



**Avikus**  
MARITIME AUTONOMOUS PIONEER



# NEUBOAT DOCK

360° VIEW BOAT DOCKING SYSTEM

## INSTALLATION INSTRUCTIONS

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# CHAPTER 1: IMPORTANT INFORMATION

## Safety warnings



### Warning: System requirements of use

The Neuboot Dock system (“System”) is intended to aid visibility around the vessel only. The captain and crew should maintain a thorough lookout at all times when using the System.

At all times while the System is in use, the captain **MUST**:

- Maintain awareness of the vessel’s speed, position, direction of travel as well as the proximity of the boat to other vessels, docks and other objects/obstacles.
- Remain in full control of the boat and its movements.
- Always be responsible for ensuring the vessel is driven in a safe manner, at the appropriate speed, with an appropriate distance to other vessels and objects/obstacles.



### Warning: System limitations

- The System is intended to aid situational awareness and visibility around the vessel only.
- Objects/obstacles on the display may be closer to the vessel than they appear to be on the display.
- The System may have blind spots where obstacles cannot be detected.
- The System must be maintained at all times:
  - Cameras cannot be obscured; and
  - Cameras must be cleaned regularly.
- The System uses an optical camera system:
  - Lighting and weather conditions may affect performance of the System.
  - Without appropriate light/visibility the System will not function correctly.
- The System must not be used if any of the cameras become damaged
- The system is not a substitute for the captains attention and judgement



### 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: 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: 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.

**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.

**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).

**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.

**Warning: Entrapment hazard**

This product features moving parts that provide a potential entrapment hazard. Keep clear of moving parts at all times.

**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.

## 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.

## Regulatory notices

### Cleaning the camera

The camera housing and lens require regular cleaning. You should clean the lens when system performance appears to deviate from its usual level, or when excessive contaminant buildup is seen on the lens. You should also ensure that the camera's protective cover is also unobstructed and operating correctly.

When cleaning this product:

- Do NOT wipe the lens window with a dry cloth, or with abrasive materials such as paper or scrub brushes, as this could scratch the coating.
- Do NOT use acid or ammonia based products.
- Do NOT pressure wash.

Particular care should be taken when cleaning the lens window, as this has a protective anti-reflective coating which may be damaged by improper cleaning.

1. Switch off the power to the unit.
2. Clean the camera body with a clean, soft cotton cloth. You can moisten the cloth and use a mild detergent if required.
3. Clean the camera lens.
  - Rinse the lens with fresh water to remove all dirt particles and salt deposits, and allow to dry naturally.
  - If any spots or smears remain, very gently wipe the lens window with a clean microfibre cloth or soft cotton cloth.
  - If necessary, use isopropyl alcohol (IPA) or a mild detergent to remove any remaining spots, marks, or salt deposits.

### 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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This product is subject to certain open source license agreements. Copies of the license agreements can be found on the Raymarine website: <https://bit.ly/rym-docs>

### EMC installation guidelines

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

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

**Note:**

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

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

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3.28 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).
  - More than 2 m (6.56 ft) from the path of a Radar beam. A Radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended, unless doing so is detailed in the installation manual.

**Note:**

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

## Suppression ferrites

- 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 <https://bit.ly/rym-docs>

## Warranty registration

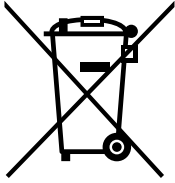
To register your Raymarine product ownership, please visit <https://bit.ly/rym-warranty> and register online.

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

## Product disposal

Dispose of this product in accordance with the WEEE Directive.

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



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

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

For more information about suitable collection points for waste electrical and electronic equipment in your region, refer to the Raymarine website: <https://bit.ly/rym-recycling>

## IMO and SOLAS

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

## Technical accuracy

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

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# CHAPTER 2: DOCUMENT INFORMATION

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- 2.2 Product documentation — page 14
- 2.3 Document illustrations — page 14
- 2.4 Document conventions — page 14

## 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 the video feeds from the SVM cameras 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: SOFTWARE UPDATES

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- 3.3 Inserting a MicroSD card — Camera Conversion Unit — page 17
- 3.4 Inserting a MicroSD card — Object Recognition Unit — page 17

## 3.1 Software updates

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

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

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

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

### Note:

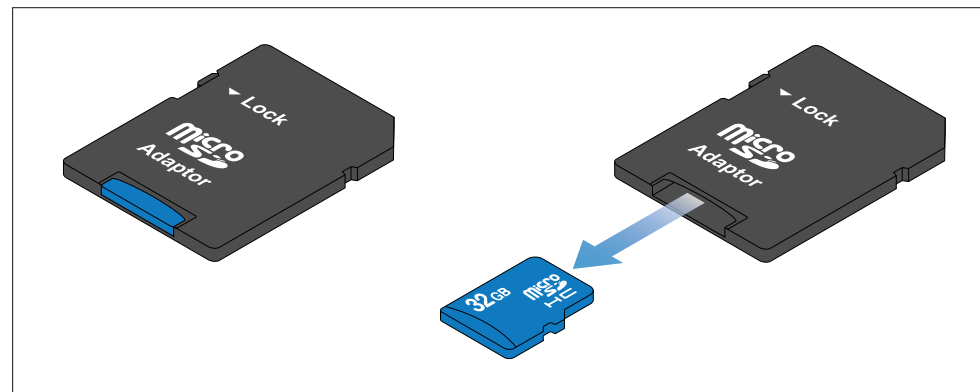
If in doubt as to the correct procedure for updating your product software, refer to your dealer or Raymarine technical support.

### Caution: Installing software updates

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

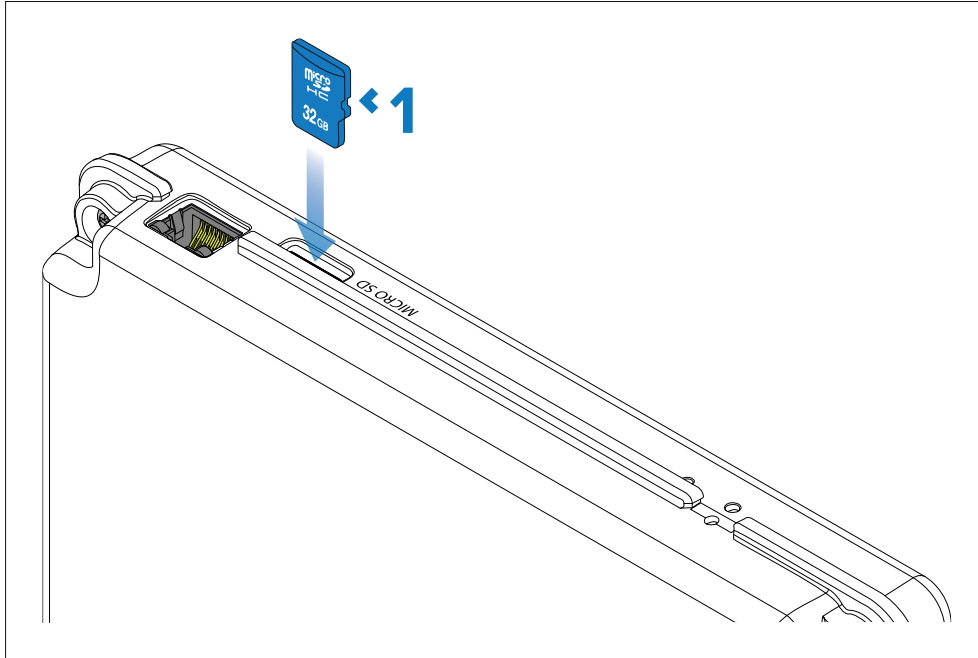
## 3.2 Removing MicroSD card from its adaptor

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



### 3.3 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.

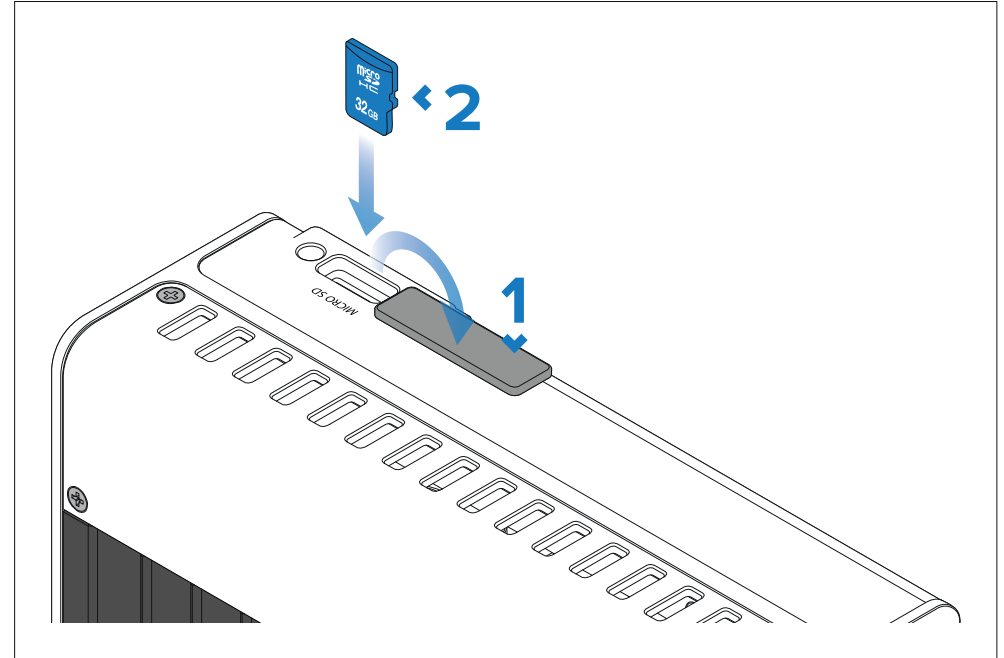


In order to insert your microSD card:

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

### 3.4 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: PRODUCT AND SYSTEM OVERVIEW

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- 4.5 Basic system — page 21
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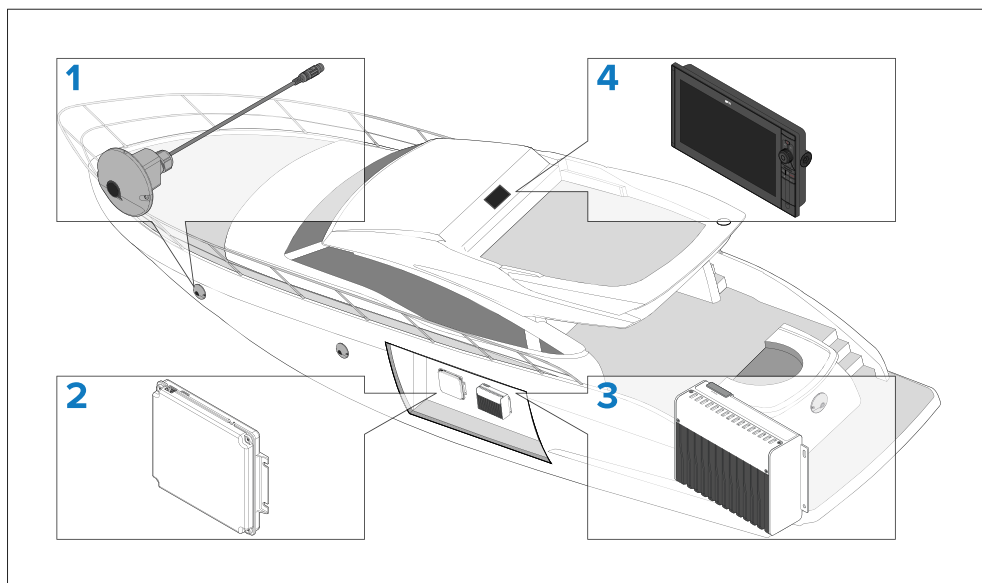
## 4.1 Product overview

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 SVM 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.

## 4.2 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.20 — Compatible multifunction displays](#)

### Raymarine® RNS-8 & 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 a Raymarine® RNS-8 network switch and an additional CCU is required in order to form an expanded system. For more information, refer to:  
[p.20 — Maximum camera cable length](#)

### Cable extensions

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

- [p.80 — Spares and accessories](#)
- [p.44 — Network connections](#)
- [p.50 — Power connections — Camera Conversion Unit](#)
- [p.55 — Power connections — Object Recognition Unit](#)

## 4.3 Multifunction display requirement

The NeuBoat Dock system requires a Raymarine® Axiom multifunction display, running LightHouse 4, v4.6.103 or later.

For software, visit: <https://bit.ly/rym-software>

Compatible displays	Required software
<b>Axiom 2 Series:</b> Axiom 2 Pro, Axiom 2 XL	<ul style="list-style-type: none"><li>LightHouse 4, v4.6.103 or later</li></ul>
<b>Axiom Series:</b> Axiom, Axiom+, Axiom Pro, Axiom XL	<ul style="list-style-type: none"><li>LightHouse 4, v4.6.103 or later</li></ul>

## 4.4 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.

### System type: Basic

Cable length	Required additional components
<b>0 to 15 m (49.21 ft)</b>	None.  For more information, refer to the following section: <a href="#">p.21 — Basic system</a>

### System type: Basic

Cable length	Required additional components
<b>15 m (49.21 ft) to 20 m (65.62 ft)</b>	SVM camera to CCU extension cable (A80762); 20 m (65.62 ft); available separately.  For more information, refer to the following sections: <ul style="list-style-type: none"><li><a href="#">p.21 — Basic system</a></li><li><a href="#">p.80 — Spares and accessories</a></li></ul>

### System type: Expanded

Cable length required	Required additional components
<b>&gt; 20 m (65.62 ft)</b>	<p><b>The following components are required, <i>in addition to the Basic system components</i>:</b></p> <ul style="list-style-type: none"><li>1x RNS-8 Network Switch (A80732); available separately.</li><li>1x additional Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable); available separately.</li><li>2x CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.</li><li>1x ORU to RayNet cable (used to connect the ORU to the RNS-8 network switch); 25 m (82.02 ft) or 50 m (164.04 ft) available separately.</li></ul> <p>For more information, refer to the following sections:</p> <ul style="list-style-type: none"><li><a href="#">p.22 — Expanded system</a></li><li><a href="#">p.80 — Spares and accessories</a></li></ul>

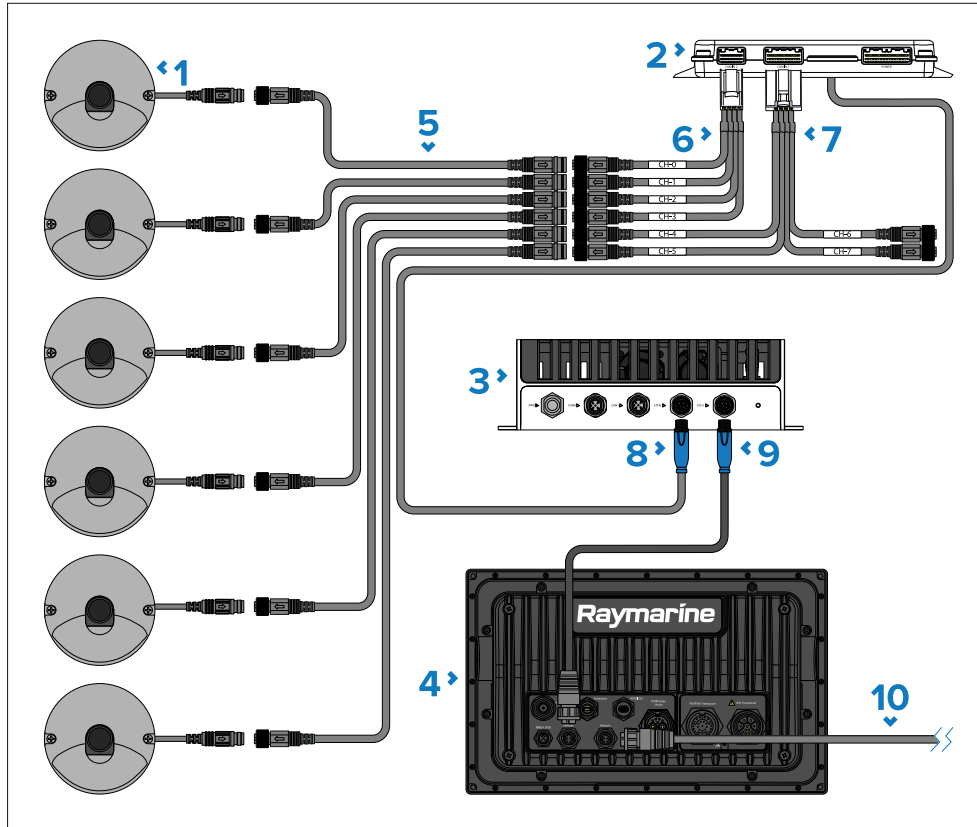
### Network cable extensions

If you wish to extend the length of a network cable connected to your product, refer to the following section for further information:  
[p.80 — Spares and accessories](#)

## 4.5 Basic system

The following example shows a NeuBoat Dock *basic system*, including available connections and required devices. In a NeuBoat Dock *basic system*, the cable length between each of the SVM cameras and the CCU **must NOT** exceed 20 m (65.62 ft).

