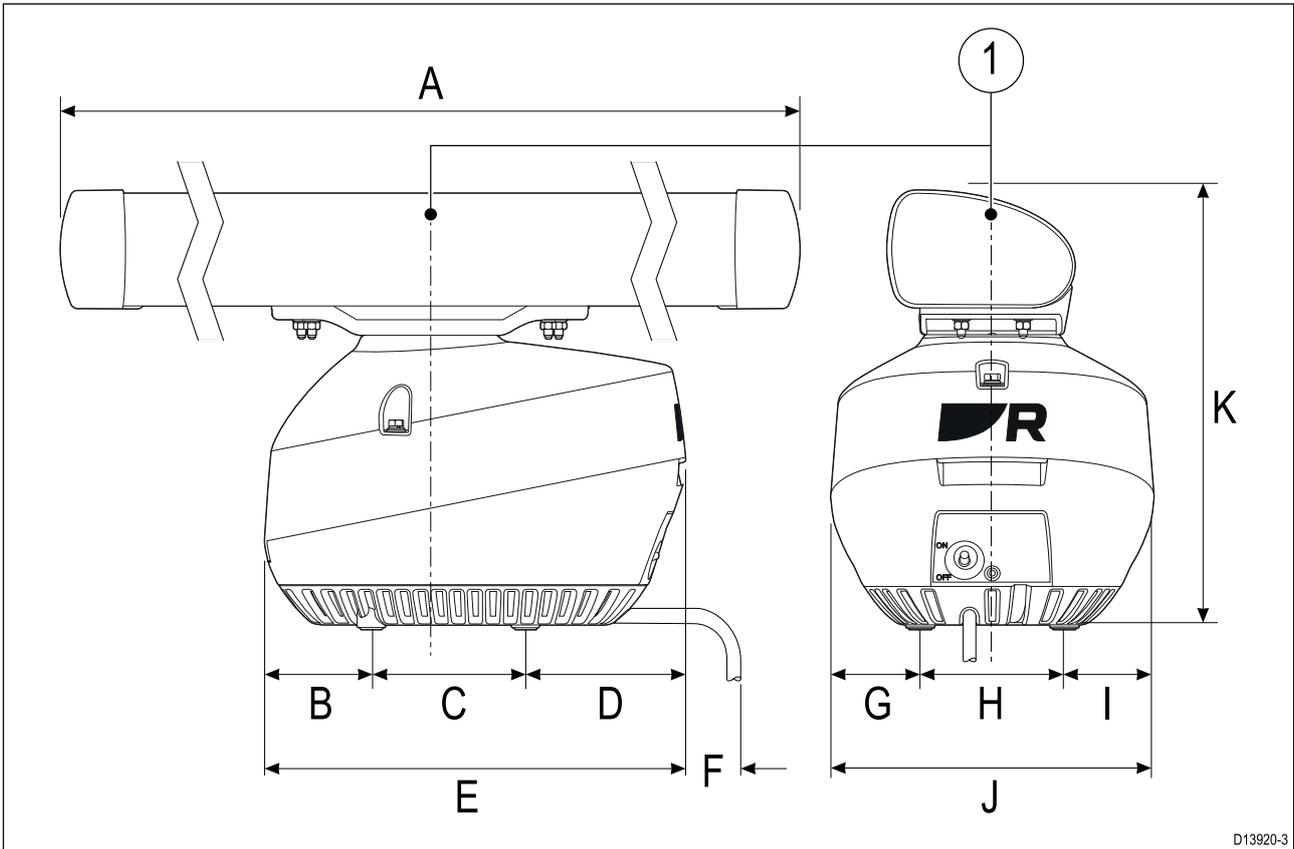
Item	Description
1	Center of rotation

Item	Dimension
A	Maximum rotation: 48" – 1306 mm (51.4 in) 72" – 1918 mm (75.7 in)
B	104 mm (4.1 in)
C	150 mm (5.9 in)
D	155 mm (6.1 in)
E	409 mm (16.1 in)
F	59 mm (2.3 in) minimum
G	87 mm (3.4 in)
H	140 mm (5.5 in)
I	87 mm (3.4 in)
J	314 mm (12.3 in)
K	430 mm (16.9 in)

Radar scanner mounting surface

Suitable radar scanner mounting surfaces include a mast platform, an arch, or a bridge structure.

If mounting the radar scanner on a sailboat, it may be necessary to install a radar guard to prevent the sails or any rigging coming into contact with the radar scanner or mounting platform. Without a proper radar guard the mounting platform and the radar scanner could be severely damaged.
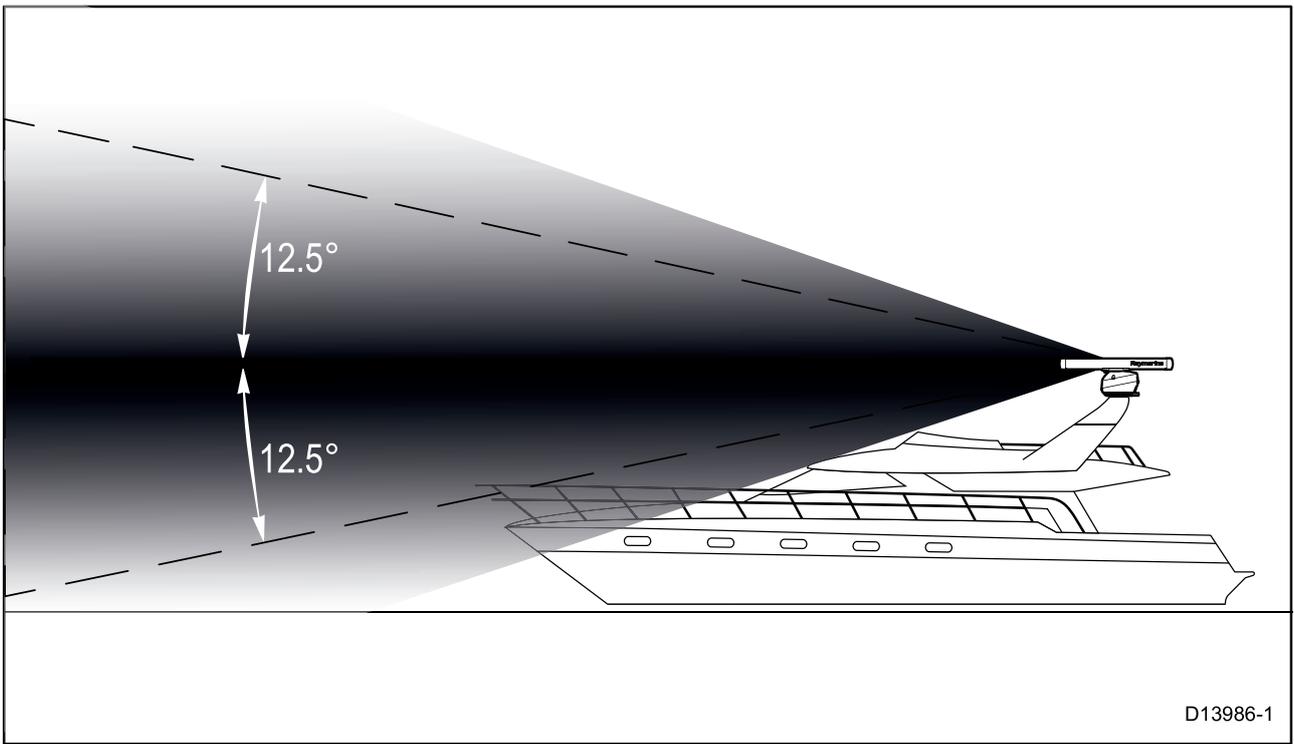
The following diagram illustrates suitable mounting surfaces for the radar scanner:

