NEUBOAT DOCK

360° VIEW BOAT DOCKING SYSTEM

INSTALLATION INSTRUCTIONS

Avikus
MARITIME AUTONOMOUS PIONEER

Raymarine®

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CHAPTER 1: IMPORTANT INFORMATION

Safety warnings

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.

- Certified installation by an approved installer is recommended. A certified installation qualifies for enhanced product warranty benefits. Contact your dealer for further details.

Warning: Switch off power supply

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

Warning: Potential ignition source

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

Product warnings

Warning: Product grounding

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

Warning: Positive ground systems

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

Warning: Power supply voltage

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

Warning: Corrosion

To avoid accelerated galvanic corrosion of the product, ensure that a non-metallic isolation mount is used when fitting the product directly to large stainless steel platforms/mounts, or directly to steel construction vessels.

Caution: Power supply protection

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

Caution: 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.

Regulatory notices

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.

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EMC installation guidelines

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

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

Note:

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

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

- Raymarine® equipment and cables connected to it are:

  – At least 1 m (3.3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).

  – More than 2 m (6.6 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.

- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.

- Raymarine® specified cables are used.

- Cables are not cut or extended, unless doing so is detailed in the installation manual.

Note:

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

Suppression ferrites

- 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 the manufacturer 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.

- If your camera installation requires long cable runs, you may need to fit additional ferrites to maintain acceptable EMC performance.

Declaration of Conformity

Raymarine® UK Ltd declares that the following products are in compliance with the EMC Directive 2014/30/EU:

- NeuBoat Dock Basic System, part number: E70699

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

Warranty registration

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

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

Product disposal

Dispose of this product in accordance with the WEEE Directive.

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

Equipment marked with the crossed-out wheeled bin symbol indicates that the equipment should not be disposed of in unsorted household waste.

Local authorities in many regions have established collection schemes under which residents can dispose of waste electrical and electronic equipment at a recycling center or other collection point.

For more information about suitable collection points for waste electrical and electronic equipment in your region, refer to the Raymarine website: www.raymarine.com/en-gb/policies/recycling

IMO and SOLAS

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

Technical accuracy

To the best of our knowledge, the information in this document was correct at the time it was produced. However, Raymarine cannot accept liability for any inaccuracies or omissions it may contain. In addition, our policy of continuous product improvement may change specifications without notice. As a result, Raymarine cannot accept liability for any differences between the product and this document. Please check the Raymarine website (www.raymarine.com) to ensure you have the most up-to-date version(s) of the documentation for your product.

Publication copyright

CHAPTER 2: DOCUMENT INFORMATION

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2.1 Applicable products

This document is applicable to the following products:

NeuBoat Dock Basic System, part number: E70699

2.2 Product documentation

The following documentation is applicable to the NeuBoat Dock system:

Documentation number	Description
87480	NeuBoat Dock Installation Instructions (this document)
81418	NeuBoat Dock Operation Instructions
87479	NeuBoat Dock Surround View Monitor (SVM) Camera Mounting Template
87478	NeuBoat Dock Camera Conversion Unit (CCU) Mounting Template
87477	NeuBoat Dock Object Recognition Unit (OCR) Mounting Template

2.3 Document illustrations

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

All images are provided for illustration purposes only.

2.4 Document conventions

Commonly used terminology

The terminology listed below is commonly used throughout this document.

- **NeuBoat Dock System** — Refers to the complete NeuBoat Dock system, consisting of multiple cameras, a Camera Conversion Unit (CCU) and an Object Recognition Unit (ORU), which connects to a compatible multifunction display.

- **Surround View Monitor (SVM) camera**, or just "camera" — Refers to one or many Surround View Monitor cameras, which combine to provide a live 360° video feed of your vessel's surroundings.

- **Camera Conversion Unit (CCU)** — Refers to the camera input unit, which receives each Surround View Monitor (SVM) camera video feed and outputs them to an Object Recognition Unit (ORU).

- **Object Recognition Unit (ORU)** — Refers to the central processing unit, which processes the data sent by the Camera Conversion Unit (CCU) and provides it to the multifunction display (MFD).

CHAPTER 3: PRODUCT AND SYSTEM OVERVIEW

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3.1 Product overview

NeuBoat Dock is a 6-camera surround-view system which combines the video feeds from all cameras to provide a 360° birds-eye view around your vessel to assist in docking maneuvers.

This intuitive view of your vessel surroundings significantly reduces the risks and complexities involved when maneuvering in tight-quarter environments, taking the stress out of vital maneuvers by creating a safer docking experience.

The NeuBoat Dock system is simple to calibrate, and does not require either Raymarine® personnel or additional calibration mats / posts to be present during the initial setup process. The system can be calibrated remotely, either via a Raymarine® Axiom MFD with a Wi-Fi Internet connection, or via a Raymarine® YachtSense Link Router.

The NeuBoat Dock system consists of 4 core components:
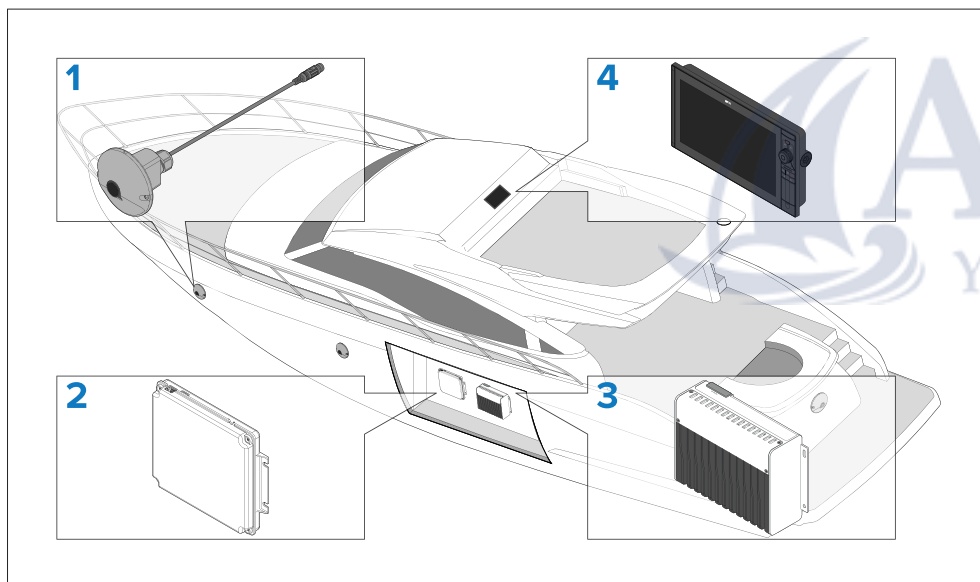
1. **Surround View Monitor (SVM) camera** — located at the *bow*, *blind-port*, *blind-starboard*, *port*, *starboard* and *stern* positions on your vessel, the live video feeds from these cameras combine to provide a 360° birds-eye surround view of your vessel's immediate surroundings.

2. **Camera Conversion Unit (CCU)** — located below deck, this unit receives data from the 6 Surround-View Monitor cameras and then transmits the processed data to the connected Object Recognition Unit.

3. **Object Recognition Unit (ORU)** — located below deck, this unit receives data from the Camera Conversion Unit and then interprets the visual information from all connected cameras into a synchronized view.

4. **Compatible multifunction display (MFD)** — located either above or below deck, this system component receives data from the Object Recognition Unit and displays it in the *[NeuBoat Dock app]*. For operation instructions, refer to the dedicated **NeuBoat Dock Operation Instructions (81418)** document.

3.2 Required additional components

This product forms part of a system of electronics and requires the following additional components in order to function.

Compatible Raymarine® multifunction display

For more information on which multifunction displays are compatible with the NeuBoat Dock system, refer to the following section:
p.15 — Compatible multifunction displays

Network switch & additional CCU (expanded systems only)

If the required cable length between each of the cameras and the Camera Conversion Unit (CCU) exceeds more than 20 m (65.62 ft), then an ethernet network switch (such as the Raymarine® RNS-5 or RNS-8) and an additional CCU is required, in order to form an expanded system. For more information, refer to: **p.15 — Maximum camera cable length**

Cable extensions

Some installations may require extensions to network or power cables. For information on cable extensions, refer to:

- **p.77 — Spares and accessories**
- **p.41 — Network connections**
- **p.47 — Power connections — Camera Conversion Unit**
- **p.53 — Power connections — Object Recognition Unit**

3.3 Compatible multifunction displays

The NeuBoat Dock system is compatible with the following Raymarine® multifunction displays.

Compatible Raymarine® MFDs	Required MFD software version
Axiom 2 Series: Axiom 2 Pro Axiom 2 XL	• Axiom 2 Pro: *LightHouse 4, v4.5 or later* • Axiom 2 XL: *LightHouse 4, v4.5 or later*

Note:

To obtain the latest software for your Raymarine® products, visit: www.raymarine.com/software

3.4 Maximum camera cable length

If the required cable length between each of the SVM cameras and the CCU exceeds the length of the supplied 15 m (49.21 ft) SVM camera to CCU extension cable, then one of the following options is required in order to form an expanded system.

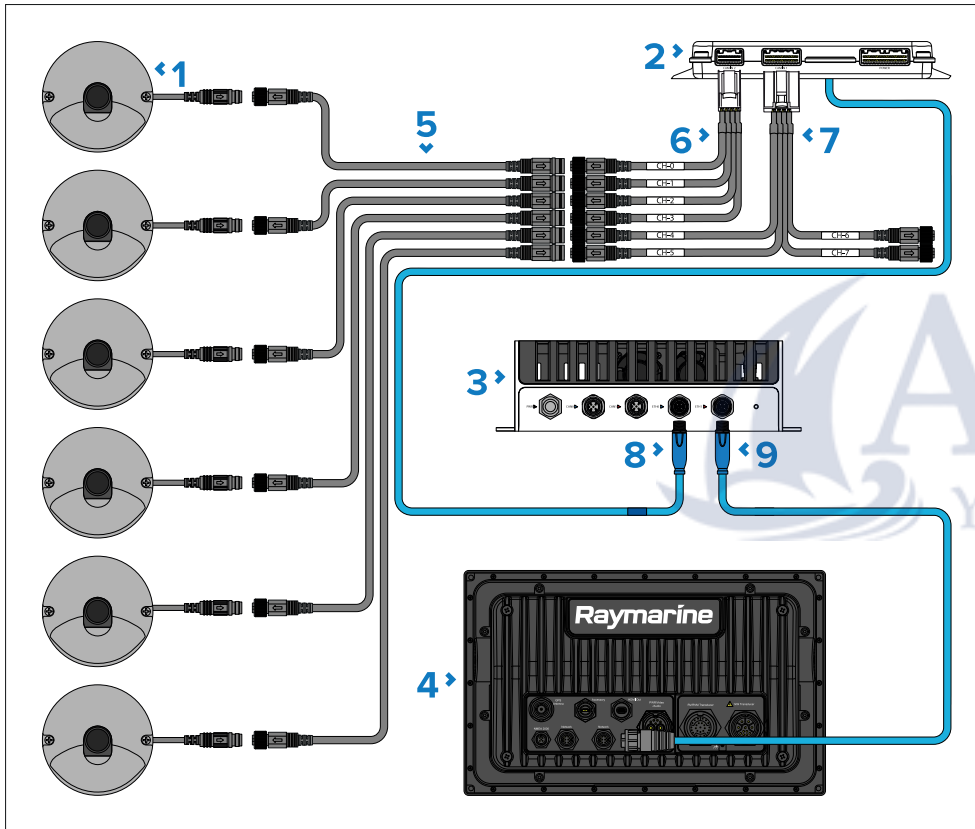| Cable length required	Recommended system type
0–15 m (49.21 ft)	**System type:** Basic. **Required additional components:** None. For more information, refer to the following section: **p.16 — Basic system**
15 m (49.21 ft) to 20 m (65.62 ft)	**System type:** Basic. **Required additional components:** SVM camera to CCU extension cable (A80762), 20 m (65.62 ft), available separately. For more information, refer to the following sections: • **p.16 — Basic system** • **p.77 — Spares and accessories**
> 20 m (65.62 ft)	**System type:** Expanded. **Required additional components:** • 1x RNS-5 or RNS-5 Network Switch (A80731), available separately. • 1x Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable), available separately. • 2x Adapter cables with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end, 15 m (49.21 ft) / 25 m (82.02 ft) available separately. For more information, refer to the following sections: • **p.17 — Expanded system** • **p.77 — Spares and accessories**

Network cable extensions

If you wish to extend the length of a network cable connected to your product, refer to the following section for further information: **p.77 — Spares and accessories**

3.5 Basic system

The following example provides an overview of a *basic system*, including available connections and the types of connected devices. In basic systems, the cable length between each of the SVM cameras and the CCU **does NOT** exceed 20 m (65.62 ft).

Example: basic system

1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 0.9 m (35.43 in))

2. Camera Conversion Unit (CCU).

3. Object Recognition Unit (ORU).

4. Axiom 2 Series multifunction display (Axiom 2 Pro shown).

5. SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

6. CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in) supplied.

7. CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in) supplied.

8. CCU to ORU cable (used to connect the CCU to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately.

9. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display), 25 m (82.02 ft) supplied / 50 m (164.04 ft) available separately.

> **Note:**
>
> Power connections are not shown in this illustration. For power connection information, refer to the following sections:
>
> • **p.45 — Power connections — Surround View Monitor camera**
>
> • **p.47 — Power connections — Camera Conversion Unit**
>
> • **p.53 — Power connections — Object Recognition Unit**

3.6 Expanded system

The following example provides an overview of an *expanded system*, including available connections and the types of connected devices. In expanded systems, the cable length between each of the SVM cameras and the CCU **exceeds** 20 m (65.62 ft). Therefore, an additional CCU and additional cables are required.

Example: expanded system

1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 0.9 m (35.43 in))

2. Camera Conversion Unit (CCU).

3. RNS-5 or RNS-8 network switch.

4. Object Recognition Unit (ORU).

5. Axiom 2 Series multifunction display (Axiom 2 Pro shown).

6. SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

7. CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in) supplied.

8. CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in) supplied.

9. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end (used to connect two CCU units to the network switch), 15 m (49.21 ft) / 25 m (82.02 ft) available separately.

10. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) socket on the other end, along with a locking gland for a watertight fit (used to connect the network switch to the ORU), 100 mm (3.9 in) available separately.

11. CCU to ORU cable (used to connect the network switch to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately.

12. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display), 25 m (82.02 ft) supplied / 50 m (164.04 ft) available separately.
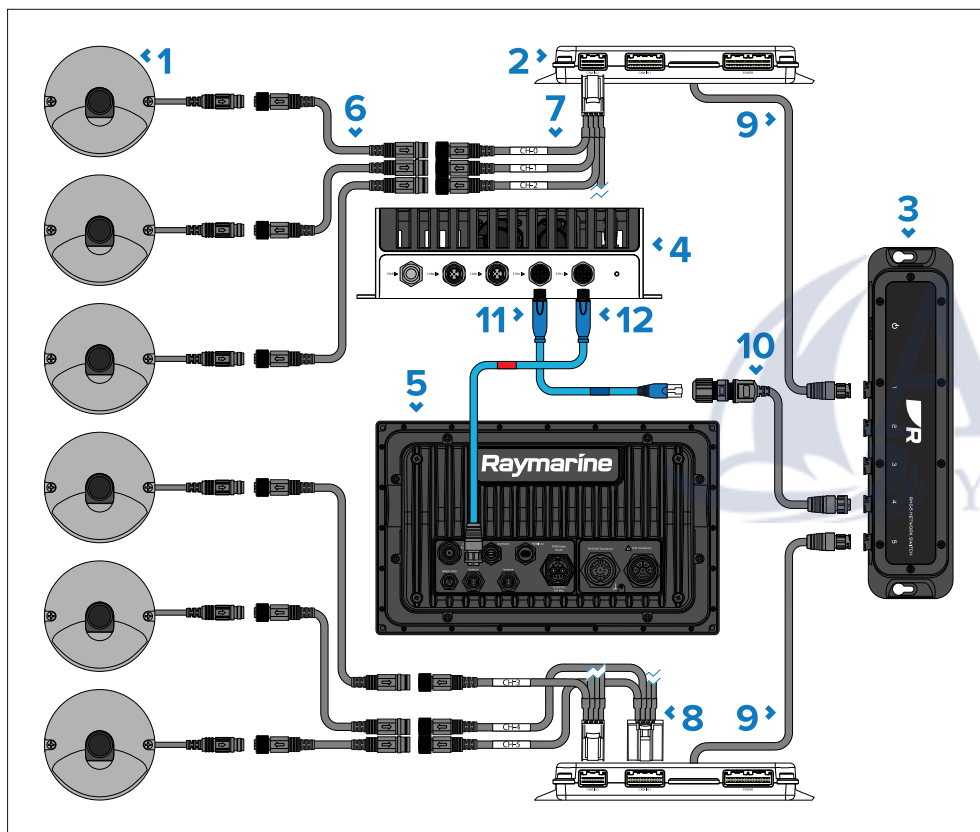
Note:

Power connections are not shown in this illustration. For power connection information, refer to the following sections:

- **p.45 — Power connections — Surround View Monitor camera**

- **p.47 — Power connections — Camera Conversion Unit**

- **p.53 — Power connections — Object Recognition Unit**

3.7 Software updates

The software running on the product can be updated.

- Raymarine® periodically releases software updates to improve product performance and add new features.

- The software on many products can be updated using a connected and compatible multifunction display (MFD) / chartplotter.

- Refer to www.raymarine.com/software for the latest software updates and the software update procedure for your specific product.


Important:

- To prevent potential software-related issues with your product, always follow the relevant update instructions carefully and in the sequence provided.