### Example: basic system



1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 500 mm (19.69 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 or 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 or 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 or 50 m (164.04 ft) available separately.
10. RayNet to RayNet cable (used to connect the NeuBoat Dock *basic system* to a wider Raymarine® network).

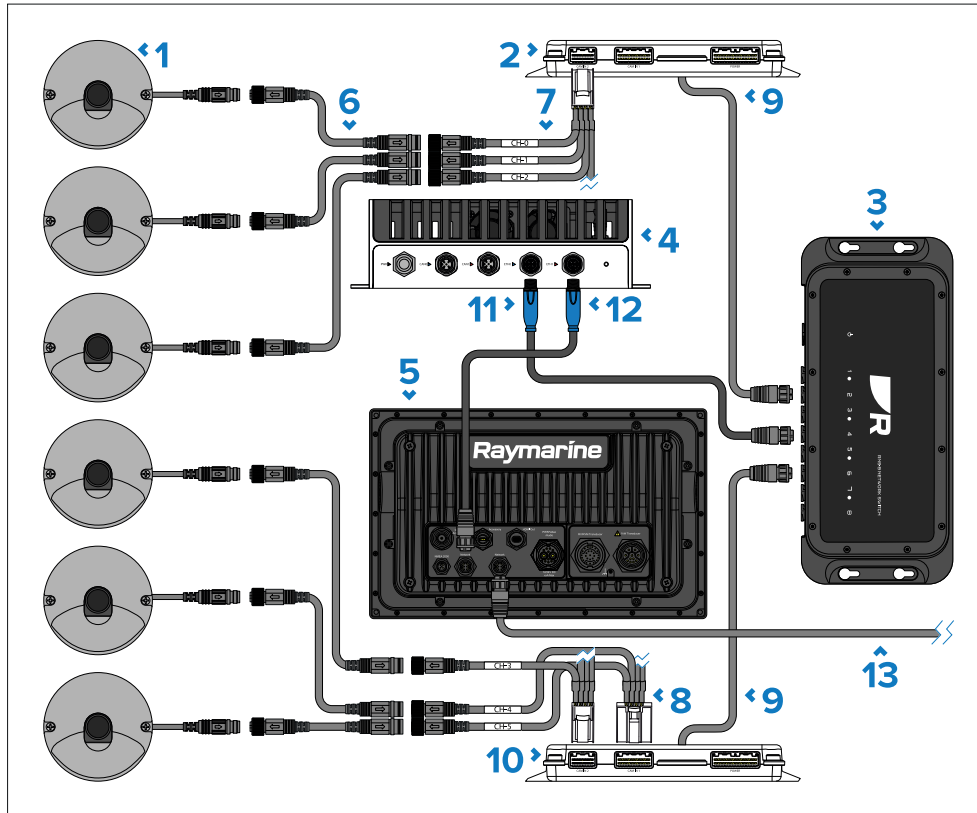
#### Note:

- The NeuBoat Dock system must be running on a 1 Gigabit network.
- Power connections are not shown in this example. Refer to the relevant *Power connection* section.

## 4.6 Expanded system

The following example provides an overview of a NeuBoat Dock *expanded system*, including available connections and the types of connected devices. In a NeuBoat Dock *expanded system*, the cable length between each of the SVM cameras and the CCU **exceeds** 20 m (65.62 ft). Therefore, an additional CCU, a Raymarine® RNS-8 network switch, and additional cables are required.

### Example: expanded system



1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 500 mm (19.69 in)).
2. Camera Conversion Unit (CCU).
3. 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 or 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. CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.
10. Additional Camera Conversion Unit (CCU).
11. ORU to RayNet cable (used to connect the ORU to the RNS-8 network switch); 25 m (82.02 ft) or 50 m (164.04 ft) available separately.
12. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display); 25 m (82.02 ft) supplied or 50 m (164.04 ft) available separately.
13. RayNet to RayNet cable (used to connect the NeuBoat Dock *expanded system* to a wider Raymarine® network).

#### Note:

- The NeuBoat Dock system must be running on a 1 Gigabit network.
- Power connections are not shown in this example. Refer to the relevant *Power connection* section.

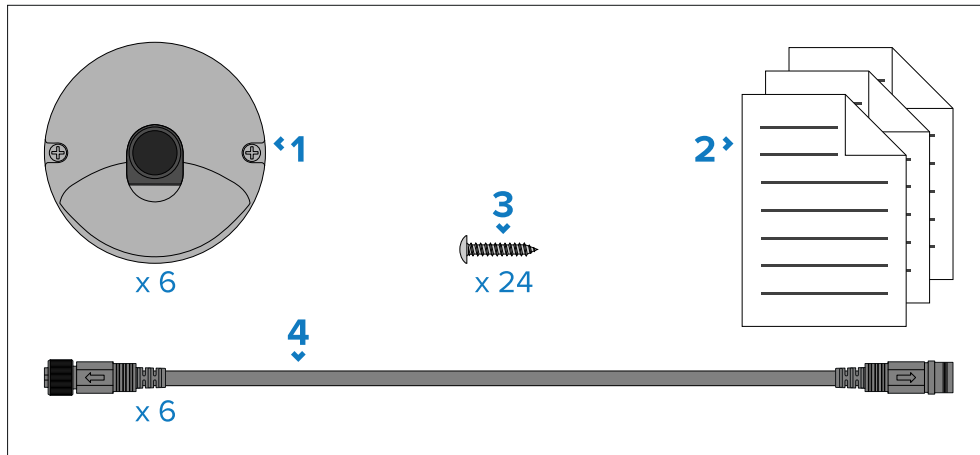
# **CHAPTER 5: PARTS SUPPLIED**

## CHAPTER CONTENTS

- 5.1 SVM camera — parts supplied — page 24
- 5.2 CCU — parts supplied — page 24
- 5.3 ORU — parts supplied — page 25

## 5.1 SVM camera — parts supplied

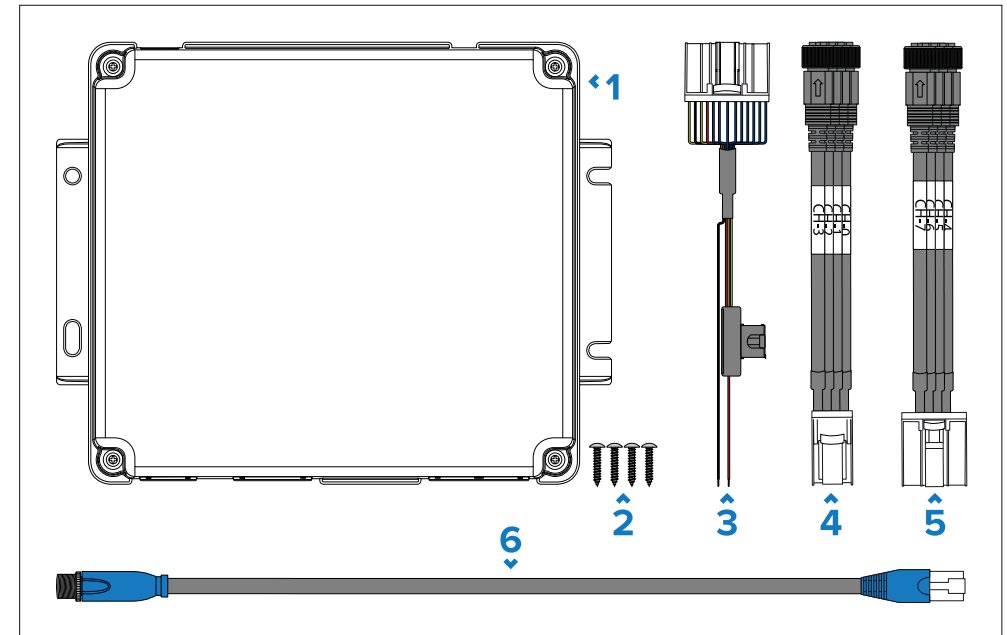
The Surround View Monitor (SVM) camera is supplied with:



Item	Description
1	(6 x) SVM camera (includes pre-fitted cable, 500 mm (19.69 in))
2	(1 x) Documentation pack (includes <b>placement position file</b> ).
3	(24 x) Fixing screws.
4	(6 x) SVM camera to CCU cable, 15 m (49.21 ft).

## 5.2 CCU — parts supplied

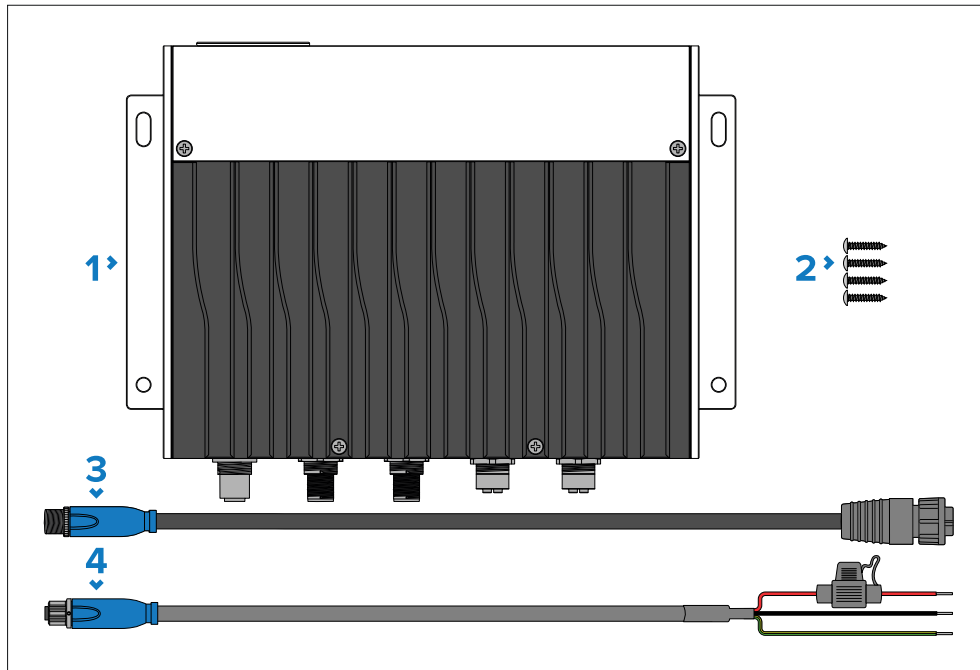
The Camera Conversion Unit (CCU) is supplied with:



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).

## 5.3 ORU — parts supplied

The Object Recognition Unit (ORU) is supplied with:



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).

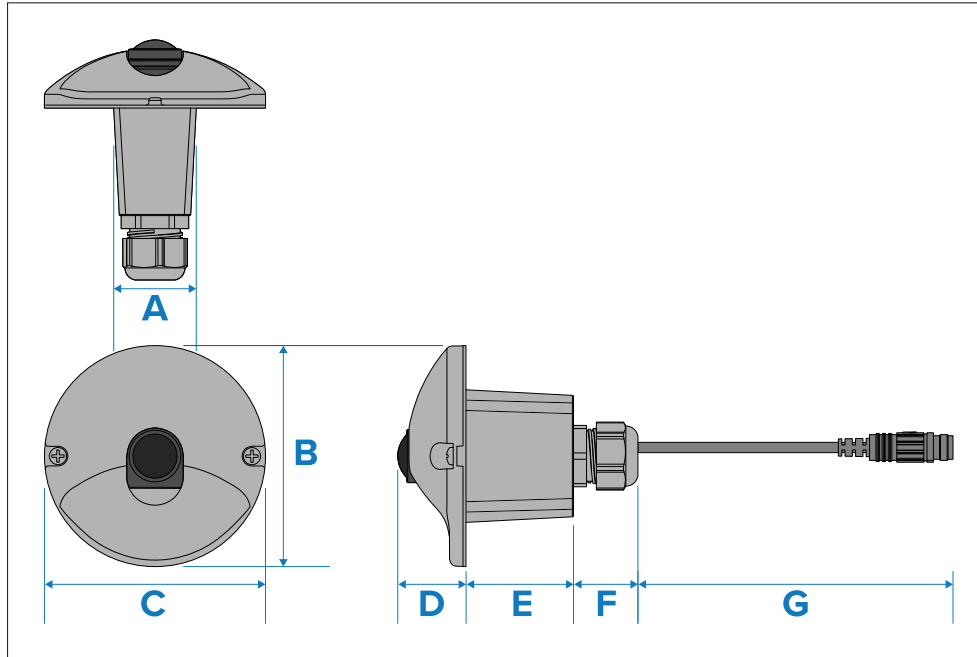
# CHAPTER 6: PRODUCT DIMENSIONS

## CHAPTER CONTENTS

- 6.1 SVM camera — dimensions — page 27
- 6.2 CCU — dimensions — page 27
- 6.3 ORU — dimensions — page 28

## 6.1 SVM camera — dimensions

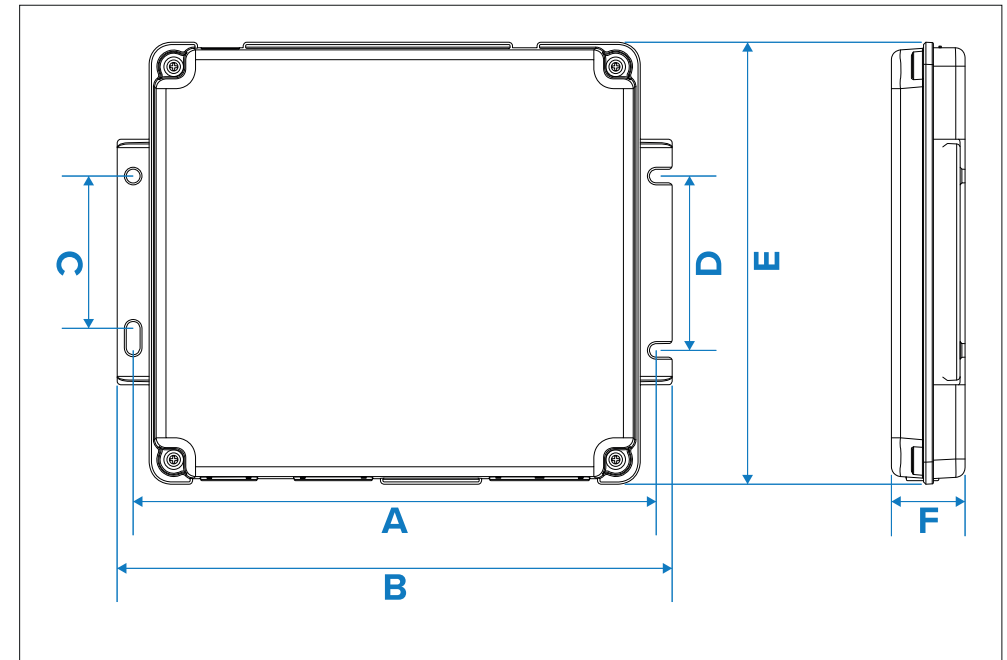
The dimensions of the Surround View Monitor (SVM) camera are shown below:



Item	Description
<b>A</b>	33.60 mm (1.32 in).
<b>B</b>	90.00 mm (3.54 in).
<b>C</b>	90.00 mm (3.54 in).
<b>D</b>	27.78 mm (1.09 in).
<b>E</b>	43.80 mm (1.72 in).
<b>F</b>	26.23 mm (1.03 in).
<b>G</b>	265.55 mm (10.45 in).