D10486-1
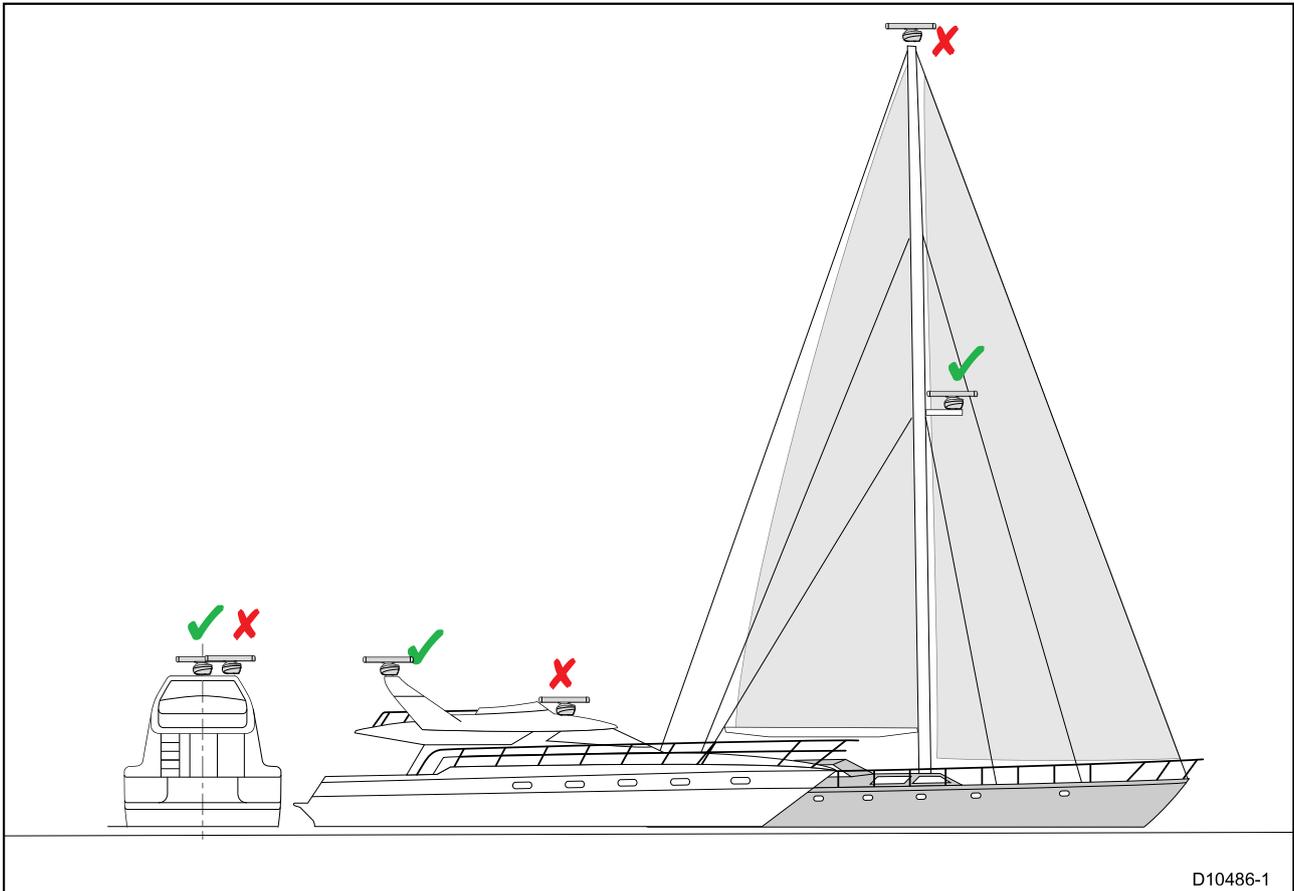
Radar scanner mounting angle

Ensure the Radar scanner rotates parallel to the water line.

The Radar beam from the Radar scanner is approximately 25° wide in the vertical direction, to give good target detection even when your vessel pitches and rolls.

D13986-1

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.

D13400-1
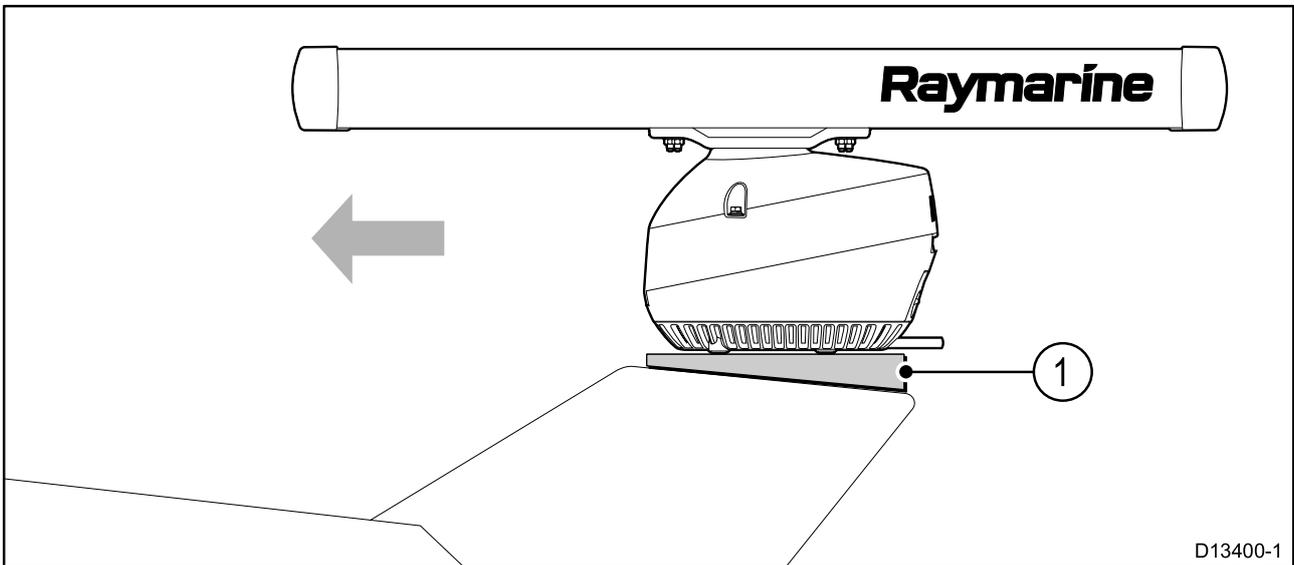
Item	Description
1	Wedge or washers

5.2 Mounting

Radar scanner installation procedures

Important installation information.

The radar scanner is supplied in 3 parts, each involving a separate installation procedure:

1. Install the VCM100 voltage converter module.

2. Secure the radar pedestal to a suitable mounting platform.

3. Attach the antenna to the pedestal.

Mounting the VCM100
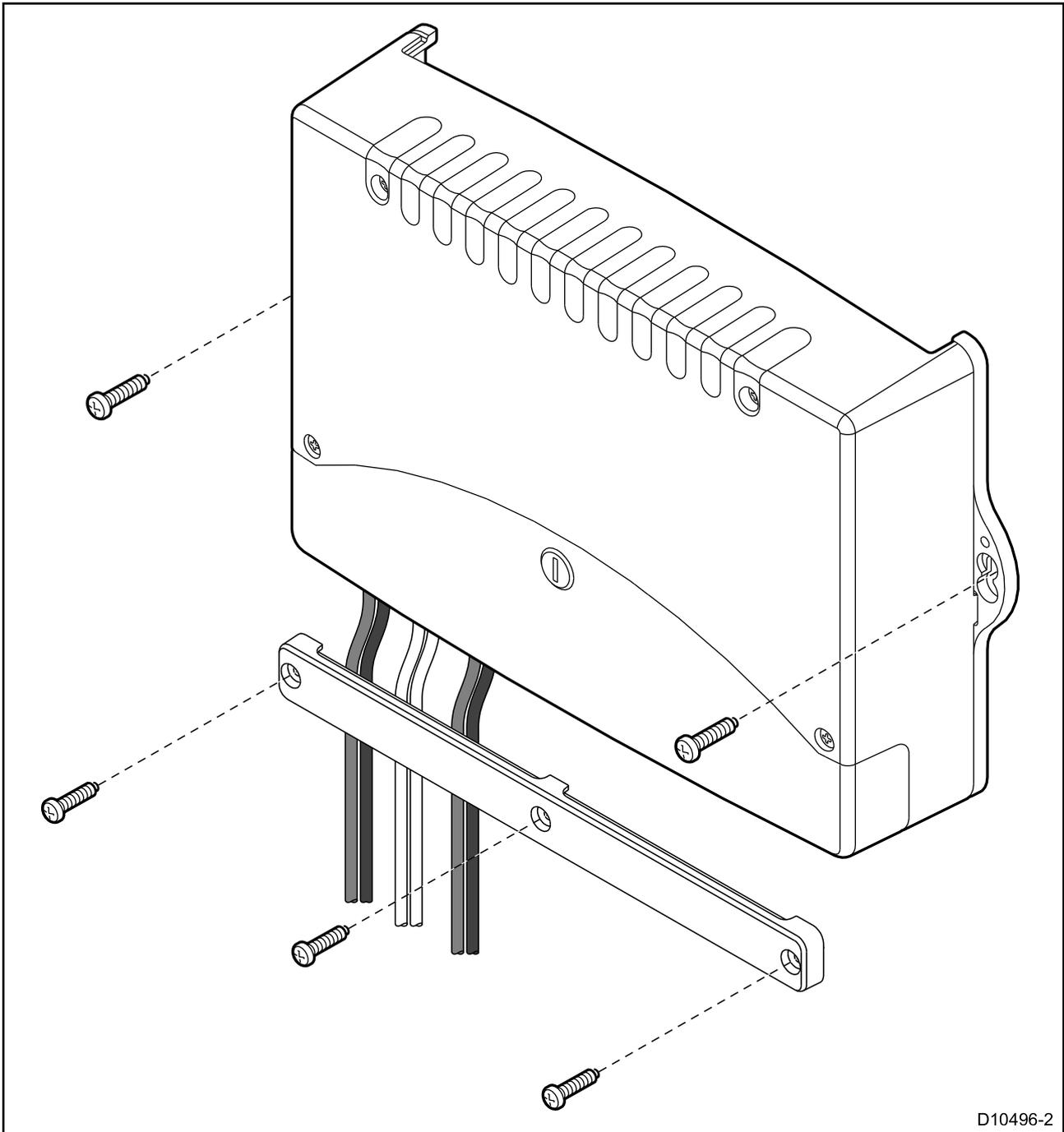
Before mounting the unit, ensure that you have:

• Selected a suitable location. See **VCM100 location requirements**

> **Note:** The VCM100 is splashproof, and suitable for mounting below decks only.

• Identified the cable connections and route that the cables will take.

> **Note:** Do NOT connect any cables to the power supply until the following steps have been completed.

1. Check the selected location for the unit. The VCM100 requires a clear, flat area with suitable space for routing the cables below the unit.
2. Hold the VCM100 in place in the required mounting location.
3. Using a pencil, mark the drilling area inside the mounting lug on each side of the VCM100 unit.
4. Using a 3 mm drill bit, drill a hole through the pencil marks.
5. Align the VCM100 mounting lugs with the drill holes.
6. Hold the VCM100 in place.
7. Using a suitable screwdriver, screw the self-tapping mounting screws through the mounting lug holes, into the drilled holes.
8. Connect the cables, according to the instructions provided in this handbook.
9. Hold the cable clamp in place over the cables, approximately 50 mm (2") below the mounted VCM100 unit.
10. Using a pencil, mark the drilling area inside each mounting bracket hole.
    ENSURE THE CABLES DO NOT COVER THE HOLES.
11. Using a 3 mm drill bit, drill a hole through the pencil marks.
12. Hold the cable clamp in place, each hole aligned with the drill holes.
13. Using a suitable screwdriver, screw the self-tapping mounting screws through the bracket holes, into the drilled holes.

D10496-2

Securing the pedestal to the mounting platform

Before mounting the unit, ensure that you have:

- Selected a suitable location.

- Identified the cable connections and route that the cables will take.

- Prepared suitable lifting equipment for fixing the pedestal to the mounting platform. The radar pedestal weighs 24.2 kg (53.35 lb) without an antenna fitted. For safety reasons it is recommended that the unit is not lifted by one person. The unit is supplied with a lifting sling (maximum Safe Working Load (SWL) = 1000 kg). Suitable lifting equipment could include a crane, hoist, or an appropriate rigid overhead structure. Do NOT attach the antenna to the pedestal prior to lifting.
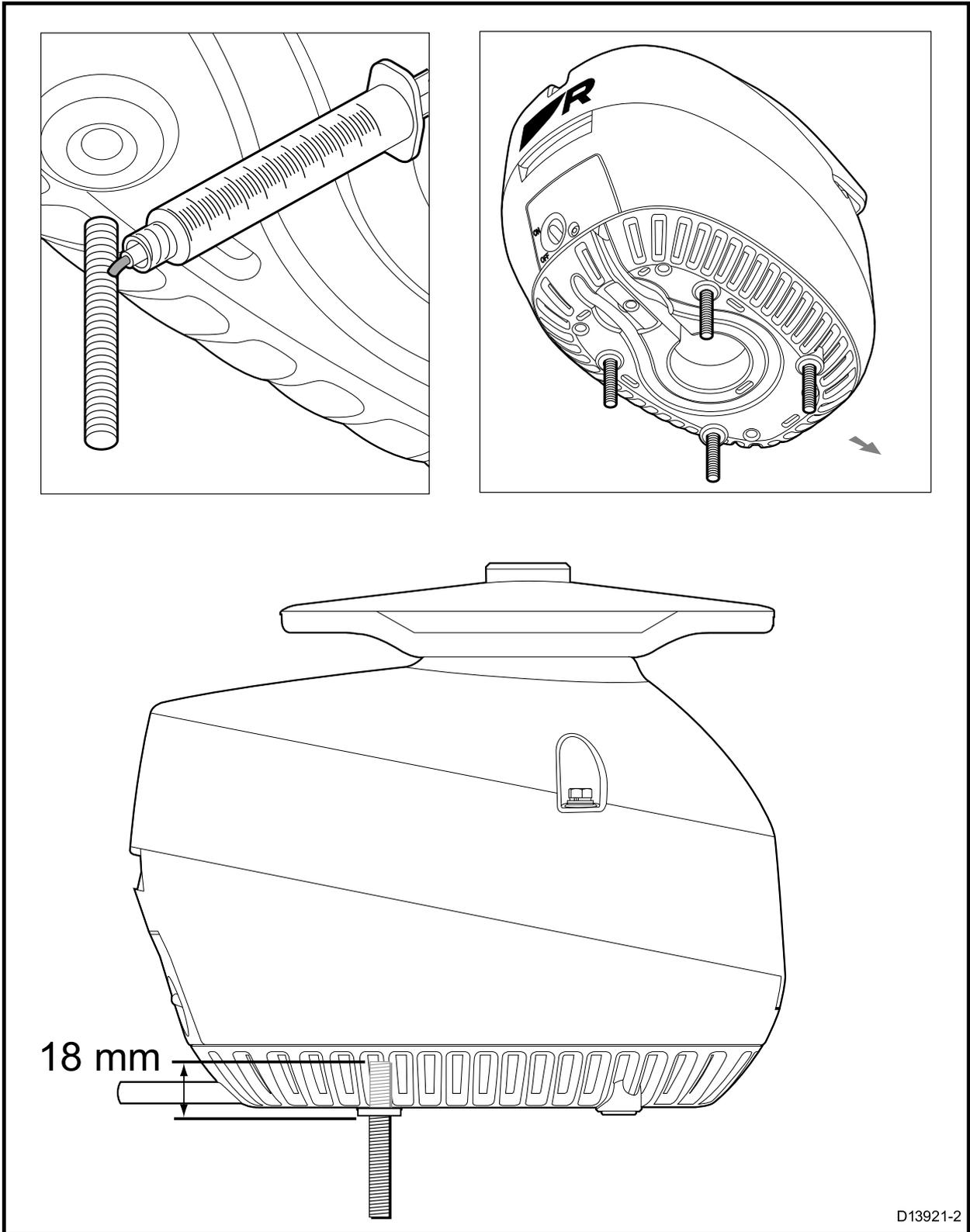
Note: Do NOT connect any cables until the following steps have been completed.