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

Caution: Installing software updates

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

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

- Damage caused by an incomplete update is not covered by Raymarine warranty.

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

Removing MicroSD card from its adapter

MicroSD memory cards are typically inserted into an SD card adaptor when supplied. The card will need to be removed from the adapter before inserting into your Camera Conversion Unit or Object Recognition Unit.
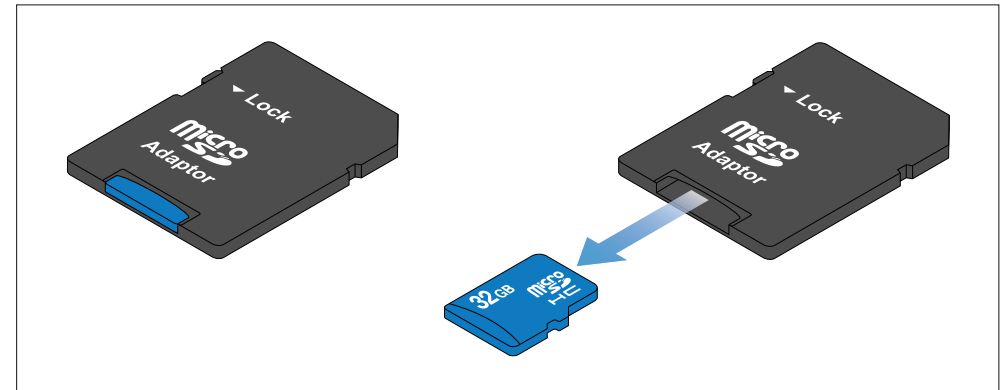
Inserting a MicroSD card — Camera Conversion Unit

The Camera Conversion Unit has a single slot MicroSD card reader located at the top of the unit for the purpose of software updates.
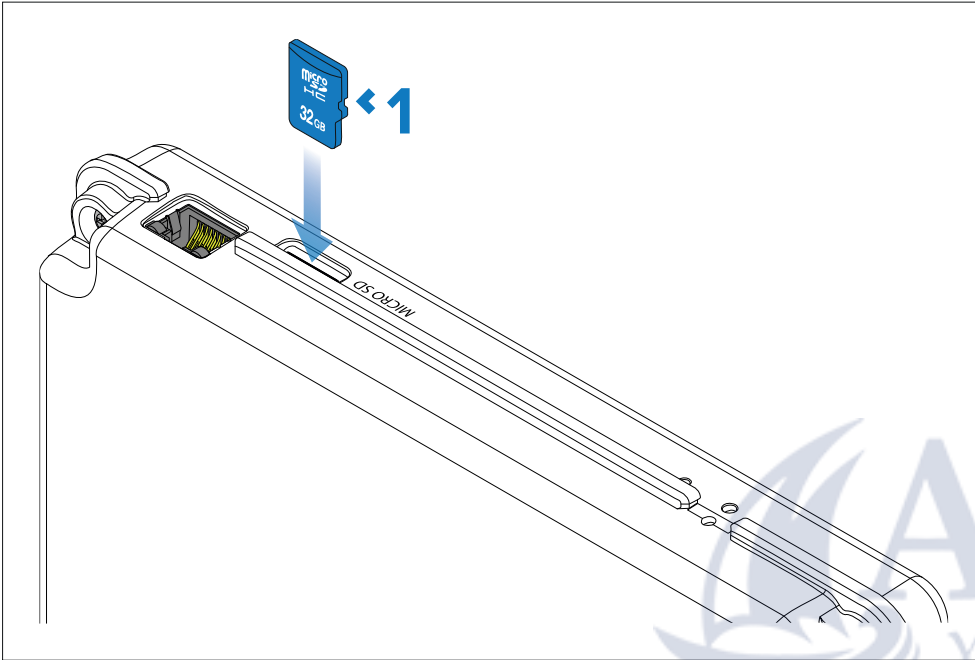
In order to insert your microSD card:

1. Position the microSD card with the contacts facing down and push the card into the slot.

Inserting a MicroSD card — Object Recognition Unit

The Object Recognition Unit has a single slot MicroSD card reader located at the top of the unit for the purpose of software updates.
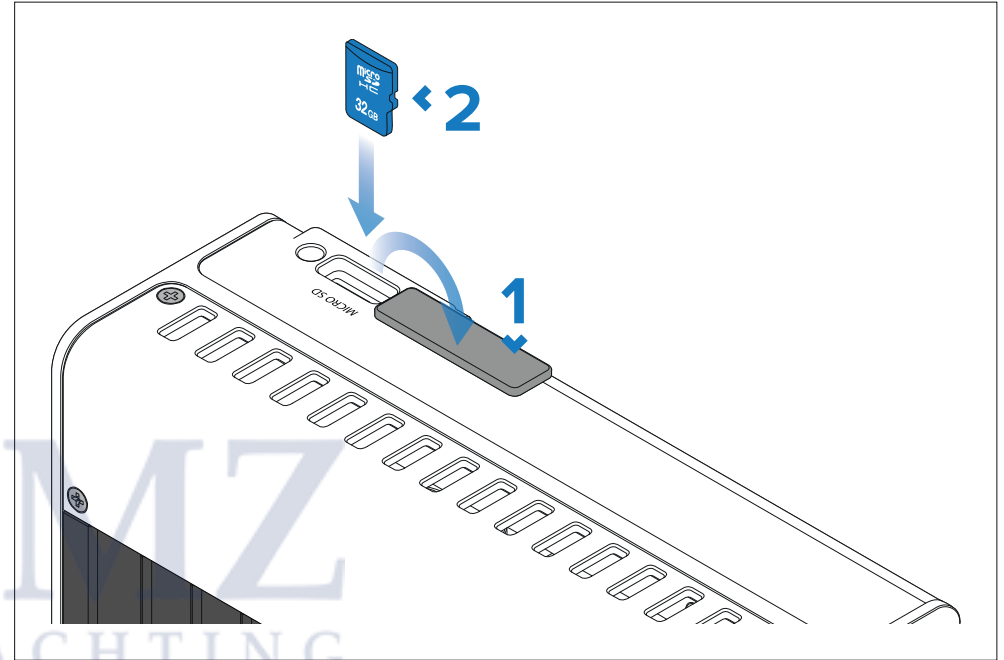
In order to insert your microSD card:

1. Pull back the microSD card reader cover as shown above.
2. Position the microSD card with the contacts facing down and push into the card into the slot.

Note:

The microSD card slot is fitted with a protective cap.

The protective cap should remain in place until the microSD card is inserted. If a microSD card insertion is not required then the protective cap should not be removed.
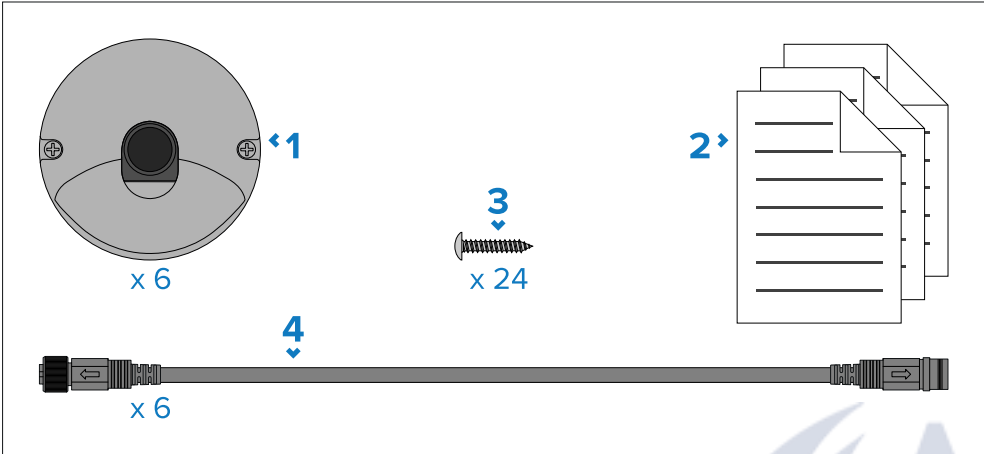
CHAPTER 4: PARTS SUPPLIED

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4.1 SVM camera — parts supplied

The parts supplied with the Surround View Monitor (SVM) camera are shown below:

Item	Description
1	(6 x) SVM camera (includes pre-fitted cable, 0.9 m (35.43 in))
2	(1 x) Documentation pack (includes **placement position file**).
3	(24 x) Fixing screws.
4	(6 x) SVM camera to CCU cable, 15 m (49.21 ft).

4.2 CCU — parts supplied

The parts supplied with the Camera Conversion Unit (CCU) are shown below:
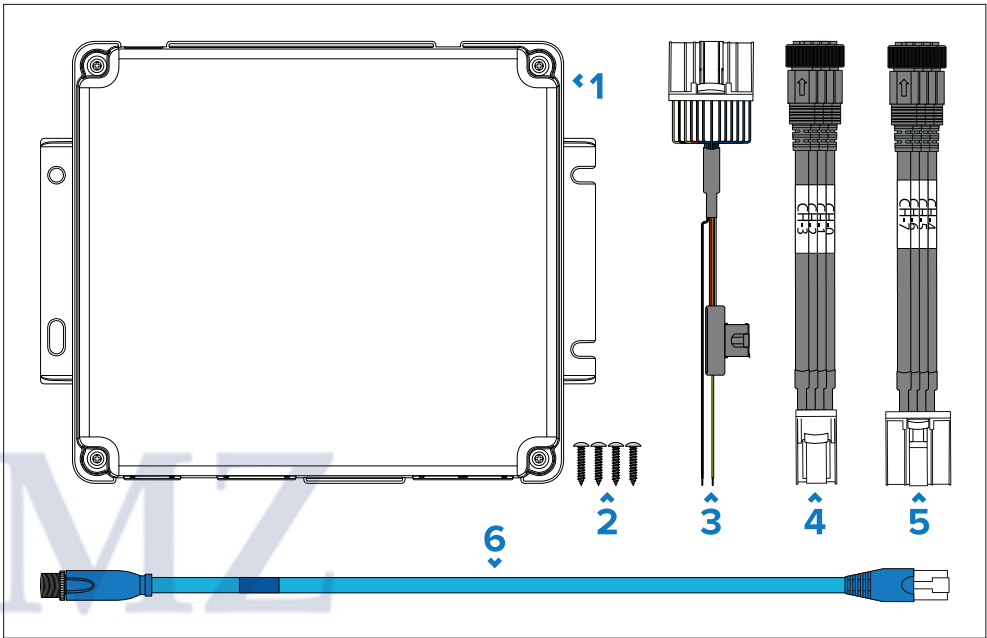
Item	Description
1	(1 x) Camera Conversion Unit (CCU).
2	(4 x) Fixing screws.
3	(1 x) CCU power cable, 1 m (3.3 ft).
4	(1x) CCU camera input cable 1, 200 mm (7.87 in).
5	(1x) CCU camera input cable 2, 200 mm (7.87 in).
6	(1 x) CCU to ORU cable, 15 m (49.21 ft).

4.3 ORU — parts supplied

The parts supplied with the Object Recognition Unit (ORU) are shown below:
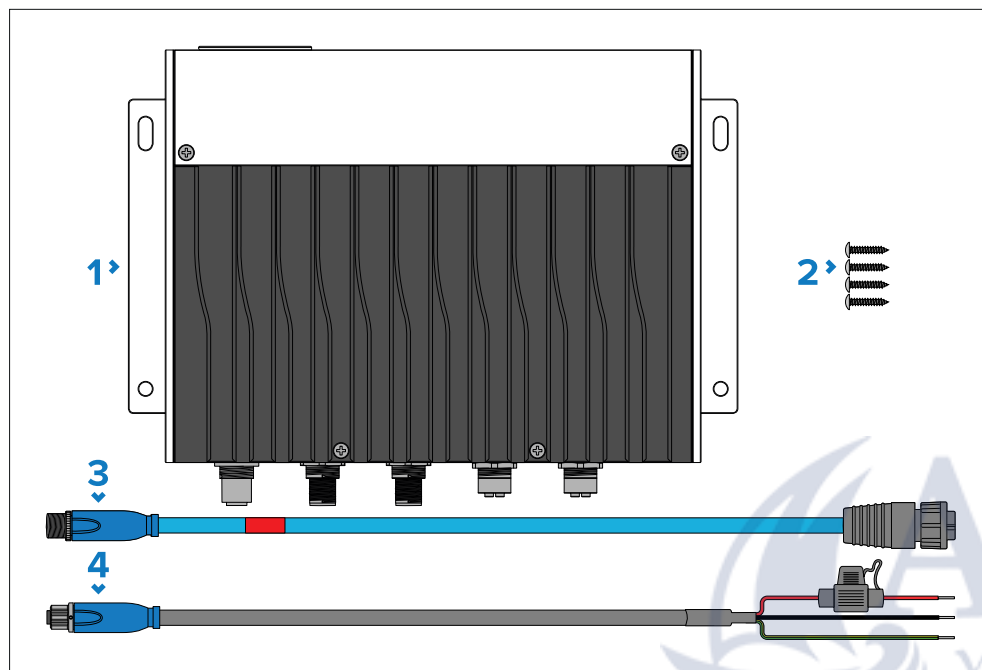
Item	Description
1	(1 x) Object Recognition Unit (ORU).
2	(4 x) Fixing screws.
3	(1 x) ORU to RayNet cable, 25 m (82.02 ft).
4	(1 x) ORU power cable, 2 m (6.56 ft).

CHAPTER 5: PRODUCT DIMENSIONS

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5.1 SVM camera — dimensions

The dimensions of the Surround View Monitor (SVM) camera are shown below:
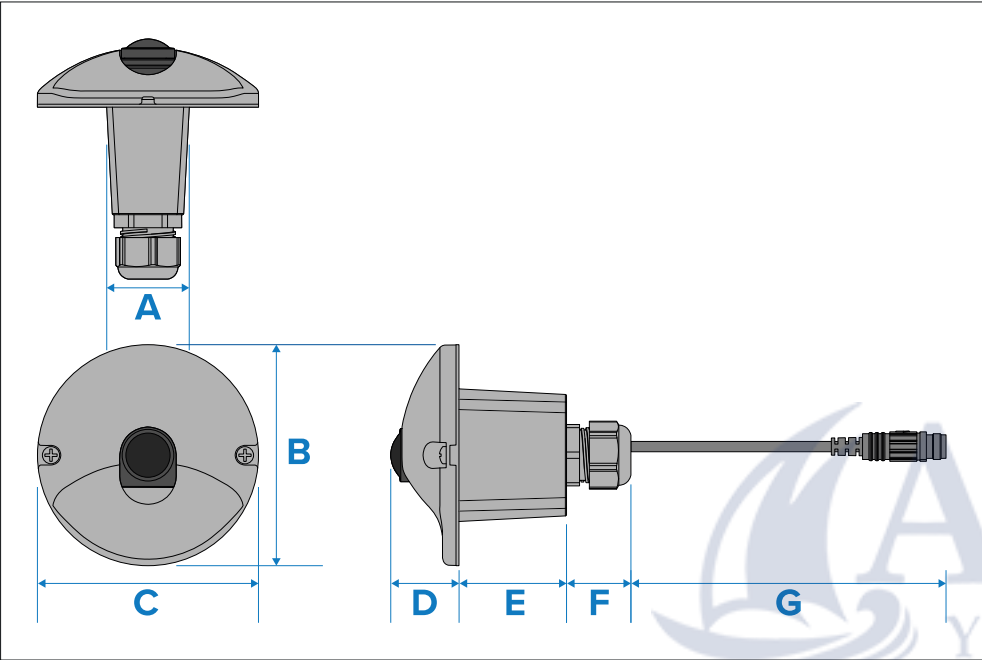
Item	Description
A	39.00 mm (1.54 in).
B	89.79 mm (3.54 in).
C	90.00 mm (3.54 in).
D	27.78 mm (1.09 in).
E	43.80 mm (1.72 in).
F	26.23 mm (1.03 in).
G	265.55 mm (10.45 in).

5.2 CCU — dimensions

The dimensions of the Camera Conversion Unit (CCU) are shown below:
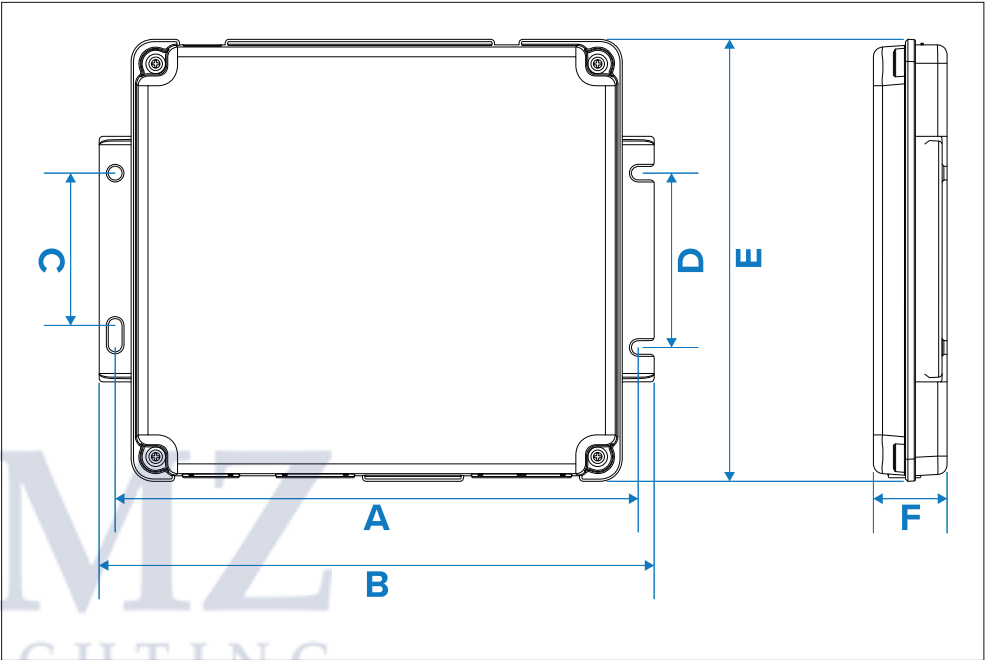
Item	Description
A	213 mm (8.39 in).
B	226.00 mm (8.90 in).
C	62.00 mm (2.44 in).
D	71.00 mm (2.80 in).
E	180.00 mm (7.09 in).
F	30.00 mm (1.18 in).