## 6.2 CCU — dimensions

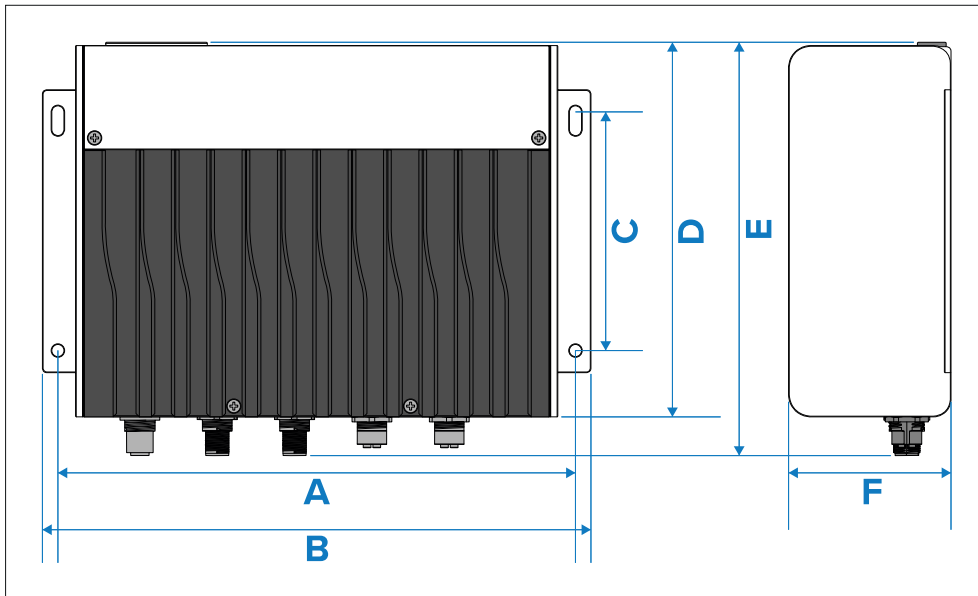
The dimensions of the Camera Conversion Unit (CCU) are shown below:



Item	Description
<b>A</b>	213 mm (8.39 in).
<b>B</b>	226.00 mm (8.90 in).
<b>C</b>	62.00 mm (2.44 in).
<b>D</b>	71.00 mm (2.80 in).
<b>E</b>	180.00 mm (7.09 in).
<b>F</b>	30.00 mm (1.18 in).

## 6.3 ORU — dimensions

The dimensions of the Object Recognition Unit (ORU) are shown below:



Item	Description
<b>A</b>	246.20 mm (9.69 in).
<b>B</b>	261.20 mm (10.28 in).
<b>C</b>	108.00 mm (4.25 in).
<b>D</b>	180.50 mm (7.11 in).
<b>E</b>	188.00 mm (7.40 in).
<b>F</b>	75.00 mm (2.95 in).

# CHAPTER 7: LOCATION REQUIREMENTS

## CHAPTER CONTENTS

- 7.1 Warnings and cautions — page 30
- 7.2 Maximum camera cable length — page 30
- 7.3 SVM camera — placement position file — page 31
- 7.4 General location requirements — page 31
- 7.5 SVM camera — location requirements — page 31
- 7.6 CCU and ORU — location requirements — page 32
- 7.7 Compass safe distance — page 33
- 7.8 EMC installation guidelines — page 33

## 7.1 Warnings and cautions

### Important:

Before proceeding, ensure that you have read and understood the warnings and cautions provided in the following section of this document:

[p.8 — Important information](#)



### Warning: 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).



### Warning: Entrapment hazard

This product features moving parts that provide a potential entrapment hazard. Keep clear of moving parts at all times.

## 7.2 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.

### System type: Basic

#### Cable length

#### Required additional components

0 to 15 m (49.21 ft)

None.

For more information, refer to the following section:

[p.21 — Basic system](#)

### System type: Basic

#### Cable length

#### Required additional components

15 m (49.21 ft) to  
20 m (65.62 ft)

SVM camera to CCU extension cable (A80762);  
20 m (65.62 ft); available separately.

For more information, refer to the following sections:

- [p.21 — Basic system](#)
- [p.80 — Spares and accessories](#)

### System type: Expanded

#### Cable length required

#### Required additional components

> 20 m (65.62 ft)

The following components are required, *in addition to the Basic system components*:

- 1x RNS-8 Network Switch (A80732); available separately.
- 1x additional Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable); available separately.
- 2x CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.
- 1x ORU to RayNet cable (used to connect the ORU to the RNS-8 network switch); 25 m (82.02 ft) or 50 m (164.04 ft) available separately.

For more information, refer to the following sections:

- [p.22 — Expanded system](#)
- [p.80 — Spares and accessories](#)

## 7.3 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.

See also: [p.31 — Surround View Monitor camera location requirements](#)

## 7.4 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.

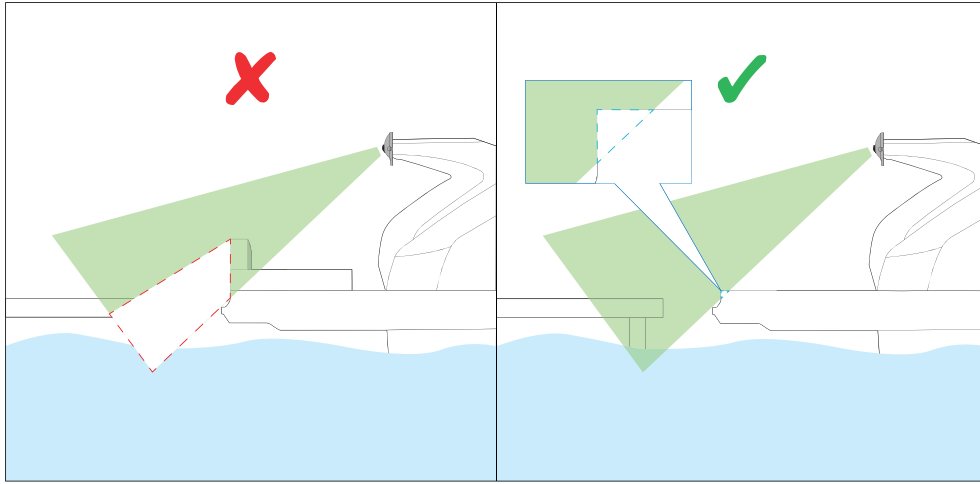
## 7.5 SVM camera — location requirements

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.31 — 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.31 — Surround View Monitor camera placement position file](#)
- **Camera view** — To ensure correct camera view:
    - The cameras must be installed with an unobstructed view of the water / dock.
    - The cameras must be installed with an unobstructed view of a part of the boat which will act as a reference point when attempting to dock.



## 7.6 CCU and ORU — location requirements

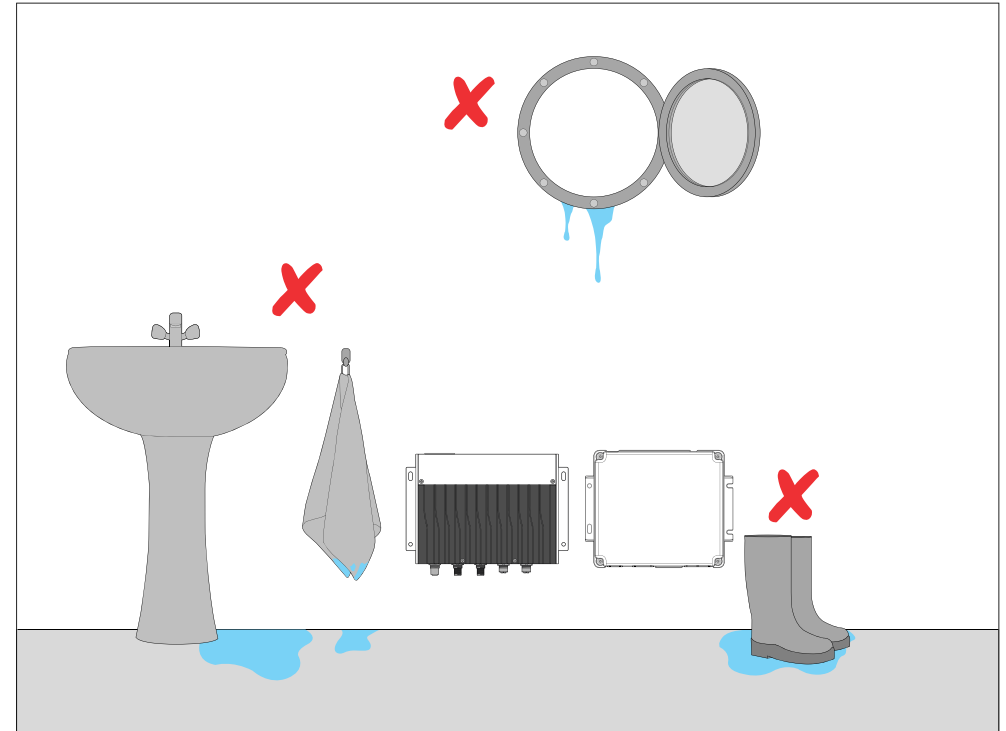
Important requirements to follow when selecting a suitable location to install the Camera Conversion Unit (CCU) and Object Recognition Unit (ORU):

### Important:

In addition to the below, ensure that your installation location meets the requirements listed in the following section:

[p.31 — General location requirements](#)

- **Water ingress** — Both products 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 both products are installed in a location with a minimum clearance of 100 mm (3.94 in) from the MicroSD card slot, to allow insertion and removal of MicroSD cards.
- **Fan clearance** — Ensure that the ORU is installed in a location with a minimum clearance of 100 mm (3.94 in) from the front and top fan apertures, to allow sufficient ventilation around the unit.
- **Fan obstruction** — Ensure that the ORU is NOT installed in a location where the front and top fan apertures will be obstructed.
- **Mounting surface** — Ensure that the CCU is NOT installed on a metallic surface, and that each of the fixings used to mount the unit do NOT come into contact with a metallic surface once secured.

## 7.7 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.

## 7.8 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 (3.28 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (6.6 ft).
  - More than 2 m (6.56 ft) from the path of a Radar beam. A Radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.

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

### Note:

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

# CHAPTER 8: CABLES AND CONNECTIONS — GENERAL INFORMATION

## CHAPTER CONTENTS

- 8.1 General cabling guidance — page 35
- 8.2 SVM camera — connections overview — page 36
- 8.3 CCU — connections overview — page 37
- 8.4 ORU — connections overview — page 38

## 8.1 General cabling guidance

### Cable types and length

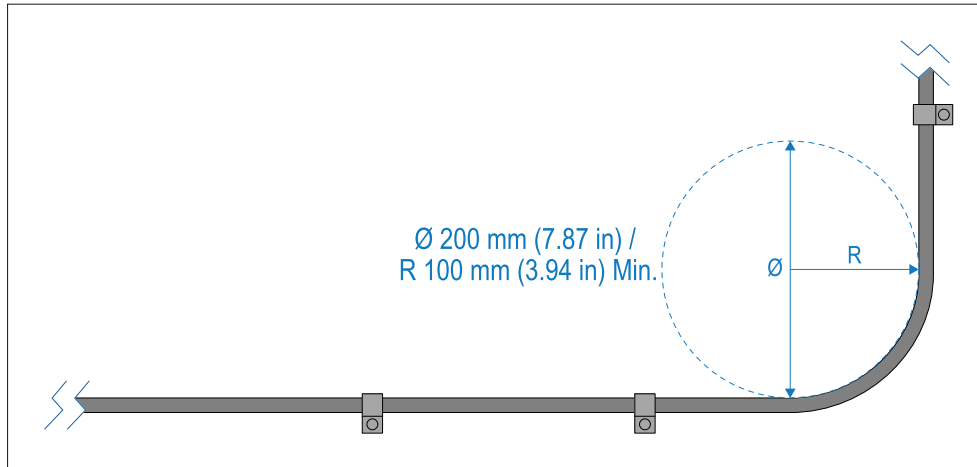
It is important to use cables of the appropriate type and length.

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

### Cable routing

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

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



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

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

### Strain relief

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

### Cable shielding

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

### 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-ended wire connections

You must ensure that any bare-ended 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 electrical insulation tape.

## Unused bare-ended wires

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

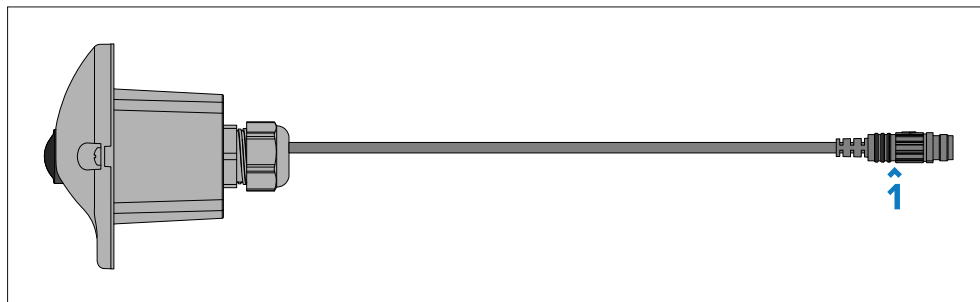


### Warning: Positive ground systems

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

## 8.2 SVM camera — connections overview

Connectors and suitable connections for the NeuBoat Dock SVM camera.



### Connector

1) **CAM (Camera)** (includes pre-fitted cable, 500 mm (19.69 in)).

Connects to:

- Camera Conversion Unit (CCU).

### Suitable connections

SVM camera to CCU extension cable; 15 m (49.21 ft) supplied or 20 m (65.62 ft) available separately.

### Note:

A maximum of 6 SVM cameras can be connected to a NeuBoat Dock system.

## 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

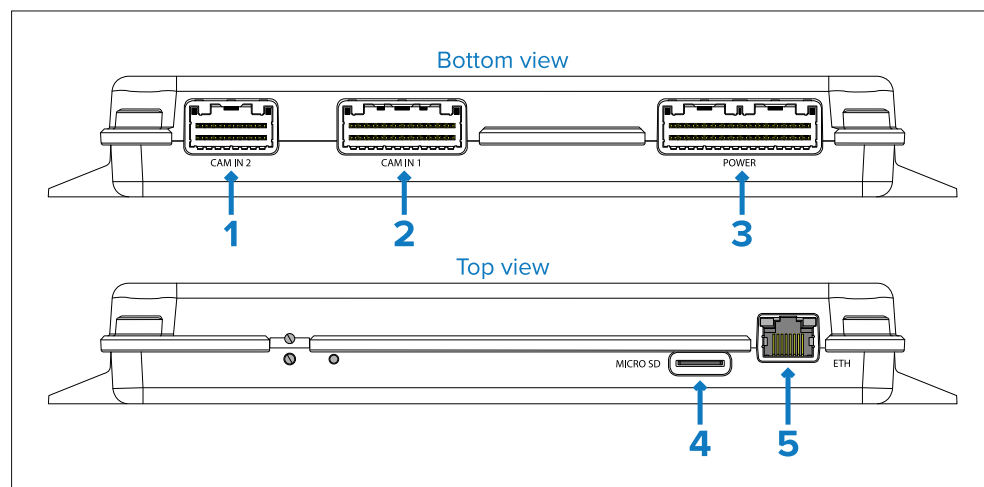
<b>Bow</b>	CH-0
<b>Blind-starboard</b>	CH-1
<b>Blind-port</b>	CH-2
<b>Starboard</b>	CH-3
<b>Port</b>	CH-4
<b>Stern</b>	CH-5

### Note:

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

## 8.3 CCU — connections overview

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



Connector	Suitable connections
1) <u>CAM IN 2 (Camera input 2)</u> Connects to:	CCU camera input cable 1 (used to connect SVM cameras 0-3 to the CCU); 200 mm (7.87 in) supplied.
<ul style="list-style-type: none"> <li>SVM cameras 0-3.</li> </ul>	
2) <u>CAM IN 1 (Camera input 1)</u> Connects to:	CCU camera input cable 2 (used to connect SVM cameras 4-5 to the CCU); 200 mm (7.87 in) supplied.
<ul style="list-style-type: none"> <li>SVM cameras 4-5.</li> </ul>	
3) <u>POWER</u> Connects to:	CCU power cable; 1 m (3.3 ft) supplied.
<ul style="list-style-type: none"> <li>12 / 24 V dc power supply.</li> </ul>	

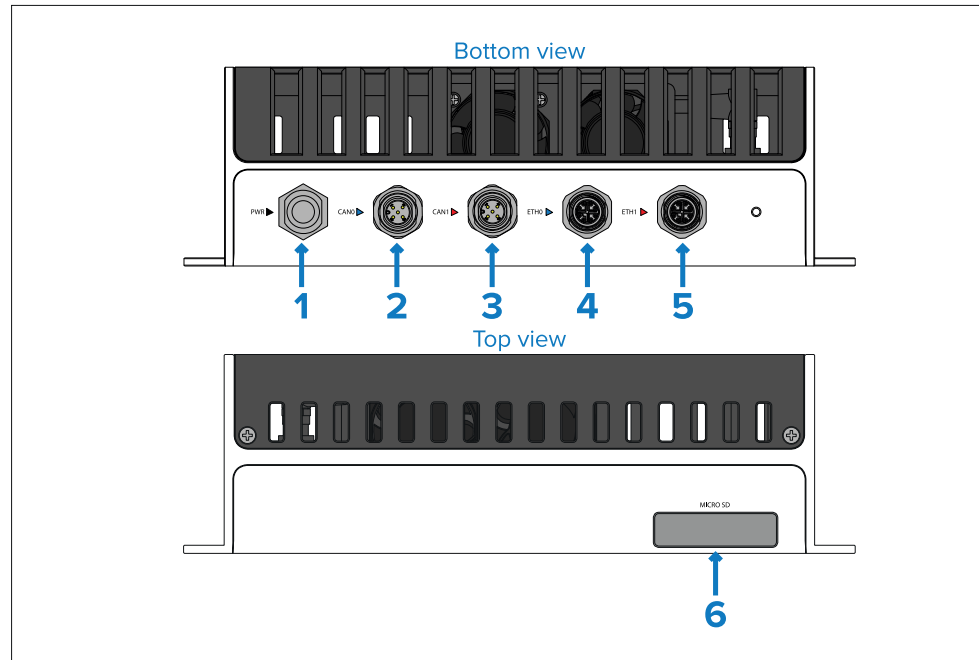
Connector	Suitable connections
4) <u>MicroSD (MicroSD card reader)</u> Connects to:	MicroSD card, available separately.
<ul style="list-style-type: none"> <li>MicroSD card (for software update purposes).</li> </ul>	
5) <u>ETH (Ethernet)</u> Connects to:	<ul style="list-style-type: none"> <li>CCU to ORU cable (used to connect the CCU to the ORU), 15 m (49.21 ft) supplied or 25 m (82.02 ft) available separately.</li> <li>CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.</li> </ul>
<ul style="list-style-type: none"> <li>(1) Object Recognition Unit (ORU).</li> <li>(2) RNS-8 Network switch.</li> </ul>	