1. Check the selected location. A clear, flat platform is required for mounting the pedestal unit.

Important: See the Radar scanner location requirements section for more information.

2. Fix the supplied mounting template to the platform, using masking or self-adhesive tape.

D13988-1

3. Using a 3 mm drill bit, drill the 4 holes, as indicated on the mounting template.

   Check that the holes have been drilled in the correct position.

4. Using an 11 mm drill bit, drill through the 4 holes.

5. Remove the mounting template.

6. The pedestal unit has a cap fitted over the open array mounting shaft to protect the protruding coaxial pin. This cap must be left in place until the open array antenna is fitted to the pedestal.

7. Grease the 4 metal studs with the supplied Denso paste.
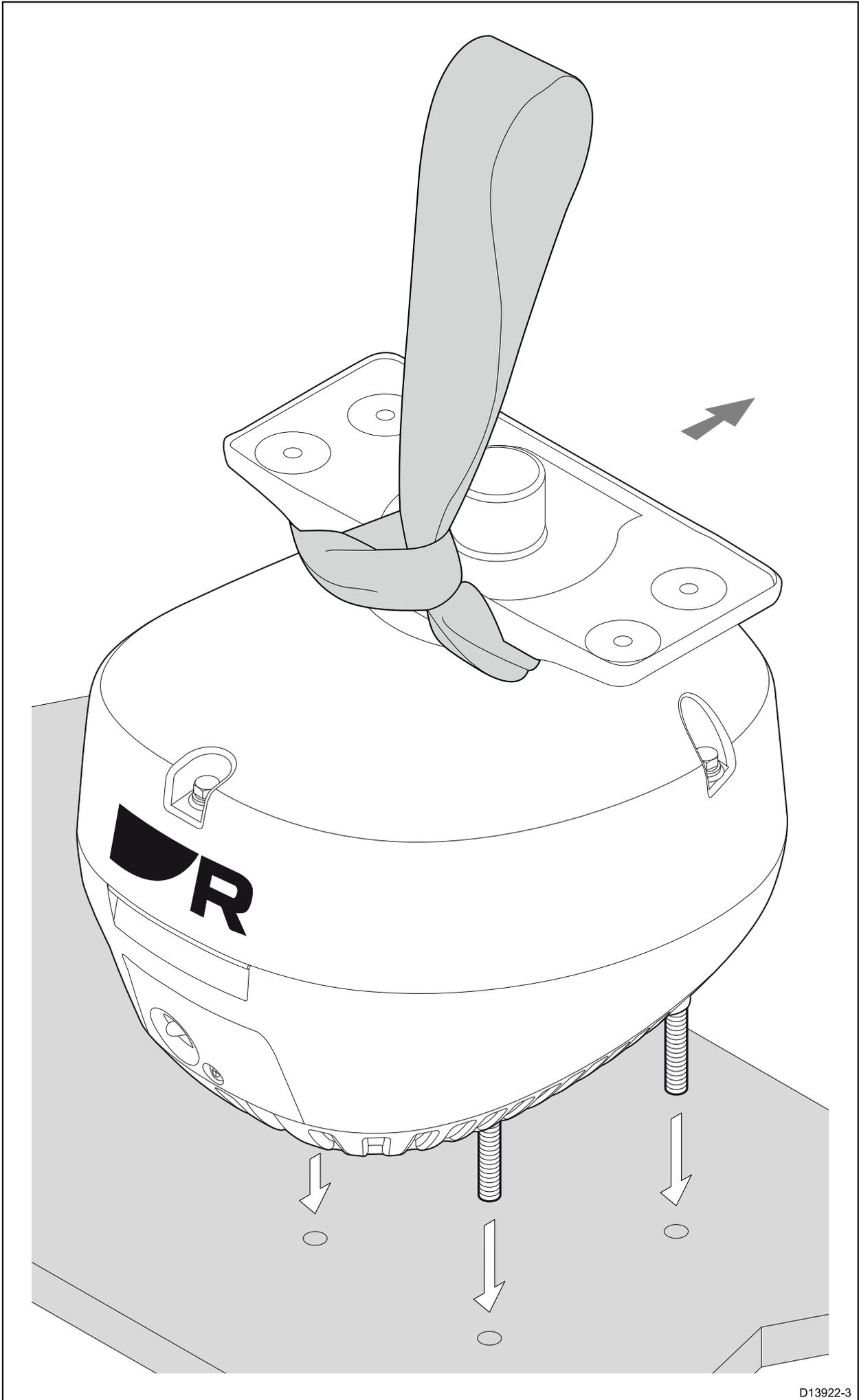

D13921-2

8. Insert the studs no more than 18 mm into the holes in the pedestal base, and hand-tighten. 4 spare nuts are provided which may be used as temporary locking nuts to aid insertion of the studs into the pedestal.

   If the supplied studs are not long enough for the mounting surface thickness, use M10 stainless steel, grade A4-70 studding of a suitable length.

9. Using the supplied lifting sling, looped beneath the antenna rotor, raise the pedestal over the mounting surface. Carefully lower into position, taking care that the studs pass through the holes without damaging the threads. Ensure that the front of the pedestal is pointing towards the bow of the vessel.
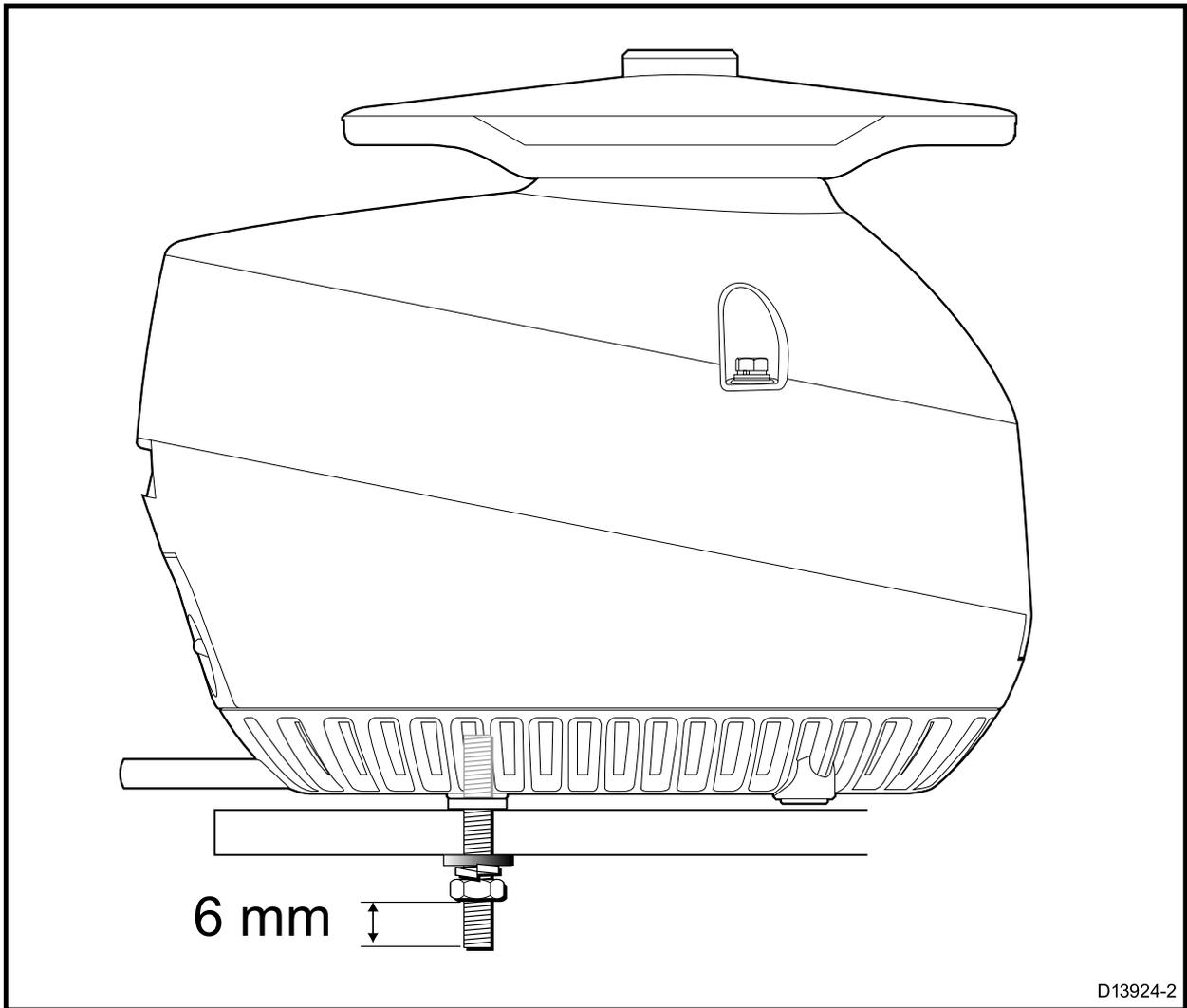
Note: Do NOT attach the antenna to the pedestal prior to lifting.