5.3 ORU — dimensions

The dimensions of the Object Recognition Unit (ORU) are shown below:
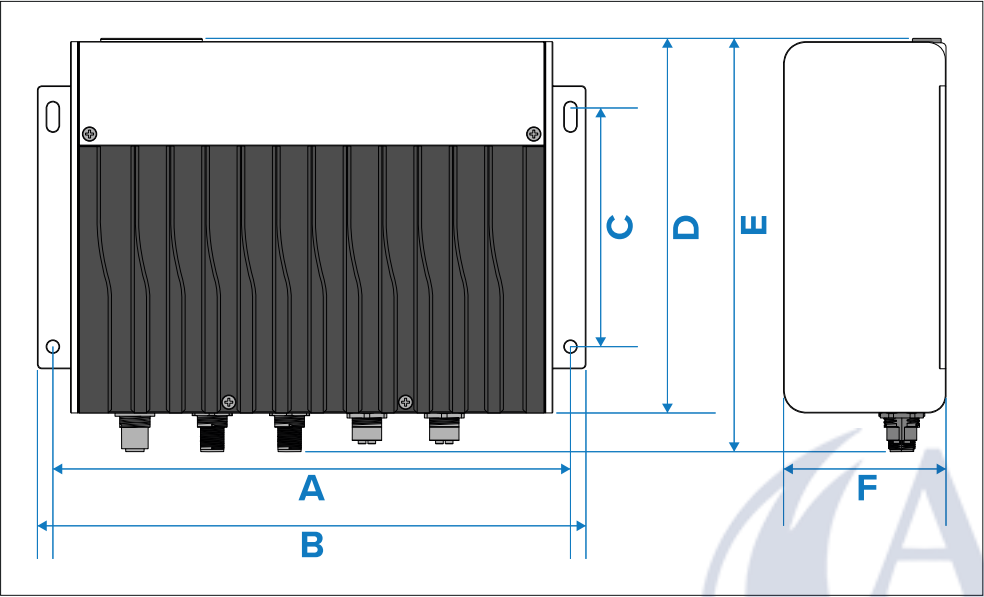
Item	Description
A	246.20 mm (9.69 in).
B	261.20 mm (10.28 in).
C	108.00 mm (4.25 in).
D	180.50 mm (7.11 in).
E	188.00 mm (7.40 in).
F	75.00 mm (2.95 in).

CHAPTER 6: LOCATION REQUIREMENTS

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6.1 Warnings and cautions

Important:

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

⚡ **Warning: Switch off power supply**

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

⚠ **Warning: Potential ignition source**

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

6.2 Maximum camera cable length

If the required cable length between each of the SVM cameras and the CCU exceeds the length of the supplied 15 m (49.21 ft) SVM camera to CCU extension cable, then one of the following options is required in order to form an expanded system.

Cable length required	Recommended system type
0–15 m (49.21 ft)	**System type:** Basic. **Required additional components:** None. For more information, refer to the following section: **p.16 — Basic system**
15 m (49.21 ft) to 20 m (65.62 ft)	**System type:** Basic. **Required additional components:** SVM camera to CCU extension cable (A80762), 20 m (65.62 ft), available separately. For more information, refer to the following sections: • **p.16 — Basic system** • **p.77 — Spares and accessories**
> 20 m (65.62 ft)	**System type:** Expanded. **Required additional components:** • 1x RNS-5 or RNS-5 Network Switch (A80731), available separately. • 1x Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable), available separately. • 2x Adapter cables with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end, 15 m (49.21 ft) / 25 m (82.02 ft) available separately. For more information, refer to the following sections: • **p.17 — Expanded system** • **p.77 — Spares and accessories**

6.3 SVM camera — placement position file

A NeuBoat Dock SVM camera **placement position file** is supplied with your system. The placement file contains precise installation locations for all the cameras in your NeuBoat Dock system. This custom file is designed to help you install the SVM cameras in the optimum locations aboard your vessel.

Important:

You must follow the instructions provided in the position file to ensure that the SVM cameras are positioned in the exact locations specified. Failure to do so can prevent the NeuBoat Dock system from functioning as intended.

The placement position file contains critical information for your installation:

- Drawings of your vessel with the NeuBoat Dock SVM cameras installed.
- Precise vertical angle adjustment values for each SVM camera.

Important:

Installing your NeuBoat Dock SVM cameras in the positions and with the angle adjustments described in the placement position file is essential.

If in doubt, refer to the following sections for additional guidance:

- **p.28 — General location requirements**
- **p.28 — Surround View Monitor camera location requirements**

6.4 General location requirements

When selecting a location for each system component it is important to consider a number of factors.

Factors for consideration:

- **Ventilation** — To ensure adequate airflow:
  - Ensure each component is mounted in a compartment of suitable size.
  - Ensure that ventilation holes are not obstructed. Allow adequate separation of all equipment.

- **Mounting surface** — Ensure each component is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.
- **Cabling** — Ensure each component is mounted in a location which allows proper routing, support and connection of cables:
  - Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
  - Use cable clips to prevent stress on connectors.
  - If your installation requires multiple ferrites to be added to a cable then additional cable clips should be used to ensure the extra weight of the cable is supported.
- **Electrical interference** — Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters / receivers.
- **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.

6.5 SVM camera — location requirements

Important requirements to follow when selecting a suitable location to install each SVM camera:

Important:

Incorrect SVM camera placement may result in a poor system calibration, which can prevent the system from functioning properly.

- In addition to the below, ensure that your installation location meets the requirements listed within: **p.28 — General location requirements**
- You must follow your NeuBoat Dock SVM camera **placement position file** instructions when positioning this product. For more information, refer to: **p.28 — Surround View Monitor camera placement position file**

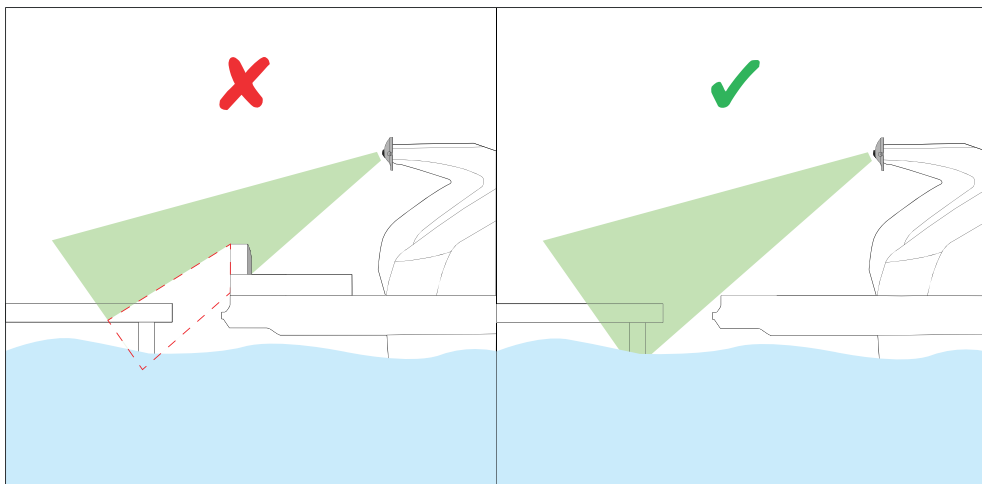- **Camera view** — Ensure that cameras are installed with an unobstructed view of the water / dock.

6.6 CCU and ORU — location requirements

Important requirements to follow when selecting a suitable location to install the Camera Conversion Unit (CCU) and Object Recognition Unit (ORU):

Important:

In addition to the below, ensure that your installation location meets the requirements listed in the following section:
p.28 — General location requirements

- **Water ingress** — The CCU and ORU are NOT protected against the ingress of moisture or liquids. The product should be located in a protected area away from moisture and exposure to rain and salt spray.
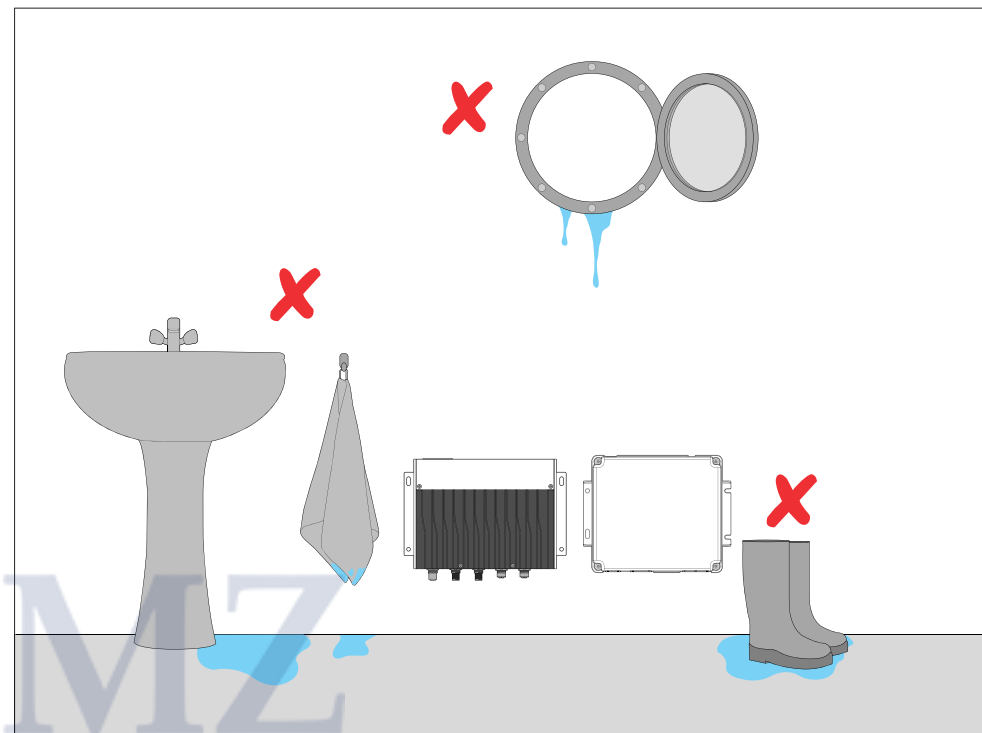
- **MicroSD access** — Ensure that the CCU and ORU are installed in a location with a minimum clearance of 80 mm (3.15 in) above the MicroSD card slot, to allow insertion and removal of MicroSD cards.

6.7 Compass safe distance

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

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

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

6.8 EMC installation guidelines

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

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

Note:

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

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

*   Raymarine® equipment and cables connected to it are:

    –   At least 1 m (3.3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).

    –   More than 2 m (6.6 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.

*   The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.

*   Raymarine® specified cables are used.

*   Cables are not cut or extended, unless doing so is detailed in the installation manual.

Note:

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

CHAPTER 7: CABLES AND CONNECTIONS — GENERAL INFORMATION

CHAPTER CONTENTS

7.1 General cabling guidance

Cable types and length

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

• Unless otherwise stated only use cables supplied by Raymarine.

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

Cable routing

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

• Do NOT bend cables excessively. Wherever possible, ensure a minimum bend diameter (Ø) of 200 mm (7.87 in) / minimum bend radius (R) of 100 mm (3.94 in).
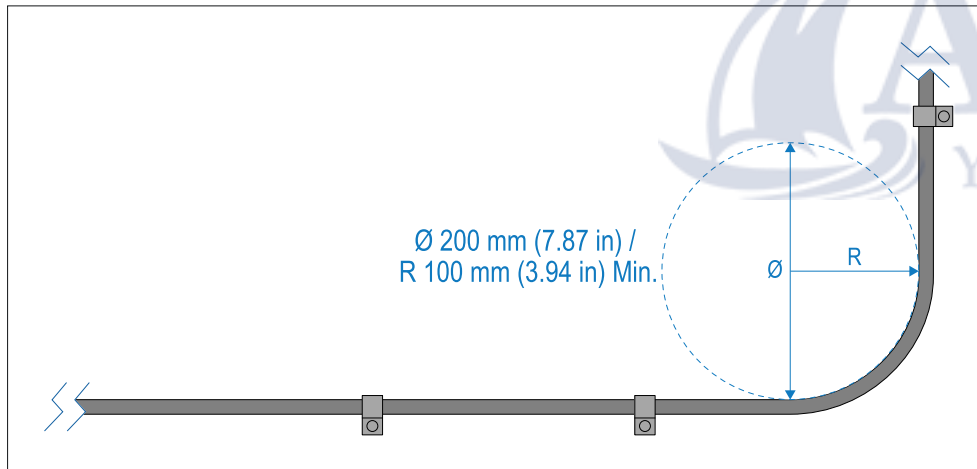
• Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Do NOT run cables through bilges or doorways, or close to moving or hot objects.

• Secure cables in place using cable clips or cable ties. Coil any excess cable and tie it out of the way.

• Where a cable passes through an exposed bulkhead or deckhead, use a suitable watertight feed-through.

• Do NOT run cables near to engines or fluorescent lights.

• Always route data cables as far away as possible from:
  – Other equipment and cables.
  – High current carrying AC and DC power lines.
  – Antennas.

Strain relief

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

Cable shielding

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

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.

Connecting cables

Follow the steps below to connect the cable(s) to your product.

1. Ensure that the vessel's power supply is switched off.

2. Ensure that the device being connected has been installed in accordance with the installation instructions supplied with that device.

3. Ensuring correct orientation, push cable connectors fully onto the corresponding connectors.

4. Engage any locking mechanism to ensure a secure connection (e.g.: turn locking collars clockwise until tight, or in the locked position).

5. Ensure any bare ended wire connections are suitably insulated to prevent shorting and corrosion due to water ingress.

Bare end wire connections

You must ensure that any bare end wires are adequately protected from short circuit and water ingress.

Bare ended wire connections

It is recommended that bare ended wire connections are made by soldering or using crimp connectors and then protected by wrapping the connection in insulation tape.

Unused bare ended wires

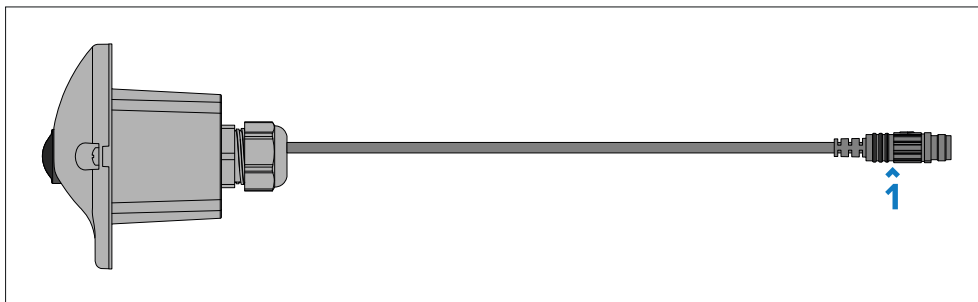Any unused bare ended wires should be folded back and wrapped in insulation tape.

> ⚡ **Warning: Positive ground systems**
>
> Do not connect this unit to a system which has positive grounding.

7.2 SVM camera — connections overview

Connectors and suitable connections for the NeuBoat Dock SVM camera.

Connector	Suitable connections
1) CAM (Camera) (includes pre-fitted cable, 0.9 m (35.43 in)) Connects to: • Camera Conversion Unit (CCU).	SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

SVM camera — input channels

Each SVM camera **must** be connected to a specific Camera Conversion Unit (CCU) input cable channel, according to the installation location.

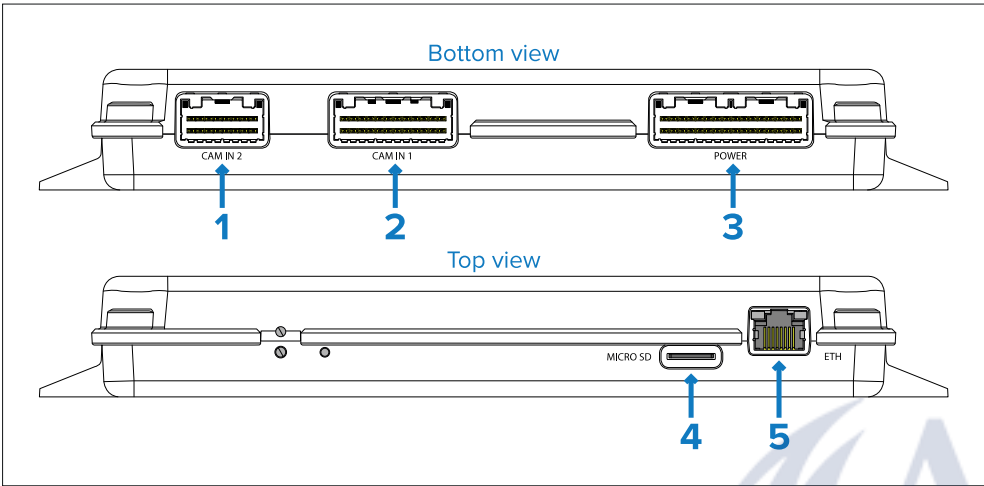| Camera location	Input channel
Bow	CH-0
Blind-starboard	CH-1
Blind-port	CH-2
Starboard	CH-3
Port	CH-4
Stern	CH-5

Note:

Input channels *CH-6* and *CH-7* on the CCU camera input cable 2 are not in use.