**Note:**

- (1) This direct connection is required for *Basic systems* only. For more information, refer to: [p.45 — Basic system](#)
- (2) This direct connection is required for *Expanded systems* only. For more information, refer to: [p.47 — Expanded system](#)

## 8.4 ORU — connections overview

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



Connector	Suitable connections
4) <u>ETH0 (Ethernet 0)</u> Connects to:	<ul style="list-style-type: none"> <li>• CCU to ORU cable (used to connect the CCU to the ORU); 15 m (49.21 ft) supplied or 25 m (82.02 ft) available separately.</li> <li>• (1) Camera Conversion Unit (CCU)</li> <li>• (2) RNS-8 Network switch.</li> <li>• ORU to RayNet cable (used to connect the ORU to an RNS-8 network switch or a compatible multifunction display); 25 m (82.02 ft) supplied or 50 m (164.04 ft) available separately.</li> </ul>
5) <u>ETH1 (Ethernet 1)</u> Connects to:	<ul style="list-style-type: none"> <li>• ORU to RayNet cable (used to connect the ORU to an RNS-8 network switch or a compatible multifunction display); 25 m (82.02 ft) supplied or 50 m (164.04 ft), available separately.</li> <li>• Compatible multifunction display (MFD).</li> </ul>
6) <u>MicroSD (MicroSD card reader)</u> Connects to:	<ul style="list-style-type: none"> <li>• MicroSD card (for software updates).</li> <li>• MicroSD card, available separately.</li> </ul>

Connector	Suitable connections
1) <u>PWR (Power)</u> Connects to:	<ul style="list-style-type: none"> <li>• ORU power cable; 2 m (6.56 ft) (supplied).</li> <li>• 12 / 24 V dc power supply.</li> </ul>
2) <u>CAN0 (Control Area Network 0)</u> <b>This connection is not currently supported.</b>	<ul style="list-style-type: none"> <li>• Not applicable — this connection is not currently supported.</li> </ul>
3) <u>CAN1 (Control Area Network 1)</u> <b>This connection is not currently supported.</b>	<ul style="list-style-type: none"> <li>• Not applicable — this connection is not currently supported.</li> </ul>

<b>Note:</b>	
• (1) This direct connection is required for <i>Basic systems</i> only. For more information, refer to: <a href="#">p.45 — Basic system</a>	
• (2) This direct connection is required for <i>Expanded systems</i> only. For more information, refer to: <a href="#">p.47 — Expanded system</a>	

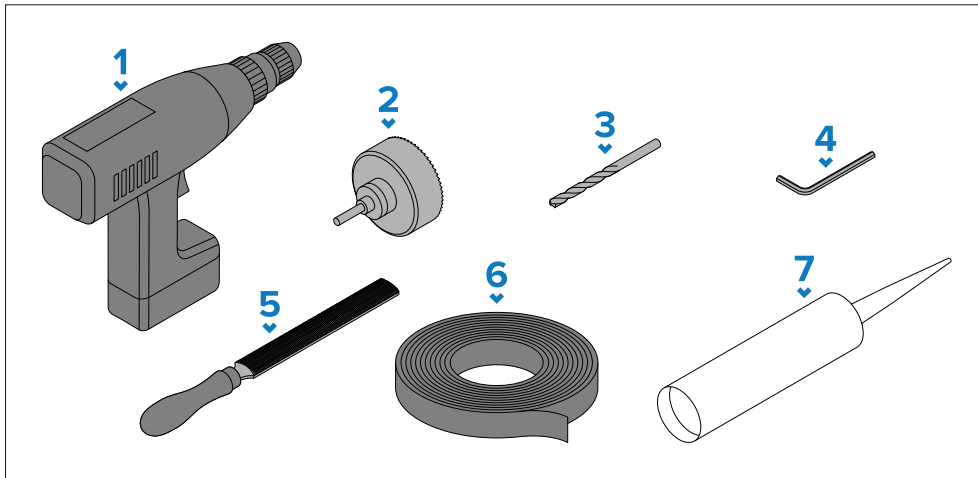
# CHAPTER 9: MOUNTING

## CHAPTER CONTENTS

- 9.1 Tools required — page 40
- 9.2 Fixing screw suitability — page 40
- 9.3 SVM camera — preparing the mounting surface — page 40
- 9.4 SVM camera — mounting — page 41
- 9.5 CCU — mounting — page 42
- 9.6 ORU — mounting — page 42

## 9.1 Tools required

The following tools are required for installation:



1. Power drill.
2. Hole cutter an appropriate size for the 60.00 mm (2.36 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.

## 9.2 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.

## 9.3 SVM camera — preparing the mounting surface

### Note:

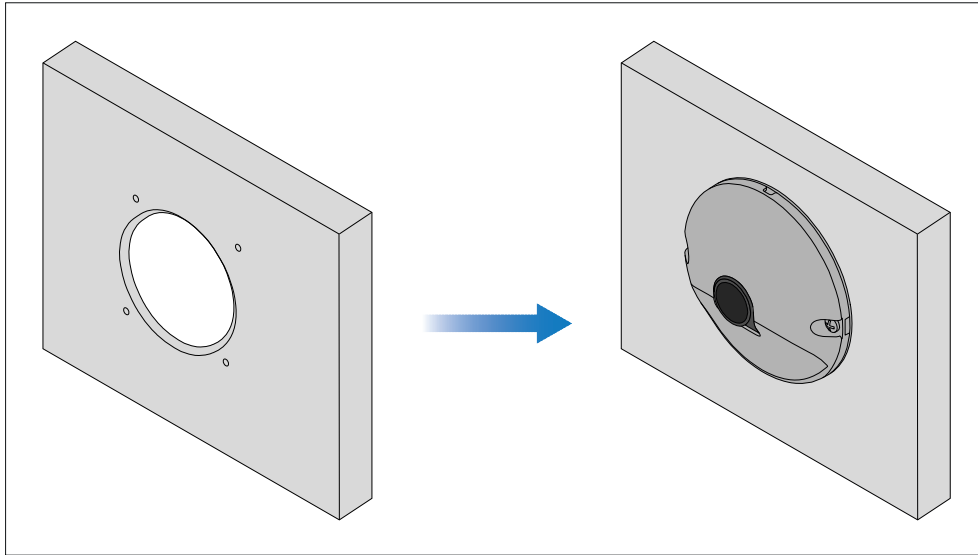
The following procedure is intended to prepare a mounting surface for an SVM camera. For mounting instructions related to the CCU or ORU units, refer to:

- [p.42 — Mounting the Camera Conversion Unit](#)
- [p.42 — 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.29 — Location requirements](#)
- You have identified cable connections and the route that the cables will take.

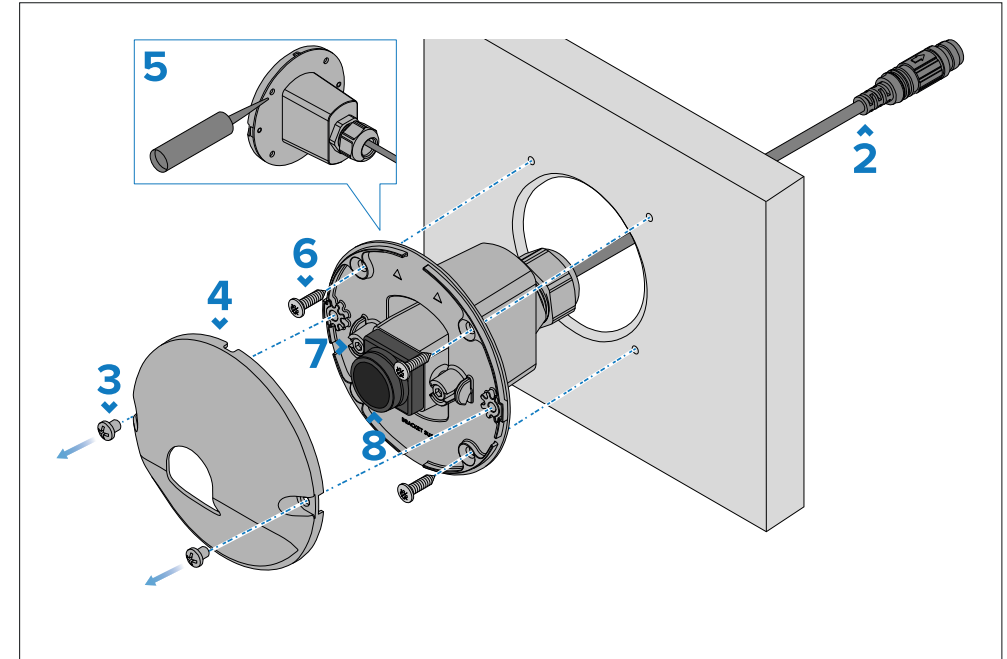


1. Mark the cutout line and drill hole locations identified on the supplied mounting template on the mounting surface.
2. Use a drill and an appropriate size drill bit to drill the holes required at the marked locations.
3. Use a drill and an appropriate size hole cutter to create the cutout. The cutout diameter is 60.00 mm (2.36 in).
4. Use a half round file and/or sandpaper to smooth-out rough edges or burs on the cutout hole.

## 9.4 SVM camera — mounting

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.
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. Using a hex wrench (Allen key), loosen the bolts on either side of the SVM camera lens.
8. Vertically adjust the camera lens to the recommended angle that has been specified in the supplied **placement position file**.
9. 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.

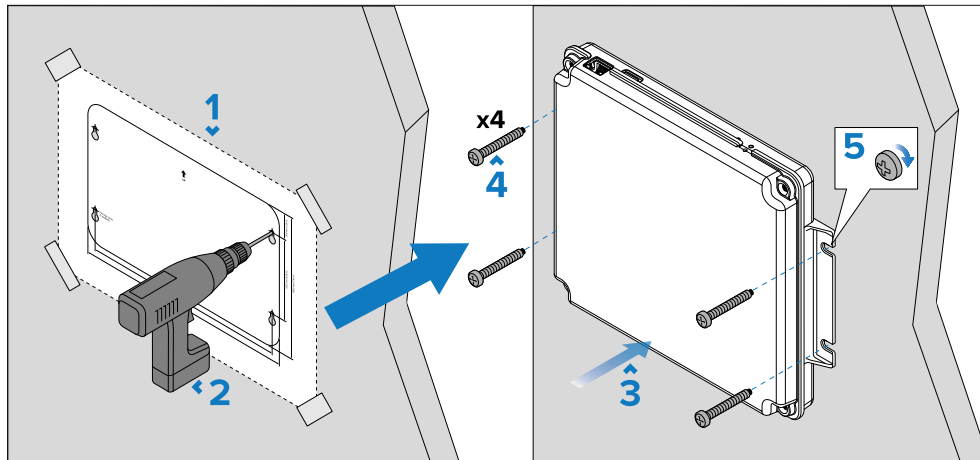
## 9.5 CCU — mounting

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.

### Important:

The CCU must NOT be installed on a metallic surface, and each of the fixings used to mount the unit must NOT come into contact with a metallic surface once secured.



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.

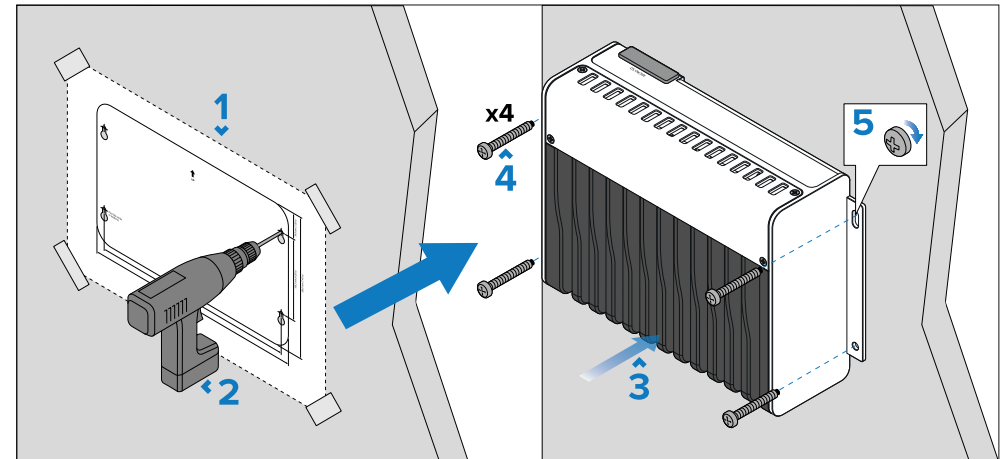
### Note:

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

## 9.6 ORU — mounting

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. 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 10: NETWORK CONNECTIONS

## CHAPTER CONTENTS

- 10.1 Maximum camera cable length — page 45
- 10.2 Basic system — page 45
- 10.3 Expanded system — page 47
- 10.4 Network cable extensions — page 47

## 10.1 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.

### System type: Basic

Cable length	Required additional components
0 to 15 m (49.21 ft)	None.  For more information, refer to the following section: <a href="#">p.45 — Basic system</a>

### System type: Basic

Cable length	Required additional components
15 m (49.21 ft) to 20 m (65.62 ft)	SVM camera to CCU extension cable (A80762); 20 m (65.62 ft); available separately.  For more information, refer to the following sections: <ul style="list-style-type: none"> <li><a href="#">p.45 — Basic system</a></li> <li><a href="#">p.80 — Spares and accessories</a></li> </ul>

### System type: Expanded

Cable length required	Required additional components
> 20 m (65.62 ft)	<b>The following components are required, <i>in addition to the Basic system components</i>:</b> <ul style="list-style-type: none"> <li>1x RNS-8 Network Switch (A80732); available separately.</li> <li>1x additional Camera Conversion Unit (A80760) (includes CCU camera input cable 1, CCU camera input cable 2, and power cable); available separately.</li> <li>2x CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.</li> </ul>

### Cable length required

### Required additional components

- 1x ORU to RayNet cable (used to connect the ORU to the RNS-8 network switch); 25 m (82.02 ft) or 50 m (164.04 ft) available separately.

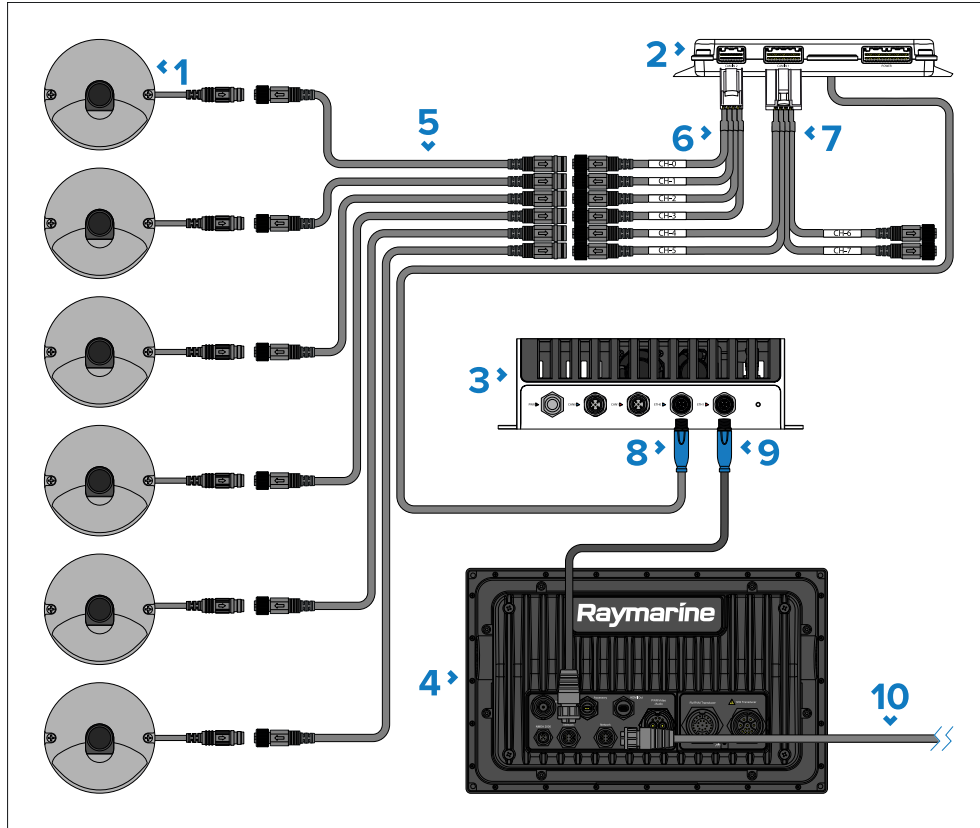
For more information, refer to the following sections:

- [p.47 — Expanded system](#)
- [p.80 — Spares and accessories](#)

## 10.2 Basic system

The following example shows a NeuBoat Dock *basic system*, including available connections and required devices. In a NeuBoat Dock *basic system*, the cable length between each of the SVM cameras and the CCU **must NOT** exceed 20 m (65.62 ft).