D13922-3

10. Grease the studs with the supplied Denso paste.
11. Referring to the following illustration, use the 4 nuts and associated washers to secure the pedestal to the platform. Tighten each nut to 30 Nm (22.1 lb ft) torque.

D13923-2

12. Ensure all 4 sets of nuts and washers are used to secure the pedestal to the mounting platform. There should be no more than 6 mm of excess stud below the nut. Cut-off any excess stud.

6 mm

D13924-2

13. Retain the 4 spare nuts (which may have been used as a temporary measure during Step 8).

Securing the radar antenna to the pedestal

Before attaching the antenna to the pedestal unit, ensure that:

- The pedestal base is securely fixed to the platform.

- The cable is NOT attached.

- The pedestal power switch is in the OFF position.

- The pedestal unit has a cap fitted over the open array mounting shaft to protect the protruding co-axial pin. This cap must remain in place until you're ready to fit the antenna to the pedestal unit.

Note: You MUST ensure that the antenna does not come into contact with the delicate protruding coaxial pin. This is a critical component and should be treated with caution. Follow all the instructions provided below, and ensure that the alignment guides are used.

1. Fit the 4 threaded alignment guides to the studs on the underside of the antenna. Ensure a close fit. The alignment guides are essential to help prevent damage to the coaxial pin.
2. Remove the protective cap from the antenna shaft. Retain the cap for future use.
3. Position the antenna mounting bracket on the Port to Starboard axis of the pedestal.
4. Lift the antenna into position, ensuring it is in the correct orientation and that the threaded alignment guides are fitted. Carefully align and slowly lower the antenna.
5. Once the antenna is in position, remove the alignment guides.
6. Grease the 4 securing studs with the supplied Denso paste.

7. Use the 4 nuts and associated washers to secure the antenna to the pedestal, as shown in the following diagram. Tighten each nut to 10 Nm (7.4 lb ft) torque.

Array

Alignment guide

Pedestal

M8 plain washer

M8 spring washer

M8 nut

D13925-2
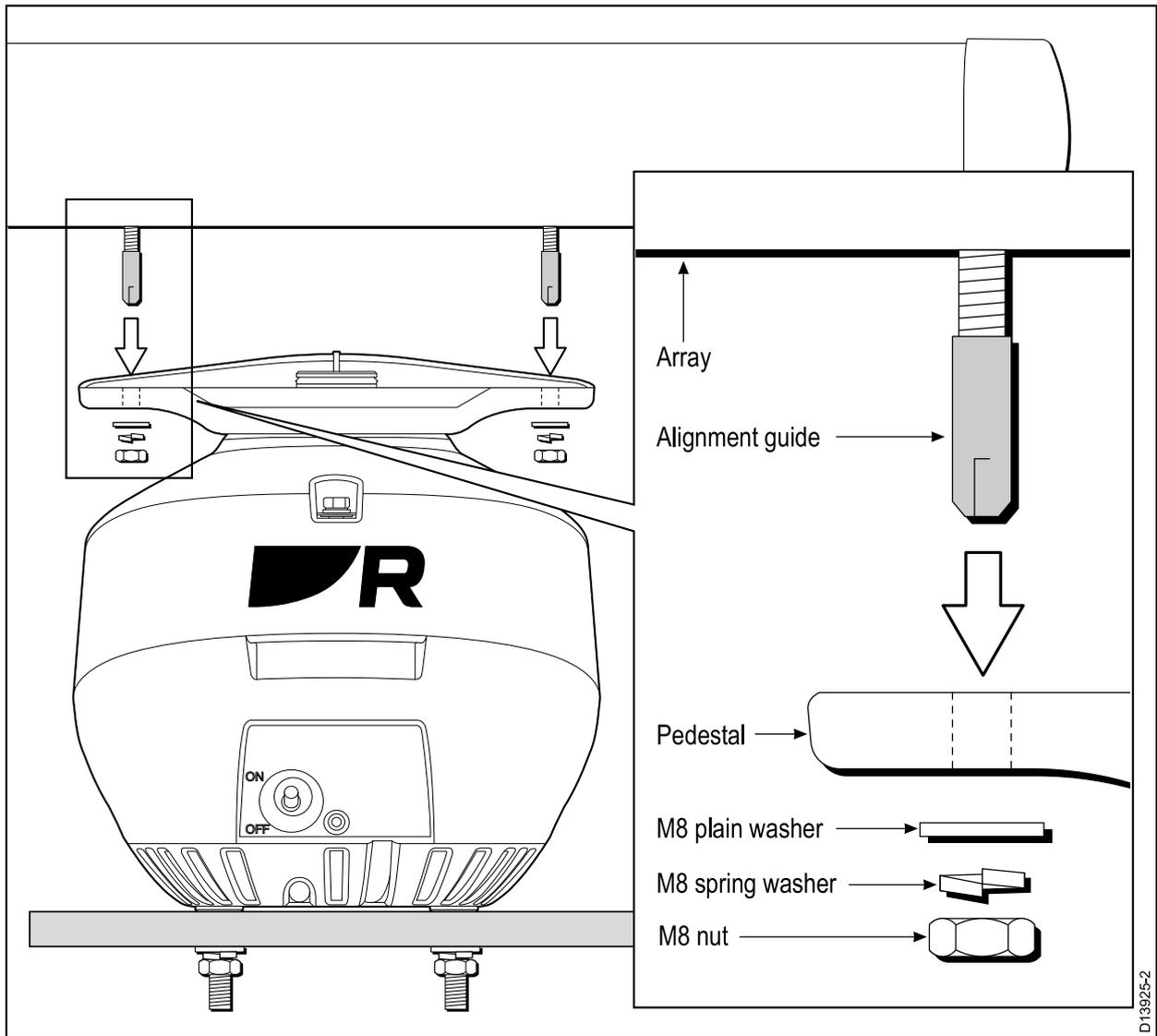
Radar scanner protection — sailing vessels

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 in the event that 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.

Chapter 6: System checks

Chapter contents

6.1 Radar scanner initial power on test

With all cables correctly and securely connected to the radar scanner, and access to a multifunction display (power OFF):

1. Ensure the radar scanner power switch is set to ON.
2. Power on the multifunction display.

   The magnetron warm-up sequence should start, after which the radar scanner should enter Standby mode.
3. If necessary, adjust the lighting and contrast on the multifunction display.

6.2 Radar check

> ⚠️ **Warning: Radar scanner safety**
>
> Before rotating the Radar scanner, ensure all personnel are clear.

> ⚠️ **Warning: Radar transmission safety**
>
> The radar scanner transmits electromagnetic energy. Ensure all personnel are clear of the scanner when the radar is transmitting.