7.3 CCU — connections overview

Connectors and suitable connections for the NeuBoat Dock Camera Conversion Unit (CCU).
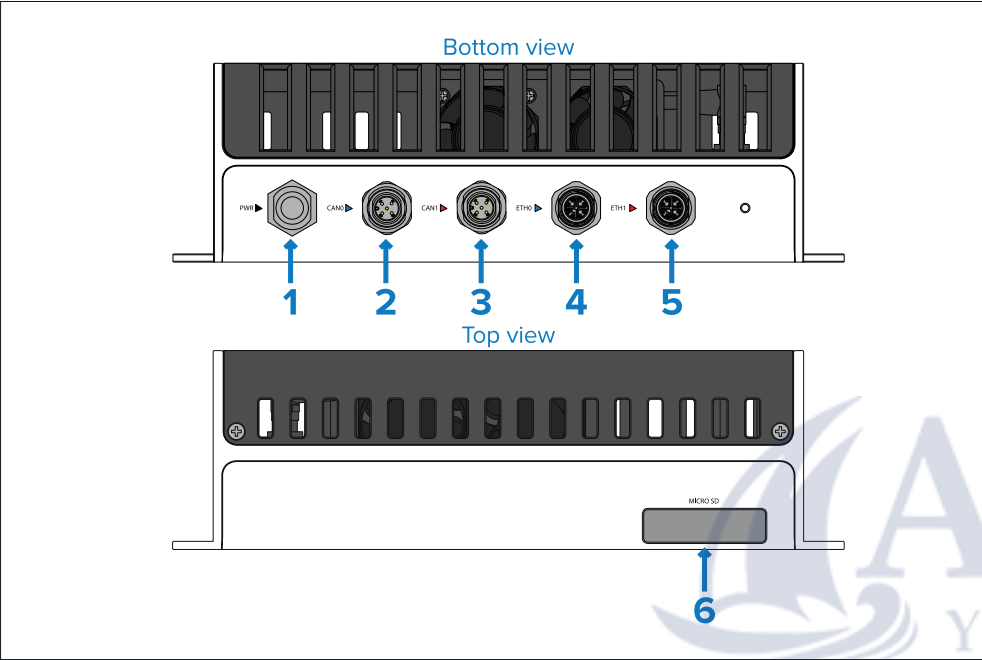

Connector	Suitable connections
1) CAM IN 2 (Camera input 2) Connects to: • SVM cameras 0-3.	CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in) supplied.
2) CAM IN 1 (Camera input 1) Connects to: • SVM cameras 4-5.	CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in) supplied.
3) POWER Connects to: • 12 / 24 V dc power supply.	CCU power cable, 1 m (3.3 ft) supplied.

Connector	Suitable connections
4) MicroSD (MicroSD card reader) • MicroSD card (for software update purposes).	MicroSD card, available separately.
4) ETH (Ethernet) Connects to: • (¹) Object Recognition Unit (ORU). • (²) Network switch, e.g. RNS-5 or RNS-8.	• CCU to ORU cable (used to connect the CCU to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately. • Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) socket on the other end, along with a locking gland for a watertight fit (used to connect the network switch to the ORU), 100 mm (3.9 in) available separately.

Note:

• **(1)** This direct connection is required for *Basic systems* only. For more information, refer to: **p.42 — Basic system**

• **(2)** This direct connection is required for *Expanded systems* only. For more information, refer to: **p.43 — Expanded system**

7.4 ORU — connections overview

Connectors and suitable connections for the NeuBoat Dock Object Recognition Unit (ORU).

Bottom view

Top view

Connector	Suitable connections
1) PWR (Power) Connects to: • 12 / 24 V dc power supply.	ORU power cable, 2 m (6.56 ft) (supplied).
2) CAN0 (Control Area Network 0) **This connection is not currently supported.**	Not applicable — this connection is not currently supported.
3) CAN1 (Control Area Network 1) **This connection is not currently supported.**	Not applicable — this connection is not currently supported.

Connector	Suitable connections
4) ETH0 (Ethernet 0) Connects to: • (¹) Camera Conversion Unit (CCU) • (²) Network switch, e.g. RNS-5 or RNS-8	• CCU to ORU cable (used to connect the network switch to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately. • Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) socket on the other end, along with a locking gland for a watertight fit (used to connect the network switch to the ORU), 100 mm (3.9 in), available separately.
5) ETH1 (Ethernet 1) Connects to: • Compatible multifunction display (MFD).	ORU to RayNet cable (used to connect the ORU to a compatible multifunction display), 25 m (82.02 ft) supplied / 50 m (164.04 ft), available separately.
6) MicroSD (MicroSD card reader) • MicroSD card (for software updates).	MicroSD card, available separately.

Note:

• **(1)** This direct connection is required for *Basic systems* only. For more information, refer to: **p.42 — Basic system**

• **(2)** This direct connection is required for *Expanded systems* only. For more information, refer to: **p.43 — Expanded system**
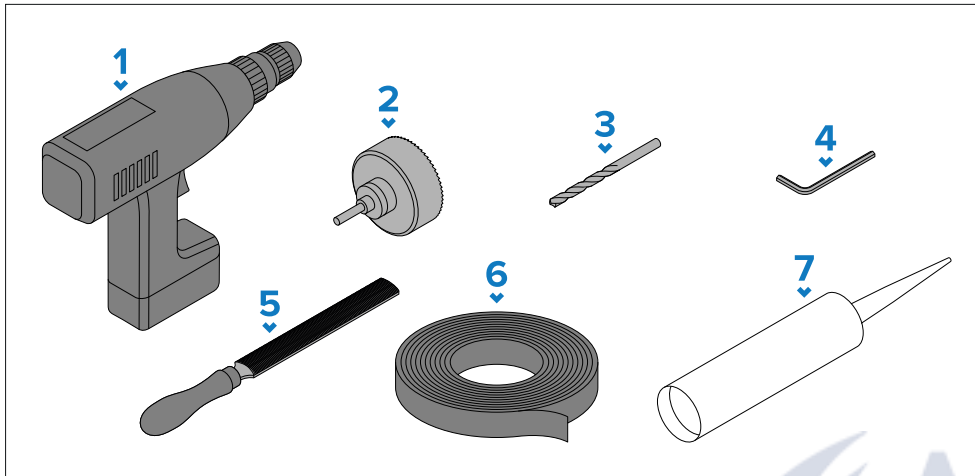
CHAPTER 8: MOUNTING

CHAPTER CONTENTS

8.1 Tools required

The following tools are required for installation:

1. Power drill.
2. Hole cutter an appropriate size for the 58.00 mm (2.28 in) centre diameter cutout line.
3. Drill bit.
4. Hex wrench (Allen key).
5. Half round file (or sandpaper).
6. Marine grade sealant (e.g. **Alpha 132 PU Sealant**).
7. Masking / self adhesive tape.

8.2 Fixing screw suitability

Important:

The fixing screws supplied may not be suitable for your mounting surface. Please check the security and integrity of the mounted product before finalizing your installation. If necessary, obtain replacement or additional mounting screws to ensure a secure installation.

⚠️ **Warning: 2 person installation required**

To prevent potential product damage, vessel damage and personal injury 2-person installation is recommended.

8.3 SVM camera — preparing the mounting surface

Note:

The following procedure is intended to prepare a mounting surface for an SVM camera. For mounting instructions related to the CCU or ORU units, refer to:

- **p.39 — Mounting the Camera Conversion Unit**
- **p.39 — Mounting the Object Recognition Unit**

Important:

Before preparing the mounting surface, ensure that:

- Your selected location meets the location requirements. For details, refer to: **p.26 — Location requirements**
- You have identified cable connections and the route that the cables will take.
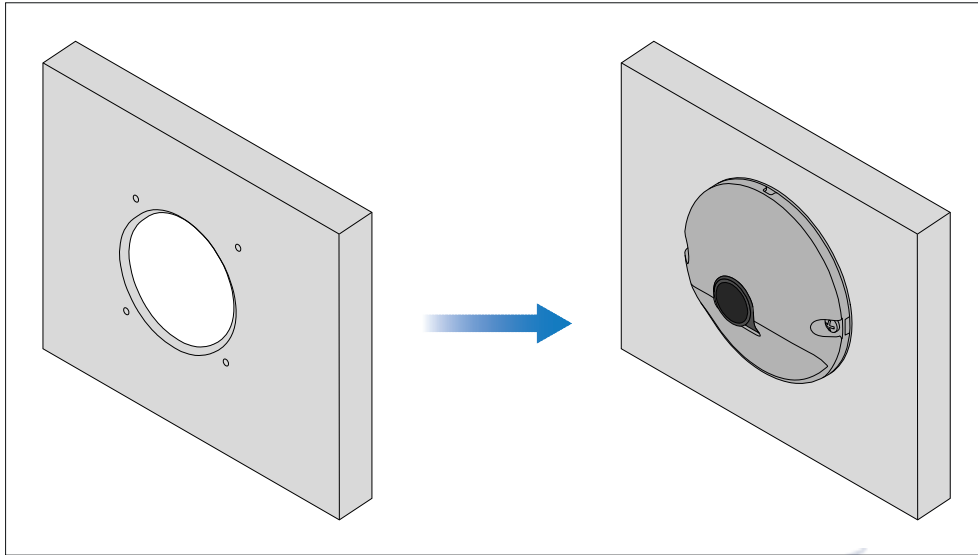
1. Mark the cutout line and drill hole locations identified on the supplied mounting template on the mounting surface.
2. Use a drill and an appropriate size drill bit to drill the holes required at the marked locations.
3. Use a drill and an appropriate size hole cutter to create the cutout. The cutout diameter is 58.00 mm (2.17 in).
4. Use a half round file and/or sandpaper to smooth-out rough edges or burs on the cutout hole.

8.4 SVM camera — mounting

Mounting procedure for the SVM camera.

Before mounting the product, ensure that you have:

- Selected a suitable location, based on the location requirements found in this document.
- Identified the relevant cable connections and the route that the cables will take.
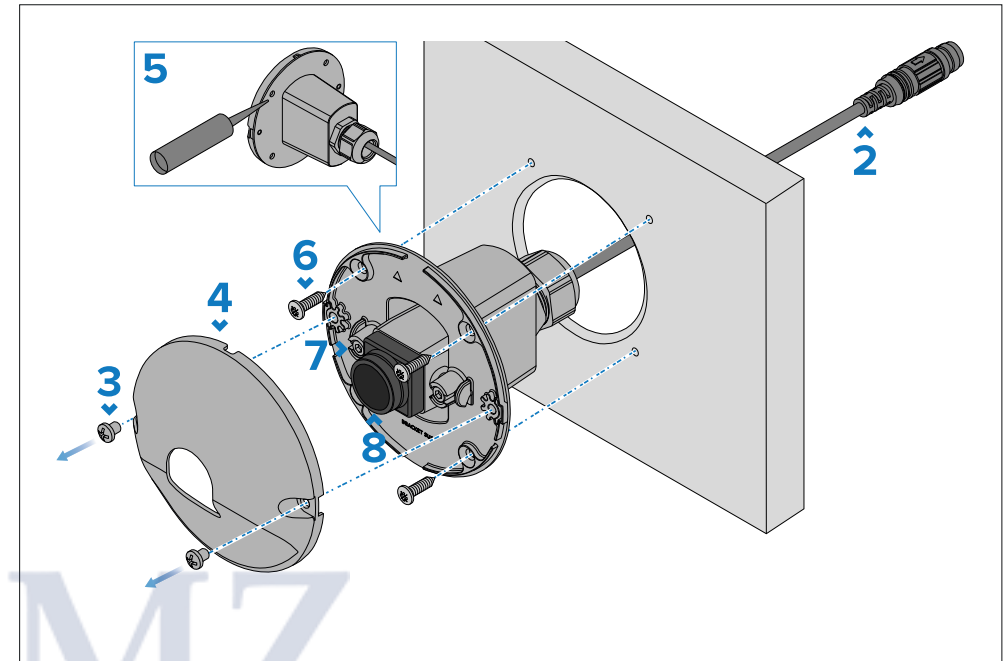
1. Ensure you have followed the relevant instructions for preparing the mounting surface.
2. Route the relevant cables behind the mounting surface cutout.

   This may be difficult or not possible once the camera has been mounted.

3. Unscrew the 2 screws which are located at the front of the SVM camera.
4. Remove the cover from the SVM camera.
5. Apply an appropriate marine-grade sealant (e.g. **Alpha 132 PU Sealant**) to the rear of the SVM camera's front plate.
6. Ensuring that the arrows are facing directly upward and that the drill holes are aligned with the fixing holes on the SVM's front plate, insert the unit's body into the cutout hole and secure using the fixing screws provided.
7. (If required) Using a hex wrench (Allen key), loosen the bolts on either side of the SVM camera lens.
8. (If required) Vertically adjust the camera lens to the recommended angle that has been specified in the supplied **placement position file**.
9. (If required) Fully tighten the bolts.
10. Place the removed cover and screws back into position and fully tighten.

> ⚠ **Warning: Marine-grade sealant**
>
> Only use marine-grade neutral cure polyurethane sealants. Do NOT use sealants containing acetate or silicone, which can cause damage to plastic parts.
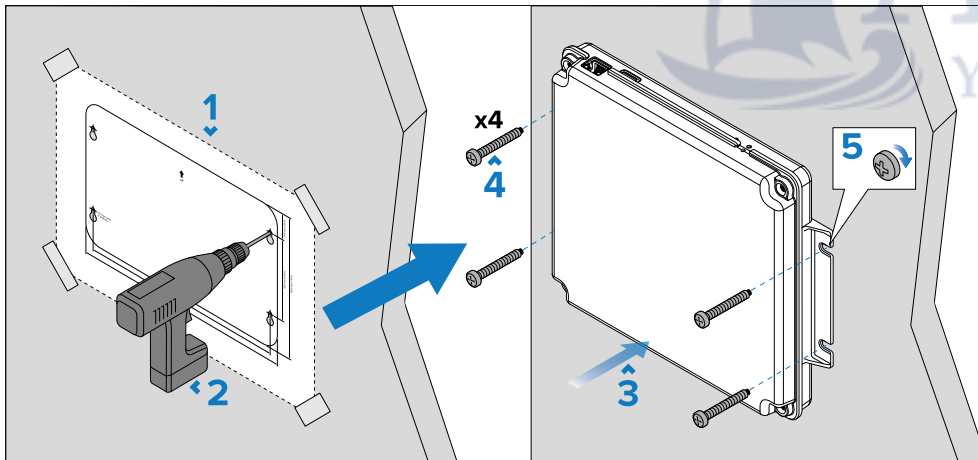
8.5 CCU — mounting

Mounting procedure for the Camera Conversion Unit (CCU).

Before mounting the product, ensure that you have:

- Selected a suitable location, based on the location requirements found in this document.
- Identified the relevant cable connections and the route that the cables will take.

> **Note:**
>
> **It is recommended that the unit is mounted vertically.**

1. Secure the mounting template in the required location using adhesive tape.
2. Drill 4 holes at the marked location on the template, and then remove the mounting template.
3. Position the unit over the 4 drill holes.

4. Push the 4 fixing screws through the Camera Conversion Unit's mounting lugs and into the drill holes.
5. Fully tighten the 4 fixing screws.

> **Note:**
>
> Drill bit, tap size and tightening torque are dependent on the thickness and type of material the unit is to be mounted on.
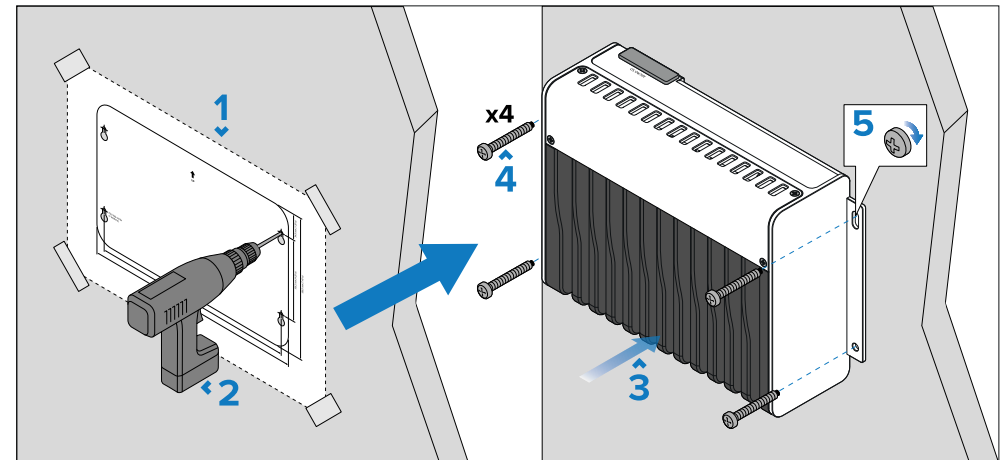
8.6 ORU — mounting

Mounting procedure for the Object Recognition Unit (ORU).

Before mounting the product, ensure that you have:

- Selected a suitable location, based on the location requirements found in this document.
- Identified the relevant cable connections and the route that the cables will take.

> **Note:**
>
> It is recommended that the unit is mounted vertically.

1. Secure the mounting template in the required location using adhesive tape.

2. Drill 4 holes at the marked location on the template, and then remove the mounting template.

3. Position the unit over the 4 drill holes.

4. Push the 4 fixing screws through the Object Recognition Unit's mounting lugs and into the drill holes.

5. Fully tighten the 4 fixing screws.

Note:

Drill bit, tap size and tightening torque are dependent on the thickness and type of material the unit is to be mounted on.