## Example: basic system



1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 500 mm (19.69 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 or 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 or 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 or 50 m (164.04 ft) available separately.
10. RayNet to RayNet cable (used to connect the NeuBoat Dock *basic system* to a wider Raymarine® network).

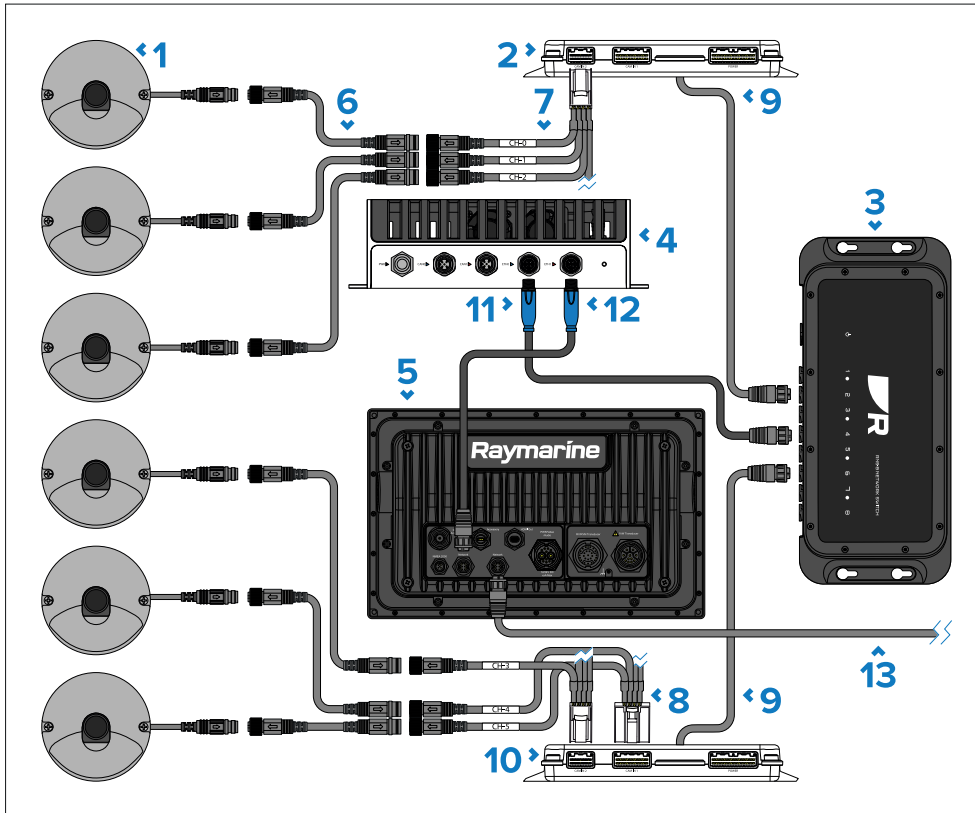
### Note:

- The NeuBoat Dock system must be running on a 1 Gigabit network.
- Power connections are not shown in this example. Refer to the relevant *Power connection* section.

## 10.3 Expanded system

The following example provides an overview of a NeuBoat Dock *expanded system*, including available connections and the types of connected devices. In a NeuBoat Dock *expanded system*, the cable length between each of the SVM cameras and the CCU **exceeds** 20 m (65.62 ft). Therefore, an additional CCU, a Raymarine® RNS-8 network switch, and additional cables are required.

### Example: expanded system



1. Surround View Monitor (SVM) camera (includes pre-fitted cable, 500 mm (19.69 in)).
2. Camera Conversion Unit (CCU).
3. 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 or 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. CCU to RayNet cable (used to connect the CCU to the RNS-8 network switch); 15 m (49.21 ft) or 25 m (82.02 ft) available separately.
10. Additional Camera Conversion Unit (CCU).
11. ORU to RayNet cable (used to connect the ORU to the RNS-8 network switch); 25 m (82.02 ft) or 50 m (164.04 ft) available separately.
12. ORU to RayNet cable (used to connect the ORU to a compatible multifunction display); 25 m (82.02 ft) supplied or 50 m (164.04 ft) available separately.
13. RayNet to RayNet cable (used to connect the NeuBoat Dock *expanded system* to a wider Raymarine® network).

#### Note:

- The NeuBoat Dock system must be running on a 1 Gigabit network.
- Power connections are not shown in this example. Refer to the relevant *Power connection* section.

## 10.4 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.80 – Spares and accessories](#)

# CHAPTER 11: POWER CONNECTIONS — SVM CAMERA

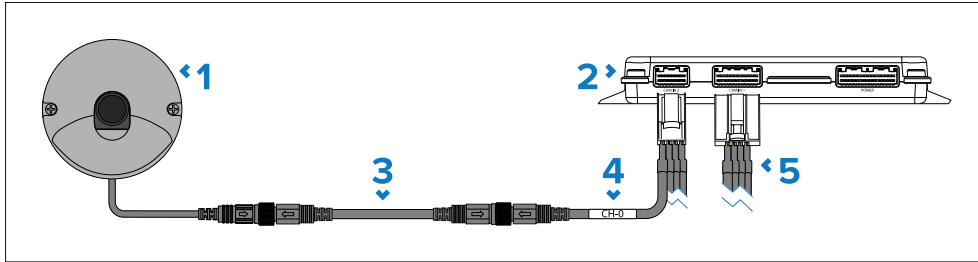
## CHAPTER CONTENTS

- 11.1 SVM camera — power connection — page 49

## 11.1 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 500 mm (19.69 in) cable, which can be connected to a CCU via the following cable connections:



1. SVM camera (includes pre-fitted cable, 500 mm (19.69 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: [p.36 — SVM camera — input channels](#)



### 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.

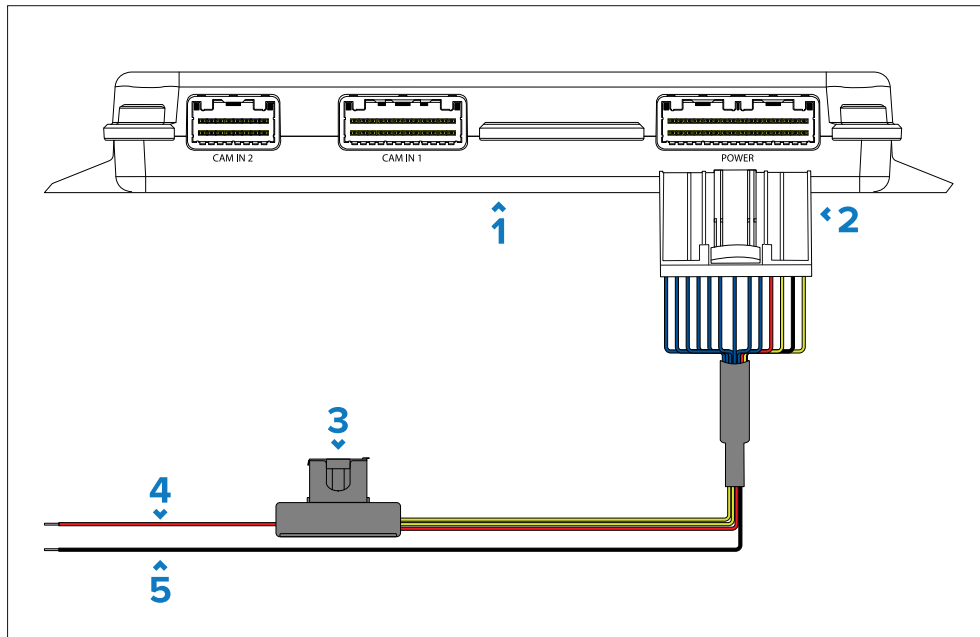
# **CHAPTER 12: POWER CONNECTIONS — CAMERA CONVERSION UNIT (CCU)**

## CHAPTER CONTENTS

- 12.1 CCU — power connection — page 51
- 12.2 CCU — power distribution — page 52
- 12.3 Power cable extension (12 / 24 V systems) — page 54

## 12.1 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, via the supplied power cable.



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

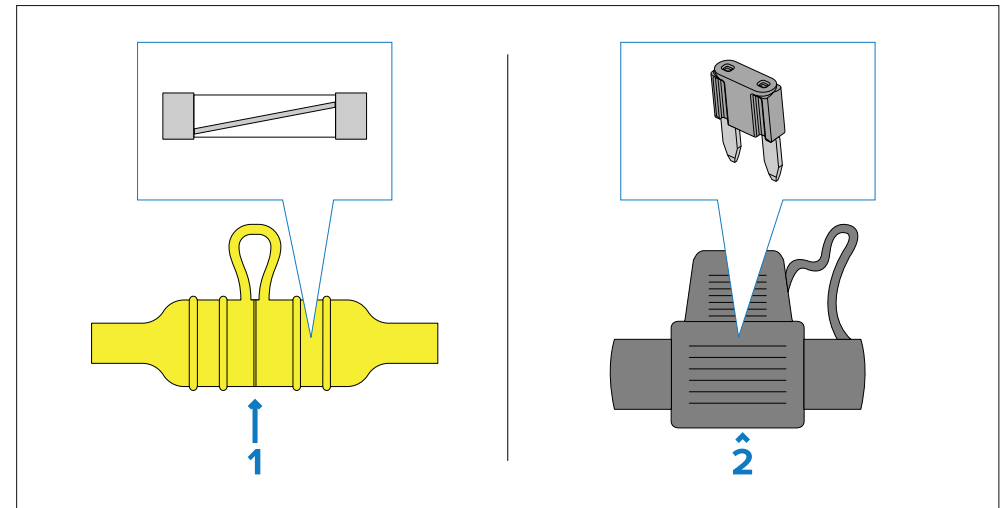
### Inline fuse requirement

If your product is NOT supplied with an inline fuse (whether separately or fitted to the power cable), you **MUST** fit a suitably-rated inline fuse to your product's red power wire, housed in a waterproof fuse holder.

The illustration below shows the two main types of inline fuse with waterproof holder, for use in marine electronics installations. Fuses in a variety of ratings are widely available at chandleries and marine electrical retailers.

Select one of the following fuse types to protect your Raymarine product:

Power connections — Camera Conversion Unit (CCU)



1. Waterproof fuse holder containing a “glass”-type inline fuse.
2. Waterproof fuse holder containing a “blade”-type inline fuse.

### Fuse ratings:

- *Voltage rating* — must be equal to or greater than the voltage of your vessel's power supply.
- *Current rating* — refer to the *Inline fuse and thermal breaker rating* section in this document.

### 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. If the supplied inline fuse needs to be replaced, or, when installing a thermal breaker, the following inline fuse and thermal breaker ratings apply:

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 connected.



### 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.



### Warning: Grounding not required

This product does NOT require separate grounding.

## 12.2 CCU — power distribution

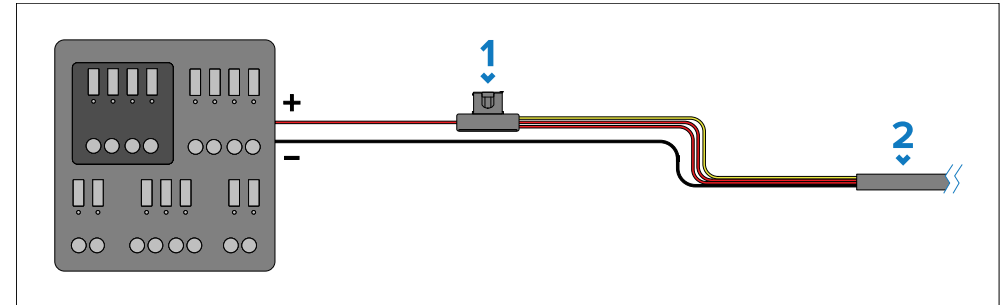
Recommendations and best practice.

- 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:

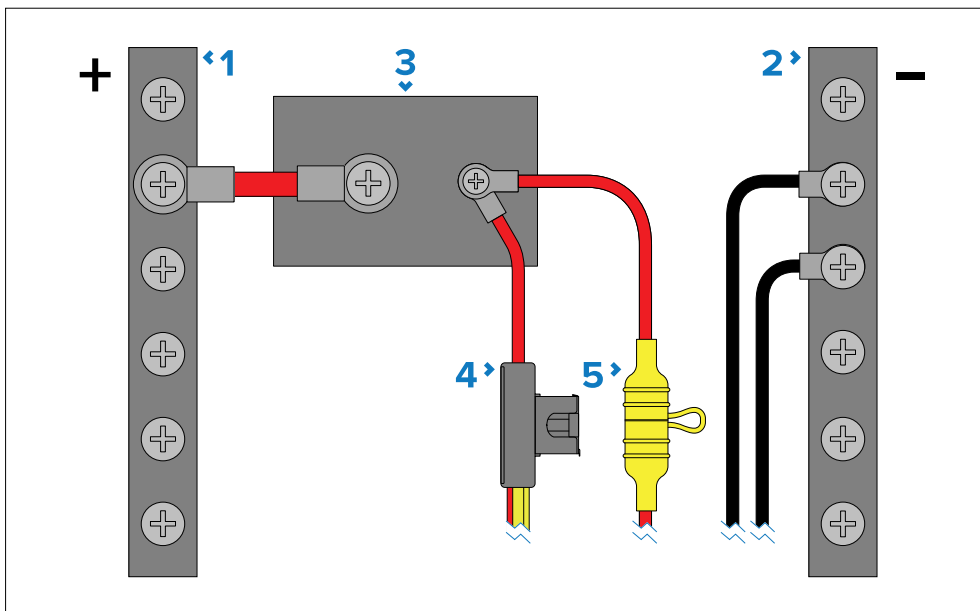
- When planning and wiring, take into consideration other products in your system, some of which (e.g. sonar modules) may place large power demand peaks on the vessel's electrical system, which may impact the voltage available to other products during the peaks.
- The information provided below is for 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: <a href="#">p.51 — Inline fuse and thermal breaker ratings</a> .
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 mm<sup>2</sup>) cable.
- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than one item of equipment shares a breaker, use individual inline fuses for each power circuit to provide the necessary protection.



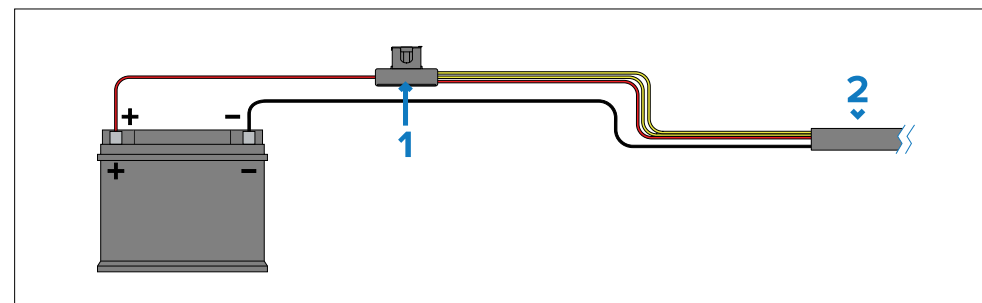
Item	Description
1	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker
4	The CCU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: <a href="#">p.51 – Inline fuse and thermal breaker ratings</a> .
5	Additional equipment's waterproof 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 red and black wires need to be connected.
- If the power cable is NOT supplied with a fitted inline fuse, you MUST fit a suitably rated fuse or breaker between the red wire and the battery's positive terminal.
- Refer to the inline fuse ratings provided in the product's documentation.
- If you need to extend the length of the power cable supplied with your product, ensure you observe the dedicated *Power cable extensions* advice provided in the product's documentation.