Checking the radar

These instructions apply to multifunction displays running LightHouse™ 3 software.

1. Select a Radar page.

   The '**Off/Not Connected**' message is displayed.

2. Select **On** to power up your radar.

   This process will take approximately 70 seconds.

   The scanner should now be transmitting and receiving.

3. Check that the radar screen is operating correctly.

   Typical radar screen
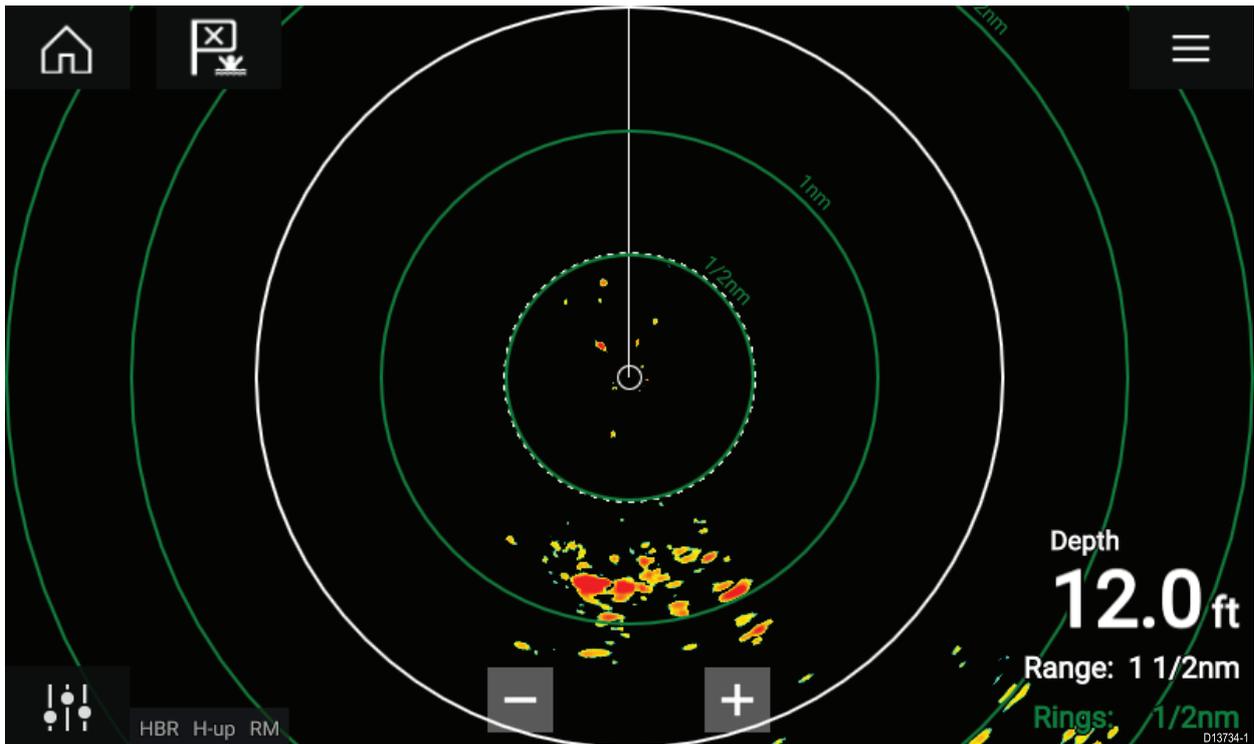
   Points to check:

   - *Radar sweep with echo responses are shown on screen.*
   - *Radar status icon rotating in top right hand corner.*

Check and adjust bearing alignment

Bearing alignment

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

Example misaligned Radar
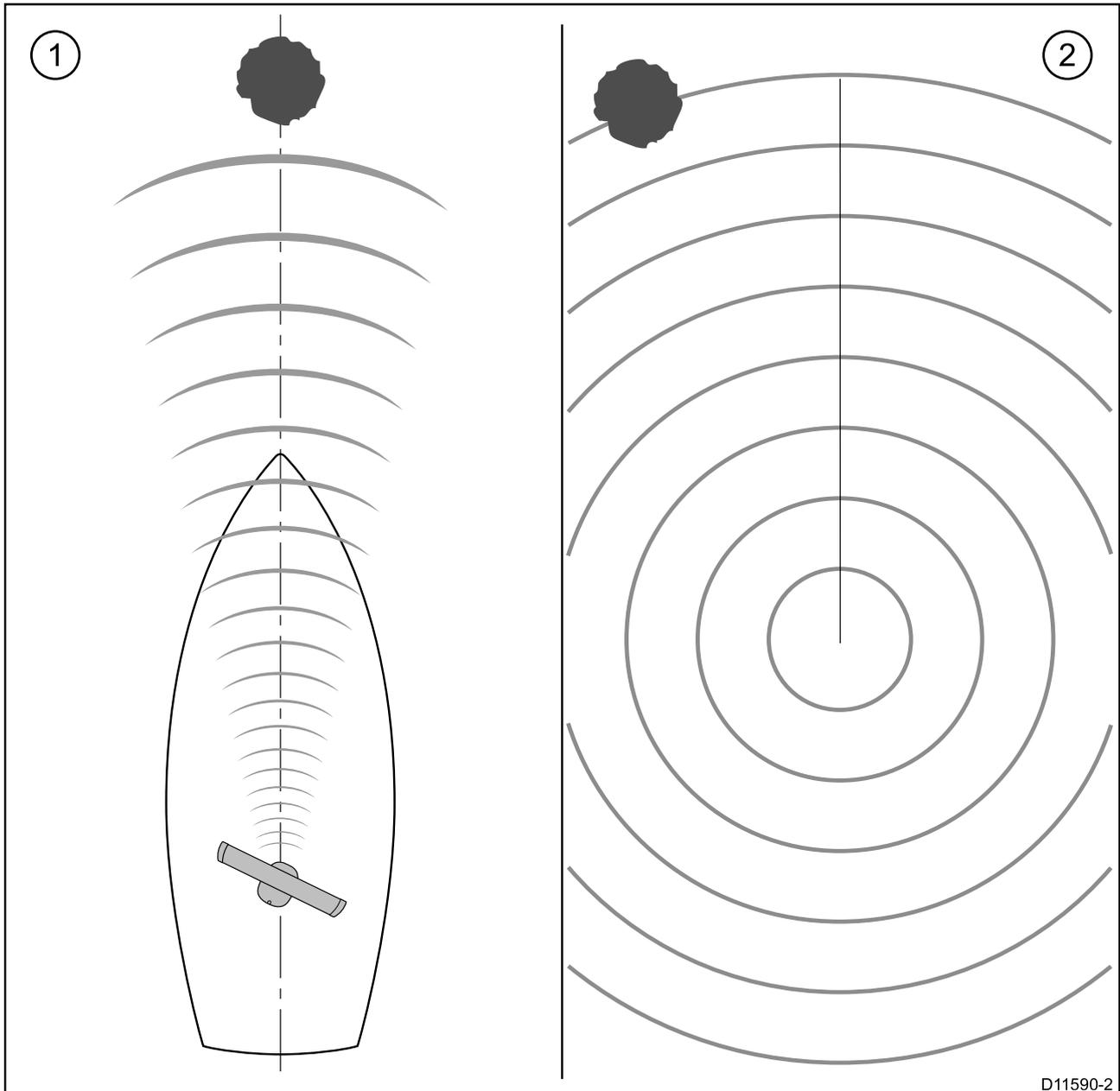
D11590-2

Item	Description
1	Target object (such as a buoy) dead ahead.
2	Target displayed on the Radar display is not aligned with the Ship's Heading Marker (SHM). Bearing alignment is required.

Checking the bearing alignment

1. With your vessel under way: Align the bow with a stationary object identified on the Radar display An object between 1 & 2 NM distant is ideal.

2. Note the position of the object on the Radar display. If the target is not under the ships heading marker (SHM), there is an alignment error and you will need to carry out bearing alignment adjustment.