CHAPTER 9: NETWORK CONNECTIONS

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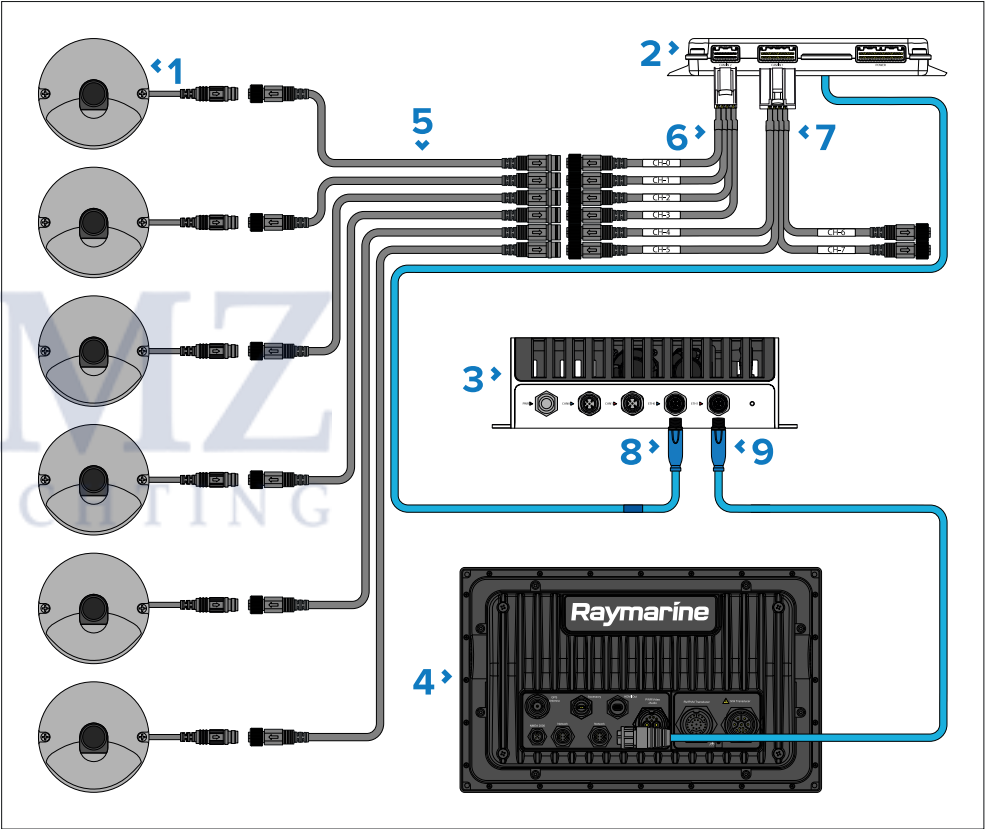
9.1 Maximum camera cable length

If the required cable length between each of the SVM cameras and the CCU exceeds the length of the supplied 15 m (49.21 ft) SVM camera to CCU extension cable, then one of the following options is required in order to form an expanded system.

Cable length required	Recommended system type
0–15 m (49.21 ft)	**System type:** Basic. **Required additional components:** None. For more information, refer to the following section: **p.42 — Basic system**
15 m (49.21 ft) to 20 m (65.62 ft)	**System type:** Basic. **Required additional components:** SVM camera to CCU extension cable (A80762), 20 m (65.62 ft), available separately. For more information, refer to the following sections: • **p.42 — Basic system** • **p.77 — Spares and accessories**
> 20 m (65.62 ft)	**System type:** Expanded. **Required additional components:** • 1x RNS-5 or RNS-5 Network Switch (A80731), available separately. • 1x Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable), available separately. • 2x Adapter cables with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end, 15 m (49.21 ft) / 25 m (82.02 ft) available separately. For more information, refer to the following sections: • **p.43 — Expanded system** • **p.77 — Spares and accessories**

9.2 Basic system

The following example provides an overview of a *basic system*, including available connections and the types of connected devices. In basic systems, the cable length between each of the SVM cameras and the CCU **does NOT** exceed 20 m (65.62 ft).

Example: basic system

1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 0.9 m (35.43 in))

2. Camera Conversion Unit (CCU).

3. Object Recognition Unit (ORU).

4. Axiom 2 Series multifunction display (Axiom 2 Pro shown).

5. SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

6. CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in) supplied.

7. CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in) supplied.

8. CCU to ORU cable (used to connect the CCU to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately.

9. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display), 25 m (82.02 ft) supplied / 50 m (164.04 ft) available separately.
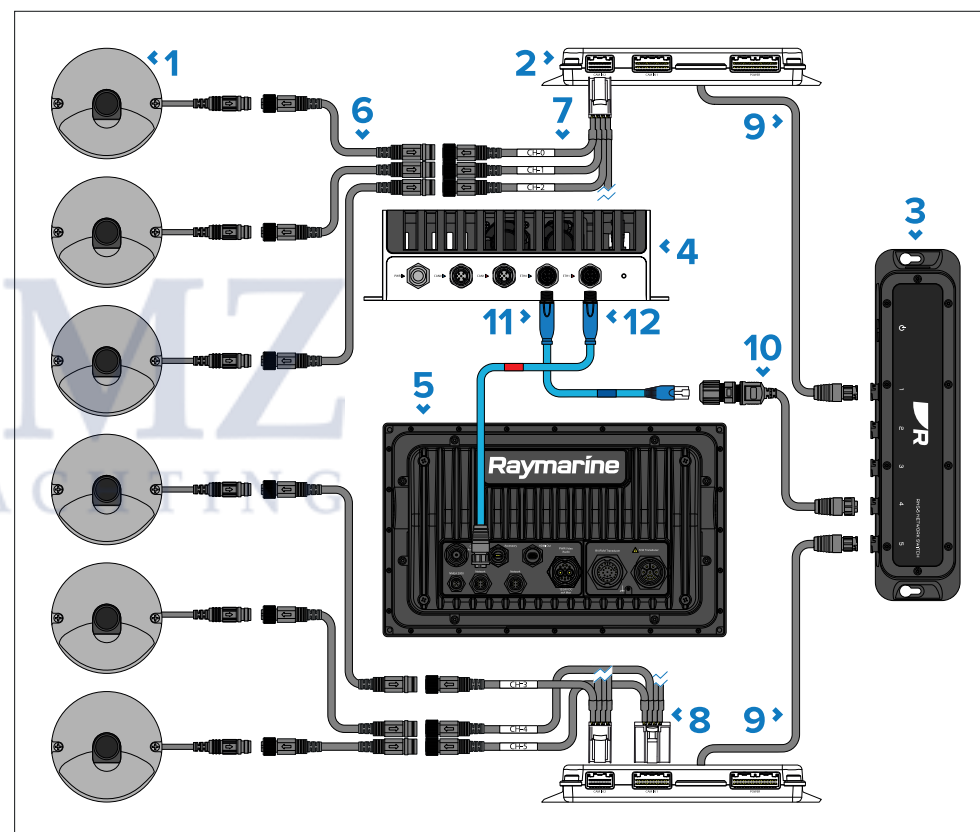
Note:

Power connections are not shown in this illustration. For power connection information, refer to the following sections:

- **p.45 — Power connections — Surround View Monitor camera**

- **p.47 — Power connections — Camera Conversion Unit**

- **p.53 — Power connections — Object Recognition Unit**

9.3 Expanded system

The following example provides an overview of an *expanded system*, including available connections and the types of connected devices. In expanded systems, the cable length between each of the SVM cameras and the CCU **exceeds** 20 m (65.62 ft). Therefore, an additional CCU and additional cables are required.

Example: expanded system

1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 0.9 m (35.43 in))

2. Camera Conversion Unit (CCU).

3. RNS-5 or RNS-8 network switch.

4. Object Recognition Unit (ORU).

5. Axiom 2 Series multifunction display (Axiom 2 Pro shown).

6. SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

7. CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in) supplied.

8. CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in) supplied.

9. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end (used to connect two CCU units to the network switch), 15 m (49.21 ft) / 25 m (82.02 ft) available separately.

10. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) socket on the other end, along with a locking gland for a watertight fit (used to connect the network switch to the ORU), 100 mm (3.9 in) available separately.

11. CCU to ORU cable (used to connect the network switch to the ORU), 15 m (49.21 ft) supplied / 25 m (82.02 ft) available separately.

12. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display), 25 m (82.02 ft) supplied / 50 m (164.04 ft) available separately.

Note:

Power connections are not shown in this illustration. For power connection information, refer to the following sections:

- **p.45 — Power connections — Surround View Monitor camera**
- **p.47 — Power connections — Camera Conversion Unit**
- **p.53 — Power connections — Object Recognition Unit**

9.4 Network cable extensions

If you wish to extend the length of a network cable connected to your product, refer to the following section for further information:
p.77 — Spares and accessories

CHAPTER 10: POWER CONNECTIONS — SURROUND VIEW MONITOR CAMERA
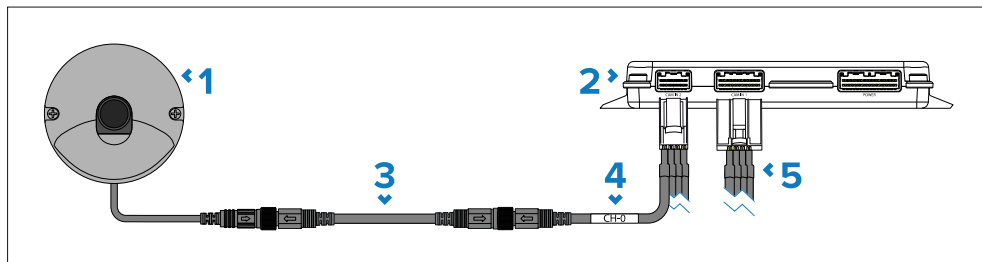
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10.1 SVM camera — power connection

The power for each SVM camera is provided directly by the connected Camera Conversion Unit (CCU).

The SVM cameras are supplied with a pre-fitted 0.9 m (35.43 in) cable, which can be connected to a CCU via the following cable connections:

1. SVM camera (includes pre-fitted cable, 0.9 m (35.43 in)).

2. Camera Conversion Unit (CCU).

3. SVM camera to CCU extension cable, 15 m (49.21 ft) supplied / 20 m (65.62 ft) available separately.

4. CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU), 200 mm (7.87 in).

5. CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU), 200 mm (7.87 in).

> **Note:**
>
> Each camera **must** be connected to a specific CCU input cable channel, according to the installation location. For more information on which input channel corresponds to each camera location, refer to the following section:

⚠️ **Warning: Only use system when vessel engine is running**

The vessel's engine must be running at ALL times while the system is in use. Loss of power to the system compromises system safety and potentially puts yourself, your crew and your vessel at risk of harm.

⚠️ **Warning: Ensure system power source is charged by vessel's engine under normal operation**

The power source for the system MUST be one that is charged by the vessel's engine (under normal operation). Failure to ensure a constant source of power to the system potentially puts yourself, your crew and your vessel at risk of harm.

CHAPTER 11: POWER CONNECTIONS — CAMERA CONVERSION UNIT (CCU)
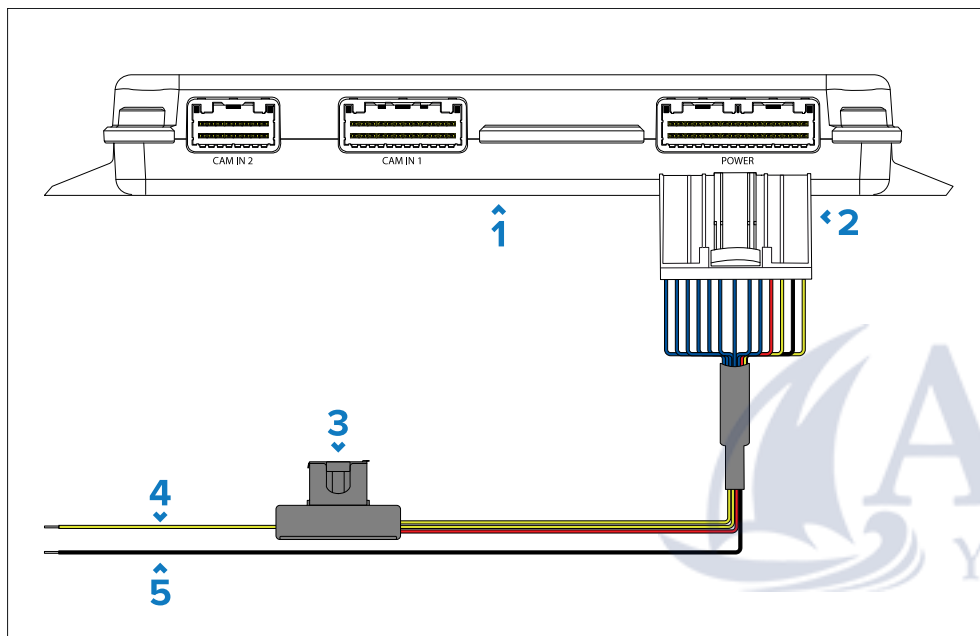
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11.1 CCU — power connection

The power for the Camera Conversion Unit (CCU) is provided directly by a 12 V dc or 24 V dc power source.

The CCU is supplied with a power cable which includes bare stripped wires, suitable for direct connection to a 12 V or 24 V power supply:

1. Camera Conversion Unit (CCU).

2. Power cable, 1 m (3.3 ft), supplied.

3. Waterproof fuse holder containing a suitably-rated inline fuse, which must be fitted to the red positive wire — refer to the fuse ratings provided.

4. Yellow wire (positive) — connects to the power supply's positive terminal.

5. Black wire (negative) — connects to the power supply's negative terminal.

Inline fuse and thermal breaker ratings

The Camera Conversion Unit (CCU)'s power cable is fitted with a waterproof fuse holder and a 3 A inline fuse. In the instance where the supplied inline fuse needs to be replaced, or, when installing a thermal breaker, the following inline fuse and thermal breaker ratings will apply to your product.

Inline fuse rating	Thermal breaker rating
3 A	3 A

Important:

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

> **Warning: Only use system when vessel engine is running**
>
> The vessel's engine must be running at ALL times while the system is in use. Loss of power to the system compromises system safety and potentially puts yourself, your crew and your vessel at risk of harm.

> **Warning: Ensure system power source is charged by vessel's engine under normal operation**
>
> The power source for the system MUST be one that is charged by the vessel's engine (under normal operation). Failure to ensure a constant source of power to the system potentially puts yourself, your crew and your vessel at risk of harm.

11.2 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.
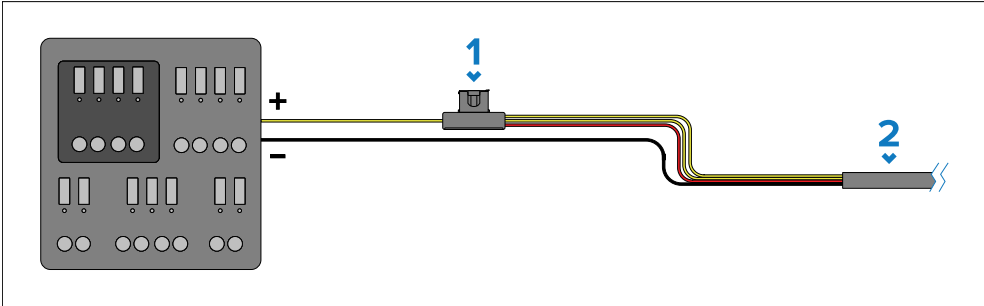
11.3 CCU — power distribution

Recommendations and best practice.

- The product is supplied with a power cable, either as a separate item or a captive cable permanently attached to the product. Only use the power cable supplied with the product. Do NOT use a power cable designed for, or supplied with, a different product.

- Refer to the *Power connection* section for more information on how to identify the wires in your product's power cable, and where to connect them.

- See below for more information on implementation for some common power distribution scenarios:
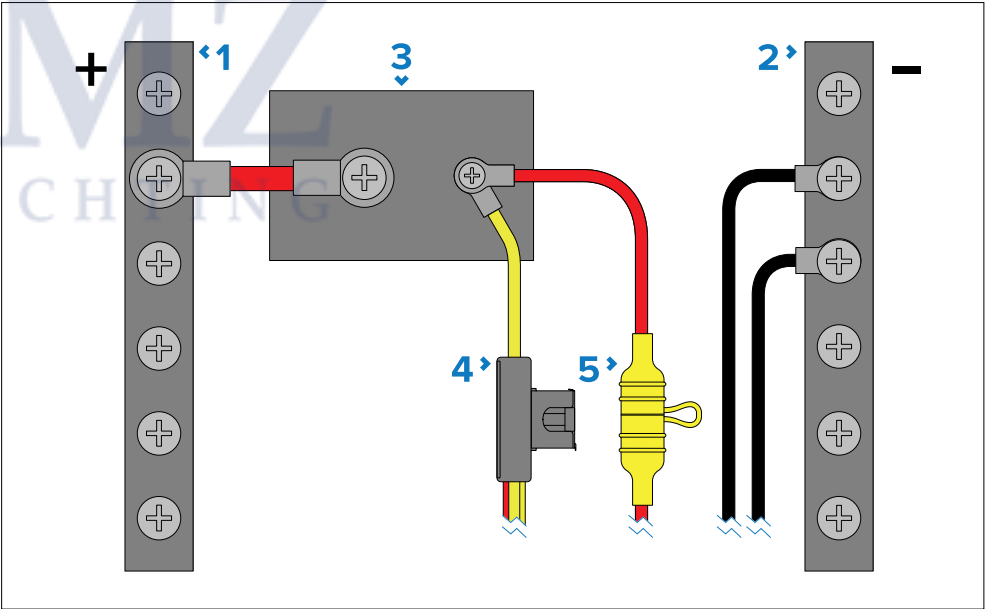
Important:

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

- The information provided below is for guidance only, to help protect your product. It covers common vessel power arrangements, but does NOT cover every scenario. If you are unsure how to provide the correct level of protection, please consult an authorized dealer or a suitably qualified professional marine electrician.