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: <a href="#">p.51 – Inline fuse and thermal breaker ratings</a> .
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
- ISO 13297: Small craft — Electrical systems — Alternating and direct current installations

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

## 12.3 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 (mm <sup>2</sup> ) for 12 V supply	Wire gauge in AWG (mm <sup>2</sup> ) for 24 V supply
<8 (<25)	16 (1.31 mm <sup>2</sup> )	18 (0.82 mm <sup>2</sup> )
16 (50)	14 (2.08 mm <sup>2</sup> )	18 (0.82 mm <sup>2</sup> )
24 (75)	14 (2.08 mm <sup>2</sup> )	16 (1.31 mm <sup>2</sup> )
>32 (>100)	14 (2.08 mm <sup>2</sup> )	16 (1.31 mm <sup>2</sup> )

### 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).

### 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.

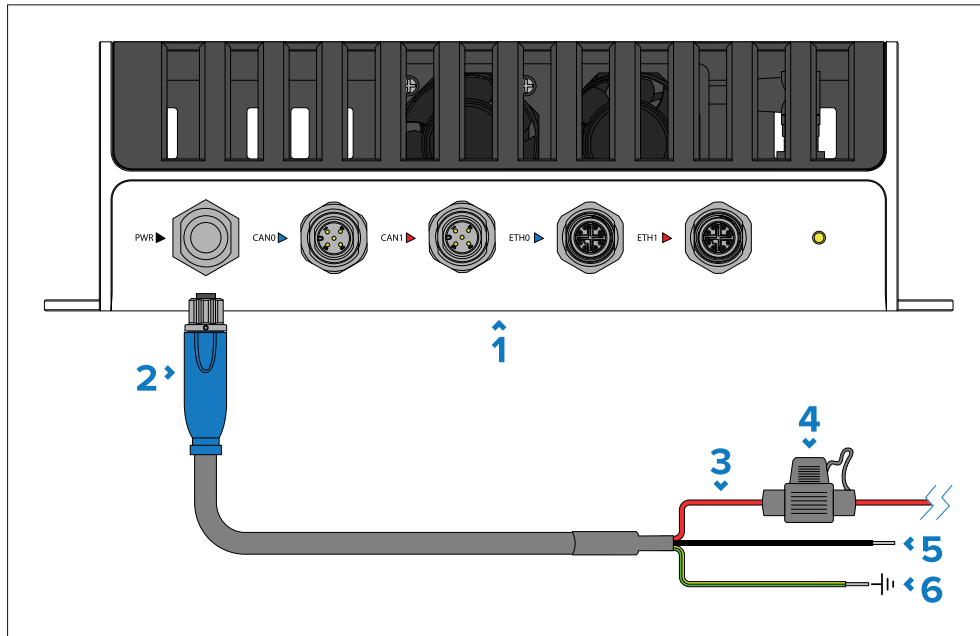
# CHAPTER 13: POWER CONNECTIONS — OBJECT RECOGNITION UNIT (ORU)

## CHAPTER CONTENTS

- 13.1 ORU — power connection — page 56
- 13.2 Product grounding — page 57
- 13.3 ORU — power distribution — page 57
- 13.4 Power cable extension (12 / 24 V systems) — page 59
- 13.5 Power cable ground wire connection — page 60

## 13.1 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, via the supplied power cable.



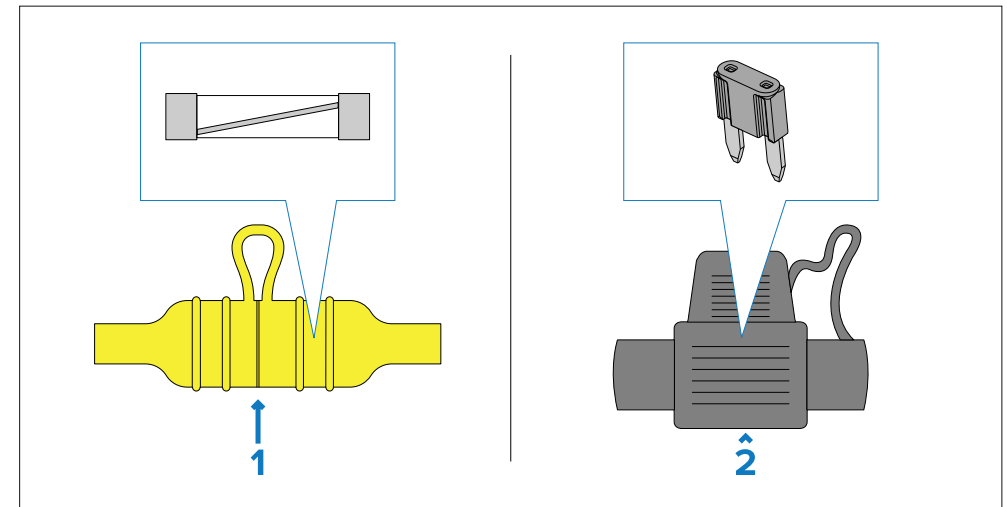
1. Object Recognition Unit (ORU).
2. Power cable, 2 m (6.56 ft), supplied.
3. Red wire (positive) — connects to the power supply's positive terminal.
4. Waterproof fuse holder containing a suitably-rated inline fuse, which must be fitted to the red positive wire — refer to the fuse ratings below.
5. 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 requirement

If your product is NOT supplied with an inline fuse (whether separately or fitted to the power cable), you **MUST** fit a suitably-rated inline fuse to your product's red power wire, housed in a waterproof fuse holder.

The illustration below shows the two main types of inline fuse with waterproof holder, for use in marine electronics installations. Fuses in a variety of ratings are widely available at chandleries and marine electrical retailers.

Select one of the following fuse types to protect your Raymarine product:



1. Waterproof fuse holder containing a “glass”-type inline fuse.
2. Waterproof fuse holder containing a “blade”-type inline fuse.

### Fuse ratings:

- *Voltage rating* — must be equal to or greater than the voltage of your vessel's power supply.
- *Current rating* — refer to the *Inline fuse and thermal breaker rating* section in this document.

## 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. If the supplied inline fuse needs to be replaced, or, when installing a thermal breaker, the following inline fuse and thermal breaker ratings apply:

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 connected.



### 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.

## 13.2 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.

## 13.3 ORU — power distribution

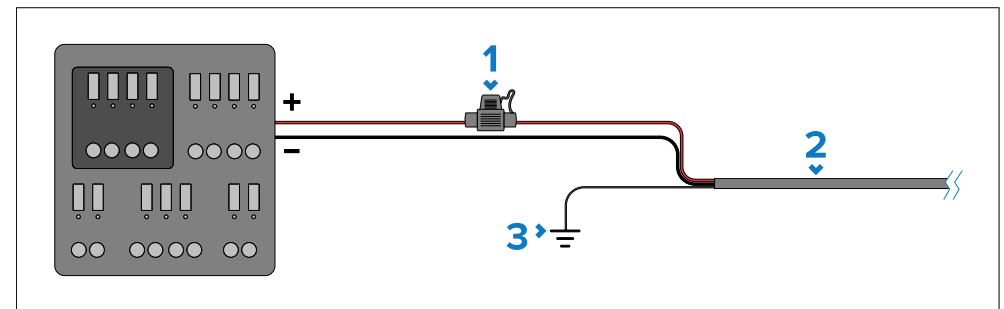
- The product is supplied with a power cable, either as a separate item or a captive cable permanently attached to the product. Only use the power cable supplied with the product. Do NOT use a power cable designed for, or supplied with, a different product.

- 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: <a href="#">p.51 — Inline fuse and thermal breaker ratings</a> .
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 mm<sup>2</sup>) cable.
- Ideally, all equipment should be wired to individual suitably-rated thermal breakers or fuses, with appropriate circuit protection. Where this is not possible and more than 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.60 — Power cable ground wire connection](#)

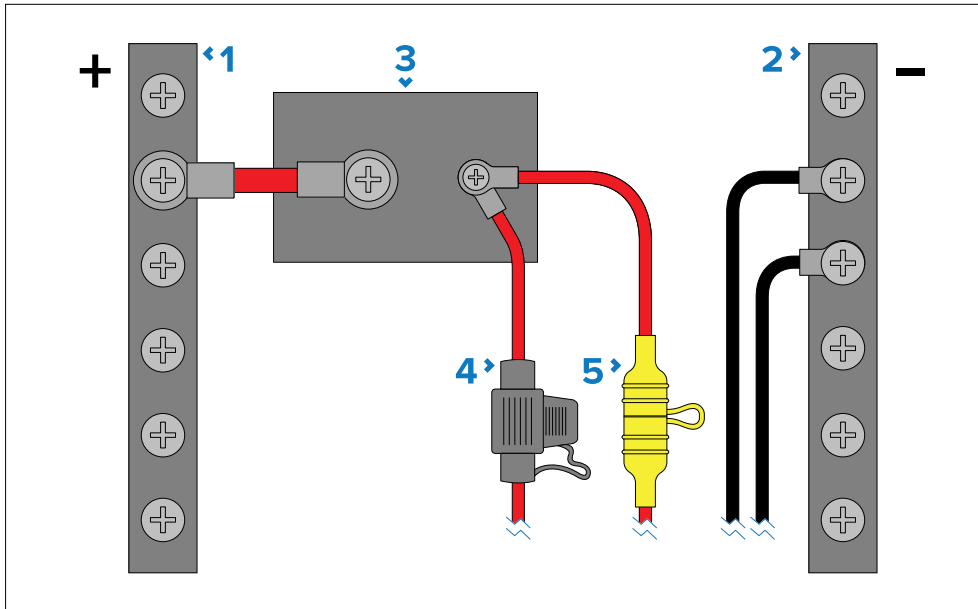
Item	Description
4	The ORU power cable includes a waterproof fuse holder, containing a suitably-rated inline fuse. If the fuse needs replacing, refer to: <a href="#">p.51 — Inline fuse and thermal breaker ratings</a> .
5	Additional equipment's waterproof fuse holder containing a suitably-rated inline fuse.

### Important:

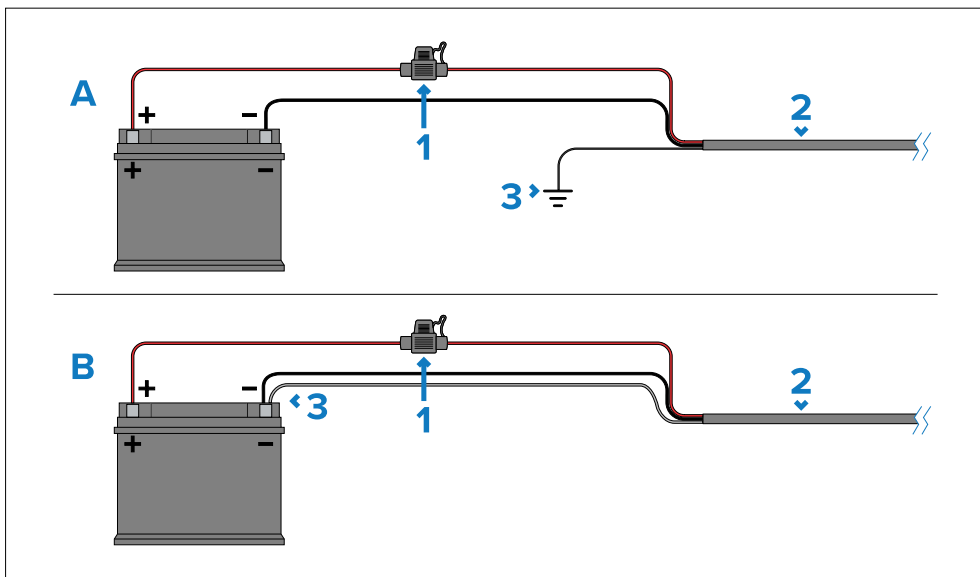
Observe the recommended fuse / breaker ratings provided in the product's documentation, however be aware that the suitable fuse / breaker rating is dependent on the number of devices being connected.

### 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.60 — 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	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker



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: <a href="#">p.51 – Inline fuse and thermal breaker ratings</a> .
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.60 – Power cable ground wire connection](#)

Power connections — Object Recognition Unit (ORU)

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

## 13.4 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 (mm <sup>2</sup> ) for 12 V supply	Wire gauge in AWG (mm <sup>2</sup> ) for 24 V supply
<8 (<25)	16 (1.31 mm <sup>2</sup> )	18 (0.82 mm <sup>2</sup> )
16 (50)	14 (2.08 mm <sup>2</sup> )	18 (0.82 mm <sup>2</sup> )
24 (75)	14 (2.08 mm <sup>2</sup> )	16 (1.31 mm <sup>2</sup> )
>32 (>100)	14 (2.08 mm <sup>2</sup> )	16 (1.31 mm <sup>2</sup> )

### 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).

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 mm<sup>2</sup> (10 AWG) or greater.
- for runs of >1 m (3 ft), use 8 mm<sup>2</sup> (8 AWG) or greater.

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

## 13.5 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.

# CHAPTER 14: CALIBRATION AND OPERATION

## CHAPTER CONTENTS

- [14.1 NeuBoat Dock system calibration — page 62](#)
- [14.2 NeuBoat Dock operation instructions — page 62](#)

## 14.1 NeuBoat Dock system calibration

The NeuBoat Dock system calibration procedure **must** be performed with the guidance of Raymarine® Product Support.

Raymarine® Product Support can provide this guidance remotely if required, via a screen-sharing video call, or similar.

For contact details, refer to the following section:

[p.74 – Raymarine product support and servicing](#)

## 14.2 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, v4.6.103 or later.

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

# CHAPTER 15: TROUBLESHOOTING

## CHAPTER CONTENTS

- 15.1 Troubleshooting — page 64
- 15.2 LED diagnostic guidance — page 64
- 15.3 LED diagnostics — CCU — page 65
- 15.4 LED diagnostics — ORU — page 66
- 15.5 Camera troubleshooting — page 66
- 15.6 Power up troubleshooting — page 67
- 15.7 System data troubleshooting — page 68
- 15.8 Miscellaneous troubleshooting — page 69
- 15.9 Alarms list — page 70

## 15.1 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.

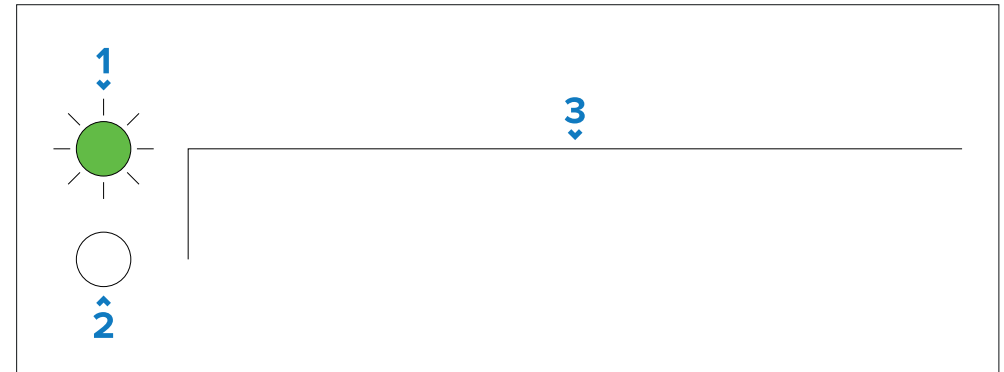
If after referring to this section you are still having problems with your product, please refer to the *Technical support* section of this manual for useful links and Raymarine technical support contact details.

## 15.2 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.

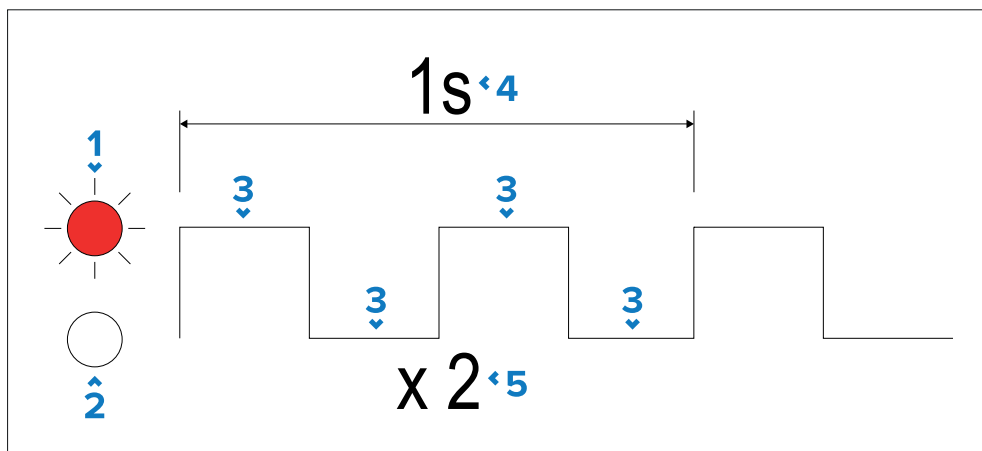
The following section provides two basic examples of how to interpret the LED diagnostic patterns included in this publication.