Adjusting the bearing alignment

These instructions apply to multifunction displays running LightHouse™ 3 software.

Once you have checked the bearing alignment you can proceed and make any required adjustments.

With the radar app displayed, 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**.

Chapter 7: Troubleshooting

Chapter contents

7.1 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.

7.2 Power up troubleshooting

Product does not turn on or keeps turning off

Possible causes	Possible solutions
Blown fuse / tripped breaker	1. Check condition of relevant fuses and breakers and connections, replace if necessary. (Refer to the *Technical Specification* section of your product's installation instructions for fuse ratings.)
	2. If fuse keeps blowing check for cable damage, broken connector pins or incorrect wiring.
Poor / damaged / insecure power supply cable / connections	1. Check that the power cable connector is fully inserted into the unit and locked in position.
	2. Check the power supply cable and connectors for signs of damage or corrosion, and replace if necessary.
	3. With the unit turned on, try flexing the power cable near to the display connector to see if this causes the unit to restart or lose power; replace if necessary.
	4. Check the vessel's battery voltage and the condition of the battery terminals and power supply cables, ensuring connections are secure, clean and free from corrosion. Replace if necessary.
	5. With the product under load, using a multi-meter, check for high voltage drop across all connectors / fuses etc, and replace if necessary.
Incorrect power connection	The power supply may be wired incorrectly, ensure the installation instructions have been followed.
Power source insufficient	With the product under load, using a multi-meter, check the power supply voltage as close to the unit as possible to establish actual voltage when the current is flowing. (Refer to the *Technical Specification* section of your product's installation instructions for power supply requirements.)

Product will not start up (restart loop)

Possible causes	Possible solutions
Power supply and connection	See possible solutions from the table above, entitled 'Product does not turn on or keeps turning off'.
Software corruption	1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine website.
	2. On display products, as a last resort, attempt to perform a 'Power on Reset'. Be aware that this will delete all settings / presets and user data (such as waypoints and tracks), and revert the unit back to factory defaults.

7.3 Radar troubleshooting

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

No connection can be made to the scanner

Possible Causes	Possible Solution
Radar powered down	• If the scanner unit has shut down, awaken it by using the **Power Up Radar** option on the Shortcuts page, accessible on your MFD by momentarily pressing the power button.
Radar not transmitting	Select Tx for the relevant Radar scanner from the Shortcuts page.
Damaged or disconnected Power cable / RayNet cable	1. Check that the cable connectors are fully inserted and locked in position. 2. Check the power supply cable and connectors for signs of damage or corrosion, replace if necessary. 3. With the unit turned on, try flexing the cable near to the display connector to see if this causes the unit to re-boot/loose power, replace if necessary. 4. Check the vessel's battery voltage, the condition of the battery terminals and power supply cables, ensuring connections are secure, clean and free from corrosion, replace if necessary. 5. With the product under load, using a multi-meter, check for high voltage drop across all connectors/fuses etc (this can cause the unit to reset/turn off), replace if necessary. 6. Check condition of relevant breakers and fuses, replace if necessary. . If breaker keeps tripping or fuses keep blowing, contact a Raymarine authorized dealer for assistance.
Open Array power switch in OFF position	Ensure Open Array power switch is in ON position.
Software mismatch between equipment may prevent communication.	Ensure all Raymarine products contain the latest available software, check the Raymarine website: www.raymarine.com/software for software compatibility.

Displayed bearing is different to the true bearing.

Possible Causes	Possible Solution
Bearing alignment adjustment required	Carry out the Bearing Alignment procedure described in the latest version of the relevant **LightHouse™** Operations manual.

Radar will not initialize (Voltage control module (VCM) stuck in "sleep mode"

Possible Causes	Possible Solution
Intermittent or poor power connection	Check power connection at VCM. (Voltage at input = 12 / 24 V, Voltage at output = 42 V)

7.4 VCM100 LED indications

LED indications associated with the VCM100.

LED name	LED color / state	Possible causes
On	Green / solid	Radar operating normally.
Fault	Red / solid	Fault condition.
Sleep	Yellow / flashing	Radar scanner in standby.
	Yellow / solid	Fault condition, unit self-recovers after 20 seconds.

Chapter 8: Technical support

Chapter contents

8.1 Raymarine product support and servicing

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

Product information

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

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

You can obtain this product information using the menus within your product.

Servicing and warranty

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

Don't forget to visit the Raymarine website to register your product for extended warranty benefits: http://www.raymarine.co.uk/display/?id=788.

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

Web support

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

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

Telephone and e-mail support

Region	Telephone	E-mail
United Kingdom (UK), EMEA, and Asia Pacific	+44 (0)1329 246 777	support.uk@raymarine.com
United States (US)	+1 (603) 324 7900 (Toll-free: +800 539 5539)	support@raymarine.com
Australia and New Zealand	+61 2 8977 0300	aus.support@raymarine.com (Raymarine subsidiary)
France	+33 (0)1 46 49 72 30	support.fr@raymarine.com (Raymarine subsidiary)
Germany	+49 (0)40 237 808 0	support.de@raymarine.com (Raymarine subsidiary)
Italy	+39 02 9945 1001	support.it@raymarine.com (Raymarine subsidiary)
Spain	+34 96 2965 102	sat@azimut.es (Authorized Raymarine distributor)
Netherlands	+31 (0)26 3614 905	support.nl@raymarine.com (Raymarine subsidiary)
Sweden	+46 (0)317 633 670	support.se@raymarine.com (Raymarine subsidiary)
Finland	+358 (0)207 619 937	support.fi@raymarine.com (Raymarine subsidiary)

Region	Telephone	E-mail
Norway	+47 692 64 600	support.no@raymarine.com (Raymarine subsidiary)
Denmark	+45 437 164 64	support.dk@raymarine.com (Raymarine subsidiary)
Russia	+7 495 788 0508	info@mikstmarine.ru (Authorized Raymarine distributor)

Chapter 9: Technical specification

Chapter contents

9.1 Technical specification

Approvals

Region	Certification
USA	47CFR FCC Part 2 & Part 80 Certificate of Approval
Canada	RSS138 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

	48" 4kW array	72" 4kW array	48" 12kW array	72" 12kW array
Dimensions	• Pedestal: 409 mm x 314 mm x 430 mm (to top of antenna) • Antenna length: 1306 mm	• Pedestal: 409 mm x 314 mm x 430 mm (to top of antenna) • Antenna length: 1918 mm	• Pedestal: 409 mm x 314 mm x 430 mm (to top of antenna) • Antenna length: 1306 mm	• Pedestal: 409 mm x 314 mm x 430 mm (to top of antenna) • Antenna length: 1918 mm
Weight	26 kg (with antenna)	29 kg (with antenna)	26 kg (with antenna)	29 kg (with antenna)
Supply voltage	Using VCM100 Nominal: 12 V dc or 24 V dc Minimum: 10.8 V dc Maximum: 31.2 V dc	Using VCM100 Nominal: 12 V dc or 24 V dc Minimum: 10.8 V dc Maximum: 31.2 V dc	Using VCM100 Nominal: 12 V dc or 24 V dc Minimum: 10.8 V dc Maximum: 31.2 V dc	Using VCM100 Nominal: 12 V dc or 24 V dc Minimum: 10.8 V dc Maximum: 31.2 V dc
Power consumption (typical)	< 70 watts	< 70 watts	< 110 watts	< 110 watts
Power consumption (standby)	< 30 watts	< 30 watts	< 30 watts	< 30 watts
Power consumption (sleep)	< 1.2 watts	< 1.2 watts	< 1.2 watts	< 1.2 watts
Maximum range scale	72 nautical miles	72 nautical miles	96 nautical miles	96 nautical miles
Warm-up time	75 seconds	75 seconds	75 seconds	75 seconds
Standby to transmit	2.5 seconds	2.5 seconds	2.5 seconds	2.5 seconds
Environmental:				
Waterproof rating	IPX6	IPX6	IPX6	IPX6
Operating temperature range	-10°C to +55°C	-10°C to +55°C	-10°C to +55°C	-10°C to +55°C
Humidity	Up to 95% at 35°C	Up to 95% at 35°C	Up to 95% at 35°C	Up to 95% at 35°C
Maximum wind speed	85 knots	85 knots	85 knots	85 knots