Implementation — connection to distribution panel (Recommended)

Item	Description
1	The CCU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
2	CCU power cable.

- It is recommended that the supplied power cable is connected to a suitable breaker or switch on the vessel's distribution panel or factory-fitted power distribution point.

- The distribution point should be fed from the vessel's primary power source by 8 AWG (8.36 mm²) cable.

- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than one item of equipment shares a breaker, use individual inline fuses for each power circuit to provide the necessary protection.

Item	Description
1	Positive (+) bar
2	Negative (-) bar

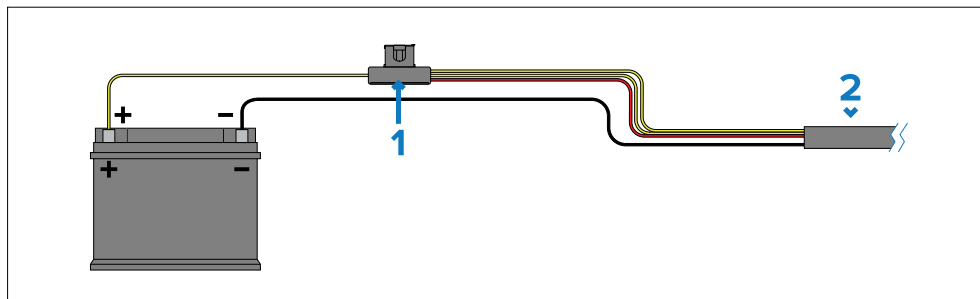| Item	Description
3	Circuit breaker
4	The CCU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
5	Additional equipment's waterproof fuse holder containing a suitably-rated inline fuse.

Important:

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

Implementation — direct connection to battery

- Where connection to a power distribution panel is not possible, the power cable supplied with your product may be connected directly to the vessel's battery, via a suitably rated fuse or breaker.
- The power cable supplied with your product does NOT include a separate drain wire. Therefore, only the power cable's yellow and black wires need to be connected.
- If the power cable is NOT supplied with a fitted inline fuse, you MUST fit a suitably rated fuse or breaker between the yellow wire and the battery's positive terminal.
- Refer to the inline fuse ratings provided in the product's documentation.
- If you need to extend the length of the power cable supplied with your product, ensure you observe the dedicated *Power cable extensions* advice provided in the product's documentation.

Item	Description
1	The CCU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
2	CCU power cable.

More information

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

- BMEA Code of Practice for Electrical and Electronic Installations in Boats
- NMEA 0400 Installation Standard
- ABYC E-11 AC & DC Electrical Systems on Boats
- ABYC A-31 Battery chargers and Inverters
- ABYC TE-4 Lightning Protection
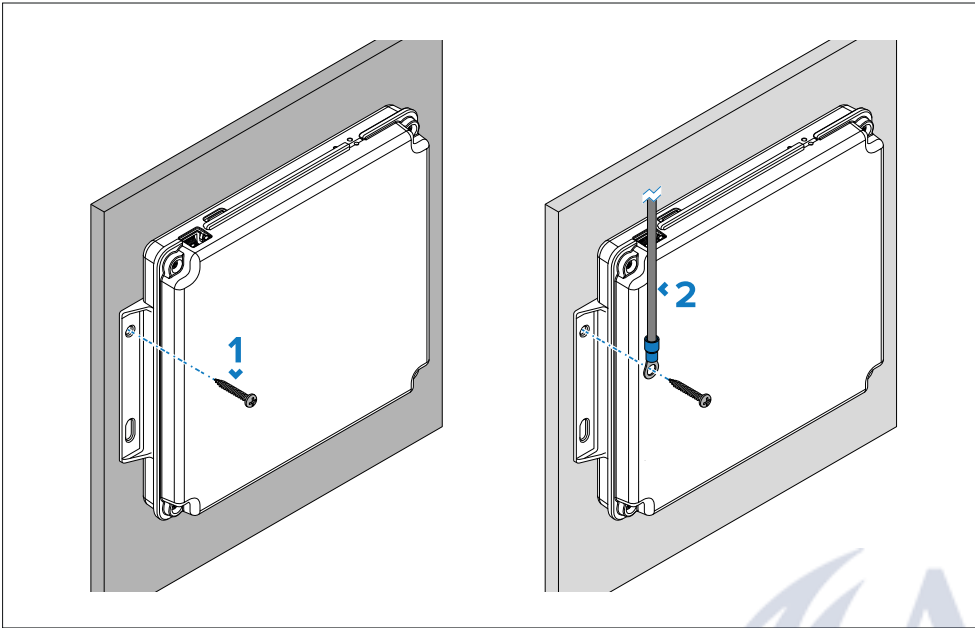
11.4 CCU — ground connection

Energy generated by Near-Lightning Strikes (NLS) and atmospheric static build-up can be conducted by the product. To ensure that this energy is safely discharged, the CCU must have a ground connection to the vessel's RF ground point. Where no RF ground is available, connect to the vessel's negative (–) battery terminal.

Failure to connect a ground connection to the vessel battery's negative (–) terminal may cause permanent damage to the product and invalidate your product's warranty.

Important:

This is NOT an optional connection.

The top-left fixing hole on the Camera Conversion Unit is used for the ground connection point. There are 2 options for the ground connection:

1. If the CCU is being mounted on a metal surface which is already grounded, then the mounting screw will act as the ground connection.

2. If the CCU is being mounted on a non-grounded surface, then a suitable grounding strap (not supplied) should be connected to the top fixing hole, and secured using the mounting screw.

Connect the other end of the ground wire to either the vessel's RF ground point, or on vessels without an RF ground system, the negative battery terminal.

The dc power system should be either:

- Negative grounded, with the negative battery terminal connected to the vessel's ground; or
- Floating, with neither battery terminal connected to the vessel's ground.

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 vessel's common RF ground point.

Implementation

The preferred minimum requirement for the path to ground 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 may be 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.

References

- ISO10133/13297
- BMEA code of practice
- NMEA 0400

11.5 Power cable extension (12 / 24 V systems)

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

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

Cable length in meters (feet)	Wire gauge in AWG (mm²) for 12 V supply	Wire gauge in AWG (mm²) for 24 V supply
<8 (<25)	16 (1.31 mm²)	18 (0.82 mm²)
16 (50)	14 (2.08 mm²)	18 (0.82 mm²)
24 (75)	14 (2.08 mm²)	16 (1.31 mm²)
>32 (>100)	14 (2.08 mm²)	16 (1.31 mm²)

Important:

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

Important:

To ensure power cables (including any extension) are of a sufficient gauge, ensure that there is a continuous **minimum** voltage of **10.8 V dc** at the end of the cable where it enters the product's power connector, even with a fully flat battery at 11 V dc. (Do not assume that a flat battery is at 0 V dc. Due to the discharge profile and internal chemistry of batteries, the current drops much faster than the voltage. A "fully flat" battery still shows a positive voltage, even if it doesn't have enough current to power your device.)

CHAPTER 12: POWER CONNECTIONS — OBJECT RECOGNITION UNIT (ORU)

CHAPTER CONTENTS

12.1 ORU — power connection

The power for the Object Recognition Unit (ORU) is provided directly by a 12 V dc or 24 V dc power source.

The ORU is supplied with a power cable which includes bare stripped wires, suitable for direct connection to a 12 V or 24 V power supply:
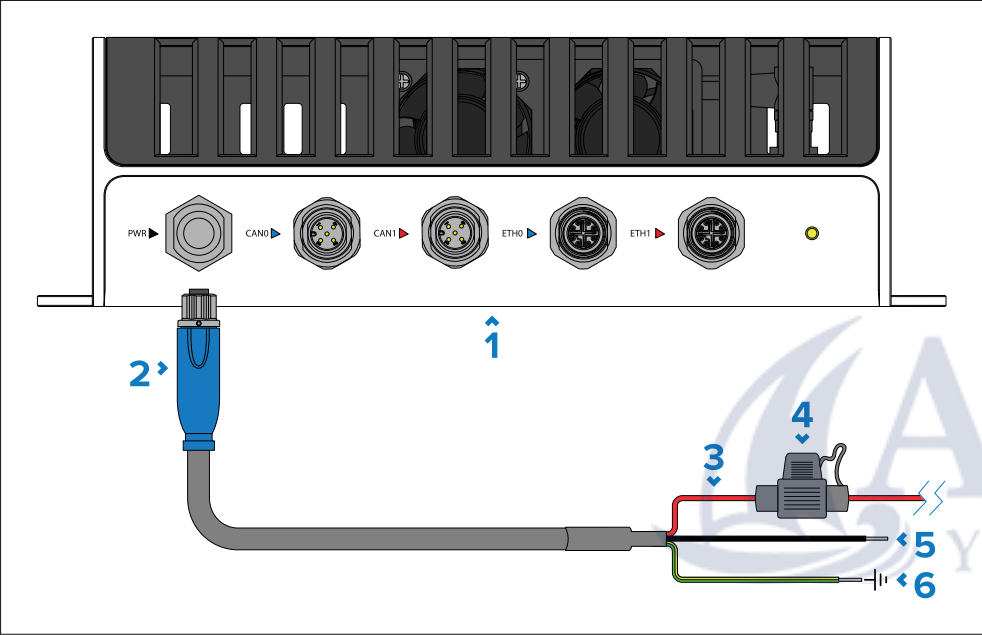
1. Object Recognition Unit (ORU).

2. Power cable, 2 m (6.56 ft), supplied.

3. Red wire (positive) — connects to the power supply's positive terminal.

4. Waterproof fuse holder containing a suitably-rated inline fuse, which must be fitted to the red positive wire — refer to the fuse ratings below.

5. Black wire (negative) — connects to the power supply's negative terminal.

6. Ground wire — connects to the vessel RF ground point (if available), or the negative battery terminal.

Inline fuse and thermal breaker ratings

The Object Recognition Unit (ORU)'s power cable is fitted with a waterproof fuse holder and a 10 A inline fuse. In the instance where the supplied inline fuse needs to be replaced, or, when installing a thermal breaker, the following inline fuse and thermal breaker ratings will apply to your product.

Inline fuse rating	Thermal breaker rating
10 A	10 A

Important:

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

> **Warning: Only use system when vessel engine is running**
>
> The vessel's engine must be running at ALL times while the system is in use. Loss of power to the system compromises system safety and potentially puts yourself, your crew and your vessel at risk of harm.

> **Warning: Ensure system power source is charged by vessel's engine under normal operation**
>
> The power source for the system MUST be one that is charged by the vessel's engine (under normal operation). Failure to ensure a constant source of power to the system potentially puts yourself, your crew and your vessel at risk of harm.

12.2 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.
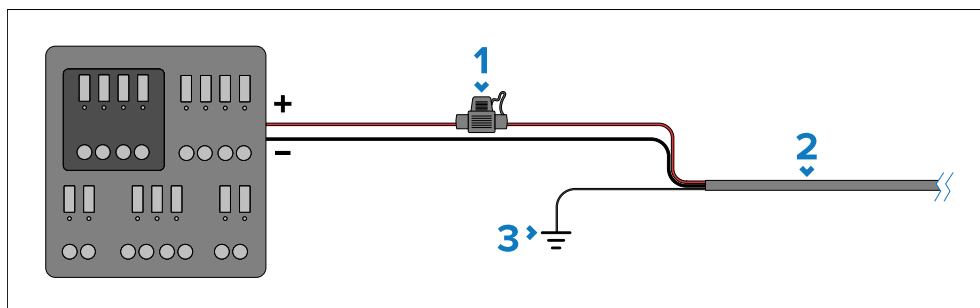
12.3 ORU — power distribution

- The product is supplied with a power cable, either as a separate item or a captive cable permanently attached to the product. Only use the power cable supplied with the product. Do NOT use a power cable designed for, or supplied with, a different product.

- Refer to the *Power connection* section for more information on how to identify the wires in your product's power cable, and where to connect them.

- See below for more information on implementation for some common power distribution scenarios:

Important:

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

- The information provided below is for guidance only, to help protect your product. It covers common vessel power arrangements, but does NOT cover every scenario. If you are unsure how to provide the correct level of protection, please consult an authorized dealer or a suitably qualified professional marine electrician.

Implementation — connection to distribution panel (Recommended)

Item	Description
1	The ORU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
2	ORU power cable.
3	Ground wire connection point.

- It is recommended that the supplied power cable is connected to a suitable breaker or switch on the vessel's distribution panel or factory-fitted power distribution point.

- The distribution point should be fed from the vessel's primary power source by 8 AWG (8.36 mm²) cable.

- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than 1 item of equipment shares a breaker, use individual inline fuses for each power circuit to provide the necessary protection.

- **The power cable supplied with your product includes a separate ground wire, which must be connected to the vessel's common RF ground.** For more information, refer to: **p.57 — Power cable ground wire connection**
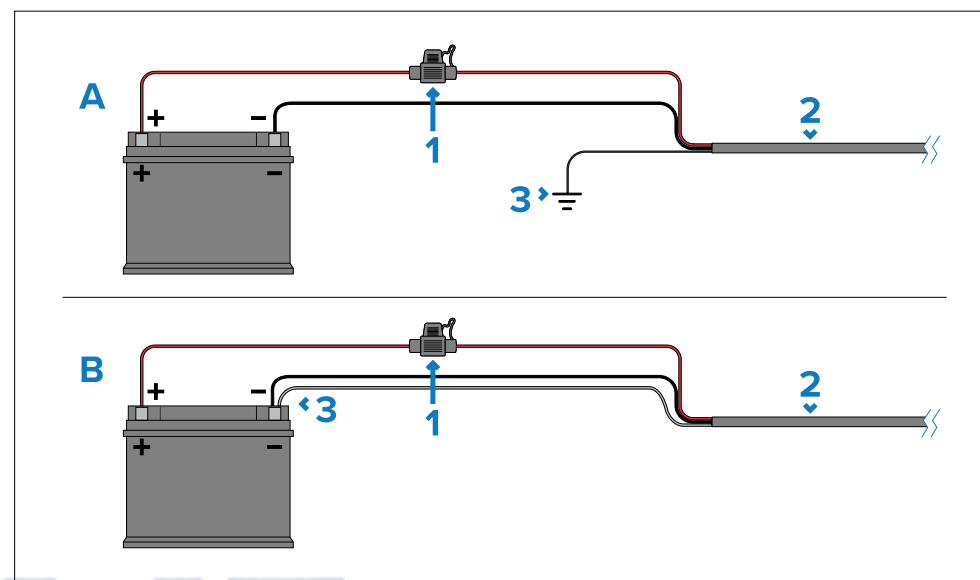
Item	Description
1	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker
4	The ORU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
5	Additional equipment's waterproof fuse holder containing a suitably-rated inline fuse.

Important:

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

Implementation — direct connection to battery

- Where connection to a power distribution panel is not possible, the power cable supplied with your product may be connected directly to the vessel's battery, via a suitably rated fuse or breaker.

- The power cable supplied with your product includes a separate ground wire, which must be connected to the vessel's common RF ground (if available), or the battery's negative terminal. For more information, refer to: **p.57 — Power cable ground wire connection**

- If the power cable is NOT supplied with a fitted inline fuse, you MUST fit a suitably rated fuse or breaker between the red wire and the battery's positive terminal.

- Refer to the inline fuse ratings provided in the product's documentation.

- If you need to extend the length of the power cable supplied with your product, ensure you observe the dedicated *Power cable extensions* advice provided in the product's documentation.

Item	Description
1	The ORU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: **p.48 — Inline fuse and thermal breaker ratings**.
2	Product power cable.
3	Ground wire connection point.

Battery connection scenario A:

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

Battery connection scenario B:

Suitable for a vessel without a common grounding point. In this case, the power cable's ground wire should be connected to the battery's negative terminal.

Grounding

The power cable supplied with your product includes a separate ground wire, which must be connected to the vessel's common RF ground (if available), or negative battery terminal. For more information, refer to: **p.57 — Power cable ground wire connection**

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

More information

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

- BMEA Code of Practice for Electrical and Electronic Installations in Boats
- NMEA 0400 Installation Standard
- ABYC E-11 AC & DC Electrical Systems on Boats
- ABYC A-31 Battery chargers and Inverters
- ABYC TE-4 Lightning Protection

12.4 Power cable extension (12 / 24 V systems)

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

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

Cable length in meters (feet)	Wire gauge in AWG (mm²) for 12 V supply	Wire gauge in AWG (mm²) for 24 V supply
<8 (<25)	16 (1.31 mm²)	18 (0.82 mm²)
16 (50)	14 (2.08 mm²)	18 (0.82 mm²)
24 (75)	14 (2.08 mm²)	16 (1.31 mm²)
>32 (>100)	14 (2.08 mm²)	16 (1.31 mm²)

Important:

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

Important:

To ensure power cables (including any extension) are of a sufficient gauge, ensure that there is a continuous **minimum** voltage of **10.8 V dc** at the end of the cable where it enters the product's power connector, even with a fully flat battery at 11 V dc. (Do not assume that a flat battery is at 0 V dc. Due to the discharge profile and internal chemistry of batteries, the current drops much faster than the voltage. A "fully flat" battery still shows a positive voltage, even if it doesn't have enough current to power your device.)

12.5 Power cable ground wire connection

The power cable supplied with this product includes a dedicated ground wire for connection to a vessel's RF ground point (if available), or the negative battery terminal.

It is important that an effective RF ground is connected to the system. A single common ground point should be used for all equipment. If several items require grounding, each item of equipment can be grounded by connecting the ground wires first to a single local point (e.g. within a distribution panel), and then this point connected via an appropriately-rated conductor to the vessel's RF common ground point. An RF ground point is typically a circuit with a very low-impedance signal at Radio Frequency, connected to the sea via an electrode immersed in the sea, or bonded to the inner side of the hull in an area that is underwater.