### 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**.

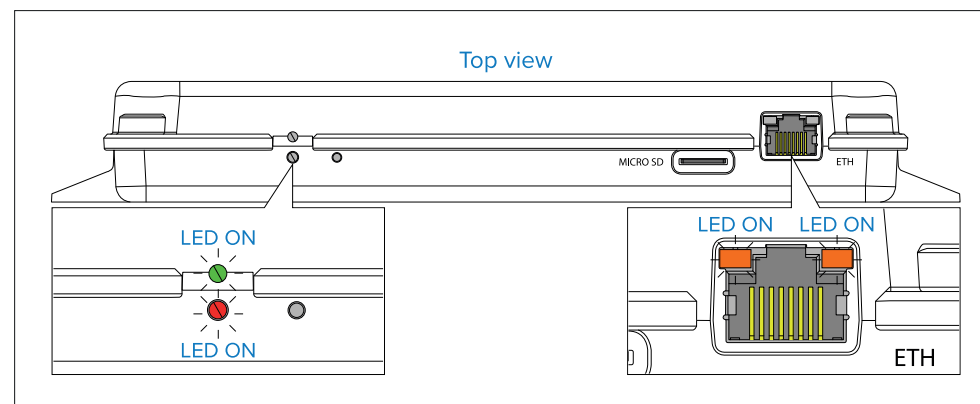
### Example flashing LED diagnostic pattern:



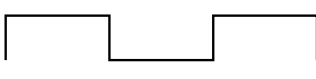





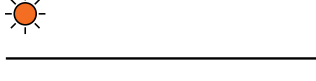





1. **LED ON** — Indicates the color assigned to the unit's diagnostic LED, and confirms that the diagnostic LED is active (switched **on**).
2. **LED OFF** — Indicates that the unit's diagnostic LED is inactive (switched **off**).
3. **Diagnostic pattern** — Indicates a diagnostic pattern based on the 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.

## 15.3 LED diagnostics — CCU

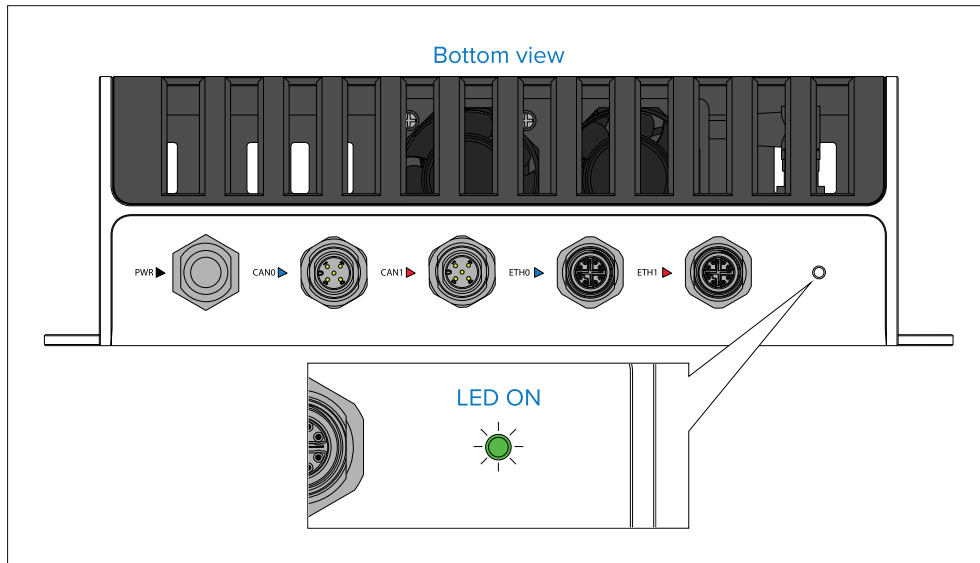
The Camera Conversion Unit (CCU) has 4 diagnostic LEDs located at the top of the unit. These LEDs are used to identify the unit's status.



LED indication	LED Status and applicable solutions
  	<u>(1x Red flashing LED) Powered up / Ok</u> Normal operation — no user action is required.
  	<u>(1x Green flashing LED) Updating</u> Normal operation — no user action is required.
  	<u>(2x Amber solid LEDs) 1000 Mb/s Ethernet Active (transferring)</u> <ul style="list-style-type: none"> <li>• Normal operation — no user action is required.</li> </ul>
  	<u>(No color) No power</u> Refer to the advice found within the following section: <a href="#">p.67 — Power up troubleshooting</a>

## 15.4 LED diagnostics — ORU

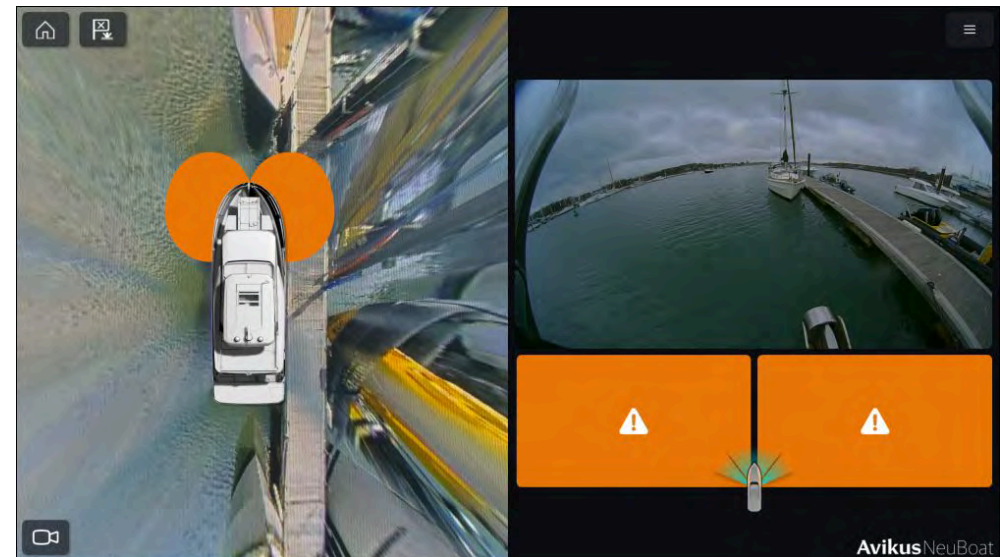
The Object Recognition Unit (ORU) has a single diagnostic LED located at the bottom of the unit. This LED is used to identify the unit's power status.



LED indication	LED Status and applicable solutions
	<p><b>(Green) Rebooting</b></p> <p>Normal operation — no user action is required.</p>
	<p><b>(No color) No power</b></p> <p>Refer to the advice found within the following section: <a href="#">p.67 — Power up troubleshooting</a></p>

## 15.5 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.



LED indication	LED Status and applicable solutions
	<p><b>(Green) Powered up / Ok</b></p> <p>Normal operation — no user action is required.</p>
	<p><b>(Green) Updating</b></p> <p><b>(Green) Normal operation</b> — no user action is required.</p>
	<p><b>(Red) Update failed</b></p> <p><b>(Red) Update failed</b> — Attempt to power cycle the unit and retry the update. If the issue persists, consider contacting your local dealer or Raymarine® Product Support. For Raymarine® Product Support contact details, refer to the following section: <a href="#">p.74 — Raymarine product support and servicing</a></p>

## Camera fault detected in NeuBoat Dock app

Possible causes	Possible solutions
<b>Camera lost connection.</b>	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
<b>Camera internal fault.</b>	1. Ensure the affected camera(s) have been installed and connected in accordance with Raymarine's recommendations in the <b>NeuBoat Dock Installation instructions (87480)</b> 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
<b>Camera connected to the wrong input channel.</b>	1. For information on which input channel your cameras must be connected to, refer to the ' <i>SVM camera input channels</i> ' section within the <b>NeuBoat Dock Installation Instructions (87480)</b> document.

## 15.6 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
<b>Blown fuse / tripped breaker</b>	<ol style="list-style-type: none"><li>1. Check the fuse, located inline with the power cable. Ensure that it has the correct rating (refer to the <i>Inline fuse and thermal breaker ratings</i> section), as an under-rated fuse can affect the power supplied to the product. If the fuse has blown, replace with a new fuse.</li><li>2. Check the condition of relevant / additional fuses and breakers and connections; replace if necessary.</li><li>3. If the fuse keeps blowing check for cable damage, broken connector pins or incorrect wiring.</li></ol>
<b>Poor / damaged / insecure power supply cable / connections</b>	<ol style="list-style-type: none"><li>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.</li><li>2. Check the power supply cable and connectors for signs of damage or corrosion; replace if necessary.</li><li>3. Check that the power cable connector is fully inserted into the unit and locked in position.</li><li>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.</li><li>5. With the product under load, using a multi-meter, check for high voltage drop across all connectors / fuses etc, and replace if necessary.</li></ol>

Possible causes	Possible solutions
<b>Incorrect power connection</b>	1. The power supply may be wired incorrectly; ensure that the installation instructions have been correctly followed.
<b>Power source insufficient</b>	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
<b>Power supply and connection</b>	1. See possible solutions from the table above, entitled 'Product does not turn on or keeps turning off'.
<b>Software corruption</b>	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.

## 15.7 System data troubleshooting

### Unit system data is unavailable at all multifunction displays

Possible causes	Possible solutions
<b>Data is not being received at the multifunction display.</b>	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
<b>Data source is not operating.</b>	<ol style="list-style-type: none"> <li>1. Check the source of the missing data (e.g. SVM camera) for signs of damage or corrosion, and replace if necessary.</li> <li>2. If possible, check that the data source is correctly powered and operational.</li> <li>3. Refer to the instructions provided with the equipment to ensure it has been correctly installed.</li> </ol>
<b>Software mismatch between equipment may prevent communication.</b>	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
<b>Connection problem.</b>	1. Check the product's attached cable(s) and connections for signs of damage or corrosion, and replace if necessary.
<b>Software corruption.</b>	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.
<b>Software mismatch between equipment may prevent communication.</b>	1. Ensure that all products have the latest software installed.

### Incorrect data reported

Possible causes	Possible solutions
<b>Camera calibration error.</b>	<ol style="list-style-type: none"> <li>1. Switch off power supply to system and switch back on again.</li> <li>2. Re-calibrate or re-configure data source, following the instructions provided with the relevant devices.</li> </ol>

## 15.8 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
<b>Intermittent problem with power to a unit.</b>	<ol style="list-style-type: none"> <li>1. Check relevant fuses and breakers.</li> <li>2. Check that the power supply cable is sound and that all connections are tight and free from corrosion.</li> <li>3. Check that the power source is of the correct voltage and sufficient current.</li> </ol>
<b>Software mismatch between equipment may prevent communication.</b>	<ol style="list-style-type: none"> <li>1. Ensure that all products have the latest software installed.</li> </ol>
<b>Corrupt data / other unknown issue.</b>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Check the data source for correct operation.</li> </ol>

**System not detected:**

Possible causes	Possible solutions
<b>Intermittent problem with power to a unit.</b>	<ol style="list-style-type: none"> <li>1. Check relevant fuses and breakers.</li> <li>2. Check that the power supply cable is sound and that all connections are tight and free from corrosion.</li> <li>3. Check that the power source is of the correct voltage and sufficient current.</li> </ol>
<b>Data is not being received at the multifunction display.</b>	<ol style="list-style-type: none"> <li>1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.</li> </ol>
<b>Software mismatch between equipment may prevent communication.</b>	<ol style="list-style-type: none"> <li>1. Ensure all products have the latest software installed.</li> </ol>
<b>Corrupt data / other unknown issue.</b>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Check the data source for correct operation.</li> </ol>

**Communication error:**

Possible causes	Possible solutions
<b>Data is not being received at the multifunction display.</b>	1. Check the relevant product, network cabling and connections for signs of damage or corrosion, and replace if necessary.
<b>Software mismatch between equipment may prevent communication.</b>	1. Ensure that all products have the latest software installed.
<b>Corrupt data / other unknown issue.</b>	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.

## 15.9 Alarms list

ID	Alert	Scope <sup>(1)</sup>	Severity <sup>(2)</sup>
AS001	CCUs — Not detected	Global	Warning
AS002	CCU — Not detected	Global	Warning
AS003	Camera — Lost connection	Global	Warning
AS004	Camera — Internal fault	Global	Warning
AS005	ORU — Internal fault	Global	Warning
AS006	ORU — Internal fault	Global	Warning

### Note:

- **(1)** Determines if the Alarm can be triggered only when using the NeuBoat Dock App (**App**), or anywhere on the MFD system (**Global**)
- **(2)** The severity of the Alarm in the NeuBoat Dock system:
  - **Warning:** Requires your attention.

## Acknowledging alarms

Follow the steps below to acknowledge an active alarm.

With an alarms notification displayed onscreen:

1. Select *[OK]*.  
The notification is dismissed and the audible tone is stopped.

An acknowledged alarm remains active until the conditions that triggered the alarm are no longer present.

### Note:

If an alarm notification includes an *[Edit]* button, selecting it will display the relevant setting in the Alarms menu so that, if required, you can change the alarm threshold.

# CHAPTER 16: MAINTENANCE

## CHAPTER CONTENTS

- 16.1 Routine equipment checks — page 72
- 16.2 Cleaning the camera — page 72

## 16.1 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.

## 16.2 Cleaning the camera

The camera housing and lens require regular cleaning. You should clean the lens when system performance appears to deviate from its usual level, or when excessive contaminant buildup is seen on the lens. You should also ensure that the camera's protective cover is also unobstructed and operating correctly.

When cleaning this product:

- Do NOT wipe the lens window with a dry cloth, or with abrasive materials such as paper or scrub brushes, as this could scratch the coating.
- Do NOT use acid or ammonia based products.
- Do NOT pressure wash.

Particular care should be taken when cleaning the lens window, as this has a protective anti-reflective coating which may be damaged by improper cleaning.

1. Switch off the power to the unit.
2. Clean the camera body with a clean, soft cotton cloth. You can moisten the cloth and use a mild detergent if required.
3. Clean the camera lens.
  - Rinse the lens with fresh water to remove all dirt particles and salt deposits, and allow to dry naturally.
  - If any spots or smears remain, very gently wipe the lens window with a clean microfibre cloth or soft cotton cloth.
  - If necessary, use isopropyl alcohol (IPA) or a mild detergent to remove any remaining spots, marks, or salt deposits.

# CHAPTER 17: TECHNICAL SUPPORT

## CHAPTER CONTENTS

- 17.1 Raymarine technical support and servicing — page 74
- 17.2 Diagnostic product information — page 75
- 17.3 Learning resources — page 75

## 17.1 Raymarine technical support and servicing

Raymarine provides a comprehensive technical 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://bit.ly/rym-warranty>

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

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

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

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

### Web support

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

- **Manuals and Documents** — <https://bit.ly/rym-docs>
- **Technical support forum** — <https://bit.ly/rym-FAQ>
- **Software updates** — <https://bit.ly/rym-software>

### Worldwide support

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

- Help desk: <https://bit.ly/rym-FAQ>
- Tel: +44 (0)1329 246 777

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

- Help desk: <https://bit.ly/rym-FAQ>
- Tel: +1 (603) 324 7900 (Toll-free: +800 539 5539)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- E-Mail: [support.no@raymarine.com](mailto:support.no@raymarine.com)

- Tel: +47 692 64 600

**Denmark (Raymarine subsidiary):**

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

**Russia (Authorized Raymarine distributor):**

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

## 17.2 Diagnostic product information

Diagnostic product information can be viewed and exported from a Raymarine LightHouse multifunction display, for supported products networked using RayNet (Ethernet), RJ45, RJ45 (SeaTalk HS) or SeaTalk NG / 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.73 – 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.

## 17.3 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*

[Technical support](#)

- <https://bit.ly/rym-tube>

### 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:

- <https://bit.ly/rym-training>

### 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://bit.ly/rym-FAQ>

# CHAPTER 18: TECHNICAL SPECIFICATION

## CHAPTER CONTENTS

- 18.1 Technical specification — SVM camera — page 77
- 18.2 Technical Specification — CCU — page 78
- 18.3 Technical Specification — ORU — page 79

## 18.1 Technical specification — SVM camera

### Physical specification

Specification	
<b>Width:</b>	90 mm (3.54 in).
<b>Height:</b>	89.79 mm (3.54 in).
<b>Depth:</b>	97.81 mm (3.85 in).