Range

Range (Nm)	Expanded range (Nm)	Pulse width (nominal)	PRF
0.125, 0.25	N/A	75 ns	3 kHz
0.5	N/A	100 ns	3 kHz
0.75	0.125, 0.25	150 ns	3 kHz
N/A	0.5	250 ns	3 kHz
1.5	0.75	350 ns	2 kHz
3	N/A	450 ns	1.5 kHz
N/A	1.5	600 ns	1.3 kHz
6 +	3 +	1.0 us	820 Hz

Transmitter

	48" 4kW array	72" 4kW array	48" 12kW array	72" 12kW array
Transmitter frequency	9405 MHz ±20 MHz	9405 MHz ±20 MHz	9405 MHz ±20 MHz	9405 MHz ±20 MHz
Peak power output	4 kW	4 kW	12 kW	12 kW
Standby mode	Magnetron heater: ON Magnetron control: ON All other services: OFF	Magnetron heater: ON Magnetron control: ON All other services: OFF	Magnetron heater: ON Magnetron control: ON All other services: OFF	Magnetron heater: ON Magnetron control: ON All other services: OFF

Receiver (all models)

Intermediate frequency:	70 MHz
Receiver characteristic:	Linear
Receiver noise:	Less than 5 dB (including low noise converter and IF amplifier)
Bandwidth:	Matched digital filter for each pulse length

Antenna

	48" 4kW array	72" 4kW array	48" 12kW array	72" 12kW array
Beamwidth (vertical)	25° (nominal)	25° (nominal)	25° (nominal)	25° (nominal)
Beamwidth (horizontal)	1.85° (nominal)	1.15° (nominal)	1.85° (nominal)	1.15° (nominal)
Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Rotation speed	24 RPM 48 RPM (compatible displays and scanners only)	24 RPM 48 RPM (compatible displays and scanners only)	24 RPM 48 RPM (compatible displays and scanners only)	24 RPM 48 RPM (compatible displays and scanners only)

Chapter 10: Spares and accessories

Chapter contents

10.1 Magnum Radar accessories

The following accessories are available for the Magnum Open Array Radar:

Accessories

Item	Part number
5 m (16.4 ft.) Radar to "RayNet & Power" cable	A80227
10 m (32.8 ft.) Radar to "RayNet & Power" cable	A80228
15 m (49.2 ft.) Radar to "RayNet & Power" cable	A80229
25 m (82.0 ft.) Radar to "RayNet & Power" cable	A80230
2.5 m (8.2 ft.) Radar extension cable (one male radar connector; one female radar connector)	A92141D
5 m (16.4 ft.) Radar extension cable (one male radar connector; one female radar connector)	A55080D
10 m (32.8 ft.) Radar extension cable (one male radar connector; one female radar connector)	A55081D
5 m (16.4 ft.) Radar to "RJ45 & Power" cable	A55076D
10 m (32.8 ft.) Radar to "RJ45 & Power" cable	A55077D
15 m (49.2 ft.) Radar to "RJ45 & Power" cable	A55078D
25 m (82.0 ft.) Radar to "RJ45 & Power" cable	A55079D

Note: For more information on additional RayNet cables and adapters, refer to the 10.4 **RayNet to RayNet cables and connectors** and 10.5 **RayNet to RJ45 adapter cables** sections.

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	• 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. **Important:** Do NOT use crossover devices for POE (Power Over Ethernet) connections.
Ethernet RJ45 coupler	R32142	• 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.
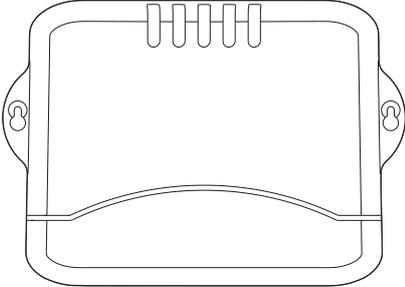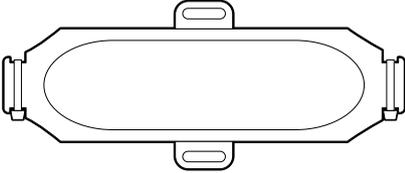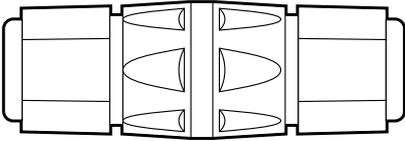
10.3 Network cable connector types

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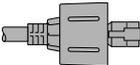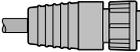
	RJ45 SeaTalk hs connector.
	RayNet connector.

10.4 RayNet to RayNet cables and connectors

| 400 mm (1.3 ft) | 2 m (6.56 ft) | 5 m (16.4 ft) | 10 m (32.8 ft) | 20 m (65.6 ft) |
| A80161 | A62361 | A80005 | A62362 | A80006 |

10 m (32.8 ft)
A80512

R70014

A80262

100 mm (3.9 in)
A80162

D13160-3
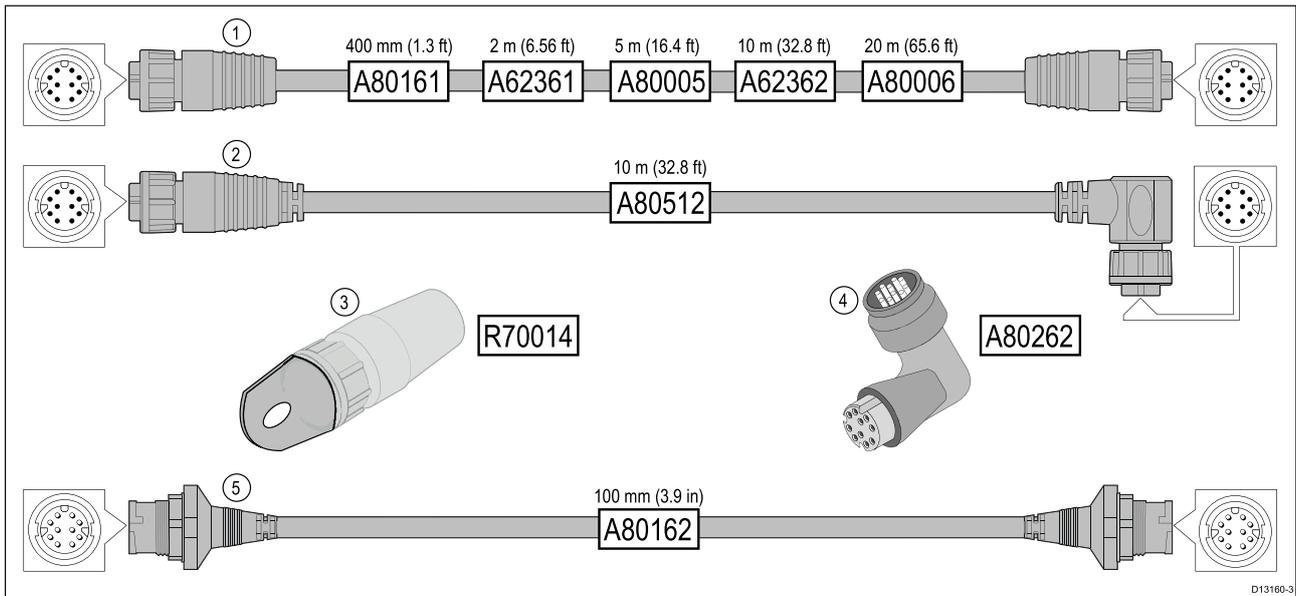
	Description
1	Standard RayNet connection cable with a RayNet (female) socket on both ends.
2	Right-angle RayNet connection cable with a straight RayNet (female) socket on one end, and a right-angle RayNet (female) socket on the other end. Suitable for connecting at 90° (right angle) to a device, for 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:
	• **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.

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