On vessels without an RF ground system, the ground wires of all equipment should be connected directly to the vessel's negative battery terminal.

The dc power system should be either:

- Negative grounded ("bonded"), with the negative battery terminal connected to the vessel's RF ground.
- Floating, with neither battery terminal connected to the vessel's 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 or greater. If this is not possible, an equivalent stranded wire conductor may be 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.

CHAPTER 13: OPERATION

CHAPTER CONTENTS

13.1 NeuBoat Dock operation instructions

The NeuBoat Dock system is controlled via the *[NeuBoat Dock]* app, accessible on the Homescreen of a compatible Raymarine® multifunction display / chartplotter, running LightHouse™ 4 version 4.5 or later.

For detailed operation instructions, refer to the dedicated **NeuBoat Dock Operation Instructions (81418)**.

CHAPTER 14: TROUBLESHOOTING

CHAPTER CONTENTS

14.1 Troubleshooting

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

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

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

14.2 LED diagnostic guidance

Your product has diagnostic LEDs which can be used to identify the unit's status and to help troubleshoot any potential issues that may occur.

The following section provides two basic examples of how to interpret the LED diagnostic patterns included in this publication.

Example solid LED diagnostic pattern:
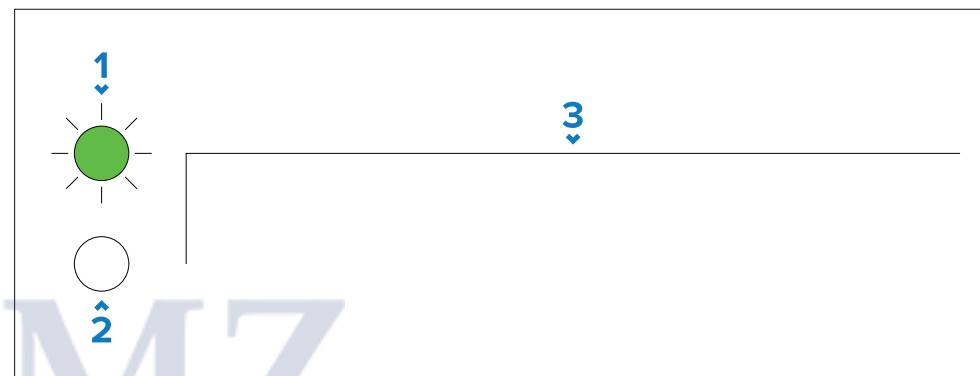
1. **LED ON** — Indicates the color assigned to the unit's diagnostic LED, and confirms that the diagnostic LED is active (switched **on**).

2. **LED OFF** — Indicates that the unit's diagnostic LED is inactive (switched **off**).

3. **Diagnostic pattern** — Indicates a diagnostic pattern based on the number and duration of *peaks* (indicating LED is switched **on**) and *troughs* (indicating LED is switched **off**) generated within the duration of the diagnostic pattern. In the example shown, a continuous peak occurs, indicating that the LED is permanently **on**.

Example flashing LED diagnostic pattern:
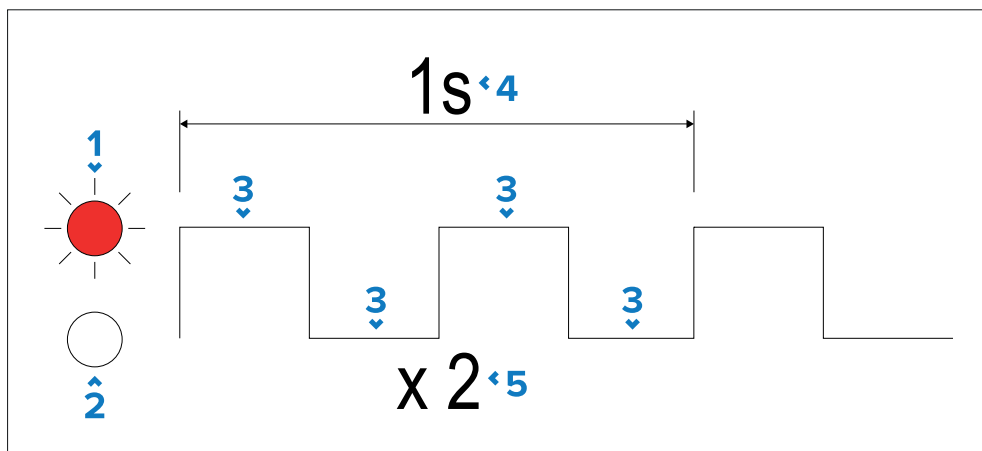
1. **LED ON** — Indicates the color assigned to the unit's diagnostic LED, and confirms that the diagnostic LED is active (switched **on**).

2. **LED OFF** — Indicates that the unit's diagnostic LED is inactive (switched **off**).

3. **Diagnostic pattern** — Indicates a diagnostic pattern based on the number and duration of *peaks* (indicating LED is switched **on**) and *troughs* (indicating LED is switched **off**) generated within the duration of the diagnostic pattern. In the example shown, a peak followed by a trough occurs and then repeats again, indicating that the LED flashes twice within a period of one second.

4. **Diagnostic pattern duration** — Indicates the total duration of the diagnostic pattern.

5. **Diagnostic pattern flash total** — Indicates the total number of flashes that occur within the diagnostic pattern.

14.3 LED diagnostics — CCU

The Camera Conversion Unit (CCU) has 2 diagnostic LEDs located at the top of the unit on the RJ45 (ethernet) connector. These 2 LEDs are used to identify the unit's status.

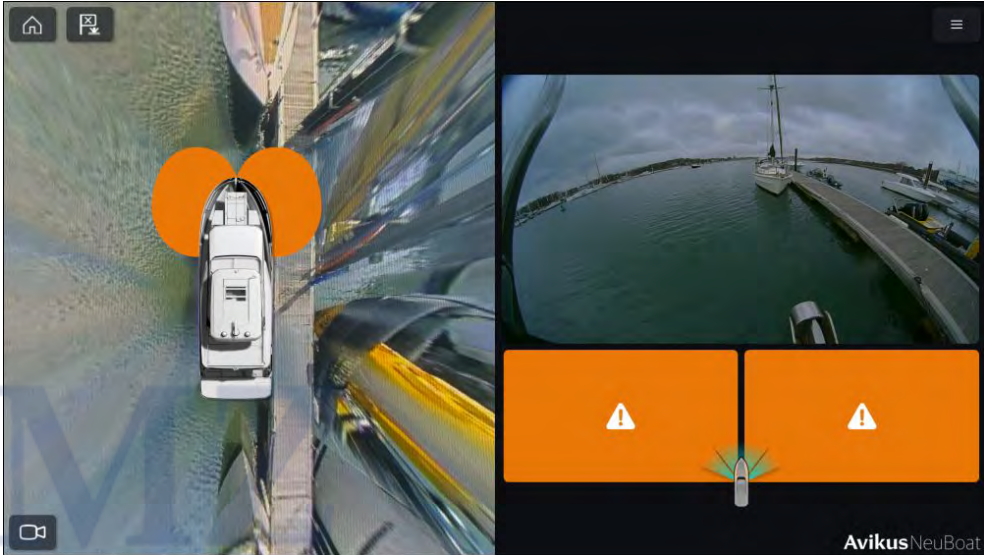| LED indication	LED Status and applicable solutions
	(1x Red flashing LED) Powered up / Ok
	Normal operation — no user action is required.
	(1x Green flashing LED) Updating
	Normal operation — no user action is required.
	(1x Amber solid LED) 100 Mbits/s Ethernet Active (transferring)
	• Normal operation — no user action is required.
	(2x Amber solid LEDs) 1000 Mbits/s Ethernet Active (transferring)
	• Normal operation — no user action is required.
	(No color) No power
	Refer to the advice found within the following section: **p.64 — Power up troubleshooting**

14.4 LED diagnostics — ORU

The Object Recognition Unit (ORU) has a single diagnostic LED located at the bottom of the unit. This LED is used to identify the unit's power status.

Bottom view

LED ON
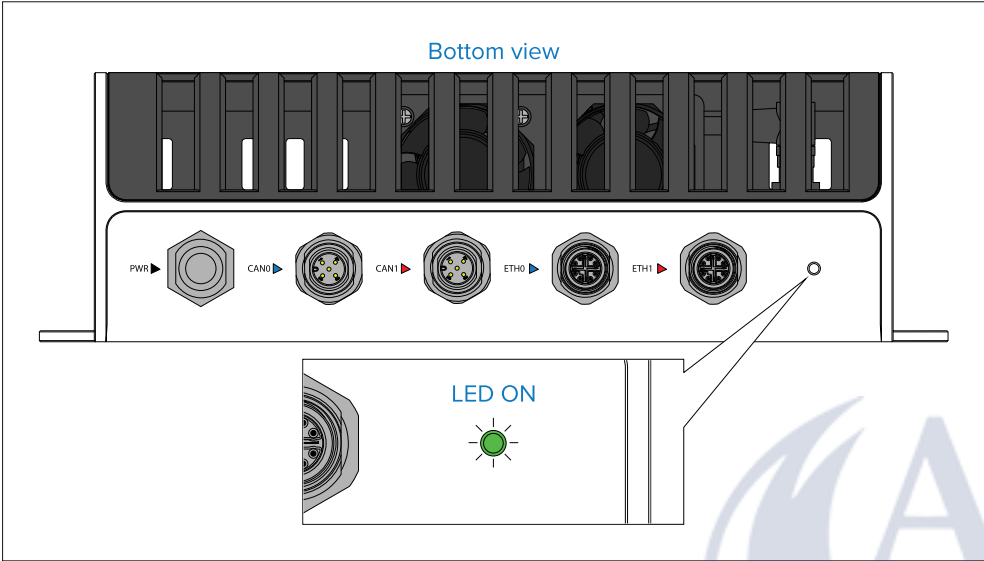
LED indication	LED Status and applicable solutions
	(Green) Powered up / Ok
	Normal operation — no user action is required.
	(No color) No power
	Refer to the advice found within the following section: **p.64 — Power up troubleshooting**

14.5 Camera troubleshooting

When a camera fault is present, the relevant camera streams will be flagged via the multifunction display's NeuBoat Dock app, with warning icons indicating where the fault has been detected.

Camera fault detected in NeuBoat Dock app

Possible causes	Possible solutions
Camera lost connection.	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
Camera internal fault.	1. Ensure the affected camera(s) have been installed and connected in accordance with Raymarine's recommendations in the **NeuBoat Dock Installation instructions (87480)** document, as appropriate. If this error is persistent, your installation will need to be reviewed by your dealer / installer.

Camera feed views do not appear in the correct position

Possible causes	Possible solutions
Camera connected to the wrong input channel.	1. For information on which input channel your cameras must be connected to, refer to the '*SVM camera input channels*' section within the **NeuBoat Dock Installation Instructions (87480)** document.

14.6 Power up troubleshooting

Before troubleshooting problems with your power connection, ensure that you have followed the power connection guidance provided in the product's installation instructions and performed a power cycle/reboot of the device. The troubleshooting information below can be used if you are experiencing problems with powering up your product.

Product does not turn on or keeps turning off

Possible causes	Possible solutions
Blown fuse / tripped breaker	1. Check the fuse, located inline with the power cable. Ensure that it has the correct rating (refer to the *Inline fuse and thermal breaker ratings* section), as an under-rated fuse can affect the power supplied to the product. If the fuse has blown, replace with a new fuse.
	2. Check the condition of relevant / additional fuses and breakers and connections; replace if necessary.
	3. If the fuse keeps blowing check for cable damage, broken connector pins or incorrect wiring.
Poor / damaged / insecure power supply cable / connections	1. 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.
	2. Check the power supply cable and connectors for signs of damage or corrosion; replace if necessary.
	3. Check that the power cable connector is fully inserted into the unit and locked in position.
	4. With the unit turned on, try flexing the power cable near to the connector to see if this causes the unit to re-boot/lose power; 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.

Possible causes	Possible solutions
Incorrect power connection	1. The power supply may be wired incorrectly; ensure that the installation instructions have been correctly followed.
Power source insufficient	1. Check that your power supply (battery or distribution panel) is providing a minimum of 10.8 V to each component in the system.

Product will not start up (restart loop)

Possible causes	Possible solutions
Power supply and connection	1. 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. Refer to your multifunction display / chartplotter's operation instructions for details on updating software for connected devices.

14.7 System data troubleshooting

Unit system data is unavailable at all multifunction displays

Possible causes	Possible solutions
Data is not being received at the multifunction display.	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
Data source is not operating.	1. Check the source of the missing data (e.g. SVM camera) for signs of damage or corrosion, and replace if necessary.
	2. If possible, check that the data source is correctly powered and operational.
	3. Refer to the instructions provided with the equipment to ensure it has been correctly installed.
Software mismatch between equipment may prevent communication.	1. Ensure all products have the latest software installed.

Unit system data is missing from some but not all multifunction displays

Possible causes	Possible solutions
Connection problem.	1. Check the product's attached cable(s) and connections for signs of damage or corrosion, and replace if necessary.
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. Refer to your multifunction display / chartplotter's operation instructions for details on updating software for connected devices.
Software mismatch between equipment may prevent communication.	1. Ensure that all products have the latest software installed.

Incorrect data reported

Possible causes	Possible solutions
Camera calibration error.	1. Switch off power supply to system and switch back on again. 2. Re-calibrate or re-configure data source, following the instructions provided with the relevant devices.

14.8 Miscellaneous troubleshooting

Miscellaneous problems and their possible causes and solutions are described here.

Display behaves erratically (frequent unexpected resets, system crashes and other erratic behavior)

Possible causes	Possible solutions
Intermittent problem with power to a unit.	1. Check relevant fuses and breakers. 2. Check that the power supply cable is sound and that all connections are tight and free from corrosion. 3. Check that the power source is of the correct voltage and sufficient current.
Software mismatch between equipment may prevent communication.	1. Ensure that all products have the latest software installed.
Corrupt data / other unknown issue.	1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine® website. Refer to your multifunction display / chartplotter's operation instructions for details on updating software for connected devices. 2. Check the data source for correct operation.

System not detected:

Possible causes	Possible solutions
Intermittent problem with power to a unit.	1. Check relevant fuses and breakers. 2. Check that the power supply cable is sound and that all connections are tight and free from corrosion. 3. Check that the power source is of the correct voltage and sufficient current.
Data is not being received at the multifunction display.	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
Software mismatch between equipment may prevent communication.	1. Ensure all products have the latest software installed.
Corrupt data / other unknown issue.	1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine® website. Refer to your multifunction display / chartplotter's operation instructions for details on updating software for connected devices. 2. Check the data source for correct operation.

Communication error:

Possible causes	Possible solutions
Data is not being received at the multifunction display.	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
Software mismatch between equipment may prevent communication.	1. Ensure that all products have the latest software installed.
Corrupt data / other unknown issue.	1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine® website. Refer to your multifunction display / chartplotter's operation instructions for details on updating software for connected devices.
	2. Check the data source for correct operation.

CHAPTER 15: MAINTENANCE

CHAPTER CONTENTS

15.1 Routine equipment checks

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

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

15.2 Product cleaning

Best cleaning practices.

When cleaning products:

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

CHAPTER 16: TECHNICAL SUPPORT

CHAPTER CONTENTS

16.1 Raymarine product support and servicing

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

Product information

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

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

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

Servicing and warranty

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

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

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

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

United States (US):

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

Web support

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

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

Worldwide support

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

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

United States (US):

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

Australia and New Zealand (Raymarine subsidiary):

- E-Mail: aus.support@raymarine.com
- Tel: +61 2 8977 0300

France (Raymarine subsidiary):

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

Germany (Raymarine subsidiary):

- E-Mail: support.de@raymarine.com
- Tel: +49 40 237 808 0

Italy (Raymarine subsidiary):

- E-Mail: support.it@raymarine.com
- Tel: +39 02 9945 1001

Spain (Authorized Raymarine distributor):

- E-Mail: sat@azimut.es
- Tel: +34 96 2965 102

Netherlands (Raymarine subsidiary):

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

Sweden (Raymarine subsidiary):

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

Finland (Raymarine subsidiary):

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

Norway (Raymarine subsidiary):

- E-Mail: support.no@raymarine.com

- Tel: +47 692 64 600

Denmark (Raymarine subsidiary):

- E-Mail: support.dk@raymarine.com
- Tel: +45 437 164 64

Russia (Authorized Raymarine distributor):

- E-Mail: info@mikstmarine.ru
- Tel: +7 495 788 0508

16.2 Diagnostic product information

Diagnostic product information can be viewed and exported from a Raymarine® LightHouse multifunction display, for supported products networked using RayNet, RJ45, or SeaTalkng ® / NMEA 2000 cables.

Diagnostic product information includes technical data related to the connected product, such as serial numbers, network addresses, firmware version numbers, and so on. It is useful for 2 main purposes:

1. Sending detailed product information to the Raymarine® product support team, in the event of a problem or fault with your product. The information can be exported to a MicroSD card, and you can then copy the file for the purposes of emailing it to the product support team. For contact details, refer to: **p.70 — Technical support**

2. Maintaining detailed off-boat records. This is particularly useful for vessels that have multiple Raymarine® products installed.

To view or export diagnostic product information, access the *[Diagnostics]* menu. For instructions on how to access this menu, refer to the relevant operation instructions for your multifunction display.

16.3 Learning resources

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

Video tutorials

Raymarine official channel on YouTube

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

Training courses

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

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

Technical support forum

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

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

CHAPTER 17: TECHNICAL SPECIFICATION

CHAPTER CONTENTS

17.1 Technical specification — SVM camera

Physical specification

Specification	
Width:	90 mm (3.54 in).
Height:	89.79 mm (3.54 in).
Depth:	97.81 mm (3.85 in).