### Power specification

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

### Environmental specification

Specification	
<b>Operating temperature:</b>	-15° C (+ 5° F) to +55° C (131° F)
<b>Storage temperature:</b>	-30 °C (-22° F) to +70 °C (158 °F)
<b>Relative humidity:</b>	up to 90% @ 40° C (185° F)
<b>Waterproof rating:</b>	IPx7

### Camera specification

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

### Video specification

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

### Conformance specification

Specification	
<b>Europe, Australia &amp; New Zealand:</b>	EN 60945:2002
<b>Canada:</b>	ICES-003
<b>USA:</b>	CFR47 Part 15
<b>Product markings:</b>	<ul style="list-style-type: none"><li>• UKCA</li><li>• CE</li><li>• RCM</li><li>• FCC</li><li>• ICES</li><li>• WEEE Directive</li></ul>

## 18.2 Technical Specification — CCU

### Physical specification

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

### Power specification

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

### Network specification

Specification	
<b>Network connection ports:</b>	<ul style="list-style-type: none"><li>• 1x RJ45 (Ethernet) connection port</li><li>• 1x Camera input port (1)</li><li>• 1x Camera input port (2)</li></ul>

### Environmental specification

Specification	
<b>Operating temperature:</b>	-15° C (+ 5° F) to +55° C (131° F)
<b>Storage temperature:</b>	-30 °C (-22° F) to +70 °C (158 °F)
<b>Relative humidity:</b>	up to 90% @ 40° C (104° F)

### Video specification

Specification	
<b>Compression:</b>	H.265
<b>Resolutions:</b>	1280 x 720 (720p)
<b>Frame Rate:</b>	Up to 30 fps
<b>Bit Rate:</b>	Up to 12 MB
<b>Bit Rate Control:</b>	CBR

### Conformance specification

Specification	
<b>Europe, Australia &amp; New Zealand:</b>	EN 60945:2002
<b>Canada:</b>	ICES-003
<b>USA:</b>	CFR47 Part 15
<b>Product markings:</b>	<ul style="list-style-type: none"><li>• UKCA</li><li>• CE</li><li>• RCM</li><li>• FCC</li><li>• ICES</li><li>• WEEE Directive</li></ul>

## 18.3 Technical Specification — ORU

### Physical specification

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

### Power specification

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

### Network specification

Specification	
<b>Network connection ports:</b>	2x M12 (Ethernet) connection ports.

### Environmental specification

Specification	
<b>Operating temperature:</b>	-15° C (+ 5° F) to +55° C (131° F)
<b>Storage temperature:</b>	-30° C (-22° F) to +70° C (158 °F)
<b>Relative humidity:</b>	up to 93% @ 40° C (104° F)
<b>Waterproof rating:</b>	IPx5

### Conformance specification

Specification	
<b>Europe, Australia &amp; New Zealand:</b>	EN 60945:2002
<b>Canada:</b>	ICES-003
<b>USA:</b>	CFR47 Part 15
<b>Product markings:</b>	<ul style="list-style-type: none"><li>• UKCA</li><li>• CE</li><li>• RCM</li><li>• ICES</li><li>• WEEE Directive</li></ul>

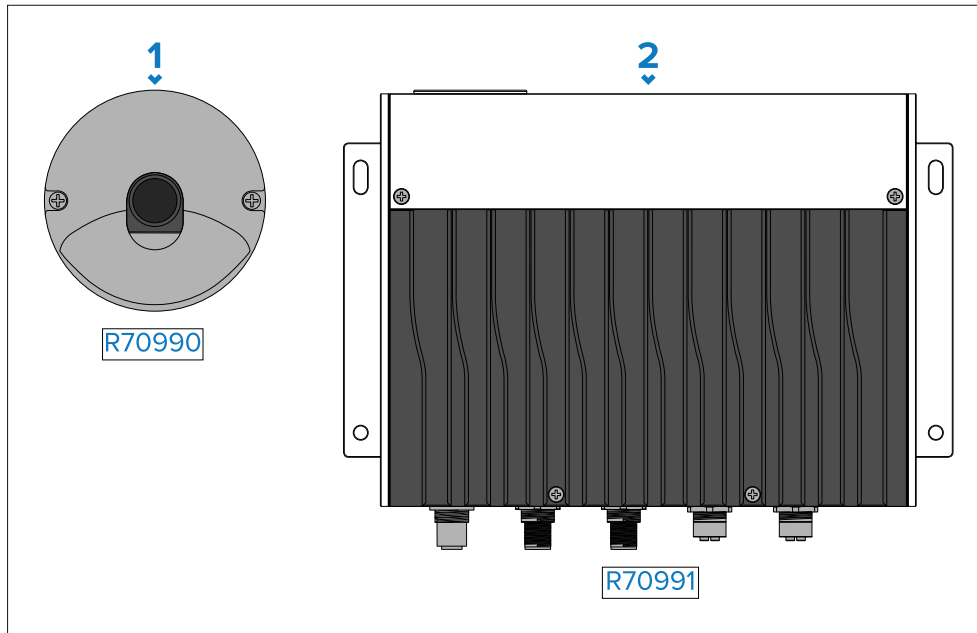
# CHAPTER 19: SPARES AND ACCESSORIES

## CHAPTER CONTENTS

- 19.1 Spares — page 81
- 19.2 Accessories — page 81
- 19.3 RayNet to RayNet cables and connectors — page 82
- 19.4 RayNet to RJ45, and RJ45 (SeaTalk HS) adapter cables — page 83

## 19.1 Spares

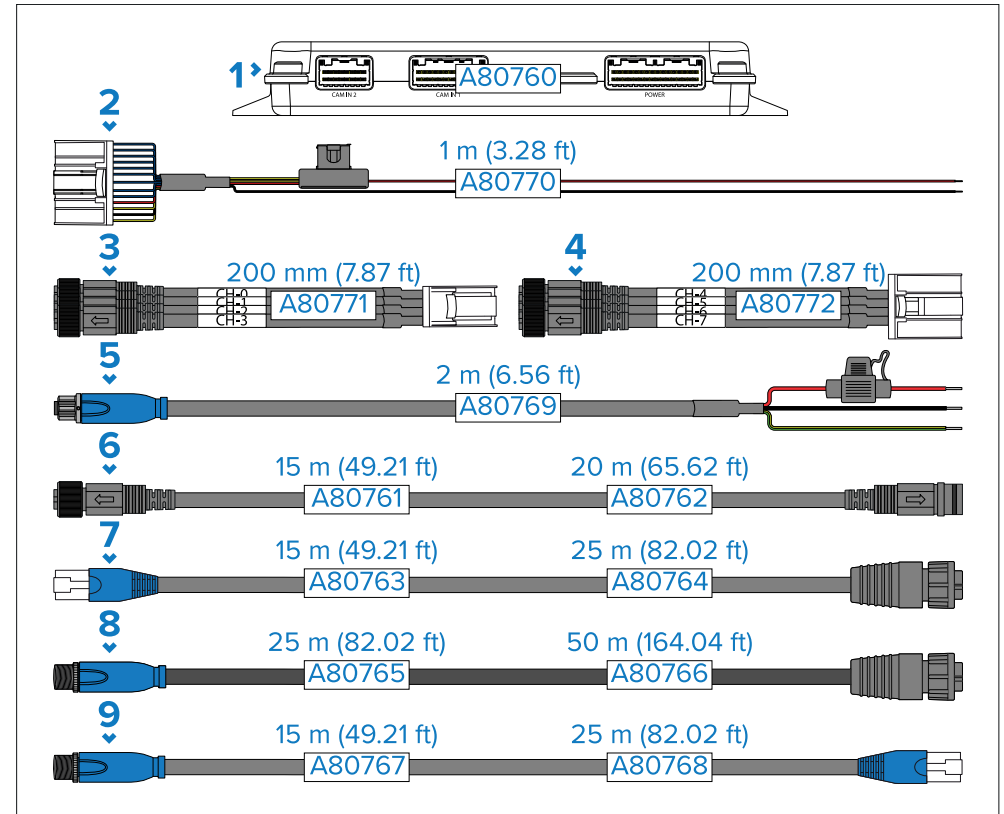
The following spares are available for your system:



1. Surround View Monitor (SVM) camera (single).
2. Object Recognition Unit (ORU).

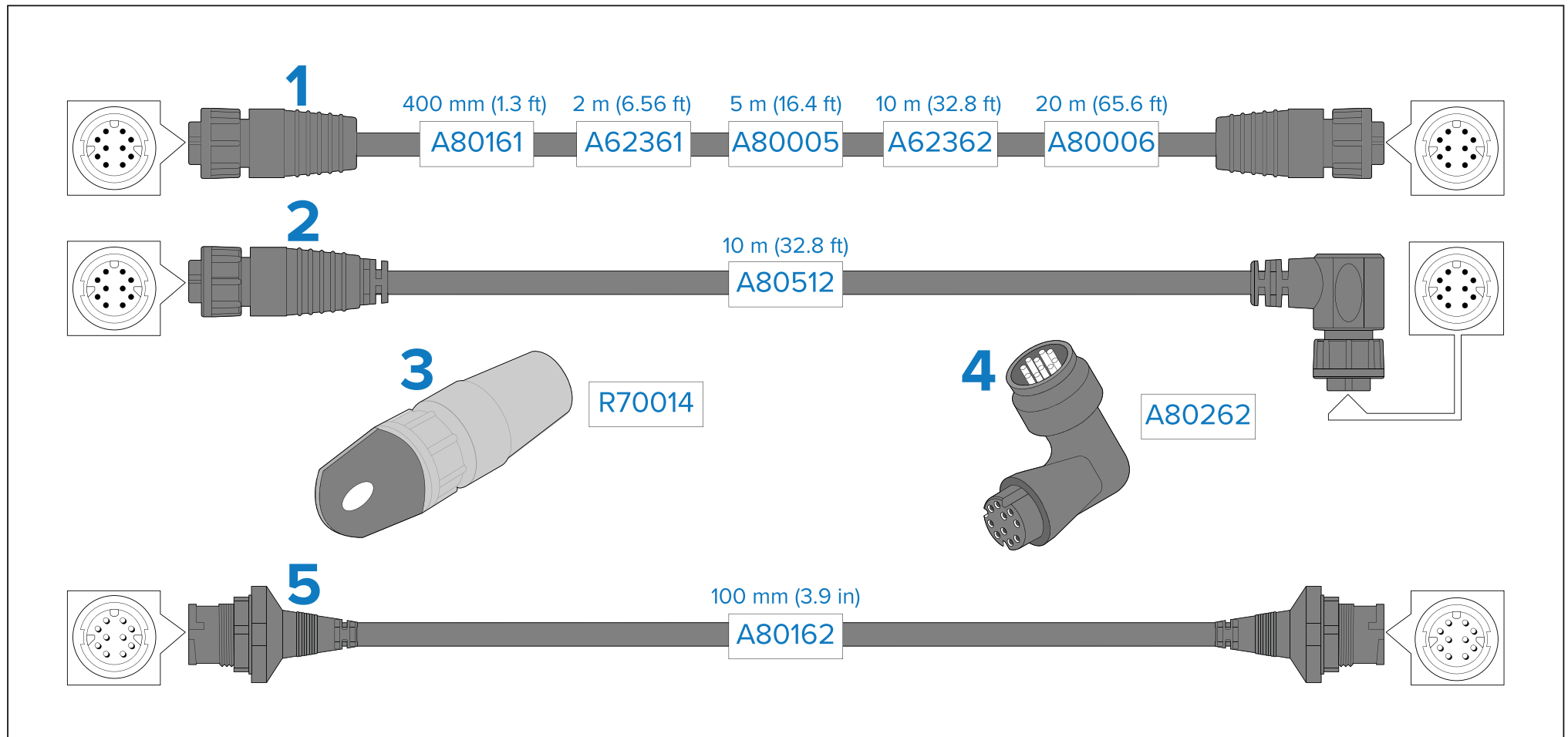
## 19.2 Accessories

The following accessories are available for your system:



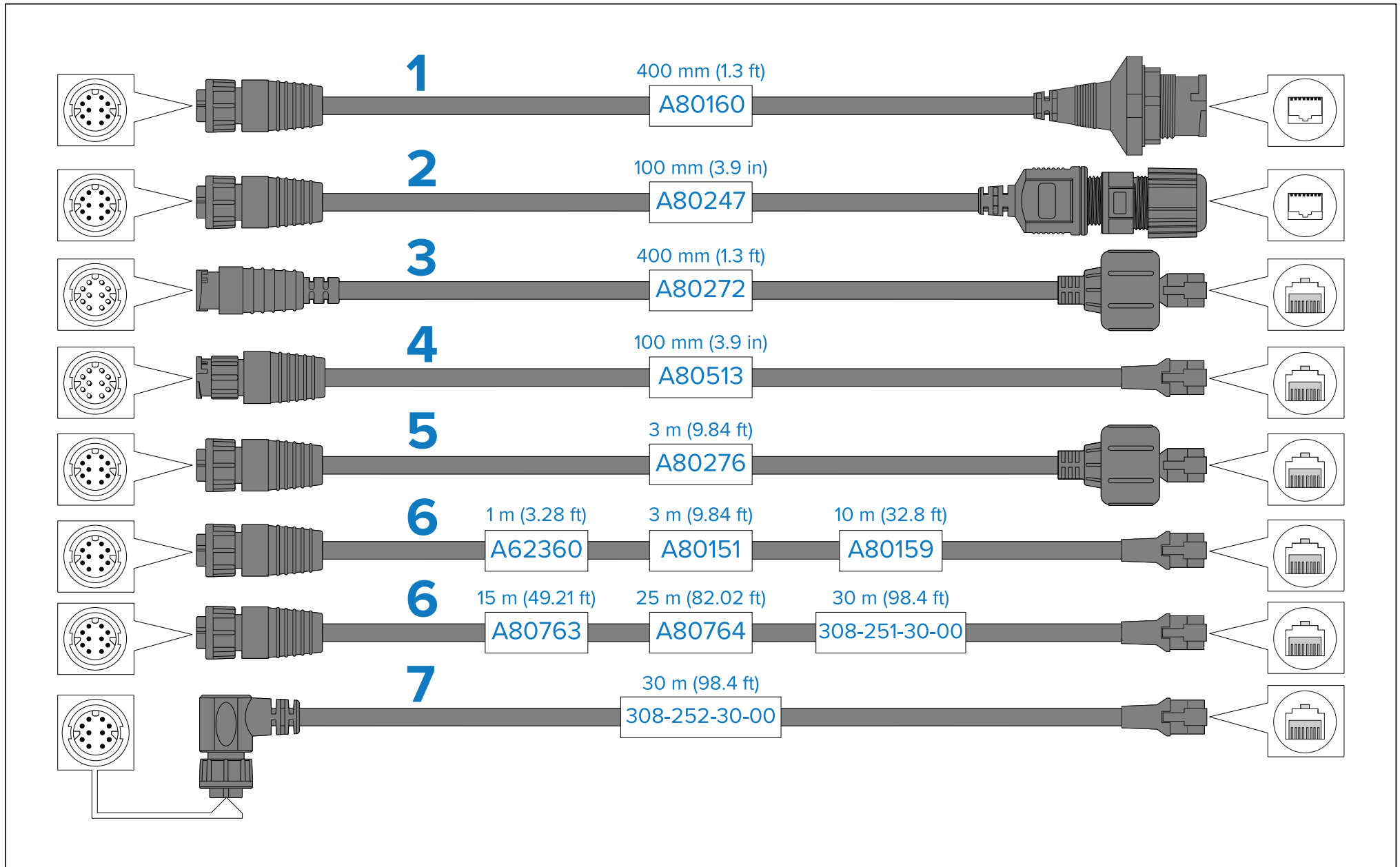
1. Camera Control Unit (CCU).
2. CCU power cable.
3. CCU camera input cable 1.
4. CCU camera input cable 2.
5. Object Recognition Unit (ORU) power cable.
6. SVM camera to CCU extension cable.
7. CCU to RayNet cable.
8. ORU to RayNet cable.
9. CCU to ORU cable.

## 19.3 RayNet to RayNet cables and connectors



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.

## 19.4 RayNet to RJ45, and RJ45 (SeaTalk HS) adapter cables



1. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalk HS) socket on the other end, accepting the following cables with an RJ45 (SeaTalk HS) waterproof locking (male) plug:
  - A62245 (1.5 m).
  - A62246 (15 m).
2. Adapter cable with a RayNet (female) socket on one end, and a waterproof (female) RJ45 (SeaTalk HS) socket on the other end, along with a locking gland for a watertight fit.
3. Adapter cable with a RayNet (male) plug on one end, and an RJ45 (SeaTalk HS) waterproof (male) plug on the other end.
4. Adapter cable with a RayNet (male) plug on one end, and an RJ45 (male) plug on the other end.
5. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (SeaTalk HS) waterproof (male) plug on the other end.
6. Adapter cable with a RayNet (female) socket on one end, and an RJ45 (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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