Power specification

Specification	
Nominal supply voltage:	5 V dc
Operating voltage range:	4.5 V to 5.5 V dc
Power consumption:	1.4 W (maximum)
Current:	240 mA (nominal) @ 5 V dc

Environmental specification

Specification	
Operating temperature:	-30° C (-22° F) to + 75° C (167° F)
Storage temperature:	-40° C (− 40° F) to + 85° C (185° F)
Relative humidity:	up to 90% @ 40° C (185° F)
Waterproof rating:	IPx7

Camera specification

Specification	
Sensor / DSP:	IMX290
Total pixels:	1920 (H) x 1080 (V)
Luminance:	1 lux
Lens / Field of View:	191.9° Horizontal FOV x 124° Vertical FOV

Video specification

Specification	
Output:	TVI Differential
Resolution:	1920 x 1080 (1080p)
Frame rate:	30 fps

Conformance specification

Specification	
Europe, Australia & New Zealand:	EN 60945:2002
Canada:	ICES-003
USA:	CFR47 Part 15
Product markings:	• UKCA
	• CE
	• RCM
	• FCC
	• ICES
	• WEEE Directive

17.2 Technical Specification — CCU

Physical specification

Specification	
Width:	226.00 mm (8.90 in).
Height:	180.00 mm (7.09 in).
Depth:	30.00 mm (1.18 in).

Power specification

Specification	
Nominal supply voltage:	12 V / 24 V dc
Operating voltage range:	10.8 V to 32 V dc
Power consumption:	25 W (maximum)
Current:	2.1 A (nominal) @ 12 V dc / 1 A (nominal) @ 24 V dc
Inline fuse rating:	3 A
Thermal breaker rating:	3 A

Network specification

Specification	
Network connection ports:	• 1x RJ45 (Ethernet) connection port • 1x Camera input port (1) • 1x Camera input port (2)

Environmental specification

Specification	
Operating temperature:	-30° C (– 22° F) to + 75° C (167° F)
Storage temperature:	– 40° C (– 40° F) to + 85° C (185° F)
Relative humidity:	up to 90% @ 40° C (104° F)

Video specification

Specification	
Compression:	H.265
Resolutions:	1280 x 720 (720p)
Frame Rate:	10 fps to 30 fps
Bit Rate:	1 MB to 12 MB
Bit Rate Control:	CBR

Conformance specification

Specification	
Europe, Australia & New Zealand:	EN 60945:2002
Canada:	ICES-003
USA:	CFR47 Part 15
Product markings:	• UKCA • CE • RCM • FCC • ICES • WEEE Directive

17.3 Technical Specification — ORU

Physical specification

Specification	
Width:	261.20 mm (10.28 in).
Height:	180.50 mm (7.11 in).
Height (including connectors):	188.00 mm (7.40 in).
Depth:	75.00 mm (2.95 in).

Power specification

Specification	
Nominal supply voltage:	12 V / 24 V dc
Operating voltage range:	10.8 V to 32 V dc
Power consumption:	45 W (maximum)
Current:	1.5 A (nominal) @ 12 V dc / 0.9 A (nominal) @ 24 V dc
Inline fuse rating:	10 A
Thermal breaker rating:	10 A

Network specification

Specification	
Network connection ports:	2x M12 (Ethernet) connection ports.

Environmental specification

Specification	
Operating temperature:	-15° C (+ 5° F) to +55° C (131° F)
Storage temperature:	-30° C (– 22° F) to + 70° C (158 °F)
Relative humidity:	up to 93% @ 40° C (104° F)
Waterproof rating:	IPx6

Conformance specification

Specification	
Europe, Australia & New Zealand:	EN 60945:2002
Canada:	ICES-003
USA:	CFR47 Part 15
Product markings:	• UKCA • CE • RCM • ICES • WEEE Directive

CHAPTER 18: SPARES AND ACCESSORIES

CHAPTER CONTENTS

18.1 Spares

The following spares are available for your system:
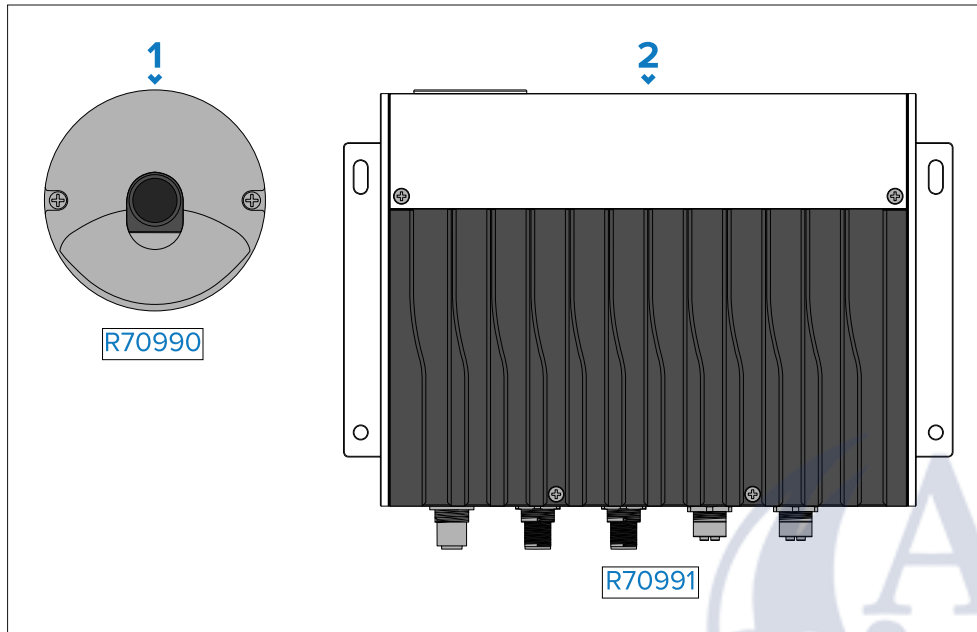
1. Surround View Monitor (SVM) camera (single).
2. Object Recognition Unit (ORU).

18.2 Accessories

The following accessories are available for your system:
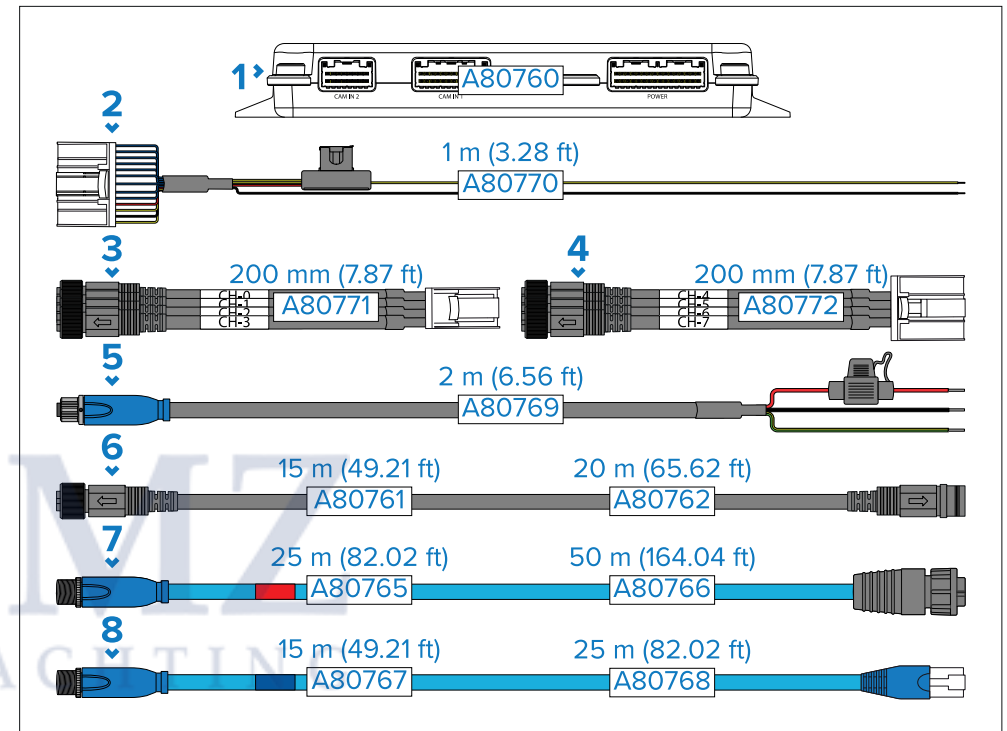
1. Camera Control Unit (CCU).
2. CCU power cable.
3. CCU camera input cable 1.
4. CCU camera input cable 2.
5. Object Recognition Unit (ORU) power cable.
6. SVM camera to CCU extension cable.
7. ORU to RayNet cable.
8. CCU to ORU cable.

18.3 RayNet to RayNet cables and connectors

1

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

2

10 m (32.8 ft) — A80512

3 R70014

4 A80262

5

100 mm (3.9 in) — A80162
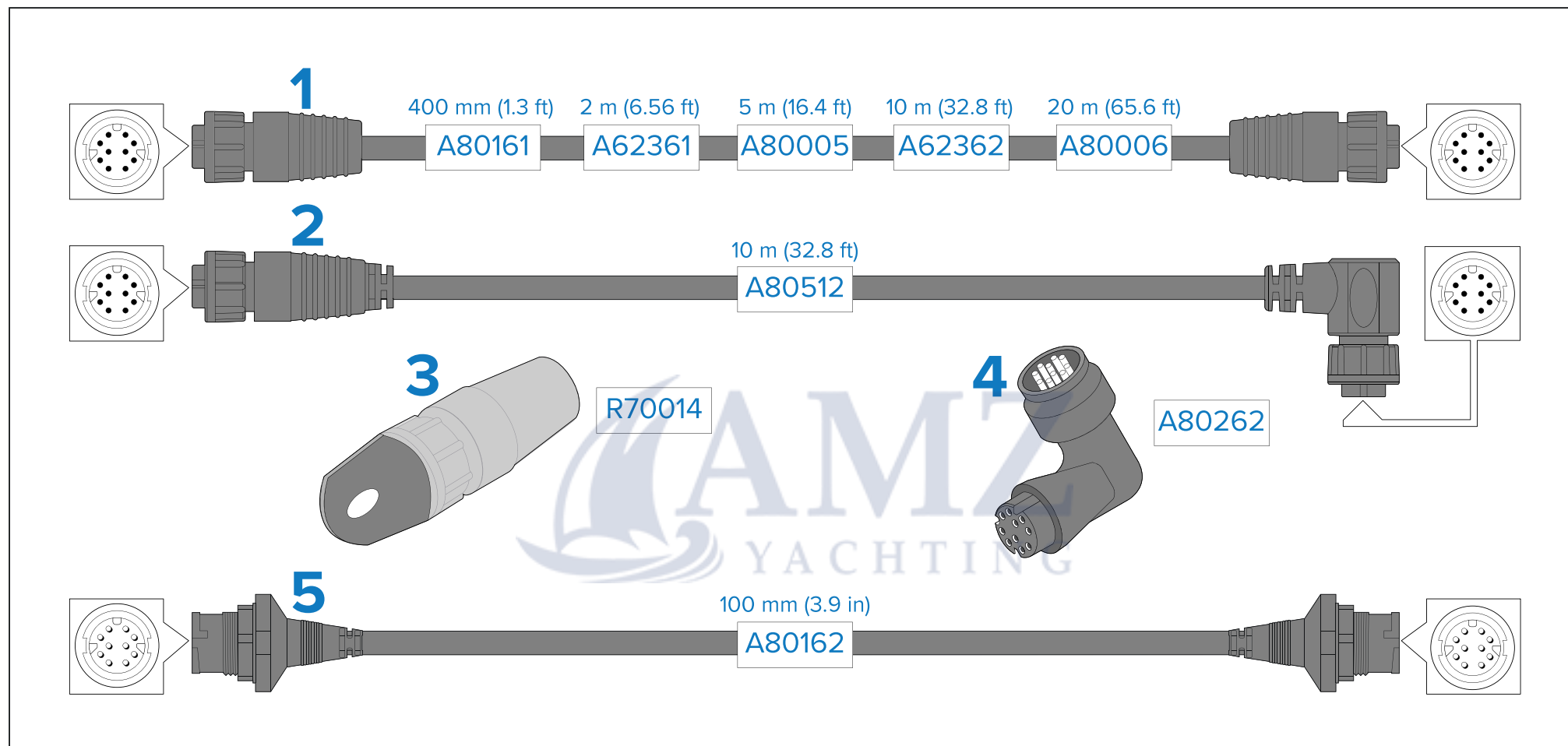
1. Standard RayNet connection cable with a RayNet (female) socket on both ends.

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.

18.4 RayNet to RJ45, and RJ45 (SeaTalkhs) adapter cables

1 — 400 mm (1.3 ft) — A80160

2 — 100 mm (3.9 in) — A80247

3 — 400 mm (1.3 ft) — A80272

4 — 100 mm (3.9 in) — A80513

5 — 3 m (9.84 ft) — A80276

6
1 m (3.28 ft)	3 m (9.84 ft)	10 m (32.8 ft)
A62360	A80151	A80159

6
15 m (49.21 ft)	25 m (82.02 ft)	30 m (98.4 ft)
A80763	A80764	308-251-30-00

7 — 30 m (98.4 ft) — 308-252-30-00
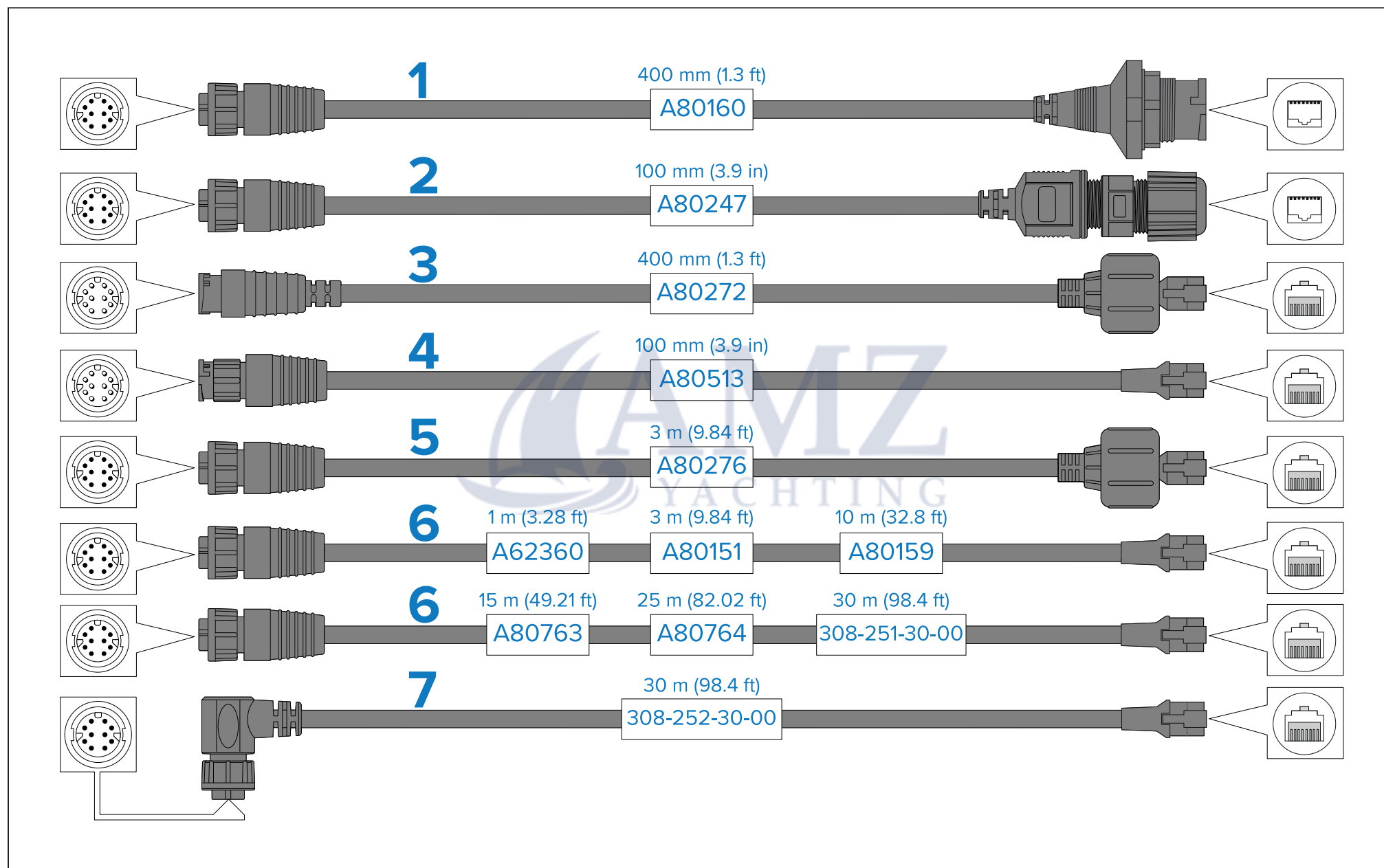
1. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) socket on the other end, accepting the following cables with an RJ45 (SeaTalkhs ®) waterproof locking (male) plug:

   - A62245 (1.5 m).

   - A62246 (15 m).

2. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalkhs ®) 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 (SeaTalkhs ®) waterproof (male) plug on the other end.

4. Adapter cable with a RayNet (male) plug on one end, and an RJ45 (male) plug on the other end.

5. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (SeaTalkhs ®) waterproof (male) plug on the other end.

6. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (male) plug on the other end.

7. Adapter cable with a right-angled RayNet (female) socket on one end, and an RJ45 (male) plug on the other end.

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